BRIDGE FOUNDATION INVESTIGATION (LRFD)

Courtesy Parkway Extension
Over Iris Drive, I-20 and Dogwood Drive
Rockdale County, Georgia
CSSTP-0006-00(934)
PI NO. 0006934

Initial Submittal, May 23, 2021
Revision #1, October 10, 2021

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

Atlas Project No. ROCK1701/GEO

Bridge Foundation Investigation (LRFD)
Courtesy Pkwy Extension over Iris Dr., I-20 and Dogwood Dr.
CSSTP-0006-00(934), Rockdale County
PI No. 0006934
Revision #1
October 10, 2021

LOCATION (See Map) Courtesy Parkway Extension over Iris Drive, Interstate 20 and Dogwood Drive

GENERAL INFORMATION

GEOLOGIC FORMATION This project will be geologically sited in the Biotitic Gneiss / Mica Schist/ Amphibolite (Precambrian-Paleozoic) Formation of the Georgia Piedmont Region.

SUBSURFACE FEATURES Subsurface soils consist of a layer of stiff sandy clay over medium dense to dense silty sand underlaid with very dense partially weathered rock (PWR) before the auger was refused. All borings were terminated at hard rock, which was encountered from elevations 777' to786'. Ground water was encountered from elevations 790' to 799'. 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. See Appendix E for calculation.

1.0 -- FOUNDATION RECOMMENDATIONS

Bents	Pile Footing (Type)	Pile Bent (Type)
1 and 4		Steel-HP (50ksi)
2 and 3	Steel-HP (50ksi)	

1.1 -- Pile Properties

Pile Type	Pile Size (in)	Nominal Compression Stress (ksi)	Nominal Tension Stress (ksi)	Maximum Factored Structural Resistance (kips)
HP (50 ksi)	14x89	45.0	45.0	653

Note: Pile properties are provided by structural engineer, see Appendix F

1.2 -- DESIGN LOADS

Bents	Maximum Factored Strength Limit State Load (kips)	Maximum Factored Service Limit State Load (kips)	Factored Extreme Event I Limit State Load (kips)
1 and 4	263	182	-
2 and 3	387	288	-

Note: Design loads are provided by structural engineer, see Appendix F

2.0 -- FOUNDATION LOADS

2.1 -- PILE FOUNDATION LOADS

Bents	Pile Type	Size (in)	Driving Resistance* (kips)
1 and 4	Steel-HP	14x89	405
2 and 3	Steel-HP	14x89	596

3.0 -- FOUNDATION ELEVATIONS

Bent	Minimum Tip Feet	Estimated Tip Feet
1 Lt	815	789
1 Rt	806	786
2 Lt	800	791
2 Rt	781	779
3 Lt	791	784
3 Rt	790	780
4 Lt	788	786
4 Rt	785	781

4.0 -- GENERAL NOTES

Elevations All elevations are based on an Elevation of 845.24 of a 5/8" rebar set in ground at station 137+42.47, 200.59' left.

Waiting Period None required.

Vibration Monitoring Several properties are located within 75 feet of the construction limits of this project. Vibration monitoring will be required due to vibrations from construction activities which may cause some concern with property owners. All work shall be performed in accordance with Special Provision 154: Vibration Monitoring.

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

4.1 -- PILE FOUNDATION NOTES

PDO Driving resistance after minimum tip elevations are achieved in conjunction with GDOT Standard Specification 520.3.05.D.2 and Special Provision 523 Dynamic Pile Testing. Perform one PDA test at Bent 1 Right and Bent 3 Left.

*** Nominal Bearing Resistance of Single Pile** Driving resistance is based on the following field verification method and resistance factor φ_{dyn} AASHTO LRFD 2014 (10.5.5.2.3-1):

Resistance Determination Method	Resistance Factor
Driving criteria established by dynamic testing of at least two piles per site condition, but no less than 2% of the production piles.	0.65

Piles Driven to Hard Rock The nominal resistance of piles driven to point bearing on hard rock where pile penetration into the rock formation is minimal is controlled by the structural limit state. The Nominal Driving Resistance should not exceed the Factored Structural Resistance. Dynamic pile measurements should be used to monitor for pile damage.

Drivability A drivability analysis has been completed on the above-mentioned piles to their respective estimated tips with a diesel hammer ICE 60-S, the driving stresses are within allowable limits.

Points Pile points are recommended for each pile to be driven at Bents 3Rt, 4Lt and 4Rt

Freeze Bearing Piles should not be overdriven at this site. If dynamic bearing has not been achieved by 2 feet above the Estimated Tip Elevation, pile driving should be stopped for a minimum of 24 hours and re-started with a warm hammer to check for “freeze” bearing.

Down-drag Protection To avoid inducing down-drag loads into the piles from potential settlement of compressible layers during construction of the MSE wall, we recommend that piles at Bents 1 & 4 be protected from down-drag by using jackets or other approved materials.

Temporary Shoring Shoring may be required to construct the pile footings at Bents 2 and 3 if the excavations cannot be safely sloped back.

Special Problems Erratic pile length can be expected.

5.0 – QA / QC

Prepared By: Jay Shah, Staff Engineer

Signature: _____

Reviewed By: Yong Shao, Ph.D., PE

Signature: _____

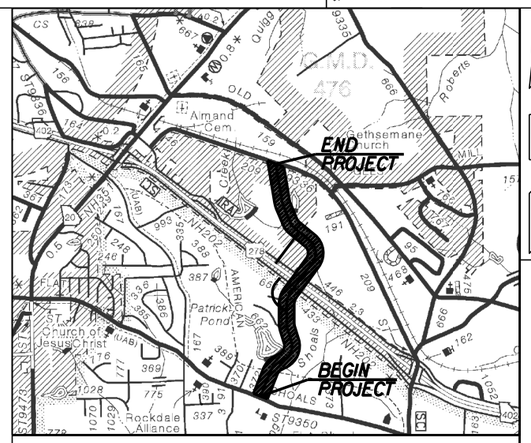
GEORGIA REGISTERED No. 26340 PROFESSIONAL ENGINEER YONG C. SHAO

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

PLAN AND PROFILE OF PROPOSED
COURTESY PKWY.EXT.FROM FLAT SHOALS RD TO OLD COVINGTON HWY.

FEDERAL AID PROJECT
CSSTP-0006-00(934)
ROCKDALE COUNTY

FEDERAL ROUTE * N/A
STATE ROUTE * N/A
P.I. NO. 0006934



LOCATION SKETCH

DESIGN DATA:	COURTESY PKWY.EXT.
TRAFFIC A.A.D.T.:	15,050 (2024)
TRAFFIC A.A.D.T.:	18,800 (2044)
TRAFFIC D.H.V.:	1,755
DIRECTIONAL DIST:	52%
% TRUCKS:	6.5%
24 HR.TRUCKS %:	3.0%
SPEED DESIGN:	35 MPH

LOCATION & DESIGN APPROVAL DATE:

FUNCTIONAL CLASS:
URBAN MINOR COLLECTOR

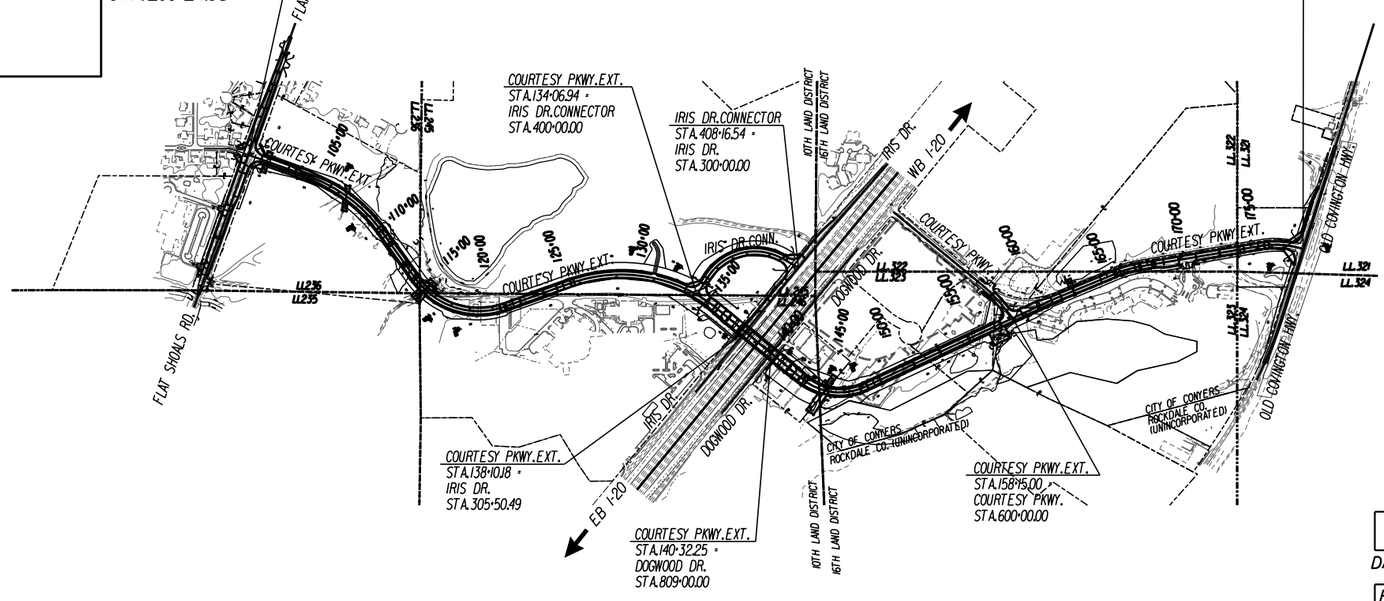
THIS PROJECT IS 100% IN ROCKDALE COUNTY AND IS 100% IN CONG.DIST.NO.4.

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.

BEGIN PROJECT
0006934
COURTESY PKWY.EXT.
STA.100+00.00 =
FLAT SHOALS RD.
STA.209+24.35

END PROJECT
0006934
COURTESY PKWY.EXT.
STA.178+13.27 =
OLD COVINGTON HWY.
STA.700+00.00



LENGTH OF PROJECT	COUNTY No.247 Project No. 0006934
	MILES
NET LENGTH OF ROADWAY	1.4356
NET LENGTH OF BRIDGES	0.0644
NET LENGTH OF PROJECT	1.5000
NET LENGTH OF EXCEPTIONS	0.0000
GROSS LENGTH OF PROJECT	1.5000

SCALE IN FEET
0 500 1000 2000

PREPARED BY:
MORELAND ALTOBELLI
— AN ATLAS COMPANY —
2450 Commerce Avenue
Suite 100
Duluth, Georgia 30096
770.263.5945

RECOMMENDED FOR APPROVAL:

STATE PROGRAM DELIVERY ENGINEER

DATE | CHIEF ENGINEER

PLANS COMPLETED - -	
REVISIONS	

DRAWING No. 01-0001

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.

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.

GRWCOV

APPENDICES

A. Special provisions

- SP 154 Construction vibration monitoring
- SP 523 Dynamic Pile Testing

B. Boring locations and logs

C. Drilling Calibration Report

D. Laboratory tests on soils

E. Seismic site class determination

F. Foundation design data

G. Pile capacity calculations with APILE

H. Drivability analysis with GRL-WEAP

I. Settlement calculations

Appendix A – Special Provisions

Revised 07/23/2014

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

PROJECT: CSSTP-0006-00(934), Rockdale County

PI No. 0006934

Section 154 — Construction Vibration Monitoring

Add the following:

154.1 General Description

This Work consists of performing preconstruction crack surveys, seismograph and other monitoring of construction vibrations, and post construction crack surveys of the buildings located on Parcels 7 adjacent to the proposed project construction on Dogwood Drive by procuring the services of a prequalified subcontractor specializing in this work.

154.1.01 Definitions

General Provisions 101 through 150.

154.1.02 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

General Provisions 101 through 150.

154.1.03 Submittals

A. Prequalification of Subcontractor

Submit the following documentation for the Engineer's review and approval a minimum of thirty days prior to beginning construction activities on the project:

Evidence of the subcontractor's successful completion of at least five projects similar in concept and scope to the proposed crack survey and vibration monitoring. Include names, addresses and telephone numbers of the owners' representatives for verification.

Résumés of employees performing this work. Provide evidence showing each employee possesses experience and knowledge similar in concept and scope of this work for performing crack surveys and installing and reading seismographs. Provide evidence that the reports will be reviewed and signed by a Georgia Licensed Professional Engineer or Georgia Licensed Professional Geologist. The Department will be sole judge of determining if employees are qualified to perform the work on this project.

A detailed survey plan, monitoring plan, and sequence of work that describes all materials, methods and equipment to be used to complete the crack survey and vibration monitoring.

B. Construction Monitoring

Submit the following documentation during construction monitoring:

Preconstruction Crack Survey Report documenting existing conditions of buildings prior to construction activities in accordance with subsection 154.3.03.B.

Monthly Seismograph Data and Data Summary Report and Activity Log of all construction activities within 500 feet (152 meters) of the seismograph in accordance with subsection 154.3.03.A.1.

Reports of building conditions regarding cracks or any other damage potentially caused by construction activities as complaints are received in accordance with subsection 154.3.03.C.

C. Post Construction

Submit a Post Construction Crack Survey Report in accordance with subsection 154.3.03.D documenting post construction condition of cracks or damage identified in the pre-construction survey and cracks or any other damage potentially caused by construction activities.

154.2 Materials

General Provision 101 through 150.

154.3 Construction Requirements

154.3.01 Personnel

Ensure all employees performing this work have been approved by the Engineer in accordance with subsection 154.1.03.A.

154.3.02 Equipment

A. Seismograph

Use a seismograph(s) that is weather proof and capable of continuously recording particle velocity in three perpendicular components with a flat response of 2-250 HZ over a range of at least 0.01 to 5.0 inches per second (0.254 to 127 mm per second). Provide a seismograph(s) that employs an internal dynamic calibration during each recording sequence and that has been shake table tested within the previous 24 months verifying an accuracy of +/- 5% over the frequency range of 4 to 125 Hertz. Provide a recorder/ software system that is capable of digitally storing and reproducing vibration levels in tabular or histogram (bar graph) form at no greater than six minute intervals.

154.3.03 Construction

Obtain Engineer's written approval of the Prequalification documents submitted in accordance with Subsection 154.1.03.A prior to beginning this work.

Perform the preconstruction crack survey prior to starting construction activities on the project.

Install and begin seismograph monitoring prior to starting excavation, shoring and backfilling construction activities on the project.

Maintain seismograph until excavation, shoring and backfilling, compaction of subgrade, base and pavement construction activities on the project are complete.

A. Seismograph Installation and Monitoring

Monitor vibrations at building(s) using seismograph(s) when construction activities including, but not limited to, excavation, shoring installation, backfilling, and compaction of subgrade, base and pavement are within 75 feet (23 meters) of the building(s), or otherwise have the potential to result in vibrations that may cause damage or complaints. Relocate seismograph(s) as needed. Protect the seismograph from weather and vandalism. Replace missing or damaged equipment at no cost to the Department. Document the following information at the time that the seismograph is installed:

Date and time of installation

Coordinates of installed instrument or Station and offset

Method of transducer attachment

Name and affiliation of the person installing the instrument

1. Monthly Seismograph Data and Data Summary Report and Activity Log:

   Compile a Monthly Seismograph Data and Data Summary Report containing the data from the seismograph and a summarization of the data showing time and magnitude of the maximum vibration that has occurred each day.

   Maintain an activity log of all construction activities within 500 feet (152 meters) of the seismograph Include the following data in each log:

   Location of construction activity

   Type of construction activity

   Types and number of construction equipment being used, including model, manufacture and weight.

   Date and times construction equipment was used.

   Submit Monthly Seismograph Data Summary Report and Activity Log to the Engineer on a monthly basis.

B. Preconstruction Crack Survey

Complete a preconstruction crack survey on the outside and inside of all buildings located on Parcels 7 Document building conditions by taking photographs and detailed notes citing location, length and width of cracks. Compile documentation into a Preconstruction Crack Survey Report and submit to the Engineer.

C. Building Monitoring

Monitor buildings during construction for any new cracks and or elongation or widening of existing cracks. Provide a report of building conditions to the Engineer regarding cracks or any other damage potentially caused by construction activities as complaints are received.

D. Post Construction Crack Survey

Complete a post construction crack survey on the outside and inside of all buildings located on Parcels: #. Document building conditions by taking photographs and detailed notes citing condition of cracks or damage identified in the pre-construction survey; also, location, length and width of cracks or any other damage potentially caused by construction activities.

154.4 Measurement

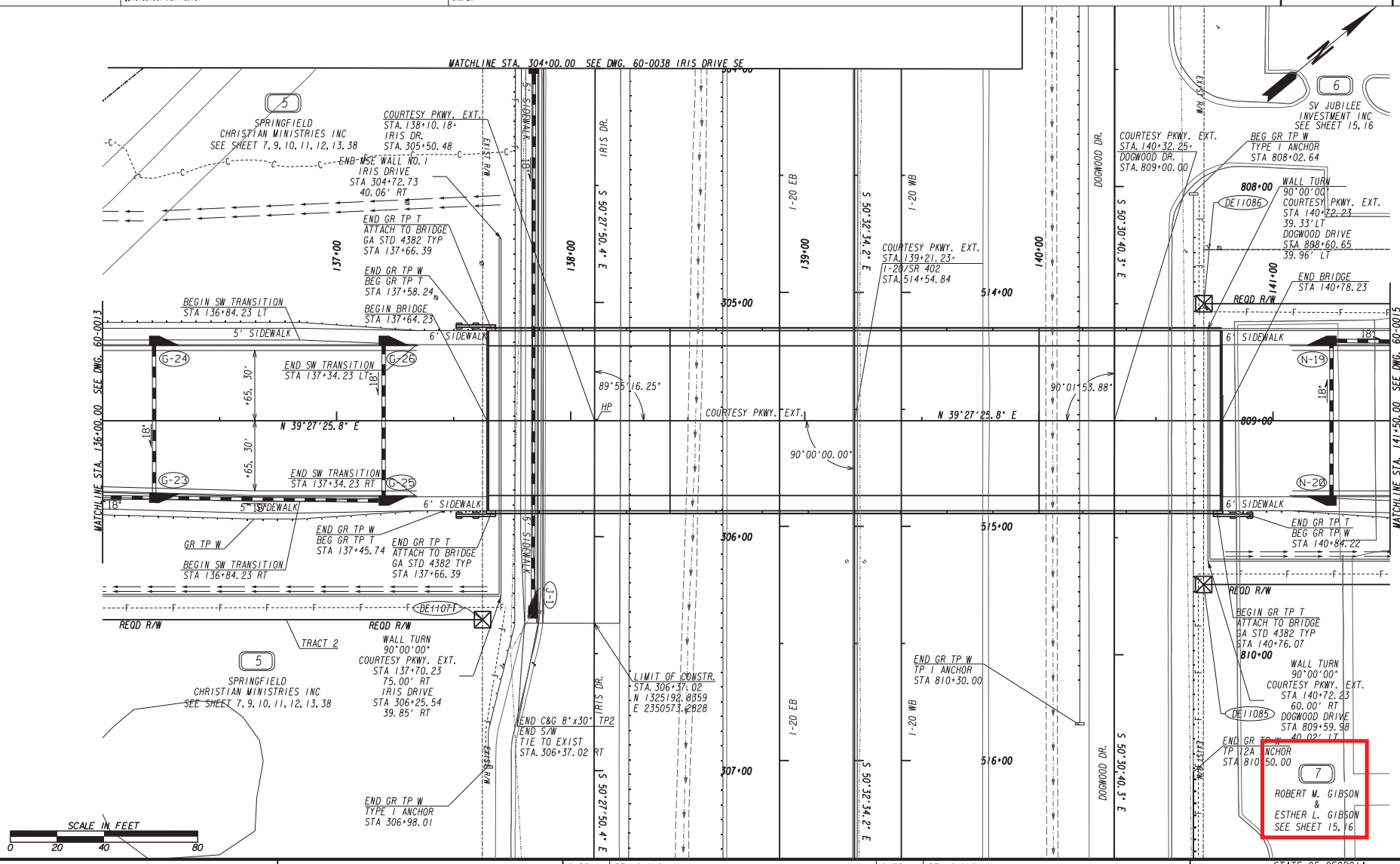
The Work under this Contract Item is not measured separately for payment.

154.5 Payment

This Contract Item completed and accepted will be paid for at the Lump Sum Price bid. Payment will be full compensation for furnishing and installing the seismograph(s), for monitoring and reporting vibration data recorded on the seismograph(s), and completing crack survey and documenting building conditions and providing copies of all data to the Engineer in accordance with this specification. Seismographs and all other measuring equipment and devices will remain property of the Contractor.

Payment will be made under:

Item No. 154	Construction Vibration Monitoring	Per Lump Sum



PROPERTY AND EXISTING R/W LINE	——℄——
REQUIRED R/W LINE	———
CONSTRUCTION LIMITS	——C——F——
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	
EASEMENT FOR CONSTR OF SLOPES	
EASEMENT FOR CONSTR OF DRIVES	

BEGIN LIMIT OF ACCESS.....BLA	
END LIMIT OF ACCESS.....ELA	
EXISTING LIMIT OF ACCESS	——ooo——
REQ'D LIMIT OF ACCESS	——ooo——
EXISTING LIMIT OF ACCESS & R/W	——|||——
REQ'D LIMIT OF ACCESS & R/W	——|||——
ORANGE BARRIER FENCE	——●—●—●——
ESA - ENV. SENSITIVE AREA	——▼——▼——

DATE	REVISIONS	DATE	REVISIONS

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

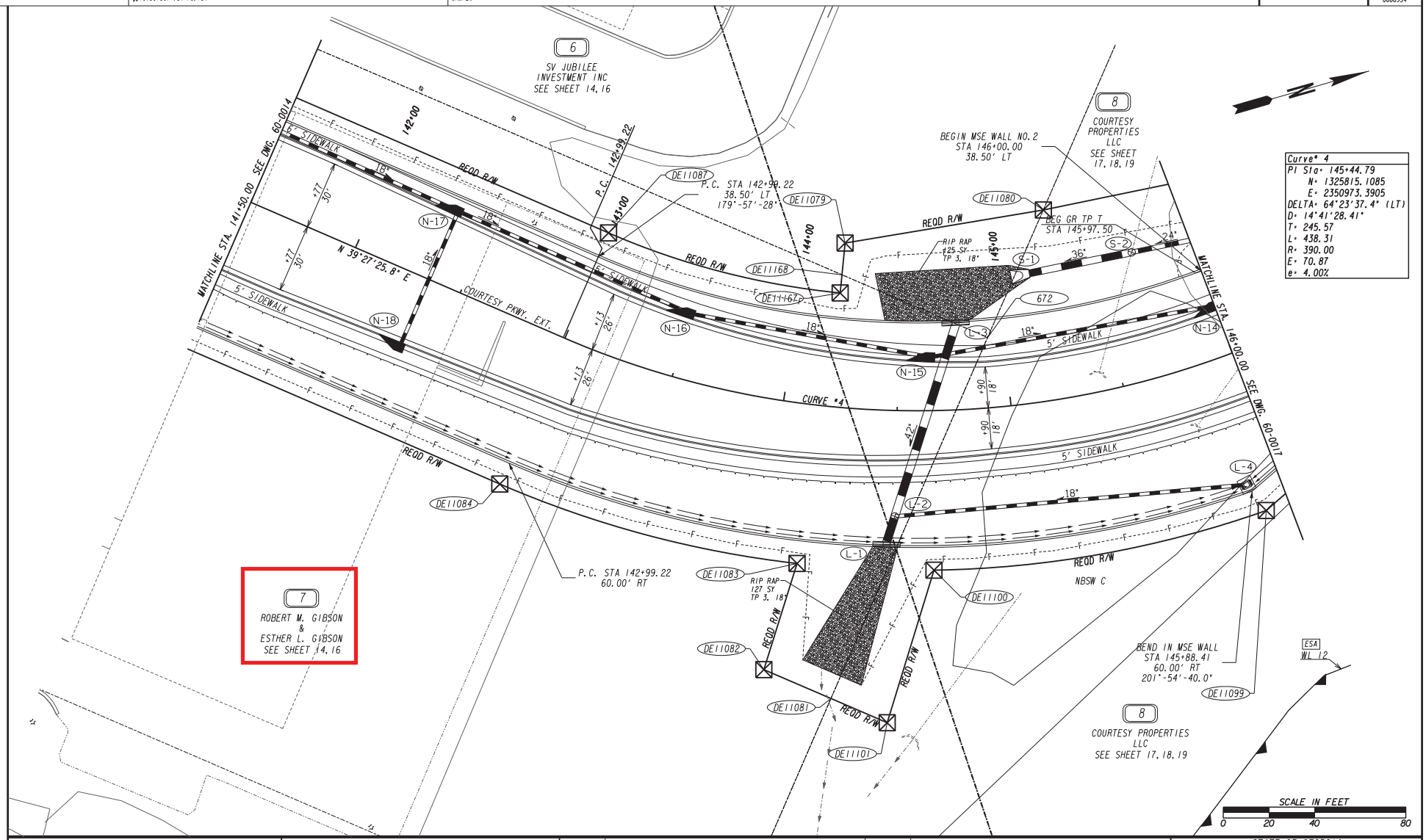
RIGHT OF WAY MAP

PROJECT NO:CSSTP-0006-00(934)
COUNTY: ROCKDALE
LAND LOT NO:246
LAND DISTRICT:10TH
GMD 476
DATE 6/18/21 SH 14 OF 45

DRAWING No. 60-0014

7/31/2015 GRMPLN

9/17/2021	GPLOT-V8	0006934_60-0015.dgn	GDOT	P. I. No.
Ben. Worden	gplotborder-V81-PO.tbl	GRMPLN		0006934



PROPERTY AND EXISTING R/W LINE	BEGIN LIMIT OF ACCESS.....BLA
REQUIRED R/W LINE	END LIMIT OF ACCESS.....ELA
CONSTRUCTION LIMITS	EXISTING LIMIT OF ACCESS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	REQ'D LIMIT OF ACCESS
EASEMENT FOR CONSTR OF SLOPES	EXISTING LIMIT OF ACCESS & R/W
EASEMENT FOR CONSTR OF DRIVES	REQ'D LIMIT OF ACCESS & R/W
	ORANGE BARRIER FENCE
	ESA - ENV. SENSITIVE AREA

DATE	REVISIONS	DATE	REVISIONS

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

RIGHT OF WAY MAP

PROJECT NO:CSSTP-0006-00(934)
COUNTY: ROCKDALE
LAND LOT NO:246, 323
LAND DISTRICT:10TH, 16TH
GMD 476
DATE 6/18/21 SH 15 OF 45

DRAWING No.
60-0015

7/31/2015 GRMPLN

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

PROJECT: CSSTP-0006-00(934), Rockdale County

PI No. 0006934

SECTION 523 - DYNAMIC PILE TESTING

523.1 General Description

The work consists of performing dynamic pile testing using the Pile Driving Analyzer (PDA) to monitor the driving of piles with accelerometer and strain gauges attached to the piles. Piles to be dynamically tested will be identified in the Special Provision or on the Plans. Prior to pile driving, the Engineer will determine production or test piles to be dynamically tested. Perform the dynamic pile testing in accordance with ASTM D4945-12.

Take dynamic measurements during driving of any required piles. Drive the pile as shown in the Special Provisions or on the Plans.

523.2 Materials

Furnish measuring instruments for dynamic pile testing. Attach instruments near the top of the piles with bolts placed in drilled holes. Furnish materials, labor and equipment necessary for installation of the instruments.

523.3 Construction Requirements

Measure wave speed prior to driving piles. Wave speed measurements will not be required for Steel H piles or metal shell piles. When wave speed measurements are performed, place the piles in a horizontal position not in contact with other piles.

Perform dynamic pile testing during driving. Modify the driving to reduce the stress and/or eliminate the damage, should the recommended stress level be exceeded or if damage occurs (determined visually or as indicated by the instrumentation).

Do not exceed the following maximum driving stresses, as determined by the dynamic pile testing:

1. For Steel piles:

   0.9 Fy, where Fy = Yield strength of steel

2. For Prestressed Concrete Piles:

   Compression:

   $\sigma_{dr} = (0.85f'_c - f_{pe})$

   Tension in Normal Environments:

   $\sigma_{dr} = (0.095\sqrt{f'_c} + f_{pe})$

   Tension in Severe Corrosive Environments:

   $\sigma_{dr} = \varphi_{da} f_{pe}$

   where;
   σ_{dr} = maximum allowed driving stress, ksi
   $f'c$= specified minimum 28-day compressive strength of concrete, ksi
   fpe= effective prestress in concrete, ksi, (after all losses) at the time of driving taken as 0.78 times the initial prestress force

Re-drive friction piles that do not obtain bearing after a freeze period of a minimum of 24 hours or for a period designated on the Plans, whichever is longer. Reset the gauges if required. Re-strike the pile with a warm hammer until a maximum penetration of 3 inches (76 mm) or 40 blows is reached, whichever occurs first. The Engineer may modify the Pile Driving Objective based on the results of the PDA work.

Provide two weeks' notice prior to the driving of designated piles and cooperate with the Engineer in connection with the performance of Dynamic Pile Testing.

Provide a complete report consisting of but not limited to PDA field monitoring data, results of CAPWAP computer analyses, and recommendations such as pile lengths, hammer fuel setting, and valid driving criteria. Valid driving criteria is defined as having the required hammer having a hammer set greater than 3 blows per inch and less than 10 blows per inch at the driving resistance for that pile. Submit the report electronically in PDF format and the electronic data files of the PDA analysis and CAPWAP to the Geotechnical Bureau and allow seven (7) calendar days for review and approval before proceeding with driving production piles.

523.4 Measurement

The Dynamic Pile Tests performed in accordance with these Specifications will be counted separately for payment. (Refer to plans summary sheet for the required amount of PDA testing.)

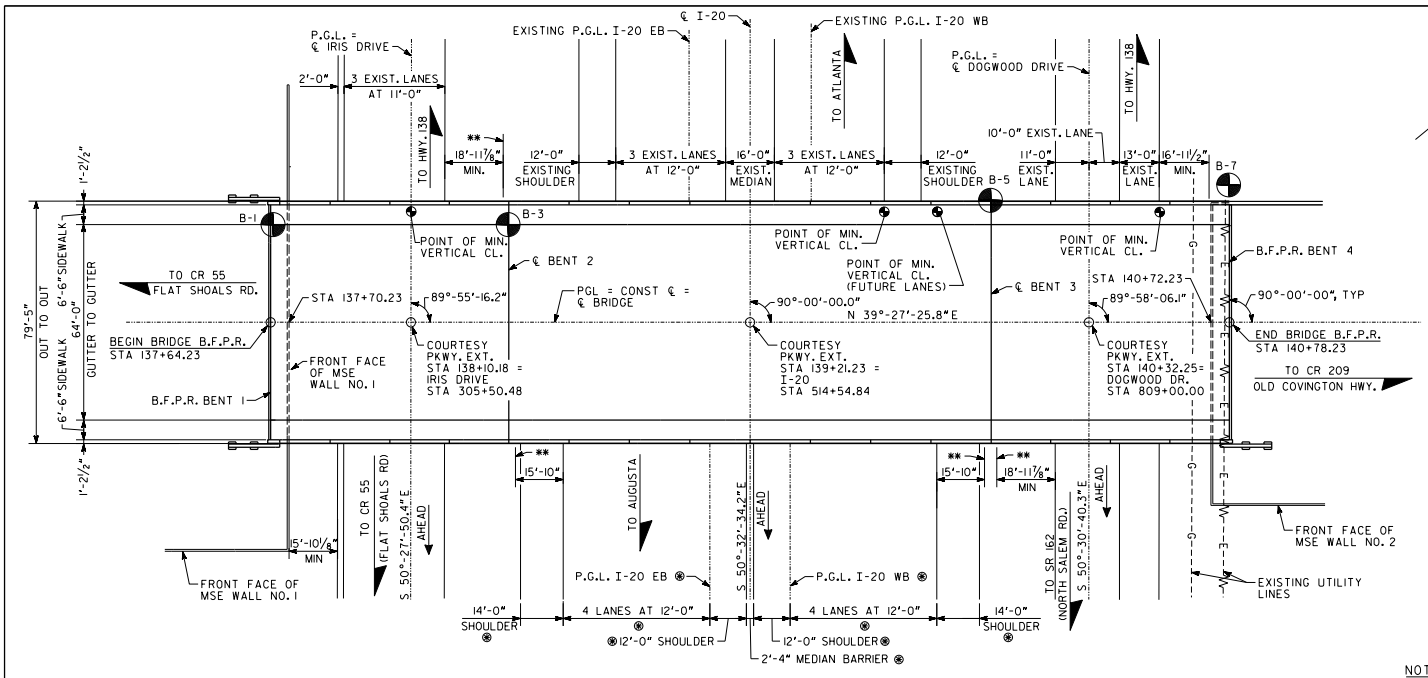
523.5 Payment

The Dynamic Pile Test completed and accepted will be paid for at the Contract unit Price. This payment will be full compensation for all costs of complying with this specification, including incidentals, additional work, and any delays incurred in conjunction therewith.

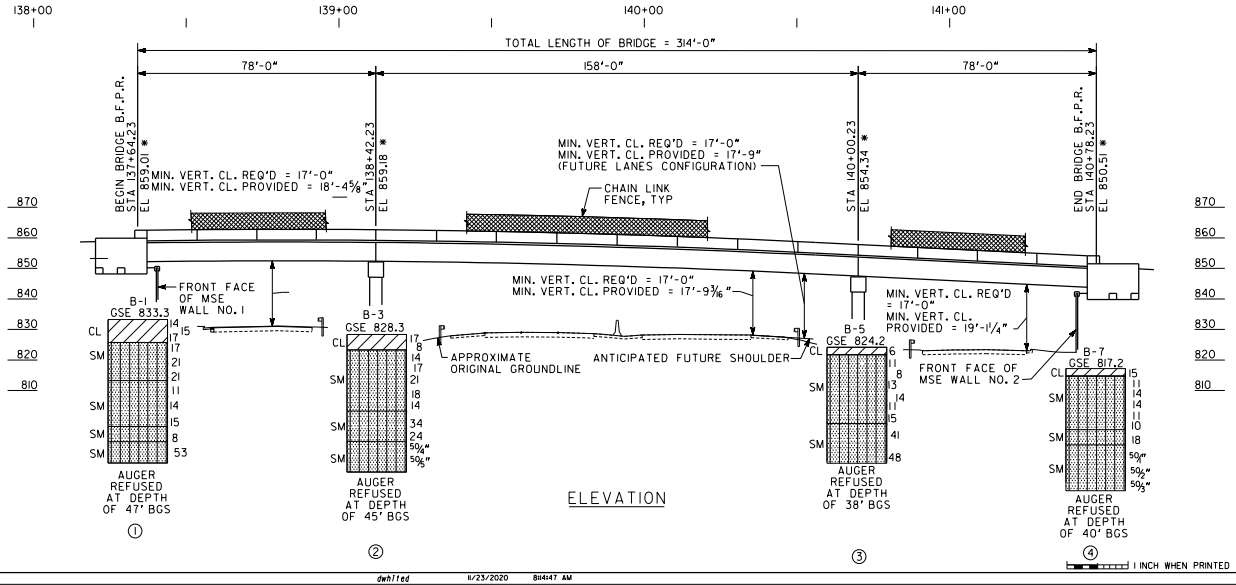
Payment will be made under:

Item No. 523. Dynamic Pile Test_____ . . . . . Per Each

Appendix B – Boring locations and boring logs



PLAN



ELEVATION

1 INCH WHEN PRINTED FULL SIZE

PROPOSED BRIDGE CONSISTS OF

2 - 78'-0" AASHTO TYPE III, PSC BEAM SPANS
WITH BULB TEE, 74 IN, PSC FASCIA BEAMS ----- SPECIAL DESIGN
1 - 158'-0" BULB TEE, 74 IN, PSC BEAM SPAN ------ SPECIAL DESIGN
2 - PILE END BENTS WITH MSE WALL ABUTMENTS --- SPECIAL DESIGN
2 - CONCRETE INTERMEDIATE BENTS ---------- SPECIAL DESIGN
CHAIN LINK WIRE FENCE

DESIGN DATA

SPECIFICATION ---------- AASHTO LRFD 7TH EDITION, 2014
DESIGN VEHICLE LIVE LOAD ---------- HL-93
FUTURE PAVING ALLOWANCE ---------- 30 LBS PER SQ FT

TRAFFIC DATA

TRAFFIC ---------- ADT = 10,600 (2024)
ADT = 13,250 (2044)
DESIGN SPEED ---------- 35 MPH
TRUCKS ---------- 6.5%
24-HR TRUCKS ---------- 3%
DIRECTIONAL ---------- 50/50%

EXISTING UTILITIES

OVERHEAD ELECTRICAL ---------- GA POWER
(TO BE RELOCATED)
4" UNDERGROUND STEEL GAS LINE ---------- AGL
(TO BE RELOCATED)

NOTES:

* STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ℄ BENTS.

** FACE OF COLUMN.

⊗ FUTURE CONFIGURATION.

1. PROPOSED BRIDGE TO BE BUILT ON A NORMAL CROWN OF 2%.
2. ALL BENTS ARE PARALLEL TO BENT 4.
3. DECK DRAIN SYSTEM REQUIRED.
4. END BENT PILES NOT SHOWN.
5. FUTURE VERTICAL CLEARANCE BASED ON ASSUMED NORMAL CROWN OF 2%.

PROPOSED UTILITIES

NO UTILITIES ON BRIDGE

BENCHMARK DATA

⅝" REBAR SET IN GROUND
N: 1325323.12
E: 2350308.64
EL: 845.24
STA: 137+42.47
OFFSET: 200.59' LT

P.I. NO. 0006934

PROJECT P.I. NO. 0006934
BRIDGE NO. 1

ATLAS
3400 Commerce Avenue, Suite 100
Duluth, Georgia 30096-8910
Tel.: (770) 822-0845
orsatlas.com

GEORGIA
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION-OFFICE OF BRIDGES AND STRUCTURES

GEOTECH BORINGS - LEFT
COURTESY PARKWAY EXTENSION
OVER IRIS DRIVE, INTERSTATE 20,
AND DOGWOOD DRIVE

ROCKDALE COUNTY CSSTP-0006-00(934)

SCALE: 1" = 20'-0", UNLESS OTHERWISE NOTED JUNE 2020

DESIGNED TAC CHECKED KFD REVIEWED DLC/SKG
DRAWN JJK DESIGN GROUP JRT APPROVED WMD

GEORGIA REGISTERED 43404 PROFESSIONAL ENGINEER KEVIN F. DASCALL

DRAWING NO. 35-0002
BRIDGE SHEET 2 OF 2

REVISIONS | DATE | BY

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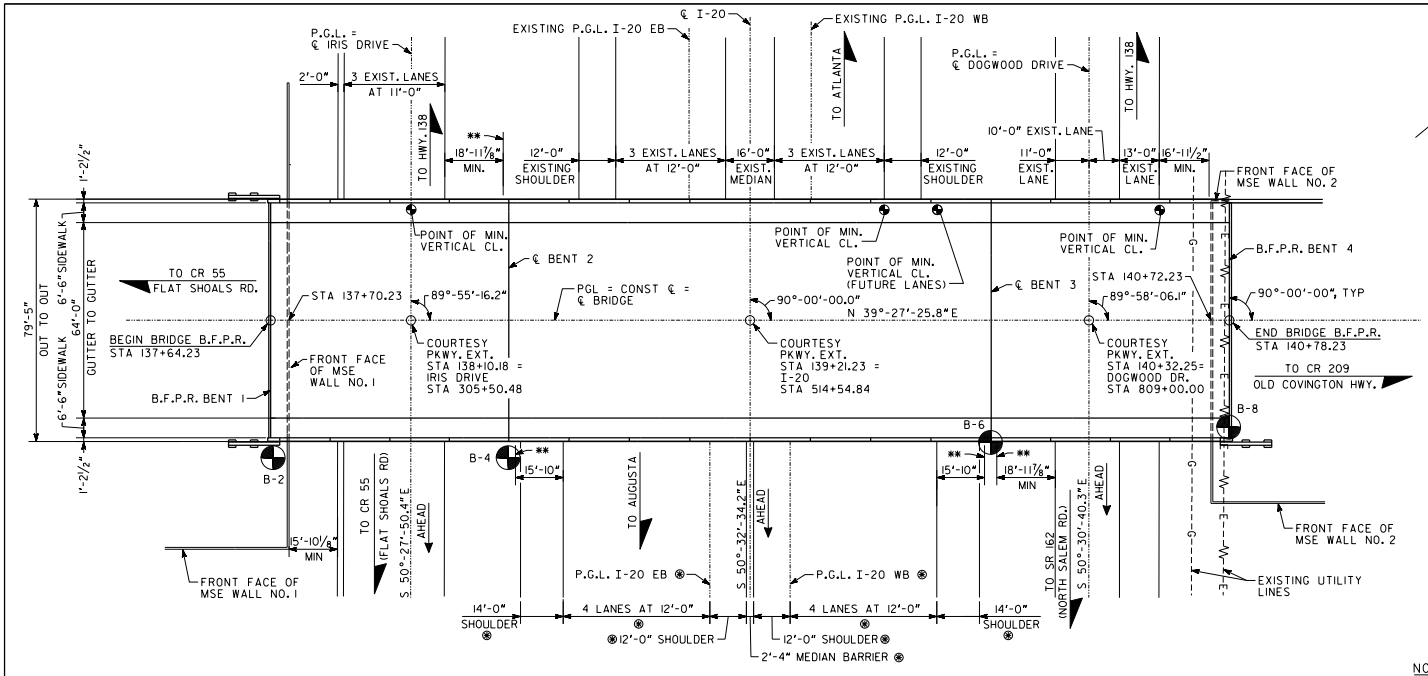

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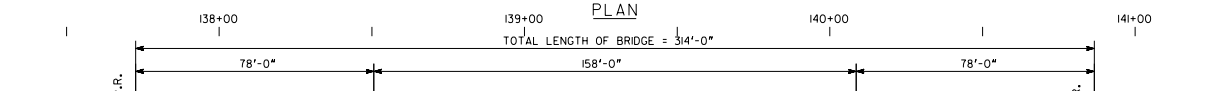
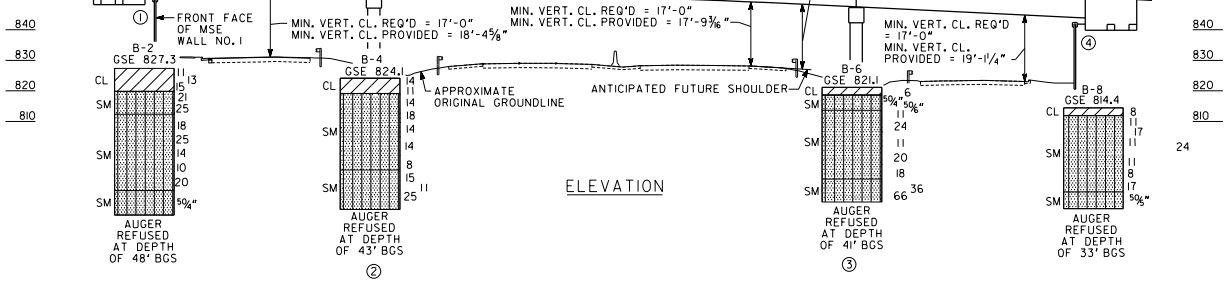
(TO BE RELOCATED)
4" UNDERGROUND STEEL GAS LINE ---------- AGL
(TO BE RELOCATED)

PLAN





ELEVATION

NOTES:

* STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ℄ BENTS.

** FACE OF COLUMN.

⊗ FUTURE CONFIGURATION.

1. PROPOSED BRIDGE TO BE BUILT ON A NORMAL CROWN OF 2%.
2. ALL BENTS ARE PARALLEL TO BENT 4.
3. DECK DRAIN SYSTEM REQUIRED.
4. END BENT PILES NOT SHOWN.
5. FUTURE VERTICAL CLEARANCE BASED ON ASSUMED NORMAL CROWN OF 2%.

PROPOSED UTILITIES

NO UTILITIES ON BRIDGE

BENCHMARK DATA

⅝" REBAR SET IN GROUND
N: 1325323.12
E: 2350308.64
EL: 845.24
STA: 137+42.47
OFFSET: 200.59' LT

PROJECT P.I. NO. 0006934
BRIDGE NO. 1

ATLAS
2400 Commerce Avenue Suite 100
Duluth, Georgia 30096-8910
Tel.: (770) 822-0845
orsatlas.com

GEORGIA
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION-OFFICE OF BRIDGES AND STRUCTURES

GEOTECH BORINGS - RIGHT
COURTESY PARKWAY EXTENSION
OVER IRIS DRIVE, INTERSTATE 20,
AND DOGWOOD DRIVE

ROCKDALE COUNTY CSSTP-0006-00(934)

SCALE: 1" = 20'-0", UNLESS OTHERWISE NOTED JUNE 2020

DESIGNED TAC CHECKED KFD REVIEWED DLC/SKG
DRAWN JJK DESIGN GROUP JRT APPROVED WMD

GEORGIA REGISTERED #34014 PROFESSIONAL ENGINEER KEVIN F. DASCALL

DRAWING NO. 35-0001
BRIDGE SHEET 1 OF 2

DATE | REVISIONS | BY

1 INCH WHEN PRINTED FULL SIZE

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

B-1: Sta. 137+65, 32' Lt (Bent 1 Left)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/11/2019	SURFACE ELE.	: 833.3'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 47'
DRILLING METHOD	: HSA / Auto Hammer	DEPTH TO WATER	: 38.5'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF CAP ELE.	: 850'+/-

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. 833.3	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0											
2	832	CL		Brown, SANDY CLAY, stiff to very stiff, slightly moist,	4-5-5	14		SS			
4	830				3-5-6	15		SS			
6	828				5-5-7	17		SS			
8	826	SM		Grey/brown, SILTY SAND, medium dense, slightly moist,	4-5-7	17		SS			
10	824										
12	822										
14	820				3-7-8	21		SS			
16	818										
18	816										
20	814				5-7-8	21		SS			
22	812	SM		Grey/orange, SILTY SAND, medium dense, slightly moist,							
24	810				4-4-4	11		SS			
26	808										
28	806				3-5-5	14		SS			
30	804										
32	802										
34	800				3-5-6	15		SS			
36	798	SM		Dark grey, SILTY SAND, loose,very moist							
38	796										
40	794				3-3-3	8		SS			
42	792	SM		Grey/white, SILTY COARSE SAND, very dense.							
44	790				14-16-22	53		SS			
46	788										
48	786			Auger refused at depth of 47' BGS							
50	784										
52	782										
54	780										

NOTE: SPT-N values have been corrected with 84% ER

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

B-2: Sta. 137+65, 45' Rt (Bent 1 Right)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/11/2019	SURFACE ELE.	: 827.3'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 48'
DRILLING METHOD	: HSA / Auto Hammer	DEPTH TO WATER	: 35'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF CAP ELE.	: 850'+/-

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. 827.3	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0, 50, 100)	Sampler Type	Sample	Moist, %	Water Level
0											
2	826	CL		Brown, SILTY CLAY, stiff, slightly moist	2-3-5	11		SS			
4	824				3-4-5	13		SS			
6	822				4-5-6	15		SS			
8	820	SM		Grey/white, SILTY COARSE SAND, medium dense, slightly moist	6-6-9	21		SS			
10	818										
12	816										
14	814				8-8-10	25		SS			
16	812	SM		Grey/orange, SILTY COARSE SAND, medium dense, moist							
18	810										
20	808				4-6-7	18		SS			
22	806										
24	804				7-8-10	25		SS			
26	802										
28	800										
30	798				3-4-6	14		SS			
32	796										
34	794				2-3-4	10		SS			▼
36	792										
38	790										
40	788				5-6-8	20		SS			
42	786	SM		Grey/brown, SILTY COARSE SAND, very dense, PWR							
44	784				50/4"	50/4"		SS			
46	782										
48	780			Auger refused at depth of 48' BGS							
50	778										
52	776										
54	774										

NOTE: SPT-N values have been corrected with 84% ER.

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

B-3: Sta. 138+42, 35' Lt (Bent 2 Left)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/12/2019	SURFACE ELE.	: 828.3'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 45'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 29'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF FTG ELE.	: 818'+/-

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. 828.3	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	Sampler Type	Sample
0	828	CL		Brown, SILTY CLAY, firm to stiff, slightly moist	3-6-6	17	SS	
2	826							
4	824				2-3-3	8	SS	
6	822	SM		Grey/brown, SILTY SAND, medium dense, slightly moist	3-5-5	14	SS	
8	820							
Btm, of Ftg 10	818				4-6-6	17	SS	
12	816							
14	814				6-7-8	21	SS	
16	812							
18	810				5-6-7	18	SS	
20	808							
22	806							
24	804				5-5-5	14	SS	
26	802	SM		Grey, SILTY SAND, medium to dense, moist				
28	800							
30	798				10-11-13	34	SS	
32	796							
34	794				8-8-9	24	SS	
36	792	SM		Grey/white, SILTY COARSE SAND, very dense, PWR				
38	790							
40	788				50/4"	50/4"	SS	
42	786							
44	784				50/5"	50/4"	SS	
46	782			Auger refused at depth of 45' BGS				
48	780							
50	778							
52	776							
54								

N Value Graph: 0 50 100

Moist, %

Water Level

NOTE: SPT-N values have been corrrected with 84% ER.

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

B-4: Sta. 138+42, 45' Rt (Bent 2 Right)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/12/2019	SURFACE ELE.	: 824.1'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 43'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 29'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF FTG ELE.	: 818'+/-

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. 824.1	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0	824										
2	822	CL		Brown, SILTY CLAY, stiff, slightly moist	3-3-7	14		SS			
4	820				4-4-4	11		SS			
Btm. of Ftg. 6	818	SM		Grey/brown, SILTY SAND, medium dense, moist	3-5-5	14		SS			
8	816				4-6-7	18		SS			
10	814										
12	812										
14	810				7-5-4	14		SS			
16	808										
18	806				3-5-5	14		SS			
20	804										
22	802										
24	800				2-3-3	8		SS			
26	798	SM		Grey, SILTY COARSE SAND, medium dense							
28	796				3-5-6	15		SS			
30	794										
32	792										
34	790				3-4-4	11		SS			
36	788										
38	786										
40	784				6-8-10	25		SS			
42	782										
44	780			Auger refused at depth of 43' BGS							
46	778										
48	776										
50	774										
52	772										
54											

NOTE: SPT-N values have been corrected with 84% ER.

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

B-5: Sta. 140+00, 40' Lt (Bent 3 Left)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/15/2019	SURFACE ELE.	: 824.2'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 38'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 30'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF FTG ELE.	: 815'+/-

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. 824.2	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0	824	CL		Brown, SILTY CLAY, firm, slightly moist	2-2-2	6		SS			
2	822										
4	820	SM		Grey/brown, SILTY SAND, loose to medium dense, moist	3-4-4	11		SS			
6	818				3-3-3	8		SS			
8	816										
Btm. of Ftg. 10	814				3-4-5	13		SS			
12	812										
14	810				3-5-5	14		SS			
16	808										
18	806				4-4-4	11		SS			
20	804										
22	802										
24	800				4-5-6	15		SS			
26	798	SM		Grey, SILTY COARSE SAND, dense, slightly moist							
28	796										
30	794				10-12-17	41		SS			▼
32	792										
34	790				13-15-19	48		SS			
36	788										
38	786			Auger refused at depth of 38' BGS							
40	784										
42	782										
44	780										
46	778										
48	776										
50	774										
52	772										
54											

NOTE: SPT-N values have been corrected with 84% ER.

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

B-6: Sta. 140+00, 40' Rt (Bent 3 Right)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/15/2019	SURFACE ELE.	: 821.1'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 41'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 29'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF FTG ELE.	: 815'+/-

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. 821.1	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0	820	CL		Brown, SILTY CLAY, firm, slightly moist	2-2-2	6		SS			
2	818	SM		Grey/orange, SILTY COARSE SAND, with some gravel, very dense, moist	50/4"	50/4"		SS			
4	816										
Btm. of Ftg. 6	814				50/6"	50/6"		SS			
8	812	SM		Grey/brown, SILTY COARSE SAND, medium dense, slightly moist	4-4-4	11		SS			
10	810										
12	808										
14	806				7-8-9	24		SS			
16	804										
18	802				3-4-4	11		SS			
20	800										
22	798										
24	796				6-7-7	20		SS			
26	794										
28	792				5-6-7	18		SS			
30	790	SM		Grey/orange, SILTY COARSE SAND, dense to very dense							
32	788										
34	786				9-11-15	36		SS			
36	784										
38	782										
40	780				13-20-27	66					
42	778			Auger refused at depth of 41' BGS.							
44	776										
46	774										
48	772										
50	770										
52	768										
54											

NOTE: SPT-N vaules have been corrected with 84% ER.

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

B-7: Sta. 140+78, 45' Lt (Bent 4 Left)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/16/2019	SURFACE ELE.	: 817.2'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 40'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 24'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF CAP ELE.	: 841'+/-

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. 817.2	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0–2	816	CL		Orange, SILTY CLAY, stiff, slightly moist	3-5-6	15		SS			
2–4	814	SM		Grey/brown, SILTY SAND, medium dense, slightly moist	4-4-4	11		SS			
4–6	812				5-5-5	14		SS			
6–8	810				3-5-5	14		SS			
8–10	808										
10–12	806				4-4-4	11		SS			
12–14	804										
14–16	802				3-3-4	10		SS			
16–18	800										
18–20	798				6-6-7	18		SS			▼
20–22	796	SM		Dark grey, SILTY COARSE SAND, medium dense, slightly moist							
22–24	794										
24–26	792	SM		Grey/brown/white, SILTY COARSE SAND, very dense, PWR	50/1"	50/1"		SS			
26–28	790										
28–30	788				50/2"	50/2"		SS			
30–32	786										
32–34	784										
34–36	782				50/2"	50/2"		SS			
36–38	780										
38–40	778										
40–42	776			Auger refused at depth of 40' BGS							
42–44	774										
44–46	772										
46–48	770										
48–50	768										
50–52	766										
52–54	764										

NOTE: SPT-N values have been corrected with 84% ER

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

B-8: Sta. 140+78, 35' Rt (Bent 4 Right)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

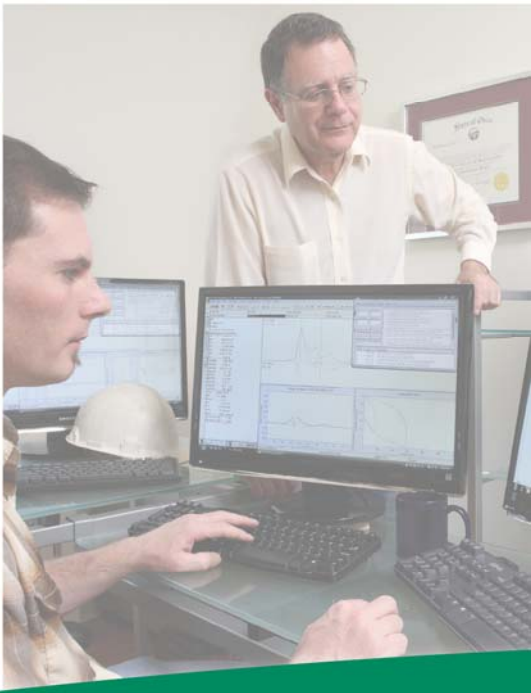
DATE COMPLETED	: 7/16/2019	SURFACE ELE.	: 814.4'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 33'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 24'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BTM OF CAP ELE.	: 841'+/-

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. 814.4	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0, 50, 100)	Sampler Type	Sample	Moist, %	Water Level
0	814	CL		Brown, SILTY CLAY, firm, slightly moist	3-3-3	8		SS			
2	812										
4	810	SM		Grey, SILTY SAND, loose to medium dense, slightly moist	6-4-4	11		SS			
6	808				4-5-7	17		SS			
8	806										
10	804				4-4-4	11		SS			
12	802										
14	800				6-5-3	11		SS			
16	798										
18	796				2-3-3	8		SS			
20	794										
22	792										
24	790				5-6-6	17		SS			▼
26	788	SM		Grey/brown, SILTY COARSE SAND, very dense, moist, PWR.							
28	786				50/5"	50/5"		SS			
30	784										
32	782										
34	780			Auger refused at depth of 33' BGS							
36	778										
38	776										
40	774										
42	772										
44	770										
46	768										
48	766										
50	764										
52	762										
54											

NOTE: SPT-N values have been corrected with 84% ER

Appendix C – Drilling Calibration Report



GRL engineers, inc.

Dynamic Measurements and Analyses

Job No. 199001-1

Report on: Standard Penetration Test Energy Measurements
Jonesboro, GA

Prepared for Kilman Bros, INC.

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

June 20, 2019

June 20, 2019

Mr. John Kilman
Kilman Bros. Inc.
110 Grayson Industrial Pkwy
Grayson, GA 30017

Re: Standard Penetration Test Energy Measurements
Jonesboro, GA GRL Job No. 199001-1

Dear Mr. Kilman,

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 Diedrich D-50 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 Big Dog Geotech, 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 # 8971)

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 55 (Serial # 1504)

SPT energy measurements were made on an automatic hammer mounted on a CME 55 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

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.

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

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 8971	330	84	309 – 367	78 – 97
CME 55 SN 1504	325	86	302 – 343	82 – 93

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 8971 drill rig. This corresponds to a transfer efficiency ranging from 78 to 97% 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 55 SN 1504 drill rig. This corresponds to a transfer efficiency ranging from 82 to 93% of the SPT hammer energy of 350 ft-lbs.

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

   CME 550 SN 8971: Average EFV = 330 ft-lbs; Average ETR = 84%

   CME 55 SN 1504: Average EFV = 325 ft-lbs; Average ETR = 86%

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 A

An Introduction into SPT Dynamic Pile Testing

APPENDIX A
AN INTRODUCTION INTO SPT DYNAMIC PILE TESTING

1. BACKGROUND

The Standard Penetration Test is frequently conducted as an in-situ assessment of soil strength. This test requires that a 140 lb weight is dropped 30 inches onto a drive rod at whose bottom a sampler is usually installed. The sampler is driven for 18 inches; the number of blows required for the last 12 inches of driving is the so-called N-value. The N-value may be used as a strength indicator for foundation design or as a means of assessing the liquefaction potential of soils.

Obviously, the SPT hammer efficiency is an important consideration when using the N-values for design purposes. Measurements have indicated that the energy in the drive rod is sometimes only 30% and and may reach 90% of the potential or rated energy of the SPT hammer (E-rated = 0.35 kip-ft or 0.475 kJ). The type of hammer used to drive the rod is the main reason for these variations. On the average, the energy in the drive rod is 60% of the standard rated energy.

Because of the variability of energy, methods based on N-values are considered unreliable. However, measurements during SPT testing using the Case Method can be done on a routine basis and these measurements yield the transferred energy values. With measured energy, EMX, known, an adjustment of the measured N-value, N_m, can be made as follows.

$$N_{60} = N_m [E_m / (0.6E_r)] \quad (1)$$

Thus, if the measured energy value is equal to the normally expected transferred energy of 60% of E-rated then the adjusted and measured N-values are identical. On the other hand, if the measured energy is only 30% then the adjusted blow count will be reduced by 50%.

2. DYNAMIC TESTING AND ANALYSIS METHODS APPLIED TO SPT

The Case Method of dynamic pile testing, named after the Case Institute of Technology where it was developed between 1964 and 1975, requires that a substantial ram mass (e.g. a pile driving hammer) impacts the pile top such that the pile undergoes at least a small permanent set. Thus, the method is also referred to as a “High Strain Method”. The Case Method requires dynamic measurements on the pile or shaft under the ram impact and then a calculation of various quantities. Conveniently, for SPT applications, the measurements and analyses are done by a single piece of equipment: the SPT Analyzer. The Pile Driving Analyzer® (PDA) is also suitable to perform these measurements and data processing.

A related analysis method is the “Wave Equation Analysis” which calculates a relationship between bearing capacity, pile stresses, transferred energy and field blow count. The GRLWEAP™ program performs this analysis and provides a complete set of helpful information and input data. This program can be used very effectively to simulate the SPT driving process.

3. MEASUREMENTS

GRL uses equipment manufactured by Pile Dynamics, Inc. The system includes either an SPT-Analyzer™ (SPTA) or a Pile Driving Analyzer® (PDA), an instrumented rod section and two accelerometers. SPT energy testing is very closely related to and borrows procedures from dynamic pile testing. Those interested in the basis of the SPT energy testing method may obtain extensive literature on dynamic pile testing from GRL Engineers, Inc.

3.1 SPT Analyzer or Pile Driving Analyzer

The basis for the results calculated by the SPTA or PDA are strain and acceleration measured in an instrumented rod section. These signals are converted to rod top force, F(t), and rod top velocity, v(t). The SPTA or PDA conditions, calibrates and displays these signals and immediately computes average pile force and velocity thereby eliminating bending effects. The product of these two

measurements is then integrated over time which yields the energy transferred to the instrumented section as a function of time (see Section 4.1).

For convenience and accuracy, strain measurements are usually taken on an instrumented section of SPT drive rod. Ideally, the section properties of the instrumented rod and those of the drive rod are the same, however, using subs, other sections can also be utilized.

For the instrumented section, PDI provides a force calibration in such a way that the output of the instrumented rod is directly calculated without the need for an accurate elastic modulus or cross sectional area of the rod section.

The acceleration measurements are often demanding in the SPT environment, because of high frequency and high acceleration motion components. An experienced measurement engineer, therefore, has to evaluate the quality of this data before final conclusions are drawn from the numerical results calculated by SPTA or PDA.

SPTA or PDA records are taken while the standard N-value is acquired in the conventional manner. This then allows a direct correlation between N-value and average transferred energy.

3.2 HPA

The SPT hammer's ram velocity may be directly obtained using radar technology in the Hammer Performance Analyzer™. The impact velocity results can be automatically processed with a PC or recorded on a strip chart. HPA measurements yield a hammer kinetic energy, but not the energy transferred to the drive rod.

4 RECORD EVALUATION BY SPTA OR PDA

4.1 HAMMER PERFORMANCE

The PDA calculates the energy transferred to the pile top from:

$$E(t) = {}_0\int^t F(\tau)v(\tau)\, d\tau \qquad (2)$$

The maximum of the E(t) curve is often called **ENTHRU or EMX;** it is the most important quantity for an overall evaluation of the performance of a hammer and driving system. **EMX** allows for a classification of the hammer's performance when presented as, e_T, the rated transfer efficiency, also called energy transfer ratio (**ETR**) or global efficiency.

$$e_T = EMX/E_R \qquad (3)$$

where E_R is the hammer manufacturer's rated energy value or 0.35 kip-ft (0.475 kJ) in the case of the SPT hammer.

Often in the SPT literature one finds also reference to the EF2 energy. This evaluation is based on assumed proportionality between force and velocity (see also Section 5):

$$v(t) = F(t) / Z \qquad (4)$$

where Z = EA/c is the pile impedance, E is the elastic modulus, A is the cross sectional area and c is the speed of the stress wave in the pile material..

Combining equations 2 and 4 leads to

$$EF(t) = {}_0\int^t F(\tau)^2 / Z\, d\tau \qquad (5)$$

The EF2 transferred energy value is the EF-value at the time t = 2L/c, where L is the drive rod length and c is the stress wave speed in steel (16,800 ft/s or 5,124 m/s). Since the force is easier to measure than both force and velocity, Equation 5 is preferred by some test engineers. However, the EF method is fraught with errors and certain correction factors have to be applied to make it approximately correct. Among the error sources are the following:

- Proportionality is often violated prior to time 2L/c. The proportionality between force and velocity in a downward traveling wave only holds if the wave does not encounter a disturbance prior to reflecting off the pile toe. Such disturbances include a change in cross sectional area, an open or loose splice or joint, or resistance along the shaft.

- Using only one force measurement precludes a data quality check based on the proportionality between force and velocity. Thus, a force measurement that is for some reason in error may not be detectable, which will lead to errors in the EF2 value. Data quality checks will be discussed further in Section 5.

The use if EF2 is therefore not recommended but it is often included in result presentations for the sake of completeness.

4.2 STRESSES

During SPT monitoring, it is also of interest to monitor compressive stresses at both the top of the drive rod and at its bottom.

At the pile top (location of sensors) the maximum compression stress averaged over the rod's cross section, **CSX**, is directly obtained from the measurements. Note that this stress value refers to the instrumented section. If the rod has a different cross sectional area then the stress in the rod will be different from CSX.

The SPTA or PDA can also calculate, in an approximate manner, the force at the rod bottom, **CFB**. To obtain the corresponding stress, this force value should be divided by the appropriate cross sectional area, e.g. by the rod area just above the sampler or by the sampler area itself. Of course, non-uniform stress components as they might occur at the sampler tip due to a sloping rock are not considered in this calculation.

5. DATA QUALITY CHECKS

Quality data is the first and foremost requirement for accurate dynamic testing results. It is therefore important that the measurement engineer performing SPTA or PDA tests has the experience necessary to recognize measurement problems and take appropriate corrective action should problems develop. Fortunately, dynamic pile testing allows for certain data quality checks because two independent measurements are taken that have to conform to the so-called proportionality relationship.

As long as there is only a wave traveling in one direction, as is the case during impact when only a downward traveling wave exists in the rod, force and velocity measured at its top are proportional

$$F = v\,Z \qquad (5)$$

where Z is again the pile impedance, Z = EA/c. This relationship can also be expressed in terms of stress

$$\sigma = F/A = v\,(E/c) \qquad (6)$$

or strain

$$\epsilon = \sigma/E = v / c \qquad (7)$$

This means that the early portion of strain times wave speed must be equal to the velocity unless the proportionality is affected by high friction near the pile top or by a pile cross sectional change not far below the sensors. Checking the proportionality is an excellent means of assuring meaningful measurements but is only truly meaningful for perfectly uniform rods. Open or loose splices, for example, will lead to a non-proportionality. For SPT rods it is fortunate that usually no soil resistance acts along the shaft and for that reason, proportionality can exist until the stress wave returns from sampler top or rod bottom unless connectors are not sufficiently tightened or have a significant mass.

Velocity data quality can also be checked by looking at the final displacement, DFN, which is calculated from the acceleration by double integration. If the calculated final displacement is much higher or lower than indicated by the N-value, the accelerometer attachment may be loose or the sensor may be faulty. If major drift in the velocity is observed, the EMX value may be in error, even though proportionality from impact to time 2L/c exists. In this case, it may be useful to evaluate the energy transferred to the drill rod at time 2L/c, which is calculated by the PDA or SPTA as the E2E quantity.

Appendix D – Laboratory tests of soils

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

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*137+65, 32' Left*	Broing No.	B-1	Sample Depth:	*3.5'-5'*
Date Sampled:	*7/11/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Brown mica 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	*99.6*
No.20	0.3346	0.85	*92.4*
No.40	0.1673	0.425	*77.8*
No.60	0.0984	0.25	*69.2*
No.100	0.0591	0.15	*56.6*
No.200	0.0295	0.075	*48.6*
% Clay	0.0079	0.02	47.6

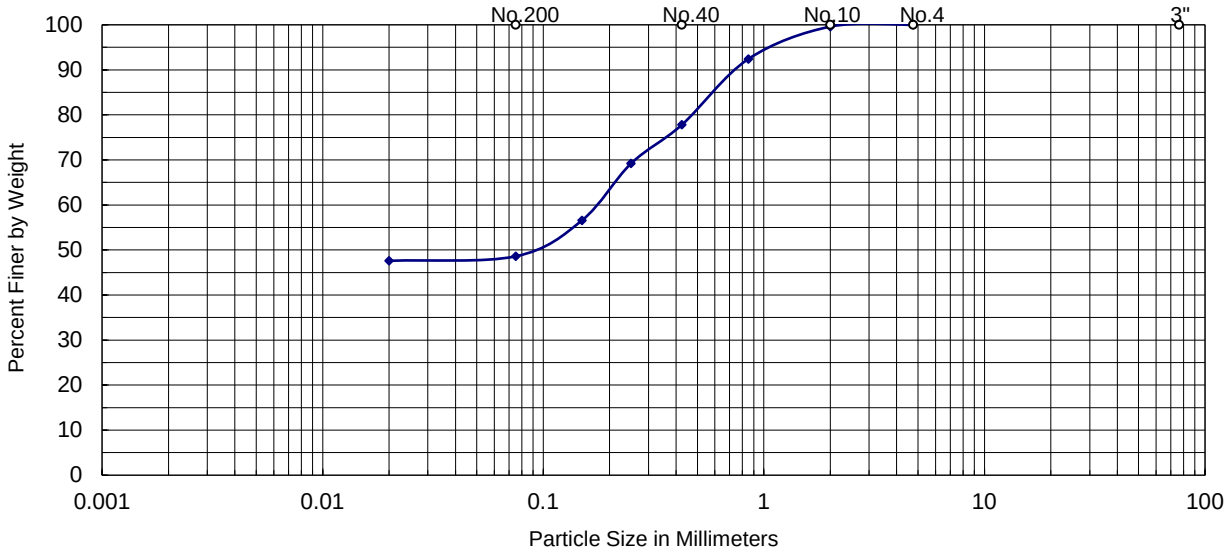
Atterberg Limits

Liquid limit (LL)	*57*
Plastic Limit (PL)	*45*
Plasticity Index (PI)	*12*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.358
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

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Duluth, Georgia 30096
Tel: 770-2635945
Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*137+65, 32' Left*	Broing No.	B-1	Sample Depth:	*18.5'-20'*
Date Sampled:	*7/11/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Light Grey mica 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	*98.8*
No.20	0.3346	0.85	*85.8*
No.40	0.1673	0.425	*65.8*
No.60	0.0984	0.25	*53.0*
No.100	0.0591	0.15	*36.4*
No.200	0.0295	0.075	*24.4*
% Clay	0.0079	0.02	22.6

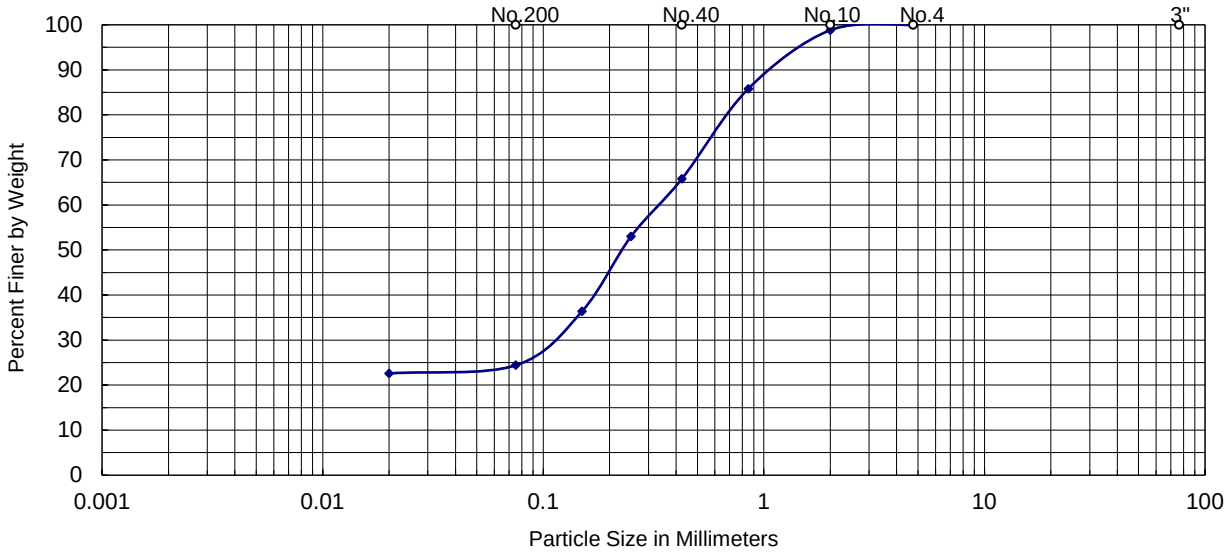
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.585
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*137+65, 45' Right*	Broing No.	B-2	Sample Depth:	*3.5'-5'*
Date Sampled:	*7/11/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Light brown/Grey mica silty sand with some rock*				

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	*99.0*
No.20	0.3346	0.85	*85.8*
No.40	0.1673	0.425	*68.6*
No.60	0.0984	0.25	*57.0*
No.100	0.0591	0.15	*40.8*
No.200	0.0295	0.075	*28.2*
% Clay	0.0079	0.02	24.2

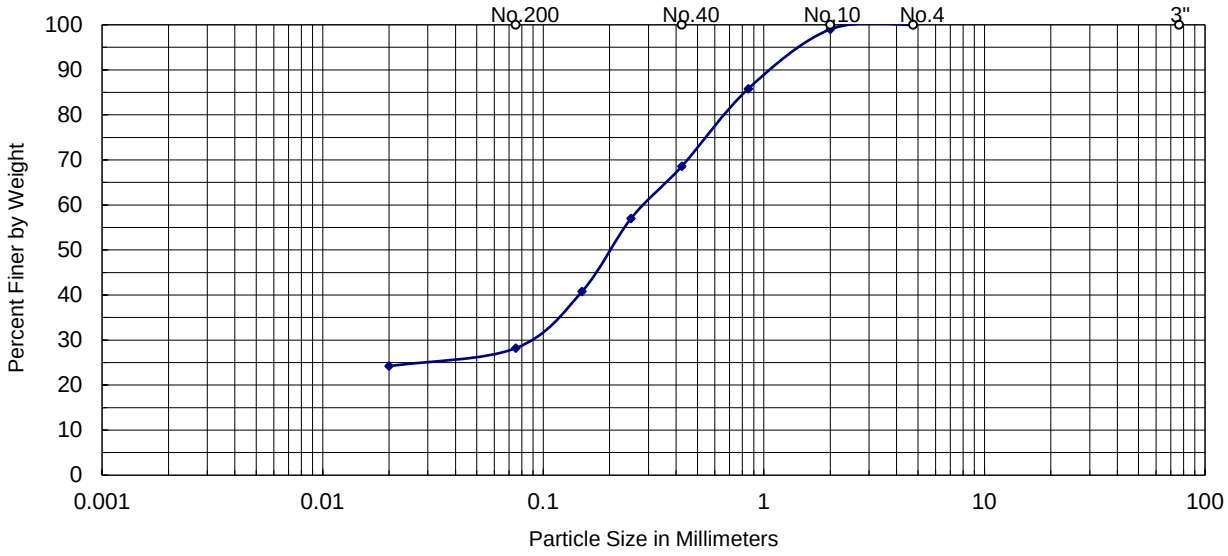
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.550
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*137+65, 45' Right*	Broing No.	B-2	Sample Depth:	*6'-7.5'*
Date Sampled:	*7/11/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*White/ Light Grey mica 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	*99.2*
No.20	0.3346	0.85	*88.0*
No.40	0.1673	0.425	*70.4*
No.60	0.0984	0.25	*60.0*
No.100	0.0591	0.15	*44.2*
No.200	0.0295	0.075	*31.6*
% Clay	0.0079	0.02	29.4

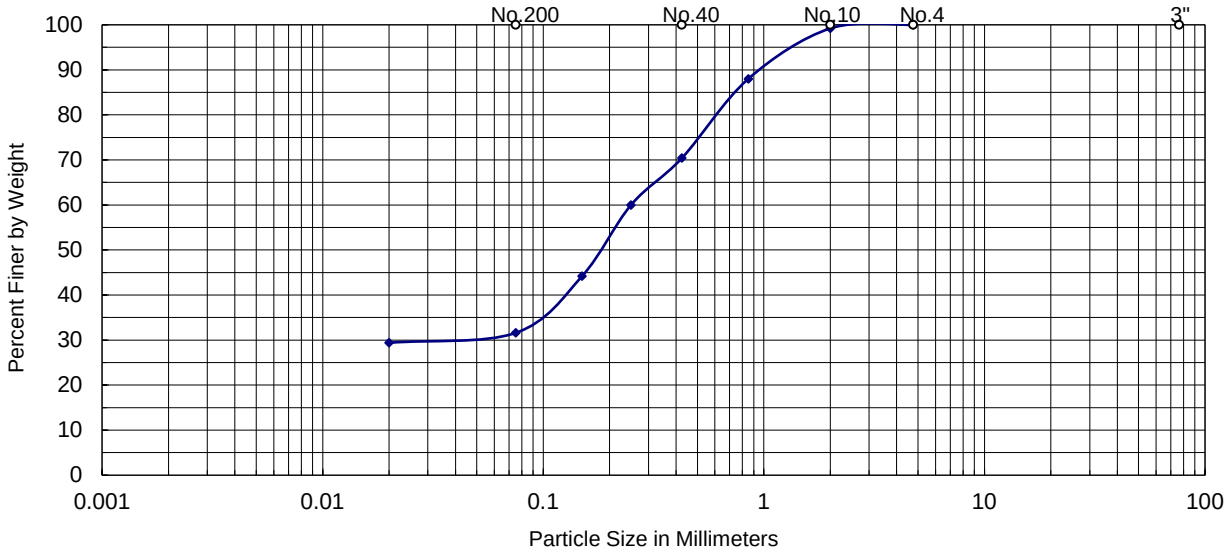
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.509
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*137+65 , 45' Right*	Broing No.	B-2	Sample Depth:	*18.5'-20'*
Date Sampled:	*7/11/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Grey mica 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	*98.0*
No.20	0.3346	0.85	*84.6*
No.40	0.1673	0.425	*66.6*
No.60	0.0984	0.25	*55.6*
No.100	0.0591	0.15	*40.0*
No.200	0.0295	0.075	*28.8*
% Clay	0.0079	0.02	27

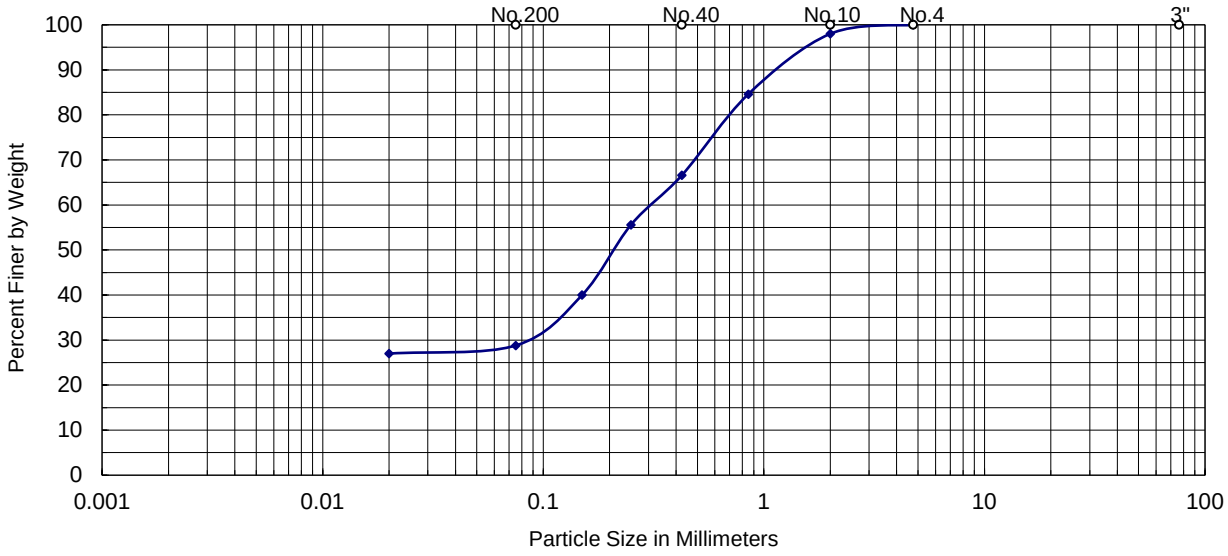
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.587
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

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USCS	SM - Silty sand
GDOT	

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Duluth, Georgia 30096
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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*138+42, 35' Left*	Broing No.	B-3	Sample Depth:	*3.5' -5'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Brown mica 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	*98.4*
No.20	0.3346	0.85	*87.0*
No.40	0.1673	0.425	*75.0*
No.60	0.0984	0.25	*65.8*
No.100	0.0591	0.15	*51.0*
No.200	0.0295	0.075	*37.8*
% Clay	0.0079	0.02	34

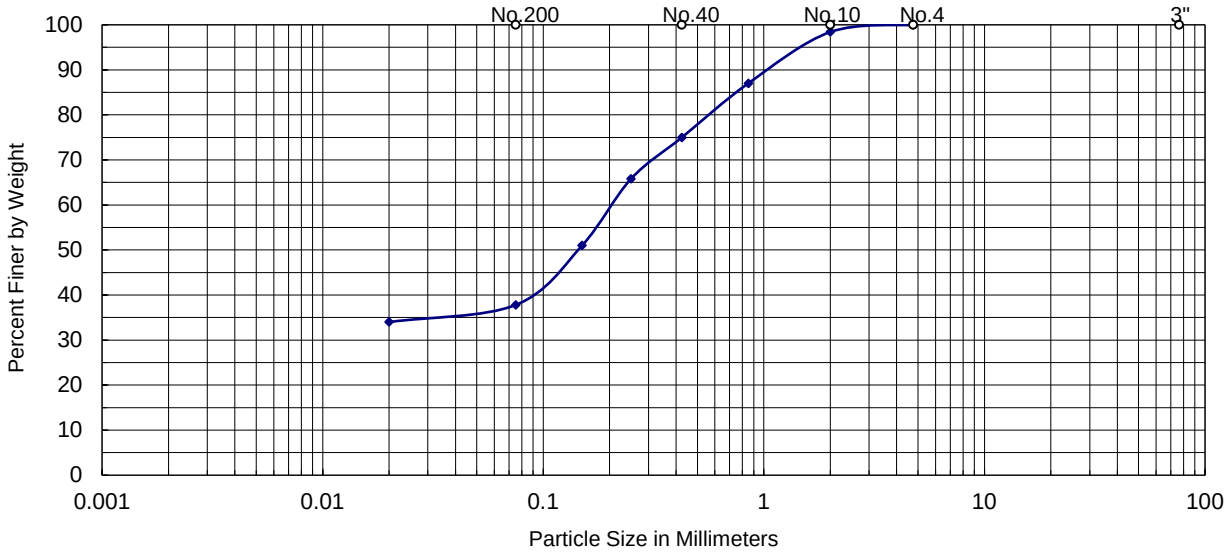
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.4250
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

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

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*138+42, 35' Left*	Broing No.	B-3	Sample Depth:	*13.5'-15'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Light Grey mica 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	*97.2*
No.20	0.3346	0.85	*82.4*
No.40	0.1673	0.425	*63.8*
No.60	0.0984	0.25	*52.6*
No.100	0.0591	0.15	*37.4*
No.200	0.0295	0.075	*26.2*
% Clay	0.0079	0.02	24.6

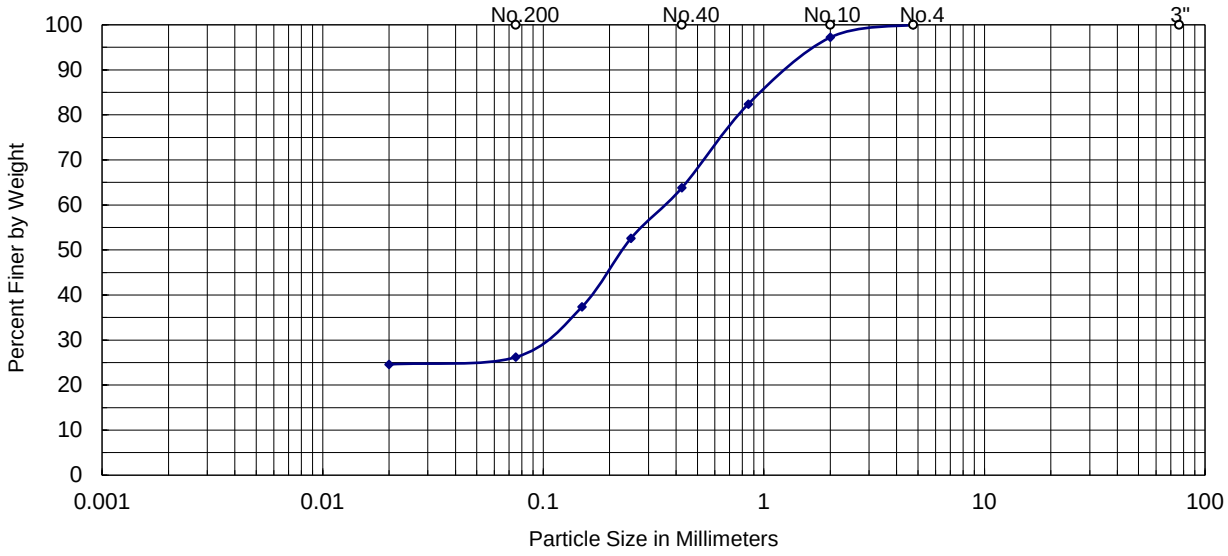
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.6451
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*138+42, 35' Left*	Broing No.	B-3	Sample Depth:	*28.5'-30'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Grey/White mica 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	*94.6*
No.20	0.3346	0.85	*74.2*
No.40	0.1673	0.425	*55.0*
No.60	0.0984	0.25	*46.0*
No.100	0.0591	0.15	*33.0*
No.200	0.0295	0.075	*24.4*
% Clay	0.0079	0.02	23.4

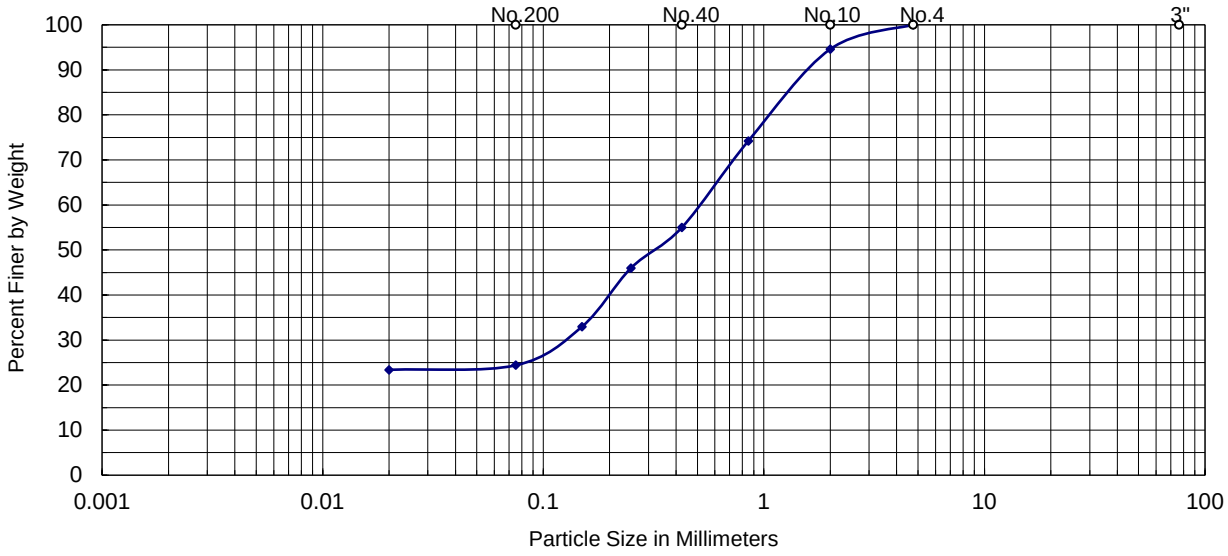
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.8790
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*138+42, 45' Right*	Broing No.	B-4	Sample Depth:	*3.5'-5'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Grey mica 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	*98.8*
No.20	0.3346	0.85	*86.0*
No.40	0.1673	0.425	*69.2*
No.60	0.0984	0.25	*54.6*
No.100	0.0591	0.15	*38.4*
No.200	0.0295	0.075	*27.2*
% Clay	0.0079	0.02	25.2

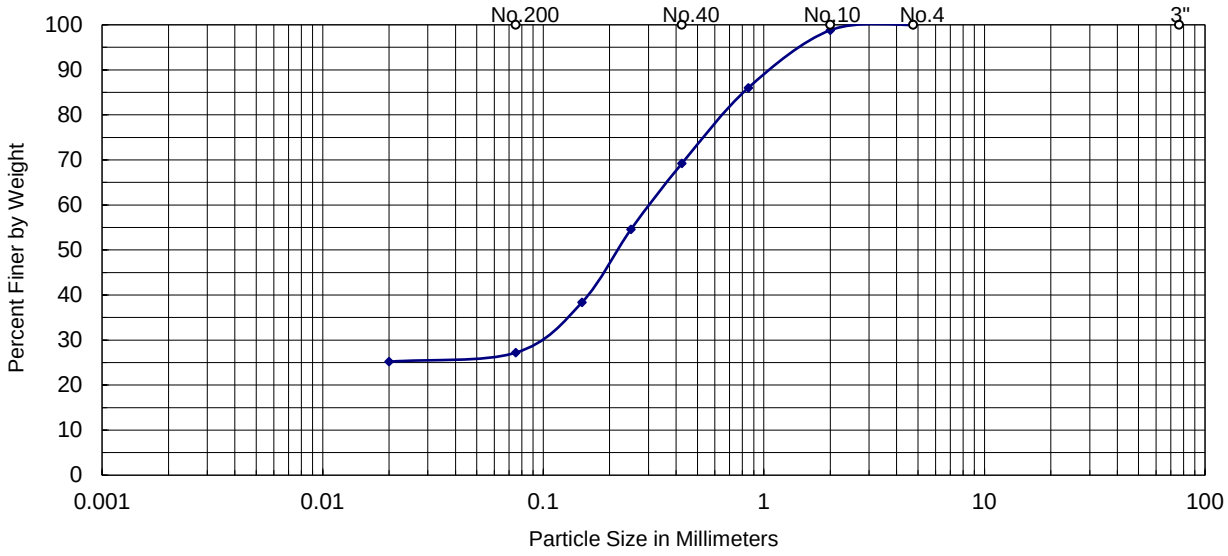
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.540
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*138+42, 45' Right*	Broing No.	B-4	Sample Depth:	*8.5'-10'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Grey mica 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	*99.4*
No.20	0.3346	0.85	*88.6*
No.40	0.1673	0.425	*73.2*
No.60	0.0984	0.25	*59.2*
No.100	0.0591	0.15	*42.2*
No.200	0.0295	0.075	*30.2*
% Clay	0.0079	0.02	28.2

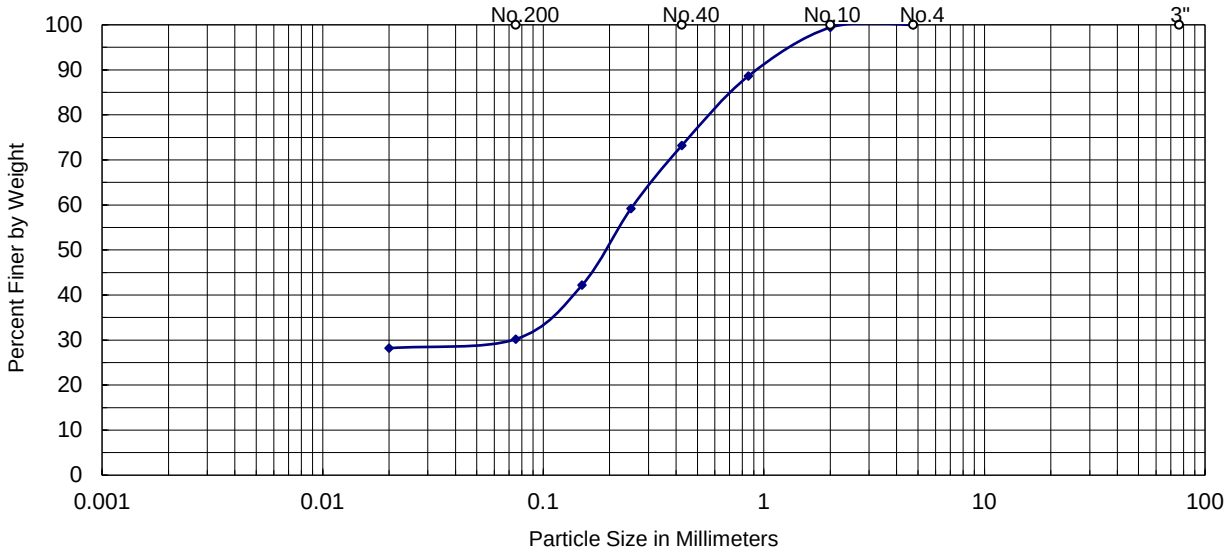
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.461
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*138+42, 45' Right*	Broing No.	B-4	Sample Depth:	*23.5'-25'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Light Brown/Grey mica 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	*96.6*
No.20	0.3346	0.85	*86.6*
No.40	0.1673	0.425	*75.4*
No.60	0.0984	0.25	*59.8*
No.100	0.0591	0.15	*41.2*
No.200	0.0295	0.075	*29.4*
% Clay	0.0079	0.02	27.4

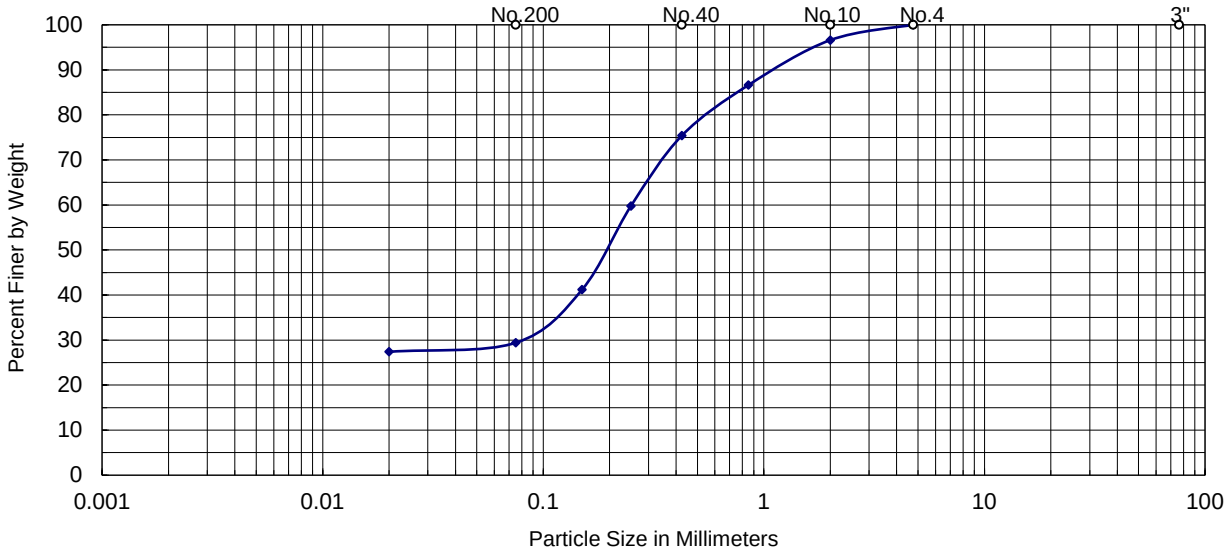
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.419
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+00, 40' Left*	Broing No.	B-5	Sample Depth:	*6'-7.5'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Light Brown/Grey mica 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	*99.6*
No.20	0.3346	0.85	*90.4*
No.40	0.1673	0.425	*74.4*
No.60	0.0984	0.25	*62.2*
No.100	0.0591	0.15	*44.6*
No.200	0.0295	0.075	*31.0*
% Clay	0.0079	0.02	28.8

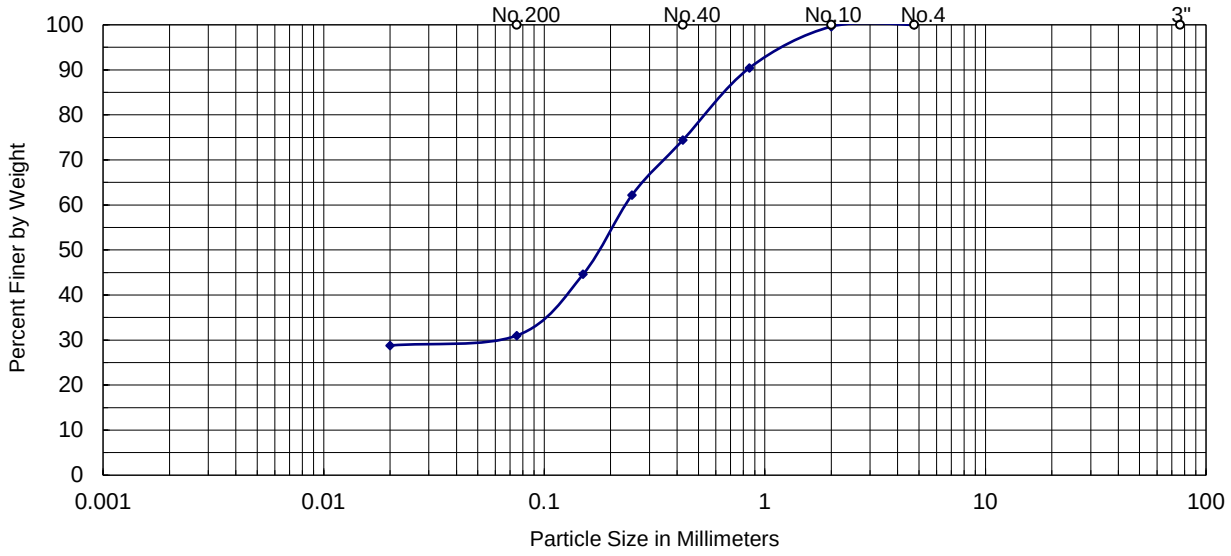
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.436
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+00, 40' Left*	Broing No.	B-5	Sample Depth:	*13.5'-15'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*3/30/2021*	Tested By:	*Randy R*		
Sample Description:	*Grey mica 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	*98.6*
No.20	0.3346	0.85	*87.2*
No.40	0.1673	0.425	*70.0*
No.60	0.0984	0.25	*58.0*
No.100	0.0591	0.15	*39.6*
No.200	0.0295	0.075	*26.6*
% Clay	0.0079	0.02	25

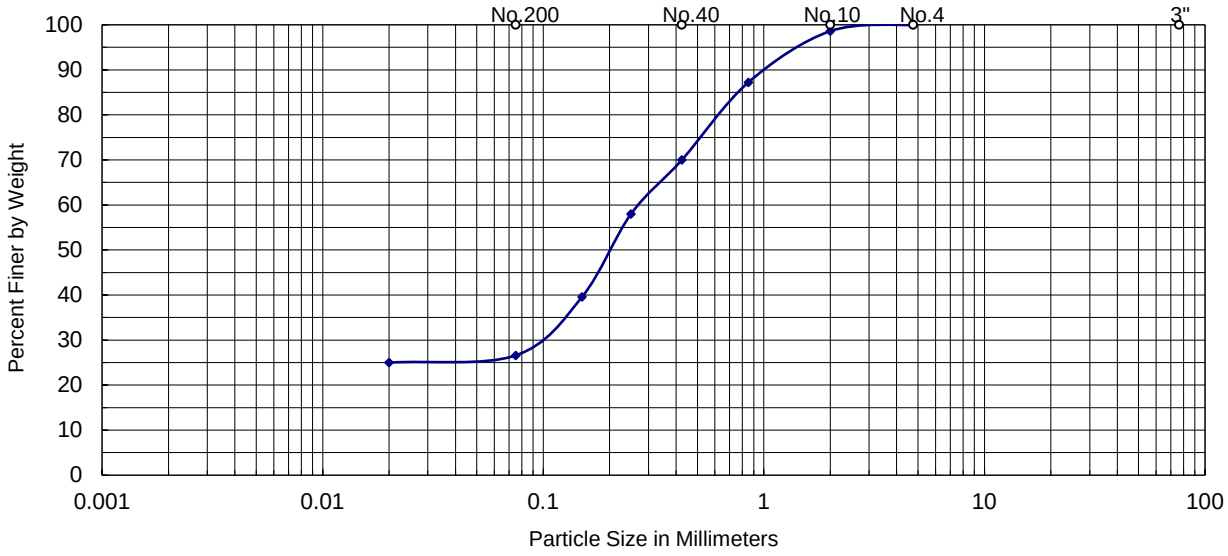
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.520
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

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USCS	SM - Silty sand
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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+00, 40' Right*	Broing No.	B-6	Sample Depth:	*0'-1.5'*
Date Sampled:	*7/15/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/1/2021*	Tested By:	*Randy R*		
Sample Description:	*Brown mica silty sand with some rock*				

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	*97.4*
No.20	0.3346	0.85	*83.8*
No.40	0.1673	0.425	*65.8*
No.60	0.0984	0.25	*52.0*
No.100	0.0591	0.15	*35.0*
No.200	0.0295	0.075	*23.4*
% Clay	0.0079	0.02	21.2

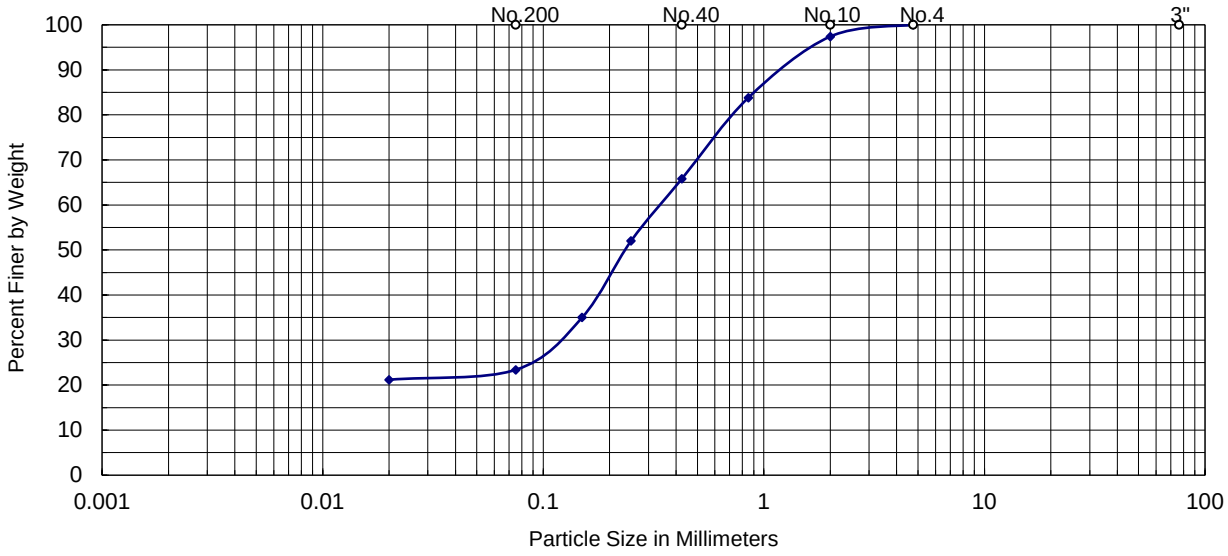
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.6057
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

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USCS	SM - Silty sand
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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+00, 40' Right*	Broing No.	B-6	Sample Depth:	*8.5'-10'*
Date Sampled:	*7/15/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/1/2021*	Tested By:	*Randy R*		
Sample Description:	*Brown/grey mica silty sand with some rock*				

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	*95.6*
No.20	0.3346	0.85	*80.2*
No.40	0.1673	0.425	*63.2*
No.60	0.0984	0.25	*49.8*
No.100	0.0591	0.15	*33.6*
No.200	0.0295	0.075	*22.2*
% Clay	0.0079	0.02	20.2

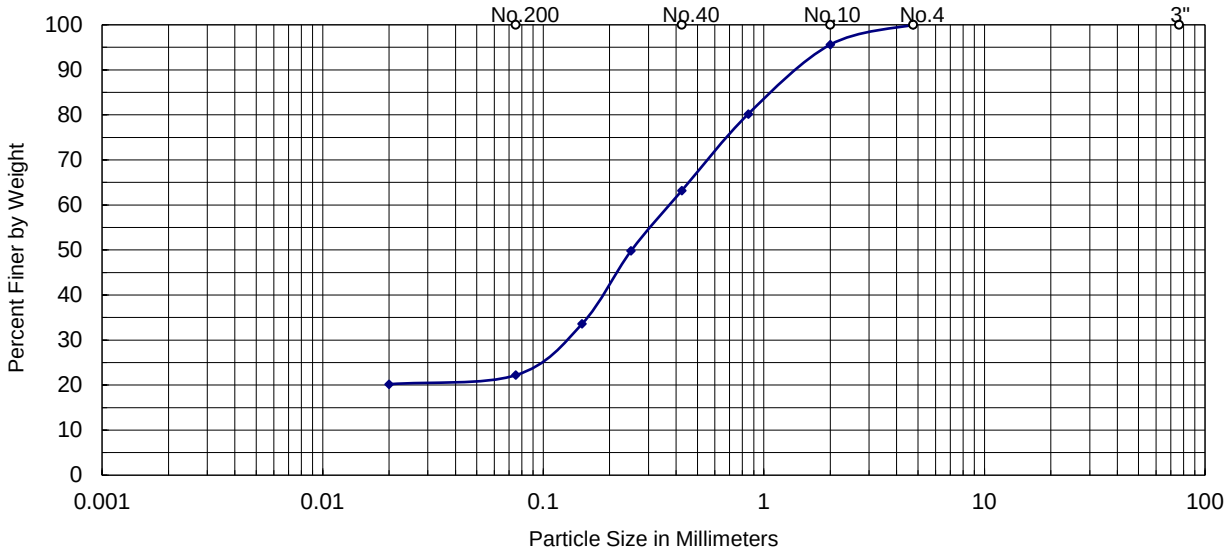
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.6876
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+00, 40' Right*	Broing No.	B-6	Sample Depth:	*23.5'-25'*
Date Sampled:	*7/15/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/1/2021*	Tested By:	*Randy R*		
Sample Description:	*Brown/grey mica silty sand with some rock*				

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	*95.2*
No.20	0.3346	0.85	*73.8*
No.40	0.1673	0.425	*53.0*
No.60	0.0984	0.25	*43.0*
No.100	0.0591	0.15	*28.8*
No.200	0.0295	0.075	*19.6*
% Clay	0.0079	0.02	18.4

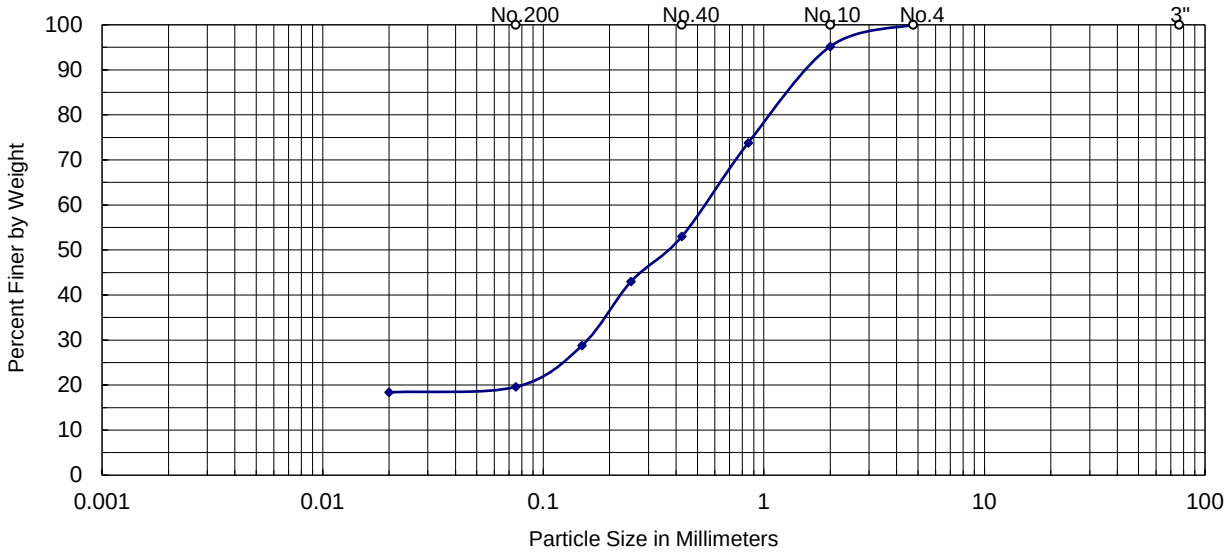
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.8918
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+78, 45' Left*	Broing No.	B-7	Sample Depth:	*0'-1.5'*
Date Sampled:	*7/16/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/1/2021*	Tested By:	*Randy R*		
Sample Description:	*Pink/Brown mica 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	*98.6*
No.20	0.3346	0.85	*87.4*
No.40	0.1673	0.425	*75.4*
No.60	0.0984	0.25	*66.4*
No.100	0.0591	0.15	*50.0*
No.200	0.0295	0.075	*36.8*
% Clay	0.0079	0.02	34.2

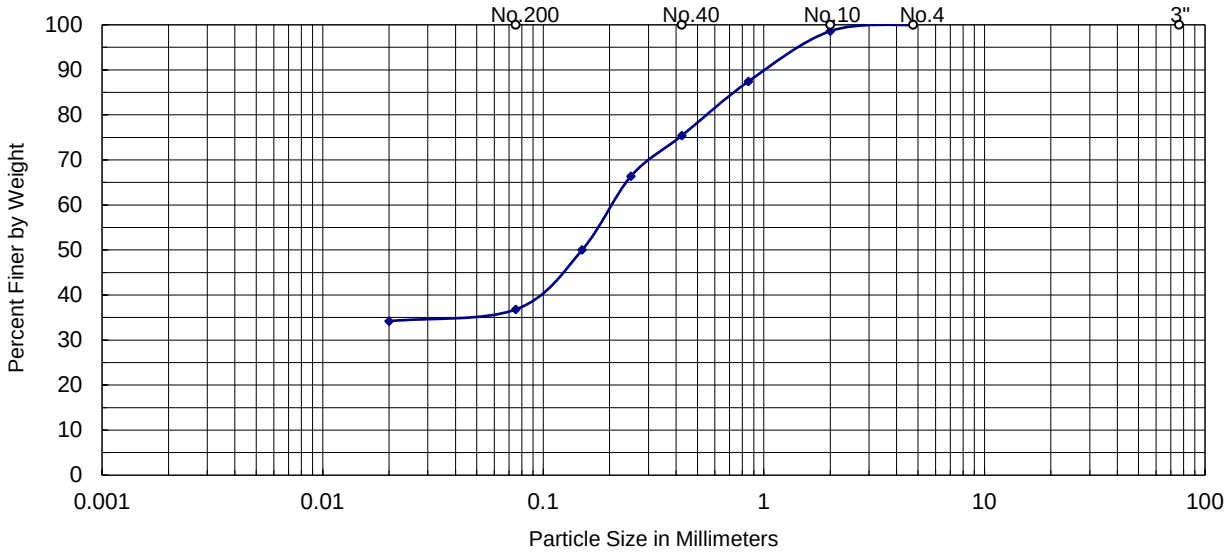
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.4151
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+78, 45' Left*	Broing No.	B-7	Sample Depth:	*13.5'-15'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/1/2021*	Tested By:	*Randy R*		
Sample Description:	*Grey/White silty sand with rock*				

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	*95.2*
No.20	0.3346	0.85	*73.6*
No.40	0.1673	0.425	*54.0*
No.60	0.0984	0.25	*44.4*
No.100	0.0591	0.15	*31.2*
No.200	0.0295	0.075	*23.4*
% Clay	0.0079	0.02	22.2

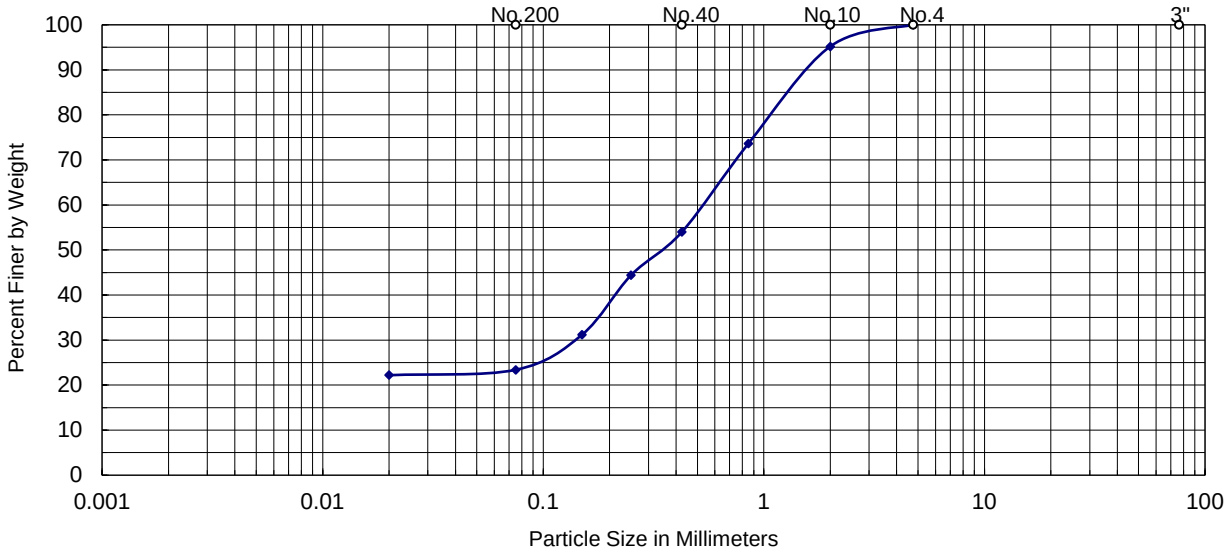
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.8985
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
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:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+78, 45' Left*	Broing No.	B-7	Sample Depth:	*23.5'-25'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/1/2021*	Tested By:	*Randy R*		
Sample Description:	*Brown/white mica 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	*98.6*
No.20	0.3346	0.85	*89.4*
No.40	0.1673	0.425	*72.0*
No.60	0.0984	0.25	*53.2*
No.100	0.0591	0.15	*34.0*
No.200	0.0295	0.075	*21.4*
% Clay	0.0079	0.02	18.8

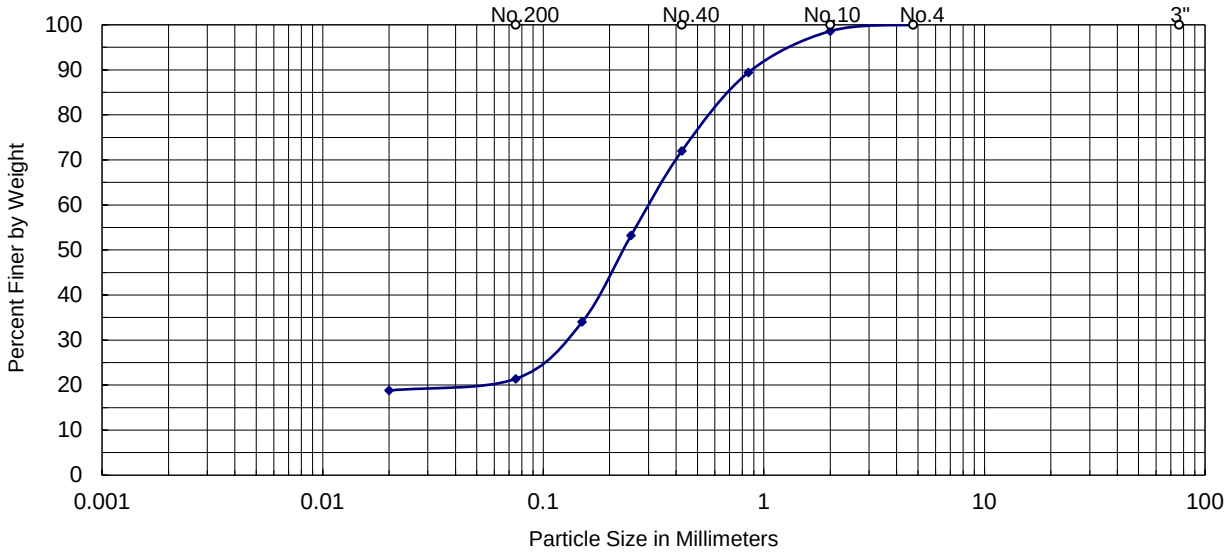
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.4790
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

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Duluth, Georgia 30096
Tel: 770-2635945
Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+78, 35' Right*	Broing No.	B-8	Sample Depth:	*0'-1.5'*
Date Sampled:	*7/16/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/7/2021*	Tested By:	*Randy R*		
Sample Description:	*Red/Brown mica 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	*99.2*
No.20	0.3346	0.85	*88.2*
No.40	0.1673	0.425	*70.2*
No.60	0.0984	0.25	*54.4*
No.100	0.0591	0.15	*35.4*
No.200	0.0295	0.075	*21.4*
% Clay	0.0079	0.02	18.2

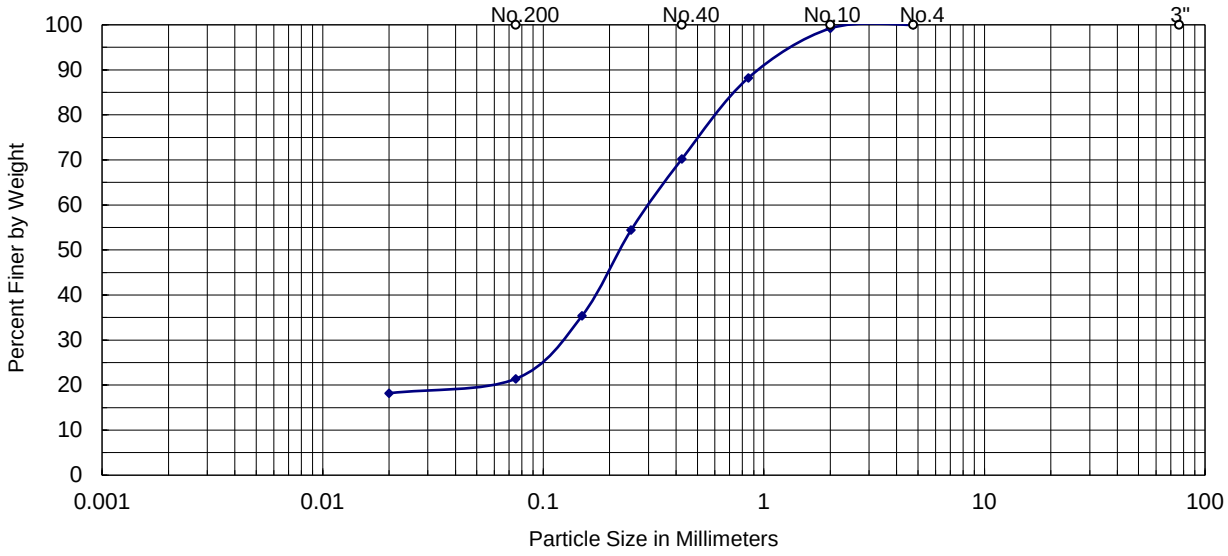
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5113
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+78, 35' Right*	Broing No.	B-8	Sample Depth:	*8.5'-10'*
Date Sampled:	*7/16/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/7/2021*	Tested By:	*Randy R*		
Sample Description:	*Dark grey/White mica 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	*98.2*
No.20	0.3346	0.85	*86.2*
No.40	0.1673	0.425	*65.4*
No.60	0.0984	0.25	*49.6*
No.100	0.0591	0.15	*31.8*
No.200	0.0295	0.075	*20.4*
% Clay	0.0079	0.02	19

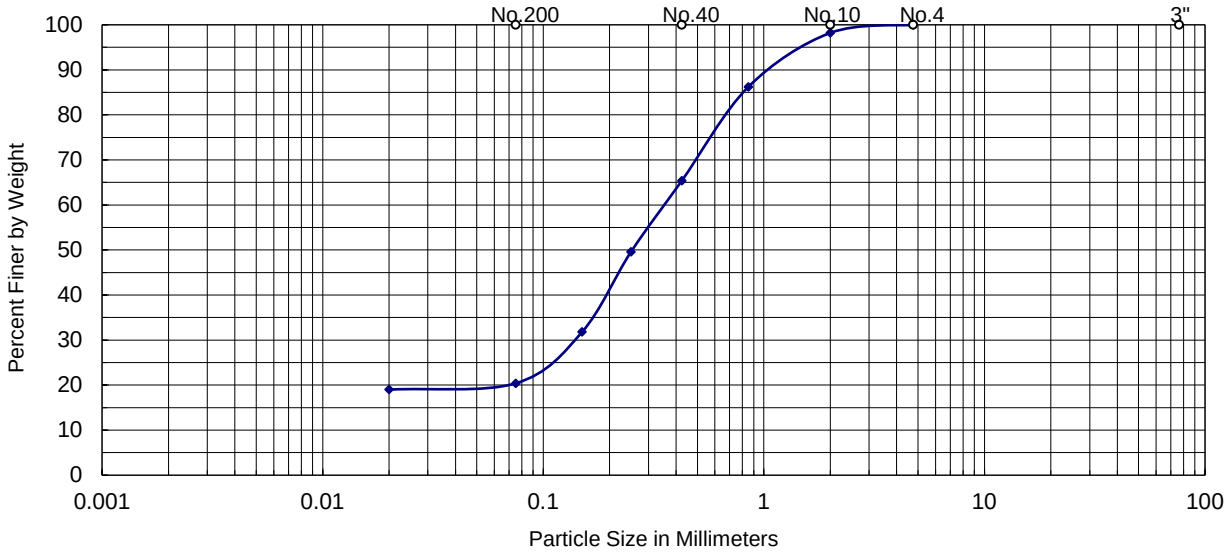
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5852
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
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:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+78, 35' Right*	Broing No.	B-8	Sample Depth:	*18.5'-20'*
Date Sampled:	*7/16/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/7/2021*	Tested By:	*Randy R*		
Sample Description:	*Dark Grey/White mica 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	*95.4*
No.20	0.3346	0.85	*78.8*
No.40	0.1673	0.425	*59.8*
No.60	0.0984	0.25	*44.6*
No.100	0.0591	0.15	*28.2*
No.200	0.0295	0.075	*18.2*
% Clay	0.0079	0.02	16.6

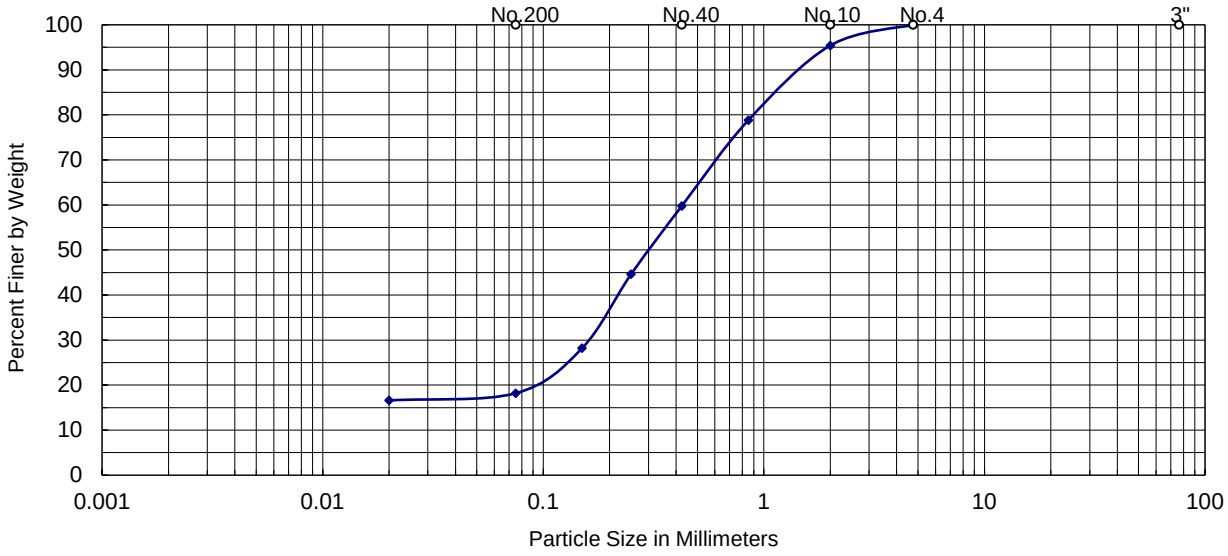
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.7400
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
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:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*140+78, 35' Right*	Broing No.	B-8	Sample Depth:	*23.5'-25'*
Date Sampled:	*7/16/2019*	Sampled By:	*Jay Shah*		
Date Tested:	*4/7/2021*	Tested By:	*Randy R*		
Sample Description:	*Light grey/White 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	*92.0*
No.20	0.3346	0.85	*69.8*
No.40	0.1673	0.425	*52.4*
No.60	0.0984	0.25	*43.0*
No.100	0.0591	0.15	*29.4*
No.200	0.0295	0.075	*20.0*
% Clay	0.0079	0.02	19.2

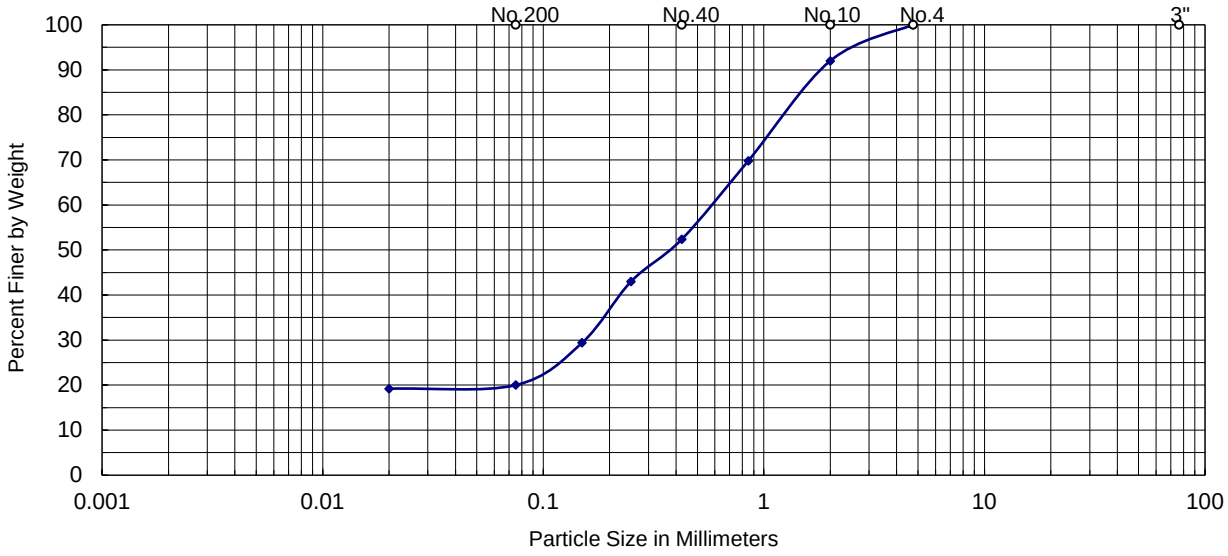
Atterberg Limits

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

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	1.0386
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	
Volume Change, %	

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	

Appendix E – Seismic site class determination

Seismic Site Class Calculations

Project: Courtsey Pkwy Ext. over Iris Dr., I-20 and Dogwood Dr., Rockdale County
GDOT PI No. 0006934
Atlas Proj. No. ROCK1701

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 B-1 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	14	0.18
2	2.5	15	0.17
3	2.5	17	0.15
4	2.5	17	0.15
5	5	21	0.24
6	5	21	0.24
7	5	11	0.45
8	5	14	0.36
9	5	15	0.33
10	5	8	0.63
11	5	53	0.09
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	3.53

Average N= 28.3
Site Class = D

Boring B-2 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	11	0.23
2	2.5	13	0.19
3	2.5	15	0.17
4	2.5	21	0.12
5	5	25	0.20
6	5	18	0.28
7	5	25	0.20
8	5	14	0.36
9	5	10	0.50
10	5	20	0.25
11	5	100	0.05
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	3.09

Average N= 32.4
Site Class = D

Seismic Site Class Calculations

Project: Courtsey Pkwy Ext. over Iris Dr., I-20 and Dogwood Dr., Rockdale County
GDOT PI No. 0006934
Atlas Proj. No. ROCK1701

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 B-3 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	17	0.15
2	2.5	8	0.31
3	2.5	14	0.18
4	2.5	17	0.15
5	5	21	0.24
6	5	18	0.28
7	5	14	0.36
8	5	34	0.15
9	5	24	0.21
10	5	100	0.05
11	5	100	0.05
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	2.66

Average N= 37.5
Site Class = D

Boring B-4 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	14	0.18
2	2.5	11	0.23
3	2.5	14	0.18
4	2.5	18	0.14
5	5	14	0.36
6	5	14	0.36
7	5	8	0.63
8	5	15	0.33
9	5	11	0.45
10	5	25	0.20
11	5	100	0.05
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	3.65

Average N= 27.4
Site Class = D

Seismic Site Class Calculations

Project: Courtsey Pkwy Ext. over Iris Dr., I-20 and Dogwood Dr., Rockdale County
GDOT PI No. 0006934
Atlas Proj. No. ROCK1701

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 B-5 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	6	0.42
2	2.5	11	0.23
3	2.5	8	0.31
4	2.5	13	0.19
5	5	14	0.36
6	5	11	0.45
7	5	15	0.33
8	5	41	0.12
9	5	48	0.10
10	5	100	0.05
11	5	100	0.05
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	3.17

Average N= 31.5
Site Class = D

Boring B-6 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	6	0.42
2	2.5	11	0.23
3	2.5	11	0.23
4	2.5	11	0.23
5	5	24	0.21
6	5	11	0.45
7	5	20	0.25
8	5	18	0.28
9	5	36	0.14
10	5	66	0.08
11	5	100	0.05
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	3.10

Average N= 32.2
Site Class = D

Seismic Site Class Calculations

Project: Courtsey Pkwy Ext. over Iris Dr., I-20 and Dogwood Dr., Rockdale County
GDOT PI No. 0006934
Atlas Proj. No. ROCK1701

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 B-7 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	15	0.17
2	2.5	11	0.23
3	2.5	14	0.18
4	2.5	14	0.18
5	5	11	0.45
6	5	10	0.50
7	5	18	0.28
8	5	100	0.05
9	5	100	0.05
10	5	100	0.05
11	5	100	0.05
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	2.73

Average N= 36.6
Site Class = D

Boring B-8 (Hammer Efficiency = 84%)

Sample Number	Layer Thickness, d_i (ft)	N_{60}	d_i/N_{60}
1	2.5	8	0.31
2	2.5	11	0.23
3	2.5	17	0.15
4	2.5	11	0.23
5	5	11	0.45
6	5	8	0.63
7	5	17	0.29
8	5	100	0.05
9	5	100	0.05
10	5	100	0.05
11	5	100	0.05
12	5	100	0.05
13	5	100	0.05
14	5	100	0.05
15	5	100	0.05
16	5	100	0.05
17	5	100	0.05
18	5	100	0.05
19	5	100	0.05
20	5	100	0.05
21	5	100	0.05
22	5	100	0.05
$\sum d_i =$	100	$\sum d_i/N_{60} =$	3.04

Average N= 32.9
Site Class = D

Appendix F – Foundation design data

Designer: Atlas Technical Consultants
Date: 10/12/2021
PI Number: 0006934
Project: Courtesy Parkway Extension over Iris Drive, I-20, and Dogwood Drive
Rockdale County, GA
From: Kevin F Dascall, PE, PMP, Consultant Structures Lead
To: Patrick Allen, P.E., State Materials Engineer

SUBJECT: Foundation Design Data (LRFD)

The following pile design loads, stress limits, and structural capacities have been calculated for the above listed structure. Please use the provided values to complete the Bridge Foundation Investigation report for the above referenced project.

	Design Loads:			***Drivability:***		***Pile Design Load:***
	Maximum Factored Load (kips)	**Service Load (kips)**		**Stress limits = σ_d**		**(Structural Capacity)**
Bent(s):			**Pile Size:**	**Comp. (ksi)**	**Tens. (ksi)**	**P_R (kips)**
1 and 4	263	182	HP 14x89	45	45	653
2 and 3	387	288	HP 14x89	45	45	653

Bottom of Pile Footing Elevations:

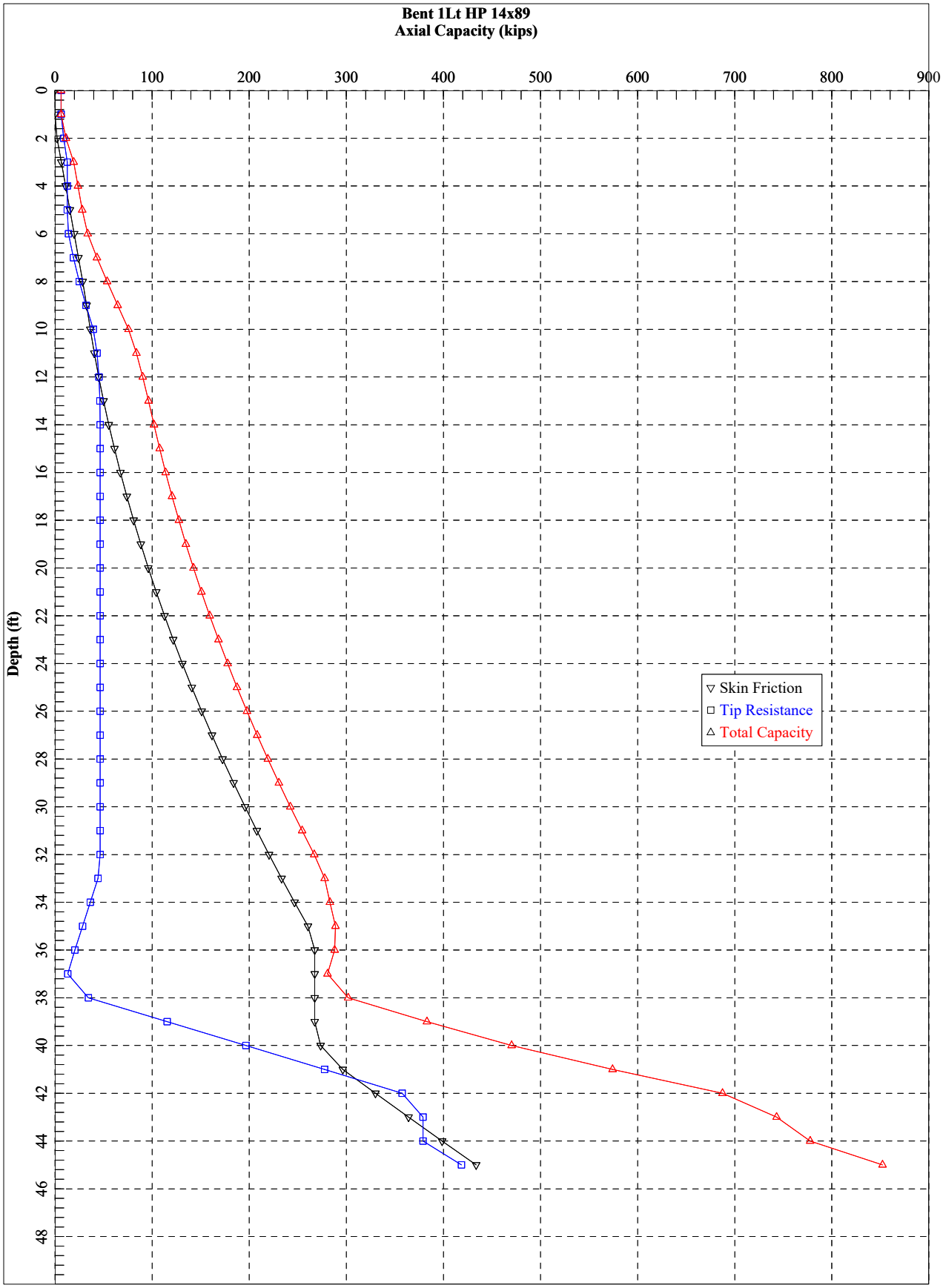
- Bent 2: **818.10**
- Bent 3: **815.10**

If you have any questions or require additional information, please call or email Kevin F Dascall at 770-263-5945 or kevin.dascall@oneatlas.com

Thank you,

Kevin F Dascall, PE, PMP

Appendix G – Pile capacity static analysis, APILE output


Bent 1Lt HP 14x89
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Skin Friction
Tip Resistance
Total Capacity

```
=========================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
                (c) Copyright ENSOFT, Inc., 1987-2015
                      All Rights Reserved

=========================================================================

This program is licensed to :

Moreland Altobelli Associates
Duluth, GA

Path to file locations      : Q:\Rockdale County\Rock1701 Courtesy Parkway\BFI\APile\
Name of input data file     : Bent1Lt_14x89.ap7d
Name of output file         : Bent1Lt_14x89.ap7o
Name of plot output file    : Bent1Lt_14x89.ap7p

-------------------------------------------------------------------------
                    Time and Date of Analysis
-------------------------------------------------------------------------

          Date:  October 11, 2021     Time:  17:30:26
```



```
     **********************
     * INPUT INFORMATION *
     **********************



     Bent 1Lt: HP14x73

     DESIGNER   : YCS

     JOB NUMBER : PI No. 0006934


     METHOD FOR UNIT LOAD TRANSFERS :

     - FHWA (Federal Highway Administration)
       Unfactored Unit Side Friction and Unit Side Resistance are used.



     COMPUTATION METHOD(S) FOR PILE CAPACITY :

     - FHWA (Federal Highway Administration)


     TYPE OF LOADING :
     - COMPRESSION


     PILE TYPE :

     H-Pile/Steel Pile


     DATA FOR AXIAL STIFFNESS :
```

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 62.00 FT.
- PILE STICKUP LENGTH, PSL = 17.00 FT.
- ZERO FRICTION LENGTH, ZFL = 0.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
7.50	CLAY	0.00	115.00	0.00	0.00
7.50	SAND	0.00	115.00	32.00	0.00
20.00	SAND	0.00	115.00	32.00	0.00
20.00	SAND	0.00	115.00	32.00	0.00
35.00	SAND	0.00	115.00	32.00	0.00
35.00	SAND	0.00	115.00	0.00	0.00
38.50	SAND	0.00	115.00	0.00	0.00
38.50	SAND	0.00	52.60	30.00	0.00
40.00	SAND	0.00	52.60	30.00	0.00
40.00	SAND	0.00	62.60	38.00	0.00
47.00	SAND	0.00	62.60	38.00	0.00
47.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	1.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	1.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

LRFD FACTOR ON UNIT   LRFD FACTOR ON UNIT

DEPTH FT.	FRICTION	BEARING
0.00	1.000	1.000
7.50	1.000	1.000
7.50	1.000	1.000
20.00	1.000	1.000
20.00	1.000	1.000
35.00	1.000	1.000
35.00	1.000	1.000
38.50	1.000	1.000
38.50	1.000	1.000
40.00	1.000	1.000
40.00	1.000	1.000
47.00	1.000	1.000
47.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
7.50	0.00	0.00	0.000E+00
7.50	0.00	0.00	0.000E+00
20.00	0.00	0.00	0.000E+00
20.00	0.00	0.00	0.000E+00
35.00	0.00	0.00	0.000E+00
35.00	0.00	0.00	0.000E+00
38.50	0.00	0.00	0.000E+00
38.50	0.00	0.00	0.000E+00
40.00	0.00	0.00	0.000E+00
40.00	0.00	0.00	0.000E+00
47.00	0.00	0.00	0.000E+00
47.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

1

****
* COMPUTATION RESULT *
****

****
* FED. HWY. METHOD *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	6.3	6.3
1.00	0.0	6.4	6.4
2.00	2.2	9.1	11.3
3.00	6.6	12.7	19.3
4.00	11.0	12.7	23.7
5.00	15.4	12.7	28.1
6.00	19.8	13.9	33.7
7.00	24.2	19.1	43.2
8.00	28.6	25.1	53.7
9.00	32.6	32.0	64.6
10.00	36.4	39.4	75.7
11.00	40.5	43.4	83.9
12.00	45.1	45.3	90.4
13.00	50.1	46.3	96.4

Zero depth Ele. 833'

	14.00	55.5	46.6	102.0
	15.00	61.3	46.6	107.8
	16.00	67.4	46.6	114.0
	17.00	74.0	46.6	120.6
Min. Tip. Ele. 815' →	18.00	81.0	46.6	127.6
	19.00	88.4	46.6	134.9
	20.00	96.1	46.6	142.7
	21.00	104.3	46.6	150.9
	22.00	112.9	46.6	159.4
	23.00	121.8	46.6	168.4
	24.00	131.2	46.6	177.8
	25.00	141.0	46.6	187.5
	26.00	151.1	46.6	197.7
	27.00	161.7	46.6	208.3
	28.00	172.6	46.6	219.2
	29.00	184.0	46.6	230.6
	30.00	195.8	46.6	242.3
	31.00	207.9	46.6	254.5
	32.00	220.5	46.6	267.0
	33.00	233.4	44.4	277.8
	34.00	246.8	36.4	283.1
	35.00	260.5	28.4	288.9
	36.00	267.5	20.5	288.0
	37.00	267.5	13.2	280.7
	38.00	267.5	34.5	302.0
	39.00	267.5	115.6	383.1
	40.00	273.6	196.7	470.3 ← Driving Resistance Rndr=263kips/0.65=405kips
	41.00	296.4	277.7	574.2
	42.00	330.1	357.5	687.5
	43.00	364.1	379.0	743.2
Est. Tip Ele. 789' →	44.00	398.7	379.0	777.7
	45.00	433.7	418.6	852.3

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

****
* COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
* CURVES FOR AXIAL LOADING *
****

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.9615E+00	0.2908E-01
			0.1602E+01	0.5634E-01
			0.2404E+01	0.1036E+00
			0.2884E+01	0.1454E+00
			0.3205E+01	0.1818E+00
			0.2884E+01	0.3635E+00
			0.2884E+01	0.5453E+00
			0.2884E+01	0.9088E+00
			0.2884E+01	0.3635E+01
2	10	0.3775E+01		
			0.0000E+00	0.0000E+00
			0.1923E+01	0.2908E-01
			0.3205E+01	0.5634E-01
			0.4807E+01	0.1036E+00
			0.5769E+01	0.1454E+00
			0.6410E+01	0.1818E+00
			0.5769E+01	0.3635E+00

```
                                0.5769E+01      0.5453E+00
                                0.5769E+01      0.9088E+00
                                0.5769E+01      0.3635E+01
3         10      0.7458E+01
                                0.0000E+00      0.0000E+00
                                0.1843E+01      0.2908E-01
                                0.3072E+01      0.5634E-01
                                0.4608E+01      0.1036E+00
                                0.5530E+01      0.1454E+00
                                0.6144E+01      0.1818E+00
                                0.5530E+01      0.3635E+00
                                0.5530E+01      0.5453E+00
                                0.5530E+01      0.9088E+00
                                0.5530E+01      0.3635E+01
4         10      0.7500E+01
                                0.0000E+00      0.0000E+00
                                0.6144E+00      0.1000E-01
                                0.1229E+01      0.2000E-01
                                0.2458E+01      0.4000E-01
                                0.3687E+01      0.6000E-01
                                0.4915E+01      0.8000E-01
                                0.5530E+01      0.9000E-01
                                0.6144E+01      0.1000E+00
                                0.6144E+01      0.5000E+00
                                0.6144E+01      0.2000E+01
5         10      0.1378E+02
                                0.0000E+00      0.0000E+00
                                0.8142E+00      0.1000E-01
                                0.1628E+01      0.2000E-01
                                0.3257E+01      0.4000E-01
                                0.4885E+01      0.6000E-01
                                0.6514E+01      0.8000E-01
                                0.7328E+01      0.9000E-01
                                0.8142E+01      0.1000E+00
                                0.8142E+01      0.5000E+00
                                0.8142E+01      0.2000E+01
6         10      0.1996E+02
                                0.0000E+00      0.0000E+00
                                0.1163E+01      0.1000E-01
                                0.2326E+01      0.2000E-01
                                0.4653E+01      0.4000E-01
                                0.6979E+01      0.6000E-01
                                0.9305E+01      0.8000E-01
                                0.1047E+02      0.9000E-01
                                0.1163E+02      0.1000E+00
                                0.1163E+02      0.5000E+00
                                0.1163E+02      0.2000E+01
7         10      0.2000E+02
                                0.0000E+00      0.0000E+00
                                0.1221E+01      0.1000E-01
                                0.2443E+01      0.2000E-01
                                0.4885E+01      0.4000E-01
                                0.7328E+01      0.6000E-01
                                0.9770E+01      0.8000E-01
                                0.1099E+02      0.9000E-01
                                0.1221E+02      0.1000E+00
                                0.1221E+02      0.5000E+00
                                0.1221E+02      0.2000E+01
8         10      0.2753E+02
                                0.0000E+00      0.0000E+00
                                0.1628E+01      0.1000E-01
                                0.3257E+01      0.2000E-01
                                0.6514E+01      0.4000E-01
                                0.9770E+01      0.6000E-01
                                0.1303E+02      0.8000E-01
                                0.1466E+02      0.9000E-01
                                0.1628E+02      0.1000E+00
                                0.1628E+02      0.5000E+00
                                0.1628E+02      0.2000E+01
```

```
 9         10      0.3496E+02
                                0.0000E+00      0.0000E+00
                                0.1512E+01      0.1000E-01
                                0.3024E+01      0.2000E-01
                                0.6048E+01      0.4000E-01
                                0.9072E+01      0.6000E-01
                                0.1210E+02      0.8000E-01
                                0.1361E+02      0.9000E-01
                                0.1512E+02      0.1000E+00
                                0.1512E+02      0.5000E+00
                                0.1512E+02      0.2000E+01
10         10      0.3500E+02
                                0.0000E+00      0.0000E+00
                                0.5089E+00      0.1000E-01
                                0.1018E+01      0.2000E-01
                                0.2035E+01      0.4000E-01
                                0.3053E+01      0.6000E-01
                                0.4071E+01      0.8000E-01
                                0.4580E+01      0.9000E-01
                                0.5089E+01      0.1000E+00
                                0.5089E+01      0.5000E+00
                                0.5089E+01      0.2000E+01
11         10      0.3678E+02
                                0.0000E+00      0.0000E+00
                                0.0000E+00      0.1000E-01
                                0.0000E+00      0.2000E-01
                                0.0000E+00      0.4000E-01
                                0.0000E+00      0.6000E-01
                                0.0000E+00      0.8000E-01
                                0.0000E+00      0.9000E-01
                                0.0000E+00      0.1000E+00
                                0.0000E+00      0.5000E+00
                                0.0000E+00      0.2000E+01
12         10      0.3846E+02
                                0.0000E+00      0.0000E+00
                                0.4473E+00      0.1000E-01
                                0.8947E+00      0.2000E-01
                                0.1789E+01      0.4000E-01
                                0.2684E+01      0.6000E-01
                                0.3579E+01      0.8000E-01
                                0.4026E+01      0.9000E-01
                                0.4473E+01      0.1000E+00
                                0.4473E+01      0.5000E+00
                                0.4473E+01      0.2000E+01
13         10      0.3850E+02
                                0.0000E+00      0.0000E+00
                                0.4473E+00      0.1000E-01
                                0.8947E+00      0.2000E-01
                                0.1789E+01      0.4000E-01
                                0.2684E+01      0.6000E-01
                                0.3579E+01      0.8000E-01
                                0.4026E+01      0.9000E-01
                                0.4473E+01      0.1000E+00
                                0.4473E+01      0.5000E+00
                                0.4473E+01      0.2000E+01
14         10      0.3928E+02
                                0.0000E+00      0.0000E+00
                                0.2113E+01      0.1000E-01
                                0.4226E+01      0.2000E-01
                                0.8453E+01      0.4000E-01
                                0.1268E+02      0.6000E-01
                                0.1691E+02      0.8000E-01
                                0.1902E+02      0.9000E-01
                                0.2113E+02      0.1000E+00
                                0.2113E+02      0.5000E+00
                                0.2113E+02      0.2000E+01
15         10      0.3996E+02
                                0.0000E+00      0.0000E+00
                                0.2113E+01      0.1000E-01
```

```
                                0.4226E+01      0.2000E-01
                                0.8453E+01      0.4000E-01
                                0.1268E+02      0.6000E-01
                                0.1691E+02      0.8000E-01
                                0.1902E+02      0.9000E-01
                                0.2113E+02      0.1000E+00
                                0.2113E+02      0.5000E+00
                                0.2113E+02      0.2000E+01
16          10      0.4000E+02
                                0.0000E+00      0.0000E+00
                                0.4119E+01      0.1000E-01
                                0.8239E+01      0.2000E-01
                                0.1648E+02      0.4000E-01
                                0.2472E+02      0.6000E-01
                                0.3295E+02      0.8000E-01
                                0.3707E+02      0.9000E-01
                                0.4119E+02      0.1000E+00
                                0.4119E+02      0.5000E+00
                                0.4119E+02      0.2000E+01
17          10      0.4353E+02
                                0.0000E+00      0.0000E+00
                                0.5073E+01      0.1000E-01
                                0.1015E+02      0.2000E-01
                                0.2029E+02      0.4000E-01
                                0.3044E+02      0.6000E-01
                                0.4058E+02      0.8000E-01
                                0.4566E+02      0.9000E-01
                                0.5073E+02      0.1000E+00
                                0.5073E+02      0.5000E+00
                                0.5073E+02      0.2000E+01
18          10      0.4696E+02
                                0.0000E+00      0.0000E+00
                                0.5106E+01      0.1000E-01
                                0.1021E+02      0.2000E-01
                                0.2042E+02      0.4000E-01
                                0.3064E+02      0.6000E-01
                                0.4085E+02      0.8000E-01
                                0.4595E+02      0.9000E-01
                                0.5106E+02      0.1000E+00
                                0.5106E+02      0.5000E+00
                                0.5106E+02      0.2000E+01
19          10      0.4700E+02
                                0.0000E+00      0.0000E+00
                                0.5106E+01      0.1000E-01
                                0.1021E+02      0.2000E-01
                                0.2042E+02      0.4000E-01
                                0.3064E+02      0.6000E-01
                                0.4085E+02      0.8000E-01
                                0.4595E+02      0.9000E-01
                                0.5106E+02      0.1000E+00
                                0.5106E+02      0.5000E+00
                                0.5106E+02      0.2000E+01
20          10      0.5353E+02
                                0.0000E+00      0.0000E+00
                                0.5106E+01      0.1000E-01
                                0.1021E+02      0.2000E-01
                                0.2042E+02      0.4000E-01
                                0.3064E+02      0.6000E-01
                                0.4085E+02      0.8000E-01
                                0.4595E+02      0.9000E-01
                                0.5106E+02      0.1000E+00
                                0.5106E+02      0.5000E+00
                                0.5106E+02      0.2000E+01
21          10      0.5996E+02
                                0.0000E+00      0.0000E+00
                                0.5106E+01      0.1000E-01
                                0.1021E+02      0.2000E-01
                                0.2042E+02      0.4000E-01
                                0.3064E+02      0.6000E-01
```

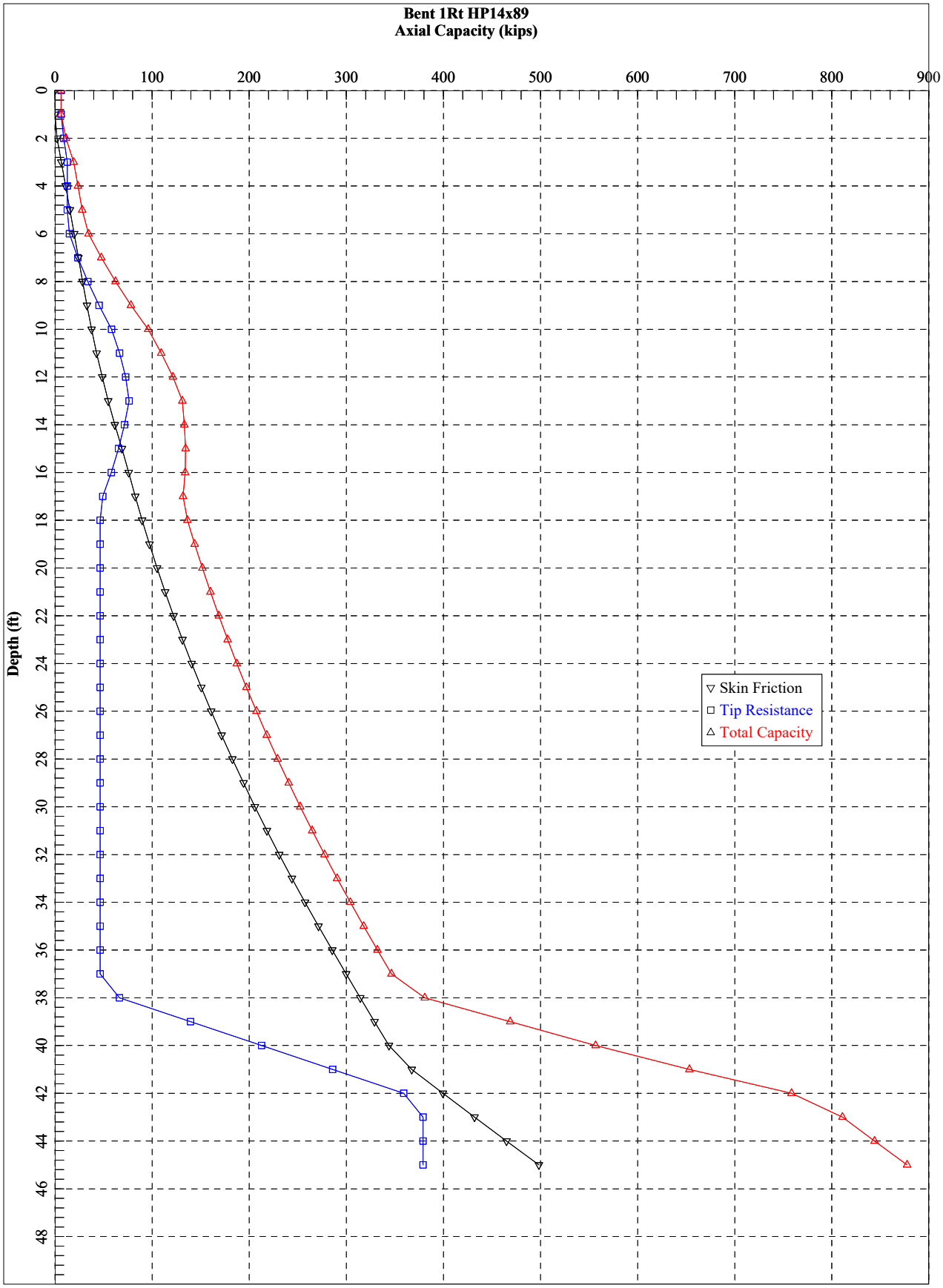
0.4085E+02	0.8000E-01
0.4595E+02	0.9000E-01
0.5106E+02	0.1000E+00
0.5106E+02	0.5000E+00
0.5106E+02	0.2000E+01

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.2616E+02	0.9088E-02
0.5233E+02	0.1818E-01
0.1047E+03	0.3635E-01
0.2093E+03	0.2363E+00
0.3140E+03	0.7634E+00
0.3768E+03	0.1327E+01
0.4186E+03	0.1818E+01
0.4186E+03	0.2726E+01
0.4186E+03	0.3635E+01

LOAD VERSUS SETTLEMENT CURVE

****

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.8043E+00	0.1844E-03	0.2879E+00	0.1000E-03
0.8043E+01	0.1844E-02	0.2879E+01	0.1000E-02
0.4022E+02	0.9218E-02	0.1440E+02	0.5000E-02
0.8049E+02	0.1844E-01	0.2879E+02	0.1000E-01
0.3630E+03	0.8776E-01	0.1118E+03	0.5000E-01
0.5840E+03	0.1606E+00	0.1380E+03	0.1000E+00
0.7087E+03	0.5762E+00	0.2617E+03	0.5000E+00
0.7874E+03	0.1086E+01	0.3403E+03	0.1000E+01
0.8656E+03	0.2096E+01	0.4186E+03	0.2000E+01


Bent 1Rt HP14x89
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Skin Friction
Tip Resistance
Total Capacity

```
=========================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
                (c) Copyright ENSOFT, Inc., 1987-2015
                      All Rights Reserved

=========================================================================


This program is licensed to :

Moreland Altobelli Associates
Duluth, GA

Path to file locations      : Q:\Rockdale County\Rock1701 Courtesy Parkway\BFI\APile\
Name of input data file     : Bent1Rt_14x89.ap7d
Name of output file         : Bent1Rt_14x89.ap7o
Name of plot output file    : Bent1Rt_14x89.ap7p

-------------------------------------------------------------------------
                    Time and Date of Analysis
-------------------------------------------------------------------------

          Date:  October 11, 2021     Time:  19:32:04



1
          **********************
          * INPUT INFORMATION *
          **********************



          Bent 1Rt: HP14x89

          DESIGNER   : YCS

          JOB NUMBER : PI No. 0006934


          METHOD FOR UNIT LOAD TRANSFERS :

          - FHWA (Federal Highway Administration)
            Unfactored Unit Side Friction and Unit Side Resistance are used.



          COMPUTATION METHOD(S) FOR PILE CAPACITY :

          - FHWA (Federal Highway Administration)
          - API RP 2A (American Petroleum Institute)


          TYPE OF LOADING :
          - COMPRESSION


          PILE TYPE :

          H-Pile/Steel Pile
```

DATA FOR AXIAL STIFFNESS :

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 68.00 FT.
- PILE STICKUP LENGTH, PSL = 23.00 FT.
- ZERO FRICTION LENGTH, ZFL = 0.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
7.50	CLAY	0.00	115.00	0.00	0.00
7.50	SAND	0.00	120.00	34.00	0.00
15.00	SAND	0.00	120.00	34.00	0.00
15.00	SAND	0.00	115.00	32.00	0.00
35.00	SAND	0.00	115.00	32.00	0.00
35.00	SAND	0.00	52.60	32.00	0.00
40.00	SAND	0.00	52.60	32.00	0.00
40.00	SAND	0.00	62.60	38.00	0.00
48.00	SAND	0.00	62.60	38.00	0.00
48.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	1.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	1.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

DEPTH FT.	LRFD FACTOR ON UNIT FRICTION	LRFD FACTOR ON UNIT BEARING
0.00	1.000	1.000

7.50	1.000	1.000
7.50	1.000	1.000
15.00	1.000	1.000
15.00	1.000	1.000
35.00	1.000	1.000
35.00	1.000	1.000
40.00	1.000	1.000
40.00	1.000	1.000
48.00	1.000	1.000
48.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
7.50	0.00	0.00	0.000E+00
7.50	0.00	0.00	0.000E+00
15.00	0.00	0.00	0.000E+00
15.00	0.00	0.00	0.000E+00
35.00	0.00	0.00	0.000E+00
35.00	0.00	0.00	0.000E+00
40.00	0.00	0.00	0.000E+00
40.00	0.00	0.00	0.000E+00
48.00	0.00	0.00	0.000E+00
48.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

1

****
* COMPUTATION RESULT *
****

****
* FED. HWY. METHOD *
****

Zero depth Ele. 827'

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	6.3	6.3
1.00	0.0	6.4	6.4
2.00	2.2	9.1	11.3
3.00	6.6	12.7	19.3
4.00	11.0	12.7	23.7
5.00	15.4	12.7	28.1
6.00	19.8	14.9	34.6
7.00	24.2	23.6	47.8
8.00	28.5	33.8	62.4
9.00	33.0	45.4	78.3
10.00	37.7	58.3	96.0
11.00	42.9	66.6	109.5
12.00	48.7	72.8	121.5
13.00	54.9	76.3	131.2
14.00	61.7	71.6	133.3
15.00	69.0	65.5	134.5
16.00	76.0	58.0	134.1
17.00	82.7	49.2	131.9
18.00	89.8	46.6	136.4
19.00	97.3	46.6	143.9
20.00	105.2	46.6	151.8

Min. Tip Ele. 806' →	21.00	113.5	46.6	160.1
	22.00	122.2	46.6	168.8
	23.00	131.3	46.6	177.8
	24.00	140.8	46.6	187.3
	25.00	150.7	46.6	197.2
	26.00	160.9	46.6	207.5
	27.00	171.6	46.6	218.2
	28.00	182.7	46.6	229.3
	29.00	194.2	46.6	240.7
	30.00	206.0	46.6	252.6
	31.00	218.3	46.6	264.9
	32.00	231.0	46.6	277.6
	33.00	244.1	46.6	290.6
	34.00	257.5	46.6	304.1
	35.00	271.4	46.6	318.0
	36.00	285.6	46.6	332.1
	37.00	299.9	46.6	346.5
	38.00	314.4	66.5	380.9
	39.00	329.1	139.6	468.8 ← Driving resistance Rndr=263kips/0.65=405kips
	40.00	344.0	212.8	556.8
Est. Tip Ele. 786' →	41.00	367.4	286.0	653.4
	42.00	399.5	359.1	758.6
	43.00	432.0	379.0	811.0
	44.00	465.0	379.0	844.0
	45.00	498.4	379.0	877.5

****
* API RP-2A (1994) *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	6.3	6.3
1.00	1.4	6.4	7.7
2.00	2.9	9.1	12.0
3.00	4.6	12.7	17.3
4.00	6.5	12.7	19.2
5.00	8.5	12.7	21.2
6.00	10.7	11.9	22.6
7.00	12.9	9.1	22.0
8.00	15.2	6.4	21.5
9.00	16.3	3.6	19.9
10.00	16.3	0.8	17.1
11.00	16.3	0.0	16.3
12.00	16.3	0.0	16.3
13.00	16.3	0.0	16.3
14.00	16.3	0.0	16.3
15.00	16.3	0.0	16.3
16.00	16.3	0.0	16.3
17.00	16.3	0.0	16.3
18.00	16.3	0.0	16.3
19.00	16.3	0.0	16.3
20.00	16.3	0.0	16.3
21.00	16.3	0.0	16.3
22.00	16.3	0.0	16.3
23.00	16.3	0.0	16.3
24.00	16.3	0.0	16.3
25.00	16.3	0.0	16.3
26.00	16.3	0.0	16.3
27.00	16.3	0.0	16.3
28.00	16.3	0.0	16.3
29.00	16.3	0.0	16.3
30.00	16.3	0.0	16.3
31.00	16.3	0.0	16.3
32.00	16.3	0.0	16.3
33.00	16.3	0.0	16.3

34.00	16.3	0.0	16.3
35.00	16.3	0.0	16.3
36.00	16.3	0.0	16.3
37.00	16.3	0.0	16.3
38.00	16.3	0.0	16.3
39.00	16.3	0.0	16.3
40.00	16.3	0.0	16.3
41.00	16.3	0.0	16.3
42.00	16.3	0.0	16.3
43.00	16.3	0.0	16.3
44.00	16.3	0.0	16.3
45.00	16.3	0.0	16.3

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

****
* COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
* CURVES FOR AXIAL LOADING *
****

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.9615E+00	0.2908E-01
			0.1602E+01	0.5634E-01
			0.2404E+01	0.1036E+00
			0.2884E+01	0.1454E+00
			0.3205E+01	0.1818E+00
			0.2884E+01	0.3635E+00
			0.2884E+01	0.5453E+00
			0.2884E+01	0.9088E+00
			0.2884E+01	0.3635E+01
2	10	0.3775E+01		
			0.0000E+00	0.0000E+00
			0.1923E+01	0.2908E-01
			0.3205E+01	0.5634E-01
			0.4807E+01	0.1036E+00
			0.5769E+01	0.1454E+00
			0.6410E+01	0.1818E+00
			0.5769E+01	0.3635E+00
			0.5769E+01	0.5453E+00
			0.5769E+01	0.9088E+00
			0.5769E+01	0.3635E+01
3	10	0.7458E+01		
			0.0000E+00	0.0000E+00
			0.1931E+01	0.2908E-01
			0.3218E+01	0.5634E-01
			0.4826E+01	0.1036E+00
			0.5792E+01	0.1454E+00
			0.6435E+01	0.1818E+00
			0.5792E+01	0.3635E+00
			0.5792E+01	0.5453E+00
			0.5792E+01	0.9088E+00
			0.5792E+01	0.3635E+01
4	10	0.7500E+01		
			0.0000E+00	0.0000E+00
			0.6435E+00	0.1000E-01
			0.1287E+01	0.2000E-01
			0.2574E+01	0.4000E-01
			0.3861E+01	0.6000E-01

```
                                0.5148E+01      0.8000E-01
                                0.5792E+01      0.9000E-01
                                0.6435E+01      0.1000E+00
                                0.6435E+01      0.5000E+00
                                0.6435E+01      0.2000E+01
  5         10      0.1128E+02
                                0.0000E+00      0.0000E+00
                                0.8766E+00      0.1000E-01
                                0.1753E+01      0.2000E-01
                                0.3506E+01      0.4000E-01
                                0.5260E+01      0.6000E-01
                                0.7013E+01      0.8000E-01
                                0.7890E+01      0.9000E-01
                                0.8766E+01      0.1000E+00
                                0.8766E+01      0.5000E+00
                                0.8766E+01      0.2000E+01
  6         10      0.1496E+02
                                0.0000E+00      0.0000E+00
                                0.1045E+01      0.1000E-01
                                0.2090E+01      0.2000E-01
                                0.4179E+01      0.4000E-01
                                0.6269E+01      0.6000E-01
                                0.8358E+01      0.8000E-01
                                0.9403E+01      0.9000E-01
                                0.1045E+02      0.1000E+00
                                0.1045E+02      0.5000E+00
                                0.1045E+02      0.2000E+01
  7         10      0.1500E+02
                                0.0000E+00      0.0000E+00
                                0.1001E+01      0.1000E-01
                                0.2002E+01      0.2000E-01
                                0.4005E+01      0.4000E-01
                                0.6007E+01      0.6000E-01
                                0.8010E+01      0.8000E-01
                                0.9011E+01      0.9000E-01
                                0.1001E+02      0.1000E+00
                                0.1001E+02      0.5000E+00
                                0.1001E+02      0.2000E+01
  8         10      0.2503E+02
                                0.0000E+00      0.0000E+00
                                0.1530E+01      0.1000E-01
                                0.3060E+01      0.2000E-01
                                0.6119E+01      0.4000E-01
                                0.9179E+01      0.6000E-01
                                0.1224E+02      0.8000E-01
                                0.1377E+02      0.9000E-01
                                0.1530E+02      0.1000E+00
                                0.1530E+02      0.5000E+00
                                0.1530E+02      0.2000E+01
  9         10      0.3496E+02
                                0.0000E+00      0.0000E+00
                                0.2045E+01      0.1000E-01
                                0.4091E+01      0.2000E-01
                                0.8181E+01      0.4000E-01
                                0.1227E+02      0.6000E-01
                                0.1636E+02      0.8000E-01
                                0.1841E+02      0.9000E-01
                                0.2045E+02      0.1000E+00
                                0.2045E+02      0.5000E+00
                                0.2045E+02      0.2000E+01
 10         10      0.3500E+02
                                0.0000E+00      0.0000E+00
                                0.2080E+01      0.1000E-01
                                0.4160E+01      0.2000E-01
                                0.8319E+01      0.4000E-01
                                0.1248E+02      0.6000E-01
                                0.1664E+02      0.8000E-01
                                0.1872E+02      0.9000E-01
                                0.2080E+02      0.1000E+00
```

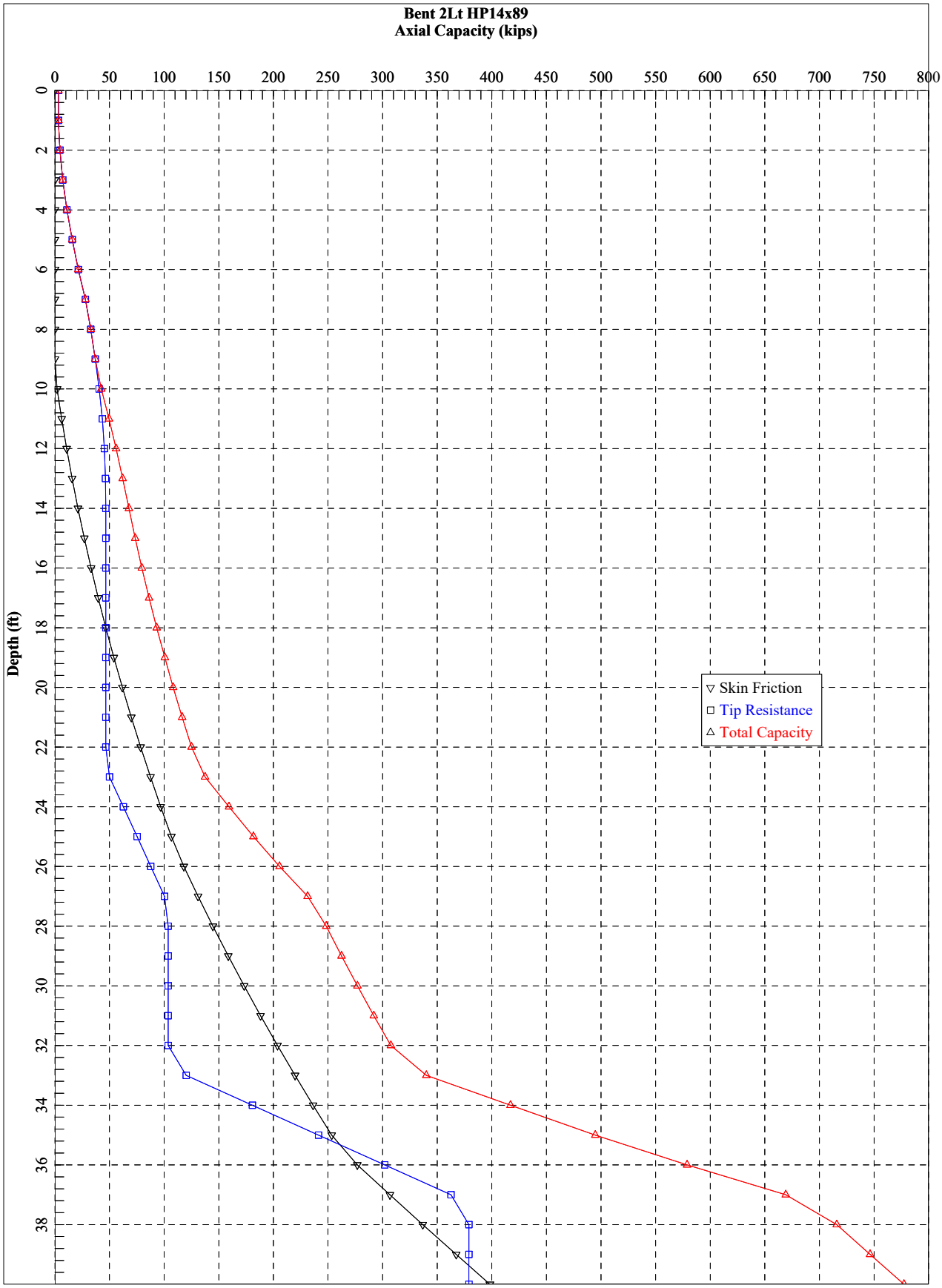
```
                                0.2080E+02      0.5000E+00
                                0.2080E+02      0.2000E+01
11          10      0.3753E+02
                                0.0000E+00      0.0000E+00
                                0.2133E+01      0.1000E-01
                                0.4266E+01      0.2000E-01
                                0.8532E+01      0.4000E-01
                                0.1280E+02      0.6000E-01
                                0.1706E+02      0.8000E-01
                                0.1920E+02      0.9000E-01
                                0.2133E+02      0.1000E+00
                                0.2133E+02      0.5000E+00
                                0.2133E+02      0.2000E+01
12          10      0.3996E+02
                                0.0000E+00      0.0000E+00
                                0.2795E+01      0.1000E-01
                                0.5589E+01      0.2000E-01
                                0.1118E+02      0.4000E-01
                                0.1677E+02      0.6000E-01
                                0.2236E+02      0.8000E-01
                                0.2515E+02      0.9000E-01
                                0.2795E+02      0.1000E+00
                                0.2795E+02      0.5000E+00
                                0.2795E+02      0.2000E+01
13          10      0.4000E+02
                                0.0000E+00      0.0000E+00
                                0.4048E+01      0.1000E-01
                                0.8096E+01      0.2000E-01
                                0.1619E+02      0.4000E-01
                                0.2429E+02      0.6000E-01
                                0.3238E+02      0.8000E-01
                                0.3643E+02      0.9000E-01
                                0.4048E+02      0.1000E+00
                                0.4048E+02      0.5000E+00
                                0.4048E+02      0.2000E+01
14          10      0.4403E+02
                                0.0000E+00      0.0000E+00
                                0.4879E+01      0.1000E-01
                                0.9757E+01      0.2000E-01
                                0.1951E+02      0.4000E-01
                                0.2927E+02      0.6000E-01
                                0.3903E+02      0.8000E-01
                                0.4391E+02      0.9000E-01
                                0.4879E+02      0.1000E+00
                                0.4879E+02      0.5000E+00
                                0.4879E+02      0.2000E+01
15          10      0.4796E+02
                                0.0000E+00      0.0000E+00
                                0.4879E+01      0.1000E-01
                                0.9757E+01      0.2000E-01
                                0.1951E+02      0.4000E-01
                                0.2927E+02      0.6000E-01
                                0.3903E+02      0.8000E-01
                                0.4391E+02      0.9000E-01
                                0.4879E+02      0.1000E+00
                                0.4879E+02      0.5000E+00
                                0.4879E+02      0.2000E+01
16          10      0.4800E+02
                                0.0000E+00      0.0000E+00
                                0.4879E+01      0.1000E-01
                                0.9757E+01      0.2000E-01
                                0.1951E+02      0.4000E-01
                                0.2927E+02      0.6000E-01
                                0.3903E+02      0.8000E-01
                                0.4391E+02      0.9000E-01
                                0.4879E+02      0.1000E+00
                                0.4879E+02      0.5000E+00
                                0.4879E+02      0.2000E+01
17          10      0.5403E+02
```

			0.0000E+00	0.0000E+00
			0.4879E+01	0.1000E-01
			0.9757E+01	0.2000E-01
			0.1951E+02	0.4000E-01
			0.2927E+02	0.6000E-01
			0.3903E+02	0.8000E-01
			0.4391E+02	0.9000E-01
			0.4879E+02	0.1000E+00
			0.4879E+02	0.5000E+00
			0.4879E+02	0.2000E+01
18	10	0.5996E+02		
			0.0000E+00	0.0000E+00
			0.4879E+01	0.1000E-01
			0.9757E+01	0.2000E-01
			0.1951E+02	0.4000E-01
			0.2927E+02	0.6000E-01
			0.3903E+02	0.8000E-01
			0.4391E+02	0.9000E-01
			0.4879E+02	0.1000E+00
			0.4879E+02	0.5000E+00
			0.4879E+02	0.2000E+01

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.2369E+02	0.9088E-02
0.4738E+02	0.1818E-01
0.9476E+02	0.3635E-01
0.1895E+03	0.2363E+00
0.2843E+03	0.7634E+00
0.3411E+03	0.1327E+01
0.3790E+03	0.1818E+01
0.3790E+03	0.2726E+01
0.3790E+03	0.3635E+01

LOAD VERSUS SETTLEMENT CURVE
****

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.8451E+00	0.1978E-03	0.2607E+00	0.1000E-03
0.8451E+01	0.1978E-02	0.2607E+01	0.1000E-02
0.4225E+02	0.9888E-02	0.1303E+02	0.5000E-02
0.8465E+02	0.1979E-01	0.2607E+02	0.1000E-01
0.3861E+03	0.9438E-01	0.1012E+03	0.5000E-01
0.6313E+03	0.1725E+00	0.1249E+03	0.1000E+00
0.7442E+03	0.5881E+00	0.2369E+03	0.5000E+00
0.8154E+03	0.1098E+01	0.3081E+03	0.1000E+01
0.8863E+03	0.2108E+01	0.3790E+03	0.2000E+01


Bent 2Lt HP14x89
Axial Capacity (kips)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
Skin Friction
Tip Resistance
Total Capacity

```
=============================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
                (c) Copyright ENSOFT, Inc., 1987-2015
                      All Rights Reserved

=============================================================================


This program is licensed to :

Moreland Altobelli Associates
Duluth, GA

Path to file locations      : C:\Users\yshao\Desktop\APILE\Courtesy Pkwy\
Name of input data file     : Bent2Lt_14x89.ap7d
Name of output file         : Bent2Lt_14x89.ap7o
Name of plot output file    : Bent2Lt_14x89.ap7p

-----------------------------------------------------------------------------
                     Time and Date of Analysis
-----------------------------------------------------------------------------

          Date:  October 11, 2021     Time:  22:29:49



1
          **********************
          * INPUT INFORMATION *
          **********************



          Bent 2Lt: HP14x89

          DESIGNER   : YCS

          JOB NUMBER : PI No. 0006934


          METHOD FOR UNIT LOAD TRANSFERS :

          - FHWA (Federal Highway Administration)
            Unfactored Unit Side Friction and Unit Side Resistance are used.



          COMPUTATION METHOD(S) FOR PILE CAPACITY :

          - FHWA (Federal Highway Administration)
          - API RP 2A (American Petroleum Institute)


          TYPE OF LOADING :
          - COMPRESSION


          PILE TYPE :

          H-Pile/Steel Pile
```

DATA FOR AXIAL STIFFNESS :

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 40.00 FT.
- PILE STICKUP LENGTH, PSL = 0.00 FT.
- ZERO FRICTION LENGTH, ZFL = 10.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
5.00	CLAY	0.00	115.00	0.00	0.00
5.00	SAND	0.00	115.00	32.00	0.00
25.00	SAND	0.00	115.00	32.00	0.00
25.00	SAND	0.00	115.00	34.00	0.00
35.00	SAND	0.00	115.00	34.00	0.00
35.00	SAND	0.00	52.60	38.00	0.00
45.00	SAND	0.00	52.60	38.00	0.00
45.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

DEPTH FT.	LRFD FACTOR ON UNIT FRICTION	LRFD FACTOR ON UNIT BEARING
0.00	1.000	1.000
5.00	1.000	1.000
5.00	1.000	1.000
25.00	1.000	1.000
25.00	1.000	1.000

35.00	1.000	1.000
35.00	1.000	1.000
45.00	1.000	1.000
45.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
5.00	0.00	0.00	0.000E+00
5.00	0.00	0.00	0.000E+00
25.00	0.00	0.00	0.000E+00
25.00	0.00	0.00	0.000E+00
35.00	0.00	0.00	0.000E+00
35.00	0.00	0.00	0.000E+00
45.00	0.00	0.00	0.000E+00
45.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

1

****
* COMPUTATION RESULT *
****

****
* FED. HWY. METHOD *
****

	PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
Zero depth Ele. 828' →	0.00	0.0	3.2	3.2
	1.00	0.0	3.2	3.2
	2.00	0.0	4.6	4.6
	3.00	0.0	7.2	7.2
	4.00	0.0	11.0	11.0
	5.00	0.0	15.8	15.8
	6.00	0.0	21.4	21.4
	7.00	0.0	27.9	27.9
	8.00	0.0	32.8	32.8
	9.00	0.0	36.9	36.9
BTM of FTG Ele. 818' →	10.00	2.0	40.5	42.5
	11.00	6.2	43.4	49.5
	12.00	10.8	45.3	56.0
	13.00	15.7	46.3	62.0
	14.00	21.1	46.6	67.7
	15.00	26.9	46.6	73.5
	16.00	33.1	46.6	79.6
	17.00	39.6	46.6	86.2
	18.00	46.6	46.6	93.2
	19.00	54.0	46.6	100.6
	20.00	61.8	46.6	108.3
	21.00	69.9	46.6	116.5
	22.00	78.5	46.6	125.1
	23.00	87.5	50.0	137.5
	24.00	96.8	62.6	159.4
	25.00	106.6	75.2	181.8
	26.00	118.0	87.7	205.7
	27.00	131.1	100.3	231.4
Min. Tip Ele. 800' →	28.00	144.6	103.7	248.4

29.00	158.7	103.7	262.4
30.00	173.3	103.7	277.0
31.00	188.3	103.7	292.0
32.00	203.8	103.7	307.6
33.00	219.9	120.2	340.1
34.00	236.4	180.8	417.2
35.00	253.4	241.4	494.8
36.00	276.9	302.0	578.8
37.00	306.7	362.6	669.2
38.00	336.8	379.0	715.9
39.00	367.4	379.0	746.4
40.00	398.3	379.0	777.4

Est. Tip Ele. 791'

Driving resistance Rndr=387kips/0.65=596kips

****
* API RP-2A (1994) *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.0	3.2	3.2
2.00	0.0	4.6	4.6
3.00	0.0	6.0	6.0
4.00	0.0	4.6	4.6
5.00	0.0	3.2	3.2
6.00	0.0	1.8	1.8
7.00	0.0	0.4	0.4
8.00	0.0	0.0	0.0
9.00	0.0	0.0	0.0
10.00	0.0	0.0	0.0
11.00	0.0	0.0	0.0
12.00	0.0	0.0	0.0
13.00	0.0	0.0	0.0
14.00	0.0	0.0	0.0
15.00	0.0	0.0	0.0
16.00	0.0	0.0	0.0
17.00	0.0	0.0	0.0
18.00	0.0	0.0	0.0
19.00	0.0	0.0	0.0
20.00	0.0	0.0	0.0
21.00	0.0	0.0	0.0
22.00	0.0	0.0	0.0
23.00	0.0	0.0	0.0
24.00	0.0	0.0	0.0
25.00	0.0	0.0	0.0
26.00	0.0	0.0	0.0
27.00	0.0	0.0	0.0
28.00	0.0	0.0	0.0
29.00	0.0	0.0	0.0
30.00	0.0	0.0	0.0
31.00	0.0	0.0	0.0
32.00	0.0	0.0	0.0
33.00	0.0	0.0	0.0
34.00	0.0	0.0	0.0
35.00	0.0	0.0	0.0
36.00	0.0	0.0	0.0
37.00	0.0	0.0	0.0
38.00	0.0	0.0	0.0
39.00	0.0	0.0	0.0
40.00	0.0	0.0	0.0

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

****
* COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
* CURVES FOR AXIAL LOADING *
****

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
2	10	0.2525E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
3	10	0.4958E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
4	10	0.5000E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.1000E-01
			0.0000E+00	0.2000E-01
			0.0000E+00	0.4000E-01
			0.0000E+00	0.6000E-01
			0.0000E+00	0.8000E-01
			0.0000E+00	0.9000E-01
			0.0000E+00	0.1000E+00
			0.0000E+00	0.5000E+00
			0.0000E+00	0.2000E+01
5	10	0.1503E+02		
			0.0000E+00	0.0000E+00
			0.9305E+00	0.1000E-01
			0.1861E+01	0.2000E-01
			0.3722E+01	0.4000E-01
			0.5583E+01	0.6000E-01
			0.7444E+01	0.8000E-01
			0.8375E+01	0.9000E-01
			0.9305E+01	0.1000E+00
			0.9305E+01	0.5000E+00
			0.9305E+01	0.2000E+01
6	10	0.2496E+02		
			0.0000E+00	0.0000E+00

```
                                0.1544E+01      0.1000E-01
                                0.3088E+01      0.2000E-01
                                0.6176E+01      0.4000E-01
                                0.9264E+01      0.6000E-01
                                0.1235E+02      0.8000E-01
                                0.1390E+02      0.9000E-01
                                0.1544E+02      0.1000E+00
                                0.1544E+02      0.5000E+00
                                0.1544E+02      0.2000E+01
 7          10      0.2500E+02
                                0.0000E+00      0.0000E+00
                                0.1786E+01      0.1000E-01
                                0.3571E+01      0.2000E-01
                                0.7143E+01      0.4000E-01
                                0.1071E+02      0.6000E-01
                                0.1429E+02      0.8000E-01
                                0.1607E+02      0.9000E-01
                                0.1786E+02      0.1000E+00
                                0.1786E+02      0.5000E+00
                                0.1786E+02      0.2000E+01
 8          10      0.3003E+02
                                0.0000E+00      0.0000E+00
                                0.2232E+01      0.1000E-01
                                0.4464E+01      0.2000E-01
                                0.8929E+01      0.4000E-01
                                0.1339E+02      0.6000E-01
                                0.1786E+02      0.8000E-01
                                0.2009E+02      0.9000E-01
                                0.2232E+02      0.1000E+00
                                0.2232E+02      0.5000E+00
                                0.2232E+02      0.2000E+01
 9          10      0.3496E+02
                                0.0000E+00      0.0000E+00
                                0.2952E+01      0.1000E-01
                                0.5904E+01      0.2000E-01
                                0.1181E+02      0.4000E-01
                                0.1771E+02      0.6000E-01
                                0.2362E+02      0.8000E-01
                                0.2657E+02      0.9000E-01
                                0.2952E+02      0.1000E+00
                                0.2952E+02      0.5000E+00
                                0.2952E+02      0.2000E+01
10          10      0.3500E+02
                                0.0000E+00      0.0000E+00
                                0.3884E+01      0.1000E-01
                                0.7768E+01      0.2000E-01
                                0.1554E+02      0.4000E-01
                                0.2330E+02      0.6000E-01
                                0.3107E+02      0.8000E-01
                                0.3496E+02      0.9000E-01
                                0.3884E+02      0.1000E+00
                                0.3884E+02      0.5000E+00
                                0.3884E+02      0.2000E+01
11          10      0.4003E+02
                                0.0000E+00      0.0000E+00
                                0.4515E+01      0.1000E-01
                                0.9030E+01      0.2000E-01
                                0.1806E+02      0.4000E-01
                                0.2709E+02      0.6000E-01
                                0.3612E+02      0.8000E-01
                                0.4064E+02      0.9000E-01
                                0.4515E+02      0.1000E+00
                                0.4515E+02      0.5000E+00
                                0.4515E+02      0.2000E+01
12          10      0.4496E+02
                                0.0000E+00      0.0000E+00
                                0.4515E+01      0.1000E-01
                                0.9030E+01      0.2000E-01
                                0.1806E+02      0.4000E-01
```

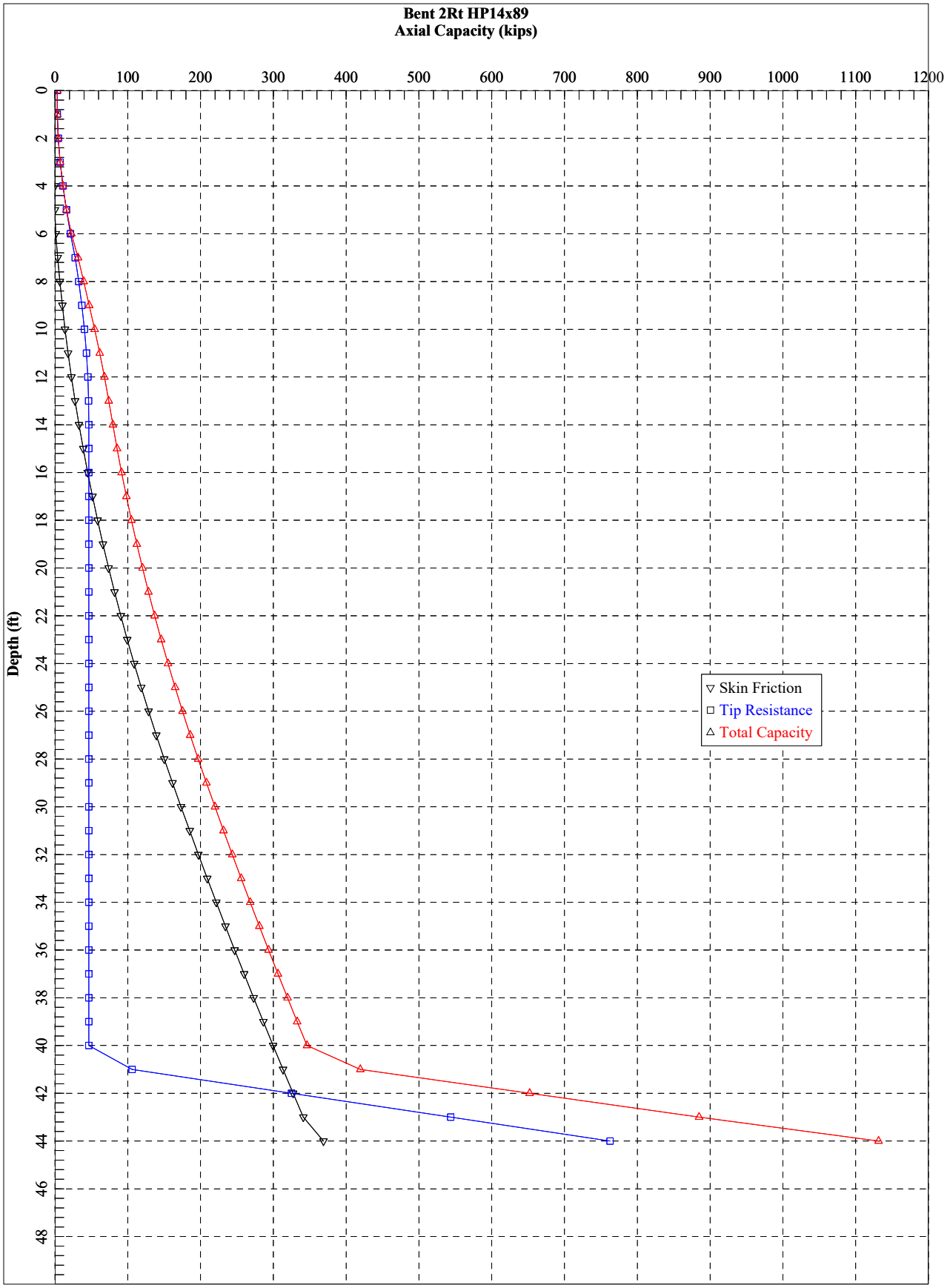
			0.2709E+02	0.6000E-01
			0.3612E+02	0.8000E-01
			0.4064E+02	0.9000E-01
			0.4515E+02	0.1000E+00
			0.4515E+02	0.5000E+00
			0.4515E+02	0.2000E+01
13	10	0.4500E+02		
			0.0000E+00	0.0000E+00
			0.4515E+01	0.1000E-01
			0.9030E+01	0.2000E-01
			0.1806E+02	0.4000E-01
			0.2709E+02	0.6000E-01
			0.3612E+02	0.8000E-01
			0.4064E+02	0.9000E-01
			0.4515E+02	0.1000E+00
			0.4515E+02	0.5000E+00
			0.4515E+02	0.2000E+01
14	10	0.5253E+02		
			0.0000E+00	0.0000E+00
			0.4515E+01	0.1000E-01
			0.9030E+01	0.2000E-01
			0.1806E+02	0.4000E-01
			0.2709E+02	0.6000E-01
			0.3612E+02	0.8000E-01
			0.4064E+02	0.9000E-01
			0.4515E+02	0.1000E+00
			0.4515E+02	0.5000E+00
			0.4515E+02	0.2000E+01
15	10	0.5996E+02		
			0.0000E+00	0.0000E+00
			0.4515E+01	0.1000E-01
			0.9030E+01	0.2000E-01
			0.1806E+02	0.4000E-01
			0.2709E+02	0.6000E-01
			0.3612E+02	0.8000E-01
			0.4064E+02	0.9000E-01
			0.4515E+02	0.1000E+00
			0.4515E+02	0.5000E+00
			0.4515E+02	0.2000E+01

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.2369E+02	0.9088E-02
0.4738E+02	0.1818E-01
0.9476E+02	0.3635E-01
0.1895E+03	0.2363E+00
0.2843E+03	0.7634E+00
0.3411E+03	0.1327E+01
0.3790E+03	0.1818E+01
0.3790E+03	0.2726E+01
0.3790E+03	0.3635E+01

LOAD VERSUS SETTLEMENT CURVE
****

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.7159E+00	0.1479E-03	0.2607E+00	0.1000E-03
0.7159E+01	0.1479E-02	0.2607E+01	0.1000E-02
0.3579E+02	0.7393E-02	0.1303E+02	0.5000E-02
0.7159E+02	0.1479E-01	0.2607E+02	0.1000E-01

0.3272E+03	0.7149E-01	0.1012E+03	0.5000E-01
0.5416E+03	0.1351E+00	0.1249E+03	0.1000E+00
0.6536E+03	0.5443E+00	0.2369E+03	0.5000E+00
0.7248E+03	0.1050E+01	0.3081E+03	0.1000E+01
0.7957E+03	0.2056E+01	0.3790E+03	0.2000E+01


Bent 2Rt HP14x89
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Skin Friction
Tip Resistance
Total Capacity

```
=============================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
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=============================================================================

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Moreland Altobelli Associates
Duluth, GA

Path to file locations      : C:\Users\yshao\Desktop\APILE\Courtesy Pkwy\
Name of input data file     : Bent2Rt_14x89.ap7d
Name of output file         : Bent2Rt_14x89.ap7o
Name of plot output file    : Bent2Rt_14x89.ap7p

-----------------------------------------------------------------------------
                     Time and Date of Analysis
-----------------------------------------------------------------------------

          Date:  October 11, 2021     Time:  23:40:56
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     **********************
     * INPUT INFORMATION *
     **********************



     Bent 2Rt: HP14x89

     DESIGNER   : YCS

     JOB NUMBER : PI No. 0006934


     METHOD FOR UNIT LOAD TRANSFERS :

     - FHWA (Federal Highway Administration)
       Unfactored Unit Side Friction and Unit Side Resistance are used.



     COMPUTATION METHOD(S) FOR PILE CAPACITY :

     - FHWA (Federal Highway Administration)
     - API RP 2A (American Petroleum Institute)


     TYPE OF LOADING :
     - COMPRESSION


     PILE TYPE :

     H-Pile/Steel Pile
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DATA FOR AXIAL STIFFNESS :

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 44.00 FT.
- PILE STICKUP LENGTH, PSL = 0.00 FT.
- ZERO FRICTION LENGTH, ZFL = 6.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
5.00	CLAY	0.00	115.00	0.00	0.00
5.00	SAND	0.00	115.00	32.00	0.00
29.00	SAND	0.00	115.00	32.00	0.00
29.00	SAND	0.00	52.60	32.00	0.00
43.00	SAND	0.00	52.60	32.00	0.00
43.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

DEPTH FT.	LRFD FACTOR ON UNIT FRICTION	LRFD FACTOR ON UNIT BEARING
0.00	1.000	1.000
5.00	1.000	1.000
5.00	1.000	1.000
29.00	1.000	1.000
29.00	1.000	1.000
43.00	1.000	1.000
43.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
5.00	0.00	0.00	0.000E+00
5.00	0.00	0.00	0.000E+00
29.00	0.00	0.00	0.000E+00
29.00	0.00	0.00	0.000E+00
43.00	0.00	0.00	0.000E+00
43.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

1

****
* COMPUTATION RESULT *
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****
* FED. HWY. METHOD *
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PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.0	3.2	3.2
2.00	0.0	4.6	4.6
3.00	0.0	7.2	7.2
4.00	0.0	11.0	11.0
5.00	0.0	15.8	15.8
6.00	1.2	21.4	22.6
7.00	3.8	27.9	31.7
8.00	6.8	32.8	39.6
9.00	10.2	36.9	47.1
10.00	13.9	40.5	54.5
11.00	18.1	43.4	61.5
12.00	22.7	45.3	68.0
13.00	27.7	46.3	74.0
14.00	33.1	46.6	79.6
15.00	38.9	46.6	85.4
16.00	45.0	46.6	91.6
17.00	51.6	46.6	98.2
18.00	58.6	46.6	105.1
19.00	66.0	46.6	112.5
20.00	73.7	46.6	120.3
21.00	81.9	46.6	128.5
22.00	90.5	46.6	137.0
23.00	99.4	46.6	146.0
24.00	108.8	46.6	155.4
25.00	118.6	46.6	165.1
26.00	128.7	46.6	175.3
27.00	139.3	46.6	185.8
28.00	150.2	46.6	196.8
29.00	161.6	46.6	208.2
30.00	173.2	46.6	219.8
31.00	185.1	46.6	231.6
32.00	197.1	46.6	243.6
33.00	209.3	46.6	255.8
34.00	221.6	46.6	268.2
35.00	234.2	46.6	280.8
36.00	246.9	46.6	293.5

Zero depth Ele. 824' →

Btm of Ftg. Ele. 818' →

37.00	259.9	46.6	306.4
38.00	273.0	46.6	319.5
39.00	286.3	46.6	332.8
40.00	299.7	46.6	346.3
41.00	313.4	106.1	419.5
42.00	327.2	324.9	652.1
43.00	341.2	543.7	884.9
44.00	368.9	762.5	1131.4

Driving resistance Rndr=387kips/0.65=596kips

Min. Tip Ele. 781'

Est. Tip Ele. 779'

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* API RP-2A (1994) *
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PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.0	3.2	3.2
2.00	0.0	4.6	4.6
3.00	0.0	6.0	6.0
4.00	0.0	4.6	4.6
5.00	0.0	3.2	3.2
6.00	0.0	1.8	1.8
7.00	0.0	0.4	0.4
8.00	0.0	0.0	0.0
9.00	0.0	0.0	0.0
10.00	0.0	0.0	0.0
11.00	0.0	0.0	0.0
12.00	0.0	0.0	0.0
13.00	0.0	0.0	0.0
14.00	0.0	0.0	0.0
15.00	0.0	0.0	0.0
16.00	0.0	0.0	0.0
17.00	0.0	0.0	0.0
18.00	0.0	0.0	0.0
19.00	0.0	0.0	0.0
20.00	0.0	0.0	0.0
21.00	0.0	0.0	0.0
22.00	0.0	0.0	0.0
23.00	0.0	0.0	0.0
24.00	0.0	0.0	0.0
25.00	0.0	0.0	0.0
26.00	0.0	0.0	0.0
27.00	0.0	0.0	0.0
28.00	0.0	0.0	0.0
29.00	0.0	0.0	0.0
30.00	0.0	0.0	0.0
31.00	0.0	0.0	0.0
32.00	0.0	0.0	0.0
33.00	0.0	0.0	0.0
34.00	0.0	0.0	0.0
35.00	0.0	0.0	0.0
36.00	0.0	0.0	0.0
37.00	0.0	0.0	0.0
38.00	0.0	0.0	0.0
39.00	0.0	0.0	0.0
40.00	0.0	0.0	0.0
41.00	0.0	0.0	0.0
42.00	0.0	0.0	0.0
43.00	0.0	0.0	0.0
44.00	0.0	0.0	0.0

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

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        ***********************************************
        * COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
        * CURVES FOR AXIAL LOADING                      *
        ***********************************************
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T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
2	10	0.2525E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
3	10	0.4958E+01		
			0.0000E+00	0.0000E+00
			0.5234E+00	0.2908E-01
			0.8724E+00	0.5634E-01
			0.1309E+01	0.1036E+00
			0.1570E+01	0.1454E+00
			0.1745E+01	0.1818E+00
			0.1570E+01	0.3635E+00
			0.1570E+01	0.5453E+00
			0.1570E+01	0.9088E+00
			0.1570E+01	0.3635E+01
4	10	0.5000E+01		
			0.0000E+00	0.0000E+00
			0.3780E+00	0.1000E-01
			0.7560E+00	0.2000E-01
			0.1512E+01	0.4000E-01
			0.2268E+01	0.6000E-01
			0.3024E+01	0.8000E-01
			0.3402E+01	0.9000E-01
			0.3780E+01	0.1000E+00
			0.3780E+01	0.5000E+00
			0.3780E+01	0.2000E+01
5	10	0.1703E+02		
			0.0000E+00	0.0000E+00
			0.1047E+01	0.1000E-01
			0.2094E+01	0.2000E-01
			0.4187E+01	0.4000E-01
			0.6281E+01	0.6000E-01
			0.8375E+01	0.8000E-01
			0.9421E+01	0.9000E-01
			0.1047E+02	0.1000E+00
			0.1047E+02	0.5000E+00
			0.1047E+02	0.2000E+01
6	10	0.2896E+02		
			0.0000E+00	0.0000E+00

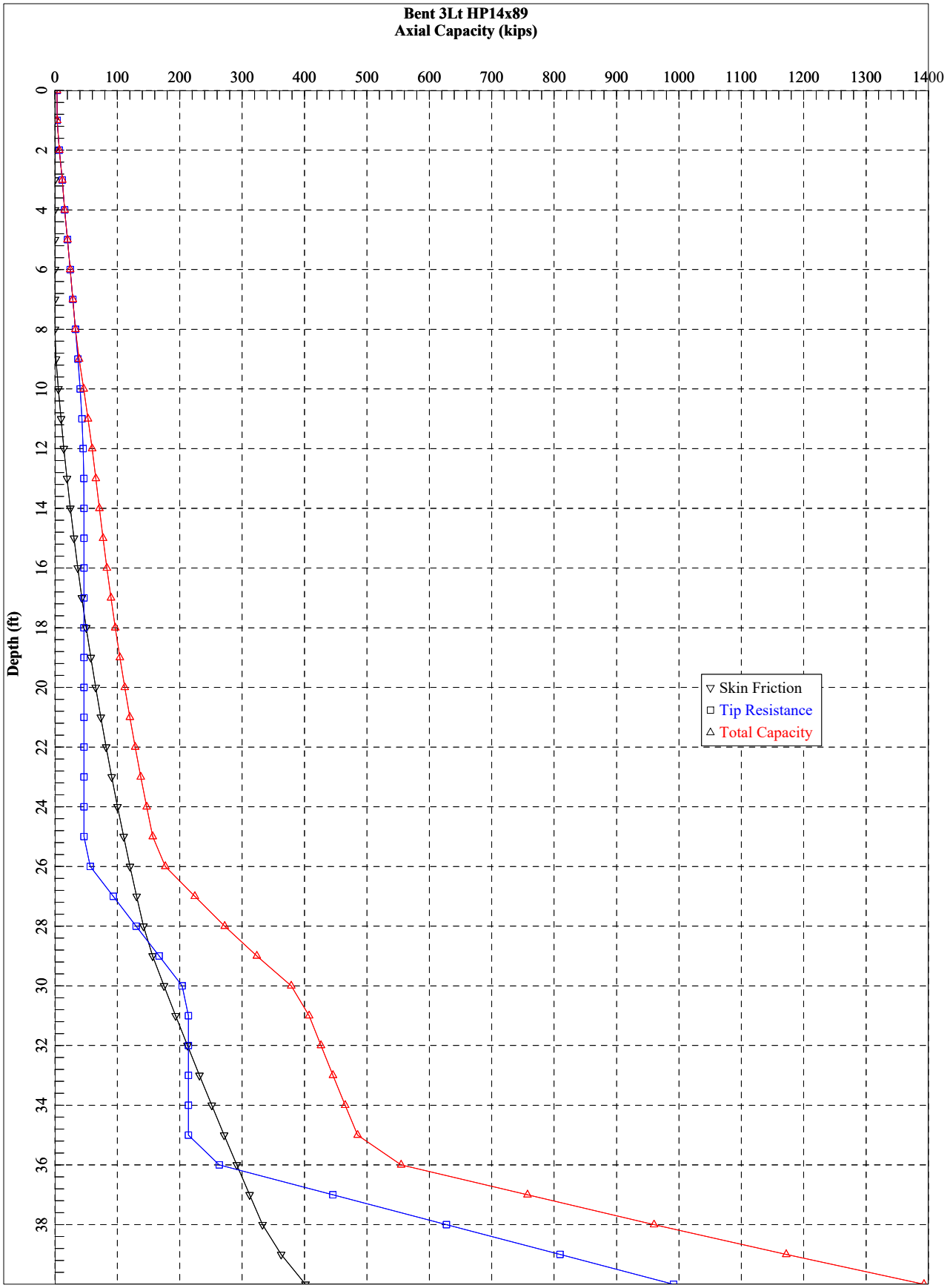
			0.1679E+01	0.1000E-01
			0.3357E+01	0.2000E-01
			0.6715E+01	0.4000E-01
			0.1007E+02	0.6000E-01
			0.1343E+02	0.8000E-01
			0.1511E+02	0.9000E-01
			0.1679E+02	0.1000E+00
			0.1679E+02	0.5000E+00
			0.1679E+02	0.2000E+01
7	10	0.2900E+02		
			0.0000E+00	0.0000E+00
			0.1713E+01	0.1000E-01
			0.3426E+01	0.2000E-01
			0.6853E+01	0.4000E-01
			0.1028E+02	0.6000E-01
			0.1371E+02	0.8000E-01
			0.1542E+02	0.9000E-01
			0.1713E+02	0.1000E+00
			0.1713E+02	0.5000E+00
			0.1713E+02	0.2000E+01
8	10	0.3603E+02		
			0.0000E+00	0.0000E+00
			0.1899E+01	0.1000E-01
			0.3799E+01	0.2000E-01
			0.7597E+01	0.4000E-01
			0.1140E+02	0.6000E-01
			0.1519E+02	0.8000E-01
			0.1709E+02	0.9000E-01
			0.1899E+02	0.1000E+00
			0.1899E+02	0.5000E+00
			0.1899E+02	0.2000E+01
9	10	0.4296E+02		
			0.0000E+00	0.0000E+00
			0.3041E+01	0.1000E-01
			0.6082E+01	0.2000E-01
			0.1216E+02	0.4000E-01
			0.1825E+02	0.6000E-01
			0.2433E+02	0.8000E-01
			0.2737E+02	0.9000E-01
			0.3041E+02	0.1000E+00
			0.3041E+02	0.5000E+00
			0.3041E+02	0.2000E+01
10	10	0.4300E+02		
			0.0000E+00	0.0000E+00
			0.4037E+01	0.1000E-01
			0.8073E+01	0.2000E-01
			0.1615E+02	0.4000E-01
			0.2422E+02	0.6000E-01
			0.3229E+02	0.8000E-01
			0.3633E+02	0.9000E-01
			0.4037E+02	0.1000E+00
			0.4037E+02	0.5000E+00
			0.4037E+02	0.2000E+01
11	10	0.5153E+02		
			0.0000E+00	0.0000E+00
			0.4037E+01	0.1000E-01
			0.8073E+01	0.2000E-01
			0.1615E+02	0.4000E-01
			0.2422E+02	0.6000E-01
			0.3229E+02	0.8000E-01
			0.3633E+02	0.9000E-01
			0.4037E+02	0.1000E+00
			0.4037E+02	0.5000E+00
			0.4037E+02	0.2000E+01
12	10	0.5996E+02		
			0.0000E+00	0.0000E+00
			0.4037E+01	0.1000E-01
			0.8073E+01	0.2000E-01
			0.1615E+02	0.4000E-01

0.2422E+02	0.6000E-01
0.3229E+02	0.8000E-01
0.3633E+02	0.9000E-01
0.4037E+02	0.1000E+00
0.4037E+02	0.5000E+00
0.4037E+02	0.2000E+01

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.4766E+02	0.9088E-02
0.9531E+02	0.1818E-01
0.1906E+03	0.3635E-01
0.3813E+03	0.2363E+00
0.5719E+03	0.7634E+00
0.6863E+03	0.1327E+01
0.7625E+03	0.1818E+01
0.7625E+03	0.2726E+01
0.7625E+03	0.3635E+01

LOAD VERSUS SETTLEMENT CURVE
****

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.1009E+01	0.1750E-03	0.5244E+00	0.1000E-03
0.1009E+02	0.1750E-02	0.5244E+01	0.1000E-02
0.5046E+02	0.8748E-02	0.2622E+02	0.5000E-02
0.1009E+03	0.1750E-01	0.5244E+02	0.1000E-01
0.4403E+03	0.8200E-01	0.2036E+03	0.5000E-01
0.6560E+03	0.1471E+00	0.2513E+03	0.1000E+00
0.8813E+03	0.5673E+00	0.4766E+03	0.5000E+00
0.1025E+04	0.1080E+01	0.6199E+03	0.1000E+01
0.1167E+04	0.2093E+01	0.7625E+03	0.2000E+01


Bent 3Lt HP14x89
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
Skin Friction
Tip Resistance
Total Capacity

```
=============================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
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                      All Rights Reserved

=============================================================================

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Duluth, GA

Path to file locations      : C:\Users\yshao\Desktop\APILE\Courtesy Pkwy\
Name of input data file     : Bent3Lt_14x89.ap7d
Name of output file         : Bent3Lt_14x89.ap7o
Name of plot output file    : Bent3Lt_14x89.ap7p

-----------------------------------------------------------------------------
                     Time and Date of Analysis
-----------------------------------------------------------------------------

          Date:  October 12, 2021     Time:  00:02:44
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     **********************
     * INPUT INFORMATION *
     **********************



     Bent 3Lt: HP14x89

     DESIGNER   : YCS

     JOB NUMBER : PI No. 0006934


     METHOD FOR UNIT LOAD TRANSFERS :

     - FHWA (Federal Highway Administration)
       Unfactored Unit Side Friction and Unit Side Resistance are used.



     COMPUTATION METHOD(S) FOR PILE CAPACITY :

     - FHWA (Federal Highway Administration)
     - API RP 2A (American Petroleum Institute)


     TYPE OF LOADING :
     - COMPRESSION


     PILE TYPE :

     H-Pile/Steel Pile
```

DATA FOR AXIAL STIFFNESS :

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 40.00 FT.
- PILE STICKUP LENGTH, PSL = 0.00 FT.
- ZERO FRICTION LENGTH, ZFL = 9.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
2.50	CLAY	0.00	115.00	0.00	0.00
2.50	SAND	0.00	115.00	32.00	0.00
28.00	SAND	0.00	115.00	32.00	0.00
28.00	SAND	0.00	57.60	36.00	0.00
38.00	SAND	0.00	57.60	36.00	0.00
38.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

DEPTH FT.	LRFD FACTOR ON UNIT FRICTION	LRFD FACTOR ON UNIT BEARING
0.00	1.000	1.000
2.50	1.000	1.000
2.50	1.000	1.000
28.00	1.000	1.000
28.00	1.000	1.000
38.00	1.000	1.000
38.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
28.00	0.00	0.00	0.000E+00
28.00	0.00	0.00	0.000E+00
38.00	0.00	0.00	0.000E+00
38.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

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****
* COMPUTATION RESULT *
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****
* FED. HWY. METHOD *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.0	3.6	3.6
2.00	0.0	7.0	7.0
3.00	0.0	11.7	11.7
4.00	0.0	15.5	15.5
5.00	0.0	20.2	20.2
6.00	0.0	24.6	24.6
7.00	0.0	28.7	28.7
8.00	0.0	32.8	32.8
9.00	1.8	36.9	38.7
10.00	5.6	40.5	46.1
11.00	9.8	43.4	53.1
12.00	14.3	45.3	59.6
13.00	19.3	46.3	65.6
14.00	24.7	46.6	71.3
15.00	30.5	46.6	77.1
16.00	36.7	46.6	83.2
17.00	43.2	46.6	89.8
18.00	50.2	46.6	96.8
19.00	57.6	46.6	104.1
20.00	65.4	46.6	111.9
21.00	73.5	46.6	120.1
22.00	82.1	46.6	128.7
23.00	91.1	46.6	137.6
24.00	100.4	46.6	147.0
25.00	110.2	46.6	156.7
26.00	120.3	56.6	176.9
27.00	130.9	93.4	224.3
28.00	141.9	130.2	272.1
29.00	156.5	167.1	323.6
30.00	174.8	203.9	378.7
31.00	193.5	213.9	407.4
32.00	212.4	213.9	426.3
33.00	231.7	213.9	445.6
34.00	251.3	213.9	465.2
35.00	271.2	213.9	485.1
36.00	291.4	263.4	554.8

Zero depth Ele. 824'

Btm of Ftg. Ele. 815'

Min. Tip Ele. 791'

Driving resistance Rndr=387kips/0.65=596kips

37.00	312.0	445.4	757.4
38.00	332.8	627.4	960.2
39.00	362.6	809.4	1171.9
40.00	401.4	991.3	1392.7

Est. Tip Ele. 784'

****
* API RP-2A (1994) *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.0	2.8	2.8
2.00	0.0	2.8	2.8
3.00	0.0	3.2	3.2
4.00	0.0	1.8	1.8
5.00	0.0	0.4	0.4
6.00	0.0	0.0	0.0
7.00	0.0	0.0	0.0
8.00	0.0	0.0	0.0
9.00	0.0	0.0	0.0
10.00	0.0	0.0	0.0
11.00	0.0	0.0	0.0
12.00	0.0	0.0	0.0
13.00	0.0	0.0	0.0
14.00	0.0	0.0	0.0
15.00	0.0	0.0	0.0
16.00	0.0	0.0	0.0
17.00	0.0	0.0	0.0
18.00	0.0	0.0	0.0
19.00	0.0	0.0	0.0
20.00	0.0	0.0	0.0
21.00	0.0	0.0	0.0
22.00	0.0	0.0	0.0
23.00	0.0	0.0	0.0
24.00	0.0	0.0	0.0
25.00	0.0	0.0	0.0
26.00	0.0	0.0	0.0
27.00	0.0	0.0	0.0
28.00	0.0	0.0	0.0
29.00	0.0	0.0	0.0
30.00	0.0	0.0	0.0
31.00	0.0	0.0	0.0
32.00	0.0	0.0	0.0
33.00	0.0	0.0	0.0
34.00	0.0	0.0	0.0
35.00	0.0	0.0	0.0
36.00	0.0	0.0	0.0
37.00	0.0	0.0	0.0
38.00	0.0	0.0	0.0
39.00	0.0	0.0	0.0
40.00	0.0	0.0	0.0

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

****
* COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
* CURVES FOR AXIAL LOADING *
****

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
2	10	0.1275E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
3	10	0.2458E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
4	10	0.2500E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.1000E-01
			0.0000E+00	0.2000E-01
			0.0000E+00	0.4000E-01
			0.0000E+00	0.6000E-01
			0.0000E+00	0.8000E-01
			0.0000E+00	0.9000E-01
			0.0000E+00	0.1000E+00
			0.0000E+00	0.5000E+00
			0.0000E+00	0.2000E+01
5	10	0.1528E+02		
			0.0000E+00	0.0000E+00
			0.9305E+00	0.1000E-01
			0.1861E+01	0.2000E-01
			0.3722E+01	0.4000E-01
			0.5583E+01	0.6000E-01
			0.7444E+01	0.8000E-01
			0.8375E+01	0.9000E-01
			0.9305E+01	0.1000E+00
			0.9305E+01	0.5000E+00
			0.9305E+01	0.2000E+01
6	10	0.2796E+02		
			0.0000E+00	0.0000E+00
			0.1869E+01	0.1000E-01
			0.3738E+01	0.2000E-01
			0.7477E+01	0.4000E-01
			0.1121E+02	0.6000E-01
			0.1495E+02	0.8000E-01
			0.1682E+02	0.9000E-01
			0.1869E+02	0.1000E+00
			0.1869E+02	0.5000E+00

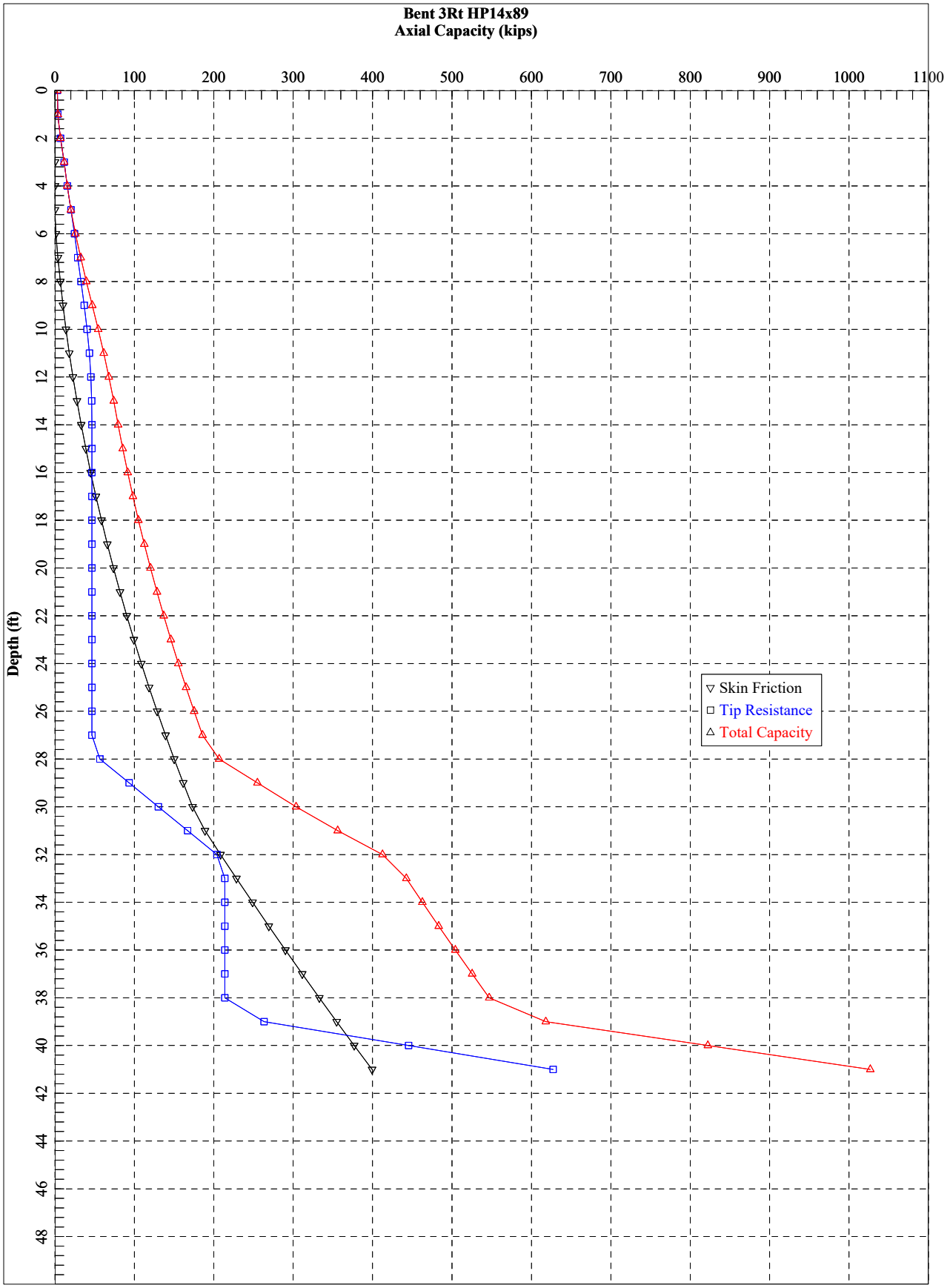
```
                                0.1869E+02      0.2000E+01
 7         10      0.2800E+02
                                0.0000E+00      0.0000E+00
                                0.2406E+01      0.1000E-01
                                0.4812E+01      0.2000E-01
                                0.9624E+01      0.4000E-01
                                0.1444E+02      0.6000E-01
                                0.1925E+02      0.8000E-01
                                0.2165E+02      0.9000E-01
                                0.2406E+02      0.1000E+00
                                0.2406E+02      0.5000E+00
                                0.2406E+02      0.2000E+01
 8         10      0.3303E+02
                                0.0000E+00      0.0000E+00
                                0.2882E+01      0.1000E-01
                                0.5765E+01      0.2000E-01
                                0.1153E+02      0.4000E-01
                                0.1729E+02      0.6000E-01
                                0.2306E+02      0.8000E-01
                                0.2594E+02      0.9000E-01
                                0.2882E+02      0.1000E+00
                                0.2882E+02      0.5000E+00
                                0.2882E+02      0.2000E+01
 9         10      0.3796E+02
                                0.0000E+00      0.0000E+00
                                0.3693E+01      0.1000E-01
                                0.7387E+01      0.2000E-01
                                0.1477E+02      0.4000E-01
                                0.2216E+02      0.6000E-01
                                0.2955E+02      0.8000E-01
                                0.3324E+02      0.9000E-01
                                0.3693E+02      0.1000E+00
                                0.3693E+02      0.5000E+00
                                0.3693E+02      0.2000E+01
10         10      0.3800E+02
                                0.0000E+00      0.0000E+00
                                0.5000E+01      0.1000E-01
                                0.1000E+02      0.2000E-01
                                0.2000E+02      0.4000E-01
                                0.3000E+02      0.6000E-01
                                0.4000E+02      0.8000E-01
                                0.4500E+02      0.9000E-01
                                0.5000E+02      0.1000E+00
                                0.5000E+02      0.5000E+00
                                0.5000E+02      0.2000E+01
11         10      0.4903E+02
                                0.0000E+00      0.0000E+00
                                0.5659E+01      0.1000E-01
                                0.1132E+02      0.2000E-01
                                0.2264E+02      0.4000E-01
                                0.3396E+02      0.6000E-01
                                0.4527E+02      0.8000E-01
                                0.5093E+02      0.9000E-01
                                0.5659E+02      0.1000E+00
                                0.5659E+02      0.5000E+00
                                0.5659E+02      0.2000E+01
12         10      0.5996E+02
                                0.0000E+00      0.0000E+00
                                0.5659E+01      0.1000E-01
                                0.1132E+02      0.2000E-01
                                0.2264E+02      0.4000E-01
                                0.3396E+02      0.6000E-01
                                0.4527E+02      0.8000E-01
                                0.5093E+02      0.9000E-01
                                0.5659E+02      0.1000E+00
                                0.5659E+02      0.5000E+00
                                0.5659E+02      0.2000E+01
```

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.6196E+02	0.9088E-02
0.1239E+03	0.1818E-01
0.2478E+03	0.3635E-01
0.4957E+03	0.2363E+00
0.7435E+03	0.7634E+00
0.8922E+03	0.1327E+01
0.9913E+03	0.1818E+01
0.9913E+03	0.2726E+01
0.9913E+03	0.3635E+01

LOAD VERSUS SETTLEMENT CURVE

****

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.1198E+01	0.1847E-03	0.6818E+00	0.1000E-03
0.1198E+02	0.1847E-02	0.6818E+01	0.1000E-02
0.5988E+02	0.9237E-02	0.3409E+02	0.5000E-02
0.1199E+03	0.1848E-01	0.6818E+02	0.1000E-01
0.5172E+03	0.8595E-01	0.2648E+03	0.5000E-01
0.7607E+03	0.1523E+00	0.3267E+03	0.1000E+00
0.1054E+04	0.5762E+00	0.6197E+03	0.5000E+00
0.1240E+04	0.1091E+01	0.8060E+03	0.1000E+01
0.1425E+04	0.2106E+01	0.9913E+03	0.2000E+01


Bent 3Rt HP14x89
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
1000
1100
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Skin Friction
Tip Resistance
Total Capacity

```
=============================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
                (c) Copyright ENSOFT, Inc., 1987-2015
                      All Rights Reserved

=============================================================================

This program is licensed to :

Moreland Altobelli Associates
Duluth, GA

Path to file locations      : C:\Users\yshao\Desktop\APILE\Courtesy Pkwy\
Name of input data file     : Bent3Rt_14x89.ap7d
Name of output file         : Bent3Rt_14x89.ap7o
Name of plot output file    : Bent3Rt_14x89.ap7p

-----------------------------------------------------------------------------
                     Time and Date of Analysis
-----------------------------------------------------------------------------

          Date:  October 12, 2021     Time:  22:38:47
```



```
     **********************
     * INPUT INFORMATION *
     **********************



     Bent 3Rt: HP14x89

     DESIGNER   : YCS

     JOB NUMBER : PI No. 0006934


     METHOD FOR UNIT LOAD TRANSFERS :

     - FHWA (Federal Highway Administration)
       Unfactored Unit Side Friction and Unit Side Resistance are used.



     COMPUTATION METHOD(S) FOR PILE CAPACITY :

     - FHWA (Federal Highway Administration)
     - API RP 2A (American Petroleum Institute)


     TYPE OF LOADING :
     - COMPRESSION


     PILE TYPE :

     H-Pile/Steel Pile
```

DATA FOR AXIAL STIFFNESS :

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 41.00 FT.
- PILE STICKUP LENGTH, PSL = 0.00 FT.
- ZERO FRICTION LENGTH, ZFL = 6.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
2.50	CLAY	0.00	115.00	0.00	0.00
2.50	SAND	0.00	115.00	32.00	0.00
30.00	SAND	0.00	115.00	32.00	0.00
30.00	SAND	0.00	57.60	36.00	0.00
41.00	SAND	0.00	57.60	36.00	0.00
41.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

DEPTH FT.	LRFD FACTOR ON UNIT FRICTION	LRFD FACTOR ON UNIT BEARING
0.00	1.000	1.000
2.50	1.000	1.000
2.50	1.000	1.000
30.00	1.000	1.000
30.00	1.000	1.000
41.00	1.000	1.000
41.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
30.00	0.00	0.00	0.000E+00
30.00	0.00	0.00	0.000E+00
41.00	0.00	0.00	0.000E+00
41.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

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****
* COMPUTATION RESULT *
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****
* FED. HWY. METHOD *
****

	PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
Zero depth Ele. 821'	0.00	0.0	3.2	3.2
	1.00	0.0	3.6	3.6
	2.00	0.0	7.0	7.0
	3.00	0.0	11.7	11.7
	4.00	0.0	15.5	15.5
	5.00	0.0	20.2	20.2
Btm of Ftg. Ele. 815' →	6.00	1.2	24.6	25.8
	7.00	3.8	28.7	32.5
	8.00	6.8	32.8	39.6
	9.00	10.2	36.9	47.1
	10.00	13.9	40.5	54.5
	11.00	18.1	43.4	61.5
	12.00	22.7	45.3	68.0
	13.00	27.7	46.3	74.0
	14.00	33.1	46.6	79.6
	15.00	38.9	46.6	85.4
	16.00	45.0	46.6	91.6
	17.00	51.6	46.6	98.2
	18.00	58.6	46.6	105.1
	19.00	66.0	46.6	112.5
	20.00	73.7	46.6	120.3
	21.00	81.9	46.6	128.5
	22.00	90.5	46.6	137.0
	23.00	99.4	46.6	146.0
	24.00	108.8	46.6	155.4
	25.00	118.6	46.6	165.1
	26.00	128.7	46.6	175.3
	27.00	139.3	46.6	185.8
	28.00	150.2	56.6	206.8
	29.00	161.6	93.4	255.0
	30.00	173.3	130.2	303.6
Min. Tip Ele. 790' →	31.00	189.0	167.1	356.1
	32.00	208.6	203.9	412.5
	33.00	228.5	213.9	442.5
	34.00	248.8	213.9	462.7
	35.00	269.3	213.9	483.2
	36.00	290.2	213.9	504.1

37.00	311.4	213.9	525.3
38.00	332.9	213.9	546.8
39.00	354.7	263.4	618.1
40.00	376.8	445.4	822.2
41.00	399.3	627.4	1026.7

Driving resistance Rndr=387kips/0.65=596kips

Est. Tip Ele. 780'

****
* API RP-2A (1994) *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.0	2.8	2.8
2.00	0.0	2.8	2.8
3.00	0.0	3.2	3.2
4.00	0.0	1.8	1.8
5.00	0.0	0.4	0.4
6.00	0.0	0.0	0.0
7.00	0.0	0.0	0.0
8.00	0.0	0.0	0.0
9.00	0.0	0.0	0.0
10.00	0.0	0.0	0.0
11.00	0.0	0.0	0.0
12.00	0.0	0.0	0.0
13.00	0.0	0.0	0.0
14.00	0.0	0.0	0.0
15.00	0.0	0.0	0.0
16.00	0.0	0.0	0.0
17.00	0.0	0.0	0.0
18.00	0.0	0.0	0.0
19.00	0.0	0.0	0.0
20.00	0.0	0.0	0.0
21.00	0.0	0.0	0.0
22.00	0.0	0.0	0.0
23.00	0.0	0.0	0.0
24.00	0.0	0.0	0.0
25.00	0.0	0.0	0.0
26.00	0.0	0.0	0.0
27.00	0.0	0.0	0.0
28.00	0.0	0.0	0.0
29.00	0.0	0.0	0.0
30.00	0.0	0.0	0.0
31.00	0.0	0.0	0.0
32.00	0.0	0.0	0.0
33.00	0.0	0.0	0.0
34.00	0.0	0.0	0.0
35.00	0.0	0.0	0.0
36.00	0.0	0.0	0.0
37.00	0.0	0.0	0.0
38.00	0.0	0.0	0.0
39.00	0.0	0.0	0.0
40.00	0.0	0.0	0.0
41.00	0.0	0.0	0.0

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

****
* COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
* CURVES FOR AXIAL LOADING *

****

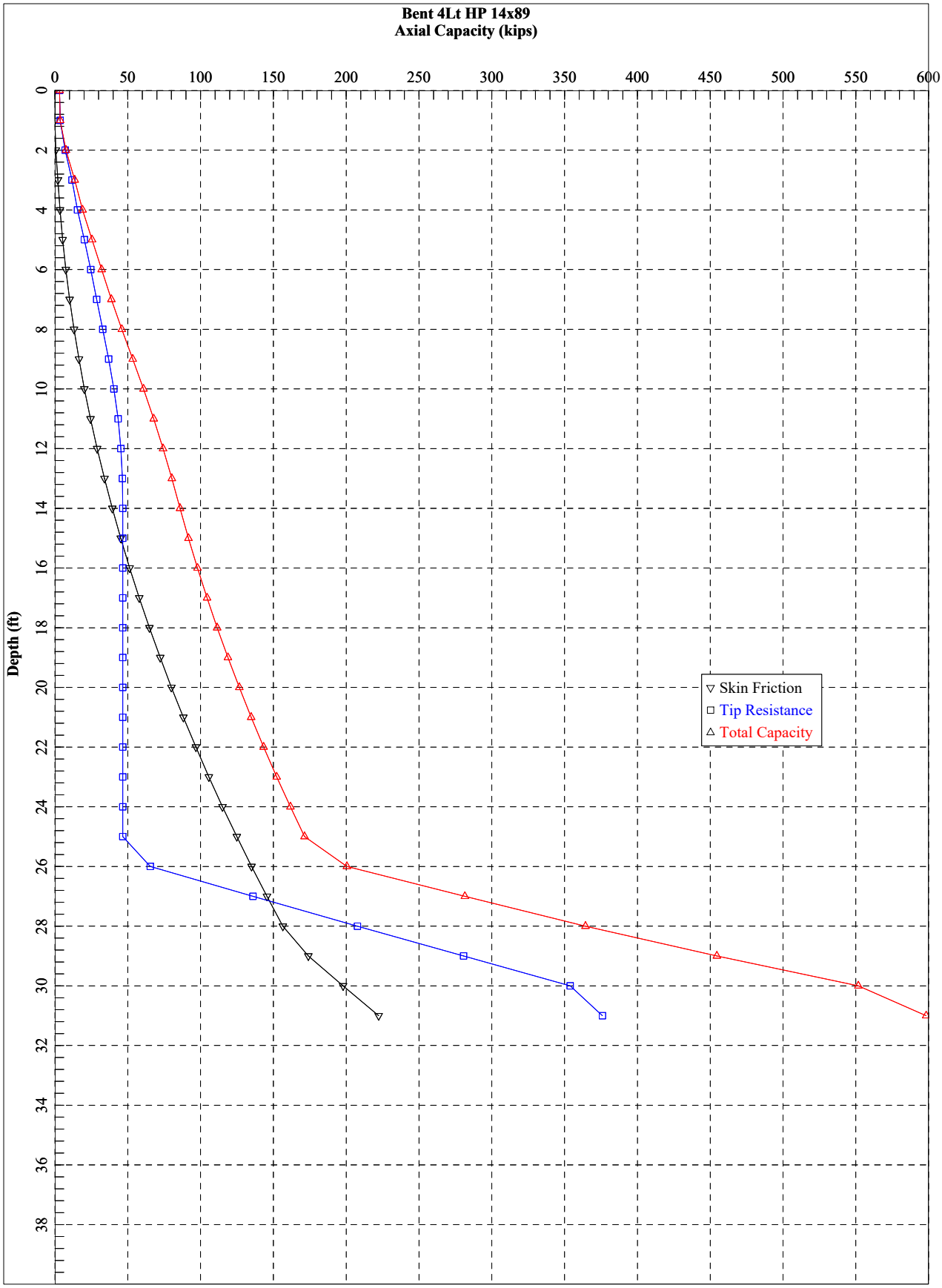
T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
2	10	0.1275E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
3	10	0.2458E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.2908E-01
			0.0000E+00	0.5634E-01
			0.0000E+00	0.1036E+00
			0.0000E+00	0.1454E+00
			0.0000E+00	0.1818E+00
			0.0000E+00	0.3635E+00
			0.0000E+00	0.5453E+00
			0.0000E+00	0.9088E+00
			0.0000E+00	0.3635E+01
4	10	0.2500E+01		
			0.0000E+00	0.0000E+00
			0.0000E+00	0.1000E-01
			0.0000E+00	0.2000E-01
			0.0000E+00	0.4000E-01
			0.0000E+00	0.6000E-01
			0.0000E+00	0.8000E-01
			0.0000E+00	0.9000E-01
			0.0000E+00	0.1000E+00
			0.0000E+00	0.5000E+00
			0.0000E+00	0.2000E+01
5	10	0.1628E+02		
			0.0000E+00	0.0000E+00
			0.9887E+00	0.1000E-01
			0.1977E+01	0.2000E-01
			0.3955E+01	0.4000E-01
			0.5932E+01	0.6000E-01
			0.7909E+01	0.8000E-01
			0.8898E+01	0.9000E-01
			0.9887E+01	0.1000E+00
			0.9887E+01	0.5000E+00
			0.9887E+01	0.2000E+01
6	10	0.2996E+02		
			0.0000E+00	0.0000E+00
			0.2003E+01	0.1000E-01
			0.4006E+01	0.2000E-01
			0.8011E+01	0.4000E-01
			0.1202E+02	0.6000E-01
			0.1602E+02	0.8000E-01
			0.1803E+02	0.9000E-01

```
                                0.2003E+02      0.1000E+00
                                0.2003E+02      0.5000E+00
                                0.2003E+02      0.2000E+01
 7          10      0.3000E+02
                                0.0000E+00      0.0000E+00
                                0.2574E+01      0.1000E-01
                                0.5149E+01      0.2000E-01
                                0.1030E+02      0.4000E-01
                                0.1545E+02      0.6000E-01
                                0.2060E+02      0.8000E-01
                                0.2317E+02      0.9000E-01
                                0.2574E+02      0.1000E+00
                                0.2574E+02      0.5000E+00
                                0.2574E+02      0.2000E+01
 8          10      0.3553E+02
                                0.0000E+00      0.0000E+00
                                0.3068E+01      0.1000E-01
                                0.6137E+01      0.2000E-01
                                0.1227E+02      0.4000E-01
                                0.1841E+02      0.6000E-01
                                0.2455E+02      0.8000E-01
                                0.2762E+02      0.9000E-01
                                0.3068E+02      0.1000E+00
                                0.3068E+02      0.5000E+00
                                0.3068E+02      0.2000E+01
 9          10      0.4096E+02
                                0.0000E+00      0.0000E+00
                                0.3278E+01      0.1000E-01
                                0.6556E+01      0.2000E-01
                                0.1311E+02      0.4000E-01
                                0.1967E+02      0.6000E-01
                                0.2622E+02      0.8000E-01
                                0.2950E+02      0.9000E-01
                                0.3278E+02      0.1000E+00
                                0.3278E+02      0.5000E+00
                                0.3278E+02      0.2000E+01
10          10      0.4100E+02
                                0.0000E+00      0.0000E+00
                                0.3278E+01      0.1000E-01
                                0.6556E+01      0.2000E-01
                                0.1311E+02      0.4000E-01
                                0.1967E+02      0.6000E-01
                                0.2622E+02      0.8000E-01
                                0.2950E+02      0.9000E-01
                                0.3278E+02      0.1000E+00
                                0.3278E+02      0.5000E+00
                                0.3278E+02      0.2000E+01
11          10      0.5053E+02
                                0.0000E+00      0.0000E+00
                                0.3278E+01      0.1000E-01
                                0.6556E+01      0.2000E-01
                                0.1311E+02      0.4000E-01
                                0.1967E+02      0.6000E-01
                                0.2622E+02      0.8000E-01
                                0.2950E+02      0.9000E-01
                                0.3278E+02      0.1000E+00
                                0.3278E+02      0.5000E+00
                                0.3278E+02      0.2000E+01
12          10      0.5996E+02
                                0.0000E+00      0.0000E+00
                                0.3278E+01      0.1000E-01
                                0.6556E+01      0.2000E-01
                                0.1311E+02      0.4000E-01
                                0.1967E+02      0.6000E-01
                                0.2622E+02      0.8000E-01
                                0.2950E+02      0.9000E-01
                                0.3278E+02      0.1000E+00
                                0.3278E+02      0.5000E+00
                                0.3278E+02      0.2000E+01
```

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.3921E+02	0.9088E-02
0.7842E+02	0.1818E-01
0.1568E+03	0.3635E-01
0.3137E+03	0.2363E+00
0.4705E+03	0.7634E+00
0.5646E+03	0.1327E+01
0.6274E+03	0.1818E+01
0.6274E+03	0.2726E+01
0.6274E+03	0.3635E+01

LOAD VERSUS SETTLEMENT CURVE

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.9030E+00	0.1629E-03	0.4315E+00	0.1000E-03
0.9030E+01	0.1629E-02	0.4315E+01	0.1000E-02
0.4515E+02	0.8145E-02	0.2157E+02	0.5000E-02
0.9030E+02	0.1629E-01	0.4315E+02	0.1000E-01
0.3997E+03	0.7728E-01	0.1676E+03	0.5000E-01
0.6191E+03	0.1416E+00	0.2068E+03	0.1000E+00
0.8045E+03	0.5571E+00	0.3922E+03	0.5000E+00
0.9224E+03	0.1067E+01	0.5101E+03	0.1000E+01
0.1040E+04	0.2077E+01	0.6274E+03	0.2000E+01


Bent 4Lt HP 14x89
Axial Capacity (kips)
0
50
100
150
200
250
300
350
400
450
500
550
600
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
Skin Friction
Tip Resistance
Total Capacity

```
=============================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
                (c) Copyright ENSOFT, Inc., 1987-2015
                      All Rights Reserved

=============================================================================


This program is licensed to :

Moreland Altobelli Associates
Duluth, GA

Path to file locations      : Q:\Rockdale County\Rock1701 Courtesy Parkway\BFI\APile\
Name of input data file     : Bent4Lt_14x89.ap7d
Name of output file         : Bent4Lt_14x89.ap7o
Name of plot output file    : Bent4Lt_14x89.ap7p

-----------------------------------------------------------------------------
                     Time and Date of Analysis
-----------------------------------------------------------------------------

          Date:  October 11, 2021     Time:  20:27:52



1
          *********************
          * INPUT INFORMATION *
          *********************



          Bent 4Lt: HP14x89

          DESIGNER   : YCS

          JOB NUMBER : PI No. 0006934


          METHOD FOR UNIT LOAD TRANSFERS :

          - FHWA (Federal Highway Administration)
            Unfactored Unit Side Friction and Unit Side Resistance are used.



          COMPUTATION METHOD(S) FOR PILE CAPACITY :

          - FHWA (Federal Highway Administration)
          - API RP 2A (American Petroleum Institute)


          TYPE OF LOADING :
          - COMPRESSION


          PILE TYPE :

          H-Pile/Steel Pile
```

DATA FOR AXIAL STIFFNESS :

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 55.00 FT.
- PILE STICKUP LENGTH, PSL = 24.00 FT.
- ZERO FRICTION LENGTH, ZFL = 0.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
2.50	CLAY	0.00	115.00	0.00	0.00
2.50	SAND	0.00	115.00	32.00	0.00
20.00	SAND	0.00	115.00	32.00	0.00
20.00	SAND	0.00	115.00	32.00	0.00
28.00	SAND	0.00	115.00	32.00	0.00
28.00	SAND	0.00	52.60	38.00	0.00
40.00	SAND	0.00	52.60	38.00	0.00
40.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

DEPTH FT.	LRFD FACTOR ON UNIT FRICTION	LRFD FACTOR ON UNIT BEARING
0.00	1.000	1.000
2.50	1.000	1.000
2.50	1.000	1.000
20.00	1.000	1.000
20.00	1.000	1.000

28.00	1.000	1.000
28.00	1.000	1.000
40.00	1.000	1.000
40.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
20.00	0.00	0.00	0.000E+00
20.00	0.00	0.00	0.000E+00
28.00	0.00	0.00	0.000E+00
28.00	0.00	0.00	0.000E+00
40.00	0.00	0.00	0.000E+00
40.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

1

****
* COMPUTATION RESULT *
****

****
* FED. HWY. METHOD *
****

Zero depth Ele. 817'

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.0	3.6	3.6
2.00	0.6	7.0	7.6
3.00	2.0	11.7	13.6
4.00	3.5	15.5	19.0
5.00	5.3	20.2	25.5
6.00	7.5	24.6	32.1
7.00	10.1	28.7	38.8
8.00	13.1	32.8	45.9
9.00	16.5	36.9	53.4
10.00	20.2	40.5	60.8
11.00	24.4	43.4	67.8
12.00	29.0	45.3	74.3
13.00	34.0	46.3	80.3
14.00	39.4	46.6	85.9
15.00	45.2	46.6	91.7
16.00	51.3	46.6	97.9
17.00	57.9	46.6	104.5
18.00	64.9	46.6	111.4
19.00	72.3	46.6	118.8
20.00	80.0	46.6	126.6
21.00	88.2	46.6	134.8
22.00	96.8	46.6	143.3
23.00	105.7	46.6	152.3
24.00	115.1	46.6	161.7
25.00	124.9	46.6	171.4
26.00	135.0	65.5	200.5
27.00	145.6	136.0	281.5
28.00	156.5	207.7	364.3

Min. Tip Ele. 788'

29.00	174.0	280.6	454.6
30.00	197.9	353.8	551.7
31.00	222.3	376.0	598.3

Driving resistance Rndr=263kips/0.65=405kips

****
* API RP-2A (1994) *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.8	2.8	3.6
2.00	1.7	2.8	4.5
3.00	2.8	3.2	5.9
4.00	3.3	1.8	5.1
5.00	3.3	0.4	3.7
6.00	3.3	0.0	3.3
7.00	3.3	0.0	3.3
8.00	3.3	0.0	3.3
9.00	3.3	0.0	3.3
10.00	3.3	0.0	3.3
11.00	3.3	0.0	3.3
12.00	3.3	0.0	3.3
13.00	3.3	0.0	3.3
14.00	3.3	0.0	3.3
15.00	3.3	0.0	3.3
16.00	3.3	0.0	3.3
17.00	3.3	0.0	3.3
18.00	3.3	0.0	3.3
19.00	3.3	0.0	3.3
20.00	3.3	0.0	3.3
21.00	3.3	0.0	3.3
22.00	3.3	0.0	3.3
23.00	3.3	0.0	3.3
24.00	3.3	0.0	3.3
25.00	3.3	0.0	3.3
26.00	3.3	0.0	3.3
27.00	3.3	0.0	3.3
28.00	3.3	0.0	3.3
29.00	3.3	0.0	3.3
30.00	3.3	0.0	3.3
31.00	3.3	0.0	3.3

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

****
* COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
* CURVES FOR AXIAL LOADING *
****

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.2703E+00	0.2908E-01
			0.4505E+00	0.5634E-01
			0.6758E+00	0.1036E+00
			0.8109E+00	0.1454E+00

```
                                0.9010E+00      0.1818E+00
                                0.8109E+00      0.3635E+00
                                0.8109E+00      0.5453E+00
                                0.8109E+00      0.9088E+00
                                0.8109E+00      0.3635E+01
2          10       0.1275E+01
                                0.0000E+00      0.0000E+00
                                0.5942E+00      0.2908E-01
                                0.9903E+00      0.5634E-01
                                0.1486E+01      0.1036E+00
                                0.1783E+01      0.1454E+00
                                0.1981E+01      0.1818E+00
                                0.1783E+01      0.3635E+00
                                0.1783E+01      0.5453E+00
                                0.1783E+01      0.9088E+00
                                0.1783E+01      0.3635E+01
3          10       0.2458E+01
                                0.0000E+00      0.0000E+00
                                0.6335E+00      0.2908E-01
                                0.1056E+01      0.5634E-01
                                0.1584E+01      0.1036E+00
                                0.1901E+01      0.1454E+00
                                0.2112E+01      0.1818E+00
                                0.1901E+01      0.3635E+00
                                0.1901E+01      0.5453E+00
                                0.1901E+01      0.9088E+00
                                0.1901E+01      0.3635E+01
4          10       0.2500E+01
                                0.0000E+00      0.0000E+00
                                0.2112E+00      0.1000E-01
                                0.4223E+00      0.2000E-01
                                0.8447E+00      0.4000E-01
                                0.1267E+01      0.6000E-01
                                0.1689E+01      0.8000E-01
                                0.1901E+01      0.9000E-01
                                0.2112E+01      0.1000E+00
                                0.2112E+01      0.5000E+00
                                0.2112E+01      0.2000E+01
5          10       0.1128E+02
                                0.0000E+00      0.0000E+00
                                0.6979E+00      0.1000E-01
                                0.1396E+01      0.2000E-01
                                0.2792E+01      0.4000E-01
                                0.4187E+01      0.6000E-01
                                0.5583E+01      0.8000E-01
                                0.6281E+01      0.9000E-01
                                0.6979E+01      0.1000E+00
                                0.6979E+01      0.5000E+00
                                0.6979E+01      0.2000E+01
6          10       0.1996E+02
                                0.0000E+00      0.0000E+00
                                0.1163E+01      0.1000E-01
                                0.2326E+01      0.2000E-01
                                0.4653E+01      0.4000E-01
                                0.6979E+01      0.6000E-01
                                0.9305E+01      0.8000E-01
                                0.1047E+02      0.9000E-01
                                0.1163E+02      0.1000E+00
                                0.1163E+02      0.5000E+00
                                0.1163E+02      0.2000E+01
7          10       0.2000E+02
                                0.0000E+00      0.0000E+00
                                0.1221E+01      0.1000E-01
                                0.2443E+01      0.2000E-01
                                0.4885E+01      0.4000E-01
                                0.7328E+01      0.6000E-01
                                0.9770E+01      0.8000E-01
                                0.1099E+02      0.9000E-01
                                0.1221E+02      0.1000E+00
```

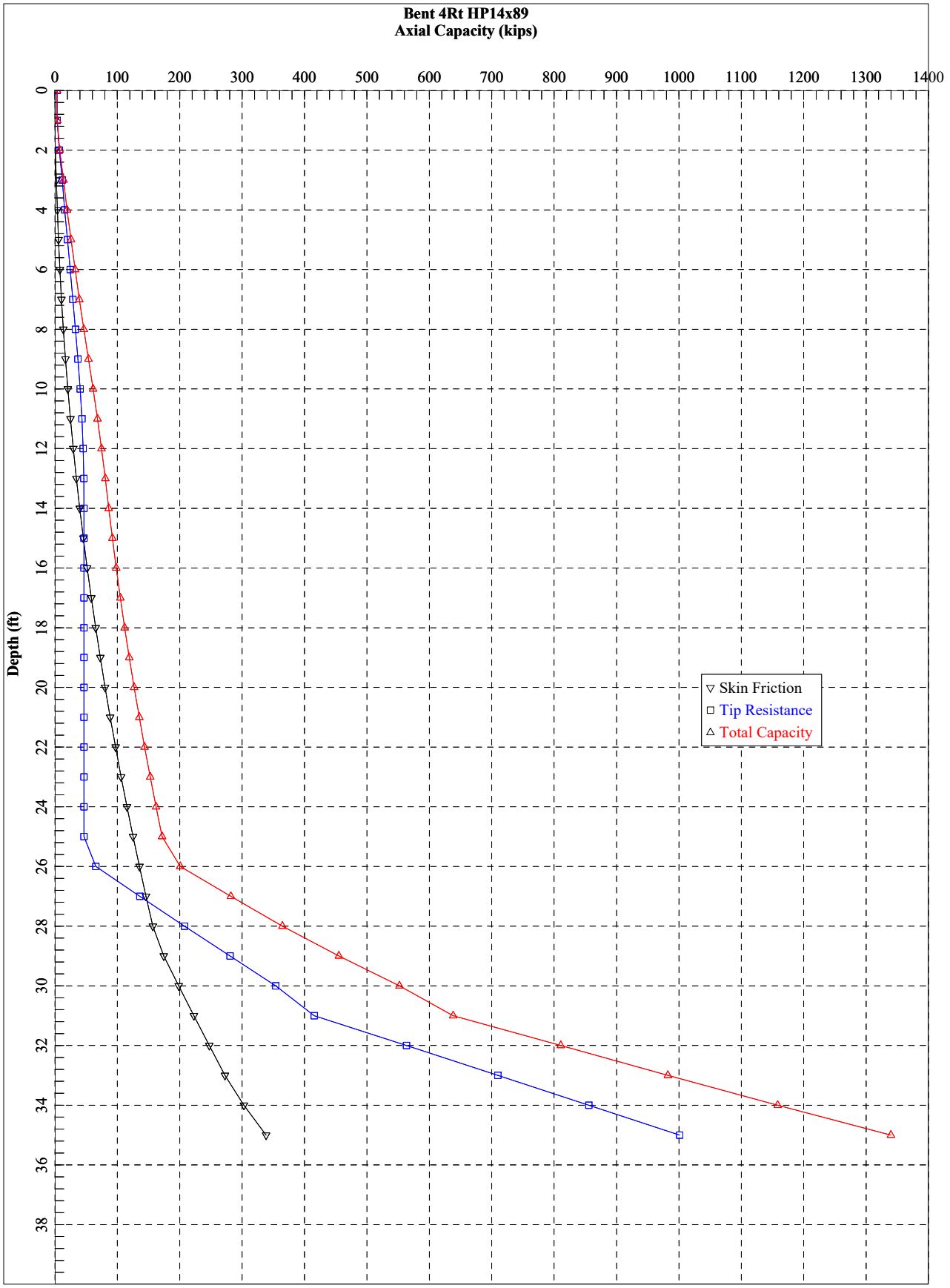
```
                                0.1221E+02      0.5000E+00
                                0.1221E+02      0.2000E+01
 8          10      0.2403E+02
                                0.0000E+00      0.0000E+00
                                0.1454E+01      0.1000E-01
                                0.2908E+01      0.2000E-01
                                0.5816E+01      0.4000E-01
                                0.8724E+01      0.6000E-01
                                0.1163E+02      0.8000E-01
                                0.1309E+02      0.9000E-01
                                0.1454E+02      0.1000E+00
                                0.1454E+02      0.5000E+00
                                0.1454E+02      0.2000E+01
 9          10      0.2796E+02
                                0.0000E+00      0.0000E+00
                                0.2074E+01      0.1000E-01
                                0.4147E+01      0.2000E-01
                                0.8294E+01      0.4000E-01
                                0.1244E+02      0.6000E-01
                                0.1659E+02      0.8000E-01
                                0.1866E+02      0.9000E-01
                                0.2074E+02      0.1000E+00
                                0.2074E+02      0.5000E+00
                                0.2074E+02      0.2000E+01
10          10      0.2800E+02
                                0.0000E+00      0.0000E+00
                                0.3021E+01      0.1000E-01
                                0.6043E+01      0.2000E-01
                                0.1209E+02      0.4000E-01
                                0.1813E+02      0.6000E-01
                                0.2417E+02      0.8000E-01
                                0.2719E+02      0.9000E-01
                                0.3021E+02      0.1000E+00
                                0.3021E+02      0.5000E+00
                                0.3021E+02      0.2000E+01
11          10      0.3403E+02
                                0.0000E+00      0.0000E+00
                                0.3551E+01      0.1000E-01
                                0.7102E+01      0.2000E-01
                                0.1420E+02      0.4000E-01
                                0.2131E+02      0.6000E-01
                                0.2841E+02      0.8000E-01
                                0.3196E+02      0.9000E-01
                                0.3551E+02      0.1000E+00
                                0.3551E+02      0.5000E+00
                                0.3551E+02      0.2000E+01
12          10      0.3996E+02
                                0.0000E+00      0.0000E+00
                                0.3551E+01      0.1000E-01
                                0.7102E+01      0.2000E-01
                                0.1420E+02      0.4000E-01
                                0.2131E+02      0.6000E-01
                                0.2841E+02      0.8000E-01
                                0.3196E+02      0.9000E-01
                                0.3551E+02      0.1000E+00
                                0.3551E+02      0.5000E+00
                                0.3551E+02      0.2000E+01
13          10      0.4000E+02
                                0.0000E+00      0.0000E+00
                                0.3551E+01      0.1000E-01
                                0.7102E+01      0.2000E-01
                                0.1420E+02      0.4000E-01
                                0.2131E+02      0.6000E-01
                                0.2841E+02      0.8000E-01
                                0.3196E+02      0.9000E-01
                                0.3551E+02      0.1000E+00
                                0.3551E+02      0.5000E+00
                                0.3551E+02      0.2000E+01
14          10      0.5003E+02
```

			0.0000E+00	0.0000E+00
			0.3551E+01	0.1000E-01
			0.7102E+01	0.2000E-01
			0.1420E+02	0.4000E-01
			0.2131E+02	0.6000E-01
			0.2841E+02	0.8000E-01
			0.3196E+02	0.9000E-01
			0.3551E+02	0.1000E+00
			0.3551E+02	0.5000E+00
			0.3551E+02	0.2000E+01
15	10	0.5996E+02		
			0.0000E+00	0.0000E+00
			0.3551E+01	0.1000E-01
			0.7102E+01	0.2000E-01
			0.1420E+02	0.4000E-01
			0.2131E+02	0.6000E-01
			0.2841E+02	0.8000E-01
			0.3196E+02	0.9000E-01
			0.3551E+02	0.1000E+00
			0.3551E+02	0.5000E+00
			0.3551E+02	0.2000E+01

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.2350E+02	0.9088E-02
0.4700E+02	0.1818E-01
0.9400E+02	0.3635E-01
0.1880E+03	0.2363E+00
0.2820E+03	0.7634E+00
0.3384E+03	0.1327E+01
0.3760E+03	0.1818E+01
0.3760E+03	0.2726E+01
0.3760E+03	0.3635E+01

LOAD VERSUS SETTLEMENT CURVE
****

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.5123E+00	0.1523E-03	0.2586E+00	0.1000E-03
0.5123E+01	0.1523E-02	0.2586E+01	0.1000E-02
0.2561E+02	0.7615E-02	0.1293E+02	0.5000E-02
0.5123E+02	0.1523E-01	0.2586E+02	0.1000E-01
0.2265E+03	0.7287E-01	0.1004E+03	0.5000E-01
0.3619E+03	0.1360E+00	0.1239E+03	0.1000E+00
0.4732E+03	0.5485E+00	0.2350E+03	0.5000E+00
0.5439E+03	0.1056E+01	0.3057E+03	0.1000E+01
0.6142E+03	0.2064E+01	0.3760E+03	0.2000E+01


Bent 4Rt HP14x89
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
Skin Friction
Tip Resistance
Total Capacity

```
=============================================================================

                 APILE for Windows, Version 2015.7.5

                  Serial Number :  139694124

                  A Program for Analyzing the Axial Capacity
                  and Short-term Settlement of Driven Piles
                            under Axial Loading.
                (c) Copyright ENSOFT, Inc., 1987-2015
                      All Rights Reserved

=============================================================================


This program is licensed to :

Moreland Altobelli Associates
Duluth, GA

Path to file locations      : Q:\Rockdale County\Rock1701 Courtesy Parkway\BFI\APile\
Name of input data file     : Bent4Rt_14x89.ap7d
Name of output file         : Bent4Rt_14x89.ap7o
Name of plot output file    : Bent4Rt_14x89.ap7p

-----------------------------------------------------------------------------
                     Time and Date of Analysis
-----------------------------------------------------------------------------

          Date:  October 11, 2021     Time:  20:54:33



1
          *********************
          * INPUT INFORMATION *
          *********************



          Bent 4Rt: HP14x89

          DESIGNER   : YCS

          JOB NUMBER : PI No. 0006934


          METHOD FOR UNIT LOAD TRANSFERS :

          - FHWA (Federal Highway Administration)
            Unfactored Unit Side Friction and Unit Side Resistance are used.



          COMPUTATION METHOD(S) FOR PILE CAPACITY :

          - FHWA (Federal Highway Administration)
          - API RP 2A (American Petroleum Institute)


          TYPE OF LOADING :
          - COMPRESSION


          PILE TYPE :

          H-Pile/Steel Pile
```

DATA FOR AXIAL STIFFNESS :

- MODULUS OF ELASTICITY = 0.290E+08 PSI
- CROSS SECTION AREA = 203.20 IN2

NONCIRCULAR PILE PROPERTIES :

- TOTAL PILE LENGTH, TL = 62.00 FT.
- PILE STICKUP LENGTH, PSL = 27.00 FT.
- ZERO FRICTION LENGTH, ZFL = 0.00 FT.
- PERIMETER OF PILE = 57.10 IN.
- TIP AREA OF PILE = 203.20 IN2
- INCREMENT OF PILE LENGTH USED IN COMPUTATION = 1.00 FT.

SOIL INFORMATIONS :

DEPTH FT.	SOIL TYPE	LATERAL EARTH PRESSURE	EFFECTIVE UNIT WEIGHT LB/CF	FRICTION ANGLE DEGREES	BEARING CAPACITY FACTOR
0.00	CLAY	0.00	115.00	0.00	0.00
2.50	CLAY	0.00	115.00	0.00	0.00
2.50	SAND	0.00	115.00	32.00	0.00
28.00	SAND	0.00	115.00	32.00	0.00
28.00	SAND	0.00	52.60	38.00	0.00
33.00	SAND	0.00	52.60	38.00	0.00
33.00	SAND	0.00	62.60	45.00	0.00
60.00	SAND	0.00	62.60	45.00	0.00

MAXIMUM UNIT FRICTION KSF	MAXIMUM UNIT BEARING KSF	UNDISTURB SHEAR STRENGTH KSF	REMOLDED SHEAR STRENGTH KSF	BLOW COUNT	UNIT SKIN FRICTION KSF	UNIT END BEARING KSF
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.50	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00
0.10E+08*	0.10E+08*	0.00	0.00	0.00	0.00	0.00

* MAXIMUM UNIT FRICTION AND/OR MAXIMUM UNIT BEARING WERE SET TO BE 0.10E+08 BECAUSE THE USER DOES NOT PLAN TO LIMIT THE COMPUTED DATA.

DEPTH FT.	LRFD FACTOR ON UNIT FRICTION	LRFD FACTOR ON UNIT BEARING
0.00	1.000	1.000
2.50	1.000	1.000
2.50	1.000	1.000
28.00	1.000	1.000
28.00	1.000	1.000
33.00	1.000	1.000
33.00	1.000	1.000
60.00	1.000	1.000

DEPTH FT.	PLASTIC INDEX PI %	YIELD STRESS RATIO	Qc FROM CPT KSF
0.00	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
2.50	0.00	0.00	0.000E+00
28.00	0.00	0.00	0.000E+00
28.00	0.00	0.00	0.000E+00
33.00	0.00	0.00	0.000E+00
33.00	0.00	0.00	0.000E+00
60.00	0.00	0.00	0.000E+00

1

****
* COMPUTATION RESULT *
****

****
* FED. HWY. METHOD *
****

	PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP	
Zero depth Ele. 814'	0.00	0.0	3.2	3.2	
	1.00	0.0	3.6	3.6	
	2.00	0.6	7.0	7.6	
	3.00	2.2	11.7	13.8	
	4.00	3.9	15.5	19.4	
	5.00	5.7	20.2	25.9	
	6.00	7.9	24.6	32.5	
	7.00	10.5	28.7	39.2	
	8.00	13.5	32.8	46.3	
	9.00	16.9	36.9	53.8	
	10.00	20.7	40.5	61.2	
	11.00	24.8	43.4	68.2	
	12.00	29.4	45.3	74.7	
	13.00	34.4	46.3	80.7	
	14.00	39.8	46.6	86.3	
	15.00	45.6	46.6	92.1	
	16.00	51.7	46.6	98.3	
	17.00	58.3	46.6	104.9	
	18.00	65.3	46.6	111.8	
	19.00	72.7	46.6	119.2	
	20.00	80.4	46.6	127.0	
	21.00	88.6	46.6	135.2	
	22.00	97.2	46.6	143.7	
	23.00	106.1	46.6	152.7	
	24.00	115.5	46.6	162.1	
	25.00	125.3	46.6	171.8	
	26.00	135.4	65.5	200.9	
	27.00	146.0	136.0	281.9	
	28.00	156.9	207.7	364.7	← Driving resistance Rndr=263kips/0.65=405kips
Min. Tip Ele. 785'	29.00	174.4	280.6	455.0	
	30.00	198.3	353.8	552.1	
	31.00	222.7	415.6	638.3	
	32.00	247.4	563.4	810.8	
	33.00	272.5	709.9	982.4	
Est. Tip Ele. 781'	34.00	302.8	855.6	1158.4	
	35.00	338.5	1001.2	1339.7	

****
* API RP-2A (1994) *
****

PILE PENETRATION FT.	TOTAL SKIN FRICTION KIP	END BEARING KIP	ULTIMATE CAPACITY KIP
0.00	0.0	3.2	3.2
1.00	0.8	2.8	3.6
2.00	1.7	2.8	4.5
3.00	2.8	3.2	5.9
4.00	3.3	1.8	5.1
5.00	3.3	0.4	3.7
6.00	3.3	0.0	3.3
7.00	3.3	0.0	3.3
8.00	3.3	0.0	3.3
9.00	3.3	0.0	3.3
10.00	3.3	0.0	3.3
11.00	3.3	0.0	3.3
12.00	3.3	0.0	3.3
13.00	3.3	0.0	3.3
14.00	3.3	0.0	3.3
15.00	3.3	0.0	3.3
16.00	3.3	0.0	3.3
17.00	3.3	0.0	3.3
18.00	3.3	0.0	3.3
19.00	3.3	0.0	3.3
20.00	3.3	0.0	3.3
21.00	3.3	0.0	3.3
22.00	3.3	0.0	3.3
23.00	3.3	0.0	3.3
24.00	3.3	0.0	3.3
25.00	3.3	0.0	3.3
26.00	3.3	0.0	3.3
27.00	3.3	0.0	3.3
28.00	3.3	0.0	3.3
29.00	3.3	0.0	3.3
30.00	3.3	0.0	3.3
31.00	3.3	0.0	3.3
32.00	3.3	0.0	3.3
33.00	3.3	0.0	3.3
34.00	3.3	0.0	3.3
35.00	3.3	0.0	3.3

NOTES:
- AN ASTERISK IS PLACED IN THE END-BEARING COLUMN
  IF THE TIP RESISTANCE IS CONTROLLED BY THE FRICTION
  OF SOIL PLUG INSIDE AN OPEN-ENDED PIPE PILE.

****
* COMPUTE LOAD-DISTRIBUTION AND LOAD-SETTLEMENT *
* CURVES FOR AXIAL LOADING   *
****

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE FT.	LOAD TRANSFER PSI	PILE MOVEMENT IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			0.2703E+00	0.2908E-01
			0.4505E+00	0.5634E-01
			0.6758E+00	0.1036E+00
			0.8109E+00	0.1454E+00

```
                                0.9010E+00      0.1818E+00
                                0.8109E+00      0.3635E+00
                                0.8109E+00      0.5453E+00
                                0.8109E+00      0.9088E+00
                                0.8109E+00      0.3635E+01
2          10       0.1275E+01
                                0.0000E+00      0.0000E+00
                                0.6825E+00      0.2908E-01
                                0.1138E+01      0.5634E-01
                                0.1706E+01      0.1036E+00
                                0.2048E+01      0.1454E+00
                                0.2275E+01      0.1818E+00
                                0.2048E+01      0.3635E+00
                                0.2048E+01      0.5453E+00
                                0.2048E+01      0.9088E+00
                                0.2048E+01      0.3635E+01
3          10       0.2458E+01
                                0.0000E+00      0.0000E+00
                                0.7218E+00      0.2908E-01
                                0.1203E+01      0.5634E-01
                                0.1805E+01      0.1036E+00
                                0.2165E+01      0.1454E+00
                                0.2406E+01      0.1818E+00
                                0.2165E+01      0.3635E+00
                                0.2165E+01      0.5453E+00
                                0.2165E+01      0.9088E+00
                                0.2165E+01      0.3635E+01
4          10       0.2500E+01
                                0.0000E+00      0.0000E+00
                                0.2406E+00      0.1000E-01
                                0.4812E+00      0.2000E-01
                                0.9624E+00      0.4000E-01
                                0.1444E+01      0.6000E-01
                                0.1925E+01      0.8000E-01
                                0.2165E+01      0.9000E-01
                                0.2406E+01      0.1000E+00
                                0.2406E+01      0.5000E+00
                                0.2406E+01      0.2000E+01
5          10       0.1528E+02
                                0.0000E+00      0.0000E+00
                                0.9305E+00      0.1000E-01
                                0.1861E+01      0.2000E-01
                                0.3722E+01      0.4000E-01
                                0.5583E+01      0.6000E-01
                                0.7444E+01      0.8000E-01
                                0.8375E+01      0.9000E-01
                                0.9305E+01      0.1000E+00
                                0.9305E+01      0.5000E+00
                                0.9305E+01      0.2000E+01
6          10       0.2796E+02
                                0.0000E+00      0.0000E+00
                                0.2074E+01      0.1000E-01
                                0.4147E+01      0.2000E-01
                                0.8294E+01      0.4000E-01
                                0.1244E+02      0.6000E-01
                                0.1659E+02      0.8000E-01
                                0.1866E+02      0.9000E-01
                                0.2074E+02      0.1000E+00
                                0.2074E+02      0.5000E+00
                                0.2074E+02      0.2000E+01
7          10       0.2800E+02
                                0.0000E+00      0.0000E+00
                                0.3021E+01      0.1000E-01
                                0.6043E+01      0.2000E-01
                                0.1209E+02      0.4000E-01
                                0.1813E+02      0.6000E-01
                                0.2417E+02      0.8000E-01
                                0.2719E+02      0.9000E-01
                                0.3021E+02      0.1000E+00
```

			0.3021E+02	0.5000E+00
			0.3021E+02	0.2000E+01
8	10	0.3053E+02		
			0.0000E+00	0.0000E+00
			0.3579E+01	0.1000E-01
			0.7157E+01	0.2000E-01
			0.1431E+02	0.4000E-01
			0.2147E+02	0.6000E-01
			0.2863E+02	0.8000E-01
			0.3221E+02	0.9000E-01
			0.3579E+02	0.1000E+00
			0.3579E+02	0.5000E+00
			0.3579E+02	0.2000E+01
9	10	0.3296E+02		
			0.0000E+00	0.0000E+00
			0.4043E+01	0.1000E-01
			0.8087E+01	0.2000E-01
			0.1617E+02	0.4000E-01
			0.2426E+02	0.6000E-01
			0.3235E+02	0.8000E-01
			0.3639E+02	0.9000E-01
			0.4043E+02	0.1000E+00
			0.4043E+02	0.5000E+00
			0.4043E+02	0.2000E+01
10	10	0.3300E+02		
			0.0000E+00	0.0000E+00
			0.4814E+01	0.1000E-01
			0.9628E+01	0.2000E-01
			0.1926E+02	0.4000E-01
			0.2888E+02	0.6000E-01
			0.3851E+02	0.8000E-01
			0.4333E+02	0.9000E-01
			0.4814E+02	0.1000E+00
			0.4814E+02	0.5000E+00
			0.4814E+02	0.2000E+01
11	10	0.4653E+02		
			0.0000E+00	0.0000E+00
			0.5204E+01	0.1000E-01
			0.1041E+02	0.2000E-01
			0.2082E+02	0.4000E-01
			0.3122E+02	0.6000E-01
			0.4163E+02	0.8000E-01
			0.4683E+02	0.9000E-01
			0.5204E+02	0.1000E+00
			0.5204E+02	0.5000E+00
			0.5204E+02	0.2000E+01
12	10	0.5996E+02		
			0.0000E+00	0.0000E+00
			0.5204E+01	0.1000E-01
			0.1041E+02	0.2000E-01
			0.2082E+02	0.4000E-01
			0.3122E+02	0.6000E-01
			0.4163E+02	0.8000E-01
			0.4683E+02	0.9000E-01
			0.5204E+02	0.1000E+00
			0.5204E+02	0.5000E+00
			0.5204E+02	0.2000E+01

TIP LOAD KIP	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
0.6258E+02	0.9088E-02
0.1252E+03	0.1818E-01
0.2503E+03	0.3635E-01
0.5006E+03	0.2363E+00
0.7509E+03	0.7634E+00

0.9011E+03	0.1327E+01
0.1001E+04	0.1818E+01
0.1001E+04	0.2726E+01
0.1001E+04	0.3635E+01

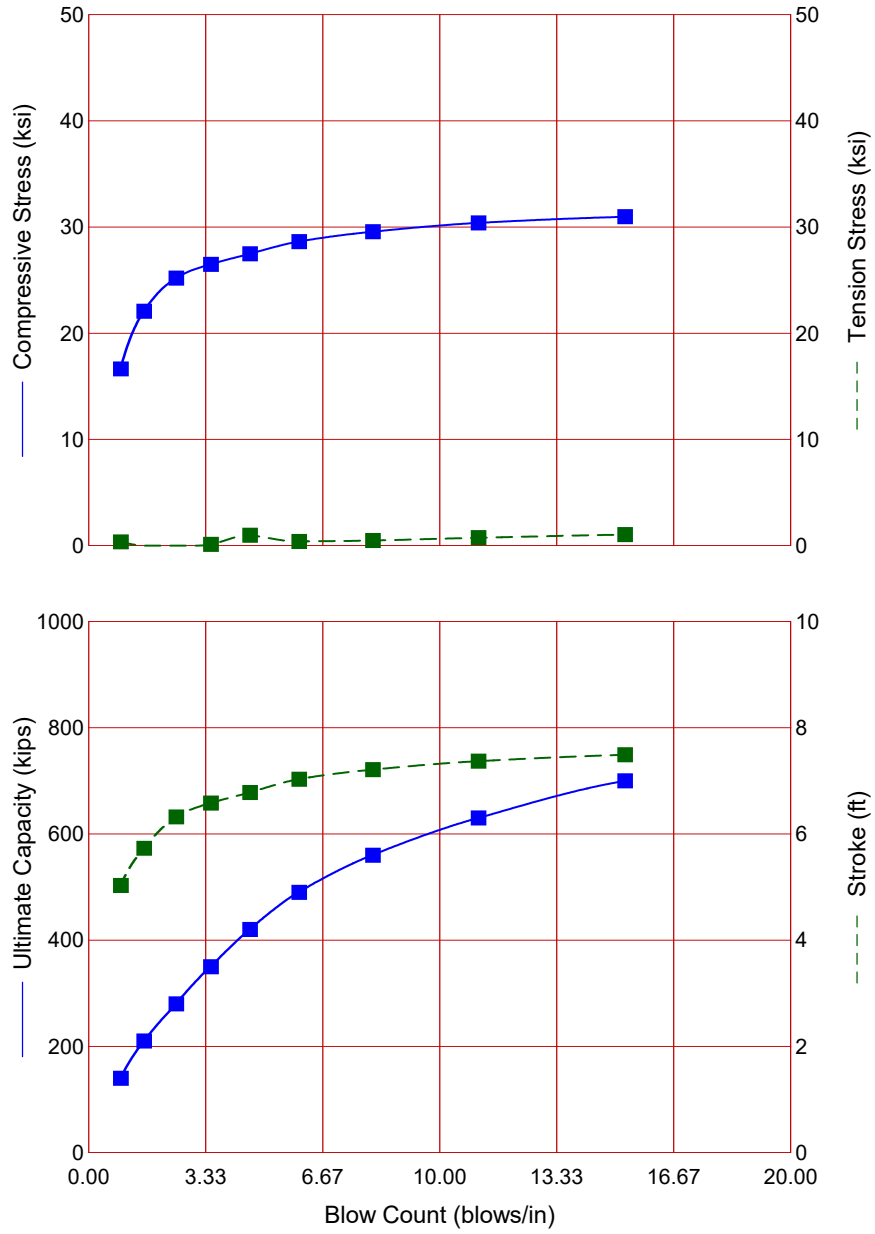
LOAD VERSUS SETTLEMENT CURVE
****

TOP LOAD KIP	TOP MOVEMENT IN.	TIP LOAD KIP	TIP MOVEMENT IN.
0.1119E+01	0.2317E-03	0.6886E+00	0.1000E-03
0.1119E+02	0.2317E-02	0.6886E+01	0.1000E-02
0.5594E+02	0.1159E-01	0.3443E+02	0.5000E-02
0.1125E+03	0.2323E-01	0.6886E+02	0.1000E-01
0.4791E+03	0.1059E+00	0.2674E+03	0.5000E-01
0.7011E+03	0.1812E+00	0.3300E+03	0.1000E+00
0.9970E+03	0.6185E+00	0.6259E+03	0.5000E+00
0.1185E+04	0.1142E+01	0.8140E+03	0.1000E+01
0.1372E+04	0.2166E+01	0.1001E+04	0.2000E+01

Appendix H – Drivability analysis, WEAP output

Moreland Altobelli Associates Inc.
PI 0006934, Bent 1Lt HP 14x89

11-Oct-2021
GRLWEAP Version 2010

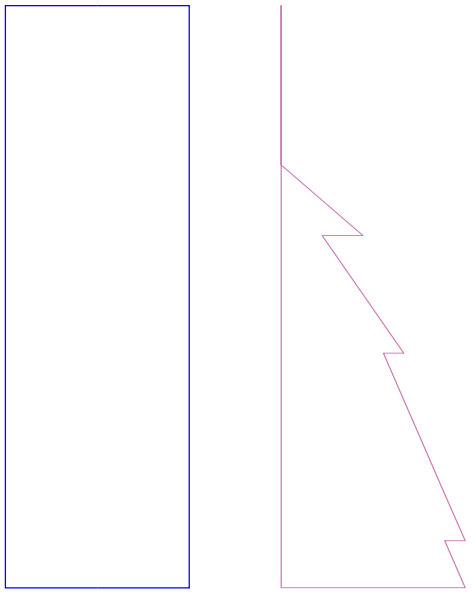


ICE 60-S

Ram Weight	7.00	kips
Efficiency	1.000	
Pressure	920 (80%)	psi
Helmet Weight	2.09	kips
Hammer Cushion	34825	kips/in
COR of H.C.	0.920	
Skin Quake	0.100	in
Toe Quake	0.244	in
Skin Damping	0.059	s/ft
Toe Damping	0.150	s/ft
Pile Length	62.00	ft
Pile Penetration	45.00	ft
Pile Top Area	26.10	in2

Pile Model

Skin Friction Distribution



Res. Shaft = 46 %
(Proportional)

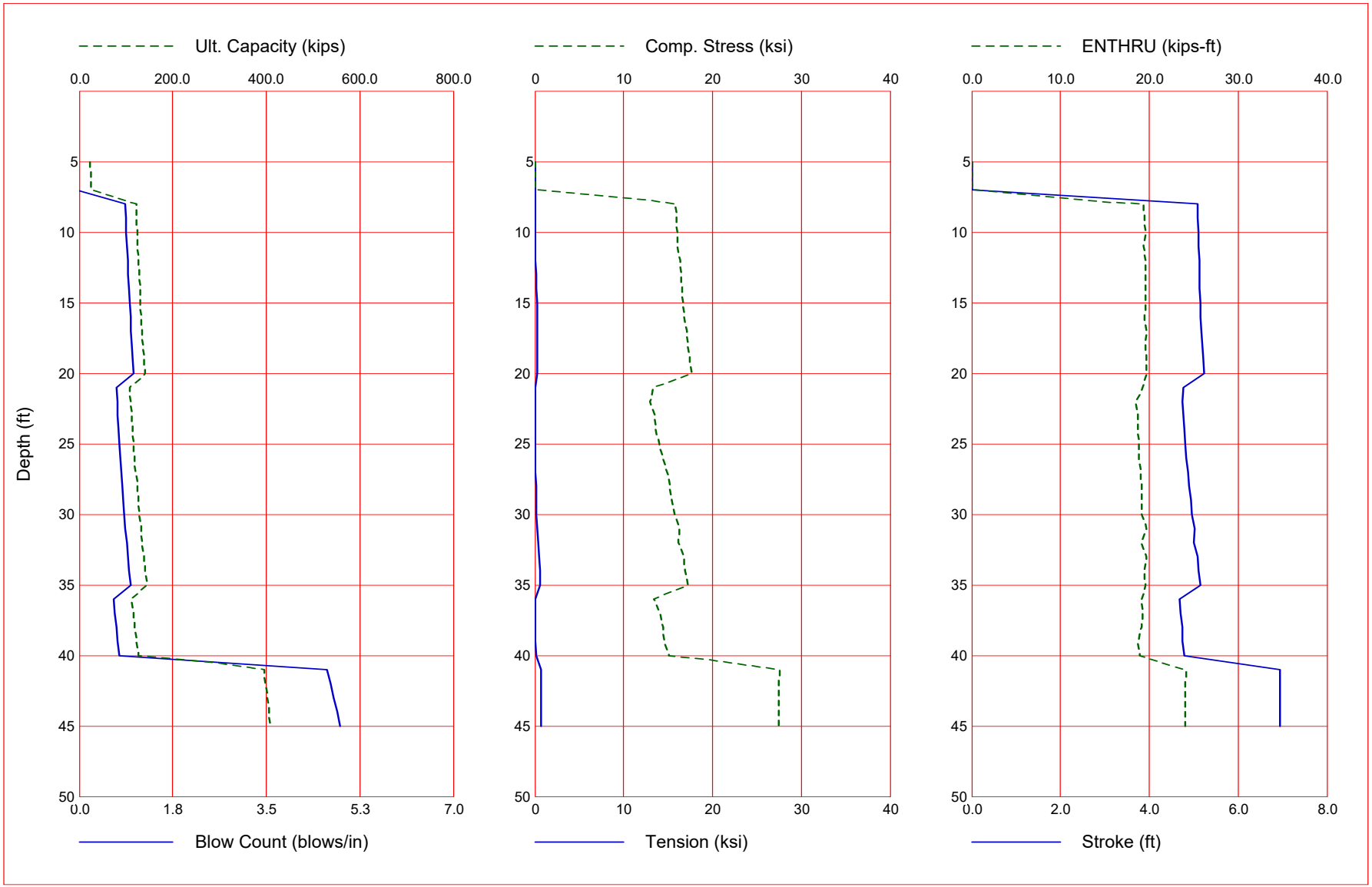
Moreland Altobelli Associates Inc. 11-Oct-2021
PI 0006934, Bent 1Lt HP 14x89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
140.0	16.63	0.36	0.9	5.03	19.25
210.0	22.07	0.00	1.6	5.73	20.12
280.0	25.18	0.00	2.5	6.32	21.62
350.0	26.48	0.12	3.5	6.58	21.76
420.0	27.47	0.98	4.6	6.78	22.59
490.0	28.62	0.40	6.0	7.03	23.73
560.0	29.55	0.49	8.1	7.21	24.60
630.0	30.39	0.75	11.1	7.37	25.50
700.0	30.96	1.04	15.3	7.49	26.11

Moreland Altobelli Associates Inc.
PI 0006934, Bent 1Lt HP 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Moreland Altobelli Associates Inc.
PI 0006934, Bent 1Lt HP 14x89

Oct 11 2021
GRLWEAP Version 2010

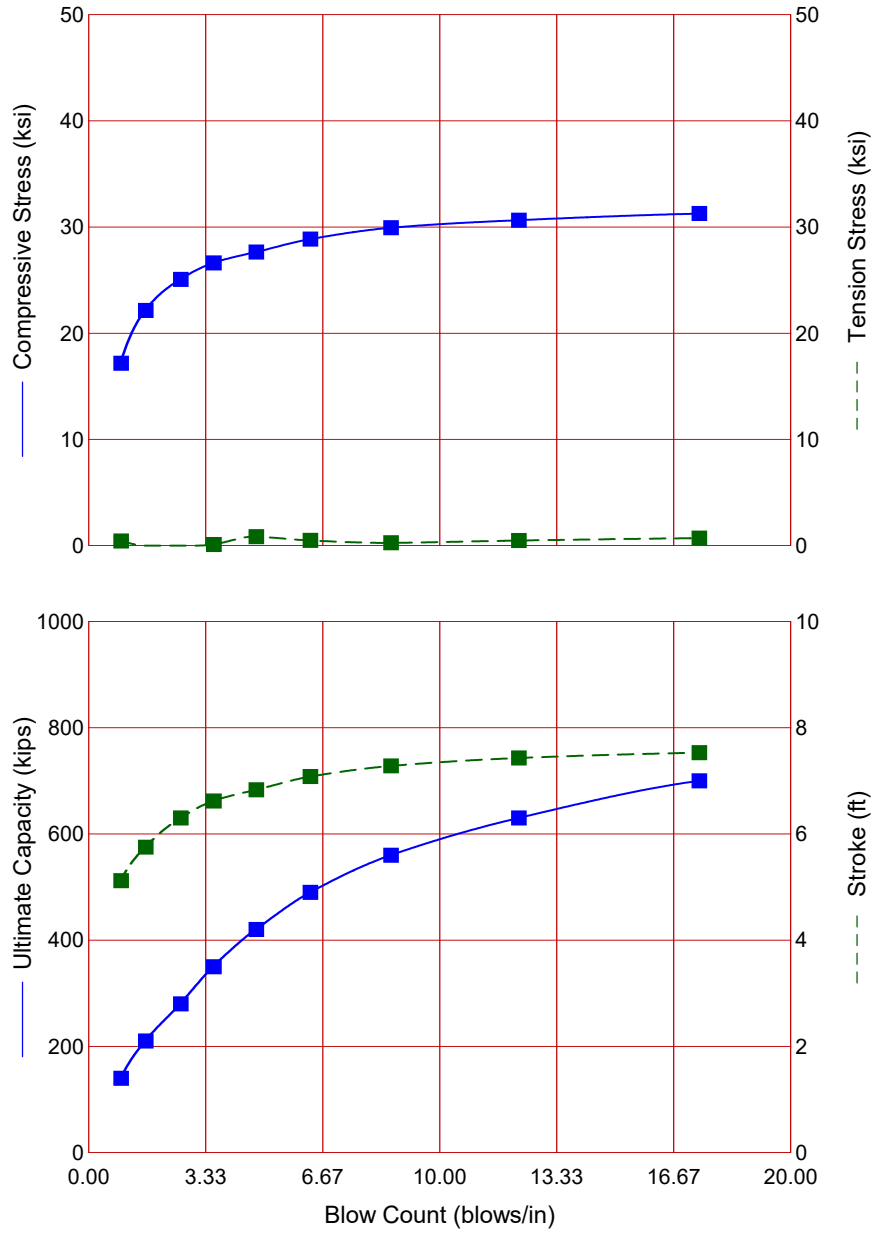
Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. = 833'									
	5.0	24.0	1.7	22.3	-0.1	0.000	0.000	0.00	0.0
	6.0	24.8	2.5	22.3	-0.1	0.000	0.000	0.00	0.0
	7.0	25.7	3.4	22.3	-0.1	0.000	0.000	0.00	0.0
	8.0	122.2	4.3	117.9	0.9	15.815	0.000	5.08	19.4
	9.0	123.2	5.3	117.9	0.9	15.948	0.000	5.08	19.5
	10.0	124.3	6.4	117.9	0.9	16.104	-0.003	5.10	19.6
	11.0	125.5	7.6	117.9	0.9	16.106	-0.050	5.10	19.4
	12.0	126.8	8.9	117.9	0.9	16.342	-0.090	5.12	19.6
	13.0	128.2	10.3	117.9	0.9	16.479	-0.137	5.13	19.6
	14.0	129.7	11.8	117.9	0.9	16.613	-0.173	5.14	19.6
	15.0	131.3	13.4	117.9	0.9	16.733	-0.215	5.15	19.6
	16.0	133.1	15.2	117.9	1.0	16.819	-0.250	5.16	19.5
	17.0	134.9	17.0	117.9	1.0	17.101	-0.272	5.18	19.7
Min.Tip 815'	18.0	136.9	19.0	117.9	1.0	17.268	-0.288	5.20	19.6
	19.0	138.9	21.0	117.9	1.0	17.467	-0.297	5.22	19.7
	20.0	141.1	23.2	117.9	1.0	17.681	-0.308	5.24	19.7
	21.0	107.6	25.1	82.5	0.7	13.280	0.000	4.77	19.2
	22.0	109.6	27.1	82.5	0.7	12.983	0.000	4.74	18.5
	23.0	111.8	29.2	82.5	0.7	13.452	0.000	4.76	18.7
	24.0	114.0	31.4	82.5	0.7	13.645	0.000	4.78	18.7
	25.0	116.3	33.7	82.5	0.8	14.074	0.000	4.81	18.8
	26.0	118.7	36.1	82.5	0.8	14.450	0.000	4.84	18.8
	27.0	121.2	38.6	82.5	0.8	14.882	-0.066	4.87	19.0
	28.0	123.7	41.2	82.5	0.8	15.206	-0.125	4.90	19.1
	29.0	126.4	43.9	82.5	0.8	15.461	-0.164	4.93	19.1
	30.0	129.2	46.7	82.5	0.8	15.714	-0.195	4.96	19.1
	31.0	132.1	49.5	82.5	0.9	16.300	-0.223	5.03	19.7
	32.0	135.0	52.5	82.5	0.9	16.153	-0.364	5.01	19.1
	33.0	138.1	55.6	82.5	0.9	16.843	-0.457	5.09	19.7
	34.0	141.3	58.7	82.5	0.9	16.949	-0.536	5.11	19.5
	35.0	144.5	62.0	82.5	1.0	17.265	-0.588	5.15	19.6
	36.0	112.5	65.3	47.2	0.6	13.348	0.000	4.68	19.1
	37.0	115.9	68.8	47.2	0.7	14.177	0.000	4.71	19.3
	38.0	119.4	72.2	47.2	0.7	14.475	0.000	4.75	19.1
	39.0	123.0	75.8	47.2	0.7	14.595	0.000	4.75	18.7
	40.0	126.6	79.4	47.2	0.7	15.138	-0.138	4.79	18.9
	41.0	395.2	82.7	312.5	4.6	27.547	-0.707	6.94	24.2
	42.0	398.5	86.0	312.5	4.7	27.448	-0.715	6.94	24.1
	43.0	401.9	89.4	312.5	4.8	27.440	-0.726	6.94	24.1
Est. Tip 789'	44.0	405.3	92.9	312.5	4.8	27.425	-0.727	6.94	24.1
	45.0	408.8	96.4	312.5	4.9	27.424	-0.720	6.94	24.0

Total Continuous Driving Time 12.00 minutes; Total Number of Blows 592 (starting at penetration 5.0 ft)

Moreland Altobelli Associates Inc.
PI 0006934, Bent 1Rt 14x89

11-Oct-2021
GRLWEAP Version 2010

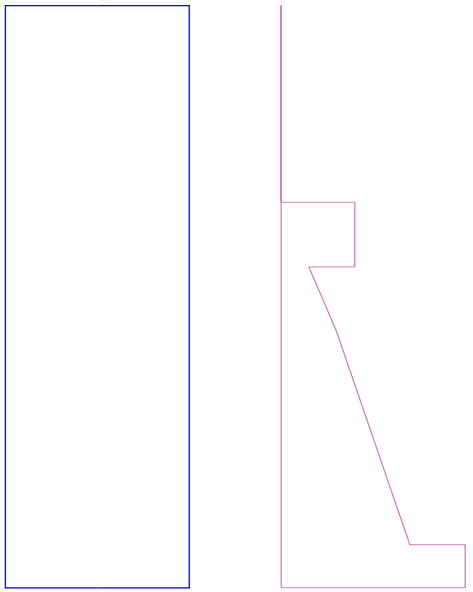


ICE 60-S

Ram Weight	7.00	kips
Efficiency	1.000	
Pressure	920 (80%)	psi
Helmet Weight	2.09	kips
Hammer Cushion	34825	kips/in
COR of H.C.	0.920	
Skin Quake	0.100	in
Toe Quake	0.237	in
Skin Damping	0.070	s/ft
Toe Damping	0.150	s/ft
Pile Length	68.00	ft
Pile Penetration	45.00	ft
Pile Top Area	26.10	in2

Pile Model

Skin Friction Distribution



Res. Shaft = 43 %
(Proportional)

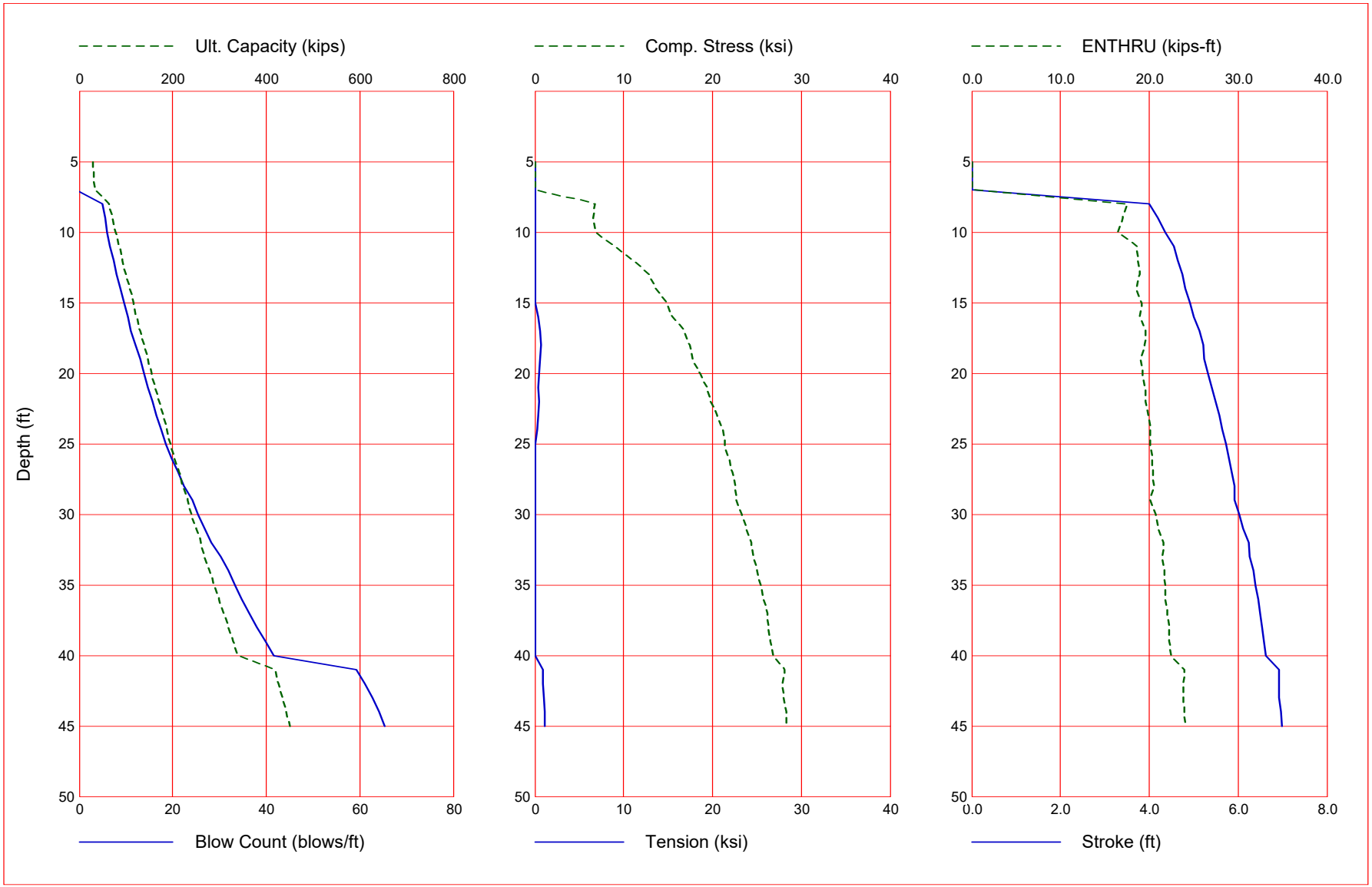
Moreland Altobelli Associates Inc. 11-Oct-2021
PI 0006934, Bent 1Rt 14x89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
140.0	17.17	0.45	0.9	5.12	19.70
210.0	22.14	0.00	1.6	5.75	20.16
280.0	25.06	0.00	2.6	6.30	21.39
350.0	26.62	0.11	3.6	6.62	22.28
420.0	27.64	0.85	4.8	6.83	23.08
490.0	28.86	0.50	6.3	7.08	24.23
560.0	29.93	0.27	8.6	7.28	25.38
630.0	30.64	0.49	12.3	7.43	26.06
700.0	31.27	0.71	17.4	7.53	26.65

Moreland Altobelli Associates Inc.
PI 0006934, Bent 1Rt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Moreland Altobelli Associates Inc.
PI 0006934, Bent 1Rt 14x89

Oct 11 2021
GRLWEAP Version 2010

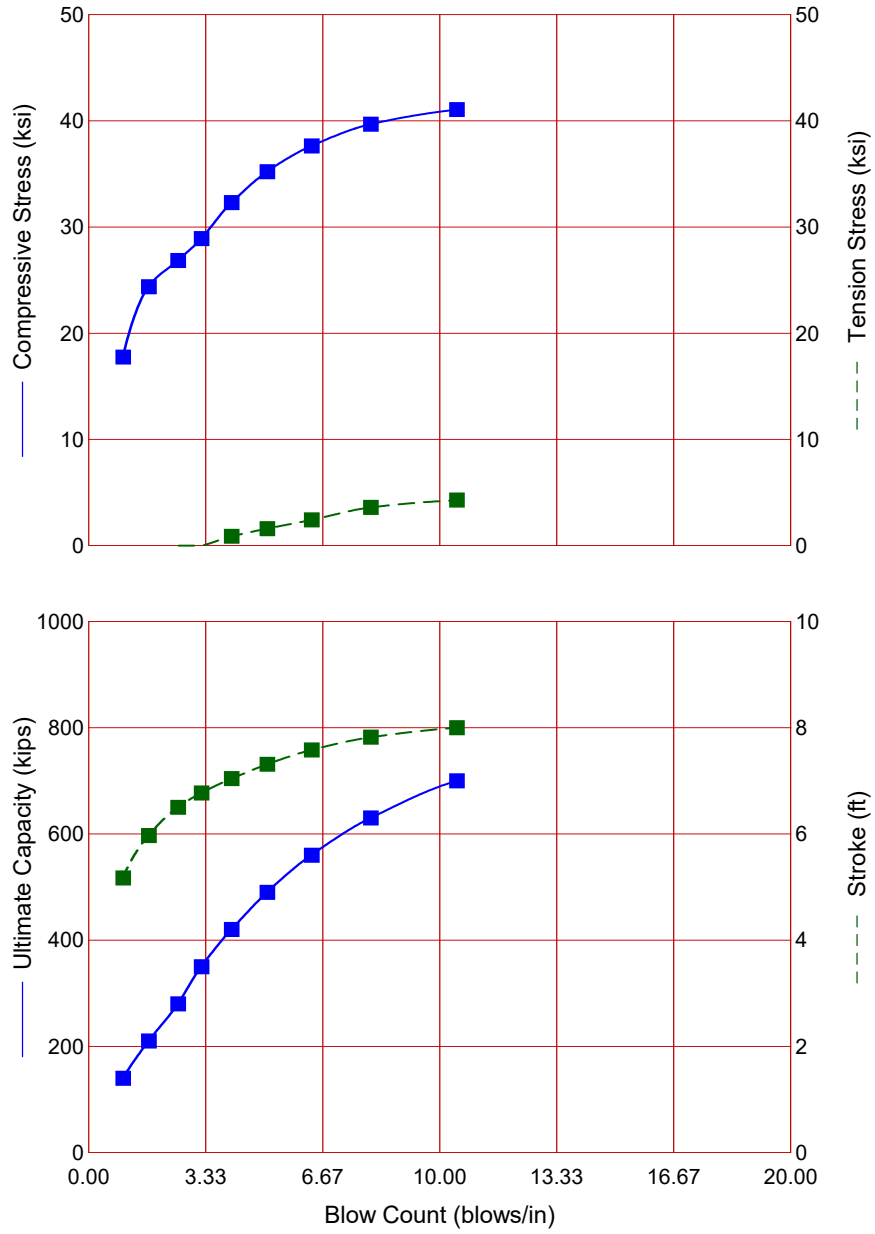
Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. 827'									
	5.0	28.8	9.7	19.2	-0.1	0.000	0.000	0.00	0.0
	6.0	30.8	11.6	19.2	-0.1	0.000	0.000	0.00	0.0
	7.0	32.7	13.6	19.2	-0.1	0.000	0.000	0.00	0.0
	8.0	63.8	15.2	48.7	0.4	6.759	0.000	4.01	17.5
	9.0	70.9	16.5	54.4	0.5	6.558	0.000	4.19	17.0
	10.0	78.1	18.0	60.0	0.5	6.861	0.000	4.36	16.5
	11.0	85.4	19.7	65.7	0.5	9.043	0.000	4.55	18.6
	12.0	92.9	21.5	71.4	0.6	11.088	0.000	4.64	18.7
	13.0	100.5	23.5	77.0	0.7	12.848	0.000	4.74	18.9
	14.0	108.3	25.6	82.7	0.7	13.584	0.000	4.80	18.5
	15.0	116.2	27.8	88.4	0.8	14.918	0.000	4.92	19.1
	16.0	123.5	30.2	93.3	0.9	15.570	-0.363	5.00	18.9
	17.0	131.0	32.8	98.2	0.9	16.847	-0.598	5.13	19.6
	18.0	138.6	35.5	103.2	1.0	17.414	-0.678	5.21	19.5
	19.0	146.4	38.3	108.1	1.1	17.778	-0.613	5.23	19.0
	20.0	154.2	41.2	113.0	1.2	18.622	-0.459	5.32	19.3
Min. Tip 806'	21.0	162.3	44.3	118.0	1.2	19.396	-0.397	5.41	19.6
	22.0	170.4	47.5	122.9	1.3	19.801	-0.431	5.49	19.6
	23.0	178.7	50.8	127.8	1.4	20.545	-0.387	5.58	19.9
	24.0	187.1	54.3	132.8	1.5	21.152	-0.255	5.65	20.1
	25.0	195.6	57.9	137.7	1.5	21.432	-0.083	5.73	20.1
	26.0	204.3	61.7	142.6	1.6	21.828	0.000	5.79	20.3
	27.0	213.1	65.6	147.6	1.8	22.214	0.000	5.85	20.4
	28.0	222.1	69.6	152.5	1.9	22.599	0.000	5.91	20.5
	29.0	231.2	73.7	157.4	2.0	22.666	0.000	5.92	20.1
	30.0	240.4	78.0	162.4	2.1	23.332	0.000	6.03	20.7
	31.0	249.8	82.5	167.3	2.2	23.802	0.000	6.12	21.0
	32.0	259.3	87.0	172.2	2.3	24.368	0.000	6.23	21.6
	33.0	268.9	91.7	177.2	2.5	24.629	0.000	6.27	21.5
	34.0	278.6	96.5	182.1	2.7	25.058	0.000	6.34	21.7
	35.0	288.5	101.5	187.0	2.8	25.401	0.000	6.39	21.8
	36.0	298.6	106.6	192.0	2.9	25.758	0.000	6.45	21.8
	37.0	308.7	111.8	196.9	3.0	26.138	0.000	6.49	22.0
	38.0	319.0	117.2	201.8	3.2	26.308	0.000	6.54	22.2
	39.0	329.5	122.7	206.8	3.3	26.505	0.000	6.59	22.2
	40.0	340.0	128.3	211.7	3.5	26.794	0.000	6.63	22.4
Est. Tip 786'	41.0	418.5	136.2	282.3	4.9	28.068	-0.910	6.92	23.9
	42.0	426.4	144.2	282.3	5.1	27.921	-0.922	6.92	23.8
	43.0	434.3	152.1	282.3	5.2	28.019	-1.011	6.93	23.8
	44.0	442.3	160.0	282.3	5.3	28.285	-1.119	6.96	23.9
	45.0	450.2	167.9	282.3	5.4	28.308	-1.105	6.98	24.1

Total Continuous Driving Time 20.00 minutes; Total Number of Blows 933 (starting at penetration 5.0 ft)

Moreland Altobelli Associates Inc.
PI 0006934, Bent 2Lt 14x89

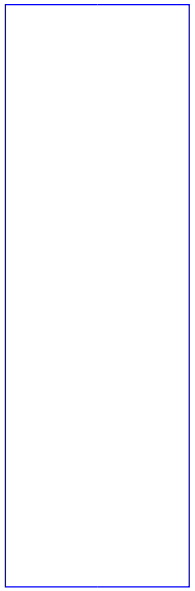
11-Oct-2021
GRLWEAP Version 2010



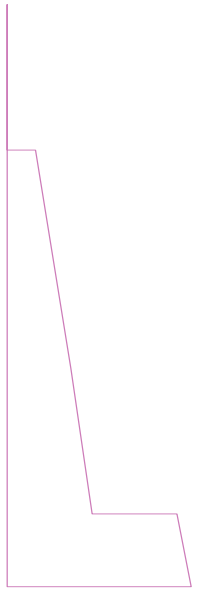
ICE 60-S

Ram Weight	7.00	kips
Efficiency	1.000	
Pressure	920 (80%)	psi
Helmet Weight	2.09	kips
Hammer Cushion	34825	kips/in
COR of H.C.	0.920	
Skin Quake	0.100	in
Toe Quake	0.118	in
Skin Damping	0.050	s/ft
Toe Damping	0.150	s/ft
Pile Length	40.00	ft
Pile Penetration	40.00	ft
Pile Top Area	26.10	in2

Pile Model



Skin Friction Distribution



Res. Shaft = 22 %
(Proportional)

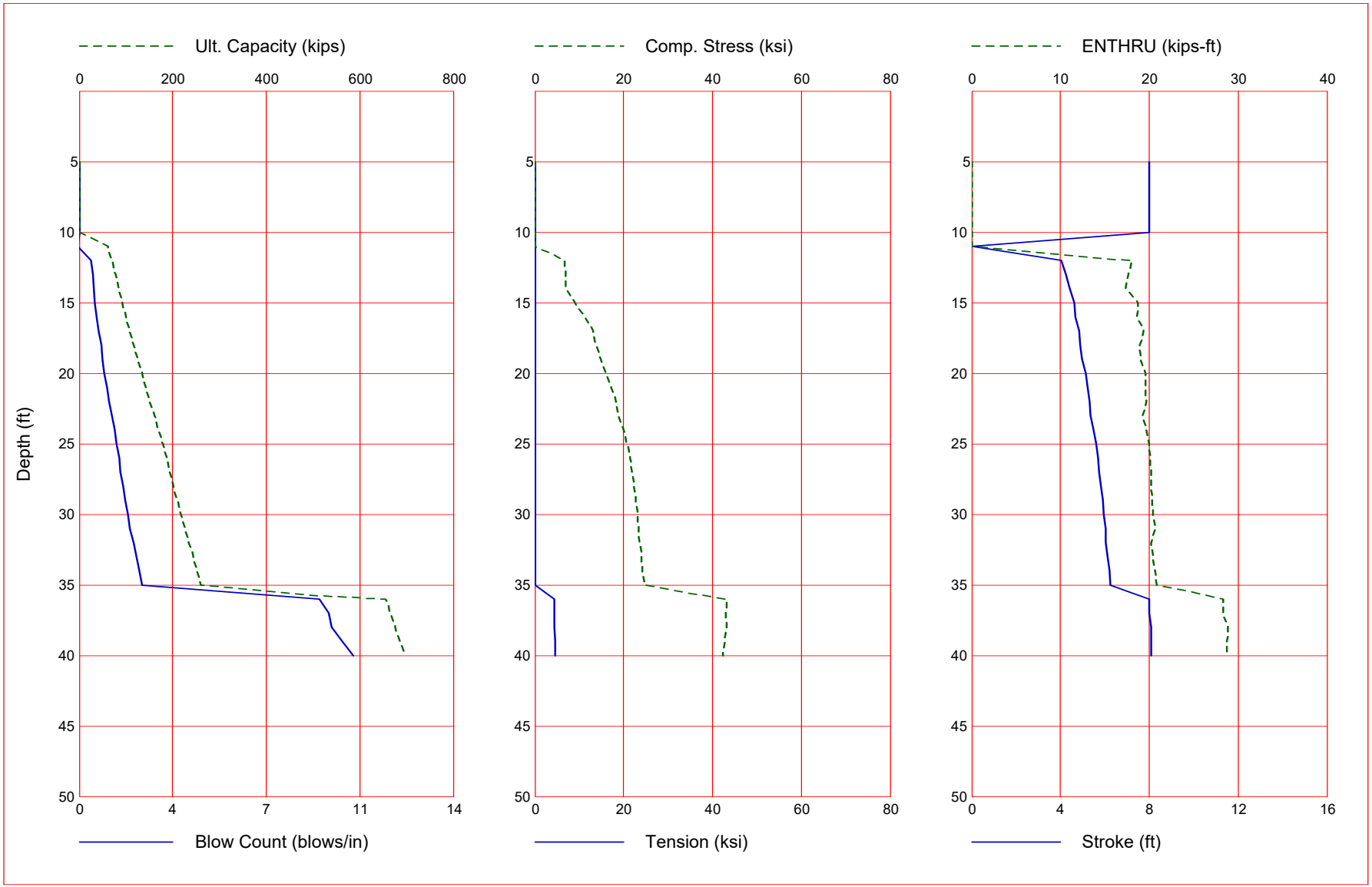
Moreland Altobelli Associates Inc. 11-Oct-2021
PI 0006934, Bent 2Lt 14x89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
140.0	17.76	0.00	1.0	5.17	19.16
210.0	24.38	0.00	1.7	5.97	20.01
280.0	26.85	0.00	2.5	6.50	20.80
350.0	28.90	0.00	3.2	6.77	21.71
420.0	32.29	0.88	4.1	7.04	22.87
490.0	35.20	1.61	5.1	7.31	24.40
560.0	37.62	2.42	6.4	7.58	25.91
630.0	39.67	3.60	8.0	7.82	27.26
700.0	41.05	4.29	10.5	8.00	28.23

Moreland Altobelli Associates Inc.
PI 0006934, Bent 2Lt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Moreland Altobelli Associates Inc.
PI 0006934, Bent 2Lt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

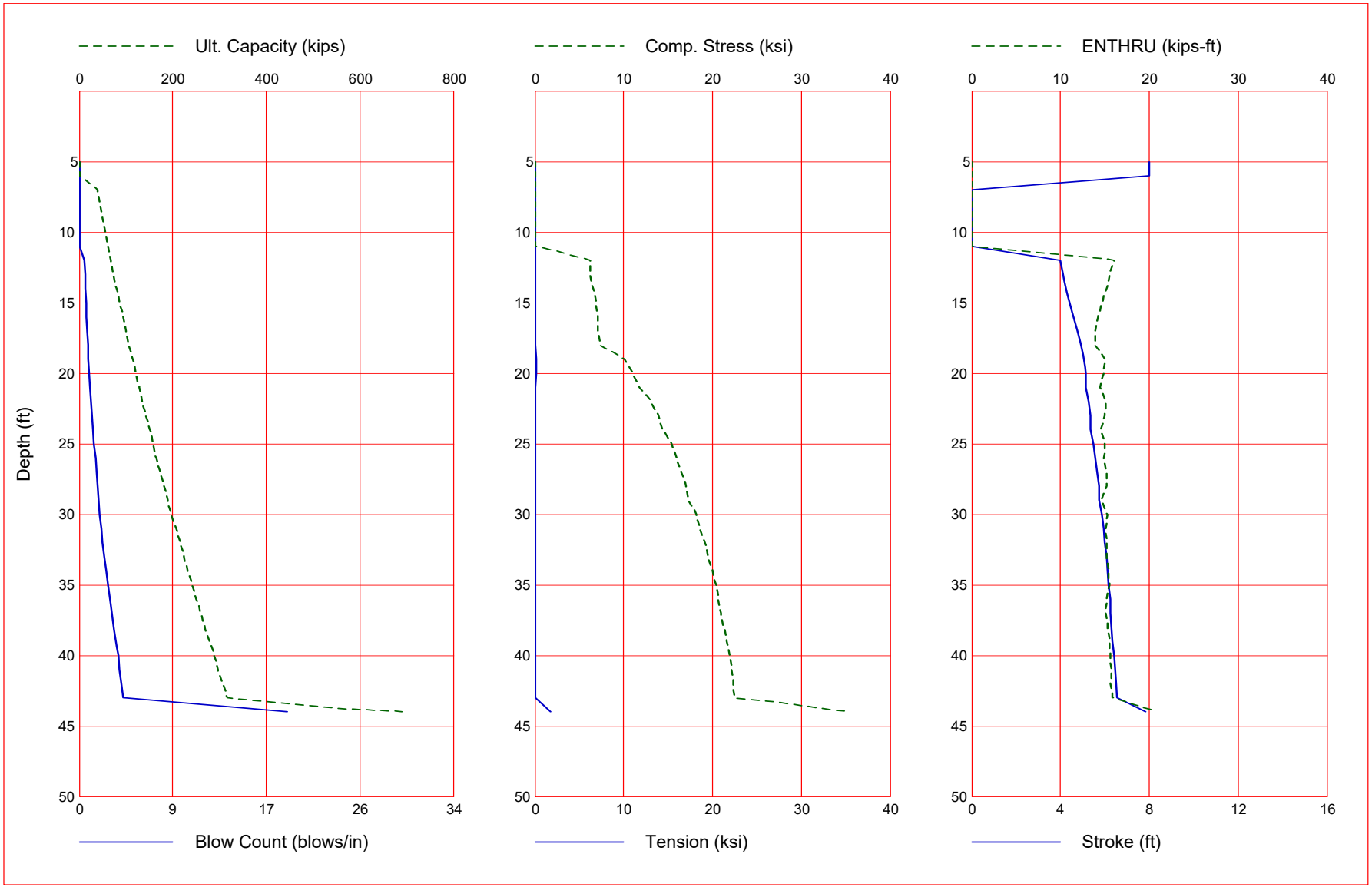
	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. 828'									
	5.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	6.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	7.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	8.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	9.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
Btm of FTG 818'	10.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	11.0	62.4	1.5	60.8	-0.1	0.000	0.000	0.00	0.0
	12.0	69.7	3.2	66.5	0.4	6.820	0.000	4.03	18.1
	13.0	77.2	5.1	72.2	0.5	6.872	0.000	4.23	17.7
	14.0	84.9	7.0	77.8	0.5	6.878	0.000	4.43	17.3
	15.0	92.7	9.2	83.5	0.6	9.130	0.000	4.61	18.7
	16.0	100.7	11.5	89.2	0.7	11.156	0.000	4.68	18.6
	17.0	108.8	13.9	94.9	0.7	13.035	-0.013	4.83	19.4
	18.0	117.0	16.5	100.5	0.8	13.756	-0.133	4.88	18.9
	19.0	125.4	19.2	106.2	0.9	14.735	-0.082	4.99	19.0
	20.0	134.0	22.1	111.9	0.9	16.114	0.000	5.13	19.6
	21.0	142.7	25.1	117.5	1.0	17.233	0.000	5.22	19.6
	22.0	151.5	28.3	123.2	1.1	18.261	0.000	5.31	19.7
	23.0	160.5	31.7	128.9	1.2	18.766	0.000	5.37	19.3
	24.0	169.7	35.1	134.5	1.3	19.858	0.000	5.49	19.7
	25.0	179.0	38.8	140.2	1.4	20.787	0.000	5.61	20.0
	26.0	186.6	42.5	144.1	1.5	21.357	0.000	5.69	20.1
	27.0	194.4	46.4	148.0	1.6	21.920	0.000	5.75	20.2
Min. Tip 800'	28.0	202.3	50.4	151.9	1.6	22.283	0.000	5.83	20.2
	29.0	210.3	54.4	155.8	1.7	22.677	0.000	5.89	20.3
	30.0	218.4	58.6	159.8	1.8	23.048	0.000	5.95	20.4
	31.0	226.6	62.9	163.7	1.9	23.379	0.000	6.02	20.6
	32.0	234.9	67.3	167.6	2.0	23.502	0.000	6.02	20.2
	33.0	243.3	71.8	171.5	2.1	23.915	0.000	6.11	20.4
	34.0	251.8	76.4	175.4	2.2	24.241	0.000	6.19	20.6
	35.0	260.4	81.0	179.3	2.3	24.555	0.000	6.26	20.8
	36.0	655.2	90.7	564.5	9.0	43.239	-4.299	8.00	28.3
Est. Tip 791'	37.0	665.0	100.4	564.5	9.4	42.963	-4.364	8.00	28.3
	38.0	675.0	110.4	564.5	9.4	43.295	-4.470	8.08	28.8
	39.0	685.1	120.6	564.5	9.8	42.855	-4.540	8.08	28.7
	40.0	695.5	131.0	564.5	10.3	42.382	-4.610	8.09	28.7

Total Continuous Driving Time 20.00 minutes; Total Number of Blows 885 (starting at penetration 5.0 ft)

Moreland Altobelli Associates Inc.
PI 0006934, Bent 2Rt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

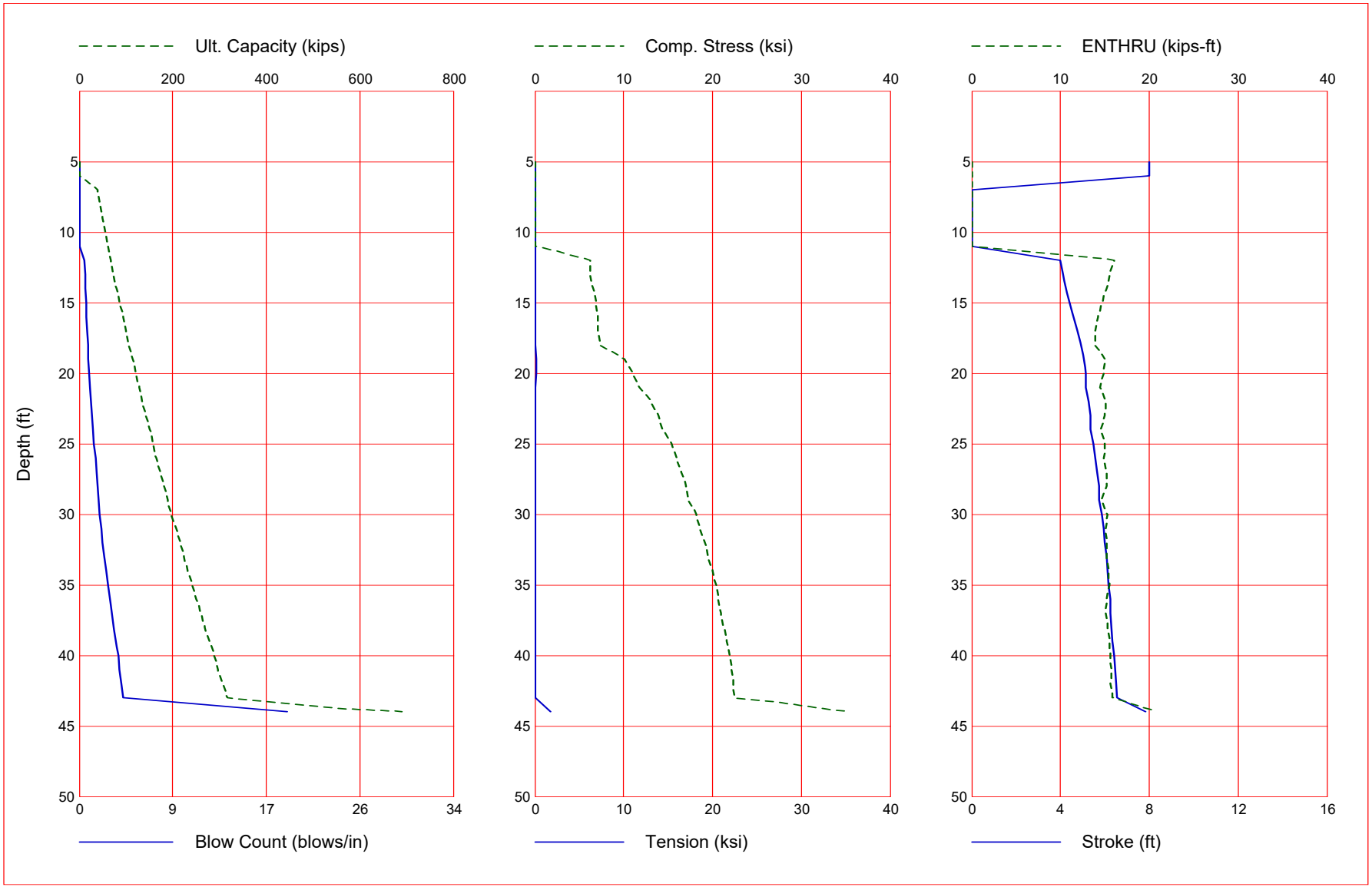
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
6.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
7.0	38.6	0.9	37.7	-0.1	0.000	0.000	0.00	0.0
8.0	44.2	2.0	42.2	-0.1	0.000	0.000	0.00	0.0
9.0	50.0	3.2	46.8	-0.1	0.000	0.000	0.00	0.0
10.0	55.8	4.5	51.4	-0.1	0.000	0.000	0.00	0.0
11.0	61.8	5.9	55.9	-0.1	0.000	0.000	0.00	0.0
12.0	67.9	7.4	60.5	0.5	6.199	0.000	3.97	16.1
13.0	74.1	9.1	65.0	0.5	6.289	0.000	4.11	15.5
14.0	80.5	10.9	69.6	0.6	6.574	0.000	4.26	15.2
15.0	86.9	12.8	74.2	0.6	6.915	0.000	4.43	14.7
16.0	93.5	14.8	78.7	0.7	7.076	0.000	4.58	14.2
17.0	100.2	16.9	83.3	0.7	7.124	0.000	4.75	13.9
18.0	107.0	19.2	87.8	0.8	7.298	-0.099	4.93	13.9
19.0	114.0	21.6	92.4	0.8	10.111	-0.178	5.05	15.0
20.0	121.0	24.1	97.0	0.9	11.065	-0.171	5.13	14.9
21.0	128.2	26.7	101.5	1.0	11.801	-0.096	5.15	14.5
22.0	135.5	29.5	106.1	1.1	13.106	-0.046	5.29	15.1
23.0	143.0	32.3	110.6	1.2	13.908	-0.041	5.35	15.0
24.0	150.5	35.3	115.2	1.3	14.385	0.000	5.37	14.6
25.0	158.2	38.4	119.8	1.4	15.410	0.000	5.49	15.0
26.0	166.0	41.6	124.3	1.5	15.936	0.000	5.58	14.9
27.0	173.9	45.0	128.9	1.6	16.522	0.000	5.66	15.2
28.0	181.9	48.5	133.5	1.7	17.029	0.000	5.73	15.2
29.0	190.1	52.1	138.0	1.8	17.174	0.000	5.75	14.7
30.0	198.3	55.8	142.6	1.9	18.200	0.000	5.88	15.3
31.0	206.7	59.6	147.1	2.0	18.594	0.000	5.94	15.1
32.0	215.2	63.6	151.7	2.1	19.116	0.000	6.01	15.2
33.0	223.9	67.6	156.3	2.3	19.508	0.000	6.06	15.2
34.0	232.6	71.8	160.8	2.4	20.051	0.000	6.12	15.4
35.0	241.5	76.1	165.4	2.6	20.477	0.000	6.18	15.5
36.0	250.5	80.6	169.9	2.8	20.672	0.000	6.23	15.2
37.0	259.6	85.1	174.5	3.0	20.917	0.000	6.23	15.1
38.0	268.9	89.8	179.1	3.2	21.325	0.000	6.30	15.3
39.0	278.2	94.6	183.6	3.3	21.621	0.000	6.35	15.5
40.0	287.7	99.5	188.2	3.5	21.926	0.000	6.40	15.6
41.0	297.3	104.6	192.7	3.7	22.129	0.000	6.45	15.7
42.0	307.0	109.7	197.3	3.9	22.333	0.000	6.49	15.6
43.0	316.9	115.0	201.9	4.0	22.473	0.000	6.53	15.8
44.0	690.3	125.8	564.5	18.9	35.122	-1.728	7.83	21.1

Total Continuous Driving Time 18.00 minutes; Total Number of Blows 824 (starting at penetration 5.0 ft)

Moreland Altobelli Associates Inc.
PI 0006934, Bent 2Rt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Moreland Altobelli Associates Inc.
PI 0006934, Bent 2Rt 14x89

Oct 11 2021
GRLWEAP Version 2010

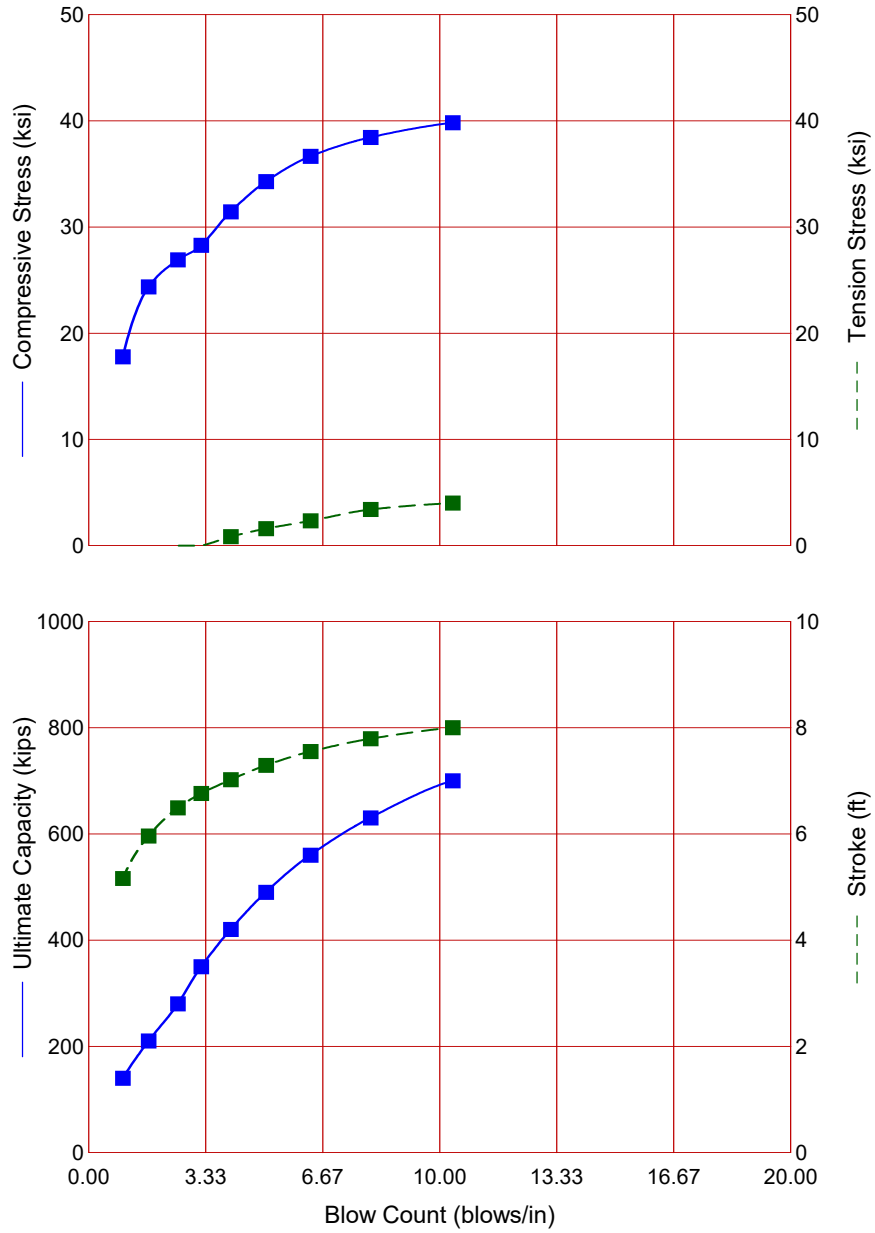
Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. 824'									
	5.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
Btm. of Ftg. 818'	6.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	7.0	38.6	0.9	37.7	-0.1	0.000	0.000	0.00	0.0
	8.0	44.2	2.0	42.2	-0.1	0.000	0.000	0.00	0.0
	9.0	50.0	3.2	46.8	-0.1	0.000	0.000	0.00	0.0
	10.0	55.8	4.5	51.4	-0.1	0.000	0.000	0.00	0.0
	11.0	61.8	5.9	55.9	-0.1	0.000	0.000	0.00	0.0
	12.0	67.9	7.4	60.5	0.5	6.199	0.000	3.97	16.1
	13.0	74.1	9.1	65.0	0.5	6.289	0.000	4.11	15.5
	14.0	80.5	10.9	69.6	0.6	6.574	0.000	4.26	15.2
	15.0	86.9	12.8	74.2	0.6	6.915	0.000	4.43	14.7
	16.0	93.5	14.8	78.7	0.7	7.076	0.000	4.58	14.2
	17.0	100.2	16.9	83.3	0.7	7.124	0.000	4.75	13.9
	18.0	107.0	19.2	87.8	0.8	7.298	-0.099	4.93	13.9
	19.0	114.0	21.6	92.4	0.8	10.111	-0.178	5.05	15.0
	20.0	121.0	24.1	97.0	0.9	11.065	-0.171	5.13	14.9
	21.0	128.2	26.7	101.5	1.0	11.801	-0.096	5.15	14.5
	22.0	135.5	29.5	106.1	1.1	13.106	-0.046	5.29	15.1
	23.0	143.0	32.3	110.6	1.2	13.908	-0.041	5.35	15.0
	24.0	150.5	35.3	115.2	1.3	14.385	0.000	5.37	14.6
	25.0	158.2	38.4	119.8	1.4	15.410	0.000	5.49	15.0
	26.0	166.0	41.6	124.3	1.5	15.936	0.000	5.58	14.9
	27.0	173.9	45.0	128.9	1.6	16.522	0.000	5.66	15.2
	28.0	181.9	48.5	133.5	1.7	17.029	0.000	5.73	15.2
	29.0	190.1	52.1	138.0	1.8	17.174	0.000	5.75	14.7
	30.0	198.3	55.8	142.6	1.9	18.200	0.000	5.88	15.3
	31.0	206.7	59.6	147.1	2.0	18.594	0.000	5.94	15.1
	32.0	215.2	63.6	151.7	2.1	19.116	0.000	6.01	15.2
	33.0	223.9	67.6	156.3	2.3	19.508	0.000	6.06	15.2
	34.0	232.6	71.8	160.8	2.4	20.051	0.000	6.12	15.4
	35.0	241.5	76.1	165.4	2.6	20.477	0.000	6.18	15.5
	36.0	250.5	80.6	169.9	2.8	20.672	0.000	6.23	15.2
	37.0	259.6	85.1	174.5	3.0	20.917	0.000	6.23	15.1
	38.0	268.9	89.8	179.1	3.2	21.325	0.000	6.30	15.3
	39.0	278.2	94.6	183.6	3.3	21.621	0.000	6.35	15.5
	40.0	287.7	99.5	188.2	3.5	21.926	0.000	6.40	15.6
	41.0	297.3	104.6	192.7	3.7	22.129	0.000	6.45	15.7
	42.0	307.0	109.7	197.3	3.9	22.333	0.000	6.49	15.6
Min. Tip 781'	43.0	316.9	115.0	201.9	4.0	22.473	0.000	6.53	15.8
	44.0	690.3	125.8	564.5	18.9	35.122	-1.728	7.83	21.1
Est. Tip. 779'									

Total Continuous Driving Time 18.00 minutes; Total Number of Blows 824 (starting at penetration 5.0 ft)

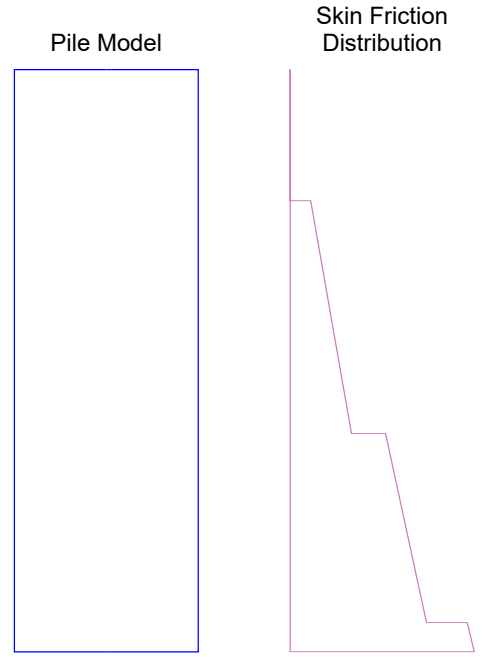
Moreland Altobelli Associates Inc.
PI 0006934, Bent 3Lt 14x89

12-Oct-2021
GRLWEAP Version 2010



ICE 60-S

Ram Weight	7.00	kips
Efficiency	1.000	
Pressure	920 (80%)	psi
Helmet Weight	2.09	kips
Hammer Cushion	34825	kips/in
COR of H.C.	0.920	
Skin Quake	0.100	in
Toe Quake	0.118	in
Skin Damping	0.050	s/ft
Toe Damping	0.150	s/ft
Pile Length	40.00	ft
Pile Penetration	40.00	ft
Pile Top Area	26.10	in2



Res. Shaft = 24 %
(Proportional)

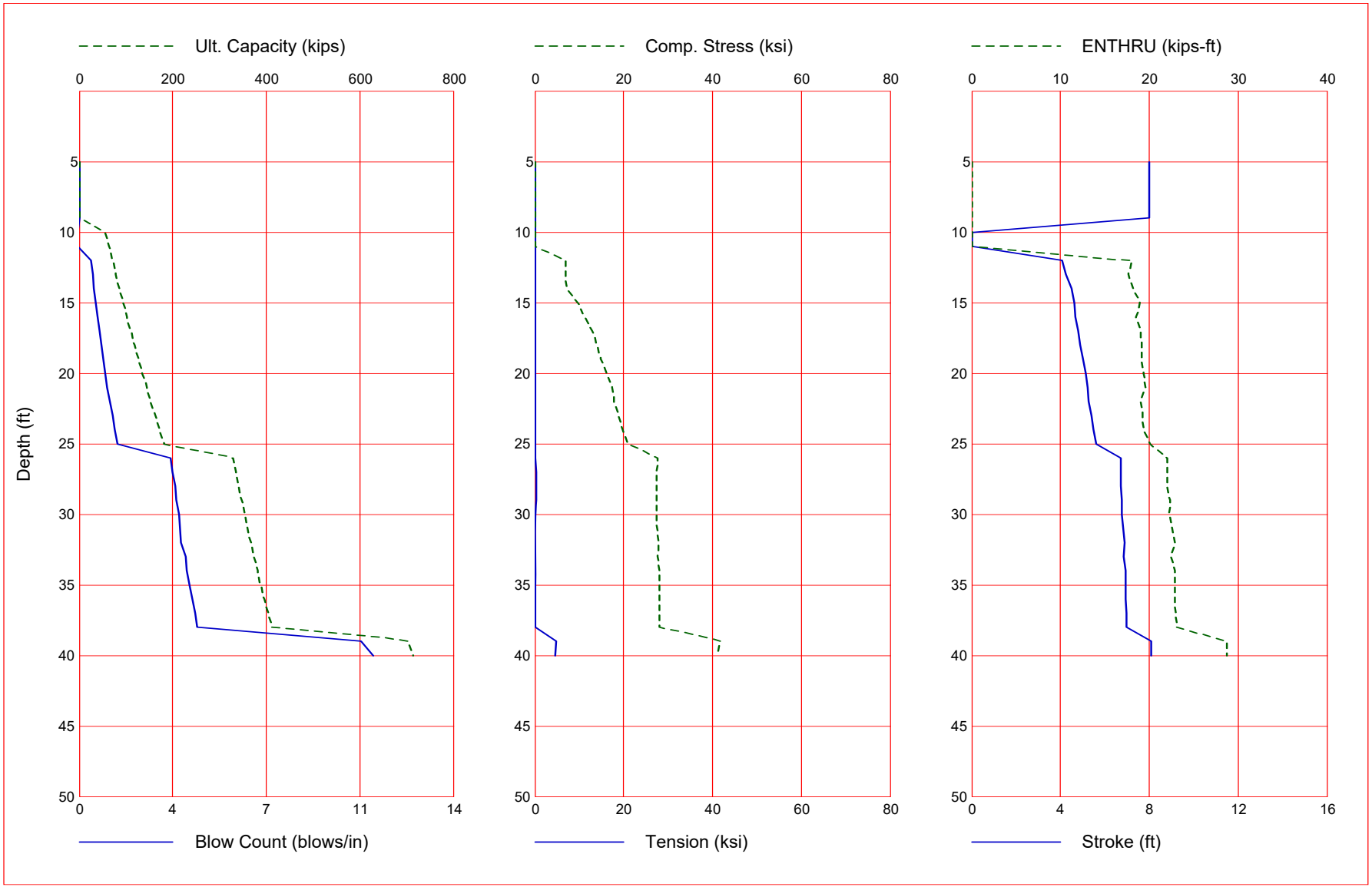
Moreland Altobelli Associates Inc. 12-Oct-2021
PI 0006934, Bent 3Lt 14x89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
140.0	17.78	0.00	1.0	5.16	19.31
210.0	24.35	0.00	1.7	5.96	19.91
280.0	26.91	0.00	2.5	6.49	20.83
350.0	28.27	0.00	3.2	6.76	21.66
420.0	31.41	0.85	4.0	7.02	22.80
490.0	34.26	1.60	5.1	7.29	24.30
560.0	36.64	2.33	6.3	7.55	25.79
630.0	38.43	3.40	8.0	7.79	27.05
700.0	39.81	4.01	10.4	8.00	28.18

Moreland Altobelli Associates Inc.
PI 0006934, Bent 3Lt 14x89

Oct 12 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



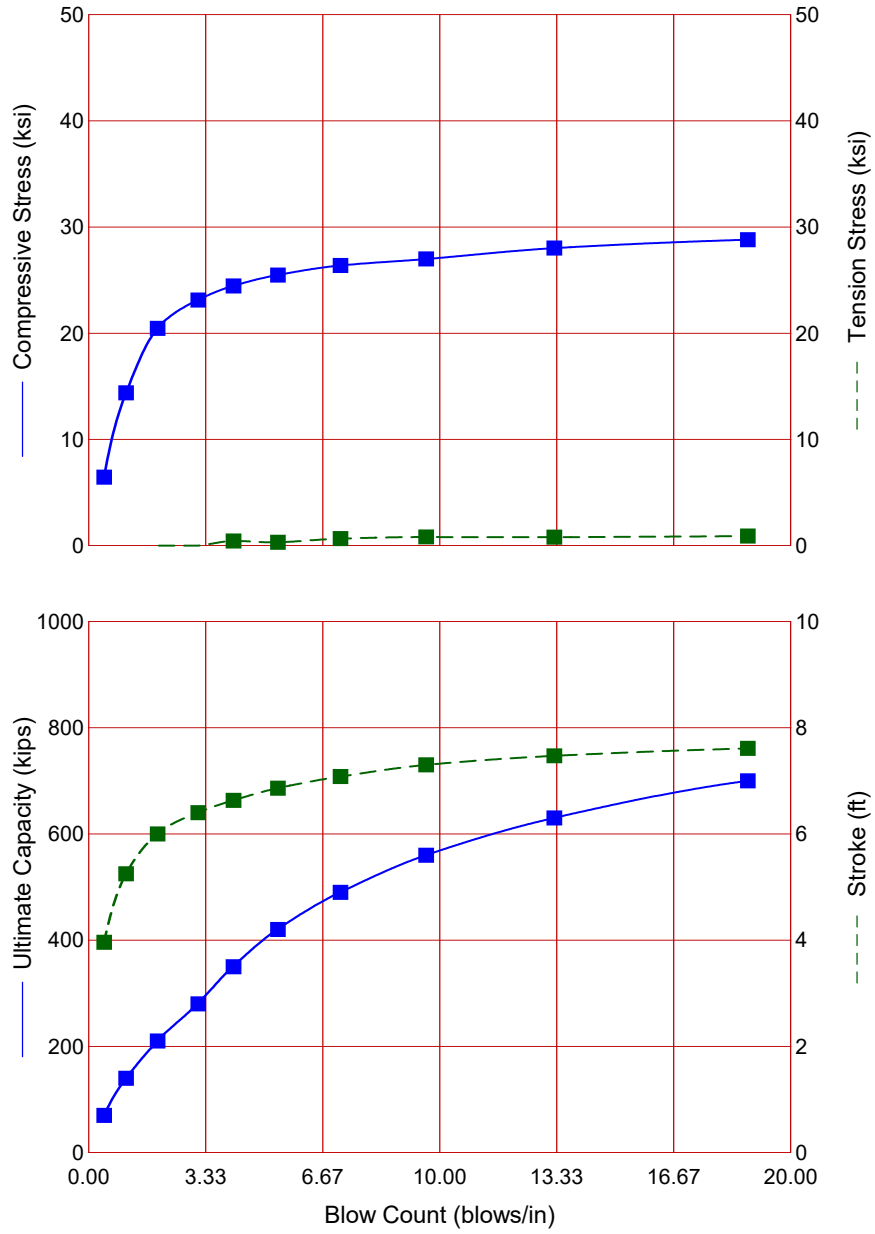
Moreland Altobelli Associates Inc.
PI 0006934, Bent 3Lt 14x89

Oct 12 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

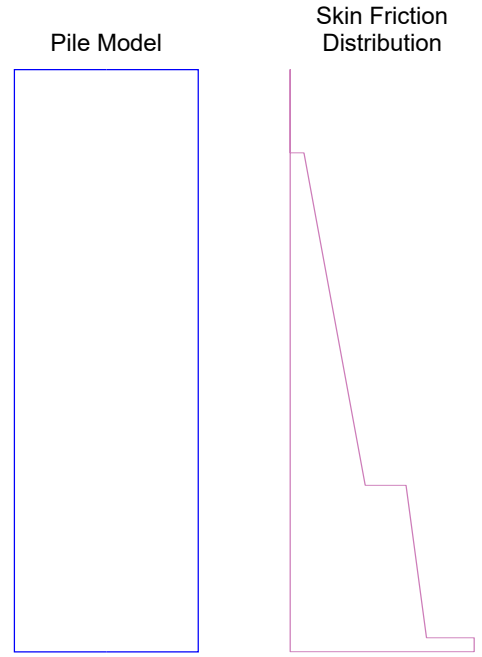
	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. 824'									
	5.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	6.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	7.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	8.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
Btm. of Ftg. 815'	9.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	10.0	56.7	1.4	55.3	-0.1	0.000	0.000	0.00	0.0
	11.0	63.9	2.9	61.0	-0.1	0.000	0.000	0.00	0.0
	12.0	71.3	4.6	66.7	0.5	6.848	0.000	4.06	18.1
	13.0	78.8	6.5	72.3	0.5	6.855	0.000	4.26	17.6
	14.0	86.4	8.4	78.0	0.5	7.067	0.000	4.51	18.2
	15.0	94.3	10.6	83.7	0.6	9.681	0.000	4.62	18.9
	16.0	102.2	12.9	89.3	0.7	11.280	0.000	4.69	18.5
	17.0	110.3	15.3	95.0	0.7	12.952	-0.056	4.80	19.0
	18.0	118.6	17.9	100.7	0.8	13.942	-0.143	4.90	19.1
	19.0	127.0	20.6	106.3	0.9	14.932	-0.069	5.01	19.1
	20.0	135.5	23.5	112.0	1.0	16.178	0.000	5.14	19.4
	21.0	144.2	26.6	117.7	1.0	17.350	0.000	5.23	19.6
	22.0	153.1	29.8	123.3	1.1	17.835	0.000	5.27	19.0
	23.0	162.1	33.1	129.0	1.2	18.900	0.000	5.39	19.3
	24.0	171.3	36.6	134.7	1.3	19.694	0.000	5.49	19.4
	25.0	180.6	40.2	140.3	1.4	20.911	0.000	5.62	20.1
	26.0	328.3	46.0	282.3	3.4	27.585	-0.192	6.70	22.0
	27.0	334.3	52.0	282.3	3.5	27.507	-0.281	6.71	22.0
	28.0	340.4	58.2	282.3	3.6	27.455	-0.373	6.73	22.0
	29.0	346.8	64.5	282.3	3.6	27.379	-0.256	6.76	22.3
	30.0	353.2	71.0	282.3	3.7	27.484	-0.093	6.78	22.2
	32.0	366.7	84.5	282.3	3.8	27.838	0.000	6.89	22.9
Min. Tip 791'	33.0	373.7	91.5	282.3	4.0	27.681	0.000	6.85	22.5
	34.0	380.9	98.6	282.3	4.0	27.977	0.000	6.93	22.9
	35.0	388.2	106.0	282.3	4.1	27.996	0.000	6.94	22.9
	36.0	395.7	113.5	282.3	4.2	28.027	0.000	6.95	22.9
	37.0	403.4	121.1	282.3	4.3	28.099	0.000	6.97	23.0
	38.0	411.2	129.0	282.3	4.4	28.073	0.000	6.98	23.1
	39.0	703.9	139.4	564.5	10.6	41.674	-4.825	8.10	28.7
Est. Tip 784'	40.0	714.5	150.0	564.5	11.0	41.336	-4.563	8.09	28.7

Total Continuous Driving Time 21.00 minutes; Total Number of Blows 949 (starting at penetration 5.0 ft)



ICE 60-S

Ram Weight	7.00	kips
Efficiency	0.800	
Pressure	920 (80%)	psi
Helmet Weight	2.09	kips
Hammer Cushion	34825	kips/in
COR of H.C.	0.920	
Skin Quake	0.100	in
Toe Quake	0.118	in
Skin Damping	0.050	s/ft
Toe Damping	0.150	s/ft
Pile Length	42.00	ft
Pile Penetration	42.00	ft
Pile Top Area	26.10	in2



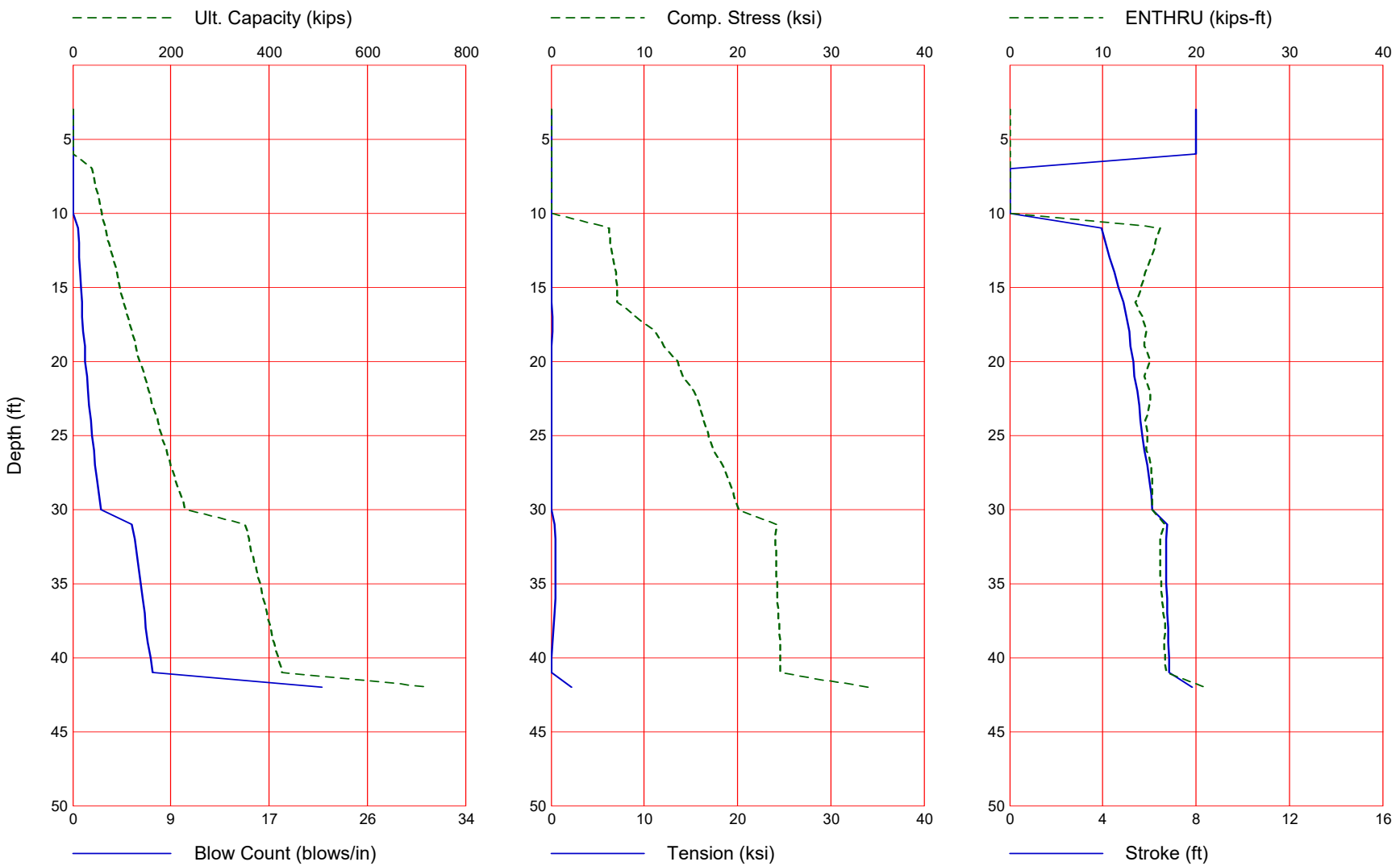
Moreland Altobelli Associates Inc. 12-Oct-2021
PI 0006934, Bent 3Rt 14x89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
70.0	6.44	0.00	0.4	3.96	16.62
140.0	14.39	0.00	1.1	5.25	14.83
210.0	20.46	0.00	2.0	6.00	14.92
280.0	23.12	0.00	3.1	6.40	14.58
350.0	24.45	0.44	4.1	6.63	15.34
420.0	25.48	0.32	5.4	6.86	16.42
490.0	26.38	0.66	7.2	7.08	17.34
560.0	26.98	0.82	9.6	7.30	18.42
630.0	28.01	0.80	13.3	7.47	19.13
700.0	28.81	0.90	18.8	7.61	19.68

Moreland Altobelli Associates Inc.
PI 0006934, Bent 3Rt 14x89

Oct 12 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Moreland Altobelli Associates Inc.
PI 0006934, Bent 3Rt 14x89

Oct 12 2021
GRLWEAP Version 2010

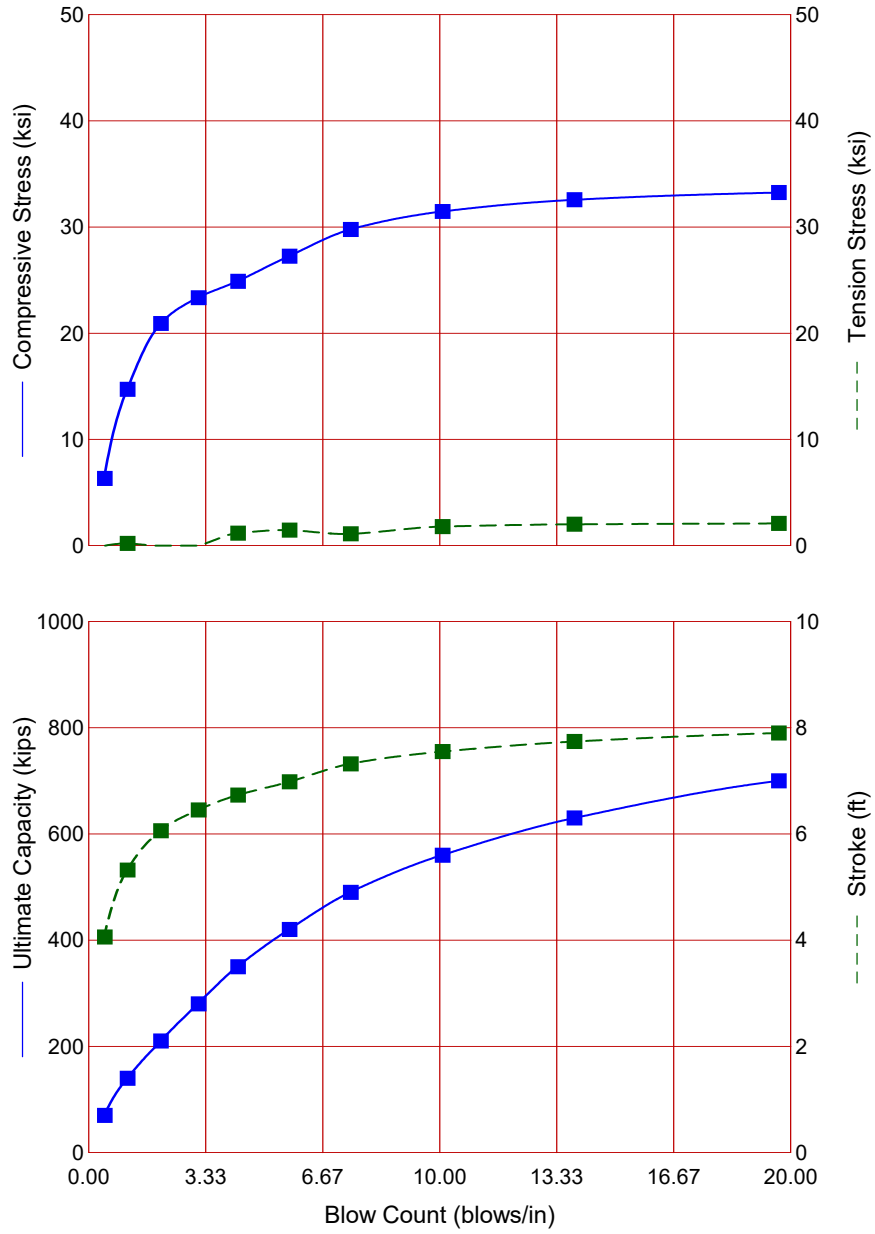
Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. 821'									
	3.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	4.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	5.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
Btm of Ftg. 815'	6.0	0.0	0.0	0.0	0.0	0.000	0.000	8.00	0.0
	7.0	39.6	0.9	38.7	-0.1	0.000	0.000	0.00	0.0
	8.0	46.2	2.0	44.2	-0.1	0.000	0.000	0.00	0.0
	9.0	53.0	3.3	49.7	-0.1	0.000	0.000	0.00	0.0
	10.0	60.0	4.7	55.3	-0.1	0.000	0.000	0.00	0.0
	11.0	67.0	6.2	60.8	0.5	6.194	0.000	3.96	16.2
	12.0	74.3	7.9	66.4	0.5	6.336	0.000	4.12	15.6
	13.0	81.7	9.7	71.9	0.6	6.670	0.000	4.30	15.2
	14.0	89.2	11.7	77.5	0.6	6.977	0.000	4.48	14.6
	15.0	96.8	13.8	83.0	0.7	7.051	0.000	4.67	14.1
	16.0	104.7	16.1	88.6	0.8	7.119	-0.099	4.87	13.5
	17.0	112.6	18.5	94.1	0.9	9.106	-0.132	5.00	14.2
	18.0	120.7	21.1	99.7	0.9	11.166	-0.129	5.14	14.7
	19.0	129.0	23.8	105.2	1.0	12.158	-0.086	5.19	14.5
	20.0	137.4	26.6	110.7	1.1	13.573	0.000	5.31	15.1
	21.0	145.9	29.6	116.3	1.2	14.143	0.000	5.34	14.5
	22.0	154.6	32.8	121.8	1.3	15.322	0.000	5.49	15.1
	23.0	163.5	36.1	127.4	1.5	15.939	0.000	5.56	15.0
	24.0	172.5	39.5	132.9	1.6	16.329	0.000	5.61	14.6
	25.0	181.6	43.1	138.5	1.7	16.934	0.000	5.71	14.8
	26.0	190.9	46.9	144.0	1.8	17.424	0.000	5.77	14.7
	27.0	200.3	50.7	149.6	1.9	18.382	0.000	5.92	15.2
	28.0	209.9	54.8	155.1	2.1	19.059	0.000	5.99	15.3
	29.0	219.6	59.0	160.7	2.2	19.562	0.000	6.06	15.3
	30.0	229.5	63.3	166.2	2.4	20.078	0.000	6.12	15.3
Min. Tip 790'	31.0	352.4	70.1	282.3	5.1	24.236	-0.339	6.78	16.6
	32.0	359.3	77.1	282.3	5.4	24.068	-0.434	6.72	16.2
	33.0	366.4	84.1	282.3	5.6	24.118	-0.486	6.72	16.2
	34.0	373.5	91.2	282.3	5.7	24.172	-0.508	6.72	16.2
	35.0	380.8	98.5	282.3	5.9	24.266	-0.527	6.74	16.3
	36.0	388.1	105.9	282.3	6.0	24.312	-0.453	6.75	16.4
	37.0	395.6	113.3	282.3	6.2	24.400	-0.334	6.77	16.5
	38.0	403.1	120.9	282.3	6.3	24.465	-0.256	6.80	16.7
	39.0	410.8	128.5	282.3	6.5	24.561	-0.140	6.82	16.6
	40.0	418.6	136.3	282.3	6.7	24.582	-0.030	6.83	16.7
Est. Tip. 780'	41.0	426.4	144.2	282.3	6.9	24.602	0.000	6.84	16.8
	42.0	719.4	154.9	564.5	21.6	34.135	-2.222	7.85	21.0

Total Continuous Driving Time 27.00 minutes; Total Number of Blows 1234 (starting at penetration 3.0 ft)

Moreland Altobelli Associates Inc.
PI 0006934, Bent 4Lt 14x89

11-Oct-2021
GRLWEAP Version 2010

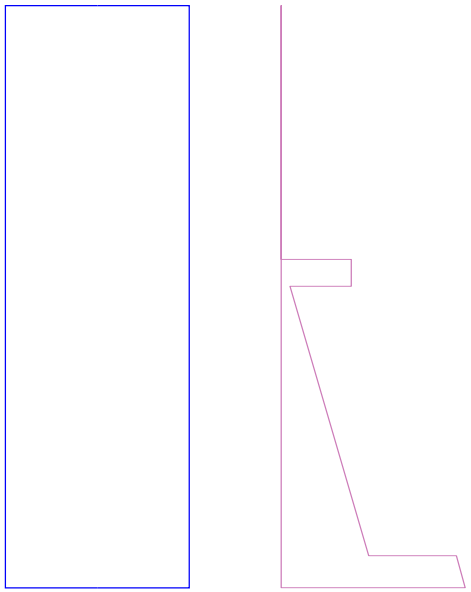


ICE 60-S

Ram Weight	7.00	kips
Efficiency	0.800	
Pressure	920 (80%)	psi
Helmet Weight	2.09	kips
Hammer Cushion	34825	kips/in
COR of H.C.	0.920	
Skin Quake	0.100	in
Toe Quake	0.118	in
Skin Damping	0.063	s/ft
Toe Damping	0.150	s/ft
Pile Length	55.00	ft
Pile Penetration	31.00	ft
Pile Top Area	26.10	in2

Pile Model

Skin Friction Distribution



Res. Shaft = 26 %
(Proportional)

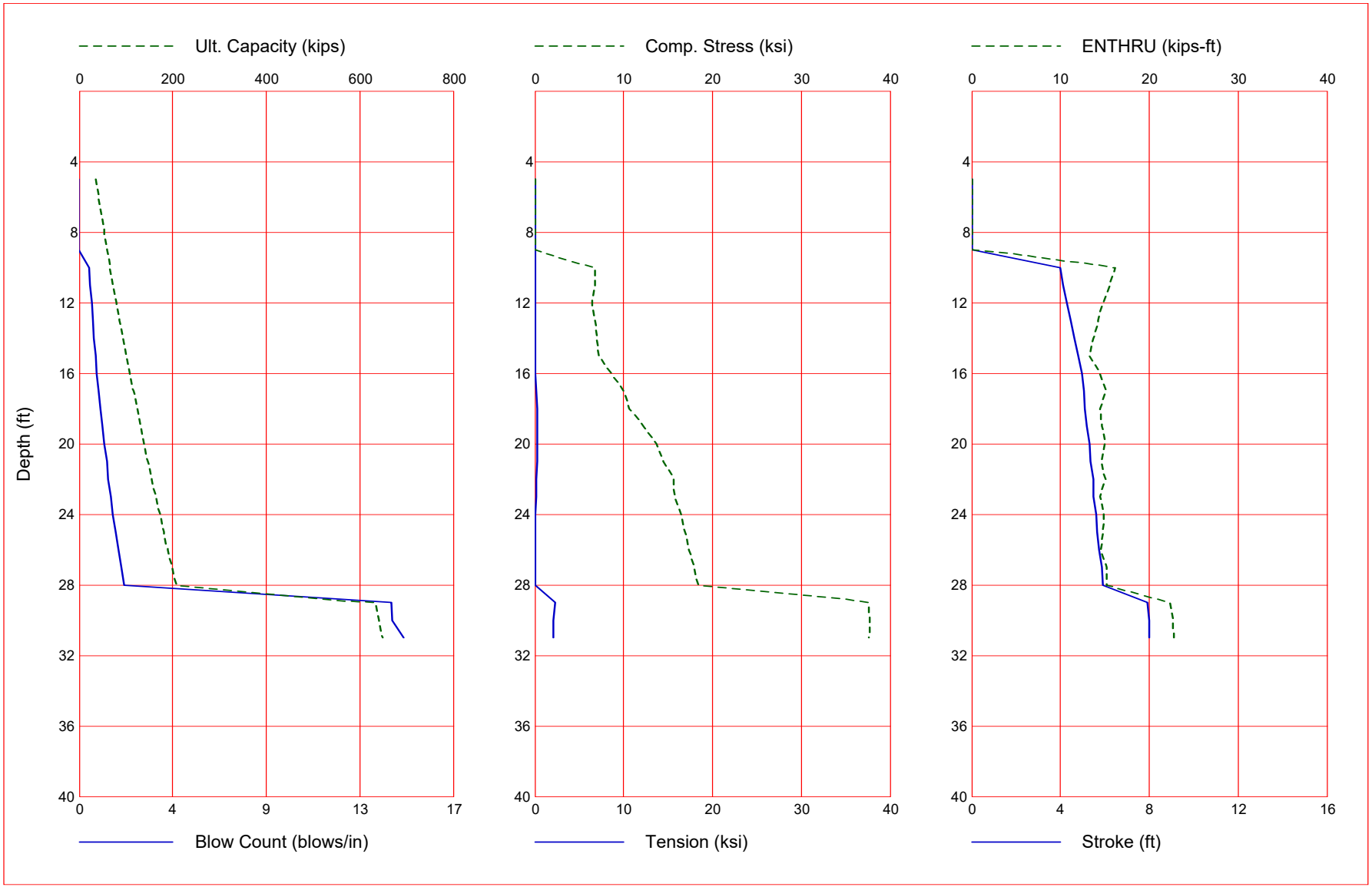
Moreland Altobelli Associates Inc. 11-Oct-2021
PI 0006934, Bent 4Lt 14x89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
70.0	6.33	0.00	0.5	4.06	15.91
140.0	14.71	0.21	1.1	5.32	14.80
210.0	20.91	0.00	2.1	6.06	15.12
280.0	23.34	0.00	3.1	6.45	15.19
350.0	24.89	1.17	4.3	6.73	16.52
420.0	27.25	1.47	5.7	6.98	17.76
490.0	29.76	1.11	7.5	7.32	19.32
560.0	31.46	1.80	10.1	7.55	20.48
630.0	32.56	2.02	13.8	7.74	21.33
700.0	33.24	2.09	19.7	7.90	21.95

Moreland Altobelli Associates Inc.
PI 0006934, Bent 4Lt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Moreland Altobelli Associates Inc.
PI 0006934, Bent 4Lt 14x89

Oct 11 2021
GRLWEAP Version 2010

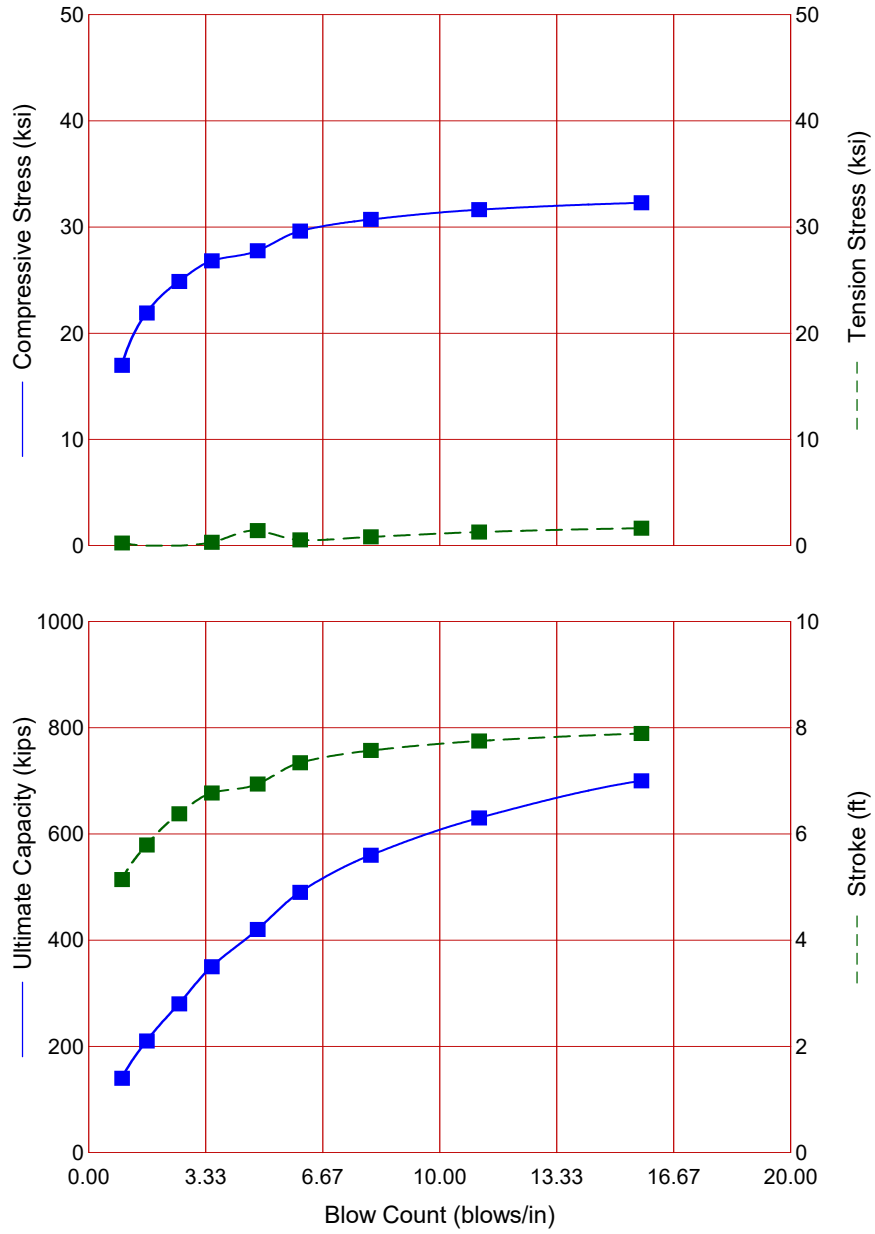
Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. 817'									
	5.0	34.6	6.3	28.3	-0.1	0.000	0.000	0.00	0.0
	6.0	40.6	7.1	33.5	-0.1	0.000	0.000	0.00	0.0
	7.0	46.8	8.1	38.7	-0.1	0.000	0.000	0.00	0.0
	8.0	53.1	9.1	43.9	-0.1	0.000	0.000	0.00	0.0
	9.0	59.5	10.4	49.1	-0.1	0.000	0.000	0.00	0.0
	10.0	66.1	11.7	54.4	0.4	6.751	0.000	3.97	16.2
	11.0	72.8	13.3	59.6	0.5	6.728	0.000	4.12	15.5
	12.0	79.7	14.9	64.8	0.6	6.421	0.000	4.27	14.8
	13.0	86.7	16.7	70.0	0.6	6.771	0.000	4.45	14.2
	14.0	93.8	18.6	75.2	0.7	6.990	0.000	4.62	13.7
	15.0	101.1	20.7	80.4	0.7	7.175	0.000	4.80	13.3
	16.0	108.5	22.9	85.6	0.8	8.637	0.000	4.98	14.5
	17.0	116.0	25.2	90.8	0.9	9.944	-0.189	5.07	15.1
	18.0	123.7	27.7	96.0	1.0	10.570	-0.278	5.10	14.4
	19.0	131.5	30.3	101.2	1.0	12.202	-0.260	5.19	14.7
	20.0	139.5	33.0	106.4	1.1	13.718	-0.247	5.31	15.0
	21.0	147.6	35.9	111.6	1.2	14.413	-0.227	5.35	14.6
	22.0	155.8	38.9	116.9	1.3	15.599	-0.183	5.49	15.1
	23.0	164.1	42.1	122.1	1.5	15.746	-0.127	5.49	14.5
	24.0	172.7	45.4	127.3	1.5	16.486	-0.044	5.63	14.9
	25.0	181.3	48.8	132.5	1.7	16.901	0.000	5.66	14.8
	26.0	190.1	52.4	137.7	1.8	17.306	0.000	5.73	14.6
	27.0	199.0	56.1	142.9	1.9	17.983	0.000	5.87	15.2
	28.0	208.1	60.0	148.1	2.0	18.426	0.000	5.93	15.2
Min.Tip 788'	29.0	632.4	67.9	564.5	14.2	37.483	-2.306	7.91	22.3
	30.0	640.6	76.0	564.5	14.2	37.690	-2.131	8.00	22.7
Est. Tip 786'	31.0	648.9	84.4	564.5	14.7	37.547	-2.028	8.00	22.8

Total Continuous Driving Time 15.00 minutes; Total Number of Blows 685 (starting at penetration 5.0 ft)

Moreland Altobelli Associates Inc.
PI 0006934, Bent 4Rt 14x89

11-Oct-2021
GRLWEAP Version 2010

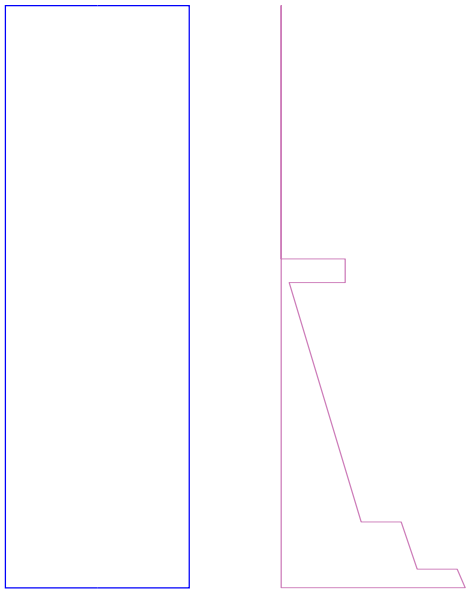


ICE 60-S

Ram Weight	7.00	kips
Efficiency	1.000	
Pressure	920 (80%)	psi
Helmet Weight	2.09	kips
Hammer Cushion	34825	kips/in
COR of H.C.	0.920	
Skin Quake	0.100	in
Toe Quake	0.237	in
Skin Damping	0.060	s/ft
Toe Damping	0.150	s/ft
Pile Length	62.00	ft
Pile Penetration	35.00	ft
Pile Top Area	26.10	in2

Pile Model

Skin Friction Distribution



Res. Shaft = 32 %
(Proportional)

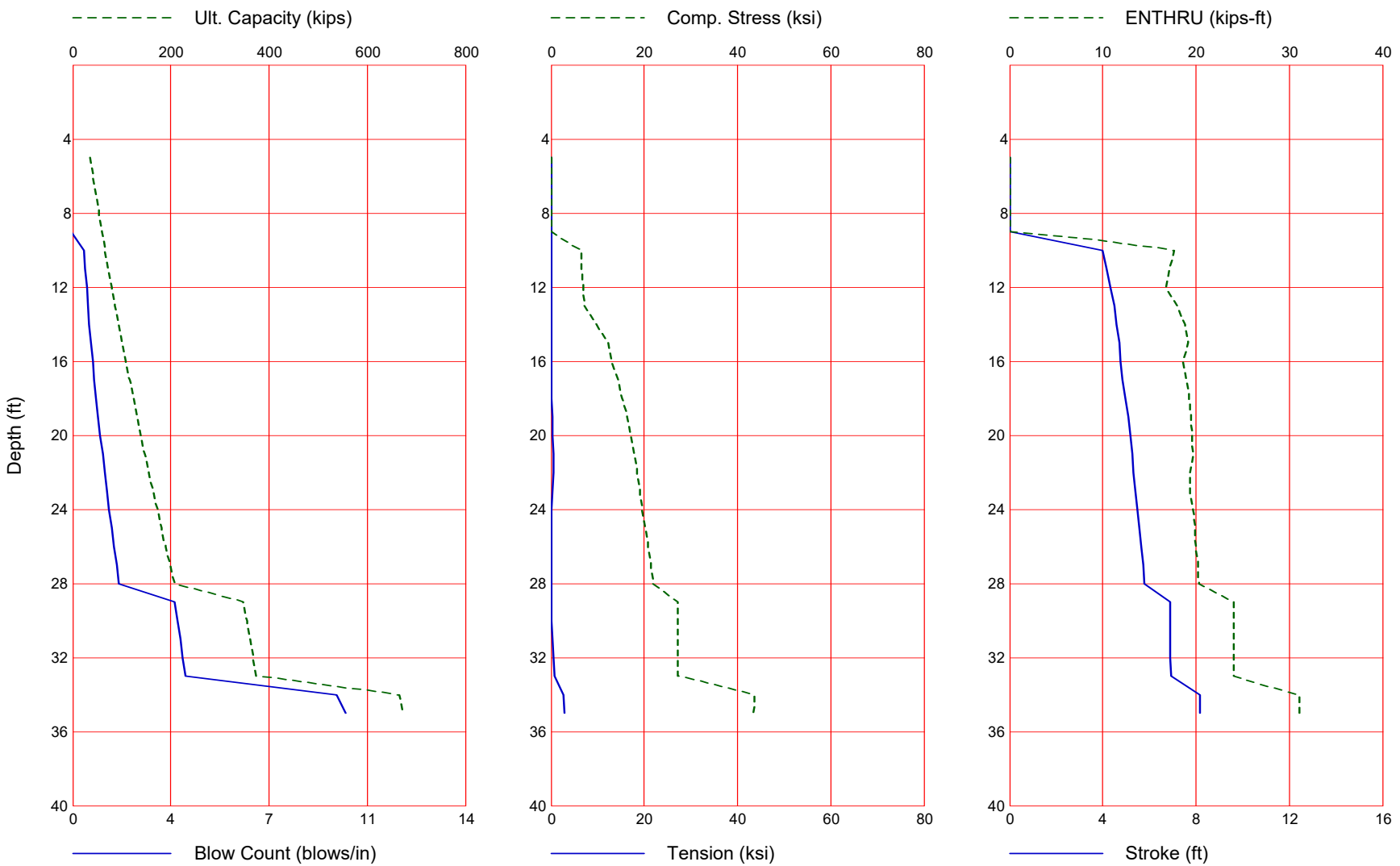
Moreland Altobelli Associates Inc. 11-Oct-2021
PI 0006934, Bent 4Rt 14x89 GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
140.0	16.98	0.25	0.9	5.14	19.72
210.0	21.90	0.00	1.7	5.79	20.33
280.0	24.87	0.00	2.6	6.38	21.92
350.0	26.81	0.32	3.5	6.77	23.29
420.0	27.76	1.42	4.8	6.94	24.06
490.0	29.61	0.54	6.0	7.34	26.39
560.0	30.71	0.83	8.0	7.57	27.61
630.0	31.63	1.29	11.1	7.75	28.57
700.0	32.28	1.65	15.8	7.89	29.20

Moreland Altobelli Associates Inc.
PI 0006934, Bent 4Rt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Moreland Altobelli Associates Inc.
PI 0006934, Bent 4Rt 14x89

Oct 11 2021
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

	Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/in	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
Zero depth Ele. 814'									
	5.0	34.6	6.3	28.3	-0.1	0.000	0.000	0.00	0.0
	6.0	40.6	7.1	33.5	-0.1	0.000	0.000	0.00	0.0
	7.0	46.8	8.1	38.7	-0.1	0.000	0.000	0.00	0.0
	8.0	53.1	9.1	43.9	-0.1	0.000	0.000	0.00	0.0
	9.0	59.5	10.4	49.1	-0.1	0.000	0.000	0.00	0.0
	10.0	66.1	11.7	54.4	0.4	6.519	0.000	3.99	17.7
	11.0	72.8	13.3	59.6	0.4	6.549	0.000	4.14	17.1
	12.0	79.7	14.9	64.8	0.5	6.879	0.000	4.31	16.8
	13.0	86.7	16.7	70.0	0.5	7.108	0.000	4.50	18.0
	14.0	93.8	18.6	75.2	0.6	9.764	0.000	4.60	18.8
	15.0	101.1	20.7	80.4	0.6	12.189	0.000	4.70	19.1
	16.0	108.5	22.9	85.6	0.7	12.922	0.000	4.74	18.6
	17.0	116.0	25.2	90.8	0.8	14.349	0.000	4.86	18.9
	18.0	123.7	27.7	96.0	0.8	15.328	-0.145	4.97	19.2
	19.0	131.5	30.3	101.2	0.9	16.329	-0.280	5.09	19.5
	20.0	139.5	33.0	106.4	1.0	17.160	-0.346	5.18	19.6
	21.0	147.5	35.9	111.6	1.1	17.833	-0.497	5.26	19.7
	22.0	155.8	38.9	116.9	1.1	18.379	-0.494	5.30	19.4
	23.0	164.1	42.1	122.1	1.2	19.014	-0.361	5.39	19.4
	24.0	172.7	45.4	127.3	1.3	19.622	-0.170	5.49	19.7
	25.0	181.3	48.8	132.5	1.4	20.243	-0.115	5.57	19.9
	26.0	190.1	52.4	137.7	1.5	20.812	-0.111	5.66	20.0
	27.0	199.0	56.1	142.9	1.6	21.379	-0.002	5.73	20.2
	28.0	208.1	60.0	148.1	1.7	21.859	0.000	5.80	20.3
Min. Tip 785'	29.0	348.3	66.1	282.3	3.6	27.303	0.000	6.88	24.0
	30.0	354.6	72.3	282.3	3.7	27.177	-0.124	6.89	24.0
	31.0	360.9	78.7	282.3	3.8	27.230	-0.346	6.90	24.1
	32.0	367.4	85.1	282.3	3.9	27.247	-0.553	6.91	24.1
Est. Tip 781'	33.0	374.0	91.8	282.3	4.0	27.292	-0.703	6.92	24.1
	34.0	665.0	100.5	564.5	9.4	43.594	-2.612	8.19	31.1
	35.0	674.0	109.5	564.5	9.7	43.337	-2.869	8.19	31.1

Total Continuous Driving Time 14.00 minutes; Total Number of Blows 617 (starting at penetration 5.0 ft)

Appendix I – Settlement Calculations

Settlement Calculations for end bent embankment.

(Using Schmertmann Strain Influence Method)

Both end bents have MSE abutment walls, bearing pressures and effective strap lengths at service limit, provided by the structure engineer, were used to estimate the settlement. Properties of foundation soils were determined from GDOT shallow foundation spreadsheet

Location	Bearing Pressure psf	Effective Strap Length feet	Settlement at ground surface inch
Abutment 1	4560	14.3	2.3
Abutment 2	6860	22.5	2.6

Wall 1 : Reference Boring B-2

Layer No.	Soil Type	Ave. Layer N60	Elev. Of Top of layer (ft)	Elev. Of Bottom of layer (ft)	Layer thickness, ft	Soil Modulus, Es, Bars	Soil Modulus, Es, tsf	Unit Weight, pcf
1	CL	14	825	820	5	192	200	120
2	SM	21	820	816	4	267	279	120
3	SM	25	816	812	4	308	322	120
4	SM	18	812	807	5	235	246	120
5	SM	25	807	802	5	308	322	120
6	SM	14	802	797	5	192	200	110
7	SM	10	797	792	5	145	152	110
8	SM	20	792	787	5	257	268	120

Wall 2 : Reference Boring B-8

Layer No.	Soil Type	Ave. Layer N60	Elev. Of Top of layer (ft)	Elev. Of Bottom of layer (ft)	Layer thickness, ft	Soil Modulus, Es, Bars	Soil Modulus, Es, tsf	Unit Weight, pcf
1	SM	11	812	810	2	157	164	110
2	SM	14	810	805	5	192	200	120
3	SM	11	805	800	5	157	164	110
4	SM	8	800	795	5	121	126	110
5	SM	17	795	790	5	225	235	120

Project Name: Courtesy Pkwy
Project Location: Wall 1
Project Number: PI 0006934
Calculations By: Jay Shah/Yong Shao
Date: 10/7/2021

Input Global Data		
Footing Width, B	14.3	feet
Elevation of Ground Surface	827.0	feet
Elevation of Base of Footing	825.0	feet
Elevation of Water Table	792.0	feet
Unit Weight of Water, γ_w	62.4	pcf
Net Bearing Pressure, ΔP	4560	psf
Soil Unit Weight Above Footing Base	120	pcf
Settlement Calculated at end of construction and at time t	1	years

Input Layer Data

Layer No.	Elev. Of Top of layer (ft)	Elev. Of Bottom of layer (ft)	Soil Modulus E_s (tsf)	Total Unit Weight, γ_t (pcf)
1	825.0	820.0	200	120
2	820.0	816.0	279	120
3	816.0	812.0	322	120
4	812.0	807.0	246	120
5	807.0	802.0	322	120
6	802.0	797.0	200	110
7	797.0	792.0	152	110
8	792.0	787.0	268	120
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Note: The depth of the water table must be a layer boundary.

Compute Global Values for Plane Strain Case			
σ'_{vo} at Elevation	825	240	psf
Elev. of I_{zp}		810.68	feet
σ'_{vp} at elevation	810.68	1958.4	psf
I_{zp}		0.653	
C_1		0.97	
C_2		1.20	

Computed Plane Strain Layer Information

Layer No.	Elev. Of Top of layer (ft)	Elev. Of Bottom of layer (ft)	Soil Modulus E_s (tsf)	Total Unit Weight, γ_T (pcf)	Δz (ft)	Elev. Of Center of Layer (ft)	I_z	ε	ΔH (inches)
1	825	820	200	120	5	822.5	0.28	0.31%	0.19
2	820	816	279	120	4	818	0.42	0.34%	0.16
3	816	812	322	120	4	814	0.55	0.38%	0.18
4	812	807	246	120	5	809.5	0.63	0.57%	0.34
5	807	802	322	120	5	804.5	0.56	0.39%	0.23
6	802	797	200	110	5	799.5	0.48	0.54%	0.32
7	797	792	152	110	5	794.5	0.41	0.59%	0.36
8	792	787	268	120	5	789.5	0.33	0.27%	0.16
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Immediate Settlement 1.9 **inches**

Settlement After 1 **year** 2.3 **inches**

Project Name: Courtesy Pkwy
Project Location: Wall 2
Project Number: PI 0006934
Calculations By: Jay Shah/Yong Shao
Date: 10/7/2021

Input Global Data		
Footing Width, B	22.5	feet
Elevation of Ground Surface	814.0	feet
Elevation of Base of Footing	812.0	feet
Elevation of Water Table	790.0	feet
Unit Weight of Water, γ_w	62.4	pcf
Net Bearing Pressure, ΔP	6860	psf
Soil Unit Weight Above Footing Base	120	pcf
Settlement Calculated at end of construction and at time t	1	years

Input Layer Data

Layer No.	Elev. Of Top of layer (ft)	Elev. Of Bottom of layer (ft)	Soil Modulus E_s (tsf)	Total Unit Weight, γ_t (pcf)
1	812.0	810.0	164	110
2	810.0	805.0	200	120
3	805.0	800.0	164	110
4	800.0	795.0	126	110
5	795.0	790.0	235	120
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Note: The depth of the water table must be a layer boundary.

Compute Global Values for Plane Strain Case			
σ'_{vo} at Elevation	812	240	psf
Elev. of I_{zp}		789.5	feet
σ'_{vp} at elevation	789.5	2820	psf
I_{zp}		0.656	
C_1		0.98	
C_2		1.20	

Computed Plane Strain Layer Information

Layer No.	Elev. Of Top of layer (ft)	Elev. Of Bottom of layer (ft)	Soil Modulus E_s (tsf)	Total Unit Weight, γ_T (pcf)	Δz (ft)	Elev. Of Center of Layer (ft)	I_z	ε	ΔH (inches)
1	812	810	164	110	2	811	0.22	0.45%	0.11
2	810	805	200	120	5	807.5	0.29	0.49%	0.29
3	805	800	164	110	5	802.5	0.39	0.81%	0.48
4	800	795	126	110	5	797.5	0.49	1.32%	0.79
5	795	790	235	120	5	792.5	0.60	0.85%	0.51
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Immediate Settlement **2.2** **inches**

Settlement After **1** **year** **2.6** **inches**

Georgia Department of Transportation

Interoffice Memo

FILE: CSSTP-0006-00(934), Rockdale County
PI No. 0006934
Courtesy Parkway Extension

DATE: February 2, 2021

Glen E. Foster Digitally signed by Glen E. Foster DN: C=US, E=gfoster@dot.ga.gov, CN=Glen E. Foster Date: 2021.02.02 09:27:33-05'00'

FROM: Monica L. Flournoy, P.E., State Materials Engineer

TO: Kimberly Nesbitt, State Program Delivery Administrator
Attn: Mary Causey, Project Manager

SUBJECT: **Acceptance of Consultant's Soil Survey Summary Report**

As requested, we have reviewed the Soil Survey Summary Report that was written on September 20, 2019 and revised on November 20, 2020 by Atlas of Duluth, Georgia. This Report is acceptable for use. Copies of this Report should be forwarded to the appropriate Offices by the Project Manager.

The Project Manager should provide a link to the accepted Report in ProjectWise to Geotechnical_Reports@dot.ga.gov.

If additional information is needed, please contact Nicolas Sotolongo of the Geotechnical Bureau at 404-608-4729 (Direct) or 404-608-4720 (Main).

MLF: GEF: NLS

cc:

Andy Casey, P.E., State Roadway Design Engineer
Kathy Zahul, P.E., District Engineer, Chamblee
Chris Woods, Area Engineer, Chamblee
Yong Shao, P.E. (Yong.Shao@oneatlas.com)

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 8:53am

Cross Section Set Name: Courtesy Parkway Ext_Earthwork

Alignment Name: DE1G

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

	Station Quantities								
	Cut				Fill				
Baseline Station	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Mass Ordinate
100+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
100+50.00	1.000	63.609	58.897	58.897	1.000	51.653	47.827	47.827	11.070
100+55.14									0.000
101+00.00	1.000	48.299	103.618	103.618	1.000	176.529	211.279	211.279	-96.591
101+50.00	1.000	31.929	74.285	74.285	1.000	99.135	255.244	255.244	-277.550
102+00.00	1.000	88.560	111.564	111.564	1.000	13.492	104.284	104.284	-270.270
102+50.00	1.000	103.018	177.387	177.387	1.000	3.943	16.143	16.143	-109.027
102+73.80									0.000
103+00.00	1.000	148.324	232.724	232.724	1.000	0.000	3.651	3.651	120.046
103+50.00	1.000	127.572	255.459	255.459	1.000	0.001	0.001	0.001	375.504
104+00.00	1.000	78.823	191.106	191.106	1.000	0.000	0.001	0.001	566.608
104+50.00	1.000	34.923	105.320	105.320	1.000	15.688	14.526	14.526	657.403
105+00.00	1.000	11.609	43.086	43.086	1.000	77.107	85.921	85.921	614.568
105+50.00	1.000	25.219	34.100	34.100	1.000	216.988	272.310	272.310	376.359
105+92.77									0.000
106+00.00	1.000	15.251	37.472	37.472	1.000	298.605	477.401	477.401	-63.570
106+50.00	1.000	10.939	24.250	24.250	1.000	334.735	586.426	586.426	-625.746
107+00.00	1.000	10.199	19.572	19.572	1.000	336.538	621.548	621.548	-1227.723
107+50.00	1.000	10.615	19.272	19.272	1.000	205.166	501.578	501.578	-1710.029
108+00.00	1.000	38.386	45.371	45.371	1.000	39.161	226.229	226.229	-1890.886
108+50.00	1.000	60.098	91.189	91.189	1.000	7.672	43.363	43.363	-1843.061
109+00.00	1.000	85.393	134.714	134.714	1.000	14.004	20.070	20.070	-1728.417
109+50.00	1.000	86.730	159.373	159.373	1.000	21.405	32.786	32.786	-1601.830
110+00.00	1.000	36.040	113.675	113.675	1.000	44.331	60.867	60.867	-1549.021
110+50.00	1.000	27.094	58.457	58.457	1.000	135.560	166.565	166.565	-1657.130
111+00.00	1.000	26.071	49.227	49.227	1.000	91.496	210.237	210.237	-1818.140
111+50.00	1.000	7.546	31.127	31.127	1.000	73.808	153.059	153.059	-1940.072
112+00.00	1.000	0.212	7.184	7.184	1.000	71.014	134.095	134.095	-2066.983
112+50.00	1.000	16.463	15.440	15.440	1.000	32.166	95.537	95.537	-2147.081
113+00.00	1.000	0.000	15.243	15.243	1.000	527.323	518.046	518.046	-2649.883
113+50.00	1.000	0.000	0.000	0.000	1.000	472.116	925.407	925.407	-3575.291
114+00.00	1.000	0.000	0.000	0.000	1.000	451.200	854.922	854.922	-4430.213
114+50.00	1.000	0.000	0.000	0.000	1.000	388.801	777.779	777.779	-5207.992

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
115+00.00	1.000	0.000	0.000	0.000	1.000	406.262	736.170	736.170	-5944.161
115+50.00	1.000	0.000	0.000	0.000	1.000	281.678	636.982	636.982	-6581.143
116+00.00	1.000	0.000	0.000	0.000	1.000	239.099	482.201	482.201	-7063.344
116+50.00	1.000	66.590	61.658	61.658	1.000	52.074	269.605	269.605	-7271.291
117+00.00	1.000	663.743	676.235	676.235	1.000	0.000	48.217	48.217	-6643.273
117+50.00	1.000	1557.100	2056.337	2056.337	1.000	0.000	0.000	0.000	-4586.937
118+00.00	1.000	838.172	2217.844	2217.844	1.000	0.000	0.000	0.000	-2369.092
118+50.00	1.000	984.285	1687.460	1687.460	1.000	0.000	0.000	0.000	-681.632
118+69.55									0.000
119+00.00	1.000	898.272	1743.109	1743.109	1.000	0.000	0.000	0.000	1061.477
119+50.00	1.000	830.926	1601.110	1601.110	1.000	0.000	0.000	0.000	2662.586
120+00.00	1.000	715.274	1431.667	1431.667	1.000	0.000	0.000	0.000	4094.253
120+50.00	1.000	537.962	1160.404	1160.404	1.000	0.000	0.000	0.000	5254.657
121+00.00	1.000	402.306	870.618	870.618	1.000	0.000	0.000	0.000	6125.275
121+50.00	1.000	303.603	653.619	653.619	1.000	0.000	0.000	0.000	6778.894
122+00.00	1.000	273.821	534.652	534.652	1.000	0.000	0.000	0.000	7313.546
122+50.00	1.000	292.893	524.735	524.735	1.000	0.000	0.000	0.000	7838.282
123+00.00	1.000	204.873	460.895	460.895	1.000	0.000	0.000	0.000	8299.176
123+50.00	1.000	124.804	305.256	305.256	1.000	0.000	0.000	0.000	8604.432
124+00.00	1.000	23.294	137.127	137.127	1.000	38.039	35.222	35.222	8706.338
124+50.00	1.000	0.000	21.568	21.568	1.000	224.302	242.909	242.909	8484.997
125+00.00	1.000	8.101	7.501	7.501	1.000	329.228	512.527	512.527	7979.971
125+50.00	1.000	13.496	19.997	19.997	1.000	372.542	649.787	649.787	7350.181
126+00.00	1.000	8.882	20.720	20.720	1.000	391.248	707.213	707.213	6663.688
126+50.00	1.000	12.203	19.523	19.523	1.000	475.102	802.176	802.176	5881.035
127+00.00	1.000	9.678	20.260	20.260	1.000	455.186	861.378	861.378	5039.916
127+50.00	1.000	12.673	20.695	20.695	1.000	578.903	957.490	957.490	4103.121
128+00.00	1.000	12.070	22.910	22.910	1.000	754.561	1234.689	1234.689	2891.343
128+50.00	1.000	9.218	19.712	19.712	1.000	932.779	1562.352	1562.352	1348.702
128+85.16									0.000
129+00.00	1.000	9.878	17.681	17.681	1.000	1157.716	1935.643	1935.643	-569.259
129+50.00	1.000	0.719	9.811	9.811	1.000	1190.243	2174.035	2174.035	-2733.483
130+00.00	1.000	9.617	9.570	9.570	1.000	1456.819	2450.983	2450.983	-5174.895
130+50.00	1.000	25.775	32.771	32.771	1.000	1365.898	2613.627	2613.627	-7755.751
131+00.00	1.000	12.501	35.441	35.441	1.000	1836.310	2965.008	2965.008	-10685.318
131+50.00	1.000	15.333	25.772	25.772	1.000	1937.218	3494.007	3494.007	-14153.553
132+00.00	1.000	19.401	32.162	32.162	1.000	1995.082	3641.018	3641.018	-17762.410
132+50.00	1.000	25.271	41.363	41.363	1.000	2156.087	3843.675	3843.675	-21564.722
133+00.00	1.000	24.418	46.008	46.008	1.000	2319.485	4144.048	4144.048	-25662.762
133+50.00	1.000	3.849	26.173	26.173	1.000	1762.696	3779.797	3779.797	-29416.386
134+00.00	1.000	3.062	6.399	6.399	1.000	1963.068	3449.781	3449.781	-32859.768
134+50.00	1.000	3.780	6.335	6.335	1.000	1950.571	3623.740	3623.740	-36477.173
135+00.00	1.000	34.183	35.151	35.151	1.000	2902.831	4493.891	4493.891	-40935.913
135+50.00	1.000	85.886	111.176	111.176	1.000	3405.400	5840.955	5840.955	-46665.693

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
136+00.00	1.000	73.707	147.772	147.772	1.000	4043.949	6897.545	6897.545	-53415.466
136+50.00	1.000	55.112	119.278	119.278	1.000	4472.122	7885.251	7885.251	-61181.440
137+00.00	1.000	37.553	85.801	85.801	1.000	4547.325	8351.340	8351.340	-69446.978
137+50.00	1.000	44.312	75.801	75.801	1.000	3828.076	7755.001	7755.001	-77126.178
138+00.00	1.000	0.000	41.030	41.030	1.000	3353.032	6649.174	6649.174	-83734.323
138+50.00	1.000	0.000	0.000	0.000	1.000	4048.046	6852.850	6852.850	-90587.173
139+00.00	1.000	0.000	0.000	0.000	1.000	3194.982	0.000	0.000	-90587.173
139+50.00	1.000	0.000	0.000	0.000	1.000	2870.349	0.000	0.000	-90587.173
140+00.00	1.000	0.000	0.000	0.000	1.000	3172.412	0.000	0.000	-90587.173
140+50.00	1.000	0.000	0.000	0.000	1.000	2431.821	0.000	0.000	-90587.173
141+00.00	1.000	6.053	5.605	5.605	1.000	3251.536	5262.368	5262.368	-95843.936
141+50.00	1.000	6.284	11.423	11.423	1.000	2988.386	5777.706	5777.706	-101610.219
142+00.00	1.000	5.829	11.215	11.215	1.000	2800.457	5360.039	5360.039	-106959.043
142+50.00	1.000	5.120	10.138	10.138	1.000	2669.665	5064.927	5064.927	-112013.832
143+00.00	1.000	4.687	9.081	9.081	1.000	2774.167	5040.585	5040.585	-117045.336
143+50.00	1.000	4.852	8.832	8.832	1.000	3061.813	5403.686	5403.686	-122440.190
144+00.00	1.000	5.196	9.303	9.303	1.000	3127.609	5730.946	5730.946	-128161.833
144+50.00	1.000	5.339	9.755	9.755	1.000	3016.792	5689.260	5689.260	-133841.338
145+00.00	1.000	6.465	10.930	10.930	1.000	2176.778	4808.861	4808.861	-138639.270
145+50.00	1.000	4.980	10.598	10.598	1.000	2162.375	4017.735	4017.735	-142646.407
146+00.00	1.000	5.861	10.038	10.038	1.000	998.712	2926.933	2926.933	-145563.301
146+50.00	1.000	2.858	8.073	8.073	1.000	747.232	1616.615	1616.615	-147171.843
147+00.00	1.000	0.000	2.646	2.646	1.000	548.752	1199.985	1199.985	-148369.182
147+50.00	1.000	0.000	0.000	0.000	1.000	447.420	922.381	922.381	-149291.563
148+00.00	1.000	0.000	0.000	0.000	1.000	368.649	755.619	755.619	-150047.182
148+50.00	1.000	0.000	0.000	0.000	1.000	286.965	607.050	607.050	-150654.232
149+00.00	1.000	0.000	0.000	0.000	1.000	275.521	520.820	520.820	-151175.053
149+50.00	1.000	0.000	0.000	0.000	1.000	288.776	522.497	522.497	-151697.550
150+00.00	1.000	0.000	0.000	0.000	1.000	257.465	505.779	505.779	-152203.329
150+50.00	1.000	0.000	0.000	0.000	1.000	239.768	460.400	460.400	-152663.729
151+00.00	1.000	0.000	0.000	0.000	1.000	163.081	373.008	373.008	-153036.737
151+50.00	1.000	0.000	0.000	0.000	1.000	88.965	233.376	233.376	-153270.112
152+00.00	1.000	5.127	4.748	4.748	1.000	67.795	145.148	145.148	-153410.513
152+50.00	1.000	1.454	6.094	6.094	1.000	124.762	178.293	178.293	-153582.712
153+00.00	1.000	1.297	2.547	2.547	1.000	136.390	241.807	241.807	-153821.972
153+50.00	1.000	10.685	11.095	11.095	1.000	76.551	197.167	197.167	-154008.044
154+00.00	1.000	11.772	20.794	20.794	1.000	60.690	127.074	127.074	-154114.324
154+50.00	1.000	97.535	101.210	101.210	1.000	1.160	57.268	57.268	-154070.382
155+00.00	1.000	143.569	223.244	223.244	1.000	0.000	1.074	1.074	-153848.212
155+50.00	1.000	164.415	285.171	285.171	1.000	0.000	0.000	0.000	-153563.041
156+00.00	1.000	121.430	264.671	264.671	1.000	213.029	197.249	197.249	-153495.618
156+50.00	1.000	0.000	112.435	112.435	1.000	939.406	1067.069	1067.069	-154450.252
157+00.00	1.000	0.000	0.000	0.000	1.000	1411.984	2177.212	2177.212	-156627.464
157+50.00	1.000	0.000	0.000	0.000	1.000	817.626	2064.454	2064.454	-158691.918
158+00.00	1.000	0.000	0.000	0.000	1.000	842.109	1536.792	1536.792	-160228.710
158+50.00	1.000	60.562	56.076	56.076	1.000	154.073	922.390	922.390	-161095.024
159+00.00	1.000	284.824	319.802	319.802	1.000	17.065	158.460	158.460	-160933.683
159+50.00	1.000	142.551	395.718	395.718	1.000	39.361	52.246	52.246	-160590.211

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Baseline Station	Cut Factor	Cut Area	Cut Volume	Cut Adjusted	Fill Factor	Fill Area	Fill Volume	Fill Adjusted	Mass Ordinate
160+00.00	1.000	163.369	283.260	283.260	1.000	2.321	38.594	38.594	-160345.546
160+50.00	1.000	382.387	505.329	505.329	1.000	2.088	4.082	4.082	-159844.298
161+00.00	1.000	55.323	405.287	405.287	1.000	1.029	2.886	2.886	-159441.897
161+50.00	1.000	57.814	104.756	104.756	1.000	0.203	1.141	1.141	-159338.282
162+00.00	1.000	62.982	111.848	111.848	1.000	0.000	0.188	0.188	-159226.623
162+50.00	1.000	60.631	114.456	114.456	1.000	0.005	0.005	0.005	-159112.171
163+00.00	1.000	61.759	113.324	113.324	1.000	0.000	0.005	0.005	-158998.852
163+50.00	1.000	67.571	119.750	119.750	1.000	0.000	0.000	0.000	-158879.101
164+00.00	1.000	66.734	124.356	124.356	1.000	0.000	0.000	0.000	-158754.745
164+50.00	1.000	65.941	122.847	122.847	1.000	0.000	0.000	0.000	-158631.899
165+00.00	1.000	54.861	111.853	111.853	1.000	0.974	0.902	0.902	-158520.947
165+50.00	1.000	46.029	93.417	93.417	1.000	9.638	9.826	9.826	-158437.357
166+00.00	1.000	57.017	95.413	95.413	1.000	10.421	18.573	18.573	-158360.517
166+50.00	1.000	55.886	104.540	104.540	1.000	9.945	18.858	18.858	-158274.834
167+00.00	1.000	58.648	106.050	106.050	1.000	6.717	15.428	15.428	-158184.213
167+50.00	1.000	55.713	105.889	105.889	1.000	1.808	7.893	7.893	-158086.217
168+00.00	1.000	67.556	114.138	114.138	1.000	0.001	1.675	1.675	-157973.754
168+50.00	1.000	111.101	165.423	165.423	1.000	0.000	0.001	0.001	-157808.331
169+00.00	1.000	112.745	207.264	207.264	1.000	0.000	0.000	0.000	-157601.067
169+50.00	1.000	108.527	204.881	204.881	1.000	0.000	0.000	0.000	-157396.185
170+00.00	1.000	84.488	178.717	178.717	1.000	1.530	1.416	1.416	-157218.885
170+50.00	1.000	73.481	146.268	146.268	1.000	1.347	2.664	2.664	-157075.281
171+00.00	1.000	67.643	130.671	130.671	1.000	0.164	1.399	1.399	-156946.010
171+50.00	1.000	72.322	129.598	129.598	1.000	0.000	0.152	0.152	-156816.564
172+00.00	1.000	61.980	124.354	124.354	1.000	0.056	0.052	0.052	-156692.262
172+50.00	1.000	69.434	121.680	121.680	1.000	0.000	0.052	0.052	-156570.633
173+00.00	1.000	75.151	133.875	133.875	1.000	0.000	0.000	0.000	-156436.758
173+50.00	1.000	73.574	137.708	137.708	1.000	0.000	0.000	0.000	-156299.050
174+00.00	1.000	74.200	136.827	136.827	1.000	0.000	0.000	0.000	-156162.223
174+50.00	1.000	64.471	128.399	128.399	1.000	1.835	1.699	1.699	-156035.523
175+00.00	1.000	58.015	113.413	113.413	1.000	4.485	5.852	5.852	-155927.961
175+50.00	1.000	56.881	106.385	106.385	1.000	22.556	25.039	25.039	-155846.615
176+00.00	1.000	55.506	104.062	104.062	1.000	20.766	40.114	40.114	-155782.666
176+50.00	1.000	57.113	104.278	104.278	1.000	17.338	35.282	35.282	-155713.671
177+00.00	1.000	55.982	104.718	104.718	1.000	17.758	32.496	32.496	-155641.449
177+50.00	1.000	107.784	151.635	151.635	1.000	10.557	26.218	26.218	-155516.032
178+00.00	1.000	0.000	99.800	99.800	1.000	0.000	9.775	9.775	-155426.006
178+15.28	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-155426.006
Grand Total:			26797.927	26797.927			182223.933	182223.933	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:01am

Cross Section Set Name: Flat Shoals Road_Earthwork

Alignment Name: DE2

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
200+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
200+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
201+00.00	1.000	1.084	1.004	1.004	1.000	2.059	1.907	1.907	-0.903
201+50.00	1.000	1.929	2.790	2.790	1.000	7.402	8.760	8.760	-6.873
202+00.00	1.000	4.920	6.341	6.341	1.000	51.408	54.454	54.454	-54.985
202+50.00	1.000	5.372	9.530	9.530	1.000	33.988	79.071	79.071	-124.527
203+00.00	1.000	8.083	12.458	12.458	1.000	34.315	63.244	63.244	-175.312
203+50.00	1.000	10.124	16.858	16.858	1.000	31.970	61.375	61.375	-219.829
204+00.00	1.000	13.148	21.549	21.549	1.000	34.886	61.904	61.904	-260.184
204+50.00	1.000	16.264	27.234	27.234	1.000	34.246	64.011	64.011	-296.962
205+00.00	1.000	29.122	42.025	42.025	1.000	29.111	58.664	58.664	-313.601
205+50.00	1.000	24.809	49.936	49.936	1.000	29.962	54.697	54.697	-318.362
206+00.00	1.000	27.924	48.827	48.827	1.000	27.420	53.131	53.131	-322.667
206+50.00	1.000	44.419	66.984	66.984	1.000	27.200	50.574	50.574	-306.256
207+00.00	1.000	29.277	68.237	68.237	1.000	28.720	51.778	51.778	-289.797
207+50.00	1.000	32.263	56.981	56.981	1.000	35.989	59.916	59.916	-292.732
208+00.00	1.000	25.645	53.618	53.618	1.000	52.491	81.926	81.926	-321.040
208+50.00	1.000	13.424	36.174	36.174	1.000	38.135	83.913	83.913	-368.778
209+00.00	1.000	13.631	25.051	25.051	1.000	6.831	41.635	41.635	-385.362
209+50.00	1.000	30.151	40.539	40.539	1.000	10.097	15.674	15.674	-360.497
210+00.00	1.000	25.890	51.890	51.890	1.000	38.663	45.147	45.147	-353.755
210+50.00	1.000	28.498	50.359	50.359	1.000	69.528	100.177	100.177	-403.573
211+00.00	1.000	27.234	51.604	51.604	1.000	86.029	144.034	144.034	-496.003
211+50.00	1.000	32.808	55.595	55.595	1.000	86.040	159.323	159.323	-599.731
212+00.00	1.000	26.696	55.097	55.097	1.000	90.445	163.412	163.412	-708.047
212+50.00	1.000	49.185	70.260	70.260	1.000	126.260	200.653	200.653	-838.440
213+00.00	1.000	31.131	74.367	74.367	1.000	71.461	183.074	183.074	-947.147
213+50.00	1.000	29.564	56.199	56.199	1.000	75.924	136.467	136.467	-1027.415
214+00.00	1.000	32.139	57.132	57.132	1.000	129.894	190.572	190.572	-1160.854
214+50.00	1.000	38.003	64.947	64.947	1.000	134.463	244.775	244.775	-1340.682
215+00.00	1.000	34.059	66.724	66.724	1.000	123.171	238.550	238.550	-1512.509
215+50.00	1.000	28.109	57.563	57.563	1.000	108.097	214.137	214.137	-1669.083
216+00.00	1.000	24.115	48.356	48.356	1.000	113.956	205.605	205.605	-1826.331
216+50.00	1.000	25.769	46.190	46.190	1.000	119.782	216.424	216.424	-1996.565
217+00.00	1.000	21.726	43.978	43.978	1.000	59.023	165.560	165.560	-2118.147
217+50.00	1.000	19.572	38.239	38.239	1.000	67.571	117.217	117.217	-2197.126
218+00.00	1.000	16.701	33.586	33.586	1.000	81.874	138.376	138.376	-2301.916
218+50.00	1.000	14.667	29.045	29.045	1.000	9.407	84.520	84.520	-2357.391

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
219+00.00	1.000	7.374	20.409	20.409	1.000	1.463	10.065	10.065	-2347.047
219+50.00	1.000	0.000	6.828	6.828	1.000	0.000	1.355	1.355	-2341.574
219+95.97	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-2341.574
Grand Total:			1564.502	1564.502			3906.076	3906.076	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:04am

Cross Section Set Name: Iris Drive SE_Earthwork

Alignment Name: DE3

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
290+94.62	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
291+00.00	1.000	0.855	0.085	0.085	1.000	0.634	0.063	0.063	0.022
291+00.05									0.000
291+50.00	1.000	2.336	2.954	2.954	1.000	27.047	25.630	25.630	-22.654
292+00.00	1.000	4.433	6.268	6.268	1.000	23.634	46.926	46.926	-63.312
292+50.00	1.000	5.651	9.337	9.337	1.000	27.685	47.517	47.517	-101.493
293+00.00	1.000	6.411	11.168	11.168	1.000	29.256	52.723	52.723	-143.047
293+50.00	1.000	6.607	12.054	12.054	1.000	28.349	53.338	53.338	-184.331
294+00.00	1.000	8.431	13.924	13.924	1.000	23.016	47.560	47.560	-217.967
294+50.00	1.000	10.079	17.139	17.139	1.000	30.250	49.321	49.321	-250.149
295+00.00	1.000	10.151	18.732	18.732	1.000	34.714	60.152	60.152	-291.569
295+50.00	1.000	10.393	19.023	19.023	1.000	28.449	58.484	58.484	-331.030
296+00.00	1.000	11.665	20.424	20.424	1.000	24.400	48.934	48.934	-359.540
296+50.00	1.000	12.453	22.332	22.332	1.000	27.069	47.656	47.656	-384.864
297+00.00	1.000	10.935	21.656	21.656	1.000	15.936	39.819	39.819	-403.027
297+50.00	1.000	12.056	21.288	21.288	1.000	17.446	30.909	30.909	-412.648
298+00.00	1.000	26.295	35.510	35.510	1.000	20.895	35.501	35.501	-412.639
298+50.00	1.000	21.314	44.082	44.082	1.000	5.646	24.575	24.575	-393.132
299+00.00	1.000	17.176	35.639	35.639	1.000	8.797	13.373	13.373	-370.866
299+50.00	1.000	12.960	27.903	27.903	1.000	4.118	11.958	11.958	-354.921
300+00.00	1.000	10.617	21.830	21.830	1.000	6.098	9.460	9.460	-342.551
300+50.00	1.000	7.900	17.145	17.145	1.000	6.663	11.816	11.816	-337.222
301+00.00	1.000	4.310	11.305	11.305	1.000	17.196	22.092	22.092	-348.009
301+50.00	1.000	0.953	4.872	4.872	1.000	10.711	25.840	25.840	-368.976
302+00.00	1.000	0.973	1.783	1.783	1.000	10.469	19.611	19.611	-386.803
302+50.00	1.000	0.957	1.788	1.788	1.000	11.313	20.169	20.169	-405.184
303+00.00	1.000	1.128	1.931	1.931	1.000	8.519	18.363	18.363	-421.616
303+50.00	1.000	2.827	3.662	3.662	1.000	4.722	12.260	12.260	-430.214
304+00.00	1.000	4.395	6.688	6.688	1.000	5.797	9.741	9.741	-433.267
304+50.00	1.000	3.862	7.646	7.646	1.000	6.246	11.151	11.151	-436.772
305+00.00	1.000	4.763	7.987	7.987	1.000	5.632	10.998	10.998	-439.784
305+50.00	1.000	4.470	8.549	8.549	1.000	6.584	11.312	11.312	-442.546
306+00.00	1.000	3.496	7.375	7.375	1.000	11.435	16.684	16.684	-451.855
306+50.00	1.000	0.000	3.237	3.237	1.000	0.000	10.588	10.588	-459.206
307+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
307+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
308+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
308+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
309+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
309+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
310+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
310+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
310+68.90	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
Grand Total:			445.317	445.317			904.523	904.523	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:08am

Cross Section Set Name: Iris Drive Connector_Earthwork

Alignment Name: DE4

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
400+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
400+50.00	1.000	0.000	0.000	0.000	1.000	2325.554	2153.288	2153.288	-2153.288
401+00.00	1.000	25.351	23.473	23.473	1.000	1978.716	3985.434	3985.434	-6115.249
401+50.00	1.000	25.066	46.683	46.683	1.000	1985.874	3670.916	3670.916	-9739.483
402+00.00	1.000	27.577	48.744	48.744	1.000	2057.518	3743.882	3743.882	-13434.621
402+50.00	1.000	24.266	48.003	48.003	1.000	1811.576	3582.494	3582.494	-16969.112
403+00.00	1.000	24.960	45.580	45.580	1.000	1430.291	3001.728	3001.728	-19925.261
403+50.00	1.000	31.626	52.394	52.394	1.000	1106.271	2348.669	2348.669	-22221.535
404+00.00	1.000	81.497	104.743	104.743	1.000	895.246	1853.256	1853.256	-23970.049
404+50.00	1.000	68.369	138.765	138.765	1.000	960.624	1718.398	1718.398	-25549.682
405+00.00	1.000	23.432	85.001	85.001	1.000	1000.926	1816.250	1816.250	-27280.931
405+50.00	1.000	15.642	36.179	36.179	1.000	922.240	1780.709	1780.709	-29025.460
406+00.00	1.000	14.188	27.620	27.620	1.000	726.546	1526.653	1526.653	-30524.493
406+50.00	1.000	10.751	23.092	23.092	1.000	380.538	1025.077	1025.077	-31526.478
407+00.00	1.000	7.692	17.077	17.077	1.000	65.470	412.970	412.970	-31922.371
407+50.00	1.000	131.558	128.935	128.935	1.000	1.226	61.755	61.755	-31855.191
408+00.00	1.000	0.000	121.813	121.813	1.000	0.000	1.135	1.135	-31734.513
408+16.54	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-31734.513
Grand Total:			948.103	948.103			32682.616	32682.616	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:13am

Cross Section Set Name: Courtesy Parkway Conn_Earthwork

Alignment Name: DE6

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
600+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
600+50.00	1.000	65.377	60.535	60.535	1.000	817.377	756.830	756.830	-696.296
601+00.00	1.000	78.364	133.094	133.094	1.000	481.927	1203.060	1203.060	-1766.262
601+50.00	1.000	76.444	143.341	143.341	1.000	172.876	606.299	606.299	-2229.220
602+00.00	1.000	73.615	138.943	138.943	1.000	0.784	160.796	160.796	-2251.073
602+50.00	1.000	63.846	127.278	127.278	1.000	1.143	1.784	1.784	-2125.579
603+00.00	1.000	74.103	127.730	127.730	1.000	1.273	2.237	2.237	-2000.085
603+50.00	1.000	72.770	135.993	135.993	1.000	1.367	2.444	2.444	-1866.535
604+00.00	1.000	0.000	67.379	67.379	1.000	0.000	1.265	1.265	-1800.422
604+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
605+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
605+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
606+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
606+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
607+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
607+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
608+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
608+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
609+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
609+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
610+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
610+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
610+60.80	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
Grand Total:			934.293	934.293			2734.715	2734.715	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:16am

Cross Section Set Name: Old Covington HWY_Earthwork

Alignment Name: DE7

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

	Station Quantities								
	Cut				Fill				
Baseline Station	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Mass Ordinate
684+39.73	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
684+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
685+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
685+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
686+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
686+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
687+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
687+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
688+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
688+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
689+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
689+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
690+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
690+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
691+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
691+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
692+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
692+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
693+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
693+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
694+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
694+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
695+00.00	1.000	7.659	7.092	7.092	1.000	0.000	0.000	0.000	7.092
695+50.00	1.000	6.966	13.542	13.542	1.000	0.764	0.707	0.707	19.927
696+00.00	1.000	20.224	25.176	25.176	1.000	9.676	9.667	9.667	35.436
696+50.00	1.000	19.359	36.651	36.651	1.000	1.530	10.376	10.376	61.711
697+00.00	1.000	25.929	41.933	41.933	1.000	13.095	13.541	13.541	90.102
697+50.00	1.000	23.871	46.111	46.111	1.000	22.446	32.908	32.908	103.305
698+00.00	1.000	15.074	36.060	36.060	1.000	26.160	45.005	45.005	94.359
698+50.00	1.000	16.881	29.588	29.588	1.000	25.169	47.527	47.527	76.420
699+00.00	1.000	20.026	34.173	34.173	1.000	15.404	37.568	37.568	73.025
699+50.00	1.000	19.224	36.342	36.342	1.000	0.000	14.263	14.263	95.105
700+00.00	1.000	2.814	20.406	20.406	1.000	0.000	0.000	0.000	115.511
700+50.00	1.000	21.901	22.885	22.885	1.000	0.000	0.000	0.000	138.395
701+00.00	1.000	26.844	45.135	45.135	1.000	0.000	0.000	0.000	183.530
701+50.00	1.000	95.834	113.591	113.591	1.000	0.000	0.000	0.000	297.121
702+00.00	1.000	98.321	179.773	179.773	1.000	0.000	0.000	0.000	476.894
702+50.00	1.000	119.400	201.593	201.593	1.000	0.000	0.000	0.000	678.487

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
703+00.00	1.000	234.030	327.250	327.250	1.000	0.000	0.000	0.000	1005.737
703+50.00	1.000	211.516	412.543	412.543	1.000	0.000	0.000	0.000	1418.280
704+00.00	1.000	132.746	318.761	318.761	1.000	0.000	0.000	0.000	1737.041
704+50.00	1.000	96.922	212.655	212.655	1.000	0.000	0.000	0.000	1949.696
705+00.00	1.000	120.665	201.469	201.469	1.000	0.000	0.000	0.000	2151.165
705+50.00	1.000	101.276	205.501	205.501	1.000	0.000	0.000	0.000	2356.666
706+00.00	1.000	67.175	155.973	155.973	1.000	0.000	0.000	0.000	2512.639
706+50.00	1.000	45.920	104.718	104.718	1.000	0.789	0.731	0.731	2616.626
707+00.00	1.000	27.137	67.646	67.646	1.000	2.330	2.888	2.888	2681.383
707+50.00	1.000	23.064	46.483	46.483	1.000	0.052	2.206	2.206	2725.660
708+00.00	1.000	16.929	37.031	37.031	1.000	0.759	0.752	0.752	2761.939
708+50.00	1.000	27.089	40.757	40.757	1.000	0.008	0.710	0.710	2801.986
709+00.00	1.000	6.563	31.159	31.159	1.000	0.000	0.007	0.007	2833.138
709+50.00	1.000	3.347	9.176	9.176	1.000	2.808	2.600	2.600	2839.714
710+00.00	1.000	2.251	5.184	5.184	1.000	0.372	2.945	2.945	2841.953
710+50.00	1.000	0.000	2.084	2.084	1.000	0.000	0.345	0.345	2843.693
711+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
711+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
712+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
712+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
713+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
713+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
714+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
714+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
715+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
715+41.12	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
Grand Total:			3068.440	3068.440			224.748	224.748	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:19am

Cross Section Set Name: Mission Ridge Drive_Earthwork

Alignment Name: DE9

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

- - - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
95+86.87	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
96+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
96+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
97+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
97+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
98+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
98+50.00	1.000	45.245	41.894	41.894	1.000	0.000	0.000	0.000	41.894
99+00.00	1.000	76.752	112.960	112.960	1.000	0.000	0.000	0.000	154.854
99+50.00	1.000	142.607	203.110	203.110	1.000	0.000	0.000	0.000	357.965
100+00.00	1.000	0.000	132.044	132.044	1.000	0.000	0.000	0.000	490.008
Grand Total:			490.008	490.008			0.000	0.000	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 3:31pm

Cross Section Set Name: Courtesy PKWY_Earthwork_STG 1_1

Alignment Name: DE1G

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	Station Quantities - Cut - Factor	Cut - Area	Cut - Volume	Cut - Adjusted	Fill - Factor	Fill - Area	Fill - Volume	Fill - Adjusted	Mass Ordinate
158+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
158+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
159+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
159+50.00	1.000	89.546	82.913	82.913	1.000	62.901	58.241	58.241	24.671
160+00.00	1.000	117.314	191.536	191.536	1.000	5.061	62.927	62.927	153.280
160+50.00	1.000	55.741	160.236	160.236	1.000	0.000	4.686	4.686	308.831
161+00.00	1.000	34.052	83.142	83.142	1.000	0.334	0.309	0.309	391.663
161+50.00	1.000	32.970	62.057	62.057	1.000	0.202	0.496	0.496	453.225
162+00.00	1.000	36.058	63.915	63.915	1.000	0.000	0.187	0.187	516.952
162+50.00	1.000	34.355	65.197	65.197	1.000	0.005	0.005	0.005	582.145
163+00.00	1.000	34.926	64.149	64.149	1.000	0.000	0.005	0.005	646.289
163+50.00	1.000	37.098	66.689	66.689	1.000	0.000	0.000	0.000	712.979
164+00.00	1.000	37.225	68.818	68.818	1.000	0.000	0.000	0.000	781.797
164+50.00	1.000	37.786	69.455	69.455	1.000	0.000	0.000	0.000	851.252
165+00.00	1.000	36.858	69.115	69.115	1.000	0.000	0.000	0.000	920.366
165+50.00	1.000	33.157	64.829	64.829	1.000	0.989	0.915	0.915	984.280
166+00.00	1.000	45.533	72.861	72.861	1.000	0.000	0.915	0.915	1056.226
166+50.00	1.000	44.728	83.575	83.575	1.000	0.000	0.000	0.000	1139.801
167+00.00	1.000	45.535	83.576	83.576	1.000	0.000	0.000	0.000	1223.377
167+50.00	1.000	39.224	78.480	78.480	1.000	0.000	0.000	0.000	1301.857
168+00.00	1.000	41.464	74.711	74.711	1.000	0.000	0.000	0.000	1376.568
168+50.00	1.000	78.770	111.328	111.328	1.000	0.000	0.000	0.000	1487.896
169+00.00	1.000	80.620	147.583	147.583	1.000	0.000	0.000	0.000	1635.480
169+50.00	1.000	77.505	146.412	146.412	1.000	0.000	0.000	0.000	1781.891
170+00.00	1.000	51.726	119.658	119.658	1.000	1.530	1.416	1.416	1900.133
170+50.00	1.000	44.948	89.513	89.513	1.000	1.347	2.664	2.664	1986.982
171+00.00	1.000	38.416	77.188	77.188	1.000	0.164	1.400	1.400	2062.771
171+50.00	1.000	41.029	73.560	73.560	1.000	0.000	0.152	0.152	2136.179
172+00.00	1.000	36.284	71.587	71.587	1.000	0.056	0.052	0.052	2207.714
172+50.00	1.000	39.620	70.281	70.281	1.000	0.000	0.052	0.052	2277.943
173+00.00	1.000	44.636	78.015	78.015	1.000	0.000	0.000	0.000	2355.958
173+50.00	1.000	41.575	79.825	79.825	1.000	0.000	0.000	0.000	2435.784
174+00.00	1.000	42.766	78.094	78.094	1.000	0.000	0.000	0.000	2513.878
174+50.00	1.000	40.392	76.998	76.998	1.000	0.000	0.000	0.000	2590.876
175+00.00	1.000	38.969	73.482	73.482	1.000	0.776	0.719	0.719	2663.639
175+50.00	1.000	42.030	74.999	74.999	1.000	0.000	0.719	0.719	2737.920
176+00.00	1.000	41.277	77.136	77.136	1.000	0.719	0.666	0.666	2814.390
176+50.00	1.000	42.507	77.578	77.578	1.000	0.197	0.848	0.848	2891.119

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
177+00.00	1.000	40.719	77.061	77.061	1.000	1.229	1.320	1.320	2966.860
177+50.00	1.000	78.074	109.993	109.993	1.000	0.000	1.138	1.138	3075.715
178+00.00	1.000	0.000	72.290	72.290	1.000	0.000	0.000	0.000	3148.005
178+15.28	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	3148.005
Grand Total:			3287.838	3287.838			139.832	139.832	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 3:34pm

Cross Section Set Name: Flat Shoals_Earthwork_STG 1

Alignment Name: DE2

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
200+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
200+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
201+00.00	1.000	0.752	0.696	0.696	1.000	0.337	0.312	0.312	0.384
201+07.86									0.000
201+50.00	1.000	1.248	1.852	1.852	1.000	4.300	4.293	4.293	-2.058
202+00.00	1.000	2.865	3.809	3.809	1.000	23.164	25.430	25.430	-23.679
202+50.00	1.000	2.172	4.664	4.664	1.000	27.509	46.919	46.919	-65.934
203+00.00	1.000	3.175	4.951	4.951	1.000	26.874	50.354	50.354	-111.338
203+50.00	1.000	4.364	6.981	6.981	1.000	18.776	42.269	42.269	-146.626
204+00.00	1.000	5.903	9.507	9.507	1.000	20.788	36.633	36.633	-173.752
204+50.00	1.000	5.737	10.778	10.778	1.000	21.689	39.331	39.331	-202.304
205+00.00	1.000	6.768	11.578	11.578	1.000	20.746	39.292	39.292	-230.018
205+50.00	1.000	7.804	13.492	13.492	1.000	16.894	34.852	34.852	-251.377
206+00.00	1.000	19.176	24.981	24.981	1.000	6.063	21.257	21.257	-247.653
206+50.00	1.000	30.817	46.290	46.290	1.000	6.225	11.379	11.379	-212.742
207+00.00	1.000	8.744	36.630	36.630	1.000	13.003	17.804	17.804	-193.915
207+50.00	1.000	4.357	12.130	12.130	1.000	20.817	31.315	31.315	-213.100
208+00.00	1.000	6.598	10.143	10.143	1.000	30.730	47.729	47.729	-250.687
208+50.00	1.000	7.641	13.183	13.183	1.000	38.135	63.764	63.764	-301.267
209+00.00	1.000	8.327	14.785	14.785	1.000	4.294	39.286	39.286	-325.768
209+50.00	1.000	25.511	31.332	31.332	1.000	5.502	9.071	9.071	-303.508
210+00.00	1.000	31.952	53.206	53.206	1.000	28.957	31.907	31.907	-282.209
210+50.00	1.000	24.049	51.852	51.852	1.000	8.026	34.244	34.244	-264.600
211+00.00	1.000	21.639	42.304	42.304	1.000	5.881	12.877	12.877	-235.173
211+50.00	1.000	27.060	45.092	45.092	1.000	4.941	10.020	10.020	-200.102
212+00.00	1.000	20.819	44.332	44.332	1.000	8.245	12.209	12.209	-167.979
212+50.00	1.000	41.295	57.513	57.513	1.000	55.049	58.606	58.606	-169.071
213+00.00	1.000	23.904	60.369	60.369	1.000	8.433	58.780	58.780	-167.482
213+50.00	1.000	23.799	44.169	44.169	1.000	18.639	25.067	25.067	-148.380
214+00.00	1.000	26.598	46.664	46.664	1.000	66.847	79.154	79.154	-180.870
214+50.00	1.000	32.336	54.569	54.569	1.000	69.902	126.619	126.619	-252.920
215+00.00	1.000	28.809	56.617	56.617	1.000	59.785	120.081	120.081	-316.384
215+50.00	1.000	23.208	48.164	48.164	1.000	52.728	104.178	104.178	-372.398
216+00.00	1.000	19.600	39.637	39.637	1.000	62.777	106.949	106.949	-439.709
216+50.00	1.000	22.649	39.119	39.119	1.000	67.252	120.396	120.396	-520.987
217+00.00	1.000	19.473	39.001	39.001	1.000	8.432	70.077	70.077	-552.063

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Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
217+50.00	1.000	17.886	34.592	34.592	1.000	5.893	13.263	13.263	-530.735
218+00.00	1.000	14.326	29.826	29.826	1.000	61.250	62.169	62.169	-563.077
218+50.00	1.000	13.382	25.655	25.655	1.000	6.705	62.921	62.921	-600.343
219+00.00	1.000	6.614	18.514	18.514	1.000	0.006	6.214	6.214	-588.043
219+50.00	1.000	0.000	6.124	6.124	1.000	0.000	0.006	0.006	-581.924
219+95.97	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-581.924
Grand Total:			1095.102	1095.102			1677.026	1677.026	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:04am

Cross Section Set Name: Iris Drive SE_Earthwork

Alignment Name: DE3

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
290+94.62	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
291+00.00	1.000	0.855	0.085	0.085	1.000	0.634	0.063	0.063	0.022
291+00.05									0.000
291+50.00	1.000	2.336	2.954	2.954	1.000	27.047	25.630	25.630	-22.654
292+00.00	1.000	4.433	6.268	6.268	1.000	23.634	46.926	46.926	-63.312
292+50.00	1.000	5.651	9.337	9.337	1.000	27.685	47.517	47.517	-101.493
293+00.00	1.000	6.411	11.168	11.168	1.000	29.256	52.723	52.723	-143.047
293+50.00	1.000	6.607	12.054	12.054	1.000	28.349	53.338	53.338	-184.331
294+00.00	1.000	8.431	13.924	13.924	1.000	23.016	47.560	47.560	-217.967
294+50.00	1.000	10.079	17.139	17.139	1.000	30.250	49.321	49.321	-250.149
295+00.00	1.000	10.151	18.732	18.732	1.000	34.714	60.152	60.152	-291.569
295+50.00	1.000	10.393	19.023	19.023	1.000	28.449	58.484	58.484	-331.030
296+00.00	1.000	11.665	20.424	20.424	1.000	24.400	48.934	48.934	-359.540
296+50.00	1.000	12.453	22.332	22.332	1.000	27.069	47.656	47.656	-384.864
297+00.00	1.000	10.935	21.656	21.656	1.000	15.936	39.819	39.819	-403.027
297+50.00	1.000	12.056	21.288	21.288	1.000	17.446	30.909	30.909	-412.648
298+00.00	1.000	26.295	35.510	35.510	1.000	20.895	35.501	35.501	-412.639
298+50.00	1.000	21.314	44.082	44.082	1.000	5.646	24.575	24.575	-393.132
299+00.00	1.000	17.176	35.639	35.639	1.000	8.797	13.373	13.373	-370.866
299+50.00	1.000	12.960	27.903	27.903	1.000	4.118	11.958	11.958	-354.921
300+00.00	1.000	10.617	21.830	21.830	1.000	6.098	9.460	9.460	-342.551
300+50.00	1.000	7.900	17.145	17.145	1.000	6.663	11.816	11.816	-337.222
301+00.00	1.000	4.310	11.305	11.305	1.000	17.196	22.092	22.092	-348.009
301+50.00	1.000	0.953	4.872	4.872	1.000	10.711	25.840	25.840	-368.976
302+00.00	1.000	0.973	1.783	1.783	1.000	10.469	19.611	19.611	-386.803
302+50.00	1.000	0.957	1.788	1.788	1.000	11.313	20.169	20.169	-405.184
303+00.00	1.000	1.128	1.931	1.931	1.000	8.519	18.363	18.363	-421.616
303+50.00	1.000	2.827	3.662	3.662	1.000	4.722	12.260	12.260	-430.214
304+00.00	1.000	4.395	6.688	6.688	1.000	5.797	9.741	9.741	-433.267
304+50.00	1.000	3.862	7.646	7.646	1.000	6.246	11.151	11.151	-436.772
305+00.00	1.000	4.763	7.987	7.987	1.000	5.632	10.998	10.998	-439.784
305+50.00	1.000	4.470	8.549	8.549	1.000	6.584	11.312	11.312	-442.546
306+00.00	1.000	3.496	7.375	7.375	1.000	11.435	16.684	16.684	-451.855
306+50.00	1.000	0.000	3.237	3.237	1.000	0.000	10.588	10.588	-459.206
307+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
307+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206

- - - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
308+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
308+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
309+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
309+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
310+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
310+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
310+68.90	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-459.206
Grand Total:			445.317	445.317			904.523	904.523	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:08am

Cross Section Set Name: Iris Drive Connector_Earthwork

Alignment Name: DE4

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

- - - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
400+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
400+50.00	1.000	0.000	0.000	0.000	1.000	2325.554	2153.288	2153.288	-2153.288
401+00.00	1.000	25.351	23.473	23.473	1.000	1978.716	3985.434	3985.434	-6115.249
401+50.00	1.000	25.066	46.683	46.683	1.000	1985.874	3670.916	3670.916	-9739.483
402+00.00	1.000	27.577	48.744	48.744	1.000	2057.518	3743.882	3743.882	-13434.621
402+50.00	1.000	24.266	48.003	48.003	1.000	1811.576	3582.494	3582.494	-16969.112
403+00.00	1.000	24.960	45.580	45.580	1.000	1430.291	3001.728	3001.728	-19925.261
403+50.00	1.000	31.626	52.394	52.394	1.000	1106.271	2348.669	2348.669	-22221.535
404+00.00	1.000	81.497	104.743	104.743	1.000	895.246	1853.256	1853.256	-23970.049
404+50.00	1.000	68.369	138.765	138.765	1.000	960.624	1718.398	1718.398	-25549.682
405+00.00	1.000	23.432	85.001	85.001	1.000	1000.926	1816.250	1816.250	-27280.931
405+50.00	1.000	15.642	36.179	36.179	1.000	922.240	1780.709	1780.709	-29025.460
406+00.00	1.000	14.188	27.620	27.620	1.000	726.546	1526.653	1526.653	-30524.493
406+50.00	1.000	10.751	23.092	23.092	1.000	380.538	1025.077	1025.077	-31526.478
407+00.00	1.000	7.692	17.077	17.077	1.000	65.470	412.970	412.970	-31922.371
407+50.00	1.000	131.558	128.935	128.935	1.000	1.226	61.755	61.755	-31855.191
408+00.00	1.000	0.000	121.813	121.813	1.000	0.000	1.135	1.135	-31734.513
408+16.54	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-31734.513
Grand Total:			948.103	948.103			32682.616	32682.616	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:13am

Cross Section Set Name: Courtesy Parkway Conn_Earthwork

Alignment Name: DE6

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
600+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
600+50.00	1.000	65.377	60.535	60.535	1.000	817.377	756.830	756.830	-696.296
601+00.00	1.000	78.364	133.094	133.094	1.000	481.927	1203.060	1203.060	-1766.262
601+50.00	1.000	76.444	143.341	143.341	1.000	172.876	606.299	606.299	-2229.220
602+00.00	1.000	73.615	138.943	138.943	1.000	0.784	160.796	160.796	-2251.073
602+50.00	1.000	63.846	127.278	127.278	1.000	1.143	1.784	1.784	-2125.579
603+00.00	1.000	74.103	127.730	127.730	1.000	1.273	2.237	2.237	-2000.085
603+50.00	1.000	72.770	135.993	135.993	1.000	1.367	2.444	2.444	-1866.535
604+00.00	1.000	0.000	67.379	67.379	1.000	0.000	1.265	1.265	-1800.422
604+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
605+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
605+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
606+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
606+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
607+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
607+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
608+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
608+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
609+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
609+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
610+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
610+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
610+60.80	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1800.422
Grand Total:			934.293	934.293			2734.715	2734.715	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:16am

Cross Section Set Name: Old Covington HWY_Earthwork

Alignment Name: DE7

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

	Station Quantities								
	Cut				Fill				
Baseline Station	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Mass Ordinate
684+39.73	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
684+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
685+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
685+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
686+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
686+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
687+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
687+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
688+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
688+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
689+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
689+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
690+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
690+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
691+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
691+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
692+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
692+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
693+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
693+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
694+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
694+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
695+00.00	1.000	7.659	7.092	7.092	1.000	0.000	0.000	0.000	7.092
695+50.00	1.000	6.966	13.542	13.542	1.000	0.764	0.707	0.707	19.927
696+00.00	1.000	20.224	25.176	25.176	1.000	9.676	9.667	9.667	35.436
696+50.00	1.000	19.359	36.651	36.651	1.000	1.530	10.376	10.376	61.711
697+00.00	1.000	25.929	41.933	41.933	1.000	13.095	13.541	13.541	90.102
697+50.00	1.000	23.871	46.111	46.111	1.000	22.446	32.908	32.908	103.305
698+00.00	1.000	15.074	36.060	36.060	1.000	26.160	45.005	45.005	94.359
698+50.00	1.000	16.881	29.588	29.588	1.000	25.169	47.527	47.527	76.420
699+00.00	1.000	20.026	34.173	34.173	1.000	15.404	37.568	37.568	73.025
699+50.00	1.000	19.224	36.342	36.342	1.000	0.000	14.263	14.263	95.105
700+00.00	1.000	2.814	20.406	20.406	1.000	0.000	0.000	0.000	115.511
700+50.00	1.000	21.901	22.885	22.885	1.000	0.000	0.000	0.000	138.395
701+00.00	1.000	26.844	45.135	45.135	1.000	0.000	0.000	0.000	183.530
701+50.00	1.000	95.834	113.591	113.591	1.000	0.000	0.000	0.000	297.121
702+00.00	1.000	98.321	179.773	179.773	1.000	0.000	0.000	0.000	476.894
702+50.00	1.000	119.400	201.593	201.593	1.000	0.000	0.000	0.000	678.487

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
703+00.00	1.000	234.030	327.250	327.250	1.000	0.000	0.000	0.000	1005.737
703+50.00	1.000	211.516	412.543	412.543	1.000	0.000	0.000	0.000	1418.280
704+00.00	1.000	132.746	318.761	318.761	1.000	0.000	0.000	0.000	1737.041
704+50.00	1.000	96.922	212.655	212.655	1.000	0.000	0.000	0.000	1949.696
705+00.00	1.000	120.665	201.469	201.469	1.000	0.000	0.000	0.000	2151.165
705+50.00	1.000	101.276	205.501	205.501	1.000	0.000	0.000	0.000	2356.666
706+00.00	1.000	67.175	155.973	155.973	1.000	0.000	0.000	0.000	2512.639
706+50.00	1.000	45.920	104.718	104.718	1.000	0.789	0.731	0.731	2616.626
707+00.00	1.000	27.137	67.646	67.646	1.000	2.330	2.888	2.888	2681.383
707+50.00	1.000	23.064	46.483	46.483	1.000	0.052	2.206	2.206	2725.660
708+00.00	1.000	16.929	37.031	37.031	1.000	0.759	0.752	0.752	2761.939
708+50.00	1.000	27.089	40.757	40.757	1.000	0.008	0.710	0.710	2801.986
709+00.00	1.000	6.563	31.159	31.159	1.000	0.000	0.007	0.007	2833.138
709+50.00	1.000	3.347	9.176	9.176	1.000	2.808	2.600	2.600	2839.714
710+00.00	1.000	2.251	5.184	5.184	1.000	0.372	2.945	2.945	2841.953
710+50.00	1.000	0.000	2.084	2.084	1.000	0.000	0.345	0.345	2843.693
711+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
711+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
712+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
712+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
713+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
713+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
714+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
714+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
715+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
715+41.12	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2843.693
Grand Total:			3068.440	3068.440			224.748	224.748	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 9:19am

Cross Section Set Name: Mission Ridge Drive_Earthwork

Alignment Name: DE9

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

- - - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
95+86.87	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
96+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
96+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
97+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
97+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
98+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
98+50.00	1.000	45.245	41.894	41.894	1.000	0.000	0.000	0.000	41.894
99+00.00	1.000	76.752	112.960	112.960	1.000	0.000	0.000	0.000	154.854
99+50.00	1.000	142.607	203.110	203.110	1.000	0.000	0.000	0.000	357.965
100+00.00	1.000	0.000	132.044	132.044	1.000	0.000	0.000	0.000	490.008
Grand Total:			490.008	490.008			0.000	0.000	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 3:20pm

Cross Section Set Name: Courtesy PKWY_Earthwork_STG 1A

Alignment Name: DE1G

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	Station Quantities - Cut - Factor	Cut - Area	Cut - Volume	Cut - Adjusted	Fill - Factor	Fill - Area	Fill - Volume	Fill - Adjusted	Mass Ordinate
158+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
158+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
159+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
159+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
160+00.00	1.000	4.934	4.568	4.568	1.000	0.000	0.000	0.000	4.568
160+50.00	1.000	12.622	16.255	16.255	1.000	0.000	0.000	0.000	20.823
161+00.00	1.000	20.831	30.975	30.975	1.000	0.000	0.000	0.000	51.798
161+50.00	1.000	25.123	42.551	42.551	1.000	0.000	0.000	0.000	94.349
162+00.00	1.000	25.023	46.432	46.432	1.000	0.000	0.000	0.000	140.780
162+50.00	1.000	24.202	45.579	45.579	1.000	0.000	0.000	0.000	186.360
163+00.00	1.000	24.799	45.372	45.372	1.000	0.000	0.000	0.000	231.732
163+50.00	1.000	28.185	49.060	49.060	1.000	0.000	0.000	0.000	280.791
164+00.00	1.000	26.221	50.376	50.376	1.000	0.000	0.000	0.000	331.167
164+50.00	1.000	23.736	46.256	46.256	1.000	0.000	0.000	0.000	377.423
165+00.00	1.000	23.428	43.671	43.671	1.000	0.000	0.000	0.000	421.094
165+50.00	1.000	22.341	42.379	42.379	1.000	0.000	0.000	0.000	463.473
166+00.00	1.000	22.640	41.648	41.648	1.000	0.000	0.000	0.000	505.122
166+50.00	1.000	24.150	43.323	43.323	1.000	0.000	0.000	0.000	548.445
167+00.00	1.000	23.761	44.362	44.362	1.000	0.000	0.000	0.000	592.807
167+50.00	1.000	23.701	43.947	43.947	1.000	0.000	0.000	0.000	636.754
168+00.00	1.000	24.518	44.648	44.648	1.000	0.000	0.000	0.000	681.401
168+50.00	1.000	26.022	46.796	46.796	1.000	0.000	0.000	0.000	728.198
169+00.00	1.000	25.038	47.277	47.277	1.000	0.000	0.000	0.000	775.475
169+50.00	1.000	24.388	45.765	45.765	1.000	0.000	0.000	0.000	821.240
170+00.00	1.000	28.060	48.563	48.563	1.000	0.000	0.000	0.000	869.803
170+50.00	1.000	25.803	49.873	49.873	1.000	0.000	0.000	0.000	919.677
171+00.00	1.000	28.136	49.944	49.944	1.000	0.000	0.000	0.000	969.620
171+50.00	1.000	26.687	50.762	50.762	1.000	0.000	0.000	0.000	1020.382
172+00.00	1.000	19.042	42.342	42.342	1.000	0.000	0.000	0.000	1062.724
172+50.00	1.000	19.402	35.597	35.597	1.000	0.000	0.000	0.000	1098.321
173+00.00	1.000	17.539	34.205	34.205	1.000	0.000	0.000	0.000	1132.526
173+50.00	1.000	18.182	33.076	33.076	1.000	0.000	0.000	0.000	1165.602
174+00.00	1.000	17.177	32.740	32.740	1.000	0.000	0.000	0.000	1198.342
174+50.00	1.000	13.996	28.864	28.864	1.000	0.000	0.000	0.000	1227.206
175+00.00	1.000	18.184	29.797	29.797	1.000	0.000	0.000	0.000	1257.002
175+50.00	1.000	13.072	28.940	28.940	1.000	0.079	0.073	0.073	1285.869
176+00.00	1.000	14.583	25.606	25.606	1.000	0.000	0.073	0.073	1311.402
176+50.00	1.000	14.039	26.502	26.502	1.000	0.000	0.000	0.000	1337.904

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
177+00.00	1.000	14.024	25.984	25.984	1.000	0.000	0.000	0.000	1363.888
177+50.00	1.000	26.299	37.336	37.336	1.000	0.000	0.000	0.000	1401.224
178+00.00	1.000	0.000	24.351	24.351	1.000	0.000	0.000	0.000	1425.575
178+15.28	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1425.575
Grand Total:			1425.722	1425.722			0.146	0.146	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 3:41pm

Cross Section Set Name: Courtesy PKWY_Earthwork_STG 2

Alignment Name: DE1G

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

	Station Quantities								
	Cut				Fill				
Baseline Station	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Mass Ordinate
158+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
158+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
159+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
159+50.00	1.000	113.105	104.726	104.726	1.000	0.000	0.000	0.000	104.726
160+00.00	1.000	87.552	185.794	185.794	1.000	1.458	1.350	1.350	289.170
160+50.00	1.000	25.789	104.946	104.946	1.000	7.363	8.167	8.167	385.948
161+00.00	1.000	19.205	41.661	41.661	1.000	7.915	14.146	14.146	413.463
161+50.00	1.000	20.085	36.380	36.380	1.000	6.398	13.253	13.253	436.590
162+00.00	1.000	21.291	38.311	38.311	1.000	5.242	10.779	10.779	464.123
162+50.00	1.000	21.171	39.316	39.316	1.000	5.406	9.859	9.859	493.580
163+00.00	1.000	21.250	39.278	39.278	1.000	5.257	9.873	9.873	522.985
163+50.00	1.000	21.818	39.877	39.877	1.000	4.756	9.271	9.271	553.591
164+00.00	1.000	22.142	40.703	40.703	1.000	4.404	8.481	8.481	585.813
164+50.00	1.000	22.457	41.295	41.295	1.000	4.134	7.905	7.905	619.203
165+00.00	1.000	17.351	36.859	36.859	1.000	10.787	13.815	13.815	642.246
165+50.00	1.000	12.958	28.064	28.064	1.000	18.796	27.391	27.391	642.919
166+00.00	1.000	11.523	22.668	22.668	1.000	21.267	37.096	37.096	628.492
166+50.00	1.000	11.061	20.911	20.911	1.000	22.105	40.160	40.160	609.243
167+00.00	1.000	13.097	22.369	22.369	1.000	18.541	37.635	37.635	593.976
167+50.00	1.000	16.194	27.121	27.121	1.000	12.634	28.866	28.866	592.232
168+00.00	1.000	20.714	34.174	34.174	1.000	5.795	17.065	17.065	609.341
168+50.00	1.000	23.282	40.736	40.736	1.000	3.253	8.378	8.378	641.699
169+00.00	1.000	23.602	43.411	43.411	1.000	2.959	5.752	5.752	679.358
169+50.00	1.000	23.380	43.502	43.502	1.000	3.234	5.735	5.735	717.125
170+00.00	1.000	22.542	42.520	42.520	1.000	4.030	6.726	6.726	752.919
170+50.00	1.000	21.464	40.746	40.746	1.000	5.266	8.608	8.608	785.057
171+00.00	1.000	20.780	39.114	39.114	1.000	5.797	10.244	10.244	813.928
171+50.00	1.000	22.375	39.958	39.958	1.000	4.194	9.251	9.251	844.635
172+00.00	1.000	22.623	41.665	41.665	1.000	3.998	7.586	7.586	878.713
172+50.00	1.000	24.600	43.724	43.724	1.000	2.116	5.662	5.662	916.776
173+00.00	1.000	26.298	47.128	47.128	1.000	1.243	3.110	3.110	960.793
173+50.00	1.000	26.892	49.250	49.250	1.000	1.018	2.093	2.093	1007.950
174+00.00	1.000	27.448	50.314	50.314	1.000	1.083	1.945	1.945	1056.320
174+50.00	1.000	23.940	47.581	47.581	1.000	3.871	4.587	4.587	1099.314
175+00.00	1.000	18.930	39.694	39.694	1.000	10.110	12.945	12.945	1126.063
175+50.00	1.000	14.874	31.299	31.299	1.000	22.889	30.555	30.555	1126.808
176+00.00	1.000	14.320	27.031	27.031	1.000	21.742	41.325	41.325	1112.514
176+50.00	1.000	14.619	26.795	26.795	1.000	18.552	37.309	37.309	1102.000

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
177+00.00	1.000	15.264	27.670	27.670	1.000	17.583	33.458	33.458	1096.211
177+50.00	1.000	25.982	38.191	38.191	1.000	15.340	30.484	30.484	1103.918
178+00.00	1.000	0.000	24.058	24.058	1.000	0.000	14.204	14.204	1113.771
178+15.28	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1113.771
Grand Total:			1688.841	1688.841			575.070	575.070	

GDOT Earthwork Volumes Report

Report Created: 7/27/2022
Time: 3:44pm

Cross Section Set Name: Flat Shoals_Earthwork_STG 2

Alignment Name: DE2

Input Grid Factor: 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

- - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
200+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
200+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
201+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
201+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
202+00.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
202+50.00	1.000	1.349	1.249	1.249	1.000	4.565	4.226	4.226	-2.978
203+00.00	1.000	1.412	2.556	2.556	1.000	4.718	8.595	8.595	-9.016
203+50.00	1.000	5.766	6.646	6.646	1.000	13.194	16.585	16.585	-18.956
204+00.00	1.000	7.189	11.995	11.995	1.000	14.098	25.270	25.270	-32.231
204+50.00	1.000	10.525	16.402	16.402	1.000	12.557	24.680	24.680	-40.509
205+00.00	1.000	21.871	29.996	29.996	1.000	8.376	19.382	19.382	-29.896
205+50.00	1.000	16.982	35.974	35.974	1.000	13.060	19.848	19.848	-13.769
206+00.00	1.000	6.351	21.605	21.605	1.000	21.879	32.351	32.351	-24.516
206+50.00	1.000	13.047	17.962	17.962	1.000	20.974	39.679	39.679	-46.233
207+00.00	1.000	20.528	31.088	31.088	1.000	15.718	33.974	33.974	-49.119
207+50.00	1.000	27.928	44.867	44.867	1.000	15.172	28.601	28.601	-32.853
208+00.00	1.000	19.000	43.452	43.452	1.000	21.761	34.197	34.197	-23.598
208+50.00	1.000	4.496	21.756	21.756	1.000	23.179	41.611	41.611	-43.453
209+00.00	1.000	5.255	9.029	9.029	1.000	24.524	44.169	44.169	-78.593
209+50.00	1.000	4.648	9.170	9.170	1.000	26.234	46.998	46.998	-116.422
210+00.00	1.000	18.677	21.597	21.597	1.000	30.909	52.911	52.911	-147.736
210+50.00	1.000	4.364	21.334	21.334	1.000	61.502	85.566	85.566	-211.968
211+00.00	1.000	4.940	8.614	8.614	1.000	80.148	131.158	131.158	-334.511
211+50.00	1.000	5.754	9.902	9.902	1.000	81.099	149.303	149.303	-473.913
212+00.00	1.000	5.938	10.826	10.826	1.000	82.202	151.205	151.205	-614.291
212+50.00	1.000	6.862	11.852	11.852	1.000	71.211	142.048	142.048	-744.488
213+00.00	1.000	7.339	13.150	13.150	1.000	63.027	124.294	124.294	-855.633
213+50.00	1.000	5.824	12.188	12.188	1.000	57.284	111.400	111.400	-954.845
214+00.00	1.000	5.485	10.471	10.471	1.000	63.047	111.418	111.418	-1055.792
214+50.00	1.000	5.716	10.372	10.372	1.000	64.561	118.156	118.156	-1163.576
215+00.00	1.000	5.276	10.178	10.178	1.000	63.386	118.470	118.470	-1271.868
215+50.00	1.000	4.664	9.203	9.203	1.000	55.382	109.970	109.970	-1372.635
216+00.00	1.000	3.258	7.335	7.335	1.000	52.797	100.165	100.165	-1465.465
216+50.00	1.000	3.230	6.007	6.007	1.000	52.530	97.525	97.525	-1556.982
217+00.00	1.000	2.222	5.048	5.048	1.000	50.685	95.570	95.570	-1647.504
217+50.00	1.000	1.635	3.572	3.572	1.000	61.744	104.101	104.101	-1748.033
218+00.00	1.000	1.232	2.655	2.655	1.000	19.876	75.574	75.574	-1820.952
218+50.00	1.000	1.183	2.236	2.236	1.000	57.339	71.495	71.495	-1890.212

- - - - - - - - - - - - - - - - - Station Quantities - - - - - - - - - - - - - - - - -

Baseline Station	Cut				Fill				Mass Ordinate
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	
219+00.00	1.000	0.000	1.095	1.095	1.000	0.000	53.091	53.091	-1942.208
219+50.00	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1942.208
219+95.97	1.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1942.208
Grand Total:			481.379	481.379			2423.588	2423.588	

2450 Commerce Avenue, Suite # 100, Duluth, GA 30096

SOIL SURVEY SUMMARY

CSSTP-0006-00(934)

PI 0006934

COURTESY PKWY EXTENSION

(From Old Covington Hwy to Flat Shoals Rd)

Rockdale County, Georgia

REVISION No. 1

November 20, 2020

Soil Survey Summary
CSSTP-0006-00(934), Rockdale County
PI No. 0006934
November 20, 2020
Revision No. 1

1. Location / Description

This project is for the new construction of the Courtesy Pkwy. The project begins at Station 100+00 at Flat Shoals Rd and continues north to Station 178+13.27 at Old Covington Hwy. The project lies west of the city limits of Covington in Rockdale County.

2. Geology

This project will be geologically sited in the Biotitic Gneiss / Mica Schist/ Amphibolite (Precambrian-Paleozoic) Formation of the Georgia Piedmont Region.

3. Rock

No solid rock was encountered at or near the proposed roadway grade.

4. Removal

No material requiring removal was encountered. However, the soils near the proposed grade in the following areas were found to have in-place moisture contents far above the optimum moisture contents. This condition has the potential to cause severe pumping problems during subgrade and base construction. After excavation in these areas is complete, we recommend that 24 inches of subgrade soils beneath the pavement and shoulders be removed and either dried out and replaced, or replaced with drier soils:

Station to Station	Location
100+00± to 107+00± (Courtesy Pkwy)	Lt & Rt
12+50± to 17 +50± (Flat Shoals)	Lt & Rt

This work should be done at the direction of the Engineer, and may be eliminated if the subgrade soils are dry and stable at the time of construction.

5. Waste

None of the soils encountered on this project will require wasting. However, high-volume change Class IIIC2 materials excavated from the following areas should not be placed within three feet of the bottom of the subgrade directly beneath the pavement section:

Station to Station	Location
117+00± to 123+50± (Courtesy Pkwy)	Lt & Rt

These soils may be used in the bottom of high fill sections, or used to flatten side slopes as directed by the Engineer. This work shall be done in accordance with Special Provision 205.

6. Subgrade Materials

No additional subgrade material will be required for this project.

7. Pavement Design Values

We recommend the following values for use in the pavement design calculations for this project:

Soil Support Value = 2.5

Graded aggregate base is the only base material recommended for use on this project.

8. Ditch Lining

We recommend the following values for use in the ditch lining calculations for this project:

Plasticity Index, PI = 26
D75 (mm) = 0.420
Unified Soils Classification System (USCS) = MH, sandy silt

Sample S-7 at station 123+00 was used for ditch lining evaluation.

9. Slopes

Maximum 2:1 slopes will be safe for this project.

10. Groundwater

The project crosses low wet areas and swamps which may be inundated at the time of construction. Because of the relatively flat terrain on this project, it does not appear that these areas may be drainable. The soils in the low areas listed below consist primarily of loose sands, which will not require removal. However, we recommend that one layer of low-strength filter fabric per Special Provision 881 be placed on top of the existing ground prior to placing the fills in accordance to Standard Specifications 455 as shown on the attached detail, to provide stability over the loose sands. The low wet areas where this fabric will be required are as follows:

Station to Station	Location
108+50± to 109+25± (Courtesy Pkwy)	Lt & Rt

However, if these areas are dry and stable at the time of construction, the fabric may be eliminated, as directed by the Engineer.

11. Shrinkage

We recommend an average shrinkage factor of 25 % for use in the earthwork calculations for this project.

12. Rock Swell

We recommend the use of an average swell factor of 30% for material shown as hard rock.

13. Culverts We recommend that a 12-inch blanket of Type II Foundation Backfill material be placed under the barrel of all culverts and 48-inch diameter and larger cross-drains on this project.

14. Corrosion Reference should be made to the attached "Pipe Culvert Material Alternates" chart for materials allowable by the Laboratory corrosion test.

15. Bench Detail Where new fills are to be placed on existing slopes steeper than 3:1, the existing slope should be benched in accordance with the attached detail.

16. Additional Subgrade Recommendations We recommend additional 4 inches of graded aggregate base be set up for use at the direction of the Engineer in the following areas:

Station to Station	Location
100+00± to 105+50± (Courtesy Pkwy)	Lt & Rt
107+50± to 112+50± (Courtesy Pkwy)	Lt & Rt
119+00± to 124+50± (Courtesy Pkwy)	Lt & Rt

17. Special Problems We recommend that all bridge approach slabs on this project be constructed in accordance with the notched detail on Georgia Standard 9017-R.

Prepared By: Yong Shao, PhD, PE

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

PLAN AND PROFILE OF PROPOSED
COURTESY PKWY.EXT.FROM FLAT SHOALS RD TO OLD COVINGTON HWY.

FEDERAL AID PROJECT
CSSTP-0006-00(934)
ROCKDALE COUNTY

FEDERAL ROUTE • N/A

STATE ROUTE • N/A

P.I. NO. 0006934

LOCATION SKETCH

DESIGN DATA:	COURTESY PKWY.EXT.
TRAFFIC A.A.D.T.:	10,600 (2024)
TRAFFIC A.A.D.T.:	13,250 (2044)
TRAFFIC D.H.V.:	1,755
DIRECTIONAL DIST:	50%
% TRUCKS:	6.5%
24 HR.TRUCKS %:	3.0%
SPEED DESIGN:	35 MPH

LOCATION & DESIGN APPROVAL DATE:

FUNCTIONAL CLASS:
URBAN MINOR COLLECTOR

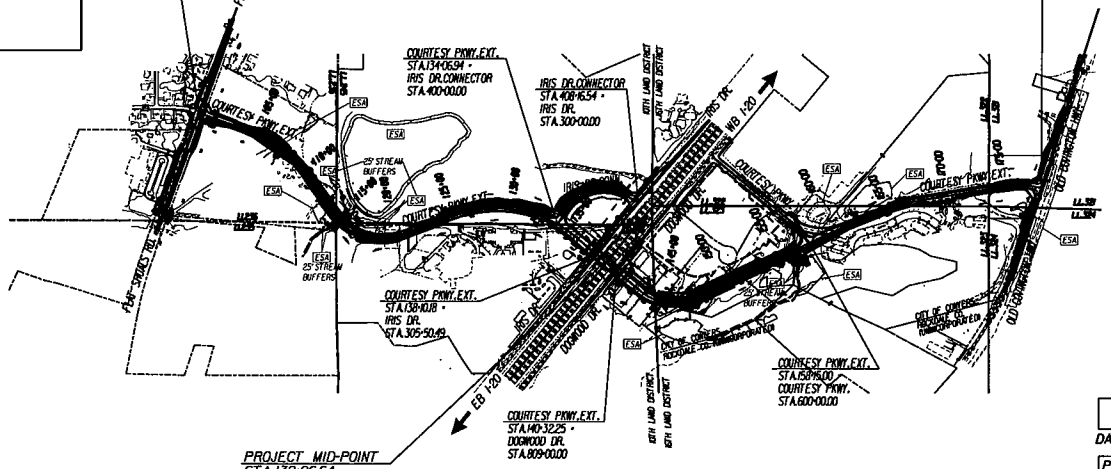
THIS PROJECT IS 100% IN ROCKDALE COUNTY AND IS 100% IN CONG.DIST.NO.4.

PROJECT DESIGNATION: EXEMPT

THIS PROJECT HAS BEEN PREPARED USING THE HORIZONTAL GEORGIA COORDINATE SYSTEM OF 1994 (NAD 1983)/94 WEST ZONE, AND THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

BEGIN PROJECT
0006934
COURTESY PKWY.EXT.
STA.100+00.00 •
FLAT SHOALS RD.
STA.209+24.35
N 1321967.1692
E 2349337.8211

END PROJECT
0006934
COURTESY PKWY.EXT.
STA.178+13.27 •
OLD COVINGTON HWY.
STA.700+00.00
N 1324163.3803
E 2350625.3372



PROJECT MID-POINT
STA.139+06.54
N 1321728.8612
E 2352857.0357

PREPARED BY:

MORELAND ALTOBELLI
— AN ATLAS COMPANY —
2450 Commerce Avenue
Suite 100
Duluth, Georgia 30096
770.263.5845

RECOMMENDED FOR APPROVAL BY:

STATE PROGRAM DELIVERY ENGINEER

DATE CHIEF ENGINEER

LENGTH OF PROJECT	COUNTY No.247 Project No. 0006934 MILES
NET LENGTH OF ROADWAY	1.4356
NET LENGTH OF BRIDGES	0.0644
NET LENGTH OF PROJECT	1.5000
NET LENGTH OF EXCEPTIONS	0.0000
GROSS LENGTH OF PROJECT	1.5000

SCALE IN FEET
0 500 1000 2000

PLANS COMPLETED	- -
REVISIONS	

DRAWING No. 01-0001

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.

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.

Appendix A – Special Provisions and Details

Revised: September 24, 2009

DEPARTMENT OF TRANSPORATION
STATE OF GEORGIA

SPECIAL PROVISION

PROJECT NO. CSSTP-0006-00(934), Rockdale County
P.I. NO. 0006934

SECTION 205 – ROADWAY EXCAVATION

Add the following to Sub-section 205.3.05.E:

The soils that will be excavated from the following cut sections are primarily Class IIIC2 soils with poor load carrying characteristics. Do not place these soils within 3 feet (915 mm) of the subgrade directly beneath the pavement in fill sections. These soils may be placed in the bottom of high fill sections or used to flatten slopes as directed by the Engineer:

Station to Station	Location
117+00± to 123+50± (Courtesy Pkwy)	Left & Right

Office of Materials and Testing

Revised 06/16/06

GEORGIA DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

SPECIAL PROVISION

CSSTP-0006-009(34), Rockdale County

P.I. NO. 0006934

Section 881- Fabrics

Add the following to Subsection 881.2.08:

881.2.08 Filter Fabric for Embankment Stabilization

A. Requirements

1. Use woven filter fabric for embankment stabilization.
2. Sew fabric with a lock stitch using high strength polypropylene or nylon thread.
3. Obtain approval of the stitch and sewing method from the Engineer prior to use.
4. Use fabric that meets the following minimum tensile strength requirements:

Fabric Type	Tensile Strengths in lbs/in (kN/m) width			
	Warp Direction		Fill Direction	
	5% Strain	Ultimate	5% Strain	Ultimate
Polyester	100 (17.5 kN/m)	250 (43.8 kN/m)	100 (17.5 kN/m)	250 (43.8 kN/m)
Polypropylene	100 (17.5 kN/m)	400 (70 kN/m)	100 (17.5 kN/m)	400 (70 kN/m)

Minimum Seam Strength = lbs/in (kN/m) width

   a. Tensile strengths at 5% strain are based on reduction factors from the ultimate strengths of 0.4 for polyester and 0.25 for polypropylene fabrics.

   b. Use of reduction factors other than those shown are allowed only if verified by laboratory tests acceptable to the Department.

5. Submit a certification from the manufacturer that shows the physical properties of the material used and how it meets this Specification. Submit the certificate according to Subsection 106.05, “Materials Certification.”

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

Test according to the following:

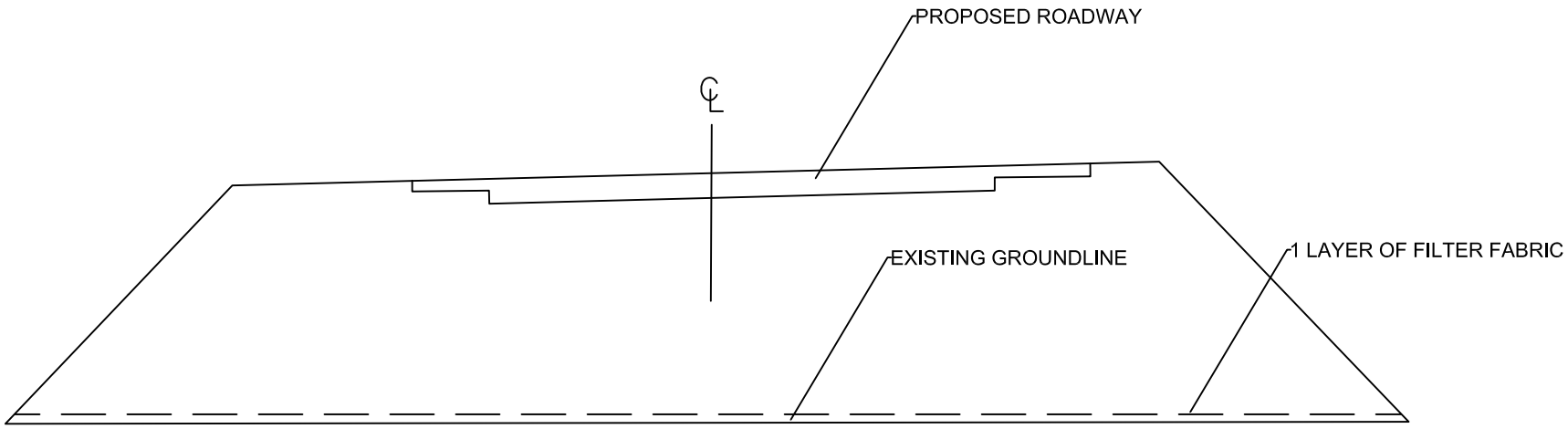
Test	Method
Tensile strength, elongation	ASTM D 4595 Wide Strip Test
Seam Strength	ASTM D 4884 Wide Strip Test

1. Run the tests at a strain rate of 10% per minute.
2. Use a pre tensioning load of 10 lbs/in (1.75 kN/m) or 3%, whichever is less.

D. Materials Warranty

General Provisions 101 through 150.

COURTSEY PKWY, ROCKDALE COUNTY
PROJ. NO. CSSTP-0006-00(934)
P.I.NO. 0006934



NOTES:

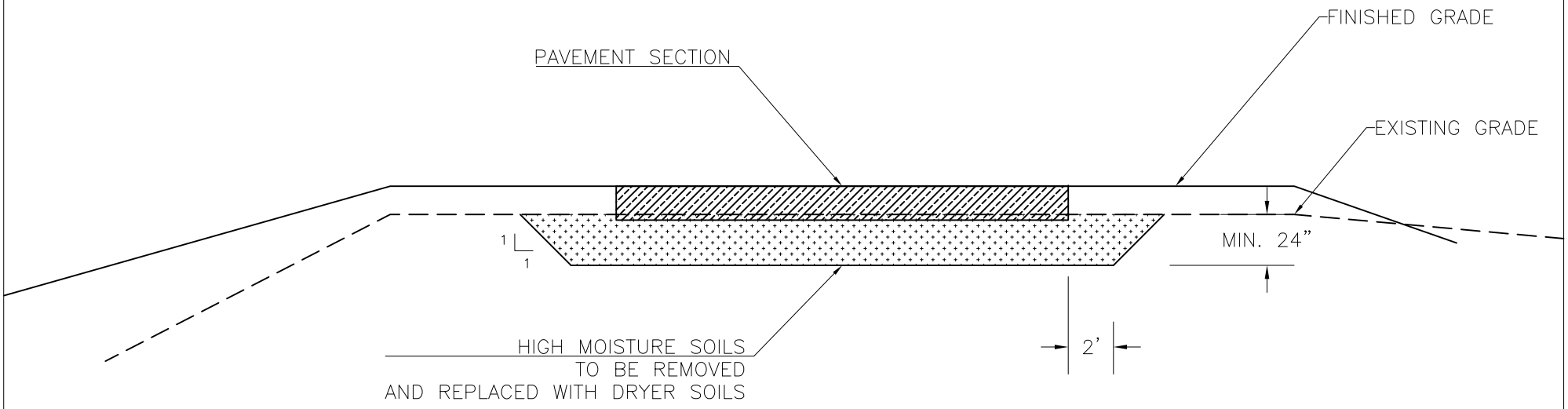
1. PLACEMENT OF FABRIC PER SECTION 455 OF STANDARD SPECIFICATION AND IN ACCORDANCE WITH SPECIAL PROVISION 881
2. PLASTIC FILTER FABRIC SHOULD BE ELIMINATED WHERE CONFLICTS WITH PILE DRIVING EXIST

APPLIED STATIONS	LOCATION
108+50+/- TO 109+25+/-	LEFT & RIGHT

FILTER FABRIC DETAIL

NOT TO SCALE

PROJECT NAME: COURTESY PKWY, ROCKDALE COUNTY
GDOT PROJ. NO.: CSSTP–0006–00(934)
GDOT P.I.NO.: 0006934



NOTES:

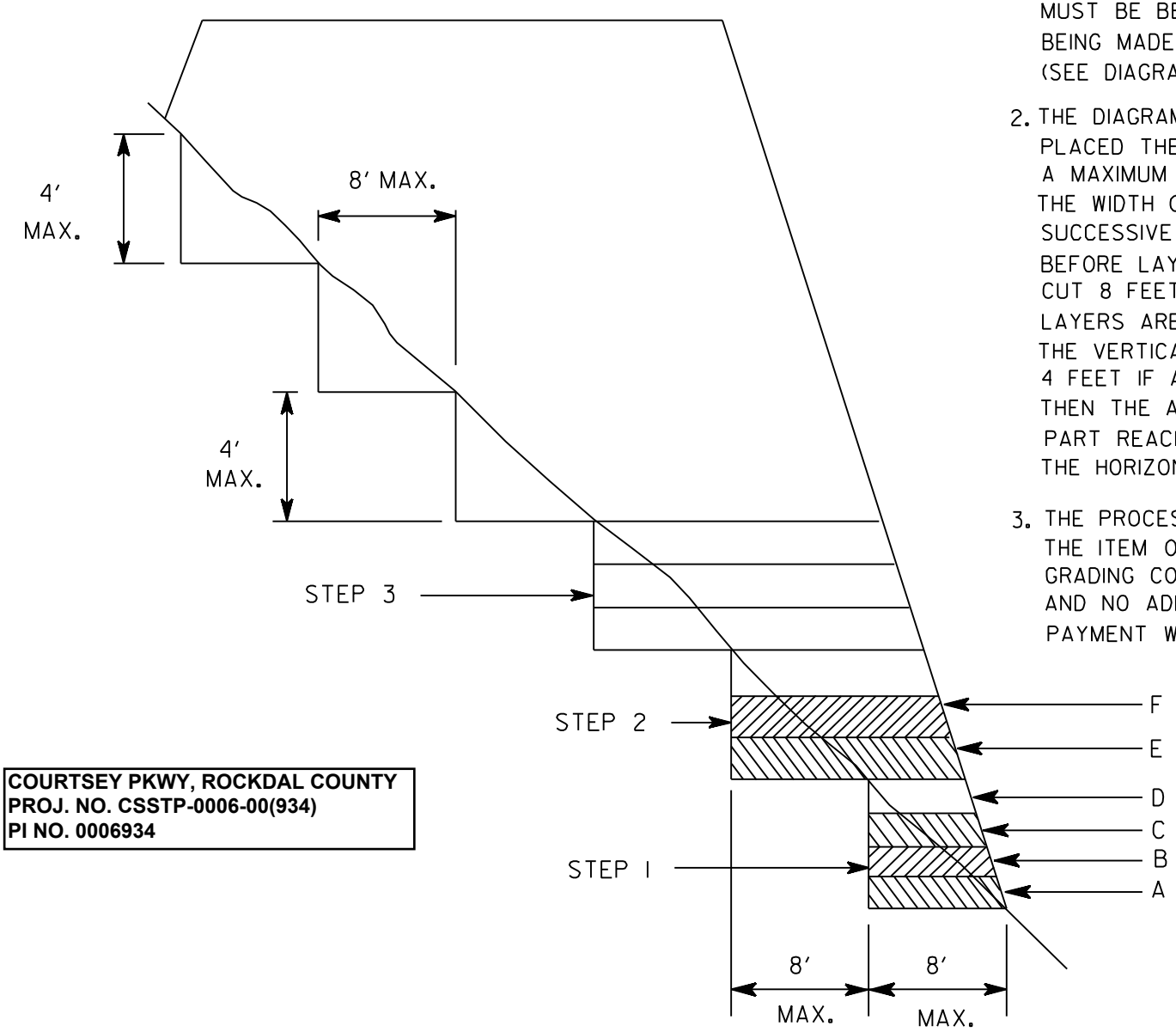
1. THIS DETAIL APPLIES TO THE FOLLOWING STATIONS:

STATION TO STATION	LOCATION
100+00± TO 107+00± (COURTESY PKWY)	RIGHT & LEFT
12+50± TO 17+50± (FLAT SHOALS)	RIGHT & LEFT

2. THIS WORK SHOULD BE DONE AT THE DIRECTION OF THE ENGINEER, AND MAY BE ELIMINATED IF THE SUBGRADE SOILS ARE DRY AND STABLE AT THE TIME OF CONSTRUCTION

REMOVAL DETAIL

REVISED 9/29/2008



1. WHERE THE EMBANKMENT IS TO BE PLACED ON A HILLSIDE OR ANOTHER EXISTING EMBANKMENT HAVING A SLOPE OF 3 TO 1 OR STEEPER, THE FOUNDATION MUST BE BENCHED WHILE THE EMBANKMENT IS BEING MADE. (SEE DIAGRAM AT LEFT.)

2. THE DIAGRAM SHOWS THAT BEFORE LAYER "A" IS PLACED THE FIRST STEP (1) IS CUT INTO THE SLOPE A MAXIMUM DISTANCE OF ABOUT 8 FEET (ABOUT ¾ THE WIDTH OF THE TYPICAL D-8 BULLDOZER BLADE). SUCCESSIVE LAYERS B, C, AND D ARE THEN PLACED BEFORE LAYER "E" IS PLACED, THE SECOND STEP IS CUT 8 FEET INTO THE SLOPE AND SUCCESSIVE LAYERS ARE AGAIN PLACED. IF IT IS ANTICIPATED THAT THE VERTICAL PART OF THE STEP WILL EXCEED 4 FEET IF A 8 FEET HORIZONTAL CUT IS MADE, THEN THE ACTUAL CUT STOPS WHEN THE VERTICAL PART REACHES A MAXIMUM OF 4 FEET ALLOWING THE HORIZONTAL DISTANCE TO VARY.

3. THE PROCESS OF BENCHING IS CONSIDERED INCIDENTAL TO THE ITEM OF UNCLASSIFIED EXCAVATION AND BORROW OR GRADING COMPLETE IN CONSTRUCTION OF THE EMBANKMENT AND NO ADDITIONAL MEASUREMENT OF QUANTITY OR PAYMENT WILL BE MADE FOR BENCHING.

COURTSEY PKWY, ROCKDAL COUNTY
PROJ. NO. CSSTP-0006-00(934)
PI NO. 0006934

BENCHING DETAIL

4.5.28

NO SCALE

pH	6.95
Resistivity	15121

Project Number: CSSTP-0006-00(934) **County:** Rockdale **P.I. Number:** 0006934

Pipe Culvert Material Alternates

TYPE OF INSTALLATION				PIPE TYPE									
				CONCRETE	STEEL			ALLUMINUM	THERMOPLASTIC				
				REINFORCED CONCRETE AASHTO M-170	CORRUGATED STEEL ALUMINUM COATED (TYPE 2) AASHTO M-36	CORRUGATED STEEL PLAIN ZINC COATED AASHTO M-36	POLYMER COATED STEEL AASHTO M-245	CORRUGATED ALUMINUM AASHTO M-196	CORRUGATED HDPE AASHTO M-252	CORRUGATED SMOOTHED LINED HDPE TYPE "S" AASHTO M-294	CORRUGATED SMOOTH LINED POLYPROPYLENE AASHTO M 330	PVC CORRUGATED SMOOTH INTERIOR ASTM F-949	PVC Profile Wall Drain Pipe AASHTO M-304
STORM DRAIN	NON-TRAVEL BEARING (OUTSIDE ROADBED)		INTERSTATE	X									
			NON INTERSTATE	X	X		X	X		X	X	X	X
	TRAVEL BEARING (INSIDE ROADBED)	GRADE <= 10%	ADT < 1,500	X	X		X	X		X	X	X	X
			1,500 < ADT < 5,000	X	X		X	X		X	X	X	X
			5,000 < ADT < 15,000	X						X	X	X	X
			ADT > 15,000 & INTERSTATES	X									
		GRADE > 10%					X			X	X	X	X
SIDE DRAIN				X	X	X	X	X		X	X	X	X
PERMANENT SLOPE DRAIN					X	X	X	X		X	X	X	X
PERFORATED UNDERDRAIN					X	X		X	X	X	X	X	X

NOTES:

1 Allowable materials are indicated by an "X".

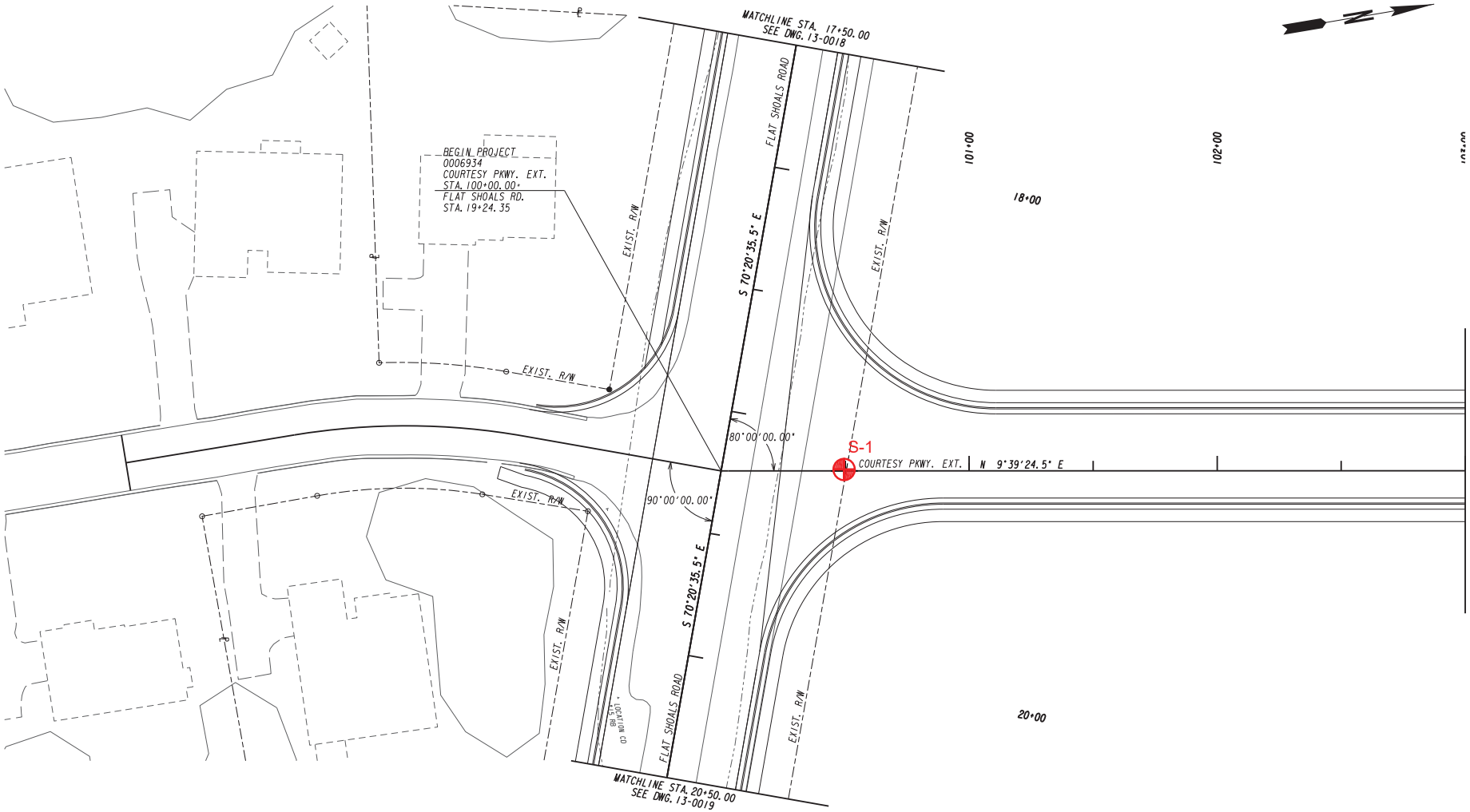
2 Structural, installation, fill height and backfill requirements of storm drain pipe will be in accordance with Georgia Standard 1030-D or 1030-P and the Standard Specifications

3 The Contractor shall provide additional storm sewer capacity calculations if a pipe material other than concrete is selected.

4 Pipe used under mechanically stabilized earth (MSE) walls, within MSE wall backfill, or within five feet of an MSE wall face shall be Class V Concrete Pipe.

Rev. 1-12-16

Appendix B – Boring location map, field notes and boring logs



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CONSTRUCTION LIMITS
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EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

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END LIMIT OF ACCESS.....ELA
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ESA - ENV. SENSITIVE AREA (SEE ERIT TABLE)

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

SCALE IN FEET
0 20 40 80

REVISION DATES

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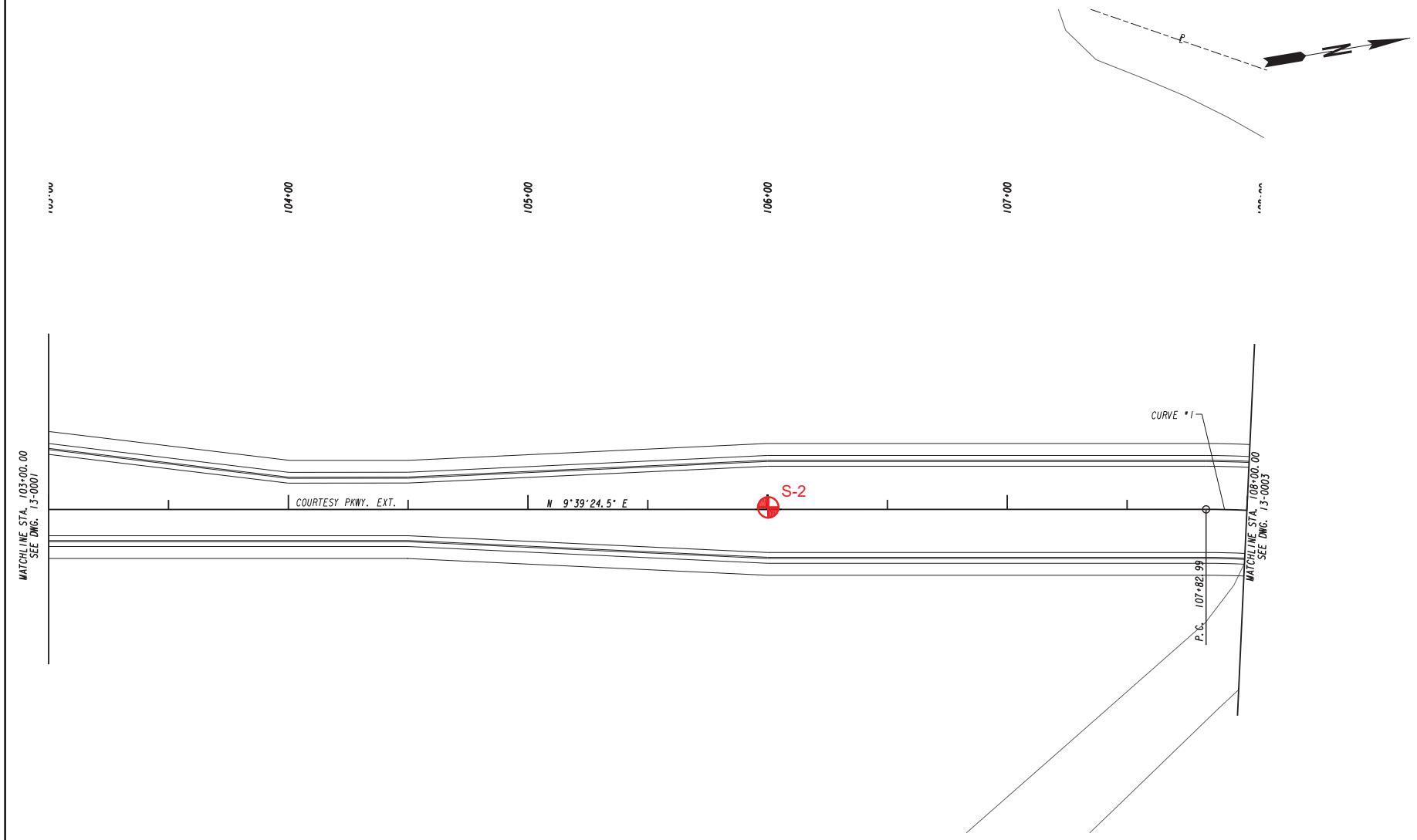

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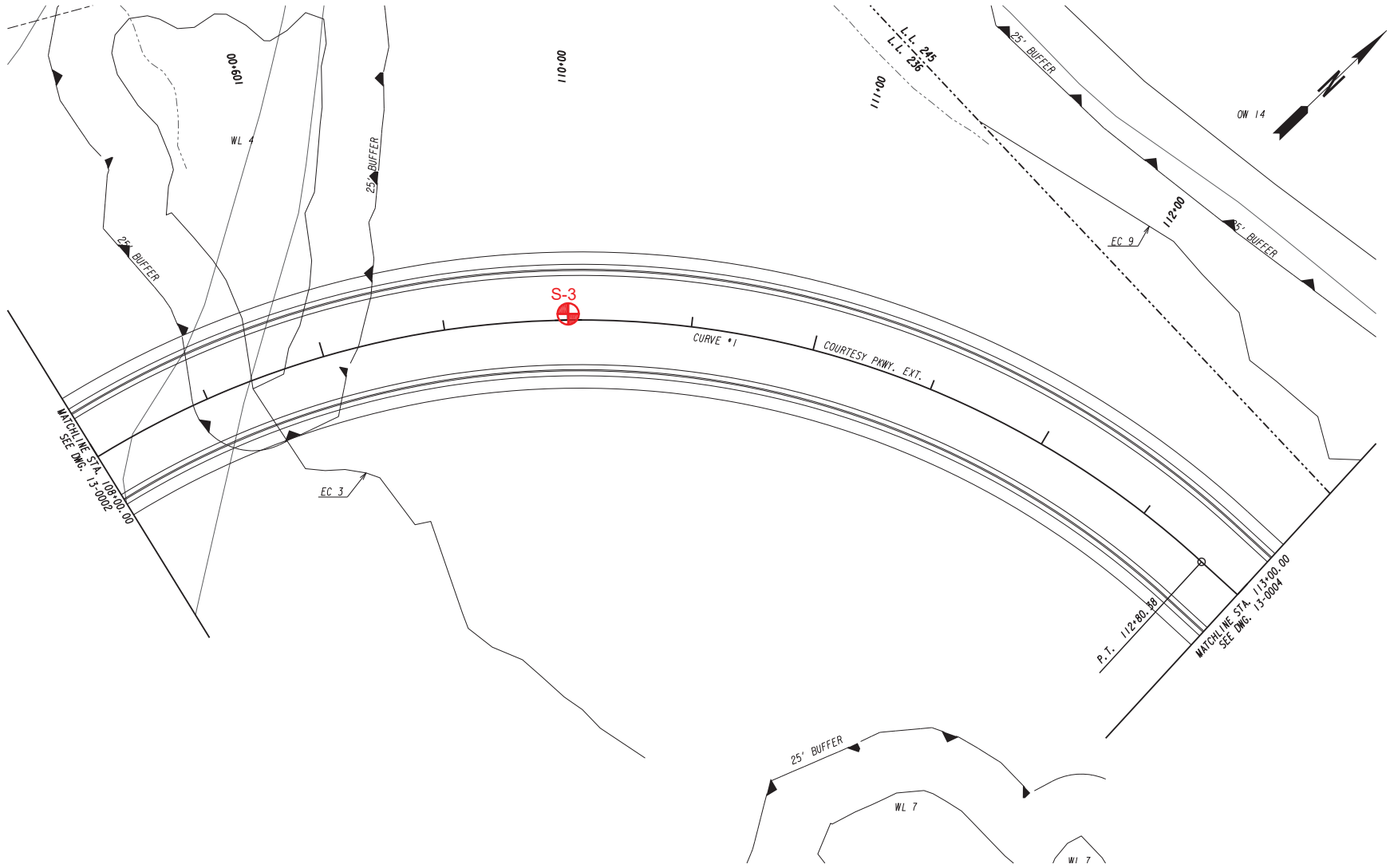

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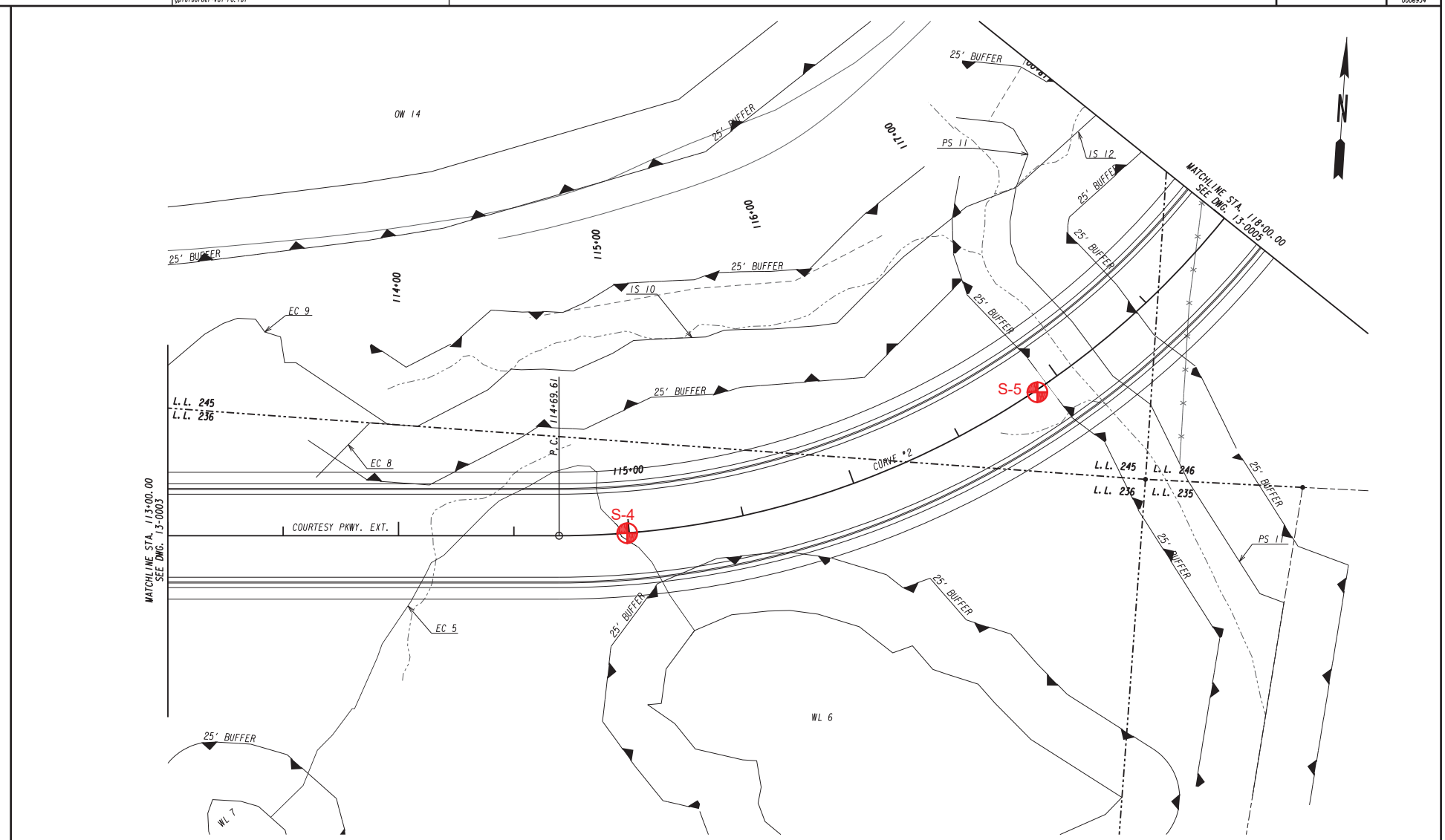

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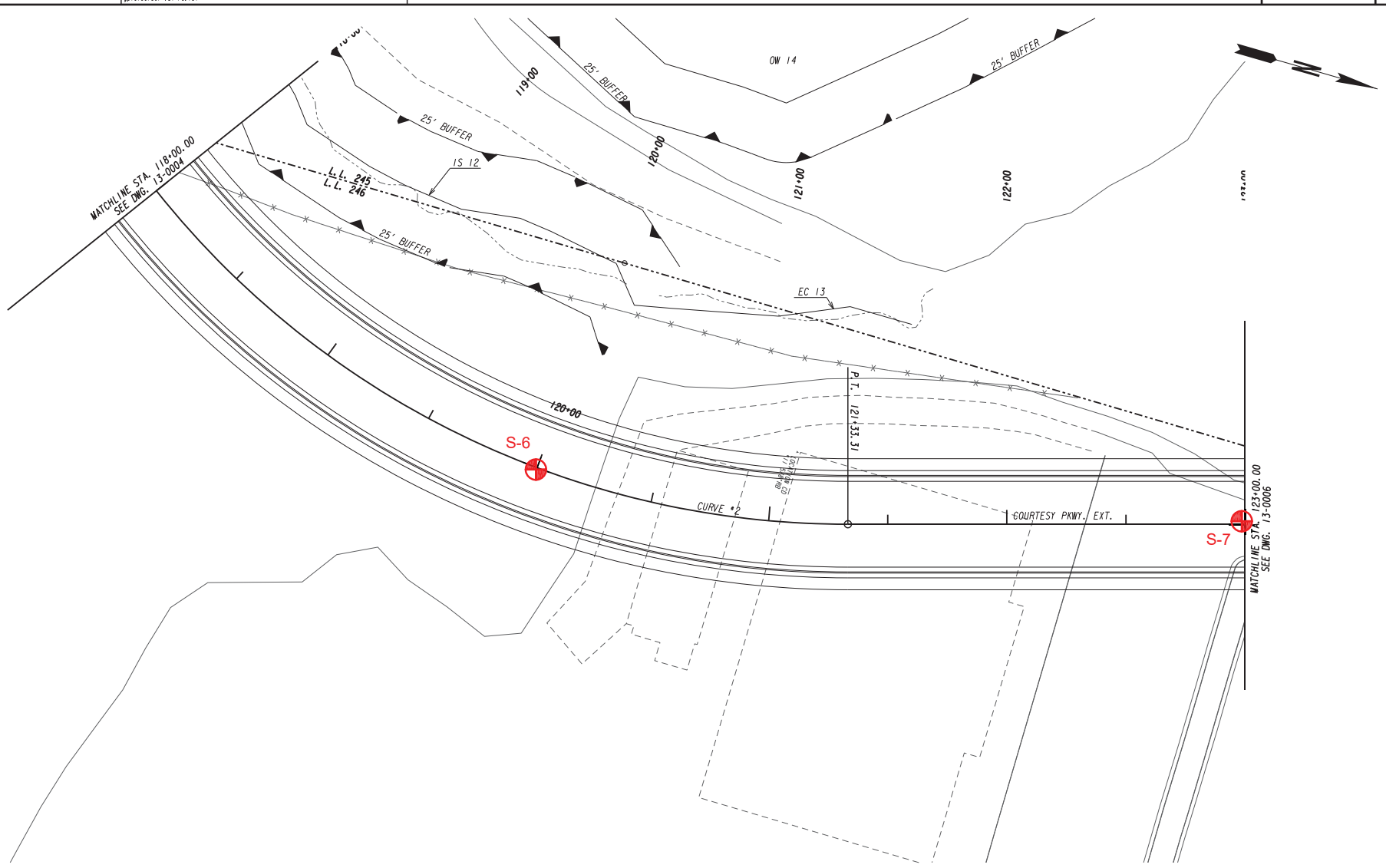

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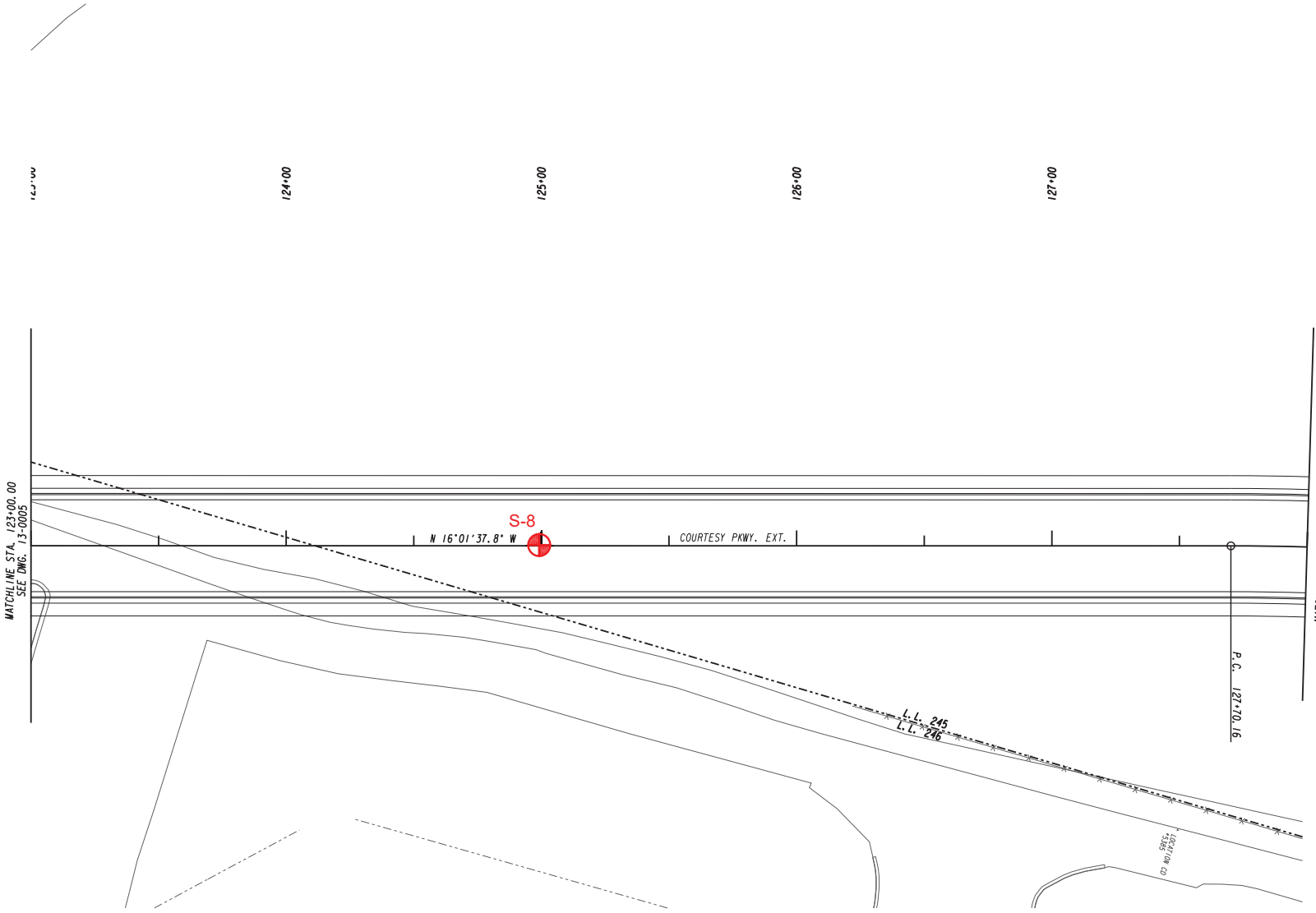

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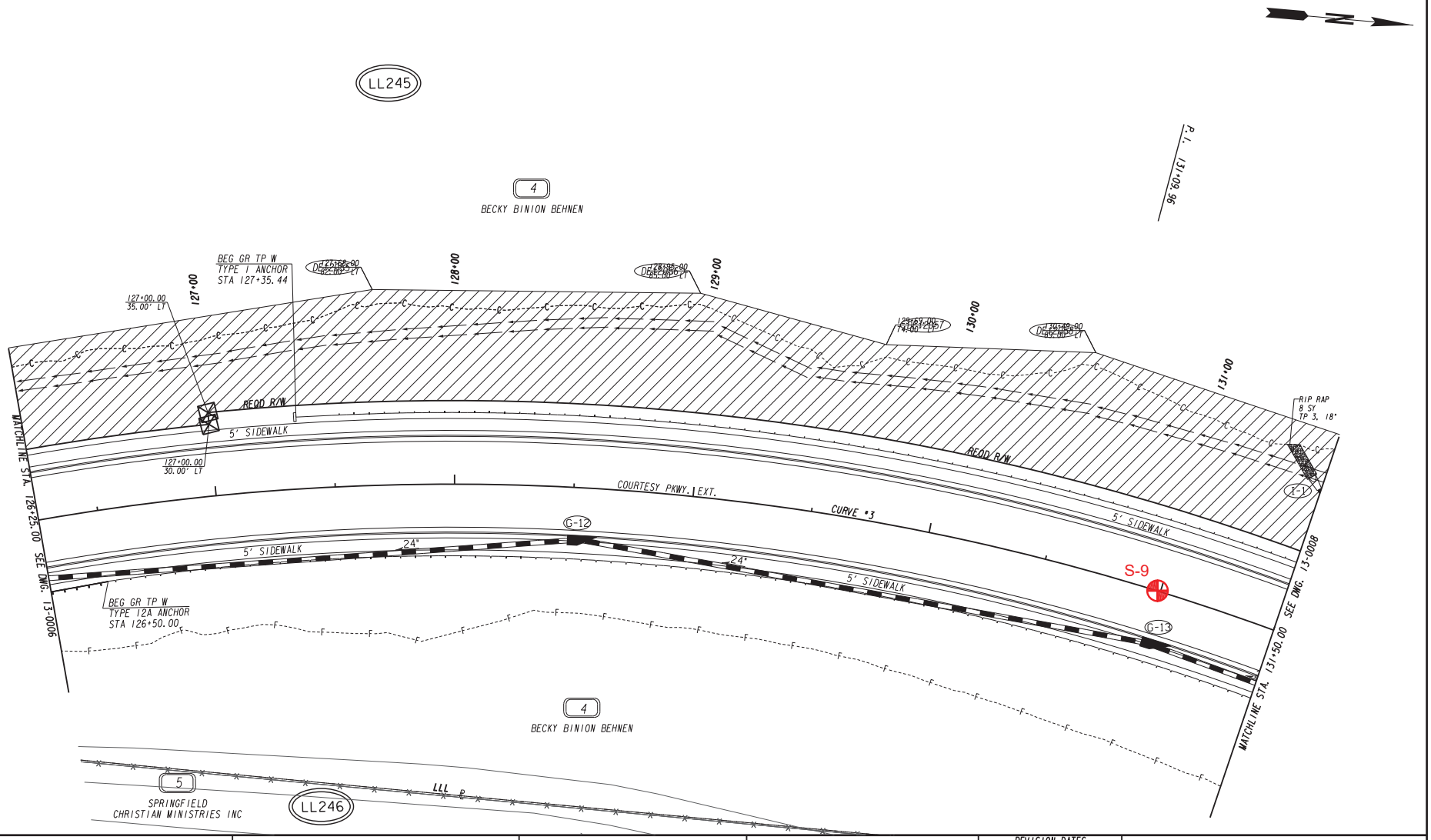

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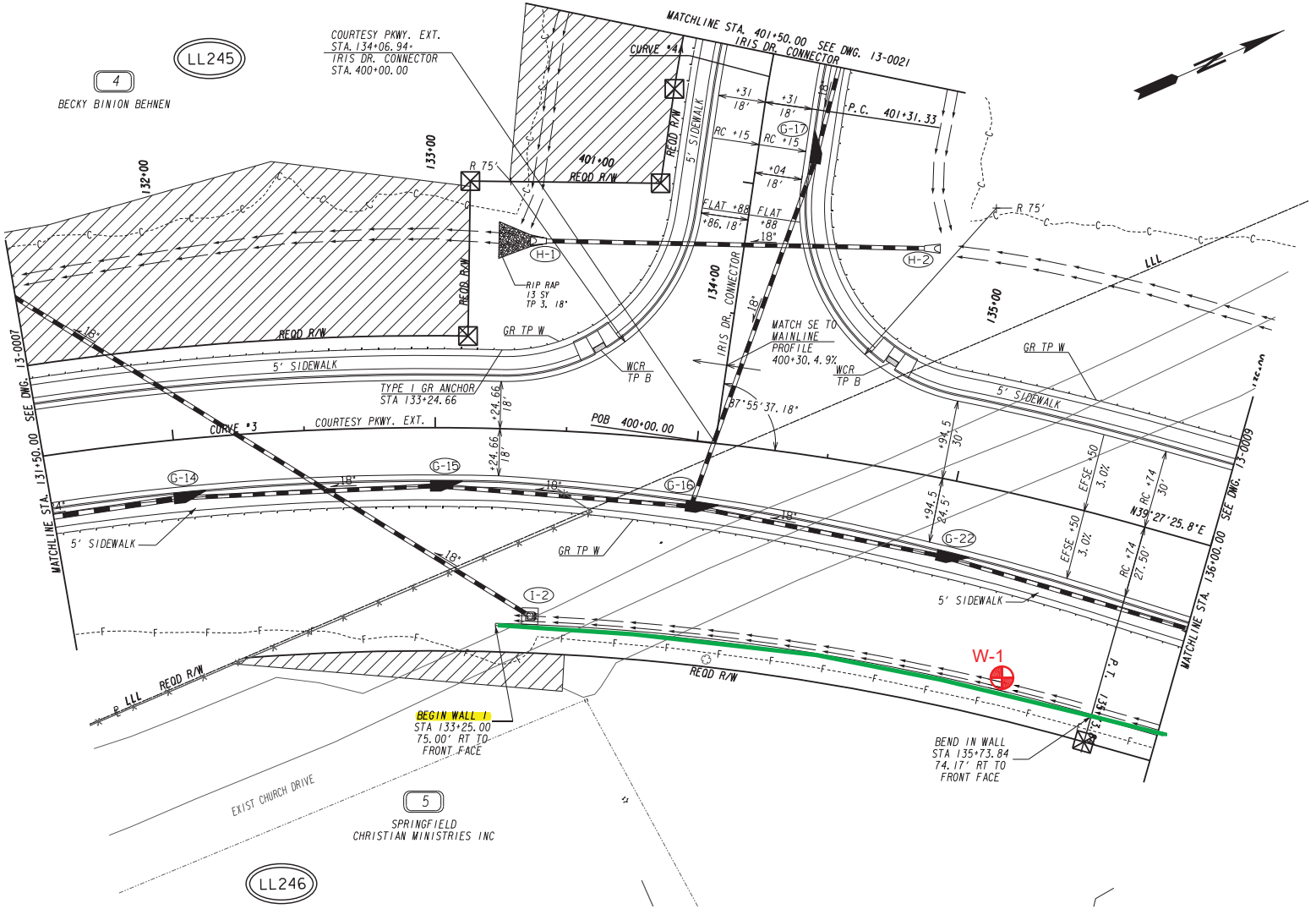

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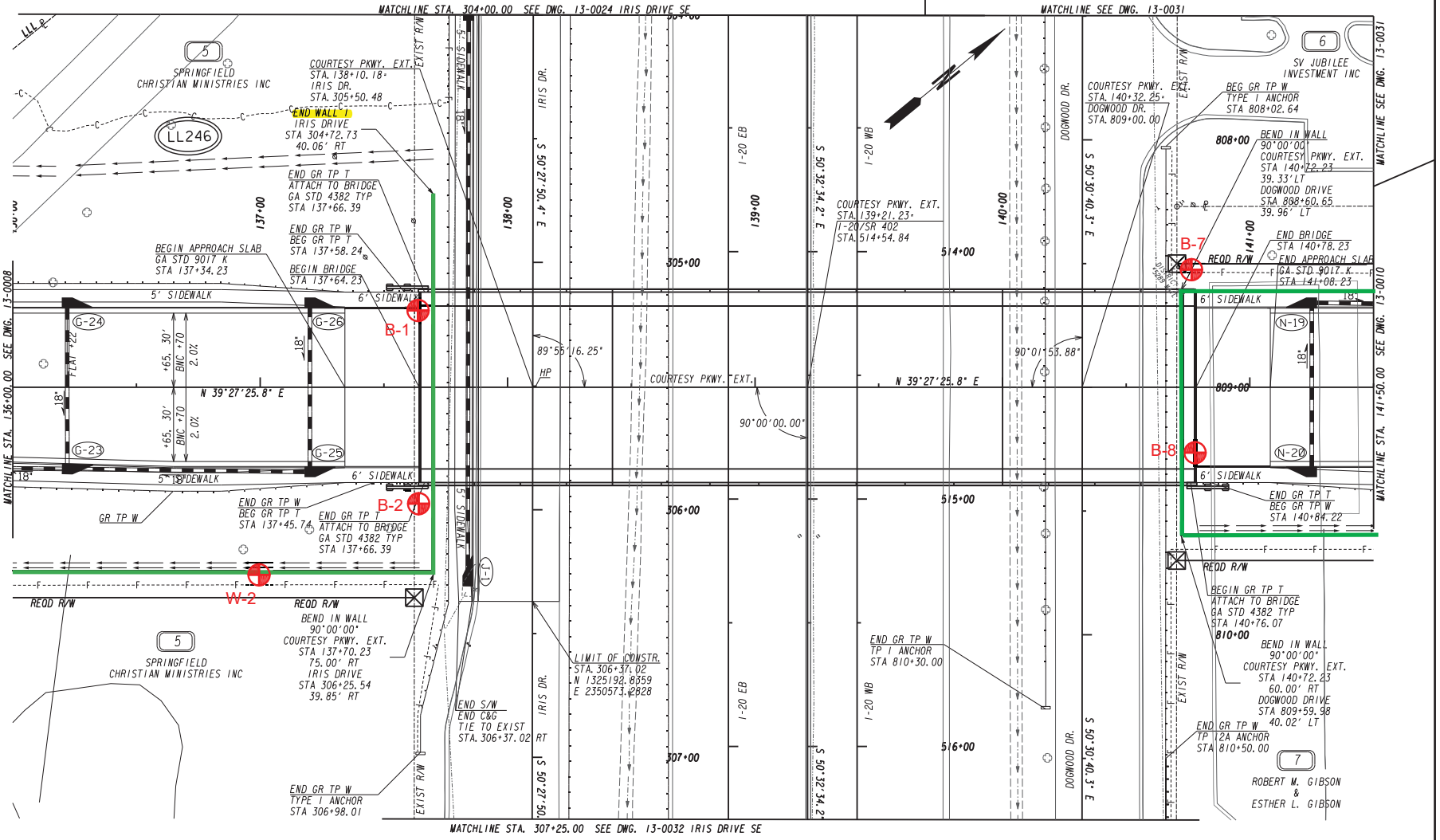

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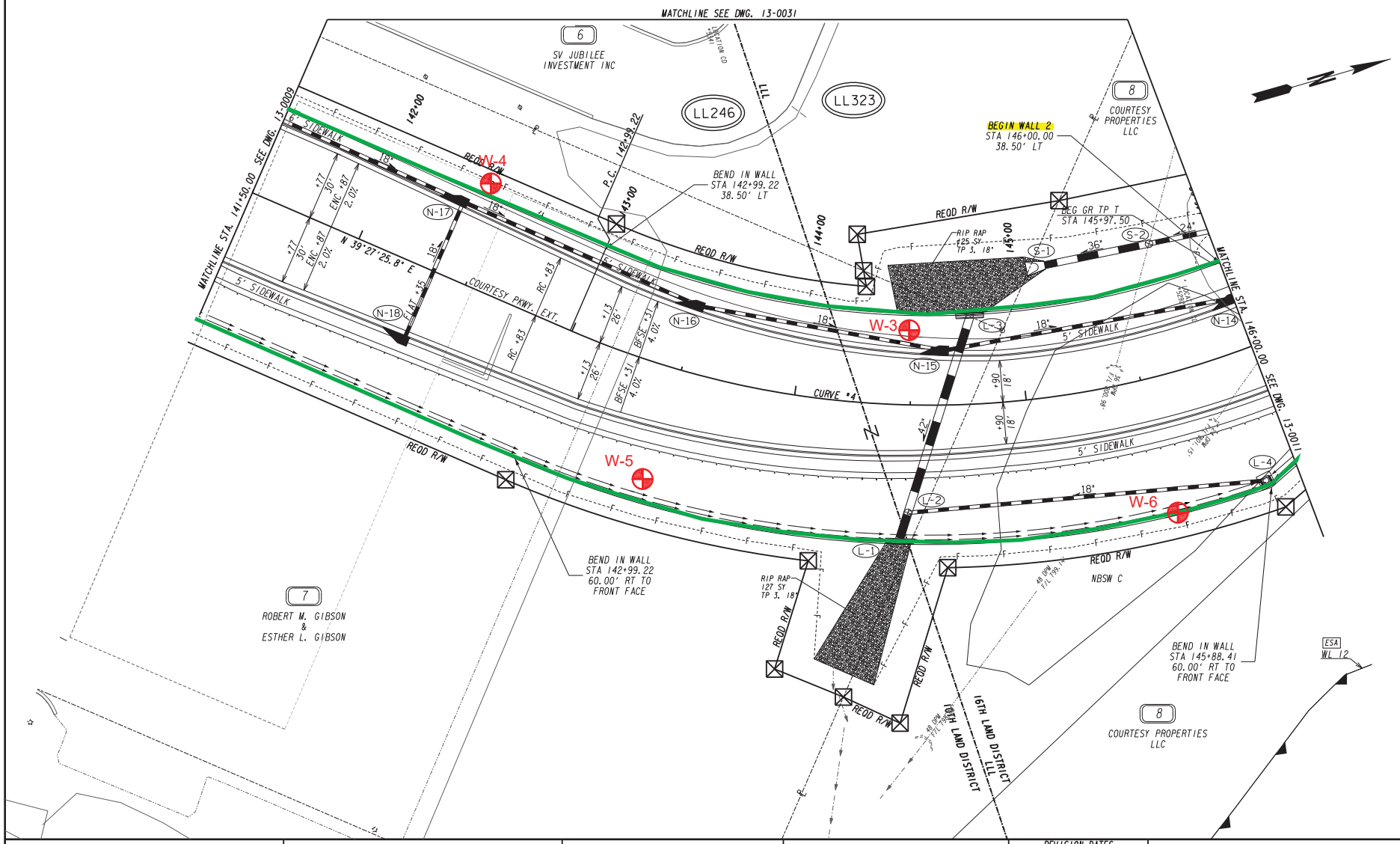

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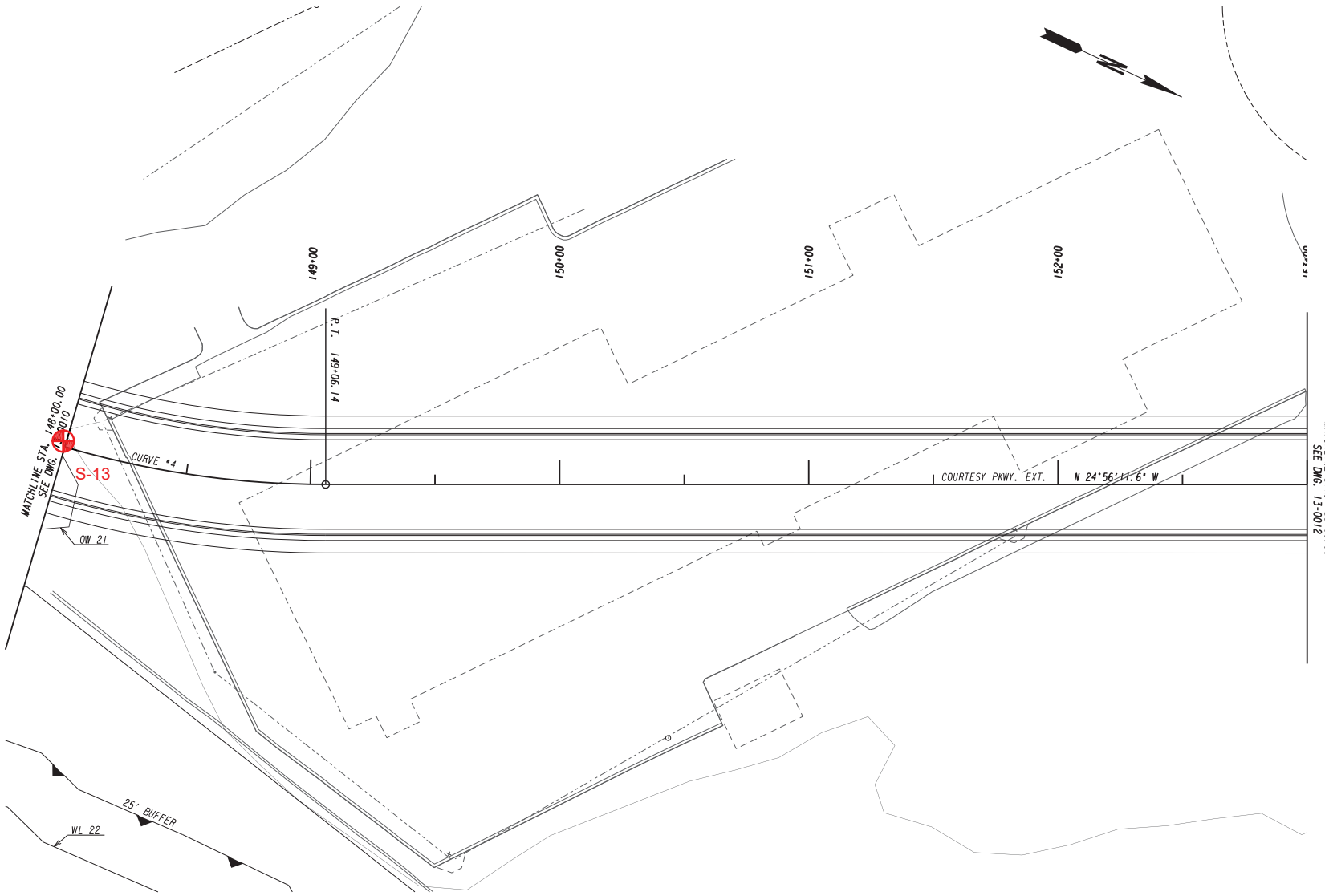

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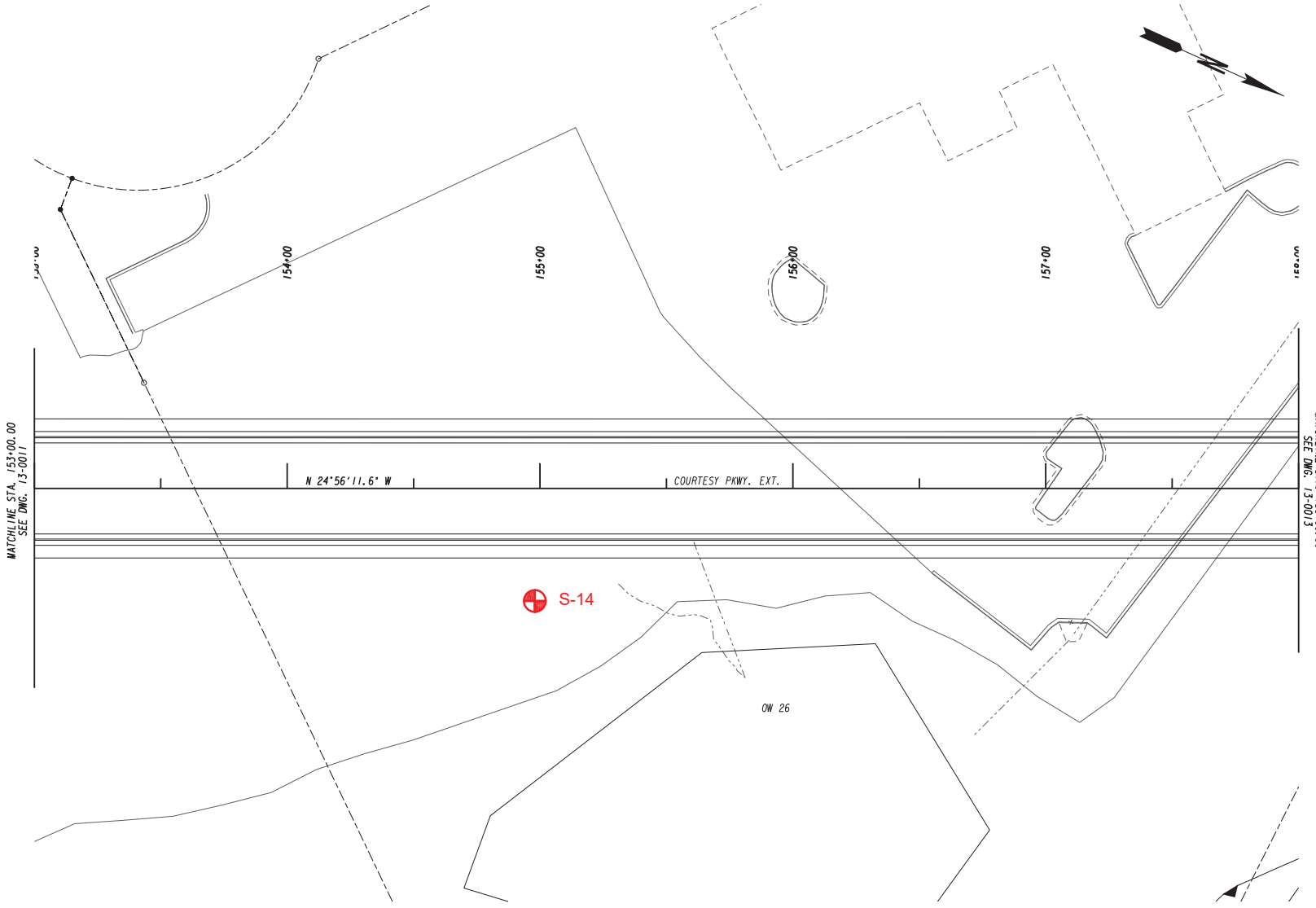

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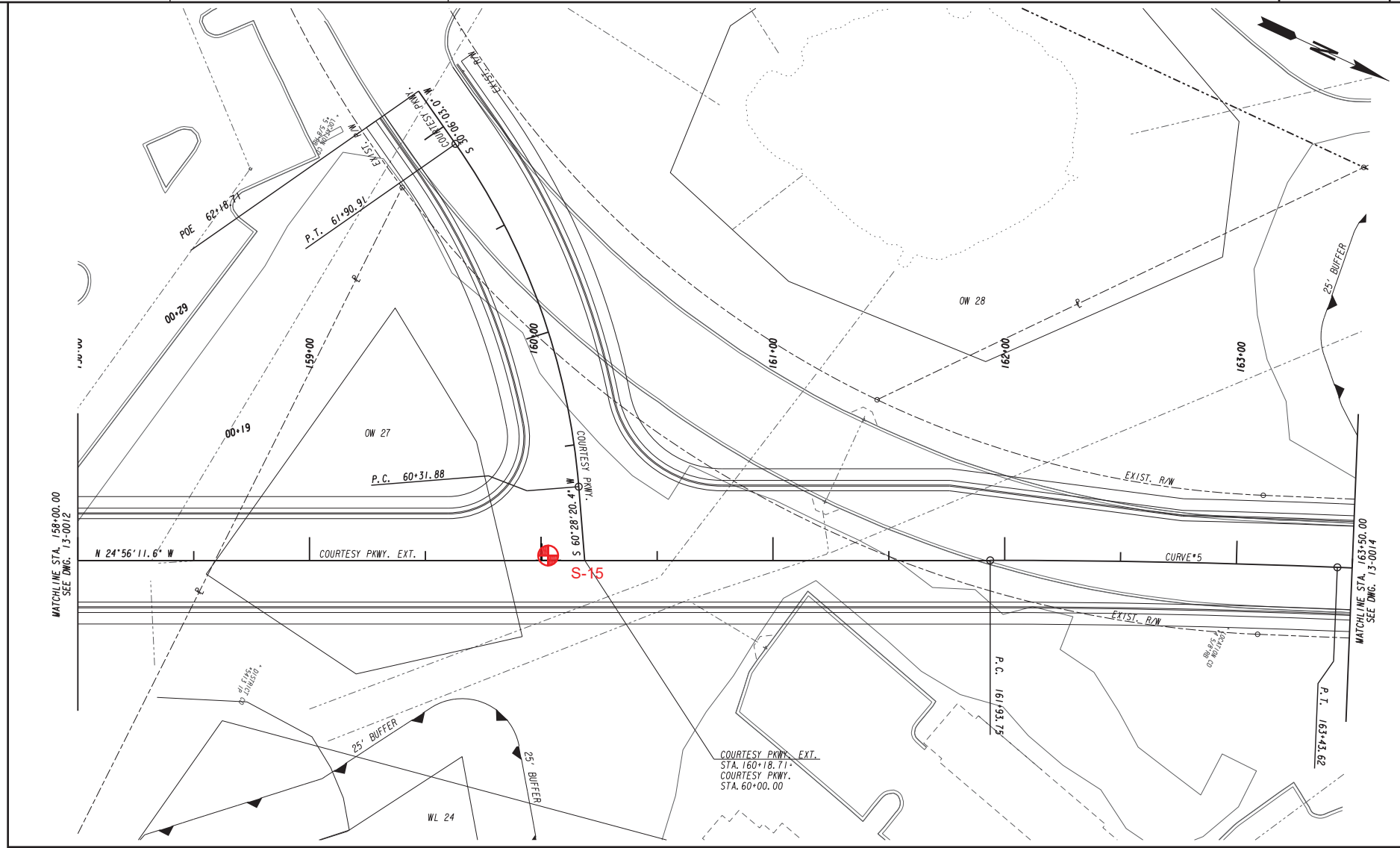

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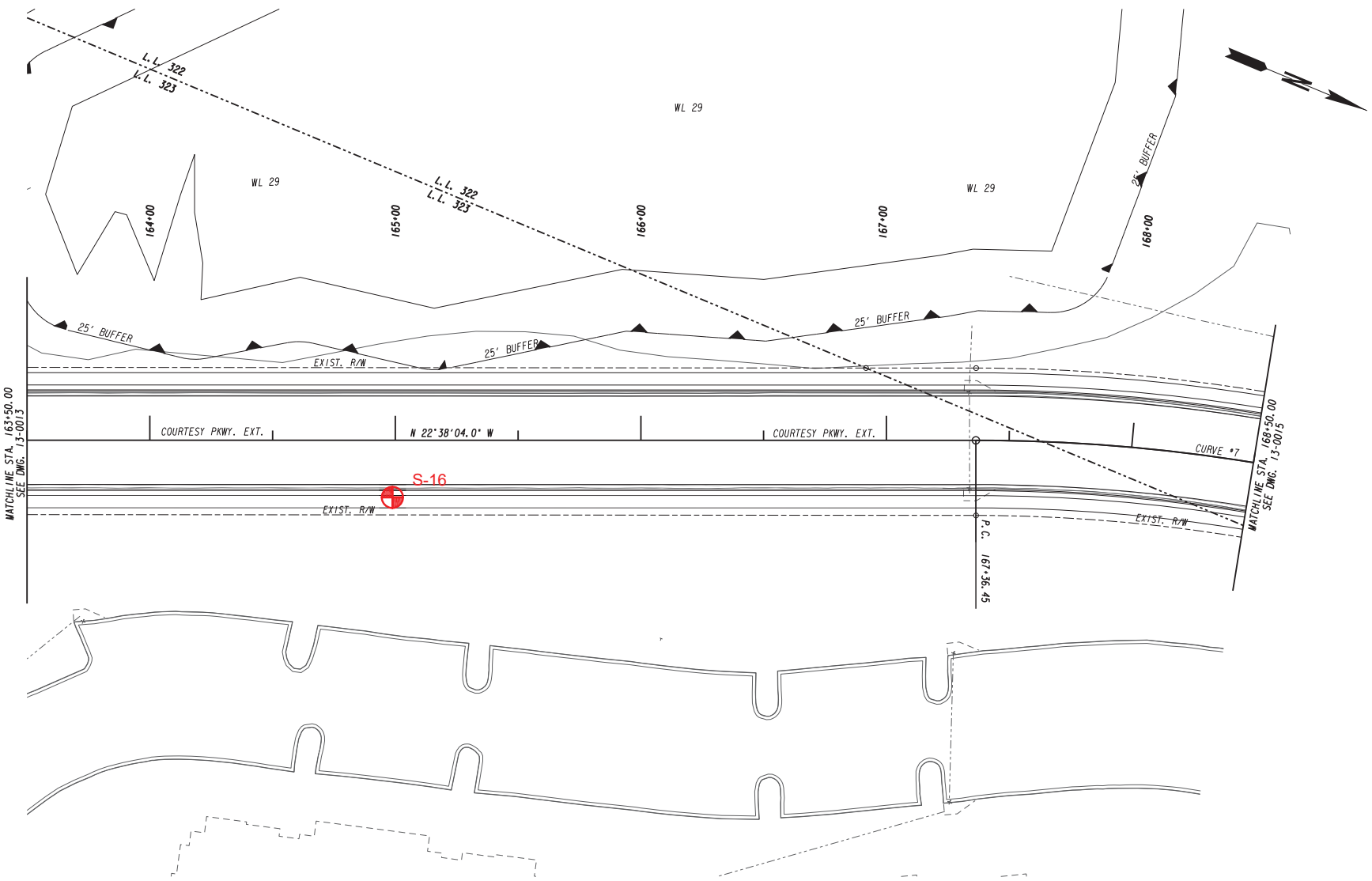

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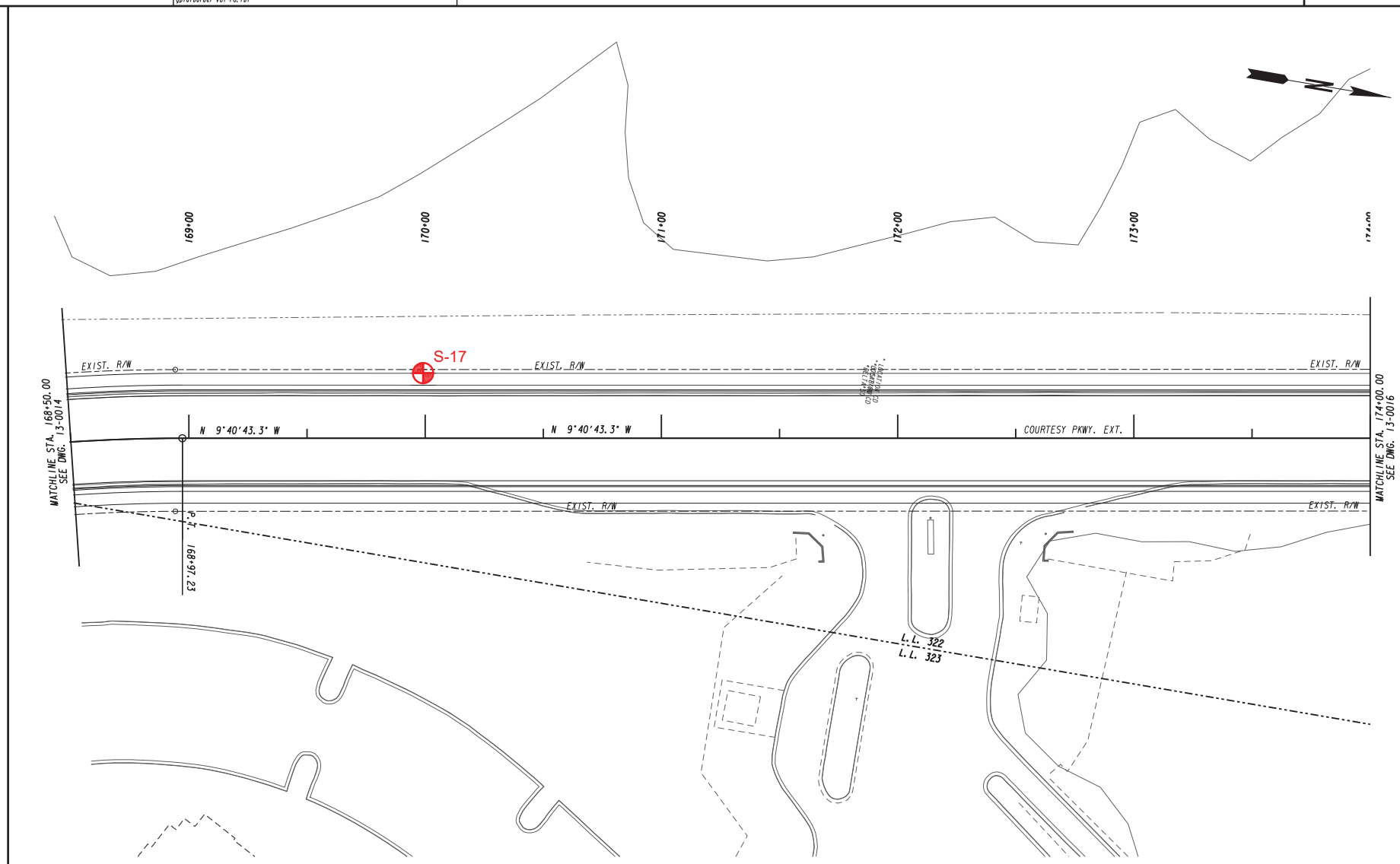

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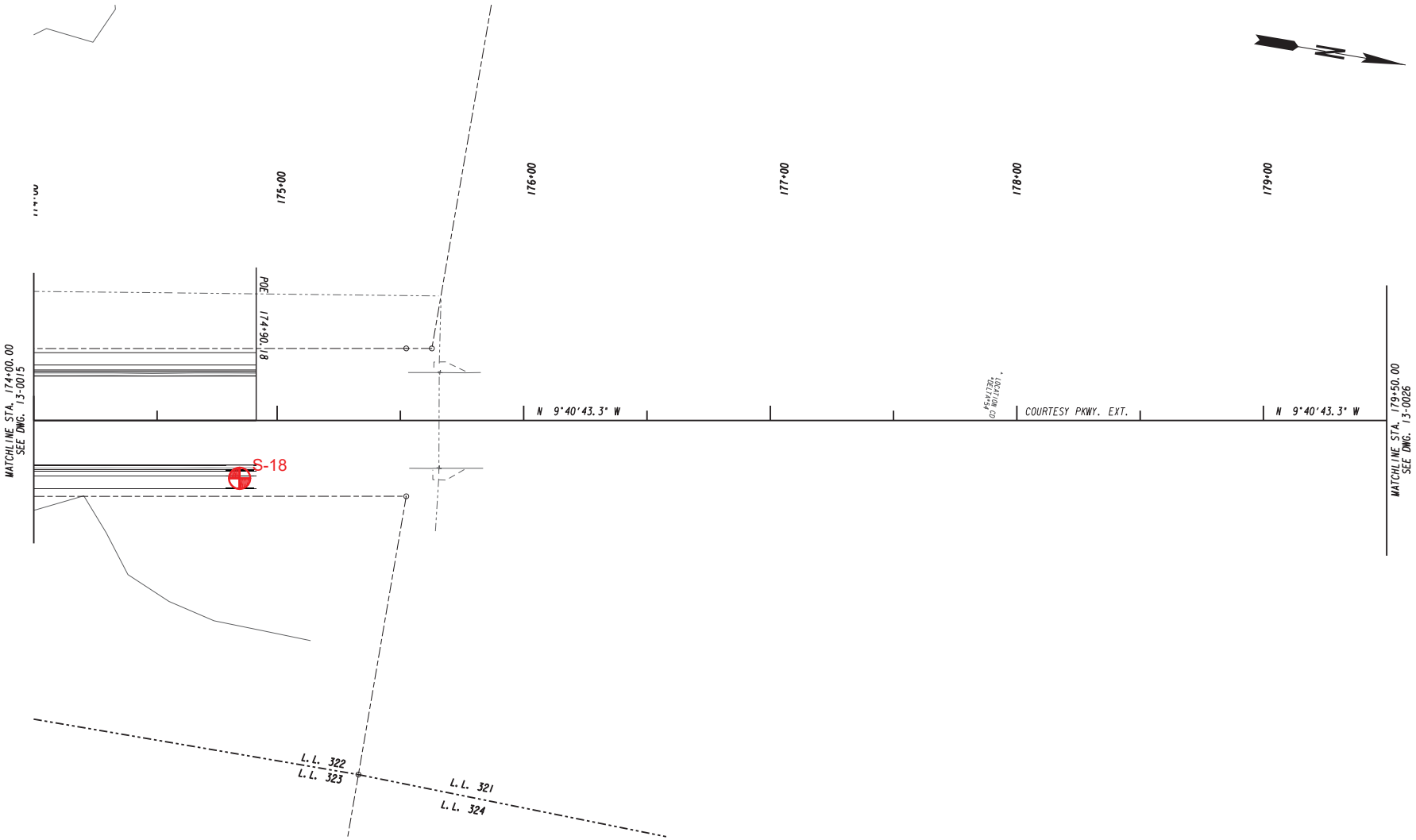

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10/23/2015 GPLN

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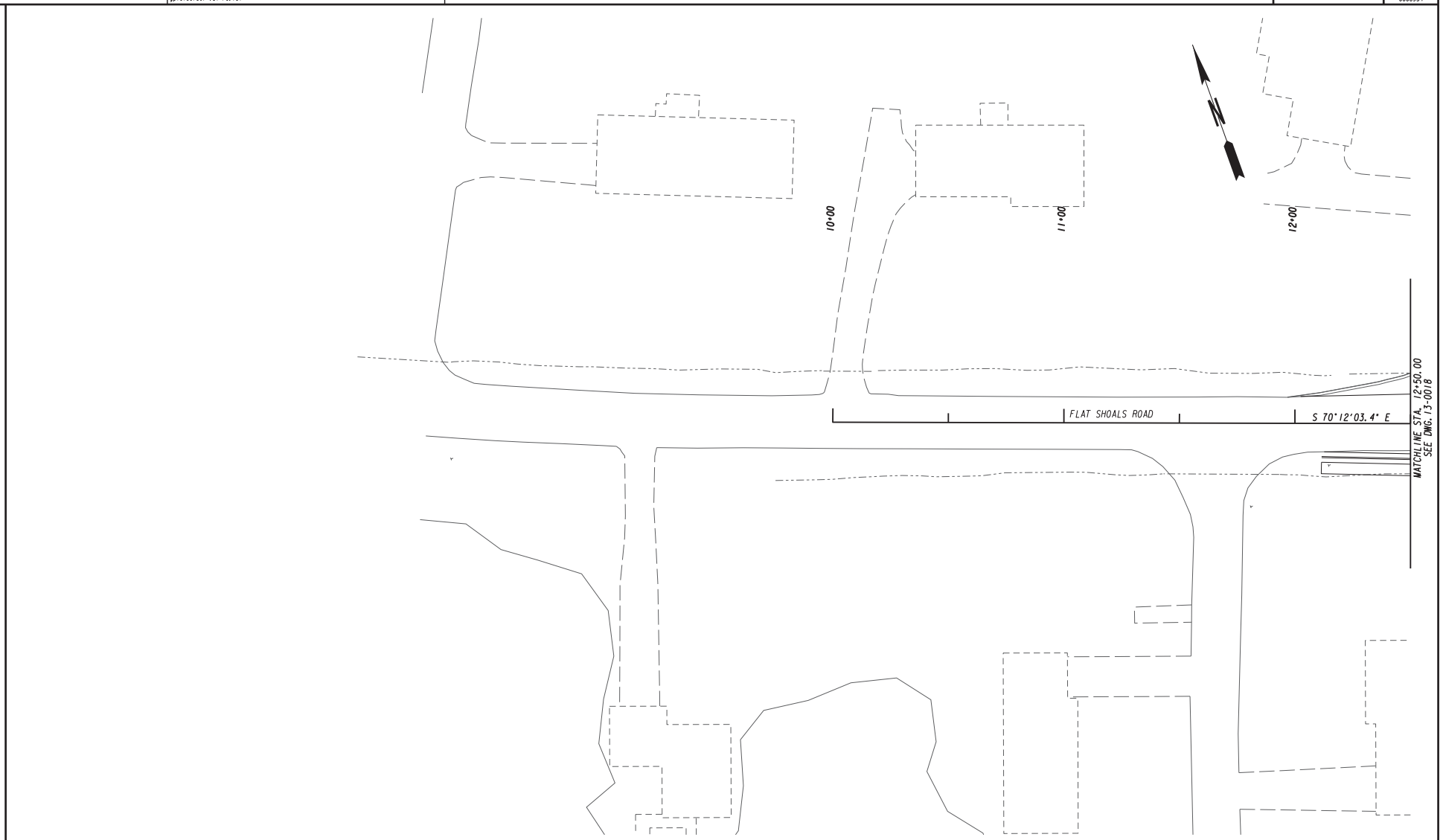


PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS
ORANGE BARRIER FENCE
ESA - ENV. SENSITIVE AREA (SEE ERIT TABLE)

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

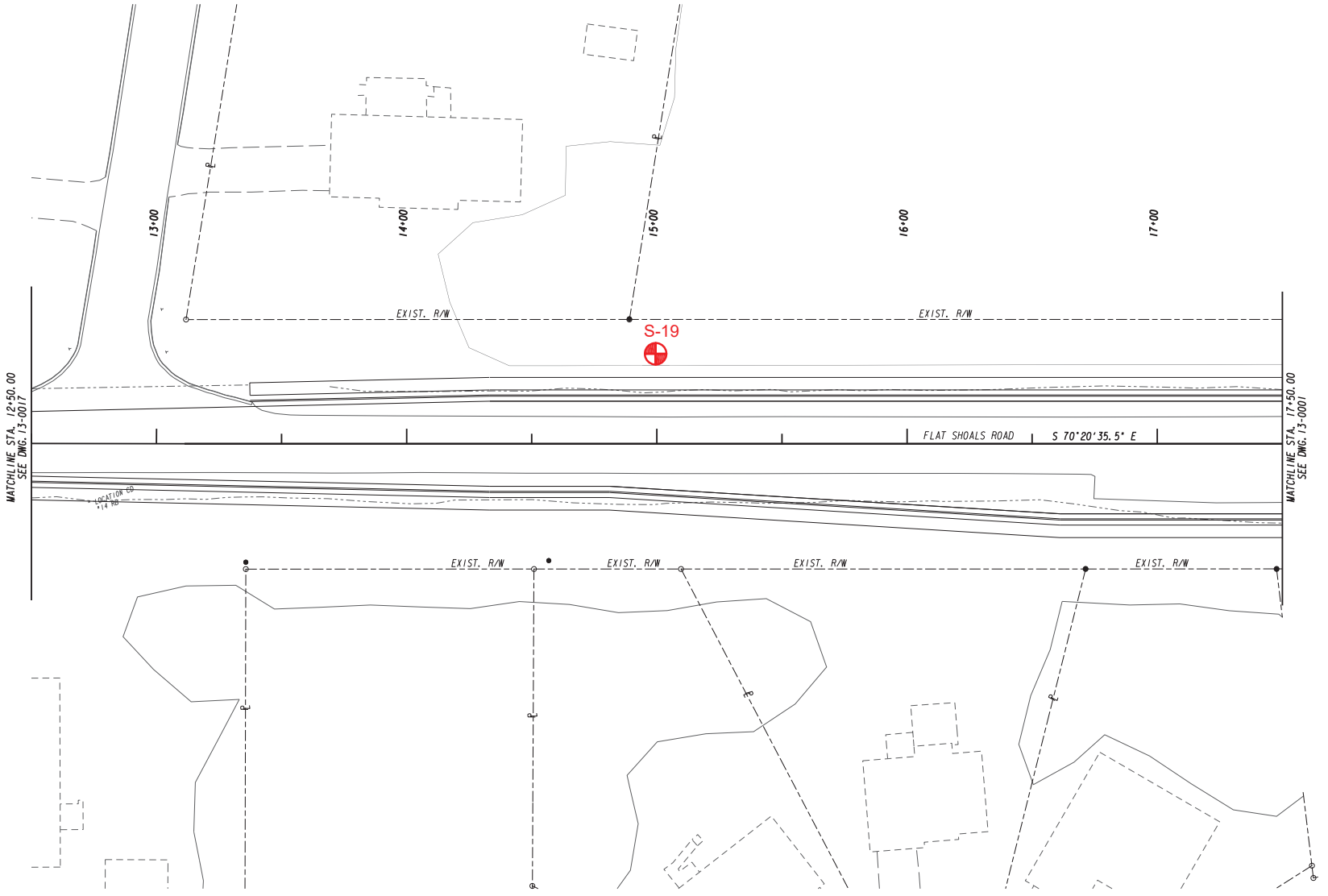
SCALE IN FEET
0 20 40 80

REVISION DATES

CONSTRUCTION PLAN
COURTESY PKWY. EXT.
FLAT SHOALS ROAD

CHECKED:		DATE:		DRAWING No.
BACKCHECKED:		DATE:		13-0017
CORRECTED:		DATE:		
VERIFIED:		DATE:		

10/23/205 GPLN



PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS
ORANGE BARRIER FENCE
ESA - ENV. SENSITIVE AREA (SEE ERIT TABLE)

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

SCALE IN FEET
0 20 40 80

REVISION DATES

CONSTRUCTION PLAN
COURTESY PKWY. EXT.
FLAT SHOALS ROAD

CHECKED:		DATE:		DRAWING No.
BACKCHECKED:		DATE:		13-0018
CORRECTED:		DATE:		
VERIFIED:		DATE:		

10/23/205 GPLN

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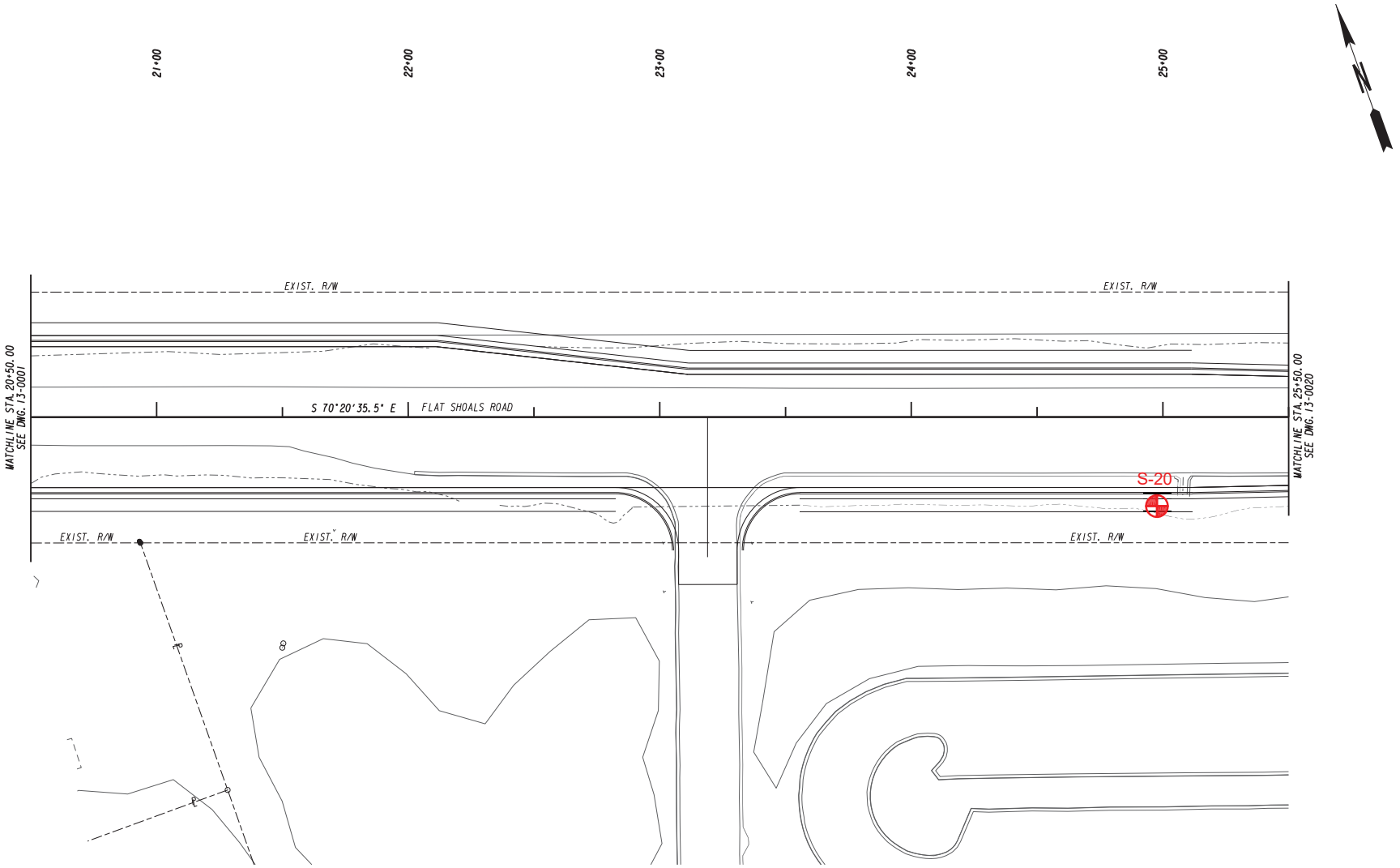


PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS
ORANGE BARRIER FENCE
ESA - ENV. SENSITIVE AREA (SEE ERIT TABLE)

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

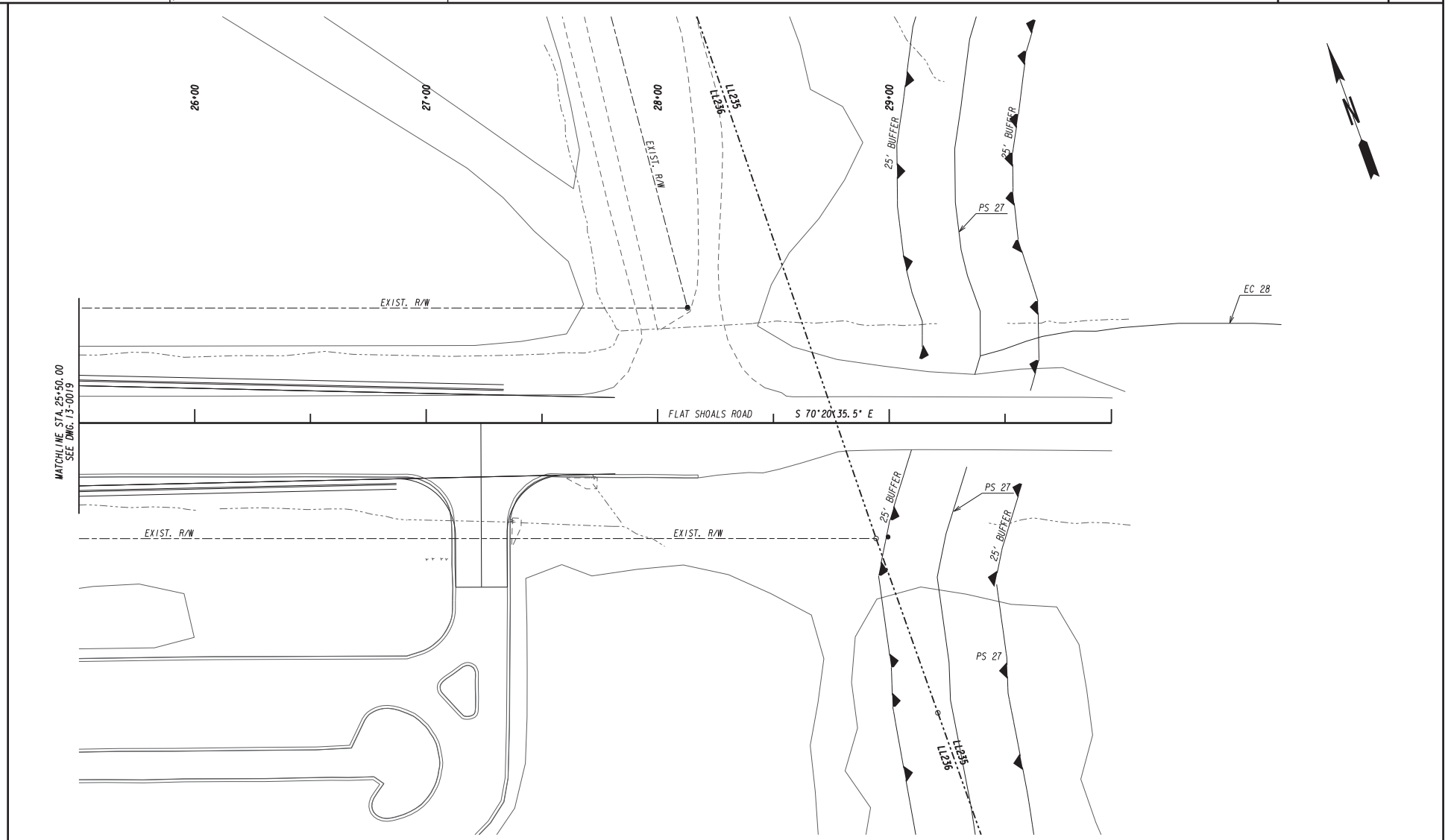
SCALE IN FEET
0 20 40 80

REVISION DATES

CONSTRUCTION PLAN
COURTESY PKWY. EXT.
FLAT SHOALS ROAD

CHECKED:		DATE:		DRAWING No.
BACKCHECKED:		DATE:		13-0019
CORRECTED:		DATE:		
VERIFIED:		DATE:		

10/23/205 GPLN



PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS
ORANGE BARRIER FENCE
ESA - ENV. SENSITIVE AREA (SEE ERIT TABLE)

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

SCALE IN FEET
0 20 40 80

REVISION DATES

CONSTRUCTION PLAN
COURTESY PKWY. EXT.
FLAT SHOALS ROAD

CHECKED:		DATE:		DRAWING No.
BACKCHECKED:		DATE:		
CORRECTED:		DATE:		13-0020
VERIFIED:		DATE:		

10/23/205 GPLN

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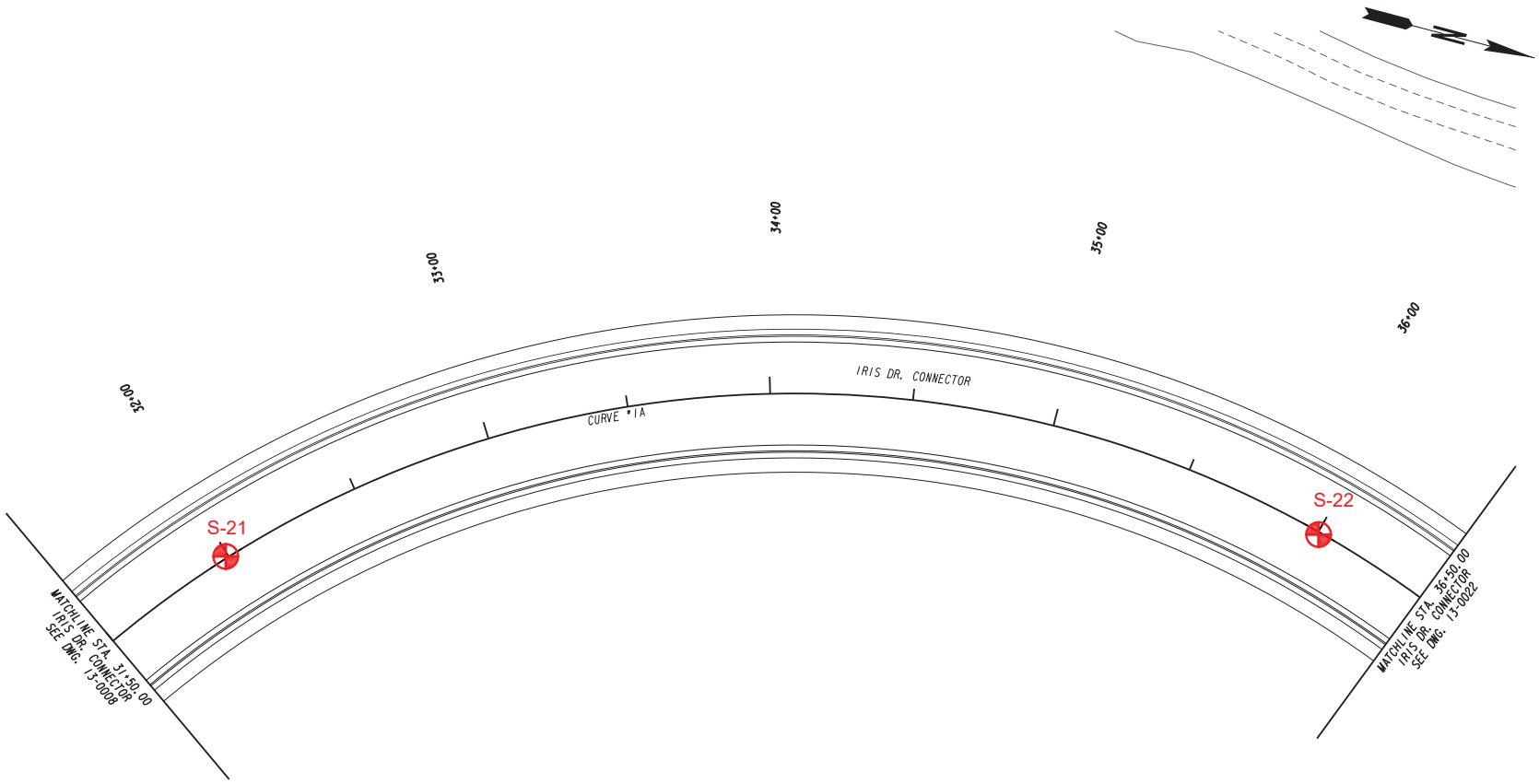

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS
ORANGE BARRIER FENCE
ESA - ENV. SENSITIVE AREA (SEE ERIT TABLE)

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

SCALE IN FEET
0 20 40 80

REVISION DATES

CONSTRUCTION PLAN
COURTESY PKWY. EXT.
IRIS DR. CONNECTOR

CHECKED:	DATE:	DRAWING No.
BACKCHECKED:	DATE:	
CORRECTED:	DATE:	13-0021
VERIFIED:	DATE:	

10/23/205 GPLN

GDOT Proj. No.: CSSTP-0006-00(934)
GDOT PI: 0006934
MA No: ROCK1701

Soil Survey Field Notes

Courtesy Pkwy Extension (From Old Covington Hwy to Flat Shoals Road)

Borings	Line	Station	Offset	Proposed Cut/Fill*, ft	Boring Depth, ft	Ground water table, ft	Lab Number	Field Moisture	GDOT	Field Soil Description and Comments
S-1	Courtesy Pkwy	100+50	CL	0' Fill	BT at 5'	NE	6911	28.3%	**IIIC3**	0.0' to 2.0' Brown mica silty sand 2.0' to 5.0' Orange mica silty clayey sand
S-2	Courtesy Pkwy	106+00	CL	2' Fill	BT at 5'	NE	6924	24.0%	**IIIC2**	0.0' to 5.0' Brown mica silty sand
S-3	Courtesy Pkwy	110+00	CL	0'	BT at 5'	NE	6924	22.0%	**IIIC2**	0.0' to 5.0' Brown mica silty sand
S-4	Courtesy Pkwy	115+00	CL	4' Fill	BT at 5'	NE	6929	24.4%	**IIB3**	0.0' to 1.5' Brown mica silty clayey sand 1.5' to 5.0' Tan silty clayey sand
S-5	Courtesy Pkwy	116+75	CL	8' Cut	BT at 13'	NE	6922-A 6922-B	17.8% 14.1%	**IIB3** **IIB4**	0.0' to 2.0' Brown mica silty sand 2.0' to 5.0' Brown/tan mica silty clayey sand 5.0' to 10.0' Grey/tan silty sand 10.0' to 15.0' Grey/tan silty sand with some clay
S-6	Courtesy Pkwy	120+00	CL	10' Cut	BT at 15'	NE	6923	15.4%	**IIIC2**	0.0' to 5.0' Red silty clayey sand

BT - Boring Termination
AR - Auger Refusal
HAR - Hand Auger Refusal
NE - Not Encountered

Soil Survey Field Notes
Courtesy Pkwy Extension (From Old Covington Hwy to Flat Shoals Road)

Borings	Line	Station	Offset	Proposed Cut/Fill*, ft	Boring Depth, ft	Ground water table, ft	Lab Number	Field Moisture	GDOT	Field Soil Description and Comments	
S-7	Courtesy Pkwy	123+00	CL	3' Cut	BT at 8'	NE	6921	18.9%	IIIC2	0.0' to 1.0'	Tan/grey silty sand
										1.0' to 4.0'	Brown mica silty clay
										4.0' to 8.0'	Brown/tan silty clay
S-8	Courtesy Pkwy	125+00	CL	5' Fill	BT at 5'	NE	6921	16.3%	IIIC2	0.0' to 5.0'	Brown mica silty clay
S-9	Courtesy Pkwy	131+00	CL	15' Fill	BT at 5'	NE	6925	13.9%	IIIC3	0.0' to 5.0'	Brown mica silty sand

* MSE Walls and Bridge from Station 133+75 to 143+13.02, see wall and bridge boring logs

BT - Boring Termination
AR - Auger Refusal
HAR - Hand Auger Refusal
NE - Not Encountered

Soil Survey Field Notes

Courtesy Pkwy Extension (From Old Covington Hwy to Flat Shoals Road)

Borings	Line	Station	Offset	Proposed Cut/Fill*, ft	Boring Depth, ft	Ground water table, ft	Lab Number	Field Moisture	GDOT	Field Soil Description and Comments	
S-13	Courtesy Pkwy	148+00	CL	4' Fill	BT at 5'	NE	6912	15.2%	**IIIC1**	0.0' to 5.0'	Tan/grey silty sand
S-14	Courtesy Pkwy	155+00	50' Rt	2' Cut	BT at 7'	NE	6912	11.2%	**IIIC1**	0.0' to 5.0'	Tan/grey silty sand
S-15	Courtesy Pkwy	160+00	CL	0'	BT at 5'	NE	6914	18.1%	**IIB4**	0.0' to 1.0' 1.0' to 5.0'	Tan/grey silty sand Brown mica silty sand
S-16	Courtesy Pkwy	165+00	30' Rt	0'	BT at 5'	NE	6916	14.2%	**IIIC2**	0.0' to 1.0' 1.0' to 5.0'	Tan/grey silty sand Brown mica silty sand
S-17	Courtesy Pkwy	170+00	30' Lt	0'	BT at 5'	NE	6916	25.1%	**IIIC2**	0.0' to 1.0' 1.0' to 5.0'	Brown mica silty sand Orange/Brown mica silty sand
S-18	Courtesy Pkwy	175+00	30' Rt	0'	BT at 5'	NE	6918	18.2%	**IIIC1**	0.0' to 5.0'	Brown mica silty sand

BT - Boring Termination
AR - Auger Refusal
HAR - Hand Auger Refusal
NE - Not Encountered

Soil Survey Field Notes

Courtesy Pkwy Extension (From Old Covington Hwy to Flat Shoals Road)

Borings	Line	Station	Distance to centerline	Proposed Cut/Fill*, ft	Boring Depth, ft	Ground water table, ft	Lab Number	Field Moisture	GDOT	Field Soil Description and Comments	
S-19	Flat Shoals	15+00	30' Lt	0'	BT at 5'	NE	6919	25.3%	**IIIC1**	0.0' to 5.0'	Tan/brown silty sand
S-20	Flat Shoals	25+00	30' Rt	0'	BT at 5'	NE	6919	16.7%	**IIIC1**	0.0' to 5.0'	Brown mica silty sand
S-21	Iris Dr. Conn.	32+00	CL	20' Fill	BT at 5'	NE	6920	12.0%	**IIB4**	0.0' to 1.0' 1.0' to 5.0'	Tan/grey silty sand Brown mica silty sand
S-22	Iris Dr. Conn.	36+00	CL	10' Fill	BT at 5'	NE	6922	20.5%	**IIB4**	0.0' to 5.0'	Brown mica silty sand

BT - Boring Termination
AR - Auger Refusal
HAR - Hand Auger Refusal
NE - Not Encountered

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

W-1: Sta. 135+25, 65' Rt. (Wall No. 1)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County, Georgia

CSSTP-0006-00(934) / PI No. 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/11/2019	SURFACE ELE.	: 813.25'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 48'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 30'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BOTTOM OF WALL	: 809'

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. 813.25	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0–2	812	CL		Brown, SILTY CLAY, firm, slightly moist	2-2-2	6		SS			
2–4	810				3-3-4	10		SS			
4–6	808	SM		Grey/brown, SILTY COARSE SAND, medium dense, slightly moist	4-4-4	11		SS			
6–8	806				3-6-6	17		SS			
8–10	804										
10–12	802										
12–14	800				5-5-5	14		SS			
14–16	798										
16–18	796										
18–20	794	SM		Grey, SILTY COARSE SAND, medium dense, slightly moist	3-4-5	13		SS			
20–22	792										
22–24	790				3-4-5	13		SS			
24–26	788										
26–28	786										
28–30	784				4-4-4	11		SS			▼
30–32	782										
32–34	780				6-7-8	21		SS			
34–36	778	SM		Grey/white, SILTY COARSE SAND, dense to very dense							
36–38	776										
38–40	774				8-10-16	36		SS			
40–42	772										
42–44	770										
44–46	768				50/6"	50/6"		SS			
46–48	766										
48–50	764			Auger refused at depth of 48' BGS							
50–52	762										
52–54	760										
54–56	758										
56–58	756										
58–60	754										

NOTE: SPT-N values have been corrected with 84% ER.

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

W-2: Sta. 137+00, 75' Rt (Wall No.1)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County, Georgia

CSSTP-0006-00(934) / PI No. 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/11/2019	SURFACE ELE.	: 816.71'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 53.5'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 38.5'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BOTTOM OF WALL	: 812.5'

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. 816.71	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0	816	CL		Brown, SILTY CLAY, firm ,slightly moist	2-2-3	7		SS			
2	814										
4	812	SM		Grey/brown, SILTY SAND, medium dense, slightly moist	3-4-5	13		SS			
6	810				4-4-4	11		SS			
8	808				6-7-8	21		SS			
10	806										
12	804										
14	802				4-5-5	14		SS			
16	800										
18	798	SM		Grey/brown, SILTY COARSE SAND, medium dense, moist	3-3-3	8		SS			
20	796										
22	794										
24	792				3-3-4	10		SS			
26	790										
28	788				3-3-3	8		SS			
30	786										
32	784										
34	782				4-6-7	18		SS			
36	780										
38	778				4-6-7	18		SS			▼
40	776	SM		Grey/white, SILTY COARSE SAND, dense to very dense							
42	774										
44	772				6-9-9	25		SS			
46	770										
48	768										
50	766				18-50/1"	50/1"		SS			
52	764										
54	762			Auger refused at depth of 53.5' BGS							
56	760										
58	758										
60											

NOTE: SPT-N values have been corrected with 84% ER.

11-17-2020 Q:\Rockdale County\Rock1701 Courtesy Parkway\Borings\W-2.bor

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

B-2: Sta. 137+65, 45' Rt (Bent 1 Right)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/11/2019	SURFACE ELE.	: 827.3'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 48'
DRILLING METHOD	: HSA / Auto Hammer	DEPTH TO WATER	: 35'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%			

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. 827.3	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0											
2	826	CL		Brown, SILTY CLAY, stiff, slightly moist	2-3-5	11		SS			
4	824				3-4-5	13		SS			
6	822				4-5-6	15		SS			
8	820	SM		Grey/white, SILTY COARSE SAND, medium dense, slightly moist	6-6-9	21		SS			
10	818										
12	816				8-8-10	25		SS			
14	814										
16	812	SM		Grey/orange, SILTY COARSE SAND, medium dense, moist	4-6-7	18		SS			
18	810										
20	808				7-8-10	25		SS			
22	806										
24	804				3-4-6	14		SS			
26	802										
28	800				2-3-4	10		SS			
30	798										▼
32	796				5-6-8	20		SS			
34	794										
36	792	SM		Grey/brown, SILTY COARSE SAND, very dense, PWR	50/4"	50/4"		SS			
38	790										
40	788										
42	786										
44	784										
46	782										
48	780			Auger refused at depth of 48' BGS							
50	778										
52	776										
54	774										

NOTE: SPT-N values have been corrected with 84% ER.

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

B-1: Sta. 137+65, 32' Lt (Bent 1 Left)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED : 7/11/2019
DRILL RIG : CME 550 (SN 8971)
DRILLING METHOD : HSA / Auto Hammer
DRILLER : Kilman Bros.
ENERGY EFFICIENCY: 84%

SURFACE ELE. : 833.3'
DEPTH OF BORING : 47'
DEPTH TO WATER : 38.5'
LOGGED BY : JP

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. 833.3	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0											
2	832	CL		Brown, SANDY CLAY, stiff to very stiff, slightly moist,	4-5-5	14		SS			
4	830				3-5-6	15		SS			
6	828				5-5-7	17		SS			
8	826	SM		Grey/brown, SILTY SAND, medium dense, slightly moist,	4-5-7	17		SS			
10	824										
12	822										
14	820				3-7-8	21		SS			
16	818										
18	816										
20	814				5-7-8	21		SS			
22	812	SM		Grey/orange, SILTY SAND, medium dense, slightly moist,							
24	810				4-4-4	11		SS			
26	808										
28	806				3-5-5	14		SS			
30	804										
32	802										
34	800				3-5-6	15		SS			
36	798	SM		Dark grey, SILTY SAND, loose,very moist							
38	796										▼
40	794				3-3-3	8		SS			
42	792	SM		Grey/white, SILTY COARSE SAND, very dense, PWR							
44	790				14-16-22	53		SS			
46	788										
48	786			Auger refused at depth of 47' BGS							
50	784										
52	782										
54	780										

NOTE: SPT-N values have been corrected with 84% ER

11-17-2020 Q:\Rockdale County\Rock1701 Courtesy Parkway\Borings\B-1.bor

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

W-3: Sta. 144+50, 30' Lt (Wall No. 2)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County, Georgia

CSSTP-0006-00(934) / PI No. 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/15/2019	SURFACE ELE.	: 803.57'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 43'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 29'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BOTTOM OF WALL	: 798.4'

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. 803.57	USCS	DESCRIPTION	Blow count	SPT-N60 Value	Sampler Type	Sample
0							
2	802	CL	Brown, SILTY CLAY, firm, slightly moist	3-3-4	10	SS	
4	800			3-3-3	8	SS	
6	798	SM	Grey/brown, SILTY SAND, medium dense, slightly moist	4-5-5	14	SS	
8	796						
10	794			5-5-5	14	SS	
12	792						
14	790			5-7-7	20	SS	
16	788	SM	Grey, SILTY COARSE SAND, loose to medium dense, slightly moist				
18	786						
20	784			3-3-3	8	SS	
22	782						
24	780			4-4-4	11	SS	
26	778						
28	776						
30	774			2-2-2	6	SS	
32	772	SM	Grey/white, SILTY COARSE SAND, dense to very dense				
34	770			11-13-15	39	SS	
36	768						
38	766						
40	764			50/3"	50/3"	SS	
42	762						
44	760		Auger refused at depth of 43ft BGS				
46	758						
48	756						
50	754						
52	752						
54	750						
56	748						
58	746						
60	744						

N60 Value Graph: 0 50 100

Moist, %

Water Level

NOTE: SPT-N values have been corrected with 84% ER.

11-17-2020 Q:\Rockdale County\Rock1701 Courtesy Parkway\Borings\W-3.bor

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

W-4: Sta. 142+50, 40' Lt (Wall No. 2)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County, Georgia

CSSTP-0006-00(934) / PI No. 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/15/2019	SURFACE ELE.	: 812.7'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 53'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 26'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BOTTOM OF WALL	: 812'

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. 812.7	USCS	DESCRIPTION	Blow count	SPT-N60 Value	Sampler Type	Sample
0	812	ML	Brown, CLAYEY SILT, very stiff, slightly moist	3-6-6	17	SS	
2	810						
4	808			5-7-7	18	SS	
6	806	CL	Grey/brown, SILTY CLAY, stiff, slightly moist	3-4-4	11	SS	
8	804	SM	Grey, SILTY SAND, loose, slightly moist	3-3-3	8	SS	
10	802						
12	800						
14	798			2-2-3	7	SS	
16	796						
18	794			3-3-3	8	SS	
20	792						
22	790						
24	788			4-2-3	7	SS	
26	786						
28	784			3-3-4	10	SS	
30	782	SM	Grey/brown, SILTY COARSE SAND,medium dense				
32	780						
34	778			6-8-9	24	SS	
36	776						
38	774			4-5-7	17	SS	
40	772						
42	770						
44	768			3-5-5	14	SS	
46	766						
48	764			5-5-7	17	SS	
50	762						
52	760						
54	758						
56	756						
58	754						
60							

N60 Value Graph: 0 50 100

Moist, %

Water Level

Auger refused at depth of 53ft BGS

NOTE: SPT-N values have been corrected with 84% ER.

11-17-2020 Q:\Rockdale County\Rock1701 Courtesy Parkway\Borings\W-4.bor

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(770)-2635945

B-7: Sta. 140+78, 45' Lt (Bent 4 Left)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/16/2019	SURFACE ELE.	: 817.2'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 40'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 24'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%			

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. 817.2	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0–2	816	CL		Orange, SILTY CLAY, stiff, slightly moist	3-5-6	15		SS			
2–4	814	SM		Grey/brown, SILTY SAND, medium dense, slightly moist	4-4-4	11		SS			
4–6	812				5-5-5	14		SS			
6–8	810				3-5-5	14		SS			
8–10	808										
10–12	806				4-4-4	11		SS			
12–14	804										
14–16	802				3-3-4	10		SS			
16–18	800										
18–20	798				6-6-7	18		SS			▼
20–22	796	SM		Dark grey, SILTY COARSE SAND, medium dense, slightly moist							
22–24	794										
24–26	792	SM		Grey/brown/white, SILTY COARSE SAND, very dense, PWR	50/1"	50/1"		SS			
26–28	790										
28–30	788				50/2"	50/2"		SS			
30–32	786										
32–34	784										
34–36	782				50/2"	50/2"		SS			
36–38	780										
38–40	778										
40–42	776			Auger refused at depth of 40' BGS							
42–44	774										
44–46	772										
46–48	770										
48–50	768										
50–52	766										
52–54	764										

NOTE: SPT-N values have been corrected with 84% ER

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

B-8: Sta. 140+78, 35' Rt (Bent 4 Right)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County. Georgia

CSSTP-0006-00(934) / PI 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/16/2019	SURFACE ELE.	: 814.4'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 33'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 24'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%			

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. 814.4	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0, 50, 100)	Sampler Type	Sample	Moist, %	Water Level
0	814	CL		Brown, SILTY CLAY, firm, slightly moist	3-3-3	8		SS			
2	812										
4	810	SM		Grey, SILTY SAND, loose to medium dense, slightly moist	6-4-4	11		SS			
6	808				4-5-7	17		SS			
8	806										
10	804				4-4-4	11		SS			
12	802										
14	800				6-5-3	11		SS			
16	798										
18	796				2-3-3	8		SS			
20	794										
22	792										
24	790				5-6-6	17		SS			▼
26	788	SM		Grey/brown, SILTY COARSE SAND, very dense, moist,							
28	786				50/5"	50/5"		SS			
30	784										
32	782			Auger refused at depth of 33' BGS							
34	780										
36	778										
38	776										
40	774										
42	772										
44	770										
46	768										
48	766										
50	764										
52	762										
54											

NOTE: SPT-N values have been corrected with 84% ER

ATLAS
TECHNICAL CONSULTANTS
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(770)-2635945

W-5: Sta. 143+50, 55' Rt (Wall No. 2)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County, Georgia

CSSTP-0006-00(934) / PI No. 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/16/2019	SURFACE ELE.	: 803.97'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 49'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 26'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BOTTOM OF WALL	: 800.2'

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. 803.97	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0, 50, 100)	Sampler Type	Sample	Moist, %	Water Level
0											
2	802	CL		Brown, SILTY CLAY, stiff, slightly moist	3-3-4	10		SS			
4	800				3-3-4	10		SS			
6	798				4-3-5	11		SS			
8	796	SM		Grey/brown, SILTY SAND, medium dense, slightly moist	5-5-7	17		SS			
10	794										
12	792										
14	790				5-7-9	22		SS			
16	788										
18	786										
20	784				3-3-5	11		SS			
22	782	SM		Grey, SILTY COARSE SAND, loose to medium dense, slightly moist							
24	780				3-3-6	13		SS			
26	778										▼
28	776				4-3-3	8		SS			
30	774										
32	772										
34	770				12-10-9	27		SS			
36	768	SM		Grey/white, SILTY COARSE SAND, very dense							
38	766										
40	764				12-23-22	63		SS			
42	762										
44	760				20-26-50/5"	50/5"		SS			
46	758										
48	756										
50	754			Auger refused at depth of 49ft BGS							
52	752										
54	750										
56	748										
58	746										
60	744										

NOTE: SPT-N values have been corrected with 84% ER.

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W-6: Sta. 145+50, 60' Rt (Wall No. 2)

Courtesy Parkway Extension
Over Iris Dr., I-20 and Dogwood Dr.
Rockdale County, Georgia

CSSTP-0006-00(934) / PI No. 0006934

Atlas Proj. No.: ROCK1701

DATE COMPLETED	: 7/16/2019	SURFACE ELE.	: 807.73'
DRILL RIG	: CME 550 (SN 8971)	DEPTH OF BORING	: 46'
DRILLING METHOD	: HSA / Auto hammer	DEPTH TO WATER	: 30'
DRILLER	: Kilman Bros.	LOGGED BY	: JP
ENERGY EFFICIENCY: 84%		BOTTOM OF WALL	: 805'

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. 807.73	USCS	GRAPHIC	DESCRIPTION	Blow count	SPT-N60 Value	N60 Value Graph (0 50 100)	Sampler Type	Sample	Moist, %	Water Level
0–2	806	CL		Brown, SILTY CLAY, firm, slightly moist	3-2-2	6		SS			
2–4	804				3-3-2	7		SS			
4–6	802				4-3-3	8		SS			
6–8	800	SM		Grey/brown, SILTY SAND, medium dense, slightly moist	5-5-4	13		SS			
8–10	798										
10–12	796				8-9-7	22		SS			
12–14	794										
14–16	792				5-5-5	14		SS			
16–18	790										
18–20	788	SM		Grey, SILTY COARSE SAND, loose to medium dense, slightly moist	3-5-6	15		SS			
20–22	786										
22–24	784				5-8-7	21		SS			▼
24–26	782										
26–28	780				12-10-8	25		SS			
28–30	778										
30–32	776										
32–34	774	SM		Grey/white, SILTY COARSE SAND, very dense	12-12-11	31		SS			
34–36	772										
36–38	770										
38–40	768										
40–42	766										
42–44	764				50/5"	50/5"		SS			
44–46	762			Auger refused at depth of 46ft BGS							
46–48	760										
48–50	758										
50–52	756										
52–54	754										
54–56	752										
56–58	750										
58–60	748										

NOTE: SPT-N values have been corrected with 84% ER.

Appendix C – Summary of Lab Tests

Summary of Soil Laboratory Tests

Project Name:	**Courtesy Parkway Extension (From Old Covington Hwy to Flat Shoals Road)**				
GDOT Project No.:	**CSSTP-0006-00(934)**				
GDOT P.I. No.:	**0006934**				
MA Project No.:	**ROCK1701**				
Sample location:	Station 100+50, S-1	Station 106+00, S-2	Station 115+00, S-4	Station 117+00, S-5	Station 117+00, S-5
Sample depth:	1' to 5'	1' to 5'	1' to 5'	1' to 5'	10' to 15'
Lab No.:	6911	6924	6920	6922-A	6922-B
Date sampled:	7/15/2019	7/15/2019	7/15/2019	7/12/2019	7/12/2019
Date tested:	8/9/2019	8/9/2019	7/30/2019	7/30/2019	7/30/2019
Soil description:	Orange mica silt sand	Brn mica silt sand	Tan silty clayey sand	Brn mica silty sand	Grey/tan silty clayey sand
% Passing No. 10:	98.6	98.9	98.5	95.6	90.9
% Passing No. 20:	89.8	86.7	86.4	84.1	76.8
% Passing No. 40:	77.3	69.8	69.6	66.6	65.0
% Passing No. 60:	65.5	58.8	58.7	51.5	59.5
% Passing No. 100:	48.9	47.2	46.4	49.5	52.8
% Passing No. 200:	36.0	37.6	38.9	36.7	48.5
% Clay:	20.4	18.7	22.0	25.6	33.2
D_{75} (mm)	0.383	0.526	0.531	0.593	0.765
Total volume change:	40.6	33.6	17.4	16.2	17.4
% Swell:	38.2	20.7	15.3	13.3	13.4
% Shrinkage:	2.4	12.9	2.1	2.9	4.0
Max. Dry Density (pcf):	94.0	106.0	111.4	106.9	101.7
% Optimal Moisture:	23.4	16.6	14.3	15.6	18.7
Liquid Limit:		48		54	
Plastic Limit:		32		37	
Plasticity Index:		16		14	
Erosion index	5.71	5.58	5.46	5.71	4.23
CBR					
Resistivity					
In-situ Moist Content, %	28.3%	24.0%	18.2%	17.8%	14.1%
Ph					
Organic					
GDOT Class:	**IIIC3**	**IIIC2**	**IIB3**	**IIB3**	**IIB4**

Remarks: GDOT Methods GDT-4, GDT-6, GDT-67

Summary of Soil Laboratory Tests

Project Name:	**Courtesy Parkway Extension (From Old Covington Hwy to Flat Shoals Road)**				
GDOT Project No.:	**CSSTP-0006-00(934)**				
GDOT P.I. No.:	**0006934**				
MAAI Project No.:	**ROCK1701**				
Sample location:	Station 120+00, S-6	Station 123+00, S-7	Station 131+00, S-9	Station 150+00, S-13	
Sample depth:	1' to 5'	1' to 8'	1' to 5'	1' to 5'	
Lab No.:	6923	6921	6925	6912	
Date sampled:	7/17/2019	7/17/2019	7/17/2019	7/17/2019	
Date tested:	7/26/2019	7/26/2019	8/9/2019	7/26/2019	
Soil description:	Red silty clayey sand	Brn mica silty clay	Brn mica silty sand	Tan/grey silty sand	
% Passing No. 10:	95.9	95.9	98.9	98.6	
% Passing No. 20:	82.5	84.3	92.9	91.3	
% Passing No. 40:	68.5	75.1	82.0	73.1	
% Passing No. 60:	62.0	70.4	74.1	53.2	
% Passing No. 100:	52.5	64.2	54.5	32.8	
% Passing No. 200:	43.8	58.4	38.0	19.2	
% Clay:	21.8	39.7	32.7	4.5	
D_{75} (mm)	0.586	0.420	0.266	0.457	
Total volume change:	33.1	33.9	41.2	29.8	
% Swell:	31.4	30.1	28.1	28.6	
% Shrinkage:	1.7	3.8	13.2	1.2	
Max. Dry Density (pcf):	102.4	94.2	99.2	94.7	
% Optimal Moisture:	18.4	23.3	21.3	22.9	
Liquid Limit:	57	69			
Plastic Limit:	44	43			
Plasticity Index:	23	26			
Erosion index	4.84	3.00	5.46	7.79	
CBR					
Resistivity					
In-situ Moist Content, %	15.4%	18.9%	18.2%	15.2%	
Ph					
Organic					
GDOT Class:	**IIIC2**	**IIIC2**	**IIIC3**	**IIIC1**	

Remarks: GDOT Methods GDT-4, GDT-6, GDT-67

Summary of Soil Laboratory Tests

Project Name:	**Courtesy Parkway Extension (From Old Covington Hwy to Flat Shoals Road)**				
GDOT Project No.:	**CSSTP-0006-00(934)**				
GDOT P.I. No.:	**0006934**				
MAAI Project No.:	**ROCK1701**				
Sample location:	Station 160+00, S-15	Station 170+00, S-17	Station 175+00, S-18	Flat Shoals 25+00, S-20	Iris Dr. Sta. 36+00, S-22
Sample depth:	1' to 5'	1' to 5'	1' to 5'	1' to 5'	1' to 5'
Lab No.:	6914	6916	6918	6919	6920
Date sampled:	7/7/2019	7/7/2019	7/7/2019	7/7/2019	7/12/2019
Date tested:	7/26/2019	7/26/2019	8/9/2019	8/9/2019	8/9/2019
Soil description:	Brn mica silty sand	Org/brn mica silty sand	Brn mica silty sand	Brn mica silty sand	Brn mica silty sand
% Passing No. 10:	94.5	97.7	95.5	92.5	96.5
% Passing No. 20:	83.4	88.7	85.2	79.8	84.7
% Passing No. 40:	67.5	75.6	66.3	67.3	66.7
% Passing No. 60:	56.4	66.5	57.4	57.3	51.6
% Passing No. 100:	45.1	54.3	55.1	45.4	44.1
% Passing No. 200:	36.4	42.9	39.6	33.6	34.8
% Clay:	21.0	20.1	18.5	15.9	19.7
D_{75} (mm)	0.589	0.410	0.585	0.651	0.585
Total volume change:	19.6	30.6	25.8	27.8	16.5
% Swell:	17.7	29.3	23.9	25.4	14.2
% Shrinkage:	1.9	1.3	1.9	2.4	2.3
Max. Dry Density (pcf):	103.2	97.5	98.4	95.4	101.1
% Optimal Moisture:	17.9	21.2	20.6	18.5	15.6
Liquid Limit:		55	58		
Plastic Limit:		31	32		
Plasticity Index:		24	26		
Erosion index	5.71	4.96	5.33	6.07	5.95
CBR					
Resistivity					
In-situ Moist Content, %	18.1%	25.1%	18.2%	16.7%	20.5%
Ph					
Organic					
GDOT Class:	**IIB4**	**IIIC2**	**IIIC1**	**IIIC1**	**IIB4**

Remarks: GDOT Methods GDT-4, GDT-6, GDT-67

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*100+50, S-1*	Sample Number:	6911	Sample Depth:	*1'-5'*
Date Sampled:	*7/15/2019*	Sampled By:	*Jason*		
Date Tested:	*8/9/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Orange Mica silty csand*				

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	*98.6*
No.20	0.3346	0.85	*89.8*
No.40	0.1673	0.425	*77.3*
No.60	0.0984	0.25	*65.5*
No.100	0.0591	0.15	*48.9*
No.200	0.0295	0.075	*36.0*
% Clay	0.0079	0.02	20.4

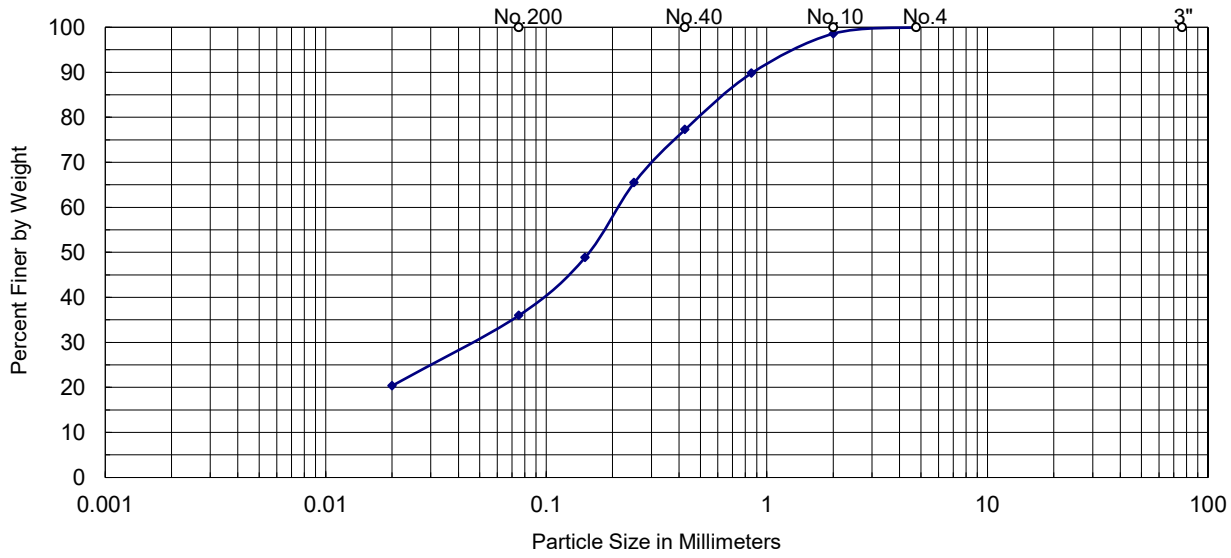
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.3832
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	94.0
Volume Change, %	40.6

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC3**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*150+00, S-13*	Sample Number:	6912	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*7/26/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Tan/grey 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	*98.6*
No.20	0.3346	0.85	*91.3*
No.40	0.1673	0.425	*73.1*
No.60	0.0984	0.25	*53.2*
No.100	0.0591	0.15	*32.8*
No.200	0.0295	0.075	*19.2*
% Clay	0.0079	0.02	4.5

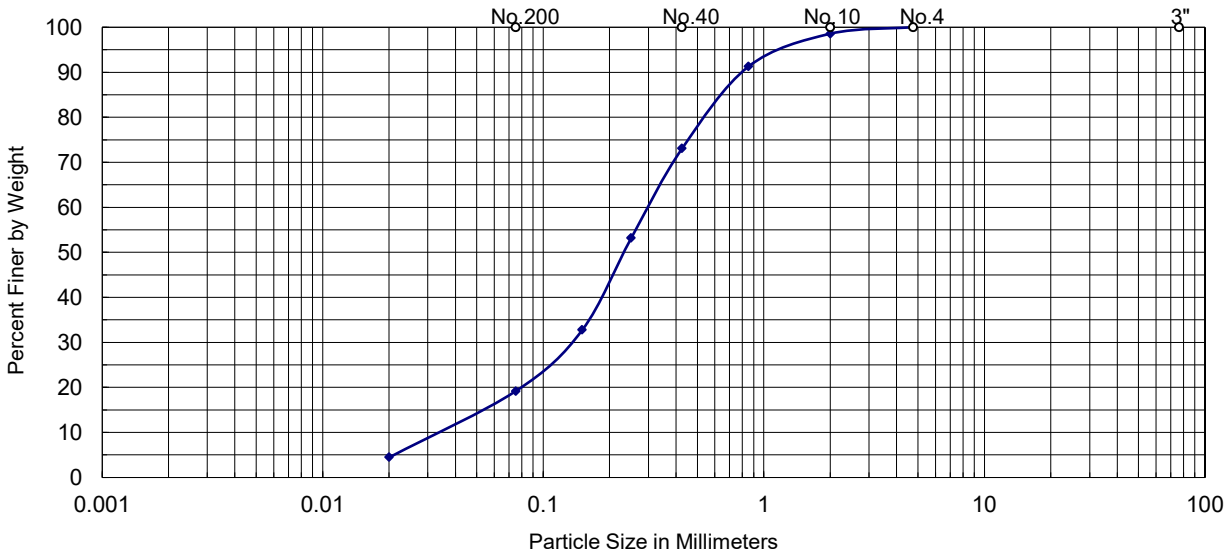
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.4570
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	94.7
Volume Change, %	29.8

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC1**

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*160+00, S-15*	Sample Number:	6914	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*7/26/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brn mica 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	*94.5*
No.20	0.3346	0.85	*83.4*
No.40	0.1673	0.425	*67.5*
No.60	0.0984	0.25	*56.4*
No.100	0.0591	0.15	*45.1*
No.200	0.0295	0.075	*36.4*
% Clay	0.0079	0.02	21

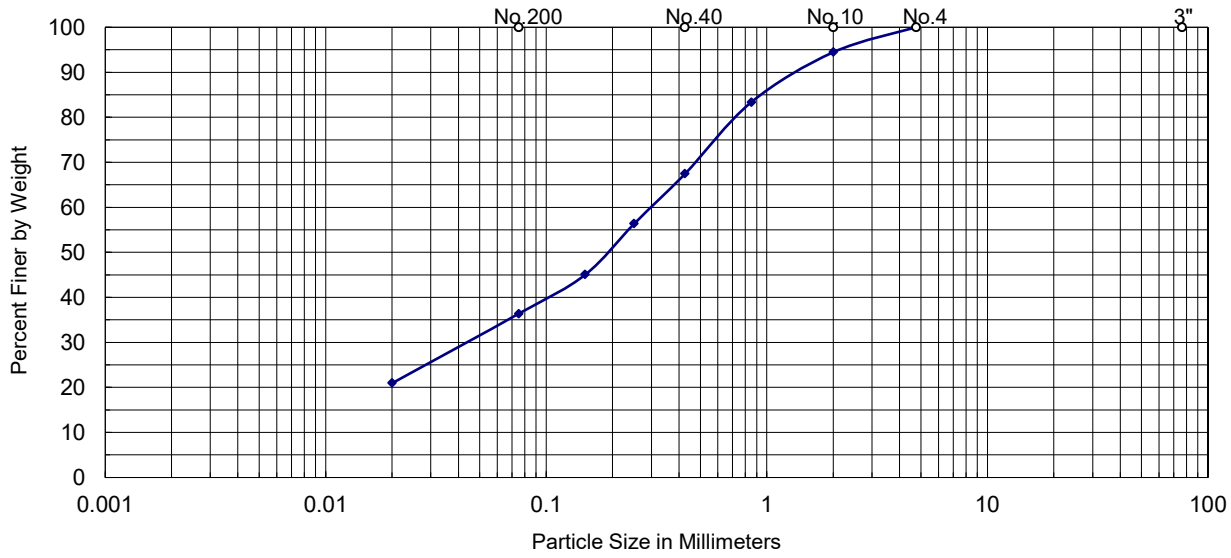
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5890
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	103.2
Volume Change, %	19.6

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIB4**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*170+00, S-17*	Sample Number:	6916	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*7/26/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Org/ Brn mica 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	*97.7*
No.20	0.3346	0.85	*88.7*
No.40	0.1673	0.425	*75.6*
No.60	0.0984	0.25	*66.5*
No.100	0.0591	0.15	*54.3*
No.200	0.0295	0.075	*42.9*
% Clay	0.0079	0.02	20.1

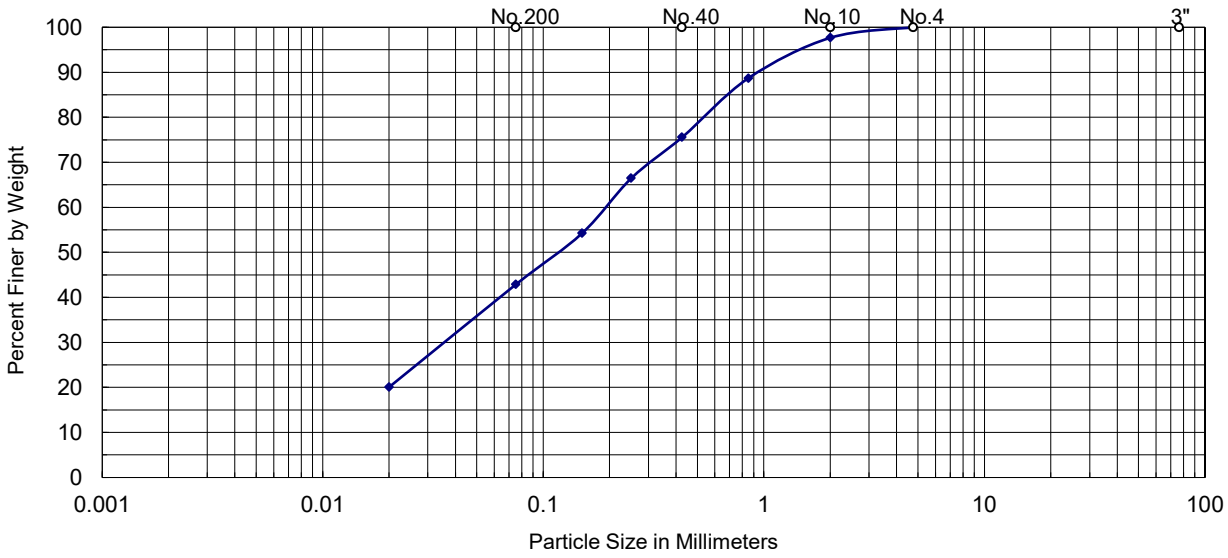
Atterberg Limits

Liquid limit (LL)	*55*
Plastic Limit (PL)	*31*
Plasticity Index (PI)	*24*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.4100
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	97.5
Volume Change, %	30.6

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC2**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*175+00, S-18*	Sample Number:	6918	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*8/9/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brn mica 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	*95.5*
No.20	0.3346	0.85	*85.2*
No.40	0.1673	0.425	*66.3*
No.60	0.0984	0.25	*57.4*
No.100	0.0591	0.15	*55.1*
No.200	0.0295	0.075	*39.6*
% Clay	0.0079	0.02	18.5

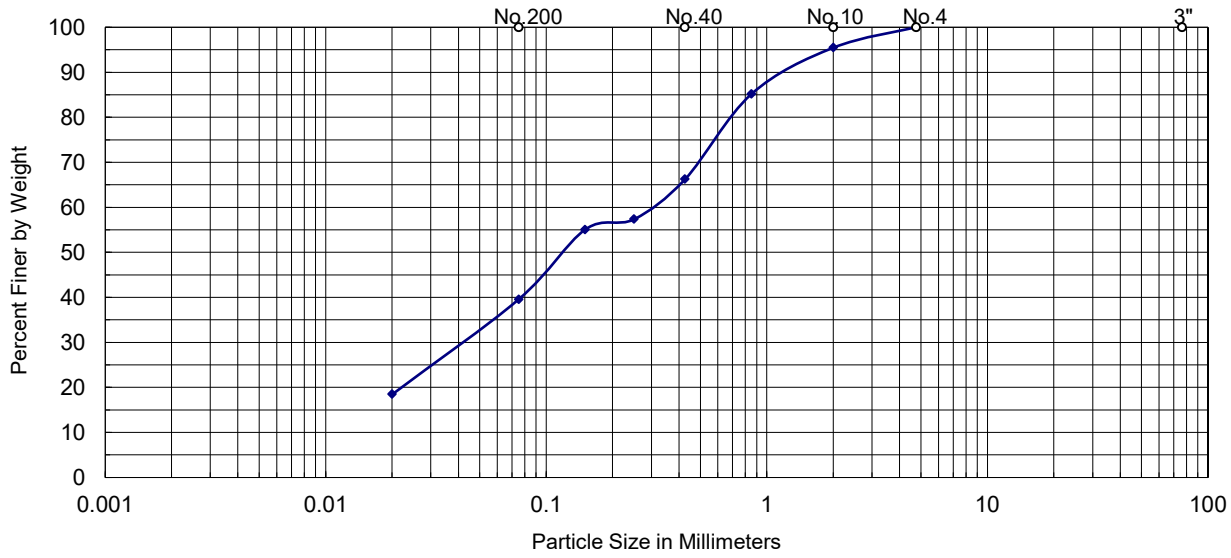
Atterberg Limits

Liquid limit (LL)	*58*
Plastic Limit (PL)	*32*
Plasticity Index (PI)	*26*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5850
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	98.4
Volume Change, %	25.8

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC1**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*25+00, S-20*	Sample Number:	6919	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*8/9/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brn mica 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	*92.5*
No.20	0.3346	0.85	*79.8*
No.40	0.1673	0.425	*67.3*
No.60	0.0984	0.25	*57.3*
No.100	0.0591	0.15	*45.4*
No.200	0.0295	0.075	*33.6*
% Clay	0.0079	0.02	15.9

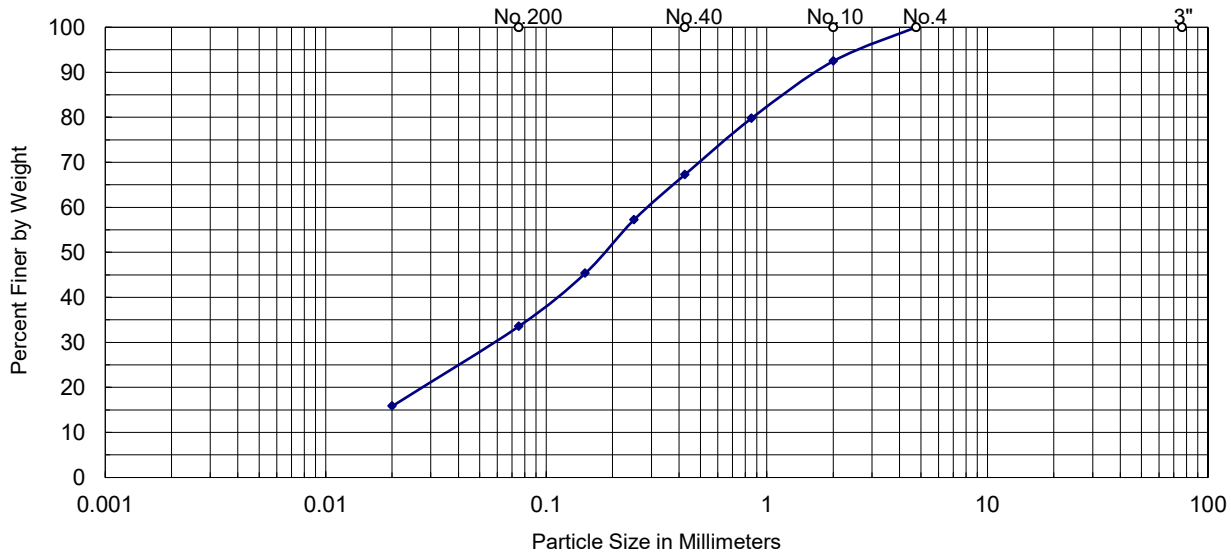
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.6510
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	95.4
Volume Change, %	27.8

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC1**

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*406+00*	Sample Number:	6920	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*8/9/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brn mica 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	*96.5*
No.20	0.3346	0.85	*84.7*
No.40	0.1673	0.425	*66.7*
No.60	0.0984	0.25	*51.6*
No.100	0.0591	0.15	*44.1*
No.200	0.0295	0.075	*34.8*
% Clay	0.0079	0.02	19.7

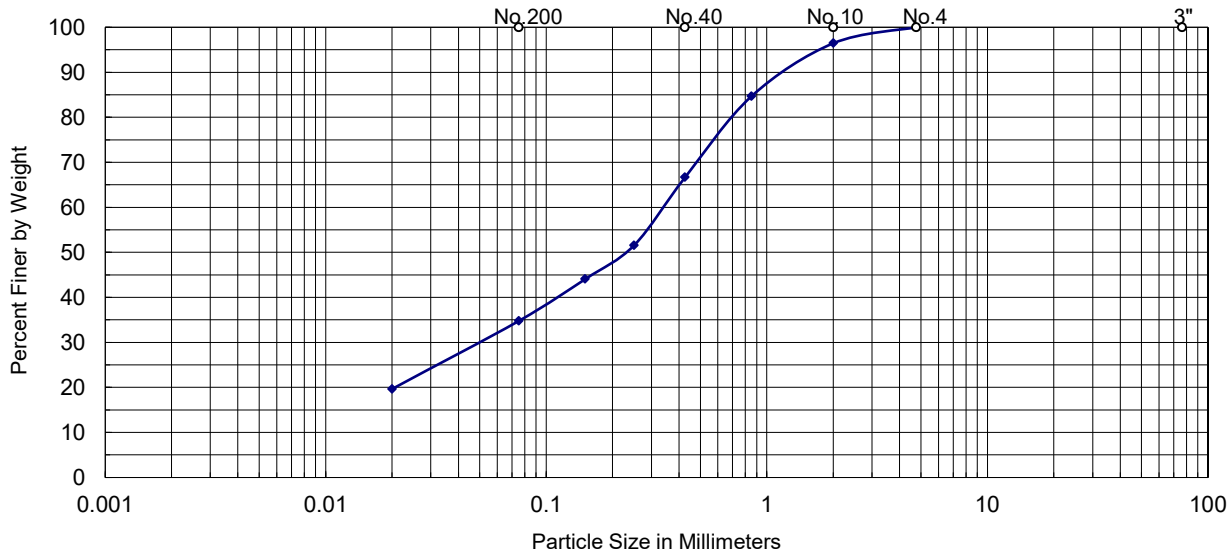
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5850
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	101.1
Volume Change, %	16.5

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIB4**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*123+00, S-7*	Sample Number:	6921	Sample Depth:	*1'-8'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*7/26/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brown Mica silty 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	*95.9*
No.20	0.3346	0.85	*84.3*
No.40	0.1673	0.425	*75.1*
No.60	0.0984	0.25	*70.4*
No.100	0.0591	0.15	*64.2*
No.200	0.0295	0.075	*58.4*
% Clay	0.0079	0.02	39.7

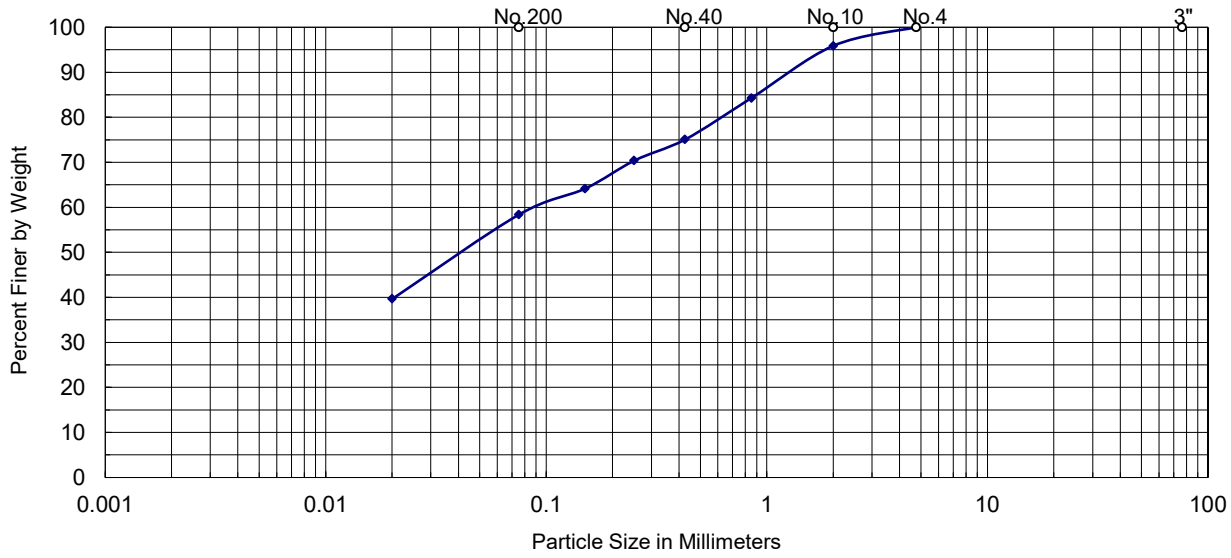
Atterberg Limits

Liquid limit (LL)	*69*
Plastic Limit (PL)	*43*
Plasticity Index (PI)	*26*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.4200
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	94.2
Volume Change, %	33.9

Grain size distribution



Soil Classification

AASHTO	
USCS	MH - Sandy elastic silt
GDOT	**IIIC2**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*117+00, S-5*	Sample Number:	6922-A	Sample Depth:	*1'-5'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jason*		
Date Tested:	*7/30/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brn Mica 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	*95.6*
No.20	0.3346	0.85	*84.1*
No.40	0.1673	0.425	*66.6*
No.60	0.0984	0.25	*51.5*
No.100	0.0591	0.15	*49.5*
No.200	0.0295	0.075	*36.7*
% Clay	0.0079	0.02	25.6

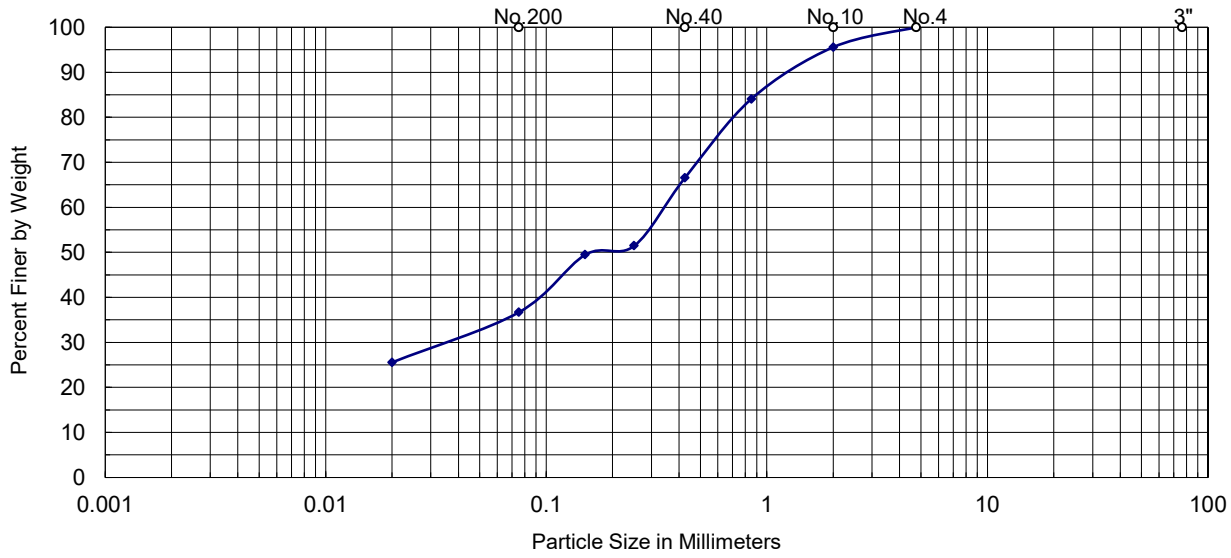
Atterberg Limits

Liquid limit (LL)	*54*
Plastic Limit (PL)	*37*
Plasticity Index (PI)	*17*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5930
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	106.9
Volume Change, %	16.2

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIB3**

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Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*117+00, S-5*	Sample Number:	6922-B	Sample Depth:	*10'-15'*
Date Sampled:	*7/12/2019*	Sampled By:	*Jason*		
Date Tested:	*7/30/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Grey/tan silty 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	*90.9*
No.20	0.3346	0.85	*76.8*
No.40	0.1673	0.425	*65.0*
No.60	0.0984	0.25	*59.5*
No.100	0.0591	0.15	*52.8*
No.200	0.0295	0.075	*48.5*
% Clay	0.0079	0.02	33.2

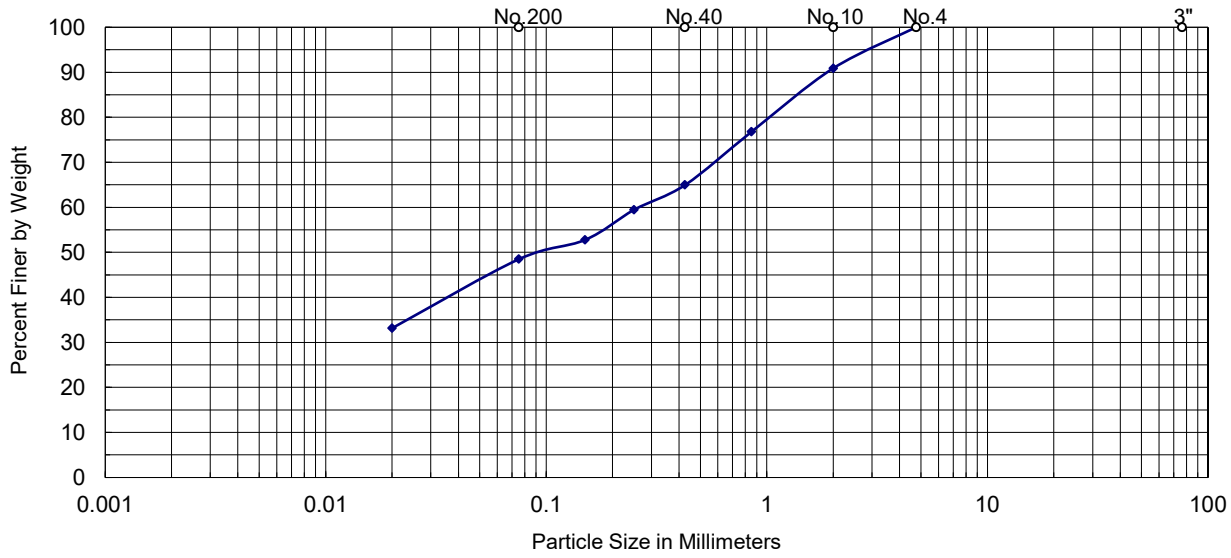
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.7650
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	101.7
Volume Change, %	17.4

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIB4**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*120+00, S-6*	Sample Number:	6923	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*7/26/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Red silty 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	*95.9*
No.20	0.3346	0.85	*82.5*
No.40	0.1673	0.425	*68.5*
No.60	0.0984	0.25	*62.0*
No.100	0.0591	0.15	*52.5*
No.200	0.0295	0.075	*43.8*
% Clay	0.0079	0.02	21.8

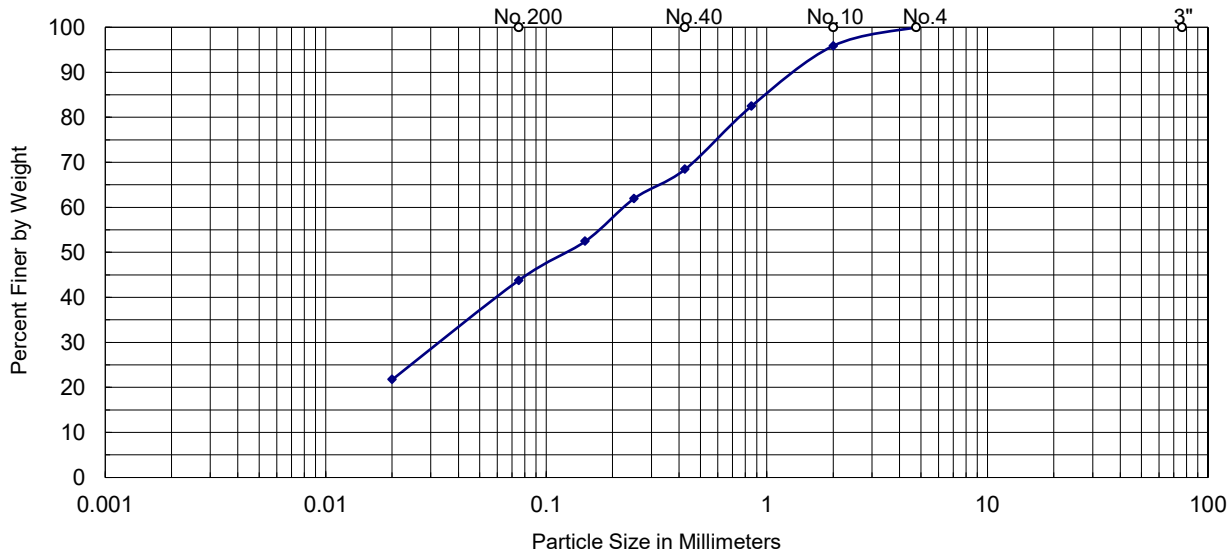
Atterberg Limits

Liquid limit (LL)	*57*
Plastic Limit (PL)	*44*
Plasticity Index (PI)	*13*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5860
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	102.4
Volume Change, %	33.1

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC2**

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Duluth, Georgia 30096
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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*106+00, S-2*	Sample Number:	6924	Sample Depth:	*1'-5'*
Date Sampled:	*7/15/2019*	Sampled By:	*Jason*		
Date Tested:	*8/9/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brown Mica silty csand*				

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	*98.9*
No.20	0.3346	0.85	*86.7*
No.40	0.1673	0.425	*69.8*
No.60	0.0984	0.25	*58.8*
No.100	0.0591	0.15	*47.2*
No.200	0.0295	0.075	*37.6*
% Clay	0.0079	0.02	18.7

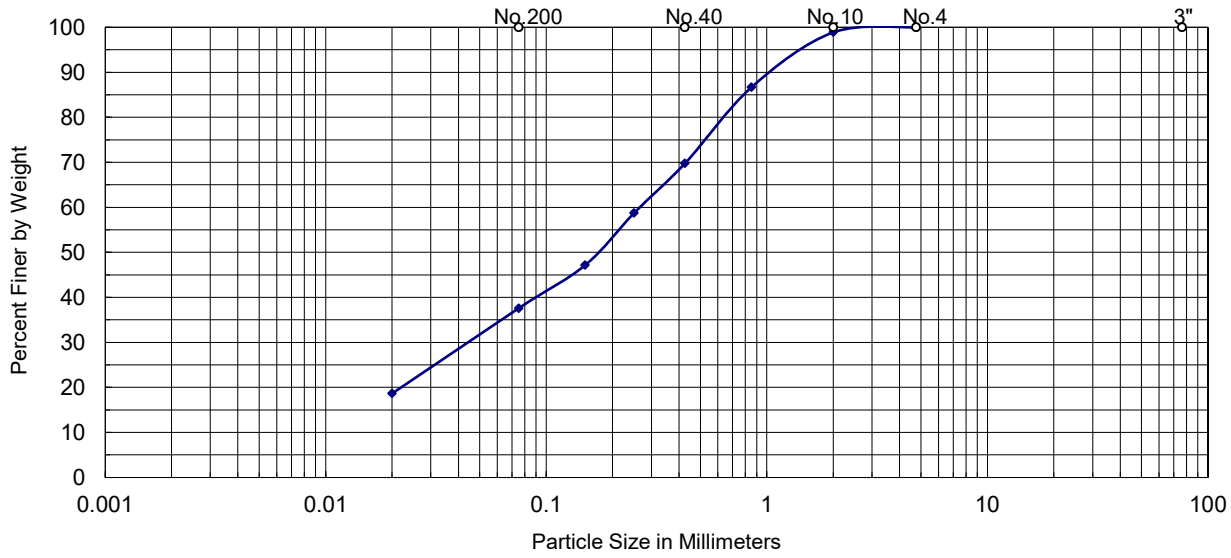
Atterberg Limits

Liquid limit (LL)	*48*
Plastic Limit (PL)	*32*
Plasticity Index (PI)	*16*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5260
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	106.0
Volume Change, %	33.6

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC2**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*131+00, S-9*	Sample Number:	6925	Sample Depth:	*1'-5'*
Date Sampled:	*7/17/2019*	Sampled By:	*Jason*		
Date Tested:	*8/9/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Brown Mica 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	*98.9*
No.20	0.3346	0.85	*92.9*
No.40	0.1673	0.425	*82.0*
No.60	0.0984	0.25	*74.1*
No.100	0.0591	0.15	*54.5*
No.200	0.0295	0.075	*38.0*
% Clay	0.0079	0.02	32.7

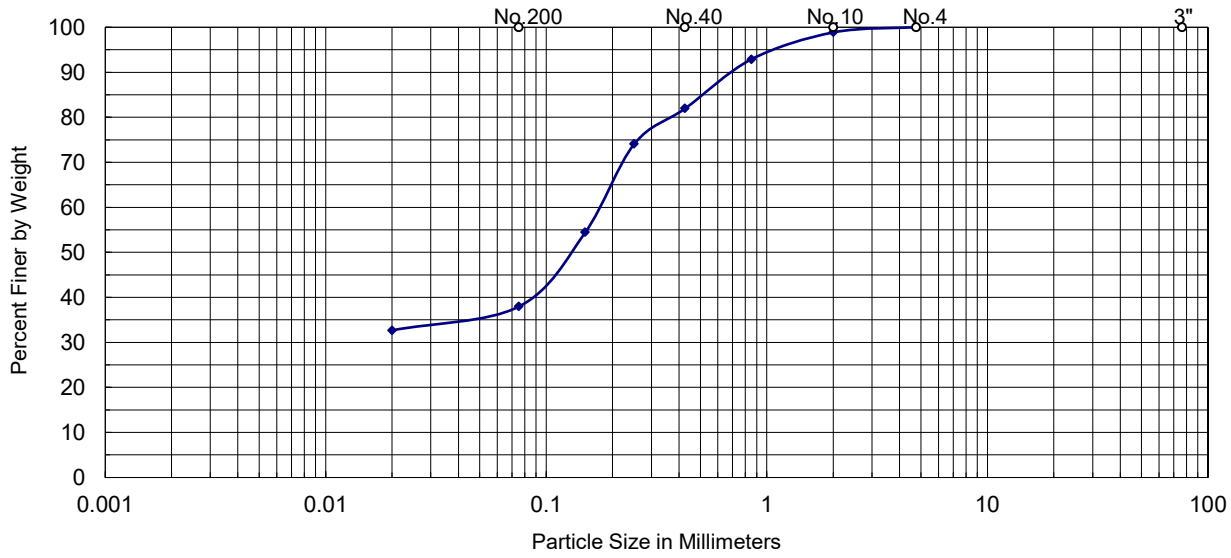
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.2660
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	99.2
Volume Change, %	41.2

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIIC3**

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Fax: 770-263-0166

Soil Classification

Project Name:	*Courtsey Pkwy*			Project Number:	*ROCK1701*
Sample Location:	*115+00, S-4*	Sample Number:	6920	Sample Depth:	*1'-5'*
Date Sampled:	*7/15/2019*	Sampled By:	*Jason*		
Date Tested:	*7/30/2019*	Tested By:	*Jay Shah*		
Sample Description:	*Tan silty 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	*98.5*
No.20	0.3346	0.85	*86.4*
No.40	0.1673	0.425	*69.6*
No.60	0.0984	0.25	*58.7*
No.100	0.0591	0.15	*46.4*
No.200	0.0295	0.075	*38.9*
% Clay	0.0079	0.02	22

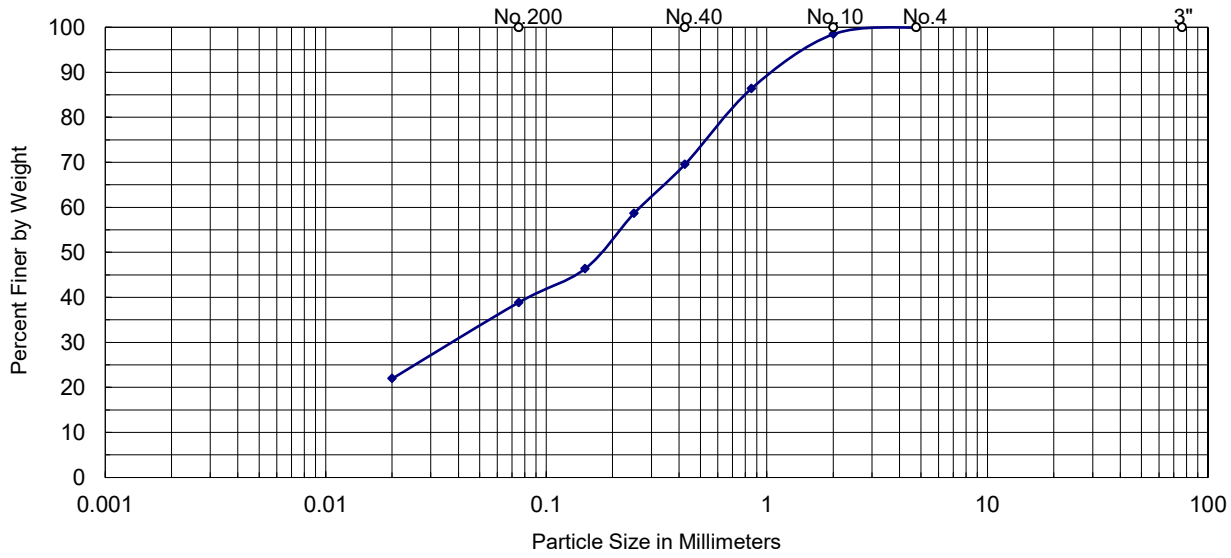
Atterberg Limits

Liquid limit (LL)	
Plastic Limit (PL)	
Plasticity Index (PI)	*0*

D_{10} (mm) =	0.0000
D_{30} (mm) =	0.0000
D_{75} (mm) =	0.5310
Coefficient of Uniformity, C_u =	1000.00
Coefficient of ccurvature, C_c =	1000.00

Organic Content, %	0
Maximum Dry Density,pcf	111.4
Volume Change, %	17.4

Grain size distribution



Soil Classification

AASHTO	
USCS	SM - Silty sand
GDOT	**IIB3**

Analytical Environmental Services, Inc

Date: 23-Jun-19

Client: Atlas Technical Consultants
Project: Courtesy Pkwy, Rockdale County
Lab ID: 2005H52

Case Narrative

pH Analysis by Method E150.1/SM4500 H+ B:

Samples for pH analysis by Method E150.1/SM4500 H+ B were received and analyzed outside holding time requirement of "immediate or 15 minutes."

Analytical Environmental Services, Inc **Date:** 23-Jun-19

Client:	Atlas Technical Consultants	**Client Sample ID:**	ROCK US
Project Name:	Courtesy Pkwy, Rockdale County	**Collection Date:**	6/15/2019 5:30:00 PM
Lab ID:	2005H52-001	**Matrix:**	Surface Water

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Resistivity SW9050A								
Resistivity (@100% Moisture Saturation)	15,121	0		ohms-cm	R428420	1	06/22/2019 13:25	SK
Hydrogen Ion (pH) by SM4500H+B								
pH	6.95	0.0100	H	pH Units	R428059	1	06/17/2019 13:21	SK

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 23-Jun-19

Client:	Atlas Technical Consultants	**Client Sample ID:**	ROCK DS
Project Name:	Courtesy Pkwy, Rockdale County	**Collection Date:**	6/15/2019 5:50:00 PM
Lab ID:	2005H52-002	**Matrix:**	Surface Water

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Resistivity SW9050A								
Resistivity (@100% Moisture Saturation)	12,660	0		ohms-cm	R428420	1	06/22/2019 13:25	SK
Hydrogen Ion (pH) by SM4500H+B								
pH	6.74	0.0100	H	pH Units	R428059	1	06/17/2019 13:24	SK

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit