INFORMATION HANDOUT

For Contract No. 04-272824

At 04-SM-101-0.8/1.1

Identified by

Project ID 040000759

PERMITS

Caltrans Encroachment Permit - Pending

WATER QUALITY

Storm Water Data Report, dated May 16, 2022.

TECHNICAL REPORTS

Foundation Report, University Avenue Pedestrian Overcrossing, Bridge No. 35-0359, dated September 27, 2022, including Underground Classification document from the California Department of Industrial Relations, Division of Occupational Safety and Health, Mining and Tunneling Unit, dated August 9, 2017, as Appendix I in the Foundation Report for Bridge No. 35-0359.

Dist-County-Route: 04-SM101
Post Mile Limits: PM 0.8/1.1
Type of Work: Bike/Pedestrian Improvements
Project ID (EA): 0400000759 (04-272821)
Program Identification: HB4C
Phase: ☐ PID ☐ PA&ED ☒ PS&E

Regional Water Quality Control Board(s): San Francisco Bay (Region 2)
Total Disturbed Soil Area: 1.76 acre Post Construction Treatment Area: 0.4 acre
Alternative Compliance (acres): ______
Estimated Const. Start Date: 11/14/2022 Estimated Const. Completion Date: 12/08/2023
Risk Level: RL 1 ☐ RL 2 ☒ RL 3 ☐ WPCP ☐ Other: ______
Is the Project within a TMDL watershed? Yes ☒ No ☐
TMDL Compliance Units (acres): 0
Notification of ADL reuse (if yes, provide date): Yes ☐ Date: ______ No ☒

This Report has been prepared under the direction of the following Licensed Person. The Licensed Person attests to the technical information contained herein and the date upon which recommendations, conclusions, and decisions are based. Professional Engineer or Landscape Architect stamp required at PS&E.

05/16/2022
Daniel Ho, Registered Civil Engineer Date

I have reviewed the stormwater quality design issues and find this report to be complete, current and accurate:

M. Suleiman 11-1-2022
Mohammad Suleiman, Project Manager *Date*

Amrinder Jhajj 11/04/2022
Amrinder Jhajj, Designated Maintenance Representative *Date*

Kimberly for 11/9/22
Alex Macdonald, Designated Landscape Architect Representative *Date*

PP 11/10/2022
Norman Gonsalves, District/Regional Design SW Coordinator or Designee *Date*

REGISTERED PROFESSIONAL ENGINEER
Daniel Ho
No. 50914
Exp. 9/30/2023
CIVIL
STATE OF CALIFORNIA

[Stamp Required at PS&E only]

STORMWATER DATA INFORMATION

1. Project Description

The purpose of the project is to improve safety and connectivity for pedestrians and bicyclists at the US 101 / University Avenue interchange, and to improve traffic operations on the southbound US 101 to University Avenue off-ramp.

Pedestrian and Bicycle Improvements:
The project is needed to address a lack of safe, adequate pedestrian and bicycle facilities within the US 101 / University Avenue interchange, which limits pedestrian and bicycle access between the high density residential areas located to the west of US 101 and the retail and services provided to the east of US 101.

The project will construct a separate, 12-foot-wide pedestrian and bicycle overcrossing (POC) along the north side of the US 101 / University Avenue Overcrossing, with 12-foot-wide Class I facility from the new POC to Donohoe Street to the east, and Woodland Avenue to the west. The existing sidewalk along University Avenue between the overcrossing and Woodland Avenue would be removed and converted to a landscaped buffer between the Class I facility and University Avenue. The new, 560-foot-long, four-span POC would be constructed on CIDH piles with diameters ranging from 24 inches to 120 inches, approximately 30 feet to 115 feet deep.

The northbound loop-off ramp at University Avenue adjacent to Donohoe Street will be realigned with tighter radius to enhance pedestrian and bicyclist safety crossing the ramp, The new pavement will vary in width from 2 to 30 feet. The maximum depth of excavation for paving and sidewalk construction would be approximately 3 feet below the current ground surface.

Public use easement (for the Class 1 facility) has been acquired from the adjacent property owner along the west side of University Avenue between Woodland Avenue and the POC.

Traffic Improvements:
The intersection of University Avenue and US 101 southbound ramps currently operates at LOS C during both the AM and PM peak hours. The projected LOS for the intersection would deteriorate to E and D respectively for AM and PM peak hours in 2040. The intersection delay during PM peak period would increase from the current 24.2 seconds to 46 seconds in 2040 without the project. Adding a right turn lane (dual left and right turn lanes at the southbound off-ramp) would reduce the delay to 36.4 seconds.

The project proposes an additional 12-foot-wide lane to be constructed on the right side of the southbound US 101 / University Avenue off-ramp. The addition of approximately 200 feet of pavement would require excavation to a maximum depth of 3 feet. A traffic signal pole at the northeast corner of the southbound ramp intersection would be relocated approximately 15 feet to the north. An 18-inch diameter pier foundation, excavated to the depth of 6 feet, would be constructed to support the new pole. Additional signal poles would be installed on the west side of University Avenue across from the southbound off-ramp terminus. Depth of excavation would be a maximum of 10 feet.

Construction is estimated to take approximately 280 working days.

Existing Drainage:
The project site gently slopes to the northeast. Surface runoff from upstream drainage areas is collected via street gutters and drainage inlets upstream of the project site, and piped underground via a series of reinforced concrete pipes (RCP) through the project site. Surface runoff from the southbound off-ramp sheet flows across the University Avenue and US 101 southbound off-ramp embankments towards an unlined drainage ditch that ultimately discharges to a drainage inlet, and commingles with runoff from upstream areas. The runoff is then conveyed downstream beneath US 101 and through the city of East Palo Alto via 24" through 72" RCP's, to an outfall off Runnymede St that discharges into a vegetated open channel running parallel to Bay Trail, and eventually reaches the Bayshore Pond and the O'Connor Pump Station.

Surface runoff from the northbound off-ramp sheet flows to the center of the landscaped loop to a rock-lined drainage ditch. According to Caltrans as-Built plans for the "State Highway between 0.3 mile south of Willow Rd. and 0.5 mile south of San-Mateo-Santa-Clara county line", the loop was designed to act as a detention pond for surface runoff from the off-ramp and upstream drainage areas (from University Avenue), with an overflow inlet located near Donohoe St. Overflow from the detention pond eventually reaches the same system of 24" through 72" RCP's described above.

Proposed Drainage:
The drainage patterns will remain the same post-project.

Runoff generated by the new POC will be conveyed to both ends of the structure and collected by drainage inlets and downdrains. On the north side, the runoff will flow to the existing rock swale located within the loop while on the south side, the downdrain will discharge the runoff to the existing lined ditch/detention basin adjacent to the southbound off-ramp. Runoff from the Class 1 facility on the north side will sheet flow to the same rock swale. Runoff from large storm events will be conveyed via the overflow drain to the downstream City piped storm drain system.

Runoff from the Class 1 facility south of the POC will sheet flow to the landscaped buffer between the the Class 1 facility and University Avenue.

The net impervious area created by the project is estimated at about 0.21 AC. It is anticipated that the additional runoff will be handled by the existing system.

The total disturbed soil areas (DSA) for the project is 1.76 acres. The DSA was estimated from AutoCAD using the project topographic mapping and includes areas for construction, access, staging, and existing pavement removed that exposes the underlying soil.

The net new impervious area (NNI) is 0.27 acre. The replaced impervious surface (RIS) is 0.50 acre. The NNI was calculated by subtracting the total existing impervious area intended to be removed from the total new impervious area.

Table 1.1 – Summary of the Project DSA and Impervious Areas

Right-of-way	DSA (acres)	Existing Impervious Area (acres)	Post-Project Impervious Area (acres)	Net New Impervious Area (acres)	Replaced Impervious Surface (acres)	Project Treatment Obligation (acres)
State	1.76	2.33	2.60	0.27	0.5	0.77

The project will construct 0.37 acre of improvements for bicyclists and pedestrian. Therefore, the project treatment obligation is 0.4 acre.

2. Site Data and Stormwater Quality Design Issues

The project is located within the jurisdictions of Caltrans District 4 and the San Francisco Bay Regional Water Quality Control Board (SFBRWQB).

Hydrologic Unit

The project site is located in Hydrologic Sub-area (HAS) Number 205.50, Santa Clara Hydrologic Unit, and Palo Alto Hydrologic Area. 401 Certificate will likely not be required as a compliance with the Federal Water Act. There are no known Drinking Water Reservoirs and/or Recharge Facilities within the project limits.

Receiving Water Bodies, Pollutants and Beneficial Uses

The closest body of water within the project limit is San Francisquito Creek. San Francisquito Creek is located in northwestern Palo Alto. It originates adjacent to US 101 approximately 0.2 mile south of US 101/University Ave Interchange and flows northerly through the city of Palo Alto eventually merging into San Francisco Bay.

San Francisquito Creek and South San Francisco Bay are in the Clean Water Act Section 303(d) list for impaired waters and total maximum daily loads. Table 2.1 below shows the pollutant, source, and proposed or approved total maximum daily load (TMDL) date for the receiving water bodies.

Table 2.1 - 303(d) list of pollutants

Waterbody	303(d) Listed Pollutant	Potential Sources	TMDL Date
San Franciscoquito Creek	Diazinon	Urban Runoff/Storm Sewers	2007 (Approved
	Sedimentatation/Siltation	Nonpoint Source	2013
	Trash	Illegal Dumping; Urban runoff/Storm Sewers	2021
San Francisco Bay, South	Chlordane	Nonpoint Source	2013
	DDT (dichlorodiphenyltrichorethan	Nonpoint Source	2013
	Dieldrin	Nonpoint Source	2013
	Dioxin compounds (including 2, 3, 7,8 – TCDD)	Atmospheric Deposition	2019
	Furan Compounds	Atmospheric Deposition	2019
	Invasive Species	Ballast Water	2019
	Mercury	Atmospheric Deposition Industrial Point Source Municipal Point Source Natural Source Nonpoint Source Resource Extraction	2008
	PCBs (Polychlorinatedbiphenyls)	Unknown Nonpoint Source	2008
	PCBs (Polychlorinated biphenyls) (dioxin-like)	Unknown Nonpoint Source	2008
	Selenium	Domestic Use of Ground Water	2019
	Selenium	Domestic Use of Ground Water	2019

Clean Water Act 401 Certification is required for any project that may result in a discharge into the waters of the state to ensure that the proposed project will not violate state water quality standards. The project will not require a 401 Certification, because no discharge of dredged or fill material into waters of the US is anticipated. There is no bridge widening or work planned within the creek channels. The improvements would be outside of any natural waterways and nearby wetlands. There are no drinking water reservoirs or recharge facilities within the project limits.

The Region 2 Basin Plan lists the identified beneficial uses of inland surface waters for San Franciscoquito Creek and South San Francisco Bay. They are listed in the following table:

Table 2.2 – Beneficial uses

Waterbody	San Francisco Bay Basin Plan Beneficial Uses	Sediment-Sensitive water Body
San Franciscoquite Creek	COLD, WARM, MIGR, SPWN, WILD	True
San Francisco Bay, South	IND, COMM, SHEL, EST, MIGR, RARE, SPWN, WILD, REC-1, REC-2 and NAV	

Source: Features identified from Water Quality Planning Tool. < http://svctenvims.dot.ca.gov/wqpt/wqpt.aspx >
Surface water beneficial uses identified in the San Francisco Bay Basin Plan (RWQCB, 2010).

SHEL = shellfish harvesting
MIGR = fish migration
IND = industrial service supply
EST = estuarine habitat
NAV = navigation
REC-1 = water contact recreation
REC-2 = non-contact water recreation
WARM = warm freshwater habitat
COLD = cold freshwater habitat
WILD = wildlife habitat
COMM = commercial and sport fishing
SPWN = spawning, reproduction, and/or early development
FRSH = freshwater replenishment
RARE = preservation of rare and endangered species

Per Region 2's Basin Plan dated May 04, 2017, the neighboring water bodies (such as San Franciscoquito Creek) contain three beneficial uses (COLD, MIGR and SPWN). Therefore, the project area is considered as a high-risk receiving watershed area.

Climate

The project area is characterized with moderate climatic conditions. This consists of mild winters, warm summers, small daily and seasonal temperature ranges and mild humidity.

Typical temperatures would range from 55°F to 81°F in July and 39°F to 58°F in January. There are no seasonal construction restrictions. The rainy season dates are from October 15 through April 15.

Based on statistics from Caltrans, the average annual rainfall precipitation is 19.66 inches in HAS No. 205.50 (covers 147,267 ac, where the project is located), which is principally during the months of November through March. January usually has the most precipitation accumulation. The 25-year rainfall intensity duration curve was obtained from National Oceanic and Atmospheric Administration (NOAA). NOAA utilizes the rainfall data from various rain gauges around the State and generates the intensity duration frequency (IDF) curves. See Supplemental Attachments section for additional information.

Topography and Soil Characteristics

The city of East Palo Alto is located in the southeast corner of San Mateo County along the southwestern shore of San Francisco Bay's South Bay. The city, including areas both to the west and east of US 101, is bound on the north by the city of Menlo Park, on the west by the city of Palo Alto, on the east by the San Francisco Bay, and on the south by sloughs leading to San Francisquito Creek and the Bay.

The project site gently slopes to the northeast. Elevations at the project site range from 13 to 40 feet above sea level.

According to the Natural Resources Conservation Services, USDA, the project site is mapped as Soil Map Unit 131, "Urban land - Elpaloalto complex, 0 to 2 percent slopes." Detailed description of Map Unit 131 is described as Alluvial fans landform that is alluvium derived from metamorphic and sedimentary rock and/or alluvium from metacolcanics with typical profile of clay loam in the upper 17 inches and underlain by silty clay loam.

Aerially Deposited Lead (ADL) and other Hazardous Wastes

Potential for soil conditions includes aerially deposited lead, metals and petroleum hydrocarbons within project boundaries. If contaminated material is encountered during construction, the material will be handled in accordance with the regulatory requirement.

Geology and Groundwater Flow

The study area is located along the southwestern margin of the San Francisco Bay (Bay), which occupies a major structural depression between the Santa Cruz mountains to the west and the East Bay hills to the east. Regional geology includes a series of continental and marine sediments overlying bedrock, which is exposed in the surrounding highlands to the west and consists of Jurassic and Cretaceous Franciscan Complex rocks and Pliocene marine sediments. Local geology consists of a series of Holocene epoch Quaternary alluvium (Brabb, Graymer, and Jones 1998). Geologic subunits consist of the following:

- Floodplain Deposit (Qhfp) – (Holocene) Medium to dark gray, dense, sandy to silty clay. Lenses of coarser material (silt, sand and pebbles) may be locally present. Flood plain deposits usually occur between levee deposits (Qhl) and basin deposits (Qhb).
- Natural levee deposits (Qhl) – (Holocene) Loose, moderately to well-sorted sandy or clayey silt grading to sandy or silty clay. These deposits are porous and permeable and provide conduits for transport of ground water. Levee deposits border stream channels, usually both banks, and slope away to flatter floodplains and basins.

Historical site characteristic information obtained from the Environmental Database Report Historical Topographic Map Report was used to establish the most likely groundwater flow direction in the project area. While regional groundwater flow is typically toward the Bay, local groundwater flow may be subject to local variations, under tidal influence, and subject to local and temporary changes. This means that the project area groundwater generally flows in a northeast direction towards the Bay shoreline. The groundwater flow gradient is very low, ranging from approximately 0.003 feet per foot to 0.005 feet per foot. The groundwater elevation is expected at approximately 11 feet below existing ground elevation.

Land Use

The project locates in a highly developed area. Land use in the proximity of the project includes residential and commercial buildings. Land use impacts are expected to be short-term construction related.

3. Construction Site BMPs to be used on Project

Risk Assessment

The R factor was determined from the EPA's "Stormwater Phase II Final Rule – Construction Rainfall Erosivity Waiver Fact Sheet" is determined to be 43.63; the K factor was determined from the Caltrans Water Quality Planning Tool websiteto be 0.32; and the LS factor was determined from the Caltrans Water Quality Planning Tool to be 0.22. See the Required Attachments for the sediment risk factor input values.

The combined low sediment risk and high receiving water risk results in this project being classified as Risk Level 2.

Storm Water Pollution Prevention Plan

The project has a DSA of 1.76 acres. A Storm Water Pollution Prevention Plan (SWPPP) must be prepared by the contractor and approved by Caltrans prior to the start of construction. The SWPPP should also include the development of a Construction Site Monitoring Program (CSMP) that presents procedures and methods related to the visual monitoring and sampling and analysis plans for non-visible pollutants, sediment and turbidity, pH, receiving waters and temporary active treatment systems (if used). The SWPPP should be prepared by a QSD-certified personnel.

Rain Event Action Plan

Risk Level 2 projects are required to prepare a Rain Event Action Plan (REAP). The quantities and costs for REAP are included in the PS&E.

Monitoring and Reporting

Performance of stormwater sampling at all discharge locations is required. Since this project is Risk Level 2, Numeric Action Levels (NALs) are applicable.

Construction Site BMP Strategy

Construction work for the project is anticipated to take approximately 13 months. Whenever possible, the scheduling of earth-disturbing construction activities should not be made during the anticipated rain events. To mitigate any potential runoff or run-on within the project area, construction site BMPs shall be installed prior to the start of construction or as early as feasibly possible during construction. DSAs will be protected in accordance with the project's pollution control measures. The construction site BMP strategy to be considered for this project will consist of the following:

- Soil Stabilization Measures
- Sediment Control Measures
- Tracking Control
- Non-storm Water Management Measures
- General Construction Site Management
- Storm Water Sampling and Analysis

Soil Stabilization and Sediment Control Measures

Disturbed soils and slopes will be managed with soil stabilization and sediment control measures. Soil stabilization and sediment control include placing linear sediment barriers – such as silt fencing at the toe of excavation and embankment slopes to prevent erosion from run-on sources. Contour grading of slopes include surface roughening by walking the slopes with tracked equipment. Immediately thereafter, slope interruption devices such as fiber rolls will be installed at intervals as specified in the Temporary Water Pollution Control Plans and Erosion Control Plans, and temporary hydraulic mulch (bonded fiber matrix) or hydroseed will be hydraulically applied. Check dams, consisting of silt fencing and fiber rolls, will be placed across ditches that drain to natural areas or drainage inlets to reduce scour and channel erosion. Wherever possible, early implementation of permanent erosion control seeding or landscape planting will be performed. Locations of sediment control BMPs are identified in the Temporary Water Pollution Control Plans, included in the Supplemental Attachments.

Temporary drainage inlet protection will be deployed throughout the project at all existing and proposed drainage inlets to prevent sediment from discharging into receiving water bodies.

Locations of temporary drainage inlet protection are identified in the Temporary Water Pollution Control Plans. No environmentally sensitive areas have been identified within the project area.

Tracking Control

There is the potential for wind erosion. Off-site tracking of sediment onto US 101 and local roads will be limited by placing temporary construction entrances. Locations of these tracking control BMPs are identified in the Temporary Water Pollution Control Plans, included in the Supplemental Attachments.

Non-stormwater Management Measures

Dewatering may be required during the consruction of the project; however, a separate dewatering permit is not anticipated. It is expected that the installation of the large diameter CIDH piles will be by wet method in which the volume of water to be disposed will be minimal. The drilling operation will be done with mixing slurry material, all the water of the dewatering process will be collected into the baker tanks. After settlement of the slurry material and taking water test, the water of the baker tanks is anticipated to be drained into the city storm drain system. The estimated dewatering from the CIDH operation is approximately 160,000 gallons.

Groundwater extracted from temporary dewatering activities will be managed based on the groundwater quality within the project area. If contaminated groundwater is found within the project area, a waste discharge requirement or permit will be obtained before construction. The design of active treatment systems, if any, will be coordinated with Caltrans District 4 Office of Water Quality and the Construction Stormwater Coordinator.

Waste Management and Materials Pollution Control

Various waste management (including concrete washout facilities), materials handling, and other housekeeping BMPs will be used throughout the duration of the project. Temporary concrete washouts will be used to collect concrete, hot mix asphalt, and slurry waste generated by construction activities. Concrete waste management will be implemented during these activities and would comply with Caltrans' Standard Specifications (2018).

Job Site Management

Stockpiles of various kinds are anticipated and will be maintained with the appropriate soil stabilization, sediment control, and tracking control BMPs. Additional construction site management BMPs include paving and grinding operations, vehicle and equipment cleaning, fueling, and maintenance, piling operations, concrete curing and finishing, and material and equipment use over water. These efforts will be covered under Job Site Management for the project.

Storm Water Sampling and Analysis

This project is required to perform stormwater sampling at all discharge locations. Numeric Action Levels are applicable to this project because the project is Risk Level 2. The required specifications are included in the project special provisions.

All construction site BMPs will need periodical inspection and proper maintenance during construction.

A summary of the quantities for the construction site BMPs are shown in Table 4.1. The total construction site BMP cost is approximately $375,000.

Table 4.1. Construction Site BMP Cost Summary Table

Item Code	Item Description	Unit	Estimated Quantity
130100	Job Site Management	LS	LS
130300	Prepare Storm Water Pollution Prevention Plan	LS	LS
130310	Rain Event Action Plan	EA	12
130320	Storm Water Sampling & Analysis	EA	9
130330	Storm Water Annual Report	EA	1
130570	Temporary Cover	SQYD	10,000
130620	Temporary Drainage Inlet Protection	EA	16
130640	Temporary Fiber Roll	LF	1,980
130680	Temporary Reinforced Silt Fence	LF	710
130530	Temporary Hydraulic Mulch (Bonded Fiber Matrix)	SQYD	10,000
130710	Temporary Construction Entrance	EA	3
130730	Street Sweeping	LS	LS
130900	Temporary Concrete Washout	EA	5
130810A	Dewatering and Non Stormwater Discharge System	LS	LS
066595	Water Pollution Control Maintenance Sharing	LS	LS
066596	Additional Water pollution Control	LS	LS

4. Maintenance BMPs

Drain inlet markers are required for this project because inlets will be placed in areas accessible to pedestrians and bicycle traffic, generally on the local streets. Drain inlet markers will be done in accordance with the Caltrans Standard Plans (2018).

5. Other Water Quality Requirements and Agreements

No impacts are proposed that will require a 401 Certification or 404 Permit. There is no work proposed within or on the banks of creek; therefore, a Lake and Streambed Alteration Agreement from the California Department of Fish and Wildlife pursuant to Section 1600 of the Fish and Game Code will not be required.

6. Permanent BMPs

Permanent BMPs are strategies and measures to minimize and avoid water quality impacts in the post-construction condition. Permanent BMPs include design pollution prevention (DPP)/source- control measures and treatment BMP strategies.

Rapid Stream Assessment

The project does not have any stream crossings and rapid stream assessment is not required.

Design Pollution Prevention (DPP) BMP Strategy

All new fill slopes along the Class 1 trail on the north side will be vegetated with new trees and groundcover. Where no trees will be planted, erosion control measures will be implanted on the slopes. The goal during construction will be to implement temporary or permanent erosion control measures as soon as possible. Highway Planting, Erosion Control Plans and Special Provisions are included in the Plans, Specification and Estimates (PS&E).

The minimum anticipated erosion control measures for this project include:

- Move-in/Move-out (Erosion Control)
- Fiber Rolls
- Erosion Control (Hydroseed)
- Rolled Erosion Control Product (Netting)

The quantities and costs for individual DPP BMPs are listed in Table 5.1. The total DPP BMP cost is approximately $233,000.

Table 5.1. DPP BMP Cost Summary Table

Item Code	Item Description	Unit	Estimated Quantity
210280	Rolled Erosion Control Product (Netting)	SQFT	6,800
210300	Hydromulch	SQFT	36,300
210350	Fiber Rolls	LF	3,500
210430	Hydroseed	SQFT	36,300
210610	Compost (CY)	CY	180

Downstream Effects Related to Potentially Increased Flow, Checklist DPP-1, Parts 1 and 2

The increase of impervious surface for the project is minimal at 0.06 ac. Thus, the downstream effect is expected to be negligible. However, sediment control or pollution prevention BMPs are proposed in order to mitigate potential velocity increases, stabilize slopes, and minimize potential for erosion. Mitigation measures will include rock slope protection, dissipator tees, hydroseeding, and fiber rolls. The project will protect existing vegetation to the maximum extent feasible.

Slope/Surface Protection Systems, Checklist DPP-1, Parts 1 and 3

The project will be constructed to minimize erosion by disturbing slopes only when necessary, minimizing cut and fill areas to reduce slope lengths, and providing cut and fill slopes flat enough to allow revegetation to limit erosion rates,

Fiber rolls are placed, and permanent erosion control (compost, hydromulch, and hydroseed) are applied to the disturbed and newly graded slopes to prevent erosion and promote vegetation. The proposed erosion control measures for the project are delineated on the Erosion Control Plans, which are included in the Supplemental Attachments.

The effectiveness of the proposed erosion control materials has been verified by using the Revised Universal Soil Loss Equation 2 (RUSLE2).

Preservation of Existing Vegetation, Checklist DPP-1, Parts 1 and 5

The project will protect existing vegetation to the maximum extent practicable. Impacted existing vegetation consists primarily of landscaped trees, shrubs or ground cover. Areas of clearing and grubbing will be limited to those areas impacted by construction. No environmentally sensitive area has been identified within the project area.

Treatment BMP Strategy

The project is not required to consider permanent treatment BMPs because the project will not add more than one acre of impervious area.

In compliance with the San Francisco Bay Regional Water Board 2019 Cease and Desist Order, trash nets will be installed at end of pipes to remove solid waste from stormwater flowing in the drainage system where feasible.

Required Attachments

A. Project Vicinity Map

B. Project Plans (Layout, Drainage, Temporary Water Pollution Control, Erosion Control)

C. Disturbed Soil Area (DSA) Exhibit

D. Impervious Surface Area Exhibit

E. Risk Level Determination Documentation

F. Evaluation Documentation Form (EDF)

G. Construction Site BMP Consideration Form

Supplemental Attachments

- Checklist SW-1, Site Data Sources
- Checklist SW-2, Stormwater Quality Issues Summary
- Checklist SW-3, Measures for Avoiding or Reducing Potential Stormwater Impacts
- Checklist DPP-1, Parts 1–5 (Design Pollution Prevention BMPs)
- Checklist CS-1, Parts 1–6 (Construction Site BMPs)

Sources/Works cited

- AECOM, (April 2016), US 101/University Avenue Interchange Improvements: Initial Site Assessment (ISA) - City of East Palo Alto, California
- CSG Consultants, (July 2017), US 101/University Avenue Interchange Improvements: Water Quality Assessment Report (WQAR) - City of East Palo Alto, California
- California Department of Transportation, (July 2017), Storm Water Quality Handbooks – Project Planning and Design Guide
- California Department of Transportation, (May 2017), Construction Site Best Management practices (BMP) Manual
- CaliforniaRegional Water Quality Control Board, San Francisco Bay Region, *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*
- Brabb, EE., R.W. Graymer, and D.L. Jones. 1998 Geologic Map and Map Database of the Palo Alto 30' X60' Quadrangle, California. U.S. Geological Survey, Washington, DC.

Attachment A

Project Vicinity Map

Project Vicinity Map

Attachment B

Project Plans

(Layout, Drainage, Water Pollution Control, and Erosion Control)

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL HO No. 50914 Exp. 9-30-23 CIVIL STATE OF CALIFORNIA

AECOM
4 N. SECOND St
SUITE 675
SAN JOSE, CA 95113

CITY OF EAST PALO ALTO
1960 TATE STREET
EAST PALO ALTO, CA 94303

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. COORDINATES, DISTANCES AND BEARINGS SHOWN ARE BASED ON CALIFORNIA COORDINATE SYSTEM ZONE 3. THE HORIZONTAL DATUM IS NAD 1983. THE VERTICAL DATUM IS NGVD 1929.

LEGEND:

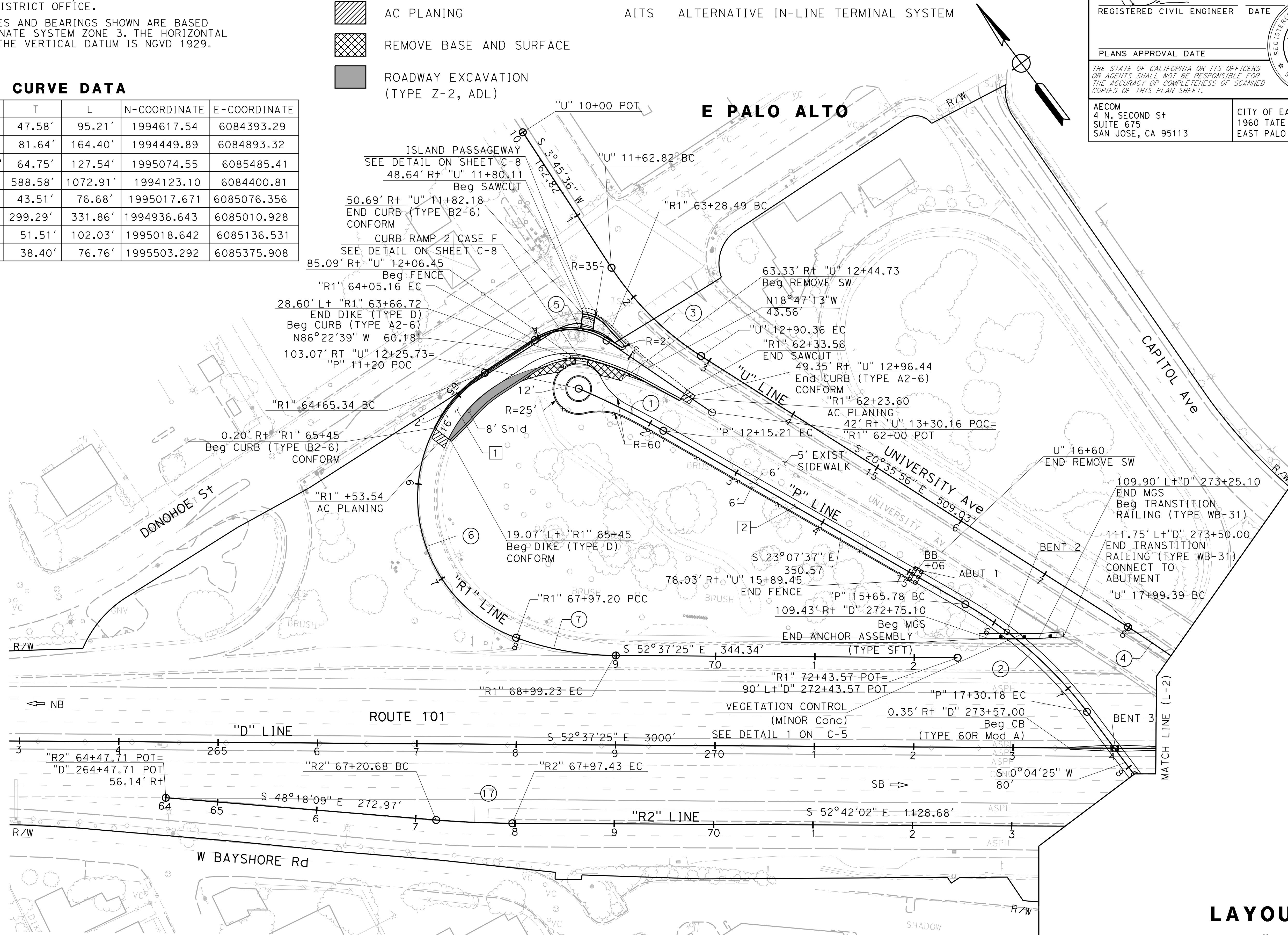
- AC PLANING
- REMOVE BASE AND SURFACE
- ROADWAY EXCAVATION (TYPE Z-2, ADL)

ABBREVIATIONS:

AITS ALTERNATIVE IN-LINE TERMINAL SYSTEM

CURVE DATA

No.	R	△	T	L	N-COORDINATE	E-COORDINATE
1	800′	6°49′09″	47.58′	95.21′	1994617.54	6084393.29
2	406′	23°12′02″	81.64′	164.40′	1994449.89	6084893.32
3	300′	24°21′31″	64.75′	127.54′	1995074.55	6085485.41
4	1050′	58°32′45″	588.58′	1072.91′	1994123.10	6084400.81
5	65′	67°35′26″	43.51′	76.68′	1995017.671	6085076.356
6	150′	126°45′38″	299.29′	331.86′	1994936.643	6085010.928
7	300′	19°29′07″	51.51′	102.03′	1995018.642	6085136.531
17	1000′	4°23′52″	38.40′	76.76′	1995503.292	6085375.908



LAYOUT

SCALE 1″ = 50′

100% SUBMITTAL

L-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR HOWARD MICHAEL

CALCULATED-DESIGNED BY JOSE CORONEL

CHECKED BY DANIEL HO

REVISED BY JC

DATE REVISED 5-16-22

LAST REVISION 5-16-22

DATE PLOTTED => 5/16/2022
TIME PLOTTED => 11:36:04 AM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	6	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL HO No. 50914 Exp. 9-30-23 CIVIL STATE OF CALIFORNIA

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4 N. SECOND St
SUITE 675
SAN JOSE, CA 95113

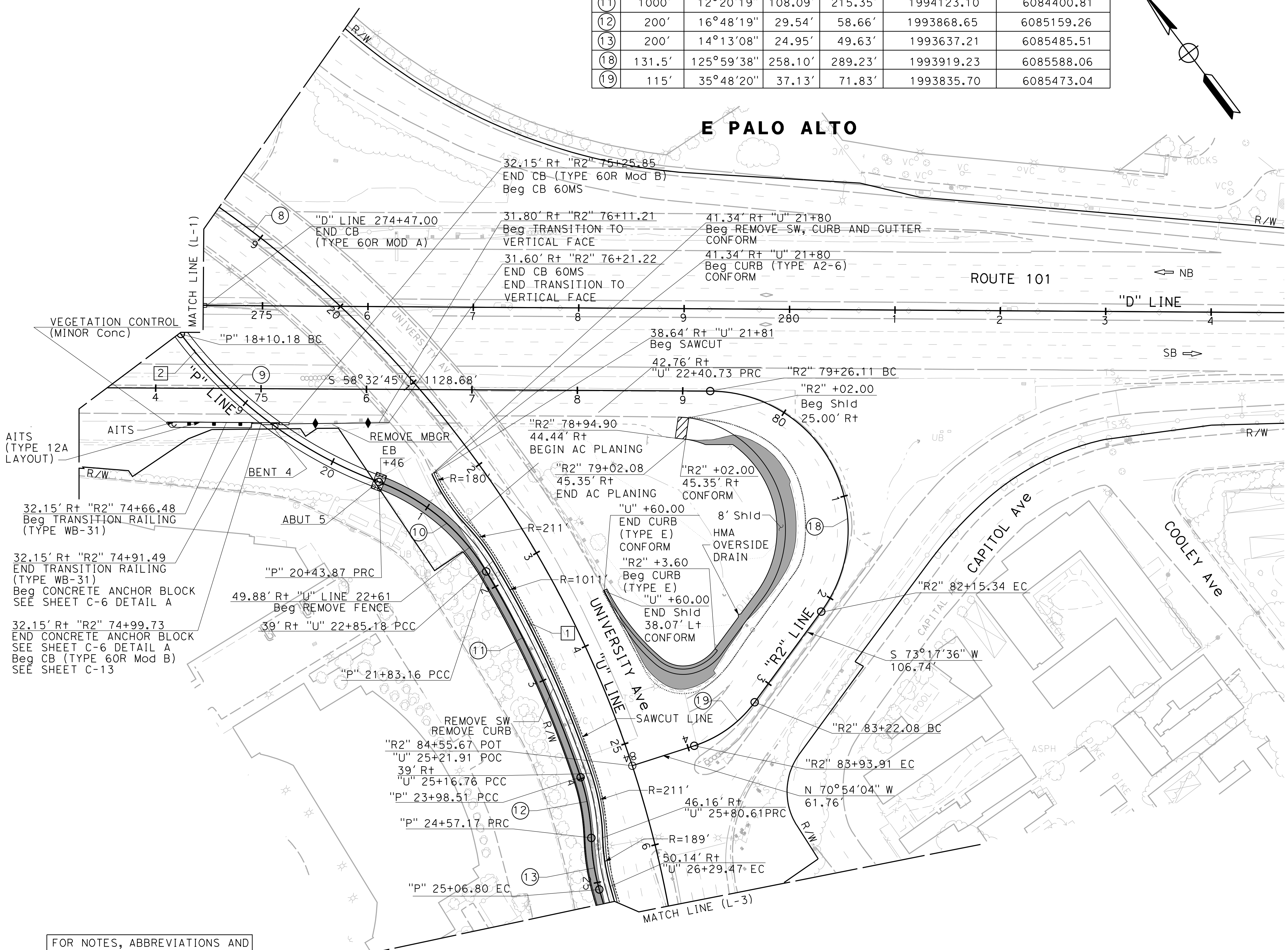
CITY OF EAST PALO ALTO
1960 TATE STREET
EAST PALO ALTO, CA 94303

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

CURVE DATA

No.	R	Δ	T	L	N-COORDINATE	E-COORDINATE
8	1050′	58°32′45″	588.58′	1072.91′	1994123.10	6084400.81
9	418′	32°35′39″	122.21′	237.79′	1994368.83	6085717.22
10	200′	38°43′42″	70.29′	135.19′	1994036.60	6085196.12
11	1000′	12°20′19″	108.09′	215.35′	1994123.10	6084400.81
12	200′	16°48′19″	29.54′	58.66′	1993868.65	6085159.26
13	200′	14°13′08″	24.95′	49.63′	1993637.21	6085485.51
18	131.5′	125°59′38″	258.10′	289.23′	1993919.23	6085588.06
19	115′	35°48′20″	37.13′	71.83′	1993835.70	6085473.04



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

LAYOUT

SCALE 1" = 50′

L-2

100% SUBMITTAL

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR HOWARD MICHAEL

CALCULATED-DESIGNED BY JOSE CORONEL

CHECKED BY DANIEL HO

REVISED BY JC

DATE REVISED 5-16-22

LAST REVISION 5-16-22

DATE PLOTTED => 5/16/2022
TIME PLOTTED => 11:57:53 AM

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	7	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL HO No. 50914 Exp. 9-30-23 CIVIL STATE OF CALIFORNIA

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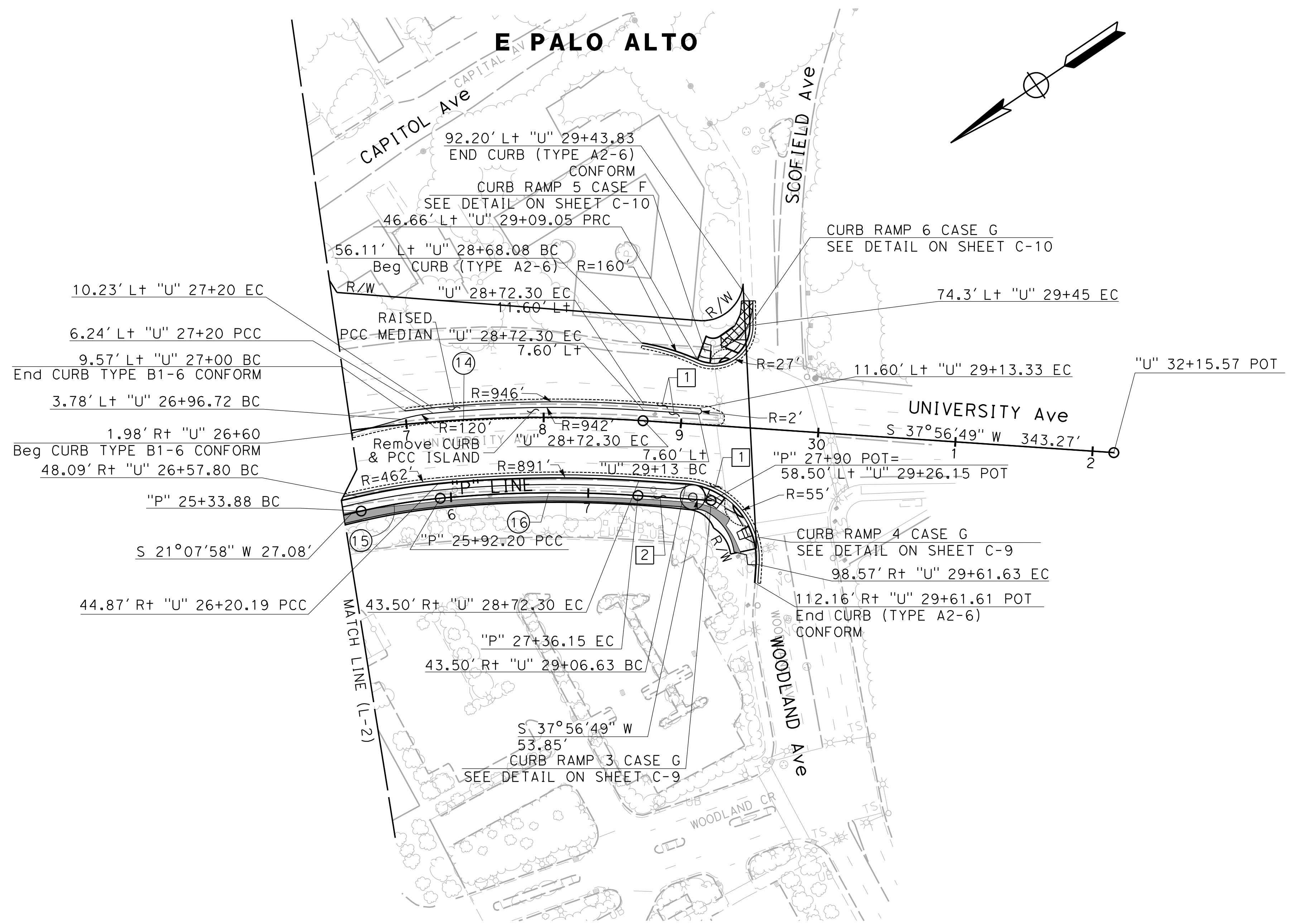
CITY OF EAST PALO ALTO
1960 TATE STREET
EAST PALO ALTO, CA 94303

CURVE DATA

No.	R	Δ	T	L	N-COORDINATE	E-COORDINATE
14	1050′	58°32′45″	588.58′	1072.91′	1994123.10	6084400.81
15	449′	07°26′31″	29.20′	58.32′	1993845.93	6084870.39
16	880′	09°22′21″	72.14′	143.95′	1994052.08	6084491.89



FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET L-1

100% SUBMITTAL

LAYOUT

SCALE 1" = 50′

L-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

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CALCULATED-DESIGNED BY: JOSE CORONEL
CHECKED BY: DANIEL HO
REVISED BY: JC
DATE REVISED: 5-16-22

DATE PLOTTED => 5/16/2022
TIME PLOTTED => 12:32:09 PM
LAST REVISION 5-16-22

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	29	134

REGISTERED CIVIL ENGINEER   DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
DANIEL HO
No. 50914
Exp. 9-30-23
CIVIL
STATE OF CALIFORNIA

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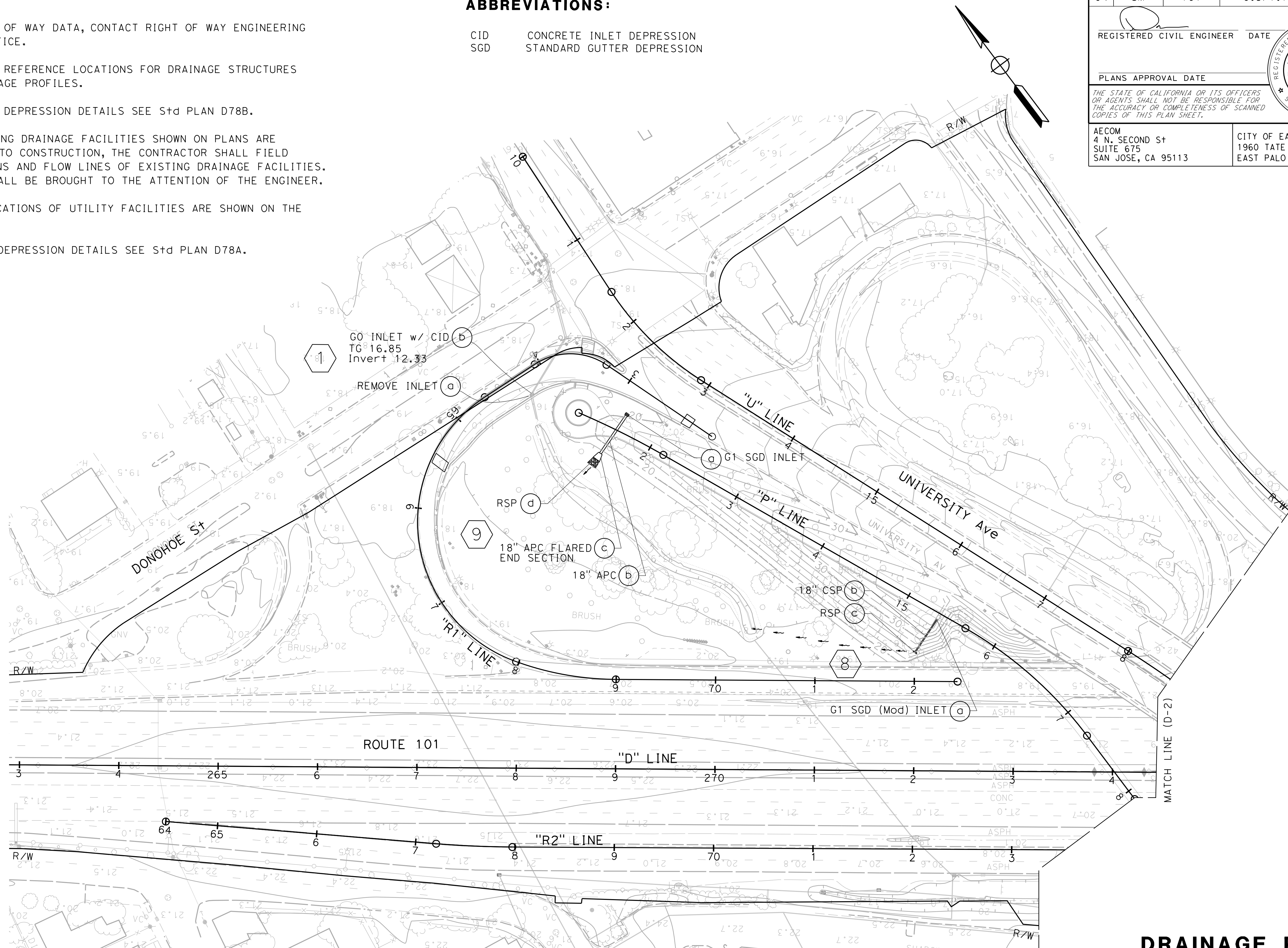
EAST PALO ALTO, CA 94303

NOTES:

1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. STATION AND OFFSET REFERENCE LOCATIONS FOR DRAINAGE STRUCTURES ARE SHOWN ON DRAINAGE PROFILES.
3. FOR CONCRETE INLET DEPRESSION DETAILS SEE Std PLAN D78B.
4. LOCATIONS OF EXISTING DRAINAGE FACILITIES SHOWN ON PLANS ARE APPROXIMATE. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS AND FLOW LINES OF EXISTING DRAINAGE FACILITIES. ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
5. INFORMATION AND LOCATIONS OF UTILITY FACILITIES ARE SHOWN ON THE UTILITY PLANS.
6. FOR STANDARD INLET DEPRESSION DETAILS SEE Std PLAN D78A.

ABBREVIATIONS:

CID	CONCRETE INLET DEPRESSION
SGD	STANDARD GUTTER DEPRESSION



DRAINAGE PLAN

SCALE 1" = 50'

D-1

100% SUBMITTAL

APPROVED FOR DRAINAGE WORK ONLY

CONSULTANT FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	CHECKED BY	REVISED BY	DATE REVISED
HOWARD MICHAEL	JOSE CORONEL	DANIEL HO	JC	5-16-22

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

LAST REVISION 5-16-22
DATE PLOTTED => 5/15/2022
TIME PLOTTED => 2:25:27 AM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	30	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
DANIEL HO
No. 50914
Exp. 9-30-23
CIVIL
STATE OF CALIFORNIA

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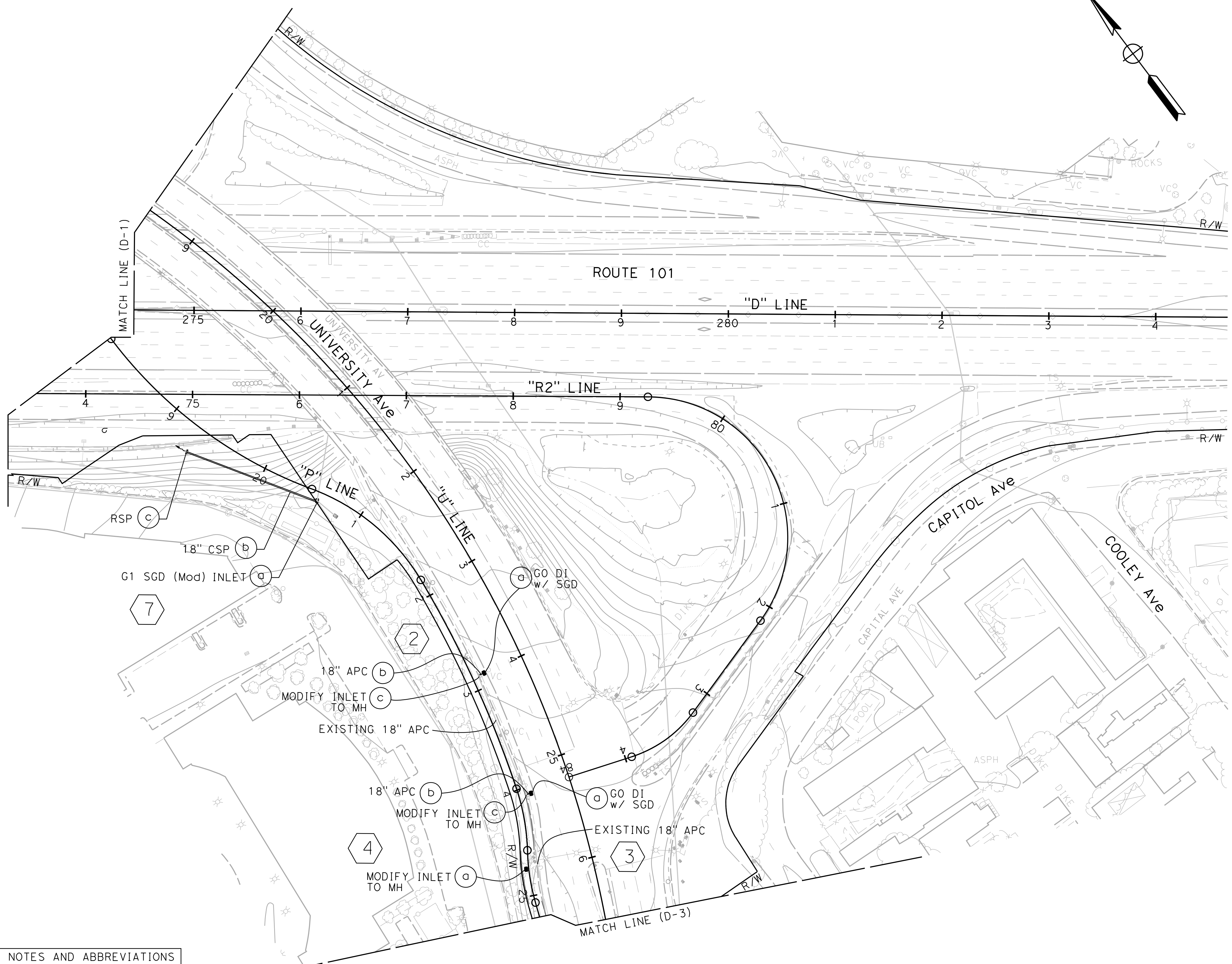

FOR NOTES AND ABBREVIATIONS SEE SHEET D-1

100% SUBMITTAL

APPROVED FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE 1" = 50'

D-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: HOWARD MICHAEL
CALCULATED-DESIGNED BY: JOSE CORONEL
CHECKED BY: DANIEL HO
REVISED BY: JC
DATE REVISED: 5-16-22

LAST REVISION: 5-16-22
DATE PLOTTED => 5/15/2022
TIME PLOTTED => 5:18:42 PM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	31	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL HO No. 50914 Exp. 9-30-23 CIVIL STATE OF CALIFORNIA

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EAST PALO ALTO, CA 94303

NOTE:

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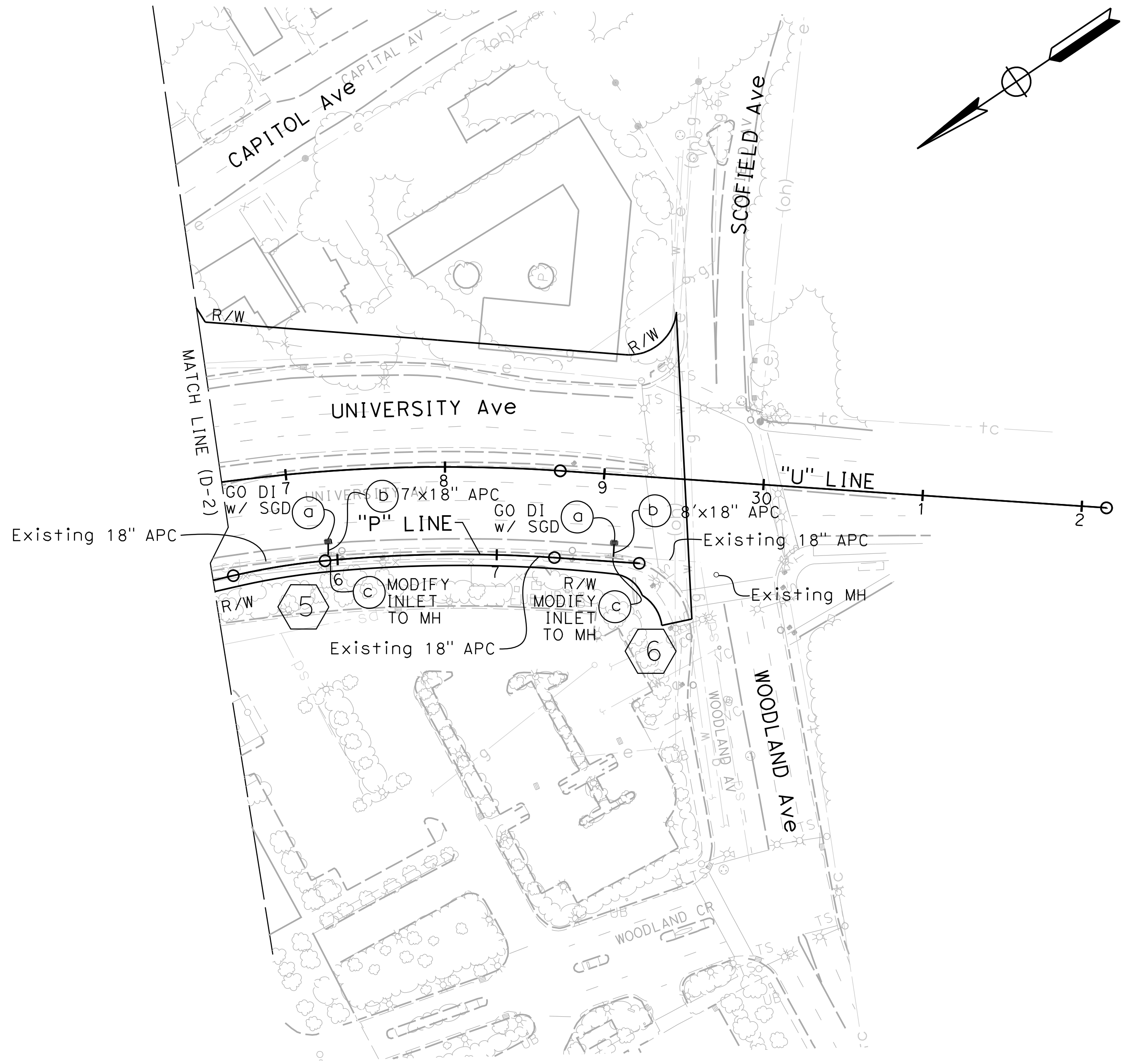

FOR NOTES, ABBREVIATIONS AND LEGEND, SEE SHEET D-1

100% SUBMITTAL

APPROVED FOR DRAINAGE WORK ONLY

DRAINAGE PLAN

SCALE 1" = 50'

D-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	REVISED BY	
HOWARD MICHAEL	JOSE CORONEL	JC	
	CHECKED BY	DATE REVISED	
	DANIEL HO	5-16-22	

LAST REVISION 5-16-22 DATE PLOTTED => 5/15/2022 TIME PLOTTED => 5:25:07 PM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	23	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL HO No. 50914 Exp. 9-30-23 CIVIL STATE OF CALIFORNIA

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1960 TATE STREET
EAST PALO ALTO, CA 94303

NOTES:

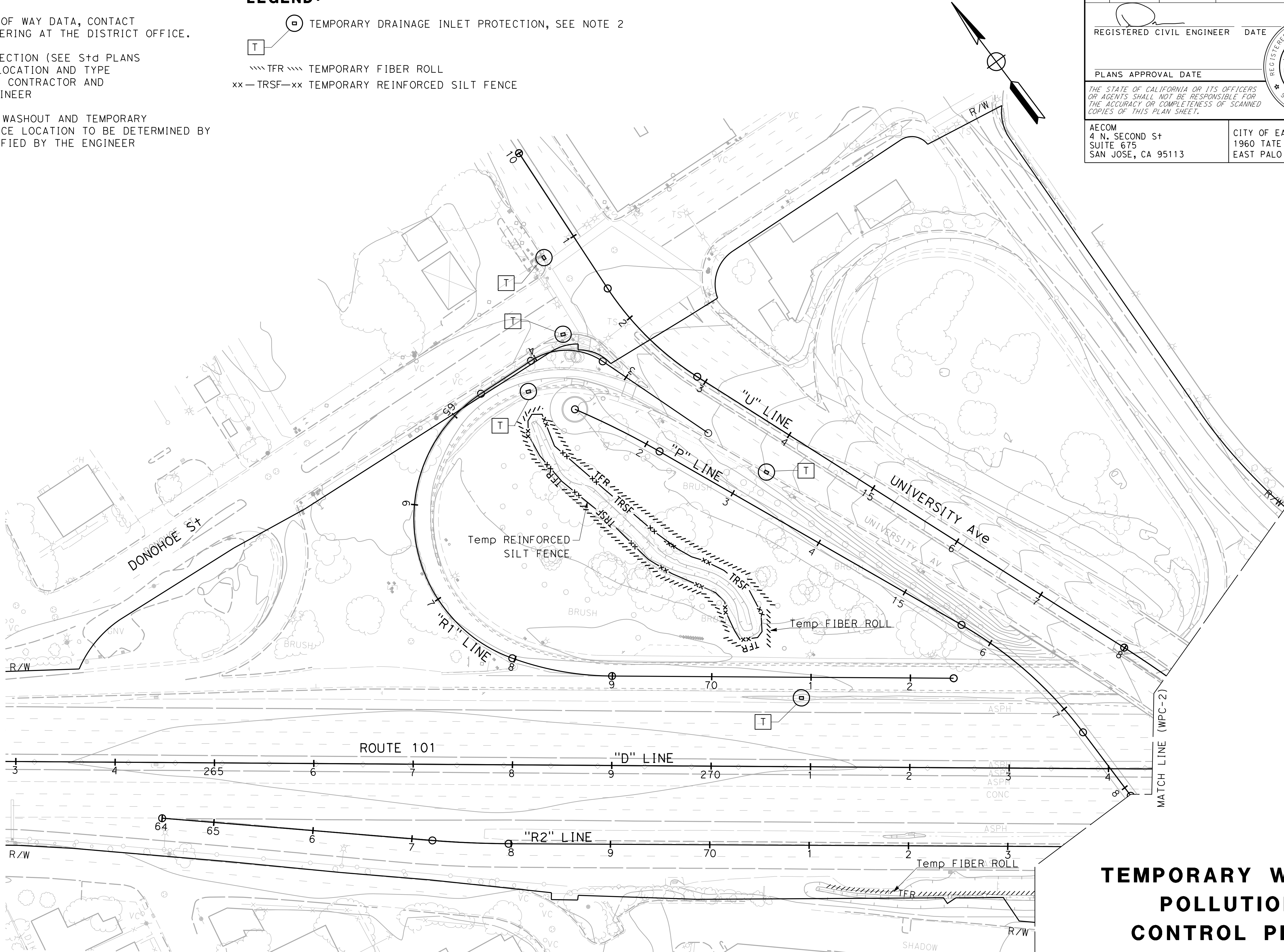
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. DRAINAGE INLET PROTECTION (SEE Std PLANS T61, T62, T63, T64) LOCATION AND TYPE TO BE DETERMINED BY CONTRACTOR AND VERIFIED BY THE ENGINEER
3. TEMPORARY CONCRETE WASHOUT AND TEMPORARY CONSTRUCTION ENTRANCE LOCATION TO BE DETERMINED BY CONTRACTOR AND VERIFIED BY THE ENGINEER

LEGEND:

T — TEMPORARY DRAINAGE INLET PROTECTION, SEE NOTE 2

TFR — TEMPORARY FIBER ROLL

xx — TRSF — xx TEMPORARY REINFORCED SILT FENCE



TEMPORARY WATER POLLUTION CONTROL PLAN

SCALE 1" = 50'

100% SUBMITTAL

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: HOWARD MICHAEL

CALCULATED-DESIGNED BY: JOSE CORONEL

CHECKED BY: DANIEL HO

REVISED BY: JC

DATE REVISED: 5-16-22

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	24	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL HO No. 50914 Exp. 9-30-23 CIVIL STATE OF CALIFORNIA

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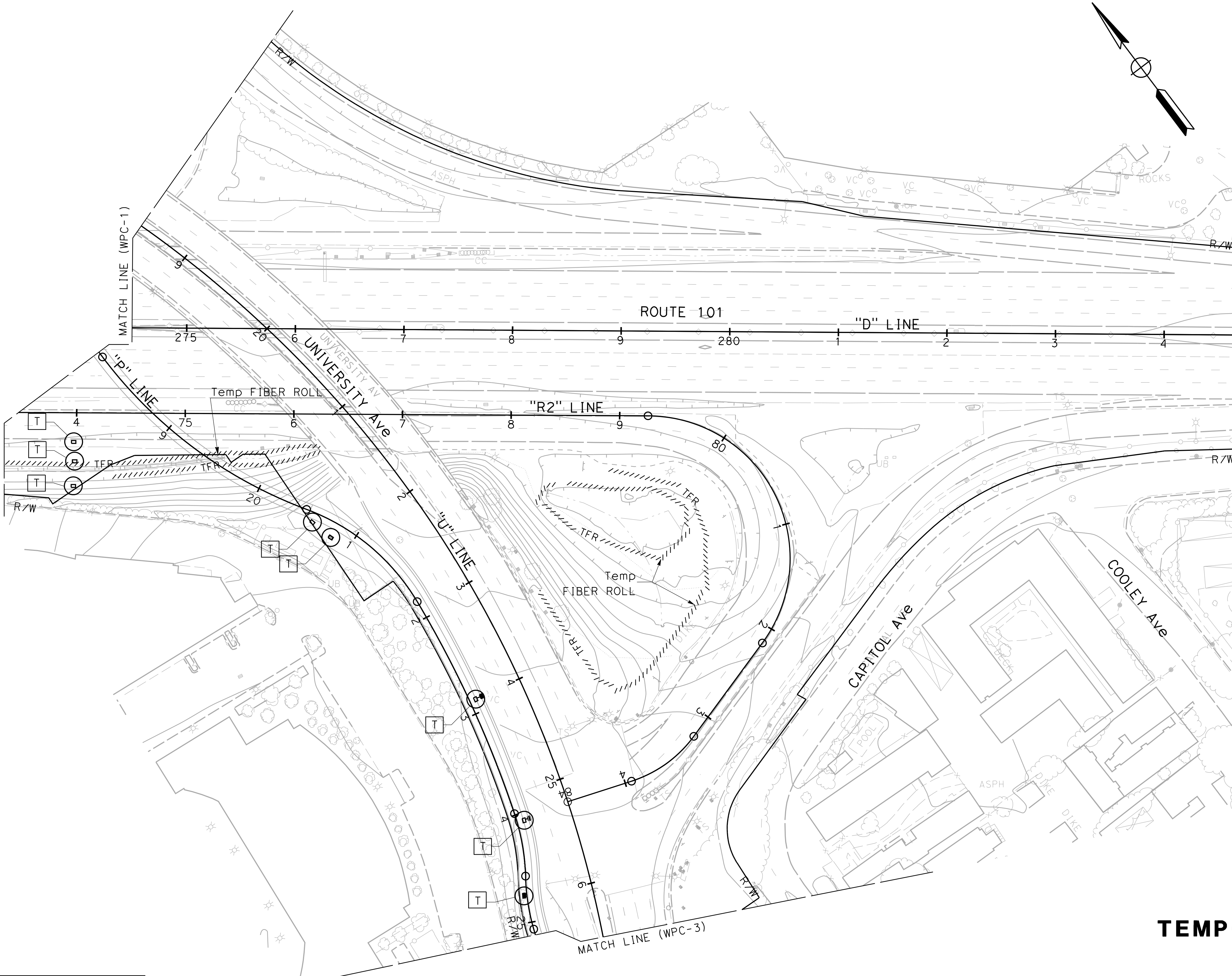

FOR NOTES AND LEGEND
SEE SHEET WPC-1

TEMPORARY WATER POLLUTION CONTROL PLAN

SCALE 1" = 50'

100% SUBMITTAL

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

WPC-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	CHECKED BY	REVISED BY	DATE REVISED
HOWARD MICHAEL	JOSE CORONEL	DANIEL HO	JC	5-16-22

LAST REVISION 5-16-22
DATE PLOTTED => 5/15/2022
TIME PLOTTED => 2:06:09 AM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	25	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DANIEL HO No. 50914 Exp. 9-30-23 CIVIL STATE OF CALIFORNIA

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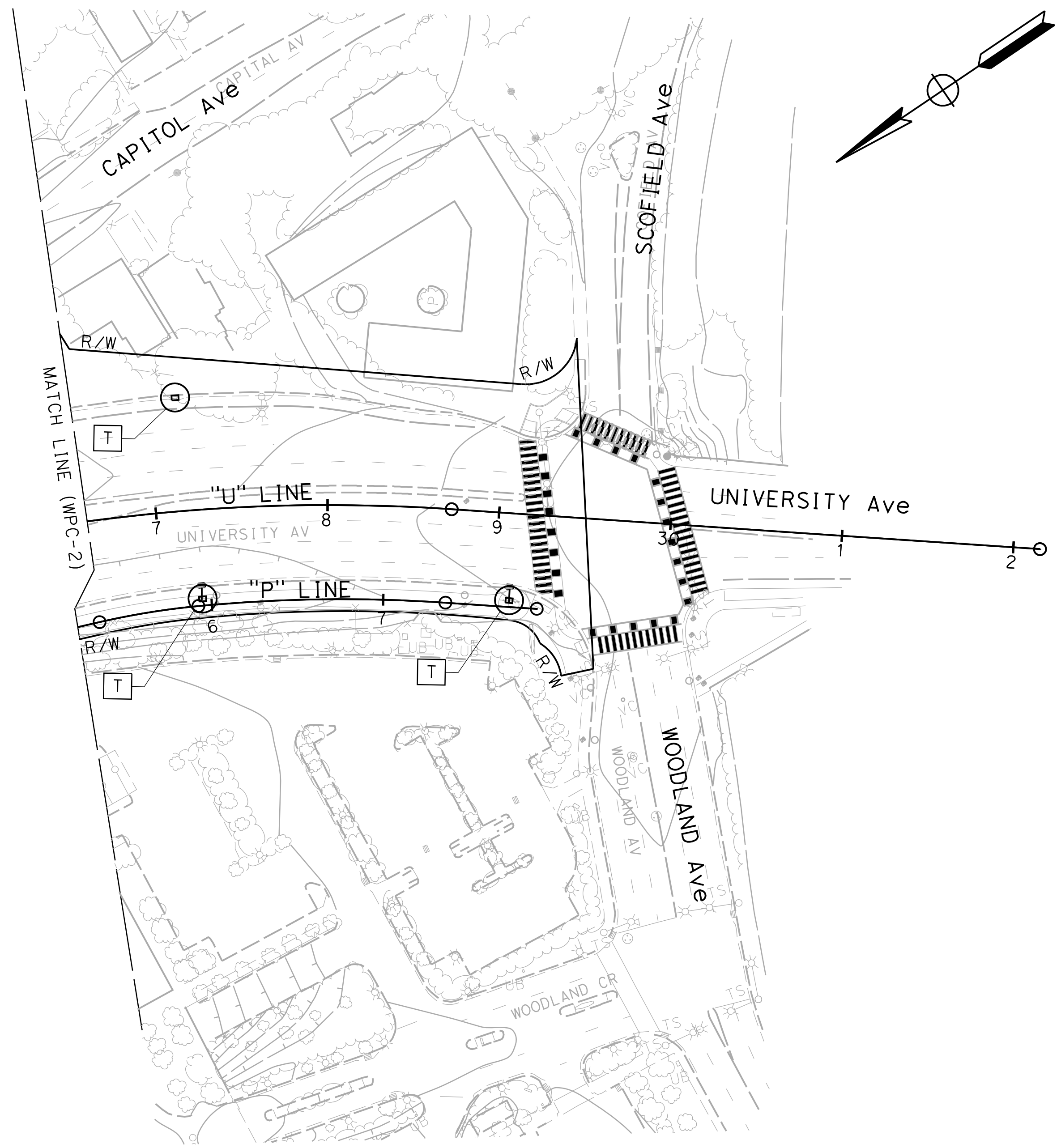
1960 TATE STREET
EAST PALO ALTO, CA 94303

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT
RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



FOR NOTES AND LEGEND
SEE SHEET WPC-1

TEMPORARY WATER POLLUTION CONTROL PLAN

SCALE 1" = 50'

WPC-3

100% SUBMITTAL

APPROVED FOR TEMPORARY WATER POLLUTION CONTROL WORK ONLY

CONSULTANT FUNCTIONAL SUPERVISOR	HOWARD MICHAEL
CALCULATED-DESIGNED BY	JOSE CORONEL
CHECKED BY	DANIEL HO
REVISED BY	JC
DATE REVISED	5-16-22

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans®

LAST REVISION 5-16-22 | DATE PLOTTED => 5/15/2022 | TIME PLOTTED => 2:18:15 AM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	80	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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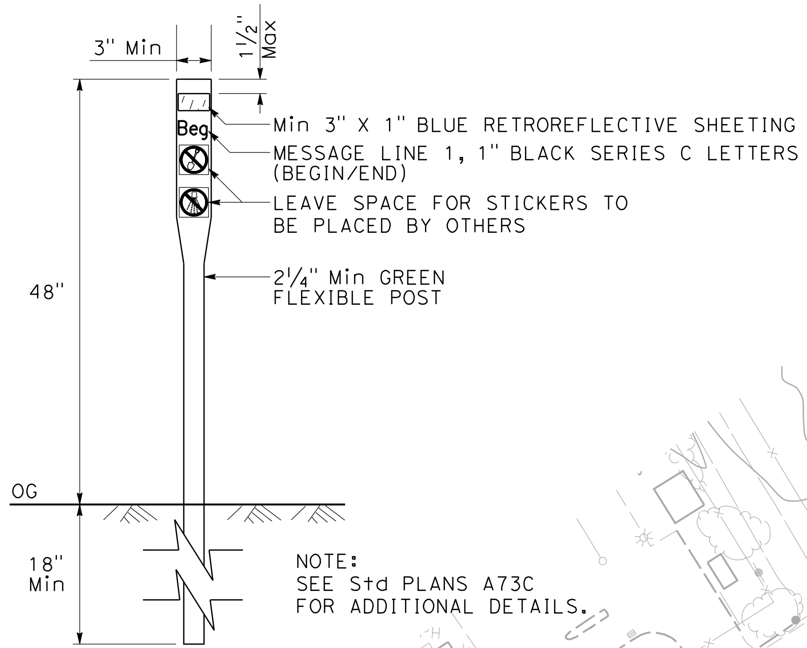
CITY OF EAST PALO ALTO
1960 TATE STREET
EAST PALO ALTO, CA 94303

NOTES:

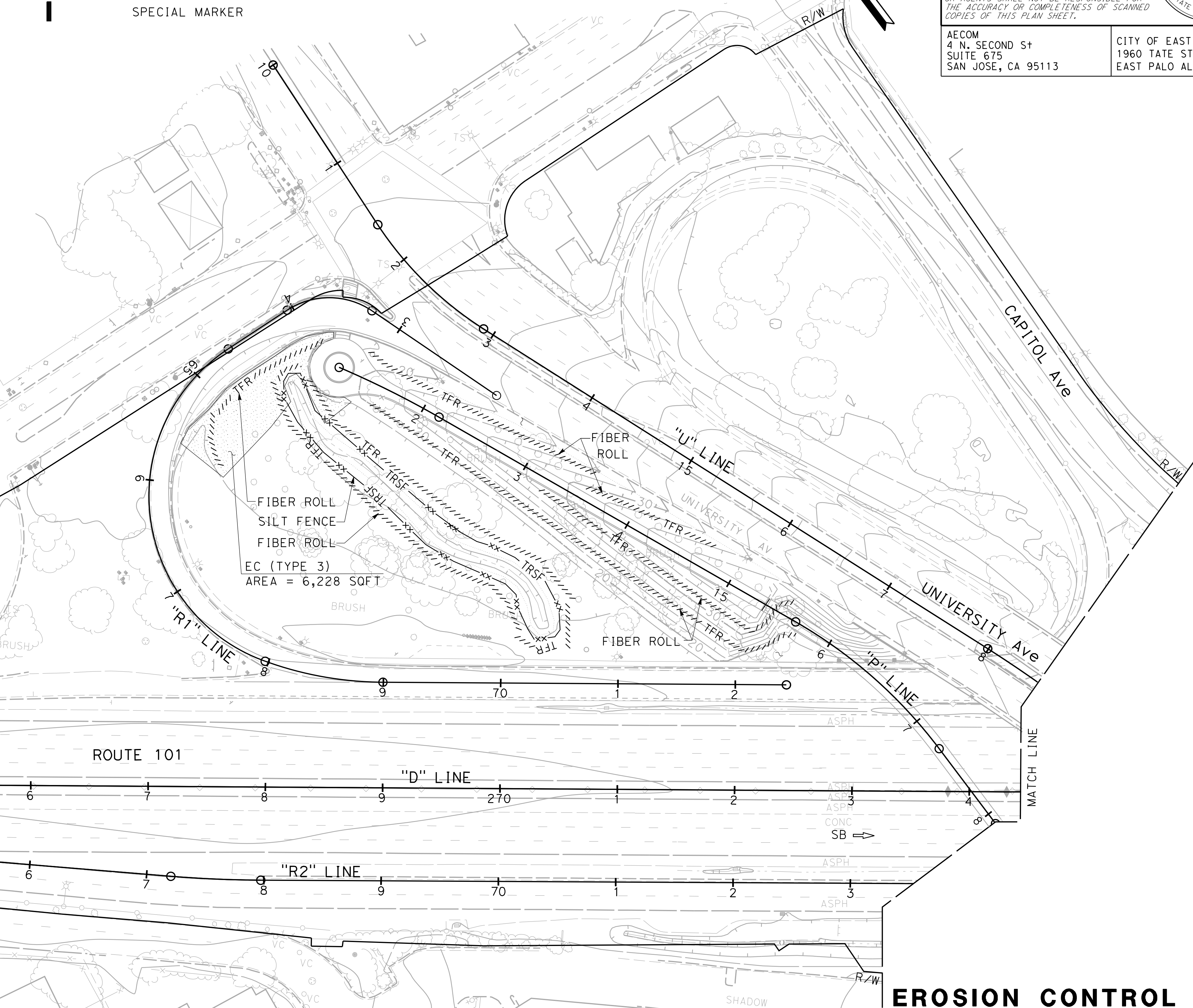
1. FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.
2. EXACT LIMITS OF WORK OR DEPLOYMENT OF EROSION CONTROL MATERIALS SHALL BE DETERMINED BY THE ENGINEER.
3. REFER TO DRAINAGE PLANS FOR BIOFILTRATION SWALES LOCATIONS AND DETAILS.

LEGEND:

- EROSION CONTROL (TYPE 2)
- EROSION CONTROL (TYPE 3)
- SPECIAL MARKER
- TFR — TEMPORARY FIBER ROLLS
- TRSF — TEMPORARY REINFORCED SILT FENCE



SPECIAL MARKER DETAIL



EROSION CONTROL PLAN

SCALE 1" = 50'

APPROVED FOR EROSION CONTROL WORK ONLY

100% SUBMITTAL

EC-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: HOWARD MICHAEL

CALCULATED-DESIGNED BY: JOSE CORONEL | CHECKED BY: DANIEL HO

REVISED BY: JC | DATE REVISED: 5-16-22

LAST REVISION 5-16-22 | DATE PLOTTED => 5/16/2022 | TIME PLOTTED => 2:58:11 PM

BORDER LAST REVISED 8/1/2016 | USERNAME => jose.coronel | DGN FILE => 04000007591te001.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 0703 | PROJECT NUMBER & PHASE 04000007591

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	81	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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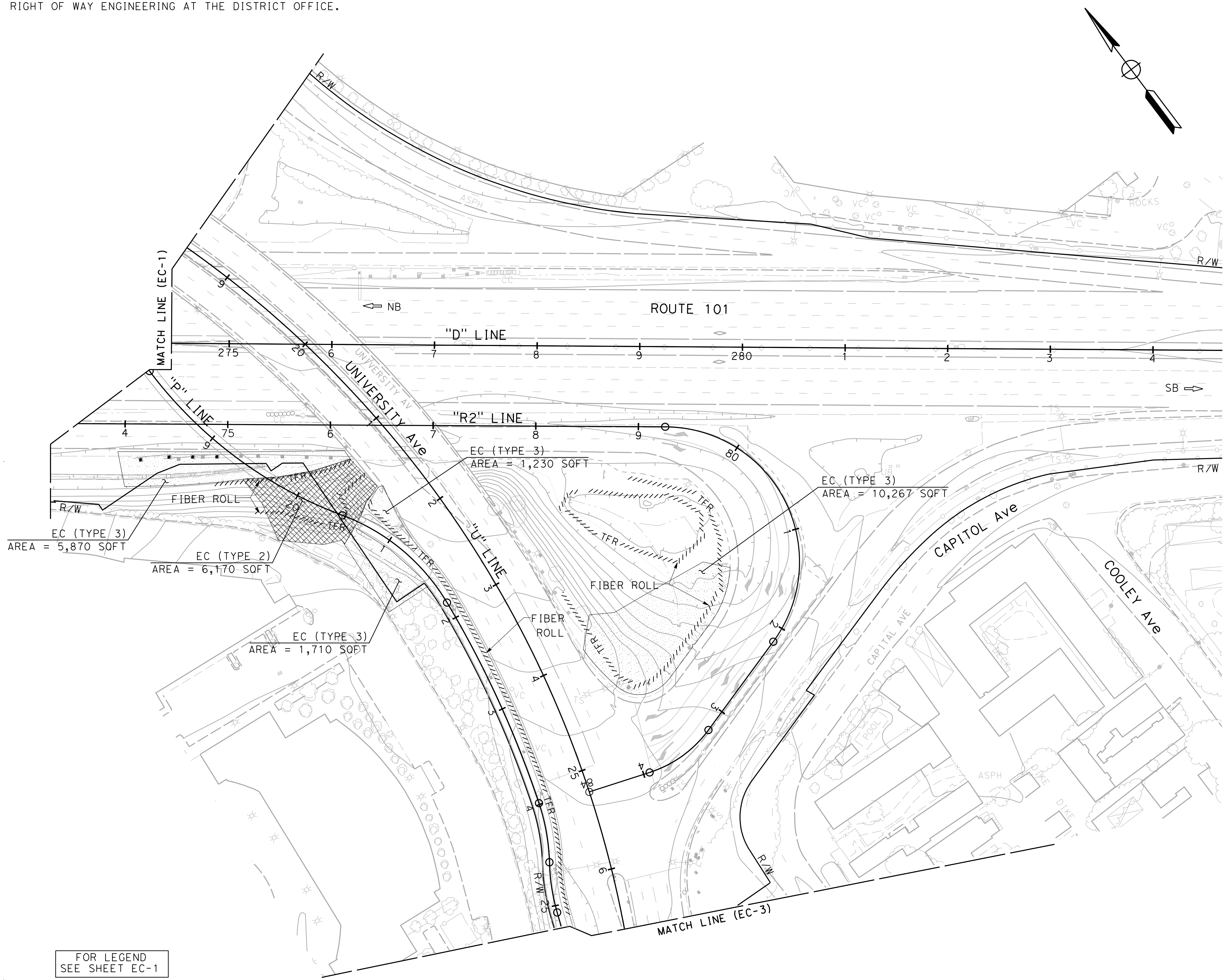
1960 TATE STREET
EAST PALO ALTO, CA 94303

NOTE:

FOR ACCURATE RIGHT OF WAY DATA, CONTACT RIGHT OF WAY ENGINEERING AT THE DISTRICT OFFICE.



FOR LEGEND SEE SHEET EC-1

EROSION CONTROL PLAN

SCALE 1" = 50'

100% SUBMITTAL

APPROVED FOR EROSION CONTROL WORK ONLY

EC-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: HOWARD MICHAEL

CALCULATED-DESIGNED BY: JOSE CORONEL

CHECKED BY: DANIEL HO

REVISED BY: JC

DATE REVISED: 5-16-22

LAST REVISION: 5-16-22

DATE PLOTTED => 5/15/2022
TIME PLOTTED => 3:12:39 PM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
04	SM	101	0.8/1.1	82	134

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
DANIEL HO
No. 50914
Exp. 9-30-23
CIVIL
STATE OF CALIFORNIA

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1960 TATE STREET
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NOTE:

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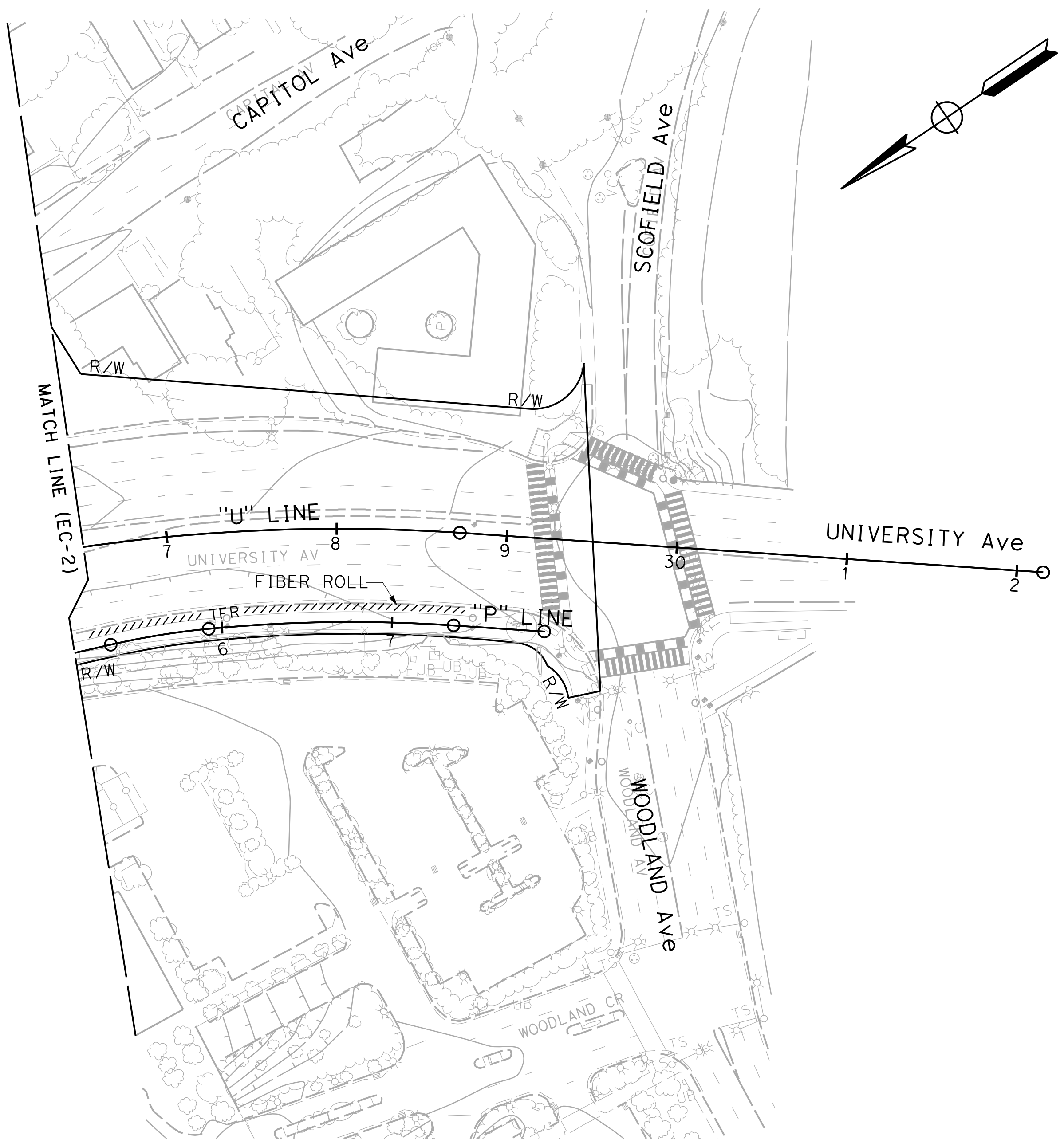

FOR LEGEND
SEE SHEET EC-1

100% SUBMITTAL

APPROVED FOR EROSION CONTROL WORK ONLY

EROSION CONTROL PLAN

SCALE 1" = 50'

EC-3

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

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CHECKED BY	DANIEL HO
REVISED BY	JC
DATE REVISED	5-16-22

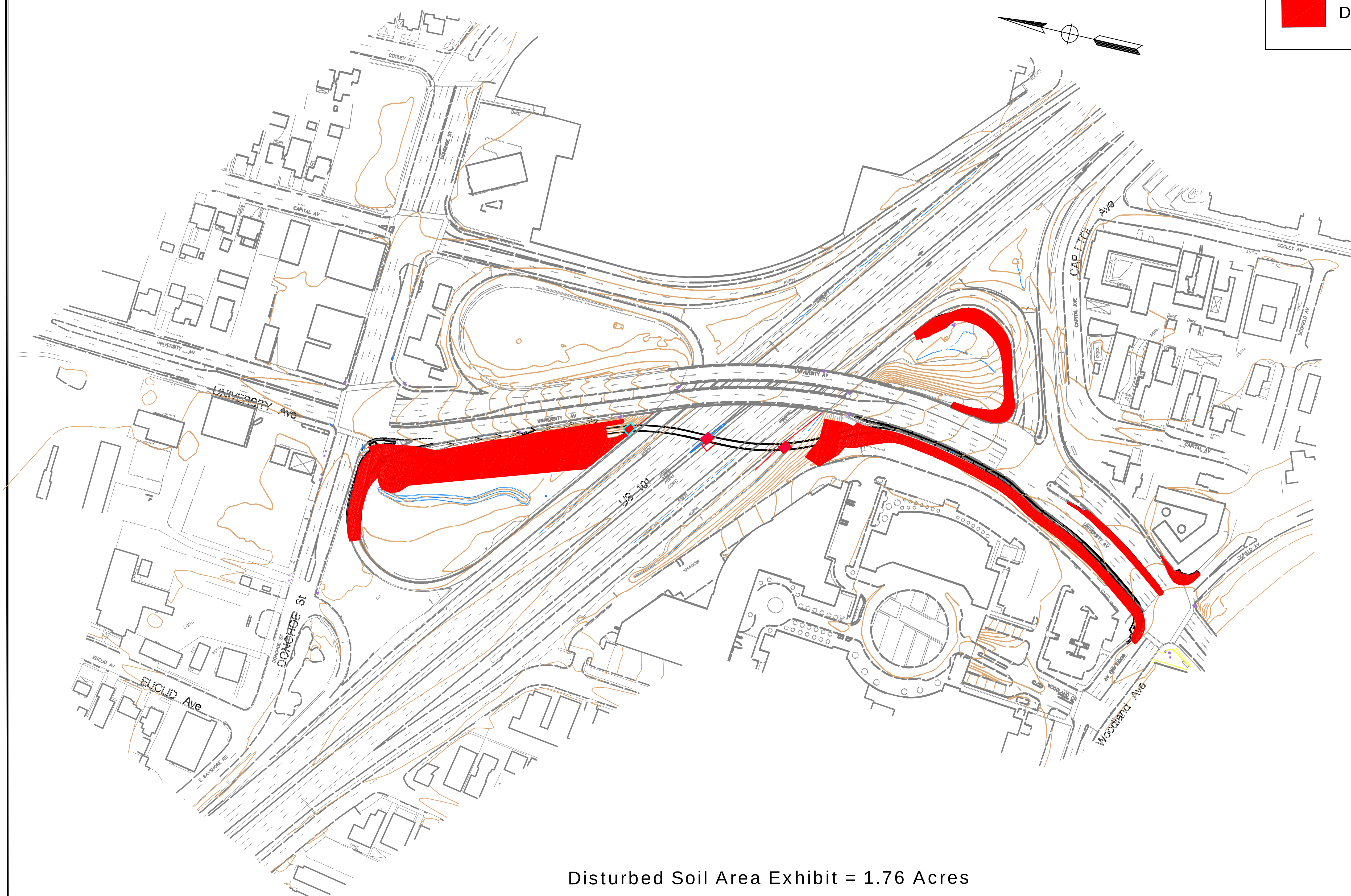
LAST REVISION 5-16-22
DATE PLOTTED => 5/16/2022
TIME PLOTTED => 3:00:51 PM

Attachment C

Disturbed Soil Area (DSA) Exhibit

LEGEND:

Disturbed Soil Area



Disturbed Soil Area Exhibit = 1.76 Acres

May 2022

AECOM

US 101/UNIVERSITY AVE INTERCHANGE IMPROVEMENT PROJECT

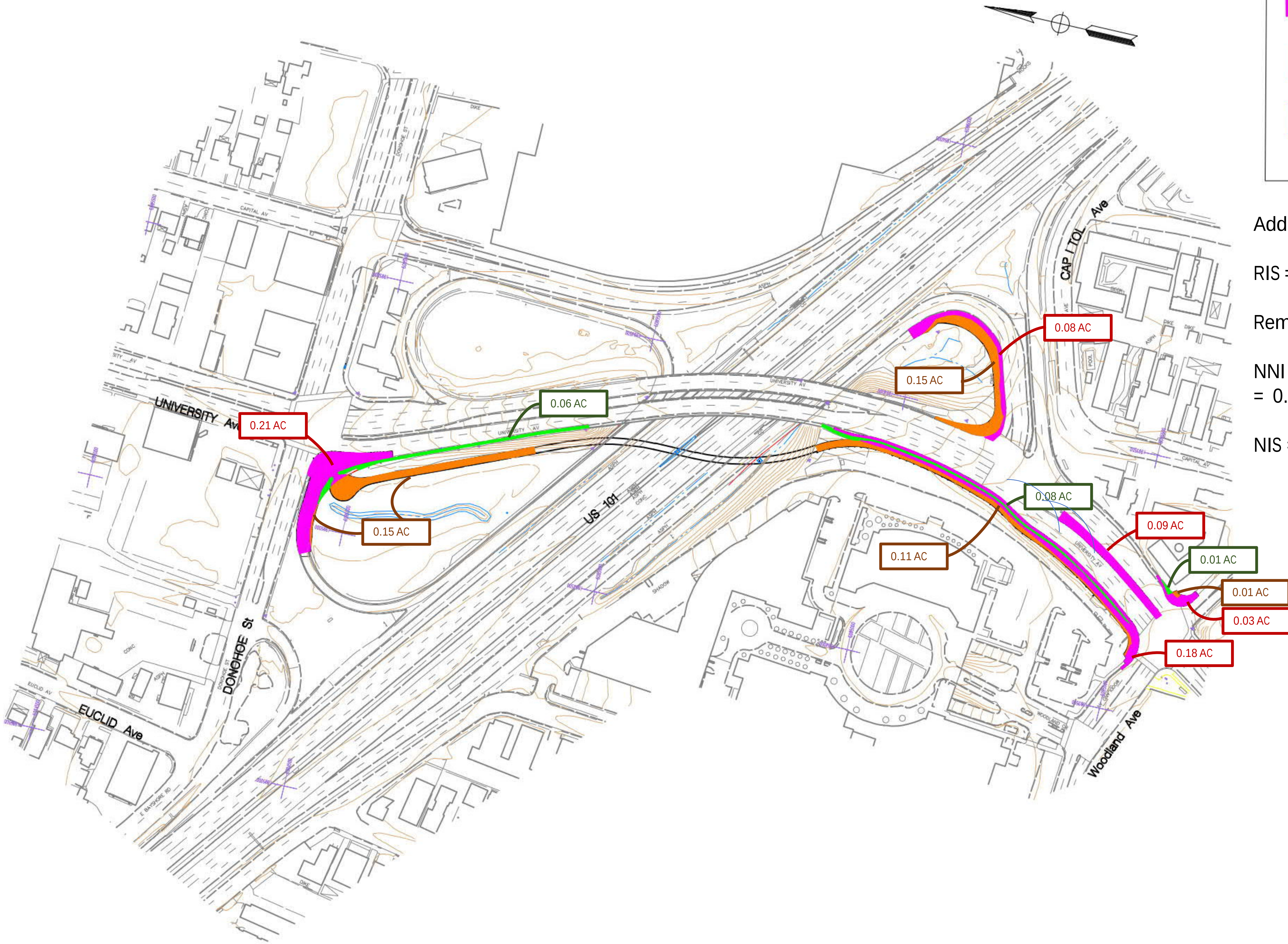
PRELIMINARY STUDY
FOR DISCUSSION ONLY

SCALE: 1″ = 100′

Disturbed Soil Area Exhibit

Attachment D

Pervious/Impervious Areas Exhibit



LEGEND:

- **Replaced Impervious Surface**
- **Added Impervious Surface**
- **Rmoved Impervious Surface**

Added IS = (0.15+0.15 +0.11 + 0.01) AC = 0.42 AC

RIS = (0.21+0.08+0.18+0.09+0.03) AC = = 0.50 AC

Removed IS = (0.06 + 0.08 + 0.01) AC = 0.15 AC

NNI = Added IS – Removed IS = (0.42 – 0.15) AC
= 0.27 AC

NIS = NNI + RIS = (0.27 + 0.50) = 0.77 AC

May 2022

AECOM

US 101/UNIVERSITY AVE INTERCHANGE IMPROVEMENT PROJECT

PRELIMINARY STUDY
FOR DISCUSSION ONLY

SCALE: 1″ = 100′

Pervious/Impervious Areas Exhibit

Attachment E

Risk Level Determination Documentation

Rainfall Erosivity Factor Calculator for Small Construction Sites

EPA's stormwater regulations allow NPDES permitting authorities to waive NPDES permitting requirements for stormwater discharges from small construction sites if:

- the construction site disturbs less than five acres, and
- the rainfall erosivity factor ("R" in the revised universal soil loss equation, or RUSLE) value is less than five during the period of construction activity.

If your small construction project is located in an area where EPA is the permitting authority and your R factor is less than five, you qualify for a low erosivity waiver (LEW) from NPDES stormwater permitting. If your small construction project does not qualify for a waiver, then NPDES stormwater permit coverage is required. Follow the steps below to calculate your R-Factor.

LEW certifications are submitted through the NPDES eReporting Tool or "CGP-NeT". Several states that are authorized to implement the NPDES permitting program also accept LEWs. Check with your state NPDES permitting authority for more information.

- Submit your LEW through EPA's eReporting Tool
- List of states, Indian country, and territories where EPA is the permitting authority
- Construction Rainfall Erosivity Waiver Fact Sheet
- Appendix C of the 2017 CGP – Small Construction Waivers and Instructions

The R-factor calculation can also be integrated directly into custom applications using the R-Factor web service.

For questions or comments, email EPA's CGP staff at cgp@epa.gov.

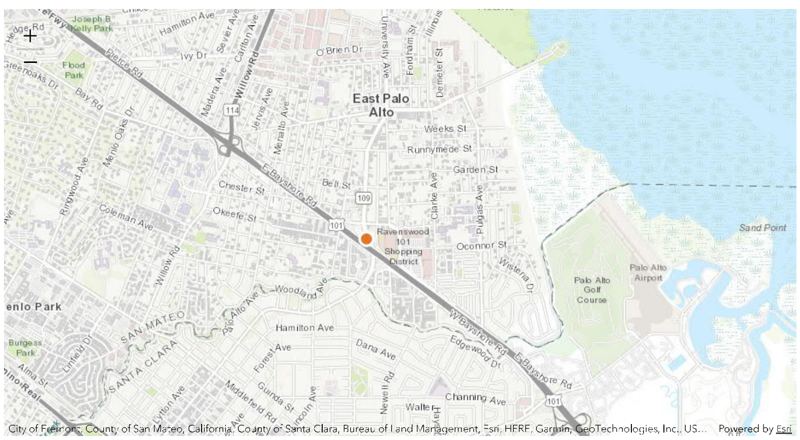
Select the estimated start and end dates of construction by clicking the boxes and using the dropdown calendar.

The period of construction activity begins at initial earth disturbance and ends with final stabilization.

Start Date: 11/14/2022 **End Date:** 12/08/2023

Locate your small construction project using the search box below or by clicking on the map.

Location: -122.14154989388238 , 37.46145402851153 **Search**



Click the "Calculate R Factor" button below to calculate an R Factor for your small construction project.

Calculate R Factor

Facility Information

Start Date: 11/14/2022	**Latitude:** 37.4615
End Date: 12/08/2023	**Longitude:** -122.1415

Calculation Results

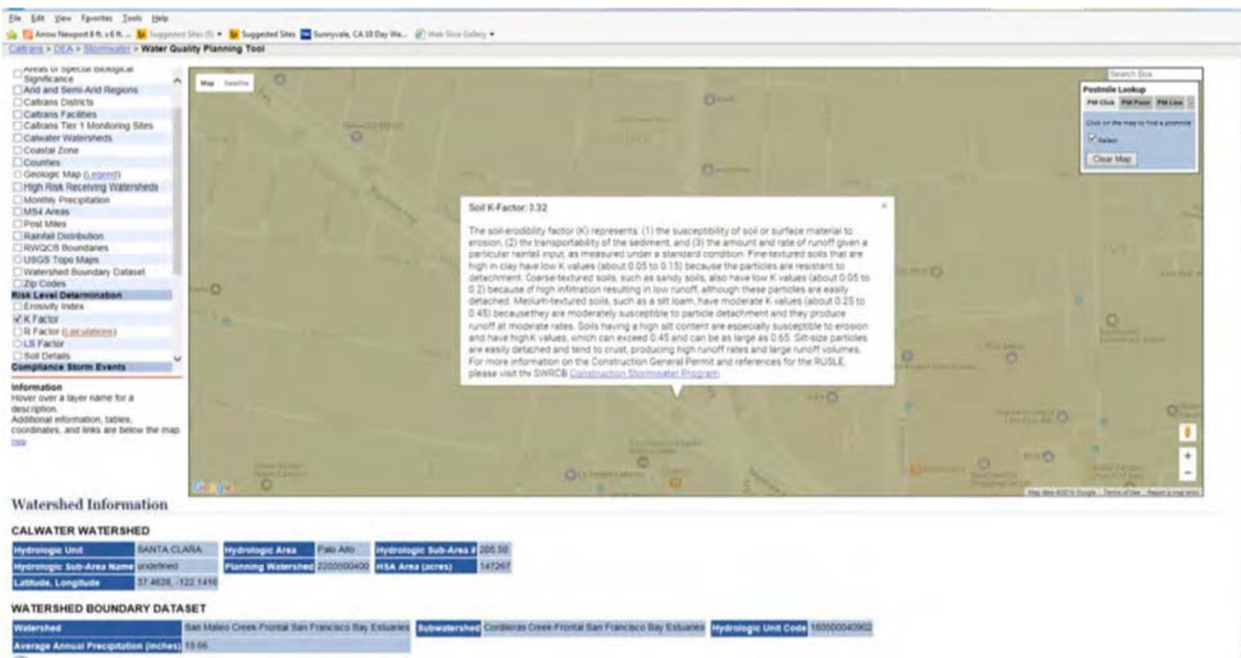
Rainfall erosivity factor (R Factor) = **43.63**

A rainfall erosivity factor of 5.0 or greater has been calculated for your site's period of construction.

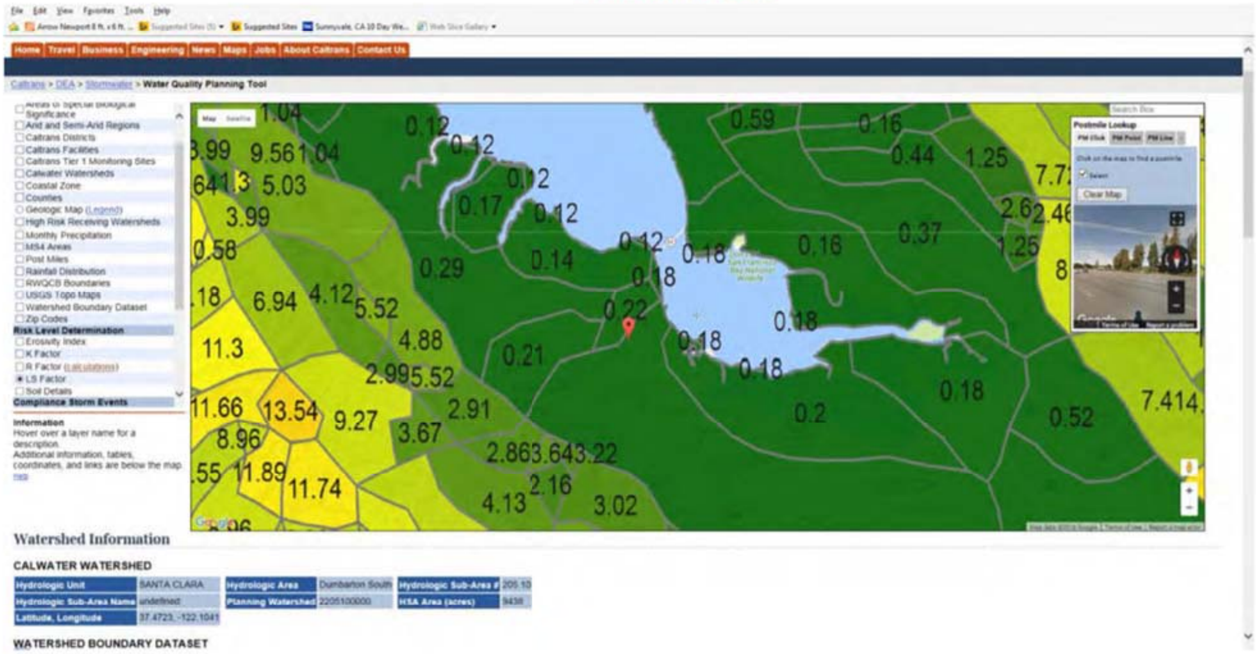
You do NOT qualify for a waiver from NPDES permitting requirements and must seek Construction General Permit (CGP) coverage. If you are located in an area where EPA is the permitting authority, you must submit a Notice of Intent (NOI) through the NPDES eReporting Tool (NeT).Otherwise, you must seek coverage under your state's CGP.

Index Zone: EI 24

Soil K-Factor: 0.32



LS-Factor: 0.22



Sediment Risk Factor Worksheet	Entry
A) R Factor	
Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site. http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm	
R Factor Value	43.63
B) K Factor (weighted average, by area, for all site soils)	
The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted. Site-specific K factor guidance	
K Factor Value	0.32
C) LS Factor (weighted average, by area, for all slopes)	
The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction. LS Table	
LS Factor Value	0.22
Watershed Erosion Estimate (=RxKxLS) in tons/acre	3.072
Site Sediment Risk Factor Low Sediment Risk: < 15 tons/acre Medium Sediment Risk: >=15 and <75 tons/acre High Sediment Risk: >= 75 tons/acre	**Low**

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	yes/no	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please check the attached worksheet or visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: 2006 Approved Sediment-impared WBs Worksheet http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp	**yes**	**High**

Combined Risk Level Matrix

<table>
<tr><td></td><td></td><td colspan="3">Sediment Risk</td></tr>
<tr><td rowspan="3">Receiving Water Risk</td><td></td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td>Low</td><td>Level 1</td><td colspan="2">Level 2</td></tr>
<tr><td>High</td><td colspan="2">Level 2</td><td>Level 3</td></tr>
</table>

Project Sediment Risk:	**Low**
Project RW Risk:	**High**
Project Combined Risk:	**Level 2**

Attachment F

Evaluation Documentation Form (EDF)

DATE: October 27, 2020

Project ID (EA): 0400000759 (04-272821)

No.	Criteria	Yes ✓	No ✓	Supplemental Information for Evaluation
1.	Begin Project evaluation regarding requirement for implementation of Treatment BMPs	✓		See Figure 4-1, Project Evaluation Process for Consideration of Treatment BMPs. Continue to 2.
2.	Is the scope of the Project to install Treatment BMPs (e.g., Alternative Compliance or TMDL Compliance Units)?		✓	If **Yes**, go to 8. If **No**, continue to 3.
3.	Is there a direct or indirect discharge to surface waters?	✓		If **Yes**, continue to 4. If **No**, go to 9.
4.	As defined in the WQAR or ED, does the project: a. discharge to areas of Special Biological Significance (ASBS), or	✓		If **Yes to any**, contact the District/Regional Design Stormwater Coordinator or District/Regional NPDES Coordinator to discuss the Department's obligations, go to 8 or 5. __RA__*(Dist./Reg. Coordinator initials)* If **No** to all, continue to 5.
	b. discharge to a TMDL watershed where Caltrans is named stakeholder, or		✓	
	c. have other pollution control requirements for surface waters within the project limits?		✓	
5.	Are any existing Treatment BMPs partially or completely removed? (ATA condition #1, Section 4.4.1)		✓	If **Yes**, go to 8 **AND** continue to 6. If **No**, continue to 6.
6.	Is this a Routine Maintenance Project?		✓	If **Yes**, go to 9. If **No**, continue to 7.
7.	Does the project result in an increase of <u>one acre or more</u> of new impervious surface (NIS)?		✓	If **Yes**, go to 8. If **No**, go to 9.
8.	Project is required to implement Treatment BMPs.	Complete Checklist T-1, Part 1.		
9.	Project is not required to implement Treatment BMPs. __RA__*(Dist./Reg. Design SW Coord. Initials)* ______*(Project Engineer Initials)* ____________ *(Date)*	Document for Project Files by completing this form and attaching it to the SWDR.		

Attachment G

Construction Site BMP Consideration Form

- DATE: October 27, 2020

Project ID / EA: 0400000759/04-272821

Project Evaluation Process for the Consideration of Construction Site BMPs

No.	Criteria	Yes ✓	No ✓	Supplemental Information
1.	Will construction of the project result in areas of disturbed soil as defined by the Project Planning and Design Guide (PPDG)?	✓		If Yes, Construction Site BMPs for Soil Stabilization (SS) will be required. Review CS-1, Part 1. Continue to 2. If No, Continue to 3.
2.	Is there a potential for disturbed soil areas within the project to discharge to storm drain inlets, drainage ditches, areas outside the RW, etc.?	✓		If Yes, Construction Site BMPs for Sediment Control (SC) will be required. Review CS-1, Part 2. Continue to 3.
3.	Is there a potential for sediment or construction related materials and wastes to be tracked offsite and deposited on private or public paved roads by construction vehicles and equipment?	✓		If Yes, Construction Site BMPs for Tracking Control (TC) will be required. Review CS-1, Part 3. Continue to 4.
4.	Is there a potential for wind to transport soil and dust offsite during the period of construction?	✓		If Yes, Construction Site BMPs for Wind Erosion Control (WE) will be required. Review CS-1, Part 4. Continue to 5.
5.	Is dewatering anticipated or will construction activities occur within or adjacent to a live channel or stream?	✓		If Yes, Construction Site BMPs for Non-Stormwater Management (NS) will be required. Review CS-1, Part 5. Continue to 6.
6.	Will construction include saw-cutting, grinding, drilling, concrete or mortar mixing, hydro-demolition, blasting, sandblasting, painting, paving, or other activities that produce residues?	✓		If Yes, Construction Site BMPs for Non-Stormwater Management (NS) will be required. Review CS-1, Parts 5 & 6. Continue to 7.
7.	Are stockpiles of soil, construction related materials, and/or wastes anticipated?	✓		If Yes, Construction Site BMPs for Waste Management and Materials Pollution Control (WM) will be required. Review CS-1, Part 6. Continue to 8.
8.	Is there a potential for construction related materials and wastes to have direct contact with precipitation; stormwater run-on, or stormwater runoff; be dispersed by wind; be dumped and/or spilled into storm drain systems?	✓		If Yes, Construction Site BMPs for Waste Management and Materials Pollution Control (WM) will be required. Review CS-1, Part 6.

Supplemental Attachment

Storm Water Checklist, SW-1, SW-2, SW-3

Design Pollution Prevention BMPs Checklist, DPP-1

Construction Site BMPs Checklist CS-1

Checklist SW-1, Site Data Sources

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM (KP): 0.8/1.1 EA: 04-272821

RWQCB: San Francisco Bay Region (Region 2)

Information for the following data categories should be obtained, reviewed and referenced as necessary throughout the project planning phase. Collect any available documents pertaining to the category and list them and reference your data source. For specific examples of documents within these categories, refer to Section 5.5 of this document. Example categories have been listed below; add additional categories, as needed. Summarize pertinent information in Section 2 of the SWDR.

DATA CATEGORY/SOURCES	Date
Topographic	
• Areal Planimetric Mapping	2015
• USGS Map	Current
Hydraulic	
• California Department of Transportation. Water Quality Planning Tool. <http://svctenvims.dot.ca.gov/wqpt/wqpt.aspx>	Accessed February 2019
• California Department of Water Resources. Water Data Library <http://www.water.ca.gov>	Accessed October 2016
• California Regional Water Quality Control Board, San Francisco Bay Region, San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)	Accessed February 2019
Soils	
• US Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx	Accessed December 2016
• AECOM, Initial Site Assessment	April 2016
Climatic	
• National Oceanic and Atmospheric Administration (NOAA) IDF Curve	Currently Available
Water Quality	
• CSG, Water Quality Assessment Report	July 2017
Other Data Categories	
• Storm Drain Master Plan – City of East Palo Alto	April 2014
• Brabb, EE., R.W. Graymer, and D.L. Jones. 1998 Geologic Map and Map Database of the Palo Alto 30' X60' Quadrangle, California. U.S. Geological Survey, Washington, DC.	1998

Checklist SW-2, Storm Water Quality Issues Summary

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101
PM (KP): 0.8/1.1 EA: 04-272821
RWQCB: San Francisco Bay Region (Region 2)

The following questions provide a guide to collecting critical information relevant to project stormwater quality issues. Complete responses to applicable questions, consulting other Caltrans functional units (Environmental, Landscape Architecture, Maintenance, etc.) and the District/Regional Storm Water Coordinator as necessary. Summarize pertinent responses in Section 2 of the SWDR.

1.	Determine the receiving waters that may be affected by the project throughout the project life cycle (i.e., construction, maintenance and operation).	☒Complete	☐NA
2.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	☒Complete	☐NA
3.	Determine if there are any municipal or domestic water supply reservoirs or groundwater percolation facilities within the project limits. Consider appropriate spill contamination and spill prevention control measures for these new areas.	☒Complete	☐NA
4.	Determine the RWQCB special requirements, including TMDLs, effluent limits, etc.	☒Complete	☐NA
5.	Determine regulatory agencies seasonal construction and construction exclusion dates or restrictions required by federal, state, or local agencies.	☒Complete	☐NA
6.	Determine if a 401 certification will be required.	☒Complete	☐NA
7.	List rainy season dates.	☒Complete	☐NA
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	☒Complete	☐NA
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.	☐Complete	☒NA
10.	Determine contaminated or hazardous soils within the project area.	☐Complete	☒NA
11.	Determine the total disturbed soil area of the project.	☒Complete	☐NA
12.	Describe the topography of the project site.	☒Complete	☐NA
13.	List any areas outside of the Caltrans right-of-way that will be included in the project (e.g. contractor's staging yard, work from barges, easements for staging, etc.).	☐Complete	☒NA
14.	Determine if additional right-of-way acquisition or easements and right-of-entry will be required for design, construction and maintenance of BMPs. If so, how much?	☐Complete	☒NA
15.	Determine if a right-of-way certification is required.	☒Complete	☐NA
16.	Determine the estimated unit costs for right-of-way should it be needed for Treatment BMPs, stabilized conveyance systems, lay-back slopes, or interception ditches.	☐Complete	☒NA
17.	Determine if project area has any slope stabilization concerns.	☒Complete	☐NA
18.	Describe the local land use within the project area and adjacent areas.	☒Complete	☐NA
19.	Evaluate the presence of dry weather flow.	☐Complete	☒NA

Checklist SW-3, Measures for Avoiding or Reducing Potential Storm Water Impacts

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101
PM (KP): 0.8/1.1 EA: 04-272821
RWQCB: San Francisco Bay Region (Region 2)

The PE must confer with other functional units, such as Landscape Architecture, Hydraulics, Environmental, Materials, Construction and Maintenance, as needed to assess these issues. Summarize pertinent responses in Section 2 of the SWDR.

Options for avoiding or reducing potential impacts during project planning include the following:

1. Can the project be relocated or realigned to avoid/reduce impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions? ☐Yes ☒No ☐NA
2. Can structures and bridges be designed or located to reduce work in live streams and minimize construction impacts? ☐Yes ☐No ☒NA
3. Can any of the following methods be utilized to minimize erosion from slopes:
   a. Disturbing existing slopes only when necessary? ☒Yes ☐No ☐NA
   b. Minimizing cut and fill areas to reduce slope lengths? ☒Yes ☐No ☐NA
   c. Incorporating retaining walls to reduce steepness of slopes or to shorten slopes? ☒Yes ☐No ☐NA
   d. Acquiring right-of-way easements (such as grading easements) to reduce steepness of slopes? ☐Yes ☐No ☒NA
   e. Avoiding soils or formations that will be particularly difficult to re-stabilize? ☐Yes ☐No ☒NA
   f. Providing cut and fill slopes flat enough to allow re-vegetation and limit erosion to pre-construction rates? ☒Yes ☐No ☐NA
   g. Providing benches or terraces on high cut and fill slopes to reduce concentration of flows? ☐Yes ☐No ☒NA
   h. Rounding and shaping slopes to reduce concentrated flow? ☒Yes ☐No ☐NA
   i. Collecting concentrated flows in stabilized drains and channels? ☒Yes ☐No ☐NA
4. Does the project design allow for the ease of maintaining all BMPs? ☒Yes ☐No
5. Can the project be scheduled or phased to minimize soil-disturbing work during the rainy season? ☒Yes ☐No
6. Can permanent storm water pollution controls such as paved slopes, vegetated slopes, basins, and conveyance systems be installed early in the construction process to provide additional protection and to possibly utilize them in addressing construction storm water impacts? ☒Yes ☐No ☐NA

Design Pollution Prevention BMPs

Checklist DPP-1, Part 1

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Consideration of Design Pollution Prevention BMPs

Consideration of Downstream Effects Related to Potentially Increased Flow [to streams or channels]

Will the project increase velocity or volume of downstream flow?	☒Yes	☐No	☐NA
Will the project discharge to unlined channels?	☒Yes	☐No	☐NA
Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?	☐Yes	☒No	☐NA

If Yes was answered to any of the above questions, consider ***Downstream Effects Related to Potentially Increased Flow***, complete the Checklist DPP-1, Part 2.

Slope/Surface Protection Systems

Will the project create new slopes or modify existing slopes?	☒Yes	☐No	☐NA

If Yes was answered to the above question, consider ***Slope/Surface Protection Systems***, complete the Checklist DPP-1, Part 3.

Concentrated Flow Conveyance Systems

Will the project create or modify ditches, dikes, berms, or swales?	☒Yes	☐No	☐NA
Will project create new slopes or modify existing slopes?	☒Yes	☐No	☐NA
Will it be necessary to direct or intercept surface runoff?	☐Yes	☒No	☐NA
Will cross drains be modified?	☐Yes	☒No	☐NA

If Yes was answered to any of the above questions, consider ***Concentrated Flow Conveyance Systems***; complete the Checklist DPP-1, Part 4.

Preservation of Existing Vegetation, Soils, and Stream Buffer Areas

It is the goal of the Stormwater Program to maximize the protection of desirable existing vegetation, soils, and stream buffer areas to provide erosion and sediment control benefits on all projects. ☒Complete

Consider ***Preservation of Existing Vegetation, soils, and stream buffer areas***, complete the Checklist DPP-1, Part 5.

Design Pollution Prevention BMPs

Checklist DPP-1, Part 2

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Downstream Effects Related to Potentially Increased Flow

1. Review total paved area and reduce to the maximum extent practicable. ☒Complete
2. Review channel lining materials and design for stream bank erosion control. N/A ☐Complete
   (a) See Chapters 860 and 870 of the HDM. ☐Complete
   (b) Consider channel erosion control measures within the construction limits as well as downstream. Consider scour velocity. If erosion control measures are required downstream of construction limits obtain the appropriate permits and right of way documents to include work within the construction limits. N/A ☐Complete
3. Include, where appropriate, energy dissipation devices at culvert outlets. N/A ☐Complete
4. Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour. N/A ☐Complete
5. Include, if appropriate, peak flow attenuation basins or devices to reduce peak discharges. N/A
6. Calculate the water quality volume infiltrated within the project limits. These calculations will be used in the Checklist T-1, Part 1. N/A ☐Complete

Design Pollution Prevention BMPs

Checklist DPP-1, Part 3

Prepared by: AECOM Date: oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Slope / Surface Protection Systems

1. What are the proposed areas of cut and fill? (attach plan or map) ☒Complete
2. Were benches or terraces provided on high cut and fill slopes to shorten slope length? ☐Yes ☒No
3. Were concentrated flows collected in stabilized drains or channels? ☒Yes ☐No
4. Are new or disturbed slopes > 4:1 horizontal:vertical (h:v)? ☐Yes ☒No

   If Yes, District Landscape Architect is responsible for an erosion control strategy and may prepare an erosion control plan.
5. Are new or disturbed slopes > 2:1 (h:v)? ☐Yes ☒No

   If Yes, DES Geotechnical Design unit must prepare a Geotechnical Design Report, and the District Landscape Architect should prepare or approve an erosion control plan. Concurrence must be obtained from the District Maintenance Stormwater Coordinator for slopes steeper than 2:1 (h:v).

VEGETATED SURFACES

1. Identify existing vegetation. ☒Complete
2. Evaluate site to determine soil types, appropriate vegetation and planting strategies. N/A – Landscape work will be a separate package ☐Complete
3. How long will it take for permanent vegetation to establish? N/A ☐Complete
4. Plan transition BMPs from construction to permanent establishment. N/A ☐Complete
5. Have vegetated areas and supporting permanent irrigation systems been designed to comply with the Model Water Efficient Landscape Ordinance (MWELO)? N/A ☐Yes ☐No
6. Minimize overland and concentrated flow depths and velocities. ☒Complete

HARD SURFACES

1. Are hard surfaces minimized? ☒Yes ☐No

   Review appropriate SSPs for Vegetated Surface and Hard Surface Protection Systems. ☒Complete

Design Pollution Prevention BMPs

Checklist DPP-1, Part 4

Prepared by: AECOM Date: Oc 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Concentrated Flow Conveyance Systems

Ditches, Berms, Dikes and Swales

1. Consider Ditches, Berms, Dikes, and Swales as per Topics 813, 834.3, 835, and Chapter 860 of the HDM. ☒Complete
2. Review existing and proposed conditions to remove any dike not required for slope stability, erosion control, and water conveyance. ☒Complete
3. Evaluate risks due to erosion, overtopping, flow backups or washout. ☒Complete
4. Consider outlet protection where localized scour is anticipated.**N/A** ☐Complete
5. Examine the site for run-on from off-site sources. ☒Complete
6. Consider permissible shear and velocity when selecting lining material (See Table 865.2 in the HDM).**N/A** ☐Complete

Overside Drains

1. Consider downdrains, as per Index 834.4 of the HDM. ☒Complete
2. Consider paved spillways for side slopes flatter than 4:1 h:v. ☒Complete

Flared Culvert End Sections

1. Consider flared end sections on culvert inlets and outlets as per Chapter 827 of the HDM. ☒Complete

Outlet Protection/Velocity Dissipation Devices

1. Consider outlet protection/velocity dissipation devices at outlets, including cross drains, as per Chapters 827 and 870 of the HDM. ☒Complete

Review appropriate SSPs for Concentrated Flow Conveyance Systems.**N/A** ☐Complete

Design Pollution Prevention BMPs

Checklist DPP-1, Part 5

Prepared by:___AECOM________Date:__Oct 27, 2020________District-Co-Route:04-SM-101________

PM :___0.8/1.1____Project ID/EA:0400000759/04-272821__RWQCB: San Francisco Bay Region 2

Preservation of Existing Vegetation, Soils, and Stream Buffer Areas

1. Review Preservation of Property, (Clearing and Grubbing) to reduce clearing and grubbing and maximize preservation of existing vegetation, soils, and stream buffer areas.	☒Complete
2. Has all vegetation, soils, and stream buffer areas to be retained been coordinated with Environmental, and identified and defined in the contract plans?	☒Yes ☐No
3. Have steps been taken to minimize disturbed areas, such as locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce cutting and filling?	☒Complete
4. Have impacts to preserved vegetation, soils, and stream buffer areas been considered while work is occurring in disturbed areas?	☒Yes ☐No
5. Are all areas to be preserved delineated on the plans?	☒Yes ☐No

Construction Site BMPs

Checklist CS-1, Part 1

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Temporary Soil Stabilization

General Parameters

1. How many rainy seasons are anticipated between begin and end of construction? 1
2. What is the total disturbed soil area for the project? (ac) 1.52
3. Consult your District/Regional Design Stormwater Coordinator for the minimum required combination of temporary soil stabilization and temporary sediment controls and barriers for area, slope inclinations, rainy and non-rainy season, and active and non-active disturbed soil areas. *There is no consultation established with the District/Regional Design at this submittal.* ☐Complete

Scheduling

4. Does the project have a duration of more than one rainy season and have disturbed soil area in excess of 25 acres? ☐Yes ☒No
   (a) Include multiple mobilizations (Move-in/Move-out) as a separate contract bid line item to implement permanent erosion control or revegetation work on slopes that are substantially complete. (Estimate at least 6 mobilizations for each additional rainy season. Designated Construction Representative may suggest an alternate number of mobilizations.) ☐Complete
   (b) Edit Order of Work specifications for permanent erosion control or revegetation work to be implemented on slopes that are substantially complete. ☐Complete
   (c) Edit permanent erosion control or revegetation specifications to require seeding and planting work to be performed when optimal. ☐Complete

Preservation of Existing Vegetation

5. Do Environmentally Sensitive Areas (ESAs) exist within or adjacent to the construction limits? (Verify the completion of DPP-1, Part 5) ☐Yes ☒No
   (a) Verify the protection of ESAs through delineation on all project plans. ☐Complete
   (b) Protect from clearing and grubbing and other construction disturbance by enclosing the ESA perimeter with high visibility plastic fence or other BMP. ☐Complete

6. Are there areas of existing vegetation (mature trees, native vegetation, landscape planting, etc.) that need not be disturbed by project construction? Will areas designated for proposed or existing Treatment BMPs need protection (infiltration characteristics, vegetative cover, etc.)? (Coordinate with District Environmental and Construction to determine limits of work necessary to preserve existing vegetation to the maximum extent practicable.) ☒Yes ☐No

   (a) Designate as outside of limits of work (or designate as ESAs) and show on all project plans. ☒Complete

   (b) Protect with high visibility plastic fence or other BMP. ☒Complete

7. If yes for 6, 7, or both, then designate ESA fencing as a separate contract bid line item, *if not already incorporated as part of design pollution prevention work (See DPP-1, Part 5).* *Use Temporary Reinforced Silt Fence.* ☒Complete

Slope Protection

8. Provide a temporary soil stabilization BMP(s) appropriate for the DSA, slope steepness, slope length, and soil erodibility. (Consult with District Landscape Architect.)

   (a) Select Hydraulic Mulch, Hydroseeding, Soil Binders, Straw Mulch, Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets, Wood Mulching, other BMPs or a combination to cover the DSA throughout the project's rainy season. ☒Complete

   (b) Increase the quantities by 25 percent for each additional rainy season. (Designated Construction Representative may suggest an alternate increase.) N/A ☐Complete

   (c) Designate as a separate contract bid line item. ☒Complete

Slope Interrupter Devices

9. For projects with temporary erosion control requirements, provide slope interrupter devices for all slopes with slope lengths equal to or greater than of 20 ft in length, in accordance with CGP requirements.

   (a) Select Fiber Rolls or other BMPs to protect slopes throughout the project's rainy season. ☒Complete

   (b) For slope inclination of 4:1 (h:v) and flatter, Fiber Rolls or other BMPs shall be placed along the contour and spaced 20 ft on center. ☒Complete

   (c) For slope inclination between 4:1 (h:v) and 2:1 (h:v), Fiber Rolls or other BMPs shall be placed along the contour and spaced 15 ft on center. ☒Complete

   (d) For slope inclination of 2:1 (h:v) and greater, Fiber Rolls or other BMPs shall be placed along the contour and spaced 10 ft on center. ☒Complete

(e) Increase the quantities by 25 percent for each additional rainy season. (Designated Construction Representative may suggest alternate increase.)N/A ☐Complete

(f) Designate as a separate contract bid line item. ☒Complete

Channelized Flow

10. Identify locations within the project site where concentrated flow from stormwater runoff can erode areas of soil disturbance. Identify locations of concentrated flow that enters the site from outside of the RW (off-site run-on). ☒Complete

    (a) Utilize Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets, Earth Dikes/Swales, Ditches, Outlet Protection/Velocity Dissipation, Slope Drains, Check Dams, or other BMPs to convey concentrated flows in a non-erosive manner. N/A ☐Complete

    (b) Designate as a separate contract bid line item. N/A ☐Complete

Construction Site BMPs
Checklist CS-1, Part 2

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Sediment Control

Perimeter Controls - Run-off Control

1. Is there a potential for sediment laden sheet and concentrated flows to discharge offsite from runoff cleared and grubbed areas, below cut slopes, embankment slopes, etc.? ☐Yes ☒No

   (a) Select linear sediment barrier such as Silt Fence, Fiber Rolls, Gravel Bag Berm, Sand Bag Barrier, Straw Bale Barrier, or a combination to protect wetlands, water courses, roads (paved and unpaved), construction activities, and adjacent properties. (Coordinate with District Construction for selection and preference of linear sediment barrier BMPs.) ☐Complete

   (b) Increase the quantities by 25 percent for each additional rainy season. (Designated Construction Representative may suggest an alternate increase.) ☐Complete

   (c) Designate as a separate contract bid line item. ☐Complete

Perimeter Controls - Run-on Control

2. Do locations exist where sheet flow upslope of the project site and where concentrated flow upstream of the project site may contact DSA and construction activities? ☐Yes ☒No

   (a) Utilize linear sediment barriers such as Earth Dike/Drainage Swales and Lined Ditches, Fiber Rolls, Gravel Bag Berm, Sand Bag Barrier, Straw Bale Barrier, or other BMPs to convey flows through and/or around the project site. (Coordinate with District Construction for selection and preference of perimeter control BMPs.) ☐Complete

   (b) Designate as a separate contract bid line item. ☐Complete

Storm Drain Inlets

3. Do existing or proposed drainage inlets exist within the construction limits? ☒Yes ☐No

   (a) Select Drainage Inlet Protection to protect municipal storm drain systems or receiving waters wetlands at each drainage inlet. (Coordinate with District Construction for selection and preference of inlet protection BMPs.) ☒Complete

   (b) Designate as a separate contract bid line item. ☒Complete

4. Can existing or proposed drainage inlets utilize an excavated sediment trap as described in Drainage Inlet Protection - Type 2? ☐Yes ☒No

   (a) Include with other types of Drainage Inlet Protection. N/A ☐Complete

<u>*Sediment/Desilting Basin*</u>

5. Does the project lie within a Rainfall Area where the required combination of temporary soil stabilization and sediment control BMPs includes desilting basins? ☐Yes ☒No

   (a) Consider feasibility for desilting basin allowing for available right-of-way within the construction limits, topography, soil type, disturbed soil area within the watershed, and climate conditions. Document if the inclusion of sediment/desilting basins is infeasible. ☐Complete

   (b) If feasible, design desilting basin(s) per the guidance in the *CASQA Construction BMP Guidance Handbook* to maximize capture of sediment-laden runoff. ☐Complete

   (c) Designate as a separate contract bid item ☐Complete

6. Is ATS to be used for controlling sediment? ☐Yes ☒No

   (a) If yes, then will desilting basin or other means of natural storage be used? ☐Yes ☐No

   (b) If no, then plan for storage tanks sufficient to hold treatment volume. ☐Complete

7. Will the project benefit from the early implementation of proposed permanent Treatment BMPs? (Coordinate with District Construction.) ☐Yes ☒No

   (a) Edit Order of Work specifications for permanent Treatment BMP work to be implemented in a manner that will allow its use as a Construction Site BMP. ☐Complete

<u>*Sediment Trap*</u>

8. Can sediment traps be located to collect channelized runoff from disturbed soil areas prior to discharge? ☐Yes ☒No

   (a) Design sediment traps in accordance with the *CASQA Construction BMP Guidance Handbook.* ☐Complete

   (b) Designate as a separate contract bid line item. ☐Complete

Construction Site BMPs
Checklist CS-1, Part 3

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Tracking Controls

Stabilized Construction Entrance/Exit

1. Are there points of entrance and exit from the project site to paved roads where mud and dirt could be transported offsite by construction equipment? (Coordinate with District Construction for selection and preference of tracking control BMPs.) ☒Yes ☐No

   (a) Identify and designate these entrance/exit points as stabilized construction entrances. ☒Complete

   (b) Designate as a separate contract bid line item. ☒Complete

Tire/Wheel Wash

2. Are site conditions anticipated that would require additional or modified tracking controls such as entrance/outlet tire wash? (Coordinate with District Construction.) ☐Yes ☒No

   (a) Designate as a separate contract bid line item. ☐Complete

Stabilized Construction Roadway

3. Are temporary access roads necessary to access remote construction activity locations or to transport materials and equipment? (In addition to controlling dust and sediment tracking, access roads limit impact to sensitive areas by limiting ingress, and provide enhanced bearing capacity.) (Coordinate with District Construction.) ☐Yes ☒No

   (a) Designate these temporary access roads as stabilized construction roadways. ☐Complete

   (b) Designate as a separate contract bid line item. ☐Complete

Street Sweeping and Vacuuming

1. Is there a potential for tracked sediment or construction related residues to be transported offsite and deposited on public or private roads? (Coordinate with District Construction for preference of including street sweeping and vacuuming with tracking control BMPs.) ☒Yes ☐No

   (a) Designate as a separate contract bid line item. ☒Complete

Construction Site BMPs

Checklist CS-1, Part 4

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Wind Erosion Controls

Wind Erosion Control

1. Is the project located in an area where standard dust control practices in accordance with *Standard Specifications*, Section 14-903: Dust Control, are anticipated to be inadequate during construction to prevent the transport of dust offsite by wind? *(Note: Dust control by water truck application is paid for through the various items of work. Dust palliative, if it is included, is paid for as a separate item.)* ☐Yes ☒No

   (a) Select Hydraulic Mulch, Hydroseeding, Soil Binders, Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets, Wood Mulching or a combination to cover the DSA subject to wind erosion year-round, especially when significant wind and dry conditions are anticipated during project construction. (Coordinate with District Construction for selection and preference of wind erosion control BMPs.) ☐Complete

   (b) Designate as a separate contract bid line item. ☐Complete

Construction Site BMPs

Checklist CS-1, Part 5

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Non-Stormwater Management

Temporary Stream Crossing & Clear Water Diversion

1. Will construction activities occur within a water body or watercourse such as a lake, wetland, or stream? (Coordinate with District Construction for selection and preference for stream crossing and clear water diversion BMPs.) ☐Yes ☒No

   (a) Select from types offered in Temporary Stream Crossing to provide access through watercourses consistent with permits and agreements.[1] ☐Complete

   (b) Select from types offered in Clear Water Diversion to divert watercourse consistent with permits and agreements.[1] ☐Complete

   (c) Designate as a separate contract bid line item(s). ☐Complete

Other Non-Stormwater Management BMPs

2. Are construction activities anticipated that will generate wastes or residues with the potential to discharge pollutants? ☐Yes ☒No

   (a) Identify potential pollutants associated with the anticipated construction activity and select the corresponding BMP such as NS-1 (Water Conservation Practices), NS-2 (Dewatering Operations), NS-3 (Paving and Grinding Operations), NS-7 (Potable Water/Irrigation), NS-8 (Vehicle and Equipment Cleaning), NS-9 (Vehicle and Equipment Fueling), NS-10 (Vehicle and Equipment Maintenance), NS-11 (Pile Driving Operations), NS-12 (Concrete Curing), NS-13 (Material and Equipment Use Over Water), NS-14 (Concrete Finishing), and NS-15 (Structure Demolition/Removal Over or Adjacent to Water).[1] ☐Complete

   (b) Verify that costs for non-stormwater management BMPs are identified in the contract documents. Designate BMP as a separate contract bid line item if the requirements in Job Site Management *Standard Specifications* Section 13 are anticipated to be inadequate or if requested by Construction. ☐Complete

[1] *Coordinate with District Environmental for consistency with US Army Corps of Engineers 404 and 401 permits and Dept. of Fish and Game 1601 Streambed alteration Agreements.*

Construction Site BMPs

Checklist CS-1, Part 6

Prepared by: AECOM Date: Oct 27, 2020 District-Co-Route: 04-SM-101

PM : 0.8/1.1 Project ID/EA: 0400000759/04-272821 RWQCB: San Francisco Bay Region 2

Waste Management & Materials Pollution Control

Concrete Waste Management

1. Does the project include concrete placement or mortar mixing? ☒Yes ☐No

   (a) Select from types offered in Concrete Waste Management to provide concrete washout facilities. In addition, consider portable concrete washouts and vendor supplied concrete waste management services. (Coordinate with District Construction for selection and preference of waste management and materials pollution control BMPs.) ☒Complete

   (b) Designate as a separate contract bid line item if the quantity of concrete waste and washout are anticipated to exceed 5.2 yd^3 or if requested by Construction. ☒Complete

Other Waste Management and Materials Pollution Controls

2. Are construction activities anticipated that will generate wastes or residues with the potential to discharge pollutants? ☐Yes ☒No

   (a) Identify potential pollutants associated with the anticipated construction activity and select the corresponding BMP such as WM-1 (Material Delivery and Storage), WM-2 (Material Use), WM-4 (Spill Prevention and Control), WM-5 (Solid Waste Management), WM-6 (Hazardous Waste Management), WM-7 (Contaminated Soil Management), WM-9 (Sanitary/Septic Waste Management) and WM-10 (Liquid Waste Management) ☐Complete

   (b) Verify that costs for waste management and materials pollution control BMPs are identified in the contract documents. Designate BMP as a separate contract bid line item if the requirements in Job Site Management *Standard Specifications* Section 13 are anticipated to be inadequate or if requested by Construction. ☐Complete

Temporary Stockpiles (Soil, Materials, and Wastes)

3. Are stockpiles of soil, etc. anticipated during construction? ☒Yes ☐No

   (a) Verify that costs for stockpile management and associated sediment control and temporary soil stabilization BMPs for temporary stockpiles are identified in the contract documents. Designate as a separate contract bid line item if the requirements in Job Site Management *Standard Specifications* Section 13 are anticipated to be inadequate or if requested by Construction. ☒Complete

(a) Verify that costs for stockpile management and associated sediment control and temporary soil stabilization BMPs for temporary stockpiles are identified in the contract documents. Designate as a separate contract bid line item if the requirements in Job Site Management *Standard Specifications* Section 13 are anticipated to be inadequate or if requested by Construction. N/A

☐ Complete

FOUNDATION REPORT

UNIVERSITY AVENUE PEDESTRIAN OVERCROSSING BRIDGE NO. 35-0359

US 101 / UNIVERSITY AVENUE IMPROVEMENTS EAST PALO ALTO, CALIFORNIA

EA 04-272820
04-SM-101, PM 0.8/1.1

Prepared for

California Department of Transportation
District 4
111 Grand Ave
Oakland, CA 94612

and

City of East Palo Alto
2200 University Avenue
East Palo Alto, CA 94303

September 27, 2022

AECOM

4 North 2nd Street, Suite 675
San Jose, California 95113

September 27 2022 | File No. 04-SM-101-PM 0.8/1.1
Project 60416357 | EA 04-272820

Mr. Glen March
Project Manager
City of East Palo Alto
1960 Tate Street
East Palo Alto, CA 94303

Subject: **Foundation Report**
University Avenue Pedestrian Overcrossing
Caltrans Bridge No. 35-0359
US 101 and University Avenue Interchange Improvements
East Palo Alto, California

Dear Mr. March:

AECOM has completed a geotechnical investigation for the proposed pedestrian overcrossing at U.S. 101/University Avenue interchange in East Palo Alto, California. The Foundation Report incorporates comments from Caltrans dated October 17, 2016, April 27, 2017, April 14, 2020, February 18, 2022, June 9, 2022, September 7, 2022, and September 21, 2022.

The report presents AECOM's engineering opinions and recommendations regarding the geotechnical factors influencing the design and construction of the proposed pedestrian overcrossing. The opinions and recommendations are based upon the results of our field investigation, laboratory testing, engineering judgment and local experience. Ms. Anne-Marie Moore, Senior Geotechnical Engineer, provided peer review.

If any questions should arise, or if we can be of further service, please contact the undersigned at (408) 297-9585.

Sincerely,

Stephen S. Huang, GE 2150
Geotechnical Project Manager

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

LIST OF APPENDICES

1.1 GENERAL

The City of East Palo Alto, in cooperation with the California Department of Transportation (Caltrans), proposes to construct a new pedestrian overcrossing (POC) adjacent to the existing University Avenue Overcrossing (OC), Bridge No. 35-0113R/L, as part of the US 101/University Avenue Interchange improvements project. The proposed interchange improvement project includes a 12-foot-wide Class 1 pedestrian and bicycle facility on a new POC, an additional lane along the right side of the southbound US 101/University Avenue off-ramp, and realignment of the northbound US 101 loop off-ramp, adjacent to Donohoe Street. The approximate location of the POC site is shown on the Project Vicinity Map, Figure 1-1.

1.2 PURPOSE AND SCOPE OF INVESTIGATION

The purpose of this Foundation Report (FR) is to document subsurface conditions encountered in project specific explorations and as described on as-built log of test borings (LOTB) and standard soil survey sheets, and provide foundation recommendations for the proposed POC design and construction.

The geotechnical services provided in preparation of this FR for the University Avenue POC included:

- Review of existing subsurface information and as-built plans
- Geotechnical field exploration including two cone penetration tests (CPTs). The locations of these explorations are shown on the LOTB.
- Design recommendations and opinions were developed for the following topics:
- – Pile foundation design recommendations
    - ∗ Vertical capacity
    - ∗ Tip elevations
- – Resistance to lateral loads
- – Pile foundation and approach fill settlement
- – Earthquake information consistent with Caltrans Response Spectra Design Techniques
- – Assessment of the potential for earthquake induced liquefaction and settlement
- – Address construction issues, including:
    - ∗ Earthwork for abutments and new bridge approaches
    - ∗ Installation of pile foundations, as applicable

This FR includes AECOM’s observations of the site conditions and a summary of the subsurface conditions at the field exploration locations; it supersedes previous report versions dated September 12, 2016, March 24, 2017, April 15, 2020, October 27, 2021, March 15, 2022, and September 14, 2022. Responses to Caltrans’ comments are incorporated herein.

1.3 EXCEPTIONS TO POLICY AND PROCEDURES

No exceptions to policy or procedures were taken for the preparation of this report.

The proposed POC will be a four-span cast-in-place prestressed concrete box girder structure that connects the approach at the US 101 southbound off-ramp intersection at University Avenue to the approach landing at the US 101 northbound off-ramp. The structure will be 14 feet wide and 540 feet long. Bents will be located at the US 101 median and just outside the traveled way on both sides of US 101.

Approximately 20 feet of fill will be needed to build the approach at Abutment 1; considerably less fill, on the order of 5 to 10 feet thick, will be needed to build the approach at Abutment 5.

The abutments and wingwalls will be supported on 24-inch-diameter cast-in-drilled-hole (CIDH) piles; each of the column bents will be supported on a single 96-inch-diameter CIDH pile. The general and foundation plans are included in Appendix A.

The datum shown on profile sheets from the plan set for original bridge construction (Caltrans Contract No. 54-4TC27) is U.S.C& G.S (mean sea level). MSL is a tidal datum determined over a 19-year National Tidal Datum Epoch. It pertains to local mean sea level and should not be confused with fixed geodetic datums NGVD29 and NAVD88 whose elevation relationships to local MSL and other tidal datums may not be consistent from one location to another (National Oceanic and Atmospheric Administration (https://tidesandcurrents.noaa.gov/benchmarks /9414525.html , accessed September 2021). For this reason, as-built information presented later in this report refer only to MSL with no attempt to convert to the project datum.

A note at the top left corner of the as-built LOTB for proposed widening (2003) indicates the benchmark for boring elevations relative to NGVD29; the conversion from NGVD29 to NAVD88 at the site is 4.05 feet (NGS Coordinate Conversion and Transformation Tool, NCAT, accessed September 2021). All project elevations reference NAVD88; stationing is based on NAD83.

.

The project site is located about 3 miles southwest of the edge of San Francisco Bay within the northern portion of Santa Clara Valley, within an alluvial basin located between the Santa Cruz Mountains to the southwest and the Diablo Range to the northeast. The Santa Clara Valley is located within the central portion of the Coast Ranges geomorphic province of California. Northwest-southeast-trending valleys and ridges characterize the regional morphology of the Coast Ranges province. These topographic features are controlled by folds and faults that resulted from the collision of the Farallon and North American plates and subsequent predominantly strike-slip faulting along the San Andreas fault system between the Pacific and North American plates.

Local geologic mapping shows the project location to be underlain by Holocene natural levee deposits that border San Francisquito Creek (Brabb *et al.*, 2000) as shown on Figure 3-1. Away from the creek, Holocene flood-plain deposits are mapped; these deposits usually occur between levee deposits and basin deposits. The natural levee deposits are described as loose, moderately to well-sorted sandy or clayey silt grading to sandy or silty clay, and the flood-plain deposits are described as medium to dark-gray, dense sandy to silty clay; lenses of coarser silt, sand and pebbles may be locally present. The nearest bedrock consists of Tertiary sedimentary rocks and volcanic basalt mapped about 3½ miles southwest of the site in the Los Altos Hills.

4.1 GENERAL

To supplement available as-built subsurface data for the existing US 101/University Avenue OC interchange, two CPTs were performed to characterize site specific ground conditions near the proposed Abutment 1 and Bent 3 locations. Prior to the start of exploration, locations were checked for conflict with underground utilities by contacting Underground Service Alert (USA) Network and a private utility locator. AECOM obtained drilling permits from the San Mateo County Department of Environmental Health. All explorations were backfilled with cement grout as required.

4.2 CONE PENETRATION TESTS

Two CPTs were conducted on November 17, 2015, in general accordance with ASTM specifications (ASTM D3441-98) using an electric cone penetrometer. The CPTs extended to depths of about 50 and 100 feet.

CPT exploration involves pushing a cone-tipped probe into the soil while simultaneously recording the cone tip resistance and side friction resistance to penetration. The CPT equipment consists of a cone assembly mounted at the end of a series of hollow rods. A set of hydraulic rams is used to push the cone and rods into the soil while a continuous record of cone and friction resistance versus depth is obtained in both analog and digital form at the ground surface. A specially designed all-wheel drive truck is used to transport and house the test equipment and to provide a 20-ton reaction to the thrust of the hydraulic rams.

The cone penetrometer conical tip has a 60-degree apex angle and a projected cross-sectional area of 2.3 in^2. The cylindrical friction sleeve is 6.5 inches long with a diameter or 1.75 inches and surface area of 35 in^2. The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals from the strain gauges are transmitted by a cable in the rods to analog and digital data recorders in the CPT truck.

Data obtained during a CPT consists of nearly continuous stratigraphic information with close vertical resolution. Stratigraphic interpretation is based on relationships between cone tip resistance and friction resistance. The calculated friction ratio (CPT friction sleeve resistance divided by cone tip resistance) is used as an indicator of soil type. Granular soils typically have low friction ratios and high cone resistance, while cohesive or organic soils have high friction ratios and low cone resistance. These stratigraphic material categories form the basis for all subsequent calculations that utilize the CPT data. Soil interpretation presented on the CPT sounding plots from this investigation was based on correlations developed by Robertson, 2008. CPT sounding plots are presented on the LOTB in Appendix B.

CPT interpretations presented graphically and in tabular form are included in Appendix C.

5.1 SITE TOPOGRAPHY AND SURFACE CONDITIONS

The project site is located in the City of East Palo Alto, southwest of San Francisco Bay. Except for the elevated bridge embankments for the existing University Avenue OC, the ground surface is relatively flat, at approximately Elevation 20 feet. The elevated bridge embankments reach as high as about Elevation 42 feet. Development in the immediate vicinity of the project site includes the freeway, the University Avenue OC, and channelization of San Francisquito Creek to the south. The Four Seasons Hotel and an IKEA retail store are located on the southwest and northeast quadrants of the interchange, respectively. Vegetation within the on-ramp/off-ramp loops includes grasses, shrubs and a few mature trees.

5.2 SUBSURFACE CONDITIONS

Five borings performed by Caltrans in 1953 for the existing University Avenue OC are shown on the LOTB sheet dated July 7, 1958; this included two rotary wash borings, B-5 and B-6, and five penetration borings, B-1, B-2, B-3, B-4 and B-7, extending to depths ranging from 50 to 75 feet.

Eight hollow stem auger borings were performed as part of a 2000 investigation for improvements to the on- and off-ramps to southbound US 101; these borings ranged in depth from 5 to 30 feet and were included as part of the project Materials Report dated September 6, 2000, prepared by others. Borings EB-6 and EB-9 were advanced west of southbound US 101 near the proposed OC.

Three borings were performed in 2002 to investigate subsurface conditions for proposed widening project of the existing University Avenue OC; one of these borings extended to a depth of about 90 feet.

Copies of the as-built LOTB, standard soil survey sheets and LOTB from each of these prior studies are presented in Appendix B.

AECOM advanced two CPTs (CPT-15-001 and CPT-15-002) for the proposed POC in November 2015. The CPTs were advanced to depths of about 50 and 100 feet at the locations shown on the LOTB presented in Appendix B; the LOTB presents the raw CPT data.

5.2.1 Fills

Boring 02-BR-1 from the 2002 investigation recorded 3 feet of fill near the ground surface, consisting of stiff lean clay, whereas Boring 02-B-2, drilled from the existing east approach embankment (near proposed Abutment 5), encountered very stiff sandy lean clay fill to a depth of about 18 feet. Borings EB-6 and EB-9 encountered about 15 and 5 feet, respectively of medium dense sandy gravel and very stiff silty clay embankment fill below the pavement section.

Prior to advancing CPT-15-001, the pavement section was cored; the asphalt concrete at this location is about 14 inches thick. Based on the CPT sounding, about 12 to 13 inches of aggregate base underlies the asphalt concrete.

5.2.2 Native Soils

Medium stiff to stiff lean clays were encountered in the upper 10 to 15 feet in both CPTs, underlain by 5 to 10 feet of loose to medium dense clayey sand to well-graded sand with gravel. Below the sand layers, the lean clays extend to the terminal CPT depths and are stiff to very stiff in consistency. The 2002 borings reveal similar soil conditions and provide pertinent in-situ and laboratory test data for these materials. Relevant borings from the 2000 study encountered very stiff sandy silt and medium dense silty sand below the approach fills and extending to their terminal depths.

5.2.3 Groundwater

Although no datum information was provided on the 1958 LOTB, elevations based on the NGVD 29 datum were presented in numerous Caltrans' project plans of the 1950s era. The 2002 LOTB for proposed widening of the existing University Avenue OC provides reference to NGVD 29. Therefore, the groundwater elevations referenced herein have been converted from NGVD 29 to NAVD 88 for consistent comparison with current topographic information.

Groundwater was encountered in Borings B-1, B-2, B-3, B-4 and B-7 in March 1953 at depths of about 10 to 14 feet, corresponding to approximately Elevation 11 to 13 feet (converted to NAVD 88). Boring 02-B-1 drilled in 2002 for proposed widening of the existing OC encountered groundwater at a depth of about 10 feet (corresponding to about Elevation 14 feet NAVD88), coincident with a very stiff to hard medium plasticity clay layer; as such, this groundwater reading could represent a perched condition. Free groundwater was also encountered in 2002 in Boring 02-B-2 at a depth of about 37 feet (corresponding to Elevation 2.7 feet NAVD 88); this boring appears to have been advanced at the top of the approach fill embankment. No groundwater was encountered to the terminal depths of borings performed as part of the September 2000 study for interchange improvements.

In cohesive soils, as generally encountered at the site, a fairly long time would be required for the groundwater to seep into the borehole and attain an equilibrium position with the long-term hydrostatic groundwater table. Thus, the immediate readings obtained in borings may or may not be representative of the actual groundwater table level.

Groundwater levels at the site are likely influenced by water levels in nearby San Francisquito Creek. In addition, seasonal fluctuations in the groundwater level should be anticipated throughout the year with variations in precipitation, evaporation, and surface runoff.

Based on available information, we believe a design groundwater table depth of 10 feet (corresponding to about Elevation 9.5 feet) would be appropriate for the POC.

6.1 REGIONAL TECTONIC SETTING AND SEISMICITY

The Santa Clara Valley is located between the active San Andreas fault to the west and the Hayward and Calaveras faults to the east, as shown in Figure 6-1. Each of these faults has produced damaging earthquakes during historic time. The valley margins are marked by belts of active thrust faults: the Foothills fault system to the southwest and the East Valley thrusts to the northeast (Fenton and Hitchcock, 2002).

The Foothills fault system is a series of southwest-dipping thrust faults located along the range front of the Santa Cruz Mountains (Bürgmann, *et al.*, 1994). The Monte Vista-Shannon fault is the main active fault in the Foothills thrust system closest to the site.

The East Valley thrusts are a series of northeast-dipping thrust faults that mark the junction between the southern end of the Hayward fault and the southern and central segments of the Calaveras fault. These faults, which include the Quimby, Piercy, Evergreen, Silver Creek, Coyote Creek, Berryessa, Crosley, and Warm Springs faults, are relatively short and appear to merge with the Calaveras faults at relatively shallow depths (Jones, *et al.*, 1994). Recent geologic and geomorphic investigations along both the Foothills and East Valley thrust systems indicate that they are active and may be capable of generating damaging earthquakes (Hitchcock and Kelson, 1999; Fenton and Hitchcock, 2002).

The active faults close to the project site are the Monte Vista-Shannon, Silver Creek, San Andreas and Hayward faults (Caltrans, 2012). The California Geological Survey (CGS, 2012) has produced maps showing Alquist-Priolo (A-P) Earthquake Fault Zones along faults with known Holocene activity that pose a potential surface faulting hazard. The San Andreas and Hayward faults are included as A-P zoned faults, but the Monte Vista-Shannon and Silver Creek faults are not. These faults are capable of generating very large earthquakes with very strong ground accelerations at the site. A site-specific discussion of ground motion is presented in Section 8.

6.2 SEISMIC AND GEOLOGIC HAZARDS

6.2.1 Fault-Related Ground Rupture

The project site is not intersected by any known active faults or mapped A-P zoned faults. Surface rupture due to faulting at the site, therefore, is not a hazard.

6.2.2 Liquefaction Potential

Liquefaction is a phenomenon whereby sediments temporarily lose shear strength and collapse. This condition is caused by cyclic loading during earthquake shaking that generates high porewater pressures within the sediments. The soil type most susceptible to liquefaction is loose, cohesionless granular soil below the water table and within about 50 feet of the ground surface. Liquefaction can result in loss of foundation support and settlement of overlying structures, ground subsidence and translation due to lateral spreading, lurch cracking, and differential settlement of affected deposits.

In a regional study of the nine-county San Francisco Bay region for the United States Geological Survey (USGS), Witter *et al.* (2006) mapped the liquefaction susceptibility of the soils in the project vicinity. An excerpt of the map is included as Figure 6-2. The map indicates the project alignment generally contains soils with moderate to very high liquefaction susceptibility.

Potentially liquefiable deposits were encountered in project explorations CPT-15-001 and CPT-15-002, ranging in thickness from about 1 to 4 feet and at various depths below ground surface (bgs), extending down to about Elevation – 3 feet (NAVD88). AECOM evaluated post-liquefaction ground surface settlement for a groundwater depth of 10 feet bgs (corresponding to about Elevation 9.5 feet, NAVD88), considering a PGA of 0.63g and earthquake magnitude of 7.19. Table 6-1 presents a summary of the analysis results; computation output is included in Appendix E.

Table 6-1 Liquefaction Potential at University Avenue POC

Support	Liquefaction Elevation (feet)	Estimated Seismic induced Settlement (inches)	Downdrag Zone Bottom Elevation (feet)	Estimated Downdrag Load (kips/pile)
Abut 1	-3 to 8	2½	-2	143
Bent 2	-3 to 8	2½	0	200
Bent 3	-3 to 8	2½	+1	390
Bent 4	-3 to 8	2½	0	200
Abut 5	-3 to 8	2½	-2	190

Historic exploration 02-BR-1 (2002) for proposed widening of the University Avenue OC revealed very loose to loose clayey sand between Elevation 4 and 9 feet (NAVD88) which the investigator for that study considered to be potentially liquefiable and for which they estimated settlement on the order of 2 inches. The logs of Borings B-5 and B-6 from the 1953 study also revealed potentially liquefiable silts and sands extending to about Elevation -3 feet (NAVD88), generally consistent with the elevations of potentially liquefiable deposits suggested by project CPTs.

Based on the analysis results, downdrag loads due to liquefaction are expected to act on the CIDH pile foundations; the estimated magnitudes of downdrag force are discussed in Section 10 of this report.

6.2.3 Subsidence and Seismic Compaction

Subsidence typically occurs as a result of subsurface fluid extraction (e.g. groundwater, petroleum) or compression of soft, geologically young sediments. Groundwater extraction for high volume municipal and agricultural use has the potential to cause future ground subsidence in the region. East Palo Alto is located at the northern fringe of the area most influenced by groundwater extraction associated with agricultural wells. However, we are unaware of subsidence in the area since the Santa Clara Valley Water District implemented groundwater recharge programs more than 50 years ago. No active petroleum wells are present within many miles of the project alignment (California Division of Oil, Gas, and Geothermal Resources, 2009).

Settlement can occur quickly when soil is loaded by a structure or by the placement of fill on top of soil, and it can also occur gradually when soil pore pressures, increased by vertical loading, gradually dissipate over time. Clays encountered in previous explorations at the site were described as medium stiff to very stiff. CPT sounding interpretations suggest these clay deposits are somewhat over-consolidated, with an over-consolidation ratio ranging from about 2 to 4. We analyzed ground surface settlement that could occur due to consolidation of these clays under the weight of new approach fill loads, expected to be about 20 feet high at Abutment 1, and estimate total long-term settlement on the order of about 1 to 1½ inches. This magnitude of settlement would be expected to induce axial downdrag loads on the proposed CIDH piles at Abutment 1; as such, we recommend a settlement period of at least 90 days following completion of fill placement before CIDH piles are constructed at this location. New fills required to construct the approach at Abutment 5 are expected to be 5 to 10 feet thick; consolidation settlement at Abutment 5 is expected to be on the order of less than about ½ inch.

Seismically-induced (dry) settlement occurs when loose granular soils above the groundwater table further densify as a result of earthquake shaking. The soil densification can result in differential settlement because of variations in soil composition, thickness, and initial density. As shown on the LOTB sheets, loose sand layers were not encountered above the groundwater table in current or previous explorations at the site. Based on this information, seismic compaction settlement is not a concern at the site.

6.2.4 Landslide and Lateral Spreading

The terrain along US 101 in the project vicinity is relatively flat and is not susceptible to landsliding. In addition, the project site is not located within a mapped landslide hazard zone (CGS, 2006). Landsliding is not a potential hazard at the site.

Lateral spreading occurs when a layer liquefies at depth and causes horizontal movement or displacement of the overburden mass toward a free face such as a stream or canal bank or excavation, or toward an open body of water. These topographic features are not present in close proximity to the site; therefore, lateral spreading is not a concern.

6.2.5 Scour

Because the proposed POC structure is to be located outside of waterways, scour is not an issue.

6.2.6 Flooding

According to the Federal Emergency Management Agency (FEMA) flood insurance rate map (FIRM) of the region, the project site is located partly outside areas of the 0.2 percent annual chance floodplain and partly within areas of 1 percent annual chance flood (100-year flood). Abutment 1 at the north approach, Bent 2 and Bent 3 will be located in areas outside of the 0.2 percent annual chance flood. Abutment 5 at the south approach and Bent 4 will be located within Zone A (areas of 1 percent annual chance flood with no base flood elevations determined). An excerpt of the FIRM, with the project area enlarged, is presented on Figure 6-3.

Caltrans *Corrosion Guidelines*, Version 3.2, dated May 2021, consider a site corrosive to foundation elements if minimum resistivity is less than or equal to 1,000 ohm-cm (as an indicator only), and one or more of the following conditions exist for the representative soil samples taken from the site:

- The chloride concentration is 500 parts per million (ppm) or greater and/or
- The sulfate concentration is 1,500 ppm or greater and/or
- The pH is 5.5 or less.

Corrosion potential of the soils at the US 101/University Avenue interchange was evaluated as part of the 2000 study. Test results indicated the following:

- The pH of site soils ranged from 6.6 to 7.5
- The minimum saturated resistivity ranged from 1,100 to >20,000 ohm-cm
- The sulfate concentration ranged from non-detect to 275 parts per million
- The chloride concentration for all samples was non-detect

Based on Caltrans *Corrosion Guidelines*, and the test results from the 2000 study, the site soils are considered to be non-corrosive to foundation elements. In addition, the proposed structure will not be located within 1,000 feet of saltwater or brackish water.

The seismic design methodology adopted for this project is based on the following current Caltrans standards:

- Seismic Design Criteria (SDC), version 1.7, 2013,
- Caltrans ARS Online, version 3.0.2, and
- Methodology for Developing Design Response Spectrum for Use in Seismic Design, Recommendations, November 2012.

For determining peak ground acceleration (PGA) and spectral acceleration (SA), the Caltrans Acceleration Response Spectra (ARS) Online (Version 3.0.2) tool was used to calculate the design spectrum. The ARS is based solely on the probabilistic spectrum at a 5% probability of exceedance in 50 years hazard level (975-year return period) and 5% damping as calculated for the 2014 USGS National Seismic Hazard Maps. A deterministic spectrum is no longer included in the development of the design spectrum. AECOM judged a shear wave velocity, V_{S30}, of 210 m/s to be representative of the subsurface conditions based on correlations with undrained shear strength (Dickerson, 1994) and relative density (Weir, 2012). The following ground motion parameters were established:

- Peak ground acceleration = 0.63 g
- Mean Magnitude = 7.19

The active faults closest to the University Avenue POC include the San Andreas fault (Peninsula segment), San Andreas fault (Santa Cruz Mountains segment), Silver Creek fault, Monte Vista-Shannon fault and Hayward fault (South). Table 8-1 presents a summary of these active faults. The near fault adjustment factor with respect to period ranges from 1.00 to 1.20.

Table 8-1 Seismic Source Parameters

Fault	Type	M_{Max}	Distance to Fault, R_{RUP}[1] (miles)	Near Field Effects?
San Andreas (Peninsula)	strike-slip	8	7.1	Y
San Andreas (Santa Cruz Mountains)	strike-slip	8	13.1	Y
Silver Creek	reverse	6.9	7.3	Y
Monte Vista-Shannon	reverse	6.4	5.8	Y
Hayward (South)	strike-slip	7.3	11.2	Y

[1] Fault distances taken from Caltrans ARS are intended for use in ground motion evaluation; these distances should not be used for project scale fault location.

Figure 8-1 presents the design acceleration response spectra for this site.

The adjacent existing University Avenue OC (Bridge No. 35-0113R/L) consists of two, 2-lane bridges that span over US 101. As-built information indicates OC structures were constructed in 1958; the north structure is about 357 feet long and the south structure is about 353 feet long. Both structures reportedly are simple-span composite welded steel girders with reinforced concrete deck. Excerpts of the as-built plans are presented in Appendix D.

The structures are each supported on two abutments and three bents; bottom of pile cap elevations at the structure supports are presented in Table 9-1.

Table 9-1 Bottom of Pile Cap Elevations for University Avenue OC

	Elevation, MSL (feet)	
Location	**North (Left)**	**South (Right)**
Abut 1	16.0	16.7
Bent 2	15.0	14.5
Bent 3	15.0	14.5
Bent 4	17.0	16.0
Abut 5	18.0	18.0

All foundations are supported on driven concrete piles designated as 32-ton bearing, with specified tip at Elevation -30 to -40 feet (MSL).

10.1 DISCUSSION

The proposed bridge and bridge approaches are underlain by moderately compressible medium stiff to very stiff lean clays interbedded with potentially liquefiable discontinuous layers of loose to medium dense sand in the upper 30 feet.

The principal geotechnical issues at the site are:

- Post-liquefaction settlement of potentially liquefiable soils,
- Consolidation settlement of the medium stiff clays due to the weight of new approach fills, and
- Selection of the type and depth of foundations that will be compatible with the underlying soils and structural loading.

We understand that single 96-inch-diameter cast-in-drilled-hole (CIDH) piles are planned at the bents and that 24-inch-diameter CIDH piles and pile caps are planned at the abutments. From a geotechnical engineering standpoint, CIDH piles are compatible with the subsurface soil conditions at the project site. At the bents, the CIDH piles will be utilized to support Type II column-shafts, whereas the pile caps at the abutments will be supported on pile groups each consisting of six CIDH piles.

For 5-foot diameter and larger Type-II shafts (Caltrans Seismic Design Criteria, 7.7.3.5), a construction joint is required below the embedded column rebar cage. The construction joint will allow the contractor to place the CIDH concrete without supporting the column rebar cage and to cast the rest of the Type-II shaft and column concrete in a dry condition. Per Section 49 of Caltrans Standard Specifications, permanent steel casing is required to a depth of 5 feet below the construction joint; this corresponds to Elevation 0 feet at Bents 2 and 4 and Elevation +8 feet at Bent 3.

10.2 FOUNDATION DESIGN INFORMATION

10.2.1 Idealized Soil Profiles

Table 10-1 presents the idealized soil profile for the structure based on project specific CPTs and historic exploratory boring data.

Table 10-1 Idealized Soil Profile and Strength Parameters for University Avenue POC

Approximate Elevation (feet)	Predominant Soil Type[1]	Total Unit Weight (pcf)	Drained Friction Angle (degrees)	Undrained Shear Strength (psf)	K (pci)	E_{50}
40 to 22	Embankment Fill	120	34	--	90	--
22 to 17	Sand	120	34	--	90	--
17 to 5	Clay	120	--	1,500	--	0.007
5 to -3	Sand	120	30	--	60	--
-3 to -7	Sand	128	36	--	125	--
-7 to -12	Clay	125	--	1,500	--	0.007
-12 and deeper	Clay	125	--	1,800	--	0.005

[1]For lateral pile analysis, model Layer 4 (El +5 to -3) as liquefiable for seismic condition; all clays should be modeled as stiff clay without free water since these soils are not subject to erosion by water forces.

[2]New embankment fills within 150 feet of the abutments (structure backfill) should be assumed to have a drained friction angle of 34 degrees.

10.2.2 Axial Pile Capacity Analysis

Table 10-2 presents a summary of the foundation design data provided by the Structural Engineer.

Table 10-2 Foundation Design Data for University Avenue POC

Location	Pile Type	Finished Grade Elevation (ft)	Cut-off Elevation* (ft)	Pile Cap Size, BxL (ft)	Permissible Settlement Under Service Load	No. of Piles per Support
Abut 1	24-inch CIDH	29	22.25*	10 x 16	1-inch	6
Bent 2	96-inch CIDH with Permanent Steel Casing	18	11	--	1-inch	1
Bent 3	96-inch CIDH with Permanent Steel Casing	21	19	--	1-inch	1
Bent 4	96-inch CIDH with Permanent Steel Casing	18	11	--	1-inch	1
Abut 5	24-inch CIDH	33	27.25	10 x 16	1-inch	6
Abut 5 Wing Wall Left	24-inch CIDH	40	35.25	4 x 4	1-inch	1
Abut 5 Wing Wall Right	24-inch CIDH	40	35.25	4 x 4	1 inch	1

*Bottom of footing is 3 inches below the cutoff elevation.

The design loading conditions and nominal resistance have been developed in accordance with the LRFD approach. Table 10-3 presents the design loads provided by the Structure Designer. No tension loads act on the abutment or bent foundations. The design tip elevations and specified tip elevations are presented in Table 10-4. The calculated nominal axial resistance of the CIDH piles is based on skin friction only, neglecting the contributions of the portion of pile with permanent casing at the bents.

Table 10-3 Factored Design Loads for University Avenue POC

Location	Service Limit I State (kips)		Strength Limit State (Controlling Group, kips)				Extreme Limit State (Controlling Group, kips)			
	Total Load		Compression		Tension		Compression		Tension	
	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile
Abut 1	544	115	722	158	-	-	471	85.4	-	-
Bent 2	956	956	1278	1278	-	-	789	773.9	-	-
Bent 3	1009	1009	1354	1354	-	-	864.3	856.6	-	-
Bent 4	963	963	1287	1287	-	-	796	775.1	-	-
Abut 5	547	124	725	172	-	-	495	53.6	-	-
Abut 5 WW Lt	25	25	37.5	37.5	-	-	25	25	-	-
Abut 5 WW Rt	25	25	37.5	37.5	-	-	25	25	-	-

Table 10-4 Foundation Recommendations for University Avenue POC

Location	Pile Type	Cut-off Elevation (ft)	Service-I Limit State Load (kips)		Total Permissible Support Settlement (inches)	Nominal Resistance (kips)[5]		Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Specified Permanent Steel Casing Tip Elevation (ft)
			Per Support	Max Per Pile		Strength Limit	Extreme Event			
						Comp. (ϕ_{qs}=0.7)	Comp. (ϕ_{qs}=1)			
Abut 1	24-inch CIDH	22.25[2]	544	115	1	230	90	-15 (a-I) -6 (a-II) +4 (c) +1 (d)	-15	-
Bent 2	96-inch CIDH with Permanent Steel Casing	11	956	956	1	1,830	780	-74 (a-I) -44 (a-II) -120 (c) -13 (d)	-120	0
Bent 3	96-inch CIDH with Permanent Steel Casing	19	1,009	1,009	1	1,940	860	-76 (a-I) -46 (a-II) -95 (c) -15 (d)	-95	8
Bent 4	96-inch CIDH	11	963	963	1	1,840	780	-74 (a-I) -44 (a-II) -106 (c) -13 (d)	-106	0
Abut 5	24-inch CIDH	27.25	547	124	1	250	60	-15 (a-I) +11 (a-II) +9 (c) 0 (d)	-15	-
Abut 5 WW Lt	24-inch CIDH	35.25	25	25	1	60	30	+12 (a-I) +13 (a-II)	+12	-
Abut 5 WW Rt	24-inch CIDH	35.25	25	25	1	60	30	+12 (a-I) +13 (a-II)	+12	-

Notes:

1. Design tip elevation is controlled by the following demands: (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event), (c) Lateral Load, (d) Settlement.
2. Bottom of footing is 3 inches below cutoff elevation.
3. Specified CIDH pile tip shall not be raised.
4. Specified tip elevation controlled by compression at the abutments and lateral demand at the bents.

The specified tip elevations presented in Table 10-4 are based on skin friction only.

Table 10-5 Pile Data Table for University Avenue POC

Location	Pile Type	Cut-off Elevation (feet)	Nominal Resistance (kips)		Design Tip Elevation (feet)	Specified Tip Elevation (feet)	Specified Steel Casing Tip Elevation (feet)
			Compression	Tension			
Abut 1	24 inch CIDH	22.25[2]	230	0	-15 (a) +4 (c) +1 (d)	-15	NA
Bent 2	96 inch CIDH with Permanent Steel Casing	11	1,830	0	-74 (a) -120 (c) -13 (d)	-120	0
Bent 3	96 inch CIDH with Permanent Steel Casing	19	1,940	0	-76 (a) -95 (c) -15 (d)	-95	+8
Bent 4	96 inch CIDH with Permanent Steel Casing	11	1,840	0	-74 (a) -106 (c) -13 (d)	-106	0
Abut 5	24 inch CIDH	27.25	250	0	-15 (a) +9 (c) +0 (d)	-15	NA
Abut 5 Wingwall Left	24 inch CIDH	35.25	60	0	+12 (a)	+12	NA
Abut 5 Wingwall Right	24 inch CIDH	35.25	60	0	+12 (a)	+12	NA

1. Design tip elevation is controlled by the following demands: (a) Compression, (c) Lateral Load, and d) Settlement.
2. Bottom of footing is 3 inches below cutoff elevation.
3. Specified CIDH pile tip shall not be raised.
4. Specified tip elevation controlled by compression at the abutments and lateral demand at the bents.

The results of the axial pile capacity analysis are presented in Appendix F. No group reduction factor needs to be applied to the single pile compression load capacities presented above provided a center-to-center spacing of at least three pile diameters is used.

Downdrag loads resulting from liquefaction induced settlement could act on CIDH piles. The following procedures consistent with the Caltrans Geotechnical Manual on Liquefaction-Induced Downdrag (January 2020) were performed:

Step 1: Perform soil liquefaction hazard analysis – discussed in Section 6.2.2 and Appendix E

Step 2: Evaluate and summarize design soil parameters – discussed in Section 10.2.1

Step 3: Determine pile design tip elevation (DTE) for compression (Extreme Event I) by comparing the seismic factored design load to available pile nominal resistance, while ignoring nominal resistance calculated for the contribution from soil layers above the bottom of the potentially liquefiable layer intervals (Elevation -3 to +5 feet), plus the effective weight of the pile.

Step 4: Determine downdrag load combination as a summation of the design permanent load, maximum downdrag load and effective weight of the pile. The maximum downdrag load (DD_{max}) is estimated from the negative side shear stresses or shaft friction that could be mobilized along the pile embedment where ground settlement profile (due to liquefaction) is greater than the pile-ground relative settlement (z_{max}) which depend on types of pile and soil. DD_{max} is based on shear strength of resettled liquefied soils and shear strength of soil above the potentially liquefiable layer (s).

Calculations for Steps 3 and 4 are presented in Appendix F.

10.2.3 Lateral Load Capacity

Pile foundations are capable of resisting lateral loads through bending of the pile and by pile-soil interaction. The magnitude of the lateral load resistance that can develop depends upon several factors such as the pile size, the physical properties of the surrounding soils, and the structural design of the pile. AECOM used the computer program LPILE 2020 (Ensoft 2020) to estimate the lateral load resistance of CIDH piles at abutments and bents; lateral analysis was not performed for the abutment wingwall piles which will be embedded in embankment fill. This program models the soil response in the form of load-deflection (p-y) curves. Earthquake loading was modeled by the Structure Designer as a horizontal force to the superstructure using the static analysis option in LPILE Plus.

California Amendment to AASHTO LRFD Bridge Design Specifications recommends that a P-multiplier (P_m) be applied to the lateral capacity of individual piles to account for pile group efficiency. Table 10-6 presents the Caltrans recommended P_m for the corresponding rows of piles within a group based on Caltrans Amendments of AASHTO LRFD, Section 10.7.2.4. Row 1 refers to the leading row of piles in the direction of loading.

Table 10-6 Pile P-Multiplier, P_m, for Multiple Row Shading

Pile Center-to-Center Spacing (in the direction of loading)	Group Efficiency Factor (P-Multiplier, P_m)		
	Row 1	Row 2	Row 3 and higher
2 x Pile Width/Diameter (B)	0.60	0.35	0.25
3 B	0.75	0.55	0.4
5 B	1.0	0.85	0.7
7 B	1.0	1.0	0.9

Lateral stability checks were conducted for the proposed Type II column-shafts at Bents 2, 3 and 4 using the "Generate Top Deflection vs Pile Length" option in LPILE to evaluate the critical pile lengths beyond which no appreciable increase in deflection occurs under the "push-over" analysis. Results of the lateral stability checks indicate the critical length for the 96-inch-diameter CIDH piles proposed at the bents is 59 feet, defined by Caltrans as the shaft length where increases to shaft length do not result in appreciable changes in top of pile deflection. The design tip elevations for the bents presented in Table 10-4 for lateral loading are based on the critical length multiplied by a safety factor of 1.2. Results of the LPILE analyses are presented in Appendix G.

10.2.4 Axial Pile Load-Deflection

Axial pile load-displacement curves are used by the Structural Engineer to develop vertical foundation stress-strain coefficients for use in the superstructure analyses. The computer program TZPILE 2021 (Ensoft, Inc. 2021) was used to model the axial pile load behavior. Axial load displacement curves were developed for 96-inch-diameter CIDH piles. Input parameters for each soil layer also include ultimate side friction, f_s. For cohesive soils, f_s is based on the α-method as outlined in Section 10.8.3.5.1, AASHTO LRFD Bridge Design Specifications, Eighth Edition; for granular soils, f_s is based on the "depth-dependent β-method" outlined in Section 10.8.3.5.2, AASHTO LRFD Bridge Design Specifications, Eighth Edition.

10.3 PILE INSTALLATION

All piles should be installed under the direct observation of the Geotechnical Engineer's representatives and in accordance with Section 49 of the Caltrans Standard Specifications (2018), Piling.

Loose and medium dense sands were encountered below the groundwater table at several exploration locations. In accordance with Standard Specifications Section 49-3, Cast-in-Drilled Hole Concrete Piling, it is the Contractor's responsibility to utilize the appropriate method(s) and equipment to minimize causes of quick soil conditions, scouring or caving of the drilled hole.

Concrete should be placed by the tremie method. Concrete placement operations should be controlled to ensure the tremie is not broken during continuous placement from bottom to top. Care should be taken to prevent extraneous material from mixing with the fresh concrete. PVC inspection pipes are required to permit Gamma-Gamma Logging (GGL) and Cross-hole Sonic Logging (CSL) tests of these CIDH piles. Inspection pipes should be installed in accordance with California Test 233.

10.4 APPROACH FILLS AND ABUTMENT EXCAVATION

All earthwork should be completed in accordance with applicable sections of the Caltrans Standard Specifications (2018).

Pile caps should be excavated as required to bring those areas to their finish subgrade elevation. All loose soil should be removed from the exposed subgrade prior to pile cap construction.

As discussed in Section 6.2.3, consolidation settlement on the order of about 1 to 1½ inches is anticipated at Abutment 1 due to placement of 20 feet of fill at the approach. A monitored settlement period of at least 90 days is recommended prior to CIDH pile construction. Settlement monitoring should be performed in accordance with California Test 112.

10.5 SLOPE STABILITY

AECOM evaluated the embankment slope stability using the computer program SLOPE/W with limit-equilibrium method. The planned side slopes of the embankment below Abutment 1 are at an inclination of 3H:1V (horizontal to vertical) or flatter. The minimum calculated factors of safety for the static cases exceed 1.5 and the minimum calculated factors of safety for the pseudo-static cases exceed 1.1.. Results of the analyses are presented in Appendix H.

10.6 NOTES TO STRUCTURAL DESIGNER

The permanent smooth-walled steel casing is to be shown on the contract plans at the construction joints. The geotechnical resistance of the casing was not used in design of the CIDH piles. Installation methods for steel casing include drilled, oscillated/rotated into place, or placed in a drilled hole with the annular space backfilled with grout as described in Section 49-3 of the Caltrans Standard Specifications (2018).

Permanent steel casing at the construction joints should not have a diameter more than 2 feet larger than the CIDH pile.

11.1 TEMPORARY CONSTRUCTION EXCAVATIONS

Safety standards set by OSHA limit the height of the unshored vertical excavations to 5 feet if construction personnel will be working in the excavations. The set of guidelines published by OSHA (Department of Labor, Occupational Safety and Health Administration, 1999), classifies soils in detail as Type A, B, or C. In general, Type A soils are stronger, Type B soils are intermediate, and Type C soils are weaker. Based on the soil type, depth, and duration the excavation is open, and sequence of soils exposed in the excavation, OSHA recommends maximum allowable slopes. Based on the strengths of the soils encountered in the previous borings and CPTs conducted for this study, the existing roadway embankment fills are generally considered to be OSHA Type B. On this basis, we recommend that temporary slopes in these soils be cut no steeper than 1:1 (horizontal: vertical). The Contractor's Engineer must submit his calculations to Caltrans for review prior to excavation.

We recommend that the Geotechnical Engineer be retained to review the conditions in temporary cut slopes as they are exposed during construction. Additional recommendations could be provided at that time regarding the advisability of different temporary slope inclinations in particular areas.

For locations where excavation with sloping sides is not viable because of space limitations or in areas where temporary slopes steeper than 1:1 (horizontal:vertical) are planned, shoring must be provided. The Contractor must retain an experienced Registered Civil Engineer to design the shoring system. Design of temporary shoring system must be submitted to Caltrans for review and approval.

11.2 PILE INSTALLATION

The edge of the proposed 96-inch-diameter CIDH pile at Bent 2 is about 22 feet from the west wingwall footing of Abutment 1 of the adjacent University Avenue OC. It is conceivable that excessive caving during the installation of the drilled shaft could lead to ground displacement around the adjacent University Avenue OC abutment. The procedures in Standard Specification Section 49 must be followed to minimize the potential for caving. In addition, we recommend both horizontal and vertical displacement monitoring of the existing OC abutment during CIDH pile installation.

Since historic and project subsurface explorations were terminated at or above Elevation -81 feet, it would be prudent, in the opinion of AECOM, for the Contractor to drill a vertical boring at the site to evaluate soil and groundwater conditions down to at least Elevation -130 feet as they relate to construction of the proposed large diameter drilled shafts proposed at Bents 2, 3 and 4.

11.3 CONSTRUCTION DEWATERING

Free groundwater was encountered in borings drilled in the vicinity of the planned POC alignment as shallow as about Elevation 10 feet (NAVD88); this does not necessarily represent a stabilized groundwater level at the boring locations.

The Contractor should be prepared to dewater excavations as necessary during construction. Groundwater encountered in pile cap excavations can likely be removed by sumping procedures.

Groundwater will be encountered in CIDH pile excavations. The Contractor should expect the slurry displacement method and/or use of temporary casing will be necessary to construct CIDH piles.

Dewatering is not expected to be required for the project. Water in CIDH piles is expected to be displaced by tremied concrete during construction. If the contractor alternatively proposes dewatering wells to construct the shafts in the dry, then he will need to work with his Geotechnical Engineer to design a dewatering system that does not result in land subsidence. The dewatering system design would need to be reviewed by the Owner's Engineer.

11.4 MINING AND TUNNELING CLASSIFICATION

Drilled shaft excavation required for construction of Type II shafts at the column bents has been classified as "potentially gassy with special conditions." Documentation provided by the State of California, Department of Industrial Relations, Division of Occupational Safety and Health Mining and Tunneling Unit, is included in Appendix I.

11.5 SUPPLEMENTAL PROJECT INFORMATION

SSP 2-1.06B, "Supplemental Project Information" discloses to bidders and contractors a list of pertinent available information for their review prior to bid opening. The following documents and information should be included in the table:

- Foundation Report for University Avenue POC
- Mining and Tunneling Classification
- Cone Penetration Test Results
- As-built Log of Test Borings

The findings of this study are intended for use in design of the POC at University Avenue and US 101 in East Palo Alto, California. The opinions, conclusions and recommendations presented in this Foundation Report are based on information obtained from new and previous explorations made at widely separated locations, site reconnaissance, review of available topographic information and historic data, and upon experience and engineering judgment.

The recommendations presented in this report are based on the assumption that the soil and geologic conditions do not deviate substantially from those encountered in the exploratory borings and CPT. If any variations are encountered during construction, AECOM should be contacted so that supplementary recommendations can be made.

If the planned construction is changed from that presently conceived, AECOM should be retained to review the changes and make modifications to the original recommendations presented in this report in order to meet the project needs.

The Geotechnical Engineer should review the final specifications and drawings to verify the documents are consistent with the intent of the geotechnical recommendations herein presented. Geotechnical issues may arise during construction not apparent at this time. AECOM should be retained during construction to review the soil conditions encountered and the construction procedures. All earthwork and testing, as well as pile installation, should be done under the direct observation of a representative of AECOM.

The elevations shown on the new LOTBs are based on interpolation from spot and contour elevations shown on available topographic maps.

As-built drawings pertinent only to the geotechnical investigation are included.

Specific review and investigation for environmental issues and subsurface environmental contamination were beyond the scope of our services.

The opinions and recommendations presented in this Foundation Report were developed with the standard of care commonly used as state of the practice in the profession. No other warranties are included, either express or implied, as to the professional advice provided in this report.

Brabb, E.E. and Pampeyan, E.H., 1972, Preliminary geologic map of San Mateo County, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-328.

Brabb, E.E. and Pampeyan, E.H., 1983, Geologic map of San Mateo County, California: U.S. Geological Survey Miscellaneous Investigation Series MapI-1257-A

Brabb, E.E., Graymer, R.W., and Jones, D.L., 2000, Geologic map and map database of the Palo Alto 30'x60' quadrangle, California: US Geological Survey Miscellaneous Field Studies Map MF-2332, http://ngmdb.usgs.gov/Prodesc/proddesc_26231.htm

Bürgmann, R., Arrowsmith, R. and Dumitru, T., 1994, Rise and fall of the southern Santa Cruz Mountains, California, from fission tracks, geomorphology, and geodesy, Journal of Geophysical Research, v. 99B, p. 20,181-20,202.California Department of Transportation, 2007, by Merriam, M. and Shantz, T. Deterministic PGA Map, a digital database dap3.dot.ca.gov/shake_stable/references/Deterministic_PGA_Map_8-12-09.pdf.

California Division of Oil, Gas, and Geothermal Resources, 2009, Oil, Gas, & Geothermal Fields in California, map W3-10, scale 1:288,000 ftp://ftp.consrv.ca.gov/pub/oil/maps/dist3/w3-10/Mapw3-10.pdf.

California Geological Survey, 2007 (revised), Fault Rupture Hazard Zones in California, Special Publication 42, Appendix A, Section 2621.7(c).

Dibblee, Jr., T.W., 1966, Geology of the Palo Alto quadrangle, Santa Clara and San Mateo counties, California: California Division of Mines and Geology M S 008, scale 1:24,000.

Fenton, C.H., and Hitchcock, C.S. 2001, Recent Geomorphic and Paleoseismic Investigations of Thrust Faults in Santa Clara Valley, California in Engineering Geology Practice in Northern California, Association of Engineering Geologists Special Publication 12, Edited by H. Ferriz and R. Anderson, pp 239 – 257. Jennings, C.W. and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, scale 1: 750,000.

Lowney Associates, 2000, Materials Report, Route 101/University Avenue Interchange, Route 101 PM 0.7/1.16, San Mateo County, California.

Pampeyan, E.H., 1970, Geologic map of the Palo Alto 7-1/2 minute quadrangle, San Mateo and Santa Clara Counties, California: US Geological Survey Open File Report 70-254, scale 1:24,000.

Pampeyan, E.H., 1993, Geologic map of the Palo Alto and part of the Redwood Point 7.5-minute quadrangles, San Mateo and Santa Clara counties, California: US Geological Survey I-2371.

Parikh Consultants, Inc., 2002, Preliminary Geotechnical Information (Foundation Type Selection), University Avenue Overcrossing (Widen), Bridge No. 35-113, University Avenue/Route 101 Interchange, San Mateo County, California, 04-SM-101-KP 1.43 (PM 0.89), CU 04245, EA 272801.

Witter, R.C., Knudsen, K.L., Sowers, J.M., Wentworth, C.M., Koehler, R.D., and Randolph, C.E., 2006, Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California, a digital database; U.S. Geological Survey Open-File Report 2006-1037.

0 1000 2000 FEET

Source: Esri, NASA, USGS.

AECOM	US 101/UNIVERSITY AVENUE POC East Palo Alto, California Project Number: 60416357	Project Vicinity Map	Figure 1-1 May 2015

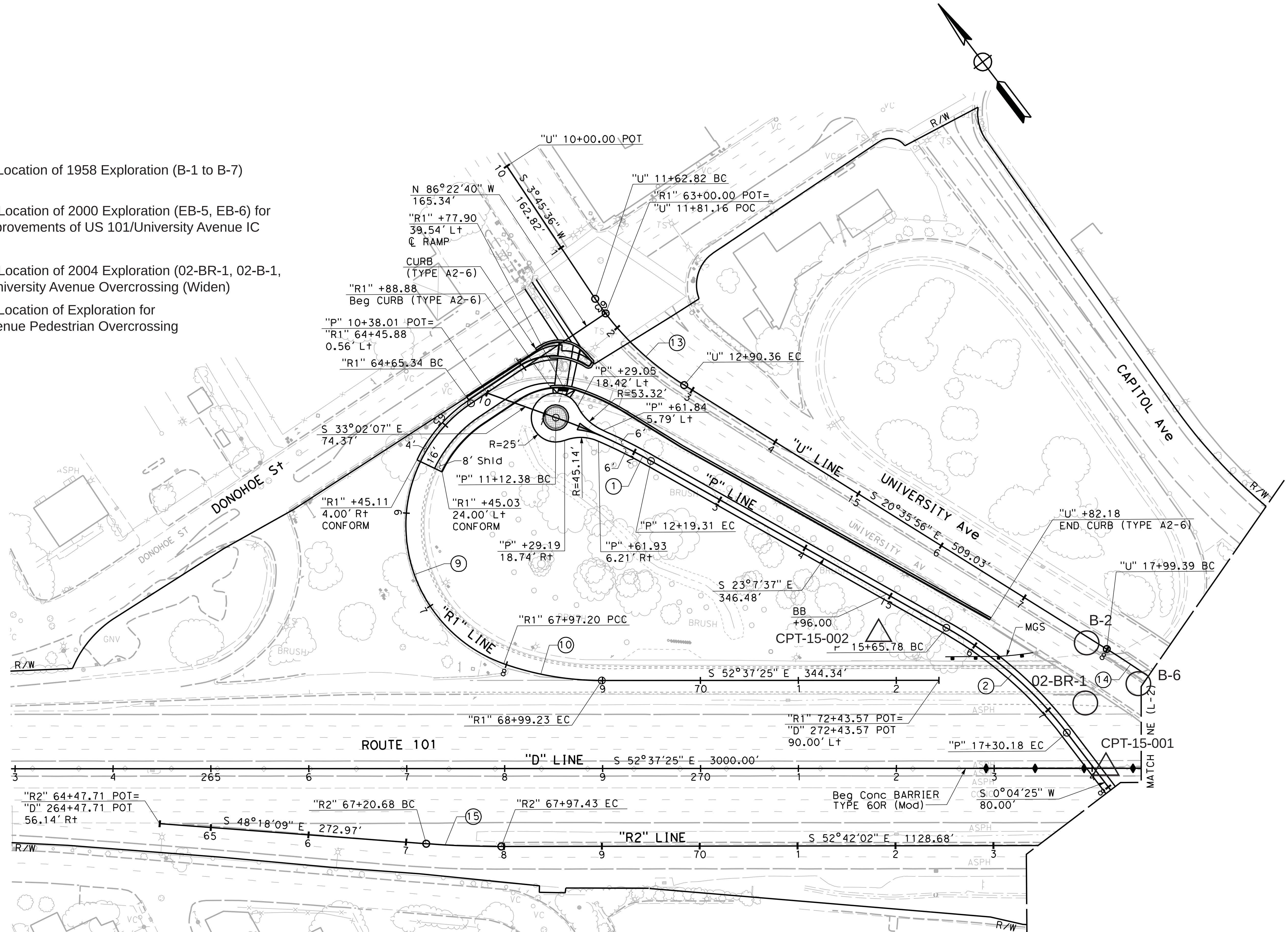
Legend

B-6 — Approximate Location of 1958 Exploration (B-1 to B-7)

EB-5 — Approximate Location of 2000 Exploration (EB-5, EB-6) for Proposed Improvements of US 101/University Avenue IC

02-BR-1 — Approximate Location of 2004 Exploration (02-BR-1, 02-B-1, 02-B-2) for University Avenue Overcrossing (Widen)

CPT-15-001 — Approximate Location of Exploration for University Avenue Pedestrian Overcrossing

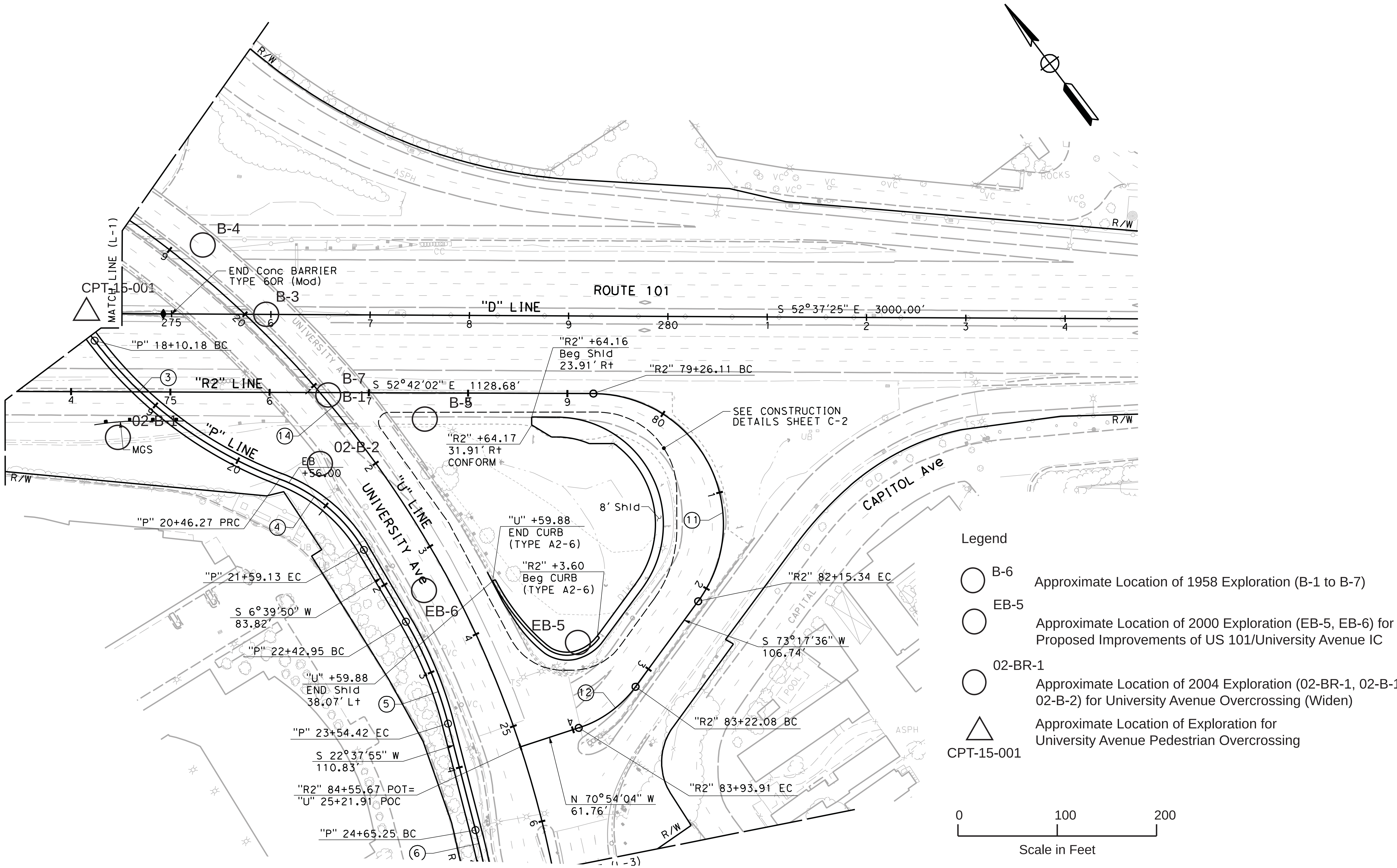


AECOM

University Avenue Pedestrian Overcrossing
US 101
East Palo Alto, California

Site and Exploration Plan

FIGURE 1-2
Sheet 1 of 2
March 2017



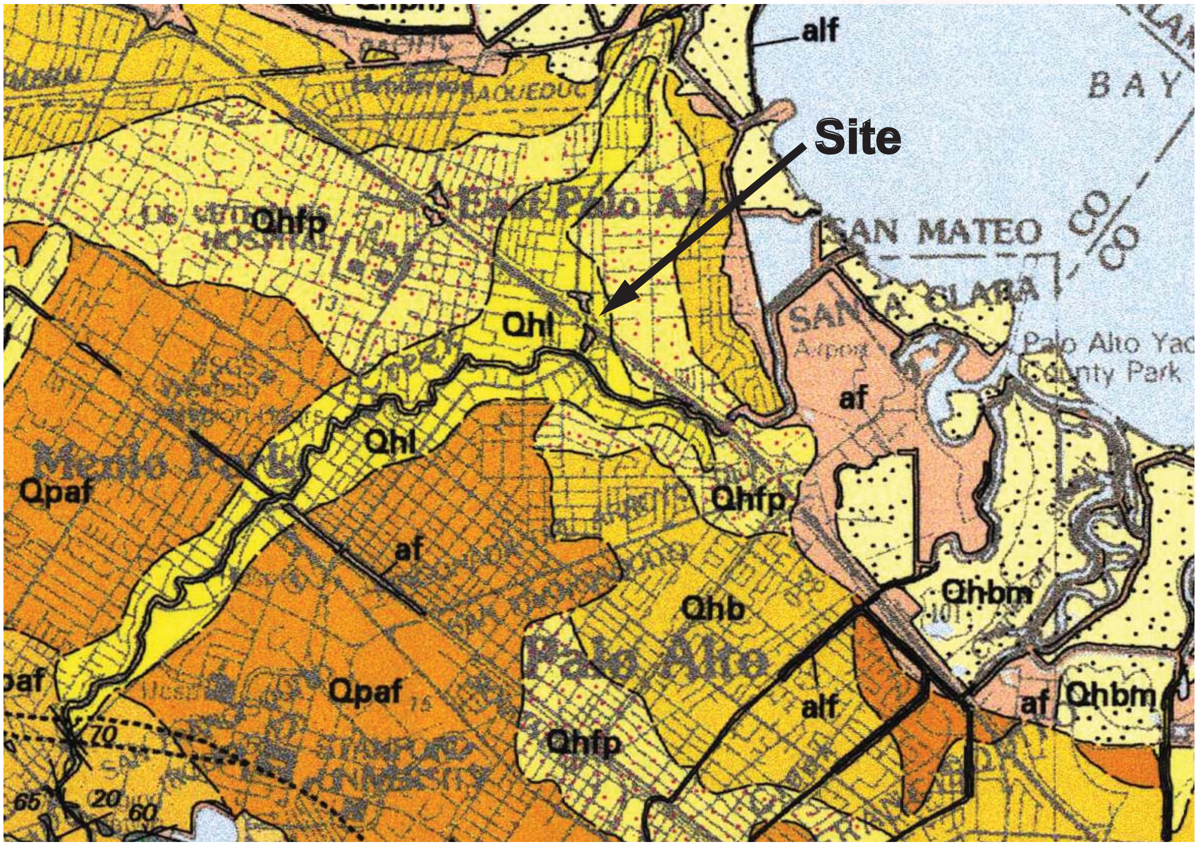
AECOM

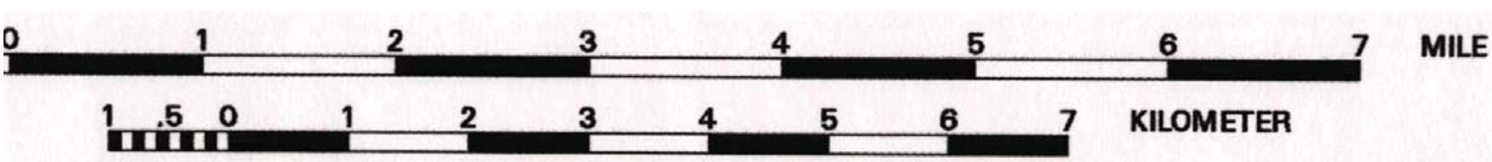
University Avenue
Pedestrian Overcrossing
US 101
East Palo Alto, California

Site and Exploration Plan

FIGURE 1-2
Sheet 2 of 2
March 2017

N





af **Artificial fill (Historic)**
Loose to very well consolidated gravel, sand, silt, clay, rock fragments, organic matter, and man-made depbris in varous combination.

Qhfp **Flood-plain deposits (Holocene)**
Medium to dark-gray, dense, sandy to silty clay. Lenses of coarser material (silt, sand, and pebbles) may be locally present. Flood-plain deposits usually occur between levee deposits (Qhl) and basin desposits (Qhb).

Qhl **Natural levee deposits (Holocene)**
Loose, moderately to well-sorted sandy or clayey silt grading to sandy or silty clay. These deposits border stream channels, usually both banks, and slope away to flatter flood plains and basins.

Modified from: Brabb and others (2000)

AECOM	Project No. 60416357 US 101/University Avenue Pedestrian OC East Palo Alto, CA	GEOLOGIC MAP OF THE SITE	Figure 3-1

Fault Source: AECOM Seismic Source Model

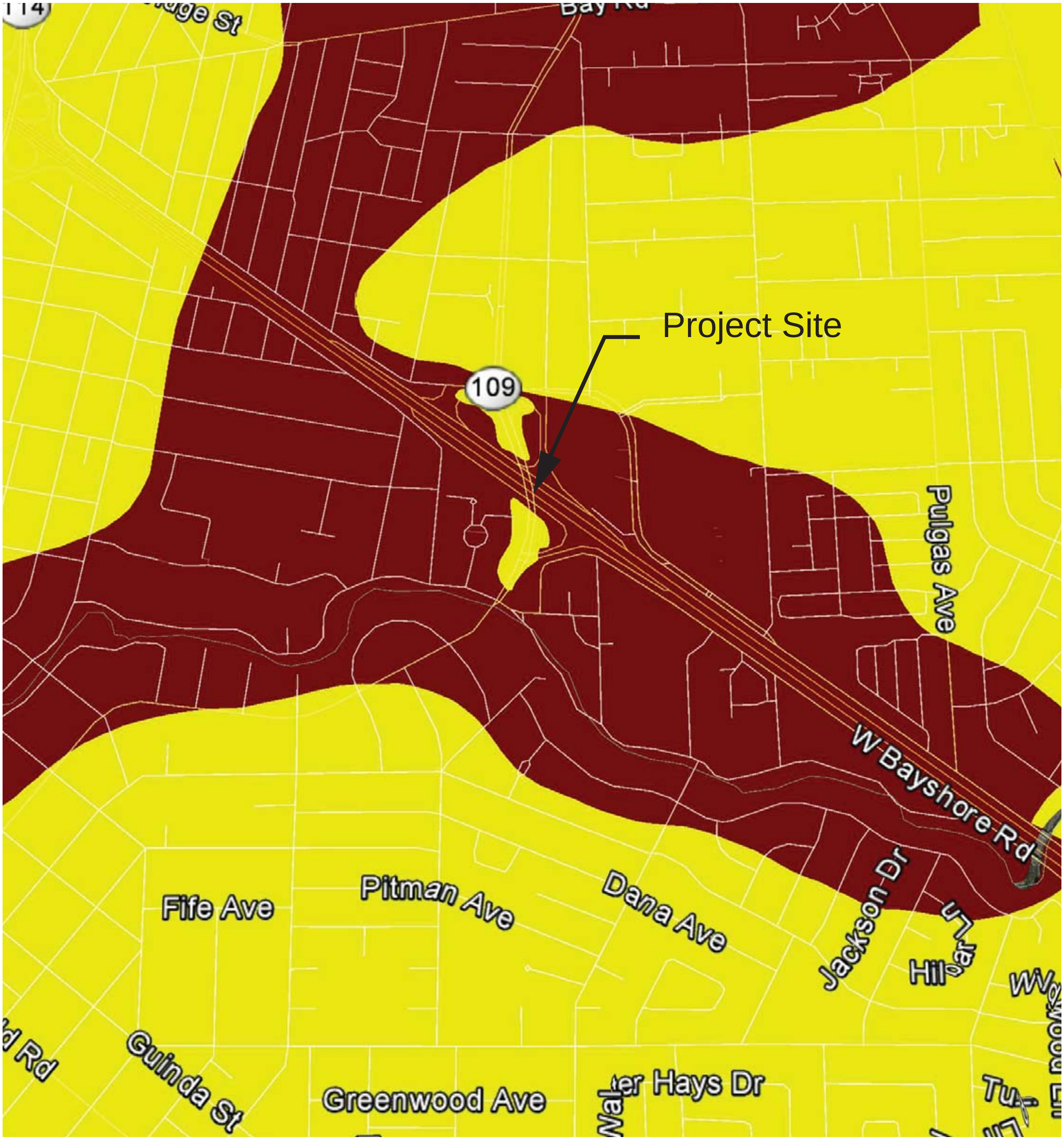
AECOM

Project No. 60416357

US 101/University Ave Improvements
East Palo Alto, CA

ACTIVE FAULTS IN THE SITE REGION

Figure 6-1



Liquefaction Susceptibility

- Very High
- High
- Moderate
- Low
- Very Low

0 500 1000 1500

Scale in Feet

Liquefaction susceptibility: USGS OFR 06-1037

AECOM	US 101/Univeristy Avenue Pedestrian OC East Palo Alto, CA	LIQUEFACTION SUSCEPTIBILITY MAP	Figure 6-2

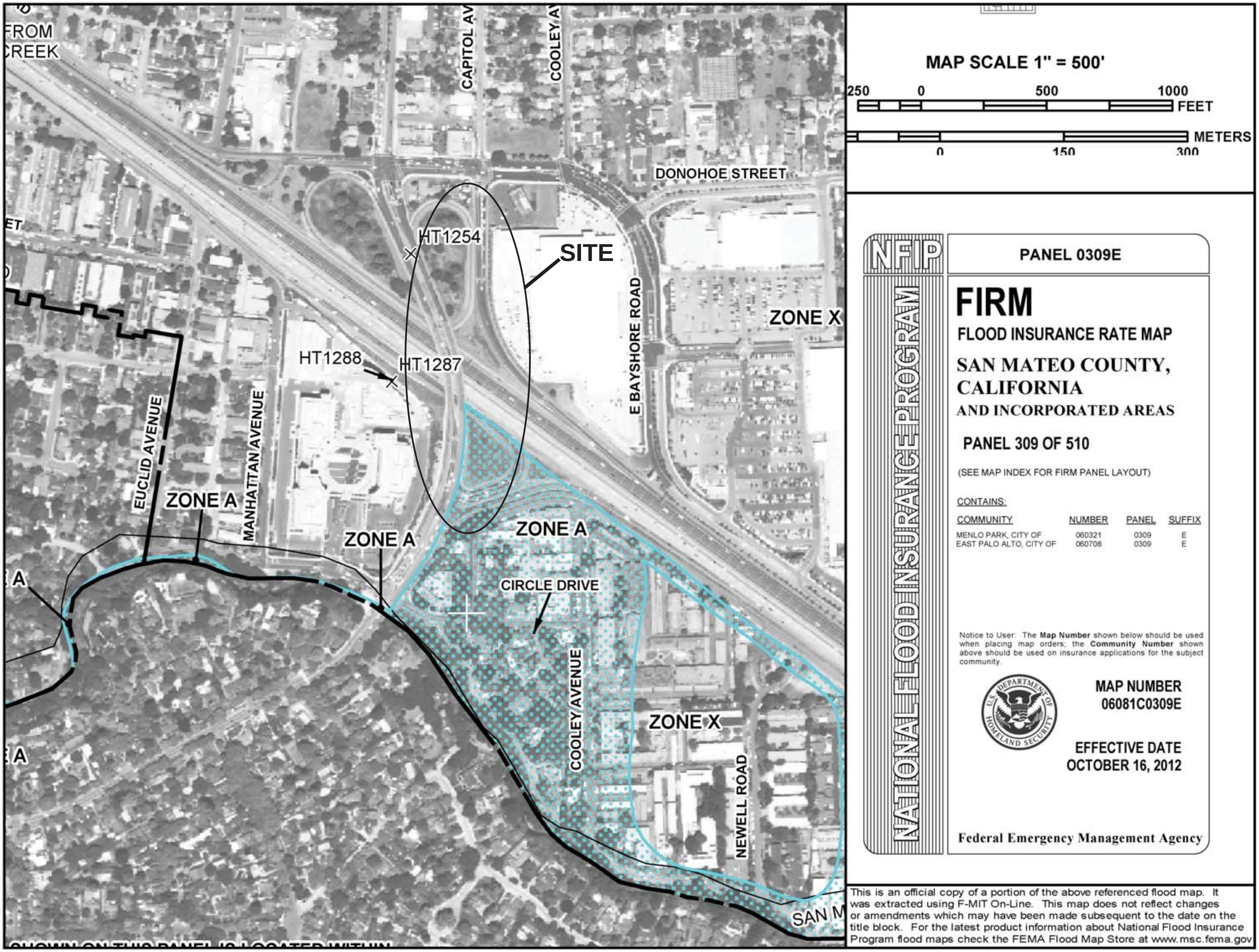
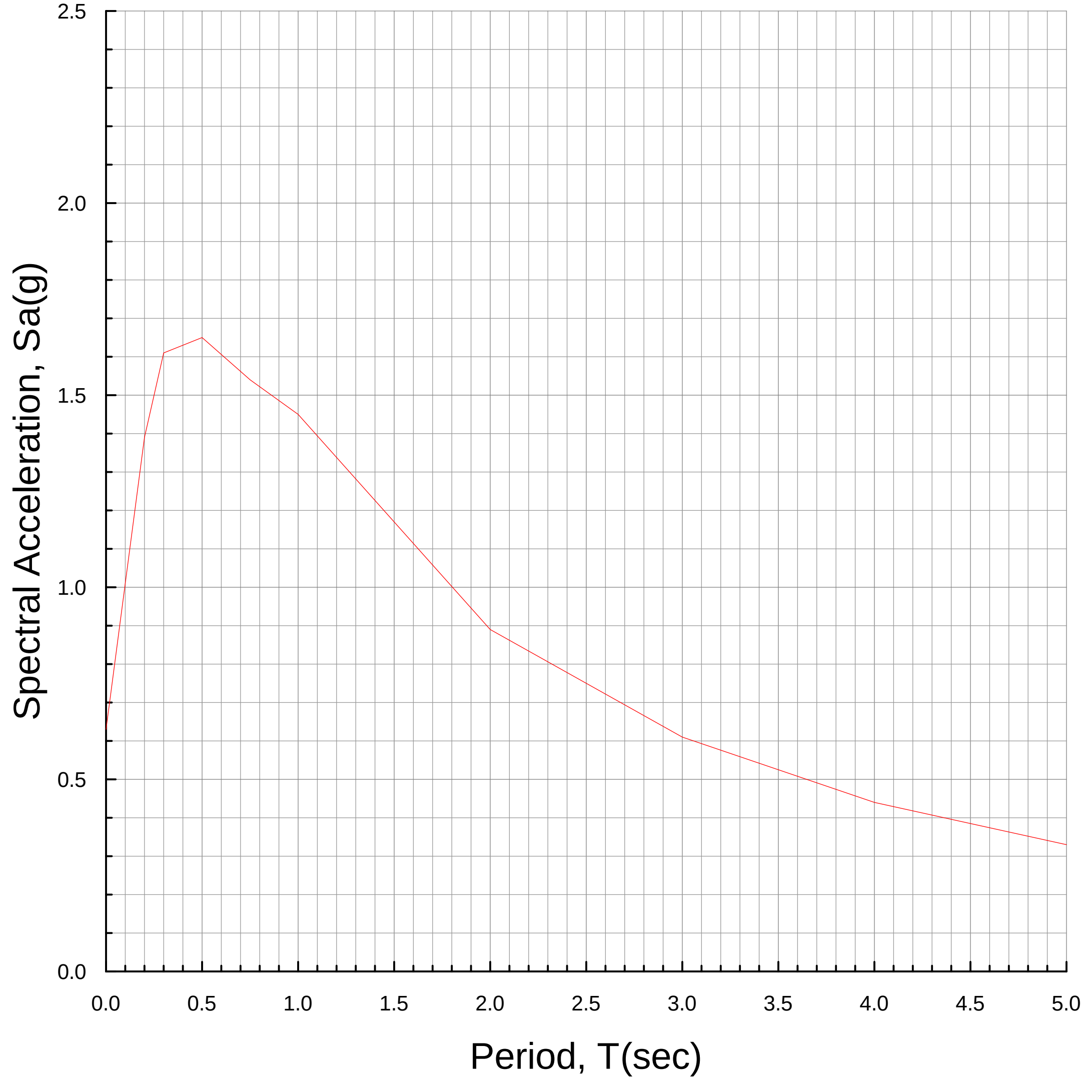

FROM
CREEK
CAPITOL AV
COOLEY AV
DONOHOE STREET
SITE
HT1254
HT1288
HT1287
E BAYSHORE ROAD
ZONE X
EUCLID AVENUE
MANHATTAN AVENUE
ZONE A
ZONE A
ZONE A
CIRCLE DRIVE
COOLEY AVENUE
ZONE X
NEWELL ROAD
SAN M
MAP SCALE 1" = 500'
250 0 500 1000
FEET
METERS
0 150 300
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0309E
FIRM
FLOOD INSURANCE RATE MAP
SAN MATEO COUNTY, CALIFORNIA
AND INCORPORATED AREAS
PANEL 309 OF 510
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
MENLO PARK, CITY OF 060321 0309 E
EAST PALO ALTO, CITY OF 060708 0309 E
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
06081C0309E
EFFECTIVE DATE
OCTOBER 16, 2012
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure 6-3



Period	Design Sa (g)
0.00	0.63
0.10	1.01
0.20	1.39
0.30	1.61
0.50	1.65
0.75	1.54
1.00	1.45
2.00	0.89
3.00	0.61
4.00	0.44
5.00	0.33

Latitude: 37.46027963
Longitude: -122.14057803
Vs30 = 210 m/s
mean magnitude = 7.19
mean site-source distance = 15.5 km

Legend
ARS Curve - Design Spectrum

Note: The Design Response Spectrum is based solely on the probabilistic spectrum at a 5 percent probability of exceedance in 50 years hazard level (975-year return period) and 5% damping as calculated for the 2014 USGS National Seismic Hazard Maps.
A deterministic spectrum is no longer included in the development of the design spectrum.

Project No. 60416357	U.S. 101/University Avenue Interchange East Palo Alto, California	**Seismic Design Data University Avenue POC (No. 35-0359)**	Figure 8-1
AECOM			

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SM	101	0.8/1.1		

REGISTERED CIVIL ENGINEER — Jan M Hueser — DATE 10-29-21

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — Jan Hueser — No. C050215 — Exp. 6-30-23 — CIVIL — STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of scanned copies of this plan sheet.

CITY OF EAST PALO ALTO
1960 TATE STREET
EAST PALO ALTO, CA 94303

AECOM
2020 L STREET, SUITE 400
SACRAMENTO, CA 95811

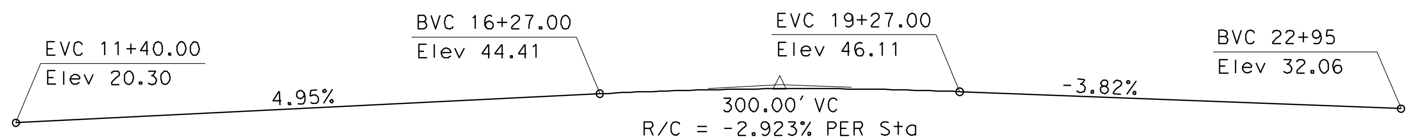
NOTES:

- (A) Chain Link Railing (Type 7 modified Vinyl-Clad)
- (B) Median Barrier, see "Roadway Plans"
- (C) MGS, see "Roadway Plans"
- (D) Paint "Bridge No. 33-0359", "Bridge Name", and "Year Completed"

1. For "INDEX TO PLANS", "TYPICAL SECTION", and "STANDARD PLANS", see "GENERAL PLAN No. 2" sheet.

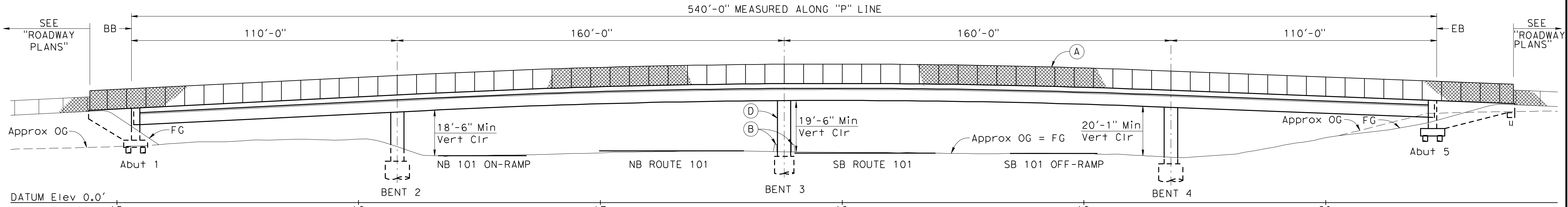
LEGEND:

- — - - — Indicates existing structure
- ⇨ Indicates direction of traffic
- ◕ Point of minimum vertical clearance



PROFILE GRADE - "P" LINE

NO SCALE

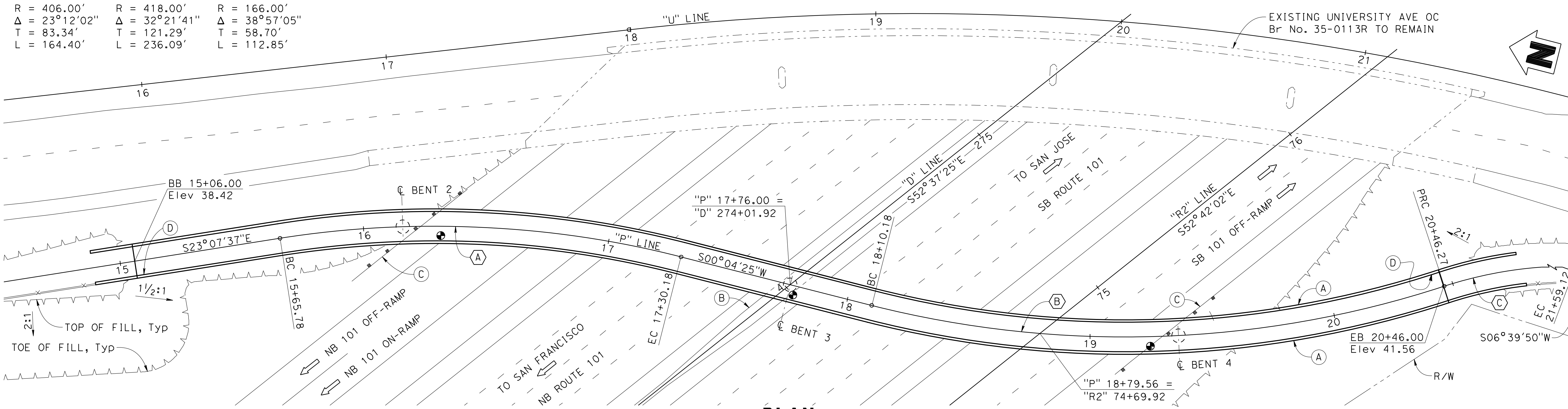


DEVELOPED ELEVATION

1"=20'-0"

CURVE DATA

(A) "P" LINE	(B) "P" LINE	(C) "P" LINE
R = 406.00'	R = 418.00'	R = 166.00'
Δ = 23°12'02"	Δ = 32°21'41"	Δ = 38°57'05"
T = 83.34'	T = 121.29'	T = 58.70'
L = 164.40'	L = 236.09'	L = 112.85'



PLAN

1"=20'-0"

DESIGN OVERSIGHT	DESIGN	BY J. Hueser	CHECKED K. Lee	LOAD & RESISTANCE FACTOR DESIGN	LIVE LOADING: H10 AND PEDESTRIAN DESIGN LOAD	
	DETAILS	BY H. Sullivan	CHECKED K. Lee	LAYOUT	BY J. Hueser	CHECKED K. Lee
SIGN OFF DATE	QUANTITIES	BY J. Hueser	CHECKED S. Kwong	SPECIFICATIONS	BY D. Harnagel	PLANS AND SPECS COMPARED J. Hueser

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Syed Kazmi
PROJECT ENGINEER

BRIDGE NO. 35-0359
POST MILES 0.9

UNIVERSITY AVENUE POC

GENERAL PLAN No. 1

DESIGN GENERAL PLAN SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0743
PROJECT NUMBER & PHASE: 04000007591
CONTRACT No.: 04-272824

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 3-24-17, 11-9-20, 10-29-21, 03-08-22

SHEET 1 OF 26

FILE => $REQUEST

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SM	101	0.8/1.1		

REGISTERED CIVIL ENGINEER 10-29-21 DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Jan Hueser No. C050215 Exp. 6-30-23 CIVIL STATE OF CALIFORNIA

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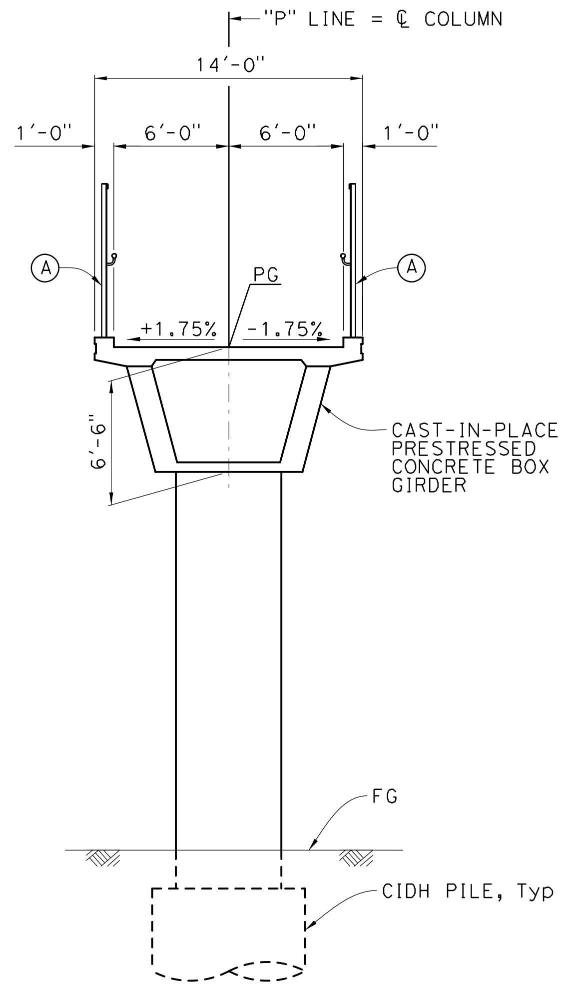
CITY OF EAST PALO ALTO
1960 TATE STREET
EAST PALO ALTO, CA 94303

AECOM
2020 L STREET, SUITE 400
SACRAMENTO, CA 95811



TYPICAL SECTION

1"= 5'-0"
(Bent 2 shown, other bents similar)

NOTES:

(A) Chain Link Railing (Type 7 Modified Vinyl-Clad)

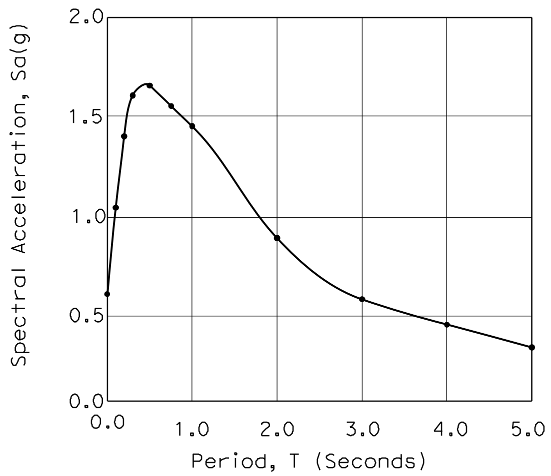
GENERAL NOTES
LOAD AND RESISTANCE FACTOR DESIGN

DESIGN: AASHTO LRFD Bridge Design Specifications, 6TH Edition and the Caltrans Amendments preface dated January 2014.

SEISMIC DESIGN: Caltrans Seismic Design Criteria (SDC), Version 1.7, April 2013

LIVE LOADING: 90 psf uniform pedestrian load and H 10 maintenance vehicle

SEISMIC LOADING: Site Specific ARS Curve



SITE SPECIFIC ARS CURVE

Peak Ground Acceleration = 0.63 g
Moment Magnitude, M_{max} = 7.19
5% Damping
Soil Profiles: Type D
Shear Wave Velocity V_{S30} = 689 ft/s

REINFORCED CONCRETE: fy = 60 ksi
f'c = 3.6 ksi, unless noted otherwise
n = 8

PRESTRESSED CONCRETE: See "Prestressing Notes" on "GIRDER LAYOUT No. 1" sheet

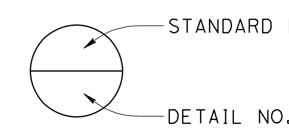
INDEX TO PLANS

LEGEND:

- Structural Concrete, Bridge (Polymer Fiber) (f'c = 5.0 ksi @ 28 days)
- Structural Concrete, Bridge (f'c = 5.0 ksi @ 28 days)
- Structural Concrete, Bridge, see "GIRDER LAYOUT" sheet
- Structural Concrete No. 1, Bridge Footing
- Cast-In-Drilled-Hole Concrete Pile (f'c = 4.0 ksi @ 28 days)

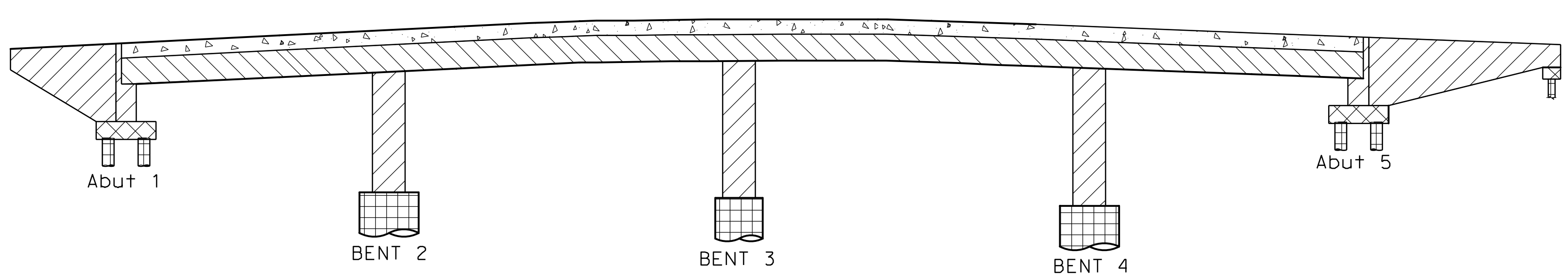
STANDARD PLANS DATED 2018

	A3A	ABBREVIATIONS (SHEET 1 OF 3)
	A3B	ABBREVIATIONS (SHEET 2 OF 3)
	A3C	ABBREVIATIONS (SHEET 3 OF 3)
	A10A	LEGEND-LINES AND SYMBOLS (SHEET 1 OF 5)
	A10B	LEGEND-LINES AND SYMBOLS (SHEET 2 OF 5)
	A10C	LEGEND-LINES AND SYMBOLS (SHEET 3 OF 5)
	A10D	LEGEND-LINES AND SYMBOLS (SHEET 4 OF 5)
	A10E	LEGEND-LINES AND SYMBOLS (SHEET 5 OF 5)
	A10F	LEGEND-SOIL (SHEET 1 OF 2)
	A10G	LEGEND-SOIL (SHEET 2 OF 2)
	A62C	LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL-BRIDGE
RSP	B0-1	BRIDGE DETAILS
RSP	B0-3	BRIDGE DETAILS
	B0-5	BRIDGE DETAILS
	B0-13	BRIDGE DETAILS
	B2-3	16" AND 24" CAST-IN-DRILLED-HOLE CONCRETE PILE
	B7-1	BOX GIRDER DETAILS
	B8-5	CAST-IN-PLACE POST-TENSIONED GIRDER DETAILS
RSP	ES-9A	ELECTRICAL SYSTEMS (STRUCTURE PULL BOX INSTALLATIONS)
	ES-9B	ELECTRICAL SYSTEMS (CONDUIT RISER AND EXPANSION FITTING, STRUCTURE INSTALLATIONS)
RSP	ES-9C	ELECTRICAL SYSTEMS (STRUCTURE PULL BOX)
RSP	ES-9D	ELECTRICAL SYSTEMS (STRUCTURE PULL BOX INSTALLATIONS)



QUANTITIES

Structure Excavation (Bridge)	167	CY
Structure Backfill (Bridge)	133	CY
24" Cast-In-Drilled-Hole Concrete Piling	525	LF
96" Cast-In-Drilled-Hole Concrete Piling	362	LF
Prestressing Cast-In-Place Concrete	1	LS
Structural Concrete, Bridge Footing	38	CY
Structural Concrete, Bridge	520	CY
Structural Concrete Bridge (Polymer Fiber)	221	CY
Joint Seal Assembly (MR $3^1/_2$")	28	LF
Bar Reinforcing Steel (Bridge)	364,384	LB
Headed Bar Reinforcement	10	EA
Miscellaneous Metal (Bridge)	860	LB
Chain Link Railing (Type 7 modified Vinyl-Clad)	1,177	LF



CONCRETE STRENGTH AND TYPE LIMITS

NO SCALE

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN	BY J. Hueser	CHECKED K. Lee	LOAD & RESISTANCE FACTOR DESIGN	LIVE LOADING: H10 AND PEDESTRIAN DESIGN LOAD	
DETAILS	BY H. Sullivan	CHECKED K. Lee	LAYOUT	BY J. Hueser	CHECKED K. Lee
QUANTITIES	BY J. Hueser	CHECKED S. Kwong	SPECIFICATIONS	BY D. Harnagel	PLANS AND SPECS COMPARED J. Hueser

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Syed Kazmi
PROJECT ENGINEER

BRIDGE NO. 35-0359
POST MILES 0.9

UNIVERSITY AVENUE POC
GENERAL PLAN No. 2

DESIGN GENERAL PLAN SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 0743
PROJECT NUMBER & PHASE: 04000007591
CONTRACT No.: 04-272824

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: 3-24-11, 11-9-20, 10-29-21, 03-08-22

SHEET 2 OF 26

FILE => $REQUEST

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SM	101	0.8/1.1		

GEOTECHNICAL PROFESSIONAL DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER Stephen Huang No. C 42289 Exp. 3-31-22 CIVIL STATE OF CALIFORNIA

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AECOM
4 N. Second Street, Suite 675
SAN JOSE, CA 95113

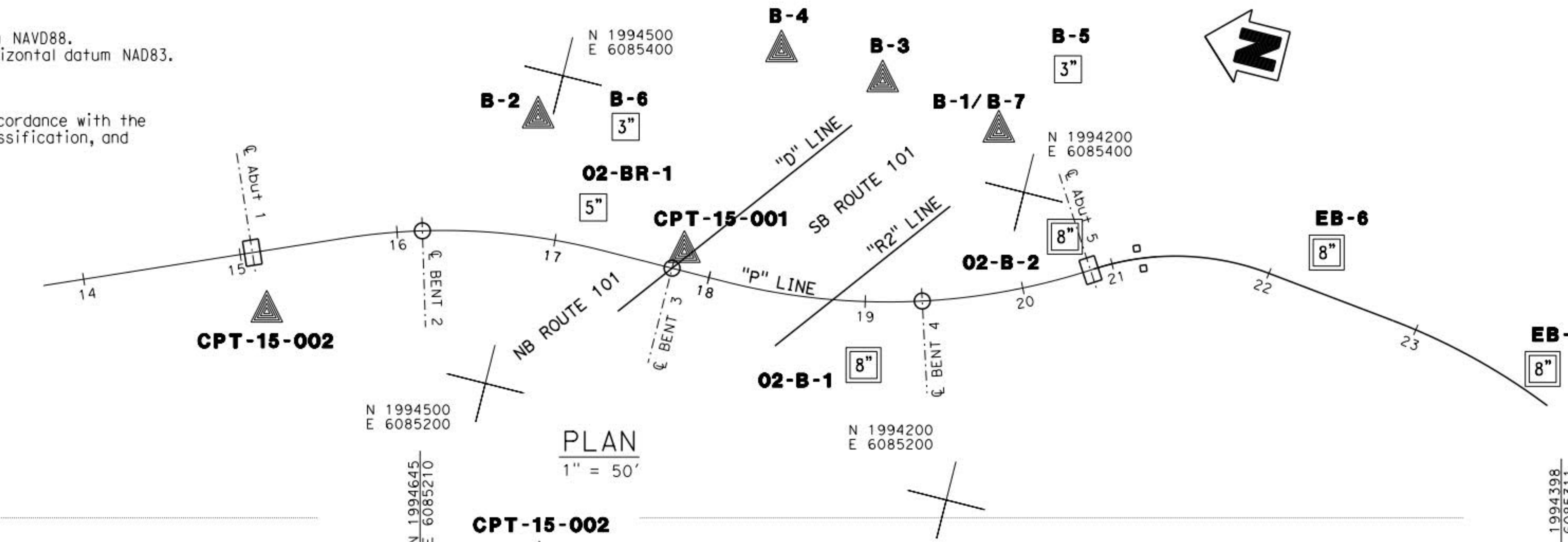
CITY OF EAST PALO ALTO
1960 TATE STREET
EAST PALO ALTO, CA 94303

BENCH MARK

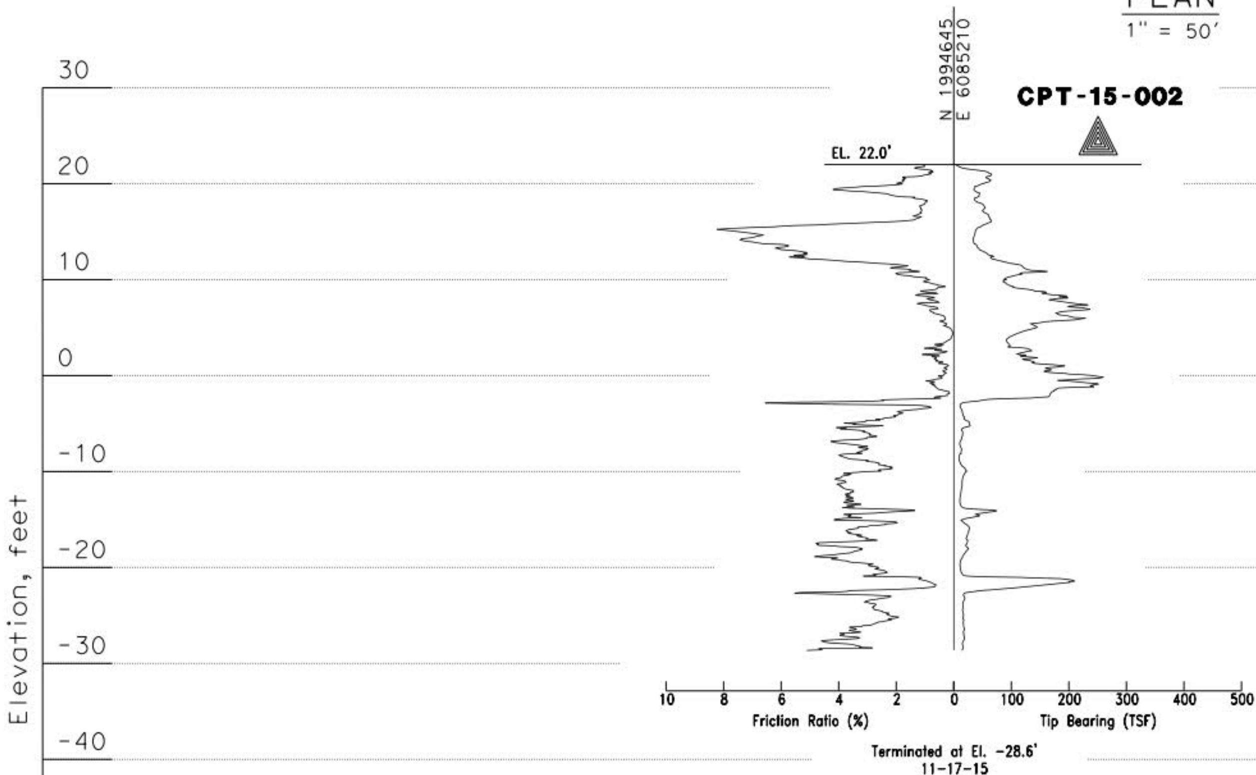
All elevations based on vertical datum NAVD88.
All stations and offsets based on horizontal datum NAD83.

NOTES

1. This LOTB Sheet was prepared in accordance with the Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).



PLAN
1" = 50'

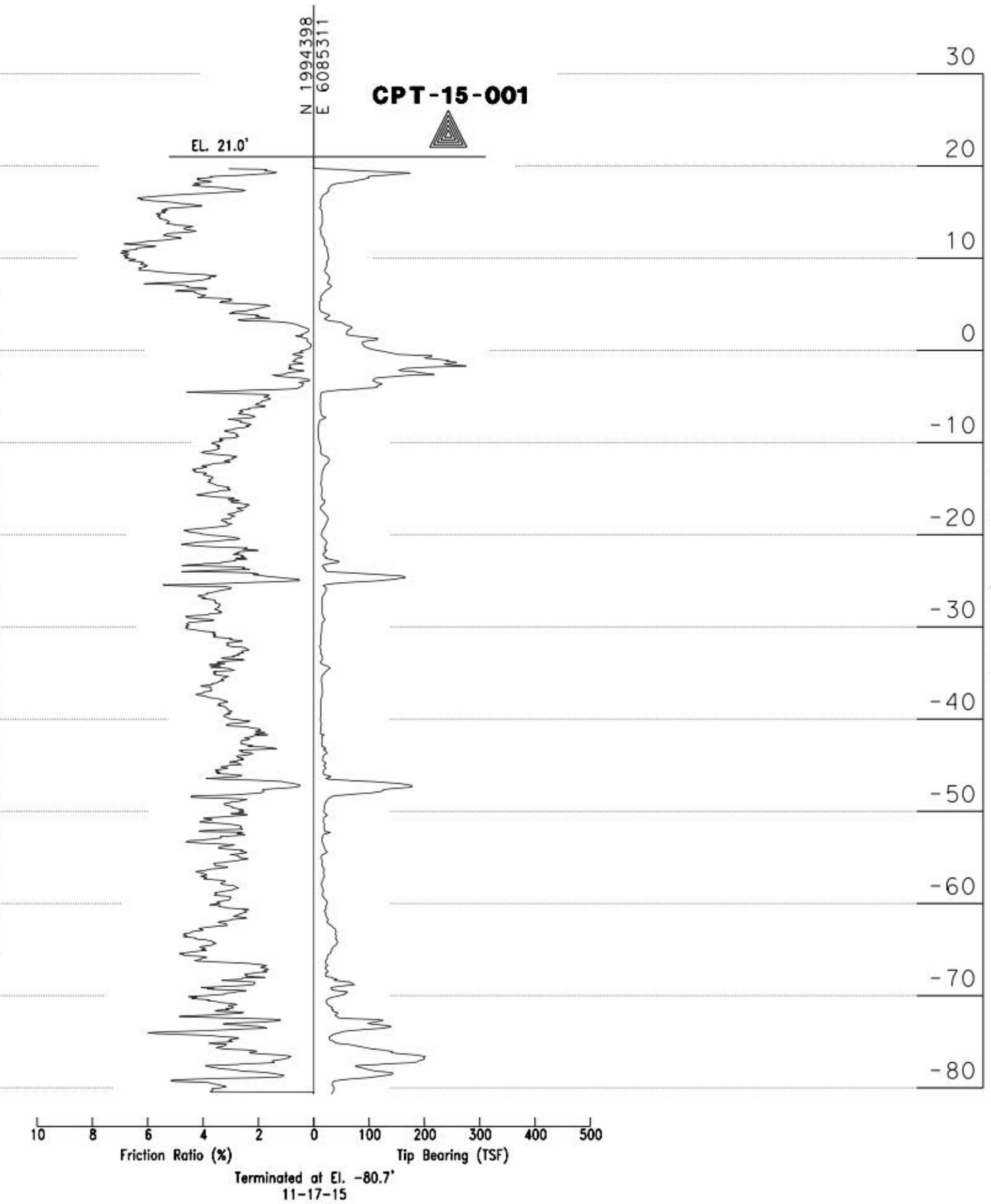


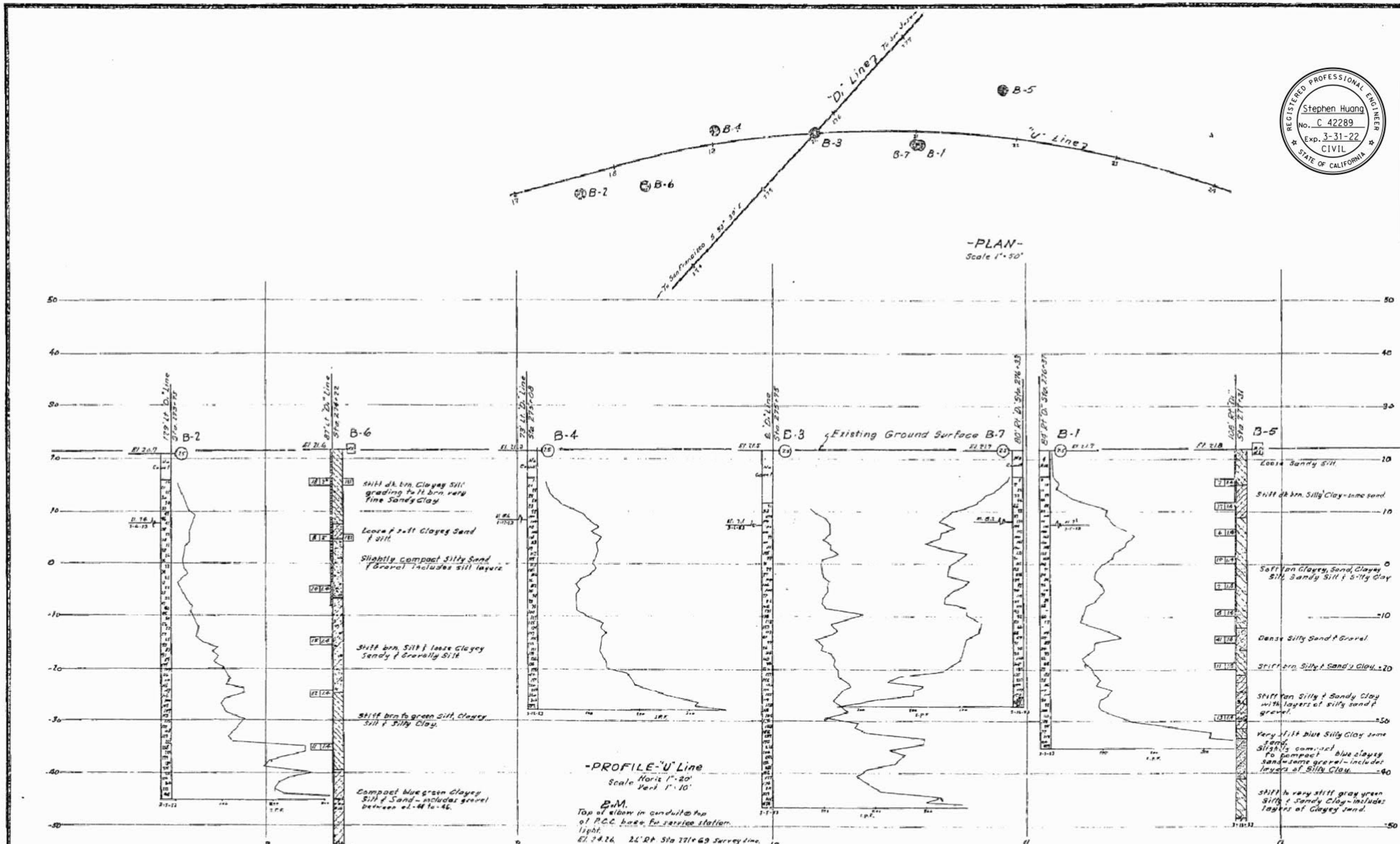
PROJECT EXPLORATION LOCATION TABLE

Hole ID	Alignment Name	Station and Offset
CPT-15-002	"P" LINE	15+11 38' Rt
CPT-15-001	"P" LINE	17+81 12' Lt

HISTORIC EXPLORATION LOCATION TABLE

Hole ID	Alignment Name	Station and Offset
EB-9	"P" LINE	23+75 10 Lt
EB-6	"P" LINE	22+30 25' Lt
02-BR-1	"P" LINE	17+20 25' Lt
02-B-1	"P" LINE	19+00 40' Rt
02-B-2	"P" LINE	20+75 25' Lt
B1/B7	"P" LINE	20+50 100' Lt
B-2	"P" LINE	16+75 75' Lt
B-3	"P" LINE	19+10 140' Lt
B-4	"P" LINE	18+10 150' Lt
B-5	"P" LINE	21+00 125' Lt
B-6	"P" LINE	17+30 75' Lt





DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
04	SM	101	0.8/1.1	X	X

REGISTERED PROFESSIONAL ENGINEER Stephen Huang No. C 42289 Exp. 3-31-22 CIVIL STATE OF CALIFORNIA

REGISTERED CIVIL ENGINEER — DATE

UNIVERSITY AVENUE POC
LOG OF TEST BORINGS (2 OF 4)

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT: 0703
PROJECT NUMBER & PHASE: 04000007591

BRIDGE No.	Sheet	of
35-0359	-	-

Revisions made to this Log of Test Borings from the original ____ Log of Test Borings are the addition of the following table and notes:

Boring	Station	Offset from "P" Line
B-2	16+75	75' Lt
B-6	17+30	75' Rt
B-4	18+10	150' Lt
B-3	19+10	140' Lt
B-1/B-7	20+50	100' Lt
B-5	21+00	125' Lt

AS BUILT PLANS
Contract No. 57-4TC27
Date Completed
Document No. 40002342

CONTRACT No. 57-4TC27
DATE ACCEPTED June 4, 1958
AS BUILT
No Change
RESIDENT ENGINEER W. S. Smith
REVISIONS BY R.M.M. DATE 5-5-58

BRIDGE DEPARTMENT

FIELD STUDY / DRAWN / CHECKED / Approval Recommended by

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

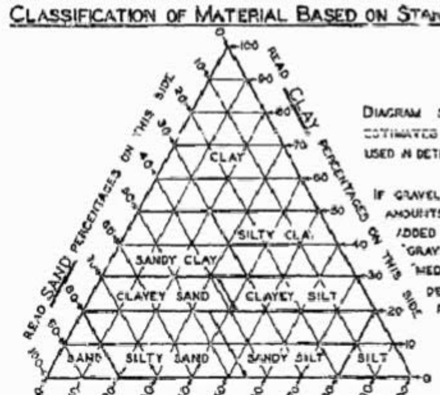


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES

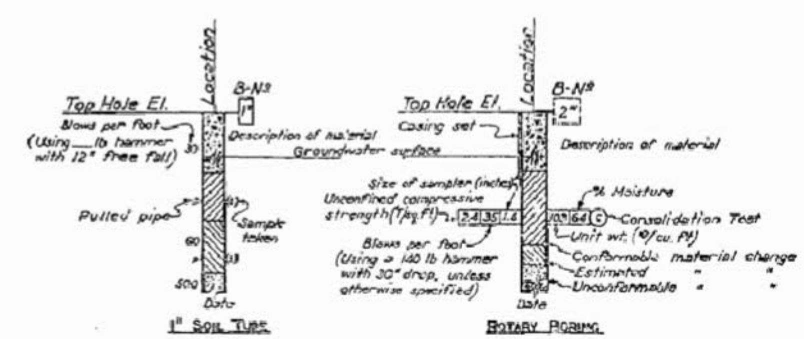
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIS. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

- GRAVEL
- SAND
- SILT
- CLAY
- SANDY CLAY OR CLAYEY SAND
- SANDY SILT OR SILTY SAND
- SILTY CLAY OR CLAYEY SILT
- PEAT AND/OR ORGANIC CLAY
- FILLED MATERIAL
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- PENETROMETER
- 2½" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT



NOTES

THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (c) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.

CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.

PENETROMETER BORINGS HAVING A RATE OF PENETRATION MEASURED IN SECONDS PER FOOT ARE DRIVEN WITH A No 2 McKIERNAN-TERRY AIR HAMMER AT 115 PSI.

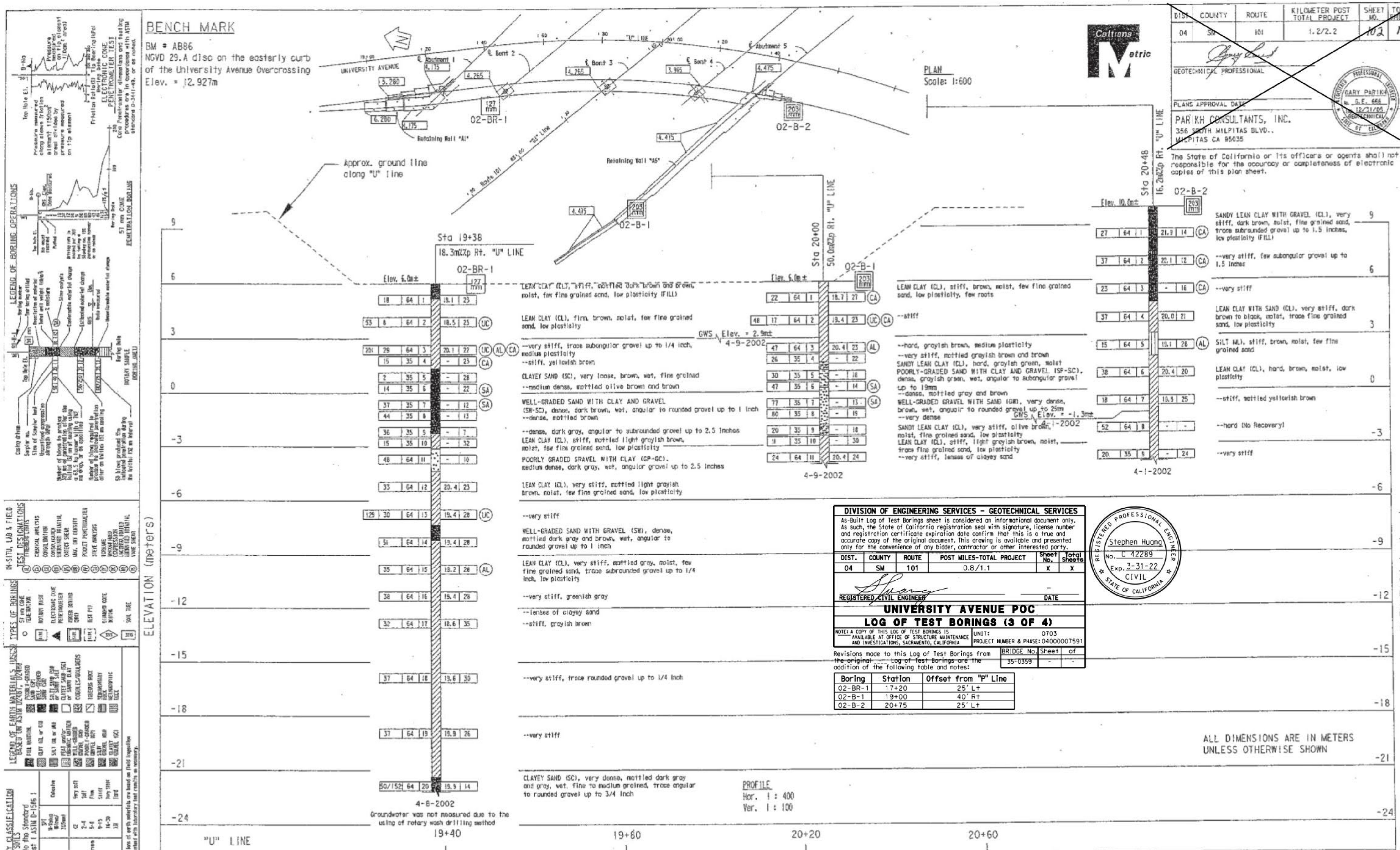
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

UNIVERSITY AVE O.C.
LOG OF TEST BORINGS

SCALE: HORIZ. As VERT. Shown | BRIDGE 35-113 R/L | FILE | DRAWING C-3515-15

3515 R/L

84



DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	SM	101	1.2/2.2	102	103

GEOTECHNICAL PROFESSIONAL

PLANS APPROVAL DATE

PARIKH CONSULTANTS, INC.
356 SOUTH MILPITAS BLVD.,
MILPITAS CA 95035

GARY PARIKH No. G.E. 666 Exp. 12/31/05 GEOTECHNICAL STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
04	SM	101	0.8/1.1	X	X

REGISTERED CIVIL ENGINEER — DATE

REGISTERED PROFESSIONAL ENGINEER Stephen Huang No. C 42289 Exp. 3-31-22 CIVIL STATE OF CALIFORNIA

UNIVERSITY AVENUE POC

LOG OF TEST BORINGS (3 OF 4)

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA — UNIT: 0703 — PROJECT NUMBER & PHASE: 04000007591

Revisions made to this Log of Test Borings from the original ___ Log of Test Borings are the addition of the following table and notes: — BRIDGE No. 35-0359 — Sheet - of -

Boring	Station	Offset from "P" Line
02-BR-1	17+20	25' Lt
02-B-1	19+00	40' Rt
02-B-2	20+75	25' Lt

DESIGN OVERSIGHT 10-16-03 SIGN OFF DATE

FIELD INVESTIGATOR	F. WANG/D. ALEXANDER	DATE	APRIL 2002
DRAWN BY	R. Au	DATE	SEP 2002
CHECKED BY	Y. DAVID WANG	DATE	SEP 2002

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Y. DAVID WANG PROJECT ENGINEER

BRIDGE NO. 35-0113 — KILOMETER POST 1.43 (PM 0.89)

UNIVERSITY AVENUE OVERCROSSING (WIDEN)

~~LOG OF TEST BORINGS 1 OF 2~~

CU 04245 — DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES (PRELIMINARY STAGE ONLY) — SHEET OF

ORIGINAL SCALE IN MILLIMETERS

\ACAD\20120.3.BR\LOTB\LOTB-FOUNDATION REPORT.DWG

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	SM	101	1.1/2.0	1	3

Caltrans Metric

GEOTECHNICAL PROFESSIONAL

PLANS APPROVAL DATE

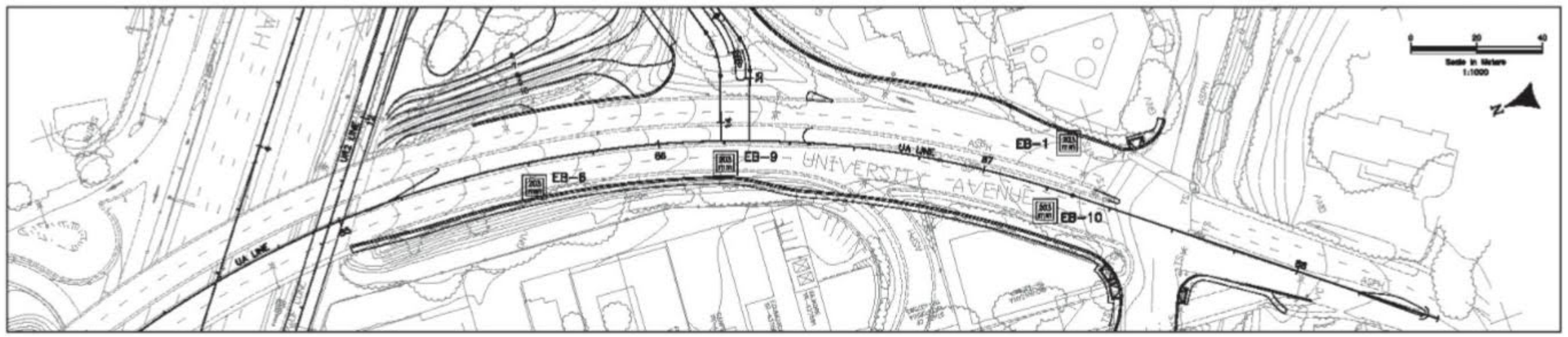
Lowney Associates
405 Clyde Avenue
Mountain View, Ca 94043

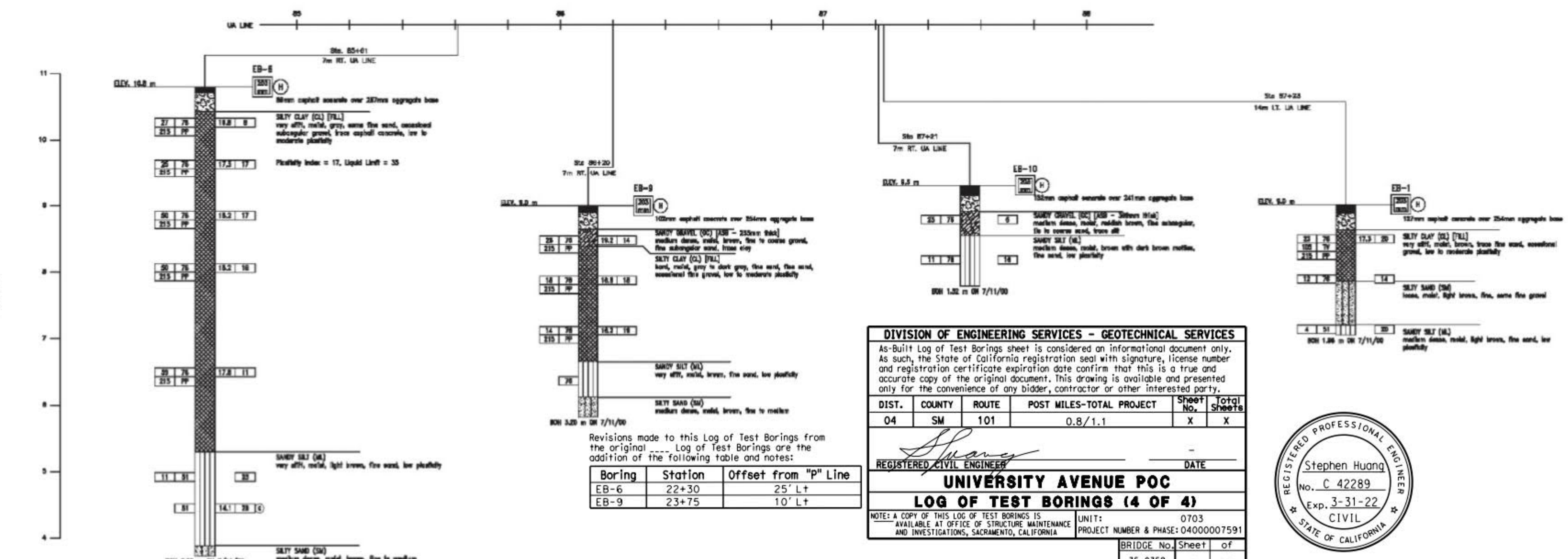
REGISTERED PROFESSIONAL ENGINEER — Laura C. Knutson — No. CE 60034 — Exp. 6-30-03 — CIVIL — STATE OF CALIFORNIA

STANDARD SOIL SURVEY SHEET

DATE ______ EWL Traffic Index ______ Combined Cohesion of Layers Above: Base ______ Subbase ______ Basement Soil ______ Units ______

DESCRIPTION	BORING OR SAMPLE No.	EB-6	EB-1
	TEST NUMBER	1	1
	DATE SAMPLED	7/11/00	7/11/00
	STATION	85+61	87+23
	LINE	UA	UA
	DISTANCE FROM LINE (RT. or LT.)	R-7m	L-14m
	DEPTH OR ELEVATION	0.6m	0.8m
	TYPE OF MATERIAL	CL	CL
SIEVE ANALYSIS	38 mm SQUARE OPENING		
	No. 4 (4708 MICRONS)		
	No. 8 (2380 MICRONS)		
	No. 16 (1190 MICRONS)		
	No. 30 (590 MICRONS)		
	No. 50 (297 MICRONS)		
	No. 200 (74 MICRONS)		
	5 MICRON		
	1 MICRON		
COMPACTION	IN-PLACE DENSITY (WET WT. kN/m³)		
	IN-PLACE MOISTURE (PERCENT)		
	MAXIMUM DENSITY (kN/m³)		
	OPT. MOISTURE (PERCENT)		
	RELATIVE COMPACTION (PERCENT)		
BIT MIX	OIL RATIO – TYPE OF BITUMEN		
	STABILOMETER VALUE		
	COHESION		
	SWELL		
	STABILOMETER VALUE AFTER MVS		
CTB	% CEMENT		
	OPT. MOISTURE		
	DENSITY		
	COMP. STRENGTH AT 7 DAYS		
ATTERBERG LIMITS	LIQUID LIMIT	35	
	PLASTICITY INDEX	17	
	SAND EQUIVALENT		
	PRODUCT P.I.X.-200		
R-VALUE	MOISTURE		13
	DENSITY		19.5
	R-VALUE-STABILOMETER		13
	R-VALUE BY EXPANSION		
	COHESION		
	THICKNESS OF COVER REQUIRED		





Revisions made to this Log of Test Borings from the original ____ Log of Test Borings are the addition of the following table and notes:

Boring	Station	Offset from "P" Line
EB-6	22+30	25' Lt
EB-9	23+75	10' Lt

DIVISION OF ENGINEERING SERVICES - GEOTECHNICAL SERVICES

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
04	SM	101	0.8/1.1	X	X

REGISTERED CIVIL ENGINEER ______ DATE ______

UNIVERSITY AVENUE POC
LOG OF TEST BORINGS (4 OF 4)

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA

UNIT: 0703
PROJECT NUMBER & PHASE: 04000007591

BRIDGE No.	Sheet	of
35-0359	-	-

REGISTERED PROFESSIONAL ENGINEER — Stephen Huang — No. C 42289 — Exp. 3-31-22 — CIVIL — STATE OF CALIFORNIA

SOIL CLASSIFICATION

PRIMARY DIVISIONS			SOIL TYPE	SECONDARY DIVISIONS
COARSE GRAINED SOILS	GRAVELS	CLEAN GRAVELS (Less than 5% Fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS	CLEAN SANDS (Less than 5% Fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt-mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS	SILTS AND CLAYS (LIQUID LIMIT IS LESS THAN 50 %)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (LIQUID LIMIT IS GREATER THAN 50 %)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils
			FILL	Fill soils

DEFINITION OF TERMS

U.S. STANDARD SIEVE SIZE: 200, 40, 10, 4 — CLEAR SQUARE SIEVE OPENINGS: 3/4", 3", 12"

SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

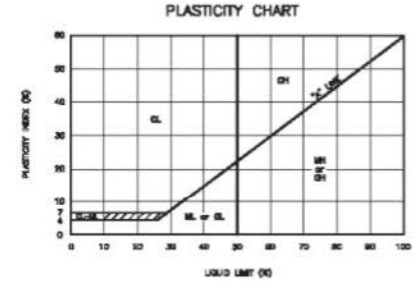
SAND AND GRAVEL	BLOWS/FOOT*
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

RELATIVE DENSITY

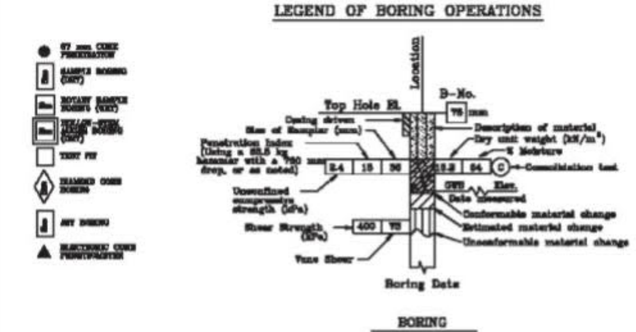
SILTS AND CLAYS	STRENGTH+	BLOWS/FOOT*
VERY SOFT	0-1/4	0-2
SOFT	1/4-1/2	2-4
MEDIUM STIFF	1/2-1	4-8
STIFF	1-2	8-16
VERY STIFF	2-4	16-32
HARD	OVER 4	OVER 32

CONSISTENCY

PLASTICITY CHART



LEGEND OF BORING OPERATIONS



C. B. Bulter	DRAWN BY	E. Barnikel	J. Hughes	LOWNEY ASSOCIATES	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	L. Knutson
DESIGN OVERSIGHT	CHECKED BY	L. Knutson	FIELD INVESTIGATION BY:			PROJECT ENGINEER
September 6, 2000 SIGN OFF DATE			DATE: July 11, 2000			

BRIDGE NO.
KILOMETER POST 1.1/2.0

~~LOG OF TEST BORING 2 OF 4~~

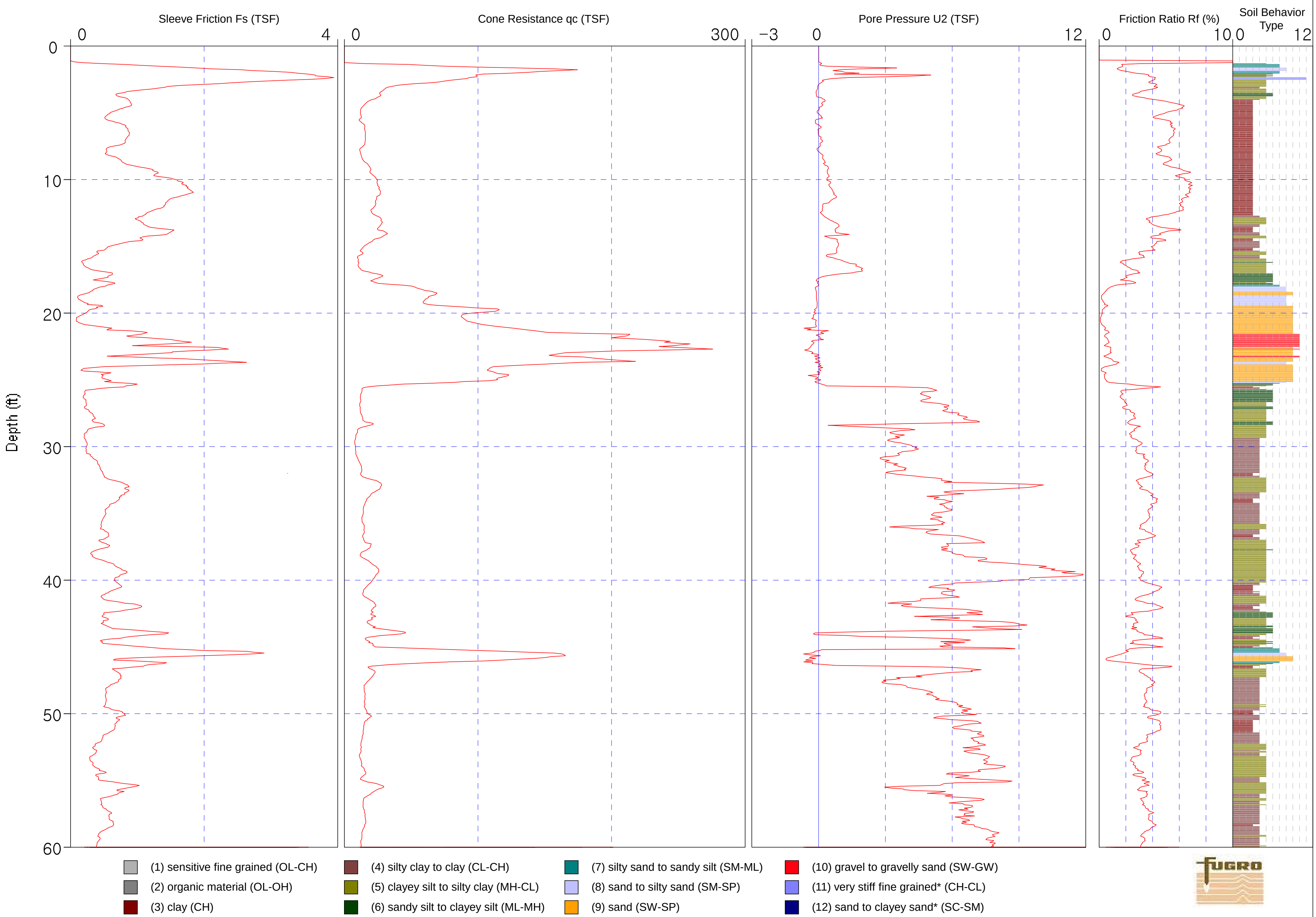
ORIGINAL SCALE IN MILLIMETERS FOR REDUCED PLANS 0 10 20 30 40 50 60 70 80 90 100

CU
EA

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

Job Number:	04.0915-0018	**CPT Number:**	CPT-15-001	**Coordinates:**	
Operator:	Danny Garza	**Date:**	17-Nov-2015	**Cone Number:**	CP15-CF25PB7SN2-P1E1 2408
Location:	E. Palo Alto	**Elevation:**	0.00		

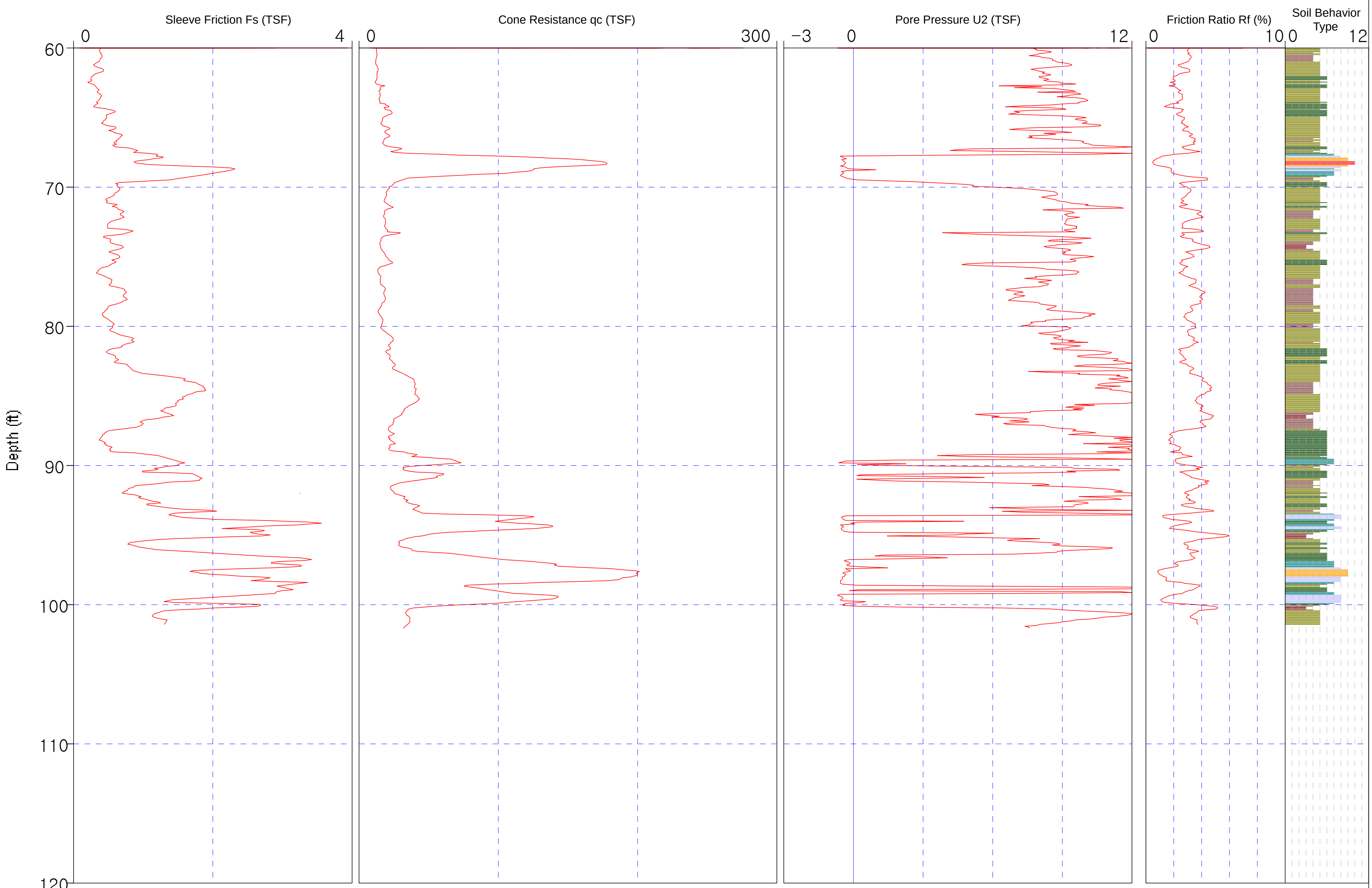


Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0915-0018
Operator: Danny Garza
Location: E. Palo Alto

CPT Number: CPT-15-001
Date: 17-Nov-2015
Elevation: 0.00

Coordinates:
Cone Number: CP15-CF25PB7SN2-P1E1 2408



(1) sensitive fine grained (OL-CH)
(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

CPT-15-001

```
"Output file from CPTINT - Version 5.2
"======================================
"Developed by: UBC In-Situ Testing FREEWARE
"     Program: Piezocone Interpretation
"    Web Site: www.civil.ubc.ca/home/in-situ
"Interpreter Name: R. YILMAZ
"SUMMARY SHEET
"'a' for calculating Qt:                 0       O
"Value for Water Table (in m):           2      2.9
"Valid Zone Classification based on:     Rf
"Missing unit weight to start depth:     0.000
"Method for calculating Su:              Nc
"Value of the constant Nc:               1      15
"Method used to calculate OCR:           Su/EOS
"(Su/EOS) for normal consolidation:      0.350
"Define Zone 6 for Sand Parameters?      YES
"Sand Compressibility for calc Dr:       Moderate
"Method for Friction Angle:              Robertson & Campanella
"Vertical Flow Gradient, i (- up):       +0.000
"CPT to SPT N60 Conversion:              Jeffries & Davies
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"Zone #1=Sensitive fine grained     Zone #7 =Sand with some Silt
"Zone #2=Organic material           Zone #8 =Fine sand
"Zone #3=Clay                       Zone #9 =Sand
"Zone #4=Silty clay                 Zone #10=Gravelly sand
"Zone #5=Clayey silt                Zone #11=Very stiff fine grained *
"Zone #6=Silty sand                 Zone #12=Sand to clayey sand *
"   * Overconsolidated and/or cemented
"NOTE:
"For soil classification, Rf values > 8 are assumed to be 8.
```

"(Note: --- means Out Of Range)

" Depth	Qc(avg)	Fs(avg)	U2	Rf	Rf Zone	Spt N	Spt N1	OCR	Su	Dr	Phi
" (feet)	(TSF)	(TSF)	(TSF)	(%)	(zone #)	(blow/ft)	(blow/ft)	(ratio)	(TSF)	(%)	(degree)
0.25	0	0	0.004	0	1	---	---	0	0	---	---
0.75	0	0	0.004	0	1	---	---	0	0	---	---
1.25	17.505	0.362	0.05	2.067	5	8	12	137.377	1.167	---	---
1.75	135.405	2.316	1.425	1.703	8	33	50	---	---	130	50
2.25	99.585	3.687	2.175	3.669	6	38	57	---	---	112	50
2.75	60.692	2.415	0.093	3.977	5	29	44	213.777	4.046	---	---
3.25	30.151	1.136	-0.07	3.771	5	14	21	71.16	2.01	---	---
3.75	25.752	0.742	-0.029	2.883	5	12	18	48.269	1.717	---	---
4.25	17.015	0.895	0.206	5.232	3	16	24	24.365	1.134	---	---
4.75	12.476	0.723	0.002	5.798	3	12	18	14.282	0.832	---	---
5.25	12.293	0.539	0.08	4.371	3	12	18	12.3	0.82	---	---
5.75	13.108	0.696	-0.091	5.322	3	13	20	11.839	0.874	---	---
6.25	15.369	0.856	0.021	5.568	3	15	23	12.963	1.025	---	---
6.75	15.729	0.859	0.048	5.451	3	15	23	12.079	1.049	---	---
7.25	15.231	0.781	0.109	5.115	3	15	23	10.581	1.015	---	---
7.75	12.079	0.549	-0.02	4.552	3	12	18	7.267	0.805	---	---
8.25	12.738	0.619	0.16	4.833	3	12	18	7.166	0.849	---	---
8.75	16.263	0.823	0.279	5.027	3	16	24	9.017	1.084	---	---
9.25	19.383	1.193	0.411	6.103	3	19	29	10.458	1.292	---	---
9.75	22.086	1.362	0.419	6.119	3	21	32	11.69	1.472	---	---
10.25	24.763	1.67	0.479	6.69	3	24	35	13.051	1.651	---	---
10.75	26.415	1.789	0.6	6.71	3	26	38	13.703	1.761	---	---
11.25	25.251	1.635	0.723	6.4	3	24	34	12.555	1.683	---	---
11.75	23.316	1.431	0.373	6.098	3	22	31	11.024	1.554	---	---
12.25	20.925	1.281	0.156	6.102	3	20	27	9.347	1.395	---	---
12.75	24.751	1.053	0.276	4.234	4	16	21	11.201	1.65	---	---
13.25	27.639	1.079	0.766	3.86	4	18	24	12.498	1.843	---	---
13.75	27.179	1.396	0.791	5.075	3	26	34	11.904	1.812	---	---
14.25	28.642	1.223	0.752	4.225	4	18	23	12.37	1.909	---	---
14.75	18.72	0.832	0.865	4.363	3	18	23	7.079	1.248	---	---
15.25	13.112	0.484	0.819	3.601	4	9	11	4.424	0.874	---	---
15.75	11.132	0.343	0.548	3.02	4	7	9	3.522	0.742	---	---
16.25	10.407	0.192	1.364	1.749	5	5	6	3.164	0.694	---	---
16.75	14.148	0.38	1.829	2.55	5	7	8	4.541	0.943	---	---
17.25	26.134	0.55	0.329	2.095	6	10	12	---	---	20	35
17.75	30.005	0.542	-0.041	1.809	6	11	13	---	---	24	37
18.25	59.093	0.355	-0.123	0.601	8	14	16	---	---	50	39
18.75	64.937	0.148	-0.097	0.228	8	16	18	---	---	53	39
19.25	63.612	0.272	-0.072	0.428	8	15	17	---	---	52	39
19.75	106.836	0.314	-0.147	0.294	9	20	22	---	---	72	41
20.25	89.369	0.137	-0.221	0.154	9	17	18	---	---	65	41
20.75	100.186	0.191	-0.121	0.191	9	19	20	---	---	69	41
21.25	136.778	0.76	-0.138	0.556	9	26	27	---	---	80	43
21.75	207.885	1.104	0.066	0.531	9	40	41	---	---	96	45
22.25	245.936	1.477	-0.265	0.601	9	47	48	---	---	103	45
22.75	227.554	1.917	-0.408	0.843	9	44	44	---	---	99	45
23.25	173.352	1.19	-0.091	0.687	9	33	33	---	---	88	43
23.75	168.533	1.978	0.025	1.174	8	40	39	---	---	87	43
24.25	109.79	0.327	0.044	0.298	9	21	20	---	---	70	41
24.75	117.916	0.498	-0.104	0.422	9	23	22	---	---	72	41
25.25	63.481	0.773	0.068	1.217	7	20	19	---	---	48	39
25.75	13.77	0.377	4.803	2.397	5	8	8	3.023	0.918	---	---
26.25	12.047	0.201	4.829	1.434	6	5	5	---	---	-10	28

"(Note: --- means Out Of Range)

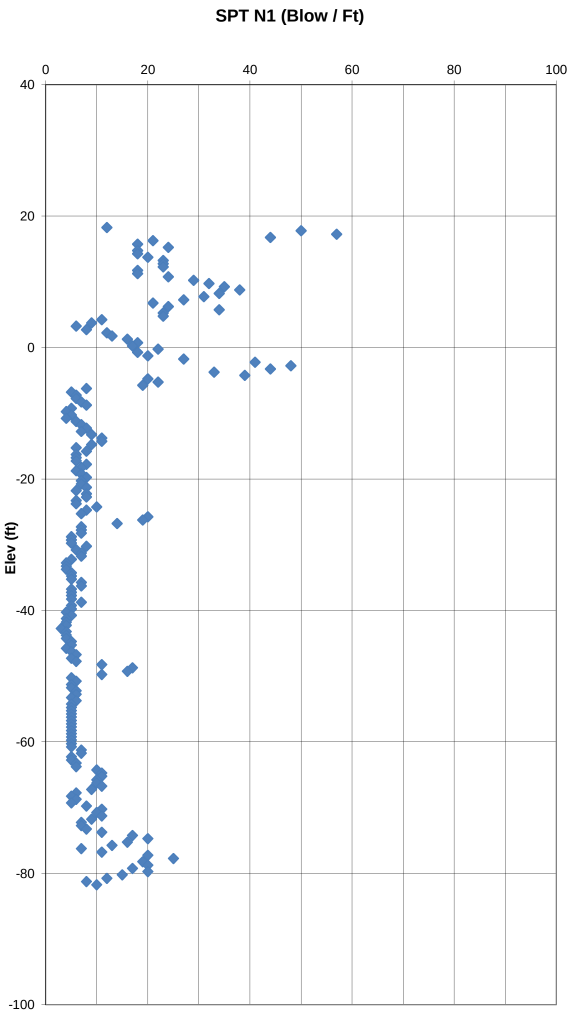
" Depth	Qc(avg)	Fs(avg)	U2	Rf	Rf Zone	Spt N	Spt N1	OCR	Su	Dr	Phi
" (feet)	(TSF)	(TSF)	(TSF)	(%)	(zone #)	(blow/ft)	(blow/ft)	(ratio)	(TSF)	(%)	(degree)
"----------	---------	----------	-----------	----------	----------	-----------	---------	----------	----------	-------	---------------
26.75	11.824	0.233	5.197	1.67	5	7	6	2.418	0.788	---	---
27.25	11.904	0.258	5.79	1.807	5	7	6	2.4	0.794	---	---
27.75	13.287	0.349	6.469	2.19	5	8	7	2.709	0.886	---	---
28.25	17.715	0.424	4.436	2.168	5	9	8	3.821	1.181	---	---
28.75	10.684	0.283	3.435	2.342	5	6	5	2	0.712	---	---
29.25	8.617	0.209	3.487	2.08	5	5	4	1.505	0.574	---	---
29.75	7.934	0.241	3.706	2.547	4	6	5	1.337	0.529	---	---
30.25	8.426	0.234	4.171	2.309	5	5	4	1.42	0.562	---	---
30.75	9.372	0.312	3.198	2.923	4	7	6	1.599	0.625	---	---
31.25	11.702	0.412	3.32	3.154	4	8	7	2.079	0.78	---	---
31.75	12.888	0.458	3.589	3.191	4	9	8	2.312	0.859	---	---
32.25	14.958	0.523	4.529	3.108	5	8	7	2.746	0.997	---	---
32.75	26.451	0.78	7.704	2.634	6	11	9	---	---	15	33
33.25	24.897	0.842	7.559	3.007	5	13	11	5.04	1.66	---	---
33.75	18.43	0.755	5.552	3.645	4	13	11	3.411	1.229	---	---
34.25	15.487	0.637	5.701	3.572	4	11	9	2.707	1.032	---	---
34.75	14.212	0.534	5.712	3.225	5	8	6	2.399	0.947	---	---
35.25	13.441	0.503	5.23	3.225	4	10	8	2.208	0.896	---	---
35.75	14.039	0.462	5.236	2.856	5	8	6	2.301	0.936	---	---
36.25	14.788	0.5	4.58	2.998	5	8	6	2.423	0.986	---	---
36.75	14.008	0.548	6.272	3.305	5	8	6	2.236	0.934	---	---
37.25	17.44	0.505	6.567	2.51	5	10	8	2.903	1.163	---	---
37.75	15.953	0.404	5.746	2.206	5	9	7	2.564	1.064	---	---
38.25	13.275	0.351	6.895	2.182	5	8	6	2.012	0.885	---	---
38.75	20.342	0.596	8.566	2.499	6	9	7	---	---	3	31
39.25	25.273	0.783	10.622	2.643	6	11	8	---	---	12	31
39.75	22.971	0.721	10.681	2.638	6	10	7	---	---	8	31
40.25	18.872	0.713	6.438	3.313	5	10	7	2.964	1.258	---	---
40.75	14.769	0.647	5.684	3.784	4	11	8	2.155	0.985	---	---
41.25	15.694	0.487	5.538	2.709	5	9	6	2.298	1.046	---	---
41.749	22.41	0.861	3.899	3.586	5	11	8	3.543	1.494	---	---
42.249	20.942	0.805	6.456	3.412	5	11	8	3.215	1.396	---	---
42.749	20.95	0.515	5.971	2.2	6	9	6	---	---	1	31
43.249	18.469	0.496	8.499	2.259	6	8	6	---	---	-1	28
43.749	33.685	0.958	5.222	2.675	6	14	10	---	---	17	33
44.249	24.109	0.902	3.185	3.549	5	12	8	3.651	1.607	---	---
44.749	20.145	0.611	5.914	2.706	5	11	7	2.882	1.343	---	---
45.249	90.467	1.975	2.782	2.156	7	29	20	---	---	53	39
45.749	148.634	1.468	-0.353	0.989	9	28	19	---	---	71	41
46.249	53.581	1.203	0.422	2.238	6	21	14	---	---	32	35
46.749	20.951	0.725	6.433	3.075	5	11	7	2.891	1.397	---	---
47.249	20.603	0.746	4.211	3.343	5	11	7	2.799	1.374	---	---
47.749	16.229	0.654	3.289	3.722	4	11	7	2.055	1.082	---	---
48.249	14.959	0.533	4.664	3.161	5	8	5	1.837	0.997	---	---
48.749	15.424	0.527	5.188	3.005	5	8	5	1.889	1.028	---	---
49.249	15.078	0.521	6.12	2.961	5	8	5	1.818	1.005	---	---
49.749	16.371	0.683	6.57	3.584	4	12	8	1.994	1.091	---	---
50.249	18.753	0.745	5.878	3.521	5	10	6	2.339	1.25	---	---
50.749	14.952	0.682	6.78	3.845	4	11	7	1.744	0.997	---	---
51.249	14.215	0.629	6.693	3.709	4	11	7	1.621	0.948	---	---
51.749	13.514	0.49	7.132	2.983	5	8	5	1.507	0.901	---	---
52.249	12.487	0.397	7.186	2.576	5	7	4	1.352	0.832	---	---
52.749	12.406	0.367	6.815	2.414	5	7	4	1.328	0.827	---	---

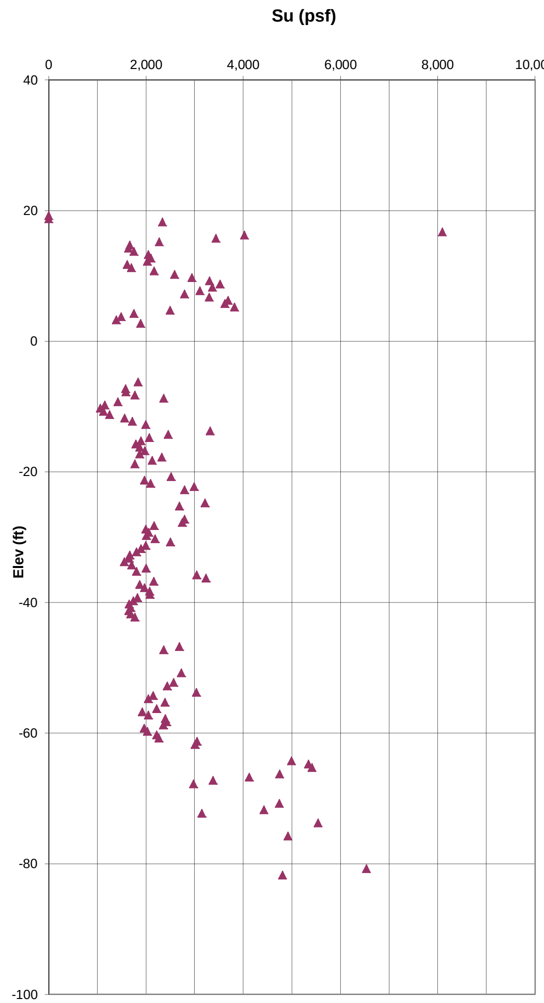
"(Note: --- means Out Of Range)

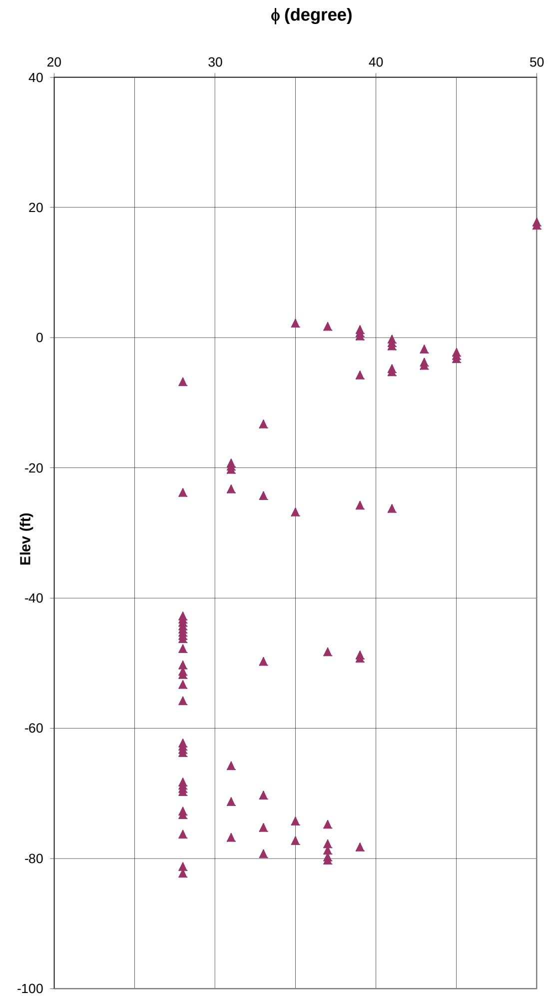
" Depth	Qc(avg)	Fs(avg)	U2	Rf	Rf Zone	Spt N	Spt N1	OCR	Su	Dr	Phi
" (feet)	(TSF)	(TSF)	(TSF)	(%)	(zone #)	(blow/ft)	(blow/ft)	(ratio)	(TSF)	(%)	(degree)
"----------	---------	----------	-----------	----------	----------	-----------	---------	----------	----------	-------	---------------
53.249	11.621	0.31	7.492	2.113	5	7	4	1.213	0.775	---	---
53.749	12.783	0.329	7.725	2.061	5	8	5	1.353	0.852	---	---
54.249	15.008	0.448	7.334	2.488	5	9	5	1.638	1.001	---	---
54.749	13.543	0.408	6.662	2.507	5	8	5	1.428	0.903	---	---
55.249	22.827	0.806	6.245	3.176	5	12	7	2.715	1.522	---	---
55.749	24.222	0.771	4.269	2.969	5	12	7	2.895	1.615	---	---
56.249	16.205	0.551	6.498	2.92	5	9	5	1.735	1.08	---	---
56.749	13.991	0.466	6.537	2.794	5	8	5	1.431	0.933	---	---
57.249	14.741	0.552	6.681	3.16	5	8	5	1.514	0.983	---	---
57.749	15.564	0.578	6.541	3.166	5	9	5	1.606	1.038	---	---
58.249	15.617	0.632	6.726	3.442	4	12	7	1.599	1.041	---	---
58.749	13.683	0.494	7.689	2.934	5	8	5	1.343	0.912	---	---
59.249	13.047	0.427	7.713	2.635	5	8	5	1.255	0.87	---	---
59.749	12.409	0.4	7.824	2.564	5	7	4	1.168	0.827	---	---
60.249	12.618	0.384	8.065	2.413	5	8	5	1.183	0.841	---	---
60.749	12.35	0.392	8.295	2.492	5	8	4	1.142	0.823	---	---
61.249	12.636	0.33	8.888	2.03	5	8	4	1.165	0.842	---	---
61.749	13.255	0.375	8.095	2.264	5	8	4	1.226	0.884	---	---
62.249	12.531	0.25	8.318	1.57	6	6	3	---	---	-20	28
62.749	14.858	0.307	8.302	1.682	6	7	4	---	---	-15	28
63.249	14.829	0.369	9.272	1.98	6	7	4	---	---	-14	28
63.749	14.739	0.365	9.718	1.948	6	7	4	---	---	-14	28
64.249	19.39	0.363	8.268	1.592	6	9	5	---	---	-6	28
64.749	21.765	0.53	7.741	2.123	6	10	5	---	---	-3	28
65.249	16.454	0.44	9.913	2.145	6	8	4	---	---	-11	28
65.749	19.725	0.55	8.691	2.362	6	9	5	---	---	-6	28
66.249	20.165	0.646	8.3	2.74	5	11	6	1.921	1.344	---	---
66.749	17.702	0.608	9.664	2.805	5	10	5	1.618	1.18	---	---
67.249	25.791	0.784	7.914	2.702	6	11	6	---	---	1	28
67.749	86.918	1.152	4.304	1.299	8	21	11	---	---	44	37
68.249	171.826	1.009	-0.408	0.588	9	33	17	---	---	70	39
68.749	128.248	2.115	-0.21	1.651	8	31	16	---	---	58	39
69.249	58.848	1.692	-0.343	2.882	6	22	11	---	---	28	33
69.749	25.586	0.741	3.777	2.73	6	10	5	---	---	-1	28
70.249	20.45	0.637	7.852	2.693	5	11	6	1.828	1.363	---	---
70.749	18.95	0.52	8.55	2.317	6	9	5	---	---	-9	28
71.249	21.037	0.552	9.998	2.196	6	10	5	---	---	-5	28
71.749	19.231	0.677	9.396	2.934	5	11	6	1.653	1.282	---	---
72.249	18.271	0.662	9.315	2.998	5	11	6	1.538	1.218	---	---
72.749	18.769	0.498	9.344	2.204	6	9	5	---	---	-9	28
73.249	22.773	0.73	7.365	2.829	5	12	6	1.994	1.518	---	---
73.749	16.11	0.494	9.178	2.487	5	10	5	1.284	1.074	---	---
74.249	15.35	0.647	8.946	3.404	5	9	5	1.2	1.023	---	---
74.749	17.938	0.577	9.241	2.657	5	10	5	1.447	1.196	---	---
75.249	21.635	0.612	9.182	2.41	6	10	5	---	---	-5	28
75.749	16.648	0.451	6.863	2.316	5	9	5	1.299	1.11	---	---
76.249	14.408	0.38	9.158	2.09	5	9	5	1.077	0.961	---	---
76.749	15.327	0.531	8.084	2.849	5	9	5	1.155	1.022	---	---
77.249	17.989	0.647	7.386	3.079	5	10	5	1.401	1.199	---	---
77.749	18.154	0.732	7.12	3.471	5	10	5	1.406	1.21	---	---
78.249	17.66	0.688	7.463	3.319	5	10	5	1.349	1.177	---	---
78.749	14.728	0.483	8.627	2.642	5	9	5	1.068	0.982	---	---
79.249	15.216	0.437	10.012	2.26	5	9	5	1.105	1.014	---	---

"(Note: --- means Out Of Range)

" Depth	Qc(avg)	Fs(avg)	U2	Rf	Rf Zone	Spt N	Spt N1	OCR	Su	Dr	Phi
" (feet)	(TSF)	(TSF)	(TSF)	(%)	(zone #)	(blow/ft)	(blow/ft)	(ratio)	(TSF)	(%)	(degree)
"----------	---------	----------	-----------	----------	----------	-----------	---------	----------	----------	-------	---------------
79.749	16.641	0.548	7.878	2.759	5	10	5	1.227	1.109	---	---
80.249	17.001	0.547	9.054	2.639	5	10	5	1.252	1.133	---	---
80.749	22.873	0.749	8.614	2.835	5	13	7	1.802	1.525	---	---
81.249	22.579	0.775	9.291	2.936	5	13	7	1.761	1.505	---	---
81.749	20.78	0.522	9.98	2.1	6	10	5	---	---	-8	28
82.249	22.249	0.602	10.612	2.263	6	10	5	---	---	-5	28
82.749	24.993	0.709	10.962	2.405	6	11	6	---	---	-1	28
83.249	27.806	0.909	10.494	2.831	6	12	6	---	---	1	28
83.749	37.44	1.497	11.563	3.549	5	20	10	3.198	2.496	---	---
84.249	40.039	1.823	10.842	4.098	5	21	11	3.454	2.669	---	---
84.749	40.622	1.771	12.854	3.859	5	22	11	3.492	2.708	---	---
85.249	42.116	1.538	15.31	3.179	6	19	10	---	---	16	31
85.749	35.625	1.409	9.959	3.549	5	19	10	2.924	2.375	---	---
86.249	30.913	1.342	7.082	3.97	4	22	11	2.432	2.061	---	---
86.749	25.353	1.088	7.066	3.853	4	18	9	1.885	1.69	---	---
87.249	22.313	0.858	8.262	3.339	5	12	6	1.596	1.488	---	---
87.749	22.8	0.44	10.286	1.628	6	10	5	---	---	-6	28
88.249	23.595	0.41	11.638	1.446	6	11	6	---	---	-4	28
88.749	22.26	0.516	12.161	1.894	6	10	5	---	---	-6	28
89.249	38.715	1.042	7.963	2.481	6	16	8	---	---	10	28
89.749	65.417	1.481	3.186	2.219	7	21	11	---	---	28	33
90.249	35.567	1.198	8.438	3.071	5	19	10	2.75	2.371	---	---
90.749	56.527	1.73	3.457	2.985	6	22	11	---	---	22	31
91.249	33.208	1.393	4.801	3.961	5	17	9	2.491	2.214	---	---
91.749	23.59	0.778	10.959	2.77	5	13	7	1.614	1.573	---	---
92.249	30.803	0.925	11.728	2.597	6	14	7	---	---	3	28
92.749	37.989	1.147	9.642	2.735	6	16	8	---	---	9	28
93.249	41.535	1.657	8.047	3.695	5	21	11	3.213	2.769	---	---
93.749	106.287	1.743	3.254	1.619	7	34	17	---	---	45	35
94.249	123.205	3.045	0.371	2.468	7	39	20	---	---	51	37
94.749	83.552	2.565	1.253	3.051	6	32	16	---	---	36	33
95.249	36.873	1.795	5.569	4.583	4	25	13	2.703	2.458	---	---
95.749	30.646	0.895	9.493	2.592	6	13	7	---	---	1	28
96.249	54.417	1.817	7.553	3.159	6	22	11	---	---	21	31
96.749	103.788	3.098	1.16	2.971	6	40	20	---	---	43	35
97.249	152.003	2.972	0.124	1.954	7	49	25	---	---	58	37
97.749	197.803	1.943	-0.316	0.983	9	38	19	---	---	68	39
98.249	167.721	2.876	-0.521	1.717	8	40	20	---	---	62	37
98.749	84.59	3.052	6.539	3.498	6	33	17	---	---	36	33
99.249	120.725	2.658	3.689	2.174	7	39	20	---	---	49	37
99.748	121.429	1.589	-0.21	1.309	8	29	15	---	---	49	37
100.248	49.023	2.129	4.388	4.189	5	24	12	3.637	3.268	---	---
100.748	34.646	1.177	11.378	2.995	6	15	8	---	---	5	28
101.248	36.033	1.314	9.08	3.305	5	19	10	2.446	2.402	---	---
101.748	32.98	0	7.612	0	8	---	---	---	---	1	28







CPT Results Interpretation Plots
CPT-15-001

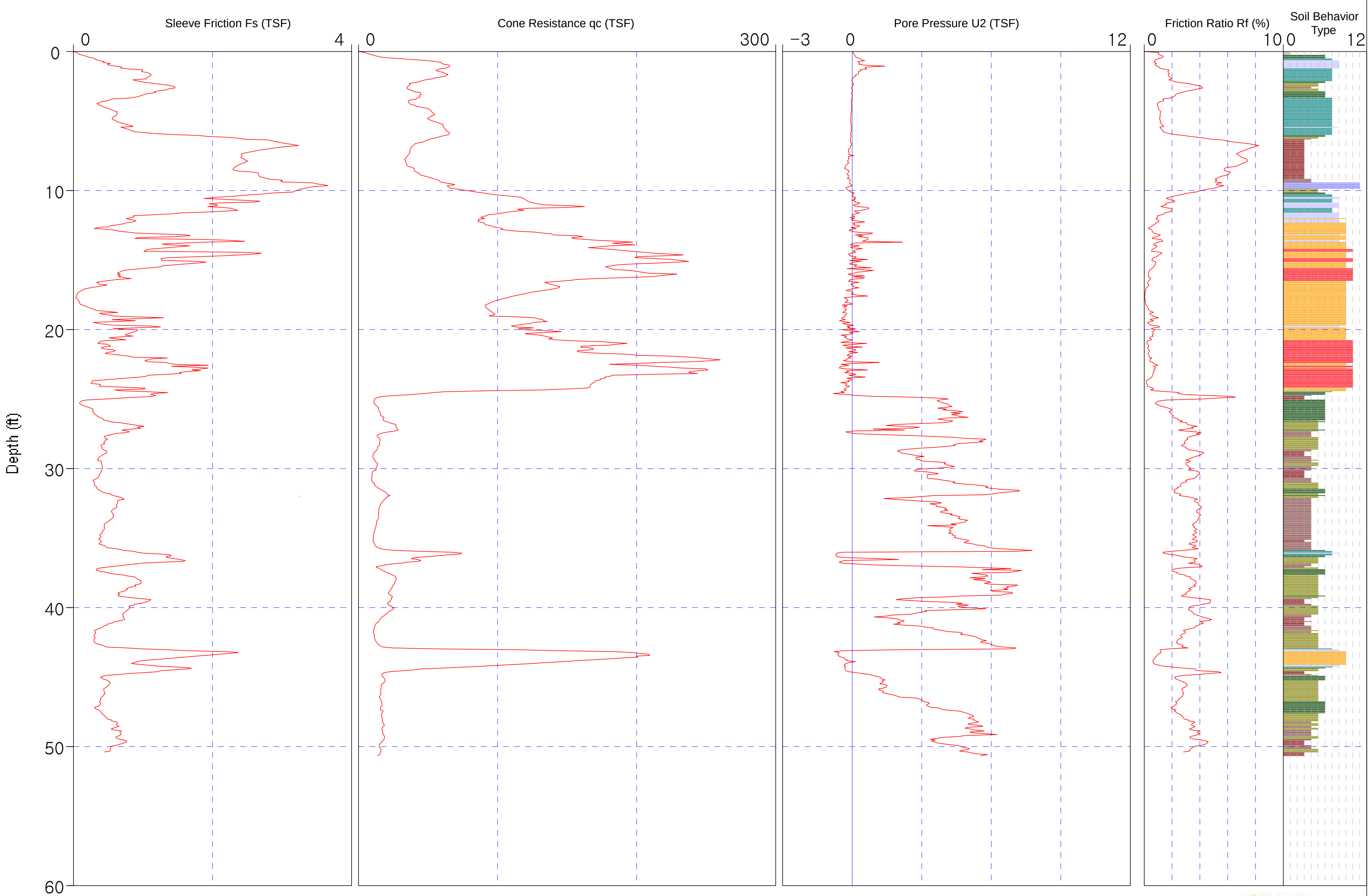
University Avenue POC
East Palo Alto, California

X:\City of East Palo Alto\28645626 101-University\440_Materials\exploration\CPT\CPT_int_plt_CPT001_0.xlsx

Job Number: 04.0915-0018
Operator: Danny Garza
Location: E. Palo Alto

CPT Number: CPT-15-002
Date: 17-Nov-2015
Elevation: 0.00

Coordinates:
Cone Number: CP15-CF25PB7SN2-P1E1 2408



(1) sensitive fine grained (OL-CH)	(7) silty sand to sandy silt (SM-ML)
(2) organic material (OL-OH)	(8) sand to silty sand (SM-SP)
(3) clay (CH)	(9) sand (SW-SP)
(4) silty clay to clay (CL-CH)	(10) gravel to gravelly sand (SW-GW)
(5) clayey silt to silty clay (MH-CL)	(11) very stiff fine grained* (CH-CL)
(6) sandy silt to clayey silt (ML-MH)	(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

CPT-15-002

```
"Output file from CPTINT - Version 5.2
"=====================================
"Developed by: UBC In-Situ Testing FREEWARE
"     Program: Piezocone Interpretation
"    Web Site: www.civil.ubc.ca/home/in-situ
"Interpreter Name: R. YILMAZ
"SUMMARY SHEET
"'a' for calculating Qt:                 0       O
"Value for Water Table (in m):           2      2.9
"Valid Zone Classification based on:     Rf
"Missing unit weight to start depth:     0.000
"Method for calculating Su:              Nc
"Value of the constant Nc:               1      15
"Method used to calculate OCR:           Su/EOS
"(Su/EOS) for normal consolidation:      0.350
"Define Zone 6 for Sand Parameters?      YES
"Sand Compressibility for calc Dr:       Moderate
"Method for Friction Angle:              Robertson & Campanella
"Vertical Flow Gradient, i (- up):       +0.000
"CPT to SPT N60 Conversion:              Jeffries & Davies
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"Zone #1=Sensitive fine grained     Zone #7 =Sand with some Silt
"Zone #2=Organic material           Zone #8 =Fine sand
"Zone #3=Clay                       Zone #9 =Sand
"Zone #4=Silty clay                 Zone #10=Gravelly sand
"Zone #5=Clayey silt                Zone #11=Very stiff fine grained *
"Zone #6=Silty sand                 Zone #12=Sand to clayey sand *
"   * Overconsolidated and/or cemented
"NOTE:
"For soil classification, Rf values > 8 are assumed to be 8.
```

CPT-15-002

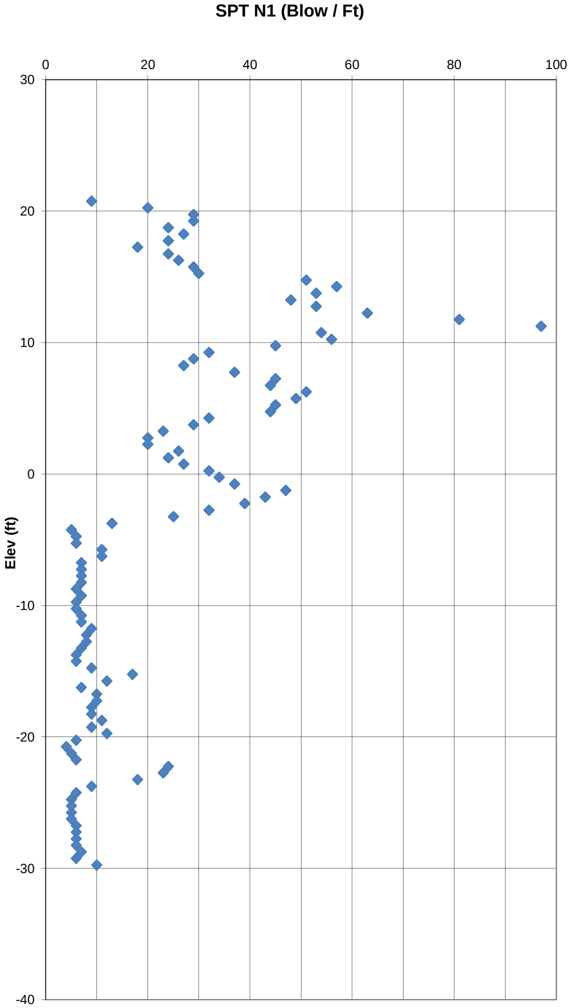
"(Note: --- means Out Of Range)

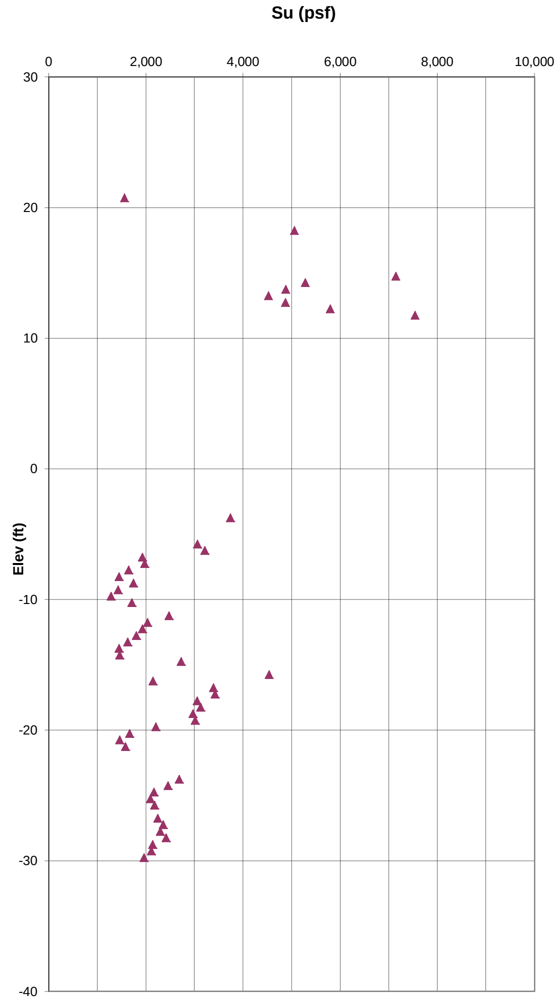
" Depth " (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	U2 (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	OCR (ratio)	Su (TSF)	Dr (%)	Phi (degree)
0.25	11.697	0.142	0.114	1.211	5	6	9	518.403	0.78	---	---
0.75	53.092	0.427	0.375	0.802	8	13	20	---	---	109	50
1.25	60.422	0.817	0.597	1.346	7	19	29	---	---	103	50
1.75	59.9	1.081	0.15	1.803	7	19	29	---	---	96	50
2.25	40.459	1.128	0.017	2.789	6	16	24	---	---	75	45
2.75	37.949	1.313	-0.009	3.461	5	18	27	110.045	2.53	---	---
3.25	42.823	0.85	-0.015	1.985	6	16	24	---	---	69	45
3.75	37.704	0.391	-0.027	1.037	7	12	18	---	---	61	43
4.25	50.871	0.558	-0.034	1.098	7	16	24	---	---	70	43
4.75	51.903	0.588	-0.057	1.134	7	17	26	---	---	68	43
5.25	59.164	0.735	-0.048	1.243	7	19	29	---	---	71	43
5.75	63.792	0.964	-0.05	1.512	7	20	30	---	---	72	43
6.25	53.596	2.418	-0.067	4.513	4	34	51	61.013	3.573	---	---
6.75	39.621	3.053	-0.056	7.711	3	38	57	37.894	2.641	---	---
7.25	36.598	2.545	-0.123	6.963	3	35	53	31.317	2.44	---	---
7.75	33.922	2.452	-0.167	7.243	3	32	48	26.155	2.261	---	---
8.25	36.553	2.357	-0.258	6.467	3	35	53	26.514	2.437	---	---
8.75	43.478	2.569	-0.167	5.918	3	42	63	30.556	2.899	---	---
9.25	56.559	2.965	-0.127	5.247	3	54	81	39.553	3.771	---	---
9.75	67.992	3.428	-0.149	5.046	11	65	97	---	---	---	---
10.25	97.623	2.651	0.016	2.716	6	37	54	---	---	77	43
10.75	122.624	2.256	0.147	1.839	7	39	56	---	---	85	43
11.25	132.777	2.165	0.359	1.629	8	32	45	---	---	88	45
11.75	96.105	1.219	0.1	1.268	8	23	32	---	---	75	43
12.25	88.721	0.786	0.137	0.885	8	21	29	---	---	71	43
12.75	105.796	0.531	0.083	0.502	9	20	27	---	---	77	43
13.25	148.292	1.246	0.556	0.839	9	28	37	---	---	90	45
13.75	183.67	1.802	0.515	0.98	9	35	45	---	---	98	45
14.25	183.448	1.367	0.121	0.745	9	35	44	---	---	97	45
14.75	215.532	1.94	0.07	0.9	9	41	51	---	---	103	45
15.25	206.384	1.533	0.075	0.743	9	40	49	---	---	101	45
15.75	193.289	0.804	0.385	0.416	9	37	45	---	---	98	45
16.25	192.738	0.669	0.121	0.347	9	37	44	---	---	97	45
16.75	140.354	0.369	0.067	0.263	9	27	32	---	---	85	43
17.25	128.927	0.102	-0.05	0.079	9	25	29	---	---	81	43
17.75	105.421	0.053	-0.054	0.05	9	20	23	---	---	73	41
18.25	92.508	0.143	-0.24	0.155	9	18	20	---	---	67	41
18.75	95.457	0.42	-0.291	0.44	9	18	20	---	---	68	41
19.25	124.065	0.75	-0.367	0.606	9	24	26	---	---	78	43
19.75	117.286	0.737	-0.147	0.629	9	22	24	---	---	75	43
20.25	130.136	0.841	-0.138	0.647	9	25	27	---	---	79	43
20.75	156.849	0.513	-0.132	0.327	9	30	32	---	---	86	43
21.25	169.718	0.483	-0.028	0.285	9	33	34	---	---	89	43
21.75	188.818	0.628	-0.049	0.333	9	36	37	---	---	92	43
22.25	238.499	1.193	0.024	0.5	9	46	47	---	---	101	45
22.75	224.077	1.726	-0.249	0.77	9	43	43	---	---	98	45
23.25	205.866	1.233	0.004	0.599	9	39	39	---	---	95	45
23.75	170.281	0.357	-0.195	0.21	9	33	32	---	---	87	43
24.25	137.44	0.733	-0.291	0.534	9	26	25	---	---	78	43
24.75	28.062	1.001	1.254	3.504	5	14	13	7.528	1.871	---	---
25.25	11.507	0.119	3.923	0.911	6	5	5	---	---	-12	28
25.75	14.598	0.254	4.206	1.557	6	6	6	---	---	-4	31
26.25	16.931	0.356	4.4	1.901	6	7	6	---	---	0	31

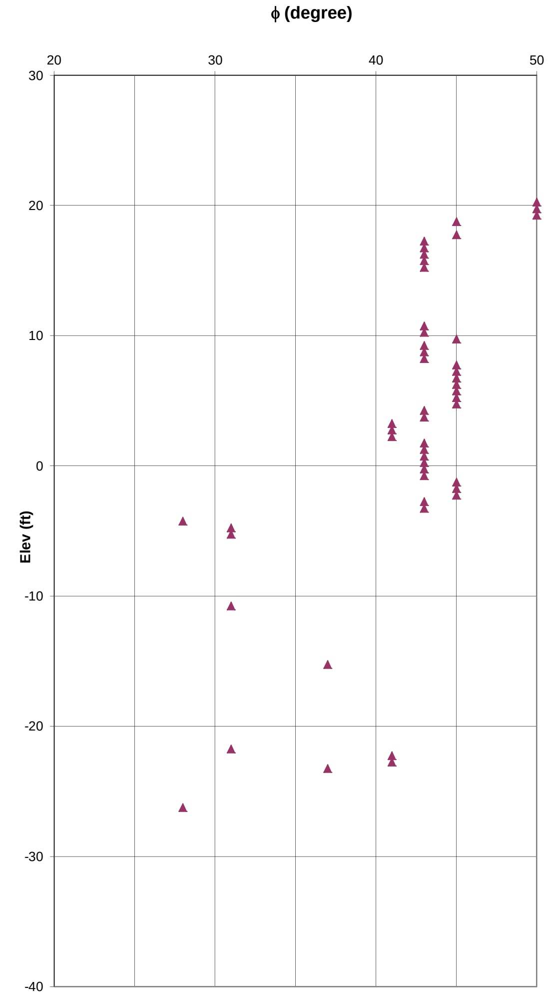
CPT-15-002

"(Note: --- means Out Of Range)

" Depth	Qc(avg)	Fs(avg)	U2	Rf	Rf Zone	Spt N	Spt N1	OCR	Su	Dr	Phi
" (feet)	(TSF)	(TSF)	(TSF)	(%)	(zone #)	(blow/ft)	(blow/ft)	(ratio)	(TSF)	(%)	(degree)
"--------	-----------	-----------	---------	-----------	----------	----------	----------	---------	----------	---------	--------------
26.75	22.961	0.709	3.088	2.925	5	12	11	5.477	1.531	---	---
27.25	24.123	0.79	1.065	3.217	5	12	11	5.726	1.608	---	---
27.75	14.438	0.478	3.952	2.978	5	8	7	2.965	0.963	---	---
28.25	14.806	0.424	4.645	2.539	5	8	7	3.013	0.987	---	---
28.75	12.327	0.451	2.252	3.402	4	8	7	2.36	0.822	---	---
29.25	10.849	0.378	2.831	3.15	4	8	7	1.981	0.723	---	---
29.75	13.067	0.41	4.012	2.79	5	7	6	2.463	0.871	---	---
30.25	10.706	0.395	3.154	3.29	4	8	7	1.891	0.714	---	---
30.75	9.627	0.326	3.653	2.93	4	7	6	1.632	0.642	---	---
31.25	12.823	0.321	5.498	2.126	5	7	6	2.302	0.855	---	---
31.75	19.869	0.47	6.093	2.103	6	9	7	---	---	4	31
32.25	18.585	0.666	2.691	3.382	5	9	7	3.554	1.239	---	---
32.75	15.267	0.609	3.757	3.625	4	11	9	2.741	1.018	---	---
33.25	14.452	0.563	4.18	3.482	4	10	8	2.524	0.963	---	---
33.75	13.493	0.509	4.69	3.303	4	10	8	2.285	0.9	---	---
34.25	12.199	0.441	4.12	3.178	4	9	7	1.988	0.813	---	---
34.75	10.882	0.397	4.326	3.136	4	8	6	1.7	0.725	---	---
35.25	10.944	0.386	4.977	2.973	4	8	6	1.69	0.73	---	---
35.75	20.446	0.606	6.496	2.624	5	11	9	3.641	1.363	---	---
36.25	57.518	1.266	-0.353	2.207	6	22	17	---	---	38	37
36.75	34.038	1.228	0.203	3.598	5	16	12	6.696	2.269	---	---
37.25	16.092	0.428	5.83	2.316	5	9	7	2.591	1.073	---	---
37.75	25.407	0.779	5.498	2.816	5	13	10	4.525	1.694	---	---
38.25	25.68	0.944	6.183	3.347	5	14	10	4.525	1.712	---	---
38.75	22.899	0.742	6.571	2.898	5	12	9	3.869	1.527	---	---
39.25	23.465	0.806	4.076	3.208	5	12	9	3.937	1.564	---	---
39.75	22.257	0.938	4.186	3.911	4	15	11	3.637	1.484	---	---
40.25	22.617	0.759	3.756	3.144	5	12	9	3.663	1.508	---	---
40.75	16.541	0.716	1.694	4.152	3	17	12	2.446	1.103	---	---
41.25	12.493	0.491	2.483	3.631	4	9	6	1.702	0.833	---	---
41.749	10.945	0.317	4.29	2.499	5	6	4	1.426	0.73	---	---
42.249	11.84	0.299	5.492	2.123	5	7	5	1.555	0.789	---	---
42.749	21.132	0.51	6.282	2.151	6	9	6	---	---	1	31
43.249	180.313	1.973	-0.237	1.095	9	35	24	---	---	80	41
43.749	171.924	1.248	-0.272	0.726	9	33	23	---	---	78	41
44.249	80.981	1.3	-0.311	1.608	7	26	18	---	---	48	37
44.749	20.155	0.84	0.393	4.133	4	13	9	2.852	1.344	---	---
45.249	18.434	0.47	1.285	2.478	5	9	6	2.524	1.229	---	---
45.749	16.241	0.467	1.342	2.781	5	8	5	2.131	1.083	---	---
46.249	15.681	0.435	1.675	2.656	5	8	5	2.018	1.045	---	---
46.749	16.32	0.388	3.094	2.205	5	8	5	2.099	1.088	---	---
47.249	16.33	0.343	3.728	1.923	6	7	5	---	---	-11	28
47.749	16.818	0.435	5.027	2.303	5	9	6	2.135	1.121	---	---
48.249	17.67	0.592	5.268	2.983	5	9	6	2.248	1.178	---	---
48.749	17.205	0.618	5.245	3.194	5	9	6	2.152	1.147	---	---
49.249	18.12	0.652	4.705	3.253	5	10	6	2.273	1.208	---	---
49.749	16.023	0.684	3.949	3.875	4	11	7	1.93	1.068	---	---
50.249	15.846	0.548	4.916	3.067	5	9	6	1.884	1.056	---	---
50.749	14.733	0.703	5.575	4.133	3	16	10	1.703	0.982	---	---







CPT Results Interpretation Plots
CPT-15-002

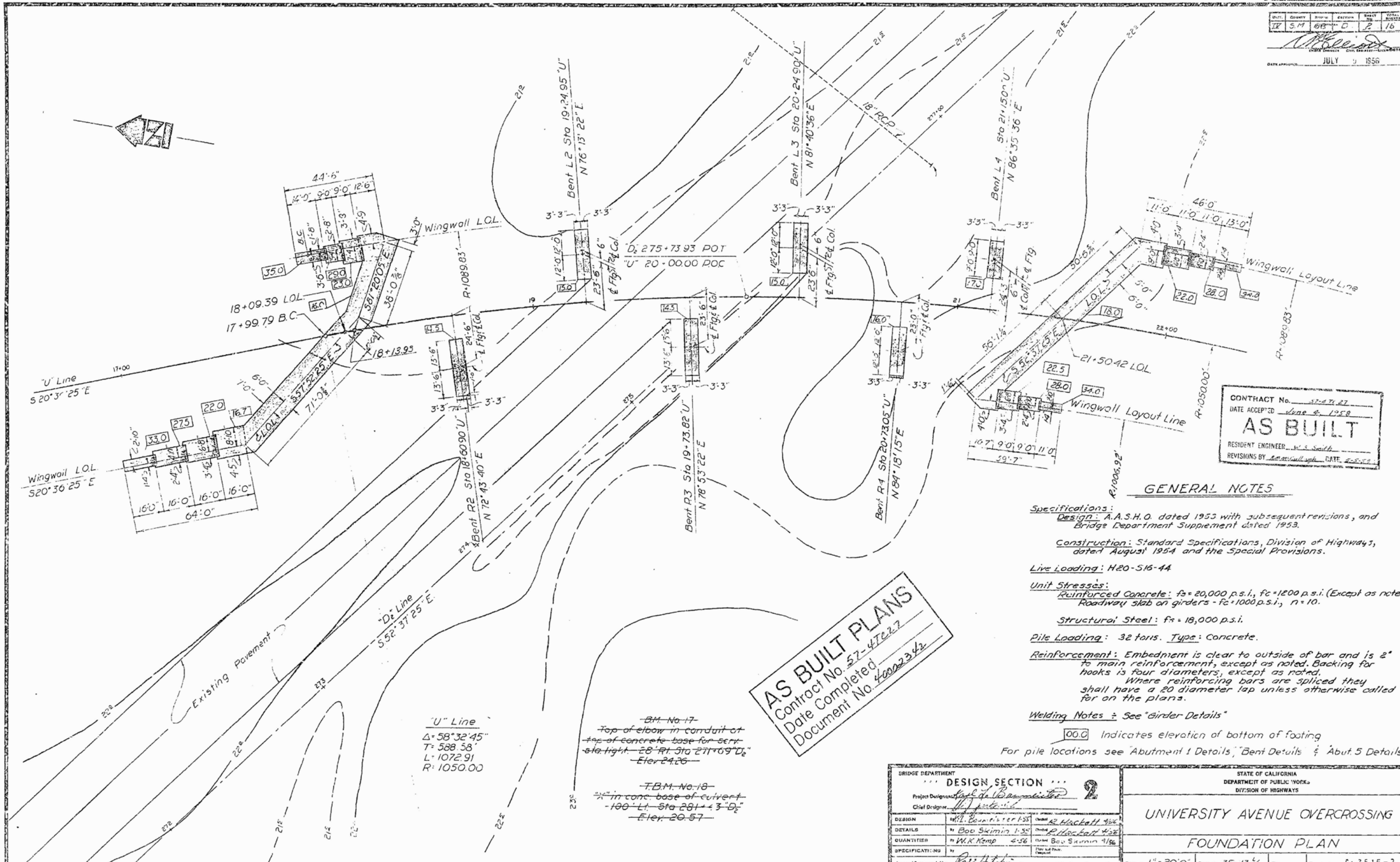
University Avenue POC
East Palo Alto, California

X:\City of East Palo Alto\28645626 101-University\440_Materials\exploration\CPT\CPT_int_plt_CPT002_.xlsx

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF.			71	107

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
IV	S.M.	68	C	2	16

DATE APPROVED JULY 9 1956



CONTRACT No. 57-4TC27
DATE ACCEPTED June 4, 1958
AS BUILT
RESIDENT ENGINEER W. S. Smith
REVISIONS BY

AS BUILT PLANS
Contract No. 57-4TC27
Date Completed
Document No. 40002342

GENERAL NOTES

Specifications:
Design: A.A.S.H.O. dated 1953 with subsequent revisions, and Bridge Department Supplement dated 1953.

Construction: Standard Specifications, Division of Highways, dated August 1954 and the Special Provisions.

Live Loading: H20-S16-44

Unit Stresses:
Reinforced Concrete: fs = 20,000 p.s.i., fc = 1200 p.s.i. (Except as noted) Roadway slab on girders - fc = 1000 p.s.i., n = 10.

Structural Steel: fs = 18,000 p.s.i.

Pile Loading: 32 tons. Type: Concrete.

Reinforcement: Embedment is clear to outside of bar and is 2" to main reinforcement, except as noted. Backing for hooks is four diameters, except as noted. Where reinforcing bars are spliced they shall have a 20 diameter lap unless otherwise called for on the plans.

Welding Notes: See "Girder Details"

$\boxed{00.0}$ Indicates elevation of bottom of footing

For pile locations see "Abutment 1 Details", "Bent Details" & "Abut. 5 Details."

BRIDGE DEPARTMENT
DESIGN SECTION 2

DESIGN	W.J. Baumeister 1-55	Checked	R. Hackett 4-56
DETAILS	Bob Skimin 1-56	Checked	R. Hackett 4-56
QUANTITIES	W.K. Kemp 4-56	Checked	Bob Skimin 4-56
SPECIFICATIONS			

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

UNIVERSITY AVENUE OVERCROSSING

FOUNDATION PLAN

SCALE 1" = 20'-0" | BRIDGE 35-113 L/R | FILE | DRAWING C-3515-2

PREL. DRAWING No. P-3515

71

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE ______ SIGNATURE ______ TITLE ______

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
1.31	19.69	15.62	3.07	2.255257				2.12	0.00
1.38	19.62	47.20	1.68	1.864192				2.12	0.00
1.44	19.56	59.71	1.74	1.828384				2.12	0.00
1.51	19.49	74.84	1.76	1.791131				2.12	0.00
1.57	19.43	99.29	1.64	1.717771				2.12	0.00
1.64	19.36	130.22	1.45	1.631908				2.12	0.00
1.71	19.29	157.15	1.34	1.577762				2.12	0.00
1.77	19.23	174.54	1.46	1.588158				2.12	0.00
1.84	19.16	162.38	1.67	1.646498				2.12	0.00
1.90	19.10	147.27	2.06	1.734054				2.12	0.00
1.97	19.03	137.68	2.38	1.796472				2.12	0.00
2.03	18.97	124.39	2.73	1.861641				2.12	0.00
2.10	18.90	103.86	3.42	1.970059				2.12	0.00
2.16	18.84	98.39	3.72	2.009581				2.12	0.00
2.23	18.77	99.58	3.68	2.007653				2.12	0.00
2.30	18.70	99.35	3.87	2.02798				2.12	0.00
2.36	18.64	93.47	4.22	2.069675				2.12	0.00
2.43	18.57	91.74	4.16	2.071218				2.12	0.00
2.49	18.51	86.09	4.19	2.087691				2.12	0.00
2.56	18.44	79.70	4.04	2.092988				2.12	0.00
2.62	18.38	74.78	3.88	2.09466				2.12	0.00
2.69	18.31	70.65	3.71	2.093877				2.12	0.00
2.76	18.24	63.75	3.76	2.121955				2.12	0.00
2.82	18.18	52.92	4.20	2.196338				2.12	0.00
2.89	18.11	44.06	4.31	2.245845				2.12	0.00
2.95	18.05	38.98	4.21	2.268126				2.12	0.00
3.02	17.98	35.36	4.11	2.285825				2.12	0.00
3.08	17.92	32.38	4.38	2.327143				2.12	0.00
3.15	17.85	30.90	4.26	2.333225				2.12	0.00
3.21	17.79	30.30	4.02	2.323683				2.12	0.00
3.28	17.72	29.39	3.69	2.310601				2.12	0.00
3.35	17.65	28.71	3.29	2.287357				2.12	0.00
3.41	17.59	27.52	3.07	2.28138				2.12	0.00
3.48	17.52	26.66	3.03	2.289471				2.12	0.00
3.54	17.46	26.31	2.76	2.27015				2.12	0.00
3.61	17.39	26.65	2.54	2.249215				2.12	0.00
3.67	17.33	27.39	2.49	2.239299				2.12	0.00
3.74	17.26	26.98	2.59	2.257107				2.12	0.00
3.80	17.20	25.41	2.95	2.30994				2.12	0.00
3.87	17.13	24.19	3.35	2.360382				2.12	0.00
3.94	17.06	23.33	3.65	2.396781				2.12	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
4.00	17.00	21.02	4.10	2.457513				2.12	0.00
4.07	16.93	19.22	4.58	2.514429				2.12	0.00
4.13	16.87	17.85	4.97	2.558807				2.12	0.00
4.20	16.80	17.02	5.25	2.58988				2.12	0.00
4.26	16.74	16.17	5.57	2.622461				2.12	0.00
4.33	16.67	15.56	5.84	2.648792				2.12	0.00
4.40	16.60	14.95	6.12	2.675694				2.12	0.00
4.46	16.54	14.35	6.35	2.699755				2.12	0.00
4.53	16.47	13.74	6.35	2.714042				2.12	0.00
4.59	16.41	13.14	6.20	2.722124				2.12	0.00
4.66	16.34	12.53	6.25	2.740352				2.12	0.00
4.72	16.28	12.31	5.93	2.733528				2.12	0.00
4.79	16.21	12.00	5.86	2.740326				2.12	0.00
4.85	16.15	12.10	5.48	2.723162				2.12	0.00
4.92	16.08	12.08	5.21	2.713026				2.12	0.00
4.99	16.01	11.91	4.98	2.708176				2.12	0.00
5.05	15.95	12.04	4.91	2.704067				2.12	0.00
5.12	15.88	12.20	4.58	2.685098				2.12	0.00
5.18	15.82	12.36	4.40	2.673996				2.12	0.00
5.25	15.75	12.59	4.22	2.66059				2.12	0.00
5.31	15.69	12.72	4.03	2.648543				2.12	0.00
5.38	15.62	12.50	4.10	2.661407				2.12	0.00
5.44	15.56	11.64	4.48	2.707277				2.12	0.00
5.51	15.49	11.13	4.81	2.742201				2.12	0.00
5.58	15.42	11.12	5.18	2.765142				2.12	0.00
5.64	15.36	11.91	5.37	2.757793				2.12	0.00
5.71	15.29	12.62	5.32	2.742022				2.12	0.00
5.77	15.23	13.44	5.49	2.7359				2.12	0.00
5.84	15.16	14.47	5.31	2.709066				2.12	0.00
5.90	15.10	15.01	5.35	2.703714				2.12	0.00
5.97	15.03	15.17	5.49	2.710376				2.12	0.00
6.04	14.96	15.37	5.37	2.703484				2.12	0.00
6.10	14.90	15.21	5.47	2.714085				2.12	0.00
6.17	14.83	15.03	5.68	2.730722				2.12	0.00
6.23	14.77	15.12	5.69	2.731928				2.12	0.00
6.30	14.70	15.46	5.55	2.721552				2.12	0.00
6.36	14.64	15.52	5.56	2.723485				2.12	0.00
6.43	14.57	15.54	5.62	2.728597				2.12	0.00
6.49	14.51	15.71	5.63	2.728684				2.12	0.00
6.56	14.44	15.84	5.56	2.72522				2.12	0.00
6.63	14.37	15.71	5.58	2.731284				2.12	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
6.69	14.31	15.70	5.58	2.73366				2.12	0.00
6.76	14.24	15.62	5.49	2.733449				2.12	0.00
6.82	14.18	15.71	5.41	2.729604				2.12	0.00
6.89	14.11	15.80	5.33	2.726448				2.12	0.00
6.95	14.05	15.73	5.27	2.726603				2.12	0.00
7.02	13.98	15.77	5.22	2.725886				2.12	0.00
7.08	13.92	15.56	5.23	2.7328				2.12	0.00
7.15	13.85	15.51	5.27	2.738357				2.12	0.00
7.22	13.78	15.41	5.32	2.74547				2.12	0.00
7.28	13.72	15.39	5.25	2.744044				2.12	0.00
7.35	13.65	15.31	5.03	2.736228				2.12	0.00
7.41	13.59	14.86	5.00	2.745423				2.12	0.00
7.48	13.52	14.04	4.65	2.745035				2.12	0.00
7.54	13.46	13.64	4.37	2.738854				2.12	0.00
7.61	13.39	12.57	4.43	2.769813				2.12	0.00
7.68	13.32	11.83	4.55	2.797813				2.12	0.00
7.74	13.26	11.42	4.66	2.817348				2.12	0.00
7.81	13.19	11.48	4.69	2.819962				2.12	0.00
7.87	13.13	11.73	4.64	2.812299				2.12	0.00
7.94	13.06	11.89	4.54	2.805255				2.12	0.00
8.00	13.00	12.04	4.38	2.793815				2.12	0.00
8.07	12.93	12.21	4.25	2.783632				2.12	0.00
8.13	12.87	12.49	4.39	2.787346				2.12	0.00
8.20	12.80	12.60	4.63	2.80121				2.12	0.00
8.27	12.73	12.73	5.06	2.823934				2.12	0.00
8.33	12.67	13.01	5.30	2.832254				2.12	0.00
8.40	12.60	13.25	5.32	2.829838				2.12	0.00
8.46	12.54	13.58	5.40	2.828576				2.12	0.00
8.53	12.47	13.79	5.44	2.828099				2.12	0.00
8.59	12.41	14.48	5.25	2.805985				2.12	0.00
8.66	12.34	14.94	5.14	2.792779				2.12	0.00
8.72	12.28	15.94	4.93	2.76358				2.12	0.00
8.79	12.21	16.98	4.80	2.739394				2.12	0.00
8.86	12.14	17.54	4.79	2.731208				2.12	0.00
8.92	12.08	17.98	5.02	2.738905				2.12	0.00
8.99	12.01	18.48	5.20	2.742823				2.12	0.00
9.05	11.95	19.12	5.40	2.745172				2.12	0.00
9.12	11.88	19.31	5.74	2.761894				2.12	0.00
9.18	11.82	19.60	6.02	2.772943				2.12	0.00
9.25	11.75	19.92	6.20	2.778859				2.12	0.00
9.32	11.68	19.54	6.30	2.791318				2.12	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
9.38	11.62	19.16	6.57	2.811017				2.12	0.00
9.45	11.55	19.05	6.86	2.827242				2.12	0.00
9.51	11.49	19.69	6.67	2.811442				2.12	0.00
9.58	11.42	20.40	6.23	2.783205				2.12	0.00
9.64	11.36	21.06	5.95	2.762068				2.12	0.00
9.71	11.29	21.81	5.70	2.741675				2.12	0.00
9.77	11.23	22.69	5.83	2.738472				2.12	0.00
9.84	11.16	23.31	6.14	2.747941				2.12	0.00
9.91	11.09	23.60	6.39	2.758109				2.12	0.00
9.97	11.03	24.17	6.42	2.754157				2.12	0.00
10.04	10.96	24.94	6.40	2.746324				2.12	0.00
10.10	10.90	24.56	6.55	2.75902				2.12	0.00
10.17	10.83	24.45	6.80	2.773573				2.12	0.00
10.23	10.77	24.39	6.93	2.781646				2.12	0.00
10.30	10.70	24.57	6.76	2.774157				2.12	0.00
10.36	10.64	25.04	6.69	2.767159				2.12	0.00
10.43	10.57	24.91	6.98	2.783418				2.12	0.00
10.50	10.50	25.29	6.83	2.774114				2.12	0.00
10.56	10.44	26.15	6.73	2.761933				2.12	0.00
10.63	10.37	26.13	6.68	2.761501				2.12	0.00
10.69	10.31	25.67	6.88	2.776999				2.12	0.00
10.76	10.24	26.38	6.76	2.766066				2.12	0.00
10.82	10.18	26.58	6.79	2.766405				2.12	0.00
10.89	10.11	27.08	6.73	2.760571				2.12	0.00
10.96	10.04	26.96	6.83	2.767748				2.12	0.00
11.02	9.98	26.85	6.69	2.764337				2.12	0.00
11.09	9.91	26.73	6.57	2.761784				2.12	0.00
11.15	9.85	26.61	6.43	2.758293				2.12	0.00
11.22	9.78	25.13	6.59	2.784103				2.12	0.00
11.28	9.72	24.20	6.69	2.800882				2.12	0.00
11.35	9.65	24.33	6.40	2.788029				2.12	0.00
11.41	9.59	24.18	6.22	2.782706				2.12	0.00
11.48	9.52	24.05	6.15	2.782713				2.12	0.00
11.55	9.45	23.57	6.21	2.792721				2.12	0.00
11.61	9.39	23.29	6.24	2.798378				2.12	0.00
11.68	9.32	23.05	6.25	2.802925				2.12	0.00
11.74	9.26	23.39	6.07	2.790703				2.12	0.00
11.81	9.19	23.69	6.00	2.783902				2.12	0.00
11.87	9.13	23.17	6.13	2.797815				2.12	0.00
11.94	9.06	23.08	6.06	2.796515				2.12	0.00
12.00	9.00	22.70	6.18	2.807719				2.12	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
12.07	8.93	21.97	6.31	2.824634				2.12	0.00
12.14	8.86	21.61	6.26	2.828568				2.12	0.00
12.20	8.80	20.56	6.28	2.845211				2.12	0.00
12.27	8.73	19.82	6.31	2.85913				2.12	0.00
12.33	8.67	19.87	6.14	2.850951				2.12	0.00
12.40	8.60	20.49	5.80	2.825461				2.12	0.00
12.46	8.54	20.39	5.66	2.82099				2.12	0.00
12.53	8.47	20.85	5.42	2.802176				2.12	0.00
12.60	8.40	21.78	5.18	2.776097				2.12	0.00
12.66	8.34	23.09	4.77	2.734815				2.12	0.00
12.73	8.27	24.44	4.43	2.696475				2.12	0.00
12.79	8.21	25.88	3.92	2.644806				2.12	0.00
12.86	8.14	26.89	3.77	2.622072				2.12	0.00
12.92	8.08	27.44	3.52	2.597528	93.20375	0.32	116.51772	2.12	0.00
12.99	8.01	27.66	3.56	2.598158	93.49237	0.32	117.2012	2.10	0.00
13.05	7.95	27.37	3.74	2.616794				2.07	0.00
13.12	7.88	27.71	3.80	2.617783				2.07	0.00
13.19	7.81	28.47	3.72	2.604061				2.07	0.00
13.25	7.75	28.09	3.87	2.620216				2.07	0.00
13.32	7.68	27.65	3.93	2.630473				2.07	0.00
13.38	7.62	27.35	4.04	2.642011				2.07	0.00
13.45	7.55	26.89	4.23	2.661339				2.07	0.00
13.51	7.49	26.20	4.44	2.684489				2.07	0.00
13.58	7.42	25.74	4.64	2.703271				2.07	0.00
13.64	7.36	25.00	5.25	2.749056				2.07	0.00
13.71	7.29	24.69	5.80	2.783091				2.07	0.00
13.78	7.22	25.25	6.14	2.79397				2.07	0.00
13.84	7.16	29.14	5.24	2.703974				2.07	0.00
13.91	7.09	30.21	4.98	2.678746				2.07	0.00
13.97	7.03	31.27	4.74	2.654082				2.07	0.00
14.04	6.96	32.33	4.51	2.630121				2.07	0.00
14.10	6.90	31.22	4.60	2.647156				2.07	0.00
14.17	6.83	30.10	4.45	2.649351				2.07	0.00
14.24	6.76	28.97	3.97	2.628427				2.07	0.00
14.30	6.70	27.86	3.86	2.633419				2.07	0.00
14.37	6.63	26.74	3.88	2.648402				2.07	0.00
14.43	6.57	23.33	4.56	2.739058				2.07	0.00
14.50	6.50	21.85	4.96	2.784959				2.07	0.00
14.56	6.44	21.27	4.99	2.795954				2.07	0.00
14.63	6.37	20.76	4.33	2.764167				2.07	0.00
14.69	6.31	19.41	4.29	2.78434				2.07	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
14.76	6.24	18.05	4.29	2.809749				2.07	0.00
14.83	6.17	17.33	4.18	2.817028				2.07	0.00
14.89	6.11	16.08	4.14	2.840896				2.07	0.00
14.96	6.04	15.07	4.08	2.860252				2.07	0.00
15.02	5.98	14.42	3.89	2.863508				2.07	0.00
15.09	5.91	13.74	4.00	2.88903				2.07	0.00
15.15	5.85	13.25	4.03	2.904672				2.07	0.00
15.22	5.78	12.80	4.06	2.91968				2.07	0.00
15.28	5.72	12.01	4.20	2.95324				2.07	0.00
15.35	5.65	11.84	3.39	2.903255				2.07	0.00
15.42	5.58	12.99	3.01	2.839147				2.07	0.00
15.48	5.52	13.90	2.96	2.810805				2.07	0.00
15.55	5.45	13.84	3.05	2.820561				2.07	0.00
15.61	5.39	12.96	3.00	2.841612				2.07	0.00
15.68	5.32	11.07	3.33	2.927391				2.07	0.00
15.74	5.26	10.23	3.31	2.958309				2.07	0.00
15.81	5.19	9.59	3.40	2.992589				2.07	0.00
15.88	5.12	10.00	3.04	2.946872				2.07	0.00
15.94	5.06	10.27	2.46	2.885848				2.07	0.00
16.01	4.99	10.41	2.20	2.854629				2.07	0.00
16.07	4.93	10.41	1.76	2.804993				2.07	0.00
16.14	4.86	10.17	1.63	2.798097				2.07	0.00
16.20	4.80	10.83	1.57	2.765551				2.07	0.00
16.27	4.73	10.68	1.79	2.7999				2.07	0.00
16.33	4.67	10.38	1.80	2.813969				2.07	0.00
16.40	4.60	10.26	1.93	2.834199				2.07	0.00
16.47	4.53	10.23	2.05	2.850894				2.07	0.00
16.53	4.47	10.58	2.11	2.84387				2.07	0.00
16.60	4.40	11.15	2.29	2.843208				2.07	0.00
16.66	4.34	11.92	2.35	2.824335				2.07	0.00
16.73	4.27	12.40	2.46	2.820576				2.07	0.00
16.79	4.21	12.95	2.81	2.837233				2.07	0.00
16.86	4.14	15.18	2.93	2.789625				2.07	0.00
16.92	4.08	18.72	2.90	2.711773				2.07	0.00
16.99	4.01	20.42	3.06	2.696262				2.07	0.00
17.06	3.94	24.55	2.56	2.586371	86.33174	0.27	122.26039	2.07	0.00
17.12	3.88	27.00	2.30	2.526314	88.79326	0.27	127.73578	2.04	0.00
17.19	3.81	28.85	2.01	2.468304	90.263	0.27	132.03173	2.01	0.00
17.25	3.75	28.32	1.97	2.470292	89.52278	0.27	131.03756	1.98	0.00
17.32	3.68	26.72	2.10	2.507703	87.958	0.27	127.721	1.96	0.00
17.38	3.62	24.99	1.95	2.512559	85.6012	0.26	124.16533	1.93	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
17.45	3.55	22.54	1.84	2.53498	82.49499	0.25	119.07421	1.90	0.00
17.52	3.48	21.48	1.58	2.517199	80.66978	0.25	117.00342	1.87	0.00
17.58	3.42	19.66	2.30	2.641653				1.83	0.00
17.65	3.35	21.62	2.57	2.636934				1.83	0.00
17.71	3.29	23.58	2.75	2.625014				1.83	0.00
17.78	3.22	25.55	2.61	2.58413	87.31543	0.26	126.39376	1.83	0.00
17.84	3.16	33.94	1.78	2.385675	94.93293	0.28	145.37503	1.80	0.00
17.91	3.09	43.88	1.24	2.205657	101.5152	0.30	126.5579	1.78	0.00
17.97	3.03	50.33	1.05	2.118388	104.3432	0.31	141.04034	1.75	0.00
18.04	2.96	52.61	0.84	2.049755	101.0034	0.30	146.77232	1.73	0.00
18.11	2.89	53.88	0.75	2.014454	98.46498	0.29	119.23823	1.70	0.00
18.17	2.83	56.24	0.66	1.970957	95.18915	0.28	124.75183	1.67	0.00
18.24	2.76	58.10	0.58	1.930476	90.42342	0.27	129.43585	1.65	0.00
18.30	2.70	60.48	0.55	1.906646	88.486	0.26	135.13491	1.62	0.00
18.37	2.63	65.26	0.47	1.843347	80.52868	0.25	147.29476	1.59	0.00
18.43	2.57	67.07	0.43	1.815821	77.78387	0.24	130.92361	1.56	0.00
18.50	2.50	69.41	0.37	1.7751	77.22931	0.24	136.44821	1.53	0.00
18.56	2.44	68.68	0.30	1.743157	76.26437	0.24	134.94671	1.50	0.00
18.63	2.37	67.72	0.22	1.702843	75.19851	0.23	132.95932	1.47	0.00
18.70	2.30	65.29	0.19	1.694863	72.58965	0.23	127.80887	1.43	0.00
18.76	2.24	62.94	0.17	1.699074	70.06016	0.22	122.85124	1.39	0.00
18.83	2.17	63.02	0.17	1.697825	70.0858	0.22	123.09099	1.36	0.00
18.89	2.11	61.94	0.19	1.717053	68.90612	0.22	120.88317	1.32	0.00
18.96	2.04	60.49	0.20	1.733399	67.32072	0.22	117.90466	1.29	0.00
19.02	1.98	60.19	0.25	1.766931	66.9928	0.22	117.33577	1.25	0.00
19.09	1.91	59.34	0.29	1.795195	66.92638	0.22	115.53206	1.22	0.00
19.16	1.84	58.98	0.32	1.816141	68.57096	0.22	114.6377	1.18	0.00
19.22	1.78	58.90	0.37	1.842638	72.74051	0.23	134.42022	1.14	0.00
19.29	1.71	59.76	0.44	1.871993	79.56286	0.24	135.81324	1.11	0.00
19.35	1.65	63.18	0.39	1.82839	74.68948	0.23	123.48767	1.07	0.00
19.42	1.58	68.90	0.66	1.903941	96.43005	0.28	156.00541	1.04	0.00
19.48	1.52	79.63	0.61	1.834134	92.99925	0.27	160.19226	1.01	0.00
19.55	1.45	90.41	0.43	1.711695	97.67472	0.28	187.67128	0.99	0.00
19.61	1.39	98.00	0.41	1.673027	105.3215	0.30	208.35832	0.96	0.00
19.68	1.32	114.28	0.31	1.558873	121.6505	0.37	261.06428	0.94	0.00
19.75	1.25	115.90	0.24	1.510677	123.1694	0.38	267.2746	0.92	0.00
19.81	1.19	114.43	0.24	1.511411	121.6126	0.37	261.82556	0.89	0.00
19.88	1.12	112.27	0.23	1.511468	119.3561	0.36	254.09827	0.88	0.00
19.94	1.06	102.55	0.24	1.556582	109.5024	0.32	222.34932	0.85	0.00
20.01	0.99	94.49	0.23	1.584495	101.2621	0.29	199.3889	0.83	0.00
20.07	0.93	89.66	0.22	1.594242	96.283	0.27	186.69601	0.81	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
20.14	0.86	87.99	0.19	1.58434	94.50137	0.27	182.52152	0.78	0.00
20.20	0.80	87.72	0.16	1.565063	94.16798	0.27	181.94085	0.75	0.00
20.27	0.73	87.45	0.13	1.545457	93.82772	0.27	181.37333	0.73	0.00
20.34	0.66	88.33	0.10	1.52065	94.65203	0.27	183.69616	0.70	0.00
20.40	0.60	89.20	0.10	1.515753	95.48414	0.27	186.02328	0.67	0.00
20.47	0.53	90.08	0.10	1.510889	96.30775	0.27	188.39068	0.65	0.00
20.53	0.47	90.96	0.10	1.506121	97.13967	0.27	190.76464	0.62	0.00
20.60	0.40	91.83	0.09	1.501405	97.95971	0.28	193.17176	0.59	0.00
20.66	0.34	94.76	0.12	1.503788	100.8623	0.28	201.14369	0.57	0.00
20.73	0.27	97.69	0.14	1.507387	103.7437	0.29	209.41351	0.54	0.00
20.80	0.20	100.62	0.17	1.520134	106.6137	0.30	218.0011	0.52	0.00
20.86	0.14	103.55	0.20	1.531711	109.4849	0.31	226.92459	0.49	0.00
20.93	0.07	108.54	0.29	1.570911	114.3867	0.33	242.98498	0.47	0.00
20.99	0.01	113.52	0.37	1.600574	119.2799	0.35	260.41973	0.45	0.00
21.06	-0.06	119.88	0.43	1.616562	125.5058	0.38	285.15991	0.43	0.00
21.12	-0.12	126.24	0.49	1.627983	131.7136	0.42	313.38552	0.41	0.00
21.19	-0.19	131.63	0.43	1.582369	136.9289	0.47	340.8154	0.39	0.00
21.25	-0.25	137.01	0.40	1.550256	142.1379	0.52	372.15709	0.37	0.00
21.32	-0.32	142.41	0.61	1.642126	147.3182	0.58	408.45194	0.36	0.00
21.39	-0.39	147.79	0.72	1.673225	152.4654	0.65	450.64128	0.34	0.00
21.45	-0.45	152.49	0.75	1.676003	156.9422	0.73	493.42015	0.32	0.00
21.52	-0.52	179.82	0.61	1.566279	183.3483	1.87		0.31	0.00
21.58	-0.58	213.73	0.49	1.451838	215.7688	2.00		0.31	0.00
21.65	-0.65	212.80	0.45	1.426329	214.7408	2.00		0.31	0.00
21.71	-0.71	210.84	0.40	1.401326	212.7604	2.00		0.31	0.00
21.78	-0.78	205.46	0.44	1.437092	207.4817	2.00		0.31	0.00
21.84	-0.84	200.08	0.58	1.517582	202.2107	2.00		0.31	0.00
21.91	-0.91	213.47	0.61	1.511615	214.8693	2.00		0.31	0.00
21.98	-0.98	226.87	0.67	1.5185	227.4731	2.00		0.31	0.00
22.04	-1.04	234.77	0.67	1.509695	234.8503	2.00		0.31	0.00
22.11	-1.11	243.95	0.69	1.504545	243.3902	2.00		0.31	0.00
22.17	-1.17	239.66	0.75	1.539417	239.1984	2.00		0.31	0.00
22.24	-1.24	245.63	0.70	1.508707	244.7031	2.00		0.31	0.00
22.30	-1.30	258.74	0.56	1.42865	256.9485	2.00		0.31	0.00
22.37	-1.37	252.82	0.47	1.386791	251.2225	2.00		0.31	0.00
22.44	-1.44	245.96	0.38	1.337822	244.6083	2.00		0.31	0.00
22.50	-1.50	235.58	0.66	1.50755	234.6565	2.00		0.31	0.00
22.57	-1.57	248.98	0.88	1.578582	247.179	2.00		0.31	0.00
22.63	-1.63	262.37	0.87	1.558781	259.6818	2.00		0.31	0.00
22.70	-1.70	275.77	0.86	1.540275	272.1247	2.00		0.31	0.00
22.76	-1.76	240.59	0.87	1.583135	238.8373	2.00		0.31	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-001
CPT File Name:	[CPT_15_001_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A Moore	Date:		3/11/2022

Ground Water Depth (ft) =	11.5
Ground Surface Elevation (ft) =	21.0
Ground Water Depth During EQ (ft) =	11.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
22.83	-1.83	205.42	0.88	1.634602	205.252	2.00		0.31	0.00
22.89	-1.89	185.70	0.82	1.645455	186.2453	2.00		0.31	0.00
22.96	-1.96	165.98	0.92	1.714164	167.1171	0.98	647.34253	0.31	0.00
23.03	-2.03	161.75	0.80	1.683119	162.8978	0.85	589.46019	0.30	0.00
23.09	-2.09	157.52	0.66	1.640174	158.701	0.75	539.63674	0.29	0.00
23.16	-2.16	153.29	0.52	1.585925	154.4849	0.67	496.33417	0.28	0.00
23.22	-2.22	159.19	0.34	1.475664	160.0979	0.78	557.79032	0.26	0.00
23.29	-2.29	178.96	0.52	1.531489	179.0368	1.51		0.26	0.00
23.35	-2.35	185.50	0.70	1.602979	185.1988	1.97		0.25	0.00
23.42	-2.42	192.04	0.88	1.658544	191.3207	2.00		0.25	0.00
23.48	-2.48	198.57	0.97	1.678413	197.451	2.00		0.25	0.00
23.55	-2.55	208.24	1.04	1.685961	206.5358	2.00		0.25	0.00
23.62	-2.62	217.91	1.10	1.691694	215.5952	2.00		0.25	0.00
23.68	-2.68	177.92	1.48	1.8454	188.9543	2.00		0.25	0.00
23.75	-2.75	164.32	1.37	1.843827	174.8789	1.27		0.25	0.00
23.81	-2.81	150.72	1.29	1.852178	163.475	0.85	571.64525	0.25	0.00
23.88	-2.88	137.11	1.07	1.824796	143.1377	0.51	373.68332	0.24	0.00
23.94	-2.94	123.51	0.80	1.776357	124.3769	0.36	306.4894	0.22	0.00
24.01	-3.01	111.65	0.45	1.67078	112.513	0.31	260.94996	0.20	0.00
24.08	-3.08	109.62	0.32	1.606477	110.4407	0.30	254.15447	0.18	0.00
24.14	-3.14	108.67	0.18	1.517167	109.4482	0.30	251.10224	0.16	0.00
24.21	-3.21	107.73	0.16	1.507172	108.448	0.29	248.11327	0.14	0.00
24.27	-3.27	106.78	0.15	1.496826	107.4619	0.29	245.15063	0.11	0.00
24.34	-3.34	109.11	0.19	1.519235	109.6606	0.30	252.90901	0.09	0.00
24.40	-3.40	111.44	0.37	1.632516	111.858	0.30	260.92857	0.06	0.00
24.47	-3.47	113.31	0.53	1.706833	113.5841	0.31	267.61879	0.04	0.00
24.53	-3.53	115.18	0.46	1.667523	115.3207	0.32	274.47749	0.02	0.00
24.60	-3.60	122.84	0.37	1.597275				0.00	0.00
24.67	-3.67	122.91	0.40	1.610645				0.00	0.00
24.73	-3.73	120.70	0.39	1.615391				0.00	0.00
24.80	-3.80	117.89	0.40	1.62635				0.00	0.00
24.86	-3.86	115.07	0.41	1.641155				0.00	0.00
24.93	-3.93	114.06	0.46	1.66946				0.00	0.00
24.99	-3.99	114.68	0.49	1.68524				0.00	0.00
25.06	-4.06	107.88	0.56	1.740117				0.00	0.00
25.12	-4.12	89.48	0.57	1.810455				0.00	0.00
25.19	-4.19	81.83	0.79	1.922968				0.00	0.00
25.26	-4.26	62.84	1.42	2.169039				0.00	0.00
25.32	-4.32	43.85	2.28	2.424637				0.00	0.00
25.39	-4.39	33.94	2.75	2.567249				0.00	0.00
25.45	-4.45	24.54	3.37	2.739927				0.00	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
0.07	21.93	4.57	1.05	1.902618				1.96	0.00
0.13	21.87	6.17	1.03	1.909378				1.96	0.00
0.20	21.80	8.35	1.01	1.894805				1.96	0.00
0.26	21.74	10.71	1.19	1.90575				1.96	0.00
0.33	21.67	13.03	1.35	1.91815				1.96	0.00
0.39	21.61	16.16	1.35	1.893541				1.96	0.00
0.46	21.54	22.89	1.21	1.814902				1.96	0.00
0.52	21.48	31.55	0.99	1.715179				1.96	0.00
0.59	21.41	41.18	0.80	1.624513				1.96	0.00
0.66	21.34	49.97	0.74	1.578237				1.96	0.00
0.72	21.28	55.56	0.79	1.577485				1.96	0.00
0.79	21.21	59.50	0.72	1.548401				1.96	0.00
0.85	21.15	59.91	0.88	1.600835				1.96	0.00
0.92	21.08	61.60	0.79	1.578369				1.96	0.00
0.98	21.02	65.49	0.80	1.572004				1.96	0.00
1.05	20.95	65.71	0.92	1.611728				1.96	0.00
1.12	20.88	64.92	1.07	1.658693				1.96	0.00
1.18	20.82	63.13	1.08	1.67302				1.96	0.00
1.25	20.75	58.81	1.31	1.743074				1.96	0.00
1.31	20.69	56.30	1.77	1.839274				1.96	0.00
1.38	20.62	55.85	1.77	1.845651				1.96	0.00
1.44	20.56	58.28	1.68	1.828407				1.96	0.00
1.51	20.49	61.28	1.73	1.830732				1.96	0.00
1.57	20.43	61.57	1.78	1.842633				1.96	0.00
1.64	20.36	64.46	1.72	1.827925				1.96	0.00
1.71	20.29	63.39	1.76	1.843104				1.96	0.00
1.77	20.23	62.20	1.76	1.850556				1.96	0.00
1.84	20.16	59.02	1.82	1.875693				1.96	0.00
1.90	20.10	54.63	1.92	1.911242				1.96	0.00
1.97	20.03	52.66	1.99	1.93415				1.96	0.00
2.03	19.97	48.07	1.78	1.928128				1.96	0.00
2.10	19.90	45.66	1.99	1.973744				1.96	0.00
2.16	19.84	43.66	2.22	2.018713				1.96	0.00
2.23	19.77	40.90	2.58	2.07913				1.96	0.00
2.30	19.70	36.49	3.20	2.169825				1.96	0.00
2.36	19.64	37.21	3.39	2.18536				1.96	0.00
2.43	19.57	36.29	3.80	2.228491				1.96	0.00
2.49	19.51	35.40	4.04	2.255921				1.96	0.00
2.56	19.44	35.18	4.15	2.269197				1.96	0.00
2.62	19.38	34.73	4.21	2.279575				1.96	0.00
2.69	19.31	35.53	3.84	2.252065				1.96	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
2.76	19.24	36.89	3.61	2.229552				1.96	0.00
2.82	19.18	38.87	3.17	2.183714				1.96	0.00
2.89	19.11	40.09	2.91	2.155437				1.96	0.00
2.95	19.05	44.35	2.66	2.110569				1.96	0.00
3.02	18.98	44.67	2.40	2.083516				1.96	0.00
3.08	18.92	45.00	2.26	2.067997				1.96	0.00
3.15	18.85	43.91	2.24	2.07482				1.96	0.00
3.21	18.79	43.76	2.15	2.067192				1.96	0.00
3.28	18.72	44.21	2.03	2.052285				1.96	0.00
3.35	18.65	42.17	1.88	2.046216				1.96	0.00
3.41	18.59	41.41	1.34	1.967074				1.96	0.00
3.48	18.52	37.44	1.41	2.008551				1.96	0.00
3.54	18.46	35.71	1.34	2.011543				1.96	0.00
3.61	18.39	35.78	1.11	1.968886				1.96	0.00
3.67	18.33	36.32	1.04	1.952337				1.96	0.00
3.74	18.26	36.51	0.93	1.929109				1.96	0.00
3.80	18.20	37.63	0.95	1.92859				1.96	0.00
3.87	18.13	40.52	0.93	1.904959				1.96	0.00
3.94	18.06	41.46	0.99	1.916369				1.96	0.00
4.00	18.00	44.94	1.00	1.896305				1.96	0.00
4.07	17.93	48.09	1.00	1.88177				1.96	0.00
4.13	17.87	50.62	1.02	1.874329				1.96	0.00
4.20	17.80	51.30	1.08	1.885845				1.96	0.00
4.26	17.74	51.98	1.13	1.896281				1.96	0.00
4.33	17.67	52.66	1.19	1.90812				1.96	0.00
4.40	17.60	53.34	1.17	1.902403				1.96	0.00
4.46	17.54	54.03	1.17	1.900223				1.96	0.00
4.53	17.47	54.71	1.14	1.892633				1.96	0.00
4.59	17.41	53.51	1.15	1.904348				1.96	0.00
4.66	17.34	52.07	1.14	1.911319				1.96	0.00
4.72	17.28	51.22	1.11	1.911153				1.96	0.00
4.79	17.21	49.78	1.12	1.924366				1.96	0.00
4.85	17.15	50.00	1.11	1.923633				1.96	0.00
4.92	17.08	51.22	1.14	1.924359				1.96	0.00
4.99	17.01	52.72	1.16	1.924403				1.96	0.00
5.05	16.95	55.09	1.13	1.907176				1.96	0.00
5.12	16.88	56.80	1.19	1.913284				1.96	0.00
5.18	16.82	58.99	1.22	1.911751				1.96	0.00
5.25	16.75	60.53	1.27	1.915922				1.96	0.00
5.31	16.69	60.88	1.34	1.929863				1.96	0.00
5.38	16.62	60.64	1.42	1.948554				1.96	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
5.44	16.56	61.22	1.12	1.885397				1.96	0.00
5.51	16.49	61.81	1.18	1.898463				1.96	0.00
5.58	16.42	62.39	1.24	1.911438				1.96	0.00
5.64	16.36	62.98	1.29	1.921853				1.96	0.00
5.71	16.29	62.97	1.35	1.934086				1.96	0.00
5.77	16.23	64.68	1.38	1.934962				1.96	0.00
5.84	16.16	65.38	1.59	1.973401				1.96	0.00
5.90	16.10	65.40	1.79	2.007353				1.96	0.00
5.97	16.03	64.72	2.24	2.076343				1.96	0.00
6.04	15.96	62.45	2.87	2.16094				1.96	0.00
6.10	15.90	58.91	3.29	2.219328				1.96	0.00
6.17	15.83	57.34	3.86	2.277005				1.96	0.00
6.23	15.77	54.21	4.36	2.329909				1.96	0.00
6.30	15.70	51.34	4.77	2.372926				1.96	0.00
6.36	15.64	49.88	5.60	2.43269				1.96	0.00
6.43	15.57	47.80	5.99	2.465983				1.96	0.00
6.49	15.51	46.82	6.26	2.486715				1.96	0.00
6.56	15.44	43.07	6.96	2.542424				1.96	0.00
6.63	15.37	40.86	7.50	2.580984				1.96	0.00
6.69	15.31	40.10	7.88	2.603529				1.96	0.00
6.76	15.24	39.33	8.23	2.624274				1.96	0.00
6.82	15.18	38.56	8.02	2.622489				1.96	0.00
6.89	15.11	37.80	7.82	2.621172				1.96	0.00
6.95	15.05	37.62	7.62	2.615812				1.96	0.00
7.02	14.98	37.40	7.42	2.611029				1.96	0.00
7.08	14.92	36.94	7.27	2.609291				1.96	0.00
7.15	14.85	37.06	7.06	2.601558				1.96	0.00
7.22	14.78	36.86	6.91	2.598396				1.96	0.00
7.28	14.72	36.66	6.76	2.594732				1.96	0.00
7.35	14.65	36.46	6.61	2.591188				1.96	0.00
7.41	14.59	35.95	6.73	2.601822				1.96	0.00
7.48	14.52	35.44	6.84	2.612846				1.96	0.00
7.54	14.46	34.92	6.92	2.621795				1.96	0.00
7.61	14.39	34.41	7.00	2.631149				1.96	0.00
7.68	14.32	33.80	7.19	2.646247				1.96	0.00
7.74	14.26	33.19	7.39	2.661244				1.96	0.00
7.81	14.19	33.46	7.39	2.661397				1.96	0.00
7.87	14.13	33.74	7.42	2.662221				1.96	0.00
7.94	14.06	33.92	7.31	2.658248				1.96	0.00
8.00	14.00	34.10	7.20	2.653958				1.96	0.00
8.07	13.93	34.49	6.98	2.643384				1.96	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
8.13	13.87	34.55	6.90	2.64097				1.96	0.00
8.20	13.80	35.07	6.73	2.631259				1.96	0.00
8.27	13.73	35.59	6.57	2.621601				1.96	0.00
8.33	13.67	38.85	5.95	2.570033				1.96	0.00
8.40	13.60	39.82	5.78	2.556524				1.96	0.00
8.46	13.54	39.93	5.74	2.555217				1.96	0.00
8.53	13.47	40.03	5.77	2.557747				1.96	0.00
8.59	13.41	40.14	5.89	2.565263				1.96	0.00
8.66	13.34	41.52	6.15	2.571617				1.96	0.00
8.72	13.28	42.91	6.19	2.567168				1.96	0.00
8.79	13.21	43.98	6.05	2.555228				1.96	0.00
8.86	13.14	44.19	6.03	2.554774				1.96	0.00
8.92	13.08	46.23	5.77	2.53092				1.96	0.00
8.99	13.01	48.79	5.48	2.502115				1.96	0.00
9.05	12.95	50.97	5.34	2.48456				1.96	0.00
9.12	12.88	53.15	5.22	2.468168				1.96	0.00
9.18	12.82	55.32	5.09	2.451339				1.96	0.00
9.25	12.75	57.50	5.23	2.451643				1.96	0.00
9.32	12.68	58.20	5.12	2.443537				1.96	0.00
9.38	12.62	58.90	5.10	2.44067				1.96	0.00
9.45	12.55	61.87	5.57	2.458051				1.96	0.00
9.51	12.49	66.97	5.22	2.418538				1.96	0.00
9.58	12.42	69.26	5.19	2.41024				1.96	0.00
9.64	12.36	63.95	5.72	2.462863				1.96	0.00
9.71	12.29	64.00	5.41	2.445867				1.96	0.00
9.77	12.23	65.56	5.18	2.427134				1.96	0.00
9.84	12.16	66.15	5.04	2.41726				1.96	0.00
9.91	12.09	72.08	4.53	2.362778				1.96	0.00
9.97	12.03	75.96	4.24	2.329252				1.96	0.00
10.04	11.96	80.39	3.96	2.293956				1.96	0.00
10.10	11.90	84.82	3.72	2.260786				1.96	0.00
10.17	11.83	89.26	3.23	2.204064				1.96	0.00
10.23	11.77	93.64	2.95	2.163727				1.96	0.00
10.30	11.70	97.72	2.62	2.116197				1.96	0.00
10.36	11.64	105.65	2.26	2.05013				1.96	0.00
10.43	11.57	112.50	1.97	1.991557				1.96	0.00
10.50	11.50	117.00	1.75	1.945071				1.96	0.00
10.56	11.44	118.43	1.59	1.912223				1.96	0.00
10.63	11.37	119.50	1.80	1.9492				1.96	0.00
10.69	11.31	120.57	2.00	1.981911				1.96	0.00
10.76	11.24	121.65	2.21	2.011417				1.96	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
10.82	11.18	122.73	2.13	1.998671				1.96	0.00
10.89	11.11	126.08	1.67	1.915919				1.96	0.00
10.96	11.04	129.42	1.51	1.878853				1.96	0.00
11.02	10.98	132.77	1.56	1.882566				1.96	0.00
11.09	10.91	152.20	1.36	1.803129				1.96	0.00
11.15	10.85	162.52	1.19	1.744968				1.96	0.00
11.22	10.78	149.36	1.44	1.828646				1.96	0.00
11.28	10.72	119.18	1.92	1.980853				1.96	0.00
11.35	10.65	114.54	2.01	2.007344				1.96	0.00
11.41	10.59	119.09	1.99	1.993949				1.96	0.00
11.48	10.52	112.59	1.92	1.999578				1.96	0.00
11.55	10.45	107.29	1.76	1.987146				1.96	0.00
11.61	10.39	103.57	1.48	1.946018				1.96	0.00
11.68	10.32	99.49	1.43	1.948486				1.96	0.00
11.74	10.26	93.18	1.22	1.924696				1.96	0.00
11.81	10.19	92.08	0.93	1.856717				1.96	0.00
11.87	10.13	89.15	0.98	1.88066				1.96	0.00
11.94	10.06	87.99	0.94	1.875415				1.96	0.00
12.00	10.00	90.78	0.84	1.836148				1.96	0.00
12.07	9.93	86.22	0.93	1.880373				1.96	0.00
12.14	9.86	86.74	1.02	1.904957				1.96	0.00
12.20	9.80	85.77	1.05	1.915876				1.96	0.00
12.27	9.73	87.37	0.96	1.888308				1.96	0.00
12.33	9.67	90.39	0.83	1.839826				1.96	0.00
12.40	9.60	90.77	0.79	1.825683				1.96	0.00
12.46	9.54	91.74	0.69	1.789927				1.96	0.00
12.53	9.47	95.23	0.55	1.725654	108.0061	0.40	192.531044	1.96	0.00
12.60	9.40	96.40	0.53	1.713711	109.122	0.41	195.894253	1.94	0.00
12.66	9.34	100.07	0.36	1.613553	112.8514	0.42	206.41997	1.92	0.00
12.73	9.27	103.60	0.29	1.563225	116.4011	0.44	217.157194	1.89	0.00
12.79	9.21	102.54	0.50	1.678406	115.2076	0.43	214.038736	1.87	0.00
12.86	9.14	107.22	0.57	1.693975	119.9222	0.46	229.039842	1.85	0.00
12.92	9.08	114.94	0.57	1.671334	127.7417	0.52	256.854131	1.83	0.00
12.99	9.01	126.38	0.61	1.65625	139.2537	0.63	308.130019	1.81	0.00
13.05	8.95	132.59	0.68	1.669597	145.41	0.72	343.016893	1.79	0.00
13.12	8.88	138.86	0.89	1.727107	151.5763	0.83	385.115897	1.78	0.00
13.19	8.81	139.97	1.16	1.803093	154.5879	0.90	391.926893	1.77	0.00
13.25	8.75	157.43	1.07	1.743892	169.7705	1.42		1.76	0.00
13.32	8.68	161.34	0.90	1.68728	173.4871	1.62		1.76	0.00
13.38	8.62	153.26	0.61	1.595563	165.3722	1.22		1.75	0.00
13.45	8.55	154.64	0.57	1.57519	166.5934	1.27		1.75	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
13.51	8.49	163.38	1.15	1.757426	175.0931	1.71		1.75	0.00
13.58	8.42	170.93	1.31	1.78421	182.8663	2.00		1.75	0.00
13.64	8.36	186.93	1.32	1.762299	197.8234	2.00		1.75	0.00
13.71	8.29	197.15	0.97	1.652169	207.5272	2.00		1.75	0.00
13.78	8.22	182.84	0.87	1.642299	193.5037	2.00		1.75	0.00
13.84	8.16	188.74	0.68	1.55922	199.0989	2.00		1.75	0.00
13.91	8.09	198.66	0.69	1.551693	208.5316	2.00		1.75	0.00
13.97	8.03	180.76	0.93	1.664273	191.0543	2.00		1.75	0.00
14.04	7.96	173.05	0.88	1.662367	183.3762	2.00		1.75	0.00
14.10	7.90	165.34	0.83	1.659212	175.6962	1.72		1.75	0.00
14.17	7.83	173.77	0.70	1.59674	183.8023	2.00		1.74	0.00
14.24	7.76	181.70	0.59	1.534041	191.38	2.00		1.74	0.00
14.30	7.70	189.23	0.55	1.504072	198.556	2.00		1.74	0.00
14.37	7.63	196.76	0.52	1.474958	205.6815	2.00		1.74	0.00
14.43	7.57	204.29	1.15	1.698106	212.7872	2.00		1.74	0.00
14.50	7.50	211.82	1.28	1.72245	219.8368	2.00		1.74	0.00
14.56	7.44	222.63	1.17	1.682669	230.018	2.00		1.74	0.00
14.63	7.37	233.44	1.02	1.624676	240.1297	2.00		1.74	0.00
14.69	7.31	219.69	0.98	1.629256	226.9059	2.00		1.74	0.00
14.76	7.24	200.43	0.88	1.623907	208.294	2.00		1.74	0.00
14.83	7.17	198.72	0.70	1.557248	206.4943	2.00		1.74	0.00
14.89	7.11	212.09	0.59	1.491953	219.1936	2.00		1.74	0.00
14.96	7.04	225.43	0.56	1.456925	231.7756	2.00		1.74	0.00
15.02	6.98	231.35	0.55	1.442732	237.2657	2.00		1.74	0.00
15.09	6.91	237.28	0.74	1.523278	242.7269	2.00		1.74	0.00
15.15	6.85	228.55	0.83	1.570894	234.3088	2.00		1.74	0.00
15.22	6.78	212.50	0.83	1.589195	218.8491	2.00		1.74	0.00
15.28	6.72	196.46	0.81	1.60827	203.3138	2.00		1.74	0.00
15.35	6.65	185.77	0.77	1.611562	192.8505	2.00		1.74	0.00
15.42	6.58	181.63	0.71	1.592177	188.6904	2.00		1.74	0.00
15.48	6.52	177.54	0.71	1.601476	184.5957	2.00		1.74	0.00
15.55	6.45	179.59	0.62	1.561906	186.4459	2.00		1.74	0.00
15.61	6.39	181.63	0.54	1.519185	188.2988	2.00		1.74	0.00
15.68	6.32	183.68	0.45	1.472628	190.1488	2.00		1.74	0.00
15.74	6.26	195.64	0.37	1.399381	201.5759	2.00		1.74	0.00
15.81	6.19	199.90	0.34	1.377159	205.5397	2.00		1.74	0.00
15.88	6.12	204.17	0.32	1.355008	209.4958	2.00		1.74	0.00
15.94	6.06	208.43	0.30	1.332862	213.4677	2.00		1.74	0.00
16.01	5.99	228.97	0.29	1.293728	232.9191	2.00		1.74	0.00
16.07	5.93	222.31	0.29	1.297634	226.4634	2.00		1.74	0.00
16.14	5.86	215.65	0.31	1.331088	219.978	2.00		1.74	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
16.20	5.80	208.98	0.31	1.339868	213.4863	2.00		1.74	0.00
16.27	5.73	187.27	0.40	1.435974	192.4913	2.00		1.74	0.00
16.33	5.67	170.10	0.49	1.519465	175.7479	1.60		1.74	0.00
16.40	5.60	156.65	0.39	1.496488	162.5108	1.01	541.129584	1.74	0.00
16.47	5.53	151.97	0.34	1.477334	157.8127	0.88	490.624418	1.74	0.00
16.53	5.47	143.95	0.30	1.467319	149.8429	0.71	420.322183	1.73	0.00
16.60	5.40	133.82	0.25	1.461756	139.7548	0.57	352.687746	1.71	0.00
16.66	5.34	135.88	0.26	1.466184	141.6985	0.59	364.968217	1.69	0.00
16.73	5.27	138.05	0.27	1.464132	143.7315	0.61	378.63747	1.68	0.00
16.79	5.21	140.23	0.35	1.510707	145.7743	0.64	393.129884	1.66	0.00
16.86	5.14	142.40	0.29	1.465954	147.8002	0.67	408.500992	1.64	0.00
16.92	5.08	144.85	0.23	1.416933	150.1116	0.71	426.984351	1.63	0.00
16.99	5.01	143.67	0.17	1.378475	148.8543	0.68	417.87728	1.61	0.00
17.06	4.94	141.16	0.12	1.342793	146.2998	0.64	399.616208	1.60	0.00
17.12	4.88	136.93	0.11	1.344677	142.0635	0.59	371.676839	1.58	0.00
17.19	4.81	132.70	0.09	1.347722	137.8112	0.54	346.842097	1.56	0.00
17.25	4.75	128.48	0.07	1.353165	133.5727	0.50	324.633125	1.54	0.00
17.32	4.68	124.25	0.06	1.364866	129.3186	0.46	304.616269	1.53	0.00
17.38	4.62	121.07	0.05	1.377141	126.1073	0.44	290.804845	1.50	0.00
17.45	4.55	117.88	0.05	1.390947	122.8825	0.42	277.922697	1.49	0.00
17.52	4.48	114.71	0.04	1.407008	119.6605	0.40	265.86806	1.46	0.00
17.58	4.42	111.53	0.04	1.425957	116.449	0.38	254.520955	1.44	0.00
17.65	4.35	109.02	0.03	1.447761	113.8978	0.37	246.045202	1.42	0.00
17.71	4.29	106.52	0.04	1.446601	111.3551	0.35	237.922285	1.40	0.00
17.78	4.22	104.03	0.05	1.44457	108.8032	0.34	230.146866	1.38	0.00
17.84	4.16	101.53	0.06	1.451796	106.2545	0.33	222.638516	1.35	0.00
17.91	4.09	99.03	0.07	1.464691	103.6933	0.32	215.402828	1.33	0.00
17.97	4.03	96.99	0.08	1.479009	101.5936	0.32	209.661842	1.31	0.00
18.04	3.96	95.51	0.09	1.489266	100.0385	0.31	205.608117	1.28	0.00
18.11	3.89	94.02	0.10	1.500129	98.48647	0.30	201.633185	1.26	0.00
18.17	3.83	92.54	0.10	1.511402	96.94096	0.30	197.700946	1.23	0.00
18.24	3.76	91.05	0.14	1.545864	95.37601	0.29	193.833	1.20	0.00
18.30	3.70	91.26	0.18	1.572092	95.52704	0.29	194.494505	1.18	0.00
18.37	3.63	91.47	0.22	1.597277	95.66082	0.29	195.166616	1.15	0.00
18.43	3.57	91.68	0.25	1.621076	95.80577	0.29	195.832582	1.12	0.00
18.50	3.50	92.61	0.29	1.639031	96.64958	0.30	198.429916	1.10	0.00
18.56	3.44	93.53	0.32	1.655649	97.50111	0.30	201.033846	1.07	0.00
18.63	3.37	94.45	0.36	1.670901	98.33896	0.30	203.686062	1.05	0.00
18.70	3.30	95.37	0.51	1.744594	99.16942	0.30	206.370264	1.02	0.00
18.76	3.24	96.29	0.66	1.803282	101.8299	0.31	208.853611	0.99	0.00
18.83	3.17	97.22	0.39	1.677579	100.8424	0.31	211.80947	0.97	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
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Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
18.89	3.11	98.14	0.43	1.696134	101.6847	0.31	214.558461	0.94	0.00
18.96	3.04	96.03	0.55	1.761704	99.50644	0.30	208.707266	0.92	0.00
19.02	2.98	93.91	0.61	1.793433	98.24415	0.30	202.872309	0.89	0.00
19.09	2.91	116.34	0.82	1.793479	120.4348	0.39	274.392985	0.87	0.00
19.16	2.84	126.58	1.02	1.829014	135.6742	0.49	316.483958	0.85	0.00
19.22	2.78	128.97	0.64	1.695214	131.6185	0.46	329.325188	0.83	0.00
19.29	2.71	132.54	0.42	1.583462	135.0025	0.48	347.781965	0.81	0.00
19.35	2.65	132.87	0.67	1.697718	135.2273	0.49	349.635803	0.79	0.00
19.42	2.58	135.68	0.46	1.598123	137.8607	0.51	365.437134	0.78	0.00
19.48	2.52	125.59	0.23	1.484709	127.9175	0.43	313.690997	0.76	0.00
19.55	2.45	124.10	0.28	1.527419	126.3645	0.42	307.135352	0.74	0.00
19.61	2.39	118.86	0.35	1.587173	121.1415	0.39	285.351536	0.72	0.00
19.68	2.32	113.80	0.51	1.683847	116.074	0.36	266.388503	0.70	0.00
19.75	2.25	109.95	1.02	1.877216	129.6283	0.44	288.247495	0.68	0.00
19.81	2.19	113.50	1.10	1.888931	136.2521	0.49	302.704108	0.65	0.00
19.88	2.12	125.86	0.70	1.728605	127.5733	0.42	315.58663	0.64	0.00
19.94	2.06	114.91	0.49	1.676175	116.7714	0.36	270.991497	0.62	0.00
20.01	1.99	119.66	0.77	1.774114	121.4649	0.38	289.340207	0.60	0.00
20.07	1.93	133.51	0.68	1.705121	134.7379	0.47	353.917913	0.58	0.00
20.14	1.86	145.76	0.61	1.645505	146.525	0.60	432.185954	0.56	0.00
20.20	1.80	136.45	0.62	1.672333	137.3921	0.50	370.617669	0.54	0.00
20.27	1.73	119.90	0.67	1.736727	121.1582	0.38	290.848842	0.52	0.00
20.34	1.66	121.44	0.62	1.715012	122.5549	0.39	297.252379	0.50	0.00
20.40	1.60	130.70	0.57	1.668147	131.4871	0.45	339.650601	0.48	0.00
20.47	1.53	133.67	0.64	1.689333	134.2658	0.47	355.284353	0.46	0.00
20.53	1.47	136.64	0.47	1.607329	137.0556	0.49	372.008301	0.44	0.00
20.60	1.40	139.61	0.37	1.54086	139.8317	0.52	390.011076	0.43	0.00
20.66	1.34	136.61	0.47	1.606542	136.8338	0.49	371.965	0.41	0.00
20.73	1.27	140.29	0.54	1.629002	140.2901	0.52	394.398356	0.39	0.00
20.80	1.20	153.14	0.30	1.461847	152.6091	0.69	492.78142	0.37	0.00
20.86	1.14	172.15	0.22	1.360033	170.8103	1.19	733.85912	0.36	0.00
20.93	1.07	183.20	0.20	1.321113	181.2972	1.79		0.35	0.00
20.99	1.01	193.16	0.18	1.283804	190.7299	2.00		0.35	0.00
21.06	0.94	184.84	0.26	1.368866	182.6635	1.90		0.35	0.00
21.12	0.88	179.71	0.28	1.39527	177.6537	1.54		0.35	0.00
21.19	0.81	160.80	0.33	1.470314	159.3981	0.82	570.761337	0.35	0.00
21.25	0.75	159.49	0.27	1.431679	158.0399	0.79	555.64008	0.34	0.00
21.32	0.68	166.52	0.24	1.39105	164.6973	0.96	642.860843	0.33	0.00
21.39	0.61	169.09	0.26	1.40284	167.0492	1.04	679.762841	0.32	0.00
21.45	0.55	167.57	0.34	1.462151	165.4965	0.98	656.84902	0.32	0.00
21.52	0.48	157.57	0.38	1.509791	155.7851	0.74	534.360607	0.31	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

Ground Water Depth (ft) =	12.5
Ground Surface Elevation (ft) =	22.0
Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
21.58	0.42	157.20	0.36	1.497461	155.3318	0.73	530.357503	0.30	0.00
21.65	0.35	163.50	0.30	1.445925	161.2761	0.86	601.160076	0.28	0.00
21.71	0.29	175.30	0.26	1.389412	172.4916	1.25		0.27	0.00
21.78	0.22	194.36	0.29	1.374877	190.5849	2.00		0.27	0.00
21.84	0.16	200.26	0.34	1.397828	196.1114	2.00		0.27	0.00
21.91	0.09	224.33	0.36	1.366685	218.8615	2.00		0.27	0.00
21.98	0.02	238.01	0.36	1.349706	231.7044	2.00		0.27	0.00
22.04	-0.04	245.40	0.55	1.45217	238.5785	2.00		0.27	0.00
22.11	-0.11	252.78	0.45	1.384663	245.4268	2.00		0.27	0.00
22.17	-0.17	260.17	0.41	1.355391	252.2896	2.00		0.27	0.00
22.24	-0.24	253.98	0.40	1.357767	246.3131	2.00		0.27	0.00
22.30	-0.30	242.53	0.44	1.393631	235.3734	2.00		0.27	0.00
22.37	-0.37	216.26	0.61	1.523925	210.3424	2.00		0.27	0.00
22.44	-0.44	198.37	0.70	1.59258	193.2123	2.00		0.27	0.00
22.50	-0.50	180.50	0.81	1.665655	176.0675	1.41		0.27	0.00
22.57	-0.57	199.81	0.97	1.687994	194.326	2.00		0.27	0.00
22.63	-0.63	211.72	0.67	1.557521	205.5408	2.00		0.27	0.00
22.70	-0.70	222.16	0.75	1.578552	215.3044	2.00		0.27	0.00
22.76	-0.76	232.59	0.83	1.594968	225.0721	2.00		0.27	0.00
22.83	-0.83	249.82	0.74	1.537237	241.2427	2.00		0.27	0.00
22.89	-0.89	251.26	0.68	1.509544	242.4812	2.00		0.27	0.00
22.96	-0.96	244.74	0.75	1.547758	236.1778	2.00		0.27	0.00
23.03	-1.03	238.23	0.68	1.527489	229.8828	2.00		0.27	0.00
23.09	-1.09	237.38	0.64	1.512005	228.97	2.00		0.27	0.00
23.16	-1.16	243.63	0.64	1.501541	234.7459	2.00		0.27	0.00
23.22	-1.22	209.22	0.63	1.547647	202.0279	2.00		0.27	0.00
23.29	-1.29	182.74	0.59	1.573745	176.7451	1.42		0.27	0.00
23.35	-1.35	180.91	0.58	1.573725	174.9029	1.32		0.27	0.00
23.42	-1.42	177.25	0.54	1.562291	171.3014	1.16	797.441866	0.26	0.00
23.48	-1.48	177.57	0.44	1.511212	171.5035	1.17	802.698861	0.26	0.00
23.55	-1.55	173.78	0.35	1.466344	167.7935	1.02	735.097638	0.25	0.00
23.62	-1.62	173.97	0.26	1.397373	167.8678	1.02	737.619309	0.25	0.00
23.68	-1.68	170.58	0.16	1.327654	164.5547	0.92	684.214914	0.24	0.00
23.75	-1.75	169.71	0.16	1.327152	163.6354	0.89	671.276901	0.23	0.00
23.81	-1.81	168.84	0.15	1.326613	162.726	0.87	658.744598	0.23	0.00
23.88	-1.88	167.97	0.15	1.326077	161.8104	0.84	646.651149	0.22	0.00
23.94	-1.94	167.11	0.23	1.396607	160.8999	0.82	634.925065	0.21	0.00
24.01	-2.01	166.79	0.23	1.395101	160.5035	0.81	630.569269	0.20	0.00
24.08	-2.08	166.48	0.23	1.393564	160.1104	0.80	626.309893	0.19	0.00
24.14	-2.14	166.17	0.43	1.52821	159.72	0.79	622.083864	0.18	0.00
24.21	-2.21	164.14	0.63	1.632988	157.6771	0.74	597.213508	0.17	0.00

Boulanger and Idriss (2014) - Simplified CSR

PROJECT NAME:	University Avenue POC
PROJECT NUMBER:	60416357
Location:	East Palo Alto, California
CPT ID:	CPT-15-002
CPT File Name:	[CPT_15_002_Interp.xlsm]

				Rev1
Analysis By:	S Huang	Date:	11/17/2015	3/3/2022
Check By:	A. Moore	Date:		3/11/2022

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Ground Water Depth During EQ (ft) =	12.5

Seismic Input Parameters:

PGA (g) =	0.63
Earthquake Magnitude (M) =	7.19

Depth (ft)	Elevation (ft)	qt (tsf)	FR (%)	Ic	qc1n-cs	FS	S_{ur} (psf)	Liquefaction Cumulative Settl (in)	Dry Cumulative Settlement (inches)
24.27	-2.27	148.57	0.68	1.690197	142.7682	0.52	452.053012	0.16	0.00
24.34	-2.34	133.00	0.45	1.622764	127.8435	0.39	357.200874	0.14	0.00
24.40	-2.40	93.23	0.71	1.865896	103.6341	0.29	242.544023	0.12	0.00
24.47	-2.47	61.12	1.79	2.260774	117.2033	0.34	194.576805	0.10	0.00
24.53	-2.53	53.91	2.51	2.401745	113.4496	0.32	233.82674	0.07	0.00
24.60	-2.60	47.02	2.43	2.438763	105.9392	0.29	213.839205	0.05	0.00
24.67	-2.67	38.82	2.86	2.552136	98.13543	0.27	191.446617	0.03	0.00
24.73	-2.73	27.79	4.25	2.783627				0.00	0.00
24.80	-2.80	18.31	6.19	3.045093				0.00	0.00
24.86	-2.86	14.67	6.54	3.146763				0.00	0.00
24.93	-2.93	12.62	5.19	3.143038				0.00	0.00
24.99	-2.99	11.47	4.13	3.122636				0.00	0.00
25.06	-3.06	11.33	1.61	2.899387				0.00	0.00
25.12	-3.12	11.23	1.12	2.825469				0.00	0.00
25.19	-3.19	11.05	0.92	2.794818				0.00	0.00
25.26	-3.26	11.08	0.81	2.770548				0.00	0.00
25.32	-3.32	11.50	0.79	2.748208				0.00	0.00
25.39	-3.39	11.99	0.89	2.751166				0.00	0.00
25.45	-3.45	12.68	1.11	2.770648				0.00	0.00
25.52	-3.52	13.51	1.24	2.766449				0.00	0.00
25.58	-3.58	14.00	1.51	2.794303				0.00	0.00
25.65	-3.65	14.58	1.73	2.807188				0.00	0.00
25.72	-3.72	14.57	1.89	2.830144				0.00	0.00
25.78	-3.78	14.67	1.94	2.833691				0.00	0.00
25.85	-3.85	14.73	1.87	2.823669				0.00	0.00
25.91	-3.91	15.33	1.76	2.792701				0.00	0.00
25.98	-3.98	15.77	1.87	2.795448				0.00	0.00
26.04	-4.04	15.59	1.93	2.808114				0.00	0.00
26.11	-4.11	15.86	1.94	2.803409				0.00	0.00
26.17	-4.17	16.00	2.09	2.817795				0.00	0.00
26.24	-4.24	17.14	2.01	2.780478				0.00	0.00
26.31	-4.31	18.36	2.03	2.75511				0.00	0.00
26.37	-4.37	18.31	2.21	2.77708				0.00	0.00
26.44	-4.44	17.59	2.43	2.817749				0.00	0.00
26.50	-4.50	17.69	2.43	2.816518				0.00	0.00
26.57	-4.57	18.45	2.71	2.828169				0.00	0.00
26.63	-4.63	20.53	2.56	2.770726				0.00	0.00
26.70	-4.70	21.98	3.05	2.79144				0.00	0.00
26.76	-4.76	24.84	3.05	2.744997				0.00	0.00
26.83	-4.83	26.81	3.14	2.725619				0.00	0.00
26.90	-4.90	27.02	3.44	2.748566				0.00	0.00

Project: 101/University POC
Project Location: Palo Alto, CA
Boring: 02-BR-1

Modified to calculate stresses correctly
Extrapolates Vs values when boring depth is less than 30m

Depth ft	Depth m	Total Unit Weight, pcf	Depth to Phreatic Surface, feet	σ_v kN/m^2	σ'_v kN/m^2	Type	N_{60}(2)	Undrained shear strength(3), psf
4	1.2192	122	4	23.4	23.4	Sand	18	#N/A
16.5	5.0292	122	-8.5	96.4	71.0	Clay	30	1500
21	6.4008	122	-13	122.7	83.8	Sand	14	#N/A
28.5	8.6868	90	-20.5	155.0	93.7	Sand	39	#N/A
33.5	10.2108	90	-25.5	176.5	100.3	Clay	15	1500
91	27.7368	90	-83	424.3	176.1	Clay	15	1800
91	27.7368	95	-83	413.9	165.7	Clay	15	1800
91	27.7368	95	-83	413.9	165.7	Clay	15	1800
91	27.7368	95	-83	413.9	165.7	Clay	15	1800
91	27.7368	95	-83	413.9	165.7	Clay	15	1800
91	27.7368	123	-83	535.9	287.7	Clay	15	1800
91	27.7368	128	-83	557.7	309.5	Clay	15	1800
91	27.7368	130	-83	566.4	318.2	Clay	15	1800
100	30.48	130	-92	622.4	347.4	Clay	15	2000

Vs in meters per second

Depth ft	All Soils: Seed et al 1983	All Soils: Imai & Tonouchi 1982	All Soils: Sisman 1995	Gravel: Ohta & Goto 1978	Sand: Lee 1992	Sand: Sykora & Stokoe 1983	Sand: Imai 1977	Sand: UCLA 2010	Silt: Lee 1992	Silt: Pitilakis 1999	Silt: UCLA 2010	Clay: Pitilakis 1999	Clay: Ohta & Goto 1978	Clay: Imai 1977	Clay: Dickenson 1994	Clay: UCLA 2010	Young Sed Rock: Imai & Tonouchi 1982
4	238	240	143	#N/A	242	232	210	159	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
16.5	307	282	186	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	332	270	217	172	239	#N/A
21	210	222	126	#N/A	223	216	193	209	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
28.5	350	306	212	#N/A	342	291	271	237	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33.5	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	172	216	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	237	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	234	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	234	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	234	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	234	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	257	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	260	#N/A
91	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	188	261	#N/A
100	217	227	131	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	275	214	177	198	265	#N/A

Depth ft	All mean	Sand mean	Silt mean	Clay mean	Selected Value	UCLA Value	top	bot	Layer thickness, t	Selected Mean t / Vs	UCLA t/Vs
4	207	211	#N/A	#N/A	159	159	0	3.1242	3.1242	0.019703	0.019703
16.5	258	#N/A	#N/A	246	172	239	3.1242	5.715	2.5908	0.015029	0.010831
21	186	210	#N/A	#N/A	209	209	5.715	7.5438	1.8288	0.00874	0.00874
28.5	290	285	#N/A	#N/A	237	237	7.5438	9.4488	1.905	0.008037	0.008037
33.5	191	#N/A	#N/A	211	172	216	9.4488	18.9738	9.525	0.055254	0.044128
91	191	#N/A	#N/A	218	188	237	18.9738	27.7368	8.763	0.046617	0.037016
91	191	#N/A	#N/A	218	188	234	27.7368	27.7368	0	0	0
91	191	#N/A	#N/A	218	188	234	27.7368	27.7368	0	0	0
91	191	#N/A	#N/A	218	188	234	27.7368	27.7368	0	0	0
91	191	#N/A	#N/A	218	188	234	27.7368	27.7368	0	0	0
91	191	#N/A	#N/A	222	188	257	27.7368	27.7368	0	0	0
91	191	#N/A	#N/A	223	188	260	27.7368	27.7368	0	0	0
91	191	#N/A	#N/A	223	188	261	27.7368	29.1084	1.3716	0.007297	0.005258
100	191	#N/A	#N/A	226	198	265	29.1084	30.48	1.3716	0.00694	0.005183
								sums	30.48	0.167618	0.138898
									Vs(d)=	181.8	219.4
									Vs30=	180.5	217.9

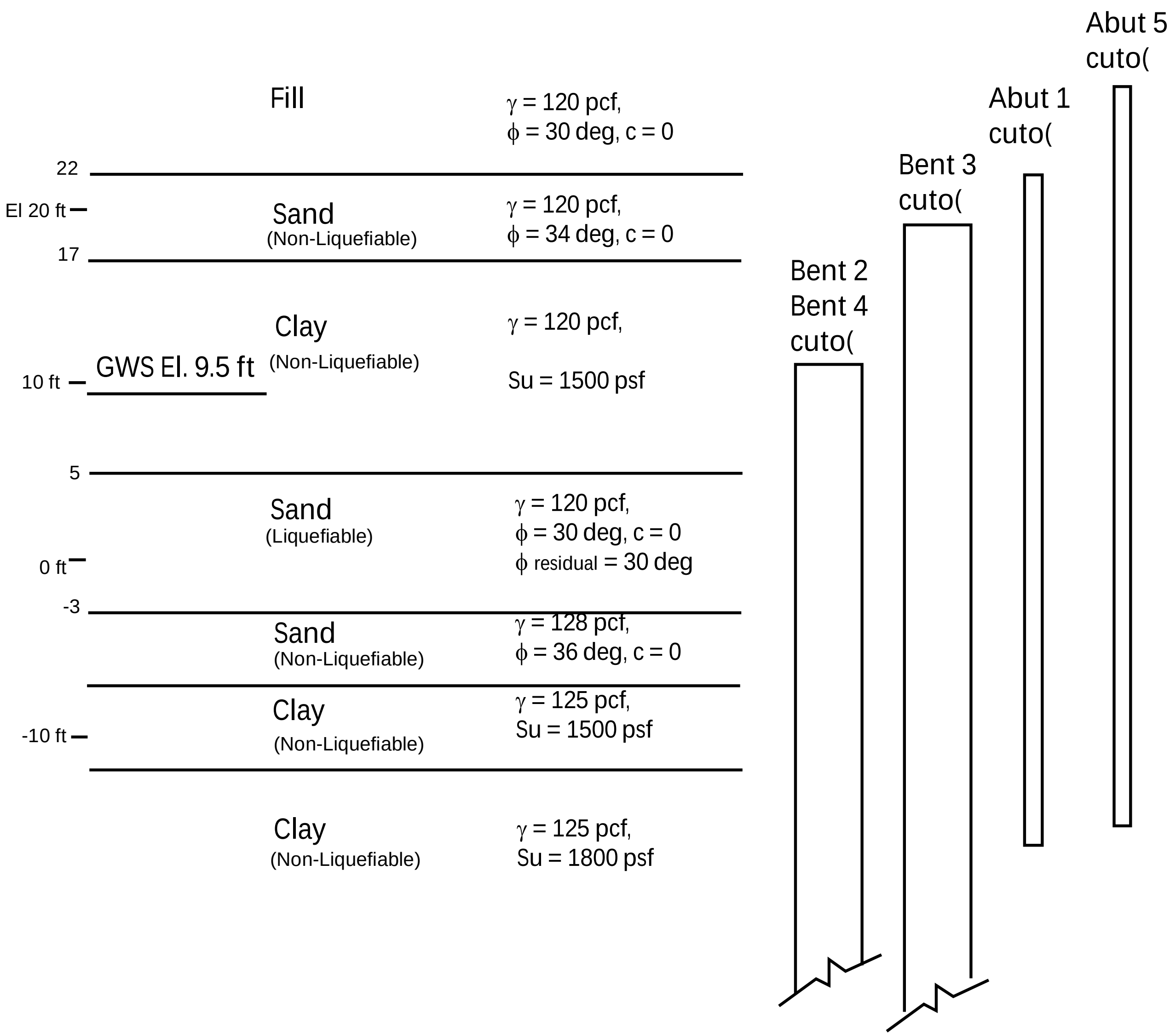
Notes:
1. Reference: DeJong, J.T., 2007. *Site Characterization - Guidelines for Estimating Vs Based on In-Situ Tests* . State 1 - Interim Report. Soil Innteractions Laboratory, UC Davis. December 19.
Reference: Caltrans 2012. *Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations* . http://dap3.dot.ca.gov/shake_stable/v2/technical.php. November.
2. Do not correct N_{60} for overburden pressure effect. Limit N_{60} to 100 blows per foot (red).
3. Blue undrained shear strengths are extrapolated from nearby test data or estimated using Pocket Penetrometer.
4. Note, Dickenson (1994) correlation based on Su values ranging to 12 ksf.
5. Selected value chooses uses Ohta & Goto for Gravels, Dickenson for Clays if Su is available, and UCLA for all others.
6. Groundwater elevation assumed.

- Estimating V_{S30} for sites with subsurface information less than 100 ft (30 m)

For borings shallower than 100 feet (30 meters) are not available, V_{S30} can be determined by extrapolating shallower Vs data assuming that no significant changes in the subsurface occur to the extrapolated depth of 100 feet (David Boore (2004)):

$$V_{S30} = \left[1.45 - (0.015 * d)\right] * V_{s(d)} \;;$$

where d is the depth in meters to the bottom of the known soil column and Vs(d) is the average shear wave velocity (m/sec) for a known depth.



02=df g9pq2qu 2t0) A9=

University Avenue POC
EA 04-272820

AECOM Project No. 60416357

Determine Pile Design Tip Elevation (DTE) for Extreme Event-I (Compression)

Table A1: Foundation Design Information

Location	Pile Type	Finished Grade Elevation (ft)	Cut-off Elevation (ft)	Pile Cap Size, BxL (ft)	Permissible Settlement Under Service Load	No. of Piles per Support
Bent 2	96-inch CIDH with Permanent Steel Casing	18	11	--	1-inch	1
Bent 3	96-inch CIDH with Permanent Steel Casing	21	19	--	1-inch	1
Bent 4	96-inch CIDH with Permanent Steel Casing	18	11	--	1-inch	1

Table A2: Foundation Factored Design Loads

Location	Service Limit I State (kips)		Strength Limit State (Controlling Group, kips)				Extreme Limit State (Controlling Group, kips)			
	Total Load		Compression		Tension		Compression		Tension	
	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile
Bent 2	956	956	1278	1278	-	-	789	774	-	-
Bent 3	1009	1009	1354	1354	-	-	864	856	-	-
Bent 4	963	963	1287	1287	-	-	796	775	-	-

Bent 2 and Bent 4	Bent 3
Extreme Limit State Max factored design load = 780 kip Preliminary DTE = 11-46 = -35 ft Effective pile weight, Wp′= 207 kip Revised factored design load = 780+207 = 987 kip; rounded to nearest 10 kip, 990 kip Pile length = 55 ft; Wp’ = 247 kip Revised factored design load = 780+247 = 1027 kip (1030 kip) DTE = 11-55 = -44 ft	Extreme Limit State Max factored design load = 860 kip Preliminary DTE = 19-53 = -34 ft Effective pile weight, Wp′= 263 kip Revised factored design load = 860+263 = 1123 kip; rounded to nearest 10 kip, 1130 kip Pile length = 65 ft; Wp’=291 kip Revised factored design load = 860+291 = 1151 kip (1160 kip) DTE = 19-65 = -46ft

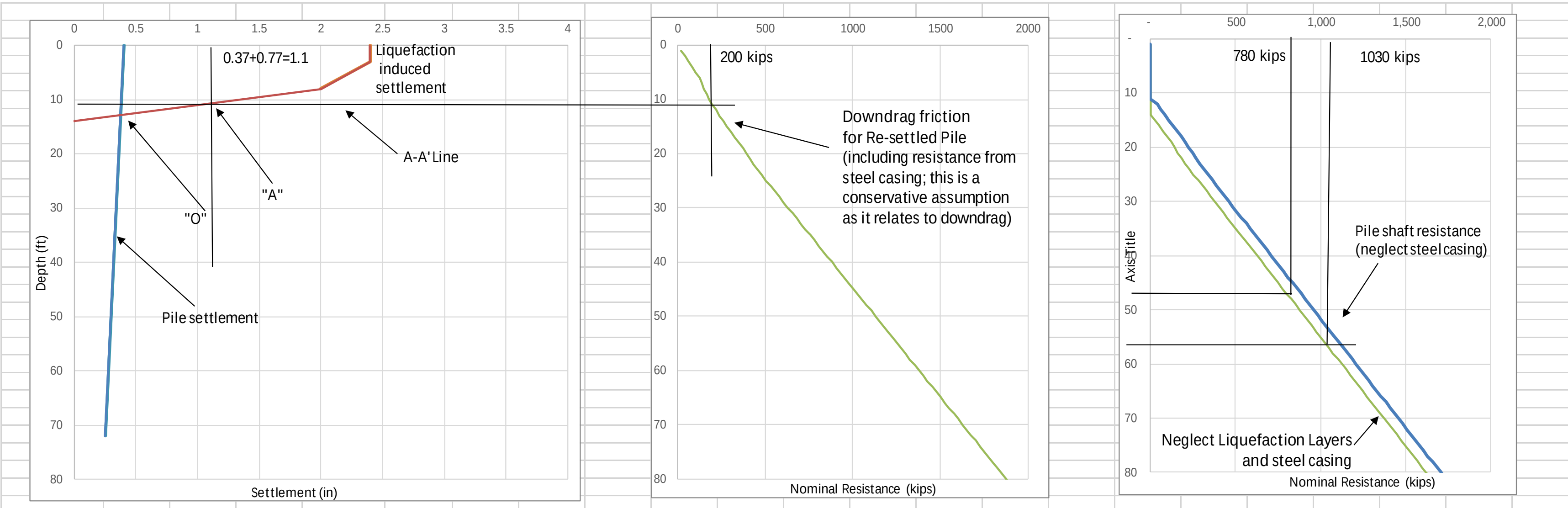
Pile and Ground Settlement Profile and Location of Maximum Downdrag Load (DD_{max})

Bent 2 and Bent 4	Bent 3
Min. DTE (Strength, Service and Extreme-I) = 11 – 85 = -74 ft Design permanent load = 780 kip Estimated pile top settlement $\delta_{t,perm}$ = 0.4 in Corresponding pile tip settlement $\delta_{b,perm}$ = 0.25 in Critical ground settlement (δ_{c-Liq}) that generate max. downdrag (point "A"): Pile and ground settlement intersecting liquefaction induced settlement (Point "O"), $\delta_0 = 0.37\ in$ Pile-ground relative settlement - $z_{max} = 0.008 \times Pile\ D = 0.008 \times 8 \times 12 = 0.77\ in$ $\delta_{c-Liq} = 0.37 + 0.77 = 1.1$ Pile length to depth where full downdrag exerting = 11 ft (El. 11-11 = El 0 ft)	Min. DTE (Strength, Service and Extreme-I) = 19 – 95 = -76 ft Design permanent load = 860 kip Estimated pile top settlement $\delta_{t,perm}$ = 0.6 in Corresponding pile tip settlement $\delta_{b,perm}$ = 0.4 in Critical ground settlement (δ_{c-Liq}) that generate max. downdrag (point "A"): Pile and ground settlement intersecting liquefaction induced settlement (Point "O"), $\delta_0 = 0.54\ in$ Pile-ground relative settlement - $z_{max} = 0.008 \times Pile\ D = 0.008 \times 8 \times 12 = 0.77\ in$ $\delta_{c-Liq} = 0.54 + 0.77 = 1.3$ Pile length to depth where full downdrag exerting = 18 ft (El. 19-18 = El +1 ft)

Maximum Downdrag Load, DD_{max}

Bent 2 and Bent 4	Bent 3
Max Downdrag (plot of Shaft resistance versus depth for post-liquefaction re-settled soil profile) DD_{max} = 200 kips	Max Downdrag (plot of Shaft resistance versus depth for post-liquefaction re-settled soil profile) DD_{max} = 390 kips

Pile Settlement, Load and Resistance Plots for Bent 2 and 4



Determine Pile Design Tip Elevation (DTE) for Extreme Event-I (Compression)

Table A1: Foundation Design Information

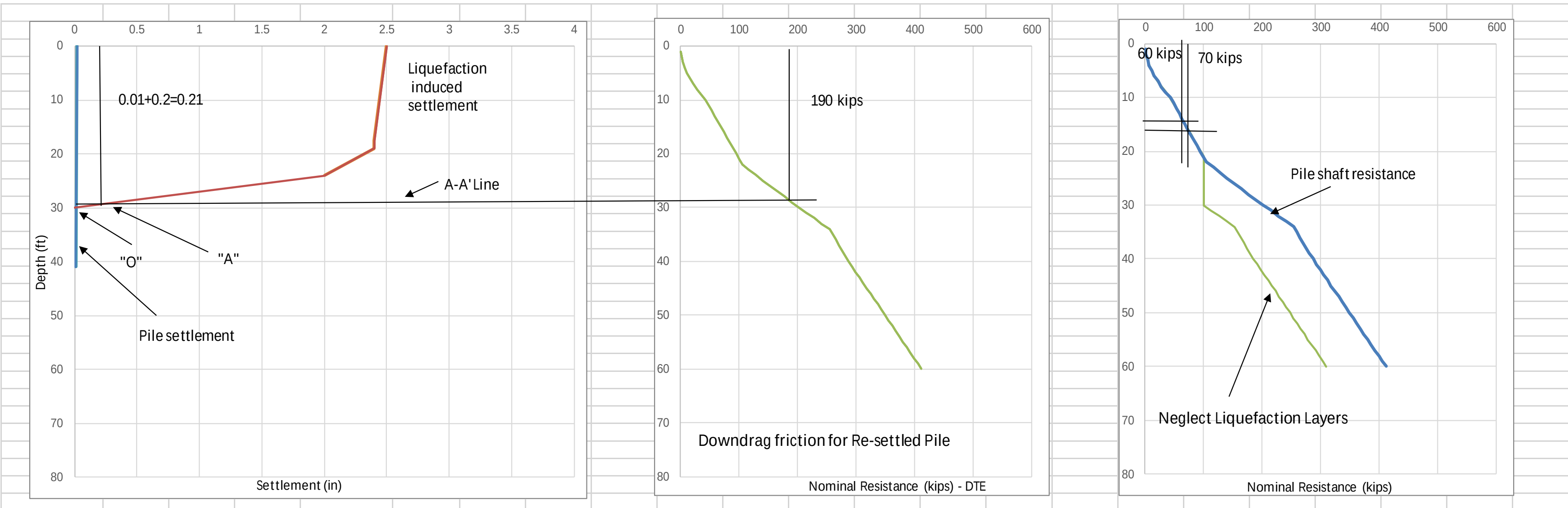
Location	Pile Type	Finished Grade Elevation (ft)	Cut-off Elevation (ft)	Pile Cap Size, BxL (ft)	Permissible Settlement Under Service Load	No. of Piles per Support
Abut 1	24-inch CIDH	29	22.25	10 x 16	1-inch	6
Abut 5	24-inch CIDH	33	27.25	10 x 16	1-inch	6

Table A2: Foundation Factored Design Loads

Location	Service Limit I State (kips)		Strength Limit State (Controlling Group, kips)				Extreme Limit State (Controlling Group, kips)			
	Total Load		Compression		Tension		Compression		Tension	
	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile	Per Support	Maximum per Pile
Abut 1	544	115	722	158	-	-	471	85	-	-
Abut 5	547	124	725	172	-	-	495	54	-	-

Abut 1	Abut 5
Extreme Limit State Max factored design load = 90 kip Preliminary DTE = 22-27 = -5 ft Effective pile weight, Wp′= 10 kip Revised factored design load = 90+10 = 100 kip; Pile length = 28 ft; Wp’=10 kip DTE = 22-28 = -6 ft	Extreme Limit State Max factored design load = 60 kip Preliminary DTE = 27-14 = 13 ft Effective pile weight, Wp′= 7 kip Revised factored design load = 60+7 = 67 kip; rounded to nearest 10 kip, 70 kip Pile length = 16 ft; Wp’=8 kip Revised factored design load = 60+8 = 68 kip (70 kip) DTE = 27-16 = 11 ft

Pile Settlement, Load and Resistance Plots for Abut 5



APPENDIX F Axial Pile Capacity Analysis and Load – Deflection Relationships

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
                (c) Copyright ENSOFT, Inc., 1987-2017
                      All Rights Reserved

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


     Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
     Name of input data file     : UnivPOC_Bent2_96-inch_CIDH_nonliqui_steelcase.sf8d
     Name of output file         : UnivPOC_Bent2_96-inch_CIDH_nonliqui_steelcase.sf8o
     Name of plot output file    : UnivPOC_Bent2_96-inch_CIDH_nonliqui_steelcase.sf8p
     Name of runtime file        : UnivPOC_Bent2_96-inch_CIDH_nonliqui_steelcase.sf8r


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

           Date:  March 15, 2022     Time:  08:00:32

     Univ POC Bent 2 96-inch CIDH


     PROPOSED DEPTH =      90.0 FT
     ----------------


     NUMBER OF LAYERS =    5
     ------------------


     WATER TABLE DEPTH =       1.5 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO  1----CLAY

       AT THE TOP

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.600E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.000E+00


       AT THE BOTTOM

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.690E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.600E+01


       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


     LAYER NO  2----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.117E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.600E+01

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.995E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.140E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.995E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.140E+02

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.927E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.180E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00
```

```
LAYER NO  4----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.870E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.180E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.230E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00


LAYER NO  5----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.230E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.120E+03


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00


(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS


INPUT DRILLED SHAFT INFORMATION
------------------------------

 MINIMUM SHAFT DIAMETER    =    8.000  FT.
 MAXIMUM SHAFT DIAMETER    =    8.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =   11.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN


COMPUTATION RESULTS
-------------------


- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1


DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    8.000  FT.
 DIAMETER OF BASE          =    8.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =   11.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =   72.392  SQ.IN.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN
 VOLUME OF UNDERREAM       =    0.000  CU.YDS.
 SHAFT LENGTH              =   90.000  FT.


PREDICTED RESULTS
-----------------

QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH  VOLUME     QS      QB      QU     LRFD QS  LRFD QB   LRFD QU
 (FT)   (CU.YDS) (TONS)  (TONS)  (TONS)   (TONS)   (TONS)    (TONS)
12.0    22.34     9.40   294.32   303.73     5.17   147.16    152.33
13.0    24.21    19.37   311.90   331.27    10.65   155.95    166.60
14.0    26.07    29.87   325.44   355.31    16.43   162.72    179.15
15.0    27.93    40.89   336.12   377.02    22.49   168.06    190.55
16.0    29.79    52.42   343.34   395.76    28.83   171.67    200.50
17.0    31.65    64.43   347.20   411.63    35.43   173.60    209.03
```

18.0	33.51	76.90	347.83	424.73	42.30	139.13	181.43
19.0	35.38	87.27	348.10	435.37	46.96	139.24	186.20
20.0	37.24	97.64	348.10	445.74	51.63	139.24	190.87
21.0	39.10	108.01	347.84	455.85	56.29	139.14	195.43
22.0	40.96	118.38	347.32	465.70	60.96	138.93	199.89
23.0	42.82	128.74	346.52	475.26	65.62	138.61	204.23
24.0	44.69	141.19	345.95	487.13	71.22	138.38	209.60
25.0	46.55	153.63	345.56	499.19	76.82	138.22	215.05
26.0	48.41	166.07	345.33	511.40	82.42	138.13	220.55
27.0	50.27	178.51	345.21	523.72	88.02	138.08	226.10
28.0	52.13	190.96	345.17	536.12	93.62	138.07	231.69
29.0	54.00	203.40	345.16	548.56	99.22	138.07	237.28
30.0	55.86	215.84	345.16	561.00	104.82	138.07	242.88
31.0	57.72	228.28	345.16	573.45	110.42	138.07	248.48
32.0	59.58	240.72	345.16	585.89	116.02	138.07	254.08
33.0	61.44	253.17	345.16	598.33	121.62	138.07	259.68
34.0	63.31	265.61	345.16	610.77	127.21	138.07	265.28
35.0	65.17	278.05	345.16	623.22	132.81	138.07	270.88
36.0	67.03	290.49	345.16	635.66	138.41	138.07	276.48
37.0	68.89	302.94	345.16	648.10	144.01	138.07	282.08
38.0	70.75	315.38	345.16	660.54	149.61	138.07	287.68
39.0	72.62	327.82	345.16	672.98	155.21	138.07	293.27
40.0	74.48	340.26	345.16	685.43	160.81	138.07	298.87
41.0	76.34	352.71	345.16	697.87	166.41	138.07	304.47
42.0	78.20	365.15	345.16	710.31	172.01	138.07	310.07
43.0	80.06	377.59	345.16	722.75	177.61	138.07	315.67
44.0	81.92	390.03	345.16	735.20	183.20	138.07	321.27
45.0	83.79	402.47	345.16	747.64	188.80	138.07	326.87
46.0	85.65	414.92	345.16	760.08	194.40	138.07	332.47
47.0	87.51	427.36	345.16	772.52	200.00	138.07	338.07
48.0	89.37	439.80	345.16	784.97	205.60	138.07	343.67
49.0	91.23	452.24	345.16	797.41	211.20	138.07	349.27
50.0	93.10	464.69	345.16	809.85	216.80	138.07	354.86
51.0	94.96	477.13	345.16	822.29	222.40	138.07	360.46
52.0	96.82	489.57	345.16	834.73	228.00	138.07	366.06
53.0	98.68	502.01	345.16	847.18	233.60	138.07	371.66
54.0	100.54	514.46	345.16	859.62	239.20	138.07	377.26
55.0	102.41	526.90	345.16	872.06	244.79	138.07	382.86
56.0	104.27	539.34	345.16	884.50	250.39	138.07	388.46
57.0	106.13	551.78	345.16	896.95	255.99	138.07	394.06
58.0	107.99	564.22	345.16	909.39	261.59	138.07	399.66
59.0	109.85	576.67	345.16	921.83	267.19	138.07	405.26
60.0	111.72	589.11	345.16	934.27	272.79	138.07	410.85
61.0	113.58	601.55	345.16	946.72	278.39	138.07	416.45
62.0	115.44	613.99	345.16	959.16	283.99	138.07	422.05
63.0	117.30	626.44	345.16	971.60	289.59	138.07	427.65
64.0	119.16	638.88	345.16	984.04	295.19	138.07	433.25
65.0	121.03	651.32	345.16	996.49	300.78	138.07	438.85
66.0	122.89	663.76	345.16	1008.93	306.38	138.07	444.45
67.0	124.75	676.21	345.16	1021.37	311.98	138.07	450.05
68.0	126.61	688.65	345.16	1033.81	317.58	138.07	455.65
69.0	128.47	701.09	345.16	1046.25	323.18	138.07	461.25
70.0	130.33	713.53	345.16	1058.70	328.78	138.07	466.85
71.0	132.20	725.98	345.16	1071.14	334.38	138.07	472.44
72.0	134.06	738.42	345.16	1083.58	339.98	138.07	478.04
73.0	135.92	750.86	345.16	1096.02	345.58	138.07	483.64
74.0	137.78	763.30	345.16	1108.47	351.18	138.07	489.24
75.0	139.64	775.74	345.16	1120.91	356.77	138.07	494.84
76.0	141.51	788.19	345.16	1133.35	362.37	138.07	500.44
77.0	143.37	800.63	345.16	1145.79	367.97	138.07	506.04
78.0	145.23	813.07	345.16	1158.24	373.57	138.07	511.64
79.0	147.09	825.51	345.16	1170.68	379.17	138.07	517.24
80.0	148.95	837.96	345.16	1183.12	384.77	138.07	522.84
81.0	150.82	850.40	345.16	1195.56	390.37	138.07	528.43
82.0	152.68	862.84	345.16	1208.00	395.97	138.07	534.03
83.0	154.54	875.28	345.16	1220.45	401.57	138.07	539.63
84.0	156.40	887.73	345.16	1232.89	407.17	138.07	545.23
85.0	158.26	900.17	345.16	1245.33	412.77	138.07	550.83
86.0	160.13	912.61	345.16	1257.77	418.36	138.07	556.43
87.0	161.99	925.05	345.16	1270.22	423.96	138.07	562.03
88.0	163.85	937.49	345.16	1282.66	429.56	138.07	567.63
89.0	165.71	949.94	345.16	1295.10	435.16	138.07	573.23
90.0	167.57	962.38	345.16	1307.54	440.76	138.07	578.83

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.5567E-01	0.1281E-04	0.2840E-02	0.1000E-04
0.2783E+00	0.6404E-04	0.1420E-01	0.5000E-04
0.5567E+00	0.1281E-03	0.2840E-01	0.1000E-03
0.2785E+02	0.6405E-02	0.1420E+01	0.5000E-02
0.4179E+02	0.9608E-02	0.2130E+01	0.7500E-02
0.5573E+02	0.1281E-01	0.2840E+01	0.1000E-01
0.1394E+03	0.3203E-01	0.7101E+01	0.2500E-01
0.2787E+03	0.6406E-01	0.1420E+02	0.5000E-01
0.4181E+03	0.9609E-01	0.2130E+02	0.7500E-01
0.5269E+03	0.1269E+00	0.2840E+02	0.1000E+00
0.8725E+03	0.2952E+00	0.7101E+02	0.2500E+00
0.1027E+04	0.5552E+00	0.1387E+03	0.5000E+00
0.1093E+04	0.1020E+01	0.1933E+03	0.9600E+00
0.1107E+04	0.2465E+01	0.2986E+03	0.2400E+01
0.1143E+04	0.4868E+01	0.3348E+03	0.4800E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.8283E-01	0.1415E-04	0.4243E-02	0.1000E-04
0.4142E+00	0.7077E-04	0.2121E-01	0.5000E-04
0.8283E+00	0.1415E-03	0.4243E-01	0.1000E-03
0.4148E+02	0.7079E-02	0.2121E+01	0.5000E-02
0.6224E+02	0.1062E-01	0.3182E+01	0.7500E-02
0.8299E+02	0.1416E-01	0.4243E+01	0.1000E-01
0.2075E+03	0.3540E-01	0.1061E+02	0.2500E-01
0.4150E+03	0.7080E-01	0.2121E+02	0.5000E-01
0.6224E+03	0.1062E+00	0.3182E+02	0.7500E-01
0.7572E+03	0.1388E+00	0.4243E+02	0.1000E+00
0.1017E+04	0.3035E+00	0.1061E+03	0.2500E+00
0.1174E+04	0.5648E+00	0.2059E+03	0.5000E+00
0.1224E+04	0.1029E+01	0.2589E+03	0.9600E+00
0.1218E+04	0.2471E+01	0.3314E+03	0.2400E+01
0.1230E+04	0.4872E+01	0.3434E+03	0.4800E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TOP MOVEMENT TIP LOAD TIP MOVEMENT

TON	IN.	TON	IN.
0.3088E-01	0.1156E-04	0.1438E-02	0.1000E-04
0.1544E+00	0.5779E-04	0.7191E-02	0.5000E-04
0.3088E+00	0.1156E-03	0.1438E-01	0.1000E-03
0.1544E+02	0.5779E-02	0.7191E+00	0.5000E-02
0.2317E+02	0.8669E-02	0.1079E+01	0.7500E-02
0.3089E+02	0.1156E-01	0.1438E+01	0.1000E-01
0.7725E+02	0.2890E-01	0.3595E+01	0.2500E-01
0.1545E+03	0.5779E-01	0.7191E+01	0.5000E-01
0.2318E+03	0.8669E-01	0.1079E+02	0.7500E-01
0.3043E+03	0.1154E+00	0.1438E+02	0.1000E+00
0.6413E+03	0.2827E+00	0.3595E+02	0.2500E+00
0.8793E+03	0.5456E+00	0.7148E+02	0.5000E+00
0.9627E+03	0.1011E+01	0.1277E+03	0.9600E+00
0.9964E+03	0.2458E+01	0.2658E+03	0.2400E+01
0.1055E+04	0.4863E+01	0.3245E+03	0.4800E+01

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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=========================================================================


     Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
     Name of input data file     : UnivPOC_Bent2_96-inch_CIDH_liq_resettle.sf8d
     Name of output file         : UnivPOC_Bent2_96-inch_CIDH_liq_resettle.sf8o
     Name of plot output file    : UnivPOC_Bent2_96-inch_CIDH_liq_resettle.sf8p
     Name of runtime file        : UnivPOC_Bent2_96-inch_CIDH_liq_resettle.sf8r


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

          Date:  March 15, 2022     Time:  08:08:27

     Univ POC Bent 2 96-inch CIDH


     PROPOSED DEPTH =      90.0 FT
     ----------------


     NUMBER OF LAYERS =    5
     ------------------


     WATER TABLE DEPTH =       1.5 FT.
     -------------------



     SOIL INFORMATION
     ---------------

     LAYER NO  1----CLAY

       AT THE TOP

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.600E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.000E+00


       AT THE BOTTOM

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.690E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.600E+01


       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


     LAYER NO  2----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.117E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.600E+01

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.995E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.140E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.995E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.140E+02

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.927E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.180E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00
```

LAYER NO 4----CLAY

AT THE TOP

```
STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
END BEARING COEFFICIENT-Nc                         = 0.870E+01  (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.150E+04
BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT                         = 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
DEPTH, FT                                          = 0.180E+02
```

AT THE BOTTOM

```
STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.150E+04
BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT                         = 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
DEPTH, FT                                          = 0.230E+02

LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.450E+00
LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.400E+00
```

LAYER NO 5----CLAY

AT THE TOP

```
STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.180E+04
BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT                         = 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
DEPTH, FT                                          = 0.230E+02
```

AT THE BOTTOM

```
STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.180E+04
BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT                         = 0.120E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
DEPTH, FT                                          = 0.120E+03

LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.450E+00
LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.400E+00
```

(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS

INPUT DRILLED SHAFT INFORMATION

```
MINIMUM SHAFT DIAMETER    =    8.000  FT.
MAXIMUM SHAFT DIAMETER    =    8.000  FT.
RATIO BASE/SHAFT DIAMETER =    0.000  FT.
ANGLE OF BELL             =    0.000  DEG.
IGNORED TOP PORTION       =    0.000  FT.
IGNORED BOTTOM PORTION    =    0.000  FT.
ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN
```

COMPUTATION RESULTS

```
- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1
```

DRILLED SHAFT INFORMATION

```
DIAMETER OF STEM          =    8.000  FT.
DIAMETER OF BASE          =    8.000  FT.
END OF STEM TO BASE       =    0.000  FT.
ANGLE OF BELL             =    0.000  DEG.
IGNORED TOP PORTION       =    0.000  FT.
IGNORED BOTTOM PORTION    =    0.000  FT.
AREA OF ONE PERCENT STEEL =   72.392  SQ.IN.
ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN
VOLUME OF UNDERREAM       =    0.000  CU.YDS.
SHAFT LENGTH              =   90.000  FT.
```

PREDICTED RESULTS

```
QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.
```

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
1.0	1.86	10.37	73.90	84.27	5.70	36.95	42.66
2.0	3.72	20.74	68.46	89.20	11.41	34.23	45.64
3.0	5.59	31.11	81.78	112.89	17.11	40.89	58.00
4.0	7.45	41.47	98.91	140.38	22.81	49.45	72.26
5.0	9.31	51.84	119.48	171.33	28.51	59.74	88.26
6.0	11.17	62.21	143.51	205.73	34.22	71.76	105.97

7.0	13.03	68.49	167.67	236.16	37.67	83.84	121.50
8.0	14.90	75.43	195.04	270.48	41.49	97.52	139.01
9.0	16.76	83.03	222.61	305.64	45.67	111.31	156.97
10.0	18.62	91.25	250.32	341.57	50.19	125.16	175.35
11.0	20.48	100.07	274.42	374.50	55.04	137.21	192.25
12.0	22.34	109.48	294.92	404.40	60.21	147.46	207.67
13.0	24.21	119.44	311.90	431.34	65.69	155.95	221.64
14.0	26.07	129.95	325.44	455.39	71.47	162.72	234.19
15.0	27.93	140.97	336.12	477.09	77.53	168.06	245.59
16.0	29.79	152.49	343.34	495.83	83.87	171.67	255.54
17.0	31.65	164.50	347.20	511.70	90.48	173.60	264.08
18.0	33.51	176.98	347.83	524.80	97.34	139.13	236.47
19.0	35.38	187.34	348.10	535.44	102.00	139.24	241.24
20.0	37.24	197.71	348.10	545.81	106.67	139.24	245.91
21.0	39.10	208.08	347.84	555.92	111.33	139.14	250.47
22.0	40.96	218.45	347.32	565.77	116.00	138.93	254.93
23.0	42.82	228.82	346.52	575.34	120.67	138.61	259.27
24.0	44.69	241.26	345.95	587.21	126.26	138.38	264.64
25.0	46.55	253.70	345.56	599.26	131.86	138.22	270.09
26.0	48.41	266.15	345.33	611.47	137.46	138.13	275.59
27.0	50.27	278.59	345.21	623.80	143.06	138.08	281.15
28.0	52.13	291.03	345.17	636.20	148.66	138.07	286.73
29.0	54.00	303.47	345.16	648.64	154.26	138.07	292.33
30.0	55.86	315.91	345.16	661.08	159.86	138.07	297.92
31.0	57.72	328.36	345.16	673.52	165.46	138.07	303.52
32.0	59.58	340.80	345.16	685.96	171.06	138.07	309.12
33.0	61.44	353.24	345.16	698.41	176.66	138.07	314.72
34.0	63.31	365.68	345.16	710.85	182.26	138.07	320.32
35.0	65.17	378.13	345.16	723.29	187.85	138.07	325.92
36.0	67.03	390.57	345.16	735.73	193.45	138.07	331.52
37.0	68.89	403.01	345.16	748.17	199.05	138.07	337.12
38.0	70.75	415.45	345.16	760.62	204.65	138.07	342.72
39.0	72.62	427.90	345.16	773.06	210.25	138.07	348.32
40.0	74.48	440.34	345.16	785.50	215.85	138.07	353.92
41.0	76.34	452.78	345.16	797.94	221.45	138.07	359.51
42.0	78.20	465.22	345.16	810.39	227.05	138.07	365.11
43.0	80.06	477.66	345.16	822.83	232.65	138.07	370.71
44.0	81.92	490.11	345.16	835.27	238.25	138.07	376.31
45.0	83.79	502.55	345.16	847.71	243.84	138.07	381.91
46.0	85.65	514.99	345.16	860.16	249.44	138.07	387.51
47.0	87.51	527.43	345.16	872.60	255.04	138.07	393.11
48.0	89.37	539.88	345.16	885.04	260.64	138.07	398.71
49.0	91.23	552.32	345.16	897.48	266.24	138.07	404.31
50.0	93.10	564.76	345.16	909.93	271.84	138.07	409.91
51.0	94.96	577.20	345.16	922.37	277.44	138.07	415.50
52.0	96.82	589.65	345.16	934.81	283.04	138.07	421.10
53.0	98.68	602.09	345.16	947.25	288.64	138.07	426.70
54.0	100.54	614.53	345.16	959.69	294.24	138.07	432.30
55.0	102.41	626.97	345.16	972.14	299.84	138.07	437.90
56.0	104.27	639.42	345.16	984.58	305.43	138.07	443.50
57.0	106.13	651.86	345.16	997.02	311.03	138.07	449.10
58.0	107.99	664.30	345.16	1009.46	316.63	138.07	454.70
59.0	109.85	676.74	345.16	1021.91	322.23	138.07	460.30
60.0	111.72	689.18	345.16	1034.35	327.83	138.07	465.90
61.0	113.58	701.63	345.16	1046.79	333.43	138.07	471.49
62.0	115.44	714.07	345.16	1059.23	339.03	138.07	477.09
63.0	117.30	726.51	345.16	1071.68	344.63	138.07	482.69
64.0	119.16	738.95	345.16	1084.12	350.23	138.07	488.29
65.0	121.03	751.40	345.16	1096.56	355.83	138.07	493.89
66.0	122.89	763.84	345.16	1109.00	361.42	138.07	499.49
67.0	124.75	776.28	345.16	1121.44	367.02	138.07	505.09
68.0	126.61	788.72	345.16	1133.89	372.62	138.07	510.69
69.0	128.47	801.17	345.16	1146.33	378.22	138.07	516.29
70.0	130.33	813.61	345.16	1158.77	383.82	138.07	521.89
71.0	132.20	826.05	345.16	1171.21	389.42	138.07	527.49
72.0	134.06	838.49	345.16	1183.66	395.02	138.07	533.08
73.0	135.92	850.93	345.16	1196.10	400.62	138.07	538.68
74.0	137.78	863.38	345.16	1208.54	406.22	138.07	544.28
75.0	139.64	875.82	345.16	1220.98	411.82	138.07	549.88
76.0	141.51	888.26	345.16	1233.43	417.41	138.07	555.48
77.0	143.37	900.70	345.16	1245.87	423.01	138.07	561.08
78.0	145.23	913.15	345.16	1258.31	428.61	138.07	566.68
79.0	147.09	925.59	345.16	1270.75	434.21	138.07	572.28
80.0	148.95	938.03	345.16	1283.19	439.81	138.07	577.88
81.0	150.82	950.47	345.16	1295.64	445.41	138.07	583.48
82.0	152.68	962.92	345.16	1308.08	451.01	138.07	589.07
83.0	154.54	975.36	345.16	1320.52	456.61	138.07	594.67
84.0	156.40	987.80	345.16	1332.96	462.21	138.07	600.27
85.0	158.26	1000.24	345.16	1345.41	467.81	138.07	605.87
86.0	160.13	1012.68	345.16	1357.85	473.41	138.07	611.47
87.0	161.99	1025.13	345.16	1370.29	479.00	138.07	617.07
88.0	163.85	1037.57	345.16	1382.73	484.60	138.07	622.67
89.0	165.71	1050.01	345.16	1395.18	490.20	138.07	628.27
90.0	167.57	1062.45	345.16	1407.62	495.80	138.07	633.87

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.6142E-01	0.1284E-04	0.2840E-02	0.1000E-04
0.3071E+00	0.6418E-04	0.1420E-01	0.5000E-04
0.6142E+00	0.1284E-03	0.2840E-01	0.1000E-03
0.3073E+02	0.6418E-02	0.1420E+01	0.5000E-02
0.4611E+02	0.9628E-02	0.2130E+01	0.7500E-02
0.6149E+02	0.1284E-01	0.2840E+01	0.1000E-01
0.1538E+03	0.3210E-01	0.7101E+01	0.2500E-01
0.3075E+03	0.6419E-01	0.1420E+02	0.5000E-01
0.4613E+03	0.9629E-01	0.2130E+02	0.7500E-01
0.5774E+03	0.1271E+00	0.2840E+02	0.1000E+00
0.9551E+03	0.2956E+00	0.7101E+02	0.2500E+00
0.1119E+04	0.5557E+00	0.1387E+03	0.5000E+00
0.1187E+04	0.1021E+01	0.1933E+03	0.9600E+00
0.1195E+04	0.2465E+01	0.2986E+03	0.2400E+01
0.1230E+04	0.4868E+01	0.3348E+03	0.4800E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.9181E-01	0.1420E-04	0.4243E-02	0.1000E-04
0.4591E+00	0.7098E-04	0.2121E-01	0.5000E-04
0.9181E+00	0.1420E-03	0.4243E-01	0.1000E-03
0.4597E+02	0.7100E-02	0.2121E+01	0.5000E-02
0.6898E+02	0.1065E-01	0.3182E+01	0.7500E-02
0.9198E+02	0.1420E-01	0.4243E+01	0.1000E-01
0.2300E+03	0.3551E-01	0.1061E+02	0.2500E-01
0.4599E+03	0.7101E-01	0.2121E+02	0.5000E-01
0.6865E+03	0.1065E+00	0.3182E+02	0.7500E-01

0.8288E+03	0.1391E+00	0.4243E+02	0.1000E+00
0.1111E+04	0.3040E+00	0.1061E+03	0.2500E+00
0.1275E+04	0.5653E+00	0.2059E+03	0.5000E+00
0.1323E+04	0.1030E+01	0.2589E+03	0.9600E+00
0.1312E+04	0.2472E+01	0.3314E+03	0.2400E+01
0.1324E+04	0.4873E+01	0.3434E+03	0.4800E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.3399E-01	0.1157E-04	0.1438E-02	0.1000E-04
0.1699E+00	0.5787E-04	0.7191E-02	0.5000E-04
0.3399E+00	0.1157E-03	0.1438E-01	0.1000E-03
0.1699E+02	0.5787E-02	0.7191E+00	0.5000E-02
0.2550E+02	0.8680E-02	0.1079E+01	0.7500E-02
0.3400E+02	0.1157E-01	0.1438E+01	0.1000E-01
0.8503E+02	0.2894E-01	0.3595E+01	0.2500E-01
0.1701E+03	0.5787E-01	0.7191E+01	0.5000E-01
0.2551E+03	0.8681E-01	0.1079E+02	0.7500E-01
0.3344E+03	0.1155E+00	0.1438E+02	0.1000E+00
0.7034E+03	0.2830E+00	0.3595E+02	0.2500E+00
0.9620E+03	0.5460E+00	0.7148E+02	0.5000E+00
0.1051E+04	0.1012E+01	0.1277E+03	0.9600E+00
0.1077E+04	0.2458E+01	0.2658E+03	0.2400E+01
0.1135E+04	0.4863E+01	0.3245E+03	0.4800E+01

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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                      All Rights Reserved

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


     Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
     Name of input data file     : UnivPOC_Bent3_96-inch_CIDH_nonliqui_steelcase.sf8d
     Name of output file         : UnivPOC_Bent3_96-inch_CIDH_nonliqui_steelcase.sf8o
     Name of plot output file    : UnivPOC_Bent3_96-inch_CIDH_nonliqui_steelcase.sf8p
     Name of runtime file        : UnivPOC_Bent3_96-inch_CIDH_nonliqui_steelcase.sf8r


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

          Date:  March 15, 2022     Time:  08:17:15

     Univ POC Bent 3 96-inch CIDH


     PROPOSED DEPTH =     100.0 FT
     ----------------


     NUMBER OF LAYERS =    6
     ------------------


     WATER TABLE DEPTH =       9.5 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.120E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.120E+01  (*)
```

```
       INTERNAL FRICTION ANGLE, DEG.                     = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.200E+01

       LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.500E+00


     LAYER NO  2----CLAY

       AT THE TOP

       STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                        = 0.630E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.200E+01


       AT THE BOTTOM

       STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                        = 0.810E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.140E+02


       LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00


     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.929E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.140E+02

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.809E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.220E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.500E+00
```

```
LAYER NO  4----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                    = 0.867E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                      = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.220E+02

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                    = 0.812E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                      = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.260E+02

  LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.550E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.500E+00


LAYER NO  5----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.260E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.310E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.400E+00


LAYER NO  6----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.310E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.120E+03


  LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.400E+00


(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS


INPUT DRILLED SHAFT INFORMATION
------------------------------

 MINIMUM SHAFT DIAMETER    =    8.000  FT.
 MAXIMUM SHAFT DIAMETER    =    8.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =   11.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN



COMPUTATION RESULTS
-------------------


- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1


DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    8.000  FT.
 DIAMETER OF BASE          =    8.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =   11.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =   72.392  SQ.IN.
```

ELASTIC MODULUS, Ec = 0.350E+07 LB/SQ IN
VOLUME OF UNDERREAM = 0.000 CU.YDS.
SHAFT LENGTH = 100.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
12.0	22.34	10.37	136.58	146.95	4.67	54.63	59.30
13.0	24.21	20.74	155.29	176.03	9.33	62.12	71.45
14.0	26.07	31.11	177.76	208.87	14.00	88.88	102.88
15.0	27.93	47.12	199.09	246.20	22.80	99.54	122.35
16.0	29.79	63.49	222.22	285.71	31.81	111.11	142.92
17.0	31.65	80.23	244.22	324.44	41.01	122.11	163.12
18.0	33.51	97.30	265.00	362.29	50.40	132.50	182.90
19.0	35.38	114.70	282.80	397.50	59.97	141.40	201.37
20.0	37.24	132.41	297.72	430.13	69.71	148.86	218.57
21.0	39.10	150.42	309.82	460.25	79.62	154.91	234.53
22.0	40.96	168.72	319.19	487.91	89.69	159.59	249.28
23.0	42.82	188.59	327.22	515.81	100.61	163.61	264.22
24.0	44.69	208.81	333.30	542.12	111.74	166.65	278.39
25.0	46.55	229.39	337.52	566.92	123.06	168.76	291.82
26.0	48.41	250.31	339.98	590.29	134.56	135.99	270.55
27.0	50.27	260.68	342.01	602.68	139.23	136.80	276.03
28.0	52.13	271.05	343.57	614.61	143.89	137.43	281.32
29.0	54.00	281.42	344.63	626.05	148.56	137.85	286.41
30.0	55.86	291.78	345.16	636.95	153.22	138.07	291.29
31.0	57.72	302.15	345.16	647.32	157.89	138.07	295.95
32.0	59.58	314.59	345.16	659.76	163.49	138.07	301.55
33.0	61.44	327.04	345.16	672.20	169.09	138.07	307.15
34.0	63.31	339.48	345.16	684.64	174.69	138.07	312.75
35.0	65.17	351.92	345.16	697.09	180.29	138.07	318.35
36.0	67.03	364.36	345.16	709.53	185.88	138.07	323.95
37.0	68.89	376.81	345.16	721.97	191.48	138.07	329.55
38.0	70.75	389.25	345.16	734.41	197.08	138.07	335.15
39.0	72.62	401.69	345.16	746.85	202.68	138.07	340.75
40.0	74.48	414.13	345.16	759.30	208.28	138.07	346.35
41.0	76.34	426.58	345.16	771.74	213.88	138.07	351.94
42.0	78.20	439.02	345.16	784.18	219.48	138.07	357.54
43.0	80.06	451.46	345.16	796.62	225.08	138.07	363.14
44.0	81.92	463.90	345.16	809.07	230.68	138.07	368.74
45.0	83.79	476.34	345.16	821.51	236.28	138.07	374.34
46.0	85.65	488.79	345.16	833.95	241.87	138.07	379.94
47.0	87.51	501.23	345.16	846.39	247.47	138.07	385.54
48.0	89.37	513.67	345.16	858.84	253.07	138.07	391.14
49.0	91.23	526.11	345.16	871.28	258.67	138.07	396.74
50.0	93.10	538.56	345.16	883.72	264.27	138.07	402.34
51.0	94.96	551.00	345.16	896.16	269.87	138.07	407.94
52.0	96.82	563.44	345.16	908.60	275.47	138.07	413.53
53.0	98.68	575.88	345.16	921.05	281.07	138.07	419.13
54.0	100.54	588.33	345.16	933.49	286.67	138.07	424.73
55.0	102.41	600.77	345.16	945.93	292.27	138.07	430.33
56.0	104.27	613.21	345.16	958.37	297.86	138.07	435.93
57.0	106.13	625.65	345.16	970.82	303.46	138.07	441.53
58.0	107.99	638.09	345.16	983.26	309.06	138.07	447.13
59.0	109.85	650.54	345.16	995.70	314.66	138.07	452.73
60.0	111.72	662.98	345.16	1008.14	320.26	138.07	458.33
61.0	113.58	675.42	345.16	1020.59	325.86	138.07	463.93
62.0	115.44	687.86	345.16	1033.03	331.46	138.07	469.52
63.0	117.30	700.31	345.16	1045.47	337.06	138.07	475.12
64.0	119.16	712.75	345.16	1057.91	342.66	138.07	480.72
65.0	121.03	725.19	345.16	1070.36	348.26	138.07	486.32
66.0	122.89	737.63	345.16	1082.80	353.86	138.07	491.92
67.0	124.75	750.08	345.16	1095.24	359.45	138.07	497.52
68.0	126.61	762.52	345.16	1107.68	365.05	138.07	503.12
69.0	128.47	774.96	345.16	1120.12	370.65	138.07	508.72
70.0	130.33	787.40	345.16	1132.57	376.25	138.07	514.32
71.0	132.20	799.85	345.16	1145.01	381.85	138.07	519.92
72.0	134.06	812.29	345.16	1157.45	387.45	138.07	525.51
73.0	135.92	824.73	345.16	1169.89	393.05	138.07	531.11
74.0	137.78	837.17	345.16	1182.34	398.65	138.07	536.71
75.0	139.64	849.61	345.16	1194.78	404.25	138.07	542.31
76.0	141.51	862.06	345.16	1207.22	409.85	138.07	547.91
77.0	143.37	874.50	345.16	1219.66	415.44	138.07	553.51
78.0	145.23	886.94	345.16	1232.11	421.04	138.07	559.11
79.0	147.09	899.38	345.16	1244.55	426.64	138.07	564.71
80.0	148.95	911.83	345.16	1256.99	432.24	138.07	570.31
81.0	150.82	924.27	345.16	1269.43	437.84	138.07	575.91
82.0	152.68	936.71	345.16	1281.87	443.44	138.07	581.51
83.0	154.54	949.15	345.16	1294.32	449.04	138.07	587.10
84.0	156.40	961.60	345.16	1306.76	454.64	138.07	592.70
85.0	158.26	974.04	345.16	1319.20	460.24	138.07	598.30
86.0	160.13	986.48	345.16	1331.64	465.84	138.07	603.90
87.0	161.99	998.92	345.16	1344.09	471.43	138.07	609.50
88.0	163.85	1011.36	345.16	1356.53	477.03	138.07	615.10
89.0	165.71	1023.81	345.16	1368.97	482.63	138.07	620.70
90.0	167.57	1036.25	345.16	1381.41	488.23	138.07	626.30
91.0	169.44	1048.69	345.16	1393.86	493.83	138.07	631.90
92.0	171.30	1061.13	345.16	1406.30	499.43	138.07	637.50
93.0	173.16	1073.58	345.16	1418.74	505.03	138.07	643.09
94.0	175.02	1086.02	345.16	1431.18	510.63	138.07	648.69
95.0	176.88	1098.46	345.16	1443.62	516.23	138.07	654.29
96.0	178.74	1110.90	345.16	1456.07	521.83	138.07	659.89
97.0	180.61	1123.35	345.16	1468.51	527.43	138.07	665.49
98.0	182.47	1135.79	345.16	1480.95	533.02	138.07	671.09
99.0	184.33	1148.23	345.16	1493.39	538.62	138.07	676.69
100.0	186.19	1160.67	345.16	1505.84	544.22	138.07	682.29

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.6554E-01	0.1351E-04	0.2840E-02	0.1000E-04
0.3277E+00	0.6756E-04	0.1420E-01	0.5000E-04
0.6554E+00	0.1351E-03	0.2840E-01	0.1000E-03
0.3280E+02	0.6756E-02	0.1420E+01	0.5000E-02
0.4922E+02	0.1014E-01	0.2130E+01	0.7500E-02

0.6563E+02	0.1351E-01	0.2840E+01	0.1000E-01
0.1641E+03	0.3379E-01	0.7101E+01	0.2500E-01
0.3282E+03	0.6758E-01	0.1420E+02	0.5000E-01
0.4923E+03	0.1014E+00	0.2130E+02	0.7500E-01
0.6167E+03	0.1335E+00	0.2840E+02	0.1000E+00
0.1026E+04	0.3062E+00	0.7101E+02	0.2500E+00
0.1208E+04	0.5681E+00	0.1387E+03	0.5000E+00
0.1283E+04	0.1034E+01	0.1933E+03	0.9600E+00
0.1291E+04	0.2478E+01	0.2986E+03	0.2400E+01
0.1326E+04	0.4882E+01	0.3348E+03	0.4800E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.9774E-01	0.1520E-04	0.4243E-02	0.1000E-04
0.4887E+00	0.7602E-04	0.2121E-01	0.5000E-04
0.9774E+00	0.1520E-03	0.4243E-01	0.1000E-03
0.4896E+02	0.7605E-02	0.2121E+01	0.5000E-02
0.7346E+02	0.1141E-01	0.3182E+01	0.7500E-02
0.9795E+02	0.1521E-01	0.4243E+01	0.1000E-01
0.2449E+03	0.3803E-01	0.1061E+02	0.2500E-01
0.4898E+03	0.7606E-01	0.2121E+02	0.5000E-01
0.7316E+03	0.1140E+00	0.3182E+02	0.7500E-01
0.8843E+03	0.1482E+00	0.4243E+02	0.1000E+00
0.1201E+04	0.3164E+00	0.1061E+03	0.2500E+00
0.1374E+04	0.5795E+00	0.2059E+03	0.5000E+00
0.1423E+04	0.1044E+01	0.2589E+03	0.9600E+00
0.1412E+04	0.2486E+01	0.3314E+03	0.2400E+01
0.1424E+04	0.4887E+01	0.3434E+03	0.4800E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.3651E-01	0.1195E-04	0.1438E-02	0.1000E-04
0.1825E+00	0.5975E-04	0.7191E-02	0.5000E-04
0.3651E+00	0.1195E-03	0.1438E-01	0.1000E-03
0.1825E+02	0.5975E-02	0.7191E+00	0.5000E-02
0.2739E+02	0.8963E-02	0.1079E+01	0.7500E-02
0.3653E+02	0.1195E-01	0.1438E+01	0.1000E-01
0.9135E+02	0.2988E-01	0.3595E+01	0.2500E-01
0.1827E+03	0.5976E-01	0.7191E+01	0.5000E-01
0.2741E+03	0.8964E-01	0.1079E+02	0.7500E-01
0.3590E+03	0.1193E+00	0.1438E+02	0.1000E+00
0.7548E+03	0.2908E+00	0.3595E+02	0.2500E+00
0.1040E+04	0.5568E+00	0.7148E+02	0.5000E+00
0.1142E+04	0.1024E+01	0.1277E+03	0.9600E+00
0.1169E+04	0.2470E+01	0.2658E+03	0.2400E+01
0.1227E+04	0.4876E+01	0.3245E+03	0.4800E+01

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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=========================================================================


     Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
     Name of input data file     : UnivPOC_Bent3_96-inch_CIDH_liq_resettle.sf8d
     Name of output file         : UnivPOC_Bent3_96-inch_CIDH_liq_resettle.sf8o
     Name of plot output file    : UnivPOC_Bent3_96-inch_CIDH_liq_resettle.sf8p
     Name of runtime file        : UnivPOC_Bent3_96-inch_CIDH_liq_resettle.sf8r


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

          Date:  March 15, 2022     Time:  08:20:35

     Univ POC Bent 3 96-inch CIDH


     PROPOSED DEPTH =     100.0 FT
     ----------------


     NUMBER OF LAYERS =    6
     ------------------


     WATER TABLE DEPTH =       9.5 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                        = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                        = 0.200E+01

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


     LAYER NO  2----CLAY

       AT THE TOP

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.630E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                        = 0.200E+01


       AT THE BOTTOM

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.810E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                        = 0.140E+02


       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.929E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                        = 0.140E+02

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.809E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                        = 0.220E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00
```

```
LAYER NO  4----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                   = 0.867E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                     = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.220E+02

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                   = 0.812E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                     = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.260E+02

  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.550E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.500E+00


LAYER NO  5----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.260E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.310E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00


LAYER NO  6----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.310E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.120E+03


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00



(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS



INPUT DRILLED SHAFT INFORMATION
------------------------------

 MINIMUM SHAFT DIAMETER    =    8.000  FT.
 MAXIMUM SHAFT DIAMETER    =    8.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN



COMPUTATION RESULTS
-------------------



- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1



DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    8.000  FT.
 DIAMETER OF BASE          =    8.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =   72.392  SQ.IN.
```

ELASTIC MODULUS, Ec = 0.350E+07 LB/SQ IN
VOLUME OF UNDERREAM = 0.000 CU.YDS.
SHAFT LENGTH = 100.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
1.0	1.86	0.90	229.80	230.71	0.50	114.90	115.40
2.0	3.72	3.62	213.07	216.69	1.99	85.23	87.22
3.0	5.59	13.99	195.01	209.00	6.66	78.00	84.66
4.0	7.45	24.36	175.62	199.97	11.32	70.25	81.57
5.0	9.31	34.73	154.88	189.60	15.99	61.95	77.94
6.0	11.17	45.09	132.78	177.87	20.65	53.11	73.77
7.0	13.03	55.46	121.41	176.87	25.32	48.56	73.88
8.0	14.90	65.83	113.84	179.67	29.99	45.54	75.52
9.0	16.76	76.20	110.14	186.34	34.65	44.06	78.71
10.0	18.62	86.57	110.36	196.93	39.32	44.15	83.46
11.0	20.48	96.94	121.61	218.54	43.98	48.64	92.63
12.0	22.34	107.31	136.58	243.88	48.65	54.63	103.28
13.0	24.21	117.67	155.29	272.96	53.32	62.12	115.43
14.0	26.07	128.04	177.76	305.80	57.98	88.88	146.86
15.0	27.93	144.05	199.09	343.14	66.79	99.54	166.33
16.0	29.79	160.43	222.22	382.65	75.79	111.11	186.90
17.0	31.65	177.16	244.22	421.38	85.00	122.11	207.11
18.0	33.51	194.23	265.00	459.23	94.39	132.50	226.88
19.0	35.38	211.63	282.80	494.44	103.96	141.40	245.36
20.0	37.24	229.35	297.72	527.07	113.70	148.86	262.56
21.0	39.10	247.36	309.82	557.18	123.61	154.91	278.52
22.0	40.96	265.66	319.19	584.85	133.67	159.59	293.27
23.0	42.82	285.52	327.22	612.74	144.60	163.61	308.21
24.0	44.69	305.75	333.30	639.05	155.72	166.65	322.37
25.0	46.55	326.33	337.52	663.86	167.04	168.76	335.80
26.0	48.41	347.25	339.98	687.23	178.54	135.99	314.54
27.0	50.27	357.61	342.01	699.62	183.21	136.80	320.01
28.0	52.13	367.98	343.57	711.55	187.87	137.43	325.30
29.0	54.00	378.35	344.63	722.98	192.54	137.85	330.39
30.0	55.86	388.72	345.16	733.88	197.21	138.07	335.27
31.0	57.72	399.09	345.16	744.25	201.87	138.07	339.94
32.0	59.58	411.53	345.16	756.70	207.47	138.07	345.54
33.0	61.44	423.97	345.16	769.14	213.07	138.07	351.14
34.0	63.31	436.42	345.16	781.58	218.67	138.07	356.74
35.0	65.17	448.86	345.16	794.02	224.27	138.07	362.33
36.0	67.03	461.30	345.16	806.46	229.87	138.07	367.93
37.0	68.89	473.74	345.16	818.91	235.47	138.07	373.53
38.0	70.75	486.19	345.16	831.35	241.07	138.07	379.13
39.0	72.62	498.63	345.16	843.79	246.66	138.07	384.73
40.0	74.48	511.07	345.16	856.23	252.26	138.07	390.33
41.0	76.34	523.51	345.16	868.68	257.86	138.07	395.93
42.0	78.20	535.95	345.16	881.12	263.46	138.07	401.53
43.0	80.06	548.40	345.16	893.56	269.06	138.07	407.13
44.0	81.92	560.84	345.16	906.00	274.66	138.07	412.73
45.0	83.79	573.28	345.16	918.45	280.26	138.07	418.32
46.0	85.65	585.72	345.16	930.89	285.86	138.07	423.92
47.0	87.51	598.17	345.16	943.33	291.46	138.07	429.52
48.0	89.37	610.61	345.16	955.77	297.06	138.07	435.12
49.0	91.23	623.05	345.16	968.21	302.66	138.07	440.72
50.0	93.10	635.49	345.16	980.66	308.25	138.07	446.32
51.0	94.96	647.94	345.16	993.10	313.85	138.07	451.92
52.0	96.82	660.38	345.16	1005.54	319.45	138.07	457.52
53.0	98.68	672.82	345.16	1017.98	325.05	138.07	463.12
54.0	100.54	685.26	345.16	1030.43	330.65	138.07	468.72
55.0	102.41	697.70	345.16	1042.87	336.25	138.07	474.31
56.0	104.27	710.15	345.16	1055.31	341.85	138.07	479.91
57.0	106.13	722.59	345.16	1067.75	347.45	138.07	485.51
58.0	107.99	735.03	345.16	1080.20	353.05	138.07	491.11
59.0	109.85	747.47	345.16	1092.64	358.65	138.07	496.71
60.0	111.72	759.92	345.16	1105.08	364.24	138.07	502.31
61.0	113.58	772.36	345.16	1117.52	369.84	138.07	507.91
62.0	115.44	784.80	345.16	1129.97	375.44	138.07	513.51
63.0	117.30	797.24	345.16	1142.41	381.04	138.07	519.11
64.0	119.16	809.69	345.16	1154.85	386.64	138.07	524.71
65.0	121.03	822.13	345.16	1167.29	392.24	138.07	530.31
66.0	122.89	834.57	345.16	1179.73	397.84	138.07	535.90
67.0	124.75	847.01	345.16	1192.18	403.44	138.07	541.50
68.0	126.61	859.46	345.16	1204.62	409.04	138.07	547.10
69.0	128.47	871.90	345.16	1217.06	414.64	138.07	552.70
70.0	130.33	884.34	345.16	1229.50	420.23	138.07	558.30
71.0	132.20	896.78	345.16	1241.95	425.83	138.07	563.90
72.0	134.06	909.22	345.16	1254.39	431.43	138.07	569.50
73.0	135.92	921.67	345.16	1266.83	437.03	138.07	575.10
74.0	137.78	934.11	345.16	1279.27	442.63	138.07	580.70
75.0	139.64	946.55	345.16	1291.72	448.23	138.07	586.30
76.0	141.51	958.99	345.16	1304.16	453.83	138.07	591.89
77.0	143.37	971.44	345.16	1316.60	459.43	138.07	597.49
78.0	145.23	983.88	345.16	1329.04	465.03	138.07	603.09
79.0	147.09	996.32	345.16	1341.48	470.63	138.07	608.69
80.0	148.95	1008.76	345.16	1353.93	476.23	138.07	614.29
81.0	150.82	1021.21	345.16	1366.37	481.82	138.07	619.89
82.0	152.68	1033.65	345.16	1378.81	487.42	138.07	625.49
83.0	154.54	1046.09	345.16	1391.25	493.02	138.07	631.09
84.0	156.40	1058.53	345.16	1403.70	498.62	138.07	636.69
85.0	158.26	1070.97	345.16	1416.14	504.22	138.07	642.29
86.0	160.13	1083.42	345.16	1428.58	509.82	138.07	647.88
87.0	161.99	1095.86	345.16	1441.02	515.42	138.07	653.48
88.0	163.85	1108.30	345.16	1453.47	521.02	138.07	659.08
89.0	165.71	1120.74	345.16	1465.91	526.62	138.07	664.68
90.0	167.57	1133.19	345.16	1478.35	532.22	138.07	670.28
91.0	169.44	1145.63	345.16	1490.79	537.81	138.07	675.88
92.0	171.30	1158.07	345.16	1503.23	543.41	138.07	681.48
93.0	173.16	1170.51	345.16	1515.68	549.01	138.07	687.08
94.0	175.02	1182.95	345.16	1528.12	554.61	138.07	692.68
95.0	176.88	1195.40	345.16	1540.56	560.21	138.07	698.28
96.0	178.74	1207.84	345.16	1553.00	565.81	138.07	703.88
97.0	180.61	1220.28	345.16	1565.45	571.41	138.07	709.47
98.0	182.47	1232.72	345.16	1577.89	577.01	138.07	715.07
99.0	184.33	1245.17	345.16	1590.33	582.61	138.07	720.67
100.0	186.19	1257.61	345.16	1602.77	588.21	138.07	726.27

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.7207E-01	0.1355E-04	0.2840E-02	0.1000E-04
0.3603E+00	0.6777E-04	0.1420E-01	0.5000E-04
0.7207E+00	0.1355E-03	0.2840E-01	0.1000E-03
0.3607E+02	0.6777E-02	0.1420E+01	0.5000E-02
0.5412E+02	0.1017E-01	0.2130E+01	0.7500E-02
0.7216E+02	0.1356E-01	0.2840E+01	0.1000E-01
0.1804E+03	0.3389E-01	0.7101E+01	0.2500E-01
0.3609E+03	0.6778E-01	0.1420E+02	0.5000E-01
0.5407E+03	0.1017E+00	0.2130E+02	0.7500E-01
0.6717E+03	0.1338E+00	0.2840E+02	0.1000E+00
0.1111E+04	0.3067E+00	0.7101E+02	0.2500E+00
0.1298E+04	0.5687E+00	0.1387E+03	0.5000E+00
0.1372E+04	0.1035E+01	0.1933E+03	0.9600E+00
0.1371E+04	0.2479E+01	0.2986E+03	0.2400E+01
0.1406E+04	0.4882E+01	0.3348E+03	0.4800E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.1083E+00	0.1527E-04	0.4243E-02	0.1000E-04
0.5413E+00	0.7636E-04	0.2121E-01	0.5000E-04
0.1083E+01	0.1527E-03	0.4243E-01	0.1000E-03
0.5423E+02	0.7638E-02	0.2121E+01	0.5000E-02
0.8136E+02	0.1146E-01	0.3182E+01	0.7500E-02
0.1085E+03	0.1528E-01	0.4243E+01	0.1000E-01
0.2713E+03	0.3820E-01	0.1061E+02	0.2500E-01
0.5425E+03	0.7640E-01	0.2121E+02	0.5000E-01
0.8035E+03	0.1145E+00	0.3182E+02	0.7500E-01
0.9623E+03	0.1487E+00	0.4243E+02	0.1000E+00
0.1294E+04	0.3170E+00	0.1061E+03	0.2500E+00
0.1471E+04	0.5801E+00	0.2059E+03	0.5000E+00
0.1519E+04	0.1045E+01	0.2589E+03	0.9600E+00
0.1500E+04	0.2487E+01	0.3314E+03	0.2400E+01
0.1512E+04	0.4888E+01	0.3434E+03	0.4800E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.3985E-01	0.1197E-04	0.1438E-02	0.1000E-04
0.1992E+00	0.5986E-04	0.7191E-02	0.5000E-04
0.3985E+00	0.1197E-03	0.1438E-01	0.1000E-03
0.1992E+02	0.5986E-02	0.7191E+00	0.5000E-02
0.2990E+02	0.8979E-02	0.1079E+01	0.7500E-02
0.3987E+02	0.1197E-01	0.1438E+01	0.1000E-01
0.9970E+02	0.2993E-01	0.3595E+01	0.2500E-01
0.1994E+03	0.5987E-01	0.7191E+01	0.5000E-01
0.2991E+03	0.8980E-01	0.1079E+02	0.7500E-01
0.3911E+03	0.1195E+00	0.1438E+02	0.1000E+00
0.8205E+03	0.2912E+00	0.3595E+02	0.2500E+00
0.1122E+04	0.5573E+00	0.7148E+02	0.5000E+00
0.1225E+04	0.1024E+01	0.1277E+03	0.9600E+00
0.1242E+04	0.2471E+01	0.2658E+03	0.2400E+01
0.1299E+04	0.4876E+01	0.3245E+03	0.4800E+01

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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=========================================================================


Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
Name of input data file     : UnivPOC_Abut1_24-inch_CIDH_nonliquif..sf8d
Name of output file         : UnivPOC_Abut1_24-inch_CIDH_nonliquif..sf8o
Name of plot output file    : UnivPOC_Abut1_24-inch_CIDH_nonliquif..sf8p
Name of runtime file        : UnivPOC_Abut1_24-inch_CIDH_nonliquif..sf8r


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

          Date:  March 15, 2022     Time:  08:29:55

Univ POC Abut 1 24-inch CIDH


PROPOSED DEPTH =      60.0 FT
----------------


NUMBER OF LAYERS =    6
------------------


WATER TABLE DEPTH =      12.5 FT.
-------------------




SOIL INFORMATION
---------------

LAYER NO  1----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.000E+00

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.500E+01

  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


LAYER NO  2----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.500E+01


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.170E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


LAYER NO  3----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.880E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.170E+02

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.770E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.250E+02

  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00
```

```
LAYER NO  4----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.825E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.250E+02

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.773E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.290E+02

  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


LAYER NO  5----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.290E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.340E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


LAYER NO  6----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.340E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.120E+03


  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS


INPUT DRILLED SHAFT INFORMATION
------------------------------

 MINIMUM SHAFT DIAMETER    =    2.000  FT.
 MAXIMUM SHAFT DIAMETER    =    2.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN



COMPUTATION RESULTS
-------------------


- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1


DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    2.000  FT.
 DIAMETER OF BASE          =    2.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    4.524  SQ.IN.
```

```
ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN
VOLUME OF UNDERREAM       =    0.000  CU.YDS.
SHAFT LENGTH              =   60.000  FT.
```

PREDICTED RESULTS

```
QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.
```

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
1.0	0.12	0.23	7.03	7.26	0.12	3.51	3.64
2.0	0.23	0.90	12.66	13.57	0.50	6.33	6.83
3.0	0.35	2.04	18.48	20.52	1.12	9.24	10.36
4.0	0.47	3.62	21.21	24.83	1.99	10.60	12.60
5.0	0.58	5.65	21.21	26.86	3.11	8.48	11.59
6.0	0.70	8.24	21.21	29.45	4.28	8.48	12.76
7.0	0.81	10.84	21.21	32.05	5.44	8.48	13.93
8.0	0.93	13.43	21.21	34.64	6.61	8.48	15.09
9.0	1.05	16.02	21.21	37.23	7.77	8.48	16.26
10.0	1.16	18.61	21.21	39.82	8.94	8.48	17.42
11.0	1.28	21.21	21.21	42.41	10.11	8.48	18.59
12.0	1.40	23.80	21.21	45.01	11.27	8.48	19.76
13.0	1.51	26.39	21.21	47.60	12.44	8.48	20.92
14.0	1.63	28.98	22.12	51.10	13.61	8.85	22.45
15.0	1.75	31.57	23.68	55.25	14.77	9.47	24.25
16.0	1.86	34.17	25.26	59.43	15.94	10.10	26.04
17.0	1.98	36.76	26.11	62.87	17.11	13.06	30.16
18.0	2.09	41.54	26.39	67.93	19.73	13.20	32.93
19.0	2.21	46.39	26.39	72.78	22.40	13.20	35.60
20.0	2.33	51.31	26.39	77.70	25.11	13.20	38.30
21.0	2.44	56.29	26.39	82.69	27.85	13.20	41.05
22.0	2.56	61.34	43.22	104.57	30.63	21.61	52.24
23.0	2.68	66.46	63.42	129.88	33.44	31.71	65.15
24.0	2.79	71.63	73.52	145.15	36.28	36.76	73.05
25.0	2.91	76.85	73.52	150.38	39.16	36.76	75.92
26.0	3.03	82.50	54.84	137.34	42.26	27.42	69.68
27.0	3.14	88.22	32.42	120.63	45.41	16.21	61.62
28.0	3.26	94.00	21.21	115.21	48.59	10.60	59.20
29.0	3.37	99.86	21.21	121.07	51.81	8.48	60.30
30.0	3.49	102.45	21.21	123.66	52.98	8.48	61.46
31.0	3.61	105.04	22.72	127.77	54.14	9.09	63.23
32.0	3.72	107.64	24.54	132.18	55.31	9.82	65.13
33.0	3.84	110.23	25.45	135.68	56.48	10.18	66.66
34.0	3.96	112.82	25.45	138.27	57.64	10.18	67.82
35.0	4.07	115.93	25.45	141.38	59.04	10.18	69.22
36.0	4.19	119.04	25.45	144.49	60.44	10.18	70.62
37.0	4.31	122.15	25.45	147.60	61.84	10.18	72.02
38.0	4.42	125.26	25.45	150.71	63.24	10.18	73.42
39.0	4.54	128.37	25.45	153.82	64.64	10.18	74.82
40.0	4.65	131.48	25.45	156.93	66.04	10.18	76.22
41.0	4.77	134.59	25.45	160.04	67.44	10.18	77.62
42.0	4.89	137.70	25.45	163.15	68.84	10.18	79.02
43.0	5.00	140.81	25.45	166.26	70.24	10.18	80.42
44.0	5.12	143.93	25.45	169.38	71.64	10.18	81.82
45.0	5.24	147.04	25.45	172.49	73.04	10.18	83.22
46.0	5.35	150.15	25.45	175.60	74.44	10.18	84.62
47.0	5.47	153.26	25.45	178.71	75.84	10.18	86.02
48.0	5.59	156.37	25.45	181.82	77.24	10.18	87.42
49.0	5.70	159.48	25.45	184.93	78.64	10.18	88.82
50.0	5.82	162.59	25.45	188.04	80.04	10.18	90.22
51.0	5.93	165.70	25.45	191.15	81.44	10.18	91.62
52.0	6.05	168.81	25.45	194.26	82.84	10.18	93.02
53.0	6.17	171.92	25.45	197.37	84.24	10.18	94.42
54.0	6.28	175.03	25.45	200.48	85.64	10.18	95.82
55.0	6.40	178.14	25.45	203.59	87.04	10.18	97.22
56.0	6.52	181.25	25.45	206.70	88.44	10.18	98.62
57.0	6.63	184.36	25.45	209.81	89.84	10.18	100.02
58.0	6.75	187.47	25.45	212.92	91.24	10.18	101.42
59.0	6.87	190.58	25.45	216.03	92.64	10.18	102.82
60.0	6.98	193.69	25.45	219.14	94.04	10.18	104.22

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.5812E-01	0.3447E-04	0.8377E-03	0.1000E-04
0.2906E+00	0.1723E-03	0.4189E-02	0.5000E-04
0.5812E+00	0.3447E-03	0.8377E-02	0.1000E-03
0.2946E+02	0.1736E-01	0.4189E+00	0.5000E-02
0.4419E+02	0.2604E-01	0.6283E+00	0.7500E-02
0.5806E+02	0.3463E-01	0.8377E+00	0.1000E-01
0.1159E+03	0.7803E-01	0.2094E+01	0.2500E-01
0.1557E+03	0.1244E+00	0.4189E+01	0.5000E-01
0.1760E+03	0.1618E+00	0.6283E+01	0.7500E-01
0.1840E+03	0.1911E+00	0.8377E+01	0.1000E+00
0.1955E+03	0.3493E+00	0.1455E+02	0.2500E+00
0.1892E+03	0.5977E+00	0.2026E+02	0.5000E+00
0.1911E+03	0.7245E+00	0.2220E+02	0.6250E+00
0.1921E+03	0.8816E+00	0.2323E+02	0.7812E+00
0.1934E+03	0.1302E+01	0.2469E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.9869E-01	0.4926E-04	0.1251E-02	0.1000E-04
0.4935E+00	0.2463E-03	0.6257E-02	0.5000E-04
0.9869E+00	0.4926E-03	0.1251E-01	0.1000E-03
0.5031E+02	0.2492E-01	0.6257E+00	0.5000E-02
0.7360E+02	0.3718E-01	0.9385E+00	0.7500E-02
0.9248E+02	0.4865E-01	0.1251E+01	0.1000E-01
0.1605E+03	0.1004E+00	0.3128E+01	0.2500E-01
0.1877E+03	0.1414E+00	0.6257E+01	0.5000E-01
0.1980E+03	0.1730E+00	0.9385E+01	0.7500E-01
0.2050E+03	0.2029E+00	0.1251E+02	0.1000E+00
0.2115E+03	0.3594E+00	0.1932E+02	0.2500E+00
0.2056E+03	0.6073E+00	0.2337E+02	0.5000E+00
0.2068E+03	0.7334E+00	0.2454E+02	0.6250E+00

0.2073E+03	0.8901E+00	0.2504E+02	0.7812E+00
0.2076E+03	0.1309E+01	0.2532E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.2860E-01	0.2272E-04	0.4242E-03	0.1000E-04
0.1430E+00	0.1136E-03	0.2121E-02	0.5000E-04
0.2860E+00	0.2272E-03	0.4242E-02	0.1000E-03
0.1442E+02	0.1140E-01	0.2121E+00	0.5000E-02
0.2162E+02	0.1710E-01	0.3181E+00	0.7500E-02
0.2883E+02	0.2280E-01	0.4242E+00	0.1000E-01
0.6771E+02	0.5571E-01	0.1060E+01	0.2500E-01
0.1138E+03	0.1033E+00	0.2121E+01	0.5000E-01
0.1418E+03	0.1430E+00	0.3181E+01	0.7500E-01
0.1583E+03	0.1765E+00	0.4242E+01	0.1000E+00
0.1792E+03	0.3392E+00	0.9777E+01	0.2500E+00
0.1728E+03	0.5881E+00	0.1716E+02	0.5000E+00
0.1754E+03	0.7156E+00	0.1986E+02	0.6250E+00
0.1769E+03	0.8732E+00	0.2139E+02	0.7812E+00
0.1791E+03	0.1294E+01	0.2392E+02	0.1200E+01

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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                      All Rights Reserved

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


     Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
     Name of input data file     : UnivPOC_Abut1_24-inch_CIDH_liq_resettle..sf8d
     Name of output file         : UnivPOC_Abut1_24-inch_CIDH_liq_resettle..sf8o
     Name of plot output file    : UnivPOC_Abut1_24-inch_CIDH_liq_resettle..sf8p
     Name of runtime file        : UnivPOC_Abut1_24-inch_CIDH_liq_resettle..sf8r


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

          Date:  March 15, 2022     Time:  08:32:58

     Univ POC Abut 1 24-inch CIDH


     PROPOSED DEPTH =      60.0 FT
     ----------------


     NUMBER OF LAYERS =    6
     ------------------


     WATER TABLE DEPTH =      12.5 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.120E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.120E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.500E+01

       LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.500E+00


     LAYER NO  2----CLAY

       AT THE TOP

       STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.500E+01


       AT THE BOTTOM

       STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.170E+02


       LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00


     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.880E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.170E+02

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 0.770E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.250E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.500E+00
```

```
LAYER NO  4----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                   = 0.825E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                     = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.250E+02

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                   = 0.773E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                     = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.290E+02

  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.550E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.500E+00


LAYER NO  5----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.290E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.340E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00


LAYER NO  6----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.340E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                   = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                        = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.120E+03


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.400E+00



(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS



INPUT DRILLED SHAFT INFORMATION
------------------------------

 MINIMUM SHAFT DIAMETER    =    2.000  FT.
 MAXIMUM SHAFT DIAMETER    =    2.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN




COMPUTATION RESULTS
-------------------



- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1



DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    2.000  FT.
 DIAMETER OF BASE          =    2.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    4.524  SQ.IN.
```

ELASTIC MODULUS, Ec = 0.350E+07 LB/SQ IN
VOLUME OF UNDERREAM = 0.000 CU.YDS.
SHAFT LENGTH = 60.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
1.0	0.12	0.23	7.03	7.26	0.12	3.51	3.64
2.0	0.23	0.90	12.66	13.57	0.50	6.33	6.83
3.0	0.35	2.04	18.48	20.52	1.12	9.24	10.36
4.0	0.47	3.62	21.21	24.83	1.99	10.60	12.60
5.0	0.58	5.65	21.21	26.86	3.11	8.48	11.59
6.0	0.70	8.24	21.21	29.45	4.28	8.48	12.76
7.0	0.81	10.84	21.21	32.05	5.44	8.48	13.93
8.0	0.93	13.43	21.21	34.64	6.61	8.48	15.09
9.0	1.05	16.02	21.21	37.23	7.77	8.48	16.26
10.0	1.16	18.61	21.21	39.82	8.94	8.48	17.42
11.0	1.28	21.21	21.21	42.41	10.11	8.48	18.59
12.0	1.40	23.80	21.21	45.01	11.27	8.48	19.76
13.0	1.51	26.39	21.21	47.60	12.44	8.48	20.92
14.0	1.63	28.98	22.12	51.10	13.61	8.85	22.45
15.0	1.75	31.57	23.68	55.25	14.77	9.47	24.25
16.0	1.86	34.17	25.26	59.43	15.94	10.10	26.04
17.0	1.98	36.76	26.11	62.87	17.11	13.06	30.16
18.0	2.09	41.54	26.39	67.93	19.73	13.20	32.93
19.0	2.21	46.39	26.39	72.78	22.40	13.20	35.60
20.0	2.33	51.31	26.39	77.70	25.11	13.20	38.30
21.0	2.44	56.29	26.39	82.69	27.85	13.20	41.05
22.0	2.56	61.34	43.22	104.57	30.63	21.61	52.24
23.0	2.68	66.46	63.42	129.88	33.44	31.71	65.15
24.0	2.79	71.63	73.52	145.15	36.28	36.76	73.05
25.0	2.91	76.85	73.52	150.38	39.16	36.76	75.92
26.0	3.03	82.50	54.84	137.34	42.26	27.42	69.68
27.0	3.14	88.22	32.42	120.63	45.41	16.21	61.62
28.0	3.26	94.00	21.21	115.21	48.59	10.60	59.20
29.0	3.37	99.86	21.21	121.07	51.81	8.48	60.30
30.0	3.49	102.45	21.21	123.66	52.98	8.48	61.46
31.0	3.61	105.04	22.72	127.77	54.14	9.09	63.23
32.0	3.72	107.64	24.54	132.18	55.31	9.82	65.13
33.0	3.84	110.23	25.45	135.68	56.48	10.18	66.66
34.0	3.96	112.82	25.45	138.27	57.64	10.18	67.82
35.0	4.07	115.93	25.45	141.38	59.04	10.18	69.22
36.0	4.19	119.04	25.45	144.49	60.44	10.18	70.62
37.0	4.31	122.15	25.45	147.60	61.84	10.18	72.02
38.0	4.42	125.26	25.45	150.71	63.24	10.18	73.42
39.0	4.54	128.37	25.45	153.82	64.64	10.18	74.82
40.0	4.65	131.48	25.45	156.93	66.04	10.18	76.22
41.0	4.77	134.59	25.45	160.04	67.44	10.18	77.62
42.0	4.89	137.70	25.45	163.15	68.84	10.18	79.02
43.0	5.00	140.81	25.45	166.26	70.24	10.18	80.42
44.0	5.12	143.93	25.45	169.38	71.64	10.18	81.82
45.0	5.24	147.04	25.45	172.49	73.04	10.18	83.22
46.0	5.35	150.15	25.45	175.60	74.44	10.18	84.62
47.0	5.47	153.26	25.45	178.71	75.84	10.18	86.02
48.0	5.59	156.37	25.45	181.82	77.24	10.18	87.42
49.0	5.70	159.48	25.45	184.93	78.64	10.18	88.82
50.0	5.82	162.59	25.45	188.04	80.04	10.18	90.22
51.0	5.93	165.70	25.45	191.15	81.44	10.18	91.62
52.0	6.05	168.81	25.45	194.26	82.84	10.18	93.02
53.0	6.17	171.92	25.45	197.37	84.24	10.18	94.42
54.0	6.28	175.03	25.45	200.48	85.64	10.18	95.82
55.0	6.40	178.14	25.45	203.59	87.04	10.18	97.22
56.0	6.52	181.25	25.45	206.70	88.44	10.18	98.62
57.0	6.63	184.36	25.45	209.81	89.84	10.18	100.02
58.0	6.75	187.47	25.45	212.92	91.24	10.18	101.42
59.0	6.87	190.58	25.45	216.03	92.64	10.18	102.82
60.0	6.98	193.69	25.45	219.14	94.04	10.18	104.22

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.5812E-01	0.3447E-04	0.8377E-03	0.1000E-04
0.2906E+00	0.1723E-03	0.4189E-02	0.5000E-04
0.5812E+00	0.3447E-03	0.8377E-02	0.1000E-03
0.2946E+02	0.1736E-01	0.4189E+00	0.5000E-02
0.4419E+02	0.2604E-01	0.6283E+00	0.7500E-02
0.5806E+02	0.3463E-01	0.8377E+00	0.1000E-01
0.1159E+03	0.7803E-01	0.2094E+01	0.2500E-01
0.1557E+03	0.1244E+00	0.4189E+01	0.5000E-01
0.1760E+03	0.1618E+00	0.6283E+01	0.7500E-01
0.1840E+03	0.1911E+00	0.8377E+01	0.1000E+00
0.1955E+03	0.3493E+00	0.1455E+02	0.2500E+00
0.1892E+03	0.5977E+00	0.2026E+02	0.5000E+00
0.1911E+03	0.7245E+00	0.2220E+02	0.6250E+00
0.1921E+03	0.8816E+00	0.2323E+02	0.7812E+00
0.1934E+03	0.1302E+01	0.2469E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.9869E-01	0.4926E-04	0.1251E-02	0.1000E-04
0.4935E+00	0.2463E-03	0.6257E-02	0.5000E-04
0.9869E+00	0.4926E-03	0.1251E-01	0.1000E-03
0.5031E+02	0.2492E-01	0.6257E+00	0.5000E-02
0.7360E+02	0.3718E-01	0.9385E+00	0.7500E-02
0.9248E+02	0.4865E-01	0.1251E+01	0.1000E-01
0.1605E+03	0.1004E+00	0.3128E+01	0.2500E-01
0.1877E+03	0.1414E+00	0.6257E+01	0.5000E-01
0.1980E+03	0.1730E+00	0.9385E+01	0.7500E-01
0.2050E+03	0.2029E+00	0.1251E+02	0.1000E+00
0.2115E+03	0.3594E+00	0.1932E+02	0.2500E+00
0.2056E+03	0.6073E+00	0.2337E+02	0.5000E+00
0.2068E+03	0.7334E+00	0.2454E+02	0.6250E+00

0.2073E+03	0.8901E+00	0.2504E+02	0.7812E+00
0.2076E+03	0.1309E+01	0.2532E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.2860E-01	0.2272E-04	0.4242E-03	0.1000E-04
0.1430E+00	0.1136E-03	0.2121E-02	0.5000E-04
0.2860E+00	0.2272E-03	0.4242E-02	0.1000E-03
0.1442E+02	0.1140E-01	0.2121E+00	0.5000E-02
0.2162E+02	0.1710E-01	0.3181E+00	0.7500E-02
0.2883E+02	0.2280E-01	0.4242E+00	0.1000E-01
0.6771E+02	0.5571E-01	0.1060E+01	0.2500E-01
0.1138E+03	0.1033E+00	0.2121E+01	0.5000E-01
0.1418E+03	0.1430E+00	0.3181E+01	0.7500E-01
0.1583E+03	0.1765E+00	0.4242E+01	0.1000E+00
0.1792E+03	0.3392E+00	0.9777E+01	0.2500E+00
0.1728E+03	0.5881E+00	0.1716E+02	0.5000E+00
0.1754E+03	0.7156E+00	0.1986E+02	0.6250E+00
0.1769E+03	0.8732E+00	0.2139E+02	0.7812E+00
0.1791E+03	0.1294E+01	0.2392E+02	0.1200E+01

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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======================================================================


     Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
     Name of input data file     : UnivPOC_Abut5_24-inch_CIDH_nonliquif..sf8d
     Name of output file         : UnivPOC_Abut5_24-inch_CIDH_nonliquif..sf8o
     Name of plot output file    : UnivPOC_Abut5_24-inch_CIDH_nonliquif..sf8p
     Name of runtime file        : UnivPOC_Abut5_24-inch_CIDH_nonliquif..sf8r


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

               Date:  March 15, 2022     Time:  08:38:17

     Univ POC Abut 5 24-inch CIDH


     PROPOSED DEPTH =      60.0 FT
     ----------------


     NUMBER OF LAYERS =    6
     ------------------


     WATER TABLE DEPTH =      17.5 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.107E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.340E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.100E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


     LAYER NO  2----CLAY

       AT THE TOP

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.100E+02


       AT THE BOTTOM

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.220E+02


       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.809E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.220E+02

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.710E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.300E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00
```

```
LAYER NO  4----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.761E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.300E+02

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                  = 0.713E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                    = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.340E+02

  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


LAYER NO  5----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.340E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.390E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


LAYER NO  6----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.390E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                       = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
  DEPTH, FT                                        = 0.120E+03


  LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS
```

```
INPUT DRILLED SHAFT INFORMATION
------------------------------

 MINIMUM SHAFT DIAMETER    =    2.000  FT.
 MAXIMUM SHAFT DIAMETER    =    2.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN



COMPUTATION RESULTS
-------------------



- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1


DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    2.000  FT.
 DIAMETER OF BASE          =    2.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    4.524  SQ.IN.
```

```
ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN
VOLUME OF UNDERREAM       =    0.000  CU.YDS.
SHAFT LENGTH              =   60.000  FT.
```

PREDICTED RESULTS

```
QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.
```

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
1.0	0.12	0.23	7.03	7.26	0.12	3.51	3.64
2.0	0.23	0.90	8.73	9.63	0.50	4.36	4.86
3.0	0.35	2.04	10.42	12.46	1.12	5.21	6.33
4.0	0.47	3.62	12.12	15.74	1.99	6.06	8.05
5.0	0.58	5.65	13.82	19.47	3.11	6.91	10.02
6.0	0.70	8.08	15.51	23.59	4.44	7.76	12.20
7.0	0.81	10.88	18.12	29.00	5.98	9.06	15.04
8.0	0.93	14.04	20.30	34.34	7.72	10.15	17.87
9.0	1.05	17.55	21.21	38.76	9.65	10.60	20.26
10.0	1.16	21.39	21.21	42.60	11.77	8.48	20.25
11.0	1.28	23.99	21.21	45.19	12.93	8.48	21.42
12.0	1.40	26.58	21.21	47.79	14.10	8.48	22.58
13.0	1.51	29.17	21.21	50.38	15.27	8.48	23.75
14.0	1.63	31.76	21.21	52.97	16.43	8.48	24.92
15.0	1.75	34.35	21.21	55.56	17.60	8.48	26.08
16.0	1.86	36.95	21.21	58.15	18.76	8.48	27.25
17.0	1.98	39.54	21.21	60.75	19.93	8.48	28.41
18.0	2.09	42.13	21.21	63.34	21.10	8.48	29.58
19.0	2.21	44.72	23.06	67.78	22.26	9.22	31.49
20.0	2.33	47.31	25.28	72.60	23.43	10.11	33.54
21.0	2.44	49.91	26.39	76.30	24.60	10.56	35.15
22.0	2.56	52.50	26.39	78.89	25.76	13.20	38.96
23.0	2.68	58.39	26.39	84.78	29.00	13.20	42.20
24.0	2.79	64.33	26.39	90.72	32.27	13.20	45.47
25.0	2.91	70.31	26.39	96.70	35.56	13.20	48.76
26.0	3.03	76.33	26.39	102.72	38.87	13.20	52.07
27.0	3.14	82.39	43.22	125.61	42.20	21.61	63.82
28.0	3.26	88.48	63.42	151.91	45.55	31.71	77.27
29.0	3.37	94.61	73.52	168.13	48.92	36.76	85.69
30.0	3.49	100.76	73.52	174.29	52.31	36.76	89.07
31.0	3.61	107.38	54.84	162.22	55.95	27.42	83.37
32.0	3.72	114.04	32.42	146.46	59.61	16.21	75.82
33.0	3.84	120.74	21.21	141.95	63.30	10.60	73.90
34.0	3.96	127.49	21.21	148.70	67.01	8.48	75.49
35.0	4.07	130.08	21.21	151.29	68.17	8.48	76.66
36.0	4.19	132.67	22.72	155.39	69.34	9.09	78.43
37.0	4.31	135.26	24.54	159.80	70.51	9.82	80.32
38.0	4.42	137.86	25.45	163.31	71.67	10.18	81.85
39.0	4.54	140.45	25.45	165.90	72.84	10.18	83.02
40.0	4.65	143.56	25.45	169.01	74.24	10.18	84.42
41.0	4.77	146.67	25.45	172.12	75.64	10.18	85.82
42.0	4.89	149.78	25.45	175.23	77.04	10.18	87.22
43.0	5.00	152.89	25.45	178.34	78.44	10.18	88.62
44.0	5.12	156.00	25.45	181.45	79.84	10.18	90.02
45.0	5.24	159.11	25.45	184.56	81.24	10.18	91.42
46.0	5.35	162.22	25.45	187.67	82.64	10.18	92.82
47.0	5.47	165.33	25.45	190.78	84.04	10.18	94.22
48.0	5.59	168.44	25.45	193.89	85.44	10.18	95.62
49.0	5.70	171.55	25.45	197.00	86.84	10.18	97.02
50.0	5.82	174.66	25.45	200.11	88.24	10.18	98.42
51.0	5.93	177.77	25.45	203.22	89.64	10.18	99.82
52.0	6.05	180.88	25.45	206.34	91.04	10.18	101.22
53.0	6.17	184.00	25.45	209.45	92.44	10.18	102.62
54.0	6.28	187.11	25.45	212.56	93.84	10.18	104.02
55.0	6.40	190.22	25.45	215.67	95.24	10.18	105.42
56.0	6.52	193.33	25.45	218.78	96.64	10.18	106.82
57.0	6.63	196.44	25.45	221.89	98.04	10.18	108.22
58.0	6.75	199.55	25.45	225.00	99.43	10.18	109.61
59.0	6.87	202.66	25.45	228.11	100.83	10.18	111.01
60.0	6.98	205.77	25.45	231.22	102.23	10.18	112.41

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.5855E-01	0.3522E-04	0.8377E-03	0.1000E-04
0.2928E+00	0.1761E-03	0.4189E-02	0.5000E-04
0.5855E+00	0.3522E-03	0.8377E-02	0.1000E-03
0.2968E+02	0.1774E-01	0.4189E+00	0.5000E-02
0.4452E+02	0.2661E-01	0.6283E+00	0.7500E-02
0.5880E+02	0.3542E-01	0.8377E+00	0.1000E-01
0.1187E+03	0.7998E-01	0.2094E+01	0.2500E-01
0.1621E+03	0.1279E+00	0.4189E+01	0.5000E-01
0.1840E+03	0.1661E+00	0.6283E+01	0.7500E-01
0.1936E+03	0.1962E+00	0.8377E+01	0.1000E+00
0.2077E+03	0.3557E+00	0.1455E+02	0.2500E+00
0.2027E+03	0.6046E+00	0.2026E+02	0.5000E+00
0.2046E+03	0.7313E+00	0.2220E+02	0.6250E+00
0.2055E+03	0.8885E+00	0.2323E+02	0.7812E+00
0.2068E+03	0.1308E+01	0.2469E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.9803E-01	0.5018E-04	0.1251E-02	0.1000E-04
0.4901E+00	0.2509E-03	0.6257E-02	0.5000E-04
0.9803E+00	0.5018E-03	0.1251E-01	0.1000E-03
0.4997E+02	0.2539E-01	0.6257E+00	0.5000E-02
0.7390E+02	0.3797E-01	0.9385E+00	0.7500E-02
0.9405E+02	0.4978E-01	0.1251E+01	0.1000E-01
0.1659E+03	0.1033E+00	0.3128E+01	0.2500E-01
0.1976E+03	0.1467E+00	0.6257E+01	0.5000E-01
0.2087E+03	0.1787E+00	0.9385E+01	0.7500E-01
0.2164E+03	0.2090E+00	0.1251E+02	0.1000E+00
0.2236E+03	0.3658E+00	0.1932E+02	0.2500E+00
0.2189E+03	0.6142E+00	0.2337E+02	0.5000E+00
0.2201E+03	0.7402E+00	0.2454E+02	0.6250E+00

0.2206E+03	0.8969E+00	0.2504E+02	0.7812E+00
0.2208E+03	0.1316E+01	0.2532E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.2943E-01	0.2328E-04	0.4242E-03	0.1000E-04
0.1472E+00	0.1164E-03	0.2121E-02	0.5000E-04
0.2943E+00	0.2328E-03	0.4242E-02	0.1000E-03
0.1484E+02	0.1168E-01	0.2121E+00	0.5000E-02
0.2226E+02	0.1752E-01	0.3181E+00	0.7500E-02
0.2968E+02	0.2336E-01	0.4242E+00	0.1000E-01
0.6975E+02	0.5705E-01	0.1060E+01	0.2500E-01
0.1178E+03	0.1057E+00	0.2121E+01	0.5000E-01
0.1477E+03	0.1462E+00	0.3181E+01	0.7500E-01
0.1660E+03	0.1805E+00	0.4242E+01	0.1000E+00
0.1914E+03	0.3455E+00	0.9777E+01	0.2500E+00
0.1865E+03	0.5950E+00	0.1716E+02	0.5000E+00
0.1891E+03	0.7224E+00	0.1986E+02	0.6250E+00
0.1905E+03	0.8800E+00	0.2139E+02	0.7812E+00
0.1926E+03	0.1301E+01	0.2392E+02	0.1200E+01

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

                 SHAFT for Windows, Version 2017.8.11

                  Serial Number :  235486655

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
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                      All Rights Reserved

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


     Path to file locations      : X:\City of East Palo Alto\28645626 101-
University\440_Materials\Analysis\Shaft\20220224\
     Name of input data file     : UnivPOC_Abut5_24-inch_CIDH_liq_resettle..sf8d
     Name of output file         : UnivPOC_Abut5_24-inch_CIDH_liq_resettle..sf8o
     Name of plot output file    : UnivPOC_Abut5_24-inch_CIDH_liq_resettle..sf8p
     Name of runtime file        : UnivPOC_Abut5_24-inch_CIDH_liq_resettle..sf8r


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

          Date:  March 15, 2022     Time:  09:24:52

     Univ POC Abut 5 24-inch CIDH


     PROPOSED DEPTH =      60.0 FT
     ----------------


     NUMBER OF LAYERS =    6
     ------------------


     WATER TABLE DEPTH =      17.5 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.120E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.107E+01  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.180E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.100E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00


     LAYER NO  2----CLAY

       AT THE TOP

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.100E+02


       AT THE BOTTOM

       STRENGTH REDUCTION FACTOR-ALPHA                  = 0.550E+00  (*)
       END BEARING COEFFICIENT-Nc                       = 0.900E+01  (*)
       UNDRAINED SHEAR STRENGTH, LB/SQ FT               = 0.150E+04
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.000E+00
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.220E+02


       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.550E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.500E+00


     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.809E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.220E+02

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                  = 0.710E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                    = 0.300E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 0.140E+02
       SOIL UNIT WEIGHT, LB/CU FT                       = 0.120E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 0.100E+11
       DEPTH, FT                                        = 0.300E+02

       LRFD RESISTANCE FACTOR (SIDE FRICTION)           = 0.450E+00
       LRFD RESISTANCE FACTOR (TIP RESISTANCE)          = 0.400E+00
```

```
LAYER NO  4----SAND

  AT THE TOP

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                    = 0.761E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                      = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.300E+02

  AT THE BOTTOM

  SIDE FRICTION PROCEDURE, BETA METHOD
  SKIN FRICTION COEFFICIENT- BETA                    = 0.713E+00  (*)
  INTERNAL FRICTION ANGLE, DEG.                      = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.390E+02
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.128E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.340E+02

  LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.400E+00


LAYER NO  5----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.340E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.150E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.390E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.400E+00


LAYER NO  6----CLAY

  AT THE TOP

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.390E+02


  AT THE BOTTOM

  STRENGTH REDUCTION FACTOR-ALPHA                    = 0.550E+00  (*)
  END BEARING COEFFICIENT-Nc                         = 0.900E+01  (*)
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                 = 0.180E+04
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 0.000E+00
  SOIL UNIT WEIGHT, LB/CU FT                         = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 0.100E+11
  DEPTH, FT                                          = 0.120E+03


  LRFD RESISTANCE FACTOR (SIDE FRICTION)             = 0.450E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)            = 0.400E+00



(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS


INPUT DRILLED SHAFT INFORMATION
------------------------------

 MINIMUM SHAFT DIAMETER    =    2.000  FT.
 MAXIMUM SHAFT DIAMETER    =    2.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 0.350E+07 LB/SQ IN




COMPUTATION RESULTS
-------------------



- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1



DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    2.000  FT.
 DIAMETER OF BASE          =    2.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    4.524  SQ.IN.
```

ELASTIC MODULUS, Ec = 0.350E+07 LB/SQ IN
VOLUME OF UNDERREAM = 0.000 CU.YDS.
SHAFT LENGTH = 60.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
1.0	0.12	0.23	7.03	7.26	0.10	2.81	2.91
2.0	0.23	0.90	8.73	9.63	0.41	3.49	3.90
3.0	0.35	2.04	10.42	12.46	0.92	4.17	5.09
4.0	0.47	3.62	12.12	15.74	1.63	4.85	6.48
5.0	0.58	5.65	13.82	19.47	2.54	5.53	8.07
6.0	0.70	8.08	15.51	23.59	3.63	6.21	9.84
7.0	0.81	10.88	18.12	29.00	4.90	7.25	12.14
8.0	0.93	14.04	20.30	34.34	6.32	8.12	14.44
9.0	1.05	17.55	21.21	38.76	7.90	8.48	16.38
10.0	1.16	21.39	21.21	42.60	9.63	10.60	20.23
11.0	1.28	23.99	21.21	45.19	11.05	10.60	21.66
12.0	1.40	26.58	21.21	47.79	12.48	10.60	23.08
13.0	1.51	29.17	21.21	50.38	13.90	10.60	24.51
14.0	1.63	31.76	21.21	52.97	15.33	10.60	25.93
15.0	1.75	34.35	21.21	55.56	16.76	10.60	27.36
16.0	1.86	36.95	21.21	58.15	18.18	10.60	28.79
17.0	1.98	39.54	21.21	60.75	19.61	10.60	30.21
18.0	2.09	42.13	21.21	63.34	21.03	10.60	31.64
19.0	2.21	44.72	23.06	67.78	22.46	11.53	33.99
20.0	2.33	47.31	25.28	72.60	23.88	12.64	36.52
21.0	2.44	49.91	26.39	76.30	25.31	13.20	38.51
22.0	2.56	52.50	26.39	78.89	26.74	10.56	37.29
23.0	2.68	58.39	26.39	84.78	29.39	10.56	39.94
24.0	2.79	64.33	26.39	90.72	32.06	10.56	42.62
25.0	2.91	70.31	26.39	96.70	34.75	10.56	45.31
26.0	3.03	76.33	26.39	102.72	37.46	10.56	48.02
27.0	3.14	82.39	43.22	125.61	40.19	17.29	57.48
28.0	3.26	88.48	63.42	151.91	42.93	25.37	68.30
29.0	3.37	94.61	73.52	168.13	45.68	29.41	75.09
30.0	3.49	100.76	73.52	174.29	48.45	29.41	77.86
31.0	3.61	107.38	54.84	162.22	51.43	21.94	73.37
32.0	3.72	114.04	32.42	146.46	54.43	12.97	67.40
33.0	3.84	120.74	21.21	141.95	57.45	8.48	65.93
34.0	3.96	127.49	21.21	148.70	60.48	8.48	68.96
35.0	4.07	130.08	21.21	151.29	61.65	8.48	70.13
36.0	4.19	132.67	22.72	155.39	62.81	9.09	71.90
37.0	4.31	135.26	24.54	159.80	63.98	9.82	73.80
38.0	4.42	137.86	25.45	163.31	65.15	10.18	75.33
39.0	4.54	140.45	25.45	165.90	66.31	10.18	76.49
40.0	4.65	143.56	25.45	169.01	67.71	10.18	77.89
41.0	4.77	146.67	25.45	172.12	69.11	10.18	79.29
42.0	4.89	149.78	25.45	175.23	70.51	10.18	80.69
43.0	5.00	152.89	25.45	178.34	71.91	10.18	82.09
44.0	5.12	156.00	25.45	181.45	73.31	10.18	83.49
45.0	5.24	159.11	25.45	184.56	74.71	10.18	84.89
46.0	5.35	162.22	25.45	187.67	76.11	10.18	86.29
47.0	5.47	165.33	25.45	190.78	77.51	10.18	87.69
48.0	5.59	168.44	25.45	193.89	78.91	10.18	89.09
49.0	5.70	171.55	25.45	197.00	80.31	10.18	90.49
50.0	5.82	174.66	25.45	200.11	81.71	10.18	91.89
51.0	5.93	177.77	25.45	203.22	83.11	10.18	93.29
52.0	6.05	180.88	25.45	206.34	84.51	10.18	94.69
53.0	6.17	184.00	25.45	209.45	85.91	10.18	96.09
54.0	6.28	187.11	25.45	212.56	87.31	10.18	97.49
55.0	6.40	190.22	25.45	215.67	88.71	10.18	98.89
56.0	6.52	193.33	25.45	218.78	90.11	10.18	100.29
57.0	6.63	196.44	25.45	221.89	91.51	10.18	101.69
58.0	6.75	199.55	25.45	225.00	92.91	10.18	103.09
59.0	6.87	202.66	25.45	228.11	94.31	10.18	104.49
60.0	6.98	205.77	25.45	231.22	95.71	10.18	105.89

AXIAL LOAD VS SETTLEMENT CURVES

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.5855E-01	0.3522E-04	0.8377E-03	0.1000E-04
0.2928E+00	0.1761E-03	0.4189E-02	0.5000E-04
0.5855E+00	0.3522E-03	0.8377E-02	0.1000E-03
0.2968E+02	0.1774E-01	0.4189E+00	0.5000E-02
0.4452E+02	0.2661E-01	0.6283E+00	0.7500E-02
0.5880E+02	0.3542E-01	0.8377E+00	0.1000E-01
0.1187E+03	0.7998E-01	0.2094E+01	0.2500E-01
0.1621E+03	0.1279E+00	0.4189E+01	0.5000E-01
0.1840E+03	0.1661E+00	0.6283E+01	0.7500E-01
0.1936E+03	0.1962E+00	0.8377E+01	0.1000E+00
0.2077E+03	0.3557E+00	0.1455E+02	0.2500E+00
0.2027E+03	0.6046E+00	0.2026E+02	0.5000E+00
0.2046E+03	0.7313E+00	0.2220E+02	0.6250E+00
0.2055E+03	0.8885E+00	0.2323E+02	0.7812E+00
0.2068E+03	0.1308E+01	0.2469E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.9803E-01	0.5018E-04	0.1251E-02	0.1000E-04
0.4901E+00	0.2509E-03	0.6257E-02	0.5000E-04
0.9803E+00	0.5018E-03	0.1251E-01	0.1000E-03
0.4997E+02	0.2539E-01	0.6257E+00	0.5000E-02
0.7390E+02	0.3797E-01	0.9385E+00	0.7500E-02
0.9405E+02	0.4978E-01	0.1251E+01	0.1000E-01
0.1659E+03	0.1033E+00	0.3128E+01	0.2500E-01
0.1976E+03	0.1467E+00	0.6257E+01	0.5000E-01
0.2087E+03	0.1787E+00	0.9385E+01	0.7500E-01
0.2164E+03	0.2090E+00	0.1251E+02	0.1000E+00
0.2236E+03	0.3658E+00	0.1932E+02	0.2500E+00
0.2189E+03	0.6142E+00	0.2337E+02	0.5000E+00
0.2201E+03	0.7402E+00	0.2454E+02	0.6250E+00

0.2206E+03	0.8969E+00	0.2504E+02	0.7812E+00
0.2208E+03	0.1316E+01	0.2532E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD TON	TOP MOVEMENT IN.	TIP LOAD TON	TIP MOVEMENT IN.
0.2943E-01	0.2328E-04	0.4242E-03	0.1000E-04
0.1472E+00	0.1164E-03	0.2121E-02	0.5000E-04
0.2943E+00	0.2328E-03	0.4242E-02	0.1000E-03
0.1484E+02	0.1168E-01	0.2121E+00	0.5000E-02
0.2226E+02	0.1752E-01	0.3181E+00	0.7500E-02
0.2968E+02	0.2336E-01	0.4242E+00	0.1000E-01
0.6975E+02	0.5705E-01	0.1060E+01	0.2500E-01
0.1178E+03	0.1057E+00	0.2121E+01	0.5000E-01
0.1477E+03	0.1462E+00	0.3181E+01	0.7500E-01
0.1660E+03	0.1805E+00	0.4242E+01	0.1000E+00
0.1914E+03	0.3455E+00	0.9777E+01	0.2500E+00
0.1865E+03	0.5950E+00	0.1716E+02	0.5000E+00
0.1891E+03	0.7224E+00	0.1986E+02	0.6250E+00
0.1905E+03	0.8800E+00	0.2139E+02	0.7812E+00
0.1926E+03	0.1301E+01	0.2392E+02	0.1200E+01

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TZPILE for Windows, Version 2021.4.1

Serial Number : 235486586

A Program for Computing Load Vs Settlement
For an Axially Loaded Pile

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This program is licensed to :

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TZPILE Global, Global License

Path to file locations : X:\City of East Palo Alto\28645626 101-University\440_Materials\Analysis\TZPile\20211021\20220221\
Name of input data file : Bent2_4_96CIDH_80ft.tz4d
Name of output file : Bent2_4_96CIDH_80ft.tz4o
Name of plot output file : Bent2_4_96CIDH_80ft.tz4p

Time and Date of Analysis

Date: March 15, 2022 Time: 14:08:25

101 University POC - Bent 2, 4 96-in CIDH

AXIALLY LOADED PILE, CONSTANT OD

LAYER	SOIL TYPE	XTOP IN.	XBOT IN.
1	Drilled Shaft in Clay	0.000E+00	1.800E+01
2	Drilled Shaft in Clay	1.800E+01	7.200E+01
3	Drilled Shaft in Sand	7.200E+01	1.680E+02
4	Drilled Shaft in Sand	1.680E+02	2.160E+02
5	Drilled Shaft in Clay	2.160E+02	2.760E+02
6	Drilled Shaft in Clay	2.760E+02	1.080E+03

XG1 IN.	GAM1 LB/IN**3
0.000E+00	6.900E-02
1.800E+01	6.900E-02
1.800E+01	3.300E-02
7.200E+01	3.300E-02
7.200E+01	3.300E-02
1.680E+02	3.300E-02
1.680E+02	3.800E-02
2.160E+02	3.800E-02
2.160E+02	3.600E-02
2.760E+02	3.600E-02
2.760E+02	3.600E-02
1.080E+03	3.600E-02

XSTR IN.	C1 LB/IN**2	EE50	PHI1 DEG.	BLOW COUNT	UNIT SIDE LB/IN**2	UNIT TIP LB/IN**2
0.000E+00	1.042E+01	5.000E-03	0.000E+00	0.000E+00	5.700E+00	9.400E+01
1.800E+01	1.042E+01	5.000E-03	0.000E+00	0.000E+00	5.700E+00	9.400E+01
1.800E+01	1.042E+01	5.000E-03	0.000E+00	0.000E+00	5.700E+00	9.400E+01
7.200E+01	1.042E+01	5.000E-03	0.000E+00	0.000E+00	5.700E+00	9.400E+01
7.200E+01	0.000E+00	0.000E+00	3.000E+01	0.000E+00	1.470E+01	6.000E+01
1.680E+02	0.000E+00	0.000E+00	3.000E+01	0.000E+00	1.470E+01	6.000E+01
1.680E+02	0.000E+00	0.000E+00	3.600E+01	0.000E+00	1.540E+01	1.700E+02
2.160E+02	0.000E+00	0.000E+00	3.600E+01	0.000E+00	1.540E+01	1.700E+02
2.160E+02	1.040E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	6.200E+01
2.760E+02	1.040E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	6.200E+01
2.760E+02	1.250E+01	5.000E-03	0.000E+00	0.000E+00	7.000E+00	7.500E+01
1.080E+03	1.250E+01	5.000E-03	0.000E+00	0.000E+00	7.000E+00	7.500E+01

DEPTH IN.	AE PILE LBS
0.0000E+00	4.7381E+09
9.6000E+02	4.7381E+09

PILE LENGTH IN.	HEAD COORD. IN.	OUTER DIAMETER IN.	TOLERANCE IN.
9.6000E+02	0.0000E+00	9.6000E+01	1.0000E-05

INTERNALLY GENERATED T-Z CURVES

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE, IN.	LOAD TRANSFER TRANSFER, PSI	PILE MOVEMENT, IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
2	10	0.4500E+01		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
3	10	0.9000E+01		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
4	10	0.1349E+02		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
5	10	0.1799E+02		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01

			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
6	10	0.1800E+02		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
7	10	0.3150E+02		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
8	10	0.4500E+02		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
9	10	0.5849E+02		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
10	10	0.7199E+02		
			0.0000E+00	0.0000E+00
			2.9070E+00	9.6000E-02
			4.1040E+00	1.9200E-01
			5.1300E+00	2.8800E-01
			5.2725E+00	4.8000E-01
			5.3865E+00	5.7600E-01
			5.4435E+00	7.6800E-01
			5.2725E+00	1.1520E+00
			5.1300E+00	1.5360E+00
			4.7595E+00	9.6000E+00
11	10	0.7200E+02		
			0.0000E+00	0.0000E+00
			4.9245E+00	9.6000E-02
			8.5260E+00	1.9200E-01
			1.0584E+01	2.8800E-01
			1.2642E+01	4.8000E-01
			1.3377E+01	5.7600E-01
			1.3965E+01	7.6800E-01
			1.4185E+01	1.1520E+00
			1.4112E+01	1.5360E+00
			1.3965E+01	9.6000E+00
12	10	0.9600E+02		
			0.0000E+00	0.0000E+00
			4.9245E+00	9.6000E-02
			8.5260E+00	1.9200E-01
			1.0584E+01	2.8800E-01
			1.2642E+01	4.8000E-01
			1.3377E+01	5.7600E-01
			1.3965E+01	7.6800E-01
			1.4185E+01	1.1520E+00
			1.4112E+01	1.5360E+00
			1.3965E+01	9.6000E+00
13	10	0.1200E+03		
			0.0000E+00	0.0000E+00
			4.9245E+00	9.6000E-02
			8.5260E+00	1.9200E-01
			1.0584E+01	2.8800E-01
			1.2642E+01	4.8000E-01
			1.3377E+01	5.7600E-01
			1.3965E+01	7.6800E-01
			1.4185E+01	1.1520E+00
			1.4112E+01	1.5360E+00
			1.3965E+01	9.6000E+00
14	10	0.1440E+03		
			0.0000E+00	0.0000E+00
			4.9245E+00	9.6000E-02
			8.5260E+00	1.9200E-01
			1.0584E+01	2.8800E-01
			1.2642E+01	4.8000E-01
			1.3377E+01	5.7600E-01
			1.3965E+01	7.6800E-01
			1.4185E+01	1.1520E+00
			1.4112E+01	1.5360E+00
			1.3965E+01	9.6000E+00
15	10	0.1680E+03		
			0.0000E+00	0.0000E+00
			4.9245E+00	9.6000E-02
			8.5260E+00	1.9200E-01
			1.0584E+01	2.8800E-01
			1.2642E+01	4.8000E-01
			1.3377E+01	5.7600E-01
			1.3965E+01	7.6800E-01
			1.4185E+01	1.1520E+00
			1.4112E+01	1.5360E+00
			1.3965E+01	9.6000E+00
16	10	0.1680E+03		
			0.0000E+00	0.0000E+00
			5.1590E+00	9.6000E-02
			8.9320E+00	1.9200E-01
			1.1088E+01	2.8800E-01
			1.3244E+01	4.8000E-01
			1.4014E+01	5.7600E-01
			1.4630E+01	7.6800E-01
			1.4861E+01	1.1520E+00
			1.4784E+01	1.5360E+00
			1.4630E+01	9.6000E+00
17	10	0.1800E+03		
			0.0000E+00	0.0000E+00
			5.1590E+00	9.6000E-02
			8.9320E+00	1.9200E-01
			1.1088E+01	2.8800E-01
			1.3244E+01	4.8000E-01
			1.4014E+01	5.7600E-01
			1.4630E+01	7.6800E-01
			1.4861E+01	1.1520E+00
			1.4784E+01	1.5360E+00
			1.4630E+01	9.6000E+00
18	10	0.1920E+03		
			0.0000E+00	0.0000E+00
			5.1590E+00	9.6000E-02
			8.9320E+00	1.9200E-01
			1.1088E+01	2.8800E-01
			1.3244E+01	4.8000E-01
			1.4014E+01	5.7600E-01
			1.4630E+01	7.6800E-01
			1.4861E+01	1.1520E+00
			1.4784E+01	1.5360E+00
			1.4630E+01	9.6000E+00
19	10	0.2040E+03		
			0.0000E+00	0.0000E+00
			5.1590E+00	9.6000E-02
			8.9320E+00	1.9200E-01
			1.1088E+01	2.8800E-01
			1.3244E+01	4.8000E-01

			1.4014E+01	5.7600E-01
			1.4630E+01	7.6800E-01
			1.4861E+01	1.1520E+00
			1.4784E+01	1.5360E+00
			1.4630E+01	9.6000E+00
20	10	0.2160E+03		
			0.0000E+00	0.0000E+00
			5.1590E+00	9.6000E-02
			8.9320E+00	1.9200E-01
			1.1088E+01	2.8800E-01
			1.3244E+01	4.8000E-01
			1.4014E+01	5.7600E-01
			1.4630E+01	7.6800E-01
			1.4861E+01	1.1520E+00
			1.4784E+01	1.5360E+00
			1.4630E+01	9.6000E+00
21	10	0.2160E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
22	10	0.2310E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
23	10	0.2460E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
24	10	0.2610E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
25	10	0.2760E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
26	10	0.2760E+03		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00
27	10	0.4770E+03		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00
28	10	0.6780E+03		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00
29	10	0.8790E+03		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00
30	10	0.1080E+04		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00

INTERNALLY GENERATED Q-W CURVE

TIP LOAD LBS	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
2.1443E+05	4.8000E-01
3.0400E+05	9.6000E-01
3.8001E+05	1.4400E+00
4.6958E+05	2.4000E+00
4.8858E+05	2.8800E+00
5.1572E+05	3.8400E+00
5.2658E+05	4.8000E+00
5.3201E+05	6.7200E+00
5.3744E+05	9.6000E+00

USER-DEFINED TIP MOVEMENTS IN.
1.0000E-01
2.5000E-01
5.0000E-01
1.0000E+00

2.0000E+00
3.0000E+00
4.0000E+00
5.0000E+00
6.0000E+00
7.0000E+00

101 University POC - Bent 2, 4 96-in CIDH

RESULTS DUE TO TIP MOVEMENTS

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
1.0000E-01	4.4673E+04

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			4.467E+04			1.000E-01	
954.0	3.632E+00	1.315E+04		5.125E+04	1.298E-04		1.001E-01
948.0			5.782E+04			1.001E-01	
942.0	3.634E+00	1.315E+04		6.440E+04	1.631E-04		1.002E-01
936.0			7.097E+04			1.003E-01	
930.0	3.637E+00	1.316E+04		7.755E+04	1.964E-04		1.004E-01
924.0			8.414E+04			1.005E-01	
918.0	3.640E+00	1.318E+04		9.072E+04	2.298E-04		1.006E-01
912.0			9.731E+04			1.007E-01	
906.0	3.644E+00	1.319E+04		1.039E+05	2.632E-04		1.008E-01
900.0			1.105E+05			1.010E-01	
894.0	3.648E+00	1.320E+04		1.171E+05	2.966E-04		1.011E-01
888.0			1.237E+05			1.013E-01	
882.0	3.653E+00	1.322E+04		1.303E+05	3.300E-04		1.014E-01
876.0			1.369E+05			1.016E-01	
870.0	3.659E+00	1.324E+04		1.435E+05	3.636E-04		1.018E-01
864.0			1.502E+05			1.020E-01	
858.0	3.664E+00	1.326E+04		1.568E+05	3.971E-04		1.022E-01
852.0			1.634E+05			1.024E-01	
846.0	3.671E+00	1.328E+04		1.701E+05	4.307E-04		1.026E-01
840.0			1.767E+05			1.028E-01	
834.0	3.678E+00	1.331E+04		1.834E+05	4.644E-04		1.030E-01
828.0			1.900E+05			1.033E-01	
822.0	3.685E+00	1.334E+04		1.967E+05	4.982E-04		1.035E-01
816.0			2.034E+05			1.038E-01	
810.0	3.693E+00	1.336E+04		2.100E+05	5.320E-04		1.040E-01
804.0			2.167E+05			1.043E-01	
798.0	3.701E+00	1.340E+04		2.234E+05	5.659E-04		1.046E-01
792.0			2.301E+05			1.049E-01	
786.0	3.710E+00	1.343E+04		2.368E+05	5.998E-04		1.052E-01
780.0			2.435E+05			1.055E-01	
774.0	3.720E+00	1.346E+04		2.503E+05	6.339E-04		1.058E-01
768.0			2.570E+05			1.061E-01	
762.0	3.730E+00	1.350E+04		2.638E+05	6.680E-04		1.064E-01
756.0			2.705E+05			1.068E-01	
750.0	3.740E+00	1.354E+04		2.773E+05	7.022E-04		1.071E-01
744.0			2.840E+05			1.075E-01	
738.0	3.751E+00	1.358E+04		2.908E+05	7.366E-04		1.078E-01
732.0			2.976E+05			1.082E-01	
726.0	3.763E+00	1.362E+04		3.044E+05	7.710E-04		1.086E-01
720.0			3.112E+05			1.090E-01	
714.0	3.775E+00	1.366E+04		3.181E+05	8.056E-04		1.094E-01
708.0			3.249E+05			1.098E-01	
702.0	3.787E+00	1.371E+04		3.318E+05	8.402E-04		1.102E-01
696.0			3.386E+05			1.106E-01	
690.0	3.800E+00	1.375E+04		3.455E+05	8.750E-04		1.111E-01
684.0			3.524E+05			1.115E-01	
678.0	3.814E+00	1.380E+04		3.593E+05	9.099E-04		1.119E-01
672.0			3.662E+05			1.124E-01	
666.0	3.828E+00	1.386E+04		3.731E+05	9.449E-04		1.129E-01
660.0			3.800E+05			1.133E-01	
654.0	3.843E+00	1.391E+04		3.870E+05	9.801E-04		1.138E-01
648.0			3.939E+05			1.143E-01	
642.0	3.858E+00	1.396E+04		4.009E+05	1.015E-03		1.148E-01
636.0			4.079E+05			1.153E-01	
630.0	3.874E+00	1.402E+04		4.149E+05	1.051E-03		1.159E-01
624.0			4.219E+05			1.164E-01	
618.0	3.891E+00	1.408E+04		4.290E+05	1.086E-03		1.169E-01
612.0			4.360E+05			1.175E-01	
606.0	3.907E+00	1.414E+04		4.431E+05	1.122E-03		1.180E-01
600.0			4.501E+05			1.186E-01	
594.0	3.925E+00	1.420E+04		4.572E+05	1.158E-03		1.192E-01
588.0			4.643E+05			1.198E-01	
582.0	3.943E+00	1.427E+04		4.715E+05	1.194E-03		1.204E-01
576.0			4.786E+05			1.210E-01	
570.0	3.961E+00	1.434E+04		4.858E+05	1.230E-03		1.216E-01
564.0			4.929E+05			1.222E-01	
558.0	3.981E+00	1.441E+04		5.001E+05	1.267E-03		1.228E-01
552.0			5.074E+05			1.235E-01	
546.0	4.000E+00	1.448E+04		5.146E+05	1.303E-03		1.241E-01
540.0			5.218E+05			1.248E-01	
534.0	4.021E+00	1.455E+04		5.291E+05	1.340E-03		1.254E-01
528.0			5.364E+05			1.261E-01	
522.0	4.041E+00	1.463E+04		5.437E+05	1.377E-03		1.268E-01
516.0			5.510E+05			1.275E-01	
510.0	4.063E+00	1.470E+04		5.584E+05	1.414E-03		1.282E-01
504.0			5.657E+05			1.289E-01	
498.0	4.085E+00	1.478E+04		5.731E+05	1.451E-03		1.296E-01
492.0			5.805E+05			1.303E-01	
486.0	4.107E+00	1.486E+04		5.879E+05	1.489E-03		1.311E-01
480.0			5.954E+05			1.318E-01	
474.0	4.130E+00	1.495E+04		6.028E+05	1.527E-03		1.326E-01
468.0			6.103E+05			1.334E-01	
462.0	4.154E+00	1.503E+04		6.178E+05	1.565E-03		1.341E-01
456.0			6.253E+05			1.349E-01	
450.0	4.178E+00	1.512E+04		6.329E+05	1.603E-03		1.357E-01
444.0			6.405E+05			1.365E-01	
438.0	4.203E+00	1.521E+04		6.481E+05	1.641E-03		1.373E-01
432.0			6.557E+05			1.382E-01	
426.0	4.228E+00	1.530E+04		6.633E+05	1.680E-03		1.390E-01
420.0			6.710E+05			1.398E-01	
414.0	4.254E+00	1.540E+04		6.787E+05	1.719E-03		1.407E-01
408.0			6.864E+05			1.416E-01	
402.0	4.281E+00	1.549E+04		6.941E+05	1.758E-03		1.424E-01
396.0			7.019E+05			1.433E-01	
390.0	4.308E+00	1.559E+04		7.097E+05	1.797E-03		1.442E-01
384.0			7.175E+05			1.451E-01	
378.0	4.336E+00	1.569E+04		7.253E+05	1.837E-03		1.460E-01
372.0			7.331E+05			1.470E-01	
366.0	4.365E+00	1.580E+04		7.410E+05	1.877E-03		1.479E-01
360.0			7.489E+05			1.488E-01	
354.0	4.394E+00	1.590E+04		7.569E+05	1.917E-03		1.498E-01
348.0			7.648E+05			1.507E-01	
342.0	4.423E+00	1.601E+04		7.728E+05	1.957E-03		1.517E-01
336.0			7.809E+05			1.527E-01	
330.0	4.454E+00	1.612E+04		7.889E+05	1.998E-03		1.537E-01
324.0			7.970E+05			1.547E-01	
318.0	4.484E+00	1.623E+04		8.051E+05	2.039E-03		1.557E-01
312.0			8.132E+05			1.567E-01	
306.0	4.516E+00	1.634E+04		8.214E+05	2.080E-03		1.578E-01
300.0			8.295E+05			1.588E-01	
294.0	4.548E+00	1.646E+04		8.378E+05	2.122E-03		1.599E-01
288.0			8.460E+05			1.609E-01	
282.0	4.581E+00	1.658E+04		8.543E+05	2.164E-03		1.620E-01
276.0			8.626E+05			1.631E-01	
270.0	3.955E+00	1.431E+04		8.697E+05	2.203E-03		1.642E-01
264.0			8.769E+05			1.653E-01	
258.0	3.984E+00	1.442E+04		8.841E+05	2.239E-03		1.664E-01
252.0			8.913E+05			1.675E-01	
246.0	4.014E+00	1.453E+04		8.986E+05	2.276E-03		1.687E-01
240.0			9.058E+05			1.698E-01	
234.0	4.044E+00	1.464E+04		9.132E+05	2.313E-03		1.710E-01
228.0			9.205E+05			1.721E-01	
222.0	4.075E+00	1.475E+04		9.279E+05	2.350E-03		1.733E-01
216.0			9.352E+05			1.745E-01	
210.0	8.291E+00	3.000E+04		9.502E+05	2.407E-03		1.757E-01

204.0			9.652E+05			1.769E-01	
198.0	8.387E+00	3.035E+04		9.804E+05	2.483E-03		1.781E-01
192.0			9.956E+05			1.794E-01	
186.0	8.486E+00	3.071E+04		1.011E+06	2.560E-03		1.806E-01
180.0			1.026E+06			1.819E-01	
174.0	8.588E+00	3.108E+04		1.042E+06	2.639E-03		1.832E-01
168.0			1.057E+06			1.846E-01	
162.0	8.298E+00	3.003E+04		1.072E+06	2.716E-03		1.859E-01
156.0			1.087E+06			1.873E-01	
150.0	8.401E+00	3.041E+04		1.103E+06	2.793E-03		1.887E-01
144.0			1.118E+06			1.901E-01	
138.0	8.508E+00	3.079E+04		1.133E+06	2.870E-03		1.915E-01
132.0			1.149E+06			1.930E-01	
126.0	8.578E+00	3.104E+04		1.164E+06	2.948E-03		1.944E-01
120.0			1.180E+06			1.959E-01	
114.0	8.642E+00	3.128E+04		1.195E+06	3.027E-03		1.974E-01
108.0			1.211E+06			1.989E-01	
102.0	8.708E+00	3.151E+04		1.227E+06	3.107E-03		2.005E-01
96.0			1.242E+06			2.020E-01	
90.0	8.775E+00	3.176E+04		1.258E+06	3.187E-03		2.036E-01
84.0			1.274E+06			2.052E-01	
78.0	8.844E+00	3.201E+04		1.290E+06	3.268E-03		2.068E-01
72.0			1.306E+06			2.085E-01	
66.0	4.298E+00	1.555E+04		1.314E+06	3.328E-03		2.102E-01
60.0			1.322E+06			2.118E-01	
54.0	4.334E+00	1.568E+04		1.330E+06	3.367E-03		2.135E-01
48.0			1.337E+06			2.152E-01	
42.0	4.370E+00	1.582E+04		1.345E+06	3.407E-03		2.169E-01
36.0			1.353E+06			2.186E-01	
30.0	4.407E+00	1.595E+04		1.361E+06	3.448E-03		2.203E-01
24.0			1.369E+06			2.220E-01	
18.0	4.444E+00	1.608E+04		1.377E+06	3.488E-03		2.238E-01
12.0			1.385E+06			2.255E-01	
6.0	4.481E+00	1.622E+04		1.393E+06	3.529E-03		2.273E-01
0.0			1.402E+06			2.291E-01	

APPLIED TIP MOVEMENT	TIP LOAD
IN.	LBS
2.5000E-01	1.1168E+05

DEPTH	LOAD TRANSFER	LOAD INCR	TOTAL LOAD	AVG LOAD	DEFORM OF INCR	TOTAL MVMNT	AVG MVMNT
IN.	PSI	LBS	LBS	LBS	IN.	IN.	IN.
960.0			1.117E+05			2.500E-01	
954.0	5.803E+00	2.100E+04		1.222E+05	3.095E-04		2.501E-01
948.0			1.327E+05			2.503E-01	
942.0	5.808E+00	2.102E+04		1.432E+05	3.627E-04		2.505E-01
936.0			1.537E+05			2.507E-01	
930.0	5.813E+00	2.104E+04		1.642E+05	4.159E-04		2.509E-01
924.0			1.747E+05			2.511E-01	
918.0	5.819E+00	2.106E+04		1.853E+05	4.692E-04		2.513E-01
912.0			1.958E+05			2.516E-01	
906.0	5.825E+00	2.108E+04		2.063E+05	5.226E-04		2.518E-01
900.0			2.169E+05			2.521E-01	
894.0	5.832E+00	2.111E+04		2.274E+05	5.760E-04		2.524E-01
888.0			2.380E+05			2.527E-01	
882.0	5.840E+00	2.114E+04		2.486E+05	6.295E-04		2.530E-01
876.0			2.591E+05			2.533E-01	
870.0	5.849E+00	2.117E+04		2.697E+05	6.831E-04		2.536E-01
864.0			2.803E+05			2.540E-01	
858.0	5.858E+00	2.120E+04		2.909E+05	7.367E-04		2.543E-01
852.0			3.015E+05			2.547E-01	
846.0	5.868E+00	2.124E+04		3.121E+05	7.905E-04		2.551E-01
840.0			3.227E+05			2.555E-01	
834.0	5.879E+00	2.128E+04		3.334E+05	8.443E-04		2.559E-01
828.0			3.440E+05			2.563E-01	
822.0	5.890E+00	2.132E+04		3.547E+05	8.983E-04		2.568E-01
816.0			3.653E+05			2.572E-01	
810.0	5.902E+00	2.136E+04		3.760E+05	9.523E-04		2.577E-01
804.0			3.867E+05			2.582E-01	
798.0	5.915E+00	2.141E+04		3.974E+05	1.006E-03		2.587E-01
792.0			4.081E+05			2.592E-01	
786.0	5.929E+00	2.146E+04		4.188E+05	1.061E-03		2.597E-01
780.0			4.296E+05			2.603E-01	
774.0	5.943E+00	2.151E+04		4.403E+05	1.115E-03		2.608E-01
768.0			4.511E+05			2.614E-01	
762.0	5.958E+00	2.156E+04		4.618E+05	1.170E-03		2.620E-01
756.0			4.726E+05			2.625E-01	
750.0	5.974E+00	2.162E+04		4.834E+05	1.224E-03		2.631E-01
744.0			4.942E+05			2.638E-01	
738.0	5.990E+00	2.168E+04		5.051E+05	1.279E-03		2.644E-01
732.0			5.159E+05			2.650E-01	
726.0	6.007E+00	2.174E+04		5.268E+05	1.334E-03		2.657E-01
720.0			5.377E+05			2.664E-01	
714.0	6.025E+00	2.181E+04		5.486E+05	1.389E-03		2.671E-01
708.0			5.595E+05			2.678E-01	
702.0	6.044E+00	2.187E+04		5.704E+05	1.445E-03		2.685E-01
696.0			5.813E+05			2.692E-01	
690.0	6.063E+00	2.194E+04		5.923E+05	1.500E-03		2.700E-01
684.0			6.033E+05			2.707E-01	
678.0	6.083E+00	2.202E+04		6.143E+05	1.556E-03		2.715E-01
672.0			6.253E+05			2.723E-01	
666.0	6.104E+00	2.209E+04		6.363E+05	1.612E-03		2.731E-01
660.0			6.474E+05			2.739E-01	
654.0	6.126E+00	2.217E+04		6.585E+05	1.668E-03		2.747E-01
648.0			6.696E+05			2.755E-01	
642.0	6.148E+00	2.225E+04		6.807E+05	1.724E-03		2.764E-01
636.0			6.918E+05			2.773E-01	
630.0	6.171E+00	2.233E+04		7.030E+05	1.780E-03		2.782E-01
624.0			7.141E+05			2.791E-01	
618.0	6.195E+00	2.242E+04		7.254E+05	1.837E-03		2.800E-01
612.0			7.366E+05			2.809E-01	
606.0	6.219E+00	2.251E+04		7.478E+05	1.894E-03		2.818E-01
600.0			7.591E+05			2.828E-01	
594.0	6.244E+00	2.260E+04		7.704E+05	1.951E-03		2.838E-01
588.0			7.817E+05			2.847E-01	
582.0	6.270E+00	2.269E+04		7.930E+05	2.008E-03		2.857E-01
576.0			8.044E+05			2.867E-01	
570.0	6.297E+00	2.279E+04		8.158E+05	2.066E-03		2.878E-01
564.0			8.272E+05			2.888E-01	
558.0	6.302E+00	2.281E+04		8.386E+05	2.124E-03		2.899E-01
552.0			8.500E+05			2.909E-01	
546.0	6.304E+00	2.281E+04		8.614E+05	2.182E-03		2.920E-01
540.0			8.728E+05			2.931E-01	
534.0	6.306E+00	2.282E+04		8.842E+05	2.239E-03		2.942E-01
528.0			8.956E+05			2.954E-01	
522.0	6.308E+00	2.283E+04		9.070E+05	2.297E-03		2.965E-01
516.0			9.184E+05			2.977E-01	
510.0	6.310E+00	2.284E+04		9.298E+05	2.355E-03		2.988E-01
504.0			9.413E+05			3.000E-01	
498.0	6.312E+00	2.284E+04		9.527E+05	2.413E-03		3.012E-01
492.0			9.641E+05			3.024E-01	
486.0	6.314E+00	2.285E+04		9.755E+05	2.471E-03		3.036E-01
480.0			9.870E+05			3.049E-01	
474.0	6.317E+00	2.286E+04		9.984E+05	2.529E-03		3.061E-01
468.0			1.010E+06			3.074E-01	
462.0	6.319E+00	2.287E+04		1.021E+06	2.586E-03		3.087E-01
456.0			1.033E+06			3.100E-01	
450.0	6.321E+00	2.288E+04		1.044E+06	2.644E-03		3.113E-01
444.0			1.056E+06			3.127E-01	
438.0	6.324E+00	2.289E+04		1.067E+06	2.702E-03		3.140E-01
432.0			1.078E+06			3.154E-01	
426.0	6.326E+00	2.290E+04		1.090E+06	2.760E-03		3.167E-01
420.0			1.101E+06			3.181E-01	
414.0	6.329E+00	2.290E+04		1.113E+06	2.818E-03		3.195E-01
408.0			1.124E+06			3.209E-01	
402.0	6.331E+00	2.291E+04		1.136E+06	2.876E-03		3.224E-01
396.0			1.147E+06			3.238E-01	
390.0	6.334E+00	2.292E+04		1.159E+06	2.934E-03		3.253E-01
384.0			1.170E+06			3.267E-01	
378.0	6.337E+00	2.293E+04		1.182E+06	2.992E-03		3.282E-01
372.0			1.193E+06			3.297E-01	
366.0	6.339E+00	2.294E+04		1.204E+06	3.051E-03		3.313E-01
360.0			1.216E+06			3.328E-01	
354.0	6.342E+00	2.295E+04		1.227E+06	3.109E-03		3.343E-01
348.0			1.239E+06			3.359E-01	
342.0	6.345E+00	2.296E+04		1.250E+06	3.167E-03		3.375E-01
336.0			1.262E+06			3.391E-01	

330.0	6.348E+00	2.297E+04		1.273E+06	3.225E-03		3.407E-01
324.0			1.285E+06			3.423E-01	
318.0	6.351E+00	2.298E+04		1.296E+06	3.283E-03		3.439E-01
312.0			1.308E+06			3.456E-01	
306.0	6.354E+00	2.300E+04		1.319E+06	3.341E-03		3.472E-01
300.0			1.331E+06			3.489E-01	
294.0	6.357E+00	2.301E+04		1.342E+06	3.400E-03		3.506E-01
288.0			1.354E+06			3.523E-01	
282.0	6.360E+00	2.302E+04		1.365E+06	3.458E-03		3.540E-01
276.0			1.377E+06			3.558E-01	
270.0	5.454E+00	1.974E+04		1.387E+06	3.512E-03		3.575E-01
264.0			1.397E+06			3.593E-01	
258.0	5.457E+00	1.975E+04		1.406E+06	3.562E-03		3.611E-01
252.0			1.416E+06			3.628E-01	
246.0	5.460E+00	1.976E+04		1.426E+06	3.612E-03		3.646E-01
240.0			1.436E+06			3.665E-01	
234.0	5.463E+00	1.977E+04		1.446E+06	3.662E-03		3.683E-01
228.0			1.456E+06			3.701E-01	
222.0	5.466E+00	1.978E+04		1.466E+06	3.712E-03		3.720E-01
216.0			1.476E+06			3.738E-01	
210.0	1.207E+01	4.369E+04		1.498E+06	3.793E-03		3.757E-01
204.0			1.519E+06			3.776E-01	
198.0	1.212E+01	4.385E+04		1.541E+06	3.904E-03		3.796E-01
192.0			1.563E+06			3.815E-01	
186.0	1.216E+01	4.401E+04		1.585E+06	4.015E-03		3.835E-01
180.0			1.607E+06			3.855E-01	
174.0	1.221E+01	4.418E+04		1.629E+06	4.126E-03		3.876E-01
168.0			1.651E+06			3.897E-01	
162.0	1.170E+01	4.233E+04		1.673E+06	4.236E-03		3.918E-01
156.0			1.694E+06			3.939E-01	
150.0	1.174E+01	4.250E+04		1.715E+06	4.343E-03		3.961E-01
144.0			1.736E+06			3.982E-01	
138.0	1.179E+01	4.267E+04		1.758E+06	4.451E-03		4.005E-01
132.0			1.779E+06			4.027E-01	
126.0	1.184E+01	4.284E+04		1.800E+06	4.560E-03		4.050E-01
120.0			1.822E+06			4.073E-01	
114.0	1.189E+01	4.302E+04		1.843E+06	4.668E-03		4.096E-01
108.0			1.865E+06			4.119E-01	
102.0	1.194E+01	4.320E+04		1.886E+06	4.778E-03		4.143E-01
96.0			1.908E+06			4.167E-01	
90.0	1.199E+01	4.339E+04		1.930E+06	4.887E-03		4.191E-01
84.0			1.951E+06			4.216E-01	
78.0	1.204E+01	4.358E+04		1.973E+06	4.997E-03		4.241E-01
72.0			1.995E+06			4.266E-01	
66.0	5.235E+00	1.895E+04		2.004E+06	5.076E-03		4.291E-01
60.0			2.014E+06			4.317E-01	
54.0	5.239E+00	1.896E+04		2.023E+06	5.124E-03		4.342E-01
48.0			2.033E+06			4.368E-01	
42.0	5.242E+00	1.897E+04		2.042E+06	5.173E-03		4.394E-01
36.0			2.052E+06			4.420E-01	
30.0	5.246E+00	1.899E+04		2.061E+06	5.221E-03		4.446E-01
24.0			2.071E+06			4.472E-01	
18.0	5.250E+00	1.900E+04		2.080E+06	5.269E-03		4.498E-01
12.0			2.090E+06			4.525E-01	
6.0	5.254E+00	1.901E+04		2.099E+06	5.317E-03		4.551E-01
0.0			2.109E+06			4.578E-01	

APPLIED TIP MOVEMENT	TIP LOAD
IN.	LBS
5.0000E-01	2.1816E+05

DEPTH	LOAD TRANSFER	LOAD INCR	TOTAL LOAD	AVG LOAD	DEFORM OF INCR	TOTAL MVMNT	AVG MVMNT
IN.	PSI	LBS	LBS	LBS	IN.	IN.	IN.
960.0			2.182E+05			5.000E-01	
954.0	6.505E+00	2.354E+04		2.299E+05	5.823E-04		5.003E-01
948.0			2.417E+05			5.006E-01	
942.0	6.505E+00	2.354E+04		2.535E+05	6.420E-04		5.009E-01
936.0			2.652E+05			5.012E-01	
930.0	6.506E+00	2.355E+04		2.770E+05	7.016E-04		5.016E-01
924.0			2.888E+05			5.019E-01	
918.0	6.508E+00	2.355E+04		3.006E+05	7.613E-04		5.023E-01
912.0			3.123E+05			5.027E-01	
906.0	6.509E+00	2.356E+04		3.241E+05	8.209E-04		5.031E-01
900.0			3.359E+05			5.035E-01	
894.0	6.510E+00	2.356E+04		3.477E+05	8.806E-04		5.039E-01
888.0			3.595E+05			5.044E-01	
882.0	6.511E+00	2.356E+04		3.712E+05	9.402E-04		5.049E-01
876.0			3.830E+05			5.053E-01	
870.0	6.513E+00	2.357E+04		3.948E+05	9.999E-04		5.058E-01
864.0			4.066E+05			5.063E-01	
858.0	6.514E+00	2.358E+04		4.184E+05	1.060E-03		5.069E-01
852.0			4.302E+05			5.074E-01	
846.0	6.516E+00	2.358E+04		4.420E+05	1.119E-03		5.079E-01
840.0			4.538E+05			5.085E-01	
834.0	6.517E+00	2.359E+04		4.655E+05	1.179E-03		5.091E-01
828.0			4.773E+05			5.097E-01	
822.0	6.519E+00	2.359E+04		4.891E+05	1.239E-03		5.103E-01
816.0			5.009E+05			5.109E-01	
810.0	6.521E+00	2.360E+04		5.127E+05	1.299E-03		5.116E-01
804.0			5.245E+05			5.122E-01	
798.0	6.523E+00	2.361E+04		5.363E+05	1.358E-03		5.129E-01
792.0			5.481E+05			5.136E-01	
786.0	6.525E+00	2.361E+04		5.600E+05	1.418E-03		5.143E-01
780.0			5.718E+05			5.150E-01	
774.0	6.527E+00	2.362E+04		5.836E+05	1.478E-03		5.157E-01
768.0			5.954E+05			5.165E-01	
762.0	6.529E+00	2.363E+04		6.072E+05	1.538E-03		5.172E-01
756.0			6.190E+05			5.180E-01	
750.0	6.532E+00	2.364E+04		6.308E+05	1.598E-03		5.188E-01
744.0			6.427E+05			5.196E-01	
738.0	6.534E+00	2.365E+04		6.545E+05	1.658E-03		5.204E-01
732.0			6.663E+05			5.213E-01	
726.0	6.536E+00	2.366E+04		6.781E+05	1.717E-03		5.221E-01
720.0			6.900E+05			5.230E-01	
714.0	6.539E+00	2.367E+04		7.018E+05	1.777E-03		5.239E-01
708.0			7.136E+05			5.248E-01	
702.0	6.542E+00	2.367E+04		7.255E+05	1.837E-03		5.257E-01
696.0			7.373E+05			5.266E-01	
690.0	6.544E+00	2.368E+04		7.491E+05	1.897E-03		5.275E-01
684.0			7.610E+05			5.285E-01	
678.0	6.547E+00	2.369E+04		7.728E+05	1.957E-03		5.295E-01
672.0			7.847E+05			5.305E-01	
666.0	6.550E+00	2.371E+04		7.965E+05	2.017E-03		5.315E-01
660.0			8.084E+05			5.325E-01	
654.0	6.553E+00	2.372E+04		8.202E+05	2.077E-03		5.335E-01
648.0			8.321E+05			5.346E-01	
642.0	6.556E+00	2.373E+04		8.440E+05	2.137E-03		5.356E-01
636.0			8.558E+05			5.367E-01	
630.0	6.559E+00	2.374E+04		8.677E+05	2.198E-03		5.378E-01
624.0			8.796E+05			5.389E-01	
618.0	6.563E+00	2.375E+04		8.914E+05	2.258E-03		5.400E-01
612.0			9.033E+05			5.411E-01	
606.0	6.566E+00	2.376E+04		9.152E+05	2.318E-03		5.423E-01
600.0			9.271E+05			5.435E-01	
594.0	6.569E+00	2.378E+04		9.390E+05	2.378E-03		5.446E-01
588.0			9.509E+05			5.458E-01	
582.0	6.573E+00	2.379E+04		9.627E+05	2.438E-03		5.471E-01
576.0			9.746E+05			5.483E-01	
570.0	6.576E+00	2.380E+04		9.865E+05	2.499E-03		5.495E-01
564.0			9.984E+05			5.508E-01	
558.0	6.580E+00	2.381E+04		1.010E+06	2.559E-03		5.521E-01
552.0			1.022E+06			5.533E-01	
546.0	6.584E+00	2.383E+04		1.034E+06	2.619E-03		5.546E-01
540.0			1.046E+06			5.560E-01	
534.0	6.588E+00	2.384E+04		1.058E+06	2.680E-03		5.573E-01
528.0			1.070E+06			5.586E-01	
522.0	6.592E+00	2.386E+04		1.082E+06	2.740E-03		5.600E-01
516.0			1.094E+06			5.614E-01	
510.0	6.596E+00	2.387E+04		1.106E+06	2.800E-03		5.628E-01
504.0			1.118E+06			5.642E-01	
498.0	6.600E+00	2.389E+04		1.130E+06	2.861E-03		5.656E-01
492.0			1.142E+06			5.670E-01	
486.0	6.604E+00	2.390E+04		1.153E+06	2.921E-03		5.685E-01
480.0			1.165E+06			5.700E-01	
474.0	6.608E+00	2.392E+04		1.177E+06	2.982E-03		5.714E-01
468.0			1.189E+06			5.729E-01	
462.0	6.613E+00	2.393E+04		1.201E+06	3.043E-03		5.745E-01

456.0			1.213E+06			5.760E-01	
450.0	6.616E+00	2.394E+04		1.225E+06	3.103E-03		5.775E-01
444.0			1.237E+06			5.791E-01	
438.0	6.617E+00	2.395E+04		1.249E+06	3.164E-03		5.807E-01
432.0			1.261E+06			5.823E-01	
426.0	6.618E+00	2.395E+04		1.273E+06	3.224E-03		5.839E-01
420.0			1.285E+06			5.855E-01	
414.0	6.619E+00	2.396E+04		1.297E+06	3.285E-03		5.871E-01
408.0			1.309E+06			5.888E-01	
402.0	6.620E+00	2.396E+04		1.321E+06	3.346E-03		5.904E-01
396.0			1.333E+06			5.921E-01	
390.0	6.621E+00	2.396E+04		1.345E+06	3.407E-03		5.938E-01
384.0			1.357E+06			5.955E-01	
378.0	6.623E+00	2.397E+04		1.369E+06	3.467E-03		5.972E-01
372.0			1.381E+06			5.990E-01	
366.0	6.624E+00	2.397E+04		1.393E+06	3.528E-03		6.007E-01
360.0			1.405E+06			6.025E-01	
354.0	6.625E+00	2.398E+04		1.417E+06	3.589E-03		6.043E-01
348.0			1.429E+06			6.061E-01	
342.0	6.627E+00	2.398E+04		1.441E+06	3.649E-03		6.079E-01
336.0			1.453E+06			6.097E-01	
330.0	6.628E+00	2.399E+04		1.465E+06	3.710E-03		6.116E-01
324.0			1.477E+06			6.135E-01	
318.0	6.629E+00	2.399E+04		1.489E+06	3.771E-03		6.153E-01
312.0			1.501E+06			6.172E-01	
306.0	6.631E+00	2.400E+04		1.513E+06	3.832E-03		6.191E-01
300.0			1.525E+06			6.211E-01	
294.0	6.632E+00	2.400E+04		1.537E+06	3.892E-03		6.230E-01
288.0			1.549E+06			6.250E-01	
282.0	6.634E+00	2.401E+04		1.561E+06	3.953E-03		6.269E-01
276.0			1.573E+06			6.289E-01	
270.0	5.687E+00	2.058E+04		1.583E+06	4.010E-03		6.309E-01
264.0			1.593E+06			6.329E-01	
258.0	5.688E+00	2.059E+04		1.604E+06	4.062E-03		6.349E-01
252.0			1.614E+06			6.370E-01	
246.0	5.690E+00	2.059E+04		1.624E+06	4.114E-03		6.390E-01
240.0			1.635E+06			6.411E-01	
234.0	5.691E+00	2.060E+04		1.645E+06	4.166E-03		6.432E-01
228.0			1.655E+06			6.453E-01	
222.0	5.692E+00	2.060E+04		1.666E+06	4.218E-03		6.474E-01
216.0			1.676E+06			6.495E-01	
210.0	1.426E+01	5.160E+04		1.702E+06	4.310E-03		6.516E-01
204.0			1.727E+06			6.538E-01	
198.0	1.427E+01	5.165E+04		1.753E+06	4.440E-03		6.560E-01
192.0			1.779E+06			6.582E-01	
186.0	1.429E+01	5.170E+04		1.805E+06	4.571E-03		6.605E-01
180.0			1.831E+06			6.628E-01	
174.0	1.430E+01	5.175E+04		1.857E+06	4.702E-03		6.651E-01
168.0			1.883E+06			6.675E-01	
162.0	1.366E+01	4.945E+04		1.907E+06	4.831E-03		6.699E-01
156.0			1.932E+06			6.723E-01	
150.0	1.368E+01	4.951E+04		1.957E+06	4.956E-03		6.748E-01
144.0			1.982E+06			6.773E-01	
138.0	1.369E+01	4.956E+04		2.006E+06	5.081E-03		6.798E-01
132.0			2.031E+06			6.824E-01	
126.0	1.371E+01	4.962E+04		2.056E+06	5.207E-03		6.850E-01
120.0			2.081E+06			6.876E-01	
114.0	1.373E+01	4.968E+04		2.106E+06	5.333E-03		6.902E-01
108.0			2.130E+06			6.929E-01	
102.0	1.374E+01	4.974E+04		2.155E+06	5.459E-03		6.956E-01
96.0			2.180E+06			6.984E-01	
90.0	1.376E+01	4.980E+04		2.205E+06	5.585E-03		7.011E-01
84.0			2.230E+06			7.039E-01	
78.0	1.378E+01	4.986E+04		2.255E+06	5.711E-03		7.068E-01
72.0			2.280E+06			7.097E-01	
66.0	5.427E+00	1.964E+04		2.290E+06	5.799E-03		7.126E-01
60.0			2.299E+06			7.155E-01	
54.0	5.429E+00	1.965E+04		2.309E+06	5.849E-03		7.184E-01
48.0			2.319E+06			7.213E-01	
42.0	5.431E+00	1.965E+04		2.329E+06	5.898E-03		7.242E-01
36.0			2.339E+06			7.272E-01	
30.0	5.432E+00	1.966E+04		2.349E+06	5.948E-03		7.302E-01
24.0			2.358E+06			7.332E-01	
18.0	5.434E+00	1.967E+04		2.368E+06	5.998E-03		7.361E-01
12.0			2.378E+06			7.392E-01	
6.0	5.436E+00	1.967E+04		2.388E+06	6.048E-03		7.422E-01
0.0			2.398E+06			7.452E-01	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
1.0000E+00	3.1034E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			3.103E+05			1.000E+00	
954.0	6.558E+00	2.373E+04		3.222E+05	8.160E-04		1.000E+00
948.0			3.341E+05			1.001E+00	
942.0	6.557E+00	2.373E+04		3.459E+05	8.761E-04		1.001E+00
936.0			3.578E+05			1.002E+00	
930.0	6.557E+00	2.373E+04		3.697E+05	9.363E-04		1.002E+00
924.0			3.815E+05			1.003E+00	
918.0	6.556E+00	2.373E+04		3.934E+05	9.964E-04		1.003E+00
912.0			4.053E+05			1.004E+00	
906.0	6.556E+00	2.373E+04		4.171E+05	1.056E-03		1.004E+00
900.0			4.290E+05			1.005E+00	
894.0	6.555E+00	2.372E+04		4.409E+05	1.117E-03		1.005E+00
888.0			4.527E+05			1.006E+00	
882.0	6.555E+00	2.372E+04		4.646E+05	1.177E-03		1.006E+00
876.0			4.764E+05			1.007E+00	
870.0	6.554E+00	2.372E+04		4.883E+05	1.237E-03		1.008E+00
864.0			5.002E+05			1.008E+00	
858.0	6.553E+00	2.372E+04		5.120E+05	1.297E-03		1.009E+00
852.0			5.239E+05			1.010E+00	
846.0	6.553E+00	2.371E+04		5.357E+05	1.357E-03		1.010E+00
840.0			5.476E+05			1.011E+00	
834.0	6.552E+00	2.371E+04		5.594E+05	1.417E-03		1.012E+00
828.0			5.713E+05			1.012E+00	
822.0	6.551E+00	2.371E+04		5.832E+05	1.477E-03		1.013E+00
816.0			5.950E+05			1.014E+00	
810.0	6.550E+00	2.371E+04		6.069E+05	1.537E-03		1.015E+00
804.0			6.187E+05			1.015E+00	
798.0	6.549E+00	2.370E+04		6.306E+05	1.597E-03		1.016E+00
792.0			6.424E+05			1.017E+00	
786.0	6.548E+00	2.370E+04		6.543E+05	1.657E-03		1.018E+00
780.0			6.661E+05			1.019E+00	
774.0	6.548E+00	2.370E+04		6.780E+05	1.717E-03		1.019E+00
768.0			6.898E+05			1.020E+00	
762.0	6.547E+00	2.369E+04		7.017E+05	1.777E-03		1.021E+00
756.0			7.135E+05			1.022E+00	
750.0	6.546E+00	2.369E+04		7.253E+05	1.837E-03		1.023E+00
744.0			7.372E+05			1.024E+00	
738.0	6.545E+00	2.369E+04		7.490E+05	1.897E-03		1.025E+00
732.0			7.609E+05			1.026E+00	
726.0	6.543E+00	2.368E+04		7.727E+05	1.957E-03		1.027E+00
720.0			7.846E+05			1.028E+00	
714.0	6.542E+00	2.368E+04		7.964E+05	2.017E-03		1.029E+00
708.0			8.082E+05			1.030E+00	
702.0	6.541E+00	2.367E+04		8.201E+05	2.077E-03		1.031E+00
696.0			8.319E+05			1.032E+00	
690.0	6.540E+00	2.367E+04		8.437E+05	2.137E-03		1.033E+00
684.0			8.556E+05			1.034E+00	
678.0	6.539E+00	2.367E+04		8.674E+05	2.197E-03		1.035E+00
672.0			8.792E+05			1.036E+00	
666.0	6.538E+00	2.366E+04		8.911E+05	2.257E-03		1.037E+00
660.0			9.029E+05			1.038E+00	
654.0	6.536E+00	2.366E+04		9.147E+05	2.317E-03		1.040E+00
648.0			9.266E+05			1.041E+00	
642.0	6.535E+00	2.365E+04		9.384E+05	2.377E-03		1.042E+00
636.0			9.502E+05			1.043E+00	
630.0	6.534E+00	2.365E+04		9.620E+05	2.437E-03		1.044E+00
624.0			9.739E+05			1.046E+00	
618.0	6.533E+00	2.364E+04		9.857E+05	2.496E-03		1.047E+00
612.0			9.975E+05			1.048E+00	
606.0	6.531E+00	2.364E+04		1.009E+06	2.556E-03		1.049E+00
600.0			1.021E+06			1.051E+00	
594.0	6.530E+00	2.363E+04		1.033E+06	2.616E-03		1.052E+00
588.0			1.045E+06			1.053E+00	

582.0	6.528E+00	2.363E+04		1.057E+06	2.676E-03		1.055E+00
576.0			1.068E+06			1.056E+00	
570.0	6.527E+00	2.362E+04		1.080E+06	2.736E-03		1.057E+00
564.0			1.092E+06			1.059E+00	
558.0	6.525E+00	2.362E+04		1.104E+06	2.796E-03		1.060E+00
552.0			1.116E+06			1.061E+00	
546.0	6.524E+00	2.361E+04		1.127E+06	2.855E-03		1.063E+00
540.0			1.139E+06			1.064E+00	
534.0	6.522E+00	2.360E+04		1.151E+06	2.915E-03		1.066E+00
528.0			1.163E+06			1.067E+00	
522.0	6.521E+00	2.360E+04		1.175E+06	2.975E-03		1.069E+00
516.0			1.186E+06			1.070E+00	
510.0	6.519E+00	2.359E+04		1.198E+06	3.035E-03		1.072E+00
504.0			1.210E+06			1.073E+00	
498.0	6.517E+00	2.359E+04		1.222E+06	3.095E-03		1.075E+00
492.0			1.234E+06			1.076E+00	
486.0	6.516E+00	2.358E+04		1.245E+06	3.154E-03		1.078E+00
480.0			1.257E+06			1.079E+00	
474.0	6.514E+00	2.357E+04		1.269E+06	3.214E-03		1.081E+00
468.0			1.281E+06			1.083E+00	
462.0	6.512E+00	2.357E+04		1.293E+06	3.274E-03		1.084E+00
456.0			1.304E+06			1.086E+00	
450.0	6.510E+00	2.356E+04		1.316E+06	3.333E-03		1.088E+00
444.0			1.328E+06			1.089E+00	
438.0	6.508E+00	2.355E+04		1.340E+06	3.393E-03		1.091E+00
432.0			1.351E+06			1.093E+00	
426.0	6.507E+00	2.355E+04		1.363E+06	3.453E-03		1.094E+00
420.0			1.375E+06			1.096E+00	
414.0	6.505E+00	2.354E+04		1.387E+06	3.512E-03		1.098E+00
408.0			1.399E+06			1.100E+00	
402.0	6.503E+00	2.353E+04		1.410E+06	3.572E-03		1.101E+00
396.0			1.422E+06			1.103E+00	
390.0	6.501E+00	2.353E+04		1.434E+06	3.631E-03		1.105E+00
384.0			1.446E+06			1.107E+00	
378.0	6.499E+00	2.352E+04		1.457E+06	3.691E-03		1.109E+00
372.0			1.469E+06			1.111E+00	
366.0	6.497E+00	2.351E+04		1.481E+06	3.751E-03		1.112E+00
360.0			1.493E+06			1.114E+00	
354.0	6.495E+00	2.350E+04		1.504E+06	3.810E-03		1.116E+00
348.0			1.516E+06			1.118E+00	
342.0	6.492E+00	2.350E+04		1.528E+06	3.870E-03		1.120E+00
336.0			1.540E+06			1.122E+00	
330.0	6.490E+00	2.349E+04		1.551E+06	3.929E-03		1.124E+00
324.0			1.563E+06			1.126E+00	
318.0	6.488E+00	2.348E+04		1.575E+06	3.989E-03		1.128E+00
312.0			1.587E+06			1.130E+00	
306.0	6.486E+00	2.347E+04		1.598E+06	4.048E-03		1.132E+00
300.0			1.610E+06			1.134E+00	
294.0	6.484E+00	2.347E+04		1.622E+06	4.108E-03		1.136E+00
288.0			1.634E+06			1.138E+00	
282.0	6.482E+00	2.346E+04		1.645E+06	4.167E-03		1.140E+00
276.0			1.657E+06			1.142E+00	
270.0	5.554E+00	2.010E+04		1.667E+06	4.222E-03		1.144E+00
264.0			1.677E+06			1.146E+00	
258.0	5.552E+00	2.009E+04		1.687E+06	4.273E-03		1.149E+00
252.0			1.697E+06			1.151E+00	
246.0	5.550E+00	2.008E+04		1.707E+06	4.324E-03		1.153E+00
240.0			1.717E+06			1.155E+00	
234.0	5.548E+00	2.008E+04		1.727E+06	4.375E-03		1.157E+00
228.0			1.737E+06			1.159E+00	
222.0	5.546E+00	2.007E+04		1.747E+06	4.426E-03		1.162E+00
216.0			1.757E+06			1.164E+00	
210.0	1.486E+01	5.377E+04		1.784E+06	4.519E-03		1.166E+00
204.0			1.811E+06			1.168E+00	
198.0	1.486E+01	5.377E+04		1.838E+06	4.655E-03		1.171E+00
192.0			1.865E+06			1.173E+00	
186.0	1.486E+01	5.377E+04		1.892E+06	4.792E-03		1.175E+00
180.0			1.919E+06			1.178E+00	
174.0	1.486E+01	5.376E+04		1.946E+06	4.928E-03		1.180E+00
168.0			1.973E+06			1.183E+00	
162.0	1.418E+01	5.132E+04		1.998E+06	5.061E-03		1.185E+00
156.0			2.024E+06			1.188E+00	
150.0	1.418E+01	5.131E+04		2.049E+06	5.191E-03		1.190E+00
144.0			2.075E+06			1.193E+00	
138.0	1.418E+01	5.131E+04		2.101E+06	5.321E-03		1.196E+00
132.0			2.126E+06			1.198E+00	
126.0	1.418E+01	5.131E+04		2.152E+06	5.451E-03		1.201E+00
120.0			2.178E+06			1.204E+00	
114.0	1.418E+01	5.130E+04		2.203E+06	5.581E-03		1.207E+00
108.0			2.229E+06			1.209E+00	
102.0	1.417E+01	5.130E+04		2.255E+06	5.710E-03		1.212E+00
96.0			2.280E+06			1.215E+00	
90.0	1.417E+01	5.129E+04		2.306E+06	5.840E-03		1.218E+00
84.0			2.332E+06			1.221E+00	
78.0	1.417E+01	5.129E+04		2.357E+06	5.970E-03		1.224E+00
72.0			2.383E+06			1.227E+00	
66.0	5.244E+00	1.898E+04		2.392E+06	6.059E-03		1.230E+00
60.0			2.402E+06			1.233E+00	
54.0	5.241E+00	1.897E+04		2.411E+06	6.107E-03		1.236E+00
48.0			2.421E+06			1.239E+00	
42.0	5.239E+00	1.896E+04		2.430E+06	6.155E-03		1.242E+00
36.0			2.440E+06			1.245E+00	
30.0	5.237E+00	1.895E+04		2.449E+06	6.203E-03		1.248E+00
24.0			2.459E+06			1.251E+00	
18.0	5.234E+00	1.894E+04		2.468E+06	6.251E-03		1.254E+00
12.0			2.478E+06			1.258E+00	
6.0	5.232E+00	1.894E+04		2.487E+06	6.299E-03		1.261E+00
0.0			2.497E+06			1.264E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
2.0000E+00	4.3226E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			4.323E+05			2.000E+00	
954.0	6.274E+00	2.271E+04		4.436E+05	1.124E-03		2.001E+00
948.0			4.550E+05			2.001E+00	
942.0	6.274E+00	2.271E+04		4.663E+05	1.181E-03		2.002E+00
936.0			4.777E+05			2.002E+00	
930.0	6.274E+00	2.271E+04		4.890E+05	1.239E-03		2.003E+00
924.0			5.004E+05			2.004E+00	
918.0	6.274E+00	2.270E+04		5.117E+05	1.296E-03		2.004E+00
912.0			5.231E+05			2.005E+00	
906.0	6.274E+00	2.270E+04		5.344E+05	1.354E-03		2.006E+00
900.0			5.458E+05			2.006E+00	
894.0	6.273E+00	2.270E+04		5.571E+05	1.411E-03		2.007E+00
888.0			5.685E+05			2.008E+00	
882.0	6.273E+00	2.270E+04		5.798E+05	1.469E-03		2.008E+00
876.0			5.912E+05			2.009E+00	
870.0	6.273E+00	2.270E+04		6.025E+05	1.526E-03		2.010E+00
864.0			6.139E+05			2.011E+00	
858.0	6.273E+00	2.270E+04		6.252E+05	1.584E-03		2.011E+00
852.0			6.366E+05			2.012E+00	
846.0	6.273E+00	2.270E+04		6.479E+05	1.641E-03		2.013E+00
840.0			6.593E+05			2.014E+00	
834.0	6.273E+00	2.270E+04		6.707E+05	1.699E-03		2.015E+00
828.0			6.820E+05			2.016E+00	
822.0	6.273E+00	2.270E+04		6.934E+05	1.756E-03		2.016E+00
816.0			7.047E+05			2.017E+00	
810.0	6.273E+00	2.270E+04		7.161E+05	1.814E-03		2.018E+00
804.0			7.274E+05			2.019E+00	
798.0	6.273E+00	2.270E+04		7.388E+05	1.871E-03		2.020E+00
792.0			7.501E+05			2.021E+00	
786.0	6.273E+00	2.270E+04		7.615E+05	1.929E-03		2.022E+00
780.0			7.728E+05			2.023E+00	
774.0	6.272E+00	2.270E+04		7.842E+05	1.986E-03		2.024E+00
768.0			7.955E+05			2.025E+00	
762.0	6.272E+00	2.270E+04		8.069E+05	2.044E-03		2.026E+00
756.0			8.182E+05			2.027E+00	
750.0	6.272E+00	2.270E+04		8.296E+05	2.101E-03		2.028E+00
744.0			8.409E+05			2.029E+00	
738.0	6.272E+00	2.270E+04		8.523E+05	2.159E-03		2.030E+00
732.0			8.636E+05			2.031E+00	
726.0	6.272E+00	2.270E+04		8.750E+05	2.216E-03		2.032E+00
720.0			8.863E+05			2.033E+00	
714.0	6.272E+00	2.270E+04		8.977E+05	2.273E-03		2.035E+00

708.0			9.090E+05			2.036E+00	
702.0	6.272E+00	2.270E+04		9.204E+05	2.331E-03		2.037E+00
696.0			9.317E+05			2.038E+00	
690.0	6.272E+00	2.270E+04		9.431E+05	2.388E-03		2.039E+00
684.0			9.544E+05			2.040E+00	
678.0	6.271E+00	2.270E+04		9.658E+05	2.446E-03		2.042E+00
672.0			9.771E+05			2.043E+00	
666.0	6.271E+00	2.270E+04		9.885E+05	2.503E-03		2.044E+00
660.0			9.998E+05			2.045E+00	
654.0	6.271E+00	2.270E+04		1.011E+06	2.561E-03		2.047E+00
648.0			1.022E+06			2.048E+00	
642.0	6.271E+00	2.270E+04		1.034E+06	2.618E-03		2.049E+00
636.0			1.045E+06			2.051E+00	
630.0	6.271E+00	2.270E+04		1.057E+06	2.676E-03		2.052E+00
624.0			1.068E+06			2.053E+00	
618.0	6.271E+00	2.269E+04		1.079E+06	2.733E-03		2.055E+00
612.0			1.091E+06			2.056E+00	
606.0	6.271E+00	2.269E+04		1.102E+06	2.791E-03		2.057E+00
600.0			1.113E+06			2.059E+00	
594.0	6.270E+00	2.269E+04		1.125E+06	2.848E-03		2.060E+00
588.0			1.136E+06			2.062E+00	
582.0	6.270E+00	2.269E+04		1.147E+06	2.906E-03		2.063E+00
576.0			1.159E+06			2.064E+00	
570.0	6.270E+00	2.269E+04		1.170E+06	2.963E-03		2.066E+00
564.0			1.181E+06			2.067E+00	
558.0	6.270E+00	2.269E+04		1.193E+06	3.021E-03		2.069E+00
552.0			1.204E+06			2.070E+00	
546.0	6.270E+00	2.269E+04		1.215E+06	3.078E-03		2.072E+00
540.0			1.227E+06			2.074E+00	
534.0	6.270E+00	2.269E+04		1.238E+06	3.136E-03		2.075E+00
528.0			1.249E+06			2.077E+00	
522.0	6.269E+00	2.269E+04		1.261E+06	3.193E-03		2.078E+00
516.0			1.272E+06			2.080E+00	
510.0	6.269E+00	2.269E+04		1.283E+06	3.251E-03		2.081E+00
504.0			1.295E+06			2.083E+00	
498.0	6.269E+00	2.269E+04		1.306E+06	3.308E-03		2.085E+00
492.0			1.317E+06			2.086E+00	
486.0	6.269E+00	2.269E+04		1.329E+06	3.366E-03		2.088E+00
480.0			1.340E+06			2.090E+00	
474.0	6.269E+00	2.269E+04		1.352E+06	3.423E-03		2.091E+00
468.0			1.363E+06			2.093E+00	
462.0	6.268E+00	2.269E+04		1.374E+06	3.480E-03		2.095E+00
456.0			1.386E+06			2.097E+00	
450.0	6.268E+00	2.269E+04		1.397E+06	3.538E-03		2.098E+00
444.0			1.408E+06			2.100E+00	
438.0	6.268E+00	2.268E+04		1.420E+06	3.595E-03		2.102E+00
432.0			1.431E+06			2.104E+00	
426.0	6.268E+00	2.268E+04		1.442E+06	3.653E-03		2.106E+00
420.0			1.454E+06			2.107E+00	
414.0	6.268E+00	2.268E+04		1.465E+06	3.710E-03		2.109E+00
408.0			1.476E+06			2.111E+00	
402.0	6.267E+00	2.268E+04		1.488E+06	3.768E-03		2.113E+00
396.0			1.499E+06			2.115E+00	
390.0	6.267E+00	2.268E+04		1.510E+06	3.825E-03		2.117E+00
384.0			1.522E+06			2.119E+00	
378.0	6.267E+00	2.268E+04		1.533E+06	3.883E-03		2.121E+00
372.0			1.544E+06			2.123E+00	
366.0	6.267E+00	2.268E+04		1.556E+06	3.940E-03		2.125E+00
360.0			1.567E+06			2.127E+00	
354.0	6.267E+00	2.268E+04		1.578E+06	3.997E-03		2.129E+00
348.0			1.590E+06			2.131E+00	
342.0	6.266E+00	2.268E+04		1.601E+06	4.055E-03		2.133E+00
336.0			1.612E+06			2.135E+00	
330.0	6.266E+00	2.268E+04		1.624E+06	4.112E-03		2.137E+00
324.0			1.635E+06			2.139E+00	
318.0	6.266E+00	2.268E+04		1.646E+06	4.170E-03		2.141E+00
312.0			1.658E+06			2.143E+00	
306.0	6.266E+00	2.268E+04		1.669E+06	4.227E-03		2.145E+00
300.0			1.680E+06			2.147E+00	
294.0	6.265E+00	2.268E+04		1.692E+06	4.285E-03		2.149E+00
288.0			1.703E+06			2.151E+00	
282.0	6.265E+00	2.267E+04		1.714E+06	4.342E-03		2.154E+00
276.0			1.726E+06			2.156E+00	
270.0	5.370E+00	1.943E+04		1.735E+06	4.395E-03		2.158E+00
264.0			1.745E+06			2.160E+00	
258.0	5.370E+00	1.943E+04		1.755E+06	4.445E-03		2.162E+00
252.0			1.765E+06			2.165E+00	
246.0	5.369E+00	1.943E+04		1.774E+06	4.494E-03		2.167E+00
240.0			1.784E+06			2.169E+00	
234.0	5.369E+00	1.943E+04		1.794E+06	4.543E-03		2.171E+00
228.0			1.803E+06			2.174E+00	
222.0	5.369E+00	1.943E+04		1.813E+06	4.592E-03		2.176E+00
216.0			1.823E+06			2.178E+00	
210.0	1.477E+01	5.346E+04		1.850E+06	4.685E-03		2.181E+00
204.0			1.876E+06			2.183E+00	
198.0	1.477E+01	5.346E+04		1.903E+06	4.820E-03		2.185E+00
192.0			1.930E+06			2.188E+00	
186.0	1.477E+01	5.346E+04		1.957E+06	4.955E-03		2.190E+00
180.0			1.983E+06			2.193E+00	
174.0	1.477E+01	5.346E+04		2.010E+06	5.091E-03		2.195E+00
168.0			2.037E+06			2.198E+00	
162.0	1.410E+01	5.103E+04		2.062E+06	5.223E-03		2.200E+00
156.0			2.088E+06			2.203E+00	
150.0	1.410E+01	5.103E+04		2.113E+06	5.352E-03		2.206E+00
144.0			2.139E+06			2.208E+00	
138.0	1.410E+01	5.103E+04		2.164E+06	5.482E-03		2.211E+00
132.0			2.190E+06			2.214E+00	
126.0	1.410E+01	5.103E+04		2.215E+06	5.611E-03		2.217E+00
120.0			2.241E+06			2.219E+00	
114.0	1.410E+01	5.103E+04		2.266E+06	5.740E-03		2.222E+00
108.0			2.292E+06			2.225E+00	
102.0	1.410E+01	5.103E+04		2.317E+06	5.869E-03		2.228E+00
96.0			2.343E+06			2.231E+00	
90.0	1.410E+01	5.103E+04		2.368E+06	5.999E-03		2.234E+00
84.0			2.394E+06			2.237E+00	
78.0	1.410E+01	5.103E+04		2.419E+06	6.128E-03		2.240E+00
72.0			2.445E+06			2.243E+00	
66.0	5.097E+00	1.845E+04		2.454E+06	6.216E-03		2.246E+00
60.0			2.463E+06			2.249E+00	
54.0	5.097E+00	1.845E+04		2.473E+06	6.262E-03		2.253E+00
48.0			2.482E+06			2.256E+00	
42.0	5.097E+00	1.845E+04		2.491E+06	6.309E-03		2.259E+00
36.0			2.500E+06			2.262E+00	
30.0	5.096E+00	1.844E+04		2.510E+06	6.356E-03		2.265E+00
24.0			2.519E+06			2.268E+00	
18.0	5.096E+00	1.844E+04		2.528E+06	6.403E-03		2.272E+00
12.0			2.537E+06			2.275E+00	
6.0	5.096E+00	1.844E+04		2.546E+06	6.449E-03		2.278E+00
0.0			2.556E+06			2.281E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
3.0000E+00	4.9197E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			4.920E+05			3.000E+00	
954.0	6.217E+00	2.250E+04		5.032E+05	1.274E-03		3.001E+00
948.0			5.145E+05			3.001E+00	
942.0	6.217E+00	2.250E+04		5.257E+05	1.331E-03		3.002E+00
936.0			5.370E+05			3.003E+00	
930.0	6.217E+00	2.250E+04		5.482E+05	1.388E-03		3.003E+00
924.0			5.595E+05			3.004E+00	
918.0	6.217E+00	2.250E+04		5.707E+05	1.445E-03		3.005E+00
912.0			5.820E+05			3.005E+00	
906.0	6.217E+00	2.250E+04		5.932E+05	1.502E-03		3.006E+00
900.0			6.045E+05			3.007E+00	
894.0	6.217E+00	2.250E+04		6.157E+05	1.559E-03		3.008E+00
888.0			6.270E+05			3.009E+00	
882.0	6.217E+00	2.250E+04		6.382E+05	1.616E-03		3.009E+00
876.0			6.495E+05			3.010E+00	
870.0	6.217E+00	2.250E+04		6.607E+05	1.673E-03		3.011E+00
864.0			6.720E+05			3.012E+00	
858.0	6.217E+00	2.250E+04		6.832E+05	1.730E-03		3.013E+00
852.0			6.945E+05			3.014E+00	
846.0	6.217E+00	2.250E+04		7.057E+05	1.787E-03		3.014E+00
840.0			7.170E+05			3.015E+00	

834.0	6.216E+00	2.250E+04		7.282E+05	1.844E-03		3.016E+00
828.0			7.395E+05			3.017E+00	
822.0	6.216E+00	2.250E+04		7.507E+05	1.901E-03		3.018E+00
816.0			7.620E+05			3.019E+00	
810.0	6.216E+00	2.250E+04		7.732E+05	1.958E-03		3.020E+00
804.0			7.845E+05			3.021E+00	
798.0	6.216E+00	2.250E+04		7.957E+05	2.015E-03		3.022E+00
792.0			8.070E+05			3.023E+00	
786.0	6.216E+00	2.250E+04		8.182E+05	2.072E-03		3.024E+00
780.0			8.295E+05			3.025E+00	
774.0	6.216E+00	2.250E+04		8.407E+05	2.129E-03		3.026E+00
768.0			8.520E+05			3.027E+00	
762.0	6.216E+00	2.250E+04		8.632E+05	2.186E-03		3.028E+00
756.0			8.745E+05			3.029E+00	
750.0	6.216E+00	2.250E+04		8.857E+05	2.243E-03		3.031E+00
744.0			8.969E+05			3.032E+00	
738.0	6.216E+00	2.249E+04		9.082E+05	2.300E-03		3.033E+00
732.0			9.194E+05			3.034E+00	
726.0	6.215E+00	2.249E+04		9.307E+05	2.357E-03		3.035E+00
720.0			9.419E+05			3.036E+00	
714.0	6.215E+00	2.249E+04		9.532E+05	2.414E-03		3.038E+00
708.0			9.644E+05			3.039E+00	
702.0	6.215E+00	2.249E+04		9.757E+05	2.471E-03		3.040E+00
696.0			9.869E+05			3.041E+00	
690.0	6.215E+00	2.249E+04		9.982E+05	2.528E-03		3.042E+00
684.0			1.009E+06			3.044E+00	
678.0	6.215E+00	2.249E+04		1.021E+06	2.585E-03		3.045E+00
672.0			1.032E+06			3.046E+00	
666.0	6.215E+00	2.249E+04		1.043E+06	2.642E-03		3.048E+00
660.0			1.054E+06			3.049E+00	
654.0	6.215E+00	2.249E+04		1.066E+06	2.699E-03		3.050E+00
648.0			1.077E+06			3.052E+00	
642.0	6.214E+00	2.249E+04		1.088E+06	2.756E-03		3.053E+00
636.0			1.099E+06			3.054E+00	
630.0	6.214E+00	2.249E+04		1.111E+06	2.813E-03		3.056E+00
624.0			1.122E+06			3.057E+00	
618.0	6.214E+00	2.249E+04		1.133E+06	2.870E-03		3.059E+00
612.0			1.144E+06			3.060E+00	
606.0	6.214E+00	2.249E+04		1.156E+06	2.927E-03		3.062E+00
600.0			1.167E+06			3.063E+00	
594.0	6.214E+00	2.249E+04		1.178E+06	2.984E-03		3.065E+00
588.0			1.189E+06			3.066E+00	
582.0	6.214E+00	2.249E+04		1.201E+06	3.041E-03		3.068E+00
576.0			1.212E+06			3.069E+00	
570.0	6.213E+00	2.249E+04		1.223E+06	3.098E-03		3.071E+00
564.0			1.234E+06			3.072E+00	
558.0	6.213E+00	2.249E+04		1.246E+06	3.155E-03		3.074E+00
552.0			1.257E+06			3.075E+00	
546.0	6.213E+00	2.249E+04		1.268E+06	3.212E-03		3.077E+00
540.0			1.279E+06			3.079E+00	
534.0	6.213E+00	2.249E+04		1.291E+06	3.268E-03		3.080E+00
528.0			1.302E+06			3.082E+00	
522.0	6.213E+00	2.248E+04		1.313E+06	3.325E-03		3.083E+00
516.0			1.324E+06			3.085E+00	
510.0	6.212E+00	2.248E+04		1.335E+06	3.382E-03		3.087E+00
504.0			1.347E+06			3.088E+00	
498.0	6.212E+00	2.248E+04		1.358E+06	3.439E-03		3.090E+00
492.0			1.369E+06			3.092E+00	
486.0	6.212E+00	2.248E+04		1.380E+06	3.496E-03		3.094E+00
480.0			1.392E+06			3.095E+00	
474.0	6.212E+00	2.248E+04		1.403E+06	3.553E-03		3.097E+00
468.0			1.414E+06			3.099E+00	
462.0	6.212E+00	2.248E+04		1.425E+06	3.610E-03		3.101E+00
456.0			1.437E+06			3.103E+00	
450.0	6.212E+00	2.248E+04		1.448E+06	3.667E-03		3.104E+00
444.0			1.459E+06			3.106E+00	
438.0	6.211E+00	2.248E+04		1.470E+06	3.724E-03		3.108E+00
432.0			1.482E+06			3.110E+00	
426.0	6.211E+00	2.248E+04		1.493E+06	3.781E-03		3.112E+00
420.0			1.504E+06			3.114E+00	
414.0	6.211E+00	2.248E+04		1.515E+06	3.838E-03		3.116E+00
408.0			1.527E+06			3.118E+00	
402.0	6.211E+00	2.248E+04		1.538E+06	3.895E-03		3.120E+00
396.0			1.549E+06			3.121E+00	
390.0	6.210E+00	2.248E+04		1.560E+06	3.952E-03		3.123E+00
384.0			1.572E+06			3.125E+00	
378.0	6.210E+00	2.248E+04		1.583E+06	4.009E-03		3.127E+00
372.0			1.594E+06			3.129E+00	
366.0	6.210E+00	2.247E+04		1.605E+06	4.066E-03		3.131E+00
360.0			1.616E+06			3.134E+00	
354.0	6.210E+00	2.247E+04		1.628E+06	4.123E-03		3.136E+00
348.0			1.639E+06			3.138E+00	
342.0	6.210E+00	2.247E+04		1.650E+06	4.179E-03		3.140E+00
336.0			1.661E+06			3.142E+00	
330.0	6.209E+00	2.247E+04		1.673E+06	4.236E-03		3.144E+00
324.0			1.684E+06			3.146E+00	
318.0	6.209E+00	2.247E+04		1.695E+06	4.293E-03		3.148E+00
312.0			1.706E+06			3.150E+00	
306.0	6.209E+00	2.247E+04		1.718E+06	4.350E-03		3.153E+00
300.0			1.729E+06			3.155E+00	
294.0	6.209E+00	2.247E+04		1.740E+06	4.407E-03		3.157E+00
288.0			1.751E+06			3.159E+00	
282.0	6.208E+00	2.247E+04		1.763E+06	4.464E-03		3.161E+00
276.0			1.774E+06			3.164E+00	
270.0	5.321E+00	1.926E+04		1.783E+06	4.517E-03		3.166E+00
264.0			1.793E+06			3.168E+00	
258.0	5.321E+00	1.926E+04		1.803E+06	4.566E-03		3.170E+00
252.0			1.812E+06			3.173E+00	
246.0	5.321E+00	1.926E+04		1.822E+06	4.614E-03		3.175E+00
240.0			1.832E+06			3.177E+00	
234.0	5.321E+00	1.926E+04		1.841E+06	4.663E-03		3.180E+00
228.0			1.851E+06			3.182E+00	
222.0	5.320E+00	1.925E+04		1.860E+06	4.712E-03		3.184E+00
216.0			1.870E+06			3.187E+00	
210.0	1.475E+01	5.339E+04		1.897E+06	4.804E-03		3.189E+00
204.0			1.923E+06			3.191E+00	
198.0	1.475E+01	5.339E+04		1.950E+06	4.939E-03		3.194E+00
192.0			1.977E+06			3.196E+00	
186.0	1.475E+01	5.339E+04		2.004E+06	5.074E-03		3.199E+00
180.0			2.030E+06			3.201E+00	
174.0	1.475E+01	5.339E+04		2.057E+06	5.210E-03		3.204E+00
168.0			2.084E+06			3.207E+00	
162.0	1.408E+01	5.096E+04		2.109E+06	5.342E-03		3.209E+00
156.0			2.135E+06			3.212E+00	
150.0	1.408E+01	5.096E+04		2.160E+06	5.471E-03		3.215E+00
144.0			2.186E+06			3.217E+00	
138.0	1.408E+01	5.096E+04		2.211E+06	5.600E-03		3.220E+00
132.0			2.237E+06			3.223E+00	
126.0	1.408E+01	5.096E+04		2.262E+06	5.729E-03		3.226E+00
120.0			2.287E+06			3.229E+00	
114.0	1.408E+01	5.096E+04		2.313E+06	5.858E-03		3.232E+00
108.0			2.338E+06			3.235E+00	
102.0	1.408E+01	5.096E+04		2.364E+06	5.987E-03		3.238E+00
96.0			2.389E+06			3.241E+00	
90.0	1.408E+01	5.096E+04		2.415E+06	6.116E-03		3.244E+00
84.0			2.440E+06			3.247E+00	
78.0	1.408E+01	5.096E+04		2.466E+06	6.245E-03		3.250E+00
72.0			2.491E+06			3.253E+00	
66.0	5.051E+00	1.828E+04		2.500E+06	6.333E-03		3.256E+00
60.0			2.510E+06			3.259E+00	
54.0	5.051E+00	1.828E+04		2.519E+06	6.379E-03		3.263E+00
48.0			2.528E+06			3.266E+00	
42.0	5.050E+00	1.828E+04		2.537E+06	6.425E-03		3.269E+00
36.0			2.546E+06			3.272E+00	
30.0	5.050E+00	1.828E+04		2.555E+06	6.472E-03		3.275E+00
24.0			2.564E+06			3.279E+00	
18.0	5.050E+00	1.828E+04		2.574E+06	6.518E-03		3.282E+00
12.0			2.583E+06			3.285E+00	
6.0	5.049E+00	1.827E+04		2.592E+06	6.564E-03		3.288E+00
0.0			2.601E+06			3.292E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
4.0000E+00	5.1753E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.

960.0			5.175E+05			4.000E+00	
954.0	6.161E+00	2.230E+04		5.287E+05	1.339E-03		4.001E+00
948.0			5.398E+05			4.001E+00	
942.0	6.161E+00	2.230E+04		5.510E+05	1.395E-03		4.002E+00
936.0			5.621E+05			4.003E+00	
930.0	6.161E+00	2.230E+04		5.733E+05	1.452E-03		4.003E+00
924.0			5.844E+05			4.004E+00	
918.0	6.161E+00	2.230E+04		5.956E+05	1.508E-03		4.005E+00
912.0			6.067E+05			4.006E+00	
906.0	6.161E+00	2.230E+04		6.179E+05	1.565E-03		4.006E+00
900.0			6.290E+05			4.007E+00	
894.0	6.161E+00	2.230E+04		6.402E+05	1.621E-03		4.008E+00
888.0			6.513E+05			4.009E+00	
882.0	6.160E+00	2.230E+04		6.625E+05	1.678E-03		4.010E+00
876.0			6.736E+05			4.011E+00	
870.0	6.160E+00	2.229E+04		6.848E+05	1.734E-03		4.011E+00
864.0			6.959E+05			4.012E+00	
858.0	6.160E+00	2.229E+04		7.070E+05	1.791E-03		4.013E+00
852.0			7.182E+05			4.014E+00	
846.0	6.160E+00	2.229E+04		7.293E+05	1.847E-03		4.015E+00
840.0			7.405E+05			4.016E+00	
834.0	6.160E+00	2.229E+04		7.516E+05	1.904E-03		4.017E+00
828.0			7.628E+05			4.018E+00	
822.0	6.160E+00	2.229E+04		7.739E+05	1.960E-03		4.019E+00
816.0			7.851E+05			4.020E+00	
810.0	6.160E+00	2.229E+04		7.962E+05	2.017E-03		4.021E+00
804.0			8.074E+05			4.022E+00	
798.0	6.160E+00	2.229E+04		8.185E+05	2.073E-03		4.023E+00
792.0			8.297E+05			4.024E+00	
786.0	6.160E+00	2.229E+04		8.408E+05	2.129E-03		4.025E+00
780.0			8.520E+05			4.026E+00	
774.0	6.159E+00	2.229E+04		8.631E+05	2.186E-03		4.027E+00
768.0			8.742E+05			4.028E+00	
762.0	6.159E+00	2.229E+04		8.854E+05	2.242E-03		4.029E+00
756.0			8.965E+05			4.030E+00	
750.0	6.159E+00	2.229E+04		9.077E+05	2.299E-03		4.032E+00
744.0			9.188E+05			4.033E+00	
738.0	6.159E+00	2.229E+04		9.300E+05	2.355E-03		4.034E+00
732.0			9.411E+05			4.035E+00	
726.0	6.159E+00	2.229E+04		9.523E+05	2.412E-03		4.036E+00
720.0			9.634E+05			4.038E+00	
714.0	6.159E+00	2.229E+04		9.746E+05	2.468E-03		4.039E+00
708.0			9.857E+05			4.040E+00	
702.0	6.159E+00	2.229E+04		9.968E+05	2.525E-03		4.041E+00
696.0			1.008E+06			4.043E+00	
690.0	6.159E+00	2.229E+04		1.019E+06	2.581E-03		4.044E+00
684.0			1.030E+06			4.045E+00	
678.0	6.158E+00	2.229E+04		1.041E+06	2.638E-03		4.046E+00
672.0			1.053E+06			4.048E+00	
666.0	6.158E+00	2.229E+04		1.064E+06	2.694E-03		4.049E+00
660.0			1.075E+06			4.050E+00	
654.0	6.158E+00	2.229E+04		1.086E+06	2.750E-03		4.052E+00
648.0			1.097E+06			4.053E+00	
642.0	6.158E+00	2.229E+04		1.108E+06	2.807E-03		4.055E+00
636.0			1.119E+06			4.056E+00	
630.0	6.158E+00	2.229E+04		1.131E+06	2.863E-03		4.057E+00
624.0			1.142E+06			4.059E+00	
618.0	6.158E+00	2.229E+04		1.153E+06	2.920E-03		4.060E+00
612.0			1.164E+06			4.062E+00	
606.0	6.157E+00	2.228E+04		1.175E+06	2.976E-03		4.063E+00
600.0			1.186E+06			4.065E+00	
594.0	6.157E+00	2.228E+04		1.197E+06	3.033E-03		4.066E+00
588.0			1.209E+06			4.068E+00	
582.0	6.157E+00	2.228E+04		1.220E+06	3.089E-03		4.069E+00
576.0			1.231E+06			4.071E+00	
570.0	6.157E+00	2.228E+04		1.242E+06	3.146E-03		4.072E+00
564.0			1.253E+06			4.074E+00	
558.0	6.157E+00	2.228E+04		1.264E+06	3.202E-03		4.076E+00
552.0			1.275E+06			4.077E+00	
546.0	6.157E+00	2.228E+04		1.287E+06	3.258E-03		4.079E+00
540.0			1.298E+06			4.080E+00	
534.0	6.156E+00	2.228E+04		1.309E+06	3.315E-03		4.082E+00
528.0			1.320E+06			4.084E+00	
522.0	6.156E+00	2.228E+04		1.331E+06	3.371E-03		4.085E+00
516.0			1.342E+06			4.087E+00	
510.0	6.156E+00	2.228E+04		1.353E+06	3.428E-03		4.089E+00
504.0			1.365E+06			4.091E+00	
498.0	6.156E+00	2.228E+04		1.376E+06	3.484E-03		4.092E+00
492.0			1.387E+06			4.094E+00	
486.0	6.156E+00	2.228E+04		1.398E+06	3.541E-03		4.096E+00
480.0			1.409E+06			4.098E+00	
474.0	6.155E+00	2.228E+04		1.420E+06	3.597E-03		4.099E+00
468.0			1.431E+06			4.101E+00	
462.0	6.155E+00	2.228E+04		1.443E+06	3.653E-03		4.103E+00
456.0			1.454E+06			4.105E+00	
450.0	6.155E+00	2.228E+04		1.465E+06	3.710E-03		4.107E+00
444.0			1.476E+06			4.109E+00	
438.0	6.155E+00	2.227E+04		1.487E+06	3.766E-03		4.110E+00
432.0			1.498E+06			4.112E+00	
426.0	6.155E+00	2.227E+04		1.509E+06	3.823E-03		4.114E+00
420.0			1.520E+06			4.116E+00	
414.0	6.154E+00	2.227E+04		1.532E+06	3.879E-03		4.118E+00
408.0			1.543E+06			4.120E+00	
402.0	6.154E+00	2.227E+04		1.554E+06	3.935E-03		4.122E+00
396.0			1.565E+06			4.124E+00	
390.0	6.154E+00	2.227E+04		1.576E+06	3.992E-03		4.126E+00
384.0			1.587E+06			4.128E+00	
378.0	6.154E+00	2.227E+04		1.598E+06	4.048E-03		4.130E+00
372.0			1.610E+06			4.132E+00	
366.0	6.153E+00	2.227E+04		1.621E+06	4.105E-03		4.134E+00
360.0			1.632E+06			4.136E+00	
354.0	6.153E+00	2.227E+04		1.643E+06	4.161E-03		4.138E+00
348.0			1.654E+06			4.140E+00	
342.0	6.153E+00	2.227E+04		1.665E+06	4.217E-03		4.142E+00
336.0			1.676E+06			4.144E+00	
330.0	6.153E+00	2.227E+04		1.687E+06	4.274E-03		4.147E+00
324.0			1.699E+06			4.149E+00	
318.0	6.152E+00	2.227E+04		1.710E+06	4.330E-03		4.151E+00
312.0			1.721E+06			4.153E+00	
306.0	6.152E+00	2.227E+04		1.732E+06	4.387E-03		4.155E+00
300.0			1.743E+06			4.157E+00	
294.0	6.152E+00	2.226E+04		1.754E+06	4.443E-03		4.160E+00
288.0			1.765E+06			4.162E+00	
282.0	6.152E+00	2.226E+04		1.777E+06	4.499E-03		4.164E+00
276.0			1.788E+06			4.166E+00	
270.0	5.273E+00	1.908E+04		1.797E+06	4.552E-03		4.169E+00
264.0			1.807E+06			4.171E+00	
258.0	5.272E+00	1.908E+04		1.816E+06	4.600E-03		4.173E+00
252.0			1.826E+06			4.176E+00	
246.0	5.272E+00	1.908E+04		1.835E+06	4.648E-03		4.178E+00
240.0			1.845E+06			4.180E+00	
234.0	5.272E+00	1.908E+04		1.854E+06	4.697E-03		4.183E+00
228.0			1.864E+06			4.185E+00	
222.0	5.272E+00	1.908E+04		1.874E+06	4.745E-03		4.187E+00
216.0			1.883E+06			4.190E+00	
210.0	1.473E+01	5.332E+04		1.910E+06	4.837E-03		4.192E+00
204.0			1.936E+06			4.194E+00	
198.0	1.473E+01	5.332E+04		1.963E+06	4.972E-03		4.197E+00
192.0			1.990E+06			4.199E+00	
186.0	1.473E+01	5.332E+04		2.016E+06	5.107E-03		4.202E+00
180.0			2.043E+06			4.205E+00	
174.0	1.473E+01	5.332E+04		2.070E+06	5.242E-03		4.207E+00
168.0			2.096E+06			4.210E+00	
162.0	1.406E+01	5.090E+04		2.122E+06	5.374E-03		4.212E+00
156.0			2.147E+06			4.215E+00	
150.0	1.406E+01	5.090E+04		2.173E+06	5.503E-03		4.218E+00
144.0			2.198E+06			4.221E+00	
138.0	1.406E+01	5.090E+04		2.224E+06	5.632E-03		4.223E+00
132.0			2.249E+06			4.226E+00	
126.0	1.406E+01	5.090E+04		2.275E+06	5.761E-03		4.229E+00
120.0			2.300E+06			4.232E+00	
114.0	1.406E+01	5.090E+04		2.325E+06	5.890E-03		4.235E+00
108.0			2.351E+06			4.238E+00	
102.0	1.406E+01	5.089E+04		2.376E+06	6.018E-03		4.241E+00
96.0			2.402E+06			4.244E+00	
90.0	1.406E+01	5.089E+04		2.427E+06	6.147E-03		4.247E+00
84.0			2.453E+06			4.250E+00	
78.0	1.406E+01	5.089E+04		2.478E+06	6.276E-03		4.253E+00
72.0			2.504E+06			4.256E+00	
66.0	5.005E+00	1.811E+04		2.513E+06	6.364E-03		4.260E+00
60.0			2.522E+06			4.263E+00	
54.0	5.005E+00	1.811E+04		2.531E+06	6.409E-03		4.266E+00

48.0			2.540E+06			4.269E+00	
42.0	5.004E+00	1.811E+04		2.549E+06	6.455E-03		4.272E+00
36.0			2.558E+06			4.276E+00	
30.0	5.004E+00	1.811E+04		2.567E+06	6.501E-03		4.279E+00
24.0			2.576E+06			4.282E+00	
18.0	5.004E+00	1.811E+04		2.585E+06	6.547E-03		4.285E+00
12.0			2.594E+06			4.289E+00	
6.0	5.003E+00	1.811E+04		2.603E+06	6.593E-03		4.292E+00
0.0			2.612E+06			4.295E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
5.0000E+00	5.2714E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			5.271E+05			5.000E+00	
954.0	6.105E+00	2.209E+04		5.382E+05	1.363E-03		5.001E+00
948.0			5.492E+05			5.001E+00	
942.0	6.104E+00	2.209E+04		5.603E+05	1.419E-03		5.002E+00
936.0			5.713E+05			5.003E+00	
930.0	6.104E+00	2.209E+04		5.824E+05	1.475E-03		5.004E+00
924.0			5.934E+05			5.004E+00	
918.0	6.104E+00	2.209E+04		6.045E+05	1.531E-03		5.005E+00
912.0			6.155E+05			5.006E+00	
906.0	6.104E+00	2.209E+04		6.266E+05	1.587E-03		5.007E+00
900.0			6.376E+05			5.007E+00	
894.0	6.104E+00	2.209E+04		6.487E+05	1.643E-03		5.008E+00
888.0			6.597E+05			5.009E+00	
882.0	6.104E+00	2.209E+04		6.707E+05	1.699E-03		5.010E+00
876.0			6.818E+05			5.011E+00	
870.0	6.104E+00	2.209E+04		6.928E+05	1.755E-03		5.012E+00
864.0			7.039E+05			5.012E+00	
858.0	6.104E+00	2.209E+04		7.149E+05	1.811E-03		5.013E+00
852.0			7.260E+05			5.014E+00	
846.0	6.104E+00	2.209E+04		7.370E+05	1.867E-03		5.015E+00
840.0			7.481E+05			5.016E+00	
834.0	6.104E+00	2.209E+04		7.591E+05	1.923E-03		5.017E+00
828.0			7.701E+05			5.018E+00	
822.0	6.103E+00	2.209E+04		7.812E+05	1.979E-03		5.019E+00
816.0			7.922E+05			5.020E+00	
810.0	6.103E+00	2.209E+04		8.033E+05	2.034E-03		5.021E+00
804.0			8.143E+05			5.022E+00	
798.0	6.103E+00	2.209E+04		8.254E+05	2.090E-03		5.023E+00
792.0			8.364E+05			5.024E+00	
786.0	6.103E+00	2.209E+04		8.475E+05	2.146E-03		5.025E+00
780.0			8.585E+05			5.026E+00	
774.0	6.103E+00	2.209E+04		8.695E+05	2.202E-03		5.027E+00
768.0			8.806E+05			5.029E+00	
762.0	6.103E+00	2.209E+04		8.916E+05	2.258E-03		5.030E+00
756.0			9.027E+05			5.031E+00	
750.0	6.103E+00	2.209E+04		9.137E+05	2.314E-03		5.032E+00
744.0			9.248E+05			5.033E+00	
738.0	6.103E+00	2.209E+04		9.358E+05	2.370E-03		5.034E+00
732.0			9.469E+05			5.035E+00	
726.0	6.102E+00	2.209E+04		9.579E+05	2.426E-03		5.037E+00
720.0			9.689E+05			5.038E+00	
714.0	6.102E+00	2.209E+04		9.800E+05	2.482E-03		5.039E+00
708.0			9.910E+05			5.040E+00	
702.0	6.102E+00	2.208E+04		1.002E+06	2.538E-03		5.042E+00
696.0			1.013E+06			5.043E+00	
690.0	6.102E+00	2.208E+04		1.024E+06	2.594E-03		5.044E+00
684.0			1.035E+06			5.046E+00	
678.0	6.102E+00	2.208E+04		1.046E+06	2.650E-03		5.047E+00
672.0			1.057E+06			5.048E+00	
666.0	6.102E+00	2.208E+04		1.068E+06	2.706E-03		5.050E+00
660.0			1.079E+06			5.051E+00	
654.0	6.102E+00	2.208E+04		1.090E+06	2.762E-03		5.052E+00
648.0			1.101E+06			5.054E+00	
642.0	6.101E+00	2.208E+04		1.112E+06	2.818E-03		5.055E+00
636.0			1.124E+06			5.056E+00	
630.0	6.101E+00	2.208E+04		1.135E+06	2.873E-03		5.058E+00
624.0			1.146E+06			5.059E+00	
618.0	6.101E+00	2.208E+04		1.157E+06	2.929E-03		5.061E+00
612.0			1.168E+06			5.062E+00	
606.0	6.101E+00	2.208E+04		1.179E+06	2.985E-03		5.064E+00
600.0			1.190E+06			5.065E+00	
594.0	6.101E+00	2.208E+04		1.201E+06	3.041E-03		5.067E+00
588.0			1.212E+06			5.068E+00	
582.0	6.101E+00	2.208E+04		1.223E+06	3.097E-03		5.070E+00
576.0			1.234E+06			5.071E+00	
570.0	6.100E+00	2.208E+04		1.245E+06	3.153E-03		5.073E+00
564.0			1.256E+06			5.075E+00	
558.0	6.100E+00	2.208E+04		1.267E+06	3.209E-03		5.076E+00
552.0			1.278E+06			5.078E+00	
546.0	6.100E+00	2.208E+04		1.289E+06	3.265E-03		5.079E+00
540.0			1.300E+06			5.081E+00	
534.0	6.100E+00	2.208E+04		1.311E+06	3.321E-03		5.083E+00
528.0			1.322E+06			5.084E+00	
522.0	6.100E+00	2.208E+04		1.333E+06	3.377E-03		5.086E+00
516.0			1.344E+06			5.088E+00	
510.0	6.100E+00	2.207E+04		1.355E+06	3.433E-03		5.089E+00
504.0			1.366E+06			5.091E+00	
498.0	6.099E+00	2.207E+04		1.377E+06	3.489E-03		5.093E+00
492.0			1.388E+06			5.095E+00	
486.0	6.099E+00	2.207E+04		1.399E+06	3.544E-03		5.096E+00
480.0			1.411E+06			5.098E+00	
474.0	6.099E+00	2.207E+04		1.422E+06	3.600E-03		5.100E+00
468.0			1.433E+06			5.102E+00	
462.0	6.099E+00	2.207E+04		1.444E+06	3.656E-03		5.104E+00
456.0			1.455E+06			5.105E+00	
450.0	6.098E+00	2.207E+04		1.466E+06	3.712E-03		5.107E+00
444.0			1.477E+06			5.109E+00	
438.0	6.098E+00	2.207E+04		1.488E+06	3.768E-03		5.111E+00
432.0			1.499E+06			5.113E+00	
426.0	6.098E+00	2.207E+04		1.510E+06	3.824E-03		5.115E+00
420.0			1.521E+06			5.117E+00	
414.0	6.098E+00	2.207E+04		1.532E+06	3.880E-03		5.119E+00
408.0			1.543E+06			5.121E+00	
402.0	6.098E+00	2.207E+04		1.554E+06	3.936E-03		5.123E+00
396.0			1.565E+06			5.125E+00	
390.0	6.097E+00	2.207E+04		1.576E+06	3.992E-03		5.127E+00
384.0			1.587E+06			5.129E+00	
378.0	6.097E+00	2.207E+04		1.598E+06	4.048E-03		5.131E+00
372.0			1.609E+06			5.133E+00	
366.0	6.097E+00	2.207E+04		1.620E+06	4.103E-03		5.135E+00
360.0			1.631E+06			5.137E+00	
354.0	6.097E+00	2.206E+04		1.642E+06	4.159E-03		5.139E+00
348.0			1.653E+06			5.141E+00	
342.0	6.096E+00	2.206E+04		1.664E+06	4.215E-03		5.143E+00
336.0			1.675E+06			5.145E+00	
330.0	6.096E+00	2.206E+04		1.686E+06	4.271E-03		5.147E+00
324.0			1.697E+06			5.149E+00	
318.0	6.096E+00	2.206E+04		1.708E+06	4.327E-03		5.151E+00
312.0			1.719E+06			5.154E+00	
306.0	6.096E+00	2.206E+04		1.731E+06	4.383E-03		5.156E+00
300.0			1.742E+06			5.158E+00	
294.0	6.096E+00	2.206E+04		1.753E+06	4.439E-03		5.160E+00
288.0			1.764E+06			5.162E+00	
282.0	6.095E+00	2.206E+04		1.775E+06	4.495E-03		5.165E+00
276.0			1.786E+06			5.167E+00	
270.0	5.224E+00	1.891E+04		1.795E+06	4.546E-03		5.169E+00
264.0			1.805E+06			5.172E+00	
258.0	5.224E+00	1.891E+04		1.814E+06	4.594E-03		5.174E+00
252.0			1.823E+06			5.176E+00	
246.0	5.224E+00	1.891E+04		1.833E+06	4.642E-03		5.178E+00
240.0			1.842E+06			5.181E+00	
234.0	5.224E+00	1.890E+04		1.852E+06	4.690E-03		5.183E+00
228.0			1.861E+06			5.185E+00	
222.0	5.223E+00	1.890E+04		1.871E+06	4.738E-03		5.188E+00
216.0			1.880E+06			5.190E+00	
210.0	1.471E+01	5.325E+04		1.907E+06	4.829E-03		5.193E+00
204.0			1.933E+06			5.195E+00	
198.0	1.471E+01	5.325E+04		1.960E+06	4.964E-03		5.197E+00
192.0			1.987E+06			5.200E+00	
186.0	1.471E+01	5.325E+04		2.013E+06	5.099E-03		5.203E+00
180.0			2.040E+06			5.205E+00	

174.0	1.471E+01	5.325E+04		2.067E+06	5.234E-03		5.208E+00
168.0			2.093E+06			5.210E+00	
162.0	1.404E+01	5.083E+04		2.119E+06	5.366E-03		5.213E+00
156.0			2.144E+06			5.216E+00	
150.0	1.404E+01	5.083E+04		2.169E+06	5.494E-03		5.218E+00
144.0			2.195E+06			5.221E+00	
138.0	1.404E+01	5.083E+04		2.220E+06	5.623E-03		5.224E+00
132.0			2.246E+06			5.227E+00	
126.0	1.404E+01	5.083E+04		2.271E+06	5.752E-03		5.230E+00
120.0			2.297E+06			5.233E+00	
114.0	1.404E+01	5.083E+04		2.322E+06	5.881E-03		5.235E+00
108.0			2.347E+06			5.238E+00	
102.0	1.404E+01	5.083E+04		2.373E+06	6.009E-03		5.241E+00
96.0			2.398E+06			5.244E+00	
90.0	1.404E+01	5.083E+04		2.424E+06	6.138E-03		5.247E+00
84.0			2.449E+06			5.251E+00	
78.0	1.404E+01	5.083E+04		2.474E+06	6.267E-03		5.254E+00
72.0			2.500E+06			5.257E+00	
66.0	4.959E+00	1.795E+04		2.509E+06	6.354E-03		5.260E+00
60.0			2.518E+06			5.263E+00	
54.0	4.959E+00	1.795E+04		2.527E+06	6.399E-03		5.266E+00
48.0			2.536E+06			5.270E+00	
42.0	4.958E+00	1.794E+04		2.545E+06	6.445E-03		5.273E+00
36.0			2.554E+06			5.276E+00	
30.0	4.958E+00	1.794E+04		2.563E+06	6.490E-03		5.279E+00
24.0			2.572E+06			5.283E+00	
18.0	4.958E+00	1.794E+04		2.581E+06	6.536E-03		5.286E+00
12.0			2.590E+06			5.289E+00	
6.0	4.957E+00	1.794E+04		2.599E+06	6.581E-03		5.292E+00
0.0			2.607E+06			5.296E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
6.0000E+00	5.2997E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			5.300E+05			6.000E+00	
954.0	6.048E+00	2.189E+04		5.409E+05	1.370E-03		6.001E+00
948.0			5.519E+05			6.001E+00	
942.0	6.048E+00	2.189E+04		5.628E+05	1.425E-03		6.002E+00
936.0			5.737E+05			6.003E+00	
930.0	6.048E+00	2.189E+04		5.847E+05	1.481E-03		6.004E+00
924.0			5.956E+05			6.004E+00	
918.0	6.048E+00	2.189E+04		6.066E+05	1.536E-03		6.005E+00
912.0			6.175E+05			6.006E+00	
906.0	6.048E+00	2.189E+04		6.285E+05	1.592E-03		6.007E+00
900.0			6.394E+05			6.007E+00	
894.0	6.048E+00	2.189E+04		6.504E+05	1.647E-03		6.008E+00
888.0			6.613E+05			6.009E+00	
882.0	6.048E+00	2.189E+04		6.722E+05	1.703E-03		6.010E+00
876.0			6.832E+05			6.011E+00	
870.0	6.047E+00	2.189E+04		6.941E+05	1.758E-03		6.012E+00
864.0			7.051E+05			6.013E+00	
858.0	6.047E+00	2.189E+04		7.160E+05	1.813E-03		6.013E+00
852.0			7.270E+05			6.014E+00	
846.0	6.047E+00	2.189E+04		7.379E+05	1.869E-03		6.015E+00
840.0			7.488E+05			6.016E+00	
834.0	6.047E+00	2.189E+04		7.598E+05	1.924E-03		6.017E+00
828.0			7.707E+05			6.018E+00	
822.0	6.047E+00	2.189E+04		7.817E+05	1.980E-03		6.019E+00
816.0			7.926E+05			6.020E+00	
810.0	6.047E+00	2.188E+04		8.036E+05	2.035E-03		6.021E+00
804.0			8.145E+05			6.022E+00	
798.0	6.047E+00	2.188E+04		8.254E+05	2.091E-03		6.023E+00
792.0			8.364E+05			6.024E+00	
786.0	6.047E+00	2.188E+04		8.473E+05	2.146E-03		6.025E+00
780.0			8.583E+05			6.026E+00	
774.0	6.047E+00	2.188E+04		8.692E+05	2.201E-03		6.027E+00
768.0			8.802E+05			6.029E+00	
762.0	6.046E+00	2.188E+04		8.911E+05	2.257E-03		6.030E+00
756.0			9.020E+05			6.031E+00	
750.0	6.046E+00	2.188E+04		9.130E+05	2.312E-03		6.032E+00
744.0			9.239E+05			6.033E+00	
738.0	6.046E+00	2.188E+04		9.349E+05	2.368E-03		6.034E+00
732.0			9.458E+05			6.036E+00	
726.0	6.046E+00	2.188E+04		9.567E+05	2.423E-03		6.037E+00
720.0			9.677E+05			6.038E+00	
714.0	6.046E+00	2.188E+04		9.786E+05	2.479E-03		6.039E+00
708.0			9.896E+05			6.040E+00	
702.0	6.046E+00	2.188E+04		1.001E+06	2.534E-03		6.042E+00
696.0			1.011E+06			6.043E+00	
690.0	6.046E+00	2.188E+04		1.022E+06	2.589E-03		6.044E+00
684.0			1.033E+06			6.046E+00	
678.0	6.045E+00	2.188E+04		1.044E+06	2.645E-03		6.047E+00
672.0			1.055E+06			6.048E+00	
666.0	6.045E+00	2.188E+04		1.066E+06	2.700E-03		6.050E+00
660.0			1.077E+06			6.051E+00	
654.0	6.045E+00	2.188E+04		1.088E+06	2.756E-03		6.052E+00
648.0			1.099E+06			6.054E+00	
642.0	6.045E+00	2.188E+04		1.110E+06	2.811E-03		6.055E+00
636.0			1.121E+06			6.056E+00	
630.0	6.045E+00	2.188E+04		1.132E+06	2.866E-03		6.058E+00
624.0			1.143E+06			6.059E+00	
618.0	6.045E+00	2.188E+04		1.154E+06	2.922E-03		6.061E+00
612.0			1.165E+06			6.062E+00	
606.0	6.045E+00	2.188E+04		1.176E+06	2.977E-03		6.064E+00
600.0			1.186E+06			6.065E+00	
594.0	6.044E+00	2.188E+04		1.197E+06	3.033E-03		6.067E+00
588.0			1.208E+06			6.068E+00	
582.0	6.044E+00	2.187E+04		1.219E+06	3.088E-03		6.070E+00
576.0			1.230E+06			6.071E+00	
570.0	6.044E+00	2.187E+04		1.241E+06	3.143E-03		6.073E+00
564.0			1.252E+06			6.074E+00	
558.0	6.044E+00	2.187E+04		1.263E+06	3.199E-03		6.076E+00
552.0			1.274E+06			6.078E+00	
546.0	6.044E+00	2.187E+04		1.285E+06	3.254E-03		6.079E+00
540.0			1.296E+06			6.081E+00	
534.0	6.043E+00	2.187E+04		1.307E+06	3.310E-03		6.083E+00
528.0			1.318E+06			6.084E+00	
522.0	6.043E+00	2.187E+04		1.329E+06	3.365E-03		6.086E+00
516.0			1.340E+06			6.088E+00	
510.0	6.043E+00	2.187E+04		1.351E+06	3.420E-03		6.089E+00
504.0			1.361E+06			6.091E+00	
498.0	6.043E+00	2.187E+04		1.372E+06	3.476E-03		6.093E+00
492.0			1.383E+06			6.094E+00	
486.0	6.043E+00	2.187E+04		1.394E+06	3.531E-03		6.096E+00
480.0			1.405E+06			6.098E+00	
474.0	6.042E+00	2.187E+04		1.416E+06	3.587E-03		6.100E+00
468.0			1.427E+06			6.102E+00	
462.0	6.042E+00	2.187E+04		1.438E+06	3.642E-03		6.103E+00
456.0			1.449E+06			6.105E+00	
450.0	6.042E+00	2.187E+04		1.460E+06	3.697E-03		6.107E+00
444.0			1.471E+06			6.109E+00	
438.0	6.042E+00	2.187E+04		1.482E+06	3.753E-03		6.111E+00
432.0			1.493E+06			6.113E+00	
426.0	6.042E+00	2.187E+04		1.504E+06	3.808E-03		6.115E+00
420.0			1.515E+06			6.117E+00	
414.0	6.041E+00	2.186E+04		1.525E+06	3.863E-03		6.118E+00
408.0			1.536E+06			6.120E+00	
402.0	6.041E+00	2.186E+04		1.547E+06	3.919E-03		6.122E+00
396.0			1.558E+06			6.124E+00	
390.0	6.041E+00	2.186E+04		1.569E+06	3.974E-03		6.126E+00
384.0			1.580E+06			6.128E+00	
378.0	6.041E+00	2.186E+04		1.591E+06	4.030E-03		6.130E+00
372.0			1.602E+06			6.132E+00	
366.0	6.041E+00	2.186E+04		1.613E+06	4.085E-03		6.134E+00
360.0			1.624E+06			6.136E+00	
354.0	6.040E+00	2.186E+04		1.635E+06	4.140E-03		6.138E+00
348.0			1.646E+06			6.141E+00	
342.0	6.040E+00	2.186E+04		1.657E+06	4.196E-03		6.143E+00
336.0			1.668E+06			6.145E+00	
330.0	6.040E+00	2.186E+04		1.678E+06	4.251E-03		6.147E+00
324.0			1.689E+06			6.149E+00	
318.0	6.040E+00	2.186E+04		1.700E+06	4.306E-03		6.151E+00
312.0			1.711E+06			6.153E+00	
306.0	6.039E+00	2.186E+04		1.722E+06	4.362E-03		6.155E+00

300.0			1.733E+06			6.158E+00	
294.0	6.039E+00	2.186E+04		1.744E+06	4.417E-03		6.160E+00
288.0			1.755E+06			6.162E+00	
282.0	6.039E+00	2.186E+04		1.766E+06	4.472E-03		6.164E+00
276.0			1.777E+06			6.167E+00	
270.0	5.176E+00	1.873E+04		1.786E+06	4.524E-03		6.169E+00
264.0			1.796E+06			6.171E+00	
258.0	5.176E+00	1.873E+04		1.805E+06	4.571E-03		6.173E+00
252.0			1.814E+06			6.176E+00	
246.0	5.176E+00	1.873E+04		1.824E+06	4.619E-03		6.178E+00
240.0			1.833E+06			6.180E+00	
234.0	5.175E+00	1.873E+04		1.842E+06	4.666E-03		6.183E+00
228.0			1.852E+06			6.185E+00	
222.0	5.175E+00	1.873E+04		1.861E+06	4.714E-03		6.187E+00
216.0			1.870E+06			6.190E+00	
210.0	1.470E+01	5.318E+04		1.897E+06	4.805E-03		6.192E+00
204.0			1.924E+06			6.194E+00	
198.0	1.469E+01	5.318E+04		1.950E+06	4.939E-03		6.197E+00
192.0			1.977E+06			6.199E+00	
186.0	1.469E+01	5.318E+04		2.003E+06	5.074E-03		6.202E+00
180.0			2.030E+06			6.204E+00	
174.0	1.469E+01	5.318E+04		2.057E+06	5.209E-03		6.207E+00
168.0			2.083E+06			6.210E+00	
162.0	1.403E+01	5.076E+04		2.109E+06	5.340E-03		6.212E+00
156.0			2.134E+06			6.215E+00	
150.0	1.403E+01	5.076E+04		2.159E+06	5.469E-03		6.218E+00
144.0			2.185E+06			6.220E+00	
138.0	1.403E+01	5.076E+04		2.210E+06	5.598E-03		6.223E+00
132.0			2.236E+06			6.226E+00	
126.0	1.403E+01	5.076E+04		2.261E+06	5.726E-03		6.229E+00
120.0			2.286E+06			6.232E+00	
114.0	1.403E+01	5.076E+04		2.312E+06	5.855E-03		6.235E+00
108.0			2.337E+06			6.238E+00	
102.0	1.403E+01	5.076E+04		2.362E+06	5.983E-03		6.241E+00
96.0			2.388E+06			6.244E+00	
90.0	1.403E+01	5.076E+04		2.413E+06	6.112E-03		6.247E+00
84.0			2.439E+06			6.250E+00	
78.0	1.403E+01	5.076E+04		2.464E+06	6.240E-03		6.253E+00
72.0			2.489E+06			6.256E+00	
66.0	4.913E+00	1.778E+04		2.498E+06	6.327E-03		6.259E+00
60.0			2.507E+06			6.262E+00	
54.0	4.913E+00	1.778E+04		2.516E+06	6.372E-03		6.265E+00
48.0			2.525E+06			6.269E+00	
42.0	4.912E+00	1.778E+04		2.534E+06	6.417E-03		6.272E+00
36.0			2.543E+06			6.275E+00	
30.0	4.912E+00	1.778E+04		2.552E+06	6.462E-03		6.278E+00
24.0			2.560E+06			6.282E+00	
18.0	4.912E+00	1.778E+04		2.569E+06	6.507E-03		6.285E+00
12.0			2.578E+06			6.288E+00	
6.0	4.912E+00	1.778E+04		2.587E+06	6.552E-03		6.291E+00
0.0			2.596E+06			6.295E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
7.0000E+00	5.3254E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			5.325E+05			7.000E+00	
954.0	5.992E+00	2.168E+04		5.434E+05	1.376E-03		7.001E+00
948.0			5.542E+05			7.001E+00	
942.0	5.992E+00	2.168E+04		5.651E+05	1.431E-03		7.002E+00
936.0			5.759E+05			7.003E+00	
930.0	5.992E+00	2.168E+04		5.867E+05	1.486E-03		7.004E+00
924.0			5.976E+05			7.004E+00	
918.0	5.991E+00	2.168E+04		6.084E+05	1.541E-03		7.005E+00
912.0			6.193E+05			7.006E+00	
906.0	5.991E+00	2.168E+04		6.301E+05	1.596E-03		7.007E+00
900.0			6.410E+05			7.007E+00	
894.0	5.991E+00	2.168E+04		6.518E+05	1.651E-03		7.008E+00
888.0			6.626E+05			7.009E+00	
882.0	5.991E+00	2.168E+04		6.735E+05	1.706E-03		7.010E+00
876.0			6.843E+05			7.011E+00	
870.0	5.991E+00	2.168E+04		6.952E+05	1.761E-03		7.012E+00
864.0			7.060E+05			7.013E+00	
858.0	5.991E+00	2.168E+04		7.168E+05	1.816E-03		7.013E+00
852.0			7.277E+05			7.014E+00	
846.0	5.991E+00	2.168E+04		7.385E+05	1.870E-03		7.015E+00
840.0			7.494E+05			7.016E+00	
834.0	5.991E+00	2.168E+04		7.602E+05	1.925E-03		7.017E+00
828.0			7.710E+05			7.018E+00	
822.0	5.991E+00	2.168E+04		7.819E+05	1.980E-03		7.019E+00
816.0			7.927E+05			7.020E+00	
810.0	5.991E+00	2.168E+04		8.036E+05	2.035E-03		7.021E+00
804.0			8.144E+05			7.022E+00	
798.0	5.990E+00	2.168E+04		8.252E+05	2.090E-03		7.023E+00
792.0			8.361E+05			7.024E+00	
786.0	5.990E+00	2.168E+04		8.469E+05	2.145E-03		7.025E+00
780.0			8.578E+05			7.026E+00	
774.0	5.990E+00	2.168E+04		8.686E+05	2.200E-03		7.028E+00
768.0			8.794E+05			7.029E+00	
762.0	5.990E+00	2.168E+04		8.903E+05	2.255E-03		7.030E+00
756.0			9.011E+05			7.031E+00	
750.0	5.990E+00	2.168E+04		9.120E+05	2.310E-03		7.032E+00
744.0			9.228E+05			7.033E+00	
738.0	5.990E+00	2.168E+04		9.336E+05	2.365E-03		7.034E+00
732.0			9.445E+05			7.036E+00	
726.0	5.990E+00	2.168E+04		9.553E+05	2.420E-03		7.037E+00
720.0			9.662E+05			7.038E+00	
714.0	5.989E+00	2.168E+04		9.770E+05	2.474E-03		7.039E+00
708.0			9.878E+05			7.040E+00	
702.0	5.989E+00	2.168E+04		9.987E+05	2.529E-03		7.042E+00
696.0			1.010E+06			7.043E+00	
690.0	5.989E+00	2.168E+04		1.020E+06	2.584E-03		7.044E+00
684.0			1.031E+06			7.046E+00	
678.0	5.989E+00	2.168E+04		1.042E+06	2.639E-03		7.047E+00
672.0			1.053E+06			7.048E+00	
666.0	5.989E+00	2.167E+04		1.064E+06	2.694E-03		7.050E+00
660.0			1.075E+06			7.051E+00	
654.0	5.989E+00	2.167E+04		1.085E+06	2.749E-03		7.052E+00
648.0			1.096E+06			7.054E+00	
642.0	5.989E+00	2.167E+04		1.107E+06	2.804E-03		7.055E+00
636.0			1.118E+06			7.056E+00	
630.0	5.988E+00	2.167E+04		1.129E+06	2.859E-03		7.058E+00
624.0			1.140E+06			7.059E+00	
618.0	5.988E+00	2.167E+04		1.150E+06	2.914E-03		7.061E+00
612.0			1.161E+06			7.062E+00	
606.0	5.988E+00	2.167E+04		1.172E+06	2.968E-03		7.064E+00
600.0			1.183E+06			7.065E+00	
594.0	5.988E+00	2.167E+04		1.194E+06	3.023E-03		7.067E+00
588.0			1.205E+06			7.068E+00	
582.0	5.988E+00	2.167E+04		1.215E+06	3.078E-03		7.070E+00
576.0			1.226E+06			7.071E+00	
570.0	5.988E+00	2.167E+04		1.237E+06	3.133E-03		7.073E+00
564.0			1.248E+06			7.074E+00	
558.0	5.987E+00	2.167E+04		1.259E+06	3.188E-03		7.076E+00
552.0			1.270E+06			7.078E+00	
546.0	5.987E+00	2.167E+04		1.280E+06	3.243E-03		7.079E+00
540.0			1.291E+06			7.081E+00	
534.0	5.987E+00	2.167E+04		1.302E+06	3.298E-03		7.082E+00
528.0			1.313E+06			7.084E+00	
522.0	5.987E+00	2.167E+04		1.324E+06	3.353E-03		7.086E+00
516.0			1.335E+06			7.087E+00	
510.0	5.987E+00	2.167E+04		1.345E+06	3.408E-03		7.089E+00
504.0			1.356E+06			7.091E+00	
498.0	5.986E+00	2.167E+04		1.367E+06	3.462E-03		7.093E+00
492.0			1.378E+06			7.094E+00	
486.0	5.986E+00	2.167E+04		1.389E+06	3.517E-03		7.096E+00
480.0			1.400E+06			7.098E+00	
474.0	5.986E+00	2.166E+04		1.410E+06	3.572E-03		7.100E+00
468.0			1.421E+06			7.101E+00	
462.0	5.986E+00	2.166E+04		1.432E+06	3.627E-03		7.103E+00
456.0			1.443E+06			7.105E+00	
450.0	5.986E+00	2.166E+04		1.454E+06	3.682E-03		7.107E+00
444.0			1.465E+06			7.109E+00	
438.0	5.985E+00	2.166E+04		1.475E+06	3.737E-03		7.111E+00
432.0			1.486E+06			7.112E+00	

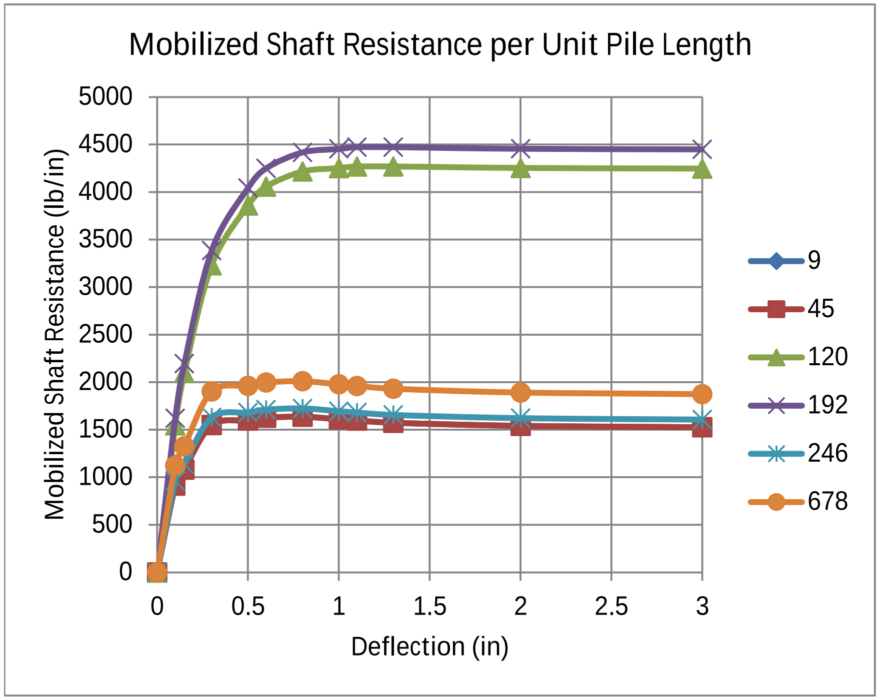
426.0	5.985E+00	2.166E+04		1.497E+06	3.792E-03		7.114E+00
420.0			1.508E+06			7.116E+00	
414.0	5.985E+00	2.166E+04		1.519E+06	3.846E-03		7.118E+00
408.0			1.530E+06			7.120E+00	
402.0	5.985E+00	2.166E+04		1.540E+06	3.901E-03		7.122E+00
396.0			1.551E+06			7.124E+00	
390.0	5.985E+00	2.166E+04		1.562E+06	3.956E-03		7.126E+00
384.0			1.573E+06			7.128E+00	
378.0	5.984E+00	2.166E+04		1.584E+06	4.011E-03		7.130E+00
372.0			1.595E+06			7.132E+00	
366.0	5.984E+00	2.166E+04		1.605E+06	4.066E-03		7.134E+00
360.0			1.616E+06			7.136E+00	
354.0	5.984E+00	2.166E+04		1.627E+06	4.121E-03		7.138E+00
348.0			1.638E+06			7.140E+00	
342.0	5.984E+00	2.166E+04		1.649E+06	4.176E-03		7.142E+00
336.0			1.660E+06			7.144E+00	
330.0	5.983E+00	2.165E+04		1.670E+06	4.230E-03		7.146E+00
324.0			1.681E+06			7.149E+00	
318.0	5.983E+00	2.165E+04		1.692E+06	4.285E-03		7.151E+00
312.0			1.703E+06			7.153E+00	
306.0	5.983E+00	2.165E+04		1.714E+06	4.340E-03		7.155E+00
300.0			1.724E+06			7.157E+00	
294.0	5.983E+00	2.165E+04		1.735E+06	4.395E-03		7.159E+00
288.0			1.746E+06			7.162E+00	
282.0	5.982E+00	2.165E+04		1.757E+06	4.450E-03		7.164E+00
276.0			1.768E+06			7.166E+00	
270.0	5.128E+00	1.856E+04		1.777E+06	4.501E-03		7.168E+00
264.0			1.786E+06			7.171E+00	
258.0	5.127E+00	1.856E+04		1.796E+06	4.548E-03		7.173E+00
252.0			1.805E+06			7.175E+00	
246.0	5.127E+00	1.856E+04		1.814E+06	4.595E-03		7.177E+00
240.0			1.823E+06			7.180E+00	
234.0	5.127E+00	1.856E+04		1.833E+06	4.642E-03		7.182E+00
228.0			1.842E+06			7.184E+00	
222.0	5.127E+00	1.855E+04		1.851E+06	4.689E-03		7.187E+00
216.0			1.861E+06			7.189E+00	
210.0	1.468E+01	5.311E+04		1.887E+06	4.779E-03		7.191E+00
204.0			1.914E+06			7.194E+00	
198.0	1.468E+01	5.311E+04		1.940E+06	4.914E-03		7.196E+00
192.0			1.967E+06			7.199E+00	
186.0	1.468E+01	5.311E+04		1.993E+06	5.048E-03		7.201E+00
180.0			2.020E+06			7.204E+00	
174.0	1.468E+01	5.311E+04		2.046E+06	5.183E-03		7.206E+00
168.0			2.073E+06			7.209E+00	
162.0	1.401E+01	5.070E+04		2.098E+06	5.314E-03		7.212E+00
156.0			2.124E+06			7.214E+00	
150.0	1.401E+01	5.070E+04		2.149E+06	5.443E-03		7.217E+00
144.0			2.174E+06			7.220E+00	
138.0	1.401E+01	5.070E+04		2.200E+06	5.571E-03		7.222E+00
132.0			2.225E+06			7.225E+00	
126.0	1.401E+01	5.070E+04		2.250E+06	5.700E-03		7.228E+00
120.0			2.276E+06			7.231E+00	
114.0	1.401E+01	5.070E+04		2.301E+06	5.828E-03		7.234E+00
108.0			2.326E+06			7.237E+00	
102.0	1.401E+01	5.070E+04		2.352E+06	5.956E-03		7.240E+00
96.0			2.377E+06			7.243E+00	
90.0	1.401E+01	5.070E+04		2.403E+06	6.085E-03		7.246E+00
84.0			2.428E+06			7.249E+00	
78.0	1.401E+01	5.070E+04		2.453E+06	6.213E-03		7.252E+00
72.0			2.479E+06			7.255E+00	
66.0	4.867E+00	1.761E+04		2.487E+06	6.300E-03		7.258E+00
60.0			2.496E+06			7.261E+00	
54.0	4.867E+00	1.761E+04		2.505E+06	6.344E-03		7.265E+00
48.0			2.514E+06			7.268E+00	
42.0	4.867E+00	1.761E+04		2.523E+06	6.389E-03		7.271E+00
36.0			2.531E+06			7.274E+00	
30.0	4.866E+00	1.761E+04		2.540E+06	6.434E-03		7.277E+00
24.0			2.549E+06			7.281E+00	
18.0	4.866E+00	1.761E+04		2.558E+06	6.478E-03		7.284E+00
12.0			2.567E+06			7.287E+00	
6.0	4.866E+00	1.761E+04		2.575E+06	6.523E-03		7.290E+00
0.0			2.584E+06			7.294E+00	

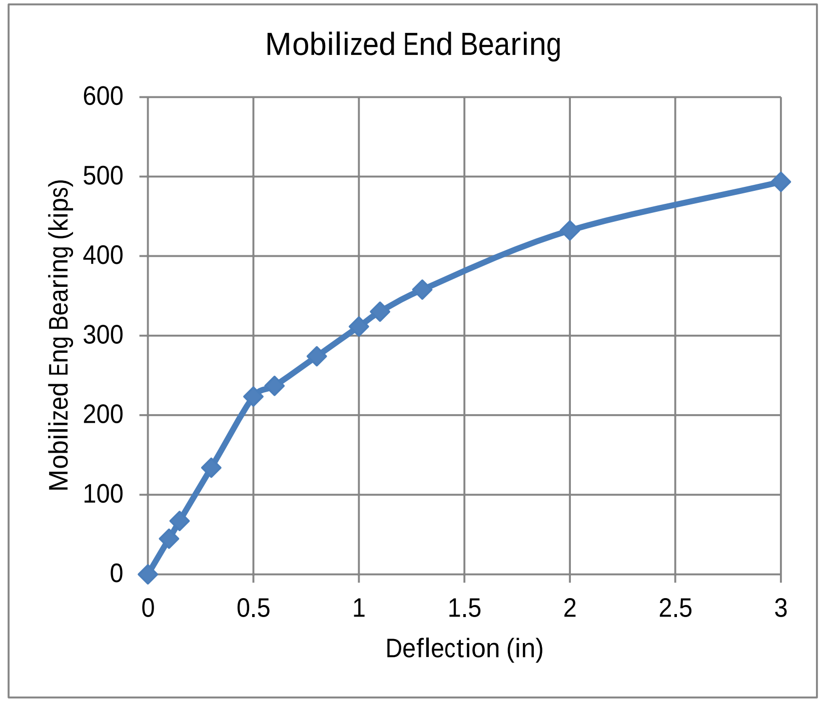
RESULTS DUE TO TIP MOVEMENTS

TOP LOAD LBS	TOP MOVEMENT IN.	TIP MOVEMENT IN.	TIP LOAD LBS
1.4015E+06	2.2906E-01	1.0000E-01	4.4673E+04
2.1088E+06	4.5777E-01	2.5000E-01	1.1168E+05
2.3977E+06	7.4520E-01	5.0000E-01	2.1816E+05
2.4967E+06	1.2639E+00	1.0000E+00	3.1034E+05
2.5557E+06	2.2812E+00	2.0000E+00	4.3226E+05
2.6010E+06	3.2917E+00	3.0000E+00	4.9197E+05
2.6122E+06	4.2953E+00	4.0000E+00	5.1753E+05
2.6075E+06	5.2956E+00	5.0000E+00	5.2714E+05
2.5960E+06	6.2946E+00	6.0000E+00	5.2997E+05
2.5843E+06	7.2935E+00	7.0000E+00	5.3254E+05

Mobilized Shaft Resistance and End Bearing
Bent 2
University Avenue Pedestrian Overcrossing
East Palo Alto, California

Layer Depth Interval		Mid-depth	Deflection											
From	To		0	0.1	0.15	0.3	0.5	0.6	0.8	1	1.1	1.3	2	3
0	18	9	0	913	1080	1550	1597	1627	1637	1611	1597	1574	1541	1527
18	72	45	0	913	1080	1550	1597	1627	1637	1611	1597	1574	1541	1527
72	168	120	0	1547	2096	3231	3859	4057	4217	4252	4269	4270	4254	4248
168	216	192	0	1621	2196	3385	4043	4250	4418	4454	4473	4473	4456	4450
216	276	246	0	961	1137	1631	1681	1712	1724	1695	1681	1656	1622	1607
276	1080	678	0	1122	1326	1903	1962	1998	2011	1978	1961	1932	1892	1875
Mobilized End Bearing (kips)			0	45	67	134	223	237	274	311	330	358	432	493





===

TZPILE for Windows, Version 2021.4.1

Serial Number : 235486586

A Program for Computing Load Vs Settlement
For an Axially Loaded Pile

===

This program is licensed to :

AECOM
TZPILE Global, Global License

Path to file locations : X:\City of East Palo Alto\28645626 101-University\440_Materials\Analysis\TZPile\20211021\20220221\
Name of input data file : Bent3_96CIDH_80ft.tz4d
Name of output file : Bent3_96CIDH_80ft.tz4o
Name of plot output file : Bent3_96CIDH_80ft.tz4p

Time and Date of Analysis

Date: March 15, 2022 Time: 14:05:03

101 University POC - Bent 3 96-in CIDH, 80 ft

AXIALLY LOADED PILE, CONSTANT OD

LAYER	SOIL TYPE	XTOP IN.	XBOT IN.
1	Drilled Shaft in Sand	0.000E+00	2.400E+01
2	Drilled Shaft in Clay	2.400E+01	1.140E+02
3	Drilled Shaft in Clay	1.140E+02	1.680E+02
4	Drilled Shaft in Sand	1.680E+02	2.640E+02
5	Drilled Shaft in Sand	2.640E+02	3.120E+02
6	Drilled Shaft in Clay	3.120E+02	3.720E+02
7	Drilled Shaft in Clay	3.720E+02	1.200E+03

XG1 IN.	GAM1 LB/IN**3
0.000E+00	6.900E-02
2.400E+01	6.900E-02
2.400E+01	6.900E-02
1.140E+02	6.900E-02
1.140E+02	3.300E-02
1.680E+02	3.300E-02
1.680E+02	3.300E-02
2.640E+02	3.300E-02
2.640E+02	3.800E-02
3.120E+02	3.800E-02
3.120E+02	3.600E-02
3.720E+02	3.600E-02
3.720E+02	3.600E-02
1.200E+03	3.600E-02

XSTR IN.	C1 LB/IN**2	EE50	PHI1 DEG.	BLOW COUNT	UNIT SIDE LB/IN**2	UNIT TIP LB/IN**2
0.000E+00	0.000E+00	0.000E+00	3.400E+01	0.000E+00	3.400E+00	7.800E+01
2.400E+01	0.000E+00	0.000E+00	3.400E+01	0.000E+00	3.400E+00	7.800E+01
2.400E+01	1.042E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	9.400E+01
1.140E+02	1.042E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	9.400E+01
1.140E+02	1.042E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	9.400E+01
1.680E+02	1.042E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	9.400E+01
1.680E+02	0.000E+00	0.000E+00	3.000E+01	0.000E+00	6.200E+00	6.000E+01
2.640E+02	0.000E+00	0.000E+00	3.000E+01	0.000E+00	6.200E+00	6.000E+01
2.640E+02	0.000E+00	0.000E+00	3.600E+01	0.000E+00	7.500E+00	1.700E+02
3.120E+02	0.000E+00	0.000E+00	3.600E+01	0.000E+00	7.500E+00	1.700E+02
3.120E+02	1.040E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	9.400E+01
3.720E+02	1.040E+01	5.000E-03	0.000E+00	0.000E+00	6.000E+00	9.400E+01
3.720E+02	1.250E+01	5.000E-03	0.000E+00	0.000E+00	7.000E+00	7.500E+01
1.200E+03	1.250E+01	5.000E-03	0.000E+00	0.000E+00	7.000E+00	7.500E+01

DEPTH IN.	AE PILE LBS
0.0000E+00	4.7381E+09
9.6000E+02	4.7381E+09

PILE LENGTH IN.	HEAD COORD. IN.	OUTER DIAMETER IN.	TOLERANCE IN.
9.6000E+02	0.0000E+00	9.6000E+01	1.0000E-05

INTERNALLY GENERATED T-Z CURVES

T-Z CURVE NO.	NO. OF POINTS	DEPTH TO CURVE,IN.	LOAD TRANSFER TRANSFER,PSI	PILE MOVEMENT,IN.
1	10	0.0000E+00		
			0.0000E+00	0.0000E+00
			1.1390E+00	9.6000E-02
			1.9720E+00	1.9200E-01
			2.4480E+00	2.8800E-01
			2.9240E+00	4.8000E-01
			3.0940E+00	5.7600E-01
			3.2300E+00	7.6800E-01
			3.2810E+00	1.1520E+00
			3.2640E+00	1.5360E+00
			3.2300E+00	9.6000E+00
2	10	0.6000E+01		
			0.0000E+00	0.0000E+00
			1.1390E+00	9.6000E-02
			1.9720E+00	1.9200E-01
			2.4480E+00	2.8800E-01
			2.9240E+00	4.8000E-01
			3.0940E+00	5.7600E-01
			3.2300E+00	7.6800E-01
			3.2810E+00	1.1520E+00
			3.2640E+00	1.5360E+00
			3.2300E+00	9.6000E+00
3	10	0.1200E+02		
			0.0000E+00	0.0000E+00
			1.1390E+00	9.6000E-02
			1.9720E+00	1.9200E-01
			2.4480E+00	2.8800E-01
			2.9240E+00	4.8000E-01
			3.0940E+00	5.7600E-01
			3.2300E+00	7.6800E-01
			3.2810E+00	1.1520E+00
			3.2640E+00	1.5360E+00
			3.2300E+00	9.6000E+00
4	10	0.1799E+02		
			0.0000E+00	0.0000E+00
			1.1390E+00	9.6000E-02
			1.9720E+00	1.9200E-01
			2.4480E+00	2.8800E-01
			2.9240E+00	4.8000E-01
			3.0940E+00	5.7600E-01
			3.2300E+00	7.6800E-01
			3.2810E+00	1.1520E+00
			3.2640E+00	1.5360E+00
			3.2300E+00	9.6000E+00
5	10	0.2399E+02		
			0.0000E+00	0.0000E+00
			1.1390E+00	9.6000E-02

			1.9720E+00	1.9200E-01
			2.4480E+00	2.8800E-01
			2.9240E+00	4.8000E-01
			3.0940E+00	5.7600E-01
			3.2300E+00	7.6800E-01
			3.2810E+00	1.1520E+00
			3.2640E+00	1.5360E+00
			3.2300E+00	9.6000E+00
6	10	0.2400E+02		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
7	10	0.4650E+02		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
8	10	0.6900E+02		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
9	10	0.9149E+02		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
10	10	0.1140E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
11	10	0.1140E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
12	10	0.1275E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
13	10	0.1410E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
14	10	0.1545E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
15	10	0.1680E+03		
			0.0000E+00	0.0000E+00
			3.0600E+00	9.6000E-02
			4.3200E+00	1.9200E-01
			5.4000E+00	2.8800E-01
			5.5500E+00	4.8000E-01
			5.6700E+00	5.7600E-01
			5.7300E+00	7.6800E-01
			5.5500E+00	1.1520E+00
			5.4000E+00	1.5360E+00
			5.0100E+00	9.6000E+00
16	10	0.1680E+03		
			0.0000E+00	0.0000E+00
			2.0770E+00	9.6000E-02
			3.5960E+00	1.9200E-01
			4.4640E+00	2.8800E-01
			5.3320E+00	4.8000E-01
			5.6420E+00	5.7600E-01
			5.8900E+00	7.6800E-01
			5.9830E+00	1.1520E+00
			5.9520E+00	1.5360E+00
			5.8900E+00	9.6000E+00
17	10	0.1920E+03		
			0.0000E+00	0.0000E+00
			2.0770E+00	9.6000E-02
			3.5960E+00	1.9200E-01
			4.4640E+00	2.8800E-01
			5.3320E+00	4.8000E-01
			5.6420E+00	5.7600E-01
			5.8900E+00	7.6800E-01
			5.9830E+00	1.1520E+00
			5.9520E+00	1.5360E+00
			5.8900E+00	9.6000E+00
18	10	0.2160E+03		
			0.0000E+00	0.0000E+00
			2.0770E+00	9.6000E-02
			3.5960E+00	1.9200E-01
			4.4640E+00	2.8800E-01
			5.3320E+00	4.8000E-01
			5.6420E+00	5.7600E-01
			5.8900E+00	7.6800E-01
			5.9830E+00	1.1520E+00
			5.9520E+00	1.5360E+00
			5.8900E+00	9.6000E+00
19	10	0.2400E+03		

```
                     0.0000E+00   0.0000E+00
                     2.0770E+00   9.6000E-02
                     3.5960E+00   1.9200E-01
                     4.4640E+00   2.8800E-01
                     5.3320E+00   4.8000E-01
                     5.6420E+00   5.7600E-01
                     5.8900E+00   7.6800E-01
                     5.9830E+00   1.1520E+00
                     5.9520E+00   1.5360E+00
                     5.8900E+00   9.6000E+00
20     10     0.2640E+03
                     0.0000E+00   0.0000E+00
                     2.0770E+00   9.6000E-02
                     3.5960E+00   1.9200E-01
                     4.4640E+00   2.8800E-01
                     5.3320E+00   4.8000E-01
                     5.6420E+00   5.7600E-01
                     5.8900E+00   7.6800E-01
                     5.9830E+00   1.1520E+00
                     5.9520E+00   1.5360E+00
                     5.8900E+00   9.6000E+00
21     10     0.2640E+03
                     0.0000E+00   0.0000E+00
                     2.5125E+00   9.6000E-02
                     4.3500E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     6.4500E+00   4.8000E-01
                     6.8250E+00   5.7600E-01
                     7.1250E+00   7.6800E-01
                     7.2375E+00   1.1520E+00
                     7.2000E+00   1.5360E+00
                     7.1250E+00   9.6000E+00
22     10     0.2760E+03
                     0.0000E+00   0.0000E+00
                     2.5125E+00   9.6000E-02
                     4.3500E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     6.4500E+00   4.8000E-01
                     6.8250E+00   5.7600E-01
                     7.1250E+00   7.6800E-01
                     7.2375E+00   1.1520E+00
                     7.2000E+00   1.5360E+00
                     7.1250E+00   9.6000E+00
23     10     0.2880E+03
                     0.0000E+00   0.0000E+00
                     2.5125E+00   9.6000E-02
                     4.3500E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     6.4500E+00   4.8000E-01
                     6.8250E+00   5.7600E-01
                     7.1250E+00   7.6800E-01
                     7.2375E+00   1.1520E+00
                     7.2000E+00   1.5360E+00
                     7.1250E+00   9.6000E+00
24     10     0.3000E+03
                     0.0000E+00   0.0000E+00
                     2.5125E+00   9.6000E-02
                     4.3500E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     6.4500E+00   4.8000E-01
                     6.8250E+00   5.7600E-01
                     7.1250E+00   7.6800E-01
                     7.2375E+00   1.1520E+00
                     7.2000E+00   1.5360E+00
                     7.1250E+00   9.6000E+00
25     10     0.3120E+03
                     0.0000E+00   0.0000E+00
                     2.5125E+00   9.6000E-02
                     4.3500E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     6.4500E+00   4.8000E-01
                     6.8250E+00   5.7600E-01
                     7.1250E+00   7.6800E-01
                     7.2375E+00   1.1520E+00
                     7.2000E+00   1.5360E+00
                     7.1250E+00   9.6000E+00
26     10     0.3120E+03
                     0.0000E+00   0.0000E+00
                     3.0600E+00   9.6000E-02
                     4.3200E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     5.5500E+00   4.8000E-01
                     5.6700E+00   5.7600E-01
                     5.7300E+00   7.6800E-01
                     5.5500E+00   1.1520E+00
                     5.4000E+00   1.5360E+00
                     5.0100E+00   9.6000E+00
27     10     0.3270E+03
                     0.0000E+00   0.0000E+00
                     3.0600E+00   9.6000E-02
                     4.3200E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     5.5500E+00   4.8000E-01
                     5.6700E+00   5.7600E-01
                     5.7300E+00   7.6800E-01
                     5.5500E+00   1.1520E+00
                     5.4000E+00   1.5360E+00
                     5.0100E+00   9.6000E+00
28     10     0.3420E+03
                     0.0000E+00   0.0000E+00
                     3.0600E+00   9.6000E-02
                     4.3200E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     5.5500E+00   4.8000E-01
                     5.6700E+00   5.7600E-01
                     5.7300E+00   7.6800E-01
                     5.5500E+00   1.1520E+00
                     5.4000E+00   1.5360E+00
                     5.0100E+00   9.6000E+00
29     10     0.3570E+03
                     0.0000E+00   0.0000E+00
                     3.0600E+00   9.6000E-02
                     4.3200E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     5.5500E+00   4.8000E-01
                     5.6700E+00   5.7600E-01
                     5.7300E+00   7.6800E-01
                     5.5500E+00   1.1520E+00
                     5.4000E+00   1.5360E+00
                     5.0100E+00   9.6000E+00
30     10     0.3720E+03
                     0.0000E+00   0.0000E+00
                     3.0600E+00   9.6000E-02
                     4.3200E+00   1.9200E-01
                     5.4000E+00   2.8800E-01
                     5.5500E+00   4.8000E-01
                     5.6700E+00   5.7600E-01
                     5.7300E+00   7.6800E-01
                     5.5500E+00   1.1520E+00
                     5.4000E+00   1.5360E+00
                     5.0100E+00   9.6000E+00
31     10     0.3720E+03
                     0.0000E+00   0.0000E+00
                     3.5700E+00   9.6000E-02
                     5.0400E+00   1.9200E-01
                     6.3000E+00   2.8800E-01
                     6.4750E+00   4.8000E-01
                     6.6150E+00   5.7600E-01
                     6.6850E+00   7.6800E-01
                     6.4750E+00   1.1520E+00
                     6.3000E+00   1.5360E+00
                     5.8450E+00   9.6000E+00
32     10     0.5790E+03
                     0.0000E+00   0.0000E+00
                     3.5700E+00   9.6000E-02
                     5.0400E+00   1.9200E-01
                     6.3000E+00   2.8800E-01
                     6.4750E+00   4.8000E-01
                     6.6150E+00   5.7600E-01
                     6.6850E+00   7.6800E-01
                     6.4750E+00   1.1520E+00
                     6.3000E+00   1.5360E+00
```

			5.8450E+00	9.6000E+00
33	10	0.7860E+03		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00
34	10	0.9930E+03		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00
35	10	0.1200E+04		
			0.0000E+00	0.0000E+00
			3.5700E+00	9.6000E-02
			5.0400E+00	1.9200E-01
			6.3000E+00	2.8800E-01
			6.4750E+00	4.8000E-01
			6.6150E+00	5.7600E-01
			6.6850E+00	7.6800E-01
			6.4750E+00	1.1520E+00
			6.3000E+00	1.5360E+00
			5.8450E+00	9.6000E+00

INTERNALLY GENERATED Q-W CURVE

TIP LOAD LBS.	TIP MOVEMENT IN.
0.0000E+00	0.0000E+00
2.1443E+05	4.8000E-01
3.0400E+05	9.6000E-01
3.8001E+05	1.4400E+00
4.6958E+05	2.4000E+00
4.8858E+05	2.8800E+00
5.1572E+05	3.8400E+00
5.2658E+05	4.8000E+00
5.3201E+05	6.7200E+00
5.3744E+05	9.6000E+00

USER-DEFINED TIP MOVEMENTS
IN.
1.0000E-02
5.0000E-02
1.0000E-01
5.0000E-01
1.0000E+00
1.5000E+00
2.0000E+00
3.0000E+00
4.0000E+00
5.0000E+00
6.0000E+00
7.0000E+00

101 University POC - Bent 3 96-in CIDH, 80 ft

RESULTS DUE TO TIP MOVEMENTS

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
1.0000E-02	4.4673E+03

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			4.467E+03			1.000E-02	
954.0	3.719E-01	1.346E+03		5.140E+03	1.302E-05		1.001E-02
948.0			5.813E+03			1.001E-02	
942.0	3.724E-01	1.348E+03		6.487E+03	1.643E-05		1.002E-02
936.0			7.161E+03			1.003E-02	
930.0	3.730E-01	1.350E+03		7.836E+03	1.985E-05		1.004E-02
924.0			8.511E+03			1.005E-02	
918.0	3.741E-01	1.354E+03		9.188E+03	2.327E-05		1.006E-02
912.0			9.865E+03			1.007E-02	
906.0	3.751E-01	1.357E+03		1.054E+04	2.670E-05		1.009E-02
900.0			1.122E+04			1.010E-02	
894.0	3.761E-01	1.361E+03		1.190E+04	3.015E-05		1.011E-02
888.0			1.258E+04			1.013E-02	
882.0	3.773E-01	1.365E+03		1.327E+04	3.360E-05		1.015E-02
876.0			1.395E+04			1.016E-02	
870.0	3.786E-01	1.370E+03		1.463E+04	3.706E-05		1.018E-02
864.0			1.532E+04			1.020E-02	
858.0	3.801E-01	1.375E+03		1.601E+04	4.054E-05		1.022E-02
852.0			1.669E+04			1.024E-02	
846.0	3.816E-01	1.381E+03		1.738E+04	4.403E-05		1.026E-02
840.0			1.808E+04			1.028E-02	
834.0	3.833E-01	1.387E+03		1.877E+04	4.754E-05		1.031E-02
828.0			1.946E+04			1.033E-02	
822.0	3.852E-01	1.394E+03		2.016E+04	5.106E-05		1.036E-02
816.0			2.086E+04			1.038E-02	
810.0	3.871E-01	1.401E+03		2.156E+04	5.460E-05		1.041E-02
804.0			2.226E+04			1.044E-02	
798.0	3.892E-01	1.409E+03		2.296E+04	5.816E-05		1.047E-02
792.0			2.367E+04			1.050E-02	
786.0	3.915E-01	1.417E+03		2.437E+04	6.173E-05		1.053E-02
780.0			2.508E+04			1.056E-02	
774.0	3.938E-01	1.425E+03		2.580E+04	6.533E-05		1.059E-02
768.0			2.651E+04			1.062E-02	
762.0	3.963E-01	1.434E+03		2.723E+04	6.895E-05		1.066E-02
756.0			2.794E+04			1.069E-02	
750.0	3.989E-01	1.444E+03		2.866E+04	7.260E-05		1.073E-02
744.0			2.939E+04			1.076E-02	
738.0	4.017E-01	1.454E+03		3.011E+04	7.627E-05		1.080E-02
732.0			3.084E+04			1.084E-02	
726.0	4.046E-01	1.464E+03		3.157E+04	7.996E-05		1.088E-02
720.0			3.230E+04			1.092E-02	
714.0	4.077E-01	1.475E+03		3.304E+04	8.369E-05		1.096E-02
708.0			3.378E+04			1.100E-02	
702.0	4.108E-01	1.487E+03		3.452E+04	8.744E-05		1.105E-02
696.0			3.527E+04			1.109E-02	
690.0	4.142E-01	1.499E+03		3.602E+04	9.122E-05		1.114E-02
684.0			3.677E+04			1.118E-02	
678.0	4.176E-01	1.511E+03		3.752E+04	9.503E-05		1.123E-02
672.0			3.828E+04			1.128E-02	
666.0	4.212E-01	1.524E+03		3.904E+04	9.887E-05		1.133E-02
660.0			3.980E+04			1.138E-02	
654.0	4.250E-01	1.538E+03		4.057E+04	1.028E-04		1.143E-02
648.0			4.134E+04			1.148E-02	
642.0	4.289E-01	1.552E+03		4.212E+04	1.067E-04		1.153E-02
636.0			4.289E+04			1.159E-02	
630.0	4.329E-01	1.567E+03		4.368E+04	1.106E-04		1.164E-02
624.0			4.446E+04			1.170E-02	
618.0	4.371E-01	1.582E+03		4.525E+04	1.146E-04		1.175E-02
612.0			4.604E+04			1.181E-02	
606.0	4.414E-01	1.598E+03		4.684E+04	1.186E-04		1.187E-02
600.0			4.764E+04			1.193E-02	
594.0	4.459E-01	1.614E+03		4.845E+04	1.227E-04		1.199E-02
588.0			4.925E+04			1.205E-02	
582.0	4.506E-01	1.631E+03		5.007E+04	1.268E-04		1.212E-02

576.0			5.088E+04			1.218E-02	
570.0	4.554E-01	1.648E+03		5.171E+04	1.310E-04		1.224E-02
564.0			5.253E+04			1.231E-02	
558.0	4.603E-01	1.666E+03		5.336E+04	1.352E-04		1.238E-02
552.0			5.420E+04			1.245E-02	
546.0	4.654E-01	1.684E+03		5.504E+04	1.394E-04		1.252E-02
540.0			5.588E+04			1.259E-02	
534.0	4.707E-01	1.703E+03		5.673E+04	1.437E-04		1.266E-02
528.0			5.758E+04			1.273E-02	
522.0	4.761E-01	1.723E+03		5.845E+04	1.480E-04		1.280E-02
516.0			5.931E+04			1.288E-02	
510.0	4.817E-01	1.743E+03		6.018E+04	1.524E-04		1.295E-02
504.0			6.105E+04			1.303E-02	
498.0	4.874E-01	1.764E+03		6.193E+04	1.569E-04		1.311E-02
492.0			6.281E+04			1.319E-02	
486.0	4.933E-01	1.785E+03		6.371E+04	1.614E-04		1.327E-02
480.0			6.460E+04			1.335E-02	
474.0	4.994E-01	1.808E+03		6.550E+04	1.659E-04		1.343E-02
468.0			6.641E+04			1.351E-02	
462.0	5.057E-01	1.830E+03		6.732E+04	1.705E-04		1.360E-02
456.0			6.824E+04			1.368E-02	
450.0	5.121E-01	1.853E+03		6.916E+04	1.752E-04		1.377E-02
444.0			7.009E+04			1.386E-02	
438.0	5.187E-01	1.877E+03		7.103E+04	1.799E-04		1.395E-02
432.0			7.197E+04			1.404E-02	
426.0	5.255E-01	1.902E+03		7.292E+04	1.847E-04		1.413E-02
420.0			7.387E+04			1.422E-02	
414.0	5.325E-01	1.927E+03		7.483E+04	1.895E-04		1.432E-02
408.0			7.580E+04			1.441E-02	
402.0	5.396E-01	1.953E+03		7.677E+04	1.944E-04		1.451E-02
396.0			7.775E+04			1.461E-02	
390.0	5.469E-01	1.979E+03		7.874E+04	1.994E-04		1.471E-02
384.0			7.973E+04			1.481E-02	
378.0	5.544E-01	2.007E+03		8.073E+04	2.045E-04		1.491E-02
372.0			8.174E+04			1.501E-02	
366.0	4.818E-01	1.744E+03		8.261E+04	2.092E-04		1.512E-02
360.0			8.348E+04			1.522E-02	
354.0	4.886E-01	1.768E+03		8.436E+04	2.137E-04		1.533E-02
348.0			8.525E+04			1.543E-02	
342.0	4.954E-01	1.793E+03		8.614E+04	2.182E-04		1.554E-02
336.0			8.704E+04			1.565E-02	
330.0	5.025E-01	1.818E+03		8.795E+04	2.227E-04		1.576E-02
324.0			8.886E+04			1.588E-02	
318.0	5.096E-01	1.844E+03		8.978E+04	2.274E-04		1.599E-02
312.0			9.070E+04			1.610E-02	
306.0	4.245E-01	1.536E+03		9.147E+04	2.317E-04		1.622E-02
300.0			9.224E+04			1.633E-02	
294.0	4.306E-01	1.558E+03		9.302E+04	2.356E-04		1.645E-02
288.0			9.380E+04			1.657E-02	
282.0	4.368E-01	1.581E+03		9.459E+04	2.396E-04		1.669E-02
276.0			9.538E+04			1.681E-02	
270.0	4.431E-01	1.604E+03		9.618E+04	2.436E-04		1.693E-02
264.0			9.698E+04			1.705E-02	
258.0	3.716E-01	1.345E+03		9.766E+04	2.473E-04		1.718E-02
252.0			9.833E+04			1.730E-02	
246.0	3.770E-01	1.364E+03		9.901E+04	2.508E-04		1.743E-02
240.0			9.969E+04			1.755E-02	
234.0	3.825E-01	1.384E+03		1.004E+05	2.542E-04		1.768E-02
228.0			1.011E+05			1.781E-02	
222.0	3.880E-01	1.404E+03		1.018E+05	2.578E-04		1.793E-02
216.0			1.025E+05			1.806E-02	
210.0	3.936E-01	1.425E+03		1.032E+05	2.614E-04		1.819E-02
204.0			1.039E+05			1.832E-02	
198.0	3.993E-01	1.445E+03		1.046E+05	2.650E-04		1.846E-02
192.0			1.054E+05			1.859E-02	
186.0	4.051E-01	1.466E+03		1.061E+05	2.687E-04		1.872E-02
180.0			1.068E+05			1.886E-02	
174.0	4.109E-01	1.487E+03		1.076E+05	2.724E-04		1.899E-02
168.0			1.083E+05			1.913E-02	
162.0	6.142E-01	2.223E+03		1.094E+05	2.771E-04		1.927E-02
156.0			1.105E+05			1.941E-02	
150.0	6.231E-01	2.255E+03		1.117E+05	2.828E-04		1.955E-02
144.0			1.128E+05			1.969E-02	
138.0	6.322E-01	2.288E+03		1.139E+05	2.885E-04		1.983E-02
132.0			1.151E+05			1.998E-02	
126.0	6.415E-01	2.322E+03		1.162E+05	2.944E-04		2.013E-02
120.0			1.174E+05			2.027E-02	
114.0	6.510E-01	2.356E+03		1.186E+05	3.003E-04		2.042E-02
108.0			1.197E+05			2.057E-02	
102.0	6.607E-01	2.391E+03		1.209E+05	3.063E-04		2.073E-02
96.0			1.221E+05			2.088E-02	
90.0	6.705E-01	2.427E+03		1.234E+05	3.124E-04		2.104E-02
84.0			1.246E+05			2.119E-02	
78.0	6.806E-01	2.463E+03		1.258E+05	3.186E-04		2.135E-02
72.0			1.270E+05			2.151E-02	
66.0	6.908E-01	2.500E+03		1.283E+05	3.249E-04		2.167E-02
60.0			1.295E+05			2.184E-02	
54.0	7.013E-01	2.538E+03		1.308E+05	3.313E-04		2.200E-02
48.0			1.321E+05			2.217E-02	
42.0	7.119E-01	2.577E+03		1.334E+05	3.377E-04		2.234E-02
36.0			1.346E+05			2.251E-02	
30.0	7.228E-01	2.616E+03		1.360E+05	3.443E-04		2.268E-02
24.0			1.373E+05			2.285E-02	
18.0	2.732E-01	9.886E+02		1.378E+05	3.489E-04		2.302E-02
12.0			1.382E+05			2.320E-02	
6.0	2.773E-01	1.004E+03		1.387E+05	3.514E-04		2.337E-02
0.0			1.393E+05			2.355E-02	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
5.0000E-02	2.2337E+04

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			2.234E+04			5.000E-02	
954.0	1.861E+00	6.733E+03		2.570E+04	6.510E-05		5.003E-02
948.0			2.907E+04			5.007E-02	
942.0	1.863E+00	6.743E+03		3.244E+04	8.216E-05		5.010E-02
936.0			3.581E+04			5.015E-02	
930.0	1.867E+00	6.756E+03		3.919E+04	9.926E-05		5.019E-02
924.0			4.257E+04			5.025E-02	
918.0	1.871E+00	6.770E+03		4.595E+04	1.164E-04		5.030E-02
912.0			4.934E+04			5.036E-02	
906.0	1.875E+00	6.787E+03		5.273E+04	1.336E-04		5.043E-02
900.0			5.613E+04			5.050E-02	
894.0	1.881E+00	6.806E+03		5.953E+04	1.508E-04		5.057E-02
888.0			6.293E+04			5.065E-02	
882.0	1.886E+00	6.827E+03		6.635E+04	1.680E-04		5.073E-02
876.0			6.976E+04			5.082E-02	
870.0	1.893E+00	6.851E+03		7.318E+04	1.854E-04		5.091E-02
864.0			7.661E+04			5.100E-02	
858.0	1.900E+00	6.877E+03		8.005E+04	2.027E-04		5.110E-02
852.0			8.349E+04			5.120E-02	
846.0	1.908E+00	6.906E+03		8.694E+04	2.202E-04		5.131E-02
840.0			9.039E+04			5.142E-02	
834.0	1.917E+00	6.937E+03		9.386E+04	2.377E-04		5.154E-02
828.0			9.733E+04			5.166E-02	
822.0	1.926E+00	6.970E+03		1.008E+05	2.553E-04		5.179E-02
816.0			1.043E+05			5.192E-02	
810.0	1.936E+00	7.005E+03		1.078E+05	2.730E-04		5.205E-02
804.0			1.113E+05			5.219E-02	
798.0	1.946E+00	7.043E+03		1.148E+05	2.908E-04		5.233E-02
792.0			1.183E+05			5.248E-02	
786.0	1.957E+00	7.084E+03		1.219E+05	3.087E-04		5.263E-02
780.0			1.254E+05			5.279E-02	
774.0	1.969E+00	7.126E+03		1.290E+05	3.267E-04		5.295E-02
768.0			1.326E+05			5.312E-02	
762.0	1.982E+00	7.172E+03		1.361E+05	3.448E-04		5.329E-02
756.0			1.397E+05			5.346E-02	
750.0	1.995E+00	7.219E+03		1.433E+05	3.630E-04		5.364E-02
744.0			1.469E+05			5.382E-02	
738.0	2.009E+00	7.269E+03		1.506E+05	3.814E-04		5.401E-02
732.0			1.542E+05			5.421E-02	
726.0	2.023E+00	7.322E+03		1.579E+05	3.999E-04		5.440E-02
720.0			1.615E+05			5.460E-02	
714.0	2.038E+00	7.377E+03		1.652E+05	4.185E-04		5.481E-02
708.0			1.689E+05			5.502E-02	

702.0	2.054E+00	7.434E+03		1.726E+05	4.372E-04		5.524E-02
696.0			1.764E+05			5.546E-02	
690.0	2.071E+00	7.495E+03		1.801E+05	4.561E-04		5.569E-02
684.0			1.838E+05			5.592E-02	
678.0	2.088E+00	7.557E+03		1.876E+05	4.752E-04		5.615E-02
672.0			1.914E+05			5.639E-02	
666.0	2.106E+00	7.623E+03		1.952E+05	4.944E-04		5.664E-02
660.0			1.990E+05			5.689E-02	
654.0	2.125E+00	7.690E+03		2.029E+05	5.138E-04		5.714E-02
648.0			2.067E+05			5.740E-02	
642.0	2.144E+00	7.761E+03		2.106E+05	5.334E-04		5.766E-02
636.0			2.145E+05			5.793E-02	
630.0	2.165E+00	7.834E+03		2.184E+05	5.531E-04		5.821E-02
624.0			2.223E+05			5.849E-02	
618.0	2.186E+00	7.910E+03		2.263E+05	5.731E-04		5.877E-02
612.0			2.302E+05			5.906E-02	
606.0	2.207E+00	7.988E+03		2.342E+05	5.932E-04		5.935E-02
600.0			2.382E+05			5.965E-02	
594.0	2.230E+00	8.069E+03		2.422E+05	6.135E-04		5.996E-02
588.0			2.463E+05			6.027E-02	
582.0	2.253E+00	8.153E+03		2.504E+05	6.341E-04		6.058E-02
576.0			2.544E+05			6.090E-02	
570.0	2.277E+00	8.240E+03		2.586E+05	6.548E-04		6.123E-02
564.0			2.627E+05			6.156E-02	
558.0	2.302E+00	8.330E+03		2.668E+05	6.758E-04		6.189E-02
552.0			2.710E+05			6.223E-02	
546.0	2.327E+00	8.422E+03		2.752E+05	6.970E-04		6.258E-02
540.0			2.794E+05			6.293E-02	
534.0	2.353E+00	8.517E+03		2.837E+05	7.185E-04		6.328E-02
528.0			2.879E+05			6.365E-02	
522.0	2.381E+00	8.615E+03		2.922E+05	7.402E-04		6.401E-02
516.0			2.966E+05			6.439E-02	
510.0	2.408E+00	8.716E+03		3.009E+05	7.621E-04		6.477E-02
504.0			3.053E+05			6.515E-02	
498.0	2.437E+00	8.821E+03		3.097E+05	7.843E-04		6.554E-02
492.0			3.141E+05			6.593E-02	
486.0	2.467E+00	8.928E+03		3.186E+05	8.068E-04		6.633E-02
480.0			3.230E+05			6.674E-02	
474.0	2.497E+00	9.038E+03		3.275E+05	8.296E-04		6.715E-02
468.0			3.321E+05			6.757E-02	
462.0	2.528E+00	9.151E+03		3.366E+05	8.526E-04		6.799E-02
456.0			3.412E+05			6.842E-02	
450.0	2.561E+00	9.267E+03		3.458E+05	8.759E-04		6.886E-02
444.0			3.505E+05			6.930E-02	
438.0	2.594E+00	9.387E+03		3.552E+05	8.995E-04		6.974E-02
432.0			3.599E+05			7.020E-02	
426.0	2.628E+00	9.509E+03		3.646E+05	9.235E-04		7.066E-02
420.0			3.694E+05			7.112E-02	
414.0	2.662E+00	9.635E+03		3.742E+05	9.477E-04		7.159E-02
408.0			3.790E+05			7.207E-02	
402.0	2.698E+00	9.764E+03		3.839E+05	9.723E-04		7.255E-02
396.0			3.888E+05			7.304E-02	
390.0	2.735E+00	9.897E+03		3.937E+05	9.972E-04		7.354E-02
384.0			3.987E+05			7.404E-02	
378.0	2.772E+00	1.003E+04		4.037E+05	1.022E-03		7.455E-02
372.0			4.087E+05			7.506E-02	
366.0	2.409E+00	8.719E+03		4.131E+05	1.046E-03		7.558E-02
360.0			4.174E+05			7.611E-02	
354.0	2.443E+00	8.841E+03		4.218E+05	1.068E-03		7.664E-02
348.0			4.263E+05			7.718E-02	
342.0	2.477E+00	8.965E+03		4.307E+05	1.091E-03		7.772E-02
336.0			4.352E+05			7.827E-02	
330.0	2.512E+00	9.093E+03		4.398E+05	1.114E-03		7.882E-02
324.0			4.443E+05			7.938E-02	
318.0	2.548E+00	9.222E+03		4.489E+05	1.137E-03		7.995E-02
312.0			4.535E+05			8.052E-02	
306.0	2.122E+00	7.681E+03		4.574E+05	1.158E-03		8.109E-02
300.0			4.612E+05			8.168E-02	
294.0	2.153E+00	7.792E+03		4.651E+05	1.178E-03		8.226E-02
288.0			4.690E+05			8.285E-02	
282.0	2.184E+00	7.904E+03		4.730E+05	1.198E-03		8.345E-02
276.0			4.769E+05			8.405E-02	
270.0	2.216E+00	8.019E+03		4.809E+05	1.218E-03		8.466E-02
264.0			4.849E+05			8.527E-02	
258.0	1.858E+00	6.725E+03		4.883E+05	1.237E-03		8.589E-02
252.0			4.917E+05			8.651E-02	
246.0	1.885E+00	6.822E+03		4.951E+05	1.254E-03		8.713E-02
240.0			4.985E+05			8.776E-02	
234.0	1.912E+00	6.921E+03		5.019E+05	1.271E-03		8.839E-02
228.0			5.054E+05			8.903E-02	
222.0	1.940E+00	7.022E+03		5.089E+05	1.289E-03		8.967E-02
216.0			5.124E+05			9.032E-02	
210.0	1.968E+00	7.123E+03		5.160E+05	1.307E-03		9.097E-02
204.0			5.196E+05			9.163E-02	
198.0	1.997E+00	7.226E+03		5.232E+05	1.325E-03		9.229E-02
192.0			5.268E+05			9.295E-02	
186.0	2.026E+00	7.331E+03		5.304E+05	1.343E-03		9.362E-02
180.0			5.341E+05			9.430E-02	
174.0	2.055E+00	7.437E+03		5.378E+05	1.362E-03		9.497E-02
168.0			5.415E+05			9.566E-02	
162.0	3.065E+00	1.109E+04		5.471E+05	1.386E-03		9.635E-02
156.0			5.526E+05			9.704E-02	
150.0	3.083E+00	1.116E+04		5.582E+05	1.414E-03		9.775E-02
144.0			5.638E+05			9.846E-02	
138.0	3.102E+00	1.123E+04		5.694E+05	1.442E-03		9.917E-02
132.0			5.750E+05			9.990E-02	
126.0	3.121E+00	1.129E+04		5.807E+05	1.471E-03		1.006E-01
120.0			5.863E+05			1.014E-01	
114.0	3.140E+00	1.137E+04		5.920E+05	1.499E-03		1.021E-01
108.0			5.977E+05			1.029E-01	
102.0	3.160E+00	1.144E+04		6.034E+05	1.528E-03		1.036E-01
96.0			6.091E+05			1.044E-01	
90.0	3.180E+00	1.151E+04		6.149E+05	1.557E-03		1.052E-01
84.0			6.206E+05			1.060E-01	
78.0	3.201E+00	1.158E+04		6.264E+05	1.587E-03		1.067E-01
72.0			6.322E+05			1.075E-01	
66.0	3.222E+00	1.166E+04		6.380E+05	1.616E-03		1.083E-01
60.0			6.439E+05			1.092E-01	
54.0	3.243E+00	1.174E+04		6.497E+05	1.646E-03		1.100E-01
48.0			6.556E+05			1.108E-01	
42.0	3.265E+00	1.182E+04		6.615E+05	1.675E-03		1.116E-01
36.0			6.674E+05			1.125E-01	
30.0	3.287E+00	1.190E+04		6.734E+05	1.705E-03		1.133E-01
24.0			6.793E+05			1.142E-01	
18.0	1.304E+00	4.720E+03		6.817E+05	1.726E-03		1.150E-01
12.0			6.840E+05			1.159E-01	
6.0	1.319E+00	4.775E+03		6.864E+05	1.739E-03		1.168E-01
0.0			6.888E+05			1.176E-01	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
1.0000E-01	4.4673E+04

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			4.467E+04			1.000E-01	
954.0	3.632E+00	1.315E+04		5.125E+04	1.298E-04		1.001E-01
948.0			5.782E+04			1.001E-01	
942.0	3.634E+00	1.315E+04		6.440E+04	1.631E-04		1.002E-01
936.0			7.097E+04			1.003E-01	
930.0	3.637E+00	1.316E+04		7.755E+04	1.964E-04		1.004E-01
924.0			8.414E+04			1.005E-01	
918.0	3.640E+00	1.318E+04		9.072E+04	2.298E-04		1.006E-01
912.0			9.731E+04			1.007E-01	
906.0	3.644E+00	1.319E+04		1.039E+05	2.632E-04		1.008E-01
900.0			1.105E+05			1.010E-01	
894.0	3.648E+00	1.320E+04		1.171E+05	2.966E-04		1.011E-01
888.0			1.237E+05			1.013E-01	
882.0	3.653E+00	1.322E+04		1.303E+05	3.300E-04		1.014E-01
876.0			1.369E+05			1.016E-01	
870.0	3.659E+00	1.324E+04		1.435E+05	3.636E-04		1.018E-01
864.0			1.502E+05			1.020E-01	
858.0	3.664E+00	1.326E+04		1.568E+05	3.971E-04		1.022E-01
852.0			1.634E+05			1.024E-01	
846.0	3.671E+00	1.328E+04		1.701E+05	4.307E-04		1.026E-01
840.0			1.767E+05			1.028E-01	
834.0	3.678E+00	1.331E+04		1.834E+05	4.644E-04		1.030E-01

828.0			1.900E+05			1.033E-01	
822.0	3.685E+00	1.334E+04		1.967E+05	4.982E-04		1.035E-01
816.0			2.034E+05			1.038E-01	
810.0	3.693E+00	1.336E+04		2.100E+05	5.320E-04		1.040E-01
804.0			2.167E+05			1.043E-01	
798.0	3.701E+00	1.340E+04		2.234E+05	5.659E-04		1.046E-01
792.0			2.301E+05			1.049E-01	
786.0	3.710E+00	1.343E+04		2.368E+05	5.998E-04		1.052E-01
780.0			2.435E+05			1.055E-01	
774.0	3.720E+00	1.346E+04		2.503E+05	6.339E-04		1.058E-01
768.0			2.570E+05			1.061E-01	
762.0	3.730E+00	1.350E+04		2.638E+05	6.680E-04		1.064E-01
756.0			2.705E+05			1.068E-01	
750.0	3.740E+00	1.354E+04		2.773E+05	7.022E-04		1.071E-01
744.0			2.840E+05			1.075E-01	
738.0	3.751E+00	1.358E+04		2.908E+05	7.366E-04		1.078E-01
732.0			2.976E+05			1.082E-01	
726.0	3.763E+00	1.362E+04		3.044E+05	7.710E-04		1.086E-01
720.0			3.112E+05			1.090E-01	
714.0	3.775E+00	1.366E+04		3.181E+05	8.056E-04		1.094E-01
708.0			3.249E+05			1.098E-01	
702.0	3.787E+00	1.371E+04		3.318E+05	8.402E-04		1.102E-01
696.0			3.386E+05			1.106E-01	
690.0	3.800E+00	1.375E+04		3.455E+05	8.750E-04		1.111E-01
684.0			3.524E+05			1.115E-01	
678.0	3.814E+00	1.380E+04		3.593E+05	9.099E-04		1.119E-01
672.0			3.662E+05			1.124E-01	
666.0	3.828E+00	1.386E+04		3.731E+05	9.449E-04		1.129E-01
660.0			3.800E+05			1.133E-01	
654.0	3.843E+00	1.391E+04		3.870E+05	9.801E-04		1.138E-01
648.0			3.939E+05			1.143E-01	
642.0	3.858E+00	1.396E+04		4.009E+05	1.015E-03		1.148E-01
636.0			4.079E+05			1.153E-01	
630.0	3.874E+00	1.402E+04		4.149E+05	1.051E-03		1.159E-01
624.0			4.219E+05			1.164E-01	
618.0	3.891E+00	1.408E+04		4.290E+05	1.086E-03		1.169E-01
612.0			4.360E+05			1.175E-01	
606.0	3.907E+00	1.414E+04		4.431E+05	1.122E-03		1.180E-01
600.0			4.501E+05			1.186E-01	
594.0	3.925E+00	1.420E+04		4.572E+05	1.158E-03		1.192E-01
588.0			4.643E+05			1.198E-01	
582.0	3.943E+00	1.427E+04		4.715E+05	1.194E-03		1.204E-01
576.0			4.786E+05			1.210E-01	
570.0	3.961E+00	1.434E+04		4.858E+05	1.230E-03		1.216E-01
564.0			4.929E+05			1.222E-01	
558.0	3.981E+00	1.441E+04		5.001E+05	1.267E-03		1.228E-01
552.0			5.074E+05			1.235E-01	
546.0	4.000E+00	1.448E+04		5.146E+05	1.303E-03		1.241E-01
540.0			5.218E+05			1.248E-01	
534.0	4.021E+00	1.455E+04		5.291E+05	1.340E-03		1.254E-01
528.0			5.364E+05			1.261E-01	
522.0	4.041E+00	1.463E+04		5.437E+05	1.377E-03		1.268E-01
516.0			5.510E+05			1.275E-01	
510.0	4.063E+00	1.470E+04		5.584E+05	1.414E-03		1.282E-01
504.0			5.657E+05			1.289E-01	
498.0	4.085E+00	1.478E+04		5.731E+05	1.451E-03		1.296E-01
492.0			5.805E+05			1.303E-01	
486.0	4.107E+00	1.486E+04		5.879E+05	1.489E-03		1.311E-01
480.0			5.954E+05			1.318E-01	
474.0	4.130E+00	1.495E+04		6.028E+05	1.527E-03		1.326E-01
468.0			6.103E+05			1.334E-01	
462.0	4.154E+00	1.503E+04		6.178E+05	1.565E-03		1.341E-01
456.0			6.253E+05			1.349E-01	
450.0	4.178E+00	1.512E+04		6.329E+05	1.603E-03		1.357E-01
444.0			6.405E+05			1.365E-01	
438.0	4.203E+00	1.521E+04		6.481E+05	1.641E-03		1.373E-01
432.0			6.557E+05			1.382E-01	
426.0	4.228E+00	1.530E+04		6.633E+05	1.680E-03		1.390E-01
420.0			6.710E+05			1.398E-01	
414.0	4.254E+00	1.540E+04		6.787E+05	1.719E-03		1.407E-01
408.0			6.864E+05			1.416E-01	
402.0	4.281E+00	1.549E+04		6.941E+05	1.758E-03		1.424E-01
396.0			7.019E+05			1.433E-01	
390.0	4.308E+00	1.559E+04		7.097E+05	1.797E-03		1.442E-01
384.0			7.175E+05			1.451E-01	
378.0	4.336E+00	1.569E+04		7.253E+05	1.837E-03		1.460E-01
372.0			7.331E+05			1.470E-01	
366.0	3.741E+00	1.354E+04		7.399E+05	1.874E-03		1.479E-01
360.0			7.467E+05			1.488E-01	
354.0	3.766E+00	1.363E+04		7.535E+05	1.908E-03		1.498E-01
348.0			7.603E+05			1.507E-01	
342.0	3.791E+00	1.372E+04		7.672E+05	1.943E-03		1.517E-01
336.0			7.740E+05			1.527E-01	
330.0	3.817E+00	1.381E+04		7.809E+05	1.978E-03		1.537E-01
324.0			7.879E+05			1.547E-01	
318.0	3.843E+00	1.391E+04		7.948E+05	2.013E-03		1.557E-01
312.0			8.018E+05			1.567E-01	
306.0	3.693E+00	1.337E+04		8.084E+05	2.048E-03		1.577E-01
300.0			8.151E+05			1.587E-01	
294.0	3.733E+00	1.351E+04		8.219E+05	2.082E-03		1.598E-01
288.0			8.286E+05			1.608E-01	
282.0	3.773E+00	1.365E+04		8.355E+05	2.116E-03		1.619E-01
276.0			8.423E+05			1.629E-01	
270.0	3.814E+00	1.380E+04		8.492E+05	2.151E-03		1.640E-01
264.0			8.561E+05			1.651E-01	
258.0	3.187E+00	1.153E+04		8.619E+05	2.183E-03		1.662E-01
252.0			8.676E+05			1.672E-01	
246.0	3.222E+00	1.166E+04		8.735E+05	2.212E-03		1.684E-01
240.0			8.793E+05			1.695E-01	
234.0	3.257E+00	1.179E+04		8.852E+05	2.242E-03		1.706E-01
228.0			8.911E+05			1.717E-01	
222.0	3.293E+00	1.192E+04		8.970E+05	2.272E-03		1.728E-01
216.0			9.030E+05			1.740E-01	
210.0	3.329E+00	1.205E+04		9.090E+05	2.302E-03		1.751E-01
204.0			9.150E+05			1.763E-01	
198.0	3.366E+00	1.218E+04		9.211E+05	2.333E-03		1.774E-01
192.0			9.272E+05			1.786E-01	
186.0	3.403E+00	1.232E+04		9.334E+05	2.364E-03		1.798E-01
180.0			9.395E+05			1.810E-01	
174.0	3.440E+00	1.245E+04		9.458E+05	2.395E-03		1.822E-01
168.0			9.520E+05			1.834E-01	
162.0	4.223E+00	1.528E+04		9.596E+05	2.430E-03		1.846E-01
156.0			9.673E+05			1.858E-01	
150.0	4.255E+00	1.540E+04		9.750E+05	2.469E-03		1.870E-01
144.0			9.827E+05			1.883E-01	
138.0	4.287E+00	1.552E+04		9.904E+05	2.508E-03		1.895E-01
132.0			9.982E+05			1.908E-01	
126.0	4.321E+00	1.564E+04		1.006E+06	2.548E-03		1.920E-01
120.0			1.014E+06			1.933E-01	
114.0	4.349E+00	1.574E+04		1.022E+06	2.588E-03		1.946E-01
108.0			1.030E+06			1.959E-01	
102.0	4.379E+00	1.585E+04		1.037E+06	2.628E-03		1.972E-01
96.0			1.045E+06			1.985E-01	
90.0	4.409E+00	1.595E+04		1.053E+06	2.668E-03		1.999E-01
84.0			1.061E+06			2.012E-01	
78.0	4.439E+00	1.606E+04		1.069E+06	2.708E-03		2.026E-01
72.0			1.077E+06			2.039E-01	
66.0	4.469E+00	1.618E+04		1.086E+06	2.749E-03		2.053E-01
60.0			1.094E+06			2.067E-01	
54.0	4.501E+00	1.629E+04		1.102E+06	2.790E-03		2.081E-01
48.0			1.110E+06			2.095E-01	
42.0	4.532E+00	1.640E+04		1.118E+06	2.832E-03		2.109E-01
36.0			1.126E+06			2.123E-01	
30.0	4.564E+00	1.652E+04		1.135E+06	2.873E-03		2.137E-01
24.0			1.143E+06			2.152E-01	
18.0	2.094E+00	7.579E+03		1.147E+06	2.904E-03		2.166E-01
12.0			1.150E+06			2.181E-01	
6.0	2.108E+00	7.631E+03		1.154E+06	2.923E-03		2.195E-01
0.0			1.158E+06			2.210E-01	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
5.0000E-01	2.1816E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			2.182E+05			5.000E-01	

954.0	6.505E+00	2.354E+04		2.299E+05	5.823E-04		5.003E-01
948.0			2.417E+05			5.006E-01	
942.0	6.505E+00	2.354E+04		2.535E+05	6.420E-04		5.009E-01
936.0			2.652E+05			5.012E-01	
930.0	6.506E+00	2.355E+04		2.770E+05	7.016E-04		5.016E-01
924.0			2.888E+05			5.019E-01	
918.0	6.508E+00	2.355E+04		3.006E+05	7.613E-04		5.023E-01
912.0			3.123E+05			5.027E-01	
906.0	6.509E+00	2.356E+04		3.241E+05	8.209E-04		5.031E-01
900.0			3.359E+05			5.035E-01	
894.0	6.510E+00	2.356E+04		3.477E+05	8.806E-04		5.039E-01
888.0			3.595E+05			5.044E-01	
882.0	6.511E+00	2.356E+04		3.712E+05	9.402E-04		5.049E-01
876.0			3.830E+05			5.053E-01	
870.0	6.513E+00	2.357E+04		3.948E+05	9.999E-04		5.058E-01
864.0			4.066E+05			5.063E-01	
858.0	6.514E+00	2.358E+04		4.184E+05	1.060E-03		5.069E-01
852.0			4.302E+05			5.074E-01	
846.0	6.516E+00	2.358E+04		4.420E+05	1.119E-03		5.079E-01
840.0			4.538E+05			5.085E-01	
834.0	6.517E+00	2.359E+04		4.655E+05	1.179E-03		5.091E-01
828.0			4.773E+05			5.097E-01	
822.0	6.519E+00	2.359E+04		4.891E+05	1.239E-03		5.103E-01
816.0			5.009E+05			5.109E-01	
810.0	6.521E+00	2.360E+04		5.127E+05	1.299E-03		5.116E-01
804.0			5.245E+05			5.122E-01	
798.0	6.523E+00	2.361E+04		5.363E+05	1.358E-03		5.129E-01
792.0			5.481E+05			5.136E-01	
786.0	6.525E+00	2.361E+04		5.600E+05	1.418E-03		5.143E-01
780.0			5.718E+05			5.150E-01	
774.0	6.527E+00	2.362E+04		5.836E+05	1.478E-03		5.157E-01
768.0			5.954E+05			5.165E-01	
762.0	6.529E+00	2.363E+04		6.072E+05	1.538E-03		5.172E-01
756.0			6.190E+05			5.180E-01	
750.0	6.532E+00	2.364E+04		6.308E+05	1.598E-03		5.188E-01
744.0			6.427E+05			5.196E-01	
738.0	6.534E+00	2.365E+04		6.545E+05	1.658E-03		5.204E-01
732.0			6.663E+05			5.213E-01	
726.0	6.536E+00	2.366E+04		6.781E+05	1.717E-03		5.221E-01
720.0			6.900E+05			5.230E-01	
714.0	6.539E+00	2.367E+04		7.018E+05	1.777E-03		5.239E-01
708.0			7.136E+05			5.248E-01	
702.0	6.542E+00	2.367E+04		7.255E+05	1.837E-03		5.257E-01
696.0			7.373E+05			5.266E-01	
690.0	6.544E+00	2.368E+04		7.491E+05	1.897E-03		5.275E-01
684.0			7.610E+05			5.285E-01	
678.0	6.547E+00	2.369E+04		7.728E+05	1.957E-03		5.295E-01
672.0			7.847E+05			5.305E-01	
666.0	6.550E+00	2.371E+04		7.965E+05	2.017E-03		5.315E-01
660.0			8.084E+05			5.325E-01	
654.0	6.553E+00	2.372E+04		8.202E+05	2.077E-03		5.335E-01
648.0			8.321E+05			5.346E-01	
642.0	6.556E+00	2.373E+04		8.440E+05	2.137E-03		5.356E-01
636.0			8.558E+05			5.367E-01	
630.0	6.559E+00	2.374E+04		8.677E+05	2.198E-03		5.378E-01
624.0			8.796E+05			5.389E-01	
618.0	6.563E+00	2.375E+04		8.914E+05	2.258E-03		5.400E-01
612.0			9.033E+05			5.411E-01	
606.0	6.566E+00	2.376E+04		9.152E+05	2.318E-03		5.423E-01
600.0			9.271E+05			5.435E-01	
594.0	6.569E+00	2.378E+04		9.390E+05	2.378E-03		5.446E-01
588.0			9.509E+05			5.458E-01	
582.0	6.573E+00	2.379E+04		9.627E+05	2.438E-03		5.471E-01
576.0			9.746E+05			5.483E-01	
570.0	6.576E+00	2.380E+04		9.865E+05	2.499E-03		5.495E-01
564.0			9.984E+05			5.508E-01	
558.0	6.580E+00	2.381E+04		1.010E+06	2.559E-03		5.521E-01
552.0			1.022E+06			5.533E-01	
546.0	6.584E+00	2.383E+04		1.034E+06	2.619E-03		5.546E-01
540.0			1.046E+06			5.560E-01	
534.0	6.588E+00	2.384E+04		1.058E+06	2.680E-03		5.573E-01
528.0			1.070E+06			5.586E-01	
522.0	6.592E+00	2.386E+04		1.082E+06	2.740E-03		5.600E-01
516.0			1.094E+06			5.614E-01	
510.0	6.596E+00	2.387E+04		1.106E+06	2.800E-03		5.628E-01
504.0			1.118E+06			5.642E-01	
498.0	6.600E+00	2.389E+04		1.130E+06	2.861E-03		5.656E-01
492.0			1.142E+06			5.670E-01	
486.0	6.604E+00	2.390E+04		1.153E+06	2.921E-03		5.685E-01
480.0			1.165E+06			5.700E-01	
474.0	6.608E+00	2.392E+04		1.177E+06	2.982E-03		5.714E-01
468.0			1.189E+06			5.729E-01	
462.0	6.613E+00	2.393E+04		1.201E+06	3.043E-03		5.745E-01
456.0			1.213E+06			5.760E-01	
450.0	6.616E+00	2.394E+04		1.225E+06	3.103E-03		5.775E-01
444.0			1.237E+06			5.791E-01	
438.0	6.617E+00	2.395E+04		1.249E+06	3.164E-03		5.807E-01
432.0			1.261E+06			5.823E-01	
426.0	6.618E+00	2.395E+04		1.273E+06	3.224E-03		5.839E-01
420.0			1.285E+06			5.855E-01	
414.0	6.619E+00	2.396E+04		1.297E+06	3.285E-03		5.871E-01
408.0			1.309E+06			5.888E-01	
402.0	6.620E+00	2.396E+04		1.321E+06	3.346E-03		5.904E-01
396.0			1.333E+06			5.921E-01	
390.0	6.621E+00	2.396E+04		1.345E+06	3.407E-03		5.938E-01
384.0			1.357E+06			5.955E-01	
378.0	6.623E+00	2.397E+04		1.369E+06	3.467E-03		5.972E-01
372.0			1.381E+06			5.990E-01	
366.0	5.678E+00	2.055E+04		1.391E+06	3.524E-03		6.007E-01
360.0			1.402E+06			6.025E-01	
354.0	5.679E+00	2.055E+04		1.412E+06	3.576E-03		6.043E-01
348.0			1.422E+06			6.061E-01	
342.0	5.680E+00	2.056E+04		1.432E+06	3.628E-03		6.079E-01
336.0			1.443E+06			6.097E-01	
330.0	5.681E+00	2.056E+04		1.453E+06	3.680E-03		6.115E-01
324.0			1.463E+06			6.134E-01	
318.0	5.682E+00	2.056E+04		1.473E+06	3.732E-03		6.152E-01
312.0			1.484E+06			6.171E-01	
306.0	6.892E+00	2.494E+04		1.496E+06	3.789E-03		6.190E-01
300.0			1.509E+06			6.209E-01	
294.0	6.898E+00	2.497E+04		1.521E+06	3.853E-03		6.228E-01
288.0			1.534E+06			6.248E-01	
282.0	6.904E+00	2.499E+04		1.546E+06	3.916E-03		6.267E-01
276.0			1.559E+06			6.287E-01	
270.0	6.910E+00	2.501E+04		1.571E+06	3.979E-03		6.307E-01
264.0			1.584E+06			6.327E-01	
258.0	5.718E+00	2.069E+04		1.594E+06	4.037E-03		6.347E-01
252.0			1.604E+06			6.367E-01	
246.0	5.723E+00	2.071E+04		1.615E+06	4.090E-03		6.387E-01
240.0			1.625E+06			6.408E-01	
234.0	5.728E+00	2.073E+04		1.635E+06	4.142E-03		6.428E-01
228.0			1.646E+06			6.449E-01	
222.0	5.734E+00	2.075E+04		1.656E+06	4.195E-03		6.470E-01
216.0			1.667E+06			6.491E-01	
210.0	5.739E+00	2.077E+04		1.677E+06	4.247E-03		6.512E-01
204.0			1.687E+06			6.534E-01	
198.0	5.745E+00	2.079E+04		1.698E+06	4.300E-03		6.555E-01
192.0			1.708E+06			6.577E-01	
186.0	5.750E+00	2.081E+04		1.719E+06	4.352E-03		6.598E-01
180.0			1.729E+06			6.620E-01	
174.0	5.756E+00	2.083E+04		1.739E+06	4.405E-03		6.642E-01
168.0			1.750E+06			6.664E-01	
162.0	5.699E+00	2.063E+04		1.760E+06	4.458E-03		6.686E-01
156.0			1.770E+06			6.709E-01	
150.0	5.700E+00	2.063E+04		1.781E+06	4.510E-03		6.731E-01
144.0			1.791E+06			6.754E-01	
138.0	5.702E+00	2.064E+04		1.801E+06	4.562E-03		6.777E-01
132.0			1.812E+06			6.800E-01	
126.0	5.703E+00	2.064E+04		1.822E+06	4.614E-03		6.823E-01
120.0			1.832E+06			6.846E-01	
114.0	5.705E+00	2.065E+04		1.843E+06	4.667E-03		6.869E-01
108.0			1.853E+06			6.892E-01	
102.0	5.706E+00	2.065E+04		1.863E+06	4.719E-03		6.916E-01
96.0			1.874E+06			6.940E-01	
90.0	5.708E+00	2.066E+04		1.884E+06	4.771E-03		6.963E-01
84.0			1.894E+06			6.987E-01	
78.0	5.709E+00	2.066E+04		1.905E+06	4.824E-03		7.011E-01
72.0			1.915E+06			7.035E-01	
66.0	5.711E+00	2.067E+04		1.925E+06	4.876E-03		7.060E-01
60.0			1.936E+06			7.084E-01	
54.0	5.712E+00	2.067E+04		1.946E+06	4.928E-03		7.109E-01
48.0			1.956E+06			7.134E-01	

42.0	5.714E+00	2.068E+04		1.967E+06	4.981E-03		7.158E-01
36.0			1.977E+06			7.183E-01	
30.0	5.715E+00	2.068E+04		1.987E+06	5.033E-03		7.208E-01
24.0			1.998E+06			7.234E-01	
18.0	3.200E+00	1.158E+04		2.003E+06	5.074E-03		7.259E-01
12.0			2.009E+06			7.284E-01	
6.0	3.204E+00	1.159E+04		2.015E+06	5.103E-03		7.310E-01
0.0			2.021E+06			7.335E-01	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
1.0000E+00	3.1034E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			3.103E+05			1.000E+00	
954.0	6.558E+00	2.373E+04		3.222E+05	8.160E-04		1.000E+00
948.0			3.341E+05			1.001E+00	
942.0	6.557E+00	2.373E+04		3.459E+05	8.761E-04		1.001E+00
936.0			3.578E+05			1.002E+00	
930.0	6.557E+00	2.373E+04		3.697E+05	9.363E-04		1.002E+00
924.0			3.815E+05			1.003E+00	
918.0	6.556E+00	2.373E+04		3.934E+05	9.964E-04		1.003E+00
912.0			4.053E+05			1.004E+00	
906.0	6.556E+00	2.373E+04		4.171E+05	1.056E-03		1.004E+00
900.0			4.290E+05			1.005E+00	
894.0	6.555E+00	2.372E+04		4.409E+05	1.117E-03		1.005E+00
888.0			4.527E+05			1.006E+00	
882.0	6.555E+00	2.372E+04		4.646E+05	1.177E-03		1.006E+00
876.0			4.764E+05			1.007E+00	
870.0	6.554E+00	2.372E+04		4.883E+05	1.237E-03		1.008E+00
864.0			5.002E+05			1.008E+00	
858.0	6.553E+00	2.372E+04		5.120E+05	1.297E-03		1.009E+00
852.0			5.239E+05			1.010E+00	
846.0	6.553E+00	2.371E+04		5.357E+05	1.357E-03		1.010E+00
840.0			5.476E+05			1.011E+00	
834.0	6.552E+00	2.371E+04		5.594E+05	1.417E-03		1.012E+00
828.0			5.713E+05			1.012E+00	
822.0	6.551E+00	2.371E+04		5.832E+05	1.477E-03		1.013E+00
816.0			5.950E+05			1.014E+00	
810.0	6.550E+00	2.371E+04		6.069E+05	1.537E-03		1.015E+00
804.0			6.187E+05			1.015E+00	
798.0	6.549E+00	2.370E+04		6.306E+05	1.597E-03		1.016E+00
792.0			6.424E+05			1.017E+00	
786.0	6.548E+00	2.370E+04		6.543E+05	1.657E-03		1.018E+00
780.0			6.661E+05			1.019E+00	
774.0	6.548E+00	2.370E+04		6.780E+05	1.717E-03		1.019E+00
768.0			6.898E+05			1.020E+00	
762.0	6.547E+00	2.369E+04		7.017E+05	1.777E-03		1.021E+00
756.0			7.135E+05			1.022E+00	
750.0	6.546E+00	2.369E+04		7.253E+05	1.837E-03		1.023E+00
744.0			7.372E+05			1.024E+00	
738.0	6.545E+00	2.369E+04		7.490E+05	1.897E-03		1.025E+00
732.0			7.609E+05			1.026E+00	
726.0	6.543E+00	2.368E+04		7.727E+05	1.957E-03		1.027E+00
720.0			7.846E+05			1.028E+00	
714.0	6.542E+00	2.368E+04		7.964E+05	2.017E-03		1.029E+00
708.0			8.082E+05			1.030E+00	
702.0	6.541E+00	2.367E+04		8.201E+05	2.077E-03		1.031E+00
696.0			8.319E+05			1.032E+00	
690.0	6.540E+00	2.367E+04		8.437E+05	2.137E-03		1.033E+00
684.0			8.556E+05			1.034E+00	
678.0	6.539E+00	2.367E+04		8.674E+05	2.197E-03		1.035E+00
672.0			8.792E+05			1.036E+00	
666.0	6.538E+00	2.366E+04		8.911E+05	2.257E-03		1.037E+00
660.0			9.029E+05			1.038E+00	
654.0	6.536E+00	2.366E+04		9.147E+05	2.317E-03		1.040E+00
648.0			9.266E+05			1.041E+00	
642.0	6.535E+00	2.365E+04		9.384E+05	2.377E-03		1.042E+00
636.0			9.502E+05			1.043E+00	
630.0	6.534E+00	2.365E+04		9.620E+05	2.437E-03		1.044E+00
624.0			9.739E+05			1.046E+00	
618.0	6.533E+00	2.364E+04		9.857E+05	2.496E-03		1.047E+00
612.0			9.975E+05			1.048E+00	
606.0	6.531E+00	2.364E+04		1.009E+06	2.556E-03		1.049E+00
600.0			1.021E+06			1.051E+00	
594.0	6.530E+00	2.363E+04		1.033E+06	2.616E-03		1.052E+00
588.0			1.045E+06			1.053E+00	
582.0	6.528E+00	2.363E+04		1.057E+06	2.676E-03		1.055E+00
576.0			1.068E+06			1.056E+00	
570.0	6.527E+00	2.362E+04		1.080E+06	2.736E-03		1.057E+00
564.0			1.092E+06			1.059E+00	
558.0	6.525E+00	2.362E+04		1.104E+06	2.796E-03		1.060E+00
552.0			1.116E+06			1.061E+00	
546.0	6.524E+00	2.361E+04		1.127E+06	2.855E-03		1.063E+00
540.0			1.139E+06			1.064E+00	
534.0	6.522E+00	2.360E+04		1.151E+06	2.915E-03		1.066E+00
528.0			1.163E+06			1.067E+00	
522.0	6.521E+00	2.360E+04		1.175E+06	2.975E-03		1.069E+00
516.0			1.186E+06			1.070E+00	
510.0	6.519E+00	2.359E+04		1.198E+06	3.035E-03		1.072E+00
504.0			1.210E+06			1.073E+00	
498.0	6.517E+00	2.359E+04		1.222E+06	3.095E-03		1.075E+00
492.0			1.234E+06			1.076E+00	
486.0	6.516E+00	2.358E+04		1.245E+06	3.154E-03		1.078E+00
480.0			1.257E+06			1.079E+00	
474.0	6.514E+00	2.357E+04		1.269E+06	3.214E-03		1.081E+00
468.0			1.281E+06			1.083E+00	
462.0	6.512E+00	2.357E+04		1.293E+06	3.274E-03		1.084E+00
456.0			1.304E+06			1.086E+00	
450.0	6.510E+00	2.356E+04		1.316E+06	3.333E-03		1.088E+00
444.0			1.328E+06			1.089E+00	
438.0	6.508E+00	2.355E+04		1.340E+06	3.393E-03		1.091E+00
432.0			1.351E+06			1.093E+00	
426.0	6.507E+00	2.355E+04		1.363E+06	3.453E-03		1.094E+00
420.0			1.375E+06			1.096E+00	
414.0	6.505E+00	2.354E+04		1.387E+06	3.512E-03		1.098E+00
408.0			1.399E+06			1.100E+00	
402.0	6.503E+00	2.353E+04		1.410E+06	3.572E-03		1.101E+00
396.0			1.422E+06			1.103E+00	
390.0	6.501E+00	2.353E+04		1.434E+06	3.631E-03		1.105E+00
384.0			1.446E+06			1.107E+00	
378.0	6.499E+00	2.352E+04		1.457E+06	3.691E-03		1.109E+00
372.0			1.469E+06			1.111E+00	
366.0	5.569E+00	2.015E+04		1.479E+06	3.746E-03		1.112E+00
360.0			1.489E+06			1.114E+00	
354.0	5.567E+00	2.015E+04		1.499E+06	3.797E-03		1.116E+00
348.0			1.509E+06			1.118E+00	
342.0	5.565E+00	2.014E+04		1.520E+06	3.848E-03		1.120E+00
336.0			1.530E+06			1.122E+00	
330.0	5.563E+00	2.013E+04		1.540E+06	3.899E-03		1.124E+00
324.0			1.550E+06			1.126E+00	
318.0	5.561E+00	2.013E+04		1.560E+06	3.950E-03		1.128E+00
312.0			1.570E+06			1.130E+00	
306.0	7.232E+00	2.617E+04		1.583E+06	4.009E-03		1.132E+00
300.0			1.596E+06			1.134E+00	
294.0	7.233E+00	2.618E+04		1.609E+06	4.075E-03		1.136E+00
288.0			1.622E+06			1.138E+00	
282.0	7.234E+00	2.618E+04		1.635E+06	4.142E-03		1.140E+00
276.0			1.648E+06			1.142E+00	
270.0	7.235E+00	2.619E+04		1.661E+06	4.208E-03		1.144E+00
264.0			1.675E+06			1.146E+00	
258.0	5.982E+00	2.165E+04		1.685E+06	4.269E-03		1.148E+00
252.0			1.696E+06			1.150E+00	
246.0	5.983E+00	2.165E+04		1.707E+06	4.323E-03		1.153E+00
240.0			1.718E+06			1.155E+00	
234.0	5.983E+00	2.165E+04		1.729E+06	4.378E-03		1.157E+00
228.0			1.740E+06			1.159E+00	
222.0	5.982E+00	2.165E+04		1.750E+06	4.433E-03		1.161E+00
216.0			1.761E+06			1.164E+00	
210.0	5.982E+00	2.165E+04		1.772E+06	4.488E-03		1.166E+00
204.0			1.783E+06			1.168E+00	
198.0	5.982E+00	2.165E+04		1.794E+06	4.543E-03		1.170E+00
192.0			1.804E+06			1.173E+00	
186.0	5.981E+00	2.165E+04		1.815E+06	4.598E-03		1.175E+00
180.0			1.826E+06			1.177E+00	
174.0	5.981E+00	2.165E+04		1.837E+06	4.652E-03		1.180E+00

168.0			1.848E+06			1.182E+00	
162.0	5.537E+00	2.004E+04		1.858E+06	4.705E-03		1.184E+00
156.0			1.868E+06			1.187E+00	
150.0	5.536E+00	2.003E+04		1.878E+06	4.756E-03		1.189E+00
144.0			1.888E+06			1.191E+00	
138.0	5.534E+00	2.003E+04		1.898E+06	4.807E-03		1.194E+00
132.0			1.908E+06			1.196E+00	
126.0	5.532E+00	2.002E+04		1.918E+06	4.857E-03		1.199E+00
120.0			1.928E+06			1.201E+00	
114.0	5.530E+00	2.001E+04		1.938E+06	4.908E-03		1.203E+00
108.0			1.948E+06			1.206E+00	
102.0	5.528E+00	2.001E+04		1.958E+06	4.959E-03		1.208E+00
96.0			1.968E+06			1.211E+00	
90.0	5.526E+00	2.000E+04		1.978E+06	5.009E-03		1.213E+00
84.0			1.988E+06			1.216E+00	
78.0	5.524E+00	1.999E+04		1.998E+06	5.060E-03		1.218E+00
72.0			2.008E+06			1.221E+00	
66.0	5.522E+00	1.999E+04		2.018E+06	5.111E-03		1.223E+00
60.0			2.028E+06			1.226E+00	
54.0	5.520E+00	1.998E+04		2.038E+06	5.161E-03		1.229E+00
48.0			2.048E+06			1.231E+00	
42.0	5.518E+00	1.997E+04		2.058E+06	5.212E-03		1.234E+00
36.0			2.068E+06			1.236E+00	
30.0	5.516E+00	1.996E+04		2.078E+06	5.262E-03		1.239E+00
24.0			2.088E+06			1.242E+00	
18.0	3.277E+00	1.186E+04		2.094E+06	5.303E-03		1.244E+00
12.0			2.100E+06			1.247E+00	
6.0	3.277E+00	1.186E+04		2.106E+06	5.333E-03		1.250E+00
0.0			2.111E+06			1.252E+00	

APPLIED TIP MOVEMENT	TIP LOAD
IN.	LBS
1.5000E+00	3.8560E+05

DEPTH	LOAD TRANSFER	LOAD INCR	TOTAL LOAD	AVG LOAD	DEFORM OF INCR	TOTAL MVMNT	AVG MVMNT
IN.	PSI	LBS	LBS	LBS	IN.	IN.	IN.
960.0			3.856E+05			1.500E+00	
954.0	6.316E+00	2.286E+04		3.970E+05	1.006E-03		1.500E+00
948.0			4.085E+05			1.501E+00	
942.0	6.316E+00	2.286E+04		4.199E+05	1.063E-03		1.502E+00
936.0			4.313E+05			1.502E+00	
930.0	6.315E+00	2.286E+04		4.427E+05	1.121E-03		1.503E+00
924.0			4.542E+05			1.503E+00	
918.0	6.315E+00	2.285E+04		4.656E+05	1.179E-03		1.504E+00
912.0			4.770E+05			1.504E+00	
906.0	6.314E+00	2.285E+04		4.885E+05	1.237E-03		1.505E+00
900.0			4.999E+05			1.506E+00	
894.0	6.314E+00	2.285E+04		5.113E+05	1.295E-03		1.506E+00
888.0			5.227E+05			1.507E+00	
882.0	6.313E+00	2.285E+04		5.342E+05	1.353E-03		1.508E+00
876.0			5.456E+05			1.508E+00	
870.0	6.312E+00	2.285E+04		5.570E+05	1.411E-03		1.509E+00
864.0			5.684E+05			1.510E+00	
858.0	6.312E+00	2.284E+04		5.798E+05	1.469E-03		1.510E+00
852.0			5.913E+05			1.511E+00	
846.0	6.311E+00	2.284E+04		6.027E+05	1.526E-03		1.512E+00
840.0			6.141E+05			1.513E+00	
834.0	6.310E+00	2.284E+04		6.255E+05	1.584E-03		1.513E+00
828.0			6.369E+05			1.514E+00	
822.0	6.310E+00	2.284E+04		6.484E+05	1.642E-03		1.515E+00
816.0			6.598E+05			1.516E+00	
810.0	6.309E+00	2.283E+04		6.712E+05	1.700E-03		1.517E+00
804.0			6.826E+05			1.518E+00	
798.0	6.308E+00	2.283E+04		6.940E+05	1.758E-03		1.518E+00
792.0			7.054E+05			1.519E+00	
786.0	6.307E+00	2.283E+04		7.169E+05	1.816E-03		1.520E+00
780.0			7.283E+05			1.521E+00	
774.0	6.306E+00	2.282E+04		7.397E+05	1.873E-03		1.522E+00
768.0			7.511E+05			1.523E+00	
762.0	6.305E+00	2.282E+04		7.625E+05	1.931E-03		1.524E+00
756.0			7.739E+05			1.525E+00	
750.0	6.305E+00	2.282E+04		7.853E+05	1.989E-03		1.526E+00
744.0			7.967E+05			1.527E+00	
738.0	6.304E+00	2.281E+04		8.081E+05	2.047E-03		1.528E+00
732.0			8.195E+05			1.529E+00	
726.0	6.303E+00	2.281E+04		8.309E+05	2.105E-03		1.530E+00
720.0			8.424E+05			1.531E+00	
714.0	6.302E+00	2.281E+04		8.538E+05	2.162E-03		1.532E+00
708.0			8.652E+05			1.533E+00	
702.0	6.301E+00	2.280E+04		8.766E+05	2.220E-03		1.534E+00
696.0			8.880E+05			1.535E+00	
690.0	6.300E+00	2.280E+04		8.994E+05	2.278E-03		1.537E+00
684.0			9.108E+05			1.538E+00	
678.0	6.300E+00	2.280E+04		9.222E+05	2.336E-03		1.539E+00
672.0			9.336E+05			1.540E+00	
666.0	6.300E+00	2.280E+04		9.450E+05	2.393E-03		1.541E+00
660.0			9.564E+05			1.542E+00	
654.0	6.300E+00	2.280E+04		9.678E+05	2.451E-03		1.544E+00
648.0			9.792E+05			1.545E+00	
642.0	6.299E+00	2.280E+04		9.906E+05	2.509E-03		1.546E+00
636.0			1.002E+06			1.547E+00	
630.0	6.299E+00	2.280E+04		1.013E+06	2.567E-03		1.549E+00
624.0			1.025E+06			1.550E+00	
618.0	6.299E+00	2.280E+04		1.036E+06	2.624E-03		1.551E+00
612.0			1.048E+06			1.553E+00	
606.0	6.299E+00	2.280E+04		1.059E+06	2.682E-03		1.554E+00
600.0			1.070E+06			1.555E+00	
594.0	6.299E+00	2.280E+04		1.082E+06	2.740E-03		1.557E+00
588.0			1.093E+06			1.558E+00	
582.0	6.299E+00	2.280E+04		1.105E+06	2.797E-03		1.559E+00
576.0			1.116E+06			1.561E+00	
570.0	6.299E+00	2.280E+04		1.127E+06	2.855E-03		1.562E+00
564.0			1.139E+06			1.564E+00	
558.0	6.298E+00	2.279E+04		1.150E+06	2.913E-03		1.565E+00
552.0			1.162E+06			1.567E+00	
546.0	6.298E+00	2.279E+04		1.173E+06	2.971E-03		1.568E+00
540.0			1.184E+06			1.570E+00	
534.0	6.298E+00	2.279E+04		1.196E+06	3.028E-03		1.571E+00
528.0			1.207E+06			1.573E+00	
522.0	6.298E+00	2.279E+04		1.219E+06	3.086E-03		1.574E+00
516.0			1.230E+06			1.576E+00	
510.0	6.298E+00	2.279E+04		1.241E+06	3.144E-03		1.577E+00
504.0			1.253E+06			1.579E+00	
498.0	6.297E+00	2.279E+04		1.264E+06	3.202E-03		1.580E+00
492.0			1.275E+06			1.582E+00	
486.0	6.297E+00	2.279E+04		1.287E+06	3.259E-03		1.584E+00
480.0			1.298E+06			1.585E+00	
474.0	6.297E+00	2.279E+04		1.310E+06	3.317E-03		1.587E+00
468.0			1.321E+06			1.589E+00	
462.0	6.297E+00	2.279E+04		1.332E+06	3.375E-03		1.590E+00
456.0			1.344E+06			1.592E+00	
450.0	6.297E+00	2.279E+04		1.355E+06	3.432E-03		1.594E+00
444.0			1.367E+06			1.595E+00	
438.0	6.297E+00	2.279E+04		1.378E+06	3.490E-03		1.597E+00
432.0			1.389E+06			1.599E+00	
426.0	6.296E+00	2.279E+04		1.401E+06	3.548E-03		1.601E+00
420.0			1.412E+06			1.602E+00	
414.0	6.296E+00	2.279E+04		1.424E+06	3.606E-03		1.604E+00
408.0			1.435E+06			1.606E+00	
402.0	6.296E+00	2.279E+04		1.446E+06	3.663E-03		1.608E+00
396.0			1.458E+06			1.610E+00	
390.0	6.296E+00	2.279E+04		1.469E+06	3.721E-03		1.612E+00
384.0			1.481E+06			1.613E+00	
378.0	6.296E+00	2.278E+04		1.492E+06	3.779E-03		1.615E+00
372.0			1.503E+06			1.617E+00	
366.0	5.396E+00	1.953E+04		1.513E+06	3.832E-03		1.619E+00
360.0			1.523E+06			1.621E+00	
354.0	5.396E+00	1.953E+04		1.533E+06	3.882E-03		1.623E+00
348.0			1.542E+06			1.625E+00	
342.0	5.396E+00	1.953E+04		1.552E+06	3.931E-03		1.627E+00
336.0			1.562E+06			1.629E+00	
330.0	5.395E+00	1.953E+04		1.572E+06	3.981E-03		1.631E+00
324.0			1.581E+06			1.633E+00	
318.0	5.395E+00	1.953E+04		1.591E+06	4.030E-03		1.635E+00
312.0			1.601E+06			1.637E+00	
306.0	7.199E+00	2.605E+04		1.614E+06	4.088E-03		1.639E+00
300.0			1.627E+06			1.641E+00	

294.0	7.199E+00	2.605E+04		1.640E+06	4.154E-03		1.643E+00
288.0			1.653E+06			1.645E+00	
282.0	7.199E+00	2.605E+04		1.666E+06	4.220E-03		1.647E+00
276.0			1.679E+06			1.649E+00	
270.0	7.199E+00	2.605E+04		1.692E+06	4.286E-03		1.652E+00
264.0			1.705E+06			1.654E+00	
258.0	5.951E+00	2.154E+04		1.716E+06	4.346E-03		1.656E+00
252.0			1.727E+06			1.658E+00	
246.0	5.951E+00	2.154E+04		1.738E+06	4.401E-03		1.660E+00
240.0			1.748E+06			1.662E+00	
234.0	5.951E+00	2.154E+04		1.759E+06	4.455E-03		1.665E+00
228.0			1.770E+06			1.667E+00	
222.0	5.951E+00	2.154E+04		1.781E+06	4.510E-03		1.669E+00
216.0			1.791E+06			1.671E+00	
210.0	5.951E+00	2.154E+04		1.802E+06	4.564E-03		1.674E+00
204.0			1.813E+06			1.676E+00	
198.0	5.951E+00	2.154E+04		1.824E+06	4.619E-03		1.678E+00
192.0			1.834E+06			1.681E+00	
186.0	5.951E+00	2.154E+04		1.845E+06	4.673E-03		1.683E+00
180.0			1.856E+06			1.685E+00	
174.0	5.951E+00	2.154E+04		1.867E+06	4.728E-03		1.688E+00
168.0			1.878E+06			1.690E+00	
162.0	5.392E+00	1.952E+04		1.887E+06	4.780E-03		1.692E+00
156.0			1.897E+06			1.695E+00	
150.0	5.392E+00	1.952E+04		1.907E+06	4.829E-03		1.697E+00
144.0			1.917E+06			1.700E+00	
138.0	5.392E+00	1.951E+04		1.926E+06	4.879E-03		1.702E+00
132.0			1.936E+06			1.704E+00	
126.0	5.392E+00	1.951E+04		1.946E+06	4.928E-03		1.707E+00
120.0			1.956E+06			1.709E+00	
114.0	5.391E+00	1.951E+04		1.965E+06	4.978E-03		1.712E+00
108.0			1.975E+06			1.714E+00	
102.0	5.391E+00	1.951E+04		1.985E+06	5.027E-03		1.717E+00
96.0			1.995E+06			1.719E+00	
90.0	5.391E+00	1.951E+04		2.004E+06	5.076E-03		1.722E+00
84.0			2.014E+06			1.724E+00	
78.0	5.391E+00	1.951E+04		2.024E+06	5.126E-03		1.727E+00
72.0			2.034E+06			1.730E+00	
66.0	5.391E+00	1.951E+04		2.043E+06	5.175E-03		1.732E+00
60.0			2.053E+06			1.735E+00	
54.0	5.390E+00	1.951E+04		2.063E+06	5.225E-03		1.737E+00
48.0			2.073E+06			1.740E+00	
42.0	5.390E+00	1.951E+04		2.082E+06	5.274E-03		1.743E+00
36.0			2.092E+06			1.745E+00	
30.0	5.390E+00	1.951E+04		2.102E+06	5.323E-03		1.748E+00
24.0			2.112E+06			1.751E+00	
18.0	3.263E+00	1.181E+04		2.118E+06	5.363E-03		1.753E+00
12.0			2.123E+06			1.756E+00	
6.0	3.263E+00	1.181E+04		2.129E+06	5.393E-03		1.759E+00
0.0			2.135E+06			1.761E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
2.0000E+00	4.3226E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			4.323E+05			2.000E+00	
954.0	6.274E+00	2.271E+04		4.436E+05	1.124E-03		2.001E+00
948.0			4.550E+05			2.001E+00	
942.0	6.274E+00	2.271E+04		4.663E+05	1.181E-03		2.002E+00
936.0			4.777E+05			2.002E+00	
930.0	6.274E+00	2.271E+04		4.890E+05	1.239E-03		2.003E+00
924.0			5.004E+05			2.004E+00	
918.0	6.274E+00	2.270E+04		5.117E+05	1.296E-03		2.004E+00
912.0			5.231E+05			2.005E+00	
906.0	6.274E+00	2.270E+04		5.344E+05	1.354E-03		2.006E+00
900.0			5.458E+05			2.006E+00	
894.0	6.273E+00	2.270E+04		5.571E+05	1.411E-03		2.007E+00
888.0			5.685E+05			2.008E+00	
882.0	6.273E+00	2.270E+04		5.798E+05	1.469E-03		2.008E+00
876.0			5.912E+05			2.009E+00	
870.0	6.273E+00	2.270E+04		6.025E+05	1.526E-03		2.010E+00
864.0			6.139E+05			2.011E+00	
858.0	6.273E+00	2.270E+04		6.252E+05	1.584E-03		2.011E+00
852.0			6.366E+05			2.012E+00	
846.0	6.273E+00	2.270E+04		6.479E+05	1.641E-03		2.013E+00
840.0			6.593E+05			2.014E+00	
834.0	6.273E+00	2.270E+04		6.707E+05	1.699E-03		2.015E+00
828.0			6.820E+05			2.016E+00	
822.0	6.273E+00	2.270E+04		6.934E+05	1.756E-03		2.016E+00
816.0			7.047E+05			2.017E+00	
810.0	6.273E+00	2.270E+04		7.161E+05	1.814E-03		2.018E+00
804.0			7.274E+05			2.019E+00	
798.0	6.273E+00	2.270E+04		7.388E+05	1.871E-03		2.020E+00
792.0			7.501E+05			2.021E+00	
786.0	6.273E+00	2.270E+04		7.615E+05	1.929E-03		2.022E+00
780.0			7.728E+05			2.023E+00	
774.0	6.272E+00	2.270E+04		7.842E+05	1.986E-03		2.024E+00
768.0			7.955E+05			2.025E+00	
762.0	6.272E+00	2.270E+04		8.069E+05	2.044E-03		2.026E+00
756.0			8.182E+05			2.027E+00	
750.0	6.272E+00	2.270E+04		8.296E+05	2.101E-03		2.028E+00
744.0			8.409E+05			2.029E+00	
738.0	6.272E+00	2.270E+04		8.523E+05	2.159E-03		2.030E+00
732.0			8.636E+05			2.031E+00	
726.0	6.272E+00	2.270E+04		8.750E+05	2.216E-03		2.032E+00
720.0			8.863E+05			2.033E+00	
714.0	6.272E+00	2.270E+04		8.977E+05	2.273E-03		2.035E+00
708.0			9.090E+05			2.036E+00	
702.0	6.272E+00	2.270E+04		9.204E+05	2.331E-03		2.037E+00
696.0			9.317E+05			2.038E+00	
690.0	6.272E+00	2.270E+04		9.431E+05	2.388E-03		2.039E+00
684.0			9.544E+05			2.040E+00	
678.0	6.271E+00	2.270E+04		9.658E+05	2.446E-03		2.042E+00
672.0			9.771E+05			2.043E+00	
666.0	6.271E+00	2.270E+04		9.885E+05	2.503E-03		2.044E+00
660.0			9.998E+05			2.045E+00	
654.0	6.271E+00	2.270E+04		1.011E+06	2.561E-03		2.047E+00
648.0			1.022E+06			2.048E+00	
642.0	6.271E+00	2.270E+04		1.034E+06	2.618E-03		2.049E+00
636.0			1.045E+06			2.051E+00	
630.0	6.271E+00	2.270E+04		1.057E+06	2.676E-03		2.052E+00
624.0			1.068E+06			2.053E+00	
618.0	6.271E+00	2.269E+04		1.079E+06	2.733E-03		2.055E+00
612.0			1.091E+06			2.056E+00	
606.0	6.271E+00	2.269E+04		1.102E+06	2.791E-03		2.057E+00
600.0			1.113E+06			2.059E+00	
594.0	6.270E+00	2.269E+04		1.125E+06	2.848E-03		2.060E+00
588.0			1.136E+06			2.062E+00	
582.0	6.270E+00	2.269E+04		1.147E+06	2.906E-03		2.063E+00
576.0			1.159E+06			2.064E+00	
570.0	6.270E+00	2.269E+04		1.170E+06	2.963E-03		2.066E+00
564.0			1.181E+06			2.067E+00	
558.0	6.270E+00	2.269E+04		1.193E+06	3.021E-03		2.069E+00
552.0			1.204E+06			2.070E+00	
546.0	6.270E+00	2.269E+04		1.215E+06	3.078E-03		2.072E+00
540.0			1.227E+06			2.074E+00	
534.0	6.270E+00	2.269E+04		1.238E+06	3.136E-03		2.075E+00
528.0			1.249E+06			2.077E+00	
522.0	6.269E+00	2.269E+04		1.261E+06	3.193E-03		2.078E+00
516.0			1.272E+06			2.080E+00	
510.0	6.269E+00	2.269E+04		1.283E+06	3.251E-03		2.081E+00
504.0			1.295E+06			2.083E+00	
498.0	6.269E+00	2.269E+04		1.306E+06	3.308E-03		2.085E+00
492.0			1.317E+06			2.086E+00	
486.0	6.269E+00	2.269E+04		1.329E+06	3.366E-03		2.088E+00
480.0			1.340E+06			2.090E+00	
474.0	6.269E+00	2.269E+04		1.352E+06	3.423E-03		2.091E+00
468.0			1.363E+06			2.093E+00	
462.0	6.268E+00	2.269E+04		1.374E+06	3.480E-03		2.095E+00
456.0			1.386E+06			2.097E+00	
450.0	6.268E+00	2.269E+04		1.397E+06	3.538E-03		2.098E+00
444.0			1.408E+06			2.100E+00	
438.0	6.268E+00	2.268E+04		1.420E+06	3.595E-03		2.102E+00
432.0			1.431E+06			2.104E+00	
426.0	6.268E+00	2.268E+04		1.442E+06	3.653E-03		2.106E+00

420.0			1.454E+06			2.107E+00	
414.0	6.268E+00	2.268E+04		1.465E+06	3.710E-03		2.109E+00
408.0			1.476E+06			2.111E+00	
402.0	6.267E+00	2.268E+04		1.488E+06	3.768E-03		2.113E+00
396.0			1.499E+06			2.115E+00	
390.0	6.267E+00	2.268E+04		1.510E+06	3.825E-03		2.117E+00
384.0			1.522E+06			2.119E+00	
378.0	6.267E+00	2.268E+04		1.533E+06	3.883E-03		2.121E+00
372.0			1.544E+06			2.123E+00	
366.0	5.372E+00	1.944E+04		1.554E+06	3.936E-03		2.125E+00
360.0			1.564E+06			2.127E+00	
354.0	5.371E+00	1.944E+04		1.573E+06	3.985E-03		2.129E+00
348.0			1.583E+06			2.131E+00	
342.0	5.371E+00	1.944E+04		1.593E+06	4.034E-03		2.133E+00
336.0			1.603E+06			2.135E+00	
330.0	5.371E+00	1.944E+04		1.612E+06	4.084E-03		2.137E+00
324.0			1.622E+06			2.139E+00	
318.0	5.371E+00	1.944E+04		1.632E+06	4.133E-03		2.141E+00
312.0			1.642E+06			2.143E+00	
306.0	7.194E+00	2.604E+04		1.655E+06	4.190E-03		2.145E+00
300.0			1.668E+06			2.147E+00	
294.0	7.194E+00	2.604E+04		1.681E+06	4.256E-03		2.149E+00
288.0			1.694E+06			2.151E+00	
282.0	7.194E+00	2.604E+04		1.707E+06	4.322E-03		2.153E+00
276.0			1.720E+06			2.156E+00	
270.0	7.194E+00	2.604E+04		1.733E+06	4.388E-03		2.158E+00
264.0			1.746E+06			2.160E+00	
258.0	5.947E+00	2.152E+04		1.756E+06	4.449E-03		2.162E+00
252.0			1.767E+06			2.164E+00	
246.0	5.947E+00	2.152E+04		1.778E+06	4.503E-03		2.167E+00
240.0			1.789E+06			2.169E+00	
234.0	5.947E+00	2.152E+04		1.799E+06	4.558E-03		2.171E+00
228.0			1.810E+06			2.174E+00	
222.0	5.947E+00	2.152E+04		1.821E+06	4.612E-03		2.176E+00
216.0			1.832E+06			2.178E+00	
210.0	5.947E+00	2.152E+04		1.843E+06	4.667E-03		2.180E+00
204.0			1.853E+06			2.183E+00	
198.0	5.947E+00	2.152E+04		1.864E+06	4.721E-03		2.185E+00
192.0			1.875E+06			2.188E+00	
186.0	5.947E+00	2.152E+04		1.886E+06	4.776E-03		2.190E+00
180.0			1.896E+06			2.192E+00	
174.0	5.947E+00	2.152E+04		1.907E+06	4.830E-03		2.195E+00
168.0			1.918E+06			2.197E+00	
162.0	5.368E+00	1.943E+04		1.928E+06	4.882E-03		2.200E+00
156.0			1.937E+06			2.202E+00	
150.0	5.368E+00	1.943E+04		1.947E+06	4.931E-03		2.204E+00
144.0			1.957E+06			2.207E+00	
138.0	5.367E+00	1.943E+04		1.966E+06	4.980E-03		2.209E+00
132.0			1.976E+06			2.212E+00	
126.0	5.367E+00	1.942E+04		1.986E+06	5.030E-03		2.214E+00
120.0			1.996E+06			2.217E+00	
114.0	5.367E+00	1.942E+04		2.005E+06	5.079E-03		2.219E+00
108.0			2.015E+06			2.222E+00	
102.0	5.367E+00	1.942E+04		2.025E+06	5.128E-03		2.225E+00
96.0			2.034E+06			2.227E+00	
90.0	5.366E+00	1.942E+04		2.044E+06	5.177E-03		2.230E+00
84.0			2.054E+06			2.232E+00	
78.0	5.366E+00	1.942E+04		2.064E+06	5.226E-03		2.235E+00
72.0			2.073E+06			2.238E+00	
66.0	5.366E+00	1.942E+04		2.083E+06	5.275E-03		2.240E+00
60.0			2.093E+06			2.243E+00	
54.0	5.366E+00	1.942E+04		2.102E+06	5.325E-03		2.245E+00
48.0			2.112E+06			2.248E+00	
42.0	5.365E+00	1.942E+04		2.122E+06	5.374E-03		2.251E+00
36.0			2.132E+06			2.254E+00	
30.0	5.365E+00	1.942E+04		2.141E+06	5.423E-03		2.256E+00
24.0			2.151E+06			2.259E+00	
18.0	3.261E+00	1.180E+04		2.157E+06	5.463E-03		2.262E+00
12.0			2.163E+06			2.264E+00	
6.0	3.261E+00	1.180E+04		2.169E+06	5.492E-03		2.267E+00
0.0			2.175E+06			2.270E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
3.0000E+00	4.9197E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			4.920E+05			3.000E+00	
954.0	6.217E+00	2.250E+04		5.032E+05	1.274E-03		3.001E+00
948.0			5.145E+05			3.001E+00	
942.0	6.217E+00	2.250E+04		5.257E+05	1.331E-03		3.002E+00
936.0			5.370E+05			3.003E+00	
930.0	6.217E+00	2.250E+04		5.482E+05	1.388E-03		3.003E+00
924.0			5.595E+05			3.004E+00	
918.0	6.217E+00	2.250E+04		5.707E+05	1.445E-03		3.005E+00
912.0			5.820E+05			3.005E+00	
906.0	6.217E+00	2.250E+04		5.932E+05	1.502E-03		3.006E+00
900.0			6.045E+05			3.007E+00	
894.0	6.217E+00	2.250E+04		6.157E+05	1.559E-03		3.008E+00
888.0			6.270E+05			3.009E+00	
882.0	6.217E+00	2.250E+04		6.382E+05	1.616E-03		3.009E+00
876.0			6.495E+05			3.010E+00	
870.0	6.217E+00	2.250E+04		6.607E+05	1.673E-03		3.011E+00
864.0			6.720E+05			3.012E+00	
858.0	6.217E+00	2.250E+04		6.832E+05	1.730E-03		3.013E+00
852.0			6.945E+05			3.014E+00	
846.0	6.217E+00	2.250E+04		7.057E+05	1.787E-03		3.014E+00
840.0			7.170E+05			3.015E+00	
834.0	6.216E+00	2.250E+04		7.282E+05	1.844E-03		3.016E+00
828.0			7.395E+05			3.017E+00	
822.0	6.216E+00	2.250E+04		7.507E+05	1.901E-03		3.018E+00
816.0			7.620E+05			3.019E+00	
810.0	6.216E+00	2.250E+04		7.732E+05	1.958E-03		3.020E+00
804.0			7.845E+05			3.021E+00	
798.0	6.216E+00	2.250E+04		7.957E+05	2.015E-03		3.022E+00
792.0			8.070E+05			3.023E+00	
786.0	6.216E+00	2.250E+04		8.182E+05	2.072E-03		3.024E+00
780.0			8.295E+05			3.025E+00	
774.0	6.216E+00	2.250E+04		8.407E+05	2.129E-03		3.026E+00
768.0			8.520E+05			3.027E+00	
762.0	6.216E+00	2.250E+04		8.632E+05	2.186E-03		3.028E+00
756.0			8.745E+05			3.029E+00	
750.0	6.216E+00	2.250E+04		8.857E+05	2.243E-03		3.031E+00
744.0			8.969E+05			3.032E+00	
738.0	6.216E+00	2.249E+04		9.082E+05	2.300E-03		3.033E+00
732.0			9.194E+05			3.034E+00	
726.0	6.215E+00	2.249E+04		9.307E+05	2.357E-03		3.035E+00
720.0			9.419E+05			3.036E+00	
714.0	6.215E+00	2.249E+04		9.532E+05	2.414E-03		3.038E+00
708.0			9.644E+05			3.039E+00	
702.0	6.215E+00	2.249E+04		9.757E+05	2.471E-03		3.040E+00
696.0			9.869E+05			3.041E+00	
690.0	6.215E+00	2.249E+04		9.982E+05	2.528E-03		3.042E+00
684.0			1.009E+06			3.044E+00	
678.0	6.215E+00	2.249E+04		1.021E+06	2.585E-03		3.045E+00
672.0			1.032E+06			3.046E+00	
666.0	6.215E+00	2.249E+04		1.043E+06	2.642E-03		3.048E+00
660.0			1.054E+06			3.049E+00	
654.0	6.215E+00	2.249E+04		1.066E+06	2.699E-03		3.050E+00
648.0			1.077E+06			3.052E+00	
642.0	6.214E+00	2.249E+04		1.088E+06	2.756E-03		3.053E+00
636.0			1.099E+06			3.054E+00	
630.0	6.214E+00	2.249E+04		1.111E+06	2.813E-03		3.056E+00
624.0			1.122E+06			3.057E+00	
618.0	6.214E+00	2.249E+04		1.133E+06	2.870E-03		3.059E+00
612.0			1.144E+06			3.060E+00	
606.0	6.214E+00	2.249E+04		1.156E+06	2.927E-03		3.062E+00
600.0			1.167E+06			3.063E+00	
594.0	6.214E+00	2.249E+04		1.178E+06	2.984E-03		3.065E+00
588.0			1.189E+06			3.066E+00	
582.0	6.214E+00	2.249E+04		1.201E+06	3.041E-03		3.068E+00
576.0			1.212E+06			3.069E+00	
570.0	6.213E+00	2.249E+04		1.223E+06	3.098E-03		3.071E+00
564.0			1.234E+06			3.072E+00	
558.0	6.213E+00	2.249E+04		1.246E+06	3.155E-03		3.074E+00
552.0			1.257E+06			3.075E+00	

546.0	6.213E+00	2.249E+04		1.268E+06	3.212E-03		3.077E+00
540.0			1.279E+06			3.079E+00	
534.0	6.213E+00	2.249E+04		1.291E+06	3.268E-03		3.080E+00
528.0			1.302E+06			3.082E+00	
522.0	6.213E+00	2.248E+04		1.313E+06	3.325E-03		3.083E+00
516.0			1.324E+06			3.085E+00	
510.0	6.212E+00	2.248E+04		1.335E+06	3.382E-03		3.087E+00
504.0			1.347E+06			3.088E+00	
498.0	6.212E+00	2.248E+04		1.358E+06	3.439E-03		3.090E+00
492.0			1.369E+06			3.092E+00	
486.0	6.212E+00	2.248E+04		1.380E+06	3.496E-03		3.094E+00
480.0			1.392E+06			3.095E+00	
474.0	6.212E+00	2.248E+04		1.403E+06	3.553E-03		3.097E+00
468.0			1.414E+06			3.099E+00	
462.0	6.212E+00	2.248E+04		1.425E+06	3.610E-03		3.101E+00
456.0			1.437E+06			3.103E+00	
450.0	6.212E+00	2.248E+04		1.448E+06	3.667E-03		3.104E+00
444.0			1.459E+06			3.106E+00	
438.0	6.211E+00	2.248E+04		1.470E+06	3.724E-03		3.108E+00
432.0			1.482E+06			3.110E+00	
426.0	6.211E+00	2.248E+04		1.493E+06	3.781E-03		3.112E+00
420.0			1.504E+06			3.114E+00	
414.0	6.211E+00	2.248E+04		1.515E+06	3.838E-03		3.116E+00
408.0			1.527E+06			3.118E+00	
402.0	6.211E+00	2.248E+04		1.538E+06	3.895E-03		3.120E+00
396.0			1.549E+06			3.121E+00	
390.0	6.210E+00	2.248E+04		1.560E+06	3.952E-03		3.123E+00
384.0			1.572E+06			3.125E+00	
378.0	6.210E+00	2.248E+04		1.583E+06	4.009E-03		3.127E+00
372.0			1.594E+06			3.129E+00	
366.0	5.323E+00	1.926E+04		1.604E+06	4.062E-03		3.131E+00
360.0			1.613E+06			3.134E+00	
354.0	5.323E+00	1.926E+04		1.623E+06	4.110E-03		3.136E+00
348.0			1.633E+06			3.138E+00	
342.0	5.322E+00	1.926E+04		1.642E+06	4.159E-03		3.140E+00
336.0			1.652E+06			3.142E+00	
330.0	5.322E+00	1.926E+04		1.661E+06	4.208E-03		3.144E+00
324.0			1.671E+06			3.146E+00	
318.0	5.322E+00	1.926E+04		1.681E+06	4.257E-03		3.148E+00
312.0			1.690E+06			3.150E+00	
306.0	7.185E+00	2.600E+04		1.703E+06	4.314E-03		3.152E+00
300.0			1.716E+06			3.155E+00	
294.0	7.185E+00	2.600E+04		1.729E+06	4.380E-03		3.157E+00
288.0			1.742E+06			3.159E+00	
282.0	7.185E+00	2.600E+04		1.755E+06	4.446E-03		3.161E+00
276.0			1.768E+06			3.163E+00	
270.0	7.185E+00	2.600E+04		1.781E+06	4.512E-03		3.166E+00
264.0			1.794E+06			3.168E+00	
258.0	5.939E+00	2.150E+04		1.805E+06	4.572E-03		3.170E+00
252.0			1.816E+06			3.172E+00	
246.0	5.939E+00	2.150E+04		1.827E+06	4.626E-03		3.175E+00
240.0			1.837E+06			3.177E+00	
234.0	5.939E+00	2.150E+04		1.848E+06	4.681E-03		3.179E+00
228.0			1.859E+06			3.182E+00	
222.0	5.939E+00	2.150E+04		1.870E+06	4.735E-03		3.184E+00
216.0			1.880E+06			3.187E+00	
210.0	5.939E+00	2.150E+04		1.891E+06	4.789E-03		3.189E+00
204.0			1.902E+06			3.191E+00	
198.0	5.939E+00	2.149E+04		1.913E+06	4.844E-03		3.194E+00
192.0			1.923E+06			3.196E+00	
186.0	5.939E+00	2.149E+04		1.934E+06	4.898E-03		3.199E+00
180.0			1.945E+06			3.201E+00	
174.0	5.939E+00	2.149E+04		1.956E+06	4.953E-03		3.204E+00
168.0			1.966E+06			3.206E+00	
162.0	5.319E+00	1.925E+04		1.976E+06	5.004E-03		3.208E+00
156.0			1.986E+06			3.211E+00	
150.0	5.319E+00	1.925E+04		1.995E+06	5.053E-03		3.214E+00
144.0			2.005E+06			3.216E+00	
138.0	5.319E+00	1.925E+04		2.014E+06	5.102E-03		3.219E+00
132.0			2.024E+06			3.221E+00	
126.0	5.318E+00	1.925E+04		2.034E+06	5.151E-03		3.224E+00
120.0			2.043E+06			3.226E+00	
114.0	5.318E+00	1.925E+04		2.053E+06	5.199E-03		3.229E+00
108.0			2.063E+06			3.232E+00	
102.0	5.318E+00	1.925E+04		2.072E+06	5.248E-03		3.234E+00
96.0			2.082E+06			3.237E+00	
90.0	5.318E+00	1.925E+04		2.091E+06	5.297E-03		3.239E+00
84.0			2.101E+06			3.242E+00	
78.0	5.317E+00	1.924E+04		2.111E+06	5.346E-03		3.245E+00
72.0			2.120E+06			3.247E+00	
66.0	5.317E+00	1.924E+04		2.130E+06	5.394E-03		3.250E+00
60.0			2.140E+06			3.253E+00	
54.0	5.317E+00	1.924E+04		2.149E+06	5.443E-03		3.256E+00
48.0			2.159E+06			3.258E+00	
42.0	5.317E+00	1.924E+04		2.168E+06	5.492E-03		3.261E+00
36.0			2.178E+06			3.264E+00	
30.0	5.316E+00	1.924E+04		2.188E+06	5.541E-03		3.266E+00
24.0			2.197E+06			3.269E+00	
18.0	3.257E+00	1.179E+04		2.203E+06	5.580E-03		3.272E+00
12.0			2.209E+06			3.275E+00	
6.0	3.257E+00	1.179E+04		2.215E+06	5.610E-03		3.278E+00
0.0			2.221E+06			3.280E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
4.0000E+00	5.1753E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			5.175E+05			4.000E+00	
954.0	6.161E+00	2.230E+04		5.287E+05	1.339E-03		4.001E+00
948.0			5.398E+05			4.001E+00	
942.0	6.161E+00	2.230E+04		5.510E+05	1.395E-03		4.002E+00
936.0			5.621E+05			4.003E+00	
930.0	6.161E+00	2.230E+04		5.733E+05	1.452E-03		4.003E+00
924.0			5.844E+05			4.004E+00	
918.0	6.161E+00	2.230E+04		5.956E+05	1.508E-03		4.005E+00
912.0			6.067E+05			4.006E+00	
906.0	6.161E+00	2.230E+04		6.179E+05	1.565E-03		4.006E+00
900.0			6.290E+05			4.007E+00	
894.0	6.161E+00	2.230E+04		6.402E+05	1.621E-03		4.008E+00
888.0			6.513E+05			4.009E+00	
882.0	6.160E+00	2.230E+04		6.625E+05	1.678E-03		4.010E+00
876.0			6.736E+05			4.011E+00	
870.0	6.160E+00	2.229E+04		6.848E+05	1.734E-03		4.011E+00
864.0			6.959E+05			4.012E+00	
858.0	6.160E+00	2.229E+04		7.070E+05	1.791E-03		4.013E+00
852.0			7.182E+05			4.014E+00	
846.0	6.160E+00	2.229E+04		7.293E+05	1.847E-03		4.015E+00
840.0			7.405E+05			4.016E+00	
834.0	6.160E+00	2.229E+04		7.516E+05	1.904E-03		4.017E+00
828.0			7.628E+05			4.018E+00	
822.0	6.160E+00	2.229E+04		7.739E+05	1.960E-03		4.019E+00
816.0			7.851E+05			4.020E+00	
810.0	6.160E+00	2.229E+04		7.962E+05	2.017E-03		4.021E+00
804.0			8.074E+05			4.022E+00	
798.0	6.160E+00	2.229E+04		8.185E+05	2.073E-03		4.023E+00
792.0			8.297E+05			4.024E+00	
786.0	6.160E+00	2.229E+04		8.408E+05	2.129E-03		4.025E+00
780.0			8.520E+05			4.026E+00	
774.0	6.159E+00	2.229E+04		8.631E+05	2.186E-03		4.027E+00
768.0			8.742E+05			4.028E+00	
762.0	6.159E+00	2.229E+04		8.854E+05	2.242E-03		4.029E+00
756.0			8.965E+05			4.030E+00	
750.0	6.159E+00	2.229E+04		9.077E+05	2.299E-03		4.032E+00
744.0			9.188E+05			4.033E+00	
738.0	6.159E+00	2.229E+04		9.300E+05	2.355E-03		4.034E+00
732.0			9.411E+05			4.035E+00	
726.0	6.159E+00	2.229E+04		9.523E+05	2.412E-03		4.036E+00
720.0			9.634E+05			4.038E+00	
714.0	6.159E+00	2.229E+04		9.746E+05	2.468E-03		4.039E+00
708.0			9.857E+05			4.040E+00	
702.0	6.159E+00	2.229E+04		9.968E+05	2.525E-03		4.041E+00
696.0			1.008E+06			4.043E+00	
690.0	6.159E+00	2.229E+04		1.019E+06	2.581E-03		4.044E+00
684.0			1.030E+06			4.045E+00	
678.0	6.158E+00	2.229E+04		1.041E+06	2.638E-03		4.046E+00

672.0			1.053E+06			4.048E+00	
666.0	6.158E+00	2.229E+04		1.064E+06	2.694E-03		4.049E+00
660.0			1.075E+06			4.050E+00	
654.0	6.158E+00	2.229E+04		1.086E+06	2.750E-03		4.052E+00
648.0			1.097E+06			4.053E+00	
642.0	6.158E+00	2.229E+04		1.108E+06	2.807E-03		4.055E+00
636.0			1.119E+06			4.056E+00	
630.0	6.158E+00	2.229E+04		1.131E+06	2.863E-03		4.057E+00
624.0			1.142E+06			4.059E+00	
618.0	6.158E+00	2.229E+04		1.153E+06	2.920E-03		4.060E+00
612.0			1.164E+06			4.062E+00	
606.0	6.157E+00	2.228E+04		1.175E+06	2.976E-03		4.063E+00
600.0			1.186E+06			4.065E+00	
594.0	6.157E+00	2.228E+04		1.197E+06	3.033E-03		4.066E+00
588.0			1.209E+06			4.068E+00	
582.0	6.157E+00	2.228E+04		1.220E+06	3.089E-03		4.069E+00
576.0			1.231E+06			4.071E+00	
570.0	6.157E+00	2.228E+04		1.242E+06	3.146E-03		4.072E+00
564.0			1.253E+06			4.074E+00	
558.0	6.157E+00	2.228E+04		1.264E+06	3.202E-03		4.076E+00
552.0			1.275E+06			4.077E+00	
546.0	6.157E+00	2.228E+04		1.287E+06	3.258E-03		4.079E+00
540.0			1.298E+06			4.080E+00	
534.0	6.156E+00	2.228E+04		1.309E+06	3.315E-03		4.082E+00
528.0			1.320E+06			4.084E+00	
522.0	6.156E+00	2.228E+04		1.331E+06	3.371E-03		4.085E+00
516.0			1.342E+06			4.087E+00	
510.0	6.156E+00	2.228E+04		1.353E+06	3.428E-03		4.089E+00
504.0			1.365E+06			4.091E+00	
498.0	6.156E+00	2.228E+04		1.376E+06	3.484E-03		4.092E+00
492.0			1.387E+06			4.094E+00	
486.0	6.156E+00	2.228E+04		1.398E+06	3.541E-03		4.096E+00
480.0			1.409E+06			4.098E+00	
474.0	6.155E+00	2.228E+04		1.420E+06	3.597E-03		4.099E+00
468.0			1.431E+06			4.101E+00	
462.0	6.155E+00	2.228E+04		1.443E+06	3.653E-03		4.103E+00
456.0			1.454E+06			4.105E+00	
450.0	6.155E+00	2.228E+04		1.465E+06	3.710E-03		4.107E+00
444.0			1.476E+06			4.109E+00	
438.0	6.155E+00	2.227E+04		1.487E+06	3.766E-03		4.110E+00
432.0			1.498E+06			4.112E+00	
426.0	6.155E+00	2.227E+04		1.509E+06	3.823E-03		4.114E+00
420.0			1.520E+06			4.116E+00	
414.0	6.154E+00	2.227E+04		1.532E+06	3.879E-03		4.118E+00
408.0			1.543E+06			4.120E+00	
402.0	6.154E+00	2.227E+04		1.554E+06	3.935E-03		4.122E+00
396.0			1.565E+06			4.124E+00	
390.0	6.154E+00	2.227E+04		1.576E+06	3.992E-03		4.126E+00
384.0			1.587E+06			4.128E+00	
378.0	6.154E+00	2.227E+04		1.598E+06	4.048E-03		4.130E+00
372.0			1.610E+06			4.132E+00	
366.0	5.274E+00	1.909E+04		1.619E+06	4.101E-03		4.134E+00
360.0			1.629E+06			4.136E+00	
354.0	5.274E+00	1.909E+04		1.638E+06	4.149E-03		4.138E+00
348.0			1.648E+06			4.140E+00	
342.0	5.274E+00	1.909E+04		1.657E+06	4.197E-03		4.142E+00
336.0			1.667E+06			4.144E+00	
330.0	5.274E+00	1.909E+04		1.676E+06	4.246E-03		4.147E+00
324.0			1.686E+06			4.149E+00	
318.0	5.274E+00	1.909E+04		1.695E+06	4.294E-03		4.151E+00
312.0			1.705E+06			4.153E+00	
306.0	7.176E+00	2.597E+04		1.718E+06	4.351E-03		4.155E+00
300.0			1.731E+06			4.157E+00	
294.0	7.176E+00	2.597E+04		1.744E+06	4.417E-03		4.160E+00
288.0			1.757E+06			4.162E+00	
282.0	7.176E+00	2.597E+04		1.770E+06	4.483E-03		4.164E+00
276.0			1.783E+06			4.166E+00	
270.0	7.176E+00	2.597E+04		1.796E+06	4.548E-03		4.169E+00
264.0			1.809E+06			4.171E+00	
258.0	5.932E+00	2.147E+04		1.820E+06	4.608E-03		4.173E+00
252.0			1.830E+06			4.175E+00	
246.0	5.932E+00	2.147E+04		1.841E+06	4.663E-03		4.178E+00
240.0			1.852E+06			4.180E+00	
234.0	5.932E+00	2.147E+04		1.863E+06	4.717E-03		4.182E+00
228.0			1.873E+06			4.185E+00	
222.0	5.932E+00	2.147E+04		1.884E+06	4.772E-03		4.187E+00
216.0			1.895E+06			4.190E+00	
210.0	5.932E+00	2.147E+04		1.905E+06	4.826E-03		4.192E+00
204.0			1.916E+06			4.194E+00	
198.0	5.932E+00	2.147E+04		1.927E+06	4.880E-03		4.197E+00
192.0			1.938E+06			4.199E+00	
186.0	5.932E+00	2.147E+04		1.948E+06	4.935E-03		4.202E+00
180.0			1.959E+06			4.204E+00	
174.0	5.931E+00	2.147E+04		1.970E+06	4.989E-03		4.207E+00
168.0			1.981E+06			4.209E+00	
162.0	5.271E+00	1.907E+04		1.990E+06	5.040E-03		4.212E+00
156.0			2.000E+06			4.214E+00	
150.0	5.270E+00	1.907E+04		2.009E+06	5.089E-03		4.217E+00
144.0			2.019E+06			4.219E+00	
138.0	5.270E+00	1.907E+04		2.028E+06	5.137E-03		4.222E+00
132.0			2.038E+06			4.224E+00	
126.0	5.270E+00	1.907E+04		2.047E+06	5.185E-03		4.227E+00
120.0			2.057E+06			4.230E+00	
114.0	5.270E+00	1.907E+04		2.066E+06	5.234E-03		4.232E+00
108.0			2.076E+06			4.235E+00	
102.0	5.269E+00	1.907E+04		2.086E+06	5.282E-03		4.237E+00
96.0			2.095E+06			4.240E+00	
90.0	5.269E+00	1.907E+04		2.105E+06	5.330E-03		4.243E+00
84.0			2.114E+06			4.245E+00	
78.0	5.269E+00	1.907E+04		2.124E+06	5.379E-03		4.248E+00
72.0			2.133E+06			4.251E+00	
66.0	5.269E+00	1.907E+04		2.143E+06	5.427E-03		4.254E+00
60.0			2.152E+06			4.256E+00	
54.0	5.268E+00	1.907E+04		2.162E+06	5.475E-03		4.259E+00
48.0			2.171E+06			4.262E+00	
42.0	5.268E+00	1.907E+04		2.181E+06	5.523E-03		4.265E+00
36.0			2.190E+06			4.267E+00	
30.0	5.268E+00	1.906E+04		2.200E+06	5.572E-03		4.270E+00
24.0			2.209E+06			4.273E+00	
18.0	3.252E+00	1.177E+04		2.215E+06	5.611E-03		4.276E+00
12.0			2.221E+06			4.278E+00	
6.0	3.252E+00	1.177E+04		2.227E+06	5.641E-03		4.281E+00
0.0			2.233E+06			4.284E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
5.0000E+00	5.2714E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			5.271E+05			5.000E+00	
954.0	6.105E+00	2.209E+04		5.382E+05	1.363E-03		5.001E+00
948.0			5.492E+05			5.001E+00	
942.0	6.104E+00	2.209E+04		5.603E+05	1.419E-03		5.002E+00
936.0			5.713E+05			5.003E+00	
930.0	6.104E+00	2.209E+04		5.824E+05	1.475E-03		5.004E+00
924.0			5.934E+05			5.004E+00	
918.0	6.104E+00	2.209E+04		6.045E+05	1.531E-03		5.005E+00
912.0			6.155E+05			5.006E+00	
906.0	6.104E+00	2.209E+04		6.266E+05	1.587E-03		5.007E+00
900.0			6.376E+05			5.007E+00	
894.0	6.104E+00	2.209E+04		6.487E+05	1.643E-03		5.008E+00
888.0			6.597E+05			5.009E+00	
882.0	6.104E+00	2.209E+04		6.707E+05	1.699E-03		5.010E+00
876.0			6.818E+05			5.011E+00	
870.0	6.104E+00	2.209E+04		6.928E+05	1.755E-03		5.012E+00
864.0			7.039E+05			5.012E+00	
858.0	6.104E+00	2.209E+04		7.149E+05	1.811E-03		5.013E+00
852.0			7.260E+05			5.014E+00	
846.0	6.104E+00	2.209E+04		7.370E+05	1.867E-03		5.015E+00
840.0			7.481E+05			5.016E+00	
834.0	6.104E+00	2.209E+04		7.591E+05	1.923E-03		5.017E+00
828.0			7.701E+05			5.018E+00	
822.0	6.103E+00	2.209E+04		7.812E+05	1.979E-03		5.019E+00
816.0			7.922E+05			5.020E+00	
810.0	6.103E+00	2.209E+04		8.033E+05	2.034E-03		5.021E+00
804.0			8.143E+05			5.022E+00	

798.0	6.103E+00	2.209E+04		8.254E+05	2.090E-03		5.023E+00
792.0			8.364E+05			5.024E+00	
786.0	6.103E+00	2.209E+04		8.475E+05	2.146E-03		5.025E+00
780.0			8.585E+05			5.026E+00	
774.0	6.103E+00	2.209E+04		8.695E+05	2.202E-03		5.027E+00
768.0			8.806E+05			5.029E+00	
762.0	6.103E+00	2.209E+04		8.916E+05	2.258E-03		5.030E+00
756.0			9.027E+05			5.031E+00	
750.0	6.103E+00	2.209E+04		9.137E+05	2.314E-03		5.032E+00
744.0			9.248E+05			5.033E+00	
738.0	6.103E+00	2.209E+04		9.358E+05	2.370E-03		5.034E+00
732.0			9.469E+05			5.035E+00	
726.0	6.102E+00	2.209E+04		9.579E+05	2.426E-03		5.037E+00
720.0			9.689E+05			5.038E+00	
714.0	6.102E+00	2.209E+04		9.800E+05	2.482E-03		5.039E+00
708.0			9.910E+05			5.040E+00	
702.0	6.102E+00	2.208E+04		1.002E+06	2.538E-03		5.042E+00
696.0			1.013E+06			5.043E+00	
690.0	6.102E+00	2.208E+04		1.024E+06	2.594E-03		5.044E+00
684.0			1.035E+06			5.046E+00	
678.0	6.102E+00	2.208E+04		1.046E+06	2.650E-03		5.047E+00
672.0			1.057E+06			5.048E+00	
666.0	6.102E+00	2.208E+04		1.068E+06	2.706E-03		5.050E+00
660.0			1.079E+06			5.051E+00	
654.0	6.102E+00	2.208E+04		1.090E+06	2.762E-03		5.052E+00
648.0			1.101E+06			5.054E+00	
642.0	6.101E+00	2.208E+04		1.112E+06	2.818E-03		5.055E+00
636.0			1.124E+06			5.056E+00	
630.0	6.101E+00	2.208E+04		1.135E+06	2.873E-03		5.058E+00
624.0			1.146E+06			5.059E+00	
618.0	6.101E+00	2.208E+04		1.157E+06	2.929E-03		5.061E+00
612.0			1.168E+06			5.062E+00	
606.0	6.101E+00	2.208E+04		1.179E+06	2.985E-03		5.064E+00
600.0			1.190E+06			5.065E+00	
594.0	6.101E+00	2.208E+04		1.201E+06	3.041E-03		5.067E+00
588.0			1.212E+06			5.068E+00	
582.0	6.101E+00	2.208E+04		1.223E+06	3.097E-03		5.070E+00
576.0			1.234E+06			5.071E+00	
570.0	6.100E+00	2.208E+04		1.245E+06	3.153E-03		5.073E+00
564.0			1.256E+06			5.075E+00	
558.0	6.100E+00	2.208E+04		1.267E+06	3.209E-03		5.076E+00
552.0			1.278E+06			5.078E+00	
546.0	6.100E+00	2.208E+04		1.289E+06	3.265E-03		5.079E+00
540.0			1.300E+06			5.081E+00	
534.0	6.100E+00	2.208E+04		1.311E+06	3.321E-03		5.083E+00
528.0			1.322E+06			5.084E+00	
522.0	6.100E+00	2.208E+04		1.333E+06	3.377E-03		5.086E+00
516.0			1.344E+06			5.088E+00	
510.0	6.100E+00	2.207E+04		1.355E+06	3.433E-03		5.089E+00
504.0			1.366E+06			5.091E+00	
498.0	6.099E+00	2.207E+04		1.377E+06	3.489E-03		5.093E+00
492.0			1.388E+06			5.095E+00	
486.0	6.099E+00	2.207E+04		1.399E+06	3.544E-03		5.096E+00
480.0			1.411E+06			5.098E+00	
474.0	6.099E+00	2.207E+04		1.422E+06	3.600E-03		5.100E+00
468.0			1.433E+06			5.102E+00	
462.0	6.099E+00	2.207E+04		1.444E+06	3.656E-03		5.104E+00
456.0			1.455E+06			5.105E+00	
450.0	6.098E+00	2.207E+04		1.466E+06	3.712E-03		5.107E+00
444.0			1.477E+06			5.109E+00	
438.0	6.098E+00	2.207E+04		1.488E+06	3.768E-03		5.111E+00
432.0			1.499E+06			5.113E+00	
426.0	6.098E+00	2.207E+04		1.510E+06	3.824E-03		5.115E+00
420.0			1.521E+06			5.117E+00	
414.0	6.098E+00	2.207E+04		1.532E+06	3.880E-03		5.119E+00
408.0			1.543E+06			5.121E+00	
402.0	6.098E+00	2.207E+04		1.554E+06	3.936E-03		5.123E+00
396.0			1.565E+06			5.125E+00	
390.0	6.097E+00	2.207E+04		1.576E+06	3.992E-03		5.127E+00
384.0			1.587E+06			5.129E+00	
378.0	6.097E+00	2.207E+04		1.598E+06	4.048E-03		5.131E+00
372.0			1.609E+06			5.133E+00	
366.0	5.226E+00	1.891E+04		1.619E+06	4.099E-03		5.135E+00
360.0			1.628E+06			5.137E+00	
354.0	5.226E+00	1.891E+04		1.638E+06	4.147E-03		5.139E+00
348.0			1.647E+06			5.141E+00	
342.0	5.226E+00	1.891E+04		1.656E+06	4.195E-03		5.143E+00
336.0			1.666E+06			5.145E+00	
330.0	5.225E+00	1.891E+04		1.675E+06	4.243E-03		5.147E+00
324.0			1.685E+06			5.149E+00	
318.0	5.225E+00	1.891E+04		1.694E+06	4.291E-03		5.151E+00
312.0			1.704E+06			5.154E+00	
306.0	7.166E+00	2.594E+04		1.717E+06	4.348E-03		5.156E+00
300.0			1.730E+06			5.158E+00	
294.0	7.166E+00	2.594E+04		1.743E+06	4.413E-03		5.160E+00
288.0			1.756E+06			5.162E+00	
282.0	7.166E+00	2.594E+04		1.769E+06	4.479E-03		5.165E+00
276.0			1.782E+06			5.167E+00	
270.0	7.166E+00	2.594E+04		1.794E+06	4.545E-03		5.169E+00
264.0			1.807E+06			5.171E+00	
258.0	5.924E+00	2.144E+04		1.818E+06	4.605E-03		5.174E+00
252.0			1.829E+06			5.176E+00	
246.0	5.924E+00	2.144E+04		1.840E+06	4.659E-03		5.178E+00
240.0			1.850E+06			5.181E+00	
234.0	5.924E+00	2.144E+04		1.861E+06	4.713E-03		5.183E+00
228.0			1.872E+06			5.185E+00	
222.0	5.924E+00	2.144E+04		1.882E+06	4.768E-03		5.188E+00
216.0			1.893E+06			5.190E+00	
210.0	5.924E+00	2.144E+04		1.904E+06	4.822E-03		5.192E+00
204.0			1.915E+06			5.195E+00	
198.0	5.924E+00	2.144E+04		1.925E+06	4.876E-03		5.197E+00
192.0			1.936E+06			5.200E+00	
186.0	5.924E+00	2.144E+04		1.947E+06	4.931E-03		5.202E+00
180.0			1.958E+06			5.205E+00	
174.0	5.924E+00	2.144E+04		1.968E+06	4.985E-03		5.207E+00
168.0			1.979E+06			5.210E+00	
162.0	5.222E+00	1.890E+04		1.988E+06	5.036E-03		5.212E+00
156.0			1.998E+06			5.215E+00	
150.0	5.222E+00	1.890E+04		2.007E+06	5.084E-03		5.217E+00
144.0			2.017E+06			5.220E+00	
138.0	5.222E+00	1.890E+04		2.026E+06	5.132E-03		5.222E+00
132.0			2.036E+06			5.225E+00	
126.0	5.221E+00	1.890E+04		2.045E+06	5.180E-03		5.228E+00
120.0			2.055E+06			5.230E+00	
114.0	5.221E+00	1.890E+04		2.064E+06	5.227E-03		5.233E+00
108.0			2.073E+06			5.235E+00	
102.0	5.221E+00	1.890E+04		2.083E+06	5.275E-03		5.238E+00
96.0			2.092E+06			5.241E+00	
90.0	5.221E+00	1.889E+04		2.102E+06	5.323E-03		5.243E+00
84.0			2.111E+06			5.246E+00	
78.0	5.220E+00	1.889E+04		2.121E+06	5.371E-03		5.249E+00
72.0			2.130E+06			5.251E+00	
66.0	5.220E+00	1.889E+04		2.140E+06	5.419E-03		5.254E+00
60.0			2.149E+06			5.257E+00	
54.0	5.220E+00	1.889E+04		2.158E+06	5.467E-03		5.259E+00
48.0			2.168E+06			5.262E+00	
42.0	5.220E+00	1.889E+04		2.177E+06	5.515E-03		5.265E+00
36.0			2.187E+06			5.268E+00	
30.0	5.219E+00	1.889E+04		2.196E+06	5.562E-03		5.270E+00
24.0			2.206E+06			5.273E+00	
18.0	3.248E+00	1.176E+04		2.212E+06	5.601E-03		5.276E+00
12.0			2.217E+06			5.279E+00	
6.0	3.248E+00	1.176E+04		2.223E+06	5.631E-03		5.282E+00
0.0			2.229E+06			5.285E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
6.0000E+00	5.2997E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			5.300E+05			6.000E+00	
954.0	6.048E+00	2.189E+04		5.409E+05	1.370E-03		6.001E+00
948.0			5.519E+05			6.001E+00	
942.0	6.048E+00	2.189E+04		5.628E+05	1.425E-03		6.002E+00
936.0			5.737E+05			6.003E+00	
930.0	6.048E+00	2.189E+04		5.847E+05	1.481E-03		6.004E+00

924.0			5.956E+05			6.004E+00	
918.0	6.048E+00	2.189E+04		6.066E+05	1.536E-03		6.005E+00
912.0			6.175E+05			6.006E+00	
906.0	6.048E+00	2.189E+04		6.285E+05	1.592E-03		6.007E+00
900.0			6.394E+05			6.007E+00	
894.0	6.048E+00	2.189E+04		6.504E+05	1.647E-03		6.008E+00
888.0			6.613E+05			6.009E+00	
882.0	6.048E+00	2.189E+04		6.722E+05	1.703E-03		6.010E+00
876.0			6.832E+05			6.011E+00	
870.0	6.047E+00	2.189E+04		6.941E+05	1.758E-03		6.012E+00
864.0			7.051E+05			6.013E+00	
858.0	6.047E+00	2.189E+04		7.160E+05	1.813E-03		6.013E+00
852.0			7.270E+05			6.014E+00	
846.0	6.047E+00	2.189E+04		7.379E+05	1.869E-03		6.015E+00
840.0			7.488E+05			6.016E+00	
834.0	6.047E+00	2.189E+04		7.598E+05	1.924E-03		6.017E+00
828.0			7.707E+05			6.018E+00	
822.0	6.047E+00	2.189E+04		7.817E+05	1.980E-03		6.019E+00
816.0			7.926E+05			6.020E+00	
810.0	6.047E+00	2.188E+04		8.036E+05	2.035E-03		6.021E+00
804.0			8.145E+05			6.022E+00	
798.0	6.047E+00	2.188E+04		8.254E+05	2.091E-03		6.023E+00
792.0			8.364E+05			6.024E+00	
786.0	6.047E+00	2.188E+04		8.473E+05	2.146E-03		6.025E+00
780.0			8.583E+05			6.026E+00	
774.0	6.047E+00	2.188E+04		8.692E+05	2.201E-03		6.027E+00
768.0			8.802E+05			6.029E+00	
762.0	6.046E+00	2.188E+04		8.911E+05	2.257E-03		6.030E+00
756.0			9.020E+05			6.031E+00	
750.0	6.046E+00	2.188E+04		9.130E+05	2.312E-03		6.032E+00
744.0			9.239E+05			6.033E+00	
738.0	6.046E+00	2.188E+04		9.349E+05	2.368E-03		6.034E+00
732.0			9.458E+05			6.036E+00	
726.0	6.046E+00	2.188E+04		9.567E+05	2.423E-03		6.037E+00
720.0			9.677E+05			6.038E+00	
714.0	6.046E+00	2.188E+04		9.786E+05	2.479E-03		6.039E+00
708.0			9.896E+05			6.040E+00	
702.0	6.046E+00	2.188E+04		1.001E+06	2.534E-03		6.042E+00
696.0			1.011E+06			6.043E+00	
690.0	6.046E+00	2.188E+04		1.022E+06	2.589E-03		6.044E+00
684.0			1.033E+06			6.046E+00	
678.0	6.045E+00	2.188E+04		1.044E+06	2.645E-03		6.047E+00
672.0			1.055E+06			6.048E+00	
666.0	6.045E+00	2.188E+04		1.066E+06	2.700E-03		6.050E+00
660.0			1.077E+06			6.051E+00	
654.0	6.045E+00	2.188E+04		1.088E+06	2.756E-03		6.052E+00
648.0			1.099E+06			6.054E+00	
642.0	6.045E+00	2.188E+04		1.110E+06	2.811E-03		6.055E+00
636.0			1.121E+06			6.056E+00	
630.0	6.045E+00	2.188E+04		1.132E+06	2.866E-03		6.058E+00
624.0			1.143E+06			6.059E+00	
618.0	6.045E+00	2.188E+04		1.154E+06	2.922E-03		6.061E+00
612.0			1.165E+06			6.062E+00	
606.0	6.045E+00	2.188E+04		1.176E+06	2.977E-03		6.064E+00
600.0			1.186E+06			6.065E+00	
594.0	6.044E+00	2.188E+04		1.197E+06	3.033E-03		6.067E+00
588.0			1.208E+06			6.068E+00	
582.0	6.044E+00	2.187E+04		1.219E+06	3.088E-03		6.070E+00
576.0			1.230E+06			6.071E+00	
570.0	6.044E+00	2.187E+04		1.241E+06	3.143E-03		6.073E+00
564.0			1.252E+06			6.074E+00	
558.0	6.044E+00	2.187E+04		1.263E+06	3.199E-03		6.076E+00
552.0			1.274E+06			6.078E+00	
546.0	6.044E+00	2.187E+04		1.285E+06	3.254E-03		6.079E+00
540.0			1.296E+06			6.081E+00	
534.0	6.043E+00	2.187E+04		1.307E+06	3.310E-03		6.083E+00
528.0			1.318E+06			6.084E+00	
522.0	6.043E+00	2.187E+04		1.329E+06	3.365E-03		6.086E+00
516.0			1.340E+06			6.088E+00	
510.0	6.043E+00	2.187E+04		1.351E+06	3.420E-03		6.089E+00
504.0			1.361E+06			6.091E+00	
498.0	6.043E+00	2.187E+04		1.372E+06	3.476E-03		6.093E+00
492.0			1.383E+06			6.094E+00	
486.0	6.043E+00	2.187E+04		1.394E+06	3.531E-03		6.096E+00
480.0			1.405E+06			6.098E+00	
474.0	6.042E+00	2.187E+04		1.416E+06	3.587E-03		6.100E+00
468.0			1.427E+06			6.102E+00	
462.0	6.042E+00	2.187E+04		1.438E+06	3.642E-03		6.103E+00
456.0			1.449E+06			6.105E+00	
450.0	6.042E+00	2.187E+04		1.460E+06	3.697E-03		6.107E+00
444.0			1.471E+06			6.109E+00	
438.0	6.042E+00	2.187E+04		1.482E+06	3.753E-03		6.111E+00
432.0			1.493E+06			6.113E+00	
426.0	6.042E+00	2.187E+04		1.504E+06	3.808E-03		6.115E+00
420.0			1.515E+06			6.117E+00	
414.0	6.041E+00	2.186E+04		1.525E+06	3.863E-03		6.118E+00
408.0			1.536E+06			6.120E+00	
402.0	6.041E+00	2.186E+04		1.547E+06	3.919E-03		6.122E+00
396.0			1.558E+06			6.124E+00	
390.0	6.041E+00	2.186E+04		1.569E+06	3.974E-03		6.126E+00
384.0			1.580E+06			6.128E+00	
378.0	6.041E+00	2.186E+04		1.591E+06	4.030E-03		6.130E+00
372.0			1.602E+06			6.132E+00	
366.0	5.178E+00	1.874E+04		1.611E+06	4.081E-03		6.134E+00
360.0			1.621E+06			6.136E+00	
354.0	5.177E+00	1.874E+04		1.630E+06	4.128E-03		6.138E+00
348.0			1.639E+06			6.141E+00	
342.0	5.177E+00	1.874E+04		1.649E+06	4.176E-03		6.143E+00
336.0			1.658E+06			6.145E+00	
330.0	5.177E+00	1.874E+04		1.668E+06	4.223E-03		6.147E+00
324.0			1.677E+06			6.149E+00	
318.0	5.177E+00	1.874E+04		1.686E+06	4.271E-03		6.151E+00
312.0			1.696E+06			6.153E+00	
306.0	7.157E+00	2.590E+04		1.709E+06	4.327E-03		6.155E+00
300.0			1.722E+06			6.158E+00	
294.0	7.157E+00	2.590E+04		1.735E+06	4.393E-03		6.160E+00
288.0			1.747E+06			6.162E+00	
282.0	7.157E+00	2.590E+04		1.760E+06	4.459E-03		6.164E+00
276.0			1.773E+06			6.166E+00	
270.0	7.157E+00	2.590E+04		1.786E+06	4.524E-03		6.169E+00
264.0			1.799E+06			6.171E+00	
258.0	5.916E+00	2.141E+04		1.810E+06	4.584E-03		6.173E+00
252.0			1.821E+06			6.175E+00	
246.0	5.916E+00	2.141E+04		1.831E+06	4.638E-03		6.178E+00
240.0			1.842E+06			6.180E+00	
234.0	5.916E+00	2.141E+04		1.853E+06	4.693E-03		6.182E+00
228.0			1.864E+06			6.185E+00	
222.0	5.916E+00	2.141E+04		1.874E+06	4.747E-03		6.187E+00
216.0			1.885E+06			6.190E+00	
210.0	5.916E+00	2.141E+04		1.896E+06	4.801E-03		6.192E+00
204.0			1.906E+06			6.194E+00	
198.0	5.916E+00	2.141E+04		1.917E+06	4.855E-03		6.197E+00
192.0			1.928E+06			6.199E+00	
186.0	5.916E+00	2.141E+04		1.938E+06	4.909E-03		6.202E+00
180.0			1.949E+06			6.204E+00	
174.0	5.916E+00	2.141E+04		1.960E+06	4.964E-03		6.207E+00
168.0			1.971E+06			6.209E+00	
162.0	5.174E+00	1.872E+04		1.980E+06	5.015E-03		6.212E+00
156.0			1.989E+06			6.214E+00	
150.0	5.174E+00	1.872E+04		1.999E+06	5.062E-03		6.217E+00
144.0			2.008E+06			6.219E+00	
138.0	5.173E+00	1.872E+04		2.017E+06	5.109E-03		6.222E+00
132.0			2.027E+06			6.224E+00	
126.0	5.173E+00	1.872E+04		2.036E+06	5.157E-03		6.227E+00
120.0			2.045E+06			6.229E+00	
114.0	5.173E+00	1.872E+04		2.055E+06	5.204E-03		6.232E+00
108.0			2.064E+06			6.235E+00	
102.0	5.173E+00	1.872E+04		2.074E+06	5.252E-03		6.237E+00
96.0			2.083E+06			6.240E+00	
90.0	5.172E+00	1.872E+04		2.092E+06	5.299E-03		6.243E+00
84.0			2.102E+06			6.245E+00	
78.0	5.172E+00	1.872E+04		2.111E+06	5.346E-03		6.248E+00
72.0			2.120E+06			6.251E+00	
66.0	5.172E+00	1.872E+04		2.130E+06	5.394E-03		6.253E+00
60.0			2.139E+06			6.256E+00	
54.0	5.172E+00	1.872E+04		2.148E+06	5.441E-03		6.259E+00
48.0			2.158E+06			6.261E+00	
42.0	5.171E+00	1.872E+04		2.167E+06	5.489E-03		6.264E+00
36.0			2.176E+06			6.267E+00	
30.0	5.171E+00	1.871E+04		2.186E+06	5.536E-03		6.270E+00
24.0			2.195E+06			6.272E+00	
18.0	3.244E+00	1.174E+04		2.201E+06	5.575E-03		6.275E+00

12.0			2.207E+06			6.278E+00	
6.0	3.244E+00	1.174E+04		2.213E+06	5.604E-03		6.281E+00
0.0			2.219E+06			6.284E+00	

APPLIED TIP MOVEMENT IN.	TIP LOAD LBS
7.0000E+00	5.3254E+05

DEPTH IN.	LOAD TRANSFER PSI	LOAD INCR LBS	TOTAL LOAD LBS	AVG LOAD LBS	DEFORM OF INCR IN.	TOTAL MVMNT IN.	AVG MVMNT IN.
960.0			5.325E+05			7.000E+00	
954.0	5.992E+00	2.168E+04		5.434E+05	1.376E-03		7.001E+00
948.0			5.542E+05			7.001E+00	
942.0	5.992E+00	2.168E+04		5.651E+05	1.431E-03		7.002E+00
936.0			5.759E+05			7.003E+00	
930.0	5.992E+00	2.168E+04		5.867E+05	1.486E-03		7.004E+00
924.0			5.976E+05			7.004E+00	
918.0	5.991E+00	2.168E+04		6.084E+05	1.541E-03		7.005E+00
912.0			6.193E+05			7.006E+00	
906.0	5.991E+00	2.168E+04		6.301E+05	1.596E-03		7.007E+00
900.0			6.410E+05			7.007E+00	
894.0	5.991E+00	2.168E+04		6.518E+05	1.651E-03		7.008E+00
888.0			6.626E+05			7.009E+00	
882.0	5.991E+00	2.168E+04		6.735E+05	1.706E-03		7.010E+00
876.0			6.843E+05			7.011E+00	
870.0	5.991E+00	2.168E+04		6.952E+05	1.761E-03		7.012E+00
864.0			7.060E+05			7.013E+00	
858.0	5.991E+00	2.168E+04		7.168E+05	1.816E-03		7.013E+00
852.0			7.277E+05			7.014E+00	
846.0	5.991E+00	2.168E+04		7.385E+05	1.870E-03		7.015E+00
840.0			7.494E+05			7.016E+00	
834.0	5.991E+00	2.168E+04		7.602E+05	1.925E-03		7.017E+00
828.0			7.710E+05			7.018E+00	
822.0	5.991E+00	2.168E+04		7.819E+05	1.980E-03		7.019E+00
816.0			7.927E+05			7.020E+00	
810.0	5.991E+00	2.168E+04		8.036E+05	2.035E-03		7.021E+00
804.0			8.144E+05			7.022E+00	
798.0	5.990E+00	2.168E+04		8.252E+05	2.090E-03		7.023E+00
792.0			8.361E+05			7.024E+00	
786.0	5.990E+00	2.168E+04		8.469E+05	2.145E-03		7.025E+00
780.0			8.578E+05			7.026E+00	
774.0	5.990E+00	2.168E+04		8.686E+05	2.200E-03		7.028E+00
768.0			8.794E+05			7.029E+00	
762.0	5.990E+00	2.168E+04		8.903E+05	2.255E-03		7.030E+00
756.0			9.011E+05			7.031E+00	
750.0	5.990E+00	2.168E+04		9.120E+05	2.310E-03		7.032E+00
744.0			9.228E+05			7.033E+00	
738.0	5.990E+00	2.168E+04		9.336E+05	2.365E-03		7.034E+00
732.0			9.445E+05			7.036E+00	
726.0	5.990E+00	2.168E+04		9.553E+05	2.420E-03		7.037E+00
720.0			9.662E+05			7.038E+00	
714.0	5.989E+00	2.168E+04		9.770E+05	2.474E-03		7.039E+00
708.0			9.878E+05			7.040E+00	
702.0	5.989E+00	2.168E+04		9.987E+05	2.529E-03		7.042E+00
696.0			1.010E+06			7.043E+00	
690.0	5.989E+00	2.168E+04		1.020E+06	2.584E-03		7.044E+00
684.0			1.031E+06			7.046E+00	
678.0	5.989E+00	2.168E+04		1.042E+06	2.639E-03		7.047E+00
672.0			1.053E+06			7.048E+00	
666.0	5.989E+00	2.167E+04		1.064E+06	2.694E-03		7.050E+00
660.0			1.075E+06			7.051E+00	
654.0	5.989E+00	2.167E+04		1.085E+06	2.749E-03		7.052E+00
648.0			1.096E+06			7.054E+00	
642.0	5.989E+00	2.167E+04		1.107E+06	2.804E-03		7.055E+00
636.0			1.118E+06			7.056E+00	
630.0	5.988E+00	2.167E+04		1.129E+06	2.859E-03		7.058E+00
624.0			1.140E+06			7.059E+00	
618.0	5.988E+00	2.167E+04		1.150E+06	2.914E-03		7.061E+00
612.0			1.161E+06			7.062E+00	
606.0	5.988E+00	2.167E+04		1.172E+06	2.968E-03		7.064E+00
600.0			1.183E+06			7.065E+00	
594.0	5.988E+00	2.167E+04		1.194E+06	3.023E-03		7.067E+00
588.0			1.205E+06			7.068E+00	
582.0	5.988E+00	2.167E+04		1.215E+06	3.078E-03		7.070E+00
576.0			1.226E+06			7.071E+00	
570.0	5.988E+00	2.167E+04		1.237E+06	3.133E-03		7.073E+00
564.0			1.248E+06			7.074E+00	
558.0	5.987E+00	2.167E+04		1.259E+06	3.188E-03		7.076E+00
552.0			1.270E+06			7.078E+00	
546.0	5.987E+00	2.167E+04		1.280E+06	3.243E-03		7.079E+00
540.0			1.291E+06			7.081E+00	
534.0	5.987E+00	2.167E+04		1.302E+06	3.298E-03		7.082E+00
528.0			1.313E+06			7.084E+00	
522.0	5.987E+00	2.167E+04		1.324E+06	3.353E-03		7.086E+00
516.0			1.335E+06			7.087E+00	
510.0	5.987E+00	2.167E+04		1.345E+06	3.408E-03		7.089E+00
504.0			1.356E+06			7.091E+00	
498.0	5.986E+00	2.167E+04		1.367E+06	3.462E-03		7.093E+00
492.0			1.378E+06			7.094E+00	
486.0	5.986E+00	2.167E+04		1.389E+06	3.517E-03		7.096E+00
480.0			1.400E+06			7.098E+00	
474.0	5.986E+00	2.166E+04		1.410E+06	3.572E-03		7.100E+00
468.0			1.421E+06			7.101E+00	
462.0	5.986E+00	2.166E+04		1.432E+06	3.627E-03		7.103E+00
456.0			1.443E+06			7.105E+00	
450.0	5.986E+00	2.166E+04		1.454E+06	3.682E-03		7.107E+00
444.0			1.465E+06			7.109E+00	
438.0	5.985E+00	2.166E+04		1.475E+06	3.737E-03		7.111E+00
432.0			1.486E+06			7.112E+00	
426.0	5.985E+00	2.166E+04		1.497E+06	3.792E-03		7.114E+00
420.0			1.508E+06			7.116E+00	
414.0	5.985E+00	2.166E+04		1.519E+06	3.846E-03		7.118E+00
408.0			1.530E+06			7.120E+00	
402.0	5.985E+00	2.166E+04		1.540E+06	3.901E-03		7.122E+00
396.0			1.551E+06			7.124E+00	
390.0	5.985E+00	2.166E+04		1.562E+06	3.956E-03		7.126E+00
384.0			1.573E+06			7.128E+00	
378.0	5.984E+00	2.166E+04		1.584E+06	4.011E-03		7.130E+00
372.0			1.595E+06			7.132E+00	
366.0	5.129E+00	1.856E+04		1.604E+06	4.062E-03		7.134E+00
360.0			1.613E+06			7.136E+00	
354.0	5.129E+00	1.856E+04		1.622E+06	4.109E-03		7.138E+00
348.0			1.632E+06			7.140E+00	
342.0	5.129E+00	1.856E+04		1.641E+06	4.156E-03		7.142E+00
336.0			1.650E+06			7.144E+00	
330.0	5.129E+00	1.856E+04		1.660E+06	4.203E-03		7.146E+00
324.0			1.669E+06			7.149E+00	
318.0	5.128E+00	1.856E+04		1.678E+06	4.250E-03		7.151E+00
312.0			1.687E+06			7.153E+00	
306.0	7.148E+00	2.587E+04		1.700E+06	4.306E-03		7.155E+00
300.0			1.713E+06			7.157E+00	
294.0	7.148E+00	2.587E+04		1.726E+06	4.372E-03		7.159E+00
288.0			1.739E+06			7.161E+00	
282.0	7.148E+00	2.587E+04		1.752E+06	4.437E-03		7.164E+00
276.0			1.765E+06			7.166E+00	
270.0	7.148E+00	2.587E+04		1.778E+06	4.503E-03		7.168E+00
264.0			1.791E+06			7.170E+00	
258.0	5.909E+00	2.138E+04		1.802E+06	4.563E-03		7.173E+00
252.0			1.812E+06			7.175E+00	
246.0	5.909E+00	2.138E+04		1.823E+06	4.617E-03		7.177E+00
240.0			1.834E+06			7.180E+00	
234.0	5.909E+00	2.138E+04		1.844E+06	4.671E-03		7.182E+00
228.0			1.855E+06			7.184E+00	
222.0	5.909E+00	2.138E+04		1.866E+06	4.725E-03		7.187E+00
216.0			1.876E+06			7.189E+00	
210.0	5.909E+00	2.138E+04		1.887E+06	4.779E-03		7.191E+00
204.0			1.898E+06			7.194E+00	
198.0	5.908E+00	2.138E+04		1.908E+06	4.833E-03		7.196E+00
192.0			1.919E+06			7.199E+00	
186.0	5.908E+00	2.138E+04		1.930E+06	4.888E-03		7.201E+00
180.0			1.941E+06			7.203E+00	
174.0	5.908E+00	2.138E+04		1.951E+06	4.942E-03		7.206E+00
168.0			1.962E+06			7.208E+00	
162.0	5.126E+00	1.855E+04		1.971E+06	4.992E-03		7.211E+00
156.0			1.980E+06			7.213E+00	
150.0	5.125E+00	1.855E+04		1.990E+06	5.039E-03		7.216E+00
144.0			1.999E+06			7.218E+00	

138.0	5.125E+00	1.855E+04		2.008E+06	5.086E-03		7.221E+00
132.0			2.018E+06			7.224E+00	
126.0	5.125E+00	1.855E+04		2.027E+06	5.133E-03		7.226E+00
120.0			2.036E+06			7.229E+00	
114.0	5.125E+00	1.855E+04		2.045E+06	5.180E-03		7.231E+00
108.0			2.055E+06			7.234E+00	
102.0	5.124E+00	1.855E+04		2.064E+06	5.227E-03		7.236E+00
96.0			2.073E+06			7.239E+00	
90.0	5.124E+00	1.854E+04		2.082E+06	5.274E-03		7.242E+00
84.0			2.092E+06			7.244E+00	
78.0	5.124E+00	1.854E+04		2.101E+06	5.321E-03		7.247E+00
72.0			2.110E+06			7.250E+00	
66.0	5.124E+00	1.854E+04		2.120E+06	5.368E-03		7.252E+00
60.0			2.129E+06			7.255E+00	
54.0	5.123E+00	1.854E+04		2.138E+06	5.415E-03		7.258E+00
48.0			2.147E+06			7.260E+00	
42.0	5.123E+00	1.854E+04		2.157E+06	5.462E-03		7.263E+00
36.0			2.166E+06			7.266E+00	
30.0	5.123E+00	1.854E+04		2.175E+06	5.509E-03		7.269E+00
24.0			2.184E+06			7.271E+00	
18.0	3.240E+00	1.173E+04		2.190E+06	5.547E-03		7.274E+00
12.0			2.196E+06			7.277E+00	
6.0	3.240E+00	1.173E+04		2.202E+06	5.577E-03		7.280E+00
0.0			2.208E+06			7.283E+00	

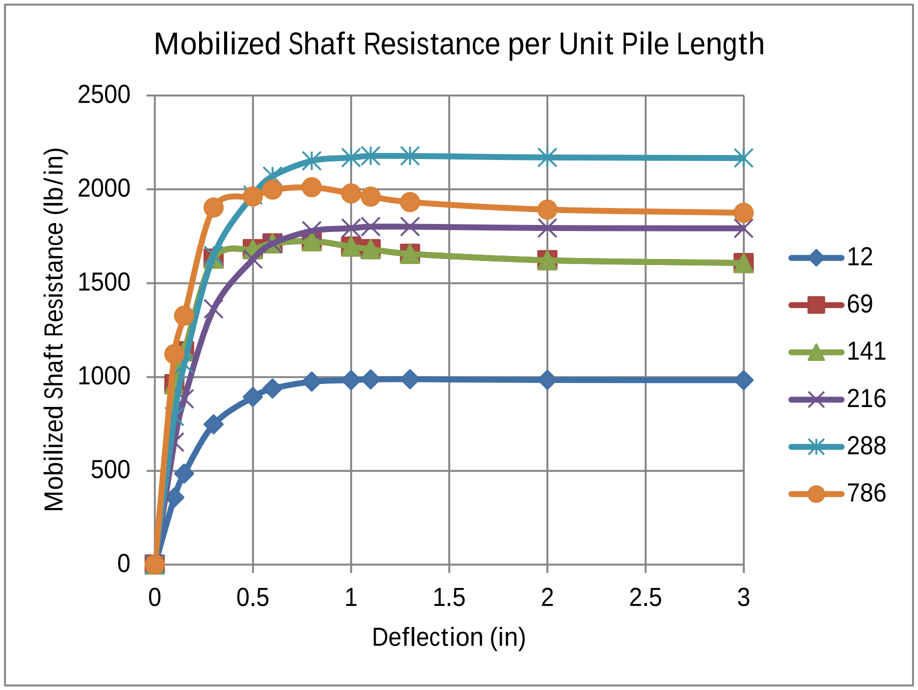
101 University POC - Bent 3 96-in CIDH, 80 ft

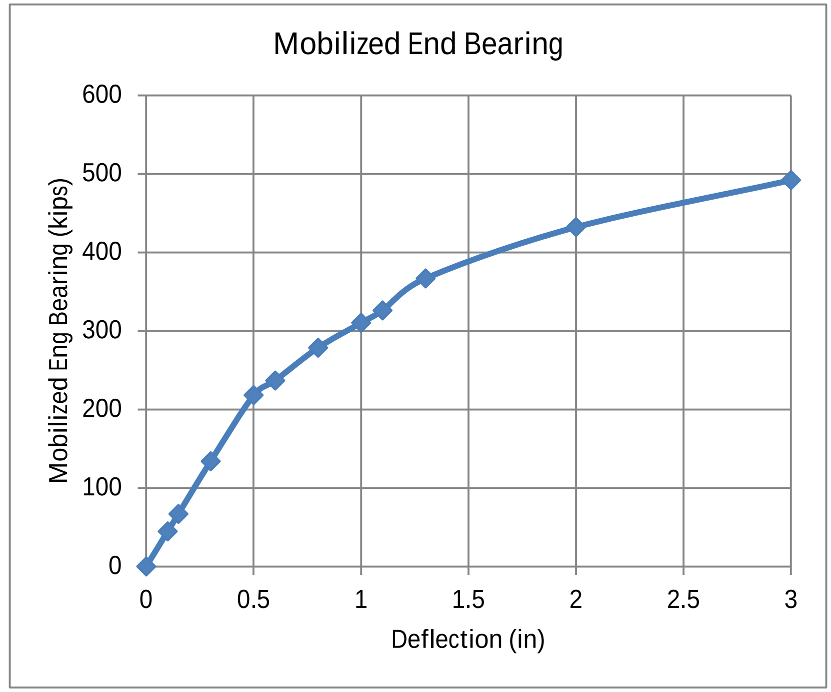
RESULTS DUE TO TIP MOVEMENTS

TOP LOAD LBS	TOP MOVEMENT IN.	TIP MOVEMENT IN.	TIP LOAD LBS
1.3925E+05	2.3550E-02	1.0000E-02	4.4673E+03
6.8882E+05	1.1765E-01	5.0000E-02	2.2337E+04
1.1580E+06	2.2099E-01	1.0000E-01	4.4673E+04
2.0208E+06	7.3354E-01	5.0000E-01	2.1816E+05
2.1115E+06	1.2523E+00	1.0000E+00	3.1034E+05
2.1353E+06	1.7613E+00	1.5000E+00	3.8560E+05
2.1745E+06	2.2699E+00	2.0000E+00	4.3226E+05
2.2208E+06	3.2805E+00	3.0000E+00	4.9197E+05
2.2330E+06	4.2841E+00	4.0000E+00	5.1753E+05
2.2292E+06	5.2845E+00	5.0000E+00	5.2714E+05
2.2187E+06	6.2836E+00	6.0000E+00	5.2997E+05
2.2079E+06	7.2825E+00	7.0000E+00	5.3254E+05

Mobilized Shaft Resistance and End Bearing
Bent 3
University Avenue Pedestrian Overcrossing
East Palo Alto, California

Layer Depth Interval		Mid-depth	Deflection (in)											
From	To		0	0.1	0.15	0.3	0.5	0.6	0.8	1	1.1	1.3	2	3
0	24	12	0	358	485	747	893	938	975	983	987	988	984	983
24	114	69	0	961	1137	1631	1681	1712	1724	1695	1681	1656	1622	1607
114	168	141	0	961	1137	1631	1681	1712	1724	1695	1681	1656	1622	1607
168	264	216	0	653	884	1363	1628	1711	1779	1793	1801	1801	1794	1792
264	312	288	0	789	1069	1648	1969	2070	2152	2169	2178	2178	2170	2167
312	372	342	0	961	1137	1631	1681	1712	1724	1695	1681	1656	1622	1607
372	1200	786	0	1122	1326	1903	1962	1998	2011	1978	1961	1932	1892	1875
Mobilized End Bearing (kips)			0	45	67	134	218	237	279	310	326	367	432	492





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

                     LPile for Windows, Version 2019-11.008

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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================================================================================

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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Users\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent2_Stability1.lp11d

Name of output report file:
University_Bent2_Stability1.lp11o

Name of plot output file:
University_Bent2_Stability1.lp11p

Name of runtime message file:
University_Bent2_Stability1.lp11r


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

               Date:  October 16, 2021           Time:  17:32:03


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 2 Stability1
Job Number:
Client:
Engineer:
Description:


--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
```

- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- 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
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile 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	=	2
Total length of pile	=	86.360 ft
Depth of ground surface below top of pile	=	21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	26.360	66.0000
3	26.360	90.0000
4	86.360	90.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	26.360000 ft
Width of top of section	=	66.000000 in
Width of bottom of section	=	66.000000 in
Top Area	=	3421. sq. in
Bottom Area	=	3421. sq. in
Moment of Inertia at Top	=	268020. in^4
Moment of Inertia at Bottom	=	274567. in^4
Elastic Modulus	=	4887733. psi

Pile Section No. 2:

Section 2 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	60.000000 ft
Width of top of section	=	90.000000 in
Width of bottom of section	=	90.000000 in
Top Area	=	6362. sq. in
Bottom Area	=	6362. sq. in
Moment of Inertia at Top	=	3220623. in^4
Moment of Inertia at Bottom	=	3220623. in^4
Elastic Modulus	=	4371722. psi

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 6 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer          =    21.360000 ft
   Distance from top of pile to bottom of layer       =    27.860000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer          =    27.860000 ft
   Distance from top of pile to bottom of layer       =    32.360000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


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

   Distance from top of pile to top of layer          =    32.360000 ft
   Distance from top of pile to bottom of layer       =    40.360000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Friction angle at top of layer                     =    30.000000 deg.
   Friction angle at bottom of layer                  =    30.000000 deg.
   Subgrade k at top of layer                         =    60.000000 pci
   Subgrade k at bottom of layer                      =    60.000000 pci


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

   Distance from top of pile to top of layer          =    40.360000 ft
   Distance from top of pile to bottom of layer       =    44.360000 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                     =    36.000000 deg.
   Friction angle at bottom of layer                  =    36.000000 deg.
   Subgrade k at top of layer                         =   125.000000 pci
   Subgrade k at bottom of layer                      =   125.000000 pci


Layer 5 is stiff clay without free water

   Distance from top of pile to top of layer          =    44.360000 ft
   Distance from top of pile to bottom of layer       =    49.360000 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                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer          =    49.360000 ft
   Distance from top of pile to bottom of layer       =   200.000000 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                 =        1800. psf
   Undrained cohesion at bottom of layer              =        1800. psf
```

Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 113.640 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 875000.0 lbs
Applied moment at pile head = -137424000.0 in-lbs
Axial thrust load on pile head = 673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	12.1589	-1.37E+08	875000.	-0.01570	17117.	1.31E+12	0.00	0.00	0.00
1.2337	11.9150	-1.24E+08	875000.	-0.01718	15485.	1.31E+12	0.00	0.00	0.00
2.4674	11.6503	-1.11E+08	875000.	-0.01851	13854.	1.31E+12	0.00	0.00	0.00
3.7011	11.3671	-9.80E+07	875000.	-0.01968	12226.	1.31E+12	0.00	0.00	0.00
4.9349	11.0675	-8.49E+07	875000.	-0.02071	10600.	1.32E+12	0.00	0.00	0.00
6.1686	10.7538	-7.17E+07	875000.	-0.02159	8976.	1.32E+12	0.00	0.00	0.00
7.4023	10.4281	-5.85E+07	875000.	-0.02233	7355.	1.32E+12	0.00	0.00	0.00
8.6360	10.0927	-4.54E+07	875000.	-0.02291	5737.	1.32E+12	0.00	0.00	0.00
9.8697	9.7498	-3.22E+07	875000.	-0.02334	4122.	1.32E+12	0.00	0.00	0.00
11.1034	9.4016	-1.90E+07	875000.	-0.02363	2510.	1.32E+12	0.00	0.00	0.00
12.3371	9.0502	-5791847.	875000.	-0.02377	901.8148	1.32E+12	0.00	0.00	0.00
13.5709	8.6979	7399281.	875000.	-0.02376	1096.	1.33E+12	0.00	0.00	0.00
14.8046	8.3467	2.06E+07	875000.	-0.02360	2698.	1.33E+12	0.00	0.00	0.00
16.0383	7.9990	3.38E+07	875000.	-0.02330	4295.	1.33E+12	0.00	0.00	0.00
17.2720	7.6569	4.70E+07	875000.	-0.02285	5888.	1.33E+12	0.00	0.00	0.00
18.5057	7.3224	6.01E+07	875000.	-0.02225	7477.	1.33E+12	0.00	0.00	0.00
19.7394	6.9979	7.33E+07	875000.	-0.02151	9062.	1.33E+12	0.00	0.00	0.00
20.9731	6.6854	8.65E+07	875000.	-0.02063	10642.	1.34E+12	0.00	0.00	0.00
22.2069	6.3871	9.96E+07	862729.	-0.01960	12217.	1.34E+12	-1658.	3842.	0.00
23.4406	6.1052	1.12E+08	837512.	-0.01842	13744.	1.34E+12	-1749.	4241.	0.00
24.6743	5.8416	1.25E+08	810956.	-0.01711	15219.	1.34E+12	-1839.	4659.	0.00
25.9080	5.5985	1.37E+08	783085.	-0.01567	16641.	1.34E+12	-1927.	5095.	0.00

27.1417	5.3777	1.48E+08	750674.	-0.01484	2178.	1.41E+13	-2452.	6750.	0.00
28.3754	5.1592	1.59E+08	714550.	-0.01467	2331.	1.41E+13	-2428.	6968.	0.00
29.6091	4.9432	1.70E+08	678164.	-0.01450	2478.	1.41E+13	-2487.	7449.	0.00
30.8429	4.7299	1.80E+08	640930.	-0.01432	2616.	1.41E+13	-2543.	7959.	0.00
32.0766	4.5193	1.89E+08	602897.	-0.01412	2747.	1.41E+13	-2595.	8502.	0.00
33.3103	4.3117	1.98E+08	583686.	-0.01392	2869.	1.41E+13	0.00	0.00	0.00
34.5440	4.1072	2.07E+08	583686.	-0.01371	2992.	1.41E+13	0.00	0.00	0.00
35.7777	3.9058	2.15E+08	583686.	-0.01349	3115.	1.41E+13	0.00	0.00	0.00
37.0114	3.7079	2.24E+08	583686.	-0.01325	3237.	1.41E+13	0.00	0.00	0.00
38.2451	3.5134	2.33E+08	583686.	-0.01301	3360.	1.41E+13	0.00	0.00	0.00
39.4789	3.3225	2.42E+08	583686.	-0.01276	3482.	1.41E+13	0.00	0.00	0.00
40.7126	3.1354	2.50E+08	497219.	-0.01251	3605.	1.41E+13	-11681.	55155.	0.00
41.9463	2.9522	2.57E+08	322876.	-0.01224	3692.	1.41E+13	-11871.	59532.	0.00
43.1800	2.7730	2.60E+08	146091.	-0.01197	3742.	1.41E+13	-12011.	64124.	0.00
44.4137	2.5979	2.61E+08	30589.	-0.01169	3755.	1.41E+13	-3593.	20474.	0.00
45.6474	2.4268	2.61E+08	-22651.	-0.01142	3758.	1.41E+13	-3600.	21959.	0.00
46.8811	2.2598	2.61E+08	-75964.	-0.01114	3749.	1.41E+13	-3603.	23602.	0.00
48.1149	2.0968	2.59E+08	-129292.	-0.01087	3729.	1.41E+13	-3601.	25428.	0.00
49.3486	1.9379	2.57E+08	-182567.	-0.01060	3699.	1.41E+13	-3596.	27469.	0.00
50.5823	1.7830	2.54E+08	-240496.	-0.01033	3657.	1.41E+13	-4230.	35124.	0.00
51.8160	1.6320	2.50E+08	-303001.	-0.01007	3602.	1.41E+13	-4214.	38227.	0.00
53.0497	1.4849	2.45E+08	-365212.	-0.00980	3534.	1.41E+13	-4190.	41778.	0.00
54.2834	1.3417	2.40E+08	-427013.	-0.00955	3454.	1.41E+13	-4158.	45885.	0.00
55.5171	1.2022	2.33E+08	-488268.	-0.00930	3360.	1.41E+13	-4117.	50697.	0.00
56.7509	1.0663	2.25E+08	-548825.	-0.00906	3254.	1.41E+13	-4064.	56427.	0.00
57.9846	0.9339	2.17E+08	-608506.	-0.00883	3136.	1.41E+13	-3998.	63383.	0.00
59.2183	0.8049	2.07E+08	-667096.	-0.00860	3005.	1.41E+13	-3917.	72042.	0.00
60.4520	0.6791	1.97E+08	-724333.	-0.00839	2862.	1.41E+13	-3816.	83178.	0.00
61.6857	0.5564	1.86E+08	-779882.	-0.00819	2708.	1.41E+13	-3689.	98149.	0.00
62.9194	0.4366	1.74E+08	-833296.	-0.00800	2542.	1.41E+13	-3527.	119598.	0.00
64.1531	0.3195	1.62E+08	-883931.	-0.00782	2365.	1.41E+13	-3313.	153526.	0.00
65.3869	0.2049	1.48E+08	-930745.	-0.00766	2178.	1.41E+13	-3011.	217513.	0.00
66.6206	0.09267	1.34E+08	-971587.	-0.00751	1982.	1.41E+13	-2507.	400456.	0.00
67.8543	-0.01751	1.20E+08	-977723.	-0.00738	1778.	1.41E+13	1678.	1418269.	0.00
69.0880	-0.1258	1.05E+08	-944675.	-0.00726	1580.	1.41E+13	2787.	327910.	0.00
70.3217	-0.2325	9.19E+07	-899643.	-0.00716	1390.	1.41E+13	3297.	209913.	0.00
71.5554	-0.3377	7.90E+07	-848068.	-0.00707	1210.	1.41E+13	3671.	160917.	0.00
72.7891	-0.4417	6.69E+07	-791422.	-0.00699	1041.	1.41E+13	3981.	133430.	0.00
74.0229	-0.5447	5.57E+07	-730691.	-0.00693	884.1202	1.41E+13	4223.	114775.	0.00
75.2566	-0.6468	4.54E+07	-666800.	-0.00687	740.3987	1.41E+13	4408.	100899.	0.00
76.4903	-0.7482	3.61E+07	-600326.	-0.00683	610.1707	1.41E+13	4572.	90460.	0.00
77.7240	-0.8490	2.78E+07	-531556.	-0.00680	493.9381	1.41E+13	4719.	82276.	0.00
78.9577	-0.9495	2.05E+07	-460710.	-0.00677	392.1517	1.41E+13	4852.	75661.	0.00
80.1914	-1.0495	1.43E+07	-387963.	-0.00675	305.2220	1.41E+13	4975.	70182.	0.00
81.4251	-1.1494	9142104.	-313458.	-0.00674	233.5269	1.41E+13	5090.	65558.	0.00
82.6589	-1.2491	5126381.	-237314.	-0.00673	177.4174	1.41E+13	5197.	61592.	0.00
83.8926	-1.3487	2249596.	-159634.	-0.00673	137.2217	1.41E+13	5297.	58147.	0.00
85.1263	-1.4483	533840.	-80504.	-0.00673	113.2484	1.41E+13	5393.	55121.	0.00
86.3600	-1.5479	0.00	0.00	-0.00673	105.7893	1.41E+13	5483.	26220.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =    12.15890775 inches
Computed slope at pile head      =    -0.01569723 radians
Maximum bending moment           =     261371102. inch-lbs
Maximum shear force              =        -977723. lbs
Depth of maximum bending moment  =    45.64742857 feet below pile head
Depth of maximum shear force     =    67.85428571 feet below pile head
Number of iterations             =             44
Number of zero deflection points =              1
```

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	Pile-head Load 1	Load Type 2	Pile-head 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  V, lb    875000.  M, in-lb   -1.37E+08    673000.    12.1589   -0.01570   -977723.   2.61E+08

Maximum pile-head deflection = 12.1589077490 inches
Maximum pile-head rotation   = -0.0156972321 radians = -0.899385 deg.

The analysis ended normally.
```

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

                     LPile for Windows, Version 2019-11.008

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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===============================================================================

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-------------------------------------------------------------------------------
                             Files Used for Analysis
-------------------------------------------------------------------------------

Path to file locations:
\Users\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent2_Stability2.lp11d

Name of output report file:
University_Bent2_Stability2.lp11o

Name of plot output file:
University_Bent2_Stability2.lp11p

Name of runtime message file:
University_Bent2_Stability2.lp11r


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

               Date:  October 16, 2021           Time:  17:31:28


-------------------------------------------------------------------------------
                                  Problem Title
-------------------------------------------------------------------------------

University Ave POC - Bent 2 Stability2
Job Number:
Client:
Engineer:
Description:


-------------------------------------------------------------------------------
                          Program Options and Settings
-------------------------------------------------------------------------------
```

```
Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =            2
Total length of pile                                   =       96.360 ft
Depth of ground surface below top of pile              =      21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below           Pile
Point        Pile Head          Diameter
 No.           feet              inches
-----      -------------     -------------
  1            0.000           66.0000
  2           26.360           66.0000
  3           26.360           90.0000
  4           96.360           90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    26.360000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      268020. in^4
   Moment of Inertia at Bottom                         =      274567. in^4
   Elastic Modulus                                     =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    70.000000 ft
   Width of top of section                             =    90.000000 in
   Width of bottom of section                          =    90.000000 in
```

```
   Top Area                                             =        6362. sq. in
   Bottom Area                                          =        6362. sq. in
   Moment of Inertia at Top                             =     3220623. in^4
   Moment of Inertia at Bottom                          =     3220623. in^4
   Elastic Modulus                                      =     4371722. psi



--------------------------------------------------------------------------------
                      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 6 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer            =    21.360000 ft
   Distance from top of pile to bottom of layer         =    27.860000 ft
   Effective unit weight at top of layer                =   120.000000 pcf
   Effective unit weight at bottom of layer             =   120.000000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer            =    27.860000 ft
   Distance from top of pile to bottom of layer         =    32.360000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


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

   Distance from top of pile to top of layer            =    32.360000 ft
   Distance from top of pile to bottom of layer         =    40.360000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Friction angle at top of layer                       =    30.000000 deg.
   Friction angle at bottom of layer                    =    30.000000 deg.
   Subgrade k at top of layer                           =    60.000000 pci
   Subgrade k at bottom of layer                        =    60.000000 pci


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

   Distance from top of pile to top of layer            =    40.360000 ft
   Distance from top of pile to bottom of layer         =    44.360000 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                       =    36.000000 deg.
   Friction angle at bottom of layer                    =    36.000000 deg.
   Subgrade k at top of layer                           =   125.000000 pci
   Subgrade k at bottom of layer                        =   125.000000 pci


Layer 5 is stiff clay without free water

   Distance from top of pile to top of layer            =    44.360000 ft
   Distance from top of pile to bottom of layer         =    49.360000 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                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
```

Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer	=	49.360000 ft
Distance from top of pile to bottom of layer	=	200.000000 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	=	1800. psf
Undrained cohesion at bottom of layer	=	1800. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

(Depth of the lowest soil layer extends 103.640 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Layer Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 875000.0 lbs
Applied moment at pile head = -137424000.0 in-lbs
Axial thrust load on pile head = 673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	8.9618	-1.37E+08	875000.	-0.01185	17117.	1.31E+12	0.00	0.00	0.00
1.3766	8.7517	-1.23E+08	875000.	-0.01349	15301.	1.31E+12	0.00	0.00	0.00
2.7531	8.5161	-1.08E+08	875000.	-0.01494	13487.	1.31E+12	0.00	0.00	0.00
4.1297	8.2580	-9.36E+07	875000.	-0.01621	11676.	1.31E+12	0.00	0.00	0.00
5.5063	7.9805	-7.89E+07	875000.	-0.01730	9868.	1.32E+12	0.00	0.00	0.00
6.8829	7.6866	-6.43E+07	875000.	-0.01819	8063.	1.32E+12	0.00	0.00	0.00
8.2594	7.3794	-4.96E+07	875000.	-0.01891	6262.	1.32E+12	0.00	0.00	0.00
9.6360	7.0619	-3.50E+07	875000.	-0.01944	4464.	1.32E+12	0.00	0.00	0.00
11.0126	6.7372	-2.03E+07	875000.	-0.01978	2670.	1.32E+12	0.00	0.00	0.00
12.3891	6.4083	-5619548.	875000.	-0.01994	880.8066	1.32E+12	0.00	0.00	0.00

13.7657	6.0783	9056558.	875000.	-0.01992	1298.	1.33E+12	0.00	0.00	0.00
15.1423	5.7502	2.37E+07	875000.	-0.01972	3078.	1.33E+12	0.00	0.00	0.00
16.5189	5.4269	3.84E+07	875000.	-0.01933	4854.	1.33E+12	0.00	0.00	0.00
17.8954	5.1115	5.31E+07	875000.	-0.01876	6625.	1.33E+12	0.00	0.00	0.00
19.2720	4.8069	6.77E+07	875000.	-0.01802	8390.	1.33E+12	0.00	0.00	0.00
20.6486	4.5163	8.24E+07	875000.	-0.01709	10149.	1.34E+12	0.00	0.00	0.00
22.0251	4.2424	9.70E+07	862762.	-0.01598	11903.	1.34E+12	-1482.	5770.	0.00
23.4017	3.9884	1.11E+08	837562.	-0.01469	13602.	1.34E+12	-1569.	6500.	0.00
24.7783	3.7570	1.25E+08	810934.	-0.01323	15244.	1.34E+12	-1655.	7275.	0.00
26.1549	3.5511	1.38E+08	782908.	-0.01161	16825.	1.34E+12	-1739.	8087.	0.00
27.5314	3.3734	1.51E+08	750258.	-0.01067	2218.	1.41E+13	-2214.	10844.	0.00
28.9080	3.1985	1.63E+08	713898.	-0.01049	2388.	1.41E+13	-2188.	11298.	0.00
30.2846	3.0269	1.75E+08	677321.	-0.01029	2550.	1.41E+13	-2241.	12229.	0.00
31.6611	2.8586	1.86E+08	639898.	-0.01008	2704.	1.41E+13	-2290.	13234.	0.00
33.0377	2.6939	1.96E+08	620982.	-0.00985	2849.	1.41E+13	0.00	0.00	0.00
34.4143	2.5331	2.07E+08	620982.	-0.00962	2994.	1.41E+13	0.00	0.00	0.00
35.7909	2.3762	2.17E+08	620982.	-0.00937	3139.	1.41E+13	0.00	0.00	0.00
37.1674	2.2235	2.27E+08	620982.	-0.00911	3283.	1.41E+13	0.00	0.00	0.00
38.5440	2.0753	2.38E+08	620982.	-0.00884	3428.	1.41E+13	0.00	0.00	0.00
39.9206	1.9316	2.48E+08	620982.	-0.00855	3573.	1.41E+13	0.00	0.00	0.00
41.2971	1.7928	2.58E+08	543992.	-0.00825	3717.	1.41E+13	-9322.	85888.	0.00
42.6737	1.6590	2.66E+08	389000.	-0.00795	3826.	1.41E+13	-9444.	94035.	0.00
44.0503	1.5303	2.72E+08	231735.	-0.00763	3899.	1.41E+13	-9597.	103591.	0.00
45.4269	1.4069	2.74E+08	126616.	-0.00731	3936.	1.41E+13	-3130.	36755.	0.00
46.8034	1.2888	2.76E+08	74932.	-0.00699	3960.	1.41E+13	-3127.	40081.	0.00
48.1800	1.1761	2.77E+08	23336.	-0.00666	3972.	1.41E+13	-3120.	43819.	0.00
49.5566	1.0687	2.77E+08	-32701.	-0.00634	3973.	1.41E+13	-3665.	56647.	0.00
50.9331	0.9667	2.76E+08	-93109.	-0.00601	3959.	1.41E+13	-3649.	62352.	0.00
52.3097	0.8700	2.74E+08	-153202.	-0.00569	3932.	1.41E+13	-3627.	68864.	0.00
53.6863	0.7787	2.71E+08	-212882.	-0.00537	3890.	1.41E+13	-3599.	76345.	0.00
55.0629	0.6925	2.67E+08	-272040.	-0.00506	3835.	1.41E+13	-3564.	85006.	0.00
56.4394	0.6116	2.62E+08	-330562.	-0.00475	3766.	1.41E+13	-3522.	95119.	0.00
57.8160	0.5357	2.56E+08	-388324.	-0.00444	3684.	1.41E+13	-3472.	107049.	0.00
59.1926	0.4648	2.49E+08	-445190.	-0.00415	3589.	1.41E+13	-3413.	121299.	0.00
60.5691	0.3988	2.41E+08	-501011.	-0.00386	3480.	1.41E+13	-3345.	138575.	0.00
61.9457	0.3374	2.33E+08	-555616.	-0.00358	3358.	1.41E+13	-3266.	159916.	0.00
63.3223	0.2805	2.23E+08	-608806.	-0.00331	3224.	1.41E+13	-3174.	186919.	0.00
64.6989	0.2279	2.13E+08	-660343.	-0.00306	3078.	1.41E+13	-3066.	222188.	0.00
66.0754	0.1795	2.01E+08	-709929.	-0.00281	2921.	1.41E+13	-2938.	270324.	0.00
67.4520	0.1350	1.89E+08	-757166.	-0.00258	2752.	1.41E+13	-2782.	340395.	0.00
68.8286	0.09413	1.76E+08	-801482.	-0.00237	2572.	1.41E+13	-2584.	453451.	0.00
70.2051	0.05670	1.63E+08	-841931.	-0.00217	2382.	1.41E+13	-2313.	674032.	0.00
71.5817	0.02242	1.49E+08	-876433.	-0.00199	2184.	1.41E+13	-1864.	1373366.	0.00
72.9583	-0.00898	1.34E+08	-879387.	-0.00182	1978.	1.41E+13	1506.	2771816.	0.00
74.3349	-0.03777	1.20E+08	-849049.	-0.00167	1779.	1.41E+13	2167.	947720.	0.00
75.7114	-0.06425	1.06E+08	-810709.	-0.00154	1587.	1.41E+13	2475.	636297.	0.00
77.0880	-0.08867	9.30E+07	-768113.	-0.00142	1405.	1.41E+13	2682.	499715.	0.00
78.4646	-0.1113	8.07E+07	-722507.	-0.00132	1233.	1.41E+13	2839.	421417.	0.00
79.8411	-0.1323	6.91E+07	-674569.	-0.00123	1072.	1.41E+13	2965.	370058.	0.00
81.2177	-0.1521	5.84E+07	-624727.	-0.00116	921.8214	1.41E+13	3070.	333453.	0.00
82.5943	-0.1707	4.85E+07	-573278.	-0.00110	783.6555	1.41E+13	3159.	305827.	0.00
83.9709	-0.1883	3.95E+07	-520438.	-0.00105	657.5268	1.41E+13	3238.	284071.	0.00
85.3474	-0.2052	3.13E+07	-466368.	-0.00100	543.7368	1.41E+13	3308.	266356.	0.00
86.7240	-0.2215	2.41E+07	-411191.	-9.71E-04	442.5549	1.41E+13	3372.	251538.	0.00
88.1006	-0.2373	1.78E+07	-355004.	-9.46E-04	354.2253	1.41E+13	3431.	238863.	0.00
89.4771	-0.2527	1.24E+07	-297881.	-9.29E-04	278.9728	1.41E+13	3485.	227817.	0.00
90.8537	-0.2679	7959742.	-239884.	-9.17E-04	217.0064	1.41E+13	3537.	218040.	0.00
92.2303	-0.2830	4489789.	-181061.	-9.09E-04	168.5227	1.41E+13	3585.	209275.	0.00
93.6069	-0.2980	1998113.	-121451.	-9.06E-04	133.7079	1.41E+13	3632.	201334.	0.00
94.9834	-0.3129	497445.	-61088.	-9.04E-04	112.7399	1.41E+13	3677.	194081.	0.00
96.3600	-0.3279	0.00	0.00	-9.04E-04	105.7893	1.41E+13	3720.	93707.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

Pile-head deflection = 8.96176531 inches
Computed slope at pile head = -0.01184885 radians
Maximum bending moment = 276768180. inch-lbs
Maximum shear force = -879387. lbs
Depth of maximum bending moment = 49.55657143 feet below pile head
Depth of maximum shear force = 72.95828571 feet below pile head
Number of iterations = 44
Number of zero deflection points = 1

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 Load                Load                    Axial    Pile-head  Pile-head  Max Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs      in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
  1  V, lb    875000.  M, in-lb   -1.37E+08    673000.     8.9618   -0.01185   -879387.   2.77E+08


Maximum pile-head deflection = 8.9617653069 inches
Maximum pile-head rotation   = -0.0118488489 radians = -0.678889 deg.

The analysis ended normally.


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

                     LPile for Windows, Version 2019-11.008

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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================================================================================

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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Users\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent2_Stability3.lp11d

Name of output report file:
University_Bent2_Stability3.lp11o

Name of plot output file:
University_Bent2_Stability3.lp11p

Name of runtime message file:
University_Bent2_Stability3.lp11r



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

               Date:  October 16, 2021           Time:  17:31:46



--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 2 Stability3
Job Number:
Client:
```

```
Engineer:
Description:


--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =            2
Total length of pile                                   =      106.360 ft
Depth of ground surface below top of pile              =      21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000          66.0000
  2           26.360          66.0000
  3           26.360          90.0000
  4          106.360          90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    26.360000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      268020. in^4
   Moment of Inertia at Bottom                         =      274567. in^4
```

```
   Elastic Modulus                                          =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                                    =   Circular Pile
   Length of section                                        =    80.000000 ft
   Width of top of section                                  =    90.000000 in
   Width of bottom of section                               =    90.000000 in
   Top Area                                                 =        6362. sq. in
   Bottom Area                                              =        6362. sq. in
   Moment of Inertia at Top                                 =     3220623. in^4
   Moment of Inertia at Bottom                              =     3220623. in^4
   Elastic Modulus                                          =     4371722. psi



--------------------------------------------------------------------------------
                       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 6 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer                =    21.360000 ft
   Distance from top of pile to bottom of layer             =    27.860000 ft
   Effective unit weight at top of layer                    =   120.000000 pcf
   Effective unit weight at bottom of layer                 =   120.000000 pcf
   Undrained cohesion at top of layer                       =        1500. psf
   Undrained cohesion at bottom of layer                    =        1500. psf
   Epsilon-50 at top of layer                               =     0.007000
   Epsilon-50 at bottom of layer                            =     0.007000


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer                =    27.860000 ft
   Distance from top of pile to bottom of layer             =    32.360000 ft
   Effective unit weight at top of layer                    =    57.600000 pcf
   Effective unit weight at bottom of layer                 =    57.600000 pcf
   Undrained cohesion at top of layer                       =        1500. psf
   Undrained cohesion at bottom of layer                    =        1500. psf
   Epsilon-50 at top of layer                               =     0.007000
   Epsilon-50 at bottom of layer                            =     0.007000


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

   Distance from top of pile to top of layer                =    32.360000 ft
   Distance from top of pile to bottom of layer             =    40.360000 ft
   Effective unit weight at top of layer                    =    57.600000 pcf
   Effective unit weight at bottom of layer                 =    57.600000 pcf
   Friction angle at top of layer                           =    30.000000 deg.
   Friction angle at bottom of layer                        =    30.000000 deg.
   Subgrade k at top of layer                               =    60.000000 pci
   Subgrade k at bottom of layer                            =    60.000000 pci


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

   Distance from top of pile to top of layer                =    40.360000 ft
   Distance from top of pile to bottom of layer             =    44.360000 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                           =    36.000000 deg.
   Friction angle at bottom of layer                        =    36.000000 deg.
   Subgrade k at top of layer                               =   125.000000 pci
   Subgrade k at bottom of layer                            =   125.000000 pci
```

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer	=	44.360000 ft
Distance from top of pile to bottom of layer	=	49.360000 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	=	1500. psf
Undrained cohesion at bottom of layer	=	1500. psf
Epsilon-50 at top of layer	=	0.007000
Epsilon-50 at bottom of layer	=	0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer	=	49.360000 ft
Distance from top of pile to bottom of layer	=	200.000000 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	=	1800. psf
Undrained cohesion at bottom of layer	=	1800. psf
Epsilon-50 at top of layer	=	0.005000
Epsilon-50 at bottom of layer	=	0.005000

(Depth of the lowest soil layer extends 93.640 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 875000.0 lbs
Applied moment at pile head = -137424000.0 in-lbs
Axial thrust load on pile head = 673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	8.2415	-1.37E+08	875000.	-0.01085	17117.	1.31E+12	0.00	0.00	0.00

1.5194	8.0262	-1.21E+08	875000.	-0.01265	15114.	1.31E+12	0.00	0.00	0.00
3.0389	7.7802	-1.05E+08	875000.	-0.01422	13114.	1.31E+12	0.00	0.00	0.00
4.5583	7.5075	-8.91E+07	875000.	-0.01557	11117.	1.32E+12	0.00	0.00	0.00
6.0777	7.2123	-7.29E+07	875000.	-0.01669	9124.	1.32E+12	0.00	0.00	0.00
7.5971	6.8987	-5.68E+07	875000.	-0.01759	7136.	1.32E+12	0.00	0.00	0.00
9.1166	6.5709	-4.06E+07	875000.	-0.01826	5151.	1.32E+12	0.00	0.00	0.00
10.6360	6.2328	-2.44E+07	875000.	-0.01871	3171.	1.32E+12	0.00	0.00	0.00
12.1554	5.8885	-8208445.	875000.	-0.01894	1196.	1.32E+12	0.00	0.00	0.00
13.6749	5.5422	7978607.	875000.	-0.01894	1167.	1.33E+12	0.00	0.00	0.00
15.1943	5.1979	2.42E+07	875000.	-0.01872	3131.	1.33E+12	0.00	0.00	0.00
16.7137	4.8597	4.03E+07	875000.	-0.01827	5089.	1.33E+12	0.00	0.00	0.00
18.2331	4.5315	5.65E+07	875000.	-0.01761	7041.	1.33E+12	0.00	0.00	0.00
19.7526	4.2175	7.27E+07	875000.	-0.01673	8986.	1.33E+12	0.00	0.00	0.00
21.2720	3.9215	8.88E+07	875000.	-0.01562	10924.	1.34E+12	0.00	0.00	0.00
22.7914	3.6477	1.05E+08	861445.	-0.01430	12855.	1.34E+12	-1487.	7432.	0.00
24.3109	3.4000	1.21E+08	833505.	-0.01277	14719.	1.34E+12	-1578.	8462.	0.00
25.8303	3.1822	1.36E+08	803923.	-0.01102	16513.	1.34E+12	-1667.	9551.	0.00
27.3497	2.9980	1.50E+08	769258.	-0.01000	2204.	1.41E+13	-2135.	12987.	0.00
28.8691	2.8174	1.64E+08	730490.	-0.00980	2397.	1.41E+13	-2117.	13701.	0.00
30.3886	2.6406	1.77E+08	691391.	-0.00958	2580.	1.41E+13	-2172.	14995.	0.00
31.9080	2.4680	1.89E+08	651340.	-0.00934	2753.	1.41E+13	-2222.	16412.	0.00
33.4274	2.2999	2.01E+08	631087.	-0.00909	2915.	1.41E+13	0.00	0.00	0.00
34.9469	2.1366	2.13E+08	631087.	-0.00882	3077.	1.41E+13	0.00	0.00	0.00
36.4663	1.9782	2.24E+08	631087.	-0.00854	3240.	1.41E+13	0.00	0.00	0.00
37.9857	1.8252	2.36E+08	631087.	-0.00824	3402.	1.41E+13	0.00	0.00	0.00
39.5051	1.6777	2.47E+08	631087.	-0.00793	3564.	1.41E+13	0.00	0.00	0.00
41.0246	1.5361	2.59E+08	551482.	-0.00760	3726.	1.41E+13	-8732.	103647.	0.00
42.5440	1.4006	2.68E+08	391003.	-0.00726	3848.	1.41E+13	-8871.	115484.	0.00
44.0634	1.2714	2.74E+08	228252.	-0.00691	3928.	1.41E+13	-8981.	128801.	0.00
45.5829	1.1487	2.76E+08	119180.	-0.00655	3966.	1.41E+13	-2983.	47346.	0.00
47.1023	1.0325	2.78E+08	64895.	-0.00619	3991.	1.41E+13	-2972.	52481.	0.00
48.6217	0.9228	2.79E+08	10859.	-0.00583	4001.	1.41E+13	-2955.	58393.	0.00
50.1411	0.8198	2.79E+08	-47630.	-0.00547	3998.	1.41E+13	-3460.	76962.	0.00
51.6606	0.7233	2.77E+08	-110450.	-0.00511	3979.	1.41E+13	-3430.	86476.	0.00
53.1800	0.6334	2.75E+08	-172654.	-0.00475	3944.	1.41E+13	-3393.	97672.	0.00
54.6994	0.5499	2.71E+08	-234098.	-0.00440	3893.	1.41E+13	-3347.	110973.	0.00
56.2189	0.4729	2.66E+08	-294625.	-0.00405	3826.	1.41E+13	-3292.	126945.	0.00
57.7383	0.4021	2.60E+08	-354068.	-0.00371	3744.	1.41E+13	-3228.	146374.	0.00
59.2577	0.3375	2.53E+08	-412247.	-0.00338	3647.	1.41E+13	-3154.	170368.	0.00
60.7771	0.2789	2.45E+08	-468960.	-0.00306	3535.	1.41E+13	-3067.	200557.	0.00
62.2966	0.2260	2.36E+08	-523984.	-0.00274	3409.	1.41E+13	-2968.	239433.	0.00
63.8160	0.1788	2.26E+08	-577060.	-0.00244	3269.	1.41E+13	-2854.	291032.	0.00
65.3354	0.1369	2.15E+08	-627875.	-0.00216	3116.	1.41E+13	-2720.	362371.	0.00
66.8549	0.1001	2.04E+08	-676036.	-0.00189	2950.	1.41E+13	-2562.	466964.	0.00
68.3743	0.06804	1.91E+08	-721001.	-0.00163	2772.	1.41E+13	-2370.	635047.	0.00
69.8937	0.04053	1.77E+08	-761930.	-0.00139	2583.	1.41E+13	-2120.	953495.	0.00
71.4131	0.01721	1.63E+08	-797130.	-0.00117	2384.	1.41E+13	-1742.	1845030.	0.00
72.9326	-0.00226	1.48E+08	-803290.	-9.72E-04	2177.	1.41E+13	1066.	8591747.	0.00
74.4520	-0.01823	1.34E+08	-777109.	-7.89E-04	1975.	1.41E+13	1806.	1806118.	0.00
75.9714	-0.03105	1.20E+08	-741833.	-6.25E-04	1782.	1.41E+13	2063.	1211754.	0.00
77.4909	-0.04103	1.07E+08	-702856.	-4.78E-04	1597.	1.41E+13	2212.	983166.	0.00
79.0103	-0.04849	9.43E+07	-661660.	-3.48E-04	1424.	1.41E+13	2307.	867390.	0.00
80.5297	-0.05372	8.26E+07	-619058.	-2.33E-04	1260.	1.41E+13	2366.	803220.	0.00
82.0491	-0.05700	7.17E+07	-575588.	-1.34E-04	1108.	1.41E+13	2402.	768286.	0.00
83.5686	-0.05859	6.17E+07	-531645.	-4.71E-05	967.2124	1.41E+13	2418.	752621.	0.00
85.0880	-0.05872	5.24E+07	-487539.	2.67E-05	837.3875	1.41E+13	2420.	751356.	0.00
86.6074	-0.05761	4.39E+07	-443524.	8.90E-05	718.7908	1.41E+13	2408.	762136.	0.00
88.1269	-0.05547	3.62E+07	-399821.	1.41E-04	611.3710	1.41E+13	2386.	784088.	0.00
89.6463	-0.05248	2.93E+07	-356624.	1.83E-04	515.0243	1.41E+13	2353.	817414.	0.00
91.1657	-0.04879	2.32E+07	-314114.	2.17E-04	429.5998	1.41E+13	2310.	863310.	0.00
92.6851	-0.04456	1.78E+07	-272463.	2.44E-04	354.9014	1.41E+13	2258.	924126.	0.00
94.2046	-0.03990	1.32E+07	-231845.	2.64E-04	290.6897	1.41E+13	2197.	1003848.	0.00
95.7240	-0.03494	9367787.	-192442.	2.78E-04	236.6803	1.41E+13	2125.	1109091.	0.00
97.2434	-0.02975	6208728.	-154456.	2.89E-04	192.5405	1.41E+13	2041.	1251210.	0.00
98.7629	-0.02441	3728250.	-118131.	2.95E-04	157.8821	1.41E+13	1943.	1451124.	0.00
100.2823	-0.01899	1893679.	-83781.	2.99E-04	132.2487	1.41E+13	1825.	1751953.	0.00
101.8017	-0.01352	665731.	-51863.	3.00E-04	115.0912	1.41E+13	1676.	2260063.	0.00
103.3211	-0.00804	-4940.	-23161.	3.01E-04	105.8584	1.41E+13	1472.	3338056.	0.00
104.8406	-0.00256	-186244.	337.7868	3.01E-04	108.3916	1.41E+13	1106.	7882751.	0.00
106.3600	0.00292	0.00	0.00	3.00E-04	105.7893	1.41E+13	-1143.	3565493.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection            =     8.24150094 inches
Computed slope at pile head     =    -0.01084977 radians
Maximum bending moment          =     278804737. inch-lbs
Maximum shear force             =        875000. lbs
Depth of maximum bending moment =    48.62171429 feet below pile head
Depth of maximum shear force    =    19.75257143 feet below pile head
```

Number of iterations   =   36
Number of zero deflection points =   2

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	875000.	M, in-lb	-1.37E+08	673000.	8.2415	-0.01085	875000.	2.79E+08

Maximum pile-head deflection = 8.2415009377 inches
Maximum pile-head rotation   = -0.0108497663 radians = -0.621646 deg.

The analysis ended normally.

===

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent2_Stability4.lp11d

Name of output report file:
University_Bent2_Stability4.lp11o

Name of plot output file:
University_Bent2_Stability4.lp11p

Name of runtime message file:
University_Bent2_Stability4.lp11r

Date and Time of Analysis

Date: October 16, 2021   Time: 17:32:29

```
--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 2 Stability4
Job Number:
Client:
Engineer:
Description:



--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =            2
Total length of pile                                   =      116.360 ft
Depth of ground surface below top of pile              =      21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000           66.0000
  2           26.360           66.0000
  3           26.360           90.0000
  4          116.360           90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:
```

```
   Section 1 is an elastic pile
   Cross-sectional Shape                                =   Circular Pile
   Length of section                                    =    26.360000 ft
   Width of top of section                              =    66.000000 in
   Width of bottom of section                           =    66.000000 in
   Top Area                                             =        3421. sq. in
   Bottom Area                                          =        3421. sq. in
   Moment of Inertia at Top                             =      268020. in^4
   Moment of Inertia at Bottom                          =      274567. in^4
   Elastic Modulus                                      =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                                =   Circular Pile
   Length of section                                    =    90.000000 ft
   Width of top of section                              =    90.000000 in
   Width of bottom of section                           =    90.000000 in
   Top Area                                             =        6362. sq. in
   Bottom Area                                          =        6362. sq. in
   Moment of Inertia at Top                             =     3220623. in^4
   Moment of Inertia at Bottom                          =     3220623. in^4
   Elastic Modulus                                      =     4371722. psi



--------------------------------------------------------------------------------
                       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 6 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer            =    21.360000 ft
   Distance from top of pile to bottom of layer         =    27.860000 ft
   Effective unit weight at top of layer                =   120.000000 pcf
   Effective unit weight at bottom of layer             =   120.000000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer            =    27.860000 ft
   Distance from top of pile to bottom of layer         =    32.360000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


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

   Distance from top of pile to top of layer            =    32.360000 ft
   Distance from top of pile to bottom of layer         =    40.360000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Friction angle at top of layer                       =    30.000000 deg.
   Friction angle at bottom of layer                    =    30.000000 deg.
   Subgrade k at top of layer                           =    60.000000 pci
   Subgrade k at bottom of layer                        =    60.000000 pci


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

```
   Distance from top of pile to top of layer          =    40.360000 ft
   Distance from top of pile to bottom of layer       =    44.360000 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                     =    36.000000 deg.
   Friction angle at bottom of layer                  =    36.000000 deg.
   Subgrade k at top of layer                         =   125.000000 pci
   Subgrade k at bottom of layer                      =   125.000000 pci
```

Layer 5 is stiff clay without free water

```
   Distance from top of pile to top of layer          =    44.360000 ft
   Distance from top of pile to bottom of layer       =    49.360000 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                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000
```

Layer 6 is stiff clay without free water

```
   Distance from top of pile to top of layer          =    49.360000 ft
   Distance from top of pile to bottom of layer       =   200.000000 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                 =        1800. psf
   Undrained cohesion at bottom of layer              =        1800. psf
   Epsilon-50 at top of layer                         =     0.005000
   Epsilon-50 at bottom of layer                      =     0.005000
```

(Depth of the lowest soil layer extends 83.640 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

----

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

```
Shear force at pile head                                  =     875000.0 lbs
Applied moment at pile head                               = -137424000.0 in-lbs
Axial thrust load on pile head                            =     673000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	8.1995	-1.37E+08	875000.	-0.01014	17117.	1.31E+12	0.00	0.00	0.00
1.6623	7.9763	-1.20E+08	875000.	-0.01210	14927.	1.31E+12	0.00	0.00	0.00
3.3246	7.7168	-1.02E+08	875000.	-0.01379	12741.	1.31E+12	0.00	0.00	0.00
4.9869	7.4264	-8.45E+07	875000.	-0.01520	10558.	1.32E+12	0.00	0.00	0.00
6.6491	7.1103	-6.69E+07	875000.	-0.01635	8381.	1.32E+12	0.00	0.00	0.00
8.3114	6.7741	-4.92E+07	875000.	-0.01723	6208.	1.32E+12	0.00	0.00	0.00
9.9737	6.4231	-3.15E+07	875000.	-0.01784	4040.	1.32E+12	0.00	0.00	0.00
11.6360	6.0626	-1.38E+07	875000.	-0.01818	1879.	1.32E+12	0.00	0.00	0.00
13.2983	5.6979	3891556.	875000.	-0.01825	670.0566	1.33E+12	0.00	0.00	0.00
14.9606	5.3344	2.16E+07	875000.	-0.01806	2819.	1.33E+12	0.00	0.00	0.00
16.6229	4.9774	3.93E+07	875000.	-0.01760	4960.	1.33E+12	0.00	0.00	0.00
18.2851	4.6321	5.70E+07	875000.	-0.01688	7095.	1.33E+12	0.00	0.00	0.00
19.9474	4.3038	7.46E+07	875000.	-0.01590	9221.	1.33E+12	0.00	0.00	0.00
21.6097	3.9978	9.23E+07	860771.	-0.01465	11339.	1.34E+12	-1427.	7118.	0.00
23.2720	3.7193	1.09E+08	831264.	-0.01315	13380.	1.34E+12	-1532.	8216.	0.00
24.9343	3.4733	1.26E+08	799682.	-0.01140	15339.	1.34E+12	-1635.	9387.	0.00
26.5966	3.2646	1.42E+08	762242.	-0.01036	2084.	1.41E+13	-2119.	12949.	0.00
28.2589	3.0600	1.57E+08	719923.	-0.01015	2293.	1.41E+13	-2124.	13845.	0.00
29.9211	2.8598	1.71E+08	676921.	-0.00992	2489.	1.41E+13	-2188.	15260.	0.00
31.5834	2.6644	1.84E+08	632703.	-0.00967	2674.	1.41E+13	-2246.	16813.	0.00
33.2457	2.4742	1.96E+08	610304.	-0.00940	2846.	1.41E+13	0.00	0.00	0.00
34.9080	2.2895	2.08E+08	610304.	-0.00911	3017.	1.41E+13	0.00	0.00	0.00
36.5703	2.1108	2.21E+08	610304.	-0.00881	3189.	1.41E+13	0.00	0.00	0.00
38.2326	1.9382	2.33E+08	610304.	-0.00848	3361.	1.41E+13	0.00	0.00	0.00
39.8949	1.7723	2.45E+08	610304.	-0.00815	3533.	1.41E+13	0.00	0.00	0.00
41.5571	1.6132	2.58E+08	520057.	-0.00779	3704.	1.41E+13	-9049.	111883.	0.00
43.2194	1.4615	2.66E+08	338091.	-0.00742	3825.	1.41E+13	-9196.	125514.	0.00
44.8817	1.3173	2.71E+08	215915.	-0.00704	3895.	1.41E+13	-3054.	46241.	0.00
46.5440	1.1807	2.75E+08	155063.	-0.00665	3948.	1.41E+13	-3048.	51485.	0.00
48.2063	1.0519	2.78E+08	94397.	-0.00626	3984.	1.41E+13	-3035.	57554.	0.00
49.8686	0.9310	2.79E+08	28645.	-0.00587	4003.	1.41E+13	-3557.	76220.	0.00
51.5309	0.8179	2.79E+08	-42051.	-0.00547	4002.	1.41E+13	-3531.	86106.	0.00
53.1931	0.7128	2.77E+08	-112126.	-0.00508	3982.	1.41E+13	-3495.	97815.	0.00
54.8554	0.6154	2.75E+08	-181396.	-0.00469	3942.	1.41E+13	-3450.	111823.	0.00
56.5177	0.5259	2.70E+08	-249666.	-0.00430	3883.	1.41E+13	-3395.	128776.	0.00
58.1800	0.4439	2.65E+08	-316725.	-0.00392	3804.	1.41E+13	-3329.	149574.	0.00
59.8423	0.3695	2.58E+08	-382348.	-0.00355	3708.	1.41E+13	-3251.	175505.	0.00
61.5046	0.3023	2.50E+08	-446284.	-0.00319	3593.	1.41E+13	-3160.	208487.	0.00
63.1669	0.2422	2.40E+08	-508252.	-0.00284	3460.	1.41E+13	-3054.	251500.	0.00
64.8291	0.1889	2.29E+08	-567929.	-0.00251	3310.	1.41E+13	-2930.	309462.	0.00
66.4914	0.1420	2.17E+08	-624923.	-0.00219	3144.	1.41E+13	-2785.	391157.	0.00
68.1537	0.1013	2.04E+08	-678734.	-0.00190	2963.	1.41E+13	-2611.	514134.	0.00
69.8160	0.06637	1.90E+08	-728665.	-0.00162	2767.	1.41E+13	-2395.	720007.	0.00
71.4783	0.03682	1.75E+08	-773579.	-0.00136	2557.	1.41E+13	-2108.	1141861.	0.00
73.1406	0.01223	1.60E+08	-810865.	-0.00112	2336.	1.41E+13	-1631.	2659725.	0.00
74.8029	-0.00785	1.43E+08	-812544.	-9.05E-04	2106.	1.41E+13	1463.	3718129.	0.00
76.4651	-0.02388	1.27E+08	-778686.	-7.14E-04	1883.	1.41E+13	1932.	1614013.	0.00
78.1274	-0.03632	1.12E+08	-738014.	-5.44E-04	1672.	1.41E+13	2146.	1178579.	0.00
79.7897	-0.04559	9.78E+07	-693960.	-3.95E-04	1472.	1.41E+13	2271.	993840.	0.00
81.4520	-0.05209	8.44E+07	-647886.	-2.66E-04	1285.	1.41E+13	2348.	899215.	0.00
83.1143	-0.05621	7.20E+07	-600593.	-1.56E-04	1111.	1.41E+13	2393.	849312.	0.00
84.7766	-0.05830	6.04E+07	-552631.	-6.18E-05	950.4075	1.41E+13	2415.	826402.	0.00
86.4389	-0.05868	4.99E+07	-504411.	1.63E-05	803.0992	1.41E+13	2419.	822395.	0.00
88.1011	-0.05765	4.03E+07	-456259.	8.03E-05	669.2280	1.41E+13	2409.	833404.	0.00
89.7634	-0.05548	3.17E+07	-408443.	1.31E-04	548.7370	1.41E+13	2386.	857744.	0.00
91.4257	-0.05241	2.40E+07	-361193.	1.71E-04	441.5006	1.41E+13	2352.	895115.	0.00
93.0880	-0.04867	1.73E+07	-314708.	2.00E-04	347.3337	1.41E+13	2309.	946304.	0.00
94.7503	-0.04443	1.15E+07	-269173.	2.20E-04	265.9979	1.41E+13	2257.	1013162.	0.00
96.4126	-0.03987	6542641.	-224757.	2.33E-04	197.2061	1.41E+13	2197.	1098842.	0.00
98.0749	-0.03513	2493125.	-181625.	2.40E-04	140.6244	1.41E+13	2128.	1208331.	0.00
99.7371	-0.03032	-709675.	-139942.	2.41E-04	115.7052	1.41E+13	2051.	1349536.	0.00
101.3994	-0.02552	-3096325.	-99890.	2.38E-04	149.0526	1.41E+13	1965.	1535478.	0.00
103.0617	-0.02082	-4701153.	-61672.	2.33E-04	171.4760	1.41E+13	1867.	1789068.	0.00
104.7240	-0.01624	-5562961.	-25547.	2.25E-04	183.5175	1.41E+13	1755.	2154868.	0.00
106.3863	-0.01183	-5726406.	8123.	2.17E-04	185.8013	1.41E+13	1621.	2733702.	0.00
108.0486	-0.00757	-5244723.	38754.	2.10E-04	179.0710	1.41E+13	1450.	3818882.	0.00
109.7109	-0.00347	-4185940.	65115.	2.03E-04	164.2772	1.41E+13	1193.	6860199.	0.00
111.3731	5.19E-04	-2652427.	74100.	1.98E-04	142.8502	1.41E+13	-291.9634	1.12E+07	0.00
113.0354	0.00443	-1235036.	58539.	1.95E-04	123.0458	1.41E+13	-1268.	5708545.	0.00
114.6977	0.00831	-322262.	31088.	1.94E-04	110.2921	1.41E+13	-1484.	3562649.	0.00
116.3600	0.01218	0.00	0.00	1.94E-04	105.7893	1.41E+13	-1633.	1337326.	0.00

* The above values of total stress are combined axial and bending stresses.

```
Output Summary for Load Case No. 1:

Pile-head deflection             =     8.19946227 inches
Computed slope at pile head      =    -0.01013927 radians
Maximum bending moment           =     278945477. inch-lbs
Maximum shear force              =        875000. lbs
Depth of maximum bending moment  =    49.86857143 feet below pile head
Depth of maximum shear force     =     1.66228571 feet below pile head
Number of iterations             =             36
Number of zero deflection points =              2


--------------------------------------------------------------------------------
            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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	875000.	M, in-lb	-1.37E+08	673000.	8.1995	-0.01014	875000.	2.79E+08

```
Maximum pile-head deflection = 8.1994622663 inches
Maximum pile-head rotation   = -0.0101392687 radians = -0.580937 deg.

The analysis ended normally.


================================================================================
                      LPile for Windows, Version 2019-11.008

                 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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent2_Stability5.lp11d

Name of output report file:
University_Bent2_Stability5.lp11o

Name of plot output file:
University_Bent2_Stability5.lp11p

Name of runtime message file:
```

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

               Date:  October 16, 2021           Time:  17:32:49


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 2 Stability5
Job Number:
Client:
Engineer:
Description:


--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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               =          100
 - Deflection tolerance for convergence               =   1.0000E-05 in
 - Maximum allowable deflection                       =     100.0000 in
 - Number of pile increments                          =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                       =            2
Total length of pile                                  =      126.360 ft
Depth of ground surface below top of pile             =      21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000          66.0000
```

```
  2           26.360          66.0000
  3           26.360          90.0000
  4          126.360          90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                              =   Circular Pile
   Length of section                                  =    26.360000 ft
   Width of top of section                            =    66.000000 in
   Width of bottom of section                         =    66.000000 in
   Top Area                                           =        3421. sq. in
   Bottom Area                                        =        3421. sq. in
   Moment of Inertia at Top                           =      268020. in^4
   Moment of Inertia at Bottom                        =      274567. in^4
   Elastic Modulus                                    =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                              =   Circular Pile
   Length of section                                  =   100.000000 ft
   Width of top of section                            =    90.000000 in
   Width of bottom of section                         =    90.000000 in
   Top Area                                           =        6362. sq. in
   Bottom Area                                        =        6362. sq. in
   Moment of Inertia at Top                           =     3220623. in^4
   Moment of Inertia at Bottom                        =     3220623. in^4
   Elastic Modulus                                    =     4371722. psi



--------------------------------------------------------------------------------
                       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 6 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer          =    21.360000 ft
   Distance from top of pile to bottom of layer       =    27.860000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer          =    27.860000 ft
   Distance from top of pile to bottom of layer       =    32.360000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


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

   Distance from top of pile to top of layer          =    32.360000 ft
   Distance from top of pile to bottom of layer       =    40.360000 ft
```

Effective unit weight at top of layer = 57.600000 pcf
Effective unit weight at bottom of layer = 57.600000 pcf
Friction angle at top of layer = 30.000000 deg.
Friction angle at bottom of layer = 30.000000 deg.
Subgrade k at top of layer = 60.000000 pci
Subgrade k at bottom of layer = 60.000000 pci

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

Distance from top of pile to top of layer = 40.360000 ft
Distance from top of pile to bottom of layer = 44.360000 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 = 36.000000 deg.
Friction angle at bottom of layer = 36.000000 deg.
Subgrade k at top of layer = 125.000000 pci
Subgrade k at bottom of layer = 125.000000 pci

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer = 44.360000 ft
Distance from top of pile to bottom of layer = 49.360000 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 = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 49.360000 ft
Distance from top of pile to bottom of layer = 200.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 73.640 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000

4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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 Analysis No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head	=	875000.0 lbs
Applied moment at pile head	=	-137424000.0 in-lbs
Axial thrust load on pile head	=	673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	8.3955	-1.37E+08	875000.	-0.01068	17117.	1.31E+12	0.00	0.00	0.00
1.8051	8.1396	-1.18E+08	875000.	-0.01279	14738.	1.31E+12	0.00	0.00	0.00
3.6103	7.8413	-9.91E+07	875000.	-0.01459	12363.	1.31E+12	0.00	0.00	0.00
5.4154	7.5076	-8.00E+07	875000.	-0.01606	9994.	1.32E+12	0.00	0.00	0.00
7.2206	7.1454	-6.08E+07	875000.	-0.01722	7629.	1.32E+12	0.00	0.00	0.00
9.0257	6.7616	-4.16E+07	875000.	-0.01806	5271.	1.32E+12	0.00	0.00	0.00
10.8309	6.3630	-2.23E+07	875000.	-0.01858	2919.	1.32E+12	0.00	0.00	0.00
12.6360	5.9565	-3104547.	875000.	-0.01879	574.5595	1.33E+12	0.00	0.00	0.00
14.4411	5.5489	1.61E+07	875000.	-0.01868	2156.	1.33E+12	0.00	0.00	0.00
16.2463	5.1470	3.53E+07	875000.	-0.01827	4485.	1.33E+12	0.00	0.00	0.00
18.0514	4.7576	5.46E+07	875000.	-0.01753	6805.	1.33E+12	0.00	0.00	0.00
19.8566	4.3874	7.38E+07	875000.	-0.01649	9116.	1.33E+12	0.00	0.00	0.00
21.6617	4.0431	9.30E+07	859460.	-0.01514	11417.	1.34E+12	-1435.	7687.	0.00
23.4669	3.7315	1.11E+08	827147.	-0.01348	13626.	1.34E+12	-1549.	8989.	0.00
25.2720	3.4590	1.29E+08	792408.	-0.01154	15738.	1.34E+12	-1659.	10389.	0.00
27.0771	3.2316	1.46E+08	751116.	-0.01038	2147.	1.41E+13	-2153.	14435.	0.00
28.8823	3.0092	1.62E+08	704473.	-0.01015	2370.	1.41E+13	-2153.	15498.	0.00
30.6874	2.7921	1.77E+08	657112.	-0.00988	2578.	1.41E+13	-2220.	17221.	0.00
32.4926	2.5810	1.91E+08	633071.	-0.00960	2771.	1.41E+13	0.00	0.00	0.00
34.2977	2.3761	2.05E+08	633071.	-0.00930	2965.	1.41E+13	0.00	0.00	0.00
36.1029	2.1782	2.18E+08	633071.	-0.00897	3158.	1.41E+13	0.00	0.00	0.00
37.9080	1.9874	2.32E+08	633071.	-0.00863	3352.	1.41E+13	0.00	0.00	0.00
39.7131	1.8045	2.46E+08	633071.	-0.00826	3545.	1.41E+13	0.00	0.00	0.00
41.5183	1.6297	2.60E+08	534840.	-0.00787	3738.	1.41E+13	-9070.	120549.	0.00
43.3234	1.4636	2.70E+08	336609.	-0.00746	3872.	1.41E+13	-9233.	136646.	0.00
45.1286	1.3065	2.75E+08	203478.	-0.00704	3945.	1.41E+13	-3059.	50718.	0.00
46.9337	1.1586	2.79E+08	137302.	-0.00662	3998.	1.41E+13	-3051.	57044.	0.00
48.7389	1.0199	2.81E+08	71382.	-0.00619	4031.	1.41E+13	-3035.	64471.	0.00
50.5440	0.8906	2.82E+08	11.3737	-0.00575	4044.	1.41E+13	-3554.	86447.	0.00
52.3491	0.7707	2.81E+08	-76614.	-0.00532	4033.	1.41E+13	-3521.	98958.	0.00
54.1543	0.6601	2.79E+08	-152398.	-0.00489	4000.	1.41E+13	-3476.	114076.	0.00
55.9594	0.5589	2.75E+08	-227095.	-0.00446	3943.	1.41E+13	-3420.	132576.	0.00
57.7646	0.4667	2.69E+08	-300443.	-0.00405	3864.	1.41E+13	-3352.	155558.	0.00
59.5697	0.3836	2.62E+08	-372159.	-0.00364	3763.	1.41E+13	-3270.	184630.	0.00
61.3749	0.3092	2.53E+08	-441929.	-0.00324	3640.	1.41E+13	-3172.	222239.	0.00
63.1800	0.2432	2.43E+08	-509398.	-0.00286	3497.	1.41E+13	-3057.	272305.	0.00
64.9851	0.1853	2.31E+08	-574153.	-0.00250	3333.	1.41E+13	-2922.	341538.	0.00
66.7903	0.1351	2.18E+08	-635689.	-0.00215	3150.	1.41E+13	-2760.	442555.	0.00
68.5954	0.09215	2.03E+08	-693344.	-0.00183	2949.	1.41E+13	-2563.	602509.	0.00
70.4006	0.05599	1.88E+08	-746141.	-0.00152	2731.	1.41E+13	-2311.	894230.	0.00
72.2057	0.02610	1.71E+08	-792295.	-0.00125	2498.	1.41E+13	-1950.	1618627.	0.00
74.0109	0.00190	1.54E+08	-824539.	-9.99E-04	2252.	1.41E+13	-1027.	1.17E+07	0.00
75.8160	-0.01717	1.36E+08	-816392.	-7.76E-04	1999.	1.41E+13	1779.	2244971.	0.00
77.6211	-0.03172	1.18E+08	-774652.	-5.81E-04	1758.	1.41E+13	2075.	1416530.	0.00
79.4263	-0.04234	1.02E+08	-728034.	-4.12E-04	1531.	1.41E+13	2230.	1140830.	0.00
81.2314	-0.04955	8.67E+07	-678764.	-2.66E-04	1318.	1.41E+13	2319.	1013831.	0.00
83.0366	-0.05388	7.26E+07	-627995.	-1.44E-04	1120.	1.41E+13	2368.	952168.	0.00
84.8417	-0.05578	5.95E+07	-576471.	-4.22E-05	937.6572	1.41E+13	2389.	927669.	0.00
86.6469	-0.05570	4.76E+07	-524732.	4.03E-05	771.0088	1.41E+13	2388.	928652.	0.00
88.4520	-0.05404	3.68E+07	-473197.	1.05E-04	620.0025	1.41E+13	2370.	950034.	0.00
90.2571	-0.05115	2.71E+07	-422209.	1.54E-04	484.5232	1.41E+13	2338.	990042.	0.00
92.0623	-0.04735	1.85E+07	-372054.	1.89E-04	364.3619	1.41E+13	2293.	1048978.	0.00
93.8674	-0.04294	1.10E+07	-322983.	2.12E-04	259.2288	1.41E+13	2238.	1128815.	0.00
95.6726	-0.03816	4506982.	-275215.	2.24E-04	168.7629	1.41E+13	2173.	1233232.	0.00
97.4777	-0.03323	-948236.	-228952.	2.27E-04	119.0385	1.41E+13	2099.	1367986.	0.00
99.2829	-0.02834	-5418599.	-184375.	2.22E-04	181.5004	1.41E+13	2017.	1541690.	0.00
101.0880	-0.02362	-8942474.	-141659.	2.11E-04	230.7376	1.41E+13	1927.	1767198.	0.00
102.8931	-0.01920	-1.16E+07	-100966.	1.95E-04	267.3371	1.41E+13	1830.	2064081.	0.00
104.6983	-0.01517	-1.33E+07	-62461.	1.76E-04	291.9355	1.41E+13	1725.	2463198.	0.00
106.5034	-0.01158	-1.43E+07	-26309.	1.55E-04	305.2187	1.41E+13	1613.	3015818.	0.00
108.3086	-0.00847	-1.45E+07	7310.	1.33E-04	307.9243	1.41E+13	1491.	3813743.	0.00
110.1137	-0.00584	-1.40E+07	38180.	1.11E-04	300.8479	1.41E+13	1359.	5040682.	0.00
111.9189	-0.00367	-1.28E+07	66006.	9.01E-05	284.8578	1.41E+13	1210.	7135261.	0.00
113.7240	-0.00194	-1.11E+07	90283.	7.17E-05	260.9286	1.41E+13	1031.	1.15E+07	0.00

115.5291	-5.68E-04	-8906533.	104910.	5.63E-05	230.2354	1.41E+13	319.2765	1.22E+07	0.00
117.3343	5.04E-04	-6559825.	105298.	4.44E-05	197.4462	1.41E+13	-283.4393	1.22E+07	0.00
119.1394	0.00136	-4345967.	93962.	3.60E-05	166.5131	1.41E+13	-763.1825	1.22E+07	0.00
120.9446	0.00206	-2490120.	74347.	3.08E-05	140.5824	1.41E+13	-1048.	1.10E+07	0.00
122.7497	0.00269	-1125918.	50872.	2.80E-05	121.5212	1.41E+13	-1120.	9015629.	0.00
124.5549	0.00328	-287005.	26007.	2.69E-05	109.7995	1.41E+13	-1176.	7774110.	0.00
126.3600	0.00386	0.00	0.00	2.67E-05	105.7893	1.41E+13	-1225.	3441288.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     8.39551308 inches
Computed slope at pile head      =    -0.01067853 radians
Maximum bending moment           =     281851489. inch-lbs
Maximum shear force              =        875000. lbs
Depth of maximum bending moment  =    50.54400000 feet below pile head
Depth of maximum shear force     =     1.80514286 feet below pile head
Number of iterations             =             30
Number of zero deflection points =              2
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	875000.	M, in-lb	-1.37E+08	673000.	8.3955	-0.01068	875000.	2.82E+08

Maximum pile-head deflection = 8.3955130792 inches
Maximum pile-head rotation   = -0.0106785251 radians = -0.611834 deg.

The analysis ended normally.

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LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:

```
University_Bent2_Stability6.lp11d

Name of output report file:
University_Bent2_Stability6.lp11o

Name of plot output file:
University_Bent2_Stability6.lp11p

Name of runtime message file:
University_Bent2_Stability6.lp11r


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

               Date:  October 16, 2021           Time:  17:41:31


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 2 Stability6
Job Number:
Client:
Engineer:
Description:


--------------------------------------------------------------------------------
                          Program Options and Settings
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Computational Options:
 - 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               =          100
 - Deflection tolerance for convergence               =   1.0000E-05 in
 - Maximum allowable deflection                       =     100.0000 in
 - Number of pile increments                          =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                       =            2
Total length of pile                                  =      136.360 ft
Depth of ground surface below top of pile             =      21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	26.360	66.0000
3	26.360	90.0000
4	136.360	90.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                              =   Circular Pile
   Length of section                                  =    26.360000 ft
   Width of top of section                            =    66.000000 in
   Width of bottom of section                         =    66.000000 in
   Top Area                                           =        3421. sq. in
   Bottom Area                                        =        3421. sq. in
   Moment of Inertia at Top                           =      268020. in^4
   Moment of Inertia at Bottom                        =      274567. in^4
   Elastic Modulus                                    =     4887733. psi
```

Pile Section No. 2:

```
   Section 2 is an elastic pile
   Cross-sectional Shape                              =   Circular Pile
   Length of section                                  =   110.000000 ft
   Width of top of section                            =    90.000000 in
   Width of bottom of section                         =    90.000000 in
   Top Area                                           =        6362. sq. in
   Bottom Area                                        =        6362. sq. in
   Moment of Inertia at Top                           =     3220623. in^4
   Moment of Inertia at Bottom                        =     3220623. in^4
   Elastic Modulus                                    =     4371722. psi
```

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 6 layers

Layer 1 is stiff clay without free water

```
   Distance from top of pile to top of layer          =    21.360000 ft
   Distance from top of pile to bottom of layer       =    27.860000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000
```

Layer 2 is stiff clay without free water

```
   Distance from top of pile to top of layer          =    27.860000 ft
   Distance from top of pile to bottom of layer       =    32.360000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
```

Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

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

Distance from top of pile to top of layer = 32.360000 ft
Distance from top of pile to bottom of layer = 40.360000 ft
Effective unit weight at top of layer = 57.600000 pcf
Effective unit weight at bottom of layer = 57.600000 pcf
Friction angle at top of layer = 30.000000 deg.
Friction angle at bottom of layer = 30.000000 deg.
Subgrade k at top of layer = 60.000000 pci
Subgrade k at bottom of layer = 60.000000 pci

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

Distance from top of pile to top of layer = 40.360000 ft
Distance from top of pile to bottom of layer = 44.360000 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 = 36.000000 deg.
Friction angle at bottom of layer = 36.000000 deg.
Subgrade k at top of layer = 125.000000 pci
Subgrade k at bottom of layer = 125.000000 pci

Layer 5 is stiff clay without free water

Distance from top of pile to top of layer = 44.360000 ft
Distance from top of pile to bottom of layer = 49.360000 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 = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 49.360000 ft
Distance from top of pile to bottom of layer = 200.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 63.640 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

----
p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.

5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 875000.0 lbs
Applied moment at pile head = -137424000.0 in-lbs
Axial thrust load on pile head = 673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	8.0580	-1.37E+08	875000.	-0.01031	17117.	1.31E+12	0.00	0.00	0.00
1.9480	7.7883	-1.17E+08	875000.	-0.01258	14551.	1.31E+12	0.00	0.00	0.00
3.8960	7.4698	-9.61E+07	875000.	-0.01448	11989.	1.31E+12	0.00	0.00	0.00
5.8440	7.1114	-7.54E+07	875000.	-0.01600	9434.	1.32E+12	0.00	0.00	0.00
7.7920	6.7216	-5.47E+07	875000.	-0.01716	6885.	1.32E+12	0.00	0.00	0.00
9.7400	6.3092	-3.40E+07	875000.	-0.01794	4343.	1.32E+12	0.00	0.00	0.00
11.6880	5.8828	-1.32E+07	875000.	-0.01836	1809.	1.32E+12	0.00	0.00	0.00
13.6360	5.4509	7508579.	875000.	-0.01841	1110.	1.33E+12	0.00	0.00	0.00
15.5840	5.0221	2.83E+07	875000.	-0.01810	3626.	1.33E+12	0.00	0.00	0.00
17.5320	4.6049	4.90E+07	875000.	-0.01742	6132.	1.33E+12	0.00	0.00	0.00
19.4800	4.2079	6.97E+07	875000.	-0.01638	8628.	1.33E+12	0.00	0.00	0.00
21.4280	3.8394	9.04E+07	858662.	-0.01497	11112.	1.34E+12	-1398.	8511.	0.00
23.3760	3.5078	1.10E+08	824584.	-0.01322	13492.	1.34E+12	-1518.	10114.	0.00
25.3240	3.2213	1.29E+08	787751.	-0.01113	15761.	1.34E+12	-1634.	11855.	0.00
27.2720	2.9876	1.48E+08	743793.	-0.00988	2167.	1.41E+13	-2127.	16645.	0.00
29.2200	2.7595	1.64E+08	694069.	-0.00962	2404.	1.41E+13	-2127.	18017.	0.00
31.1680	2.5379	1.80E+08	643556.	-0.00933	2624.	1.41E+13	-2195.	20217.	0.00
33.1160	2.3232	1.95E+08	617902.	-0.00902	2828.	1.41E+13	0.00	0.00	0.00
35.0640	2.1161	2.09E+08	617902.	-0.00869	3032.	1.41E+13	0.00	0.00	0.00
37.0120	1.9172	2.24E+08	617902.	-0.00833	3236.	1.41E+13	0.00	0.00	0.00
38.9600	1.7269	2.39E+08	617902.	-0.00794	3439.	1.41E+13	0.00	0.00	0.00
40.9080	1.5459	2.53E+08	516062.	-0.00753	3643.	1.41E+13	-8713.	131756.	0.00
42.8560	1.3747	2.63E+08	310308.	-0.00711	3780.	1.41E+13	-8891.	151180.	0.00
44.8040	1.2137	2.68E+08	171468.	-0.00666	3849.	1.41E+13	-2988.	57553.	0.00
46.7520	1.0631	2.71E+08	101735.	-0.00622	3895.	1.41E+13	-2978.	65479.	0.00
48.7000	0.9231	2.73E+08	32344.	-0.00577	3918.	1.41E+13	-2959.	74935.	0.00
50.6480	0.7936	2.73E+08	-42663.	-0.00531	3918.	1.41E+13	-3459.	101874.	0.00
52.5960	0.6747	2.71E+08	-123034.	-0.00486	3892.	1.41E+13	-3418.	118415.	0.00
54.5440	0.5663	2.67E+08	-202303.	-0.00441	3840.	1.41E+13	-3364.	138863.	0.00
56.4920	0.4683	2.62E+08	-280157.	-0.00397	3762.	1.41E+13	-3297.	164551.	0.00
58.4400	0.3805	2.54E+08	-356257.	-0.00355	3659.	1.41E+13	-3214.	197462.	0.00
60.3880	0.3025	2.45E+08	-430227.	-0.00313	3531.	1.41E+13	-3115.	240664.	0.00
62.3360	0.2341	2.34E+08	-501645.	-0.00273	3379.	1.41E+13	-2996.	299182.	0.00
64.2840	0.1747	2.22E+08	-570016.	-0.00236	3204.	1.41E+13	-2854.	381868.	0.00
66.2320	0.1239	2.08E+08	-634731.	-0.00200	3008.	1.41E+13	-2683.	506015.	0.00
68.1800	0.08125	1.92E+08	-694977.	-0.00167	2791.	1.41E+13	-2472.	711109.	0.00
70.1280	0.04600	1.75E+08	-749505.	-0.00136	2555.	1.41E+13	-2194.	1114707.	0.00
72.0760	0.01757	1.57E+08	-795761.	-0.00109	2302.	1.41E+13	-1764.	2347119.	0.00
74.0240	-0.00477	1.38E+08	-801281.	-8.41E-04	2035.	1.41E+13	1291.	6325069.	0.00
75.9720	-0.02175	1.20E+08	-764123.	-6.27E-04	1779.	1.41E+13	1888.	2028466.	0.00
77.9200	-0.03409	1.02E+08	-717375.	-4.43E-04	1536.	1.41E+13	2112.	1448389.	0.00
79.8680	-0.04245	8.62E+07	-666612.	-2.86E-04	1310.	1.41E+13	2231.	1228700.	0.00
81.8160	-0.04746	7.12E+07	-613720.	-1.55E-04	1101.	1.41E+13	2294.	1129994.	0.00
83.7640	-0.04971	5.75E+07	-559776.	-4.85E-05	909.3313	1.41E+13	2321.	1091412.	0.00
85.7120	-0.04973	4.51E+07	-505517.	3.66E-05	735.3581	1.41E+13	2321.	1091110.	0.00
87.6600	-0.04800	3.39E+07	-451495.	1.02E-04	579.0913	1.41E+13	2301.	1120479.	0.00
89.6080	-0.04496	2.39E+07	-398148.	1.50E-04	440.3789	1.41E+13	2263.	1176931.	0.00
91.5560	-0.04098	1.53E+07	-345844.	1.83E-04	318.9390	1.41E+13	2212.	1261536.	0.00
93.5040	-0.03641	7771727.	-294897.	2.02E-04	214.3794	1.41E+13	2147.	1378412.	0.00
95.4520	-0.03155	1461603.	-245587.	2.09E-04	126.2115	1.41E+13	2072.	1535043.	0.00
97.4000	-0.02662	-3716560.	-198168.	2.08E-04	157.7188	1.41E+13	1986.	1743431.	0.00
99.3480	-0.02184	-7809659.	-152874.	1.98E-04	214.9094	1.41E+13	1890.	2022422.	0.00
101.2960	-0.01736	-1.09E+07	-109932.	1.83E-04	257.6694	1.41E+13	1784.	2402106.	0.00
103.2440	-0.01331	-1.30E+07	-69563.	1.63E-04	286.8018	1.41E+13	1670.	2932442.	0.00
105.1920	-0.00976	-1.41E+07	-31993.	1.40E-04	303.1823	1.41E+13	1545.	3701472.	0.00

107.1400	-0.00675	-1.45E+07	2531.	1.17E-04	307.7628	1.41E+13	1409.	4878311.	0.00
109.0880	-0.00431	-1.40E+07	33719.	9.29E-05	301.5801	1.41E+13	1259.	6832749.	0.00
111.0360	-0.00241	-1.29E+07	61165.	7.06E-05	285.7773	1.41E+13	1089.	1.06E+07	0.00
112.9840	-0.00101	-1.12E+07	80527.	5.06E-05	261.6557	1.41E+13	567.6587	1.31E+07	0.00
114.9320	-4.25E-05	-9118417.	87441.	3.38E-05	233.1960	1.41E+13	23.9039	1.31E+07	0.00
116.8800	5.70E-04	-7068267.	83971.	2.03E-05	204.5503	1.41E+13	-320.7882	1.31E+07	0.00
118.8280	9.09E-04	-5193223.	74247.	1.02E-05	178.3514	1.41E+13	-511.1740	1.31E+07	0.00
120.7760	0.00105	-3597368.	61398.	2.87E-06	156.0534	1.41E+13	-588.1874	1.31E+07	0.00
122.7240	0.00104	-2322827.	47666.	-2.04E-06	138.2449	1.41E+13	-586.6673	1.31E+07	0.00
124.6720	9.50E-04	-1368802.	34563.	-5.11E-06	124.9148	1.41E+13	-534.4378	1.31E+07	0.00
126.6200	8.04E-04	-706778.	23030.	-6.83E-06	115.6647	1.41E+13	-452.3263	1.31E+07	0.00
128.5680	6.31E-04	-291903.	13596.	-7.66E-06	109.8679	1.41E+13	-354.7852	1.31E+07	0.00
130.5160	4.46E-04	-70889.	6517.	-7.96E-06	106.7798	1.41E+13	-250.8717	1.31E+07	0.00
132.4640	2.59E-04	13041.	1885.	-8.01E-06	105.9716	1.41E+13	-145.4105	1.31E+07	0.00
134.4120	7.15E-05	17514.	-284.3206	-7.98E-06	106.0340	1.41E+13	-40.2341	1.31E+07	0.00
136.3600	-1.15E-04	0.00	0.00	-7.97E-06	105.7893	1.41E+13	64.5600	6574500.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     8.05802922 inches
Computed slope at pile head      =    -0.01031414 radians
Maximum bending moment           =     272858990. inch-lbs
Maximum shear force              =        875000. lbs
Depth of maximum bending moment  =    50.64800000 feet below pile head
Depth of maximum shear force     =     1.94800000 feet below pile head
Number of iterations             =             36
Number of zero deflection points =              3
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	875000.	M, in-lb	-1.37E+08	673000.	8.0580	-0.01031	875000.	2.73E+08

Maximum pile-head deflection = 8.0580292245 inches
Maximum pile-head rotation   = -0.0103141376 radians = -0.590957 deg.

The analysis ended normally.

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LPile for Windows, Version 2019-11.008

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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                             Files Used for Analysis
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Path to file locations:
\Users\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent2_Stability7.lp11d

Name of output report file:
University_Bent2_Stability7.lp11o

Name of plot output file:
University_Bent2_Stability7.lp11p

Name of runtime message file:
University_Bent2_Stability7.lp11r


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

               Date:  October 16, 2021           Time:  17:41:52


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 2 Stability7
Job Number:
Client:
Engineer:
Description:


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                           Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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
```

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--------------------------------------------------------------------------------
                    Pile Structural Properties and Geometry
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Number of pile sections defined                        =            2
Total length of pile                                   =      146.360 ft
Depth of ground surface below top of pile              =      21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000           66.0000
  2           26.360           66.0000
  3           26.360           90.0000
  4          146.360           90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    26.360000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      268020. in^4
   Moment of Inertia at Bottom                         =      274567. in^4
   Elastic Modulus                                     =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =   120.000000 ft
   Width of top of section                             =    90.000000 in
   Width of bottom of section                          =    90.000000 in
   Top Area                                            =        6362. sq. in
   Bottom Area                                         =        6362. sq. in
   Moment of Inertia at Top                            =     3220623. in^4
   Moment of Inertia at Bottom                         =     3220623. in^4
   Elastic Modulus                                     =     4371722. psi



--------------------------------------------------------------------------------
                      Ground Slope and Pile Batter Angles
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Ground Slope Angle                                     =        0.000 degrees
                                                       =        0.000 radians

Pile Batter Angle                                      =        0.000 degrees
                                                       =        0.000 radians


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                      Soil and Rock Layering Information
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The soil profile is modelled using 6 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer           =    21.360000 ft
   Distance from top of pile to bottom of layer        =    27.860000 ft
   Effective unit weight at top of layer               =   120.000000 pcf
   Effective unit weight at bottom of layer            =   120.000000 pcf
   Undrained cohesion at top of layer                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000
```

```
Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer           =    27.860000 ft
   Distance from top of pile to bottom of layer        =    32.360000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000


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

   Distance from top of pile to top of layer           =    32.360000 ft
   Distance from top of pile to bottom of layer        =    40.360000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Friction angle at top of layer                      =    30.000000 deg.
   Friction angle at bottom of layer                   =    30.000000 deg.
   Subgrade k at top of layer                          =    60.000000 pci
   Subgrade k at bottom of layer                       =    60.000000 pci


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

   Distance from top of pile to top of layer           =    40.360000 ft
   Distance from top of pile to bottom of layer        =    44.360000 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                      =    36.000000 deg.
   Friction angle at bottom of layer                   =    36.000000 deg.
   Subgrade k at top of layer                          =   125.000000 pci
   Subgrade k at bottom of layer                       =   125.000000 pci


Layer 5 is stiff clay without free water

   Distance from top of pile to top of layer           =    44.360000 ft
   Distance from top of pile to bottom of layer        =    49.360000 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                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer           =    49.360000 ft
   Distance from top of pile to bottom of layer        =   200.000000 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                  =        1800. psf
   Undrained cohesion at bottom of layer               =        1800. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000


 (Depth of the lowest soil layer extends 53.640 ft below the pile tip)



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                        Summary of Input Soil Properties
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Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000

5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of   Equivalent

Layer No.	Layer Below Pile Head ft	Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 875000.0 lbs
Applied moment at pile head = -137424000.0 in-lbs
Axial thrust load on pile head = 673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	8.2826	-1.37E+08	875000.	-0.01055	17117.	1.31E+12	0.00	0.00	0.00
2.0909	7.9848	-1.15E+08	875000.	-0.01297	14362.	1.31E+12	0.00	0.00	0.00
4.1817	7.6317	-9.31E+07	875000.	-0.01496	11613.	1.32E+12	0.00	0.00	0.00
6.2726	7.2339	-7.09E+07	875000.	-0.01653	8871.	1.32E+12	0.00	0.00	0.00
8.3634	6.8024	-4.86E+07	875000.	-0.01766	6136.	1.32E+12	0.00	0.00	0.00
10.4543	6.3477	-2.64E+07	875000.	-0.01837	3410.	1.32E+12	0.00	0.00	0.00
12.5451	5.8804	-4083331.	875000.	-0.01866	693.7254	1.33E+12	0.00	0.00	0.00
14.6360	5.4111	1.82E+07	875000.	-0.01853	2406.	1.33E+12	0.00	0.00	0.00
16.7269	4.9505	4.05E+07	875000.	-0.01798	5101.	1.33E+12	0.00	0.00	0.00
18.8177	4.5091	6.27E+07	875000.	-0.01700	7785.	1.33E+12	0.00	0.00	0.00
20.9086	4.0973	8.49E+07	875000.	-0.01562	10456.	1.34E+12	0.00	0.00	0.00
22.9994	3.7255	1.07E+08	856043.	-0.01381	13113.	1.34E+12	-1511.	10177.	0.00
25.0903	3.4041	1.28E+08	816533.	-0.01161	15642.	1.34E+12	-1638.	12076.	0.00
27.1811	3.1430	1.49E+08	769045.	-0.01027	2181.	1.41E+13	-2147.	17140.	0.00
29.2720	2.8885	1.67E+08	715082.	-0.00999	2443.	1.41E+13	-2154.	18714.	0.00
31.3629	2.6415	1.85E+08	660101.	-0.00968	2687.	1.41E+13	-2228.	21164.	0.00
33.4537	2.4028	2.01E+08	632148.	-0.00934	2911.	1.41E+13	0.00	0.00	0.00
35.5446	2.1730	2.17E+08	632148.	-0.00896	3134.	1.41E+13	0.00	0.00	0.00
37.6354	1.9529	2.33E+08	632148.	-0.00856	3358.	1.41E+13	0.00	0.00	0.00
39.7263	1.7433	2.49E+08	632148.	-0.00813	3582.	1.41E+13	0.00	0.00	0.00
41.8171	1.5448	2.65E+08	519408.	-0.00768	3805.	1.41E+13	-8987.	145965.	0.00
43.9080	1.3581	2.75E+08	291803.	-0.00720	3950.	1.41E+13	-9156.	169160.	0.00
45.9989	1.1837	2.80E+08	138997.	-0.00670	4013.	1.41E+13	-3024.	64107.	0.00
48.0897	1.0218	2.82E+08	63320.	-0.00620	4050.	1.41E+13	-3008.	73862.	0.00
50.1806	0.8725	2.83E+08	-18532.	-0.00570	4061.	1.41E+13	-3517.	101127.	0.00
52.2714	0.7359	2.82E+08	-106261.	-0.00519	4040.	1.41E+13	-3476.	118524.	0.00
54.3623	0.6119	2.78E+08	-192790.	-0.00470	3988.	1.41E+13	-3421.	140285.	0.00
56.4531	0.5003	2.72E+08	-277732.	-0.00421	3907.	1.41E+13	-3350.	168003.	0.00
58.5440	0.4008	2.64E+08	-360663.	-0.00373	3796.	1.41E+13	-3261.	204109.	0.00
60.6349	0.3132	2.54E+08	-441111.	-0.00327	3656.	1.41E+13	-3152.	252491.	0.00
62.7257	0.2369	2.42E+08	-518537.	-0.00282	3488.	1.41E+13	-3020.	319786.	0.00
64.8166	0.1715	2.28E+08	-592296.	-0.00241	3294.	1.41E+13	-2860.	418376.	0.00
66.9074	0.1162	2.12E+08	-661566.	-0.00201	3074.	1.41E+13	-2662.	574571.	0.00
68.9983	0.07050	1.95E+08	-725179.	-0.00165	2831.	1.41E+13	-2409.	857236.	0.00
71.0891	0.03347	1.76E+08	-781099.	-0.00132	2566.	1.41E+13	-2049.	1535848.	0.00
73.1800	0.00431	1.56E+08	-822579.	-0.00102	2284.	1.41E+13	-1258.	7313804.	0.00
75.2709	-0.01787	1.35E+08	-815811.	-7.64E-04	1990.	1.41E+13	1797.	2522955.	0.00
77.3617	-0.03403	1.15E+08	-766781.	-5.42E-04	1712.	1.41E+13	2111.	1556573.	0.00
79.4526	-0.04505	9.64E+07	-711887.	-3.53E-04	1453.	1.41E+13	2265.	1261292.	0.00
81.5434	-0.05176	7.92E+07	-654066.	-1.97E-04	1213.	1.41E+13	2345.	1136585.	0.00
83.6343	-0.05492	6.36E+07	-594801.	-6.95E-05	994.0229	1.41E+13	2380.	1087097.	0.00
85.7251	-0.05524	4.94E+07	-535053.	3.11E-05	795.9703	1.41E+13	2383.	1082328.	0.00
87.8160	-0.05336	3.67E+07	-475519.	1.08E-04	618.8585	1.41E+13	2362.	1110890.	0.00
89.9069	-0.04983	2.55E+07	-416746.	1.63E-04	462.5116	1.41E+13	2322.	1169360.	0.00
91.9977	-0.04516	1.58E+07	-359183.	2.00E-04	326.5821	1.41E+13	2266.	1258902.	0.00
94.0886	-0.03979	7499650.	-303214.	2.21E-04	210.5778	1.41E+13	2195.	1384423.	0.00

96.1794	-0.03408	579089.	-249179.	2.28E-04	113.8806	1.41E+13	2112.	1555017.	0.00
98.2703	-0.02834	-5011975.	-197383.	2.24E-04	175.8189	1.41E+13	2017.	1785573.	0.00
100.3611	-0.02283	-9333252.	-148112.	2.11E-04	236.1977	1.41E+13	1911.	2100072.	0.00
102.4520	-0.01773	-1.25E+07	-101640.	1.92E-04	279.7666	1.41E+13	1794.	2538077.	0.00
104.5429	-0.01319	-1.44E+07	-58238.	1.68E-04	307.5526	1.41E+13	1666.	3168120.	0.00
106.6337	-0.00930	-1.54E+07	-18188.	1.41E-04	320.6791	1.41E+13	1526.	4117985.	0.00
108.7246	-0.00610	-1.54E+07	18192.	1.14E-04	320.3720	1.41E+13	1373.	5653438.	0.00
110.8154	-0.00358	-1.45E+07	50503.	8.75E-05	307.9776	1.41E+13	1202.	8432006.	0.00
112.9063	-0.00171	-1.28E+07	77618.	6.32E-05	285.0034	1.41E+13	959.3109	1.41E+07	0.00
114.9971	-4.07E-04	-1.06E+07	92528.	4.23E-05	253.5857	1.41E+13	229.1520	1.41E+07	0.00
117.0880	4.18E-04	-8184582.	92455.	2.56E-05	220.1480	1.41E+13	-234.9757	1.41E+07	0.00
119.1789	8.77E-04	-5939140.	83319.	1.30E-05	188.7737	1.41E+13	-493.2596	1.41E+07	0.00
121.2697	0.00107	-4004037.	69576.	4.15E-06	161.7355	1.41E+13	-602.1730	1.41E+07	0.00
123.3606	0.00109	-2447895.	54365.	-1.60E-06	139.9924	1.41E+13	-610.3841	1.41E+07	0.00
125.4514	9.90E-04	-1275929.	39719.	-4.92E-06	123.6172	1.41E+13	-557.0302	1.41E+07	0.00
127.5423	8.38E-04	-454589.	26815.	-6.46E-06	112.1410	1.41E+13	-471.5864	1.41E+07	0.00
129.6331	6.66E-04	69892.	16198.	-6.80E-06	106.7659	1.41E+13	-374.7096	1.41E+07	0.00
131.7240	4.97E-04	358482.	7990.	-6.42E-06	110.7982	1.41E+13	-279.5906	1.41E+07	0.00
133.8149	3.44E-04	471052.	2055.	-5.68E-06	112.3711	1.41E+13	-193.4875	1.41E+07	0.00
135.9057	2.12E-04	461804.	-1868.	-4.85E-06	112.2419	1.41E+13	-119.2314	1.41E+07	0.00
137.9966	1.01E-04	377483.	-4074.	-4.10E-06	111.0637	1.41E+13	-56.5898	1.41E+07	0.00
140.0874	6.12E-06	257526.	-4827.	-3.54E-06	109.3876	1.41E+13	-3.4420	1.41E+07	0.00
142.1783	-7.69E-05	135395.	-4328.	-3.19E-06	107.6811	1.41E+13	43.2290	1.41E+07	0.00
144.2691	-1.54E-04	40473.	-2700.	-3.03E-06	106.3548	1.41E+13	86.4948	1.41E+07	0.00
146.3600	-2.29E-04	0.00	0.00	-2.99E-06	105.7893	1.41E+13	128.7427	7056643.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     8.28255120 inches
Computed slope at pile head      =    -0.01055127 radians
Maximum bending moment           =     283038390. inch-lbs
Maximum shear force              =        875000. lbs
Depth of maximum bending moment  =    50.18057143 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             33
Number of zero deflection points =              3
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	875000.	M, in-lb	-1.37E+08	673000.	8.2826	-0.01055	875000.	2.83E+08

Maximum pile-head deflection = 8.2825511968 inches
Maximum pile-head rotation = -0.0105512707 radians = -0.604543 deg.

The analysis ended normally.

==

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent2_Stability8.lp11d

Name of output report file:
University_Bent2_Stability8.lp11o

Name of plot output file:
University_Bent2_Stability8.lp11p

Name of runtime message file:
University_Bent2_Stability8.lp11r


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

               Date:  October 16, 2021           Time:  17:46:37


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                                 Problem Title
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University Ave POC - Bent 2 Stability8
Job Number:
Client:
Engineer:
Description:


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                          Program Options and Settings
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Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =            2
Total length of pile                                   =      156.360 ft
Depth of ground surface below top of pile              =      21.3600 ft
```

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	26.360	66.0000
3	26.360	90.0000
4	156.360	90.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    26.360000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      268020. in^4
   Moment of Inertia at Bottom                         =      274567. in^4
   Elastic Modulus                                     =     4887733. psi
```

Pile Section No. 2:

```
   Section 2 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =   130.000000 ft
   Width of top of section                             =    90.000000 in
   Width of bottom of section                          =    90.000000 in
   Top Area                                            =        6362. sq. in
   Bottom Area                                         =        6362. sq. in
   Moment of Inertia at Top                            =     3220623. in^4
   Moment of Inertia at Bottom                         =     3220623. in^4
   Elastic Modulus                                     =     4371722. psi
```

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 6 layers

Layer 1 is stiff clay without free water

```
   Distance from top of pile to top of layer          =    21.360000 ft
   Distance from top of pile to bottom of layer       =    27.860000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer          =    27.860000 ft
   Distance from top of pile to bottom of layer       =    32.360000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


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

   Distance from top of pile to top of layer          =    32.360000 ft
   Distance from top of pile to bottom of layer       =    40.360000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Friction angle at top of layer                     =    30.000000 deg.
   Friction angle at bottom of layer                  =    30.000000 deg.
   Subgrade k at top of layer                         =    60.000000 pci
   Subgrade k at bottom of layer                      =    60.000000 pci


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

   Distance from top of pile to top of layer          =    40.360000 ft
   Distance from top of pile to bottom of layer       =    44.360000 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                     =    36.000000 deg.
   Friction angle at bottom of layer                  =    36.000000 deg.
   Subgrade k at top of layer                         =   125.000000 pci
   Subgrade k at bottom of layer                      =   125.000000 pci


Layer 5 is stiff clay without free water

   Distance from top of pile to top of layer          =    44.360000 ft
   Distance from top of pile to bottom of layer       =    49.360000 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                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer          =    49.360000 ft
   Distance from top of pile to bottom of layer       =   200.000000 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                 =        1800. psf
   Undrained cohesion at bottom of layer              =        1800. psf
   Epsilon-50 at top of layer                         =     0.005000
   Epsilon-50 at bottom of layer                      =     0.005000

 (Depth of the lowest soil layer extends 43.640 ft below the pile tip)



--------------------------------------------------------------------------------
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------

Layer         Soil Type          Layer      Effective    Undrained    Angle of        E50
Layer           Name             Depth       Unit Wt.    Cohesion     Friction        or            kpy
 Num.     (p-y Curve Type)        ft           pcf          psf         deg.          krm           pci
```

1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 875000. lbs	M = -137424000. in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 875000.0 lbs
Applied moment at pile head = -137424000.0 in-lbs
Axial thrust load on pile head = 673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	8.7880	-1.37E+08	875000.	-0.01078	17117.	1.31E+12	0.00	0.00	0.00
2.2337	8.4613	-1.14E+08	875000.	-0.01335	14174.	1.31E+12	0.00	0.00	0.00
4.4674	8.0722	-9.00E+07	875000.	-0.01543	11237.	1.32E+12	0.00	0.00	0.00
6.7011	7.6340	-6.63E+07	875000.	-0.01702	8308.	1.32E+12	0.00	0.00	0.00
8.9349	7.1596	-4.25E+07	875000.	-0.01813	5388.	1.32E+12	0.00	0.00	0.00
11.1686	6.6621	-1.87E+07	875000.	-0.01875	2479.	1.32E+12	0.00	0.00	0.00
13.4023	6.1544	5072402.	875000.	-0.01889	813.6277	1.33E+12	0.00	0.00	0.00
15.6360	5.6495	2.89E+07	875000.	-0.01855	3700.	1.33E+12	0.00	0.00	0.00
17.8697	5.1601	5.26E+07	875000.	-0.01773	6574.	1.33E+12	0.00	0.00	0.00
20.1034	4.6992	7.64E+07	875000.	-0.01643	9433.	1.33E+12	0.00	0.00	0.00
22.3371	4.2795	1.00E+08	854757.	-0.01466	12278.	1.34E+12	-1510.	9460.	0.00
24.5709	3.9135	1.23E+08	812332.	-0.01242	14976.	1.34E+12	-1655.	11336.	0.00
26.8046	3.6134	1.44E+08	760781.	-0.01106	2120.	1.41E+13	-2191.	16256.	0.00
29.0383	3.3206	1.64E+08	701708.	-0.01077	2397.	1.41E+13	-2216.	17891.	0.00
31.2720	3.0362	1.82E+08	641155.	-0.01044	2651.	1.41E+13	-2302.	20320.	0.00
33.5057	2.7611	1.99E+08	610307.	-0.01007	2882.	1.41E+13	0.00	0.00	0.00
35.7394	2.4962	2.15E+08	610307.	-0.00968	3113.	1.41E+13	0.00	0.00	0.00
37.9731	2.2422	2.32E+08	610307.	-0.00925	3344.	1.41E+13	0.00	0.00	0.00
40.2069	2.0000	2.48E+08	610307.	-0.00880	3575.	1.41E+13	0.00	0.00	0.00
42.4406	1.7706	2.65E+08	481417.	-0.00831	3806.	1.41E+13	-9617.	145592.	0.00
44.6743	1.5546	2.74E+08	310007.	-0.00780	3940.	1.41E+13	-3173.	54703.	0.00
46.9080	1.3526	2.82E+08	225000.	-0.00727	4042.	1.41E+13	-3170.	62822.	0.00
49.1417	1.1650	2.87E+08	140206.	-0.00673	4112.	1.41E+13	-3157.	72627.	0.00
51.3754	0.9921	2.89E+08	48354.	-0.00618	4150.	1.41E+13	-3697.	99882.	0.00
53.6091	0.8339	2.90E+08	-50202.	-0.00563	4151.	1.41E+13	-3657.	117546.	0.00
55.8429	0.6905	2.87E+08	-147463.	-0.00508	4115.	1.41E+13	-3600.	139762.	0.00
58.0766	0.5617	2.82E+08	-242964.	-0.00454	4043.	1.41E+13	-3526.	168238.	0.00
60.3103	0.4473	2.74E+08	-336197.	-0.00401	3936.	1.41E+13	-3431.	205596.	0.00
62.5440	0.3469	2.64E+08	-426598.	-0.00349	3794.	1.41E+13	-3314.	256073.	0.00
64.7777	0.2600	2.51E+08	-513521.	-0.00300	3618.	1.41E+13	-3172.	326988.	0.00
67.0114	0.1859	2.37E+08	-596196.	-0.00254	3410.	1.41E+13	-2997.	432218.	0.00
69.2451	0.1238	2.19E+08	-673637.	-0.00211	3173.	1.41E+13	-2781.	601927.	0.00
71.4789	0.07301	2.00E+08	-744427.	-0.00171	2907.	1.41E+13	-2501.	918224.	0.00
73.7126	0.03240	1.80E+08	-805896.	-0.00134	2616.	1.41E+13	-2086.	1725326.	0.00
75.9463	9.63E-04	1.57E+08	-841109.	-0.00102	2304.	1.41E+13	-541.9005	1.51E+07	0.00
78.1800	-0.02245	1.35E+08	-822872.	-7.45E-04	1986.	1.41E+13	1903.	2272129.	0.00
80.4137	-0.03899	1.13E+08	-768097.	-5.09E-04	1688.	1.41E+13	2184.	1501752.	0.00

82.6474	-0.04975	9.34E+07	-707709.	-3.13E-04	1411.	1.41E+13	2322.	1250823.	0.00
84.8811	-0.05574	7.53E+07	-644584.	-1.52E-04	1158.	1.41E+13	2389.	1148521.	0.00
87.1149	-0.05790	5.89E+07	-580256.	-2.42E-05	928.5848	1.41E+13	2411.	1116357.	0.00
89.3486	-0.05704	4.42E+07	-515743.	7.39E-05	723.3594	1.41E+13	2402.	1128859.	0.00
91.5823	-0.05393	3.12E+07	-451798.	1.46E-04	542.2297	1.41E+13	2369.	1177317.	0.00
93.8160	-0.04923	2.00E+07	-389017.	1.94E-04	384.8663	1.41E+13	2315.	1260695.	0.00
96.0497	-0.04351	1.04E+07	-327895.	2.23E-04	250.7384	1.41E+13	2245.	1383105.	0.00
98.2834	-0.03726	2387142.	-268862.	2.35E-04	139.1436	1.41E+13	2160.	1553739.	0.00
100.5171	-0.03088	-4048025.	-212299.	2.34E-04	162.3502	1.41E+13	2061.	1788484.	0.00
102.7509	-0.02472	-9002459.	-158558.	2.21E-04	231.5757	1.41E+13	1949.	2113645.	0.00
104.9846	-0.01901	-1.26E+07	-107972.	2.01E-04	281.2298	1.41E+13	1825.	2573610.	0.00
107.2183	-0.01394	-1.48E+07	-60869.	1.75E-04	312.5536	1.41E+13	1689.	3247098.	0.00
109.4520	-0.00963	-1.58E+07	-17590.	1.46E-04	326.9122	1.41E+13	1540.	4285218.	0.00
111.6857	-0.00613	-1.57E+07	21484.	1.16E-04	325.8028	1.41E+13	1375.	6015036.	0.00
113.9194	-0.00343	-1.47E+07	55862.	8.68E-05	310.8776	1.41E+13	1190.	9298490.	0.00
116.1531	-0.00148	-1.28E+07	82948.	6.07E-05	284.0031	1.41E+13	831.3899	1.51E+07	0.00
118.3869	-1.78E-04	-1.02E+07	95430.	3.88E-05	248.7762	1.41E+13	99.9685	1.51E+07	0.00
120.6206	6.00E-04	-7640138.	92244.	2.18E-05	212.5408	1.41E+13	-337.7072	1.51E+07	0.00
122.8543	9.89E-04	-5289165.	80265.	9.45E-06	179.6919	1.41E+13	-556.0777	1.51E+07	0.00
125.0880	0.00111	-3337544.	64468.	1.24E-06	152.4230	1.41E+13	-622.6261	1.51E+07	0.00
127.3217	0.00105	-1833156.	48170.	-3.69E-06	131.4030	1.41E+13	-593.3724	1.51E+07	0.00
129.5554	9.09E-04	-755034.	33363.	-6.15E-06	116.3390	1.41E+13	-511.4992	1.51E+07	0.00
131.7891	7.25E-04	-44391.	21040.	-6.91E-06	106.4096	1.41E+13	-407.9532	1.51E+07	0.00
134.0229	5.39E-04	373145.	11510.	-6.60E-06	111.0031	1.41E+13	-303.1329	1.51E+07	0.00
136.2566	3.72E-04	572872.	4646.	-5.70E-06	113.7938	1.41E+13	-209.0236	1.51E+07	0.00
138.4903	2.34E-04	622399.	83.7455	-4.56E-06	114.4858	1.41E+13	-131.3582	1.51E+07	0.00
140.7240	1.27E-04	577526.	-2636.	-3.42E-06	113.8588	1.41E+13	-71.5583	1.51E+07	0.00
142.9577	5.04E-05	481220.	-3975.	-2.41E-06	112.5132	1.41E+13	-28.3360	1.51E+07	0.00
145.1914	-1.91E-06	364538.	-4340.	-1.60E-06	110.8828	1.41E+13	1.0732	1.51E+07	0.00
147.4251	-3.56E-05	248614.	-4057.	-1.02E-06	109.2631	1.41E+13	20.0186	1.51E+07	0.00
149.6589	-5.66E-05	147065.	-3362.	-6.43E-07	107.8442	1.41E+13	31.8277	1.51E+07	0.00
151.8926	-7.01E-05	68379.	-2408.	-4.38E-07	106.7448	1.41E+13	39.4153	1.51E+07	0.00
154.1263	-8.01E-05	18009.	-1276.	-3.56E-07	106.0410	1.41E+13	45.0403	1.51E+07	0.00
156.3600	-8.92E-05	0.00	0.00	-3.39E-07	105.7893	1.41E+13	50.1482	7538786.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     8.78797997 inches
Computed slope at pile head      =    -0.01078182 radians
Maximum bending moment           =     289534168. inch-lbs
Maximum shear force              =        875000. lbs
Depth of maximum bending moment  =    53.60914286 feet below pile head
Depth of maximum shear force     =     2.23371429 feet below pile head
Number of iterations             =             28
Number of zero deflection points =              3
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	875000.	M, in-lb	-1.37E+08	673000.	8.7880	-0.01078	875000.	2.90E+08

Maximum pile-head deflection = 8.7879799681 inches
Maximum pile-head rotation = -0.0107818166 radians = -0.617753 deg.

The analysis ended normally.

==

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile\

Name of input data file:
University_Bent2_Transverse.lp11d

Name of output report file:
University_Bent2_Transverse.lp11o

Name of plot output file:
University_Bent2_Transverse.lp11p

Name of runtime message file:
University_Bent2_Transverse.lp11r

Date and Time of Analysis

Date: October 16, 2021   Time: 16:14:20

Problem Title

University Ave POC - Bent 2 Transverse
Job Number:
Client:
Engineer:
Description:

Program Options and Settings

Computational Options:
 - 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   =   100
 - Deflection tolerance for convergence   =   1.0000E-05 in
 - Maximum allowable deflection   =   100.0000 in
 - Number of pile increments   =   70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =            2
Total length of pile                                   =      146.360 ft
Depth of ground surface below top of pile              =      21.3600 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1             0.000          66.0000
  2            26.360          66.0000
  3            26.360          90.0000
  4           146.360          90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    26.360000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      268020. in^4
   Moment of Inertia at Bottom                         =      274567. in^4
   Elastic Modulus                                     =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =   120.000000 ft
   Width of top of section                             =    90.000000 in
   Width of bottom of section                          =    90.000000 in
   Top Area                                            =        6362. sq. in
   Bottom Area                                         =        6362. sq. in
   Moment of Inertia at Top                            =     3220623. in^4
   Moment of Inertia at Bottom                         =     3220623. in^4
   Elastic Modulus                                     =     4371722. psi



--------------------------------------------------------------------------------
                       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 6 layers

Layer 1 is stiff clay without free water

   Distance from top of pile to top of layer           =    21.360000 ft
   Distance from top of pile to bottom of layer        =    27.860000 ft
   Effective unit weight at top of layer               =   120.000000 pcf
   Effective unit weight at bottom of layer            =   120.000000 pcf
   Undrained cohesion at top of layer                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer           =    27.860000 ft
   Distance from top of pile to bottom of layer        =    32.360000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Undrained cohesion at top of layer                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000


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

   Distance from top of pile to top of layer           =    32.360000 ft
   Distance from top of pile to bottom of layer        =    40.360000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
   Friction angle at top of layer                      =    30.000000 deg.
   Friction angle at bottom of layer                   =    30.000000 deg.
   Subgrade k at top of layer                          =    60.000000 pci
   Subgrade k at bottom of layer                       =    60.000000 pci


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

   Distance from top of pile to top of layer           =    40.360000 ft
   Distance from top of pile to bottom of layer        =    44.360000 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                      =    36.000000 deg.
   Friction angle at bottom of layer                   =    36.000000 deg.
   Subgrade k at top of layer                          =   125.000000 pci
   Subgrade k at bottom of layer                       =   125.000000 pci


Layer 5 is stiff clay without free water

   Distance from top of pile to top of layer           =    44.360000 ft
   Distance from top of pile to bottom of layer        =    49.360000 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                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer           =    49.360000 ft
   Distance from top of pile to bottom of layer        =   200.000000 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                  =        1800. psf
   Undrained cohesion at bottom of layer               =        1800. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000

 (Depth of the lowest soil layer extends 53.640 ft below the pile tip)
```

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Stiff Clay	21.3600	120.0000	1500.	--	0.00700	--
	w/o Free Water	27.8600	120.0000	1500.	--	0.00700	--
2	Stiff Clay	27.8600	57.6000	1500.	--	0.00700	--
	w/o Free Water	32.3600	57.6000	1500.	--	0.00700	--
3	Sand	32.3600	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	40.3600	57.6000	--	30.0000	--	60.0000
4	Sand	40.3600	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	44.3600	65.6000	--	36.0000	--	125.0000
5	Stiff Clay	44.3600	62.6000	1500.	--	0.00700	--
	w/o Free Water	49.3600	62.6000	1500.	--	0.00700	--
6	Stiff Clay	49.3600	62.6000	1800.	--	0.00500	--
	w/o Free Water	200.0000	62.6000	1800.	--	0.00500	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 7 points

Point No.	Depth X ft	p-mult	y-mult
1	21.360	1.0000	1.0000
2	27.860	1.0000	1.0000
3	32.360	1.0000	1.0000
4	32.360	0.0000	1.0000
5	40.360	0.0000	1.0000
6	40.360	1.0000	1.0000
7	200.000	1.0000	1.0000

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	Run Analysis
1	1	V = 440000. lbs	M = 0.0000 in-lbs	673000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.3600	0.00	N.A.	No	0.00	206622.
2	27.8600	5.4074	Yes	No	206622.	204545.
3	32.3600	11.1326	No	No	411167.	724701.
4	40.3600	16.3416	Yes	No	1135868.	615503.
5	44.3600	31.9097	No	No	1751372.	395003.
6	49.3600	33.1932	Yes	No	2146375.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 440000.0 lbs
Applied moment at pile head = 0.0 in-lbs
Axial thrust load on pile head = 673000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	6.9262	1.66E-05	440000.	-0.02281	196.7152	1.31E+12	0.00	0.00	0.00
2.0909	6.3539	1.14E+07	440000.	-0.02270	1601.	1.31E+12	0.00	0.00	0.00
4.1817	5.7872	2.28E+07	440000.	-0.02237	2999.	1.32E+12	0.00	0.00	0.00
6.2726	5.2314	3.43E+07	440000.	-0.02183	4391.	1.32E+12	0.00	0.00	0.00
8.3634	4.6920	4.57E+07	440000.	-0.02107	5776.	1.32E+12	0.00	0.00	0.00
10.4543	4.1744	5.71E+07	440000.	-0.02009	7154.	1.32E+12	0.00	0.00	0.00
12.5451	3.6839	6.84E+07	440000.	-0.01890	8525.	1.33E+12	0.00	0.00	0.00
14.6360	3.2259	7.98E+07	440000.	-0.01750	9887.	1.33E+12	0.00	0.00	0.00
16.7269	2.8057	9.11E+07	440000.	-0.01589	11242.	1.33E+12	0.00	0.00	0.00
18.8177	2.4286	1.02E+08	440000.	-0.01406	12587.	1.33E+12	0.00	0.00	0.00
20.9086	2.0999	1.14E+08	440000.	-0.01203	13924.	1.34E+12	0.00	0.00	0.00
22.9994	1.8248	1.25E+08	424141.	-0.00979	15251.	1.34E+12	-1264.	17382.	0.00
25.0903	1.6085	1.35E+08	391241.	-0.00736	16472.	1.34E+12	-1358.	21189.	0.00
27.1811	1.4556	1.45E+08	351981.	-0.00596	2128.	1.41E+13	-1771.	30530.	0.00
29.2720	1.3092	1.53E+08	307584.	-0.00570	2245.	1.41E+13	-1768.	33878.	0.00
31.3629	1.1697	1.60E+08	262604.	-0.00542	2347.	1.41E+13	-1818.	38989.	0.00
33.4537	1.0374	1.66E+08	239801.	-0.00513	2432.	1.41E+13	0.00	0.00	0.00
35.5446	0.9124	1.73E+08	239801.	-0.00482	2517.	1.41E+13	0.00	0.00	0.00
37.6354	0.7952	1.79E+08	239801.	-0.00451	2602.	1.41E+13	0.00	0.00	0.00
39.7263	0.6860	1.85E+08	239801.	-0.00419	2687.	1.41E+13	0.00	0.00	0.00
41.8171	0.5851	1.91E+08	158712.	-0.00385	2773.	1.41E+13	-6464.	277186.	0.00
43.9080	0.4927	1.93E+08	-2318.	-0.00351	2801.	1.41E+13	-6372.	324517.	0.00
45.9989	0.4089	1.91E+08	-111347.	-0.00317	2773.	1.41E+13	-2319.	142275.	0.00
48.0897	0.3336	1.87E+08	-168959.	-0.00283	2724.	1.41E+13	-2274.	170998.	0.00
50.1806	0.2668	1.82E+08	-230290.	-0.00250	2655.	1.41E+13	-2615.	245962.	0.00
52.2714	0.2080	1.76E+08	-294896.	-0.00218	2564.	1.41E+13	-2535.	305719.	0.00
54.3623	0.1572	1.68E+08	-357251.	-0.00188	2450.	1.41E+13	-2436.	388786.	0.00
56.4531	0.1138	1.58E+08	-416830.	-0.00159	2314.	1.41E+13	-2314.	509968.	0.00

58.5440	0.07754	1.47E+08	-472985.	-0.00132	2158.	1.41E+13	-2163.	699757.	0.00
60.6349	0.04782	1.34E+08	-524833.	-0.00106	1983.	1.41E+13	-1970.	1033743.	0.00
62.7257	0.02411	1.21E+08	-570950.	-8.38E-04	1791.	1.41E+13	-1706.	1775044.	0.00
64.8166	0.00579	1.06E+08	-607733.	-6.36E-04	1583.	1.41E+13	-1226.	5312911.	0.00
66.9074	-0.00780	9.01E+07	-606122.	-4.61E-04	1365.	1.41E+13	1355.	4356491.	0.00
68.9983	-0.01736	7.53E+07	-567844.	-3.14E-04	1158.	1.41E+13	1697.	2451482.	0.00
71.0891	-0.02356	6.16E+07	-523020.	-1.92E-04	966.8815	1.41E+13	1876.	1998292.	0.00
73.1800	-0.02700	4.91E+07	-474538.	-9.33E-05	791.8095	1.41E+13	1988.	1847661.	0.00
75.2709	-0.02824	3.78E+07	-424316.	-1.59E-05	634.2053	1.41E+13	2015.	1790094.	0.00
77.3617	-0.02780	2.78E+07	-373859.	4.26E-05	494.3094	1.41E+13	2007.	1811636.	0.00
79.4526	-0.02611	1.91E+07	-323893.	8.43E-05	372.0557	1.41E+13	1976.	1898903.	0.00
81.5434	-0.02356	1.16E+07	-274946.	1.12E-04	267.1732	1.41E+13	1926.	2050554.	0.00
83.6343	-0.02051	5255794.	-227451.	1.27E-04	179.2256	1.41E+13	1860.	2275902.	0.00
85.7251	-0.01721	132238.	-181781.	1.31E-04	107.6370	1.41E+13	1780.	2595253.	0.00
87.8160	-0.01391	-3870512.	-138267.	1.28E-04	159.8699	1.41E+13	1688.	3044337.	0.00
89.9069	-0.01079	-6810407.	-97216.	1.19E-04	200.9474	1.41E+13	1584.	3684591.	0.00
91.9977	-0.00797	-8752873.	-58922.	1.05E-04	228.0884	1.41E+13	1468.	4625582.	0.00
94.0886	-0.00553	-9770666.	-23681.	8.82E-05	242.3095	1.41E+13	1341.	6077698.	0.00
96.1794	-0.00354	-9944175.	8180.	7.06E-05	244.7338	1.41E+13	1199.	8495753.	0.00
98.2703	-0.00199	-9362564.	36249.	5.34E-05	236.6073	1.41E+13	1038.	1.31E+07	0.00
100.3611	-8.62E-04	-8126966.	55358.	3.78E-05	219.3430	1.41E+13	484.7402	1.41E+07	0.00
102.4520	-9.48E-05	-6585969.	62107.	2.47E-05	197.8115	1.41E+13	53.3093	1.41E+07	0.00
104.5429	3.78E-04	-5011214.	60111.	1.44E-05	175.8083	1.41E+13	-212.4832	1.41E+07	0.00
106.6337	6.26E-04	-3570071.	53026.	6.72E-06	155.6720	1.41E+13	-352.2427	1.41E+07	0.00
108.7246	7.15E-04	-2350566.	43561.	1.45E-06	138.6325	1.41E+13	-402.2143	1.41E+07	0.00
110.8154	6.99E-04	-1384193.	33584.	-1.88E-06	125.1299	1.41E+13	-393.0686	1.41E+07	0.00
112.9063	6.21E-04	-665223.	24274.	-3.71E-06	115.0841	1.41E+13	-349.1102	1.41E+07	0.00
114.9971	5.13E-04	-166007.	16276.	-4.45E-06	108.1089	1.41E+13	-288.4214	1.41E+07	0.00
117.0880	3.97E-04	151647.	9853.	-4.46E-06	107.9082	1.41E+13	-223.5574	1.41E+07	0.00
119.1789	2.89E-04	328562.	5010.	-4.03E-06	110.3802	1.41E+13	-162.5074	1.41E+07	0.00
121.2697	1.95E-04	403165.	1594.	-3.38E-06	111.4225	1.41E+13	-109.7208	1.41E+07	0.00
123.3606	1.19E-04	408684.	-623.5134	-2.66E-06	111.4997	1.41E+13	-67.0739	1.41E+07	0.00
125.4514	6.17E-05	371967.	-1900.	-1.96E-06	110.9866	1.41E+13	-34.7054	1.41E+07	0.00
127.5423	2.08E-05	313390.	-2482.	-1.35E-06	110.1682	1.41E+13	-11.6920	1.41E+07	0.00
129.6331	-6.11E-06	247443.	-2586.	-8.52E-07	109.2467	1.41E+13	3.4396	1.41E+07	0.00
131.7240	-2.20E-05	183655.	-2388.	-4.68E-07	108.3554	1.41E+13	12.3480	1.41E+07	0.00
133.8149	-2.96E-05	127634.	-2024.	-1.90E-07	107.5727	1.41E+13	16.6374	1.41E+07	0.00
135.9057	-3.15E-05	82083.	-1593.	-3.34E-09	106.9362	1.41E+13	17.7168	1.41E+07	0.00
137.9966	-2.97E-05	47683.	-1161.	1.12E-07	106.4556	1.41E+13	16.7317	1.41E+07	0.00
140.0874	-2.59E-05	23814.	-768.7128	1.76E-07	106.1221	1.41E+13	14.5475	1.41E+07	0.00
142.1783	-2.09E-05	9102.	-438.6269	2.05E-07	105.9165	1.41E+13	11.7643	1.41E+07	0.00
144.2691	-1.56E-05	1796.	-181.2431	2.15E-07	105.8144	1.41E+13	8.7523	1.41E+07	0.00
146.3600	-1.01E-05	0.00	0.00	2.17E-07	105.7893	1.41E+13	5.6950	7056643.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     6.92615139 inches
Computed slope at pile head      =    -0.02280628 radians
Maximum bending moment           =     192865159. inch-lbs
Maximum shear force              =        -607733. lbs
Depth of maximum bending moment  =    43.90800000 feet below pile head
Depth of maximum shear force     =    64.81657143 feet below pile head
Number of iterations             =             31
Number of zero deflection points =              3
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	440000.	M, in-lb	0.00	673000.	6.9262	-0.02281	-607733.	1.93E+08

Maximum pile-head deflection = 6.9261513947 inches
Maximum pile-head rotation = -0.0228062842 radians = -1.306704 deg.

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

                    LPile for Windows, Version 2019-11.008

                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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent3_Stability1.lp11d

Name of output report file:
University_Bent3_Stability1.lp11o

Name of plot output file:
University_Bent3_Stability1.lp11p

Name of runtime message file:
University_Bent3_Stability1.lp11r


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

               Date:  October 16, 2021           Time:  17:51:19


-------------------------------------------------------------------------------
                                  Problem Title
-------------------------------------------------------------------------------

University Ave POC - Bent 3 Stability1
Job Number:
Client:
Engineer:
Description:


-------------------------------------------------------------------------------
                          Program Options and Settings
-------------------------------------------------------------------------------

Computational Options:
 - 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                =           100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =            70

Loading Type and Number of Cycles of Loading:
```

- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- 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
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile 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	=	2
Total length of pile	=	83.040 ft
Depth of ground surface below top of pile	=	21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	23.040	66.0000
3	23.040	90.0000
4	83.040	90.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	23.040000 ft
Width of top of section	=	66.000000 in
Width of bottom of section	=	66.000000 in
Top Area	=	3421. sq. in
Bottom Area	=	3421. sq. in
Moment of Inertia at Top	=	215643. in^4
Moment of Inertia at Bottom	=	222190. in^4
Elastic Modulus	=	4887733. psi

Pile Section No. 2:

Section 2 is an elastic pile

Cross-sectional Shape	=	Circular Pile
Length of section	=	60.000000 ft
Width of top of section	=	90.000000 in
Width of bottom of section	=	90.000000 in
Top Area	=	6362. sq. in
Bottom Area	=	6362. sq. in
Moment of Inertia at Top	=	3220623. in^4
Moment of Inertia at Bottom	=	3220623. in^4
Elastic Modulus	=	4371722. psi

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

   Distance from top of pile to top of layer          =    21.040000 ft
   Distance from top of pile to bottom of layer       =    25.040000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 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                         =    90.000000 pci
   Subgrade k at bottom of layer                      =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer          =    25.040000 ft
   Distance from top of pile to bottom of layer       =    33.540000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer          =    33.540000 ft
   Distance from top of pile to bottom of layer       =    38.040000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


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

   Distance from top of pile to top of layer          =    38.040000 ft
   Distance from top of pile to bottom of layer       =    46.040000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Friction angle at top of layer                     =    30.000000 deg.
   Friction angle at bottom of layer                  =    30.000000 deg.
   Subgrade k at top of layer                         =    60.000000 pci
   Subgrade k at bottom of layer                      =    60.000000 pci


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

   Distance from top of pile to top of layer          =    46.040000 ft
   Distance from top of pile to bottom of layer       =    50.040000 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                     =    36.000000 deg.
   Friction angle at bottom of layer                  =    36.000000 deg.
   Subgrade k at top of layer                         =   125.000000 pci
   Subgrade k at bottom of layer                      =   125.000000 pci


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer          =    50.040000 ft
   Distance from top of pile to bottom of layer       =    55.040000 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                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
```

Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 55.040000 ft
Distance from top of pile to bottom of layer = 150.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 66.960 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis

----- ---- ------------------- ---------------------- ---------------- --------------- ----------
--

1	1	V =	764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

----
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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 764000.0 lbs
Applied moment at pile head = -104928000.0 in-lbs
Axial thrust load on pile head = 742000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	10.5742	-1.05E+08	764000.	-0.01457	16274.	1.05E+12	0.00	0.00	0.00
1.1863	10.3567	-9.39E+07	764000.	-0.01591	14563.	1.05E+12	0.00	0.00	0.00
2.3726	10.1212	-8.28E+07	764000.	-0.01710	12855.	1.06E+12	0.00	0.00	0.00
3.5589	9.8698	-7.18E+07	764000.	-0.01814	11150.	1.06E+12	0.00	0.00	0.00
4.7451	9.6047	-6.07E+07	764000.	-0.01903	9449.	1.06E+12	0.00	0.00	0.00
5.9314	9.3280	-4.96E+07	764000.	-0.01977	7752.	1.06E+12	0.00	0.00	0.00

7.1177	9.0418	-3.85E+07	764000.	-0.02036	6060.	1.06E+12	0.00	0.00	0.00
8.3040	8.7482	-2.74E+07	764000.	-0.02080	4371.	1.07E+12	0.00	0.00	0.00
9.4903	8.4495	-1.63E+07	764000.	-0.02110	2687.	1.07E+12	0.00	0.00	0.00
10.6766	8.1476	-5244684.	764000.	-0.02124	1008.	1.07E+12	0.00	0.00	0.00
11.8629	7.8448	5855900.	764000.	-0.02124	1099.	1.07E+12	0.00	0.00	0.00
13.0491	7.5430	1.70E+07	764000.	-0.02108	2768.	1.07E+12	0.00	0.00	0.00
14.2354	7.2445	2.81E+07	764000.	-0.02079	4431.	1.07E+12	0.00	0.00	0.00
15.4217	6.9512	3.91E+07	764000.	-0.02034	6089.	1.08E+12	0.00	0.00	0.00
16.6080	6.6654	5.02E+07	764000.	-0.01975	7740.	1.08E+12	0.00	0.00	0.00
17.7943	6.3889	6.13E+07	764000.	-0.01901	9386.	1.08E+12	0.00	0.00	0.00
18.9806	6.1241	7.24E+07	764000.	-0.01813	11025.	1.08E+12	0.00	0.00	0.00
20.1669	5.8727	8.35E+07	764000.	-0.01711	12657.	1.08E+12	0.00	0.00	0.00
21.3531	5.6370	9.45E+07	762834.	-0.01594	14283.	1.08E+12	-163.8317	413.7297	0.00
22.5394	5.4190	1.06E+08	755477.	-0.01462	15897.	1.09E+12	-869.7341	2285.	0.00
23.7257	5.2207	1.16E+08	733649.	-0.01387	1742.	1.41E+13	-2197.	5990.	0.00
24.9120	5.0241	1.27E+08	694246.	-0.01375	1887.	1.41E+13	-3339.	9461.	0.00
26.0983	4.8293	1.36E+08	655214.	-0.01362	2022.	1.41E+13	-2145.	6322.	0.00
27.2846	4.6364	1.46E+08	624075.	-0.01347	2151.	1.41E+13	-2230.	6847.	0.00
28.4709	4.4456	1.54E+08	591745.	-0.01332	2274.	1.41E+13	-2312.	7404.	0.00
29.6571	4.2571	1.63E+08	558261.	-0.01316	2391.	1.41E+13	-2392.	7999.	0.00
30.8434	4.0709	1.71E+08	523663.	-0.01299	2500.	1.41E+13	-2469.	8633.	0.00
32.0297	3.8872	1.78E+08	487992.	-0.01282	2603.	1.41E+13	-2543.	9312.	0.00
33.2160	3.7060	1.85E+08	451291.	-0.01263	2698.	1.41E+13	-2614.	10039.	0.00
34.4023	3.5275	1.91E+08	413730.	-0.01244	2786.	1.41E+13	-2664.	10749.	0.00
35.5886	3.3517	1.97E+08	375525.	-0.01225	2867.	1.41E+13	-2704.	11484.	0.00
36.7749	3.1788	2.02E+08	336770.	-0.01205	2939.	1.41E+13	-2741.	12274.	0.00
37.9611	3.0087	2.07E+08	297513.	-0.01184	3004.	1.41E+13	-2775.	13128.	0.00
39.1474	2.8417	2.11E+08	277764.	-0.01163	3061.	1.41E+13	0.00	0.00	0.00
40.3337	2.6777	2.15E+08	277764.	-0.01141	3118.	1.41E+13	0.00	0.00	0.00
41.5200	2.5167	2.19E+08	277764.	-0.01119	3175.	1.41E+13	0.00	0.00	0.00
42.7063	2.3590	2.23E+08	277764.	-0.01097	3232.	1.41E+13	0.00	0.00	0.00
43.8926	2.2044	2.27E+08	277764.	-0.01074	3289.	1.41E+13	0.00	0.00	0.00
45.0789	2.0531	2.31E+08	277764.	-0.01051	3345.	1.41E+13	0.00	0.00	0.00
46.2651	1.9051	2.35E+08	196862.	-0.01028	3402.	1.41E+13	-11366.	84930.	0.00
47.4514	1.7605	2.37E+08	34536.	-0.01004	3427.	1.41E+13	-11440.	92500.	0.00
48.6377	1.6193	2.36E+08	-128154.	-0.00980	3419.	1.41E+13	-11417.	100369.	0.00
49.8240	1.4816	2.33E+08	-289648.	-0.00956	3379.	1.41E+13	-11272.	108302.	0.00
51.0103	1.3471	2.28E+08	-395313.	-0.00933	3307.	1.41E+13	-3574.	37766.	0.00
52.1966	1.2160	2.22E+08	-445931.	-0.00910	3224.	1.41E+13	-3538.	41413.	0.00
53.3829	1.0881	2.16E+08	-495975.	-0.00888	3132.	1.41E+13	-3493.	45704.	0.00
54.5691	0.9632	2.08E+08	-545323.	-0.00866	3029.	1.41E+13	-3440.	50835.	0.00
55.7554	0.8414	2.00E+08	-597965.	-0.00846	2917.	1.41E+13	-3956.	66932.	0.00
56.9417	0.7225	1.92E+08	-653654.	-0.00826	2794.	1.41E+13	-3868.	76210.	0.00
58.1280	0.6063	1.82E+08	-707940.	-0.00807	2660.	1.41E+13	-3759.	88259.	0.00
59.3143	0.4927	1.72E+08	-760485.	-0.00789	2515.	1.41E+13	-3623.	104680.	0.00
60.5006	0.3816	1.61E+08	-810830.	-0.00772	2360.	1.41E+13	-3450.	128689.	0.00
61.6869	0.2729	1.49E+08	-858300.	-0.00757	2195.	1.41E+13	-3219.	167958.	0.00
62.8731	0.1662	1.36E+08	-901752.	-0.00742	2020.	1.41E+13	-2885.	247136.	0.00
64.0594	0.06153	1.23E+08	-938540.	-0.00729	1838.	1.41E+13	-2283.	528231.	0.00
65.2457	-0.04138	1.10E+08	-939865.	-0.00717	1649.	1.41E+13	2097.	721319.	0.00
66.4320	-0.1427	9.66E+07	-904317.	-0.00707	1466.	1.41E+13	2897.	289015.	0.00
67.6183	-0.2427	8.41E+07	-859819.	-0.00698	1292.	1.41E+13	3354.	196780.	0.00
68.8046	-0.3414	7.23E+07	-809589.	-0.00690	1126.	1.41E+13	3703.	154405.	0.00
69.9909	-0.4391	6.12E+07	-754789.	-0.00683	971.5426	1.41E+13	3996.	129566.	0.00
71.1771	-0.5359	5.09E+07	-696409.	-0.00677	828.0735	1.41E+13	4206.	111724.	0.00
72.3634	-0.6320	4.15E+07	-635279.	-0.00673	696.5053	1.41E+13	4383.	98726.	0.00
73.5497	-0.7274	3.30E+07	-571771.	-0.00669	577.3407	1.41E+13	4540.	88839.	0.00
74.7360	-0.8224	2.54E+07	-506140.	-0.00666	471.0253	1.41E+13	4681.	81025.	0.00
75.9223	-0.9171	1.87E+07	-438582.	-0.00664	377.9606	1.41E+13	4810.	74670.	0.00
77.1086	-1.0114	1.30E+07	-369255.	-0.00662	298.5137	1.41E+13	4930.	69381.	0.00
78.2949	-1.1056	8329781.	-298290.	-0.00661	233.0229	1.41E+13	5041.	64899.	0.00
79.4811	-1.1997	4664018.	-225795.	-0.00661	181.8032	1.41E+13	5145.	61044.	0.00
80.6674	-1.2937	2040729.	-151864.	-0.00660	145.1495	1.41E+13	5242.	57687.	0.00
81.8537	-1.3877	479788.	-76575.	-0.00660	123.3393	1.41E+13	5335.	54732.	0.00
83.0400	-1.4816	0.00	0.00	-0.00660	116.6355	1.41E+13	5423.	26054.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection              =    10.57417433 inches
Computed slope at pile head       =    -0.01456746 radians
Maximum bending moment            =     236904614. inch-lbs
Maximum shear force               =       -939865. lbs
Depth of maximum bending moment   =    47.45142857 feet below pile head
Depth of maximum shear force      =    65.24571429 feet below pile head
Number of iterations              =             50
Number of zero deflection points  =              1
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	764000.	M, in-lb	-1.05E+08	742000.	10.5742	-0.01457	-939865.	2.37E+08

Maximum pile-head deflection = 10.5741743313 inches
Maximum pile-head rotation = -0.0145674637 radians = -0.834654 deg.

The analysis ended normally.

===

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent3_Stability2.lp11d

Name of output report file:
University_Bent3_Stability2.lp11o

Name of plot output file:
University_Bent3_Stability2.lp11p

Name of runtime message file:
University_Bent3_Stability2.lp11r

Date and Time of Analysis

Date: October 16, 2021 Time: 17:52:12

Problem Title

University Ave POC - Bent 3 Stability2
Job Number:
Client:
Engineer:
Description:

Program Options and Settings

Computational Options:
- 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 = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 70

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Analysis uses p-y modification factors for p-y curves
- 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
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile 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 = 2
Total length of pile = 93.040 ft
Depth of ground surface below top of pile = 21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	23.040	66.0000
3	23.040	90.0000
4	93.040	90.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is an elastic pile
Cross-sectional Shape = Circular Pile
Length of section = 23.040000 ft
Width of top of section = 66.000000 in
Width of bottom of section = 66.000000 in
Top Area = 3421. sq. in

```
   Bottom Area                                       =        3421. sq. in
   Moment of Inertia at Top                          =      215643. in^4
   Moment of Inertia at Bottom                       =      222190. in^4
   Elastic Modulus                                   =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                             =   Circular Pile
   Length of section                                 =    70.000000 ft
   Width of top of section                           =    90.000000 in
   Width of bottom of section                        =    90.000000 in
   Top Area                                          =        6362. sq. in
   Bottom Area                                       =        6362. sq. in
   Moment of Inertia at Top                          =     3220623. in^4
   Moment of Inertia at Bottom                       =     3220623. in^4
   Elastic Modulus                                   =     4371722. psi



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

   Distance from top of pile to top of layer         =    21.040000 ft
   Distance from top of pile to bottom of layer      =    25.040000 ft
   Effective unit weight at top of layer             =   120.000000 pcf
   Effective unit weight at bottom of layer          =   120.000000 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                        =    90.000000 pci
   Subgrade k at bottom of layer                     =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer         =    25.040000 ft
   Distance from top of pile to bottom of layer      =    33.540000 ft
   Effective unit weight at top of layer             =   120.000000 pcf
   Effective unit weight at bottom of layer          =   120.000000 pcf
   Undrained cohesion at top of layer                =        1500. psf
   Undrained cohesion at bottom of layer             =        1500. psf
   Epsilon-50 at top of layer                        =     0.007000
   Epsilon-50 at bottom of layer                     =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer         =    33.540000 ft
   Distance from top of pile to bottom of layer      =    38.040000 ft
   Effective unit weight at top of layer             =    57.600000 pcf
   Effective unit weight at bottom of layer          =    57.600000 pcf
   Undrained cohesion at top of layer                =        1500. psf
   Undrained cohesion at bottom of layer             =        1500. psf
   Epsilon-50 at top of layer                        =     0.007000
   Epsilon-50 at bottom of layer                     =     0.007000


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

   Distance from top of pile to top of layer         =    38.040000 ft
   Distance from top of pile to bottom of layer      =    46.040000 ft
   Effective unit weight at top of layer             =    57.600000 pcf
   Effective unit weight at bottom of layer          =    57.600000 pcf
   Friction angle at top of layer                    =    30.000000 deg.
   Friction angle at bottom of layer                 =    30.000000 deg.
```

```
   Subgrade k at top of layer                          =    60.000000 pci
   Subgrade k at bottom of layer                       =    60.000000 pci


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

   Distance from top of pile to top of layer           =    46.040000 ft
   Distance from top of pile to bottom of layer        =    50.040000 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                      =    36.000000 deg.
   Friction angle at bottom of layer                   =    36.000000 deg.
   Subgrade k at top of layer                          =   125.000000 pci
   Subgrade k at bottom of layer                       =   125.000000 pci


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer           =    50.040000 ft
   Distance from top of pile to bottom of layer        =    55.040000 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                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000


Layer 7 is stiff clay without free water

   Distance from top of pile to top of layer           =    55.040000 ft
   Distance from top of pile to bottom of layer        =   150.000000 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                  =        1800. psf
   Undrained cohesion at bottom of layer               =        1800. psf
   Epsilon-50 at top of layer                          =     0.005000
   Epsilon-50 at bottom of layer                       =     0.005000

 (Depth of the lowest soil layer extends 56.960 ft below the pile tip)



--------------------------------------------------------------------------------
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------
```

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

```
--------------------------------------------------------------------------------
                    p-y Modification Factors for Group Action
--------------------------------------------------------------------------------

Distribution of p-y modifiers with depth defined using 8 points
```

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000

6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 764000.0 lbs
Applied moment at pile head = -104928000.0 in-lbs
Axial thrust load on pile head = 742000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	7.7983	-1.05E+08	764000.	-0.01088	16274.	1.05E+12	0.00	0.00	0.00
1.3291	7.6121	-9.26E+07	764000.	-0.01237	14364.	1.05E+12	0.00	0.00	0.00
2.6583	7.4036	-8.03E+07	764000.	-0.01368	12457.	1.06E+12	0.00	0.00	0.00
3.9874	7.1758	-6.79E+07	764000.	-0.01479	10555.	1.06E+12	0.00	0.00	0.00
5.3166	6.9316	-5.55E+07	764000.	-0.01572	8658.	1.06E+12	0.00	0.00	0.00
6.6457	6.6742	-4.32E+07	764000.	-0.01646	6766.	1.06E+12	0.00	0.00	0.00
7.9749	6.4064	-3.08E+07	764000.	-0.01702	4879.	1.07E+12	0.00	0.00	0.00
9.3040	6.1313	-1.84E+07	764000.	-0.01739	2998.	1.07E+12	0.00	0.00	0.00
10.6331	5.8518	-5999058.	764000.	-0.01757	1122.	1.07E+12	0.00	0.00	0.00
11.9623	5.5709	6394979.	764000.	-0.01757	1180.	1.07E+12	0.00	0.00	0.00
13.2914	5.2914	1.88E+07	764000.	-0.01738	3043.	1.07E+12	0.00	0.00	0.00
14.6206	5.0165	3.12E+07	764000.	-0.01701	4898.	1.07E+12	0.00	0.00	0.00
15.9497	4.7489	4.36E+07	764000.	-0.01645	6746.	1.08E+12	0.00	0.00	0.00
17.2789	4.4916	5.59E+07	764000.	-0.01572	8587.	1.08E+12	0.00	0.00	0.00
18.6080	4.2476	6.83E+07	764000.	-0.01480	10420.	1.08E+12	0.00	0.00	0.00
19.9371	4.0196	8.07E+07	764000.	-0.01370	12245.	1.08E+12	0.00	0.00	0.00
21.2663	3.8106	9.30E+07	763064.	-0.01242	14061.	1.08E+12	-117.3607	491.2333	0.00
22.5954	3.6234	1.05E+08	754903.	-0.01096	15864.	1.09E+12	-906.0172	3988.	0.00
23.9246	3.4609	1.17E+08	728676.	-0.01012	1756.	1.41E+13	-2383.	10980.	0.00
25.2537	3.3005	1.29E+08	694680.	-0.00998	1916.	1.41E+13	-1880.	9087.	0.00
26.5829	3.1424	1.40E+08	664007.	-0.00983	2069.	1.41E+13	-1966.	9978.	0.00
27.9120	2.9869	1.50E+08	631993.	-0.00967	2215.	1.41E+13	-2048.	10938.	0.00
29.2411	2.8341	1.60E+08	598690.	-0.00949	2354.	1.41E+13	-2128.	11973.	0.00
30.5703	2.6842	1.70E+08	564153.	-0.00930	2485.	1.41E+13	-2203.	13092.	0.00
31.8994	2.5373	1.78E+08	528436.	-0.00911	2609.	1.41E+13	-2275.	14303.	0.00
33.2286	2.3937	1.87E+08	491598.	-0.00890	2724.	1.41E+13	-2344.	15618.	0.00
34.5577	2.2534	1.94E+08	453844.	-0.00868	2831.	1.41E+13	-2390.	16918.	0.00
35.8869	2.1167	2.01E+08	415428.	-0.00846	2929.	1.41E+13	-2427.	18288.	0.00
37.2160	1.9835	2.08E+08	376456.	-0.00823	3019.	1.41E+13	-2460.	19780.	0.00
38.5451	1.8542	2.13E+08	356839.	-0.00799	3099.	1.41E+13	0.00	0.00	0.00
39.8743	1.7287	2.19E+08	356839.	-0.00774	3180.	1.41E+13	0.00	0.00	0.00
41.2034	1.6071	2.25E+08	356839.	-0.00749	3261.	1.41E+13	0.00	0.00	0.00
42.5326	1.4896	2.31E+08	356839.	-0.00724	3342.	1.41E+13	0.00	0.00	0.00
43.8617	1.3763	2.37E+08	356839.	-0.00697	3422.	1.41E+13	0.00	0.00	0.00
45.1909	1.2673	2.42E+08	356839.	-0.00670	3503.	1.41E+13	0.00	0.00	0.00
46.5200	1.1626	2.48E+08	280355.	-0.00642	3584.	1.41E+13	-9591.	131571.	0.00
47.8491	1.0624	2.51E+08	127218.	-0.00614	3630.	1.41E+13	-9612.	144298.	0.00
49.1783	0.9668	2.52E+08	-25097.	-0.00585	3642.	1.41E+13	-9487.	156516.	0.00
50.5074	0.8757	2.51E+08	-126182.	-0.00557	3621.	1.41E+13	-3188.	58064.	0.00
51.8366	0.7892	2.48E+08	-176811.	-0.00529	3588.	1.41E+13	-3160.	63873.	0.00
53.1657	0.7071	2.45E+08	-226959.	-0.00501	3544.	1.41E+13	-3128.	70549.	0.00
54.4949	0.6295	2.41E+08	-276545.	-0.00473	3489.	1.41E+13	-3090.	78286.	0.00
55.8240	0.5563	2.37E+08	-329661.	-0.00446	3422.	1.41E+13	-3571.	102378.	0.00
57.1531	0.4873	2.31E+08	-386166.	-0.00419	3343.	1.41E+13	-3515.	115046.	0.00
58.4823	0.4225	2.24E+08	-441709.	-0.00394	3251.	1.41E+13	-3450.	130249.	0.00
59.8114	0.3617	2.17E+08	-496136.	-0.00369	3148.	1.41E+13	-3375.	148816.	0.00
61.1406	0.3049	2.09E+08	-549269.	-0.00345	3032.	1.41E+13	-3288.	171997.	0.00
62.4697	0.2518	1.99E+08	-600892.	-0.00321	2904.	1.41E+13	-3186.	201786.	0.00
63.7989	0.2023	1.90E+08	-650739.	-0.00299	2765.	1.41E+13	-3065.	241601.	0.00
65.1280	0.1563	1.79E+08	-698461.	-0.00279	2615.	1.41E+13	-2919.	297893.	0.00
66.4571	0.1135	1.67E+08	-743566.	-0.00259	2454.	1.41E+13	-2737.	384665.	0.00
67.7863	0.07369	1.55E+08	-785288.	-0.00241	2284.	1.41E+13	-2495.	539967.	0.00
69.1154	0.03671	1.42E+08	-822153.	-0.00224	2105.	1.41E+13	-2128.	924559.	0.00
70.4446	0.00229	1.29E+08	-847699.	-0.00208	1919.	1.41E+13	-1076.	7480736.	0.00
71.7737	-0.02979	1.15E+08	-839990.	-0.00195	1728.	1.41E+13	2042.	1093387.	0.00
73.1029	-0.05979	1.02E+08	-804318.	-0.00182	1545.	1.41E+13	2431.	648420.	0.00
74.4320	-0.08794	8.97E+07	-763586.	-0.00171	1370.	1.41E+13	2677.	485485.	0.00
75.7611	-0.1145	7.79E+07	-719435.	-0.00162	1205.	1.41E+13	2859.	398376.	0.00
77.0903	-0.1396	6.68E+07	-672671.	-0.00154	1050.	1.41E+13	3005.	343291.	0.00
78.4194	-0.1635	5.65E+07	-623780.	-0.00147	905.6737	1.41E+13	3126.	304897.	0.00
79.7486	-0.1864	4.69E+07	-573093.	-0.00141	772.4531	1.41E+13	3230.	276353.	0.00
81.0777	-0.2085	3.82E+07	-520845.	-0.00136	650.7048	1.41E+13	3322.	254127.	0.00
82.4069	-0.2298	3.04E+07	-467214.	-0.00132	540.7557	1.41E+13	3404.	236200.	0.00
83.7360	-0.2506	2.34E+07	-412334.	-0.00129	442.8987	1.41E+13	3478.	221333.	0.00

85.0651	-0.2710	1.72E+07	-356311.	-0.00127	357.4003	1.41E+13	3547.	208724.	0.00
86.3943	-0.2911	1.20E+07	-299231.	-0.00125	284.5057	1.41E+13	3611.	197831.	0.00
87.7234	-0.3110	7715719.	-241163.	-0.00124	224.4430	1.41E+13	3671.	188277.	0.00
89.0526	-0.3307	4350787.	-182161.	-0.00123	177.4266	1.41E+13	3728.	179791.	0.00
90.3817	-0.3503	1934083.	-122275.	-0.00123	143.6594	1.41E+13	3782.	172177.	0.00
91.7109	-0.3699	479418.	-61543.	-0.00123	123.3341	1.41E+13	3834.	165286.	0.00
93.0400	-0.3895	0.00	0.00	-0.00123	116.6355	1.41E+13	3883.	79504.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     7.79827968 inches
Computed slope at pile head      =    -0.01087819 radians
Maximum bending moment           =     252339595. inch-lbs
Maximum shear force              =       -847699. lbs
Depth of maximum bending moment  =    49.17828571 feet below pile head
Depth of maximum shear force     =    70.44457143 feet below pile head
Number of iterations             =             45
Number of zero deflection points =              1
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	764000.	M, in-lb	-1.05E+08	742000.	7.7983	-0.01088	-847699.	2.52E+08

Maximum pile-head deflection = 7.7982796799 inches
Maximum pile-head rotation   = -0.0108781887 radians = -0.623274 deg.

The analysis ended normally.

==

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent3_Stability3.lp11d

```
Name of output report file:
University_Bent3_Stability3.lp11o

Name of plot output file:
University_Bent3_Stability3.lp11p

Name of runtime message file:
University_Bent3_Stability3.lp11r


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

               Date:  October 16, 2021           Time:  17:52:38


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 3 Stability3
Job Number:
Client:
Engineer:
Description:


--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =           100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =            70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =             2
Total length of pile                                   =       103.040 ft
Depth of ground surface below top of pile              =       21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	23.040	66.0000
3	23.040	90.0000
4	103.040	90.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                           =   Circular Pile
   Length of section                               =    23.040000 ft
   Width of top of section                         =    66.000000 in
   Width of bottom of section                      =    66.000000 in
   Top Area                                        =        3421. sq. in
   Bottom Area                                     =        3421. sq. in
   Moment of Inertia at Top                        =      215643. in^4
   Moment of Inertia at Bottom                     =      222190. in^4
   Elastic Modulus                                 =     4887733. psi
```

Pile Section No. 2:

```
   Section 2 is an elastic pile
   Cross-sectional Shape                           =   Circular Pile
   Length of section                               =    80.000000 ft
   Width of top of section                         =    90.000000 in
   Width of bottom of section                      =    90.000000 in
   Top Area                                        =        6362. sq. in
   Bottom Area                                     =        6362. sq. in
   Moment of Inertia at Top                        =     3220623. in^4
   Moment of Inertia at Bottom                     =     3220623. in^4
   Elastic Modulus                                 =     4371722. psi
```

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

```
   Distance from top of pile to top of layer       =    21.040000 ft
   Distance from top of pile to bottom of layer    =    25.040000 ft
   Effective unit weight at top of layer           =   120.000000 pcf
   Effective unit weight at bottom of layer        =   120.000000 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                      =    90.000000 pci
   Subgrade k at bottom of layer                   =    90.000000 pci
```

Layer 2 is stiff clay without free water

```
   Distance from top of pile to top of layer       =    25.040000 ft
   Distance from top of pile to bottom of layer    =    33.540000 ft
   Effective unit weight at top of layer           =   120.000000 pcf
   Effective unit weight at bottom of layer        =   120.000000 pcf
   Undrained cohesion at top of layer              =        1500. psf
   Undrained cohesion at bottom of layer           =        1500. psf
```

Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 3 is stiff clay without free water

Distance from top of pile to top of layer = 33.540000 ft
Distance from top of pile to bottom of layer = 38.040000 ft
Effective unit weight at top of layer = 57.600000 pcf
Effective unit weight at bottom of layer = 57.600000 pcf
Undrained cohesion at top of layer = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

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

Distance from top of pile to top of layer = 38.040000 ft
Distance from top of pile to bottom of layer = 46.040000 ft
Effective unit weight at top of layer = 57.600000 pcf
Effective unit weight at bottom of layer = 57.600000 pcf
Friction angle at top of layer = 30.000000 deg.
Friction angle at bottom of layer = 30.000000 deg.
Subgrade k at top of layer = 60.000000 pci
Subgrade k at bottom of layer = 60.000000 pci

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

Distance from top of pile to top of layer = 46.040000 ft
Distance from top of pile to bottom of layer = 50.040000 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 = 36.000000 deg.
Friction angle at bottom of layer = 36.000000 deg.
Subgrade k at top of layer = 125.000000 pci
Subgrade k at bottom of layer = 125.000000 pci

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 50.040000 ft
Distance from top of pile to bottom of layer = 55.040000 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 = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 55.040000 ft
Distance from top of pile to bottom of layer = 150.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 46.960 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--

4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 764000.0 lbs
Applied moment at pile head = -104928000.0 in-lbs
Axial thrust load on pile head = 742000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	7.1421	-1.05E+08	764000.	-0.00971	16274.	1.05E+12	0.00	0.00	0.00
1.4720	6.9551	-9.13E+07	764000.	-0.01135	14161.	1.05E+12	0.00	0.00	0.00
2.9440	6.7411	-7.76E+07	764000.	-0.01276	12053.	1.06E+12	0.00	0.00	0.00
4.4160	6.5042	-6.40E+07	764000.	-0.01394	9950.	1.06E+12	0.00	0.00	0.00
5.8880	6.2485	-5.03E+07	764000.	-0.01489	7853.	1.06E+12	0.00	0.00	0.00
7.3600	5.9780	-3.66E+07	764000.	-0.01562	5763.	1.06E+12	0.00	0.00	0.00
8.8320	5.6968	-2.29E+07	764000.	-0.01611	3679.	1.07E+12	0.00	0.00	0.00
10.3040	5.4089	-9174898.	764000.	-0.01638	1602.	1.07E+12	0.00	0.00	0.00
11.7760	5.1183	4536019.	764000.	-0.01641	900.4842	1.07E+12	0.00	0.00	0.00
13.2480	4.8290	1.82E+07	764000.	-0.01623	2961.	1.07E+12	0.00	0.00	0.00
14.7200	4.5451	3.20E+07	764000.	-0.01581	5014.	1.07E+12	0.00	0.00	0.00
16.1920	4.2704	4.57E+07	764000.	-0.01518	7057.	1.08E+12	0.00	0.00	0.00
17.6640	4.0089	5.93E+07	764000.	-0.01432	9092.	1.08E+12	0.00	0.00	0.00
19.1360	3.7646	7.30E+07	764000.	-0.01323	11116.	1.08E+12	0.00	0.00	0.00
20.6080	3.5414	8.67E+07	764000.	-0.01193	13131.	1.08E+12	0.00	0.00	0.00
22.0800	3.3432	1.00E+08	758864.	-0.01040	15135.	1.08E+12	-581.5472	3073.	0.00
23.5520	3.1739	1.14E+08	736230.	-0.00952	1706.	1.41E+13	-1981.	11026.	0.00
25.0240	3.0070	1.27E+08	689832.	-0.00937	1885.	1.41E+13	-3272.	19222.	0.00
26.4960	2.8430	1.38E+08	644059.	-0.00920	2050.	1.41E+13	-1910.	11870.	0.00
27.9680	2.6820	1.50E+08	609536.	-0.00902	2207.	1.41E+13	-1998.	13162.	0.00
29.4400	2.5244	1.60E+08	573495.	-0.00882	2354.	1.41E+13	-2082.	14570.	0.00
30.9120	2.3703	1.70E+08	536012.	-0.00862	2493.	1.41E+13	-2162.	16110.	0.00
32.3840	2.2199	1.79E+08	497162.	-0.00840	2622.	1.41E+13	-2237.	17799.	0.00
33.8560	2.0736	1.88E+08	457075.	-0.00817	2741.	1.41E+13	-2302.	19609.	0.00
35.3280	1.9314	1.96E+08	416062.	-0.00793	2851.	1.41E+13	-2342.	21417.	0.00
36.8000	1.7935	2.03E+08	374388.	-0.00768	2950.	1.41E+13	-2377.	23409.	0.00
38.2720	1.6602	2.09E+08	353396.	-0.00742	3038.	1.41E+13	0.00	0.00	0.00
39.7440	1.5314	2.15E+08	353396.	-0.00715	3127.	1.41E+13	0.00	0.00	0.00
41.2160	1.4075	2.22E+08	353396.	-0.00688	3215.	1.41E+13	0.00	0.00	0.00
42.6880	1.2884	2.28E+08	353396.	-0.00660	3304.	1.41E+13	0.00	0.00	0.00
44.1600	1.1744	2.34E+08	353396.	-0.00631	3392.	1.41E+13	0.00	0.00	0.00
45.6320	1.0656	2.41E+08	353396.	-0.00601	3481.	1.41E+13	0.00	0.00	0.00
47.1040	0.9622	2.47E+08	272830.	-0.00570	3569.	1.41E+13	-9122.	167468.	0.00
48.5760	0.8642	2.51E+08	112540.	-0.00539	3617.	1.41E+13	-9027.	184503.	0.00
50.0480	0.7718	2.51E+08	5700.	-0.00508	3626.	1.41E+13	-3070.	70273.	0.00
51.5200	0.6849	2.51E+08	-48248.	-0.00476	3622.	1.41E+13	-3038.	78351.	0.00
52.9920	0.6036	2.50E+08	-101573.	-0.00445	3604.	1.41E+13	-3000.	87790.	0.00
54.4640	0.5278	2.47E+08	-154171.	-0.00413	3573.	1.41E+13	-2956.	98914.	0.00
55.9360	0.4575	2.44E+08	-210350.	-0.00383	3530.	1.41E+13	-3405.	131475.	0.00
57.4080	0.3926	2.40E+08	-269934.	-0.00352	3471.	1.41E+13	-3341.	150307.	0.00

58.8800	0.3331	2.35E+08	-328300.	-0.00322	3398.	1.41E+13	-3267.	173279.	0.00
60.3520	0.2787	2.29E+08	-385274.	-0.00293	3310.	1.41E+13	-3183.	201751.	0.00
61.8240	0.2294	2.21E+08	-440664.	-0.00265	3209.	1.41E+13	-3088.	237741.	0.00
63.2960	0.1850	2.13E+08	-494249.	-0.00238	3094.	1.41E+13	-2979.	284383.	0.00
64.7680	0.1454	2.04E+08	-545773.	-0.00212	2966.	1.41E+13	-2855.	346832.	0.00
66.2400	0.1102	1.94E+08	-594922.	-0.00187	2825.	1.41E+13	-2710.	434281.	0.00
67.7120	0.07939	1.83E+08	-641288.	-0.00163	2673.	1.41E+13	-2540.	565063.	0.00
69.1840	0.05259	1.71E+08	-684295.	-0.00141	2509.	1.41E+13	-2330.	782533.	0.00
70.6560	0.02959	1.59E+08	-722878.	-0.00120	2335.	1.41E+13	-2039.	1217153.	0.00
72.1280	0.01010	1.46E+08	-754650.	-0.00101	2153.	1.41E+13	-1559.	2724741.	0.00
73.6000	-0.00615	1.32E+08	-756259.	-8.37E-04	1963.	1.41E+13	1376.	3953161.	0.00
75.0720	-0.01948	1.19E+08	-727885.	-6.80E-04	1780.	1.41E+13	1836.	1665426.	0.00
76.5440	-0.03016	1.06E+08	-693574.	-5.38E-04	1604.	1.41E+13	2049.	1199602.	0.00
78.0160	-0.03849	9.45E+07	-656252.	-4.12E-04	1437.	1.41E+13	2177.	999125.	0.00
79.4880	-0.04473	8.33E+07	-617056.	-3.01E-04	1280.	1.41E+13	2261.	892748.	0.00
80.9600	-0.04912	7.27E+07	-576653.	-2.03E-04	1133.	1.41E+13	2314.	832228.	0.00
82.4320	-0.05189	6.29E+07	-535493.	-1.18E-04	995.7165	1.41E+13	2346.	798602.	0.00
83.9040	-0.05328	5.38E+07	-493914.	-4.45E-05	868.6802	1.41E+13	2362.	783010.	0.00
85.3760	-0.05347	4.55E+07	-452180.	1.78E-05	751.9274	1.41E+13	2364.	780926.	0.00
86.8480	-0.05265	3.78E+07	-410507.	7.00E-05	645.4692	1.41E+13	2355.	790008.	0.00
88.3200	-0.05099	3.10E+07	-369080.	1.13E-04	549.2676	1.41E+13	2336.	809182.	0.00
89.7920	-0.04865	2.48E+07	-328060.	1.48E-04	463.2427	1.41E+13	2309.	838237.	0.00
91.2640	-0.04576	1.94E+07	-287591.	1.76E-04	387.2767	1.41E+13	2274.	877675.	0.00
92.7360	-0.04243	1.46E+07	-247806.	1.97E-04	321.2180	1.41E+13	2231.	928718.	0.00
94.2080	-0.03879	1.06E+07	-208834.	2.13E-04	264.8826	1.41E+13	2182.	993458.	0.00
95.6800	-0.03491	7258573.	-170801.	2.24E-04	218.0555	1.41E+13	2125.	1075209.	0.00
97.1520	-0.03087	4570041.	-133836.	2.32E-04	180.4902	1.41E+13	2060.	1179187.	0.00
98.6240	-0.02672	2524326.	-98085.	2.36E-04	151.9065	1.41E+13	1988.	1313834.	0.00
100.0960	-0.02252	1098711.	-63711.	2.38E-04	131.9872	1.41E+13	1904.	1493603.	0.00
101.5680	-0.01830	267282.	-30923.	2.39E-04	120.3701	1.41E+13	1808.	1745386.	0.00
103.0400	-0.01407	0.00	0.00	2.39E-04	116.6355	1.41E+13	1693.	1062904.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

Pile-head deflection = 7.14207736 inches
Computed slope at pile head = -0.00970549 radians
Maximum bending moment = 251186442. inch-lbs
Maximum shear force = 764000. lbs
Depth of maximum bending moment = 50.04800000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 38
Number of zero deflection points = 1

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	764000.	M, in-lb	-1.05E+08	742000.	7.1421	-0.00971	764000.	2.51E+08

Maximum pile-head deflection = 7.1420773569 inches
Maximum pile-head rotation = -0.0097054861 radians = -0.556083 deg.

The analysis ended normally.

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent3_Stability4.lp11d

Name of output report file:
University_Bent3_Stability4.lp11o

Name of plot output file:
University_Bent3_Stability4.lp11p

Name of runtime message file:
University_Bent3_Stability4.lp11r


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

               Date:  October 16, 2021           Time:  17:53:06


--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 3 Stability4
Job Number:
Client:
Engineer:
Description:


--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =           100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =            70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                    =           2
Total length of pile                               =      113.040 ft
Depth of ground surface below top of pile          =      21.0400 ft
```

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	23.040	66.0000
3	23.040	90.0000
4	113.040	90.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

```
   Section 1 is an elastic pile
   Cross-sectional Shape                           =   Circular Pile
   Length of section                               =    23.040000 ft
   Width of top of section                         =    66.000000 in
   Width of bottom of section                      =    66.000000 in
   Top Area                                        =        3421. sq. in
   Bottom Area                                     =        3421. sq. in
   Moment of Inertia at Top                        =      215643. in^4
   Moment of Inertia at Bottom                     =      222190. in^4
   Elastic Modulus                                 =     4887733. psi
```

Pile Section No. 2:

```
   Section 2 is an elastic pile
   Cross-sectional Shape                           =   Circular Pile
   Length of section                               =    90.000000 ft
   Width of top of section                         =    90.000000 in
   Width of bottom of section                      =    90.000000 in
   Top Area                                        =        6362. sq. in
   Bottom Area                                     =        6362. sq. in
   Moment of Inertia at Top                        =     3220623. in^4
   Moment of Inertia at Bottom                     =     3220623. in^4
   Elastic Modulus                                 =     4371722. psi
```

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

   Distance from top of pile to top of layer          =    21.040000 ft
   Distance from top of pile to bottom of layer       =    25.040000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 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                         =    90.000000 pci
   Subgrade k at bottom of layer                      =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer          =    25.040000 ft
   Distance from top of pile to bottom of layer       =    33.540000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer          =    33.540000 ft
   Distance from top of pile to bottom of layer       =    38.040000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


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

   Distance from top of pile to top of layer          =    38.040000 ft
   Distance from top of pile to bottom of layer       =    46.040000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Friction angle at top of layer                     =    30.000000 deg.
   Friction angle at bottom of layer                  =    30.000000 deg.
   Subgrade k at top of layer                         =    60.000000 pci
   Subgrade k at bottom of layer                      =    60.000000 pci


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

   Distance from top of pile to top of layer          =    46.040000 ft
   Distance from top of pile to bottom of layer       =    50.040000 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                     =    36.000000 deg.
   Friction angle at bottom of layer                  =    36.000000 deg.
   Subgrade k at top of layer                         =   125.000000 pci
   Subgrade k at bottom of layer                      =   125.000000 pci


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer          =    50.040000 ft
   Distance from top of pile to bottom of layer       =    55.040000 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                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 7 is stiff clay without free water

   Distance from top of pile to top of layer          =    55.040000 ft
   Distance from top of pile to bottom of layer       =   150.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 36.960 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 764000.0 lbs
Applied moment at pile head = -104928000.0 in-lbs
Axial thrust load on pile head = 742000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	7.3220	-1.05E+08	764000.	-0.01041	16274.	1.05E+12	0.00	0.00	0.00
1.6149	7.1016	-9.00E+07	764000.	-0.01220	13955.	1.05E+12	0.00	0.00	0.00
3.2297	6.8491	-7.50E+07	764000.	-0.01372	11641.	1.06E+12	0.00	0.00	0.00
4.8446	6.5700	-6.00E+07	764000.	-0.01495	9334.	1.06E+12	0.00	0.00	0.00
6.4594	6.2696	-4.49E+07	764000.	-0.01591	7035.	1.06E+12	0.00	0.00	0.00
8.0743	5.9534	-2.99E+07	764000.	-0.01659	4743.	1.07E+12	0.00	0.00	0.00
9.6891	5.6267	-1.48E+07	764000.	-0.01700	2459.	1.07E+12	0.00	0.00	0.00
11.3040	5.2948	211305.	764000.	-0.01713	248.7478	1.07E+12	0.00	0.00	0.00
12.9189	4.9629	1.53E+07	764000.	-0.01699	2514.	1.07E+12	0.00	0.00	0.00
14.5337	4.6363	3.03E+07	764000.	-0.01658	4768.	1.07E+12	0.00	0.00	0.00
16.1486	4.3204	4.53E+07	764000.	-0.01590	7013.	1.08E+12	0.00	0.00	0.00
17.7634	4.0203	6.04E+07	764000.	-0.01494	9246.	1.08E+12	0.00	0.00	0.00
19.3783	3.7412	7.54E+07	764000.	-0.01373	11467.	1.08E+12	0.00	0.00	0.00
20.9931	3.4883	9.04E+07	764000.	-0.01224	13676.	1.08E+12	0.00	0.00	0.00
22.6080	3.2667	1.05E+08	755142.	-0.01049	15873.	1.09E+12	-914.1955	5423.	0.00
24.2229	3.0816	1.20E+08	721502.	-0.00947	1793.	1.41E+13	-2558.	16084.	0.00

25.8377	2.8997	1.34E+08	678628.	-0.00930	1983.	1.41E+13	-1867.	12478.	0.00
27.4526	2.7213	1.47E+08	641497.	-0.00910	2164.	1.41E+13	-1965.	13993.	0.00
29.0674	2.5469	1.59E+08	602517.	-0.00889	2334.	1.41E+13	-2058.	15659.	0.00
30.6823	2.3766	1.70E+08	561786.	-0.00867	2494.	1.41E+13	-2146.	17496.	0.00
32.2971	2.2110	1.81E+08	519406.	-0.00843	2642.	1.41E+13	-2228.	19529.	0.00
33.9120	2.0501	1.90E+08	475547.	-0.00817	2778.	1.41E+13	-2298.	21726.	0.00
35.5269	1.8943	1.99E+08	430593.	-0.00790	2903.	1.41E+13	-2341.	23949.	0.00
37.1417	1.7439	2.07E+08	384868.	-0.00762	3015.	1.41E+13	-2378.	26426.	0.00
38.7566	1.5989	2.15E+08	361826.	-0.00733	3114.	1.41E+13	0.00	0.00	0.00
40.3714	1.4597	2.22E+08	361826.	-0.00703	3214.	1.41E+13	0.00	0.00	0.00
41.9863	1.3264	2.29E+08	361826.	-0.00672	3313.	1.41E+13	0.00	0.00	0.00
43.6011	1.1992	2.36E+08	361826.	-0.00640	3412.	1.41E+13	0.00	0.00	0.00
45.2160	1.0783	2.43E+08	361826.	-0.00607	3511.	1.41E+13	0.00	0.00	0.00
46.8309	0.9639	2.50E+08	273993.	-0.00573	3611.	1.41E+13	-9065.	182246.	0.00
48.4457	0.8561	2.54E+08	99164.	-0.00539	3662.	1.41E+13	-8979.	203227.	0.00
50.0606	0.7552	2.54E+08	-17424.	-0.00504	3666.	1.41E+13	-3054.	78374.	0.00
51.6754	0.6609	2.53E+08	-76250.	-0.00469	3655.	1.41E+13	-3017.	88458.	0.00
53.2903	0.5735	2.51E+08	-134288.	-0.00434	3627.	1.41E+13	-2973.	100458.	0.00
54.9051	0.4927	2.48E+08	-191400.	-0.00400	3584.	1.41E+13	-2921.	114892.	0.00
56.5200	0.4186	2.44E+08	-252222.	-0.00366	3525.	1.41E+13	-3356.	155363.	0.00
58.1349	0.3510	2.38E+08	-316511.	-0.00333	3449.	1.41E+13	-3279.	181056.	0.00
59.7497	0.2897	2.32E+08	-379193.	-0.00300	3355.	1.41E+13	-3190.	213402.	0.00
61.3646	0.2346	2.24E+08	-440021.	-0.00269	3245.	1.41E+13	-3088.	255051.	0.00
62.9794	0.1855	2.15E+08	-498710.	-0.00239	3118.	1.41E+13	-2970.	310250.	0.00
64.5943	0.1421	2.05E+08	-554926.	-0.00210	2975.	1.41E+13	-2832.	386295.	0.00
66.2091	0.1042	1.93E+08	-608250.	-0.00182	2818.	1.41E+13	-2671.	496976.	0.00
67.8240	0.07137	1.81E+08	-658122.	-0.00157	2647.	1.41E+13	-2476.	672256.	0.00
69.4389	0.04343	1.68E+08	-703692.	-0.00133	2462.	1.41E+13	-2227.	993902.	0.00
71.0537	0.01995	1.54E+08	-743174.	-0.00111	2266.	1.41E+13	-1848.	1794210.	0.00
72.6686	5.86E-04	1.39E+08	-764269.	-9.04E-04	2060.	1.41E+13	-329.7238	1.09E+07	0.00
74.2834	-0.01507	1.24E+08	-750776.	-7.22E-04	1853.	1.41E+13	1722.	2214491.	0.00
75.8983	-0.02742	1.10E+08	-714708.	-5.61E-04	1654.	1.41E+13	2000.	1413832.	0.00
77.5131	-0.03682	9.66E+07	-674464.	-4.19E-04	1466.	1.41E+13	2153.	1133161.	0.00
79.1280	-0.04366	8.39E+07	-631828.	-2.95E-04	1289.	1.41E+13	2247.	997346.	0.00
80.7429	-0.04825	7.21E+07	-587735.	-1.88E-04	1124.	1.41E+13	2304.	925221.	0.00
82.3577	-0.05093	6.11E+07	-542786.	-9.59E-05	970.8077	1.41E+13	2335.	888554.	0.00
83.9726	-0.05197	5.11E+07	-497420.	-1.87E-05	829.9787	1.41E+13	2347.	875151.	0.00
85.5874	-0.05165	4.19E+07	-451974.	4.53E-05	701.4502	1.41E+13	2343.	879202.	0.00
87.2023	-0.05022	3.35E+07	-406722.	9.71E-05	585.2058	1.41E+13	2327.	897984.	0.00
88.8171	-0.04789	2.61E+07	-361895.	1.38E-04	481.1615	1.41E+13	2299.	930556.	0.00
90.4320	-0.04486	1.95E+07	-317696.	1.70E-04	389.1752	1.41E+13	2262.	977241.	0.00
92.0469	-0.04131	1.38E+07	-274303.	1.92E-04	309.0535	1.41E+13	2216.	1039493.	0.00
93.6617	-0.03740	8868922.	-231885.	2.08E-04	240.5561	1.41E+13	2162.	1120038.	0.00
95.2766	-0.03325	4778200.	-190601.	2.17E-04	183.3987	1.41E+13	2099.	1223314.	0.00
96.8914	-0.02897	1475639.	-150612.	2.22E-04	137.2538	1.41E+13	2028.	1356392.	0.00
98.5063	-0.02466	-1065365.	-112087.	2.22E-04	131.5212	1.41E+13	1948.	1530834.	0.00
100.1211	-0.02037	-2874863.	-75220.	2.19E-04	156.8044	1.41E+13	1857.	1766662.	0.00
101.7360	-0.01616	-3986929.	-40244.	2.15E-04	172.3427	1.41E+13	1753.	2101805.	0.00
103.3509	-0.01205	-4440772.	-7481.	2.09E-04	178.6840	1.41E+13	1629.	2618525.	0.00
104.9657	-0.00807	-4282875.	22575.	2.03E-04	176.4778	1.41E+13	1473.	3538807.	0.00
106.5806	-0.00420	-3571657.	48972.	1.97E-04	166.5403	1.41E+13	1251.	5779107.	0.00
108.1954	-4.18E-04	-2390551.	63374.	1.93E-04	150.0373	1.41E+13	235.2172	1.09E+07	0.00
109.8103	0.00330	-1121070.	54242.	1.91E-04	132.2996	1.41E+13	-1178.	6925559.	0.00
111.4251	0.00698	-293788.	29067.	1.90E-04	120.7404	1.41E+13	-1421.	3945086.	0.00
113.0400	0.01065	0.00	0.00	1.90E-04	116.6355	1.41E+13	-1579.	1436211.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection              =     7.32202154 inches
Computed slope at pile head       =    -0.01041166 radians
Maximum bending moment            =     254060641. inch-lbs
Maximum shear force               =       -764269. lbs
Depth of maximum bending moment  =    50.06057143 feet below pile head
Depth of maximum shear force      =    72.66857143 feet below pile head
Number of iterations              =             27
Number of zero deflection points =              2
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	764000.	M, in-lb	-1.05E+08	742000.	7.3220	-0.01041	-764269.	2.54E+08

Maximum pile-head deflection = 7.3220215429 inches
Maximum pile-head rotation   = -0.0104116642 radians = -0.596544 deg.

The analysis ended normally.

==

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent3_Stability5.lp11d

Name of output report file:
University_Bent3_Stability5.lp11o

Name of plot output file:
University_Bent3_Stability5.lp11p

Name of runtime message file:
University_Bent3_Stability5.lp11r

Date and Time of Analysis

Date: October 16, 2021   Time: 17:53:43

Problem Title

University Ave POC - Bent 3 Stability5
Job Number:
Client:
Engineer:
Description:

Program Options and Settings

```
--------------------------------------------------------------------------------

Computational Options:
 - 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               =          100
 - Deflection tolerance for convergence               =   1.0000E-05 in
 - Maximum allowable deflection                       =     100.0000 in
 - Number of pile increments                          =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                       =            2
Total length of pile                                  =      123.040 ft
Depth of ground surface below top of pile             =      21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000          66.0000
  2           23.040          66.0000
  3           23.040          90.0000
  4          123.040          90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                              =   Circular Pile
   Length of section                                  =    23.040000 ft
   Width of top of section                            =    66.000000 in
   Width of bottom of section                         =    66.000000 in
   Top Area                                           =        3421. sq. in
   Bottom Area                                        =        3421. sq. in
   Moment of Inertia at Top                           =      215643. in^4
   Moment of Inertia at Bottom                        =      222190. in^4
   Elastic Modulus                                    =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                              =   Circular Pile
   Length of section                                  =   100.000000 ft
```

```
   Width of top of section                          =    90.000000 in
   Width of bottom of section                       =    90.000000 in
   Top Area                                         =        6362. sq. in
   Bottom Area                                      =        6362. sq. in
   Moment of Inertia at Top                         =     3220623. in^4
   Moment of Inertia at Bottom                      =     3220623. in^4
   Elastic Modulus                                  =     4371722. psi



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

   Distance from top of pile to top of layer        =    21.040000 ft
   Distance from top of pile to bottom of layer     =    25.040000 ft
   Effective unit weight at top of layer            =   120.000000 pcf
   Effective unit weight at bottom of layer         =   120.000000 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                       =    90.000000 pci
   Subgrade k at bottom of layer                    =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer        =    25.040000 ft
   Distance from top of pile to bottom of layer     =    33.540000 ft
   Effective unit weight at top of layer            =   120.000000 pcf
   Effective unit weight at bottom of layer         =   120.000000 pcf
   Undrained cohesion at top of layer               =        1500. psf
   Undrained cohesion at bottom of layer            =        1500. psf
   Epsilon-50 at top of layer                       =     0.007000
   Epsilon-50 at bottom of layer                    =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer        =    33.540000 ft
   Distance from top of pile to bottom of layer     =    38.040000 ft
   Effective unit weight at top of layer            =    57.600000 pcf
   Effective unit weight at bottom of layer         =    57.600000 pcf
   Undrained cohesion at top of layer               =        1500. psf
   Undrained cohesion at bottom of layer            =        1500. psf
   Epsilon-50 at top of layer                       =     0.007000
   Epsilon-50 at bottom of layer                    =     0.007000


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

   Distance from top of pile to top of layer        =    38.040000 ft
   Distance from top of pile to bottom of layer     =    46.040000 ft
   Effective unit weight at top of layer            =    57.600000 pcf
   Effective unit weight at bottom of layer         =    57.600000 pcf
   Friction angle at top of layer                   =    30.000000 deg.
   Friction angle at bottom of layer                =    30.000000 deg.
   Subgrade k at top of layer                       =    60.000000 pci
   Subgrade k at bottom of layer                    =    60.000000 pci


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

   Distance from top of pile to top of layer        =    46.040000 ft
   Distance from top of pile to bottom of layer     =    50.040000 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 = 36.000000 deg.
Friction angle at bottom of layer = 36.000000 deg.
Subgrade k at top of layer = 125.000000 pci
Subgrade k at bottom of layer = 125.000000 pci

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 50.040000 ft
Distance from top of pile to bottom of layer = 55.040000 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 = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 55.040000 ft
Distance from top of pile to bottom of layer = 150.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 26.960 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

```
Shear force at pile head                          =     764000.0 lbs
Applied moment at pile head                       = -104928000.0 in-lbs
Axial thrust load on pile head                    =     742000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	7.4251	-1.05E+08	764000.	-0.01077	16274.	1.05E+12	0.00	0.00	0.00
1.7577	7.1757	-8.86E+07	764000.	-0.01271	13749.	1.05E+12	0.00	0.00	0.00
3.5154	6.8890	-7.23E+07	764000.	-0.01432	11231.	1.06E+12	0.00	0.00	0.00
5.2731	6.5718	-5.60E+07	764000.	-0.01559	8720.	1.06E+12	0.00	0.00	0.00
7.0309	6.2312	-3.96E+07	764000.	-0.01654	6219.	1.06E+12	0.00	0.00	0.00
8.7886	5.8741	-2.32E+07	764000.	-0.01716	3727.	1.07E+12	0.00	0.00	0.00
10.5463	5.5072	-6816589.	764000.	-0.01746	1246.	1.07E+12	0.00	0.00	0.00
12.3040	5.1375	9572437.	764000.	-0.01743	1659.	1.07E+12	0.00	0.00	0.00
14.0617	4.7718	2.60E+07	764000.	-0.01708	4117.	1.07E+12	0.00	0.00	0.00
15.8194	4.4169	4.23E+07	764000.	-0.01641	6564.	1.08E+12	0.00	0.00	0.00
17.5771	4.0795	5.87E+07	764000.	-0.01542	8997.	1.08E+12	0.00	0.00	0.00
19.3349	3.7662	7.50E+07	764000.	-0.01412	11417.	1.08E+12	0.00	0.00	0.00
21.0926	3.4839	9.14E+07	763718.	-0.01250	13822.	1.08E+12	-26.7794	162.1302	0.00
22.8503	3.2391	1.08E+08	752107.	-0.01056	16210.	1.09E+12	-1074.	6994.	0.00
24.6080	3.0384	1.23E+08	710228.	-0.00942	1841.	1.41E+13	-2897.	20110.	0.00
26.3657	2.8416	1.38E+08	659640.	-0.00923	2044.	1.41E+13	-1900.	14102.	0.00
28.1234	2.6492	1.52E+08	618465.	-0.00901	2234.	1.41E+13	-2004.	15959.	0.00
29.8811	2.4616	1.64E+08	575146.	-0.00877	2412.	1.41E+13	-2103.	18021.	0.00
31.6389	2.2791	1.76E+08	529811.	-0.00852	2577.	1.41E+13	-2196.	20319.	0.00
33.3966	2.1022	1.87E+08	482595.	-0.00825	2728.	1.41E+13	-2282.	22891.	0.00
35.1543	1.9313	1.97E+08	433937.	-0.00796	2865.	1.41E+13	-2332.	25472.	0.00
36.9120	1.7665	2.05E+08	384307.	-0.00766	2987.	1.41E+13	-2374.	28343.	0.00
38.6697	1.6082	2.13E+08	359274.	-0.00734	3095.	1.41E+13	0.00	0.00	0.00
40.4274	1.4567	2.21E+08	359274.	-0.00702	3202.	1.41E+13	0.00	0.00	0.00
42.1851	1.3121	2.29E+08	359274.	-0.00668	3310.	1.41E+13	0.00	0.00	0.00
43.9429	1.1748	2.36E+08	359274.	-0.00633	3417.	1.41E+13	0.00	0.00	0.00
45.7006	1.0449	2.44E+08	359274.	-0.00597	3524.	1.41E+13	0.00	0.00	0.00
47.4583	0.9228	2.52E+08	263706.	-0.00560	3631.	1.41E+13	-9062.	207134.	0.00
49.2160	0.8085	2.55E+08	74609.	-0.00522	3682.	1.41E+13	-8868.	231348.	0.00
50.9737	0.7024	2.55E+08	-50932.	-0.00484	3678.	1.41E+13	-3035.	91154.	0.00
52.7314	0.6043	2.53E+08	-114486.	-0.00446	3654.	1.41E+13	-2991.	104389.	0.00
54.4891	0.5142	2.50E+08	-177004.	-0.00408	3612.	1.41E+13	-2937.	120489.	0.00
56.2469	0.4320	2.46E+08	-243528.	-0.00371	3552.	1.41E+13	-3371.	164569.	0.00
58.0046	0.3576	2.40E+08	-313761.	-0.00335	3470.	1.41E+13	-3289.	194011.	0.00
59.7623	0.2907	2.33E+08	-382128.	-0.00299	3368.	1.41E+13	-3194.	231694.	0.00
61.5200	0.2312	2.24E+08	-448318.	-0.00265	3246.	1.41E+13	-3083.	281170.	0.00
63.2777	0.1788	2.14E+08	-511973.	-0.00232	3105.	1.41E+13	-2953.	348323.	0.00
65.0354	0.1332	2.02E+08	-572664.	-0.00201	2946.	1.41E+13	-2802.	443709.	0.00
66.7931	0.09392	1.90E+08	-629850.	-0.00172	2768.	1.41E+13	-2621.	588540.	0.00
68.5509	0.06067	1.76E+08	-682771.	-0.00144	2575.	1.41E+13	-2397.	833511.	0.00
70.3086	0.03297	1.61E+08	-730146.	-0.00119	2367.	1.41E+13	-2095.	1340215.	0.00
72.0663	0.01036	1.45E+08	-768780.	-9.63E-04	2145.	1.41E+13	-1569.	3194179.	0.00
73.8240	-0.00766	1.29E+08	-769988.	-7.58E-04	1914.	1.41E+13	1454.	4001401.	0.00
75.5817	-0.02162	1.13E+08	-734777.	-5.77E-04	1692.	1.41E+13	1885.	1838602.	0.00
77.3394	-0.03202	9.77E+07	-692972.	-4.20E-04	1481.	1.41E+13	2079.	1369726.	0.00
79.0971	-0.03933	8.35E+07	-647959.	-2.84E-04	1283.	1.41E+13	2189.	1173976.	0.00
80.8549	-0.04400	7.03E+07	-601132.	-1.69E-04	1099.	1.41E+13	2251.	1079205.	0.00
82.6126	-0.04645	5.82E+07	-553324.	-7.26E-05	929.1553	1.41E+13	2282.	1036245.	0.00
84.3703	-0.04706	4.70E+07	-505113.	6.20E-06	773.1813	1.41E+13	2289.	1026131.	0.00
86.1280	-0.04619	3.68E+07	-456937.	6.90E-05	631.4237	1.41E+13	2279.	1040648.	0.00
87.8857	-0.04415	2.77E+07	-409142.	1.17E-04	503.8191	1.41E+13	2253.	1076463.	0.00
89.6434	-0.04124	1.96E+07	-362019.	1.53E-04	390.2117	1.41E+13	2215.	1133006.	0.00
91.4011	-0.03770	1.24E+07	-315815.	1.77E-04	290.3673	1.41E+13	2166.	1211702.	0.00
93.1589	-0.03378	6251437.	-270748.	1.91E-04	203.9834	1.41E+13	2107.	1315819.	0.00
94.9166	-0.02966	1006373.	-227011.	1.96E-04	130.6970	1.41E+13	2040.	1450726.	0.00
96.6743	-0.02550	-3331198.	-184782.	1.94E-04	163.1805	1.41E+13	1964.	1624552.	0.00
98.4320	-0.02146	-6794773.	-144226.	1.87E-04	211.5751	1.41E+13	1881.	1849427.	0.00
100.1897	-0.01762	-9421235.	-105499.	1.75E-04	248.2732	1.41E+13	1791.	2143666.	0.00
101.9474	-0.01409	-1.13E+07	-68753.	1.59E-04	273.8356	1.41E+13	1693.	2535798.	0.00
103.7051	-0.01090	-1.23E+07	-34143.	1.42E-04	288.8680	1.41E+13	1588.	3072432.	0.00
105.4629	-0.00811	-1.27E+07	-1834.	1.23E-04	294.0225	1.41E+13	1475.	3835206.	0.00
107.2206	-0.00572	-1.24E+07	27982.	1.04E-04	290.0026	1.41E+13	1352.	4982599.	0.00
108.9783	-0.00373	-1.15E+07	55046.	8.61E-05	277.5747	1.41E+13	1214.	6875816.	0.00
110.7360	-0.00209	-1.01E+07	78937.	6.99E-05	257.5946	1.41E+13	1051.	1.06E+07	0.00
112.4937	-7.76E-04	-8190549.	94623.	5.62E-05	231.0775	1.41E+13	436.3367	1.19E+07	0.00
114.2514	2.81E-04	-6098422.	97560.	4.55E-05	201.8454	1.41E+13	-157.9249	1.19E+07	0.00
116.0091	0.00114	-4076412.	89104.	3.79E-05	173.5930	1.41E+13	-643.7921	1.19E+07	0.00
117.7669	0.00188	-2340727.	71522.	3.31E-05	149.3412	1.41E+13	-1023.	1.15E+07	0.00
119.5246	0.00254	-1060293.	49091.	3.05E-05	131.4504	1.41E+13	-1103.	9161659.	0.00
121.2823	0.00317	-270762.	25156.	2.95E-05	120.4187	1.41E+13	-1166.	7763749.	0.00
123.0400	0.00379	0.00	0.00	2.93E-05	116.6355	1.41E+13	-1219.	3395560.	0.00

* The above values of total stress are combined axial and bending stresses.

```
Output Summary for Load Case No. 1:

Pile-head deflection             =     7.42509196 inches
Computed slope at pile head      =    -0.01077219 radians
Maximum bending moment           =     255182429. inch-lbs
Maximum shear force              =       -769988. lbs
Depth of maximum bending moment  =    49.21600000 feet below pile head
Depth of maximum shear force     =    73.82400000 feet below pile head
Number of iterations             =             34
Number of zero deflection points =              2


--------------------------------------------------------------------------------
            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 Load                Load                  Axial    Pile-head  Pile-head  Max Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs       in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
  1  V, lb    764000.  M, in-lb   -1.05E+08    742000.     7.4251   -0.01077   -769988.   2.55E+08


Maximum pile-head deflection = 7.4250919635 inches
Maximum pile-head rotation   = -0.0107721864 radians = -0.617201 deg.

The analysis ended normally.

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

                     LPile for Windows, Version 2019-11.008

                 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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent3_Stability6.lp11d

Name of output report file:
University_Bent3_Stability6.lp11o

Name of plot output file:
University_Bent3_Stability6.lp11p

Name of runtime message file:
University_Bent3_Stability6.lp11r
```

Date and Time of Analysis

Date: October 16, 2021 Time: 17:54:07

Problem Title

University Ave POC - Bent 3 Stability6
Job Number:
Client:
Engineer:
Description:

Program Options and Settings

Computational Options:
 - 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	=	100
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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	=	2
Total length of pile	=	133.040 ft
Depth of ground surface below top of pile	=	21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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	66.0000
2	23.040	66.0000
3	23.040	90.0000

```
  4          133.040          90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    23.040000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      215643. in^4
   Moment of Inertia at Bottom                         =      222190. in^4
   Elastic Modulus                                     =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =   110.000000 ft
   Width of top of section                             =    90.000000 in
   Width of bottom of section                          =    90.000000 in
   Top Area                                            =        6362. sq. in
   Bottom Area                                         =        6362. sq. in
   Moment of Inertia at Top                            =     3220623. in^4
   Moment of Inertia at Bottom                         =     3220623. in^4
   Elastic Modulus                                     =     4371722. psi



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

   Distance from top of pile to top of layer           =    21.040000 ft
   Distance from top of pile to bottom of layer        =    25.040000 ft
   Effective unit weight at top of layer               =   120.000000 pcf
   Effective unit weight at bottom of layer            =   120.000000 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                          =    90.000000 pci
   Subgrade k at bottom of layer                       =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer           =    25.040000 ft
   Distance from top of pile to bottom of layer        =    33.540000 ft
   Effective unit weight at top of layer               =   120.000000 pcf
   Effective unit weight at bottom of layer            =   120.000000 pcf
   Undrained cohesion at top of layer                  =        1500. psf
   Undrained cohesion at bottom of layer               =        1500. psf
   Epsilon-50 at top of layer                          =     0.007000
   Epsilon-50 at bottom of layer                       =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer           =    33.540000 ft
   Distance from top of pile to bottom of layer        =    38.040000 ft
   Effective unit weight at top of layer               =    57.600000 pcf
   Effective unit weight at bottom of layer            =    57.600000 pcf
```

Undrained cohesion at top of layer = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

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

Distance from top of pile to top of layer = 38.040000 ft
Distance from top of pile to bottom of layer = 46.040000 ft
Effective unit weight at top of layer = 57.600000 pcf
Effective unit weight at bottom of layer = 57.600000 pcf
Friction angle at top of layer = 30.000000 deg.
Friction angle at bottom of layer = 30.000000 deg.
Subgrade k at top of layer = 60.000000 pci
Subgrade k at bottom of layer = 60.000000 pci

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

Distance from top of pile to top of layer = 46.040000 ft
Distance from top of pile to bottom of layer = 50.040000 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 = 36.000000 deg.
Friction angle at bottom of layer = 36.000000 deg.
Subgrade k at top of layer = 125.000000 pci
Subgrade k at bottom of layer = 125.000000 pci

Layer 6 is stiff clay without free water

Distance from top of pile to top of layer = 50.040000 ft
Distance from top of pile to bottom of layer = 55.040000 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 = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 55.040000 ft
Distance from top of pile to bottom of layer = 150.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 16.960 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs

1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 764000.0 lbs
Applied moment at pile head = -104928000.0 in-lbs
Axial thrust load on pile head = 742000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	7.1724	-1.05E+08	764000.	-0.01047	16274.	1.05E+12	0.00	0.00	0.00
1.9006	6.9077	-8.73E+07	764000.	-0.01255	13545.	1.05E+12	0.00	0.00	0.00
3.8011	6.5999	-6.97E+07	764000.	-0.01425	10824.	1.06E+12	0.00	0.00	0.00
5.7017	6.2579	-5.20E+07	764000.	-0.01555	8112.	1.06E+12	0.00	0.00	0.00
7.6023	5.8905	-3.43E+07	764000.	-0.01648	5411.	1.06E+12	0.00	0.00	0.00
9.5029	5.5062	-1.66E+07	764000.	-0.01702	2721.	1.07E+12	0.00	0.00	0.00
11.4034	5.1140	1146018.	764000.	-0.01719	389.6778	1.07E+12	0.00	0.00	0.00
13.3040	4.7222	1.89E+07	764000.	-0.01698	3054.	1.07E+12	0.00	0.00	0.00
15.2046	4.3396	3.66E+07	764000.	-0.01639	5704.	1.08E+12	0.00	0.00	0.00
17.1051	3.9748	5.43E+07	764000.	-0.01542	8339.	1.08E+12	0.00	0.00	0.00
19.0057	3.6361	7.19E+07	764000.	-0.01409	10958.	1.08E+12	0.00	0.00	0.00
20.9063	3.3320	8.96E+07	764000.	-0.01239	13560.	1.08E+12	0.00	0.00	0.00
22.8069	3.0710	1.07E+08	752082.	-0.01032	16144.	1.09E+12	-1045.	7762.	0.00
24.7074	2.8613	1.24E+08	706955.	-0.00909	1853.	1.41E+13	-2912.	23213.	0.00
26.6080	2.6562	1.40E+08	652227.	-0.00888	2069.	1.41E+13	-1887.	16203.	0.00
28.5086	2.4563	1.54E+08	607941.	-0.00864	2273.	1.41E+13	-1997.	18538.	0.00
30.4091	2.2621	1.68E+08	561240.	-0.00838	2461.	1.41E+13	-2099.	21161.	0.00
32.3097	2.0741	1.80E+08	512289.	-0.00810	2634.	1.41E+13	-2194.	24123.	0.00
34.2103	1.8927	1.91E+08	461395.	-0.00780	2791.	1.41E+13	-2269.	27345.	0.00
36.1109	1.7184	2.01E+08	409113.	-0.00748	2932.	1.41E+13	-2315.	30731.	0.00
38.0114	1.5516	2.10E+08	355867.	-0.00715	3056.	1.41E+13	-2354.	34599.	0.00
39.9120	1.3925	2.18E+08	329026.	-0.00680	3162.	1.41E+13	0.00	0.00	0.00
41.8126	1.2415	2.26E+08	329026.	-0.00644	3269.	1.41E+13	0.00	0.00	0.00
43.7131	1.0988	2.33E+08	329026.	-0.00607	3375.	1.41E+13	0.00	0.00	0.00
45.6137	0.9647	2.41E+08	329026.	-0.00568	3481.	1.41E+13	0.00	0.00	0.00
47.5143	0.8395	2.48E+08	228999.	-0.00529	3587.	1.41E+13	-8772.	238287.	0.00
49.4149	0.7235	2.51E+08	31896.	-0.00488	3630.	1.41E+13	-8513.	268336.	0.00
51.3154	0.6168	2.50E+08	-98839.	-0.00448	3610.	1.41E+13	-2952.	109133.	0.00
53.2160	0.5194	2.47E+08	-165538.	-0.00407	3569.	1.41E+13	-2897.	127238.	0.00
55.1166	0.4310	2.43E+08	-236425.	-0.00368	3506.	1.41E+13	-3319.	175613.	0.00
57.0171	0.3516	2.36E+08	-311146.	-0.00329	3420.	1.41E+13	-3234.	209746.	0.00
58.9177	0.2810	2.29E+08	-383747.	-0.00291	3310.	1.41E+13	-3133.	254296.	0.00
60.8183	0.2188	2.19E+08	-453840.	-0.00255	3177.	1.41E+13	-3014.	314201.	0.00
62.7189	0.1646	2.08E+08	-520974.	-0.00220	3022.	1.41E+13	-2873.	398018.	0.00
64.6194	0.1182	1.95E+08	-584595.	-0.00188	2846.	1.41E+13	-2706.	522083.	0.00
66.5200	0.07898	1.81E+08	-643979.	-0.00157	2650.	1.41E+13	-2502.	722381.	0.00
68.4206	0.04645	1.66E+08	-698040.	-0.00129	2436.	1.41E+13	-2239.	1099317.	0.00
70.3211	0.02006	1.50E+08	-744670.	-0.00104	2206.	1.41E+13	-1850.	2103204.	0.00
72.2217	-8.10E-04	1.32E+08	-760574.	-8.08E-04	1962.	1.41E+13	455.3492	1.28E+07	0.00
74.1223	-0.01680	1.15E+08	-735200.	-6.08E-04	1721.	1.41E+13	1770.	2402309.	0.00
76.0229	-0.02855	9.85E+07	-691977.	-4.35E-04	1493.	1.41E+13	2021.	1614081.	0.00
77.9234	-0.03666	8.33E+07	-644407.	-2.88E-04	1280.	1.41E+13	2151.	1338124.	0.00
79.8240	-0.04169	6.92E+07	-594550.	-1.65E-04	1083.	1.41E+13	2221.	1215068.	0.00
81.7246	-0.04417	5.62E+07	-543522.	-6.31E-05	901.5322	1.41E+13	2254.	1163589.	0.00
83.6251	-0.04457	4.44E+07	-492069.	1.83E-05	736.5223	1.41E+13	2259.	1155709.	0.00
85.5257	-0.04333	3.37E+07	-440737.	8.16E-05	587.9107	1.41E+13	2243.	1180364.	0.00
87.4263	-0.04085	2.43E+07	-389961.	1.29E-04	455.5864	1.41E+13	2210.	1233773.	0.00
89.3269	-0.03747	1.59E+07	-340097.	1.61E-04	339.3142	1.41E+13	2163.	1316311.	0.00
91.2274	-0.03350	8739983.	-291452.	1.81E-04	238.7545	1.41E+13	2103.	1431579.	0.00
93.1280	-0.02921	2636666.	-244295.	1.90E-04	153.4762	1.41E+13	2032.	1586548.	0.00

95.0286	-0.02483	-2409643.	-198869.	1.90E-04	150.3041	1.41E+13	1951.	1792546.	0.00
96.9291	-0.02053	-6440953.	-155401.	1.83E-04	206.6314	1.41E+13	1861.	2067338.	0.00
98.8297	-0.01647	-9504277.	-114104.	1.70E-04	249.4335	1.41E+13	1761.	2439063.	0.00
100.7303	-0.01275	-1.17E+07	-75186.	1.53E-04	279.4345	1.41E+13	1652.	2953847.	0.00
102.6309	-0.00948	-1.29E+07	-38859.	1.33E-04	297.4248	1.41E+13	1534.	3691521.	0.00
104.5314	-0.00667	-1.34E+07	-5348.	1.12E-04	304.2637	1.41E+13	1405.	4801555.	0.00
106.4320	-0.00437	-1.32E+07	25085.	9.04E-05	300.8862	1.41E+13	1264.	6598475.	0.00
108.3326	-0.00255	-1.23E+07	52092.	6.98E-05	288.3191	1.41E+13	1105.	9881274.	0.00
110.2331	-0.00119	-1.08E+07	72289.	5.11E-05	267.7192	1.41E+13	666.5677	1.28E+07	0.00
112.1337	-2.20E-04	-8991637.	81301.	3.50E-05	242.2707	1.41E+13	123.7330	1.28E+07	0.00
114.0343	4.13E-04	-7105697.	80064.	2.20E-05	215.9195	1.41E+13	-232.2490	1.28E+07	0.00
115.9349	7.83E-04	-5340367.	72392.	1.19E-05	191.2535	1.41E+13	-440.5692	1.28E+07	0.00
117.8354	9.56E-04	-3804053.	61233.	4.51E-06	169.7874	1.41E+13	-537.9128	1.28E+07	0.00
119.7360	9.89E-04	-2547433.	48757.	-6.37E-07	152.2294	1.41E+13	-556.2053	1.28E+07	0.00
121.6366	9.27E-04	-1580054.	36467.	-3.98E-06	138.7127	1.41E+13	-521.5602	1.28E+07	0.00
123.5371	8.07E-04	-883922.	25341.	-5.98E-06	128.9861	1.41E+13	-454.0805	1.28E+07	0.00
125.4377	6.55E-04	-423958.	15964.	-7.04E-06	122.5592	1.41E+13	-368.2322	1.28E+07	0.00
127.3383	4.86E-04	-155519.	8645.	-7.50E-06	118.8085	1.41E+13	-273.5738	1.28E+07	0.00
129.2389	3.12E-04	-29376.	3522.	-7.65E-06	117.0459	1.41E+13	-175.6835	1.28E+07	0.00
131.1394	1.37E-04	5385.	638.3271	-7.67E-06	116.7107	1.41E+13	-77.1828	1.28E+07	0.00
133.0400	-3.77E-05	0.00	0.00	-7.67E-06	116.6355	1.41E+13	21.2060	6414429.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection            =     7.17242494 inches
Computed slope at pile head     =    -0.01047138 radians
Maximum bending moment          =     251417832. inch-lbs
Maximum shear force             =        764000. lbs
Depth of maximum bending moment =    49.41485714 feet below pile head
Depth of maximum shear force    =       0.000000 feet below pile head
Number of iterations            =             27
Number of zero deflection points =             3
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	764000.	M, in-lb	-1.05E+08	742000.	7.1724	-0.01047	764000.	2.51E+08

Maximum pile-head deflection = 7.1724249369 inches
Maximum pile-head rotation   = -0.0104713808 radians = -0.599966 deg.

The analysis ended normally.

===

LPile for Windows, Version 2019-11.008

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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile Stability\

Name of input data file:
University_Bent3_Stability7.lp11d

Name of output report file:
University_Bent3_Stability7.lp11o

Name of plot output file:
University_Bent3_Stability7.lp11p

Name of runtime message file:
University_Bent3_Stability7.lp11r



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

               Date:  October 16, 2021            Time:  17:54:32



--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 3 Stability7
Job Number:
Client:
Engineer:
Description:



--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =           100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =            70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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
```

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 - Print using wide report formats



--------------------------------------------------------------------------------
                     Pile Structural Properties and Geometry
--------------------------------------------------------------------------------

Number of pile sections defined                        =            2
Total length of pile                                   =      143.040 ft
Depth of ground surface below top of pile              =      21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000           66.0000
  2           23.040           66.0000
  3           23.040           90.0000
  4          143.040           90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    23.040000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      215643. in^4
   Moment of Inertia at Bottom                         =      222190. in^4
   Elastic Modulus                                     =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =   120.000000 ft
   Width of top of section                             =    90.000000 in
   Width of bottom of section                          =    90.000000 in
   Top Area                                            =        6362. sq. in
   Bottom Area                                         =        6362. sq. in
   Moment of Inertia at Top                            =     3220623. in^4
   Moment of Inertia at Bottom                         =     3220623. in^4
   Elastic Modulus                                     =     4371722. psi



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

   Distance from top of pile to top of layer           =    21.040000 ft
   Distance from top of pile to bottom of layer        =    25.040000 ft
   Effective unit weight at top of layer               =   120.000000 pcf
```

```
   Effective unit weight at bottom of layer           =   120.000000 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                         =    90.000000 pci
   Subgrade k at bottom of layer                      =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer          =    25.040000 ft
   Distance from top of pile to bottom of layer       =    33.540000 ft
   Effective unit weight at top of layer              =   120.000000 pcf
   Effective unit weight at bottom of layer           =   120.000000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer          =    33.540000 ft
   Distance from top of pile to bottom of layer       =    38.040000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Undrained cohesion at top of layer                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


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

   Distance from top of pile to top of layer          =    38.040000 ft
   Distance from top of pile to bottom of layer       =    46.040000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Friction angle at top of layer                     =    30.000000 deg.
   Friction angle at bottom of layer                  =    30.000000 deg.
   Subgrade k at top of layer                         =    60.000000 pci
   Subgrade k at bottom of layer                      =    60.000000 pci


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

   Distance from top of pile to top of layer          =    46.040000 ft
   Distance from top of pile to bottom of layer       =    50.040000 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                     =    36.000000 deg.
   Friction angle at bottom of layer                  =    36.000000 deg.
   Subgrade k at top of layer                         =   125.000000 pci
   Subgrade k at bottom of layer                      =   125.000000 pci


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer          =    50.040000 ft
   Distance from top of pile to bottom of layer       =    55.040000 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                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 7 is stiff clay without free water

   Distance from top of pile to top of layer          =    55.040000 ft
   Distance from top of pile to bottom of layer       =   150.000000 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                 =        1800. psf
   Undrained cohesion at bottom of layer              =        1800. psf
   Epsilon-50 at top of layer                         =     0.005000
   Epsilon-50 at bottom of layer                      =     0.005000


 (Depth of the lowest soil layer extends 6.960 ft below the pile tip)
```

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 764000.0 lbs
Applied moment at pile head = -104928000.0 in-lbs
Axial thrust load on pile head = 742000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	7.0844	-1.05E+08	764000.	-0.01017	16274.	1.05E+12	0.00	0.00	0.00
2.0434	6.8052	-8.60E+07	764000.	-0.01239	13341.	1.05E+12	0.00	0.00	0.00
4.0869	6.4769	-6.70E+07	764000.	-0.01416	10417.	1.06E+12	0.00	0.00	0.00
6.1303	6.1106	-4.80E+07	764000.	-0.01549	7504.	1.06E+12	0.00	0.00	0.00
8.1737	5.7172	-2.90E+07	764000.	-0.01638	4604.	1.07E+12	0.00	0.00	0.00
10.2171	5.3074	-9938682.	764000.	-0.01683	1718.	1.07E+12	0.00	0.00	0.00
12.2606	4.8920	9103701.	764000.	-0.01684	1588.	1.07E+12	0.00	0.00	0.00
14.3040	4.4817	2.81E+07	764000.	-0.01641	4444.	1.07E+12	0.00	0.00	0.00
16.3474	4.0871	4.72E+07	764000.	-0.01555	7283.	1.08E+12	0.00	0.00	0.00
18.3909	3.7190	6.62E+07	764000.	-0.01426	10105.	1.08E+12	0.00	0.00	0.00
20.4343	3.3876	8.52E+07	764000.	-0.01255	12907.	1.08E+12	0.00	0.00	0.00
22.4777	3.1036	1.04E+08	753823.	-0.01041	15689.	1.09E+12	-830.0306	6558.	0.00
24.5211	2.8773	1.23E+08	709930.	-0.00912	1828.	1.41E+13	-2750.	23436.	0.00
26.5646	2.6561	1.39E+08	653120.	-0.00890	2062.	1.41E+13	-1884.	17389.	0.00
28.6080	2.4410	1.55E+08	605492.	-0.00864	2280.	1.41E+13	-2001.	20101.	0.00
30.6514	2.2324	1.69E+08	555087.	-0.00836	2482.	1.41E+13	-2110.	23178.	0.00
32.6949	2.0311	1.82E+08	502113.	-0.00805	2665.	1.41E+13	-2211.	26688.	0.00
34.7383	1.8376	1.94E+08	447043.	-0.00772	2830.	1.41E+13	-2281.	30439.	0.00
36.7817	1.6523	2.05E+08	390538.	-0.00738	2975.	1.41E+13	-2328.	34543.	0.00
38.8251	1.4758	2.14E+08	362000.	-0.00701	3101.	1.41E+13	0.00	0.00	0.00
40.8686	1.3084	2.23E+08	362000.	-0.00663	3227.	1.41E+13	0.00	0.00	0.00
42.9120	1.1506	2.32E+08	362000.	-0.00624	3353.	1.41E+13	0.00	0.00	0.00
44.9554	1.0026	2.41E+08	362000.	-0.00583	3478.	1.41E+13	0.00	0.00	0.00
46.9989	0.8649	2.50E+08	254544.	-0.00540	3604.	1.41E+13	-8764.	248489.	0.00
49.0423	0.7378	2.53E+08	42222.	-0.00496	3655.	1.41E+13	-8553.	284262.	0.00

51.0857	0.6216	2.52E+08	-98795.	-0.00452	3635.	1.41E+13	-2948.	116315.	0.00
53.1291	0.5161	2.49E+08	-170373.	-0.00409	3590.	1.41E+13	-2890.	137298.	0.00
55.1726	0.4212	2.44E+08	-246290.	-0.00366	3520.	1.41E+13	-3302.	192235.	0.00
57.2160	0.3368	2.37E+08	-326101.	-0.00324	3423.	1.41E+13	-3207.	233537.	0.00
59.2594	0.2624	2.28E+08	-403347.	-0.00283	3299.	1.41E+13	-3093.	289046.	0.00
61.3029	0.1978	2.17E+08	-477517.	-0.00245	3148.	1.41E+13	-2956.	366564.	0.00
63.3463	0.1424	2.04E+08	-547996.	-0.00208	2973.	1.41E+13	-2792.	480785.	0.00
65.3897	0.09576	1.90E+08	-613990.	-0.00174	2774.	1.41E+13	-2591.	663377.	0.00
67.4331	0.05724	1.74E+08	-674351.	-0.00142	2553.	1.41E+13	-2333.	999302.	0.00
69.4766	0.02617	1.57E+08	-727020.	-0.00113	2312.	1.41E+13	-1963.	1839759.	0.00
71.5200	0.00180	1.39E+08	-763510.	-8.73E-04	2055.	1.41E+13	-1013.	1.38E+07	0.00
73.5634	-0.01663	1.20E+08	-754286.	-6.48E-04	1789.	1.41E+13	1765.	2602244.	0.00
75.6069	-0.02996	1.02E+08	-707568.	-4.55E-04	1539.	1.41E+13	2045.	1673828.	0.00
77.6503	-0.03894	8.50E+07	-655722.	-2.92E-04	1305.	1.41E+13	2184.	1375087.	0.00
79.6937	-0.04429	6.96E+07	-601302.	-1.57E-04	1089.	1.41E+13	2255.	1248584.	0.00
81.7371	-0.04666	5.56E+07	-545644.	-4.84E-05	892.8823	1.41E+13	2285.	1200630.	0.00
83.7806	-0.04666	4.29E+07	-489622.	3.73E-05	715.5307	1.41E+13	2285.	1200603.	0.00
85.8240	-0.04483	3.15E+07	-433878.	1.02E-04	557.3544	1.41E+13	2262.	1237155.	0.00
87.8674	-0.04166	2.16E+07	-378918.	1.48E-04	418.1678	1.41E+13	2221.	1307246.	0.00
89.9109	-0.03756	1.30E+07	-325158.	1.78E-04	297.6292	1.41E+13	2164.	1412815.	0.00
91.9543	-0.03291	5627519.	-272956.	1.95E-04	195.2657	1.41E+13	2094.	1560069.	0.00
93.9977	-0.02802	-439852.	-222629.	1.99E-04	122.7813	1.41E+13	2011.	1760175.	0.00
96.0411	-0.02314	-5297945.	-174463.	1.94E-04	190.6608	1.41E+13	1917.	2031352.	0.00
98.0846	-0.01850	-9003000.	-128729.	1.82E-04	242.4295	1.41E+13	1813.	2403096.	0.00
100.1280	-0.01424	-1.16E+07	-85683.	1.64E-04	278.9633	1.41E+13	1698.	2924581.	0.00
102.1714	-0.01047	-1.32E+07	-45584.	1.42E-04	301.2261	1.41E+13	1573.	3682328.	0.00
104.2149	-0.00727	-1.39E+07	-8705.	1.18E-04	310.2717	1.41E+13	1435.	4841409.	0.00
106.2583	-0.00466	-1.36E+07	24642.	9.45E-05	307.2515	1.41E+13	1284.	6757619.	0.00
108.3017	-0.00263	-1.27E+07	54044.	7.16E-05	293.4340	1.41E+13	1114.	1.04E+07	0.00
110.3451	-0.00115	-1.10E+07	75612.	5.10E-05	270.2544	1.41E+13	645.4571	1.38E+07	0.00
112.3886	-1.31E-04	-8947013.	84426.	3.37E-05	241.6472	1.41E+13	73.4206	1.38E+07	0.00
114.4320	5.04E-04	-6855181.	81848.	1.99E-05	212.4192	1.41E+13	-283.6896	1.38E+07	0.00
116.4754	8.46E-04	-4933710.	72533.	9.66E-06	185.5715	1.41E+13	-476.1238	1.38E+07	0.00
118.5189	9.78E-04	-3298369.	59951.	2.49E-06	162.7218	1.41E+13	-550.0397	1.38E+07	0.00
120.5623	9.68E-04	-1993655.	46529.	-2.12E-06	144.4917	1.41E+13	-544.7218	1.38E+07	0.00
122.6057	8.74E-04	-1016412.	33824.	-4.74E-06	130.8373	1.41E+13	-491.5121	1.38E+07	0.00
124.6491	7.36E-04	-334676.	22723.	-5.92E-06	121.3117	1.41E+13	-413.8860	1.38E+07	0.00
126.6926	5.84E-04	98206.	13625.	-6.13E-06	118.0077	1.41E+13	-328.2202	1.38E+07	0.00
128.7360	4.35E-04	333731.	6598.	-5.75E-06	121.2985	1.41E+13	-244.9136	1.38E+07	0.00
130.7794	3.02E-04	421982.	1515.	-5.09E-06	122.5316	1.41E+13	-169.6238	1.38E+07	0.00
132.8229	1.86E-04	408227.	-1845.	-4.37E-06	122.3394	1.41E+13	-104.4710	1.38E+07	0.00
134.8663	8.73E-05	331642.	-3728.	-3.72E-06	121.2693	1.41E+13	-49.1247	1.38E+07	0.00
136.9097	3.10E-06	225509.	-4352.	-3.24E-06	119.7864	1.41E+13	-1.7451	1.38E+07	0.00
138.9531	-7.15E-05	118319.	-3880.	-2.94E-06	118.2887	1.41E+13	40.2173	1.38E+07	0.00
140.9966	-1.41E-04	35308.	-2415.	-2.81E-06	117.1288	1.41E+13	79.3374	1.38E+07	0.00
143.0400	-2.09E-04	0.00	0.00	-2.77E-06	116.6355	1.41E+13	117.6093	6896571.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection            =     7.08440614 inches
Computed slope at pile head     =    -0.01016592 radians
Maximum bending moment          =     253259232. inch-lbs
Maximum shear force             =        764000. lbs
Depth of maximum bending moment =    49.04228571 feet below pile head
Depth of maximum shear force    =    12.26057143 feet below pile head
Number of iterations            =             26
Number of zero deflection points =             3
```

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	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	764000.	M, in-lb	-1.05E+08	742000.	7.0844	-0.01017	764000.	2.53E+08

```
Maximum pile-head deflection = 7.0844061429 inches
Maximum pile-head rotation   = -0.0101659245 radians = -0.582465 deg.

The analysis ended normally.


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

                     LPile for Windows, Version 2019-11.008

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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================================================================================

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--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations:
\Users\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile\

Name of input data file:
University_Bent3_Longitudinal.lp11d

Name of output report file:
University_Bent3_Longitudinal.lp11o

Name of plot output file:
University_Bent3_Longitudinal.lp11p

Name of runtime message file:
University_Bent3_Longitudinal.lp11r



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

               Date:  October 16, 2021           Time:  15:59:04



--------------------------------------------------------------------------------
                                  Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 3 Longitudinal
Job Number:
Client:
Engineer:
Description:



--------------------------------------------------------------------------------
                          Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =            2
Total length of pile                                   =      143.040 ft
Depth of ground surface below top of pile              =      21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000           66.0000
  2           23.040           66.0000
  3           23.040           90.0000
  4          143.040           90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:

   Section 1 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =    23.040000 ft
   Width of top of section                             =    66.000000 in
   Width of bottom of section                          =    66.000000 in
   Top Area                                            =        3421. sq. in
   Bottom Area                                         =        3421. sq. in
   Moment of Inertia at Top                            =      215643. in^4
   Moment of Inertia at Bottom                         =      222190. in^4
   Elastic Modulus                                     =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                               =   Circular Pile
   Length of section                                   =   120.000000 ft
   Width of top of section                             =    90.000000 in
   Width of bottom of section                          =    90.000000 in
   Top Area                                            =        6362. sq. in
   Bottom Area                                         =        6362. sq. in
   Moment of Inertia at Top                            =     3220623. in^4
   Moment of Inertia at Bottom                         =     3220623. in^4
   Elastic Modulus                                     =     4371722. psi
```

```
--------------------------------------------------------------------------------
                       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 sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer            =    21.040000 ft
   Distance from top of pile to bottom of layer         =    25.040000 ft
   Effective unit weight at top of layer                =   120.000000 pcf
   Effective unit weight at bottom of layer             =   120.000000 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                           =    90.000000 pci
   Subgrade k at bottom of layer                        =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer            =    25.040000 ft
   Distance from top of pile to bottom of layer         =    33.540000 ft
   Effective unit weight at top of layer                =   120.000000 pcf
   Effective unit weight at bottom of layer             =   120.000000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer            =    33.540000 ft
   Distance from top of pile to bottom of layer         =    38.040000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


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

   Distance from top of pile to top of layer            =    38.040000 ft
   Distance from top of pile to bottom of layer         =    46.040000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Friction angle at top of layer                       =    30.000000 deg.
   Friction angle at bottom of layer                    =    30.000000 deg.
   Subgrade k at top of layer                           =    60.000000 pci
   Subgrade k at bottom of layer                        =    60.000000 pci


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

   Distance from top of pile to top of layer            =    46.040000 ft
   Distance from top of pile to bottom of layer         =    50.040000 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                       =    36.000000 deg.
   Friction angle at bottom of layer                    =    36.000000 deg.
   Subgrade k at top of layer                           =   125.000000 pci
   Subgrade k at bottom of layer                        =   125.000000 pci


Layer 6 is stiff clay without free water
```

Distance from top of pile to top of layer = 50.040000 ft
Distance from top of pile to bottom of layer = 55.040000 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 = 1500. psf
Undrained cohesion at bottom of layer = 1500. psf
Epsilon-50 at top of layer = 0.007000
Epsilon-50 at bottom of layer = 0.007000

Layer 7 is stiff clay without free water

Distance from top of pile to top of layer = 55.040000 ft
Distance from top of pile to bottom of layer = 150.000000 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 = 1800. psf
Undrained cohesion at bottom of layer = 1800. psf
Epsilon-50 at top of layer = 0.005000
Epsilon-50 at bottom of layer = 0.005000

(Depth of the lowest soil layer extends 6.960 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

Point No.	Depth X ft	p-mult	y-mult
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 764000. lbs	M = -104928000. in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

Shear force at pile head = 764000.0 lbs
Applied moment at pile head = -104928000.0 in-lbs
Axial thrust load on pile head = 742000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch

0.00	7.0844	-1.05E+08	764000.	-0.01017	16274.	1.05E+12	0.00	0.00	0.00
2.0434	6.8052	-8.60E+07	764000.	-0.01239	13341.	1.05E+12	0.00	0.00	0.00
4.0869	6.4769	-6.70E+07	764000.	-0.01416	10417.	1.06E+12	0.00	0.00	0.00
6.1303	6.1106	-4.80E+07	764000.	-0.01549	7504.	1.06E+12	0.00	0.00	0.00
8.1737	5.7172	-2.90E+07	764000.	-0.01638	4604.	1.07E+12	0.00	0.00	0.00
10.2171	5.3074	-9938682.	764000.	-0.01683	1718.	1.07E+12	0.00	0.00	0.00
12.2606	4.8920	9103701.	764000.	-0.01684	1588.	1.07E+12	0.00	0.00	0.00
14.3040	4.4817	2.81E+07	764000.	-0.01641	4444.	1.07E+12	0.00	0.00	0.00
16.3474	4.0871	4.72E+07	764000.	-0.01555	7283.	1.08E+12	0.00	0.00	0.00
18.3909	3.7190	6.62E+07	764000.	-0.01426	10105.	1.08E+12	0.00	0.00	0.00
20.4343	3.3876	8.52E+07	764000.	-0.01255	12907.	1.08E+12	0.00	0.00	0.00
22.4777	3.1036	1.04E+08	753823.	-0.01041	15689.	1.09E+12	-830.0306	6558.	0.00
24.5211	2.8773	1.23E+08	709930.	-0.00912	1828.	1.41E+13	-2750.	23436.	0.00
26.5646	2.6561	1.39E+08	653120.	-0.00890	2062.	1.41E+13	-1884.	17389.	0.00
28.6080	2.4410	1.55E+08	605492.	-0.00864	2280.	1.41E+13	-2001.	20101.	0.00
30.6514	2.2324	1.69E+08	555087.	-0.00836	2482.	1.41E+13	-2110.	23178.	0.00
32.6949	2.0311	1.82E+08	502113.	-0.00805	2665.	1.41E+13	-2211.	26688.	0.00
34.7383	1.8376	1.94E+08	447043.	-0.00772	2830.	1.41E+13	-2281.	30439.	0.00
36.7817	1.6523	2.05E+08	390538.	-0.00738	2975.	1.41E+13	-2328.	34543.	0.00
38.8251	1.4758	2.14E+08	362000.	-0.00701	3101.	1.41E+13	0.00	0.00	0.00
40.8686	1.3084	2.23E+08	362000.	-0.00663	3227.	1.41E+13	0.00	0.00	0.00
42.9120	1.1506	2.32E+08	362000.	-0.00624	3353.	1.41E+13	0.00	0.00	0.00
44.9554	1.0026	2.41E+08	362000.	-0.00583	3478.	1.41E+13	0.00	0.00	0.00
46.9989	0.8649	2.50E+08	254544.	-0.00540	3604.	1.41E+13	-8764.	248489.	0.00
49.0423	0.7378	2.53E+08	42222.	-0.00496	3655.	1.41E+13	-8553.	284262.	0.00
51.0857	0.6216	2.52E+08	-98795.	-0.00452	3635.	1.41E+13	-2948.	116315.	0.00
53.1291	0.5161	2.49E+08	-170373.	-0.00409	3590.	1.41E+13	-2890.	137298.	0.00
55.1726	0.4212	2.44E+08	-246290.	-0.00366	3520.	1.41E+13	-3302.	192235.	0.00
57.2160	0.3368	2.37E+08	-326101.	-0.00324	3423.	1.41E+13	-3207.	233537.	0.00
59.2594	0.2624	2.28E+08	-403347.	-0.00283	3299.	1.41E+13	-3093.	289046.	0.00
61.3029	0.1978	2.17E+08	-477517.	-0.00245	3148.	1.41E+13	-2956.	366564.	0.00
63.3463	0.1424	2.04E+08	-547996.	-0.00208	2973.	1.41E+13	-2792.	480785.	0.00
65.3897	0.09576	1.90E+08	-613990.	-0.00174	2774.	1.41E+13	-2591.	663377.	0.00
67.4331	0.05724	1.74E+08	-674351.	-0.00142	2553.	1.41E+13	-2333.	999302.	0.00
69.4766	0.02617	1.57E+08	-727020.	-0.00113	2312.	1.41E+13	-1963.	1839759.	0.00
71.5200	0.00180	1.39E+08	-763510.	-8.73E-04	2055.	1.41E+13	-1013.	1.38E+07	0.00
73.5634	-0.01663	1.20E+08	-754286.	-6.48E-04	1789.	1.41E+13	1765.	2602244.	0.00
75.6069	-0.02996	1.02E+08	-707568.	-4.55E-04	1539.	1.41E+13	2045.	1673828.	0.00
77.6503	-0.03894	8.50E+07	-655722.	-2.92E-04	1305.	1.41E+13	2184.	1375087.	0.00
79.6937	-0.04429	6.96E+07	-601302.	-1.57E-04	1089.	1.41E+13	2255.	1248584.	0.00
81.7371	-0.04666	5.56E+07	-545644.	-4.84E-05	892.8823	1.41E+13	2285.	1200630.	0.00
83.7806	-0.04666	4.29E+07	-489622.	3.73E-05	715.5307	1.41E+13	2285.	1200603.	0.00
85.8240	-0.04483	3.15E+07	-433878.	1.02E-04	557.3544	1.41E+13	2262.	1237155.	0.00
87.8674	-0.04166	2.16E+07	-378918.	1.48E-04	418.1678	1.41E+13	2221.	1307246.	0.00
89.9109	-0.03756	1.30E+07	-325158.	1.78E-04	297.6292	1.41E+13	2164.	1412815.	0.00
91.9543	-0.03291	5627519.	-272956.	1.95E-04	195.2657	1.41E+13	2094.	1560069.	0.00
93.9977	-0.02802	-439852.	-222629.	1.99E-04	122.7813	1.41E+13	2011.	1760175.	0.00
96.0411	-0.02314	-5297945.	-174463.	1.94E-04	190.6608	1.41E+13	1917.	2031352.	0.00
98.0846	-0.01850	-9003000.	-128729.	1.82E-04	242.4295	1.41E+13	1813.	2403096.	0.00
100.1280	-0.01424	-1.16E+07	-85683.	1.64E-04	278.9633	1.41E+13	1698.	2924581.	0.00
102.1714	-0.01047	-1.32E+07	-45584.	1.42E-04	301.2261	1.41E+13	1573.	3682328.	0.00
104.2149	-0.00727	-1.39E+07	-8705.	1.18E-04	310.2717	1.41E+13	1435.	4841409.	0.00
106.2583	-0.00466	-1.36E+07	24642.	9.45E-05	307.2515	1.41E+13	1284.	6757619.	0.00
108.3017	-0.00263	-1.27E+07	54044.	7.16E-05	293.4340	1.41E+13	1114.	1.04E+07	0.00
110.3451	-0.00115	-1.10E+07	75612.	5.10E-05	270.2544	1.41E+13	645.4571	1.38E+07	0.00
112.3886	-1.31E-04	-8947013.	84426.	3.37E-05	241.6472	1.41E+13	73.4206	1.38E+07	0.00
114.4320	5.04E-04	-6855181.	81848.	1.99E-05	212.4192	1.41E+13	-283.6896	1.38E+07	0.00
116.4754	8.46E-04	-4933710.	72533.	9.66E-06	185.5715	1.41E+13	-476.1238	1.38E+07	0.00
118.5189	9.78E-04	-3298369.	59951.	2.49E-06	162.7218	1.41E+13	-550.0397	1.38E+07	0.00
120.5623	9.68E-04	-1993655.	46529.	-2.12E-06	144.4917	1.41E+13	-544.7218	1.38E+07	0.00
122.6057	8.74E-04	-1016412.	33824.	-4.74E-06	130.8373	1.41E+13	-491.5121	1.38E+07	0.00
124.6491	7.36E-04	-334676.	22723.	-5.92E-06	121.3117	1.41E+13	-413.8860	1.38E+07	0.00
126.6926	5.84E-04	98206.	13625.	-6.13E-06	118.0077	1.41E+13	-328.2202	1.38E+07	0.00
128.7360	4.35E-04	333731.	6598.	-5.75E-06	121.2985	1.41E+13	-244.9136	1.38E+07	0.00
130.7794	3.02E-04	421982.	1515.	-5.09E-06	122.5316	1.41E+13	-169.6238	1.38E+07	0.00
132.8229	1.86E-04	408227.	-1845.	-4.37E-06	122.3394	1.41E+13	-104.4710	1.38E+07	0.00
134.8663	8.73E-05	331642.	-3728.	-3.72E-06	121.2693	1.41E+13	-49.1247	1.38E+07	0.00
136.9097	3.10E-06	225509.	-4352.	-3.24E-06	119.7864	1.41E+13	-1.7451	1.38E+07	0.00
138.9531	-7.15E-05	118319.	-3880.	-2.94E-06	118.2887	1.41E+13	40.2173	1.38E+07	0.00
140.9966	-1.41E-04	35308.	-2415.	-2.81E-06	117.1288	1.41E+13	79.3374	1.38E+07	0.00
143.0400	-2.09E-04	0.00	0.00	-2.77E-06	116.6355	1.41E+13	117.6093	6896571.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     7.08440614 inches
Computed slope at pile head      =    -0.01016592 radians
Maximum bending moment           =     253259232. inch-lbs
Maximum shear force              =        764000. lbs
Depth of maximum bending moment  =    49.04228571 feet below pile head
```

```
Depth of maximum shear force     =    12.26057143 feet below pile head
Number of iterations             =             26
Number of zero deflection points =              3


--------------------------------------------------------------------------------
            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 Load                Load                  Axial    Pile-head  Pile-head  Max Shear Max Moment
Case Type   Pile-head    Type     Pile-head   Loading  Deflection  Rotation    in Pile    in Pile
 No.  1      Load 1       2        Load 2       lbs      inches     radians      lbs      in-lbs
---- ----- ---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
  1  V, lb    764000.  M, in-lb   -1.05E+08    742000.     7.0844   -0.01017    764000.   2.53E+08


Maximum pile-head deflection = 7.0844061429 inches
Maximum pile-head rotation   = -0.0101659245 radians = -0.582465 deg.

The analysis ended normally.


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

                     LPile for Windows, Version 2019-11.008

                 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\jan.hueser\Documents\A 1 1 1 University\Calculations\Revised Calculations 9-2021\LPile\

Name of input data file:
University_Bent3_Transverse.lp11d

Name of output report file:
University_Bent3_Transverse.lp11o

Name of plot output file:
University_Bent3_Transverse.lp11p

Name of runtime message file:
University_Bent3_Transverse.lp11r


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

               Date:  October 16, 2021           Time:  16:20:18
```

```
--------------------------------------------------------------------------------
                                 Problem Title
--------------------------------------------------------------------------------

University Ave POC - Bent 3 Transverse
Job Number:
Client:
Engineer:
Description:



--------------------------------------------------------------------------------
                         Program Options and Settings
--------------------------------------------------------------------------------

Computational Options:
 - 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                =          100
 - Deflection tolerance for convergence                =   1.0000E-05 in
 - Maximum allowable deflection                        =     100.0000 in
 - Number of pile increments                           =           70

Loading Type and Number of Cycles of Loading:
 - Static loading specified

 - Analysis uses p-y modification factors for p-y curves
 - 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
 - Input of moment resistance at the pile tip not selected
 - Input of side resistance moment along pile 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                        =            2
Total length of pile                                   =      143.040 ft
Depth of ground surface below top of pile              =      21.0400 ft

Pile diameters used for p-y curve computations are defined using 4 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.

            Depth Below          Pile
Point        Pile Head         Diameter
 No.           feet             inches
-----      -------------     -------------
  1            0.000           66.0000
  2           23.040           66.0000
  3           23.040           90.0000
  4          143.040           90.0000


Input Structural Properties for Pile Sections:
----------------------------------------------

Pile Section No. 1:
```

```
   Section 1 is an elastic pile
   Cross-sectional Shape                                =   Circular Pile
   Length of section                                    =    23.040000 ft
   Width of top of section                              =    66.000000 in
   Width of bottom of section                           =    66.000000 in
   Top Area                                             =        3421. sq. in
   Bottom Area                                          =        3421. sq. in
   Moment of Inertia at Top                             =      215643. in^4
   Moment of Inertia at Bottom                          =      222190. in^4
   Elastic Modulus                                      =     4887733. psi

Pile Section No. 2:

   Section 2 is an elastic pile
   Cross-sectional Shape                                =   Circular Pile
   Length of section                                    =   120.000000 ft
   Width of top of section                              =    90.000000 in
   Width of bottom of section                           =    90.000000 in
   Top Area                                             =        6362. sq. in
   Bottom Area                                          =        6362. sq. in
   Moment of Inertia at Top                             =     3220623. in^4
   Moment of Inertia at Bottom                          =     3220623. in^4
   Elastic Modulus                                      =     4371722. psi



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

   Distance from top of pile to top of layer            =    21.040000 ft
   Distance from top of pile to bottom of layer         =    25.040000 ft
   Effective unit weight at top of layer                =   120.000000 pcf
   Effective unit weight at bottom of layer             =   120.000000 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                           =    90.000000 pci
   Subgrade k at bottom of layer                        =    90.000000 pci


Layer 2 is stiff clay without free water

   Distance from top of pile to top of layer            =    25.040000 ft
   Distance from top of pile to bottom of layer         =    33.540000 ft
   Effective unit weight at top of layer                =   120.000000 pcf
   Effective unit weight at bottom of layer             =   120.000000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


Layer 3 is stiff clay without free water

   Distance from top of pile to top of layer            =    33.540000 ft
   Distance from top of pile to bottom of layer         =    38.040000 ft
   Effective unit weight at top of layer                =    57.600000 pcf
   Effective unit weight at bottom of layer             =    57.600000 pcf
   Undrained cohesion at top of layer                   =        1500. psf
   Undrained cohesion at bottom of layer                =        1500. psf
   Epsilon-50 at top of layer                           =     0.007000
   Epsilon-50 at bottom of layer                        =     0.007000


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

```
   Distance from top of pile to top of layer          =    38.040000 ft
   Distance from top of pile to bottom of layer       =    46.040000 ft
   Effective unit weight at top of layer              =    57.600000 pcf
   Effective unit weight at bottom of layer           =    57.600000 pcf
   Friction angle at top of layer                     =    30.000000 deg.
   Friction angle at bottom of layer                  =    30.000000 deg.
   Subgrade k at top of layer                         =    60.000000 pci
   Subgrade k at bottom of layer                      =    60.000000 pci


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

   Distance from top of pile to top of layer          =    46.040000 ft
   Distance from top of pile to bottom of layer       =    50.040000 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                     =    36.000000 deg.
   Friction angle at bottom of layer                  =    36.000000 deg.
   Subgrade k at top of layer                         =   125.000000 pci
   Subgrade k at bottom of layer                      =   125.000000 pci


Layer 6 is stiff clay without free water

   Distance from top of pile to top of layer          =    50.040000 ft
   Distance from top of pile to bottom of layer       =    55.040000 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                 =        1500. psf
   Undrained cohesion at bottom of layer              =        1500. psf
   Epsilon-50 at top of layer                         =     0.007000
   Epsilon-50 at bottom of layer                      =     0.007000


Layer 7 is stiff clay without free water

   Distance from top of pile to top of layer          =    55.040000 ft
   Distance from top of pile to bottom of layer       =   150.000000 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                 =        1800. psf
   Undrained cohesion at bottom of layer              =        1800. psf
   Epsilon-50 at top of layer                         =     0.005000
   Epsilon-50 at bottom of layer                      =     0.005000

 (Depth of the lowest soil layer extends 6.960 ft below the pile tip)
```

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	E50 or krm	kpy pci
1	Sand	21.0400	120.0000	--	34.0000	--	90.0000
	(Reese, et al.)	25.0400	120.0000	--	34.0000	--	90.0000
2	Stiff Clay	25.0400	120.0000	1500.	--	0.00700	--
	w/o Free Water	33.5400	120.0000	1500.	--	0.00700	--
3	Stiff Clay	33.5400	57.6000	1500.	--	0.00700	--
	w/o Free Water	38.0400	57.6000	1500.	--	0.00700	--
4	Sand	38.0400	57.6000	--	30.0000	--	60.0000
	(Reese, et al.)	46.0400	57.6000	--	30.0000	--	60.0000
5	Sand	46.0400	65.6000	--	36.0000	--	125.0000
	(Reese, et al.)	50.0400	65.6000	--	36.0000	--	125.0000
6	Stiff Clay	50.0400	62.6000	1500.	--	0.00700	--
	w/o Free Water	55.0400	62.6000	1500.	--	0.00700	--
7	Stiff Clay	55.0400	62.6000	1800.	--	0.00500	--
	w/o Free Water	150.0000	62.6000	1800.	--	0.00500	--

---

p-y Modification Factors for Group Action

Distribution of p-y modifiers with depth defined using 8 points

```
Point      Depth X         p-mult         y-mult
```

No.	ft		
1	21.040	1.0000	1.0000
2	25.040	1.0000	1.0000
3	33.040	1.0000	1.0000
4	38.040	1.0000	1.0000
5	38.040	0.0000	1.0000
6	46.040	0.0000	1.0000
7	46.040	1.0000	1.0000
8	150.000	1.0000	1.0000

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	Run Analysis
1	1	V = 380750. lbs	M = 0.0000 in-lbs	742000.	No	Yes

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 = 2

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

Pile Section No. 2:

Moment-curvature properties were derived from elastic section properties

---

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 is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	21.0400	0.00	N.A.	No	0.00	73149.
2	25.0400	2.0633	No	No	73149.	375419.
3	33.5400	10.5633	Yes	No	448568.	242870.
4	38.0400	13.7316	No	No	691439.	929300.
5	46.0400	18.3854	Yes	No	1620739.	755733.
6	50.0400	39.0182	No	No	2376472.	455003.
7	55.0400	39.9819	Yes	No	2831475.	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 Shear and Moment (Loading Type 1)

```
Shear force at pile head                             =     380750.0 lbs
Applied moment at pile head                          =          0.0 in-lbs
Axial thrust load on pile head                       =     742000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*H lb/inch	Distrib. Lat. Load lb/inch
0.00	5.5107	0.00	380750.	-0.01965	216.8836	1.05E+12	0.00	0.00	0.00
2.0434	5.0287	9694019.	380750.	-0.01954	1696.	1.05E+12	0.00	0.00	0.00
4.0869	4.5523	1.94E+07	380750.	-0.01920	3167.	1.06E+12	0.00	0.00	0.00
6.1303	4.0869	2.91E+07	380750.	-0.01864	4629.	1.06E+12	0.00	0.00	0.00
8.1737	3.6380	3.87E+07	380750.	-0.01786	6082.	1.07E+12	0.00	0.00	0.00
10.2171	3.2109	4.84E+07	380750.	-0.01686	7524.	1.07E+12	0.00	0.00	0.00
12.2606	2.8110	5.80E+07	380750.	-0.01564	8956.	1.07E+12	0.00	0.00	0.00
14.3040	2.4438	6.76E+07	380750.	-0.01421	10376.	1.07E+12	0.00	0.00	0.00
16.3474	2.1144	7.72E+07	380750.	-0.01255	11784.	1.08E+12	0.00	0.00	0.00
18.3909	1.8281	8.68E+07	380750.	-0.01069	13180.	1.08E+12	0.00	0.00	0.00
20.4343	1.5901	9.63E+07	380750.	-0.00861	14564.	1.08E+12	0.00	0.00	0.00
22.4777	1.4057	1.06E+08	372574.	-0.00633	15934.	1.09E+12	-666.8638	11633.	0.00
24.5211	1.2798	1.15E+08	338788.	-0.00503	1720.	1.41E+13	-2089.	40022.	0.00
26.5646	1.1588	1.23E+08	294409.	-0.00483	1829.	1.41E+13	-1531.	32394.	0.00
28.6080	1.0431	1.29E+08	255804.	-0.00461	1925.	1.41E+13	-1618.	38034.	0.00
30.6514	0.9328	1.35E+08	215168.	-0.00438	2007.	1.41E+13	-1697.	44596.	0.00
32.6949	0.8284	1.40E+08	172709.	-0.00414	2074.	1.41E+13	-1767.	52292.	0.00
34.7383	0.7299	1.44E+08	128847.	-0.00389	2127.	1.41E+13	-1811.	60835.	0.00
36.7817	0.6376	1.47E+08	84151.	-0.00364	2164.	1.41E+13	-1835.	70553.	0.00
38.8251	0.5516	1.48E+08	61658.	-0.00338	2186.	1.41E+13	0.00	0.00	0.00
40.8686	0.4718	1.50E+08	61658.	-0.00312	2208.	1.41E+13	0.00	0.00	0.00
42.9120	0.3985	1.51E+08	61658.	-0.00286	2230.	1.41E+13	0.00	0.00	0.00
44.9554	0.3316	1.53E+08	61658.	-0.00259	2252.	1.41E+13	0.00	0.00	0.00
46.9989	0.2713	1.54E+08	-9877.	-0.00233	2274.	1.41E+13	-5835.	527404.	0.00
49.0423	0.2175	1.52E+08	-147550.	-0.00206	2247.	1.41E+13	-5394.	608113.	0.00
51.0857	0.1703	1.47E+08	-239841.	-0.00180	2174.	1.41E+13	-2133.	307188.	0.00
53.1291	0.1293	1.41E+08	-291061.	-0.00155	2083.	1.41E+13	-2045.	387687.	0.00
55.1726	0.09437	1.33E+08	-343984.	-0.00131	1975.	1.41E+13	-2272.	590353.	0.00
57.2160	0.06510	1.24E+08	-397915.	-0.00109	1848.	1.41E+13	-2127.	801066.	0.00
59.2594	0.04113	1.14E+08	-447853.	-8.79E-04	1703.	1.41E+13	-1946.	1160429.	0.00
61.3029	0.02200	1.02E+08	-492652.	-6.91E-04	1542.	1.41E+13	-1708.	1903133.	0.00
63.3463	0.00723	8.94E+07	-529844.	-5.24E-04	1366.	1.41E+13	-1326.	4495673.	0.00
65.3897	-0.00372	7.60E+07	-532006.	-3.80E-04	1179.	1.41E+13	1149.	7575596.	0.00
67.4331	-0.01143	6.33E+07	-498799.	-2.59E-04	1001.	1.41E+13	1559.	3345441.	0.00
69.4766	-0.01643	5.16E+07	-458264.	-1.59E-04	837.1594	1.41E+13	1747.	2608090.	0.00
71.5200	-0.01923	4.09E+07	-414401.	-7.86E-05	687.5177	1.41E+13	1830.	2334254.	0.00
73.5634	-0.02028	3.12E+07	-369219.	-1.58E-05	553.2349	1.41E+13	1855.	2242676.	0.00
75.6069	-0.02000	2.28E+07	-323814.	3.12E-05	434.5219	1.41E+13	1848.	2266217.	0.00
77.6503	-0.01875	1.54E+07	-278851.	6.44E-05	331.3285	1.41E+13	1819.	2378787.	0.00
79.6937	-0.01684	9073114.	-234841.	8.57E-05	243.4091	1.41E+13	1771.	2578187.	0.00
81.7371	-0.01455	3845176.	-192203.	9.70E-05	170.3620	1.41E+13	1707.	2877690.	0.00
83.7806	-0.01209	-356495.	-151293.	1.00E-04	121.6166	1.41E+13	1630.	3306618.	0.00
85.8240	-0.00964	-3578218.	-112428.	9.66E-05	166.6320	1.41E+13	1540.	3917309.	0.00
87.8674	-0.00735	-5873720.	-75899.	8.83E-05	198.7058	1.41E+13	1439.	4801641.	0.00
89.9109	-0.00531	-7303686.	-41987.	7.69E-05	218.6859	1.41E+13	1327.	6128305.	0.00
91.9543	-0.00358	-7935662.	-10980.	6.36E-05	227.5161	1.41E+13	1202.	8235408.	0.00
93.9977	-0.00219	-7844475.	16797.	4.99E-05	226.2420	1.41E+13	1063.	1.19E+07	0.00
96.0411	-0.00113	-7113728.	37659.	3.68E-05	216.0317	1.41E+13	638.2988	1.38E+07	0.00
98.0846	-3.84E-04	-5998955.	48130.	2.54E-05	200.4556	1.41E+13	215.7371	1.38E+07	0.00
100.1280	1.11E-04	-4754271.	50006.	1.60E-05	183.0643	1.41E+13	-62.7169	1.38E+07	0.00
102.1714	4.03E-04	-3547148.	46454.	8.82E-06	166.1978	1.41E+13	-226.9632	1.38E+07	0.00
104.2149	5.44E-04	-2476383.	39920.	3.57E-06	151.2366	1.41E+13	-305.9995	1.38E+07	0.00
106.2583	5.79E-04	-1589532.	32176.	3.31E-08	138.8451	1.41E+13	-325.5477	1.38E+07	0.00
108.3017	5.46E-04	-898378.	24422.	-2.13E-06	129.1880	1.41E+13	-306.9120	1.38E+07	0.00
110.3451	4.74E-04	-391738.	17389.	-3.26E-06	122.1090	1.41E+13	-266.6954	1.38E+07	0.00
112.3886	3.86E-04	-45446.	11458.	-3.64E-06	117.2705	1.41E+13	-217.0684	1.38E+07	0.00
114.4320	2.96E-04	170327.	6757.	-3.53E-06	119.0154	1.41E+13	-166.3497	1.38E+07	0.00

116.4754	2.13E-04	286072.	3250.	-3.13E-06	120.6326	1.41E+13	-119.7226	1.38E+07	0.00
118.5189	1.42E-04	329819.	801.4871	-2.60E-06	121.2439	1.41E+13	-79.9675	1.38E+07	0.00
120.5623	8.56E-05	325473.	-769.1285	-2.02E-06	121.1831	1.41E+13	-48.1354	1.38E+07	0.00
122.6057	4.29E-05	292173.	-1655.	-1.49E-06	120.7179	1.41E+13	-24.1219	1.38E+07	0.00
124.6491	1.27E-05	244360.	-2038.	-1.02E-06	120.0498	1.41E+13	-7.1270	1.38E+07	0.00
126.6926	-7.11E-06	192253.	-2077.	-6.39E-07	119.3217	1.41E+13	3.9979	1.38E+07	0.00
128.7360	-1.87E-05	142545.	-1899.	-3.48E-07	118.6272	1.41E+13	10.5045	1.38E+07	0.00
130.7794	-2.42E-05	99148.	-1603.	-1.37E-07	118.0208	1.41E+13	13.5868	1.38E+07	0.00
132.8229	-2.54E-05	63917.	-1262.	4.87E-09	117.5286	1.41E+13	14.2874	1.38E+07	0.00
134.8663	-2.39E-05	37276.	-921.4987	9.30E-08	117.1563	1.41E+13	13.4525	1.38E+07	0.00
136.9097	-2.08E-05	18722.	-612.8425	1.42E-07	116.8971	1.41E+13	11.7222	1.38E+07	0.00
138.9531	-1.70E-05	7215.	-352.1293	1.64E-07	116.7363	1.41E+13	9.5422	1.38E+07	0.00
140.9966	-1.28E-05	1446.	-146.9981	1.72E-07	116.6557	1.41E+13	7.1888	1.38E+07	0.00
143.0400	-8.53E-06	0.00	0.00	1.73E-07	116.6355	1.41E+13	4.8007	6896571.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     5.51066684 inches
Computed slope at pile head      =    -0.01965375 radians
Maximum bending moment           =     154393178. inch-lbs
Maximum shear force              =       -532006. lbs
Depth of maximum bending moment  =    46.99885714 feet below pile head
Depth of maximum shear force     =    65.38971429 feet below pile head
Number of iterations             =             29
Number of zero deflection points =              3
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

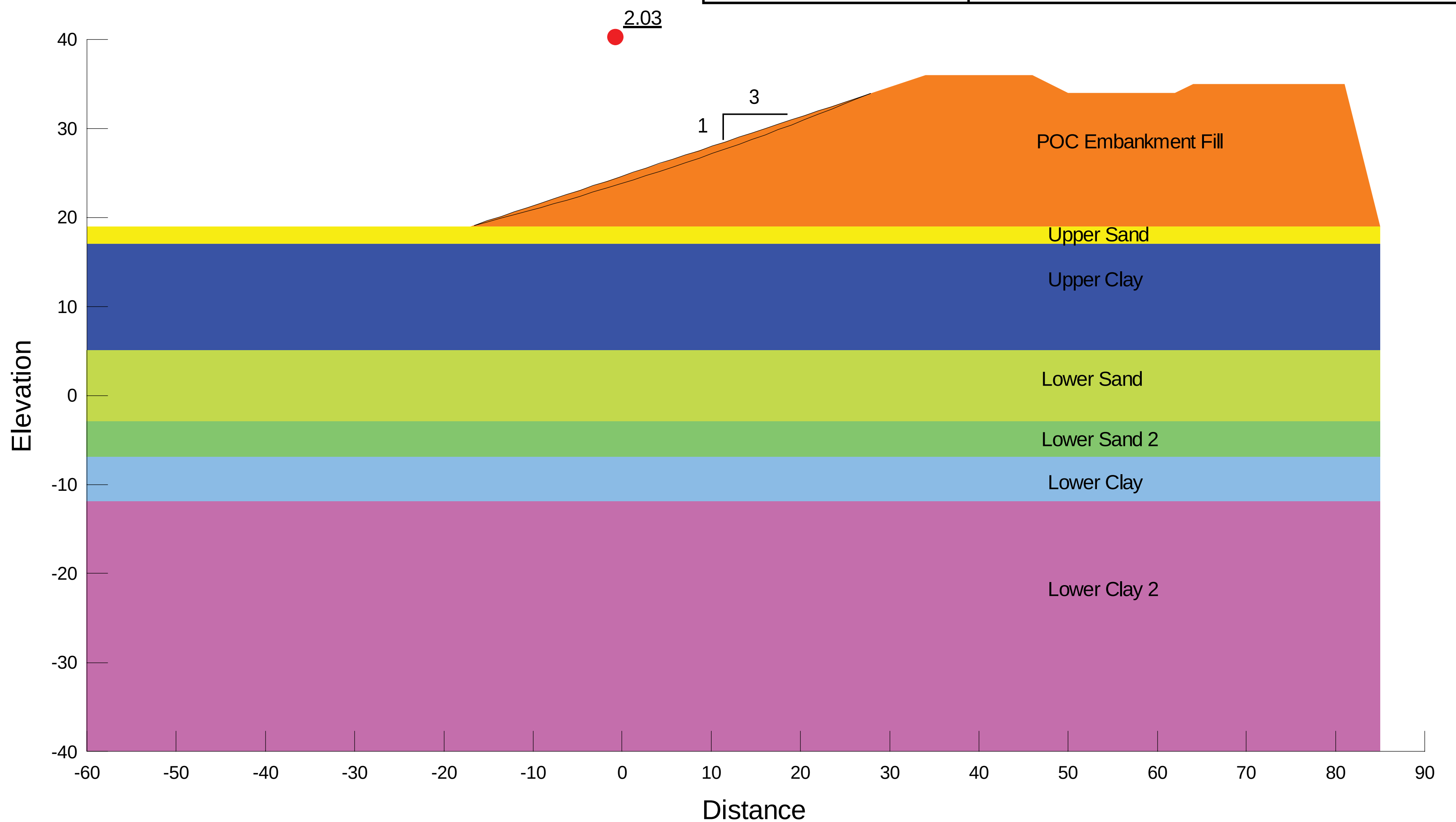
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head 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	V, lb	380750.	M, in-lb	0.00	742000.	5.5107	-0.01965	-532006.	1.54E+08

Maximum pile-head deflection = 5.5106668433 inches
Maximum pile-head rotation   = -0.0196537545 radians = -1.126077 deg.

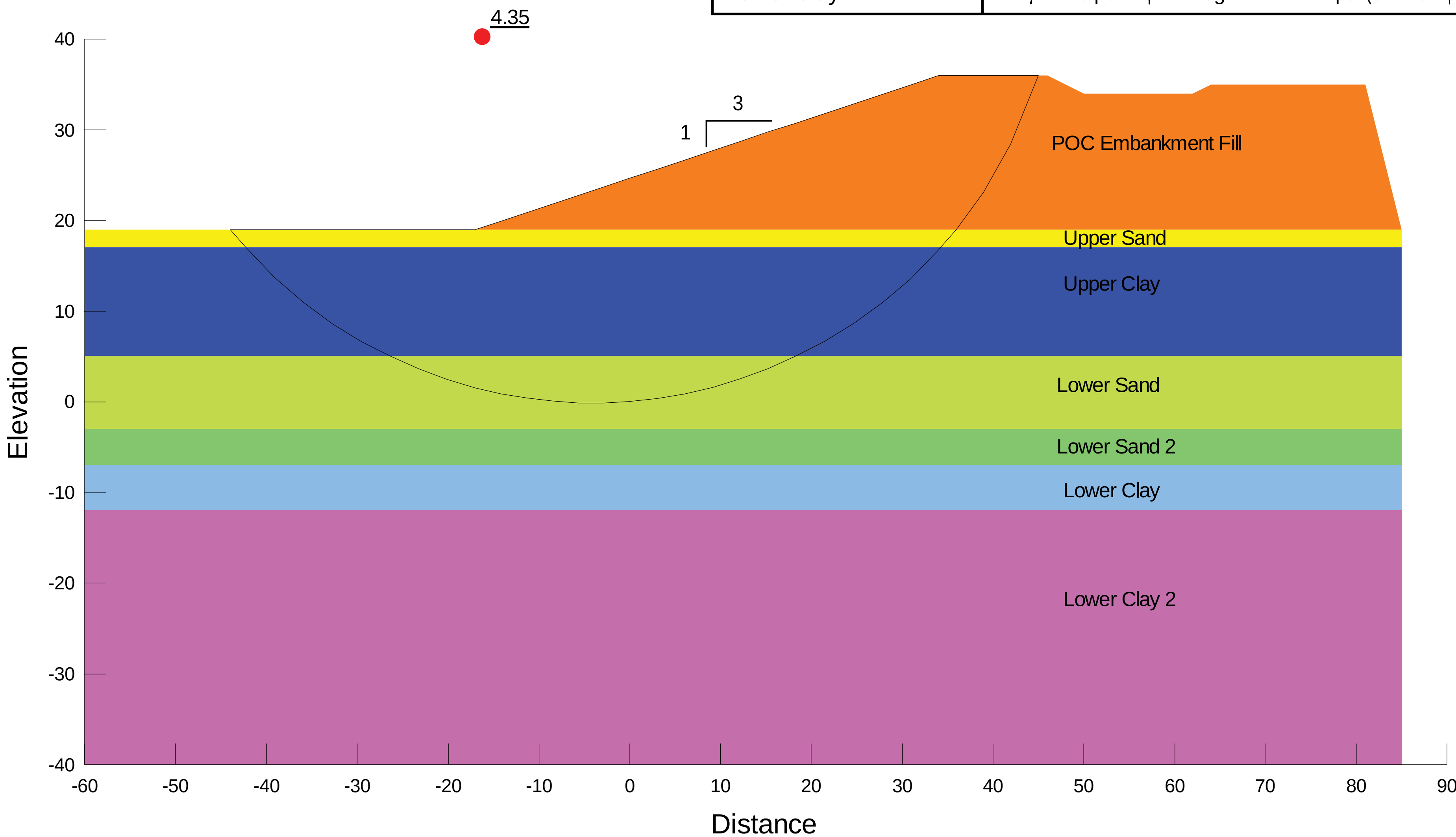
The analysis ended normally.

POC Embankment Fill	γ = 120 pcf ϕ = 34 deg c = 0
Upper Sand	γ = 120 pcf ϕ = 34 deg c = 0
Upper Clay	γ = 120 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Sand (Liquefiable)	γ = 120 pcf ϕ = 30 deg c = 0
Lower Sand 2	γ = 128 pcf ϕ = 36 deg c = 0
Lower Clay	γ = 125 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Clay 2	γ = 125 pcf ϕ = 0 deg c = 1800 psf (drained ϕ = 32 deg)



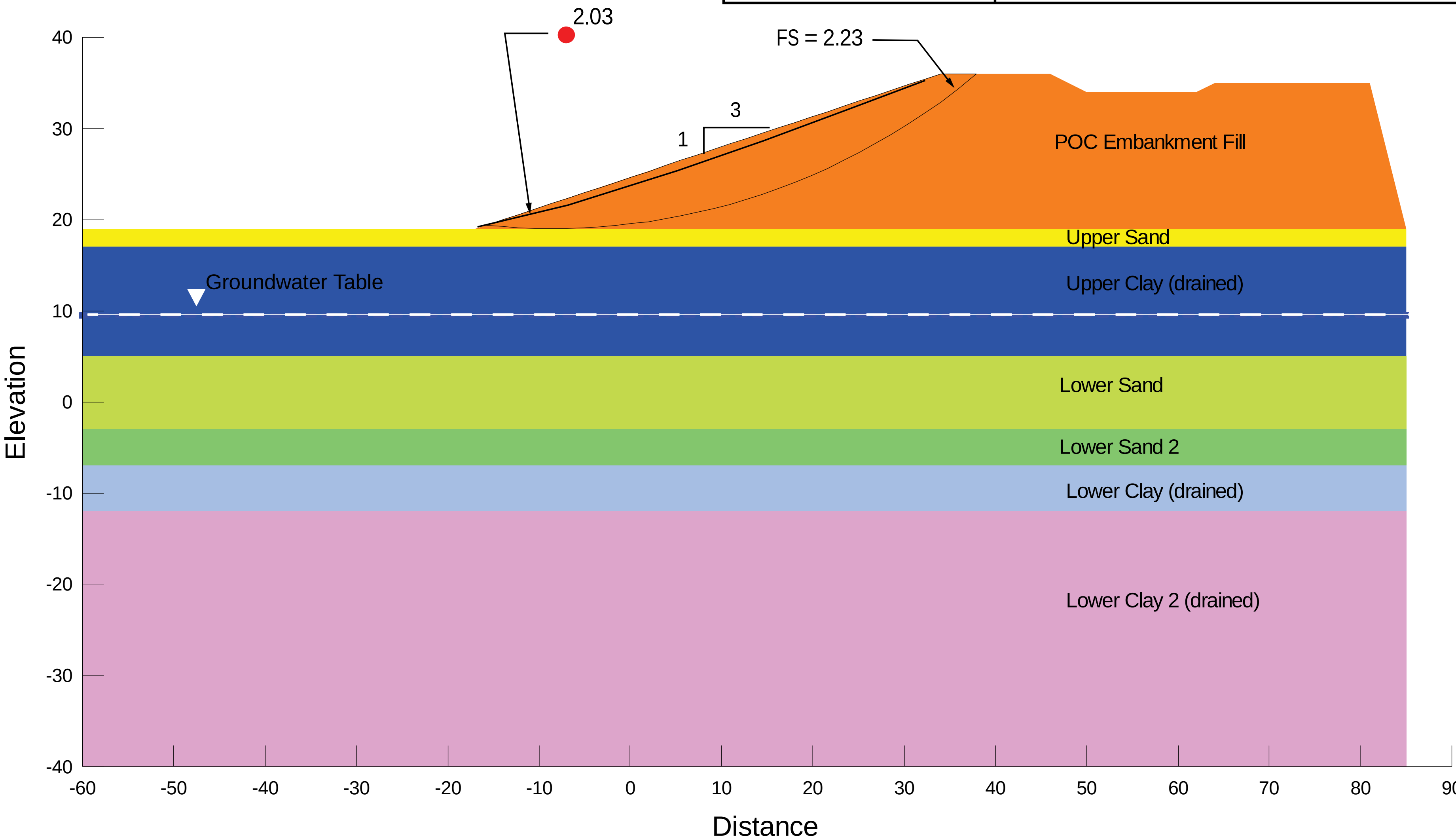
Slope Stability - Static (End of Construction)
Abutment 1 Approach Embankment (Approx. Sta. 15+00)
US 101 / University Ave POC

POC Embankment Fill	γ = 120 pcf ϕ = 34 deg c = 0
Upper Sand	γ = 120 pcf ϕ = 34 deg c = 0
Upper Clay	γ = 120 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Sand (Liquefiable)	γ = 120 pcf ϕ = 30 deg c = 0
Lower Sand 2	γ = 128 pcf ϕ = 36 deg c = 0
Lower Clay	γ = 125 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Clay 2	γ = 125 pcf ϕ = 0 deg c = 1800 psf (drained ϕ = 32 deg)



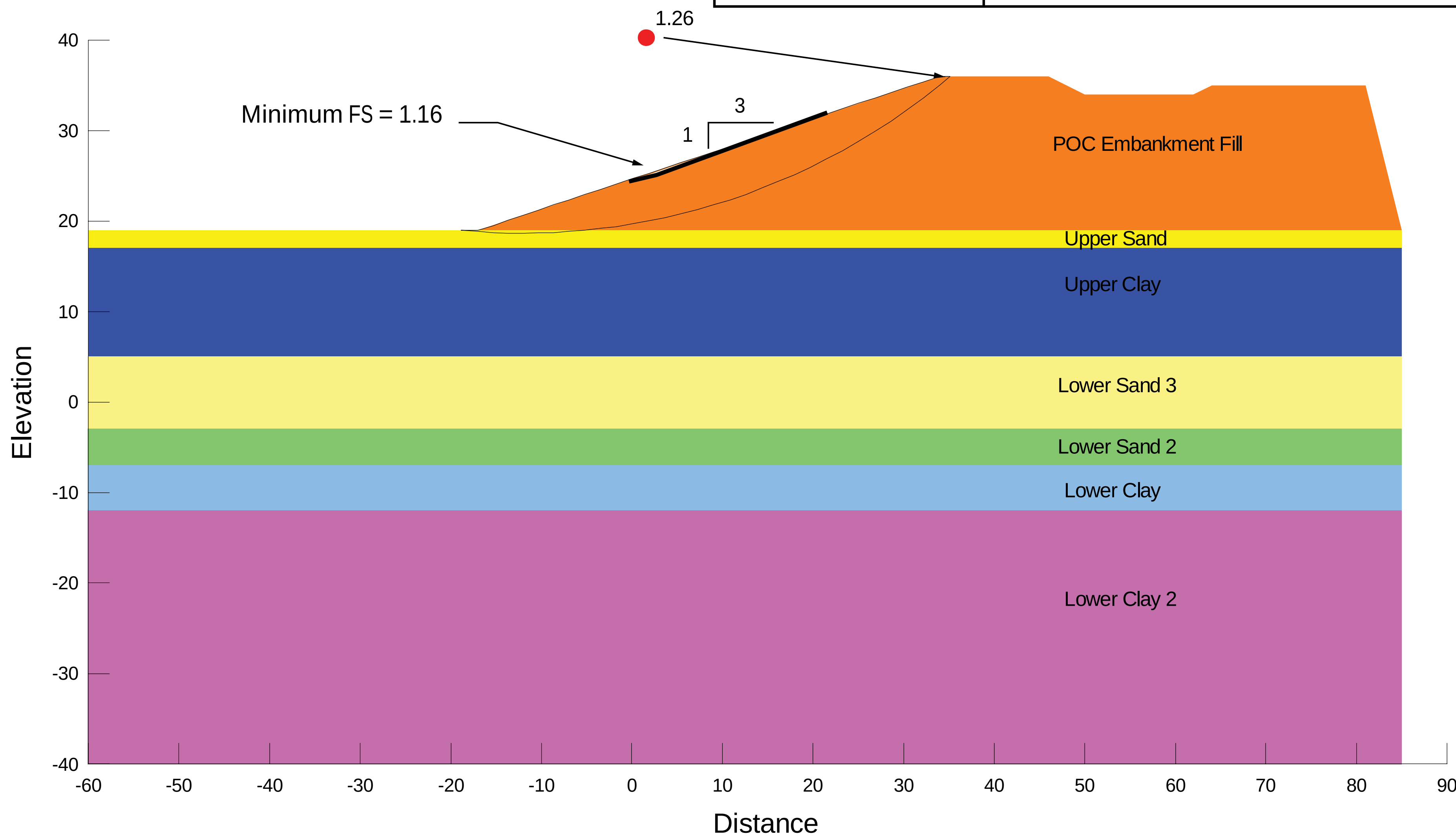
Slope Stability - Static (End of Construction)
Abutment 1 Approach Embankment (Approx. Sta. 15+00)
US 101 / University Ave POC

POC Embankment Fill	γ = 120 pcf ϕ = 34 deg c = 0
Upper Sand	γ = 120 pcf ϕ = 34 deg c = 0
Upper Clay	γ = 120 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Sand (Liquefiable)	γ = 120 pcf ϕ = 30 deg c = 0
Lower Sand 2	γ = 128 pcf ϕ = 36 deg c = 0
Lower Clay	γ = 125 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Clay 2	γ = 125 pcf ϕ = 0 deg c = 1800 psf (drained ϕ = 32 deg)



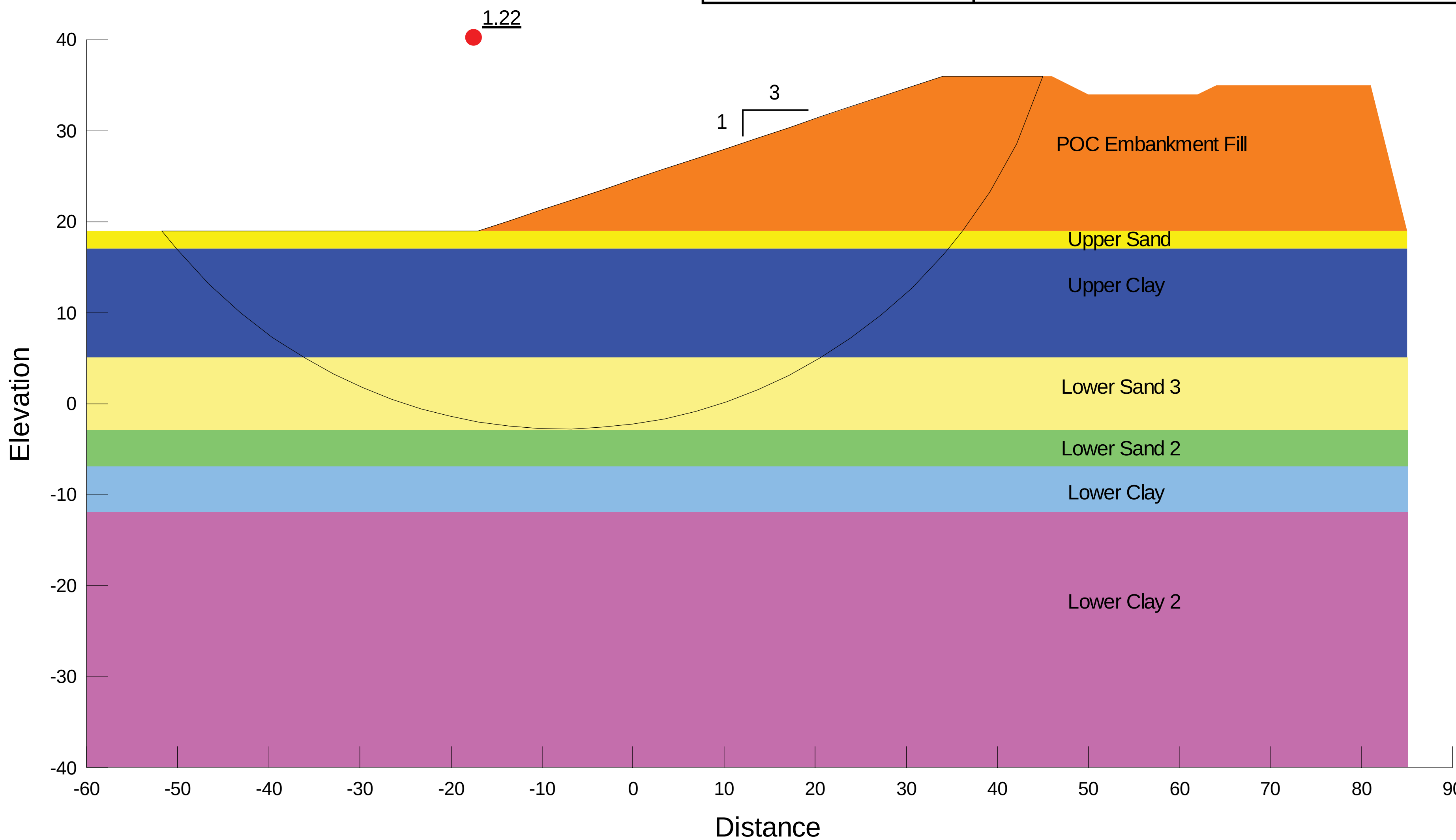
Slope Stability - Static (Drained)
Abutment 1 Approach Embankment (Approx. Sta. 15+00)
US 101 / University Ave POC

POC Embankment Fill	γ = 120 pcf ϕ = 34 deg c = 0
Upper Sand	γ = 120 pcf ϕ = 34 deg c = 0
Upper Clay	γ = 120 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Sand (Liquefiable)	γ = 120 pcf ϕ(0(2(9=c((((((d(0(f g2(pqu( )APS=a=9(qeh=i cel n
Lower Sand 2	γ = 128 pcf ϕ = 36 deg c = 0
Lower Clay	γ = 125 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Clay 2	γ = 125 pcf ϕ = 0 deg c = 1800 psf (drained ϕ = 32 deg)



Slope Stability - Pseudo-static (shallow slip)
Abutment 1 Approach Embankment (Approx. Sta. 15+00)
US 101 / University Ave POC

POC Embankment Fill	γ = 120 pcf ϕ = 34 deg c = 0
Upper Sand	γ = 120 pcf ϕ = 34 deg c = 0
Upper Clay	γ = 120 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Sand 3 (Liquefiable)	γ = 120 pcf ϕ(0(2(9=c((((d(0(f g2(pqµ( )ΆS=a=9(qeh=i cel n
Lower Sand 2	γ = 128 pcf ϕ = 36 deg c = 0
Lower Clay	γ = 125 pcf ϕ = 0 deg c = 1500 psf (drained ϕ = 30 deg)
Lower Clay 2	γ = 125 pcf ϕ = 0 deg c = 1800 psf (drained ϕ = 32 deg)



Slope Stability - Pseudo-static (Liquefied Sand)
Abutment 1 Approach Embankment (Approx. Sta. 15+00)
US 101 / University Ave POC

Abut 1 Embankment - EOC_shallow

File Information

File Version: 11.01
Title: University POC - Abut 1 Emb
Created By: Huang, Stephen
Last Edited By: Huang, Stephen
Revision Number: 65
Date: 09/27/2022
Time: 11:28:39 AM
Tool Version: 11.1.3.22700
File Name: abut1_emb_2022_3to1side.gsz
Directory: X:\City of East Palo Alto\28645626 101-University\440_Materials\Analysis\Slope\
Last Solved Date: 09/27/2022
Last Solved Time: 11:28:45 AM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Abut 1 Embankment - EOC_shallow

Kind: SLOPE/W
Analysis Type: Spencer
Settings
- PWP Conditions from: (none)
- Critical Slip Surface Source from: (none)
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Advanced
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Slices: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings
  - Search Method: Root Finder
  - Tolerable difference between starting and converged F of S: 3

Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

POC Embankment Fill

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °

Upper Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Steady State Strength (Css): 0 psf
Collapse Surface Angle: 0 °

Upper Clay

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °

Lower Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 30 °
Phi-B: 0 °

Lower Sand 2

Material Model: Mohr-Coulomb
Unit Weight: 128 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 36 °
Phi-B: 0 °

Lower Clay

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °

Lower Clay 2

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf

Effective Cohesion: 1,800 psf
Effective Friction Angle: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (-30, 19) ft
Left-Zone Right Coordinate: (-9.8, 21.4) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (27.888504, 33.962835) ft
Right-Zone Right Coordinate: (48, 35) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-60, 19) ft
Right Coordinate: (85, 19) ft

Geometry

Name: Default Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	-60 ft	19 ft
Point 2	-17 ft	19 ft
Point 3	34 ft	36 ft
Point 4	46 ft	36 ft
Point 5	50 ft	34 ft
Point 6	62 ft	34 ft
Point 7	64 ft	35 ft
Point 8	81 ft	35 ft
Point 9	-60 ft	17 ft
Point 10	0 ft	17 ft
Point 11	85 ft	17 ft
Point 12	85 ft	19 ft
Point 13	-60 ft	5 ft
Point 14	85 ft	5 ft
Point 15	-60 ft	-3 ft
Point 16	85 ft	-3 ft
Point 17	-60 ft	-7 ft
Point 18	85 ft	-7 ft
Point 19	-60 ft	-12 ft

Point 20	85 ft	-12 ft
Point 21	-60 ft	-40 ft
Point 22	85 ft	-40 ft

Regions

	Material	Points	Area
Region 1	POC Embankment Fill	2,3,4,5,6,7,8,12	1,216.5 ft²
Region 2	Upper Sand	1,2,12,11,10,9	290 ft²
Region 3	Upper Clay	9,10,11,14,13	1,740 ft²
Region 4	Lower Sand	13,14,16,15	1,160 ft²
Region 5	Lower Sand 2	15,16,18,17	580 ft²
Region 6	Lower Clay	17,18,20,19	725 ft²
Region 7	Lower Clay 2	19,20,22,21	4,060 ft²

Slip Results

Slip Surfaces Analysed: 368 of 405 converged

Current Slip Surface

Slip Surface: 226
Factor of Safety: 2.03
Volume: 26.06473 ft³
Weight: 3,127.7676 lbf
Resisting Moment: 659,427.77 lbf·ft
Activating Moment: 325,141.61 lbf·ft
Resisting Force: 1,899.565 lbf
Activating Force: 936.61712 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (-16.571956, 19.142681) ft
Entry: (27.888504, 33.962835) ft
Radius: 329.23147 ft
Center: (-98.189821, 338.09704) ft

Slip Slices

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Base Material
Slice 1	-15.830948 ft	19.334136 ft	0 psf	6.2817811 psf	4.2371149 psf	0 psf	0 psf	POC Embankment Fill
Slice 2	-14.348933 ft	19.720726 ft	0 psf	18.371739 psf	12.391895 psf	0 psf	0 psf	POC Embankment Fill
Slice 3	-12.866918 ft	20.114694 ft	0 psf	29.557374 psf	19.9367 psf	0 psf	0 psf	POC Embankment Fill
Slice 4	-11.384902 ft	20.516066 ft	0 psf	39.8436 psf	26.874847 psf	0 psf	0 psf	POC Embankment Fill
Slice 5	-9.902887 ft	20.924872 ft	0 psf	49.235253 psf	33.209598 psf	0 psf	0 psf	POC Embankment

								Fill
Slice 6	-8.4208717 ft	21.341138 ft	0 psf	57.737092 psf	38.94416 psf	0 psf	0 psf	POC Embankment Fill
Slice 7	-6.9388564 ft	21.764896 ft	0 psf	65.353798 psf	44.081693 psf	0 psf	0 psf	POC Embankment Fill
Slice 8	-5.456841 ft	22.196174 ft	0 psf	72.089977 psf	48.625304 psf	0 psf	0 psf	POC Embankment Fill
Slice 9	-3.9748257 ft	22.635005 ft	0 psf	77.950164 psf	52.578049 psf	0 psf	0 psf	POC Embankment Fill
Slice 10	-2.4928103 ft	23.081419 ft	0 psf	82.938818 psf	55.942939 psf	0 psf	0 psf	POC Embankment Fill
Slice 11	-1.010795 ft	23.535449 ft	0 psf	87.060332 psf	58.722935 psf	0 psf	0 psf	POC Embankment Fill
Slice 12	0.47122033 ft	23.997128 ft	0 psf	90.319027 psf	60.920953 psf	0 psf	0 psf	POC Embankment Fill
Slice 13	1.9532357 ft	24.46649 ft	0 psf	92.719159 psf	62.539863 psf	0 psf	0 psf	POC Embankment Fill
Slice 14	3.435251 ft	24.943569 ft	0 psf	94.264917 psf	63.58249 psf	0 psf	0 psf	POC Embankment Fill
Slice 15	4.9172664 ft	25.4284 ft	0 psf	94.960426 psf	64.051616 psf	0 psf	0 psf	POC Embankment Fill
Slice 16	6.3992817 ft	25.92102 ft	0 psf	94.809749 psf	63.949983 psf	0 psf	0 psf	POC Embankment Fill
Slice 17	7.881297 ft	26.421465 ft	0 psf	93.816885 psf	63.280288 psf	0 psf	0 psf	POC Embankment Fill
Slice 18	9.3633124 ft	26.929774 ft	0 psf	91.985777 psf	62.04519 psf	0 psf	0 psf	POC Embankment Fill
Slice 19	10.845328 ft	27.445984 ft	0 psf	89.320306 psf	60.247307 psf	0 psf	0 psf	POC Embankment Fill
Slice 20	12.327343 ft	27.970136 ft	0 psf	85.824301 psf	57.889222 psf	0 psf	0 psf	POC Embankment Fill
Slice 21	13.809358 ft	28.50227 ft	0 psf	81.501532 psf	54.973477 psf	0 psf	0 psf	POC Embankment Fill
Slice 22	15.291374 ft	29.042426 ft	0 psf	76.355717 psf	51.502581 psf	0 psf	0 psf	POC Embankment Fill
Slice 23	16.773389 ft	29.590648 ft	0 psf	70.390521 psf	47.479006 psf	0 psf	0 psf	POC Embankment

								Fill
Slice 24	18.255404 ft	30.146978 ft	0 psf	63.609561 psf	42.905191 psf	0 psf	0 psf	POC Embankment Fill
Slice 25	19.73742 ft	30.71146 ft	0 psf	56.016404 psf	37.783541 psf	0 psf	0 psf	POC Embankment Fill
Slice 26	21.219435 ft	31.284139 ft	0 psf	47.614568 psf	32.116432 psf	0 psf	0 psf	POC Embankment Fill
Slice 27	22.70145 ft	31.865061 ft	0 psf	38.407529 psf	25.906205 psf	0 psf	0 psf	POC Embankment Fill
Slice 28	24.183466 ft	32.454274 ft	0 psf	28.398717 psf	19.155176 psf	0 psf	0 psf	POC Embankment Fill
Slice 29	25.665481 ft	33.051825 ft	0 psf	17.591521 psf	11.865631 psf	0 psf	0 psf	POC Embankment Fill
Slice 30	27.147496 ft	33.657763 ft	0 psf	5.9892901 psf	4.0398272 psf	0 psf	0 psf	POC Embankment Fill

Slip #	F of S	X Center (ft)	Y Center (ft)	Radius (ft)	Details
226	2.03	-98.19	338.1	329.23	Critical (analysis)
231	2.03	-102.63	355.49	347.19	
236	2.03	-107.06	372.89	365.14	
371	2.03	-86.866	323.59	311.86	
366	2.03	-82.429	306.19	293.9	
361	2.03	-77.993	288.79	275.95	
326	2.03	-93.726	340.1	329.74	
321	2.03	-89.289	322.7	311.78	
316	2.03	-84.852	305.3	293.83	
281	2.03	-100.58	356.6	347.61	
276	2.03	-96.148	339.21	329.66	
271	2.03	-91.711	321.81	311.7	
241	2.04	-107.66	387.68	379.63	
286	2.04	-101.18	371.39	362.1	
331	2.05	-94.322	354.88	344.22	
376	2.05	-87.465	338.37	326.35	
246	2.11	-104.68	399.97	390.9	
291	2.12	-98.2	383.68	373.37	
336	2.13	-91.352	367.17	355.5	
201	2.13	-104.46	412.25	402.28	
381	2.13	-84.505	350.67	337.63	
192	2.16	-13.216	89.797	71.094	
187	2.16	-13.452	86.417	67.707	
182	2.16	-13.689	83.038	64.32	
227	2.17	-12.735	80.98	62.135	
232	2.17	-12.499	84.36	65.524	
237	2.17	-12.263	87.74	68.912	
372	2.17	-5.7075	80.11	58.853	
367	2.17	-5.9431	76.73	55.465	
362	2.17	-6.1787	73.35	52.076	
327	2.17	-7.9145	82.662	62.226	

Abut 1 Embankment - EOC_deep

File Information

File Version: 11.01
Title: University POC - Abut 1 Emb
Created By: Huang, Stephen
Last Edited By: Huang, Stephen
Revision Number: 65
Date: 09/27/2022
Time: 11:28:39 AM
Tool Version: 11.1.3.22700
File Name: abut1_emb_2022_3to1side.gsz
Directory: X:\City of East Palo Alto\28645626 101-University\440_Materials\Analysis\Slope\
Last Solved Date: 09/27/2022
Last Solved Time: 11:28:46 AM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Abut 1 Embankment - EOC_deep

- Kind: SLOPE/W
- Analysis Type: Spencer
- Settings
  - PWP Conditions from: (none)
  - Critical Slip Surface Source from: (none)
  - Unit Weight of Water: 62.430189 pcf
- Slip Surface
  - Direction of movement: Right to Left
  - Use Passive Mode: No
  - Slip Surface Option: Entry and Exit
  - Critical slip surfaces saved: 1
  - Optimize Critical Slip Surface Location: No
  - Tension Crack Option: (none)
- Distribution
  - F of S Calculation Option: Constant
- Advanced
  - Geometry Settings
    - Minimum Slip Surface Depth: 0.1 ft
    - Number of Slices: 30
  - Factor of Safety Convergence Settings
    - Maximum Number of Iterations: 100
    - Tolerable difference in F of S: 0.001
  - Solution Settings
    - Search Method: Root Finder
    - Tolerable difference between starting and converged F of S: 3

Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

POC Embankment Fill

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °

Upper Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Steady State Strength (Css): 0 psf
Collapse Surface Angle: 0 °

Upper Clay

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °

Lower Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 30 °
Phi-B: 0 °

Lower Sand 2

Material Model: Mohr-Coulomb
Unit Weight: 128 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 36 °
Phi-B: 0 °

Lower Clay

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °

Lower Clay 2

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf

Effective Cohesion: 1,800 psf
Effective Friction Angle: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (-53, 19) ft
Left-Zone Right Coordinate: (-44, 19) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (34, 36) ft
Right-Zone Right Coordinate: (45, 36) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-60, 19) ft
Right Coordinate: (85, 19) ft

Geometry

Name: Default Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	-60 ft	19 ft
Point 2	-17 ft	19 ft
Point 3	34 ft	36 ft
Point 4	46 ft	36 ft
Point 5	50 ft	34 ft
Point 6	62 ft	34 ft
Point 7	64 ft	35 ft
Point 8	81 ft	35 ft
Point 9	-60 ft	17 ft
Point 10	0 ft	17 ft
Point 11	85 ft	17 ft
Point 12	85 ft	19 ft
Point 13	-60 ft	5 ft
Point 14	85 ft	5 ft
Point 15	-60 ft	-3 ft
Point 16	85 ft	-3 ft
Point 17	-60 ft	-7 ft
Point 18	85 ft	-7 ft
Point 19	-60 ft	-12 ft

Point 20	85 ft	-12 ft
Point 21	-60 ft	-40 ft
Point 22	85 ft	-40 ft

Regions

	Material	Points	Area
Region 1	POC Embankment Fill	2,3,4,5,6,7,8,12	1,216.5 ft²
Region 2	Upper Sand	1,2,12,11,10,9	290 ft²
Region 3	Upper Clay	9,10,11,14,13	1,740 ft²
Region 4	Lower Sand	13,14,16,15	1,160 ft²
Region 5	Lower Sand 2	15,16,18,17	580 ft²
Region 6	Lower Clay	17,18,20,19	725 ft²
Region 7	Lower Clay 2	19,20,22,21	4,060 ft²

Slip Results

Slip Surfaces Analysed: 324 of 405 converged

Current Slip Surface

Slip Surface: 404
Factor of Safety: 4.35
Volume: 1,614.2504 ft³
Weight: 193,710.05 lbf
Resisting Moment: 7,391,674.3 lbf·ft
Activating Moment: 1,700,544.3 lbf·ft
Resisting Force: 123,728.39 lbf
Activating Force: 28,462.971 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (-44, 19) ft
Entry: (45, 36) ft
Radius: 51.360274 ft
Center: (-4.0393684, 51.264929) ft

Slip Slices

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Base Material
Slice 1	-43.149454 ft	18 ft	0 psf	185.72091 psf	125.27034 psf	0 psf	0 psf	Upper Sand
Slice 2	-40.703277 ft	15.370178 ft	0 psf	958.63193 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 3	-37.512015 ft	12.367265 ft	0 psf	1,279.1165 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 4	-34.320753 ft	9.828113 ft	0 psf	1,542.4539 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 5	-31.129491 ft	7.6705054 ft	0 psf	1,759.2481 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 6	-27.938229 ft	5.8394801 ft	0 psf	1,936.5013 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 7	-24.785499 ft	4.3119962 ft	0 psf	2,032.2666 psf	1,173.3297 psf	0 psf	0 psf	Lower Sand

Slice 8	-21.671299 ft	3.0545164 ft	0 psf	2,156.7297 psf	1,245.1885 psf	0 psf	0 psf	Lower Sand
Slice 9	-18.5571 ft	2.0259416 ft	0 psf	2,248.8416 psf	1,298.3693 psf	0 psf	0 psf	Lower Sand
Slice 10	-15.583333 ft	1.2399274 ft	0 psf	2,371.644 psf	1,369.2693 psf	0 psf	0 psf	Lower Sand
Slice 11	-12.75 ft	0.66911692 ft	0 psf	2,526.7524 psf	1,458.8212 psf	0 psf	0 psf	Lower Sand
Slice 12	-9.9166667 ft	0.26197318 ft	0 psf	2,657.4887 psf	1,534.3018 psf	0 psf	0 psf	Lower Sand
Slice 13	-7.0833333 ft	0.014582803 ft	0 psf	2,765.2008 psf	1,596.4894 psf	0 psf	0 psf	Lower Sand
Slice 14	-4.25 ft	-0.075370846 ft	0 psf	2,850.8853 psf	1,645.9594 psf	0 psf	0 psf	Lower Sand
Slice 15	-1.4166667 ft	-0.0087189315 ft	0 psf	2,915.2475 psf	1,683.1189 psf	0 psf	0 psf	Lower Sand
Slice 16	1.5219885 ft	0.22959726 ft	0 psf	2,959.5898 psf	1,708.72 psf	0 psf	0 psf	Lower Sand
Slice 17	4.5659654 ft	0.65423306 ft	0 psf	2,982.486 psf	1,721.9391 psf	0 psf	0 psf	Lower Sand
Slice 18	7.6099424 ft	1.2676382 ft	0 psf	2,981.5419 psf	1,721.394 psf	0 psf	0 psf	Lower Sand
Slice 19	10.653919 ft	2.0769033 ft	0 psf	2,956.4556 psf	1,706.9104 psf	0 psf	0 psf	Lower Sand
Slice 20	13.697896 ft	3.091942 ft	0 psf	2,906.6129 psf	1,678.1338 psf	0 psf	0 psf	Lower Sand
Slice 21	16.741873 ft	4.3261686 ft	0 psf	2,831.0456 psf	1,634.5049 psf	0 psf	0 psf	Lower Sand
Slice 22	19.837476 ft	5.8269051 ft	0 psf	2,732.4351 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 23	22.984703 ft	7.6283469 ft	0 psf	2,588.2556 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 24	26.131931 ft	9.7464212 ft	0 psf	2,404.3238 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 25	29.279159 ft	12.233239 ft	0 psf	2,174.002 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 26	32.426386 ft	15.166129 ft	0 psf	1,887.3778 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 27	34.110086 ft	16.87787 ft	0 psf	1,711.6434 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 28	35.070717 ft	18 ft	0 psf	1,643.9558 psf	1,108.8622 psf	0 psf	0 psf	Upper Sand
Slice 29	37.434386 ft	21.078941 ft	0 psf	1,306.7623 psf	881.42233 psf	0 psf	0 psf	POC Embankment Fill
Slice 30	40.460632 ft	25.802305 ft	0 psf	828.88864 psf	559.09245 psf	0 psf	0 psf	POC Embankment Fill
Slice 31	43.486877 ft	32.223365 ft	0 psf	268.34222 psf	180.99911 psf	0 psf	0 psf	POC Embankment Fill

Slip #	F of S	X Center (ft)	Y Center (ft)	Radius (ft)	Details
404	4.35	-4.0394	51.265	51.36	Critical (analysis)
399	4.36	-4.7553	51.044	50.665	
394	4.38	-5.4721	50.823	49.971	
359	4.39	-4.5793	51.446	51.93	
354	4.40	-5.2945	51.225	51.234	
349	4.42	-6.0105	51.004	50.539	
389	4.42	-6.1898	50.603	49.278	
314	4.43	-5.1198	51.627	52.499	
309	4.44	-5.8343	51.406	51.803	
344	4.46	-6.7275	50.783	49.845	
304	4.46	-6.5496	51.185	51.107	
384	4.47	-6.9087	50.382	48.586	
269	4.47	-5.6609	51.808	53.07	
264	4.49	-6.3747	51.586	52.373	
299	4.50	-7.2658	50.964	50.413	
339	4.50	-7.4455	50.563	49.152	
259	4.51	-7.0893	51.365	51.676	
224	4.52	-6.2025	51.989	53.641	
379	4.53	-7.6286	50.162	47.895	
219	4.53	-6.9156	51.767	52.943	
294	4.55	-7.983	50.743	49.719	
254	4.55	-7.8047	51.144	50.981	
214	4.55	-7.6295	51.546	52.246	
179	4.57	-6.7446	52.17	54.212	
334	4.58	-8.1645	50.342	48.46	
174	4.58	-7.4571	51.948	53.514	
249	4.59	-8.5211	50.924	50.287	
209	4.59	-8.3443	51.325	51.55	
169	4.60	-8.1703	51.727	52.816	
134	4.61	-7.2872	52.351	54.784	
289	4.62	-8.7011	50.523	49.026	

Abut 1 Embankment - Drained

File Information

File Version: 11.01
Title: University POC - Abut 1 Emb
Created By: Huang, Stephen
Last Edited By: Huang, Stephen
Revision Number: 65
Date: 09/27/2022
Time: 11:28:39 AM
Tool Version: 11.1.3.22700
File Name: abut1_emb_2022_3to1side.gsz
Directory: X:\City of East Palo Alto\28645626 101-University\440_Materials\Analysis\Slope\
Last Solved Date: 09/27/2022
Last Solved Time: 11:28:46 AM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Abut 1 Embankment - Drained

Kind: SLOPE/W
Analysis Type: Spencer
Settings
- PWP Conditions from: Piezometric Line
- Apply Phreatic Correction: No
- Use Staged Rapid Drawdown: No
- Critical Slip Surface Source from: (none)
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Advanced
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Slices: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings

Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

POC Embankment Fill

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Upper Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Steady State Strength (Css): 0 psf
Collapse Surface Angle: 0 °
Pore Water Pressure
Piezometric Line: 1

Lower Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Lower Sand 2

Material Model: Mohr-Coulomb
Unit Weight: 128 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 36 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Lower Clay (drained)

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Lower Clay 2 (drained)

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Upper Clay (drained)

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 30 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (-40, 19) ft
Left-Zone Right Coordinate: (-12.5, 20.5) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (27.888504, 33.962835) ft
Right-Zone Right Coordinate: (48, 35) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-60, 19) ft
Right Coordinate: (85, 19) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X	Y
Coordinate 1	-60 ft	9.5 ft
Coordinate 2	85 ft	9.5 ft

Geometry

Name: Default Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	-60 ft	19 ft
Point 2	-17 ft	19 ft
Point 3	34 ft	36 ft
Point 4	46 ft	36 ft
Point 5	50 ft	34 ft
Point 6	62 ft	34 ft
Point 7	64 ft	35 ft
Point 8	81 ft	35 ft
Point 9	-60 ft	17 ft
Point 10	0 ft	17 ft
Point 11	85 ft	17 ft
Point 12	85 ft	19 ft
Point 13	-60 ft	5 ft
Point 14	85 ft	5 ft
Point 15	-60 ft	-3 ft
Point 16	85 ft	-3 ft
Point 17	-60 ft	-7 ft
Point 18	85 ft	-7 ft
Point 19	-60 ft	-12 ft
Point 20	85 ft	-12 ft
Point 21	-60 ft	-40 ft
Point 22	85 ft	-40 ft

Regions

	Material	Points	Area
Region 1	POC Embankment Fill	2,3,4,5,6,7,8,12	1,216.5 ft^2
Region 2	Upper Sand	1,2,12,11,10,9	290 ft^2
Region 3	Upper Clay (drained)	9,10,11,14,13	1,740 ft^2
Region 4	Lower Sand	13,14,16,15	1,160 ft^2
Region 5	Lower Sand 2	15,16,18,17	580 ft^2
Region 6	Lower Clay (drained)	17,18,20,19	725 ft^2
Region 7	Lower Clay 2 (drained)	19,20,22,21	4,060 ft^2

Slip Results

Slip Surfaces Analysed: 344 of 405 converged

Current Slip Surface

Slip Surface: 326
Factor of Safety: 2.03
Volume: 31.476709 ft^3
Weight: 3,777.2051 lbf
Resisting Moment: 860,425.53 lbf·ft
Activating Moment: 424,224.91 lbf·ft
Resisting Force: 2,294.0061 lbf
Activating Force: 1,131.0456 lbf
Slip Rank: 1 of 405 slip surfaces

Exit: (-15.789964, 19.403345) ft
Entry: (32.792758, 35.597586) ft
Radius: 355.71654 ft
Center: (-103.69425, 364.08739) ft

Slip Slices

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Base Material
Slice 1	-14.980252 ft	19.611873 ft	-631.28615 psf	6.944427 psf	4.6840752 psf	0 psf	0 psf	POC Embankment Fill
Slice 2	-13.360828 ft	20.032996 ft	-657.5769 psf	20.309202 psf	13.69873 psf	0 psf	0 psf	POC Embankment Fill
Slice 3	-11.741404 ft	20.462266 ft	-684.37634 psf	32.673758 psf	22.038728 psf	0 psf	0 psf	POC Embankment Fill
Slice 4	-10.12198 ft	20.899715 ft	-711.68637 psf	44.043601 psf	29.707784 psf	0 psf	0 psf	POC Embankment Fill
Slice 5	-8.5025561 ft	21.345374 ft	-739.50894 psf	54.424144 psf	36.709549 psf	0 psf	0 psf	POC Embankment Fill
Slice 6	-6.883132 ft	21.799275 ft	-767.84606 psf	63.820715 psf	43.047616 psf	0 psf	0 psf	POC Embankment Fill
Slice 7	-5.2637079 ft	22.261451 ft	-796.69978 psf	72.238555 psf	48.725521 psf	0 psf	0 psf	POC Embankment Fill
Slice 8	-3.6442838 ft	22.731935 ft	-826.0722 psf	79.682818 psf	53.74674 psf	0 psf	0 psf	POC Embankment Fill
Slice 9	-2.0248598 ft	23.210762 ft	-855.96546 psf	86.158577 psf	58.114694 psf	0 psf	0 psf	POC Embankment Fill
Slice 10	-0.40543568 ft	23.697967 ft	-886.38177 psf	91.670823 psf	61.832751 psf	0 psf	0 psf	POC Embankment Fill
Slice 11	1.2139884 ft	24.193586 ft	-917.32337 psf	96.224468 psf	64.904223 psf	0 psf	0 psf	POC Embankment Fill
Slice 12	2.8334125 ft	24.697656 ft	-948.79256 psf	99.824343 psf	67.33237 psf	0 psf	0 psf	POC Embankment Fill
Slice 13	4.4528366 ft	25.210215 ft	-980.79169 psf	102.47521 psf	69.120401 psf	0 psf	0 psf	POC Embankment Fill
Slice 14	6.0722607 ft	25.731301 ft	-1,013.3232 psf	104.18175 psf	70.271475 psf	0 psf	0 psf	POC Embankment Fill
Slice 15	7.6916847 ft	26.260954 ft	-1,046.3895 psf	104.94856 psf	70.788701 psf	0 psf	0 psf	POC Embankment Fill

Slice 16	9.3111088 ft	26.799213 ft	-1,079.9932 psf	104.78021 psf	70.675141 psf	0 psf	0 psf	POC Embankment Fill
Slice 17	10.930533 ft	27.346121 ft	-1,114.1367 psf	103.68114 psf	69.933811 psf	0 psf	0 psf	POC Embankment Fill
Slice 18	12.549957 ft	27.90172 ft	-1,148.8228 psf	101.65576 psf	68.567679 psf	0 psf	0 psf	POC Embankment Fill
Slice 19	14.169381 ft	28.466052 ft	-1,184.0542 psf	98.708421 psf	66.579671 psf	0 psf	0 psf	POC Embankment Fill
Slice 20	15.788805 ft	29.039162 ft	-1,219.8336 psf	94.843382 psf	63.972669 psf	0 psf	0 psf	POC Embankment Fill
Slice 21	17.408229 ft	29.621095 ft	-1,256.1638 psf	90.064856 psf	60.749513 psf	0 psf	0 psf	POC Embankment Fill
Slice 22	19.027653 ft	30.211897 ft	-1,293.0476 psf	84.376996 psf	56.913002 psf	0 psf	0 psf	POC Embankment Fill
Slice 23	20.647077 ft	30.811615 ft	-1,330.4882 psf	77.783891 psf	52.465897 psf	0 psf	0 psf	POC Embankment Fill
Slice 24	22.266502 ft	31.420298 ft	-1,368.4883 psf	70.289577 psf	47.410918 psf	0 psf	0 psf	POC Embankment Fill
Slice 25	23.885926 ft	32.037995 ft	-1,407.0513 psf	61.898034 psf	41.750751 psf	0 psf	0 psf	POC Embankment Fill
Slice 26	25.50535 ft	32.664755 ft	-1,446.18 psf	52.613189 psf	35.488044 psf	0 psf	0 psf	POC Embankment Fill
Slice 27	27.124774 ft	33.300632 ft	-1,485.8779 psf	42.438917 psf	28.625411 psf	0 psf	0 psf	POC Embankment Fill
Slice 28	28.744198 ft	33.945676 ft	-1,526.1482 psf	31.379046 psf	21.165434 psf	0 psf	0 psf	POC Embankment Fill
Slice 29	30.363622 ft	34.599943 ft	-1,566.9942 psf	19.437356 psf	13.110662 psf	0 psf	0 psf	POC Embankment Fill
Slice 30	31.983046 ft	35.263488 ft	-1,608.4194 psf	6.6175791 psf	4.4636135 psf	0 psf	0 psf	POC Embankment Fill

Slip #	F of S	X Center (ft)	Y Center (ft)	Radius (ft)	Details
371	2.03	-94.452	341.84	331.63	
366	2.03	-90.015	324.45	313.67	
361	2.03	-85.578	307.05	295.72	
326	2.03	-103.69	364.09	355.72	Critical (analysis)
321	2.03	-99.257	346.69	337.76	
316	2.03	-94.821	329.29	319.81	
331	2.04	-104.29	378.87	370.2	
376	2.05	-95.048	356.62	346.11	
336	2.12	-101.3	391.16	381.46	
381	2.13	-92.077	368.92	357.39	
277	2.16	-13.259	86.007	67.269	
272	2.16	-13.496	82.627	63.881	
282	2.16	-13.023	89.386	70.656	
372	2.17	-8.148	82.932	62.584	
367	2.17	-8.3836	79.552	59.195	
362	2.17	-8.6193	76.172	55.807	
327	2.17	-11.122	86.37	67.129	
322	2.17	-11.357	82.99	63.741	
317	2.17	-11.593	79.61	60.353	
237	2.17	-14.351	92.171	73.641	
232	2.17	-14.59	88.792	70.257	
227	2.18	-14.83	85.413	66.873	
287	2.18	-12.089	92.102	73.446	
332	2.18	-10.174	89.082	69.904	
377	2.18	-7.2	85.644	65.359	
242	2.18	-13.436	94.891	76.45	
192	2.20	-15.73	94.969	76.678	
341	2.21	-98.491	403.5	392.9	
187	2.21	-15.975	91.592	73.298	
197	2.21	-14.83	97.694	79.501	
182	2.21	-16.22	88.215	69.92	
386	2.22	-89.285	381.27	368.85	
296	2.22	-101.79	422.18	411.55	
292	2.23	-10.504	94.18	75.68	
337	2.23	-8.5615	91.152	72.112	
247	2.23	-11.886	96.979	78.72	
382	2.24	-5.5904	87.715	67.569	

Abut 1 Embankment - Pseudo_shallow

File Information

File Version: 11.01
Title: University POC - Abut 1 Emb
Created By: Huang, Stephen
Last Edited By: Huang, Stephen
Revision Number: 62
Date: 09/23/2022
Time: 08:40:03 AM
Tool Version: 11.1.3.22700
File Name: abut1_emb_2022_3to1side.gsz
Directory: X:\City of East Palo Alto\28645626 101-University\440_Materials\Analysis\Slope\
Last Solved Date: 09/23/2022
Last Solved Time: 08:40:09 AM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Abut 1 Embankment - Pseudo_shallow

Kind: SLOPE/W
Analysis Type: Spencer
Settings
- PWP Conditions from: Ru
- Critical Slip Surface Source from: (none)
- Unit Weight of Water: 62.430189 pcf

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack Option: (none)

Distribution
- F of S Calculation Option: Constant

Advanced
- Geometry Settings
  - Minimum Slip Surface Depth: 0.1 ft
  - Number of Slices: 30
- Factor of Safety Convergence Settings
  - Maximum Number of Iterations: 100
  - Tolerable difference in F of S: 0.001
- Solution Settings
  - Search Method: Root Finder
  - Tolerable difference between starting and converged F of S: 3

Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

POC Embankment Fill

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Upper Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Steady State Strength (Css): 0 psf
Collapse Surface Angle: 0 °
Pore Water Pressure
Ru: 0

Upper Clay

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Sand 2

Material Model: Mohr-Coulomb
Unit Weight: 128 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 36 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Clay

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Clay 2

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 1,800 psf
Effective Friction Angle: 0 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Sand 3

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 290 psf
Effective Friction Angle: 1e-05 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (-25, 19) ft
Left-Zone Right Coordinate: (4.6, 26.2) ft
Left-Zone Increment: 20
Right Type: Range
Right-Zone Left Coordinate: (26.65, 33.55) ft
Right-Zone Right Coordinate: (46, 36) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-60, 19) ft
Right Coordinate: (85, 19) ft

Seismic Coefficients

Horz Seismic Coef.: 0.21

Geometry

Name: Default Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	-60 ft	19 ft
Point 2	-17 ft	19 ft
Point 3	34 ft	36 ft

Point 4	46 ft	36 ft
Point 5	50 ft	34 ft
Point 6	62 ft	34 ft
Point 7	64 ft	35 ft
Point 8	81 ft	35 ft
Point 9	-60 ft	17 ft
Point 10	0 ft	17 ft
Point 11	85 ft	17 ft
Point 12	85 ft	19 ft
Point 13	-60 ft	5 ft
Point 14	85 ft	5 ft
Point 15	-60 ft	-3 ft
Point 16	85 ft	-3 ft
Point 17	-60 ft	-7 ft
Point 18	85 ft	-7 ft
Point 19	-60 ft	-12 ft
Point 20	85 ft	-12 ft
Point 21	-60 ft	-40 ft
Point 22	85 ft	-40 ft

Regions

	Material	Points	Area
Region 1	POC Embankment Fill	2,3,4,5,6,7,8,12	1,216.5 ft²
Region 2	Upper Sand	1,2,12,11,10,9	290 ft²
Region 3	Upper Clay	9,10,11,14,13	1,740 ft²
Region 4	Lower Sand 3	13,14,16,15	1,160 ft²
Region 5	Lower Sand 2	15,16,18,17	580 ft²
Region 6	Lower Clay	17,18,20,19	725 ft²
Region 7	Lower Clay 2	19,20,22,21	4,060 ft²

Slip Results

Slip Surfaces Analysed: 2178 of 2205 converged

Current Slip Surface

Slip Surface: 106
Factor of Safety: 1.16
Volume: 3.7260127 ft³
Weight: 447.12152 lbf
Resisting Moment: 92,609.32 lbf·ft
Activating Moment: 80,155.08 lbf·ft
Resisting Force: 252.48857 lbf
Activating Force: 218.62482 lbf
Slip Rank: 1 of 2,205 slip surfaces
Exit: (2.9619018, 25.653967) ft
Entry: (26.65, 33.55) ft
Radius: 347.92535 ft
Center: (-95.14685, 359.46039) ft

Slip Slices

	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength	Base Material
Slice 1	3.3567034 ft	25.770511 ft	0 psf	1.5358735 psf	1.0359597 psf	0 psf	0 psf	POC Embankment Fill
Slice 2	4.1463067 ft	26.004614 ft	0 psf	4.4992511 psf	3.0347832 psf	0 psf	0 psf	POC Embankment Fill
Slice 3	4.93591 ft	26.240753 ft	0 psf	7.2492811 psf	4.8897018 psf	0 psf	0 psf	POC Embankment Fill
Slice 4	5.7255132 ft	26.478932 ft	0 psf	9.7861677 psf	6.6008534 psf	0 psf	0 psf	POC Embankment Fill
Slice 5	6.5151165 ft	26.719155 ft	0 psf	12.110112 psf	8.1683735 psf	0 psf	0 psf	POC Embankment Fill
Slice 6	7.3047198 ft	26.961427 ft	0 psf	14.221311 psf	9.5923953 psf	0 psf	0 psf	POC Embankment Fill
Slice 7	8.0943231 ft	27.205752 ft	0 psf	16.119959 psf	10.87305 psf	0 psf	0 psf	POC Embankment Fill
Slice 8	8.8839263 ft	27.452135 ft	0 psf	17.806247 psf	12.010465 psf	0 psf	0 psf	POC Embankment Fill
Slice 9	9.6735296 ft	27.70058 ft	0 psf	19.280363 psf	13.004769 psf	0 psf	0 psf	POC Embankment Fill
Slice 10	10.463133 ft	27.951092 ft	0 psf	20.542491 psf	13.856085 psf	0 psf	0 psf	POC Embankment Fill
Slice 11	11.252736 ft	28.203675 ft	0 psf	21.592812 psf	14.564536 psf	0 psf	0 psf	POC Embankment Fill
Slice 12	12.042339 ft	28.458335 ft	0 psf	22.431504 psf	15.130241 psf	0 psf	0 psf	POC Embankment Fill
Slice 13	12.831943 ft	28.715076 ft	0 psf	23.058742 psf	15.553318 psf	0 psf	0 psf	POC Embankment Fill
Slice 14	13.621546 ft	28.973903 ft	0 psf	23.474697 psf	15.833883 psf	0 psf	0 psf	POC Embankment Fill
Slice 15	14.411149 ft	29.23482 ft	0 psf	23.679537 psf	15.972049 psf	0 psf	0 psf	POC Embankment Fill
Slice 16	15.200753 ft	29.497834 ft	0 psf	23.673427 psf	15.967928 psf	0 psf	0 psf	POC Embankment Fill
Slice 17	15.990356 ft	29.762949 ft	0 psf	23.45653 psf	15.821629 psf	0 psf	0 psf	POC Embankment

								Fill
Slice 18	16.779959 ft	30.030169 ft	0 psf	23.029005 psf	15.53326 psf	0 psf	0 psf	POC Embankment Fill
Slice 19	17.569562 ft	30.2995 ft	0 psf	22.391006 psf	15.102924 psf	0 psf	0 psf	POC Embankment Fill
Slice 20	18.359166 ft	30.570948 ft	0 psf	21.542686 psf	14.530725 psf	0 psf	0 psf	POC Embankment Fill
Slice 21	19.148769 ft	30.844517 ft	0 psf	20.484196 psf	13.816765 psf	0 psf	0 psf	POC Embankment Fill
Slice 22	19.938372 ft	31.120213 ft	0 psf	19.215682 psf	12.961141 psf	0 psf	0 psf	POC Embankment Fill
Slice 23	20.727975 ft	31.398041 ft	0 psf	17.737287 psf	11.963951 psf	0 psf	0 psf	POC Embankment Fill
Slice 24	21.517579 ft	31.678007 ft	0 psf	16.049151 psf	10.825289 psf	0 psf	0 psf	POC Embankment Fill
Slice 25	22.307182 ft	31.960116 ft	0 psf	14.151412 psf	9.5452481 psf	0 psf	0 psf	POC Embankment Fill
Slice 26	23.096785 ft	32.244373 ft	0 psf	12.044205 psf	8.1239188 psf	0 psf	0 psf	POC Embankment Fill
Slice 27	23.886389 ft	32.530785 ft	0 psf	9.7276604 psf	6.5613898 psf	0 psf	0 psf	POC Embankment Fill
Slice 28	24.675992 ft	32.819357 ft	0 psf	7.2019073 psf	4.8577478 psf	0 psf	0 psf	POC Embankment Fill
Slice 29	25.465595 ft	33.110094 ft	0 psf	4.4670711 psf	3.0130775 psf	0 psf	0 psf	POC Embankment Fill
Slice 30	26.255198 ft	33.403002 ft	0 psf	1.5232743 psf	1.0274615 psf	0 psf	0 psf	POC Embankment Fill

Slip #	F of S	X Center (ft)	Y Center (ft)	Radius (ft)	Details
106	1.16	-95.147	359.46	347.93	Critical (analysis)
111	1.16	-96.83	366.1	354.77	
116	1.16	-98.513	372.74	361.62	
121	1.16	-100.2	379.39	368.47	
126	1.16	-101.88	386.03	375.31	
131	1.16	-103.56	392.67	382.16	
136	1.16	-105.25	399.31	389.01	
141	1.16	-106.93	405.96	395.86	
211	1.16	-95.237	352.1	341.07	
216	1.16	-96.924	358.74	347.92	
221	1.16	-98.612	365.39	354.78	
226	1.16	-100.3	372.03	361.63	
231	1.16	-101.99	378.68	368.48	
236	1.16	-103.68	385.32	375.33	
241	1.16	-105.37	391.96	382.18	
246	1.16	-107.05	398.61	389.04	
316	1.16	-95.39	344.76	334.28	
321	1.16	-97.081	351.41	341.14	
326	1.16	-98.772	358.05	347.99	
146	1.16	-108.2	412.31	402.33	
331	1.16	-100.46	364.69	354.85	
336	1.16	-102.15	371.34	361.7	
341	1.16	-103.85	377.98	368.56	
251	1.16	-108.32	404.95	395.51	

Slip #	F of S	X Center (ft)	Y Center (ft)	Radius (ft)	Details
22	1.26	-15.513	90.757	72.381	
152	1.26	-13.859	95.398	76.999	
677	1.26	-10.322	88.988	69.817	
782	1.26	-9.0024	87.463	67.8	
17	1.26	-15.606	89.466	71.09	
887	1.26	-7.6833	85.937	65.784	
992	1.26	-6.3642	84.412	63.767	
181	1.26	-101.33	445.51	433.56	
12	1.26	-15.699	88.176	69.798	
1,026	1.26	-84.747	381.72	368.24	
1,097	1.26	-5.0451	82.887	61.751	
1,202	1.26	-3.726	81.362	59.734	
396	1.26	-100.24	435.44	424.03	
1,307	1.26	-2.4069	79.836	57.718	
7	1.26	-15.793	86.886	68.507	
1,441	1.26	-69.449	337.54	321.15	
1,412	1.26	-1.0878	78.311	55.701	
611	1.26	-99.228	425.4	414.58	
1,517	1.26	0.23126	76.786	53.685	
2	1.26	-15.886	85.596	67.216	
1,856	1.26	-54.151	293.36	274.07	
1,622	1.26	1.5503	75.261	51.668	
1,727	1.26	2.8693	73.736	49.652	
47	1.26	-14.475	96.641	78.351	
716	1.26	-95.972	416.04	404.66	
1,832	1.26	4.1884	72.21	47.635	
367	1.26	-12.048	93.714	75.178	
1,937	1.26	5.5073	70.685	45.619	
472	1.26	-11.454	92.477	73.848	
262	1.26	-12.652	94.953	76.517	
1,131	1.26	-80.674	371.86	357.58	

Liquefied shear strength ratio [Olson and Stark (2003)]

$$\frac{s_u(\mathrm{LIQ})}{\sigma'_{v0}} = 0.03 + 0.0143(q_{c1}) \pm 0.03 \quad \text{for } q_{c1} \lesssim 6.5 \text{ MPa} \tag{7a}$$

$$\frac{s_u(\mathrm{LIQ})}{\sigma'_{v0}} = 0.03 + 0.0075[(N_1)_{60}] \pm 0.03 \quad \text{for } (N_1)_{60} \lesssim 12 \tag{7b}$$

Liquefied Layer from El 5 to -3

$qc1min := 2502 \text{ kPa}$

$qc1max := 19907 \text{ kPa}$

$\sigma base\_eff := 1918 - 376$

$\sigma base\_eff = 1542 \text{ psf}$

$$SuLIQmin := \sigma base\_eff \cdot \left[0.03 + 0.0143 \cdot \left(\frac{qc1min}{1000}\right)\right]$$

$SuLIQmin = 101 \text{ psf}$

$$SuLIQmax := \sigma base\_eff \cdot \left[0.03 + 0.0143 \cdot \left(\frac{qc1max}{1000}\right)\right]$$

$SuLIQmax = 485 \text{ psf}$

$$SuLIQavg := \frac{(SuLIQmin + SuLIQmax)}{2} = 293 \text{ psf}$$

Abut 1 Embankment - Pseudo_liquefy

File Information

File Version: 11.01
Title: University POC - Abut 1 Emb
Created By: Huang, Stephen
Last Edited By: Huang, Stephen
Revision Number: 61
Date: 09/23/2022
Time: 08:36:09 AM
Tool Version: 11.1.3.22700
File Name: abut1_emb_2022_3to1side.gsz
Directory: X:\City of East Palo Alto\28645626 101-University\440_Materials\Analysis\Slope\
Last Solved Date: 09/23/2022
Last Solved Time: 08:36:16 AM

Project Settings

Unit System: U.S. Customary Units

Analysis Settings

Abut 1 Embankment - Pseudo_liquefy

- Kind: SLOPE/W
- Analysis Type: Spencer
- Settings
  - PWP Conditions from: Ru
  - Critical Slip Surface Source from: (none)
  - Unit Weight of Water: 62.430189 pcf
- Slip Surface
  - Direction of movement: Right to Left
  - Use Passive Mode: No
  - Slip Surface Option: Entry and Exit
  - Critical slip surfaces saved: 1
  - Optimize Critical Slip Surface Location: No
  - Tension Crack Option: (none)
- Distribution
  - F of S Calculation Option: Constant
- Advanced
  - Geometry Settings
    - Minimum Slip Surface Depth: 0.1 ft
    - Number of Slices: 30
  - Factor of Safety Convergence Settings
    - Maximum Number of Iterations: 100
    - Tolerable difference in F of S: 0.001
  - Solution Settings
    - Search Method: Root Finder
    - Tolerable difference between starting and converged F of S: 3

Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

POC Embankment Fill

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Upper Sand

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 34 °
Phi-B: 0 °
Steady State Strength (Css): 0 psf
Collapse Surface Angle: 0 °
Pore Water Pressure
Ru: 0

Upper Clay

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Sand 2

Material Model: Mohr-Coulomb
Unit Weight: 128 pcf
Effective Cohesion: 0 psf
Effective Friction Angle: 36 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Clay

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 1,500 psf
Effective Friction Angle: 0 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Clay 2

Material Model: Mohr-Coulomb
Unit Weight: 125 pcf
Effective Cohesion: 1,800 psf
Effective Friction Angle: 0 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Lower Sand 3

Material Model: Mohr-Coulomb
Unit Weight: 120 pcf
Effective Cohesion: 290 psf
Effective Friction Angle: 1e-05 °
Phi-B: 0 °
Pore Water Pressure
Ru: 0

Slip Surface Entry and Exit

Left Type: Range
Left-Zone Left Coordinate: (-55, 19) ft
Left-Zone Right Coordinate: (-29, 19) ft
Left-Zone Increment: 8
Right Type: Range
Right-Zone Left Coordinate: (37, 36) ft
Right-Zone Right Coordinate: (45, 36) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-60, 19) ft
Right Coordinate: (85, 19) ft

Seismic Coefficients

Horz Seismic Coef.: 0.21

Geometry

Name: Default Geometry

Settings

View: 2D
Element Thickness: 1 ft

Points

	X	Y
Point 1	-60 ft	19 ft
Point 2	-17 ft	19 ft
Point 3	34 ft	36 ft
Point 4	46 ft	36 ft

Point 5	50 ft	34 ft
Point 6	62 ft	34 ft
Point 7	64 ft	35 ft
Point 8	81 ft	35 ft
Point 9	-60 ft	17 ft
Point 10	0 ft	17 ft
Point 11	85 ft	17 ft
Point 12	85 ft	19 ft
Point 13	-60 ft	5 ft
Point 14	85 ft	5 ft
Point 15	-60 ft	-3 ft
Point 16	85 ft	-3 ft
Point 17	-60 ft	-7 ft
Point 18	85 ft	-7 ft
Point 19	-60 ft	-12 ft
Point 20	85 ft	-12 ft
Point 21	-60 ft	-40 ft
Point 22	85 ft	-40 ft

Regions

	Material	Points	Area
Region 1	POC Embankment Fill	2,3,4,5,6,7,8,12	1,216.5 ft²
Region 2	Upper Sand	1,2,12,11,10,9	290 ft²
Region 3	Upper Clay	9,10,11,14,13	1,740 ft²
Region 4	Lower Sand 3	13,14,16,15	1,160 ft²
Region 5	Lower Sand 2	15,16,18,17	580 ft²
Region 6	Lower Clay	17,18,20,19	725 ft²
Region 7	Lower Clay 2	19,20,22,21	4,060 ft²

Slip Results

Slip Surfaces Analysed: 286 of 405 converged

Current Slip Surface

Slip Surface: 89
Factor of Safety: 1.22
Volume: 1,890.696 ft³
Weight: 226,883.53 lbf
Resisting Moment: 4,594,488.8 lbf·ft
Activating Moment: 3,758,013.4 lbf·ft
Resisting Force: 64,304.01 lbf
Activating Force: 52,605.4 lbf
Slip Rank: 1 of 405 slip surfaces
Exit: (-51.75, 19) ft
Entry: (45, 36) ft
Radius: 55.292863 ft
Center: (-7.7698563, 52.511903) ft

Slip Slices

	X	Y	PWP	Base	Frictional	Cohesive	Suction	Base

				Normal Stress	Strength	Strength	Strength	Material
Slice 1	-50.95076 ft	18 ft	0 psf	987.62449 psf	666.16113 psf	0 psf	0 psf	Upper Sand
Slice 2	-48.389169 ft	15.087212 ft	0 psf	2,169.7757 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 3	-44.864466 ft	11.577392 ft	0 psf	2,336.6471 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 4	-41.339763 ft	8.6320863 ft	0 psf	2,486.267 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 5	-37.81506 ft	6.1419067 ft	0 psf	2,612.6415 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 6	-34.464983 ft	4.1240662 ft	0 psf	2,019.3729 psf	0.00035244705 psf	290 psf	0 psf	Lower Sand 3
Slice 7	-31.289532 ft	2.5014329 ft	0 psf	2,181.098 psf	0.00038067341 psf	290 psf	0 psf	Lower Sand 3
Slice 8	-28.11408 ft	1.1261343 ft	0 psf	2,313.1738 psf	0.00040372498 psf	290 psf	0 psf	Lower Sand 3
Slice 9	-24.938629 ft	-0.021360836 ft	0 psf	2,418.1249 psf	0.0004220424 psf	290 psf	0 psf	Lower Sand 3
Slice 10	-21.763177 ft	-0.95578922 ft	0 psf	2,497.8551 psf	0.00043595796 psf	290 psf	0 psf	Lower Sand 3
Slice 11	-18.587726 ft	-1.6882177 ft	0 psf	2,553.8012 psf	0.00044572239 psf	290 psf	0 psf	Lower Sand 3
Slice 12	-15.3 ft	-2.238923 ft	0 psf	2,654.8686 psf	0.00046336198 psf	290 psf	0 psf	Lower Sand 3
Slice 13	-11.9 ft	-2.6001317 ft	0 psf	2,798.9173 psf	0.00048850322 psf	290 psf	0 psf	Lower Sand 3
Slice 14	-8.5 ft	-2.7499923 ft	0 psf	2,916.6963 psf	0.00050905953 psf	290 psf	0 psf	Lower Sand 3
Slice 15	-5.1 ft	-2.6902327 ft	0 psf	3,008.5572 psf	0.00052509229 psf	290 psf	0 psf	Lower Sand 3
Slice 16	-1.7 ft	-2.4201663 ft	0 psf	3,074.5335 psf	0.00053660732 psf	290 psf	0 psf	Lower Sand 3
Slice 17	1.7094164 ft	-1.9347075 ft	0 psf	3,114.3806 psf	0.00054356196 psf	290 psf	0 psf	Lower Sand 3
Slice 18	5.1282491 ft	-1.2268086 ft	0 psf	3,127.3257 psf	0.0005458213 psf	290 psf	0 psf	Lower Sand 3
Slice 19	8.5470818 ft	-0.2882584 ft	0 psf	3,112.179 psf	0.00054317771 psf	290 psf	0 psf	Lower Sand 3
Slice 20	11.965915 ft	0.89358493 ft	0 psf	3,067.48 psf	0.00053537626 psf	290 psf	0 psf	Lower Sand 3
Slice 21	15.384747 ft	2.336006 ft	0 psf	2,991.2025 psf	0.00052206331 psf	290 psf	0 psf	Lower Sand 3
Slice 22	18.80358 ft	4.062424 ft	0 psf	2,880.5769 psf	0.00050275552 psf	290 psf	0 psf	Lower Sand 3
Slice 23	22.198872 ft	6.0883162 ft	0 psf	2,233.4998 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 24	25.570623 ft	8.4523582 ft	0 psf	1,948.2477 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 25	28.942374 ft	11.227242 ft	0 psf	1,597.7025 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice	32.314125	14.50438 ft	0 psf	1,162.874	0 psf	1,500	0 psf	Upper Clay

26	ft			psf		psf		
Slice 27	34.305904 ft	16.64118 ft	0 psf	856.48994 psf	0 psf	1,500 psf	0 psf	Upper Clay
Slice 28	35.411047 ft	18 ft	0 psf	1,197.1615 psf	807.49565 psf	0 psf	0 psf	Upper Sand
Slice 29	37.675239 ft	21.120822 ft	0 psf	922.0752 psf	621.94758 psf	0 psf	0 psf	POC Embankment Fill
Slice 30	40.605144 ft	25.905142 ft	0 psf	554.29422 psf	373.87617 psf	0 psf	0 psf	POC Embankment Fill
Slice 31	43.535048 ft	32.28432 ft	0 psf	167.10132 psf	112.71127 psf	0 psf	0 psf	POC Embankment Fill

Slip #	F of S	X Center (ft)	Y Center (ft)	Radius (ft)	Details
89	1.22	-7.7699	52.512	55.293	Critical (analysis)
84	1.25	-8.2872	52.351	54.784	
29	1.26	-10.891	52.552	55.42	
134	1.28	-6.2025	51.989	53.641	
79	1.28	-8.8048	52.19	54.276	
362	1.29	-15.034	101.4	83.571	
24	1.30	-11.408	52.391	54.911	
367	1.30	-14.456	102.21	84.472	
372	1.31	-13.881	103.03	85.374	
317	1.31	-16.416	104.04	86.506	
129	1.31	-6.721	51.828	53.133	
74	1.32	-9.3229	52.029	53.768	
322	1.32	-15.846	104.86	87.414	
377	1.32	-13.309	103.84	86.28	
327	1.33	-15.278	105.68	88.324	
19	1.33	-11.925	52.23	54.403	
382	1.33	-12.738	104.66	87.187	
272	1.34	-17.821	106.7	89.465	
332	1.34	-14.712	106.5	89.236	
387	1.34	-12.17	105.47	88.097	
179	1.34	-4.6393	51.466	51.993	
277	1.34	-17.258	107.52	90.379	
337	1.35	-14.148	107.31	90.15	
124	1.35	-7.24	51.667	52.626	
282	1.35	-16.696	108.34	91.295	
392	1.36	-11.604	106.29	89.008	

APPENDIX I Mining and Tunnel Classification for Construction Joints at Bents 2 through 4

State of California

Department of Industrial Relations

DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
MINING AND TUNNELING UNIT

Underground Classification

18012A081CT **STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - DISTRICT 4**

of **111 GRAND AVE; OAKLAND CA 94612**

at **UNIVERSITY AVENUE PEDESTRIAN OVERCROSSING**

has been classified as ***** POTENTIALLY GASSY WITH SPECIAL CONDITIONS *****

as required by the California Labor Code § 7955.

The Division shall be notified if sufficient quantities of flammable gas or vapors have been encountered underground. Classifications are based on the California Labor Code Part 9, Tunnel Safety Orders and Mine Safety Orders.

*****SPECIAL CONDITIONS*****

1. **A Certified Gas Tester shall perform pre-entry and continuous monitoring of the underground environment to measure Oxygen and detect explosive, flammable, and toxic gasses whenever an employee is working in the underground environment.**
2. **Mechanical ventilation shall provide for continuous exhaust of fumes and air at any time an employee is working in the underground environment. The primary ventilation fans must be located outside of the underground environment and shall be reversible by a single switch near the fan location.**
3. **The Division shall be notified immediately if any Flammable Gas or Petroleum Vapor exceeds 5% of the Lower Explosive Limit.**
4. **All utilities that may be in conflict with the project shall be identified and physically located (potholed) prior to the start of project operations.**

CONSTRUCTION JOINTS REQUIRE ENTRY FOR EACH BENT.

The three 8-foot diameter by approximately 100-feet deep drilled shafts located on the north, south and median of Highway 101 at its intersection with University Avenue in East Palo Alto, San Mateo County.

This classification shall be conspicuously posted at the place of employment.

John R. Leahy, Principal Safety Engineer

August 9, 2017

STATE OF CALIFORNIA EDMUND G. BROWN, JR., Governor

DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
MINING AND TUNNELING UNIT
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August 9, 2017

California Department of Transportation – District 4
111 Grand Ave.
Oakland, CA 94612

Subject: Project: 18012 – University Avenue Pedestrian Overcrossing, San Mateo County
Classification: Potentially Gassy With Special Conditions
Number Attached: 1 (A)

The information provided to this office relative to the above project has been reviewed. On the basis of this analysis, an Underground Classification of "Potentially Gassy With Special Conditions" has been assigned to the tunnel identified on your submittal. Please retain the original Classification for your records and deliver a true and correct copy of the Classification to the tunnel contractor for posting at the job site.

When the contractor who will be performing the work is selected, please advise them to notify this office to schedule the mandated Pre-Job Conference with the Division prior to commencing any activity associated with boring of the tunnel. A Pre-Job Request Form is enclosed.

Should you have another bore under construction that is not required to have an Underground Classification (i.e.: less than 30 inches in diameter), please contact the Mining and Tunneling Unit prior to any employee entry of such a space.

If you have any questions on this subject, please contact this office at your earliest convenience.

Sincerely,

John R. Leahy

John R. Leahy
Principal Safety Engineer

enc: Classification
Pre-Job Request Form

cc: ann-marie.moore@aecom.com

State of California
Department of Industrial Relations
Division of Occupational Safety & Health

REQUEST FOR PRE-JOB (TUNNEL)

ATTACH COPY OF CLASSIFICATION AND DIESEL PERMIT

Company Name: ______________________________

Phone ______________________ FAX: ______________________

DATE FAXED: ______________________

PLEASE NOTE: THE BORING CONTRACTOR SHOULD SCHEDULE THE PREJOB AS FAR IN ADVANCE AS POSSIBLE – AT LEAST 3-4 DAYS IN ADVANCE. THE DIVISION REQUIRES THE JOB TO BE SET UP WHEN THE FIELD ENGINEER ARRIVES FOR THE PREJOB. THIS MEANS THAT THE BORE PIT HAS BEEN DUG AND PROPERLY GUARDED, THE CRANE IS IN PLACE AND READY TO LIFT, THE BORING MACHINE IS IN THE PIT AND READY TO GO, AND THE CREW IS READY TO BEGIN BORING THE TUNNEL. IF THERE IS A DELAY IN SETTING UP THE JOB, THE BORING CONTRACTOR SHOULD CONTACT THE DIVISION IMMEDIATELY.

PRE-JOB REQUEST DATE & TIME: ______________________

ON-SITE SUPERVISOR & CELL NO.: ______________________

CLASSIFICATION #: ______________ **DIESEL PERMIT #:** ______________

BORE DIAMETER AND LENGTH: ______________ ______________
(Diameter) (Length)

IS BORE ENTRY ANTICIPATED? YES NO
(Circle One)

You MUST contact the Division if entry is planned, REGARDLESS of the bore diameter.

MANNER OF EXCAVATION: ______________________

____

JOB-SITE LOCATION AND DIRECTIONS: ______________________

____

____

GENERAL CONTRACTOR: ______________________

SUBMITTED BY: ______________________

REVIEWED BY: ______________ **DATE:** ______________

☐ *Mining & Tunneling Unit, District 1*
2424 Arden Way, Suite 125
Sacramento, California 95825-2400
(916) 574-2540; ***FAX: (916) 574-2542***

☐ *Mining & Tunneling Unit, District 2*
6150 Van Nuys Blvd., Suite 310
Van Nuys, California 91401-3333
(818) 901-5420; ***FAX: (818) 901-5579***

☐ *Mining & Tunneling Unit, District 3*
464 West Fourth Street, Suite 354
San Bernardino, California 92401-1442
(909) 383-6782; ***FAX: (909) 388-7132***

OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 EA: 272821 Project Name: University Ave. I/C Improvement OSFP Liaison: Emil Vergara Phone: (916) 227-8360 e-mail: emil.vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☒ PS&E (Review No. 4) ☐ Construction Support ☒ Other: FOUNDATION REPORT	Reviewer Name: T. Nguyen/ M. Momenzadeh/M. Gaffney Functional Unit: GS-GDW Phone Number: (510) 622-1775/ (510) 622-1775 e-mail: tung. nguyen@dot.ca.gov Date of Review: 04/27/2017-12/17/2020 (90%) 02/18/2022, 06/09/2022; 09/07/2022; 09/21/2022 09/28/2022
	Structure Information (Use when necessary to document comments by individual structure) Structure Name: University Avenue POC Br No: 35-0359		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments 02/18/2022
		Geotechnical comments for PFR dated September 12, 2016 were not addressed in any report or responses. Please clarify.				PM 0.9/1.4 provided in the cover sheet of foundation report is inconsistent with the project plans. *Cover sheet updated to show PM 0.8/1.1 consistent with the project plan.* Noted.
FR	Figures	All figures are not included in the report.	Included Figures 1-1 to 8-1 in the updated report.	Noted.		
FR	Page 4-1, Section 4.2	Please clarify the cylindrical friction sleeve area 35 in^2 and outer diameter 1.75 inch.	The friction sleeve is 6.5 inches long (to the conical tip); therefore, the surface area length	Noted.		

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			times pi times diameter is 35 in^2.			
FR	Page 5-1, Section 5.2	LOTB of 8 borings are not included.	Included the soil survey sheets of the referenced borings in Appendix D.	Noted.		Are LOTBs of CPT-15-001/002 prepared with interpreted or raw data as provided in appendix C? Please clarify. *CPT soundings present raw data.* Noted.
FR	Pages 6-2 and 8-1 Sections 6.2.2 and 8	PGA 0.54g is not consistent with the ARS Curve previously provided in the PFR dated September 12, 2016. Furthermore, will post-liquefaction ground surface settlement be reevaluated with the design PGA? Please clarify.	The intended Figure 8-1 is the same one as Figure 6-1 of the September 12, 2016 PFR. The PGA is based on extrapolation of the spectral value (0.61) at 0.01 second to 0 second. Understand Caltrans Design Division considers spectral value at 0.01 second to be PGA; therefore, liquefaction was re-evaluated using PGA=0.61g.	Caltrans ARS v3.0.2 should be used. V_{s30} determination is not provided. Liquefaction should also be performed for SPT data from as-built borings. Therefore, downdrag loads can be expected to act on the CIDH pile foundation to lower elevations rather than 0 feet as provided in this section. Please clarify.		1-2. Magnitude MMax = 8.0 is inconsistent with the Figure 8-1. *Revised to Mean Magnitude of 7.19 from the ARS Online tool results.* Noted. 3. Bottom of downdrag zones and loads should also be included in section 6.2.2 according to Caltrans Guidelines of Foundation Report for Bridges. PGA used in CPT liquefaction analyses of appendix C was not updated. Furthermore, elevations of these CPT are inconsistent with LOTB. Please clarify. *Two columns have been added to Table 6-1 to provide the downdrag zone bottom elevation and estimated downdrag loads. The elevations in Table 6-1 updated.* Noted.
FR	Page 10-1, Section 10.1	Liquefaction and related pile capacity are	Added liquefaction induced downdrag force to be included	The depth(s) of potentially liquefiable discontinuous layers should be		Noted.

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		not discussed in this section.	in the pile embedment requirement.	reevaluated. Please clarify.		
FR	Page 10-2, Section 10.2.1	Please clarify the statement "Loads from LRFD Service-1 Limit State are used as design loads for WDS of abutments". The soil profile(s) and shaft analyses (inputs and outputs) should be included/defined in the report for all Abutments, Bents, and Abutment 5 Wing Walls. Are pile capacities consisted of both shaft and end bearing capacities? How much is downdrag load? Please clarify.	Deleted the statement in reference to WDS. Loading conditions for both abutments and bents are load factored. Included discussion of soil parameters for shaft analysis, pile resistance and downdrag load considered.	Soil profiles are not provided. Downdrag load is considered only for Bent 3. It should be considered for other supports. Caltrans Liquefaction-Induced Downdrag procedure can be used to estimate downdrag loads. Please clarify. The nominal resistance reported in the Foundation Design Recommendations Table 10-3 must be rounded up to the nearest 10 kips. Design pile tip elevations should be reexamined.		1. Noted. 2. Approach of downdrag load evaluation is not discussed. Were all loads including effective weights of the CIDH piles considered in determinations of pile tip elevations for extreme event?Please clarify. *Discussion of downdrag load evaluation including the effective weights of the CIDH piles added to Section 10.2.2.* Noted. The SHAFT analyses are altered and cannot be verified. Please see the last comment and clarify. 3. Notes #3 of Tables 10-4 and 10-5 are inconsistent. Nominal resistance in compression provided in pile data table 10-5 should be corrected. *Note #3 of Table 10-4 revised to state that specified tip shall not be raised. Nominal compression resistance in Table 10-5 corrected to 1,940 at Bent 3.* Noted. 4. Design pile tip elevations for extreme event should be reexamined. *Updated with revised load combinations presented in Appendix F.* Noted.

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FR	Section 10.2.2	Page numbers should be corrected. Were LPILE analyses performed for static or seismic condition? LPILE analyses were not performed for abutments and wing walls. What are allowable deflections at the top of CIDH piles established for this project under static and seismic conditions? Please clarify.	LPILE analyses were used to characterize the pile lateral response to lateral load applied to the pile. Earthquake loading was modeled as a horizontal force to the superstructure.	Responses to comments are not provided. Furthermore, LPILE and SHAFT input data are inconsistent. All piles are chosen as elastic pile section which will be deflected less than CIDH pile section. Please clarify.		1. Noted. 2. Noted. 3. Caltrans structure should provide concurrence for pile deflection acceptance 5.2 to 6.3 inches. *AECOM structure designer presented calculations in structures package and received concurrence from Caltrans structures reviewer.* Noted. 4. Noted.
FR	Section 10.2.3	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program.	Replaced "deflection" with "displacement."	The calculated nominal axial resistance of the CIDH piles is based on skin friction only as stated in Section 10.2.1, however, mobilized end bearing are reported in Appendix F. Please clarify.		TZPILE 2015 should be corrected. TZPILE analysis was provided for Bent 3 only with specified ultimate unit side friction fs. Please provide reference(s) of these fs and calculations for mobilized shaft resistances. Moreover, soil profile and some soil engineering properties are inconsistent with the Table 10-1. Please clarify. *Errors corrected. TZPILE results for Bents 2 and 4 also be provided, and input corrected to be consistent with Table 10-1. Section 10.2.4 updated to provide reference of fs and calculations for mobilized shaft resistances.* Noted. Please see the last comment and clarify.
FR/Plans	Section 10.3/Plans	Pile inspection tubes are not discussed/shown.	Included the requirements of inspection tubes.	Noted.		

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FR	Section 11.1	Design of temporary shoring system should be submitted to the Department for review and approval.	Updated report to reflect the need of Departmental approval of temporary shoring system.	Unshored vertical excavations should be less than 5 ft.		Noted.
FR		Construction considerations should be included in the report to discuss the impact of pile and embankment construction on the existing bridge/facilities.	Included potential impact of pile and embankment construction to existing bridge and facilities.	Noted.		
FR/Plans	Appendix A / Plans	Project number and phase should be checked.	Modified project number and phase to match submittal version.	Not modified.		The latest GP should be used. *Updated.* Noted.
FR/Plans	Appendix A /Foundation Plan	"Driving" term should be removed from the notes of pile data table. Furthermore, it appears that the pile nominal resistances do not include the downdrag. Please clarify.	Updated notes on Pile Data Table.	Noted. Please provide response to downdrag evaluations for other supports.		Please see comment above for downdrag load. *Please see response to previous comment.* Noted.
FR/Plans	Appendix B /LOTB	LOTB should be updated.	Revised.	All as-built borings of Appendix B should be shown in plan of LOTB 1 of 6 accordingly to "P" Line, not "U" Line. Furthermore, locations of many borings provided in Tables are incorrect.		Noted.
FR	Appendix C	Please provide CPT raw and interpretation data with	Included CPT data in updated report.	Noted.		

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		corresponding shear strength, blow counts, OCR,…				
FR	Appendix F	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program. Please provide input and output data of this program.	Modified the term "deflection" to "displacement" and included T-Z Pile input and output data.	Not complied. Please provide full input-output of T-Z Pile.		Please see comment above for TZPILE. *Please see response to previous comment.* Noted.
FR	Section 6.2.3			Settlement and settlement period evaluations of new approach fills at abutments should be provided.		Noted.
FR	Section 9			As-built foundation data for this bridge widening are not included. Please clarify.		Noted.
						Slope stability analyses for both static and seismic conditions should be performed and provided. *Results of slope stability analyses included in Section 10-5.* The friction angle 34 deg. of embankment fill is inconsistent with Table 10.1. It appears that safety factors of slope stability analyses are not minimum for different modes of failure surfaces. Please clarify.

Based on Typical Cross Sections, Sheet X-1, the side slopes of the approach embankment have been modified to 3:1 (horizontal to vertical) and 4:1. Slope stability analyses were updated for 3:1 slope inclination. Computed factors of safety for the 3:1 embankment slope are greater than 1.1 for both shallow and deep seated potential slip surfaces. Therefore, geosynthetic reinforcement is not needed. The factors of safety are less than 1.1 with deeper failure planes for wider entry/exit ranges.

Cohesion 35 psf for POC Embankment Fill was not shown in the Tables of slope stability figures. Please clarify.

As previously comment provided, specifications should be developed to reflect this added cohesion.

Slope stability analyses updated based on revised drained strength parameters for new embankment fill and revised undrained strength parameters for potentially liquefiable sand; the minimum calculated factors of safety exceed 1.5 static and 1.1 for pseudstatic.

Noted.

As noted on Footnote 2 of Table 10-1, new embankment fill within 150 feet of the abutments (structure backfill) was assumed to have a drained fricition angle of 34 degrees.

We agree with the reviewer that analysis of the proposed 2:1 embankment slope using commercially available software reveals slip surfaces local to the slope face having minimum computed factors of safety of less than 1.1 for the pseudo-static case when the new embankment fills are assumed to be cohesionless. These slip surfaces are not representative of a deep-seated slope failure mechanism that could compromise the roadway as a whole, but rather suggest shallow slumps or raveling might occur along a cohesionless slope face following a large seismic event which could require repair consistent with routine maintenance. It is worth noting that including just 35 psf of drained cohesion to the model, which in the opinion of AECOM would be reasonable for well-compacted and engineered fill, effectively eliminates these shallow slip circles from consideration.

If this judgment is viable, final foundation report should be revised, updated with design soil properties, and provided for archive. Moreover, fill properties, relative compaction and strength should also be specified and provided for embankment construction.

If maintenance of the slope face following a large seismic event is unacceptable to the State, then geosynthetic reinforcement could be incorporated in the fill embankment; AECOM's analysis of a reinforced embankment indicates that 20-foot-long geogrids having a minimum long term design strength of 1,200 pounds per foot and maximum vertical spacing of 16 inches for a 2:1 (horizontal:vertical) slope would be sufficient. Geosynthetic reinforcement and reinforced fill material should meet the requirements of the Standard Specifications.

If this judgment is viable, final foundation report and structure plans should be revised, updated with geosynthetic reinforced embankment (GRE), and provided for archive. Moreover, fill properties, relative compaction and material strength should also be specified and provided for GRE construction.

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FR	Section 11.3			Potential land subsidence due to dewatering is not discussed.		Please add these phrases "If the contractor…by the Owner's Engineer" in the response in this section 11.3. *Report section updated.* Noted.
Plans	GP No. 2			Site specific ARS Curve data should be consistent with the final foundation report.		Noted.
Plans	Foundation Plan					Nominal resistances in compression of Bents 2 and 4 are inconsistent with foundation report. *Pile Data Table updated and consistent with FR.* Noted.
Plans	General Plan No. 2					Type D of soil profile should be corrected.
FR	Appendix F					Soil layers and groundwater depths are altered and inconsistent. Please clarify. Pages 2 and 4 of UnivPOC_Bent2_96-inch_CIDH_nonliqui_steelcase.sf8o are not included.

The Structure Designer has removed the Soil Profile Type from the Foundation Plan; the ARS presented on the plan was developed using Caltrans ARS on-line for the site specific average shear wave velocity. Noted.

SHAFT and TZPILE files were updated to make them consistent with soil layering shown in the idealized soil profile tables and the differing cutoff elevations at each structure support. These small revisions to design soil layer and groundwater depths had negligible effects on analysis results. For report completeness and archive, please insert the missing page.

The missing pages 2 and 4 of the SHAFT output have been inserted. Noted.

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Plans/ Construction	General			Section 11.2 of the report revised to recommend the contractor drill a vertical boring at the site down to at least Elevation -130 feet to evaluate soil and groundwater conditions as they relate to construction of drilled shafts at Bents 2, 3 and 4. Noted.		The risk of CIDH pile construction at Bents 2, 3, and 4 is due to the fact that the design pile tip elevations -120, -95, and -106 ft at Bents 2, 3, and 4 respectively provided in the FP are much lower than the lowest elevation -80.7 ft at one cone penetration test CPT-15-001 of log of test borings.

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OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 EA: 272821 Project Name: University Ave. I/C Improvement OSFP Liaison: Emil Vergara Phone: (916) 227-8360 e-mail: emil.vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☒ PS&E (Review No. 4) ☐ Construction Support ☒ Other: FOUNDATION REPORT	Reviewer Name: T. Nguyen/ M. Momenzadeh/M. Gaffney Functional Unit: GS-GDW Phone Number: (510) 622-1775/ (510) 622-1775 e-mail: tung. nguyen@dot.ca.gov Date of Review: 04/27/2017-12/17/2020 (90%) 02/18/2022; 06/09/2022; 09/07/2022; 09/21/2022
	Structure Information (Use when necessary to document comments by individual structure) Structure Name: University Avenue POC Br No: 35-0359		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments 02/18/2022
		Geotechnical comments for PFR dated September 12, 2016 were not addressed in any report or responses. Please clarify.				PM 0.9/1.4 provided in the cover sheet of foundation report is inconsistent with the project plans. *Cover sheet updated to show PM 0.8/1.1 consistent with the project plan.* Noted.
FR	Figures	All figures are not included in the report.	Included Figures 1-1 to 8-1 in the updated report.	Noted.		
FR	Page 4-1, Section 4.2	Please clarify the cylindrical friction sleeve area 35 in^2 and outer diameter 1.75 inch.	The friction sleeve is 6.5 inches long (to the conical tip); therefore, the surface area length	Noted.		

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			times pi times diameter is 35 in^2.			
FR	Page 5-1, Section 5.2	LOTB of 8 borings are not included.	Included the soil survey sheets of the referenced borings in Appendix D.	Noted.		Are LOTBs of CPT-15-001/002 prepared with interpreted or raw data as provided in appendix C? Please clarify. *CPT soundings present raw data.* Noted.
FR	Pages 6-2 and 8-1 Sections 6.2.2 and 8	PGA 0.54g is not consistent with the ARS Curve previously provided in the PFR dated September 12, 2016. Furthermore, will post-liquefaction ground surface settlement be reevaluated with the design PGA? Please clarify.	The intended Figure 8-1 is the same one as Figure 6-1 of the September 12, 2016 PFR. The PGA is based on extrapolation of the spectral value (0.61) at 0.01 second to 0 second. Understand Caltrans Design Division considers spectral value at 0.01 second to be PGA; therefore, liquefaction was re-evaluated using PGA=0.61g.	Caltrans ARS v3.0.2 should be used. V_{s30} determination is not provided. Liquefaction should also be performed for SPT data from as-built borings. Therefore, downdrag loads can be expected to act on the CIDH pile foundation to lower elevations rather than 0 feet as provided in this section. Please clarify.		1-2. Magnitude MMax = 8.0 is inconsistent with the Figure 8-1. *Revised to Mean Magnitude of 7.19 from the ARS Online tool results.* Noted. 3. Bottom of downdrag zones and loads should also be included in section 6.2.2 according to Caltrans Guidelines of Foundation Report for Bridges. PGA used in CPT liquefaction analyses of appendix C was not updated. Furthermore, elevations of these CPT are inconsistent with LOTB. Please clarify. *Two columns have been added to Table 6-1 to provide the downdrag zone bottom elevation and estimated downdrag loads. The elevations in Table 6-1 updated.* Noted.
FR	Page 10-1, Section 10.1	Liquefaction and related pile capacity are	Added liquefaction induced downdrag force to be included	The depth(s) of potentially liquefiable discontinuous layers should be		Noted.

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		not discussed in this section.	in the pile embedment requirement.	reevaluated. Please clarify.		
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FR	Section 10.2.3	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program.	Replaced "deflection" with "displacement."	The calculated nominal axial resistance of the CIDH piles is based on skin friction only as stated in Section 10.2.1, however, mobilized end bearing are reported in Appendix F. Please clarify.		TZPILE 2015 should be corrected. TZPILE analysis was provided for Bent 3 only with specified ultimate unit side friction fs. Please provide reference(s) of these fs and calculations for mobilized shaft resistances. Moreover, soil profile and some soil engineering properties are inconsistent with the Table 10-1. Please clarify. *Errors corrected. TZPILE results for Bents 2 and 4 also be provided, and input corrected to be consistent with Table 10-1. Section 10.2.4 updated to provide reference of fs and calculations for mobilized shaft resistances.* Noted. Please see the last comment and clarify.
FR/Plans	Section 10.3/Plans	Pile inspection tubes are not discussed/shown.	Included the requirements of inspection tubes.	Noted.		

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FR	Section 11.1	Design of temporary shoring system should be submitted to the Department for review and approval.	Updated report to reflect the need of Departmental approval of temporary shoring system.	Unshored vertical excavations should be less than 5 ft.		Noted.
FR		Construction considerations should be included in the report to discuss the impact of pile and embankment construction on the existing bridge/facilities.	Included potential impact of pile and embankment construction to existing bridge and facilities.	Noted.		
FR/Plans	Appendix A / Plans	Project number and phase should be checked.	Modified project number and phase to match submittal version.	Not modified.		The latest GP should be used. *Updated.* Noted.
FR/Plans	Appendix A /Foundation Plan	"Driving" term should be removed from the notes of pile data table. Furthermore, it appears that the pile nominal resistances do not include the downdrag. Please clarify.	Updated notes on Pile Data Table.	Noted. Please provide response to downdrag evaluations for other supports.		Please see comment above for downdrag load. *Please see response to previous comment.* Noted.
FR/Plans	Appendix B /LOTB	LOTB should be updated.	Revised.	All as-built borings of Appendix B should be shown in plan of LOTB 1 of 6 accordingly to "P" Line, not "U" Line. Furthermore, locations of many borings provided in Tables are incorrect.		Noted.
FR	Appendix C	Please provide CPT raw and interpretation data with	Included CPT data in updated report.	Noted.		

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		corresponding shear strength, blow counts, OCR,…				
FR	Appendix F	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program. Please provide input and output data of this program.	Modified the term "deflection" to "displacement" and included T-Z Pile input and output data.	Not complied. Please provide full input-output of T-Z Pile.		Please see comment above for TZPILE. *Please see response to previous comment.* Noted.
FR	Section 6.2.3			Settlement and settlement period evaluations of new approach fills at abutments should be provided.		Noted.
FR	Section 9			As-built foundation data for this bridge widening are not included. Please clarify.		Noted.
					Based on Typical Cross Sections, Sheet X-1, the side slopes of the approach embankment have been modified to 3:1 (horizontal to vertical) and 4:1. Slope stability analyses were updated for 3:1 slope inclination. Computed factors of safety for the 3:1 embankment slope are greater than 1.1 for both shallow and deep seated potential slip surfaces. Therefore, geosynthetic reinforcement is not needed. The factors of safety are less than 1.1 with deeper failure planes for wider entry/ exit ranges. Cohesion 35 psf for POC Embankment Fill was not shown in the Tables of slope stability figures. Please clarify. As previously commented provided, specifications should be developed to reflect this added cohesion.	Slope stability analyses for both static and seismic conditions should be performed and provided. *Results of slope stability analyses included in Section 10-5.* The friction angle 34 deg. of embankment fill is inconsistent with Table 10.1. It appears that safety factors of slope stability analyses are not minimum for different modes of failure surfaces. Please clarify.

As noted on Footnote 2 of Table 10-1, new embankment fill within 150 feet of the abutments (structure backfill) was assumed to have a drained fricition angle of 34 degrees.
We agree with the reviewer that analysis of the proposed 2:1 embankment slope using commercially available software reveals slip surfaces local to the slope face having minimum computed factors of safety of less than 1.1 for the pseudo-static case when the new embankment fills are assumed to be cohesionless. These slip surfaces are not representative of a deep-seated slope failure mechanism that could compromise the roadway as a whole, but rather suggest shallow slumps or raveling might occur along a cohesionless slope face following a large seismic event which could require repair consistent with routine maintenance. It is worth noting that including just 35 psf of drained cohesion to the model, which in the opinion of AECOM would be reasonable for well-compacted and engineered fill, effectively eliminates these shallow slip circles from consideration.

If this judgment is viable, final foundation report should be revised, updated with design soil properties, and provided for archive. Moreover, fill properties, relative compaction and strength should also be specified and provided for embankment construction.

If maintenance of the slope face following a large seismic event is unacceptable to the State, then geosynthetic reinforcement could be incorporated in the fill embankment; AECOM's analysis of a reinforced embankment indicates that 20-foot-long geogrids having a minimum long term design strength of 1,200 pounds per foot and maximum vertical spacing of 16 inches for a 2:1 (horizontal:vertical) slope would be sufficient. Geosynthetic reinforcement and reinforced fill material should meet the requirements of the Standard Specifications.

If this judgment is viable, final foundation report and structure plans should be revised, updated with geosynthetic reinforced embankment (GRE), and provided for archive. Moreover, fill properties, relative compaction and material strength should also be specified and provided for GRE construction.

Slope stability analyses updated based on revised drained strength parameters for new embankment fill and revised undrained strength parameters for potentially liquefiable sand; the minimum calculated factors of safety exceed 1.5 static and 1.1 for pseudstatic.

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Reviewer's use)

FR	Section 11.3			Potential land subsidence due to dewatering is not discussed.		Please add these phrases "If the contractor…by the Owner's Engineer" in the response in this section 11.3. *Report section updated.* Noted.
Plans	GP No. 2			Site specific ARS Curve data should be consistent with the final foundation report.		Noted.
Plans	Foundation Plan					Nominal resistances in compression of Bents 2 and 4 are inconsistent with foundation report. *Pile Data Table updated and consistent with FR.* Noted.
Plans	General Plan No. 2					Type D of soil profile should be corrected.
FR	Appendix F					Soil layers and groundwater depths are altered and inconsistent. Please clarify. Pages 2 and 4 of UnivPOC_Bent2_96-inch_CIDH_nonliqui_steelcase.sf8o are not included.

The Structure Designer has removed the Soil Profile Type from the Foundation Plan; the ARS presented on the plan was developed using Caltrans ARS on-line for the site specific average shear wave velocity. Noted.

SHAFT and TZPILE files were updated to make them consistent with soil layering shown in the idealized soil profile tables and the differing cutoff elevations at each structure support. These small revisions to design soil layer and groundwater depths had negligible effects on analysis results. For report completeness and archive, please insert the missing page.

The missing pages 2 and 4 of the SHAFT output have been inserted. Noted.

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Plans/ Construction	General			Section 11.2 of the report revised to recommend the contractor drill a vertical boring at the site down to at least Elevation -130 feet to evaluate soil and groundwater conditions as they relate to construction of drilled shafts at Bents 2, 3 and 4.		The risk of CIDH pile construction at Bents 2, 3, and 4 is due to the fact that the design pile tip elevations -120, -95, and -106 ft at Bents 2, 3, and 4 respectively provided in the FP are much lower than the lowest elevation -80.7 ft at one cone penetration test CPT-15-001 of log of test borings.

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OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 EA: 272821 Project Name: University Ave. I/C Improvement OSFP Liaison: Emil Vergara Phone: (916) 227-8360 e-mail: emil.vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☒ PS&E (Review No. 4) ☐ Construction Support ☒ Other: FOUNDATION REPORT	Reviewer Name: T. Nguyen/ M. Momenzadeh/M. Gaffney Functional Unit: GS-GDW Phone Number: (510) 622-1775/ (510) 622-1775 e-mail: tung. nguyen@dot.ca.gov Date of Review: 04/27/2017-12/17/2020 (90%) 02/18/2022; 06/09/2022; 09/07/2022
	Structure Information (Use when necessary to document comments by individual structure) Structure Name: University Avenue POC Br No: 35-0359		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments 02/18/2022
		Geotechnical comments for PFR dated September 12, 2016 were not addressed in any report or responses. Please clarify.				PM 0.9/1.4 provided in the cover sheet of foundation report is inconsistent with the project plans. *Cover sheet updated to show PM 0.8/1.1 consistent with the project plan.* Noted.
FR	Figures	All figures are not included in the report.	Included Figures 1-1 to 8-1 in the updated report.	Noted.		
FR	Page 4-1, Section 4.2	Please clarify the cylindrical friction sleeve area 35 in^2 and outer diameter 1.75 inch.	The friction sleeve is 6.5 inches long (to the conical tip); therefore, the surface area length	Noted.		

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			times pi times diameter is 35 in^2.			
FR	Page 5-1, Section 5.2	LOTB of 8 borings are not included.	Included the soil survey sheets of the referenced borings in Appendix D.	Noted.		Are LOTBs of CPT-15-001/002 prepared with interpreted or raw data as provided in appendix C? Please clarify. *CPT soundings present raw data.* Noted.
FR	Pages 6-2 and 8-1 Sections 6.2.2 and 8	PGA 0.54g is not consistent with the ARS Curve previously provided in the PFR dated September 12, 2016. Furthermore, will post-liquefaction ground surface settlement be reevaluated with the design PGA? Please clarify.	The intended Figure 8-1 is the same one as Figure 6-1 of the September 12, 2016 PFR. The PGA is based on extrapolation of the spectral value (0.61) at 0.01 second to 0 second. Understand Caltrans Design Division considers spectral value at 0.01 second to be PGA; therefore, liquefaction was re-evaluated using PGA=0.61g.	Caltrans ARS v3.0.2 should be used. V_{s30} determination is not provided. Liquefaction should also be performed for SPT data from as-built borings. Therefore, downdrag loads can be expected to act on the CIDH pile foundation to lower elevations rather than 0 feet as provided in this section. Please clarify.		1-2. Magnitude MMax = 8.0 is inconsistent with the Figure 8-1. *Revised to Mean Magnitude of 7.19 from the ARS Online tool results.* Noted. 3. Bottom of downdrag zones and loads should also be included in section 6.2.2 according to Caltrans Guidelines of Foundation Report for Bridges. PGA used in CPT liquefaction analyses of appendix C was not updated. Furthermore, elevations of these CPT are inconsistent with LOTB. Please clarify. *Two columns have been added to Table 6-1 to provide the downdrag zone bottom elevation and estimated downdrag loads. The elevations in Table 6-1 updated.* Noted.
FR	Page 10-1, Section 10.1	Liquefaction and related pile capacity are	Added liquefaction induced downdrag force to be included	The depth(s) of potentially liquefiable discontinuous layers should be		Noted.

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		not discussed in this section.	in the pile embedment requirement.	reevaluated. Please clarify.		
FR	Page 10-2, Section 10.2.1	Please clarify the statement "Loads from LRFD Service-1 Limit State are used as design loads for WDS of abutments". The soil profile(s) and shaft analyses (inputs and outputs) should be included/defined in the report for all Abutments, Bents, and Abutment 5 Wing Walls. Are pile capacities consisted of both shaft and end bearing capacities? How much is downdrag load? Please clarify.	Deleted the statement in reference to WDS. Loading conditions for both abutments and bents are load factored. Included discussion of soil parameters for shaft analysis, pile resistance and downdrag load considered.	Soil profiles are not provided. Downdrag load is considered only for Bent 3. It should be considered for other supports. Caltrans Liquefaction-Induced Downdrag procedure can be used to estimate downdrag loads. Please clarify. The nominal resistance reported in the Foundation Design Recommendations Table 10-3 must be rounded up to the nearest 10 kips. Design pile tip elevations should be reexamined.		1. Noted. 2. Approach of downdrag load evaluation is not discussed. Were all loads including effective weights of the CIDH piles considered in determinations of pile tip elevations for extreme event?Please clarify. *Discussion of downdrag load evaluation including the effective weights of the CIDH piles added to Section 10.2.2.* Noted. The SHAFT analyses are altered and cannot be verified. Please see the last comment and clarify. 3. Notes #3 of Tables 10-4 and 10-5 are inconsistent. Nominal resistance in compression provided in pile data table 10-5 should be corrected. *Note #3 of Table 10-4 revised to state that specified tip shall not be raised. Nominal compression resistance in Table 10-5 corrected to 1,940 at Bent 3.* Noted. 4. Design pile tip elevations for extreme event should be reexamined. *Updated with revised load combinations presented in Appendix F.* Noted.

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FR	Section 10.2.2	Page numbers should be corrected. Were LPILE analyses performed for static or seismic condition? LPILE analyses were not performed for abutments and wing walls. What are allowable deflections at the top of CIDH piles established for this project under static and seismic conditions? Please clarify.	LPILE analyses were used to characterize the pile lateral response to lateral load applied to the pile. Earthquake loading was modeled as a horizontal force to the superstructure.	Responses to comments are not provided. Furthermore, LPILE and SHAFT input data are inconsistent. All piles are chosen as elastic pile section which will be deflected less than CIDH pile section. Please clarify.		1. Noted. 2. Noted. 3. Caltrans structure should provide concurrence for pile deflection acceptance 5.2 to 6.3 inches. *AECOM structure designer presented calculations in structures package and received concurrence from Caltrans structures reviewer.* Noted. 4. Noted.
FR	Section 10.2.3	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program.	Replaced "deflection" with "displacement."	The calculated nominal axial resistance of the CIDH piles is based on skin friction only as stated in Section 10.2.1, however, mobilized end bearing are reported in Appendix F. Please clarify.		TZPILE 2015 should be corrected. TZPILE analysis was provided for Bent 3 only with specified ultimate unit side friction fs. Please provide reference(s) of these fs and calculations for mobilized shaft resistances. Moreover, soil profile and some soil engineering properties are inconsistent with the Table 10-1. Please clarify. *Errors corrected. TZPILE results for Bents 2 and 4 also be provided, and input corrected to be consistent with Table 10-1. Section 10.2.4 updated to provide reference of fs and calculations for mobilized shaft resistances.* Noted. Please see the last comment and clarify.
FR/Plans	Section 10.3/Plans	Pile inspection tubes are not discussed/shown.	Included the requirements of inspection tubes.	Noted.		

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FR	Section 11.1	Design of temporary shoring system should be submitted to the Department for review and approval.	Updated report to reflect the need of Departmental approval of temporary shoring system.	Unshored vertical excavations should be less than 5 ft.		Noted.
FR		Construction considerations should be included in the report to discuss the impact of pile and embankment construction on the existing bridge/facilities.	Included potential impact of pile and embankment construction to existing bridge and facilities.	Noted.		
FR/Plans	Appendix A / Plans	Project number and phase should be checked.	Modified project number and phase to match submittal version.	Not modified.		The latest GP should be used. *Updated.* Noted.
FR/Plans	Appendix A /Foundation Plan	"Driving" term should be removed from the notes of pile data table. Furthermore, it appears that the pile nominal resistances do not include the downdrag. Please clarify.	Updated notes on Pile Data Table.	Noted. Please provide response to downdrag evaluations for other supports.		Please see comment above for downdrag load. *Please see response to previous comment.* Noted.
FR/Plans	Appendix B /LOTB	LOTB should be updated.	Revised.	All as-built borings of Appendix B should be shown in plan of LOTB 1 of 6 accordingly to "P" Line, not "U" Line. Furthermore, locations of many borings provided in Tables are incorrect.		Noted.
FR	Appendix C	Please provide CPT raw and interpretation data with	Included CPT data in updated report.	Noted.		

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		corresponding shear strength, blow counts, OCR,…				
FR	Appendix F	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program. Please provide input and output data of this program.	Modified the term "deflection" to "displacement" and included T-Z Pile input and output data.	Not complied. Please provide full input-output of T-Z Pile.		Please see comment above for TZPILE. *Please see response to previous comment.* Noted.
FR	Section 6.2.3			Settlement and settlement period evaluations of new approach fills at abutments should be provided.		Noted.
FR	Section 9			As-built foundation data for this bridge widening are not included. Please clarify.		Noted.
						Slope stability analyses for both static and seismic conditions should be performed and provided. *Results of slope stability analyses included in Section 10-5.* The friction angle 34 deg. of embankment fill is inconsistent with Table 10.1. It appears that safety factors of slope stability analyses are not minimum for different modes of failure surfaces. Please clarify.

Based on Typical Cross Sections, Sheet X-1, the side slopes of the approach embankment have been modified to 3:1 (horizontal to vertical) and 4:1. Slope stability analyses were updated for 3:1 slope inclination. Computed factors of safety for the 3:1 embankment slope are greater than 1.1 for both shallow and deep seated potential slip surfaces. Therefore, geosynthetic reinforcement is not needed.

As noted on Footnote 2 of Table 10-1, new embankment fill within 150 feet of the abutments (structure backfill) was assumed to have a drained fricition angle of 34 degrees.
We agree with the reviewer that analysis of the proposed 2:1 embankment slope using commercially available software reveals slip surfaces local to the slope face having minimum computed factors of safety of less than 1.1 for the pseudo-static case when the new embankment fills are assumed to be cohesionless. These slip surfaces are not representative of a deep-seated slope failure mechanism that could compromise the roadway as a whole, but rather suggest shallow slumps or raveling might occur along a cohesionless slope face following a large seismic event which could require repair consistent with routine maintenance. It is worth noting that including just 35 psf of drained cohesion to the model, which in the opinion of AECOM would be reasonable for well-compacted and engineered fill, effectively eliminates these shallow slip circles from consideration.

If this judgment is viable, final foundation report should be revised, updated with design soil properties, and provided for archive. Moreover, fill properties, relative compaction and strength should also be specified and provided for embankment construction.

If maintenance of the slope face following a large seismic event is unacceptable to the State, then geosynthetic reinforcement could be incorporated in the fill embankment; AECOM's analysis of a reinforced embankment indicates that 20-foot-long geogrids having a minimum long term design strength of 1,200 pounds per foot and maximum vertical spacing of 16 inches for a 2:1 (horizontal:vertical) slope would be sufficient. Geosynthetic reinforcement and reinforced fill material should meet the requirements of the Standard Specifications.

If this judgment is viable, final foundation report and structure plans should be revised, updated with geosynthetic reinforced embankment (GRE), and provided for archive. Moreover, fill properties, relative compaction and material strength should also be specified and provided for GRE construction.

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FR	Section 11.3			Potential land subsidence due to dewatering is not discussed.		Please add these phrases "If the contractor…by the Owner's Engineer" in the response in this section 11.3. *Report section updated.* Noted.
Plans	GP No. 2			Site specific ARS Curve data should be consistent with the final foundation report.		Noted.
Plans	Foundation Plan					Nominal resistances in compression of Bents 2 and 4 are inconsistent with foundation report. *Pile Data Table updated and consistent with FR.* Noted.
Plans	General Plan No. 2			The Structure Designer has removed the Soil Profile Type from the Foundation Plan; the ARS presented on the plan was developed using Caltrans ARS on-line for the site specific average shear wave velocity. Noted.		Type D of soil profile should be corrected.
FR	Appendix F					Soil layers and groundwater depths are altered and inconsistent. Please clarify. Pages 2 and 4 of UnivPOC_Bent2_96-inch_CIDH_nonliqui_steelcase.sf8o are not included.

SHAFT and TZPILE files were updated to make them consistent with soil layering shown in the idealized soil profile tables and the differing cutoff elevations at each structure support. These small revisions to design soil layer and groundwater depths had negligible effects on analysis results. For report completeness and archive, please insert the missing page.

The missing pages 2 and 4 of the SHAFT output have been inserted.

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OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 EA: 272821 Project Name: University Ave. I/C Improvement OSFP Liaison: Emil Vergara Phone: (916) 227-8360 e-mail: emil.vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☒ PS&E (Review No. 3) ☐ Construction Support ☒ Other: FOUNDATION REPORT	Reviewer Name: T. Nguyen/ M. Momenzadeh/M. Gaffney Functional Unit: GS-GDW Phone Number: (510) 622-1775/ (510) 622-1775 e-mail: tung. nguyen@dot.ca.gov Date of Review: 04/27/2017-12/17/2020 (90%) 02/18/2022
	Structure Information (Use when necessary to document comments by individual structure) Structure Name: University Avenue POC Br No: 35-0359		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments 02/18/2022
		Geotechnical comments for PFR dated September 12, 2016 were not addressed in any report or responses. Please clarify.				PM 0.9/1.4 provided in the cover sheet of foundation report is inconsistent with the project plans. *Cover sheet updated to show PM 0.8/1.1 consistent with the project plan.*
FR	Figures	All figures are not included in the report.	Included Figures 1-1 to 8-1 in the updated report.	Noted.		
FR	Page 4-1, Section 4.2	Please clarify the cylindrical friction sleeve area 35 in^2 and outer diameter 1.75 inch.	The friction sleeve is 6.5 inches long (to the conical tip); therefore, the surface area length	Noted.		

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			times pi times diameter is 35 in^2.			
FR	Page 5-1, Section 5.2	LOTB of 8 borings are not included.	Included the soil survey sheets of the referenced borings in Appendix D.	Noted.		Are LOTBs of CPT-15-001/002 prepared with interpreted or raw data as provided in appendix C? Please clarify. *CPT soundings present raw data.*
FR	Pages 6-2 and 8-1 Sections 6.2.2 and 8	PGA 0.54g is not consistent with the ARS Curve previously provided in the PFR dated September 12, 2016. Furthermore, will post-liquefaction ground surface settlement be reevaluated with the design PGA? Please clarify.	The intended Figure 8-1 is the same one as Figure 6-1 of the September 12, 2016 PFR. The PGA is based on extrapolation of the spectral value (0.61) at 0.01 second to 0 second. Understand Caltrans Design Division considers spectral value at 0.01 second to be PGA; therefore, liquefaction was re-evaluated using PGA=0.61g.	Caltrans ARS v3.0.2 should be used. V_{s30} determination is not provided. Liquefaction should also be performed for SPT data from as-built borings. Therefore, downdrag loads can be expected to act on the CIDH pile foundation to lower elevations rather than 0 feet as provided in this section. Please clarify.		1-2. Magnitude MMax = 8.0 is inconsistent with the Figure 8-1. *Revised to Mean Magnitude of 7.19 from the ARS Online tool results.* 3. Bottom of downdrag zones and loads should also be included in section 6.2.2 according to Caltrans Guidelines of Foundation Report for Bridges. PGA used in CPT liquefaction analyses of appendix C was not updated. Furthermore, elevations of these CPT are inconsistent with LOTB. Please clarify. *Two columns have been added to Table 6-1 to provide the downdrag zone bottom elevation and estimated downdrag loads. The elevations in Table 6-1 updated..*
FR	Page 10-1, Section 10.1	Liquefaction and related pile capacity are	Added liquefaction induced downdrag force to be included	The depth(s) of potentially liquefiable discontinuous layers should be		Noted.

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		not discussed in this section.	in the pile embedment requirement.	reevaluated. Please clarify.		
FR	Page 10-2, Section 10.2.1	Please clarify the statement “Loads from LRFD Service-1 Limit State are used as design loads for WDS of abutments”. The soil profile(s) and shaft analyses (inputs and outputs) should be included/defined in the report for all Abutments, Bents, and Abutment 5 Wing Walls. Are pile capacities consisted of both shaft and end bearing capacities? How much is downdrag load? Please clarify.	Deleted the statement in reference to WDS. Loading conditions for both abutments and bents are load factored. Included discussion of soil parameters for shaft analysis, pile resistance and downdrag load considered.	Soil profiles are not provided. Downdrag load is considered only for Bent 3. It should be considered for other supports. Caltrans Liquefaction-Induced Downdrag procedure can be used to estimate downdrag loads. Please clarify. The nominal resistance reported in the Foundation Design Recommendations Table 10-3 must be rounded up to the nearest 10 kips. Design pile tip elevations should be reexamined.		1. Noted. 2. Approach of downdrag load evaluation is not discussed. Were all loads including effective weights of the CIDH piles considered in determinations of pile tip elevations for extreme event? Please clarify. *Discussion of downdrag load evaluation including the effective weights of the CIDH piles added to Section 10.2.2.* 3. Notes #3 of Tables 10-4 and 10-5 are inconsistent. Nominal resistance in compression provided in pile data table 10-5 should be corrected. *Note #3 of Table 10-4 revised to state that specified tip shall not be raised. Nominal compression resistance in Table 10-5 corrected to 1,940 at Bent 3.* 4. Design pile tip elevations for extreme event should be reexamined. *Updated with revised load combinations presented in Appendix F.*

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FR	Section 10.2.2	Page numbers should be corrected. Were LPILE analyses performed for static or seismic condition? LPILE analyses were not performed for abutments and wing walls. What are allowable deflections at the top of CIDH piles established for this project under static and seismic conditions? Please clarify.	LPILE analyses were used to characterize the pile lateral response to lateral load applied to the pile. Earthquake loading was modeled as a horizontal force to the superstructure.	Responses to comments are not provided. Furthermore, LPILE and SHAFT input data are inconsistent. All piles are chosen as elastic pile section which will be deflected less than CIDH pile section. Please clarify.		1. Noted. 2. Noted. 3. Caltrans structure should provide concurrence for pile deflection acceptance 5.2 to 6.3 inches. *AECOM structure designer presented calculations in structures package and received concurrence from Caltrans structures reviewer.* 4. Noted.
FR	Section 10.2.3	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program.	Replaced "deflection" with "displacement."	The calculated nominal axial resistance of the CIDH piles is based on skin friction only as stated in Section 10.2.1, however, mobilized end bearing are reported in Appendix F. Please clarify.		TZPILE 2015 should be corrected. TZPILE analysis was provided for Bent 3 only with specified ultimate unit side friction fs. Please provide reference(s) of these fs and calculations for mobilized shaft resistances. Moreover, soil profile and some soil engineering properties are inconsistent with the Table 10-1. Please clarify. *Errors corrected. TZPILE results for Bents 2 and 4 also be provided, and input corrected to be consistent with Table 10-1. Section 10.2.4 updated to provide reference of fs and calculations for mobilized shaft resistances.*
FR/Plans	Section 10.3/Plans	Pile inspection tubes are not discussed/shown.	Included the requirements of inspection tubes.	Noted.		

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FR	Section 11.1	Design of temporary shoring system should be submitted to the Department for review and approval.	Updated report to reflect the need of Departmental approval of temporary shoring system.	Unshored vertical excavations should be less than 5 ft.		Noted.
FR		Construction considerations should be included in the report to discuss the impact of pile and embankment construction on the existing bridge/facilities.	Included potential impact of pile and embankment construction to existing bridge and facilities.	Noted.		
FR/Plans	Appendix A / Plans	Project number and phase should be checked.	Modified project number and phase to match submittal version.	Not modified.		The latest GP should be used. *Updated.*
FR/Plans	Appendix A /Foundation Plan	"Driving" term should be removed from the notes of pile data table. Furthermore, it appears that the pile nominal resistances do not include the downdrag. Please clarify.	Updated notes on Pile Data Table.	Noted. Please provide response to downdrag evaluations for other supports.		Please see comment above for downdrag load. *Please see response to previous comment.*
FR/Plans	Appendix B /LOTB	LOTB should be updated.	Revised.	All as-built borings of Appendix B should be shown in plan of LOTB 1 of 6 accordingly to "P" Line, not "U" Line. Furthermore, locations of many borings provided in Tables are incorrect.		Noted.
FR	Appendix C	Please provide CPT raw and interpretation data with	Included CPT data in updated report.	Noted.		

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		corresponding shear strength, blow counts, OCR,…				
FR	Appendix F	Instead of “deflection”, term “displacement” should be used to be consistent with the T-ZPILE program. Please provide input and output data of this program.	Modified the term “deflection” to “displacement” and included T-Z Pile input and output data.	Not complied. Please provide full input-output of T-Z Pile.		Please see comment above for TZPILE. *Please see response to previous comment.*
FR	Section 6.2.3			Settlement and settlement period evaluations of new approach fills at abutments should be provided.		Noted.
FR	Section 9			As-built foundation data for this bridge widening are not included. Please clarify.		Noted.
FR	Section 10.5			Slope stability of the embankments at abutments should be provided. Please clarify.		Slope stability analyses for both static and seismic conditions should be performed and provided. *Results of slope stability analyses included in Section 10-5.*
FR	Section 11.3			Potential land subsidence due to dewatering is not discussed.		Please add these phrases “If the contractor…by the Owner’s Engineer” in the response in this section 11.3. *Report section updated.*
Plans	GP No. 2			Site specific ARS Curve data should be consistent with the final foundation report.		Noted.

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Plans	Foundation Plan					Nominal resistances in compression of Bents 2 and 4 are inconsistent with foundation report. *Pile Data Table updated and consistent with FR.*

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OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 **EA:** 272821 **Project Name:** University Ave. I/C Improvement **OSFP Liaison:** Emil Vergara **Phone:** (916) 227-8360 **e-mail:** emil.vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☐ 65% PS&E Unchecked Details ☒ PS&E (Review No. 2) ☐ Construction Support ☒ Other: FOUNDATION REPORT	**Reviewer Name:** T. Nguyen/ M. Momenzadeh/M. Gaffney **Functional Unit:** GS-GDW **Phone Number:** (510) 622-1775/ (510) 622-1775 **e-mail:** tung. nguyen@dot.ca.gov **Date of Review:** 04/27/2017-12/17/2020 (90%)
	Structure Information (Use when necessary to document comments by individual structure) **Structure Name:** University Avenue POC **Br No:** 35-0359		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Stephen Huang	AECOM	408-297-9585	stephen.huang@aecom.com	09/30/2021

Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments
		Geotechnical comments for PFR dated September 12, 2016 were not addressed in any report or responses. Please clarify.				
FR	Figures	All figures are not included in the report.	Included Figures 1-1 to 8-1 in the updated report.	Noted.		
FR	Page 4-1, Section 4.2	Please clarify the cylindrical friction sleeve area 35 in^2 and outer diameter 1.75 inch.	The friction sleeve is 6.5 inches long (to the conical tip); therefore, the surface area length times pi times diameter is 35 in^2.	Noted.		

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FR	Page 5-1, Section 5.2	LOTB of 8 borings are not included.	Included the soil survey sheets of the referenced borings in Appendix D.	Noted.	LOTB set updated to include soil survey sheet for EB-6 and EB-9 only as these are the only explorations from that 2000 study judged close enough to be relevant to the proposed structure. The other soil survey sheets are included with the project Materials Report as they are relevant to roadway widening west of US 101.	
FR	Pages 6-2 and 8-1 Sections 6.2.2 and 8	PGA 0.54g is not consistent with the ARS Curve previously provided in the PFR dated September 12, 2016. Furthermore, will post-liquefaction ground surface settlement be reevaluated with the design PGA? Please clarify.	The intended Figure 8-1 is the same one as Figure 6-1 of the September 12, 2016 PFR. The PGA is based on extrapolation of the spectral value (0.61) at 0.01 second to 0 second. Understand Caltrans Design Division considers spectral value at 0.01 second to be PGA; therefore, liquefaction was re-evaluated using PGA=0.61g.	1.Caltrans ARS v3.0.2 should be used. 2.V_{s30} determination is not provided. 3.Liquefaction should also be performed for SPT data from as-built borings. Therefore, downdrag loads can be expected to act on the CIDH pile foundation to lower elevations rather than 0 feet as provided in this section. Please clarify.	1. Report and plans updated with ARS curve from ARS V3.0.2. 2.The revised ARS curve is based on Vs30 of 210 m/sec estimated from published correlations with undrained shear strengths and relative densities of the materials revealed in explorations; this explanation and spreadsheet showing estimation of Vs with depth using relationships by Dickerson (1994) for clay and Weir (2012) for sand is included in an appendix to the revised report. 3.AECOM evaluated liquefaction susceptibility and resulting estimated settlement for the granular soils encountered in historic borings from the 2000 study for widening of University	

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					Avenue west of US 101, and the 2002 study for widening of the University Avenue OC. For the five explorations proximal to the proposed POC and judged by AECOM to be relevant (EB-9, EB-6, 02-B1, 02-B2 and 02-BR-1) only the 5-foot-thick layer of loose clayey sand layer revealed in Boring 02-BR-1 between about Elevation 4 and 9 feet (NAVD88) could be considered to be potentially liquefiable, with estimated post-liquefaction of 2 inches. The logs of Borings B-5 and B-6 from the 1953 study also suggest the presence of potentially liquefiable silts and sands extending to about Elevation -3 to -6 feet (NAVD88), consistent with the elevations of potentially liquefiable deposits suggested by the records for CPT-001 and CPT-002, which appear to extend to about Elevation -3 and -6.5 feet, respectively (NAVD88). The estimated downdrag load at each structure support is included in the revised report.	
FR	Page 10-1, Section 10.1	Liquefaction and related pile capacity are not discussed in this section.	Added liquefaction induced downdrag force to be included in the pile	The depth(s) of potentially liquefiable discontinuous layers should be reevaluated. Please clarify.	Text updated. See preceding response for more detail.	

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			embedment requirement.			
FR	Page 10-2, Section 10.2.1	Please clarify the statement "Loads from LRFD Service-1 Limit State are used as design loads for WDS of abutments". The soil profile(s) and shaft analyses (inputs and outputs) should be included/defined in the report for all Abutments, Bents, and Abutment 5 Wing Walls. Are pile capacities consisted of both shaft and end bearing capacities? How much is downdrag load? Please clarify.	Deleted the statement in reference to WDS. Loading conditions for both abutments and bents are load factored. Included discussion of soil parameters for shaft analysis, pile resistance and downdrag load considered.	1.Soil profiles are not provided. 2.Downdrag load is considered only for Bent 3. It should be considered for other supports. Caltrans Liquefaction-Induced Downdrag procedure can be used to estimate downdrag loads. Please clarify. 3.The nominal resistance reported in the Foundation Design Recommendations Table 10-3 must be rounded up to the nearest 10 kips. 4.Design pile tip elevations should be reexamined.	1.Idealized soil profiles at each structure support are included in tabular format in Section 10 of the revised report. 2.The estimated downdrag load at each structure support is included in the revised Section 10. 3.The nominal resistance reported in the Foundation Recommendations table rounded up to nearest 10 kips. 4.Design pile tip elevations updated.	
FR	Section 10.2.2	1.Page numbers should be corrected. 2.Were LPILE analyses performed for static or seismic condition? LPILE analyses were not performed for abutments and wing walls. 3.What are allowable deflections at the top of CIDH piles established	LPILE analyses were used to characterize the pile lateral response to lateral load applied to the pile. Earthquake loading was modeled as a horizontal force to the superstructure.	Responses to comments are not provided. 4.Furthermore, LPILE and SHAFT input data are inconsistent. All piles are chosen as elastic pile section which will be deflected less than CIDH pile section. Please clarify.	1.Page numbers have been corrected. 2.Results of LPILE analysis performed top of pile loads provided by the Structural Engineer for the service and extreme event states for each support locations are included in appendix to revised report. 3.The Structure Designer has determined that the calculated top of pile deflections of 5.2 to	

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		for this project under static and seismic conditions? Please clarify.			6.3 inches as shown on the LPILE results are acceptable. 4. Per SDC 1.7, Type II shafts are designed to have a capacity that is at least 1.25 times the maximum moment from the LPILE analysis. The maximum moment from the LPILE analysis is the result of the overstrength moment and shear being applied to the bottom of the column. Section 7.7.3.5 of SDC 1.7 says, "Type II shafts typically are enlarged relative to the column diameter to confine the inelastic action in the column." In the opinion of AECOM, this suggests that the shafts are to remain elastic under the design seismic event.	
FR	Section 10.2.3	Instead of "deflection", term "displacement" should be used to be consistent with the T-ZPILE program.	Replaced "deflection" with "displacement."	The calculated nominal axial resistance of the CIDH piles is based on skin friction only as stated in Section 10.2.1, however, mobilized end bearing are reported in Appendix F. Please clarify.	Report updated to state that axial support is derived through skin friction only. The tables in the appendix that show mobilized tip resistance have been removed.	
FR/Plans	Section 10.3/Plans	Pile inspection tubes are not discussed/shown.	Included the requirements of inspection tubes.	Noted.		

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FR	Section 11.1	Design of temporary shoring system should be submitted to the Department for review and approval.	Updated report to reflect the need of Departmental approval of temporary shoring system.	Unshored vertical excavations should be less than 5 ft.	This requirement has been added to the “construction considerations” section of the revised report.	
FR		Construction considerations should be included in the report to discuss the impact of pile and embankment construction on the existing bridge/facilities.	Included potential impact of pile and embankment construction to existing bridge and facilities.	Noted.		
FR/Plans	Appendix A / Plans	Project number and phase should be checked.	Modified project number and phase to match submittal version.	Not modified.	References to project number and phase have been corrected in the FR and structural plans.	
FR/Plans	Appendix A /Foundation Plan	“Driving” term should be removed from the notes of pile data table. Furthermore, it appears that the pile nominal resistances do not include the downdrag. Please clarify.	Updated notes on Pile Data Table.	Noted. Please provide response to downdrag evaluations for other supports.	Report updated to include estimated downdrag load at each structure support; notes below PDT updated.	
FR/Plans	Appendix B /LOTB	LOTB should be updated.	Revised.	All as-built borings of Appendix B should be shown in plan of LOTB 1 of 6 accordingly to “P” Line, not “U” Line. Furthermore, locations of many borings provided in Tables are incorrect.	LOTB updated to show locations of relevant historic explorations referenced to “P” Line; table on the LOTB has been updated accordingly.	
FR	Appendix C	Please provide CPT raw and interpretation data with	Included CPT data in updated report.	Noted.		

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		corresponding shear strength, blow counts, OCR,…				
FR	Appendix F	Instead of “deflection”, term “displacement” should be used to be consistent with the T-ZPILE program. Please provide input and output data of this program.	Modified the term “deflection” to “displacement” and included T-Z Pile input and output data.	Not complied. Please provide full input-output of T-Z Pile.	Provided to reviewer electronically.	
FR	Section 6.2.3			Settlement and settlement period evaluations of new approach fills at abutments should be provided.	Calculations to support the estimated consolidation settlement at the abutments and recommended settlement period of 90 days included in an appendix to the revised report.	
FR	Section 9			As-built foundation data for this bridge widening are not included. Please clarify.	Since this is a new structure, as-built foundation data for it are not applicable. Information presented in Section 9 of the report is for the adjacent existing structure, University Avenue OC.	
FR	Section 10.5			Slope stability of the embankments at abutments should be provided. Please clarify.	Results for global stability analysis of abutment slopes will be included in an appendix to the revised report.	
FR	Section 11.3			Potential land subsidence due to dewatering is not discussed.	Dewatering is not expected to be required for the project. Water in CIDH piles is expected to displaced by tremied concrete during construction. If the contractor alternatively proposes dewatering wells to construct the shafts in the dry, then he	

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					will need to work with his Geotechnical Engineer to design a dewatering system that does not result in land subsidence. The dewatering system design would need to be reviewed by the Owner's Engineer.	
Plans	GP No. 2			Site specific ARS Curve data should be consistent with the final foundation report.	Please refer to response to comment on FR pages 6-2 and 8-1.	

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OSFP Review Comment & Response Form

General Project Information	Review Phase		Reviewer Information
Dist: 04 **EA:** 272821 **Project Name:** University Ave. I/C Improvement **OSFP Liaison:** Emil Vergara **Phone:** (916) 227-8360 **e-mail:** emil.vergara@dot.ca.gov	☐ PSR/PDS (Review No. _) ☐ APS/PSR (Review No. _) ☐ APS/PR (Review No. _) ☐ Type Selection	☒ 65% PS&E Unchecked Details ☐ PS&E (Review No. 2) ☐ Construction Support ☒ Other: FOUNDATION REPORT	**Reviewer Name:** T. Nguyen/ M. Momenzadeh/M. Gaffney **Functional Unit:** GS-GDW **Phone Number:** (510) 622-1775/ (510) 622-1775 **e-mail:** tung. nguyen@dot.ca.gov **Date of Review:** 04/27/2017
	Structure Information (Use when necessary to document comments by individual structure) **Structure Name:** University Avenue POC **Br No:** 35-0359		

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments
		Geotechnical comments for PFR dated September 12, 2016 were not addressed in any report or responses. Please clarify.				
FR	Figures	All figures are not included in the report.	Included Figures 1-1 to 8-1 in the updated report.			
FR	Page 4-1, Section 4.2	Please clarify the cylindrical friction sleeve area 35 in^2 and outer diameter 1.75 inch.	The friction sleeve is 6.5 inches long (to the conical tip); therefore, the surface area length times pi times diameter is 35 in^2.			
FR	Page 5-1, Section 5.2	LOTB of 8 borings are not included.	Included the soil survey sheets of the referenced borings in Appendix D.			

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Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments
FR	Pages 6-2 and 8-1 Sections 6.2.2 and 8	PGA 0.54g is not consistent with the ARS Curve previously provided in the PFR dated September 12, 2016. Furthermore, will post-liquefaction ground surface settlement be reevaluated with the design PGA? Please clarify.	The intended Figure 8-1 is the same one as Figure 6-1 of the September 12, 2016 PFR. The PGA is based on extrapolation of the spectral value (0.61) at 0.01 second to 0 second. Understand Caltrans Design Division considers spectral value at 0.01 second to be PGA; therefore, liquefaction was re-evaluated using PGA=0.61g.			
FR	Page 10-1, Section 10.1	Liquefaction and related pile capacity are not discussed in this section.	Added liquefaction induced downdrag force to be included in the pile embedment requirement.			
FR	Page 10-2, Section 10.2.1	Please clarify the statement “Loads from LRFD Service-1 Limit State are used as design loads for WDS of abutments”. The soil profile(s) and shaft analyses (inputs and outputs) should be included/defined in the report for all Abutments, Bents, and Abutment 5 Wing Walls. Are pile capacities consisted of both shaft and end bearing capacities? How much is downdrag load? Please clarify.	Deleted the statement in reference to WDS. Loading conditions for both abutments and bents are load factored. Included discussion of soil parameters for shaft analysis, pile resistance and downdrag load considered.			

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Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments
FR	Section 10.2.2	Page numbers should be corrected. Were LPILE analyses performed for static or seismic condition? LPILE analyses were not performed for abutments and wing walls. What are allowable deflections at the top of CIDH piles established for this project under static and seismic conditions? Please clarify.	LPILE analyses were used to characterize the pile lateral response to lateral load applied to the pile. Earthquake loading was modeled as a horizontal force to the superstructure.			
FR	Section 10.2.3	Instead of “deflection”, term “displacement” should be used to be consistent with the T-ZPILE program.	Replaced “deflection” with “displacement.”			
FR/Plans	Section 10.3/Plans	Pile inspection tubes are not discussed/shown.	Included the requirements of inspection tubes.			
FR	Section 11.1	Design of temporary shoring system should be submitted to the Department for review and approval.	Updated report to reflect the need of Departmental approval of temporary shoring system.			
FR		Construction considerations should be included in the report to discuss the impact of pile and embankment construction on the existing bridge/facilities.	Included potential impact of pile and embankment construction to existing bridge and facilities.			
FR/Plans	Appendix A / Plans	Project number and phase should be checked.	Modified project number and phase to match submittal version.			
FR/Plans	Appendix A /Foundation Plan	“Driving” term should be removed from the notes of pile data table. Furthermore,	Updated notes on Pile Data Table.			

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Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	Review Comments	Consultant Responses	Review Comments
		it appears that the pile nominal resistances do not include the downdrag. Please clarify.				
FR/Plans	Appendix B /LOTB	LOTB should be updated.	Revised.			
FR	Appendix C	Please provide CPT raw and interpretation data with corresponding shear strength, blow counts, OCR,…	Included CPT data in updated report.			
FR	Appendix F	Instead of “deflection”, term “displacement” should be used to be consistent with the T-ZPILE program. Please provide input and output data of this program.	Modified the term “deflection” to “displacement” and included T-Z Pile input and output data.			

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RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved
(for Reviewer’s use)

DES Structures Constructability Review Comments & Responses Feedback Form

Form SC-010 (April 2014)

Constructability Reviewer	Dan Dait – Structure Construction			***Structure Name/Br #***	University Ave POC Br No 35-0359 SM 101. PM 0.9/1.4
Functional Unit	Structure Construction			***Project EA***	04-272821 efis 04 0000 0132
PD Stage Check Box		APS (PID-Bldgs)		GP (Prelim-Bldgs)	***Date Reviewed*** May 5, 2017
	X	Unchecked Details (65% PS&E)		PS&E 95%	***Conveyed via:*** email

#	Plan Sheet or Section	Page or Sheet #		Reviewer Comments **M-**mandatory, **S-**suggested correction**, Q-**question**, G-**general comment**.** Attach detail when needed to clarify	Design Response/Actions * **NA**- No Action **WI**- Will Incorporate	Responder's Initials
				Foundation Report and Log of Test Borings		
	CIDH piles		M	Need Tunnel & Mining Soil Classifications. Is the soil gassy or potentially gassy?	According Highway Design Manual (HMD) Section 110, a request of 8422 Tunnel Classification had been initiated with District 4 Mining and Tunneling (M&T) Unit office. The classification and relevant information will be included in project specifications at the next submittal.	SH
	LOTB		G	Bents 2, 3, and 4 are large diameter CIDH piles. The most useful borings are B-6 and 02-BR-1 which show the soil profile. However, these two bores are closest to Bent 2. To avoid claims, can we get another bore near Bent 3 in the center median?	A site specific cone penetration test (CPT) CPT-15-001 was conducted at US 101 Lane Number 1 at Bent 3. CPT sounding was presented on LOTB.	SH
	Section 10		G	The page numbers for section 10 are not correct.	Page numbers revised.	SH
		10-2	G	Table 1 on page 10-2 shows Bent 2 as 96-inch CIDH. However, other Tables are showing 120-inch CIDH for Bent 2.	Pile type and diameters were modified to match that presented on Table 1.	SH

Notes:

*Give reasons if comments are not incorporated or no action is taken.

Responder's name and title (PE,TM..)

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#	**Plan Sheet or Section**	**Page or Sheet #**		**Reviewer Comments** **M-**mandatory, **S-**suggested correction**, Q-**question**, G-**general comment**.** Attach detail when needed to clarify	**Design Response/Actions *** **NA-** No Action **WI**- Will Incorporate	**Responder's Initials**
				NO OTHER COMMENTS.		

Notes:

*Give reasons if comments are not incorporated or no action is taken.

Responder's name and title (PE,TM..)

Office of Special Funded Projects
Comment & Response Form

(Revised 08/2011)

General Project Information (OSFP Liaison to complete)		Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)	
Dist:	**04**	☐ PSR/PDS (Review No.)	Reviewer Name:	**Tung Nguyen/Mahmood Momenzadeh**
Proj ID (Phase):	**0400000759**	☐ APS/PSR (Review No.)	Functional Unit:	**Geotechnical Design West, Branch C**
Project Name:	**University Avenue BOC/POC**	☐ APS/PR (Review No.)	Cost Center:	**59-3660**
OSFP Liaison:	**Emil Vergara**	☐ **Type Selection**	Phone Number:	**510-622-1775**
Phone:	**916-227-5671**	☐ 65% PS&E Unchecked Details	e-mail:	**tung.nguyen@dot.ca.gov**
E-mail:	**Vergara Jr, Emil A@dot.ca.gov**	PS&E (Review No. 1)	Date of Review:	**10/17/2016**
		☐ Construction	Structure Name*:	**University Avenue BOC/POC**
		☐ Other: PRELIMINARY FR (PFR)	Br No*:	
			(*Use if necessary to when comment sheets are by individual structure)	

Consultant Information (to be filled in by Consultant)				
Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	E-mail	Response Date

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	PFR	Page 3-1, Section 3.1.1	Maximum depth of about 90 feet is contradicted with depths ranging from 50 to 75 feet. Please clarify.	Report revised to note that one of the borings from the 2002 study extended to a depth of about 90 feet.	
2	PFR	Page 6-1, Section 6	Peak ground acceleration = 0.54g is not consistent with Figure 6-1. Please clarify.	Figure 6-1 shows a PGA of 0.61g, which was used for evaluation of liquefaction potential. Report text corrected as well.	
3	PFR	Page 10-1, Section 10-1	It states that “we recommend that one exploratory boring be performed at each structure support location…”. However, only cone penetration tests (CPT) are proposed in item 1 of this section. Please clarify.	Upon further review of available laboratory test data and in consideration of existing site conditions, AECOM judged CPTs to be well-suited to confirm subsurface conditions and to complement exploratory boring data for liquefaction analysis and deep foundation design.	
4	PFR	Page 10-1, Section 10-3	In conjunction with comment #3, please clarify soil samples if only CPT will be performed.	Laboratory test data presented on LOTBs from prior studies was deemed adequate for foundation design; as such, collection of soil samples was not necessary and only CPTs	

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✓= Comment Resolved (for Reviewer’s use)

Submittal Data (Reviewer to complete)
Project ID: 0400000759 Reviewer: TNguyen/MMomenzadeh Str Name*: University Avenue BOC/POC
Date of Review: 10/17/2016 Functional Unit: 3660 Br No*. *=if applicable

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
				were performed as part of the current study.	
5	PFR	LOTB, Appendix A	Reference(s) should be provided to transfer LOTB metric unit to imperial unit.	Conversion of boring elevation data from metric to imperial units provided on LOTBs from previous studies.	
6	TS/E	Estimate for Alt. No. 2	It seems that class 140 and 200 pile lengths 45 ft are not consistent with the PFR Section 8. Please clarify.	The recommended foundation type for the POC is now CIDH piles. Report revised accordingly.	
7	FP	Sheet 3 of 3	Project EA and number are incorrect.	Project EA and number corrected.	

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✓= Comment Resolved
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OSFP Rev Form 12/2010