FOUNDATION REPORT FOR LACK ROAD BRIDGE REPLACEMENT OVER NEW RIVER

September 20, 2019

Prepared For:

Imperial County Department of Public Works
155 S. 11th Street
El Centro, California 92243

Lack Road Bridge Replacement
Over New River
Bridge No. 58C-101
Imperial County, CA

NV5 PROJECT No.: 227518-0000439

NV5 West, Inc.
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Imperial County Department of Public Works
155 S. 11th Street
El Centro, California 92243

September 20, 2019
NV5 Project No: 227518-0000439

Attention: **Ms. Jenell Guerrero, MPA - Administrative Analyst II**

Subject: Foundation Report for Lack Road Bridge Replacement

Project: Lack Road Bridge Replacement Over New River
Bridge No. 58C-101
Imperial County, California

Dear Ms. Guerrero:

As requested, NV5 is pleased to present the results of the Foundation Report (FR) for design of the proposed replacement of the Lack Road Bridge Replacement Over New River (Bridge No. 58C-101). This study was conducted in conformance with NV5 West, Inc.'s (NV5) proposal dated February 21, 2018, submitted to NV5 Infrastructure.

NV5 appreciates the opportunity to be of service. Please do not hesitate to contact us if you have any questions or comments.

Respectfully submitted,

NV5 West, Inc.

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1.0 INTRODUCTION

This report presents results of NV5's foundation investigations for the proposed replacement of the Lack Road Bridge (Bridge No. 58C-101) located over New River in Imperial County, California. The approximate location of the project area is shown on *Figure 1, Site Location Map*.

The purpose of this report is to summarize the results of the recent geotechnical study conducted by the geotechnical group of NV5 West, Inc. and provide seismic and foundation design recommendations for the proposed replacement of the existing bridge structure. This report summarizes the data collected and presents findings, conclusions, and recommendations.

2.0 SCOPE OF WORK

NV5's scope of work for this project included the following tasks:

- Review of readily available background data, published geologic maps, topographic maps, seismic hazard maps and literature relevant to the subject site.
- Performing a site reconnaissance to observe the general surficial site conditions, check for accessibility, and select the exploratory boring locations.
- Coordinating with entities having an interest in the field exploration activities the drilling subcontractor (Baja Exploration), and Underground Service Alert (USA) for mark-out prior to site exploration.
- Conducting a subsurface investigation, which included the drilling, logging, and sampling of two (2) exploratory borings (A-19-001 and A-19-002) located within the project area to a maximum depth of approximately 100 feet below ground surface (bgs). Soil samples obtained from the borings were transported to NV5's in-house laboratory for observation and testing.
- Performing laboratory testing on selected representative bulk and relatively undisturbed soil samples obtained during the field exploration program to evaluate their pertinent geotechnical engineering properties.
- Performing an assessment of general seismic conditions and geotechnical hazards affecting the area and potential impacts on the subject project.
- Engineering evaluation of the data collected to develop geotechnical design parameters and recommendations for the design of the proposed construction.
- Preparation of this report.

This scope of this study did not include assessment for the presence of contaminants in the soils and groundwater. Our recommendations are based on the results of our field explorations, laboratory tests, engineering analyses, and our previous experience working on similar projects.

3.0 SITE AND PROJECT DESCRIPTION

The proposed replacement of the Lack Road Bridge over New River is located near Westmorland in Imperial County, California. The area in the immediate vicinity of the project limits is relatively flat. The elevation at the project site is approximately 215 feet below mean sea level. The New River flows beneath Lack Road at the location of the bridge replacement (refer to *Figure 2, Boring Location Map*). The area surrounding the bridge consists predominantly of agricultural fields, and the natural river channel which has limited wetland and riparian (mainly tamarisk) vegetation. All elevations referenced within this report are based on the World Geodetic System of 1984 (WGS84), unless otherwise noted.

Based on preliminary information provided by Imperial County Department of Public Works (dated January 18, 2018), it is understood that the proposed construction includes the replacement and widening of the existing bridge at Lack Road over the New River. The bridge was closed to all traffic by the County when they discovered a failed pile/column in August 2016. The existing bridge was constructed in 1940, is approximately 106 feet in length, 27 feet wide and is currently supported by treated timber pile bents and pile abutments with timber lagging walls

4.0 EXCEPTIONS TO POLICIES AND PROCEDURES

The geotechnical investigation and preparation of this report generally conforms to current Caltrans design guidelines and practices presented in the References section of this report.

5.0 FIELD INVESTIGATION AND FIELD TESTING PROGRAM

Before starting NV5's field exploration program, Underground Service Alert was notified of the operations for underground utility marking at the locations of exploration. The subsurface conditions were explored on March 18th and 19th, 2019 by drilling, logging and sampling of two (2) exploratory borings (A-19-001 and A-19-002). The borings were drilled to a maximum depth (each) of about 100 feet bgs by Baja Exploration using a CME-95 truck mounted drill rig equipped with hollow-stem augers.

The borings were logged by an NV5 geologist. Representative samples of the soils encountered were obtained for visual soils classification and laboratory testing. The soil conditions encountered in the borings were visually examined, classified, and logged in general accordance with the Caltrans *Soil & Rock Logging, Classification, and Presentation Manual (*2010) and its associated errata (August 2018). The logs of the exploratory test borings are presented in *Appendix A, Boring Records*. The approximate locations of the exploratory borings are presented on *Figure 2, Boring Location Map*. Subsequent to logging and sampling, the borings were backfilled.

The bulk and relatively undisturbed drive samples of the soils encountered in the borings were tagged in the field and transported to NV5's laboratory for observation and testing. The drive samples were obtained using the California Modified Split Spoon and Standard Penetration Test (SPT) samplers, as described below. The CME-95 truck mounted drill rig's driving hammer was previously calibrated for SPT sampling and realized an average hammer efficiency ratio (ERi) of 67.9%).

California Modified Split Spoon Sampler

The split barrel drive sampler was driven with a 140-pound hammer allowed to drop freely 30 inches in general accordance with ASTM D1587. The number of blows for the last two of three 6-inch intervals were recorded during sampling and are presented in the logs of borings. The sampler has external and internal diameters of approximately 3.0 and 2.4 inches, respectively, and the inside of the sampler is lined with 1-inch-long brass rings. The relatively undisturbed soil samples within the rings were removed, sealed, and transported to the laboratory for observation and testing.

Standard Penetration Test (SPT) Sampler

A split barrel sampler was driven with a 140-pound hammer allowed to drop freely 30 inches in general accordance with ASTM D1586. The numbers of blows for the last two of three 6-inch intervals were recorded during sampling and are presented in the logs of borings (i.e., N-value). The sampler has external and internal diameters of 2.0 and 1.4 inches, respectively. The soil samples obtained in the interior of the barrel were measured, removed, sealed and transported to the laboratory for observation and testing.

6.0 LABORATORY TESTING PROGRAM

Laboratory testing was performed on selected representative bulk and relatively undisturbed soil samples obtained from the exploratory borings, to aid in the material classifications and to evaluate engineering properties of the materials encountered (see *Appendix B, Laboratory Test Results*). The following tests were performed:

- In-situ density and moisture content (ASTM D2937 and ASTM D2216);
- Particle size analyses (ASTM D6913, ASTM D2487 and ASTM D422);
- Atterberg Limits (ASTM 4318);
- Direct Shear (ASTM D3080);
- R-Value (ASTM D2844);
- Expansion Index (ASTM D4829); and
- Corrosivity test series including sulfate content, chloride content, pH-value, and resistivity (CTM 417, 422 and 643, respectively).

Testing was performed in general accordance with applicable ASTM standards and California Test Methods. A summary of the laboratory testing program and the laboratory test results are presented in *Appendix B, Laboratory Test Results*.

7.0 GEOLOGY

7.1 SITE GEOLOGY

The project site is located in Imperial County in the southern portion of the Salton Trough, a structural depression within the Colorado Desert geomorphic province. This province is generally a low-lying barren desert basin (in part about 230 feet below mean sea level) dominated by the Salton Sea. The province is a depressed block between active branches of the San Andreas fault system. The fault branches are buried by recent alluvial deposits. The dominant structural features related to the San Andreas fault system consist of northwest-trending faults and fault zones. The major northwest-trending fault zones include the San Jacinto fault, Imperial fault, the Superstition Hills fault, the Elsinore fault and the San Andreas fault. The Salton Trough has been inundated during the Quaternary by an ancient freshwater lake (Lake Cahuilla) which resulted in a sequence of lacustrine (lake) deposits consisting of interbedded sand, silt and clay. Remnants of the ancient shorelines of the extinct Lake Cahuilla remain prevalent in the Salton Trough.

7.2 SUBSURFACE CONDITIONS

Geologic materials encountered during the subsurface explorations consisted of natural deposits mapped as Quaternary-aged lake deposits known as the Cahuilla Beds (Ql) on published geologic maps. *Figure 3, Regional Geologic Map* presents the general distribution of geologic units in the site area. As encountered in the borings, the soils ranged from brown, dry to wet, soft to hard lean clay with lenses of fat clay, and loose to very dense silty sands and clayey sands. Detailed descriptions of the earth materials encountered are presented on the boring records in *Appendix A*.

7.3 GROUNDWATER

Groundwater was encountered in the exploratory borings at depths between approximately 18 and 19 feet bgs, as indicated in the following Table 1. Water elevation measurements were also taken at the New River beneath the existing bridge where it is approximately 12 feet below the roadway elevation. The New River, per the Imperial County Health Department, is polluted with both biological and chemical wastes and has been designated as a Class 4 contaminated waterway.

Table 1 - Depth to Groundwater as Measured in Each Boring

Boring Number	Depth to Groundwater
A-19-001	18 feet
A-19-002	19 feet

Groundwater levels may vary due to seasonal fluctuations and factors such as a substantial increase in surface water infiltration from landscape irrigation, agricultural activity, storage facility leaks or unusually heavy precipitation. There is uncertainty in the accuracy of short-term groundwater level measurements, particularly in fine-grained soil. The groundwater level, as reported herein, should not be interpreted to represent an accurate or permanent condition. Seasonal variations in the groundwater levels should be anticipated.

8.0 SCOUR EVALUATION

The proposed bridge structure spans over the New River. The bridge inspection report prepared by Caltrans (dated December 13, 2017) indicates that soft near-surface soils have eroded away at one end of the bridge, reducing the effective embedment depth of the piles.

9.0 CORROSION EVALUATION

The corrosion potential of the on-site materials to steel and buried concrete was evaluated. Laboratory testing was performed on selected soil samples to evaluate pH, minimum resistivity, and chloride and soluble sulfate content. Table 2 below, presents the results of the corrosivity testing.

Table 2 - Corrosivity Test Results

Test Location	Depth (feet)	Material Type	pH	Minimum Resistivity (ohm-cm)	Water Soluble Sulfate Content (ppm)	Water Soluble Chloride Content (ppm)
A-19-001	15 - 26.5	Lean Clay	8.3	82	2700	6410
A-19-002	13 - 26.5	Lean Clay	8.2	93	2880	5340

General recommendations to address the corrosion potential of the on-site soils are provided below. If additional recommendations are desired, it is recommended that a corrosion specialist be consulted.

Caltrans Corrosion Guidelines dated March 2018 considers a site to be corrosive if one or more of the following conditions exist for the representative soil samples taken at the site:

> *Chloride concentration is 500 ppm or greater, sulfate concentration is 1500 ppm or greater, or the pH is 5.5 or less*

Based on experience and the Caltrans Corrosion Guidelines, the site soils are considered corrosive to steel and concrete foundation elements based on sulfate and chloride test results. As noted previously, the Salton Trough has been inundated during the Quaternary by an ancient freshwater lake (Lake Cahuilla) which resulted in a sequence of lacustrine (lake) deposits consisting of interbedded sand, silt and clay. Remnants of the ancient shorelines of the extinct Lake Cahuilla remain prevalent in the Salton Trough. These Cahuilla Beds also contain evaporite salt deposits that are high in chloride and sulfate minerals which can be extremely corrosive to steel and concrete. At a minimum, the use of Type V cement should be considered for use in the foundations and substructures (Abutments). The use of epoxy coated reinforcement may also be considered for use. Additional concrete cover for reinforcement is also a consideration.

As indicated in the 2006 edition (second edition) of "Corrosion Basics - An Introduction," a general guideline for soil resistivity and corrosion-severity ratings is presented in Table 3 below.

Table 3 - Corrosivity Test Results

Soil Resistivity	Corrosivity
<1,000 ohm-cm	Extremely Corrosive
1,000 to 3,000 ohm-cm	Highly Corrosive
3,000 to 5,000 ohm-cm	Corrosive
5,000 to 10,000 ohm-cm	Moderately Corrosive
10,000 to 20,000 ohm-cm	Mildly Corrosive
>20,000 ohm-cm	Essentially Noncorrosive

Soil resistivity is not the only parameter affecting the risk of corrosion damage; and a high soil resistivity will not guarantee the absence of serious corrosion. For example, the American Water Works Association (AWWA) has developed a numerical soil-corrosivity scale, applicable to cast-iron alloys. The soil resistivity test results suggest the potential for soils to be extremely corrosive to ferrous pipes.

Any imported soils should be evaluated for corrosion characteristics if they will be in contact with buried or at-grade structures and appropriate mitigation measures should be included in the structure design. It is recommended that a corrosion specialist be contacted to determine mitigation measures for the proposed abutment and foundation construction.

10.0 SEISMIC DESIGN INFORMATION AND RECOMMENDATIONS

The principal seismic considerations for most facilities in southern California are damage caused by surface rupturing of fault traces, ground shaking, seismically induced ground settlement and liquefaction. Potential impacts to the project due to faulting, seismicity and other geologic hazards are discussed in the following sections.

10.1 FAULTING AND SEISMICITY

The project site is located in the seismically active region in Southern California, which is within the influence of several fault systems that are considered to be active or potentially active. *Figure 4, Regional Fault Map*, depicts the site in relation to known active faults in the region. Recommended seismic ground motion design parameters are provided in the Seismic Design Parameter Section of this report.

The *Caltrans Fault Database and ARS Online Report (V2.0)* prepared by T. Shantz (2012a) lists several known active faults, defined as active within the late Quaternary time (within the past 700,000 years) and capable of producing a maximum moment magnitude (MMax) earthquake of 6.0 or greater when evaluated deterministically. Using the bridge site location coordinates of: Latitude = 33.100001 degrees North, Longitude = 115.648826 degrees West, a list of five significant faults obtained from the Caltrans *ARS Online Tool* (V2.3.09) is summarized in Table 4 below.

Table 4 - Summary of Significant Faults Based on Caltrans ARS Online

Fault Name	Caltrans Fault ID No.	Maximum Moment Magnitude (M_{Max})	Slip Rate (mm/yr)	Fault Type	Approximate Site to Fault Distance R_{rup}/R_x (km)
Brawley (Seismic Zone) alt 2	388	6.5	23.0	Strike Slip	4.47/4.47
Elmore Ranch	392	6.6	1.0	Strike Slip	9.86/9.86
San Jacinto (Superstition Mountain)	402	7.7	6.0	Strike Slip	22.81/22.80
San Jacinto-Lone Tree fault	398	6.6	1.0	Strike Slip	10.56/8.22
San Andreas (Coachella) rev	372	7.9	10.6	Strike Slip	28.46/8.78

Notes: R_{rup} = Closest distance to fault rupture plane, R_x = Horizontal distance to the fault trace or surface projection of the top of rupture plane

10.2 SEISMIC DESIGN PARAMETERS

A bridge design ARS curve was developed following the Caltrans guidelines, namely, *Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations* (Caltrans, 2012a) and the *Seismic Design Criteria, Version 2.0* (Caltrans, 2019), and the latest *ARS Online Tool (V2.3.09)*, which can be accessed at the link: http://dap3.dot.ca.gov/ARS_Online/.

Development of the bridge design ARS curve requires several input parameters, including site location coordinates (longitude and latitude), average shear wave velocity for the top 30 meters (100 feet) of soils (Vs30), and other site parameters, such as fault characteristics and site-to-fault distances.

Due to the lack of site specific geophysical data for the average shear wave velocity in the top 30 m (100 feet) of soils, VS30, a value of 270 m/s was used in the *ARS Online Tool,* assuming a Type D soil (based on soil conditions encountered in the test borings) for the site.

The current design approach incorporates the results of both deterministic and probabilistic seismic hazard analyses to produce the design response spectrum (ARS curve). The probabilistic base spectrum obtained from the ARS Online Tool has been checked to be within a 10% difference with the results from the USGS Unified Hazard seismic deaggregation analysis at the periods of 0.01s (PGA), 0.2s, 1.0 s and 2.0s as documented in the *Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations* (Caltrans, 2012a). The ARS calculation results show the probabilistic spectrum controls the design. The recommended design ARS curve is shown on *Figure 5, Recommended Bridge Design ARS Curve*. A summary of the computed deterministic and probabilistic acceleration response spectra, USGS seismic deaggregation spectrum, adjustment factors and final

envelope spectrum for the site is included in *Appendix C, ARS Curve Calculations*. Copies of the Caltrans ARS Online calculation outputs and the USGS Unified Hazard seismic deaggregation analyses are also included in Appendix C.

The values for the envelope of the spectral response based on ARS Online Version 2.3.09 (April 2017) are presented in the following Table 5. The spectral acceleration curve for the envelope is presented in Figure 5.

Table 5 - Spectral Envelope Values Based on Caltrans ARS Online (v2.3.09)

Period (sec)	S_A
0.01	0.611
0.05	0.934
0.1	1.121
0.15	1.248
0.2	1.346
0.25	1.322
0.3	1.303
0.4	1.190
0.5	1.110
0.6	1.040
0.7	0.990
0.85	0.914
1	0.851
1.2	0.719
1.5	0.585
2	0.449
3	0.277
4	0.197
5	0.162

10.3 SURFACE FAULT RUPTURE POTENTIAL

The project site is not located within an *Earthquake Fault Zone* delineated by the State of California for the hazard of fault surface rupture. The surface traces of known active or potentially active faults are not known to pass directly through the site. It should be noted that ground surface rupture due to a seismic event may occur in areas where no evidence of ground rupture had been previously noted. Based on the available geologic data, known active or potentially active faults with the potential for surface fault rupture are not known to exist beneath the site. Accordingly, the potential for surface rupture at the site due to faulting is considered low during the design life of the proposed structure.

10.4 SEISMIC SHAKING

The project site is located in southern California, which is considered a seismically active area, and as such, the seismic hazard most likely to impact the site is ground shaking resulting from an earthquake along one of the known active faults in the region. The seismic design of the project may be performed using seismic design recommendations in accordance with current Caltrans design methodology, and engineering practices presented in Section 11.0 of this report.

10.5 LIQUEFACTION AND SEISMICALLY-INDUCED SETTLEMENT

Liquefaction and dynamic settlement of soils can be caused by ground shaking during earthquakes. Dynamic settlement due to earthquake shaking can occur in both dry or unsaturated and saturated sands. Research and historical data indicate that loose, relatively clean granular soils are susceptible to liquefaction and dynamic settlement, whereas the stability of the majority of clayey silts, silty clays and clays is not adversely affected by ground shaking. Research through the California Department of Conservation indicate that the project area is not located within a designated Special Studies Zone.

Liquefaction is generally known to occur in saturated loose cohesionless soils at depths shallower than approximately 50 feet. The potential for liquefaction under the same conditions of ground shaking intensity and duration will decrease for sands that are more well-graded, irregular, gritty, coarser and denser. Also, a pronounced decrease in liquefaction potential will occur with the increase in fine-grained (i.e., silt and clay) content and plasticity of the soil. Idriss and Boulanger (2008) have suggested that soils with plasticity index of greater than 7 may be considered non-liquefiable. The potential consequences of liquefaction to engineered structures include loss of bearing capacity, buoyancy forces on underground structures (including pipelines), increased lateral earth pressures on retaining walls, and lateral spreading.

The subsurface exploration program encountered poorly (nearer to the surface) to moderately consolidated alluvial clay, and silty sands. A liquefaction assessment was completed in general accordance with the *California Geotechnical Manual, Liquefaction Evaluation, dated December 2014.* Excerpts from this manual (portions of page 4, 5, and 6) which provides guidance for quantitative liquefaction analysis is provided as follows.

4 Quantitative Liquefaction Analysis

Quantitative liquefaction analysis uses site-specific field and laboratory test data. Use the procedure of Youd, et al (2001): *Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils October, 2001* for quantitative liquefaction analysis. The procedure consists of the following general steps:

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1. Determine groundwater elevation. Use the ground water elevation measured during the field investigation. A higher elevation may be used if there is clear evidence for seasonal or long-term fluctuations. Do not combine liquefaction analysis with other extreme events, such as maximum scour and/or temporary or abnormally high groundwater levels. Combining extreme events results in conservative, costly, and unnecessary overdesign.
2. Determine which soil layers are to be evaluated for quantitative liquefaction analysis.
3. Correct SPT Blow Counts
4. Determine Cyclic Stress Ratio (CSR)
5. Determine Fines Content Correction
6. Calculate Cyclic Resistance Ratio $(CRR)_{7.5}$
7. Calculate the Magnitude Scaling Factor (MSF)
8. Calculate the Factor of Safety Against Liquefaction

Modifications or elaborations to Youd et al (2001) are as follows:

- Use Youd et al (2001) to depths of 50 feet; with caution to 70 feet; do not use below 70 feet.
- Extreme conditions below 70 feet (e.g.: loose fine sands without fines, thick layers, etc) require special analysis and consideration that is beyond the scope of this module.
- Use the Seed and Idriss formula (1997) found in Youd et al (2001) for the fines correction.
- Do not use the "Modified Chinese Criteria" as it is unconservative for determining if certain fine grained soils are liquefiable. Use the method in Bray and Sancio (2006) which states that fine grained soils will not liquefy (regardless of SPT blow count or CSR) if PI >12 or Wc < .85*LL
- Use the more conservative of the deterministic or probabilistic earthquake (5% probability of exceedance in 50 years or 975 year return period) to determine the PGA (a_{max}) and M_{Max}. (Youd uses the term a_{max} for PGA)
- For *deterministic* liquefaction seismic parameters run ARS Online to obtain the deterministic PGA and M_{Max}.
- For *probabilistic* liquefaction seismic parameters run ARS Online to obtain the PGA associated with a 975 year return period. Do a deaggregation using the 2008 USGS tool and use the larger of the M_{Median} or M_{Mode} value for M_{Max}. (Youd uses the term Mw for M_{Max})
- When the California minimum acceleration controls use the actual ground acceleration for liquefaction determination.
- Use a factor of safety against liquefaction of 1. (Soils with FS≥1 are not liquefiable.) Borderline cases where the factor of safety ranges between 0.95 and

1.05 may need further investigation depending on the consequences of liquefaction.

A peak ground acceleration (PGA) of 0.611g for geometric-mean MCE and earthquake moment magnitude of 6.5 based on the results of deaggregation analysis using the USGS online tools were used in liquefaction analysis. Groundwater levels at the time of drilling were also utilized in our analysis. Results of the liquefaction analysis are presented in *Appendix D, Liquefaction Analysis* and summarized in the following table. Based on correspondence from LC Engineering Consultants, it is understood that to obtain positive elevation values for the project, 996.91 feet has been added to the site's NAVD 88 elevation determinations. So for instance, a site elevation of -224.41 feet (NAVD 88) will correspond to a project elevation of 772.50 feet.

Table 6 – Summary of Liquefaction Analysis Results

Substructure	Estimated Base pf Pile Cap Project Elevation (feet)	Liquefiable Soil Layer Description	Estimated Top of Liquefiable Layer Project Elevation (feet)	Estimated Bottom of Liquefiable Layer Project Elevation (feet)	Estimated Liquefaction Settlement in layer (inches)	Estimated Cumulative Liquefaction Settlement at Top of Layer (inches)
Abutment 1	772.5	Silty Sand (SM) – Generally Medium	749	742	1.21	1.21 (1.59 inches when all of seismic settlement is included)
Abutment 2	772.5	Silty Sand (SM) - Generally Loose to Medium Dense	757.5	740.5	3.21	3.21 (3.58 inches when all of seismic settlement is included)

Seismic Settlement: Seismically-induced ground settlement can occur with or without liquefaction which results from densification of loose soils as a result of strong seismic ground shaking. Seismic settlement includes both settlement of liquefied soil layers and settlement of non-liquefied, unsaturated, loose sandy sediments. Total seismic settlement expected at the site is on the order of 1.59 inches for Abutment 1, and 3.58 inches for Abutment 2.

Lateral Spreading: Seismically-induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking in conjunction with liquefaction. Lateral spreading can manifest as near-vertical cracks with predominantly horizontal movement of the soil mass involved towards an adjacent open slope face. Lateral spreading occurs when there is widespread liquefaction and a gentle slope, or a free face toward which lateral spreading may occur. Liquefiable layers as noted below are located below the elevation of the stream channel and abutment slope face. In addition it is noted that piles for the existing bridge abutments will be left in place, which should provide some

buttress/dissipation of additional lateral pressures that may result from an earthquake event. Therefore, the potential for lateral spreading is deemed to be low for this site.

10.6 LANDSLIDES AND SLOPE INSTABILITY

There are no high or steep natural slopes on or in close proximity to the project site. Based on the investigation, there appears to be no indications of landslides or deep-seated instability at the site. It is NV5's opinion that the potential damage to the planned facilities due to landsliding or slope instability is considered low.

10.7 SUBSIDENCE

The Imperial Valley is a region generally known for historic ground subsidence. The subsidence has been attributed to regional geologic processes and to fluid withdrawal associated with geothermal production. Most of the subsidence is tectonic in nature and the broad Salton Trough basin has been subsiding for at least the past 35 million years. Historic soil subsidence due to groundwater withdrawal associated with geothermal production has also been documented. The subsidence occurs when groundwater (near the surface or in a deep aquifer) is lowered past its historical level. This occurrence results in an increase of effective stress within a soil layer which typically translates into additional soil consolidation. Due to the depth of the reservoir, subsidence is not localized. Considering the distance to the geothermal production areas to the project site, and that ground subsidence in the Imperial Valley is occurring on a regional and not local level ground subsidence at the site is not expected to create significant differential settlement conditions. Therefore, potential for damaging localized differential settlement from fluid withdrawal subsidence is considered low.

10.8 TSUNAMIS, INUNDATION SEICHES, AND FLOODING

The site and surrounding areas are at an approximate elevation of 215 feet below mean sea level, the site is approximately 105 miles from the Gulf of California. Therefore, tsunamis (seismic sea waves) are not considered a hazard at the site.

There have been no documented occurrences of seiches at the Salton Sea, but given the relatively shallow depth and seismic exposure, it is likely that one could occur. It is noted that the elevation of the bridge site is approximately 15 feet higher than the surface of the Salton Sea, and given the distance to the Sea, the potential for seiches affecting the project site are considered low.

10.9 EXPANSIVE SOILS

Improvements including foundations and slabs in contact with earth materials with a high potential for expansion can be expected to be subject to distress based on the potential for volume change associated with medium to highly expansive soil. Soils such as these should not be relied upon for foundation bearing.

The project site is underlain predominantly by poorly to moderately consolidated alluvial materials consisting of lean clay with lenses of fat clay, silty sands and clayey sands. Two (2) tested samples of the near-surface clay soils indicate medium expansion potential with an Expansion Index (EI) of 71 to 89. These materials are generally considered unsuitable for use as backfill for structure foundations,

retaining walls or pipe bedding. Since site grading will redistribute on-site soils, potential expansive soil properties should be verified at the completion of rough grading.

11.0 FOUNDATION RECOMMENDATIONS

Based on the results of our investigation, Cast-In-Drilled Hole (CIDH) piles are recommended for foundation support of the proposed Lack Road Bridge replacement. CISS piles are typically recommended to reduce the potential for construction difficulties due to caving of the loose sandy layers and to withstand the large lateral loads due to potential extreme events. However due to the extreme corrosion potential of subsurface soils and other cost considerations, CIDH piles are recommended provided that provisions for temporary casing or drilling fluids are provided.

Shallow foundations are not recommended due to the presence of loose near-surface compressible soil. Detailed recommendations including vertical pile tip elevations, lateral capacity, estimated settlement, pile design and construction considerations, and embankment recommendations are provided in the following sections of the report.

11.1 VERTICAL DESIGN AND PILE TIP ELEVATIONS

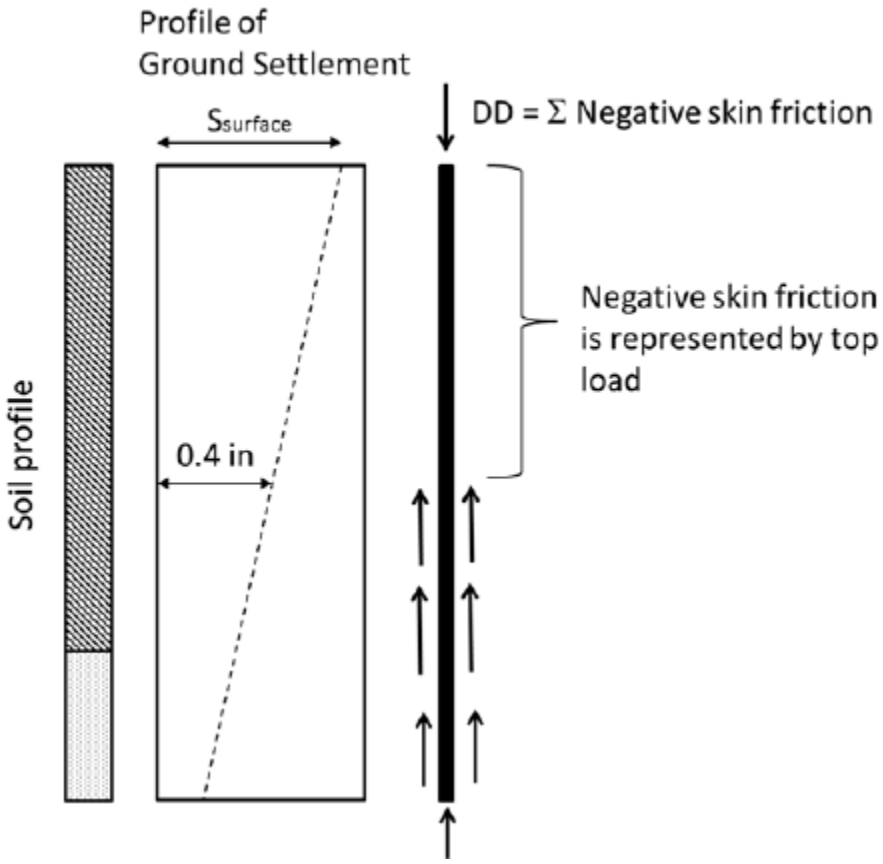
The ultimate axial capacity for 24-inch and 30-inch diameter CIDH piles in both compression and tension were computed using the static method of analysis with the computer program ALLPILE 7.0 by CIVILTECH, Inc. Both ultimate side resistance and end bearing were estimated in our analysis with results presented in *Appendix F, Axial Pile Resistance Analysis*. However since the amount of vertical strain (in soil) necessary to mobilize end bearing resistance may be significant, and due to the associated difficulty in maintaining a clean pile bottom during pile construction, suggested that end bearing be neglected in the design analysis. Additionally since CIDH piles will likely be constructed by "wet" methods, the potential contribution from end bearing has been ignored for this reason as well.

Due to the potential for liquefaction and associated seismic induced settlement, potential downdrag forces should be accommodated in pile design. For this project the "AASHTO Explicit Approach" is recommended to estimate drag force as follows:

- For Abutment 1, no nominal axial pile resistance should be assumed for pile length above project elevation 742. Negative skin friction above Elevation 742 feet should be included as downdrag load (on top of pile). The nominal geotechnical resistance available to resist the structural load plus the downdrag load is estimated by considering only the positive side resistance below project elevation 742.

- For Abutment 2, no nominal axial pile resistance should be assumed for pile length above project elevation 740.5. Negative skin friction above Elevation 740.5 feet should be included as downdrag load (on top of pile). The nominal geotechnical resistance available to resist the structural load plus the downdrag load is estimated by considering only the positive side resistance below project elevation 740.5.

The above downdrag assessment approach is conceptually shown in the following figure.



A Resistance Factor φ_{qs} = 0.7 should be multiplied by the side resistance presented in Appendix F for Strength Limit State design. For the Extreme Event Limit State, a Resistance Factor φ = 1.0 should be used. No reduction in the axial capacity of an individual pile will be required to account for group action effects provided adjacent piles are spaced at least 3 pile diameters, center-to-center. Determining the load-bearing capacity of group piles is extremely complicated and, in current geotechnical practice, is a subject of ongoing study. In practice, the minimum center-to-center pile spacing is typically 2½ pile diameters.

11.2 LATERAL PILE RESISTANCE

NV5 has estimated the relevant geotechnical input parameters for LPILE based on the current investigation. The recommended geotechnical input parameters for LPILE are presented in Table 7. It is noted per *Caltrans LRFD, Bridge Design Aids 12-2, dated May 2016* that the permissible horizontal loads for deep foundations at abutments is the load that results in a horizontal displacement of ¼ inch at the top or cut cut-off elevation of the pile/shaft. For comparison purposes the results of an

analysis for 24-inch and 30-inch diameter CIDH piles, assuming a ¼ inch limiting deflection, is provided in *Appendix E, Lateral Pile Resistance Analysis*. It is important to note that the results of analysis is heavily dependent upon assumed pile configuration, loading conditions, and reinforcement details.

Table 7 - Recommended Soil Parameters for LPILE – Abutment 1

Project Elevation (feet)	Soil Type	P-Y Model	Effective Unit Weight (pcf)	ϕ (deg)	C (psf)	K (psf)	ε_{50} (in/in)
772.5 to 749	CL	Soft Clay (Matlock)	58.7	-	300	Program Default	
749 to 734	SM	Sand (Reese, et.al)	63.5	34	-		
734 to 719	CL	Stiff Clay (w/o Free Water)	56.2	-	1,750		
719 to 705	SM	Sand (Reese, et al.)	65.5	35	-		
705 to 685	SM	Sand (Reese, et al.)	65.9	38	-		

Table 8 - Recommended Soil Parameters for LPILE – Abutment 2

Project Elevation (feet)	Soil Type	P-Y Model	Effective Unit Weight (pcf)	ϕ (deg)	C (psf)	K (psf)	ε_{50} (in/in)
772.5 to 757.5	CL	Soft Clay (Matlock)	60.4	-	500	Program Default	
757.5 to 743	SM	Soft Clay (Matlock) – due to this being a liquefiable layer. Residual Strength estimated using Seed/Harder curves	59.8	-	350		
743 to 732	SM	Sand (Reese, et.al)	66.8	34	-		
732 to 719	CL	Stiff Clay (w/o Free Water)	61.6		1,500		
719 to 705	SM	Sand (Reese, et al.)	61.6	33	-		
705 to 689	SM	Sand (Reese, et al.)	65.6	38	-		
689 to 685	CL	Stiff Clay (w/o Free Water)	62.6	-	2,000		

For lateral resistance and pile spacing using multiple rows, reductions in lateral resistance may be applied utilizing Pile P-multipliers (reductions) presented in Caltrans, *California Amendments to AASHTO LRFD Bridge Design Specifications – Sixth Edition.* A relevant excerpt from this document is presented below.

10.7.2.4—Horizontal Pile Foundation Movement **C10.7.2.4**

Revise Table as follows:

Table 10.7.2.4-1 Pile P-Multipliers, P_m for Multiple Row Shading ~~(average from Hannigan et al., 2005).~~

Pile *CTC* spacing (in the Direction of Loading)	P-Multipliers, P_m		
	Row 1	Row 2	Row 3
2.0*B*	0.60	0.35	0.25
3.0*B*	0.75 ~~0.8~~	0.55 ~~0.4~~	0.40 ~~0.3~~
5.0*B*	1.0	0.85	0.70
7.0*B*	1.0	1.0	0.90

Revise the 7th Paragraph as follows:

Loading direction and spacing shall be taken as defined in Figure 10.7.2.4-1. A P-multiplier of 1.0 shall be used for pile *CTC* spacing of 8*B* or greater. If the loading direction for a single row of piles is perpendicular to the row (bottom detail in the Figure), a P-multiplier ~~group reduction factor~~ of less than 1.0 shall only be used if the pile spacing is ~~5~~4*B* or less~~, i.e., a *Pm* of 0.8 for a spacing of 3*B*, as shown in Figure 10.7.2.4-1~~. A P-multiplier of 0.80, 0.90 and 1.0 shall be used for pile spacing of 2.5*B*, 3*B* and 4*B*, respectively.

Revise the 6th Paragraph as follows:

The multipliers on the pile rows are a topic of current research and may change in the future. Values from recent research have been ~~tabulated by~~ compiled from Reese and Van Impe (2000), Caltrans (2003), Hannigan et al. (2006), and Rollins et al. (2006).

11.3 PILE DATA TABLE

Based on the axial and lateral resistance requirements noted above for CIDH piles, the following Pile Data Table is presented for use in project plans.

Table 9 – Pile Data Table

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (ft)	Specified Tip Elevation (ft)
		Compression	Tension		
Abutment 1	Class 200 24" CIDH	400	0	691.5 (A) 719.5 (B) 691.5 (C)	691.5
Abutment 2	Class 200 24" CIDH	400	0	691.5 (A) 719.5 (B) 691.5 (C)	691.5

Notes: 1.) Design Tip Elevations are controlled by (A) Compression, (B) Lateral Loads, (C) Settlement
2.) The Specified Tip Elevation shall not be raised above the Design Tip Elevations for Tension, Lateral, and Tolerable Settlement
3.) The Nominal Resistance required is equal to the nominal resistance needed to support factored loads plus potential downdrag loads from liquefaction.

11.4 ESTIMATED SETTLEMENT

Settlement of the proposed bridge supported on CIDH piles in the manner recommended is estimated to be less than 0.4 inch.

11.5 CIDH PILE DESIGN AND CONSTRUCTION CONSIDERATIONS

Current (2018) Caltrans standard specifications for "Cast-in-Drill Hole (CIDH) Concrete Piling" (Section 49-3.02) and Caltrans *2018 Standard Plan B2-3, 16" and 24" Cast-In-Drilled-Hole Concrete Pile* should generally apply for construction of the CIDH piles. Groundwater is expected during pile construction. Due to the potential for groundwater infiltration and "caving" soils during pile construction, the "wet" method of construction should be utilized for installation of piles. For acceptance testing, the installation of inspection tubes will be required.

Mineral slurry may be required to construct the CIDH piles in wet-hole conditions. Allowable slurries shall be approved by the Engineer. Temporary or permanent steel casing may also be considered for portions of CIDH piles within alluvium containing loose granular zones. The method for placing steel casing should be chosen by the contractor and approved by the Engineer so as to ensure that the casing provides a secure seal with the soil to prevent running, caving, or heaving of alluvial soils into the drilled shaft. There shall be no voids surrounding the casing. Due to the lateral and skin friction resistance demands on the CIDH piles, construction methods should be chosen that ensure the piles and casings are installed tightly within the native undisturbed material. In the event that permanent steel casing is utilized, no frictional resistance for the cased pile zones should be prescribed.

The estimated capacity of the piles relies on a concrete bond between the walls of the drilled shaft and the surrounding soil. It is imperative that the borehole walls not be contaminated with drill cuttings or loose materials. If an oscillator or rotator is used to construct CIDH piles, the following is required unless otherwise directed by the Geotechnical Engineer:

- The contractor must maintain a positive fluid head within the drill rod at all times. The fluid must be a mineral or polymer slurry; water is not allowed.

- The contractor is to maintain a minimum 10 foot soil plug within the drill rod. The 10 foot plug is to be maintained until the drill rod reaches the specified pile tip elevation. At no time is the Contractor to have less than the minimum 10 foot soil plug until the specified tip elevation has been reached.

- The contractor must provide access to the top of the oscillator/rotator drill rod, as requested by the Engineer, to verify the positive head and minimum soil plug are being maintained.

Due to the high sulfate and chloride content measured in soils (see Section 9.0 of this report), the use of high sulfate resistant cement (Type V) should be used in CIDH pile construction.

12.0 ADDITIONAL CONSIDERATIONS

12.1 GENERAL

Based on the results of field exploration, laboratory testing, and engineering evaluation and analyses, the proposed construction is considered geotechnically feasible, provided the recommendations contained herein are incorporated into the project plans and specifications and implemented during construction.

12.2 APPROACH FILL AND GENERAL EARTHWORK

Fill settlement issues at the abutments are not anticipated provided that the embankments are constructed and compacted according to Caltrans specifications. Site grading should be performed in accordance with requirements presented in Section 19 (Earthwork) of the Caltrans Standard Specifications (2018) supplemented by the following recommendations. In the event of conflict, the recommendations presented herein supersede.

- Clearing and Grubbing: Prior to grading, the project area should be cleared of significant surface vegetation, demolition rubble, trash, pavement, debris, etc. Any buried organic debris or other unsuitable contaminated material encountered during subsequent excavation and grading work should also be removed. Removed material and debris should be properly disposed of offsite. Holes resulting from removal of buried obstruction which extend below finished site grades should be filled with properly compacted soils. Any utilities within the footprint of planned structural improvements should be appropriately abandoned.

- Site Grading: Areas to receive surface improvements or fill soils should be treated as follows:

- Excavatability: Based on the subsurface exploration, it is anticipated that the on-site soils can be excavated by modern conventional heavy-duty excavating equipment in good operating condition.

- Structural Fill Placement: The on-site clay soil may not be suitable for backfill of trenches or buried structures. The on-site sandy soils may be used for backfill provided they are free of any contaminated soil, debris, organic matter, or other deleterious materials. Areas to receive fill and/or surface improvements should be scarified to a minimum depth of 6 inches, brought to near-optimum moisture conditions, and compacted to at least 90 percent relative compaction, based on laboratory standard ASTM D1557. Fill soils should be brought to within 2 percent over optimum moisture content and compacted in uniform lifts to at least 90 percent relative compaction (ASTM D1557). Rocks with a maximum dimension greater than 4 inches should not be placed in the upper 3 feet of pad grade. The optimum lift thickness to produce a uniformly compacted fill will depend on the size and type of construction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in loose thickness. Placement and compaction of fill should be observed and tested by the geotechnical consultant.

- Graded Slopes: Graded slopes should be constructed at a gradient of 2:1 (H:V) or flatter. To reduce the potential for surface runoff over slope faces, cut slopes should be provided with brow ditches and berms should be constructed at the top of fill slopes.

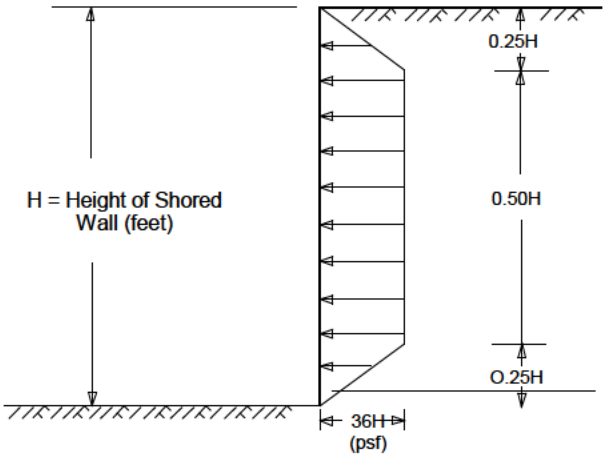
12.3 TEMPORARY EXCAVATIONS AND SHORING

Temporary, shallow excavations with vertical side slopes less than 4 feet high will generally be stable, although there is a potential for localized sloughing. In these soil types, vertical excavations greater than 4 feet high should not be attempted without proper shoring to prevent local instabilities. Stockpiled (excavated) materials should be placed no closer to the edge of a trench excavation than a distance defined by a line drawn upward from the bottom of the trench at an inclination of 1H:1V, but no closer than 4 feet. All trench excavations should be in accordance with Cal-OSHA regulations. For planning purposes, the native soil materials may be considered as Type C, as defined in the current Cal-OSHA soil classification.

Although not anticipated, in the event of possible applicability, temporary shoring may be accomplished by several methods including: hydraulic shores and trench plates; trench boxes; and soldier piles and lagging. For vertical excavations less than about 15 feet in height, cantilevered shoring may be used. Cantilevered shoring may also be used for deeper excavations; however, the total deflection at the top of the wall should not exceed one-inch. Therefore, shoring of excavations deeper than about 15 feet may need to be accomplished with the aid of tied back earth anchors. The excavation support system should be designed to resist lateral earth pressures of the soil and hydrostatic pressures. Preliminary design of cantilevered temporary shoring, a triangular distribution of lateral earth pressure may be used. It may be assumed that the subgrade soils, with a level surface behind the cantilevered shoring, will exert an equivalent fluid pressure of 36 pcf.

Tied-back or braced shoring should be designed to resist a trapezoidal distribution of lateral earth pressure. The recommended pressure distribution, for the case where the grade is level behind the

shoring, is illustrated in the following diagram with the maximum pressure equal to 36H in psf, where H is the height of the shored wall in feet.



Any surcharge (live, including traffic, or dead load) located within a 1H:1V plane drawn upward from the base of the shored excavation should be added to the lateral earth pressures. The vertical loads imposed by existing structures, if any, should be determined by the structural engineer. The lateral load contribution of a uniform surcharge load located across the 1:1 (H:V) zone behind the excavation may be calculated in accordance with *Figure 6, Lateral Surcharge Loads*. Lateral load contributions of surcharges located at a distance behind the shored wall should be provided by NV5 once the load configurations and layouts are known. As a minimum, a 2-ft equivalent soil surcharge is recommended to account for nominal construction loads.

The actual shoring design should be provided by a registered civil engineer in the State of California experienced in the design and construction of shoring under similar conditions. Once the final excavation and shoring plans are complete, the plans and the design should be reviewed by NV5 for conformance with the design intent and geotechnical recommendations. The shoring system should further satisfy requirements of Cal-OSHA.

12.4 DEWATERING

Groundwater was encountered at depths between approximately 18 to 19 feet below the existing ground surface. The groundwater table is subject to fluctuations in response to a number of factors. If necessary, the actual means and methods of any dewatering scheme should be established by a contractor with local experience. It is important to note that temporary dewatering, if necessary, will require a permit and plan that complies with RWQCB regulations. If excessive water is encountered, NV5 should be contacted to provide additional recommendations for temporary construction dewatering. Any cases of localized seepage or heavy precipitation should be monitored during construction. Based on the subsurface exploration the onsite soils maybe considered to be relatively permeable.

12.5 RETAINING WALLS

Retaining walls should be designed in accordance with the following recommendations and design parameters presented herein.

- Bearing Capacity - The proposed wall may be supported on continuous footings bearing on dense natural soils or properly compacted fill soils at a minimum depth of 18 inches beneath the lowest adjacent grade. At this depth, footings may be designed for an allowable soil-bearing pressure of 2,000 psf. This value may be increased by one-third for loads of short duration, such as wind or seismic forces.

- Lateral Earth Pressures - Based on laboratory test results and encountered soil conditions, the recommended lateral earth pressures for preliminary design of flexible retaining walls supported on shallow foundations are summarized in the following Table 10.

Table 10 - Recommended Lateral Earth Pressures

Parameter	Recommended Values				
	Level Backfill	5H:1V Slope	4H:1V Slope	3H:1V Slope	2H:1V Slope
Static Active Earth Pressure (P_a)	37H	43H	45H	49H	62H
Static At-Rest Earth Pressure (P_o)	60H	72H	75H	79H	87H
Seismic Earth Pressure (P_e)	23H	26H	27H	30H	38H
Coefficient of Friction (μ) for Lateral Resistance of Footing	0.35	N/A	N/A	N/A	N/A
Passive Earth Pressure (P_p) for Lateral Resistance of Footing	250H	N/A	N/A	N/A	N/A

Notes:

1. All values of height (H) are in feet (ft) and pressure (P) in pounds per square feet (psf).
2. Seismic earth pressure (P_e) is in addition to the static active or at-rest pressure, P_a and P_o which should be distributed as an inverted triangle along the wall height and the resultant of this pressure is an increment of force which should be applied to the back of the wall in the upper one-third (1/3) of the wall height and may also be applied as a reduction of force to the front of the wall in the upper one-third (1/3) of the footing depth.
3. The above pressure values do not include hydrostatic pressures that might be caused by groundwater or water trapped behind the structure.
4. The pressures listed in the table were based on the assumption that backfill soils will be compacted to 90 percent of maximum dry density (per ASTM D1557).
5. The coefficient of friction (μ) should be applied to dead normal (buoyant) loads when evaluating the sliding frictional resistance.
6. A resistance factor of 0.5 has been applied to the passive earth pressure and may be combined with the sliding frictional resistance using a resistance factor of 0.80. Neglect the upper 6 inches for passive pressure unless the surface is contained by a pavement or a slab. The passive earth pressure should not exceed a maximum value of 3,000 psf.

7. In addition to the above-mentioned pressures, retaining walls must be designed to resist horizontal pressures that may be generated by surcharge loads applied at the ground surface such as from uniform loads or vehicle loads. Figure 6 may be used to evaluate these surcharge loads.

- Drainage and Waterproofing - Retaining walls should be properly drained, and if desired, appropriately waterproofed. Adequate backfill drainage is essential to provide a free-drained backfill condition and to reduce the potential for the development of hydrostatic pressure buildup behind walls. Drainage behind the retaining walls may be provided with geosynthetic drainage composite such as TerraDrain, MiraDrain, or equivalent, placed continuously along the back of the wall and connected to a 4-inch-diameter perforated pipe. The pipe should be sloped at least 2 percent and surrounded by 3 cubic feet per foot of ¾-inch crushed rock wrapped in suitable non-woven filter fabric (Mirafi 140N or equivalent) or Caltrans Class 2 permeable granular filter materials without filter fabric. The crushed rock should meet the requirements defined in Caltrans Standard Specifications (2018). These drains should be connected to an adequate discharge system.

  In lieu of a perforated drainage pipe and connection to an existing drainage system, weep holes or open vertical masonry joints may be provided in the lowest row of block exposed to the air to reduce the buildup of hydrostatic pressure behind the wall. Weep holes should be a minimum of three inches in diameter and provided at intervals of at least every six feet along the wall. Open vertical masonry joints should be provided at a minimum of 32-inch intervals. A continuous gravel fill, a minimum of one cubic foot per foot should be placed behind the weep holes or open masonry joints. The gravel should be wrapped in filter fabric (Mirafi 140N or equivalent). To prevent efflorescence at the face of the wall, the wall may also be appropriately waterproofed. Waterproofing treatments and alternative, suitable wall drainage products are available commercially. Design of waterproofing and its protection during construction should be addressed by the project design professional.

- Retaining Wall Backfill Compaction - Retaining wall backfill material should be non-expansive (E.I. of 20 or less) and free draining. Backfill should be brought to near-optimum moisture conditions and compacted by mechanical means to at least 95 percent relative compaction (ASTM D1557). Care should be taken when using compaction equipment in close proximity to retaining walls so that the walls are not damaged by excessive loading.

12.6 PAVEMENTS

Design of asphalt concrete pavement sections depends primarily on support characteristics (strength) of soil beneath the pavement section and on cumulative traffic loads within the service life of the pavement. Strength of the pavement subgrade is represented by R-value test data. R-value tests were performed on representative samples of the near-surface soil. The results yielded R-values ranging from 8 and 11. A summary of the test is included in *Appendix B*.

Traffic loads within service life of a pavement are represented by a Traffic Index (TI), which is calculated based on anticipated traffic loads and on the projected number of load repetitions during the design life of the pavement. The design TI value should be verified by the project Civil/Traffic Engineer prior to construction.

Preliminary pavement section recommendations were developed using a design R-value of 5 and traffic indices ranging from 6.0 to 12.0. The project Engineer should select the appropriate pavement section based on the anticipated traffic loads. NV5 can provide alternate sections based on other traffic loadings, if requested. Based on these design parameters, analysis in accordance with California Department of Transportation (Caltrans) Highway Design Manual, and assuming compliance with site preparation recommendations, NV5 recommends the flexible and rigid structural pavement sections presented in the following Table 11.

Table 11 - Flexible Asphalt Pavement Sections (Design R-value = 5)

Traffic Index (TI)	Pavement Section	
	HMA (inches)	AB[2] (inches)
6.0	4.0	13.0
8.0	5.0	18.0
10.0	6.0	24.0
12.0	7.5	30.0

(1) Hot Mix Asphalt (HMA) in accordance with Section 39 of Caltrans Standard Specification (2018).
(2) Class 2 Aggregate Base in accordance with Section 26 of Caltrans Standard Specifications (2018) compacted to at least 95% relative compaction (ASTM D1557);
Note: The upper 12 inches of subgrade soils should be compacted to at least 95% relative compaction (ASTM D1557).

Assuming that the near-surface on-site soils will be thoroughly mixed and compacted during grading operations, it is recommended that R-value testing be performed on representative soil samples after rough grading operations on the upper 2 feet to confirm applicability of the above pavement sections. If the paved areas are to be used during construction, or if the type and frequency of traffic is greater than assumed in the design, the pavement section should be re-evaluated for the anticipated traffic.

The upper 12 inches of subgrade soils should be compacted to a minimum dry density of 95 percent of the material's maximum dry density as determined by the ASTM D1557 test procedure. The aggregate base should conform to Class II aggregate base in accordance with Section 26 of Caltrans Standard Specifications (2018). The base course should also be compacted to a minimum dry density of 95 percent. Field and laboratory testing should be used to check compaction, aggregate gradation, and compacted thickness.

The asphalt pavement should be compacted to 95 percent of the unit weight as tested in accordance with the Hveem procedure (ASTM D1560). The maximum lift thickness should be 4.0 inches. The asphalt material shall conform with the Section 39 of Caltrans Standard Specifications (2018). Construction and the supplement. An approved mix design should be submitted 30 days prior to placement. The mix design should include proportions of materials, maximum density and required

lay-down temperature range. Field and lab testing should be used to verify oil content, aggregate gradation, compaction, compacted thickness, and lay-down temperature.

Control joints are required for the Portland cement concrete pavement (rigid) at a maximum of 15 feet spacing each way and should be constructed immediately after concrete finishing.

The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of the pavement. The ponding of water on or adjacent to pavement areas will likely cause failure of the subgrade and resultant pavement distress. Where planters are proposed, the perimeter curb should extend at least 6 inches below the subgrade elevation of the adjacent pavement. In addition, experience indicates that even with these provisions, a saturated subgrade condition can develop as a result of increased irrigation, landscaping and surface runoff. A subdrain system should be considered along the perimeter of pavement subgrade areas to reduce the potential of this condition developing. The subdrain system should be designed to intercept irrigation water and surface runoff prior to entry into the pavement subgrade and carry the water to a suitable outlet.

13.0 DESIGN REVIEW AND CONSTRUCTION MONITORING

Geotechnical review of plans and specifications is of paramount importance in engineering practice. The poor performance of many pipelines has been attributed to inadequate geotechnical review of construction documents. Additionally, observation and testing of the backfill, subgrade and base will be important to the performance of the proposed improvements. The following sections present NV5's recommendations relative to the review of construction documents and the monitoring of construction activities.

13.1 PLANS AND SPECIFICATIONS

The design plans and specifications will be reviewed and approved by NV5 prior to construction, as the geotechnical recommendations may need to be re-evaluated in the light of the actual design configuration. This review is necessary to evaluate whether the recommendations contained in this report and future reports have been properly incorporated into the project plans and specifications.

13.2 CONSTRUCTION MONITORING

Site preparation, removal of unsuitable soils, assessment of imported fill materials, backfill placement, and other earthwork operations should be observed and tested. The substrata exposed during the construction may differ from that encountered in the test borings. Continuous observation by a representative of NV5 during construction allows for evaluation of the soil/rock conditions as they are encountered and allows the opportunity to recommend appropriate revisions where necessary.

14.0 LIMITATIONS

The recommendations and opinions expressed in this report are based on NV5's review of background documents and on information developed during this study. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site. More detailed limitations of this geotechnical study are presented in the GBA's information bulletin in *Appendix G*.

Due to the limited nature of the field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation and laboratory testing can be performed upon request. It should be understood that conditions different from those anticipated in this report may be encountered during the proposed structure construction operations.

Site conditions, including ground-water level, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which NV5 has no control.

NV5's recommendations for this site are, to a high degree, dependent upon appropriate quality control of subgrade preparation, fill/backfill placement, etc. Accordingly, the recommendations are made contingent upon the opportunity for NV5 to observe grading operations and foundation excavations for the proposed construction. If parties other than NV5 are engaged to provide such services, such parties must be notified that they will be required to assume complete responsibility as the geotechnical engineer of record for the geotechnical phase of the project by concurring with the recommendations in this report and/or by providing alternative recommendations.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. NV5 should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

NV5 has endeavored to perform this study using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil/rock conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this study.

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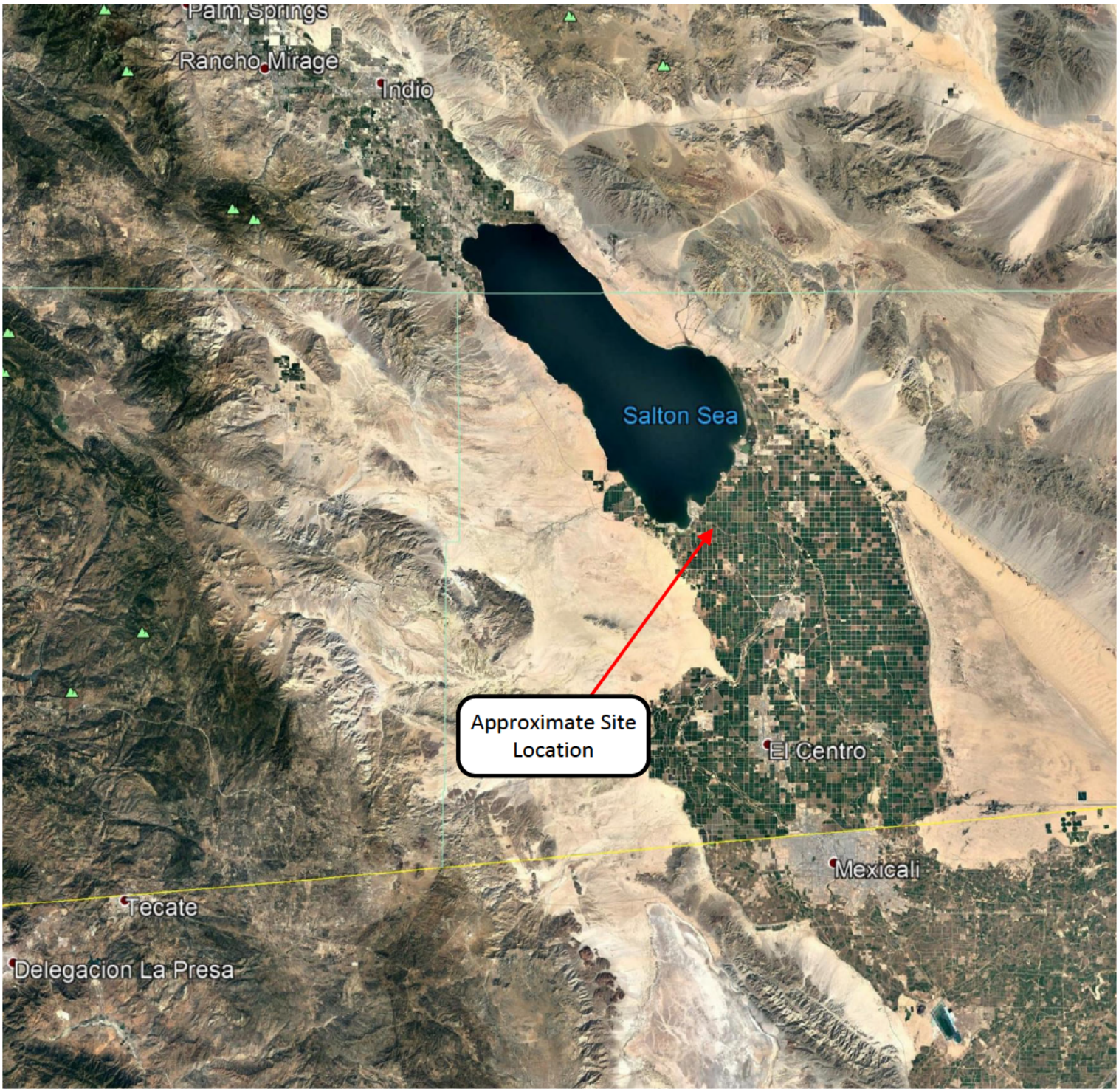
FIGURES



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Reference: Google Earth 2019

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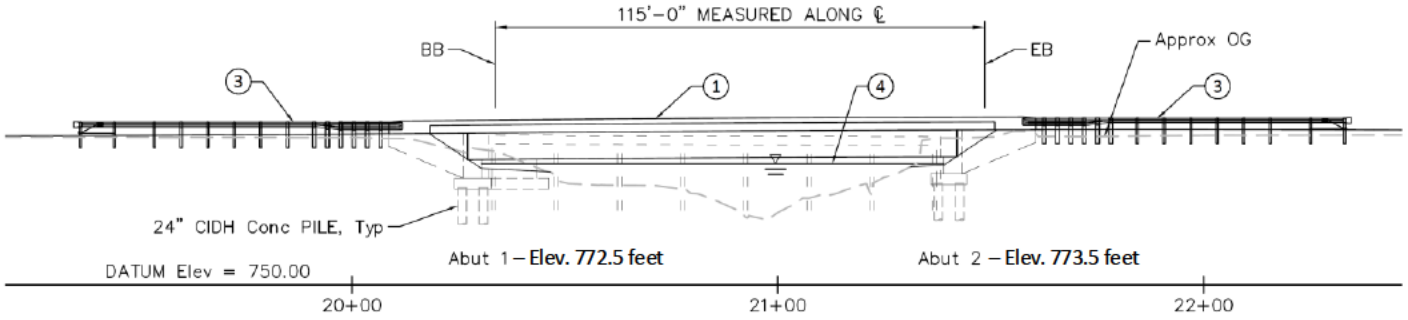
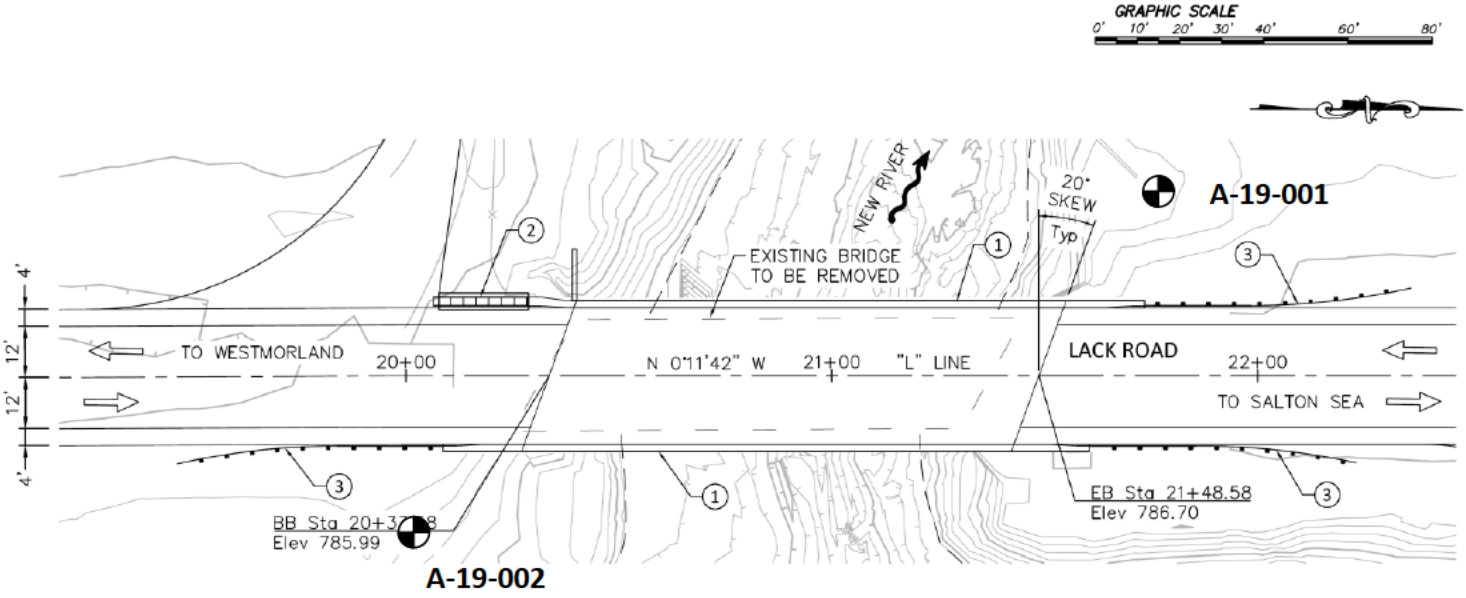
Drawn: SB
Date: April 2019

Site Location Map
Lack Road Bridge Replacement Over New River
Bridge No. 58C-101
Imperial County, CA

Figure 1





Note: Datum reflects addition of 1,000 feet to actual elevation

Legend:

A-19-002 ⊕ **Approximate location of geotechnical boring**

Reference: NV5, General Plan, Preliminary, Lack Road Bridge Replacement Over New River, Bridge No. 58C-101, dated June 4, 2019.

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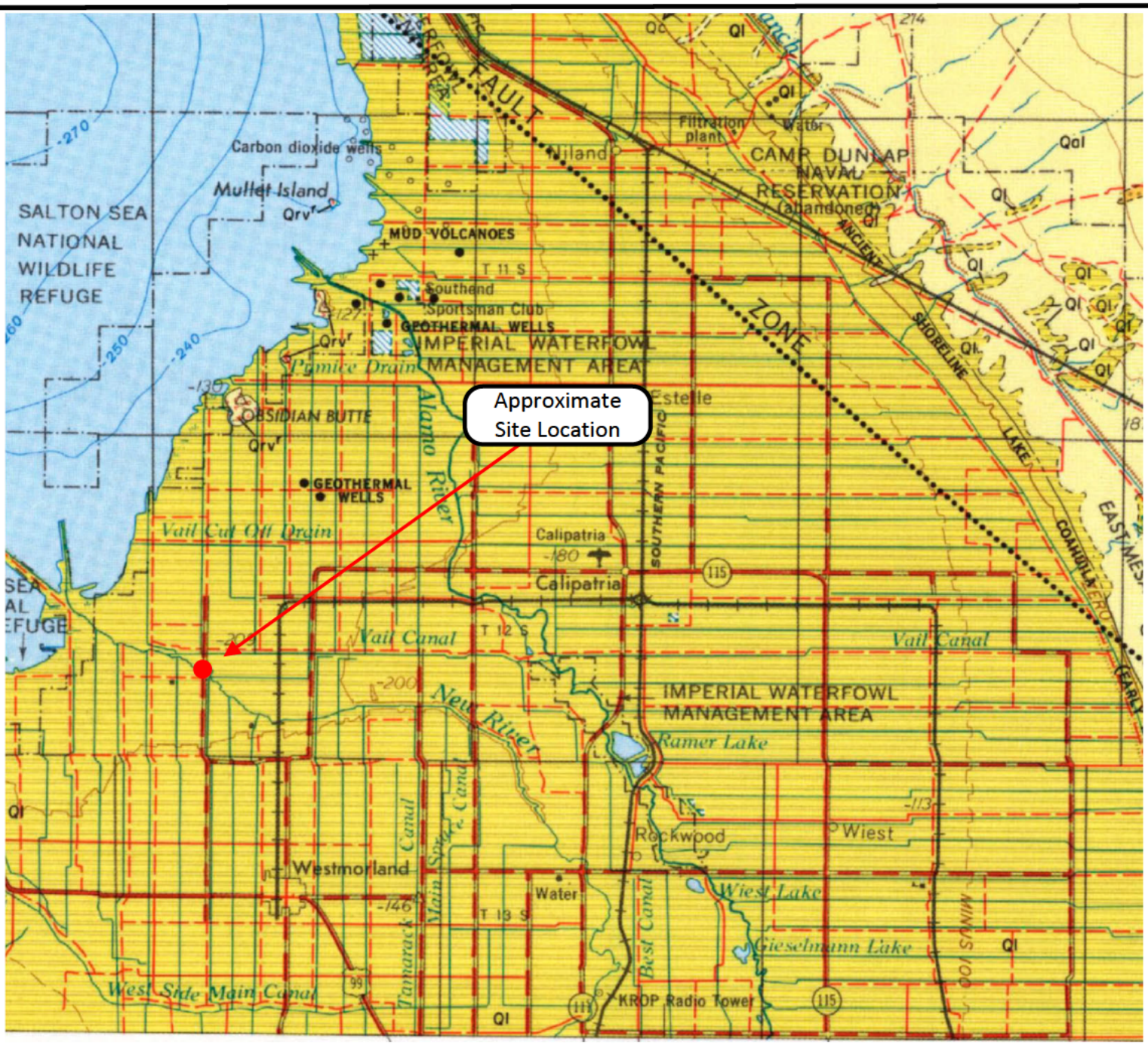
Boring Location Map
Lack Road Bridge Replacement Over New River
Bridge No. 58C-101
Imperial County, CA

Figure 2



DESCRIPTION OF MAP UNITS

Qal	Alluvium
Qrv	Recent volcanic: Qrv^r —rhyolite; Qrv^a —andesite; Qrv^b —basalt; Qrv^p —pyroclastic rocks
Ql	Quaternary lake deposits

Reference: Jennings, C.W., 1967, Geologic Map California, Olaf P. Jenkins Edition, Salton Sea Edition: Department of Conservation, California Geological Survey, scale 1:250,000.

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Date: April 2019

Regional Geologic Map
Lack Road Bridge Replacement Over New River
Bridge No. 58C-101
Imperial County, CA

Figure 3

0 10 20 30 40

Approximate Scale in Miles

Reference: Caltrans ARS Online Version (2.3.09),
http://dap3.dot.ca.gov/ARS_Online/index.php

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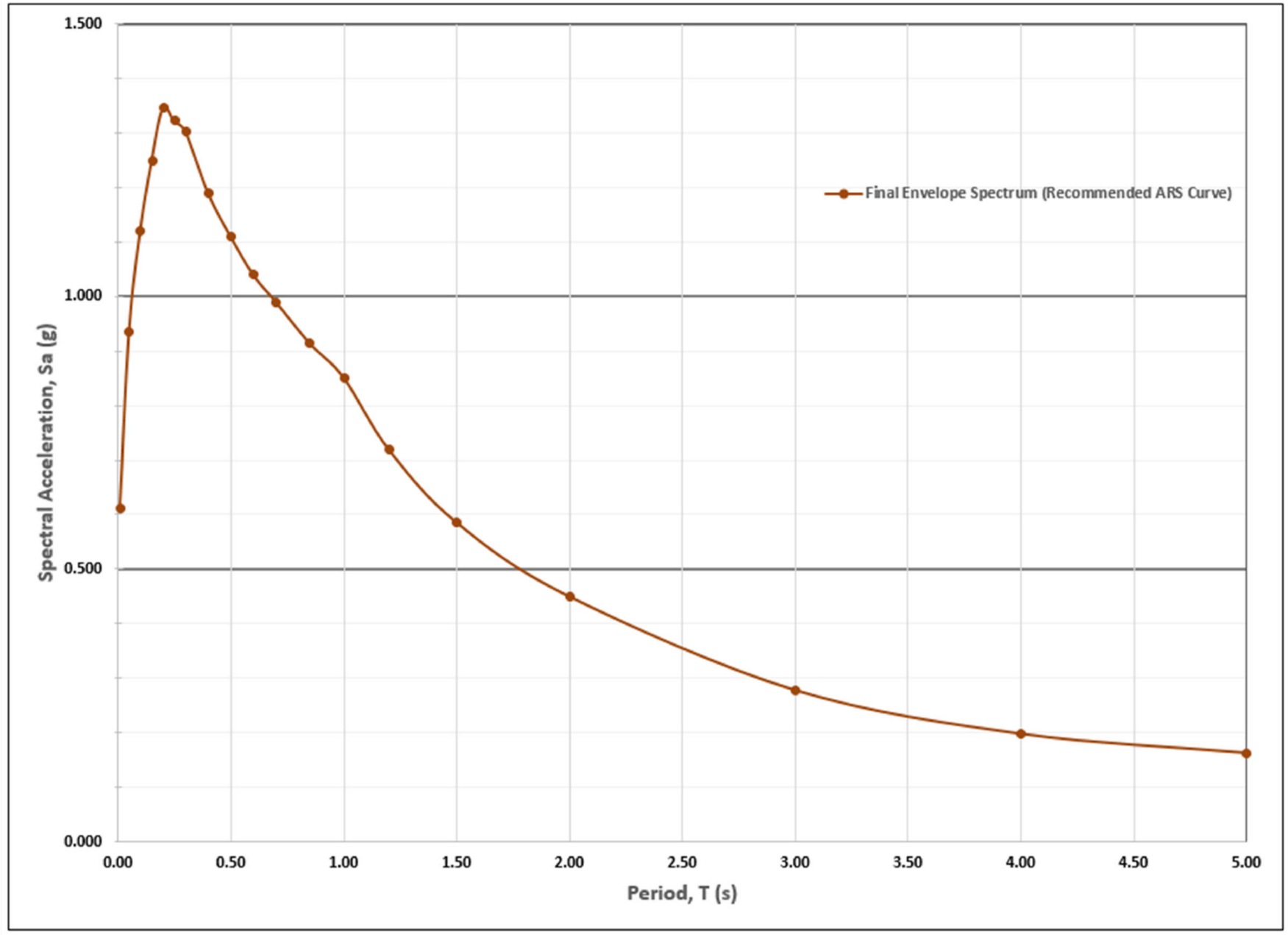
Drawn: **SR**

Date: **May 2019**

Regional Fault Map

Lack Road Bridge Replacement Over New River
Bridge No. 58C-101
Imperial County, California

Figure 4



Project Site Information:

Latitude	33.100001
Longitude	-115.648826
Ave. Shear Wave Velocity, Vs_{30}	270 m/s
Depth to Vs = 1.0 km/s, $Z_{1.0}$ (m)	N/A
Depth to Vs = 2.5 km/s, Z2.5 (km)	N/A
Near-Fault Deaggregation Distance	11.62 km

References:

1. CalTrans ARS Online Tool (v2.3.09), 2017.

2. CalTrans Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations, Nov. 2012.

3. USGS Unified Hazard Tool, Seismic Deaggregation, Dynamic Conterminous U.S. 2008 (v3.3.1).

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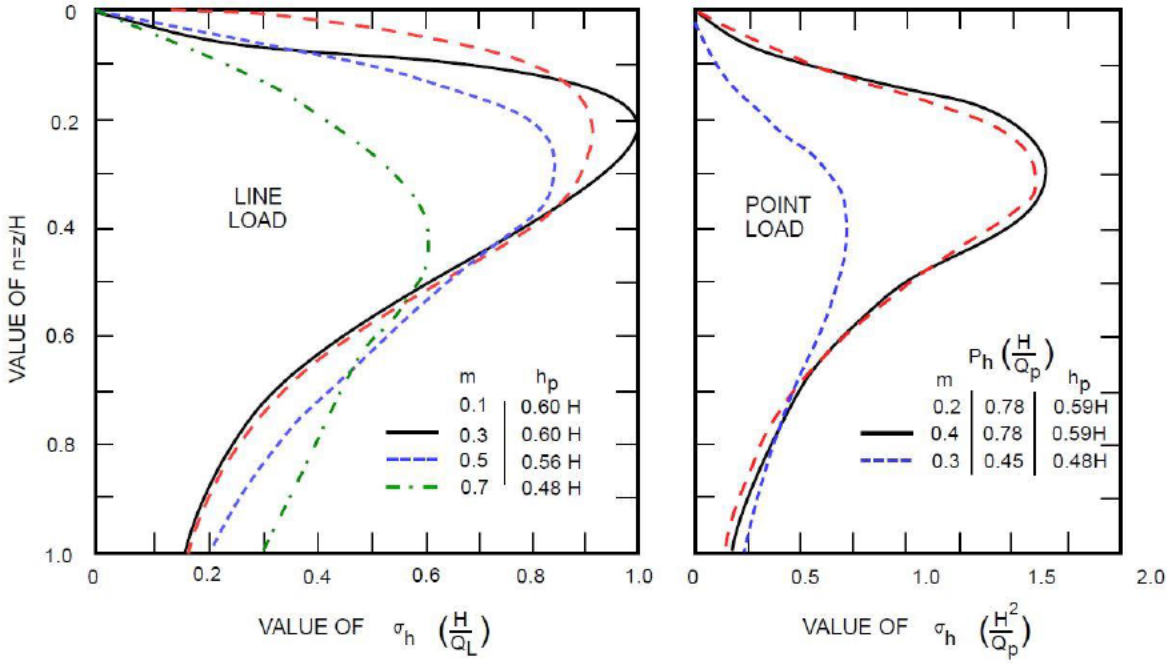
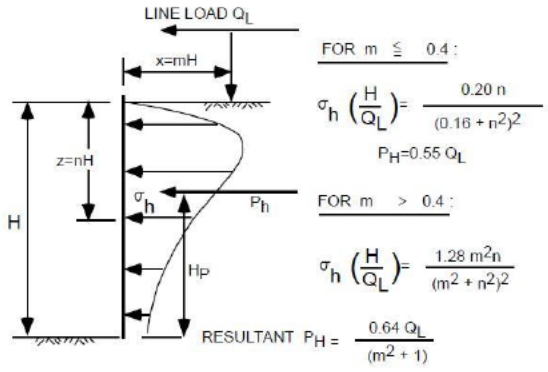
Date: May 2019

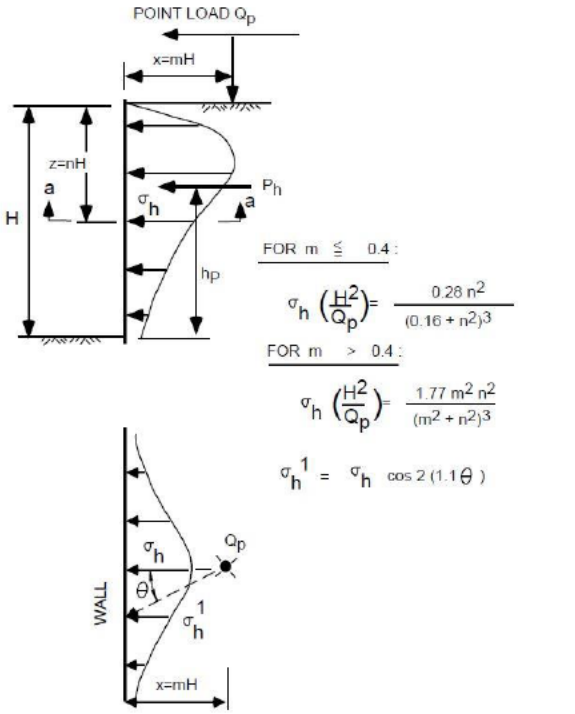
Recommended Bridge Design
ARS Curve
Lack Road Bridge Replacement Over New River
Bridge No. 58C-101
Imperial County, California

Figure No. 5





PRESSURE FROM LINE LOAD Q_L
(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)



SECTION a –a
PRESSURE FROM POINT LOAD Q_p
(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)

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Drawn: **SB**
Date: **April 2019**

Lateral Surcharge Loads

Lack Road Bridge Replacement Over New River
Bridge No. 58C-101
Imperial County, California

Figure 6

APPENDIX A

Boring Records

Boring Records

To investigate the geotechnical subsurface soil and groundwater conditions at the project site, NV5 drilled two exploratory borings (A-19-001 through A-19-002) to approximately 100 feet below ground surface (bgs). The borings were drilled using an 8-inch diameter hollow-stem auger drilling technique to the maximum depth explored. Baja Exploration drilled and sampled the borings using a CME-95 truck-mounted drill rig which has been calibrated to an average hammer efficiency ratio (ERi) of 67.9%. All drilling, field testing and traffic control companies were subcontractors to NV5.

The boring locations are shown on Figure 2, Boring Location Map. The boring records are attached in this appendix.

All field explorations were supervised by an NV5 engineering geologist licensed in California and conducted in accordance with the requirements given in the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010). These Boring Records were prepared in general accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010) and associated errata dated August 2018.

Soil samples were collected at 5-ft alternating depth intervals using Standard Penetration Test (SPT) sampler in accordance with ASTM D1586 and Modified California ring-lined split-barrel samplers in accordance with ASTM D3550. Bulk samples of near surface soils and every major change of soil stratigraphy will also be collected from auger cuttings and placed in sealed plastic bags.

SPT drive samples were obtained using a 2.0-inch outside diameter and 1.4-inch inside diameter split-spoon sampler without lining. The soils recovered from the SPT sampling were stored in sealed plastic bags to preserve the natural moisture content.

Modified California drive samples were collected with a 3.0-inch outside diameter 2.5-inch inside diameter split-barrel sampler and a 2.4-inch inside diameter cutting shoe. The sampler barrel consists of 18-inch long metal rings for sample collection and has an additional length of waste barrel. Stainless steel or brass liner rings for sample collection are 1-inch high, 2.4-inch inside diameter, and 2.5-inch outside diameter. Modified California drive samples were retained in the metal rings and placed in sealed plastic canisters to prevent loss of moisture.

At each sampling interval, the drive samplers were fitted onto a sampling rod, lowered to the bottom of the boring, and driven 18 inches or to refusal (50 blows per 6 inches) with a 140-lb free-falling hammer dropped from a height of 30 inches using an energy-calibrated hammer delivery system. Compared to the SPT, the California sampler provides less disturbed samples.

At the completion of the drilling and sampling, the boring was abandoned by backfilling the borehole with Bentonite grout.

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Name
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND and SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Name
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (ASTM D 1557)
CR	Corrosion, Sulfates, Chlorides (CTM 643-99; CTM 417-06; CTM 422-06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeablility (CTM 220-05)
PA	Particle Size Analysis (ASTM D422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301-00)
SE	Sand Equivalent (CTM 217-99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Mud Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

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REPORT TITLE **Boring Record**				HOLE ID **A-19-001**
DIST	COUNTY **IMP**	ROUTE	POSTMILE	EA
PROJECT OR BRIDGE NAME **Lack Road Bridge Replacement Over New River**				
BRIDGE NUMBER **58C-101**	PREPARED BY **S. Burford**	DATE **5/17/2019**	SHEET **1 of 2**	

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	<0.25	<0.25	<0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
S iff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	>4.0	>4.0	>2.0	Indented by humbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	N_{60} - Value (blows / foot)	
	SPT	CAL-Modified
Very Loose	0 - 4	0 - 5
Loose	5 - 10	6 - 15
Medium Dense	11 - 30	16 - 45
Dense	31 - 50	46 - 75
Very Dense	>50	>75

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OF PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptions and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

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REPORT TITLE **Boring Record**				HOLE ID **A-19-001**
DIST	COUNTY **IMP**	ROUTE	POSTMILE	EA
PROJECT OR BRIDGE NAME **Lack Road Bridge Replacement Over New River**				
BRIDGE NUMBER **58C-101**	PREPARED BY **S. Burford**	DATE **5/17/2019**	SHEET **2 of 2**	

LOGGED BY: **S. Burford**	BEGIN DATE: **3/19/2019**	COMPLETION DATE: **3/19/2019**	BOREHOLE LOCATION (Lat/Long or East/North and Datum): **33.100095 N, -115.648916 W**	HOLE ID: **A-19-001**
DRILLING CONTRACTOR: **Baja Exploration**			BOREHOLE LOCATION (Station, Offset, Line): **Northwest Side of Bridge**	SURFACE ELEVATION: **-215.0 ft**
DRILLING METHOD: **Hollow Stem Auger**			DRILL RIG: **CME-95**	BOREHOLE DIAMETER: **8 in**
SAMPLER TYPE(S) AND SIZE(S) (ID): **SPT (1.4") CalMod (2.4")**			SPT HAMMER TYPE: **Automatic, Weight= 140 lbs/ Drop= 30"**	HAMMER EFFICIENCY, ERi: **67.9 %**
BOREHOLE BACKFILL AND COMPLETION: **Bentonite Cement Slurry**			GROUNDWATER READING: DURING DRILLING **18.0 ft on 3/19/2019** AFTER DRILLING **18.0 ft on 3/19/2019**	TOTAL DEPTH OF BORING: **100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Type	Sample ID	Blows per 6 in.	Blows per foot	Recovery %	RQD %	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks (Other Tests)
-216	0 1 2		Silty SAND (SM): Brown; moist; trace of gravel, fine to medium sand												
	2.5		El. -217.5'												
-218	3 4		Lean CLAY (CL): Brown; moist; trace of gravel, fine to medium sand		B01					21.0					R EI M
	4.5		El. -219.5'												
-220	5 6		Silty SAND (SM): Medium dense; brown; moist; trace of gravel, fine sand		S01	4 7 8	15			9.3					M
-222	7 8														
-224	9														
	9.0		El. -224.0'												
	10		Lean CLAY (CL): Brown; moist to wet; 6% fine sand												
-226	11				S02	4 5 5	10			26.0	97.3				DS M UW
-228	12 13 14														
-230	15 16		Lenses of fat CLAY (CH), soft		S03	1 2 2	4			27.2					PA PI CR M
-232	17 18														
-234	19				B02										PA PI CR
	20														
-236	21		Soft		S04	1 1 2	3			38.7					PA M PI CR
-238	22 23														
-240	24 25														
	26				S05	6 7 9	16			26.7	95.6	PP=0 25			PA M PI CR UW
-242	27 28														
-244	29				B03										
	30		Medium stiff												
-246	31				S06	2 3 4	7			30.6					M
-248	32 33														
-250	34 35		Stiff												
	36.0		El. -251.0'		S07	3 5 7	12								
-252	36 37		Silty SAND (SM): Dense; brown; wet; fine sand												
-254	38 39 40														

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Ventura, CA 93003

REPORT TITLE: **Boring Record**				HOLE ID: **A-19-001**
DIST	COUNTY: **IMPERIAL**	ROUTE	POSTMILE	EA
PROJECT OR BRIDGE NAME: **Lack Road Bridge Replacement Over New River**				
BRIDGE NUMBER: **58C-101**	PREPARED BY: **S. Burford**	DATE: **5/17/2019**	SHEET: **1 of 3**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or East/North and Datum)	HOLE ID
S. Burford	**3/19/2019**	**3/19/2019**	**33.100095 N, -115.648916 W**	**A-19-001**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Station, Offset, Line)	SURFACE ELEVATION
Baja Exploration			**Northwest Side of Bridge**	**-215.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow Stem Auger			**CME-95**	**8 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4") CalMod (2.4")			**Automatic, Weight= 140 lbs/ Drop= 30"**	**67.9 %**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READING — DURING DRILLING / AFTER DRILLING	TOTAL DEPTH OF BORING
Bentonite Cement Slurry			**18.0 ft on 3/19/2019** / **18.0 ft on 3/19/2019**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Type	Sample ID	Blows per 6 in.	Blows per foot	Recovery %	RQD %	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks (Other Tests)
-256	40 41		Silty SAND (SM): Dense; brown; wet; fine sand		S08	9 17 28				22.2	103.0				PA PI M UW
	42		Dense												
-258	43 44														
-260	45		Dense		S09	14 17 19	36			21.9					PA PI M
	46														
-262	47 48														
-264	49 50														
-266	51		51.0 Medium dense El -266.0'		S10	7 8 14	22			33.3	89.2	PP=1.75			PA DS(51-51.5') PP
	52		Lean CLAY (CL): Stiff; brown; wet; fine sand												
-268	53 54														
-270	55				S11	4 4 6	10								
	56		Stiff												
-272	57 58														
-274	59 60														
-276	61		Lenses of fat CLAY (CH), stiff		S12	4 5 9	14			30.9					M
	62														
-278	63 64														
-280	65		Hard												
	66		66.0 El -281.0'		S13	7 13 22	35								
-282	67		Silty SAND (SM): Dense; brown; wet; fine sand												
-284	68 69														
	70		Dense		S14	12 17 20	37								PA
-286	71														
-288	72 73														
-290	74 75														
	76				S15	13 18 19	37			22.4	104.5				PA M UW
-292	77														
-294	78 79														
	80														

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REPORT TITLE				HOLE ID
Boring Record				**A-19-001**
DIST	COUNTY	ROUTE	POSTMILE	EA
	IMPERIAL			
PROJECT OR BRIDGE NAME				
Lack Road Bridge Replacement Over New River				
BRIDGE NUMBER	PREPARED BY	DATE	SHEET	
58C-101	**S. Burford**	**5/17/2019**	**2 of 3**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or East/North and Datum)	HOLE ID
S. Burford	**3/19/2019**	**3/19/2019**	**33.100095 N, -115.648916 W**	**A-19-001**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Station, Offset, Line)	SURFACE ELEVATION
Baja Exploration			**Northwest Side of Bridge**	**-215.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow Stem Auger			**CME-95**	**8 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4") CalMod (2.4")			**Automatic, Weight= 140 lbs/ Drop= 30"**	**67.9 %**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READING DURING DRILLING / AFTER DRILLING	TOTAL DEPTH OF BORING
Bentonite Cement Slurry			**18.0 ft on 3/19/2019 / 18.0 ft on 3/19/2019**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Type	Sample ID	Blows per 6 in.	Blows per foot	Recovery %	RQD %	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks (Other Tests)
-296	80 / 81		Silty SAND (SM): Dense; brown; wet; fine sand Very dense	X	S16	18 19 37	56								PA
-298	82 / 83 / 84														
-300	85 / 86		Dense	X	S17	11 21 24	45								
-302	87 / 88														
-304	89 / 90														
-306	91		Very dense	■	S18	27 42 50/4"	92			22.3	104 9				M UW
	92														
-308	93 / 94														
-310	95 / 96		Very dense	X	S19	10 26 33	59								
-312	97 / 98														
-314	99		Very dense	X	S20	14 28 39	67								
	100		100.0 EL -315.0' Bottom of Borehole at 100.0 feet. Groundwater encountered at 18' BGS. Refusal not encountered. Backfilled with bentonite cement slurry.												
-316	101 / 102														
-318	103 / 104														
-320	105 / 106														
-322	107 / 108														
-324	109 / 110														
-326	111 / 112														
-328	113 / 114														
-330	115 / 116														
-332	117 / 118														
-334	119 / 120														

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REPORT TITLE				HOLE ID
Boring Record				**A-19-001**
DIST	COUNTY	ROUTE	POSTMILE	EA
	IMPERIAL			
PROJECT OR BRIDGE NAME				
Lack Road Bridge Replacement Over New River				
BRIDGE NUMBER	PREPARED BY	DATE	SHEET	
58C-101	**S. Burford**	**5/17/2019**	**3 of 3**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or East/North and Datum)	HOLE ID
S. Burford	**3/18/2019**	**3/18/2019**	**33.099600 N, -115.648740 W**	**A-19-002**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Station, Offset, Line)	SURFACE ELEVATION
Baja Exploration			**Southeast Side of Bridge**	**-215.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow Stem Auger			**CME-95**	**8 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4") CalMod (2.4")			**Automatic, Weight= 140 lbs/ Drop= 30"**	**67.9 %**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READING — DURING DRILLING / AFTER DRILLING	TOTAL DEPTH OF BORING
Bentonite Cement Slurry			**19.0 ft on 3/18/2019 / 19.0 ft on 3/18/2019**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Type	Sample ID	Blows per 6 in.	Blows per foot	Recovery %	RQD %	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks (Other Tests)
-216	0		Silty SAND (SM): Loose; brown; moist; trace of gravel, fine to medium sand												
	1														
	2		2.0 El -217.0'												
-218	3		Lean CLAY (CL): Brown; moist to wet; 9% fine sand												
	4				B01					17.6					R EI M
-220	5		Stiff			2									
	6				S01	4 18	22			26.3					M
-222	7														
	8														
-224	9														
	10					4									DS
-226	11		Lenses of fat CLAY (CH)		S02	5 9	14			23.8	99.2	PP=1.5			PP M UW
	12														
-228	13														
	14				B02										PA PI CR
-230	15		Soft			2									PA
	16				S03	2 2	4			28.9					M CR
-232	17														
	18														
-234	19		▼												
	20					4									PA PI
-236	21		Medium stiff		S04	5 5	10			32.4	87.0	PP=1.0			M CR PP UW
	22														
-238	23														
	24														
-240	25					1									PA
	26		Soft		S05	1 3	4			34.4					PI M
-242	27		27.5 El -242.5'												CR
	28		Silty SAND (SM): Loose; brown; wet; fine sand												
-244	29														
	30					1									
-246	31		Loose		S06	2 3	5								PA PI
	32														
-248	33														
	34														
-250	35					9									PA
	36		Medium dense		S07	13 15	28			23.8	98.7				DS PI UW
-252	37														M
	38														
-254	39														
	40		40.0 El -255.0'												

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REPORT TITLE				HOLE ID
Boring Record				**A-19-002**
DIST	COUNTY	ROUTE	POSTMILE	EA
	IMPERIAL			
PROJECT OR BRIDGE NAME				
Lack Road Bridge Replacement Over New River				
BRIDGE NUMBER	PREPARED BY	DATE	SHEET	
58C-101	**S. Burford**	**5/17/2019**	**1 of 3**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or East/North and Datum)	HOLE ID
S. Burford	**3/18/2019**	**3/18/2019**	**33.099600 N, -115.648740 W**	**A-19-002**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Station, Offset, Line)	SURFACE ELEVATION
Baja Exploration			**Southeast Side of Bridge**	**-215.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow Stem Auger			**CME-95**	**8 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4") CalMod (2.4")			**Automatic, Weight= 140 lbs/ Drop= 30"**	**67.9 %**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READING / DURING DRILLING / AFTER DRILLING	TOTAL DEPTH OF BORING
Bentonite Cement Slurry			**19.0 ft on 3/18/2019 / 19.0 ft on 3/18/2019**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Type	Sample ID	Blows per 6 in.	Blows per foot	Recovery %	RQD %	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks (Other Tests)
-256	40		Silty SAND (SM): Brown; wet; fine sand												
	41		Medium dense		S08	4 5 8	13								PA PI
	42														
-258	43														
	44														
-260	45		Dense			19									PA
	46				S09	24 29	53			20.1	107 6				PI M
-262	47														UW
	48														
-264	49														
	50		Dense			9									
-266	51				S10	15 17	32								PA PI
	52														
-268	53		53.0 El. -268.0'												
	54		Lean CLAY (CL): Stiff; brown; wet; fine sand												
-270	55		Stiff			5									
	56				S11	6 6	12			30.7					M
-272	57														
	58														
-274	59														
	60		Lenses of fat CLAY (CH), very stiff			6									
-276	61				S12	8 10	18								
	62														
-278	63														
	64														
-280	65		Medium stiff			6									M
	66		66.3 El. -281.3'		S13	7 8	15			27.8	97.0	PP=0.5			UW PP
-282	67		Silty SAND (SM): Medium dense; brown; wet; fine sand												
	68														
-284	69														
	70		Medium dense			6									
-286	71				S14	8 8	16								PA
	72														
-288	73														
	74														
-290	75		Dense			12									
	76				S15	14 19	33			22.9					PA M
-292	77														
	78														
-294	79														
	80		80.0 El. -295.0'												

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REPORT TITLE				HOLE ID
Boring Record				**A-19-002**
DIST	COUNTY	ROUTE	POSTMILE	EA
	IMPERIAL			
PROJECT OR BRIDGE NAME				
Lack Road Bridge Replacement Over New River				
BRIDGE NUMBER	PREPARED BY	DATE	SHEET	
58C-101	**S. Burford**	**5/17/2019**	**2 of 3**	

LOGGED BY	BEGIN DATE	COMPLETION DATE	BOREHOLE LOCATION (Lat/Long or East/North and Datum)	HOLE ID
S. Burford	**3/18/2019**	**3/18/2019**	**33.099600 N, -115.648740 W**	**A-19-002**
DRILLING CONTRACTOR			BOREHOLE LOCATION (Station, Offset, Line)	SURFACE ELEVATION
Baja Exploration			**Southeast Side of Bridge**	**-215.0 ft**
DRILLING METHOD			DRILL RIG	BOREHOLE DIAMETER
Hollow Stem Auger			**CME-95**	**8 in**
SAMPLER TYPE(S) AND SIZE(S) (ID)			SPT HAMMER TYPE	HAMMER EFFICIENCY, ERi
SPT (1.4") CalMod (2.4")			**Automatic, Weight= 140 lbs/ Drop= 30"**	**67.9 %**
BOREHOLE BACKFILL AND COMPLETION			GROUNDWATER READING DURING DRILLING / AFTER DRILLING	TOTAL DEPTH OF BORING
Bentonite Cement Slurry			**19.0 ft on 3/18/2019 / 19.0 ft on 3/18/2019**	**100.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Type	Sample ID	Blows per 6 in.	Blows per foot	Recovery %	RQD %	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks (Other Tests)
-296	80 / 81		Silty SAND (SM): Brown; wet; fine sand Dense	X	S16	12 18 24	42								PA
-298	82 / 83 / 84														
-300	85 / 86		Very dense	X	S17	27 44 50/4"	94			20.2					M
-302	87 / 88														
-304	89 / 90														
-306	91		Very dense	X	S18	15 30 34	64								
-308	92 / 93 / 94														
-310	95 / 96		Very dense 96.0 El. -311.0'	X	S19	18 28 36	64								
-312	97 / 98		Lean CLAY (CL): Very stiff; brown; wet; fine sand Lenses of fat CLAY (CH), very stiff												
-314	99 / 100		100.0 El. -315.0'	X	S20	9 9 12	21								
-316	101 / 102		Bottom of Borehole at 100.0 feet. Groundwater encountered at 19' BGS. Refusal not encountered. Backfilled with bentonite cement slurry.												
-318	103 / 104														
-320	105 / 106														
-322	107 / 108														
-324	109 / 110														
-326	111 / 112														
-328	113 / 114														
-330	115 / 116														
-332	117 / 118														
-334	119 / 120														

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REPORT TITLE				HOLE ID
Boring Record				**A-19-002**
DIST	COUNTY	ROUTE	POSTMILE	EA
	IMPERIAL			
PROJECT OR BRIDGE NAME				
Lack Road Bridge Replacement Over New River				
BRIDGE NUMBER	PREPARED BY	DATE	SHEET	
58C-101	**S. Burford**	**5/17/2019**	**3 of 3**	

APPENDIX B

Laboratory Test Results

SUMMARY OF LABORATORY TEST RESULTS

In-situ Moisture and Density Tests

The in-situ moisture contents and dry densities of selected samples obtained from the test borings were evaluated in general accordance with the latest version of D2216 and D2937 laboratory test methods. The method involves obtaining the moist weight of the sample and then drying the sample to obtain it's dry weight. The moisture content is calculated by taking the difference between the wet and dry weights, dividing it by the dry weight of the sample and expressing the result as a percentage. The results of the in-situ moisture content and density tests are presented in the following table and on the boring records in Appendix A.

RESULTS OF MOISTURE CONTENT AND DENSITY TESTS
(ASTM D2216 and ASTM D2937)

Sample Location	Moisture Content (percent)	Dry Density (pounds per cubic foot)
A-19-001 @ 3 - 5 feet	21.0	Not Tested
A-19-001 @ 5 - 6.5 feet	9.3	Not Tested
A-19-001 @ 11 – 11.5 feet	26.0	97.3
A-19-001 @ 15 - 16.5 feet	27.2	Not Tested
A-19-001 @ 20 - 21.5 feet	38.7	Not Tested
A-19-001 @ 25 – 26.5 feet	26.7	95.6
A-19-001 @ 30 – 31.5 feet	30.6	Not Tested
A-19-001 @ 40 - 41.5 feet	22.2	103.0
A-19-001 @ 45 - 46.5 feet	21.9	Not Tested
A-19-001 @ 51 – 51.5 feet	33.3	89.2
A-19-001 @ 60 - 61.5 feet	30.9	Not Tested
A-19-001 @ 75 - 76.5 feet	22.4	104.5
A-19-001 @ 90 - 91.5 feet	22.3	104.9
A-19-002 @ 3 - 5 feet	17.6	Not Tested
A-19-002 @ 5 - 6.5 feet	26.3	Not Tested
A-19-002 @ 11 – 11.5 feet	23.8	99.2
A-19-002 @ 15 - 16.5 feet	28.9	Not Tested
A-19-002 @ 20 - 21.5 feet	32.4	87.0
A-19-002 @ 25 - 26.5 feet	34.4	Not Tested
A-19-002 @ 36 – 36.5 feet	23.8	98.7
A-19-002 @ 45 - 46.5 feet	20.1	107.6

Sample Location	Moisture Content (percent)	Dry Density (pounds per cubic foot)
A-19-002 @ 55 - 56.5 feet	30.7	Not Tested
A-19-002 @ 65 - 66.5 feet	27.8	97.0
A-19-002 @ 75 - 76.5 feet	22.9	Not Tested
A-19-002 @ 85 - 86.5 feet	20.2	Not Tested

Classification

Soils were visually and texturally classified in general accordance with the Unified Soil Classification System (ASTM D2487). Soil classifications are indicated on the boring records presented in Appendix A.

Particle-size Distribution Tests

An evaluation of the grain-size distribution of selected soil samples was performed in general accordance with the latest version of ASTM D6913 (including –200 wash). These test results were utilized in evaluating the soil classifications in accordance with the Unified Soil Classification System. Particle size distribution test results are presented on the laboratory test sheets attached in this appendix.

Atterberg Limits

Atterberg limits tests were performed in general accordance with ASTM D4318 on selected soil samples. These tests were useful in classification of the soils. Test results are attached in this appendix and summarized below.

RESULTS OF ATTERBERG LIMITS TESTS
(ASTM D4318)

Location	A-19-001 @ 15 – 26.5 ft	A-19-001 @ 40 – 51 ft	A-19-002 @ 13 – 26.5 ft	A-19-002 @ 30 – 51.5
Group Name	Lean CLAY (CL)	Non-Plastic	Lean CLAY (CL)	Non-Plastic
Liquid Limit	37	NR	40	NR
Plastic Limit	17	NR	16	NR
Plasticity Index	20	NR	24	NR

Direct Shear

Direct shear tests were performed on representative relatively undisturbed samples in general accordance with ASTM D3080 to evaluate the shear strength characteristics of the on-site materials. The test method consists of placing the soil sample in the direct shear device, applying a series of normal stresses, and then shearing the sample at the constant rate of shearing deformation. The shearing force and horizontal displacements are measured and recorded as the soil specimen is sheared. The shearing is continued well beyond the point of maximum stress until the stress reaches a constant or residual value. The results of the tests are presented in the following table and attached in this appendix.

RESULTS OF DIRECT SHEAR TESTS
(ASTM D3080)

Location	USCS Classification	Peak Friction (degrees)	Ultimate Friction (degrees)	Peak Cohesion (psf)	Ultimate Cohesion (psf)	Notes
A-19-001 @ 11 - 11.5 ft.	CL	30	29	0	0	Relatively undisturbed
A-19-001 @ 51 - 51.5 ft.	CL	21	21	610	597	Relatively undisturbed
A-19-002 @ 11 - 11.5 ft.	CL	18	21	970	640	Relatively undisturbed
A-19-002 @ 36 - 36.5 ft.	SM	35	29	273	358	Relatively undisturbed

Resistance "R" Values Tests

R-Value tests were performed on samples of the on-site soils. The tests were performed in general accordance with California Test Method 301/ ASTM D2844. The result of the tests are presented below and attached in this appendix.

RESULTS OF R-VALUE TESTS
(ASTM D2844 and CTM 301)

Location	A-19-001 @ 3 – 5 ft	A-19-02 @ 3 – 5 ft
"R" Value	8	11
Material Type	Lean CLAY (CL)	Lean CLAY (CL)

Expansion Index Tests

Expansion index tests were performed on samples of the on-site soils. The tests were performed in general accordance with ASTM D4829. The result of the tests are presented below and attached in this appendix.

RESULTS OF EXPANSION INDEX TESTS
(ASTM D4829)

Location	Material Type	Initial Moisture Content, %	Final Moisture Content, %	Dry Density, pcf	Initial Saturation, %	Expansion Index	Potential Expansion
A-19-001 @ 3 - 5 ft.	Lean CLAY (CL)	12.4	29.3	102.4	51.9	89	MEDIUM
A-19-002 @ 3 - 5 ft.	Lean CLAY (CL)	10.6	23.2	108.4	51.5	71	MEDIUM

Soil Corrosivity Tests

Water soluble sulfate & chloride, resistivity and pH tests were performed by Clarkson Laboratory and Supply Inc., in general accordance with California Test Methods 643, 417 and 422 to provide an indication of the degree of corrosivity of the subgrade soils at locations tested with regard to concrete and normal grade steel.

RESULTS OF CORROSIVITY TESTS
(CTM 417, CTM 422 and CTM 643)

Sample Location	A-19-001 @ 15 - 26.5 ft	A-19-002 @ 13 - 26.5 ft
pH	8.3	8.2
Minimum Resistivity (Ohm-cm)	82	93
Water Soluble Sulfates (ppm)	2700	2880
Water Soluble Chlorides (ppm)	6410	5340
Material Type	Lean CLAY (CL)	Lean CLAY (CL)

Natural Moisture & Density Report

(ASTM D2216 & ASTM D2937)

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7182
Address:	1002 State Street	Lab Number:	117939-117940, 117942-
	El Centro, CA 92243		117947, 117949, 117951-
Project:	Lack Road Bridge – Bridge No.58C-101		117954, 117957- 117959
Project Add:	Imperial County, CA		117962-117964
			117966-117967

Sampled By:	Sean Burford
Date Sampled:	3/19/2019
Date Rcvd:	3/19/2019

Lab Number	117939	117940	117942	117943	117944
Exploration No.	A-19-001	A-19-001	A-19-001	A-19-001	A-19-001
Sample ID	A-19-001-B01-1	A-19-001-S01-1	A-19-001-S03-1	A-19-001-S04-1	A-19-001-S05-1
Depth, ft.	3-5	5-6.5	15-16.5	20-21.5	26-26.5
Moisture Content, %	21.0	9.3	27.2	38.7	26.7
Dry Density, pcf	-	-	-	-	95.6

Lab Number	117945	117946	117947	117949	117951
Exploration No.	A-19-001	A-19-001	A-19-001	A-19-001	A-19-001
Sample ID	A-19-001-S06-1	A-19-001-S08-1	A-19-001-S09-1	A-19-001-S12-1	A-19-001-S15-1
Depth, ft.	30-31.5	41-41.5	45-46.5	60-61.5	76-76.5
Moisture Content, %	30.6	22.2	21.9	30.9	22.4
Dry Density, pcf	-	103.0	-	-	104.5

Lab Number	117952	117953	117954	117957	117958
Exploration No.	A-19-001	A-19-002	A-19-002	A-19-002	A-19-002
Sample ID	A-19-001-S18-1	A-19-002-B01-1	A-19-002-S01-1	A-19-002-S03-1	A-19-002-S04-1
Depth, ft.	91-91.5	3-5	5-6.5	15-16.5	21-21.5
Moisture Content, %	22.3	17.6	26.3	28.9	32.4
Dry Density, pcf	104.9	-	-	-	87.0

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Construction Quality Assurance · Infrastructure · Energy · Program Management · Environmental

Natural Moisture & Density Report

(ASTM D2216 & ASTM D2937)

Lab Number	117959	117962	117963	117964	117966
Exploration No.	A-19-002	A-19-002	A-19-002	A-19-002	A-19-002
Sample ID	A-19-002-S05-1	A-19-002-S09-1	A-19-002-S11-1	A-19-002-S13-1	A-19-002-S15-1
Depth, ft.	25-26.5	46-46.5	55-56.5	66-66.5	75-76.5
Moisture Content, %	34.4	20.1	30.7	27.8	22.9
Dry Density, pcf	-	107.6	-	97.0	

Lab Number	117967				
Exploration No.	A-19-002				
Sample ID	A-19-002-S17-1				
Depth, ft.	85-86.5				
Moisture Content, %	20.2				
Dry Density, pcf	-				

Respectfully Submitted,
NV5 West, Inc.

Reviewed by:

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

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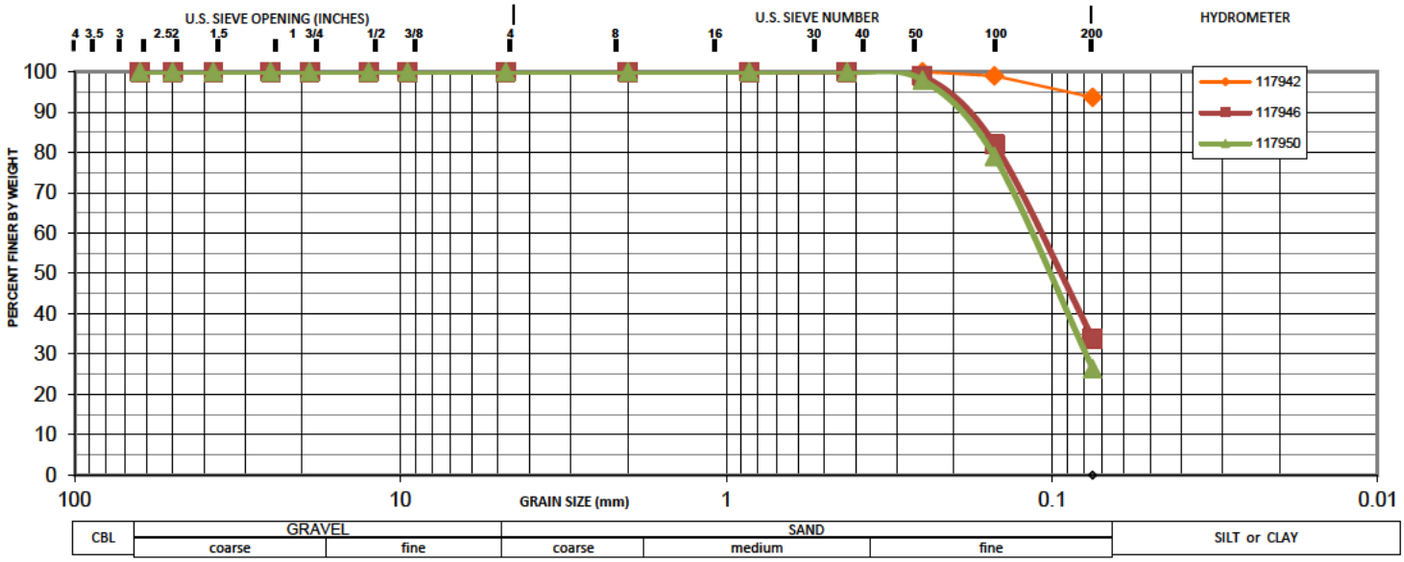
Construction Quality Assurance · Infrastructure · Energy · Program Management · Environmental

REPORT OF SIEVE ANALYSIS TEST

ASTM D6913 - Soil

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street El Centro, CA 92243	Lab Number:	117942, 117946, 117950
Project :	Lack Road Bridge – Bridge No.58C-101		
Project Address:	Imperial County, CA		

	117942	117946	117950			
Material	Lean CLAY (CL)	Silty SAND (SM)	Silty SAND (SM)			
Color	Brown	Brown	Brown			
Sample Location	A-19-001 @ 15'-26.5'	A-19-001 @ 41'-51'	A-19-001 @ 70'-86.5'			
Sample ID	A-19-001-S03,B02,S04,S05-1	A-19-001-S08,S09,S10-1	A-19-001-S14,S15,S16,S17-1			
Date Sampled	3/19/2019	3/19/2019	3/19/2019			
Date Submitted	3/19/2019	3/19/2019	3/19/2019			
Sampled By	Sean Burford	Sean Burford	Sean Burford			
Date Tested	3/28/2019	3/28/2019	3/28/2019			
Tested By	Darrel Delgado	Darrel Delgado	Darrel Delgado			



Sample ID:	117942	117946	117950			
Sieve Size	% Passing					
63mm (2 1/2")	100	100	100			
50mm (2")	100	100	100			
37.5mm (1 1/2")	100	100	100			
25mm (1")	100	100	100			
19mm (3/4")	100	100	100			
12.5mm (1/2")	100	100	100			
9.5mm (3/8")	100	100	100			
4.75mm (#4)	100	100	100			
2mm (#10)	100	100	100			
850µm (#20)	100	100	100			
425µm (#40)	100	100	100			
250µm (#60)	100	99	98			
150 µm (#100)	99	82	79			
75 um (#200) washµ	93.7	33.9	26.4			
Fineness Modulus	0 0	0.2	0.2			
Shape (sand & gravel)	N.R.	N.R.	Round			
Hardness (sand & gravel)	N.R.	H&D	N.R.			
Specific Gravity	2.65	2.65	2.65			
Coef. of Curvature (C_c)	N.R.	N.R.	N.R.			
Coef. of Uniformity (C_u)	N.R.	N.R.	N.R.			
% Gravel	0	0	0			
% Sand	6	66	74			
% Fines	93.7	33.9	26.4			
USCS Class:	CL	SM	SM			

Notes: *Hardness: H&D = Hard & Durable; W&F = Weathered & Friable*
N.R.: Not Recorded; N/A: Not Available.

Respectfully Submitted,
NV5 West, Inc.

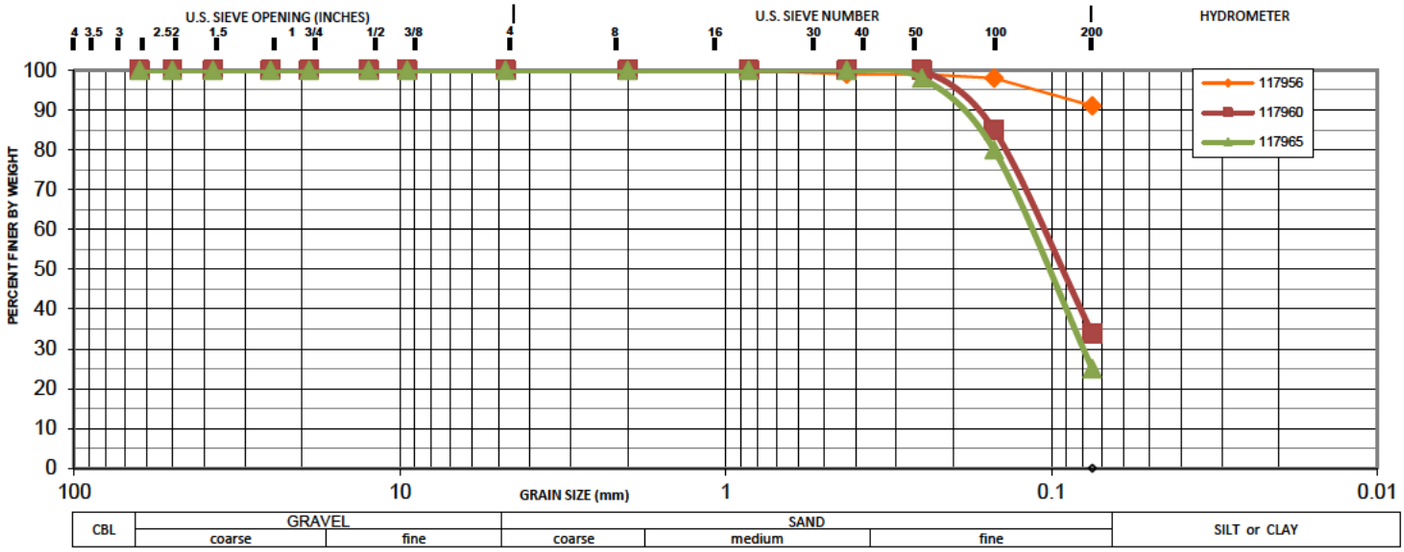
Carl Henderson, PhD, PE ,GE
CQA Group Director (San Diego)

REPORT OF SIEVE ANALYSIS TEST

ASTM D6913 - Soil

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street El Centro, CA 92243	Lab Number:	117956, 117960, 117965
Project :	Lack Road Bridge – Bridge No.58C-101		
Project Address:	Imperial County, CA		

	117956	117960	117965			
Material	Lean CLAY (CL)	Silty SAND (SM)	Silty SAND (SM)			
Color	Brown	Brown	Brown			
Sample Location	A-19-002 @ 13'-26.5'	A-19-002 @ 30'-51.5'	A-19-002 @ 70'-81.5'			
Sample ID	A-19-002-B02,S03,S04,S05-1	A-19-002-S06,S07,S08,S09,S10-1	A-19-002-S14,S15,S16-1			
Date Sampled	3/19/2019	3/19/2019	3/19/2019			
Date Submitted	3/19/2019	3/19/2019	3/19/2019			
Sampled By	Sean Burford	Sean Burford	Sean Burford			
Date Tested	3/28/2019	4/1/2019	4/1/2019			
Tested By	Darrel Delgado	Darrel Delgado	Darrel Delgado			



Sample ID:	117956	117960	117965			
Sieve Size	% Passing					
63mm (2 1/2")	100	100	100			
50mm (2")	100	100	100			
37.5mm (1 1/2")	100	100	100			
25mm (1")	100	100	100			
19mm (3/4")	100	100	100			
12.5mm (1/2")	100	100	100			
9.5mm (3/8")	100	100	100			
4.75mm (#4)	100	100	100			
2mm (#10)	100	100	100			
850µm (#20)	100	100	100			
425µm (#40)	99	100	100			
250µm (#60)	99	100	98			
150 µm (#100)	98	85	80			
75 um (#200) washµ	91.1	33.9	25.0			
Fineness Modulus	0 0	0.2	0.2			
Shape (sand & gravel)	N.R.	N.R.	Round			
Hardness (sand & gravel)	N.R.	H&D	N.R.			
Specific Gravity	2.65	2.65	2.65			
Coef. of Curvature (C_c)	N.R.	N.R.	N.R.			
Coef. of Uniformity (C_u)	N.R.	N.R.	N.R.			
% Gravel	0	0	0			
% Sand	9	66	75			
% Fines	91.1	33.9	25.0			
USCS Class:	CL	SM	SM			

Notes: *Hardness: H&D = Hard & Durable; W&F = Weathered & Friable*
N.R.: Not Recorded; N/A: Not Available.

Respectfully Submitted,
NV5 West, Inc.

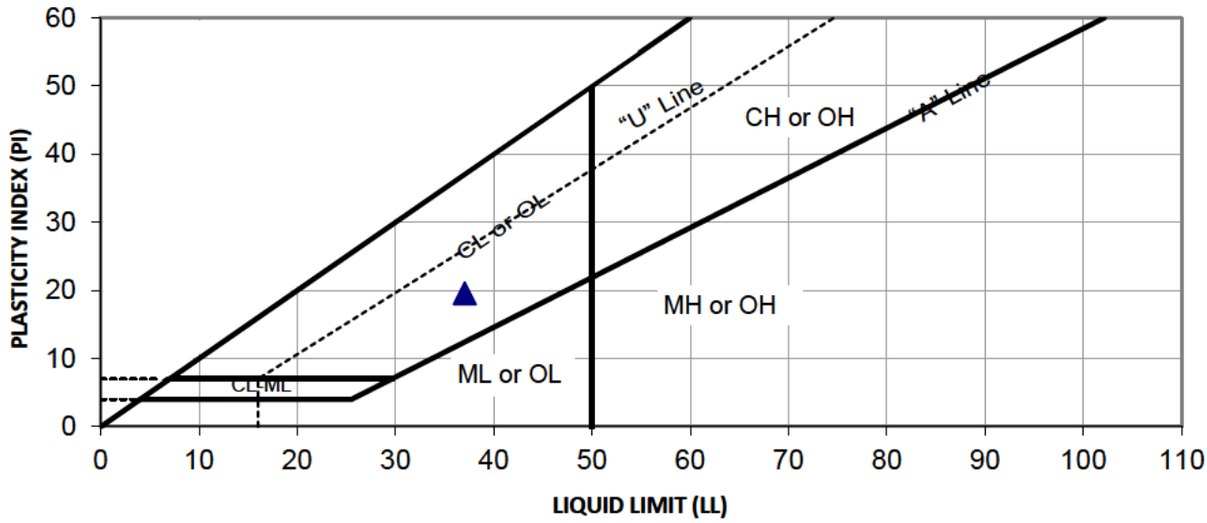
Carl Henderson, PhD, PE ,GE
CQA Group Director (San Diego)

REPORT OF LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX TESTS

(ASTM D4318)

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street	Lab Number:	117942
	El Centro, CA 92243		

Project:	Lack Road Bridge – Bridge No.58C-101
Project Address:	Imperial County, CA
Material:	Brown Lean CLAY (CL)
Location:	A-19-001 @ 15'-26.5' (Combined Sample)
Sample ID:	A-19-001-S03,B02,S04,S05-1
Date Sampled:	3/19/2019
Date Submitted:	3/19/2019
Sampled By:	Sean Burford
Date Tested:	4/3/2019



SUMMARY OF TEST RESULTS

SAMPLE ID	SOURCE /LOCATION DEPTH	%>#40	TEST RESULT			USCS	
			LL	PL	PI	Class	Group Name
117942	A-19-001 @ 15'-26.5' (Combined Sample)		**37**	**17**	**20**	CL	Lean CLAY

Reviewed By: Carl Henderson

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

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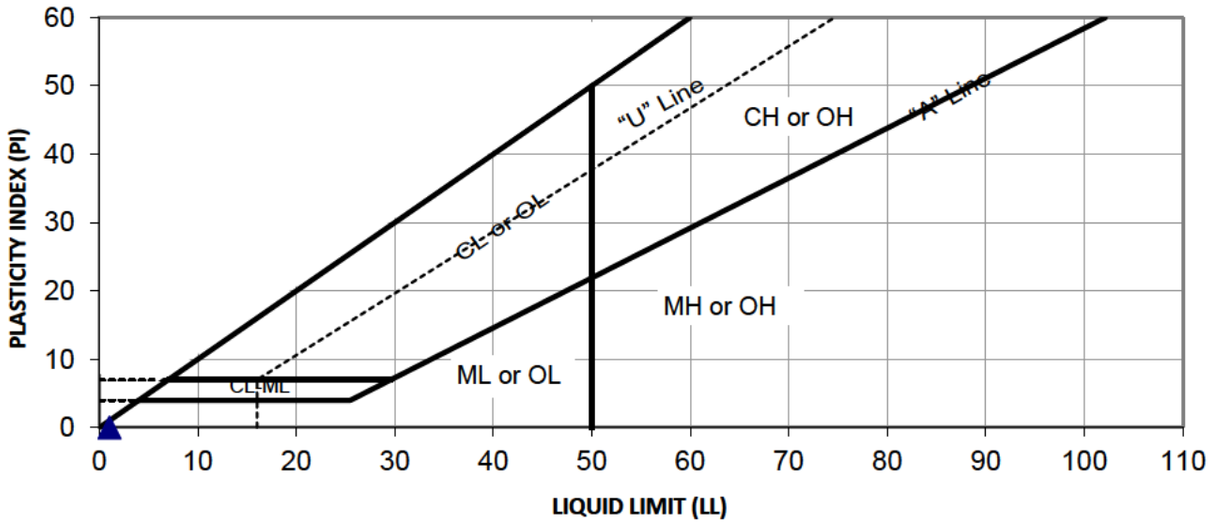
REPORT OF LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX TESTS

(ASTM D4318)

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street El Centro, CA 92243	Lab Number:	117946

Project:	Lack Road Bridge – Bridge No.58C-101
Project Address:	Imperial County, CA
Material:	Brown Silty SAND (SM)
Location:	A-19-001 @ 41'-51' (Combined Sample)
Sample ID:	A-19-001-S08,S09,S10-1
Date Sampled:	3/19/2019
Date Submitted:	3/19/2019
Sampled By:	Sean Burford
Date Tested:	4/3/2019



SUMMARY OF TEST RESULTS

SAMPLE ID	SOURCE /LOCATION DEPTH	%>#40	TEST RESULT			USCS	
			LL	PL	PI	Class	Group Name
117946	A-19-001 @ 41'-51' (Combined Sample)		**NR**	**NR**	**NR**	-	Non-Plastic

Reviewed By: Carl Henderson

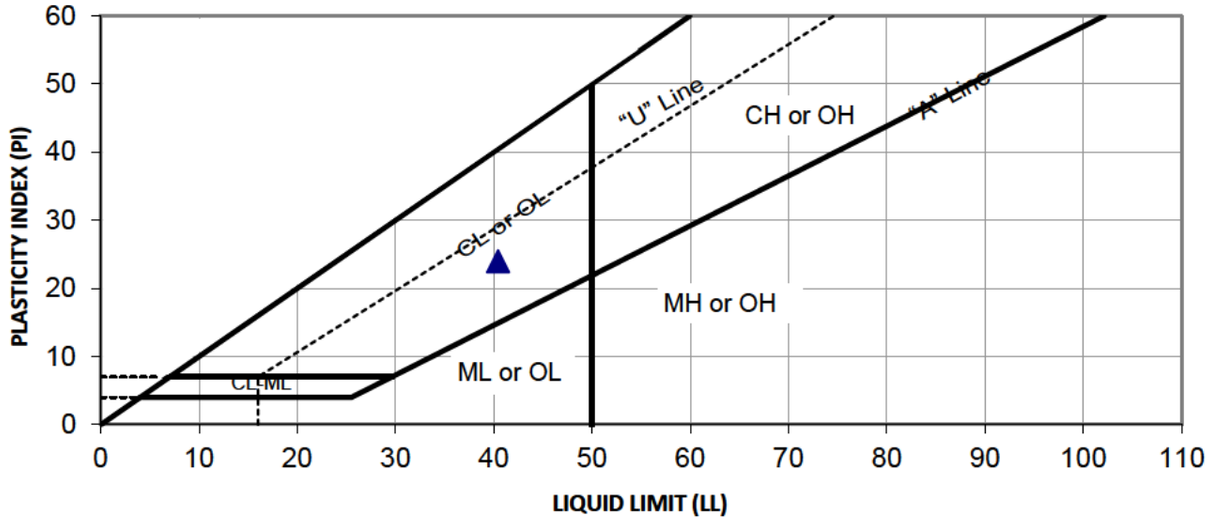
Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

REPORT OF LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX TESTS

(ASTM D4318)

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street	Lab Number:	117956
	El Centro, CA 92243		

Project:	Lack Road Bridge – Bridge No.58C-101
Project Address:	Imperial County, CA
Material:	Brown Lean CLAY (CL)
Location:	A-19-002 @ 13'-26.5' (Combined Sample)
Sample ID:	A-19-002-B02,S03,S04,S05-1
Date Sampled:	3/19/2019
Date Submitted:	3/19/2019
Sampled By:	Sean Burford
Date Tested:	4/2/2019



SUMMARY OF TEST RESULTS

SAMPLE ID	SOURCE /LOCATION DEPTH	%>#40	TEST RESULT			USCS	
			LL	PL	PI	Class	Group Name
117956	A-19-002 @ 13'-26.5' (Combined Sample)	1	**40**	**16**	**24**	CL	Lean CLAY

Reviewed By: Carl Henderson

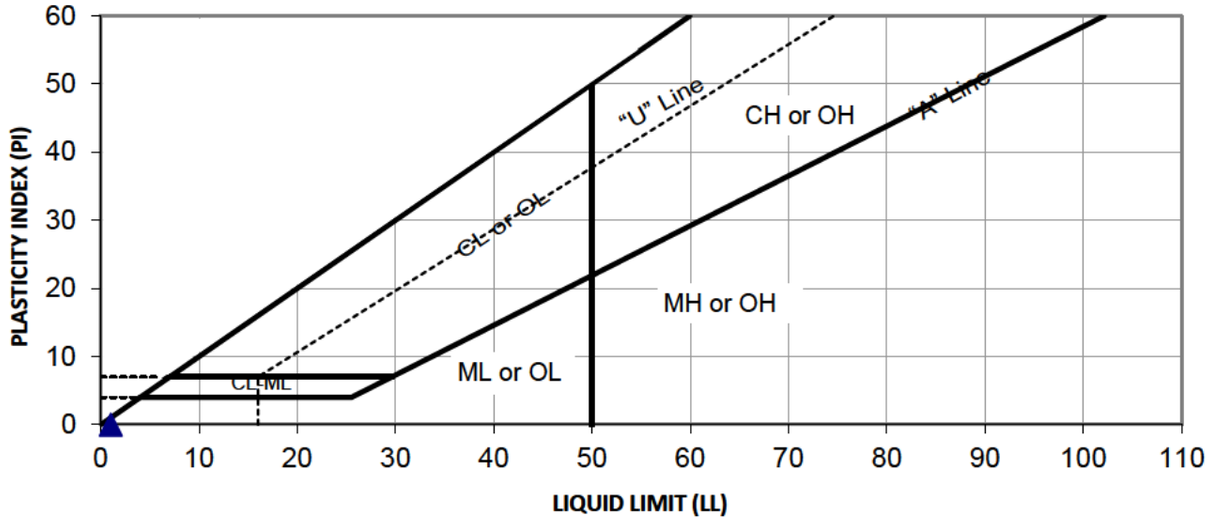
Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

REPORT OF LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX TESTS

(ASTM D4318)

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street	Lab Number:	117960
	El Centro, CA 92243		

Project:	Lack Road Bridge – Bridge No.58C-101
Project Address:	Imperial County, CA
Material:	Brown Silty SAND (SM)
Location:	A-19-002 @ 30'-51.5' (Combined Sample)
Sample ID:	A-19-002-S06,S07,S08,S09,S10-1
Date Sampled:	3/19/2019
Date Submitted:	3/19/2019
Sampled By:	Sean Burford
Date Tested:	4/3/2019



SUMMARY OF TEST RESULTS

SAMPLE ID	SOURCE /LOCATION DEPTH	%>#40	TEST RESULT			USCS	
			LL	PL	PI	Class	Group Name
117960	A-19-002 @ 30'-51.5' (Combined Sample)		**NR**	**NR**	**NR**	-	Non-Plastic

Reviewed By: Carl Henderson

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

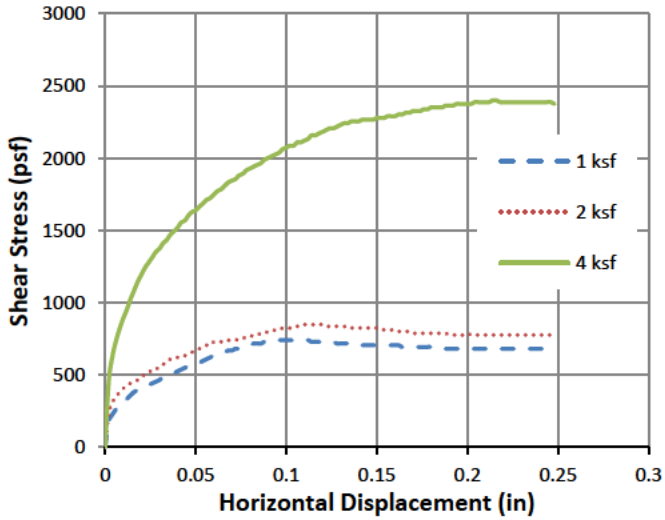
DIRECT SHEAR TEST (ASTM D3080)

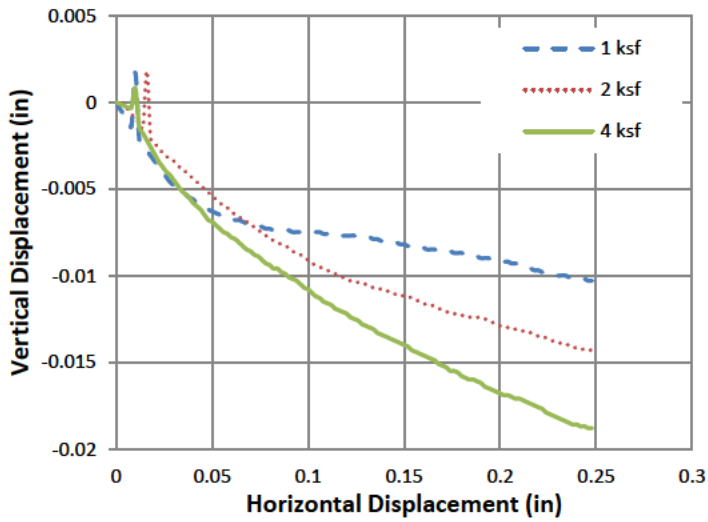
Project No.	227518-0000439.00			Date:	4/16/2019
Client:	County of Imperial			Report No.:	7217
Proj. Name:	Lack Road Bridge – Bridge No.58C-101			Lab No.:	117941
Location:	Imperial County, CA		Boring No. A-19-001	Date Rcvd:	3/19/2019
Sample date:	3/19/2019	Sample ID: A-19-001-S02-1	Sample Location: 11'-11.5'	Test Date:	3/29/2019

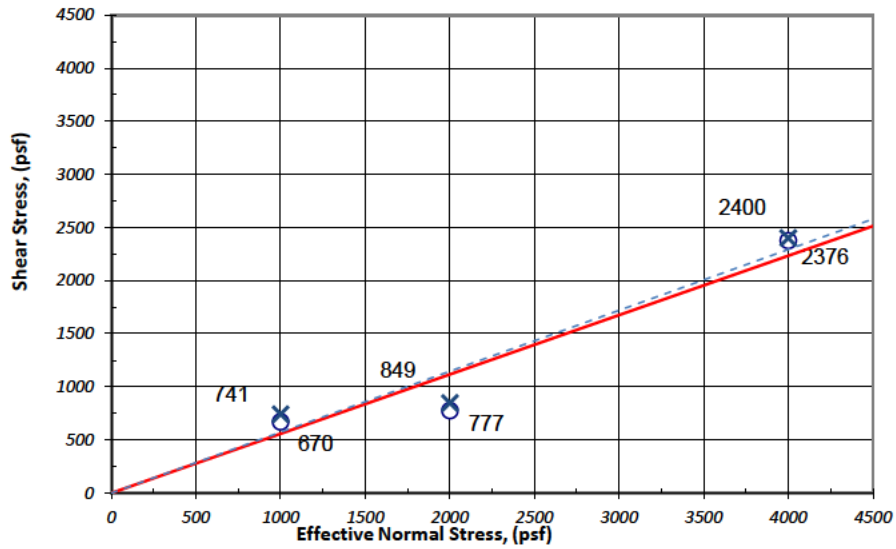
TEST DATA:

	Sample ID:	1 ksf	2 ksf	4 ksf
Initial	Water Content (%)	26.0	26.0	26.0
	Dry Density	98.5	96.4	97.1
	Saturation (%)	94.0	89.6	91.2
Final	Water Content (%)	27.3	27.9	25.9
	Dry Density	97.1	92.8	95.8
	Saturation (%)	95.5	88.4	88.0
Normal Stress (psf)		1000	2000	4000
Ultimate Shear Stress (psf)		670	777	2376
Peak Shear Stress (psf)		741	849	2400

Sample Type:	Relatively Undisturbed Sample
Description:	Lean CLAY (CL)
Color:	Brown
Tested By:	Chirag Padhiar







Peak Cohesion, C'(psf): **0**	Ultimate Cohesion, C'(psf): **0**
Peak Friction,Φ' (deg): **30**	Ultimate Friction,Φ' (deg): **29**

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Respectfully Submitted,
NV5 West, Inc.

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

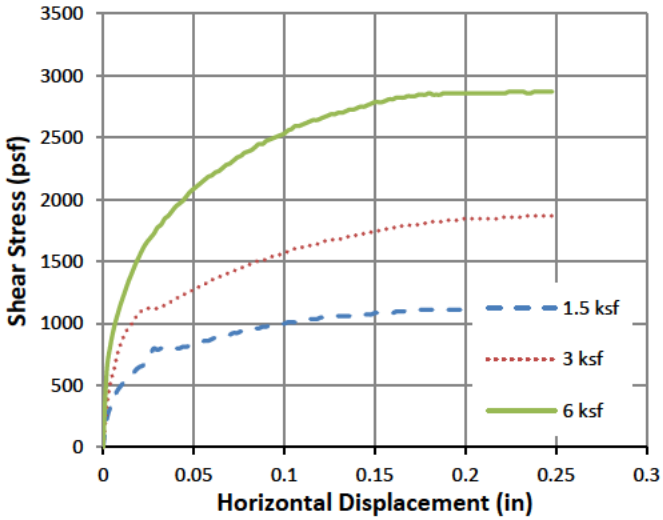
DIRECT SHEAR TEST (ASTM D3080)

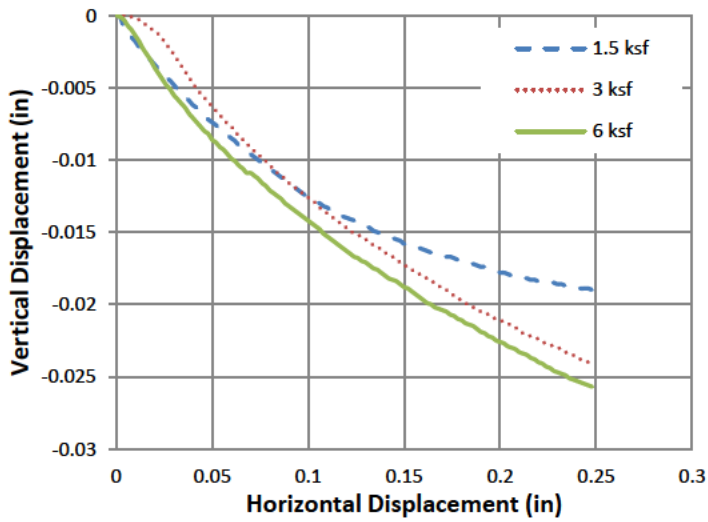
Project No.	227518-0000439.00			Date:	4/16/2019
Client:	County of Imperial			Report No.:	7217
Proj. Name:	Lack Road Bridge – Bridge No.58C-101			Lab No.:	117948
Location:	Imperial County, CA		Boring No. A-19-001	Date Rcvd:	3/19/2019
Sample date:	3/19/2019	Sample ID: A-19-001-S10-1	Sample Location: 51'-51.5'	Test Date:	4/5/2019

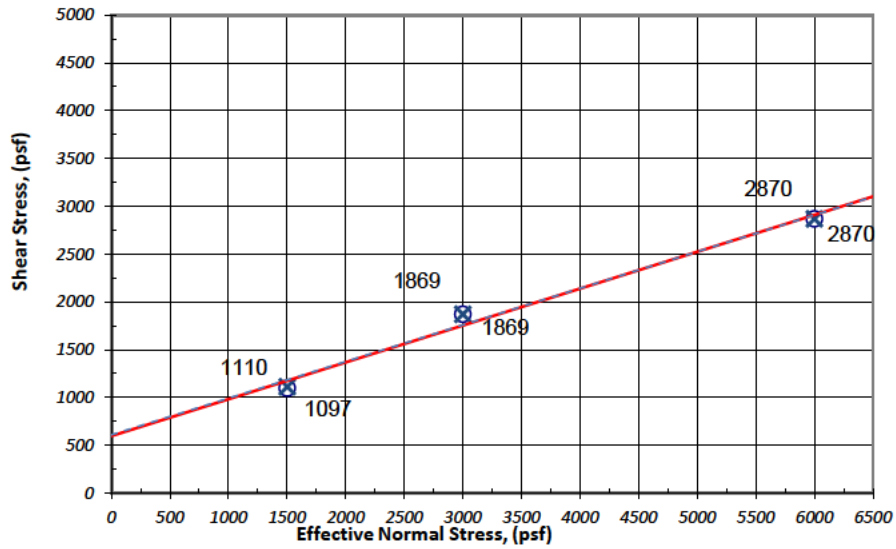
TEST DATA:

	Sample ID:	1.5 ksf	3 ksf	6 ksf
Initial	Water Content (%)	33.3	33.3	33.3
	Dry Density	89.1	89.1	89.4
	Saturation (%)	97.1	97.1	97.7
Final	Water Content (%)	30.0	27.6	26.2
	Dry Density	88.0	85.8	85.8
	Saturation (%)	85.3	74.7	70.8
Normal Stress (psf)		1500	3000	6000
Ultimate Shear Stress (psf)		1097	1869	2870
Peak Shear Stress (psf)		1110	1869	2870

Sample Type:	Relatively Undisturbed Sample
Description:	Lean CLAY (CL)
Color:	Brown
Tested By:	Darrel Delgado







Linear (Ultimate Strength Envelope)

Linear (Peak Strength Envelope)

Peak y = 0.3829x + 609.5

Ultimate y = 0.3854x + 596.5

Peak Cohesion, C'(psf): **610**	Ultimate Cohesion, C'(psf): **597**
Peak Friction,Φ' (deg): **21**	Ultimate Friction,Φ' (deg): **21**

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Respectfully Submitted,
NV5 West, Inc.

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

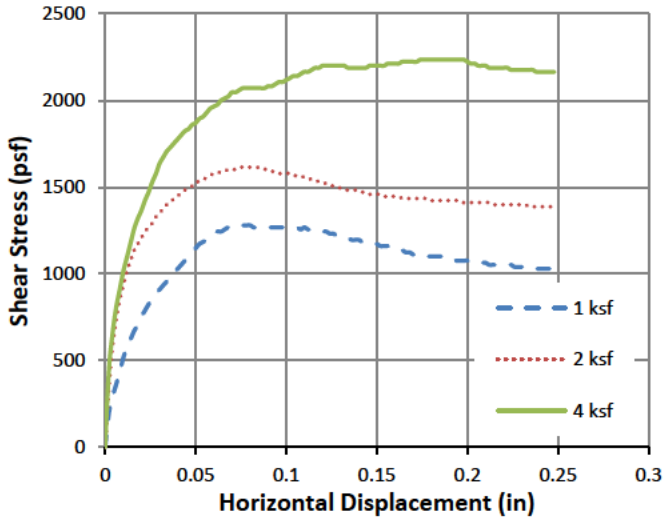
DIRECT SHEAR TEST (ASTM D3080)

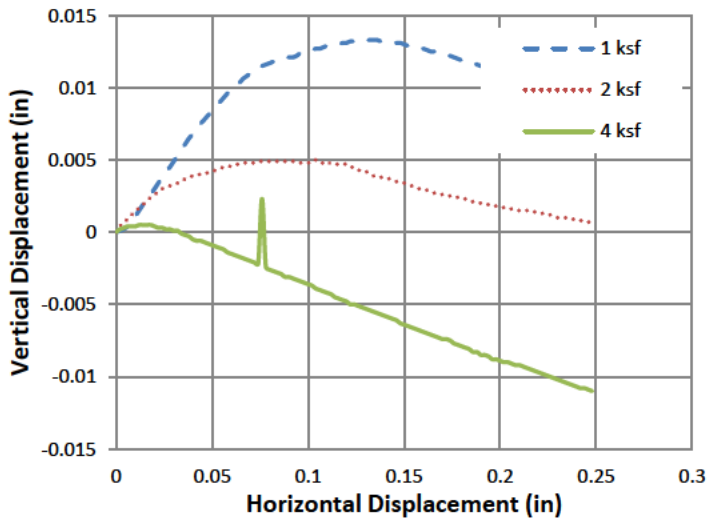
Project No.	227518-0000439.00			Date:	4/16/2019
Client:	County of Imperial			Report No.:	7217
Proj. Name:	Lack Road Bridge – Bridge No.58C-101			Lab No.:	117955
Location:	Imperial County, CA		Boring No. A-19-002	Date Rcvd:	3/19/2019
Sample date:	3/19/2019	Sample ID: A-19-002-S02-1	Sample Location:. 11'-11.5'	Test Date:	4/9/2019

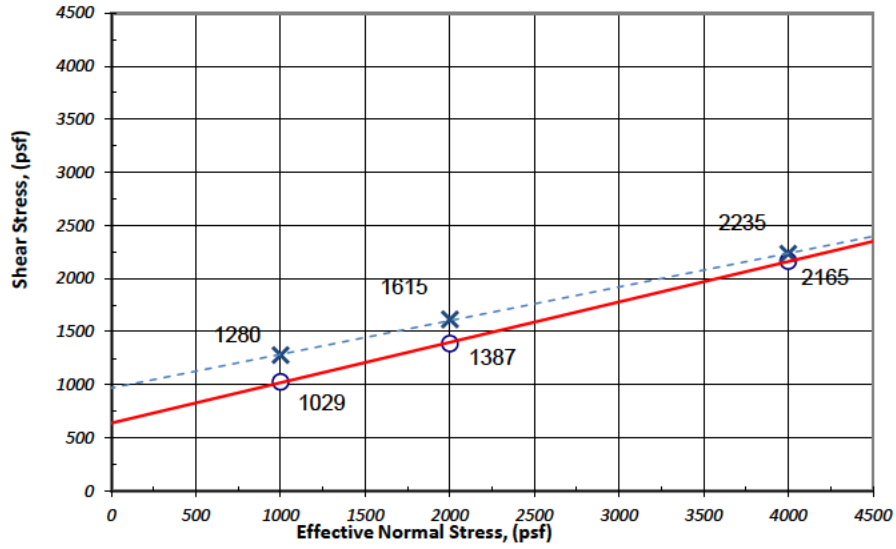
TEST DATA:

	Sample ID:	1 ksf	2 ksf	4 ksf
Initial	Water Content (%)	23.8	23.8	23.8
	Dry Density	99.4	100.1	98.0
	Saturation (%)	88.0	89.3	85.0
Final	Water Content (%)	27.8	27.0	26.1
	Dry Density	97.4	98.5	96.7
	Saturation (%)	98.1	97.6	90.6
Normal Stress (psf)		1000	2000	4000
Ultimate Shear Stress (psf)		1029	1387	2165
Peak Shear Stress (psf)		1280	1615	2235

Sample Type:	Relatively Undisturbed Sample
Description:	Lean CLAY (CL)
Color:	Brown
Tested By:	Darrel Delgado







Peak Cohesion, C'(psf): **970**	Ultimate Cohesion, C'(psf): **640**
Peak Friction,Φ' (deg): **18**	Ultimate Friction,Φ' (deg): **21**

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Respectfully Submitted,
NV5 West, Inc.

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

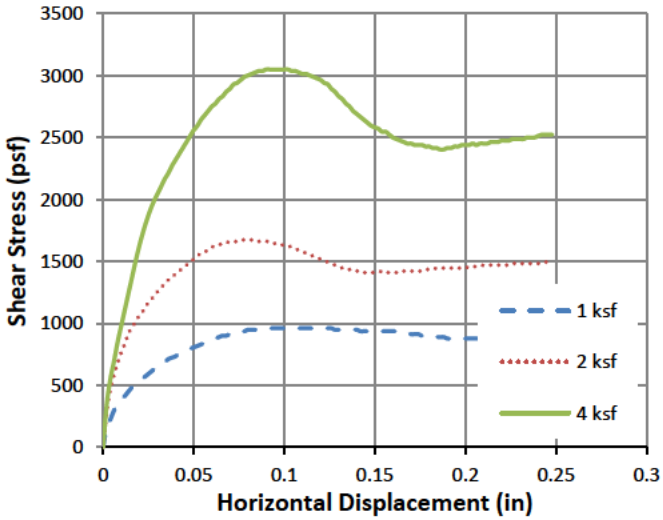
DIRECT SHEAR TEST (ASTM D3080)

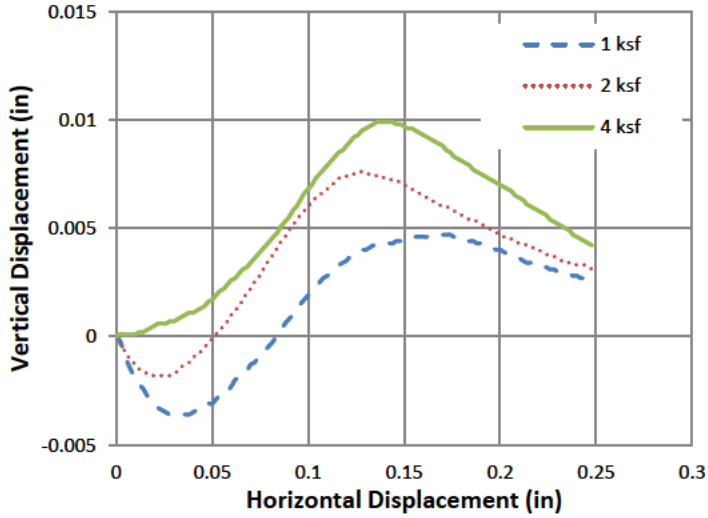
Project No.	227518-0000439.00			Date:	4/16/2019
Client:	County of Imperial			Report No.:	7217
Proj. Name:	Lack Road Bridge – Bridge No.58C-101			Lab No.:	117961
Location:	Imperial County, CA		Boring No. A-19-002	Date Rcvd:	3/19/2019
Sample date:	3/19/2019	Sample ID: A-19-002-S07-1	Sample Location: 36'-36.5'	Test Date:	4/11/2019

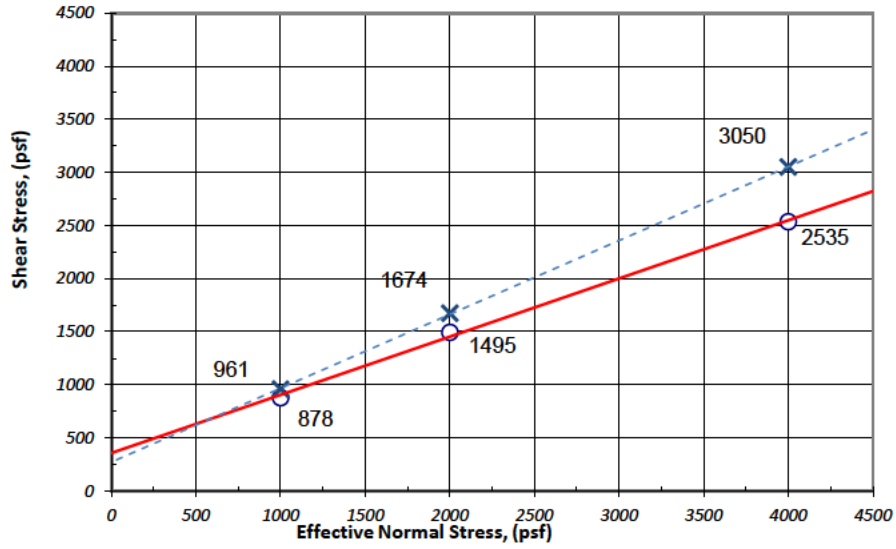
TEST DATA:

	Sample ID:	1 ksf	2 ksf	4 ksf
Initial	Water Content (%)	23.8	23.8	23.8
	Dry Density	99.9	96.9	99.3
	Saturation (%)	89.1	83.0	87.8
Final	Water Content (%)	22.5	25.1	25.0
	Dry Density	95.9	92.8	92.2
	Saturation (%)	76.7	79.5	78.1
Normal Stress (psf)		1000	2000	4000
Ultimate Shear Stress (psf)		878	1495	2535
Peak Shear Stress (psf)		961	1674	3050

Sample Type:	Relatively Undisturbed Sample
Description:	Silty SAND (SM)
Color:	Brown
Tested By:	Darrel Delgado







Linear (Ultimate Strength Envelope)

Linear (Peak Strength Envelope)

Peak y = 0.6951x + 273

Ultimate y = 0.5477x + 358

Peak Cohesion, C'(psf): **273**	Ultimate Cohesion, C'(psf): **358**
Peak Friction,Φ' (deg): **35**	Ultimate Friction,Φ' (deg): **29**

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Respectfully Submitted,
NV5 West, Inc.

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

RESISTANCE "R" VALUE TEST

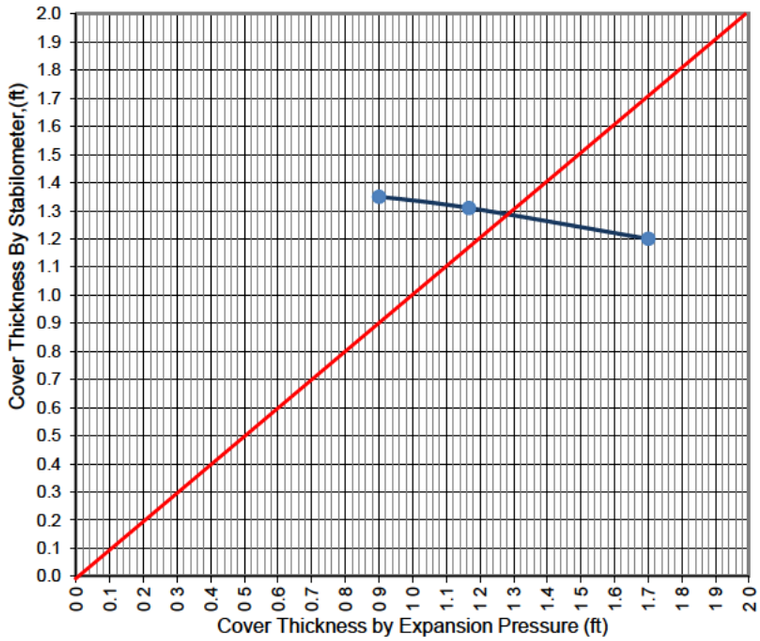
(CTM301 Caltrans / ASTM D2844)

Date:	4/16/2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street El Centro, CA 92243	Lab Number:	117939
Project :	Lack Road Bridge – Bridge No.58C-101		
Project Address :	Imperial County, CA		

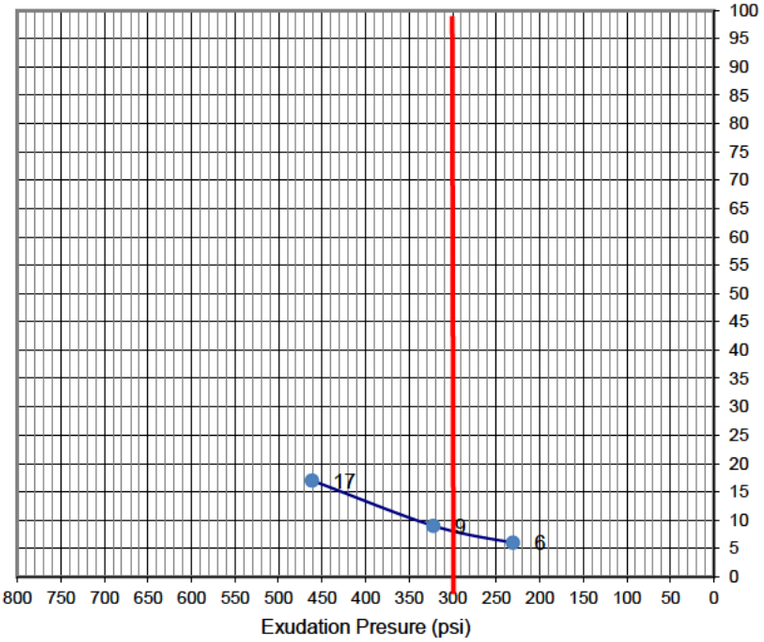
Material:	Brown Lean CLAY (CL)
Location:	A-19-001 @ 3'-5'
Sample ID:	A-19-001-B01-1
Sampled By:	Sean Burford
Date Sampled:	3/19/2019
Date Received:	3/19/2019

Tested By: Noah Regalado

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



TEST SPECIMEN	A	B	C	D
COMP. FOOT PRESSURE, psi	220	150	110	
INITIAL MOISTURE %	11.3	11.3	11.3	
MOISTURE @ COMPACTION %	17.8	19.7	21.5	
DRY DENSITY, pcf	111.2	107.3	103.5	
EXUDATION PRESSURE, psi	462	322	231	
STABILOMETER VALUE 'R'	17	9	6	

R-VALUE BY EXUDATION	8
R-VALUE BY EXPANSION	10
R-VALUE AT EQUILIBRIUM	**8**

Respectfully Submitted,

NV5 West, Inc.

Reviewed By: Carl Henderson

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

RESISTANCE "R" VALUE TEST

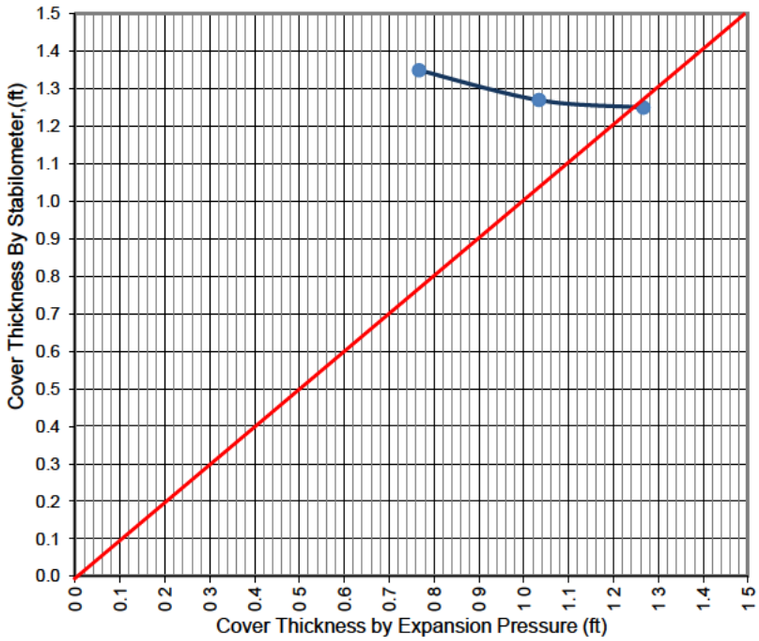
(CTM301 Caltrans / ASTM D2844)

Date:	4/16/2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7217
Address:	1002 State Street El Centro, CA 92243	Lab Number:	117953
Project :	Lack Road Bridge – Bridge No.58C-101		
Project Address :	Imperial County, CA		

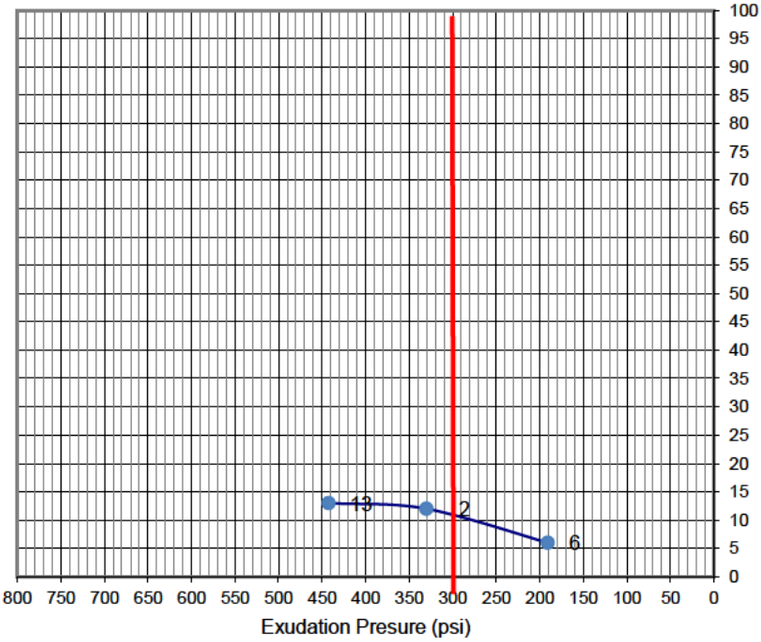
Material:	Brown Lean CLAY (CL)
Location:	A-19-002 @ 3'-5'
Sample ID:	A-19-002-B01-1
Sampled By:	Sean Burford
Date Sampled:	3/19/2019
Date Received:	3/19/2019

Tested By: Noah Regalado

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



TEST SPECIMEN	A	B	C	D
COMP. FOOT PRESSURE, psi	190	130	90	
INITIAL MOISTURE %	6.6	6.6	6.6	
MOISTURE @ COMPACTION %	14.6	16.3	18.1	
DRY DENSITY, pcf	115.6	110.9	109.0	
EXUDATION PRESSURE, psi	443	330	191	
STABILOMETER VALUE 'R'	13	12	6	

R-VALUE BY EXUDATION	11
R-VALUE BY EXPANSION	12
R-VALUE AT EQUILIBRIUM	**11**

Respectfully Submitted,

NV5 West, Inc.

Reviewed By:

Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

Expansion Index Test Report

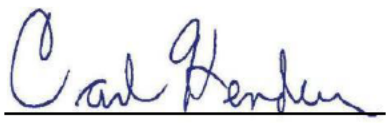
(ASTM D4829)

Date:	April 16, 2019	Job Number:	227518-0000439.00
Client:	County of Imperial	Report Number:	7182
Address:	1002 State Street	Lab Number:	117939, 117953
	El Centro, CA 92243		
Project:	Lack Road Bridge – Bridge No.58C-101		
Project Add:	Imperial County, CA		

Sampled By:	Sean Burford
Date Sampled:	3/19/2019
Date Rcvd:	3/19/2019

Lab Number	117939	117953
Location	A-19-001 @ 3'-5'	A-19-002 @ 3'-5'
Sample ID	A-19-001-B01-1	A-19-002-B01-1
Material Type	Brown Lean Clay (CL)	Brown Lean Clay (CL)
Initial Moisture Content, %	12.4	10.6
Final Moisture Content, %	29.3	23.2
Dry Density, pcf	102.4	108.4
Initial Saturation, %	51.9	51.5
Expansion Index	**89**	**71**
Potential Expansion	**MEDIUM**	**MEDIUM**

Respectfully Submitted,
NV5 West, Inc.



Carl Henderson, PhD, PE, GE
CQA Group Director (San Diego)

L A B O R A T O R Y R E P O R T

Telephone (619) 425-1993 Fax 425-7917 Established 1928

C L A R K S O N L A B O R A T O R Y A N D S U P P L Y I N C.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
A N A L Y T I C A L A N D C O N S U L T I N G C H E M I S T S

Date: April 2, 2019
Purchase Order Number: 19-0505
Sales Order Number: 43806
Account Number: NV5-SD

To:

NV5 West Inc
15092 Avenue of Science #200
San Diego, CA 92128
Attention: Brittani Escobedo

Laboratory Number: SO7253-1 Customers Phone: 858-715-5800
Fax: 858-715-5810

Sample Designation:

One soil sample received on 03/29/19 at 12:45pm,
taken from Lack Road Bridge Job 439.0 marked as
Lab#117942 Report#7217 A-19-001 Depth 15-26.5.

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.3

Water Added (ml)	Resistivity (ohm-cm)
20	250
5	140
5	120
5	92
5	88
5	82
5	82
5	83
5	85

11 years to perforation for a 16 gauge metal culvert.
14 years to perforation for a 14 gauge metal culvert.
20 years to perforation for a 12 gauge metal culvert.
25 years to perforation for a 10 gauge metal culvert.
31 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417 0.270% (2700ppm)

Water Soluble Chloride Calif. Test 422 0.641% (6410ppm)

Laura Torres
LT/ilv

L A B O R A T O R Y R E P O R T

Telephone (619) 425-1993 Fax 425-7917 Established 1928

C L A R K S O N L A B O R A T O R Y A N D S U P P L Y I N C.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
A N A L Y T I C A L A N D C O N S U L T I N G C H E M I S T S

Date: April 2, 2019
Purchase Order Number: 19-0505
Sales Order Number: 43806
Account Number: NV5-SD

To:
--
NV5 West Inc
15092 Avenue of Science #200
San Diego, CA 92128
Attention: Brittani Escobedo

Laboratory Number: SO7253-2 Customers Phone: 858-715-5800
Fax: 858-715-5810
Sample Designation:
--
One soil sample received on 03/29/19 at 12:45pm,
taken from Lack Road Bridge Job 439.0 marked as
Lab#117956, Report#7217 A-19-002 Depth 13-26.5.

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.2

Water Added (ml)	Resistivity (ohm-cm)
30	120
5	100
5	100
5	96
5	96
5	93
5	93
5	94
5	95

12 years to perforation for a 16 gauge metal culvert.
15 years to perforation for a 14 gauge metal culvert.
21 years to perforation for a 12 gauge metal culvert.
27 years to perforation for a 10 gauge metal culvert.
32 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417 0.288% (2880ppm)

Water Soluble Chloride Calif. Test 422 0.534% (5340ppm)

Laura Torres

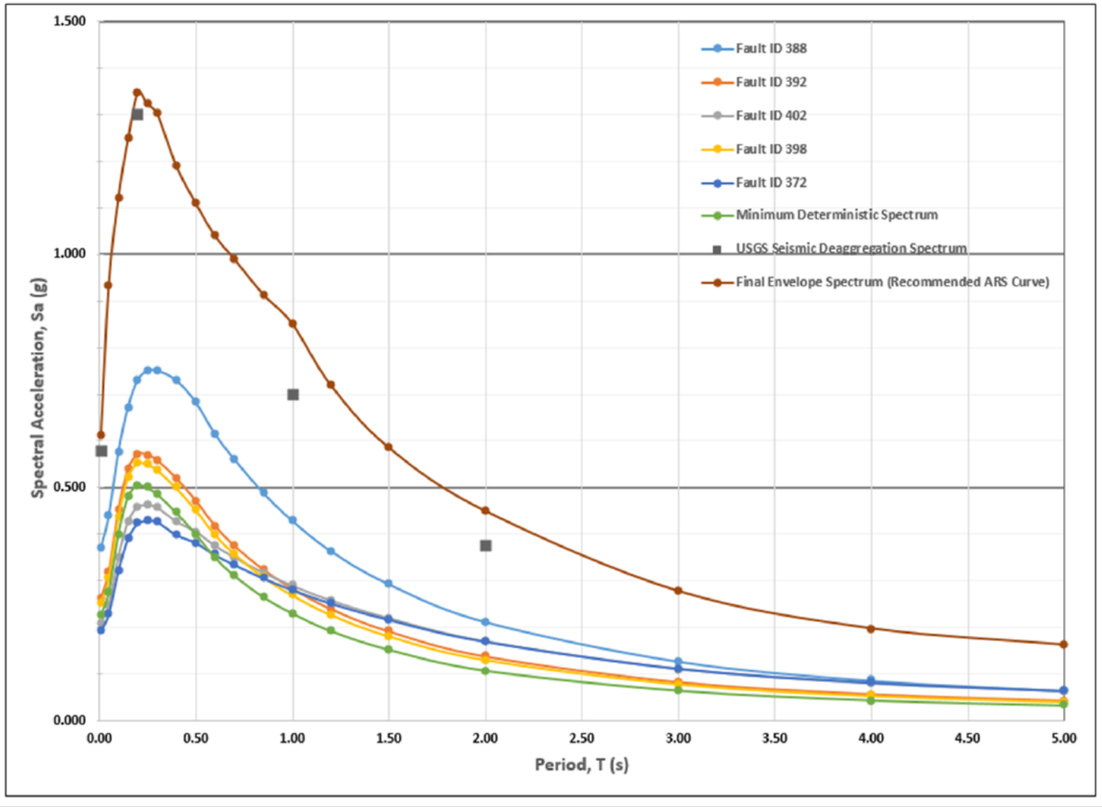
Laura Torres
LT/ilv

APPENDIX C

ARS Curve Calculations

Summary of Computed Acceleration Response Spectra

Period T (sec)	Fault ID 388 Brawley alt 2 (Seismic Zone) Mmax = 6.5 Deterministic Base Spectrum (g)	Fault ID 392 Elmore Ranch Mmax = 6.6 Deterministic Base Spectrum (g)	Fault ID 402 San Jacinto (Superstition Mtn.) Mmax = 7.7 Deterministic Base Spectrum (g)	Fault ID 398 San Jacinto Lone Tree fault Mmax = 6.6 Deterministic Base Spectrum (g)	Fault ID 372 San Andreas (Coachella) Mmax = 7.9 Deterministic Base Spectrum (g)	Minimum Deterministic Spectrum (g)	Probabalistic ARS Base Spectrum (g)	USGS Seismic Deaggregation Spectrum (g)	Basin Effect Adjustment Factor	Near-Fault Effect Adjustment Factor	Adjusted Probabalistic Spectrum (g)	Final Envelope Spectrum (g)
0.01	0.371	0.263	0.208	0.252	0.192	0.226	0.611	0.578	1.000	1.000	0.611	0.611
0.05	0.440	0.318	0.248	0.305	0.229	0.275	0.934		1.000	1.000	0.934	0.934
0.10	0.577	0.452	0.351	0.437	0.321	0.400	1.121		1.000	1.000	1.121	1.121
0.15	0.673	0.540	0.427	0.523	0.391	0.481	1.248		1.000	1.000	1.248	1.248
0.20	0.731	0.572	0.458	0.553	0.423	0.505	1.346	1.301	1.000	1.000	1.346	1.346
0.25	0.750	0.570	0.462	0.549	0.429	0.499	1.322		1.000	1.000	1.322	1.322
0.30	0.751	0.559	0.457	0.538	0.427	0.486	1.303		1.000	1.000	1.303	1.303
0.40	0.730	0.520	0.427	0.499	0.399	0.446	1.190		1.000	1.000	1.190	1.190
0.50	0.683	0.472	0.405	0.452	0.382	0.400	1.110		1.000	1.000	1.110	1.110
0.60	0.615	0.418	0.375	0.399	0.356	0.350	1.000		1.000	1.040	1.040	1.040
0.70	0.561	0.375	0.350	0.358	0.335	0.311	0.916		1.000	1.080	0.990	0.990
0.85	0.489	0.324	0.317	0.308	0.306	0.265	0.802		1.000	1.140	0.914	0.914
1.00	0.429	0.283	0.289	0.269	0.281	0.230	0.709	0.699	1.000	1.200	0.851	0.851
1.20	0.364	0.239	0.257	0.227	0.252	0.192	0.599		1.000	1.200	0.719	0.719
1.50	0.293	0.191	0.219	0.181	0.217	0.152	0.488		1.000	1.200	0.585	0.585
2.00	0.212	0.137	0.169	0.130	0.170	0.107	0.374	0.376	1.000	1.200	0.449	0.449
3.00	0.127	0.082	0.110	0.078	0.112	0.064	0.231		1.000	1.200	0.277	0.277
4.00	0.086	0.056	0.079	0.053	0.082	0.043	0.164		1.000	1.200	0.197	0.197
5.00	0.064	0.042	0.062	0.040	0.064	0.032	0.135		1.000	1.200	0.162	0.162



Project Site Information:

Latitude	33.100001
Longitude	-115.648826
Ave. Shear Wave Velocity, Vs_{30}	270 m/s
Depth to Vs = 1.0 km/s, $Z_{1.0}$ (m)	N/A
Depth to Vs = 2.5 km/s, Z2.5 (km)	N/A
Near-Fault Deaggregation Distance	11.62 km

References:

1. CalTrans ARS Online Tool (v2.3.09), 2017.

2. CalTrans Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations, Nov. 2012.

3. USGS Unified Hazard Tool, Seismic Deaggregation, Dynamic Conterminous U.S. 2008 (v3.3.1).

NV5

An NV5 West, Inc. Company – Offices Nationwide

15092 Avenue of Science, Suite 200
San Diego, CA
Tel: (858) 385-0500, Fax: (858) 385-0400

Project No: 227518-0000439
Drawn: SR
Date: May 2019

Summary of Computed Acceleration Response Spectra
Lack Road Bridge
Imperial County, California

SITE DATA (ARS Online Version 2.3.09)

Shear Wave Velocity, $Vs30$:	270 m/s
Latitude:	33.100001
Longitude:	-115.648826
Depth to Vs = 1.0 km/s:	N/A
Depth to Vs = 2.5 km/s:	N/A

DETERMINISTIC

Brawley (Seismic Zone) alt 2

Fault ID:	388
Maximum Magnitude (MMax):	6.5
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	13 20 km
Top of Rupture Plane(Ztor):	0 00 km
Rrup	4 47 km
Rjb:	4 47 km
Rx:	4 47 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.371	1.000	1.000	0.371
0.05	0.440	1.000	1.000	0.440
0.1	0.577	1.000	1.000	0.577
0.15	0.673	1.000	1.000	0.673
0.2	0.731	1.000	1.000	0.731
0.25	0.750	1.000	1.000	0.750
0.3	0.751	1.000	1.000	0.751
0.4	0.730	1.000	1.000	0.730
0.5	0.683	1.000	1.000	0.683
0.6	0.615	1.000	1.040	0.640
0.7	0.561	1.000	1.080	0.606
0.85	0.489	1.000	1.140	0.557
1	0.429	1.000	1.200	0.515
1.2	0.364	1.000	1.200	0.437
1.5	0.293	1.000	1.200	0.351
2	0.212	1.000	1.200	0.254
3	0.127	1.000	1.200	0.152
4	0.086	1.000	1.200	0.104
5	0.064	1.000	1.200	0.077

Elmore Ranch

Fault ID:	392

Maximum Magnitude (MMax):	6.6
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	11.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	9.86 km
Rjb:	9.86 km
Rx:	9.86 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.263	1.000	1.000	0.263
0.05	0.318	1.000	1.000	0.318
0.1	0.452	1.000	1.000	0.452
0.15	0.540	1.000	1.000	0.540
0.2	0.572	1.000	1.000	0.572
0.25	0.570	1.000	1.000	0.570
0.3	0.559	1.000	1.000	0.559
0.4	0.520	1.000	1.000	0.520
0.5	0.472	1.000	1.000	0.472
0.6	0.418	1.000	1.040	0.435
0.7	0.375	1.000	1.080	0.405
0.85	0.324	1.000	1.140	0.369
1	0.283	1.000	1.200	0.339
1.2	0.239	1.000	1.200	0.286
1.5	0.191	1.000	1.200	0.229
2	0.137	1.000	1.200	0.164
3	0.082	1.000	1.200	0.098
4	0.056	1.000	1.200	0.067
5	0.042	1.000	1.200	0.050

San Jacinto (Superstition Mtn)

Fault ID:	402
Maximum Magnitude (MMax):	7.7
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	12.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	22.81 km
Rjb:	22.81 km
Rx:	22.80 km
Fnorm:	0
Frev:	0

Period	SA(Base	Basin	Near Fault	SA(Final

	Spectrum)	Factor	Factor(Applied)	Spectrum)
0.01	0.208	1.000	1.000	0.208
0.05	0.248	1.000	1.000	0.248
0.1	0.351	1.000	1.000	0.351
0.15	0.427	1.000	1.000	0.427
0.2	0.458	1.000	1.000	0.458
0.25	0.462	1.000	1.000	0.462
0.3	0.457	1.000	1.000	0.457
0.4	0.427	1.000	1.000	0.427
0.5	0.405	1.000	1.000	0.405
0.6	0.375	1.000	1.009	0.378
0.7	0.350	1.000	1.018	0.356
0.85	0.317	1.000	1.031	0.326
1	0.289	1.000	1.044	0.302
1.2	0.257	1.000	1.044	0.268
1.5	0.219	1.000	1.044	0.228
2	0.169	1.000	1.044	0.177
3	0.110	1.000	1.044	0.115
4	0.079	1.000	1.044	0.083
5	0.062	1.000	1.044	0.065

San Jacinto-Lone Tree fault

Fault ID:	398
Maximum Magnitude (MMax):	6.6
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	12.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	10.56 km
Rjb:	10.56 km
Rx:	8.22 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0 252	1 000	1 000	0 252
0.05	0 305	1 000	1 000	0 305
0.1	0 437	1 000	1 000	0 437
0.15	0 523	1 000	1 000	0 523
0.2	0 553	1 000	1 000	0 553
0.25	0 549	1 000	1 000	0 549
0.3	0 538	1 000	1 000	0 538
0.4	0 499	1 000	1 000	0 499
0.5	0 452	1 000	1 000	0 452
0.6	0 399	1 000	1 040	0 415
0.7	0 358	1 000	1 080	0 387
0.85	0 308	1 000	1 140	0 351

1	0 269	1 000	1 200	0 323
1.2	0 227	1 000	1 200	0 272
1.5	0 181	1 000	1 200	0 217
2	0 130	1 000	1 200	0 156
3	0 078	1 000	1 200	0 093
4	0 053	1 000	1 200	0 064
5	0 040	1 000	1 200	0 048

San Andreas (Coachella) rev

Fault ID:	372
Maximum Magnitude (MMax):	7 9
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	10 60 km
Top of Rupture Plane(Ztor):	0 00 km
Rrup	28.46 km
Rjb:	28.46 km
Rx:	8.78 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.192	1.000	1.000	0.192
0.05	0.229	1.000	1.000	0.229
0.1	0.321	1.000	1.000	0.321
0.15	0.391	1.000	1.000	0.391
0.2	0.423	1.000	1.000	0.423
0.25	0.429	1.000	1.000	0.429
0.3	0.427	1.000	1.000	0.427
0.4	0.399	1.000	1.000	0.399
0.5	0.382	1.000	1.000	0.382
0.6	0.356	1.000	1.000	0.356
0.7	0.335	1.000	1.000	0.335
0.85	0.306	1.000	1.000	0.306
1	0.281	1.000	1.000	0.281
1.2	0.252	1.000	1.000	0.252
1.5	0.217	1.000	1.000	0.217
2	0.170	1.000	1.000	0.170
3	0.112	1.000	1.000	0.112
4	0.082	1.000	1.000	0.082
5	0.064	1.000	1.000	0.064

PROBABILISTIC

Probabilistic Model

USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.611	1.000	1.000	0.611
0.05	0.934	1.000	1.000	0.934
0.1	1.121	1.000	1.000	1.121
0.15	1.248	1.000	1.000	1.248
0.2	1.346	1.000	1.000	1.346
0.25	1.322	1.000	1.000	1.322
0.3	1.303	1.000	1.000	1.303
0.4	1.190	1.000	1.000	1.190
0.5	1.110	1.000	1.000	1.110
0.6	1.000	1.000	1.040	1.040
0.7	0.916	1.000	1.080	0.990
0.85	0.802	1.000	1.140	0.914
1	0.709	1.000	1.200	0.851
1.2	0.599	1.000	1.200	0.719
1.5	0.488	1.000	1.200	0.585
2	0.374	1.000	1.200	0.449
3	0.231	1.000	1.200	0.277
4	0.164	1.000	1.200	0.197
5	0.135	1.000	1.200	0.162

MINIMUM DETERMINISTIC SPECTRUM

Period	SA
0.01	0.226
0.05	0.275
0.1	0.400
0.15	0.481
0.2	0.505
0.25	0.499
0.3	0.486
0.4	0.446
0.5	0.400
0.6	0.350
0.7	0.311
0.85	0.265
1	0.230
1.2	0.192
1.5	0.152
2	0.107
3	0.064
4	0.043
5	0.032

Envelope Data

Period	SA
0.01	0 611
0.05	0 934
0.1	1 121
0.15	1 248
0.2	1 346
0.25	1 322
0.3	1 303
0.4	1 190
0.5	1 110
0.6	1 040
0.7	0 990
0.85	0 914
1	0 851
1.2	0 719
1.5	0 585
2	0 449
3	0 277
4	0 197
5	0 162

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

ease do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2008 (v3.3.

Spectral Period

Peak ground acceleration

Latitude

Decimal degrees

33.100001

Time Horizon

Return period in years

975

Longitude

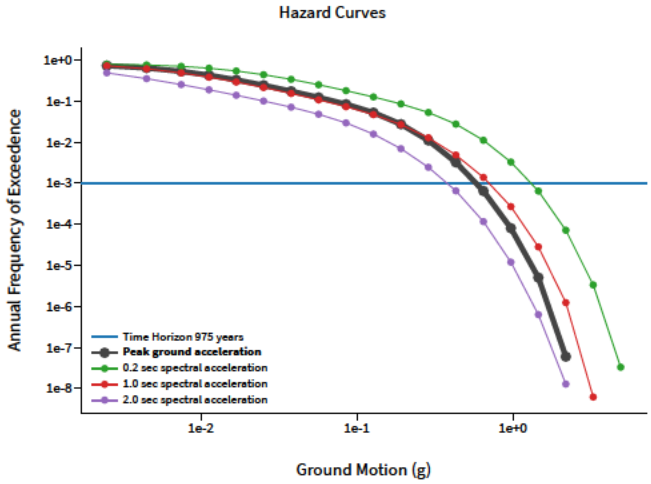
Decimal degrees, negative values for western longitudes

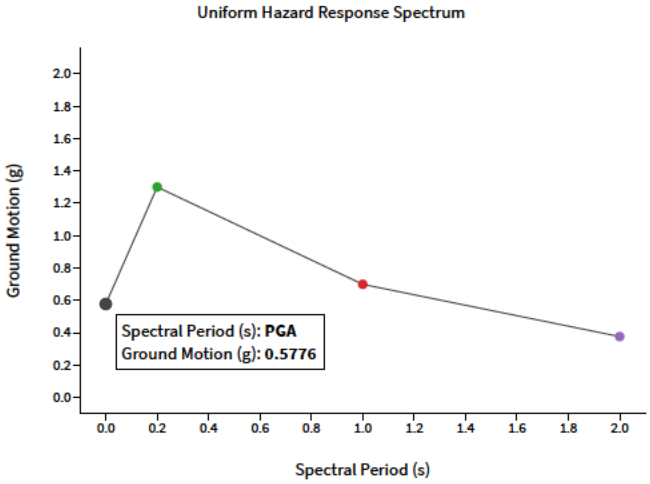
-115.648826

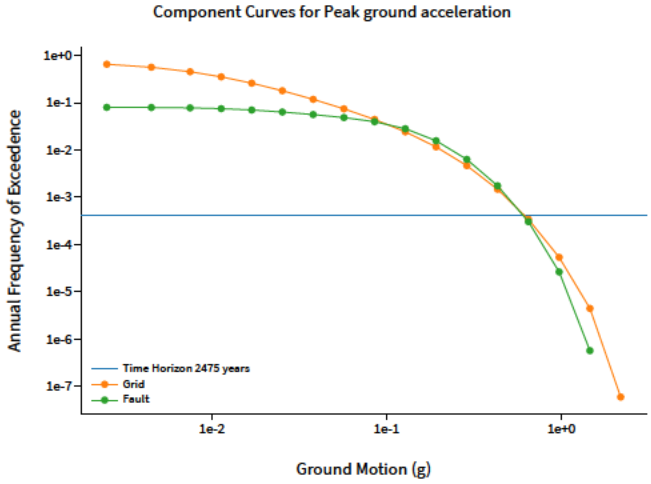
Site Class

259 m/s (Site class D)

Hazard Curve





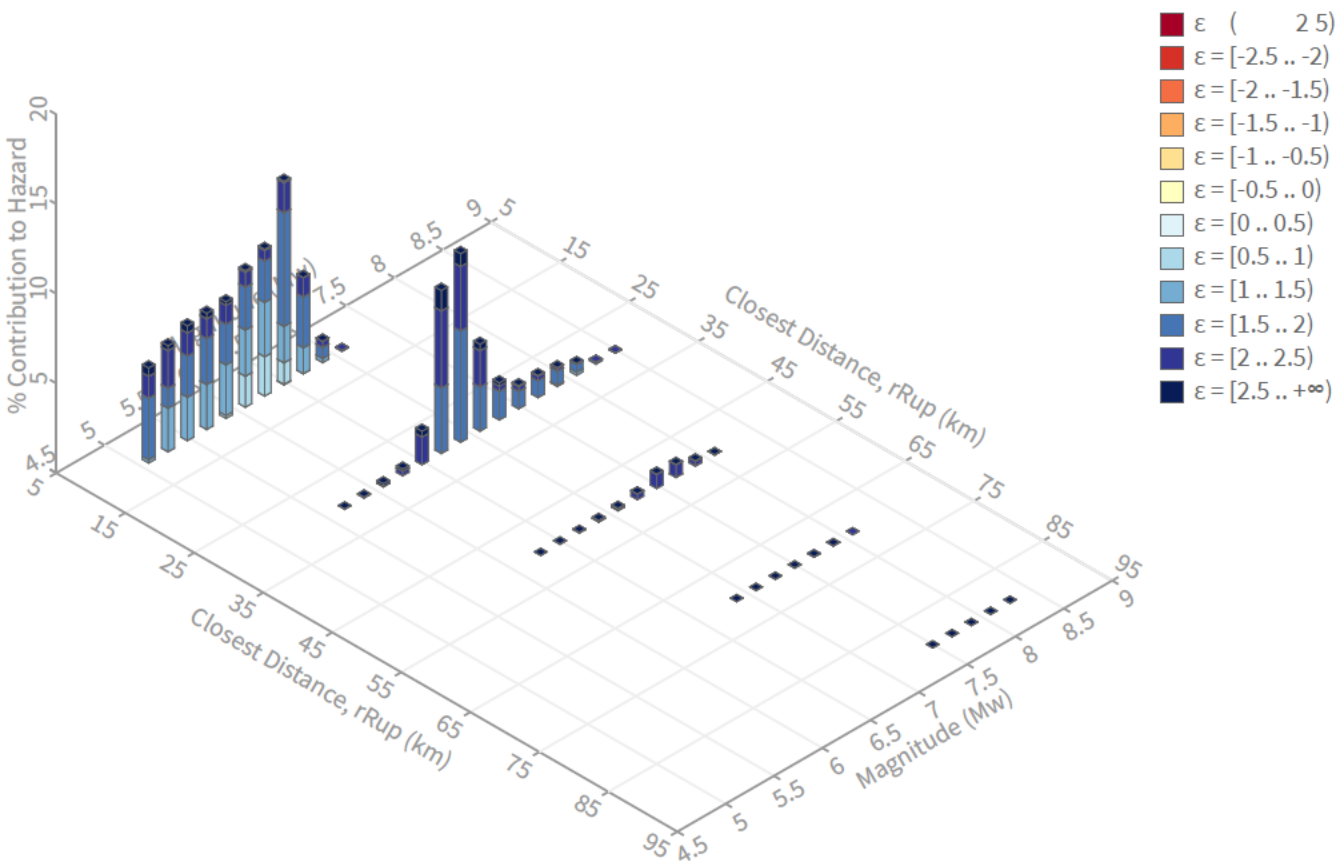


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 975 yrs
Exceedance rate: 0.001025641 yr^{-1}
PGA ground motion: 0 57759466 g

Recovered targets

Return period: 1177.6244 yrs
Exceedance rate: 0.0008491672 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (for all sources)

r: 15.3 km
m: 6 36
ε_0: 1.79 σ

Mode (largest r m bin)

r: 11.62 km
m: 6 5
ε_0: 1.62 σ
Contribution: 11.35 %

Mode (largest ε_0 bin)

r: 12.26 km
m: 6 52
ε_0: 1.73 σ
Contribution: 6.33 %

Discretization

r: min 0 0, max 1000 0, Δ 20 0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [2 5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [1 0 0 5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1 0 1 5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
brawmap.in	Grid							35.63
PointSourceFixedStrike: -115.600, 33.100		6.53	5.69	1.47	115.600°W	33.100°N	89.99	13.60
PointSourceFixedStrike: -115.700, 33.100		6.66	5.69	1.48	115.700°W	33.100°N	270.01	9.01
PointSourceFixedStrike: -115.700, 33.200		8.94	6.00	1.66	115.700°W	33.200°N	336.82	3.58
PointSourceFixedStrike: -115.600, 33.000		8.89	5.99	1.65	115.600°W	33.000°N	157.73	3.20
PointSourceFixedStrike: -115.600, 33.200		10.85	5.94	1.85	115.600°W	33.200°N	22.22	2.52
PointSourceFixedStrike: -115.700, 33.000		10.98	5.94	1.87	115.700°W	33.000°N	203.23	1.08
bFault.ch	Fault							21.07
Imperial		21.39	6.90	2.03	115.553°W	32.926°N	155.14	12.38
Superstition Hills		17.24	6.70	2.01	115.802°W	33.008°N	234.54	4.38
Elmore Ranch		9.79	6.59	1.58	115.656°W	33.231°N	357.49	4.09
bFault.gr	Fault							12.08
Imperial		23.44	6.74	2.15	115.553°W	32.926°N	155.14	6.57
Superstition Hills		17.41	6.60	2.05	115.802°W	33.008°N	234.54	2.94
Elmore Ranch		9.95	6.55	1.58	115.656°W	33.231°N	357.49	2.52
aFault_aPriori_D2.1	Fault							7.44
aFault_MoBal	Fault							7.34
S. San Andreas : CO		28.43	6.96	2.14	115.712°W	33.350°N	348.10	2.91
impext.ch.in (opt)	Grid							3.75
PointSourceFinite: -115.649, 33.140		6.68	5.72	1.46	115.649°W	33.140°N	0.00	2.39
CAmap.21.ch.in (opt)	Grid							3.35
PointSourceFinite: -115.649, 33.140		6.88	5.69	1.30	115.649°W	33.140°N	0.00	2.01
CAmap 24 ch in (opt)	Grid							3 35
PointSourceFinite 115 649 33 140		6 88	5 69	1 30	115 649°W	33 140°N	0 00	2 01
impext.gr.in (opt)	Grid							1.85
PointSourceFinite: -115.649, 33.140		6.68	5.72	1.46	115.649°W	33.140°N	0.00	1.19
CAmap.24.gr.in (opt)	Grid							1.64
PointSourceFinite: -115.649, 33.140		6.88	5.69	1.30	115.649°W	33.140°N	0.00	1.00
CAmap.21.gr.in (opt)	Grid							1.64
PointSourceFinite: -115.649, 33.140		6.88	5.69	1.30	115.649°W	33.140°N	0.00	1.00

U.S. Geological Survey Earthquake Hazards Program

Unified Hazard Tool

ease do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2008 (v3.3.

Spectral Period

0.2 sec spectral acceleration

Latitude

Decimal degrees

33.100001

Time Horizon

Return period in years

975

Longitude

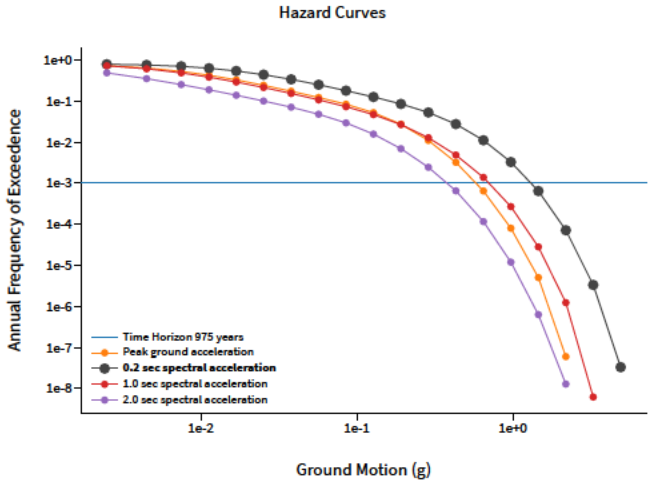
Decimal degrees, negative values for western longitudes

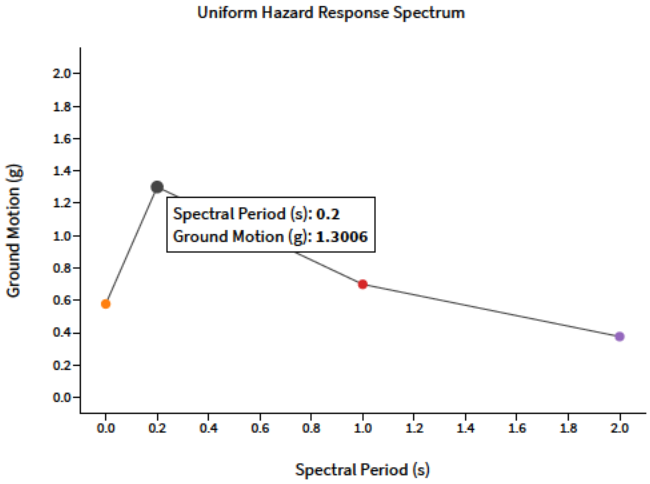
-115.648826

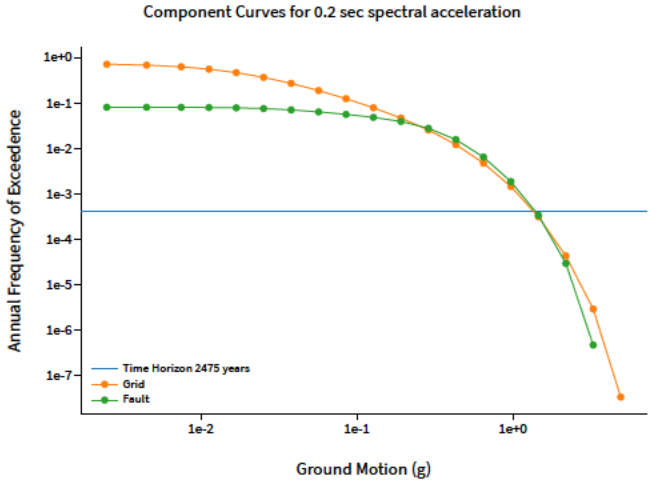
Site Class

259 m/s (Site class D)

Hazard Curve





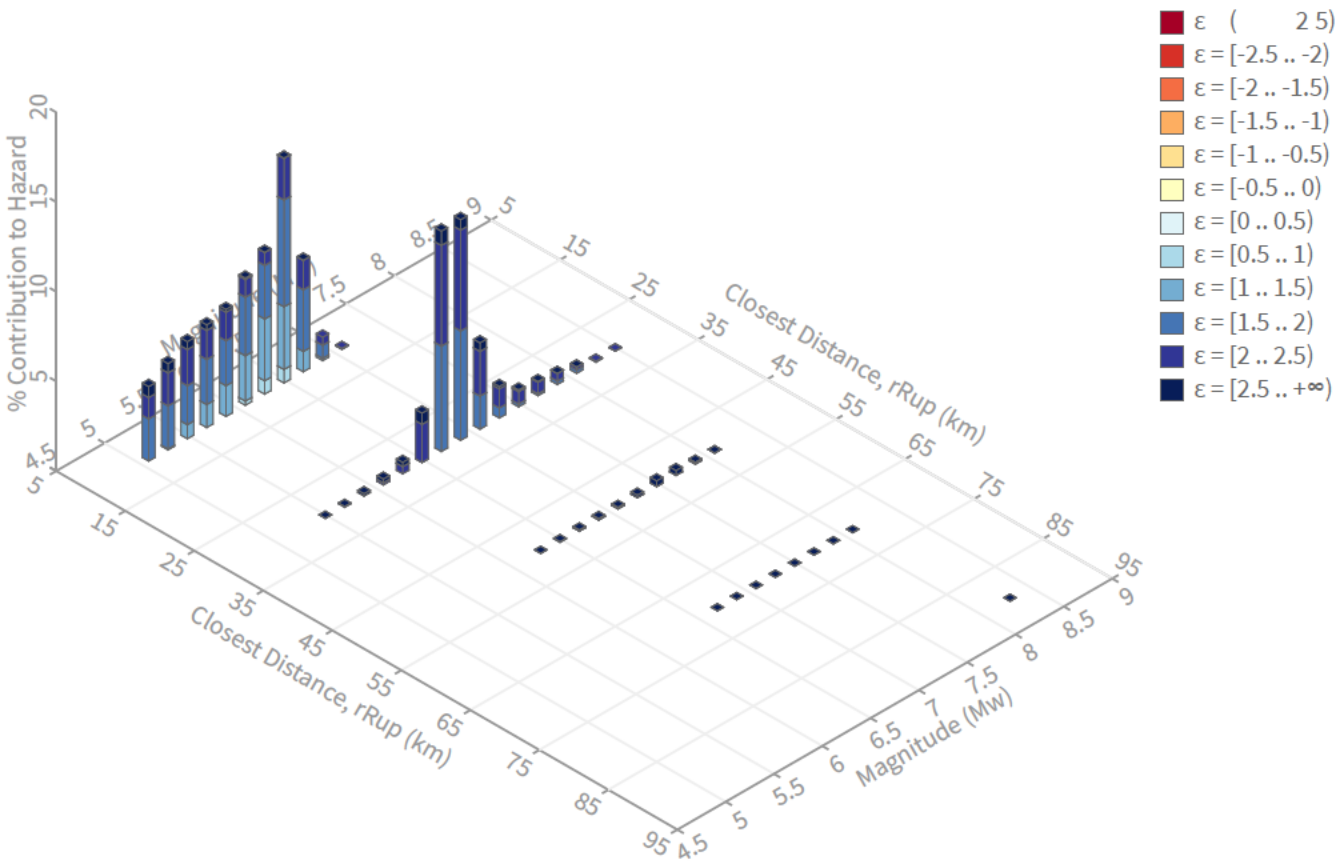


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 975 yrs
Exceedance rate: 0.001025641 yr^{-1}
0.2 s SA ground motion: 1 3006378 g

Recovered targets

Return period: 1161.1623 yrs
Exceedance rate: 0.00086120603 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.03 %

Mean (for all sources)

r: 15.82 km
m: 6 38
ε_0: 1.91 σ

Mode (largest r m bin)

r: 12.27 km
m: 6 5
ε_0: 1.66 σ
Contribution: 12.53 %

Mode (largest ε_0 bin)

r: 21.63 km
m: 6 91
ε_0: 1.89 σ
Contribution: 6.1 %

Discretization

r: min 0 0, max 1000 0, Δ 20 0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [2 5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [1 0 0 5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1 0 1 5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
brawmap.in	Grid							32.27
PointSourceFixedStrike: -115.600, 33.100		6.53	5.71	1.60	115.600°W	33.100°N	89.99	10.73
PointSourceFixedStrike: -115.700, 33.100		6.66	5.72	1.61	115.700°W	33.100°N	270.01	7.19
PointSourceFixedStrike: -115.700, 33.200		9.08	5.97	1.77	115.700°W	33.200°N	336.82	3.56
PointSourceFixedStrike: -115.600, 33.000		9.03	5.96	1.76	115.600°W	33.000°N	157.73	3.18
PointSourceFixedStrike: -115.600, 33.200		10.88	5.93	1.91	115.600°W	33.200°N	22.22	2.73
PointSourceFixedStrike: -115.700, 33.000		11.00	5.93	1.92	115.700°W	33.000°N	203.23	1.18
bFault.ch	Fault							24.61
Imperial		21.39	6.88	2.05	115.553°W	32.926°N	155.14	14.69
Superstition Hills		17.24	6.69	1.95	115.802°W	33.008°N	234.54	5.56
Elmore Ranch		9.79	6.59	1.56	115.656°W	33.231°N	357.49	4.25
bFault.gr	Fault							15.03
Imperial		23.53	6.73	2.15	115.553°W	32.926°N	155.14	8.63
Superstition Hills		17.39	6.60	1.99	115.802°W	33.008°N	234.54	3.78
Elmore Ranch		9.94	6.54	1.57	115.656°W	33.231°N	357.49	2.59
aFault_MoBal	Fault							6.90
S. San Andreas : CO		28.43	6.94	2.26	115.712°W	33.350°N	348.10	3.27
San Jacinto : SM		23.01	6.60	2.24	115.807°W	32.938°N	219.26	1.11
aFault_aPriori_D2.1	Fault							6.40
San Jacinto : B		29.55	6.74	2.32	115.943°W	33.001°N	248.20	1.16
impext.ch.in (opt)	Grid							3.67
PointSourceFinite: -115.649, 33.140		6.76	5.74	1.59	115.649°W	33.140°N	0.00	1.93
CAmap.21.ch.in (opt)	Grid							2.93
PointSourceFinite: -115.649, 33.140		6.90	5.72	1.48	115.649°W	33.140°N	0.00	1.43
CAmap.24.ch.in (opt)	Grid							2.93
PointSourceFinite: -115.649, 33.140		6.90	5.72	1.48	115.649°W	33.140°N	0.00	1.43
impext.gr.in (opt)	Grid							1.80
CAmap 24 gr in (opt)	Grid							1 42
CAmap.21.gr.in (opt)	Grid							1.42

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

ease do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2008 (v3.3.

Spectral Period

1.0 sec spectral acceleration

Latitude

Decimal degrees

33.100001

Time Horizon

Return period in years

975

Longitude

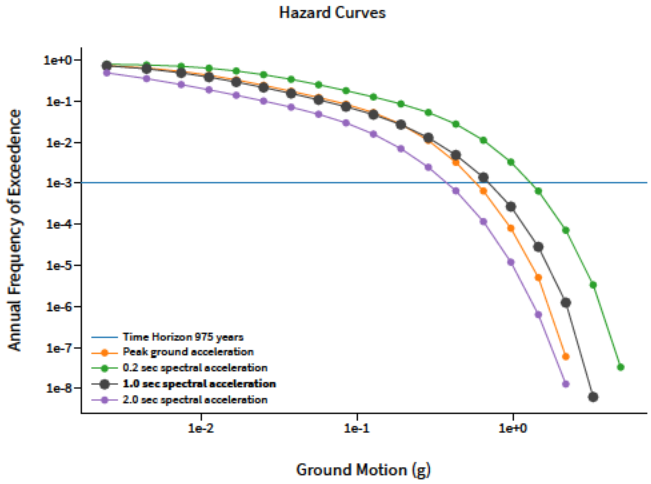
Decimal degrees, negative values for western longitudes

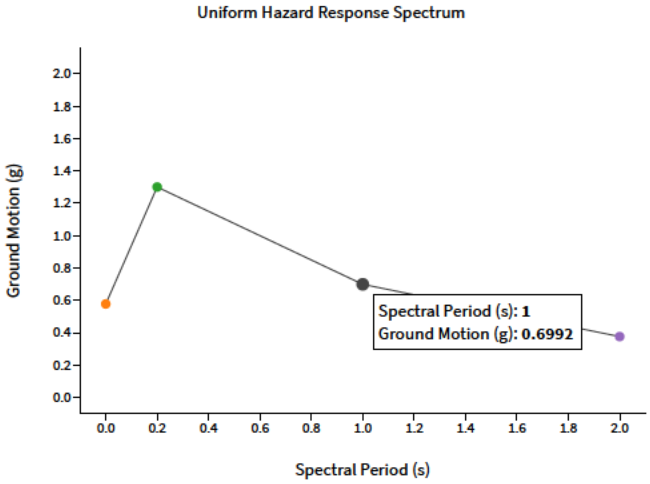
-115.648826

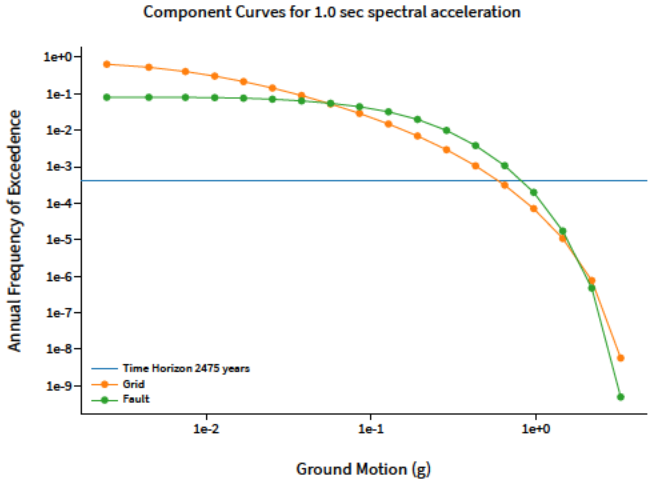
Site Class

259 m/s (Site class D)

Hazard Curve





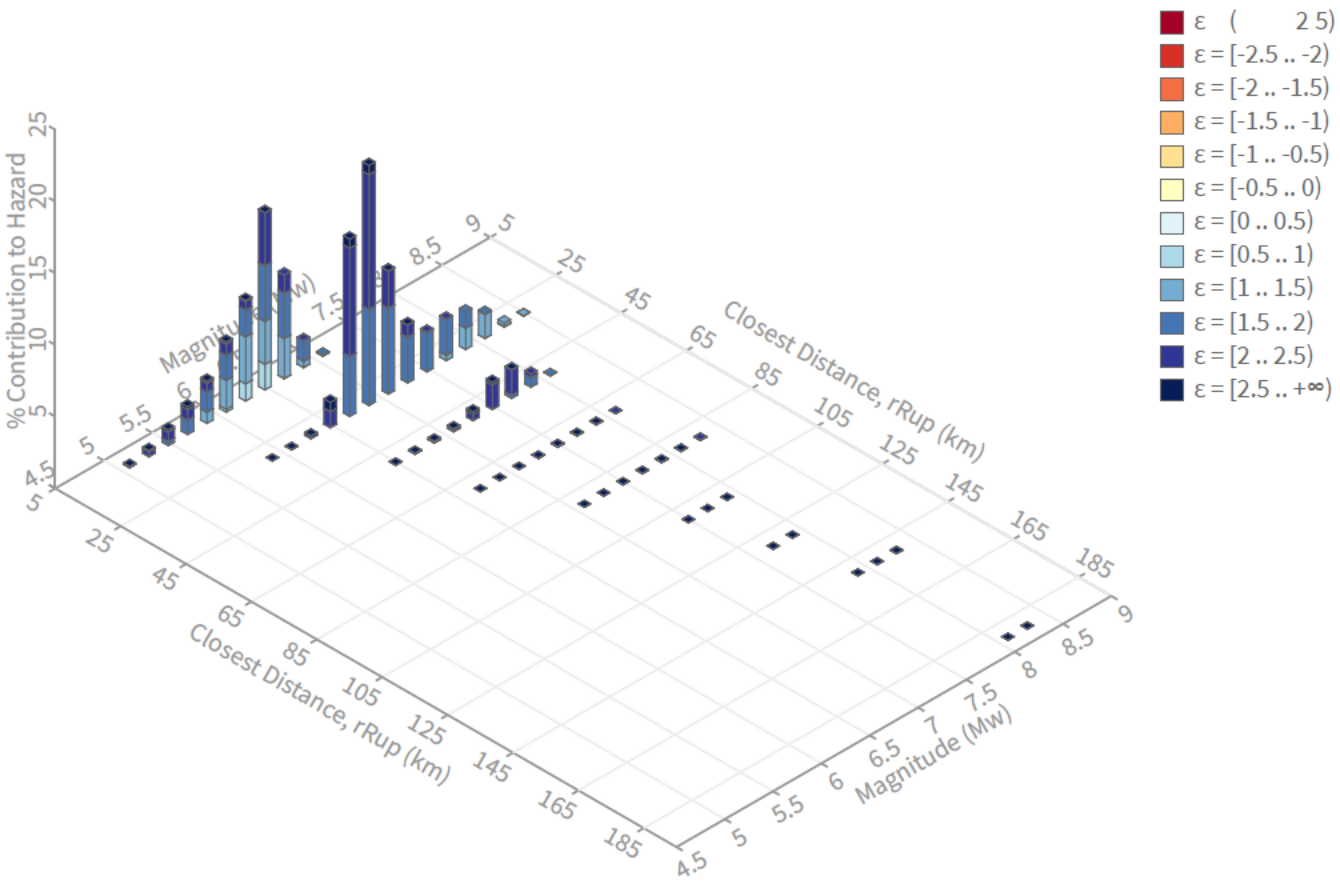


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 975 yrs
Exceedance rate: 0.001025641 yr^{-1}
1.0 s SA ground motion: 0 69915642 g

Recovered targets

Return period: 1114.6666 yrs
Exceedance rate: 0.00089712924 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.09 %

Mean (for all sources)

r: 20.43 km
m: 6 82
ε_0: 1.85 σ

Mode (largest r m bin)

r: 23.17 km
m: 6 91
ε_0: 2.03 σ
Contribution: 16.72 %

Mode (largest ε_0 bin)

r: 23.87 km
m: 6 91
ε_0: 2.13 σ
Contribution: 9.39 %

Discretization

r: min 0 0, max 1000 0, Δ 20 0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [2 5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [1 0 0 5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1 0 1 5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
bFault.ch	Fault							30.84
Imperial		21.39	6.91	1.97	115.553°W	32.926°N	155.14	19.47
Superstition Hills		17.24	6.72	1.92	115.802°W	33.008°N	234.54	5.90
Elmore Ranch		9.79	6.61	1.44	115.656°W	33.231°N	357.49	5.05
brawmap.in	Grid							15.95
PointSourceFixedStrike: -115.600, 33.100		6.52	6.02	1.52	115.600°W	33.100°N	89.99	5.28
PointSourceFixedStrike: -115.700, 33.100		6.65	6.02	1.53	115.700°W	33.100°N	270.01	3.50
PointSourceFixedStrike: -115.700, 33.200		7.73	6.23	1.46	115.700°W	33.200°N	336.82	2.12
PointSourceFixedStrike: -115.600, 33.000		7.68	6.23	1.46	115.600°W	33.000°N	157.73	1.90
PointSourceFixedStrike: -115.600, 33.200		10.28	6.21	1.75	115.600°W	33.200°N	22.22	1.22
bFault.gr	Fault							15.20
Imperial		23.12	6.75	2.14	115.553°W	32.926°N	155.14	8.75
Superstition Hills		17.40	6.61	2.03	115.802°W	33.008°N	234.54	3.45
Elmore Ranch		9.94	6.55	1.49	115.656°W	33.231°N	357.49	2.92
aFault_aPriori_D2.1	Fault							14.83
San Jacinto : CC+B+SM		23.01	7.33	1.74	115.807°W	32.938°N	219.26	1.82
San Jacinto : A+C		45.34	7.51	2.25	116.099°W	33.256°N	292.59	1.55
S. San Andreas : CO		28.43	7.00	2.18	115.712°W	33.350°N	348.10	1.41
S. San Andreas : SM+NSB+SSB+BG+CO		28.42	7.84	1.54	115.712°W	33.350°N	348.10	1.28
San Jacinto : B+SM		23.01	7.01	1.98	115.807°W	32.938°N	219.26	1.20
San Jacinto : B		29.55	6.79	2.34	115.943°W	33.001°N	248.20	1.16
San Jacinto : SBV+SJV+A+C		45.34	7.78	2.03	116.099°W	33.256°N	292.59	1.05
aFault_MoBal	Fault							14.00
S. San Andreas : CO		28.43	6.97	2.20	115.712°W	33.350°N	348.10	4.77
S. San Andreas : SM+NSB+SSB+BG+CO		28.42	7.84	1.53	115.712°W	33.350°N	348.10	1.02
aFault_unseg	Fault							1.96
S. San Andreas		34.77	8.00	1.54	115.712°W	33.350°N	348.10	1.11
impext.ch.in (opt)	Grid							1.84
PointSourceFinite: -115.649, 33.140		6.44	6.06	1.42	115.649°W	33.140°N	0.00	1.00
CAmap.21.ch.in (opt)	Grid							1.51
CAmap.24.ch.in (opt)	Grid							1.51

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

ease do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2008 (v3.3.

Spectral Period

2.0 sec spectral acceleration

Latitude

Decimal degrees

33.100001

Time Horizon

Return period in years

975

Longitude

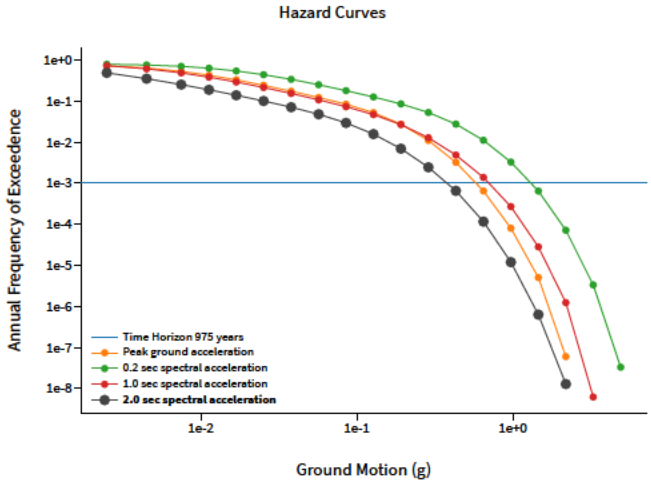
Decimal degrees, negative values for western longitudes

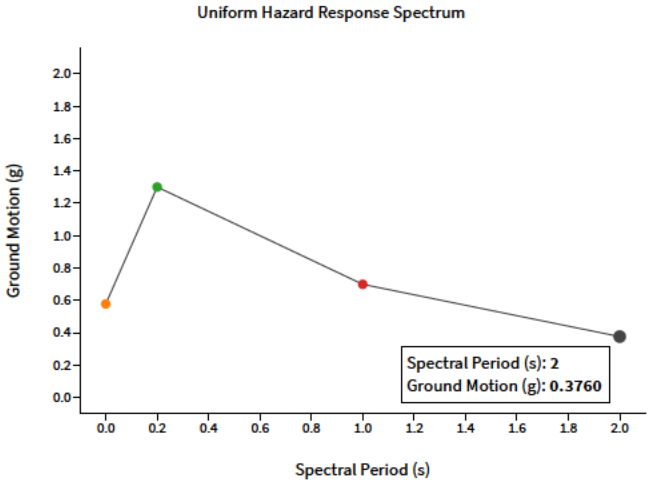
-115.648826

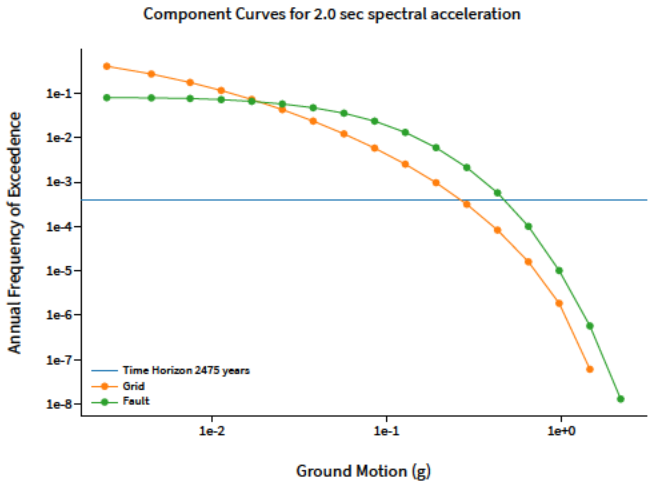
Site Class

259 m/s (Site class D)

Hazard Curve





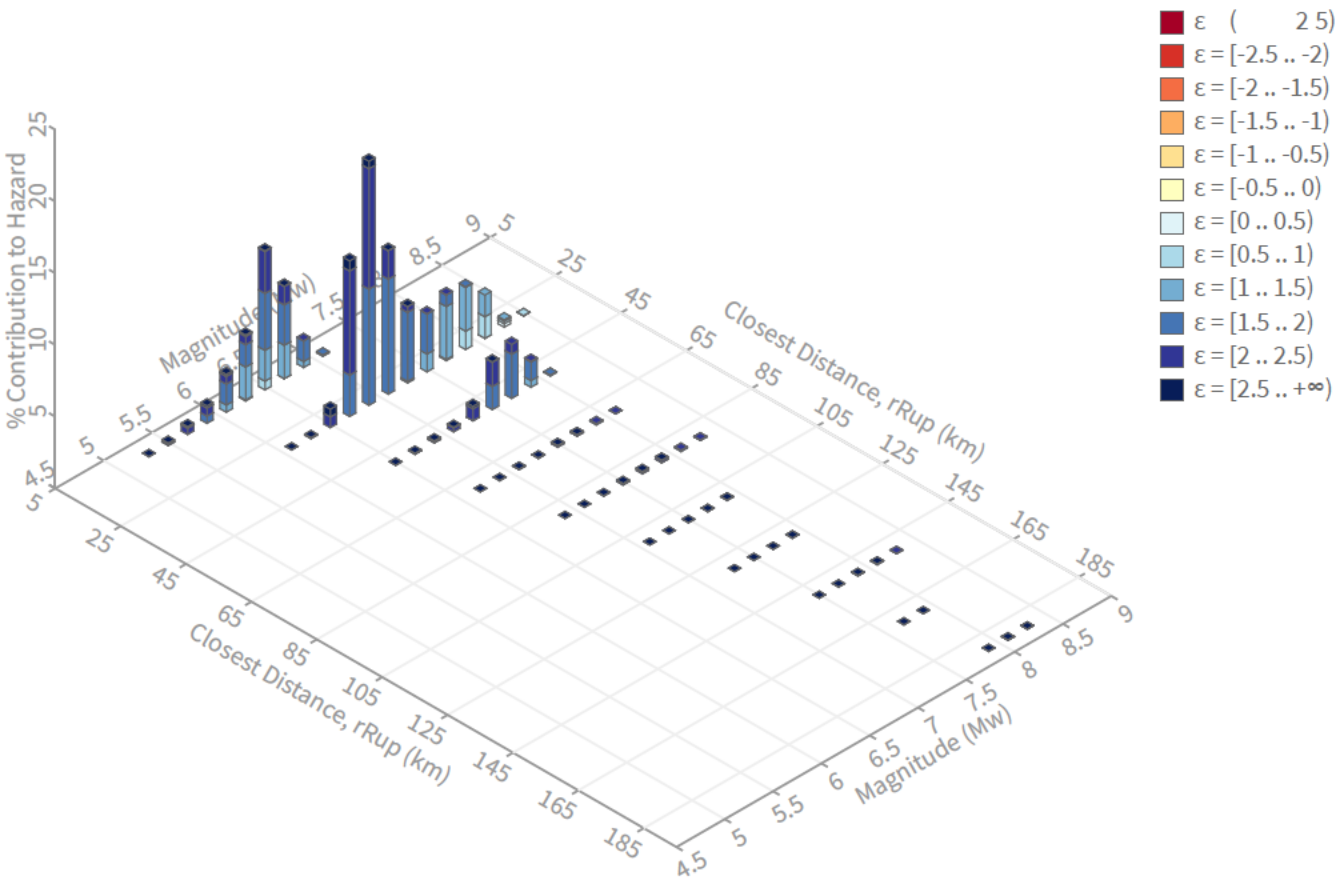


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 975 yrs
Exceedance rate: 0.001025641 yr^{-1}
2.0 s SA ground motion: 0 37603219 g

Recovered targets

Return period: 1085.0489 yrs
Exceedance rate: 0.00092161743 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.15 %

Mean (for all sources)

r: 24.27 km
m: 7 03
ε_0: 1.8 σ

Mode (largest r m bin)

r: 23.18 km
m: 6 91
ε_0: 2.02 σ
Contribution: 17.01 %

Mode (largest ε_0 bin)

r: 24.15 km
m: 6 9
ε_0: 2.14 σ
Contribution: 8.4 %

Discretization

r: min 0 0, max 1000 0, Δ 20 0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

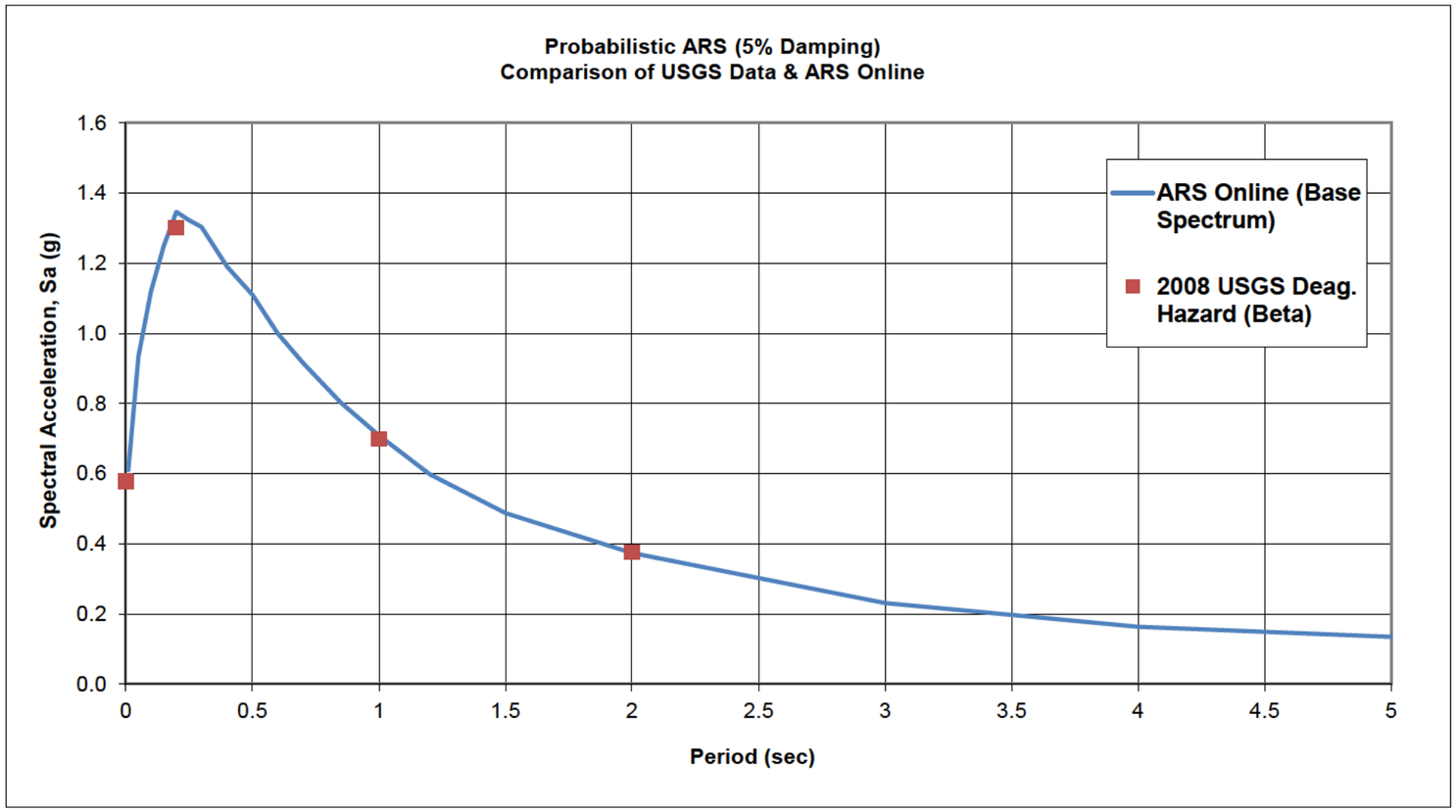
ε0: [2 5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [1 0 0 5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1 0 1 5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
bFault.ch	Fault							30.21
Imperial		21.39	6.93	1.94	115.553°W	32.926°N	155.14	19.77
Superstition Hills		17.24	6.73	1.94	115.802°W	33.008°N	234.54	5.29
Elmore Ranch		9.79	6.62	1.48	115.656°W	33.231°N	357.49	4.45
aFault_aPriori_D2.1	Fault							21.42
San Jacinto : A+C		45.34	7.52	2.03	116.099°W	33.256°N	292.59	2.72
San Jacinto : CC+B+SM		23.01	7.34	1.59	115.807°W	32.938°N	219.26	2.41
S. San Andreas : SM+NSB+SSB+BG+CO		28.42	7.84	1.23	115.712°W	33.350°N	348.10	2.12
San Jacinto : SBV+SJV+A+C		45.34	7.79	1.72	116.099°W	33.256°N	292.59	2.01
S. San Andreas : CO		28.43	7.01	2.12	115.712°W	33.350°N	348.10	1.57
S. San Andreas : NSB+SSB+BG+CO		28.42	7.64	1.47	115.712°W	33.350°N	348.10	1.37
San Jacinto : B+SM		23.01	7.03	1.92	115.807°W	32.938°N	219.26	1.32
S. San Andreas : BG+CO		28.42	7.39	1.75	115.712°W	33.350°N	348.10	1.31
S. San Andreas : SSB+BG+CO		28.42	7.54	1.58	115.712°W	33.350°N	348.10	1.09
San Jacinto : B		29.55	6.80	2.32	115.943°W	33.001°N	248.20	1.09
aFault_MoBal	Fault							19.26
S. San Andreas : CO		28.43	6.99	2.14	115.712°W	33.350°N	348.10	5.19
S. San Andreas : SM+NSB+SSB+BG+CO		28.42	7.84	1.22	115.712°W	33.350°N	348.10	1.70
San Jacinto : CC+B+SM		23.01	7.34	1.59	115.807°W	32.938°N	219.26	1.12
San Jacinto : A+C		45.34	7.52	2.03	116.099°W	33.256°N	292.59	1.01
bFault.gr	Fault							13.21
Imperial		23.05	6.77	2.15	115.553°W	32.926°N	155.14	7.81
Superstition Hills		17.40	6.61	2.09	115.802°W	33.008°N	234.54	2.80
Elmore Ranch		9.94	6.55	1.56	115.656°W	33.231°N	357.49	2.46
brawmap.in	Grid							8.84
PointSourceFixedStrike: -115.600, 33.100		6.52	6.14	1.60	115.600°W	33.100°N	89.99	2.78
PointSourceFixedStrike: -115.700, 33.100		6.65	6.15	1.61	115.700°W	33.100°N	270.01	1.84
PointSourceFixedStrike: -115.700, 33.200		7.35	6.29	1.52	115.700°W	33.200°N	336.82	1.34
PointSourceFixedStrike: -115.600, 33.000		7.30	6.29	1.51	115.600°W	33.000°N	157.73	1.20
aFault_unseg	Fault							3.26
S. San Andreas		37.69	8.00	1.22	115.712°W	33.350°N	348.10	2.06
impext.ch.in (opt)	Grid							1.09

Comparison spreadsheet of the 2008 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data

- This spreadsheet facilitates a data check of the ARS Online base spectrum vs the USGS Data. This spreadsheet does not perform a deaggregation.
- Spectral acceleration points may be obtained from USGS Website at https://geohazards.usgs.gov/deaggint/2008/



Place ARS Online Probabilistic Data Here (Use 19 Period Data Option in ARS Online)				
T (sec)	Base Spectrum S(a)	Basin Factor	Near Fault Factor	Final Adj. Spectrum S(a)
0.01	0.611	1	1	0.611
0.05	0.934	1	1	0.934
0.1	1.121	1	1	1.121
0.15	1.248	1	1	1.248
0.2	1.346	1	1	1.346
0.25	1.322	1	1	1.322
0.3	1.303	1	1	1.303
0.4	1.19	1	1	1.19
0.5	1.11	1	1	1.11
0.6	1	1	1.04	1.04
0.7	0.916	1	1.08	0.99
0.85	0.802	1	1.14	0.914
1	0.709	1	1.2	0.851
1.2	0.599	1	1.2	0.719
1.5	0.488	1	1.2	0.585
2	0.374	1	1.2	0.449
3	0.231	1	1.2	0.277
4	0.164	1	1.2	0.197
5	0.135	1	1.2	0.162

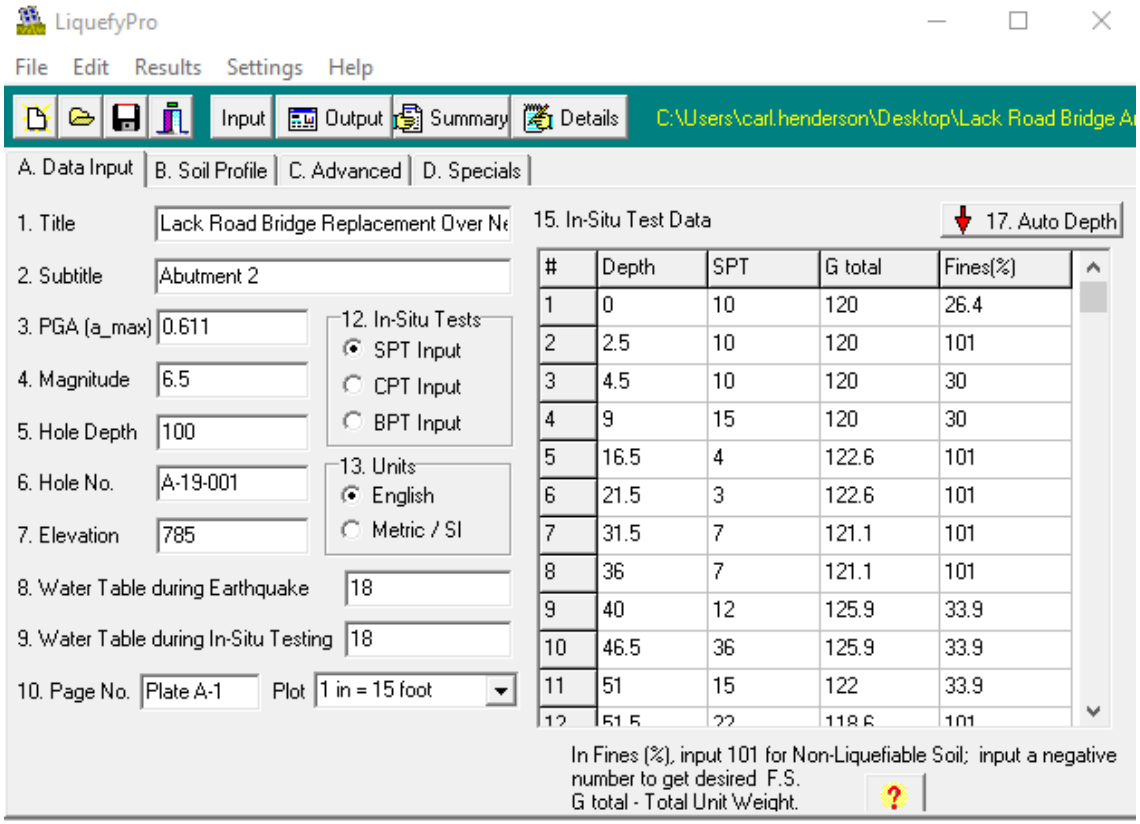
Input USGS Deaggregation Hazard Data for a Exceedance Probability of 5% in 50yr			
Period (sec)	INPUT USGS Deagg. Spec Accel	ARS Online Base Sa(g)	% Difference (bet. USGS & ARS Online)
0	0.5776	0.611	5.5%
0.2	1.3006	1.346	3.4%
1	0.6992	0.709	1.4%
2	0.376	0.374	0.5%

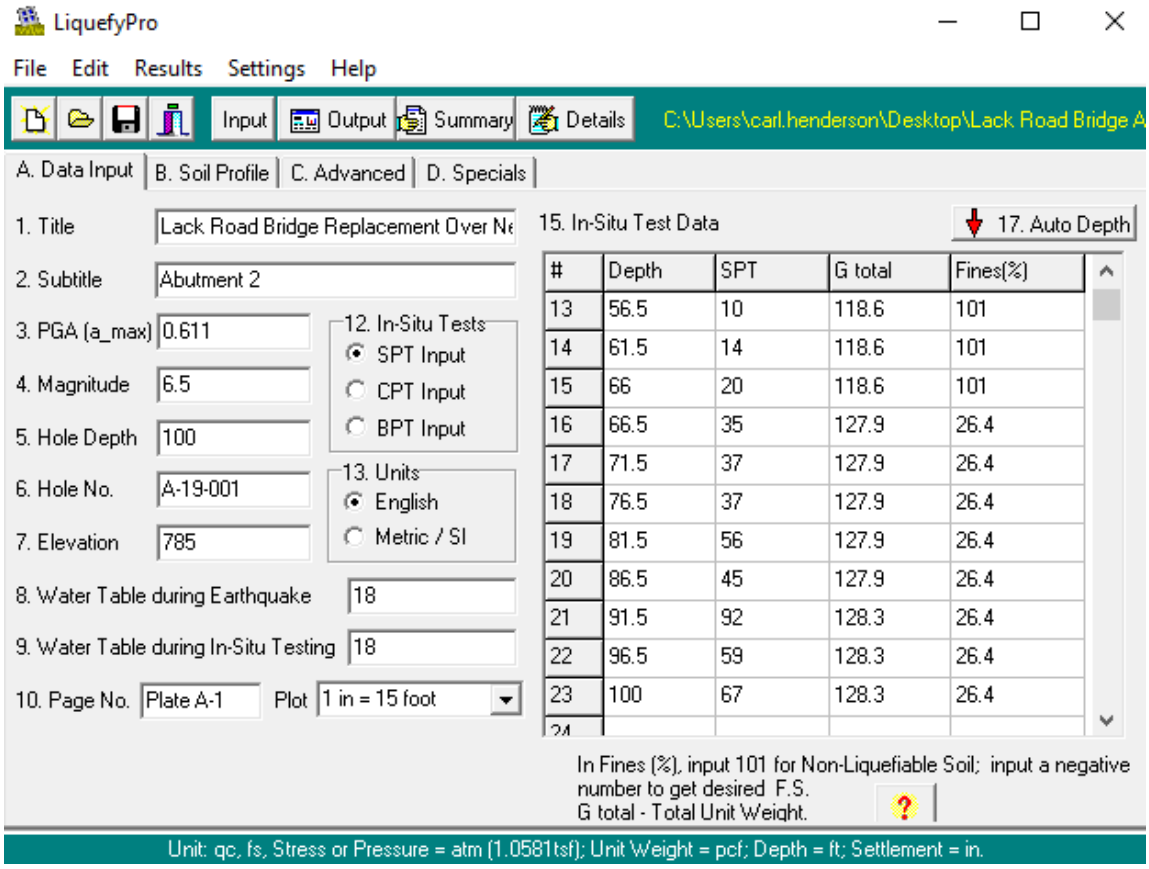
Max % Difference = **5.5%**

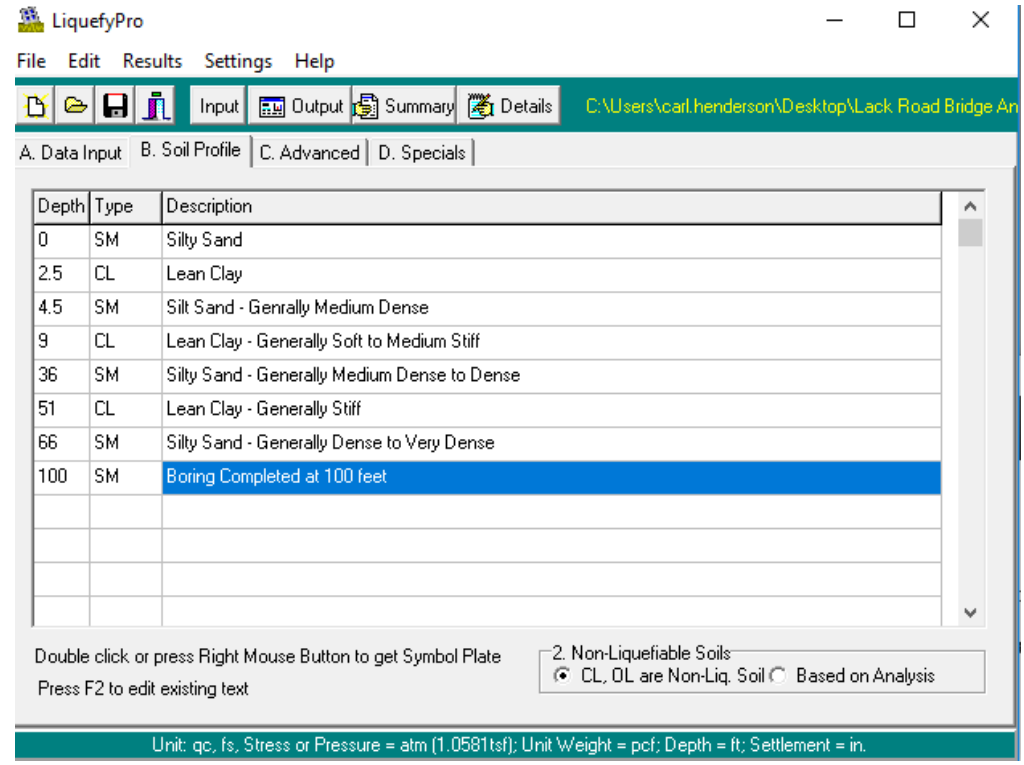
APPENDIX D

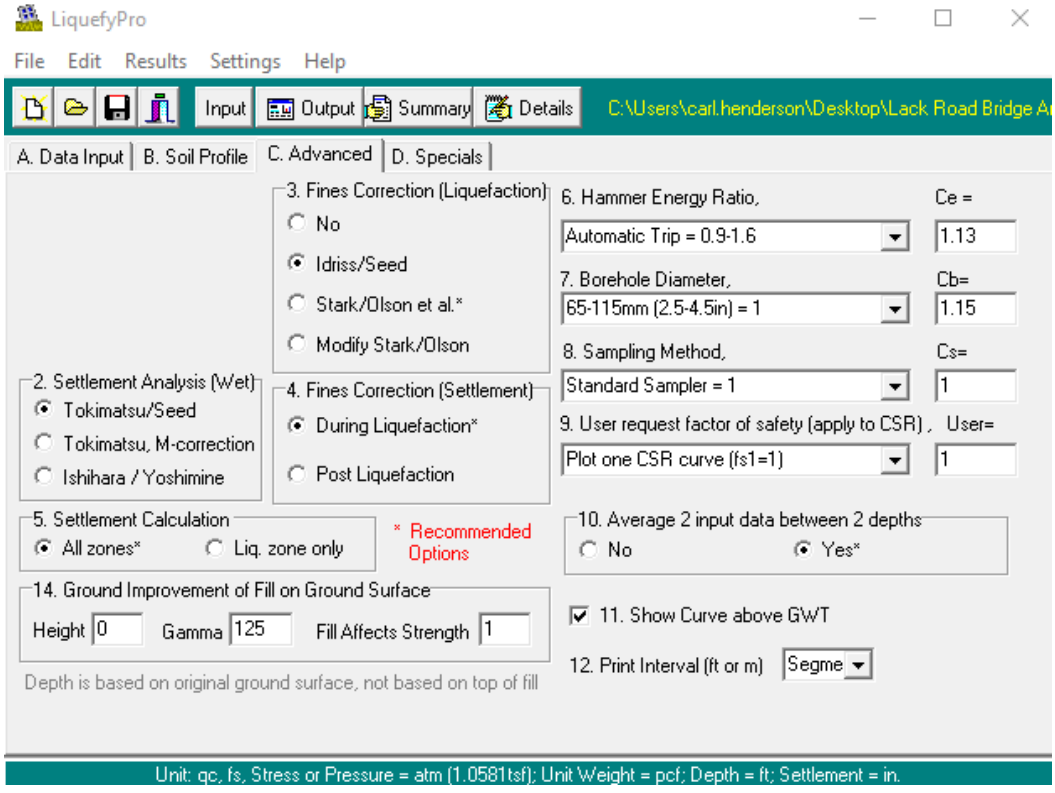
Liquefaction Analysis Results

Liquefaction Analysis – A-19-001


LiquefyPro
File Edit Results Settings Help
Input Output Summary Details
C:\Users\carl.henderson\Desktop\Lack Road Bridge A
A. Data Input B. Soil Profile C. Advanced D. Specials
1. Title Lack Road Bridge Replacement Over Ne
2. Subtitle Abutment 2
3. PGA (a_max) 0.611
4. Magnitude 6.5
5. Hole Depth 100
6. Hole No. A-19-001
7. Elevation 785
8. Water Table during Earthquake 18
9. Water Table during In-Situ Testing 18
10. Page No. Plate A-1
Plot 1 in = 15 foot
12. In-Situ Tests
SPT Input
CPT Input
BPT Input
13. Units
English
Metric / SI
15. In-Situ Test Data
17. Auto Depth
Depth SPT G total Fines(%)
1 0 10 120 26.4
2 2.5 10 120 101
3 4.5 10 120 30
4 9 15 120 30
5 16.5 4 122.6 101
6 21.5 3 122.6 101
7 31.5 7 121.1 101
8 36 7 121.1 101
9 40 12 125.9 33.9
10 46.5 36 125.9 33.9
11 51 15 122 33.9
In Fines (%), input 101 for Non-Liquefiable Soil; input a negative number to get desired F.S.
G total - Total Unit Weight.

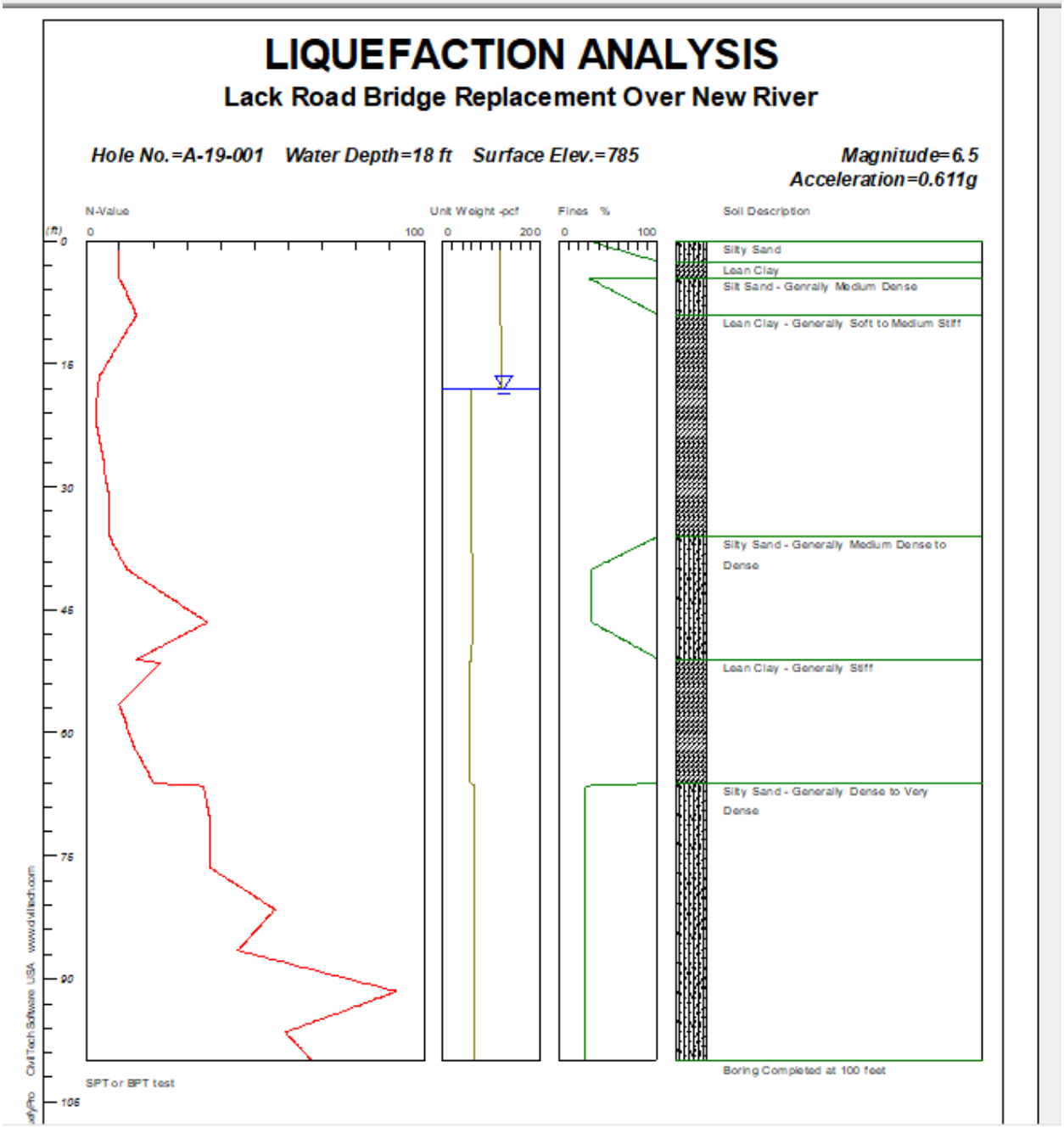

LiquefyPro
File Edit Results Settings Help
Input Output Summary Details
C:\Users\carl.henderson\Desktop\Lack Road Bridge A
A. Data Input B. Soil Profile C. Advanced D. Specials
1. Title Lack Road Bridge Replacement Over Ne
2. Subtitle Abutment 2
3. PGA (a_max) 0.611
4. Magnitude 6.5
5. Hole Depth 100
6. Hole No. A-19-001
7. Elevation 785
8. Water Table during Earthquake 18
9. Water Table during In-Situ Testing 18
10. Page No. Plate A-1
Plot 1 in = 15 foot
12. In-Situ Tests
SPT Input
CPT Input
BPT Input
13. Units
English
Metric / SI
15. In-Situ Test Data
17. Auto Depth
Depth SPT G total Fines(%)
13 56.5 10 118.6 101
14 61.5 14 118.6 101
15 66 20 118.6 101
16 66.5 35 127.9 26.4
17 71.5 37 127.9 26.4
18 76.5 37 127.9 26.4
19 81.5 56 127.9 26.4
20 86.5 45 127.9 26.4
21 91.5 92 128.3 26.4
22 96.5 59 128.3 26.4
23 100 67 128.3 26.4
In Fines (%), input 101 for Non-Liquefiable Soil; input a negative number to get desired F.S.
G total - Total Unit Weight.
Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.


LiquefyPro
File Edit Results Settings Help
Input Output Summary Details
C:\Users\carl.henderson\Desktop\Lack Road Bridge An
A. Data Input B. Soil Profile C. Advanced D. Specials
Depth Type Description
0 SM Silty Sand
2.5 CL Lean Clay
4.5 SM Silt Sand - Genrally Medium Dense
9 CL Lean Clay - Generally Soft to Medium Stiff
36 SM Silty Sand - Generally Medium Dense to Dense
51 CL Lean Clay - Generally Stiff
66 SM Silty Sand - Generally Dense to Very Dense
100 SM Boring Completed at 100 feet
Double click or press Right Mouse Button to get Symbol Plate
Press F2 to edit existing text
2. Non-Liquefiable Soils
CL, OL are Non-Liq. Soil Based on Analysis
Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.


LiquefyPro
File Edit Results Settings Help
Input Output Summary Details
C:\Users\carl.henderson\Desktop\Lack Road Bridge A
A. Data Input B. Soil Profile C. Advanced D. Specials
3. Fines Correction (Liquefaction)
No
Idriss/Seed
Stark/Olson et al.*
Modify Stark/Olson
6. Hammer Energy Ratio, Ce =
Automatic Trip = 0.9-1.6
1.13
7. Borehole Diameter, Cb=
65-115mm (2.5-4.5in) = 1
1.15
8. Sampling Method, Cs=
Standard Sampler = 1
1
9. User request factor of safety (apply to CSR), User=
Plot one CSR curve (fs1=1)
1
2. Settlement Analysis (Wet)
Tokimatsu/Seed
Tokimatsu, M-correction
Ishihara / Yoshimine
4. Fines Correction (Settlement)
During Liquefaction*
Post Liquefaction
5. Settlement Calculation
All zones* Liq. zone only
* Recommended Options
10. Average 2 input data between 2 depths
No Yes*
14. Ground Improvement of Fill on Ground Surface
Height 0 Gamma 125 Fill Affects Strength 1
11. Show Curve above GWT
12. Print Interval (ft or m) Segme
Depth is based on original ground surface, not based on top of fill
Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

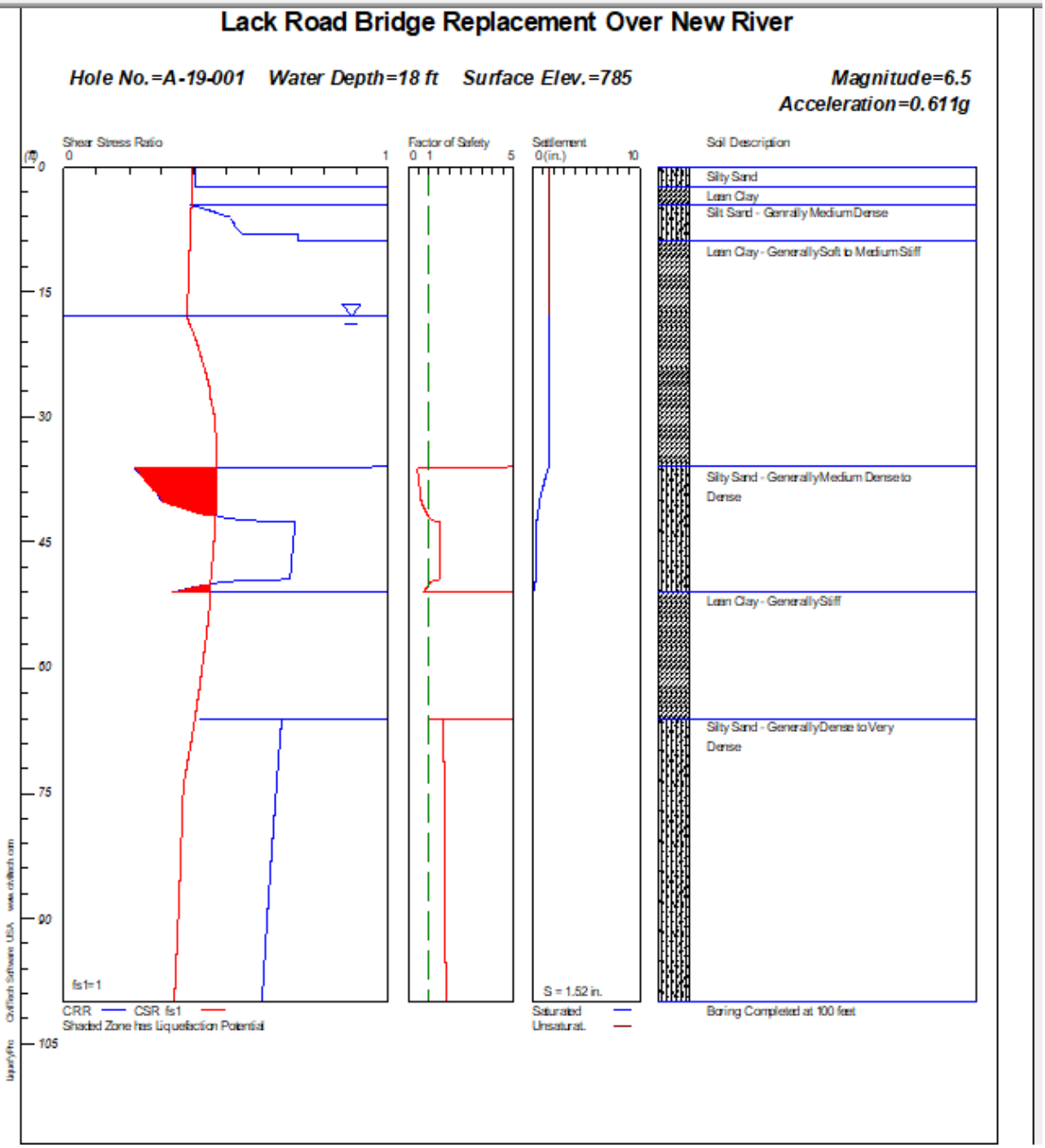
Viewform1

Page 1 of 1 | 1 | Zoom % | 80.0



Viewform1

Page 1 of 1 1 Zoom % 80.0



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LIQUEFACTION ANALYSIS SUMMARY

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Input File Name: C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix D - Liquefaction Analysis\A-19-001.liq

Title: Lack Road Bridge Replacement Over New River

Subtitle: Abutment 2

Surface Elev.=785

Hole No.=A-19-001

Depth of Hole= 100.00 ft

Water Table during Earthquake= 18.00 ft

Water Table during In-Situ Testing= 18.00 ft

Max. Acceleration= 0.61 g

Earthquake Magnitude= 6.50

Input Data:

Surface Elev.=785

Hole No.=A-19-001

Depth of Hole=100.00 ft

Water Table during Earthquake= 18.00 ft

Water Table during In-Situ Testing= 18.00 ft

Max. Acceleration=0.61 g

Earthquake Magnitude=6.50

No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.

2. Settlement Analysis Method: Tokimatsu/Seed

3. Fines Correction for Liquefaction: Idriss/Seed

4. Fine Correction for Settlement: During Liquefaction*

5. Settlement Calculation in: All zones*

6. Hammer Energy Ratio, Ce = 1.13

7. Borehole Diameter, Cb= 1.15

8. Sampling Method, Cs= 1

9. User request factor of safety (apply to CSR) , User= 1

Plot one CSR curve (fs1=1)

10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth	SPT	gamma	Fines
ft		pcf	%
0.00	10.00	120.00	30.00
2.50	10.00	120.00	NoLiq
4.50	10.00	120.00	30.00
9.00	15.00	120.00	NoLiq
16.50	4.00	122.60	NoLiq
21.50	3.00	122.60	NoLiq
31.50	7.00	121.10	NoLiq
36.00	7.00	121.10	NoLiq
40.00	12.00	125.90	33.90
46.50	36.00	125.90	33.90
51.00	15.00	122.00	NoLiq
51.50	22.00	118.60	NoLiq

56.50	10.00	118.60	NoLiq
61.50	14.00	118.60	NoLiq
66.00	20.00	118.60	NoLiq
66.50	35.00	127.90	26.40
71.50	37.00	127.90	26.40
76.50	37.00	127.90	26.40
81.50	56.00	127.90	26.40
86.50	45.00	127.90	26.40
91.50	92.00	128.30	26.40
96.50	59.00	128.30	26.40
100.00	67.00	128.30	26.40

Output Results:

Settlement of Saturated Sands=1.49 in.

Settlement of Unsaturated Sands=0.03 in.

Total Settlement of Saturated and Unsaturated Sands=1.52 in.

Differential Settlement=0.762 to 1.006 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	0.38	0.40	5.00	1.49	0.03	1.52
0.05	0.39	0.40	5.00	1.49	0.03	1.52
0.10	0.39	0.40	5.00	1.49	0.03	1.52
0.15	0.40	0.40	5.00	1.49	0.03	1.52
0.20	0.40	0.40	5.00	1.49	0.03	1.52
0.25	0.40	0.40	5.00	1.49	0.03	1.52
0.30	0.40	0.40	5.00	1.49	0.03	1.52
0.35	0.40	0.40	5.00	1.49	0.03	1.52
0.40	0.40	0.40	5.00	1.49	0.03	1.52

0.45	0.40	0.40	5.00	1.49	0.03	1.52
0.50	0.40	0.40	5.00	1.49	0.03	1.52
0.55	0.40	0.40	5.00	1.49	0.03	1.52
0.60	0.40	0.40	5.00	1.49	0.03	1.52
0.65	0.40	0.40	5.00	1.49	0.03	1.52
0.70	0.40	0.40	5.00	1.49	0.03	1.52
0.75	0.40	0.40	5.00	1.49	0.03	1.52
0.80	0.40	0.40	5.00	1.49	0.03	1.52
0.85	0.40	0.40	5.00	1.49	0.03	1.52
0.90	0.40	0.40	5.00	1.49	0.03	1.52
0.95	0.40	0.40	5.00	1.49	0.03	1.52
1.00	0.40	0.40	5.00	1.49	0.03	1.52
1.05	0.40	0.40	5.00	1.49	0.03	1.52
1.10	0.40	0.40	5.00	1.49	0.03	1.52
1.15	0.40	0.40	5.00	1.49	0.03	1.52
1.20	0.40	0.40	5.00	1.49	0.03	1.52
1.25	0.40	0.40	5.00	1.49	0.03	1.52
1.30	0.40	0.40	5.00	1.49	0.03	1.52
1.35	0.40	0.40	5.00	1.49	0.03	1.52
1.40	0.40	0.40	5.00	1.49	0.03	1.52
1.45	0.40	0.40	5.00	1.49	0.03	1.52
1.50	0.40	0.40	5.00	1.49	0.03	1.52
1.55	0.40	0.40	5.00	1.49	0.03	1.52
1.60	0.40	0.40	5.00	1.49	0.03	1.52
1.65	0.40	0.40	5.00	1.49	0.03	1.52
1.70	0.40	0.40	5.00	1.49	0.03	1.52
1.75	0.40	0.40	5.00	1.49	0.03	1.52
1.80	0.40	0.40	5.00	1.49	0.03	1.52
1.85	0.40	0.40	5.00	1.49	0.03	1.52
1.90	0.40	0.40	5.00	1.49	0.03	1.52
1.95	0.40	0.40	5.00	1.49	0.03	1.52

2.00	0.40	0.40	5.00	1.49	0.03	1.52
2.05	0.40	0.40	5.00	1.49	0.03	1.52
2.10	0.40	0.40	5.00	1.49	0.02	1.52
2.15	0.40	0.40	5.00	1.49	0.02	1.52
2.20	0.40	0.40	5.00	1.49	0.02	1.52
2.25	0.40	0.40	5.00	1.49	0.02	1.52
2.30	0.40	0.40	5.00	1.49	0.02	1.52
2.35	0.40	0.39	5.00	1.49	0.02	1.52
2.40	0.40	0.39	5.00	1.49	0.02	1.52
2.45	0.40	0.39	5.00	1.49	0.02	1.52
2.50	0.40	0.39	5.00	1.49	0.02	1.52
2.55	2.00	0.39	5.00	1.49	0.02	1.52
2.60	2.00	0.39	5.00	1.49	0.02	1.52
2.65	2.00	0.39	5.00	1.49	0.02	1.52
2.70	2.00	0.39	5.00	1.49	0.02	1.52
2.75	2.00	0.39	5.00	1.49	0.02	1.52
2.80	2.00	0.39	5.00	1.49	0.02	1.52
2.85	2.00	0.39	5.00	1.49	0.02	1.52
2.90	2.00	0.39	5.00	1.49	0.02	1.52
2.95	2.00	0.39	5.00	1.49	0.02	1.52
3.00	2.00	0.39	5.00	1.49	0.02	1.52
3.05	2.00	0.39	5.00	1.49	0.02	1.52
3.10	2.00	0.39	5.00	1.49	0.02	1.52
3.15	2.00	0.39	5.00	1.49	0.02	1.52
3.20	2.00	0.39	5.00	1.49	0.02	1.52
3.25	2.00	0.39	5.00	1.49	0.02	1.52
3.30	2.00	0.39	5.00	1.49	0.02	1.52
3.35	2.00	0.39	5.00	1.49	0.02	1.52
3.40	2.00	0.39	5.00	1.49	0.02	1.52
3.45	2.00	0.39	5.00	1.49	0.02	1.52
3.50	2.00	0.39	5.00	1.49	0.02	1.52

3.55	2.00	0.39	5.00	1.49	0.02	1.52
3.60	2.00	0.39	5.00	1.49	0.02	1.52
3.65	2.00	0.39	5.00	1.49	0.02	1.52
3.70	2.00	0.39	5.00	1.49	0.02	1.52
3.75	2.00	0.39	5.00	1.49	0.02	1.52
3.80	2.00	0.39	5.00	1.49	0.02	1.52
3.85	2.00	0.39	5.00	1.49	0.02	1.52
3.90	2.00	0.39	5.00	1.49	0.02	1.52
3.95	2.00	0.39	5.00	1.49	0.02	1.52
4.00	2.00	0.39	5.00	1.49	0.02	1.52
4.05	2.00	0.39	5.00	1.49	0.02	1.52
4.10	2.00	0.39	5.00	1.49	0.02	1.52
4.15	2.00	0.39	5.00	1.49	0.02	1.52
4.20	2.00	0.39	5.00	1.49	0.02	1.52
4.25	2.00	0.39	5.00	1.49	0.02	1.52
4.30	2.00	0.39	5.00	1.49	0.02	1.52
4.35	2.00	0.39	5.00	1.49	0.02	1.52
4.40	2.00	0.39	5.00	1.49	0.02	1.52
4.45	2.00	0.39	5.00	1.49	0.02	1.52
4.50	2.00	0.39	5.00	1.49	0.02	1.52
4.55	0.39	0.39	5.00	1.49	0.02	1.52
4.60	0.39	0.39	5.00	1.49	0.02	1.52
4.65	0.40	0.39	5.00	1.49	0.02	1.52
4.70	0.41	0.39	5.00	1.49	0.02	1.52
4.75	0.41	0.39	5.00	1.49	0.02	1.52
4.80	0.42	0.39	5.00	1.49	0.02	1.52
4.85	0.42	0.39	5.00	1.49	0.02	1.52
4.90	0.43	0.39	5.00	1.49	0.02	1.52
4.95	0.43	0.39	5.00	1.49	0.02	1.52
5.00	0.43	0.39	5.00	1.49	0.02	1.52
5.05	0.43	0.39	5.00	1.49	0.02	1.52

5.10	0.44	0.39	5.00	1.49	0.02	1.52
5.15	0.44	0.39	5.00	1.49	0.02	1.52
5.20	0.44	0.39	5.00	1.49	0.02	1.51
5.25	0.45	0.39	5.00	1.49	0.02	1.51
5.30	0.45	0.39	5.00	1.49	0.02	1.51
5.35	0.45	0.39	5.00	1.49	0.02	1.51
5.40	0.46	0.39	5.00	1.49	0.02	1.51
5.45	0.46	0.39	5.00	1.49	0.02	1.51
5.50	0.46	0.39	5.00	1.49	0.02	1.51
5.55	0.47	0.39	5.00	1.49	0.02	1.51
5.60	0.47	0.39	5.00	1.49	0.02	1.51
5.65	0.47	0.39	5.00	1.49	0.02	1.51
5.70	0.48	0.39	5.00	1.49	0.02	1.51
5.75	0.48	0.39	5.00	1.49	0.02	1.51
5.80	0.49	0.39	5.00	1.49	0.02	1.51
5.85	0.49	0.39	5.00	1.49	0.02	1.51
5.90	0.49	0.39	5.00	1.49	0.02	1.51
5.95	0.50	0.39	5.00	1.49	0.02	1.51
6.00	0.50	0.39	5.00	1.49	0.02	1.51
6.05	0.51	0.39	5.00	1.49	0.02	1.51
6.10	0.51	0.39	5.00	1.49	0.02	1.51
6.15	0.51	0.39	5.00	1.49	0.02	1.51
6.20	0.51	0.39	5.00	1.49	0.02	1.51
6.25	0.51	0.39	5.00	1.49	0.02	1.51
6.30	0.51	0.39	5.00	1.49	0.01	1.51
6.35	0.51	0.39	5.00	1.49	0.01	1.51
6.40	0.52	0.39	5.00	1.49	0.01	1.51
6.45	0.52	0.39	5.00	1.49	0.01	1.51
6.50	0.52	0.39	5.00	1.49	0.01	1.51
6.55	0.52	0.39	5.00	1.49	0.01	1.51
6.60	0.52	0.39	5.00	1.49	0.01	1.51

6.65	0.52	0.39	5.00	1.49	0.01	1.51
6.70	0.52	0.39	5.00	1.49	0.01	1.51
6.75	0.52	0.39	5.00	1.49	0.01	1.51
6.80	0.52	0.39	5.00	1.49	0.01	1.51
6.85	0.52	0.39	5.00	1.49	0.01	1.51
6.90	0.52	0.39	5.00	1.49	0.01	1.51
6.95	0.52	0.39	5.00	1.49	0.01	1.51
7.00	0.53	0.39	5.00	1.49	0.01	1.51
7.05	0.53	0.39	5.00	1.49	0.01	1.51
7.10	0.53	0.39	5.00	1.49	0.01	1.51
7.15	0.53	0.39	5.00	1.49	0.01	1.51
7.20	0.53	0.39	5.00	1.49	0.01	1.50
7.25	0.53	0.39	5.00	1.49	0.01	1.50
7.30	0.53	0.39	5.00	1.49	0.01	1.50
7.35	0.53	0.39	5.00	1.49	0.01	1.50
7.40	0.53	0.39	5.00	1.49	0.01	1.50
7.45	0.53	0.39	5.00	1.49	0.01	1.50
7.50	0.54	0.39	5.00	1.49	0.01	1.50
7.55	0.54	0.39	5.00	1.49	0.01	1.50
7.60	0.54	0.39	5.00	1.49	0.01	1.50
7.65	0.54	0.39	5.00	1.49	0.01	1.50
7.70	0.54	0.39	5.00	1.49	0.01	1.50
7.75	0.54	0.39	5.00	1.49	0.01	1.50
7.80	0.54	0.39	5.00	1.49	0.01	1.50
7.85	0.54	0.39	5.00	1.49	0.01	1.50
7.90	0.55	0.39	5.00	1.49	0.01	1.50
7.95	0.55	0.39	5.00	1.49	0.01	1.50
8.00	0.55	0.39	5.00	1.49	0.01	1.50
8.05	0.55	0.39	5.00	1.49	0.01	1.50
8.10	0.55	0.39	5.00	1.49	0.00	1.50
8.15	0.55	0.39	5.00	1.49	0.00	1.50

8.20	0.55	0.39	5.00	1.49	0.00	1.50
8.25	0.72	0.39	5.00	1.49	0.00	1.50
8.30	0.72	0.39	5.00	1.49	0.00	1.50
8.35	0.72	0.39	5.00	1.49	0.00	1.50
8.40	0.72	0.39	5.00	1.49	0.00	1.50
8.45	0.72	0.39	5.00	1.49	0.00	1.50
8.50	0.72	0.39	5.00	1.49	0.00	1.50
8.55	0.72	0.39	5.00	1.49	0.00	1.50
8.60	0.72	0.39	5.00	1.49	0.00	1.50
8.65	0.72	0.39	5.00	1.49	0.00	1.50
8.70	0.72	0.39	5.00	1.49	0.00	1.50
8.75	0.72	0.39	5.00	1.49	0.00	1.50
8.80	0.72	0.39	5.00	1.49	0.00	1.50
8.85	0.72	0.39	5.00	1.49	0.00	1.50
8.90	0.72	0.39	5.00	1.49	0.00	1.49
8.95	0.72	0.39	5.00	1.49	0.00	1.49
9.00	2.00	0.39	5.00	1.49	0.00	1.49
9.05	2.00	0.39	5.00	1.49	0.00	1.49
9.10	2.00	0.39	5.00	1.49	0.00	1.49
9.15	2.00	0.39	5.00	1.49	0.00	1.49
9.20	2.00	0.39	5.00	1.49	0.00	1.49
9.25	2.00	0.39	5.00	1.49	0.00	1.49
9.30	2.00	0.39	5.00	1.49	0.00	1.49
9.35	2.00	0.39	5.00	1.49	0.00	1.49
9.40	2.00	0.39	5.00	1.49	0.00	1.49
9.45	2.00	0.39	5.00	1.49	0.00	1.49
9.50	2.00	0.39	5.00	1.49	0.00	1.49
9.55	2.00	0.39	5.00	1.49	0.00	1.49
9.60	2.00	0.39	5.00	1.49	0.00	1.49
9.65	2.00	0.39	5.00	1.49	0.00	1.49
9.70	2.00	0.39	5.00	1.49	0.00	1.49

9.75	2.00	0.39	5.00	1.49	0.00	1.49
9.80	2.00	0.39	5.00	1.49	0.00	1.49
9.85	2.00	0.39	5.00	1.49	0.00	1.49
9.90	2.00	0.39	5.00	1.49	0.00	1.49
9.95	2.00	0.39	5.00	1.49	0.00	1.49
10.00	2.00	0.39	5.00	1.49	0.00	1.49
10.05	2.00	0.39	5.00	1.49	0.00	1.49
10.10	2.00	0.39	5.00	1.49	0.00	1.49
10.15	2.00	0.39	5.00	1.49	0.00	1.49
10.20	2.00	0.39	5.00	1.49	0.00	1.49
10.25	2.00	0.39	5.00	1.49	0.00	1.49
10.30	2.00	0.39	5.00	1.49	0.00	1.49
10.35	2.00	0.39	5.00	1.49	0.00	1.49
10.40	2.00	0.39	5.00	1.49	0.00	1.49
10.45	2.00	0.39	5.00	1.49	0.00	1.49
10.50	2.00	0.39	5.00	1.49	0.00	1.49
10.55	2.00	0.39	5.00	1.49	0.00	1.49
10.60	2.00	0.39	5.00	1.49	0.00	1.49
10.65	2.00	0.39	5.00	1.49	0.00	1.49
10.70	2.00	0.39	5.00	1.49	0.00	1.49
10.75	2.00	0.39	5.00	1.49	0.00	1.49
10.80	2.00	0.39	5.00	1.49	0.00	1.49
10.85	2.00	0.39	5.00	1.49	0.00	1.49
10.90	2.00	0.39	5.00	1.49	0.00	1.49
10.95	2.00	0.39	5.00	1.49	0.00	1.49
11.00	2.00	0.39	5.00	1.49	0.00	1.49
11.05	2.00	0.39	5.00	1.49	0.00	1.49
11.10	2.00	0.39	5.00	1.49	0.00	1.49
11.15	2.00	0.39	5.00	1.49	0.00	1.49
11.20	2.00	0.39	5.00	1.49	0.00	1.49
11.25	2.00	0.39	5.00	1.49	0.00	1.49

11.30	2.00	0.39	5.00	1.49	0.00	1.49
11.35	2.00	0.39	5.00	1.49	0.00	1.49
11.40	2.00	0.39	5.00	1.49	0.00	1.49
11.45	2.00	0.39	5.00	1.49	0.00	1.49
11.50	2.00	0.39	5.00	1.49	0.00	1.49
11.55	2.00	0.39	5.00	1.49	0.00	1.49
11.60	2.00	0.39	5.00	1.49	0.00	1.49
11.65	2.00	0.39	5.00	1.49	0.00	1.49
11.70	2.00	0.39	5.00	1.49	0.00	1.49
11.75	2.00	0.39	5.00	1.49	0.00	1.49
11.80	2.00	0.39	5.00	1.49	0.00	1.49
11.85	2.00	0.39	5.00	1.49	0.00	1.49
11.90	2.00	0.39	5.00	1.49	0.00	1.49
11.95	2.00	0.39	5.00	1.49	0.00	1.49
12.00	2.00	0.39	5.00	1.49	0.00	1.49
12.05	2.00	0.39	5.00	1.49	0.00	1.49
12.10	2.00	0.39	5.00	1.49	0.00	1.49
12.15	2.00	0.39	5.00	1.49	0.00	1.49
12.20	2.00	0.39	5.00	1.49	0.00	1.49
12.25	2.00	0.39	5.00	1.49	0.00	1.49
12.30	2.00	0.39	5.00	1.49	0.00	1.49
12.35	2.00	0.39	5.00	1.49	0.00	1.49
12.40	2.00	0.39	5.00	1.49	0.00	1.49
12.45	2.00	0.39	5.00	1.49	0.00	1.49
12.50	2.00	0.39	5.00	1.49	0.00	1.49
12.55	2.00	0.39	5.00	1.49	0.00	1.49
12.60	2.00	0.39	5.00	1.49	0.00	1.49
12.65	2.00	0.39	5.00	1.49	0.00	1.49
12.70	2.00	0.39	5.00	1.49	0.00	1.49
12.75	2.00	0.39	5.00	1.49	0.00	1.49
12.80	2.00	0.39	5.00	1.49	0.00	1.49

12.85	2.00	0.39	5.00	1.49	0.00	1.49
12.90	2.00	0.39	5.00	1.49	0.00	1.49
12.95	2.00	0.39	5.00	1.49	0.00	1.49
13.00	2.00	0.39	5.00	1.49	0.00	1.49
13.05	2.00	0.39	5.00	1.49	0.00	1.49
13.10	2.00	0.39	5.00	1.49	0.00	1.49
13.15	2.00	0.38	5.00	1.49	0.00	1.49
13.20	2.00	0.38	5.00	1.49	0.00	1.49
13.25	2.00	0.38	5.00	1.49	0.00	1.49
13.30	2.00	0.38	5.00	1.49	0.00	1.49
13.35	2.00	0.38	5.00	1.49	0.00	1.49
13.40	2.00	0.38	5.00	1.49	0.00	1.49
13.45	2.00	0.38	5.00	1.49	0.00	1.49
13.50	2.00	0.38	5.00	1.49	0.00	1.49
13.55	2.00	0.38	5.00	1.49	0.00	1.49
13.60	2.00	0.38	5.00	1.49	0.00	1.49
13.65	2.00	0.38	5.00	1.49	0.00	1.49
13.70	2.00	0.38	5.00	1.49	0.00	1.49
13.75	2.00	0.38	5.00	1.49	0.00	1.49
13.80	2.00	0.38	5.00	1.49	0.00	1.49
13.85	2.00	0.38	5.00	1.49	0.00	1.49
13.90	2.00	0.38	5.00	1.49	0.00	1.49
13.95	2.00	0.38	5.00	1.49	0.00	1.49
14.00	2.00	0.38	5.00	1.49	0.00	1.49
14.05	2.00	0.38	5.00	1.49	0.00	1.49
14.10	2.00	0.38	5.00	1.49	0.00	1.49
14.15	2.00	0.38	5.00	1.49	0.00	1.49
14.20	2.00	0.38	5.00	1.49	0.00	1.49
14.25	2.00	0.38	5.00	1.49	0.00	1.49
14.30	2.00	0.38	5.00	1.49	0.00	1.49
14.35	2.00	0.38	5.00	1.49	0.00	1.49

14.40	2.00	0.38	5.00	1.49	0.00	1.49
14.45	2.00	0.38	5.00	1.49	0.00	1.49
14.50	2.00	0.38	5.00	1.49	0.00	1.49
14.55	2.00	0.38	5.00	1.49	0.00	1.49
14.60	2.00	0.38	5.00	1.49	0.00	1.49
14.65	2.00	0.38	5.00	1.49	0.00	1.49
14.70	2.00	0.38	5.00	1.49	0.00	1.49
14.75	2.00	0.38	5.00	1.49	0.00	1.49
14.80	2.00	0.38	5.00	1.49	0.00	1.49
14.85	2.00	0.38	5.00	1.49	0.00	1.49
14.90	2.00	0.38	5.00	1.49	0.00	1.49
14.95	2.00	0.38	5.00	1.49	0.00	1.49
15.00	2.00	0.38	5.00	1.49	0.00	1.49
15.05	2.00	0.38	5.00	1.49	0.00	1.49
15.10	2.00	0.38	5.00	1.49	0.00	1.49
15.15	2.00	0.38	5.00	1.49	0.00	1.49
15.20	2.00	0.38	5.00	1.49	0.00	1.49
15.25	2.00	0.38	5.00	1.49	0.00	1.49
15.30	2.00	0.38	5.00	1.49	0.00	1.49
15.35	2.00	0.38	5.00	1.49	0.00	1.49
15.40	2.00	0.38	5.00	1.49	0.00	1.49
15.45	2.00	0.38	5.00	1.49	0.00	1.49
15.50	2.00	0.38	5.00	1.49	0.00	1.49
15.55	2.00	0.38	5.00	1.49	0.00	1.49
15.60	2.00	0.38	5.00	1.49	0.00	1.49
15.65	2.00	0.38	5.00	1.49	0.00	1.49
15.70	2.00	0.38	5.00	1.49	0.00	1.49
15.75	2.00	0.38	5.00	1.49	0.00	1.49
15.80	2.00	0.38	5.00	1.49	0.00	1.49
15.85	2.00	0.38	5.00	1.49	0.00	1.49
15.90	2.00	0.38	5.00	1.49	0.00	1.49

15.95	2.00	0.38	5.00	1.49	0.00	1.49
16.00	2.00	0.38	5.00	1.49	0.00	1.49
16.05	2.00	0.38	5.00	1.49	0.00	1.49
16.10	2.00	0.38	5.00	1.49	0.00	1.49
16.15	2.00	0.38	5.00	1.49	0.00	1.49
16.20	2.00	0.38	5.00	1.49	0.00	1.49
16.25	2.00	0.38	5.00	1.49	0.00	1.49
16.30	2.00	0.38	5.00	1.49	0.00	1.49
16.35	2.00	0.38	5.00	1.49	0.00	1.49
16.40	2.00	0.38	5.00	1.49	0.00	1.49
16.45	2.00	0.38	5.00	1.49	0.00	1.49
16.50	2.00	0.38	5.00	1.49	0.00	1.49
16.55	2.00	0.38	5.00	1.49	0.00	1.49
16.60	2.00	0.38	5.00	1.49	0.00	1.49
16.65	2.00	0.38	5.00	1.49	0.00	1.49
16.70	2.00	0.38	5.00	1.49	0.00	1.49
16.75	2.00	0.38	5.00	1.49	0.00	1.49
16.80	2.00	0.38	5.00	1.49	0.00	1.49
16.85	2.00	0.38	5.00	1.49	0.00	1.49
16.90	2.00	0.38	5.00	1.49	0.00	1.49
16.95	2.00	0.38	5.00	1.49	0.00	1.49
17.00	2.00	0.38	5.00	1.49	0.00	1.49
17.05	2.00	0.38	5.00	1.49	0.00	1.49
17.10	2.00	0.38	5.00	1.49	0.00	1.49
17.15	2.00	0.38	5.00	1.49	0.00	1.49
17.20	2.00	0.38	5.00	1.49	0.00	1.49
17.25	2.00	0.38	5.00	1.49	0.00	1.49
17.30	2.00	0.38	5.00	1.49	0.00	1.49
17.35	2.00	0.38	5.00	1.49	0.00	1.49
17.40	2.00	0.38	5.00	1.49	0.00	1.49
17.45	2.00	0.38	5.00	1.49	0.00	1.49

17.50	2.00	0.38	5.00	1.49	0.00	1.49
17.55	2.00	0.38	5.00	1.49	0.00	1.49
17.60	2.00	0.38	5.00	1.49	0.00	1.49
17.65	2.00	0.38	5.00	1.49	0.00	1.49
17.70	2.00	0.38	5.00	1.49	0.00	1.49
17.75	2.00	0.38	5.00	1.49	0.00	1.49
17.80	2.00	0.38	5.00	1.49	0.00	1.49
17.85	2.00	0.38	5.00	1.49	0.00	1.49
17.90	2.00	0.38	5.00	1.49	0.00	1.49
17.95	2.00	0.38	5.00	1.49	0.00	1.49
18.00	2.00	0.38	5.00	1.49	0.00	1.49
18.05	2.00	0.38	5.00	1.49	0.00	1.49
18.10	2.00	0.38	5.00	1.49	0.00	1.49
18.15	2.00	0.38	5.00	1.49	0.00	1.49
18.20	2.00	0.38	5.00	1.49	0.00	1.49
18.25	2.00	0.38	5.00	1.49	0.00	1.49
18.30	2.00	0.38	5.00	1.49	0.00	1.49
18.35	2.00	0.38	5.00	1.49	0.00	1.49
18.40	2.00	0.38	5.00	1.49	0.00	1.49
18.45	2.00	0.38	5.00	1.49	0.00	1.49
18.50	2.00	0.39	5.00	1.49	0.00	1.49
18.55	2.00	0.39	5.00	1.49	0.00	1.49
18.60	2.00	0.39	5.00	1.49	0.00	1.49
18.65	2.00	0.39	5.00	1.49	0.00	1.49
18.70	2.00	0.39	5.00	1.49	0.00	1.49
18.75	2.00	0.39	5.00	1.49	0.00	1.49
18.80	2.00	0.39	5.00	1.49	0.00	1.49
18.85	2.00	0.39	5.00	1.49	0.00	1.49
18.90	2.00	0.39	5.00	1.49	0.00	1.49
18.95	2.00	0.39	5.00	1.49	0.00	1.49
19.00	2.00	0.39	5.00	1.49	0.00	1.49

19.05	2.00	0.39	5.00	1.49	0.00	1.49
19.10	2.00	0.39	5.00	1.49	0.00	1.49
19.15	2.00	0.39	5.00	1.49	0.00	1.49
19.20	2.00	0.39	5.00	1.49	0.00	1.49
19.25	2.00	0.39	5.00	1.49	0.00	1.49
19.30	2.00	0.39	5.00	1.49	0.00	1.49
19.35	2.00	0.39	5.00	1.49	0.00	1.49
19.40	2.00	0.39	5.00	1.49	0.00	1.49
19.45	2.00	0.39	5.00	1.49	0.00	1.49
19.50	2.00	0.39	5.00	1.49	0.00	1.49
19.55	2.00	0.40	5.00	1.49	0.00	1.49
19.60	2.00	0.40	5.00	1.49	0.00	1.49
19.65	2.00	0.40	5.00	1.49	0.00	1.49
19.70	2.00	0.40	5.00	1.49	0.00	1.49
19.75	2.00	0.40	5.00	1.49	0.00	1.49
19.80	2.00	0.40	5.00	1.49	0.00	1.49
19.85	2.00	0.40	5.00	1.49	0.00	1.49
19.90	2.00	0.40	5.00	1.49	0.00	1.49
19.95	2.00	0.40	5.00	1.49	0.00	1.49
20.00	2.00	0.40	5.00	1.49	0.00	1.49
20.05	2.00	0.40	5.00	1.49	0.00	1.49
20.10	2.00	0.40	5.00	1.49	0.00	1.49
20.15	2.00	0.40	5.00	1.49	0.00	1.49
20.20	2.00	0.40	5.00	1.49	0.00	1.49
20.25	2.00	0.40	5.00	1.49	0.00	1.49
20.30	2.00	0.40	5.00	1.49	0.00	1.49
20.35	2.00	0.40	5.00	1.49	0.00	1.49
20.40	2.00	0.40	5.00	1.49	0.00	1.49
20.45	2.00	0.40	5.00	1.49	0.00	1.49
20.50	2.00	0.40	5.00	1.49	0.00	1.49
20.55	2.00	0.40	5.00	1.49	0.00	1.49

20.60	2.00	0.40	5.00	1.49	0.00	1.49
20.65	2.00	0.40	5.00	1.49	0.00	1.49
20.70	2.00	0.41	5.00	1.49	0.00	1.49
20.75	2.00	0.41	5.00	1.49	0.00	1.49
20.80	2.00	0.41	5.00	1.49	0.00	1.49
20.85	2.00	0.41	5.00	1.49	0.00	1.49
20.90	2.00	0.41	5.00	1.49	0.00	1.49
20.95	2.00	0.41	5.00	1.49	0.00	1.49
21.00	2.00	0.41	5.00	1.49	0.00	1.49
21.05	2.00	0.41	5.00	1.49	0.00	1.49
21.10	2.00	0.41	5.00	1.49	0.00	1.49
21.15	2.00	0.41	5.00	1.49	0.00	1.49
21.20	2.00	0.41	5.00	1.49	0.00	1.49
21.25	2.00	0.41	5.00	1.49	0.00	1.49
21.30	2.00	0.41	5.00	1.49	0.00	1.49
21.35	2.00	0.41	5.00	1.49	0.00	1.49
21.40	2.00	0.41	5.00	1.49	0.00	1.49
21.45	2.00	0.41	5.00	1.49	0.00	1.49
21.50	2.00	0.41	5.00	1.49	0.00	1.49
21.55	2.00	0.41	5.00	1.49	0.00	1.49
21.60	2.00	0.41	5.00	1.49	0.00	1.49
21.65	2.00	0.41	5.00	1.49	0.00	1.49
21.70	2.00	0.41	5.00	1.49	0.00	1.49
21.75	2.00	0.41	5.00	1.49	0.00	1.49
21.80	2.00	0.41	5.00	1.49	0.00	1.49
21.85	2.00	0.41	5.00	1.49	0.00	1.49
21.90	2.00	0.41	5.00	1.49	0.00	1.49
21.95	2.00	0.42	5.00	1.49	0.00	1.49
22.00	2.00	0.42	5.00	1.49	0.00	1.49
22.05	2.00	0.42	5.00	1.49	0.00	1.49
22.10	2.00	0.42	5.00	1.49	0.00	1.49

22.15	2.00	0.42	5.00	1.49	0.00	1.49
22.20	2.00	0.42	5.00	1.49	0.00	1.49
22.25	2.00	0.42	5.00	1.49	0.00	1.49
22.30	2.00	0.42	5.00	1.49	0.00	1.49
22.35	2.00	0.42	5.00	1.49	0.00	1.49
22.40	2.00	0.42	5.00	1.49	0.00	1.49
22.45	2.00	0.42	5.00	1.49	0.00	1.49
22.50	2.00	0.42	5.00	1.49	0.00	1.49
22.55	2.00	0.42	5.00	1.49	0.00	1.49
22.60	2.00	0.42	5.00	1.49	0.00	1.49
22.65	2.00	0.42	5.00	1.49	0.00	1.49
22.70	2.00	0.42	5.00	1.49	0.00	1.49
22.75	2.00	0.42	5.00	1.49	0.00	1.49
22.80	2.00	0.42	5.00	1.49	0.00	1.49
22.85	2.00	0.42	5.00	1.49	0.00	1.49
22.90	2.00	0.42	5.00	1.49	0.00	1.49
22.95	2.00	0.42	5.00	1.49	0.00	1.49
23.00	2.00	0.42	5.00	1.49	0.00	1.49
23.05	2.00	0.42	5.00	1.49	0.00	1.49
23.10	2.00	0.42	5.00	1.49	0.00	1.49
23.15	2.00	0.42	5.00	1.49	0.00	1.49
23.20	2.00	0.42	5.00	1.49	0.00	1.49
23.25	2.00	0.43	5.00	1.49	0.00	1.49
23.30	2.00	0.43	5.00	1.49	0.00	1.49
23.35	2.00	0.43	5.00	1.49	0.00	1.49
23.40	2.00	0.43	5.00	1.49	0.00	1.49
23.45	2.00	0.43	5.00	1.49	0.00	1.49
23.50	2.00	0.43	5.00	1.49	0.00	1.49
23.55	2.00	0.43	5.00	1.49	0.00	1.49
23.60	2.00	0.43	5.00	1.49	0.00	1.49
23.65	2.00	0.43	5.00	1.49	0.00	1.49

23.70	2.00	0.43	5.00	1.49	0.00	1.49
23.75	2.00	0.43	5.00	1.49	0.00	1.49
23.80	2.00	0.43	5.00	1.49	0.00	1.49
23.85	2.00	0.43	5.00	1.49	0.00	1.49
23.90	2.00	0.43	5.00	1.49	0.00	1.49
23.95	2.00	0.43	5.00	1.49	0.00	1.49
24.00	2.00	0.43	5.00	1.49	0.00	1.49
24.05	2.00	0.43	5.00	1.49	0.00	1.49
24.10	2.00	0.43	5.00	1.49	0.00	1.49
24.15	2.00	0.43	5.00	1.49	0.00	1.49
24.20	2.00	0.43	5.00	1.49	0.00	1.49
24.25	2.00	0.43	5.00	1.49	0.00	1.49
24.30	2.00	0.43	5.00	1.49	0.00	1.49
24.35	2.00	0.43	5.00	1.49	0.00	1.49
24.40	2.00	0.43	5.00	1.49	0.00	1.49
24.45	2.00	0.43	5.00	1.49	0.00	1.49
24.50	2.00	0.43	5.00	1.49	0.00	1.49
24.55	2.00	0.43	5.00	1.49	0.00	1.49
24.60	2.00	0.43	5.00	1.49	0.00	1.49
24.65	2.00	0.43	5.00	1.49	0.00	1.49
24.70	2.00	0.44	5.00	1.49	0.00	1.49
24.75	2.00	0.44	5.00	1.49	0.00	1.49
24.80	2.00	0.44	5.00	1.49	0.00	1.49
24.85	2.00	0.44	5.00	1.49	0.00	1.49
24.90	2.00	0.44	5.00	1.49	0.00	1.49
24.95	2.00	0.44	5.00	1.49	0.00	1.49
25.00	2.00	0.44	5.00	1.49	0.00	1.49
25.05	2.00	0.44	5.00	1.49	0.00	1.49
25.10	2.00	0.44	5.00	1.49	0.00	1.49
25.15	2.00	0.44	5.00	1.49	0.00	1.49
25.20	2.00	0.44	5.00	1.49	0.00	1.49

25.25	2.00	0.44	5.00	1.49	0.00	1.49
25.30	2.00	0.44	5.00	1.49	0.00	1.49
25.35	2.00	0.44	5.00	1.49	0.00	1.49
25.40	2.00	0.44	5.00	1.49	0.00	1.49
25.45	2.00	0.44	5.00	1.49	0.00	1.49
25.50	2.00	0.44	5.00	1.49	0.00	1.49
25.55	2.00	0.44	5.00	1.49	0.00	1.49
25.60	2.00	0.44	5.00	1.49	0.00	1.49
25.65	2.00	0.44	5.00	1.49	0.00	1.49
25.70	2.00	0.44	5.00	1.49	0.00	1.49
25.75	2.00	0.44	5.00	1.49	0.00	1.49
25.80	2.00	0.44	5.00	1.49	0.00	1.49
25.85	2.00	0.44	5.00	1.49	0.00	1.49
25.90	2.00	0.44	5.00	1.49	0.00	1.49
25.95	2.00	0.44	5.00	1.49	0.00	1.49
26.00	2.00	0.44	5.00	1.49	0.00	1.49
26.05	2.00	0.44	5.00	1.49	0.00	1.49
26.10	2.00	0.44	5.00	1.49	0.00	1.49
26.15	2.00	0.44	5.00	1.49	0.00	1.49
26.20	2.00	0.44	5.00	1.49	0.00	1.49
26.25	2.00	0.44	5.00	1.49	0.00	1.49
26.30	2.00	0.45	5.00	1.49	0.00	1.49
26.35	2.00	0.45	5.00	1.49	0.00	1.49
26.40	2.00	0.45	5.00	1.49	0.00	1.49
26.45	2.00	0.45	5.00	1.49	0.00	1.49
26.50	2.00	0.45	5.00	1.49	0.00	1.49
26.55	2.00	0.45	5.00	1.49	0.00	1.49
26.60	2.00	0.45	5.00	1.49	0.00	1.49
26.65	2.00	0.45	5.00	1.49	0.00	1.49
26.70	2.00	0.45	5.00	1.49	0.00	1.49
26.75	2.00	0.45	5.00	1.49	0.00	1.49

26.80	2.00	0.45	5.00	1.49	0.00	1.49
26.85	2.00	0.45	5.00	1.49	0.00	1.49
26.90	2.00	0.45	5.00	1.49	0.00	1.49
26.95	2.00	0.45	5.00	1.49	0.00	1.49
27.00	2.00	0.45	5.00	1.49	0.00	1.49
27.05	2.00	0.45	5.00	1.49	0.00	1.49
27.10	2.00	0.45	5.00	1.49	0.00	1.49
27.15	2.00	0.45	5.00	1.49	0.00	1.49
27.20	2.00	0.45	5.00	1.49	0.00	1.49
27.25	2.00	0.45	5.00	1.49	0.00	1.49
27.30	2.00	0.45	5.00	1.49	0.00	1.49
27.35	2.00	0.45	5.00	1.49	0.00	1.49
27.40	2.00	0.45	5.00	1.49	0.00	1.49
27.45	2.00	0.45	5.00	1.49	0.00	1.49
27.50	2.00	0.45	5.00	1.49	0.00	1.49
27.55	2.00	0.45	5.00	1.49	0.00	1.49
27.60	2.00	0.45	5.00	1.49	0.00	1.49
27.65	2.00	0.45	5.00	1.49	0.00	1.49
27.70	2.00	0.45	5.00	1.49	0.00	1.49
27.75	2.00	0.45	5.00	1.49	0.00	1.49
27.80	2.00	0.45	5.00	1.49	0.00	1.49
27.85	2.00	0.45	5.00	1.49	0.00	1.49
27.90	2.00	0.45	5.00	1.49	0.00	1.49
27.95	2.00	0.45	5.00	1.49	0.00	1.49
28.00	2.00	0.45	5.00	1.49	0.00	1.49
28.05	2.00	0.46	5.00	1.49	0.00	1.49
28.10	2.00	0.46	5.00	1.49	0.00	1.49
28.15	2.00	0.46	5.00	1.49	0.00	1.49
28.20	2.00	0.46	5.00	1.49	0.00	1.49
28.25	2.00	0.46	5.00	1.49	0.00	1.49
28.30	2.00	0.46	5.00	1.49	0.00	1.49

28.35	2.00	0.46	5.00	1.49	0.00	1.49
28.40	2.00	0.46	5.00	1.49	0.00	1.49
28.45	2.00	0.46	5.00	1.49	0.00	1.49
28.50	2.00	0.46	5.00	1.49	0.00	1.49
28.55	2.00	0.46	5.00	1.49	0.00	1.49
28.60	2.00	0.46	5.00	1.49	0.00	1.49
28.65	2.00	0.46	5.00	1.49	0.00	1.49
28.70	2.00	0.46	5.00	1.49	0.00	1.49
28.75	2.00	0.46	5.00	1.49	0.00	1.49
28.80	2.00	0.46	5.00	1.49	0.00	1.49
28.85	2.00	0.46	5.00	1.49	0.00	1.49
28.90	2.00	0.46	5.00	1.49	0.00	1.49
28.95	2.00	0.46	5.00	1.49	0.00	1.49
29.00	2.00	0.46	5.00	1.49	0.00	1.49
29.05	2.00	0.46	5.00	1.49	0.00	1.49
29.10	2.00	0.46	5.00	1.49	0.00	1.49
29.15	2.00	0.46	5.00	1.49	0.00	1.49
29.20	2.00	0.46	5.00	1.49	0.00	1.49
29.25	2.00	0.46	5.00	1.49	0.00	1.49
29.30	2.00	0.46	5.00	1.49	0.00	1.49
29.35	2.00	0.46	5.00	1.49	0.00	1.49
29.40	2.00	0.46	5.00	1.49	0.00	1.49
29.45	2.00	0.46	5.00	1.49	0.00	1.49
29.50	2.00	0.46	5.00	1.49	0.00	1.49
29.55	2.00	0.46	5.00	1.49	0.00	1.49
29.60	2.00	0.46	5.00	1.49	0.00	1.49
29.65	2.00	0.46	5.00	1.49	0.00	1.49
29.70	2.00	0.46	5.00	1.49	0.00	1.49
29.75	2.00	0.46	5.00	1.49	0.00	1.49
29.80	2.00	0.46	5.00	1.49	0.00	1.49
29.85	2.00	0.46	5.00	1.49	0.00	1.49

29.90	2.00	0.46	5.00	1.49	0.00	1.49
29.95	2.00	0.46	5.00	1.49	0.00	1.49
30.00	2.00	0.47	5.00	1.49	0.00	1.49
30.05	2.00	0.47	5.00	1.49	0.00	1.49
30.10	2.00	0.47	5.00	1.49	0.00	1.49
30.15	2.00	0.47	5.00	1.49	0.00	1.49
30.20	2.00	0.47	5.00	1.49	0.00	1.49
30.25	2.00	0.47	5.00	1.49	0.00	1.49
30.30	2.00	0.47	5.00	1.49	0.00	1.49
30.35	2.00	0.47	5.00	1.49	0.00	1.49
30.40	2.00	0.47	5.00	1.49	0.00	1.49
30.45	2.00	0.47	5.00	1.49	0.00	1.49
30.50	2.00	0.47	5.00	1.49	0.00	1.49
30.55	2.00	0.47	5.00	1.49	0.00	1.49
30.60	2.00	0.47	5.00	1.49	0.00	1.49
30.65	2.00	0.47	5.00	1.49	0.00	1.49
30.70	2.00	0.47	5.00	1.49	0.00	1.49
30.75	2.00	0.47	5.00	1.49	0.00	1.49
30.80	2.00	0.47	5.00	1.49	0.00	1.49
30.85	2.00	0.47	5.00	1.49	0.00	1.49
30.90	2.00	0.47	5.00	1.49	0.00	1.49
30.95	2.00	0.47	5.00	1.49	0.00	1.49
31.00	2.00	0.47	5.00	1.49	0.00	1.49
31.05	2.00	0.47	5.00	1.49	0.00	1.49
31.10	2.00	0.47	5.00	1.49	0.00	1.49
31.15	2.00	0.47	5.00	1.49	0.00	1.49
31.20	2.00	0.47	5.00	1.49	0.00	1.49
31.25	2.00	0.47	5.00	1.49	0.00	1.49
31.30	2.00	0.47	5.00	1.49	0.00	1.49
31.35	2.00	0.47	5.00	1.49	0.00	1.49
31.40	2.00	0.47	5.00	1.49	0.00	1.49

31.45	2.00	0.47	5.00	1.49	0.00	1.49
31.50	2.00	0.47	5.00	1.49	0.00	1.49
31.55	2.00	0.47	5.00	1.49	0.00	1.49
31.60	2.00	0.47	5.00	1.49	0.00	1.49
31.65	2.00	0.47	5.00	1.49	0.00	1.49
31.70	2.00	0.47	5.00	1.49	0.00	1.49
31.75	2.00	0.47	5.00	1.49	0.00	1.49
31.80	2.00	0.47	5.00	1.49	0.00	1.49
31.85	2.00	0.47	5.00	1.49	0.00	1.49
31.90	2.00	0.47	5.00	1.49	0.00	1.49
31.95	2.00	0.47	5.00	1.49	0.00	1.49
32.00	2.00	0.47	5.00	1.49	0.00	1.49
32.05	2.00	0.47	5.00	1.49	0.00	1.49
32.10	2.00	0.47	5.00	1.49	0.00	1.49
32.15	2.00	0.47	5.00	1.49	0.00	1.49
32.20	2.00	0.47	5.00	1.49	0.00	1.49
32.25	2.00	0.47	5.00	1.49	0.00	1.49
32.30	2.00	0.47	5.00	1.49	0.00	1.49
32.35	2.00	0.47	5.00	1.49	0.00	1.49
32.40	2.00	0.47	5.00	1.49	0.00	1.49
32.45	2.00	0.47	5.00	1.49	0.00	1.49
32.50	2.00	0.47	5.00	1.49	0.00	1.49
32.55	2.00	0.47	5.00	1.49	0.00	1.49
32.60	2.00	0.47	5.00	1.49	0.00	1.49
32.65	2.00	0.47	5.00	1.49	0.00	1.49
32.70	2.00	0.47	5.00	1.49	0.00	1.49
32.75	2.00	0.47	5.00	1.49	0.00	1.49
32.80	2.00	0.47	5.00	1.49	0.00	1.49
32.85	2.00	0.47	5.00	1.49	0.00	1.49
32.90	2.00	0.47	5.00	1.49	0.00	1.49
32.95	2.00	0.47	5.00	1.49	0.00	1.49

33.00	2.00	0.47	5.00	1.49	0.00	1.49
33.05	2.00	0.47	5.00	1.49	0.00	1.49
33.10	2.00	0.47	5.00	1.49	0.00	1.49
33.15	2.00	0.47	5.00	1.49	0.00	1.49
33.20	2.00	0.47	5.00	1.49	0.00	1.49
33.25	2.00	0.47	5.00	1.49	0.00	1.49
33.30	2.00	0.47	5.00	1.49	0.00	1.49
33.35	2.00	0.47	5.00	1.49	0.00	1.49
33.40	2.00	0.47	5.00	1.49	0.00	1.49
33.45	2.00	0.47	5.00	1.49	0.00	1.49
33.50	2.00	0.47	5.00	1.49	0.00	1.49
33.55	2.00	0.47	5.00	1.49	0.00	1.49
33.60	2.00	0.47	5.00	1.49	0.00	1.49
33.65	2.00	0.47	5.00	1.49	0.00	1.49
33.70	2.00	0.47	5.00	1.49	0.00	1.49
33.75	2.00	0.47	5.00	1.49	0.00	1.49
33.80	2.00	0.47	5.00	1.49	0.00	1.49
33.85	2.00	0.47	5.00	1.49	0.00	1.49
33.90	2.00	0.47	5.00	1.49	0.00	1.49
33.95	2.00	0.47	5.00	1.49	0.00	1.49
34.00	2.00	0.47	5.00	1.49	0.00	1.49
34.05	2.00	0.47	5.00	1.49	0.00	1.49
34.10	2.00	0.47	5.00	1.49	0.00	1.49
34.15	2.00	0.47	5.00	1.49	0.00	1.49
34.20	2.00	0.47	5.00	1.49	0.00	1.49
34.25	2.00	0.47	5.00	1.49	0.00	1.49
34.30	2.00	0.47	5.00	1.49	0.00	1.49
34.35	2.00	0.47	5.00	1.49	0.00	1.49
34.40	2.00	0.47	5.00	1.49	0.00	1.49
34.45	2.00	0.47	5.00	1.49	0.00	1.49
34.50	2.00	0.47	5.00	1.49	0.00	1.49

34.55	2.00	0.47	5.00	1.49	0.00	1.49
34.60	2.00	0.47	5.00	1.49	0.00	1.49
34.65	2.00	0.47	5.00	1.49	0.00	1.49
34.70	2.00	0.47	5.00	1.49	0.00	1.49
34.75	2.00	0.47	5.00	1.49	0.00	1.49
34.80	2.00	0.47	5.00	1.49	0.00	1.49
34.85	2.00	0.47	5.00	1.49	0.00	1.49
34.90	2.00	0.47	5.00	1.49	0.00	1.49
34.95	2.00	0.47	5.00	1.49	0.00	1.49
35.00	2.00	0.47	5.00	1.49	0.00	1.49
35.05	2.00	0.47	5.00	1.49	0.00	1.49
35.10	2.00	0.47	5.00	1.49	0.00	1.49
35.15	2.00	0.47	5.00	1.49	0.00	1.49
35.20	2.00	0.47	5.00	1.49	0.00	1.49
35.25	2.00	0.47	5.00	1.49	0.00	1.49
35.30	2.00	0.47	5.00	1.49	0.00	1.49
35.35	2.00	0.47	5.00	1.49	0.00	1.49
35.40	2.00	0.47	5.00	1.49	0.00	1.49
35.45	2.00	0.47	5.00	1.49	0.00	1.49
35.50	2.00	0.47	5.00	1.49	0.00	1.49
35.55	2.00	0.47	5.00	1.49	0.00	1.49
35.60	2.00	0.47	5.00	1.49	0.00	1.49
35.65	2.00	0.47	5.00	1.49	0.00	1.49
35.70	2.00	0.47	5.00	1.49	0.00	1.49
35.75	2.00	0.47	5.00	1.49	0.00	1.49
35.80	2.00	0.47	5.00	1.49	0.00	1.49
35.85	2.00	0.47	5.00	1.49	0.00	1.49
35.90	2.00	0.47	5.00	1.49	0.00	1.49
35.95	2.00	0.47	5.00	1.49	0.00	1.49
36.00	2.00	0.47	5.00	1.49	0.00	1.49
36.05	0.22	0.47	0.46*	1.49	0.00	1.49

36.10	0.22	0.47	0.46*	1.49	0.00	1.49
36.15	0.22	0.47	0.47*	1.48	0.00	1.48
36.20	0.22	0.47	0.47*	1.47	0.00	1.47
36.25	0.22	0.47	0.47*	1.46	0.00	1.46
36.30	0.22	0.47	0.48*	1.45	0.00	1.45
36.35	0.23	0.47	0.48*	1.44	0.00	1.44
36.40	0.23	0.47	0.48*	1.42	0.00	1.42
36.45	0.23	0.47	0.48*	1.41	0.00	1.41
36.50	0.23	0.47	0.48*	1.40	0.00	1.40
36.55	0.23	0.47	0.49*	1.39	0.00	1.39
36.60	0.23	0.47	0.49*	1.38	0.00	1.38
36.65	0.23	0.47	0.49*	1.37	0.00	1.37
36.70	0.23	0.47	0.49*	1.35	0.00	1.35
36.75	0.23	0.47	0.50*	1.34	0.00	1.34
36.80	0.24	0.47	0.50*	1.33	0.00	1.33
36.85	0.24	0.47	0.50*	1.32	0.00	1.32
36.90	0.24	0.47	0.50*	1.31	0.00	1.31
36.95	0.24	0.47	0.51*	1.30	0.00	1.30
37.00	0.24	0.47	0.51*	1.29	0.00	1.29
37.05	0.24	0.47	0.51*	1.27	0.00	1.27
37.10	0.24	0.47	0.51*	1.26	0.00	1.26
37.15	0.24	0.47	0.52*	1.25	0.00	1.25
37.20	0.24	0.47	0.52*	1.24	0.00	1.24
37.25	0.24	0.47	0.52*	1.23	0.00	1.23
37.30	0.25	0.47	0.52*	1.22	0.00	1.22
37.35	0.25	0.47	0.52*	1.21	0.00	1.21
37.40	0.25	0.47	0.53*	1.20	0.00	1.20
37.45	0.25	0.47	0.53*	1.19	0.00	1.19
37.50	0.25	0.47	0.53*	1.18	0.00	1.18
37.55	0.25	0.47	0.53*	1.16	0.00	1.16
37.60	0.25	0.47	0.54*	1.15	0.00	1.15

37.65	0.25	0.47	0.54*	1.14	0.00	1.14
37.70	0.25	0.47	0.54*	1.13	0.00	1.13
37.75	0.26	0.47	0.54*	1.12	0.00	1.12
37.80	0.26	0.47	0.55*	1.11	0.00	1.11
37.85	0.26	0.47	0.55*	1.10	0.00	1.10
37.90	0.26	0.47	0.55*	1.09	0.00	1.09
37.95	0.26	0.47	0.55*	1.08	0.00	1.08
38.00	0.26	0.47	0.55*	1.07	0.00	1.07
38.05	0.26	0.47	0.56*	1.06	0.00	1.06
38.10	0.26	0.47	0.56*	1.05	0.00	1.05
38.15	0.26	0.47	0.56*	1.04	0.00	1.04
38.20	0.27	0.47	0.56*	1.03	0.00	1.03
38.25	0.27	0.47	0.57*	1.02	0.00	1.02
38.30	0.27	0.47	0.57*	1.01	0.00	1.01
38.35	0.27	0.47	0.57*	0.99	0.00	0.99
38.40	0.27	0.47	0.57*	0.98	0.00	0.98
38.45	0.27	0.47	0.57*	0.97	0.00	0.97
38.50	0.27	0.47	0.58*	0.96	0.00	0.96
38.55	0.27	0.47	0.58*	0.95	0.00	0.95
38.60	0.27	0.47	0.58*	0.94	0.00	0.94
38.65	0.27	0.47	0.58*	0.93	0.00	0.93
38.70	0.28	0.47	0.59*	0.92	0.00	0.92
38.75	0.28	0.47	0.59*	0.91	0.00	0.91
38.80	0.28	0.47	0.59*	0.90	0.00	0.90
38.85	0.28	0.47	0.59*	0.89	0.00	0.89
38.90	0.28	0.47	0.60*	0.88	0.00	0.88
38.95	0.28	0.47	0.60*	0.87	0.00	0.87
39.00	0.28	0.47	0.60*	0.86	0.00	0.86
39.05	0.28	0.47	0.60*	0.85	0.00	0.85
39.10	0.28	0.47	0.60*	0.84	0.00	0.84
39.15	0.29	0.47	0.61*	0.83	0.00	0.83

39.20	0.29	0.47	0.61*	0.82	0.00	0.82
39.25	0.29	0.47	0.61*	0.81	0.00	0.81
39.30	0.29	0.47	0.61*	0.80	0.00	0.80
39.35	0.29	0.47	0.62*	0.79	0.00	0.79
39.40	0.29	0.47	0.62*	0.79	0.00	0.79
39.45	0.29	0.47	0.62*	0.78	0.00	0.78
39.50	0.29	0.47	0.62*	0.77	0.00	0.77
39.55	0.29	0.47	0.63*	0.76	0.00	0.76
39.60	0.29	0.47	0.63*	0.75	0.00	0.75
39.65	0.30	0.47	0.63*	0.74	0.00	0.74
39.70	0.30	0.47	0.63*	0.73	0.00	0.73
39.75	0.30	0.47	0.63*	0.72	0.00	0.72
39.80	0.30	0.47	0.64*	0.71	0.00	0.71
39.85	0.30	0.47	0.64*	0.70	0.00	0.70
39.90	0.30	0.47	0.64*	0.69	0.00	0.69
39.95	0.30	0.47	0.64*	0.68	0.00	0.68
40.00	0.30	0.47	0.64*	0.67	0.00	0.67
40.05	0.30	0.47	0.65*	0.66	0.00	0.66
40.10	0.31	0.47	0.65*	0.65	0.00	0.65
40.15	0.31	0.47	0.66*	0.64	0.00	0.64
40.20	0.31	0.47	0.67*	0.64	0.00	0.64
40.25	0.32	0.47	0.68*	0.63	0.00	0.63
40.30	0.32	0.47	0.68*	0.62	0.00	0.62
40.35	0.32	0.47	0.69*	0.61	0.00	0.61
40.40	0.33	0.47	0.70*	0.60	0.00	0.60
40.45	0.33	0.47	0.71*	0.59	0.00	0.59
40.50	0.33	0.47	0.71*	0.58	0.00	0.58
40.55	0.34	0.47	0.72*	0.58	0.00	0.58
40.60	0.34	0.47	0.73*	0.57	0.00	0.57
40.65	0.35	0.47	0.74*	0.56	0.00	0.56
40.70	0.35	0.47	0.75*	0.55	0.00	0.55

40.75	0.35	0.47	0.75*	0.54	0.00	0.54
40.80	0.36	0.47	0.76*	0.53	0.00	0.53
40.85	0.36	0.47	0.77*	0.53	0.00	0.53
40.90	0.37	0.47	0.78*	0.52	0.00	0.52
40.95	0.37	0.47	0.79*	0.51	0.00	0.51
41.00	0.37	0.47	0.80*	0.50	0.00	0.50
41.05	0.38	0.47	0.81*	0.50	0.00	0.50
41.10	0.38	0.47	0.82*	0.49	0.00	0.49
41.15	0.39	0.47	0.83*	0.48	0.00	0.48
41.20	0.39	0.47	0.84*	0.47	0.00	0.47
41.25	0.40	0.47	0.85*	0.47	0.00	0.47
41.30	0.40	0.47	0.86*	0.46	0.00	0.46
41.35	0.41	0.47	0.87*	0.45	0.00	0.45
41.40	0.41	0.47	0.88*	0.44	0.00	0.44
41.45	0.42	0.47	0.89*	0.44	0.00	0.44
41.50	0.42	0.47	0.90*	0.43	0.00	0.43
41.55	0.43	0.47	0.91*	0.42	0.00	0.42
41.60	0.43	0.47	0.92*	0.42	0.00	0.42
41.65	0.44	0.47	0.93*	0.41	0.00	0.41
41.70	0.44	0.47	0.95*	0.40	0.00	0.40
41.75	0.45	0.47	0.96*	0.40	0.00	0.40
41.80	0.46	0.47	0.97*	0.39	0.00	0.39
41.85	0.46	0.47	0.99*	0.38	0.00	0.38
41.90	0.47	0.47	1.00	0.38	0.00	0.38
41.95	0.47	0.47	1.02	0.37	0.00	0.37
42.00	0.48	0.47	1.03	0.37	0.00	0.37
42.05	0.49	0.47	1.05	0.36	0.00	0.36
42.10	0.50	0.47	1.07	0.35	0.00	0.35
42.15	0.51	0.47	1.08	0.35	0.00	0.35
42.20	0.52	0.47	1.10	0.34	0.00	0.34
42.25	0.53	0.47	1.13	0.34	0.00	0.34

42.30	0.54	0.47	1.15	0.33	0.00	0.33
42.35	0.55	0.47	1.18	0.33	0.00	0.33
42.40	0.57	0.47	1.21	0.32	0.00	0.32
42.45	0.59	0.47	1.26	0.32	0.00	0.32
42.50	0.62	0.47	1.33	0.31	0.00	0.31
42.55	0.69	0.47	1.48	0.31	0.00	0.31
42.60	0.71	0.47	1.52	0.30	0.00	0.30
42.65	0.71	0.47	1.52	0.30	0.00	0.30
42.70	0.71	0.47	1.52	0.30	0.00	0.30
42.75	0.71	0.47	1.52	0.29	0.00	0.29
42.80	0.71	0.47	1.52	0.29	0.00	0.29
42.85	0.71	0.47	1.52	0.29	0.00	0.29
42.90	0.71	0.47	1.52	0.28	0.00	0.28
42.95	0.71	0.47	1.52	0.28	0.00	0.28
43.00	0.71	0.47	1.52	0.28	0.00	0.28
43.05	0.71	0.47	1.52	0.27	0.00	0.27
43.10	0.71	0.47	1.52	0.27	0.00	0.27
43.15	0.71	0.47	1.53	0.27	0.00	0.27
43.20	0.71	0.47	1.53	0.27	0.00	0.27
43.25	0.71	0.47	1.53	0.26	0.00	0.26
43.30	0.71	0.47	1.53	0.26	0.00	0.26
43.35	0.71	0.47	1.53	0.26	0.00	0.26
43.40	0.71	0.47	1.53	0.26	0.00	0.26
43.45	0.71	0.47	1.53	0.26	0.00	0.26
43.50	0.71	0.47	1.53	0.26	0.00	0.26
43.55	0.71	0.47	1.53	0.26	0.00	0.26
43.60	0.71	0.47	1.53	0.26	0.00	0.26
43.65	0.71	0.47	1.53	0.26	0.00	0.26
43.70	0.71	0.47	1.53	0.26	0.00	0.26
43.75	0.71	0.46	1.53	0.25	0.00	0.25
43.80	0.71	0.46	1.53	0.25	0.00	0.25

43.85	0.71	0.46	1.53	0.25	0.00	0.25
43.90	0.71	0.46	1.53	0.25	0.00	0.25
43.95	0.71	0.46	1.53	0.25	0.00	0.25
44.00	0.71	0.46	1.53	0.25	0.00	0.25
44.05	0.71	0.46	1.53	0.25	0.00	0.25
44.10	0.71	0.46	1.53	0.25	0.00	0.25
44.15	0.71	0.46	1.53	0.25	0.00	0.25
44.20	0.71	0.46	1.53	0.25	0.00	0.25
44.25	0.71	0.46	1.53	0.25	0.00	0.25
44.30	0.71	0.46	1.53	0.25	0.00	0.25
44.35	0.71	0.46	1.53	0.25	0.00	0.25
44.40	0.71	0.46	1.53	0.25	0.00	0.25
44.45	0.71	0.46	1.53	0.25	0.00	0.25
44.50	0.71	0.46	1.53	0.25	0.00	0.25
44.55	0.71	0.46	1.53	0.25	0.00	0.25
44.60	0.71	0.46	1.53	0.25	0.00	0.25
44.65	0.71	0.46	1.53	0.25	0.00	0.25
44.70	0.71	0.46	1.53	0.25	0.00	0.25
44.75	0.71	0.46	1.53	0.25	0.00	0.25
44.80	0.71	0.46	1.53	0.25	0.00	0.25
44.85	0.71	0.46	1.53	0.25	0.00	0.25
44.90	0.71	0.46	1.53	0.25	0.00	0.25
44.95	0.71	0.46	1.53	0.25	0.00	0.25
45.00	0.71	0.46	1.53	0.25	0.00	0.25
45.05	0.71	0.46	1.53	0.25	0.00	0.25
45.10	0.71	0.46	1.53	0.25	0.00	0.25
45.15	0.71	0.46	1.53	0.25	0.00	0.25
45.20	0.71	0.46	1.53	0.25	0.00	0.25
45.25	0.71	0.46	1.53	0.25	0.00	0.25
45.30	0.71	0.46	1.53	0.25	0.00	0.25
45.35	0.71	0.46	1.53	0.25	0.00	0.25

45.40	0.71	0.46	1.53	0.25	0.00	0.25
45.45	0.71	0.46	1.53	0.25	0.00	0.25
45.50	0.71	0.46	1.53	0.25	0.00	0.25
45.55	0.71	0.46	1.53	0.25	0.00	0.25
45.60	0.71	0.46	1.53	0.25	0.00	0.25
45.65	0.71	0.46	1.53	0.25	0.00	0.25
45.70	0.71	0.46	1.53	0.25	0.00	0.25
45.75	0.70	0.46	1.53	0.25	0.00	0.25
45.80	0.70	0.46	1.53	0.25	0.00	0.25
45.85	0.70	0.46	1.53	0.25	0.00	0.25
45.90	0.70	0.46	1.53	0.25	0.00	0.25
45.95	0.70	0.46	1.53	0.25	0.00	0.25
46.00	0.70	0.46	1.53	0.25	0.00	0.25
46.05	0.70	0.46	1.53	0.25	0.00	0.25
46.10	0.70	0.46	1.53	0.25	0.00	0.25
46.15	0.70	0.46	1.53	0.25	0.00	0.25
46.20	0.70	0.46	1.53	0.25	0.00	0.25
46.25	0.70	0.46	1.53	0.25	0.00	0.25
46.30	0.70	0.46	1.53	0.25	0.00	0.25
46.35	0.70	0.46	1.53	0.25	0.00	0.25
46.40	0.70	0.46	1.53	0.25	0.00	0.25
46.45	0.70	0.46	1.53	0.25	0.00	0.25
46.50	0.70	0.46	1.53	0.25	0.00	0.25
46.55	0.70	0.46	1.53	0.25	0.00	0.25
46.60	0.70	0.46	1.53	0.25	0.00	0.25
46.65	0.70	0.46	1.53	0.25	0.00	0.25
46.70	0.70	0.46	1.53	0.25	0.00	0.25
46.75	0.70	0.46	1.53	0.25	0.00	0.25
46.80	0.70	0.46	1.53	0.25	0.00	0.25
46.85	0.70	0.46	1.53	0.25	0.00	0.25
46.90	0.70	0.46	1.53	0.25	0.00	0.25

46.95	0.70	0.46	1.53	0.25	0.00	0.25
47.00	0.70	0.46	1.53	0.25	0.00	0.25
47.05	0.70	0.46	1.53	0.25	0.00	0.25
47.10	0.70	0.46	1.53	0.25	0.00	0.25
47.15	0.70	0.46	1.53	0.25	0.00	0.25
47.20	0.70	0.46	1.53	0.25	0.00	0.25
47.25	0.70	0.46	1.53	0.25	0.00	0.25
47.30	0.70	0.46	1.53	0.25	0.00	0.25
47.35	0.70	0.46	1.53	0.25	0.00	0.25
47.40	0.70	0.46	1.53	0.25	0.00	0.25
47.45	0.70	0.46	1.53	0.25	0.00	0.25
47.50	0.70	0.46	1.53	0.25	0.00	0.25
47.55	0.70	0.46	1.53	0.25	0.00	0.25
47.60	0.70	0.46	1.53	0.25	0.00	0.25
47.65	0.70	0.46	1.53	0.25	0.00	0.25
47.70	0.70	0.46	1.53	0.25	0.00	0.25
47.75	0.70	0.46	1.53	0.25	0.00	0.25
47.80	0.70	0.46	1.53	0.25	0.00	0.25
47.85	0.70	0.46	1.53	0.25	0.00	0.25
47.90	0.70	0.46	1.53	0.25	0.00	0.25
47.95	0.70	0.46	1.53	0.25	0.00	0.25
48.00	0.70	0.46	1.53	0.25	0.00	0.25
48.05	0.70	0.46	1.53	0.25	0.00	0.25
48.10	0.70	0.46	1.53	0.25	0.00	0.25
48.15	0.70	0.46	1.53	0.25	0.00	0.25
48.20	0.70	0.46	1.53	0.25	0.00	0.25
48.25	0.70	0.46	1.53	0.25	0.00	0.25
48.30	0.70	0.46	1.53	0.25	0.00	0.25
48.35	0.70	0.46	1.53	0.25	0.00	0.25
48.40	0.70	0.46	1.53	0.25	0.00	0.25
48.45	0.70	0.46	1.53	0.25	0.00	0.25

48.50	0.70	0.46	1.53	0.25	0.00	0.25
48.55	0.70	0.46	1.53	0.25	0.00	0.25
48.60	0.70	0.46	1.53	0.25	0.00	0.25
48.65	0.70	0.46	1.53	0.25	0.00	0.25
48.70	0.70	0.46	1.53	0.25	0.00	0.25
48.75	0.70	0.46	1.53	0.25	0.00	0.25
48.80	0.70	0.46	1.53	0.25	0.00	0.25
48.85	0.70	0.46	1.54	0.24	0.00	0.24
48.90	0.70	0.45	1.54	0.24	0.00	0.24
48.95	0.70	0.45	1.54	0.24	0.00	0.24
49.00	0.70	0.45	1.54	0.24	0.00	0.24
49.05	0.70	0.45	1.54	0.24	0.00	0.24
49.10	0.70	0.45	1.54	0.24	0.00	0.24
49.15	0.70	0.45	1.54	0.23	0.00	0.23
49.20	0.70	0.45	1.54	0.23	0.00	0.23
49.25	0.70	0.45	1.54	0.23	0.00	0.23
49.30	0.70	0.45	1.54	0.22	0.00	0.22
49.35	0.70	0.45	1.54	0.22	0.00	0.22
49.40	0.70	0.45	1.54	0.22	0.00	0.22
49.45	0.63	0.45	1.38	0.21	0.00	0.21
49.50	0.58	0.45	1.28	0.21	0.00	0.21
49.55	0.55	0.45	1.21	0.20	0.00	0.20
49.60	0.53	0.45	1.17	0.20	0.00	0.20
49.65	0.52	0.45	1.14	0.19	0.00	0.19
49.70	0.50	0.45	1.11	0.19	0.00	0.19
49.75	0.49	0.45	1.08	0.18	0.00	0.18
49.80	0.48	0.45	1.06	0.18	0.00	0.18
49.85	0.47	0.45	1.04	0.17	0.00	0.17
49.90	0.46	0.45	1.02	0.17	0.00	0.17
49.95	0.45	0.45	1.00	0.16	0.00	0.16
50.00	0.44	0.45	0.98*	0.15	0.00	0.15

50.05	0.44	0.45	0.97*	0.15	0.00	0.15
50.10	0.43	0.45	0.95*	0.14	0.00	0.14
50.15	0.42	0.45	0.93*	0.14	0.00	0.14
50.20	0.42	0.45	0.92*	0.13	0.00	0.13
50.25	0.41	0.45	0.90*	0.12	0.00	0.12
50.30	0.40	0.45	0.89*	0.12	0.00	0.12
50.35	0.40	0.45	0.88*	0.11	0.00	0.11
50.40	0.39	0.45	0.86*	0.10	0.00	0.10
50.45	0.38	0.45	0.85*	0.09	0.00	0.09
50.50	0.38	0.45	0.84*	0.09	0.00	0.09
50.55	0.37	0.45	0.83*	0.08	0.00	0.08
50.60	0.37	0.45	0.81*	0.07	0.00	0.07
50.65	0.36	0.45	0.80*	0.06	0.00	0.06
50.70	0.36	0.45	0.79*	0.06	0.00	0.06
50.75	0.35	0.45	0.78*	0.05	0.00	0.05
50.80	0.35	0.45	0.77*	0.04	0.00	0.04
50.85	0.34	0.45	0.76*	0.03	0.00	0.03
50.90	0.34	0.45	0.75*	0.03	0.00	0.03
50.95	0.33	0.45	0.74*	0.02	0.00	0.02
51.00	0.33	0.45	0.73*	0.02	0.00	0.02
51.05	2.00	0.45	5.00	0.02	0.00	0.02
51.10	2.00	0.45	5.00	0.02	0.00	0.02
51.15	2.00	0.45	5.00	0.02	0.00	0.02
51.20	2.00	0.45	5.00	0.02	0.00	0.02
51.25	2.00	0.45	5.00	0.02	0.00	0.02
51.30	2.00	0.45	5.00	0.02	0.00	0.02
51.35	2.00	0.45	5.00	0.02	0.00	0.02
51.40	2.00	0.45	5.00	0.02	0.00	0.02
51.45	2.00	0.45	5.00	0.02	0.00	0.02
51.50	2.00	0.45	5.00	0.02	0.00	0.02
51.55	2.00	0.45	5.00	0.02	0.00	0.02

51.60	2.00	0.45	5.00	0.02	0.00	0.02
51.65	2.00	0.45	5.00	0.02	0.00	0.02
51.70	2.00	0.45	5.00	0.02	0.00	0.02
51.75	2.00	0.45	5.00	0.02	0.00	0.02
51.80	2.00	0.45	5.00	0.02	0.00	0.02
51.85	2.00	0.45	5.00	0.02	0.00	0.02
51.90	2.00	0.45	5.00	0.02	0.00	0.02
51.95	2.00	0.45	5.00	0.02	0.00	0.02
52.00	2.00	0.45	5.00	0.02	0.00	0.02
52.05	2.00	0.45	5.00	0.02	0.00	0.02
52.10	2.00	0.45	5.00	0.02	0.00	0.02
52.15	2.00	0.45	5.00	0.02	0.00	0.02
52.20	2.00	0.45	5.00	0.02	0.00	0.02
52.25	2.00	0.45	5.00	0.02	0.00	0.02
52.30	2.00	0.45	5.00	0.02	0.00	0.02
52.35	2.00	0.45	5.00	0.02	0.00	0.02
52.40	2.00	0.45	5.00	0.02	0.00	0.02
52.45	2.00	0.45	5.00	0.02	0.00	0.02
52.50	2.00	0.45	5.00	0.02	0.00	0.02
52.55	2.00	0.45	5.00	0.02	0.00	0.02
52.60	2.00	0.45	5.00	0.02	0.00	0.02
52.65	2.00	0.45	5.00	0.02	0.00	0.02
52.70	2.00	0.45	5.00	0.02	0.00	0.02
52.75	2.00	0.45	5.00	0.02	0.00	0.02
52.80	2.00	0.45	5.00	0.02	0.00	0.02
52.85	2.00	0.45	5.00	0.02	0.00	0.02
52.90	2.00	0.45	5.00	0.02	0.00	0.02
52.95	2.00	0.45	5.00	0.02	0.00	0.02
53.00	2.00	0.45	5.00	0.02	0.00	0.02
53.05	2.00	0.44	5.00	0.02	0.00	0.02
53.10	2.00	0.44	5.00	0.02	0.00	0.02

53.15	2.00	0.44	5.00	0.02	0.00	0.02
53.20	2.00	0.44	5.00	0.02	0.00	0.02
53.25	2.00	0.44	5.00	0.02	0.00	0.02
53.30	2.00	0.44	5.00	0.02	0.00	0.02
53.35	2.00	0.44	5.00	0.02	0.00	0.02
53.40	2.00	0.44	5.00	0.02	0.00	0.02
53.45	2.00	0.44	5.00	0.02	0.00	0.02
53.50	2.00	0.44	5.00	0.02	0.00	0.02
53.55	2.00	0.44	5.00	0.02	0.00	0.02
53.60	2.00	0.44	5.00	0.02	0.00	0.02
53.65	2.00	0.44	5.00	0.02	0.00	0.02
53.70	2.00	0.44	5.00	0.02	0.00	0.02
53.75	2.00	0.44	5.00	0.02	0.00	0.02
53.80	2.00	0.44	5.00	0.02	0.00	0.02
53.85	2.00	0.44	5.00	0.02	0.00	0.02
53.90	2.00	0.44	5.00	0.02	0.00	0.02
53.95	2.00	0.44	5.00	0.02	0.00	0.02
54.00	2.00	0.44	5.00	0.02	0.00	0.02
54.05	2.00	0.44	5.00	0.02	0.00	0.02
54.10	2.00	0.44	5.00	0.02	0.00	0.02
54.15	2.00	0.44	5.00	0.02	0.00	0.02
54.20	2.00	0.44	5.00	0.02	0.00	0.02
54.25	2.00	0.44	5.00	0.02	0.00	0.02
54.30	2.00	0.44	5.00	0.02	0.00	0.02
54.35	2.00	0.44	5.00	0.02	0.00	0.02
54.40	2.00	0.44	5.00	0.02	0.00	0.02
54.45	2.00	0.44	5.00	0.02	0.00	0.02
54.50	2.00	0.44	5.00	0.02	0.00	0.02
54.55	2.00	0.44	5.00	0.02	0.00	0.02
54.60	2.00	0.44	5.00	0.02	0.00	0.02
54.65	2.00	0.44	5.00	0.02	0.00	0.02

54.70	2.00	0.44	5.00	0.02	0.00	0.02
54.75	2.00	0.44	5.00	0.02	0.00	0.02
54.80	2.00	0.44	5.00	0.02	0.00	0.02
54.85	2.00	0.44	5.00	0.02	0.00	0.02
54.90	2.00	0.44	5.00	0.02	0.00	0.02
54.95	2.00	0.44	5.00	0.02	0.00	0.02
55.00	2.00	0.44	5.00	0.02	0.00	0.02
55.05	2.00	0.44	5.00	0.02	0.00	0.02
55.10	2.00	0.44	5.00	0.02	0.00	0.02
55.15	2.00	0.44	5.00	0.02	0.00	0.02
55.20	2.00	0.44	5.00	0.02	0.00	0.02
55.25	2.00	0.44	5.00	0.02	0.00	0.02
55.30	2.00	0.44	5.00	0.02	0.00	0.02
55.35	2.00	0.44	5.00	0.02	0.00	0.02
55.40	2.00	0.44	5.00	0.02	0.00	0.02
55.45	2.00	0.44	5.00	0.02	0.00	0.02
55.50	2.00	0.44	5.00	0.02	0.00	0.02
55.55	2.00	0.44	5.00	0.02	0.00	0.02
55.60	2.00	0.44	5.00	0.02	0.00	0.02
55.65	2.00	0.44	5.00	0.02	0.00	0.02
55.70	2.00	0.44	5.00	0.02	0.00	0.02
55.75	2.00	0.44	5.00	0.02	0.00	0.02
55.80	2.00	0.44	5.00	0.02	0.00	0.02
55.85	2.00	0.44	5.00	0.02	0.00	0.02
55.90	2.00	0.44	5.00	0.02	0.00	0.02
55.95	2.00	0.44	5.00	0.02	0.00	0.02
56.00	2.00	0.44	5.00	0.02	0.00	0.02
56.05	2.00	0.44	5.00	0.02	0.00	0.02
56.10	2.00	0.44	5.00	0.02	0.00	0.02
56.15	2.00	0.44	5.00	0.02	0.00	0.02
56.20	2.00	0.44	5.00	0.02	0.00	0.02

56.25	2.00	0.44	5.00	0.02	0.00	0.02
56.30	2.00	0.44	5.00	0.02	0.00	0.02
56.35	2.00	0.44	5.00	0.02	0.00	0.02
56.40	2.00	0.44	5.00	0.02	0.00	0.02
56.45	2.00	0.44	5.00	0.02	0.00	0.02
56.50	2.00	0.44	5.00	0.02	0.00	0.02
56.55	2.00	0.44	5.00	0.02	0.00	0.02
56.60	2.00	0.44	5.00	0.02	0.00	0.02
56.65	2.00	0.44	5.00	0.02	0.00	0.02
56.70	2.00	0.43	5.00	0.02	0.00	0.02
56.75	2.00	0.43	5.00	0.02	0.00	0.02
56.80	2.00	0.43	5.00	0.02	0.00	0.02
56.85	2.00	0.43	5.00	0.02	0.00	0.02
56.90	2.00	0.43	5.00	0.02	0.00	0.02
56.95	2.00	0.43	5.00	0.02	0.00	0.02
57.00	2.00	0.43	5.00	0.02	0.00	0.02
57.05	2.00	0.43	5.00	0.02	0.00	0.02
57.10	2.00	0.43	5.00	0.02	0.00	0.02
57.15	2.00	0.43	5.00	0.02	0.00	0.02
57.20	2.00	0.43	5.00	0.02	0.00	0.02
57.25	2.00	0.43	5.00	0.02	0.00	0.02
57.30	2.00	0.43	5.00	0.02	0.00	0.02
57.35	2.00	0.43	5.00	0.02	0.00	0.02
57.40	2.00	0.43	5.00	0.02	0.00	0.02
57.45	2.00	0.43	5.00	0.02	0.00	0.02
57.50	2.00	0.43	5.00	0.02	0.00	0.02
57.55	2.00	0.43	5.00	0.02	0.00	0.02
57.60	2.00	0.43	5.00	0.02	0.00	0.02
57.65	2.00	0.43	5.00	0.02	0.00	0.02
57.70	2.00	0.43	5.00	0.02	0.00	0.02
57.75	2.00	0.43	5.00	0.02	0.00	0.02

57.80	2.00	0.43	5.00	0.02	0.00	0.02
57.85	2.00	0.43	5.00	0.02	0.00	0.02
57.90	2.00	0.43	5.00	0.02	0.00	0.02
57.95	2.00	0.43	5.00	0.02	0.00	0.02
58.00	2.00	0.43	5.00	0.02	0.00	0.02
58.05	2.00	0.43	5.00	0.02	0.00	0.02
58.10	2.00	0.43	5.00	0.02	0.00	0.02
58.15	2.00	0.43	5.00	0.02	0.00	0.02
58.20	2.00	0.43	5.00	0.02	0.00	0.02
58.25	2.00	0.43	5.00	0.02	0.00	0.02
58.30	2.00	0.43	5.00	0.02	0.00	0.02
58.35	2.00	0.43	5.00	0.02	0.00	0.02
58.40	2.00	0.43	5.00	0.02	0.00	0.02
58.45	2.00	0.43	5.00	0.02	0.00	0.02
58.50	2.00	0.43	5.00	0.02	0.00	0.02
58.55	2.00	0.43	5.00	0.02	0.00	0.02
58.60	2.00	0.43	5.00	0.02	0.00	0.02
58.65	2.00	0.43	5.00	0.02	0.00	0.02
58.70	2.00	0.43	5.00	0.02	0.00	0.02
58.75	2.00	0.43	5.00	0.02	0.00	0.02
58.80	2.00	0.43	5.00	0.02	0.00	0.02
58.85	2.00	0.43	5.00	0.02	0.00	0.02
58.90	2.00	0.43	5.00	0.02	0.00	0.02
58.95	2.00	0.43	5.00	0.02	0.00	0.02
59.00	2.00	0.43	5.00	0.02	0.00	0.02
59.05	2.00	0.43	5.00	0.02	0.00	0.02
59.10	2.00	0.43	5.00	0.02	0.00	0.02
59.15	2.00	0.43	5.00	0.02	0.00	0.02
59.20	2.00	0.43	5.00	0.02	0.00	0.02
59.25	2.00	0.43	5.00	0.02	0.00	0.02
59.30	2.00	0.43	5.00	0.02	0.00	0.02

59.35	2.00	0.43	5.00	0.02	0.00	0.02
59.40	2.00	0.43	5.00	0.02	0.00	0.02
59.45	2.00	0.43	5.00	0.02	0.00	0.02
59.50	2.00	0.43	5.00	0.02	0.00	0.02
59.55	2.00	0.43	5.00	0.02	0.00	0.02
59.60	2.00	0.43	5.00	0.02	0.00	0.02
59.65	2.00	0.43	5.00	0.02	0.00	0.02
59.70	2.00	0.43	5.00	0.02	0.00	0.02
59.75	2.00	0.43	5.00	0.02	0.00	0.02
59.80	2.00	0.43	5.00	0.02	0.00	0.02
59.85	2.00	0.43	5.00	0.02	0.00	0.02
59.90	2.00	0.43	5.00	0.02	0.00	0.02
59.95	2.00	0.42	5.00	0.02	0.00	0.02
60.00	2.00	0.42	5.00	0.02	0.00	0.02
60.05	2.00	0.42	5.00	0.02	0.00	0.02
60.10	2.00	0.42	5.00	0.02	0.00	0.02
60.15	2.00	0.42	5.00	0.02	0.00	0.02
60.20	2.00	0.42	5.00	0.02	0.00	0.02
60.25	2.00	0.42	5.00	0.02	0.00	0.02
60.30	2.00	0.42	5.00	0.02	0.00	0.02
60.35	2.00	0.42	5.00	0.02	0.00	0.02
60.40	2.00	0.42	5.00	0.02	0.00	0.02
60.45	2.00	0.42	5.00	0.02	0.00	0.02
60.50	2.00	0.42	5.00	0.02	0.00	0.02
60.55	2.00	0.42	5.00	0.02	0.00	0.02
60.60	2.00	0.42	5.00	0.02	0.00	0.02
60.65	2.00	0.42	5.00	0.02	0.00	0.02
60.70	2.00	0.42	5.00	0.02	0.00	0.02
60.75	2.00	0.42	5.00	0.02	0.00	0.02
60.80	2.00	0.42	5.00	0.02	0.00	0.02
60.85	2.00	0.42	5.00	0.02	0.00	0.02

60.90	2.00	0.42	5.00	0.02	0.00	0.02
60.95	2.00	0.42	5.00	0.02	0.00	0.02
61.00	2.00	0.42	5.00	0.02	0.00	0.02
61.05	2.00	0.42	5.00	0.02	0.00	0.02
61.10	2.00	0.42	5.00	0.02	0.00	0.02
61.15	2.00	0.42	5.00	0.02	0.00	0.02
61.20	2.00	0.42	5.00	0.02	0.00	0.02
61.25	2.00	0.42	5.00	0.02	0.00	0.02
61.30	2.00	0.42	5.00	0.02	0.00	0.02
61.35	2.00	0.42	5.00	0.02	0.00	0.02
61.40	2.00	0.42	5.00	0.02	0.00	0.02
61.45	2.00	0.42	5.00	0.02	0.00	0.02
61.50	2.00	0.42	5.00	0.02	0.00	0.02
61.55	2.00	0.42	5.00	0.02	0.00	0.02
61.60	2.00	0.42	5.00	0.02	0.00	0.02
61.65	2.00	0.42	5.00	0.02	0.00	0.02
61.70	2.00	0.42	5.00	0.02	0.00	0.02
61.75	2.00	0.42	5.00	0.02	0.00	0.02
61.80	2.00	0.42	5.00	0.02	0.00	0.02
61.85	2.00	0.42	5.00	0.02	0.00	0.02
61.90	2.00	0.42	5.00	0.02	0.00	0.02
61.95	2.00	0.42	5.00	0.02	0.00	0.02
62.00	2.00	0.42	5.00	0.02	0.00	0.02
62.05	2.00	0.42	5.00	0.02	0.00	0.02
62.10	2.00	0.42	5.00	0.02	0.00	0.02
62.15	2.00	0.42	5.00	0.02	0.00	0.02
62.20	2.00	0.42	5.00	0.02	0.00	0.02
62.25	2.00	0.42	5.00	0.02	0.00	0.02
62.30	2.00	0.42	5.00	0.02	0.00	0.02
62.35	2.00	0.42	5.00	0.02	0.00	0.02
62.40	2.00	0.42	5.00	0.02	0.00	0.02

62.45	2.00	0.42	5.00	0.02	0.00	0.02
62.50	2.00	0.42	5.00	0.02	0.00	0.02
62.55	2.00	0.42	5.00	0.02	0.00	0.02
62.60	2.00	0.42	5.00	0.02	0.00	0.02
62.65	2.00	0.42	5.00	0.02	0.00	0.02
62.70	2.00	0.42	5.00	0.02	0.00	0.02
62.75	2.00	0.42	5.00	0.02	0.00	0.02
62.80	2.00	0.42	5.00	0.02	0.00	0.02
62.85	2.00	0.42	5.00	0.02	0.00	0.02
62.90	2.00	0.41	5.00	0.02	0.00	0.02
62.95	2.00	0.41	5.00	0.02	0.00	0.02
63.00	2.00	0.41	5.00	0.02	0.00	0.02
63.05	2.00	0.41	5.00	0.02	0.00	0.02
63.10	2.00	0.41	5.00	0.02	0.00	0.02
63.15	2.00	0.41	5.00	0.02	0.00	0.02
63.20	2.00	0.41	5.00	0.02	0.00	0.02
63.25	2.00	0.41	5.00	0.02	0.00	0.02
63.30	2.00	0.41	5.00	0.02	0.00	0.02
63.35	2.00	0.41	5.00	0.02	0.00	0.02
63.40	2.00	0.41	5.00	0.02	0.00	0.02
63.45	2.00	0.41	5.00	0.02	0.00	0.02
63.50	2.00	0.41	5.00	0.02	0.00	0.02
63.55	2.00	0.41	5.00	0.02	0.00	0.02
63.60	2.00	0.41	5.00	0.02	0.00	0.02
63.65	2.00	0.41	5.00	0.02	0.00	0.02
63.70	2.00	0.41	5.00	0.02	0.00	0.02
63.75	2.00	0.41	5.00	0.02	0.00	0.02
63.80	2.00	0.41	5.00	0.02	0.00	0.02
63.85	2.00	0.41	5.00	0.02	0.00	0.02
63.90	2.00	0.41	5.00	0.02	0.00	0.02
63.95	2.00	0.41	5.00	0.02	0.00	0.02

64.00	2.00	0.41	5.00	0.02	0.00	0.02
64.05	2.00	0.41	5.00	0.02	0.00	0.02
64.10	2.00	0.41	5.00	0.02	0.00	0.02
64.15	2.00	0.41	5.00	0.02	0.00	0.02
64.20	2.00	0.41	5.00	0.02	0.00	0.02
64.25	2.00	0.41	5.00	0.02	0.00	0.02
64.30	2.00	0.41	5.00	0.02	0.00	0.02
64.35	2.00	0.41	5.00	0.02	0.00	0.02
64.40	2.00	0.41	5.00	0.02	0.00	0.02
64.45	2.00	0.41	5.00	0.02	0.00	0.02
64.50	2.00	0.41	5.00	0.02	0.00	0.02
64.55	2.00	0.41	5.00	0.02	0.00	0.02
64.60	2.00	0.41	5.00	0.02	0.00	0.02
64.65	2.00	0.41	5.00	0.02	0.00	0.02
64.70	2.00	0.41	5.00	0.02	0.00	0.02
64.75	2.00	0.41	5.00	0.02	0.00	0.02
64.80	2.00	0.41	5.00	0.02	0.00	0.02
64.85	2.00	0.41	5.00	0.02	0.00	0.02
64.90	2.00	0.41	5.00	0.02	0.00	0.02
64.95	2.00	0.41	5.00	0.02	0.00	0.02
65.00	2.00	0.41	5.00	0.02	0.00	0.02
65.05	2.00	0.41	5.00	0.02	0.00	0.02
65.10	2.00	0.41	5.00	0.02	0.00	0.02
65.15	2.00	0.41	5.00	0.02	0.00	0.02
65.20	2.00	0.41	5.00	0.02	0.00	0.02
65.25	2.00	0.41	5.00	0.02	0.00	0.02
65.30	2.00	0.41	5.00	0.02	0.00	0.02
65.35	2.00	0.41	5.00	0.02	0.00	0.02
65.40	2.00	0.41	5.00	0.02	0.00	0.02
65.45	2.00	0.41	5.00	0.02	0.00	0.02
65.50	2.00	0.41	5.00	0.02	0.00	0.02

65.55	2.00	0.41	5.00	0.02	0.00	0.02
65.60	2.00	0.41	5.00	0.02	0.00	0.02
65.65	2.00	0.41	5.00	0.02	0.00	0.02
65.70	2.00	0.40	5.00	0.02	0.00	0.02
65.75	2.00	0.40	5.00	0.02	0.00	0.02
65.80	2.00	0.40	5.00	0.02	0.00	0.02
65.85	2.00	0.40	5.00	0.02	0.00	0.02
65.90	2.00	0.40	5.00	0.02	0.00	0.02
65.95	2.00	0.40	5.00	0.02	0.00	0.02
66.00	2.00	0.40	5.00	0.02	0.00	0.02
66.05	0.42	0.40	1.04	0.02	0.00	0.02
66.10	0.47	0.40	1.16	0.01	0.00	0.01
66.15	0.56	0.40	1.40	0.01	0.00	0.01
66.20	0.67	0.40	1.66	0.00	0.00	0.00
66.25	0.67	0.40	1.66	0.00	0.00	0.00
66.30	0.67	0.40	1.66	0.00	0.00	0.00
66.35	0.67	0.40	1.66	0.00	0.00	0.00
66.40	0.67	0.40	1.66	0.00	0.00	0.00
66.45	0.67	0.40	1.66	0.00	0.00	0.00
66.50	0.67	0.40	1.66	0.00	0.00	0.00
66.55	0.67	0.40	1.66	0.00	0.00	0.00
66.60	0.67	0.40	1.66	0.00	0.00	0.00
66.65	0.67	0.40	1.66	0.00	0.00	0.00
66.70	0.67	0.40	1.66	0.00	0.00	0.00
66.75	0.67	0.40	1.66	0.00	0.00	0.00
66.80	0.67	0.40	1.66	0.00	0.00	0.00
66.85	0.67	0.40	1.67	0.00	0.00	0.00
66.90	0.67	0.40	1.67	0.00	0.00	0.00
66.95	0.67	0.40	1.67	0.00	0.00	0.00
67.00	0.67	0.40	1.67	0.00	0.00	0.00
67.05	0.67	0.40	1.67	0.00	0.00	0.00

67.10	0.67	0.40	1.67	0.00	0.00	0.00
67.15	0.67	0.40	1.67	0.00	0.00	0.00
67.20	0.67	0.40	1.67	0.00	0.00	0.00
67.25	0.67	0.40	1.67	0.00	0.00	0.00
67.30	0.67	0.40	1.67	0.00	0.00	0.00
67.35	0.67	0.40	1.67	0.00	0.00	0.00
67.40	0.67	0.40	1.67	0.00	0.00	0.00
67.45	0.67	0.40	1.67	0.00	0.00	0.00
67.50	0.67	0.40	1.67	0.00	0.00	0.00
67.55	0.67	0.40	1.67	0.00	0.00	0.00
67.60	0.67	0.40	1.67	0.00	0.00	0.00
67.65	0.67	0.40	1.67	0.00	0.00	0.00
67.70	0.67	0.40	1.68	0.00	0.00	0.00
67.75	0.67	0.40	1.68	0.00	0.00	0.00
67.80	0.67	0.40	1.68	0.00	0.00	0.00
67.85	0.67	0.40	1.68	0.00	0.00	0.00
67.90	0.66	0.40	1.68	0.00	0.00	0.00
67.95	0.66	0.40	1.68	0.00	0.00	0.00
68.00	0.66	0.40	1.68	0.00	0.00	0.00
68.05	0.66	0.40	1.68	0.00	0.00	0.00
68.10	0.66	0.40	1.68	0.00	0.00	0.00
68.15	0.66	0.40	1.68	0.00	0.00	0.00
68.20	0.66	0.40	1.68	0.00	0.00	0.00
68.25	0.66	0.39	1.68	0.00	0.00	0.00
68.30	0.66	0.39	1.68	0.00	0.00	0.00
68.35	0.66	0.39	1.68	0.00	0.00	0.00
68.40	0.66	0.39	1.68	0.00	0.00	0.00
68.45	0.66	0.39	1.69	0.00	0.00	0.00
68.50	0.66	0.39	1.69	0.00	0.00	0.00
68.55	0.66	0.39	1.69	0.00	0.00	0.00
68.60	0.66	0.39	1.69	0.00	0.00	0.00

68.65	0.66	0.39	1.69	0.00	0.00	0.00
68.70	0.66	0.39	1.69	0.00	0.00	0.00
68.75	0.66	0.39	1.69	0.00	0.00	0.00
68.80	0.66	0.39	1.69	0.00	0.00	0.00
68.85	0.66	0.39	1.69	0.00	0.00	0.00
68.90	0.66	0.39	1.69	0.00	0.00	0.00
68.95	0.66	0.39	1.69	0.00	0.00	0.00
69.00	0.66	0.39	1.69	0.00	0.00	0.00
69.05	0.66	0.39	1.69	0.00	0.00	0.00
69.10	0.66	0.39	1.69	0.00	0.00	0.00
69.15	0.66	0.39	1.69	0.00	0.00	0.00
69.20	0.66	0.39	1.69	0.00	0.00	0.00
69.25	0.66	0.39	1.70	0.00	0.00	0.00
69.30	0.66	0.39	1.70	0.00	0.00	0.00
69.35	0.66	0.39	1.70	0.00	0.00	0.00
69.40	0.66	0.39	1.70	0.00	0.00	0.00
69.45	0.66	0.39	1.70	0.00	0.00	0.00
69.50	0.66	0.39	1.70	0.00	0.00	0.00
69.55	0.66	0.39	1.70	0.00	0.00	0.00
69.60	0.66	0.39	1.70	0.00	0.00	0.00
69.65	0.66	0.39	1.70	0.00	0.00	0.00
69.70	0.66	0.39	1.70	0.00	0.00	0.00
69.75	0.66	0.39	1.70	0.00	0.00	0.00
69.80	0.66	0.39	1.70	0.00	0.00	0.00
69.85	0.66	0.39	1.70	0.00	0.00	0.00
69.90	0.66	0.39	1.70	0.00	0.00	0.00
69.95	0.66	0.39	1.71	0.00	0.00	0.00
70.00	0.66	0.39	1.71	0.00	0.00	0.00
70.05	0.66	0.39	1.71	0.00	0.00	0.00
70.10	0.66	0.39	1.71	0.00	0.00	0.00
70.15	0.66	0.39	1.71	0.00	0.00	0.00

70.20	0.66	0.39	1.71	0.00	0.00	0.00
70.25	0.66	0.39	1.71	0.00	0.00	0.00
70.30	0.66	0.39	1.71	0.00	0.00	0.00
70.35	0.66	0.39	1.71	0.00	0.00	0.00
70.40	0.66	0.39	1.71	0.00	0.00	0.00
70.45	0.66	0.39	1.71	0.00	0.00	0.00
70.50	0.66	0.39	1.71	0.00	0.00	0.00
70.55	0.66	0.39	1.71	0.00	0.00	0.00
70.60	0.66	0.38	1.71	0.00	0.00	0.00
70.65	0.66	0.38	1.71	0.00	0.00	0.00
70.70	0.66	0.38	1.72	0.00	0.00	0.00
70.75	0.66	0.38	1.72	0.00	0.00	0.00
70.80	0.66	0.38	1.72	0.00	0.00	0.00
70.85	0.66	0.38	1.72	0.00	0.00	0.00
70.90	0.66	0.38	1.72	0.00	0.00	0.00
70.95	0.66	0.38	1.72	0.00	0.00	0.00
71.00	0.66	0.38	1.72	0.00	0.00	0.00
71.05	0.66	0.38	1.72	0.00	0.00	0.00
71.10	0.66	0.38	1.72	0.00	0.00	0.00
71.15	0.66	0.38	1.72	0.00	0.00	0.00
71.20	0.66	0.38	1.72	0.00	0.00	0.00
71.25	0.66	0.38	1.72	0.00	0.00	0.00
71.30	0.66	0.38	1.72	0.00	0.00	0.00
71.35	0.66	0.38	1.72	0.00	0.00	0.00
71.40	0.66	0.38	1.73	0.00	0.00	0.00
71.45	0.66	0.38	1.73	0.00	0.00	0.00
71.50	0.66	0.38	1.73	0.00	0.00	0.00
71.55	0.66	0.38	1.73	0.00	0.00	0.00
71.60	0.66	0.38	1.73	0.00	0.00	0.00
71.65	0.66	0.38	1.73	0.00	0.00	0.00
71.70	0.66	0.38	1.73	0.00	0.00	0.00

71.75	0.66	0.38	1.73	0.00	0.00	0.00
71.80	0.66	0.38	1.73	0.00	0.00	0.00
71.85	0.66	0.38	1.73	0.00	0.00	0.00
71.90	0.66	0.38	1.73	0.00	0.00	0.00
71.95	0.66	0.38	1.73	0.00	0.00	0.00
72.00	0.66	0.38	1.73	0.00	0.00	0.00
72.05	0.66	0.38	1.74	0.00	0.00	0.00
72.10	0.66	0.38	1.74	0.00	0.00	0.00
72.15	0.66	0.38	1.74	0.00	0.00	0.00
72.20	0.66	0.38	1.74	0.00	0.00	0.00
72.25	0.66	0.38	1.74	0.00	0.00	0.00
72.30	0.66	0.38	1.74	0.00	0.00	0.00
72.35	0.66	0.38	1.74	0.00	0.00	0.00
72.40	0.66	0.38	1.74	0.00	0.00	0.00
72.45	0.66	0.38	1.74	0.00	0.00	0.00
72.50	0.66	0.38	1.74	0.00	0.00	0.00
72.55	0.66	0.38	1.74	0.00	0.00	0.00
72.60	0.66	0.38	1.74	0.00	0.00	0.00
72.65	0.66	0.38	1.74	0.00	0.00	0.00
72.70	0.66	0.38	1.75	0.00	0.00	0.00
72.75	0.66	0.38	1.75	0.00	0.00	0.00
72.80	0.66	0.38	1.75	0.00	0.00	0.00
72.85	0.66	0.38	1.75	0.00	0.00	0.00
72.90	0.66	0.38	1.75	0.00	0.00	0.00
72.95	0.66	0.37	1.75	0.00	0.00	0.00
73.00	0.66	0.37	1.75	0.00	0.00	0.00
73.05	0.66	0.37	1.75	0.00	0.00	0.00
73.10	0.66	0.37	1.75	0.00	0.00	0.00
73.15	0.66	0.37	1.75	0.00	0.00	0.00
73.20	0.66	0.37	1.75	0.00	0.00	0.00
73.25	0.66	0.37	1.75	0.00	0.00	0.00

73.30	0.65	0.37	1.75	0.00	0.00	0.00
73.35	0.65	0.37	1.76	0.00	0.00	0.00
73.40	0.65	0.37	1.76	0.00	0.00	0.00
73.45	0.65	0.37	1.76	0.00	0.00	0.00
73.50	0.65	0.37	1.76	0.00	0.00	0.00
73.55	0.65	0.37	1.76	0.00	0.00	0.00
73.60	0.65	0.37	1.76	0.00	0.00	0.00
73.65	0.65	0.37	1.76	0.00	0.00	0.00
73.70	0.65	0.37	1.76	0.00	0.00	0.00
73.75	0.65	0.37	1.76	0.00	0.00	0.00
73.80	0.65	0.37	1.76	0.00	0.00	0.00
73.85	0.65	0.37	1.76	0.00	0.00	0.00
73.90	0.65	0.37	1.76	0.00	0.00	0.00
73.95	0.65	0.37	1.76	0.00	0.00	0.00
74.00	0.65	0.37	1.77	0.00	0.00	0.00
74.05	0.65	0.37	1.77	0.00	0.00	0.00
74.10	0.65	0.37	1.77	0.00	0.00	0.00
74.15	0.65	0.37	1.77	0.00	0.00	0.00
74.20	0.65	0.37	1.77	0.00	0.00	0.00
74.25	0.65	0.37	1.77	0.00	0.00	0.00
74.30	0.65	0.37	1.77	0.00	0.00	0.00
74.35	0.65	0.37	1.77	0.00	0.00	0.00
74.40	0.65	0.37	1.77	0.00	0.00	0.00
74.45	0.65	0.37	1.77	0.00	0.00	0.00
74.50	0.65	0.37	1.77	0.00	0.00	0.00
74.55	0.65	0.37	1.77	0.00	0.00	0.00
74.60	0.65	0.37	1.78	0.00	0.00	0.00
74.65	0.65	0.37	1.78	0.00	0.00	0.00
74.70	0.65	0.37	1.78	0.00	0.00	0.00
74.75	0.65	0.37	1.78	0.00	0.00	0.00
74.80	0.65	0.37	1.78	0.00	0.00	0.00

74.85	0.65	0.37	1.78	0.00	0.00	0.00
74.90	0.65	0.37	1.78	0.00	0.00	0.00
74.95	0.65	0.37	1.78	0.00	0.00	0.00
75.00	0.65	0.37	1.78	0.00	0.00	0.00
75.05	0.65	0.37	1.78	0.00	0.00	0.00
75.10	0.65	0.37	1.78	0.00	0.00	0.00
75.15	0.65	0.37	1.78	0.00	0.00	0.00
75.20	0.65	0.36	1.79	0.00	0.00	0.00
75.25	0.65	0.36	1.79	0.00	0.00	0.00
75.30	0.65	0.36	1.79	0.00	0.00	0.00
75.35	0.65	0.36	1.79	0.00	0.00	0.00
75.40	0.65	0.36	1.79	0.00	0.00	0.00
75.45	0.65	0.36	1.79	0.00	0.00	0.00
75.50	0.65	0.36	1.79	0.00	0.00	0.00
75.55	0.65	0.36	1.79	0.00	0.00	0.00
75.60	0.65	0.36	1.79	0.00	0.00	0.00
75.65	0.65	0.36	1.79	0.00	0.00	0.00
75.70	0.65	0.36	1.79	0.00	0.00	0.00
75.75	0.65	0.36	1.79	0.00	0.00	0.00
75.80	0.65	0.36	1.79	0.00	0.00	0.00
75.85	0.65	0.36	1.79	0.00	0.00	0.00
75.90	0.65	0.36	1.79	0.00	0.00	0.00
75.95	0.65	0.36	1.79	0.00	0.00	0.00
76.00	0.65	0.36	1.79	0.00	0.00	0.00
76.05	0.65	0.36	1.79	0.00	0.00	0.00
76.10	0.65	0.36	1.79	0.00	0.00	0.00
76.15	0.65	0.36	1.79	0.00	0.00	0.00
76.20	0.65	0.36	1.79	0.00	0.00	0.00
76.25	0.65	0.36	1.79	0.00	0.00	0.00
76.30	0.65	0.36	1.79	0.00	0.00	0.00
76.35	0.65	0.36	1.79	0.00	0.00	0.00

76.40	0.65	0.36	1.79	0.00	0.00	0.00
76.45	0.65	0.36	1.79	0.00	0.00	0.00
76.50	0.65	0.36	1.79	0.00	0.00	0.00
76.55	0.65	0.36	1.79	0.00	0.00	0.00
76.60	0.65	0.36	1.79	0.00	0.00	0.00
76.65	0.65	0.36	1.79	0.00	0.00	0.00
76.70	0.65	0.36	1.79	0.00	0.00	0.00
76.75	0.65	0.36	1.79	0.00	0.00	0.00
76.80	0.65	0.36	1.79	0.00	0.00	0.00
76.85	0.65	0.36	1.79	0.00	0.00	0.00
76.90	0.65	0.36	1.79	0.00	0.00	0.00
76.95	0.65	0.36	1.79	0.00	0.00	0.00
77.00	0.65	0.36	1.79	0.00	0.00	0.00
77.05	0.65	0.36	1.79	0.00	0.00	0.00
77.10	0.65	0.36	1.79	0.00	0.00	0.00
77.15	0.65	0.36	1.79	0.00	0.00	0.00
77.20	0.65	0.36	1.79	0.00	0.00	0.00
77.25	0.65	0.36	1.79	0.00	0.00	0.00
77.30	0.65	0.36	1.79	0.00	0.00	0.00
77.35	0.65	0.36	1.79	0.00	0.00	0.00
77.40	0.65	0.36	1.79	0.00	0.00	0.00
77.45	0.65	0.36	1.79	0.00	0.00	0.00
77.50	0.65	0.36	1.79	0.00	0.00	0.00
77.55	0.65	0.36	1.79	0.00	0.00	0.00
77.60	0.65	0.36	1.79	0.00	0.00	0.00
77.65	0.65	0.36	1.79	0.00	0.00	0.00
77.70	0.65	0.36	1.79	0.00	0.00	0.00
77.75	0.65	0.36	1.79	0.00	0.00	0.00
77.80	0.65	0.36	1.79	0.00	0.00	0.00
77.85	0.65	0.36	1.79	0.00	0.00	0.00
77.90	0.65	0.36	1.79	0.00	0.00	0.00

77.95	0.65	0.36	1.79	0.00	0.00	0.00
78.00	0.65	0.36	1.79	0.00	0.00	0.00
78.05	0.65	0.36	1.79	0.00	0.00	0.00
78.10	0.65	0.36	1.79	0.00	0.00	0.00
78.15	0.65	0.36	1.79	0.00	0.00	0.00
78.20	0.65	0.36	1.79	0.00	0.00	0.00
78.25	0.65	0.36	1.79	0.00	0.00	0.00
78.30	0.65	0.36	1.79	0.00	0.00	0.00
78.35	0.65	0.36	1.79	0.00	0.00	0.00
78.40	0.65	0.36	1.79	0.00	0.00	0.00
78.45	0.65	0.36	1.79	0.00	0.00	0.00
78.50	0.65	0.36	1.79	0.00	0.00	0.00
78.55	0.65	0.36	1.79	0.00	0.00	0.00
78.60	0.65	0.36	1.79	0.00	0.00	0.00
78.65	0.65	0.36	1.79	0.00	0.00	0.00
78.70	0.65	0.36	1.79	0.00	0.00	0.00
78.75	0.65	0.36	1.79	0.00	0.00	0.00
78.80	0.65	0.36	1.79	0.00	0.00	0.00
78.85	0.65	0.36	1.79	0.00	0.00	0.00
78.90	0.65	0.36	1.79	0.00	0.00	0.00
78.95	0.64	0.36	1.79	0.00	0.00	0.00
79.00	0.64	0.36	1.79	0.00	0.00	0.00
79.05	0.64	0.36	1.79	0.00	0.00	0.00
79.10	0.64	0.36	1.79	0.00	0.00	0.00
79.15	0.64	0.36	1.79	0.00	0.00	0.00
79.20	0.64	0.36	1.79	0.00	0.00	0.00
79.25	0.64	0.36	1.79	0.00	0.00	0.00
79.30	0.64	0.36	1.79	0.00	0.00	0.00
79.35	0.64	0.36	1.79	0.00	0.00	0.00
79.40	0.64	0.36	1.79	0.00	0.00	0.00
79.45	0.64	0.36	1.79	0.00	0.00	0.00

79.50	0.64	0.36	1.79	0.00	0.00	0.00
79.55	0.64	0.36	1.79	0.00	0.00	0.00
79.60	0.64	0.36	1.79	0.00	0.00	0.00
79.65	0.64	0.36	1.79	0.00	0.00	0.00
79.70	0.64	0.36	1.79	0.00	0.00	0.00
79.75	0.64	0.36	1.79	0.00	0.00	0.00
79.80	0.64	0.36	1.79	0.00	0.00	0.00
79.85	0.64	0.36	1.79	0.00	0.00	0.00
79.90	0.64	0.36	1.79	0.00	0.00	0.00
79.95	0.64	0.36	1.79	0.00	0.00	0.00
80.00	0.64	0.36	1.79	0.00	0.00	0.00
80.05	0.64	0.36	1.79	0.00	0.00	0.00
80.10	0.64	0.36	1.79	0.00	0.00	0.00
80.15	0.64	0.36	1.79	0.00	0.00	0.00
80.20	0.64	0.36	1.79	0.00	0.00	0.00
80.25	0.64	0.36	1.79	0.00	0.00	0.00
80.30	0.64	0.36	1.79	0.00	0.00	0.00
80.35	0.64	0.36	1.79	0.00	0.00	0.00
80.40	0.64	0.36	1.79	0.00	0.00	0.00
80.45	0.64	0.36	1.79	0.00	0.00	0.00
80.50	0.64	0.36	1.79	0.00	0.00	0.00
80.55	0.64	0.36	1.79	0.00	0.00	0.00
80.60	0.64	0.36	1.79	0.00	0.00	0.00
80.65	0.64	0.36	1.79	0.00	0.00	0.00
80.70	0.64	0.36	1.79	0.00	0.00	0.00
80.75	0.64	0.36	1.79	0.00	0.00	0.00
80.80	0.64	0.36	1.79	0.00	0.00	0.00
80.85	0.64	0.36	1.79	0.00	0.00	0.00
80.90	0.64	0.36	1.79	0.00	0.00	0.00
80.95	0.64	0.36	1.79	0.00	0.00	0.00
81.00	0.64	0.36	1.79	0.00	0.00	0.00

81.05	0.64	0.36	1.79	0.00	0.00	0.00
81.10	0.64	0.36	1.79	0.00	0.00	0.00
81.15	0.64	0.36	1.79	0.00	0.00	0.00
81.20	0.64	0.36	1.79	0.00	0.00	0.00
81.25	0.64	0.36	1.79	0.00	0.00	0.00
81.30	0.64	0.36	1.79	0.00	0.00	0.00
81.35	0.64	0.36	1.79	0.00	0.00	0.00
81.40	0.64	0.36	1.79	0.00	0.00	0.00
81.45	0.64	0.36	1.79	0.00	0.00	0.00
81.50	0.64	0.36	1.79	0.00	0.00	0.00
81.55	0.64	0.36	1.79	0.00	0.00	0.00
81.60	0.64	0.36	1.79	0.00	0.00	0.00
81.65	0.64	0.36	1.79	0.00	0.00	0.00
81.70	0.64	0.36	1.79	0.00	0.00	0.00
81.75	0.64	0.36	1.79	0.00	0.00	0.00
81.80	0.64	0.36	1.79	0.00	0.00	0.00
81.85	0.64	0.36	1.79	0.00	0.00	0.00
81.90	0.64	0.36	1.79	0.00	0.00	0.00
81.95	0.64	0.36	1.79	0.00	0.00	0.00
82.00	0.64	0.36	1.79	0.00	0.00	0.00
82.05	0.64	0.36	1.79	0.00	0.00	0.00
82.10	0.64	0.36	1.79	0.00	0.00	0.00
82.15	0.64	0.36	1.79	0.00	0.00	0.00
82.20	0.64	0.36	1.79	0.00	0.00	0.00
82.25	0.64	0.36	1.79	0.00	0.00	0.00
82.30	0.64	0.36	1.79	0.00	0.00	0.00
82.35	0.64	0.36	1.79	0.00	0.00	0.00
82.40	0.64	0.36	1.79	0.00	0.00	0.00
82.45	0.64	0.36	1.79	0.00	0.00	0.00
82.50	0.64	0.36	1.79	0.00	0.00	0.00
82.55	0.64	0.36	1.79	0.00	0.00	0.00

82.60	0.64	0.36	1.79	0.00	0.00	0.00
82.65	0.64	0.36	1.79	0.00	0.00	0.00
82.70	0.64	0.36	1.79	0.00	0.00	0.00
82.75	0.64	0.36	1.79	0.00	0.00	0.00
82.80	0.64	0.36	1.79	0.00	0.00	0.00
82.85	0.64	0.36	1.79	0.00	0.00	0.00
82.90	0.64	0.36	1.79	0.00	0.00	0.00
82.95	0.64	0.36	1.79	0.00	0.00	0.00
83.00	0.64	0.36	1.79	0.00	0.00	0.00
83.05	0.64	0.36	1.79	0.00	0.00	0.00
83.10	0.64	0.36	1.79	0.00	0.00	0.00
83.15	0.64	0.36	1.79	0.00	0.00	0.00
83.20	0.64	0.36	1.79	0.00	0.00	0.00
83.25	0.64	0.36	1.79	0.00	0.00	0.00
83.30	0.64	0.36	1.79	0.00	0.00	0.00
83.35	0.64	0.36	1.79	0.00	0.00	0.00
83.40	0.64	0.36	1.79	0.00	0.00	0.00
83.45	0.64	0.36	1.79	0.00	0.00	0.00
83.50	0.64	0.36	1.79	0.00	0.00	0.00
83.55	0.64	0.36	1.79	0.00	0.00	0.00
83.60	0.64	0.36	1.79	0.00	0.00	0.00
83.65	0.64	0.36	1.79	0.00	0.00	0.00
83.70	0.64	0.36	1.79	0.00	0.00	0.00
83.75	0.64	0.36	1.79	0.00	0.00	0.00
83.80	0.64	0.36	1.79	0.00	0.00	0.00
83.85	0.64	0.36	1.79	0.00	0.00	0.00
83.90	0.64	0.36	1.79	0.00	0.00	0.00
83.95	0.64	0.36	1.79	0.00	0.00	0.00
84.00	0.64	0.36	1.79	0.00	0.00	0.00
84.05	0.64	0.36	1.79	0.00	0.00	0.00
84.10	0.64	0.36	1.79	0.00	0.00	0.00

84.15	0.64	0.36	1.79	0.00	0.00	0.00
84.20	0.64	0.36	1.79	0.00	0.00	0.00
84.25	0.64	0.36	1.79	0.00	0.00	0.00
84.30	0.64	0.36	1.79	0.00	0.00	0.00
84.35	0.64	0.36	1.79	0.00	0.00	0.00
84.40	0.64	0.36	1.79	0.00	0.00	0.00
84.45	0.64	0.36	1.79	0.00	0.00	0.00
84.50	0.64	0.36	1.79	0.00	0.00	0.00
84.55	0.64	0.36	1.79	0.00	0.00	0.00
84.60	0.64	0.36	1.79	0.00	0.00	0.00
84.65	0.64	0.36	1.79	0.00	0.00	0.00
84.70	0.64	0.36	1.79	0.00	0.00	0.00
84.75	0.64	0.36	1.79	0.00	0.00	0.00
84.80	0.64	0.36	1.79	0.00	0.00	0.00
84.85	0.63	0.36	1.79	0.00	0.00	0.00
84.90	0.63	0.36	1.79	0.00	0.00	0.00
84.95	0.63	0.36	1.79	0.00	0.00	0.00
85.00	0.63	0.36	1.79	0.00	0.00	0.00
85.05	0.63	0.36	1.79	0.00	0.00	0.00
85.10	0.63	0.36	1.79	0.00	0.00	0.00
85.15	0.63	0.36	1.79	0.00	0.00	0.00
85.20	0.63	0.36	1.79	0.00	0.00	0.00
85.25	0.63	0.36	1.79	0.00	0.00	0.00
85.30	0.63	0.36	1.79	0.00	0.00	0.00
85.35	0.63	0.36	1.79	0.00	0.00	0.00
85.40	0.63	0.36	1.79	0.00	0.00	0.00
85.45	0.63	0.36	1.79	0.00	0.00	0.00
85.50	0.63	0.35	1.79	0.00	0.00	0.00
85.55	0.63	0.35	1.79	0.00	0.00	0.00
85.60	0.63	0.35	1.79	0.00	0.00	0.00
85.65	0.63	0.35	1.79	0.00	0.00	0.00

85.70	0.63	0.35	1.79	0.00	0.00	0.00
85.75	0.63	0.35	1.79	0.00	0.00	0.00
85.80	0.63	0.35	1.79	0.00	0.00	0.00
85.85	0.63	0.35	1.79	0.00	0.00	0.00
85.90	0.63	0.35	1.79	0.00	0.00	0.00
85.95	0.63	0.35	1.79	0.00	0.00	0.00
86.00	0.63	0.35	1.79	0.00	0.00	0.00
86.05	0.63	0.35	1.79	0.00	0.00	0.00
86.10	0.63	0.35	1.79	0.00	0.00	0.00
86.15	0.63	0.35	1.79	0.00	0.00	0.00
86.20	0.63	0.35	1.79	0.00	0.00	0.00
86.25	0.63	0.35	1.79	0.00	0.00	0.00
86.30	0.63	0.35	1.79	0.00	0.00	0.00
86.35	0.63	0.35	1.79	0.00	0.00	0.00
86.40	0.63	0.35	1.79	0.00	0.00	0.00
86.45	0.63	0.35	1.79	0.00	0.00	0.00
86.50	0.63	0.35	1.79	0.00	0.00	0.00
86.55	0.63	0.35	1.79	0.00	0.00	0.00
86.60	0.63	0.35	1.79	0.00	0.00	0.00
86.65	0.63	0.35	1.79	0.00	0.00	0.00
86.70	0.63	0.35	1.79	0.00	0.00	0.00
86.75	0.63	0.35	1.79	0.00	0.00	0.00
86.80	0.63	0.35	1.79	0.00	0.00	0.00
86.85	0.63	0.35	1.79	0.00	0.00	0.00
86.90	0.63	0.35	1.79	0.00	0.00	0.00
86.95	0.63	0.35	1.79	0.00	0.00	0.00
87.00	0.63	0.35	1.79	0.00	0.00	0.00
87.05	0.63	0.35	1.79	0.00	0.00	0.00
87.10	0.63	0.35	1.79	0.00	0.00	0.00
87.15	0.63	0.35	1.79	0.00	0.00	0.00
87.20	0.63	0.35	1.79	0.00	0.00	0.00

87.25	0.63	0.35	1.79	0.00	0.00	0.00
87.30	0.63	0.35	1.79	0.00	0.00	0.00
87.35	0.63	0.35	1.79	0.00	0.00	0.00
87.40	0.63	0.35	1.79	0.00	0.00	0.00
87.45	0.63	0.35	1.79	0.00	0.00	0.00
87.50	0.63	0.35	1.79	0.00	0.00	0.00
87.55	0.63	0.35	1.79	0.00	0.00	0.00
87.60	0.63	0.35	1.79	0.00	0.00	0.00
87.65	0.63	0.35	1.79	0.00	0.00	0.00
87.70	0.63	0.35	1.79	0.00	0.00	0.00
87.75	0.63	0.35	1.79	0.00	0.00	0.00
87.80	0.63	0.35	1.79	0.00	0.00	0.00
87.85	0.63	0.35	1.79	0.00	0.00	0.00
87.90	0.63	0.35	1.79	0.00	0.00	0.00
87.95	0.63	0.35	1.79	0.00	0.00	0.00
88.00	0.63	0.35	1.79	0.00	0.00	0.00
88.05	0.63	0.35	1.79	0.00	0.00	0.00
88.10	0.63	0.35	1.79	0.00	0.00	0.00
88.15	0.63	0.35	1.79	0.00	0.00	0.00
88.20	0.63	0.35	1.79	0.00	0.00	0.00
88.25	0.63	0.35	1.79	0.00	0.00	0.00
88.30	0.63	0.35	1.79	0.00	0.00	0.00
88.35	0.63	0.35	1.79	0.00	0.00	0.00
88.40	0.63	0.35	1.79	0.00	0.00	0.00
88.45	0.63	0.35	1.79	0.00	0.00	0.00
88.50	0.63	0.35	1.79	0.00	0.00	0.00
88.55	0.63	0.35	1.79	0.00	0.00	0.00
88.60	0.63	0.35	1.79	0.00	0.00	0.00
88.65	0.63	0.35	1.79	0.00	0.00	0.00
88.70	0.63	0.35	1.79	0.00	0.00	0.00
88.75	0.63	0.35	1.79	0.00	0.00	0.00

88.80	0.63	0.35	1.79	0.00	0.00	0.00
88.85	0.63	0.35	1.79	0.00	0.00	0.00
88.90	0.63	0.35	1.79	0.00	0.00	0.00
88.95	0.63	0.35	1.79	0.00	0.00	0.00
89.00	0.63	0.35	1.79	0.00	0.00	0.00
89.05	0.63	0.35	1.79	0.00	0.00	0.00
89.10	0.63	0.35	1.79	0.00	0.00	0.00
89.15	0.63	0.35	1.79	0.00	0.00	0.00
89.20	0.63	0.35	1.79	0.00	0.00	0.00
89.25	0.63	0.35	1.79	0.00	0.00	0.00
89.30	0.63	0.35	1.79	0.00	0.00	0.00
89.35	0.63	0.35	1.79	0.00	0.00	0.00
89.40	0.63	0.35	1.79	0.00	0.00	0.00
89.45	0.63	0.35	1.79	0.00	0.00	0.00
89.50	0.63	0.35	1.79	0.00	0.00	0.00
89.55	0.63	0.35	1.79	0.00	0.00	0.00
89.60	0.63	0.35	1.79	0.00	0.00	0.00
89.65	0.63	0.35	1.79	0.00	0.00	0.00
89.70	0.63	0.35	1.79	0.00	0.00	0.00
89.75	0.63	0.35	1.79	0.00	0.00	0.00
89.80	0.63	0.35	1.79	0.00	0.00	0.00
89.85	0.63	0.35	1.79	0.00	0.00	0.00
89.90	0.63	0.35	1.79	0.00	0.00	0.00
89.95	0.63	0.35	1.79	0.00	0.00	0.00
90.00	0.63	0.35	1.79	0.00	0.00	0.00
90.05	0.63	0.35	1.79	0.00	0.00	0.00
90.10	0.63	0.35	1.79	0.00	0.00	0.00
90.15	0.63	0.35	1.79	0.00	0.00	0.00
90.20	0.63	0.35	1.79	0.00	0.00	0.00
90.25	0.63	0.35	1.79	0.00	0.00	0.00
90.30	0.63	0.35	1.79	0.00	0.00	0.00

90.35	0.63	0.35	1.79	0.00	0.00	0.00
90.40	0.63	0.35	1.79	0.00	0.00	0.00
90.45	0.63	0.35	1.79	0.00	0.00	0.00
90.50	0.63	0.35	1.79	0.00	0.00	0.00
90.55	0.63	0.35	1.79	0.00	0.00	0.00
90.60	0.63	0.35	1.79	0.00	0.00	0.00
90.65	0.63	0.35	1.79	0.00	0.00	0.00
90.70	0.63	0.35	1.79	0.00	0.00	0.00
90.75	0.63	0.35	1.79	0.00	0.00	0.00
90.80	0.63	0.35	1.79	0.00	0.00	0.00
90.85	0.63	0.35	1.79	0.00	0.00	0.00
90.90	0.63	0.35	1.79	0.00	0.00	0.00
90.95	0.63	0.35	1.79	0.00	0.00	0.00
91.00	0.62	0.35	1.79	0.00	0.00	0.00
91.05	0.62	0.35	1.79	0.00	0.00	0.00
91.10	0.62	0.35	1.79	0.00	0.00	0.00
91.15	0.62	0.35	1.79	0.00	0.00	0.00
91.20	0.62	0.35	1.79	0.00	0.00	0.00
91.25	0.62	0.35	1.79	0.00	0.00	0.00
91.30	0.62	0.35	1.79	0.00	0.00	0.00
91.35	0.62	0.35	1.79	0.00	0.00	0.00
91.40	0.62	0.35	1.79	0.00	0.00	0.00
91.45	0.62	0.35	1.79	0.00	0.00	0.00
91.50	0.62	0.35	1.79	0.00	0.00	0.00
91.55	0.62	0.35	1.79	0.00	0.00	0.00
91.60	0.62	0.35	1.79	0.00	0.00	0.00
91.65	0.62	0.35	1.79	0.00	0.00	0.00
91.70	0.62	0.35	1.79	0.00	0.00	0.00
91.75	0.62	0.35	1.79	0.00	0.00	0.00
91.80	0.62	0.35	1.79	0.00	0.00	0.00
91.85	0.62	0.35	1.79	0.00	0.00	0.00

91.90	0.62	0.35	1.79	0.00	0.00	0.00
91.95	0.62	0.35	1.79	0.00	0.00	0.00
92.00	0.62	0.35	1.79	0.00	0.00	0.00
92.05	0.62	0.35	1.79	0.00	0.00	0.00
92.10	0.62	0.35	1.79	0.00	0.00	0.00
92.15	0.62	0.35	1.79	0.00	0.00	0.00
92.20	0.62	0.35	1.79	0.00	0.00	0.00
92.25	0.62	0.35	1.79	0.00	0.00	0.00
92.30	0.62	0.35	1.79	0.00	0.00	0.00
92.35	0.62	0.35	1.79	0.00	0.00	0.00
92.40	0.62	0.35	1.79	0.00	0.00	0.00
92.45	0.62	0.35	1.79	0.00	0.00	0.00
92.50	0.62	0.35	1.79	0.00	0.00	0.00
92.55	0.62	0.35	1.79	0.00	0.00	0.00
92.60	0.62	0.35	1.79	0.00	0.00	0.00
92.65	0.62	0.35	1.79	0.00	0.00	0.00
92.70	0.62	0.35	1.79	0.00	0.00	0.00
92.75	0.62	0.35	1.79	0.00	0.00	0.00
92.80	0.62	0.35	1.79	0.00	0.00	0.00
92.85	0.62	0.35	1.79	0.00	0.00	0.00
92.90	0.62	0.35	1.79	0.00	0.00	0.00
92.95	0.62	0.35	1.79	0.00	0.00	0.00
93.00	0.62	0.35	1.79	0.00	0.00	0.00
93.05	0.62	0.35	1.79	0.00	0.00	0.00
93.10	0.62	0.35	1.79	0.00	0.00	0.00
93.15	0.62	0.35	1.79	0.00	0.00	0.00
93.20	0.62	0.35	1.79	0.00	0.00	0.00
93.25	0.62	0.35	1.79	0.00	0.00	0.00
93.30	0.62	0.35	1.79	0.00	0.00	0.00
93.35	0.62	0.35	1.79	0.00	0.00	0.00
93.40	0.62	0.35	1.79	0.00	0.00	0.00

93.45	0.62	0.35	1.79	0.00	0.00	0.00
93.50	0.62	0.35	1.79	0.00	0.00	0.00
93.55	0.62	0.35	1.79	0.00	0.00	0.00
93.60	0.62	0.35	1.79	0.00	0.00	0.00
93.65	0.62	0.35	1.79	0.00	0.00	0.00
93.70	0.62	0.35	1.79	0.00	0.00	0.00
93.75	0.62	0.35	1.79	0.00	0.00	0.00
93.80	0.62	0.35	1.79	0.00	0.00	0.00
93.85	0.62	0.35	1.79	0.00	0.00	0.00
93.90	0.62	0.35	1.79	0.00	0.00	0.00
93.95	0.62	0.35	1.79	0.00	0.00	0.00
94.00	0.62	0.35	1.79	0.00	0.00	0.00
94.05	0.62	0.35	1.79	0.00	0.00	0.00
94.10	0.62	0.35	1.79	0.00	0.00	0.00
94.15	0.62	0.35	1.79	0.00	0.00	0.00
94.20	0.62	0.35	1.79	0.00	0.00	0.00
94.25	0.62	0.35	1.79	0.00	0.00	0.00
94.30	0.62	0.35	1.79	0.00	0.00	0.00
94.35	0.62	0.35	1.79	0.00	0.00	0.00
94.40	0.62	0.35	1.79	0.00	0.00	0.00
94.45	0.62	0.35	1.79	0.00	0.00	0.00
94.50	0.62	0.35	1.79	0.00	0.00	0.00
94.55	0.62	0.35	1.79	0.00	0.00	0.00
94.60	0.62	0.35	1.79	0.00	0.00	0.00
94.65	0.62	0.35	1.79	0.00	0.00	0.00
94.70	0.62	0.35	1.79	0.00	0.00	0.00
94.75	0.62	0.35	1.79	0.00	0.00	0.00
94.80	0.62	0.34	1.79	0.00	0.00	0.00
94.85	0.62	0.34	1.79	0.00	0.00	0.00
94.90	0.62	0.34	1.79	0.00	0.00	0.00
94.95	0.62	0.34	1.79	0.00	0.00	0.00

95.00	0.62	0.34	1.79	0.00	0.00	0.00
95.05	0.62	0.34	1.79	0.00	0.00	0.00
95.10	0.62	0.34	1.79	0.00	0.00	0.00
95.15	0.62	0.34	1.79	0.00	0.00	0.00
95.20	0.62	0.34	1.79	0.00	0.00	0.00
95.25	0.62	0.34	1.79	0.00	0.00	0.00
95.30	0.62	0.34	1.79	0.00	0.00	0.00
95.35	0.62	0.34	1.80	0.00	0.00	0.00
95.40	0.62	0.34	1.80	0.00	0.00	0.00
95.45	0.62	0.34	1.80	0.00	0.00	0.00
95.50	0.62	0.34	1.80	0.00	0.00	0.00
95.55	0.62	0.34	1.80	0.00	0.00	0.00
95.60	0.62	0.34	1.80	0.00	0.00	0.00
95.65	0.62	0.34	1.80	0.00	0.00	0.00
95.70	0.62	0.34	1.80	0.00	0.00	0.00
95.75	0.62	0.34	1.80	0.00	0.00	0.00
95.80	0.62	0.34	1.80	0.00	0.00	0.00
95.85	0.62	0.34	1.80	0.00	0.00	0.00
95.90	0.62	0.34	1.80	0.00	0.00	0.00
95.95	0.62	0.34	1.80	0.00	0.00	0.00
96.00	0.62	0.34	1.80	0.00	0.00	0.00
96.05	0.62	0.34	1.80	0.00	0.00	0.00
96.10	0.62	0.34	1.80	0.00	0.00	0.00
96.15	0.62	0.34	1.80	0.00	0.00	0.00
96.20	0.62	0.34	1.80	0.00	0.00	0.00
96.25	0.62	0.34	1.80	0.00	0.00	0.00
96.30	0.62	0.34	1.80	0.00	0.00	0.00
96.35	0.62	0.34	1.80	0.00	0.00	0.00
96.40	0.62	0.34	1.80	0.00	0.00	0.00
96.45	0.62	0.34	1.80	0.00	0.00	0.00
96.50	0.62	0.34	1.80	0.00	0.00	0.00

96.55	0.62	0.34	1.80	0.00	0.00	0.00
96.60	0.62	0.34	1.80	0.00	0.00	0.00
96.65	0.62	0.34	1.80	0.00	0.00	0.00
96.70	0.62	0.34	1.80	0.00	0.00	0.00
96.75	0.62	0.34	1.80	0.00	0.00	0.00
96.80	0.62	0.34	1.80	0.00	0.00	0.00
96.85	0.62	0.34	1.80	0.00	0.00	0.00
96.90	0.62	0.34	1.80	0.00	0.00	0.00
96.95	0.62	0.34	1.80	0.00	0.00	0.00
97.00	0.62	0.34	1.80	0.00	0.00	0.00
97.05	0.62	0.34	1.80	0.00	0.00	0.00
97.10	0.62	0.34	1.80	0.00	0.00	0.00
97.15	0.62	0.34	1.80	0.00	0.00	0.00
97.20	0.62	0.34	1.80	0.00	0.00	0.00
97.25	0.62	0.34	1.80	0.00	0.00	0.00
97.30	0.62	0.34	1.80	0.00	0.00	0.00
97.35	0.62	0.34	1.80	0.00	0.00	0.00
97.40	0.62	0.34	1.80	0.00	0.00	0.00
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97.50	0.61	0.34	1.80	0.00	0.00	0.00
97.55	0.61	0.34	1.80	0.00	0.00	0.00
97.60	0.61	0.34	1.80	0.00	0.00	0.00
97.65	0.61	0.34	1.80	0.00	0.00	0.00
97.70	0.61	0.34	1.80	0.00	0.00	0.00
97.75	0.61	0.34	1.80	0.00	0.00	0.00
97.80	0.61	0.34	1.80	0.00	0.00	0.00
97.85	0.61	0.34	1.80	0.00	0.00	0.00
97.90	0.61	0.34	1.80	0.00	0.00	0.00
97.95	0.61	0.34	1.80	0.00	0.00	0.00
98.00	0.61	0.34	1.80	0.00	0.00	0.00
98.05	0.61	0.34	1.80	0.00	0.00	0.00

98.10	0.61	0.34	1.80	0.00	0.00	0.00
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98.30	0.61	0.34	1.80	0.00	0.00	0.00
98.35	0.61	0.34	1.80	0.00	0.00	0.00
98.40	0.61	0.34	1.80	0.00	0.00	0.00
98.45	0.61	0.34	1.81	0.00	0.00	0.00
98.50	0.61	0.34	1.81	0.00	0.00	0.00
98.55	0.61	0.34	1.81	0.00	0.00	0.00
98.60	0.61	0.34	1.81	0.00	0.00	0.00
98.65	0.61	0.34	1.81	0.00	0.00	0.00
98.70	0.61	0.34	1.81	0.00	0.00	0.00
98.75	0.61	0.34	1.81	0.00	0.00	0.00
98.80	0.61	0.34	1.81	0.00	0.00	0.00
98.85	0.61	0.34	1.81	0.00	0.00	0.00
98.90	0.61	0.34	1.81	0.00	0.00	0.00
98.95	0.61	0.34	1.81	0.00	0.00	0.00
99.00	0.61	0.34	1.81	0.00	0.00	0.00
99.05	0.61	0.34	1.81	0.00	0.00	0.00
99.10	0.61	0.34	1.81	0.00	0.00	0.00
99.15	0.61	0.34	1.81	0.00	0.00	0.00
99.20	0.61	0.34	1.81	0.00	0.00	0.00
99.25	0.61	0.34	1.81	0.00	0.00	0.00
99.30	0.61	0.34	1.81	0.00	0.00	0.00
99.35	0.61	0.34	1.81	0.00	0.00	0.00
99.40	0.61	0.34	1.81	0.00	0.00	0.00
99.45	0.61	0.34	1.81	0.00	0.00	0.00
99.50	0.61	0.34	1.81	0.00	0.00	0.00
99.55	0.61	0.34	1.81	0.00	0.00	0.00
99.60	0.61	0.34	1.81	0.00	0.00	0.00

99.65	0.61	0.34	1.81	0.00	0.00	0.00
99.70	0.61	0.34	1.81	0.00	0.00	0.00
99.75	0.61	0.34	1.81	0.00	0.00	0.00
99.80	0.61	0.34	1.81	0.00	0.00	0.00
99.85	0.61	0.34	1.81	0.00	0.00	0.00
99.90	0.61	0.34	1.80	0.00	0.00	0.00
99.95	0.61	0.34	1.80	0.00	0.00	0.00
100.00	0.61	0.34	1.80	0.00	0.00	0.00

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* F.S.<1, Liquefaction Potential Zone

(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

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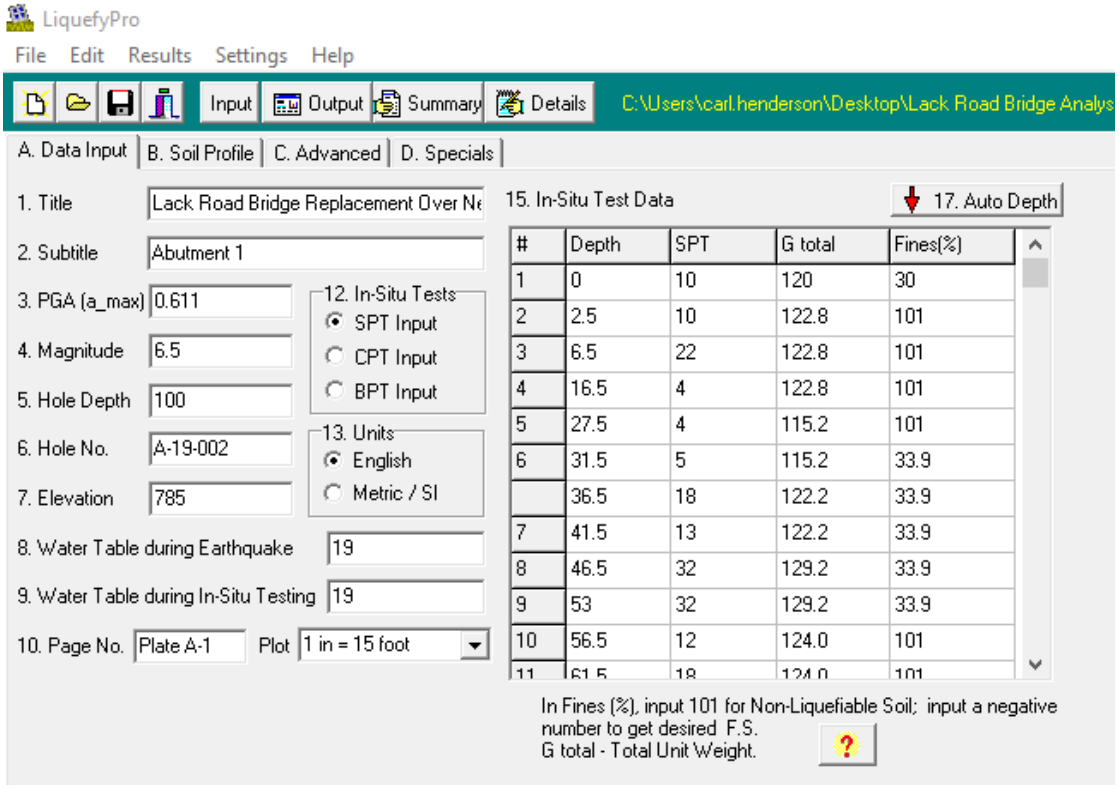
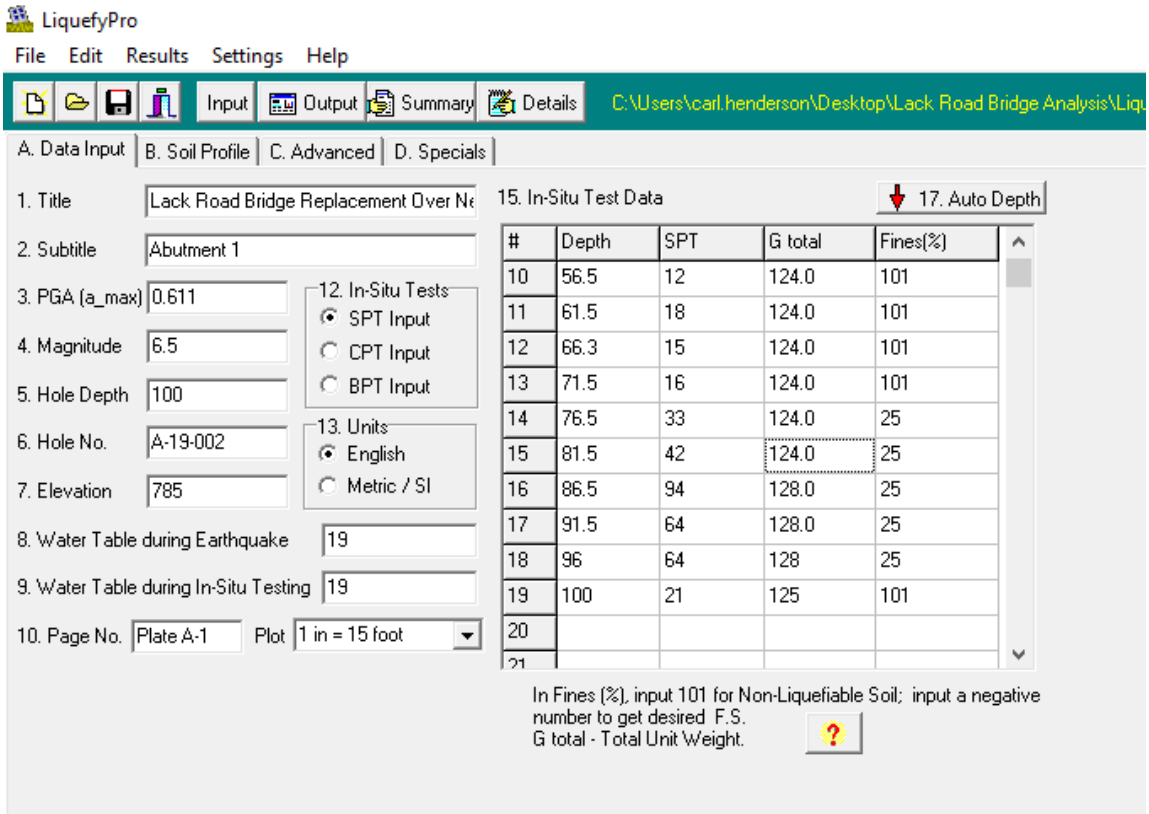
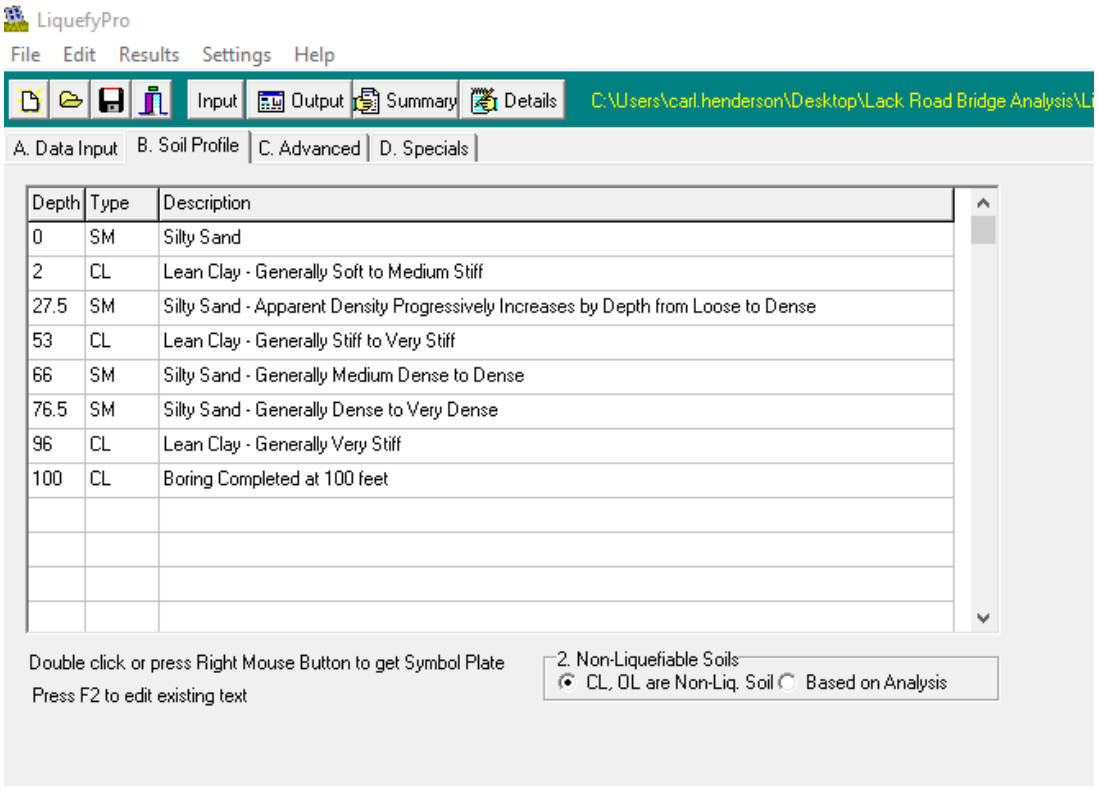
1 atm (atmosphere) = 1 tsf (ton/ft2)

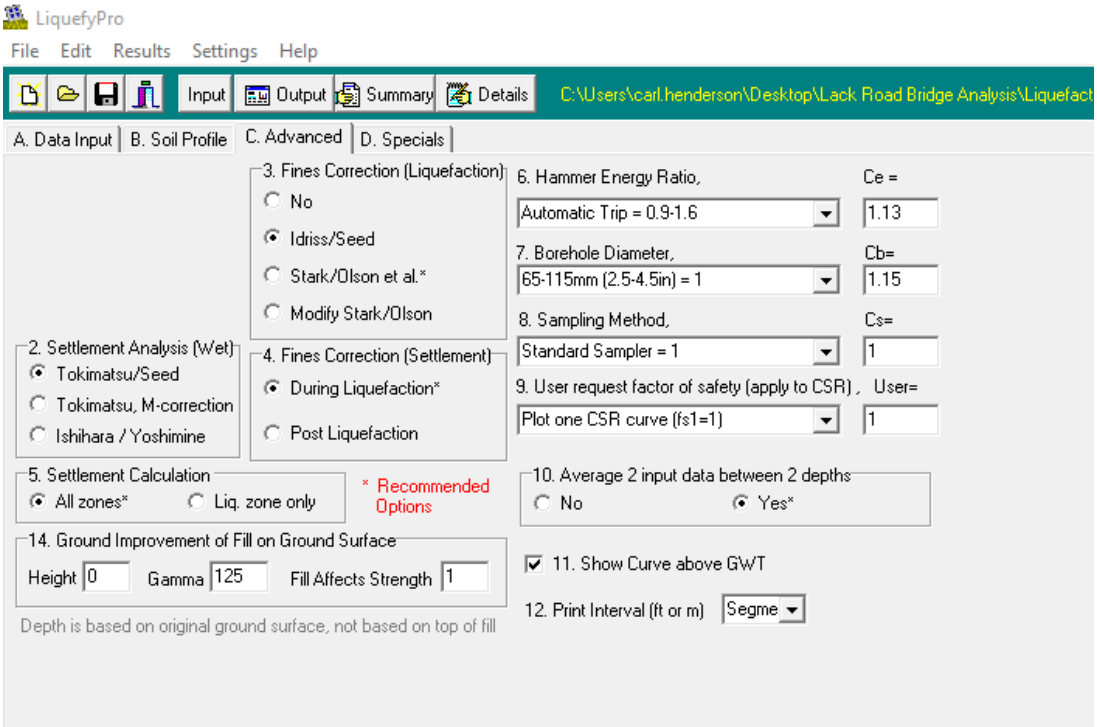
CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils

Liquefaction Analysis – A-19-002


LiquefyPro
File Edit Results Settings Help
Input Output Summary Details C:\Users\carl.henderson\Desktop\Lack Road Bridge Analys
A. Data Input B. Soil Profile C. Advanced D. Specials
1. Title Lack Road Bridge Replacement Over Ne
2. Subtitle Abutment 1
3. PGA (a_max) 0.611
4. Magnitude 6.5
5. Hole Depth 100
6. Hole No. A-19-002
7. Elevation 785
12. In-Situ Tests
SPT Input
CPT Input
BPT Input
13. Units
English
Metric / SI
8. Water Table during Earthquake 19
9. Water Table during In-Situ Testing 19
10. Page No. Plate A-1 Plot 1 in = 15 foot
15. In-Situ Test Data
17. Auto Depth
Depth SPT G total Fines(%)
1 0 10 120 30
2 2.5 10 122.8 101
3 6.5 22 122.8 101
4 16.5 4 122.8 101
5 27.5 4 115.2 101
6 31.5 5 115.2 33.9
36.5 18 122.2 33.9
7 41.5 13 122.2 33.9
8 46.5 32 129.2 33.9
9 53 32 129.2 33.9
10 56.5 12 124.0 101
In Fines (%), input 101 for Non-Liquefiable Soil; input a negative number to get desired F.S.
G total - Total Unit Weight.


LiquefyPro
File Edit Results Settings Help
Input Output Summary Details C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Liqu
A. Data Input B. Soil Profile C. Advanced D. Specials
1. Title Lack Road Bridge Replacement Over Ne
2. Subtitle Abutment 1
3. PGA (a_max) 0.611
4. Magnitude 6.5
5. Hole Depth 100
6. Hole No. A-19-002
7. Elevation 785
12. In-Situ Tests
SPT Input
CPT Input
BPT Input
13. Units
English
Metric / SI
8. Water Table during Earthquake 19
9. Water Table during In-Situ Testing 19
10. Page No. Plate A-1 Plot 1 in = 15 foot
15. In-Situ Test Data
17. Auto Depth
Depth SPT G total Fines(%)
10 56.5 12 124.0 101
11 61.5 18 124.0 101
12 66.3 15 124.0 101
13 71.5 16 124.0 101
14 76.5 33 124.0 25
15 81.5 42 124.0 25
16 86.5 94 128.0 25
17 91.5 64 128.0 25
18 96 64 128 25
19 100 21 125 101
20
In Fines (%), input 101 for Non-Liquefiable Soil; input a negative number to get desired F.S.
G total - Total Unit Weight.


LiquefyPro
File Edit Results Settings Help
Input Output Summary Details
C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\L
A. Data Input B. Soil Profile C. Advanced D. Specials
Depth Type Description
0 SM Silty Sand
2 CL Lean Clay - Generally Soft to Medium Stiff
27.5 SM Silty Sand - Apparent Density Progressively Increases by Depth from Loose to Dense
53 CL Lean Clay - Generally Stiff to Very Stiff
66 SM Silty Sand - Generally Medium Dense to Dense
76.5 SM Silty Sand - Generally Dense to Very Dense
96 CL Lean Clay - Generally Very Stiff
100 CL Boring Completed at 100 feet
Double click or press Right Mouse Button to get Symbol Plate
Press F2 to edit existing text
2. Non-Liquefiable Soils
CL, OL are Non-Liq. Soil
Based on Analysis


LiquefyPro
File Edit Results Settings Help
Input Output Summary Details
C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Liquefact
A. Data Input B. Soil Profile C. Advanced D. Specials
3. Fines Correction (Liquefaction)
No
Idriss/Seed
Stark/Olson et al.*
Modify Stark/Olson
6. Hammer Energy Ratio,
Ce =
Automatic Trip = 0.9-1.6
1.13
7. Borehole Diameter,
Cb=
65-115mm (2.5-4.5in) = 1
1.15
8. Sampling Method,
Cs=
Standard Sampler = 1
1
9. User request factor of safety (apply to CSR),
User=
Plot one CSR curve (fs1=1)
1
2. Settlement Analysis (Wet)
Tokimatsu/Seed
Tokimatsu, M-correction
Ishihara / Yoshimine
4. Fines Correction (Settlement)
During Liquefaction*
Post Liquefaction
5. Settlement Calculation
All zones*
Liq. zone only
* Recommended Options
10. Average 2 input data between 2 depths
No
Yes*
14. Ground Improvement of Fill on Ground Surface
Height 0
Gamma 125
Fill Affects Strength 1
11. Show Curve above GWT
12. Print Interval (ft or m)
Segme
Depth is based on original ground surface, not based on top of fill

Viewform1

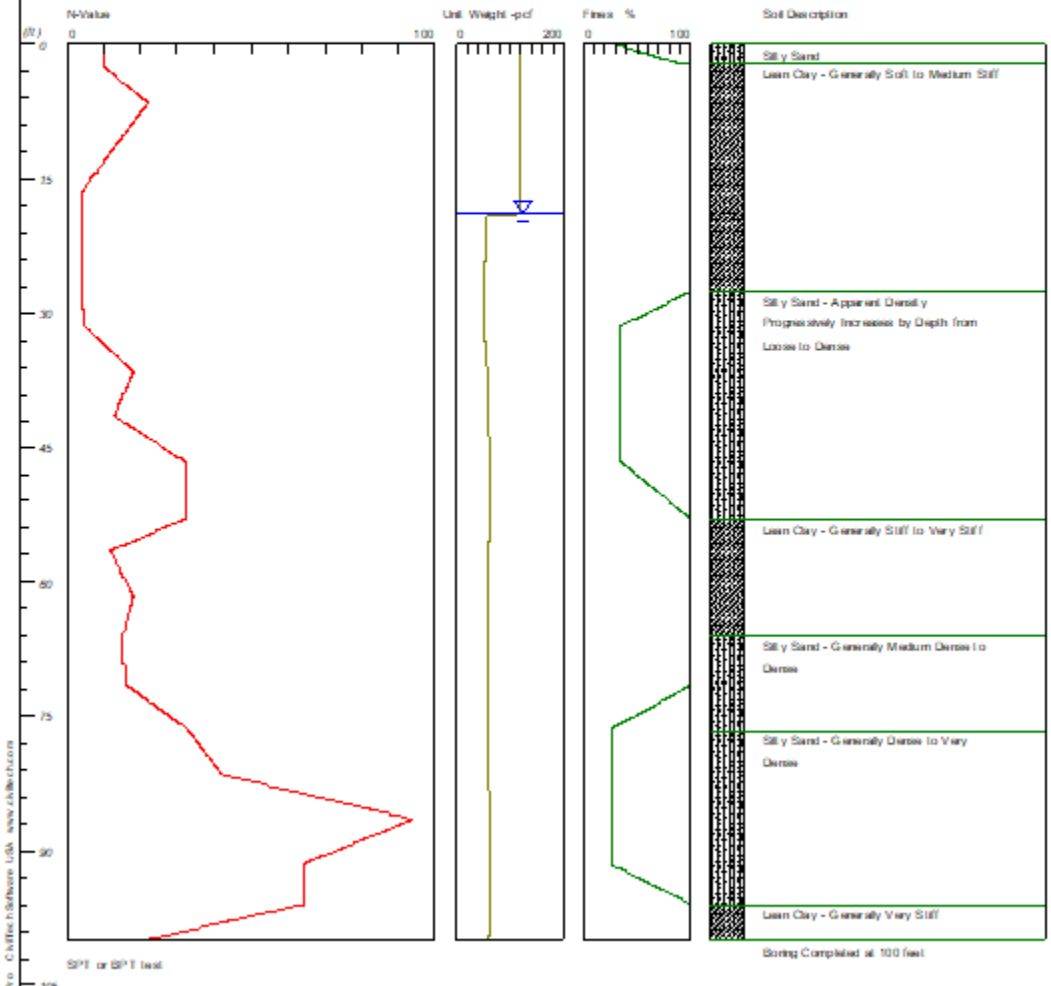
Page 1 of 1 | 1 | Zoom % | 70.0

LIQUEFACTION ANALYSIS

Lack Road Bridge Replacement Over New River

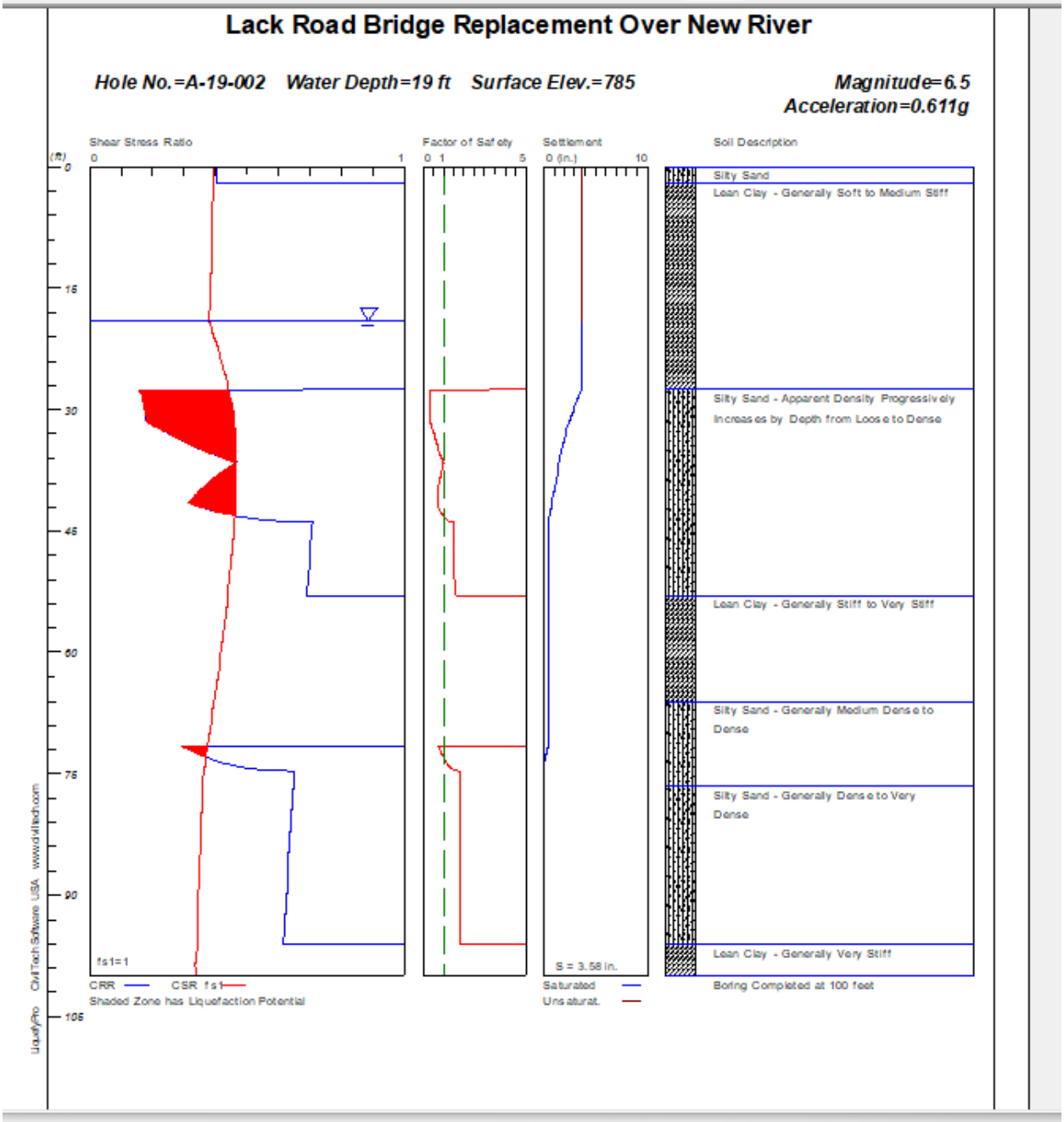
Hole No.=A-19-002 Water Depth=19 ft Surface Elev.=785

Magnitude=6.5
Acceleration=0.611g



Viewform1

Page 1 of 1 1 Zoom % 80.0



****

LIQUEFACTION ANALYSIS SUMMARY

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Font: Courier New, Regular, Size 8 is recommended for this report.

Licensed to , 6/6/2019 6:48:59 AM

Input File Name: C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix D - Liquefaction Analysis\A-19-002.liq

Title: Lack Road Bridge Replacement Over New River

Subtitle: Abutment 1

Surface Elev.=785

Hole No.=A-19-002

Depth of Hole= 100.00 ft

Water Table during Earthquake= 19.00 ft

Water Table during In-Situ Testing= 19.00 ft

Max. Acceleration= 0.61 g

Earthquake Magnitude= 6.50

Input Data:

Surface Elev.=785

Hole No.=A-19-002

Depth of Hole=100.00 ft

Water Table during Earthquake= 19.00 ft

Water Table during In-Situ Testing= 19.00 ft

Max. Acceleration=0.61 g

Earthquake Magnitude=6.50

No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.

2. Settlement Analysis Method: Tokimatsu/Seed

3. Fines Correction for Liquefaction: Idriss/Seed

4. Fine Correction for Settlement: During Liquefaction*

5. Settlement Calculation in: All zones*

6. Hammer Energy Ratio, Ce = 1.13

7. Borehole Diameter, Cb= 1.15

8. Sampling Method, Cs= 1

9. User request factor of safety (apply to CSR) , User= 1

Plot one CSR curve (fs1=1)

10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth	SPT	gamma	Fines
ft		pcf	%
0.00	10.00	120.00	30.00
2.50	10.00	122.80	NoLiq
6.50	22.00	122.80	NoLiq
16.50	4.00	122.80	NoLiq
27.50	4.00	115.20	NoLiq
31.50	5.00	115.20	33.90
36.50	18.00	122.20	33.90
41.50	13.00	122.20	33.90
46.50	32.00	129.20	33.90
53.00	32.00	129.20	NoLiq
56.50	12.00	124.00	NoLiq
61.50	18.00	124.00	NoLiq

66.30	15.00	124.00	NoLiq
71.50	16.00	124.00	NoLiq
76.50	33.00	124.00	25.00
81.50	42.00	124.00	25.00
86.50	94.00	128.00	25.00
91.50	64.00	128.00	25.00
96.00	64.00	128.00	NoLiq
100.00	21.00	125.00	NoLiq

Output Results:

Settlement of Saturated Sands=3.58 in.

Settlement of Unsaturated Sands=0.00 in.

Total Settlement of Saturated and Unsaturated Sands=3.58 in.

Differential Settlement=1.792 to 2.366 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	0.38	0.40	5.00	3.58	0.00	3.58
0.05	0.39	0.40	5.00	3.58	0.00	3.58
0.10	0.39	0.40	5.00	3.58	0.00	3.58
0.15	0.40	0.40	5.00	3.58	0.00	3.58
0.20	0.40	0.40	5.00	3.58	0.00	3.58
0.25	0.40	0.40	5.00	3.58	0.00	3.58
0.30	0.40	0.40	5.00	3.58	0.00	3.58
0.35	0.40	0.40	5.00	3.58	0.00	3.58
0.40	0.40	0.40	5.00	3.58	0.00	3.58
0.45	0.40	0.40	5.00	3.58	0.00	3.58
0.50	0.40	0.40	5.00	3.58	0.00	3.58
0.55	0.40	0.40	5.00	3.58	0.00	3.58

0.60	0.40	0.40	5.00	3.58	0.00	3.58
0.65	0.40	0.40	5.00	3.58	0.00	3.58
0.70	0.40	0.40	5.00	3.58	0.00	3.58
0.75	0.40	0.40	5.00	3.58	0.00	3.58
0.80	0.40	0.40	5.00	3.58	0.00	3.58
0.85	0.40	0.40	5.00	3.58	0.00	3.58
0.90	0.40	0.40	5.00	3.58	0.00	3.58
0.95	0.40	0.40	5.00	3.58	0.00	3.58
1.00	0.40	0.40	5.00	3.58	0.00	3.58
1.05	0.40	0.40	5.00	3.58	0.00	3.58
1.10	0.40	0.40	5.00	3.58	0.00	3.58
1.15	0.40	0.40	5.00	3.58	0.00	3.58
1.20	0.40	0.40	5.00	3.58	0.00	3.58
1.25	0.40	0.40	5.00	3.58	0.00	3.58
1.30	0.40	0.40	5.00	3.58	0.00	3.58
1.35	0.40	0.40	5.00	3.58	0.00	3.58
1.40	0.40	0.40	5.00	3.58	0.00	3.58
1.45	0.40	0.40	5.00	3.58	0.00	3.58
1.50	0.40	0.40	5.00	3.58	0.00	3.58
1.55	0.40	0.40	5.00	3.58	0.00	3.58
1.60	0.40	0.40	5.00	3.58	0.00	3.58
1.65	0.40	0.40	5.00	3.58	0.00	3.58
1.70	0.40	0.40	5.00	3.58	0.00	3.58
1.75	0.40	0.40	5.00	3.58	0.00	3.58
1.80	0.40	0.40	5.00	3.58	0.00	3.58
1.85	0.40	0.40	5.00	3.58	0.00	3.58
1.90	0.40	0.40	5.00	3.58	0.00	3.58
1.95	0.40	0.40	5.00	3.58	0.00	3.58
2.00	0.40	0.40	5.00	3.58	0.00	3.58
2.05	2.00	0.40	5.00	3.58	0.00	3.58
2.10	2.00	0.40	5.00	3.58	0.00	3.58

2.15	2.00	0.40	5.00	3.58	0.00	3.58
2.20	2.00	0.40	5.00	3.58	0.00	3.58
2.25	2.00	0.40	5.00	3.58	0.00	3.58
2.30	2.00	0.40	5.00	3.58	0.00	3.58
2.35	2.00	0.39	5.00	3.58	0.00	3.58
2.40	2.00	0.39	5.00	3.58	0.00	3.58
2.45	2.00	0.39	5.00	3.58	0.00	3.58
2.50	2.00	0.39	5.00	3.58	0.00	3.58
2.55	2.00	0.39	5.00	3.58	0.00	3.58
2.60	2.00	0.39	5.00	3.58	0.00	3.58
2.65	2.00	0.39	5.00	3.58	0.00	3.58
2.70	2.00	0.39	5.00	3.58	0.00	3.58
2.75	2.00	0.39	5.00	3.58	0.00	3.58
2.80	2.00	0.39	5.00	3.58	0.00	3.58
2.85	2.00	0.39	5.00	3.58	0.00	3.58
2.90	2.00	0.39	5.00	3.58	0.00	3.58
2.95	2.00	0.39	5.00	3.58	0.00	3.58
3.00	2.00	0.39	5.00	3.58	0.00	3.58
3.05	2.00	0.39	5.00	3.58	0.00	3.58
3.10	2.00	0.39	5.00	3.58	0.00	3.58
3.15	2.00	0.39	5.00	3.58	0.00	3.58
3.20	2.00	0.39	5.00	3.58	0.00	3.58
3.25	2.00	0.39	5.00	3.58	0.00	3.58
3.30	2.00	0.39	5.00	3.58	0.00	3.58
3.35	2.00	0.39	5.00	3.58	0.00	3.58
3.40	2.00	0.39	5.00	3.58	0.00	3.58
3.45	2.00	0.39	5.00	3.58	0.00	3.58
3.50	2.00	0.39	5.00	3.58	0.00	3.58
3.55	2.00	0.39	5.00	3.58	0.00	3.58
3.60	2.00	0.39	5.00	3.58	0.00	3.58
3.65	2.00	0.39	5.00	3.58	0.00	3.58

3.70	2.00	0.39	5.00	3.58	0.00	3.58
3.75	2.00	0.39	5.00	3.58	0.00	3.58
3.80	2.00	0.39	5.00	3.58	0.00	3.58
3.85	2.00	0.39	5.00	3.58	0.00	3.58
3.90	2.00	0.39	5.00	3.58	0.00	3.58
3.95	2.00	0.39	5.00	3.58	0.00	3.58
4.00	2.00	0.39	5.00	3.58	0.00	3.58
4.05	2.00	0.39	5.00	3.58	0.00	3.58
4.10	2.00	0.39	5.00	3.58	0.00	3.58
4.15	2.00	0.39	5.00	3.58	0.00	3.58
4.20	2.00	0.39	5.00	3.58	0.00	3.58
4.25	2.00	0.39	5.00	3.58	0.00	3.58
4.30	2.00	0.39	5.00	3.58	0.00	3.58
4.35	2.00	0.39	5.00	3.58	0.00	3.58
4.40	2.00	0.39	5.00	3.58	0.00	3.58
4.45	2.00	0.39	5.00	3.58	0.00	3.58
4.50	2.00	0.39	5.00	3.58	0.00	3.58
4.55	2.00	0.39	5.00	3.58	0.00	3.58
4.60	2.00	0.39	5.00	3.58	0.00	3.58
4.65	2.00	0.39	5.00	3.58	0.00	3.58
4.70	2.00	0.39	5.00	3.58	0.00	3.58
4.75	2.00	0.39	5.00	3.58	0.00	3.58
4.80	2.00	0.39	5.00	3.58	0.00	3.58
4.85	2.00	0.39	5.00	3.58	0.00	3.58
4.90	2.00	0.39	5.00	3.58	0.00	3.58
4.95	2.00	0.39	5.00	3.58	0.00	3.58
5.00	2.00	0.39	5.00	3.58	0.00	3.58
5.05	2.00	0.39	5.00	3.58	0.00	3.58
5.10	2.00	0.39	5.00	3.58	0.00	3.58
5.15	2.00	0.39	5.00	3.58	0.00	3.58
5.20	2.00	0.39	5.00	3.58	0.00	3.58

5.25	2.00	0.39	5.00	3.58	0.00	3.58
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5.40	2.00	0.39	5.00	3.58	0.00	3.58
5.45	2.00	0.39	5.00	3.58	0.00	3.58
5.50	2.00	0.39	5.00	3.58	0.00	3.58
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5.60	2.00	0.39	5.00	3.58	0.00	3.58
5.65	2.00	0.39	5.00	3.58	0.00	3.58
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5.75	2.00	0.39	5.00	3.58	0.00	3.58
5.80	2.00	0.39	5.00	3.58	0.00	3.58
5.85	2.00	0.39	5.00	3.58	0.00	3.58
5.90	2.00	0.39	5.00	3.58	0.00	3.58
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6.05	2.00	0.39	5.00	3.58	0.00	3.58
6.10	2.00	0.39	5.00	3.58	0.00	3.58
6.15	2.00	0.39	5.00	3.58	0.00	3.58
6.20	2.00	0.39	5.00	3.58	0.00	3.58
6.25	2.00	0.39	5.00	3.58	0.00	3.58
6.30	2.00	0.39	5.00	3.58	0.00	3.58
6.35	2.00	0.39	5.00	3.58	0.00	3.58
6.40	2.00	0.39	5.00	3.58	0.00	3.58
6.45	2.00	0.39	5.00	3.58	0.00	3.58
6.50	2.00	0.39	5.00	3.58	0.00	3.58
6.55	2.00	0.39	5.00	3.58	0.00	3.58
6.60	2.00	0.39	5.00	3.58	0.00	3.58
6.65	2.00	0.39	5.00	3.58	0.00	3.58
6.70	2.00	0.39	5.00	3.58	0.00	3.58
6.75	2.00	0.39	5.00	3.58	0.00	3.58

6.80	2.00	0.39	5.00	3.58	0.00	3.58
6.85	2.00	0.39	5.00	3.58	0.00	3.58
6.90	2.00	0.39	5.00	3.58	0.00	3.58
6.95	2.00	0.39	5.00	3.58	0.00	3.58
7.00	2.00	0.39	5.00	3.58	0.00	3.58
7.05	2.00	0.39	5.00	3.58	0.00	3.58
7.10	2.00	0.39	5.00	3.58	0.00	3.58
7.15	2.00	0.39	5.00	3.58	0.00	3.58
7.20	2.00	0.39	5.00	3.58	0.00	3.58
7.25	2.00	0.39	5.00	3.58	0.00	3.58
7.30	2.00	0.39	5.00	3.58	0.00	3.58
7.35	2.00	0.39	5.00	3.58	0.00	3.58
7.40	2.00	0.39	5.00	3.58	0.00	3.58
7.45	2.00	0.39	5.00	3.58	0.00	3.58
7.50	2.00	0.39	5.00	3.58	0.00	3.58
7.55	2.00	0.39	5.00	3.58	0.00	3.58
7.60	2.00	0.39	5.00	3.58	0.00	3.58
7.65	2.00	0.39	5.00	3.58	0.00	3.58
7.70	2.00	0.39	5.00	3.58	0.00	3.58
7.75	2.00	0.39	5.00	3.58	0.00	3.58
7.80	2.00	0.39	5.00	3.58	0.00	3.58
7.85	2.00	0.39	5.00	3.58	0.00	3.58
7.90	2.00	0.39	5.00	3.58	0.00	3.58
7.95	2.00	0.39	5.00	3.58	0.00	3.58
8.00	2.00	0.39	5.00	3.58	0.00	3.58
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8.35	2.00	0.39	5.00	3.58	0.00	3.58
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8.80	2.00	0.39	5.00	3.58	0.00	3.58
8.85	2.00	0.39	5.00	3.58	0.00	3.58
8.90	2.00	0.39	5.00	3.58	0.00	3.58
8.95	2.00	0.39	5.00	3.58	0.00	3.58
9.00	2.00	0.39	5.00	3.58	0.00	3.58
9.05	2.00	0.39	5.00	3.58	0.00	3.58
9.10	2.00	0.39	5.00	3.58	0.00	3.58
9.15	2.00	0.39	5.00	3.58	0.00	3.58
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9.45	2.00	0.39	5.00	3.58	0.00	3.58
9.50	2.00	0.39	5.00	3.58	0.00	3.58
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9.75	2.00	0.39	5.00	3.58	0.00	3.58
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9.85	2.00	0.39	5.00	3.58	0.00	3.58

9.90	2.00	0.39	5.00	3.58	0.00	3.58
9.95	2.00	0.39	5.00	3.58	0.00	3.58
10.00	2.00	0.39	5.00	3.58	0.00	3.58
10.05	2.00	0.39	5.00	3.58	0.00	3.58
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10.15	2.00	0.39	5.00	3.58	0.00	3.58
10.20	2.00	0.39	5.00	3.58	0.00	3.58
10.25	2.00	0.39	5.00	3.58	0.00	3.58
10.30	2.00	0.39	5.00	3.58	0.00	3.58
10.35	2.00	0.39	5.00	3.58	0.00	3.58
10.40	2.00	0.39	5.00	3.58	0.00	3.58
10.45	2.00	0.39	5.00	3.58	0.00	3.58
10.50	2.00	0.39	5.00	3.58	0.00	3.58
10.55	2.00	0.39	5.00	3.58	0.00	3.58
10.60	2.00	0.39	5.00	3.58	0.00	3.58
10.65	2.00	0.39	5.00	3.58	0.00	3.58
10.70	2.00	0.39	5.00	3.58	0.00	3.58
10.75	2.00	0.39	5.00	3.58	0.00	3.58
10.80	2.00	0.39	5.00	3.58	0.00	3.58
10.85	2.00	0.39	5.00	3.58	0.00	3.58
10.90	2.00	0.39	5.00	3.58	0.00	3.58
10.95	2.00	0.39	5.00	3.58	0.00	3.58
11.00	2.00	0.39	5.00	3.58	0.00	3.58
11.05	2.00	0.39	5.00	3.58	0.00	3.58
11.10	2.00	0.39	5.00	3.58	0.00	3.58
11.15	2.00	0.39	5.00	3.58	0.00	3.58
11.20	2.00	0.39	5.00	3.58	0.00	3.58
11.25	2.00	0.39	5.00	3.58	0.00	3.58
11.30	2.00	0.39	5.00	3.58	0.00	3.58
11.35	2.00	0.39	5.00	3.58	0.00	3.58
11.40	2.00	0.39	5.00	3.58	0.00	3.58

11.45	2.00	0.39	5.00	3.58	0.00	3.58
11.50	2.00	0.39	5.00	3.58	0.00	3.58
11.55	2.00	0.39	5.00	3.58	0.00	3.58
11.60	2.00	0.39	5.00	3.58	0.00	3.58
11.65	2.00	0.39	5.00	3.58	0.00	3.58
11.70	2.00	0.39	5.00	3.58	0.00	3.58
11.75	2.00	0.39	5.00	3.58	0.00	3.58
11.80	2.00	0.39	5.00	3.58	0.00	3.58
11.85	2.00	0.39	5.00	3.58	0.00	3.58
11.90	2.00	0.39	5.00	3.58	0.00	3.58
11.95	2.00	0.39	5.00	3.58	0.00	3.58
12.00	2.00	0.39	5.00	3.58	0.00	3.58
12.05	2.00	0.39	5.00	3.58	0.00	3.58
12.10	2.00	0.39	5.00	3.58	0.00	3.58
12.15	2.00	0.39	5.00	3.58	0.00	3.58
12.20	2.00	0.39	5.00	3.58	0.00	3.58
12.25	2.00	0.39	5.00	3.58	0.00	3.58
12.30	2.00	0.39	5.00	3.58	0.00	3.58
12.35	2.00	0.39	5.00	3.58	0.00	3.58
12.40	2.00	0.39	5.00	3.58	0.00	3.58
12.45	2.00	0.39	5.00	3.58	0.00	3.58
12.50	2.00	0.39	5.00	3.58	0.00	3.58
12.55	2.00	0.39	5.00	3.58	0.00	3.58
12.60	2.00	0.39	5.00	3.58	0.00	3.58
12.65	2.00	0.39	5.00	3.58	0.00	3.58
12.70	2.00	0.39	5.00	3.58	0.00	3.58
12.75	2.00	0.39	5.00	3.58	0.00	3.58
12.80	2.00	0.39	5.00	3.58	0.00	3.58
12.85	2.00	0.39	5.00	3.58	0.00	3.58
12.90	2.00	0.39	5.00	3.58	0.00	3.58
12.95	2.00	0.39	5.00	3.58	0.00	3.58

13.00	2.00	0.39	5.00	3.58	0.00	3.58
13.05	2.00	0.39	5.00	3.58	0.00	3.58
13.10	2.00	0.39	5.00	3.58	0.00	3.58
13.15	2.00	0.38	5.00	3.58	0.00	3.58
13.20	2.00	0.38	5.00	3.58	0.00	3.58
13.25	2.00	0.38	5.00	3.58	0.00	3.58
13.30	2.00	0.38	5.00	3.58	0.00	3.58
13.35	2.00	0.38	5.00	3.58	0.00	3.58
13.40	2.00	0.38	5.00	3.58	0.00	3.58
13.45	2.00	0.38	5.00	3.58	0.00	3.58
13.50	2.00	0.38	5.00	3.58	0.00	3.58
13.55	2.00	0.38	5.00	3.58	0.00	3.58
13.60	2.00	0.38	5.00	3.58	0.00	3.58
13.65	2.00	0.38	5.00	3.58	0.00	3.58
13.70	2.00	0.38	5.00	3.58	0.00	3.58
13.75	2.00	0.38	5.00	3.58	0.00	3.58
13.80	2.00	0.38	5.00	3.58	0.00	3.58
13.85	2.00	0.38	5.00	3.58	0.00	3.58
13.90	2.00	0.38	5.00	3.58	0.00	3.58
13.95	2.00	0.38	5.00	3.58	0.00	3.58
14.00	2.00	0.38	5.00	3.58	0.00	3.58
14.05	2.00	0.38	5.00	3.58	0.00	3.58
14.10	2.00	0.38	5.00	3.58	0.00	3.58
14.15	2.00	0.38	5.00	3.58	0.00	3.58
14.20	2.00	0.38	5.00	3.58	0.00	3.58
14.25	2.00	0.38	5.00	3.58	0.00	3.58
14.30	2.00	0.38	5.00	3.58	0.00	3.58
14.35	2.00	0.38	5.00	3.58	0.00	3.58
14.40	2.00	0.38	5.00	3.58	0.00	3.58
14.45	2.00	0.38	5.00	3.58	0.00	3.58
14.50	2.00	0.38	5.00	3.58	0.00	3.58

14.55	2.00	0.38	5.00	3.58	0.00	3.58
14.60	2.00	0.38	5.00	3.58	0.00	3.58
14.65	2.00	0.38	5.00	3.58	0.00	3.58
14.70	2.00	0.38	5.00	3.58	0.00	3.58
14.75	2.00	0.38	5.00	3.58	0.00	3.58
14.80	2.00	0.38	5.00	3.58	0.00	3.58
14.85	2.00	0.38	5.00	3.58	0.00	3.58
14.90	2.00	0.38	5.00	3.58	0.00	3.58
14.95	2.00	0.38	5.00	3.58	0.00	3.58
15.00	2.00	0.38	5.00	3.58	0.00	3.58
15.05	2.00	0.38	5.00	3.58	0.00	3.58
15.10	2.00	0.38	5.00	3.58	0.00	3.58
15.15	2.00	0.38	5.00	3.58	0.00	3.58
15.20	2.00	0.38	5.00	3.58	0.00	3.58
15.25	2.00	0.38	5.00	3.58	0.00	3.58
15.30	2.00	0.38	5.00	3.58	0.00	3.58
15.35	2.00	0.38	5.00	3.58	0.00	3.58
15.40	2.00	0.38	5.00	3.58	0.00	3.58
15.45	2.00	0.38	5.00	3.58	0.00	3.58
15.50	2.00	0.38	5.00	3.58	0.00	3.58
15.55	2.00	0.38	5.00	3.58	0.00	3.58
15.60	2.00	0.38	5.00	3.58	0.00	3.58
15.65	2.00	0.38	5.00	3.58	0.00	3.58
15.70	2.00	0.38	5.00	3.58	0.00	3.58
15.75	2.00	0.38	5.00	3.58	0.00	3.58
15.80	2.00	0.38	5.00	3.58	0.00	3.58
15.85	2.00	0.38	5.00	3.58	0.00	3.58
15.90	2.00	0.38	5.00	3.58	0.00	3.58
15.95	2.00	0.38	5.00	3.58	0.00	3.58
16.00	2.00	0.38	5.00	3.58	0.00	3.58
16.05	2.00	0.38	5.00	3.58	0.00	3.58

16.10	2.00	0.38	5.00	3.58	0.00	3.58
16.15	2.00	0.38	5.00	3.58	0.00	3.58
16.20	2.00	0.38	5.00	3.58	0.00	3.58
16.25	2.00	0.38	5.00	3.58	0.00	3.58
16.30	2.00	0.38	5.00	3.58	0.00	3.58
16.35	2.00	0.38	5.00	3.58	0.00	3.58
16.40	2.00	0.38	5.00	3.58	0.00	3.58
16.45	2.00	0.38	5.00	3.58	0.00	3.58
16.50	2.00	0.38	5.00	3.58	0.00	3.58
16.55	2.00	0.38	5.00	3.58	0.00	3.58
16.60	2.00	0.38	5.00	3.58	0.00	3.58
16.65	2.00	0.38	5.00	3.58	0.00	3.58
16.70	2.00	0.38	5.00	3.58	0.00	3.58
16.75	2.00	0.38	5.00	3.58	0.00	3.58
16.80	2.00	0.38	5.00	3.58	0.00	3.58
16.85	2.00	0.38	5.00	3.58	0.00	3.58
16.90	2.00	0.38	5.00	3.58	0.00	3.58
16.95	2.00	0.38	5.00	3.58	0.00	3.58
17.00	2.00	0.38	5.00	3.58	0.00	3.58
17.05	2.00	0.38	5.00	3.58	0.00	3.58
17.10	2.00	0.38	5.00	3.58	0.00	3.58
17.15	2.00	0.38	5.00	3.58	0.00	3.58
17.20	2.00	0.38	5.00	3.58	0.00	3.58
17.25	2.00	0.38	5.00	3.58	0.00	3.58
17.30	2.00	0.38	5.00	3.58	0.00	3.58
17.35	2.00	0.38	5.00	3.58	0.00	3.58
17.40	2.00	0.38	5.00	3.58	0.00	3.58
17.45	2.00	0.38	5.00	3.58	0.00	3.58
17.50	2.00	0.38	5.00	3.58	0.00	3.58
17.55	2.00	0.38	5.00	3.58	0.00	3.58
17.60	2.00	0.38	5.00	3.58	0.00	3.58

17.65	2.00	0.38	5.00	3.58	0.00	3.58
17.70	2.00	0.38	5.00	3.58	0.00	3.58
17.75	2.00	0.38	5.00	3.58	0.00	3.58
17.80	2.00	0.38	5.00	3.58	0.00	3.58
17.85	2.00	0.38	5.00	3.58	0.00	3.58
17.90	2.00	0.38	5.00	3.58	0.00	3.58
17.95	2.00	0.38	5.00	3.58	0.00	3.58
18.00	2.00	0.38	5.00	3.58	0.00	3.58
18.05	2.00	0.38	5.00	3.58	0.00	3.58
18.10	2.00	0.38	5.00	3.58	0.00	3.58
18.15	2.00	0.38	5.00	3.58	0.00	3.58
18.20	2.00	0.38	5.00	3.58	0.00	3.58
18.25	2.00	0.38	5.00	3.58	0.00	3.58
18.30	2.00	0.38	5.00	3.58	0.00	3.58
18.35	2.00	0.38	5.00	3.58	0.00	3.58
18.40	2.00	0.38	5.00	3.58	0.00	3.58
18.45	2.00	0.38	5.00	3.58	0.00	3.58
18.50	2.00	0.38	5.00	3.58	0.00	3.58
18.55	2.00	0.38	5.00	3.58	0.00	3.58
18.60	2.00	0.38	5.00	3.58	0.00	3.58
18.65	2.00	0.38	5.00	3.58	0.00	3.58
18.70	2.00	0.38	5.00	3.58	0.00	3.58
18.75	2.00	0.38	5.00	3.58	0.00	3.58
18.80	2.00	0.38	5.00	3.58	0.00	3.58
18.85	2.00	0.38	5.00	3.58	0.00	3.58
18.90	2.00	0.38	5.00	3.58	0.00	3.58
18.95	2.00	0.38	5.00	3.58	0.00	3.58
19.00	2.00	0.38	5.00	3.58	0.00	3.58
19.05	2.00	0.38	5.00	3.58	0.00	3.58
19.10	2.00	0.38	5.00	3.58	0.00	3.58
19.15	2.00	0.38	5.00	3.58	0.00	3.58

19.20	2.00	0.38	5.00	3.58	0.00	3.58
19.25	2.00	0.38	5.00	3.58	0.00	3.58
19.30	2.00	0.38	5.00	3.58	0.00	3.58
19.35	2.00	0.38	5.00	3.58	0.00	3.58
19.40	2.00	0.38	5.00	3.58	0.00	3.58
19.45	2.00	0.38	5.00	3.58	0.00	3.58
19.50	2.00	0.38	5.00	3.58	0.00	3.58
19.55	2.00	0.38	5.00	3.58	0.00	3.58
19.60	2.00	0.38	5.00	3.58	0.00	3.58
19.65	2.00	0.38	5.00	3.58	0.00	3.58
19.70	2.00	0.39	5.00	3.58	0.00	3.58
19.75	2.00	0.39	5.00	3.58	0.00	3.58
19.80	2.00	0.39	5.00	3.58	0.00	3.58
19.85	2.00	0.39	5.00	3.58	0.00	3.58
19.90	2.00	0.39	5.00	3.58	0.00	3.58
19.95	2.00	0.39	5.00	3.58	0.00	3.58
20.00	2.00	0.39	5.00	3.58	0.00	3.58
20.05	2.00	0.39	5.00	3.58	0.00	3.58
20.10	2.00	0.39	5.00	3.58	0.00	3.58
20.15	2.00	0.39	5.00	3.58	0.00	3.58
20.20	2.00	0.39	5.00	3.58	0.00	3.58
20.25	2.00	0.39	5.00	3.58	0.00	3.58
20.30	2.00	0.39	5.00	3.58	0.00	3.58
20.35	2.00	0.39	5.00	3.58	0.00	3.58
20.40	2.00	0.39	5.00	3.58	0.00	3.58
20.45	2.00	0.39	5.00	3.58	0.00	3.58
20.50	2.00	0.39	5.00	3.58	0.00	3.58
20.55	2.00	0.39	5.00	3.58	0.00	3.58
20.60	2.00	0.39	5.00	3.58	0.00	3.58
20.65	2.00	0.39	5.00	3.58	0.00	3.58
20.70	2.00	0.39	5.00	3.58	0.00	3.58

20.75	2.00	0.39	5.00	3.58	0.00	3.58
20.80	2.00	0.39	5.00	3.58	0.00	3.58
20.85	2.00	0.40	5.00	3.58	0.00	3.58
20.90	2.00	0.40	5.00	3.58	0.00	3.58
20.95	2.00	0.40	5.00	3.58	0.00	3.58
21.00	2.00	0.40	5.00	3.58	0.00	3.58
21.05	2.00	0.40	5.00	3.58	0.00	3.58
21.10	2.00	0.40	5.00	3.58	0.00	3.58
21.15	2.00	0.40	5.00	3.58	0.00	3.58
21.20	2.00	0.40	5.00	3.58	0.00	3.58
21.25	2.00	0.40	5.00	3.58	0.00	3.58
21.30	2.00	0.40	5.00	3.58	0.00	3.58
21.35	2.00	0.40	5.00	3.58	0.00	3.58
21.40	2.00	0.40	5.00	3.58	0.00	3.58
21.45	2.00	0.40	5.00	3.58	0.00	3.58
21.50	2.00	0.40	5.00	3.58	0.00	3.58
21.55	2.00	0.40	5.00	3.58	0.00	3.58
21.60	2.00	0.40	5.00	3.58	0.00	3.58
21.65	2.00	0.40	5.00	3.58	0.00	3.58
21.70	2.00	0.40	5.00	3.58	0.00	3.58
21.75	2.00	0.40	5.00	3.58	0.00	3.58
21.80	2.00	0.40	5.00	3.58	0.00	3.58
21.85	2.00	0.40	5.00	3.58	0.00	3.58
21.90	2.00	0.40	5.00	3.58	0.00	3.58
21.95	2.00	0.40	5.00	3.58	0.00	3.58
22.00	2.00	0.40	5.00	3.58	0.00	3.58
22.05	2.00	0.40	5.00	3.58	0.00	3.58
22.10	2.00	0.41	5.00	3.58	0.00	3.58
22.15	2.00	0.41	5.00	3.58	0.00	3.58
22.20	2.00	0.41	5.00	3.58	0.00	3.58
22.25	2.00	0.41	5.00	3.58	0.00	3.58

22.30	2.00	0.41	5.00	3.58	0.00	3.58
22.35	2.00	0.41	5.00	3.58	0.00	3.58
22.40	2.00	0.41	5.00	3.58	0.00	3.58
22.45	2.00	0.41	5.00	3.58	0.00	3.58
22.50	2.00	0.41	5.00	3.58	0.00	3.58
22.55	2.00	0.41	5.00	3.58	0.00	3.58
22.60	2.00	0.41	5.00	3.58	0.00	3.58
22.65	2.00	0.41	5.00	3.58	0.00	3.58
22.70	2.00	0.41	5.00	3.58	0.00	3.58
22.75	2.00	0.41	5.00	3.58	0.00	3.58
22.80	2.00	0.41	5.00	3.58	0.00	3.58
22.85	2.00	0.41	5.00	3.58	0.00	3.58
22.90	2.00	0.41	5.00	3.58	0.00	3.58
22.95	2.00	0.41	5.00	3.58	0.00	3.58
23.00	2.00	0.41	5.00	3.58	0.00	3.58
23.05	2.00	0.41	5.00	3.58	0.00	3.58
23.10	2.00	0.41	5.00	3.58	0.00	3.58
23.15	2.00	0.41	5.00	3.58	0.00	3.58
23.20	2.00	0.41	5.00	3.58	0.00	3.58
23.25	2.00	0.41	5.00	3.58	0.00	3.58
23.30	2.00	0.41	5.00	3.58	0.00	3.58
23.35	2.00	0.41	5.00	3.58	0.00	3.58
23.40	2.00	0.41	5.00	3.58	0.00	3.58
23.45	2.00	0.42	5.00	3.58	0.00	3.58
23.50	2.00	0.42	5.00	3.58	0.00	3.58
23.55	2.00	0.42	5.00	3.58	0.00	3.58
23.60	2.00	0.42	5.00	3.58	0.00	3.58
23.65	2.00	0.42	5.00	3.58	0.00	3.58
23.70	2.00	0.42	5.00	3.58	0.00	3.58
23.75	2.00	0.42	5.00	3.58	0.00	3.58
23.80	2.00	0.42	5.00	3.58	0.00	3.58

23.85	2.00	0.42	5.00	3.58	0.00	3.58
23.90	2.00	0.42	5.00	3.58	0.00	3.58
23.95	2.00	0.42	5.00	3.58	0.00	3.58
24.00	2.00	0.42	5.00	3.58	0.00	3.58
24.05	2.00	0.42	5.00	3.58	0.00	3.58
24.10	2.00	0.42	5.00	3.58	0.00	3.58
24.15	2.00	0.42	5.00	3.58	0.00	3.58
24.20	2.00	0.42	5.00	3.58	0.00	3.58
24.25	2.00	0.42	5.00	3.58	0.00	3.58
24.30	2.00	0.42	5.00	3.58	0.00	3.58
24.35	2.00	0.42	5.00	3.58	0.00	3.58
24.40	2.00	0.42	5.00	3.58	0.00	3.58
24.45	2.00	0.42	5.00	3.58	0.00	3.58
24.50	2.00	0.42	5.00	3.58	0.00	3.58
24.55	2.00	0.42	5.00	3.58	0.00	3.58
24.60	2.00	0.42	5.00	3.58	0.00	3.58
24.65	2.00	0.42	5.00	3.58	0.00	3.58
24.70	2.00	0.42	5.00	3.58	0.00	3.58
24.75	2.00	0.42	5.00	3.58	0.00	3.58
24.80	2.00	0.42	5.00	3.58	0.00	3.58
24.85	2.00	0.43	5.00	3.58	0.00	3.58
24.90	2.00	0.43	5.00	3.58	0.00	3.58
24.95	2.00	0.43	5.00	3.58	0.00	3.58
25.00	2.00	0.43	5.00	3.58	0.00	3.58
25.05	2.00	0.43	5.00	3.58	0.00	3.58
25.10	2.00	0.43	5.00	3.58	0.00	3.58
25.15	2.00	0.43	5.00	3.58	0.00	3.58
25.20	2.00	0.43	5.00	3.58	0.00	3.58
25.25	2.00	0.43	5.00	3.58	0.00	3.58
25.30	2.00	0.43	5.00	3.58	0.00	3.58
25.35	2.00	0.43	5.00	3.58	0.00	3.58

25.40	2.00	0.43	5.00	3.58	0.00	3.58
25.45	2.00	0.43	5.00	3.58	0.00	3.58
25.50	2.00	0.43	5.00	3.58	0.00	3.58
25.55	2.00	0.43	5.00	3.58	0.00	3.58
25.60	2.00	0.43	5.00	3.58	0.00	3.58
25.65	2.00	0.43	5.00	3.58	0.00	3.58
25.70	2.00	0.43	5.00	3.58	0.00	3.58
25.75	2.00	0.43	5.00	3.58	0.00	3.58
25.80	2.00	0.43	5.00	3.58	0.00	3.58
25.85	2.00	0.43	5.00	3.58	0.00	3.58
25.90	2.00	0.43	5.00	3.58	0.00	3.58
25.95	2.00	0.43	5.00	3.58	0.00	3.58
26.00	2.00	0.43	5.00	3.58	0.00	3.58
26.05	2.00	0.43	5.00	3.58	0.00	3.58
26.10	2.00	0.43	5.00	3.58	0.00	3.58
26.15	2.00	0.43	5.00	3.58	0.00	3.58
26.20	2.00	0.43	5.00	3.58	0.00	3.58
26.25	2.00	0.43	5.00	3.58	0.00	3.58
26.30	2.00	0.43	5.00	3.58	0.00	3.58
26.35	2.00	0.43	5.00	3.58	0.00	3.58
26.40	2.00	0.43	5.00	3.58	0.00	3.58
26.45	2.00	0.44	5.00	3.58	0.00	3.58
26.50	2.00	0.44	5.00	3.58	0.00	3.58
26.55	2.00	0.44	5.00	3.58	0.00	3.58
26.60	2.00	0.44	5.00	3.58	0.00	3.58
26.65	2.00	0.44	5.00	3.58	0.00	3.58
26.70	2.00	0.44	5.00	3.58	0.00	3.58
26.75	2.00	0.44	5.00	3.58	0.00	3.58
26.80	2.00	0.44	5.00	3.58	0.00	3.58
26.85	2.00	0.44	5.00	3.58	0.00	3.58
26.90	2.00	0.44	5.00	3.58	0.00	3.58

26.95	2.00	0.44	5.00	3.58	0.00	3.58
27.00	2.00	0.44	5.00	3.58	0.00	3.58
27.05	2.00	0.44	5.00	3.58	0.00	3.58
27.10	2.00	0.44	5.00	3.58	0.00	3.58
27.15	2.00	0.44	5.00	3.58	0.00	3.58
27.20	2.00	0.44	5.00	3.58	0.00	3.58
27.25	2.00	0.44	5.00	3.58	0.00	3.58
27.30	2.00	0.44	5.00	3.58	0.00	3.58
27.35	2.00	0.44	5.00	3.58	0.00	3.58
27.40	2.00	0.44	5.00	3.58	0.00	3.58
27.45	2.00	0.44	5.00	3.58	0.00	3.58
27.50	2.00	0.44	5.00	3.58	0.00	3.58
27.55	0.16	0.44	0.36*	3.58	0.00	3.58
27.60	0.16	0.44	0.36*	3.58	0.00	3.58
27.65	0.16	0.44	0.36*	3.56	0.00	3.56
27.70	0.16	0.44	0.36*	3.55	0.00	3.55
27.75	0.16	0.44	0.36*	3.53	0.00	3.53
27.80	0.16	0.44	0.36*	3.52	0.00	3.52
27.85	0.16	0.44	0.36*	3.50	0.00	3.50
27.90	0.16	0.44	0.37*	3.49	0.00	3.49
27.95	0.16	0.44	0.37*	3.47	0.00	3.47
28.00	0.17	0.44	0.37*	3.46	0.00	3.46
28.05	0.17	0.44	0.37*	3.44	0.00	3.44
28.10	0.17	0.45	0.37*	3.43	0.00	3.43
28.15	0.17	0.45	0.37*	3.41	0.00	3.41
28.20	0.17	0.45	0.37*	3.40	0.00	3.40
28.25	0.17	0.45	0.37*	3.38	0.00	3.38
28.30	0.17	0.45	0.37*	3.37	0.00	3.37
28.35	0.17	0.45	0.37*	3.35	0.00	3.35
28.40	0.17	0.45	0.37*	3.34	0.00	3.34
28.45	0.17	0.45	0.37*	3.32	0.00	3.32

28.50	0.17	0.45	0.37*	3.31	0.00	3.31
28.55	0.17	0.45	0.37*	3.30	0.00	3.30
28.60	0.17	0.45	0.37*	3.28	0.00	3.28
28.65	0.17	0.45	0.37*	3.27	0.00	3.27
28.70	0.17	0.45	0.37*	3.25	0.00	3.25
28.75	0.17	0.45	0.38*	3.24	0.00	3.24
28.80	0.17	0.45	0.38*	3.22	0.00	3.22
28.85	0.17	0.45	0.38*	3.21	0.00	3.21
28.90	0.17	0.45	0.38*	3.19	0.00	3.19
28.95	0.17	0.45	0.38*	3.18	0.00	3.18
29.00	0.17	0.45	0.38*	3.16	0.00	3.16
29.05	0.17	0.45	0.38*	3.15	0.00	3.15
29.10	0.17	0.45	0.38*	3.13	0.00	3.13
29.15	0.17	0.45	0.38*	3.12	0.00	3.12
29.20	0.17	0.45	0.38*	3.10	0.00	3.10
29.25	0.17	0.45	0.38*	3.09	0.00	3.09
29.30	0.17	0.45	0.38*	3.08	0.00	3.08
29.35	0.17	0.45	0.38*	3.06	0.00	3.06
29.40	0.17	0.45	0.38*	3.05	0.00	3.05
29.45	0.17	0.45	0.38*	3.03	0.00	3.03
29.50	0.17	0.45	0.38*	3.02	0.00	3.02
29.55	0.17	0.45	0.38*	3.00	0.00	3.00
29.60	0.17	0.45	0.38*	2.99	0.00	2.99
29.65	0.17	0.45	0.38*	2.97	0.00	2.97
29.70	0.17	0.45	0.38*	2.96	0.00	2.96
29.75	0.17	0.45	0.38*	2.94	0.00	2.94
29.80	0.17	0.45	0.38*	2.93	0.00	2.93
29.85	0.17	0.45	0.38*	2.92	0.00	2.92
29.90	0.17	0.45	0.38*	2.90	0.00	2.90
29.95	0.17	0.46	0.38*	2.89	0.00	2.89
30.00	0.17	0.46	0.38*	2.87	0.00	2.87

30.05	0.17	0.46	0.38*	2.86	0.00	2.86
30.10	0.17	0.46	0.38*	2.84	0.00	2.84
30.15	0.17	0.46	0.38*	2.83	0.00	2.83
30.20	0.17	0.46	0.38*	2.82	0.00	2.82
30.25	0.17	0.46	0.38*	2.80	0.00	2.80
30.30	0.17	0.46	0.38*	2.79	0.00	2.79
30.35	0.18	0.46	0.38*	2.77	0.00	2.77
30.40	0.18	0.46	0.38*	2.76	0.00	2.76
30.45	0.18	0.46	0.38*	2.74	0.00	2.74
30.50	0.18	0.46	0.39*	2.73	0.00	2.73
30.55	0.18	0.46	0.39*	2.72	0.00	2.72
30.60	0.18	0.46	0.39*	2.70	0.00	2.70
30.65	0.18	0.46	0.39*	2.69	0.00	2.69
30.70	0.18	0.46	0.39*	2.67	0.00	2.67
30.75	0.18	0.46	0.39*	2.66	0.00	2.66
30.80	0.18	0.46	0.39*	2.64	0.00	2.64
30.85	0.18	0.46	0.39*	2.63	0.00	2.63
30.90	0.18	0.46	0.39*	2.62	0.00	2.62
30.95	0.18	0.46	0.39*	2.60	0.00	2.60
31.00	0.18	0.46	0.39*	2.59	0.00	2.59
31.05	0.18	0.46	0.39*	2.57	0.00	2.57
31.10	0.18	0.46	0.39*	2.56	0.00	2.56
31.15	0.18	0.46	0.39*	2.55	0.00	2.55
31.20	0.18	0.46	0.39*	2.53	0.00	2.53
31.25	0.18	0.46	0.39*	2.52	0.00	2.52
31.30	0.18	0.46	0.39*	2.50	0.00	2.50
31.35	0.18	0.46	0.39*	2.49	0.00	2.49
31.40	0.18	0.46	0.39*	2.47	0.00	2.47
31.45	0.18	0.46	0.39*	2.46	0.00	2.46
31.50	0.18	0.46	0.39*	2.45	0.00	2.45
31.55	0.18	0.46	0.39*	2.43	0.00	2.43

31.60	0.18	0.46	0.40*	2.42	0.00	2.42
31.65	0.19	0.46	0.40*	2.40	0.00	2.40
31.70	0.19	0.46	0.41*	2.39	0.00	2.39
31.75	0.19	0.46	0.42*	2.38	0.00	2.38
31.80	0.19	0.46	0.42*	2.36	0.00	2.36
31.85	0.20	0.46	0.43*	2.35	0.00	2.35
31.90	0.20	0.46	0.43*	2.34	0.00	2.34
31.95	0.20	0.46	0.44*	2.32	0.00	2.32
32.00	0.20	0.46	0.44*	2.31	0.00	2.31
32.05	0.21	0.46	0.45*	2.30	0.00	2.30
32.10	0.21	0.46	0.45*	2.29	0.00	2.29
32.15	0.21	0.46	0.46*	2.27	0.00	2.27
32.20	0.21	0.46	0.46*	2.26	0.00	2.26
32.25	0.22	0.46	0.47*	2.25	0.00	2.25
32.30	0.22	0.46	0.48*	2.24	0.00	2.24
32.35	0.22	0.46	0.48*	2.23	0.00	2.23
32.40	0.22	0.46	0.49*	2.22	0.00	2.22
32.45	0.23	0.46	0.49*	2.20	0.00	2.20
32.50	0.23	0.46	0.50*	2.19	0.00	2.19
32.55	0.23	0.46	0.50*	2.18	0.00	2.18
32.60	0.23	0.46	0.51*	2.17	0.00	2.17
32.65	0.24	0.46	0.51*	2.16	0.00	2.16
32.70	0.24	0.46	0.52*	2.15	0.00	2.15
32.75	0.24	0.46	0.52*	2.13	0.00	2.13
32.80	0.24	0.46	0.53*	2.12	0.00	2.12
32.85	0.25	0.46	0.53*	2.11	0.00	2.11
32.90	0.25	0.46	0.54*	2.10	0.00	2.10
32.95	0.25	0.46	0.54*	2.09	0.00	2.09
33.00	0.25	0.46	0.55*	2.08	0.00	2.08
33.05	0.26	0.46	0.56*	2.07	0.00	2.07
33.10	0.26	0.46	0.56*	2.06	0.00	2.06

33.15	0.26	0.46	0.57*	2.05	0.00	2.05
33.20	0.26	0.46	0.57*	2.04	0.00	2.04
33.25	0.27	0.46	0.58*	2.03	0.00	2.03
33.30	0.27	0.46	0.58*	2.02	0.00	2.02
33.35	0.27	0.46	0.59*	2.01	0.00	2.01
33.40	0.27	0.46	0.59*	2.00	0.00	2.00
33.45	0.28	0.46	0.60*	1.99	0.00	1.99
33.50	0.28	0.46	0.60*	1.98	0.00	1.98
33.55	0.28	0.46	0.61*	1.97	0.00	1.97
33.60	0.28	0.46	0.61*	1.96	0.00	1.96
33.65	0.29	0.46	0.62*	1.95	0.00	1.95
33.70	0.29	0.46	0.62*	1.94	0.00	1.94
33.75	0.29	0.46	0.63*	1.93	0.00	1.93
33.80	0.29	0.46	0.63*	1.92	0.00	1.92
33.85	0.30	0.46	0.64*	1.91	0.00	1.91
33.90	0.30	0.46	0.65*	1.90	0.00	1.90
33.95	0.30	0.46	0.65*	1.89	0.00	1.89
34.00	0.30	0.46	0.66*	1.88	0.00	1.88
34.05	0.31	0.46	0.66*	1.87	0.00	1.87
34.10	0.31	0.46	0.67*	1.86	0.00	1.86
34.15	0.31	0.46	0.67*	1.85	0.00	1.85
34.20	0.31	0.46	0.68*	1.84	0.00	1.84
34.25	0.32	0.46	0.68*	1.83	0.00	1.83
34.30	0.32	0.46	0.69*	1.82	0.00	1.82
34.35	0.32	0.46	0.69*	1.82	0.00	1.82
34.40	0.32	0.46	0.70*	1.81	0.00	1.81
34.45	0.33	0.46	0.71*	1.80	0.00	1.80
34.50	0.33	0.46	0.71*	1.79	0.00	1.79
34.55	0.33	0.46	0.72*	1.78	0.00	1.78
34.60	0.33	0.46	0.72*	1.77	0.00	1.77
34.65	0.34	0.46	0.73*	1.76	0.00	1.76

34.70	0.34	0.46	0.74*	1.76	0.00	1.76
34.75	0.34	0.46	0.74*	1.75	0.00	1.75
34.80	0.35	0.46	0.75*	1.74	0.00	1.74
34.85	0.35	0.46	0.75*	1.73	0.00	1.73
34.90	0.35	0.46	0.76*	1.72	0.00	1.72
34.95	0.35	0.46	0.77*	1.71	0.00	1.71
35.00	0.36	0.46	0.77*	1.71	0.00	1.71
35.05	0.36	0.46	0.78*	1.70	0.00	1.70
35.10	0.36	0.46	0.78*	1.69	0.00	1.69
35.15	0.37	0.46	0.79*	1.68	0.00	1.68
35.20	0.37	0.46	0.80*	1.68	0.00	1.68
35.25	0.37	0.46	0.80*	1.67	0.00	1.67
35.30	0.38	0.46	0.81*	1.66	0.00	1.66
35.35	0.38	0.46	0.82*	1.65	0.00	1.65
35.40	0.38	0.46	0.82*	1.64	0.00	1.64
35.45	0.38	0.46	0.83*	1.64	0.00	1.64
35.50	0.39	0.46	0.84*	1.63	0.00	1.63
35.55	0.39	0.46	0.85*	1.62	0.00	1.62
35.60	0.39	0.46	0.85*	1.61	0.00	1.61
35.65	0.40	0.46	0.86*	1.61	0.00	1.61
35.70	0.40	0.46	0.87*	1.60	0.00	1.60
35.75	0.41	0.46	0.88*	1.59	0.00	1.59
35.80	0.41	0.46	0.88*	1.59	0.00	1.59
35.85	0.41	0.46	0.90*	1.58	0.00	1.58
35.90	0.42	0.46	0.90*	1.57	0.00	1.57
35.95	0.42	0.46	0.91*	1.57	0.00	1.57
36.00	0.43	0.46	0.92*	1.56	0.00	1.56
36.05	0.43	0.46	0.93*	1.55	0.00	1.55
36.10	0.43	0.46	0.94*	1.54	0.00	1.54
36.15	0.44	0.46	0.95*	1.54	0.00	1.54
36.20	0.44	0.46	0.95*	1.53	0.00	1.53

36.25	0.45	0.46	0.96*	1.52	0.00	1.52
36.30	0.45	0.46	0.97*	1.52	0.00	1.52
36.35	0.45	0.46	0.98*	1.51	0.00	1.51
36.40	0.46	0.46	0.99*	1.51	0.00	1.51
36.45	0.46	0.46	1.00	1.50	0.00	1.50
36.50	0.47	0.46	1.01	1.49	0.00	1.49
36.55	0.47	0.46	1.01	1.49	0.00	1.49
36.60	0.46	0.46	1.00	1.48	0.00	1.48
36.65	0.46	0.46	1.00*	1.47	0.00	1.47
36.70	0.46	0.46	0.99*	1.47	0.00	1.47
36.75	0.46	0.46	0.99*	1.46	0.00	1.46
36.80	0.45	0.46	0.98*	1.46	0.00	1.46
36.85	0.45	0.46	0.98*	1.45	0.00	1.45
36.90	0.45	0.46	0.97*	1.44	0.00	1.44
36.95	0.45	0.46	0.97*	1.44	0.00	1.44
37.00	0.45	0.46	0.96*	1.43	0.00	1.43
37.05	0.44	0.46	0.96*	1.42	0.00	1.42
37.10	0.44	0.46	0.95*	1.42	0.00	1.42
37.15	0.44	0.46	0.95*	1.41	0.00	1.41
37.20	0.44	0.46	0.95*	1.40	0.00	1.40
37.25	0.44	0.46	0.94*	1.40	0.00	1.40
37.30	0.43	0.46	0.94*	1.39	0.00	1.39
37.35	0.43	0.46	0.93*	1.38	0.00	1.38
37.40	0.43	0.46	0.93*	1.38	0.00	1.38
37.45	0.43	0.46	0.92*	1.37	0.00	1.37
37.50	0.43	0.46	0.92*	1.36	0.00	1.36
37.55	0.42	0.46	0.92*	1.36	0.00	1.36
37.60	0.42	0.46	0.91*	1.35	0.00	1.35
37.65	0.42	0.46	0.91*	1.34	0.00	1.34
37.70	0.42	0.46	0.90*	1.34	0.00	1.34
37.75	0.42	0.46	0.90*	1.33	0.00	1.33

37.80	0.42	0.46	0.90*	1.32	0.00	1.32
37.85	0.41	0.46	0.89*	1.32	0.00	1.32
37.90	0.41	0.46	0.89*	1.31	0.00	1.31
37.95	0.41	0.46	0.89*	1.30	0.00	1.30
38.00	0.41	0.46	0.88*	1.29	0.00	1.29
38.05	0.41	0.46	0.88*	1.29	0.00	1.29
38.10	0.41	0.46	0.87*	1.28	0.00	1.28
38.15	0.40	0.46	0.87*	1.27	0.00	1.27
38.20	0.40	0.46	0.87*	1.27	0.00	1.27
38.25	0.40	0.46	0.86*	1.26	0.00	1.26
38.30	0.40	0.46	0.86*	1.25	0.00	1.25
38.35	0.40	0.46	0.86*	1.24	0.00	1.24
38.40	0.40	0.46	0.85*	1.24	0.00	1.24
38.45	0.39	0.46	0.85*	1.23	0.00	1.23
38.50	0.39	0.46	0.85*	1.22	0.00	1.22
38.55	0.39	0.46	0.84*	1.22	0.00	1.22
38.60	0.39	0.46	0.84*	1.21	0.00	1.21
38.65	0.39	0.46	0.84*	1.20	0.00	1.20
38.70	0.39	0.46	0.83*	1.19	0.00	1.19
38.75	0.38	0.46	0.83*	1.19	0.00	1.19
38.80	0.38	0.46	0.83*	1.18	0.00	1.18
38.85	0.38	0.46	0.82*	1.17	0.00	1.17
38.90	0.38	0.46	0.82*	1.16	0.00	1.16
38.95	0.38	0.46	0.82*	1.16	0.00	1.16
39.00	0.38	0.46	0.81*	1.15	0.00	1.15
39.05	0.38	0.46	0.81*	1.14	0.00	1.14
39.10	0.37	0.46	0.81*	1.13	0.00	1.13
39.15	0.37	0.46	0.81*	1.13	0.00	1.13
39.20	0.37	0.46	0.80*	1.12	0.00	1.12
39.25	0.37	0.46	0.80*	1.11	0.00	1.11
39.30	0.37	0.46	0.80*	1.10	0.00	1.10

39.35	0.37	0.46	0.79*	1.09	0.00	1.09
39.40	0.37	0.46	0.79*	1.09	0.00	1.09
39.45	0.36	0.46	0.79*	1.08	0.00	1.08
39.50	0.36	0.46	0.78*	1.07	0.00	1.07
39.55	0.36	0.46	0.78*	1.06	0.00	1.06
39.60	0.36	0.46	0.78*	1.06	0.00	1.06
39.65	0.36	0.46	0.78*	1.05	0.00	1.05
39.70	0.36	0.46	0.77*	1.04	0.00	1.04
39.75	0.36	0.46	0.77*	1.03	0.00	1.03
39.80	0.35	0.46	0.77*	1.02	0.00	1.02
39.85	0.35	0.46	0.76*	1.02	0.00	1.02
39.90	0.35	0.46	0.76*	1.01	0.00	1.01
39.95	0.35	0.46	0.76*	1.00	0.00	1.00
40.00	0.35	0.46	0.76*	0.99	0.00	0.99
40.05	0.35	0.46	0.75*	0.98	0.00	0.98
40.10	0.35	0.46	0.75*	0.98	0.00	0.98
40.15	0.35	0.46	0.75*	0.97	0.00	0.97
40.20	0.34	0.46	0.75*	0.96	0.00	0.96
40.25	0.34	0.46	0.74*	0.95	0.00	0.95
40.30	0.34	0.46	0.74*	0.94	0.00	0.94
40.35	0.34	0.46	0.74*	0.93	0.00	0.93
40.40	0.34	0.46	0.73*	0.93	0.00	0.93
40.45	0.34	0.46	0.73*	0.92	0.00	0.92
40.50	0.34	0.46	0.73*	0.91	0.00	0.91
40.55	0.34	0.46	0.73*	0.90	0.00	0.90
40.60	0.33	0.46	0.72*	0.89	0.00	0.89
40.65	0.33	0.46	0.72*	0.88	0.00	0.88
40.70	0.33	0.46	0.72*	0.88	0.00	0.88
40.75	0.33	0.46	0.72*	0.87	0.00	0.87
40.80	0.33	0.46	0.71*	0.86	0.00	0.86
40.85	0.33	0.46	0.71*	0.85	0.00	0.85

40.90	0.33	0.46	0.71*	0.84	0.00	0.84
40.95	0.33	0.46	0.71*	0.83	0.00	0.83
41.00	0.33	0.46	0.70*	0.82	0.00	0.82
41.05	0.32	0.46	0.70*	0.82	0.00	0.82
41.10	0.32	0.46	0.70*	0.81	0.00	0.81
41.15	0.32	0.46	0.70*	0.80	0.00	0.80
41.20	0.32	0.46	0.69*	0.79	0.00	0.79
41.25	0.32	0.46	0.69*	0.78	0.00	0.78
41.30	0.32	0.46	0.69*	0.77	0.00	0.77
41.35	0.32	0.46	0.69*	0.76	0.00	0.76
41.40	0.32	0.46	0.68*	0.76	0.00	0.76
41.45	0.31	0.46	0.68*	0.75	0.00	0.75
41.50	0.31	0.46	0.68*	0.74	0.00	0.74
41.55	0.32	0.46	0.69*	0.73	0.00	0.73
41.60	0.32	0.46	0.70*	0.72	0.00	0.72
41.65	0.32	0.46	0.70*	0.71	0.00	0.71
41.70	0.33	0.46	0.71*	0.70	0.00	0.70
41.75	0.33	0.46	0.72*	0.69	0.00	0.69
41.80	0.34	0.46	0.73*	0.69	0.00	0.69
41.85	0.34	0.46	0.74*	0.68	0.00	0.68
41.90	0.34	0.46	0.74*	0.67	0.00	0.67
41.95	0.35	0.46	0.75*	0.66	0.00	0.66
42.00	0.35	0.46	0.76*	0.65	0.00	0.65
42.05	0.36	0.46	0.77*	0.64	0.00	0.64
42.10	0.36	0.46	0.78*	0.64	0.00	0.64
42.15	0.36	0.46	0.79*	0.63	0.00	0.63
42.20	0.37	0.46	0.80*	0.62	0.00	0.62
42.25	0.37	0.46	0.81*	0.61	0.00	0.61
42.30	0.38	0.46	0.82*	0.61	0.00	0.61
42.35	0.38	0.46	0.83*	0.60	0.00	0.60
42.40	0.38	0.46	0.84*	0.59	0.00	0.59

42.45	0.39	0.46	0.85*	0.58	0.00	0.58
42.50	0.39	0.46	0.86*	0.58	0.00	0.58
42.55	0.40	0.46	0.87*	0.57	0.00	0.57
42.60	0.40	0.46	0.88*	0.56	0.00	0.56
42.65	0.41	0.46	0.89*	0.55	0.00	0.55
42.70	0.41	0.46	0.90*	0.55	0.00	0.55
42.75	0.42	0.46	0.91*	0.54	0.00	0.54
42.80	0.42	0.46	0.92*	0.53	0.00	0.53
42.85	0.43	0.46	0.93*	0.53	0.00	0.53
42.90	0.44	0.46	0.95*	0.52	0.00	0.52
42.95	0.44	0.46	0.96*	0.51	0.00	0.51
43.00	0.45	0.46	0.97*	0.51	0.00	0.51
43.05	0.45	0.46	0.99*	0.50	0.00	0.50
43.10	0.46	0.46	1.00	0.50	0.00	0.50
43.15	0.47	0.46	1.02	0.49	0.00	0.49
43.20	0.47	0.46	1.03	0.48	0.00	0.48
43.25	0.48	0.46	1.05	0.48	0.00	0.48
43.30	0.49	0.46	1.06	0.47	0.00	0.47
43.35	0.50	0.46	1.08	0.47	0.00	0.47
43.40	0.51	0.46	1.10	0.46	0.00	0.46
43.45	0.52	0.46	1.12	0.45	0.00	0.45
43.50	0.53	0.46	1.15	0.45	0.00	0.45
43.55	0.54	0.46	1.17	0.44	0.00	0.44
43.60	0.55	0.46	1.20	0.44	0.00	0.44
43.65	0.57	0.46	1.24	0.43	0.00	0.43
43.70	0.60	0.46	1.30	0.43	0.00	0.43
43.75	0.64	0.46	1.39	0.42	0.00	0.42
43.80	0.71	0.46	1.54	0.42	0.00	0.42
43.85	0.71	0.46	1.54	0.42	0.00	0.42
43.90	0.71	0.46	1.54	0.41	0.00	0.41
43.95	0.71	0.46	1.54	0.41	0.00	0.41

44.00	0.71	0.46	1.54	0.40	0.00	0.40
44.05	0.71	0.46	1.54	0.40	0.00	0.40
44.10	0.71	0.46	1.54	0.40	0.00	0.40
44.15	0.71	0.46	1.54	0.39	0.00	0.39
44.20	0.71	0.46	1.54	0.39	0.00	0.39
44.25	0.71	0.46	1.54	0.39	0.00	0.39
44.30	0.71	0.46	1.54	0.39	0.00	0.39
44.35	0.71	0.46	1.54	0.38	0.00	0.38
44.40	0.71	0.46	1.54	0.38	0.00	0.38
44.45	0.71	0.46	1.54	0.38	0.00	0.38
44.50	0.71	0.46	1.54	0.38	0.00	0.38
44.55	0.71	0.46	1.54	0.38	0.00	0.38
44.60	0.71	0.46	1.54	0.38	0.00	0.38
44.65	0.71	0.46	1.54	0.38	0.00	0.38
44.70	0.71	0.46	1.54	0.37	0.00	0.37
44.75	0.71	0.46	1.55	0.37	0.00	0.37
44.80	0.71	0.46	1.55	0.37	0.00	0.37
44.85	0.71	0.46	1.55	0.37	0.00	0.37
44.90	0.71	0.46	1.55	0.37	0.00	0.37
44.95	0.71	0.46	1.55	0.37	0.00	0.37
45.00	0.71	0.46	1.55	0.37	0.00	0.37
45.05	0.71	0.46	1.55	0.37	0.00	0.37
45.10	0.71	0.46	1.55	0.37	0.00	0.37
45.15	0.71	0.46	1.55	0.37	0.00	0.37
45.20	0.71	0.46	1.55	0.37	0.00	0.37
45.25	0.71	0.46	1.55	0.37	0.00	0.37
45.30	0.71	0.46	1.55	0.37	0.00	0.37
45.35	0.71	0.46	1.55	0.37	0.00	0.37
45.40	0.71	0.46	1.55	0.37	0.00	0.37
45.45	0.71	0.46	1.55	0.37	0.00	0.37
45.50	0.71	0.46	1.55	0.37	0.00	0.37

45.55	0.71	0.46	1.55	0.37	0.00	0.37
45.60	0.70	0.46	1.55	0.37	0.00	0.37
45.65	0.70	0.46	1.55	0.37	0.00	0.37
45.70	0.70	0.46	1.55	0.37	0.00	0.37
45.75	0.70	0.46	1.55	0.37	0.00	0.37
45.80	0.70	0.46	1.55	0.37	0.00	0.37
45.85	0.70	0.46	1.55	0.37	0.00	0.37
45.90	0.70	0.46	1.55	0.37	0.00	0.37
45.95	0.70	0.46	1.55	0.37	0.00	0.37
46.00	0.70	0.46	1.55	0.37	0.00	0.37
46.05	0.70	0.46	1.55	0.37	0.00	0.37
46.10	0.70	0.46	1.55	0.37	0.00	0.37
46.15	0.70	0.45	1.55	0.37	0.00	0.37
46.20	0.70	0.45	1.55	0.37	0.00	0.37
46.25	0.70	0.45	1.55	0.37	0.00	0.37
46.30	0.70	0.45	1.55	0.37	0.00	0.37
46.35	0.70	0.45	1.55	0.37	0.00	0.37
46.40	0.70	0.45	1.55	0.37	0.00	0.37
46.45	0.70	0.45	1.55	0.37	0.00	0.37
46.50	0.70	0.45	1.55	0.37	0.00	0.37
46.55	0.70	0.45	1.55	0.37	0.00	0.37
46.60	0.70	0.45	1.55	0.37	0.00	0.37
46.65	0.70	0.45	1.55	0.37	0.00	0.37
46.70	0.70	0.45	1.55	0.37	0.00	0.37
46.75	0.70	0.45	1.55	0.37	0.00	0.37
46.80	0.70	0.45	1.55	0.37	0.00	0.37
46.85	0.70	0.45	1.55	0.37	0.00	0.37
46.90	0.70	0.45	1.55	0.37	0.00	0.37
46.95	0.70	0.45	1.55	0.37	0.00	0.37
47.00	0.70	0.45	1.55	0.37	0.00	0.37
47.05	0.70	0.45	1.55	0.37	0.00	0.37

47.10	0.70	0.45	1.55	0.37	0.00	0.37
47.15	0.70	0.45	1.55	0.37	0.00	0.37
47.20	0.70	0.45	1.55	0.37	0.00	0.37
47.25	0.70	0.45	1.55	0.37	0.00	0.37
47.30	0.70	0.45	1.55	0.37	0.00	0.37
47.35	0.70	0.45	1.55	0.37	0.00	0.37
47.40	0.70	0.45	1.55	0.37	0.00	0.37
47.45	0.70	0.45	1.55	0.37	0.00	0.37
47.50	0.70	0.45	1.55	0.37	0.00	0.37
47.55	0.70	0.45	1.55	0.37	0.00	0.37
47.60	0.70	0.45	1.55	0.37	0.00	0.37
47.65	0.70	0.45	1.55	0.37	0.00	0.37
47.70	0.70	0.45	1.55	0.37	0.00	0.37
47.75	0.70	0.45	1.55	0.37	0.00	0.37
47.80	0.70	0.45	1.55	0.37	0.00	0.37
47.85	0.70	0.45	1.55	0.37	0.00	0.37
47.90	0.70	0.45	1.55	0.37	0.00	0.37
47.95	0.70	0.45	1.55	0.37	0.00	0.37
48.00	0.70	0.45	1.55	0.37	0.00	0.37
48.05	0.70	0.45	1.55	0.37	0.00	0.37
48.10	0.70	0.45	1.55	0.37	0.00	0.37
48.15	0.70	0.45	1.55	0.37	0.00	0.37
48.20	0.70	0.45	1.55	0.37	0.00	0.37
48.25	0.70	0.45	1.55	0.37	0.00	0.37
48.30	0.70	0.45	1.55	0.37	0.00	0.37
48.35	0.70	0.45	1.55	0.37	0.00	0.37
48.40	0.70	0.45	1.55	0.37	0.00	0.37
48.45	0.70	0.45	1.55	0.37	0.00	0.37
48.50	0.70	0.45	1.55	0.37	0.00	0.37
48.55	0.70	0.45	1.55	0.37	0.00	0.37
48.60	0.70	0.45	1.55	0.37	0.00	0.37

48.65	0.70	0.45	1.55	0.37	0.00	0.37
48.70	0.70	0.45	1.55	0.37	0.00	0.37
48.75	0.70	0.45	1.55	0.37	0.00	0.37
48.80	0.70	0.45	1.55	0.37	0.00	0.37
48.85	0.70	0.45	1.55	0.37	0.00	0.37
48.90	0.70	0.45	1.55	0.37	0.00	0.37
48.95	0.70	0.45	1.55	0.37	0.00	0.37
49.00	0.70	0.45	1.55	0.37	0.00	0.37
49.05	0.70	0.45	1.55	0.37	0.00	0.37
49.10	0.70	0.45	1.55	0.37	0.00	0.37
49.15	0.70	0.45	1.55	0.37	0.00	0.37
49.20	0.70	0.45	1.55	0.37	0.00	0.37
49.25	0.70	0.45	1.55	0.37	0.00	0.37
49.30	0.70	0.45	1.55	0.37	0.00	0.37
49.35	0.70	0.45	1.55	0.37	0.00	0.37
49.40	0.70	0.45	1.55	0.37	0.00	0.37
49.45	0.70	0.45	1.56	0.37	0.00	0.37
49.50	0.70	0.45	1.56	0.37	0.00	0.37
49.55	0.70	0.45	1.56	0.37	0.00	0.37
49.60	0.70	0.45	1.56	0.37	0.00	0.37
49.65	0.70	0.45	1.56	0.37	0.00	0.37
49.70	0.70	0.45	1.56	0.37	0.00	0.37
49.75	0.70	0.45	1.56	0.37	0.00	0.37
49.80	0.70	0.45	1.56	0.37	0.00	0.37
49.85	0.70	0.45	1.56	0.37	0.00	0.37
49.90	0.70	0.45	1.56	0.37	0.00	0.37
49.95	0.70	0.45	1.56	0.37	0.00	0.37
50.00	0.70	0.45	1.56	0.37	0.00	0.37
50.05	0.70	0.45	1.56	0.37	0.00	0.37
50.10	0.70	0.45	1.56	0.37	0.00	0.37
50.15	0.69	0.45	1.56	0.37	0.00	0.37

50.20	0.69	0.45	1.56	0.37	0.00	0.37
50.25	0.69	0.45	1.56	0.37	0.00	0.37
50.30	0.69	0.45	1.56	0.37	0.00	0.37
50.35	0.69	0.45	1.56	0.37	0.00	0.37
50.40	0.69	0.45	1.56	0.37	0.00	0.37
50.45	0.69	0.45	1.56	0.37	0.00	0.37
50.50	0.69	0.45	1.56	0.37	0.00	0.37
50.55	0.69	0.45	1.56	0.37	0.00	0.37
50.60	0.69	0.45	1.56	0.37	0.00	0.37
50.65	0.69	0.44	1.56	0.37	0.00	0.37
50.70	0.69	0.44	1.56	0.37	0.00	0.37
50.75	0.69	0.44	1.56	0.37	0.00	0.37
50.80	0.69	0.44	1.56	0.37	0.00	0.37
50.85	0.69	0.44	1.56	0.37	0.00	0.37
50.90	0.69	0.44	1.56	0.37	0.00	0.37
50.95	0.69	0.44	1.56	0.37	0.00	0.37
51.00	0.69	0.44	1.56	0.37	0.00	0.37
51.05	0.69	0.44	1.56	0.37	0.00	0.37
51.10	0.69	0.44	1.56	0.37	0.00	0.37
51.15	0.69	0.44	1.56	0.37	0.00	0.37
51.20	0.69	0.44	1.56	0.37	0.00	0.37
51.25	0.69	0.44	1.56	0.37	0.00	0.37
51.30	0.69	0.44	1.56	0.37	0.00	0.37
51.35	0.69	0.44	1.56	0.37	0.00	0.37
51.40	0.69	0.44	1.56	0.37	0.00	0.37
51.45	0.69	0.44	1.56	0.37	0.00	0.37
51.50	0.69	0.44	1.56	0.37	0.00	0.37
51.55	0.69	0.44	1.56	0.37	0.00	0.37
51.60	0.69	0.44	1.56	0.37	0.00	0.37
51.65	0.69	0.44	1.56	0.37	0.00	0.37
51.70	0.69	0.44	1.56	0.37	0.00	0.37

51.75	0.69	0.44	1.56	0.37	0.00	0.37
51.80	0.69	0.44	1.56	0.37	0.00	0.37
51.85	0.69	0.44	1.56	0.37	0.00	0.37
51.90	0.69	0.44	1.56	0.37	0.00	0.37
51.95	0.69	0.44	1.57	0.37	0.00	0.37
52.00	0.69	0.44	1.57	0.37	0.00	0.37
52.05	0.69	0.44	1.57	0.37	0.00	0.37
52.10	0.69	0.44	1.57	0.37	0.00	0.37
52.15	0.69	0.44	1.57	0.37	0.00	0.37
52.20	0.69	0.44	1.57	0.37	0.00	0.37
52.25	0.69	0.44	1.57	0.37	0.00	0.37
52.30	0.69	0.44	1.57	0.37	0.00	0.37
52.35	0.69	0.44	1.57	0.37	0.00	0.37
52.40	0.69	0.44	1.57	0.37	0.00	0.37
52.45	0.69	0.44	1.57	0.37	0.00	0.37
52.50	0.69	0.44	1.57	0.37	0.00	0.37
52.55	0.69	0.44	1.57	0.37	0.00	0.37
52.60	0.69	0.44	1.57	0.37	0.00	0.37
52.65	0.69	0.44	1.57	0.37	0.00	0.37
52.70	0.69	0.44	1.57	0.37	0.00	0.37
52.75	0.69	0.44	1.57	0.37	0.00	0.37
52.80	0.69	0.44	1.57	0.37	0.00	0.37
52.85	0.69	0.44	1.57	0.37	0.00	0.37
52.90	0.69	0.44	1.57	0.37	0.00	0.37
52.95	0.69	0.44	1.57	0.37	0.00	0.37
53.00	0.69	0.44	1.57	0.37	0.00	0.37
53.05	2.00	0.44	5.00	0.37	0.00	0.37
53.10	2.00	0.44	5.00	0.37	0.00	0.37
53.15	2.00	0.44	5.00	0.37	0.00	0.37
53.20	2.00	0.44	5.00	0.37	0.00	0.37
53.25	2.00	0.44	5.00	0.37	0.00	0.37

53.30	2.00	0.44	5.00	0.37	0.00	0.37
53.35	2.00	0.44	5.00	0.37	0.00	0.37
53.40	2.00	0.44	5.00	0.37	0.00	0.37
53.45	2.00	0.44	5.00	0.37	0.00	0.37
53.50	2.00	0.44	5.00	0.37	0.00	0.37
53.55	2.00	0.44	5.00	0.37	0.00	0.37
53.60	2.00	0.44	5.00	0.37	0.00	0.37
53.65	2.00	0.44	5.00	0.37	0.00	0.37
53.70	2.00	0.44	5.00	0.37	0.00	0.37
53.75	2.00	0.44	5.00	0.37	0.00	0.37
53.80	2.00	0.44	5.00	0.37	0.00	0.37
53.85	2.00	0.44	5.00	0.37	0.00	0.37
53.90	2.00	0.44	5.00	0.37	0.00	0.37
53.95	2.00	0.44	5.00	0.37	0.00	0.37
54.00	2.00	0.44	5.00	0.37	0.00	0.37
54.05	2.00	0.44	5.00	0.37	0.00	0.37
54.10	2.00	0.44	5.00	0.37	0.00	0.37
54.15	2.00	0.44	5.00	0.37	0.00	0.37
54.20	2.00	0.44	5.00	0.37	0.00	0.37
54.25	2.00	0.44	5.00	0.37	0.00	0.37
54.30	2.00	0.44	5.00	0.37	0.00	0.37
54.35	2.00	0.43	5.00	0.37	0.00	0.37
54.40	2.00	0.43	5.00	0.37	0.00	0.37
54.45	2.00	0.43	5.00	0.37	0.00	0.37
54.50	2.00	0.43	5.00	0.37	0.00	0.37
54.55	2.00	0.43	5.00	0.37	0.00	0.37
54.60	2.00	0.43	5.00	0.37	0.00	0.37
54.65	2.00	0.43	5.00	0.37	0.00	0.37
54.70	2.00	0.43	5.00	0.37	0.00	0.37
54.75	2.00	0.43	5.00	0.37	0.00	0.37
54.80	2.00	0.43	5.00	0.37	0.00	0.37

54.85	2.00	0.43	5.00	0.37	0.00	0.37
54.90	2.00	0.43	5.00	0.37	0.00	0.37
54.95	2.00	0.43	5.00	0.37	0.00	0.37
55.00	2.00	0.43	5.00	0.37	0.00	0.37
55.05	2.00	0.43	5.00	0.37	0.00	0.37
55.10	2.00	0.43	5.00	0.37	0.00	0.37
55.15	2.00	0.43	5.00	0.37	0.00	0.37
55.20	2.00	0.43	5.00	0.37	0.00	0.37
55.25	2.00	0.43	5.00	0.37	0.00	0.37
55.30	2.00	0.43	5.00	0.37	0.00	0.37
55.35	2.00	0.43	5.00	0.37	0.00	0.37
55.40	2.00	0.43	5.00	0.37	0.00	0.37
55.45	2.00	0.43	5.00	0.37	0.00	0.37
55.50	2.00	0.43	5.00	0.37	0.00	0.37
55.55	2.00	0.43	5.00	0.37	0.00	0.37
55.60	2.00	0.43	5.00	0.37	0.00	0.37
55.65	2.00	0.43	5.00	0.37	0.00	0.37
55.70	2.00	0.43	5.00	0.37	0.00	0.37
55.75	2.00	0.43	5.00	0.37	0.00	0.37
55.80	2.00	0.43	5.00	0.37	0.00	0.37
55.85	2.00	0.43	5.00	0.37	0.00	0.37
55.90	2.00	0.43	5.00	0.37	0.00	0.37
55.95	2.00	0.43	5.00	0.37	0.00	0.37
56.00	2.00	0.43	5.00	0.37	0.00	0.37
56.05	2.00	0.43	5.00	0.37	0.00	0.37
56.10	2.00	0.43	5.00	0.37	0.00	0.37
56.15	2.00	0.43	5.00	0.37	0.00	0.37
56.20	2.00	0.43	5.00	0.37	0.00	0.37
56.25	2.00	0.43	5.00	0.37	0.00	0.37
56.30	2.00	0.43	5.00	0.37	0.00	0.37
56.35	2.00	0.43	5.00	0.37	0.00	0.37

56.40	2.00	0.43	5.00	0.37	0.00	0.37
56.45	2.00	0.43	5.00	0.37	0.00	0.37
56.50	2.00	0.43	5.00	0.37	0.00	0.37
56.55	2.00	0.43	5.00	0.37	0.00	0.37
56.60	2.00	0.43	5.00	0.37	0.00	0.37
56.65	2.00	0.43	5.00	0.37	0.00	0.37
56.70	2.00	0.43	5.00	0.37	0.00	0.37
56.75	2.00	0.43	5.00	0.37	0.00	0.37
56.80	2.00	0.43	5.00	0.37	0.00	0.37
56.85	2.00	0.43	5.00	0.37	0.00	0.37
56.90	2.00	0.43	5.00	0.37	0.00	0.37
56.95	2.00	0.43	5.00	0.37	0.00	0.37
57.00	2.00	0.43	5.00	0.37	0.00	0.37
57.05	2.00	0.43	5.00	0.37	0.00	0.37
57.10	2.00	0.43	5.00	0.37	0.00	0.37
57.15	2.00	0.43	5.00	0.37	0.00	0.37
57.20	2.00	0.43	5.00	0.37	0.00	0.37
57.25	2.00	0.43	5.00	0.37	0.00	0.37
57.30	2.00	0.43	5.00	0.37	0.00	0.37
57.35	2.00	0.43	5.00	0.37	0.00	0.37
57.40	2.00	0.43	5.00	0.37	0.00	0.37
57.45	2.00	0.43	5.00	0.37	0.00	0.37
57.50	2.00	0.43	5.00	0.37	0.00	0.37
57.55	2.00	0.43	5.00	0.37	0.00	0.37
57.60	2.00	0.43	5.00	0.37	0.00	0.37
57.65	2.00	0.43	5.00	0.37	0.00	0.37
57.70	2.00	0.43	5.00	0.37	0.00	0.37
57.75	2.00	0.42	5.00	0.37	0.00	0.37
57.80	2.00	0.42	5.00	0.37	0.00	0.37
57.85	2.00	0.42	5.00	0.37	0.00	0.37
57.90	2.00	0.42	5.00	0.37	0.00	0.37

57.95	2.00	0.42	5.00	0.37	0.00	0.37
58.00	2.00	0.42	5.00	0.37	0.00	0.37
58.05	2.00	0.42	5.00	0.37	0.00	0.37
58.10	2.00	0.42	5.00	0.37	0.00	0.37
58.15	2.00	0.42	5.00	0.37	0.00	0.37
58.20	2.00	0.42	5.00	0.37	0.00	0.37
58.25	2.00	0.42	5.00	0.37	0.00	0.37
58.30	2.00	0.42	5.00	0.37	0.00	0.37
58.35	2.00	0.42	5.00	0.37	0.00	0.37
58.40	2.00	0.42	5.00	0.37	0.00	0.37
58.45	2.00	0.42	5.00	0.37	0.00	0.37
58.50	2.00	0.42	5.00	0.37	0.00	0.37
58.55	2.00	0.42	5.00	0.37	0.00	0.37
58.60	2.00	0.42	5.00	0.37	0.00	0.37
58.65	2.00	0.42	5.00	0.37	0.00	0.37
58.70	2.00	0.42	5.00	0.37	0.00	0.37
58.75	2.00	0.42	5.00	0.37	0.00	0.37
58.80	2.00	0.42	5.00	0.37	0.00	0.37
58.85	2.00	0.42	5.00	0.37	0.00	0.37
58.90	2.00	0.42	5.00	0.37	0.00	0.37
58.95	2.00	0.42	5.00	0.37	0.00	0.37
59.00	2.00	0.42	5.00	0.37	0.00	0.37
59.05	2.00	0.42	5.00	0.37	0.00	0.37
59.10	2.00	0.42	5.00	0.37	0.00	0.37
59.15	2.00	0.42	5.00	0.37	0.00	0.37
59.20	2.00	0.42	5.00	0.37	0.00	0.37
59.25	2.00	0.42	5.00	0.37	0.00	0.37
59.30	2.00	0.42	5.00	0.37	0.00	0.37
59.35	2.00	0.42	5.00	0.37	0.00	0.37
59.40	2.00	0.42	5.00	0.37	0.00	0.37
59.45	2.00	0.42	5.00	0.37	0.00	0.37

59.50	2.00	0.42	5.00	0.37	0.00	0.37
59.55	2.00	0.42	5.00	0.37	0.00	0.37
59.60	2.00	0.42	5.00	0.37	0.00	0.37
59.65	2.00	0.42	5.00	0.37	0.00	0.37
59.70	2.00	0.42	5.00	0.37	0.00	0.37
59.75	2.00	0.42	5.00	0.37	0.00	0.37
59.80	2.00	0.42	5.00	0.37	0.00	0.37
59.85	2.00	0.42	5.00	0.37	0.00	0.37
59.90	2.00	0.42	5.00	0.37	0.00	0.37
59.95	2.00	0.42	5.00	0.37	0.00	0.37
60.00	2.00	0.42	5.00	0.37	0.00	0.37
60.05	2.00	0.42	5.00	0.37	0.00	0.37
60.10	2.00	0.42	5.00	0.37	0.00	0.37
60.15	2.00	0.42	5.00	0.37	0.00	0.37
60.20	2.00	0.42	5.00	0.37	0.00	0.37
60.25	2.00	0.42	5.00	0.37	0.00	0.37
60.30	2.00	0.42	5.00	0.37	0.00	0.37
60.35	2.00	0.42	5.00	0.37	0.00	0.37
60.40	2.00	0.42	5.00	0.37	0.00	0.37
60.45	2.00	0.42	5.00	0.37	0.00	0.37
60.50	2.00	0.42	5.00	0.37	0.00	0.37
60.55	2.00	0.42	5.00	0.37	0.00	0.37
60.60	2.00	0.42	5.00	0.37	0.00	0.37
60.65	2.00	0.42	5.00	0.37	0.00	0.37
60.70	2.00	0.42	5.00	0.37	0.00	0.37
60.75	2.00	0.42	5.00	0.37	0.00	0.37
60.80	2.00	0.42	5.00	0.37	0.00	0.37
60.85	2.00	0.41	5.00	0.37	0.00	0.37
60.90	2.00	0.41	5.00	0.37	0.00	0.37
60.95	2.00	0.41	5.00	0.37	0.00	0.37
61.00	2.00	0.41	5.00	0.37	0.00	0.37

61.05	2.00	0.41	5.00	0.37	0.00	0.37
61.10	2.00	0.41	5.00	0.37	0.00	0.37
61.15	2.00	0.41	5.00	0.37	0.00	0.37
61.20	2.00	0.41	5.00	0.37	0.00	0.37
61.25	2.00	0.41	5.00	0.37	0.00	0.37
61.30	2.00	0.41	5.00	0.37	0.00	0.37
61.35	2.00	0.41	5.00	0.37	0.00	0.37
61.40	2.00	0.41	5.00	0.37	0.00	0.37
61.45	2.00	0.41	5.00	0.37	0.00	0.37
61.50	2.00	0.41	5.00	0.37	0.00	0.37
61.55	2.00	0.41	5.00	0.37	0.00	0.37
61.60	2.00	0.41	5.00	0.37	0.00	0.37
61.65	2.00	0.41	5.00	0.37	0.00	0.37
61.70	2.00	0.41	5.00	0.37	0.00	0.37
61.75	2.00	0.41	5.00	0.37	0.00	0.37
61.80	2.00	0.41	5.00	0.37	0.00	0.37
61.85	2.00	0.41	5.00	0.37	0.00	0.37
61.90	2.00	0.41	5.00	0.37	0.00	0.37
61.95	2.00	0.41	5.00	0.37	0.00	0.37
62.00	2.00	0.41	5.00	0.37	0.00	0.37
62.05	2.00	0.41	5.00	0.37	0.00	0.37
62.10	2.00	0.41	5.00	0.37	0.00	0.37
62.15	2.00	0.41	5.00	0.37	0.00	0.37
62.20	2.00	0.41	5.00	0.37	0.00	0.37
62.25	2.00	0.41	5.00	0.37	0.00	0.37
62.30	2.00	0.41	5.00	0.37	0.00	0.37
62.35	2.00	0.41	5.00	0.37	0.00	0.37
62.40	2.00	0.41	5.00	0.37	0.00	0.37
62.45	2.00	0.41	5.00	0.37	0.00	0.37
62.50	2.00	0.41	5.00	0.37	0.00	0.37
62.55	2.00	0.41	5.00	0.37	0.00	0.37

62.60	2.00	0.41	5.00	0.37	0.00	0.37
62.65	2.00	0.41	5.00	0.37	0.00	0.37
62.70	2.00	0.41	5.00	0.37	0.00	0.37
62.75	2.00	0.41	5.00	0.37	0.00	0.37
62.80	2.00	0.41	5.00	0.37	0.00	0.37
62.85	2.00	0.41	5.00	0.37	0.00	0.37
62.90	2.00	0.41	5.00	0.37	0.00	0.37
62.95	2.00	0.41	5.00	0.37	0.00	0.37
63.00	2.00	0.41	5.00	0.37	0.00	0.37
63.05	2.00	0.41	5.00	0.37	0.00	0.37
63.10	2.00	0.41	5.00	0.37	0.00	0.37
63.15	2.00	0.41	5.00	0.37	0.00	0.37
63.20	2.00	0.41	5.00	0.37	0.00	0.37
63.25	2.00	0.41	5.00	0.37	0.00	0.37
63.30	2.00	0.41	5.00	0.37	0.00	0.37
63.35	2.00	0.41	5.00	0.37	0.00	0.37
63.40	2.00	0.41	5.00	0.37	0.00	0.37
63.45	2.00	0.41	5.00	0.37	0.00	0.37
63.50	2.00	0.41	5.00	0.37	0.00	0.37
63.55	2.00	0.41	5.00	0.37	0.00	0.37
63.60	2.00	0.41	5.00	0.37	0.00	0.37
63.65	2.00	0.41	5.00	0.37	0.00	0.37
63.70	2.00	0.41	5.00	0.37	0.00	0.37
63.75	2.00	0.40	5.00	0.37	0.00	0.37
63.80	2.00	0.40	5.00	0.37	0.00	0.37
63.85	2.00	0.40	5.00	0.37	0.00	0.37
63.90	2.00	0.40	5.00	0.37	0.00	0.37
63.95	2.00	0.40	5.00	0.37	0.00	0.37
64.00	2.00	0.40	5.00	0.37	0.00	0.37
64.05	2.00	0.40	5.00	0.37	0.00	0.37
64.10	2.00	0.40	5.00	0.37	0.00	0.37

64.15	2.00	0.40	5.00	0.37	0.00	0.37
64.20	2.00	0.40	5.00	0.37	0.00	0.37
64.25	2.00	0.40	5.00	0.37	0.00	0.37
64.30	2.00	0.40	5.00	0.37	0.00	0.37
64.35	2.00	0.40	5.00	0.37	0.00	0.37
64.40	2.00	0.40	5.00	0.37	0.00	0.37
64.45	2.00	0.40	5.00	0.37	0.00	0.37
64.50	2.00	0.40	5.00	0.37	0.00	0.37
64.55	2.00	0.40	5.00	0.37	0.00	0.37
64.60	2.00	0.40	5.00	0.37	0.00	0.37
64.65	2.00	0.40	5.00	0.37	0.00	0.37
64.70	2.00	0.40	5.00	0.37	0.00	0.37
64.75	2.00	0.40	5.00	0.37	0.00	0.37
64.80	2.00	0.40	5.00	0.37	0.00	0.37
64.85	2.00	0.40	5.00	0.37	0.00	0.37
64.90	2.00	0.40	5.00	0.37	0.00	0.37
64.95	2.00	0.40	5.00	0.37	0.00	0.37
65.00	2.00	0.40	5.00	0.37	0.00	0.37
65.05	2.00	0.40	5.00	0.37	0.00	0.37
65.10	2.00	0.40	5.00	0.37	0.00	0.37
65.15	2.00	0.40	5.00	0.37	0.00	0.37
65.20	2.00	0.40	5.00	0.37	0.00	0.37
65.25	2.00	0.40	5.00	0.37	0.00	0.37
65.30	2.00	0.40	5.00	0.37	0.00	0.37
65.35	2.00	0.40	5.00	0.37	0.00	0.37
65.40	2.00	0.40	5.00	0.37	0.00	0.37
65.45	2.00	0.40	5.00	0.37	0.00	0.37
65.50	2.00	0.40	5.00	0.37	0.00	0.37
65.55	2.00	0.40	5.00	0.37	0.00	0.37
65.60	2.00	0.40	5.00	0.37	0.00	0.37
65.65	2.00	0.40	5.00	0.37	0.00	0.37

65.70	2.00	0.40	5.00	0.37	0.00	0.37
65.75	2.00	0.40	5.00	0.37	0.00	0.37
65.80	2.00	0.40	5.00	0.37	0.00	0.37
65.85	2.00	0.40	5.00	0.37	0.00	0.37
65.90	2.00	0.40	5.00	0.37	0.00	0.37
65.95	2.00	0.40	5.00	0.37	0.00	0.37
66.00	2.00	0.40	5.00	0.37	0.00	0.37
66.05	2.00	0.40	5.00	0.37	0.00	0.37
66.10	2.00	0.40	5.00	0.37	0.00	0.37
66.15	2.00	0.40	5.00	0.37	0.00	0.37
66.20	2.00	0.40	5.00	0.37	0.00	0.37
66.25	2.00	0.40	5.00	0.37	0.00	0.37
66.30	2.00	0.40	5.00	0.37	0.00	0.37
66.35	2.00	0.40	5.00	0.37	0.00	0.37
66.40	2.00	0.40	5.00	0.37	0.00	0.37
66.45	2.00	0.39	5.00	0.37	0.00	0.37
66.50	2.00	0.39	5.00	0.37	0.00	0.37
66.55	2.00	0.39	5.00	0.37	0.00	0.37
66.60	2.00	0.39	5.00	0.37	0.00	0.37
66.65	2.00	0.39	5.00	0.37	0.00	0.37
66.70	2.00	0.39	5.00	0.37	0.00	0.37
66.75	2.00	0.39	5.00	0.37	0.00	0.37
66.80	2.00	0.39	5.00	0.37	0.00	0.37
66.85	2.00	0.39	5.00	0.37	0.00	0.37
66.90	2.00	0.39	5.00	0.37	0.00	0.37
66.95	2.00	0.39	5.00	0.37	0.00	0.37
67.00	2.00	0.39	5.00	0.37	0.00	0.37
67.05	2.00	0.39	5.00	0.37	0.00	0.37
67.10	2.00	0.39	5.00	0.37	0.00	0.37
67.15	2.00	0.39	5.00	0.37	0.00	0.37
67.20	2.00	0.39	5.00	0.37	0.00	0.37

67.25	2.00	0.39	5.00	0.37	0.00	0.37
67.30	2.00	0.39	5.00	0.37	0.00	0.37
67.35	2.00	0.39	5.00	0.37	0.00	0.37
67.40	2.00	0.39	5.00	0.37	0.00	0.37
67.45	2.00	0.39	5.00	0.37	0.00	0.37
67.50	2.00	0.39	5.00	0.37	0.00	0.37
67.55	2.00	0.39	5.00	0.37	0.00	0.37
67.60	2.00	0.39	5.00	0.37	0.00	0.37
67.65	2.00	0.39	5.00	0.37	0.00	0.37
67.70	2.00	0.39	5.00	0.37	0.00	0.37
67.75	2.00	0.39	5.00	0.37	0.00	0.37
67.80	2.00	0.39	5.00	0.37	0.00	0.37
67.85	2.00	0.39	5.00	0.37	0.00	0.37
67.90	2.00	0.39	5.00	0.37	0.00	0.37
67.95	2.00	0.39	5.00	0.37	0.00	0.37
68.00	2.00	0.39	5.00	0.37	0.00	0.37
68.05	2.00	0.39	5.00	0.37	0.00	0.37
68.10	2.00	0.39	5.00	0.37	0.00	0.37
68.15	2.00	0.39	5.00	0.37	0.00	0.37
68.20	2.00	0.39	5.00	0.37	0.00	0.37
68.25	2.00	0.39	5.00	0.37	0.00	0.37
68.30	2.00	0.39	5.00	0.37	0.00	0.37
68.35	2.00	0.39	5.00	0.37	0.00	0.37
68.40	2.00	0.39	5.00	0.37	0.00	0.37
68.45	2.00	0.39	5.00	0.37	0.00	0.37
68.50	2.00	0.39	5.00	0.37	0.00	0.37
68.55	2.00	0.39	5.00	0.37	0.00	0.37
68.60	2.00	0.39	5.00	0.37	0.00	0.37
68.65	2.00	0.39	5.00	0.37	0.00	0.37
68.70	2.00	0.39	5.00	0.37	0.00	0.37
68.75	2.00	0.39	5.00	0.37	0.00	0.37

68.80	2.00	0.39	5.00	0.37	0.00	0.37
68.85	2.00	0.39	5.00	0.37	0.00	0.37
68.90	2.00	0.39	5.00	0.37	0.00	0.37
68.95	2.00	0.39	5.00	0.37	0.00	0.37
69.00	2.00	0.39	5.00	0.37	0.00	0.37
69.05	2.00	0.38	5.00	0.37	0.00	0.37
69.10	2.00	0.38	5.00	0.37	0.00	0.37
69.15	2.00	0.38	5.00	0.37	0.00	0.37
69.20	2.00	0.38	5.00	0.37	0.00	0.37
69.25	2.00	0.38	5.00	0.37	0.00	0.37
69.30	2.00	0.38	5.00	0.37	0.00	0.37
69.35	2.00	0.38	5.00	0.37	0.00	0.37
69.40	2.00	0.38	5.00	0.37	0.00	0.37
69.45	2.00	0.38	5.00	0.37	0.00	0.37
69.50	2.00	0.38	5.00	0.37	0.00	0.37
69.55	2.00	0.38	5.00	0.37	0.00	0.37
69.60	2.00	0.38	5.00	0.37	0.00	0.37
69.65	2.00	0.38	5.00	0.37	0.00	0.37
69.70	2.00	0.38	5.00	0.37	0.00	0.37
69.75	2.00	0.38	5.00	0.37	0.00	0.37
69.80	2.00	0.38	5.00	0.37	0.00	0.37
69.85	2.00	0.38	5.00	0.37	0.00	0.37
69.90	2.00	0.38	5.00	0.37	0.00	0.37
69.95	2.00	0.38	5.00	0.37	0.00	0.37
70.00	2.00	0.38	5.00	0.37	0.00	0.37
70.05	2.00	0.38	5.00	0.37	0.00	0.37
70.10	2.00	0.38	5.00	0.37	0.00	0.37
70.15	2.00	0.38	5.00	0.37	0.00	0.37
70.20	2.00	0.38	5.00	0.37	0.00	0.37
70.25	2.00	0.38	5.00	0.37	0.00	0.37
70.30	2.00	0.38	5.00	0.37	0.00	0.37

70.35	2.00	0.38	5.00	0.37	0.00	0.37
70.40	2.00	0.38	5.00	0.37	0.00	0.37
70.45	2.00	0.38	5.00	0.37	0.00	0.37
70.50	2.00	0.38	5.00	0.37	0.00	0.37
70.55	2.00	0.38	5.00	0.37	0.00	0.37
70.60	2.00	0.38	5.00	0.37	0.00	0.37
70.65	2.00	0.38	5.00	0.37	0.00	0.37
70.70	2.00	0.38	5.00	0.37	0.00	0.37
70.75	2.00	0.38	5.00	0.37	0.00	0.37
70.80	2.00	0.38	5.00	0.37	0.00	0.37
70.85	2.00	0.38	5.00	0.37	0.00	0.37
70.90	2.00	0.38	5.00	0.37	0.00	0.37
70.95	2.00	0.38	5.00	0.37	0.00	0.37
71.00	2.00	0.38	5.00	0.37	0.00	0.37
71.05	2.00	0.38	5.00	0.37	0.00	0.37
71.10	2.00	0.38	5.00	0.37	0.00	0.37
71.15	2.00	0.38	5.00	0.37	0.00	0.37
71.20	2.00	0.38	5.00	0.37	0.00	0.37
71.25	2.00	0.38	5.00	0.37	0.00	0.37
71.30	2.00	0.38	5.00	0.37	0.00	0.37
71.35	2.00	0.38	5.00	0.37	0.00	0.37
71.40	2.00	0.38	5.00	0.37	0.00	0.37
71.45	2.00	0.38	5.00	0.37	0.00	0.37
71.50	2.00	0.38	5.00	0.37	0.00	0.37
71.55	0.29	0.38	0.78*	0.37	0.00	0.37
71.60	0.30	0.37	0.79*	0.37	0.00	0.37
71.65	0.30	0.37	0.79*	0.36	0.00	0.36
71.70	0.30	0.37	0.80*	0.35	0.00	0.35
71.75	0.30	0.37	0.81*	0.34	0.00	0.34
71.80	0.31	0.37	0.82*	0.33	0.00	0.33
71.85	0.31	0.37	0.82*	0.33	0.00	0.33

71.90	0.31	0.37	0.83*	0.32	0.00	0.32
71.95	0.31	0.37	0.84*	0.31	0.00	0.31
72.00	0.32	0.37	0.85*	0.30	0.00	0.30
72.05	0.32	0.37	0.85*	0.29	0.00	0.29
72.10	0.32	0.37	0.86*	0.29	0.00	0.29
72.15	0.32	0.37	0.87*	0.28	0.00	0.28
72.20	0.33	0.37	0.88*	0.27	0.00	0.27
72.25	0.33	0.37	0.88*	0.26	0.00	0.26
72.30	0.33	0.37	0.89*	0.26	0.00	0.26
72.35	0.33	0.37	0.90*	0.25	0.00	0.25
72.40	0.34	0.37	0.91*	0.24	0.00	0.24
72.45	0.34	0.37	0.92*	0.23	0.00	0.23
72.50	0.34	0.37	0.92*	0.23	0.00	0.23
72.55	0.35	0.37	0.93*	0.22	0.00	0.22
72.60	0.35	0.37	0.94*	0.21	0.00	0.21
72.65	0.35	0.37	0.95*	0.20	0.00	0.20
72.70	0.35	0.37	0.96*	0.20	0.00	0.20
72.75	0.36	0.37	0.97*	0.19	0.00	0.19
72.80	0.36	0.37	0.98*	0.18	0.00	0.18
72.85	0.36	0.37	0.99*	0.18	0.00	0.18
72.90	0.37	0.37	0.99*	0.17	0.00	0.17
72.95	0.37	0.37	1.00	0.16	0.00	0.16
73.00	0.37	0.37	1.01	0.16	0.00	0.16
73.05	0.38	0.37	1.02	0.15	0.00	0.15
73.10	0.38	0.37	1.03	0.14	0.00	0.14
73.15	0.38	0.37	1.04	0.14	0.00	0.14
73.20	0.39	0.37	1.05	0.13	0.00	0.13
73.25	0.39	0.37	1.06	0.12	0.00	0.12
73.30	0.40	0.37	1.08	0.12	0.00	0.12
73.35	0.40	0.37	1.09	0.11	0.00	0.11
73.40	0.40	0.37	1.10	0.10	0.00	0.10

73.45	0.41	0.37	1.11	0.10	0.00	0.10
73.50	0.41	0.37	1.12	0.09	0.00	0.09
73.55	0.42	0.37	1.13	0.09	0.00	0.09
73.60	0.42	0.37	1.15	0.08	0.00	0.08
73.65	0.42	0.37	1.16	0.08	0.00	0.08
73.70	0.43	0.37	1.17	0.07	0.00	0.07
73.75	0.43	0.37	1.19	0.07	0.00	0.07
73.80	0.44	0.37	1.20	0.06	0.00	0.06
73.85	0.44	0.37	1.21	0.06	0.00	0.06
73.90	0.45	0.37	1.23	0.05	0.00	0.05
73.95	0.45	0.37	1.24	0.05	0.00	0.05
74.00	0.46	0.36	1.26	0.04	0.00	0.04
74.05	0.47	0.36	1.28	0.04	0.00	0.04
74.10	0.47	0.36	1.30	0.04	0.00	0.04
74.15	0.48	0.36	1.32	0.03	0.00	0.03
74.20	0.49	0.36	1.34	0.03	0.00	0.03
74.25	0.50	0.36	1.36	0.03	0.00	0.03
74.30	0.51	0.36	1.39	0.02	0.00	0.02
74.35	0.52	0.36	1.43	0.02	0.00	0.02
74.40	0.53	0.36	1.47	0.02	0.00	0.02
74.45	0.55	0.36	1.52	0.02	0.00	0.02
74.50	0.58	0.36	1.60	0.01	0.00	0.01
74.55	0.63	0.36	1.74	0.01	0.00	0.01
74.60	0.65	0.36	1.79	0.01	0.00	0.01
74.65	0.65	0.36	1.79	0.01	0.00	0.01
74.70	0.65	0.36	1.79	0.01	0.00	0.01
74.75	0.65	0.36	1.80	0.01	0.00	0.01
74.80	0.65	0.36	1.80	0.01	0.00	0.01
74.85	0.65	0.36	1.80	0.01	0.00	0.01
74.90	0.65	0.36	1.80	0.01	0.00	0.01
74.95	0.65	0.36	1.80	0.00	0.00	0.00

75.00	0.65	0.36	1.80	0.00	0.00	0.00
75.05	0.65	0.36	1.80	0.00	0.00	0.00
75.10	0.65	0.36	1.80	0.00	0.00	0.00
75.15	0.65	0.36	1.80	0.00	0.00	0.00
75.20	0.65	0.36	1.80	0.00	0.00	0.00
75.25	0.65	0.36	1.80	0.00	0.00	0.00
75.30	0.65	0.36	1.80	0.00	0.00	0.00
75.35	0.65	0.36	1.81	0.00	0.00	0.00
75.40	0.65	0.36	1.81	0.00	0.00	0.00
75.45	0.65	0.36	1.81	0.00	0.00	0.00
75.50	0.65	0.36	1.81	0.00	0.00	0.00
75.55	0.65	0.36	1.81	0.00	0.00	0.00
75.60	0.65	0.36	1.81	0.00	0.00	0.00
75.65	0.65	0.36	1.81	0.00	0.00	0.00
75.70	0.65	0.36	1.81	0.00	0.00	0.00
75.75	0.65	0.36	1.81	0.00	0.00	0.00
75.80	0.65	0.36	1.81	0.00	0.00	0.00
75.85	0.65	0.36	1.81	0.00	0.00	0.00
75.90	0.65	0.36	1.81	0.00	0.00	0.00
75.95	0.65	0.36	1.81	0.00	0.00	0.00
76.00	0.65	0.36	1.81	0.00	0.00	0.00
76.05	0.65	0.36	1.81	0.00	0.00	0.00
76.10	0.65	0.36	1.81	0.00	0.00	0.00
76.15	0.65	0.36	1.81	0.00	0.00	0.00
76.20	0.65	0.36	1.81	0.00	0.00	0.00
76.25	0.65	0.36	1.81	0.00	0.00	0.00
76.30	0.65	0.36	1.81	0.00	0.00	0.00
76.35	0.65	0.36	1.81	0.00	0.00	0.00
76.40	0.65	0.36	1.81	0.00	0.00	0.00
76.45	0.65	0.36	1.81	0.00	0.00	0.00
76.50	0.65	0.36	1.81	0.00	0.00	0.00

76.55	0.65	0.36	1.81	0.00	0.00	0.00
76.60	0.65	0.36	1.81	0.00	0.00	0.00
76.65	0.65	0.36	1.81	0.00	0.00	0.00
76.70	0.65	0.36	1.81	0.00	0.00	0.00
76.75	0.65	0.36	1.81	0.00	0.00	0.00
76.80	0.65	0.36	1.81	0.00	0.00	0.00
76.85	0.65	0.36	1.80	0.00	0.00	0.00
76.90	0.65	0.36	1.80	0.00	0.00	0.00
76.95	0.65	0.36	1.80	0.00	0.00	0.00
77.00	0.65	0.36	1.80	0.00	0.00	0.00
77.05	0.65	0.36	1.80	0.00	0.00	0.00
77.10	0.65	0.36	1.80	0.00	0.00	0.00
77.15	0.65	0.36	1.80	0.00	0.00	0.00
77.20	0.65	0.36	1.80	0.00	0.00	0.00
77.25	0.65	0.36	1.80	0.00	0.00	0.00
77.30	0.65	0.36	1.80	0.00	0.00	0.00
77.35	0.65	0.36	1.80	0.00	0.00	0.00
77.40	0.65	0.36	1.80	0.00	0.00	0.00
77.45	0.65	0.36	1.80	0.00	0.00	0.00
77.50	0.64	0.36	1.80	0.00	0.00	0.00
77.55	0.64	0.36	1.80	0.00	0.00	0.00
77.60	0.64	0.36	1.80	0.00	0.00	0.00
77.65	0.64	0.36	1.80	0.00	0.00	0.00
77.70	0.64	0.36	1.80	0.00	0.00	0.00
77.75	0.64	0.36	1.80	0.00	0.00	0.00
77.80	0.64	0.36	1.80	0.00	0.00	0.00
77.85	0.64	0.36	1.80	0.00	0.00	0.00
77.90	0.64	0.36	1.80	0.00	0.00	0.00
77.95	0.64	0.36	1.80	0.00	0.00	0.00
78.00	0.64	0.36	1.80	0.00	0.00	0.00
78.05	0.64	0.36	1.80	0.00	0.00	0.00

78.10	0.64	0.36	1.80	0.00	0.00	0.00
78.15	0.64	0.36	1.80	0.00	0.00	0.00
78.20	0.64	0.36	1.80	0.00	0.00	0.00
78.25	0.64	0.36	1.80	0.00	0.00	0.00
78.30	0.64	0.36	1.80	0.00	0.00	0.00
78.35	0.64	0.36	1.80	0.00	0.00	0.00
78.40	0.64	0.36	1.80	0.00	0.00	0.00
78.45	0.64	0.36	1.80	0.00	0.00	0.00
78.50	0.64	0.36	1.80	0.00	0.00	0.00
78.55	0.64	0.36	1.80	0.00	0.00	0.00
78.60	0.64	0.36	1.80	0.00	0.00	0.00
78.65	0.64	0.36	1.80	0.00	0.00	0.00
78.70	0.64	0.36	1.80	0.00	0.00	0.00
78.75	0.64	0.36	1.80	0.00	0.00	0.00
78.80	0.64	0.36	1.80	0.00	0.00	0.00
78.85	0.64	0.36	1.80	0.00	0.00	0.00
78.90	0.64	0.36	1.80	0.00	0.00	0.00
78.95	0.64	0.36	1.80	0.00	0.00	0.00
79.00	0.64	0.36	1.80	0.00	0.00	0.00
79.05	0.64	0.36	1.80	0.00	0.00	0.00
79.10	0.64	0.36	1.80	0.00	0.00	0.00
79.15	0.64	0.36	1.80	0.00	0.00	0.00
79.20	0.64	0.36	1.80	0.00	0.00	0.00
79.25	0.64	0.36	1.80	0.00	0.00	0.00
79.30	0.64	0.36	1.80	0.00	0.00	0.00
79.35	0.64	0.36	1.80	0.00	0.00	0.00
79.40	0.64	0.36	1.80	0.00	0.00	0.00
79.45	0.64	0.36	1.80	0.00	0.00	0.00
79.50	0.64	0.36	1.80	0.00	0.00	0.00
79.55	0.64	0.36	1.80	0.00	0.00	0.00
79.60	0.64	0.36	1.80	0.00	0.00	0.00

79.65	0.64	0.36	1.80	0.00	0.00	0.00
79.70	0.64	0.36	1.80	0.00	0.00	0.00
79.75	0.64	0.36	1.80	0.00	0.00	0.00
79.80	0.64	0.36	1.80	0.00	0.00	0.00
79.85	0.64	0.36	1.80	0.00	0.00	0.00
79.90	0.64	0.36	1.80	0.00	0.00	0.00
79.95	0.64	0.36	1.80	0.00	0.00	0.00
80.00	0.64	0.36	1.80	0.00	0.00	0.00
80.05	0.64	0.36	1.80	0.00	0.00	0.00
80.10	0.64	0.36	1.80	0.00	0.00	0.00
80.15	0.64	0.36	1.80	0.00	0.00	0.00
80.20	0.64	0.36	1.80	0.00	0.00	0.00
80.25	0.64	0.36	1.80	0.00	0.00	0.00
80.30	0.64	0.36	1.80	0.00	0.00	0.00
80.35	0.64	0.36	1.80	0.00	0.00	0.00
80.40	0.64	0.36	1.80	0.00	0.00	0.00
80.45	0.64	0.36	1.80	0.00	0.00	0.00
80.50	0.64	0.36	1.80	0.00	0.00	0.00
80.55	0.64	0.36	1.80	0.00	0.00	0.00
80.60	0.64	0.36	1.80	0.00	0.00	0.00
80.65	0.64	0.36	1.80	0.00	0.00	0.00
80.70	0.64	0.36	1.80	0.00	0.00	0.00
80.75	0.64	0.36	1.80	0.00	0.00	0.00
80.80	0.64	0.36	1.80	0.00	0.00	0.00
80.85	0.64	0.36	1.80	0.00	0.00	0.00
80.90	0.64	0.36	1.80	0.00	0.00	0.00
80.95	0.64	0.36	1.80	0.00	0.00	0.00
81.00	0.64	0.36	1.80	0.00	0.00	0.00
81.05	0.64	0.35	1.80	0.00	0.00	0.00
81.10	0.64	0.35	1.80	0.00	0.00	0.00
81.15	0.64	0.35	1.80	0.00	0.00	0.00

81.20	0.64	0.35	1.80	0.00	0.00	0.00
81.25	0.64	0.35	1.80	0.00	0.00	0.00
81.30	0.64	0.35	1.80	0.00	0.00	0.00
81.35	0.64	0.35	1.80	0.00	0.00	0.00
81.40	0.64	0.35	1.80	0.00	0.00	0.00
81.45	0.64	0.35	1.80	0.00	0.00	0.00
81.50	0.64	0.35	1.80	0.00	0.00	0.00
81.55	0.64	0.35	1.80	0.00	0.00	0.00
81.60	0.64	0.35	1.80	0.00	0.00	0.00
81.65	0.64	0.35	1.80	0.00	0.00	0.00
81.70	0.64	0.35	1.80	0.00	0.00	0.00
81.75	0.64	0.35	1.80	0.00	0.00	0.00
81.80	0.64	0.35	1.80	0.00	0.00	0.00
81.85	0.64	0.35	1.80	0.00	0.00	0.00
81.90	0.64	0.35	1.80	0.00	0.00	0.00
81.95	0.64	0.35	1.80	0.00	0.00	0.00
82.00	0.64	0.35	1.80	0.00	0.00	0.00
82.05	0.64	0.35	1.80	0.00	0.00	0.00
82.10	0.64	0.35	1.80	0.00	0.00	0.00
82.15	0.64	0.35	1.80	0.00	0.00	0.00
82.20	0.64	0.35	1.80	0.00	0.00	0.00
82.25	0.64	0.35	1.80	0.00	0.00	0.00
82.30	0.64	0.35	1.80	0.00	0.00	0.00
82.35	0.64	0.35	1.80	0.00	0.00	0.00
82.40	0.64	0.35	1.80	0.00	0.00	0.00
82.45	0.64	0.35	1.80	0.00	0.00	0.00
82.50	0.64	0.35	1.80	0.00	0.00	0.00
82.55	0.64	0.35	1.80	0.00	0.00	0.00
82.60	0.64	0.35	1.80	0.00	0.00	0.00
82.65	0.64	0.35	1.80	0.00	0.00	0.00
82.70	0.64	0.35	1.80	0.00	0.00	0.00

82.75	0.64	0.35	1.80	0.00	0.00	0.00
82.80	0.64	0.35	1.80	0.00	0.00	0.00
82.85	0.64	0.35	1.80	0.00	0.00	0.00
82.90	0.64	0.35	1.80	0.00	0.00	0.00
82.95	0.64	0.35	1.80	0.00	0.00	0.00
83.00	0.64	0.35	1.80	0.00	0.00	0.00
83.05	0.64	0.35	1.80	0.00	0.00	0.00
83.10	0.64	0.35	1.80	0.00	0.00	0.00
83.15	0.64	0.35	1.80	0.00	0.00	0.00
83.20	0.64	0.35	1.80	0.00	0.00	0.00
83.25	0.64	0.35	1.80	0.00	0.00	0.00
83.30	0.64	0.35	1.80	0.00	0.00	0.00
83.35	0.64	0.35	1.80	0.00	0.00	0.00
83.40	0.64	0.35	1.80	0.00	0.00	0.00
83.45	0.64	0.35	1.80	0.00	0.00	0.00
83.50	0.64	0.35	1.80	0.00	0.00	0.00
83.55	0.64	0.35	1.80	0.00	0.00	0.00
83.60	0.64	0.35	1.80	0.00	0.00	0.00
83.65	0.64	0.35	1.80	0.00	0.00	0.00
83.70	0.64	0.35	1.80	0.00	0.00	0.00
83.75	0.63	0.35	1.80	0.00	0.00	0.00
83.80	0.63	0.35	1.80	0.00	0.00	0.00
83.85	0.63	0.35	1.80	0.00	0.00	0.00
83.90	0.63	0.35	1.80	0.00	0.00	0.00
83.95	0.63	0.35	1.80	0.00	0.00	0.00
84.00	0.63	0.35	1.80	0.00	0.00	0.00
84.05	0.63	0.35	1.80	0.00	0.00	0.00
84.10	0.63	0.35	1.80	0.00	0.00	0.00
84.15	0.63	0.35	1.80	0.00	0.00	0.00
84.20	0.63	0.35	1.80	0.00	0.00	0.00
84.25	0.63	0.35	1.80	0.00	0.00	0.00

84.30	0.63	0.35	1.80	0.00	0.00	0.00
84.35	0.63	0.35	1.80	0.00	0.00	0.00
84.40	0.63	0.35	1.80	0.00	0.00	0.00
84.45	0.63	0.35	1.80	0.00	0.00	0.00
84.50	0.63	0.35	1.80	0.00	0.00	0.00
84.55	0.63	0.35	1.80	0.00	0.00	0.00
84.60	0.63	0.35	1.80	0.00	0.00	0.00
84.65	0.63	0.35	1.80	0.00	0.00	0.00
84.70	0.63	0.35	1.80	0.00	0.00	0.00
84.75	0.63	0.35	1.80	0.00	0.00	0.00
84.80	0.63	0.35	1.80	0.00	0.00	0.00
84.85	0.63	0.35	1.80	0.00	0.00	0.00
84.90	0.63	0.35	1.80	0.00	0.00	0.00
84.95	0.63	0.35	1.80	0.00	0.00	0.00
85.00	0.63	0.35	1.80	0.00	0.00	0.00
85.05	0.63	0.35	1.80	0.00	0.00	0.00
85.10	0.63	0.35	1.80	0.00	0.00	0.00
85.15	0.63	0.35	1.80	0.00	0.00	0.00
85.20	0.63	0.35	1.80	0.00	0.00	0.00
85.25	0.63	0.35	1.80	0.00	0.00	0.00
85.30	0.63	0.35	1.80	0.00	0.00	0.00
85.35	0.63	0.35	1.80	0.00	0.00	0.00
85.40	0.63	0.35	1.80	0.00	0.00	0.00
85.45	0.63	0.35	1.80	0.00	0.00	0.00
85.50	0.63	0.35	1.80	0.00	0.00	0.00
85.55	0.63	0.35	1.80	0.00	0.00	0.00
85.60	0.63	0.35	1.80	0.00	0.00	0.00
85.65	0.63	0.35	1.80	0.00	0.00	0.00
85.70	0.63	0.35	1.80	0.00	0.00	0.00
85.75	0.63	0.35	1.80	0.00	0.00	0.00
85.80	0.63	0.35	1.80	0.00	0.00	0.00

85.85	0.63	0.35	1.80	0.00	0.00	0.00
85.90	0.63	0.35	1.80	0.00	0.00	0.00
85.95	0.63	0.35	1.80	0.00	0.00	0.00
86.00	0.63	0.35	1.80	0.00	0.00	0.00
86.05	0.63	0.35	1.80	0.00	0.00	0.00
86.10	0.63	0.35	1.80	0.00	0.00	0.00
86.15	0.63	0.35	1.80	0.00	0.00	0.00
86.20	0.63	0.35	1.80	0.00	0.00	0.00
86.25	0.63	0.35	1.80	0.00	0.00	0.00
86.30	0.63	0.35	1.80	0.00	0.00	0.00
86.35	0.63	0.35	1.80	0.00	0.00	0.00
86.40	0.63	0.35	1.80	0.00	0.00	0.00
86.45	0.63	0.35	1.80	0.00	0.00	0.00
86.50	0.63	0.35	1.80	0.00	0.00	0.00
86.55	0.63	0.35	1.80	0.00	0.00	0.00
86.60	0.63	0.35	1.80	0.00	0.00	0.00
86.65	0.63	0.35	1.80	0.00	0.00	0.00
86.70	0.63	0.35	1.80	0.00	0.00	0.00
86.75	0.63	0.35	1.80	0.00	0.00	0.00
86.80	0.63	0.35	1.80	0.00	0.00	0.00
86.85	0.63	0.35	1.80	0.00	0.00	0.00
86.90	0.63	0.35	1.80	0.00	0.00	0.00
86.95	0.63	0.35	1.80	0.00	0.00	0.00
87.00	0.63	0.35	1.80	0.00	0.00	0.00
87.05	0.63	0.35	1.80	0.00	0.00	0.00
87.10	0.63	0.35	1.80	0.00	0.00	0.00
87.15	0.63	0.35	1.80	0.00	0.00	0.00
87.20	0.63	0.35	1.80	0.00	0.00	0.00
87.25	0.63	0.35	1.80	0.00	0.00	0.00
87.30	0.63	0.35	1.80	0.00	0.00	0.00
87.35	0.63	0.35	1.80	0.00	0.00	0.00

87.40	0.63	0.35	1.80	0.00	0.00	0.00
87.45	0.63	0.35	1.80	0.00	0.00	0.00
87.50	0.63	0.35	1.80	0.00	0.00	0.00
87.55	0.63	0.35	1.80	0.00	0.00	0.00
87.60	0.63	0.35	1.80	0.00	0.00	0.00
87.65	0.63	0.35	1.80	0.00	0.00	0.00
87.70	0.63	0.35	1.80	0.00	0.00	0.00
87.75	0.63	0.35	1.80	0.00	0.00	0.00
87.80	0.63	0.35	1.80	0.00	0.00	0.00
87.85	0.63	0.35	1.80	0.00	0.00	0.00
87.90	0.63	0.35	1.80	0.00	0.00	0.00
87.95	0.63	0.35	1.80	0.00	0.00	0.00
88.00	0.63	0.35	1.80	0.00	0.00	0.00
88.05	0.63	0.35	1.80	0.00	0.00	0.00
88.10	0.63	0.35	1.80	0.00	0.00	0.00
88.15	0.63	0.35	1.80	0.00	0.00	0.00
88.20	0.63	0.35	1.80	0.00	0.00	0.00
88.25	0.63	0.35	1.80	0.00	0.00	0.00
88.30	0.63	0.35	1.80	0.00	0.00	0.00
88.35	0.63	0.35	1.80	0.00	0.00	0.00
88.40	0.63	0.35	1.80	0.00	0.00	0.00
88.45	0.63	0.35	1.80	0.00	0.00	0.00
88.50	0.63	0.35	1.80	0.00	0.00	0.00
88.55	0.63	0.35	1.80	0.00	0.00	0.00
88.60	0.63	0.35	1.80	0.00	0.00	0.00
88.65	0.63	0.35	1.80	0.00	0.00	0.00
88.70	0.63	0.35	1.80	0.00	0.00	0.00
88.75	0.63	0.35	1.80	0.00	0.00	0.00
88.80	0.63	0.35	1.80	0.00	0.00	0.00
88.85	0.63	0.35	1.80	0.00	0.00	0.00
88.90	0.63	0.35	1.80	0.00	0.00	0.00

88.95	0.63	0.35	1.80	0.00	0.00	0.00
89.00	0.63	0.35	1.80	0.00	0.00	0.00
89.05	0.63	0.35	1.80	0.00	0.00	0.00
89.10	0.63	0.35	1.80	0.00	0.00	0.00
89.15	0.63	0.35	1.80	0.00	0.00	0.00
89.20	0.63	0.35	1.80	0.00	0.00	0.00
89.25	0.63	0.35	1.80	0.00	0.00	0.00
89.30	0.63	0.35	1.80	0.00	0.00	0.00
89.35	0.63	0.35	1.80	0.00	0.00	0.00
89.40	0.63	0.35	1.80	0.00	0.00	0.00
89.45	0.63	0.35	1.80	0.00	0.00	0.00
89.50	0.63	0.35	1.80	0.00	0.00	0.00
89.55	0.63	0.35	1.80	0.00	0.00	0.00
89.60	0.63	0.35	1.80	0.00	0.00	0.00
89.65	0.63	0.35	1.80	0.00	0.00	0.00
89.70	0.63	0.35	1.80	0.00	0.00	0.00
89.75	0.63	0.35	1.80	0.00	0.00	0.00
89.80	0.63	0.35	1.80	0.00	0.00	0.00
89.85	0.63	0.35	1.80	0.00	0.00	0.00
89.90	0.63	0.35	1.80	0.00	0.00	0.00
89.95	0.62	0.35	1.80	0.00	0.00	0.00
90.00	0.62	0.35	1.80	0.00	0.00	0.00
90.05	0.62	0.35	1.80	0.00	0.00	0.00
90.10	0.62	0.35	1.80	0.00	0.00	0.00
90.15	0.62	0.35	1.80	0.00	0.00	0.00
90.20	0.62	0.35	1.80	0.00	0.00	0.00
90.25	0.62	0.35	1.80	0.00	0.00	0.00
90.30	0.62	0.35	1.80	0.00	0.00	0.00
90.35	0.62	0.35	1.80	0.00	0.00	0.00
90.40	0.62	0.35	1.80	0.00	0.00	0.00
90.45	0.62	0.35	1.80	0.00	0.00	0.00

90.50	0.62	0.35	1.80	0.00	0.00	0.00
90.55	0.62	0.35	1.80	0.00	0.00	0.00
90.60	0.62	0.35	1.80	0.00	0.00	0.00
90.65	0.62	0.35	1.80	0.00	0.00	0.00
90.70	0.62	0.35	1.80	0.00	0.00	0.00
90.75	0.62	0.35	1.80	0.00	0.00	0.00
90.80	0.62	0.35	1.80	0.00	0.00	0.00
90.85	0.62	0.35	1.80	0.00	0.00	0.00
90.90	0.62	0.35	1.80	0.00	0.00	0.00
90.95	0.62	0.35	1.80	0.00	0.00	0.00
91.00	0.62	0.35	1.80	0.00	0.00	0.00
91.05	0.62	0.35	1.80	0.00	0.00	0.00
91.10	0.62	0.35	1.80	0.00	0.00	0.00
91.15	0.62	0.35	1.80	0.00	0.00	0.00
91.20	0.62	0.35	1.80	0.00	0.00	0.00
91.25	0.62	0.35	1.80	0.00	0.00	0.00
91.30	0.62	0.35	1.80	0.00	0.00	0.00
91.35	0.62	0.35	1.80	0.00	0.00	0.00
91.40	0.62	0.35	1.80	0.00	0.00	0.00
91.45	0.62	0.35	1.80	0.00	0.00	0.00
91.50	0.62	0.35	1.80	0.00	0.00	0.00
91.55	0.62	0.35	1.80	0.00	0.00	0.00
91.60	0.62	0.35	1.80	0.00	0.00	0.00
91.65	0.62	0.35	1.80	0.00	0.00	0.00
91.70	0.62	0.35	1.80	0.00	0.00	0.00
91.75	0.62	0.35	1.80	0.00	0.00	0.00
91.80	0.62	0.34	1.80	0.00	0.00	0.00
91.85	0.62	0.34	1.80	0.00	0.00	0.00
91.90	0.62	0.34	1.80	0.00	0.00	0.00
91.95	0.62	0.34	1.80	0.00	0.00	0.00
92.00	0.62	0.34	1.80	0.00	0.00	0.00

92.05	0.62	0.34	1.80	0.00	0.00	0.00
92.10	0.62	0.34	1.80	0.00	0.00	0.00
92.15	0.62	0.34	1.80	0.00	0.00	0.00
92.20	0.62	0.34	1.80	0.00	0.00	0.00
92.25	0.62	0.34	1.80	0.00	0.00	0.00
92.30	0.62	0.34	1.80	0.00	0.00	0.00
92.35	0.62	0.34	1.80	0.00	0.00	0.00
92.40	0.62	0.34	1.80	0.00	0.00	0.00
92.45	0.62	0.34	1.80	0.00	0.00	0.00
92.50	0.62	0.34	1.80	0.00	0.00	0.00
92.55	0.62	0.34	1.80	0.00	0.00	0.00
92.60	0.62	0.34	1.80	0.00	0.00	0.00
92.65	0.62	0.34	1.80	0.00	0.00	0.00
92.70	0.62	0.34	1.80	0.00	0.00	0.00
92.75	0.62	0.34	1.80	0.00	0.00	0.00
92.80	0.62	0.34	1.80	0.00	0.00	0.00
92.85	0.62	0.34	1.80	0.00	0.00	0.00
92.90	0.62	0.34	1.80	0.00	0.00	0.00
92.95	0.62	0.34	1.80	0.00	0.00	0.00
93.00	0.62	0.34	1.80	0.00	0.00	0.00
93.05	0.62	0.34	1.80	0.00	0.00	0.00
93.10	0.62	0.34	1.80	0.00	0.00	0.00
93.15	0.62	0.34	1.80	0.00	0.00	0.00
93.20	0.62	0.34	1.80	0.00	0.00	0.00
93.25	0.62	0.34	1.80	0.00	0.00	0.00
93.30	0.62	0.34	1.80	0.00	0.00	0.00
93.35	0.62	0.34	1.80	0.00	0.00	0.00
93.40	0.62	0.34	1.81	0.00	0.00	0.00
93.45	0.62	0.34	1.81	0.00	0.00	0.00
93.50	0.62	0.34	1.81	0.00	0.00	0.00
93.55	0.62	0.34	1.81	0.00	0.00	0.00

93.60	0.62	0.34	1.81	0.00	0.00	0.00
93.65	0.62	0.34	1.81	0.00	0.00	0.00
93.70	0.62	0.34	1.81	0.00	0.00	0.00
93.75	0.62	0.34	1.81	0.00	0.00	0.00
93.80	0.62	0.34	1.81	0.00	0.00	0.00
93.85	0.62	0.34	1.81	0.00	0.00	0.00
93.90	0.62	0.34	1.81	0.00	0.00	0.00
93.95	0.62	0.34	1.81	0.00	0.00	0.00
94.00	0.62	0.34	1.81	0.00	0.00	0.00
94.05	0.62	0.34	1.81	0.00	0.00	0.00
94.10	0.62	0.34	1.81	0.00	0.00	0.00
94.15	0.62	0.34	1.81	0.00	0.00	0.00
94.20	0.62	0.34	1.81	0.00	0.00	0.00
94.25	0.62	0.34	1.81	0.00	0.00	0.00
94.30	0.62	0.34	1.81	0.00	0.00	0.00
94.35	0.62	0.34	1.81	0.00	0.00	0.00
94.40	0.62	0.34	1.81	0.00	0.00	0.00
94.45	0.62	0.34	1.81	0.00	0.00	0.00
94.50	0.62	0.34	1.81	0.00	0.00	0.00
94.55	0.62	0.34	1.81	0.00	0.00	0.00
94.60	0.62	0.34	1.81	0.00	0.00	0.00
94.65	0.62	0.34	1.81	0.00	0.00	0.00
94.70	0.62	0.34	1.81	0.00	0.00	0.00
94.75	0.62	0.34	1.81	0.00	0.00	0.00
94.80	0.62	0.34	1.81	0.00	0.00	0.00
94.85	0.62	0.34	1.81	0.00	0.00	0.00
94.90	0.62	0.34	1.81	0.00	0.00	0.00
94.95	0.62	0.34	1.81	0.00	0.00	0.00
95.00	0.62	0.34	1.81	0.00	0.00	0.00
95.05	0.62	0.34	1.81	0.00	0.00	0.00
95.10	0.62	0.34	1.81	0.00	0.00	0.00

95.15	0.62	0.34	1.81	0.00	0.00	0.00
95.20	0.62	0.34	1.81	0.00	0.00	0.00
95.25	0.62	0.34	1.81	0.00	0.00	0.00
95.30	0.62	0.34	1.81	0.00	0.00	0.00
95.35	0.62	0.34	1.81	0.00	0.00	0.00
95.40	0.62	0.34	1.81	0.00	0.00	0.00
95.45	0.62	0.34	1.81	0.00	0.00	0.00
95.50	0.62	0.34	1.81	0.00	0.00	0.00
95.55	0.62	0.34	1.81	0.00	0.00	0.00
95.60	0.62	0.34	1.81	0.00	0.00	0.00
95.65	0.62	0.34	1.81	0.00	0.00	0.00
95.70	0.62	0.34	1.81	0.00	0.00	0.00
95.75	0.62	0.34	1.81	0.00	0.00	0.00
95.80	0.62	0.34	1.81	0.00	0.00	0.00
95.85	0.62	0.34	1.81	0.00	0.00	0.00
95.90	0.62	0.34	1.81	0.00	0.00	0.00
95.95	0.62	0.34	1.81	0.00	0.00	0.00
96.00	2.00	0.34	5.00	0.00	0.00	0.00
96.05	2.00	0.34	5.00	0.00	0.00	0.00
96.10	2.00	0.34	5.00	0.00	0.00	0.00
96.15	2.00	0.34	5.00	0.00	0.00	0.00
96.20	2.00	0.34	5.00	0.00	0.00	0.00
96.25	2.00	0.34	5.00	0.00	0.00	0.00
96.30	2.00	0.34	5.00	0.00	0.00	0.00
96.35	2.00	0.34	5.00	0.00	0.00	0.00
96.40	2.00	0.34	5.00	0.00	0.00	0.00
96.45	2.00	0.34	5.00	0.00	0.00	0.00
96.50	2.00	0.34	5.00	0.00	0.00	0.00
96.55	2.00	0.34	5.00	0.00	0.00	0.00
96.60	2.00	0.34	5.00	0.00	0.00	0.00
96.65	2.00	0.34	5.00	0.00	0.00	0.00

96.70	2.00	0.34	5.00	0.00	0.00	0.00
96.75	2.00	0.34	5.00	0.00	0.00	0.00
96.80	2.00	0.34	5.00	0.00	0.00	0.00
96.85	2.00	0.34	5.00	0.00	0.00	0.00
96.90	2.00	0.34	5.00	0.00	0.00	0.00
96.95	2.00	0.34	5.00	0.00	0.00	0.00
97.00	2.00	0.34	5.00	0.00	0.00	0.00
97.05	2.00	0.34	5.00	0.00	0.00	0.00
97.10	2.00	0.34	5.00	0.00	0.00	0.00
97.15	2.00	0.34	5.00	0.00	0.00	0.00
97.20	2.00	0.34	5.00	0.00	0.00	0.00
97.25	2.00	0.34	5.00	0.00	0.00	0.00
97.30	2.00	0.34	5.00	0.00	0.00	0.00
97.35	2.00	0.34	5.00	0.00	0.00	0.00
97.40	2.00	0.34	5.00	0.00	0.00	0.00
97.45	2.00	0.34	5.00	0.00	0.00	0.00
97.50	2.00	0.34	5.00	0.00	0.00	0.00
97.55	2.00	0.34	5.00	0.00	0.00	0.00
97.60	2.00	0.34	5.00	0.00	0.00	0.00
97.65	2.00	0.34	5.00	0.00	0.00	0.00
97.70	2.00	0.34	5.00	0.00	0.00	0.00
97.75	2.00	0.34	5.00	0.00	0.00	0.00
97.80	2.00	0.34	5.00	0.00	0.00	0.00
97.85	2.00	0.34	5.00	0.00	0.00	0.00
97.90	2.00	0.34	5.00	0.00	0.00	0.00
97.95	2.00	0.34	5.00	0.00	0.00	0.00
98.00	2.00	0.34	5.00	0.00	0.00	0.00
98.05	2.00	0.34	5.00	0.00	0.00	0.00
98.10	2.00	0.34	5.00	0.00	0.00	0.00
98.15	2.00	0.34	5.00	0.00	0.00	0.00
98.20	2.00	0.34	5.00	0.00	0.00	0.00

98.25	2.00	0.34	5.00	0.00	0.00	0.00
98.30	2.00	0.34	5.00	0.00	0.00	0.00
98.35	2.00	0.34	5.00	0.00	0.00	0.00
98.40	2.00	0.34	5.00	0.00	0.00	0.00
98.45	2.00	0.34	5.00	0.00	0.00	0.00
98.50	2.00	0.34	5.00	0.00	0.00	0.00
98.55	2.00	0.34	5.00	0.00	0.00	0.00
98.60	2.00	0.34	5.00	0.00	0.00	0.00
98.65	2.00	0.34	5.00	0.00	0.00	0.00
98.70	2.00	0.34	5.00	0.00	0.00	0.00
98.75	2.00	0.34	5.00	0.00	0.00	0.00
98.80	2.00	0.34	5.00	0.00	0.00	0.00
98.85	2.00	0.34	5.00	0.00	0.00	0.00
98.90	2.00	0.34	5.00	0.00	0.00	0.00
98.95	2.00	0.34	5.00	0.00	0.00	0.00
99.00	2.00	0.34	5.00	0.00	0.00	0.00
99.05	2.00	0.34	5.00	0.00	0.00	0.00
99.10	2.00	0.34	5.00	0.00	0.00	0.00
99.15	2.00	0.34	5.00	0.00	0.00	0.00
99.20	2.00	0.34	5.00	0.00	0.00	0.00
99.25	2.00	0.34	5.00	0.00	0.00	0.00
99.30	2.00	0.34	5.00	0.00	0.00	0.00
99.35	2.00	0.34	5.00	0.00	0.00	0.00
99.40	2.00	0.34	5.00	0.00	0.00	0.00
99.45	2.00	0.34	5.00	0.00	0.00	0.00
99.50	2.00	0.34	5.00	0.00	0.00	0.00
99.55	2.00	0.34	5.00	0.00	0.00	0.00
99.60	2.00	0.34	5.00	0.00	0.00	0.00
99.65	2.00	0.34	5.00	0.00	0.00	0.00
99.70	2.00	0.34	5.00	0.00	0.00	0.00
99.75	2.00	0.34	5.00	0.00	0.00	0.00

99.80	2.00	0.34	5.00	0.00	0.00	0.00
99.85	2.00	0.34	5.00	0.00	0.00	0.00
99.90	2.00	0.34	5.00	0.00	0.00	0.00
99.95	2.00	0.34	5.00	0.00	0.00	0.00
100.00	2.00	0.34	5.00	0.00	0.00	0.00

---

* F.S.<1, Liquefaction Potential Zone

(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

---

1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils

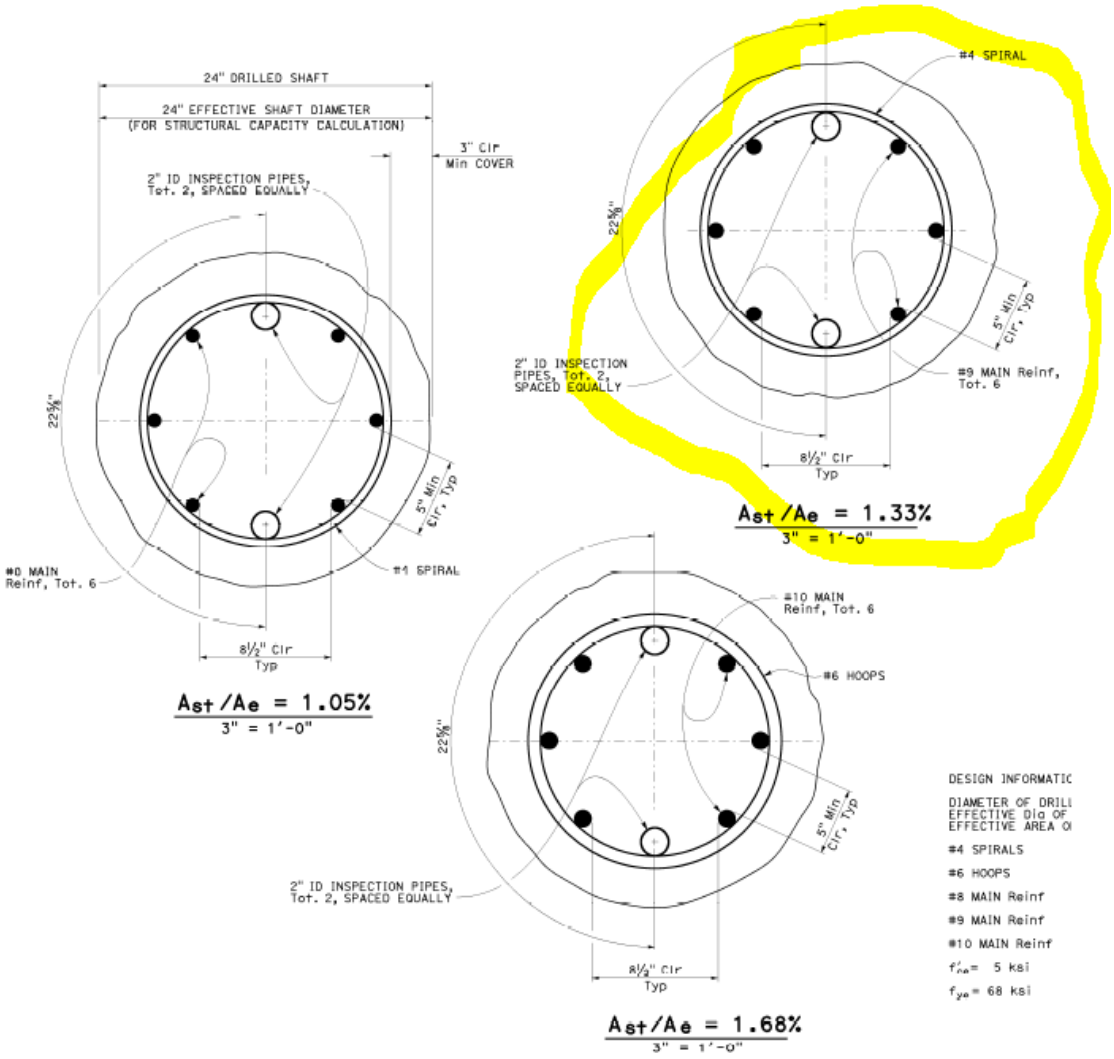
APPENDIX E

Lateral Resistance Analysis

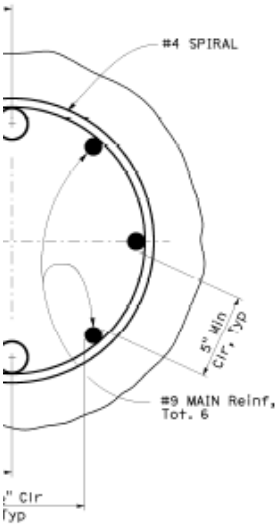
Boring A-19-001

Abutment #2

24-inch CIDH Pile


24" DRILLED SHAFT
24" EFFECTIVE SHAFT DIAMETER
(FOR STRUCTURAL CAPACITY CALCULATION)
3" Clr
Min COVER
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
22⅝"
5" Min
Clr, Typ
#8 MAIN
Reinf, Tot. 6
#4 SPIRAL
8½" Clr
Typ
Ast /Ae = 1.05%
3" = 1'-0"
#4 SPIRAL
2" ID INSPECTION
PIPES, Tot. 2,
SPACED EQUALLY
#9 MAIN Reinf,
Tot. 6
Ast /Ae = 1.33%
3" = 1'-0"
#10 MAIN
Reinf, Tot. 6
#6 HOOPS
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
Ast/Ae = 1.68%
3" = 1'-0"
DESIGN INFORMATIC
DIAMETER OF DRILL
EFFECTIVE Dia OF
EFFECTIVE AREA O
#4 SPIRALS
#6 HOOPS
#8 MAIN Reinf
#9 MAIN Reinf
#10 MAIN Reinf
f'ce= 5 ksi
fye= 68 ksi

ATTACHMENT A



= 1.33%
1'-0"

AIN
, Tot. 6

#6 HOOPS

5" Min
Clr, Typ

STEEL $P_s = A_{st}/A_e$	UNFACTORED AXIAL LOAD (P_n)		SPIRALS SPACING C-C	HOOPS SPACING C-C	M_{nx} @ ϵ_c=0.003	M_p	Φ_p	I_{cr}	Φ_{Yi}	V_s
%	%	kips	in	in	kip-ft	kip-ft	rad/in	ft^4	rad/in	kips
1.05% STEEL	0	0	6		236	224	0.001770	0.143	0.000224	55
		0	6		236	224	0.001770	0.143	0.000224	55
	5	95	6		294	273	0.002006	0.177	0.000221	55
		95	6		294	273	0.002006	0.177	0.000221	55
	10	189	6		344	318	0.001657	0.203	0.000225	55
		189	6		344	318	0.001657	0.203	0.000225	55
	15	284	6		380	358	0.001469	0.223	0.000231	55
		284	6		380	358	0.001469	0.223	0.000231	55
	20	378	6		414	392	0.001265	0.236	0.000238	55
		378	6		414	392	0.001265	0.236	0.000238	55
1.33% STEEL	0	0	6		287	274	0.001669	0.171	0.000230	55
		0	6		287	274	0.001669	0.171	0.000230	55
	5	98	6		345	323	0.001850	0.202	0.000230	55
		98	6		345	323	0.001850	0.202	0.000230	55
	10	196	6		385	366	0.001565	0.225	0.000234	55
		196	6		385	366	0.001565	0.225	0.000234	55
	15	294	6		420	403	0.001368	0.242	0.000239	55
		294	6		420	403	0.001368	0.242	0.000239	55
	20	392	6		453	434	0.001204	0.253	0.000246	55
		392	6		453	434	0.001204	0.253	0.000246	55
1.68% STEEL	0	0		6	345	326	0.001311	0.1983	0.000242	118
		0		6	345	326	0.001311	0.193	0.000242	118
	5	102		6	390	377	0.002795	0.22	0.000245	118
		102		6	390	377	0.002795	0.22	0.000245	118
	10	205		6	425	415	0.002552	0.239	0.000249	118
		205		6	425	415	0.002552	0.239	0.000249	118
	15	307		6	458	447	0.002271	0.253	0.000254	118
		307		6	458	447	0.002271	0.253	0.000254	118
	20	409		6	490	472	0.002054	0.261	0.000261	118
		409		6	490	472	0.002054	0.261	0.000261	118

DESIGN INFORMATION:

DIAMETER OF DRILLED SHAFT = 24"
EFFECTIVE Dia OF PILE (ϕ_{eff}) = 24"
EFFECTIVE AREA OF PILE (A_e) = 452 in^2

#4 SPIRALS - DEFORMED ϕ = 0.56", A_b = 0.20 in^2

#6 HOOPS - DEFORMED ϕ = 0.88", A_b = 0.44 in^2

#8 MAIN Reinf - DEFORMED ϕ = 1.13", A_b = 0.79 in^2

#9 MAIN Reinf - DEFORMED ϕ = 1.25", A_b = 1.00 in^2

#10 MAIN Reinf - DEFORMED ϕ = 1.44", A_b = 1.27 in^2

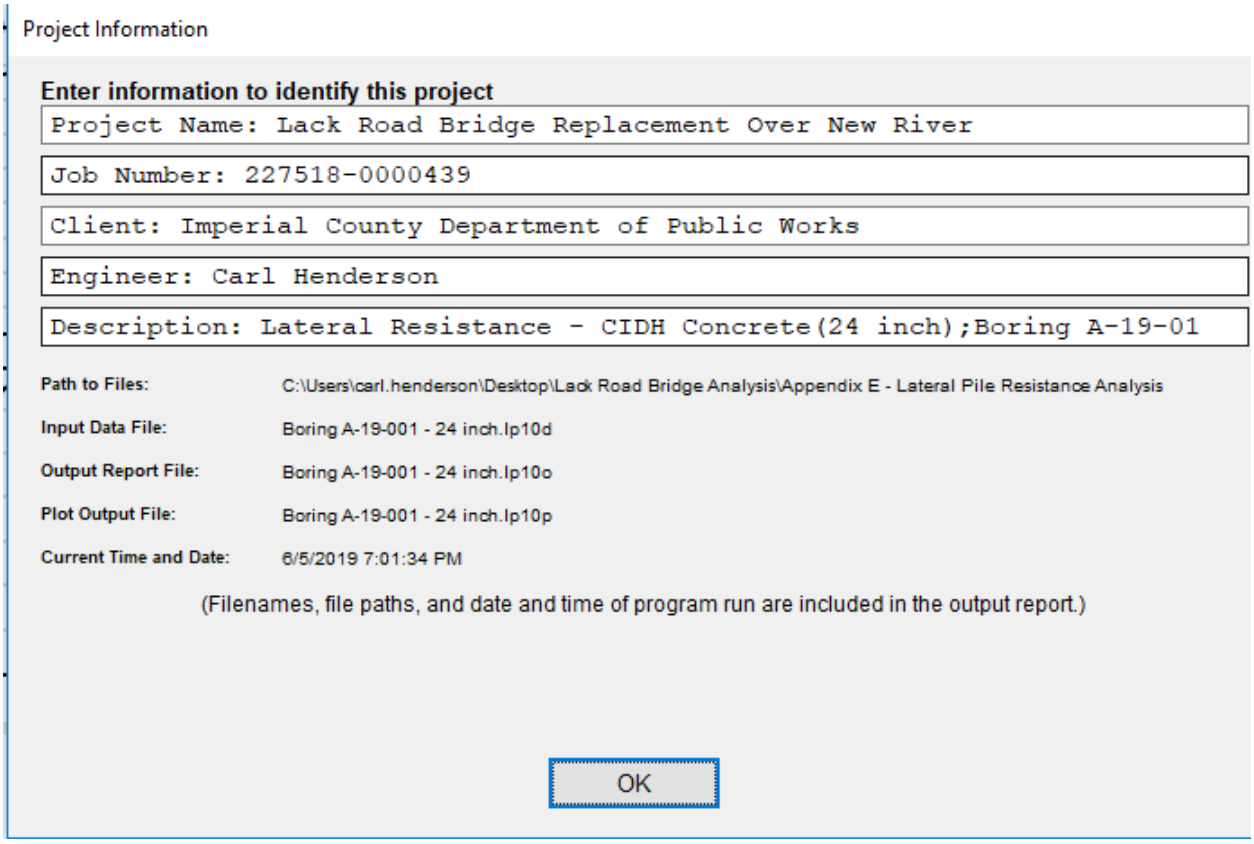
f'_{ce} = 5 ksi

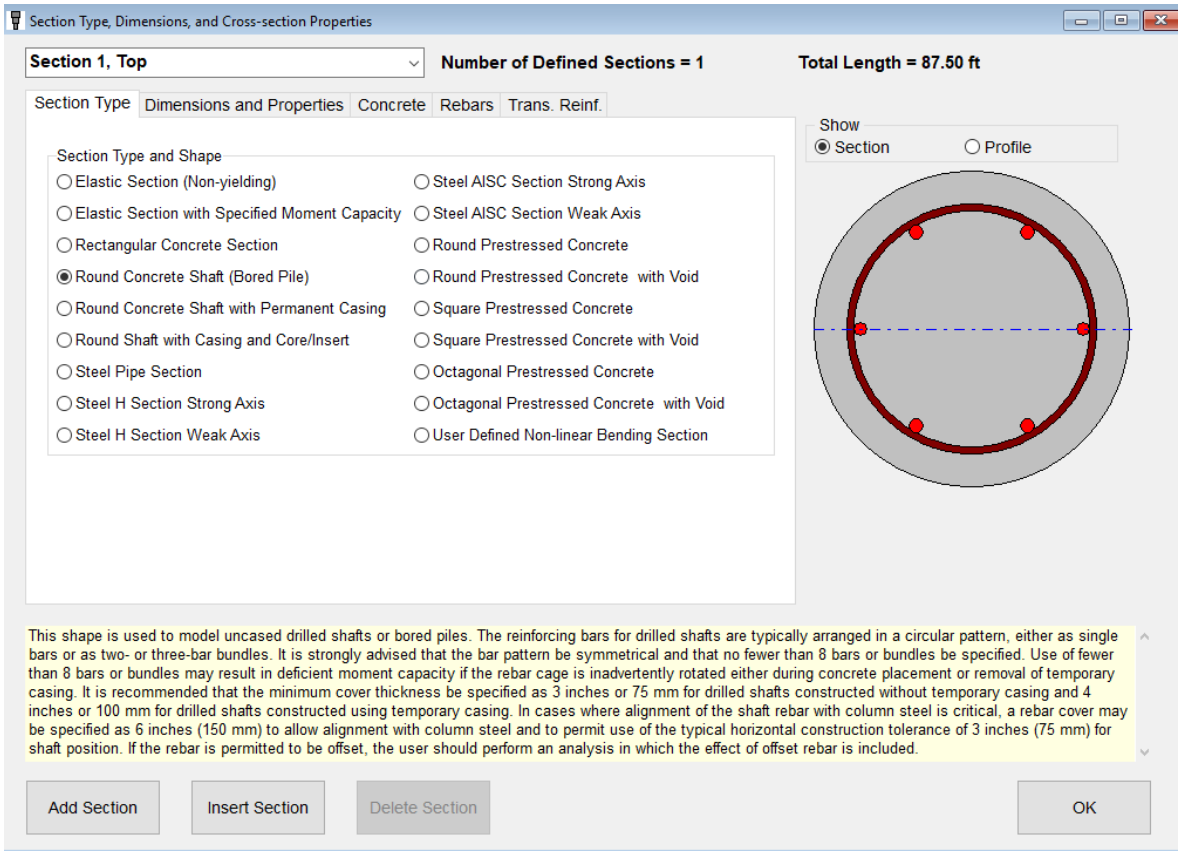
f_{ye} = 68 ksi

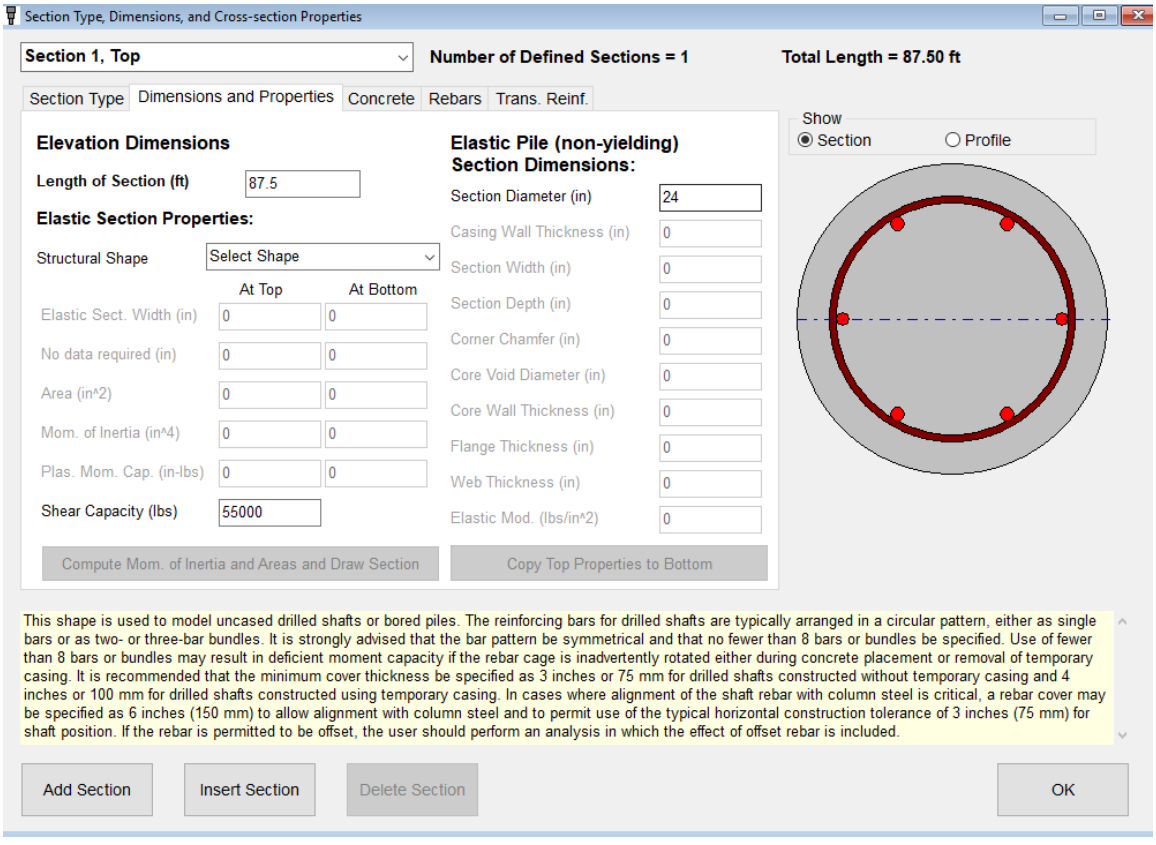
NOTES:

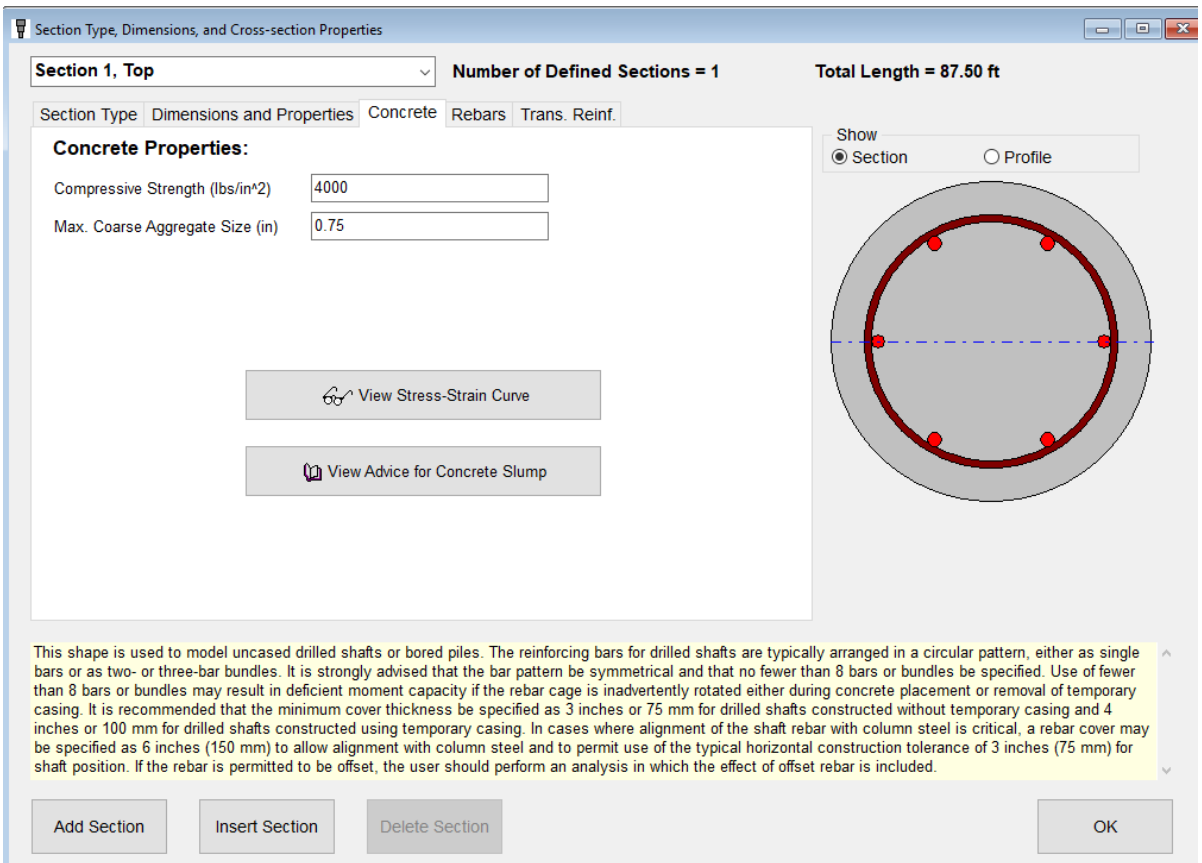
- CLEARANCES SHOWN ARE TYPICAL
- CLEARANCES SHOWN ARE BASED ON DEFORMED REINFORCEMENT DIMENSIONS
- INSPECTION PIPES WILL NOT BE REQUIRED IF THE HOLE IS DRY OR DEWATERED WITHOUT THE USE OF TEMPORARY CASING TO CONTROL GROUND WATER

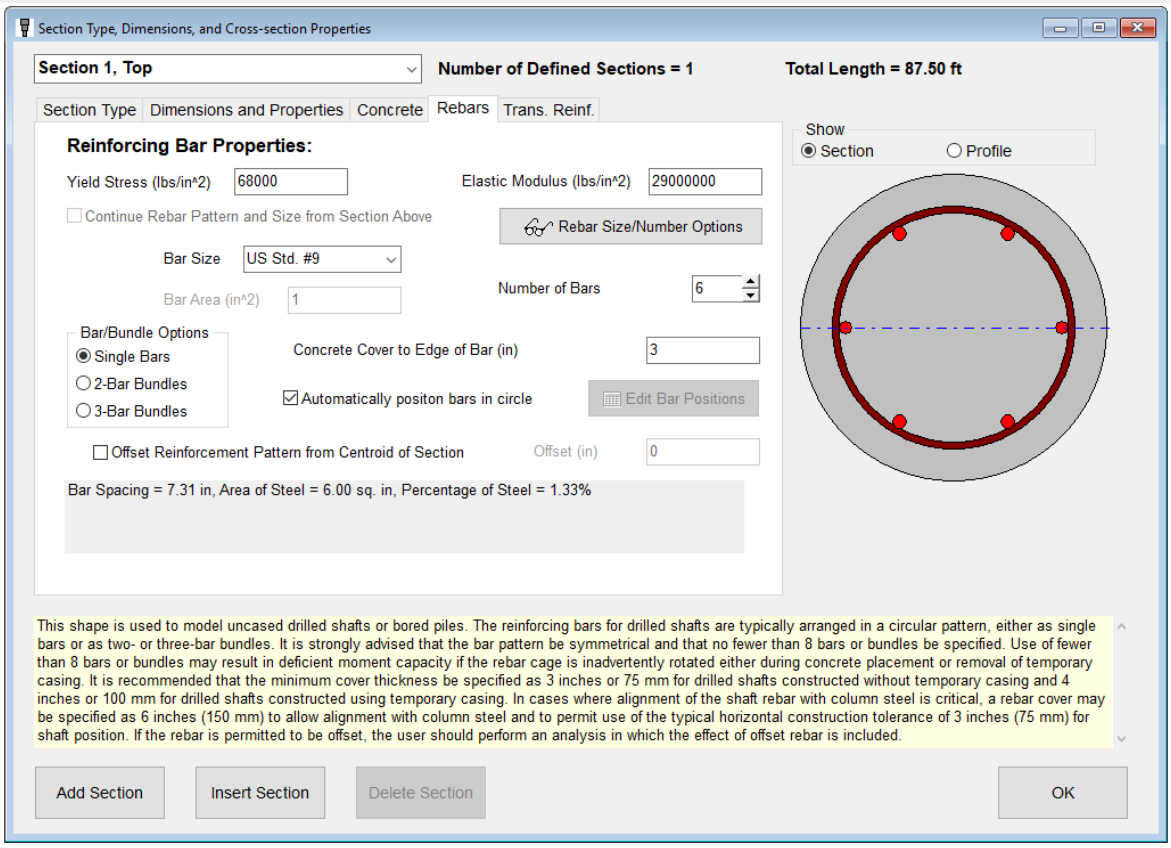
24" DIA CIDH PILE DETAILS WITHOUT CASING

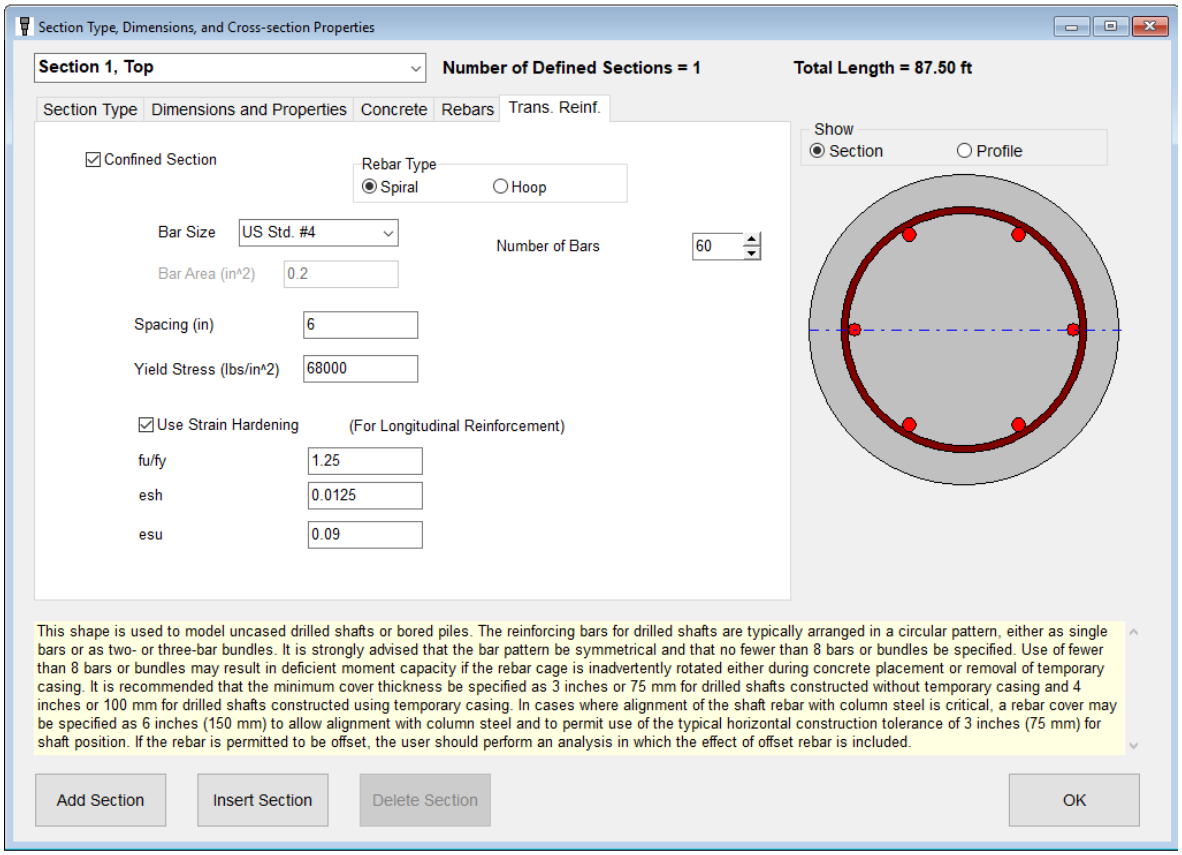

Project Information
Enter information to identify this project
Project Name: Lack Road Bridge Replacement Over New River
Job Number: 227518-0000439
Client: Imperial County Department of Public Works
Engineer: Carl Henderson
Description: Lateral Resistance - CIDH Concrete(24 inch);Boring A-19-01
Path to Files: C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis
Input Data File: Boring A-19-001 - 24 inch.lp10d
Output Report File: Boring A-19-001 - 24 inch.lp10o
Plot Output File: Boring A-19-001 - 24 inch.lp10p
Current Time and Date: 6/5/2019 7:01:34 PM
(Filenames, file paths, and date and time of program run are included in the output report.)
OK

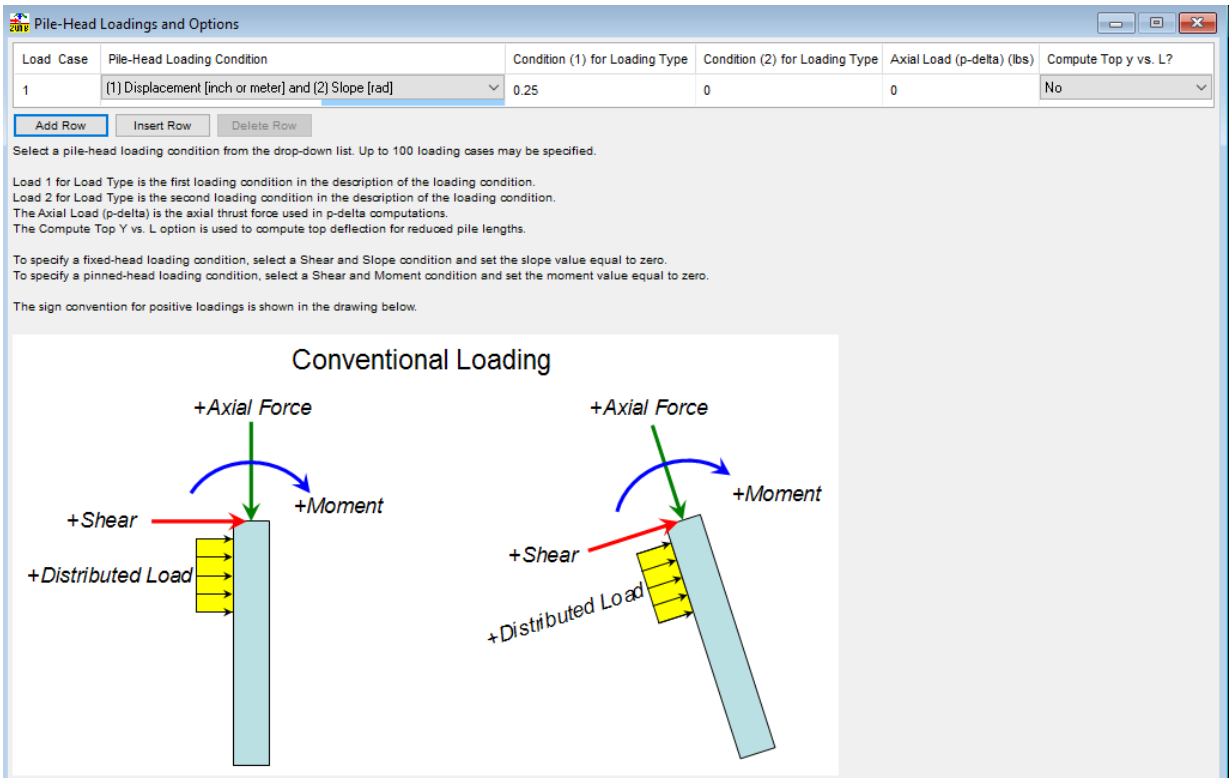

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Section Type and Shape
Elastic Section (Non-yielding)
Elastic Section with Specified Moment Capacity
Rectangular Concrete Section
Round Concrete Shaft (Bored Pile)
Round Concrete Shaft with Permanent Casing
Round Shaft with Casing and Core/Insert
Steel Pipe Section
Steel H Section Strong Axis
Steel H Section Weak Axis
Steel AISC Section Strong Axis
Steel AISC Section Weak Axis
Round Prestressed Concrete
Round Prestressed Concrete with Void
Square Prestressed Concrete
Square Prestressed Concrete with Void
Octagonal Prestressed Concrete
Octagonal Prestressed Concrete with Void
User Defined Non-linear Bending Section
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Elevation Dimensions
Length of Section (ft)
87.5
Elastic Section Properties:
Structural Shape
Select Shape
At Top
At Bottom
Elastic Sect. Width (in)
No data required (in)
Area (in^2)
Mom. of Inertia (in^4)
Plas. Mom. Cap. (in-lbs)
Shear Capacity (lbs)
55000
Elastic Pile (non-yielding) Section Dimensions:
Section Diameter (in)
24
Casing Wall Thickness (in)
Section Width (in)
Section Depth (in)
Corner Chamfer (in)
Core Void Diameter (in)
Core Wall Thickness (in)
Flange Thickness (in)
Web Thickness (in)
Elastic Mod. (lbs/in^2)
Compute Mom. of Inertia and Areas and Draw Section
Copy Top Properties to Bottom
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Concrete Properties:
Compressive Strength (lbs/in^2)
4000
Max. Coarse Aggregate Size (in)
0.75
View Stress-Strain Curve
View Advice for Concrete Slump
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Reinforcing Bar Properties:
Yield Stress (lbs/in^2)
68000
Elastic Modulus (lbs/in^2)
29000000
Continue Rebar Pattern and Size from Section Above
Rebar Size/Number Options
Bar Size
US Std. #9
Bar Area (in^2)
1
Number of Bars
6
Bar/Bundle Options
Single Bars
2-Bar Bundles
3-Bar Bundles
Concrete Cover to Edge of Bar (in)
3
Automatically positon bars in circle
Edit Bar Positions
Offset Reinforcement Pattern from Centroid of Section
Offset (in)
0
Bar Spacing = 7.31 in, Area of Steel = 6.00 sq. in, Percentage of Steel = 1.33%
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Confined Section
Rebar Type
Spiral
Hoop
Bar Size
US Std. #4
Number of Bars
60
Bar Area (in^2)
0.2
Spacing (in)
6
Yield Stress (lbs/in^2)
68000
Use Strain Hardening
(For Longitudinal Reinforcement)
fu/fy
1.25
esh
0.0125
esu
0.09
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

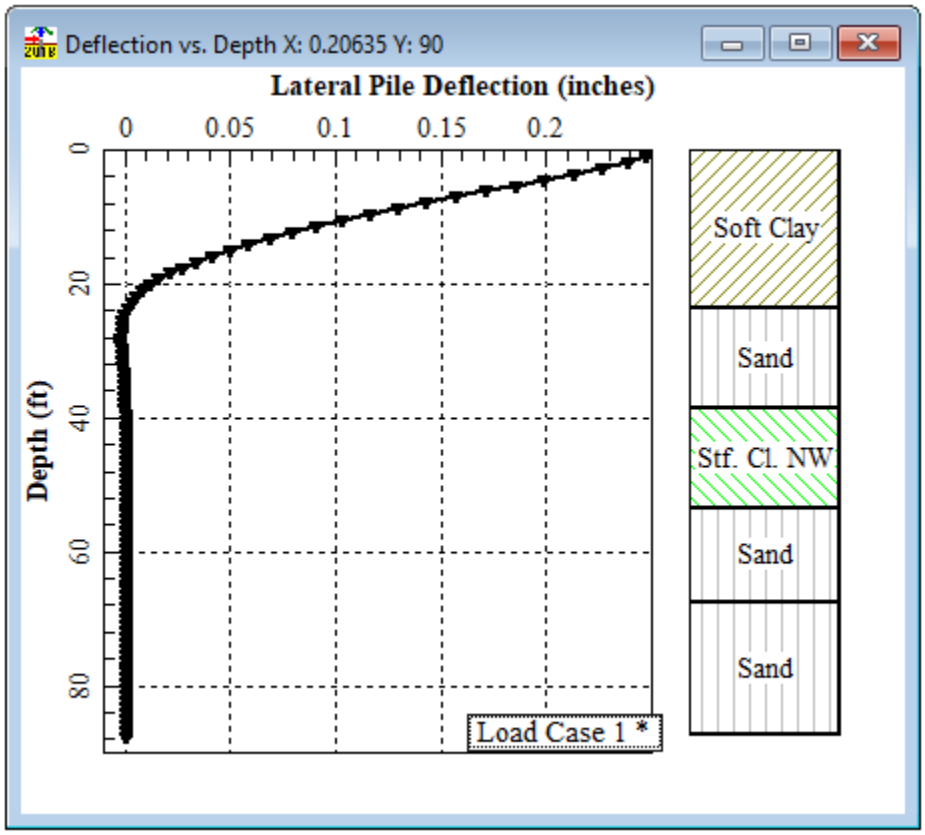

Pile-Head Loadings and Options
Load Case
Pile-Head Loading Condition
Condition (1) for Loading Type
Condition (2) for Loading Type
Axial Load (p-delta) (lbs)
Compute Top y vs. L?
1
(1) Displacement [inch or meter] and (2) Slope [rad]
0.25
0
0
No
Add Row
Insert Row
Delete Row
Select a pile-head loading condition from the drop-down list. Up to 100 loading cases may be specified.
Load 1 for Load Type is the first loading condition in the description of the loading condition.
Load 2 for Load Type is the second loading condition in the description of the loading condition.
The Axial Load (p-delta) is the axial thrust force used in p-delta computations.
The Compute Top Y vs. L option is used to compute top deflection for reduced pile lengths.
To specify a fixed-head loading condition, select a Shear and Slope condition and set the slope value equal to zero.
To specify a pinned-head loading condition, select a Shear and Moment condition and set the moment value equal to zero.
The sign convention for positive loadings is shown in the drawing below.
Conventional Loading
+Axial Force
+Moment
+Shear
+Distributed Load
+Axial Force
+Moment
+Shear
+Distributed Load

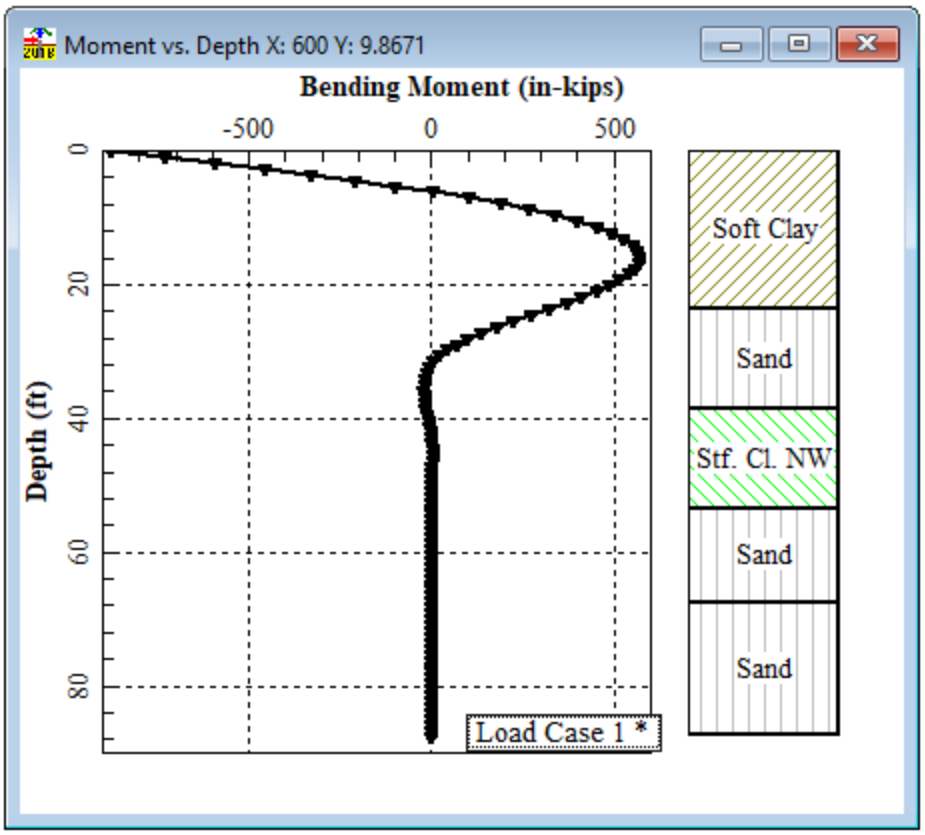
Soil Layers

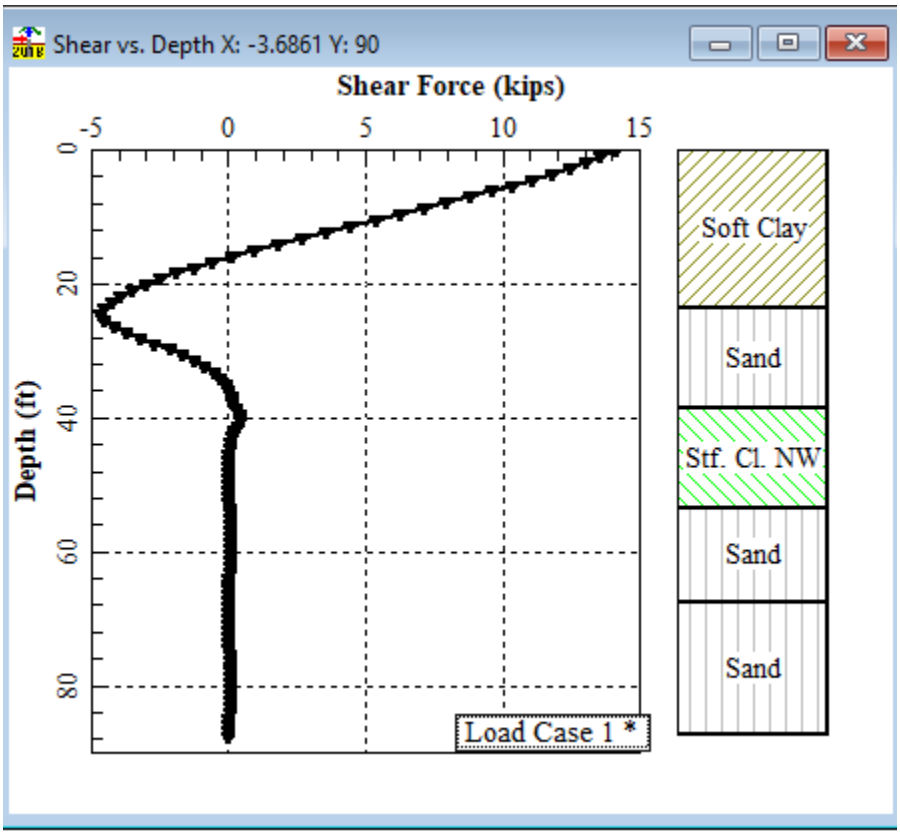
Layer	Select p-y Curve Type from Drop-down List	Vertical Depth Below Pile Head of Top of Soil Layer (ft)	Vertical Depth Below Pile Head of Bottom of Soil Layer (ft)	Press Button to Enter Soil Properties
1	Soft Clay (Matlock)	0	23.5	1: Soft Clay
2	Sand (Reese)	23.5	38.5	2: Sand (Reese, et al.)
3	Stiff Clay w/o Free Water (Reese)	38.5	53.5	3: Stiff Clay without Free Water
4	Sand (Reese)	53.5	67.5	4: Sand (Reese, et al.)
5	Sand (Reese)	67.5	87.5	5: Sand (Reese, et al.)

Add Row | Insert Row | Delete Row

All positive depth coordinates are defined as vertical distances below the pile-head.
If the pile-head is embedded below the ground surface, the top layer must extend from the ground surface (defined by a negative vertical depth) to some point below the pile head.
Select the p-y soil type using the drop-down list in the left table column.




Moment vs. Depth X: 600 Y: 9.8671
Bending Moment (in-kips)
-500
0
500
Depth (ft)
0
20
40
60
80
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Load Case 1 *


Shear vs. Depth X: -3.6861 Y: 90
Shear Force (kips)
-5
0
5
10
15
Depth (ft)
0
20
40
60
80
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Load Case 1 *

==========

LPile for Windows, Version 2018-10.002

Analysis of Individual Piles and Drilled Shafts

Subjected to Lateral Loading Using the p-y Method

==========

This copy of LPile is being used by:

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Files Used for Analysis

Path to file locations:

\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis\

Name of input data file:

Boring A-19-001 - 24 inch.lp10

Name of output report file:

Boring A-19-001 - 24 inch.lp10

Name of plot output file:

Boring A-19-001 - 24 inch.lp10

Name of runtime message file:

Boring A-19-001 - 24 inch.lp10

Date and Time of Analysis

Date: June 5, 2019 Time: 19:09:16

Problem Title

Project Name: Lack Road Bridge Replacement Over New River

Job Number: 227518-0000439

Client: Imperial County Department of Public Works

Engineer: Carl Henderson

Description: Lateral Resistance - CIDH Concrete(24 inch);Boring A-19-01

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1

Total length of pile = 87.500 ft

Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	87.500	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile

Length of section = 87.500000 ft

Shaft Diameter = 24.000000 in

Shear capacity of section = 55000. lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees

= 0.000 radians

Pile Batter Angle = 0.000 degrees

= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 0.0000 ft

Distance from top of pile to bottom of layer = 23.500000 ft

Effective unit weight at top of layer = 58.700000 pcf

Effective unit weight at bottom of layer = 58.700000 pcf

Undrained cohesion at top of layer = 300.000000 psf

Undrained cohesion at bottom of layer = 300.000000 psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 23.500000 ft

Distance from top of pile to bottom of layer = 38.500000 ft

Effective unit weight at top of layer = 63.500000 pcf

Effective unit weight at bottom of layer = 63.500000 pcf

Friction angle at top of layer = 34.000000 deg.

Friction angle at bottom of layer = 34.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer = 38.500000 ft

Distance from top of pile to bottom of layer = 53.500000 ft

Effective unit weight at top of layer = 56.200000 pcf

Effective unit weight at bottom of layer = 56.200000 pcf

Undrained cohesion at top of layer = 1750. psf

Undrained cohesion at bottom of layer = 1750. psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 4 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 53.500000 ft

Distance from top of pile to bottom of layer = 67.500000 ft

Effective unit weight at top of layer = 65.500000 pcf

Effective unit weight at bottom of layer = 65.500000 pcf

Friction angle at top of layer = 35.000000 deg.

Friction angle at bottom of layer = 35.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 67.500000 ft

Distance from top of pile to bottom of layer = 87.500000 ft

Effective unit weight at top of layer = 65.900000 pcf

Effective unit weight at bottom of layer = 65.900000 pcf

Friction angle at top of layer = 38.000000 deg.

Friction angle at bottom of layer = 38.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 0.000 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Soft Clay	0.00 23.5000	58.7000 58.7000	300.0000 300.0000	-- --	default default	-- --
2	Sand (Reese, et al.)	23.5000 38.5000	63.5000 63.5000	-- --	34.0000 34.0000	-- --	default default
3	Stiff Clay w/o Free Water	38.5000 53.5000	56.2000 56.2000	1750. 1750.	-- --	default default	-- --
4	Sand (Reese, et al.)	53.5000 67.5000	65.5000 65.5000	-- --	35.0000 35.0000	-- --	default default
5	Sand (Reese, et al.)	67.5000 87.5000	65.9000 65.9000	-- --	38.0000 38.0000	-- --	default default

---

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	0.0000000	N.A.

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with

specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section = 87.500000 ft

Shaft Diameter = 24.000000 in

Concrete Cover Thickness = 3.000000 in

Number of Reinforcing Bars = 6 bars

Yield Stress of Reinforcing Bars = 68000. psi

Modulus of Elasticity of Reinforcing Bars = 29000000. psi

Gross Area of Shaft = 452.389342 sq. in.

Total Area of Reinforcing Steel = 6.000000 sq. in.

Area Ratio of Steel Reinforcement = 1.33 percent

Edge-to-Edge Bar Spacing = 7.308000 in

Maximum Concrete Aggregate Size = 0.750000 in

Ratio of Bar Spacing to Aggregate Size = 9.74

Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Confined Section

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 1925.724 kips

Tensile Load for Cracking of Concrete = -205.732 kips

Nominal Axial Tensile Capacity = -408.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	8.436000	0.00000
2	1.128000	1.000000	4.218000	7.305790
3	1.128000	1.000000	-4.218000	7.305790
4	1.128000	1.000000	-8.436000	0.00000
5	1.128000	1.000000	-4.218000	-7.305790
6	1.128000	1.000000	4.218000	-7.305790

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 7.308 inches

between bars 4 and 5.

Ratio of bar spacing to maximum aggregate size = 9.74

Concrete Properties:

Compressive Strength of Concrete = 4000. psi

Modulus of Elasticity of Concrete = 3604997. psi

Modulus of Rupture of Concrete = -474.341649 psi

Compression Strain at Peak Stress = 0.001886

Tensile Strain at Fracture of Concrete = -0.0001154

Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.

Y = stress in reinforcing steel has reached yield stress.

T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.

Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.

Position of neutral axis is measured from edge of compression side of pile.

Compressive stresses and strains are positive in sign.

Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conf Stress ksi	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
0.00000200	149.9781433	74989072.	12.0000155	0.00002400	-0.00002400	-0.0010177	0.1001357	0.6890409	
0.00000400	298.7624583	74690615.	12.0000156	0.00004800	-0.00004800	-0.0020352	0.1990021	1.3780818	
0.00000600	446.3529448	74392157.	12.0000157	0.00007200	-0.00007200	-0.0030527	0.2965992	2.0671227	
0.00000800	592.7496030	74093700.	12.0000157	0.00009600	-0.00009600	-0.0040700	0.3929269	2.7561637	
0.00001000	592.7496030	59274960.	6.2332537	0.00006233	-0.0001777	0.00000	0.2550722	-5.1175564	C
0.00001200	592.7496030	49395800.	6.2366937	0.00007484	-0.0002132	0.00000	0.3052466	-6.1398706	C
0.00001400	592.7496030	42339257.	6.2401470	0.00008736	-0.0002486	0.00000	0.3551390	-7.1617803	C
0.00001600	592.7496030	37046850.	6.2436135	0.00009990	-0.0002841	0.00000	0.4047487	-8.1832833	C
0.00001800	592.7496030	32930533.	6.2470935	0.0001124	-0.0003196	0.00000	0.4540748	-9.2043772	C
0.00002000	592.7496030	29637480.	6.2505870	0.0001250	-0.0003550	0.00000	0.5031164	-10.2250595	C
0.00002200	592.7496030	26943164.	6.2540941	0.0001376	-0.0003904	0.00000	0.5518727	-11.2453280	C
0.00002400	592.7496030	24697900.	6.2576149	0.0001502	-0.0004258	0.00000	0.6003429	-12.2651800	C
0.00002600	592.7496030	22798062.	6.2611496	0.0001628	-0.0004612	0.00000	0.6485261	-13.2846132	C
0.00002800	592.7496030	21169629.	6.2646982	0.0001754	-0.0004966	0.00000	0.6964214	-14.3036250	C
0.00003000	592.7496030	19758320.	6.2682609	0.0001880	-0.0005320	0.00000	0.7440279	-15.3222130	C
0.00003200	592.7496030	18523425.	6.2718377	0.0002007	-0.0005673	0.00000	0.7913448	-16.3403745	C

0.00003400 592.7496030 17433812. 6.2754289 0.0002134 -0.0006026 0.00000 0.8383711 -17.3581071 C

0.00003600 592.7496030 16465267. 6.2790345 0.0002260 -0.0006380 0.00000 0.8851059 -18.3754080 C

0.00003800 592.7496030 15598674. 6.2826546 0.0002387 -0.0006733 0.00000 0.9315484 -19.3922747 C

0.00004000 619.4931606 15487329. 6.2862893 0.0002515 -0.0007085 0.00000 0.9776976 -20.4087044 C

0.00004200 650.1062681 15478721. 6.2899388 0.0002642 -0.0007438 0.00000 1.0235526 -21.4246945 C

0.00004400 680.6836129 15470082. 6.2936032 0.0002769 -0.0007791 0.00000 1.0691124 -22.4402423 C

0.00004600 711.2250030 15461413. 6.2972826 0.0002897 -0.0008143 0.00000 1.1143761 -23.4553450 C

0.00004800 741.7302443 15452713. 6.3009771 0.0003024 -0.0008496 0.00000 1.1593428 -24.4699998 C

0.00005000 772.1991407 15443983. 6.3046870 0.0003152 -0.0008848 0.00000 1.2040115 -25.4842040 C

0.00005200 802.6314943 15435221. 6.3084122 0.0003280 -0.0009200 0.00000 1.2483812 -26.4979545 C

0.00005400 833.0271047 15426428. 6.3121529 0.0003409 -0.0009551 0.00000 1.2924510 -27.5112487 C

0.00005600 863.3857697 15417603. 6.3159093 0.0003537 -0.0009903 0.00000 1.3362198 -28.5240834 C

0.00005800 893.7072847 15408746. 6.3196814 0.0003665 -0.0010255 0.00000 1.3796867 -29.5364559 C

0.00006000 923.9914431 15399857. 6.3234695 0.0003794 -0.0010606 0.00000 1.4228506 -30.5483631 C

0.00006200 954.2380359 15390936. 6.3272737 0.0003923 -0.0010957 0.00000 1.4657105 -31.5598021 C

0.00006400 984.4468519 15381982. 6.3310940 0.0004052 -0.0011308 0.00000 1.5082655 -32.5707696 C

0.00006600 1015. 15372995. 6.3349307 0.0004181 -0.0011659 0.00000 1.5505145 -33.5812628 C

0.00006800 1045. 15363975. 6.3387839 0.0004310 -0.0012010 0.00000 1.5924564 -34.5912783 C

0.00007000 1075. 15354921. 6.3426537 0.0004440 -0.0012360 0.00000 1.6340902 -35.6008132 C

0.00007200 1105. 15345834. 6.3465403 0.0004570 -0.0012710 0.00000 1.6754148 -36.6098641 C

0.00007400 1135. 15336712. 6.3504438 0.0004699 -0.0013061 0.00000 1.7164291 -37.6184279 C

0.00007600 1165. 15327557. 6.3543644 0.0004829 -0.0013411 0.00000 1.7571321 -38.6265012 C

0.00007800 1195. 15318366. 6.3583022 0.0004959 -0.0013761 0.00000 1.7975227 -39.6340808 C

0.00008200 1255. 15299903. 6.3659839 0.0005220 -0.0014460 0.00000 1.8772997 -41.6483301 C

0.00008600 1314. 15281309. 6.3736641 0.0005481 -0.0015159 0.00000 1.9557911 -43.6608014 C

0.00009000 1374. 15262577. 6.3814108 0.0005743 -0.0015857 0.00000 2.0330043 -45.6713175 C

0.00009400 1433. 15243704. 6.3892252 0.0006006 -0.0016554 0.00000 2.1089304 -47.6798519 C

0.00009800 1492. 15224688. 6.3971084 0.0006269 -0.0017251 0.00000 2.1835601 -49.6863775 C

0.0001020 1551. 15205527. 6.4050619 0.0006533 -0.0017947 0.00000 2.2568839 -51.6908667 C

0.0001060 1610. 15186218. 6.4130867 0.0006798 -0.0018642 0.00000 2.3288925 -53.6932911 C

0.0001100 1668. 15166759. 6.4211843 0.0007063 -0.0019337 0.00000 2.3995758 -55.6936216 C

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0.0001180 1785. 15127380. 6.4376035 0.0007596 -0.0020724 0.00000 2.5369267 -59.6878806 C

0.0001220 1843. 15107455. 6.4459278 0.0007864 -0.0021416 0.00000 2.6035738 -61.6817471 C

0.0001260 1901. 15087368. 6.4543306 0.0008132 -0.0022108 0.00000 2.6688543 -63.6733955 C

0.0001300 1959. 15067117. 6.4628135 0.0008402 -0.0022798 0.00000 2.7327576 -65.6627927 C

0.0001340 2016. 15046700. 6.4713780 0.0008672 -0.0023488 0.00000 2.7952725 -67.6499047 C

0.0001380 2074. 15026112. 6.4800257 0.0008942 -0.0024178 0.00000 2.8563875 -68.0000000 CY

0.0001420 2131. 15005350. 6.4887584 0.0009214 -0.0024866 0.00000 2.9160912 -68.0000000 CY

0.0001460 2188. 14984412. 6.4975777 0.0009486 -0.0025554 0.00000 2.9743716 -68.0000000 CY

0.0001500 2244. 14963294. 6.5064854 0.0009760 -0.0026240 0.00000 3.0312165 -68.0000000 CY

0.0001540 2301. 14941993. 6.5154834 0.0010034 -0.0026926 0.00000 3.0866134 -68.0000000 CY

0.0001580 2357. 14920504. 6.5245736 0.0010309 -0.0027611 0.00000 3.1405497 -68.0000000 CY

0.0001620 2414. 14898825. 6.5337579 0.0010585 -0.0028295 0.00000 3.1930123 -68.0000000 CY

0.0001660 2470. 14876951. 6.5430384 0.0010861 -0.0028979 0.00000 3.2439878 -68.0000000 CY

0.0001700 2525. 14854878. 6.5524172 0.0011139 -0.0029661 0.00000 3.2934624 -68.0000000 CY

0.0001740 2581. 14832603. 6.5618964 0.0011418 -0.0030342 0.00000 3.3414222 -68.0000000 CY

0.0001780 2635. 14805485. 6.5707289 0.0011696 -0.0031024 0.00000 3.3876313 -68.0000000 CY

0.0001820 2683. 14741307. 6.5735984 0.0011964 -0.0031716 0.00000 3.4305372 -68.0000000 CY

0.0001860 2719. 14617703. 6.5664909 0.0012214 -0.0032426 0.00000 3.4690569 -68.0000000 CY

0.0001900 2743. 14436291. 6.5492859 0.0012444 -0.0033156 0.00000 3.5032798 -68.0000000 CY

0.0001940 2759. 14221164. 6.5258794 0.0012660 -0.0033900 0.00000 3.5344248 -68.0000000 CY

0.0001980 2774. 14009254. 6.5027375 0.0012875 -0.0034645 0.00000 3.5643728 -68.0000000 CY

0.0002020 2789. 13805401. 6.4807391 0.0013091 -0.0035389 0.00000 3.5933873 -68.0000000 CY

0.0002060 2803. 13609134. 6.4598196 0.0013307 -0.0036133 0.00000 3.6214623 -68.0000000 CY

0.0002100 2818. 13420016. 6.4399198 0.0013524 -0.0036876 0.00000 3.6485919 -68.0000000 CY

0.0002140 2833. 13237643. 6.4209846 0.0013741 -0.0037619 0.00000 3.6747700 -68.0000000 CY

0.0002180 2847. 13061639. 6.4029633 0.0013958 -0.0038362 0.00000 3.6999904 -68.0000000 CY

0.0002220 2862. 12891659. 6.3858088 0.0014176 -0.0039104 0.00000 3.7242467 -68.0000000 CY

0.0002260 2876. 12727378. 6.3694773 0.0014395 -0.0039845 0.00000 3.7475327 -68.0000000 CY

0.0002300 2891. 12568375. 6.3535862 0.0014613 -0.0040587 0.00000 3.7697618 -68.0000000 CY

0.0002340 2905. 12414322. 6.3379422 0.0014831 -0.0041329 0.00000 3.7908994 -68.0000000 CY

0.0002380 2919. 12265149. 6.3230396 0.0015049 -0.0042071 0.00000 3.8110668 -68.0000000 CY

0.0002540 2975. 11712577. 6.2701918 0.0015926 -0.0045034 0.00000 3.8818947 -68.0000000 CY

0.0002700 3030. 11221045. 6.2268376 0.0016812 -0.0047988 0.00000 3.9366271 -68.0000000 CY

0.0002860 3083. 10780114. 6.1915423 0.0017708 -0.0050932 0.00000 3.9747691 -68.0000000 CY

0.0003020 3135. 10381541. 6.1631908 0.0018613 -0.0053867 0.00000 3.9957855 -68.0000000 CY

0.0003180 3186. 10018614. 6.1409649 0.0019528 -0.0056792 0.00000 3.9974180 -68.0000000 CY

0.0003340 3235. 9685782. 6.1242842 0.0020455 -0.0059705 0.00000 3.9980954 -68.0000000 CY

0.0003500 3283. 9378850. 6.1119838 0.0021392 -0.0062608 0.00000 3.9981031 -68.0000000 CY

0.0003660 3328. 9093458. 6.1033294 0.0022338 -0.0065502 0.00000 3.9974386 -68.0000000 CY

0.0003820 3368. 8816061. 6.0921625 0.0023272 -0.0068408 0.00000 3.9954947 -68.0000000 CY

0.0003980 3396. 8532256. 6.0702145 0.0024159 -0.0071361 0.00000 3.9986473 68.0000000 CY

0.0004140 3412. 8240510. 6.0357469 0.0024988 -0.0074372 0.00000 3.9987525 68.0000000 CY

0.0004300 3417. 7946549. 5.9910159 0.0025761 -0.0077439 0.00000 3.9940224 68.0000000 CY

0.0004460 3419. 7666008. 5.9461724 0.0026520 -0.0080520 0.00000 3.9984544 68.0000000 CY

0.0004620 3421. 7403934. 5.9050089 0.0027281 -0.0083599 0.00000 3.9967885
68.0000000 CY

0.0004780 3422. 7158568. 5.8663683 0.0028041 -0.0086679 0.00000 3.9963131
68.0000000 CY

0.0004940 3423. 6928263. 5.8284564 0.0028793 -0.0089767 0.00000 3.9997546
68.0000000 CY

0.0005100 3423. 6712034. 5.7938333 0.0029549 -0.0092851 0.00000 3.9911636
68.0000000 CY

0.0005260 3424. 6508704. 5.7619981 0.0030308 -0.0095932 0.00000 3.9966313
68.0000000 CY

0.0005420 3424. 6317203. 5.7325695 0.0031071 -0.0099009 0.00000 3.9997478
68.0000000 CY

0.0005580 3424. 6136399. 5.7055814 0.0031837 -0.0102083 0.00000 3.9920981
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0.0005740 3424. 5965475. 5.6806677 0.0032607 -0.0105153 0.00000 3.9941643
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0.0005900 3424. 5803700. 5.6575201 0.0033379 -0.0108221 0.00000 3.9986123
68.0000000 CY

0.0006060 3424. 5650467. 5.6355248 0.0034151 -0.0111289 0.00000 3.9994553
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0.0006220 3424. 5505117. 5.6133141 0.0034915 -0.0114365 0.00000 3.9881580
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0.0006380 3424. 5367058. 5.5925248 0.0035680 -0.0117440 0.00000 3.9929624
68.0000000 CY

0.0006540 3424. 5235754. 5.5730592 0.0036448 -0.0120512 0.00000 3.9975660
68.0000000 CY

0.0006700 3424. 5110721. 5.5548293 0.0037217 -0.0123583 0.00000 3.9997879
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0.0006860 3424. 4991520. 5.5379478 0.0037990 -0.0126650 0.00000 3.9939172 -
68.0781955 CY

0.0007020 3424. 4877753. 5.5461614 0.0038934 -0.0129546 0.00000 3.9890114 -
68.3471142 CY

0.0007180 3424. 4769057. 5.5308184 0.0039711 -0.0132609 0.00000 3.9946253 -
68.6261436 CY

0.0007340 3424. 4665099. 5.5163748 0.0040490 -0.0135670 0.00000 3.9982679 -
68.8995630 CY

0.0007500 3424. 4565577. 5.5449909 0.0041587 -0.0138413 0.00000 3.9929544 -
69.1398603 CY

0.0007660 3424. 4470213. 5.5315728 0.0042372 -0.0141468 0.00000 3.9834102 -69.4028619 CY

0.0007820 3424. 4378751. 5.5729707 0.0043581 -0.0144099 0.00000 3.9956941 -69.6250747 CY

0.0007980 3424. 4290956. 5.5598516 0.0044368 -0.0147152 0.00000 3.9986205 -69.8786051 CY

0.0008140 3424. 4206613. 5.6117214 0.0045679 -0.0149681 0.00000 3.9861077 -70.0846555 CY

0.0008300 3424. 4125522. 5.5989183 0.0046471 -0.0152729 0.00000 3.9817047 -70.3291599 CY

0.0008460 3424. 4047498. 5.6570973 0.0047859 -0.0155181 0.00000 3.9977790 -70.5222203 CY

0.0008620 3424. 3972370. 5.6458894 0.0048668 -0.0158212 0.00000 3.9995824 -70.7572827 CY

0.0008780 3424. 3899981. 5.6345047 0.0049471 -0.0161249 0.00000 3.9983119 -70.9884286 CY

0.0009740 3424. 3515588. 5.8085599 0.0056575 -0.0177185 0.00000 3.9917289 -72.1336175 CY

0.0010700 3424. 3200171. 5.9320456 0.0063473 -0.0193327 216719. 3.9987771 -73.1894705 CY

0.0011660 3424. 2936692. 5.9707509 0.0069619 -0.0210221 223166. 3.9884373 -74.1954513 CY

0.0012620 3424. 2713299. 6.1073980 0.0077075 -0.0225805 159488. 3.9918977 -75.0428632 CY

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003

or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.
No.	kips	in-kip	Strain

1	0.000	3423.399	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	3423.	0.0000	2225.	14970468.
1	0.70	3423.	0.0000	2396.	14905475.
1	0.75	3423.	0.0000	2568.	14837946.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Pile Head ft	Equivalent Top Depth Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	102667.
2	23.5000	11.4149	No	No	102667.	908781.
3	38.5000	39.1366	No	No	1011447.	472500.
4	53.5000	29.4243	No	No	1483947.	3140944.
5	67.5000	39.6115	Yes	No	4624891.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals
for Layer n. Layering correction equivalent depths are computed only
for soil types with both shallow-depth and deep-depth expressions for
peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

Displacement of pile head = 0.250000 inches

Rotation of pile head = 0.000E+00 radians

Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	-877121.	14095.	0.00	0.00	1.54E+10	-44.4612	933.6845	0.00
0.8750	0.2469	-731879.	13570.	-5.48E-04	0.00	1.54E+10	-50.0294	2128.	0.00
1.7500	0.2385	-592152.	13018.	-9.94E-04	0.00	1.58E+10	-55.1462	2428.	0.00
2.6250	0.2260	-458506.	12415.	-0.00122	0.00	7.44E+10	-59.7538	2776.	0.00
3.5000	0.2128	-331447.	11765.	-0.00128	0.00	7.46E+10	-64.0465	3160.	0.00
4.3750	0.1991	-211449.	11071.	-0.00132	0.00	7.48E+10	-68.0026	3585.	0.00
5.2500	0.1852	-98949.	10338.	-0.00134	0.00	7.50E+10	-71.6019	4060.	0.00
6.1250	0.1710	5658.	9570.	-0.00134	0.00	7.50E+10	-74.8256	4594.	0.00
7.0000	0.1569	102015.	8769.	-0.00134	0.00	7.50E+10	-77.6563	5196.	0.00
7.8750	0.1430	189810.	7941.	-0.00132	0.00	7.49E+10	-80.0777	5882.	0.00
8.7500	0.1293	268776.	7090.	-0.00128	0.00	7.47E+10	-82.0748	6667.	0.00
9.6250	0.1160	338694.	6220.	-0.00124	0.00	7.46E+10	-83.6339	7572.	0.00
10.5000	0.1032	399392.	5336.	-0.00119	0.00	7.45E+10	-84.7422	8624.	0.00
11.3750	0.09098	450746.	4443.	-0.00113	0.00	7.44E+10	-85.3883	9855.	0.00
12.2500	0.07945	492687.	3545.	-0.00106	0.00	7.43E+10	-85.5614	11308.	0.00
13.1250	0.06865	525194.	2648.	-9.91E-04	0.00	7.42E+10	-85.2515	13039.	0.00
14.0000	0.05863	548302.	1769.	-9.15E-04	0.00	7.42E+10	-82.2612	14732.	0.00
14.8750	0.04942	562341.	929.0691	-8.37E-04	0.00	7.41E+10	-77.7097	16509.	0.00
15.7500	0.04105	567812.	137.5777	-7.57E-04	0.00	7.41E+10	-73.0506	18683.	0.00
16.6250	0.03353	565230.	-604.4317	-6.77E-04	0.00	7.41E+10	-68.2845	21383.	0.00
17.5000	0.02685	555119.	-1296.	-5.97E-04	0.00	7.42E+10	-63.4084	24800.	0.00
18.3750	0.02099	538018.	-1935.	-5.20E-04	0.00	7.42E+10	-58.4141	29224.	0.00
19.2500	0.01593	514476.	-2522.	-4.45E-04	0.00	7.42E+10	-53.2848	35123.	0.00
20.1250	0.01163	485060.	-3053.	-3.75E-04	0.00	7.43E+10	-47.9884	43309.	0.00
21.0000	0.00806	450353.	-3528.	-3.09E-04	0.00	7.44E+10	-42.4631	55322.	0.00

21.8750	0.00515	410964.	-3943.	-2.48E-04	0.00	7.44E+10	-36.5823	74557.	0.00
22.7500	0.00285	367543.	-4293.	-1.93E-04	0.00	7.45E+10	-30.0465	110577.	0.00
23.6250	0.00110	320808.	-4574.	-1.45E-04	0.00	7.46E+10	-23.3582	223372.	0.00
24.5000	-1.83E-04	271499.	-4675.	-1.03E-04	0.00	7.47E+10	4.0409	231645.	0.00
25.3750	-0.00106	222634.	-4526.	-6.82E-05	0.00	7.48E+10	24.3056	239918.	0.00
26.2500	-0.00162	176450.	-4198.	-4.02E-05	0.00	7.49E+10	38.2006	248191.	0.00
27.1250	-0.00191	134477.	-3753.	-1.85E-05	0.00	7.50E+10	46.6222	256464.	0.00
28.0000	-0.00200	97644.	-3243.	-2.21E-06	0.00	7.50E+10	50.5201	264737.	0.00
28.8750	-0.00196	66381.	-2711.	9.28E-06	0.00	7.50E+10	50.8350	273010.	0.00
29.7500	-0.00181	40723.	-2189.	1.68E-05	0.00	7.50E+10	48.4588	281283.	0.00
30.6250	-0.00160	20407.	-1703.	2.11E-05	0.00	7.50E+10	44.2011	289556.	0.00
31.5000	-0.00137	4965.	-1267.	2.28E-05	0.00	7.50E+10	38.7677	297829.	0.00
32.3750	-0.00112	-6204.	-891.7280	2.27E-05	0.00	7.50E+10	32.7494	306102.	0.00
33.2500	-8.89E-04	-13761.	-580.0349	2.13E-05	0.00	7.50E+10	26.6207	314375.	0.00
34.1250	-6.75E-04	-18384.	-331.3672	1.91E-05	0.00	7.50E+10	20.7446	322648.	0.00
35.0000	-4.88E-04	-20720.	-141.6973	1.64E-05	0.00	7.50E+10	15.3830	330921.	0.00
35.8750	-3.32E-04	-21360.	-4.7041	1.34E-05	0.00	7.50E+10	10.7109	339194.	0.00
36.7500	-2.06E-04	-20819.	87.3926	1.05E-05	0.00	7.50E+10	6.8313	347467.	0.00
37.6250	-1.12E-04	-19525.	143.1628	7.64E-06	0.00	7.50E+10	3.7916	355740.	0.00
38.5000	-4.61E-05	-17813.	284.7365	5.02E-06	0.00	7.50E+10	23.1748	5278923.	0.00
39.3750	-6.47E-06	-13545.	423.4765	2.83E-06	0.00	7.50E+10	3.2518	5278923.	0.00
40.2500	1.32E-05	-8920.	405.5881	1.25E-06	0.00	7.50E+10	-6.6591	5278923.	0.00
41.1250	1.98E-05	-5028.	318.2482	2.77E-07	0.00	7.50E+10	-9.9771	5278923.	0.00
42.0000	1.91E-05	-2236.	215.5810	-2.32E-07	0.00	7.50E+10	-9.5786	5278923.	0.00
42.8750	1.50E-05	-500.7696	125.7764	-4.24E-07	0.00	7.50E+10	-7.5271	5278923.	0.00
43.7500	1.02E-05	404.9526	59.4559	-4.30E-07	0.00	7.50E+10	-5.1054	5278923.	0.00
44.6250	5.93E-06	747.8035	16.9913	-3.50E-07	0.00	7.50E+10	-2.9831	5278923.	0.00
45.5000	2.81E-06	761.7705	-6.0906	-2.44E-07	0.00	7.50E+10	-1.4135	5278923.	0.00
46.3750	8.09E-07	619.9008	-15.6479	-1.47E-07	0.00	7.50E+10	-0.4070	5278923.	0.00
47.2500	-2.81E-07	433.1637	-17.0424	-7.35E-08	0.00	7.50E+10	0.1414	5278923.	0.00
48.1250	-7.35E-07	262.0111	-14.3604	-2.49E-08	0.00	7.50E+10	0.3695	5278923.	0.00

49.0000	-8.04E-07	131.5957	-10.2996	2.68E-09	0.00	7.50E+10	0.4040	5278923.	0.00
49.8750	-6.79E-07	45.7186	-6.3876	1.51E-08	0.00	7.50E+10	0.3412	5278923.	0.00
50.7500	-4.87E-07	-2.5436	-3.3123	1.81E-08	0.00	7.50E+10	0.2446	5278923.	0.00
51.6250	-2.98E-07	-23.8395	-1.2413	1.63E-08	0.00	7.50E+10	0.1499	5278923.	0.00
52.5000	-1.45E-07	-28.6109	-0.07223	1.26E-08	0.00	7.50E+10	0.07280	5278923.	0.00
53.3750	-3.35E-08	-25.3564	0.3985	8.82E-09	0.00	7.50E+10	0.01686	5278923.	0.00
54.2500	4.05E-08	-20.2434	0.4751	5.63E-09	0.00	7.50E+10	-0.00225	585230.	0.00
55.1250	8.47E-08	-15.3789	0.4381	3.14E-09	0.00	7.50E+10	-0.00480	594669.	0.00
56.0000	1.06E-07	-11.0433	0.3808	1.29E-09	0.00	7.50E+10	-0.00612	604108.	0.00
56.8750	1.12E-07	-7.3818	0.3145	-4.70E-12	0.00	7.50E+10	-0.00653	613547.	0.00
57.7500	1.06E-07	-4.4397	0.2471	-8.32E-10	0.00	7.50E+10	-0.00630	622986.	0.00
58.6250	9.42E-08	-2.1923	0.1843	-1.30E-09	0.00	7.50E+10	-0.00567	632426.	0.00
59.5000	7.90E-08	-0.5703	0.1291	-1.49E-09	0.00	7.50E+10	-0.00483	641865.	0.00
60.3750	6.29E-08	0.5195	0.08331	-1.49E-09	0.00	7.50E+10	-0.00390	651304.	0.00
61.2500	4.76E-08	1.1791	0.04710	-1.37E-09	0.00	7.50E+10	-0.00300	660743.	0.00
62.1250	3.40E-08	1.5085	0.01997	-1.19E-09	0.00	7.50E+10	-0.00217	670182.	0.00
63.0000	2.27E-08	1.5984	8.59E-04	-9.69E-10	0.00	7.50E+10	-0.00147	679622.	0.00
63.8750	1.37E-08	1.5265	-0.01156	-7.50E-10	0.00	7.50E+10	-8.98E-04	689061.	0.00
64.7500	6.93E-09	1.3556	-0.01869	-5.48E-10	0.00	7.50E+10	-4.61E-04	698500.	0.00
65.6250	2.16E-09	1.1339	-0.02188	-3.74E-10	0.00	7.50E+10	-1.46E-04	707939.	0.00
66.5000	-9.31E-10	0.8962	-0.02231	-2.32E-10	0.00	7.50E+10	6.36E-05	717378.	0.00
67.3750	-2.71E-09	0.6654	-0.02099	-1.23E-10	0.00	7.50E+10	1.87E-04	726817.	0.00
68.2500	-3.51E-09	0.4553	-0.01820	-4.42E-11	0.00	7.50E+10	3.45E-04	1032209.	0.00
69.1250	-3.64E-09	0.2832	-0.01449	7.47E-12	0.00	7.50E+10	3.62E-04	1045443.	0.00
70.0000	-3.35E-09	0.1511	-0.01081	3.79E-11	0.00	7.50E+10	3.38E-04	1058676.	0.00
70.8750	-2.84E-09	0.05619	-0.00751	5.24E-11	0.00	7.50E+10	2.90E-04	1071909.	0.00
71.7500	-2.25E-09	-0.00672	-0.00477	5.58E-11	0.00	7.50E+10	2.33E-04	1085143.	0.00
72.6250	-1.67E-09	-0.04398	-0.00263	5.23E-11	0.00	7.50E+10	1.75E-04	1098376.	0.00
73.5000	-1.15E-09	-0.06198	-0.00107	4.49E-11	0.00	7.50E+10	1.22E-04	1111610.	0.00
74.3750	-7.27E-10	-0.06654	-2.48E-05	3.59E-11	0.00	7.50E+10	7.79E-05	1124843.	0.00
75.2500	-3.99E-10	-0.06250	6.11E-04	2.69E-11	0.00	7.50E+10	4.32E-05	1138077.	0.00

76.1250	-1.63E-10	-0.05370	9.32E-04	1.87E-11	0.00	7.50E+10	1.79E-05	1151310.	0.00
77.0000	-6.01E-12	-0.04293	0.00103	1.19E-11	0.00	7.50E+10	6.67E-07	1164544.	0.00
77.8750	8.79E-11	-0.03209	9.81E-04	6.70E-12	0.00	7.50E+10	-9.86E-06	1177777.	0.00
78.7500	1.35E-10	-0.02233	8.49E-04	2.89E-12	0.00	7.50E+10	-1.53E-05	1191010.	0.00
79.6250	1.49E-10	-0.01426	6.80E-04	0.00	0.00	7.50E+10	-1.70E-05	1204244.	0.00
80.5000	1.41E-10	-0.00806	5.04E-04	-1.24E-12	0.00	7.50E+10	-1.64E-05	1217477.	0.00
81.3750	1.23E-10	-0.00367	3.42E-04	-2.06E-12	0.00	7.50E+10	-1.44E-05	1230711.	0.00
82.2500	9.82E-11	-8.69E-04	2.06E-04	-2.38E-12	0.00	7.50E+10	-1.16E-05	1243944.	0.00
83.1250	7.26E-11	6.53E-04	9.92E-05	-2.39E-12	0.00	7.50E+10	-8.70E-06	1257178.	0.00
84.0000	4.80E-11	0.00122	2.31E-05	-2.26E-12	0.00	7.50E+10	-5.81E-06	1270411.	0.00
84.8750	2.52E-11	0.00114	-2.36E-05	-2.10E-12	0.00	7.50E+10	-3.08E-06	1283645.	0.00
85.7500	3.98E-12	7.20E-04	-4.23E-05	-1.97E-12	0.00	7.50E+10	-4.92E-07	1296878.	0.00
86.6250	-1.61E-11	2.49E-04	-3.43E-05	-1.90E-12	0.00	7.50E+10	2.01E-06	1310112.	0.00
87.5000	-3.59E-11	0.00	0.00	-1.88E-12	0.00	7.50E+10	4.52E-06	661672.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.25000000 inches

Computed slope at pile head = 0.000000 radians

Maximum bending moment = -877121. inch-lbs

Maximum shear force = 14095. lbs

Depth of maximum bending moment = 0.000000 feet below pile head

Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 15

Number of zero deflection points = 7

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs

Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians

Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.

Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs

Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load Type 2	Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.2500	S, rad	0.00	0.00	0.2500	0.00	14095.	-877121.

Maximum pile-head deflection = 0.2500000000 inches

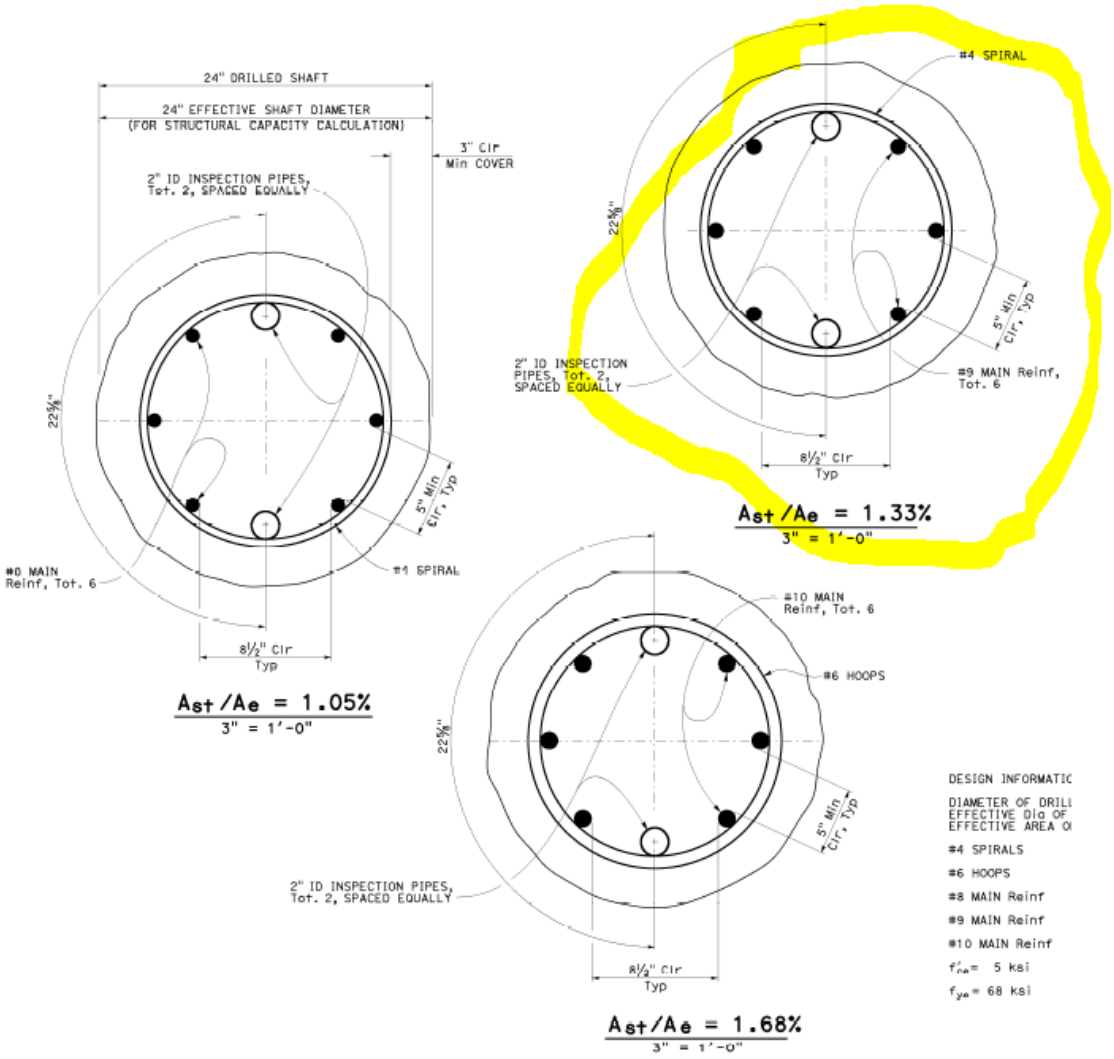
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

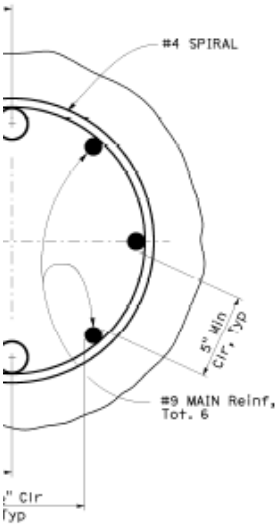
Boring A-19-002

Abutment #1

24-inch CIDH Pile


24" DRILLED SHAFT
24" EFFECTIVE SHAFT DIAMETER
(FOR STRUCTURAL CAPACITY CALCULATION)
3" Clr
Min COVER
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
22⅝"
5" Min
Clr, Typ
#8 MAIN
Reinf, Tot. 6
#4 SPIRAL
8½" Clr
Typ
Ast /Ae = 1.05%
3" = 1'-0"
#4 SPIRAL
22⅝"
2" ID INSPECTION
PIPES, Tot. 2,
SPACED EQUALLY
5" Min
Clr, Typ
#9 MAIN Reinf,
Tot. 6
8½" Clr
Typ
Ast /Ae = 1.33%
3" = 1'-0"
#10 MAIN
Reinf, Tot. 6
#6 HOOPS
22⅝"
5" Min
Clr, Typ
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
8½" Clr
Typ
Ast/Ae = 1.68%
3" = 1'-0"
DESIGN INFORMATIC
DIAMETER OF DRILL
EFFECTIVE Dia OF
EFFECTIVE AREA O
#4 SPIRALS
#6 HOOPS
#8 MAIN Reinf
#9 MAIN Reinf
#10 MAIN Reinf
f'ce= 5 ksi
fye= 68 ksi

ATTACHMENT A



= 1.33%
1'-0"

AIN
, Tot. 6

#6 HOOPS

5" Min
Clr, Typ

STEEL $P_s = A_{st}/A_e$	UNFACTORED AXIAL LOAD (P_n)		SPIRALS SPACING C-C	HOOPS SPACING C-C	M_{nx} @ ϵ_c=0.003	M_p	Φ_p	I_{cr}	$\Phi\gamma i$	V_s
%	%	kips	in	in	kip-ft	kip-ft	rad/in	ft^4	rad/in	kips
1.05% STEEL	0	0	6		236	224	0.001770	0.143	0.000224	55
		0	6		236	224	0.001770	0.143	0.000224	55
	5	95	6		294	273	0.002006	0.177	0.000221	55
		95	6		294	273	0.002006	0.177	0.000221	55
	10	189	6		344	318	0.001657	0.203	0.000225	55
		189	6		344	318	0.001657	0.203	0.000225	55
	15	284	6		380	358	0.001469	0.223	0.000231	55
		284	6		380	358	0.001469	0.223	0.000231	55
	20	378	6		414	392	0.001265	0.236	0.000238	55
		378	6		414	392	0.001265	0.236	0.000238	55
1.33% STEEL	0	0	6		287	274	0.001669	0.171	0.000230	55
		0	6		287	274	0.001669	0.171	0.000230	55
	5	98	6		345	323	0.001850	0.202	0.000230	55
		98	6		345	323	0.001850	0.202	0.000230	55
	10	196	6		385	366	0.001565	0.225	0.000234	55
		196	6		385	366	0.001565	0.225	0.000234	55
	15	294	6		420	403	0.001368	0.242	0.000239	55
		294	6		420	403	0.001368	0.242	0.000239	55
	20	392	6		453	434	0.001204	0.253	0.000246	55
		392	6		453	434	0.001204	0.253	0.000246	55
1.68% STEEL	0	0		6	345	326	0.001311	0.1983	0.000242	118
		0		6	345	326	0.001311	0.193	0.000242	118
	5	102		6	390	377	0.002795	0.22	0.000245	118
		102		6	390	377	0.002795	0.22	0.000245	118
	10	205		6	425	415	0.002552	0.239	0.000249	118
		205		6	425	415	0.002552	0.239	0.000249	118
	15	307		6	458	447	0.002271	0.253	0.000254	118
		307		6	458	447	0.002271	0.253	0.000254	118
	20	409		6	490	472	0.002054	0.261	0.000261	118
		409		6	490	472	0.002054	0.261	0.000261	118

DESIGN INFORMATION:

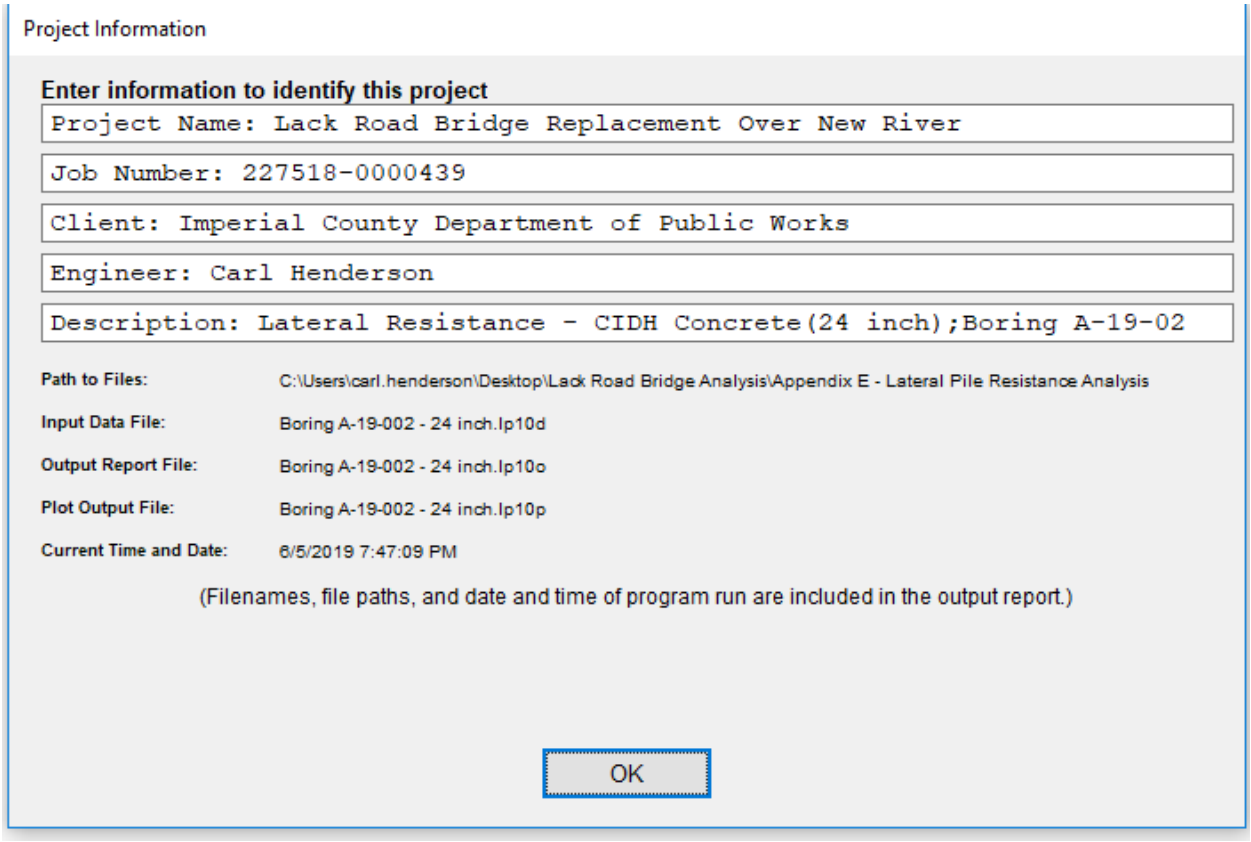
DIAMETER OF DRILLED SHAFT = 24"
EFFECTIVE Dia OF PILE (ϕ_{eff}) = 24"
EFFECTIVE AREA OF PILE (A_e) = 452 in^2

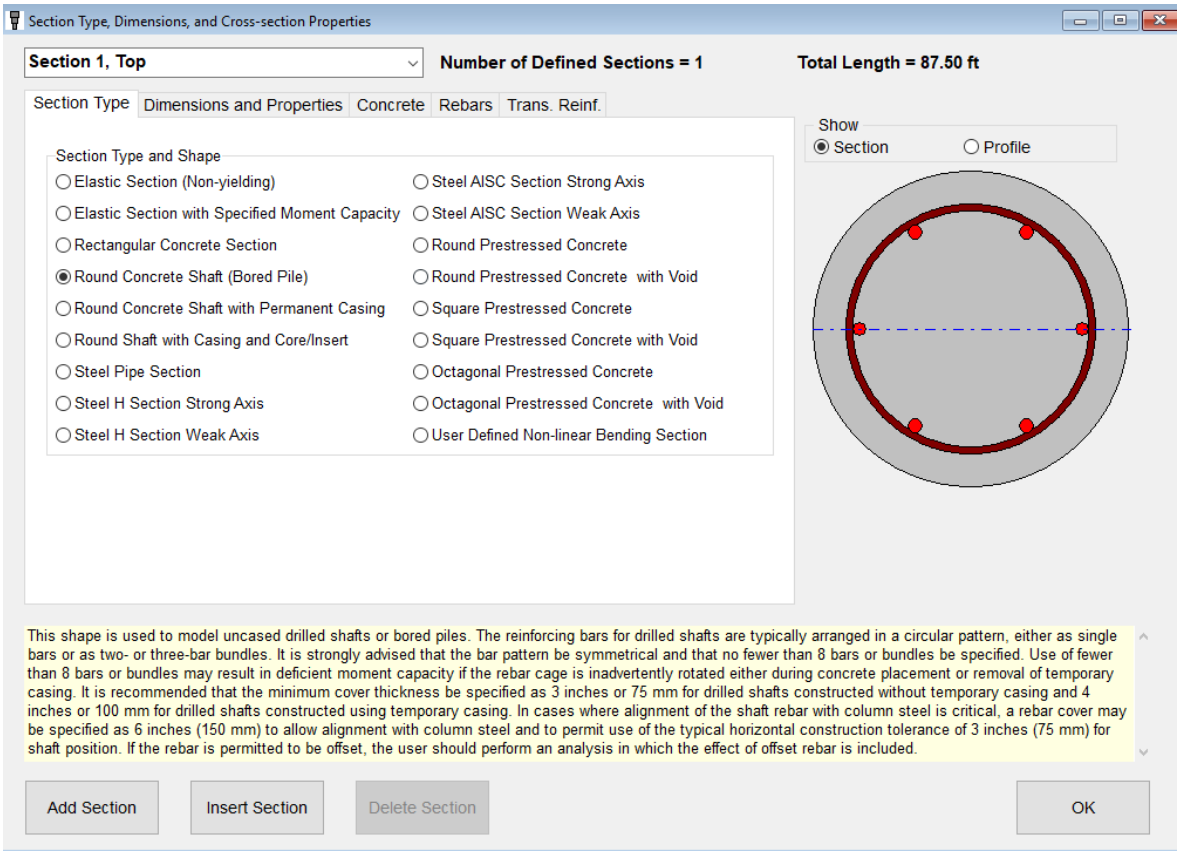
#4 SPIRALS - DEFORMED ϕ = 0.56", A_b = 0.20 in^2
#6 HOOPS - DEFORMED ϕ = 0.88", A_b = 0.44 in^2
#8 MAIN Reinf - DEFORMED ϕ = 1.13", A_b = 0.79 in^2
#9 MAIN Reinf - DEFORMED ϕ = 1.25", A_b = 1.00 in^2
#10 MAIN Reinf - DEFORMED ϕ = 1.44", A_b = 1.27 in^2
f'_{ce} = 5 ksi
f_{ye} = 68 ksi

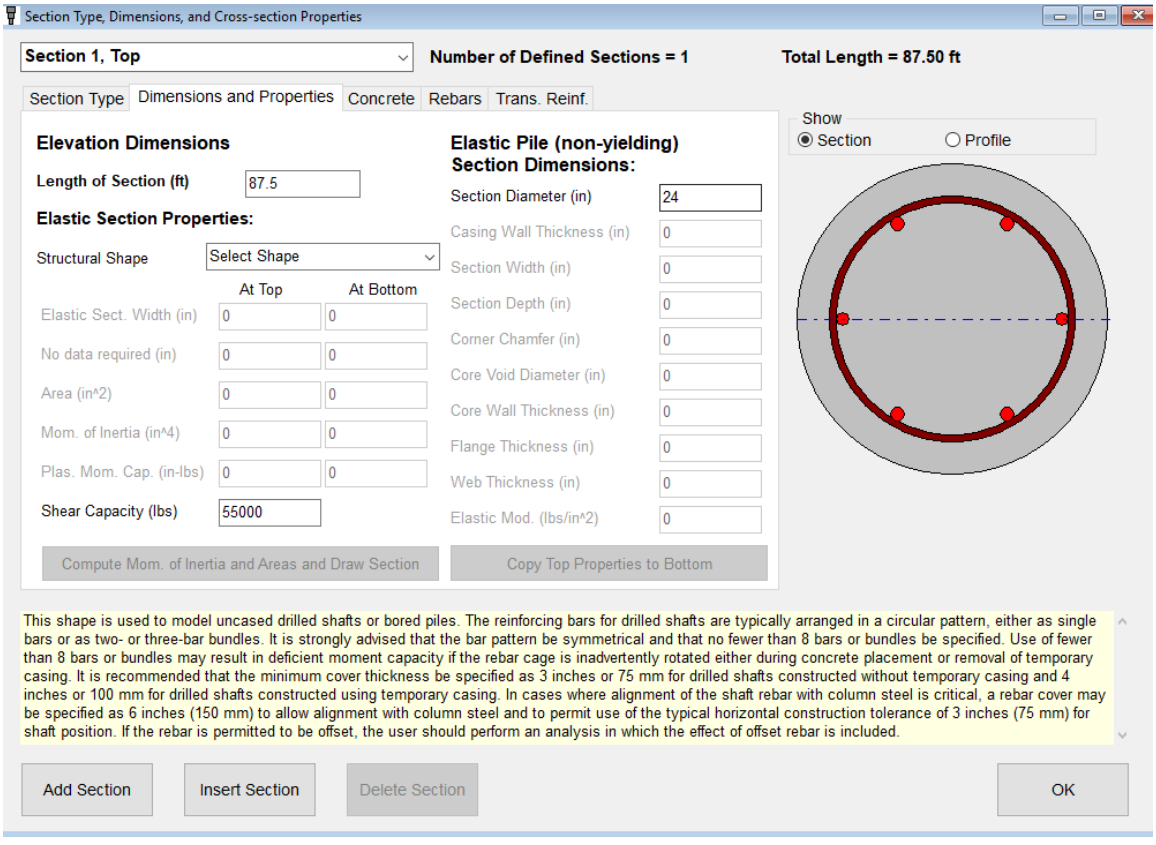
NOTES:

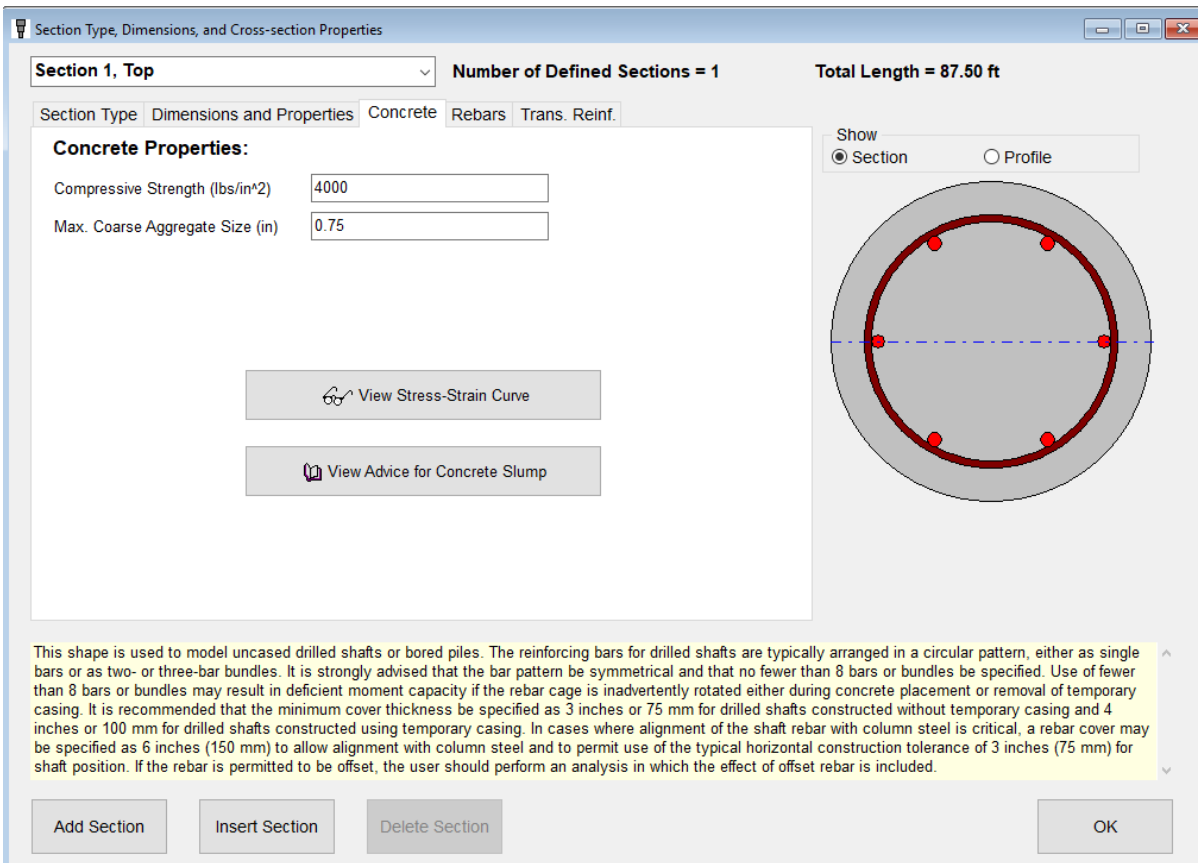
- CLEARANCES SHOWN ARE TYPICAL
- CLEARANCES SHOWN ARE BASED ON DEFORMED REINFORCEMENT DIMENSIONS
- INSPECTION PIPES WILL NOT BE REQUIRED IF THE HOLE IS DRY OR DEWATERED WITHOUT THE USE OF TEMPORARY CASING TO CONTROL GROUND WATER

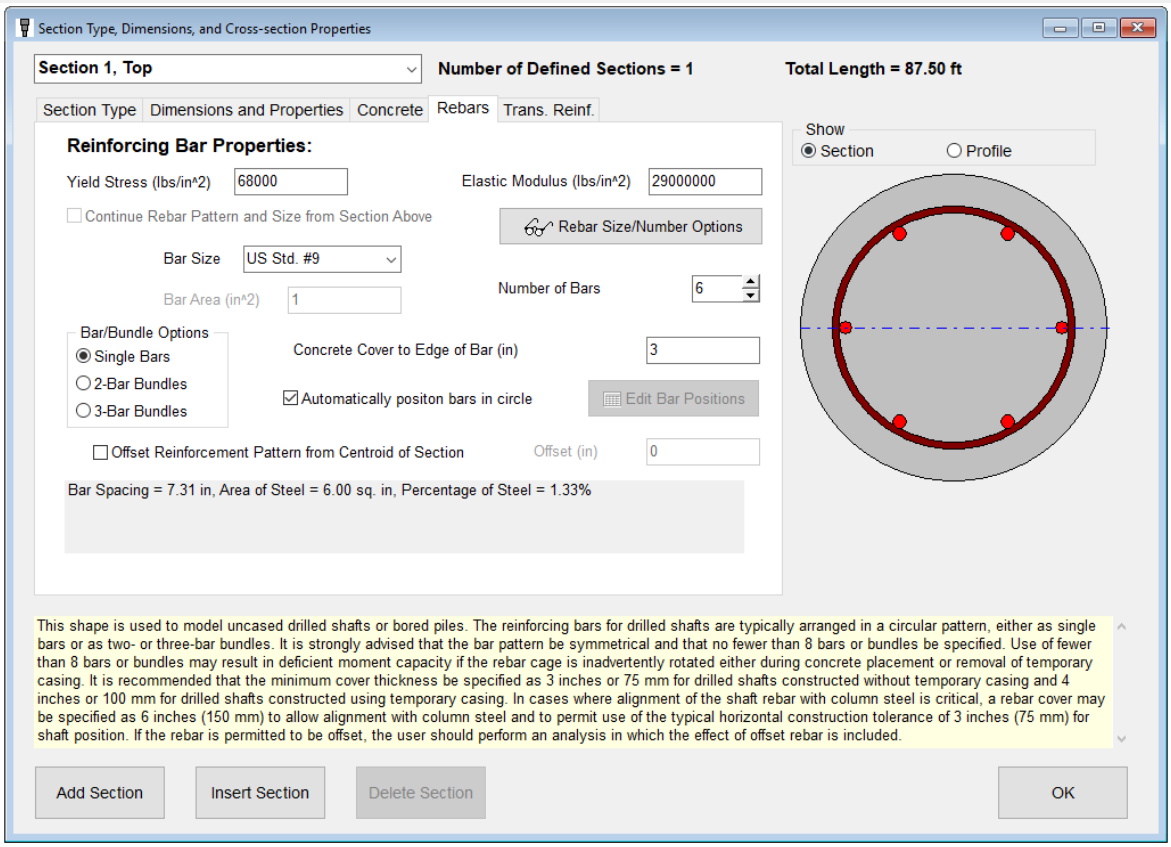
24" DIA CIDH PILE DETAILS WITHOUT CASING

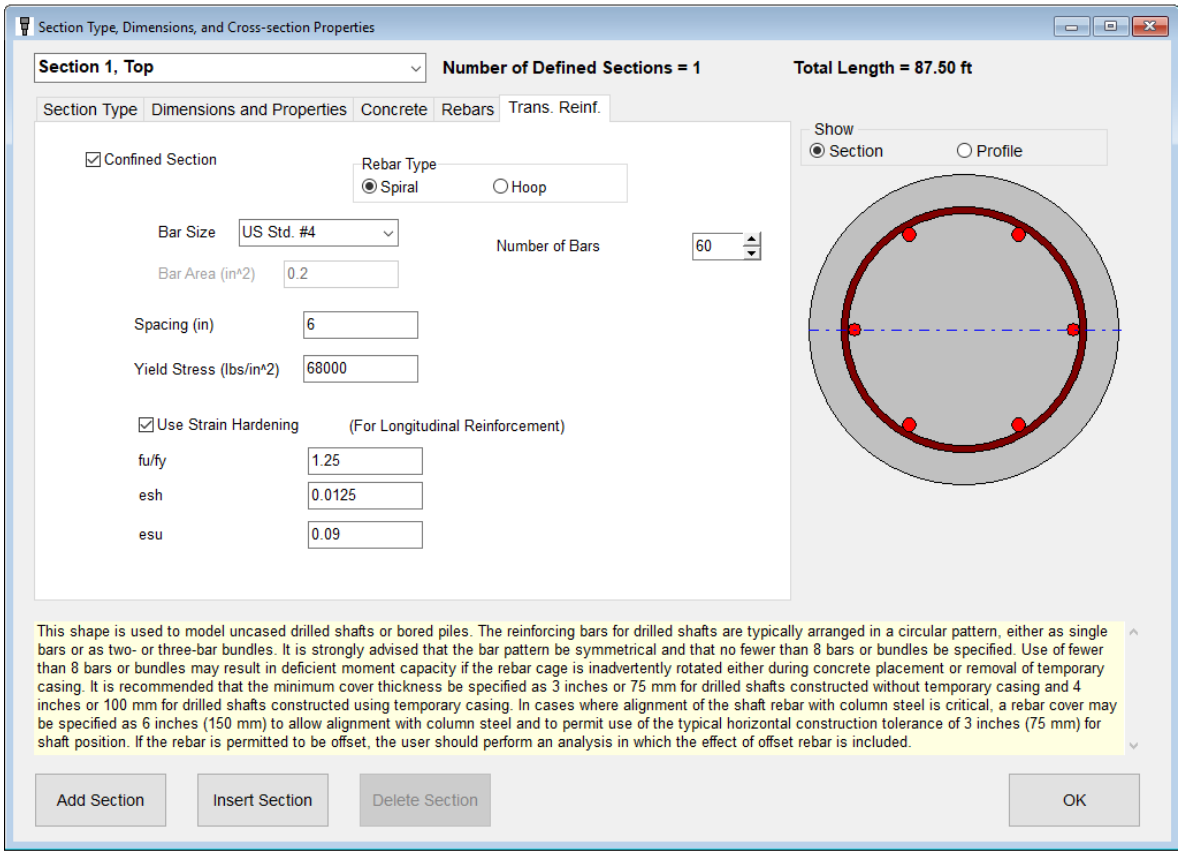

Project Information
Enter information to identify this project
Project Name: Lack Road Bridge Replacement Over New River
Job Number: 227518-0000439
Client: Imperial County Department of Public Works
Engineer: Carl Henderson
Description: Lateral Resistance - CIDH Concrete(24 inch);Boring A-19-02
Path to Files: C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis
Input Data File: Boring A-19-002 - 24 inch.lp10d
Output Report File: Boring A-19-002 - 24 inch.lp10o
Plot Output File: Boring A-19-002 - 24 inch.lp10p
Current Time and Date: 6/5/2019 7:47:09 PM
(Filenames, file paths, and date and time of program run are included in the output report.)
OK

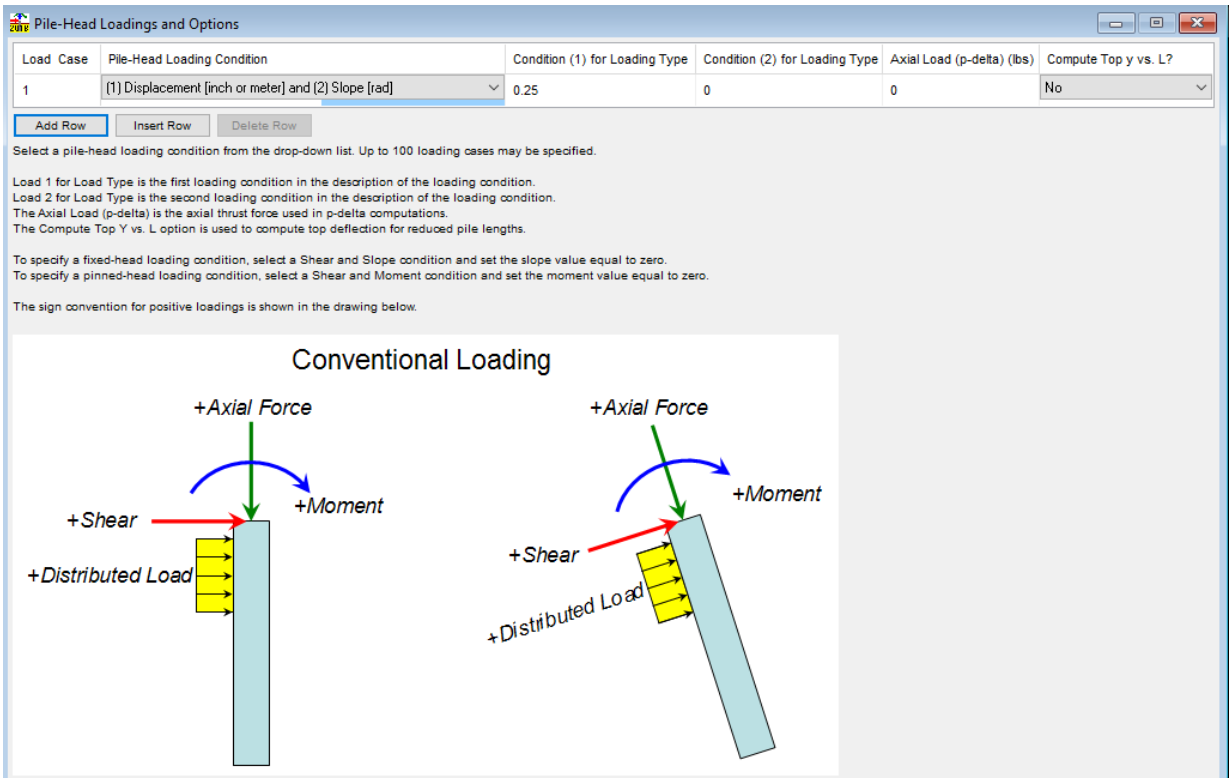

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Show
Section
Profile
Section Type and Shape
Elastic Section (Non-yielding)
Elastic Section with Specified Moment Capacity
Rectangular Concrete Section
Round Concrete Shaft (Bored Pile)
Round Concrete Shaft with Permanent Casing
Round Shaft with Casing and Core/Insert
Steel Pipe Section
Steel H Section Strong Axis
Steel H Section Weak Axis
Steel AISC Section Strong Axis
Steel AISC Section Weak Axis
Round Prestressed Concrete
Round Prestressed Concrete with Void
Square Prestressed Concrete
Square Prestressed Concrete with Void
Octagonal Prestressed Concrete
Octagonal Prestressed Concrete with Void
User Defined Non-linear Bending Section
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Show
Section
Profile
Elevation Dimensions
Length of Section (ft)
87.5
Elastic Section Properties:
Structural Shape
Select Shape
At Top
At Bottom
Elastic Sect. Width (in)
No data required (in)
Area (in^2)
Mom. of Inertia (in^4)
Plas. Mom. Cap. (in-lbs)
Shear Capacity (lbs)
55000
Elastic Pile (non-yielding) Section Dimensions:
Section Diameter (in)
24
Casing Wall Thickness (in)
Section Width (in)
Section Depth (in)
Corner Chamfer (in)
Core Void Diameter (in)
Core Wall Thickness (in)
Flange Thickness (in)
Web Thickness (in)
Elastic Mod. (lbs/in^2)
Compute Mom. of Inertia and Areas and Draw Section
Copy Top Properties to Bottom
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Concrete Properties:
Compressive Strength (lbs/in^2)
4000
Max. Coarse Aggregate Size (in)
0.75
View Stress-Strain Curve
View Advice for Concrete Slump
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Reinforcing Bar Properties:
Yield Stress (lbs/in^2)
68000
Elastic Modulus (lbs/in^2)
29000000
Continue Rebar Pattern and Size from Section Above
Rebar Size/Number Options
Bar Size
US Std. #9
Bar Area (in^2)
1
Number of Bars
6
Bar/Bundle Options
Single Bars
2-Bar Bundles
3-Bar Bundles
Concrete Cover to Edge of Bar (in)
3
Automatically positon bars in circle
Edit Bar Positions
Offset Reinforcement Pattern from Centroid of Section
Offset (in)
0
Bar Spacing = 7.31 in, Area of Steel = 6.00 sq. in, Percentage of Steel = 1.33%
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Dimensions and Properties
Concrete
Rebars
Trans. Reinf.
Confined Section
Rebar Type
Spiral
Hoop
Bar Size
US Std. #4
Number of Bars
60
Bar Area (in^2)
0.2
Spacing (in)
6
Yield Stress (lbs/in^2)
68000
Use Strain Hardening
(For Longitudinal Reinforcement)
fu/fy
1.25
esh
0.0125
esu
0.09
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

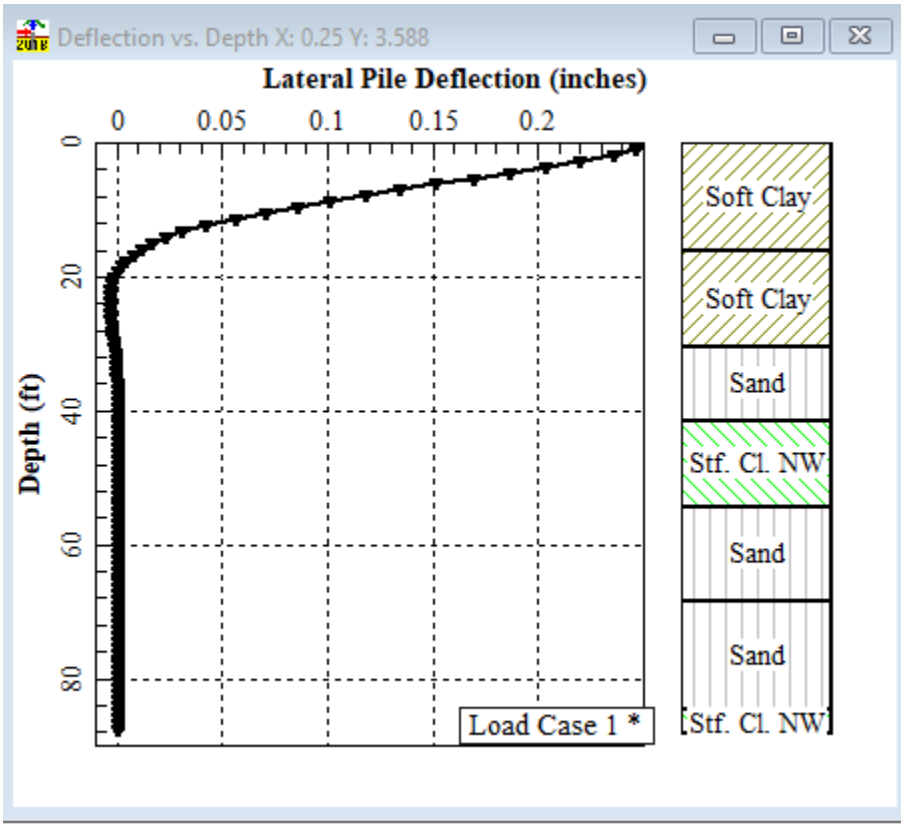

Pile-Head Loadings and Options
Load Case
Pile-Head Loading Condition
Condition (1) for Loading Type
Condition (2) for Loading Type
Axial Load (p-delta) (lbs)
Compute Top y vs. L?
1
(1) Displacement [inch or meter] and (2) Slope [rad]
0.25
0
0
No
Add Row
Insert Row
Delete Row
Select a pile-head loading condition from the drop-down list. Up to 100 loading cases may be specified.
Load 1 for Load Type is the first loading condition in the description of the loading condition.
Load 2 for Load Type is the second loading condition in the description of the loading condition.
The Axial Load (p-delta) is the axial thrust force used in p-delta computations.
The Compute Top Y vs. L option is used to compute top deflection for reduced pile lengths.
To specify a fixed-head loading condition, select a Shear and Slope condition and set the slope value equal to zero.
To specify a pinned-head loading condition, select a Shear and Moment condition and set the moment value equal to zero.
The sign convention for positive loadings is shown in the drawing below.
Conventional Loading
+Axial Force
+Moment
+Shear
+Distributed Load
+Axial Force
+Moment
+Shear
+Distributed Load

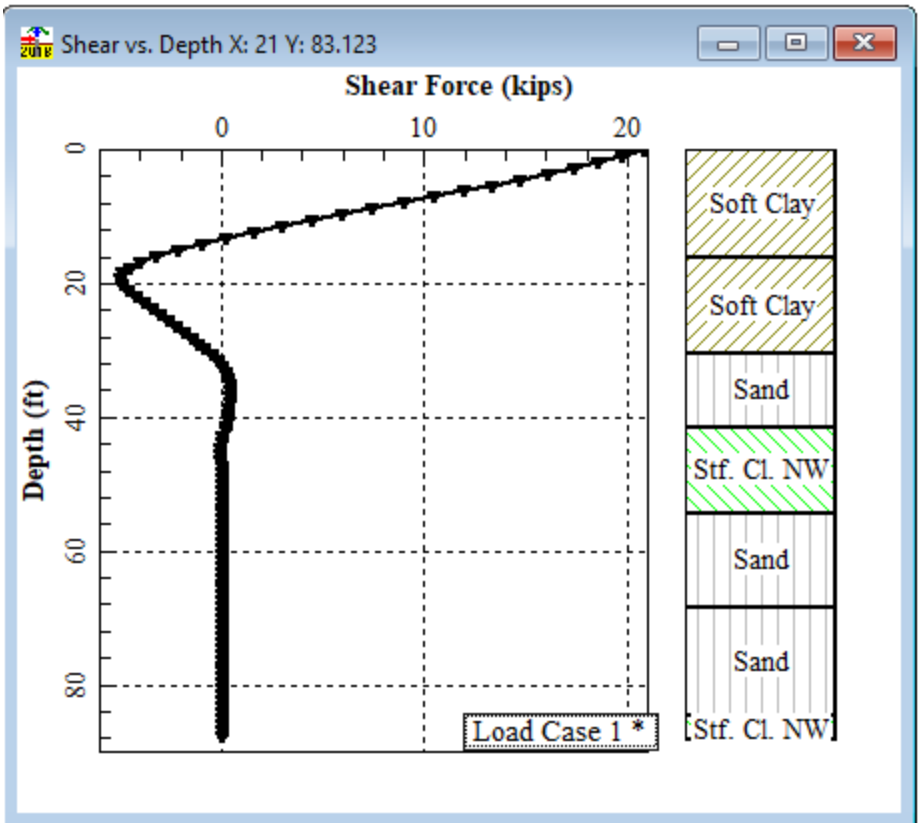
Soil Layers

Layer	Select p-y Curve Type from Drop-down List	Vertical Depth Below Pile Head of Top of Soil Layer (ft)	Vertical Depth Below Pile Head of Bottom of Soil Layer (ft)	Press Button to Enter Soil Properties
1	Soft Clay (Matlock)	0	16	1: Soft Clay
2	Soft Clay (Matlock)	16	30.5	2: Soft Clay
3	Sand (Reese)	30.5	41.5	3: Sand (Reese, et al.)
4	Stiff Clay w/o Free Water (Reese)	41.5	54.5	4: Stiff Clay without Free Water
5	Sand (Reese)	54.5	68.5	5: Sand (Reese, et al.)
6	Sand (Reese)	68.5	84.5	6: Sand (Reese, et al.)
7	Stiff Clay w/o Free Water (Reese)	84.5	88.5	7: Stiff Clay without Free Water

Add Row | Insert Row | Delete Row

All positive depth coordinates are defined as vertical distances below the pile-head.
If the pile-head is embedded below the ground surface, the top layer must extend from the ground surface (defined by a negative vertical depth) to some point below the pile head.
Select the p-y soil type using the drop-down list in the left table column.




Shear vs. Depth X: 21 Y: 83.123
Shear Force (kips)
0
10
20
Depth (ft)
0
20
40
60
80
Soft Clay
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Stf. Cl. NW
Load Case 1 *

==========

LPile for Windows, Version 2018-10.002

Analysis of Individual Piles and Drilled Shafts

Subjected to Lateral Loading Using the p-y Method

==========

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Files Used for Analysis

Path to file locations:

\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis\

Name of input data file:

Boring A-19-002 - 24 inch.lp10

Name of output report file:

Boring A-19-002 - 24 inch.lp10

Name of plot output file:

Boring A-19-002 - 24 inch.lp10

Name of runtime message file:

Boring A-19-002 - 24 inch.lp10

Date and Time of Analysis

Date: June 5, 2019 Time: 19:46:32

Problem Title

Project Name: Lack Road Bridge Replacement Over New River

Job Number: 227518-0000439

Client: Imperial County Department of Public Works

Engineer: Carl Henderson

Description: Lateral Resistance - CIDH Concrete(24 inch);Boring A-19-02

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1

Total length of pile = 87.500 ft

Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	24.0000
2	87.500	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile

Length of section = 87.500000 ft

Shaft Diameter = 24.000000 in

Shear capacity of section = 55000. lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees

= 0.000 radians

Pile Batter Angle = 0.000 degrees

= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 0.0000 ft

Distance from top of pile to bottom of layer = 16.000000 ft

Effective unit weight at top of layer = 60.400000 pcf

Effective unit weight at bottom of layer = 60.400000 pcf

Undrained cohesion at top of layer = 500.000000 psf

Undrained cohesion at bottom of layer = 500.000000 psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 16.000000 ft

Distance from top of pile to bottom of layer = 30.500000 ft

Effective unit weight at top of layer = 59.800000 pcf

Effective unit weight at bottom of layer = 59.800000 pcf

Undrained cohesion at top of layer = 350.000000 psf

Undrained cohesion at bottom of layer = 350.000000 psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 30.500000 ft

Distance from top of pile to bottom of layer = 41.500000 ft

Effective unit weight at top of layer = 66.800000 pcf

Effective unit weight at bottom of layer = 66.800000 pcf

Friction angle at top of layer = 34.000000 deg.

Friction angle at bottom of layer = 34.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 4 is stiff clay without free water

Distance from top of pile to top of layer = 41.500000 ft

Distance from top of pile to bottom of layer = 54.500000 ft

Effective unit weight at top of layer = 61.600000 pcf

Effective unit weight at bottom of layer = 61.600000 pcf

Undrained cohesion at top of layer = 1500. psf

Undrained cohesion at bottom of layer = 1500. psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 54.500000 ft

Distance from top of pile to bottom of layer = 68.500000 ft

Effective unit weight at top of layer = 61.600000 pcf

Effective unit weight at bottom of layer = 61.600000 pcf

Friction angle at top of layer = 33.000000 deg.

Friction angle at bottom of layer = 33.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 68.500000 ft

Distance from top of pile to bottom of layer = 84.500000 ft

Effective unit weight at top of layer = 65.600000 pcf

Effective unit weight at bottom of layer = 65.600000 pcf

Friction angle at top of layer = 38.000000 deg.

Friction angle at bottom of layer = 38.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 84.500000 ft

Distance from top of pile to bottom of layer = 88.500000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 pcf

Undrained cohesion at top of layer = 2000. psf

Undrained cohesion at bottom of layer = 2000. psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

(Depth of the lowest soil layer extends 1.000 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Soft Clay	0.00 16.0000	60.4000 60.4000	500.0000 500.0000	-- --	default default	-- --
2	Soft Clay	16.0000 30.5000	59.8000 59.8000	350.0000 350.0000	-- --	default default	-- --
3	Sand (Reese, et al.)	30.5000 41.5000	66.8000 66.8000	-- --	34.0000 34.0000	-- --	default default
4	Stiff Clay w/o Free Water	41.5000 54.5000	61.6000 61.6000	1500. 1500.	-- --	default default	-- --
5	Sand (Reese, et al.)	54.5000 68.5000	61.6000 61.6000	-- --	33.0000 33.0000	-- --	default default
6	Sand (Reese, et al.)	68.5000 84.5000	65.6000 65.6000	-- --	38.0000 38.0000	-- --	default default
7	Stiff Clay w/o Free Water	84.5000 88.5000	62.6000 62.6000	2000. 2000.	-- --	default default	-- --

---

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	0.0000000	N.A.

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with

specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section = 87.500000 ft

Shaft Diameter = 24.000000 in

Concrete Cover Thickness = 3.000000 in

Number of Reinforcing Bars = 6 bars

Yield Stress of Reinforcing Bars = 68000. psi

Modulus of Elasticity of Reinforcing Bars = 29000000. psi

Gross Area of Shaft = 452.389342 sq. in.

Total Area of Reinforcing Steel = 6.000000 sq. in.

Area Ratio of Steel Reinforcement = 1.33 percent

Edge-to-Edge Bar Spacing = 7.308000 in

Maximum Concrete Aggregate Size = 0.750000 in

Ratio of Bar Spacing to Aggregate Size = 9.74

Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Confined Section

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 1925.724 kips

Tensile Load for Cracking of Concrete = -205.732 kips

Nominal Axial Tensile Capacity = -408.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	8.436000	0.00000
2	1.128000	1.000000	4.218000	7.305790
3	1.128000	1.000000	-4.218000	7.305790
4	1.128000	1.000000	-8.436000	0.00000
5	1.128000	1.000000	-4.218000	-7.305790
6	1.128000	1.000000	4.218000	-7.305790

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 7.308 inches
between bars 4 and 5.

Ratio of bar spacing to maximum aggregate size = 9.74

Concrete Properties:

Compressive Strength of Concrete = 4000. psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.341649 psi
Compression Strain at Peak Stress = 0.001886

Tensile Strain at Fracture of Concrete = -0.0001154

Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.

Y = stress in reinforcing steel has reached yield stress.

T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.

Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.

Position of neutral axis is measured from edge of compression side of pile.

Compressive stresses and strains are positive in sign.

Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conf Stress ksi	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
0.00000200	149.9781433	74989072.	12.0000155	0.00002400	-0.00002400	-0.0010177	0.1001357	0.6890409	
0.00000400	298.7624583	74690615.	12.0000156	0.00004800	-0.00004800	-0.0020352	0.1990021	1.3780818	
0.00000600	446.3529448	74392157.	12.0000157	0.00007200	-0.00007200	-0.0030527	0.2965992	2.0671227	
0.00000800	592.7496030	74093700.	12.0000157	0.00009600	-0.00009600	-0.0040700	0.3929269	2.7561637	
0.00001000	592.7496030	59274960.	6.2332537	0.00006233	-0.0001777	0.00000	0.2550722	-5.1175564	C
0.00001200	592.7496030	49395800.	6.2366937	0.00007484	-0.0002132	0.00000	0.3052466	-6.1398706	C
0.00001400	592.7496030	42339257.	6.2401470	0.00008736	-0.0002486	0.00000	0.3551390	-7.1617803	C
0.00001600	592.7496030	37046850.	6.2436135	0.00009990	-0.0002841	0.00000	0.4047487	-8.1832833	C
0.00001800	592.7496030	32930533.	6.2470935	0.0001124	-0.0003196	0.00000	0.4540748	-9.2043772	C
0.00002000	592.7496030	29637480.	6.2505870	0.0001250	-0.0003550	0.00000	0.5031164	-10.2250595	C
0.00002200	592.7496030	26943164.	6.2540941	0.0001376	-0.0003904	0.00000	0.5518727	-11.2453280	C
0.00002400	592.7496030	24697900.	6.2576149	0.0001502	-0.0004258	0.00000	0.6003429	-12.2651800	C
0.00002600	592.7496030	22798062.	6.2611496	0.0001628	-0.0004612	0.00000	0.6485261	-13.2846132	C
0.00002800	592.7496030	21169629.	6.2646982	0.0001754	-0.0004966	0.00000	0.6964214	-14.3036250	C
0.00003000	592.7496030	19758320.	6.2682609	0.0001880	-0.0005320	0.00000	0.7440279	-15.3222130	C
0.00003200	592.7496030	18523425.	6.2718377	0.0002007	-0.0005673	0.00000	0.7913448	-16.3403745	C

0.00003400 592.7496030 17433812. 6.2754289 0.0002134 -0.0006026 0.00000 0.8383711 -17.3581071 C

0.00003600 592.7496030 16465267. 6.2790345 0.0002260 -0.0006380 0.00000 0.8851059 -18.3754080 C

0.00003800 592.7496030 15598674. 6.2826546 0.0002387 -0.0006733 0.00000 0.9315484 -19.3922747 C

0.00004000 619.4931606 15487329. 6.2862893 0.0002515 -0.0007085 0.00000 0.9776976 -20.4087044 C

0.00004200 650.1062681 15478721. 6.2899388 0.0002642 -0.0007438 0.00000 1.0235526 -21.4246945 C

0.00004400 680.6836129 15470082. 6.2936032 0.0002769 -0.0007791 0.00000 1.0691124 -22.4402423 C

0.00004600 711.2250030 15461413. 6.2972826 0.0002897 -0.0008143 0.00000 1.1143761 -23.4553450 C

0.00004800 741.7302443 15452713. 6.3009771 0.0003024 -0.0008496 0.00000 1.1593428 -24.4699998 C

0.00005000 772.1991407 15443983. 6.3046870 0.0003152 -0.0008848 0.00000 1.2040115 -25.4842040 C

0.00005200 802.6314943 15435221. 6.3084122 0.0003280 -0.0009200 0.00000 1.2483812 -26.4979545 C

0.00005400 833.0271047 15426428. 6.3121529 0.0003409 -0.0009551 0.00000 1.2924510 -27.5112487 C

0.00005600 863.3857697 15417603. 6.3159093 0.0003537 -0.0009903 0.00000 1.3362198 -28.5240834 C

0.00005800 893.7072847 15408746. 6.3196814 0.0003665 -0.0010255 0.00000 1.3796867 -29.5364559 C

0.00006000 923.9914431 15399857. 6.3234695 0.0003794 -0.0010606 0.00000 1.4228506 -30.5483631 C

0.00006200 954.2380359 15390936. 6.3272737 0.0003923 -0.0010957 0.00000 1.4657105 -31.5598021 C

0.00006400 984.4468519 15381982. 6.3310940 0.0004052 -0.0011308 0.00000 1.5082655 -32.5707696 C

0.00006600 1015. 15372995. 6.3349307 0.0004181 -0.0011659 0.00000 1.5505145 -33.5812628 C

0.00006800 1045. 15363975. 6.3387839 0.0004310 -0.0012010 0.00000 1.5924564 -34.5912783 C

0.00007000 1075. 15354921. 6.3426537 0.0004440 -0.0012360 0.00000 1.6340902 -35.6008132 C

0.00007200	1105.	15345834.	6.3465403	0.0004570	-0.0012710	0.00000	1.6754148	-36.6098641 C
0.00007400	1135.	15336712.	6.3504438	0.0004699	-0.0013061	0.00000	1.7164291	-37.6184279 C
0.00007600	1165.	15327557.	6.3543644	0.0004829	-0.0013411	0.00000	1.7571321	-38.6265012 C
0.00007800	1195.	15318366.	6.3583022	0.0004959	-0.0013761	0.00000	1.7975227	-39.6340808 C
0.00008200	1255.	15299903.	6.3659839	0.0005220	-0.0014460	0.00000	1.8772997	-41.6483301 C
0.00008600	1314.	15281309.	6.3736641	0.0005481	-0.0015159	0.00000	1.9557911	-43.6608014 C
0.00009000	1374.	15262577.	6.3814108	0.0005743	-0.0015857	0.00000	2.0330043	-45.6713175 C
0.00009400	1433.	15243704.	6.3892252	0.0006006	-0.0016554	0.00000	2.1089304	-47.6798519 C
0.00009800	1492.	15224688.	6.3971084	0.0006269	-0.0017251	0.00000	2.1835601	-49.6863775 C
0.0001020	1551.	15205527.	6.4050619	0.0006533	-0.0017947	0.00000	2.2568839	-51.6908667 C
0.0001060	1610.	15186218.	6.4130867	0.0006798	-0.0018642	0.00000	2.3288925	-53.6932911 C
0.0001100	1668.	15166759.	6.4211843	0.0007063	-0.0019337	0.00000	2.3995758	-55.6936216 C
0.0001140	1727.	15147148.	6.4293561	0.0007329	-0.0020031	0.00000	2.4689240	-57.6918283 C
0.0001180	1785.	15127380.	6.4376035	0.0007596	-0.0020724	0.00000	2.5369267	-59.6878806 C
0.0001220	1843.	15107455.	6.4459278	0.0007864	-0.0021416	0.00000	2.6035738	-61.6817471 C
0.0001260	1901.	15087368.	6.4543306	0.0008132	-0.0022108	0.00000	2.6688543	-63.6733955 C
0.0001300	1959.	15067117.	6.4628135	0.0008402	-0.0022798	0.00000	2.7327576	-65.6627927 C
0.0001340	2016.	15046700.	6.4713780	0.0008672	-0.0023488	0.00000	2.7952725	-67.6499047 C
0.0001380	2074.	15026112.	6.4800257	0.0008942	-0.0024178	0.00000	2.8563875	-68.0000000 CY

0.0001420 2131. 15005350. 6.4887584 0.0009214 -0.0024866 0.00000 2.9160912 -68.0000000 CY

0.0001460 2188. 14984412. 6.4975777 0.0009486 -0.0025554 0.00000 2.9743716 -68.0000000 CY

0.0001500 2244. 14963294. 6.5064854 0.0009760 -0.0026240 0.00000 3.0312165 -68.0000000 CY

0.0001540 2301. 14941993. 6.5154834 0.0010034 -0.0026926 0.00000 3.0866134 -68.0000000 CY

0.0001580 2357. 14920504. 6.5245736 0.0010309 -0.0027611 0.00000 3.1405497 -68.0000000 CY

0.0001620 2414. 14898825. 6.5337579 0.0010585 -0.0028295 0.00000 3.1930123 -68.0000000 CY

0.0001660 2470. 14876951. 6.5430384 0.0010861 -0.0028979 0.00000 3.2439878 -68.0000000 CY

0.0001700 2525. 14854878. 6.5524172 0.0011139 -0.0029661 0.00000 3.2934624 -68.0000000 CY

0.0001740 2581. 14832603. 6.5618964 0.0011418 -0.0030342 0.00000 3.3414222 -68.0000000 CY

0.0001780 2635. 14805485. 6.5707289 0.0011696 -0.0031024 0.00000 3.3876313 -68.0000000 CY

0.0001820 2683. 14741307. 6.5735984 0.0011964 -0.0031716 0.00000 3.4305372 -68.0000000 CY

0.0001860 2719. 14617703. 6.5664909 0.0012214 -0.0032426 0.00000 3.4690569 -68.0000000 CY

0.0001900 2743. 14436291. 6.5492859 0.0012444 -0.0033156 0.00000 3.5032798 -68.0000000 CY

0.0001940 2759. 14221164. 6.5258794 0.0012660 -0.0033900 0.00000 3.5344248 -68.0000000 CY

0.0001980 2774. 14009254. 6.5027375 0.0012875 -0.0034645 0.00000 3.5643728 -68.0000000 CY

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0.0002100 2818. 13420016. 6.4399198 0.0013524 -0.0036876 0.00000 3.6485919 -68.0000000 CY

0.0002140 2833. 13237643. 6.4209846 0.0013741 -0.0037619 0.00000 3.6747700 -68.0000000 CY

0.0002180 2847. 13061639. 6.4029633 0.0013958 -0.0038362 0.00000 3.6999904 -68.0000000 CY

0.0002220 2862. 12891659. 6.3858088 0.0014176 -0.0039104 0.00000 3.7242467 -68.0000000 CY

0.0002260 2876. 12727378. 6.3694773 0.0014395 -0.0039845 0.00000 3.7475327 -68.0000000 CY

0.0002300 2891. 12568375. 6.3535862 0.0014613 -0.0040587 0.00000 3.7697618 -68.0000000 CY

0.0002340 2905. 12414322. 6.3379422 0.0014831 -0.0041329 0.00000 3.7908994 -68.0000000 CY

0.0002380 2919. 12265149. 6.3230396 0.0015049 -0.0042071 0.00000 3.8110668 -68.0000000 CY

0.0002540 2975. 11712577. 6.2701918 0.0015926 -0.0045034 0.00000 3.8818947 -68.0000000 CY

0.0002700 3030. 11221045. 6.2268376 0.0016812 -0.0047988 0.00000 3.9366271 -68.0000000 CY

0.0002860 3083. 10780114. 6.1915423 0.0017708 -0.0050932 0.00000 3.9747691 -68.0000000 CY

0.0003020 3135. 10381541. 6.1631908 0.0018613 -0.0053867 0.00000 3.9957855 -68.0000000 CY

0.0003180 3186. 10018614. 6.1409649 0.0019528 -0.0056792 0.00000 3.9974180 -68.0000000 CY

0.0003340 3235. 9685782. 6.1242842 0.0020455 -0.0059705 0.00000 3.9980954 -68.0000000 CY

0.0003500 3283. 9378850. 6.1119838 0.0021392 -0.0062608 0.00000 3.9981031 -68.0000000 CY

0.0003660 3328. 9093458. 6.1033294 0.0022338 -0.0065502 0.00000 3.9974386 -68.0000000 CY

0.0003820 3368. 8816061. 6.0921625 0.0023272 -0.0068408 0.00000 3.9954947 -68.0000000 CY

0.0003980 3396. 8532256. 6.0702145 0.0024159 -0.0071361 0.00000 3.9986473 68.0000000 CY

0.0004140 3412. 8240510. 6.0357469 0.0024988 -0.0074372 0.00000 3.9987525 68.0000000 CY

0.0004300 3417. 7946549. 5.9910159 0.0025761 -0.0077439 0.00000 3.9940224 68.0000000 CY

0.0004460 3419. 7666008. 5.9461724 0.0026520 -0.0080520 0.00000 3.9984544 68.0000000 CY

0.0004620 3421. 7403934. 5.9050089 0.0027281 -0.0083599 0.00000 3.9967885
68.0000000 CY

0.0004780 3422. 7158568. 5.8663683 0.0028041 -0.0086679 0.00000 3.9963131
68.0000000 CY

0.0004940 3423. 6928263. 5.8284564 0.0028793 -0.0089767 0.00000 3.9997546
68.0000000 CY

0.0005100 3423. 6712034. 5.7938333 0.0029549 -0.0092851 0.00000 3.9911636
68.0000000 CY

0.0005260 3424. 6508704. 5.7619981 0.0030308 -0.0095932 0.00000 3.9966313
68.0000000 CY

0.0005420 3424. 6317203. 5.7325695 0.0031071 -0.0099009 0.00000 3.9997478
68.0000000 CY

0.0005580 3424. 6136399. 5.7055814 0.0031837 -0.0102083 0.00000 3.9920981
68.0000000 CY

0.0005740 3424. 5965475. 5.6806677 0.0032607 -0.0105153 0.00000 3.9941643
68.0000000 CY

0.0005900 3424. 5803700. 5.6575201 0.0033379 -0.0108221 0.00000 3.9986123
68.0000000 CY

0.0006060 3424. 5650467. 5.6355248 0.0034151 -0.0111289 0.00000 3.9994553
68.0000000 CY

0.0006220 3424. 5505117. 5.6133141 0.0034915 -0.0114365 0.00000 3.9881580
68.0000000 CY

0.0006380 3424. 5367058. 5.5925248 0.0035680 -0.0117440 0.00000 3.9929624
68.0000000 CY

0.0006540 3424. 5235754. 5.5730592 0.0036448 -0.0120512 0.00000 3.9975660
68.0000000 CY

0.0006700 3424. 5110721. 5.5548293 0.0037217 -0.0123583 0.00000 3.9997879
68.0000000 CY

0.0006860 3424. 4991520. 5.5379478 0.0037990 -0.0126650 0.00000 3.9939172 -
68.0781955 CY

0.0007020 3424. 4877753. 5.5461614 0.0038934 -0.0129546 0.00000 3.9890114 -
68.3471142 CY

0.0007180 3424. 4769057. 5.5308184 0.0039711 -0.0132609 0.00000 3.9946253 -
68.6261436 CY

0.0007340 3424. 4665099. 5.5163748 0.0040490 -0.0135670 0.00000 3.9982679 -
68.8995630 CY

0.0007500 3424. 4565577. 5.5449909 0.0041587 -0.0138413 0.00000 3.9929544 -
69.1398603 CY

0.0007660 3424. 4470213. 5.5315728 0.0042372 -0.0141468 0.00000 3.9834102 -69.4028619 CY

0.0007820 3424. 4378751. 5.5729707 0.0043581 -0.0144099 0.00000 3.9956941 -69.6250747 CY

0.0007980 3424. 4290956. 5.5598516 0.0044368 -0.0147152 0.00000 3.9986205 -69.8786051 CY

0.0008140 3424. 4206613. 5.6117214 0.0045679 -0.0149681 0.00000 3.9861077 -70.0846555 CY

0.0008300 3424. 4125522. 5.5989183 0.0046471 -0.0152729 0.00000 3.9817047 -70.3291599 CY

0.0008460 3424. 4047498. 5.6570973 0.0047859 -0.0155181 0.00000 3.9977790 -70.5222203 CY

0.0008620 3424. 3972370. 5.6458894 0.0048668 -0.0158212 0.00000 3.9995824 -70.7572827 CY

0.0008780 3424. 3899981. 5.6345047 0.0049471 -0.0161249 0.00000 3.9983119 -70.9884286 CY

0.0009740 3424. 3515588. 5.8085599 0.0056575 -0.0177185 0.00000 3.9917289 -72.1336175 CY

0.0010700 3424. 3200171. 5.9320456 0.0063473 -0.0193327 216719. 3.9987771 -73.1894705 CY

0.0011660 3424. 2936692. 5.9707509 0.0069619 -0.0210221 223166. 3.9884373 -74.1954513 CY

0.0012620 3424. 2713299. 6.1073980 0.0077075 -0.0225805 159488. 3.9918977 -75.0428632 CY

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003

or maximum developed moment if pile fails at smaller strains.

Load	Axial Thrust	Nominal Mom. Cap.	Max. Comp.
No.	kips	in-kip	Strain

1	0.000	3423.399	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	3423.	0.0000	2225.	14970468.
1	0.70	3423.	0.0000	2396.	14905475.
1	0.75	3423.	0.0000	2568.	14837946.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or Below	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	95394.
2	16.0000	19.8748	Yes	No	95394.	91415.
3	30.5000	14.2991	No	No	186809.	724831.
4	41.5000	40.6312	No	No	911640.	351000.
5	54.5000	29.0666	No	No	1262640.	2671102.
6	68.5000	37.2309	Yes	No	3933742.	7318055.
7	84.5000	319.6611	No	No	1.13E+07	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals
for Layer n. Layering correction equivalent depths are computed only
for soil types with both shallow-depth and deep-depth expressions for
peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

Displacement of pile head = 0.250000 inches

Rotation of pile head = 0.000E+00 radians

Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	-1125156.	20767.	0.00	0.00	1.53E+10	-93.3626	1961.	0.00
0.8750	0.2460	-912774.	19687.	-6.97E-04	0.00	1.53E+10	-102.8990	4393.	0.00
1.7500	0.2354	-711738.	18562.	-0.00125	0.00	1.55E+10	-111.2946	4965.	0.00
2.6250	0.2197	-522971.	17356.	-0.00153	0.00	7.42E+10	-118.4375	5661.	0.00
3.5000	0.2032	-347263.	16079.	-0.00159	0.00	7.46E+10	-124.8268	6450.	0.00
4.3750	0.1862	-185316.	14739.	-0.00163	0.00	7.49E+10	-130.4047	7352.	0.00
5.2500	0.1690	-37747.	13345.	-0.00164	0.00	7.50E+10	-135.1119	8394.	0.00
6.1250	0.1517	94927.	11906.	-0.00164	0.00	7.50E+10	-138.8847	9612.	0.00
7.0000	0.1346	212288.	10434.	-0.00162	0.00	7.48E+10	-141.6521	11054.	0.00
7.8750	0.1177	314032.	8937.	-0.00158	0.00	7.46E+10	-143.3315	12786.	0.00
8.7500	0.1013	399974.	7430.	-0.00153	0.00	7.45E+10	-143.8212	14904.	0.00
9.6250	0.08553	470060.	5924.	-0.00147	0.00	7.43E+10	-142.9892	17553.	0.00
10.5000	0.07044	524381.	4435.	-0.00140	0.00	7.42E+10	-140.6519	20965.	0.00
11.3750	0.05613	563195.	2980.	-0.00132	0.00	7.41E+10	-136.5366	25542.	0.00
12.2500	0.04265	586956.	1579.	-0.00120	0.00	3.52E+10	-130.2018	32051.	0.00
13.1250	0.03101	596362.	254.9336	-9.46E-04	0.00	1.93E+10	-122.0767	41330.	0.00
14.0000	0.02278	592310.	-988.0833	-6.66E-04	0.00	2.64E+10	-114.6884	52865.	0.00
14.8750	0.01702	575613.	-2158.	-5.08E-04	0.00	7.41E+10	-108.1884	66747.	0.00
15.7500	0.01211	546988.	-3253.	-4.28E-04	0.00	7.42E+10	-100.2781	86911.	0.00
16.6250	0.00802	507307.	-4039.	-3.54E-04	0.00	7.42E+10	-49.4410	64698.	0.00
17.5000	0.00469	462176.	-4515.	-2.85E-04	0.00	7.44E+10	-41.3245	92595.	0.00
18.3750	0.00203	412489.	-4896.	-2.24E-04	0.00	7.44E+10	-31.2826	161517.	0.00
19.2500	-7.91E-06	359352.	-5054.	-1.69E-04	0.00	7.45E+10	1.2431	1649489.	0.00

20.1250	-0.00152	306353.	-4898.	-1.22E-04	0.00	7.47E+10	28.3908	196387.	0.00
21.0000	-0.00258	256484.	-4572.	-8.27E-05	0.00	7.47E+10	33.8581	138029.	0.00
21.8750	-0.00325	210347.	-4202.	-4.99E-05	0.00	7.48E+10	36.6041	118079.	0.00
22.7500	-0.00362	168247.	-3810.	-2.34E-05	0.00	7.49E+10	37.9383	109910.	0.00
23.6250	-0.00375	130329.	-3410.	-2.48E-06	0.00	7.50E+10	38.3578	107512.	0.00
24.5000	-0.00368	96640.	-3008.	1.34E-05	0.00	7.50E+10	38.1173	108867.	0.00
25.3750	-0.00346	67153.	-2612.	2.49E-05	0.00	7.50E+10	37.3698	113260.	0.00
26.2500	-0.00315	41786.	-2226.	3.25E-05	0.00	7.50E+10	36.2172	120578.	0.00
27.1250	-0.00278	20413.	-1853.	3.69E-05	0.00	7.50E+10	34.7325	131101.	0.00
28.0000	-0.00238	2868.	-1498.	3.85E-05	0.00	7.50E+10	32.9708	145479.	0.00
28.8750	-0.00197	-11041.	-1162.	3.79E-05	0.00	7.50E+10	30.9757	164814.	0.00
29.7500	-0.00158	-21536.	-848.3491	3.56E-05	0.00	7.50E+10	28.7829	190874.	0.00
30.6250	-0.00122	-28857.	-519.8916	3.21E-05	0.00	7.50E+10	33.7805	289556.	0.00
31.5000	-9.09E-04	-32453.	-207.1814	2.78E-05	0.00	7.50E+10	25.7834	297829.	0.00
32.3750	-6.41E-04	-33207.	26.2480	2.32E-05	0.00	7.50E+10	18.6794	306102.	0.00
33.2500	-4.21E-04	-31902.	190.5404	1.87E-05	0.00	7.50E+10	12.6144	314375.	0.00
34.1250	-2.49E-04	-29206.	296.9018	1.44E-05	0.00	7.50E+10	7.6449	322648.	0.00
35.0000	-1.19E-04	-25667.	356.7608	1.05E-05	0.00	7.50E+10	3.7568	330921.	0.00
35.8750	-2.74E-05	-21714.	381.1229	7.23E-06	0.00	7.50E+10	0.8836	339194.	0.00
36.7500	3.26E-05	-17664.	380.1023	4.47E-06	0.00	7.50E+10	-1.0780	347467.	0.00
37.6250	6.65E-05	-13732.	362.6089	2.27E-06	0.00	7.50E+10	-2.2541	355740.	0.00
38.5000	8.03E-05	-10049.	336.1596	6.08E-07	0.00	7.50E+10	-2.7839	364013.	0.00
39.3750	7.93E-05	-6673.	306.7841	-5.63E-07	0.00	7.50E+10	-2.8115	372286.	0.00
40.2500	6.85E-05	-3606.	278.9935	-1.28E-06	0.00	7.50E+10	-2.4820	380560.	0.00
41.1250	5.24E-05	-813.7031	255.7832	-1.59E-06	0.00	7.50E+10	-1.9391	388833.	0.00
42.0000	3.50E-05	1765.	166.3107	-1.53E-06	0.00	7.50E+10	-15.1033	4524791.	0.00
42.8750	2.03E-05	2679.	41.0254	-1.21E-06	0.00	7.50E+10	-8.7605	4524791.	0.00
43.7500	9.55E-06	2627.	-26.5707	-8.43E-07	0.00	7.50E+10	-4.1149	4524791.	0.00
44.6250	2.63E-06	2121.	-54.1247	-5.10E-07	0.00	7.50E+10	-1.1335	4524791.	0.00
45.5000	-1.17E-06	1490.	-57.4279	-2.58E-07	0.00	7.50E+10	0.5043	4524791.	0.00
46.3750	-2.78E-06	914.8511	-48.4906	-8.93E-08	0.00	7.50E+10	1.1980	4524791.	0.00

47.2500	-3.04E-06	471.7413	-35.3122	7.81E-09	0.00	7.50E+10	1.3121	4524791.	0.00
48.1250	-2.62E-06	173.2959	-22.5046	5.30E-08	0.00	7.50E+10	1.1274	4524791.	0.00
49.0000	-1.93E-06	-0.8551	-12.2134	6.50E-08	0.00	7.50E+10	0.8328	4524791.	0.00
49.8750	-1.25E-06	-83.1865	-5.0123	5.92E-08	0.00	7.50E+10	0.5388	4524791.	0.00
50.7500	-6.90E-07	-106.1134	-0.6216	4.59E-08	0.00	7.50E+10	0.2975	4524791.	0.00
51.6250	-2.86E-07	-96.2403	1.5883	3.17E-08	0.00	7.50E+10	0.1234	4524791.	0.00
52.5000	-2.39E-08	-72.7595	2.2904	1.99E-08	0.00	7.50E+10	0.01032	4524791.	0.00
53.3750	1.32E-07	-48.1412	2.0470	1.14E-08	0.00	7.50E+10	-0.05669	4524791.	0.00
54.2500	2.16E-07	-29.7730	1.2601	5.98E-09	0.00	7.50E+10	-0.09320	4524791.	0.00
55.1250	2.57E-07	-21.6800	0.7129	2.38E-09	0.00	7.50E+10	-0.01102	449686.	0.00
56.0000	2.66E-07	-14.8015	0.5943	-1.72E-10	0.00	7.50E+10	-0.01159	456824.	0.00
56.8750	2.54E-07	-9.2003	0.4746	-1.85E-09	0.00	7.50E+10	-0.01121	463962.	0.00
57.7500	2.27E-07	-4.8345	0.3622	-2.84E-09	0.00	7.50E+10	-0.01020	471100.	0.00
58.6250	1.94E-07	-1.5935	0.2623	-3.29E-09	0.00	7.50E+10	-0.00884	478238.	0.00
59.5000	1.58E-07	0.6729	0.1774	-3.35E-09	0.00	7.50E+10	-0.00732	485376.	0.00
60.3750	1.24E-07	2.1321	0.1085	-3.15E-09	0.00	7.50E+10	-0.00580	492513.	0.00
61.2500	9.22E-08	2.9515	0.05501	-2.80E-09	0.00	7.50E+10	-0.00439	499651.	0.00
62.1250	6.50E-08	3.2872	0.01551	-2.36E-09	0.00	7.50E+10	-0.00314	506789.	0.00
63.0000	4.26E-08	3.2772	-0.01190	-1.90E-09	0.00	7.50E+10	-0.00209	513927.	0.00
63.8750	2.51E-08	3.0373	-0.02938	-1.46E-09	0.00	7.50E+10	-0.00124	521065.	0.00
64.7500	1.20E-08	2.6602	-0.03907	-1.06E-09	0.00	7.50E+10	-6.02E-04	528203.	0.00
65.6250	2.80E-09	2.2168	-0.04298	-7.19E-10	0.00	7.50E+10	-1.43E-04	535341.	0.00
66.5000	-3.12E-09	1.7576	-0.04289	-4.40E-10	0.00	7.50E+10	1.61E-04	542479.	0.00
67.3750	-6.45E-09	1.3161	-0.04027	-2.25E-10	0.00	7.50E+10	3.38E-04	549616.	0.00
68.2500	-7.84E-09	0.9119	-0.03631	-6.92E-11	0.00	7.50E+10	4.16E-04	556754.	0.00
69.1250	-7.90E-09	0.5535	-0.03000	3.34E-11	0.00	7.50E+10	7.87E-04	1045443.	0.00
70.0000	-7.14E-09	0.2819	-0.02209	9.19E-11	0.00	7.50E+10	7.20E-04	1058676.	0.00
70.8750	-5.97E-09	0.08964	-0.01511	1.18E-10	0.00	7.50E+10	6.09E-04	1071909.	0.00
71.7500	-4.67E-09	-0.03541	-0.00938	1.22E-10	0.00	7.50E+10	4.82E-04	1085143.	0.00
72.6250	-3.41E-09	-0.1073	-0.00497	1.12E-10	0.00	7.50E+10	3.57E-04	1098376.	0.00
73.5000	-2.32E-09	-0.1398	-0.00181	9.44E-11	0.00	7.50E+10	2.46E-04	1111610.	0.00

74.3750	-1.43E-09	-0.1452	2.87E-04	7.45E-11	0.00	7.50E+10	1.53E-04	1124843.	0.00
75.2500	-7.56E-10	-0.1338	0.00152	5.50E-11	0.00	7.50E+10	8.19E-05	1138077.	0.00
76.1250	-2.77E-10	-0.1133	0.00211	3.77E-11	0.00	7.50E+10	3.04E-05	1151310.	0.00
77.0000	3.52E-11	-0.08942	0.00225	2.35E-11	0.00	7.50E+10	-3.91E-06	1164544.	0.00
77.8750	2.16E-10	-0.06601	0.00210	1.26E-11	0.00	7.50E+10	-2.42E-05	1177777.	0.00
78.7500	3.00E-10	-0.04526	0.00180	4.79E-12	0.00	7.50E+10	-3.40E-05	1191010.	0.00
79.6250	3.17E-10	-0.02827	0.00143	0.00	0.00	7.50E+10	-3.63E-05	1204244.	0.00
80.5000	2.92E-10	-0.01527	0.00106	-3.40E-12	0.00	7.50E+10	-3.39E-05	1217477.	0.00
81.3750	2.45E-10	-0.00601	7.31E-04	-4.89E-12	0.00	7.50E+10	-2.87E-05	1230711.	0.00
82.2500	1.89E-10	8.02E-05	4.62E-04	-5.31E-12	0.00	7.50E+10	-2.24E-05	1243944.	0.00
83.1250	1.34E-10	0.00370	2.61E-04	-5.04E-12	0.00	7.50E+10	-1.60E-05	1257178.	0.00
84.0000	8.35E-11	0.00555	1.23E-04	-4.39E-12	0.00	7.50E+10	-1.01E-05	1270411.	0.00
84.8750	4.14E-11	0.00629	-6.55E-05	-3.57E-12	0.00	7.50E+10	-2.59E-05	6562500.	0.00
85.7500	8.62E-12	0.00418	-2.30E-04	-2.83E-12	0.00	7.50E+10	-5.39E-06	6562500.	0.00
86.6250	-1.80E-11	0.00147	-1.99E-04	-2.44E-12	0.00	7.50E+10	1.13E-05	6562500.	0.00
87.5000	-4.26E-11	0.00	0.00	-2.33E-12	0.00	7.50E+10	2.66E-05	3281250.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.25000000 inches

Computed slope at pile head = 0.000000 radians

Maximum bending moment = -1125156. inch-lbs

Maximum shear force = 20767. lbs

Depth of maximum bending moment = 0.000000 feet below pile head

Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 47

Number of zero deflection points = 7

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs

Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians

Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.

Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs

Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load Pile-head 1	Load Type 2	Load Pile-head 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.2500	S, rad	0.00	0.00	0.2500	0.00	20767.	-1125156.

Maximum pile-head deflection = 0.2500000000 inches

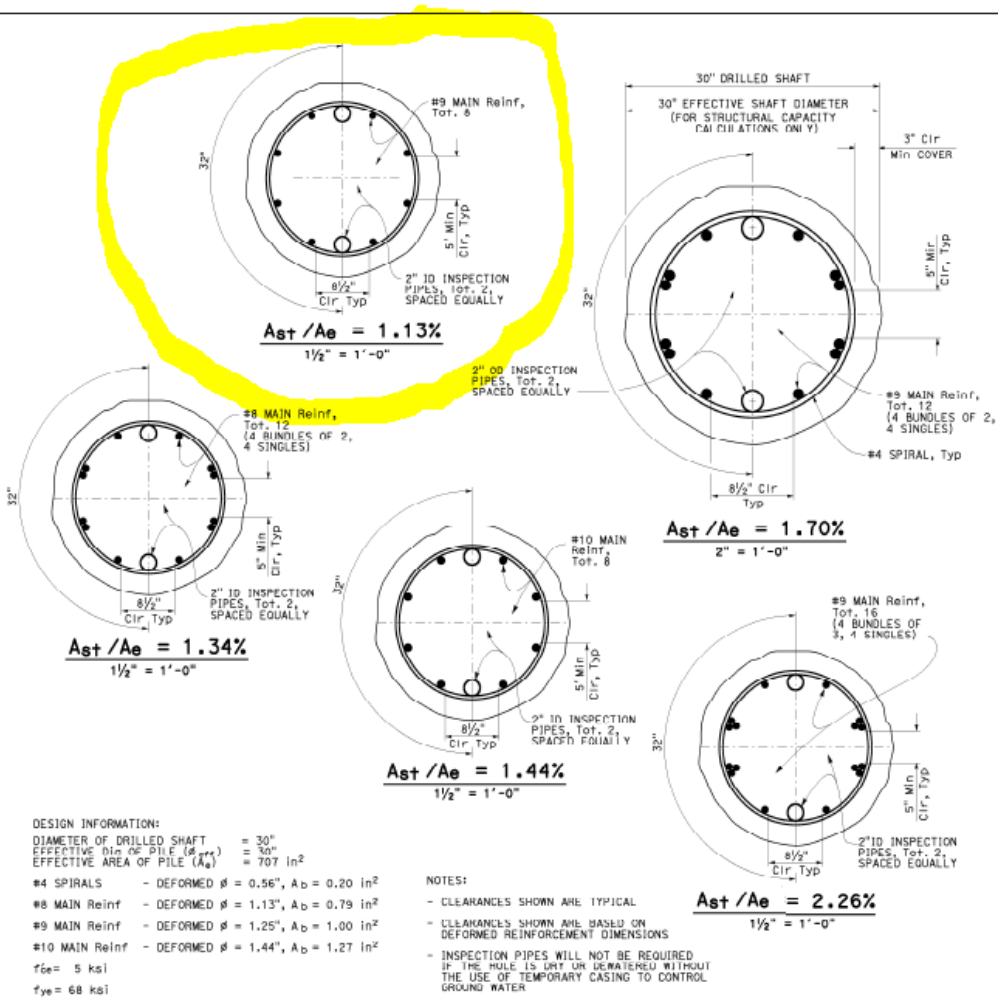
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

Boring A-19-001

Abutment #2

30-inch CIDH Pile


#9 MAIN Reinf, Tot. 8
32"
5" Min Clr, Typ
8½" Clr Typ
2" ID INSPECTION PIPES, Tot. 2, SPACED EQUALLY
Ast /Ae = 1.13%
1½" = 1'-0"
30" DRILLED SHAFT
30" EFFECTIVE SHAFT DIAMETER (FOR STRUCTURAL CAPACITY CALCULATIONS ONLY)
3" Clr Min COVER
5" Min Clr, Typ
2" OD INSPECTION PIPES, Tot. 2, SPACED EQUALLY
#9 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
#4 SPIRAL, Typ
8½" Clr Typ
Ast /Ae = 1.70%
2" = 1'-0"
#8 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
Ast /Ae = 1.34%
1½" = 1'-0"
#10 MAIN Reinf, Tot. 8
Ast /Ae = 1.44%
1½" = 1'-0"
#9 MAIN Reinf, Tot. 16 (4 BUNDLES OF 3, 4 SINGLES)
Ast /Ae = 2.26%
1½" = 1'-0"
DESIGN INFORMATION:
DIAMETER OF DRILLED SHAFT = 30"
EFFECTIVE DIA OF PILE (d_{eff}) = 30"
EFFECTIVE AREA OF PILE (A_e) = 707 in²
#4 SPIRALS - DEFORMED ø = 0.56", A_b = 0.20 in²
#8 MAIN Reinf - DEFORMED ø = 1.13", A_b = 0.79 in²
#9 MAIN Reinf - DEFORMED ø = 1.25", A_b = 1.00 in²
#10 MAIN Reinf - DEFORMED ø = 1.44", A_b = 1.27 in²
f'_{ce} = 5 ksi
f_{ye} = 68 ksi
NOTES:
- CLEARANCES SHOWN ARE TYPICAL
- CLEARANCES SHOWN ARE BASED ON DEFORMED REINFORCEMENT DIMENSIONS
- INSPECTION PIPES WILL NOT BE REQUIRED IF THE HOLE IS DRY OR DEWATERED WITHOUT THE USE OF TEMPORARY CASING TO CONTROL GROUND WATER

ATTACHMENT A

STEEL ρ_L A_{st}/A_g	UNFACTORED AXIAL LOAD (P_n)		SPIRALS SPACING C-C	M_{nc} @ ϵ_c=0.003	M_p	ϕ_p	I_{cr}	$\phi\gamma i$	V_s
%	%	kips	in	kip-ft	kip-ft	rad/in	ft^4	rad/in	kips
1.13% STEEL	0	0	6	500	494	0.001491	0.403	0.000176	74
		0	6	500	494	0.001491	0.403	0.000176	74
	5	149	6	613	591	0.001355	0.494	0.000172	74
		149	6	613	591	0.001355	0.494	0.000172	74
	10	299	6	714	684	0.001215	0.567	0.000173	74
		299	6	714	684	0.001215	0.567	0.000173	74
	15	448	6	790	767	0.001068	0.625	0.000176	74
		448	6	790	767	0.001068	0.625	0.000176	74
	20	597	6	862	841	0.000939	0.668	0.000181	74
		597	6	862	841	0.000939	0.668	0.000181	74
1.34% STEEL	0	0	6	577	569	0.001425	0.458	0.000178	74
		0	6	577	569	0.001425	0.458	0.000178	74
	5	153	6	685	662	0.001252	0.544	0.000175	74
		153	6	685	662	0.001252	0.544	0.000175	74
	10	307	6	779	750	0.001117	0.613	0.000175	74
		307	6	779	750	0.001117	0.613	0.000175	74
	15	460	6	858	829	0.001015	0.673	0.000177	74
		460	6	858	829	0.001015	0.673	0.000177	74
	20	613	6	932	902	0.000918	0.707	0.000183	74
		613	6	932	902	0.000918	0.707	0.000183	74
1.44% STEEL	0	0	6	611	602	0.001402	0.480	0.000180	74
		0	6	611	602	0.001402	0.480	0.000180	74
	5	155	6	723	698	0.001278	0.563	0.000178	74
		155	6	723	698	0.001278	0.563	0.000178	74
	10	310	6	808	788	0.001149	0.630	0.000180	74
		310	6	808	788	0.001149	0.630	0.000180	74
	15	466	6	882	870	0.001006	0.681	0.000183	74
		466	6	882	870	0.001006	0.681	0.000183	74
	20	621	6	952	941	0.000875	0.719	0.000188	74
		621	6	952	941	0.000875	0.719	0.000188	74
1.70% STEEL	0	0	6	701	695	0.001289	0.546	0.000183	74
		0	6	701	695	0.001289	0.546	0.000183	74
	5	160	6	807	786	0.001164	0.625	0.000180	74
		160	6	807	786	0.001164	0.625	0.000180	74
	10	320	6	890	870	0.001056	0.687	0.000182	74
		320	6	890	870	0.001056	0.687	0.000182	74
	15	481	6	968	948	0.000961	0.735	0.000185	74
		481	6	968	948	0.000961	0.735	0.000185	74
	20	641	6	1036	1018	0.000866	0.770	0.000190	74
		641	6	1036	1018	0.000866	0.770	0.000190	74
2.26% STEEL	0	0	6	888	880	0.001146	0.675	0.000187	74
		0	6	888	880	0.001146	0.675	0.000187	74
	5	171	6	979	970	0.001032	0.744	0.000187	74
		171	6	979	970	0.001032	0.744	0.000187	74
	10	342	6	1063	1054	0.000936	0.797	0.000190	74
		342	6	1063	1054	0.000936	0.797	0.000190	74
	15	513	6	1132	1130	0.000847	0.837	0.000194	74
		513	6	1132	1130	0.000847	0.837	0.000194	74
	20	684	6	1188	1197	0.000762	0.864	0.000199	74
		684	6	1188	1197	0.000762	0.864	0.000199	74

30" DIA CIDH PILE DETAILS
WITHOUT CASING

Project Information

Enter information to identify this project

Project Name: Lack Road Bridge Replacement Over New River

Job Number: 227518-0000439

Client: Imperial County Department of Public Works

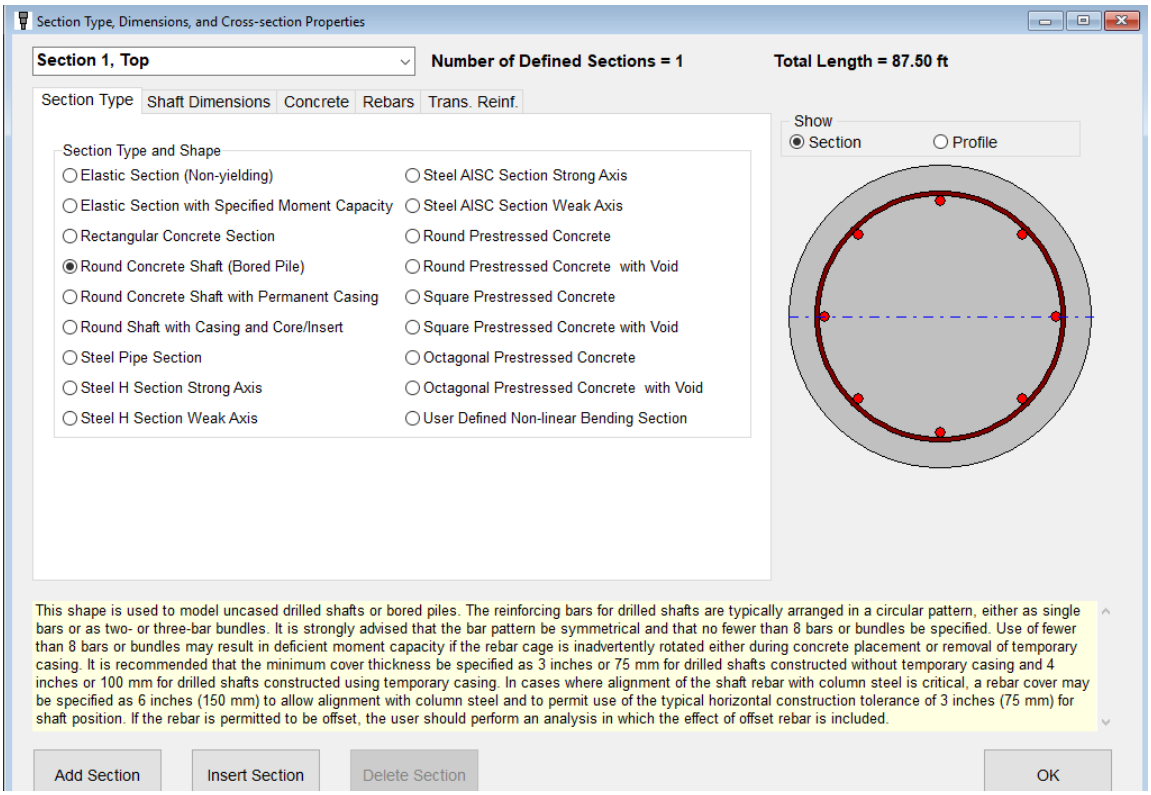
Engineer: Carl Henderson

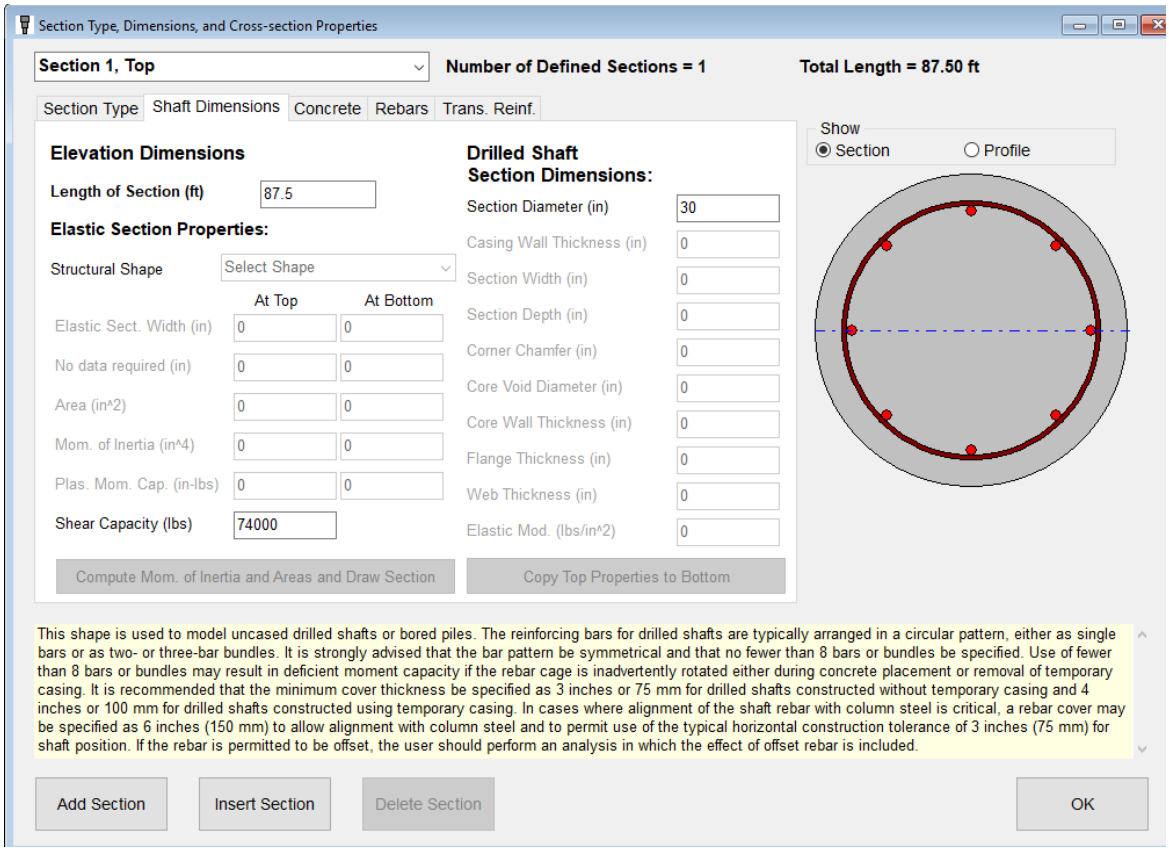
Description: Lateral Resistance - CIDH Concrete(30 inch);Boring A-19-01

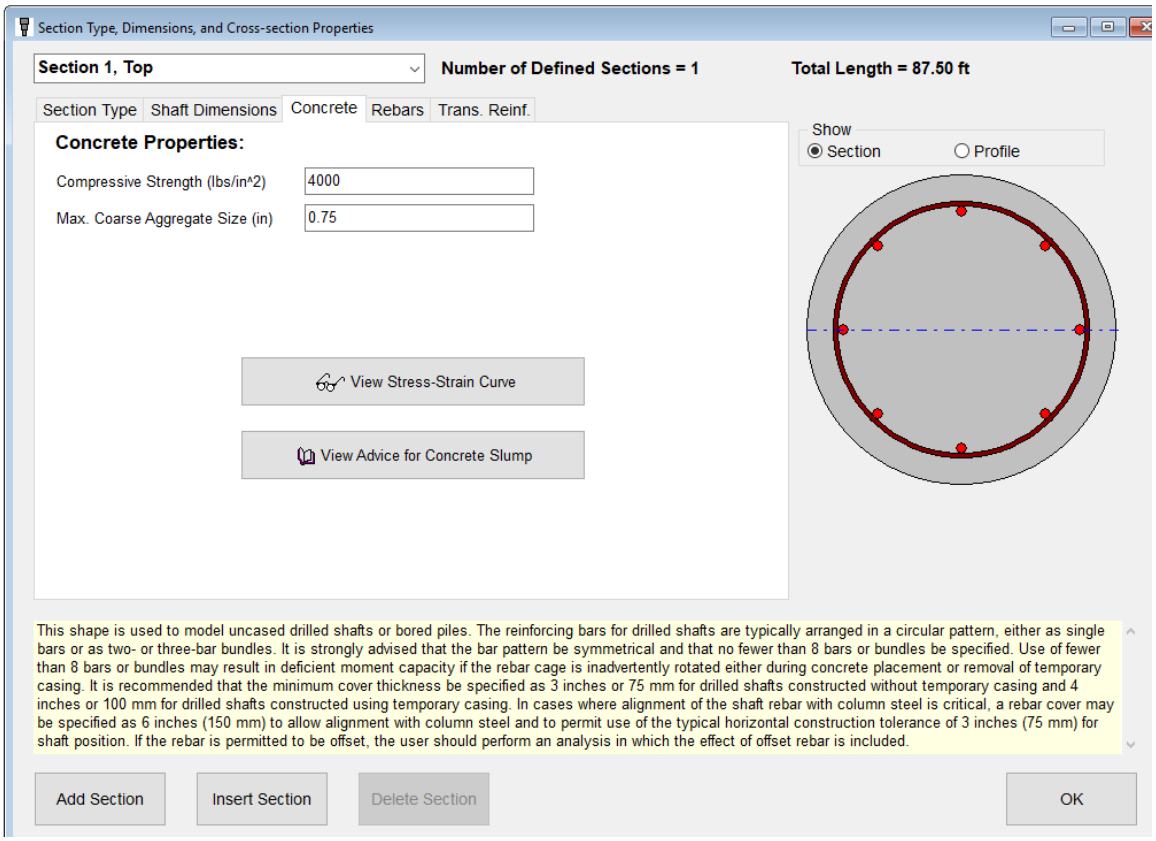
Path to Files:	C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis
Input Data File:	Boring A-19-001 - 30 inch.lp10d
Output Report File:	Boring A-19-001 - 30 inch.lp10o
Plot Output File:	Boring A-19-001 - 30 inch.lp10p
Current Time and Date:	6/5/2019 8:03:45 PM

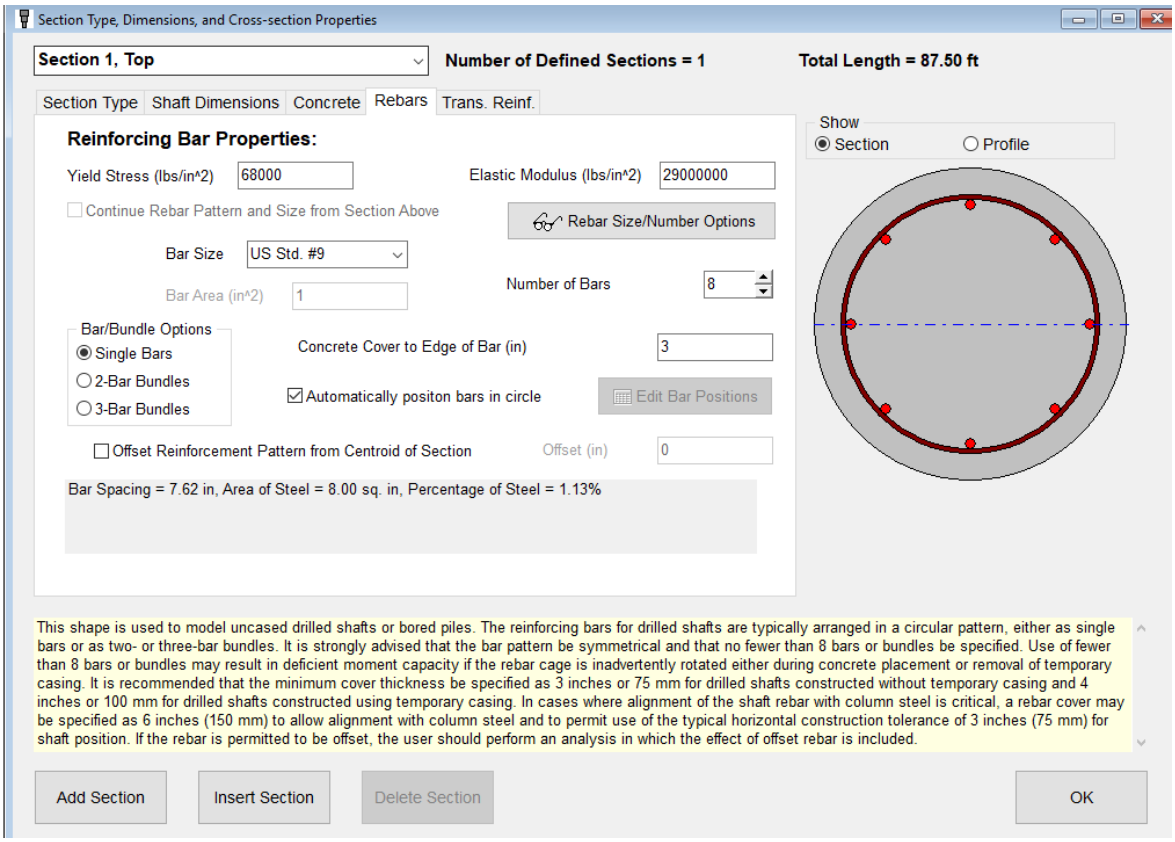
(Filenames, file paths, and date and time of program run are included in the output report.)

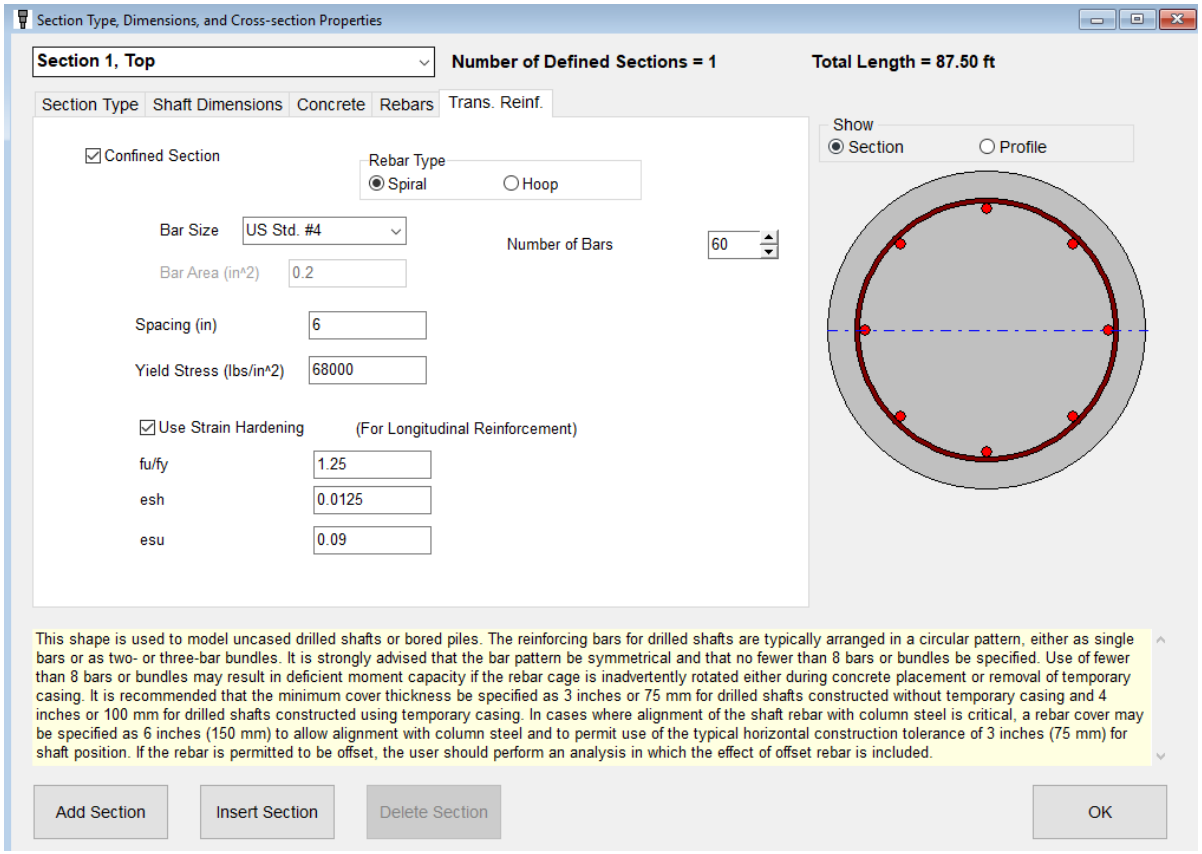
OK

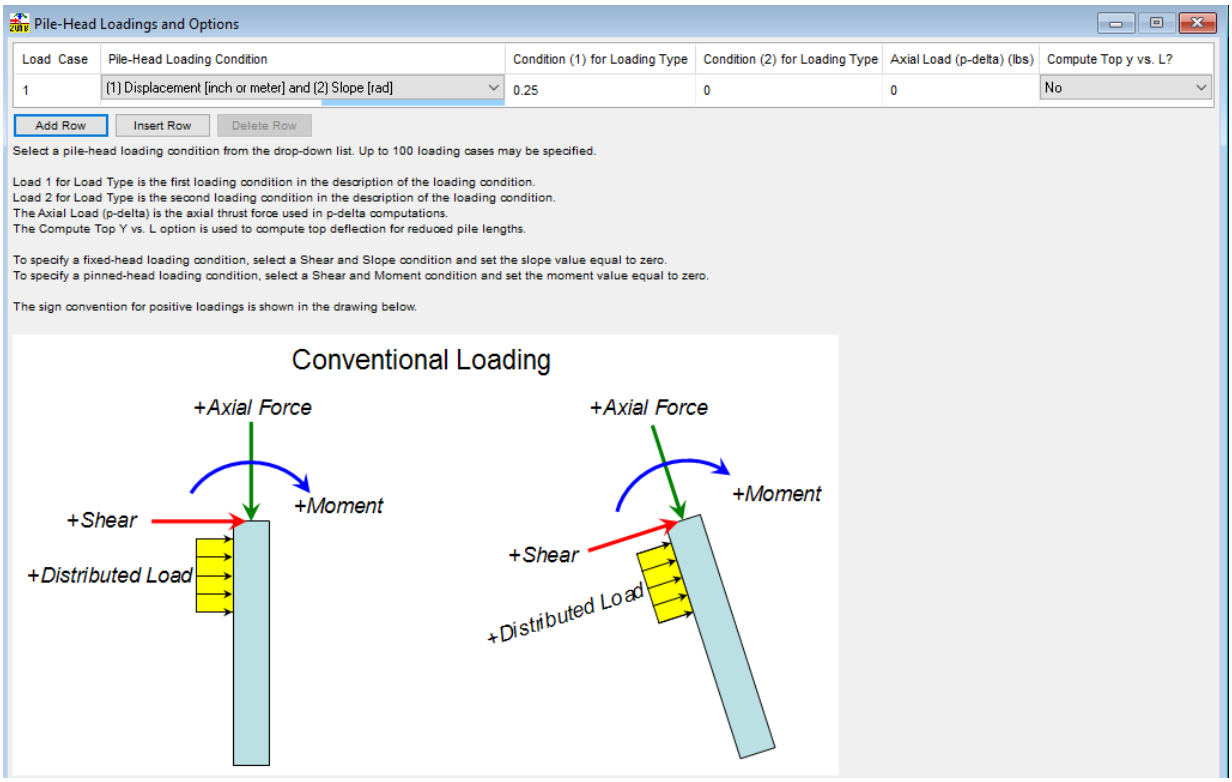

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Section Type and Shape
Elastic Section (Non-yielding)
Elastic Section with Specified Moment Capacity
Rectangular Concrete Section
Round Concrete Shaft (Bored Pile)
Round Concrete Shaft with Permanent Casing
Round Shaft with Casing and Core/Insert
Steel Pipe Section
Steel H Section Strong Axis
Steel H Section Weak Axis
Steel AISC Section Strong Axis
Steel AISC Section Weak Axis
Round Prestressed Concrete
Round Prestressed Concrete with Void
Square Prestressed Concrete
Square Prestressed Concrete with Void
Octagonal Prestressed Concrete
Octagonal Prestressed Concrete with Void
User Defined Non-linear Bending Section
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Elevation Dimensions
Length of Section (ft)
87.5
Elastic Section Properties:
Structural Shape
Select Shape
At Top
At Bottom
Elastic Sect. Width (in)
No data required (in)
Area (in^2)
Mom. of Inertia (in^4)
Plas. Mom. Cap. (in-lbs)
Shear Capacity (lbs)
74000
Drilled Shaft Section Dimensions:
Section Diameter (in)
30
Casing Wall Thickness (in)
Section Width (in)
Section Depth (in)
Corner Chamfer (in)
Core Void Diameter (in)
Core Wall Thickness (in)
Flange Thickness (in)
Web Thickness (in)
Elastic Mod. (lbs/in^2)
Compute Mom. of Inertia and Areas and Draw Section
Copy Top Properties to Bottom
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Concrete Properties:
Compressive Strength (lbs/in^2)
4000
Max. Coarse Aggregate Size (in)
0.75
View Stress-Strain Curve
View Advice for Concrete Slump
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Reinforcing Bar Properties:
Yield Stress (lbs/in^2)
68000
Elastic Modulus (lbs/in^2)
29000000
Continue Rebar Pattern and Size from Section Above
Rebar Size/Number Options
Bar Size
US Std. #9
Bar Area (in^2)
1
Number of Bars
8
Bar/Bundle Options
Single Bars
2-Bar Bundles
3-Bar Bundles
Concrete Cover to Edge of Bar (in)
3
Automatically positon bars in circle
Edit Bar Positions
Offset Reinforcement Pattern from Centroid of Section
Offset (in)
0
Bar Spacing = 7.62 in, Area of Steel = 8.00 sq. in, Percentage of Steel = 1.13%
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK


Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Confined Section
Rebar Type
Spiral
Hoop
Bar Size
US Std. #4
Number of Bars
60
Bar Area (in^2)
0.2
Spacing (in)
6
Yield Stress (lbs/in^2)
68000
Use Strain Hardening
(For Longitudinal Reinforcement)
fu/fy
1.25
esh
0.0125
esu
0.09
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

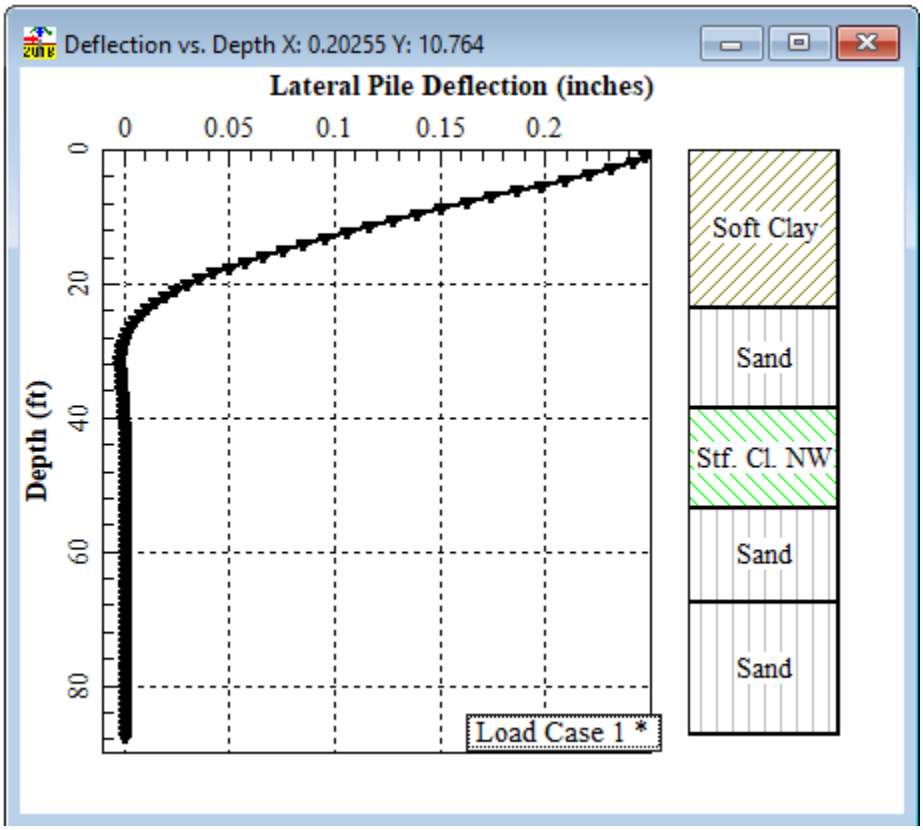

Pile-Head Loadings and Options
Load Case
Pile-Head Loading Condition
Condition (1) for Loading Type
Condition (2) for Loading Type
Axial Load (p-delta) (lbs)
Compute Top y vs. L?
1
(1) Displacement [inch or meter] and (2) Slope [rad]
0.25
0
0
No
Add Row
Insert Row
Delete Row
Select a pile-head loading condition from the drop-down list. Up to 100 loading cases may be specified.
Load 1 for Load Type is the first loading condition in the description of the loading condition.
Load 2 for Load Type is the second loading condition in the description of the loading condition.
The Axial Load (p-delta) is the axial thrust force used in p-delta computations.
The Compute Top Y vs. L option is used to compute top deflection for reduced pile lengths.
To specify a fixed-head loading condition, select a Shear and Slope condition and set the slope value equal to zero.
To specify a pinned-head loading condition, select a Shear and Moment condition and set the moment value equal to zero.
The sign convention for positive loadings is shown in the drawing below.
Conventional Loading
+Axial Force
+Moment
+Shear
+Distributed Load
+Axial Force
+Moment
+Shear
+Distributed Load

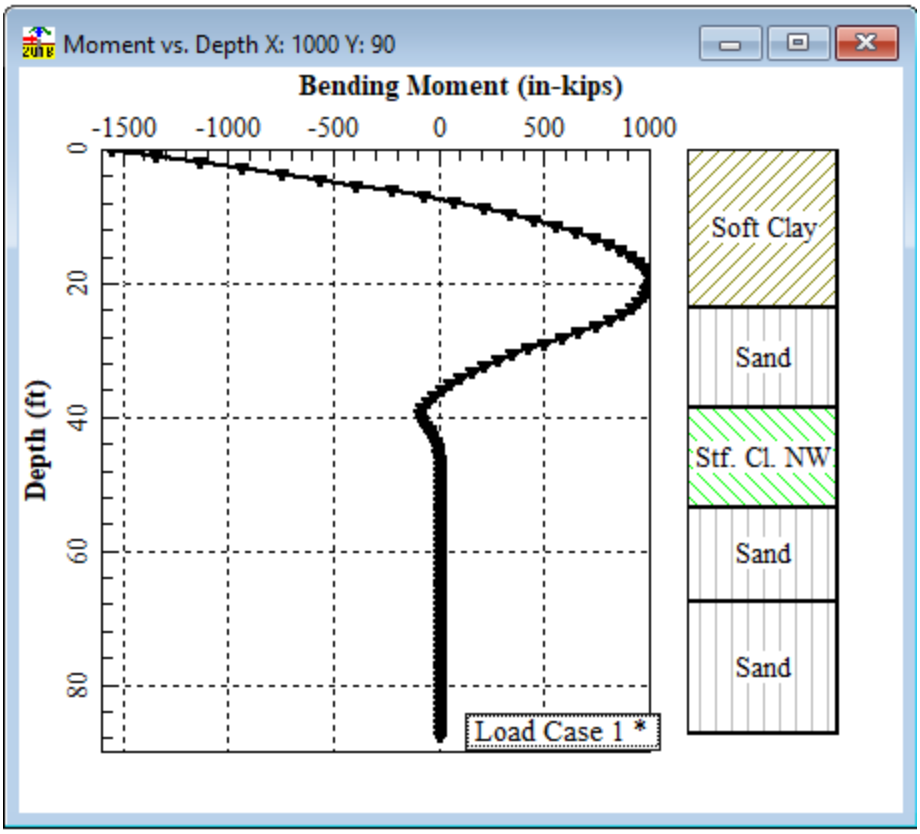
Soil Layers

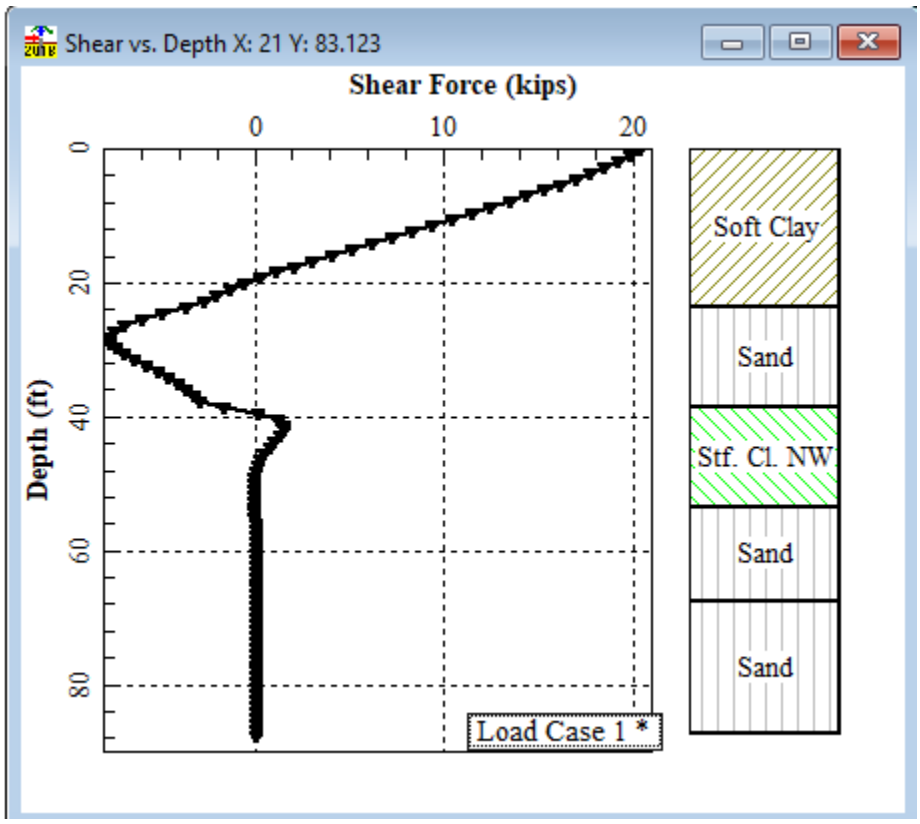
Layer	Select p-y Curve Type from Drop-down List	Vertical Depth Below Pile Head of Top of Soil Layer (ft)	Vertical Depth Below Pile Head of Bottom of Soil Layer (ft)	Press Button to Enter Soil Properties
1	Soft Clay (Matlock)	0	23.5	1: Soft Clay
2	Sand (Reese)	23.5	38.5	2: Sand (Reese, et al.)
3	Stiff Clay w/o Free Water (Reese)	38.5	53.5	3: Stiff Clay without Free Water
4	Sand (Reese)	53.5	67.5	4: Sand (Reese, et al.)
5	Sand (Reese)	67.5	87.5	5: Sand (Reese, et al.)

Add Row | Insert Row | Delete Row

All positive depth coordinates are defined as vertical distances below the pile-head.
If the pile-head is embedded below the ground surface, the top layer must extend from the ground surface (defined by a negative vertical depth) to some point below the pile head.
Select the p-y soil type using the drop-down list in the left table column.




Moment vs. Depth X: 1000 Y: 90
Bending Moment (in-kips)
-1500
-1000
-500
0
500
1000
Depth (ft)
0
20
40
60
80
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Load Case 1 *


Shear vs. Depth X: 21 Y: 83.123
Shear Force (kips)
0
10
20
Depth (ft)
0
20
40
60
80
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Load Case 1 *

==========

LPile for Windows, Version 2018-10.002

Analysis of Individual Piles and Drilled Shafts

Subjected to Lateral Loading Using the p-y Method

==========

This copy of LPile is being used by:

Carl Henderson

NV5, Inc. - San Diego, CA

Serial Number of Security Device: 161221202

This copy of LPile is licensed for exclusive use by:

NV5, San Diego, CA

Use of this program by any entity other than NV5, San Diego, CA

is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis\

Name of input data file:

Boring A-19-001 - 30 inch.lp10

Name of output report file:

Boring A-19-001 - 30 inch.lp10

Name of plot output file:

Boring A-19-001 - 30 inch.lp10

Name of runtime message file:

Boring A-19-001 - 30 inch.lp10

Date and Time of Analysis

Date: June 5, 2019 Time: 20:10:16

Problem Title

Project Name: Lack Road Bridge Replacement Over New River

Job Number: 227518-0000439

Client: Imperial County Department of Public Works

Engineer: Carl Henderson

Description: Lateral Resistance - CIDH Concrete(30 inch);Boring A-19-01

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1

Total length of pile = 87.500 ft

Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	30.0000
2	87.500	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile

Length of section = 87.500000 ft

Shaft Diameter = 30.000000 in

Shear capacity of section = 74000. lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees

= 0.000 radians

Pile Batter Angle = 0.000 degrees

= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 0.0000 ft

Distance from top of pile to bottom of layer = 23.500000 ft

Effective unit weight at top of layer = 58.700000 pcf

Effective unit weight at bottom of layer = 58.700000 pcf

Undrained cohesion at top of layer = 300.000000 psf

Undrained cohesion at bottom of layer = 300.000000 psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 23.500000 ft

Distance from top of pile to bottom of layer = 38.500000 ft

Effective unit weight at top of layer = 63.500000 pcf

Effective unit weight at bottom of layer = 63.500000 pcf

Friction angle at top of layer = 34.000000 deg.

Friction angle at bottom of layer = 34.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer = 38.500000 ft

Distance from top of pile to bottom of layer = 53.500000 ft

Effective unit weight at top of layer = 56.200000 pcf

Effective unit weight at bottom of layer = 56.200000 pcf

Undrained cohesion at top of layer = 1750. psf

Undrained cohesion at bottom of layer = 1750. psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 4 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 53.500000 ft

Distance from top of pile to bottom of layer = 67.500000 ft

Effective unit weight at top of layer = 65.500000 pcf

Effective unit weight at bottom of layer = 65.500000 pcf

Friction angle at top of layer = 35.000000 deg.

Friction angle at bottom of layer = 35.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 67.500000 ft

Distance from top of pile to bottom of layer = 87.500000 ft

Effective unit weight at top of layer = 65.900000 pcf

Effective unit weight at bottom of layer = 65.900000 pcf

Friction angle at top of layer = 38.000000 deg.

Friction angle at bottom of layer = 38.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 0.000 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Soft Clay	0.00 23.5000	58.7000 58.7000	300.0000 300.0000	-- --	default default	-- --
2	Sand (Reese, et al.)	23.5000 38.5000	63.5000 63.5000	-- --	34.0000 34.0000	-- --	default default
3	Stiff Clay w/o Free Water	38.5000 53.5000	56.2000 56.2000	1750. 1750.	-- --	default default	-- --
4	Sand (Reese, et al.)	53.5000 67.5000	65.5000 65.5000	-- --	35.0000 35.0000	-- --	default default
5	Sand (Reese, et al.)	67.5000 87.5000	65.9000 65.9000	-- --	38.0000 38.0000	-- --	default default

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Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	0.0000000	N.A.

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with

specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section = 87.500000 ft

Shaft Diameter = 30.000000 in

Concrete Cover Thickness = 3.000000 in

Number of Reinforcing Bars = 8 bars

Yield Stress of Reinforcing Bars = 68000. psi

Modulus of Elasticity of Reinforcing Bars = 29000000. psi

Gross Area of Shaft = 706.858347 sq. in.

Total Area of Reinforcing Steel = 8.000000 sq. in.

Area Ratio of Steel Reinforcement = 1.13 percent

Edge-to-Edge Bar Spacing = 7.624735 in

Maximum Concrete Aggregate Size = 0.750000 in

Ratio of Bar Spacing to Aggregate Size = 10.17

Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Confined Section

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2920.118 kips

Tensile Load for Cracking of Concrete = -317.428 kips

Nominal Axial Tensile Capacity = -544.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	11.436000	0.00000
2	1.128000	1.000000	8.086473	8.086473
3	1.128000	1.000000	0.00000	11.436000
4	1.128000	1.000000	-8.086473	8.086473
5	1.128000	1.000000	-11.436000	0.00000
6	1.128000	1.000000	-8.086473	-8.086473
7	1.128000	1.000000	0.00000	-11.436000
8	1.128000	1.000000	8.086473	-8.086473

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 7.625 inches

between bars 1 and 2.

Ratio of bar spacing to maximum aggregate size = 10.17

Concrete Properties:

Compressive Strength of Concrete = 4000. psi

Modulus of Elasticity of Concrete = 3604997. psi

Modulus of Rupture of Concrete = -474.341649 psi

Compression Strain at Peak Stress = 0.001886

Tensile Strain at Fracture of Concrete = -0.0001154

Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.

Y = stress in reinforcing steel has reached yield stress.

T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.

Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.

Position of neutral axis is measured from edge of compression side of pile.

Compressive stresses and strains are positive in sign.

Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conf Stress ksi	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
0.00000200	365.8607984	182930399.	15.0000125	0.00003000	-0.00003000	-0.0012721	0.1249713	0.8613007	
0.00000400	728.0783216	182019580.	15.0000126	0.00006000	-0.00006000	-0.0025441	0.2479592	1.7226015	
0.00000600	1087.	181108762.	15.0000127	0.00009000	-0.00009000	-0.0038158	0.3689638	2.5839022	
0.00000800	1087.	135831571.	7.4425598	0.00005954	-0.0001805	0.00000	0.2436056	-5.1985261	C
0.00001000	1087.	108665257.	7.4475595	0.00007448	-0.0002255	0.00000	0.3035151	-6.4967077	C
0.00001200	1087.	90554381.	7.4525827	0.00008943	-0.0002706	0.00000	0.3630250	-7.7943012	C
0.00001400	1087.	77618041.	7.4576294	0.0001044	-0.0003156	0.00000	0.4221340	-9.0913025	C
0.00001600	1087.	67915786.	7.4627000	0.0001194	-0.0003606	0.00000	0.4808404	-10.3877072	C
0.00001800	1087.	60369587.	7.4677946	0.0001344	-0.0004056	0.00000	0.5391430	-11.6835112	C
0.00002000	1087.	54332628.	7.4729136	0.0001495	-0.0004505	0.00000	0.5970402	-12.9787101	C
0.00002200	1087.	49393299.	7.4780570	0.0001645	-0.0004955	0.00000	0.6545305	-14.2732996	C
0.00002400	1087.	45277190.	7.4832253	0.0001796	-0.0005404	0.00000	0.7116125	-15.5672752	C
0.00002600	1087.	41794330.	7.4884186	0.0001947	-0.0005853	0.00000	0.7682846	-16.8606324	C
0.00002800	1087.	38809020.	7.4936372	0.0002098	-0.0006302	0.00000	0.8245452	-18.1533666	C
0.00003000	1087.	36221752.	7.4988813	0.0002250	-0.0006750	0.00000	0.8803929	-19.4454733	C

0.00003200	1144.	35736003.	7.5041512	0.0002401	-0.0007199	0.00000	0.9358260	-20.7369478 C
0.00003400	1214.	35714613.	7.5094471	0.0002553	-0.0007647	0.00000	0.9908430	-22.0277853 C
0.00003600	1285.	35693132.	7.5147693	0.0002705	-0.0008095	0.00000	1.0454423	-23.3179810 C
0.00003800	1356.	35671558.	7.5201181	0.0002858	-0.0008542	0.00000	1.0996222	-24.6075300 C
0.00004000	1426.	35649891.	7.5254937	0.0003010	-0.0008990	0.00000	1.1533811	-25.8964274 C
0.00004200	1496.	35628131.	7.5308965	0.0003163	-0.0009437	0.00000	1.2067174	-27.1846683 C
0.00004400	1567.	35606275.	7.5363266	0.0003316	-0.0009884	0.00000	1.2596294	-28.4722474 C
0.00004600	1637.	35584324.	7.5417845	0.0003469	-0.0010331	0.00000	1.3121154	-29.7591598 C
0.00004800	1707.	35562276.	7.5472703	0.0003623	-0.0010777	0.00000	1.3641736	-31.0454001 C
0.00005000	1777.	35540130.	7.5527843	0.0003776	-0.0011224	0.00000	1.4158024	-32.3309630 C
0.00005200	1847.	35517886.	7.5583269	0.0003930	-0.0011670	0.00000	1.4670000	-33.6158433 C
0.00005400	1917.	35495542.	7.5638984	0.0004085	-0.0012115	0.00000	1.5177647	-34.9000354 C
0.00005600	1986.	35473097.	7.5694991	0.0004239	-0.0012561	0.00000	1.5680946	-36.1835339 C
0.00005800	2056.	35450551.	7.5751292	0.0004394	-0.0013006	0.00000	1.6179879	-37.4663331 C
0.00006000	2126.	35427903.	7.5807892	0.0004548	-0.0013452	0.00000	1.6674428	-38.7484273 C
0.00006200	2195.	35405151.	7.5864793	0.0004704	-0.0013896	0.00000	1.7164575	-40.0298109 C
0.00006400	2264.	35382294.	7.5921998	0.0004859	-0.0014341	0.00000	1.7650301	-41.3104778 C
0.00006600	2334.	35359332.	7.5979511	0.0005015	-0.0014785	0.00000	1.8131586	-42.5904223 C
0.00006800	2403.	35336262.	7.6037335	0.0005171	-0.0015229	0.00000	1.8608411	-43.8696383 C

0.00007000 2472. 35313085. 7.6095474 0.0005327 -0.0015673 0.00000 1.9080758 -45.1481196 C

0.00007200 2541. 35289799. 7.6153931 0.0005483 -0.0016117 0.00000 1.9548607 -46.4258600 C

0.00007400 2610. 35266403. 7.6212710 0.0005640 -0.0016560 0.00000 2.0011936 -47.7028533 C

0.00007600 2678. 35242895. 7.6271814 0.0005797 -0.0017003 0.00000 2.0470727 -48.9790931 C

0.00007800 2747. 35219275. 7.6331248 0.0005954 -0.0017446 0.00000 2.0924959 -50.2545729 C

0.00008200 2884. 35171696. 7.6451117 0.0006269 -0.0018331 0.00000 2.1819664 -52.8032243 C

0.00008600 3021. 35123711. 7.6569201 0.0006585 -0.0019215 0.00000 2.2695125 -55.3495410 C

0.00009000 3157. 35075312. 7.6686447 0.0006902 -0.0020098 0.00000 2.3551349 -57.8933372 C

0.00009400 3292. 35026451. 7.6804997 0.0007220 -0.0020980 0.00000 2.4388659 -60.4340576 C

0.00009800 3428. 34977118. 7.6924883 0.0007539 -0.0021861 0.00000 2.5206881 -62.9716481 C

0.0001020 3563. 34927303. 7.7046135 0.0007859 -0.0022741 0.00000 2.6005836 -65.5060530 C

0.0001060 3697. 34876996. 7.7168786 0.0008180 -0.0023620 0.00000 2.6785338 -68.0000000 CY

0.0001100 3831. 34826185. 7.7292870 0.0008502 -0.0024498 0.00000 2.7545200 -68.0000000 CY

0.0001140 3964. 34774859. 7.7418421 0.0008826 -0.0025374 0.00000 2.8285225 -68.0000000 CY

0.0001180 4097. 34723007. 7.7545476 0.0009150 -0.0026250 0.00000 2.9005216 -68.0000000 CY

0.0001220 4230. 34670615. 7.7674072 0.0009476 -0.0027124 0.00000 2.9704965 -68.0000000 CY

0.0001260 4351. 34534896. 7.7742259 0.0009796 -0.0028004 0.00000 3.0368014 -68.0000000 CY

0.0001300 4450. 34230190. 7.7681627 0.0010099 -0.0028901 0.00000 3.0976389 -68.0000000 CY

0.0001340 4541. 33887936. 7.7590277 0.0010397 -0.0029803 0.00000 3.1555955 -68.0000000 CY

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0.0001460 4812. 32960004. 7.7386199 0.0011298 -0.0032502 0.00000 3.3189452 -68.0000000 CY

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0.0001620 5027. 31027991. 7.6383937 0.0012374 -0.0036226 0.00000 3.4905788 -68.0000000 CY

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0.0001740 5109. 29360817. 7.5307337 0.0013103 -0.0039097 0.00000 3.5925462 -68.0000000 CY

0.0001780 5136. 28853570. 7.4987332 0.0013348 -0.0040052 0.00000 3.6241604 -68.0000000 CY

0.0001820 5163. 28367885. 7.4684682 0.0013593 -0.0041007 0.00000 3.6545726 -68.0000000 CY

0.0001860 5190. 27902362. 7.4398306 0.0013838 -0.0041962 0.00000 3.6837742 -68.0000000 CY

0.0001900 5217. 27455719. 7.4127211 0.0014084 -0.0042916 0.00000 3.7117561 -68.0000000 CY

0.0001940 5243. 27026782. 7.3870490 0.0014331 -0.0043869 0.00000 3.7385092 -68.0000000 CY

0.0001980 5270. 26614468. 7.3627308 0.0014578 -0.0044822 0.00000 3.7640241 -68.0000000 CY

0.0002020 5296. 26217370. 7.3390323 0.0014825 -0.0045775 0.00000 3.7881619 -68.0000000 CY

0.0002060 5322. 25834537. 7.3157941 0.0015071 -0.0046729 0.00000 3.8109102 -68.0000000 CY

0.0002100 5348. 25465631. 7.2937549 0.0015317 -0.0047683 0.00000 3.8324240 -68.0000000 CY

0.0002140 5374. 25109864. 7.2728516 0.0015564 -0.0048636 0.00000 3.8526933 -68.0000000 CY

0.0002180 5399. 24766505. 7.2530258 0.0015812 -0.0049588 0.00000 3.8717079 -68.0000000 CY

0.0002220 5425. 24434873. 7.2342233 0.0016060 -0.0050540 0.00000 3.8894573 -68.0000000 CY

0.0002260 5450. 24114340. 7.2163941 0.0016309 -0.0051491 0.00000 3.9059311 -68.0000000 CY

0.0002300 5475. 23804318. 7.1994914 0.0016559 -0.0052441 0.00000 3.9211184 -68.0000000 CY

0.0002340 5500. 23504259. 7.1834722 0.0016809 -0.0053391 0.00000 3.9350081 -68.0000000 CY

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0.0002700 5718. 21177790. 7.0732358 0.0019098 -0.0061902 0.00000 3.9996752 -68.0000000 CY

0.0002860 5805. 20295938. 7.0348066 0.0020120 -0.0065680 0.00000 3.9999898 -68.0000000 CY

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0.0006060 5966. 9844862. 6.2114328 0.0037641 -0.0144159 0.00000 3.9989167 -69.6325603 CY

0.0006220 5971. 9599362. 6.1979490 0.0038551 -0.0148049 0.00000 3.9970048 -69.9546162 CY

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0.0006540 5971. 9129669. 6.2043996 0.0040577 -0.0155623 0.00000 3.9918978 -70.5596923 CY

0.0006700 5971. 8911647. 6.2447916 0.0041840 -0.0159160 0.00000 3.9997871 -70.8325822 CY

0.0006860 5971. 8703795. 6.2352134 0.0042774 -0.0163026 0.00000 3.9923545 -71.1244500 CY

0.0007020 5971. 8505418. 6.2910434 0.0044163 -0.0166437 0.00000 3.9881982 -71.3760802 CY

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0.0007500 5971. 7961071. 6.3440593 0.0047580 -0.0177420 0.00000 3.9814163 -72.1528388 CY

0.0007660 5971. 7794782. 6.4302503 0.0049256 -0.0180544 0.00000 3.9955380 -72.3645535 CY

0.0007820 5971. 7635298. 6.4258518 0.0050250 -0.0184350 0.00000 3.9990961 -72.6175874 CY

0.0007980 5971. 7482210. 6.5194460 0.0052025 -0.0187375 0.00000 3.9735552 -72.8144524 CY

0.0008140 5971. 7335139. 6.5182900 0.0053059 -0.0191141 0.00000 3.9834632 -73.0551934 CY

0.0008300 5971. 7193739. 6.5174131 0.0054095 -0.0194905 0.00000 3.9914284 -73.2906734 CY

0.0008460 5971. 7057687. 6.6228339 0.0056029 -0.0197771 0.00000 3.9885417 -73.4662113 CY

0.0008620 5971. 6926686. 6.6244490 0.0057103 -0.0201497 0.00000 3.9767041 -73.6907232 CY

0.0008780 5971. 6800459. 6.7472796 0.0059241 -0.0204159 0.00000 3.9977377 -73.8478165 CY

0.0009740 5971. 6130188. 6.9997482 0.0068178 -0.0224022 0.00000 3.9654547 -74.9516944 CY

0.0010700 5971. 5580190. 7.2551920 0.0077631 -0.0243369 0.00000 3.9957181 -75.9180299 CY

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003

or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	0.000	5937.922	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	5938.	0.0000	3860.	34815120.
1	0.70	5938.	0.0000	4157.	34699586.
1	0.75	5938.	0.0000	4453.	34216971.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Pile Head ft	Equivalent Top Depth Grnd Surf ft	Same Layer Below Layer Above	Layer is Type As Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	124505.
2	23.5000	11.6608	No	No	124505.	954836.
3	38.5000	35.9366	No	No	1079341.	590625.
4	53.5000	30.3196	No	No	1669966.	3337940.
5	67.5000	40.4228	Yes	No	5007906.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals
for Layer n. Layering correction equivalent depths are computed only
for soil types with both shallow-depth and deep-depth expressions for
peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

Displacement of pile head = 0.250000 inches

Rotation of pile head = 0.000E+00 radians

Axial load on pile head = 0.0 lbs

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Spr. Es*h	Distrib. Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	in-lb^2	lb/inch	lb/inch	lb/inch
0.00	0.2500	-1553879.	20409.	0.00	0.00	3.56E+10	-51.5926	1083.	0.00
0.8750	0.2476	-1342745.	19807.	-4.27E-04	0.00	3.56E+10	-57.3615	2433.	0.00
1.7500	0.2410	-1137935.	19176.	-7.92E-04	0.00	3.58E+10	-62.7322	2733.	0.00
2.6250	0.2310	-940041.	18492.	-9.86E-04	0.00	1.81E+11	-67.6450	3075.	0.00
3.5000	0.2203	-749605.	17757.	-0.00103	0.00	1.82E+11	-72.2983	3446.	0.00
4.3750	0.2092	-567140.	16975.	-0.00107	0.00	1.82E+11	-76.6749	3848.	0.00
5.2500	0.1978	-393128.	16149.	-0.00110	0.00	1.83E+11	-80.7584	4287.	0.00
6.1250	0.1861	-228021.	15281.	-0.00112	0.00	1.83E+11	-84.5336	4769.	0.00
7.0000	0.1743	-72232.	14375.	-0.00113	0.00	1.83E+11	-87.9859	5300.	0.00
7.8750	0.1625	73855.	13435.	-0.00113	0.00	1.83E+11	-91.1015	5888.	0.00
8.7500	0.1506	209899.	12464.	-0.00112	0.00	1.83E+11	-93.8672	6543.	0.00
9.6250	0.1390	335594.	11466.	-0.00110	0.00	1.83E+11	-96.2706	7274.	0.00
10.5000	0.1275	450675.	10444.	-0.00108	0.00	1.83E+11	-98.2997	8097.	0.00
11.3750	0.1163	554918.	9403.	-0.00105	0.00	1.82E+11	-99.9431	9026.	0.00
12.2500	0.1054	648143.	8347.	-0.00102	0.00	1.82E+11	-101.1899	10081.	0.00
13.1250	0.09491	730212.	7280.	-9.77E-04	0.00	1.82E+11	-102.0295	11288.	0.00
14.0000	0.08487	801032.	6207.	-9.33E-04	0.00	1.82E+11	-102.4516	12675.	0.00
14.8750	0.07532	860556.	5131.	-8.85E-04	0.00	1.82E+11	-102.4460	14282.	0.00
15.7500	0.06629	908786.	4071.	-8.34E-04	0.00	1.81E+11	-99.4415	15752.	0.00
16.6250	0.05781	946053.	3050.	-7.80E-04	0.00	1.81E+11	-95.0078	17257.	0.00
17.5000	0.04990	972844.	2077.	-7.25E-04	0.00	1.81E+11	-90.4651	19035.	0.00
18.3750	0.04259	989662.	1151.	-6.68E-04	0.00	1.81E+11	-85.8125	21156.	0.00
19.2500	0.03588	997020.	275.1912	-6.10E-04	0.00	1.81E+11	-81.0473	23718.	0.00
20.1250	0.02978	995441.	-550.1701	-5.53E-04	0.00	1.81E+11	-76.1644	26858.	0.00
21.0000	0.02428	985466.	-1324.	-4.95E-04	0.00	1.81E+11	-71.1554	30776.	0.00
21.8750	0.01938	967646.	-2044.	-4.39E-04	0.00	1.81E+11	-66.0069	35767.	0.00
22.7500	0.01507	942548.	-2709.	-3.83E-04	0.00	1.81E+11	-60.6984	42302.	0.00

23.6250	0.01133	910759.	-3682.	-3.30E-04	0.00	1.81E+11	-124.6904	115578.	0.00
24.5000	0.00814	865222.	-4905.	-2.78E-04	0.00	1.82E+11	-108.2431	139577.	0.00
25.3750	0.00548	807752.	-5979.	-2.30E-04	0.00	1.82E+11	-96.3451	184495.	0.00
26.2500	0.00331	739659.	-6896.	-1.85E-04	0.00	1.82E+11	-78.3238	248191.	0.00
27.1250	0.00159	662932.	-7512.	-1.45E-04	0.00	1.82E+11	-38.8864	256464.	0.00
28.0000	2.72E-04	581917.	-7752.	-1.09E-04	0.00	1.82E+11	-6.8552	264737.	0.00
28.8750	-6.96E-04	500146.	-7693.	-7.78E-05	0.00	1.82E+11	18.1033	273010.	0.00
29.7500	-0.00136	420371.	-7406.	-5.13E-05	0.00	1.83E+11	36.4906	281283.	0.00
30.6250	-0.00177	344620.	-6958.	-2.94E-05	0.00	1.83E+11	48.9315	289556.	0.00
31.5000	-0.00198	274263.	-6406.	-1.16E-05	0.00	1.83E+11	56.1307	297829.	0.00
32.3750	-0.00202	210094.	-5802.	2.29E-06	0.00	1.83E+11	58.8334	306102.	0.00
33.2500	-0.00193	152412.	-5190.	1.27E-05	0.00	1.83E+11	57.8068	314375.	0.00
34.1250	-0.00175	101103.	-4604.	2.00E-05	0.00	1.83E+11	53.8199	322648.	0.00
35.0000	-0.00151	55728.	-4071.	2.45E-05	0.00	1.83E+11	47.6301	330921.	0.00
35.8750	-0.00124	15604.	-3611.	2.65E-05	0.00	1.83E+11	39.9768	339194.	0.00
36.7500	-9.54E-04	-20113.	-3236.	2.64E-05	0.00	1.83E+11	31.5809	347467.	0.00
37.6250	-6.83E-04	-52348.	-2948.	2.43E-05	0.00	1.83E+11	23.1495	355740.	0.00
38.5000	-4.44E-04	-82031.	-1656.	2.05E-05	0.00	1.83E+11	223.1084	5278923.	0.00
39.3750	-2.54E-04	-87116.	185.3629	1.56E-05	0.00	1.83E+11	127.5513	5278923.	0.00
40.2500	-1.16E-04	-78138.	1162.	1.09E-05	0.00	1.83E+11	58.3906	5278923.	0.00
41.1250	-2.57E-05	-62723.	1536.	6.82E-06	0.00	1.83E+11	12.9061	5278923.	0.00
42.0000	2.70E-05	-45885.	1532.	3.70E-06	0.00	1.83E+11	-13.5731	5278923.	0.00
42.8750	5.20E-05	-30543.	1324.	1.51E-06	0.00	1.83E+11	-26.1490	5278923.	0.00
43.7500	5.86E-05	-18085.	1032.	1.10E-07	0.00	1.83E+11	-29.4702	5278923.	0.00
44.6250	5.43E-05	-8875.	733.7190	-6.64E-07	0.00	1.83E+11	-27.3117	5278923.	0.00
45.5000	4.47E-05	-2676.	472.3963	-9.95E-07	0.00	1.83E+11	-22.4641	5278923.	0.00
46.3750	3.34E-05	1045.	266.2311	-1.04E-06	0.00	1.83E+11	-16.8055	5278923.	0.00
47.2500	2.28E-05	2914.	117.8179	-9.28E-07	0.00	1.83E+11	-11.4637	5278923.	0.00
48.1250	1.39E-05	3520.	20.8576	-7.44E-07	0.00	1.83E+11	-7.0050	5278923.	0.00
49.0000	7.19E-06	3352.	-34.8851	-5.46E-07	0.00	1.83E+11	-3.6127	5278923.	0.00
49.8750	2.46E-06	2787.	-60.3421	-3.70E-07	0.00	1.83E+11	-1.2362	5278923.	0.00

50.7500	-5.88E-07	2085.	-65.2797	-2.30E-07	0.00	1.83E+11	0.2957	5278923.	0.00
51.6250	-2.38E-06	1416.	-57.4488	-1.30E-07	0.00	1.83E+11	1.1959	5278923.	0.00
52.5000	-3.32E-06	878.8505	-42.4192	-6.40E-08	0.00	1.83E+11	1.6669	5278923.	0.00
53.3750	-3.72E-06	525.3363	-23.8419	-2.37E-08	0.00	1.83E+11	1.8716	5278923.	0.00
54.2500	-3.81E-06	378.1706	-12.8999	2.22E-09	0.00	1.83E+11	0.2125	585230.	0.00
55.1250	-3.68E-06	254.4378	-10.6910	2.04E-08	0.00	1.83E+11	0.2082	594669.	0.00
56.0000	-3.39E-06	153.6586	-8.5754	3.21E-08	0.00	1.83E+11	0.1948	604108.	0.00
56.8750	-3.00E-06	74.3537	-6.6319	3.86E-08	0.00	1.83E+11	0.1754	613547.	0.00
57.7500	-2.57E-06	14.3897	-4.9090	4.12E-08	0.00	1.83E+11	0.1527	622986.	0.00
58.6250	-2.14E-06	-28.7360	-3.4313	4.08E-08	0.00	1.83E+11	0.1287	632426.	0.00
59.5000	-1.72E-06	-57.6685	-2.2041	3.83E-08	0.00	1.83E+11	0.1050	641865.	0.00
60.3750	-1.33E-06	-75.0226	-1.2186	3.45E-08	0.00	1.83E+11	0.08270	651304.	0.00
61.2500	-9.94E-07	-83.2587	-0.4560	2.99E-08	0.00	1.83E+11	0.06254	660743.	0.00
62.1250	-7.05E-07	-84.5996	0.1084	2.51E-08	0.00	1.83E+11	0.04497	670182.	0.00
63.0000	-4.66E-07	-80.9823	0.5030	2.04E-08	0.00	1.83E+11	0.03018	679622.	0.00
63.8750	-2.77E-07	-74.0376	0.7568	1.59E-08	0.00	1.83E+11	0.01817	689061.	0.00
64.7500	-1.32E-07	-65.0899	0.8983	1.19E-08	0.00	1.83E+11	0.00878	698500.	0.00
65.6250	-2.63E-08	-55.1743	0.9537	8.48E-09	0.00	1.83E+11	0.00178	707939.	0.00
66.5000	4.60E-08	-45.0628	0.9465	5.60E-09	0.00	1.83E+11	-0.00314	717378.	0.00
67.3750	9.12E-08	-35.2980	0.8968	3.29E-09	0.00	1.83E+11	-0.00632	726817.	0.00
68.2500	1.15E-07	-26.2295	0.8042	1.53E-09	0.00	1.83E+11	-0.01132	1032209.	0.00
69.1250	1.23E-07	-18.4092	0.6803	2.46E-10	0.00	1.83E+11	-0.01228	1045443.	0.00
70.0000	1.20E-07	-11.9425	0.5522	-6.25E-10	0.00	1.83E+11	-0.01213	1058676.	0.00
70.8750	1.10E-07	-6.8135	0.4294	-1.16E-09	0.00	1.83E+11	-0.01125	1071909.	0.00
71.7500	9.59E-08	-2.9246	0.3183	-1.44E-09	0.00	1.83E+11	-0.00991	1085143.	0.00
72.6250	7.99E-08	-0.1285	0.2224	-1.53E-09	0.00	1.83E+11	-0.00836	1098376.	0.00
73.5000	6.38E-08	1.7463	0.1431	-1.48E-09	0.00	1.83E+11	-0.00675	1111610.	0.00
74.3750	4.87E-08	2.8767	0.08026	-1.35E-09	0.00	1.83E+11	-0.00522	1124843.	0.00
75.2500	3.54E-08	3.4318	0.03272	-1.17E-09	0.00	1.83E+11	-0.00384	1138077.	0.00
76.1250	2.41E-08	3.5639	-0.00132	-9.69E-10	0.00	1.83E+11	-0.00265	1151310.	0.00
77.0000	1.50E-08	3.4041	-0.02397	-7.70E-10	0.00	1.83E+11	-0.00167	1164544.	0.00

77.8750	7.98E-09	3.0604	-0.03743	-5.84E-10	0.00	1.83E+11	-8.95E-04	1177777.	0.00
78.7500	2.77E-09	2.6180	-0.04378	-4.21E-10	0.00	1.83E+11	-3.15E-04	1191010.	0.00
79.6250	-8.58E-10	2.1410	-0.04492	-2.84E-10	0.00	1.83E+11	9.84E-05	1204244.	0.00
80.5000	-3.20E-09	1.6747	-0.04246	-1.75E-10	0.00	1.83E+11	3.71E-04	1217477.	0.00
81.3750	-4.53E-09	1.2494	-0.03772	-9.10E-11	0.00	1.83E+11	5.31E-04	1230711.	0.00
82.2500	-5.11E-09	0.8826	-0.03175	-2.98E-11	0.00	1.83E+11	6.05E-04	1243944.	0.00
83.1250	-5.16E-09	0.5826	-0.02533	1.22E-11	0.00	1.83E+11	6.17E-04	1257178.	0.00
84.0000	-4.85E-09	0.3506	-0.01901	3.90E-11	0.00	1.83E+11	5.87E-04	1270411.	0.00
84.8750	-4.34E-09	0.1834	-0.01314	5.43E-11	0.00	1.83E+11	5.30E-04	1283645.	0.00
85.7500	-3.71E-09	0.07462	-0.00795	6.18E-11	0.00	1.83E+11	4.58E-04	1296878.	0.00
86.6250	-3.04E-09	0.01640	-0.00355	6.44E-11	0.00	1.83E+11	3.79E-04	1310112.	0.00
87.5000	-2.36E-09	0.00	0.00	6.48E-11	0.00	1.83E+11	2.97E-04	661672.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.25000000 inches

Computed slope at pile head = 0.000000 radians

Maximum bending moment = -1553879. inch-lbs

Maximum shear force = 20409. lbs

Depth of maximum bending moment = 0.000000 feet below pile head

Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 14

Number of zero deflection points = 5

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs

Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians

Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.

Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs

Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Load Pile-head 1	Load Type 2	Load Pile-head 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.2500	S, rad	0.00	0.00	0.2500	0.00	20409.	-1553879.

Maximum pile-head deflection = 0.2500000000 inches

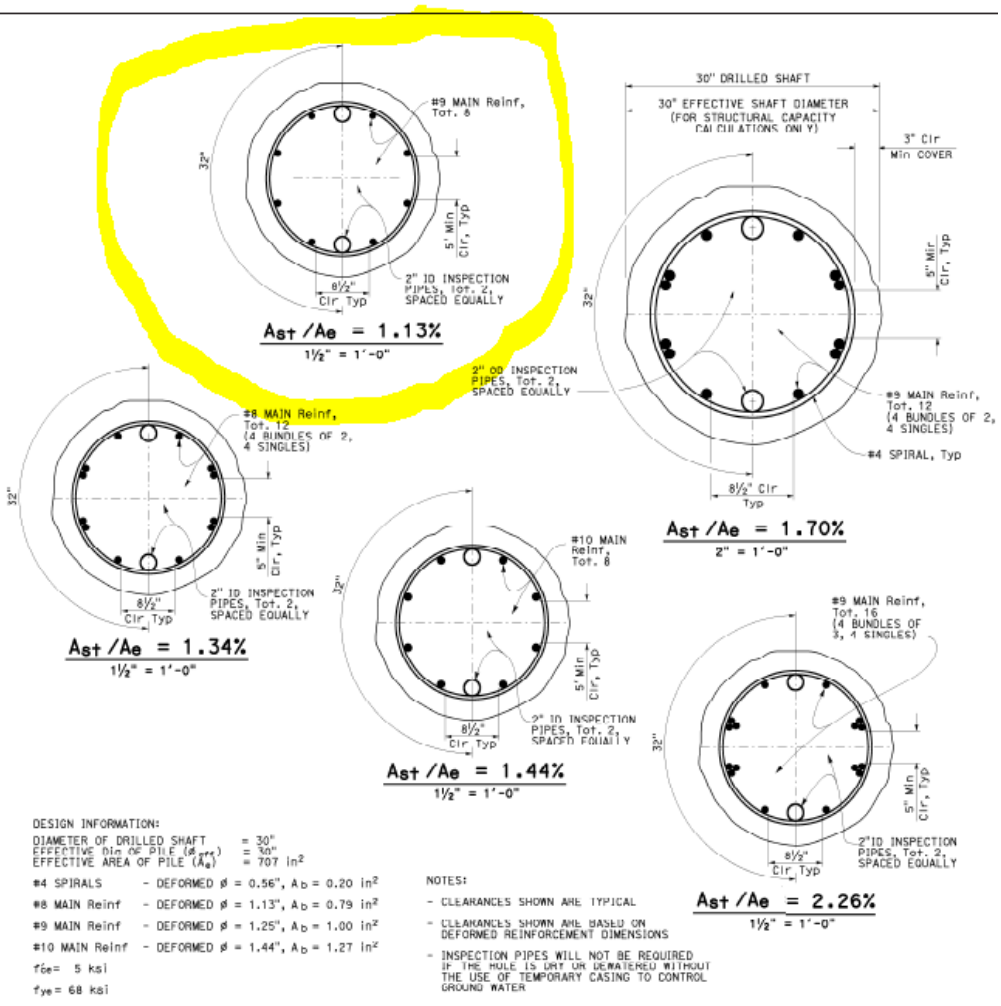
Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

Boring A-19-002

Abutment #1

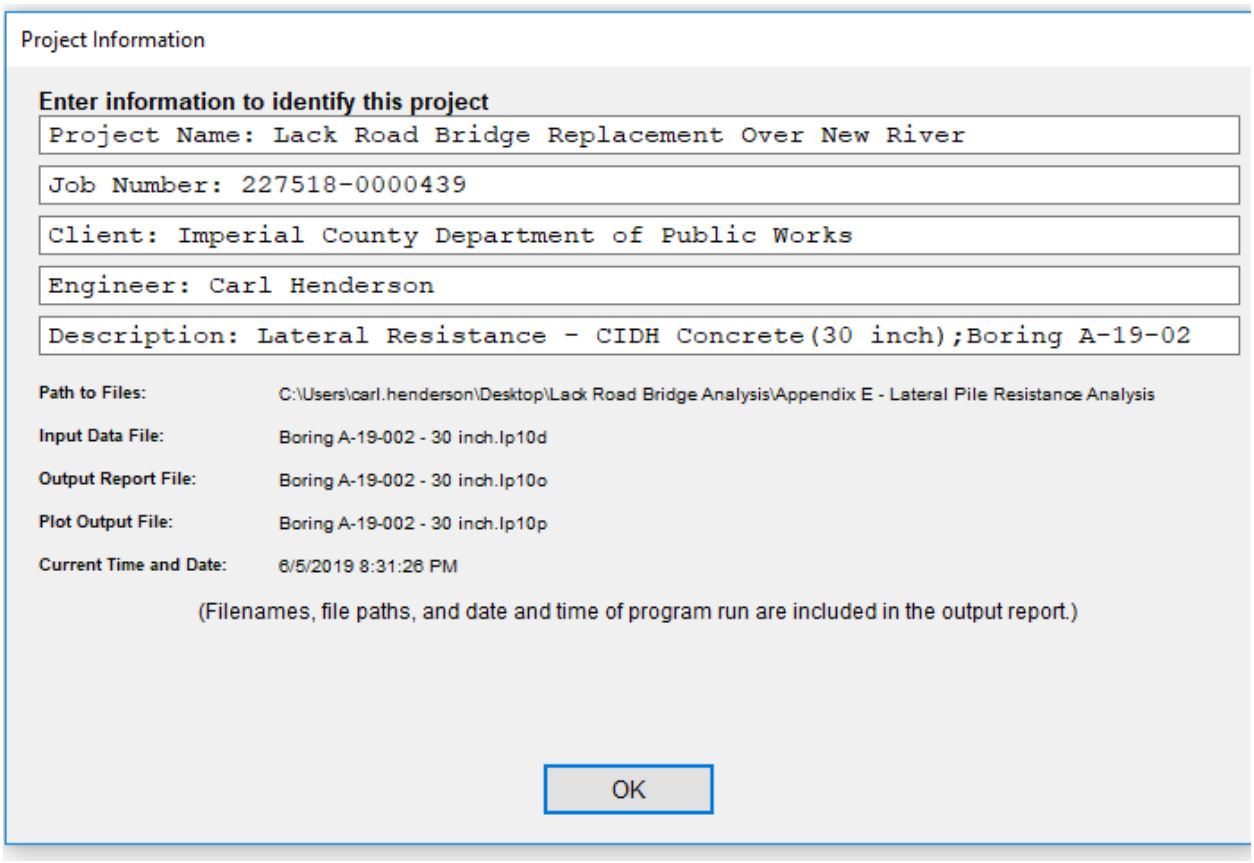
30-inch CIDH Pile

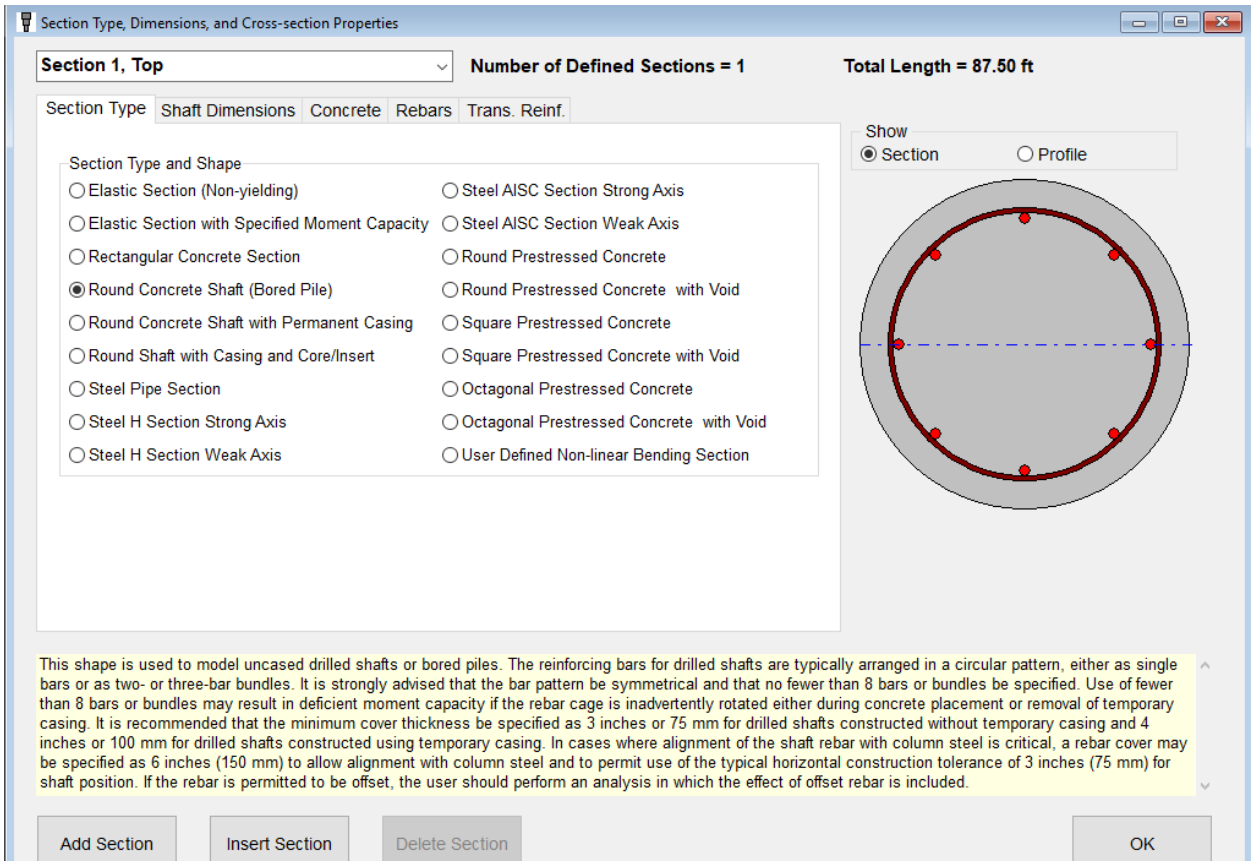

#9 MAIN Reinf, Tot. 8
32"
5" Min Clr, Typ
8½" Clr Typ
2" ID INSPECTION PIPES, Tot. 2, SPACED EQUALLY
Ast /Ae = 1.13%
1½" = 1'-0"
30" DRILLED SHAFT
30" EFFECTIVE SHAFT DIAMETER (FOR STRUCTURAL CAPACITY CALCULATIONS ONLY)
3" Clr Min COVER
5" Min Clr, Typ
2" OD INSPECTION PIPES, Tot. 2, SPACED EQUALLY
#9 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
#4 SPIRAL, Typ
8½" Clr Typ
Ast /Ae = 1.70%
2" = 1'-0"
#8 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
Ast /Ae = 1.34%
1½" = 1'-0"
#10 MAIN Reinf, Tot. 8
Ast /Ae = 1.44%
1½" = 1'-0"
#9 MAIN Reinf, Tot. 16 (4 BUNDLES OF 3, 4 SINGLES)
Ast /Ae = 2.26%
1½" = 1'-0"
DESIGN INFORMATION:
DIAMETER OF DRILLED SHAFT = 30"
EFFECTIVE DIA OF PILE (d_{eff}) = 30"
EFFECTIVE AREA OF PILE (A_e) = 707 in²
#4 SPIRALS - DEFORMED ø = 0.56", A_b = 0.20 in²
#8 MAIN Reinf - DEFORMED ø = 1.13", A_b = 0.79 in²
#9 MAIN Reinf - DEFORMED ø = 1.25", A_b = 1.00 in²
#10 MAIN Reinf - DEFORMED ø = 1.44", A_b = 1.27 in²
f'ce= 5 ksi
fye= 68 ksi
NOTES:
- CLEARANCES SHOWN ARE TYPICAL
- CLEARANCES SHOWN ARE BASED ON DEFORMED REINFORCEMENT DIMENSIONS
- INSPECTION PIPES WILL NOT BE REQUIRED IF THE HOLE IS DRY OR DEWATERED WITHOUT THE USE OF TEMPORARY CASING TO CONTROL GROUND WATER

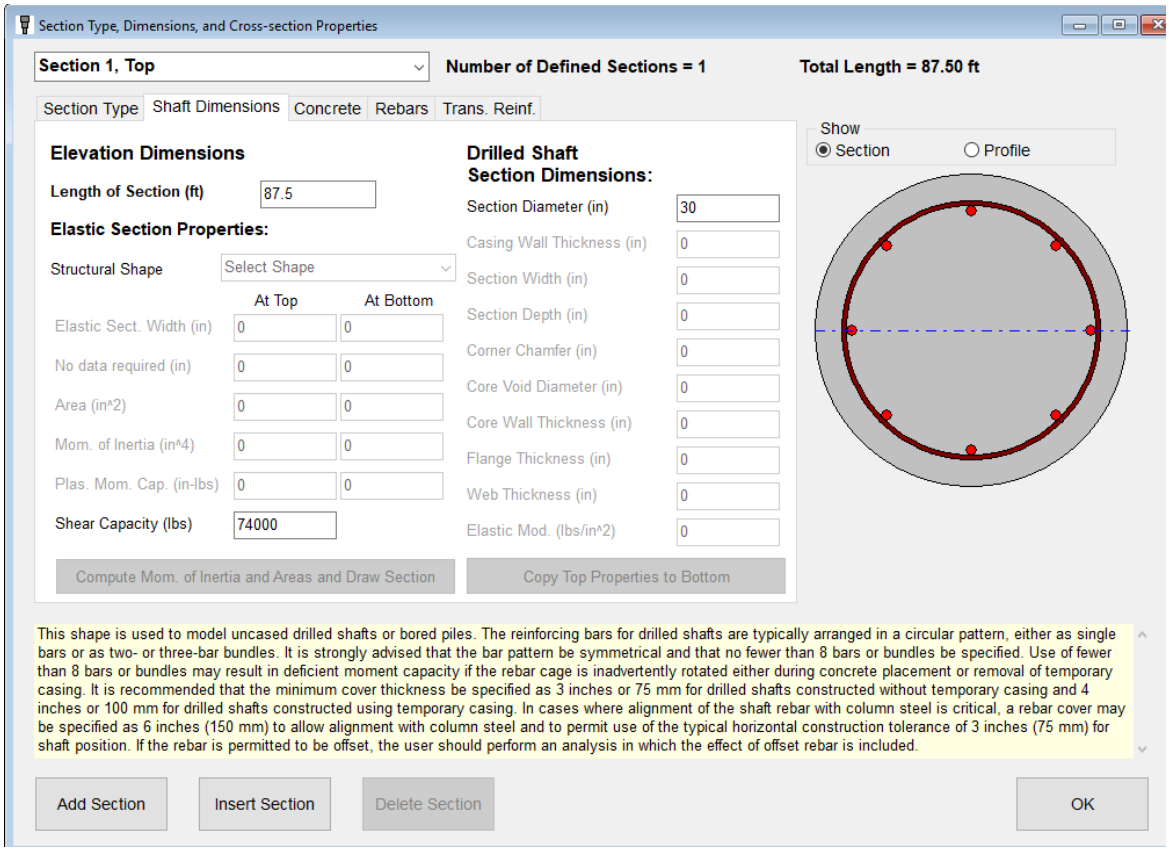
ATTACHMENT A

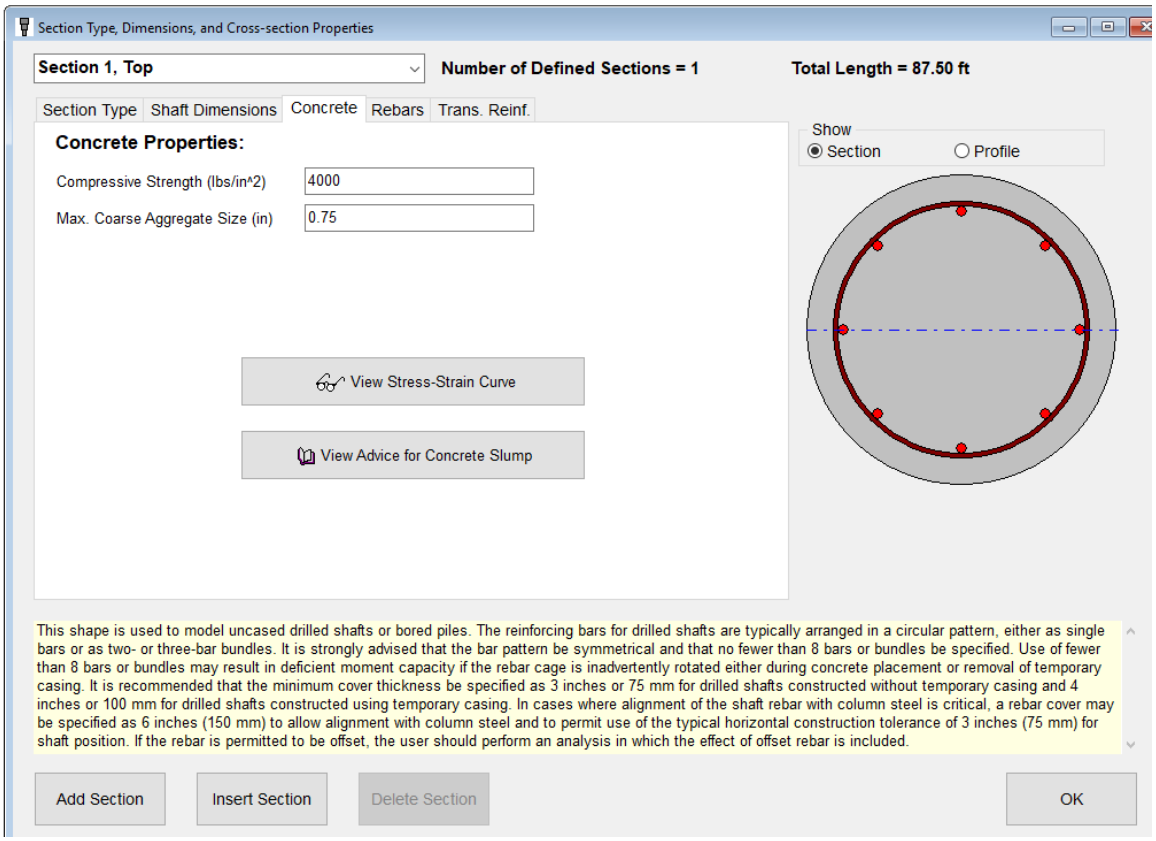
STEEL ρ_L A_{st}/A_g	UNFACTORED AXIAL LOAD (P_n)		SPIRALS SPACING C-C	M_{nc} @ ϵ_c=0.003	M_p	ϕ_p	I_{cr}	$\phi\gamma i$	V_s
%	%	kips	in	kip-ft	kip-ft	rad/in	ft^4	rad/in	kips
1.13% STEEL	0	0	6	500	494	0.001491	0.403	0.000176	74
		0	6	500	494	0.001491	0.403	0.000176	74
	5	149	6	613	591	0.001355	0.494	0.000172	74
		149	6	613	591	0.001355	0.494	0.000172	74
	10	299	6	714	684	0.001215	0.567	0.000173	74
		299	6	714	684	0.001215	0.567	0.000173	74
	15	448	6	790	767	0.001068	0.625	0.000176	74
		448	6	790	767	0.001068	0.625	0.000176	74
	20	597	6	862	841	0.000939	0.668	0.000181	74
		597	6	862	841	0.000939	0.668	0.000181	74
1.34% STEEL	0	0	6	577	569	0.001425	0.458	0.000178	74
		0	6	577	569	0.001425	0.458	0.000178	74
	5	153	6	685	662	0.001252	0.544	0.000175	74
		153	6	685	662	0.001252	0.544	0.000175	74
	10	307	6	779	750	0.001117	0.613	0.000175	74
		307	6	779	750	0.001117	0.613	0.000175	74
	15	460	6	858	829	0.001015	0.673	0.000177	74
		460	6	858	829	0.001015	0.673	0.000177	74
	20	613	6	932	902	0.000918	0.707	0.000183	74
		613	6	932	902	0.000918	0.707	0.000183	74
1.44% STEEL	0	0	6	611	602	0.001402	0.480	0.000180	74
		0	6	611	602	0.001402	0.480	0.000180	74
	5	155	6	723	698	0.001278	0.563	0.000178	74
		155	6	723	698	0.001278	0.563	0.000178	74
	10	310	6	808	788	0.001149	0.630	0.000180	74
		310	6	808	788	0.001149	0.630	0.000180	74
	15	466	6	882	870	0.001006	0.681	0.000183	74
		466	6	882	870	0.001006	0.681	0.000183	74
	20	621	6	952	941	0.000875	0.719	0.000188	74
		621	6	952	941	0.000875	0.719	0.000188	74
1.70% STEEL	0	0	6	701	695	0.001289	0.546	0.000183	74
		0	6	701	695	0.001289	0.546	0.000183	74
	5	160	6	807	786	0.001164	0.625	0.000180	74
		160	6	807	786	0.001164	0.625	0.000180	74
	10	320	6	890	870	0.001056	0.687	0.000182	74
		320	6	890	870	0.001056	0.687	0.000182	74
	15	481	6	968	948	0.000961	0.735	0.000185	74
		481	6	968	948	0.000961	0.735	0.000185	74
	20	641	6	1036	1018	0.000866	0.770	0.000190	74
		641	6	1036	1018	0.000866	0.770	0.000190	74
2.26% STEEL	0	0	6	888	880	0.001146	0.675	0.000187	74
		0	6	888	880	0.001146	0.675	0.000187	74
	5	171	6	979	970	0.001032	0.744	0.000187	74
		171	6	979	970	0.001032	0.744	0.000187	74
	10	342	6	1063	1054	0.000936	0.797	0.000190	74
		342	6	1063	1054	0.000936	0.797	0.000190	74
	15	513	6	1132	1130	0.000847	0.837	0.000194	74
		513	6	1132	1130	0.000847	0.837	0.000194	74
	20	684	6	1188	1197	0.000762	0.864	0.000199	74
		684	6	1188	1197	0.000762	0.864	0.000199	74

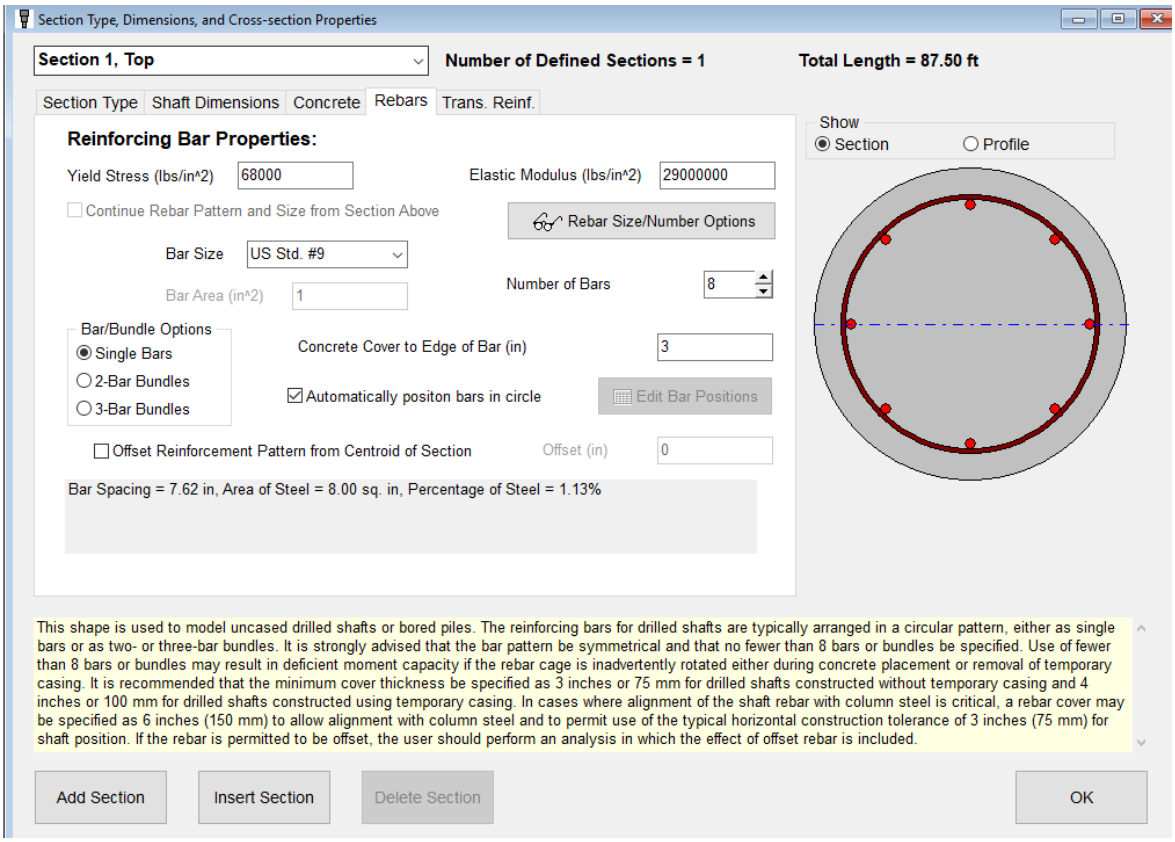
30" DIA CIDH PILE DETAILS
WITHOUT CASING

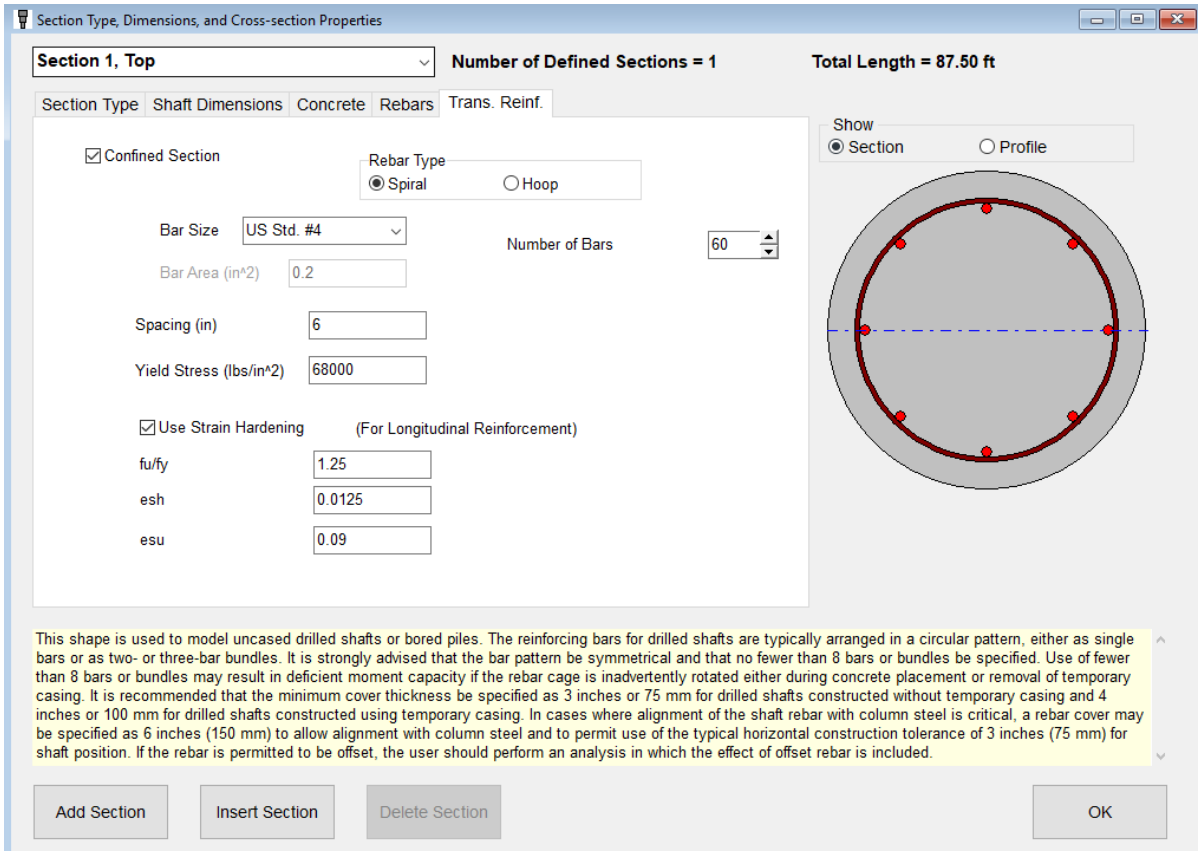

Project Information
Enter information to identify this project
Project Name: Lack Road Bridge Replacement Over New River
Job Number: 227518-0000439
Client: Imperial County Department of Public Works
Engineer: Carl Henderson
Description: Lateral Resistance - CIDH Concrete(30 inch);Boring A-19-02
Path to Files: C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis
Input Data File: Boring A-19-002 - 30 inch.lp10d
Output Report File: Boring A-19-002 - 30 inch.lp10o
Plot Output File: Boring A-19-002 - 30 inch.lp10p
Current Time and Date: 6/5/2019 8:31:26 PM
(Filenames, file paths, and date and time of program run are included in the output report.)
OK

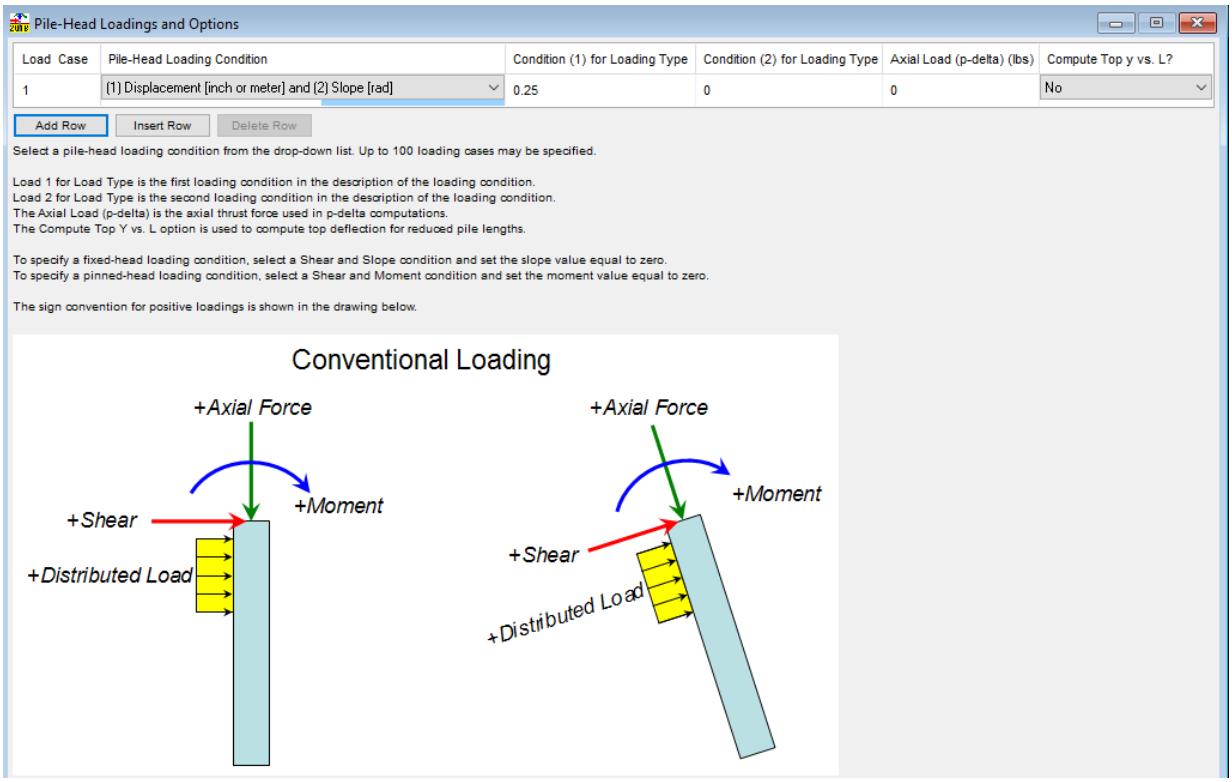

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Section Type and Shape
Elastic Section (Non-yielding)
Elastic Section with Specified Moment Capacity
Rectangular Concrete Section
Round Concrete Shaft (Bored Pile)
Round Concrete Shaft with Permanent Casing
Round Shaft with Casing and Core/Insert
Steel Pipe Section
Steel H Section Strong Axis
Steel H Section Weak Axis
Steel AISC Section Strong Axis
Steel AISC Section Weak Axis
Round Prestressed Concrete
Round Prestressed Concrete with Void
Square Prestressed Concrete
Square Prestressed Concrete with Void
Octagonal Prestressed Concrete
Octagonal Prestressed Concrete with Void
User Defined Non-linear Bending Section
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

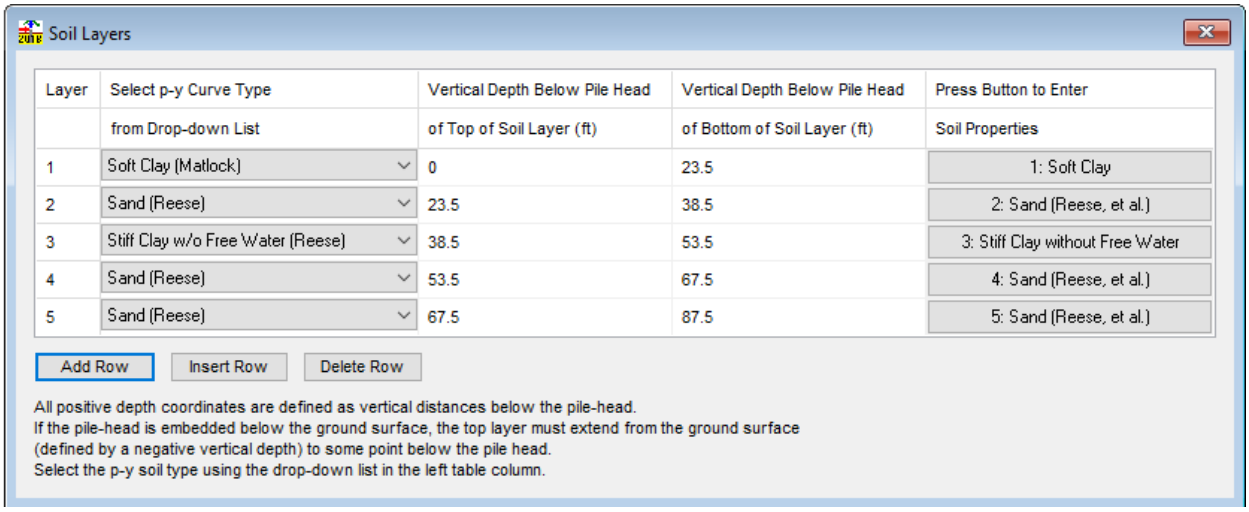

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Elevation Dimensions
Length of Section (ft)
87.5
Elastic Section Properties:
Structural Shape
Select Shape
At Top
At Bottom
Elastic Sect. Width (in)
No data required (in)
Area (in^2)
Mom. of Inertia (in^4)
Plas. Mom. Cap. (in-lbs)
Shear Capacity (lbs)
74000
Drilled Shaft Section Dimensions:
Section Diameter (in)
30
Casing Wall Thickness (in)
Section Width (in)
Section Depth (in)
Corner Chamfer (in)
Core Void Diameter (in)
Core Wall Thickness (in)
Flange Thickness (in)
Web Thickness (in)
Elastic Mod. (lbs/in^2)
Compute Mom. of Inertia and Areas and Draw Section
Copy Top Properties to Bottom
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

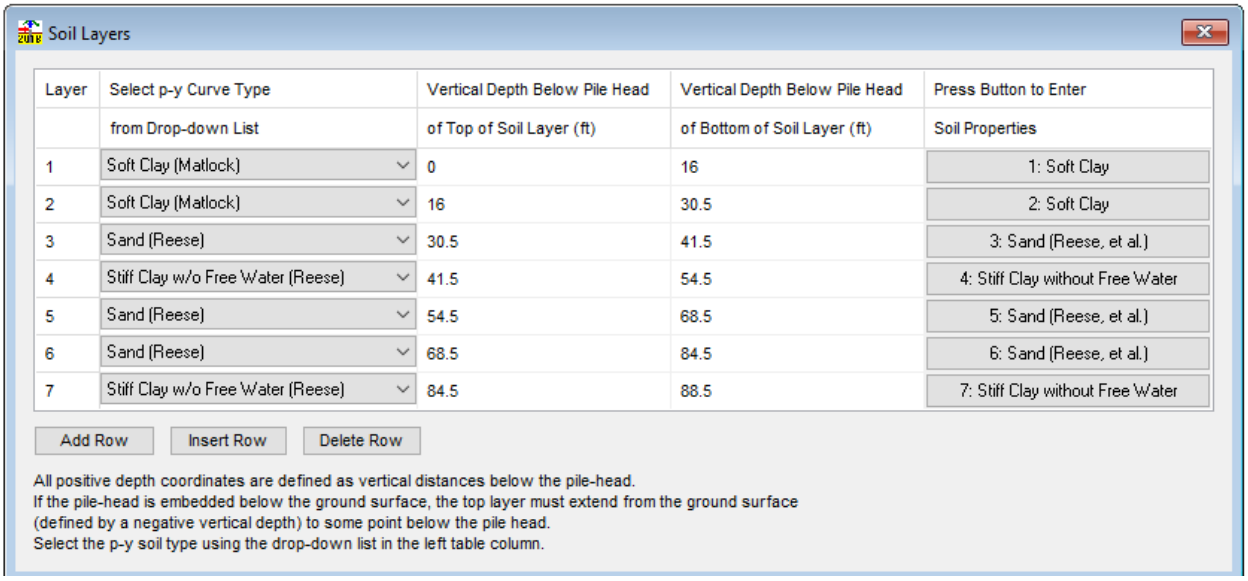

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Concrete Properties:
Compressive Strength (lbs/in^2)
4000
Max. Coarse Aggregate Size (in)
0.75
View Stress-Strain Curve
View Advice for Concrete Slump
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

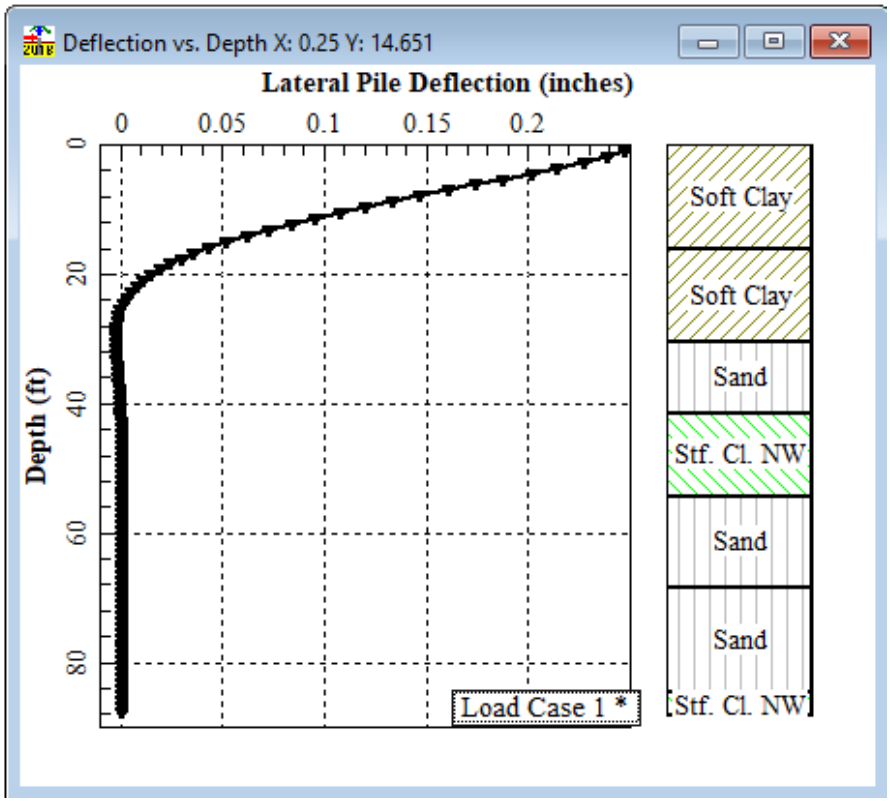

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Reinforcing Bar Properties:
Yield Stress (lbs/in^2)
68000
Elastic Modulus (lbs/in^2)
29000000
Continue Rebar Pattern and Size from Section Above
Rebar Size/Number Options
Bar Size
US Std. #9
Bar Area (in^2)
1
Number of Bars
8
Bar/Bundle Options
Single Bars
2-Bar Bundles
3-Bar Bundles
Concrete Cover to Edge of Bar (in)
3
Automatically positon bars in circle
Edit Bar Positions
Offset Reinforcement Pattern from Centroid of Section
Offset (in)
0
Bar Spacing = 7.62 in, Area of Steel = 8.00 sq. in, Percentage of Steel = 1.13%
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

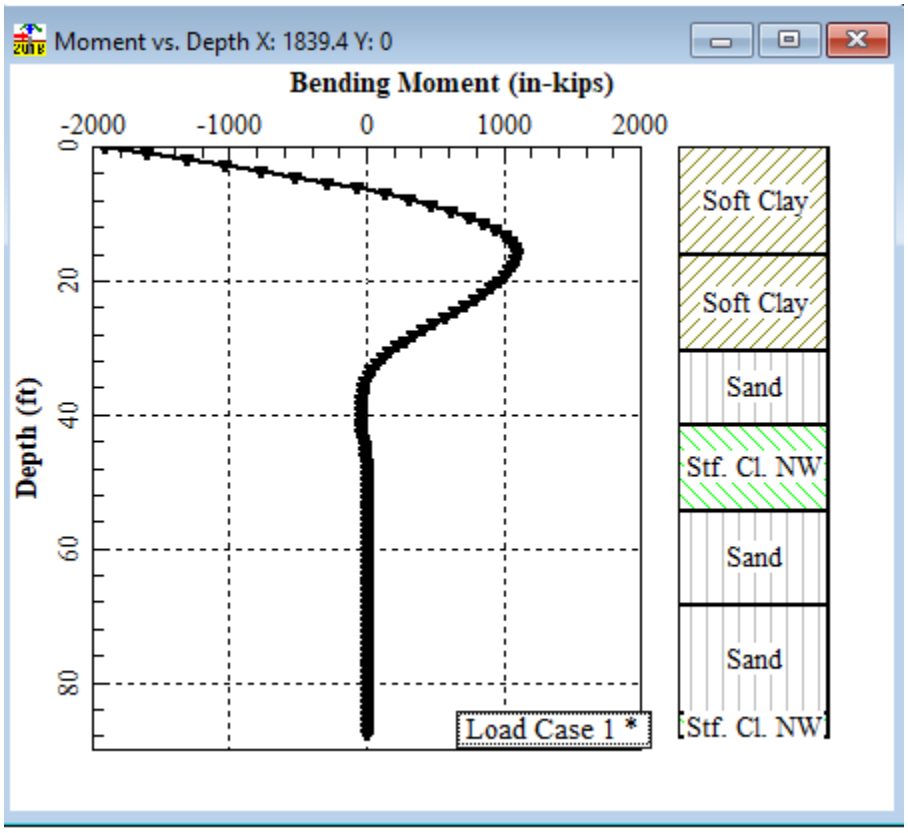

Section Type, Dimensions, and Cross-section Properties
Section 1, Top
Number of Defined Sections = 1
Total Length = 87.50 ft
Section Type
Shaft Dimensions
Concrete
Rebars
Trans. Reinf.
Confined Section
Rebar Type
Spiral
Hoop
Bar Size
US Std. #4
Number of Bars
60
Bar Area (in^2)
0.2
Spacing (in)
6
Yield Stress (lbs/in^2)
68000
Use Strain Hardening
(For Longitudinal Reinforcement)
fu/fy
1.25
esh
0.0125
esu
0.09
Show
Section
Profile
This shape is used to model uncased drilled shafts or bored piles. The reinforcing bars for drilled shafts are typically arranged in a circular pattern, either as single bars or as two- or three-bar bundles. It is strongly advised that the bar pattern be symmetrical and that no fewer than 8 bars or bundles be specified. Use of fewer than 8 bars or bundles may result in deficient moment capacity if the rebar cage is inadvertently rotated either during concrete placement or removal of temporary casing. It is recommended that the minimum cover thickness be specified as 3 inches or 75 mm for drilled shafts constructed without temporary casing and 4 inches or 100 mm for drilled shafts constructed using temporary casing. In cases where alignment of the shaft rebar with column steel is critical, a rebar cover may be specified as 6 inches (150 mm) to allow alignment with column steel and to permit use of the typical horizontal construction tolerance of 3 inches (75 mm) for shaft position. If the rebar is permitted to be offset, the user should perform an analysis in which the effect of offset rebar is included.
Add Section
Insert Section
Delete Section
OK

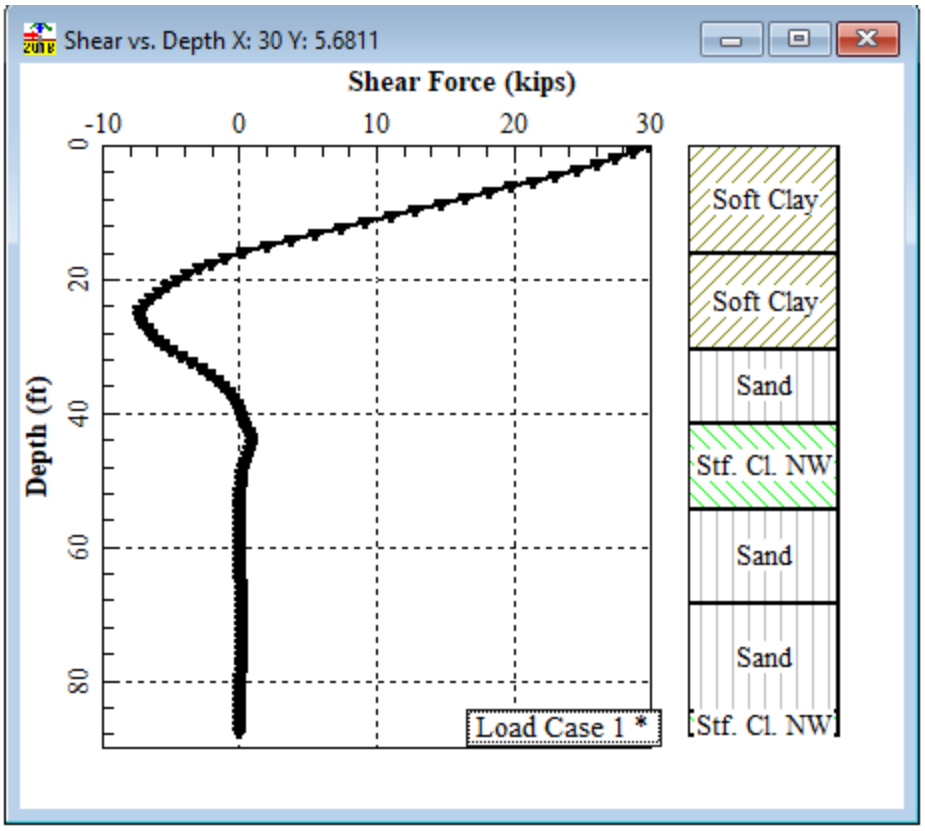

Pile-Head Loadings and Options
Load Case
Pile-Head Loading Condition
Condition (1) for Loading Type
Condition (2) for Loading Type
Axial Load (p-delta) (lbs)
Compute Top y vs. L?
1
(1) Displacement [inch or meter] and (2) Slope [rad]
0.25
0
0
No
Add Row
Insert Row
Delete Row
Select a pile-head loading condition from the drop-down list. Up to 100 loading cases may be specified.
Load 1 for Load Type is the first loading condition in the description of the loading condition.
Load 2 for Load Type is the second loading condition in the description of the loading condition.
The Axial Load (p-delta) is the axial thrust force used in p-delta computations.
The Compute Top Y vs. L option is used to compute top deflection for reduced pile lengths.
To specify a fixed-head loading condition, select a Shear and Slope condition and set the slope value equal to zero.
To specify a pinned-head loading condition, select a Shear and Moment condition and set the moment value equal to zero.
The sign convention for positive loadings is shown in the drawing below.
Conventional Loading
+Axial Force
+Moment
+Shear
+Distributed Load
+Axial Force
+Moment
+Shear
+Distributed Load


Soil Layers
Layer
Select p-y Curve Type
from Drop-down List
Vertical Depth Below Pile Head
of Top of Soil Layer (ft)
Vertical Depth Below Pile Head
of Bottom of Soil Layer (ft)
Press Button to Enter
Soil Properties
1 Soft Clay (Matlock) 0 23.5 1: Soft Clay
2 Sand (Reese) 23.5 38.5 2: Sand (Reese, et al.)
3 Stiff Clay w/o Free Water (Reese) 38.5 53.5 3: Stiff Clay without Free Water
4 Sand (Reese) 53.5 67.5 4: Sand (Reese, et al.)
5 Sand (Reese) 67.5 87.5 5: Sand (Reese, et al.)
Add Row
Insert Row
Delete Row
All positive depth coordinates are defined as vertical distances below the pile-head.
If the pile-head is embedded below the ground surface, the top layer must extend from the ground surface
(defined by a negative vertical depth) to some point below the pile head.
Select the p-y soil type using the drop-down list in the left table column.


Soil Layers
Layer
Select p-y Curve Type
from Drop-down List
Vertical Depth Below Pile Head
of Top of Soil Layer (ft)
Vertical Depth Below Pile Head
of Bottom of Soil Layer (ft)
Press Button to Enter
Soil Properties
1 Soft Clay (Matlock) 0 16 1: Soft Clay
2 Soft Clay (Matlock) 16 30.5 2: Soft Clay
3 Sand (Reese) 30.5 41.5 3: Sand (Reese, et al.)
4 Stiff Clay w/o Free Water (Reese) 41.5 54.5 4: Stiff Clay without Free Water
5 Sand (Reese) 54.5 68.5 5: Sand (Reese, et al.)
6 Sand (Reese) 68.5 84.5 6: Sand (Reese, et al.)
7 Stiff Clay w/o Free Water (Reese) 84.5 88.5 7: Stiff Clay without Free Water
Add Row
Insert Row
Delete Row
All positive depth coordinates are defined as vertical distances below the pile-head.
If the pile-head is embedded below the ground surface, the top layer must extend from the ground surface
(defined by a negative vertical depth) to some point below the pile head.
Select the p-y soil type using the drop-down list in the left table column.


Deflection vs. Depth X: 0.25 Y: 14.651
Lateral Pile Deflection (inches)
0
0.05
0.1
0.15
0.2
Depth (ft)
0
20
40
60
80
Soft Clay
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Stf. Cl. NW
Load Case 1 *


Moment vs. Depth X: 1839.4 Y: 0
Bending Moment (in-kips)
-2000
-1000
0
1000
2000
Depth (ft)
0
20
40
60
80
Soft Clay
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Stf. Cl. NW
Load Case 1 *


Shear vs. Depth X: 30 Y: 5.6811
Shear Force (kips)
-10
0
10
20
30
Depth (ft)
0
20
40
60
80
Load Case 1 *
Soft Clay
Soft Clay
Sand
Stf. Cl. NW
Sand
Sand
Stf. Cl. NW

==========

LPile for Windows, Version 2018-10.002

Analysis of Individual Piles and Drilled Shafts

Subjected to Lateral Loading Using the p-y Method

==========

This copy of LPile is being used by:

Carl Henderson

NV5, Inc. - San Diego, CA

Serial Number of Security Device: 161221202

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Use of this program by any entity other than NV5, San Diego, CA

is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix E - Lateral Pile Resistance Analysis\

Name of input data file:

Boring A-19-002 - 30 inch.lp10

Name of output report file:

Boring A-19-002 - 30 inch.lp10

Name of plot output file:

Boring A-19-002 - 30 inch.lp10

Name of runtime message file:

Boring A-19-002 - 30 inch.lp10

Date and Time of Analysis

Date: June 5, 2019 Time: 20:30:17

Problem Title

Project Name: Lack Road Bridge Replacement Over New River

Job Number: 227518-0000439

Client: Imperial County Department of Public Works

Engineer: Carl Henderson

Description: Lateral Resistance - CIDH Concrete(30 inch);Boring A-19-02

Program Options and Settings

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1

Total length of pile = 87.500 ft

Depth of ground surface below top of pile = 0.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	30.0000
2	87.500	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile

Length of section = 87.500000 ft

Shaft Diameter = 30.000000 in

Shear capacity of section = 55000. lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees

= 0.000 radians

Pile Batter Angle = 0.000 degrees

= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 7 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 0.0000 ft

Distance from top of pile to bottom of layer = 16.000000 ft

Effective unit weight at top of layer = 60.400000 pcf

Effective unit weight at bottom of layer = 60.400000 pcf

Undrained cohesion at top of layer = 500.000000 psf

Undrained cohesion at bottom of layer = 500.000000 psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 2 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer = 16.000000 ft

Distance from top of pile to bottom of layer = 30.500000 ft

Effective unit weight at top of layer = 59.800000 pcf

Effective unit weight at bottom of layer = 59.800000 pcf

Undrained cohesion at top of layer = 350.000000 psf

Undrained cohesion at bottom of layer = 350.000000 psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 30.500000 ft

Distance from top of pile to bottom of layer = 41.500000 ft

Effective unit weight at top of layer = 66.800000 pcf

Effective unit weight at bottom of layer = 66.800000 pcf

Friction angle at top of layer = 34.000000 deg.

Friction angle at bottom of layer = 34.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 4 is stiff clay without free water

Distance from top of pile to top of layer = 41.500000 ft

Distance from top of pile to bottom of layer = 54.500000 ft

Effective unit weight at top of layer = 61.600000 pcf

Effective unit weight at bottom of layer = 61.600000 pcf

Undrained cohesion at top of layer = 1500. psf

Undrained cohesion at bottom of layer = 1500. psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

Layer 5 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 54.500000 ft

Distance from top of pile to bottom of layer = 68.500000 ft

Effective unit weight at top of layer = 61.600000 pcf

Effective unit weight at bottom of layer = 61.600000 pcf

Friction angle at top of layer = 33.000000 deg.

Friction angle at bottom of layer = 33.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 6 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 68.500000 ft

Distance from top of pile to bottom of layer = 84.500000 ft

Effective unit weight at top of layer = 65.600000 pcf

Effective unit weight at bottom of layer = 65.600000 pcf

Friction angle at top of layer = 38.000000 deg.

Friction angle at bottom of layer = 38.000000 deg.

Subgrade k at top of layer = 0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 84.500000 ft

Distance from top of pile to bottom of layer = 88.500000 ft

Effective unit weight at top of layer = 62.600000 pcf

Effective unit weight at bottom of layer = 62.600000 pcf

Undrained cohesion at top of layer = 2000. psf

Undrained cohesion at bottom of layer = 2000. psf

Epsilon-50 at top of layer = 0.0000

Epsilon-50 at bottom of layer = 0.0000

NOTE: Default values for Epsilon-50 will be computed for this layer.

(Depth of the lowest soil layer extends 1.000 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Soft Clay	0.00 16.0000	60.4000 60.4000	500.0000 500.0000	-- --	default default	-- --
2	Soft Clay	16.0000 30.5000	59.8000 59.8000	350.0000 350.0000	-- --	default default	-- --
3	Sand (Reese, et al.)	30.5000 41.5000	66.8000 66.8000	-- --	34.0000 34.0000	-- --	default default
4	Stiff Clay w/o Free Water	41.5000 54.5000	61.6000 61.6000	1500. 1500.	-- --	default default	-- --
5	Sand (Reese, et al.)	54.5000 68.5000	61.6000 61.6000	-- --	33.0000 33.0000	-- --	default default
6	Sand (Reese, et al.)	68.5000 84.5000	65.6000 65.6000	-- --	38.0000 38.0000	-- --	default default
7	Stiff Clay w/o Free Water	84.5000 88.5000	62.6000 62.6000	2000. 2000.	-- --	default default	-- --

---

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	0.0000000	N.A.

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with

specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section = 87.500000 ft

Shaft Diameter = 30.000000 in

Concrete Cover Thickness = 3.000000 in

Number of Reinforcing Bars = 8 bars

Yield Stress of Reinforcing Bars = 68000. psi

Modulus of Elasticity of Reinforcing Bars = 29000000. psi

Gross Area of Shaft = 706.858347 sq. in.

Total Area of Reinforcing Steel = 8.000000 sq. in.

Area Ratio of Steel Reinforcement = 1.13 percent

Edge-to-Edge Bar Spacing = 7.624735 in

Maximum Concrete Aggregate Size = 0.750000 in

Ratio of Bar Spacing to Aggregate Size = 10.17

Offset of Center of Rebar Cage from Center of Pile = 0.0000 in

Confined Section

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2920.118 kips

Tensile Load for Cracking of Concrete = -317.428 kips

Nominal Axial Tensile Capacity = -544.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.128000	1.000000	11.436000	0.00000
2	1.128000	1.000000	8.086473	8.086473
3	1.128000	1.000000	0.00000	11.436000
4	1.128000	1.000000	-8.086473	8.086473
5	1.128000	1.000000	-11.436000	0.00000
6	1.128000	1.000000	-8.086473	-8.086473
7	1.128000	1.000000	0.00000	-11.436000
8	1.128000	1.000000	8.086473	-8.086473

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 7.625 inches

between bars 1 and 2.

Ratio of bar spacing to maximum aggregate size = 10.17

Concrete Properties:

Compressive Strength of Concrete = 4000. psi

Modulus of Elasticity of Concrete = 3604997. psi

Modulus of Rupture of Concrete = -474.341649 psi

Compression Strain at Peak Stress = 0.001886

Tensile Strain at Fracture of Concrete = -0.0001154

Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.

Y = stress in reinforcing steel has reached yield stress.

T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.

Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.

Position of neutral axis is measured from edge of compression side of pile.

Compressive stresses and strains are positive in sign.

Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conf Stress ksi	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
0.00000200	365.8607984	182930399.	15.0000125	0.00003000	-0.00003000	-0.0012721	0.1249713	0.8613007	
0.00000400	728.0783216	182019580.	15.0000126	0.00006000	-0.00006000	-0.0025441	0.2479592	1.7226015	
0.00000600	1087.	181108762.	15.0000127	0.00009000	-0.00009000	-0.0038158	0.3689638	2.5839022	
0.00000800	1087.	135831571.	7.4425598	0.00005954	-0.0001805	0.00000	0.2436056	-5.1985261	C
0.00001000	1087.	108665257.	7.4475595	0.00007448	-0.0002255	0.00000	0.3035151	-6.4967077	C
0.00001200	1087.	90554381.	7.4525827	0.00008943	-0.0002706	0.00000	0.3630250	-7.7943012	C
0.00001400	1087.	77618041.	7.4576294	0.0001044	-0.0003156	0.00000	0.4221340	-9.0913025	C
0.00001600	1087.	67915786.	7.4627000	0.0001194	-0.0003606	0.00000	0.4808404	-10.3877072	C
0.00001800	1087.	60369587.	7.4677946	0.0001344	-0.0004056	0.00000	0.5391430	-11.6835112	C
0.00002000	1087.	54332628.	7.4729136	0.0001495	-0.0004505	0.00000	0.5970402	-12.9787101	C
0.00002200	1087.	49393299.	7.4780570	0.0001645	-0.0004955	0.00000	0.6545305	-14.2732996	C
0.00002400	1087.	45277190.	7.4832253	0.0001796	-0.0005404	0.00000	0.7116125	-15.5672752	C
0.00002600	1087.	41794330.	7.4884186	0.0001947	-0.0005853	0.00000	0.7682846	-16.8606324	C
0.00002800	1087.	38809020.	7.4936372	0.0002098	-0.0006302	0.00000	0.8245452	-18.1533666	C
0.00003000	1087.	36221752.	7.4988813	0.0002250	-0.0006750	0.00000	0.8803929	-19.4454733	C

0.00003200	1144.	35736003.	7.5041512	0.0002401	-0.0007199	0.00000	0.9358260	-20.7369478 C
0.00003400	1214.	35714613.	7.5094471	0.0002553	-0.0007647	0.00000	0.9908430	-22.0277853 C
0.00003600	1285.	35693132.	7.5147693	0.0002705	-0.0008095	0.00000	1.0454423	-23.3179810 C
0.00003800	1356.	35671558.	7.5201181	0.0002858	-0.0008542	0.00000	1.0996222	-24.6075300 C
0.00004000	1426.	35649891.	7.5254937	0.0003010	-0.0008990	0.00000	1.1533811	-25.8964274 C
0.00004200	1496.	35628131.	7.5308965	0.0003163	-0.0009437	0.00000	1.2067174	-27.1846683 C
0.00004400	1567.	35606275.	7.5363266	0.0003316	-0.0009884	0.00000	1.2596294	-28.4722474 C
0.00004600	1637.	35584324.	7.5417845	0.0003469	-0.0010331	0.00000	1.3121154	-29.7591598 C
0.00004800	1707.	35562276.	7.5472703	0.0003623	-0.0010777	0.00000	1.3641736	-31.0454001 C
0.00005000	1777.	35540130.	7.5527843	0.0003776	-0.0011224	0.00000	1.4158024	-32.3309630 C
0.00005200	1847.	35517886.	7.5583269	0.0003930	-0.0011670	0.00000	1.4670000	-33.6158433 C
0.00005400	1917.	35495542.	7.5638984	0.0004085	-0.0012115	0.00000	1.5177647	-34.9000354 C
0.00005600	1986.	35473097.	7.5694991	0.0004239	-0.0012561	0.00000	1.5680946	-36.1835339 C
0.00005800	2056.	35450551.	7.5751292	0.0004394	-0.0013006	0.00000	1.6179879	-37.4663331 C
0.00006000	2126.	35427903.	7.5807892	0.0004548	-0.0013452	0.00000	1.6674428	-38.7484273 C
0.00006200	2195.	35405151.	7.5864793	0.0004704	-0.0013896	0.00000	1.7164575	-40.0298109 C
0.00006400	2264.	35382294.	7.5921998	0.0004859	-0.0014341	0.00000	1.7650301	-41.3104778 C
0.00006600	2334.	35359332.	7.5979511	0.0005015	-0.0014785	0.00000	1.8131586	-42.5904223 C
0.00006800	2403.	35336262.	7.6037335	0.0005171	-0.0015229	0.00000	1.8608411	-43.8696383 C

0.00007000 2472. 35313085. 7.6095474 0.0005327 -0.0015673 0.00000 1.9080758 -45.1481196 C

0.00007200 2541. 35289799. 7.6153931 0.0005483 -0.0016117 0.00000 1.9548607 -46.4258600 C

0.00007400 2610. 35266403. 7.6212710 0.0005640 -0.0016560 0.00000 2.0011936 -47.7028533 C

0.00007600 2678. 35242895. 7.6271814 0.0005797 -0.0017003 0.00000 2.0470727 -48.9790931 C

0.00007800 2747. 35219275. 7.6331248 0.0005954 -0.0017446 0.00000 2.0924959 -50.2545729 C

0.00008200 2884. 35171696. 7.6451117 0.0006269 -0.0018331 0.00000 2.1819664 -52.8032243 C

0.00008600 3021. 35123711. 7.6569201 0.0006585 -0.0019215 0.00000 2.2695125 -55.3495410 C

0.00009000 3157. 35075312. 7.6686447 0.0006902 -0.0020098 0.00000 2.3551349 -57.8933372 C

0.00009400 3292. 35026451. 7.6804997 0.0007220 -0.0020980 0.00000 2.4388659 -60.4340576 C

0.00009800 3428. 34977118. 7.6924883 0.0007539 -0.0021861 0.00000 2.5206881 -62.9716481 C

0.0001020 3563. 34927303. 7.7046135 0.0007859 -0.0022741 0.00000 2.6005836 -65.5060530 C

0.0001060 3697. 34876996. 7.7168786 0.0008180 -0.0023620 0.00000 2.6785338 -68.0000000 CY

0.0001100 3831. 34826185. 7.7292870 0.0008502 -0.0024498 0.00000 2.7545200 -68.0000000 CY

0.0001140 3964. 34774859. 7.7418421 0.0008826 -0.0025374 0.00000 2.8285225 -68.0000000 CY

0.0001180 4097. 34723007. 7.7545476 0.0009150 -0.0026250 0.00000 2.9005216 -68.0000000 CY

0.0001220 4230. 34670615. 7.7674072 0.0009476 -0.0027124 0.00000 2.9704965 -68.0000000 CY

0.0001260 4351. 34534896. 7.7742259 0.0009796 -0.0028004 0.00000 3.0368014 -68.0000000 CY

0.0001300 4450. 34230190. 7.7681627 0.0010099 -0.0028901 0.00000 3.0976389 -68.0000000 CY

0.0001340 4541. 33887936. 7.7590277 0.0010397 -0.0029803 0.00000 3.1555955 -68.0000000 CY

0.0001380 4632. 33563132. 7.7511187 0.0010697 -0.0030703 0.00000 3.2118096 -68.0000000 CY

0.0001420 4722. 33254269. 7.7443433 0.0010997 -0.0031603 0.00000 3.2662650 -68.0000000 CY

0.0001460 4812. 32960004. 7.7386199 0.0011298 -0.0032502 0.00000 3.3189452 -68.0000000 CY

0.0001500 4898. 32650503. 7.7311928 0.0011597 -0.0033403 0.00000 3.3691558 -68.0000000 CY

0.0001540 4962. 32223153. 7.7121859 0.0011877 -0.0034323 0.00000 3.4144576 -68.0000000 CY

0.0001580 4999. 31636913. 7.6770703 0.0012130 -0.0035270 0.00000 3.4538529 -68.0000000 CY

0.0001620 5027. 31027991. 7.6383937 0.0012374 -0.0036226 0.00000 3.4905788 -68.0000000 CY

0.0001660 5054. 30446267. 7.6004273 0.0012617 -0.0037183 0.00000 3.5257470 -68.0000000 CY

0.0001700 5081. 29891157. 7.5645883 0.0012860 -0.0038140 0.00000 3.5597389 -68.0000000 CY

0.0001740 5109. 29360817. 7.5307337 0.0013103 -0.0039097 0.00000 3.5925462 -68.0000000 CY

0.0001780 5136. 28853570. 7.4987332 0.0013348 -0.0040052 0.00000 3.6241604 -68.0000000 CY

0.0001820 5163. 28367885. 7.4684682 0.0013593 -0.0041007 0.00000 3.6545726 -68.0000000 CY

0.0001860 5190. 27902362. 7.4398306 0.0013838 -0.0041962 0.00000 3.6837742 -68.0000000 CY

0.0001900 5217. 27455719. 7.4127211 0.0014084 -0.0042916 0.00000 3.7117561 -68.0000000 CY

0.0001940 5243. 27026782. 7.3870490 0.0014331 -0.0043869 0.00000 3.7385092 -68.0000000 CY

0.0001980 5270. 26614468. 7.3627308 0.0014578 -0.0044822 0.00000 3.7640241 -68.0000000 CY

0.0002020 5296. 26217370. 7.3390323 0.0014825 -0.0045775 0.00000 3.7881619 -68.0000000 CY

0.0002060 5322. 25834537. 7.3157941 0.0015071 -0.0046729 0.00000 3.8109102 -68.0000000 CY

0.0002100 5348. 25465631. 7.2937549 0.0015317 -0.0047683 0.00000 3.8324240 -68.0000000 CY

0.0002140 5374. 25109864. 7.2728516 0.0015564 -0.0048636 0.00000 3.8526933 -68.0000000 CY

0.0002180 5399. 24766505. 7.2530258 0.0015812 -0.0049588 0.00000 3.8717079 -68.0000000 CY

0.0002220 5425. 24434873. 7.2342233 0.0016060 -0.0050540 0.00000 3.8894573 -68.0000000 CY

0.0002260 5450. 24114340. 7.2163941 0.0016309 -0.0051491 0.00000 3.9059311 -68.0000000 CY

0.0002300 5475. 23804318. 7.1994914 0.0016559 -0.0052441 0.00000 3.9211184 -68.0000000 CY

0.0002340 5500. 23504259. 7.1834722 0.0016809 -0.0053391 0.00000 3.9350081 -68.0000000 CY

0.0002380 5525. 23213654. 7.1682960 0.0017061 -0.0054339 0.00000 3.9475889 -68.0000000 CY

0.0002540 5623. 22136674. 7.1153109 0.0018073 -0.0058127 0.00000 3.9845890 -68.0000000 CY

0.0002700 5718. 21177790. 7.0732358 0.0019098 -0.0061902 0.00000 3.9996752 -68.0000000 CY

0.0002860 5805. 20295938. 7.0348066 0.0020120 -0.0065680 0.00000 3.9999898 -68.0000000 CY

0.0003020 5855. 19386647. 6.9732568 0.0021059 -0.0069541 0.00000 3.9999473 -68.0000000 CY

0.0003180 5872. 18464254. 6.8926260 0.0021919 -0.0073481 0.00000 3.9990986 -68.0000000 CY

0.0003340 5882. 17611251. 6.8174051 0.0022770 -0.0077430 0.00000 3.9959315 -68.0000000 CY

0.0003500 5892. 16834041. 6.7512031 0.0023629 -0.0081371 0.00000 3.9986988 -68.0000000 CY

0.0003660 5900. 16119820. 6.6872110 0.0024475 -0.0085325 0.00000 3.9979549 68.0000000 CY

0.0003820 5907. 15463980. 6.6301419 0.0025327 -0.0089273 0.00000 3.9949387 68.0000000 CY

0.0003980 5914. 14859360. 6.5794263 0.0026186 -0.0093214 0.00000 3.9978473 68.0000000 CY

0.0004140 5920. 14300419. 6.5340027 0.0027051 -0.0097149 0.00000 3.9963925 68.0000000 CY

0.0004300 5926. 13781812. 6.4935223 0.0027922 -0.0101078 0.00000 3.9957401 68.0000000 CY

0.0004460 5932. 13299718. 6.4569659 0.0028798 -0.0105002 0.00000 3.9998884 68.0000000 CY

0.0004620 5936. 12849109. 6.4212412 0.0029666 -0.0108934 0.00000 3.9892564 68.0000000 CY

0.0004780 5941. 12427908. 6.3880561 0.0030535 -0.0112865 0.00000 3.9969974 68.0000000 CY

0.0004940 5945. 12033549. 6.3578227 0.0031408 -0.0116792 0.00000 3.9999695 68.0000000 CY

0.0005100 5948. 11663166. 6.3307284 0.0032287 -0.0120713 0.00000 3.9868631 68.0000000 CY

0.0005260 5952. 11314958. 6.3059733 0.0033169 -0.0124631 0.00000 3.9947358 68.0000000 CY

0.0005420 5955. 10986995. 6.2833080 0.0034056 -0.0128544 0.00000 3.9992737 -68.2568215 CY

0.0005580 5958. 10677391. 6.2627794 0.0034946 -0.0132454 0.00000 3.9943377 -68.6142988 CY

0.0005740 5961. 10384615. 6.2442063 0.0035842 -0.0136358 0.00000 3.9863483 -68.9624564 CY

0.0005900 5963. 10107504. 6.2271222 0.0036740 -0.0140260 0.00000 3.9943697 -69.3017802 CY

0.0006060 5966. 9844862. 6.2114328 0.0037641 -0.0144159 0.00000 3.9989167 -69.6325603 CY

0.0006220 5971. 9599362. 6.1979490 0.0038551 -0.0148049 0.00000 3.9970048 -69.9546162 CY

0.0006380 5971. 9358626. 6.2148740 0.0039651 -0.0151749 0.00000 3.9831899 -70.2537094 CY

0.0006540 5971. 9129669. 6.2043996 0.0040577 -0.0155623 0.00000 3.9918978 -70.5596923 CY

0.0006700 5971. 8911647. 6.2447916 0.0041840 -0.0159160 0.00000 3.9997871 -70.8325822 CY

0.0006860 5971. 8703795. 6.2352134 0.0042774 -0.0163026 0.00000 3.9923545 -71.1244500 CY

0.0007020 5971. 8505418. 6.2910434 0.0044163 -0.0166437 0.00000 3.9881982 -71.3760802 CY

0.0007180 5971. 8315882. 6.2816400 0.0045102 -0.0170298 0.00000 3.9947167 -71.6550383 CY

0.0007340 5971. 8134609. 6.3499047 0.0046608 -0.0173592 0.00000 3.9930840 -71.8877565 CY

0.0007500 5971. 7961071. 6.3440593 0.0047580 -0.0177420 0.00000 3.9814163 -72.1528388 CY

0.0007660 5971. 7794782. 6.4302503 0.0049256 -0.0180544 0.00000 3.9955380 -72.3645535 CY

0.0007820 5971. 7635298. 6.4258518 0.0050250 -0.0184350 0.00000 3.9990961 -72.6175874 CY

0.0007980 5971. 7482210. 6.5194460 0.0052025 -0.0187375 0.00000 3.9735552 -72.8144524 CY

0.0008140 5971. 7335139. 6.5182900 0.0053059 -0.0191141 0.00000 3.9834632 -73.0551934 CY

0.0008300 5971. 7193739. 6.5174131 0.0054095 -0.0194905 0.00000 3.9914284 -73.2906734 CY

0.0008460 5971. 7057687. 6.6228339 0.0056029 -0.0197771 0.00000 3.9885417 -73.4662113 CY

0.0008620 5971. 6926686. 6.6244490 0.0057103 -0.0201497 0.00000 3.9767041 -73.6907232 CY

0.0008780 5971. 6800459. 6.7472796 0.0059241 -0.0204159 0.00000 3.9977377 -73.8478165 CY

0.0009740 5971. 6130188. 6.9997482 0.0068178 -0.0224022 0.00000 3.9654547 -74.9516944 CY

0.0010700 5971. 5580190. 7.2551920 0.0077631 -0.0243369 0.00000 3.9957181 -75.9180299 CY

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003

or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	0.000	5937.922	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	5938.	0.0000	3860.	34815120.
1	0.70	5938.	0.0000	4157.	34699586.
1	0.75	5938.	0.0000	4453.	34216971.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N.A.	No	0.00	111266.
2	16.0000	19.4971	Yes	No	111266.	114269.
3	30.5000	14.8186	No	No	225535.	779975.
4	41.5000	38.0828	No	No	1005510.	438750.
5	54.5000	30.1015	No	No	1444260.	2863508.
6	68.5000	38.1226	Yes	No	4307768.	7680178.
7	84.5000	275.0475	No	No	1.20E+07	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals
for Layer n. Layering correction equivalent depths are computed only
for soil types with both shallow-depth and deep-depth expressions for
peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)

Displacement of pile head = 0.250000 inches

Rotation of pile head = 0.000E+00 radians

Axial load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	-1916330.	29885.	0.00	0.00	3.55E+10	-108.3377	2275.	0.00
0.8750	0.2470	-1609040.	28646.	-5.21E-04	0.00	3.55E+10	-118.0025	5016.	0.00
1.7500	0.2391	-1314760.	27361.	-9.53E-04	0.00	3.57E+10	-126.7055	5565.	0.00
2.6250	0.2270	-1034449.	25991.	-0.00118	0.00	1.81E+11	-134.3583	6214.	0.00
3.5000	0.2143	-768951.	24543.	-0.00123	0.00	1.82E+11	-141.4417	6929.	0.00
4.3750	0.2012	-519048.	23024.	-0.00127	0.00	1.82E+11	-147.9215	7719.	0.00
5.2500	0.1878	-285452.	21440.	-0.00129	0.00	1.83E+11	-153.7649	8598.	0.00
6.1250	0.1742	-68809.	19798.	-0.00130	0.00	1.83E+11	-158.9401	9583.	0.00
7.0000	0.1605	130310.	18106.	-0.00130	0.00	1.83E+11	-163.4159	10691.	0.00
7.8750	0.1469	311413.	16370.	-0.00128	0.00	1.83E+11	-167.1609	11947.	0.00
8.7500	0.1335	474087.	14599.	-0.00126	0.00	1.83E+11	-170.1431	13380.	0.00
9.6250	0.1204	618002.	12801.	-0.00123	0.00	1.82E+11	-172.3292	15027.	0.00
10.5000	0.1077	742918.	10985.	-0.00119	0.00	1.82E+11	-173.6831	16935.	0.00
11.3750	0.09540	848686.	9159.	-0.00115	0.00	1.82E+11	-174.1638	19168.	0.00
12.2500	0.08364	935252.	7332.	-0.00109	0.00	1.81E+11	-173.7233	21810.	0.00
13.1250	0.07244	1002665.	5516.	-0.00104	0.00	1.81E+11	-172.3022	24975.	0.00
14.0000	0.06185	1051081.	3720.	-9.78E-04	0.00	1.81E+11	-169.8230	28830.	0.00
14.8750	0.05190	1080775.	1956.	-8.99E-04	0.00	1.16E+11	-166.1803	33620.	0.00
15.7500	0.04297	1092147.	234.3133	-7.75E-04	0.00	7.67E+10	-161.6679	39500.	0.00
16.6250	0.03562	1085695.	-1110.	-6.46E-04	0.00	1.04E+11	-94.2996	27798.	0.00
17.5000	0.02942	1068847.	-2069.	-5.60E-04	0.00	1.81E+11	-88.4751	31578.	0.00
18.3750	0.02387	1042245.	-2967.	-4.98E-04	0.00	1.81E+11	-82.5191	36300.	0.00
19.2500	0.01895	1006544.	-3801.	-4.39E-04	0.00	1.81E+11	-76.4133	42331.	0.00
20.1250	0.01465	962420.	-4571.	-3.82E-04	0.00	1.81E+11	-70.1266	50258.	0.00
21.0000	0.01093	910563.	-5273.	-3.28E-04	0.00	1.81E+11	-63.6057	61087.	0.00

21.8750	0.00777	851694.	-5905.	-2.77E-04	0.00	1.82E+11	-56.7555	76714.	0.00
22.7500	0.00512	786568.	-6462.	-2.29E-04	0.00	1.82E+11	-49.3907	101280.	0.00
23.6250	0.00295	715997.	-6937.	-1.86E-04	0.00	1.82E+11	-41.0913	146272.	0.00
24.5000	0.00121	640895.	-7313.	-1.47E-04	0.00	1.82E+11	-30.5417	264470.	0.00
25.3750	-1.37E-04	562426.	-7395.	-1.12E-04	0.00	1.82E+11	14.8445	1140797.	0.00
26.2500	-0.00115	485593.	-7160.	-8.21E-05	0.00	1.82E+11	30.0078	275020.	0.00
27.1250	-0.00186	412069.	-6817.	-5.63E-05	0.00	1.83E+11	35.2671	198947.	0.00
28.0000	-0.00233	342434.	-6433.	-3.47E-05	0.00	1.83E+11	37.9957	171348.	0.00
28.8750	-0.00259	276987.	-6026.	-1.69E-05	0.00	1.83E+11	39.3616	159637.	0.00
29.7500	-0.00268	215879.	-5611.	-2.73E-06	0.00	1.83E+11	39.8295	155892.	0.00
30.6250	-0.00265	159163.	-5018.	8.04E-06	0.00	1.83E+11	72.9758	289556.	0.00
31.5000	-0.00251	110493.	-4261.	1.58E-05	0.00	1.83E+11	71.3073	297829.	0.00
32.3750	-0.00232	69684.	-3532.	2.09E-05	0.00	1.83E+11	67.4889	306102.	0.00
33.2500	-0.00207	36316.	-2852.	2.40E-05	0.00	1.83E+11	62.0996	314375.	0.00
34.1250	-0.00181	9794.	-2234.	2.53E-05	0.00	1.83E+11	55.6581	322648.	0.00
35.0000	-0.00154	-10591.	-1686.	2.53E-05	0.00	1.83E+11	48.6164	330921.	0.00
35.8750	-0.00128	-25616.	-1214.	2.42E-05	0.00	1.83E+11	41.3575	339194.	0.00
36.7500	-0.00103	-36082.	-817.2093	2.25E-05	0.00	1.83E+11	34.1961	347467.	0.00
37.6250	-8.08E-04	-42778.	-493.9219	2.02E-05	0.00	1.83E+11	27.3824	355740.	0.00
38.5000	-6.09E-04	-46455.	-239.3482	1.77E-05	0.00	1.83E+11	21.1078	364013.	0.00
39.3750	-4.37E-04	-47804.	-47.0963	1.49E-05	0.00	1.83E+11	15.5116	372286.	0.00
40.2500	-2.95E-04	-47444.	90.4607	1.22E-05	0.00	1.83E+11	10.6897	380560.	0.00
41.1250	-1.81E-04	-45905.	181.7669	9.54E-06	0.00	1.83E+11	6.7020	388833.	0.00
42.0000	-9.47E-05	-43627.	431.1694	6.97E-06	0.00	1.83E+11	40.8033	4524791.	0.00
42.8750	-3.47E-05	-36850.	723.8601	4.66E-06	0.00	1.83E+11	14.9473	4524791.	0.00
43.7500	3.10E-06	-28425.	795.3089	2.78E-06	0.00	1.83E+11	-1.3380	4524791.	0.00
44.6250	2.38E-05	-20148.	734.5199	1.39E-06	0.00	1.83E+11	-10.2408	4524791.	0.00
45.5000	3.23E-05	-13001.	607.7248	4.38E-07	0.00	1.83E+11	-13.9106	4524791.	0.00
46.3750	3.30E-05	-7386.	460.1229	-1.47E-07	0.00	1.83E+11	-14.2040	4524791.	0.00
47.2500	2.92E-05	-3338.	319.5121	-4.55E-07	0.00	1.83E+11	-12.5790	4524791.	0.00
48.1250	2.34E-05	-676.5078	200.5149	-5.70E-07	0.00	1.83E+11	-10.0871	4524791.	0.00

49.0000	1.72E-05	872.8464	108.6052	-5.65E-07	0.00	1.83E+11	-7.4195	4524791.	0.00
49.8750	1.16E-05	1604.	43.5153	-4.93E-07	0.00	1.83E+11	-4.9786	4524791.	0.00
50.7500	6.86E-06	1787.	1.8677	-3.96E-07	0.00	1.83E+11	-2.9543	4524791.	0.00
51.6250	3.23E-06	1643.	-20.9611	-2.98E-07	0.00	1.83E+11	-1.3940	4524791.	0.00
52.5000	6.05E-07	1346.	-29.6481	-2.12E-07	0.00	1.83E+11	-0.2606	4524791.	0.00
53.3750	-1.21E-06	1021.	-28.2702	-1.44E-07	0.00	1.83E+11	0.5231	4524791.	0.00
54.2500	-2.42E-06	752.8110	-20.0551	-9.30E-08	0.00	1.83E+11	1.0417	4524791.	0.00
55.1250	-3.17E-06	599.6556	-13.8742	-5.42E-08	0.00	1.83E+11	0.1356	449686.	0.00
56.0000	-3.56E-06	461.4537	-12.3500	-2.37E-08	0.00	1.83E+11	0.1547	456824.	0.00
56.8750	-3.67E-06	340.3054	-10.6876	-7.28E-10	0.00	1.83E+11	0.1620	463962.	0.00
57.7500	-3.57E-06	237.0139	-8.9962	1.58E-08	0.00	1.83E+11	0.1602	471100.	0.00
58.6250	-3.33E-06	151.3846	-7.3582	2.70E-08	0.00	1.83E+11	0.1518	478238.	0.00
59.5000	-3.00E-06	82.4910	-5.8323	3.37E-08	0.00	1.83E+11	0.1389	485376.	0.00
60.3750	-2.63E-06	28.9065	-4.4568	3.69E-08	0.00	1.83E+11	0.1231	492513.	0.00
61.2500	-2.23E-06	-11.1024	-3.2535	3.74E-08	0.00	1.83E+11	0.1061	499651.	0.00
62.1250	-1.84E-06	-39.4171	-2.2305	3.60E-08	0.00	1.83E+11	0.08879	506789.	0.00
63.0000	-1.47E-06	-57.9428	-1.3856	3.32E-08	0.00	1.83E+11	0.07214	513927.	0.00
63.8750	-1.14E-06	-68.5149	-0.7090	2.95E-08	0.00	1.83E+11	0.05673	521065.	0.00
64.7500	-8.54E-07	-72.8326	-0.1857	2.55E-08	0.00	1.83E+11	0.04294	528203.	0.00
65.6250	-6.08E-07	-72.4157	0.2025	2.13E-08	0.00	1.83E+11	0.03101	535341.	0.00
66.5000	-4.06E-07	-68.5804	0.4754	1.73E-08	0.00	1.83E+11	0.02099	542479.	0.00
67.3750	-2.46E-07	-62.4314	0.6531	1.35E-08	0.00	1.83E+11	0.01286	549616.	0.00
68.2500	-1.23E-07	-54.8650	0.7547	1.01E-08	0.00	1.83E+11	0.00650	556754.	0.00
69.1250	-3.27E-08	-46.5817	0.8060	7.22E-09	0.00	1.83E+11	0.00326	1045443.	0.00
70.0000	2.91E-08	-37.9389	0.8077	4.80E-09	0.00	1.83E+11	-0.00293	1058676.	0.00
70.8750	6.80E-08	-29.6194	0.7559	2.86E-09	0.00	1.83E+11	-0.00695	1071909.	0.00
71.7500	8.91E-08	-22.0656	0.6710	1.38E-09	0.00	1.83E+11	-0.00921	1085143.	0.00
72.6250	9.70E-08	-15.5276	0.5694	2.98E-10	0.00	1.83E+11	-0.01014	1098376.	0.00
73.5000	9.54E-08	-10.1077	0.4631	-4.38E-10	0.00	1.83E+11	-0.01010	1111610.	0.00
74.3750	8.78E-08	-5.8014	0.3608	-8.94E-10	0.00	1.83E+11	-0.00940	1124843.	0.00
75.2500	7.66E-08	-2.5317	0.2678	-1.13E-09	0.00	1.83E+11	-0.00831	1138077.	0.00

76.1250	6.40E-08	-0.1777	0.1874	-1.21E-09	0.00	1.83E+11	-0.00701	1151310.	0.00
77.0000	5.12E-08	1.4031	0.1207	-1.18E-09	0.00	1.83E+11	-0.00568	1164544.	0.00
77.8750	3.93E-08	2.3580	0.06781	-1.07E-09	0.00	1.83E+11	-0.00440	1177777.	0.00
78.7500	2.88E-08	2.8272	0.02756	-9.19E-10	0.00	1.83E+11	-0.00326	1191010.	0.00
79.6250	2.00E-08	2.9367	-0.00159	-7.54E-10	0.00	1.83E+11	-0.00229	1204244.	0.00
80.5000	1.29E-08	2.7938	-0.02148	-5.89E-10	0.00	1.83E+11	-0.00150	1217477.	0.00
81.3750	7.59E-09	2.4856	-0.03402	-4.38E-10	0.00	1.83E+11	-8.89E-04	1230711.	0.00
82.2500	3.74E-09	2.0793	-0.04102	-3.07E-10	0.00	1.83E+11	-4.43E-04	1243944.	0.00
83.1250	1.14E-09	1.6242	-0.04406	-2.01E-10	0.00	1.83E+11	-1.37E-04	1257178.	0.00
84.0000	-4.72E-10	1.1540	-0.04448	-1.21E-10	0.00	1.83E+11	5.71E-05	1270411.	0.00
84.8750	-1.39E-09	0.6901	-0.03961	-6.79E-11	0.00	1.83E+11	8.71E-04	6562500.	0.00
85.7500	-1.90E-09	0.3222	-0.02881	-3.88E-11	0.00	1.83E+11	0.00119	6562500.	0.00
86.6250	-2.21E-09	0.08501	-0.01534	-2.71E-11	0.00	1.83E+11	0.00138	6562500.	0.00
87.5000	-2.47E-09	0.00	0.00	-2.47E-11	0.00	1.83E+11	0.00154	3281250.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.25000000 inches

Computed slope at pile head = 0.000000 radians

Maximum bending moment = -1916330. inch-lbs

Maximum shear force = 29885. lbs

Depth of maximum bending moment = 0.000000 feet below pile head

Depth of maximum shear force = 0.000000 feet below pile head

Number of iterations = 48

Number of zero deflection points = 5

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs

Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians

Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.

Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs

Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load Type 2	Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.2500	S, rad	0.00	0.00	0.2500	0.00	29885.	-1916330.

Maximum pile-head deflection = 0.2500000000 inches

Maximum pile-head rotation = 0.0000000000 radians = 0.000000 deg.

The analysis ended normally.

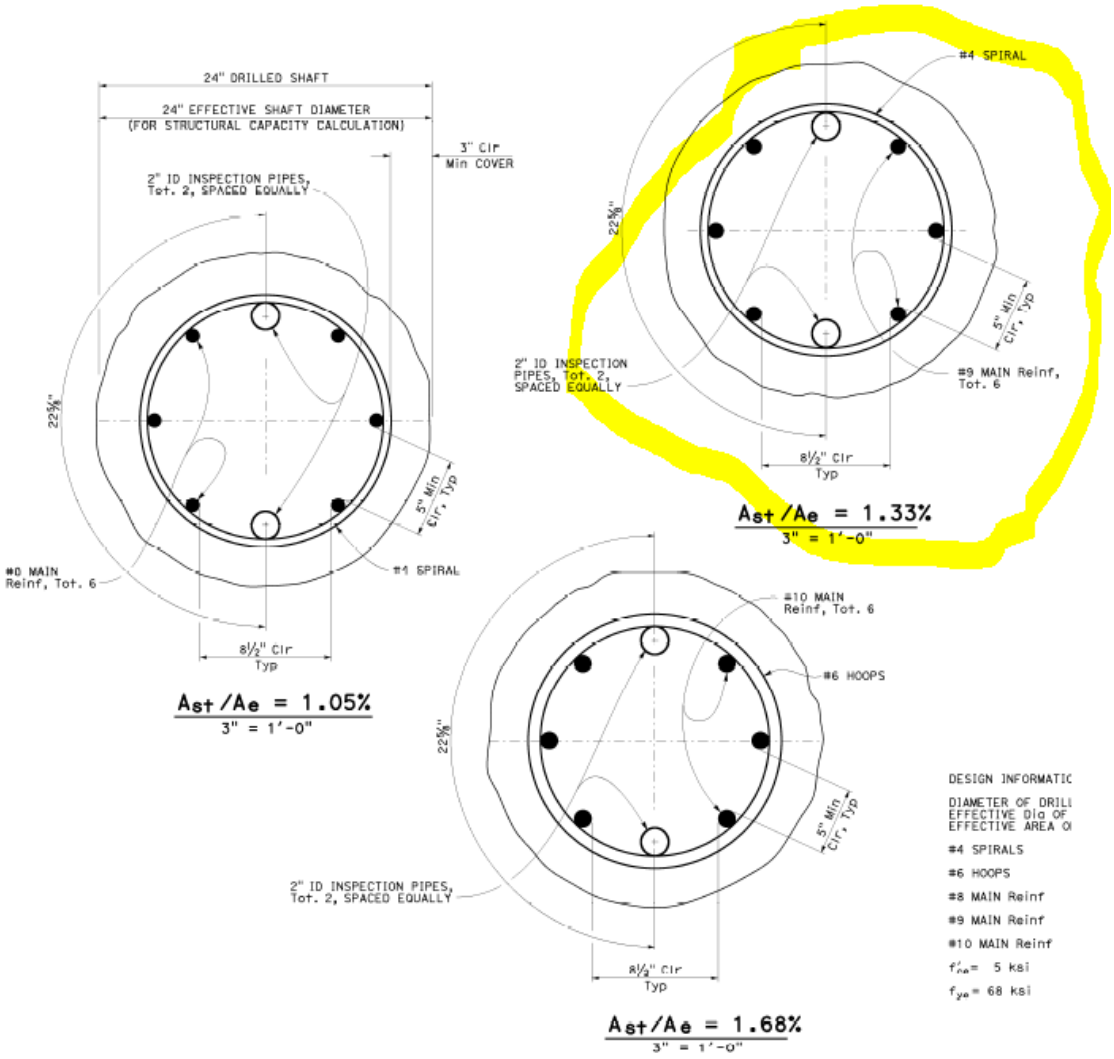
APPENDIX F

Axial Pile Resistance Analysis

Boring A-19-002

Abutment #1

24-inch CIDH Pile


24" DRILLED SHAFT
24" EFFECTIVE SHAFT DIAMETER
(FOR STRUCTURAL CAPACITY CALCULATION)
3" Clr
Min COVER
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
22⅝"
5" Min
Clr, Typ
#8 MAIN
Reinf, Tot. 6
#4 SPIRAL
8½" Clr
Typ
Ast /Ae = 1.05%
3" = 1'-0"
#4 SPIRAL
2" ID INSPECTION
PIPES, Tot. 2,
SPACED EQUALLY
#9 MAIN Reinf,
Tot. 6
Ast /Ae = 1.33%
3" = 1'-0"
#10 MAIN
Reinf, Tot. 6
#6 HOOPS
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
Ast/Ae = 1.68%
3" = 1'-0"
DESIGN INFORMATIC
DIAMETER OF DRILL
EFFECTIVE Dia OF
EFFECTIVE AREA O
#4 SPIRALS
#6 HOOPS
#8 MAIN Reinf
#9 MAIN Reinf
#10 MAIN Reinf
f'ce= 5 ksi
fye= 68 ksi

Allpile - file name: A-19-002 24-inch CIDH.alp

File Edit Run Setup Help

Vertical | Lateral | K | Sample: List of Sample: (E-English, M-Metric)

A. Pile Type | B. Pile Profile | C. Pile Properties | D. Load and Group | E. Soil Properties | F. Advanced Page

1. Pile Type

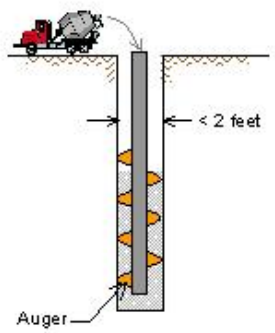
- (•) Drilled Pile (dia <=24 in. or 61 cm)
- ( ) Drilled Shaft (dia >24 in. or 61 cm)
- ( ) SHAFT (US. FHWA Methods)
- ( ) Driving Steel Pile (Open end)
- ( ) Driving Steel Pile (Closed end)
- ( ) Driving Concrete Pile
- ( ) Driving Tapered Pile (Timber Pile)
- ( ) Driving Jetted
- ( ) Micropile (MiniPile)
- ( ) Uplift Anchor
- ( ) Plate, Screw, and Helical
- ( ) Shallow Footing

Project Title 1:

Lack Road Bridge Replacement

Project Title 2:

Abutment 1; Boring A-19-002; 24-Inch CIDH



[x] Shown following text in Profile.

The text can be edited and saved.

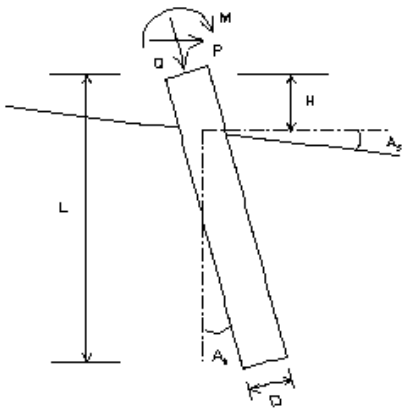
Concrete poured into drilled hole.
Diameter is limited to 24in (61cm).

2. Units: (•) English ( ) Metric

The parameters for all the types of piles are adjustable in Setup Page 3.

VERTICAL ANALYSIS

Figure 1



Drilled Pile (dia <=24 in. or 61 cm)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 0.0 -kp

Profile:
Pile Length, L= 87.5 -ft
Top Height, H= -3 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0
Fixed Head Condition

Soil Data:

Depth -ft	Gamma -lb/ft3	Phi	C -kp/ft2	K -lb/in3	e50 or Dr %	Nspt
0	60.4	0.0	0.30	0	0.00	4
3	60.4	0.0	0.30	0	0.00	4
19	59.8	30	0.00	0	0.0	9
33.5	66.8	34	0.00	0	0	43
44.5	61.6	0.0	1.5	0	0	15
57.8	61.6	33	0.00	0	0	25
71.5	65.6	38	0.00	0	0	57
87.5	62.6	0.0	2	0	0	21
91.5	62.6	0.0	2	0	0	21

Pile Data:

Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/in2	Weight -kp/f
0.0	24	452.4	75.4	16286.0	3000	0.471
87.5	24	452.4	75.4	16286.0	3000	0.471

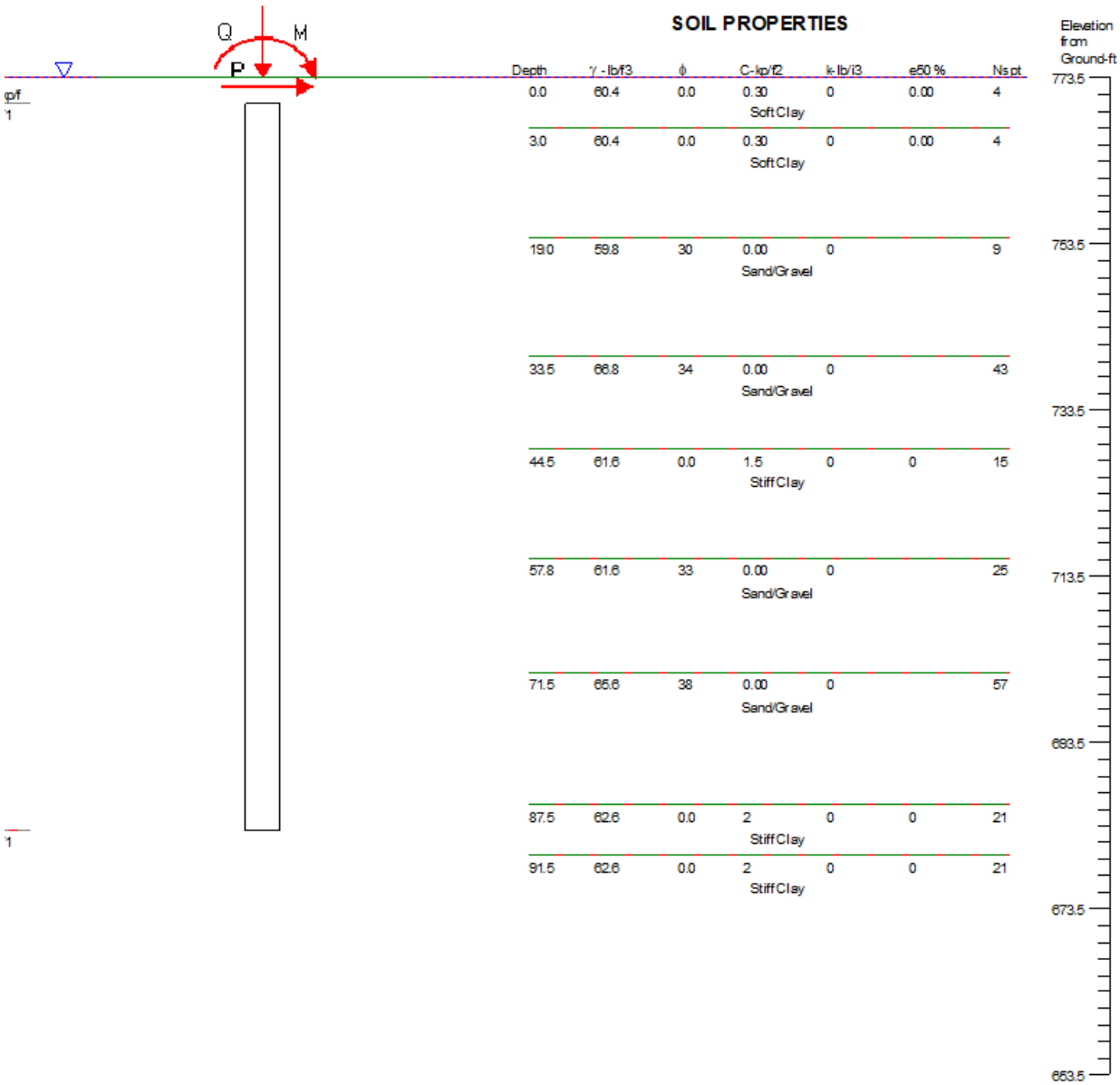
Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 24.04-kp *Soil Weight is not included
Side Resistance (Down)= 468.857-kp Side Resistance (Up)= 349.918-kp
Tip Resistance (Down)= 56.550-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 525.407-kp Total Ultimate Capacity (Up)= 373.954-kp
Total Allowable Capacity (Down) Qallow= 525.407-kp Total Allowable Capacity (Up) Qallow= 373.954-kp
OK! Qallow > Q

Settlement Calculation:
At Q= 0.00-kp Settlement= 0.00000-in
At Xallow= 1.00-in Q= 427.79221-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

Concrete poured into drilled hole.
Diameter is limited to 24in (61cm).

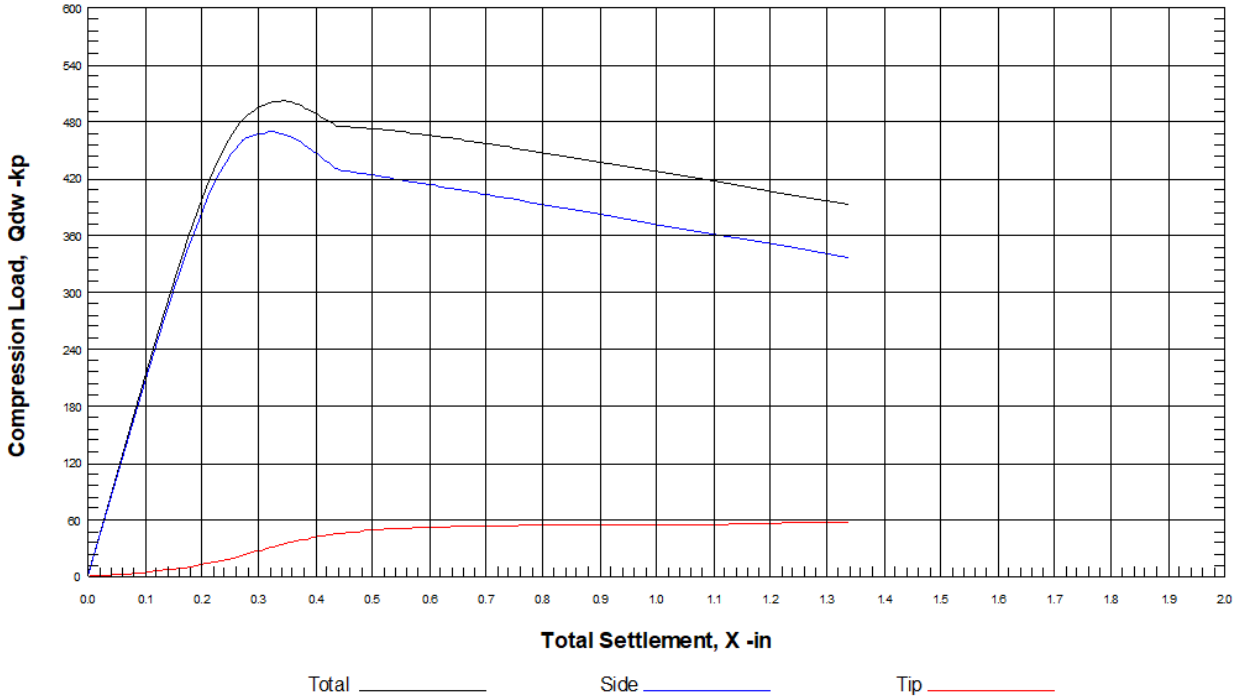
OUNDATION PROFILE & SOIL CONDITIONS



(Pile diameter not to scale) Surface Angle=0

Lack Road Bridge Replacement
Abutment 1; Boring A-19-002; 24-Inch CIDH Figure 1

Vertical Load vs. Total Settlement



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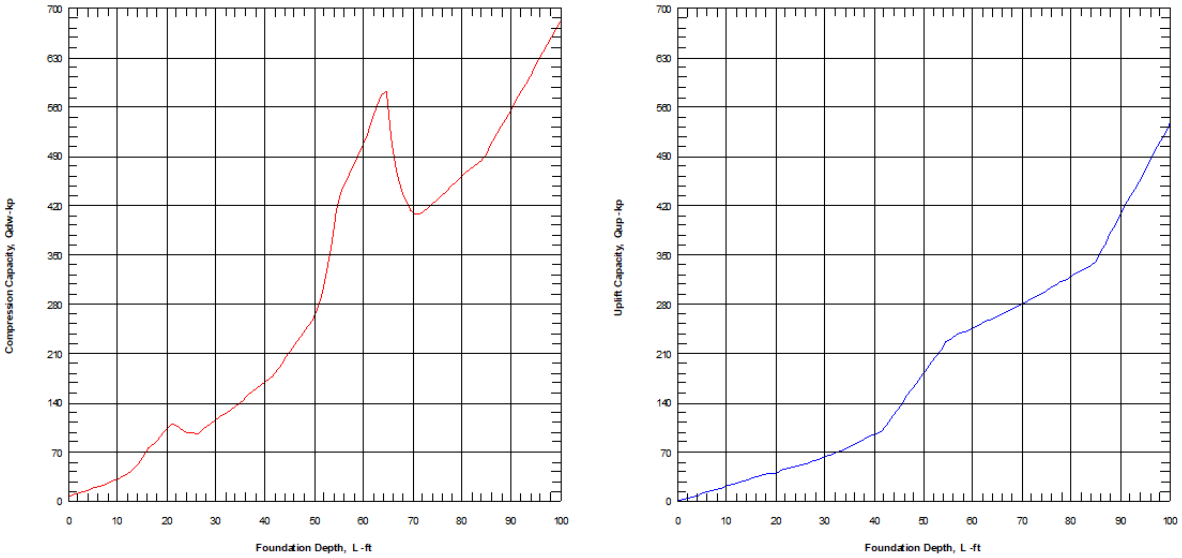
Tware

Lack Road Bridge Replacement
Abutment 1; Boring A-19-002; 24-Inch CIDH **igure 1**

ULTIMATE CAPACITY vs FOUNDATION DEPTH



CivilTech Software

Lack Road Bridge Replacement
Abutment 1; Boring A-19-002; 24-Inch CIDH Figure 1

****

ALLPILE 7

VERTICAL ANALYSIS SUMMARY OUTPUT

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Date: 6/6/2019 File: C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix F - Axial Pile Resistance Analysis\Abutment 1\A-19-002 24-inch CIDH.alp 1.0

Title 1: Lack Road Bridge Replacement

Title 2: Abutment 1; Boring A-19-002; 24-Inch CIDH

ALLPILE INPUT DATA:

---

* Pile Type Page *

Unit: English

Concrete poured into drilled hole. Diameter is limited to 24in (61cm).

Pile Type: Drilled Pile (dia <=24 in. or 61 cm)

* Pile Profile *

Foundation Depth: 87.5 -ft

Top Height: -3 -ft

Slope Angle: 0

Pile Angle: 0

* Pile Properties *

Zs	Width	Area	Perim.	I	E	Weight	Mix*	Out	In	Other	Type
-ft	-in	-in2	-in	-in4	-kp/i2	-kp/f	%	Side	Side	Par.	

0.0	24	452.4	75.4	16286.0	3000	0.471	0.0	3	3	30	Concrete (rough)
87.5	24	452.4	75.4								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0

Top Type: 5

Water Table: 0 -ft

Ground Elevation: 773.5 -ft

* Soil Properties *

Zs	Gamma	Phi	C	K	E50/Dr	Nspt	Type	Soil
-ft	-lb/f3	o	-kp/f2	-lb/i3	- %			
0.0	60.4	0.0	0.30	0	0.00	4	1	Soft Clay
3.0	60.4	0.0	0.30	0	0.00	4	1	Soft Clay
19.0	59.8	30	0.00	0	0.0	9	4	Sand/Gravel
33.5	66.8	34	0.00	0	0	43	4	Sand/Gravel
44.5	61.6	0.0	1.5	0	0	15	2	Stiff Clay
57.8	61.6	33	0.00	0	0	25	4	Sand/Gravel
71.5	65.6	38	0.00	0	0	57	4	Sand/Gravel
87.5	62.6	0.0	2	0	0	21	2	Stiff Clay
91.5	62.6	0.0	2	0	0	21	2	Stiff Clay

Surcharge Pressure on ground: 0 -kp/f2

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 0.0 -kp

Vertical Load with Load Factor, Q: 0.0 -kp

Vertical Load with Load factor and Pile Cap, Q= 0.0 -kp

Load Factor for Vertical Load and Torsion= 1.0

Vertical Loads Supported by Pile Cap: 0 %

Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 87.5 -ft

Top Height, H= -3 -ft

Slope Angle, As= 0

Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 10 Diameter of pile, which is 20.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.7 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 525.407-kp Total Ultimate Capacity (Up)= 373.954-kp

Total Allowable Capacity (Down)= 525.407-kp Total Allowable Capacity (Up)= 373.954-kp

Weight above Ground= 0.00 Total Weight= 24.04-kp *Soil Weight is not included

Side Resistance (Down)= 468.857-kp Side Resistance (Up)= 349.918-kp

Tip Resistance (Down)= 56.550-kp Tip Resistance (Up)= 0.000-kp

Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)

Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 0.00-kp, Settlement= 0.00000-in

At Work Load= 0.00-kp, Secant Stiffness Kqx= 2502.52-kp/-in

At Allowable Settlement= 1.000000-in, Capacity= 427.79-kp

Work Load, 0.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 427.79-kp

Work Load, 0.00-kp, OK with the Allowable Capacity (Down)= 525.41-kp

---

FACTOR OF SAFETY:

FSside	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

Vertical Side and Tip Resistance vs. Total Settlement:

****

Xtop -in	Qside -kp	Qtip -kp	Qtotal -kp
0.001	1.8	0.0	1.8
0.090	188.7	4.5	193.2
0.125	255.4	6.6	262.0
0.153	308.0	8.7	316.7
0.177	349.2	10.6	359.9
0.197	381.1	12.5	393.6
0.214	405.4	14.3	419.7
0.228	423.6	16.1	439.7
0.241	437.2	17.8	455.0
0.252	447.1	19.4	466.5
0.261	454.2	20.9	475.1
0.270	459.3	22.4	481.7
0.279	462.8	23.8	486.6
0.287	465.2	25.1	490.4
0.294	466.8	26.4	493.3
0.301	467.9	27.7	495.6
0.308	468.5	28.9	497.4
0.315	468.8	30.0	498.8
0.322	468.9	31.1	500.0
0.328	468.7	32.2	500.8
0.335	468.2	33.2	501.4
0.341	467.5	34.1	501.6
0.347	466.5	35.0	501.6

0.353	465.3	35.9	501.2
0.359	463.8	36.8	500.5
0.364	462.0	37.6	499.6
0.370	460.0	38.3	498.3
0.376	457.7	39.1	496.8
0.381	455.3	39.8	495.1
0.386	452.8	40.4	493.2
0.391	450.3	41.1	491.3
0.397	447.7	41.7	489.4
0.402	445.2	42.3	487.5
0.407	442.8	42.8	485.6
0.413	440.5	43.3	483.8
0.418	438.2	43.8	482.0
0.423	435.9	44.3	480.2
0.428	433.4	44.8	478.2
0.433	430.4	45.2	475.6
0.439	429.8	45.7	475.5
0.445	429.2	46.1	475.3
0.451	428.7	46.4	475.1
0.457	428.1	46.8	474.9
0.462	427.5	47.2	474.6
0.468	426.9	47.5	474.4
0.474	426.3	47.8	474.1
0.480	425.7	48.1	473.9
0.486	425.2	48.4	473.6
0.492	424.6	48.7	473.3
0.497	424.0	48.9	472.9
0.503	423.4	49.2	472.6
0.509	422.8	49.4	472.3
0.515	422.3	49.7	471.9
0.520	421.7	49.9	471.6

0.526	421.1	50.1	471.2
0.532	420.5	50.3	470.8
0.537	419.9	50.5	470.4
0.543	419.3	50.7	470.0
0.549	418.8	50.9	469.6
0.555	418.2	51.0	469.2
0.560	417.6	51.2	468.8
0.566	417.0	51.4	468.4
0.572	416.4	51.5	468.0
0.577	415.9	51.7	467.5
0.583	415.3	51.8	467.1
0.589	414.7	51.9	466.6
0.594	414.1	52.1	466.2
0.600	413.5	52.2	465.7
0.606	413.0	52.3	465.3
0.611	412.4	52.4	464.8
0.617	411.8	52.6	464.3
0.623	411.2	52.7	463.9
0.628	410.6	52.8	463.4
0.634	410.0	52.9	462.9
0.640	409.5	53.0	462.4
0.645	408.9	53.1	462.0
0.651	408.3	53.2	461.5
0.657	407.7	53.3	461.0
0.662	407.1	53.3	460.5
0.668	406.6	53.4	460.0
0.673	406.0	53.5	459.5
0.679	405.4	53.6	459.0
0.685	404.8	53.7	458.5
0.690	404.2	53.8	458.0
0.696	403.6	53.8	457.5

0.702	403.1	53.9	457.0
0.707	402.5	54.0	456.5
0.713	401.9	54.0	456.0
0.718	401.3	54.1	455.4
0.724	400.7	54.2	454.9
0.730	400.2	54.2	454.4
0.735	399.6	54.3	453.9
0.741	399.0	54.4	453.4
0.747	398.4	54.4	452.8
0.780	394.9	54.8	449.7
0.892	383.3	55.5	438.8
1.004	371.7	55.8	427.4
1.115	360.0	55.8	415.9
1.227	348.4	56.1	404.5
1.338	336.8	56.5	393.3

Xtop - Total Vertical Settlement

Qside - Vertical Side Resistance (Down)

Qtip - Vertical Tip Resistance (Down)

Qtotal - Vertical Total Resistance (Ultimate)

Downward and Uplift Capacity vs Pile Length

The results are for single section pile. Multiple sections may not be correct!

****

Length -ft	Qtip -kp	Qside -kp	Q_dw -kp	Qd_alw -kp	Weight -kp	Qsid* -kp	Q_up -kp	Qu_alw -kp
0.00	6.85	0.00	6.9	6.85	0.00	0.00	0.00	0.00
1.01	7.12	1.89	9.0	9.02	0.28	1.89	2.17	2.17
2.02	7.41	3.79	11.2	11.21	0.55	3.79	4.35	4.35
3.03	7.77	5.69	13.5	13.47	0.83	5.69	6.53	6.53
4.04	8.23	7.61	15.8	15.83	1.11	7.61	8.72	8.72
5.05	8.80	9.52	18.3	18.31	1.39	9.52	10.91	10.91
6.06	9.41	11.40	20.8	20.81	1.66	11.40	13.06	13.06
7.07	10.14	13.31	23.5	23.46	1.94	13.31	15.26	15.26
8.08	10.99	15.19	26.2	26.18	2.22	15.19	17.41	17.41
9.09	11.95	17.13	29.1	29.08	2.50	17.13	19.63	19.63
10.10	13.03	19.00	32.0	32.03	2.77	19.00	21.78	21.78
11.11	14.29	20.90	35.2	35.19	3.05	20.90	23.94	23.94
12.12	15.72	22.85	38.6	38.57	3.33	22.85	26.18	26.18
13.13	18.97	24.74	43.7	43.71	3.61	24.74	28.35	28.35
14.14	25.29	26.61	51.9	51.90	3.88	26.61	30.50	30.50
15.15	34.08	28.52	62.6	62.60	4.16	28.52	32.69	32.69
16.16	44.89	30.46	75.3	75.35	4.43	30.31	34.74	34.74
17.17	48.81	32.80	81.6	81.61	4.71	31.67	36.39	36.39
18.18	52.95	35.31	88.3	88.26	5.00	33.11	38.10	38.10
19.19	57.33	37.87	95.2	95.20	5.27	34.58	39.85	39.85
20.20	61.96	40.59	102.6	102.55	5.55	36.12	41.66	41.66
21.21	66.87	43.44	110.3	110.31	5.83	37.76	43.59	43.59
22.22	60.33	46.35	106.7	106.68	6.10	39.39	45.49	45.49
23.23	51.85	49.37	101.2	101.22	6.37	41.12	47.50	47.50

24.24	45.51	52.64	98.1	98.15	6.66	43.05	49.71	49.71
25.25	40.64	55.96	96.6	96.60	6.94	44.92	51.86	51.86
26.26	36.97	59.30	96.3	96.26	7.21	46.77	53.98	53.98
27.27	39.22	62.85	102.1	102.07	7.49	48.86	56.35	56.35
28.28	40.46	66.56	107.0	107.02	7.77	51.00	58.77	58.77
29.29	41.59	70.29	111.9	111.88	8.04	53.08	61.12	61.12
30.30	42.60	74.27	116.9	116.87	8.33	55.38	63.71	63.71
31.31	43.34	78.71	122.1	122.05	8.60	57.92	66.52	66.52
32.32	43.91	83.48	127.4	127.39	8.88	60.63	69.50	69.50
33.33	44.34	88.41	132.7	132.75	9.15	63.40	72.55	72.55
34.34	44.62	93.52	138.1	138.14	9.42	66.32	75.74	75.74
35.35	44.92	98.77	143.7	143.69	9.70	69.35	79.05	79.05
36.36	45.32	104.19	149.5	149.51	9.98	72.41	82.39	82.39
37.37	45.53	109.71	155.2	155.24	10.26	75.57	85.83	85.83
38.38	45.46	115.35	160.8	160.81	10.54	78.84	89.38	89.38
39.39	45.36	120.92	166.3	166.28	10.82	82.00	92.82	92.82
40.40	45.28	126.51	171.8	171.79	11.10	85.22	96.32	96.32
41.41	45.22	132.17	177.4	177.39	11.38	88.47	99.85	99.85
42.42	45.60	141.33	186.9	186.92	11.66	97.38	109.04	109.04
43.43	46.00	150.44	196.4	196.44	11.92	106.42	118.34	118.34
44.44	46.43	160.00	206.4	206.42	12.21	115.85	128.06	128.06
45.45	46.83	169.69	216.5	216.53	12.50	125.60	138.09	138.09
46.46	47.29	179.36	226.6	226.64	12.76	135.40	148.16	148.16
47.47	47.71	188.91	236.6	236.61	13.04	144.96	158.01	158.01
48.48	48.11	198.06	246.2	246.17	13.31	154.02	167.32	167.32
49.49	48.96	207.56	256.5	256.52	13.60	163.39	176.99	176.99
50.51	55.05	217.17	272.2	272.22	13.89	173.04	186.92	186.92
51.52	68.48	226.74	295.2	295.21	14.15	182.61	196.76	196.76
52.53	87.32	236.53	323.9	323.85	14.44	192.60	207.04	207.04
53.54	115.48	245.97	361.5	361.45	14.70	201.97	216.67	216.67
54.55	158.94	255.35	414.3	414.29	14.97	211.41	226.37	226.37

55.56	180.12	261.81	441.9	441.94	15.26	216.06	231.32	231.32
56.57	189.75	267.61	457.4	457.36	15.52	219.84	235.37	235.37
57.58	199.25	273.08	472.3	472.33	15.82	222.93	238.75	238.75
58.59	209.87	278.31	488.2	488.17	16.09	225.74	241.82	241.82
59.60	220.32	283.53	503.8	503.84	16.38	228.70	245.08	245.08
60.61	232.17	288.75	520.9	520.92	16.65	231.52	248.17	248.17
61.62	244.58	294.37	538.9	538.95	16.91	234.95	251.86	251.86
62.63	258.59	299.87	558.5	558.47	17.21	237.97	255.18	255.18
63.64	272.45	304.84	577.3	577.29	17.48	240.54	258.02	258.02
64.65	271.77	310.45	582.2	582.22	17.74	243.99	261.73	261.73
65.66	195.43	316.12	511.5	511.54	18.05	247.55	265.59	265.59
66.67	146.39	321.78	468.2	468.17	18.31	250.98	269.29	269.29
67.68	114.11	326.73	440.8	440.84	18.58	253.41	271.98	271.98
68.69	91.71	332.58	424.3	424.29	18.88	257.01	275.89	275.89
69.70	74.21	338.54	412.8	412.75	19.15	259.95	279.09	279.09
70.71	61.95	344.77	406.7	406.72	19.41	263.60	283.01	283.01
71.72	57.82	351.58	409.4	409.40	19.68	267.55	287.23	287.23
72.73	57.66	357.36	415.0	415.02	19.99	270.53	290.52	290.52
73.74	57.63	364.16	421.8	421.79	20.25	274.43	294.68	294.68
74.75	57.44	370.05	427.5	427.49	20.52	277.79	298.31	298.31
75.76	57.38	377.09	434.5	434.48	20.79	282.55	303.34	303.34
76.77	57.31	383.37	440.7	440.68	21.10	285.57	306.67	306.67
77.78	57.23	390.55	447.8	447.78	21.36	290.39	311.76	311.76
78.79	57.12	396.12	453.2	453.25	21.63	292.83	314.46	314.46
79.80	57.03	402.62	459.6	459.65	21.90	296.56	318.45	318.45
80.81	56.92	409.68	466.6	466.60	22.21	301.40	323.61	323.61
81.82	56.81	415.78	472.6	472.59	22.48	304.74	327.22	327.22
82.83	56.71	421.98	478.7	478.69	22.75	308.25	330.99	330.99
83.84	56.61	427.91	484.5	484.52	23.02	311.58	334.59	334.59
84.85	56.55	435.70	492.3	492.25	23.28	316.76	340.05	340.05
85.86	56.55	448.55	505.1	505.10	23.60	329.92	353.52	353.52

86.87	56.55	461.27	517.8	517.82	23.87	342.24	366.11	366.11
87.88	56.55	473.82	530.4	530.37	24.14	355.06	379.19	379.19
88.89	56.55	486.30	542.8	542.85	24.40	367.19	391.60	391.60
89.90	56.55	499.06	555.6	555.61	24.67	380.58	405.25	405.25
90.91	56.55	512.84	569.4	569.39	24.99	394.41	419.40	419.40
91.92	56.55	525.61	582.2	582.16	25.26	406.99	432.26	432.26
92.93	56.55	537.30	593.9	593.85	25.53	418.02	443.55	443.55
93.94	56.55	549.03	605.6	605.58	25.80	430.18	455.98	455.98
94.95	56.55	562.85	619.4	619.40	26.07	444.42	470.49	470.49
95.96	56.55	574.76	631.3	631.31	26.34	455.80	482.14	482.14
96.97	56.55	588.11	644.7	644.66	26.66	469.32	495.98	495.98
97.98	56.55	600.76	657.3	657.31	26.93	482.09	509.02	509.02
98.99	56.55	612.89	669.4	669.44	27.20	493.82	521.02	521.02
100.00	56.55	626.70	683.2	683.25	27.47	508.69	536.16	536.16

FACTOR OF SAFETY:

FSside	FStip	FSup	FSweight
1.0	1.0	1.0	1.0

Note: Data can be selected, copied and pasted to Excel to create graphics

Length - Pile length, distance from pile top to tip (not from ground surface)

Qtip - Ultimate pile tip resistance

Qside - Ultimate pile side resistance

Q_dw - Ultimate pile downward resistance

Qd_alw - Allowable pile downward resistance

Weight - Weight of pile shaft

Qsid* - Ultimate pile side uplift resistance

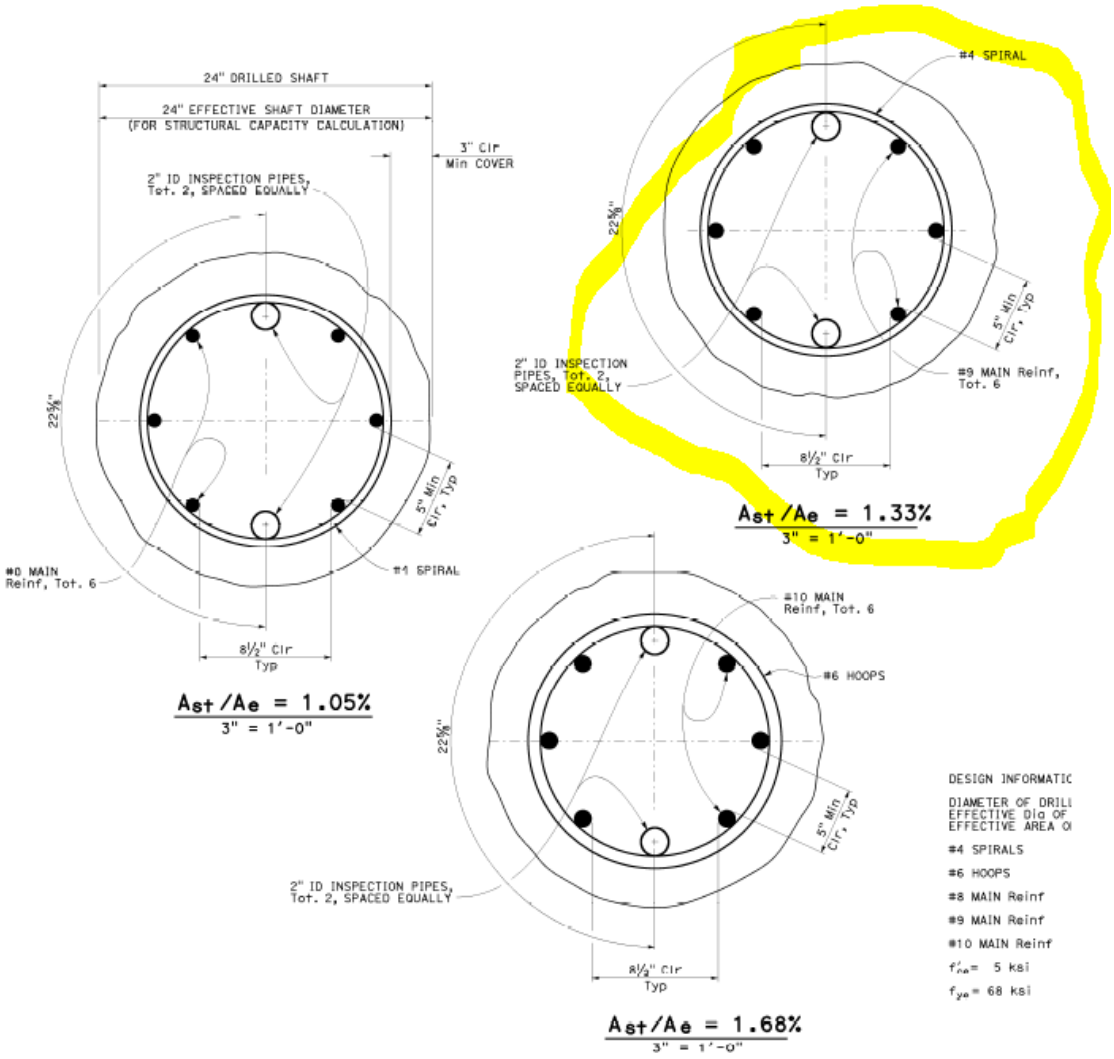
Q_up - Ultimate pile uplift resistance

Qu_alw - Allowable pile uplift resistance

Boring A-19-001

Abutment #2

24-inch CIDH Pile


24" DRILLED SHAFT
24" EFFECTIVE SHAFT DIAMETER
(FOR STRUCTURAL CAPACITY CALCULATION)
3" Clr
Min COVER
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
22⅝"
5" Min
Clr, Typ
#8 MAIN
Reinf, Tot. 6
#4 SPIRAL
8½" Clr
Typ
Ast /Ae = 1.05%
3" = 1'-0"
#4 SPIRAL
2" ID INSPECTION
PIPES, Tot. 2,
SPACED EQUALLY
#9 MAIN Reinf,
Tot. 6
Ast /Ae = 1.33%
3" = 1'-0"
#10 MAIN
Reinf, Tot. 6
#6 HOOPS
2" ID INSPECTION PIPES,
Tot. 2, SPACED EQUALLY
Ast/Ae = 1.68%
3" = 1'-0"
DESIGN INFORMATIC
DIAMETER OF DRILL
EFFECTIVE Dia OF
EFFECTIVE AREA O
#4 SPIRALS
#6 HOOPS
#8 MAIN Reinf
#9 MAIN Reinf
#10 MAIN Reinf
f'ce= 5 ksi
fye= 68 ksi

Allpile - file name: A-19-001 24-inch CIDH.alp

File Edit Run Setup Help

Vertical | Lateral | K | Sample: List of Sample: (E-English, M-Metric)

A. Pile Type | B. Pile Profile | C. Pile Properties | D. Load and Group | E. Soil Properties | F. Advanced Page

1. Pile Type

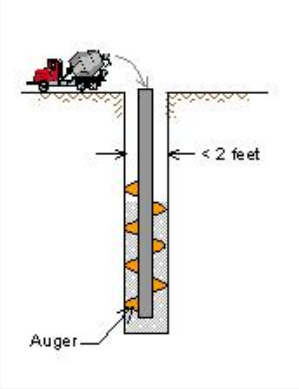
- (•) Drilled Pile (dia <=24 in. or 61 cm)
- ( ) Drilled Shaft (dia >24 in. or 61 cm)
- ( ) SHAFT (US. FHWA Methods)
- ( ) Driving Steel Pile (Open end)
- ( ) Driving Steel Pile (Closed end)
- ( ) Driving Concrete Pile
- ( ) Driving Tapered Pile (Timber Pile)
- ( ) Driving Jetted
- ( ) Micropile (MiniPile)
- ( ) Uplift Anchor
- ( ) Plate, Screw, and Helical
- ( ) Shallow Footing

Project Title 1:

Lack Road Bridge Replacement

Project Title 2:

Abutment 2; Boring A-19-001; 24-Inch CIDH



[x] Shown following text in Profile.

The text can be edited and saved.

Concrete poured into drilled hole.
Diameter is limited to 24in (61cm).

2. Units:

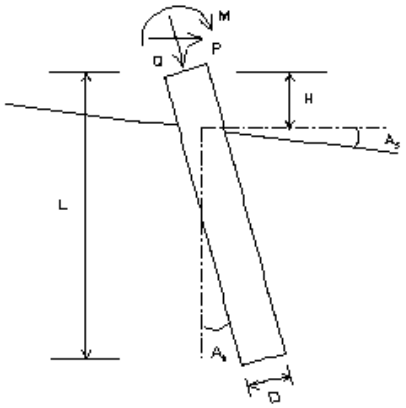
(•) English ( ) Metric

The parameters for all the types of piles are adjustable in Setup Page 3.

Default File Path: C:\AllpileS\sample\

VERTICAL ANALYSIS

Figure 1



Drilled Pile (dia <=24 in. or 61 cm)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 0.0 -kp

Profile:
Pile Length, L= 87.5 -ft
Top Height, H= -3 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0
Fixed Head Condition

Soil Data:

Depth -ft	Gamma -lb/ft3	Phi	C -kp/ft2	K -lb/in3	e50 or Dr %	Nspt
0	58.7	0.0	0.30	0.0	0.00	4
3	58.7	0.0	0.30	0.0	0.00	4
26.5	63.5	34	0.00	0.0	0.0	36
41.5	56.2	0.0	1.75	0	0	15
56.5	65.5	35	0.00	0	0	37
70.5	65.9	38	0.00	0	0	57
90.5	65.9	38	0.00	0	0	57

Pile Data:

Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/i2	Weight -kp/f
0.0	24	452.4	75.4	16286.0	3000	0.471
87.5	24	452.4	75.4	16286.0	3000	0.471

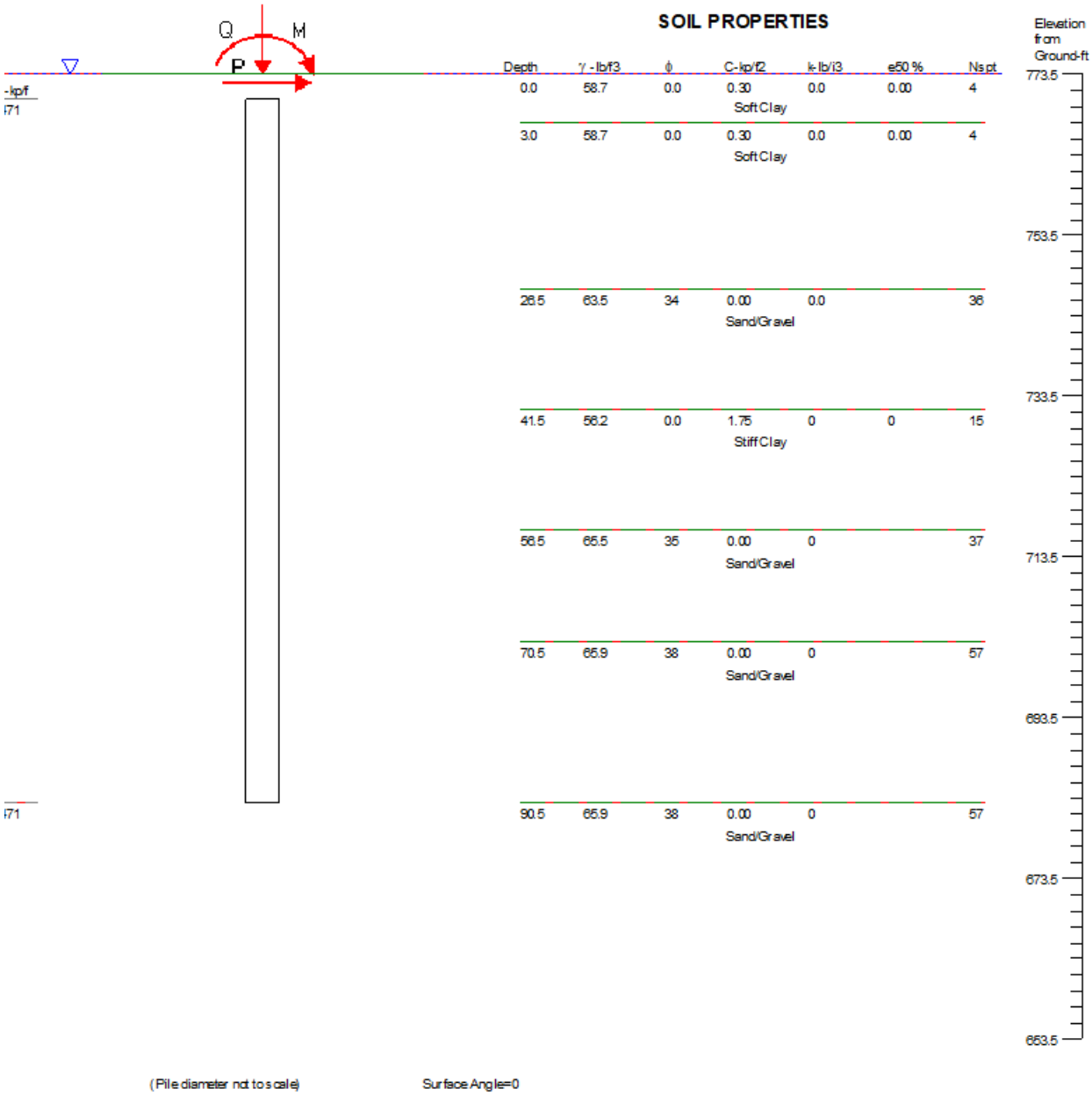
Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 24.04-kp *Soil Weight is not included
Side Resistance (Down)= 481.122-kp Side Resistance (Up)= 364.909-kp
Tip Resistance (Down)= 349.394-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 830.516-kp Total Ultimate Capacity (Up)= 388.945-kp
Total Allowable Capacity (Down) Qallow= 830.516-kp Total Allowable Capacity (Up) Qallow= 388.945-kp
OK! Qallow > Q

Settlement Calculation:
At Q= 0.00-kp Settlement= 0.00000-in
At Xallow= 1.00-in Q= 613.21625-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

Concrete poured into drilled hole.
Diameter is limited to 24in (61cm).

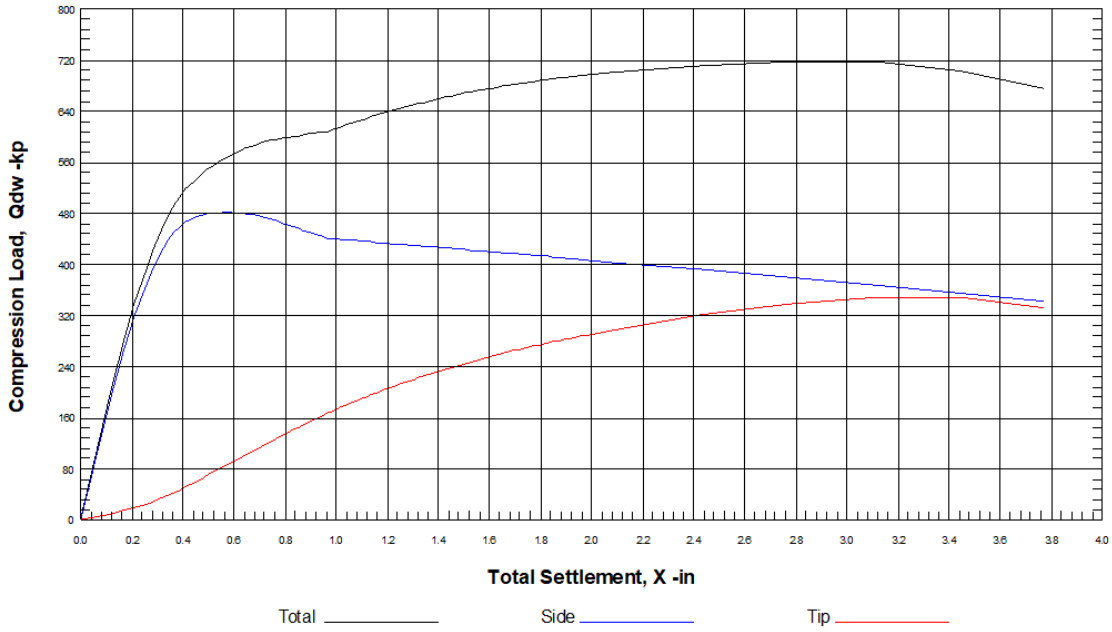
OUNDATION PROFILE & SOIL CONDITIONS



(Pile diameter not to scale) Surface Angle=0

Lack Road Bridge Replacement
Abutment 2; Boring A-19-001; 24-Inch CIDH Figure 1

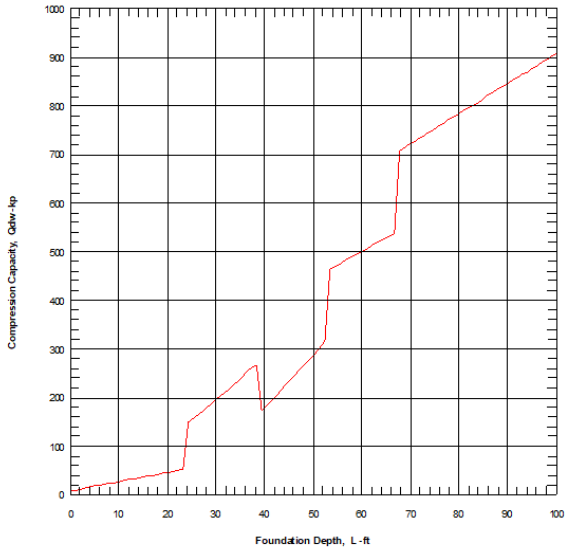
Vertical Load vs. Total Settlement

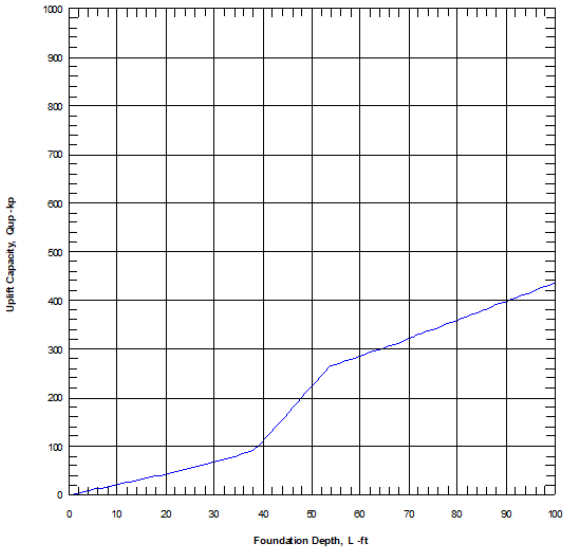


CivilTech Software

Lack Road Bridge Replacement
Abutment 2; Boring A-19-001; 24-Inch CIDH Figure 1

ULTIMATE CAPACITY vs FOUNDATION DEPTH





CivilTech Software

Lack Road Bridge Replacement
Abutment 2; Boring A-19-001; 24-Inch CIDH Figure 1

****

ALLPILE 7

VERTICAL ANALYSIS SUMMARY OUTPUT

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Date: 6/6/2019 File: \\cms1\project\PROJECTS\00,000's Projects\2019 Projects\227518-0000439.00 Lack Road Bridge - Bridge No. 58C-101\Report\Appendix F - Axial Pile Resistance Analysis\Abutment 2\A-19-001 24-inch CIDH.alp 1.0

Title 1: Lack Road Bridge Replacement

Title 2: Abutment 2; Boring A-19-001; 24-Inch CIDH

ALLPILE INPUT DATA:

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* Pile Type Page *

Unit: English

Concrete poured into drilled hole. Diameter is limited to 24in (61cm).

Pile Type: Drilled Pile (dia <=24 in. or 61 cm)

* Pile Profile *

Foundation Depth: 87.5 -ft

Top Height: -3 -ft

Slope Angle: 0

Pile Angle: 0

* Pile Properties *

Zs	Width	Area	Perim.	I	E	Weight	Mix*	Out	In	Other	Type
-ft	-in	-in2	-in	-in4	-kp/i2	-kp/f	%	Side	Side	Par.	

0.0	24	452.4	75.4	16286.0	3000	0.471	0.0	3	3	30	Concrete (rough)
87.5	24	452.4	75.4								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0

Top Type: 5

Water Table: 0 -ft

Ground Elevation: 773.5 -ft

* Soil Properties *

Zs	Gamma	Phi	C	K	E50/Dr	Nspt	Type	Soil
-ft	-lb/f3	o	-kp/f2	-lb/i3	- %			
0.0	58.7	0.0	0.30	0.0	0.00	4	1	Soft Clay
3.0	58.7	0.0	0.30	0.0	0.00	4	1	Soft Clay
26.5	63.5	34	0.00	0.0	0.0	36	4	Sand/Gravel
41.5	56.2	0.0	1.75	0	0	15	2	Stiff Clay
56.5	65.5	35	0.00	0	0	37	4	Sand/Gravel
70.5	65.9	38	0.00	0	0	57	4	Sand/Gravel
90.5	65.9	38	0.00	0	0	57	4	Sand/Gravel

Surcharge Pressure on ground: 0 -kp/f2

Vertical Side and Tip Resistance vs. Total Settlement:

****

Xtop -in	Qside -kp	Qtip -kp	Qtotal -kp
0.001	1.7	0.5	2.2
0.120	195.5	9.9	205.4
0.168	264.2	14.7	278.9
0.210	318.4	19.4	337.8
0.247	360.6	24.1	384.8
0.281	393.1	28.9	422.0
0.311	417.8	33.6	451.4
0.339	436.2	38.3	474.6
0.365	449.9	43.0	492.9
0.389	459.8	47.7	507.5
0.413	466.9	52.3	519.2
0.435	471.8	57.0	528.8
0.457	475.3	61.6	536.9
0.478	477.6	66.2	543.8
0.499	479.2	70.7	549.9
0.520	480.2	75.2	555.4
0.541	480.8	79.7	560.5
0.561	481.1	84.1	565.2
0.581	481.1	88.6	569.7
0.601	480.9	92.9	573.8
0.622	480.4	97.3	577.7
0.641	479.7	101.5	581.2
0.661	478.6	105.8	584.4

0.681	477.3	110.0	587.3
0.700	475.7	114.1	589.8
0.719	473.8	118.2	592.0
0.739	471.6	122.3	593.9
0.758	469.2	126.3	595.5
0.777	466.7	130.3	596.9
0.795	464.1	134.2	598.2
0.814	461.4	138.0	599.4
0.833	458.7	141.8	600.6
0.852	456.2	145.6	601.8
0.870	453.7	149.3	603.0
0.889	451.4	152.9	604.3
0.908	449.1	156.5	605.6
0.927	446.7	160.1	606.8
0.945	444.2	163.6	607.7
0.963	441.1	167.0	608.1
0.983	440.3	170.4	610.8
1.002	439.7	173.7	613.5
1.021	439.1	177.0	616.2
1.040	438.5	180.3	618.8
1.059	437.9	183.4	621.4
1.078	437.3	186.6	623.9
1.097	436.7	189.7	626.3
1.116	436.1	192.7	628.8
1.135	435.5	195.7	631.1
1.154	434.9	198.6	633.4
1.173	434.3	201.5	635.7
1.192	433.6	204.3	637.9
1.211	433.0	207.1	640.1
1.229	432.4	209.8	642.2
1.248	431.8	212.5	644.3

1.267	431.2	215.1	646.3
1.285	430.6	217.7	648.3
1.304	430.0	220.2	650.2
1.323	429.4	222.7	652.1
1.341	428.8	225.2	653.9
1.360	428.2	227.6	655.7
1.378	427.5	230.0	657.5
1.396	426.9	232.3	659.2
1.415	426.3	234.6	660.9
1.433	425.7	236.8	662.5
1.452	425.1	239.0	664.1
1.470	424.5	241.2	665.7
1.488	423.9	243.3	667.2
1.506	423.3	245.4	668.7
1.525	422.7	247.5	670.1
1.543	422.1	249.5	671.5
1.561	421.4	251.5	672.9
1.579	420.8	253.4	674.2
1.597	420.2	255.3	675.6
1.615	419.6	257.2	676.8
1.633	419.0	259.1	678.1
1.651	418.4	260.9	679.3
1.669	417.8	262.7	680.5
1.687	417.2	264.4	681.6
1.705	416.6	266.2	682.7
1.723	416.0	267.9	683.8
1.741	415.4	269.6	684.9
1.759	414.7	271.2	686.0
1.777	414.1	272.8	687.0
1.795	413.5	274.5	688.0
1.813	412.9	276.0	689.0

1.831	412.3	277.6	689.9
1.848	411.7	279.1	690.8
1.866	411.1	280.6	691.7
1.884	410.5	282.1	692.6
1.902	409.9	283.6	693.5
1.920	409.3	285.1	694.3
1.937	408.6	286.5	695.1
1.955	408.0	287.9	696.0
1.973	407.4	289.3	696.7
2.079	403.8	297.4	701.1
2.429	391.6	320.6	712.2
2.776	379.4	338.9	718.2
3.117	367.2	349.4	716.6
3.448	355.0	347.9	702.9
3.769	342.8	332.3	675.1

Xtop - Total Vertical Settlement

Qside - Vertical Side Resistance (Down)

Qtip - Vertical Tip Resistance (Down)

Qtotal - Vertical Total Resistance (Ultimate)

Downward and Uplift Capacity vs Pile Length

The results are for single section pile. Multiple sections may not be correct!

****

Length -ft	Qtip -kp	Qside -kp	Q_dw -kp	Qd_alw -kp	Weight -kp	Qsid* -kp	Q_up -kp	Qu_alw -kp
0.00	7.71	0.00	7.7	7.71	0.00	0.00	0.00	0.00
1.01	7.98	1.89	9.9	9.87	0.28	1.89	2.17	2.17
2.02	8.14	3.79	11.9	11.94	0.55	3.79	4.35	4.35
3.03	8.26	5.69	14.0	13.95	0.83	5.69	6.53	6.53
4.04	8.36	7.61	16.0	15.97	1.11	7.61	8.72	8.72
5.05	8.48	9.52	18.0	18.00	1.39	9.52	10.91	10.91
6.06	8.48	11.40	19.9	19.88	1.66	11.40	13.06	13.06
7.07	8.48	13.31	21.8	21.80	1.94	13.31	15.26	15.26
8.08	8.48	15.19	23.7	23.68	2.22	15.19	17.41	17.41
9.09	8.48	17.13	25.6	25.61	2.50	17.13	19.63	19.63
10.10	8.48	19.00	27.5	27.49	2.77	19.00	21.78	21.78
11.11	8.48	20.90	29.4	29.38	3.05	20.90	23.94	23.94
12.12	8.48	22.85	31.3	31.33	3.33	22.85	26.18	26.18
13.13	8.48	24.74	33.2	33.22	3.61	24.74	28.35	28.35
14.14	8.48	26.61	35.1	35.10	3.88	26.61	30.50	30.50
15.15	8.48	28.52	37.0	37.01	4.16	28.52	32.69	32.69
16.16	8.48	30.40	38.9	38.88	4.43	30.40	34.84	34.84
17.17	8.48	32.31	40.8	40.79	4.71	32.31	37.02	37.02
18.18	8.48	34.25	42.7	42.73	5.00	34.25	39.24	39.24
19.19	8.48	36.13	44.6	44.61	5.27	36.13	41.40	41.40
20.20	8.48	38.04	46.5	46.52	5.55	38.04	43.59	43.59
21.21	8.48	39.97	48.5	48.45	5.83	39.97	45.80	45.80
22.22	8.48	41.83	50.3	50.31	6.10	41.83	47.93	47.93
23.23	8.48	43.70	52.2	52.18	6.37	43.70	50.07	50.07

24.24	102.14	46.89	149.0	149.03	6.66	45.80	52.47	52.47
25.25	106.22	50.59	156.8	156.81	6.94	47.94	54.88	54.88
26.26	110.33	54.45	164.8	164.78	7.21	50.07	57.27	57.27
27.27	114.41	58.50	172.9	172.91	7.49	52.40	59.89	59.89
28.28	118.50	62.71	181.2	181.21	7.77	54.82	62.60	62.60
29.29	122.58	66.94	189.5	189.52	8.04	57.23	65.27	65.27
30.30	126.66	71.43	198.1	198.09	8.33	59.85	68.18	68.18
31.31	130.76	76.03	206.8	206.78	8.60	62.44	71.04	71.04
32.32	134.84	80.75	215.6	215.59	8.88	65.13	74.00	74.00
33.33	138.94	85.69	224.6	224.64	9.15	67.91	77.06	77.06
34.34	143.01	90.61	233.6	233.63	9.42	70.76	80.19	80.19
35.35	147.12	95.89	243.0	243.00	9.70	73.73	83.43	83.43
36.36	151.21	101.25	252.5	252.45	9.98	76.78	86.76	86.76
37.37	153.65	106.67	260.3	260.32	10.26	79.91	90.17	90.17
38.38	153.67	112.19	265.9	265.86	10.54	83.07	93.60	93.60
39.39	49.48	122.47	172.0	171.96	10.82	92.93	103.75	103.75
40.40	49.48	133.38	182.9	182.86	11.10	103.80	114.90	114.90
41.41	49.48	144.61	194.1	194.09	11.38	115.04	126.42	126.42
42.42	49.48	155.96	205.4	205.44	11.66	126.62	138.28	138.28
43.43	49.48	167.09	216.6	216.57	11.92	137.66	149.59	149.59
44.44	49.48	177.98	227.5	227.46	12.21	148.45	160.66	160.66
45.45	49.48	189.11	238.6	238.59	12.50	159.54	172.03	172.03
46.46	49.48	200.15	249.6	249.63	12.76	170.72	183.48	183.48
47.47	49.48	211.23	260.7	260.71	13.04	181.61	194.65	194.65
48.48	49.48	222.15	271.6	271.64	13.31	192.54	205.85	205.85
49.49	49.48	233.51	283.0	282.99	13.60	203.95	217.54	217.54
50.51	49.48	244.29	293.8	293.78	13.89	214.74	228.63	228.63
51.52	49.48	255.86	305.3	305.34	14.15	226.45	240.60	240.60
52.53	49.48	267.03	316.5	316.51	14.44	237.72	252.16	252.16
53.54	186.37	277.78	464.1	464.15	14.70	248.15	262.86	262.86
54.55	185.92	283.53	469.5	469.45	14.97	251.58	266.55	266.55

55.56	185.91	289.50	475.4	475.40	15.26	255.17	270.43	270.43
56.57	186.37	295.30	481.7	481.66	15.52	258.52	274.05	274.05
57.58	186.09	301.01	487.1	487.10	15.82	261.97	277.79	277.79
58.59	186.35	306.10	492.5	492.45	16.09	264.23	280.32	280.32
59.60	185.86	312.38	498.2	498.24	16.38	268.49	284.88	284.88
60.61	185.93	318.07	504.0	504.00	16.65	271.58	288.23	288.23
61.62	185.85	323.48	509.3	509.33	16.91	274.57	291.48	291.48
62.63	186.33	329.29	515.6	515.62	17.21	277.84	295.05	295.05
63.64	186.07	335.33	521.4	521.41	17.48	281.72	299.20	299.20
64.65	186.39	340.10	526.5	526.49	17.74	283.56	301.31	301.31
65.66	185.95	346.30	532.3	532.25	18.05	287.56	305.61	305.61
66.67	186.11	351.70	537.8	537.81	18.31	290.32	308.63	308.63
67.68	349.63	356.87	706.5	706.50	18.58	293.00	311.58	311.58
68.69	349.64	364.60	714.2	714.24	18.88	298.46	317.34	317.34
69.70	349.51	370.47	720.0	719.98	19.15	301.36	320.51	320.51
70.71	349.13	376.71	725.8	725.84	19.41	305.24	324.65	324.65
71.72	350.10	382.89	733.0	732.99	19.68	308.23	327.91	327.91
72.73	349.45	389.34	738.8	738.79	19.99	312.28	332.27	332.27
73.74	350.08	395.93	746.0	746.02	20.25	316.28	336.53	336.53
74.75	349.17	401.12	750.3	750.30	20.52	318.71	339.23	339.23
75.76	349.68	407.98	757.7	757.67	20.79	322.67	343.45	343.45
76.77	349.98	414.69	764.7	764.67	21.10	326.76	347.86	347.86
77.78	350.17	421.15	771.3	771.32	21.36	330.57	351.93	351.93
78.79	350.25	426.63	776.9	776.88	21.63	333.01	354.64	354.64
79.80	350.22	433.02	783.2	783.24	21.90	336.71	358.61	358.61
80.81	350.09	439.58	789.7	789.68	22.21	340.62	362.84	362.84
81.82	349.86	445.78	795.6	795.64	22.48	344.17	366.65	366.65
82.83	349.39	451.55	800.9	800.95	22.75	347.59	370.33	370.33
83.84	348.94	457.53	806.5	806.48	23.02	350.95	373.97	373.97
84.85	350.01	464.44	814.4	814.45	23.28	354.83	378.11	378.11
85.86	349.36	470.71	820.1	820.08	23.60	358.46	382.06	382.06

86.87	350.15	477.09	827.2	827.23	23.87	362.12	385.99	385.99
87.88	349.31	483.80	833.1	833.11	24.14	366.67	390.81	390.81
88.89	350.06	489.61	839.7	839.67	24.40	368.96	393.36	393.36
89.90	348.89	495.78	844.7	844.68	24.67	373.32	397.99	397.99
90.91	349.49	502.74	852.2	852.22	24.99	377.23	402.23	402.23
91.92	349.88	508.90	858.8	858.78	25.26	380.67	405.93	405.93
92.93	350.33	515.49	865.8	865.82	25.53	384.18	409.71	409.71
93.94	348.79	520.28	869.1	869.07	25.80	386.79	412.59	412.59
94.95	348.95	526.16	875.1	875.10	26.07	389.99	416.06	416.06
95.96	349.17	532.56	881.7	881.74	26.34	393.31	419.65	419.65
96.97	349.19	539.89	889.1	889.08	26.66	398.42	425.08	425.08
97.98	349.27	546.09	895.4	895.37	26.93	401.59	428.52	428.52
98.99	349.15	551.88	901.0	901.02	27.20	404.66	431.86	431.86
100.00	348.95	557.47	906.4	906.43	27.47	407.60	435.07	435.07

FACTOR OF SAFETY:

FSside	FStip	FSup	FSweight
1.0	1.0	1.0	1.0

Note: Data can be selected, copied and pasted to Excel to create graphics

Length - Pile length, distance from pile top to tip (not from ground surface)

Qtip - Ultimate pile tip resistance

Qside - Ultimate pile side resistance

Q_dw - Ultimate pile downward resistance

Qd_alw - Allowable pile downward resistance

Weight - Weight of pile shaft

Qsid* - Ultimate pile side uplift resistance

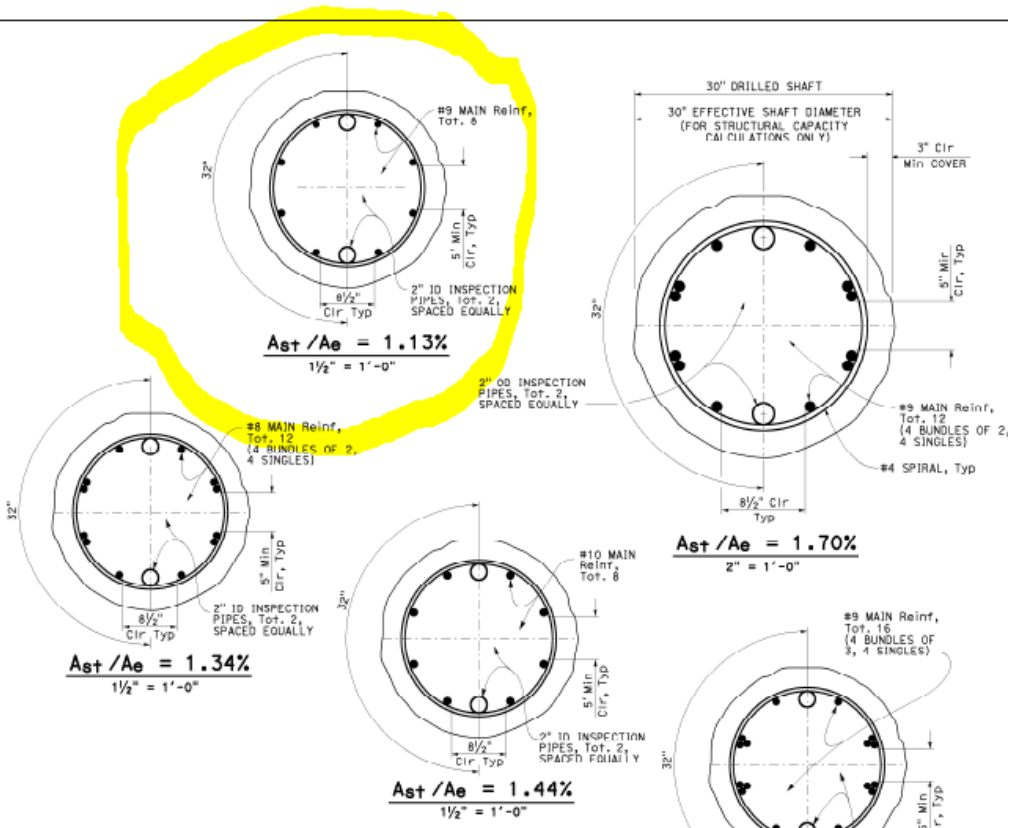
Q_up - Ultimate pile uplift resistance

Qu_alw - Allowable pile uplift resistance

Boring A-19-002

Abutment #1

30-inch CIDH Pile


#9 MAIN Reinf, Tot. 8
32"
5" Min Clr, Typ
8½" Clr Typ
2" ID INSPECTION PIPES, Tot. 2, SPACED EQUALLY
Ast /Ae = 1.13%
1½" = 1'-0"
30" DRILLED SHAFT
30" EFFECTIVE SHAFT DIAMETER (FOR STRUCTURAL CAPACITY CALCULATIONS ONLY)
3" Clr Min COVER
2" OD INSPECTION PIPES, Tot. 2, SPACED EQUALLY
#9 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
#4 SPIRAL, Typ
Ast /Ae = 1.70%
2" = 1'-0"
#8 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
Ast /Ae = 1.34%
1½" = 1'-0"
#10 MAIN Reinf, Tot. 8
Ast /Ae = 1.44%
1½" = 1'-0"
#9 MAIN Reinf, Tot. 16 (4 BUNDLES OF 3, 4 SINGLES)
Ast /Ae = 2.26%
1½" = 1'-0"
DESIGN INFORMATION:
DIAMETER OF DRILLED SHAFT = 30"
EFFECTIVE Dia OF PILE (Deff) = 30"
EFFECTIVE AREA OF PILE (Ae) = 707 in²
#4 SPIRALS - DEFORMED ø = 0.56", Ab = 0.20 in²
#8 MAIN Reinf - DEFORMED ø = 1.13", Ab = 0.79 in²
#9 MAIN Reinf - DEFORMED ø = 1.25", Ab = 1.00 in²
#10 MAIN Reinf - DEFORMED ø = 1.44", Ab = 1.27 in²
f'ce= 5 ksi
fye= 68 ksi
NOTES:
- CLEARANCES SHOWN ARE TYPICAL
- CLEARANCES SHOWN ARE BASED ON DEFORMED REINFORCEMENT DIMENSIONS
- INSPECTION PIPES WILL NOT BE REQUIRED IF THE HOLE IS DRY OR DEWATERED WITHOUT THE USE OF TEMPORARY CASING TO CONTROL GROUND WATER

Allpile - file name: A-19-002 24-inch CIDH.alp

File Edit Run Setup Help

Vertical | Lateral | K | Sample: List of Sample: (E-English, M-Metric)

A. Pile Type | B. Pile Profile | C. Pile Properties | D. Load and Group | E. Soil Properties | F. Advanced Page

1. Pile Type

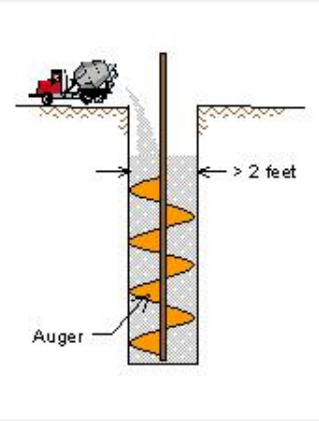
- ○ Drilled Pile (dia <=24 in. or 61 cm)
- ◉ Drilled Shaft (dia >24 in. or 61 cm)
- ○ SHAFT (US. FHWA Methods)
- ○ Driving Steel Pile (Open end)
- ○ Driving Steel Pile (Closed end)
- ○ Driving Concrete Pile
- ○ Driving Tapered Pile (Timber Pile)
- ○ Driving Jetted
- ○ Micropile (MiniPile)
- ○ Uplift Anchor
- ○ Plate, Screw, and Helical
- ○ Shallow Footing

Project Title 1:

Lack Road Bridge Replacement

Project Title 2:

Abutment 1; Boring A-19-002; 30-Inch CIDH



☑ Shown follewing text in Profile.

The text can be edited and saved.

Diameter more than 24in (61cm).
For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4).
Recommendation: 2 to 4 in Item 3 of Page F.

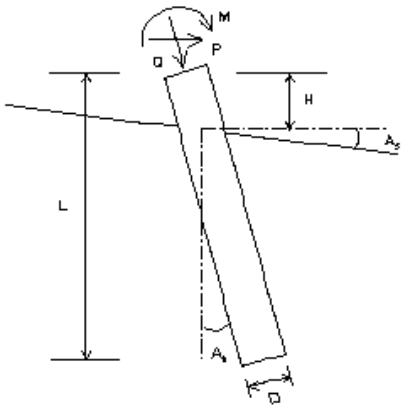
2. Units:

◉ English ○ Metric

The parameters for all the types of piles are adjustable in Setup Page 3.

VERTICAL ANALYSIS

Figure 1



Drilled Shaft (dia >24 in. or 61 cm)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 0.0 -kp

Profile:
Pile Length, L= 87.5 -ft
Top Height, H= -3 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0
Fixed Head Condition

Soil Data:

Depth -ft	Gamma -lb/ft3	Phi	C -kp/ft2	K -lb/i3	e50 or Dr %	Nspt
0	60.4	0.0	0.30	0	0.00	4
3	60.4	0.0	0.30	0	0.00	4
19	59.8	30	0.00	0	0.0	9
33.5	66.8	34	0.00	0	0	43
44.5	61.6	0.0	1.5	0	0	15
57.8	61.6	33	0.00	0	0	25
71.5	65.6	38	0.00	0	0	57
87.5	62.6	0.0	2	0	0	21
91.5	62.6	0.0	2	0	0	21

Pile Data:

Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/i2	Weight -kp/f
0.0	30	706.9	94.2	39760.8	3000	0.736
87.5	30	706.9	94.2	39760.8	3000	0.736

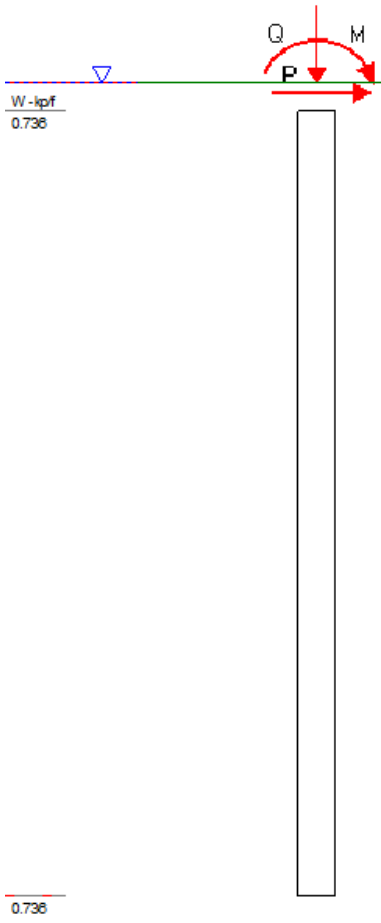
Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 37.56-kp *Soil Weight is not included
Side Resistance (Down)= 644.681-kp Side Resistance (Up)= 470.833-kp
Tip Resistance (Down)= 88.363-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 733.043-kp Total Ultimate Capacity (Up)= 508.394-kp
Total Allowable Capacity (Down) Qallow= 733.043-kp Total Allowable Capacity (Up) Qallow= 508.394-kp
OK! Qallow > Q

Settlement Calculation:
At Q= 0.00-kp Settlement= 0.00000-in
At Xallow= 1.00-in Q= 622.60736-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

FOUNDATION PROFILE & SOIL CONDITIONS

Diameter more than 24in (61cm).
For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item4).
Recommendation: 2 to 4 in Item3 of Page F.



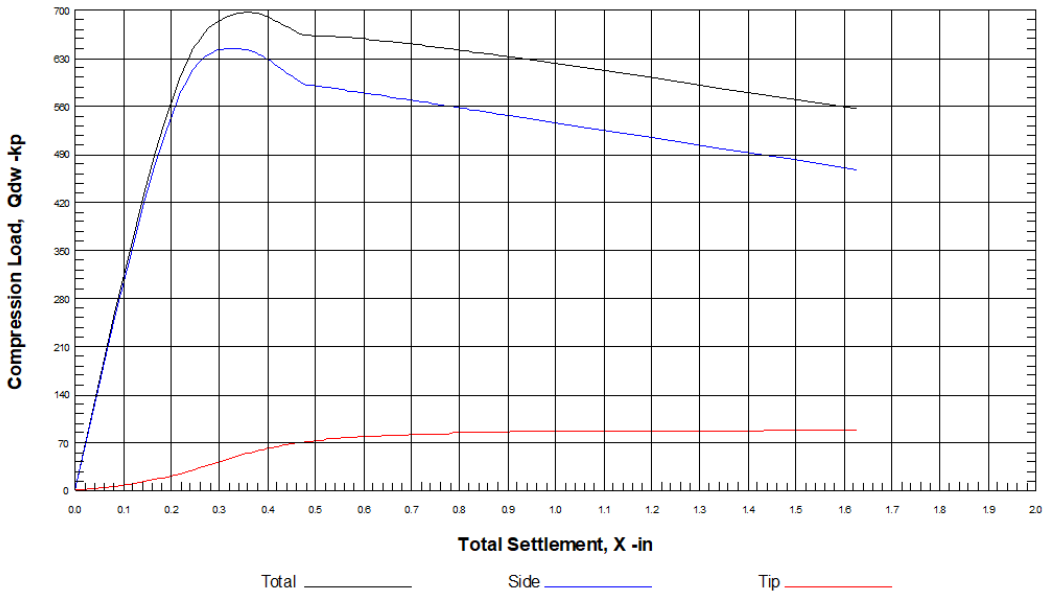
SOIL PROPERTIES

Depth	γ - lbf3	ϕ	C-kp/f2	k-lb/i3	e50 %	Nspt	Elevation from Ground-ft
0.0	60.4	0.0	0.30 Soft Clay	0	0.00	4	773.5
3.0	60.4	0.0	0.30 Soft Clay	0	0.00	4	
19.0	59.8	30	0.00 Sand/Gravel	0		9	753.5
33.5	66.8	34	0.00 Sand/Gravel	0		43	
44.5	61.6	0.0	1.5 Stiff Clay	0	0	15	733.5
57.8	61.6	33	0.00 Sand/Gravel	0		25	
71.5	65.6	38	0.00 Sand/Gravel	0		57	713.5
87.5	62.6	0.0	2 Stiff Clay	0	0	21	693.5
91.5	62.6	0.0	2 Stiff Clay	0	0	21	
							673.5
							653.5

=0 (Pile diameter not to scale) Surface Angle=0

Lack Road Bridge Replacement
Abutment 1; Boring A-19-002; 30-Inch CIDH Figure 1

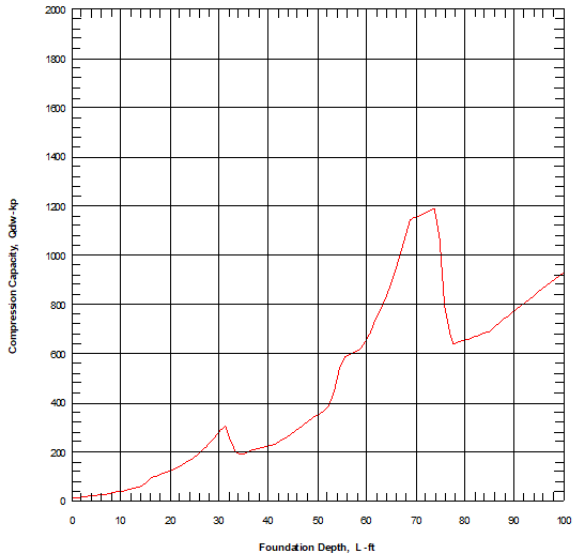
Vertical Load vs. Total Settlement

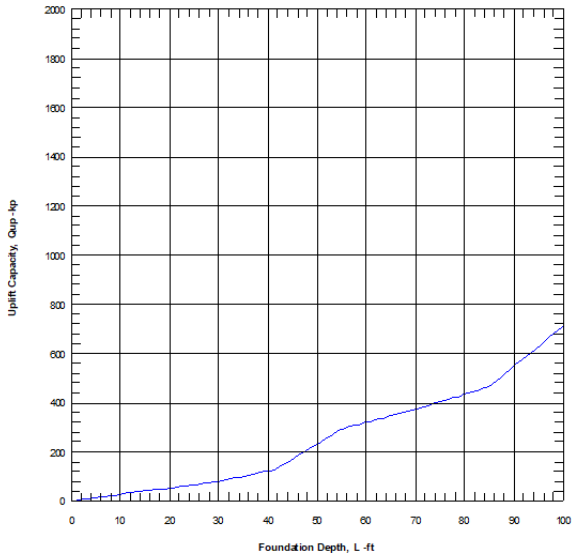


CivilTech Software

Lack Road Bridge Replacement
Abutment 1; Boring A-19-002; 30-Inch CIDH Figure 1

ULTIMATE CAPACITY vs FOUNDATION DEPTH





CivilTech Software

Lack Road Bridge Replacement
Abutment 1; Boring A-19-002; 30-Inch CIDH Figure 1

****

ALLPILE 7

VERTICAL ANALYSIS SUMMARY OUTPUT

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Date: 6/6/2019 File: C:\Users\carl.henderson\Desktop\Lack Road Bridge Analysis\Appendix F - Axial Pile Resistance Analysis\Abutment 1\A-19-002 30-inch CIDH.alp 1.0

Title 1: Lack Road Bridge Replacement

Title 2: Abutment 1; Boring A-19-002; 30-Inch CIDH

ALLPILE INPUT DATA:

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* Pile Type Page *

Unit: English

Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4 in Item 3 of Page F.

Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

* Pile Profile *

Foundation Depth: 87.5 -ft

Top Height: -3 -ft

Slope Angle: 0

Pile Angle: 0

* Pile Properties *

Zs	Width	Area	Perim.	I	E	Weight	Mix*	Out	In	Other	Type
-ft	-in	-in2	-in	-in4	-kp/i2	-kp/f	%	Side	Side	Par.	

0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
87.5	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0

Top Type: 5

Water Table: 0 -ft

Ground Elevation: 773.5 -ft

* Soil Properties *

Zs	Gamma	Phi	C	K	E50/Dr	Nspt	Type	Soil
-ft	-lb/f3	o	-kp/f2	-lb/i3	- %			
0.0	60.4	0.0	0.30	0	0.00	4	1	Soft Clay
3.0	60.4	0.0	0.30	0	0.00	4	1	Soft Clay
19.0	59.8	30	0.00	0	0.0	9	4	Sand/Gravel
33.5	66.8	34	0.00	0	0	43	4	Sand/Gravel
44.5	61.6	0.0	1.5	0	0	15	2	Stiff Clay
57.8	61.6	33	0.00	0	0	25	4	Sand/Gravel
71.5	65.6	38	0.00	0	0	57	4	Sand/Gravel
87.5	62.6	0.0	2	0	0	21	2	Stiff Clay
91.5	62.6	0.0	2	0	0	21	2	Stiff Clay

Surcharge Pressure on ground: 0 -kp/f2

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 0.0 -kp

Vertical Load with Load Factor, Q: 0.0 -kp

Vertical Load with Load factor and Pile Cap, Q= 0.0 -kp

Load Factor for Vertical Load and Torsion= 1.0

Vertical Loads Supported by Pile Cap: 0 %

Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 87.5 -ft

Top Height, H= -3 -ft

Slope Angle, As= 0

Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.7 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 733.043-kp Total Ultimate Capacity (Up)= 508.394-kp

Total Allowable Capacity (Down)= 733.043-kp Total Allowable Capacity (Up)= 508.394-kp

Weight above Ground= 0.00 Total Weight= 37.56-kp *Soil Weight is not included

Side Resistance (Down)= 644.681-kp Side Resistance (Up)= 470.833-kp

Tip Resistance (Down)= 88.363-kp Tip Resistance (Up)= 0.000-kp

Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)

Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 0.00-kp, Settlement= 0.00000-in

At Work Load= 0.00-kp, Secant Stiffness Kqx= 3910.32-kp/-in

At Allowable Settlement= 1.000000-in, Capacity= 622.61-kp

Work Load, 0.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 622.61-kp

Work Load, 0.00-kp, OK with the Allowable Capacity (Down)= 733.04-kp

---

FACTOR OF SAFETY:

FSside	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1	1	1	1	1

Vertical Side and Tip Resistance vs. Total Settlement:

****

Xtop -in	Qside -kp	Qtip -kp	Qtotal -kp
0.001	2.6	0.0	2.6
0.084	256.2	7.1	263.3
0.116	347.2	10.4	357.6
0.143	419.5	13.6	433.1
0.167	476.3	16.6	492.9
0.187	520.4	19.6	539.9
0.204	554.2	22.4	576.6
0.219	579.8	25.1	605.0
0.233	599.0	27.7	626.7
0.245	613.1	30.2	643.3
0.256	623.3	32.6	656.0
0.266	630.6	35.0	665.6
0.276	635.7	37.2	672.9
0.285	639.3	39.3	678.5
0.294	641.6	41.3	682.9
0.303	643.2	43.3	686.4
0.312	644.1	45.1	689.2
0.320	644.6	46.9	691.5
0.328	644.7	48.6	693.3
0.336	644.4	50.2	694.7
0.344	643.9	51.8	695.7
0.352	643.0	53.3	696.3
0.360	641.7	54.7	696.5

0.367	640.1	56.1	696.2
0.375	638.2	57.4	695.6
0.382	635.8	58.7	694.5
0.389	633.2	59.9	693.1
0.396	630.2	61.0	691.3
0.403	627.1	62.1	689.2
0.410	623.7	63.2	686.9
0.417	620.3	64.2	684.4
0.424	616.8	65.1	681.9
0.431	613.3	66.0	679.4
0.438	610.0	66.9	676.9
0.445	606.7	67.7	674.4
0.452	603.5	68.5	672.0
0.459	600.3	69.3	669.5
0.466	596.8	70.0	666.8
0.472	592.9	70.7	663.5
0.480	592.3	71.3	663.6
0.487	591.5	72.0	663.4
0.495	590.7	72.6	663.3
0.502	589.9	73.1	663.1
0.509	589.1	73.7	662.8
0.517	588.4	74.2	662.6
0.524	587.6	74.7	662.3
0.531	586.8	75.2	662.0
0.539	586.0	75.6	661.7
0.546	585.3	76.1	661.3
0.554	584.5	76.5	661.0
0.561	583.7	76.9	660.6
0.568	582.9	77.3	660.2
0.575	582.2	77.6	659.8
0.583	581.4	78.0	659.3

0.590	580.6	78.3	658.9
0.597	579.8	78.6	658.4
0.605	579.1	78.9	658.0
0.612	578.3	79.2	657.5
0.619	577.5	79.5	657.0
0.626	576.7	79.8	656.5
0.634	575.9	80.0	656.0
0.641	575.2	80.3	655.4
0.648	574.4	80.5	654.9
0.655	573.6	80.7	654.4
0.663	572.8	81.0	653.8
0.670	572.1	81.2	653.2
0.677	571.3	81.4	652.7
0.684	570.5	81.6	652.1
0.692	569.7	81.8	651.5
0.699	569.0	81.9	650.9
0.706	568.2	82.1	650.3
0.713	567.4	82.3	649.7
0.720	566.6	82.5	649.1
0.728	565.8	82.6	648.5
0.735	565.1	82.8	647.9
0.742	564.3	82.9	647.2
0.749	563.5	83.1	646.6
0.756	562.7	83.2	646.0
0.764	562.0	83.4	645.3
0.771	561.2	83.5	644.7
0.778	560.4	83.6	644.0
0.785	559.6	83.8	643.4
0.792	558.9	83.9	642.7
0.799	558.1	84.0	642.1
0.807	557.3	84.1	641.4

0.814	556.5	84.2	640.8
0.821	555.7	84.3	640.1
0.828	555.0	84.5	639.4
0.835	554.2	84.6	638.8
0.843	553.4	84.7	638.1
0.850	552.6	84.8	637.4
0.857	551.9	84.9	636.7
0.864	551.1	85.0	636.1
0.871	550.3	85.1	635.4
0.914	545.7	85.6	631.2
1.057	530.1	86.7	616.8
1.200	514.6	87.1	601.7
1.343	499.1	87.2	586.3
1.485	483.5	87.7	571.2
1.628	468.0	88.4	556.4

Xtop - Total Vertical Settlement

Qside - Vertical Side Resistance (Down)

Qtip - Vertical Tip Resistance (Down)

Qtotal - Vertical Total Resistance (Ultimate)

Downward and Uplift Capacity vs Pile Length

The results are for single section pile. Multiple sections may not be correct!

****

Length -ft	Qtip -kp	Qside -kp	Q_dw -kp	Qd_alw -kp	Weight -kp	Qsid* -kp	Q_up -kp	Qu_alw -kp
0.00	11.71	0.00	11.7	11.71	0.00	0.00	0.00	0.00
1.01	12.15	2.37	14.5	14.52	0.43	2.37	2.80	2.80
2.02	12.46	4.74	17.2	17.20	0.86	4.74	5.60	5.60
3.03	12.68	7.11	19.8	19.80	1.30	7.11	8.41	8.41
4.04	12.84	9.50	22.3	22.34	1.73	9.50	11.24	11.24
5.05	12.97	11.89	24.9	24.86	2.17	11.89	14.06	14.06
6.06	13.12	14.24	27.4	27.36	2.60	14.24	16.84	16.84
7.07	13.76	16.63	30.4	30.39	3.04	16.63	19.67	19.67
8.08	14.60	18.98	33.6	33.59	3.46	18.98	22.45	22.45
9.09	15.81	21.40	37.2	37.21	3.90	21.40	25.30	25.30
10.10	17.39	23.74	41.1	41.13	4.33	23.74	28.07	28.07
11.11	19.32	26.11	45.4	45.43	4.76	26.11	30.87	30.87
12.12	21.62	28.55	50.2	50.17	5.21	28.55	33.75	33.75
13.13	24.29	30.91	55.2	55.20	5.64	30.91	36.55	36.55
14.14	27.32	33.25	60.6	60.56	6.07	33.25	39.32	39.32
15.15	38.78	35.64	74.4	74.42	6.50	35.64	42.14	42.14
16.16	58.64	38.05	96.7	96.69	6.93	37.87	44.80	44.80
17.17	61.70	40.98	102.7	102.68	7.36	39.57	46.94	46.94
18.18	64.76	44.11	108.9	108.88	7.81	41.36	49.17	49.17
19.19	67.83	47.32	115.1	115.14	8.24	43.20	51.43	51.43
20.20	70.89	50.71	121.6	121.59	8.67	45.12	53.79	53.79
21.21	77.31	54.27	131.6	131.58	9.11	47.17	56.28	56.28
22.22	85.80	57.90	143.7	143.71	9.53	49.21	58.74	58.74
23.23	95.17	61.68	156.8	156.85	9.96	51.38	61.34	61.34

24.24	105.51	65.76	171.3	171.27	10.42	53.78	64.19	64.19
25.25	116.95	69.91	186.9	186.86	10.85	56.12	66.97	66.97
26.26	129.65	74.08	203.7	203.73	11.26	58.43	69.69	69.69
27.27	143.76	78.53	222.3	222.28	11.70	61.04	72.74	72.74
28.28	159.47	83.16	242.6	242.62	12.15	63.72	75.86	75.86
29.29	176.99	87.82	264.8	264.81	12.57	66.32	78.88	78.88
30.30	196.57	92.79	289.4	289.36	13.02	69.19	82.21	82.21
31.31	206.03	98.33	304.4	304.36	13.44	72.36	85.81	85.81
32.32	136.38	104.29	240.7	240.67	13.87	75.74	89.61	89.61
33.33	91.51	110.46	202.0	201.96	14.30	79.21	93.51	93.51
34.34	73.16	116.84	190.0	190.00	14.73	82.86	97.58	97.58
35.35	73.57	123.39	197.0	196.97	15.16	86.65	101.80	101.80
36.36	73.53	130.16	203.7	203.69	15.59	90.46	106.05	106.05
37.37	73.03	137.08	210.1	210.11	16.03	94.42	110.45	110.45
38.38	72.08	144.29	216.4	216.37	16.46	98.60	115.07	115.07
39.39	70.67	151.62	222.3	222.29	16.90	102.76	119.66	119.66
40.40	68.81	159.17	228.0	227.98	17.34	107.11	124.45	124.45
41.41	66.49	166.96	233.5	233.45	17.78	111.58	129.36	129.36
42.42	66.27	178.48	244.8	244.75	18.23	122.75	140.98	140.98
43.43	66.27	189.96	256.2	256.23	18.63	134.09	152.72	152.72
44.44	66.27	201.89	268.2	268.17	19.08	145.89	164.96	164.96
45.45	68.29	214.01	282.3	282.29	19.53	158.06	177.59	177.59
46.46	71.73	226.00	297.7	297.73	19.93	170.26	190.19	190.19
47.47	75.31	237.92	313.2	313.23	20.38	182.20	202.58	202.58
48.48	78.72	249.43	328.1	328.14	20.79	193.55	214.35	214.35
49.49	82.16	261.29	343.4	343.44	21.25	205.26	226.51	226.51
50.51	85.57	273.27	358.8	358.84	21.70	217.30	239.00	239.00
51.52	88.94	285.21	374.2	374.15	22.11	229.25	251.36	251.36
52.53	93.67	297.42	391.1	391.09	22.57	241.72	264.29	264.29
53.54	138.97	309.18	448.2	448.15	22.98	253.40	276.38	276.38
54.55	223.20	320.98	544.2	544.18	23.39	265.24	288.63	288.63

55.56	256.45	330.36	586.8	586.81	23.85	271.80	295.65	295.65
56.57	255.96	339.12	595.1	595.08	24.26	277.39	301.65	301.65
57.58	255.98	347.76	603.7	603.75	24.72	282.28	307.01	307.01
58.59	258.37	356.07	614.4	614.45	25.14	286.81	311.94	311.94
59.60	282.56	364.55	647.1	647.11	25.60	291.62	317.22	317.22
60.61	310.57	372.88	683.4	683.45	26.02	296.18	322.20	322.20
61.62	341.91	381.63	723.5	723.54	26.43	301.46	327.89	327.89
62.63	377.30	390.11	767.4	767.41	26.90	306.15	333.05	333.05
63.64	417.20	398.27	815.5	815.48	27.31	310.47	337.78	337.78
64.65	462.07	406.67	868.7	868.74	27.73	315.57	343.30	343.30
65.66	514.23	415.76	930.0	929.99	28.20	321.18	349.37	349.37
66.67	573.20	424.53	997.7	997.72	28.61	326.43	355.04	355.04
67.68	639.76	432.57	1072.3	1072.33	29.03	330.52	359.55	359.55
68.69	700.09	441.68	1141.8	1141.77	29.51	336.05	365.56	365.56
69.70	699.99	451.40	1151.4	1151.38	29.92	341.01	370.94	370.94
70.71	699.38	461.17	1160.5	1160.55	30.34	346.71	377.05	377.05
71.72	698.49	471.15	1169.6	1169.64	30.75	352.49	383.25	383.25
72.73	699.45	481.12	1180.6	1180.58	31.23	357.79	389.02	389.02
73.74	700.17	491.57	1191.7	1191.73	31.65	363.77	395.43	395.43
74.75	570.97	501.02	1072.0	1072.00	32.07	369.17	401.24	401.24
75.76	277.28	511.43	788.7	788.71	32.48	376.04	408.52	408.52
76.77	162.03	521.39	683.4	683.43	32.97	381.03	414.00	414.00
77.78	108.07	532.03	640.1	640.10	33.39	388.00	421.38	421.38
78.79	103.79	541.79	645.6	645.58	33.80	392.64	426.44	426.44
79.80	101.03	551.82	652.8	652.85	34.22	398.39	432.61	432.61
80.81	98.24	562.28	660.5	660.52	34.71	405.38	440.09	440.09
81.82	95.59	572.58	668.2	668.18	35.13	411.08	446.21	446.21
82.83	92.84	582.23	675.1	675.06	35.55	416.55	452.10	452.10
83.84	90.14	592.44	682.6	682.58	35.97	422.31	458.28	458.28
84.85	88.36	603.44	691.8	691.80	36.38	429.52	465.90	465.90
85.86	88.36	619.19	707.6	707.55	36.88	445.78	482.66	482.66

86.87	88.36	634.69	723.1	723.05	37.30	460.96	498.26	498.26
87.88	88.36	651.05	739.4	739.41	37.72	477.35	515.07	515.07
88.89	88.36	666.32	754.7	754.69	38.14	492.33	530.47	530.47
89.90	88.36	682.70	771.1	771.07	38.56	509.31	547.87	547.87
90.91	88.36	699.28	787.6	787.64	39.06	526.21	565.27	565.27
91.92	88.36	714.80	803.2	803.16	39.48	541.70	581.18	581.18
92.93	88.36	730.33	818.7	818.69	39.90	555.99	595.89	595.89
93.94	88.36	745.67	834.0	834.04	40.32	571.58	611.90	611.90
94.95	88.36	762.09	850.5	850.45	40.74	588.89	629.62	629.62
95.96	88.36	777.84	866.2	866.20	41.16	603.61	644.76	644.76
96.97	88.36	793.87	882.2	882.23	41.66	620.12	661.78	661.78
97.98	88.36	810.18	898.5	898.55	42.08	636.37	678.45	678.45
98.99	88.36	825.05	913.4	913.41	42.51	650.85	693.36	693.36
100.00	88.36	842.25	930.6	930.61	42.93	669.41	712.33	712.33

FACTOR OF SAFETY:

FSside	FStip	FSup	FSweight
1.0	1.0	1.0	1.0

Note: Data can be selected, copied and pasted to Excel to create graphics

Length - Pile length, distance from pile top to tip (not from ground surface)

Qtip - Ultimate pile tip resistance

Qside - Ultimate pile side resistance

Q_dw - Ultimate pile downward resistance

Qd_alw - Allowable pile downward resistance

Weight - Weight of pile shaft

Qsid* - Ultimate pile side uplift resistance

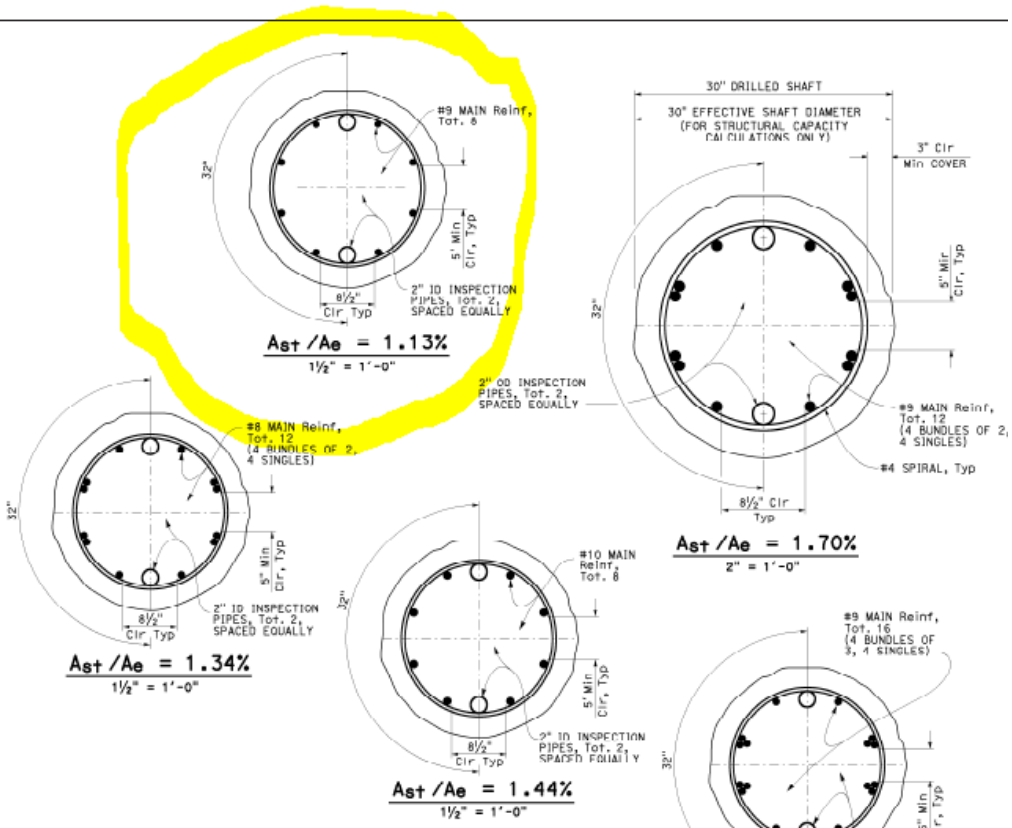
Q_up - Ultimate pile uplift resistance

Qu_alw - Allowable pile uplift resistance

Boring A-19-001

Abutment #2

30-inch CIDH Pile


#9 MAIN Reinf, Tot. 8
32"
5" Min Clr, Typ
8½" Clr Typ
2" ID INSPECTION PIPES, Tot. 2, SPACED EQUALLY
Ast /Ae = 1.13%
1½" = 1'-0"
30" DRILLED SHAFT
30" EFFECTIVE SHAFT DIAMETER (FOR STRUCTURAL CAPACITY CALCULATIONS ONLY)
3" Clr Min COVER
2" OD INSPECTION PIPES, Tot. 2, SPACED EQUALLY
#9 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
#4 SPIRAL, Typ
Ast /Ae = 1.70%
2" = 1'-0"
#8 MAIN Reinf, Tot. 12 (4 BUNDLES OF 2, 4 SINGLES)
Ast /Ae = 1.34%
1½" = 1'-0"
#10 MAIN Reinf, Tot. 8
Ast /Ae = 1.44%
1½" = 1'-0"
#9 MAIN Reinf, Tot. 16 (4 BUNDLES OF 3, 4 SINGLES)
Ast /Ae = 2.26%
1½" = 1'-0"
DESIGN INFORMATION:
DIAMETER OF DRILLED SHAFT = 30"
EFFECTIVE Dia OF PILE (Deff) = 30"
EFFECTIVE AREA OF PILE (Ae) = 707 in²
#4 SPIRALS - DEFORMED ø = 0.56", Ab = 0.20 in²
#8 MAIN Reinf - DEFORMED ø = 1.13", Ab = 0.79 in²
#9 MAIN Reinf - DEFORMED ø = 1.25", Ab = 1.00 in²
#10 MAIN Reinf - DEFORMED ø = 1.44", Ab = 1.27 in²
f'ce= 5 ksi
fye= 68 ksi
NOTES:
- CLEARANCES SHOWN ARE TYPICAL
- CLEARANCES SHOWN ARE BASED ON DEFORMED REINFORCEMENT DIMENSIONS
- INSPECTION PIPES WILL NOT BE REQUIRED IF THE HOLE IS DRY OR DEWATERED WITHOUT THE USE OF TEMPORARY CASING TO CONTROL GROUND WATER

File Edit Run Setup Help

Vertical | Lateral | K | Sample: List of Sample: (E-English, M-Metric)

A. Pile Type | B. Pile Profile | C. Pile Properties | D. Load and Group | E. Soil Properties | F. Advanced Page

1. Pile Type

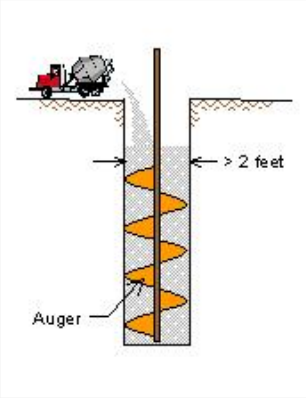
- ○ Drilled Pile (dia <=24 in. or 61 cm)
- ◉ Drilled Shaft (dia >24 in. or 61 cm)
- ○ SHAFT (US. FHWA Methods)
- ○ Driving Steel Pile (Open end)
- ○ Driving Steel Pile (Closed end)
- ○ Driving Concrete Pile
- ○ Driving Tapered Pile (Timber Pile)
- ○ Driving Jetted
- ○ Micropile (MiniPile)
- ○ Uplift Anchor
- ○ Plate, Screw, and Helical
- ○ Shallow Footing

Project Title 1:

Lack Road Bridge Replacement

Project Title 2:

Abutment 2; Boring A-19-001; 30-Inch CIDH



☑ Shown following text in Profile.

The text can be edited and saved.

Diameter more than 24in (61cm).
For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4).
Recommendation: 2 to 4 in Item 3 of Page F.

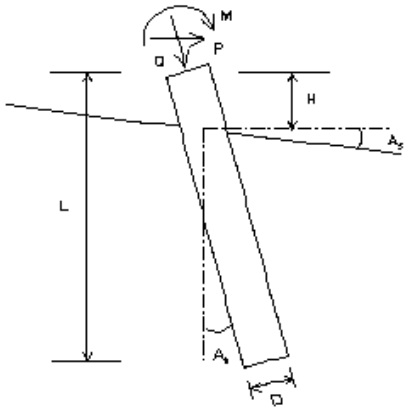
2. Units:

◉ English ○ Metric

The parameters for all the types of piles are adjustable in Setup Page 3.

VERTICAL ANALYSIS

Figure 1



Drilled Shaft (dia >24 in. or 61 cm)

Loads:
Load Factor for Vertical Loads= 1.0
Load Factor for Lateral Loads= 1.0
Loads Supported by Pile Cap= 0 %
Shear Condition: Static

(with Load Factor)
Vertical Load, Q= 0.0 -kp

Profile:
Pile Length, L= 87.5 -ft
Top Height, H= -3 -ft
Slope Angle, As= 0
Batter Angle, Ab= 0
Fixed Head Condition

Soil Data:

Depth -ft	Gamma -lb/ft3	Phi	C -kp/ft2	K -lb/in3	e50 or Dr %	Nspt
0	58.7	0.0	0.30	0.0	0.00	4
3	58.7	0.0	0.30	0.0	0.00	4
26.5	63.5	34	0.00	0.0	0.0	36
41.5	56.2	0.0	1.75	0	0	15
56.5	65.5	35	0.00	0	0	37
70.5	65.9	38	0.00	0	0	57
90.5	65.9	38	0.00	0	0	57

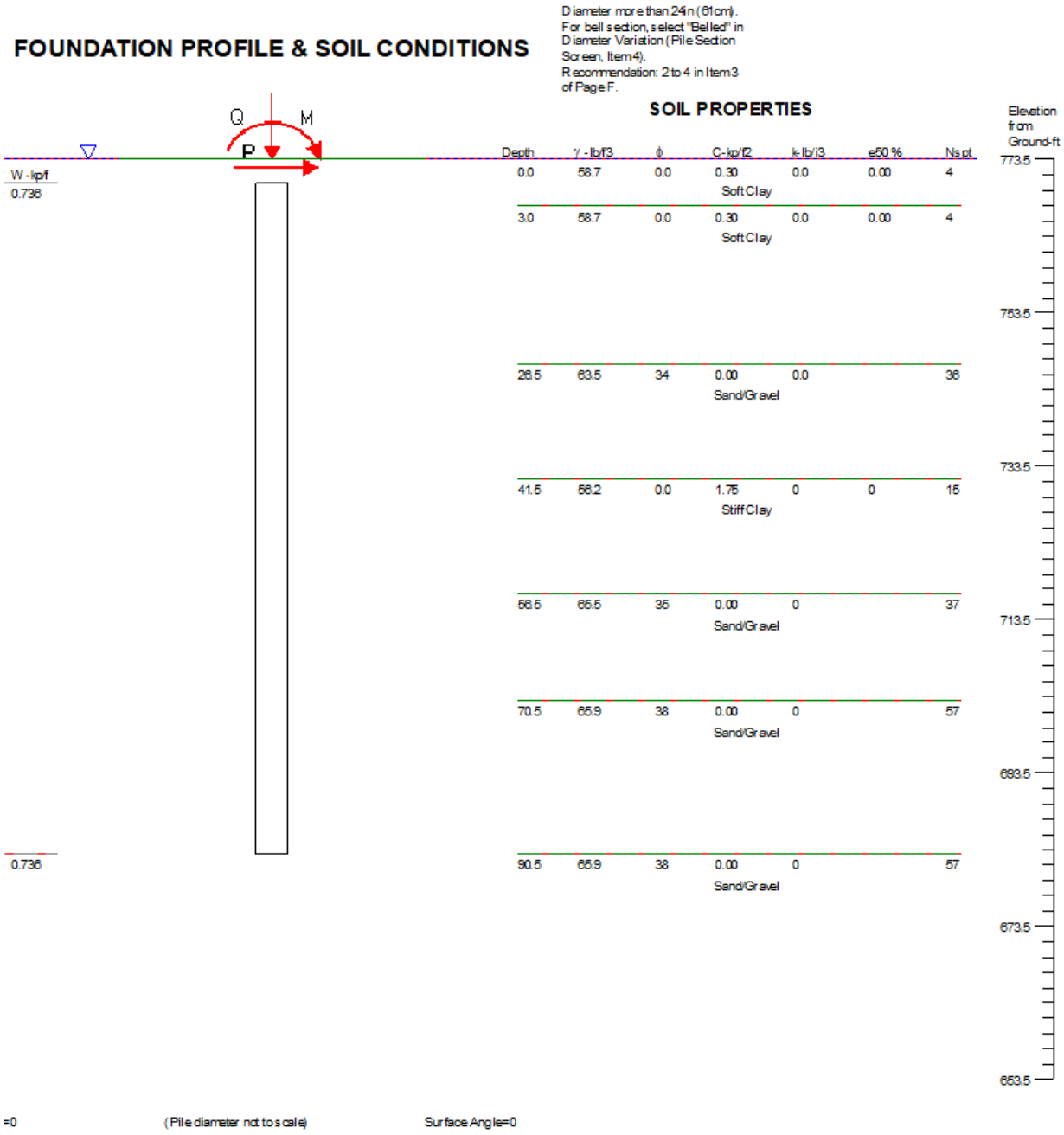
Pile Data:

Depth -ft	Width -in	Area -in2	Per. -in	I -in4	E -kp/in2	Weight -kp/f
0.0	30	706.9	94.2	39760.8	3000	0.736
87.5	30	706.9	94.2	39760.8	3000	0.736

Vertical Capacity:
Weight above Ground= 0.00 Total Weight= 37.56-kp *Soil Weight is not included
Side Resistance (Down)= 661.476-kp Side Resistance (Up)= 490.408-kp
Tip Resistance (Down)= 675.588-kp Tip Resistance (Up)= 0.000-kp
Total Ultimate Capacity (Down) Qult= 1337.064-kp Total Ultimate Capacity (Up)= 527.969-kp
Total Allowable Capacity (Down) Qallow= 1337.064-kp Total Allowable Capacity (Up) Qallow= 527.969-kp
OK! Qallow > Q

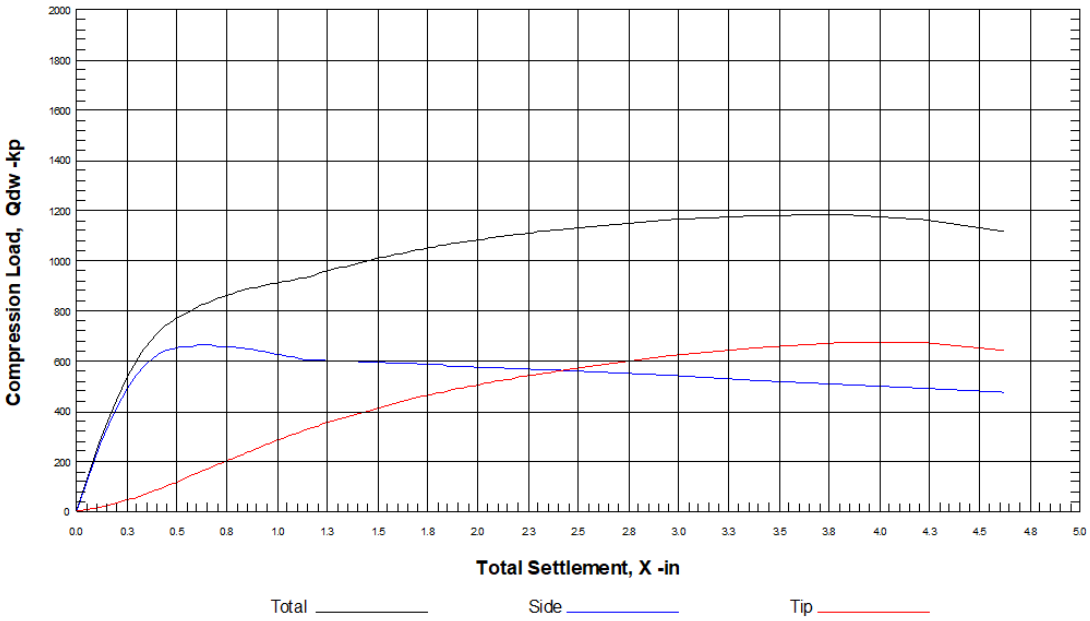
Settlement Calculation:
At Q= 0.00-kp Settlement= 0.00000-in
At Xallow= 1.00-in Q= 911.63080-kp

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.



Lack Road Bridge Replacement
Abutment 2; Boring A-19-001; 30-Inch CIDH Figure 1

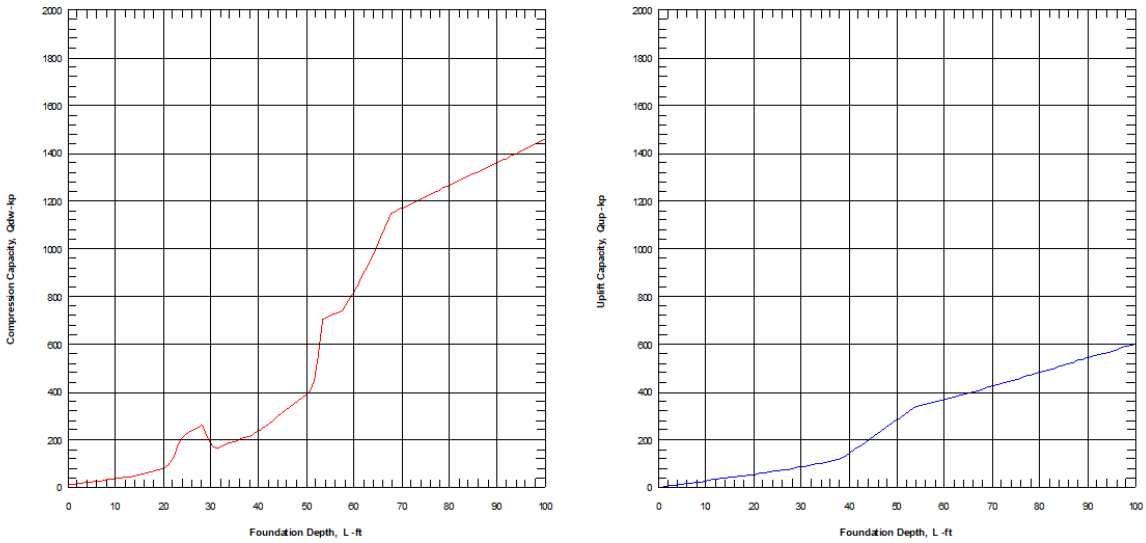
Vertical Load vs. Total Settlement



CivilTech Software

Lack Road Bridge Replacement
Abutment 2; Boring A-19-001; 30-Inch CIDH Figure 1

ULTIMATE CAPACITY vs FOUNDATION DEPTH



CivilTech Software

Lack Road Bridge Replacement
Abutment 2; Boring A-19-001; 30-Inch CIDH Figure 1

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ALLPILE 7

VERTICAL ANALYSIS SUMMARY OUTPUT

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Date: 6/6/2019 File: \\cms1\project\PROJECTS\00,000's Projects\2019 Projects\227518-0000439.00 Lack Road Bridge - Bridge No. 58C-101\Report\Appendix F - Axial Pile Resistance Analysis\Abutment 2\A-19-001 30-inch CIDH.alp 1.0

Title 1: Lack Road Bridge Replacement

Title 2: Abutment 2; Boring A-19-001; 30-Inch CIDH

ALLPILE INPUT DATA:

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* Pile Type Page *

Unit: English

Diameter more than 24in (61cm). For bell section, select "Belled" in Diameter Variation (Pile Section Screen, Item 4). Recommendation: 2 to 4 in Item 3 of Page F.

Pile Type: Drilled Shaft (dia >24 in. or 61 cm)

* Pile Profile *

Foundation Depth: 87.5 -ft

Top Height: -3 -ft

Slope Angle: 0

Pile Angle: 0

* Pile Properties *

Zs	Width	Area	Perim.	I	E	Weight	Mix*	Out	In	Other	Type
-ft	-in	-in2	-in	-in4	-kp/i2	-kp/f	%	Side	Side	Par.	

0.0	30	706.9	94.2	39760.8	3000	0.736	0.0	3	3	30	Concrete (rough)
87.5	30	706.9	94.2								Pile Tip

Note: Mix = % of Inside material/Outside material

Group Type: 0

Top Type: 5

Water Table: 0 -ft

Ground Elevation: 773.5 -ft

* Soil Properties *

Zs	Gamma	Phi	C	K	E50/Dr	Nspt	Type	Soil
-ft	-lb/f3	o	-kp/f2	-lb/i3	- %			
0.0	58.7	0.0	0.30	0.0	0.00	4	1	Soft Clay
3.0	58.7	0.0	0.30	0.0	0.00	4	1	Soft Clay
26.5	63.5	34	0.00	0.0	0.0	36	4	Sand/Gravel
41.5	56.2	0.0	1.75	0	0	15	2	Stiff Clay
56.5	65.5	35	0.00	0	0	37	4	Sand/Gravel
70.5	65.9	38	0.00	0	0	57	4	Sand/Gravel
90.5	65.9	38	0.00	0	0	57	4	Sand/Gravel

Surcharge Pressure on ground: 0 -kp/f2

ALLPILE ANALYSIS AND RESULTS:

TOTAL LOADS:

Vertical Load, Q: 0.0 -kp

Vertical Load with Load Factor, Q: 0.0 -kp

Vertical Load with Load factor and Pile Cap, Q= 0.0 -kp

Load Factor for Vertical Load and Torsion= 1.0

Vertical Loads Supported by Pile Cap: 0 %

Load Factor for Vertical Loads: 1.0

PILE PROFILE:

Pile Length, L= 87.5 -ft

Top Height, H= -3 -ft

Slope Angle, As= 0

Batter Angle, Ab= 0.00 Batter Factor, Kbat= 1.00

*To consider the influence of different soils below the pile tip, bearing stratum is defined from pile tip extending to 4 Diameter of pile, which is 10.0-ft (Input Page F, Item 3)

SINGLE PILE:

Kdown= 0.7 Kup= 0.4 Ka= 1.00

Single Pile Vertical Analysis:

Total Ultimate Capacity (Down)= 1337.064-kp Total Ultimate Capacity (Up)= 527.969-kp

Total Allowable Capacity (Down)= 1337.064-kp Total Allowable Capacity (Up)= 527.969-kp

Weight above Ground= 0.00 Total Weight= 37.56-kp *Soil Weight is not included

Side Resistance (Down)= 661.476-kp Side Resistance (Up)= 490.408-kp

Tip Resistance (Down)= 675.588-kp Tip Resistance (Up)= 0.000-kp

Negative Friction, Qneg= 0.000-kp, which has been subtracted from Total Ultimate Capacity (Down)

Negative friction does not affect Total Ultimate Capacity (Up)

At Work Load= 0.00-kp, Settlement= 0.00000-in

At Work Load= 0.00-kp, Secant Stiffness Kqx= 3142.56-kp/-in

At Allowable Settlement= 1.000000-in, Capacity= 911.63-kp

Work Load, 0.00-kp, OK with the Capacity at Allowable Settlement= 1.00000-in, Capacity= 911.63-kp

Work Load, 0.00-kp, OK with the Allowable Capacity (Down)= 1337.06-kp

---

FACTOR OF SAFETY:

FSside	FStip	FSuplif	FSweight
1.0	1.0	1.0	1.0

Note: If the program cannot find a result or the result exceeds the upper limit. The result will be displayed as 99999.

1 1 1 1 1

Vertical Side and Tip Resistance vs. Total Settlement:

****

Xtop -in	Qside -kp	Qtip -kp	Qtotal -kp
0.001	2.5	0.9	3.4
0.119	265.2	19.2	284.4
0.169	359.0	28.4	387.4
0.213	433.3	37.5	470.8
0.253	491.5	46.7	538.2
0.290	536.5	55.8	592.3
0.324	570.9	65.0	635.9
0.356	596.9	74.1	670.9
0.387	616.1	83.2	699.3
0.416	630.3	92.2	722.5
0.444	640.5	101.2	741.7
0.471	647.7	110.2	757.8
0.498	652.7	119.1	771.8
0.524	656.2	127.9	784.1
0.550	658.5	136.7	795.3
0.575	660.0	145.4	805.5
0.601	661.0	154.1	815.1
0.626	661.4	162.7	824.1
0.651	661.5	171.2	832.7
0.676	661.2	179.7	840.9
0.701	660.6	188.0	848.6
0.726	659.6	196.3	855.9

0.750	658.3	204.5	862.8
0.775	656.6	212.6	869.2
0.799	654.5	220.7	875.1
0.823	652.0	228.6	880.6
0.847	649.2	236.5	885.6
0.871	646.1	244.2	890.3
0.895	642.7	251.9	894.6
0.919	639.2	259.4	898.6
0.942	635.6	266.9	902.5
0.966	632.0	274.2	906.2
0.990	628.5	281.5	910.0
1.013	625.1	288.7	913.7
1.037	621.8	295.7	917.5
1.060	618.5	302.7	921.2
1.084	615.2	309.5	924.8
1.107	611.7	316.3	928.0
1.130	607.5	323.0	930.5
1.154	606.8	329.5	936.3
1.178	606.0	336.0	941.9
1.202	605.2	342.3	947.5
1.226	604.4	348.6	952.9
1.249	603.5	354.7	958.3
1.273	602.7	360.8	963.5
1.297	601.9	366.7	968.6
1.320	601.1	372.6	973.7
1.344	600.3	378.3	978.6
1.367	599.5	384.0	983.4
1.391	598.7	389.5	988.2
1.414	597.9	395.0	992.8
1.437	597.0	400.4	997.4
1.461	596.2	405.6	1001.9

1.484	595.4	410.8	1006.2
1.507	594.6	415.9	1010.5
1.530	593.8	420.9	1014.7
1.554	593.0	425.8	1018.8
1.577	592.2	430.7	1022.8
1.600	591.3	435.4	1026.8
1.623	590.5	440.1	1030.6
1.646	589.7	444.7	1034.4
1.669	588.9	449.1	1038.1
1.691	588.1	453.6	1041.7
1.714	587.3	457.9	1045.2
1.737	586.5	462.2	1048.6
1.760	585.7	466.4	1052.0
1.783	584.8	470.5	1055.3
1.805	584.0	474.5	1058.5
1.828	583.2	478.5	1061.7
1.851	582.4	482.4	1064.8
1.873	581.6	486.2	1067.8
1.896	580.8	490.0	1070.8
1.918	580.0	493.7	1073.7
1.941	579.1	497.3	1076.5
1.963	578.3	500.9	1079.3
1.986	577.5	504.4	1082.0
2.008	576.7	507.9	1084.6
2.030	575.9	511.3	1087.2
2.053	575.1	514.7	1089.8
2.075	574.3	518.0	1092.2
2.097	573.5	521.2	1094.7
2.120	572.6	524.4	1097.1
2.142	571.8	527.6	1099.4
2.164	571.0	530.7	1101.7

2.186	570.2	533.7	1103.9
2.208	569.4	536.8	1106.2
2.231	568.6	539.7	1108.3
2.253	567.8	542.7	1110.4
2.275	566.9	545.5	1112.5
2.297	566.1	548.4	1114.5
2.319	565.3	551.2	1116.5
2.341	564.5	554.0	1118.5
2.363	563.7	556.7	1120.4
2.385	562.9	559.4	1122.3
2.517	558.0	575.0	1133.0
2.953	541.7	620.0	1161.8
3.384	525.5	655.2	1180.7
3.808	509.2	675.6	1184.8
4.221	493.0	672.8	1165.7
4.620	476.7	642.4	1119.1

Xtop - Total Vertical Settlement

Qside - Vertical Side Resistance (Down)

Qtip - Vertical Tip Resistance (Down)

Qtotal - Vertical Total Resistance (Ultimate)

Downward and Uplift Capacity vs Pile Length

The results are for single section pile. Multiple sections may not be correct!

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Length -ft	Qtip -kp	Qside -kp	Q_dw -kp	Qd_alw -kp	Weight -kp	Qsid* -kp	Q_up -kp	Qu_alw -kp
0.00	11.71	0.00	11.7	11.71	0.00	0.00	0.00	0.00
1.01	12.15	2.37	14.5	14.52	0.43	2.37	2.80	2.80
2.02	12.46	4.74	17.2	17.20	0.86	4.74	5.60	5.60
3.03	12.68	7.11	19.8	19.80	1.30	7.11	8.41	8.41
4.04	12.84	9.50	22.3	22.34	1.73	9.50	11.24	11.24
5.05	12.97	11.89	24.9	24.86	2.17	11.89	14.06	14.06
6.06	13.11	14.24	27.3	27.35	2.60	14.24	16.84	16.84
7.07	13.25	16.63	29.9	29.89	3.04	16.63	19.67	19.67
8.08	13.25	18.98	32.2	32.24	3.46	18.98	22.45	22.45
9.09	13.25	21.40	34.7	34.65	3.90	21.40	25.30	25.30
10.10	13.25	23.74	37.0	37.00	4.33	23.74	28.07	28.07
11.11	13.25	26.11	39.4	39.36	4.76	26.11	30.87	30.87
12.12	13.25	28.55	41.8	41.80	5.21	28.55	33.75	33.75
13.13	13.25	30.91	44.2	44.16	5.64	30.91	36.55	36.55
14.14	14.56	33.25	47.8	47.81	6.07	33.25	39.32	39.32
15.15	16.95	35.64	52.6	52.58	6.50	35.64	42.14	42.14
16.16	19.73	37.98	57.7	57.71	6.93	37.98	44.91	44.91
17.17	22.92	40.36	63.3	63.28	7.36	40.36	47.73	47.73
18.18	26.50	42.79	69.3	69.29	7.81	42.79	50.59	50.59
19.19	30.49	45.14	75.6	75.63	8.24	45.14	53.38	53.38
20.20	34.87	47.52	82.4	82.39	8.67	47.52	56.19	56.19
21.21	43.49	49.93	93.4	93.42	9.11	49.94	59.05	59.05
22.22	72.82	52.26	125.1	125.08	9.53	52.26	61.79	61.79
23.23	130.28	54.59	184.9	184.87	9.96	54.60	64.56	64.56

24.24	159.61	58.58	218.2	218.19	10.42	57.22	67.64	67.64
25.25	165.98	63.20	229.2	229.18	10.85	59.89	70.74	70.74
26.26	172.39	68.03	240.4	240.43	11.26	62.55	73.81	73.81
27.27	178.78	73.09	251.9	251.87	11.70	65.46	77.17	77.17
28.28	185.16	78.34	263.5	263.51	12.15	68.49	80.64	80.64
29.29	125.99	83.63	209.6	209.62	12.57	71.50	84.07	84.07
30.30	86.64	89.23	175.9	175.87	13.02	74.77	87.79	87.79
31.31	71.02	94.98	166.0	166.00	13.44	78.01	91.45	91.45
32.32	73.22	100.88	174.1	174.10	13.87	81.36	95.23	95.23
33.33	75.00	107.06	182.1	182.07	14.30	84.84	99.14	99.14
34.34	76.34	113.21	189.5	189.55	14.73	88.41	103.13	103.13
35.35	77.26	119.79	197.0	197.05	15.16	92.11	107.27	107.27
36.36	77.73	126.49	204.2	204.22	15.59	95.93	111.52	111.52
37.37	77.78	133.28	211.1	211.06	16.03	99.84	115.87	115.87
38.38	77.39	140.33	217.7	217.72	16.46	103.88	120.34	120.34
39.39	77.32	153.23	230.6	230.55	16.90	116.23	133.13	133.13
40.40	77.32	166.88	244.2	244.19	17.34	129.81	147.16	147.16
41.41	77.32	180.88	258.2	258.20	17.78	143.84	161.63	161.63
42.42	77.32	195.05	272.4	272.37	18.23	158.30	176.53	176.53
43.43	77.32	208.96	286.3	286.28	18.63	172.11	190.74	190.74
44.44	79.25	222.57	301.8	301.82	19.08	185.59	204.67	204.67
45.45	81.70	236.49	318.2	318.19	19.53	199.45	218.97	218.97
46.46	84.53	250.27	334.8	334.80	19.93	213.41	233.34	233.34
47.47	87.39	264.12	351.5	351.51	20.38	227.02	247.40	247.40
48.48	89.92	277.77	367.7	367.70	20.79	240.68	261.47	261.47
49.49	92.51	291.94	384.4	384.45	21.25	254.91	276.16	276.16
50.51	95.07	305.42	400.5	400.49	21.70	268.41	290.11	290.11
51.52	127.50	319.86	447.4	447.36	22.11	283.02	305.13	305.13
52.53	202.32	333.82	536.1	536.13	22.57	297.10	319.67	319.67
53.54	360.16	347.24	707.4	707.40	22.98	310.15	333.12	333.12
54.55	359.90	356.20	716.1	716.10	23.39	315.43	338.82	338.82

55.56	360.31	365.29	725.6	725.59	23.85	320.85	344.70	344.70
56.57	359.70	374.08	733.8	733.78	24.26	325.92	350.18	350.18
57.58	361.22	382.95	744.2	744.17	24.72	331.22	355.94	355.94
58.59	384.42	391.11	775.5	775.53	25.14	335.08	360.22	360.22
59.60	408.10	400.62	808.7	808.71	25.60	341.35	366.95	366.95
60.61	434.63	409.44	844.1	844.07	26.02	346.19	372.21	372.21
61.62	462.94	417.97	880.9	880.91	26.43	350.94	377.37	377.37
62.63	493.24	426.80	920.0	920.04	26.90	355.92	382.82	382.82
63.64	525.66	435.97	961.6	961.63	27.31	361.69	389.00	389.00
64.65	560.51	443.57	1004.1	1004.08	27.73	364.93	392.66	392.66
65.66	599.10	453.26	1052.4	1052.36	28.20	371.05	399.25	399.25
66.67	640.68	461.74	1102.4	1102.43	28.61	375.48	404.10	404.10
67.68	677.11	470.00	1147.1	1147.11	29.03	379.87	408.89	408.89
68.69	676.92	481.33	1158.3	1158.25	29.51	387.63	417.14	417.14
69.70	676.70	490.68	1167.4	1167.38	29.92	392.41	422.33	422.33
70.71	676.05	500.25	1176.3	1176.30	30.34	398.26	428.59	428.59
71.72	675.53	509.34	1184.9	1184.88	30.75	402.78	433.54	433.54
72.73	676.26	519.66	1195.9	1195.93	31.23	409.15	440.38	440.38
73.74	676.78	529.64	1206.4	1206.42	31.65	415.12	446.78	446.78
74.75	675.34	538.09	1213.4	1213.43	32.07	419.29	451.35	451.35
75.76	675.55	548.42	1224.0	1223.96	32.48	425.23	457.72	457.72
76.77	675.63	558.37	1234.0	1234.00	32.97	431.25	464.22	464.22
77.78	675.49	568.07	1243.6	1243.56	33.39	436.94	470.32	470.32
78.79	677.23	577.47	1254.7	1254.69	33.80	441.45	475.26	475.26
79.80	676.68	587.11	1263.8	1263.79	34.22	447.03	481.25	481.25
80.81	675.92	596.94	1272.9	1272.86	34.71	452.84	487.55	487.55
81.82	677.10	607.13	1284.2	1284.24	35.13	458.67	493.80	493.80
82.83	675.75	616.01	1291.8	1291.75	35.55	463.89	499.44	499.44
83.84	676.57	625.99	1302.6	1302.55	35.97	469.54	505.50	505.50
84.85	677.23	636.12	1313.4	1313.35	36.38	475.24	511.62	511.62
85.86	675.75	645.50	1321.2	1321.25	36.88	480.65	517.53	517.53

86.87	675.86	654.90	1330.8	1330.76	37.30	486.05	523.35	523.35
87.88	675.99	665.68	1341.7	1341.67	37.72	493.09	530.80	530.80
88.89	676.27	674.57	1350.8	1350.84	38.14	496.89	535.03	535.03
89.90	675.87	684.74	1360.6	1360.62	38.56	503.74	542.29	542.29
90.91	675.82	694.74	1370.6	1370.56	39.06	509.37	548.43	548.43
91.92	675.41	703.71	1379.1	1379.12	39.48	514.39	553.87	553.87
92.93	677.17	714.59	1391.8	1391.76	39.90	520.29	560.19	560.19
93.94	676.45	723.43	1399.9	1399.88	40.32	525.18	565.49	565.49
94.95	675.57	731.99	1407.6	1407.56	40.74	529.88	570.62	570.62
95.96	677.26	742.68	1419.9	1419.94	41.16	535.57	576.73	576.73
96.97	676.08	752.74	1428.8	1428.83	41.66	542.46	584.12	584.12
97.98	677.53	763.20	1440.7	1440.74	42.08	547.98	590.06	590.06
98.99	676.06	771.62	1447.7	1447.68	42.51	552.50	595.00	595.00
100.00	677.04	781.42	1458.5	1458.46	42.93	557.77	600.70	600.70

FACTOR OF SAFETY:

FSside	FStip	FSup	FSweight
1.0	1.0	1.0	1.0

Note: Data can be selected, copied and pasted to Excel to create graphics

Length - Pile length, distance from pile top to tip (not from ground surface)

Qtip - Ultimate pile tip resistance

Qside - Ultimate pile side resistance

Q_dw - Ultimate pile downward resistance

Qd_alw - Allowable pile downward resistance

APPENDIX G

GBA - Important Information About This Geotechnical Report

Important Information about This

Geotechnical-Engineering Report

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

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

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

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

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

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

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

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

This Report's Recommendations Are Confirmation-Dependent

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

This Report Could Be Misinterpreted

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

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

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

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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NV5

Delivering Solutions
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