FINAL REPORT
STRUCTURE FOUNDATION EXPLORATION
BRIDGE NO. CUY-90-1696
RETAINING WALL AF, AH, & AI
CUY-90-16.28 (CCG3A)
CUYAHOGA COUNTY, OHIO
PID#: 82382

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NEAS PROJECT 21-0011

May 20, 2024

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1. INTRODUCTION

1.1. General

National Engineering & Architectural Services, Inc. (NEAS) presents our Structure Foundation Exploration Report for the proposed Bridge CUY-90-1696 (Bridge 14) structure and associated retaining walls, Retaining Walls AF, AH & AI (RW-AF, RW-AH and RW-AI), as part of the proposed Ohio Department of Transportation (ODOT) project CCG3A (CUY-90-16.28, PID 82382) in the City of Cleveland, Cuyahoga County, Ohio. The overall project objective is to reconstruct and improve the IR-77/IR-90 interchange, IR-90 and associated surface streets within the project limits. As part of the planned improvements, IR-90 is proposed to be widened and to facilitate the widening, the existing Bridge CUY-90-1696 carrying Carnegie Avenue (Ave) over IR-90 is required to be replaced with a lengthened structure. Furthermore, the construction of three associated retaining walls (RW-AF, RW-AH and RW-AI) are also required. This report presents a summary of the encountered surficial and subsurface conditions and our recommendations for bridge and retaining wall foundation design and construction in accordance with Load and Resistance Factor Design (LRFD) method as set forth in AASHTO's Publication *LRFD Bridge Design Specifications, 9th Edition* (BDS) (AASHTO, 2020) and the 2021 revision of *ODOT's Bridge Design Manual 2020 Edition* (BDM) (ODOT [1], 2021).

The exploration was conducted in general accordance with Barr Engineering, Inc. DBA National Engineering & Architectural Services, Inc.'s (formerly Barr & Prevost) proposal to Michael Baker International (Baker) dated June 11, 2014, subsequent Modification 7 (MOD 7) proposal to Baker dated October 12, 2020 and with the provisions of the July 2014 (ODOT, 2014) and January 2021 (ODOT, 2021) revisions of ODOT's *Specifications for Geotechnical Explorations* (SGE) for the initial project exploration and the MOD 7 exploration, respectively.

The scope of work performed by NEAS as part of the CCG3A project included: 1) a review of published geotechnical information; 2) performing 182 total test soil borings (9 utilized within this report as a part of the indicated structure foundation exploration); 3) performing 30 total cone penetration test (CPT) sounding; 4) laboratory testing of soil samples in accordance with the SGE; 5) performing geotechnical engineering analysis to assess foundation design and construction considerations; and, 6) development of this summary report.

1.2. Proposed Construction

The existing Bridge CUY-90-1696 consists of a two-span, continuous steel beam bridge originally built in 1958. The referenced bridge carries Carnegie Ave over IR-90 and is about 190 ft in length (abutment to abutment) with an approximate roadway width of 56 ft (curb to curb). The structure carries four lanes of traffic and a turn lane on a reinforced concrete bridge deck supported by concrete abutments. As IR-90 is planned to be widened as part of the CCG3A project, Bridge CUY-90-1696 is planned to be replaced with a lengthened structure to traverse the new IR-90 alignment. Based on the available Stage 2 Plan developed by Baker and dated December 15, 2023, the new structure will be a two span, continuous steel beam bridge with a tangent drilled shaft wall abutment at the rear abutment, a cap and column type pier and wall type forward abutment. The proposed bridge will be approximately 460 ft in length (abutment to abutment) and approximately 68 ft in width (curb to curb). The proposed rear abutment is planned to be supported by a friction drilled shaft foundation system with the proposed pier and forward abutment planned to be supported by a driven, cast-in-place pile foundation system.

Each of the referenced retaining walls (RW-AF, RW-AH and RW-AI) are either abutment walls or wing walls for Bridge CUY-90-1696 or adjoin the proposed bridge's abutments or wing walls. Due to the proposed widening and realignment (horizontal and vertical) of IR-90, retaining walls RW-AF, RW-AH and RW-AI are required to provide the necessary grade separation between IR-90 roadway grades and the surrounding Carnegie Ave grades as well as other nearby surface street grades. RW-AF is proposed at the rear abutment (west) is anticipated to be about 278 ft in length with maximum wall height of about 35 ft. RW-AH is proposed at the rear abutment (east) and is about 97 ft in length with maximum wall height of about 39 ft. Walls RW-AF and RW-AH are anticipated to be a tangent drilled shaft walls with a reinforced concrete wall facing. RW-AI is proposed at the forward abutment and is about 160 ft in length with maximum wall height of about 15 ft. RW-AI is anticipated to be a soldier pile lagging (SPL) wall type.

2. GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1. Geology and Physiography

The project site is located within the Erie Lake Plain, part of the Huron-Erie Lake Plains. This area is characterized as the edge of the very low-relief (10 ft), Ice-Age lake basin separated from the modern Lake Erie by shoreline cliffs with major streams in deep gorges being characteristic. The geology in this region is described as Pleistocene-age lacustrine sand, silt, clay and wave-planed glacial till over Devonian- and Mississippi-age shales and sandstones (ODGS, 1998).

The geology underlying the bridge site is mapped as an average of 20 ft of Wisconsinan-age sand atop a maximum of 290 ft of Wisconsinan-age lacustrine silts and clays all over Devonian-age Ohio Shale. The Wisconsinan-age sand mapped at the site is characterized as well to moderately sorted, moderately to well rounded, finely stratified to massive and contains minor amounts of disseminated gravel or thin lenses of silt or clay. The lacustrine soil at the site is described as laminated silts and clays that may contain fine sand or gravel layers.

Bedrock beneath the proposed bridge has been mapped as sedimentary Devonian-age Ohio shale with carbonate and/or siderite concretions in the lowermost 50 ft. This brownish black to greenish gray shale is carbonaceous to clayey, laminated to thin bedded, and can have a petroliferous odor (USGS & ODGS, 2005). Based on the ODNR bedrock topography map of Ohio, bedrock elevations near the proposed structure sites can be expected to be between elevations of 450 and 400 ft above mean sea level (amsl), putting bedrock at a depth ranging from about 200 to 270 ft below ground surface (bgs).

The soils at the bridge site have been mapped (Web Soil Survey) by the Natural Resources Conservation Service as Udorthents, loamy (Ua) and Urban Land (Ub). These are soils that have been disturbed by cutting or filling and are not rated for local roads (USDA, 2019).

2.2. Hydrology/Hydrogeology

The local hydro-geologic system is dominated by the valley of the Cuyahoga River, located approximately 0.8 to 1.0 miles to the southwest of the proposed bridge structure and flows northwest discharging into Lake Erie. The elevation of the Cuyahoga River and Lake Erie is about 570 to 575 ft amsl in this region and is likely to be representative of the regional groundwater table. As mentioned previously, the surficial geology consists of primarily granular soils underlain by a relatively impermeable lacustrine layer. It is possible for groundwater to become trapped in granular soils above the regional groundwater level by an underlying impermeable layer forming a perched water table. The project site follows a similar geological model and

therefore, could result in a groundwater elevation within the project limits that is likely above the regional groundwater table elevation.

The proposed bridge site is not located within a special flood hazard area based on available mapping by the Federal Emergency Management Agency's (FEMA) National Flood Hazard mapping program (FEMA, 2016).

2.3. Mining and Oil/Gas Production

No abandoned mines are noted on ODNR's Abandoned Underground Mine Locator within the immediate vicinity of the proposed structure locations (ODNR [1], 2016).

No oil or gas wells are noted on ODNR's Ohio Oil & Gas Locator within the immediate vicinity of the proposed structure locations (ODNR [2], 2016).

2.4. Historical Records and Previous Phases of Project Exploration

A historic record search was performed through ODOT's Transportation Information Mapping System (TIMS). Two (2) historical soil borings (B-002-CR-57 and B-011-CR-56) were reviewed and considered in our evaluation of the proposed structure subsurface conditions. A summary of the historic boring information (location, elevation, etc.) is provided in Table 1, and the location is depicted on the Soil Profile Sheets provided in Appendix A. The historic boring logs of the referenced borings are provided in Appendix B.

ODOT District 12 provided NEAS with "Report of Subsurface Exploration for CUY-INNERBELT, Innerbelt Corridor Project – Retaining Walls, PID 77510 & 25795" dated March 16, 2007, submitted by DLZ Ohio, Inc. (DLZ). One soil boring performed as part of the DLZ exploration was reviewed and considered in our evaluation of the proposed structures subsurface conditions. It should be noted that the location information regarding these borings was assumed based on Figure 1 provided with the referenced report. Boring coordinate information for the referenced logs was not provided in the report or on the logs. A summary of the boring information (location, elevation, etc.) is provided in Table 1, and their locations are depicted on the Soil Profile Sheets provided in Appendix A. The historic boring logs of the borings utilized within this report are provided in Appendix B.

Table 1: Historic Boring Summary

Boring Number	Latitude	Longitude	Elevation (NAVD 88) (ft)	Depth (ft)	Proposed Structure
B-002-CR-57	41.499302	-81.671514	670.0	66.0	CUY-90-1696 Pier 1
B-011-CR-56	41.499619	-81.670462	670.0	75.0	CUY-90-1696 Rear Abutment
B-004-D-06[(1)]	41.499601	-81.671610	648.0	100.0	RW-AH

Notes:
1. Based on Figure 1 provided with the referenced March 16, 2007, DLZ Ohio, Inc. report.

2.5. Site Reconnaissance

Field reconnaissance visits for the proposed Bridge CUY-90-1696 and retaining walls RW-AF, RW-AH and RW-AI were conducted between July 6, 2015 and July 10, 2015, along the existing IR-90 alignment at this location. Site conditions were noted and photographed during the visit. A summary of our observations are provided below.

2.5.1. Bridge No. CUY 90-1696 and Retaining Walls AH & AI

The existing bridge carrying Carnegie Ave over IR-90 is a two span, continuous steel beam bridge with a reinforced concrete deck supported by wall type abutments and a cap and column type pier. Existing embankment slopes on either side of the rear abutment wing walls (RW-AH site) were observed to be approximately two horizontal to one vertical (2H:1V) and generally appeared to be in good condition with no visible slope instability (Photograph 1). The embankment slopes near the rear abutment were heavily vegetated primarily with various grasses and brush, however, some mature trees are present. Existing embankment slopes on either side of the forward abutment wing walls (RW-AI site) were observed to range from approximately 2H:1V to 4H:1V and generally appeared to be in good condition with no visible slope instability (Photograph 2). The embankment slopes near the forward abutment were heavily vegetated primarily with various grasses and brush.

Overall, the bridge appeared to be in good condition with no signs of distress observed. No apparent signs of structural distress due to geotechnical concerns were noted during our field reconnaissance visit. The deck surface of the bridge was observed to be in good condition showing little signs of distress including minor joint cracking near the abutments, minor pavement patches along the center of the deck and some longitudinal cracking (Photograph 3). Surface water drains to either side of the bridge which is directed to storm drains along the curbs. Some ponding water observed on the roadway shoulders as well as on the north side of the roadway beyond the rear abutment, however, the reconnaissance was conducted on a rainy day.

2.5.2. Retaining Wall AF

The location of the proposed RW-AF encompasses the area located along the northern limits of IR-90 from Bridge CUY-90-1678 (East 22nd St) to Bridge CUY-90-1696 (Carnegie Ave). This area consists of property which currently includes the existing Cedar Ave Bridge as well as existing embankment slopes which support the surrounding surface streets and private property. At the time of our site visit, the area located adjacent to the existing Cedar Ave Bridge and within the limits of the proposed wall was observed to be a heavily vegetated area with grasses and bushes as well as mature trees. The terrain slopes downward from north to south with a maximum slope of about 2H:1V. This area generally appeared to be well-drained and in good condition with no visible sign of instability or ponding observed at the time of our visit.

Photograph 1: Existing rear abutment wing wall and slope

Photograph 2: Existing forward abutment wing wall and slope

Photograph 3: Existing bridge deck

3. GEOTECHNICAL EXPLORATION

3.1. Field Exploration Program

The exploration for the proposed Bridge CUY 90-1696 and associated retaining wall (RW-AF, RW-AH and RW-AI) structures was conducted by NEAS between November 6, 2014 and June 3, 2021. The exploration for the referenced structures included 9 borings drilled to depths ranging from 25.5 to 135.0 ft bgs. The exploration locations were selected by NEAS in general accordance with the guidelines contained in the SGE with the intent to evaluate subsurface soil and groundwater conditions. Borings were typically located at/near proposed substructure locations and along wall alignments that were not restricted by maintenance of traffic, underground utilities or dictated by terrain (i.e. steep embankment slopes). Project exploration locations were located and surveyed in the field by NEAS after the completion of

drilling. Each individual project boring log (included within Appendix B) includes the recorded boring latitude and longitude location (based on the surveyed Ohio State Plane North, NAD83, location) and the corresponding ground surface elevation. A summary of the exploration locations including stationing, offsets, location information and elevations of the indicated structure foundation exploration are shown in Table 2 below, while the locations are depicted on the Soil Profile Sheets provided within Appendix A.

Table 2: Project Boring Summary

Boring Number	Latitude	Longitude	Elevation (NAVD 88) (ft)	Depth (ft)	Structure
B-167-0-14	41.498878	-81.673419	671.9	61.5	RW-AF
C-168-0-14	41.498858	-81.673454	671.8	67.3	RW-AF
B-168-1-20	41.499000	-81.673234	672.1	80.0	RW-AF
B-169-0-14	41.499079	-81.673039	671.9	61.0	RW-AF
B-169-4-20	41.499345	-81.672124	669.8	121.5	Rear Abutment/RW-AH
B-169-6-20	41.499871	-81.671684	670.2	25.5	Rear Abutment/RW-AH
B-169-7-20	41.499322	-81.671213	669.8	135.0	Pier
B-169-8-20	41.499538	-81.670947	668.7	135.0	Pier
B-170-0-14	41.499394	-81.670458	666.9	112.0	Forward Abutment/RW-AI
B-170-3-20	41.499796	-81.670194	656.9	126.5	Forward Abutment/RW-AI

Notes:
1. As-drilled boring location and corresponding ground surface elevation was surveyed in the field by NEAS Inc.

The borings were drilled using a either a CME 55T truck mounted, CME 75T truck mounted or CME 55X track mounted drilling rig each utilizing 3.25-inch diameter hollow stem augers. Soil samples were generally recovered at 2.5-ft intervals to depths ranging from 30 ft to 60 ft bgs and at 5.0-ft intervals thereafter using a split spoon sampler (AASHTO T-206 “Standard Method for Penetration Test and Split Barrel Sampling of Soils”). The soil samples obtained from the exploration program were visually observed in the field by the NEAS field representative and preserved for review by a Geologist and possible laboratory testing. Standard penetration tests (SPT) were conducted using CME auto hammers that had been calibrated to be between 68.4% and 89.0% efficient as indicated on the individual boring logs. Field boring logs were prepared by drilling personnel, and included lithological description, SPT results recorded as blows per 6-inch increment of penetration and estimated unconfined shear strength values on specimens exhibiting cohesion (using a hand penetrometer). Groundwater level observations were recorded both during and after the completion of drilling. These groundwater level observations are included on the individual boring log. After completing the boring, the borehole was backfilled with auger cuttings to the ground surface.

3.2. Laboratory Testing Program

The laboratory testing program consisted of classification testing and moisture content determinations. Data from the laboratory testing program was incorporated onto the final boring logs included within Appendix B. Soil samples are retained at the laboratory for 60 days following report submittal, after which time they will be discarded.

3.2.1. Classification Testing

Representative soil samples were selected for index properties (Atterberg Limits) and gradation testing for classification purposes on approximately 33% of the samples. At the boring location, samples were selected for testing with the intent of identification and classification of all significant soil units. Soils not selected for testing were compared to laboratory tested samples/strata and classified visually. Moisture content testing was conducted on all samples. The laboratory testing was performed in general accordance with applicable AASHTO specifications.

A final classification of the soil strata was made in accordance with AASHTO M-145 "Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes," as modified by ODOT "Classification of Soils" once laboratory test results became available. The results of the soil classification are presented on the boring log in Appendix B.

3.2.2. Standard Penetration Test Results

Standard Penetration Tests (SPT) and split-barrel (commonly known as split-spoon) sampling of soils were performed at varying intervals (i.e., continuous, 2.5-ft and 5.0-ft) in the project borings performed. To account for the high efficiency (automatic) hammers used during SPT sampling, field SPT N-values were converted based on the calibrated efficiency (energy ratio) of the specific drill rig's hammer. Field N-values were converted to an equivalent rod energy of 60% (N_{60}) for use in analysis or for correlation purposes. The resulting N_{60} values are presented on the boring logs provided in Appendix B.

4. GEOTECHNICAL FINDINGS

The subsurface conditions encountered during NEAS's explorations are described in the following subsections and on each boring log presented in Appendix B. The boring logs represent NEAS's interpretation of the subsurface conditions encountered at each exploration location based on our site observations, field logs, visual review of the soil samples by NEAS's geologist, and laboratory test results. The lines designating the interfaces between various soil strata on the logs represent the approximate interface location; the actual transition between strata may be gradual and indistinct. The subsurface and groundwater characterizations included herein, including summary test data, are based on the subsurface findings from the geotechnical explorations performed by NEAS as part of the referenced project, results of historical explorations, and consideration of the geological history of the site.

4.1. Subsurface Conditions

The general subsurface profile is relatively uniform and consistent with the geological model for the project. The subsurface profile at the site of proposed Bridge CUY-90-1696 and associated retaining walls generally consists of surficial materials (i.e., topsoil or pavement) underlain by existing embankment or historical fill soils followed by natural sands and gravels underlain by natural lacustrine and/or till soils. Where encountered, the embankment fill at the site can generally be described as loose to very dense non-cohesive, granular soils. The natural sands and gravels encountered at the site were generally comprised of loose to very dense non-cohesive, granular material. The lacustrine/till soils at the site were highly variable though can generally as very soft to hard fine-grained, cohesive material. Bedrock was not encountered within the depths of the explorations performed.

4.1.1. Overburden Soil

At the site of proposed structures, three different materials were encountered below the surficial material. In general, the three different overburden materials consisted of historical or embankment "man-made" fill soils, natural sands and gravels, and natural lacustrine and/or till soils. These materials and the general profile underlying the site is further described below.

Fill soils were encountered in 7 of the 12 borings utilized for the proposed structures. These fill soils were encountered immediately below the topsoil, pavement section or at the ground surface and extended to depths ranging from 4.5 to 19.5 ft bgs (approximate elevations 642.5 to 665.7 ft amsl). Based on laboratory testing results and a visual review of the soil samples obtained, the fill within the borings is comprised of granular material and is classified on the boring logs as Gravel (A-1-a), Gravel and Stone Fragments with Sand (A-1-b), Gravel and Stone Fragments with Sand and Silt (A-2-4), and Coarse and Fine Sand (A-3a). With respect to the soil strength, the granular fill soils can be described having a relative compactness of loose to very dense correlating to converted SPT-N values (N_{60}) between 8 and 75 blows per foot (bpf). Natural moisture contents of the granular fill ranged from 6 to 15 percent.

The stratum encountered either immediately beneath the fill, below the pavement section or at the ground surface consisted of a natural sand layer extending to depths between 22.0 and 56.0 ft bgs (approximate elevations 603.6 and 623.6 ft amsl). Based on laboratory testing results and a visual review of the soil samples obtained within this stratum, these soils are comprised of granular material and are classified on the boring logs as Gravel (A-1-a), Gravel with Sand (A-1-b), Gravel with Sand and Silt (A-2-4), Fine Sand (A-3), Coarse and Fine Sand (A-3a) and non-cohesive Sandy Silt (A-4a) or Silt (A-4b). The exception being various seams of fine-grained cohesive material that were encountered within two of the structure borings performed (B-170-0-14 and B-170-3-14) and classified on the boring logs as Silt and Clay (A-6a) and cohesive Silt (A-4b). These seams of cohesive soil were encountered in the indicated borings at depths ranging from 8.5 to 42.0 ft bgs (elevations 614.9 to 652.4 ft amsl) with thicknesses ranging from 2.0-ft to 3-ft. With respect to the soil strength, the natural sand can be described having a relative compactness of loose to very dense correlating to converted N_{60} values between 7 and 49 bpf. It should be noted that the upper approximate 5 to 8 ft of the natural sand layer along RW-AI and forward abutment alignment was generally loose in compactness, ranging from 7 to 9 bpf. Natural moisture contents of the natural sand ranged from 7 to 31 percent. With respect to the soil strength of the fine-grained seams encountered within this stratum, these soils can be described as having a consistency of medium stiff to very stiff correlating to N_{60} values between 7 and 13 bpf and unconfined compressive strengths (estimated by means of hand penetrometer) between 1.25 and in excess of 4.5 tons per square foot (tsf). Natural moisture contents of the cohesive soils ranged from 20 to 28 percent. Based on Atterberg Limits tests performed on representative samples of the cohesive material, the liquid and plastic limits ranged from 27 to 30 percent and from 19 to 20 percent, respectively.

The soils encountered directly underlying the natural sand layer encountered at the site consisted of highly variable lacustrine soils which consisted of an upper stratum comprised predominantly of low to moderately plastic cohesive, fine-grained soils and a lower stratum comprised of predominantly moderately to highly plastic cohesive, fine-grained soils. The upper stratum of the lacustrine soils extended to depths between 77.0 and 128.3 ft bgs (approximate elevations 541.8 and 571.0 ft amsl) and are classified on the boring logs as Silt and Clay (A-6a), Silty Clay (A-6b), and cohesive Silt (A-4b). With respect to the soil strength, the upper lacustrine soils can be described as having a consistency of medium stiff to very stiff correlating to N_{60} values between 2 and 36 bpf and unconfined compressive strengths (estimated by means of hand penetrometer) between 0.25 and in excess of 4.5 tsf. Natural moisture contents of the cohesive soils ranged from 16 to 31 percent. Based on Atterberg Limits tests performed on representative samples of the upper lacustrine material, the liquid and plastic limits ranged from 22 to 34 percent and from 16 to 22 percent,

respectively. The lower cohesive portion of the lacustrine stratum extended to termination depths ranging from 85.0 to 141.5 ft bgs (approximate elevations 528.6 and 560.2 ft amsl) and are classified on the boring logs as Clay (A-7-6), Silt and Clay (A-6a), Silty Clay (A-6b), and cohesive Silt (A-4b). The exception being borings B-169-4-20 and B-169-6-20 in which the lower cohesive lacustrine stratum was not encountered. With respect to the soil strength, the lower lacustrine soils can be described having a consistency of very soft to hard correlating to N_{60} values between 0 and 43 bpf and unconfined compressive strengths (estimated by means of hand penetrometer and laboratory test results) between 0.3 and in excess of 4.5 tsf. Natural moisture contents of the lower lacustrine soils ranged from 24 to 45 percent. Based on Atterberg Limits tests performed on representative samples of the lower lacustrine material, the liquid and plastic limits ranged from 32 to 47 percent and from 20 to 22 percent, respectively.

4.1.2. Groundwater

Groundwater measurements were taken during the boring drilling procedures and immediately following the completion of the boring performed. Groundwater was observed during drilling in 11 of the 12 borings performed at the bridge and retaining wall site at depths ranging from 15 to 28.2 ft bgs (elevations 630.2 to 644.8 ft amsl). Groundwater was not encountered within boring B-169-6-20 performed as part of the structure foundation exploration. In boring B-004-D-06, groundwater seepage was noted at various depths while a static groundwater table was not encountered. Piezometers were installed in borings B-170-3-20, the results of the piezometer readings is summarized in the Roadway Exploration Report for this project.

It should be noted that groundwater is affected by many hydrologic characteristics in the area and may vary from those measured at the time of the exploration. The specific groundwater and pore pressure readings are included on the logs located within Appendix B.

5. ANALYSES AND RECOMMENDATIONS

5.1. Retaining Walls AF and AH Analysis and Recommendations

5.1.1. Retaining Wall Design Assumptions

As the proposed CUY-90-1696 retaining walls RW-AF and RW-AH are planned as tangent drilled shaft wall type with a reinforced concrete wall facing, ODOT's BDM and AASHTO's LRFD BDS dictate analysis parameters and design minimums/constraints to be used in the analysis and design process. The referenced parameters and design minimums/constraints that were significant to their analyses consist of the following:

- Measure the design retained height (H) of drilled shaft walls from the top of the retained earth to the design grade, according to LRFD Figures 3.11.5.6-1 through 3.11.5.6-7.
- Minimum embedment (D) for drilled shaft walls shall be equal to the retained height (H) such that the embedment-to-length ratio (D/L) shall not be less than 0.5.
- For drilled shaft walls with a cast-in-place concrete facing, provide a structural attachment between the facing and the exposed face of the discrete vertical wall elements.; and,
- For tangent drilled shaft walls with a permanent cast-in-place facing, place wall drainage between the permanent facing and the drilled shafts at the joints between the adjacent drilled shafts. Provide vertical drainage paths with a minimum width of 18-inch.

With respect to design constraints and assumptions specific to the RW-AF and RW-AH walls, the geometry of the proposed walls (i.e., exposed wall heights, existing ground elevations, proposed final grade behind/at

the toe of the wall, etc.) is assumed to be consistent with that shown in the available Stage 2 Plan developed by Baker dated December 15, 2023.

5.1.2. Soil Profile for Analysis

For analysis purposes, each boring location was reviewed and a generalized material profile was developed. Utilizing the generalized soil profile, engineering properties for each soil strata was estimated based on their field (i.e., SPT N60 Values, hand penetrometer values, etc.) and laboratory test (i.e., Atterberg Limits, grain size, etc.) results using correlations provided in published engineering manuals, research reports and guidance documents. Engineering soil properties were estimated for each individual classified layer per boring location. Soil layers from each of the borings with similar behavior (i.e., cohesive or non-cohesive/granular) and characteristics (i.e., relative compactness/consistency, moisture content, etc.) were grouped into generalized soil units (i.e., Soil Types) and weighted average values of the estimated engineering soil properties were assigned to each Soil Type to develop a generalized soil profile for analysis. The summary of the generalized soil profile including designated Soil Types, elevations, average engineering soil properties per boring location are presented in Tables 3 through 11 below.

<u>CUY-90-1696 Forward Abutment</u>

Table 3: Soil Profile and Estimated Engineering Properties - At Boring B-170-0-14

Bridge CUY-90-1696: Forward Abutment, B-170-0-14						
Soil Description	**Moist Unit Weight[1] (pcf)**	**Total Cohesion[2] (psf)**	**Total Friction Angle (degrees)**	**Effective Cohesion[3] (psf)**	**Effective Friction Angle[3] (degrees)**	**Setup Factor (f_{su})**
Soil Type 1 - Granular Depth (666.9 ft - 662.4 ft)	125	-	33	-	33	1.0
Soil Type 2 - Granular Depth (662.4 ft - 652.4 ft)	110	-	29	-	29	1.0
Soil Type 3 - Granular Depth (652.4 ft - 623.6 ft)	125	-	33	-	33	1.0
Soil Type 4 - Cohesive Depth (623.6 ft - 568.6 ft)	128	2200	0	200	24	1.5
Soil Type 5 - Cohesive Depth (568.6 ft - 554.9 ft)	122	1550	0	150	23	1.75

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 4: Soil Profile and Estimated Engineering Properties - At Boring B-170-3-20

Bridge CUY-90-1696: Forward Abutment, B-170-3-20						
Soil Description	**Moist Unit Weight[1] (pcf)**	**Total Cohesion[2] (psf)**	**Total Friction Angle (degrees)**	**Effective Cohesion[3] (psf)**	**Effective Friction Angle[3] (degrees)**	**Setup Factor (f_{su})**
Soil Type 2 - Granular Depth (656.9 ft - 652.4 ft)	110	-	29	-	29	1.0
Soil Type 3 - Granular Depth (652.4 ft - 603.6 ft)	125	-	33	-	33	1.0
Soil Type 4 - Cohesive Depth (603.6 ft - 563.6 ft)	128	2200	0	200	24	1.5
Soil Type 5 - Cohesive Depth (563.6 ft - 554.9 ft)	122	1550	0	150	23	1.75

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

CUY-90-1696 Rear Abutment, RW-AF and RW-AH

Table 5: Soil Profile and Estimated Engineering Properties - At Boring B-167-0-14 & C-168-0-14

Wall AF: Profile for Analysis, B-167-0-14 & C-168-0-14							
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Presumptive Ultimate Unit Bond Stress (ksf)	
						Gravity Grouted (<50 psi)	Pressure Grouted (50 psi - 400 psi)
Soil Type 1 Depth (671.9 ft - 654.9 ft)	122	-	32	-	32	1.71	2.62
Soil Type 2 Depth (654.9 ft - 621.3 ft)	125	-	33	-	33	1.80	3.04
Soil Type 3 Depth (621.3 ft - 604.5 ft)	122	2100	0	200	25	-	-

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 6: Soil Profile and Estimated Engineering Properties - At Boring B-168-1-20

Wall AF: Profile for Analysis, B-168-1-20							
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Presumptive Ultimate Unit Bond Stress (ksf)	
						Gravity Grouted (<50 psi)	Pressure Grouted (50 psi - 400 psi)
Soil Type 1 Depth (672.1 ft - 652.6 ft)	122	-	32	-	32	1.71	2.62
Soil Type 2 Depth (652.6 ft - 620.1 ft)	125	-	33	-	33	1.80	3.04
Soil Type 3 Depth (620.1 ft - 592.1 ft)	122	2100	0	200	25	-	-

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 7: Soil Profile and Estimated Engineering Properties - At Boring B-168-1-20

Wall AF: Profile for Analysis, B-168-1-20							
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Presumptive Ultimate Unit Bond Stress (ksf)	
						Gravity Grouted (<50 psi)	Pressure Grouted (50 psi - 400 psi)
Soil Type 1 Depth (672.1 ft - 652.6 ft)	122	-	32	-	32	1.71	2.62
Soil Type 2 Depth (652.6 ft - 620.1 ft)	125	-	33	-	33	1.80	3.04
Soil Type 3 Depth (620.1 ft - 592.1 ft)	122	2100	0	200	25	-	-

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 8: Soil Profile and Estimated Engineering Properties At Boring B-169-0-14

Wall AF: Profile for Analysis, B-169-0-14							
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Presumptive Ultimate Unit Bond Stress (ksf)	
						Gravity Grouted (<50 psi)	Pressure Grouted (50 psi - 400 psi)
Soil Type 1 Depth (671.9 ft - 649.9 ft)	122	-	32	-	32	1.71	2.62
Soil Type 2 Depth (649.9 ft - 622.4 ft)	125	-	33	-	33	1.80	3.04
Soil Type 3 Depth (622.4 ft - 610.9 ft)	122	2100	0	200	25	-	-

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 9: Soil Profile and Estimated Engineering Properties - At Boring B-169-4-20

Bridge CUY-90-1696: Rear Abutment, B-169-4-20						
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Setup Factor (f_{su})
Soil Type 1 - Granular Depth (669.8 ft - 650.3 ft)	125	125	-	-	34	1.0
Soil Type 3 - Granular Depth (650.3 ft - 613.8 ft)	125	125	-	-	31	1.0
Soil Type 4 - Cohesive Depth (613.8 ft - 548.3 ft)	128	122	2200	200	24	1.5

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 10: Soil Profile and Estimated Engineering Properties - At Boring B-004-D-06

Bridge CUY-90-1696: Rear Abutment, B-004-D-06						
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Setup Factor (f_{su})
Soil Type 3 - Granular Depth (648 ft - 621 ft)	125	-	31	-	31	1.0
Soil Type 4 - Cohesive Depth (621 ft - 571 ft)	128	2200	0	200	24	1.5
Soil Type 5 - Cohesive Depth (571 ft - 548 ft)	122	650	0	75	21	1.8

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 11: Soil Profile and Estimated Engineering Properties - At Boring B-169-6-20

Wall AH: Profile for Analysis, B-169-6-20						
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Setup Factor (f_{su})
Soil Type 1 - Granular Depth (670.2 ft - 665.7 ft)	125	-	34	-	34	1.0
Soil Type 3 - Granular Depth (665.7 ft - 644.7 ft)	125	-	31	-	31	1.0

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

In addition to the Soil Type parameters presented above, a graphical depiction of the generalized subsurface profiles are located within Appendix C. The generalized subsurface profiles includes: a color coded general interpretation of the Soil Types between borings, a graphical interpretation of the soil strata identified by the project soil borings along the referenced wall profiles, representative boring data (N_{60}-values, moisture

contents, and groundwater levels), current ground surface elevation, proposed fill, and proposed wall location (i.e., top of leveling pad and top of coping).

5.1.3. Parameters for Lateral Load Analysis

Deep foundation elements subjected to horizontal loads and/or moments should be analyzed for maximum bending moments and lateral deflections. The required lateral load capacity can be obtained by increasing the diameter or the embedment depth of the foundation element. The generalized soil parameters, including recommended lateral soil modulus, and soil strain to be used to analyze the laterally loaded shaft by the p-y curve method are presented in Tables 12 and 13 below. Furthermore, a resistance factor of 1.0 should be used when estimating the lateral geotechnical resistance of a single shaft/pile or shaft/pile group in accordance with LRFD BDS Tables 10.5.5.2.3-1 and 10.5.5.2.4-1.

Table 12: Soil Parameters for Lateral Load Analysis - RW-AF

LPILE Parameters For Soil and Severely Weathered Bedrock							
Boring Number	**p-y model**	**Elevation (ft)**	**Effective Unit Weight (pcf)**	**Friction Angle**	**Undrained Shear Strength (psf)**	**Lateral Soil Modulus Parameter, k (pci)**	**Soil Strain Parameter, E_{50} (%)**
C-087-0-14	Sand (Reese)	671.4 - 655.4	122.0	32	-	80	-
	Sand (Reese)	655.4 - 624.4	87.6	33	-	70	-
	Stiff Clay with Water	624.4 - 566.4	59.6	25	1,900	640	0.006
	Stiff Clay with Water	566.4 - 554.4	59.6	24	2,050	680	0.006
B-167-0-14 & C-168-0-14	Sand (Reese)	671.9 - 654.8	122.0	32	-	80	-
	Sand (Reese)	654.8 - 621.3	68.0	33	-	70	-
	Stiff Clay with Water	621.3 - 604.5	59.6	25	1,900	640	0.006
B-168-1-20	Sand (Reese)	672.1 - 652.6	122.0	32	-	80	-
	Sand (Reese)	652.6 - 620.1	78.0	33	-	70	-
	Stiff Clay with Water	620.1 - 592.1	59.6	25	1,900	640	0.006
B-169-0-14	Sand (Reese)	671.9 - 649.9	122.0	32	-	80	-
	Sand (Reese)	649.9 - 622.4	85.3	33	-	70	-
	Stiff Clay with Water	622.4 - 610.9	59.6	25	1,900	640	0.006

Table 13: Soil Parameters for Lateral Load Analysis - CUY-90-1696 Rear Abutment – RW-AH

LPILE Parameters For Soil and Severely Weathered Bedrock							
Boring Number (Structure)	**p-y model**	**Elevation (ft)**	**Effective Unit Weight (pcf)**	**Friction Angle**	**Undrained Shear Strength (psf)**	**Lateral Soil Modulus Parameter, k (pci)**	**Soil Strain Parameter, E_{50} (%)**
B-169-4-20 (Rear Abutment)	Sand (Reese)	669.8 - 650.3	125.0	34	-	140	-
	Sand (Reese)	650.3 - 613.8	77.5	31	-	45	-
	Stiff Clay with Water	613.8 - 548.3	65.6	24	2,200	740	0.006
B-004-D-06 (Rear Abutment)	Sand (Reese)	648.0 - 621.0	77.4	31	-	45	-
	Stiff Clay with Water	621.0 - 571.0	65.6	24	2,200	740	0.006
	Soft Clay	571.0 - 548.0	59.6	21	650	100	0.013
B-169-6-20 (Wall AH)	Sand (Reese)	670.2 - 665.7	125.0	34	-	140	-
	Sand (Reese)	665.7 - 644.7	125.0	31	-	65	-

5.1.4. Drilled Shaft Lateral Load Analysis

The lateral load analysis of the project drilled shafts and tangent drilled shaft retaining walls has been performed by the CCG3A design team. These calculations will be provided to ODOT as part of a separate submission.

5.2. Retaining Walls AI Analysis and Recommendations

A foundation review was completed for the foundations of the proposed RW-AI SPL retaining wall based on: 1) information gathered during the subsurface exploration (i.e., SPT results, laboratory test results, etc.); 2) the soil profile, estimated engineering properties and other design assumptions presented in Section 5.1 of this report; and, 3) proposed structure basemaps developed by the design team and obtained via ProjectWise on September 23, 2021. Geotechnical analyses consisting of the development of soil parameters and global stability was performed. The geotechnical engineering analyses were performed in accordance with ODOT's BDM (ODOT [1], 2021) and AASHTO's LRFD BDS 9th Edition (AASHTO, 2020).

5.2.1. Soil Profile for Analysis

A summary of the generalized soil profile near RW-AI as well as at boring B-170-3-20 which was used for analysis of RW-AI can be found in Section 5.1.2 of this report. The tables here include designated Soil Types, elevations and average engineering soil properties per boring location.

5.2.2. Parameters for Lateral Load Analysis

Deep foundation elements subjected to horizontal loads and/or moments should be analyzed for maximum bending moments and lateral deflections. The generalized soil and rock parameters for boring B-170-3-20 to be used to analyze the laterally loaded shafts of RW-AI by the p-y curve method are presented in Table 14 in Section 5.1.3 of this report.

5.2.3. Drilled Shaft Lateral Load Analysis

The lateral load analysis of the project drilled shafts has been performed by MBI. These calculations will be provided to ODOT as part of a separate submission.

5.2.4. Global Stability

For purposes of evaluating the stability of the proposed RW-AI site, NEAS reviewed one cross-section within the project limits that was interpreted to represent conditions that posed the greatest potential for slope instability. In general, cross-sections along the proposed wall alignment were reviewed to determine if the section would represent a combination of existing subsurface conditions and planned site grading that would be most critical to slope stability (i.e., maximum total wall height, maximum embankment height measured from toe of slope to top of wall coping, proposed cut into existing embankment slopes, weak or thick soil layer, etc.). Based on our review of the available information at the referenced locations and the associated soil properties, one (1) cross-section was estimated to be most "critical" and was analyzed for global stability. The one cross-section analyzed for global stability include STA 1+00 in reference to the RW-AI alignment.

For the cross-section, NEAS developed a representative cross-sectional model to use as the basis for global stability analyses. The model was developed from NEAS's interpretation of the available information which included: 1) The proposed RW-AI site plan developed by MBI on September 23, 2021; 2) a live load surcharge of 250 pounds per square foot (psf), accounting for traffic induced loads; and 3) test borings and laboratory data developed as part of this report; 4) the steel reinforcing beam W21x166 has 50 kips per square inch (ksi) (ASTM grade 50) yield strength. With respect to the soil's engineering properties, the provided Soil Profile and Estimated Engineering Properties presented for B-170-3-20 in Section 5.1.2 of this report were used in our analyses.

The above referenced slope stability model was analyzed for long-term (Effective Stress) and short-term (Total Stress) slope stability utilizing the software entitled *Slide 7.0* by Rocscience, Inc. Specifically, the Modified Bishop, Corrected Janbu, Spencer and GLE analysis methods were used to calculate a factor of safety (FOS) for circular and block type slope failures, respectively. The FOS is the ratio of the resisting forces and the driving forces, with the desired safety factor being more than about 1.33 which equates to an AASHTO resistance factor less than 0.75 (per AASHTO's LRFD BDS the specified resistance factors are essentially the inverse of the FOS that should be targeted in slope stability programs). For this analysis, a resistance factor of 0.75 or lower is targeted as the slope does not contain or support a structural element.

Based on our slope stability analyses for the referenced retaining wall section, the minimum slope stability safety factor is about 3.448 (0.29 resistance factor). The graphical output of the slope stability program (cross-sectional model, calculated safety factor, and critical failure plane) is presented in Appendix F.

5.3. Bridge No. CUY-90-1696 Analysis and Recommendations

We understand that the existing two-span bridge structure along Carnegie Ave over IR-90 (CUY-90-1696) in Cuyahoga County, Ohio is proposed to be replaced with a new structure. Based on proposed structure basemaps developed by the design team and obtained via ProjectWise on June 16, 2022, the existing bridge will be replaced with a new two span bridge structure. The new bridge deck will be constructed on: 1) a tangent drilled shaft rear abutment supported in friction by the natural subsurface material; 2) a cap and column type pier supported through a deep foundation system consisting of 16-inch diameter driven, closed-ended CIP pipe piles; and, 3) a wall type forward abutment supported through a deep foundation system consisting of 16-inch diameter driven, closed-ended CIP pipe piles. For this purpose, a deep foundation pile analysis was performed at the replacement bridge site. The pile analysis is presented in the subsections below. For design of the drilled shafts associated with the rear abutment, the soil profile information, design soil properties/parameters as well as design soil lateral parameters presented in Section 5.1 of this report should be utilized.

For deep foundation pile analysis purposes, the proposed bearing elevation for the pier and forward abutment was based on the elevations shown proposed structure basemaps developed by the design team and obtained via ProjectWise on June 16, 2022, while design pile loads are based on design information provided by MBI Engineering obtained via ProjectWise on June 20, 2022.

5.3.1. Soil Profile for Analysis

For friction pile analyses purposes, each boring drilled for the Bridge CUY-90-1696 piers and forward abutment was reviewed, and a generalized material profile was developed. Utilizing the generalized soil profile, engineering properties for each soil stratum were estimated based on their field (i.e., SPT N_{60} Values, hand penetrometer values, etc.) and laboratory test (i.e., Atterberg Limits, grain size, etc.) results using correlations provided in published engineering manuals, research reports and guidance documents. Engineering soil properties were estimated for each individual classified layer per boring location. The developed soil profiles and estimated engineering soil properties for use in analysis of Bridge CUY-90-1696 piers and forward abutment (with cited correlation/reference material) are summarized within Tables 18 through 21 below.

Table 14: Soil Profile and Estimated Engineering Properties - At Boring B-169-7-20

Bridge CUY-90-1696 Over IR-90: Pier 1, B-169-7-20						
Soil Description	**Moist Unit Weight[1] (pcf)**	**Total Cohesion[2] (psf)**	**Total Friction Angle (degrees)**	**Effective Cohesion[3] (psf)**	**Effective Friction Angle[3] (degrees)**	**Setup Factor (f_{su})**
Coarse and Fine Sand Depth (669.8 ft - 665.3 ft)	125	-	36	-	36	1.0
Fine Sand Depth (665.3 ft - 657.8 ft)	120	-	33	-	33	1.2
Coarse and Fine Sand Depth (657.8 ft - 650.3 ft)	120	-	29	-	29	1.0
Gravel with Sand Depth (650.3 ft - 647.8 ft)	125	-	36	-	36	1.0
Coarse and Fine Sand Depth (647.8 ft - 640.3 ft)	125	-	35	-	35	1.0
Fine Sand Depth (640.3 ft - 637.8 ft)	120	-	31	-	31	1.2
Silt Depth (637.8 ft - 635.3 ft)	122	-	29	-	29	1.5
Coarse and Fine Sand Depth (635.3 ft - 625.3 ft)	125	-	32	-	32	1.0
Fine Sand Elevation (625.3 ft - 620.3 ft)	125	-	34	-	34	1.2
Silt and Clay Elevation (620.3 ft - 606.5 ft)	122	1800	0	200	24	1.5
Silt Elevation (606.5 ft - 601.5 ft)	122	2000	0	200	25	1.5
Silt and Clay Elevation (601.5 ft - 586.5 ft)	122	2350	0	200	25	1.5
Silt Elevation (586.5 ft - 576.5 ft)	125	2750	0	250	26	1.5
Silt and Clay Elevation (576.5 ft - 556.5 ft)	125	2650	0	250	25	1.5
Clay Elevation (556.5 ft - 534.8 ft)	118	1050	0	100	21	2.0

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 15: Soil Profile and Estimated Engineering Properties - At Boring B-169-8-20

Bridge CUY-90-1696 Over IR-90: Pier 1, B-169-8-20						
Soil Description	**Moist Unit Weight[1] (pcf)**	**Total Cohesion[2] (psf)**	**Total Friction Angle (degrees)**	**Effective Cohesion[3] (psf)**	**Effective Friction Angle[3] (degrees)**	**Setup Factor (f_{su})**
Fine Sand Depth (668.7 ft - 656.7 ft)	120	-	35	-	35	1.2
Coarse and Fine Sand Depth (656.7 ft - 646.7 ft)	125	-	32	-	32	1.0
Gravel Depth (646.7 ft - 641.7 ft)	115	-	32	-	32	1.0
Sandy Silt Depth (641.7 ft - 636.7 ft)	110	-	28	-	28	1.2
Gravel with Sand Depth (636.7 ft - 631.7 ft)	125	-	33	-	33	1.0
Coarse and Fine Sand Depth (631.7 ft - 624.2 ft)	125	-	32	-	32	1.0
Gravel with Sand Depth (624.2 ft - 621.7 ft)	128	-	35	-	35	1.0
Silt and Clay Depth (621.7 ft - 610.4 ft)	122	2300	0	200	25	1.5
Silt Elevation (610.4 ft - 590.4 ft)	122	2250	0	200	26	1.5
Silt and Clay Elevation (590.4 ft - 555.4 ft)	125	2900	0	250	25	1.5
Clay Elevation (555.4 ft - 533.7 ft)	118	1200	0	100	21	2.0

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 16: Soil Profile and Estimated Engineering Properties - At Boring B-170-0-14

Bridge CUY-90-1696: Forward Abutment, B-170-0-14						
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Setup Factor (f_{su})
Soil Type 1 - Granular Depth (666.9 ft - 662.4 ft)	125	-	33	-	33	1.0
Soil Type 2 - Granular Depth (662.4 ft - 652.4 ft)	110	-	29	-	29	1.0
Soil Type 3 - Granular Depth (652.4 ft - 623.6 ft)	125	-	33	-	33	1.0
Soil Type 4 - Cohesive Depth (623.6 ft - 568.6 ft)	128	2200	0	200	24	1.5
Soil Type 5 - Cohesive Depth (568.6 ft - 554.9 ft)	122	1550	0	150	23	1.75

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

Table 17: Soil Profile and Estimated Engineering Properties - At Boring B-170-3-20

Bridge CUY-90-1696: Forward Abutment, B-170-3-14						
Soil Description	Moist Unit Weight[1] (pcf)	Total Cohesion[2] (psf)	Total Friction Angle (degrees)	Effective Cohesion[3] (psf)	Effective Friction Angle[3] (degrees)	Setup Factor (f_{su})
Coarse and Fine Sand Depth (633.9 ft - 632.4 ft)	125	-	37	-	37	1.0
Silt Depth (632.4 ft - 629.4 ft)	125	-	32	-	32	1.5
Coarse and Fine Sand Depth (629.4 ft - 616.9 ft)	128	-	34	-	34	1.0
Silt Depth (616.9 ft - 614.9 ft)	125	-	30	-	30	1.5
Silt Depth (614.9 ft - 611.9 ft)	120	1350	0	150	24	1.5
Coarse and Fine Sand Depth (611.9 ft - 603.6 ft)	120	-	29	-	29	1.0
Silt Depth (603.6 ft - 598.6 ft)	115	600	0	75	22	1.5
Silt and Clay Depth (598.6 ft - 593.6 ft)	115	750	0	75	21	1.5
Silt and Clay Elevation (593.6 ft - 563.6 ft)	122	2300	0	200	25	1.5
Clay Elevation (563.6 ft - 530.4 ft)	122	2000	0	200	23	2.0

Notes:
1. *Values interpreted from Geotechnical Bulletin 7 Table 1.*
2. *Values calculated from Terzaghi and Peck (1967) if $N1_{60}$<52, else Stroud and Butler (1975) was used.*
3. *Values interpreted from Geotechnical Bulletin 7 Table 2 for cohesive soils and Kulhawy & Mayne (1990) for granular soils.*

5.3.2. Pile Foundation Analysis

Based on the determined soil profile and our estimated engineering soil properties, a pile analysis was performed using the computer program Driven to determine the estimated geotechnical pile length needed to achieve the UBV required to support the design load for a single pile at each substructure (Driven results included within Appendix F). For the purposes of this report and our analysis, the term 'geotechnical pile length' has been assumed to represent the length of pile from bottom of pile cap (assumed pile cap bearing elevation) to the depth at which the required UBV is obtained. Based on the soil profile encountered at the site, it is our opinion that pile resistances obtained during dynamic testing (driving) may be reduced due to the potential for soil disturbance (development of high pore water pressure) near the pile perimeter. This disturbance could cause piles to potentially drive easily or “run” for extended depths and initial driving resistances may not reach the indicated target UBV utilizing the estimated pile lengths. This reduced resistance value obtained at the end of driving the estimated pile length is designated as the End of Initial Driving resistance or EOID. If the EOID is significantly different than the required UBV, it may be

necessary let the piles "set up" (reduction of pore water pressure in the soils adjacent to the pile) for an established time period. To estimate the potential effects of this disturbance during driving, the setup factors presented in Tables 18 through 21 of the Section 5.3.1. of this report are used to estimate driving strength losses as well as the side resistance expected to gain following the setup period.

The UBV and EOID values are determined in accordance with Sections 305.3.2.4 and 305.3.5.9 of the ODOT BDM. The UBV is determined by dividing the total factored load for the highest loaded pile at each substructure by the appropriate driven pile resistance factor, while the EOID is determined by subtracting the amount of side resistance expected to gain from soil setup from the UBV value. The amount of side resistance expected to gain from soil setup is taken as the difference between the side resistance obtained in ultimate (post setup) conditions and the side resistance obtained during driving (dynamic) conditions at the determined geotechnical pile length. It is recommended that the piles for the referenced project be installed according to ODOT's Construction and Material Specifications (CMS) 507 and CMS 523.

The results for our analysis including the estimated skin friction (Rs) and pile tip bearing (Rp) for ultimate and during driving conditions are summarized in Table 22 below (*Driven* results included within Appendix D). The referenced table also includes 1) the required geotechnical pile length in ultimate conditions for a 16-inch diameter CIP pile driven to the respective UBV per substructure location; 2) the length of driven pile required in driving conditions for a 16-inch diameter CIP pile driven to the respective UBV per substructure location; and, 3) the estimated difference in pile length between a pile in ultimate and driving conditions.

Table 18: Deep Foundation Analysis Summary

Pile Type	Ultimate Conditions				Driving Conditions				Pile Length Difference Ultimate vs. Driving Conditions (ft)	End of Initial Driving Value[3] (kips)	Setup Factor (f_{su})
	Geotechnical Pile Length[1] (ft)	Ultimate Side Resistance[2] (kips)	Ultimate Point Resistance[2] (kips)	Ultimate Bearing Value[2] (kips)	Driven Pile Length[1] (ft)	Side Resistance During Driving[2] (kips)	Point Resistance During Driving[2] (kips)	Bearing Value During Driving[2][4] (kips)			
CUY-90-1696 Pier 1C, B-169-7-20											
16-inch CIP pile	82.2	366.5	13.2	380	94.2	265.0	13.2	278	> 12	253	1.5
CUY-90-1696 Pier 1A & 1B, B-169-8-20											
16-inch CIP pile	74.0	364.6	15.1	380	95.3	294.2	15.1	309	> 21.3	260	1.5
CUY-90-1696 Forward Abutment, B-170-0-14											
16-inch CIP pile	67.7	305.5	23.3	329	79.0	229.8	23.3	253	> 11.3	216	1.5
CUY-90-1696 Forward Abutment, B-170-3-20											
16-inch CIP pile	75.2	303.6	25.1	329	103.5	287.8	25.1	313	> 28.3	217	1.5

Notes:
1. *The length of pile from bottom of pile cap (pile cap bearing elevation) to the depth at which the required UBV is obtained.*
2. *Resistance factor for driven piles, dynamic analysis and static load test methods (BDM Table 305-1) for piles installed according to C&MS 507 using dynamic test methods according to C&MS 523 has not been applied to values calculated.*
3. *EOID is based on driving resistance obtained at the indicated geotechnical pile length.*
4. *At each of the substructures the required UBV could not be obtained during driving conditions within the length of the boring performed.*

5.3.3. Pile Drivability

NEAS's pile drivability evaluation estimated a Delmag D19-42 diesel hammer to determine if the 16-inch diameter CIP piles at the Pier or Forward Abutment would be overstressed (i.e., compressive stresses experienced by pile during driving are greater than 90% of the yield strength of the steel) at any time during pile installation. The results of the evaluation indicated that the referenced CIP pile size would not be overstressed during the pile installation process based on: 1) a minimum wall thickness calculated in accordance with Section 507.03 "Cast-in-Place Reinforced Concrete Piles" of ODOT's CMS; 2) the use of ASTM A 252 Grade 2 steel piles; 3) a pile hammer with a minimum rated energy of 42,000 ft-lbs; and, 4) our developed model used in the computer program *GRLWEAP* by GRL Engineers, Inc. Using the assumed UBVs (Table 22), the minimum wall thicknesses were calculated to be 0.42 inches at the pier and 0.39 inches at the forward abutment. *GRLWEAP* results for each boring location are included within Appendix E.

It should be noted that the driving resistance of CIP piles through soils encountered at the bridge site is expected to be high. Drivability is difficult to assess quantitatively as the field test results (i.e., SPT N_{60} values, pocket penetrometer values, etc.) tend to be very high. Furthermore, pile drivability is highly reliant

upon the specific equipment used in construction; therefore, it is recommended that the contractor provide an analysis to demonstrate that the equipment and pile combination planned for use is capable of obtaining the UBV without over-stressing the piles.

5.3.4. Pile Foundation Recommendations

Based on our evaluation of the subsurface conditions and our geotechnical engineering analysis for the proposed Bridge CUY-90-1696, it is our opinion that the bridge pier and forward abutment foundations can be supported on driven friction CIP piles seated within the medium stiff to very stiff natural lacustrine/glacial till material encountered at the site.

We recommend that a driven pile foundation be used for support for the proposed bridge pier and forward abutment. New 16-inch diameter CIP piles are recommended to be installed in accordance with Sections 507 and 523 of ODOT's CMS at each substructure. During driving conditions and if driven to the UBVs indicated in Table 22 of this report, it is anticipated that the newly driven 16-inch diameter CIP piles would "run" for extended depths at each substructure location extending the indicated geotechnical pile lengths by greater than 6 to 23 ft. Therefore, it is recommended that the proposed piles be driven to the full estimated length and pile/soil setup be utilized to achieve the required UBV. It is recommended that plan note 606.7-4 of ODOT's 2020 BDM "Piles Driven To Full Estimated Length With Pile/Soil Setup" be including on the plans. The first two piles at each substructure should be driven to the full Estimated Length indicated in Table 23 below. After driving and testing the first two piles, drive the remaining piles in the substructure to the same depth as the first two piles. After driving all piles to the estimated length, cease all driving operations at the substructure for a period of 14 days. After the specified waiting period, it is recommended that pile driving contractor perform a restrike on both of the first two piles at each substructure. If the restrike test results indicate that both piles achieved the required UBV, all piles in the substructure may be accepted by the Engineer. If the restrike test results indicate that either of the two piles did not achieve the required UBV, immediately notify the Engineer so that the Engineer can notify the District Geotechnical Engineer, the Office of Construction Administration, and the Office of Geotechnical Engineering.

When new piles are installed in accordance with referenced construction specifications utilizing the referenced method as specified in the ODOT BDM, 16-inch diameter CIP piles driven to the indicated UBVs may be used to support a total factored load (single pile) of 265.8 kips at the proposed Pier location and 247.7 kips at the proposed Forward Abutment location. It should be noted that if preferred, methods B and C specified in Section 305.3.5.9 of ODOT's 2020 BDM can also be used to establish driving criteria accounting for the anticipated pile/soil setup. It should also be noted that a resistance factor of 0.8 was utilized and a static pile load test is to be performed at the forward abutment location as more than 10,000 ft of pile was calculated when utilizing a resistance factor of 0.7.

Newly driven pile lengths and estimated geotechnical pile tip elevations based on: 1) our Deep Foundation Analysis (presented in Section 5.3.2); and, 2) the "Estimated Length" and "Order Length" definitions and formulas presented in Section 305.3.5.2 "Pile Foundations" of the ODOT BDM, are presented in Table 23 below.

Table 19: Estimated Pile Lengths

Pile Type	Bottom of Pile Cap Elevation (ft amsl)	Geotechnical Pile Length (ft)	Geotechnical Pile Tip Elevation (ft amsl)	Estimated Pile Length[(1)] (ft)	Order Length[(1)] (ft)
CUY-90-1696 Pier 1C, B-169-7-20					
16-inch CIP	628.8	82.2	546.6	85	90
CUY-90-1696 Pier 1A & 1B, B-169-8-20					
16-inch CIP	628.8	74.0	554.8	80	85
CUY-90-1696 Forward Abutment, B-170-0-14					
16-inch CIP	633.9	67.7	566.2	75	80
CUY-90-1696 Forward Abutment, B-170-3-20					
16-inch CIP	633.9	75.2	558.7	80	85

Notes:
1. Based on definitions and formulas presented in Section 305.3.5.2 of the 2020 BDM.

5.4. Preconstruction Condition Survey and Vibration Monitoring

As existing structures including a historical building are located within 200 ft of both pile driving operations as well as in close proximity to drilled shaft and wall construction it is recommended that a preconstruction condition survey be performed on the interior and exterior of these structures within 200 ft. Furthermore, based on the location of the planned piles/shafts and the existing structures, it is our opinion that vibration as a result of pile driving operations is a concern that needs to be addressed and monitored. It is recommended that plan notes: 606.7-2 "ITEM SPECIAL - STRUCTURE MISC.: VIBRATION MONITORING" and 606.7-3 "ITEM SPECIAL - STRUCTURE MISC.: PRECONSTRUCTION CONDITION SURVEY" of ODOT's 2020 BDM be including on the plans.

5.5. Settlement and Global Stability Analysis

For tangent drilled shaft walls, tangent drilled shaft abutments, and solider pile and lagging walls settlement and global stability are not anticipated to be a concern. With respect to settlement, as these wall and abutment types are generally in "cut" sections where additional fill is not added and settlement is not anticipated. For global stability, as the drilled shafts extend to significant depths to account for lateral loads associated with the exposed wall face, failure planes must travel beneath the drilled shafts for global failure. Therefore, AASHTO resistance factors less than 0.65 are anticipated.

5.6. Seismic Site Class

It is NEAS's opinion that the subsurface conditions encountered at the proposed Bridge CUY-90-1696 site are characterized as a Seismic Site Class of E in accordance with Section 3.10.3.1, Method B, of the LRFD BDS. For the overall bridge site, seismic site class parameters were determined at each substructure and subsequently averaged to obtain an overall global Site Class Definition. Seismic Site Classification Calculation results are included within Appendix G.

6. QUALIFICATIONS

This investigation was performed in accordance with accepted geotechnical engineering practice for the purpose of characterizing the subsurface conditions at the site of the proposed Bridge CUY-90-1696 as well as Retaining Walls AG, AH and AI. This report has been prepared for Michael Baker International, ODOT and their design consultants to be used solely in evaluating the soils underlying the referenced proposed

structures and presenting geotechnical engineering recommendations specific to this project. The assessment of general site environmental conditions or the presence of pollutants in the soil, rock and groundwater of the site was beyond the scope of this geotechnical exploration. Our recommendations are based on the results of our field explorations, laboratory test results from representative soil samples, and geotechnical engineering analyses. The results of the field explorations and laboratory tests, which form the basis of our recommendations, are presented in the appendices as noted. This report does not reflect any variations that may occur between the borings or elsewhere on the site, or variations whose nature and extent may not become evident until a later stage of construction. In the event that any changes in the nature, design or location of the referenced structures is made, the conclusions and recommendations contained in this report should not be considered valid until they are reviewed and have been modified or verified in writing by a geotechnical engineer.

It has been a pleasure to be of service to Michael Baker International in performing this geotechnical exploration for the CUY-90-16.28 (CCG3A) project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

Brendan P. Andrews, P.E.
Geotechnical Engineer

Kevin C. Arens, P.E.
Geotechnical Engineer

REFERENCES

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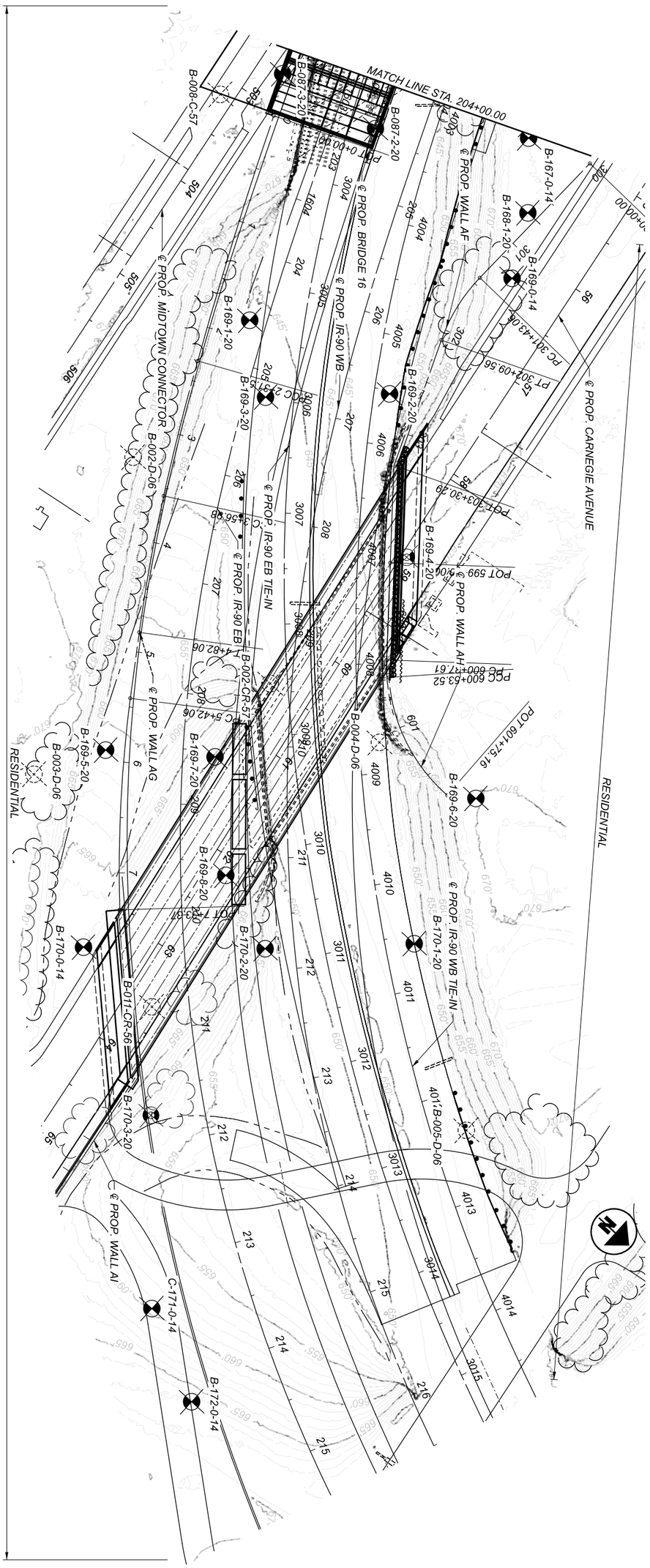
APPENDIX A

SOIL PROFILE SHEETS

MODEL: 082382_IP0103 PAPERSIZE: 17x11 (in.) DATE: 6/23/2022 TIME: 13:09 PM USER: mjaslewicz
pw:\\mb-us-pw.bentley.com:mb-us-pw-03\Documents\Cleveland_OH\01_Projects\ODOT\District2\82382\400-Engineering\Geotechnical\Sheets\82382_IP104.dgn



DESIGN AGENCY
2800 CORPORATE EXCHANGE DR. SUITE 240
COLUMBUS, OH. 43231
TEL:614.714.0299
WWW.JNEASINC.COM

DESIGNER MWJ
REVIEWER BPA 06/23/22
PROJECT ID 82382
SUBSET 29 TOTAL 302
SHEET P.0 TOTAL 0

SOIL PROFILE - ROADWAY
STA. 204+00 TO END IR-90 WB

HORIZONTAL SCALE IN FEET
0 50
25 100

APPENDIX C

GENERALIZED SUBSURFACE PROFILE
RETAINING WALLS AG, AH AND AI

OHIO DEPARTMENT OF TRANSPORTION
OFFICE OF GEOTECHNICAL ENGINEERING

CLIENT Michael Baker International

PROJECT NUMBER 82380

Non-cohesive
Cohesive

SUBSURFACE DIAGRAM
RETAINING WALL AG & BRIDGE CUY-90-1696
(OVER IR-90) FORWARD ABUTMENT

PROJECT NAME CCG3A

PROJECT LOCATION Cuyahoga County, Ohio

- Ohio DOT: Pavement or Aggregate base
- Ohio DOT: A-3, fine sand
- Ohio DOT: A-6a, silt and clay
- Concrete
- Ohio DOT: A-1-a, gravel and/or stone fragments
- Ohio DOT: A-4b, silt
- Ohio DOT: A-6b, silty clay
- Ohio DOT: Sod and Topsoil
- Ohio DOT: A-3a, coarse and fine sand
- Ohio DOT: A-4a, sandy silt
- Ohio DOT: A-1-b, gravel and/or stone fragments with sand
- Ohio DOT: A-7-6, clay

N60 - Corrected SPT-N Number (bpf) MC - Moisture Content (%)

Approx. Begin Wall AG

Existing Ground Along Wall

Approx. End Wall AG / Begin Bridge CUY-90-1696

Approx. End Bridge CUY-90-1696

B-087-3-20

B-169-1-20

B-002-D-06

B-169-5-20

B-003-D-06

B-170-0-14

B-170-3-20

Soil Type 1

Soil Type 2

Soil Type 3

Soil Type 4

Soil Type 5

Elevation (ft)

Distance Along Baseline (ft)

STRATIGRAPHY & GW - B SIZE - OH DOT.GDT - 8/31/21 12:16 - C:\USERS\KARENS\DESKTOP\WALLAG_GINT-PROFILE\083021.GPJ

OHIO DEPARTMENT OF TRANSPORTION
OFFICE OF GEOTECHNICAL ENGINEERING

CLIENT Michael Baker International

PROJECT NUMBER 82382

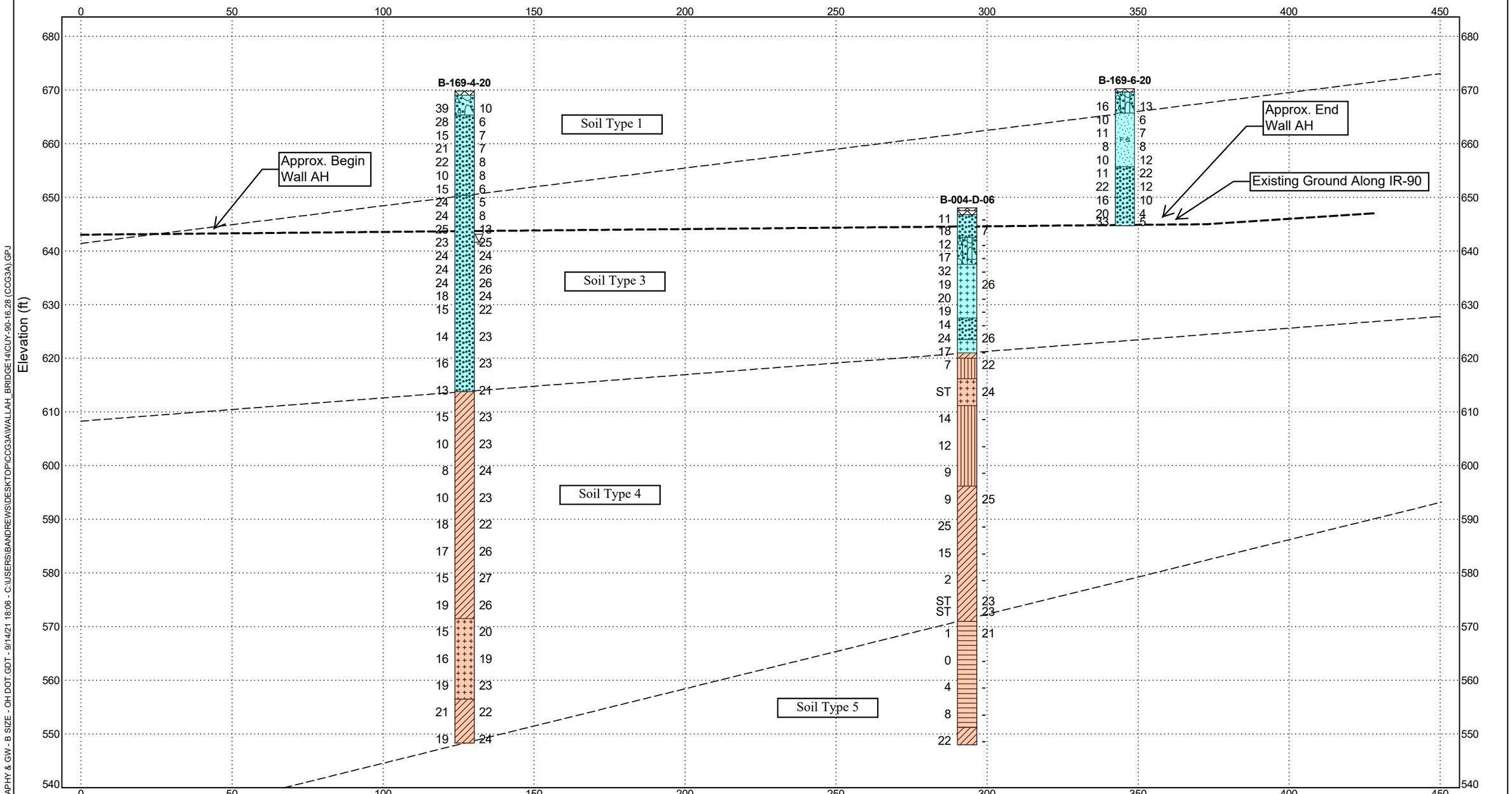
Non-cohesive
Cohesive

SUBSURFACE DIAGRAM
RETAINING WALL AH & BRIDGE CUY-90-1696 (OVER IR-90) REAR ABUTMENT

PROJECT NAME CCG3A

PROJECT LOCATION Cuyahoga County, Ohio

Ohio DOT: Pavement or Aggregate base
Ohio DOT: A-4b, silt
Ohio DOT: A-6b, silty clay
Ohio DOT: A-3a, coarse and fine sand
Ohio DOT: A-6a, silt and clay
Ohio DOT: A-1-b, gravel and/or stone fragments with sand
Ohio DOT: A-2-4, gravel and/or stone fragments with sand and silt
Ohio DOT: A-4a, sandy silt
Ohio DOT: A-3, fine sand



STRATIGRAPHY & GW - B SIZE - OH DOT.GDT - 9/14/21 18:06 - C:\USERS\BANDREWS\DESKTOP\CCG3A\WALLAH_BRIDGE14\CUY-90-16.28 (CCG3A).GPJ

APPENDIX B

BORING LOGS AND LABORATORY TESTING RESULTS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 13:25 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\CUY-90-16.28 (CCG3A - MOD#7)\GINT FILES\CUY-90-16.28 (CCG3

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 55T	STATION / OFFSET: 202+41, 58' RT.	EXPLORATION ID B-087-3-20
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90 EB	
PID: 82382 SFN: 1807841	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 670.1 (MSL) EOB: 141.5 ft.	PAGE 1 OF 5
START: 3/31/21 END: 3/31/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 68.4	LAT / LONG: 41.498318, -81.673037	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
9.5" ASPHALT AND 6.0" CONCRETE (DRILLERS DESCRIPTION)	670.1	1																
	668.8																	
LOOSE TO MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE TO LITTLE GRAVEL AND STONE FRAGMENTS, TRACE CLAY, CONTAINS INTERBEDDED 0.25" TO 1.0" SOFT GRAY SILT AND CLAY (A-6A) LAYERS, CONTAINS RED BRICK FRAGMENTS AND CONCRETE FRAGMENTS, DAMP TO MOIST **(FILL)**		2	11 5 4	10	61	SS-1	-	18	18	42	16	6	NP	NP	NP	8	A-3a (0)	
		3																
		4	5 4 5	10	78	SS-2	-	6	20	54	15	5	NP	NP	NP	10	A-3a (0)	
		5	6 6 7	15	72	SS-3	-	-	-	-	-	-	-	-	-	11	A-3a (V)	
		6	10 7 5	14	72	SS-4	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
		7	5 6 6	14	78	SS-5	-	5	20	55	15	5	NP	NP	NP	11	A-3a (0)	
		8																
		9	5 7 5	14	78	SS-6	-	-	-	-	-	-	-	-	-	11	A-3a (V)	
		10																
		11	6 5 7	14	83	SS-7	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
		12																
		13	7 6 7	15	100	SS-8	-	4	18	52	17	9	NP	NP	NP	11	A-3a (0)	
		14																
	653.1	15																
LOOSE TO MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, SS-9 CONTAINS A 3.0" GRAY SILT (A-4B) SEAM, MOIST TO DAMP		16	9 6 7	15	94	SS-9	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
		17																
@20.0'; BECOMES TRACE TO LITTLE SILT		18	3 4 4	9	67	SS-10	-	-	-	-	-	-	-	-	-	7	A-3a (V)	
		19																
		20	4 3 4	8	56	SS-11	-	1	7	64	20	8	NP	NP	NP	9	A-3a (0)	
		21																
		22	4 5 6	13	78	SS-12	-	-	-	-	-	-	-	-	-	9	A-3a (V)	
	W 643.4	23																
@27.5'; BECOMES BROWNISH GRAY AND GRAY, WET		24	6 9 13	25	44	SS-13	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
		25																
		26																
		27																
		28																
		29																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
LOOSE TO MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, SS-9 CONTAINS A 3.0" GRAY SILT (A-4B) SEAM, MOIST TO DAMP *(continued)*	640.1	31	7 10 15	29	72	SS-14	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		33	6 12 13	29	89	SS-15	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		35	7 14 12	30	83	SS-16	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
		38	7 13 17	34	83	SS-17	-	-	-	-	-	-	-	-	-	19	A-3a (V)	
		40	7 15 19	39	89	SS-18	-	-	-	-	-	-	-	-	-	19	A-3a (V)	
		43	7 12 15	31	78	SS-19	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
		45	5 8 12	23	78	SS-20	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
		48	4 7 9	18	78	SS-21	-	-	-	-	-	-	-	-	-	17	A-3a (V)	
	619.1	50	4 6 7	15	100	SS-22	-	-	-	-	-	-	-	-	-	16	A-3a (V)	
STIFF TO VERY STIFF, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST		53	4 5 6	13	94	SS-23	1.75	0	1	8	61	30	28	18	10	22	A-4b (8)	
		55	3 5 5	11	100	SS-24	2.00	-	-	-	-	-	-	-	-	22	A-4b (V)	
		58	4 4 4	9	100	SS-25	1.50	-	-	-	-	-	-	-	-	24	A-4b (V)	
		60	3 3 5	9	100	SS-26	1.25	0	0	1	62	37	31	21	10	25	A-4b (8)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO VERY STIFF, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*	607.9	63																
		64																
		65	5 6 8	16	100	SS-27	1.50	-	-	-	-	-	-	-	-	23	A-4b (V)	
		66																
		67																
	601.8	68																
STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST		69																
		70	7 7 11	21	100	SS-28	1.25	0	0	2	49	49	33	22	11	29	A-6a (8)	
		71																
		72																
		73																
		74																
		75	8 8 12	23	100	SS-29	1.50	-	-	-	-	-	-	-	-	26	A-6a (V)	
		76																
	591.8	77																
HARD, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		78																
		79																
		80	10 12 16	32	100	SS-30	4.50	1	0	1	59	39	30	20	10	22	A-4b (8)	
		81																
		82																
		83																
		84																
		85	9 10 16	30	100	SS-31	4.50	-	-	-	-	-	-	-	-	18	A-4b (V)	
		86																
		87																
		88																
		89																
		90	8 10 17	31	100	SS-32	4.50	0	0	0	65	35	30	20	10	18	A-4b (8)	
		91																
		92																
		93																
		94																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
HARD, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP *(continued)*	575.8	95	9 11 12	26	100	SS-33	4.50	-	-	-	-	-	-	-	-	18	A-4b (V)	
		96																
		97																
		98																
		99																
		100	8 9 15	27	100	SS-34	4.50	0	0	0	66	34	28	20	8	20	A-4b (8)	
		101																
		102																
	566.8	103																
STIFF TO HARD, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST		104																
		105	10 10 15	29	100	SS-35	2.00	-	-	-	-	-	-	-	-	25	A-6a (V)	
		106																
		107																
		108																
		109																
		110	11 12 14	30	100	SS-36	4.50	0	0	0	56	44	33	19	14	22	A-6a (10)	
		111																
		112																
		113																
		114																
		115	8 13 16	33	100	SS-37	4.50	-	-	-	-	-	-	-	-	18	A-6a (V)	
		116																
		117																
		118																
		119																
		120	9 12 15	31	100	SS-38	3.75	-	-	-	-	-	-	-	-	24	A-6a (V)	
		121																
		122																
		123																
		124																
		125	10 10	26	100	SS-39	3.50	1	1	5	49	44	30	18	12	22	A-6a (9)	
		126																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO HARD, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST *(continued)*	543.7	127	13															
	541.8	128																
STIFF, GRAY, **SILTY CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		129																
		130	12															
		131	11 13	27	100	SS-40	1.25	0	1	1	31	67	40	22	18	27	A-6b (11)	
		132																
		133																
		134																
		135	11															
		136	15 16	35	100	SS-41	1.25	-	-	-	-	-	-	-	-	30	A-6b (V)	
	531.8	137																
		138																
STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		139																
		140	8															
	528.6	141	18 20	43	100	SS-42	1.50	1	1	2	45	51	35	20	15	24	A-6a (10)	
		EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 26.7' DURING DRILLING. HOLE DID NOT CAVE. BORING OFFSET 11.0' WEST AND 5.0' SOUTH.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; PUMPED 250 GAL. BENTONITE GROUT

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 75T	STATION / OFFSET: 204+60, 15' RT.	EXPLORATION ID B-169-1-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90 EB	
PID: 82382 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/1/19	ELEVATION: 645.2 (MSL) EOB: 85.0 ft.	PAGE 1 OF 3
START: 3/8/21 END: 3/8/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 89	LAT / LONG: 41.498665, -81.672360	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM DENSE TO DENSE, BROWN AND BROWNISH GRAY, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, CONTAINS TRACE IRON STAINING, MOIST TO WET	645.2																	
			6 7 7	21	83	SS-1	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
			5 7 8	22	100	SS-2	-	0	0	75	20	5	NP	NP	NP	25	A-3a (0)	
			5 6 10	24	100	SS-3	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
			6 5 9	21	100	SS-4	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
			4 10 12	33	100	SS-5	-	-	-	-	-	-	-	-	-	29	A-3a (V)	
		W 630.2																
			6 10 13	34	100	SS-6	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
	628.2																	
DENSE, BROWNISH GRAY, **COARSE AND FINE SAND**, LITTLE TO SOME SILT, TRACE CLAY, TRACE GRAVEL, WET			7 10 12	33	100	SS-7	-	-	-	-	-	-	-	-	-	27	A-3a (V)	
			6 10 13	34	100	SS-8	-	-	-	-	-	-	-	-	-	29	A-3a (V)	
	623.2																	
STIFF TO HARD, GRAY AND BROWNISH GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO WET			1 3 4	10	100	SS-9	1.75	-	-	-	-	-	-	-	-	29	A-4b (V)	
			2 2 4	9	100	SS-10	1.50	0	0	3	62	35	27	20	7	26	A-4b (8)	
			2 3 4	10	100	SS-11	1.50	-	-	-	-	-	-	-	-	24	A-4b (V)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO HARD, GRAY AND BROWNISH GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO WET *(continued)*	615.2	31	1 2 4	9	100	SS-12	4.25	-	-	-	-	-	-	-	-	23	A-4b (V)	
		32																
		33	1 1 3	6	100	SS-13	2.75	-	-	-	-	-	-	-	-	25	A-4b (V)	
	610.7	34																
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		35	1 2 3	7	100	SS-14	1.25	0	1	1	53	45	32	21	11	25	A-6a (8)	
		36																
		37																
		38	2 2 5	10	100	SS-15	1.75	-	-	-	-	-	-	-	-	24	A-6a (V)	
		39																
		40																
		41	3 4 5	13	100	SS-16	1.50	-	-	-	-	-	-	-	-	23	A-6a (V)	
		42																
		43	4 5 7	18	100	SS-17	2.00	0	0	2	49	49	30	19	11	26	A-6a (8)	
		44																
		45																
		46	3 5 8	19	100	SS-18	2.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
		47																
		48																
		49																
		50																
		51	2 4 5	13	100	SS-19	2.75	-	-	-	-	-	-	-	-	25	A-6a (V)	
		52																
		53																
		54																
		55																
		56	3 4 6	15	100	SS-20	2.75	0	0	1	45	54	32	21	11	25	A-6a (8)	
		57																
	586.9	58																
VERY STIFF TO HARD, GRAY, **SILT**, "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		59																
		60																
		61	4 6 8	21	100	SS-21	4.00	-	-	-	-	-	-	-	-	22	A-4b (V)	

PID: 82382	SFN:	PROJECT: CUY-90-16.28 (CCG3A)	STATION / OFFSET: 204+60, 15' RT.	START: 3/8/21	END: 3/8/21	PG 3 OF 3	B-169-1-20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF TO HARD, GRAY, **SILT**, "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP *(continued)*	583.1	63																
		64																
		65	5 6 8	21	100	SS-22	2.75	0	0	1	55	44	30	20	10	21	A-4b (8)	
		66																
		67																
		68																
		69																
		70	6 8 14	33	100	SS-23	2.25	-	-	-	-	-	-	-	-	21	A-4b (V)	
		71																
		72																
		73																
		74																
		75	7 8 16	36	100	SS-24	3.25	-	-	-	-	-	-	-	-	19	A-4b (V)	
		76																
		77																
		78																
		79																
		80	6 9 13	33	100	SS-25	4.50	-	-	-	-	-	-	-	-	19	A-4b (V)	
		81																
	562.7	82																
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		83																
		84	7 10 14	36	100	SS-26	2.00	0	0	1	45	54	32	21	11	23	A-6a (8)	
	560.2	EOB 85																

NOTES: GROUNDWATER ENCOUNTERED AT 15.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 180 GAL. BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 13:27 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\CUY-90-16.28 (CCG3A - MOD#7)\GINT FILES\CUY-90-16.28 (CCG3

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 55T	STATION / OFFSET: 206+66, 42' LT.	EXPLORATION ID B-169-2-20	
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90 WB		
PID: 82382 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 640.8 (MSL) EOB: 31.5 ft.	PAGE 1 OF 2	
START: 6/23/21 END: 6/23/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 68.4	LAT / LONG: 41.499044, -81.672487		

MATERIAL DESCRIPTION AND NOTES	ELEV. 640.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
8.5" ASPHALT AND 7.0" CONCRETE AND 9.5" BASE (DRILLERS DESCRIPTION)	638.7																	
LOOSE TO MEDIUM DENSE, BROWNISH GRAY, **SANDY SILT**, TRACE CLAY, TRACE GRAVEL, WET			5 8 10	21	67	SS-1	-	-	-	-	-	-	-	-	-	21	A-4a (V)	
			4 7 7	16	56	SS-2	-	-	-	-	-	-	-	-	-	21	A-4a (V)	
			5 5 4	10	56	SS-3	-	3	3	57	32	5	NP	NP	NP	23	A-4a (0)	
			4 6 8	16	67	SS-4	-	-	-	-	-	-	-	-	-	27	A-4a (V)	
		W 628.8	7 6 7	15	61	SS-5	-	-	-	-	-	-	-	-	-	26	A-4a (V)	
			6 7 9	18	89	SS-6	-	-	-	-	-	-	-	-	-	28	A-4a (V)	
	618.8		5 6 5	13	50	SS-7	-	-	-	-	-	-	-	-	-	21	A-4a (V)	
			4 5 7	14	56	SS-8	-	-	-	-	-	-	-	-	-	22	A-4a (V)	
VERY STIFF, GRAY, **SILT**, SOME SAND, LITTLE CLAY, TRACE GRAVEL, MOIST			6 5 5	11	61	SS-9	4.00	0	6	18	57	19	23	18	5	20	A-4b (8)	
	613.8		7 9 9	21	67	SS-10	4.00	-	-	-	-	-	-	-	-	20	A-4b (V)	
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE CLAY, TRACE GRAVEL, MOIST	611.3		8 10 11	24	72	SS-11	-	-	-	-	-	-	-	-	-	18	A-3a (V)	

PID: 82382	SFN:	PROJECT: CUY-90-16.28 (CCG3A)	STATION / OFFSET: 206+66, 42' LT.	START: 6/23/21	END: 6/23/21	PG 2 OF 2	B-169-2-20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY STIFF, GRAY, **SILT**, SOME CLAY, LITTLE SAND, TRACE GRAVEL, MOIST *(continued)*	610.8																	
	609.3	31	7 6 10	18	78	SS-12	3.00	0	5	13	58	24	25	17	8	20	A-4b (8)	
		EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 12.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; POURED 1 BAG HOLE PLUG; SHOVELED SOIL CUTTINGS

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 55T	STATION / OFFSET: 58+86, 5' LT.
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: CARNEGIE AVE
PID: 82382 SFN: 1807898	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 669.8 (MSL) EOB: 121.5 ft.
START: 4/19/21 END: 4/19/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 68.4	LAT / LONG: 41.499345, -81.672124

EXPLORATION ID: B-169-4-20

MATERIAL DESCRIPTION AND NOTES	ELEV. 669.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
4.0" ASPHALT AND 6.0" CONCRETE (DRILLERS DESCRIPTION)	669.0																	
DENSE, BROWN AND BLACK, **GRAVEL AND STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, CONTAINS CONCRETE AND ASPHALT FRAGMENTS, DAMP **(FILL)**	665.3		11 15 19	39	72	SS-1	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
LOOSE TO MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, CONTAINS RED BRICK FRAGMENTS, DAMP **(FILL)**			6 13 12	29	78	SS-2	-	-	-	-	-	-	-	-	-	6	A-3a (V)	
			7 7 6	15	83	SS-3	-	7	25	50	13	5	NP	NP	NP	7	A-3a (0)	
			5 9 9	21	67	SS-4	-	-	-	-	-	-	-	-	-	7	A-3a (V)	
			6 9 10	22	67	SS-5	-	10	21	49	14	6	NP	NP	NP	8	A-3a (0)	
			6 4 5	10	56	SS-6	-	-	-	-	-	-	-	-	-	8	A-3a (V)	
	650.3		7 6 7	15	78	SS-7	-	5	20	59	11	5	NP	NP	NP	6	A-3a (0)	
MEDIUM DENSE, LIGHT BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP TO MOIST			4 10 11	24	72	SS-8	-	-	-	-	-	-	-	-	-	5	A-3a (V)	
			6 11 10	24	61	SS-9	-	1	9	65	20	5	NP	NP	NP	8	A-3a (0)	
			7 11 11	25	83	SS-10	-	-	-	-	-	-	-	-	-	13	A-3a (V)	
@27.5'; BECOMES GRAY, WET		W 641.6	8 9 11	23	56	SS-11	-	-	-	-	-	-	-	-	-	25	A-3a (V)	

PID: 82382	SFN:	PROJECT: CUY-90-16.28 (CCG3A)	STATION / OFFSET: 58+86, 5' LT.	START: 4/19/21	END: 4/19/21	PG 2 OF 4	B-169-4-20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM DENSE, LIGHT BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, DAMP TO MOIST *(continued)*	639.8	31	8 10 11	24	67	SS-12	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
		33	7 10 11	24	78	SS-13	-	-	-	-	-	-	-	-	-	26	A-3a (V)	
		36	7 9 12	24	72	SS-14	-	-	-	-	-	-	-	-	-	26	A-3a (V)	
		38	7 7 9	18	78	SS-15	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
		41	4 5 8	15	72	SS-16	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		46	5 5 7	14	100	SS-17	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
		51	6 7 7	16	100	SS-18	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
	613.8	56	5 5 6	13	100	SS-19A	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST						SS-19B	2.25	-	-	-	-	-	-	-	-	24	A-6a (V)	
		61	6 7 6	15	94	SS-20	1.50	0	0	6	58	36	31	19	12	23	A-6a (9)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*	607.6	63																
		64																
		65	5 4 5	10	100	SS-21	1.25	-	-	-	-	-	-	-	-	23	A-6a (V)	
		66																
		67																
		68																
		69																
		70	3 3 4	8	100	SS-22	1.50	0	0	2	53	45	32	21	11	24	A-6a (8)	
		71																
		72																
		73																
		74																
		75	4 4 5	10	100	SS-23	1.75	-	-	-	-	-	-	-	-	23	A-6a (V)	
		76																
		77																
		78																
		79																
		80	6 7 9	18	100	SS-24	2.00	-	-	-	-	-	-	-	-	22	A-6a (V)	
		81																
		82																
		83																
		84																
		85	5 7 8	17	100	SS-25	1.75	0	0	2	59	39	32	20	12	26	A-6a (9)	
		86																
		87																
		88																
		89																
		90	7 6 7	15	100	SS-26	2.00	-	-	-	-	-	-	-	-	27	A-6a (V)	
		91																
		92																
		93																
		94																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*	575.5	95	7 8 9	19	100	SS-27	2.25	-	-	-	-	-	-	-	-	26	A-6a (V)	
	571.5	96–99																
VERY STIFF TO HARD, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST		100	7 6 7	15	100	SS-28	4.50	0	0	0	64	36	29	20	9	20	A-4b (8)	
		101–104																
		105	6 8 6	16	100	SS-29	4.50	-	-	-	-	-	-	-	-	19	A-4b (V)	
		106–109																
		110	8 8 9	19	100	SS-30	2.25	0	1	3	52	44	29	19	10	23	A-4b (8)	
	556.5	111–114																
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		115	7 9 9	21	100	SS-31	1.50	0	3	6	45	46	32	17	15	22	A-6a (10)	
		116–119																
		120	6 8 9	19	100	SS-32	3.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
	548.3	EOB 121																

NOTES: GROUNDWATER ENCOUNTERED AT 28.2' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; PUMPED 250 GAL. BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 13:28 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\CUY-90-16.28 (CCG3A - MOD#7)\GINT FILES\CUY-90-16.28 (CCG3

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 75T	STATION / OFFSET: 208+55, 70' RT.	EXPLORATION ID B-169-5-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90 EB	
PID: 82382 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/1/19	ELEVATION: 660.9 (MSL) EOB: 85.0 ft.	PAGE 1 OF 3
START: 3/5/21 END: 3/5/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 89	LAT / LONG: 41.499109, -81.670990	

MATERIAL DESCRIPTION AND NOTES	ELEV. 660.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
8.0" ASPHALT AND 6.0" BASE (DRILLERS DESCRIPTION)	659.7																	
LOOSE TO MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, CONTAINS TRACE IRON STAINING, DAMP TO MOIST			12 6 8	21	100	SS-1	-	-	-	-	-	-	-	-	-	10	A-3a (V)	
			14 5 4	13	100	SS-2	-	9	24	45	14	8	NP	NP	NP	10	A-3a (0)	
	652.4		3 2 3	7	100	SS-3A	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
STIFF TO VERY STIFF, BROWNISH GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO WET						SS-3B	1.75	-	-	-	-	-	-	-	-	28	A-6a (V)	
	650.4		2 2 6	12	100	SS-4A	2.00	-	-	-	-	-	-	-	-	24	A-6a (V)	
LOOSE TO DENSE, BROWNISH GRAY BECOMING GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE GRAVEL, LITTLE SILT, TRACE CLAY, DAMP TO MOIST						SS-4B	-	-	-	-	-	-	-	-	-	9	A-3a (V)	
			3 5 10	22	89	SS-5	-	-	-	-	-	-	-	-	-	4	A-3a (V)	
			2 2 4	9	67	SS-6	-	-	-	-	-	-	-	-	-	14	A-3a (V)	
		W 643.4																
@17.5'; BECOMES WET			2 5 7	18	78	SS-7	-	-	-	-	-	-	-	-	-	24	A-3a (V)	
			2 4 8	18	100	SS-8	-	-	-	-	-	-	-	-	-	28	A-3a (V)	
			2 2 4	9	100	SS-9	-	-	-	-	-	-	-	-	-	28	A-3a (V)	
			2 3 5	12	100	SS-10	-	-	-	-	-	-	-	-	-	27	A-3a (V)	
			9 10 13	34	100	SS-11	-	-	-	-	-	-	-	-	-	21	A-3a (V)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
LOOSE TO DENSE, BROWNISH GRAY BECOMING GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE GRAVEL, LITTLE SILT, TRACE CLAY, DAMP TO MOIST *(continued)*	630.9	31	10 10 14	36	100	SS-12	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		32																
		33	5 6 7	19	100	SS-13	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		34																
		35	5 7 9	24	100	SS-14	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		36																
		37	5 8 12	30	100	SS-15	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
	621.4	38																
DENSE, GRAY, **SANDY SILT**, TRACE CLAY, TRACE GRAVEL, WET		39																
	618.9	40	7 10 14	36	100	SS-16	-	0	0	45	45	10	NP	NP	NP	19	A-4a (4)	
MEDIUM STIFF TO HARD, GRAY, **SILT**, "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO WET		41																
		42																
		43	3 3 4	10	100	SS-17	2.50	-	-	-	-	-	-	-	-	27	A-4b (V)	
		44																
		45	3 4 6	15	100	SS-18	1.25	0	0	4	54	42	28	18	10	23	A-4b (8)	
		46																
		47																
		48																
		49																
		50	2 3 3	9	100	SS-19	0.75	-	-	-	-	-	-	-	-	29	A-4b (V)	
		51																
		52																
		53																
		54																
		55	1 2 3	7	100	SS-20	1.00	0	0	1	57	42	29	19	10	24	A-4b (8)	
		56																
		57																
		58																
		59																
		60	2 5 5	15	100	SS-21	2.00	-	-	-	-	-	-	-	-	21	A-4b (V)	
		61																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM STIFF TO HARD, GRAY, **SILT**, "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO WET *(continued)*	598.8	63																
		64																
		65	3 6 6	18	100	SS-22	2.75	0	0	1	56	43	28	18	10	22	A-4b (8)	
		66																
		67																
		68																
		69																
		70	4 7 10	25	100	SS-23	4.25	-	-	-	-	-	-	-	-	22	A-4b (V)	
		71																
		72																
		73																
		74																
		75	5 11 13	36	100	SS-24	3.25	0	0	1	63	36	27	20	7	22	A-4b (8)	
		76																
		77																
		78																
		79																
		80	4 6 7	19	100	SS-25	3.25	-	-	-	-	-	-	-	-	24	A-4b (V)	
		81																
		82																
		83																
		84	5 5 6	16	100	SS-26	3.00	0	0	1	53	46	28	20	8	26	A-4b (8)	
	575.9	EOB 85																

NOTES: GROUNDWATER ENCOUNTERED AT 17.5' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 180 GAL. BENTONITE GROUT

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 210+46, 170' LT.	EXPLORATION ID B-169-6-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90 WB	
PID: 82382 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 670.2 (MSL) EOB: 25.5 ft.	PAGE 1 OF 1
START: 6/1/21 END: 6/1/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 41.499871, -81.671684	

MATERIAL DESCRIPTION AND NOTES	ELEV. 670.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
7.0" ASPHALT (DRILLERS DESCRIPTION)	669.6																	
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND AND SILT**, TRACE CLAY, CONTAINS TRACE BRICK, SLAG, AND GLASS FRAGMENTS, DAMP **(FILL)**	665.7	1																
		2																
		3	9 7 5	16	100	SS-1	-	-	-	-	-	-	-	-	-	13	A-2-4 (V)	
		4																
LOOSE TO MEDIUM DENSE, BROWN, **FINE SAND**, TRACE SILT, TRACE COARSE SAND, TRACE CLAY, TRACE GRAVEL, DAMP TO MOIST		5																
		6	5 4 3	10	100	SS-2	-	-	-	-	-	-	-	-	-	6	A-3 (V)	
		7																
		8	3 4 4	11	100	SS-3	-	-	-	-	-	-	-	-	-	7	A-3 (V)	
		9																
		10	4 3 3	8	100	SS-4	-	0	2	91	6	1	NP	NP	NP	8	A-3 (0)	
	655.7	11																
MEDIUM DENSE TO DENSE, GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE TO LITTLE GRAVEL, TRACE CLAY, MOIST TO DAMP		12																
		13	3 3 4	10	100	SS-5	-	-	-	-	-	-	-	-	-	12	A-3 (V)	
		14																
		15	2 3 5	11	100	SS-6	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		16																
		17																
		18	4 7 9	22	100	SS-7	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
		19																
		20	3 4 8	16	100	SS-8	-	11	9	65	12	3	NP	NP	NP	10	A-3a (0)	
		21																
		22																
		23	6 6 9	20	100	SS-9	-	-	-	-	-	-	-	-	-	4	A-3a (V)	
		24																
	644.7	25	5 10 14	33	100	SS-10	-	-	-	-	-	-	-	-	-	5	A-3a (V)	
		EOB																

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 13:28 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\CUY-90-16.28 (CCG3A - MOD#7)\GINT FILES\CUY-90-16.28 (CCG3

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 55X	STATION / OFFSET: 61+30, 46' RT.	EXPLORATION ID B-169-7-20	
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CARNEGIE AVE		
PID: 82382 SFN: 1807898	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 669.8 (MSL) EOB: 135.0 ft.	PAGE 1 OF 5	
START: 6/2/21 END: 6/3/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 81.9	LAT / LONG: 41.499322, -81.671213		

MATERIAL DESCRIPTION AND NOTES	ELEV. 669.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM DENSE, ORANGISH BROWN, **COARSE AND FINE SAND**, LITTLE GRAVEL, TRACE SILT, TRACE CLAY, CONTAINS IRON STAINING, DAMP	665.3		5 5 17	30	100	SS-1	-	-	-	-	-	-	-	-	-	7	A-3a (V)	
MEDIUM DENSE, ORANGISH BROWN, **FINE SAND**, TRACE SILT, TRACE COARSE SAND, TRACE CLAY, TRACE GRAVEL, CONTAINS IRON STAINING, DAMP	657.8		10 5 4	12	100	SS-2	-	-	-	-	-	-	-	-	-	6	A-3 (V)	
			8 5 5	14	100	SS-3	-	0	4	89	6	1	NP	NP	NP	8	A-3 (0)	
			8 7 6	18	100	SS-4	-	-	-	-	-	-	-	-	-	7	A-3 (V)	
LOOSE, BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE CLAY, TRACE GRAVEL, WET TO MOIST	650.3		4 3 2	7	100	SS-5	-	-	-	-	-	-	-	-	-	18	A-3a (V)	
			3 3 2	7	100	SS-6	-	0	9	66	20	5	NP	NP	NP	16	A-3a (0)	
			2 2 3	7	100	SS-7	-	-	-	-	-	-	-	-	-	11	A-3a (V)	
DENSE, BROWNISH GRAY, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, DAMP	647.8		7 11 16	37	100	SS-8	-	-	-	-	-	-	-	-	-	4	A-1-b (V)	
MEDIUM DENSE TO DENSE, BROWNISH GRAY BECOMING GRAY, **COARSE AND FINE SAND**, TRACE SILT, TRACE GRAVEL, TRACE CLAY, DAMP TO WET			5 12 13	34	100	SS-9	-	-	-	-	-	-	-	-	-	5	A-3a (V)	
		W 644.8	7 8 8	22	100	SS-10	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
	640.3		5 14 17	42	100	SS-11	-	-	-	-	-	-	-	-	-	21	A-3a (V)	

PID: 82382	SFN:	PROJECT: CUY-90-16.28 (CCG3A)	STATION / OFFSET: 61+30, 46' RT.	START: 6/2/21	END: 6/3/21	PG 2 OF 5	B-169-7-20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM DENSE, GRAY, **FINE SAND**, TRACE COARSE SAND, TRACE SILT, TRACE GRAVEL, TRACE CLAY, WET *(continued)*	639.8	31	6 5 6	15	100	SS-12	-	-	-	-	-	-	-	-	-	31	A-3 (V)	
MEDIUM DENSE, GRAY, **SILT**, "AND" SAND, TRACE CLAY, TRACE GRAVEL, WET	637.8	32																
		33	3 3 7	14	100	SS-13	-	0	0	37	57	6	NP	NP	NP	26	A-4b (6)	
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE GRAVEL, TRACE CLAY, WET	635.3	34																
		35																
		36	3 7 8	20	100	SS-14	-	-	-	-	-	-	-	-	-	28	A-3a (V)	
		37																
		38	4 5 7	16	100	SS-15	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
		39																
		40																
		41	3 6 11	23	100	SS-16	-	-	-	-	-	-	-	-	-	27	A-3a (V)	
		42																
		43	10 9 8	23	100	SS-17	-	-	-	-	-	-	-	-	-	18	A-3a (V)	
	625.3	44																
DENSE, GRAY, **FINE SAND**, TRACE COARSE SAND, TRACE SILT, TRACE GRAVEL, TRACE CLAY, WET		45																
		46	4 11 13	33	100	SS-18	-	-	-	-	-	-	-	-	-	20	A-3 (V)	
		47																
		48	10 14 9	31	100	SS-19	-	-	-	-	-	-	-	-	-	22	A-3 (V)	
	620.3	49																
MEDIUM STIFF TO STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST TO WET		50																
		51	3 7 8	20	100	SS-20	1.25	-	-	-	-	-	-	-	-	25	A-6a (V)	
		52																
		53	3 3 5	11	100	SS-21	1.50	0	1	5	58	36	29	18	11	26	A-6a (8)	
		54																
		55																
		56	3 4 5	12	100	SS-22	1.00	-	-	-	-	-	-	-	-	30	A-6a (V)	
		57																
		58																
		59																
		60																
		61	2 5 7	16	100	SS-23	0.75	-	-	-	-	-	-	-	-	25	A-6a (V)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	607.7																	
	606.5	63																
SOFT TO MEDIUM STIFF, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST		64																
		65	3 5 7	16	100	SS-24	0.50	0	0	1	69	30	28	20	8	22	A-4b (8)	
		66																
	601.5	67																
STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		68																
		69																
		70	0 4 4	11	100	SS-25	1.50	-	-	-	-	-	-	-	-	24	A-6a (V)	
		71																
		72																
		73																
		74																
		75	3 9 10	26	100	SS-26	1.25	0	0	1	55	44	31	20	11	27	A-6a (8)	
		76																
		77																
		78																
		79																
		80	4 7 8	20	100	SS-27	1.25	-	-	-	-	-	-	-	-	28	A-6a (V)	
		81																
	586.5	82																
HARD, GRAY, **SILT**, SOME CLAY, TRACE SAND, TRACE GRAVEL, MOIST TO DAMP		83																
		84																
		85	4 8 10	25	100	SS-28	4.25	0	1	0	70	29	28	21	7	22	A-4b (8)	
		86																
		87																
		88																
		89																
		90	5 6 8	19	100	SS-29	4.50	-	-	-	-	-	-	-	-	20	A-4b (V)	
		91																
	576.5	92																
		93																
		94																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO HARD, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*	575.6	95	5 7 11	25	100	SS-30	4.50	0	0	0	60	40	30	19	11	22	A-6a (8)	
		96																
		97																
		98																
		99																
		100	5 6 10	22	100	SS-31	4.25	-	-	-	-	-	-	-	-	20	A-6a (V)	
		101																
		102																
		103																
		104																
		105	5 6 9	20	100	SS-32	1.50	0	0	1	50	49	33	19	14	25	A-6a (10)	
		106																
		107																
		108																
		109																
		110	6 6 8	19	100	SS-33	1.50	-	-	-	-	-	-	-	-	22	A-6a (V)	
		111																
		112																
		113																
		114																
	556.5	115	0 0 3	4	100	SS-34	0.20	-	-	-	-	-	-	-	-	31	A-7-6 (V)	
VERY SOFT TO MEDIUM STIFF, GRAY, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, MOIST		116																
		117																
		118																
		119																
		120	0 1 2	4	100	SS-35	0.25	1	2	3	28	66	41	21	20	30	A-7-6 (12)	
		121																
		122																
		123																
		124																
		125	0 2	8	100	SS-36	0.50	-	-	-	-	-	-	-	-	31	A-7-6 (V)	
		126																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY SOFT TO MEDIUM STIFF, GRAY, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*	543.4	127	4															
		128																
		129																
		130	1 2 6	11	100	SS-37	0.25	1	1	1	26	71	45	22	23	30	A-7-6 (14)	
		131																
		132																
		133																
		134	0 4 7	15	100	SS-38	0.50	-	-	-	-	-	-	-	-	30	A-7-6 (V)	
	534.8	EOB 135																

NOTES: GROUNDWATER ENCOUNTERED AT 25.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 300 GAL. BENTONITE GROUT

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 6/22/22 13:28 - X:\ACTIVE PROJECTS\ACTIVE SOIL PROJECTS\CUY-90-16.28 (CCG3A - MOD#7)\GINT FILES\CUY-90-16.28 (CCG3A

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 75T	STATION / OFFSET: 62+16, 19' LT.	EXPLORATION ID B-169-8-20
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: CARNEGIE AVE	
PID: 82382 SFN: 1807898	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/1/19	ELEVATION: 668.7 (MSL) EOB: 135.0 ft.	PAGE 1 OF 5
START: 5/18/21 END: 5/19/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 89	LAT / LONG: 41.499538, -81.670947	

MATERIAL DESCRIPTION AND NOTES	ELEV. 668.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
MEDIUM DENSE TO DENSE, ORANGISH BROWN AND BROWN, **FINE SAND**, TRACE COARSE SAND, TRACE SILT, TRACE CLAY, TRACE GRAVEL, CONTAINS IRON STAINING, DAMP		1																
		2																
		3	23 11 12	34	100	SS-1	-	-	-	-	-	-	-	-	-	6	A-3 (V)	
		4																
		5	4 4 5	13	100	SS-2	-	-	-	-	-	-	-	-	-	7	A-3 (V)	
		6																
		7	7 5 6	16	100	SS-3	-	0	5	90	4	1	NP	NP	NP	7	A-3 (0)	
		8																
		9	9 5 4	13	100	SS-4	-	-	-	-	-	-	-	-	-	9	A-3 (V)	
	656.7	10																
LOOSE TO MEDIUM DENSE, BROWN, **COARSE AND FINE SAND**, TRACE SILT, TRACE CLAY, TRACE GRAVEL, MOIST TO DAMP		11	10 3 3	9	100	SS-5	-	-	-	-	-	-	-	-	-	15	A-3a (V)	
		12																
		13	8 5 4	13	100	SS-6	-	2	15	72	9	2	NP	NP	NP	6	A-3a (0)	
		14																
		15																
@17.5' TO 21.5'; BECOMES LITTLE TO SOME GRAVEL		16																
		17																
		18	9 6 11	25	100	SS-7	-	-	-	-	-	-	-	-	-	8	A-3a (V)	
		19																
		20																
	646.7	21	6 7 7	21	100	SS-8	-	-	-	-	-	-	-	-	-	3	A-3a (V)	
MEDIUM DENSE, BROWN, **GRAVEL**, "AND" SAND, TRACE SILT, TRACE CLAY, DAMP TO MOIST		22																
		23	4 5 5	15	100	SS-9	-	56	29	7	6	2	NP	NP	NP	4	A-1-a (0)	
		24																
W 643.7		25																
		26	3 4 5	13	100	SS-10	-	-	-	-	-	-	-	-	-	13	A-1-a (V)	
	641.7	27																
VERY LOOSE, GRAY, **SANDY SILT**, TRACE GRAVEL, TRACE CLAY, WET		28	1 2 1	4	100	SS-11	-	8	19	27	40	6	NP	NP	NP	19	A-4a (2)	
		29																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY LOOSE, GRAY, **SANDY SILT**, TRACE GRAVEL, TRACE CLAY, WET *(continued)*	638.7	31	1 0 2	3	100	SS-12	-	-	-	-	-	-	-	-	-	22	A-4a (V)	
	636.7	32																
MEDIUM DENSE, GRAY, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, MOIST		33	4 6 7	19	100	SS-13	-	-	-	-	-	-	-	-	-	13	A-1-b (V)	
		34																
		35	5 6 8	21	100	SS-14	-	-	-	-	-	-	-	-	-	15	A-1-b (V)	
	631.7	36																
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, LITTLE GRAVEL, TRACE SILT, TRACE CLAY, MOIST		37																
		38	5 6 7	19	100	SS-15	-	-	-	-	-	-	-	-	-	13	A-3a (V)	
		39																
		40																
		41	6 6 7	19	100	SS-16	-	-	-	-	-	-	-	-	-	13	A-3a (V)	
		42																
	624.2	43	8 8 10	27	100	SS-17	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
MEDIUM DENSE, GRAY, **GRAVEL WITH SAND**, TRACE SILT, TRACE CLAY, MOIST		44																
		45																
		46	8 9 11	30	100	SS-18	-	-	-	-	-	-	-	-	-	12	A-1-b (V)	
	621.7	47																
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		48	4 7 8	22	100	SS-19	2.25	-	-	-	-	-	-	-	-	21	A-6a (V)	
		49																
		50																
		51	5 7 9	24	100	SS-20	2.00	0	0	4	63	33	30	19	11	21	A-6a (8)	
		52																
		53	4 5 5	15	100	SS-21	2.25	-	-	-	-	-	-	-	-	24	A-6a (V)	
		54																
		55																
		56	4 4 5	13	100	SS-22	1.50	-	-	-	-	-	-	-	-	22	A-6a (V)	
		57																
	610.4	58																
STIFF TO VERY STIFF, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, WET TO MOIST		59																
		60																
		61	3 6 6	18	100	SS-23	1.50	0	0	2	66	32	28	19	9	28	A-4b (8)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO VERY STIFF, GRAY, **SILT**, SOME TO "AND" CLAY, TRACE SAND, TRACE GRAVEL, WET TO MOIST *(continued)*	606.6	63																
		64																
		65	4 5 8	19	100	SS-24	1.25	-	-	-	-	-	-	-	-	23	A-4b (V)	
		66																
		67																
		68																
		69																
		70	1 3 4	10	100	SS-25	2.50	-	-	-	-	-	-	-	-	25	A-4b (V)	
		71																
		72																
		73																
		74																
		75	4 8 9	25	100	SS-26	2.75	0	0	1	57	42	30	20	10	24	A-4b (8)	
		76																
		77																
		78																
	590.4	79																
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST		80	3 6 8	21	100	SS-27	2.00	-	-	-	-	-	-	-	-	21	A-6a (V)	
		81																
		82																
		83																
		84																
		85	5 6 9	22	100	SS-28	3.00	-	-	-	-	-	-	-	-	22	A-6a (V)	
		86																
		87																
		88																
		89																
		90	4 7 9	24	100	SS-29	4.00	0	0	1	52	47	33	19	14	22	A-6a (10)	
		91																
		92																
		93																
		94																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, DAMP TO MOIST *(continued)*	574.5	95	4 6 10	24	100	SS-30	3.75	-	-	-	-	-	-	-	-	21	A-6a (V)	
		96																
		97																
		98																
		99																
		100	6 8 11	28	100	SS-31	4.00	-	-	-	-	-	-	-	-	19	A-6a (V)	
		101																
		102																
		103																
		104																
		105	6 7 8	22	100	SS-32	1.50	0	0	1	57	42	33	19	14	23	A-6a (10)	
		106																
		107																
		108																
		109																
		110	5 7 9	24	100	SS-33	2.00	-	-	-	-	-	-	-	-	25	A-6a (V)	
		111																
		112																
		113																
		114																
SOFT TO MEDIUM STIFF, GRAY, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, MOIST TO WET	555.4	115	1 2 3	7	100	SS-34	0.50	-	-	-	-	-	-	-	-	30	A-7-6 (V)	
		116																
		117																
		118																
		119																
		120	0 2 3	7	100	SS-35	0.50	2	2	3	26	67	46	21	25	45	A-7-6 (15)	
		121																
		122																
		123																
		124																
		125	1 3	10	100	SS-36	0.25	-	-	-	-	-	-	-	-	33	A-7-6 (V)	
		126																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
SOFT TO MEDIUM STIFF, GRAY, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, MOIST TO WET *(continued)*	542.4	127	4															
		128																
		129																
		130	0 2 5	10	100	SS-37	0.25	0	1	2	26	71	44	22	22	30	A-7-6 (14)	
		131																
		132																
		133																
		134	0 3 7	15	100	SS-38	0.25	-	-	-	-	-	-	-	-	30	A-7-6 (V)	
	533.7	EOB 135																

NOTES: GROUNDWATER ENCOUNTERED AT 25.0' DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED 0.5 BAG ASPHALT PATCH; PUMPED 300 GAL. BENTONITE GROUT

PROJECT: CUY-CCG3	DRILLING FIRM / OPERATOR: BARR / T.GILBERT	DRILL RIG: CME 55	STATION / OFFSET: 63+40, 55.0 RT
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: BARR / D.KLIMKOWICZ	HAMMER: CME AUTOMATIC	ALIGNMENT: CARNEGIE AVE
PID: 82380 BR ID: BRIDGE 14	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 1/26/14	ELEVATION: 666.9 (MSL) EOB: 112.0 ft.
START: 2/25/15 END: 2/25/15	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 78.8	COORD: 41.499394, -81.670458

EXPLORATION ID B-170-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
6.0", **ASPHALT**	666.4																	
12.0", **CONCRETE**	665.4																	
LOOSE TO MEDIUM DENSE, LIGHT BROWN, **COARSE AND FINE SAND**, SOME SILT, TRACE GRAVEL, TRACE CLAY, DAMP TO MOIST **(FILL)**			6 7 7	18	100	SS-1	-	-	-	-	-	-	-	-	-	6	A-3a (V)	
			3 2 3	7	100	SS-2	-	6	8	61	21	4	NP	NP	NP	5	A-3a (0)	
			2 2 3	7	100	SS-3	-	-	-	-	-	-	-	-	-	12	A-3a (V)	
@10.0'; SS-4 AND SS-5 CHANGE TO TRACE SILT			2 2 3	7	100	SS-4	-	0	5	83	8	4	NP	NP	NP	11	A-3a (0)	
			3 3 4	9	100	SS-5	-	-	-	-	-	-	-	-	-	10	A-3a (V)	
MEDIUM DENSE, GRAYISH BROWN, **SILT**, SOME CLAY, TRACE SAND, MOIST	652.4		2 4 6	13	100	SS-6	4.5+	0	1	6	70	23	27	19	8	20	A-4b (8)	
MEDIUM DENSE, GRAYISH BROWN, **FINE SAND**, TRACE COARSE SAND, TRACE GRAVEL, TRACE SILT, TRACE CLAY, DAMP	649.9		6 9 9	24	100	SS-7	-	-	-	-	-	-	-	-	-	7	A-3 (V)	
MEDIUM DENSE TO DENSE, GRAYISH BROWN, **SANDY SILT**, TRACE CLAY, WET	647.4		4 6 4	13	67	SS-8	-	-	-	-	-	-	-	-	-	19	A-4a (V)	
		W	8 15 16	41	100	SS-9	0.0 - 1.25	0	0	49	45	6	NP	NP	NP	20	A-4a (3)	
			13 18 19	49	100	SS-10	0.50	-	-	-	-	-	-	-	-	22	A-4a (V)	
			7 13 15	37	100	SS-11	-	0	1	56	37	6	NP	NP	NP	20	A-4a (2)	

PID: 82380	BR ID: BRIDGE 14	PROJECT: CUY-CCG3	STATION / OFFSET: 63+40, 55.0 RT	START: 2/25/15	END: 2/25/15	PG 2 OF 4	B-170-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
MEDIUM DENSE TO DENSE, GRAYISH BROWN, **SANDY SILT**, TRACE CLAY, WET *(continued)*	636.9	31	7 9 13	29	100	SS-12	0.0 - 1.5	-	-	-	-	-	-	-	-	19	A-4a (V)	
	633.6	32																
MEDIUM DENSE, GRAYISH BROWN MOTTLED WITH DARK GRAY, **SILT**, LITTLE SAND, TRACE CLAY, SLIGHTLY ORGANIC, WET		33																
		34																
		35	4 6 10	21	100	SS-13	1.50	0	0	11	83	6	NP	NP	NP	25	A-4b (8)	
	628.6	36																
MEDIUM DENSE, GRAY, **COARSE AND FINE SAND**, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, CONTAINS 1.0" SILT SEAM, WET		37																
		38																
		39																
		40	3 9 10	25	100	SS-14	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
	623.6	41																
MEDIUM DENSE, GRAYISH BROWN, **SILT**, "AND" CLAY, TRACE SAND, MOIST		42																
		43																
		44																
		45	6 7 16	30	100	SS-15	2.25	-	-	-	-	-	-	-	-	19	A-4b (V)	
		46																
		47																
		48																
		49																
		50	4 4 6	13	100	SS-16	0.0 - 0.6	0	1	6	57	36	28	18	10	23	A-4b (8)	
		51																
		52																
		53																
		54																
		55	3 4 5	12	450	SS-17	0.25 - 1.5	-	-	-	-	-	-	-	-	25	A-4b (V)	
	608.6	56																
MEDIUM STIFF TO STIFF, GRAYISH BROWN, **SILT AND CLAY**, TRACE SAND, MOIST TO WET		57																
		58																
		59																
		60																
@61.3'; UNIT WEIGHT: 133.1 PCF @ 22.2% MC		61			93	ST-18	0.9 - 1.8	0	0	1	62	37	29	18	11	22	A-6a (8)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
MEDIUM STIFF TO STIFF, GRAYISH BROWN, **SILT AND CLAY**, TRACE SAND, MOIST TO WET *(continued)*	604.8	63																
		64																
		65	3 5 6	14	100	SS-19	0.5 - 1.25	-	-	-	-	-	-	-	-	21	A-6a (V)	
		66																
		67																
		68																
		69																
		70	0 3 4	9	100	SS-20	1.3 - 1.5	-	-	-	-	-	-	-	-	24	A-6a (V)	
		71																
		72																
	593.6	73																
MEDIUM DENSE, GRAYISH BROWN, **SILT**, SOME CLAY, TRACE SAND, MOIST		74																
		75																
@75.1'; UNIT WEIGHT: 128.6 PCF @ 22.1% MC		76			77	ST-21	1.2 - 3.3	0	0	1	69	30	27	19	8	22	A-4b (8)	
		77																
		78																
		79																
		80	5 7 10	22	100	SS-22	1.0 - 2.5	-	-	-	-	-	-	-	-	21	A-4b (V)	
		81																
		82																
	583.6	83																
VERY SOFT TO STIFF, GRAYISH BROWN, **SILT AND CLAY**, TRACE SAND, CONTAINS 1.0" SILT SEAM, MOIST TO WET		84																
		85																
		86	0 6 8	18	100	SS-23	0.3 - 2.0	-	-	-	-	-	-	-	-	26	A-6a (V)	
		87																
		88																
		89																
		90																
@90.1'; UNIT WEIGHT: 127.9 PCF @ 28.7% MC		91			89	ST-24	0.2 - 1.8	0	0	0	51	49	29	18	11	29	A-6a (8)	
		92																
		93																
		94																

PID: 82380	BR ID: BRIDGE 14	PROJECT: CUY-CCG3	STATION / OFFSET: 63+40, 55.0 RT	START: 2/25/15	END: 2/25/15	PG 4 OF 4	B-170-0-14

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
VERY SOFT TO STIFF, GRAYISH BROWN, **SILT AND CLAY**, TRACE SAND, CONTAINS 1.0" SILT SEAM, MOIST TO WET *(continued)*	572.6	95	3 3 5	11	100	SS-25	1.0 - 1.8	-	-	-	-	-	-	-	-	25	A-6a (V)	
	568.6	96 97 98 99 100																
VERY SOFT TO STIFF, GRAYISH BROWN, **SILTY CLAY**, TRACE SAND, MOIST		101	4 5 6	14	100	SS-26	0.0 - 1.2	-	-	-	-	-	-	-	-	30	A-6b (V)	
		102 103 104 105																
		106	5 6 6	16	100	SS-27	0.3 - 0.5	-	-	-	-	-	-	-	-	28	A-6b (V)	
		107 108 109 110																
@110.1'; UNIT WEIGHT: 122.6 PCF @ 33.7% MC	554.9	111 EOB 112			94	ST-28	0.25 - 2.0	0	1	1	19	79	40	22	18	34	A-6b (11)	

NOTES: GROUNDWATER ENCOUNTERED AT 22.5' DURING DRILLING. CAVE DEPTH 22.8'.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PLACED .5 BAG ASPHALT PATCH; SHOVELED SOIL CUTTINGS

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / J. HODGES	DRILL RIG: CME 75T	STATION / OFFSET: 211+80, 26' RT.	EXPLORATION ID B-170-2-20
TYPE: RETAINING WALL	SAMPLING FIRM / LOGGER: NEAS / J. HODGES	HAMMER: CME AUTOMATIC	ALIGNMENT: IR-90 WB	
PID: 82382 SFN:	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 5/1/19	ELEVATION: 651.7 (MSL) EOB: 30.5 ft.	PAGE 1 OF 2
START: 5/21/21 END: 5/21/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 89	LAT / LONG: 41.499731, -81.670853	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND**, LITTLE SILT, TRACE CLAY, DAMP **(FILL)**	651.7																	
	647.2	3	12 12 10	33	100	SS-1	-	27	24	30	13	6	NP	NP	NP	7	A-1-b (0)	
MEDIUM DENSE TO DENSE, BROWN BECOMING BROWNISH GRAY, **FINE SAND**, LITTLE COARSE SAND, TRACE SILT, TRACE CLAY, TRACE GRAVEL, DAMP		6	5 6 8	21	100	SS-2	-	-	-	-	-	-	-	-	-	7	A-3 (V)	
@7.5' TO 19.0'; BECOMES WET		8	4 4 5	13	100	SS-3	-	0	19	73	6	2	NP	NP	NP	24	A-3 (0)	
		11	3 4 4	12	100	SS-4	-	-	-	-	-	-	-	-	-	23	A-3 (V)	
		13	3 5 6	16	100	SS-5	-	-	-	-	-	-	-	-	-	26	A-3 (V)	
		16	6 8 11	28	100	SS-6	-	-	-	-	-	-	-	-	-	22	A-3 (V)	
	632.2	18	11 13 17	45	100	SS-7	-	-	-	-	-	-	-	-	-	20	A-3 (V)	
DENSE, GRAY, **SILT**, SOME SAND, TRACE CLAY, TRACE GRAVEL, WET	630.2	21	7 13 14	40	100	SS-8	-	0	0	22	69	9	NP	NP	NP	19	A-4b (8)	
MEDIUM DENSE TO DENSE, GRAY, **FINE SAND**, LITTLE SILT, TRACE COARSE SAND, TRACE CLAY, TRACE GRAVEL, WET TO MOIST		23	4 6 11	25	100	SS-9	-	-	-	-	-	-	-	-	-	28	A-3 (V)	
		26	9 8 8	24	100	SS-10	-	-	-	-	-	-	-	-	-	23	A-3 (V)	
		28	10 9 10	28	100	SS-11	-	-	-	-	-	-	-	-	-	20	A-3 (V)	
		29	10 10	33	100	SS-12	-	-	-	-	-	-	-	-	-	17	A-3 (V)	

PID: 82382	SFN:	PROJECT: CUY-90-16.28 (CCG3A)	STATION / OFFSET: 211+80, 26' RT.	START: 5/21/21	END: 5/21/21	PG 2 OF 2	B-170-2-20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
P.S.	621.7																	
	621.2	EOB	12															

NOTES: GROUNDWATER NOT ENCOUNTERED DURING DRILLING. HOLE DID NOT CAVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SHOVELED SOIL CUTTINGS

PROJECT: CUY-90-16.28 (CCG3A)	DRILLING FIRM / OPERATOR: NEAS / ASHBAUGH	DRILL RIG: CME 55T	STATION / OFFSET: 64+33, 77' LT.	EXPLORATION ID B-170-3-20
TYPE: BRIDGE	SAMPLING FIRM / LOGGER: NEAS / ASHBAUGH	HAMMER: CME AUTOMATIC	ALIGNMENT: CARNEGIE AVE	
PID: 82382 SFN: 1807898	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 12/5/19	ELEVATION: 656.9 (MSL) EOB: 126.5 ft.	PAGE 1 OF 5
START: 4/14/21 END: 4/14/21	SAMPLING METHOD: SPT	ENERGY RATIO (%): 68.4	LAT / LONG: 41.499796, -81.670194	

MATERIAL DESCRIPTION AND NOTES	ELEV. 656.9	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	PIEZ.
5.0" TOPSOIL (DRILLERS DESCRIPTION)	656.5																	
LOOSE TO MEDIUM DENSE, BROWN BECOMING GRAYISH BROWN, **COARSE AND FINE SAND**, LITTLE SILT, TRACE GRAVEL, TRACE CLAY, MOIST TO DAMP			3 3 4	8	50	SS-1	-	-	-	-	-	-	-	-	-	11	A-3a (V)	
			4 5 10	17	78	SS-2	-	-	-	-	-	-	-	-	-	10	A-3a (V)	
			7 10 10	23	83	SS-3	-	-	-	-	-	-	-	-	-	5	A-3a (V)	
@10.0' TO 24.0'; BECOMES WET			8 12 13	29	78	SS-4	-	-	-	-	-	-	-	-	-	17	A-3a (V)	
			5 10 12	25	83	SS-5	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
@15.0' TO 24.0'; BECOMES DENSE			9 14 19	38	89	SS-6	-	-	-	-	-	-	-	-	-	20	A-3a (V)	
		W 639.8																
			12 15 21	41	78	SS-7	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
			10 14 20	39	72	SS-8	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
			10 15 22	42	94	SS-9	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
	632.4																	
MEDIUM DENSE, GRAY, **SILT**, SOME SAND, TRACE CLAY, TRACE GRAVEL, WET			7 10 9	22	100	SS-10	-	0	0	24	70	6	NP	NP	NP	22	A-4b (8)	
	629.4																	
MEDIUM DENSE, BROWNISH GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE GRAVEL, TRACE CLAY, WET			7 10 12	25	83	SS-11	-	-	-	-	-	-	-	-	-	25	A-3a (V)	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	PIEZ.
MEDIUM DENSE, BROWNISH GRAY, **COARSE AND FINE SAND**, TRACE TO LITTLE SILT, TRACE GRAVEL, TRACE CLAY, WET *(continued)*	626.9	31	7 12 13	29	94	SS-12	-	-	-	-	-	-	-	-	-	23	A-3a (V)	
		32																
		33	7 11 13	27	89	SS-13	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
		34																
		35	8 10 14	27	83	SS-14	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
		36																
		37																
		38	7 7 12	22	83	SS-15	-	-	-	-	-	-	-	-	-	22	A-3a (V)	
	616.9	39																
MEDIUM DENSE, GRAY, **SILT**, SOME SAND, LITTLE CLAY, TRACE GRAVEL, WET		40	4 6 7	15	89	SS-16	-	0	0	30	50	20	NP	NP	NP	22	A-4b (7)	
	614.9	41																
STIFF, GRAY, **SILT**, "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST		42																
		43	4 5 5	11	89	SS-17	1.25	0	0	4	59	37	30	20	10	24	A-4b (8)	
	611.9	44																
LOOSE, GRAY, **COARSE AND FINE SAND**, SOME SILT, TRACE TO LITTLE CLAY, TRACE GRAVEL, WET		45	3 4 3	8	100	SS-18	-	-	-	-	-	-	-	-	-	25	A-3a (V)	
		46																
		47																
		48																
		49																
		50	2 3 4	8	100	SS-19	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
	603.6	51																
STIFF TO VERY STIFF, GRAY, **SILT**, "AND" CLAY, TRACE SAND, TRACE GRAVEL, MOIST		52																
		53																
		54																
		55	2 2 2	5	100	SS-20	2.00	0	0	2	62	36	30	20	10	22	A-4b (8)	
	598.6	56																
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST		57																
		58																
		59																
		60	2 2 3	6	100	SS-21	2.50	-	-	-	-	-	-	-	-	28	A-6a (V)	
		61																

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	PIEZ.
VERY STIFF TO HARD, GRAY, **SILT AND CLAY**, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*	594.8	63																
		64																
		65	4 5 8	15	100	SS-22	2.50	0	0	2	56	42	34	19	15	26	A-6a (10)	
		66																
		67																
		68																
		69																
		70	5 8 9	19	100	SS-23	3.50	-	-	-	-	-	-	-	-	20	A-6a (V)	
		71																
		72																
		73																
		74																
		75	5 10 10	23	100	SS-24	3.75	0	1	1	58	40	33	19	14	20	A-6a (10)	
		76																
		77																
		78																
		79																
		80	7 10 11	24	100	SS-25	4.25	-	-	-	-	-	-	-	-	19	A-6a (V)	
		81																
		82																
		83																
		84																
		85	7 7 7	16	100	SS-26	2.50	-	-	-	-	-	-	-	-	21	A-6a (V)	
		86																
		87																
		88																
		89																
		90	5 6 6	14	100	SS-27	2.25	0	0	5	51	44	33	18	15	23	A-6a (10)	
		91																
		92																
	563.6	93																
		94																

PID: 82382	SFN:	PROJECT: CUY-90-16.28 (CCG3A)	STATION / OFFSET: 64+33, 77' LT.	START: 4/14/21	END: 4/14/21	PG 4 OF 5	B-170-3-20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	PIEZ.
SOFT TO STIFF, GRAY, **CLAY**, SOME SILT, TRACE SAND, TRACE GRAVEL, MOIST *(continued)*	562.7	95																
		96	5 6 6	14	100	SS-28	0.75	-	-	-	-	-	-	-	-	30	A-7-6 (V)	
		97																
		98																
		99																
		100																
		101	4 5 7	14	100	SS-29	0.50	1	1	2	32	64	42	20	22	29	A-7-6 (13)	
		102																
		103																
		104																
		105																
		106	6 5 6	13	100	SS-30	0.75	-	-	-	-	-	-	-	-	28	A-7-6 (V)	
		107																
		108																
		109																
		110																
		111	7 8 8	18	100	SS-31	1.00	-	-	-	-	-	-	-	-	30	A-7-6 (V)	
		112																
		113																
		114																
		115																
		116	6 8 7	17	100	SS-32	1.00	0	1	2	30	67	47	22	25	31	A-7-6 (15)	
		117																
		118																
		119																
		120																
		121	7 7 9	18	100	SS-33	1.00	-	-	-	-	-	-	-	-	30	A-7-6 (V)	
		122																
		123																
		124																
		125																
		126	8 9	19	100	SS-34	1.00	-	-	-	-	-	-	-	-	30	A-7-6 (V)	

PID: 82382	SFN:	PROJECT: CUY-90-16.28 (CCG3A)	STATION / OFFSET: 64+33, 77' LT.	START: 4/14/21	END: 4/14/21	PG 5 OF 5	B-170-3-20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	PIEZ.
	530.5																	
	530.4	EOB																

NOTES: GROUNDWATER ENCOUNTERED AT 17.1' DURING DRILLING, 11.6' AFTER PIEZOMETER INSTALLATION. HOLE DID NOT CAVE. BORING OFFSET 16.0' EAST.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: POURED 80 GAL. BENTONITE GROUT; POURED 2 BAGS CEMENT; POURED 12 BAGS SAND

B-002-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

LOG OF: Boring W-DLZ-2 | *Location:* As per plan | *Date Drilled:* 9/18/06 to 9/19/06

WATER OBSERVATIONS: Water seepage at: 26.0'
Water level at completion: ?

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	668.0												
0.3	667.7						Asphalt Concrete - 4"						
		14 26 45	13	1			FILL: Very dense gray GRAVEL (A-1-a); contains brick; damp.						
3.0	665.0												
		7 17 10	8	2			FILL: Medium dense brown COARSE AND FINE SAND (A-3a), little gravel; contains brick, slag, roots; damp.						
5													
5.5	662.5						POSSIBLE FILL: Loose to medium dense light brown FINE SAND (A-3); damp.						
		4 6 6	15	3									
							@ 8.0'; brown.						
		4 4 5	18	4									
10													
10.5	657.5						Loose to medium dense brown GRAVEL WITH SAND AND SILT (A-2-4); damp.						
		4 4 5	18	5									
		1 3 10	18	6			@ 14.0'; 10" silty clay seam.						
15													
		3 8 10	16	7			@ 16.0'; peppered.						
		8 11 12	17	8			@ 18.5'; gray.						
20													
		8 11 11	17	9									
		8 12 14	14	10				0	1	--	94	5	
25													
		14 14 13	18	11			@ 26.0'; wet.						
		2 8 11	15	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % -
PL — *LL*
Blows per foot -
10 20 30 40

71

Non-Plastic

FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-002-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

LOG OF: Boring W-DLZ-2 | *Location:* As per plan | *Date Drilled:* 9/18/06 to 9/19/06

WATER OBSERVATIONS: Water seepage at: 26.0'
Water level at completion: ?

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
30	638.0						Medium dense gray COARSE AND FINE SAND (A-3a); wet.						
		3 9 15	18	13									
35													
		3 12 16	17	14									
40													
41.8	626.3						Dense gray SILT (A-4b), little fine sand, trace clay; wet.						
		6 15 25		15									
45													
49.5	618.5	4 5 5	18	16		0.75	Medium stiff to stiff gray SANDY SILT (A-4a); moist.						
50													
		2 3 6	14	17		1.0							
55													
		4 7 9	18	18		---	@ 58.5'; contains organic material.						
60													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-002-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | Project: ODOT Innerbelt - Retaining Walls | Job No. 0422-1007.00

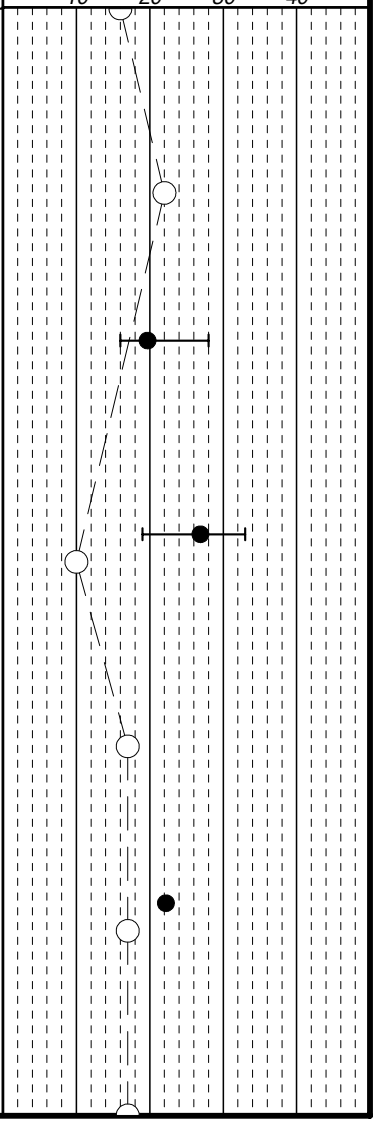
LOG OF: Boring W-DLZ-2 | Location: As per plan | Date Drilled: 9/18/06 to 9/19/06

WATER OBSERVATIONS: Water seepage at: 26.0'
Water level at completion: ?

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
60	608.0						Medium stiff to stiff gray SANDY SILT (A-4a); moist.						
61.8	606.3						Very stiff gray SILT AND CLAY (A-6a), trace fine sand; moist.						
65		7 9 13	18	19		2.25							
70					P-1	2.5 TSF	@ 68.0'; 24" Press Tube - 24" Recovery.	0	0	--	1	62	37
75		2 4 6	18	20		2.25	@ 73.5'; trace fine and coarse sand, trace gravel.		0	--	1	45	54
80		4 7 10	14	21		1.75							
85		3 7 10	18	22		2.0							
90		5 7 10	18	23		1.25							

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % -
PL — LL
Blows per foot - 10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-002-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

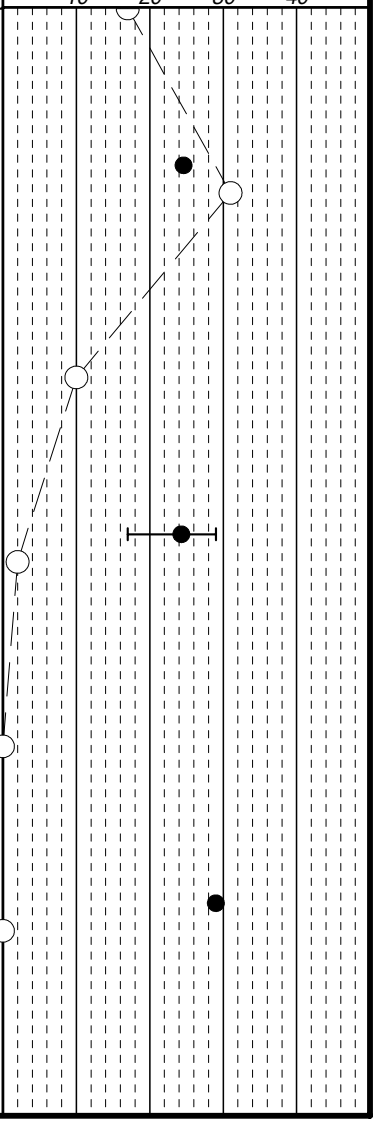
Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

LOG OF: Boring W-DLZ-2 | *Location:* As per plan | *Date Drilled:* 9/18/06 to 9/19/06

WATER OBSERVATIONS: Water seepage at: 26.0'
Water level at completion: ?

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
578.0													
90.1	577.9						Very stiff gray SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; moist.						
95		12 16 15	17	24		2.5							
96.8	571.3						Soft to medium stiff gray SANDY SILT (A-4a), trace gravel; moist.						
100		2 3 7	16	25		0.5							
101.8	566.2						Very soft to soft SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; moist.						
105		WOH WOH 2	18	26		0.0		1	3	--	8	48	40
106.8	561.2						Very soft gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
110		WOH WOH WOH	18	27		0.0							
115		WOH WOH WOH	18	28		0.0							
120					29	0.0	@ 118.0'; 24" Press Tube - 0" recovery.						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-002-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | Project: ODOT Innerbelt - Retaining Walls | Job No. 0422-1007.00

LOG OF: Boring W-DLZ-2 | Location: As per plan | Date Drilled: 9/18/06 to 9/19/06

WATER OBSERVATIONS: Water seepage at: 26.0'
Water level at completion: ?

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION
120	548.0						Very soft gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.
125		WOH WOH WOH	18	30		0.0	
		WOH WOH WOH	14	31		0.0	
130.0	538.0						Bottom of Boring - 130.0'
135							
140							
145							
150							

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-003-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

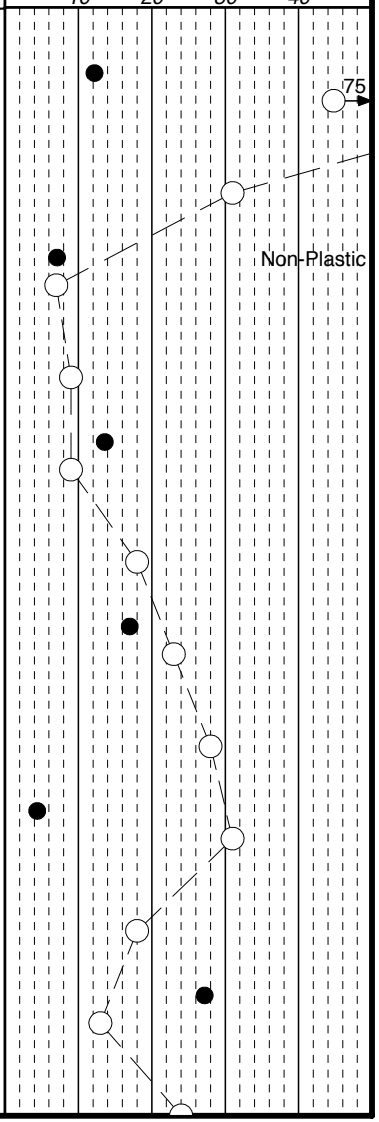
LOG OF: Boring W-DLZ-3 | *Location:* As per plan | *Date Drilled:* 9/21/06

WATER OBSERVATIONS: Water seepage at: 23.9' - 49.0'
Water level at completion: 25.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	669.0												
0.3	668.7						Asphalt Concrete - 3.5"						
		23 47 28	18	1			FILL: Very dense gray GRAVEL WITH SAND (A-1-b); damp.						
3.0	666.0												
		6 8 23	12	2			FILL: Dense gray GRAVEL (A-1-a); damp.						
5													
5.5	663.5						Loose brown GRAVEL WITH SAND AND SILT (A-2-4); damp.						
		3 3 4	14	3				10	22	--	53	15	
		3 4 5	16	4									
10													
		3 4 5	18	5			@ 11.0'; little gravel.						
		3 5 13	18	6			@ 13.5'; medium dense. @ 14.0'; 6" clump of clayey silt.						
15													
		8 6 17	18	7			@ 16.7'; 6" clump of clayey silt.						
		3 11 17	18	8			@ 18.5'; trace gravel.						
20													
		7 14 17	16	9			@ 20.5'; dense, peppered.						
		5 7 11	18	10			@ 23.0' - 25.5'; medium dense, brown and gray, contains clumps of clayey silt.						
25													
		4 5 8	18	11			@ 25.5'; gray.						
28.0	641.0												
		9 11 13	18	12			Medium dense gray GRAVEL WITH SAND AND SILT (A-2-4); wet.						
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-003-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | Project: ODOT Innerbelt - Retaining Walls | Job No. 0422-1007.00

LOG OF: Boring W-DLZ-3 | Location: As per plan | Date Drilled: 9/21/06

WATER OBSERVATIONS: Water seepage at: 23.9' - 49.0'
Water level at completion: 25.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
30	639.0						Medium dense gray GRAVEL WITH SAND AND SILT (A-2-4); wet.						
		5 8 9	18	13				0	0	--	67	33	
35													
		WOH 3 9	18	14									
40													
		4 14 20	18	15									
45													
46.8	622.3						Stiff gray SILT (A-4b), trace fine to coarse sand; moist.						
		7 8 11	18	16		1.75							
50													
							Lean clay						
						3.5 TSF	Lean clay	0	0	--	1	69	30
55						3.5 TSF	@ 53.5'; 24" Press Tube - 24" Recovery.	0	0	--	1	69	30
		9 12 14	18	17		4.0	@ 58.5' - 60.0'; very stiff to hard.	0	0	--	4	66	30
60													

STANDARD PENETRATION (N)
Natural Moisture Content, % -
PL — LL
Blows per foot - 10 20 30 40

Non-Plastic

FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-003-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

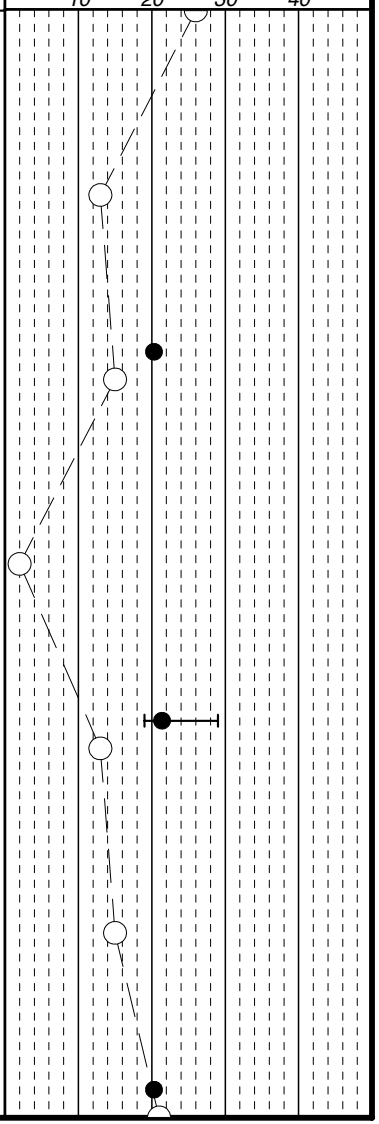
Client: Ohio Department of Transportation - District 12 | Project: ODOT Innerbelt - Retaining Walls | Job No. 0422-1007.00

LOG OF: Boring W-DLZ-3 | Location: As per plan | Date Drilled: 9/21/06

WATER OBSERVATIONS: Water seepage at: 23.9' - 49.0'
Water level at completion: 25.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
60	609.0						Medium stiff gray SILT (A-4b), trace fine to coarse sand; moist.						
65		3 5 8	18	18		.75							
70		2 6 9	18	19		2.5	@ 68.5'; very stiff.						
71.8	597.3						Very soft gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
75		WOH WOH 2	18	20		0.0							
76.8	592.3						Stiff to very stiff gray SILT (A-4b), trace fine sand; moist.						
80		1 5 8	18	21		2.5		0	0	--	0	65	35
85		1 5 10	18	22		1.5							
90		3 9 12	18	23		2.25							

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-003-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

LOG OF: Boring W-DLZ-3 | *Location:* As per plan | *Date Drilled:* 9/21/06

WATER OBSERVATIONS: Water seepage at: 23.9' - 49.0'
Water level at completion: 25.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
90	579.0						Stiff to very stiff gray SILT (A-4b), trace fine sand; moist.						
		6 10 18	18	24		3.25							
95													
					P-2	1.5	@ 98.0'; 24" Press Tube - 0" recovery.						
100													
		1 5 7	18	26		1.0	@ 103.5' - 105.0'; medium stiff to stiff.						
105													
106.8	562.2						Very stiff gray SANDY SILT (A-4a), trace gravel; moist.						
		6 12 16	18	27		2.75							
110													
111.8	557.2						Very soft gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
		WOH WOH WOH	18	28		0.0							
115													
		WOH WOH 3	18	29		0.0		4	1	--	2	30	63
120													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-003-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | Project: ODOT Innerbelt - Retaining Walls | Job No. 0422-1007.00

LOG OF: Boring W-DLZ-3 | Location: As per plan | Date Drilled: 9/21/06

WATER OBSERVATIONS: Water seepage at: 23.9' - 49.0'
Water level at completion: 25.0' (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
120	549.0						Very soft gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
		WOH WOH WOH	18	30		0.0							
125													
		WOH WOH 1	18	31		0.0							
130.0	539.0						Bottom of Boring - 130.0'						
135													
140													
145													
150													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-004-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

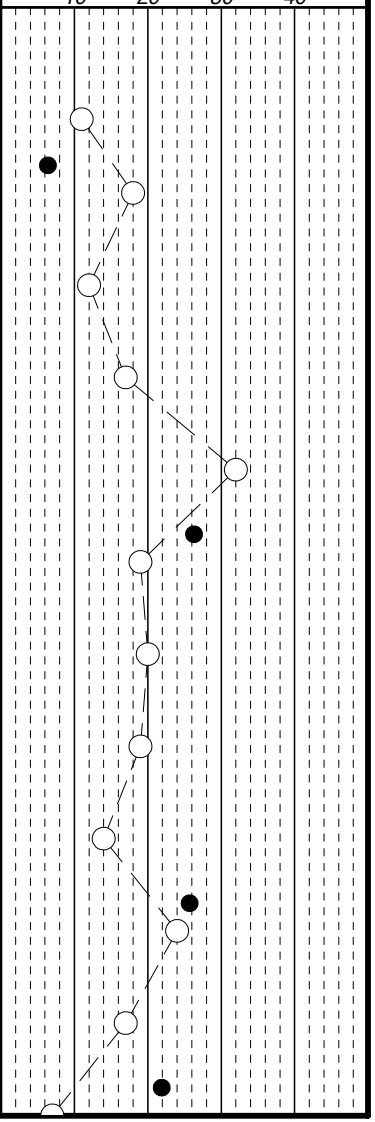
LOG OF: Boring W-DLZ-4 | *Location:* As per plan | *Date Drilled:* 10/2/06

WATER OBSERVATIONS: Water seepage at: 6.0' - 27.0'
Water level at completion: None (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	648.0												
1.3	646.7						Asphalt Concrete - 6" Portland Cement Concrete - 9"						
		17 5 6	16	1			POSSIBLE FILL: Medium dense brown COARSE AND FINE SAND (A-3a), trace to little gravel; damp.						
		7 9 9	10	2									
5													
5.5	642.5						Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4); wet.						
		5 5 7	9	3									
		5 7 10	16	4			S-4: gray, contains a petroleum-like odor.						
10													
10.5	637.5						Medium dense to dense gray SILT (A-4b), some to "and" fine sand; wet.						
		3 12 20	18	5									
		3 9 10	16	6									
15													
		6 9 11	17	7									
		5 6 13	18	8									
20													
20.5	627.5						Medium dense gray COARSE AND FINE SAND (A-3a), trace gravel; wet.						
		7 7 7	16	9									
		5 11 13	18	10A 10B			S-10A contains a petroleum-like odor.						
24.5	623.5						Medium dense gray SILT (A-4b), some fine sand; wet.						
25													
		12 10 7	18	11A 11B		1.5							
27.0	621.0						Stiff gray SILT AND CLAY (A-6a), trace fine to coarse sand; moist.						
28.0	620.0												
		2 3 4	12	12		1.0	Medium stiff to stiff gray SANDY SILT (A-4a); moist.						
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-004-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

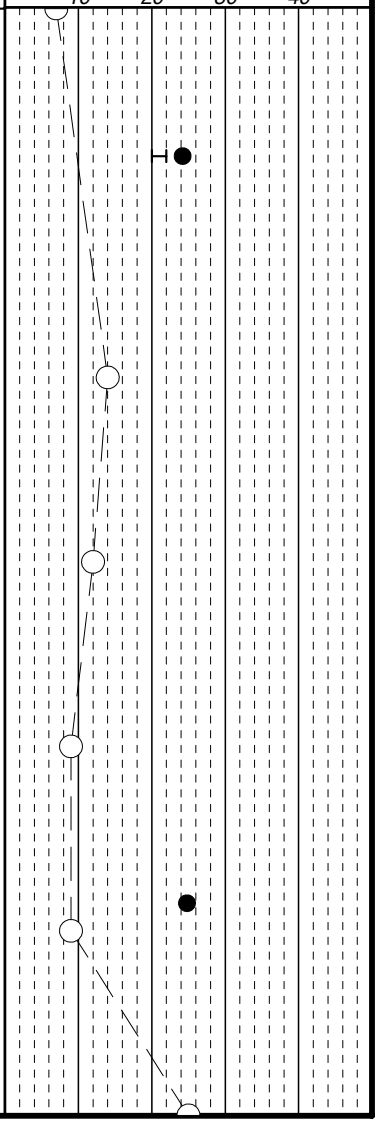
Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

LOG OF: Boring W-DLZ-4 | *Location:* As per plan | *Date Drilled:* 10/2/06

WATER OBSERVATIONS: Water seepage at: 6.0' - 27.0'
Water level at completion: None (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
30	618.0						Stiff to very stiff gray SANDY SILT (A-4a); moist.						
31.8	616.2						Stiff gray SILT (A-4b), little clay, trace fine sand; moist to wet.						
35					P-1	1.5		0	0	--	2	86	12
36.8	611.2						Stiff to very stiff gray SANDY SILT (A-4a); moist.						
40		3 6 8	18	13		1.5							
45		6 6 6	18	14		2.25							
50		3 4 5	18	15		2.0							
51.8	596.3						Stiff to very stiff gray SILT AND CLAY (A-6a), trace fine to coarse sand; moist.						
55		1 4 5	18	16		1.5							
60		5 10 15	16	17		3.0							

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-004-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

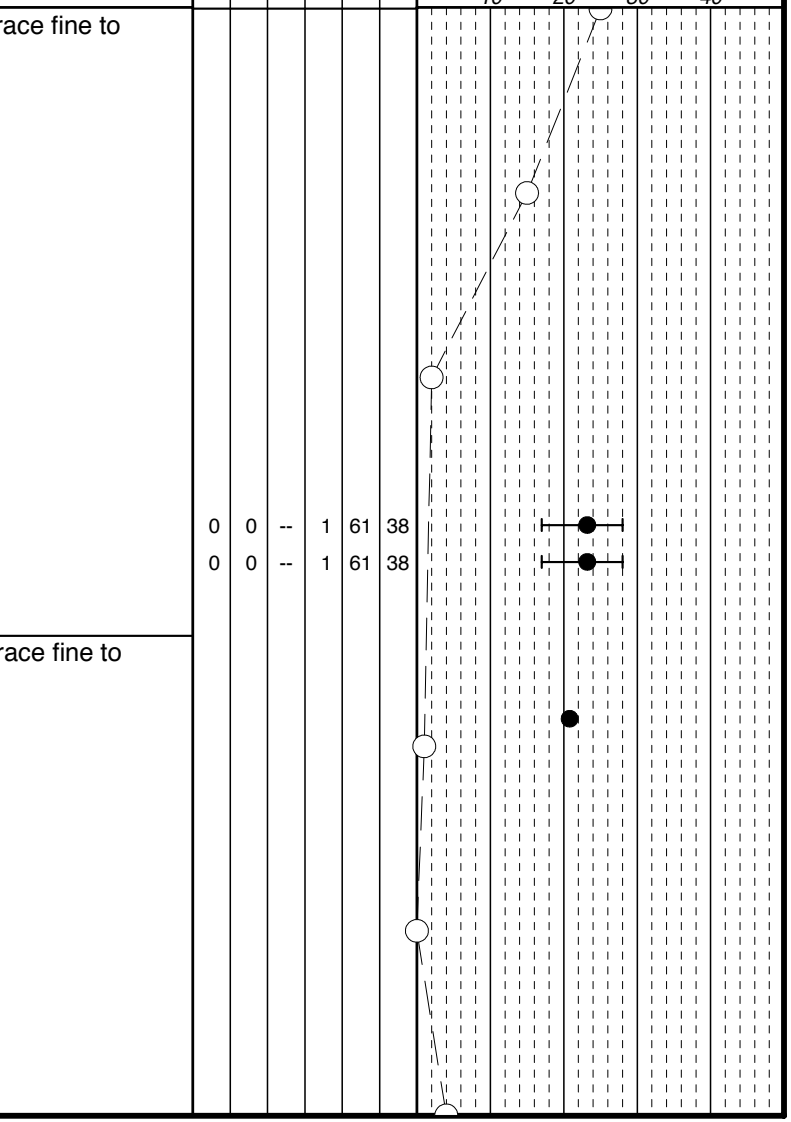
Client: Ohio Department of Transportation - District 12 | Project: ODOT Innerbelt - Retaining Walls | Job No. 0422-1007.00

LOG OF: Boring W-DLZ-4 | Location: As per plan | Date Drilled: 10/2/06

WATER OBSERVATIONS: Water seepage at: 6.0' - 27.0'
Water level at completion: None (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
60	588.0						Stiff to very stiff gray SILT AND CLAY (A-6a), trace fine to coarse sand; moist.						
65		3 7 8	18	18		2.5							
70		WOH WOH 2	18	19		0.5	@ 68.5' - 70.0'; soft to medium stiff.						
					P-2	1.5 TSF		0	0	--	1	61	38
75					P-2	1.5 TSF		0	0	--	1	61	38
77.0	571.0						Soft to medium stiff gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
80		WOH WOH 1	18	20		0.0	@ 78.5'; very soft.						
85		WOH WOH WOH	18	21		0.0							
90		WOH WOH 4	18	22		0.5	@ 88.5'; soft to medium stiff.						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

B-004-D-06

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: Ohio Department of Transportation - District 12 | *Project:* ODOT Innerbelt - Retaining Walls | *Job No.* 0422-1007.00

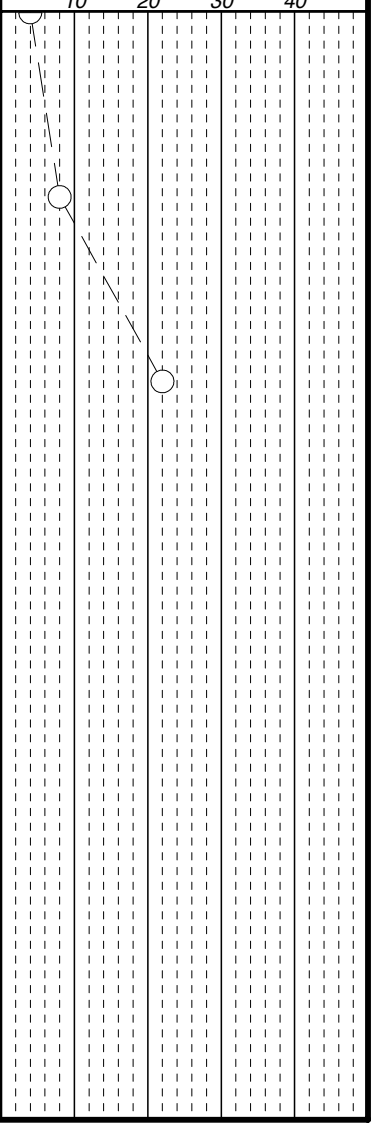
LOG OF: Boring W-DLZ-4 | *Location:* As per plan | *Date Drilled:* 10/2/06

WATER OBSERVATIONS: Water seepage at: 6.0' - 27.0'
Water level at completion: None (inside hollowstem augers)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION
90	558.0						Soft to medium stiff gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.
95		WOH 2 6	18	23		0.5	
96.8	551.3						Soft to medium stiff gray SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp to moist.
100.0	548.0	6 11 11	18	24		0.5	Bottom of Boring - 100.0'
105							
110							
115							
120							

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ——— LL
Blows per foot - ○
10 20 30 40



FILE: Innerbelt RW's Newest [11/25/2006 11:09 AM]

C

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
TESTING LABORATORY

LOG OF BORING

CO., RT. NO., SEC. CUY-42-18.81 BRIDGE NO. CUY-42-1896
REAR ABUTMENT UNDER CARNEGIE AVE.

LOCATION: T.H. 2 STA. 5+19 OFFSET 45' RT. FED. NO.

ELEV.	DEPTH	NO. BLOWS	SAMPLE NO.	DESCRIPTION
671.0	0			
	2			
	4			
	6			
	8			
	10			GRAY SANDY SILT
	12			
	14			
	16			
	18			
	20			
	22			
	24			
	26			
	28			
	30			
640.0	32	43	5558	GRAY SANDY SILT
	34			
635.0	36			

RO
12-31-56

LOG OF BORING (CONTINUED)

BRIDGE NO. CUY-42-1896 T.H. 2

ELEV.	DEPTH	NO. BLOWS	SAMPLE NO.	DESCRIPTION
	38	63		GRAY SANDY SILT AND CLAY
	40			
630.0	42	62	55585	GRAY SANDY SILT
	44			
625.0	46			
	48	57		GRAY SANDY SILT AND GRAVEL
	50			
620.0	52	23	55586	GRAY SILT
	54			
615.0	56			
	58	19	55587	GRAY SILT
	60			
610.0	62	18	55588	GRAY SILT
	64			
606.0	66			GRAY SILT CLAY
	68			BOTTOM OF HOLE
	70			
	72			
	74			
	76			
	78			
	80			
	82			

RC
12-31-56

B-011-CR-56

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
TESTING LABORATORY

LOG OF BORING

CO., RT. NO., SEC. CUY-11-18.81 BRIDGE NO. CUY-11-1896
FORWARD ABUTMENT UNDER CARNEGIE AVE.

LOCATION: T.H. 11 STA. 8+23 OFFSET 36' LT. FED. NO.

ELEV.	DEPTH	NO. BLOWS	SAMPLE NO.	DESCRIPTION
670.0	0			
	2			
	4			
	6			
	8			
	10			
	12			GRAY SANDY SILT
	14			
	16			
	18			
	20			
	22			
	24			
645.0	26	45	55575	BROWN GRAVEL
	28			
640.0	30			
	32	65	55576	GRAY SILTY SAND
	34			
635.0	36	15	55577	GRAY SANDY SILT

PC
12-31-56

B-011-CR-56

SHEET 6 C

LOG OF BORING (CONTINUED)

BRIDGE NO. GUY-12-1896 T.H. 11

ELEV.	DEPTH	NO. BLOWS	SAMPLE NO.	DESCRIPTION
	38			
630.0	40	35	55578	GRAY SILTY SAND
	42			
	44			
625.0	46	67	55579	GRAY SANDY SILT
	48			
620.0	50	30	55580	GRAY SILT
	52			
	54			
615.0	56	16	55581	GRAY SILT
	58			
610.0	60	17	55582	GRAY SILT
	62			
	64			
605.0	66	24	55583	GRAY SILT
	68			
	70			
	72			
	74			
595.0	76			BOTTOM OF HOLE
	78			
	80			
	82			

RC
12/3/56

APPENDIX D

DRIVEN ANALYSIS - CUY-90-1696

PIER - B-169-7-20

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE14\P1B1697.DVN
Project Name: CCG3A Project Date: 09/27/2021
Project Client: Michael Baker
Computed By: ZM
Project Manager: Brendan P. Andrews

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	0.00 ft
	- Driving/Restrike	0.00 ft
	- Ultimate:	0.00 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	3.70 ft	0.00%	125.00 pcf	32.0/32.0	Nordlund
2	Cohesionless	5.00 ft	17.00%	125.00 pcf	34.0/34.0	Nordlund
3	Cohesive	13.80 ft	33.00%	122.00 pcf	1800.00 psf	T-80 Same
4	Cohesive	5.00 ft	33.00%	122.00 pcf	2000.00 psf	T-80 Same
5	Cohesive	15.00 ft	33.00%	122.00 pcf	2350.00 psf	T-80 Same
6	Cohesive	10.00 ft	33.00%	125.00 pcf	2750.00 psf	T-80 Same
7	Cohesive	20.00 ft	33.00%	125.00 pcf	2650.00 psf	T-80 Same
8	Cohesive	21.70 ft	50.00%	118.00 pcf	1050.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.31 psf	23.44	N/A	0.00 Kips
3.69 ft	Cohesionless	115.50 psf	23.44	N/A	0.91 Kips
3.71 ft	Cohesionless	231.93 psf	24.90	N/A	0.92 Kips
8.69 ft	Cohesionless	387.81 psf	24.90	N/A	5.12 Kips
8.71 ft	Cohesive	N/A	N/A	1357.70 psf	5.17 Kips
17.71 ft	Cohesive	N/A	N/A	1357.70 psf	39.46 Kips
22.49 ft	Cohesive	N/A	N/A	1361.89 psf	57.84 Kips
22.51 ft	Cohesive	N/A	N/A	1375.16 psf	57.92 Kips
27.49 ft	Cohesive	N/A	N/A	1375.16 psf	77.14 Kips
27.51 ft	Cohesive	N/A	N/A	1202.12 psf	77.21 Kips
36.51 ft	Cohesive	N/A	N/A	1202.12 psf	107.57 Kips
42.49 ft	Cohesive	N/A	N/A	1226.30 psf	128.77 Kips
42.51 ft	Cohesive	N/A	N/A	992.27 psf	128.84 Kips
51.51 ft	Cohesive	N/A	N/A	992.27 psf	153.90 Kips
52.49 ft	Cohesive	N/A	N/A	992.27 psf	156.63 Kips
52.51 ft	Cohesive	N/A	N/A	1025.42 psf	156.68 Kips
61.51 ft	Cohesive	N/A	N/A	1025.42 psf	182.58 Kips
70.51 ft	Cohesive	N/A	N/A	1103.79 psf	212.45 Kips
72.49 ft	Cohesive	N/A	N/A	1136.97 psf	220.44 Kips
72.51 ft	Cohesive	N/A	N/A	960.60 psf	220.49 Kips
81.51 ft	Cohesive	N/A	N/A	960.60 psf	238.60 Kips
90.51 ft	Cohesive	N/A	N/A	971.05 psf	257.10 Kips
94.19 ft	Cohesive	N/A	N/A	979.27 psf	264.96 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.63 psf	40.40	46.08 Kips	0.02 Kips
3.69 ft	Cohesionless	230.99 psf	40.40	46.08 Kips	8.15 Kips
3.71 ft	Cohesionless	232.25 psf	55.60	102.65 Kips	11.95 Kips
8.69 ft	Cohesionless	543.99 psf	55.60	102.65 Kips	27.99 Kips
8.71 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
17.71 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
22.49 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
22.51 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
27.49 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
27.51 ft	Cohesive	N/A	N/A	N/A	29.53 Kips
36.51 ft	Cohesive	N/A	N/A	N/A	29.53 Kips
42.49 ft	Cohesive	N/A	N/A	N/A	29.53 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
52.49 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
52.51 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
61.51 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
70.51 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
72.49 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
72.51 ft	Cohesive	N/A	N/A	N/A	13.19 Kips
81.51 ft	Cohesive	N/A	N/A	N/A	13.19 Kips
90.51 ft	Cohesive	N/A	N/A	N/A	13.19 Kips
94.19 ft	Cohesive	N/A	N/A	N/A	13.19 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
3.69 ft	0.91 Kips	8.15 Kips	9.06 Kips
3.71 ft	0.92 Kips	11.95 Kips	12.87 Kips
8.69 ft	5.12 Kips	27.99 Kips	33.11 Kips
8.71 ft	5.17 Kips	22.62 Kips	27.79 Kips
17.71 ft	39.46 Kips	22.62 Kips	62.08 Kips
22.49 ft	57.84 Kips	22.62 Kips	80.46 Kips
22.51 ft	57.92 Kips	25.13 Kips	83.05 Kips
27.49 ft	77.14 Kips	25.13 Kips	102.27 Kips
27.51 ft	77.21 Kips	29.53 Kips	106.74 Kips
36.51 ft	107.57 Kips	29.53 Kips	137.11 Kips
42.49 ft	128.77 Kips	29.53 Kips	158.30 Kips
42.51 ft	128.84 Kips	34.56 Kips	163.39 Kips
51.51 ft	153.90 Kips	34.56 Kips	188.46 Kips
52.49 ft	156.63 Kips	34.56 Kips	191.19 Kips
52.51 ft	156.68 Kips	33.30 Kips	189.99 Kips
61.51 ft	182.58 Kips	33.30 Kips	215.89 Kips
70.51 ft	212.45 Kips	33.30 Kips	245.75 Kips
72.49 ft	220.44 Kips	33.30 Kips	253.74 Kips
72.51 ft	220.49 Kips	13.19 Kips	233.69 Kips
81.51 ft	238.60 Kips	13.19 Kips	251.79 Kips
90.51 ft	257.10 Kips	13.19 Kips	270.29 Kips
94.19 ft	264.96 Kips	13.19 Kips	278.15 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.31 psf	23.44	N/A	0.00 Kips
3.69 ft	Cohesionless	115.50 psf	23.44	N/A	0.91 Kips
3.71 ft	Cohesionless	231.93 psf	24.90	N/A	0.92 Kips
8.69 ft	Cohesionless	387.81 psf	24.90	N/A	5.98 Kips
8.71 ft	Cohesive	N/A	N/A	1357.70 psf	6.06 Kips
17.71 ft	Cohesive	N/A	N/A	1357.70 psf	57.24 Kips
22.49 ft	Cohesive	N/A	N/A	1361.89 psf	84.67 Kips
22.51 ft	Cohesive	N/A	N/A	1375.16 psf	84.79 Kips
27.49 ft	Cohesive	N/A	N/A	1375.16 psf	113.47 Kips
27.51 ft	Cohesive	N/A	N/A	1202.12 psf	113.58 Kips
36.51 ft	Cohesive	N/A	N/A	1202.12 psf	158.90 Kips
42.49 ft	Cohesive	N/A	N/A	1226.30 psf	190.53 Kips
42.51 ft	Cohesive	N/A	N/A	992.27 psf	190.63 Kips
51.51 ft	Cohesive	N/A	N/A	992.27 psf	228.04 Kips
52.49 ft	Cohesive	N/A	N/A	992.27 psf	232.11 Kips
52.51 ft	Cohesive	N/A	N/A	1025.42 psf	232.20 Kips
61.51 ft	Cohesive	N/A	N/A	1025.42 psf	270.85 Kips
70.51 ft	Cohesive	N/A	N/A	1103.79 psf	315.42 Kips
72.49 ft	Cohesive	N/A	N/A	1136.97 psf	327.36 Kips
72.51 ft	Cohesive	N/A	N/A	960.60 psf	327.46 Kips
81.51 ft	Cohesive	N/A	N/A	960.60 psf	363.67 Kips
90.51 ft	Cohesive	N/A	N/A	971.05 psf	400.67 Kips
94.19 ft	Cohesive	N/A	N/A	979.27 psf	416.39 Kips

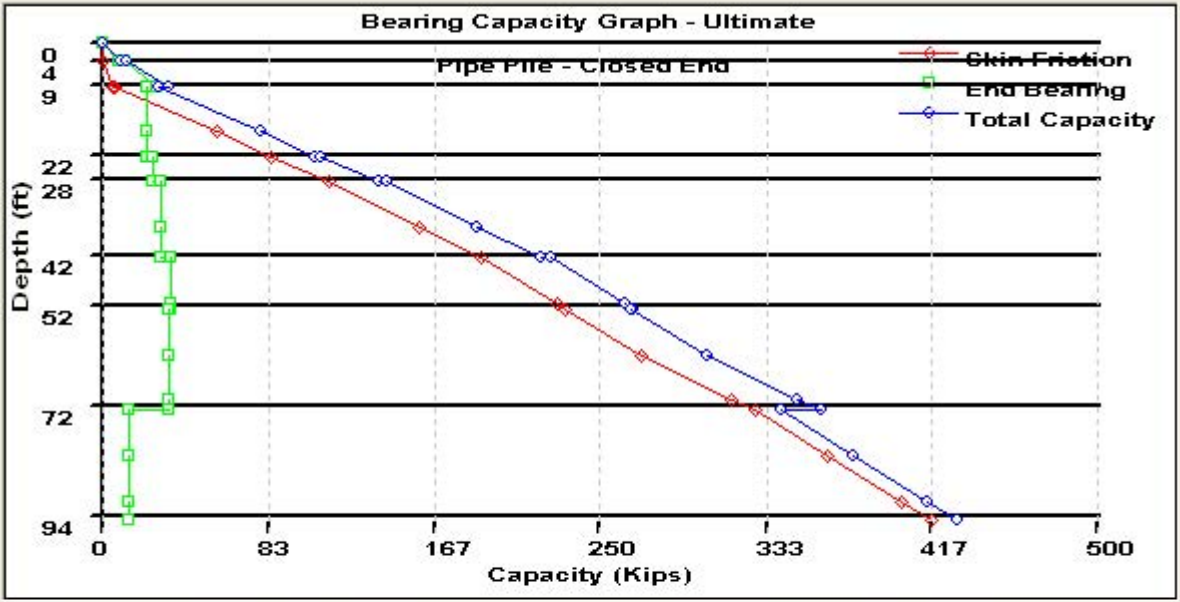
ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.63 psf	40.40	46.08 Kips	0.02 Kips
3.69 ft	Cohesionless	230.99 psf	40.40	46.08 Kips	8.15 Kips
3.71 ft	Cohesionless	232.25 psf	55.60	102.65 Kips	11.95 Kips
8.69 ft	Cohesionless	543.99 psf	55.60	102.65 Kips	27.99 Kips
8.71 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
17.71 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
22.49 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
22.51 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
27.49 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
27.51 ft	Cohesive	N/A	N/A	N/A	29.53 Kips
36.51 ft	Cohesive	N/A	N/A	N/A	29.53 Kips
42.49 ft	Cohesive	N/A	N/A	N/A	29.53 Kips
42.51 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
51.51 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
52.49 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
52.51 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
61.51 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
70.51 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
72.49 ft	Cohesive	N/A	N/A	N/A	33.30 Kips
72.51 ft	Cohesive	N/A	N/A	N/A	13.19 Kips
81.51 ft	Cohesive	N/A	N/A	N/A	13.19 Kips
90.51 ft	Cohesive	N/A	N/A	N/A	13.19 Kips
94.19 ft	Cohesive	N/A	N/A	N/A	13.19 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
3.69 ft	0.91 Kips	8.15 Kips	9.06 Kips
3.71 ft	0.92 Kips	11.95 Kips	12.87 Kips
8.69 ft	5.98 Kips	27.99 Kips	33.98 Kips
8.71 ft	6.06 Kips	22.62 Kips	28.68 Kips
17.71 ft	57.24 Kips	22.62 Kips	79.86 Kips
22.49 ft	84.67 Kips	22.62 Kips	107.29 Kips
22.51 ft	84.79 Kips	25.13 Kips	109.92 Kips
27.49 ft	113.47 Kips	25.13 Kips	138.60 Kips
27.51 ft	113.58 Kips	29.53 Kips	143.11 Kips
36.51 ft	158.90 Kips	29.53 Kips	188.43 Kips
42.49 ft	190.53 Kips	29.53 Kips	220.06 Kips
42.51 ft	190.63 Kips	34.56 Kips	225.19 Kips
51.51 ft	228.04 Kips	34.56 Kips	262.60 Kips
52.49 ft	232.11 Kips	34.56 Kips	266.67 Kips
52.51 ft	232.20 Kips	33.30 Kips	265.50 Kips
61.51 ft	270.85 Kips	33.30 Kips	304.15 Kips
70.51 ft	315.42 Kips	33.30 Kips	348.72 Kips
72.49 ft	327.36 Kips	33.30 Kips	360.66 Kips
72.51 ft	327.46 Kips	13.19 Kips	340.65 Kips
81.51 ft	363.67 Kips	13.19 Kips	376.87 Kips
90.51 ft	400.67 Kips	13.19 Kips	413.87 Kips
94.19 ft	416.39 Kips	13.19 Kips	429.58 Kips

Output - Graphical



Printer
Current
All

Clipboard
Current

Plots
Skin Friction
End Bearing
Total Capacity

Plot Set
Restrike
Driving
Ultimate

Axis Options
X Extent
Set

Help
OK

PIER - B-169-8-20

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE14\P1B1698.DVN
Project Name: CCG3A Project Date: 09/27/2021
Project Client: Michael Baker
Computed By: ZM
Project Manager: Brendan P. Andrews

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	0.00 ft
	- Driving/Restrike	0.00 ft
	- Ultimate:	0.00 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	4.80 ft	0.00%	125.00 pcf	32.0/32.0	Nordlund
2	Cohesionless	2.50 ft	0.00%	128.00 pcf	35.0/35.0	Nordlund
3	Cohesive	11.30 ft	33.00%	122.00 pcf	2300.00 psf	T-80 Same
4	Cohesive	20.00 ft	33.00%	122.00 pcf	2250.00 psf	T-80 Same
5	Cohesive	35.00 ft	33.00%	125.00 pcf	2900.00 psf	T-80 Same
6	Cohesive	21.70 ft	50.00%	118.00 pcf	1200.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.31 psf	23.44	N/A	0.00 Kips
4.79 ft	Cohesionless	149.93 psf	23.44	N/A	1.54 Kips
4.81 ft	Cohesionless	300.81 psf	25.63	N/A	1.55 Kips
7.29 ft	Cohesionless	382.15 psf	25.63	N/A	4.27 Kips
7.31 ft	Cohesive	N/A	N/A	1233.00 psf	4.31 Kips
16.31 ft	Cohesive	N/A	N/A	1233.00 psf	35.46 Kips
18.59 ft	Cohesive	N/A	N/A	1233.00 psf	43.35 Kips
18.61 ft	Cohesive	N/A	N/A	1265.48 psf	43.42 Kips
27.61 ft	Cohesive	N/A	N/A	1265.48 psf	75.38 Kips
36.61 ft	Cohesive	N/A	N/A	1327.80 psf	110.50 Kips
38.59 ft	Cohesive	N/A	N/A	1354.18 psf	119.35 Kips
38.61 ft	Cohesive	N/A	N/A	938.55 psf	119.43 Kips
47.61 ft	Cohesive	N/A	N/A	938.55 psf	143.13 Kips
56.61 ft	Cohesive	N/A	N/A	1010.68 psf	170.48 Kips
65.61 ft	Cohesive	N/A	N/A	1149.49 psf	206.54 Kips
73.59 ft	Cohesive	N/A	N/A	1272.57 psf	244.36 Kips
73.61 ft	Cohesive	N/A	N/A	1069.09 psf	244.43 Kips
82.61 ft	Cohesive	N/A	N/A	1069.09 psf	264.58 Kips
91.61 ft	Cohesive	N/A	N/A	1084.40 psf	285.31 Kips
95.29 ft	Cohesive	N/A	N/A	1096.44 psf	294.21 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.63 psf	40.40	46.08 Kips	0.02 Kips
4.79 ft	Cohesionless	299.85 psf	40.40	46.08 Kips	10.58 Kips
4.81 ft	Cohesionless	301.14 psf	64.00	150.24 Kips	18.30 Kips
7.29 ft	Cohesionless	463.82 psf	64.00	150.24 Kips	28.18 Kips
7.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
16.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
18.59 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
18.61 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
27.61 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
36.61 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
38.59 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
38.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
47.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
56.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
65.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
73.59 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
73.61 ft	Cohesive	N/A	N/A	N/A	15.08 Kips
82.61 ft	Cohesive	N/A	N/A	N/A	15.08 Kips
91.61 ft	Cohesive	N/A	N/A	N/A	15.08 Kips
95.29 ft	Cohesive	N/A	N/A	N/A	15.08 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
4.79 ft	1.54 Kips	10.58 Kips	12.12 Kips
4.81 ft	1.55 Kips	18.30 Kips	19.85 Kips
7.29 ft	4.27 Kips	28.18 Kips	32.46 Kips
7.31 ft	4.31 Kips	28.90 Kips	33.22 Kips
16.31 ft	35.46 Kips	28.90 Kips	64.36 Kips
18.59 ft	43.35 Kips	28.90 Kips	72.25 Kips
18.61 ft	43.42 Kips	28.27 Kips	71.69 Kips
27.61 ft	75.38 Kips	28.27 Kips	103.66 Kips
36.61 ft	110.50 Kips	28.27 Kips	138.77 Kips
38.59 ft	119.35 Kips	28.27 Kips	147.63 Kips
38.61 ft	119.43 Kips	36.44 Kips	155.87 Kips
47.61 ft	143.13 Kips	36.44 Kips	179.57 Kips
56.61 ft	170.48 Kips	36.44 Kips	206.93 Kips
65.61 ft	206.54 Kips	36.44 Kips	242.98 Kips
73.59 ft	244.36 Kips	36.44 Kips	280.81 Kips
73.61 ft	244.43 Kips	15.08 Kips	259.50 Kips
82.61 ft	264.58 Kips	15.08 Kips	279.66 Kips
91.61 ft	285.31 Kips	15.08 Kips	300.39 Kips
95.29 ft	294.21 Kips	15.08 Kips	309.29 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.31 psf	23.44	N/A	0.00 Kips
4.79 ft	Cohesionless	149.93 psf	23.44	N/A	1.54 Kips
4.81 ft	Cohesionless	300.81 psf	25.63	N/A	1.55 Kips
7.29 ft	Cohesionless	382.15 psf	25.63	N/A	4.27 Kips
7.31 ft	Cohesive	N/A	N/A	1233.00 psf	4.34 Kips
16.31 ft	Cohesive	N/A	N/A	1233.00 psf	50.82 Kips
18.59 ft	Cohesive	N/A	N/A	1233.00 psf	62.59 Kips
18.61 ft	Cohesive	N/A	N/A	1265.48 psf	62.70 Kips
27.61 ft	Cohesive	N/A	N/A	1265.48 psf	110.41 Kips
36.61 ft	Cohesive	N/A	N/A	1327.80 psf	162.82 Kips
38.59 ft	Cohesive	N/A	N/A	1354.18 psf	176.04 Kips
38.61 ft	Cohesive	N/A	N/A	938.55 psf	176.14 Kips
47.61 ft	Cohesive	N/A	N/A	938.55 psf	211.53 Kips
56.61 ft	Cohesive	N/A	N/A	1010.68 psf	252.35 Kips
65.61 ft	Cohesive	N/A	N/A	1149.49 psf	306.16 Kips
73.59 ft	Cohesive	N/A	N/A	1272.57 psf	362.62 Kips
73.61 ft	Cohesive	N/A	N/A	1069.09 psf	362.74 Kips
82.61 ft	Cohesive	N/A	N/A	1069.09 psf	403.04 Kips
91.61 ft	Cohesive	N/A	N/A	1084.40 psf	444.50 Kips
95.29 ft	Cohesive	N/A	N/A	1096.44 psf	462.31 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.63 psf	40.40	46.08 Kips	0.02 Kips
4.79 ft	Cohesionless	299.85 psf	40.40	46.08 Kips	10.58 Kips
4.81 ft	Cohesionless	301.14 psf	64.00	150.24 Kips	18.30 Kips
7.29 ft	Cohesionless	463.82 psf	64.00	150.24 Kips	28.18 Kips
7.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
16.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
18.59 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
18.61 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
27.61 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
36.61 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
38.59 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
38.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
47.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
56.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
65.61 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
73.59 ft	Cohesive	N/A	N/A	N/A	36.44 Kips
73.61 ft	Cohesive	N/A	N/A	N/A	15.08 Kips
82.61 ft	Cohesive	N/A	N/A	N/A	15.08 Kips
91.61 ft	Cohesive	N/A	N/A	N/A	15.08 Kips
95.29 ft	Cohesive	N/A	N/A	N/A	15.08 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
4.79 ft	1.54 Kips	10.58 Kips	12.12 Kips
4.81 ft	1.55 Kips	18.30 Kips	19.85 Kips
7.29 ft	4.27 Kips	28.18 Kips	32.46 Kips
7.31 ft	4.34 Kips	28.90 Kips	33.24 Kips
16.31 ft	50.82 Kips	28.90 Kips	79.72 Kips
18.59 ft	62.59 Kips	28.90 Kips	91.50 Kips
18.61 ft	62.70 Kips	28.27 Kips	90.97 Kips
27.61 ft	110.41 Kips	28.27 Kips	138.68 Kips
36.61 ft	162.82 Kips	28.27 Kips	191.09 Kips
38.59 ft	176.04 Kips	28.27 Kips	204.31 Kips
38.61 ft	176.14 Kips	36.44 Kips	212.59 Kips
47.61 ft	211.53 Kips	36.44 Kips	247.97 Kips
56.61 ft	252.35 Kips	36.44 Kips	288.79 Kips
65.61 ft	306.16 Kips	36.44 Kips	342.60 Kips
73.59 ft	362.62 Kips	36.44 Kips	399.06 Kips
73.61 ft	362.74 Kips	15.08 Kips	377.82 Kips
82.61 ft	403.04 Kips	15.08 Kips	418.12 Kips
91.61 ft	444.50 Kips	15.08 Kips	459.58 Kips
95.29 ft	462.31 Kips	15.08 Kips	477.39 Kips

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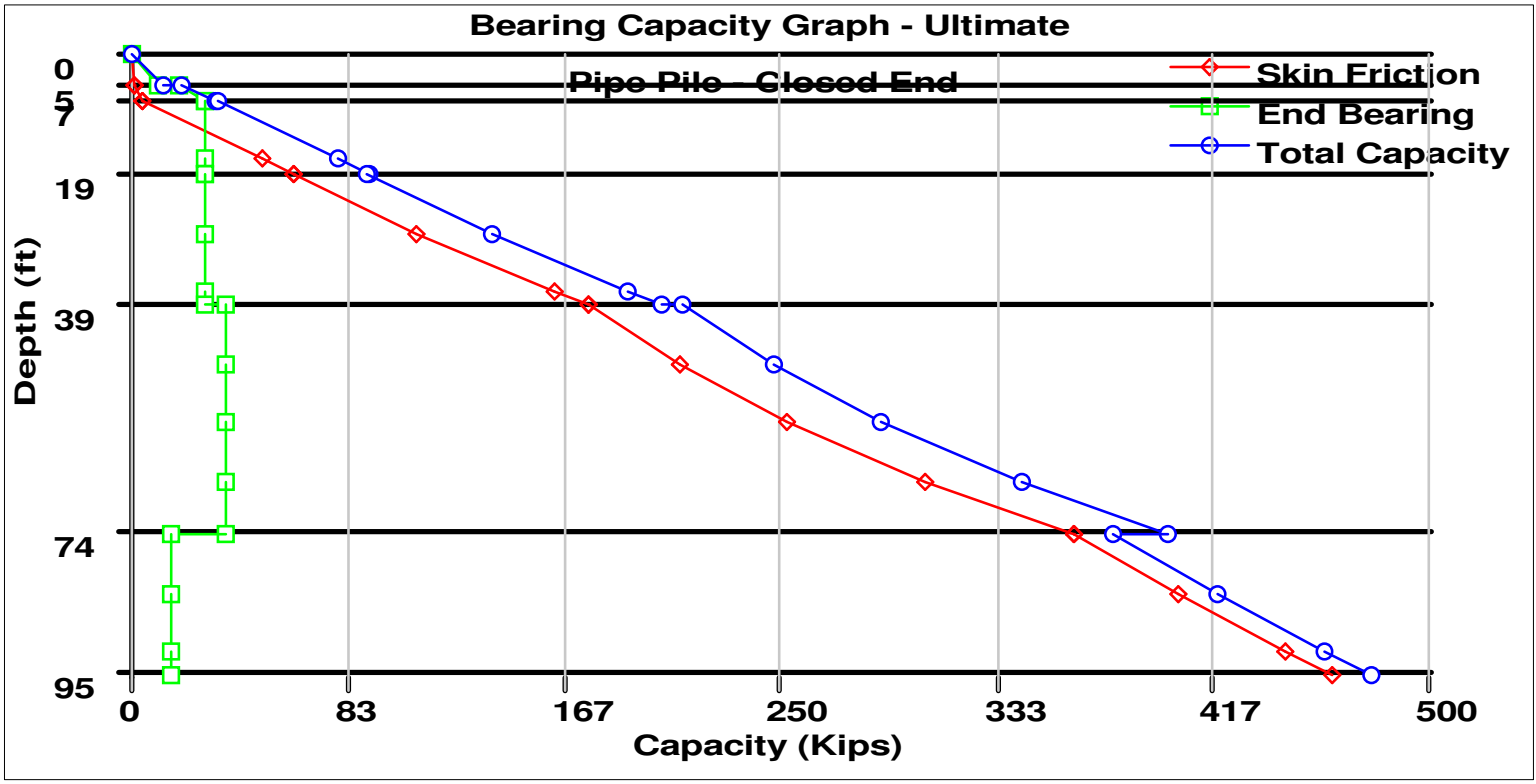

FORWARD ABUTMENT - B-170-0-14

DRIVEN 1.2

GENERAL PROJECT INFORMATION

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Project Name: CCG3A Project Date: 04/13/2022
Project Client: Michael Baker International
Computed By: KCA
Project Manager: BPA

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	-10.50 ft
	- Driving/Restrike	-10.50 ft
	- Ultimate:	-10.50 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	0.30 ft	17.00%	128.00 pcf	36.0/36.0	Nordlund
2	Cohesionless	5.00 ft	33.00%	125.00 pcf	31.0/31.0	Nordlund
3	Cohesionless	5.00 ft	0.00%	128.00 pcf	33.0/33.0	Nordlund
4	Cohesive	15.00 ft	33.00%	122.00 pcf	2250.00 psf	T-80 Same
5	Cohesive	15.00 ft	33.00%	130.00 pcf	1400.00 psf	T-80 Same
6	Cohesive	10.00 ft	33.00%	128.00 pcf	2750.00 psf	T-80 Same
7	Cohesive	15.00 ft	33.00%	128.00 pcf	1800.00 psf	T-80 Same
8	Cohesive	13.70 ft	43.00%	122.00 pcf	1850.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	-654.87 psf	26.37	N/A	-0.02 Kips
0.29 ft	Cohesionless	-645.69 psf	26.37	N/A	-0.52 Kips
0.31 ft	Cohesionless	-635.21 psf	22.70	N/A	-0.54 Kips
5.29 ft	Cohesionless	-479.33 psf	22.70	N/A	-3.59 Kips
5.31 ft	Cohesionless	-322.19 psf	24.17	N/A	-3.60 Kips
10.29 ft	Cohesionless	-158.85 psf	24.17	N/A	-5.48 Kips
10.31 ft	Cohesive	N/A	N/A	1265.48 psf	-5.44 Kips
19.31 ft	Cohesive	N/A	N/A	1265.48 psf	26.52 Kips
25.29 ft	Cohesive	N/A	N/A	1287.56 psf	48.69 Kips
25.31 ft	Cohesive	N/A	N/A	1193.00 psf	48.76 Kips
34.31 ft	Cohesive	N/A	N/A	1193.00 psf	78.90 Kips
40.29 ft	Cohesive	N/A	N/A	1201.57 psf	99.28 Kips
40.31 ft	Cohesive	N/A	N/A	992.27 psf	99.34 Kips
49.31 ft	Cohesive	N/A	N/A	992.27 psf	124.41 Kips
50.29 ft	Cohesive	N/A	N/A	992.27 psf	127.13 Kips
50.31 ft	Cohesive	N/A	N/A	1357.70 psf	127.20 Kips
59.31 ft	Cohesive	N/A	N/A	1357.70 psf	161.49 Kips
65.29 ft	Cohesive	N/A	N/A	1372.89 psf	184.92 Kips
65.31 ft	Cohesive	N/A	N/A	1367.44 psf	184.99 Kips
74.31 ft	Cohesive	N/A	N/A	1367.44 psf	214.37 Kips
78.99 ft	Cohesive	N/A	N/A	1370.84 psf	229.76 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	-654.54 psf	77.60	211.67 Kips	-49.17 Kips
0.29 ft	Cohesionless	-636.18 psf	77.60	211.67 Kips	-47.79 Kips
0.31 ft	Cohesionless	-634.89 psf	35.20	28.85 Kips	-18.81 Kips
5.29 ft	Cohesionless	-323.15 psf	35.20	28.85 Kips	-9.57 Kips
5.31 ft	Cohesionless	-321.86 psf	47.20	69.81 Kips	-13.69 Kips
10.29 ft	Cohesionless	4.82 psf	47.20	69.81 Kips	0.21 Kips
10.31 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
19.31 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
25.29 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
25.31 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
34.31 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
40.29 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
40.31 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
49.31 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
50.29 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
50.31 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
59.31 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
65.29 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
65.31 ft	Cohesive	N/A	N/A	N/A	23.25 Kips
74.31 ft	Cohesive	N/A	N/A	N/A	23.25 Kips
78.99 ft	Cohesive	N/A	N/A	N/A	23.25 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	-0.02 Kips	-49.17 Kips	-49.19 Kips
0.29 ft	-0.52 Kips	-47.79 Kips	-48.31 Kips
0.31 ft	-0.54 Kips	-18.81 Kips	-19.35 Kips
5.29 ft	-3.59 Kips	-9.57 Kips	-13.16 Kips
5.31 ft	-3.60 Kips	-13.69 Kips	-17.30 Kips
10.29 ft	-5.48 Kips	0.21 Kips	-5.27 Kips
10.31 ft	-5.44 Kips	28.27 Kips	22.83 Kips
19.31 ft	26.52 Kips	28.27 Kips	54.79 Kips
25.29 ft	48.69 Kips	28.27 Kips	76.96 Kips
25.31 ft	48.76 Kips	17.59 Kips	66.36 Kips
34.31 ft	78.90 Kips	17.59 Kips	96.49 Kips
40.29 ft	99.28 Kips	17.59 Kips	116.87 Kips
40.31 ft	99.34 Kips	34.56 Kips	133.90 Kips
49.31 ft	124.41 Kips	34.56 Kips	158.96 Kips
50.29 ft	127.13 Kips	34.56 Kips	161.69 Kips
50.31 ft	127.20 Kips	22.62 Kips	149.82 Kips
59.31 ft	161.49 Kips	22.62 Kips	184.11 Kips
65.29 ft	184.92 Kips	22.62 Kips	207.54 Kips
65.31 ft	184.99 Kips	23.25 Kips	208.24 Kips
74.31 ft	214.37 Kips	23.25 Kips	237.62 Kips
78.99 ft	229.76 Kips	23.25 Kips	253.01 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.33 psf	26.37	N/A	0.00 Kips
0.29 ft	Cohesionless	9.51 psf	26.37	N/A	0.01 Kips
0.31 ft	Cohesionless	19.99 psf	22.70	N/A	0.01 Kips
5.29 ft	Cohesionless	175.87 psf	22.70	N/A	1.68 Kips
5.31 ft	Cohesionless	333.01 psf	24.17	N/A	1.70 Kips
10.29 ft	Cohesionless	496.35 psf	24.17	N/A	7.57 Kips
10.31 ft	Cohesive	N/A	N/A	1265.48 psf	7.64 Kips
19.31 ft	Cohesive	N/A	N/A	1265.48 psf	55.35 Kips
25.29 ft	Cohesive	N/A	N/A	1287.56 psf	88.43 Kips
25.31 ft	Cohesive	N/A	N/A	1193.00 psf	88.55 Kips
34.31 ft	Cohesive	N/A	N/A	1193.00 psf	133.52 Kips
40.29 ft	Cohesive	N/A	N/A	1201.57 psf	163.94 Kips
40.31 ft	Cohesive	N/A	N/A	992.27 psf	164.04 Kips
49.31 ft	Cohesive	N/A	N/A	992.27 psf	201.45 Kips
50.29 ft	Cohesive	N/A	N/A	992.27 psf	205.52 Kips
50.31 ft	Cohesive	N/A	N/A	1357.70 psf	205.62 Kips
59.31 ft	Cohesive	N/A	N/A	1357.70 psf	256.80 Kips
65.29 ft	Cohesive	N/A	N/A	1372.89 psf	291.76 Kips
65.31 ft	Cohesive	N/A	N/A	1367.44 psf	291.88 Kips
74.31 ft	Cohesive	N/A	N/A	1367.44 psf	343.44 Kips
78.99 ft	Cohesive	N/A	N/A	1370.84 psf	370.44 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.66 psf	77.60	211.67 Kips	0.05 Kips
0.29 ft	Cohesionless	19.02 psf	77.60	211.67 Kips	1.43 Kips
0.31 ft	Cohesionless	20.31 psf	35.20	28.85 Kips	0.60 Kips
5.29 ft	Cohesionless	332.05 psf	35.20	28.85 Kips	9.84 Kips
5.31 ft	Cohesionless	333.34 psf	47.20	69.81 Kips	14.18 Kips
10.29 ft	Cohesionless	660.02 psf	47.20	69.81 Kips	28.08 Kips
10.31 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
19.31 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
25.29 ft	Cohesive	N/A	N/A	N/A	28.27 Kips
25.31 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
34.31 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
40.29 ft	Cohesive	N/A	N/A	N/A	17.59 Kips
40.31 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
49.31 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
50.29 ft	Cohesive	N/A	N/A	N/A	34.56 Kips
50.31 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
59.31 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
65.29 ft	Cohesive	N/A	N/A	N/A	22.62 Kips
65.31 ft	Cohesive	N/A	N/A	N/A	23.25 Kips
74.31 ft	Cohesive	N/A	N/A	N/A	23.25 Kips
78.99 ft	Cohesive	N/A	N/A	N/A	23.25 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.05 Kips	0.05 Kips
0.29 ft	0.01 Kips	1.43 Kips	1.44 Kips
0.31 ft	0.01 Kips	0.60 Kips	0.61 Kips
5.29 ft	1.68 Kips	9.84 Kips	11.52 Kips
5.31 ft	1.70 Kips	14.18 Kips	15.88 Kips
10.29 ft	7.57 Kips	28.08 Kips	35.66 Kips
10.31 ft	7.64 Kips	28.27 Kips	35.92 Kips
19.31 ft	55.35 Kips	28.27 Kips	83.62 Kips
25.29 ft	88.43 Kips	28.27 Kips	116.71 Kips
25.31 ft	88.55 Kips	17.59 Kips	106.14 Kips
34.31 ft	133.52 Kips	17.59 Kips	151.11 Kips
40.29 ft	163.94 Kips	17.59 Kips	181.54 Kips
40.31 ft	164.04 Kips	34.56 Kips	198.60 Kips
49.31 ft	201.45 Kips	34.56 Kips	236.00 Kips
50.29 ft	205.52 Kips	34.56 Kips	240.08 Kips
50.31 ft	205.62 Kips	22.62 Kips	228.24 Kips
59.31 ft	256.80 Kips	22.62 Kips	279.42 Kips
65.29 ft	291.76 Kips	22.62 Kips	314.38 Kips
65.31 ft	291.88 Kips	23.25 Kips	315.13 Kips
74.31 ft	343.44 Kips	23.25 Kips	366.68 Kips
78.99 ft	370.44 Kips	23.25 Kips	393.69 Kips

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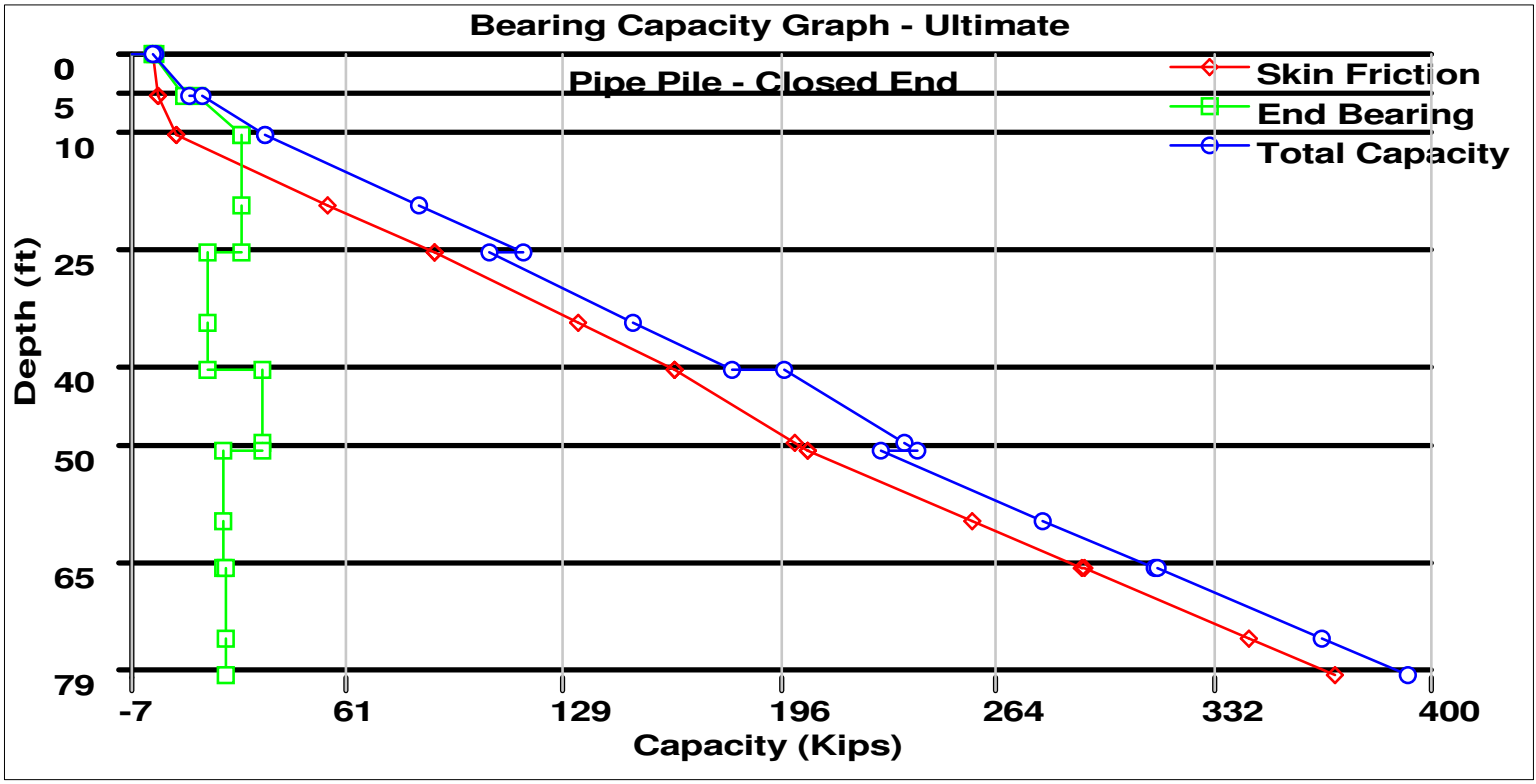

FORWARD ABUTMENT - B-170-3-20

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\DESKTOP\CCG3\BRIDGE14\FA_B17~1.DVN
Project Name: CCG3A Project Date: 04/13/2022
Project Client: Michael Baker International
Computed By: KCA
Project Manager: BPA

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 16.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	-5.90 ft
	- Driving/Restrike	-5.90 ft
	- Ultimate:	-5.90 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	1.50 ft	0.00%	125.00 pcf	37.0/37.0	Nordlund
2	Cohesionless	3.00 ft	33.00%	125.00 pcf	32.0/32.0	Nordlund
3	Cohesionless	12.50 ft	0.00%	128.00 pcf	34.0/34.0	Nordlund
4	Cohesionless	2.00 ft	33.00%	125.00 pcf	30.0/30.0	Nordlund
5	Cohesive	3.00 ft	33.00%	120.00 pcf	1350.00 psf	T-80 Same
6	Cohesionless	8.30 ft	0.00%	120.00 pcf	29.0/29.0	Nordlund
7	Cohesive	5.00 ft	33.00%	115.00 pcf	600.00 psf	T-80 Same
8	Cohesive	5.00 ft	33.00%	115.00 pcf	750.00 psf	T-80 Same
9	Cohesive	30.00 ft	33.00%	122.00 pcf	2300.00 psf	T-80 Same
10	Cohesive	33.20 ft	50.00%	122.00 pcf	2000.00 psf	T-80 Same

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	-367.85 psf	27.10	N/A	-0.01 Kips
1.49 ft	Cohesionless	-321.52 psf	27.10	N/A	-1.84 Kips
1.51 ft	Cohesionless	-273.95 psf	23.44	N/A	-1.85 Kips
4.49 ft	Cohesionless	-180.67 psf	23.44	N/A	-2.62 Kips
4.51 ft	Cohesionless	-86.13 psf	24.90	N/A	-2.63 Kips
13.51 ft	Cohesionless	209.07 psf	24.90	N/A	2.31 Kips
16.99 ft	Cohesionless	323.21 psf	24.90	N/A	7.95 Kips
17.01 ft	Cohesionless	733.85 psf	21.97	N/A	7.97 Kips
18.99 ft	Cohesionless	795.83 psf	21.97	N/A	9.75 Kips
19.01 ft	Cohesive	N/A	N/A	1166.25 psf	9.79 Kips
21.99 ft	Cohesive	N/A	N/A	1166.25 psf	19.54 Kips
22.01 ft	Cohesionless	1031.83 psf	21.24	N/A	19.61 Kips
30.29 ft	Cohesionless	1270.29 psf	21.24	N/A	35.90 Kips
30.31 ft	Cohesive	N/A	N/A	582.11 psf	35.93 Kips
35.29 ft	Cohesive	N/A	N/A	582.11 psf	44.07 Kips
35.31 ft	Cohesive	N/A	N/A	715.25 psf	44.10 Kips
40.29 ft	Cohesive	N/A	N/A	715.25 psf	54.10 Kips
40.31 ft	Cohesive	N/A	N/A	1233.00 psf	54.15 Kips
49.31 ft	Cohesive	N/A	N/A	1233.00 psf	85.30 Kips
58.31 ft	Cohesive	N/A	N/A	1298.50 psf	119.75 Kips
67.31 ft	Cohesive	N/A	N/A	1424.55 psf	162.10 Kips
70.29 ft	Cohesive	N/A	N/A	1466.29 psf	177.53 Kips
70.31 ft	Cohesive	N/A	N/A	1375.16 psf	177.60 Kips
79.31 ft	Cohesive	N/A	N/A	1375.16 psf	203.52 Kips
88.31 ft	Cohesive	N/A	N/A	1424.89 psf	231.32 Kips
97.31 ft	Cohesive	N/A	N/A	1520.57 psf	263.59 Kips
103.49 ft	Cohesive	N/A	N/A	1586.28 psf	287.84 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	-367.53 psf	91.20	287.69 Kips	-33.11 Kips
1.49 ft	Cohesionless	-274.89 psf	91.20	287.69 Kips	-24.77 Kips
1.51 ft	Cohesionless	-273.63 psf	40.40	46.08 Kips	-9.66 Kips
4.49 ft	Cohesionless	-87.09 psf	40.40	46.08 Kips	-3.07 Kips
4.51 ft	Cohesionless	-85.80 psf	55.60	102.65 Kips	-4.42 Kips
13.51 ft	Cohesionless	504.60 psf	55.60	102.65 Kips	25.96 Kips
16.99 ft	Cohesionless	732.88 psf	55.60	102.65 Kips	37.71 Kips
17.01 ft	Cohesionless	734.17 psf	30.00	18.60 Kips	17.84 Kips
18.99 ft	Cohesionless	858.11 psf	30.00	18.60 Kips	18.60 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	16.96 Kips
21.99 ft	Cohesive	N/A	N/A	N/A	16.96 Kips
22.01 ft	Cohesionless	1032.12 psf	26.40	18.60 Kips	18.60 Kips
30.29 ft	Cohesionless	1509.04 psf	26.40	18.60 Kips	18.60 Kips
30.31 ft	Cohesive	N/A	N/A	N/A	7.54 Kips
35.29 ft	Cohesive	N/A	N/A	N/A	7.54 Kips
35.31 ft	Cohesive	N/A	N/A	N/A	9.42 Kips
40.29 ft	Cohesive	N/A	N/A	N/A	9.42 Kips
40.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
49.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
58.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
67.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
70.29 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
70.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
79.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
88.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
97.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
103.49 ft	Cohesive	N/A	N/A	N/A	25.13 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	-0.01 Kips	-33.11 Kips	-33.13 Kips
1.49 ft	-1.84 Kips	-24.77 Kips	-26.61 Kips
1.51 ft	-1.85 Kips	-9.66 Kips	-11.51 Kips
4.49 ft	-2.62 Kips	-3.07 Kips	-5.69 Kips
4.51 ft	-2.63 Kips	-4.42 Kips	-7.04 Kips
13.51 ft	2.31 Kips	25.96 Kips	28.27 Kips
16.99 ft	7.95 Kips	37.71 Kips	45.66 Kips
17.01 ft	7.97 Kips	17.84 Kips	25.81 Kips
18.99 ft	9.75 Kips	18.60 Kips	28.35 Kips
19.01 ft	9.79 Kips	16.96 Kips	26.76 Kips
21.99 ft	19.54 Kips	16.96 Kips	36.51 Kips
22.01 ft	19.61 Kips	18.60 Kips	38.21 Kips
30.29 ft	35.90 Kips	18.60 Kips	54.50 Kips
30.31 ft	35.93 Kips	7.54 Kips	43.47 Kips
35.29 ft	44.07 Kips	7.54 Kips	51.61 Kips
35.31 ft	44.10 Kips	9.42 Kips	53.53 Kips
40.29 ft	54.10 Kips	9.42 Kips	63.52 Kips
40.31 ft	54.15 Kips	28.90 Kips	83.06 Kips
49.31 ft	85.30 Kips	28.90 Kips	114.20 Kips
58.31 ft	119.75 Kips	28.90 Kips	148.65 Kips
67.31 ft	162.10 Kips	28.90 Kips	191.01 Kips
70.29 ft	177.53 Kips	28.90 Kips	206.43 Kips
70.31 ft	177.60 Kips	25.13 Kips	202.73 Kips
79.31 ft	203.52 Kips	25.13 Kips	228.65 Kips
88.31 ft	231.32 Kips	25.13 Kips	256.45 Kips
97.31 ft	263.59 Kips	25.13 Kips	288.72 Kips
103.49 ft	287.84 Kips	25.13 Kips	312.97 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.31 psf	27.10	N/A	0.00 Kips
1.49 ft	Cohesionless	46.64 psf	27.10	N/A	0.27 Kips
1.51 ft	Cohesionless	94.21 psf	23.44	N/A	0.27 Kips
4.49 ft	Cohesionless	187.49 psf	23.44	N/A	1.47 Kips
4.51 ft	Cohesionless	282.03 psf	24.90	N/A	1.48 Kips
13.51 ft	Cohesionless	577.23 psf	24.90	N/A	15.10 Kips
16.99 ft	Cohesionless	691.37 psf	24.90	N/A	24.09 Kips
17.01 ft	Cohesionless	1102.01 psf	21.97	N/A	24.14 Kips
18.99 ft	Cohesionless	1163.99 psf	21.97	N/A	28.02 Kips
19.01 ft	Cohesive	N/A	N/A	1166.25 psf	28.09 Kips
21.99 ft	Cohesive	N/A	N/A	1166.25 psf	42.65 Kips
22.01 ft	Cohesionless	1399.99 psf	21.24	N/A	42.72 Kips
30.29 ft	Cohesionless	1638.45 psf	21.24	N/A	63.72 Kips
30.31 ft	Cohesive	N/A	N/A	582.11 psf	63.78 Kips
35.29 ft	Cohesive	N/A	N/A	582.11 psf	75.92 Kips
35.31 ft	Cohesive	N/A	N/A	715.25 psf	75.98 Kips
40.29 ft	Cohesive	N/A	N/A	715.25 psf	90.90 Kips
40.31 ft	Cohesive	N/A	N/A	1233.00 psf	90.98 Kips
49.31 ft	Cohesive	N/A	N/A	1233.00 psf	137.46 Kips
58.31 ft	Cohesive	N/A	N/A	1298.50 psf	188.88 Kips
67.31 ft	Cohesive	N/A	N/A	1424.55 psf	252.10 Kips
70.29 ft	Cohesive	N/A	N/A	1466.29 psf	275.12 Kips
70.31 ft	Cohesive	N/A	N/A	1375.16 psf	275.26 Kips
79.31 ft	Cohesive	N/A	N/A	1375.16 psf	327.10 Kips
88.31 ft	Cohesive	N/A	N/A	1424.89 psf	382.70 Kips
97.31 ft	Cohesive	N/A	N/A	1520.57 psf	447.24 Kips
103.49 ft	Cohesive	N/A	N/A	1586.28 psf	495.74 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.63 psf	91.20	287.69 Kips	0.06 Kips
1.49 ft	Cohesionless	93.27 psf	91.20	287.69 Kips	8.40 Kips
1.51 ft	Cohesionless	94.53 psf	40.40	46.08 Kips	3.34 Kips
4.49 ft	Cohesionless	281.07 psf	40.40	46.08 Kips	9.92 Kips
4.51 ft	Cohesionless	282.36 psf	55.60	102.65 Kips	14.53 Kips
13.51 ft	Cohesionless	872.76 psf	55.60	102.65 Kips	44.91 Kips
16.99 ft	Cohesionless	1101.04 psf	55.60	102.65 Kips	56.65 Kips
17.01 ft	Cohesionless	1102.33 psf	30.00	18.60 Kips	18.60 Kips
18.99 ft	Cohesionless	1226.27 psf	30.00	18.60 Kips	18.60 Kips
19.01 ft	Cohesive	N/A	N/A	N/A	16.96 Kips
21.99 ft	Cohesive	N/A	N/A	N/A	16.96 Kips
22.01 ft	Cohesionless	1400.28 psf	26.40	18.60 Kips	18.60 Kips
30.29 ft	Cohesionless	1877.20 psf	26.40	18.60 Kips	18.60 Kips
30.31 ft	Cohesive	N/A	N/A	N/A	7.54 Kips
35.29 ft	Cohesive	N/A	N/A	N/A	7.54 Kips
35.31 ft	Cohesive	N/A	N/A	N/A	9.42 Kips
40.29 ft	Cohesive	N/A	N/A	N/A	9.42 Kips
40.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
49.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
58.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
67.31 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
70.29 ft	Cohesive	N/A	N/A	N/A	28.90 Kips
70.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
79.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
88.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
97.31 ft	Cohesive	N/A	N/A	N/A	25.13 Kips
103.49 ft	Cohesive	N/A	N/A	N/A	25.13 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.06 Kips	0.06 Kips
1.49 ft	0.27 Kips	8.40 Kips	8.67 Kips
1.51 ft	0.27 Kips	3.34 Kips	3.61 Kips
4.49 ft	1.47 Kips	9.92 Kips	11.39 Kips
4.51 ft	1.48 Kips	14.53 Kips	16.01 Kips
13.51 ft	15.10 Kips	44.91 Kips	60.00 Kips
16.99 ft	24.09 Kips	56.65 Kips	80.75 Kips
17.01 ft	24.14 Kips	18.60 Kips	42.74 Kips
18.99 ft	28.02 Kips	18.60 Kips	46.62 Kips
19.01 ft	28.09 Kips	16.96 Kips	45.05 Kips
21.99 ft	42.65 Kips	16.96 Kips	59.61 Kips
22.01 ft	42.72 Kips	18.60 Kips	61.31 Kips
30.29 ft	63.72 Kips	18.60 Kips	82.32 Kips
30.31 ft	63.78 Kips	7.54 Kips	71.32 Kips
35.29 ft	75.92 Kips	7.54 Kips	83.46 Kips
35.31 ft	75.98 Kips	9.42 Kips	85.40 Kips
40.29 ft	90.90 Kips	9.42 Kips	100.32 Kips
40.31 ft	90.98 Kips	28.90 Kips	119.88 Kips
49.31 ft	137.46 Kips	28.90 Kips	166.36 Kips
58.31 ft	188.88 Kips	28.90 Kips	217.79 Kips
67.31 ft	252.10 Kips	28.90 Kips	281.00 Kips
70.29 ft	275.12 Kips	28.90 Kips	304.03 Kips
70.31 ft	275.26 Kips	25.13 Kips	300.39 Kips
79.31 ft	327.10 Kips	25.13 Kips	352.24 Kips
88.31 ft	382.70 Kips	25.13 Kips	407.83 Kips
97.31 ft	447.24 Kips	25.13 Kips	472.37 Kips
103.49 ft	495.74 Kips	25.13 Kips	520.87 Kips

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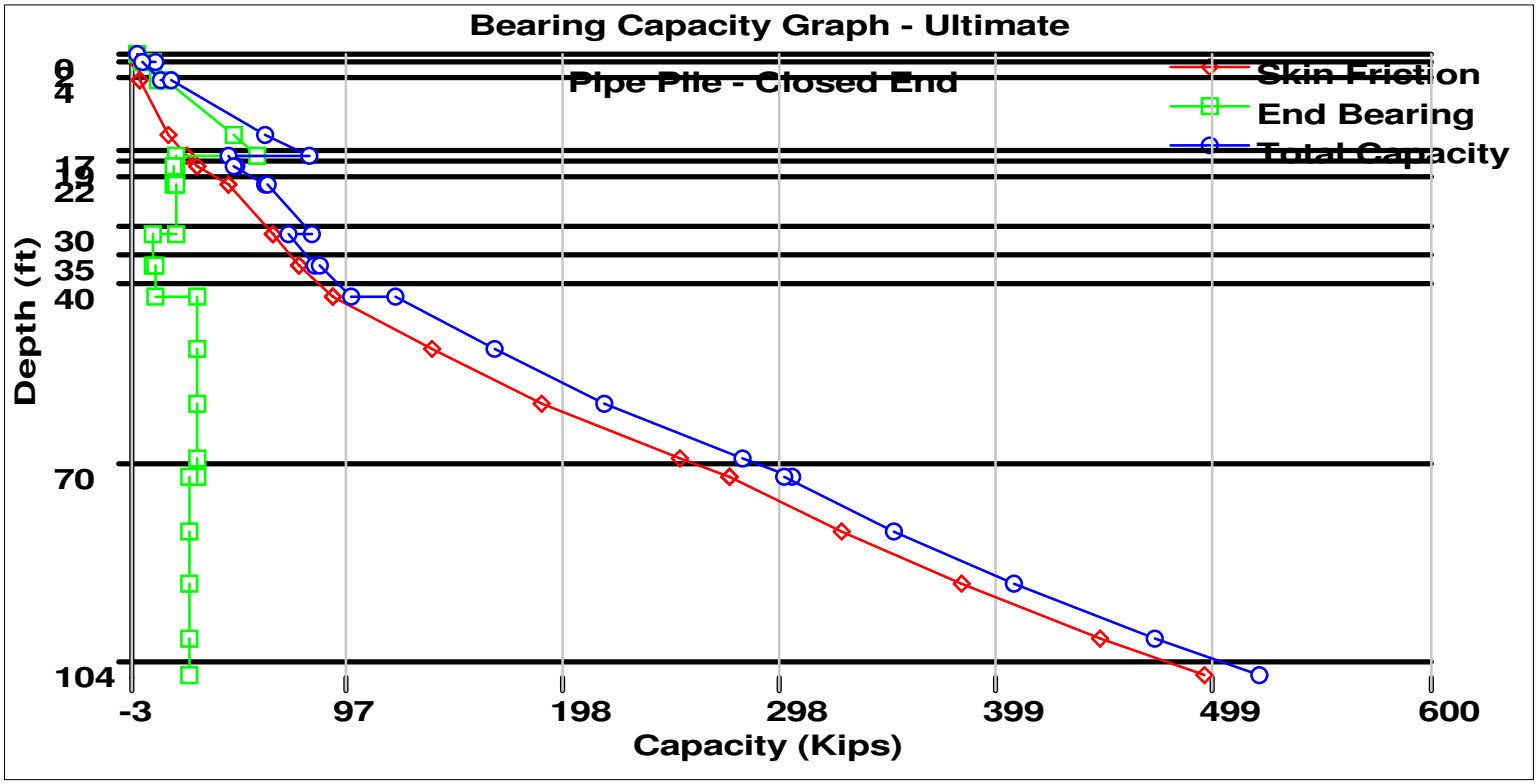

APPENDIX E

DRIVABILITY ANALYSIS - CUY-90-1696

PIER - B-169-7-20

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
6.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
13.7	48.0	5.8	42.2	4.0	14.694	-2.544	5.66	21.2
13.7	67.6	5.9	61.7	6.2	15.726	-1.191	6.00	20.0
16.2	83.8	11.0	72.9	8.1	16.331	-0.311	6.21	19.4
18.7	100.8	16.8	84.0	9.9	16.903	-0.523	6.40	19.0
18.7	48.6	17.0	31.6	3.7	14.835	-3.197	5.66	21.2
25.6	74.8	43.2	31.6	6.8	16.352	-1.249	6.10	19.6
32.5	101.0	69.4	31.6	10.0	17.886	-1.277	6.47	18.7
32.5	104.7	69.6	35.1	10.4	18.036	-1.484	6.51	18.7
35.0	114.2	79.1	35.1	11.8	18.620	-2.145	6.63	18.5
37.5	123.8	88.7	35.1	13.3	19.222	-2.409	6.75	18.3
37.5	130.1	88.8	41.2	14.1	19.531	-2.401	6.88	18.4
45.0	155.3	114.1	41.2	17.9	20.366	-2.549	7.11	17.9
52.5	180.7	139.5	41.2	21.2	20.912	-2.497	7.30	17.6
52.5	187.9	139.6	48.2	22.3	20.961	-2.625	7.34	17.6
57.5	201.7	153.5	48.2	24.6	21.221	-2.050	7.44	17.5
62.5	215.6	167.3	48.2	27.0	21.462	-1.344	7.55	17.4
62.5	213.9	167.4	46.5	26.8	21.427	-1.379	7.54	17.3
72.5	242.6	196.1	46.5	32.9	21.902	-2.494	7.77	17.4
82.5	272.9	226.4	46.5	41.4	22.381	-2.277	8.01	17.3
82.5	244.9	226.5	18.4	33.0	22.140	-2.309	7.88	17.0
93.3	266.6	248.2	18.4	38.6	22.468	-1.132	8.04	16.6
104.2	288.7	270.2	18.4	45.0	23.063	-0.686	8.29	16.5

Total Continuous Driving Time 52.00 minutes; Total Number of Blows 2232 (starting at penetration 6.8 ft)

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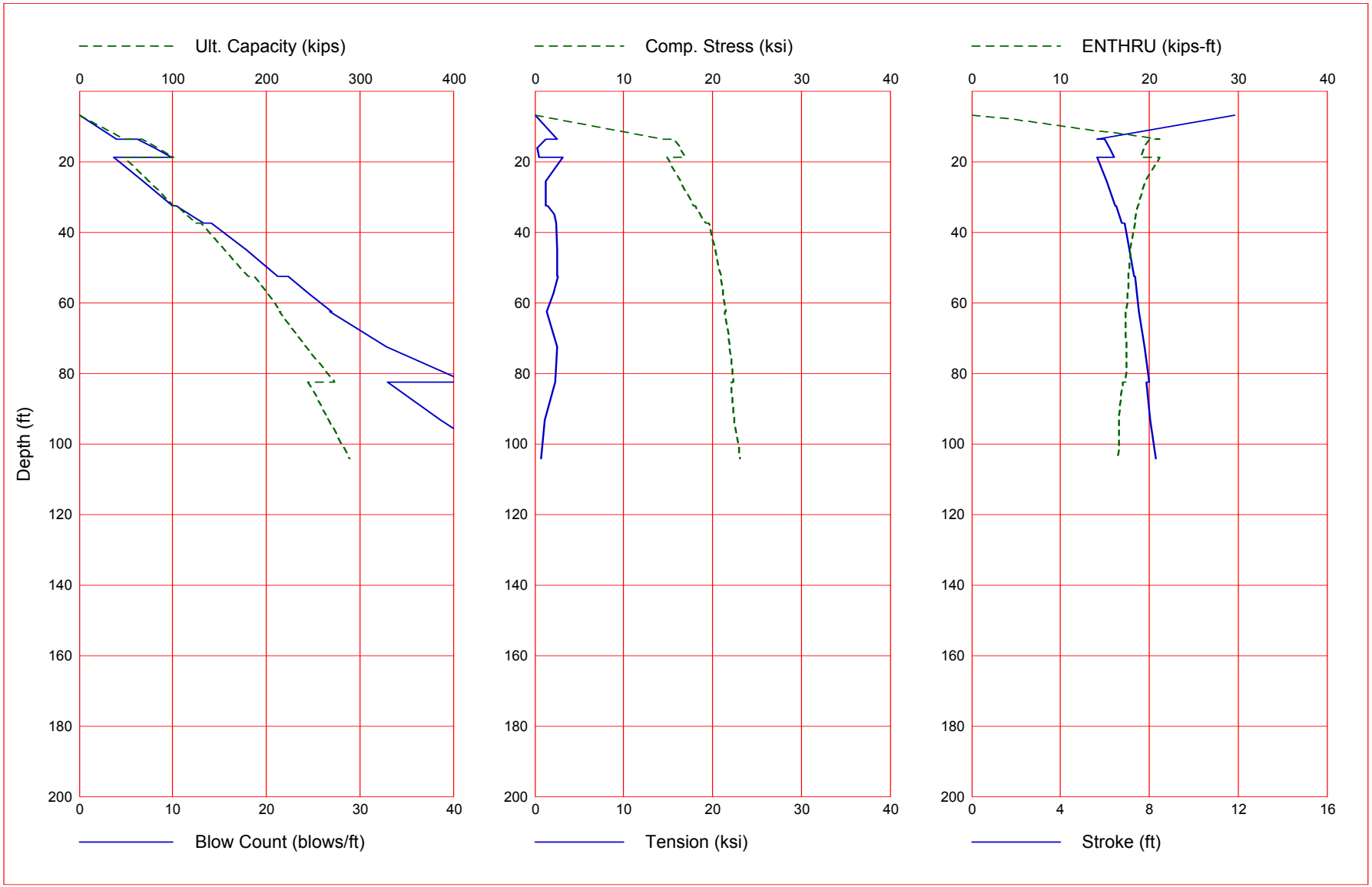
Jun 20 2022
GRLWEAP Version 2010

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000



GRLWEAP - Version 2010
WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

written by GRL Engineers, Inc. (formerly Goble Rausche Likins and Associates, Inc.) with cooperation from Pile Dynamics, Inc.

ABOUT THE WAVE EQUATION ANALYSIS RESULTS

The GRLWEAP program simulates the behavior of a preformed pile driven by either an impact hammer or a vibratory hammer. The program is based on mathematical models, which describe motion and forces of hammer, driving system, pile and soil under the hammer action. Under certain conditions, the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents normal situations. In particular, the hammer data file supplied with the program assumes that the hammer is in good working order. All of the input data selected by the user may be the best available information at the time when the analysis is performed. However, input data and therefore results may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results. Soil response and hammer performance should be verified by static and/or dynamic testing and measurements. Estimates of bending or other local stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.), prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph, should be used in conjunction with observed blow counts for the capacity assessment of a driven pile. Soil setup occurring after pile installation may produce bearing capacity values that differ substantially from those expected from a wave equation analysis due to soil setup or relaxation. This is particularly true for pile driven with vibratory hammers. The GRLWEAP user must estimate such effects and should also use proper care when applying blow counts from restrike because of the variability of hammer energy, soil resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of building and other factors.

♀

Input File: C:\USERS\KARENS\DESKTOP\GRL FILES\16IN-P1-69-7.GWW
Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
Hammer File Version: 2003 (10/17/2016)

Input File Contents

CCG3A : 09/27/2021 : ZM

OUT	OSG	HAM	STR	FUL	PEL	N	SPL	N-U	P-D	%SK	ISM	0	PHI	RSA	ITR	H-D	MXT	DEx
-100	0	41	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.000

Pile g	Hammer g	Toe Area	Pile Size	Pile Type
32.170	32.170	201.060	16.000	Pipe

W Cp	A Cp	E Cp	T Cp	CoR	ROut	StCp
2.500	20.550	530.0	2.000	0.800	0.010	0.0

A Cu	E Cu	T Cu	CoR	ROut	StCu
0.000	0.0	0.000	0.000	0.000	0.0

LPle	APle	EPle	WPle	Peri	CI	CoR	ROut
104.180	20.55	29000.0	492.000	4.188	0	0.850	0.010

FFatigue	F0	0-Bottom
0	0.000	0.000

Manufac	Hmr Name	HmrType	No Seg-s
DELMAG	D 19-42	1	5

Ram Wt	Ram L	Ram Dia	MaxStrk	RtdStrk	Efficy
4.00	129.10	12.60	11.86	10.81	0.80

IB. Wt	IB. L	IB.Dia	IB CoR	IB RO
0.75	25.30	12.60	0.900	0.010

CompStrk	A Chamber	V Chamber	C Delay	C Duratn	Exp Coeff	VolCStart	Vol CEnd
16.65	124.70	157.70	0.0020	0.0020	1.250	0.00	0.00

P atm	P1	P2	P3	P4	P5
14.70	1600.00	1440.00	1295.00	1165.00	0.00

Stroke	Effic.	Pressure	R-Weight	T-Delay	Exp-Coeff	Eps-Str	Total-AW
10.8100	0.8000	1600.0000	0.0000	0.0000	0.0000	0.0100	0.0000

Qs	Qt	Js	Jt	Qx	Jx	Rati	Dept
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Research Soil Model: Atoe, Plug, Gap, Q-fac

0.000	0.000	0.000	0.000

Research Soil Model: RD-skn: m, d, toe: m, d

0.000	0.000	0.000	0.000

Res. Distribution

Dpth	Rskn	Rtoe	Qs	Qt	Js	Jt	SU F	LimL	TSf0
0.01	0.00	0.00	0.10	0.20	0.05	0.15	1.00	6.00	1.000
9.01	0.00	0.00	0.10	0.20	0.05	0.15	1.00	6.00	1.000
9.99	0.00	0.00	0.10	0.20	0.05	0.15	1.00	6.00	1.000
10.00	0.32	30.84	0.10	0.20	0.05	0.15	1.00	6.00	1.000
13.69	0.44	42.22	0.10	0.20	0.05	0.15	1.00	6.00	1.000
13.71	0.54	61.66	0.10	0.17	0.05	0.15	1.21	6.00	24.000
18.69	0.73	84.05	0.10	0.17	0.05	0.15	1.21	6.00	24.000
18.71	1.36	31.58	0.10	0.16	0.15	0.15	1.49	6.00	168.000
27.71	1.36	31.58	0.10	0.16	0.15	0.15	1.49	6.00	168.000
32.49	1.36	31.58	0.10	0.16	0.15	0.15	1.49	6.00	168.000
32.51	1.38	35.09	0.10	0.16	0.15	0.15	1.49	6.00	24.000
37.49	1.38	35.09	0.10	0.16	0.15	0.15	1.49	6.00	24.000
37.51	1.20	41.23	0.10	0.15	0.15	0.15	1.49	6.00	168.000
46.51	1.20	41.23	0.10	0.15	0.15	0.15	1.49	6.00	168.000
52.49	1.23	41.23	0.10	0.15	0.15	0.15	1.49	6.00	168.000
52.51	0.99	48.25	0.10	0.15	0.15	0.15	1.49	6.00	24.000
61.51	0.99	48.25	0.10	0.15	0.15	0.15	1.49	6.00	24.000
62.49	0.99	48.25	0.10	0.15	0.15	0.15	1.49	6.00	24.000
62.51	1.02	46.50	0.10	0.15	0.15	0.15	1.49	6.00	168.000
71.51	1.02	46.50	0.10	0.15	0.15	0.15	1.49	6.00	168.000
80.51	1.10	46.50	0.10	0.15	0.15	0.15	1.49	6.00	168.000
82.49	1.14	46.50	0.10	0.15	0.15	0.15	1.49	6.00	168.000
82.51	0.96	18.42	0.10	0.15	0.20	0.15	2.00	6.00	168.000
91.51	0.96	18.42	0.10	0.15	0.20	0.15	2.00	6.00	168.000
100.51	0.97	18.42	0.10	0.15	0.20	0.15	2.00	6.00	168.000
104.18	0.98	18.42	0.10	0.15	0.20	0.15	2.00	6.00	168.000

Gain/Loss factors: shaft and toe

0.40000	0.45000	0.50000	0.55000	0.60000
1.00000	1.00000	1.00000	1.00000	1.00000

Dpth	L	Wait	Strk	Pmx%	Eff.	Stff	CoR
6.85	0.00	0.00	0.000	0.0	0.000	0.000	0.000
13.68	0.00	0.00	0.000	0.0	0.000	0.000	0.000
13.72	0.00	0.00	0.000	0.0	0.000	0.000	0.000
16.20	0.00	0.00	0.000	0.0	0.000	0.000	0.000
18.68	0.00	0.00	0.000	0.0	0.000	0.000	0.000
18.72	0.00	0.00	0.000	0.0	0.000	0.000	0.000
25.60	0.00	0.00	0.000	0.0	0.000	0.000	0.000
32.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
32.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
35.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
37.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000

37.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
45.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
52.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
52.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
57.50	0.00	0.00	0.000	0.0	0.000	0.000	0.000
62.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
62.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
72.50	0.00	0.00	0.000	0.0	0.000	0.000	0.000
82.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
82.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
93.33	0.00	0.00	0.000	0.0	0.000	0.000	0.000
104.18	0.00	0.00	0.000	0.0	0.000	0.000	0.000
0.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000

GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
Version 2010
English Units

CCG3A : 09/27/2021 : ZM

Hammer Model: D 19-42 Made by: DELMAG

No.	Weight kips	Stiffn k/inch	CoR	C-Slk ft	Dampg k/ft/s
1	0.800				
2	0.800	140046.6	1.000	0.0000	
3	0.800	140046.6	1.000	0.0000	
4	0.800	140046.6	1.000	0.0000	
5	0.800	140046.6	1.000	0.0000	
Imp Block	0.753	70735.6	0.900	0.0100	
Helmet	2.500	5445.8	0.800	0.0100	5.8
Combined Pile Top		14777.7			

HAMMER OPTIONS:

Hammer File ID No.	41	Hammer Type	OE Diesel
Stroke Option	FxdP-VarS	Stroke Convergence Crit.	0.010
Fuel Pump Setting	Maximum		

HAMMER DATA:

Ram Weight	(kips)	4.00	Ram Length	(inch)	129.10
Maximum Stroke	(ft)	11.86			
Rated Stroke	(ft)	10.81	Efficiency		0.800
Maximum Pressure	(psi)	1600.00	Actual Pressure	(psi)	1600.00
Compression Exponent		1.350	Expansion Exponent		1.250
Ram Diameter	(inch)	12.60			
Combustion Delay	(s)	0.00200	Ignition Duration	(s)	0.00200

The Hammer Data Includes Estimated (NON-MEASURED) Quantities

HAMMER CUSHION			PILE CUSHION		
Cross Sect. Area	(in2)	20.55	Cross Sect. Area	(in2)	0.00
Elastic-Modulus	(ksi)	530.0	Elastic-Modulus	(ksi)	0.0
Thickness	(inch)	2.00	Thickness	(inch)	0.00
Coeff of Restitution		0.8	Coeff of Restitution		1.0
RoundOut	(ft)	0.0	RoundOut	(ft)	0.0
Stiffness	(kips/in)	5445.8	Stiffness	(kips/in)	0.0

Depth (ft) 6.8 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 0.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	97.46	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	104.18	4.2	20.5
Toe						0.0	0.150	0.200			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

PILE, SOIL, ANALYSIS OPTIONS:
Uniform pile Pile Segments: Automatic
No. of Slacks/Splices 0 Pile Damping (%) 1
Pile Damping Fact.(k/ft/s) 0.721
Driveability Analysis
Soil Damping Option Smith
Max No Analysis Iterations 0 Time Increment/Critical 160
Output Time Interval 1 Analysis Time-Input (ms) 0
Output Level: Normal
Gravity Mass, Pile, Hammer: 32.170 32.170 32.170
Output Segment Generation: Automatic

Depth ft	Stroke ft	Pressure Ratio	Efficy
6.85	10.81	1.00	0.800

INITIAL STATIC ANALYSIS: Total Wt, Sum(R) 10.6 0.0
Hammer+Pile Weight > Rult: Pile Runs

INITIAL STATIC ANALYSIS: Total Wt, Sum(R) 10.6 0.0
Hammer+Pile Weight > Rult: Pile Runs

INITIAL STATIC ANALYSIS: Total Wt, Sum(R) 10.6 0.0
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INITIAL STATIC ANALYSIS: Total Wt, Sum(R) 10.6 0.0
Hammer+Pile Weight > Rult: Pile Runs

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Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 13.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 48.0

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	90.74	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	0.4	0.050	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	5.4	0.050	0.100	104.18	4.2	20.5
Toe						42.2	0.150	0.200			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
13.68	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
48.0	4.0	5.66	5.70	-2.54	5	15	14.69	3	4	21.2	49.8
48.0	4.0	5.66	5.70	-2.54	5	15	14.69	3	4	21.2	49.8
48.0	4.0	5.66	5.70	-2.54	5	15	14.69	3	4	21.2	49.8
48.0	4.0	5.66	5.70	-2.54	5	15	14.69	3	4	21.2	49.8
48.0	4.0	5.66	5.70	-2.54	5	15	14.69	3	4	21.2	49.8

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 13.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model — Total Capacity Rut (kips) 67.6

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	90.74	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	0.5	0.050	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	5.4	0.050	0.100	104.18	4.2	20.5
Toe						61.7	0.150	0.170			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
13.72	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
67.6	6.2	6.00	6.03	-1.18	4	15	15.70	18	7	20.0	48.2
67.6	6.2	6.00	6.03	-1.18	4	15	15.70	18	7	20.0	48.2
67.6	6.2	6.00	6.02	-1.19	4	15	15.73	19	7	20.0	48.2
67.6	6.2	6.00	6.03	-1.19	4	15	15.73	18	7	20.0	48.2
67.6	6.2	6.00	6.03	-1.18	4	15	15.70	18	7	20.0	48.2

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 16.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model — Total Capacity Rut (kips) 83.6

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	90.74	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	4.3	0.050	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	6.4	0.050	0.100	104.18	4.2	20.5
Toe						72.9	0.150	0.170			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
16.20	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
83.6	8.0	6.20	6.22	-0.32	3	15	16.33	22	8	19.4	47.4
83.7	8.0	6.20	6.22	-0.31	3	15	16.33	22	8	19.4	47.4
83.8	8.1	6.21	6.23	-0.31	3	15	16.33	22	8	19.4	47.4
83.9	8.1	6.21	6.22	-0.32	3	15	16.36	22	8	19.4	47.4
84.0	8.1	6.21	6.23	-0.32	3	15	16.36	22	8	19.4	47.4

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 18.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 100.4

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	87.38	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	2.9	0.050	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	7.5	0.050	0.100	104.18	4.2	20.5
Toe						84.0	0.150	0.170			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
18.68	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
100.4	9.9	6.40	6.41	-0.51	7	50	16.90	23	8	19.0	46.6
100.6	9.9	6.40	6.42	-0.52	7	50	16.91	23	8	19.0	46.6
100.8	9.9	6.40	6.42	-0.52	7	50	16.90	23	8	19.0	46.6

101.1	9.9	6.41	6.42	-0.52	7	49	16.90	23	8	18.9	46.6
101.3	9.9	6.41	6.42	-0.53	7	49	16.90	23	8	18.9	46.6

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Depth (ft) 18.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 48.1

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	87.38	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	2.9	0.050	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	7.5	0.051	0.100	104.18	4.2	20.5
Toe						31.6	0.150	0.160			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
18.72	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
48.1	3.7	5.65	5.68	-3.20	5	15	14.81	13	6	21.3	49.8
48.3	3.7	5.65	5.69	-3.21	5	15	14.83	13	6	21.3	49.8
48.6	3.7	5.66	5.69	-3.20	5	15	14.83	13	6	21.2	49.8
48.8	3.7	5.66	5.69	-3.19	5	15	14.84	13	6	21.2	49.8
49.0	3.7	5.66	5.69	-3.19	5	15	14.87	13	6	21.2	49.8

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 25.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1

104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model — Total Capacity Rut (kips) 71.7

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	80.66	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	3.2	0.050	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	7.7	0.060	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	104.18	4.2	20.5
Toe						31.6	0.150	0.160			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
25.60	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
71.7	6.4	6.06	6.08	-1.50	4	15	16.23	23	8	19.8	48.0
73.2	6.6	6.08	6.11	-1.37	4	15	16.29	23	8	19.7	47.9
74.8	6.8	6.10	6.13	-1.25	4	15	16.35	23	8	19.6	47.8
76.3	7.0	6.12	6.15	-1.12	4	15	16.41	23	8	19.6	47.7
77.8	7.2	6.15	6.17	-1.02	3	15	16.51	23	8	19.5	47.6

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Depth (ft) 32.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model — Total Capacity Rut (kips) 95.4

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	73.93	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	3.5	0.050	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	6.2	0.050	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	7.9	0.068	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	94.10	4.2	20.5

30	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	104.18	4.2	20.5
Toe						31.6	0.150	0.160			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
32.48	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
95.4	9.3	6.40	6.42	-1.07	8	50	17.64	24	8	18.9	46.6
98.2	9.6	6.44	6.45	-1.12	7	50	17.80	24	8	18.8	46.5
101.0	10.0	6.47	6.48	-1.28	15	48	17.89	24	8	18.7	46.4
103.8	10.3	6.50	6.51	-1.49	14	48	18.04	25	8	18.7	46.3
106.6	10.7	6.54	6.55	-1.65	14	48	18.18	25	8	18.6	46.1

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CCG3A : 09/27/2021 : ZM 06/20/2022
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Depth (ft) 32.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L ft	b Top in2	Area ksi	E-Mod lb/ft3	Spec Wt ft	Perim	C Index ft/s	Wave Sp k/ft/s	EA/c
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1	
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1	

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 99.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	73.93	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	3.5	0.050	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	6.2	0.050	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	8.0	0.070	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	94.10	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	104.18	4.2	20.5
Toe						35.1	0.150	0.160			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
32.52	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
99.0	9.7	6.44	6.46	-1.09	15	48	17.76	24	8	18.8	46.5
101.8	10.1	6.48	6.49	-1.28	15	48	17.88	24	8	18.7	46.3
104.7	10.4	6.51	6.52	-1.48	14	48	18.04	25	8	18.7	46.2
107.5	10.8	6.55	6.56	-1.64	14	48	18.17	25	8	18.7	46.1
110.3	11.2	6.58	6.59	-1.84	14	48	18.31	25	8	18.6	46.0

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Depth (ft) 35.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 107.6

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	70.57	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	2.1	0.050	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	5.9	0.050	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	7.2	0.050	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	11.0	0.141	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	94.10	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	104.18	4.2	20.5
Toe						35.1	0.150	0.160			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
35.00	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
107.6	10.9	6.56	6.57	-1.75	14	48	18.32	24	8	18.6	46.1
110.9	11.4	6.60	6.61	-1.95	14	48	18.48	24	8	18.6	45.9
114.2	11.8	6.63	6.64	-2.14	14	48	18.62	24	8	18.5	45.8
117.5	12.3	6.67	6.68	-2.26	14	48	18.79	24	8	18.5	45.7
120.8	12.8	6.71	6.72	-2.33	14	48	18.92	24	8	18.4	45.5

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 37.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
	ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 116.3

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	67.21	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	0.8	0.050	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	5.5	0.050	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	6.9	0.050	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	10.0	0.123	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	90.74	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	104.18	4.2	20.5
Toe						35.1	0.150	0.160			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
37.48	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
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Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
116.3	12.2	6.67	6.68	-2.32	14	48	18.86	24	8	18.4	45.7
120.0	12.7	6.71	6.72	-2.40	14	48	19.04	24	8	18.4	45.5
123.8	13.3	6.75	6.76	-2.41	14	48	19.22	24	8	18.3	45.4
127.6	13.7	6.86	6.80	-2.36	19	46	19.52	24	8	18.5	45.2
131.3	14.3	6.89	6.83	-2.43	20	46	19.68	24	8	18.4	45.0

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Depth (ft) 37.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
	ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1

104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model — Total Capacity Rut (kips) 122.5

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	67.21	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	0.9	0.050	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	5.5	0.050	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	6.9	0.050	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	10.1	0.124	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	90.74	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	104.18	4.2	20.5
Toe						41.2	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
37.52	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
122.5	13.1	6.74	6.75	-2.37	14	48	19.08	24	8	18.4	45.4
126.3	13.5	6.85	6.78	-2.35	15	47	19.37	24	8	18.5	45.2
130.1	14.1	6.88	6.82	-2.40	20	46	19.53	24	8	18.4	45.1
133.8	14.7	6.92	6.86	-2.47	23	45	19.68	24	8	18.4	45.0
137.6	15.3	6.95	6.90	-2.60	23	45	19.84	24	8	18.3	44.8

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 45.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model — Total Capacity Rut (kips) 145.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	60.49	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	2.0	0.050	0.100	70.57	4.2	20.5

22	0.236	14778	0.000	0.000	1.00	5.8	0.050	0.100	73.93	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	7.2	0.050	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	10.9	0.140	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	84.02	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	11.3	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	104.18	4.2	20.5
Toe						41.2	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
45.00	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
145.3	16.7	7.04	7.00	-2.67	21	44	19.99	22	8	18.1	44.5
150.3	17.3	7.08	7.04	-2.67	21	43	20.18	23	8	18.0	44.4
155.3	17.9	7.11	7.08	-2.55	21	43	20.37	23	8	17.9	44.3
160.3	18.4	7.15	7.11	-2.40	21	43	20.55	23	8	17.9	44.2
165.3	19.0	7.18	7.15	-2.23	21	43	20.75	23	8	17.9	44.1

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Depth (ft) 52.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 168.2

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	53.77	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	3.2	0.050	0.100	63.85	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	67.21	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	7.7	0.060	0.100	70.57	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	73.93	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	11.0	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	94.10	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	100.82	4.2	20.5

31	0.236	14778	0.000	0.000	1.00	10.4	0.150	0.100	104.18	4.2	20.5
Toe						41.2	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
52.48	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
168.2	19.5	7.22	7.20	-1.95	20	37	20.52	21	8	17.6	43.9
174.4	20.4	7.26	7.24	-2.24	19	37	20.67	21	8	17.5	43.8
180.7	21.2	7.30	7.27	-2.50	19	37	20.91	21	8	17.6	43.7
187.0	22.1	7.33	7.31	-2.63	19	37	21.07	21	8	17.5	43.6
193.3	23.0	7.37	7.35	-2.57	19	37	21.26	21	8	17.6	43.5

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 52.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 175.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	53.77	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	3.3	0.050	0.100	63.85	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	67.21	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	7.8	0.062	0.100	70.57	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	73.93	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	11.0	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	94.10	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	10.3	0.150	0.100	104.18	4.2	20.5
Toe						48.2	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy

ft	ft	Ratio	
52.52	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
175.3	20.6	7.26	7.24	-2.24	19	37	20.58	21	8	17.5	43.8
181.6	21.4	7.30	7.28	-2.48	19	37	20.77	21	8	17.5	43.7
187.9	22.3	7.34	7.32	-2.63	19	37	20.96	21	8	17.6	43.6
194.1	23.3	7.38	7.36	-2.59	19	37	21.15	21	8	17.6	43.5
200.4	24.2	7.42	7.40	-2.45	19	37	21.38	21	8	17.7	43.3

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 57.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 187.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
14	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	47.05	4.2	20.5
17	0.236	14778	0.000	0.000	1.00	0.6	0.050	0.100	57.13	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	5.4	0.050	0.100	60.49	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	6.8	0.050	0.100	63.85	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	9.9	0.120	0.100	67.21	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	70.57	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	10.3	0.150	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	10.3	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	9.4	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	104.18	4.2	20.5
Toe						48.2	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
57.50	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
187.8	22.5	7.35	7.33	-2.35	18	37	20.80	19	7	17.4	43.6
194.8	23.5	7.40	7.37	-2.23	18	37	21.04	20	8	17.5	43.5
201.7	24.6	7.44	7.42	-2.05	18	37	21.22	20	8	17.5	43.3
208.7	25.7	7.49	7.48	-1.86	17	37	21.41	20	7	17.5	43.2
215.6	26.9	7.54	7.52	-1.66	16	36	21.65	20	8	17.5	43.0

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CCG3A : 09/27/2021 : ZM 06/20/2022
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Depth (ft) 62.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 200.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
13	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	43.69	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	3.1	0.050	0.100	53.77	4.2	20.5
17	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	57.13	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	7.6	0.055	0.100	60.49	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	63.85	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	70.57	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	73.93	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	11.0	0.150	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	84.02	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	10.4	0.150	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	8.5	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	104.18	4.2	20.5
Toe						48.2	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
62.48	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
200.3	24.5	7.45	7.43	-1.76	16	37	21.01	18	7	17.3	43.3
207.9	25.8	7.50	7.48	-1.57	16	36	21.24	18	7	17.3	43.1

215.6	27.0	7.55	7.53	-1.34	15	36	21.46	18	7	17.4	43.0
223.2	28.5	7.60	7.59	-1.79	16	28	21.65	18	7	17.4	42.8
230.9	29.9	7.65	7.64	-2.29	16	28	21.87	18	7	17.6	42.7

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 62.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
	ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 198.6

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
13	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	43.69	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	3.1	0.050	0.100	53.77	4.2	20.5
17	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	57.13	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	7.7	0.058	0.100	60.49	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	63.85	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	70.57	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	73.93	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	11.0	0.150	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	84.02	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	10.4	0.150	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	8.5	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	104.18	4.2	20.5
Toe						46.5	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
62.52	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
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Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
198.6	24.2	7.43	7.42	-1.77	16	37	21.03	18	7	17.3	43.3
206.3	25.5	7.49	7.47	-1.60	16	37	21.21	18	7	17.3	43.2
213.9	26.8	7.54	7.53	-1.38	15	36	21.43	18	7	17.3	43.0
221.6	28.1	7.59	7.58	-1.75	16	28	21.66	18	7	17.5	42.9
229.2	29.6	7.64	7.63	-2.23	16	28	21.84	18	7	17.5	42.7

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CCG3A : 09/27/2021 : ZM 06/20/2022

Depth (ft) 72.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 224.5

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
10	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	33.61	4.2	20.5
13	0.236	14778	0.000	0.000	1.00	3.0	0.050	0.100	43.69	4.2	20.5
14	0.236	14778	0.000	0.000	1.00	6.1	0.050	0.100	47.05	4.2	20.5
15	0.236	14778	0.000	0.000	1.00	7.5	0.052	0.100	50.41	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	53.77	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	60.49	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	63.85	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	67.21	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	11.1	0.150	0.100	70.57	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	73.93	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	10.4	0.150	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	8.5	0.150	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	90.74	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	104.18	4.2	20.5
Toe						46.5	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
72.50	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
224.5	29.1	7.64	7.63	-1.76	10	29	21.47	15	6	17.2	42.7
233.6	31.0	7.71	7.70	-2.13	10	29	21.67	15	6	17.3	42.5
242.6	32.9	7.77	7.76	-2.49	13	29	21.90	15	6	17.4	42.4
251.7	35.0	7.83	7.83	-2.88	13	29	22.11	16	7	17.4	42.2
260.8	37.1	7.90	7.89	-3.26	14	28	22.39	16	7	17.6	42.0

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 82.5 Standard Soil Setup

Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 251.7

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
7	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	23.52	4.2	20.5
10	0.236	14778	0.000	0.000	1.00	2.8	0.050	0.100	33.61	4.2	20.5
11	0.236	14778	0.000	0.000	1.00	6.0	0.050	0.100	36.97	4.2	20.5
12	0.236	14778	0.000	0.000	1.00	7.4	0.050	0.100	40.33	4.2	20.5
13	0.236	14778	0.000	0.000	1.00	11.5	0.149	0.100	43.69	4.2	20.5
14	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	47.05	4.2	20.5
15	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	50.41	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	53.77	4.2	20.5
17	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	57.13	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	11.1	0.150	0.100	60.49	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	63.85	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	70.57	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	10.4	0.150	0.100	73.93	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	8.6	0.150	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	80.66	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	8.9	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	9.2	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	9.4	0.150	0.100	104.18	4.2	20.5
Toe						46.5	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
82.48	10.81	1.00	0.800

♀
CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
251.7	35.7	7.88	7.88	-2.24	10	29	21.92	12	6	17.2	42.1
262.3	38.5	7.95	7.94	-2.31	10	29	22.14	13	6	17.2	41.9
272.9	41.4	8.01	8.01	-2.28	10	29	22.38	13	6	17.3	41.7
283.4	45.2	7.99	8.07	-2.48	11	27	22.48	13	6	17.2	41.7
294.0	48.5	8.07	8.14	-2.73	11	27	22.75	13	6	17.3	41.5

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 82.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 223.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
7	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	23.52	4.2	20.5
10	0.236	14778	0.000	0.000	1.00	2.9	0.050	0.100	33.61	4.2	20.5
11	0.236	14778	0.000	0.000	1.00	6.0	0.050	0.100	36.97	4.2	20.5
12	0.236	14778	0.000	0.000	1.00	7.5	0.050	0.100	40.33	4.2	20.5
13	0.236	14778	0.000	0.000	1.00	11.5	0.149	0.100	43.69	4.2	20.5
14	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	47.05	4.2	20.5
15	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	50.41	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	53.77	4.2	20.5
17	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	57.13	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	11.1	0.150	0.100	60.49	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	63.85	4.2	20.5
21	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	70.57	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	10.4	0.150	0.100	73.93	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	8.6	0.150	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	80.66	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	8.9	0.150	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	9.2	0.150	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	9.4	0.150	0.100	104.18	4.2	20.5
Toe						18.4	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
82.52	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
223.8	28.8	7.75	7.74	-1.97	9	29	21.65	12	6	16.8	42.4
234.3	30.8	7.82	7.81	-2.17	9	29	21.91	12	6	17.0	42.2
244.9	33.0	7.88	7.88	-2.31	10	29	22.14	13	6	17.0	42.1
255.4	35.5	7.95	7.95	-2.36	10	29	22.38	13	6	17.1	41.9
266.0	38.1	8.01	8.01	-2.34	10	29	22.62	13	6	17.2	41.7

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Depth (ft) 93.3 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model Total Capacity Rut (kips) 241.2

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	20.5
4	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	13.44	4.2	20.5
7	0.236	14778	0.000	0.000	1.00	4.1	0.050	0.100	23.52	4.2	20.5
8	0.236	14778	0.000	0.000	1.00	6.3	0.050	0.100	26.89	4.2	20.5
9	0.236	14778	0.000	0.000	1.00	8.4	0.084	0.100	30.25	4.2	20.5
10	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	33.61	4.2	20.5
12	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	40.33	4.2	20.5
13	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	43.69	4.2	20.5
14	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	47.05	4.2	20.5
15	0.236	14778	0.000	0.000	1.00	10.8	0.150	0.100	50.41	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	53.77	4.2	20.5
18	0.236	14778	0.000	0.000	1.00	10.3	0.150	0.100	60.49	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	10.1	0.150	0.100	63.85	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	67.21	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	8.5	0.150	0.100	73.93	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	77.29	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	9.0	0.150	0.100	87.38	4.2	20.5
27	0.236	14778	0.000	0.000	1.00	9.2	0.150	0.100	90.74	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	8.6	0.160	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	5.4	0.200	0.100	97.46	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	5.4	0.200	0.100	104.18	4.2	20.5
Toe						18.4	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
93.33	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
241.2	32.5	7.96	7.96	-1.58	9	29	22.09	9	5	16.6	41.9
253.9	35.2	8.04	8.04	-1.38	8	29	22.35	9	5	16.7	41.7
266.6	38.6	8.04	8.11	-1.13	8	29	22.47	9	5	16.6	41.6
279.4	41.7	8.13	8.17	-0.97	7	50	22.76	9	5	16.8	41.4
292.1	45.4	8.21	8.24	-1.08	7	49	23.02	9	5	17.0	41.2

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Depth (ft) 104.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
	ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	104.2	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.609

Pile and Soil Model — Total Capacity Rut (kips) 258.8

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.236	14778	0.010	0.000	0.85	0.0	0.050	0.100	3.36	4.2	20.5
2	0.236	14778	0.000	0.000	1.00	0.0	0.050	0.100	6.72	4.2	20.5
3	0.236	14778	0.000	0.000	1.00	0.1	0.050	0.100	10.08	4.2	20.5
4	0.236	14778	0.000	0.000	1.00	5.3	0.050	0.100	13.44	4.2	20.5
5	0.236	14778	0.000	0.000	1.00	6.6	0.050	0.100	16.80	4.2	20.5
6	0.236	14778	0.000	0.000	1.00	9.4	0.110	0.100	20.16	4.2	20.5
7	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	23.52	4.2	20.5
9	0.236	14778	0.000	0.000	1.00	11.5	0.150	0.100	30.25	4.2	20.5
10	0.236	14778	0.000	0.000	1.00	11.6	0.150	0.100	33.61	4.2	20.5
11	0.236	14778	0.000	0.000	1.00	11.7	0.150	0.100	36.97	4.2	20.5
12	0.236	14778	0.000	0.000	1.00	10.4	0.150	0.100	40.33	4.2	20.5
13	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	43.69	4.2	20.5
14	0.236	14778	0.000	0.000	1.00	10.2	0.150	0.100	47.05	4.2	20.5
15	0.236	14778	0.000	0.000	1.00	10.3	0.150	0.100	50.41	4.2	20.5
16	0.236	14778	0.000	0.000	1.00	9.6	0.150	0.100	53.77	4.2	20.5
17	0.236	14778	0.000	0.000	1.00	8.4	0.150	0.100	57.13	4.2	20.5
19	0.236	14778	0.000	0.000	1.00	8.5	0.150	0.100	63.85	4.2	20.5
20	0.236	14778	0.000	0.000	1.00	8.7	0.150	0.100	67.21	4.2	20.5
22	0.236	14778	0.000	0.000	1.00	8.8	0.150	0.100	73.93	4.2	20.5
23	0.236	14778	0.000	0.000	1.00	9.0	0.150	0.100	77.29	4.2	20.5
24	0.236	14778	0.000	0.000	1.00	9.3	0.150	0.100	80.66	4.2	20.5
25	0.236	14778	0.000	0.000	1.00	7.7	0.171	0.100	84.02	4.2	20.5
26	0.236	14778	0.000	0.000	1.00	5.4	0.200	0.100	87.38	4.2	20.5
28	0.236	14778	0.000	0.000	1.00	5.4	0.200	0.100	94.10	4.2	20.5
29	0.236	14778	0.000	0.000	1.00	5.4	0.200	0.100	97.46	4.2	20.5
30	0.236	14778	0.000	0.000	1.00	5.5	0.200	0.100	100.82	4.2	20.5
31	0.236	14778	0.000	0.000	1.00	5.5	0.200	0.100	104.18	4.2	20.5
Toe						18.4	0.150	0.150			

7.315 kips total unreduced pile weight (g= 32.17 ft/s2)
7.315 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
104.18	10.81	1.00	0.800

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Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
258.8	36.9	8.11	8.16	-1.27	19	43	22.49	6	5	16.2	41.4
273.7	40.6	8.20	8.24	-0.76	26	26	22.80	6	5	16.3	41.2

288.7	45.0	8.29	8.31	-0.69	26	26	23.06	6	5	16.5	41.0
303.6	50.2	8.37	8.38	-0.61	4	43	23.31	6	5	16.5	40.9
318.5	56.0	8.44	8.45	-0.67	4	41	23.57	6	5	16.7	40.7

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.400 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
6.8	0.0	0.0	0.0	0.0	0.000	0.000	10.81	0.0
13.7	48.0	5.8	42.2	4.0	14.694	-2.544	5.66	21.2
13.7	67.6	5.9	61.7	6.2	15.699	-1.177	6.00	20.0
16.2	83.6	10.7	72.9	8.0	16.330	-0.321	6.20	19.4
18.7	100.4	16.4	84.0	9.9	16.904	-0.507	6.40	19.0
18.7	48.1	16.5	31.6	3.7	14.810	-3.204	5.65	21.3
25.6	71.7	40.1	31.6	6.4	16.225	-1.498	6.06	19.8
32.5	95.4	63.8	31.6	9.3	17.645	-1.066	6.40	18.9
32.5	99.0	63.9	35.1	9.7	17.764	-1.085	6.44	18.8
35.0	107.6	72.5	35.1	10.9	18.322	-1.754	6.56	18.6
37.5	116.3	81.2	35.1	12.2	18.862	-2.315	6.67	18.4
37.5	122.5	81.3	41.2	13.1	19.079	-2.373	6.74	18.4
45.0	145.3	104.0	41.2	16.7	19.989	-2.673	7.04	18.1
52.5	168.2	126.9	41.2	19.5	20.524	-1.947	7.22	17.6
52.5	175.3	127.1	48.2	20.6	20.575	-2.237	7.26	17.5
57.5	187.8	139.5	48.2	22.5	20.803	-2.350	7.35	17.4
62.5	200.3	152.0	48.2	24.5	21.014	-1.763	7.45	17.3
62.5	198.6	152.1	46.5	24.2	21.029	-1.768	7.43	17.3
72.5	224.5	178.0	46.5	29.1	21.466	-1.762	7.64	17.2
82.5	251.7	205.2	46.5	35.7	21.916	-2.242	7.88	17.2
82.5	223.8	205.3	18.4	28.8	21.650	-1.975	7.75	16.8
93.3	241.2	222.7	18.4	32.5	22.090	-1.577	7.96	16.6
104.2	258.8	240.4	18.4	36.9	22.494	-1.266	8.11	16.2

Total Driving Time 46 minutes; Total No. of Blows 1972
Starting at penetration 6.8 ft

G/L at Shaft and Toe: 0.450 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
6.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
13.7	48.0	5.8	42.2	4.0	14.694	-2.544	5.66	21.2
13.7	67.6	5.9	61.7	6.2	15.700	-1.178	6.00	20.0
16.2	83.7	10.9	72.9	8.0	16.330	-0.313	6.20	19.4
18.7	100.6	16.6	84.0	9.9	16.910	-0.516	6.40	19.0
18.7	48.3	16.7	31.6	3.7	14.833	-3.208	5.65	21.3
25.6	73.2	41.7	31.6	6.6	16.287	-1.373	6.08	19.7
32.5	98.2	66.6	31.6	9.6	17.800	-1.121	6.44	18.8
32.5	101.8	66.7	35.1	10.1	17.881	-1.279	6.48	18.7
35.0	110.9	75.8	35.1	11.4	18.483	-1.947	6.60	18.6
37.5	120.0	84.9	35.1	12.7	19.043	-2.396	6.71	18.4
37.5	126.3	85.1	41.2	13.5	19.373	-2.349	6.85	18.5
45.0	150.3	109.0	41.2	17.3	20.180	-2.674	7.08	18.0
52.5	174.4	133.2	41.2	20.4	20.674	-2.243	7.26	17.5
52.5	181.6	133.3	48.2	21.4	20.766	-2.483	7.30	17.5
57.5	194.8	146.5	48.2	23.5	21.037	-2.226	7.40	17.5
62.5	207.9	159.7	48.2	25.8	21.235	-1.571	7.50	17.3
62.5	206.3	159.8	46.5	25.5	21.208	-1.596	7.49	17.3
72.5	233.6	187.1	46.5	31.0	21.674	-2.126	7.71	17.3
82.5	262.3	215.8	46.5	38.5	22.141	-2.308	7.95	17.2
82.5	234.3	215.9	18.4	30.8	21.905	-2.167	7.82	17.0

93.3	253.9	235.5	18.4	35.2	22.346	-1.378	8.04	16.7
104.2	273.7	255.3	18.4	40.6	22.797	-0.764	8.20	16.3

Total Driving Time 49 minutes; Total No. of Blows 2093
Starting at penetration 6.8 ft

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.500 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
6.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
13.7	48.0	5.8	42.2	4.0	14.694	-2.544	5.66	21.2
13.7	67.6	5.9	61.7	6.2	15.726	-1.191	6.00	20.0
16.2	83.8	11.0	72.9	8.1	16.331	-0.311	6.21	19.4
18.7	100.8	16.8	84.0	9.9	16.903	-0.523	6.40	19.0
18.7	48.6	17.0	31.6	3.7	14.835	-3.197	5.66	21.2
25.6	74.8	43.2	31.6	6.8	16.352	-1.249	6.10	19.6
32.5	101.0	69.4	31.6	10.0	17.886	-1.277	6.47	18.7
32.5	104.7	69.6	35.1	10.4	18.036	-1.484	6.51	18.7
35.0	114.2	79.1	35.1	11.8	18.620	-2.145	6.63	18.5
37.5	123.8	88.7	35.1	13.3	19.222	-2.409	6.75	18.3
37.5	130.1	88.8	41.2	14.1	19.531	-2.401	6.88	18.4
45.0	155.3	114.1	41.2	17.9	20.366	-2.549	7.11	17.9
52.5	180.7	139.5	41.2	21.2	20.912	-2.497	7.30	17.6
52.5	187.9	139.6	48.2	22.3	20.961	-2.625	7.34	17.6
57.5	201.7	153.5	48.2	24.6	21.221	-2.050	7.44	17.5
62.5	215.6	167.3	48.2	27.0	21.462	-1.344	7.55	17.4
62.5	213.9	167.4	46.5	26.8	21.427	-1.379	7.54	17.3
72.5	242.6	196.1	46.5	32.9	21.902	-2.494	7.77	17.4
82.5	272.9	226.4	46.5	41.4	22.381	-2.277	8.01	17.3
82.5	244.9	226.5	18.4	33.0	22.140	-2.309	7.88	17.0
93.3	266.6	248.2	18.4	38.6	22.468	-1.132	8.04	16.6
104.2	288.7	270.2	18.4	45.0	23.063	-0.686	8.29	16.5

Total Driving Time 52 minutes; Total No. of Blows 2232
Starting at penetration 6.8 ft

G/L at Shaft and Toe: 0.550 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
6.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
13.7	48.0	5.8	42.2	4.0	14.694	-2.544	5.66	21.2
13.7	67.6	5.9	61.7	6.2	15.730	-1.191	6.00	20.0
16.2	83.9	11.1	72.9	8.1	16.362	-0.321	6.21	19.4
18.7	101.1	17.1	84.0	9.9	16.904	-0.524	6.41	18.9
18.7	48.8	17.2	31.6	3.7	14.840	-3.186	5.66	21.2
25.6	76.3	44.7	31.6	7.0	16.410	-1.120	6.12	19.6
32.5	103.8	72.2	31.6	10.3	18.045	-1.486	6.50	18.7
32.5	107.5	72.4	35.1	10.8	18.173	-1.641	6.55	18.7
35.0	117.5	82.4	35.1	12.3	18.788	-2.261	6.67	18.5
37.5	127.6	92.5	35.1	13.7	19.522	-2.360	6.86	18.5
37.5	133.8	92.6	41.2	14.7	19.683	-2.466	6.92	18.4
45.0	160.3	119.1	41.2	18.4	20.552	-2.402	7.15	17.9
52.5	187.0	145.8	41.2	22.1	21.070	-2.629	7.33	17.5
52.5	194.1	145.9	48.2	23.3	21.147	-2.594	7.38	17.6
57.5	208.7	160.4	48.2	25.7	21.413	-1.862	7.49	17.5
62.5	223.2	175.0	48.2	28.5	21.646	-1.793	7.60	17.4
62.5	221.6	175.1	46.5	28.1	21.657	-1.746	7.59	17.5
72.5	251.7	205.2	46.5	35.0	22.115	-2.880	7.83	17.4

82.5	283.4	236.9	46.5	45.2	22.476	-2.477	7.99	17.2
82.5	255.4	237.0	18.4	35.5	22.383	-2.365	7.95	17.1
93.3	279.4	260.9	18.4	41.7	22.757	-0.971	8.13	16.8
104.2	303.6	285.2	18.4	50.2	23.306	-0.611	8.37	16.5

Total Driving Time 56 minutes; Total No. of Blows 2381
Starting at penetration 6.8 ft

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.600 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
6.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
13.7	48.0	5.8	42.2	4.0	14.694	-2.544	5.66	21.2
13.7	67.6	5.9	61.7	6.2	15.700	-1.178	6.00	20.0
16.2	84.0	11.2	72.9	8.1	16.364	-0.317	6.21	19.4
18.7	101.3	17.3	84.0	9.9	16.903	-0.528	6.41	18.9
18.7	49.0	17.4	31.6	3.7	14.869	-3.190	5.66	21.2
25.6	77.8	46.2	31.6	7.2	16.508	-1.023	6.15	19.5
32.5	106.6	75.0	31.6	10.7	18.179	-1.650	6.54	18.6
32.5	110.3	75.2	35.1	11.2	18.307	-1.845	6.58	18.6
35.0	120.8	85.7	35.1	12.8	18.917	-2.326	6.71	18.4
37.5	131.3	96.2	35.1	14.3	19.676	-2.428	6.89	18.4
37.5	137.6	96.4	41.2	15.3	19.843	-2.605	6.95	18.3
45.0	165.3	124.1	41.2	19.0	20.746	-2.232	7.18	17.9
52.5	193.3	152.0	41.2	23.0	21.264	-2.572	7.37	17.6
52.5	200.4	152.2	48.2	24.2	21.382	-2.449	7.42	17.7
57.5	215.6	167.4	48.2	26.9	21.651	-1.657	7.54	17.5
62.5	230.9	182.6	48.2	29.9	21.870	-2.294	7.65	17.6
62.5	229.2	182.7	46.5	29.6	21.839	-2.229	7.64	17.5
72.5	260.8	214.3	46.5	37.1	22.387	-3.255	7.90	17.6
82.5	294.0	247.5	46.5	48.5	22.746	-2.732	8.07	17.3
82.5	266.0	247.6	18.4	38.1	22.618	-2.339	8.01	17.2
93.3	292.1	273.7	18.4	45.4	23.017	-1.085	8.21	17.0
104.2	318.5	300.1	18.4	56.0	23.574	-0.667	8.44	16.7

Total Driving Time 60 minutes; Total No. of Blows 2535
Starting at penetration 6.8 ft

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Table of Depths Analyzed with Driving System Modifiers

Depth ft	Temp. Length ft	Wait Time hr	Equivalent Stroke ft	Pressure Ratio	Efficy.	Stiffn. Factor	Cushion CoR
6.85	104.18	0.00	10.81	1.00	0.80	1.00	1.00
13.68	104.18	0.00	10.81	1.00	0.80	1.00	1.00
13.72	104.18	0.00	10.81	1.00	0.80	1.00	1.00
16.20	104.18	0.00	10.81	1.00	0.80	1.00	1.00
18.68	104.18	0.00	10.81	1.00	0.80	1.00	1.00
18.72	104.18	0.00	10.81	1.00	0.80	1.00	1.00
25.60	104.18	0.00	10.81	1.00	0.80	1.00	1.00
32.48	104.18	0.00	10.81	1.00	0.80	1.00	1.00
32.52	104.18	0.00	10.81	1.00	0.80	1.00	1.00
35.00	104.18	0.00	10.81	1.00	0.80	1.00	1.00
37.48	104.18	0.00	10.81	1.00	0.80	1.00	1.00

37.52	104.18	0.00	10.81	1.00	0.80	1.00	1.00
45.00	104.18	0.00	10.81	1.00	0.80	1.00	1.00
52.48	104.18	0.00	10.81	1.00	0.80	1.00	1.00
52.52	104.18	0.00	10.81	1.00	0.80	1.00	1.00
57.50	104.18	0.00	10.81	1.00	0.80	1.00	1.00
62.48	104.18	0.00	10.81	1.00	0.80	1.00	1.00
62.52	104.18	0.00	10.81	1.00	0.80	1.00	1.00
72.50	104.18	0.00	10.81	1.00	0.80	1.00	1.00
82.48	104.18	0.00	10.81	1.00	0.80	1.00	1.00
82.52	104.18	0.00	10.81	1.00	0.80	1.00	1.00
93.33	104.18	0.00	10.81	1.00	0.80	1.00	1.00
104.18	104.18	0.00	10.81	1.00	0.80	1.00	1.00

Soil Layer Resistance Values

Depth ft	Shaft Res. k/ft2	End Bearing kips	Shaft Quake inch	Toe Quake inch	Shaft Damping s/ft	Toe Damping s/ft	Soil Setup Normlzd	Limit Distance ft	Setup Time hrs
0.01	0.00	0.00	0.100	0.200	0.050	0.150	0.000	6.000	1.000
9.01	0.00	0.00	0.100	0.200	0.050	0.150	0.000	6.000	1.000
9.99	0.00	0.00	0.100	0.200	0.050	0.150	0.000	6.000	1.000
10.00	0.32	30.84	0.100	0.200	0.050	0.150	0.000	6.000	1.000
13.69	0.44	42.22	0.100	0.200	0.050	0.150	0.000	6.000	1.000
13.71	0.54	61.66	0.100	0.170	0.050	0.150	0.340	6.000	24.000
18.69	0.73	84.05	0.100	0.170	0.050	0.150	0.340	6.000	24.000
18.71	1.36	31.58	0.100	0.160	0.150	0.150	0.660	6.000	168.000
27.71	1.36	31.58	0.100	0.160	0.150	0.150	0.660	6.000	168.000
32.49	1.36	31.58	0.100	0.160	0.150	0.150	0.660	6.000	168.000
32.51	1.38	35.09	0.100	0.160	0.150	0.150	0.660	6.000	24.000
37.49	1.38	35.09	0.100	0.160	0.150	0.150	0.660	6.000	24.000
37.51	1.20	41.23	0.100	0.150	0.150	0.150	0.660	6.000	168.000
46.51	1.20	41.23	0.100	0.150	0.150	0.150	0.660	6.000	168.000
52.49	1.23	41.23	0.100	0.150	0.150	0.150	0.660	6.000	168.000
52.51	0.99	48.25	0.100	0.150	0.150	0.150	0.660	6.000	24.000
61.51	0.99	48.25	0.100	0.150	0.150	0.150	0.660	6.000	24.000
62.49	0.99	48.25	0.100	0.150	0.150	0.150	0.660	6.000	24.000
62.51	1.02	46.50	0.100	0.150	0.150	0.150	0.660	6.000	168.000
71.51	1.02	46.50	0.100	0.150	0.150	0.150	0.660	6.000	168.000
80.51	1.10	46.50	0.100	0.150	0.150	0.150	0.660	6.000	168.000
82.49	1.14	46.50	0.100	0.150	0.150	0.150	0.660	6.000	168.000
82.51	0.96	18.42	0.100	0.150	0.200	0.150	1.000	6.000	168.000
91.51	0.96	18.42	0.100	0.150	0.200	0.150	1.000	6.000	168.000
100.51	0.97	18.42	0.100	0.150	0.200	0.150	1.000	6.000	168.000
104.18	0.98	18.42	0.100	0.150	0.200	0.150	1.000	6.000	168.000

PIER - B-169-8-20

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000

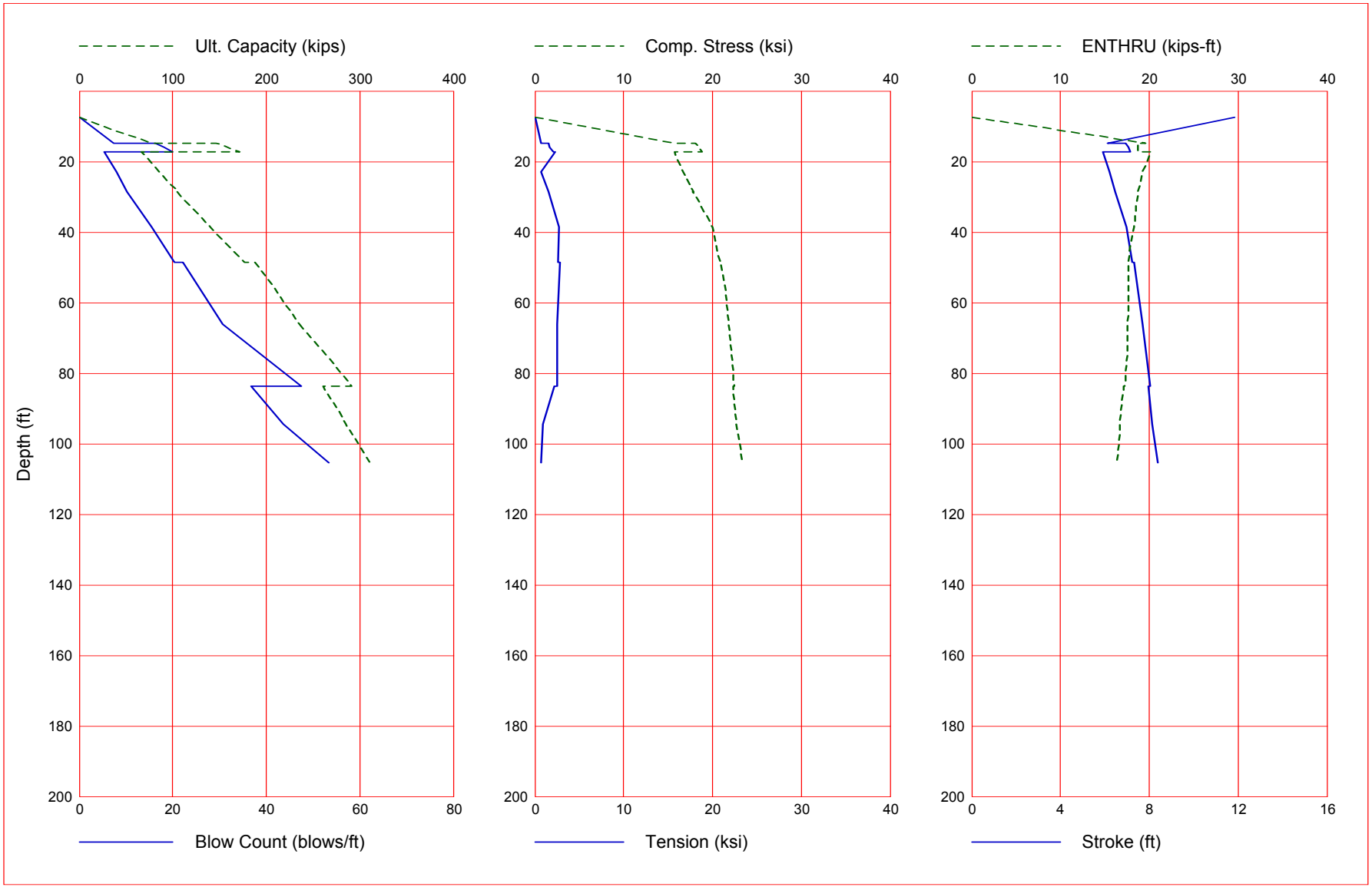
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
7.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.8	78.6	14.3	64.3	7.4	16.048	-0.687	6.12	19.6
14.8	146.1	14.5	131.7	16.4	18.099	-1.524	6.95	18.6
16.0	158.6	20.1	138.5	18.1	18.381	-1.666	7.06	18.7
17.3	171.3	26.0	145.4	19.9	18.870	-2.041	7.15	18.7
17.3	66.5	26.2	40.3	5.4	15.714	-2.253	5.92	20.2
23.0	86.0	45.6	40.3	7.9	16.689	-0.692	6.22	19.3
28.6	105.4	65.1	40.3	10.3	17.826	-1.547	6.48	18.7
28.6	104.7	65.2	39.5	10.2	17.800	-1.503	6.48	18.7
38.6	140.1	100.7	39.5	15.5	19.997	-2.755	6.96	18.3
48.6	176.7	137.3	39.5	20.4	20.809	-2.594	7.25	17.6
48.6	188.3	137.4	50.9	22.1	20.968	-2.842	7.31	17.7
66.1	235.1	184.3	50.9	30.7	21.827	-2.537	7.68	17.5
83.6	290.9	240.0	50.9	47.4	22.458	-2.455	8.03	17.2
83.6	261.2	240.2	21.1	36.8	22.368	-2.171	7.97	17.1
94.4	285.4	264.4	21.1	43.6	22.681	-0.893	8.14	16.7
105.3	310.0	288.9	21.1	53.3	23.299	-0.735	8.37	16.4

Total Continuous Driving Time 61.00 minutes; Total Number of Blows 2574 (starting at penetration 7.4 ft)

National Engineering & Architectural Ser
CCG3A : 09/27/2021 : ZM

Jun 20 2022
GRLWEAP Version 2010

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000



GRLWEAP - Version 2010
WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

written by GRL Engineers, Inc. (formerly Goble Rausche Likins and Associates, Inc.) with cooperation from Pile Dynamics, Inc.

ABOUT THE WAVE EQUATION ANALYSIS RESULTS

The GRLWEAP program simulates the behavior of a preformed pile driven by either an impact hammer or a vibratory hammer. The program is based on mathematical models, which describe motion and forces of hammer, driving system, pile and soil under the hammer action. Under certain conditions, the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents normal situations. In particular, the hammer data file supplied with the program assumes that the hammer is in good working order. All of the input data selected by the user may be the best available information at the time when the analysis is performed. However, input data and therefore results may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results. Soil response and hammer performance should be verified by static and/or dynamic testing and measurements. Estimates of bending or other local stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.), prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph, should be used in conjunction with observed blow counts for the capacity assessment of a driven pile. Soil setup occurring after pile installation may produce bearing capacity values that differ substantially from those expected from a wave equation analysis due to soil setup or relaxation. This is particularly true for pile driven with vibratory hammers. The GRLWEAP user must estimate such effects and should also use proper care when applying blow counts from restrike because of the variability of hammer energy, soil resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of building and other factors.

♀

Input File: C:\USERS\KARENS\DESKTOP\GRL FILES\16IN-P1-69-8.GWW
Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
Hammer File Version: 2003 (10/17/2016)

Input File Contents

CCG3A : 09/27/2021 : ZM

OUT	OSG	HAM	STR	FUL	PEL	N	SPL	N-U	P-D	%SK	ISM	0	PHI	RSA	ITR	H-D	MXT	DEx
-100	0	41	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.000

Pile g	Hammer g	Toe Area	Pile Size	Pile Type
32.170	32.170	201.060	16.000	Pipe

W Cp	A Cp	E Cp	T Cp	CoR	ROut	StCp
2.500	20.550	530.0	2.000	0.800	0.010	0.0

A Cu	E Cu	T Cu	CoR	ROut	StCu
0.000	0.0	0.000	0.000	0.000	0.0

LPle	APle	EPle	WPle	Peri	CI	CoR	ROut
105.280	20.55	29000.0	492.000	4.188	0	0.850	0.010

FFatigue	F0	0-Bottom
0	0.000	0.000

Manufac	Hmr Name	HmrType	No Seg-s
DELMAG	D 19-42	1	5

Ram Wt	Ram L	Ram Dia	MaxStrk	RtdStrk	Efficy
4.00	129.10	12.60	11.86	10.81	0.80

IB. Wt	IB. L	IB.Dia	IB CoR	IB RO
0.75	25.30	12.60	0.900	0.010

CompStrk	A Chamber	V Chamber	C Delay	C Duratn	Exp Coeff	VolCStart	Vol CEnd
16.65	124.70	157.70	0.0020	0.0020	1.250	0.00	0.00

P atm	P1	P2	P3	P4	P5
14.70	1600.00	1440.00	1295.00	1165.00	0.00

Stroke	Effic.	Pressure	R-Weight	T-Delay	Exp-Coeff	Eps-Str	Total-AW
10.8100	0.8000	1600.0000	0.0000	0.0000	0.0000	0.0100	0.0000

Qs	Qt	Js	Jt	Qx	Jx	Rati	Dept
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Research Soil Model: Atoe, Plug, Gap, Q-fac

0.000	0.000	0.000	0.000

Research Soil Model: RD-skn: m, d, toe: m, d

0.000	0.000	0.000	0.000

Res. Distribution

Dpth	Rskn	Rtoe	Qs	Qt	Js	Jt	SU F	LimL	TSf0
0.01	0.00	0.00	0.10	0.19	0.05	0.15	1.00	6.00	1.000
9.01	0.00	0.00	0.10	0.19	0.05	0.15	1.00	6.00	1.000
9.99	0.00	0.00	0.10	0.19	0.05	0.15	1.00	6.00	1.000
9.99	0.00	0.00	0.10	0.19	0.05	0.15	1.00	6.00	1.000
10.00	0.64	61.59	0.10	0.19	0.05	0.15	1.00	6.00	1.000
10.01	0.64	61.62	0.10	0.19	0.05	0.15	1.00	6.00	1.000
14.79	0.79	64.34	0.10	0.19	0.05	0.15	1.00	6.00	1.000
14.81	1.06	131.61	0.10	0.18	0.05	0.15	1.00	6.00	1.000
17.29	1.17	145.41	0.10	0.18	0.05	0.15	1.00	6.00	1.000
17.31	1.23	40.35	0.10	0.16	0.15	0.15	1.49	6.00	168.000
26.31	1.23	40.35	0.10	0.16	0.15	0.15	1.49	6.00	168.000
28.59	1.23	40.35	0.10	0.16	0.15	0.15	1.49	6.00	168.000
28.61	1.26	39.47	0.10	0.16	0.15	0.15	1.49	6.00	24.000
37.61	1.26	39.47	0.10	0.16	0.15	0.15	1.49	6.00	24.000
46.61	1.33	39.47	0.10	0.16	0.15	0.15	1.49	6.00	24.000
48.59	1.35	39.47	0.10	0.16	0.15	0.15	1.49	6.00	24.000
48.61	0.94	50.88	0.10	0.15	0.15	0.15	1.49	6.00	168.000
57.61	0.94	50.88	0.10	0.15	0.15	0.15	1.49	6.00	168.000
66.61	1.01	50.88	0.10	0.15	0.15	0.15	1.49	6.00	168.000
75.61	1.15	50.88	0.10	0.15	0.15	0.15	1.49	6.00	168.000
83.59	1.27	50.88	0.10	0.15	0.15	0.15	1.49	6.00	168.000
83.61	1.07	21.06	0.10	0.18	0.20	0.15	2.00	6.00	168.000
92.61	1.07	21.06	0.10	0.18	0.20	0.15	2.00	6.00	168.000
101.61	1.08	21.06	0.10	0.18	0.20	0.15	2.00	6.00	168.000
105.28	1.10	21.06	0.10	0.18	0.20	0.15	2.00	6.00	168.000

Gain/Loss factors: shaft and toe

0.40000	0.45000	0.50000	0.55000	0.60000
1.00000	1.00000	1.00000	1.00000	1.00000

Dpth	L	Wait	Strk	Pmx%	Eff.	Stff	CoR
7.40	0.00	0.00	0.000	0.0	0.000	0.000	0.000
14.78	0.00	0.00	0.000	0.0	0.000	0.000	0.000
14.82	0.00	0.00	0.000	0.0	0.000	0.000	0.000
16.05	0.00	0.00	0.000	0.0	0.000	0.000	0.000
17.28	0.00	0.00	0.000	0.0	0.000	0.000	0.000
17.32	0.00	0.00	0.000	0.0	0.000	0.000	0.000
22.95	0.00	0.00	0.000	0.0	0.000	0.000	0.000
28.58	0.00	0.00	0.000	0.0	0.000	0.000	0.000
28.62	0.00	0.00	0.000	0.0	0.000	0.000	0.000
38.60	0.00	0.00	0.000	0.0	0.000	0.000	0.000
48.58	0.00	0.00	0.000	0.0	0.000	0.000	0.000
48.62	0.00	0.00	0.000	0.0	0.000	0.000	0.000

66.10	0.00	0.00	0.000	0.0	0.000	0.000	0.000
83.58	0.00	0.00	0.000	0.0	0.000	0.000	0.000
83.62	0.00	0.00	0.000	0.0	0.000	0.000	0.000
94.43	0.00	0.00	0.000	0.0	0.000	0.000	0.000
105.28	0.00	0.00	0.000	0.0	0.000	0.000	0.000
0.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000

♀ GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
Version 2010
English Units

CCG3A : 09/27/2021 : ZM

Hammer Model: D 19-42 Made by: DELMAG

No.	Weight kips	Stiffn k/inch	CoR	C-Slk ft	Dampg k/ft/s
1	0.800				
2	0.800	140046.6	1.000	0.0000	
3	0.800	140046.6	1.000	0.0000	
4	0.800	140046.6	1.000	0.0000	
5	0.800	140046.6	1.000	0.0000	
Imp Block	0.753	70735.6	0.900	0.0100	
Helmet	2.500	5445.8	0.800	0.0100	5.8
Combined Pile Top		15095.0			

HAMMER OPTIONS:

Hammer File ID No.	41	Hammer Type	OE Diesel
Stroke Option	FxdP-VarS	Stroke Convergence Crit.	0.010
Fuel Pump Setting	Maximum		

HAMMER DATA:

Ram Weight (kips)	4.00	Ram Length (inch)	129.10
Maximum Stroke (ft)	11.86		
Rated Stroke (ft)	10.81	Efficiency	0.800
Maximum Pressure (psi)	1600.00	Actual Pressure (psi)	1600.00
Compression Exponent	1.350	Expansion Exponent	1.250
Ram Diameter (inch)	12.60		
Combustion Delay (s)	0.00200	Ignition Duration (s)	0.00200

The Hammer Data Includes Estimated (NON-MEASURED) Quantities

HAMMER CUSHION		PILE CUSHION	
Cross Sect. Area (in2)	20.55	Cross Sect. Area (in2)	0.00
Elastic-Modulus (ksi)	530.0	Elastic-Modulus (ksi)	0.0
Thickness (inch)	2.00	Thickness (inch)	0.00
Coeff of Restitution	0.8	Coeff of Restitution	1.0
RoundOut (ft)	0.0	RoundOut (ft)	0.0
Stiffness (kips/in)	5445.8	Stiffness (kips/in)	0.0

♀

Depth (ft)	7.4	Standard Soil Setup	
Shaft Gain/Loss Factor	0.400	Toe Gain/Loss Factor	1.000

PILE PROFILE:

Toe Area (in2)	201.060	Pile Type	Pipe

```
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    20.55   29000.    492.0      4.2        0    16524.     36.1
    105.3    20.55   29000.    492.0      4.2        0    16524.     36.1

 Wave Travel Time 2L/c (ms)    12.742

        Pile and Soil Model            Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.231    15095 0.010 0.000 0.85     0.0   0.000 0.100   3.29   4.2    20.5
  2  0.231    15095 0.000 0.000 1.00     0.0   0.000 0.100   6.58   4.2    20.5
 30  0.231    15095 0.000 0.000 1.00     0.0   0.050 0.100  98.70   4.2    20.6
 32  0.231    15095 0.000 0.000 1.00     0.0   0.050 0.100 105.28   4.2    20.5
Toe                                      0.0   0.150 0.190

     7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.392 kips total reduced pile weight   (g= 32.17 ft/s2)

 PILE, SOIL, ANALYSIS OPTIONS:
 Uniform pile                          Pile Segments: Automatic
 No. of Slacks/Splices            0  Pile Damping           (%)        1
                                     Pile Damping Fact.(k/ft/s)     0.721
 Driveability Analysis
 Soil Damping Option           Smith
 Max No Analysis Iterations        0  Time Increment/Critical          160
 Output Time Interval              1  Analysis Time-Input   (ms)         0
 Output Level: Normal
 Gravity Mass, Pile, Hammer:   32.170    32.170    32.170
 Output Segment Generation: Automatic

    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
     7.40     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.6     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.6     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.6     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.6     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.6     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
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    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi             ksi         kip-ft   b/min
♀
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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth	(ft)	14.8	Standard Soil Setup	
Shaft Gain/Loss Factor		0.400	Toe Gain/Loss Factor	1.000

PILE PROFILE:

Toe Area	(in2)	201.060	Pile Type	Pipe
Pile Size	(inch)	16.000		

L b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model — Total Capacity Rut (kips) 78.6

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
28	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	92.12	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	4.1	0.050	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.2	0.050	0.100	105.28	4.2	20.5
Toe						64.3	0.150	0.190			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
14.78	10.81	1.00	0.800

♀
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Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
78.6	7.4	6.12	6.14	-0.69	3	15	16.05	21	8	19.6	47.7
78.6	7.4	6.12	6.14	-0.69	3	15	16.05	21	8	19.6	47.7
78.6	7.4	6.12	6.14	-0.69	3	15	16.05	21	8	19.6	47.7
78.6	7.4	6.12	6.14	-0.69	3	15	16.05	21	8	19.6	47.7
78.6	7.4	6.12	6.14	-0.69	3	15	16.05	21	8	19.6	47.7

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth	(ft)	14.8	Standard Soil Setup	
Shaft Gain/Loss Factor		0.400	Toe Gain/Loss Factor	1.000

PILE PROFILE:

Toe Area	(in2)	201.060	Pile Type	Pipe
Pile Size	(inch)	16.000		

L b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model — Total Capacity Rut (kips) 146.1

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
28	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	92.12	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	4.3	0.050	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.2	0.050	0.100	105.28	4.2	20.5
Toe						131.7	0.150	0.180			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
14.82	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
146.1	16.4	6.95	6.91	-1.52	18	44	18.10	24	8	18.6	44.8
146.1	16.4	6.95	6.91	-1.52	18	44	18.10	24	8	18.6	44.8
146.1	16.4	6.95	6.91	-1.52	18	44	18.10	24	8	18.6	44.8
146.1	16.4	6.95	6.91	-1.52	18	44	18.10	24	8	18.6	44.8
146.1	16.4	6.95	6.91	-1.52	18	44	18.10	24	8	18.6	44.8

♀
CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 16.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model — Total Capacity Rut (kips) 158.6

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
28	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	92.12	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	7.9	0.050	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	12.2	0.050	0.100	105.28	4.2	20.5
Toe						138.5	0.150	0.180			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
16.05	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
158.6	18.1	7.06	7.01	-1.67	19	43	18.38	24	8	18.7	44.4
158.6	18.1	7.06	7.01	-1.67	19	43	18.38	24	8	18.7	44.4
158.6	18.1	7.06	7.01	-1.67	19	43	18.38	24	8	18.7	44.4
158.6	18.1	7.06	7.01	-1.67	19	43	18.38	24	8	18.7	44.4
158.6	18.1	7.06	7.01	-1.67	19	43	18.38	24	8	18.7	44.4

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 17.3 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 171.3

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
27	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	88.83	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	1.9	0.050	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	9.8	0.050	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	14.2	0.050	0.100	105.28	4.2	20.5
Toe						145.4	0.150	0.180			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
17.28	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
171.3	19.9	7.15	7.12	-2.04	18	41	18.87	30	10	18.7	44.1
171.3	19.9	7.15	7.12	-2.04	18	41	18.87	30	10	18.7	44.1
171.3	19.9	7.15	7.12	-2.04	18	41	18.87	30	10	18.7	44.1
171.3	19.9	7.15	7.12	-2.04	18	41	18.87	30	10	18.7	44.1
171.3	19.9	7.15	7.12	-2.04	18	41	18.87	30	10	18.7	44.1

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 17.3 Standard Soil Setup

Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model — Total Capacity Rut (kips) 66.5

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
27	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	88.83	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	2.0	0.050	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	9.8	0.050	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	14.3	0.051	0.100	105.28	4.2	20.5
Toe						40.3	0.150	0.160			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
17.32	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
66.5	5.4	5.92	5.96	-2.25	4	15	15.71	21	8	20.2	48.6
66.5	5.4	5.93	5.96	-2.25	5	15	15.71	21	8	20.2	48.6
66.5	5.4	5.92	5.95	-2.25	4	15	15.71	21	8	20.2	48.6
66.5	5.4	5.93	5.95	-2.25	5	15	15.70	21	8	20.2	48.6
66.5	5.4	5.93	5.95	-2.24	5	15	15.70	22	8	20.2	48.6

♀
CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 23.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model — Total Capacity Rut (kips) 84.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2

1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
26	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	85.54	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	8.9	0.050	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	12.7	0.050	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	11.9	0.123	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	105.28	4.2	20.5
Toe						40.3	0.150	0.160			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
22.95	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
84.0	7.6	6.20	6.22	-0.83	3	15	16.63	24	8	19.3	47.4
85.0	7.7	6.21	6.23	-0.75	3	15	16.66	24	8	19.3	47.4
86.0	7.9	6.22	6.24	-0.69	3	15	16.69	24	8	19.3	47.3
86.9	8.0	6.23	6.26	-0.62	3	15	16.72	24	8	19.2	47.3
87.9	8.1	6.25	6.27	-0.57	3	15	16.77	24	8	19.2	47.2

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 28.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
	ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 101.6

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
24	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	78.96	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	6.0	0.050	0.100	88.83	4.2	20.6
28	0.231	15095	0.000	0.000	1.00	11.2	0.050	0.100	92.12	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	13.3	0.095	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	98.70	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	105.28	4.2	20.5
Toe						40.3	0.150	0.160			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy

ft	ft	Ratio	
28.58	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
101.6	9.8	6.44	6.45	-1.32	15	49	17.68	25	8	18.8	46.5
103.5	10.0	6.46	6.48	-1.43	15	49	17.75	25	8	18.8	46.4
105.4	10.3	6.48	6.50	-1.55	15	49	17.83	25	8	18.7	46.3
107.4	10.5	6.51	6.52	-1.65	15	49	17.93	25	8	18.7	46.2
109.3	10.8	6.53	6.55	-1.73	15	48	17.97	25	8	18.7	46.1

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 28.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 100.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
24	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	78.96	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	6.1	0.050	0.100	88.83	4.2	20.6
28	0.231	15095	0.000	0.000	1.00	11.2	0.050	0.100	92.12	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	13.3	0.096	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	98.70	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	105.28	4.2	20.5
Toe						39.5	0.150	0.160			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
28.62	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
100.8	9.7	6.43	6.45	-1.28	15	49	17.65	25	8	18.8	46.5
102.8	9.9	6.45	6.47	-1.39	15	49	17.73	25	8	18.8	46.4
104.7	10.2	6.48	6.49	-1.50	15	49	17.80	25	8	18.7	46.3
106.6	10.4	6.50	6.51	-1.63	15	49	17.91	25	8	18.7	46.3
108.6	10.7	6.53	6.54	-1.72	15	48	17.98	25	8	18.7	46.2

♀

CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 38.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 132.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
21	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	69.09	4.2	20.6
24	0.231	15095	0.000	0.000	1.00	6.5	0.050	0.100	78.96	4.2	20.6
25	0.231	15095	0.000	0.000	1.00	11.4	0.050	0.100	82.25	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	13.1	0.099	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	88.83	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	98.70	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	105.28	4.2	20.5
Toe						39.5	0.150	0.160			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
38.60	10.81	1.00	0.800

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	Stroke (ft) up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
132.8	14.3	6.89	6.83	-2.55	21	46	19.70	24	8	18.4	45.0
136.5	14.9	6.93	6.87	-2.65	24	46	19.84	24	8	18.3	44.9
140.1	15.5	6.96	6.91	-2.76	24	45	20.00	24	8	18.3	44.8
143.8	16.1	6.99	6.95	-2.82	24	45	20.10	24	8	18.2	44.7
147.5	16.6	7.03	6.98	-2.83	24	45	20.25	24	8	18.2	44.6

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 48.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s

0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model — Total Capacity Rut (kips) 165.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
18	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	59.22	4.2	20.6
21	0.231	15095	0.000	0.000	1.00	6.8	0.050	0.100	69.09	4.2	20.6
22	0.231	15095	0.000	0.000	1.00	11.6	0.050	0.100	72.38	4.2	20.6
23	0.231	15095	0.000	0.000	1.00	12.9	0.103	0.100	75.67	4.2	20.6
24	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	78.96	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	88.83	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	10.7	0.150	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	10.9	0.150	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	11.1	0.150	0.100	105.28	4.2	20.5
Toe						39.5	0.150	0.160			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
48.58	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
165.8	19.0	7.19	7.15	-2.07	21	43	20.54	21	8	17.8	44.0
171.3	19.7	7.22	7.20	-2.35	21	38	20.65	21	8	17.6	43.9
176.7	20.4	7.25	7.23	-2.59	21	38	20.81	21	8	17.6	43.9
182.2	21.1	7.28	7.26	-2.77	21	38	20.93	22	8	17.6	43.8
187.7	21.9	7.32	7.29	-2.85	21	38	21.10	22	8	17.6	43.7

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 48.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model — Total Capacity Rut (kips) 177.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5

2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
18	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	59.22	4.2	20.6
21	0.231	15095	0.000	0.000	1.00	6.9	0.050	0.100	69.09	4.2	20.6
22	0.231	15095	0.000	0.000	1.00	11.6	0.050	0.100	72.38	4.2	20.6
23	0.231	15095	0.000	0.000	1.00	12.9	0.104	0.100	75.67	4.2	20.6
24	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	78.96	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	88.83	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	10.7	0.150	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	10.9	0.150	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	11.1	0.150	0.100	105.28	4.2	20.5
Toe						50.9	0.150	0.150			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
48.62	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
177.3	20.5	7.25	7.23	-2.55	21	38	20.70	21	8	17.7	43.9
182.8	21.3	7.29	7.26	-2.73	21	38	20.85	21	8	17.7	43.8
188.3	22.1	7.31	7.29	-2.84	21	38	20.97	21	8	17.7	43.7
193.8	22.9	7.36	7.33	-2.84	21	38	21.12	22	8	17.7	43.5
199.3	23.7	7.40	7.37	-2.72	21	38	21.28	22	8	17.8	43.4

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 66.1 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 219.5

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
12	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	39.48	4.2	20.6
15	0.231	15095	0.000	0.000	1.00	0.5	0.050	0.100	49.35	4.2	20.6
16	0.231	15095	0.000	0.000	1.00	9.6	0.050	0.100	52.64	4.2	20.6
17	0.231	15095	0.000	0.000	1.00	13.3	0.050	0.100	55.93	4.2	20.6
18	0.231	15095	0.000	0.000	1.00	11.2	0.134	0.100	59.22	4.2	20.6
19	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	62.51	4.2	20.6
21	0.231	15095	0.000	0.000	1.00	10.4	0.150	0.100	69.09	4.2	20.6
22	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	72.38	4.2	20.6

24	0.231	15095	0.000	0.000	1.00	10.6	0.150	0.100	78.96	4.2	20.6
25	0.231	15095	0.000	0.000	1.00	10.7	0.150	0.100	82.25	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	10.9	0.150	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	10.1	0.150	0.100	88.83	4.2	20.6
28	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	92.12	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	8.0	0.150	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	8.3	0.150	0.100	105.28	4.2	20.5
Toe						50.9	0.150	0.150			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
66.10	10.81	1.00	0.800

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Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
219.5	27.7	7.58	7.56	-1.60	11	30	21.50	16	7	17.3	42.9
227.3	29.2	7.63	7.62	-2.07	16	29	21.64	16	7	17.3	42.8
235.1	30.7	7.68	7.67	-2.54	16	28	21.83	16	7	17.5	42.6
242.9	32.4	7.73	7.72	-2.98	16	28	21.98	16	7	17.5	42.5
250.7	34.2	7.77	7.77	-3.40	16	28	22.13	16	7	17.6	42.3

♀

Depth (ft) 83.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
	ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 269.8

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
7	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	23.03	4.2	20.6
10	0.231	15095	0.000	0.000	1.00	3.3	0.050	0.100	32.90	4.2	20.6
11	0.231	15095	0.000	0.000	1.00	10.0	0.050	0.100	36.19	4.2	20.6
12	0.231	15095	0.000	0.000	1.00	14.2	0.066	0.100	39.48	4.2	20.6
13	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	42.77	4.2	20.6
16	0.231	15095	0.000	0.000	1.00	10.4	0.150	0.100	52.64	4.2	20.6
17	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	55.93	4.2	20.6
19	0.231	15095	0.000	0.000	1.00	10.6	0.150	0.100	62.51	4.2	20.6
20	0.231	15095	0.000	0.000	1.00	10.8	0.150	0.100	65.80	4.2	20.5
21	0.231	15095	0.000	0.000	1.00	11.0	0.150	0.100	69.09	4.2	20.6
22	0.231	15095	0.000	0.000	1.00	9.1	0.150	0.100	72.38	4.2	20.6
23	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	75.67	4.2	20.6

25	0.231	15095	0.000	0.000	1.00	7.9	0.150	0.100	82.25	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	8.1	0.150	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	8.3	0.150	0.100	88.83	4.2	20.6
28	0.231	15095	0.000	0.000	1.00	8.7	0.150	0.100	92.12	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	9.1	0.150	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	9.5	0.150	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	10.0	0.150	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.4	0.150	0.100	105.28	4.2	20.5
Toe						50.9	0.150	0.150			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
83.58	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
269.8	40.4	7.97	7.97	-2.09	10	29	22.22	11	6	17.2	41.8
280.4	43.9	7.95	8.03	-2.22	11	27	22.28	11	6	17.1	41.8
290.9	47.4	8.03	8.10	-2.45	11	27	22.46	11	6	17.2	41.6
301.5	50.9	8.10	8.15	-2.56	11	27	22.69	11	6	17.3	41.4
312.0	55.1	8.17	8.23	-2.52	11	27	22.88	11	6	17.4	41.2

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CCG3A : 09/27/2021 : ZM 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 83.6 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 240.1

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
7	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	23.03	4.2	20.6
10	0.231	15095	0.000	0.000	1.00	3.4	0.050	0.100	32.90	4.2	20.6
11	0.231	15095	0.000	0.000	1.00	10.1	0.050	0.100	36.19	4.2	20.6
12	0.231	15095	0.000	0.000	1.00	14.2	0.068	0.100	39.48	4.2	20.6
13	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	42.77	4.2	20.6
16	0.231	15095	0.000	0.000	1.00	10.4	0.150	0.100	52.64	4.2	20.6
17	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	55.93	4.2	20.6
19	0.231	15095	0.000	0.000	1.00	10.6	0.150	0.100	62.51	4.2	20.6
20	0.231	15095	0.000	0.000	1.00	10.8	0.150	0.100	65.80	4.2	20.5
21	0.231	15095	0.000	0.000	1.00	11.0	0.150	0.100	69.09	4.2	20.6
22	0.231	15095	0.000	0.000	1.00	9.0	0.150	0.100	72.38	4.2	20.6
23	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	75.67	4.2	20.6

25	0.231	15095	0.000	0.000	1.00	7.9	0.150	0.100	82.25	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	8.1	0.150	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	8.3	0.150	0.100	88.83	4.2	20.6
28	0.231	15095	0.000	0.000	1.00	8.7	0.150	0.100	92.12	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	9.1	0.150	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	9.5	0.150	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	10.0	0.150	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	10.4	0.150	0.100	105.28	4.2	20.5
Toe						21.1	0.150	0.180			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
83.62	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
240.1	31.9	7.85	7.84	-2.18	10	30	21.99	11	6	16.9	42.2
250.7	34.2	7.91	7.90	-2.22	10	29	22.18	11	6	17.0	42.0
261.2	36.8	7.97	7.97	-2.17	10	29	22.37	11	6	17.1	41.8
271.8	39.4	8.03	8.03	-2.04	10	29	22.56	11	6	17.2	41.7
282.3	42.8	8.02	8.09	-2.16	11	28	22.61	11	6	17.1	41.6

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Depth (ft) 94.4 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 259.5

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.000	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.000	0.100	6.58	4.2	20.5
4	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	13.16	4.2	20.5
7	0.231	15095	0.000	0.000	1.00	6.2	0.050	0.100	23.03	4.2	20.6
8	0.231	15095	0.000	0.000	1.00	11.2	0.050	0.100	26.32	4.2	20.6
9	0.231	15095	0.000	0.000	1.00	13.2	0.096	0.100	29.61	4.2	20.6
10	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	32.90	4.2	20.6
12	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	39.48	4.2	20.6
13	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	42.77	4.2	20.6
15	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	49.35	4.2	20.6
16	0.231	15095	0.000	0.000	1.00	10.7	0.150	0.100	52.64	4.2	20.6
17	0.231	15095	0.000	0.000	1.00	10.9	0.150	0.100	55.93	4.2	20.6
18	0.231	15095	0.000	0.000	1.00	11.1	0.150	0.100	59.22	4.2	20.6
19	0.231	15095	0.000	0.000	1.00	8.1	0.150	0.100	62.51	4.2	20.6

20	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	65.80	4.2	20.5
21	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	69.09	4.2	20.6
22	0.231	15095	0.000	0.000	1.00	8.0	0.150	0.100	72.38	4.2	20.6
23	0.231	15095	0.000	0.000	1.00	8.2	0.150	0.100	75.67	4.2	20.6
24	0.231	15095	0.000	0.000	1.00	8.4	0.150	0.100	78.96	4.2	20.6
25	0.231	15095	0.000	0.000	1.00	8.8	0.150	0.100	82.25	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	9.2	0.150	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	9.7	0.150	0.100	88.83	4.2	20.6
28	0.231	15095	0.000	0.000	1.00	10.1	0.150	0.100	92.12	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	9.1	0.163	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	5.9	0.200	0.100	98.70	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	5.9	0.200	0.100	105.28	4.2	20.5
Toe						21.1	0.150	0.180			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
94.43	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
259.5	36.3	8.06	8.05	-1.16	8	30	22.37	8	5	16.7	41.6
272.4	40.0	8.06	8.12	-0.89	6	45	22.45	8	5	16.6	41.5
285.4	43.6	8.14	8.19	-0.89	7	50	22.68	8	5	16.7	41.3
298.4	47.6	8.22	8.25	-0.91	7	49	22.92	8	5	16.9	41.2
311.4	52.5	8.30	8.32	-0.91	7	44	23.12	8	5	17.0	41.0

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Depth (ft) 105.3 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	20.55	29000.	492.0	4.2	0	16524.	36.1
	105.3	20.55	29000.	492.0	4.2	0	16524.	36.1

Wave Travel Time 2L/c (ms) 12.742

Pile and Soil Model Total Capacity Rut (kips) 279.1

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.231	15095	0.010	0.000	0.85	0.0	0.050	0.100	3.29	4.2	20.5
2	0.231	15095	0.000	0.000	1.00	0.0	0.050	0.100	6.58	4.2	20.5
4	0.231	15095	0.000	0.000	1.00	9.1	0.050	0.100	13.16	4.2	20.5
5	0.231	15095	0.000	0.000	1.00	12.8	0.050	0.100	16.45	4.2	20.6
6	0.231	15095	0.000	0.000	1.00	11.7	0.125	0.100	19.74	4.2	20.6
7	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	23.03	4.2	20.6
9	0.231	15095	0.000	0.000	1.00	10.3	0.150	0.100	29.61	4.2	20.6
10	0.231	15095	0.000	0.000	1.00	10.5	0.150	0.100	32.90	4.2	20.6
12	0.231	15095	0.000	0.000	1.00	10.6	0.150	0.100	39.48	4.2	20.6
13	0.231	15095	0.000	0.000	1.00	10.7	0.150	0.100	42.77	4.2	20.6

14	0.231	15095	0.000	0.000	1.00	10.9	0.150	0.100	46.06	4.2	20.6
15	0.231	15095	0.000	0.000	1.00	10.4	0.150	0.100	49.35	4.2	20.6
16	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	52.64	4.2	20.6
18	0.231	15095	0.000	0.000	1.00	7.8	0.150	0.100	59.22	4.2	20.6
19	0.231	15095	0.000	0.000	1.00	8.0	0.150	0.100	62.51	4.2	20.6
20	0.231	15095	0.000	0.000	1.00	8.2	0.150	0.100	65.80	4.2	20.5
21	0.231	15095	0.000	0.000	1.00	8.5	0.150	0.100	69.09	4.2	20.6
22	0.231	15095	0.000	0.000	1.00	8.9	0.150	0.100	72.38	4.2	20.6
23	0.231	15095	0.000	0.000	1.00	9.4	0.150	0.100	75.67	4.2	20.6
24	0.231	15095	0.000	0.000	1.00	9.8	0.150	0.100	78.96	4.2	20.6
25	0.231	15095	0.000	0.000	1.00	10.2	0.150	0.100	82.25	4.2	20.6
26	0.231	15095	0.000	0.000	1.00	7.8	0.177	0.100	85.54	4.2	20.6
27	0.231	15095	0.000	0.000	1.00	5.9	0.200	0.100	88.83	4.2	20.6
29	0.231	15095	0.000	0.000	1.00	5.9	0.200	0.100	95.41	4.2	20.6
30	0.231	15095	0.000	0.000	1.00	5.9	0.200	0.100	98.70	4.2	20.6
31	0.231	15095	0.000	0.000	1.00	6.0	0.200	0.100	101.99	4.2	20.6
32	0.231	15095	0.000	0.000	1.00	6.0	0.200	0.100	105.28	4.2	20.5
Toe						21.1	0.150	0.180			

7.392 kips total unreduced pile weight (g= 32.17 ft/s2)
7.392 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
105.28	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
279.1	42.5	8.21	8.24	-0.62	27	26	22.88	4	4	16.2	41.2
294.6	47.4	8.29	8.31	-0.61	4	41	23.10	4	4	16.3	41.0
310.0	53.3	8.37	8.38	-0.74	4	41	23.30	4	4	16.4	40.9
325.4	59.9	8.44	8.44	-0.72	4	41	23.51	4	4	16.6	40.7
340.9	68.2	8.51	8.50	-0.68	4	41	23.70	4	4	16.7	40.5

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.400 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.4	0.0	0.0	0.0	0.0	0.000	0.000	10.81	0.0
14.8	78.6	14.3	64.3	7.4	16.048	-0.687	6.12	19.6
14.8	146.1	14.5	131.7	16.4	18.099	-1.524	6.95	18.6
16.0	158.6	20.1	138.5	18.1	18.381	-1.666	7.06	18.7
17.3	171.3	26.0	145.4	19.9	18.870	-2.041	7.15	18.7
17.3	66.5	26.1	40.3	5.4	15.710	-2.250	5.92	20.2
23.0	84.0	43.7	40.3	7.6	16.626	-0.827	6.20	19.3
28.6	101.6	61.2	40.3	9.8	17.676	-1.317	6.44	18.8
28.6	100.8	61.4	39.5	9.7	17.649	-1.277	6.43	18.8
38.6	132.8	93.3	39.5	14.3	19.698	-2.549	6.89	18.4
48.6	165.8	126.3	39.5	19.0	20.538	-2.069	7.19	17.8
48.6	177.3	126.4	50.9	20.5	20.695	-2.551	7.25	17.7
66.1	219.5	168.7	50.9	27.7	21.496	-1.601	7.58	17.3
83.6	269.8	218.9	50.9	40.4	22.215	-2.087	7.97	17.2
83.6	240.1	219.0	21.1	31.9	21.988	-2.183	7.85	16.9
94.4	259.5	238.4	21.1	36.3	22.371	-1.165	8.06	16.7
105.3	279.1	258.1	21.1	42.5	22.876	-0.617	8.21	16.2

Total Driving Time 53 minutes; Total No. of Blows 2258
Starting at penetration 7.4 ft

G/L at Shaft and Toe: 0.450 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.8	78.6	14.3	64.3	7.4	16.048	-0.687	6.12	19.6
14.8	146.1	14.5	131.7	16.4	18.099	-1.524	6.95	18.6
16.0	158.6	20.1	138.5	18.1	18.381	-1.666	7.06	18.7
17.3	171.3	26.0	145.4	19.9	18.870	-2.041	7.15	18.7
17.3	66.5	26.1	40.3	5.4	15.706	-2.248	5.93	20.2
23.0	85.0	44.7	40.3	7.7	16.658	-0.753	6.21	19.3
28.6	103.5	63.2	40.3	10.0	17.750	-1.434	6.46	18.8
28.6	102.8	63.3	39.5	9.9	17.726	-1.395	6.45	18.8
38.6	136.5	97.0	39.5	14.9	19.844	-2.652	6.93	18.3
48.6	171.3	131.8	39.5	19.7	20.646	-2.348	7.22	17.6
48.6	182.8	131.9	50.9	21.3	20.848	-2.734	7.29	17.7
66.1	227.3	176.5	50.9	29.2	21.639	-2.068	7.63	17.3
83.6	280.4	229.5	50.9	43.9	22.277	-2.222	7.95	17.1
83.6	250.7	229.6	21.1	34.2	22.181	-2.221	7.91	17.0
94.4	272.4	251.4	21.1	40.0	22.453	-0.895	8.06	16.6
105.3	294.6	273.5	21.1	47.4	23.099	-0.611	8.29	16.3

Total Driving Time 57 minutes; Total No. of Blows 2413
Starting at penetration 7.4 ft

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.500 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.8	78.6	14.3	64.3	7.4	16.048	-0.687	6.12	19.6
14.8	146.1	14.5	131.7	16.4	18.099	-1.524	6.95	18.6
16.0	158.6	20.1	138.5	18.1	18.381	-1.666	7.06	18.7
17.3	171.3	26.0	145.4	19.9	18.870	-2.041	7.15	18.7
17.3	66.5	26.2	40.3	5.4	15.714	-2.253	5.92	20.2
23.0	86.0	45.6	40.3	7.9	16.689	-0.692	6.22	19.3
28.6	105.4	65.1	40.3	10.3	17.826	-1.547	6.48	18.7
28.6	104.7	65.2	39.5	10.2	17.800	-1.503	6.48	18.7
38.6	140.1	100.7	39.5	15.5	19.997	-2.755	6.96	18.3
48.6	176.7	137.3	39.5	20.4	20.809	-2.594	7.25	17.6
48.6	188.3	137.4	50.9	22.1	20.968	-2.842	7.31	17.7
66.1	235.1	184.3	50.9	30.7	21.827	-2.537	7.68	17.5
83.6	290.9	240.0	50.9	47.4	22.458	-2.455	8.03	17.2
83.6	261.2	240.2	21.1	36.8	22.368	-2.171	7.97	17.1
94.4	285.4	264.4	21.1	43.6	22.681	-0.893	8.14	16.7
105.3	310.0	288.9	21.1	53.3	23.299	-0.735	8.37	16.4

Total Driving Time 61 minutes; Total No. of Blows 2574
Starting at penetration 7.4 ft

G/L at Shaft and Toe: 0.550 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.8	78.6	14.3	64.3	7.4	16.048	-0.687	6.12	19.6
14.8	146.1	14.5	131.7	16.4	18.099	-1.524	6.95	18.6

16.0	158.6	20.1	138.5	18.1	18.381	-1.666	7.06	18.7
17.3	171.3	26.0	145.4	19.9	18.870	-2.041	7.15	18.7
17.3	66.5	26.2	40.3	5.4	15.704	-2.247	5.93	20.2
23.0	86.9	46.6	40.3	8.0	16.715	-0.619	6.23	19.2
28.6	107.4	67.0	40.3	10.5	17.931	-1.655	6.51	18.7
28.6	106.6	67.2	39.5	10.4	17.907	-1.627	6.50	18.7
38.6	143.8	104.3	39.5	16.1	20.102	-2.819	6.99	18.2
48.6	182.2	142.8	39.5	21.1	20.927	-2.766	7.28	17.6
48.6	193.8	142.9	50.9	22.9	21.118	-2.836	7.36	17.7
66.1	242.9	192.1	50.9	32.4	21.978	-2.981	7.73	17.5
83.6	301.5	250.6	50.9	50.9	22.688	-2.560	8.10	17.3
83.6	271.8	250.7	21.1	39.4	22.565	-2.041	8.03	17.2
94.4	298.4	277.3	21.1	47.6	22.918	-0.914	8.22	16.9
105.3	325.4	304.4	21.1	59.9	23.510	-0.721	8.44	16.6

Total Driving Time 65 minutes; Total No. of Blows 2747
Starting at penetration 7.4 ft
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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.600 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.4	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.8	78.6	14.3	64.3	7.4	16.048	-0.687	6.12	19.6
14.8	146.1	14.5	131.7	16.4	18.099	-1.524	6.95	18.6
16.0	158.6	20.1	138.5	18.1	18.381	-1.666	7.06	18.7
17.3	171.3	26.0	145.4	19.9	18.870	-2.041	7.15	18.7
17.3	66.5	26.2	40.3	5.4	15.703	-2.244	5.93	20.2
23.0	87.9	47.6	40.3	8.1	16.774	-0.567	6.25	19.2
28.6	109.3	68.9	40.3	10.8	17.970	-1.729	6.53	18.7
28.6	108.6	69.1	39.5	10.7	17.975	-1.724	6.53	18.7
38.6	147.5	108.0	39.5	16.6	20.250	-2.829	7.03	18.2
48.6	187.7	148.2	39.5	21.9	21.104	-2.853	7.32	17.6
48.6	199.3	148.4	50.9	23.7	21.283	-2.725	7.40	17.8
66.1	250.7	199.9	50.9	34.2	22.131	-3.397	7.77	17.6
83.6	312.0	261.1	50.9	55.1	22.878	-2.517	8.17	17.4
83.6	282.3	261.3	21.1	42.8	22.614	-2.159	8.02	17.1
94.4	311.4	290.3	21.1	52.5	23.116	-0.912	8.30	17.0
105.3	340.9	319.8	21.1	68.2	23.700	-0.676	8.51	16.7

Total Driving Time 70 minutes; Total No. of Blows 2950
Starting at penetration 7.4 ft
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Table of Depths Analyzed with Driving System Modifiers

Depth ft	Temp. Length ft	Wait Time hr	Equivalent Pressure Stroke ft	Ratio	Efficy.	Stiffn. Factor	Cushion CoR
7.40	105.28	0.00	10.81	1.00	0.80	1.00	1.00
14.78	105.28	0.00	10.81	1.00	0.80	1.00	1.00
14.82	105.28	0.00	10.81	1.00	0.80	1.00	1.00
16.05	105.28	0.00	10.81	1.00	0.80	1.00	1.00
17.28	105.28	0.00	10.81	1.00	0.80	1.00	1.00
17.32	105.28	0.00	10.81	1.00	0.80	1.00	1.00
22.95	105.28	0.00	10.81	1.00	0.80	1.00	1.00

28.58	105.28	0.00	10.81	1.00	0.80	1.00	1.00
28.62	105.28	0.00	10.81	1.00	0.80	1.00	1.00
38.60	105.28	0.00	10.81	1.00	0.80	1.00	1.00
48.58	105.28	0.00	10.81	1.00	0.80	1.00	1.00
48.62	105.28	0.00	10.81	1.00	0.80	1.00	1.00
66.10	105.28	0.00	10.81	1.00	0.80	1.00	1.00
83.58	105.28	0.00	10.81	1.00	0.80	1.00	1.00
83.62	105.28	0.00	10.81	1.00	0.80	1.00	1.00
94.43	105.28	0.00	10.81	1.00	0.80	1.00	1.00
105.28	105.28	0.00	10.81	1.00	0.80	1.00	1.00

Soil Layer Resistance Values

Depth ft	Shaft Res. k/ft2	End Bearing kips	Shaft Quake inch	Toe Quake inch	Shaft Damping s/ft	Toe Damping s/ft	Soil Setup Normlzd	Limit Distance ft	Setup Time hrs
0.01	0.00	0.00	0.100	0.190	0.050	0.150	0.000	6.000	1.000
9.01	0.00	0.00	0.100	0.190	0.050	0.150	0.000	6.000	1.000
9.99	0.00	0.00	0.100	0.190	0.050	0.150	0.000	6.000	1.000
9.99	0.00	0.00	0.100	0.190	0.050	0.150	0.000	6.000	1.000
10.00	0.64	61.59	0.100	0.190	0.050	0.150	0.000	6.000	1.000
10.01	0.64	61.62	0.100	0.190	0.050	0.150	0.000	6.000	1.000
14.79	0.79	64.34	0.100	0.190	0.050	0.150	0.000	6.000	1.000
14.81	1.06	131.61	0.100	0.180	0.050	0.150	0.000	6.000	1.000
17.29	1.17	145.41	0.100	0.180	0.050	0.150	0.000	6.000	1.000
17.31	1.23	40.35	0.100	0.160	0.150	0.150	0.660	6.000	168.000
26.31	1.23	40.35	0.100	0.160	0.150	0.150	0.660	6.000	168.000
28.59	1.23	40.35	0.100	0.160	0.150	0.150	0.660	6.000	168.000
28.61	1.26	39.47	0.100	0.160	0.150	0.150	0.660	6.000	24.000
37.61	1.26	39.47	0.100	0.160	0.150	0.150	0.660	6.000	24.000
46.61	1.33	39.47	0.100	0.160	0.150	0.150	0.660	6.000	24.000
48.59	1.35	39.47	0.100	0.160	0.150	0.150	0.660	6.000	24.000
48.61	0.94	50.88	0.100	0.150	0.150	0.150	0.660	6.000	168.000
57.61	0.94	50.88	0.100	0.150	0.150	0.150	0.660	6.000	168.000
66.61	1.01	50.88	0.100	0.150	0.150	0.150	0.660	6.000	168.000
75.61	1.15	50.88	0.100	0.150	0.150	0.150	0.660	6.000	168.000
83.59	1.27	50.88	0.100	0.150	0.150	0.150	0.660	6.000	168.000
83.61	1.07	21.06	0.100	0.180	0.200	0.150	1.000	6.000	168.000
92.61	1.07	21.06	0.100	0.180	0.200	0.150	1.000	6.000	168.000
101.61	1.08	21.06	0.100	0.180	0.200	0.150	1.000	6.000	168.000
105.28	1.10	21.06	0.100	0.180	0.200	0.150	1.000	6.000	168.000

FORWARD ABUTMENT - B-170-0-14

Gain/Loss 3 at Shaft and Toe 0.570 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
7.2	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.5	124.8	0.9	123.9	13.8	18.141	-0.906	6.71	18.7
14.5	41.3	1.0	40.3	3.5	14.342	-1.452	5.40	21.9
17.0	45.3	5.0	40.3	3.8	14.587	-1.214	5.48	21.6
19.5	49.8	9.5	40.3	4.3	14.891	-1.016	5.56	21.3
19.5	98.5	9.6	88.9	10.1	17.200	-0.251	6.35	19.1
22.0	112.1	18.9	93.2	11.6	17.671	-1.163	6.50	18.9
24.5	126.6	29.1	97.5	13.2	18.101	-1.649	6.66	18.7
24.5	68.8	29.3	39.5	5.8	16.042	-0.768	5.84	20.3
32.0	95.3	55.8	39.5	9.0	17.706	-0.132	6.28	19.1
39.5	122.0	82.6	39.5	12.8	19.554	-1.842	6.68	18.5
39.5	107.3	82.7	24.6	10.6	19.039	-0.990	6.48	18.7
47.0	132.3	107.7	24.6	14.4	20.463	-2.613	6.90	18.4
54.5	157.4	132.8	24.6	18.0	21.117	-2.122	7.16	17.8
54.5	181.2	133.0	48.2	21.2	21.429	-1.729	7.30	17.6
59.5	195.1	146.8	48.2	23.4	21.700	-2.062	7.40	17.4
64.5	208.9	160.7	48.2	25.7	21.943	-1.652	7.52	17.3
64.5	192.4	160.8	31.6	23.0	21.711	-1.721	7.41	17.1
72.0	220.9	189.3	31.6	28.2	22.246	-0.731	7.67	17.0
79.5	249.5	217.9	31.6	34.9	22.782	-1.446	7.91	17.1
79.5	250.5	218.0	32.5	35.3	22.765	-1.472	7.92	17.1
86.3	272.7	240.3	32.5	42.5	23.038	-1.509	8.04	16.9
93.2	295.1	262.6	32.5	51.2	23.447	-1.222	8.24	16.8

Total Continuous Driving Time 40.00 minutes; Total Number of Blows 1729 (starting at penetration 7.2 ft)

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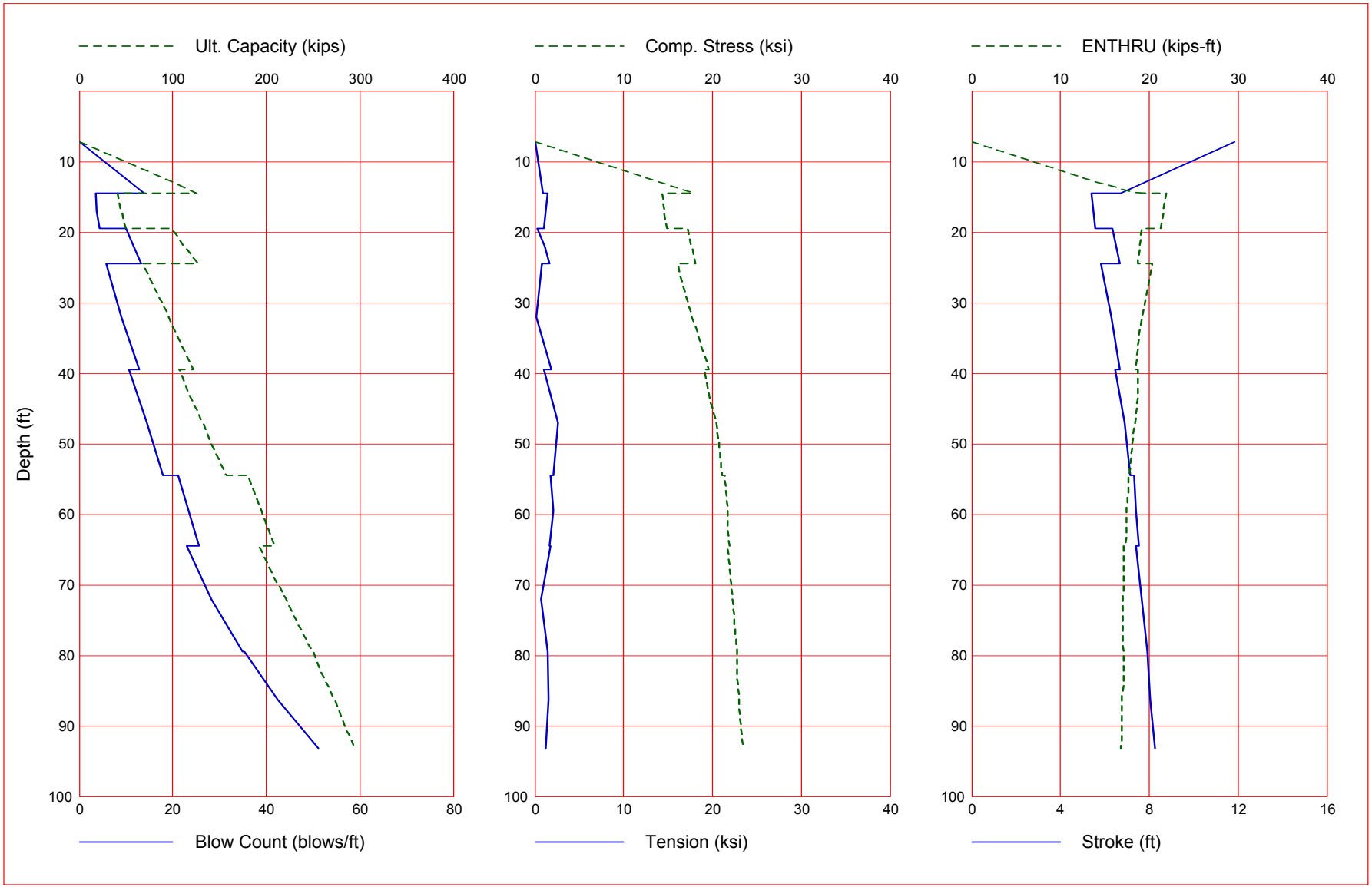
Jun 20 2022
GRLWEAP Version 2010

Gain/Loss 3 at Shaft and Toe 0.570 / 1.000



GRLWEAP - Version 2010
WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

written by GRL Engineers, Inc. (formerly Goble Rausche Likins and Associates, Inc.) with cooperation from Pile Dynamics, Inc.

ABOUT THE WAVE EQUATION ANALYSIS RESULTS

The GRLWEAP program simulates the behavior of a preformed pile driven by either an impact hammer or a vibratory hammer. The program is based on mathematical models, which describe motion and forces of hammer, driving system, pile and soil under the hammer action. Under certain conditions, the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents normal situations. In particular, the hammer data file supplied with the program assumes that the hammer is in good working order. All of the input data selected by the user may be the best available information at the time when the analysis is performed. However, input data and therefore results may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results. Soil response and hammer performance should be verified by static and/or dynamic testing and measurements. Estimates of bending or other local stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.), prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph, should be used in conjunction with observed blow counts for the capacity assessment of a driven pile. Soil setup occurring after pile installation may produce bearing capacity values that differ substantially from those expected from a wave equation analysis due to soil setup or relaxation. This is particularly true for pile driven with vibratory hammers. The GRLWEAP user must estimate such effects and should also use proper care when applying blow counts from restrike because of the variability of hammer energy, soil resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of building and other factors.

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Input File: C:\USERS\KARENS\DESKTOP\GRL FILES\16IN-FA-170.GWW
Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
Hammer File Version: 2003 (10/17/2016)

Input File Contents

CCG3A : 04/13/2022 : KCA

OUT	OSG	HAM	STR	FUL	PEL	N	SPL	N-U	P-D	%SK	ISM	0	PHI	RSA	ITR	H-D	MXT	DEx
-100	0	41	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.000

Pile g	Hammer g	Toe Area	Pile Size	Pile Type
32.170	32.170	201.060	16.000	Pipe

W Cp	A Cp	E Cp	T Cp	CoR	ROut	StCp
2.500	19.120	530.0	2.000	0.800	0.010	0.0

A Cu	E Cu	T Cu	CoR	ROut	StCu
0.000	0.0	0.000	0.000	0.000	0.0

LPle	APle	EPle	WPle	Peri	CI	CoR	ROut
93.180	19.12	29000.0	492.000	4.188	0	0.850	0.010

FFatigue	F0	0-Bottom
0	0.000	0.000

Manufac	Hmr Name	HmrType No	Seg-s
DELMAG	D 19-42	1	5

Ram Wt	Ram L	Ram Dia	MaxStrk	RtdStrk	Efficy
4.00	129.10	12.60	11.86	10.81	0.80

IB. Wt	IB. L	IB.Dia	IB CoR	IB RO
0.75	25.30	12.60	0.900	0.010

CompStrk	A Chamber	V Chamber	C Delay	C Duratn	Exp Coeff	VolCStart	Vol CEnd
16.65	124.70	157.70	0.0020	0.0020	1.250	0.00	0.00

P atm	P1	P2	P3	P4	P5
14.70	1600.00	1440.00	1295.00	1165.00	0.00

Stroke	Effic.	Pressure	R-Weight	T-Delay	Exp-Coeff	Eps-Str	Total-AW
10.8100	0.8000	1600.0000	0.0000	0.0000	0.0000	0.0100	0.0000

Qs	Qt	Js	Jt	Qx	Jx	Rati	Dept
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Research Soil Model: Atoe, Plug, Gap, Q-fac

0.000	0.000	0.000	0.000

Research Soil Model: RD-skn: m, d, toe: m, d

0.000	0.000	0.000	0.000

Res. Distribution

Dpth	Rskn	Rtoe	Qs	Qt	Js	Jt	SU F	LimL	TSf0
0.01	0.00	0.00	0.10	0.16	0.10	0.15	1.21	6.00	24.000
3.69	0.00	0.00	0.10	0.16	0.10	0.15	1.21	6.00	24.000
3.71	0.00	0.00	0.10	0.16	0.10	0.15	1.21	6.00	24.000
12.71	0.00	0.00	0.10	0.16	0.10	0.15	1.21	6.00	24.000
14.19	0.00	0.00	0.10	0.16	0.10	0.15	1.21	6.00	24.000
14.20	0.93	121.92	0.10	0.16	0.10	0.15	1.21	6.00	24.000
14.49	0.94	123.92	0.10	0.16	0.10	0.15	1.21	6.00	24.000
14.51	0.54	40.28	0.10	0.19	0.10	0.15	1.49	6.00	24.000
19.49	0.68	40.28	0.10	0.19	0.10	0.15	1.49	6.00	24.000
19.51	0.85	88.86	0.10	0.18	0.05	0.15	1.00	6.00	1.000
24.49	1.03	97.47	0.10	0.18	0.05	0.15	1.00	6.00	1.000
24.51	1.26	39.47	0.10	0.16	0.15	0.15	1.49	6.00	24.000
33.51	1.26	39.47	0.10	0.16	0.15	0.15	1.49	6.00	24.000
39.49	1.29	39.47	0.10	0.16	0.15	0.15	1.49	6.00	24.000
39.51	1.19	24.56	0.10	0.17	0.15	0.15	1.49	6.00	168.000
48.51	1.19	24.56	0.10	0.17	0.15	0.15	1.49	6.00	168.000
54.49	1.20	24.56	0.10	0.17	0.15	0.15	1.49	6.00	168.000
54.51	0.99	48.25	0.10	0.15	0.15	0.15	1.49	6.00	24.000
63.51	0.99	48.25	0.10	0.15	0.15	0.15	1.49	6.00	24.000
64.49	0.99	48.25	0.10	0.15	0.15	0.15	1.49	6.00	24.000
64.51	1.36	31.58	0.10	0.17	0.15	0.15	1.49	6.00	168.000
73.51	1.36	31.58	0.10	0.17	0.15	0.15	1.49	6.00	168.000
79.49	1.37	31.58	0.10	0.17	0.15	0.15	1.49	6.00	168.000
79.51	1.37	32.46	0.10	0.16	0.20	0.15	1.75	6.00	168.000
88.51	1.37	32.46	0.10	0.16	0.20	0.15	1.75	6.00	168.000
93.18	1.37	32.46	0.10	0.16	0.20	0.15	1.75	6.00	168.000

Gain/Loss factors: shaft and toe

0.48400	0.52700	0.57000	0.61300	0.65600
1.00000	1.00000	1.00000	1.00000	1.00000

Dpth	L	Wait	Strk	Pmx%	Eff.	Stff	CoR
7.25	0.00	0.00	0.000	0.0	0.000	0.000	0.000
14.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
14.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
17.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
19.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
19.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
22.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
24.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
24.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
32.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
39.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000

39.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
47.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
54.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
54.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
59.50	0.00	0.00	0.000	0.0	0.000	0.000	0.000
64.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
64.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
72.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
79.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
79.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
86.33	0.00	0.00	0.000	0.0	0.000	0.000	0.000
93.18	0.00	0.00	0.000	0.0	0.000	0.000	0.000
0.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000

GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
Version 2010
English Units

CCG3A : 04/13/2022 : KCA

Hammer Model: D 19-42 Made by: DELMAG

No.	Weight kips	Stiffn k/inch	CoR	C-Slk ft	Dampg k/ft/s
1	0.800				
2	0.800	140046.6	1.000	0.0000	
3	0.800	140046.6	1.000	0.0000	
4	0.800	140046.6	1.000	0.0000	
5	0.800	140046.6	1.000	0.0000	
Imp Block	0.753	70735.6	0.900	0.0100	
Helmet	2.500	5066.8	0.800	0.0100	5.8
Combined Pile Top		13884.8			

HAMMER OPTIONS:

Hammer File ID No.	41	Hammer Type	OE Diesel
Stroke Option	FxdP-VarS	Stroke Convergence Crit.	0.010
Fuel Pump Setting	Maximum		

HAMMER DATA:

Ram Weight	(kips)	4.00	Ram Length	(inch)	129.10
Maximum Stroke	(ft)	11.86			
Rated Stroke	(ft)	10.81	Efficiency		0.800
Maximum Pressure	(psi)	1600.00	Actual Pressure	(psi)	1600.00
Compression Exponent		1.350	Expansion Exponent		1.250
Ram Diameter	(inch)	12.60			
Combustion Delay	(s)	0.00200	Ignition Duration	(s)	0.00200

The Hammer Data Includes Estimated (NON-MEASURED) Quantities

HAMMER CUSHION			PILE CUSHION		
Cross Sect. Area	(in2)	19.12	Cross Sect. Area	(in2)	0.00
Elastic-Modulus	(ksi)	530.0	Elastic-Modulus	(ksi)	0.0
Thickness	(inch)	2.00	Thickness	(inch)	0.00
Coeff of Restitution		0.8	Coeff of Restitution		1.0
RoundOut	(ft)	0.0	RoundOut	(ft)	0.0
Stiffness	(kips/in)	5066.8	Stiffness	(kips/in)	0.0

```
 Depth                 (ft)       7.2  Standard Soil Setup
 Shaft Gain/Loss Factor         0.484  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                       Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi   lb/ft3       ft              ft/s    k/ft/s
      0.0    19.12   29000.    492.0      4.2        0    16524.     33.6
     93.2    19.12   29000.    492.0      4.2        0    16524.     33.6

 Wave Travel Time 2L/c (ms)    11.278

        Pile and Soil Model           Total Capacity Rut  (kips)       0.0
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.217    13885 0.010 0.000 0.85     0.0   0.000 0.100   3.33   4.2    19.1
  2  0.217    13885 0.000 0.000 1.00     0.0   0.000 0.100   6.66   4.2    19.1
 26  0.217    13885 0.000 0.000 1.00     0.0   0.100 0.100  86.52   4.2    19.1
 28  0.217    13885 0.000 0.000 1.00     0.0   0.100 0.100  93.18   4.2    19.1
Toe                                      0.0   0.150 0.160

     6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
     6.087 kips total reduced pile weight   (g= 32.17 ft/s2)

 PILE, SOIL, ANALYSIS OPTIONS:
 Uniform pile                          Pile Segments: Automatic
 No. of Slacks/Splices             0  Pile Damping           (%)          1
                                      Pile Damping Fact.(k/ft/s)     0.671
 Driveability Analysis
 Soil Damping Option           Smith
 Max No Analysis Iterations        0  Time Increment/Critical           160
 Output Time Interval              1  Analysis Time-Input   (ms)          0
 Output Level: Normal
 Gravity Mass, Pile, Hammer:   32.170    32.170    32.170
 Output Segment Generation: Automatic

    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
     7.25     10.81      1.00     0.800


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     9.3     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     9.3     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     9.3     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     9.3     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)     9.3     0.0
 Hammer+Pile Weight > Rult: Pile Runs
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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 14.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 124.7

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	79.87	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	0.9	0.100	0.100	93.18	4.2	19.1
Toe						123.9	0.150	0.160			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
14.48	10.81	1.00	0.800

♀
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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
124.7	13.8	6.71	6.72	-0.90	16	44	18.14	20	7	18.7	45.5
124.8	13.8	6.71	6.72	-0.91	16	44	18.14	20	7	18.7	45.5
124.8	13.8	6.71	6.72	-0.91	16	44	18.14	20	7	18.7	45.5
124.8	13.8	6.71	6.72	-0.91	16	44	18.14	20	7	18.7	45.5
124.8	13.8	6.71	6.72	-0.91	16	44	18.14	20	7	18.7	45.5

♀
CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 14.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c

ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model — Total Capacity Rut (kips) 41.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	79.87	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	1.0	0.100	0.100	93.18	4.2	19.1
Toe						40.3	0.150	0.190			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
14.52	10.81	1.00	0.800

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
41.3	3.5	5.41	5.46	-1.46	6	14	14.34	7	5	21.9	50.9
41.3	3.5	5.41	5.45	-1.44	6	14	14.34	8	5	21.9	50.9
41.3	3.5	5.40	5.45	-1.45	6	14	14.34	7	5	21.9	50.9
41.3	3.5	5.41	5.45	-1.45	6	14	14.34	7	5	21.9	50.9
41.3	3.5	5.41	5.45	-1.44	6	14	14.34	8	5	21.9	50.9

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 17.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model — Total Capacity Rut (kips) 44.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	76.54	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	4.6	0.100	0.100	93.18	4.2	19.1
Toe						40.3	0.150	0.190			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
17.00	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
44.9	3.8	5.47	5.52	-1.24	6	14	14.56	4	4	21.6	50.6
45.1	3.8	5.48	5.52	-1.22	3	14	14.56	2	4	21.6	50.5
45.3	3.8	5.48	5.52	-1.21	3	14	14.59	2	4	21.6	50.5
45.5	3.9	5.48	5.53	-1.20	3	14	14.58	2	4	21.5	50.5
45.7	3.9	5.49	5.53	-1.19	3	14	14.61	2	4	21.5	50.5

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 19.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model — Total Capacity Rut (kips) 48.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	76.54	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	3.3	0.100	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	5.3	0.100	0.100	93.18	4.2	19.1
Toe						40.3	0.150	0.190			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
19.48	10.81	1.00	0.800

♀

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
48.9	4.2	5.54	5.59	-1.04	3	14	14.80	6	5	21.3	50.2
49.3	4.2	5.55	5.59	-1.03	3	14	14.86	5	5	21.3	50.2
49.8	4.3	5.56	5.60	-1.02	3	14	14.89	6	5	21.3	50.2
50.2	4.3	5.57	5.61	-1.00	3	14	14.92	7	5	21.2	50.1
50.7	4.3	5.58	5.62	-0.99	3	14	14.95	8	5	21.2	50.1

♀

Depth (ft) 19.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 97.6

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	76.54	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	3.4	0.100	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	5.4	0.100	0.100	93.18	4.2	19.1
Toe						88.9	0.150	0.180			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
19.52	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
97.6	10.0	6.33	6.35	-0.14	27	50	17.17	20	8	19.1	46.8
98.0	10.0	6.34	6.36	-0.20	27	50	17.17	20	7	19.1	46.8
98.5	10.1	6.35	6.37	-0.25	27	50	17.20	20	8	19.1	46.8
98.9	10.1	6.35	6.37	-0.30	27	50	17.24	20	8	19.1	46.7
99.4	10.2	6.36	6.38	-0.36	27	50	17.23	20	7	19.1	46.7

♀
CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 22.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 111.2

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	73.21	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	2.1	0.100	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	5.1	0.100	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	10.8	0.060	0.100	93.18	4.2	19.1
Toe						93.2	0.150	0.180			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
22.00	10.81	1.00	0.800

♀

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
111.2	11.5	6.49	6.50	-1.12	24	49	17.64	20	8	18.9	46.2
111.6	11.5	6.49	6.51	-1.14	24	49	17.63	20	7	18.9	46.2
112.1	11.6	6.50	6.51	-1.16	24	49	17.67	20	8	18.9	46.2
112.5	11.6	6.50	6.52	-1.18	24	49	17.70	20	8	18.9	46.2
112.9	11.7	6.51	6.52	-1.20	24	49	17.69	20	8	18.9	46.2

♀

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 24.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 125.7

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	69.89	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	0.9	0.100	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	4.9	0.100	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	8.9	0.072	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	13.5	0.050	0.100	93.18	4.2	19.1
Toe						97.5	0.150	0.180			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy

Depth ft	Stroke ft	Pressure Ratio	Efficy
24.48	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
125.7	13.1	6.65	6.66	-1.60	25	46	18.10	20	8	18.8	45.7
126.1	13.2	6.65	6.66	-1.63	25	46	18.10	20	8	18.8	45.7
126.6	13.2	6.66	6.67	-1.65	25	46	18.10	20	7	18.7	45.6
127.0	13.3	6.66	6.67	-1.67	25	46	18.14	21	8	18.8	45.6
127.5	13.3	6.67	6.68	-1.69	25	46	18.14	21	8	18.7	45.6

♀

Depth (ft) 24.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 67.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	69.89	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	1.0	0.100	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	4.9	0.100	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	8.9	0.071	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	13.5	0.051	0.100	93.18	4.2	19.1
Toe						39.5	0.150	0.160			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
24.52	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
67.9	5.7	5.83	5.87	-0.79	3	14	15.98	19	7	20.3	48.9
68.3	5.8	5.84	5.87	-0.79	3	14	16.05	19	7	20.3	48.9
68.8	5.8	5.84	5.88	-0.77	3	14	16.04	19	7	20.3	48.9
69.2	5.8	5.85	5.88	-0.75	3	14	16.07	19	7	20.3	48.8
69.7	5.9	5.85	5.89	-0.74	3	14	16.12	19	7	20.3	48.8

♀

Depth (ft) 32.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 91.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	63.23	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	2.1	0.100	0.100	76.54	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	5.1	0.100	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.8	0.060	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	13.0	0.080	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	93.18	4.2	19.1
Toe						39.5	0.150	0.160			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
32.00	10.81	1.00	0.800

♀
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Rut kips	Bl Ct b/ft	Stroke (ft) down	Stroke (ft) up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
91.8	8.6	6.24	6.26	0.00	1	0	17.56	21	8	19.2	47.2
93.6	8.8	6.26	6.28	-0.01	5	46	17.63	21	8	19.1	47.1
95.3	9.0	6.28	6.30	-0.13	5	46	17.71	21	8	19.1	47.0
97.1	9.2	6.30	6.33	-0.23	6	46	17.78	21	8	19.0	46.9
98.8	9.4	6.33	6.35	-0.33	6	46	17.88	21	8	19.0	46.9

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 39.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model					Total Capacity Rut (kips)			115.9		
No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	56.57	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	3.3	0.100	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	5.3	0.100	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	12.7	0.050	0.100	76.54	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	12.3	0.106	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	83.20	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	10.8	0.150	0.100	93.18	4.2	19.1
Toe						39.5	0.150	0.160			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
39.48	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
115.9	11.9	6.60	6.61	-1.42	15	44	19.29	21	8	18.6	45.9
119.0	12.3	6.64	6.65	-1.65	16	44	19.41	21	8	18.5	45.7
122.0	12.8	6.68	6.69	-1.84	16	44	19.55	21	8	18.5	45.6
125.1	13.2	6.71	6.72	-2.02	16	44	19.73	21	8	18.5	45.5
128.2	13.7	6.75	6.76	-2.15	16	43	19.83	21	8	18.4	45.4

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 39.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model					Total Capacity Rut (kips)			101.1		
No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	56.57	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	3.4	0.100	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	5.4	0.099	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	12.7	0.050	0.100	76.54	4.2	19.1

24	0.217	13885	0.000	0.000	1.00	12.3	0.107	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	83.20	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	10.8	0.150	0.100	93.18	4.2	19.1
Toe						24.6	0.150	0.170			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth	Stroke	Pressure	Efficy
ft	ft	Ratio	
39.52	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut	Bl Ct	Stroke (ft)		Ten Str	i	t	Comp Str	i	t	ENTHRU	Bl Rt
kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
101.1	9.8	6.40	6.42	-0.72	7	46	18.73	21	8	18.8	46.6
104.2	10.2	6.44	6.46	-0.89	7	46	18.90	21	8	18.8	46.5
107.3	10.6	6.48	6.50	-0.99	8	45	19.04	21	8	18.7	46.3
110.3	11.1	6.53	6.54	-1.11	15	44	19.23	21	8	18.7	46.1
113.4	11.5	6.57	6.59	-1.40	15	44	19.40	21	8	18.6	46.0

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 47.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c
	ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 123.7

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area
	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
14	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	46.59	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	4.7	0.100	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	7.2	0.084	0.100	66.56	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	13.1	0.050	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	11.5	0.130	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	76.54	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	93.18	4.2	19.1
Toe						24.6	0.150	0.170			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
47.00	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
123.7	13.2	6.73	6.74	-2.41	15	44	19.97	19	7	18.4	45.4
128.0	13.7	6.85	6.78	-2.54	15	43	20.29	19	7	18.5	45.2
132.3	14.4	6.90	6.83	-2.61	19	42	20.46	19	7	18.4	45.0
136.6	15.1	6.95	6.89	-2.74	19	42	20.60	19	7	18.3	44.8
140.9	15.8	6.99	6.93	-2.77	19	42	20.79	19	7	18.2	44.7

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 54.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 146.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
12	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	39.93	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	1.0	0.100	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	4.9	0.100	0.100	56.57	4.2	19.1
18	0.217	13885	0.000	0.000	1.00	9.0	0.071	0.100	59.90	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	13.5	0.051	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	66.56	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	76.54	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	10.4	0.150	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	83.20	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	93.18	4.2	19.1
Toe						24.6	0.150	0.170			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
54.48	10.81	1.00	0.800

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Rut Bl Ct Stroke (ft) Ten Str i t Comp Str i t ENTHRU Bl Rt

kips	b/ft	down	up	ksi			ksi			kip-ft	b/min
146.3	16.8	7.07	7.02	-2.53	16	41	20.77	17	7	18.0	44.4
151.8	17.4	7.12	7.08	-2.32	16	40	20.93	17	7	17.9	44.3
157.4	18.0	7.16	7.13	-2.12	17	40	21.12	17	7	17.8	44.1
162.9	18.7	7.19	7.17	-1.90	17	39	21.25	17	7	17.6	44.0
168.5	19.3	7.23	7.20	-1.65	17	39	21.41	17	7	17.6	43.9

♀

Depth (ft) 54.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model — Total Capacity Rut (kips) 170.1

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
12	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	39.93	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	1.1	0.100	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	4.9	0.100	0.100	56.57	4.2	19.1
18	0.217	13885	0.000	0.000	1.00	9.1	0.070	0.100	59.90	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	13.5	0.053	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	66.56	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	76.54	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	10.4	0.150	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	83.20	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	93.18	4.2	19.1
Toe						48.2	0.150	0.150			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
54.52	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
170.1	19.8	7.23	7.21	-1.78	17	39	21.14	17	7	17.7	43.9
175.7	20.5	7.26	7.24	-1.59	17	39	21.27	17	7	17.6	43.8
181.2	21.2	7.30	7.28	-1.73	17	34	21.43	17	7	17.6	43.7
186.8	22.0	7.33	7.31	-2.01	17	34	21.59	17	7	17.6	43.6
192.3	22.8	7.36	7.34	-2.23	17	34	21.72	17	7	17.6	43.5

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 59.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 182.6

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
11	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	36.61	4.2	19.1
15	0.217	13885	0.000	0.000	1.00	3.4	0.100	0.100	49.92	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	5.5	0.099	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	12.7	0.050	0.100	56.57	4.2	19.1
18	0.217	13885	0.000	0.000	1.00	12.3	0.107	0.100	59.90	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	63.23	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	10.8	0.150	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	76.54	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	9.2	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	93.18	4.2	19.1
Toe						48.2	0.150	0.150			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
59.50	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
182.6	21.6	7.32	7.30	-1.63	15	34	21.39	16	7	17.4	43.7
188.8	22.5	7.35	7.34	-1.87	15	34	21.55	16	7	17.4	43.6
195.1	23.4	7.40	7.38	-2.06	15	34	21.70	16	7	17.4	43.4
201.3	24.3	7.45	7.42	-2.17	15	33	21.85	16	7	17.4	43.3
207.5	25.3	7.49	7.47	-2.14	15	33	22.04	16	7	17.5	43.2

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 64.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe

Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model — Total Capacity Rut (kips) 195.1

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
9	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	29.95	4.2	19.1
13	0.217	13885	0.000	0.000	1.00	1.0	0.100	0.100	43.26	4.2	19.1
14	0.217	13885	0.000	0.000	1.00	4.9	0.100	0.100	46.59	4.2	19.1
15	0.217	13885	0.000	0.000	1.00	9.0	0.071	0.100	49.92	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	13.5	0.052	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	56.57	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	66.56	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	10.4	0.150	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	73.21	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	93.18	4.2	19.1
Toe						48.2	0.150	0.150			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
64.48	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	Stroke (ft) up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
195.1	23.6	7.42	7.40	-1.74	14	34	21.57	15	6	17.2	43.4
202.0	24.6	7.46	7.45	-1.80	14	34	21.76	14	6	17.3	43.2
208.9	25.7	7.52	7.50	-1.65	14	33	21.94	14	6	17.3	43.1
215.8	26.9	7.58	7.56	-1.43	14	33	22.13	14	6	17.4	42.9
222.8	28.2	7.63	7.62	-1.20	14	33	22.27	15	6	17.4	42.7

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 64.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6

93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model — Total Capacity Rut (kips) 178.5

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
9	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	29.95	4.2	19.1
13	0.217	13885	0.000	0.000	1.00	1.1	0.100	0.100	43.26	4.2	19.1
14	0.217	13885	0.000	0.000	1.00	4.9	0.100	0.100	46.59	4.2	19.1
15	0.217	13885	0.000	0.000	1.00	9.1	0.070	0.100	49.92	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	13.5	0.053	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	56.57	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	66.56	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	10.4	0.150	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	73.21	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	86.52	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	8.4	0.150	0.100	93.18	4.2	19.1
Toe						31.6	0.150	0.170			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
64.52	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
178.5	21.1	7.32	7.30	-1.31	14	34	21.36	14	6	17.1	43.7
185.5	22.0	7.36	7.35	-1.54	14	34	21.51	14	6	17.1	43.5
192.4	23.0	7.41	7.39	-1.72	14	34	21.71	14	6	17.1	43.4
199.3	24.0	7.46	7.44	-1.79	14	34	21.89	14	6	17.2	43.3
206.2	25.0	7.52	7.50	-1.64	14	34	22.07	14	6	17.2	43.1

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 72.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model — Total Capacity Rut (kips) 204.2

No.	Weight	Stiffn	C-Slk	T-Slk	CoR	Soil-S	Soil-D	Quake	LbTop	Perim	Area

	kips	k/in	ft	ft		kips	s/ft	inch	ft	ft	in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
7	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	23.30	4.2	19.1
11	0.217	13885	0.000	0.000	1.00	2.2	0.100	0.100	36.61	4.2	19.1
12	0.217	13885	0.000	0.000	1.00	5.1	0.100	0.100	39.93	4.2	19.1
13	0.217	13885	0.000	0.000	1.00	10.9	0.059	0.100	43.26	4.2	19.1
14	0.217	13885	0.000	0.000	1.00	12.9	0.082	0.100	46.59	4.2	19.1
15	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	49.92	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	56.57	4.2	19.1
18	0.217	13885	0.000	0.000	1.00	10.8	0.150	0.100	59.90	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	10.2	0.150	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	66.56	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	9.6	0.150	0.100	76.54	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	79.87	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	9.1	0.150	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	93.18	4.2	19.1
Toe						31.6	0.150	0.170			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
72.00	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
204.2	25.3	7.54	7.53	-1.08	12	34	21.89	12	6	17.0	43.0
212.5	26.7	7.61	7.59	-0.89	11	34	22.08	12	6	17.0	42.8
220.9	28.2	7.67	7.66	-0.73	5	28	22.25	12	6	17.0	42.6
229.2	29.8	7.74	7.72	-0.96	5	28	22.47	12	6	17.2	42.5
237.5	31.4	7.79	7.78	-1.31	11	26	22.66	12	6	17.2	42.3

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 79.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 230.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
5	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	16.64	4.2	19.1

9	0.217	13885	0.000	0.000	1.00	3.4	0.100	0.100	29.95	4.2	19.1
10	0.217	13885	0.000	0.000	1.00	5.5	0.098	0.100	33.28	4.2	19.1
11	0.217	13885	0.000	0.000	1.00	12.7	0.050	0.100	36.61	4.2	19.1
12	0.217	13885	0.000	0.000	1.00	12.2	0.108	0.100	39.93	4.2	19.1
13	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	43.26	4.2	19.1
15	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	49.92	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	10.8	0.150	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	56.57	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	66.56	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	9.2	0.150	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	73.21	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	9.9	0.150	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	83.20	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	11.5	0.150	0.100	93.18	4.2	19.1
Toe						31.6	0.150	0.170			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
79.48	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
230.0	30.7	7.78	7.77	-0.86	5	28	22.36	10	5	16.9	42.3
239.7	32.7	7.85	7.83	-1.06	9	27	22.60	10	5	17.0	42.2
249.5	34.9	7.91	7.90	-1.45	9	27	22.78	10	5	17.1	42.0
259.2	37.4	7.98	7.97	-1.78	9	26	22.97	10	5	17.2	41.8
269.0	39.9	8.04	8.03	-2.09	9	26	23.16	10	5	17.3	41.7

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 79.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 231.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
5	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	16.64	4.2	19.1
9	0.217	13885	0.000	0.000	1.00	3.5	0.100	0.100	29.95	4.2	19.1
10	0.217	13885	0.000	0.000	1.00	5.6	0.098	0.100	33.28	4.2	19.1
11	0.217	13885	0.000	0.000	1.00	12.7	0.050	0.100	36.61	4.2	19.1

12	0.217	13885	0.000	0.000	1.00	12.2	0.109	0.100	39.93	4.2	19.1
13	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	43.26	4.2	19.1
15	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	49.92	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	10.8	0.150	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	56.57	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	66.56	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	9.2	0.150	0.100	69.89	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	73.21	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	9.9	0.150	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	83.20	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	11.5	0.150	0.100	93.18	4.2	19.1
Toe						32.5	0.150	0.160			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
79.52	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
231.0	30.8	7.79	7.77	-0.90	5	28	22.41	10	5	17.0	42.3
240.8	33.0	7.85	7.84	-1.11	9	27	22.59	10	5	17.0	42.1
250.5	35.3	7.92	7.92	-1.47	9	27	22.76	10	5	17.1	42.0
260.3	37.7	7.98	7.98	-1.82	9	26	22.96	10	5	17.2	41.8
270.0	40.3	8.04	8.04	-2.12	9	26	23.15	10	5	17.2	41.6

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 86.3 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 249.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.000	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.000	0.100	6.66	4.2	19.1
3	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	9.98	4.2	19.1
7	0.217	13885	0.000	0.000	1.00	3.7	0.100	0.100	23.30	4.2	19.1
8	0.217	13885	0.000	0.000	1.00	5.9	0.095	0.100	26.62	4.2	19.1
9	0.217	13885	0.000	0.000	1.00	12.8	0.050	0.100	29.95	4.2	19.1
10	0.217	13885	0.000	0.000	1.00	12.1	0.113	0.100	33.28	4.2	19.1
11	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	36.61	4.2	19.1
13	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	43.26	4.2	19.1

14	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	46.59	4.2	19.1
15	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	49.92	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	56.57	4.2	19.1
18	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	59.90	4.2	19.1
19	0.217	13885	0.000	0.000	1.00	9.1	0.150	0.100	63.23	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	66.56	4.2	19.1
22	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	73.21	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	76.54	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	11.5	0.150	0.100	83.20	4.2	19.1
26	0.217	13885	0.000	0.000	1.00	11.4	0.153	0.100	86.52	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	9.2	0.200	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	9.2	0.200	0.100	93.18	4.2	19.1
Toe						32.5	0.150	0.160			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
86.33	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
249.9	36.2	7.97	7.96	-0.91	8	27	22.73	8	5	16.8	41.8
261.3	38.9	8.04	8.03	-1.18	8	26	22.96	8	5	16.9	41.7
272.7	42.5	8.04	8.11	-1.51	7	25	23.04	8	5	16.9	41.6
284.2	46.0	8.12	8.17	-1.78	7	25	23.25	8	5	17.0	41.4
295.6	49.8	8.20	8.24	-1.93	7	25	23.47	8	5	17.1	41.2

♀

Depth (ft) 93.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.484 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
93.2	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 11.278

Pile and Soil Model Total Capacity Rut (kips) 268.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.217	13885	0.010	0.000	0.85	0.0	0.100	0.100	3.33	4.2	19.1
2	0.217	13885	0.000	0.000	1.00	0.0	0.100	0.100	6.66	4.2	19.1
5	0.217	13885	0.000	0.000	1.00	4.0	0.100	0.100	16.64	4.2	19.1
6	0.217	13885	0.000	0.000	1.00	6.3	0.091	0.100	19.97	4.2	19.1
7	0.217	13885	0.000	0.000	1.00	12.9	0.050	0.100	23.30	4.2	19.1
8	0.217	13885	0.000	0.000	1.00	11.9	0.119	0.100	26.62	4.2	19.1
9	0.217	13885	0.000	0.000	1.00	10.6	0.150	0.100	29.95	4.2	19.1
11	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	36.61	4.2	19.1
12	0.217	13885	0.000	0.000	1.00	10.7	0.150	0.100	39.93	4.2	19.1
13	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	43.26	4.2	19.1

15	0.217	13885	0.000	0.000	1.00	10.0	0.150	0.100	49.92	4.2	19.1
16	0.217	13885	0.000	0.000	1.00	10.1	0.150	0.100	53.25	4.2	19.1
17	0.217	13885	0.000	0.000	1.00	9.0	0.150	0.100	56.57	4.2	19.1
18	0.217	13885	0.000	0.000	1.00	8.3	0.150	0.100	59.90	4.2	19.1
20	0.217	13885	0.000	0.000	1.00	10.2	0.150	0.100	66.56	4.2	19.1
21	0.217	13885	0.000	0.000	1.00	11.4	0.150	0.100	69.89	4.2	19.1
23	0.217	13885	0.000	0.000	1.00	11.5	0.150	0.100	76.54	4.2	19.1
24	0.217	13885	0.000	0.000	1.00	11.3	0.156	0.100	79.87	4.2	19.1
25	0.217	13885	0.000	0.000	1.00	9.2	0.200	0.100	83.20	4.2	19.1
27	0.217	13885	0.000	0.000	1.00	9.2	0.200	0.100	89.85	4.2	19.1
28	0.217	13885	0.000	0.000	1.00	9.2	0.200	0.100	93.18	4.2	19.1
Toe						32.5	0.150	0.160			

6.087 kips total unreduced pile weight (g= 32.17 ft/s2)
6.087 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
93.18	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
268.9	42.3	8.06	8.12	-0.82	5	26	23.01	6	5	16.6	41.5
282.0	46.5	8.15	8.20	-1.07	5	25	23.22	6	5	16.6	41.3
295.1	51.2	8.24	8.27	-1.22	5	25	23.45	6	5	16.8	41.1
308.2	56.5	8.32	8.34	-1.30	5	25	23.67	6	5	16.9	40.9
321.3	62.6	8.40	8.40	-1.32	5	25	23.89	6	5	17.0	40.8

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.484 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.2	0.0	0.0	0.0	0.0	0.000	0.000	10.81	0.0
14.5	124.7	0.9	123.9	13.8	18.140	-0.904	6.71	18.7
14.5	41.3	1.0	40.3	3.5	14.343	-1.457	5.41	21.9
17.0	44.9	4.6	40.3	3.8	14.561	-1.238	5.47	21.6
19.5	48.9	8.6	40.3	4.2	14.799	-1.037	5.54	21.3
19.5	97.6	8.7	88.9	10.0	17.175	-0.142	6.33	19.1
22.0	111.2	18.0	93.2	11.5	17.641	-1.122	6.49	18.9
24.5	125.7	28.3	97.5	13.1	18.105	-1.605	6.65	18.8
24.5	67.9	28.4	39.5	5.7	15.975	-0.790	5.83	20.3
32.0	91.8	52.3	39.5	8.6	17.563	0.000	6.24	19.2
39.5	115.9	76.4	39.5	11.9	19.291	-1.422	6.60	18.6
39.5	101.1	76.5	24.6	9.8	18.726	-0.721	6.40	18.8
47.0	123.7	99.1	24.6	13.2	19.972	-2.410	6.73	18.4
54.5	146.3	121.7	24.6	16.8	20.774	-2.534	7.07	18.0
54.5	170.1	121.8	48.2	19.8	21.143	-1.781	7.23	17.7
59.5	182.6	134.3	48.2	21.6	21.387	-1.625	7.32	17.4
64.5	195.1	146.8	48.2	23.6	21.565	-1.745	7.42	17.2
64.5	178.5	146.9	31.6	21.1	21.362	-1.313	7.32	17.1
72.0	204.2	172.6	31.6	25.3	21.890	-1.082	7.54	17.0
79.5	230.0	198.4	31.6	30.7	22.362	-0.855	7.78	16.9
79.5	231.0	198.5	32.5	30.8	22.409	-0.901	7.79	17.0
86.3	249.9	217.4	32.5	36.2	22.728	-0.909	7.97	16.8
93.2	268.9	236.4	32.5	42.3	23.014	-0.817	8.06	16.6

Total Driving Time 36 minutes; Total No. of Blows 1554
Starting at penetration 7.2 ft

G/L at Shaft and Toe: 0.527 1.000

Depth	Rut	Frictn	End Bg	Bl Ct	Com Str	Ten Str	Stroke	ENTHRU
ft	kips	kips	kips	bl/ft	ksi	ksi	ft	kip-ft
7.2	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.5	124.8	0.9	123.9	13.8	18.140	-0.906	6.71	18.7
14.5	41.3	1.0	40.3	3.5	14.336	-1.445	5.41	21.9
17.0	45.1	4.8	40.3	3.8	14.558	-1.223	5.48	21.6
19.5	49.3	9.1	40.3	4.2	14.858	-1.034	5.55	21.3
19.5	98.0	9.2	88.9	10.0	17.171	-0.202	6.34	19.1
22.0	111.6	18.4	93.2	11.5	17.633	-1.144	6.49	18.9
24.5	126.1	28.7	97.5	13.2	18.104	-1.628	6.65	18.8
24.5	68.3	28.9	39.5	5.8	16.049	-0.791	5.84	20.3
32.0	93.6	54.1	39.5	8.8	17.629	-0.015	6.26	19.1
39.5	119.0	79.5	39.5	12.3	19.410	-1.647	6.64	18.5
39.5	104.2	79.6	24.6	10.2	18.899	-0.892	6.44	18.8
47.0	128.0	103.4	24.6	13.7	20.287	-2.539	6.85	18.5
54.5	151.8	127.3	24.6	17.4	20.931	-2.323	7.12	17.9
54.5	175.7	127.4	48.2	20.5	21.266	-1.585	7.26	17.6
59.5	188.8	140.6	48.2	22.5	21.548	-1.871	7.35	17.4
64.5	202.0	153.7	48.2	24.6	21.761	-1.801	7.46	17.3
64.5	185.5	153.9	31.6	22.0	21.513	-1.542	7.36	17.1
72.0	212.5	181.0	31.6	26.7	22.078	-0.892	7.61	17.0
79.5	239.7	208.2	31.6	32.7	22.596	-1.057	7.85	17.0
79.5	240.8	208.3	32.5	33.0	22.590	-1.108	7.85	17.0
86.3	261.3	228.8	32.5	38.9	22.957	-1.184	8.04	16.9
93.2	282.0	249.5	32.5	46.5	23.217	-1.070	8.15	16.6

Total Driving Time 38 minutes; Total No. of Blows 1635
Starting at penetration 7.2 ft

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.570 1.000

Depth	Rut	Frictn	End Bg	Bl Ct	Com Str	Ten Str	Stroke	ENTHRU
ft	kips	kips	kips	bl/ft	ksi	ksi	ft	kip-ft
7.2	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.5	124.8	0.9	123.9	13.8	18.141	-0.906	6.71	18.7
14.5	41.3	1.0	40.3	3.5	14.342	-1.452	5.40	21.9
17.0	45.3	5.0	40.3	3.8	14.587	-1.214	5.48	21.6
19.5	49.8	9.5	40.3	4.3	14.891	-1.016	5.56	21.3
19.5	98.5	9.6	88.9	10.1	17.200	-0.251	6.35	19.1
22.0	112.1	18.9	93.2	11.6	17.671	-1.163	6.50	18.9
24.5	126.6	29.1	97.5	13.2	18.101	-1.649	6.66	18.7
24.5	68.8	29.3	39.5	5.8	16.042	-0.768	5.84	20.3
32.0	95.3	55.8	39.5	9.0	17.706	-0.132	6.28	19.1
39.5	122.0	82.6	39.5	12.8	19.554	-1.842	6.68	18.5
39.5	107.3	82.7	24.6	10.6	19.039	-0.990	6.48	18.7
47.0	132.3	107.7	24.6	14.4	20.463	-2.613	6.90	18.4
54.5	157.4	132.8	24.6	18.0	21.117	-2.122	7.16	17.8
54.5	181.2	133.0	48.2	21.2	21.429	-1.729	7.30	17.6
59.5	195.1	146.8	48.2	23.4	21.700	-2.062	7.40	17.4
64.5	208.9	160.7	48.2	25.7	21.943	-1.652	7.52	17.3
64.5	192.4	160.8	31.6	23.0	21.711	-1.721	7.41	17.1
72.0	220.9	189.3	31.6	28.2	22.246	-0.731	7.67	17.0
79.5	249.5	217.9	31.6	34.9	22.782	-1.446	7.91	17.1
79.5	250.5	218.0	32.5	35.3	22.765	-1.472	7.92	17.1

86.3	272.7	240.3	32.5	42.5	23.038	-1.509	8.04	16.9
93.2	295.1	262.6	32.5	51.2	23.447	-1.222	8.24	16.8

Total Driving Time 40 minutes; Total No. of Blows 1729
Starting at penetration 7.2 ft

G/L at Shaft and Toe: 0.613 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.2	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.5	124.8	0.9	123.9	13.8	18.139	-0.905	6.71	18.7
14.5	41.3	1.0	40.3	3.5	14.342	-1.451	5.41	21.9
17.0	45.5	5.2	40.3	3.9	14.583	-1.200	5.48	21.5
19.5	50.2	9.9	40.3	4.3	14.921	-1.003	5.57	21.2
19.5	98.9	10.0	88.9	10.1	17.236	-0.300	6.35	19.1
22.0	112.5	19.3	93.2	11.6	17.702	-1.181	6.50	18.9
24.5	127.0	29.6	97.5	13.3	18.141	-1.672	6.66	18.8
24.5	69.2	29.7	39.5	5.8	16.074	-0.754	5.85	20.3
32.0	97.1	57.6	39.5	9.2	17.783	-0.228	6.30	19.0
39.5	125.1	85.6	39.5	13.2	19.728	-2.020	6.71	18.5
39.5	110.3	85.8	24.6	11.1	19.233	-1.111	6.53	18.7
47.0	136.6	112.0	24.6	15.1	20.600	-2.737	6.95	18.3
54.5	162.9	138.4	24.6	18.7	21.253	-1.901	7.19	17.6
54.5	186.8	138.5	48.2	22.0	21.593	-2.009	7.33	17.6
59.5	201.3	153.1	48.2	24.3	21.851	-2.169	7.45	17.4
64.5	215.8	167.6	48.2	26.9	22.126	-1.433	7.58	17.4
64.5	199.3	167.7	31.6	24.0	21.885	-1.789	7.46	17.2
72.0	229.2	197.6	31.6	29.8	22.472	-0.959	7.74	17.2
79.5	259.2	227.7	31.6	37.4	22.965	-1.780	7.98	17.2
79.5	260.3	227.8	32.5	37.7	22.960	-1.825	7.98	17.2
86.3	284.2	251.7	32.5	46.0	23.250	-1.783	8.12	17.0
93.2	308.2	275.8	32.5	56.5	23.672	-1.295	8.32	16.9

Total Driving Time 43 minutes; Total No. of Blows 1826
Starting at penetration 7.2 ft

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.656 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.2	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
14.5	124.8	1.0	123.9	13.8	18.142	-0.905	6.71	18.7
14.5	41.3	1.1	40.3	3.5	14.337	-1.438	5.41	21.9
17.0	45.7	5.4	40.3	3.9	14.609	-1.192	5.49	21.5
19.5	50.7	10.4	40.3	4.3	14.948	-0.989	5.58	21.2
19.5	99.4	10.5	88.9	10.2	17.232	-0.362	6.36	19.1
22.0	112.9	19.8	93.2	11.7	17.690	-1.200	6.51	18.9
24.5	127.5	30.0	97.5	13.3	18.139	-1.692	6.67	18.7
24.5	69.7	30.2	39.5	5.9	16.117	-0.741	5.85	20.3
32.0	98.8	59.3	39.5	9.4	17.881	-0.326	6.33	19.0
39.5	128.2	88.7	39.5	13.7	19.831	-2.152	6.75	18.4
39.5	113.4	88.9	24.6	11.5	19.404	-1.401	6.57	18.6
47.0	140.9	116.4	24.6	15.8	20.787	-2.772	6.99	18.2
54.5	168.5	143.9	24.6	19.3	21.411	-1.649	7.23	17.6
54.5	192.3	144.1	48.2	22.8	21.719	-2.230	7.36	17.6
59.5	207.5	159.3	48.2	25.3	22.039	-2.140	7.49	17.5
64.5	222.8	174.5	48.2	28.2	22.268	-1.198	7.63	17.4
64.5	206.2	174.7	31.6	25.0	22.067	-1.636	7.52	17.2
72.0	237.5	206.0	31.6	31.4	22.658	-1.310	7.79	17.2

79.5	269.0	237.4	31.6	39.9	23.155	-2.088	8.04	17.3
79.5	270.0	237.6	32.5	40.3	23.148	-2.119	8.04	17.2
86.3	295.6	263.1	32.5	49.8	23.473	-1.935	8.20	17.1
93.2	321.3	288.9	32.5	62.6	23.890	-1.318	8.40	17.0

Total Driving Time 45 minutes; Total No. of Blows 1932
Starting at penetration 7.2 ft

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Table of Depths Analyzed with Driving System Modifiers

Depth ft	Temp. Length ft	Wait Time hr	Equivalent Stroke ft	Pressure Ratio	Efficy.	Stiffn. Factor	Cushion CoR
7.25	93.18	0.00	10.81	1.00	0.80	1.00	1.00
14.48	93.18	0.00	10.81	1.00	0.80	1.00	1.00
14.52	93.18	0.00	10.81	1.00	0.80	1.00	1.00
17.00	93.18	0.00	10.81	1.00	0.80	1.00	1.00
19.48	93.18	0.00	10.81	1.00	0.80	1.00	1.00
19.52	93.18	0.00	10.81	1.00	0.80	1.00	1.00
22.00	93.18	0.00	10.81	1.00	0.80	1.00	1.00
24.48	93.18	0.00	10.81	1.00	0.80	1.00	1.00
24.52	93.18	0.00	10.81	1.00	0.80	1.00	1.00
32.00	93.18	0.00	10.81	1.00	0.80	1.00	1.00
39.48	93.18	0.00	10.81	1.00	0.80	1.00	1.00
39.52	93.18	0.00	10.81	1.00	0.80	1.00	1.00
47.00	93.18	0.00	10.81	1.00	0.80	1.00	1.00
54.48	93.18	0.00	10.81	1.00	0.80	1.00	1.00
54.52	93.18	0.00	10.81	1.00	0.80	1.00	1.00
59.50	93.18	0.00	10.81	1.00	0.80	1.00	1.00
64.48	93.18	0.00	10.81	1.00	0.80	1.00	1.00
64.52	93.18	0.00	10.81	1.00	0.80	1.00	1.00
72.00	93.18	0.00	10.81	1.00	0.80	1.00	1.00
79.48	93.18	0.00	10.81	1.00	0.80	1.00	1.00
79.52	93.18	0.00	10.81	1.00	0.80	1.00	1.00
86.33	93.18	0.00	10.81	1.00	0.80	1.00	1.00
93.18	93.18	0.00	10.81	1.00	0.80	1.00	1.00

Soil Layer Resistance Values

Depth ft	Shaft Res. k/ft2	End Bearing kips	Shaft Quake inch	Toe Quake inch	Shaft Damping s/ft	Toe Damping s/ft	Soil Setup Normlzd	Limit Distance ft	Setup Time hrs
0.01	0.00	0.00	0.100	0.160	0.100	0.150	0.396	6.000	24.000
3.69	0.00	0.00	0.100	0.160	0.100	0.150	0.396	6.000	24.000
3.71	0.00	0.00	0.100	0.160	0.100	0.150	0.396	6.000	24.000
12.71	0.00	0.00	0.100	0.160	0.100	0.150	0.396	6.000	24.000
14.19	0.00	0.00	0.100	0.160	0.100	0.150	0.396	6.000	24.000
14.20	0.93	121.92	0.100	0.160	0.100	0.150	0.396	6.000	24.000
14.49	0.94	123.92	0.100	0.160	0.100	0.150	0.396	6.000	24.000
14.51	0.54	40.28	0.100	0.190	0.100	0.150	0.768	6.000	24.000
19.49	0.68	40.28	0.100	0.190	0.100	0.150	0.768	6.000	24.000
19.51	0.85	88.86	0.100	0.180	0.050	0.150	0.000	6.000	1.000
24.49	1.03	97.47	0.100	0.180	0.050	0.150	0.000	6.000	1.000
24.51	1.26	39.47	0.100	0.160	0.150	0.150	0.768	6.000	24.000
33.51	1.26	39.47	0.100	0.160	0.150	0.150	0.768	6.000	24.000
39.49	1.29	39.47	0.100	0.160	0.150	0.150	0.768	6.000	24.000
39.51	1.19	24.56	0.100	0.170	0.150	0.150	0.768	6.000	168.000
48.51	1.19	24.56	0.100	0.170	0.150	0.150	0.768	6.000	168.000
54.49	1.20	24.56	0.100	0.170	0.150	0.150	0.768	6.000	168.000

54.51	0.99	48.25	0.100	0.150	0.150	0.150	0.768	6.000	24.000
63.51	0.99	48.25	0.100	0.150	0.150	0.150	0.768	6.000	24.000
64.49	0.99	48.25	0.100	0.150	0.150	0.150	0.768	6.000	24.000
64.51	1.36	31.58	0.100	0.170	0.150	0.150	0.768	6.000	168.000
73.51	1.36	31.58	0.100	0.170	0.150	0.150	0.768	6.000	168.000
79.49	1.37	31.58	0.100	0.170	0.150	0.150	0.768	6.000	168.000
79.51	1.37	32.46	0.100	0.160	0.200	0.150	1.000	6.000	168.000
88.51	1.37	32.46	0.100	0.160	0.200	0.150	1.000	6.000	168.000
93.18	1.37	32.46	0.100	0.160	0.200	0.150	1.000	6.000	168.000

FORWARD ABUTMENT - B-170-3-20

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000

Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
7.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
15.7	196.9	8.3	188.6	23.8	22.727	-2.007	7.33	19.2
15.7	72.8	8.4	64.3	6.8	16.365	-0.734	6.03	19.7
17.2	76.1	11.7	64.3	7.1	16.538	-0.595	6.07	19.6
18.7	79.5	15.2	64.3	7.5	16.695	-0.461	6.12	19.5
18.7	136.7	15.3	121.4	15.0	18.482	-1.386	6.82	18.9
25.0	182.8	46.2	136.6	20.4	20.326	-2.873	7.14	18.9
31.2	227.1	83.8	143.3	26.6	20.746	-4.640	7.42	19.2
31.2	109.9	84.0	26.0	8.8	17.936	-0.994	6.30	19.2
32.2	112.7	86.8	26.0	9.1	18.105	-1.000	6.33	19.1
33.2	115.6	89.7	26.0	9.4	18.330	-1.188	6.37	19.1
33.2	113.5	89.8	23.7	9.2	18.316	-1.230	6.35	19.1
34.7	118.3	94.6	23.7	9.7	18.610	-1.442	6.40	19.0
36.2	123.1	99.5	23.7	10.3	18.902	-1.588	6.45	18.9
36.2	125.6	99.6	26.0	10.7	18.867	-1.869	6.47	18.9
40.3	144.3	118.3	26.0	12.8	19.874	-3.566	6.65	18.7
44.5	164.5	138.6	26.0	14.9	20.768	-4.028	6.89	18.7
44.5	149.2	138.7	10.5	12.6	20.296	-3.761	6.68	18.6
47.0	153.3	142.7	10.5	13.2	20.413	-4.157	6.73	18.5
49.5	157.3	146.8	10.5	13.8	20.430	-4.467	6.78	18.3
49.5	160.0	146.9	13.1	14.2	20.530	-4.292	6.81	18.4
52.0	165.0	151.8	13.1	14.7	20.777	-4.345	6.93	18.4
54.5	170.0	156.8	13.1	15.4	21.104	-4.374	6.97	18.2
54.5	197.3	156.9	40.3	19.2	21.571	-3.647	7.16	18.0
69.5	249.4	209.1	40.3	28.5	22.184	-4.034	7.57	18.1
84.5	306.7	266.4	40.3	46.0	23.212	-4.063	7.98	18.3
84.5	301.6	266.5	35.1	43.7	23.201	-4.022	7.95	18.3
101.1	349.6	314.5	35.1	66.7	23.751	-2.993	8.27	18.0
117.7	401.7	366.6	35.1	128.2	24.280	-1.509	8.52	17.3

Total Continuous Driving Time 98.00 minutes; Total Number of Blows 4115 (starting at penetration 7.8 ft)

National Engineering & Architectural Ser
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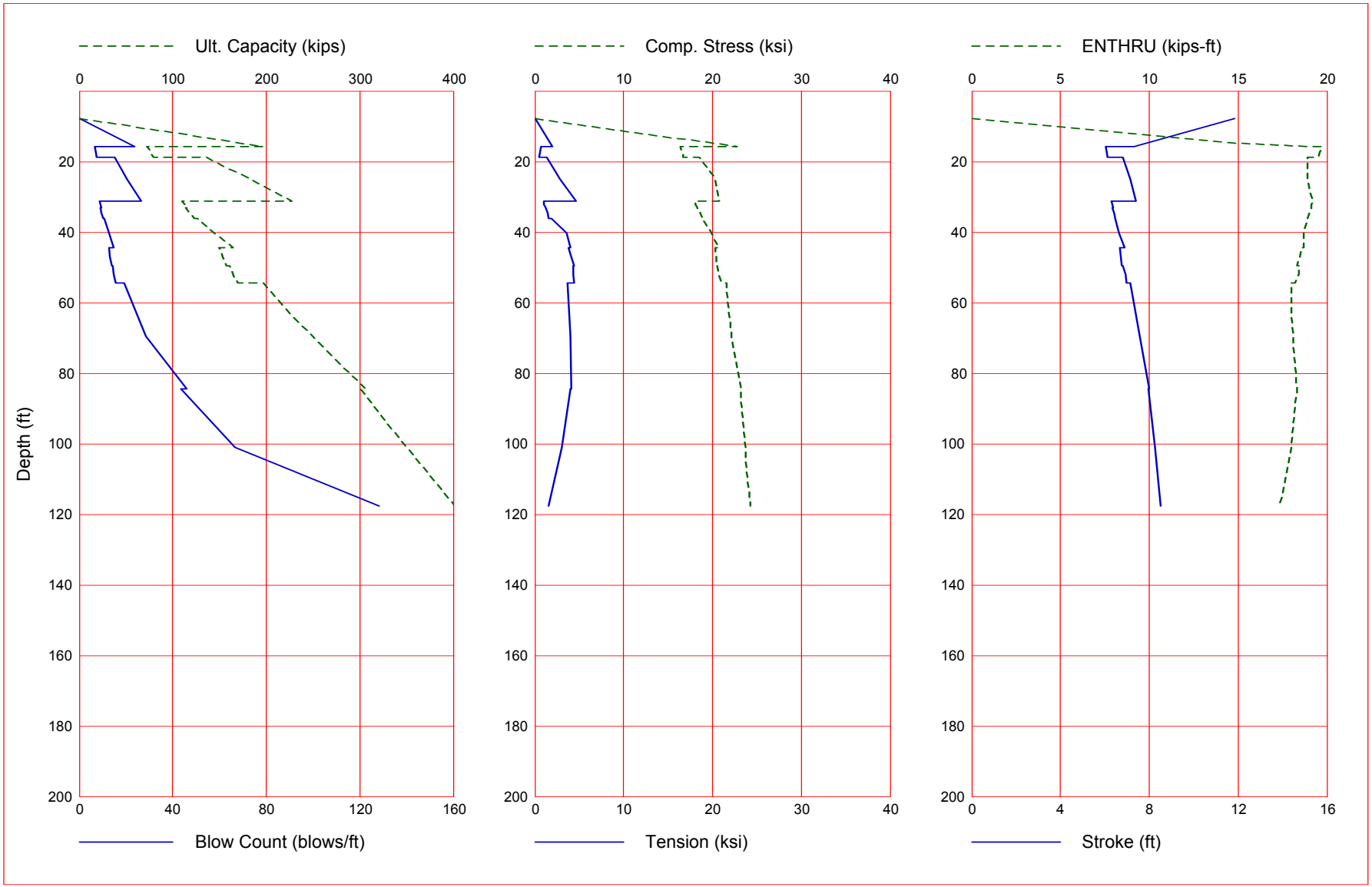
Jun 20 2022
GRLWEAP Version 2010

Gain/Loss 3 at Shaft and Toe 0.500 / 1.000



GRLWEAP - Version 2010
WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS

written by GRL Engineers, Inc. (formerly Goble Rausche Likins and Associates, Inc.) with cooperation from Pile Dynamics, Inc.

ABOUT THE WAVE EQUATION ANALYSIS RESULTS

The GRLWEAP program simulates the behavior of a preformed pile driven by either an impact hammer or a vibratory hammer. The program is based on mathematical models, which describe motion and forces of hammer, driving system, pile and soil under the hammer action. Under certain conditions, the models only crudely approximate, often complex, dynamic situations.

A wave equation analysis generally relies on input data, which represents normal situations. In particular, the hammer data file supplied with the program assumes that the hammer is in good working order. All of the input data selected by the user may be the best available information at the time when the analysis is performed. However, input data and therefore results may significantly differ from actual field conditions.

Therefore, the program authors recommend prudent use of the GRLWEAP results. Soil response and hammer performance should be verified by static and/or dynamic testing and measurements. Estimates of bending or other local stresses (e.g., helmet or clamp contact, uneven rock surfaces etc.), prestress effects and others must also be accounted for by the user.

The calculated capacity - blow count relationship, i.e. the bearing graph, should be used in conjunction with observed blow counts for the capacity assessment of a driven pile. Soil setup occurring after pile installation may produce bearing capacity values that differ substantially from those expected from a wave equation analysis due to soil setup or relaxation. This is particularly true for pile driven with vibratory hammers. The GRLWEAP user must estimate such effects and should also use proper care when applying blow counts from restrike because of the variability of hammer energy, soil resistance and blow count during early restriking.

Finally, the GRLWEAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of building and other factors.

♀
Input File: C:\USERS\KARENS\DESKTOP\GRL FILES\16IN-FA-170-3.GWW
Hammer File: C:\ProgramData\PDI\GRLWEAP\2010\Resource\HAMMER2010.GW
Hammer File Version: 2003 (10/17/2016)

Input File Contents

CCG3A : 04/13/2022 : KCA

OUT	OSG	HAM	STR	FUL	PEL	N	SPL	N-U	P-D	%SK	ISM	0	PHI	RSA	ITR	H-D	MXT	DEx
-100	0	41	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.000

Pile g	Hammer g	Toe Area	Pile Size	Pile Type
32.170	32.170	201.060	16.000	Pipe

W Cp	A Cp	E Cp	T Cp	CoR	ROut	StCp
2.500	19.120	530.0	2.000	0.800	0.010	0.0

A Cu	E Cu	T Cu	CoR	ROut	StCu
0.000	0.0	0.000	0.000	0.000	0.0

LPle	APle	EPle	WPle	Peri	CI	CoR	ROut
117.680	19.12	29000.0	492.000	4.188	0	0.850	0.010

FFatigue	F0	0-Bottom
0	0.000	0.000

Manufac	Hmr Name	HmrType No	Seg-s
DELMAG	D 19-42	1	5

Ram Wt	Ram L	Ram Dia	MaxStrk	RtdStrk	Efficy
4.00	129.10	12.60	11.86	10.81	0.80

IB. Wt	IB. L	IB.Dia	IB CoR	IB RO
0.75	25.30	12.60	0.900	0.010

CompStrk	A Chamber	V Chamber	C Delay	C Duratn	Exp Coeff	VolCStart	Vol CEnd
16.65	124.70	157.70	0.0020	0.0020	1.250	0.00	0.00

P atm	P1	P2	P3	P4	P5
14.70	1600.00	1440.00	1295.00	1165.00	0.00

Stroke	Effic.	Pressure	R-Weight	T-Delay	Exp-Coeff	Eps-Str	Total-AW
10.8100	0.8000	1600.0000	0.0000	0.0000	0.0000	0.0100	0.0000

Qs	Qt	Js	Jt	Qx	Jx	Rati	Dept
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Research Soil Model: Atoe, Plug, Gap, Q-fac

0.000	0.000	0.000	0.000

Research Soil Model: RD-skn: m, d, toe: m, d

0.000	0.000	0.000	0.000

Res. Distribution

Dpth	Rskn	Rtoe	Qs	Qt	Js	Jt	SU F	LimL	TSf0
0.01	0.00	0.00	0.10	0.14	0.05	0.15	1.00	6.00	1.000
8.29	0.00	0.00	0.10	0.14	0.05	0.15	1.00	6.00	1.000
8.31	0.00	0.00	0.10	0.14	0.05	0.15	1.00	6.00	1.000
14.19	0.00	0.00	0.10	0.14	0.05	0.15	1.00	6.00	1.000
14.20	1.29	176.97	0.10	0.14	0.05	0.15	1.00	6.00	1.000
15.69	1.38	188.70	0.10	0.14	0.05	0.15	1.00	6.00	1.000
15.71	0.77	64.34	0.10	0.16	0.10	0.15	1.49	6.00	24.000
18.69	0.86	64.34	0.10	0.16	0.10	0.15	1.49	6.00	24.000
18.71	1.06	121.36	0.10	0.15	0.05	0.15	1.00	6.00	1.000
27.71	1.42	143.33	0.10	0.15	0.05	0.15	1.00	6.00	1.000
31.19	1.57	143.33	0.10	0.15	0.05	0.15	1.00	6.00	1.000
31.21	1.01	25.97	0.10	0.19	0.10	0.15	1.49	6.00	24.000
33.19	1.06	25.97	0.10	0.19	0.10	0.15	1.49	6.00	24.000
33.21	1.17	23.68	0.10	0.15	0.10	0.15	1.49	6.00	24.000
36.19	1.17	23.68	0.10	0.15	0.10	0.15	1.49	6.00	24.000
36.21	1.04	25.97	0.10	0.23	0.05	0.15	1.00	6.00	1.000
44.49	1.21	25.97	0.10	0.23	0.05	0.15	1.00	6.00	1.000
44.51	0.58	10.53	0.10	0.19	0.15	0.15	1.49	6.00	24.000
49.49	0.58	10.53	0.10	0.19	0.15	0.15	1.49	6.00	24.000
49.51	0.71	13.15	0.10	0.18	0.15	0.15	1.49	6.00	168.000
54.49	0.71	13.15	0.10	0.18	0.15	0.15	1.49	6.00	168.000
54.51	1.23	40.35	0.10	0.14	0.15	0.15	1.49	6.00	168.000
63.51	1.23	40.35	0.10	0.14	0.15	0.15	1.49	6.00	168.000
72.51	1.30	40.35	0.10	0.14	0.15	0.15	1.49	6.00	168.000
81.51	1.42	40.35	0.10	0.14	0.15	0.15	1.49	6.00	168.000
84.49	1.47	40.35	0.10	0.14	0.15	0.15	1.49	6.00	168.000
84.51	1.38	35.09	0.10	0.14	0.20	0.15	2.00	6.00	168.000
93.51	1.38	35.09	0.10	0.14	0.20	0.15	2.00	6.00	168.000
102.51	1.42	35.09	0.10	0.14	0.20	0.15	2.00	6.00	168.000
111.51	1.52	35.09	0.10	0.14	0.20	0.15	2.00	6.00	168.000
117.68	1.59	35.09	0.10	0.14	0.20	0.15	2.00	6.00	168.000

Gain/Loss factors: shaft and toe

0.40000	0.45000	0.50000	0.55000	0.60000
1.00000	1.00000	1.00000	1.00000	1.00000

Dpth	L	Wait	Strk	Pmx%	Eff.	Stff	CoR
7.85	0.00	0.00	0.000	0.0	0.000	0.000	0.000
15.68	0.00	0.00	0.000	0.0	0.000	0.000	0.000
15.72	0.00	0.00	0.000	0.0	0.000	0.000	0.000
17.20	0.00	0.00	0.000	0.0	0.000	0.000	0.000
18.68	0.00	0.00	0.000	0.0	0.000	0.000	0.000
18.72	0.00	0.00	0.000	0.0	0.000	0.000	0.000

24.95	0.00	0.00	0.000	0.0	0.000	0.000	0.000
31.18	0.00	0.00	0.000	0.0	0.000	0.000	0.000
31.22	0.00	0.00	0.000	0.0	0.000	0.000	0.000
32.20	0.00	0.00	0.000	0.0	0.000	0.000	0.000
33.18	0.00	0.00	0.000	0.0	0.000	0.000	0.000
33.22	0.00	0.00	0.000	0.0	0.000	0.000	0.000
34.70	0.00	0.00	0.000	0.0	0.000	0.000	0.000
36.18	0.00	0.00	0.000	0.0	0.000	0.000	0.000
36.22	0.00	0.00	0.000	0.0	0.000	0.000	0.000
40.35	0.00	0.00	0.000	0.0	0.000	0.000	0.000
44.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
44.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
47.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
49.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
49.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
52.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000
54.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
54.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
69.50	0.00	0.00	0.000	0.0	0.000	0.000	0.000
84.48	0.00	0.00	0.000	0.0	0.000	0.000	0.000
84.52	0.00	0.00	0.000	0.0	0.000	0.000	0.000
101.08	0.00	0.00	0.000	0.0	0.000	0.000	0.000
117.68	0.00	0.00	0.000	0.0	0.000	0.000	0.000
0.00	0.00	0.00	0.000	0.0	0.000	0.000	0.000

♀ GRLWEAP: WAVE EQUATION ANALYSIS OF PILE FOUNDATIONS
Version 2010
English Units

CCG3A : 04/13/2022 : KCA

Hammer Model: D 19-42 Made by: DELMAG

No.	Weight kips	Stiffn k/inch	CoR	C-Slk ft	Dampg k/ft/s
1	0.800				
2	0.800	140046.6	1.000	0.0000	
3	0.800	140046.6	1.000	0.0000	
4	0.800	140046.6	1.000	0.0000	
5	0.800	140046.6	1.000	0.0000	
Imp Block	0.753	70735.6	0.900	0.0100	
Helmet	2.500	5066.8	0.800	0.0100	5.8
Combined Pile Top		13742.6			

HAMMER OPTIONS:

Hammer File ID No.	41	Hammer Type	OE Diesel
Stroke Option	FxdP-VarS	Stroke Convergence Crit.	0.010
Fuel Pump Setting	Maximum		

HAMMER DATA:

Ram Weight (kips)	4.00	Ram Length (inch)	129.10
Maximum Stroke (ft)	11.86		
Rated Stroke (ft)	10.81	Efficiency	0.800
Maximum Pressure (psi)	1600.00	Actual Pressure (psi)	1600.00
Compression Exponent	1.350	Expansion Exponent	1.250
Ram Diameter (inch)	12.60		
Combustion Delay (s)	0.00200	Ignition Duration (s)	0.00200

The Hammer Data Includes Estimated (NON-MEASURED) Quantities

HAMMER CUSHION			PILE CUSHION		
Cross Sect. Area	(in2)	19.12	Cross Sect. Area	(in2)	0.00
Elastic-Modulus	(ksi)	530.0	Elastic-Modulus	(ksi)	0.0
Thickness	(inch)	2.00	Thickness	(inch)	0.00
Coeff of Restitution		0.8	Coeff of Restitution		1.0
RoundOut	(ft)	0.0	RoundOut	(ft)	0.0
Stiffness	(kips/in)	5066.8	Stiffness	(kips/in)	0.0

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth	(ft)	7.8	Standard Soil Setup		
Shaft Gain/Loss Factor		0.400	Toe Gain/Loss Factor		1.000

PILE PROFILE:

Toe Area	(in2)	201.060	Pile Type		Pipe
Pile Size	(inch)	16.000			

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 0.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	110.96	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	117.68	4.2	19.1
Toe						0.0	0.150	0.140			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

PILE, SOIL, ANALYSIS OPTIONS:

Uniform pile		Pile Segments: Automatic	
No. of Slacks/Splices	0	Pile Damping (%)	1
		Pile Damping Fact.(k/ft/s)	0.671
Driveability Analysis			
Soil Damping Option	Smith		
Max No Analysis Iterations	0	Time Increment/Critical	160
Output Time Interval	1	Analysis Time-Input (ms)	0
Output Level: Normal			
Gravity Mass, Pile, Hammer:	32.170	32.170	32.170
Output Segment Generation: Automatic			

Depth ft	Stroke ft	Pressure Ratio	Efficy
7.85	10.81	1.00	0.800

INITIAL STATIC ANALYSIS: Total Wt, Sum(R) 10.9 0.0
Hammer+Pile Weight > Rult: Pile Runs

INITIAL STATIC ANALYSIS: Total Wt, Sum(R) 10.9 0.0
Hammer+Pile Weight > Rult: Pile Runs

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INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.9     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.9     0.0
 Hammer+Pile Weight > Rult: Pile Runs


INITIAL STATIC ANALYSIS: Total Wt, Sum(R)    10.9     0.0
 Hammer+Pile Weight > Rult: Pile Runs
♀
CCG3A : 04/13/2022 : KCA                                          06/20/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
♀
CCG3A : 04/13/2022 : KCA                                          06/20/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

 Depth                 (ft)      15.7  Standard Soil Setup
 Shaft Gain/Loss Factor         0.400  Toe Gain/Loss Factor           1.000

 PILE PROFILE:
 Toe Area             (in2)   201.060  Pile Type                        Pipe
 Pile Size           (inch)    16.000

  L b Top     Area    E-Mod  Spec Wt    Perim  C Index  Wave Sp      EA/c
       ft      in2      ksi  lb/ft3       ft              ft/s    k/ft/s
      0.0    19.12   29000.    492.0      4.2        0    16524.     33.6
    117.7    19.12   29000.    492.0      4.2        0    16524.     33.6

 Wave Travel Time 2L/c (ms)    14.243

        Pile and Soil Model            Total Capacity Rut  (kips)     196.9
No. Weight   Stiffn C-Slk T-Slk  CoR  Soil-S  Soil-D Quake  LbTop Perim    Area
      kips     k/in    ft    ft         kips    s/ft  inch     ft    ft     in2
  1  0.220    13743 0.010 0.000 0.85     0.0   0.000 0.100   3.36   4.2    19.1
  2  0.220    13743 0.000 0.000 1.00     0.0   0.000 0.100   6.72   4.2    19.1
 31  0.220    13743 0.000 0.000 1.00     0.0   0.050 0.100 104.23   4.2    19.1
 35  0.220    13743 0.000 0.000 1.00     8.3   0.050 0.100 117.68   4.2    19.1
Toe                                    188.6   0.150 0.140

     7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
     7.688 kips total reduced pile weight   (g= 32.17 ft/s2)


    Depth    Stroke  Pressure    Efficy
       ft        ft     Ratio
    15.68     10.81      1.00     0.800
♀
CCG3A : 04/13/2022 : KCA                                          06/20/2022
National Engineering & Architectural Ser                GRLWEAP Version 2010

    Rut   Bl Ct   Stroke (ft) Ten Str   i   t Comp Str   i   t ENTHRU   Bl Rt
   kips    b/ft   down     up     ksi              ksi         kip-ft   b/min
  196.9    23.8   7.33   7.30   -2.01  13  38    22.73  33  10   19.2    43.5
  196.9    23.8   7.33   7.30   -2.01  13  38    22.73  33  10   19.2    43.5
  196.9    23.8   7.33   7.30   -2.01  13  38    22.73  33  10   19.2    43.5
  196.9    23.8   7.33   7.30   -2.01  13  38    22.73  33  10   19.2    43.5
  196.9    23.8   7.33   7.30   -2.01  13  38    22.73  33  10   19.2    43.5
♀
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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 15.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0		19.12	29000.	492.0	4.2	0	16524.	33.6
117.7		19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 72.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	104.23	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	8.4	0.050	0.100	117.68	4.2	19.1
Toe						64.3	0.150	0.160			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
15.72	10.81	1.00	0.800

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
72.8	6.8	6.03	6.05	-0.73	3	17	16.36	25	9	19.7	48.1
72.8	6.8	6.03	6.05	-0.73	3	17	16.37	25	9	19.7	48.1
72.8	6.8	6.03	6.05	-0.73	3	17	16.37	25	9	19.7	48.1
72.8	6.8	6.03	6.05	-0.73	3	17	16.37	25	9	19.7	48.1
72.8	6.8	6.03	6.05	-0.74	3	17	16.37	25	9	19.7	48.1

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 17.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0		19.12	29000.	492.0	4.2	0	16524.	33.6
117.7		19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 75.7

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	100.87	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	11.4	0.069	0.100	117.68	4.2	19.1
Toe						64.3	0.150	0.160			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
17.20	10.81	1.00	0.800

♀
CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
75.7	7.1	6.07	6.09	-0.59	3	17	16.50	26	9	19.6	47.9
75.9	7.1	6.07	6.09	-0.61	3	17	16.54	26	9	19.6	47.9
76.1	7.1	6.07	6.09	-0.60	3	17	16.54	26	9	19.6	47.9
76.2	7.2	6.07	6.10	-0.58	3	17	16.54	26	9	19.6	47.9
76.4	7.2	6.08	6.10	-0.58	3	17	16.53	26	9	19.6	47.9

♀
CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 18.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 78.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	100.87	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	6.2	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	8.3	0.091	0.100	117.68	4.2	19.1
Toe						64.3	0.150	0.160			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
18.68	10.81	1.00	0.800

♀
CCG3A : 04/13/2022 : KCA 06/20/2022

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
78.9	7.4	6.11	6.13	-0.49	3	17	16.66	26	9	19.5	47.8
79.2	7.4	6.11	6.13	-0.47	3	17	16.67	26	9	19.5	47.7
79.5	7.5	6.12	6.14	-0.46	3	17	16.69	26	9	19.5	47.7
79.9	7.5	6.12	6.14	-0.43	3	17	16.67	26	9	19.5	47.7
80.2	7.5	6.12	6.15	-0.43	3	17	16.70	26	9	19.5	47.7

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 18.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 136.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	100.87	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	6.4	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	8.2	0.092	0.100	117.68	4.2	19.1
Toe						121.4	0.150	0.150			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
18.72	10.81	1.00	0.800

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
136.0	14.9	6.82	6.76	-1.36	21	48	18.48	27	9	18.9	45.2
136.4	15.0	6.82	6.76	-1.37	21	48	18.49	27	9	18.9	45.2
136.7	15.0	6.82	6.77	-1.39	21	48	18.48	27	9	18.9	45.2
137.1	15.1	6.82	6.77	-1.40	22	48	18.48	27	9	18.8	45.2
137.4	15.1	6.83	6.77	-1.41	22	48	18.51	27	9	18.9	45.2

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 25.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:

Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 182.1

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	94.14	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	3.7	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	9.9	0.082	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	14.5	0.056	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	17.5	0.050	0.100	117.68	4.2	19.1
Toe						136.6	0.150	0.150			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
24.95	10.81	1.00	0.800

♀
CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
182.1	20.3	7.14	7.11	-2.83	30	42	20.29	33	10	18.9	44.1
182.5	20.4	7.14	7.11	-2.85	30	42	20.30	33	10	18.9	44.1
182.8	20.4	7.14	7.11	-2.87	30	42	20.33	33	10	18.9	44.1
183.2	20.4	7.15	7.11	-2.89	30	42	20.36	33	10	18.9	44.1
183.5	20.5	7.14	7.11	-2.91	30	42	20.38	33	10	18.9	44.1

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 31.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 226.4

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1

26	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	87.42	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	0.9	0.050	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	11.6	0.074	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	13.1	0.062	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	17.2	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	19.2	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	21.1	0.050	0.100	117.68	4.2	19.1
Toe						143.3	0.150	0.150			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
31.18	10.81	1.00	0.800

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
226.4	26.5	7.41	7.39	-4.61	25	38	20.78	33	10	19.2	43.3
226.8	26.5	7.41	7.40	-4.62	25	38	20.76	33	10	19.2	43.3
227.1	26.6	7.42	7.40	-4.64	25	38	20.75	32	10	19.2	43.3
227.5	26.7	7.42	7.40	-4.66	25	38	20.72	32	10	19.2	43.3
227.8	26.7	7.43	7.40	-4.67	25	38	20.76	32	10	19.2	43.3

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 31.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 109.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	87.42	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	1.2	0.050	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	11.4	0.074	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	13.3	0.061	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	17.2	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	19.2	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	21.0	0.050	0.100	117.68	4.2	19.1
Toe						26.0	0.150	0.190			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
31.22	10.81	1.00	0.800

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
109.3	8.7	6.29	6.32	-0.97	31	49	17.89	28	9	19.2	47.0
109.6	8.8	6.30	6.32	-1.01	31	50	17.94	28	9	19.2	47.0
109.9	8.8	6.30	6.32	-0.99	31	49	17.94	28	9	19.2	47.0
110.3	8.8	6.31	6.33	-0.98	31	49	17.94	28	9	19.2	47.0
110.6	8.9	6.31	6.33	-1.04	31	49	17.98	28	9	19.2	47.0

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 32.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 111.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	87.42	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	6.6	0.050	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	8.2	0.092	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	15.9	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	17.8	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	19.7	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	17.6	0.061	0.100	117.68	4.2	19.1
Toe						26.0	0.150	0.190			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
32.20	10.81	1.00	0.800

♀

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
111.8	9.0	6.32	6.34	-0.96	30	49	18.06	28	9	19.1	46.9
112.3	9.0	6.33	6.35	-1.01	30	49	18.10	28	9	19.1	46.9
112.7	9.1	6.33	6.35	-1.00	30	49	18.10	28	9	19.1	46.8
113.2	9.1	6.34	6.36	-1.03	30	49	18.15	28	9	19.1	46.8

113.7	9.2	6.34	6.36	-1.05	30	49	18.16	28	9	19.1	46.8

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CCG3A : 04/13/2022 : KCA 06/20/2022
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Depth (ft) 33.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 114.4

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	87.42	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	9.7	0.060	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	9.5	0.082	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	16.4	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	18.4	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	20.3	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	14.1	0.075	0.100	117.68	4.2	19.1
Toe						26.0	0.150	0.190			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
33.18	10.81	1.00	0.800

♀

CCG3A : 04/13/2022 : KCA 06/20/2022
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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
114.4	9.3	6.35	6.38	-1.11	30	48	18.25	28	9	19.1	46.8
115.0	9.4	6.36	6.38	-1.14	30	48	18.29	28	9	19.1	46.7
115.6	9.4	6.37	6.39	-1.19	30	48	18.33	28	9	19.1	46.7
116.2	9.5	6.37	6.39	-1.20	30	48	18.33	28	9	19.0	46.7
116.9	9.6	6.38	6.40	-1.24	30	48	18.37	28	9	19.0	46.7

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Depth (ft) 33.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top	Area	E-Mod	Spec Wt	Perim	C Index	Wave Sp	EA/c

ft	in2	ksi	lb/ft3	ft		ft/s	k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 112.2

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	87.42	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	9.8	0.061	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	9.6	0.081	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	16.5	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	18.4	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	20.3	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	13.9	0.075	0.100	117.68	4.2	19.1
Toe						23.7	0.150	0.150			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
33.22	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
112.2	9.0	6.34	6.36	-1.23	30	49	18.27	28	9	19.1	46.8
112.8	9.1	6.34	6.36	-1.20	30	49	18.27	28	9	19.1	46.8
113.5	9.2	6.35	6.37	-1.23	30	49	18.32	28	9	19.1	46.8
114.1	9.2	6.36	6.38	-1.21	30	49	18.32	28	9	19.0	46.8
114.7	9.3	6.36	6.38	-1.23	30	48	18.35	28	9	19.0	46.7

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Depth (ft) 34.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L ft	b Top in2	Area ksi	E-Mod lb/ft3	Spec Wt ft	Perim	C Index ft/s	Wave Sp k/ft/s	EA/c
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6	
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6	

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 116.6

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	84.06	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	1.8	0.050	0.100	97.51	4.2	19.1

30	0.220	13743	0.000	0.000	1.00	11.0	0.076	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	13.6	0.060	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	17.3	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	19.2	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	20.6	0.051	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	9.3	0.100	0.100	117.68	4.2	19.1
Toe						23.7	0.150	0.150			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
34.70	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
116.6	9.5	6.39	6.41	-1.35	30	48	18.53	28	9	19.0	46.7
117.4	9.6	6.39	6.41	-1.39	30	48	18.57	28	9	19.0	46.6
118.3	9.7	6.40	6.42	-1.44	30	48	18.61	28	9	19.0	46.6
119.2	9.8	6.41	6.43	-1.49	30	47	18.65	28	9	19.0	46.6
120.0	9.9	6.42	6.44	-1.55	30	47	18.69	28	9	19.0	46.5

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Depth (ft) 36.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L ft	b Top in2	Area ksi	E-Mod lb/ft3	Spec Wt ft	Perim	C Index ft/s	Wave Sp k/ft/s	EA/c
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6	
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6	

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 120.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	84.06	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	9.0	0.055	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	8.6	0.088	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	16.2	0.050	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	18.2	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	20.1	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	15.4	0.069	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	9.8	0.100	0.100	117.68	4.2	19.1
Toe						23.7	0.150	0.150			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
36.18	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
120.9	10.1	6.44	6.45	-1.61	29	47	18.81	28	9	18.9	46.5
122.0	10.2	6.45	6.46	-1.60	29	47	18.86	28	9	18.9	46.4
123.1	10.3	6.45	6.48	-1.59	29	47	18.90	28	9	18.9	46.4
124.2	10.4	6.47	6.49	-1.61	16	50	18.94	28	9	18.9	46.3
125.3	10.6	6.48	6.50	-1.83	29	50	18.98	28	9	18.9	46.3

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 36.2 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 123.4

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	84.06	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	9.1	0.056	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	8.7	0.087	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	16.2	0.050	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	18.2	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	20.1	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	15.3	0.070	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	9.8	0.100	0.100	117.68	4.2	19.1
Toe						26.0	0.150	0.230			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
36.22	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
123.4	10.4	6.45	6.47	-1.43	29	47	18.78	28	9	18.9	46.4
124.5	10.6	6.46	6.48	-1.64	29	50	18.83	28	9	18.9	46.4
125.6	10.7	6.47	6.49	-1.87	29	50	18.87	28	9	18.9	46.3

126.7	10.8	6.48	6.50	-2.08	29	50	18.91	28	9	18.9	46.3
127.8	11.0	6.50	6.51	-2.21	29	50	18.98	28	9	18.9	46.2

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 40.3 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 142.1

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
23	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	77.33	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	10.6	0.065	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	10.7	0.075	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	16.7	0.050	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	18.6	0.050	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	20.6	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	12.6	0.082	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	11.0	0.089	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	15.4	0.050	0.100	117.68	4.2	19.1
Toe						26.0	0.150	0.230			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
40.35	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
142.1	12.5	6.63	6.65	-3.50	26	50	19.78	28	9	18.7	45.7
143.2	12.7	6.65	6.66	-3.53	26	50	19.82	28	9	18.7	45.7
144.3	12.8	6.65	6.67	-3.57	26	50	19.87	28	9	18.7	45.7
145.4	12.9	6.66	6.68	-3.60	26	50	19.92	28	9	18.7	45.6
146.5	13.1	6.68	6.69	-3.62	26	50	19.96	28	9	18.7	45.6

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 44.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe

Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 162.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	73.97	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	0.1	0.050	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	12.1	0.072	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	12.7	0.064	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	17.1	0.050	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	19.1	0.050	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	21.0	0.050	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	9.8	0.096	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	12.2	0.078	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	15.6	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	16.6	0.050	0.100	117.68	4.2	19.1
Toe						26.0	0.150	0.230			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
44.48	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	Stroke (ft) up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
162.3	14.8	6.81	6.81	-4.04	25	48	20.56	27	9	18.5	45.2
163.4	14.9	6.81	6.82	-4.03	25	48	20.61	27	9	18.5	45.2
164.5	14.9	6.89	6.82	-4.03	26	48	20.77	27	9	18.7	45.0
165.6	15.1	6.89	6.83	-4.02	26	48	20.78	27	9	18.6	45.0
166.7	15.2	6.90	6.84	-4.00	26	48	20.83	27	9	18.6	45.0

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Depth (ft) 44.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 147.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	73.97	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	0.3	0.050	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	11.9	0.072	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	12.8	0.063	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	17.2	0.050	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	19.1	0.050	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	21.0	0.050	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	9.7	0.097	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	12.3	0.078	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	15.6	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	16.5	0.050	0.100	117.68	4.2	19.1
Toe						10.5	0.150	0.190			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
44.52	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
147.0	12.3	6.66	6.67	-3.54	27	45	20.20	27	9	18.6	45.7
148.1	12.4	6.67	6.68	-3.63	27	50	20.25	27	9	18.6	45.6
149.2	12.6	6.68	6.69	-3.76	27	50	20.30	27	9	18.6	45.6
150.3	12.7	6.69	6.70	-3.86	27	50	20.34	27	9	18.6	45.6
151.4	12.8	6.70	6.71	-3.93	27	50	20.38	27	9	18.6	45.5

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 47.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L ft	b Top in2	Area ksi	E-Mod lb/ft3	Spec Wt ft	Perim	C Index ft/s	Wave Sp k/ft/s	EA/c
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6	
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6	

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 150.7

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	73.97	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	10.5	0.064	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	10.5	0.076	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	16.6	0.050	0.100	94.14	4.2	19.1

29	0.220	13743	0.000	0.000	1.00	18.6	0.050	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	20.5	0.050	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	12.8	0.081	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	10.9	0.090	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	15.3	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	16.3	0.050	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	8.0	0.108	0.100	117.68	4.2	19.1
Toe						10.5	0.150	0.190			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
47.00	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
150.7	12.9	6.71	6.72	-4.01	25	45	20.37	26	9	18.6	45.5
152.0	13.1	6.72	6.74	-4.07	26	44	20.37	26	9	18.5	45.4
153.3	13.2	6.73	6.75	-4.16	26	44	20.41	26	9	18.5	45.4
154.6	13.4	6.74	6.76	-4.23	26	44	20.46	26	9	18.5	45.4
155.9	13.5	6.75	6.77	-4.28	26	44	20.51	26	9	18.4	45.3

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Depth (ft) 49.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 154.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
21	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	70.61	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	8.7	0.053	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	8.2	0.090	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	16.1	0.050	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	18.1	0.050	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	20.0	0.050	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	15.9	0.067	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	9.8	0.100	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	14.8	0.053	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	16.1	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	11.1	0.081	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	4.9	0.150	0.100	117.68	4.2	19.1
Toe						10.5	0.150	0.190			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
49.48	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
154.3	13.4	6.76	6.77	-4.40	25	44	20.34	25	9	18.4	45.4
155.8	13.6	6.77	6.78	-4.48	25	44	20.43	25	9	18.4	45.3
157.3	13.8	6.78	6.80	-4.47	25	44	20.43	25	9	18.3	45.3
158.8	14.0	6.79	6.81	-4.46	25	44	20.47	25	9	18.3	45.2
160.3	14.1	6.81	6.82	-4.49	25	44	20.56	25	9	18.4	45.2

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 49.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L ft	b Top in2	Area ksi	E-Mod lb/ft3	Spec Wt ft	Perim	C Index ft/s	Wave Sp k/ft/s	EA/c
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6	
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6	

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 157.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
21	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	70.61	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	8.8	0.054	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	8.3	0.090	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	16.2	0.050	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	18.1	0.050	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	20.0	0.050	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	15.8	0.068	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	9.8	0.100	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	14.9	0.052	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	16.1	0.050	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	11.0	0.082	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	5.0	0.150	0.100	117.68	4.2	19.1
Toe						13.1	0.150	0.180			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
49.52	10.81	1.00	0.800

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National Engineering & Architectural Ser GRLWEAP Version 2010

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
157.0	13.8	6.78	6.80	-4.31	25	44	20.40	25	9	18.4	45.3
158.5	14.0	6.79	6.81	-4.30	25	44	20.45	25	9	18.3	45.2
160.0	14.2	6.81	6.82	-4.29	25	44	20.53	25	9	18.4	45.2
161.5	14.4	6.82	6.83	-4.25	25	44	20.57	25	9	18.3	45.1
163.0	14.5	6.83	6.84	-4.16	25	44	20.62	25	9	18.3	45.1

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 52.0 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 161.5

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
20	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	67.25	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	4.5	0.050	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	9.4	0.085	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	14.9	0.054	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	17.6	0.050	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	19.5	0.050	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	18.9	0.057	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	9.5	0.100	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	13.4	0.066	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	15.8	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	14.0	0.063	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	4.9	0.150	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	5.8	0.150	0.100	117.68	4.2	19.1
Toe						13.1	0.150	0.180			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
52.00	10.81	1.00	0.800

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CCG3A : 04/13/2022 : KCA 06/20/2022
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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
161.5	14.4	6.83	6.84	-4.42	25	44	20.53	25	9	18.2	45.1

163.2	14.7	6.85	6.86	-4.34	25	44	20.57	25	9	18.2	45.0
165.0	14.7	6.93	6.86	-4.35	25	44	20.78	25	9	18.4	44.9
166.7	15.0	6.94	6.88	-4.25	25	44	20.83	25	9	18.4	44.9
168.5	15.2	6.95	6.89	-4.18	25	44	20.88	25	9	18.3	44.8

♀

Depth (ft) 54.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model Total Capacity Rut (kips) 166.0

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
19	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	63.88	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	12.0	0.071	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	12.5	0.065	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	17.1	0.050	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	19.0	0.050	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	21.0	0.050	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	10.2	0.095	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	12.1	0.079	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	15.6	0.050	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	16.6	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	5.3	0.144	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	5.5	0.150	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	6.1	0.150	0.100	117.68	4.2	19.1
Toe						13.1	0.150	0.180			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
54.48	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
166.0	14.9	6.95	6.89	-4.60	24	44	21.01	24	8	18.3	44.8
168.0	15.2	6.96	6.90	-4.49	24	44	21.06	24	8	18.2	44.8
170.0	15.4	6.97	6.92	-4.37	24	44	21.10	24	8	18.2	44.7
172.0	15.7	6.98	6.93	-4.26	24	44	21.15	24	8	18.1	44.7
174.0	15.9	6.99	6.95	-4.15	24	44	21.20	24	8	18.1	44.7

♀

Depth (ft) 54.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 193.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
19	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	63.88	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	12.1	0.071	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	12.6	0.064	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	17.1	0.050	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	19.0	0.050	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	21.0	0.050	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	10.0	0.096	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	12.1	0.079	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	15.6	0.050	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	16.6	0.050	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	5.2	0.146	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	5.5	0.150	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	6.1	0.150	0.100	117.68	4.2	19.1
Toe						40.3	0.150	0.140			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
54.52	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
193.3	18.6	7.13	7.09	-3.74	23	42	21.48	24	8	18.0	44.2
195.3	18.9	7.14	7.10	-3.70	23	42	21.53	24	8	18.0	44.2
197.3	19.2	7.16	7.12	-3.65	23	42	21.57	24	8	18.0	44.1
199.3	19.4	7.17	7.13	-3.60	23	42	21.61	24	8	18.0	44.1
201.3	19.7	7.19	7.15	-3.54	23	42	21.66	24	8	18.0	44.0

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National Engineering & Architectural Ser GRLWEAP Version 2010

Depth (ft) 69.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
	0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
	117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 240.3

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
15	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	50.43	4.2	19.1
19	0.220	13743	0.000	0.000	1.00	8.4	0.050	0.100	63.88	4.2	19.1
20	0.220	13743	0.000	0.000	1.00	7.8	0.093	0.100	67.25	4.2	19.1
21	0.220	13743	0.000	0.000	1.00	16.0	0.050	0.100	70.61	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	18.0	0.050	0.100	73.97	4.2	19.1
23	0.220	13743	0.000	0.000	1.00	19.9	0.050	0.100	77.33	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	16.5	0.065	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	9.7	0.100	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	14.6	0.055	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	16.0	0.050	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	11.6	0.077	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	4.9	0.150	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	6.0	0.150	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	8.1	0.150	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	107.59	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	10.7	0.150	0.100	117.68	4.2	19.1
Toe						40.3	0.150	0.140			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
69.50	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	Stroke (ft) up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
240.3	26.7	7.50	7.47	-3.57	17	31	22.01	19	7	18.0	43.1
244.9	27.6	7.54	7.51	-3.81	18	31	22.12	19	7	18.1	43.0
249.4	28.5	7.57	7.55	-4.03	18	31	22.18	19	7	18.1	42.9
254.0	29.6	7.60	7.58	-4.24	18	31	22.25	19	7	18.1	42.8
258.6	30.5	7.66	7.62	-4.44	18	31	22.39	19	7	18.3	42.6

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Depth (ft) 84.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L	b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s

0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 291.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
10	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	33.62	4.2	19.1
15	0.220	13743	0.000	0.000	1.00	11.5	0.069	0.100	50.43	4.2	19.1
16	0.220	13743	0.000	0.000	1.00	11.8	0.069	0.100	53.80	4.2	19.1
17	0.220	13743	0.000	0.000	1.00	16.9	0.050	0.100	57.16	4.2	19.1
18	0.220	13743	0.000	0.000	1.00	18.9	0.050	0.100	60.52	4.2	19.1
19	0.220	13743	0.000	0.000	1.00	20.8	0.050	0.100	63.88	4.2	19.1
20	0.220	13743	0.000	0.000	1.00	11.1	0.090	0.100	67.25	4.2	19.1
21	0.220	13743	0.000	0.000	1.00	11.7	0.083	0.100	70.61	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	15.5	0.050	0.100	73.97	4.2	19.1
23	0.220	13743	0.000	0.000	1.00	16.5	0.050	0.100	77.33	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	6.3	0.130	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	5.4	0.150	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	6.1	0.150	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	10.1	0.150	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	10.6	0.150	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	10.8	0.150	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	11.1	0.150	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	11.5	0.150	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	11.9	0.150	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	12.3	0.150	0.100	117.68	4.2	19.1
Toe						40.3	0.150	0.140			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
84.48	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	Stroke (ft) up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
291.9	40.6	7.88	7.87	-4.06	15	29	23.00	15	6	18.1	42.0
299.3	43.0	7.93	7.92	-4.06	15	29	23.15	15	7	18.3	41.9
306.7	46.0	7.98	7.98	-4.06	15	29	23.21	15	6	18.3	41.8
314.1	48.7	8.03	8.02	-4.05	15	29	23.36	15	7	18.5	41.7
321.5	51.7	8.07	8.07	-4.09	15	27	23.47	15	6	18.6	41.5

♀

Depth (ft) 84.5 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 286.8

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
10	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	33.62	4.2	19.1
15	0.220	13743	0.000	0.000	1.00	11.5	0.069	0.100	50.43	4.2	19.1
16	0.220	13743	0.000	0.000	1.00	11.9	0.068	0.100	53.80	4.2	19.1
17	0.220	13743	0.000	0.000	1.00	17.0	0.050	0.100	57.16	4.2	19.1
18	0.220	13743	0.000	0.000	1.00	18.9	0.050	0.100	60.52	4.2	19.1
19	0.220	13743	0.000	0.000	1.00	20.8	0.050	0.100	63.88	4.2	19.1
20	0.220	13743	0.000	0.000	1.00	10.9	0.090	0.100	67.25	4.2	19.1
21	0.220	13743	0.000	0.000	1.00	11.7	0.083	0.100	70.61	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	15.5	0.050	0.100	73.97	4.2	19.1
23	0.220	13743	0.000	0.000	1.00	16.5	0.050	0.100	77.33	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	6.1	0.132	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	5.4	0.150	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	6.1	0.150	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	10.2	0.150	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	10.6	0.150	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	10.8	0.150	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	11.1	0.150	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	11.5	0.150	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	11.9	0.150	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	12.2	0.150	0.100	117.68	4.2	19.1
Toe						35.1	0.150	0.140			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
84.52	10.81	1.00	0.800

♀

Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
286.8	38.8	7.85	7.84	-4.01	15	29	22.95	15	6	18.0	42.1
294.2	41.0	7.90	7.89	-4.01	15	29	23.10	15	7	18.2	42.0
301.6	43.7	7.95	7.94	-4.02	15	29	23.20	15	6	18.3	41.9
309.0	46.6	8.00	8.00	-4.02	15	29	23.30	15	6	18.4	41.7
316.4	49.5	8.05	8.05	-4.02	15	29	23.40	15	6	18.5	41.6

♀

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Depth (ft) 101.1 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe

Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 325.2

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.000	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.000	0.100	6.72	4.2	19.1
5	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	16.81	4.2	19.1
10	0.220	13743	0.000	0.000	1.00	11.0	0.067	0.100	33.62	4.2	19.1
11	0.220	13743	0.000	0.000	1.00	11.2	0.072	0.100	36.99	4.2	19.1
12	0.220	13743	0.000	0.000	1.00	16.8	0.050	0.100	40.35	4.2	19.1
13	0.220	13743	0.000	0.000	1.00	18.7	0.050	0.100	43.71	4.2	19.1
14	0.220	13743	0.000	0.000	1.00	20.7	0.050	0.100	47.07	4.2	19.1
15	0.220	13743	0.000	0.000	1.00	11.8	0.086	0.100	50.43	4.2	19.1
16	0.220	13743	0.000	0.000	1.00	11.4	0.086	0.100	53.80	4.2	19.1
17	0.220	13743	0.000	0.000	1.00	15.4	0.050	0.100	57.16	4.2	19.1
18	0.220	13743	0.000	0.000	1.00	16.4	0.050	0.100	60.52	4.2	19.1
19	0.220	13743	0.000	0.000	1.00	7.0	0.120	0.100	63.88	4.2	19.1
20	0.220	13743	0.000	0.000	1.00	5.3	0.150	0.100	67.25	4.2	19.1
21	0.220	13743	0.000	0.000	1.00	6.1	0.150	0.100	70.61	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	9.8	0.150	0.100	73.97	4.2	19.1
23	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	77.33	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	10.6	0.150	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	10.8	0.150	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	11.1	0.150	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	11.4	0.150	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	11.8	0.150	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	12.2	0.150	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	8.1	0.196	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	7.7	0.200	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	7.7	0.200	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	7.8	0.200	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	7.9	0.200	0.100	117.68	4.2	19.1
Toe						35.1	0.150	0.140			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
101.08	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
325.2	53.5	8.13	8.21	-2.69	10	25	23.49	10	5	17.7	41.3
337.4	58.5	8.30	8.28	-2.87	10	25	23.80	10	5	18.1	41.0
349.6	66.7	8.27	8.35	-2.99	10	24	23.75	10	5	18.0	40.9
361.8	74.5	8.33	8.41	-3.07	10	24	23.89	10	5	18.1	40.8
374.1	84.2	8.40	8.47	-3.16	10	24	24.04	10	5	18.2	40.6

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Depth (ft) 117.7 Standard Soil Setup
Shaft Gain/Loss Factor 0.400 Toe Gain/Loss Factor 1.000

PILE PROFILE:
Toe Area (in2) 201.060 Pile Type Pipe
Pile Size (inch) 16.000

L b Top ft	Area in2	E-Mod ksi	Spec Wt lb/ft3	Perim ft	C Index	Wave Sp ft/s	EA/c k/ft/s
0.0	19.12	29000.	492.0	4.2	0	16524.	33.6
117.7	19.12	29000.	492.0	4.2	0	16524.	33.6

Wave Travel Time 2L/c (ms) 14.243

Pile and Soil Model — Total Capacity Rut (kips) 366.9

No.	Weight kips	Stiffn k/in	C-Slk ft	T-Slk ft	CoR	Soil-S kips	Soil-D s/ft	Quake inch	LbTop ft	Perim ft	Area in2
1	0.220	13743	0.010	0.000	0.85	0.0	0.050	0.100	3.36	4.2	19.1
2	0.220	13743	0.000	0.000	1.00	0.0	0.050	0.100	6.72	4.2	19.1
5	0.220	13743	0.000	0.000	1.00	10.6	0.065	0.100	16.81	4.2	19.1
6	0.220	13743	0.000	0.000	1.00	10.7	0.075	0.100	20.17	4.2	19.1
7	0.220	13743	0.000	0.000	1.00	16.7	0.050	0.100	23.54	4.2	19.1
8	0.220	13743	0.000	0.000	1.00	18.6	0.050	0.100	26.90	4.2	19.1
9	0.220	13743	0.000	0.000	1.00	20.6	0.050	0.100	30.26	4.2	19.1
10	0.220	13743	0.000	0.000	1.00	12.6	0.082	0.100	33.62	4.2	19.1
11	0.220	13743	0.000	0.000	1.00	11.0	0.089	0.100	36.99	4.2	19.1
12	0.220	13743	0.000	0.000	1.00	15.4	0.050	0.100	40.35	4.2	19.1
13	0.220	13743	0.000	0.000	1.00	16.4	0.050	0.100	43.71	4.2	19.1
14	0.220	13743	0.000	0.000	1.00	7.8	0.111	0.100	47.07	4.2	19.1
15	0.220	13743	0.000	0.000	1.00	5.3	0.150	0.100	50.43	4.2	19.1
16	0.220	13743	0.000	0.000	1.00	6.1	0.150	0.100	53.80	4.2	19.1
17	0.220	13743	0.000	0.000	1.00	9.6	0.150	0.100	57.16	4.2	19.1
18	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	60.52	4.2	19.1
19	0.220	13743	0.000	0.000	1.00	10.5	0.150	0.100	63.88	4.2	19.1
20	0.220	13743	0.000	0.000	1.00	10.6	0.150	0.100	67.25	4.2	19.1
21	0.220	13743	0.000	0.000	1.00	10.8	0.150	0.100	70.61	4.2	19.1
22	0.220	13743	0.000	0.000	1.00	11.0	0.150	0.100	73.97	4.2	19.1
23	0.220	13743	0.000	0.000	1.00	11.4	0.150	0.100	77.33	4.2	19.1
24	0.220	13743	0.000	0.000	1.00	11.8	0.150	0.100	80.69	4.2	19.1
25	0.220	13743	0.000	0.000	1.00	12.2	0.150	0.100	84.06	4.2	19.1
26	0.220	13743	0.000	0.000	1.00	8.4	0.193	0.100	87.42	4.2	19.1
27	0.220	13743	0.000	0.000	1.00	7.7	0.200	0.100	90.78	4.2	19.1
28	0.220	13743	0.000	0.000	1.00	7.7	0.200	0.100	94.14	4.2	19.1
29	0.220	13743	0.000	0.000	1.00	7.8	0.200	0.100	97.51	4.2	19.1
30	0.220	13743	0.000	0.000	1.00	7.9	0.200	0.100	100.87	4.2	19.1
31	0.220	13743	0.000	0.000	1.00	8.0	0.200	0.100	104.23	4.2	19.1
32	0.220	13743	0.000	0.000	1.00	8.2	0.200	0.100	107.59	4.2	19.1
33	0.220	13743	0.000	0.000	1.00	8.4	0.200	0.100	110.96	4.2	19.1
34	0.220	13743	0.000	0.000	1.00	8.6	0.200	0.100	114.32	4.2	19.1
35	0.220	13743	0.000	0.000	1.00	8.8	0.200	0.100	117.68	4.2	19.1
Toe						35.1	0.150	0.140			

7.688 kips total unreduced pile weight (g= 32.17 ft/s2)
7.688 kips total reduced pile weight (g= 32.17 ft/s2)

Depth ft	Stroke ft	Pressure Ratio	Efficy
117.68	10.81	1.00	0.800

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Rut kips	Bl Ct b/ft	Stroke (ft) down	up	Ten Str ksi	i	t	Comp Str ksi	i	t	ENTHRU kip-ft	Bl Rt b/min
366.9	82.0	8.40	8.41	-1.20	5	42	24.02	5	4	17.1	40.8
384.3	100.3	8.46	8.45	-1.40	5	42	24.18	5	4	17.2	40.6
401.7	128.2	8.52	8.50	-1.51	5	43	24.28	5	4	17.3	40.5
419.1	170.2	8.58	8.55	-1.54	5	43	24.40	5	4	17.4	40.4
436.6	222.0	8.63	8.59	-1.53	5	43	24.51	5	4	17.5	40.3

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SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.400 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.8	0.0	0.0	0.0	0.0	0.000	0.000	10.81	0.0
15.7	196.9	8.3	188.6	23.8	22.727	-2.007	7.33	19.2
15.7	72.8	8.4	64.3	6.8	16.364	-0.734	6.03	19.7
17.2	75.7	11.4	64.3	7.1	16.505	-0.595	6.07	19.6
18.7	78.9	14.5	64.3	7.4	16.664	-0.487	6.11	19.5
18.7	136.0	14.7	121.4	14.9	18.482	-1.361	6.82	18.9
25.0	182.1	45.6	136.6	20.3	20.290	-2.835	7.14	18.9
31.2	226.4	83.1	143.3	26.5	20.779	-4.608	7.41	19.2
31.2	109.3	83.3	26.0	8.7	17.894	-0.967	6.29	19.2
32.2	111.8	85.8	26.0	9.0	18.056	-0.958	6.32	19.1
33.2	114.4	88.4	26.0	9.3	18.249	-1.105	6.35	19.1
33.2	112.2	88.5	23.7	9.0	18.269	-1.225	6.34	19.1
34.7	116.6	92.9	23.7	9.5	18.528	-1.348	6.39	19.0
36.2	120.9	97.2	23.7	10.1	18.813	-1.611	6.44	18.9
36.2	123.4	97.4	26.0	10.4	18.783	-1.426	6.45	18.9
40.3	142.1	116.1	26.0	12.5	19.784	-3.497	6.63	18.7
44.5	162.3	136.3	26.0	14.8	20.561	-4.036	6.81	18.5
44.5	147.0	136.5	10.5	12.3	20.205	-3.536	6.66	18.6
47.0	150.7	140.1	10.5	12.9	20.369	-4.013	6.71	18.6
49.5	154.3	143.8	10.5	13.4	20.338	-4.400	6.76	18.4
49.5	157.0	143.8	13.1	13.8	20.401	-4.310	6.78	18.4
52.0	161.5	148.3	13.1	14.4	20.529	-4.420	6.83	18.2
54.5	166.0	152.8	13.1	14.9	21.008	-4.604	6.95	18.3
54.5	193.3	152.9	40.3	18.6	21.478	-3.736	7.13	18.0
69.5	240.3	199.9	40.3	26.7	22.008	-3.568	7.50	18.0
84.5	291.9	251.6	40.3	40.6	23.001	-4.058	7.88	18.1
84.5	286.8	251.7	35.1	38.8	22.949	-4.012	7.85	18.0
101.1	325.2	290.1	35.1	53.5	23.487	-2.686	8.13	17.7
117.7	366.9	331.8	35.1	82.0	24.018	-1.197	8.40	17.1

Total Driving Time 80 minutes; Total No. of Blows 3394
Starting at penetration 7.8 ft

G/L at Shaft and Toe: 0.450 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
15.7	196.9	8.3	188.6	23.8	22.727	-2.007	7.33	19.2
15.7	72.8	8.4	64.3	6.8	16.366	-0.734	6.03	19.7
17.2	75.9	11.6	64.3	7.1	16.541	-0.605	6.07	19.6
18.7	79.2	14.9	64.3	7.4	16.668	-0.470	6.11	19.5
18.7	136.4	15.0	121.4	15.0	18.490	-1.373	6.82	18.9
25.0	182.5	45.9	136.6	20.4	20.298	-2.855	7.14	18.9
31.2	226.8	83.5	143.3	26.5	20.760	-4.624	7.41	19.2
31.2	109.6	83.6	26.0	8.8	17.938	-1.013	6.30	19.2

32.2	112.3	86.3	26.0	9.0	18.098	-1.008	6.33	19.1
33.2	115.0	89.0	26.0	9.4	18.285	-1.139	6.36	19.1
33.2	112.8	89.1	23.7	9.1	18.273	-1.202	6.34	19.1
34.7	117.4	93.8	23.7	9.6	18.567	-1.388	6.39	19.0
36.2	122.0	98.4	23.7	10.2	18.857	-1.601	6.45	18.9
36.2	124.5	98.5	26.0	10.6	18.825	-1.637	6.46	18.9
40.3	143.2	117.2	26.0	12.7	19.823	-3.530	6.65	18.7
44.5	163.4	137.5	26.0	14.9	20.615	-4.028	6.81	18.5
44.5	148.1	137.6	10.5	12.4	20.250	-3.631	6.67	18.6
47.0	152.0	141.4	10.5	13.1	20.367	-4.071	6.72	18.5
49.5	155.8	145.3	10.5	13.6	20.426	-4.476	6.77	18.4
49.5	158.5	145.4	13.1	14.0	20.449	-4.296	6.79	18.3
52.0	163.2	150.1	13.1	14.7	20.574	-4.337	6.85	18.2
54.5	168.0	154.8	13.1	15.2	21.059	-4.490	6.96	18.2
54.5	195.3	154.9	40.3	18.9	21.529	-3.696	7.14	18.0
69.5	244.9	204.5	40.3	27.6	22.117	-3.810	7.54	18.1
84.5	299.3	259.0	40.3	43.0	23.149	-4.061	7.93	18.3
84.5	294.2	259.1	35.1	41.0	23.099	-4.005	7.90	18.2
101.1	337.4	302.3	35.1	58.5	23.801	-2.869	8.30	18.1
117.7	384.3	349.2	35.1	100.3	24.178	-1.401	8.46	17.2

Total Driving Time 88 minutes; Total No. of Blows 3686
Starting at penetration 7.8 ft

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.500 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
15.7	196.9	8.3	188.6	23.8	22.727	-2.007	7.33	19.2
15.7	72.8	8.4	64.3	6.8	16.365	-0.734	6.03	19.7
17.2	76.1	11.7	64.3	7.1	16.538	-0.595	6.07	19.6
18.7	79.5	15.2	64.3	7.5	16.695	-0.461	6.12	19.5
18.7	136.7	15.3	121.4	15.0	18.482	-1.386	6.82	18.9
25.0	182.8	46.2	136.6	20.4	20.326	-2.873	7.14	18.9
31.2	227.1	83.8	143.3	26.6	20.746	-4.640	7.42	19.2
31.2	109.9	84.0	26.0	8.8	17.936	-0.994	6.30	19.2
32.2	112.7	86.8	26.0	9.1	18.105	-1.000	6.33	19.1
33.2	115.6	89.7	26.0	9.4	18.330	-1.188	6.37	19.1
33.2	113.5	89.8	23.7	9.2	18.316	-1.230	6.35	19.1
34.7	118.3	94.6	23.7	9.7	18.610	-1.442	6.40	19.0
36.2	123.1	99.5	23.7	10.3	18.902	-1.588	6.45	18.9
36.2	125.6	99.6	26.0	10.7	18.867	-1.869	6.47	18.9
40.3	144.3	118.3	26.0	12.8	19.874	-3.566	6.65	18.7
44.5	164.5	138.6	26.0	14.9	20.768	-4.028	6.89	18.7
44.5	149.2	138.7	10.5	12.6	20.296	-3.761	6.68	18.6
47.0	153.3	142.7	10.5	13.2	20.413	-4.157	6.73	18.5
49.5	157.3	146.8	10.5	13.8	20.430	-4.467	6.78	18.3
49.5	160.0	146.9	13.1	14.2	20.530	-4.292	6.81	18.4
52.0	165.0	151.8	13.1	14.7	20.777	-4.345	6.93	18.4
54.5	170.0	156.8	13.1	15.4	21.104	-4.374	6.97	18.2
54.5	197.3	156.9	40.3	19.2	21.571	-3.647	7.16	18.0
69.5	249.4	209.1	40.3	28.5	22.184	-4.034	7.57	18.1
84.5	306.7	266.4	40.3	46.0	23.212	-4.063	7.98	18.3
84.5	301.6	266.5	35.1	43.7	23.201	-4.022	7.95	18.3
101.1	349.6	314.5	35.1	66.7	23.751	-2.993	8.27	18.0
117.7	401.7	366.6	35.1	128.2	24.280	-1.509	8.52	17.3

Total Driving Time 98 minutes; Total No. of Blows 4115

Starting at penetration 7.8 ft

G/L at Shaft and Toe: 0.550 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
15.7	196.9	8.3	188.6	23.8	22.727	-2.007	7.33	19.2
15.7	72.8	8.4	64.3	6.8	16.365	-0.734	6.03	19.7
17.2	76.2	11.9	64.3	7.2	16.538	-0.582	6.07	19.6
18.7	79.9	15.5	64.3	7.5	16.666	-0.433	6.12	19.5
18.7	137.1	15.7	121.4	15.1	18.480	-1.399	6.82	18.8
25.0	183.2	46.6	136.6	20.4	20.358	-2.892	7.15	18.9
31.2	227.5	84.1	143.3	26.7	20.723	-4.658	7.42	19.2
31.2	110.3	84.3	26.0	8.8	17.937	-0.977	6.31	19.2
32.2	113.2	87.3	26.0	9.1	18.150	-1.035	6.34	19.1
33.2	116.2	90.3	26.0	9.5	18.332	-1.200	6.37	19.0
33.2	114.1	90.4	23.7	9.2	18.318	-1.212	6.36	19.0
34.7	119.2	95.5	23.7	9.8	18.647	-1.495	6.41	19.0
36.2	124.2	100.6	23.7	10.4	18.940	-1.608	6.47	18.9
36.2	126.7	100.7	26.0	10.8	18.912	-2.075	6.48	18.9
40.3	145.4	119.4	26.0	12.9	19.924	-3.598	6.66	18.7
44.5	165.6	139.7	26.0	15.1	20.779	-4.022	6.89	18.6
44.5	150.3	139.8	10.5	12.7	20.338	-3.857	6.69	18.6
47.0	154.6	144.1	10.5	13.4	20.461	-4.229	6.74	18.5
49.5	158.8	148.3	10.5	14.0	20.473	-4.458	6.79	18.3
49.5	161.5	148.4	13.1	14.4	20.572	-4.247	6.82	18.3
52.0	166.7	153.6	13.1	15.0	20.827	-4.252	6.94	18.4
54.5	172.0	158.8	13.1	15.7	21.155	-4.261	6.98	18.1
54.5	199.3	158.9	40.3	19.4	21.615	-3.597	7.17	18.0
69.5	254.0	213.7	40.3	29.6	22.250	-4.244	7.60	18.1
84.5	314.1	273.8	40.3	48.7	23.364	-4.053	8.03	18.5
84.5	309.0	273.9	35.1	46.6	23.302	-4.022	8.00	18.4
101.1	361.8	326.7	35.1	74.5	23.894	-3.075	8.33	18.1
117.7	419.1	384.0	35.1	170.2	24.399	-1.538	8.58	17.4

Total Driving Time 112 minutes; Total No. of Blows 4659
Starting at penetration 7.8 ft

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

SUMMARY OVER DEPTHS

G/L at Shaft and Toe: 0.600 1.000

Depth ft	Rut kips	Frictn kips	End Bg kips	Bl Ct bl/ft	Com Str ksi	Ten Str ksi	Stroke ft	ENTHRU kip-ft
7.8	0.0	0.0	0.0	0.0	0.000	0.000	11.86	0.0
15.7	196.9	8.3	188.6	23.8	22.727	-2.007	7.33	19.2
15.7	72.8	8.4	64.3	6.8	16.369	-0.738	6.03	19.7
17.2	76.4	12.0	64.3	7.2	16.531	-0.575	6.08	19.6
18.7	80.2	15.9	64.3	7.5	16.699	-0.426	6.12	19.5
18.7	137.4	16.0	121.4	15.1	18.514	-1.409	6.83	18.9
25.0	183.5	46.9	136.6	20.5	20.383	-2.911	7.14	18.9
31.2	227.8	84.5	143.3	26.7	20.760	-4.674	7.43	19.2
31.2	110.6	84.7	26.0	8.9	17.982	-1.039	6.31	19.2
32.2	113.7	87.7	26.0	9.2	18.157	-1.050	6.34	19.1
33.2	116.9	90.9	26.0	9.6	18.370	-1.238	6.38	19.0
33.2	114.7	91.0	23.7	9.3	18.354	-1.234	6.36	19.0
34.7	120.0	96.3	23.7	9.9	18.691	-1.547	6.42	19.0
36.2	125.3	101.7	23.7	10.6	18.983	-1.834	6.48	18.9
36.2	127.8	101.8	26.0	11.0	18.984	-2.207	6.50	18.9
40.3	146.5	120.5	26.0	13.1	19.962	-3.623	6.68	18.7
44.5	166.7	140.8	26.0	15.2	20.833	-4.000	6.90	18.6

44.5	151.4	140.9	10.5	12.8	20.383	-3.928	6.70	18.6
47.0	155.9	145.4	10.5	13.5	20.507	-4.281	6.75	18.4
49.5	160.3	149.8	10.5	14.1	20.559	-4.485	6.81	18.4
49.5	163.0	149.9	13.1	14.5	20.619	-4.160	6.83	18.3
52.0	168.5	155.4	13.1	15.2	20.882	-4.183	6.95	18.3
54.5	174.0	160.8	13.1	15.9	21.204	-4.154	6.99	18.1
54.5	201.3	160.9	40.3	19.7	21.656	-3.542	7.19	18.0
69.5	258.6	218.3	40.3	30.5	22.389	-4.442	7.66	18.3
84.5	321.5	281.2	40.3	51.7	23.466	-4.086	8.07	18.6
84.5	316.4	281.3	35.1	49.5	23.405	-4.018	8.05	18.5
101.1	374.1	339.0	35.1	84.2	24.037	-3.155	8.40	18.2
117.7	436.6	401.5	35.1	222.0	24.510	-1.530	8.63	17.5

Total Driving Time 128 minutes; Total No. of Blows 5316
Starting at penetration 7.8 ft

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CCG3A : 04/13/2022 : KCA 06/20/2022
National Engineering & Architectural Ser GRLWEAP Version 2010

Table of Depths Analyzed with Driving System Modifiers

Depth ft	Temp. Length ft	Wait Time hr	Equivalent Stroke ft	Pressure Ratio	Efficy.	Stiffn. Factor	Cushion CoR
7.85	117.68	0.00	10.81	1.00	0.80	1.00	1.00
15.68	117.68	0.00	10.81	1.00	0.80	1.00	1.00
15.72	117.68	0.00	10.81	1.00	0.80	1.00	1.00
17.20	117.68	0.00	10.81	1.00	0.80	1.00	1.00
18.68	117.68	0.00	10.81	1.00	0.80	1.00	1.00
18.72	117.68	0.00	10.81	1.00	0.80	1.00	1.00
24.95	117.68	0.00	10.81	1.00	0.80	1.00	1.00
31.18	117.68	0.00	10.81	1.00	0.80	1.00	1.00
31.22	117.68	0.00	10.81	1.00	0.80	1.00	1.00
32.20	117.68	0.00	10.81	1.00	0.80	1.00	1.00
33.18	117.68	0.00	10.81	1.00	0.80	1.00	1.00
33.22	117.68	0.00	10.81	1.00	0.80	1.00	1.00
34.70	117.68	0.00	10.81	1.00	0.80	1.00	1.00
36.18	117.68	0.00	10.81	1.00	0.80	1.00	1.00
36.22	117.68	0.00	10.81	1.00	0.80	1.00	1.00
40.35	117.68	0.00	10.81	1.00	0.80	1.00	1.00
44.48	117.68	0.00	10.81	1.00	0.80	1.00	1.00
44.52	117.68	0.00	10.81	1.00	0.80	1.00	1.00
47.00	117.68	0.00	10.81	1.00	0.80	1.00	1.00
49.48	117.68	0.00	10.81	1.00	0.80	1.00	1.00
49.52	117.68	0.00	10.81	1.00	0.80	1.00	1.00
52.00	117.68	0.00	10.81	1.00	0.80	1.00	1.00
54.48	117.68	0.00	10.81	1.00	0.80	1.00	1.00
54.52	117.68	0.00	10.81	1.00	0.80	1.00	1.00
69.50	117.68	0.00	10.81	1.00	0.80	1.00	1.00
84.48	117.68	0.00	10.81	1.00	0.80	1.00	1.00
84.52	117.68	0.00	10.81	1.00	0.80	1.00	1.00
101.08	117.68	0.00	10.81	1.00	0.80	1.00	1.00
117.68	117.68	0.00	10.81	1.00	0.80	1.00	1.00

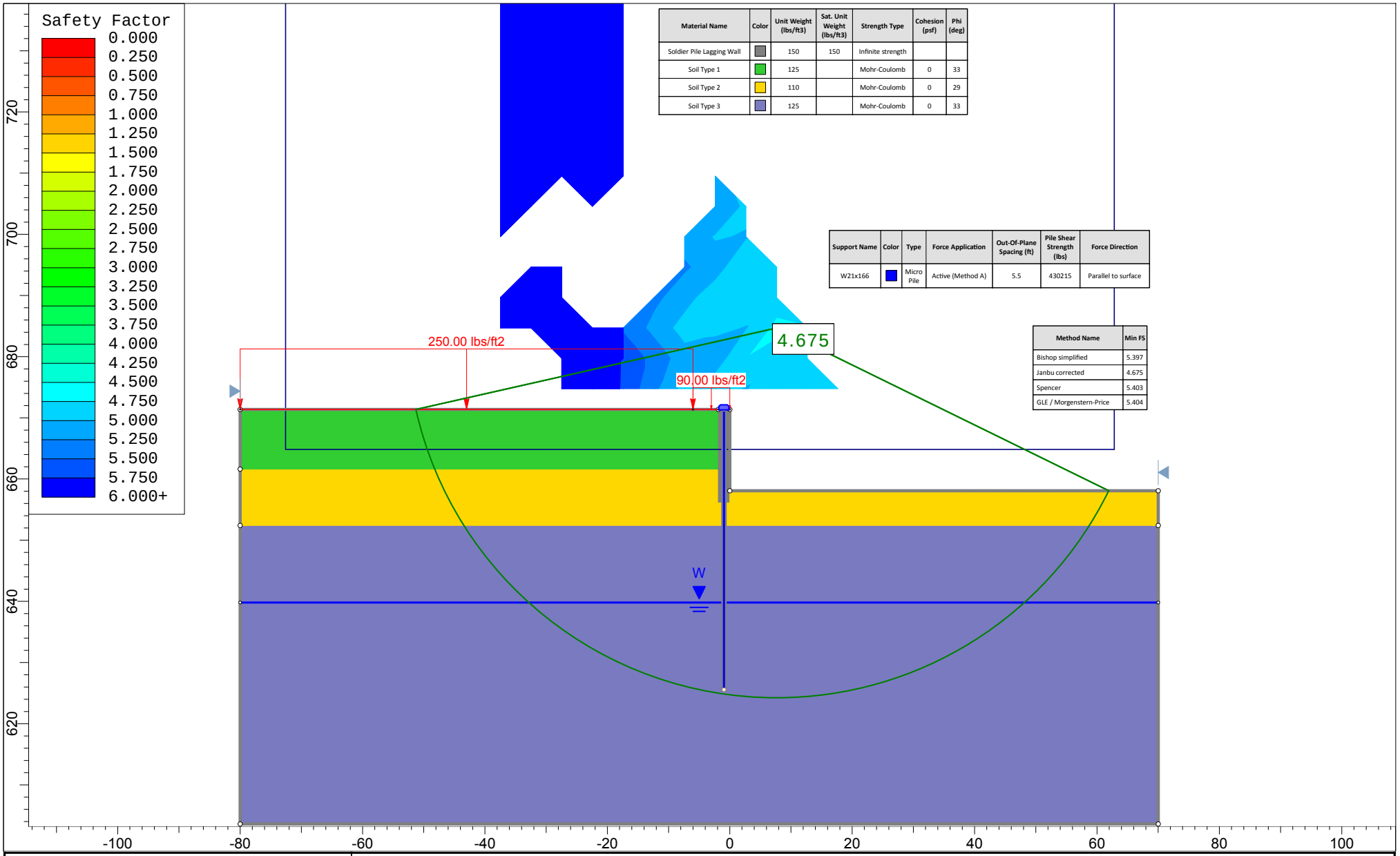
Soil Layer Resistance Values

Depth ft	Shaft Res. k/ft2	End Bearing kips	Shaft Quake inch	Toe Quake inch	Shaft Damping s/ft	Toe Damping s/ft	Soil Setup Normlzd	Limit Distance ft	Setup Time hrs
0.01	0.00	0.00	0.100	0.140	0.050	0.150	0.000	6.000	1.000
8.29	0.00	0.00	0.100	0.140	0.050	0.150	0.000	6.000	1.000
8.31	0.00	0.00	0.100	0.140	0.050	0.150	0.000	6.000	1.000

14.19	0.00	0.00	0.100	0.140	0.050	0.150	0.000	6.000	1.000
14.20	1.29	176.97	0.100	0.140	0.050	0.150	0.000	6.000	1.000
15.69	1.38	188.70	0.100	0.140	0.050	0.150	0.000	6.000	1.000
15.71	0.77	64.34	0.100	0.160	0.100	0.150	0.660	6.000	24.000
18.69	0.86	64.34	0.100	0.160	0.100	0.150	0.660	6.000	24.000
18.71	1.06	121.36	0.100	0.150	0.050	0.150	0.000	6.000	1.000
27.71	1.42	143.33	0.100	0.150	0.050	0.150	0.000	6.000	1.000
31.19	1.57	143.33	0.100	0.150	0.050	0.150	0.000	6.000	1.000
31.21	1.01	25.97	0.100	0.190	0.100	0.150	0.660	6.000	24.000
33.19	1.06	25.97	0.100	0.190	0.100	0.150	0.660	6.000	24.000
33.21	1.17	23.68	0.100	0.150	0.100	0.150	0.660	6.000	24.000
36.19	1.17	23.68	0.100	0.150	0.100	0.150	0.660	6.000	24.000
36.21	1.04	25.97	0.100	0.230	0.050	0.150	0.000	6.000	1.000
44.49	1.21	25.97	0.100	0.230	0.050	0.150	0.000	6.000	1.000
44.51	0.58	10.53	0.100	0.190	0.150	0.150	0.660	6.000	24.000
49.49	0.58	10.53	0.100	0.190	0.150	0.150	0.660	6.000	24.000
49.51	0.71	13.15	0.100	0.180	0.150	0.150	0.660	6.000	168.000
54.49	0.71	13.15	0.100	0.180	0.150	0.150	0.660	6.000	168.000
54.51	1.23	40.35	0.100	0.140	0.150	0.150	0.660	6.000	168.000
63.51	1.23	40.35	0.100	0.140	0.150	0.150	0.660	6.000	168.000
72.51	1.30	40.35	0.100	0.140	0.150	0.150	0.660	6.000	168.000
81.51	1.42	40.35	0.100	0.140	0.150	0.150	0.660	6.000	168.000
84.49	1.47	40.35	0.100	0.140	0.150	0.150	0.660	6.000	168.000
84.51	1.38	35.09	0.100	0.140	0.200	0.150	1.000	6.000	168.000
93.51	1.38	35.09	0.100	0.140	0.200	0.150	1.000	6.000	168.000
102.51	1.42	35.09	0.100	0.140	0.200	0.150	1.000	6.000	168.000
111.51	1.52	35.09	0.100	0.140	0.200	0.150	1.000	6.000	168.000
117.68	1.59	35.09	0.100	0.140	0.200	0.150	1.000	6.000	168.000

APPENDIX F

GLOBAL STABILITY ANALYSIS



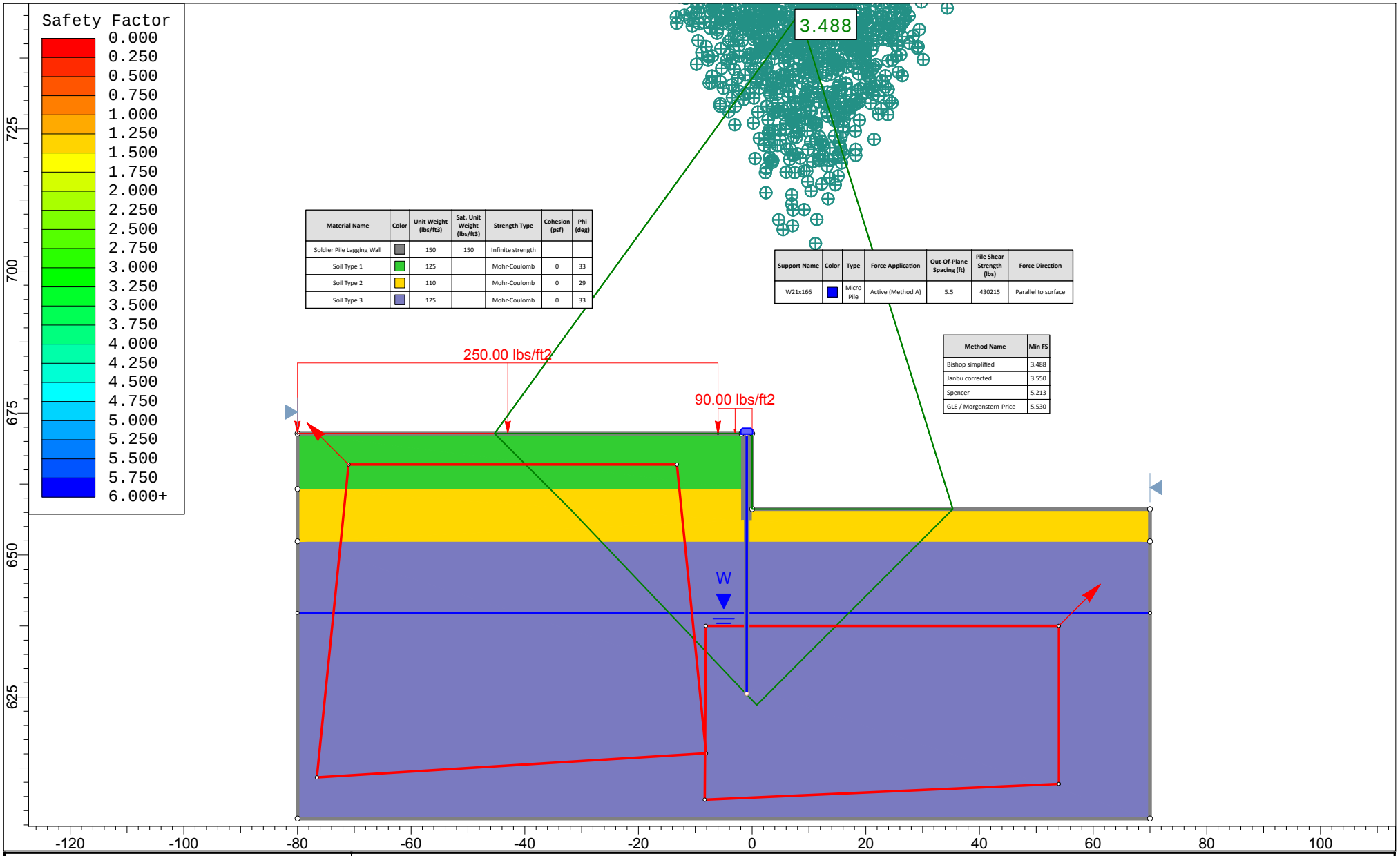
Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Soldier Pile Lagging Wall		150	150	Infinite strength		
Soil Type 1		125		Mohr-Coulomb	0	33
Soil Type 2		110		Mohr-Coulomb	0	29
Soil Type 3		125		Mohr-Coulomb	0	33

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Pile Shear Strength (lbs)	Force Direction
W21x166		Micro Pile	Active (Method A)	5.5	430215	Parallel to surface

Method Name	Min FS
Bishop simplified	5.397
Janbu corrected	4.675
Spencer	5.403
GLE / Morgenstern-Price	5.404

SLIDEINTERPRET 7.038

Project	CCGA Retaining Wall-AI		
Analysis Description	STA 1+00		
Drawn By	ZM	*Scale*	1:260
Company	National Engineering & Architectural Services, Inc
Date	9/20/2021	*File Name*	WallAI_STA1+00_Circular_Effective_092821.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Soldier Pile Lagging Wall		150	150	Infinite strength		
Soil Type 1		125		Mohr-Coulomb	0	33
Soil Type 2		110		Mohr-Coulomb	0	29
Soil Type 3		125		Mohr-Coulomb	0	33

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Pile Shear Strength (lbs)	Force Direction
W21x166		Micro Pile	Active (Method A)	5.5	430215	Parallel to surface

Method Name	Min FS
Bishop simplified	3.488
Janbu corrected	3.550
Spencer	5.213
GLE / Morgenstern-Price	5.530

Project	CCGA Retaining Wall-AI		
Analysis Description	STA 1+00		
Drawn By	ZM	Scale	1:280
Company	National Engineering & Architectural Services, Inc		
Date	9/20/2021	File Name	WallAI_STA1+00_Block_Effective_092821.slim

SLIDEINTERPRET 7.038

APPENDIX G

SEISMIC SITE CLASSIFICATION CALCULATION

Seismic Site Classification - Bridge CUY-90-1696

B-169-4-20			
Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N
4.6	4.6	12.5	0.37
22.1	17.5	24.0	0.73
41.1	19.0	15.2	1.25
63.4	22.3	10.8	2.07
100.0	36.6	17.0	2.15
Sum	100		6.57
N-avg	15.2		

B-169-7-20			
Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N
11.2	11.2	26.0	0.43
17.5	6.3	11.5	0.55
32.5	15.0	14.3	1.05
72.5	40.0	22.0	1.82
87.5	15.0	5.3	2.81
100.0	12.5	13.0	0.96
Sum	100		7.62
N-avg	13.1		

B-169-8-20			
Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N
7.3	7.3	25.3	0.29
11.2	3.9	23.0	0.17
32.5	21.3	15.0	1.42
72.5	40.0	23.8	1.68
82.5	10.0	7.0	1.43
100.0	17.5	11.7	1.50
Sum	100		6.49
N-avg	15.4		

B-170-0-14			
Depth (ft)	Layer Thickness, d (ft)	Avg. SPT Value, N (bpf)	d/N
29.4	29.4	28.0	1.05
34.4	5.0	30.0	0.17
64.4	30.0	12.0	2.50
74.4	10.0	20.0	0.50
100.0	25.6	13.7	1.87
Sum	100		6.09
N-avg	16.4		

B-170-3-14			
Depth	d	N	d/N
35.6	35.6	29.0	1.23
40.6	5.0	13.0	0.38
49.4	8.8	8.0	1.10
59.4	10.0	5.5	1.82
100.0	40.6	17.4	2.34
Sum	100		6.87
N-avg	14.6		

Site Average	14.9