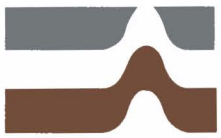
# Appendix B
# Northern Impoundment
# Geotechnical Engineering Report

100021353

**Appendix B**

**NORTHERN IMPOUNDMENT GEOTECHNICAL ENGINEERING REPORT**
**PRELIMINARY 30% REMEDIAL DESIGN – NORTHERN IMPOUNDMENT**
**SAN JACINTO RIVER WASTE PITS**

**HARRIS COUNTY, TEXAS**



Ardaman & Associates, Inc.


**CORPORATE HEADQUARTERS**

8008 S. Orange Avenue, Orlando, FL 32809 - Phone: (407) 855-3860 Fax: (407) 859-8121

Branch Office Locations

Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach
Louisiana: Baton Rouge, Monroe, New Orleans, Shreveport



**MEMBERS:**

ASTM International
American Concrete Institute
Geoprofessional Business Association
Society of American Military Engineers
American Council of Engineering Companies

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

May 28, 2020
AAI File: 18-2876-002 Rev.1

GHD Services, Inc.
5551 Corporate Blvd. #200
Baton Rouge, LA 70808

Attention: Mr. Charles Munce, P.E.
Project Manager

Re: Northern Impoundment Geotechnical Engineering Report
Preliminary 30% Remedial Design
San Jacinto River Waste Pits
Northern Impoundment
Harris County, Texas

We have completed our study and preliminary analyses based on the existing and available data to date for the San Jacinto Waste Pits Superfund Site's Northern Impoundment Preliminary 30% Remedial Design. A summary of the methods of analysis and results are provided in the attached Geotechnical Engineering Report. The analyses were based on the information made available to Ardaman to date and may be subject to change in the future.

Sincerely,
ARDAMAN & ASSOCIATES, INC.
Texas Firm # 5822

STATE OF LOUISIANA
MARK L WOODWARD
License No. 24208
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING
5/28/2020

GEORGE F. SEGRE QUILICHINI, P.E.
PROJECT ENGINEER

MARK L. WOODWARD, MECE, P.E.
SENIOR GEOTECHNICAL ENGINEER



101 Teal Street, St. Rose, Louisiana 70087 Phone: (504) 835-2593 Fax: (504) 835-2982

Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach
Louisiana: Baton Rouge, Monroe, New Orleans, Shreveport

# TABLE OF CONTENTS

TABLE OF CONTENTS ..... I
EXECUTIVE SUMMARY ..... IV
SECTION 1. GENERAL PROJECT INFORMATION ..... 1
1.1 Project Description ..... 1
1.2 Northern Impoundment Location and Description ..... 1
1.3 Geology ..... 1
1.4 Groundwater ..... 2
1.5 Seismic Site Class ..... 2
SECTION 2. HISTORICAL GEOTECHNICAL INFORMATION ..... 2
SECTION 3. CURRENT FIELD EXPLORATION ..... 3
SECTION 4. LABORATORY TESTING ..... 5
4.1 Classification and Index Testing ..... 5
4.1.1 Visual Classification ..... 6
4.1.2 Moisture Content and Density and Unit Weight Determinations ..... 6
4.1.3 Atterberg Limits ..... 6
4.1.4 Grain Size Determinations ..... 6
4.1.5 Unconsolidated-Undrained Compression Tests ..... 7
4.1.6 Consolidation Tests ..... 7
SECTION 5. EVALUATION OF CURRENT & HISTORIC SUBSURFACE CONDITIONS ..... 7
SECTION 6. ANALYSES ..... 8
6.1 Methods of Analyses ..... 8
6.1.1 Methods of Analyses – Slope Stability ..... 8
6.1.2 Methods of Analyses – BMPs (Cofferdams & Retaining Walls) ..... 8
6.2 Results of Analyses ..... 10
6.2.1 Design Assumptions ..... 10
6.2.2 Cross Sections ..... 11
6.2.3 Design Strength Parameters ..... 12
6.2.4 BMPs (Cofferdams & Retaining Walls) ..... 16
6.2.5 Pile Drivability Analysis ..... 16
6.2.6 Slope Stability ..... 16
SECTION 7. ADDITIONAL CONSIDERATIONS ..... 18
SECTION 8. REFERENCES: ..... 20
SECTION 9. FIGURES ..... 21
ATTACHMENT A. FURNISHED BORING LOGS AND GEOTECHNICAL TESTING RESULTS FROM PREVIOUS INVESTIGATIONS ..... 1

ATTACHMENT B. PDI-2 BORING LOGS AND GEOTECHNICAL TESTING RESULTS ..... 1
ATTACHMENT C. CALCULATION PACKAGE ..... 1

**List of Tables:**

Table 1 - Seismic Design Parameters ..... 2
Table 2 - Historical Soil Boring Details ..... 3
Table 3 - PDI-2 Soil Boring Details ..... 4
Table 4 - PDI-2 Laboratory Testing Summary ..... 5
Table 5 - Factors of Safety for Sheet Pile Walls ..... 10
Table 6 - Design Cases Considered ..... 11
Table 7 - Design Strength Parameters (Cell 1) ..... 12
Table 8 - Design Strength Parameters (Cell 2) ..... 13
Table 9 - Design Strength Parameters (Cell 3) ..... 14
Table 10 - Design Strength Parameters (Cell 4) ..... 15
Table 11 - Design Strength Parameters (Cell 5) ..... 15
Table 12 - Summary of Slope Stbaility Analysis (Horizontal Acceleration) ..... 17

**List of Figures:**

Figure 1 – Site Plan ..... 21
Figure 2 – Regional Geology ..... 21
Figure 3 – Historical Topographic Surveys ..... 21
Figure 4 – Soil Boring Location Plan (Northern Impoundment) ..... 21
Figure 5 – Northern Impoundment West Cells Plan Map ..... 21
Figure 6 – West Cells Profiles (Index 1 / 2) ..... 21
Figure 7 – West Cells Profiles (Index 2 / 2) ..... 21
Figure 8 – Northern Impoundment East Cells Plan Map ..... 21
Figure 9 – East Cells Profiles (Index 1 / 2) ..... 21
Figure 10 – East Cells Profiles (Index 2 / 2) ..... 21
Figure 11 – Northern Impoundment Vibration Analysis Stationing ..... 21
Figure 12 – Northern Impoundment Vibration Analysis Cross Sections ..... 21
Figure 13 – Station 5+00 Slope Stability – Static Condition ..... 21
Figure 14 – Station 5+00 Slope Stability – 0.1-g Horizontal Acceleration ..... 21
Figure 15 – Station 5+00 Slope Stability – 0.2-g Horizontal Acceleration ..... 21
Figure 16 – Station 5+00 Slope Stability – 0.3-g Horizontal Acceleration ..... 21
Figure 17 – Station 22+00 Slope Stability – Static Condition ..... 21
Figure 18 – Station 22+00 Slope Stability – 0.1-g Horizontal Acceleration ..... 21
Figure 19 – Station 22+00 Slope Stability – 0.2-g Horizontal Acceleration ..... 21
Figure 20 – Station 22+00 Slope Stability – 0.3-g Horizontal Acceleration ..... 21

## EXECUTIVE SUMMARY

This Geotechnical Engineering Report summarizes the results of the geotechnical investigation performed to better understand the soil characteristics and strengths of the underlying soil layers associated with the Northern Impoundment at the San Jacinto River Waste Pits Superfund Site. The geotechnical investigation was performed to support removal activities and design of best management practices (BMPs) to be used to isolate areas at the Northern Impoundment during excavation of waste materials.

Previous investigations of the Northern Impoundment had identified that, based on the limited information available at the time, the top of a sand formation occurs at an elevation between -50 and -60 feet North American Vertical Datum (NAVD88) to at least an elevation of approximately -80 feet NAVD88. After review of the boring log data from the Second Phase Pre-Design Investigation (PDI-2), it was concluded that these sands, although encountered in the PDI-2 borings, were not found to be as consistent at these elevations throughout the Northern Impoundment as originally believed. The occurrence of the sand is an important design consideration for the BMPs as the deeper occurrence of the top of the sand layer requires a deeper embedment of the BMPs.

The analyses for the BMPs considered the Q-Case (short-term loading condition), where the cohesive (clay) soils behave in an undrained manner. The analysis also considered the S-case (long-term loading condition) where the cohesive (clay) soils behave in a drained manner, as the BMP structures will be left in place for a minimum period of several months to a year during the remedial action (RA). In addition, a series of stability analyses were performed to estimate the minimum required embedment of the BMPs. For all cases considered, the top of BMP elevation was set to +9 feet NAVD88. The water levels inside and outside the BMP were set at variable levels and the ground surface was also varied to account for potential approaches that would be implemented during the RA. As the soil behavior changes from an undrained to the drained state, the drained state (the S-Case) governs the embedment depth, which on average, requires that the BMP be driven in excess of -80 feet NAVD88.

Results of the slope stability analysis indicate there is potential that during the installation of the BMP, the vibrations caused by pile driving could induce localized instability of the near-surface soils on the Northern Impoundment slope. This instability of the slope would cause soils containing waste to slide down and release waste to the San Jacinto River. At this stage of the design, there is significant uncertainty associated with the slope stability due to the heterogeneity in soil conditions across the Northern Impoundment and the uncertainty in the magnitude of the energy from the vibrations. For the ongoing remedial design, it would be prudent to consider, as a very likely possibility, a shallow instability occurring from vibrations due to driving the BMPs.

Additional consideration should also be given to other potential effects from the pile driving and vibrations including soil remolding, static liquefaction/cyclic mobility, densification and the potential impacts to the I-10 bridge, underground utilities and other surrounding structures.

# NORTHERN IMPOUNDMENT GEOTECHNICAL ENGINEERING REPORT
# PRELIMINARY 30% REMEDIAL DESIGN
# SAN JACINTO RIVER WASTE PITS
# NORTHERN IMPOUNDMENT
# HARRIS COUNTY, TEXAS

This Geotechnical Engineering Report summarizes the results the preliminary analyses to better understand the soil characteristics and strengths of the underlying soil layers associated with the Northern Impoundment. Ardaman & Associates, Inc. (Ardaman) is working with GHD Services, Inc. (GHD), on behalf of the International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC), to develop a Preliminary 30% Remedial Design (30% RD) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site located in Harris County, Texas. The geotechnical analyses were developed based on samples collected by Tolunay-Wong Engineers, Inc. (TWE) as part of the Second Phase Pre-Design Investigation (PDI-2) and other geotechnical data obtained from both the Remedial Investigation (RI) and the First Phase Pre-Design Investigation (PDI-1). The geotechnical investigation results from the RI and PDI-1 are provided in Attachment A. The geotechnical investigation results from PDI-2 are provided in Attachment B. The calculation package is provided in Attachment C.

## SECTION 1. GENERAL PROJECT INFORMATION

### 1.1 Project Description

This geotechnical investigation was performed to support the removal activities and design of the BMPs for the 30 % RD.

### 1.2 Northern Impoundment Location and Description

The Northern Impoundment is located along the San Jacinto River and near I-10, as approximately shown in plan on Figure 1.

### 1.3 Geology

The geology in the vicinity of the Northern Impoundment is somewhat variable given the natural meander of the San Jacinto River over time. Based on the Geologic Atlas of Texas, Houston (1982), the near surface of the western bank of the San Jacinto River is comprised predominantly by Holocene Alluvium, which is comprised of clay, silt, sand, and can include organic matter. These alluvium deposits can be comprised of point-bar, natural levee, stream channel, back-swamp, and coastal marsh deposits. The near surface of the eastern bank of the San Jacinto River is comprised predominantly of the Pleistocene Beaumont Formation, which is made up of mostly clay, silt, and sand. A geologic profile of the area in the vicinity of the Northern Impoundment is provided for reference as Figure 2.

Historical topographic maps of the area from the U.S. Geological Survey (USGS), as shown on Figure 3, indicate that the near surface in the vicinity of the Northern Impoundment may have been comprised of backswamp and/or swamp deposits. It is unclear the extent to which these were scoured out and/or eroded over time, as well as how much was physically removed due to industrialization.

### 1.4 Groundwater

The Northern Impoundment is located on the San Jacinto River; therefore, the groundwater will fluctuate over time as the river rises and falls during periods of rain and drought. During the PDI-2, groundwater measurements were not able to be recorded at all the boring locations, as some of the soil borings were collected from a barge in open water, however, groundwater can be assumed to be near surface. The actual depth of the groundwater at the Northern Impoundment will fluctuate due to climatic conditions, local surface water control and drainage features, the San Jacinto River stage, and other factors.

### 1.5 Seismic Site Class

Seismicity can be addressed in accordance with the International Building Code (IBC), Latest Edition. Based on the furnished soil borings, the Northern Impoundment is classified as Site Class "E", according to the criterion given in Table 20.3-1 of the IBC. Some additional seismic design parameters are presented in Table 1, which were obtained from the USGS website.

**TABLE 1 - SEISMIC DESIGN PARAMETERS**

| SEISMIC PARAMETERS (Per ASCE 7-16) | |
|---|---|
| PGA | 0.034 |
| $S_s$ | 0.069 |
| $S_1$ | 0.04 |

The values in the aforementioned table are for use in seismic design, not to be confused with the pseudo-vibration analysis discussed further in this report.

## SECTION 2. HISTORICAL GEOTECHNICAL INFORMATION

The following sections summarize the data Ardaman was provided that were obtained during the RI and the PDI-1. Only handwritten field logs were available. A summary of these borings is provided in Table 2. The furnished historical information is provided in Attachment A for reference.

**TABLE 2 - HISTORICAL SOIL BORING DETAILS**

| Boring ID | Termination Depth (feet below ground surface) | Completion Date | Boring ID | Termination Depth (feet below ground surface) | Completion Date |
|---|---|---|---|---|---|
| SJGB001 | 60 | 10/27/10 | SJGB019 | 57 | 12/03/18 |
| SJGB002 | 60 | 5/9/10 | SJGB020 | 62 | 12/02/18 |
| SJGB003 | 120 | 5/8/10 | SJGB021 | 56 | 12/01/18 |
| SJGB004 | 59.5 | 5/11/10 | SJGB022 | 47 | 11/30/18 |
| SJGB005 | 61.5 | 5/6/10 | SJGB023 | 60 | 12/04/18 |
| SJGB006 | 30 | 10/29/10 | SJSB028 | 37 | 11/19/18 |
| SJGB007 | 119.5 | 5/7/10 | SJSB029 | 40 | 11/16/18 |
| SJGB008 | 59.5 | 5/6/10 | SJSB030 | 40 | 11/18/18 |
| SJGB009 | 29.5 | 10/26/10 | SJSB031 | 40 | 11/18/18 |
| SJGB010 | 15 | 10/28/10 | SJSB032 | 42 | 11/17/18 |
| SJGB011 | 20 | 10/29/10 | SJSB033 | 40 | 11/14/18 |
| SJGB012 | 20 | 10/28/10 | SJSB034 | 42 | 11/10/18 |
| SJGB013 | 10 | 5/11/10 | SJSB035 | 42 | 11/11/18 |
| SJGB014 | 12 | 5/10/10 | SJSB036 | 35 | 11/17/18 |
| SJGB015 | 10 | 5/10/10 | SJSB036B | 10 | 11/17/18 |
| SJGB016 | 12 | 5/10/10 | SJSB037 | 37 | 11/16/18 |
| SJGB017 | 12 | 5/11/10 | SJSB037B | 10 | 11/16/18 |
| SJGB018 | 52 | 12/13/18 | SJSB038 | 36 | 12/09/18 |

## SECTION 3. CURRENT FIELD EXPLORATION

The geotechnical scope of work for the PDI-2 for the Northern Impoundment included performing nine (9) soil borings within and around the perimeter of the Northern Impoundment. A plan map showing the locations of the soil borings is provided on Figure 4.

The soil borings were performed between November 7 and December 13, 2019 by TWE and logged by a representative of GHD. The borings were advanced using a 4-inch diameter bit and rotary wash methods to a maximum depth of 100 feet below the existing ground surface. Discrete samples were obtained continuously to 16 feet below ground surface (bgs), and generally on 5-ft. centers thereafter to the termination depth of the borehole.

The sampling procedure consisted of advancing the borehole to the desired depth, and then either a Shelby tube was lowered to the bottom of the boring and was then pushed into the soil in one continuous 24-inch stroke (ASTM D1587), or the Standard Penetration Test (SPT) (ASTM D1586) was performed. The SPT test consists of driving a two-inch diameter split-spoon sampler 1 foot (after first seating it 6 inches) with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler gives an indication of the consistency and density of the material.

Upon retrieval, the exposed soil surface at the bottom of each Shelby tube was visually classified, and field measurements of the strength of the material were obtained by means of a pocket penetrometer. Upon retrieval of the SPT samples, the split spoon was opened, the material was visually classified, and cuttings were removed from the sample. The sample was then placed in a labeled moisture proof bag for transportation to TWE's laboratory for testing. Table 3 provides a summary of the PDI-2 boring details.

**TABLE 3 - PDI-2 SOIL BORING DETAILS**

| Boring ID | Termination Depth (feet below ground surface) | Termination Elevation (ft., NAVD88) | GPS Coordinate | | Ground Surface Elevation (ft., NAVD88) |
|---|---|---|---|---|---|
| | | | Latitude | Longitude | |
| SJSB024 | 30 | -27.36 | 29°47'36.74"N | 95° 3'44.65"W | 2.64 |
| SJSB025 | 29.5 | -24.52 | 29°47'38.65"N | 95° 3'48.91"W | 4.98 |
| SJSB026 | 21.5 | -16.16 | 29°47'39.24"N | 95° 3'49.86"W | 5.34 |
| SJSB027 | 50 | -46.08 | 29°47'41.34"N | 95° 3'47.36"W | 3.92 |
| SJSB047 | 100 | -103.40 | 29°47'38.50"N | 95° 3'41.90"W | -3.40 |
| SJSB050 | 20 | -23.60 | 29°47'41.36"N | 95° 3'40.53"W | -3.60 |
| SJSB053 | 100 | -109.70 | 29°47'43.62"N | 95° 3'42.93"W | -9.70 |
| SJSB057 | 100 | -117.10 | 29°47'45.29"N | 95° 3'46.74"W | -17.1 |
| SJSB058 | 20 | -19.38 | 29°47'42.79"N | 95° 3'48.02"W | 0.62 |

# SECTION 4. LABORATORY TESTING

Once the field logs were made available to Ardaman, a lab testing program was developed and submitted to TWE for geotechnical laboratory testing. An overview of the scope of the laboratory testing phase in terms of the type of tests performed is presented in Table 4. Results of the laboratory tests are presented and discussed in the following sections of this report.

**TABLE 4 - PDI-2 LABORATORY TESTING SUMMARY**

| Test Method | ASTM Reference |
|---|---|
| Moisture Content | D2216 |
| Density (Unit Weight) | D7263 |
| Unconsolidated-Undrained Compression Test (UU) | D2580 |
| Atterberg Limit Determination | D4318 |
| Grain Size (Sieve, Hydrometer, and/or #200 Wash) | D6913/D422/D1140 |
| Organic Content | D2974 |
| Consolidation | D2435 |

## 4.1 Classification and Index Testing

Subsurface conditions, in terms of soil classification, geotechnical index properties, effective stress history, and undrained shear strength profiles encountered at the various boring locations within the Northern Impoundment are somewhat variable. For a detailed description, refer to the individual boring logs provided in Attachment A. However, a general description of the subsurface conditions for the Northern Impoundment is provided below.

Down to an elevation of approximately -30 feet NAVD88, the Northern Impoundment is fairly heterogeneous consisting of highly interbedded alluvial deposits consisting of silty sands, sands, silts, lean clays, fat clays, and sandy clays. Below this reference elevation, the western and eastern side of the Northern Impoundment become more distinguishable. On the western side, sandy lean clays extend to an elevation of approximately -45 feet NAVD88 and are underlain by medium stiff to very stiff fat clay to an elevation of approximately -80 feet NAVD88. More granular medium dense to very dense clayey sands, silty sands and sandy lean clays extend to an elevation of approximately -108 feet NAVD88 and are underlain by stiff gray lean clay to at least an elevation of approximately -117 feet NAVD88, the maximum explored depth of boring

SJSB057. On the eastern side alternating layers of silts and clays extend below an elevation of approximately -30 feet NAVD88. These appear to be coarser towards the north and finer towards the south, with soil boring SJSGB053 (north) indicating more granular medium dense to very dense clayey sands at an elevation of approximately -68 feet NAVD88, and soil boring SJSB047 (south) indicating silty sands at an elevation of approximately -84 feet NAVD88. These more granular soils extend to an elevation of approximately -98 feet NAVD88 where stiff to very stiff fat clays and silts were encountered to at least an elevation of approximately -110 feet NAVD88, the maximum explored depth of the borings.

### *4.1.1 Visual Classification*

Visual classifications include a description of soil color, consistency and type, and identification of structural conditions (layering, seams, etc.) and variations (e.g., organics). Visual classifications are included on the soil boring logs attached in Attachment B and are based on the descriptions provided in the field logs and in the laboratory analytical reports.

### *4.1.2 Moisture Content and Density and Unit Weight Determinations*

Numerous moisture content determinations (ASTM D2216) and total unit weight determinations (ASTM D2937) were performed in conjunction with the preparation of test specimens. Total unit weights were computed based on sample volume and weight measurements during the test preparation. Moisture content and total density values for each sample are included on the soil boring logs attached in Attachment B.

### *4.1.3 Atterberg Limits*

Atterberg limit determinations (ASTM D4318) were performed on selected samples to assist in soil classification and to enable correlations to pertinent clay behavior properties. The Atterberg limit data consists of measured liquid limit (LL) and plastic limit (PL) values from which the plasticity index (PI = LL – PL) is derived. The individual test data are included on the boring logs attached in Attachment B.

### *4.1.4 Grain Size Determinations*

Grain Size Distributions Curves (ASTM D422) were performed on select samples, and fines content determinations (ASTM D 1140) were performed on selected granular samples. The test results, in terms of percent fines (i.e., percent by dry weight finer than the U.S. No. 200 sieve size, 0.074 mm, or combined silt and clay fraction) are shown on the boring logs attached in Attachment B, as well as the individual grain size distribution curves.

### *4.1.5 Unconsolidated-Undrained Compression Tests*

Unconsolidated-Undrained (UU) Triaxial Compression tests (ASTM D2850) were performed on select specimens. Results of these strength tests are included on the soil boring logs attached in Attachment B. Individual UU test stress-strain curves are also included in Attachment B.

### *4.1.6 Consolidation Tests*

One-Dimensional Incremental consolidation tests (ASTM D 2435) were included in the laboratory testing program to assess the stress history, one-dimensional stress-deformation, and time-rate of consolidation characteristics of the clay deposits. The tests were conducted using a load increment ratio (LIR) of one (LIR = 1.0) and generally included one unload-reload cycle to enable evaluation of recompression behavior.

During each load increment, the vertical displacement with time is measured. In general, each load increment was sustained for a period of 24 hours. The vertical displacement versus time data were evaluated using conventional log-time and square-root time curve fitting techniques to estimate the end of primary consolidation (i.e., the point in time at which dissipation of load-induced excess pore water pressures in the sample had dissipated and drained creep ensued for each load increment). The individual test results, in terms of vertical strain and void ratio versus effective vertical stress, are presented in Attachment B.

Typical laboratory consolidation test results, considered in terms of vertical strain, $\varepsilon_v$ (%; at the end of primary consolidation) or void ratio, $e_o$, versus vertical effective stress, $\sigma'_{vc}$ (tons/ft$^2$; log scale), may be simply characterized as being composed of recompression and virgin compression. The flatter recompression portion of the $\varepsilon_v$ versus log $\sigma'_{vc}$ curve occurs at vertical effective stresses lower than the pre-consolidation pressure, $\sigma'_p$ to which the specimen had historically been subjected. The steeper virgin compression portion of the $\varepsilon_v$ versus log $\sigma'_{vc}$ response occurs at vertical effective stresses greater than the maximum past pressure, $\sigma'_p$.

## SECTION 5. EVALUATION OF CURRENT & HISTORIC SUBSURFACE CONDITIONS

During the previous subsurface investigations, the Northern Impoundment subsurface stratigraphy was idealized as being comprised of interbedded Recent Alluvial Sediments (silts, sands, and clays) to an elevation of approximately -30 feet NAVD88, which was confirmed during the PDI-2 subsurface investigation. The previous investigations indicated that the Beaumont Clay formation extended below this reference elevation to a minimum elevation of approximately -60 feet NAVD88 on the western side and an elevation of approximately -50 feet NAVD88 on the eastern side. The PDI-2 investigation, which included boring SJSB057 (on the northwest side) encountered clays to a much deeper elevation of approximately -80 feet NAVD88, and on the eastern side clays were encountered between elevations of approximately -50 to -65 feet NAVD88.

The previous investigations, based on limited data, identified that the top of a sand formation occurs across the Northern Impoundment at an elevation between -50 and -60 feet NAVD88 to

at least an elevation of approximately -80 feet NAVD88. After review of the PDI-2 boring logs, it was determined these sand elevations, as encountered in PDI-2, were not found to be as consistent throughout the Northern Impoundment.

# SECTION 6. ANALYSES

The following engineering analyses are based on the data obtained during the subsurface investigations for the Northern Impoundment and our interpretation of the existing data. If additional data are collected during subsequent phases of the work, the following recommendations may be subject to change. The following sections will discuss the methods of analyses, interpretation of the data, and the results of these analyses.

## 6.1 Methods of Analyses

The following sections describe the methodology employed in the analyses performed.

### *6.1.1 Methods of Analyses – Slope Stability*

Two-dimensional limit equilibrium stability analyses were performed using the method of slices and Spencer's method (i.e. assuming a common inclination of inter-slice forces). The SLOPE/W (GeoStudio 2019 R2 Version 10.1.1.18972) computer program was used for calculating slope stability factors of safety for trial failure surfaces. This program incorporates search routines that, when properly managed, can systematically converge on kinematically admissible critical circular arc and sliding wedge type failure surfaces.

### *6.1.2 Methods of Analyses – BMPs (Cofferdams & Retaining Walls)*

As part of the removal efforts, areas of the Northern Impoundment (cells) will need to be excavated to remove the waste material. Engineered barriers such as sheet pile coffer dams are planned to block the introduction of water from the San Jacinto River into the removal areas. These engineered barriers are referred to herein as BMPs.

As the areas within the Northern Impoundment are excavated, any soils or water on the outside of the BMP will produce a lateral pressure that needs to be counteracted by the soils and water on the inside. Therefore, the depth of the BMP system will be highly dependent on the methods and sequence of construction.

The analyses for the BMPs considered the Q-Case, or short-term, loading condition, where the cohesive (clay) soils behave in an undrained manner. Additionally, consideration was given to the S-Case, or long-term, loading condition, where the cohesive (clay) soils behave in a drained manner. Given that these structures will be left in place for a minimum period of several months to a year during the RA, it is imperative to consider the soil behavior under both loading conditions in order to determine the loading condition that is most conservative with respect to the BMP embedment depth.

Analyses were performed using the U.S. Army Corps of Engineers' (USACE) X0031 "Computer Program for Design and Analysis of Sheet-Pile Walls by Classical Methods (CWLASHT)", and the Deep Excavation Software Program "DeepEx" 2019 Version. In general, the CWALSHT program was used as a design check.

***CWALSHT:***

This program can handle non-horizontal ground surface and soil layers, and will apply Coulomb's earth pressure coefficients on the wall. It can also apply additional surcharge loads both in front of and behind the retaining wall using Boussinesq's pressure distribution. For all cases involving a sloping of irregular soil surface and/or subsurface layer, the wedge method is used to determine the lateral pressures. It should be noted that this program was intended to analyze plane-strain conditions; therefore, it is most applicable to long sheet pile retaining walls.

***DeepEx:***

This program can perform the same calculations as CWALSHT. In addition, it can analyze braced excavations with conventional limit-equilibrium methods as well as non-linear beam on elastic foundations using the Winkler Method. It is also capable of analyzing non-plane strain conditions.

As mentioned above, these programs were used in order to verify and cross-check the results of the analyses. However, DeepEx was generally relied upon for the determination of the tip embedment, shear and bending stresses, and the deflections.

In accordance with EM 1110-2-2504, *Engineering and Design: Design of Sheet Pile Walls*, 5.2 d. factors of safety, it states: "a factor of safety may be applied for active pressures; however, it is considered sufficient to use a factor of safety on the active side equal to 1 in most cases unless deformations of the wall are restricted" (USACE 1994). The minimum recommended values of passive factors of safety used for this project are shown in Table 5.

**TABLE 5 - FACTORS OF SAFETY FOR SHEET PILE WALLS**

| Load Combination | Factor of Safety for Sheet Pile Embedment |
|---|---|
| | Passive Pressure |
| Usual | 1.50 |
| Unusual | 1.25 |
| Extreme | 1.10 |

Notes: Active and passive pressure safety factors shall be "1.00" for all load cases to be calculated for sheet pile bending moment, shear, and deflection. Passive pressure safety factors from above shall be used to determine sheet pile embedment only.

For the Northern Impoundment 30% RD, a water level elevation for outside of the Northern Impoundment (i.e. San Jacinto River) up to +5 feet NAVD88 is to be considered a usual occurrence. Additionally, water elevations greater than this and up to an elevation of +9 feet NAVD88 are to be considered unusual events. Consideration was not given to the "extreme" event case factor of safety, as per the EM 1110-2-2504 guidance, the extreme condition allows the design to accept possible major damage which could result in a failure of the BMP wall.

## 6.2 Results of Analyses

### *6.2.1 Design Assumptions*

Ardaman performed a sensitivity analysis on the design water surface elevations on the inside and outside of the proposed BMP as shown in Table 6. The following design assumptions were made regarding the Northern Impoundment for this phase of work. The analyses were based on the following cases:

**TABLE 6 - DESIGN CASES CONSIDERED**

| Case[1] | Water Surface Outside of the BMP (ft, NAVD88) | Water Surface Inside the BMP (ft., NAVD88)[2] | Factor of Safety on the Passive Resistance |
|---|---|---|---|
| 1 | 9 | -8 | 1.25 |
| 2 | 9 | -4 | 1.25 |
| 3 | 5 | -8 | 1.50 |
| 4 | 5 | -4 | 1.50 |

[1]Ground surface on inside/outside based on furnished cross sections.
[2]For cells that are to be completely dewatered, the inside water surface was taken to the excavation depth.

For all cases, it is assumed that the Top of Wall (TOW) would be set at an elevation of +9 feet NAVD88.

It should be noted that the water surface elevations selected on the inside of the BMP represent the expected working range during excavation activities. The inside water levels were fixed within a working range using elevations of -4 to -8 feet NAVD88.

### *6.2.2 Cross Sections*

GHD provided Ardaman with a preliminary BMP alignment and a series of cross sections depicting the ground surface conditions in order for the geotechnical evaluation to be completed as part of the 30% RD. As a result, the BMP alignment used as the basis for this report slightly differs from the current BMP alignment shown in the *Preliminary 30% Remedial Design Report – Northern Impoundment*. The prior alignment and current alignment are both shown on Figure 5 (for the west cell) and Figure 8 (for the east cell). Cross sections from the prior alignment that were used in the geotechnical evaluation are provided in Figure 6 and Figure 7 (for the west cell) and Figure 9 and Figure 10 (for the east cell). For the purposes of this geotechnical evaluation, the difference between the preliminary and current alignment is not a concern as the BMP changes were primarily with respect to the locations of the interior walls, whereas the outer alignment for the BMPs remained relatively unchanged. The adjustment of the alignment does not change the conclusions of the geotechnical evaluation of the BMP.

### *6.2.3 Design Strength Parameters*

The analyses were based on the design soil strength parameters developed from the soil borings located in the vicinity of the proposed alignment for the individual cells. The soil properties used for preliminary RD are summarized on Table 7 through Table 11.

**TABLE 7 - DESIGN STRENGTH PARAMETERS (CELL 1)**

| Elev. (ft., NAVD88) | Soil Type | Density (pcf) | Q-Case | | S-Case | |
|---|---|---|---|---|---|---|
| | | | Cohesion (psf) | Friction Angle (deg) | Cohesion (psf) | Friction Angle (deg) |
| G.S[1]. to -10 | Cohesive | 112 | 800 | -- | -- | 23 |
| -10 to -17 | Granular | 112 | -- | 30 | -- | 30 |
| -17 to -27 | Granular | 115 | -- | 30 | -- | 33 |
| -27 to -30 | Granular | 115 | -- | 30 | -- | 33 |
| -30 to -34 | Cohesive | 126 | 2,290 | -- | -- | 26 |
| -34 to -44 | Cohesive | 134 | 2,290 | -- | -- | 26 |
| -44 to -57 | Cohesive | 126 | 2,290 | -- | -- | 26 |
| -57 to -80 | Cohesive | 127 | 1,650 | -- | -- | 26 |
| -80 to -89 | Granular | 122 | -- | 30 | -- | 33 |
| -89 to -94 | Cohesive | 115 | 1,200 | -- | -- | 26 |
| -94 to -103 | Cohesive | 120 | 4,000 | -- | -- | 26 |
| -103 to -109 | Granular | 120 | -- | 30 | -- | 33 |
| -109 to EOP[2] | Cohesive | 115 | 1,670 | -- | -- | 26 |

[1]G.S. = Ground Surface, [2]EOP = End of Profile

**TABLE 8 - DESIGN STRENGTH PARAMETERS (CELL 2)**

| Elev. (ft., NAVD88) | Soil Type | Density (pcf) | Q-Case | | S-Case | |
|---|---|---|---|---|---|---|
| | | | Cohesion (psf) | Friction Angle (deg) | Cohesion (psf) | Friction Angle (deg) |
| G.S.[1] to +0 | Granular | 120 | -- | 25 | -- | 25 |
| +0 to -11 | Cohesive | 112 | 500 | -- | -- | 23 |
| -11 to -23 | Cohesive | 112 | 1,000 | -- | -- | 23 |
| -23 to -27 | Granular | 120 | -- | 25 | -- | 25 |
| -27 to -41 | Cohesive | 120 | 3,300 | -- | -- | 23 |
| -41 to -50 | Cohesive | 116 | 1,400 | -- | -- | 23 |
| -50 to -58 | Cohesive | 116 | 1,850 | -- | -- | 23 |
| -58 to -67 | Cohesive | 116 | 1,900 | -- | -- | 26 |
| -67 to -74 | Granular | 130 | -- | 30 | -- | 30 |
| -74 to -80 | Cohesive | 116 | 2,000 | -- | -- | 26 |
| -80 to EOP[2] | Granular | 130 | -- | 32 | -- | 32 |

[1]G.S. = Ground Surface, [2]EOP = End of Profile

**TABLE 9 - DESIGN STRENGTH PARAMETERS (CELL 3)**

| Elev. (ft., NAVD88) | Soil Type | Density (pcf) | Q-Case | | S-Case | |
|---|---|---|---|---|---|---|
| | | | Cohesion (psf) | Friction Angle (deg) | Cohesion (psf) | Friction Angle (deg) |
| G.S.[1] to -6 | Cohesive | 115 | 500 | -- | -- | 23 |
| -6 to -15 | Cohesive | 110 | 250 | -- | -- | 23 |
| -15 to -26 | Cohesive | 110 | 350 | -- | -- | 23 |
| -26 to -32 | Cohesive | 124 | 1,250 | -- | -- | 26 |
| -32 to -40 | Cohesive | 120 | 1,000 | -- | -- | 26 |
| -40 to -45 | Cohesive | 125 | 1,730 | -- | -- | 26 |
| -45 to -54 | Cohesive | 125 | 3,300 | -- | -- | 26 |
| -54 to -58 | Cohesive | 117 | 200 | 15 | -- | 28 |
| -58 to -62 | Granular | 130 | -- | 30 | -- | 30 |
| -62 to -68 | Cohesive | 117 | 200 | 15 | -- | 28 |
| -68 to -71 | Granular | 130 | -- | 30 | -- | 30 |
| -71 to -83 | Cohesive | 117 | 200 | 15 | -- | 28 |
| -83 to -93 | Granular | 130 | -- | 30 | -- | 30 |
| -93 to -102 | Cohesive | 125 | 3,500 | -- | -- | 26 |
| -102 to EOP[2] | Cohesive | 125 | 4,000 | -- | -- | 26 |

[1]G.S. = Ground Surface, [2]EOP = End of Profile

## TABLE 10 - DESIGN STRENGTH PARAMETERS (CELL 4)

| Elev. (ft., NAVD88) | Soil Type | Density (pcf) | Q-Case | | S-Case | |
|---|---|---|---|---|---|---|
| | | | Cohesion (psf) | Friction Angle (deg) | Cohesion (psf) | Friction Angle (deg) |
| G.S.[1] to -1 | Cohesive | 118 | 1,000 | -- | -- | 26 |
| -1 to -7 | Cohesive | 116 | 350 | -- | -- | 23 |
| -7 to -14 | Cohesive | 116 | 500 | -- | -- | 23 |
| -14 to -20 | Cohesive | 123 | 940 | -- | -- | 23 |
| -20 to -26 | Cohesive | 115 | 350 | -- | -- | 23 |
| -26 to -38 | Granular | 125 | -- | 30 | -- | 30 |
| -38 to -43 | Cohesive | 100 | 2,500 | -- | -- | 26 |
| -43 to -49 | Cohesive | 100 | 3,000 | -- | -- | 26 |
| -49 to -56 | Cohesive | 100 | 3,500 | -- | -- | 26 |
| -56 to EOP[2] | Granular | 128 | -- | 32 | -- | 32 |

## TABLE 11 - DESIGN STRENGTH PARAMETERS (CELL 5)

| Elev. (ft., NAVD88) | Soil Type | Density (pcf) | Q-Case | | S-Case | |
|---|---|---|---|---|---|---|
| | | | Cohesion (psf) | Friction Angle (deg) | Cohesion (psf) | Friction Angle (deg) |
| G.S.[1] to +3 | Cohesive | 117 | 200 | 15 | -- | 28 |
| +3 to +2 | Cohesive | 128 | 1,000 | -- | -- | 23 |
| +2 to +0 | Cohesive | 117 | 200 | 15 | -- | 28 |
| +0 to -5 | Cohesive | 127 | 750 | -- | -- | 23 |
| -5 to -13 | Cohesive | 130 | 1,700 | -- | -- | 23 |
| -13 to -22 | Granular | 130 | -- | 31 | -- | 31 |
| -22 to -33 | Granular | 130 | -- | 32 | -- | 32 |
| -33 to -41 | Cohesive | 128 | 1,800 | -- | -- | 23 |
| -41 to -46 | Cohesive | 130 | 1,950 | -- | -- | 23 |
| -46 to -56 | Cohesive | 130 | 2,200 | -- | -- | 23 |
| -56 to EOP[2] | Cohesive | 130 | 2,500 | -- | -- | 23 |

[1]G.S. = Ground Surface, [2]EOP = End of Profile

### *6.2.4 BMPs (Cofferdams & Retaining Walls)*

A series of stability analyses were performed for the Northern Impoundment assuming various water loads, as detailed above. The analyses were performed to estimate the minimum required embedment of the BMPs. The BMP tip elevations were determined using the factors of safety listed in Table 6 on the passive resistance afforded by the soils; however, the reported shear forces, and bending moments are based on a factor of safety 1.0. For all cases considered in Table 6, the TOW elevation is assumed to be +9 feet NAVD88; the water inside and outside the BMPs were varied, and the ground surface was also varied across the design cases considered. No additional surcharge loading from pile driving equipment, wave loads, or impact loads were considered in the analyses. The results of the analyses are given in Attachment C of this report for the various design cases from Table 6 that are considered.

The tables presented in Attachment C indicate the minimum tip elevations and the recommended tip elevations to provide an appropriate factor of safety against a toe failure. As can be seen, the different water level conditions and the different factors of safety applied do not result in significantly different embedment depths. Rather, as the soil behavior changes from an undrained to the drained state, the drained state governs the embedment depth, which, on average, requires that the BMP be driven in excess of -80 feet NAVD88.

Also given are the maximum bending moments and shear forces for the cases analyzed. These are ultimate values, and a structural factor of safety should be incorporated into the design for any BMP. The computed deflections are based on utilizing a PAZ66/AZ38-700N combi-wall section. However, at this time, the design section(s) has not been finalized, and therefore the results of the deflection calculations may not be representative for all the individual cases analyzed.

### *6.2.5 Pile Drivability Analysis*

Analyses were performed based on the two (2) deeper soil borings (SJGB053 and SJGB057) to evaluate the drivability of a 66-inch pipe pile with a wall thickness of 1-inch to depth. The analyses assumed a conventional diesel hammer Delmag D100-42 and the D80-42. The results of the drivability analyses for both hammers are attached in Attachment C. It should be noted that a gain/loss factor of 1.0 was used in order to model the driving condition of no soil strength loss during driving. The drivability analysis indicates both hammers are capable driving the piles to depth. However, these analyses should be updated during the subsequent phases of the design and especially once information regarding the specific equipment to be used for the pile driving becomes available. Results of the analysis indicate that blow counts on the order of 80 to 120 blows per foot would be required past the 80-foot depth for both soil borings. The energy required to be imparted on the piles in order to drive them was estimated to range between 75 and 130 kip-ft.

### *6.2.6 Slope Stability*

Given the depth of embedment required for stability of the proposed BMPs, a deep-seated failure extending beneath the BMP is unlikely. Instead, there is a possibility that during the installation

of the BMP, the vibrations caused by pile driving could induce localized instability of the near surface soils on the Northern Impoundment slope causing soils containing waste material to slide down and release waste material to the San Jacinto River. Therefore, this is a critical case for consideration. A series of parametric studies were performed on a select number of cross sections having been identified by GHD as having the steepest existing slope, and therefore having the highest likelihood of instability. The analyses incorporated an incremental horizontal acceleration (g-force) of 0.0-g, 0.1-g, 0.2-g, and 0.3-g as a way to approximate the additional horizontal forces that could be generated as a result of pile driving activities.

It should be mentioned that vibrations induced by pile driving activities attenuate with distance away from the "epicenter", and therefore, so do the horizontal acceleration forces. Based on our experience with pile driving activities in stiff clays and dense sands, a g-force equal to about a 0.1-g could be assumed as a representative value; however, these measurements are typically obtained some distance away from the pile/pile-driving equipment. Therefore, the possibility of higher horizontal acceleration forces being generated at distances much closer to the pile/pile-driving equipment should be considered.

GHD provided Ardaman with a plan map indicating the stationing around the perimeter of the Northern Impoundment as well as cross sections located along the Northern Impoundment for use in these analyses. The analyses focused on Station 5+00 and Station 22+00. The locations of these stations are shown on Figure 11. Consideration was given to the field logs furnished from the previous subsurface investigations, which indicated that very soft sediment was encountered in the near surface at these locations. The results of the analyses are summarized in Table 12.

**TABLE 12 - SUMMARY OF SLOPE STBAILITY ANALYSIS (HORIZONTAL ACCELERATION)**

| Station | Minimum Factor of Safety | | | | Figure No |
|---|---|---|---|---|---|
| | 0.0-g | 0.1-g | 0.2-g | 0.3-g | |
| 5+00 | 2.82 | 1.67 | 1.17 | 0.87 | 13 – 16 |
| 22+00 | 5.37 | 2.02 | 1.11 | 0.78 | 17 - 20 |

The foregoing table provides the minimum factors of safety against developing a slope stability failure given different horizontal acceleration forces. As can be seen, the existing slopes, if assumed to be stable, may become unstable as a result of additional horizontal forces that may be caused by pile driving activities. It is recommended that additional efforts be performed to evaluate the correlation between pile driving energy, peak particle velocity, and horizontal acceleration forces at this location.

These are preliminary analyses and therefore do not represent all the soil conditions that may be encountered across the alignment of the BMPs. Analyses were conducted on a very limited number of cross sections and soil types. For conditions where loose sand is encountered at the near surface rather than soft clays, these additional horizontal forces are more prone to result in

a shallow and localized instability. Furthermore, there is significant uncertainty associated with these analyses due to the heterogeneity in soil conditions across the Northern Impoundment and uncertainty in the magnitude of the vibrations. For the RD, pending further evaluation, it would be prudent to consider the likely possibility of a shallow instability occurring from vibrations due to driving the BMPs.

## SECTION 7. ADDITIONAL CONSIDERATIONS

Additional consideration should be given to the following potentialities:

- **Soil Remolding:** As the BMPs get driven to depth, the piles are shearing the soils located at the soil-pile interface, and to a lesser extent, soils located at some distance away from the pile (typically assumed as 1 to 2 pile diameters). When clay soils are sheared, or remolded, they tend to exhibit a "peak strength" lower than that of an undisturbed clay, or un-sheared clay. A lower peak strength therefore means that once the BMP is installed, the soils in and around the soil-pile interface is now weaker, and more likely to undergo significant deformation.

- **Static Liquefaction / Cyclic Mobility:** As the BMPs are driven to depth, the vibrations induced by pile driving are capable of generating excess pore pressures (an increase in the pore pressure from the normal in-situ condition). Static liquefaction is the sudden loss of strength when loose granular soils (sands, silty sands, etc.) experience a rapid increase in pore pressures. Given that the strength of granular soils is dependent on the effective stress of the soil, as the pore pressure increases, the effective stress decreases. As the pore pressure approximates the in-situ effective stress, there is a possibility for the soils to lose all strength, and "liquefy", or flow, resulting in a failure. This typically occurs if the pore pressures are not able to dissipate quickly, either because of the amount of clay within the soil matrix, or because of the boundary conditions around the granular soil.

- **Densification:** As the BMPs are driven to depth, the vibrations induced by pile driving activities are capable of causing loosely packed granular material to rearrange itself into a dense packing order. Should these loose granular (sands) soils densify, the volume of voids would decrease, meaning that the water/air within the void space would be displaced. The movement of this "pore-water" could occur vertically into the water column or laterally into the San Jacinto River depending on the local boundary conditions and impedance afforded by adjacent soils. Should any waste material be located within this "pore-water", then the potential of a release should be considered.

In addition to the potentialities listed above, there are adjacent structures in the vicinity of the project site that also should be considered.

- **I-10 Bridge Structure:** The southern boundary of the Northern Impoundment is located within 100 feet of the existing Interstate 10 (I-10) bridge, which appears to be pile-founded. Should the pile supporting this bridge include batter piles, consideration would need to be given to the BMP's alignment for the Northern Impoundment to ensure that the footprint of the BMP, such as individual sheet piles and/or king piles, are not laid over any existing piles. Should the sheet piles or king piles be driven into an existing bridge pile, they could damage the bridge's pile foundations.

- **Underground Utilities:** It is understood that there are a series of underground utilities located at depth which run parallel to the I-10 bridge. Consideration would need to be given to the BMP's alignment for the Northern Impoundment relative to the underground utilities to ensure that the BMPs do not impact the underground utilities. Similarly, consideration should be given to the effects of pile driving (vibrations) on the existing utilities.

As the design progresses from Preliminary (30%) to Pre-Final (90%), these additional considerations will need to be further developed and incorporated into the RD.

## SECTION 8. REFERENCES:

Bowles, J. E. (1977). Foundation analysis and design 5th Edition. New York: McGraw-Hill.

Naval Facilities Engineering Command. Design Manual 7.02. (1986) "Foundations & Earth Structures"

U.S. Army Corps of Engineers. EM 1110-2-1902. (2003) "Engineering Design: Slope Stability".

U.S. Army Corps of Engineers. EM 1110-2-2504. (1994) "Engineering and Design: Design of Sheet Pile Walls".

# SECTION 9. FIGURES

FIGURE 1 – SITE PLAN

FIGURE 2 – REGIONAL GEOLOGY

FIGURE 3 – HISTORICAL TOPOGRAPHIC SURVEYS

FIGURE 4 – SOIL BORING LOCATION PLAN (NORTHERN IMPOUNDMENT)

FIGURE 5 – NORTHERN IMPOUNDMENT WEST CELLS PLAN MAP

FIGURE 6 – WEST CELLS PROFILES (INDEX 1 / 2)

FIGURE 7 – WEST CELLS PROFILES (INDEX 2 / 2)

FIGURE 8 – NORTHERN IMPOUNDMENT EAST CELLS PLAN MAP

FIGURE 9 – EAST CELLS PROFILES (INDEX 1 / 2)

FIGURE 10 – EAST CELLS PROFILES (INDEX 2 / 2)

FIGURE 11 – NORTHERN IMPOUNDMENT VIBRATION ANALYSIS STATIONING

FIGURE 12 – NORTHERN IMPOUNDMENT VIBRATION ANALYSIS CROSS SECTIONS

FIGURE 13 – STATION 5+00 SLOPE STABILITY – STATIC CONDITION

FIGURE 14 – STATION 5+00 SLOPE STABILITY – 0.1-G HORIZONTAL ACCELERATION

FIGURE 15 – STATION 5+00 SLOPE STABILITY – 0.2-G HORIZONTAL ACCELERATION

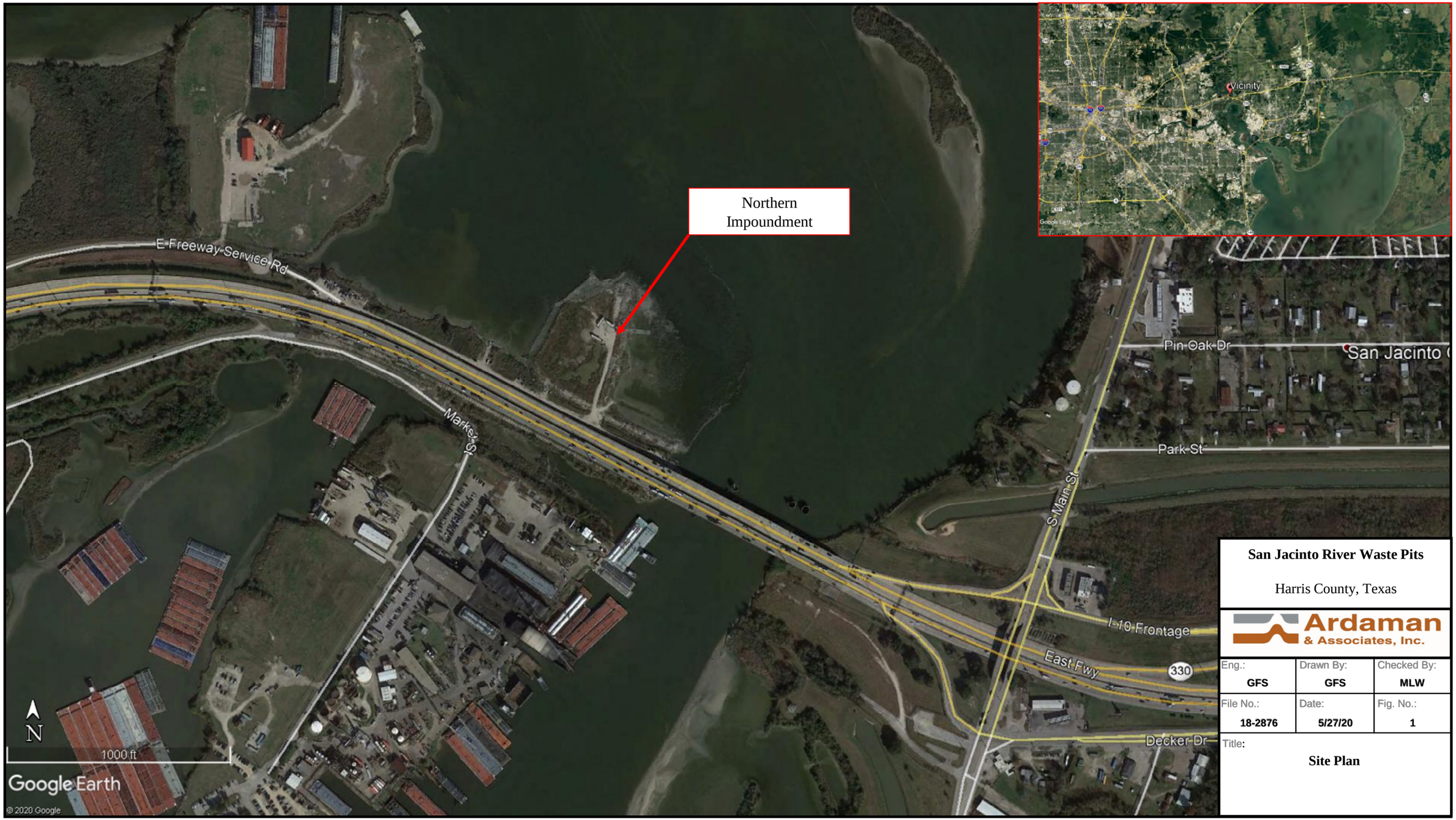
FIGURE 16 – STATION 5+00 SLOPE STABILITY – 0.3-G HORIZONTAL ACCELERATION

FIGURE 17 – STATION 22+00 SLOPE STABILITY – STATIC CONDITION

FIGURE 18 – STATION 22+00 SLOPE STABILITY – 0.1-G HORIZONTAL ACCELERATION

FIGURE 19 – STATION 22+00 SLOPE STABILITY – 0.2-G HORIZONTAL ACCELERATION

FIGURE 20 – STATION 22+00 SLOPE STABILITY – 0.3-G HORIZONTAL ACCELERATION




**San Jacinto River Waste Pits**

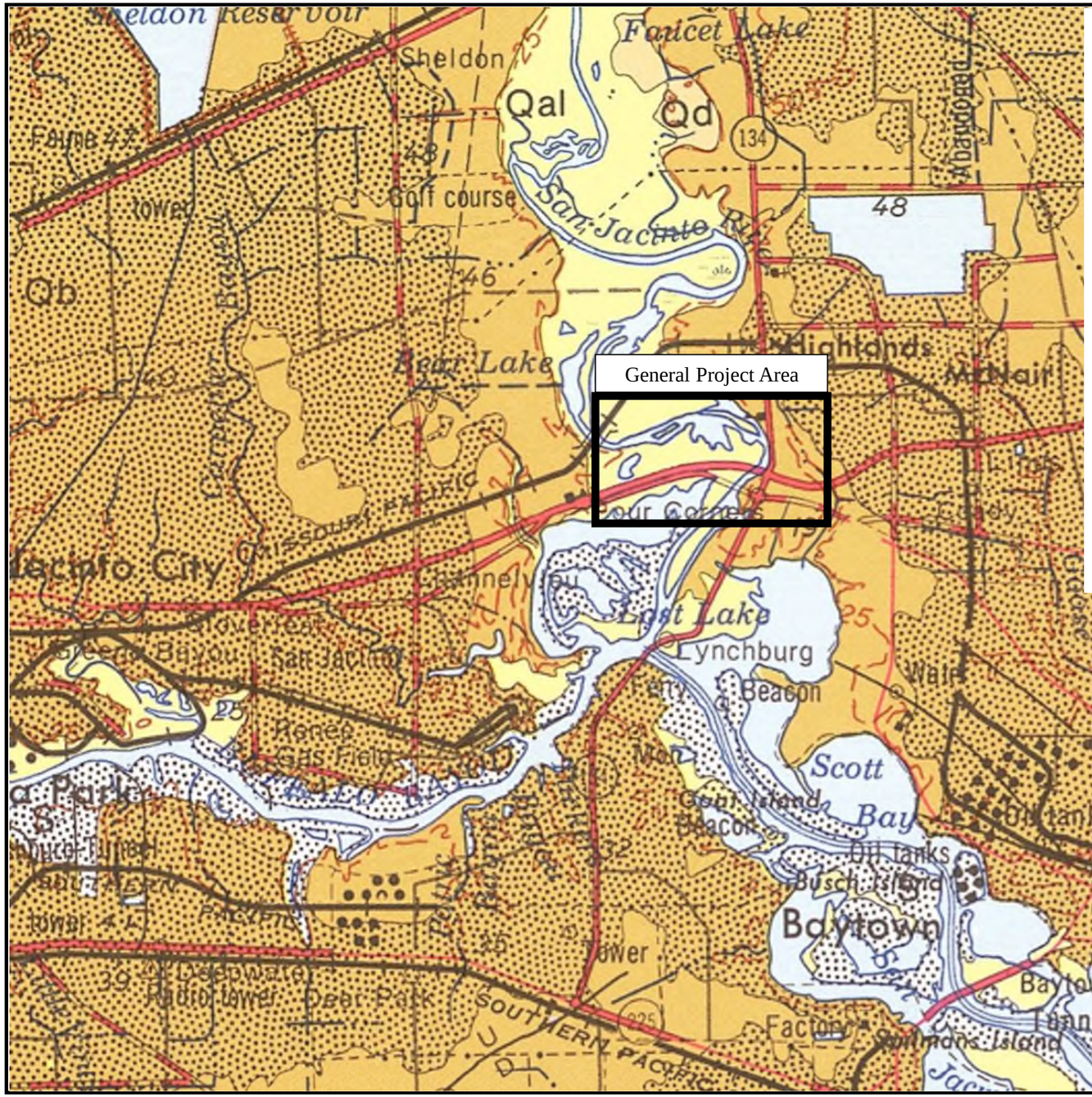
Harris County, Texas

Ardaman & Associates, Inc.

| Eng.: | Drawn By: | Checked By: |
|---|---|---|
| GFS | GFS | MLW |
| File No.: | Date: | Fig. No.: |
| 18-2876 | 5/27/20 | 1 |

Title:

**Site Plan**




## EXPLANATION

**Fill and spoil** (FS)

*Fill, F, material dredged for raising land surface above alluvium and barrier-island deposits and for creating land. Spoil, S, dredged material along waterways*

**Alluvium** (Qal)

*Clay, silt, and sand, organic matter abundant locally; includes point-bar, natural levee, stream channel, backswamp, coastal marsh, mud-flat, and narrow beach deposits that are shown by line symbol*

**Barrier-island deposits** (Qb)

*Sand, silt, and clay; mostly sand, well-sorted, fine-grained, abundant shells and shell fragments; interfingers with clay and silt in landward direction; includes beach ridge, spit, tidal channel, tidal-delta, and sand dune deposits*

**Deweyville Formation** (Qd, Qd')

*Sand, silt, and clay, some gravel; includes point-bar, natural levee, stream channel, and backswamp deposits at a level only slightly above that of the present floodplain; sand coarser than that in alluvium; surface characterized by relict meanders of much larger radius of curvature than those of present streams, some scattered pimple mounds; thickness locally more than 50 feet. High-level Deweyville, Qd', surfaces cut into the Beaumont Formation, and high-level Deweyville deposits along Trinity River are intermediate in position between the surface of the Beaumont and the level of most Deweyville deposits*

**Beaumont Formation** (Qbb, Qb, Qb)

*Beaumont Formation, Qb, with barrier-island and beach deposits, Qbb, mapped separately. Beaumont Formation, Qb, mostly clay, silt, and sand; includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent coastal marsh and mud-flat deposits, concretions of calcium carbonate, iron oxide, and iron-manganese oxides in zone of weathering; surface almost featureless, characterized by relict river channels shown by meander patterns and pimple mounds on meanderbelt ridges, separated by areas of low, relatively smooth, featureless backswamp deposits without pimple mounds; thickness ± 100 feet. The stippled overprint (source shown in Index to Geologic Mapping) shows areas that are "Dominantly clay and mud of low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, and high plasticity; geologic units include interdistributary muds, abandoned channel-fill muds, and overbank fluvial muds." The nonstippled areas are "Dominantly clayey sand and silt of moderate permeability and drainage, low to moderate compressibility and shrink-swell potential, level relief with local mounds and ridges, and high shear strength; geologic units include meanderbelt, levee, crevasse splay, and distributary sands"*

**Lissie Formation** (Ql)

*Upper part, clay, silt, sand, and very minor siliceous gravel of granule and small pebble size, gravel more abundant northwestward, locally calcareous, concretions of calcium carbonate, iron oxide, and iron-manganese oxides common in zone of weathering; fluviatile; surface fairly flat and featureless except for numerous rounded shallow depressions and pimple mounds. Lower part, clay, silt, sand, and minor amount of gravel; gravel slightly coarser than in upper part, noncalcareous, iron oxide concretions more abundant than in upper part; fluviatile; very gently rolling; thickness ± 200 feet*

**Willis Formation** (Qw)

*Clay, silt, sand, and minor siliceous gravel of granule to pebble size including some petrified wood; sand coarser than in younger units. Deeply weathered and lateritic, indurated by clay and cemented by iron oxide locally, concretions of iron oxide numerous, noncalcareous; fluviatile; maximum thickness 75 feet*

**Tertiary rocks on Hockley salt dome** (T)

*Sandstone, very fine grained, hard, abundant porcelaneous to opaline cement, poorly bedded, jointed, grayish white; possibly Catahoula Formation (Stenzel, 1946) (See Index of Geologic Mapping for reference.)*

Holocene

Holocene or late (?) Pleistocene

Pleistocene

QUATERNARY

Pleistocene

Miocene

QUATERNARY

TERTIARY

CR

Outcrop of caprock reported on Damon Mound

*Not found. Reportedly used for building stone (Bevier, 1925)*

U D

Fault

*U, upthrown; D, downthrown side*

10,000-meter Universal Transverse Mercator grid ticks, shown in blue

Partially funded by Texas Department of Water Resources

**San Jacinto River Waste Pits**

Harris County, Texas

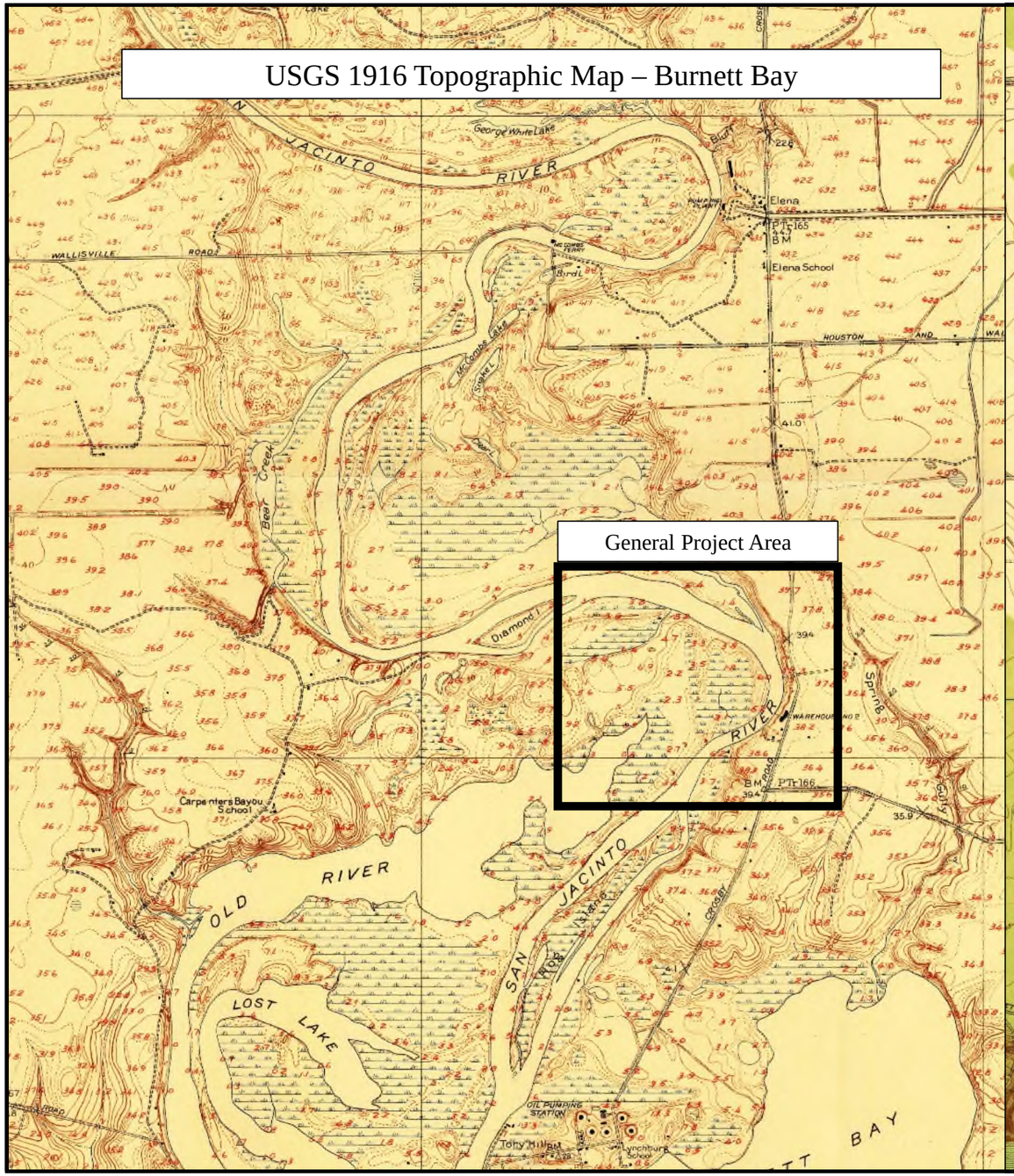
Ardaman & Associates, Inc.

| Eng.: | Drawn By: | Checked By: |
|---|---|---|
| GFS | GFS | MLW |
| File No.: | Date: | Fig. No.: |
| 18-2876 | 5/27/20 | 2 |

Title:

**Regional Geology**

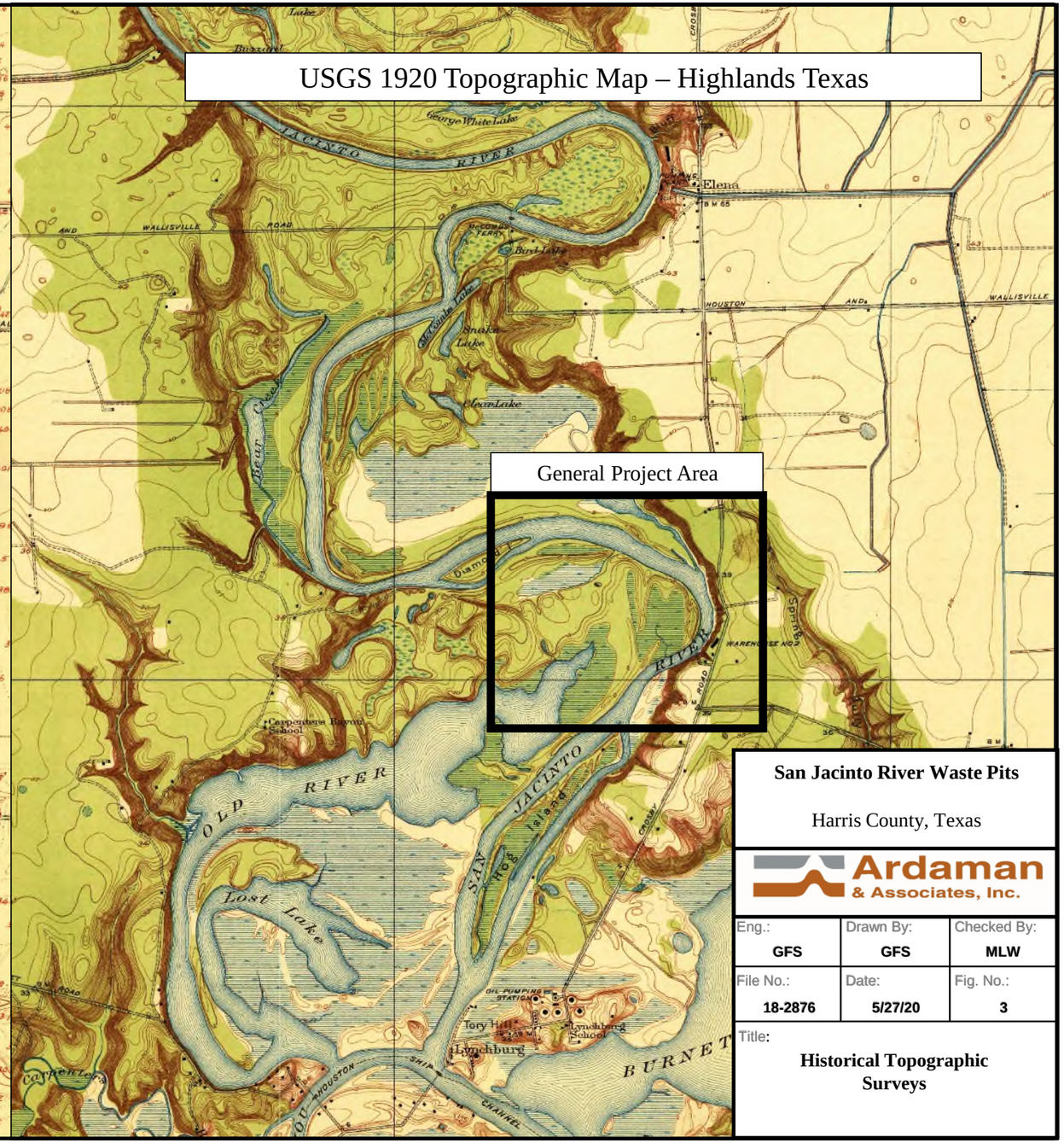
USGS 1916 Topographic Map – Burnett Bay




General Project Area



USGS 1920 Topographic Map – Highlands Texas




General Project Area



**San Jacinto River Waste Pits**

Harris County, Texas

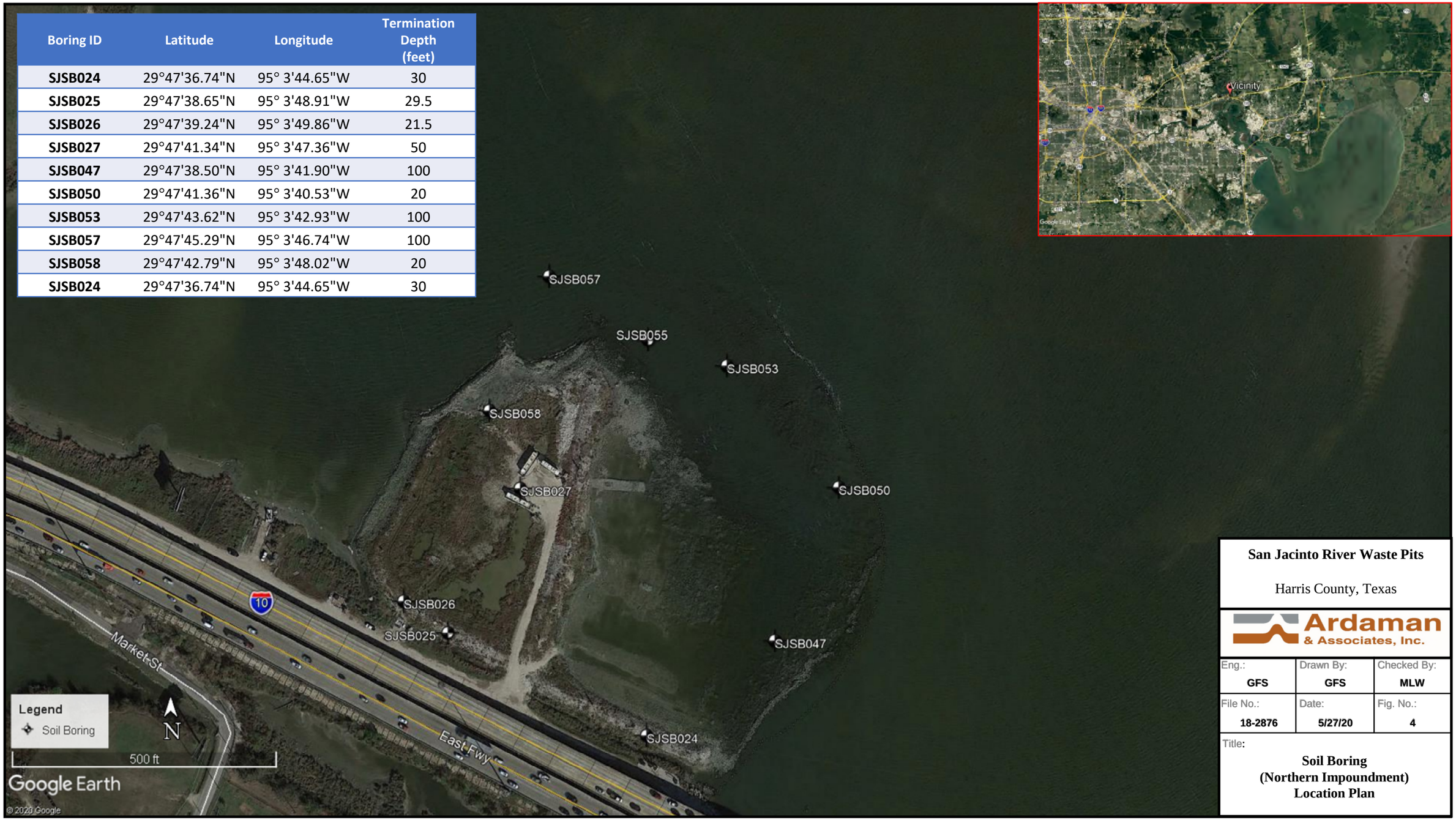
Ardaman & Associates, Inc.

| Eng.: | Drawn By: | Checked By: |
|---|---|---|
| **GFS** | **GFS** | **MLW** |
| File No.: | Date: | Fig. No.: |
| **18-2876** | **5/27/20** | **3** |

Title:

**Historical Topographic Surveys**

| Boring ID | Latitude | Longitude | Termination Depth (feet) |
|---|---|---|---|
| **SJSB024** | 29°47'36.74"N | 95° 3'44.65"W | 30 |
| **SJSB025** | 29°47'38.65"N | 95° 3'48.91"W | 29.5 |
| **SJSB026** | 29°47'39.24"N | 95° 3'49.86"W | 21.5 |
| **SJSB027** | 29°47'41.34"N | 95° 3'47.36"W | 50 |
| **SJSB047** | 29°47'38.50"N | 95° 3'41.90"W | 100 |
| **SJSB050** | 29°47'41.36"N | 95° 3'40.53"W | 20 |
| **SJSB053** | 29°47'43.62"N | 95° 3'42.93"W | 100 |
| **SJSB057** | 29°47'45.29"N | 95° 3'46.74"W | 100 |
| **SJSB058** | 29°47'42.79"N | 95° 3'48.02"W | 20 |
| **SJSB024** | 29°47'36.74"N | 95° 3'44.65"W | 30 |







**San Jacinto River Waste Pits**

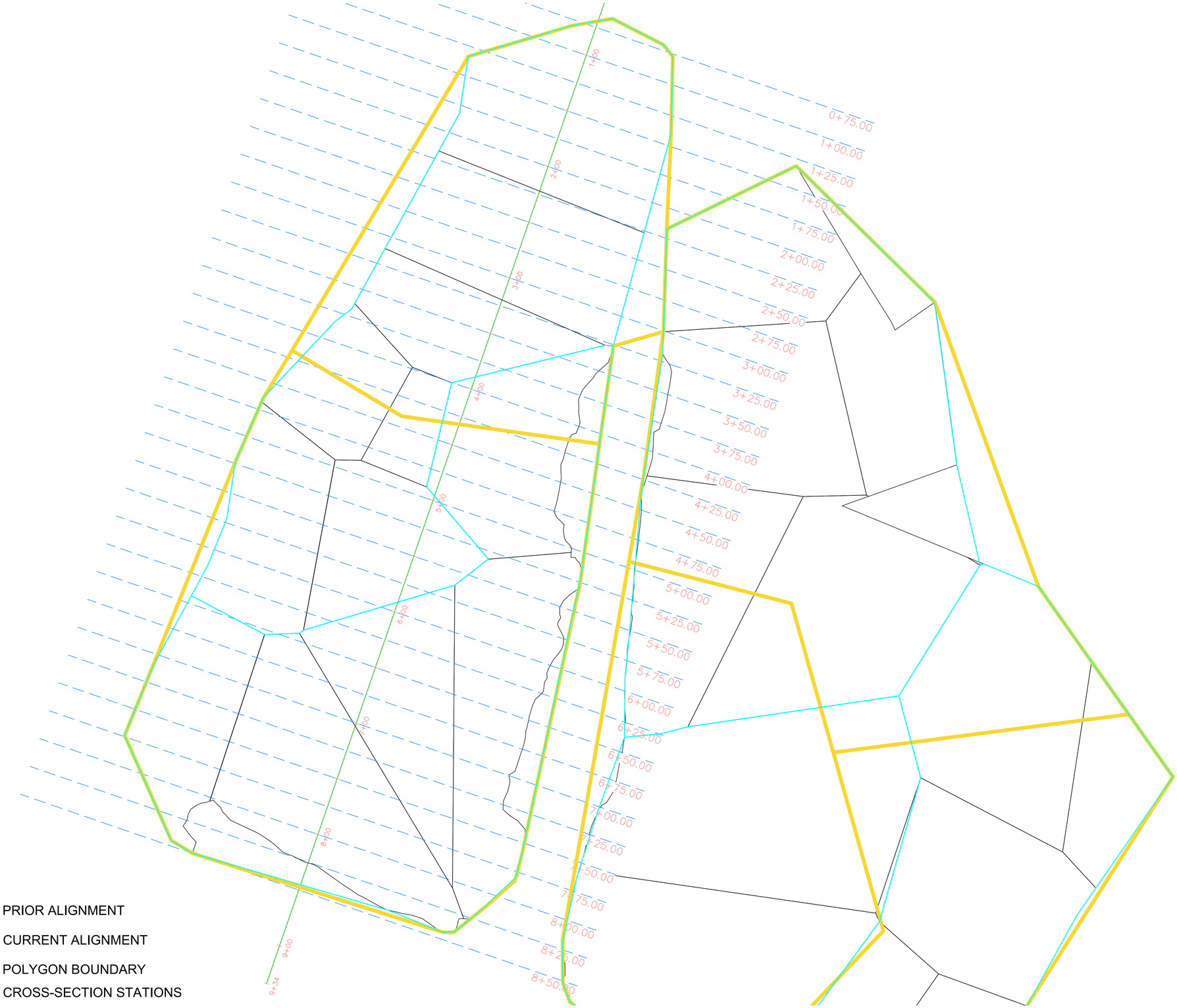
Harris County, Texas

Ardaman & Associates, Inc.

| Eng.: | Drawn By: | Checked By: |
|---|---|---|
| **GFS** | **GFS** | **MLW** |
| File No.: | Date: | Fig. No.: |
| **18-2876** | **5/27/20** | **4** |

Title:

**Soil Boring (Northern Impoundment) Location Plan**




LEGEND:

- PRIOR ALIGNMENT
- CURRENT ALIGNMENT
- POLYGON BOUNDARY
- CROSS-SECTION STATIONS

San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

| ENG | Drawn by: | Checked by: |
|---|---|---|
| GFS | AC | MLW |
| File No.: 18-2876 | Date: 05/27/20 | FIG No. 5 |

Title: N.I. West Cells & Alignment

0 40'

N

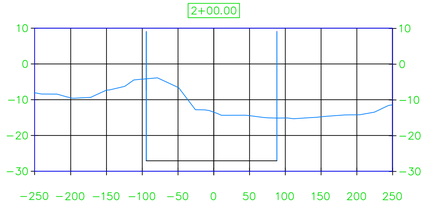
SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

NORTHERN IMPOUNDMENT

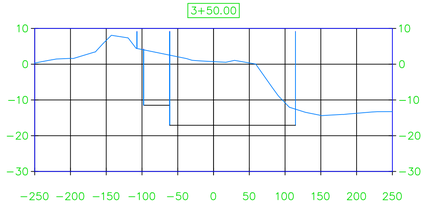
WEST CELLS CROSS-SECTION INDEX PLAN MAP

CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_eg_tif_new_poly_-_Standard1\North Impoundment eg tif new poly.dwg

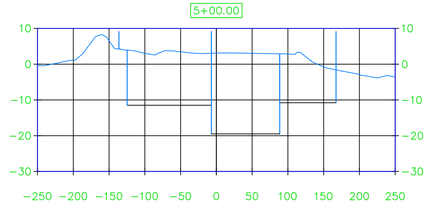
2+00.00



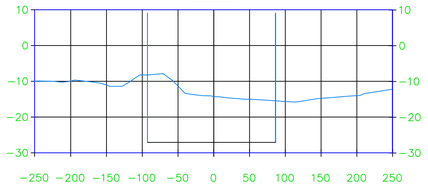

3+50.00



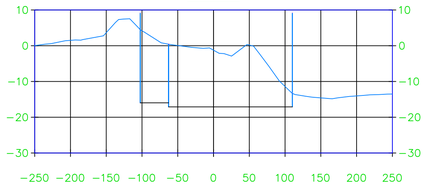

5+00.00



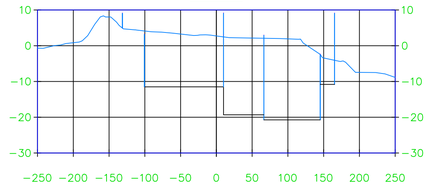

1+75.00



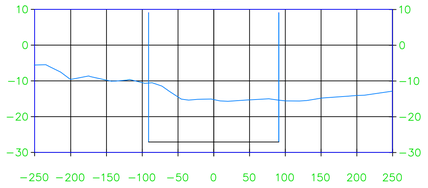

3+25.00



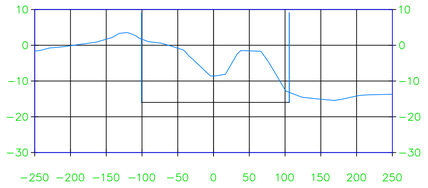

4+75.00



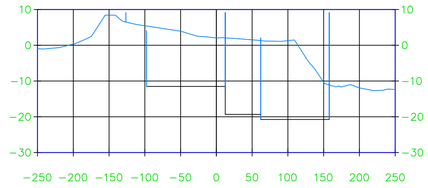

1+50.00



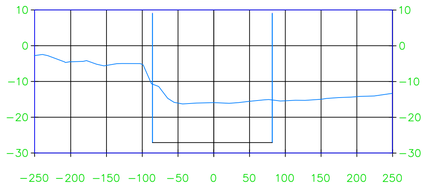

3+00.00



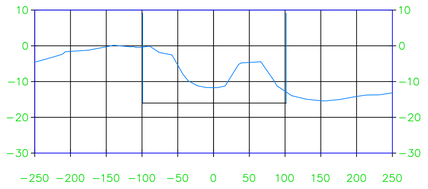

4+50.00



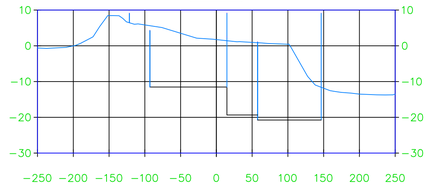

1+25.00



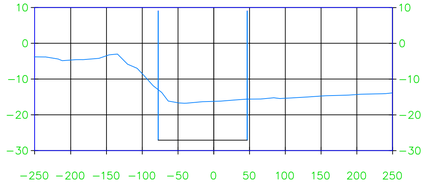

2+75.00



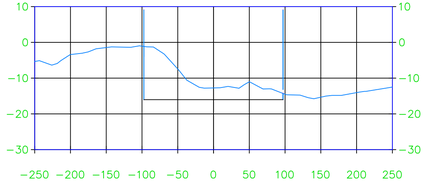

4+25.00



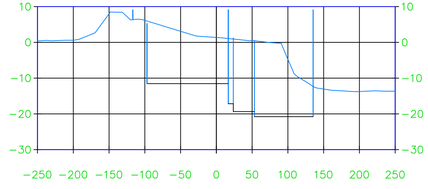

1+00.00



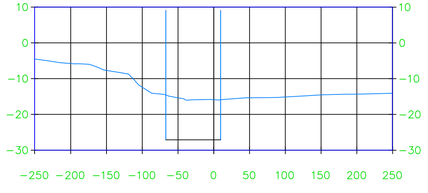

2+50.00



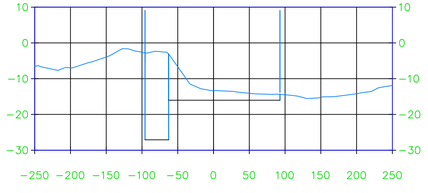

4+00.00



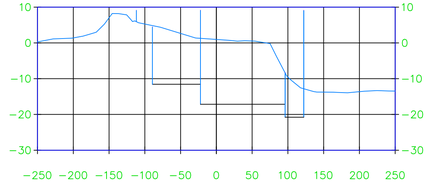

0+75.00




2+25.00




3+75.00




San Jacinto River Waste Pits

Harris County, Texas

**Ardaman & Associates, Inc.**
Geotechnical, Environmental and Materials Consultants

| ENG: GFS | Drawn by: AC | Checked by: MLW |
|---|---|---|
| File No.: 18-2876 | Date: 05/27/20 | FIG No. 6 |

Title: N.I. West Cells & Alignment

HORIZONTAL
0 100'

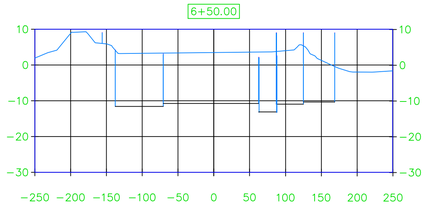
VERTICAL
0 20'

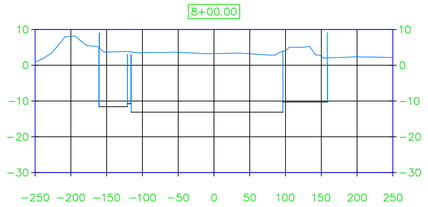
SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

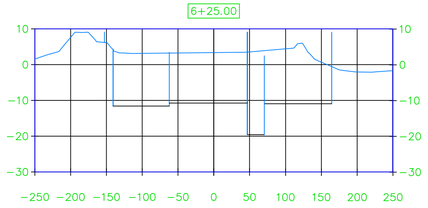
# NORTHERN IMPOUNDMENT

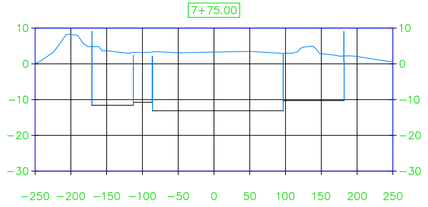
## WEST CELLS CROSS-SECTIONS STA 0+75 TO 5+00 (SHEET 1 OF 2)

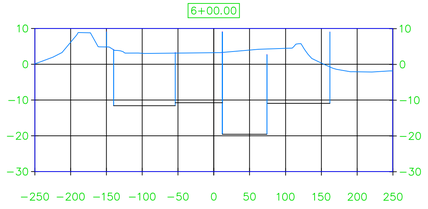
CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_eg_tif_new_poly_-_Standard1\North Impoundment eg tif new poly.dwg

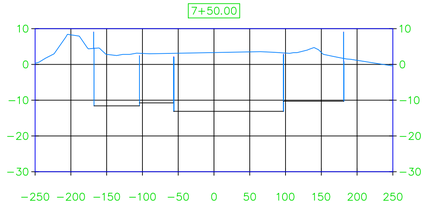


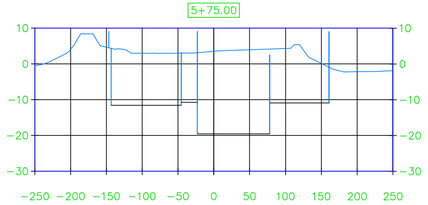



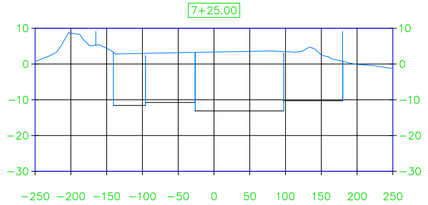



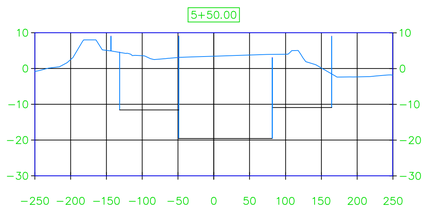



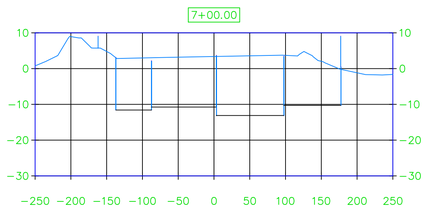



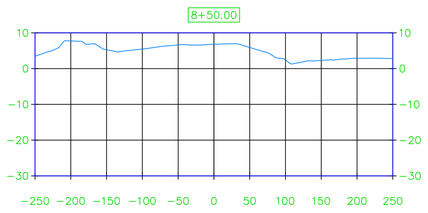



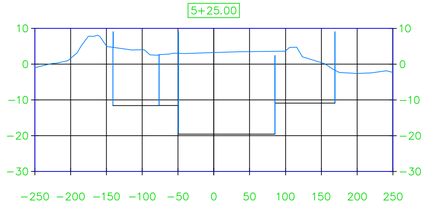



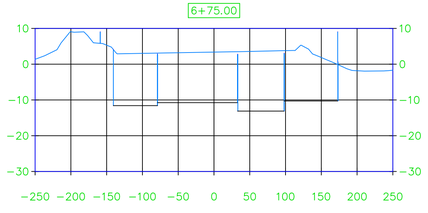



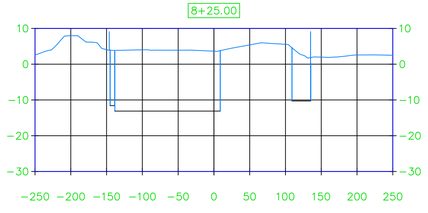




San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

| ENG | Drawn by: | Checked by: |
|---|---|---|
| GFS | AC | MLW |
| File No.: 18-2876 | Date: 05/27/20 | FIG No. 7 |

Title: N.I. West Cells & Alignment

HORIZONTAL
0 100'

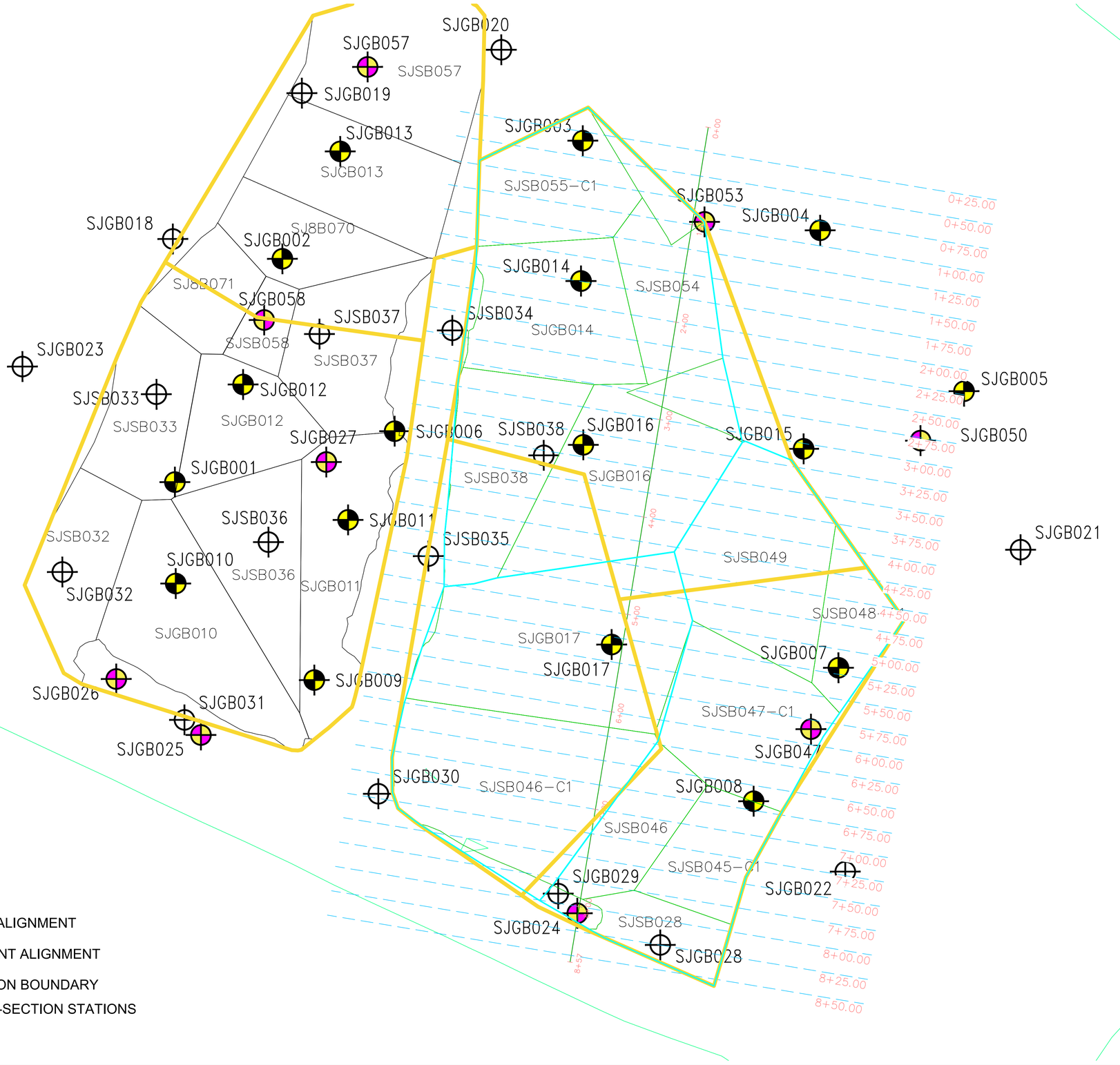
VERTICAL
0 20'

CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_eg_tif_new_poly_-_Standard1\North Impoundment eg tif new poly.dwg

SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

# NORTHERN IMPOUNDMENT

## WEST CELLS CROSS-SECTIONS STA 5+25 TO 8+50 (SHEET 2 OF 2)




LEGEND:

- PRIOR ALIGNMENT
- CURRENT ALIGNMENT
- POLYGON BOUNDARY
- CROSS-SECTION STATIONS

San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

| ENG | Drawn by: | Checked by: |
|---|---|---|
| GFS | AC | MLW |
| File No.: | Date: | FIG |
| 18-2876 | 05/27/20 | No. 8 |

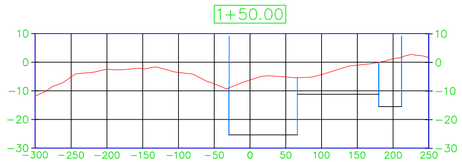
Title: N.I. East Cells & Alignment

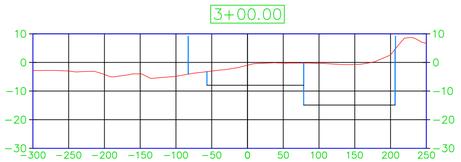
0 40'

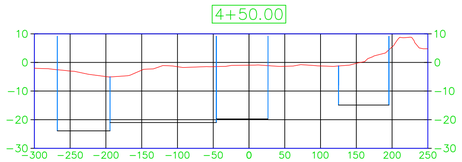
N

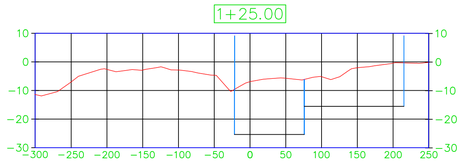
SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS
NORTHERN IMPOUNDMENT
EAST CELLS CROSS-SECTION INDEX PLAN MAP

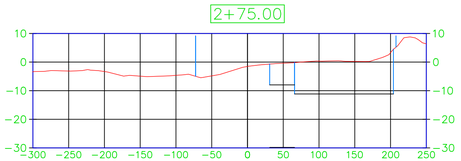
CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_East_Cells_Standard1\North Impoundment East Cells Alignment and Sections-1.dwg

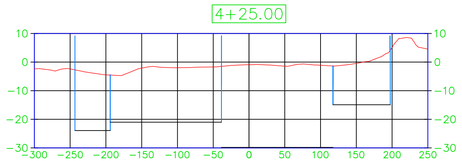


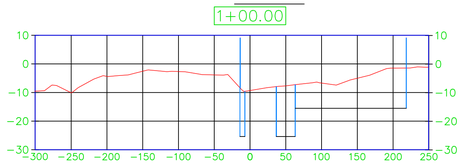



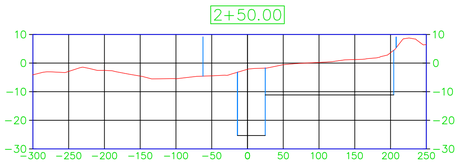



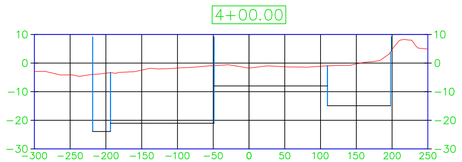



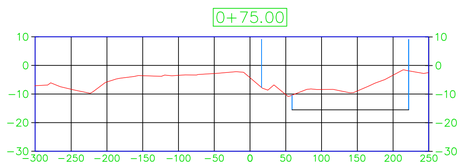



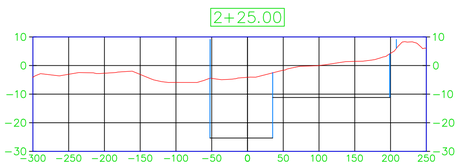



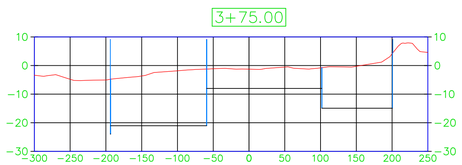



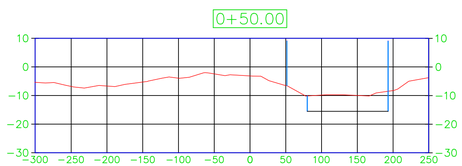



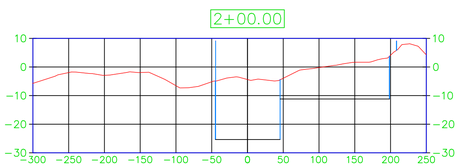



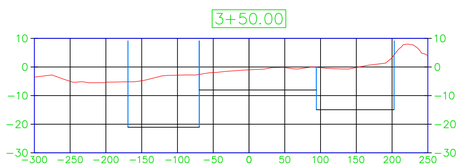



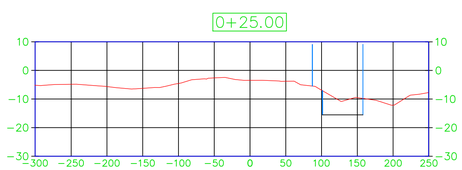



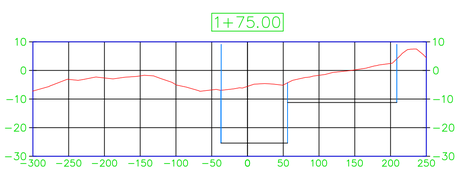



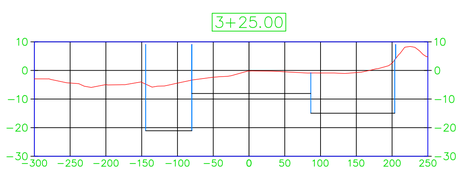




San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

| ENG | Drawn by: | Checked by: |
|---|---|---|
| GFS | AC | MLW |
| File No.: 18-2876 | Date: 05/27/20 | FIG No. 9 |

Title: N.I. East Cells & Alignment

HORIZONTAL
0 100'

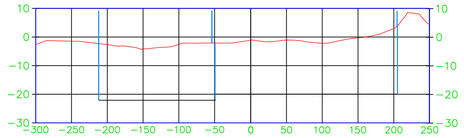
VERTICAL
0 20'

SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

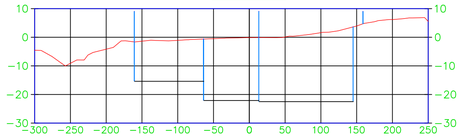
NORTHERN IMPOUNDMENT
EAST CELLS CROSS-SECTIONS STA 0+25 TO 4+50 (SHEET 1 OF 2)

CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_East_Cells_Standard1\North Impoundment East Cells Alignment and Sections-1.dwg

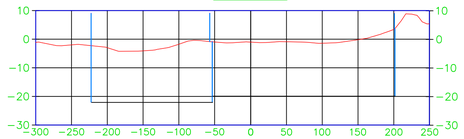
6+00.00



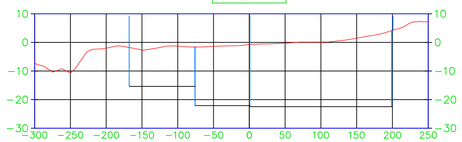

7+50.00



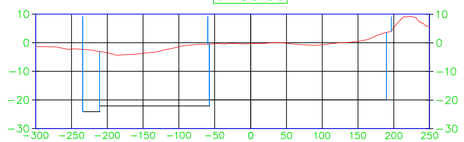

5+75.00



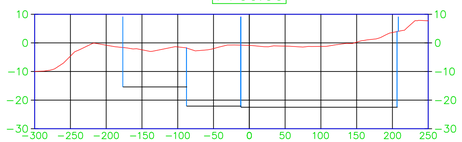

7+25.00



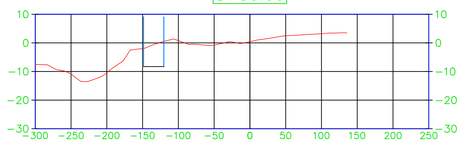

5+50.00



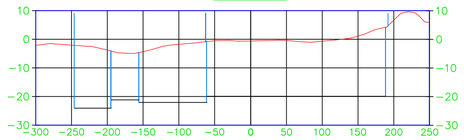

7+00.00



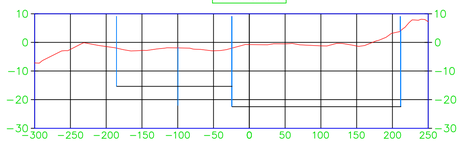

8+50.00



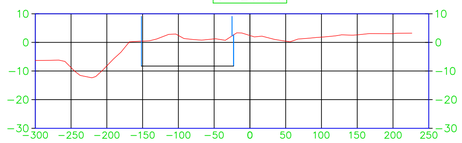

5+25.00



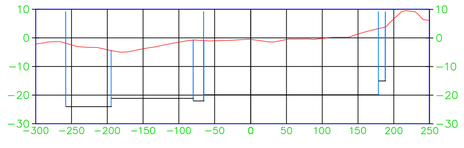

6+75.00



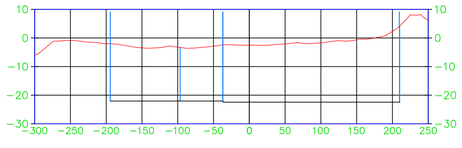

8+25.00



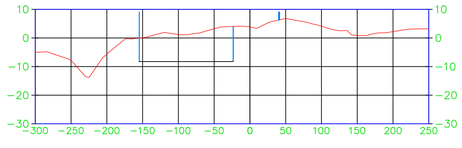

5+00.00



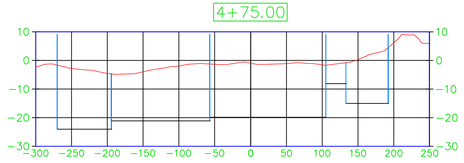

6+50.00



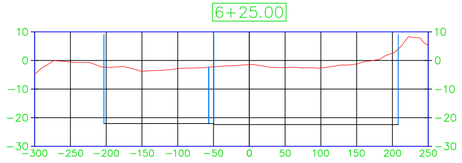

8+00.00



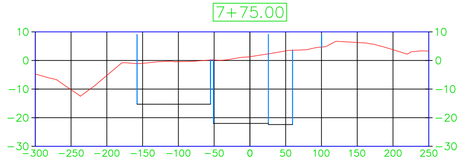

4+75.00




6+25.00




7+75.00




San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

| ENG | Drawn by: | Checked by: |
|---|---|---|
| GFS | AC | MLW |
| File No.: 18-2876 | Date: 05/27/20 | FIG No. 10 |

Title: N.I. East Cells & Alignment

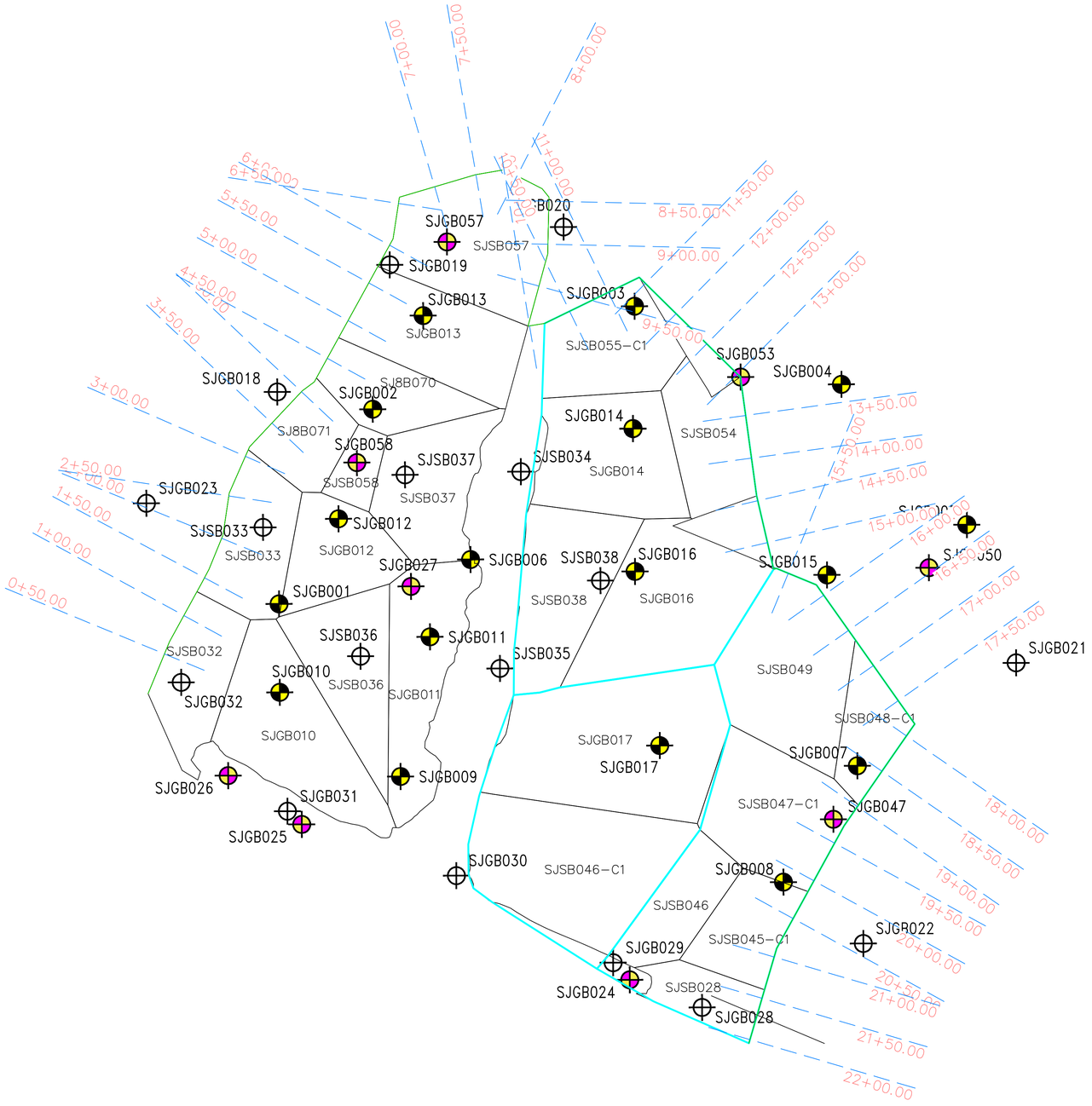
HORIZONTAL
0 100'

VERTICAL
0 20'

SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

NORTHERN IMPOUNDMENT
EAST CELLS CROSS-SECTIONS STA 4+75 TO 8+50 (SHEET 2 OF 2)

CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_East_Cells_Standard Fl\North Impoundment East Cells Alignment and Sections-1.dwg



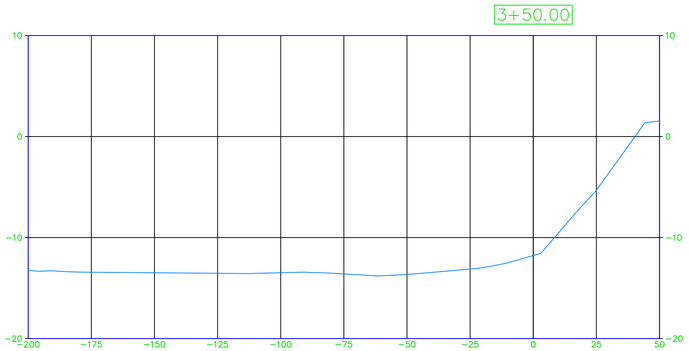

**San Jacinto River Waste Pits**

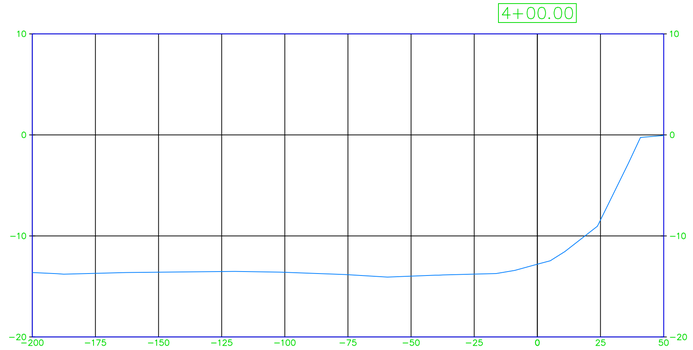
Harris County, Texas

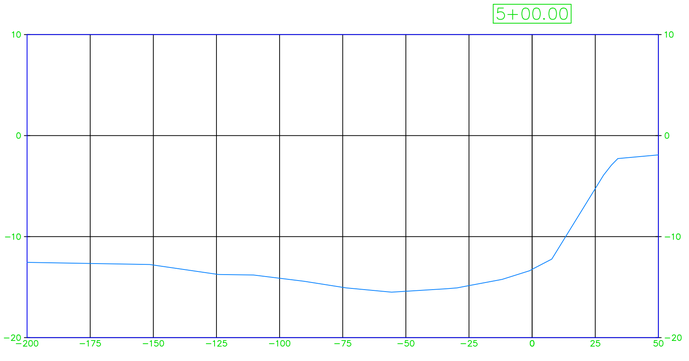
Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

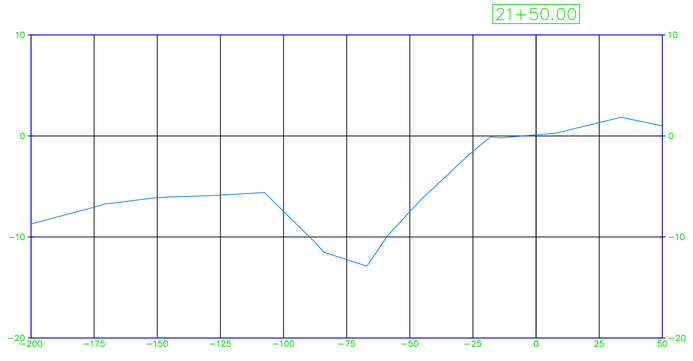
| ENG | Drawn by: | Checked by: |
|---|---|---|
| GFS | AC | MLW |
| File No.: | Date: | FIG |
| 18-2876 | 05/18/20 | No. 11 |

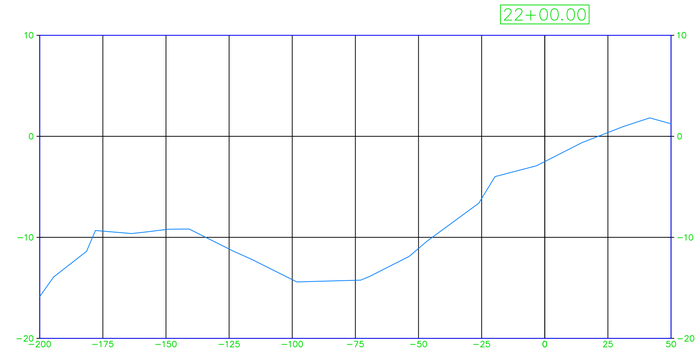
Title: N.I. Vibration Analysis Stationing




**San Jacinto River Waste Pits**

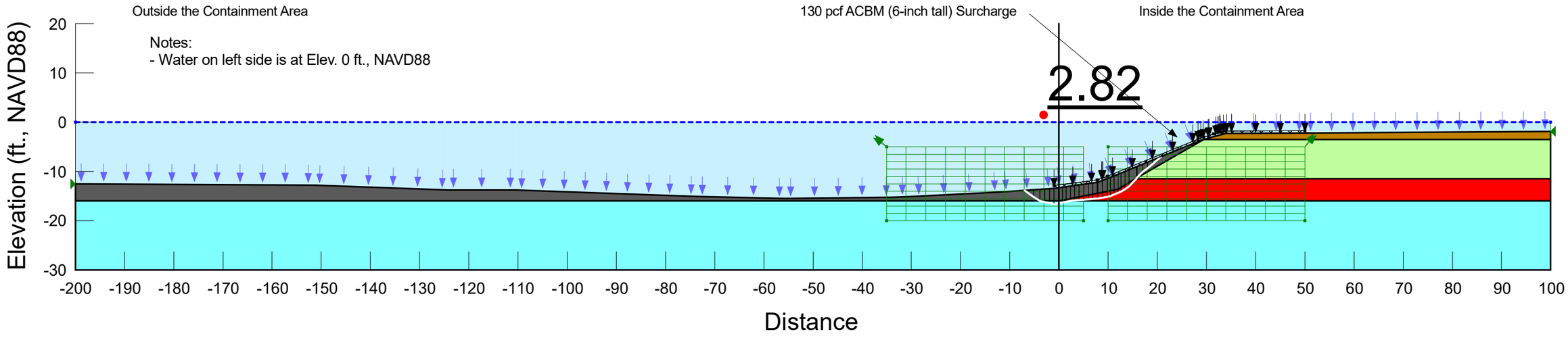
Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

| ENG | Drawn by: | Checked by: |
|---|---|---|
| GFS | AC | MLW |
| File No. | Date: | FIG |
| 18-2876 | 05/18/20 | No. 12 |

Title: **N.I. Vibration Analysis X-Sections**

Method: Spencer
Slip Surface Option: Block
Factor of Safety: 2.82
Horz Seismic Coef.:




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 2- CLs (-1.6 to -3.4) | Mohr-Coulomb | 117 | 200 | 0 | 0 | 1 |
| | 3- CL (-3.4 to -11.5) | Mohr-Coulomb | 95 | 900 | 0 | 0 | 1 |
| | 4- SM (-11.5 to -16) | Mohr-Coulomb | 120 | 0 | 25 | 0 | 1 |
| | 4- SM (-16 to -???) | Mohr-Coulomb | 120 | 0 | 33 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 90 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 0g

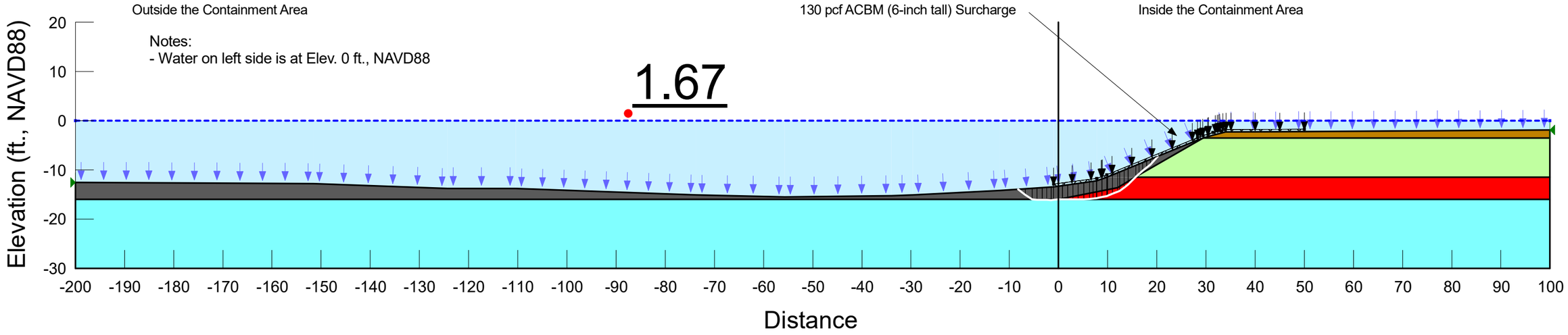
Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Ardaman & Associates, Inc.

| | |
|---|---|
| Analysis Name: Deep - Spencer Block | |
| File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz | |
| Date: 04/21/2020 | Scale: 1:250 |

Figure No. 13

Method: Spencer
Slip Surface Option: Critical Slip Surfaces from Other
Factor of Safety: 1.67
Horz Seismic Coef.: 0.1




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 2- CLs (-1.6 to -3.4) | Mohr-Coulomb | 117 | 200 | 0 | 0 | 1 |
| | 3- CL (-3.4 to -11.5) | Mohr-Coulomb | 95 | 900 | 0 | 0 | 1 |
| | 4- SM (-11.5 to -16) | Mohr-Coulomb | 120 | 0 | 25 | 0 | 1 |
| | 4- SM (-16 to -???) | Mohr-Coulomb | 120 | 0 | 33 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 90 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.1g

Ardaman & Associates, Inc.

Analysis Name: Deep - Spencer Block (EQ=0.10)

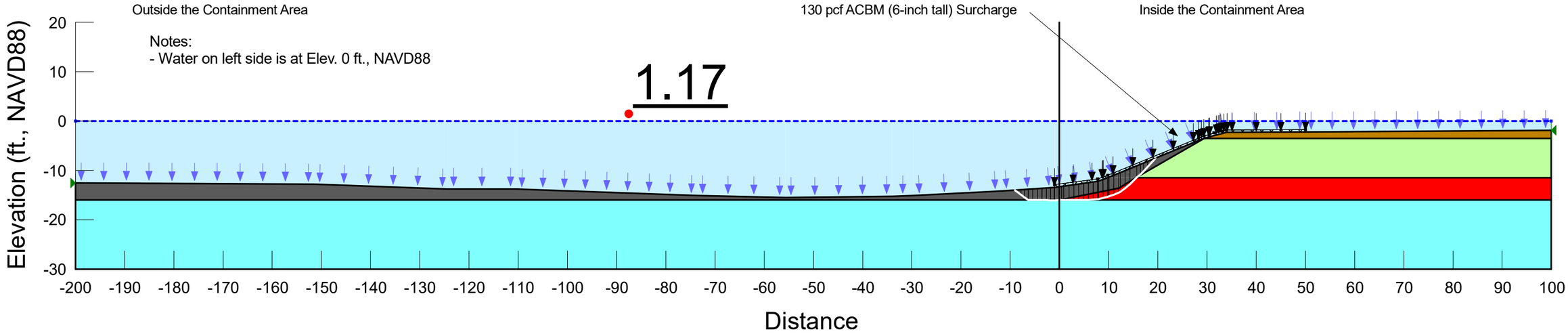
File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Figure No. 14

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Method: Spencer
Slip Surface Option: Critical Slip Surfaces from Other
Factor of Safety: 1.17
Horz Seismic Coef.: 0.2




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 2- CLs (-1.6 to -3.4) | Mohr-Coulomb | 117 | 200 | 0 | 0 | 1 |
| | 3- CL (-3.4 to -11.5) | Mohr-Coulomb | 95 | 900 | 0 | 0 | 1 |
| | 4- SM (-11.5 to -16) | Mohr-Coulomb | 120 | 0 | 25 | 0 | 1 |
| | 4- SM (-16 to -???) | Mohr-Coulomb | 120 | 0 | 33 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 90 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.2g

Ardaman & Associates, Inc.

Analysis Name: Deep - Spencer Block (EQ=0.20)

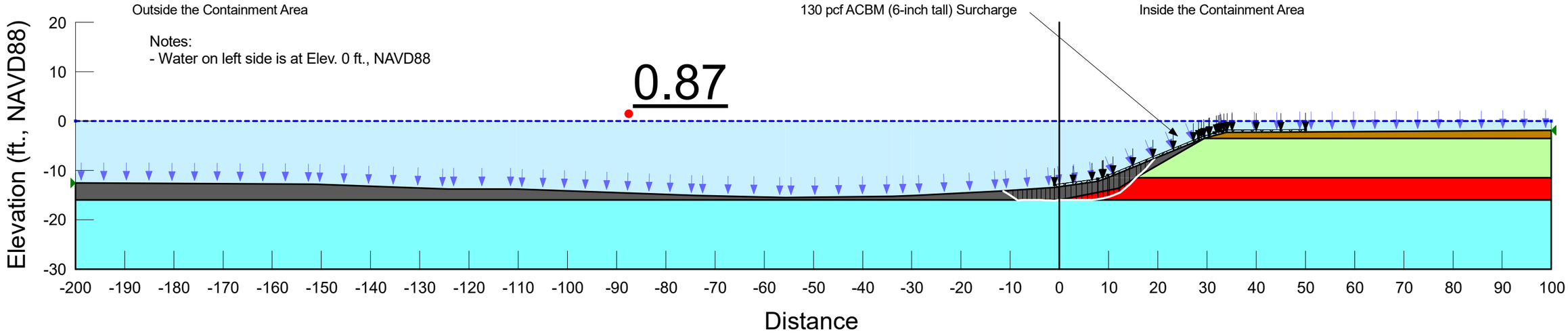
File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Figure No. 15

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Method: Spencer
Slip Surface Option: Critical Slip Surfaces from Other
Factor of Safety: 0.87
Horz Seismic Coef.: 0.3




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 2- CLs (-1.6 to -3.4) | Mohr-Coulomb | 117 | 200 | 0 | 0 | 1 |
| | 3- CL (-3.4 to -11.5) | Mohr-Coulomb | 95 | 900 | 0 | 0 | 1 |
| | 4- SM (-11.5 to -16) | Mohr-Coulomb | 120 | 0 | 25 | 0 | 1 |
| | 4- SM (-16 to -???) | Mohr-Coulomb | 120 | 0 | 33 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 90 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.3g

Ardaman & Associates, Inc.

Analysis Name: Deep - Spencer Block (EQ=0.30)

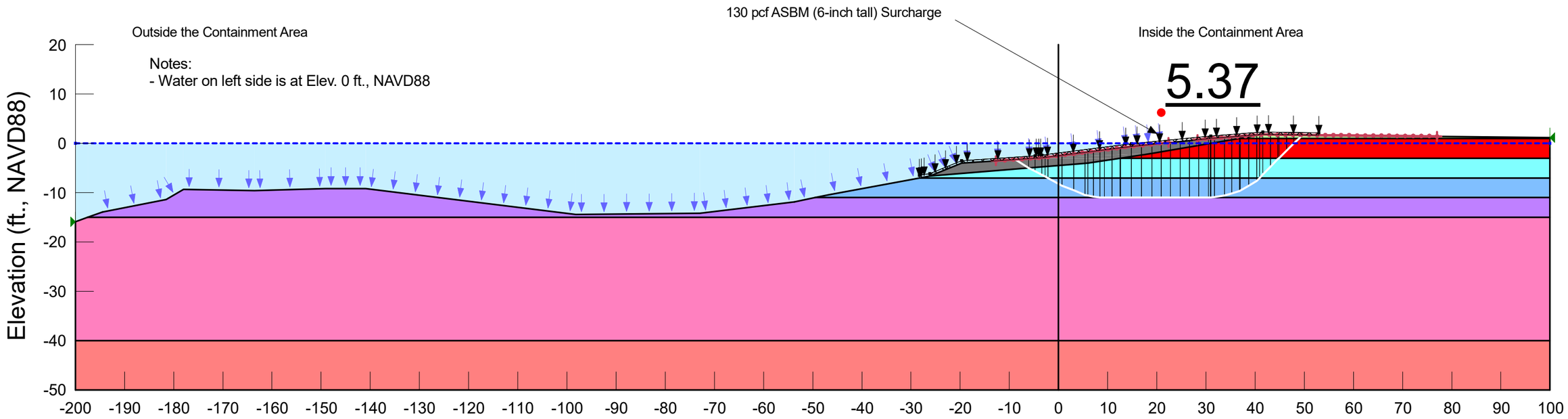
File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Figure No. 16

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 5.37
Horz Seismic Coef.:




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 3- CL (+3.3 to +1) | Mohr-Coulomb | 131 | 800 | 0 | 0 | 1 |
| | 4- OH (+1 to -3) | Mohr-Coulomb | 95 | 600 | 0 | 0 | 1 |
| | 5- SC (-3 to -7) | Mohr-Coulomb | 115 | 0 | 28 | 0 | 1 |
| | 6- CL (-7 to -11) | Mohr-Coulomb | 115 | 200 | 0 | 0 | 1 |
| | 7- CLs (-11 to -15) | Mohr-Coulomb | 121 | 700 | 0 | 0 | 1 |
| | 8- SM/SP-SC (-15 to -40) | Mohr-Coulomb | 130 | 0 | 30 | 0 | 1 |
| | 9- CH (-40 to -50) | Mohr-Coulomb | 122 | 1,500 | 0 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 95 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 22+00 (Vibration Analysis)

## Horizontal Seismic Coef.: 0g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE

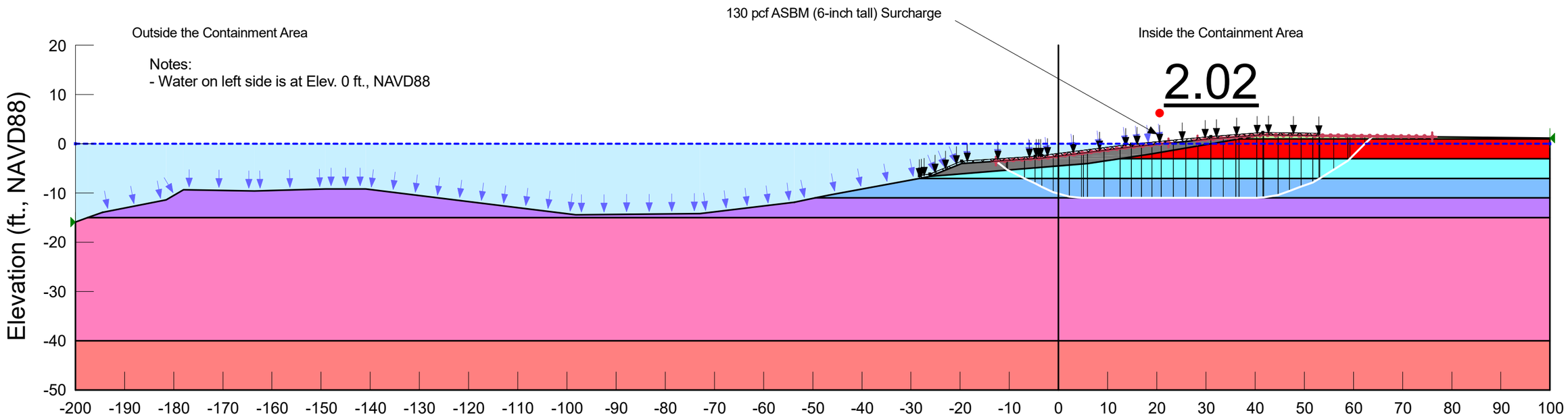
File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 17

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 2.02
Horz Seismic Coef.: 0.1




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 3- CL (+3.3 to +1) | Mohr-Coulomb | 131 | 800 | 0 | 0 | 1 |
| | 4- OH (+1 to -3) | Mohr-Coulomb | 95 | 600 | 0 | 0 | 1 |
| | 5- SC (-3 to -7) | Mohr-Coulomb | 115 | 0 | 28 | 0 | 1 |
| | 6- CL (-7 to -11) | Mohr-Coulomb | 115 | 200 | 0 | 0 | 1 |
| | 7- CLs (-11 to -15) | Mohr-Coulomb | 121 | 700 | 0 | 0 | 1 |
| | 8- SM/SP-SC (-15 to -40) | Mohr-Coulomb | 130 | 0 | 30 | 0 | 1 |
| | 9- CH (-40 to -50) | Mohr-Coulomb | 122 | 1,500 | 0 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 95 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 22+00 (Vibration Analysis)

## Horizontal Seismic Coef.: 00.1g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE (EQ=0.10)

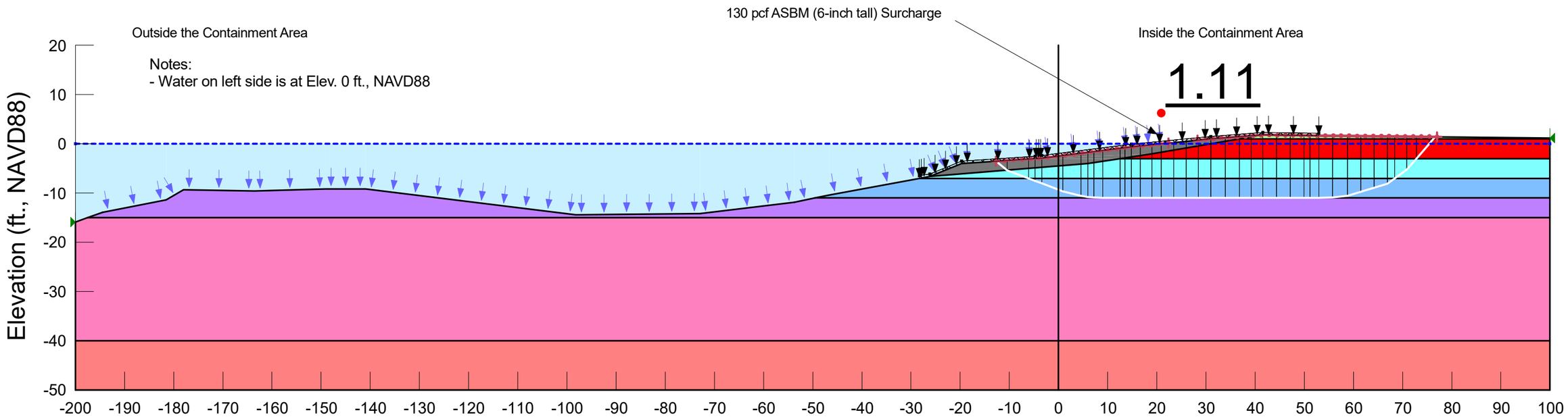
File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 18

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 1.11
Horz Seismic Coef.: 0.2




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 3- CL (+3.3 to +1) | Mohr-Coulomb | 131 | 800 | 0 | 0 | 1 |
| | 4- OH (+1 to -3) | Mohr-Coulomb | 95 | 600 | 0 | 0 | 1 |
| | 5- SC (-3 to -7) | Mohr-Coulomb | 115 | 0 | 28 | 0 | 1 |
| | 6- CL (-7 to -11) | Mohr-Coulomb | 115 | 200 | 0 | 0 | 1 |
| | 7- CLs (-11 to -15) | Mohr-Coulomb | 121 | 700 | 0 | 0 | 1 |
| | 8- SM/SP-SC (-15 to -40) | Mohr-Coulomb | 130 | 0 | 30 | 0 | 1 |
| | 9- CH (-40 to -50) | Mohr-Coulomb | 122 | 1,500 | 0 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 95 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 22+00 (Vibration Analysis)

## Horizontal Seismic Coef.: 00.2g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE (EQ=0.20)

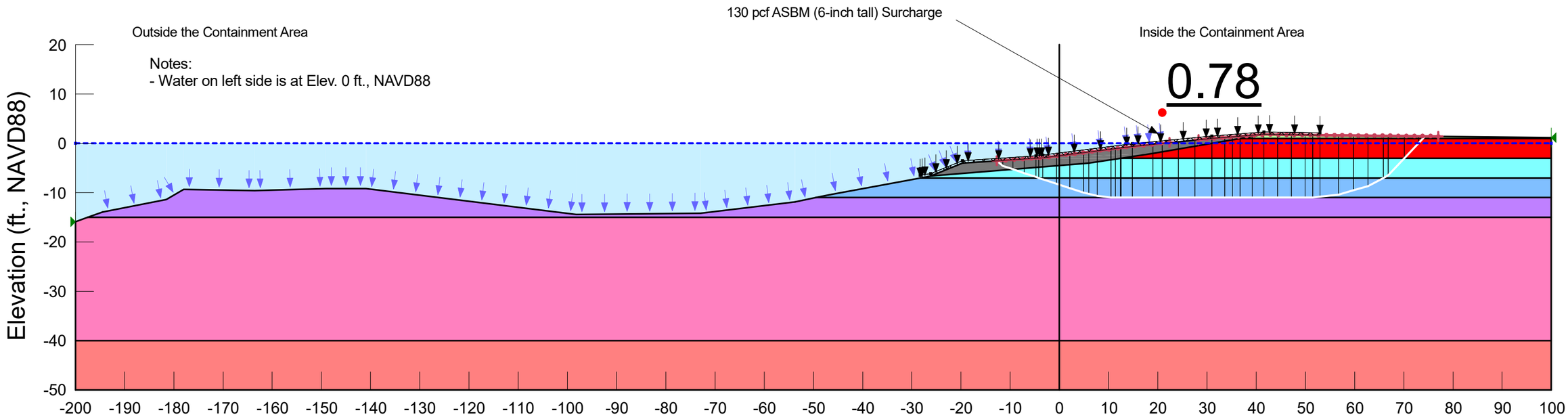
File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 19

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 0.78
Horz Seismic Coef.: 0.3




| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) | Phi-B (°) | Piezometric Line |
|---|---|---|---|---|---|---|---|
| | 3- CL (+3.3 to +1) | Mohr-Coulomb | 131 | 800 | 0 | 0 | 1 |
| | 4- OH (+1 to -3) | Mohr-Coulomb | 95 | 600 | 0 | 0 | 1 |
| | 5- SC (-3 to -7) | Mohr-Coulomb | 115 | 0 | 28 | 0 | 1 |
| | 6- CL (-7 to -11) | Mohr-Coulomb | 115 | 200 | 0 | 0 | 1 |
| | 7- CLs (-11 to -15) | Mohr-Coulomb | 121 | 700 | 0 | 0 | 1 |
| | 8- SM/SP-SC (-15 to -40) | Mohr-Coulomb | 130 | 0 | 30 | 0 | 1 |
| | 9- CH (-40 to -50) | Mohr-Coulomb | 122 | 1,500 | 0 | 0 | 1 |
| | Soft Soil | Mohr-Coulomb | 95 | 100 | 0 | 0 | 1 |

# Northern Impoundment - Sta 22+00 (Vibration Analysis)

## Horizontal Seismic Coef.: 00.3g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE (EQ=0.30)

File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 20

# Attachment A. FURNISHED BORING LOGS AND GEOTECHNICAL TESTING RESULTS FROM PREVIOUS INVESTIGATIONS

This Attachment contains the following:
(Digital Copies Only)

A.1 Field Logs – Anchor (SJGB001 to SJGB017)

A.2 Field Logs – Anchor (SJSB018 to SJSB023)

A.3 Field Logs – Anchor (SJSB028 to SJSB038)

A.4 GeoTesting Express Lab data Sheets

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: 3.5 FT FROM DECK TO MUDLINE; 5.5 FT FROM MUDLINE TO Measuring spot. ch | Boring SJGB001 Date 10/27 Sheet 1 of 3 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather P. SUNNY |
| | Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT/ST ATD Water |
| Obs. Well Install. Yes No | Bottom of Boring 60 ft Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 10 | 90 | 930 935 940 | 0 | 2 | ST | CR1-A CR1-B S1 | 0 2.2' 1 | | (Very soft), moist ~~bro~~ grayish brown, sl. sandy SILT w/ ~~tr.~~ abund. organics (roots) @ 0.6 to 0.7' brown peaty silty Peat (OL) @ 0.7' to 1' moist gray ~~silty sandy~~ Sandy SILT w/ roots/organics no plasticity | | OL |
| – | – | – | 1000 | 2 | 4 | ST | S2 | 2 2' 3 | | 1 to 1.8' moist lt gray sandy-like silt particle. H2S ODOR from 0 to 1.8' Chemical-like odor @ 1.8 | | Black Muck |
| <5 | <5 | 95 | 1010 | 4 | 6 | SPT | S3 | 4 2' 5 | 0 0 0 | 1.8' V. SOFT wet dk gray to black clay w/ ~~chem-like~~ odor Methane? Sulfur? 0-2' unknown odor | Not rotten egg H2S | |
| <5 | 10 | 90 | 1020 | 6 | 8 | SPT | S4 | 6 2' 7 | 0 0 0 | 2-4' ST FOR GEOTECH STRENGTH/CONSOL 4-6' WOR V. SOFT, wet, dk gray w/ gray patches tr. sand + gravel CLAY (Muck/mud) w/ tr. ~~chem-like~~ odor (Sulfur, Methane, muck) | | |
| – | 80 | 20 | 1040 | 8 | 10 | SPT | S5 | 8 9 ~1.1' 10 | 6 6 14 | 6-8' @ V. SOFT. SAME AS ABOVE @ sampler shoe ~0.1' lt gray moist clayey SAND | unknown odor unknown odor @ 8' | SC |
| | | | | | | | | 1 2 | | 8-10' (20) Md. dense, moist to wet, lt gray, clayey w/ layer Med grained SAND w/ layers (0.1) | hammer not falling 30" | tr. odor 8-10' in sand |
| – | 65 | 35 | 1050 | 13 | 15 | SPT | S6 | 3 1.6' 4 5 | 6 7 13 | (20) Md. dense, moist, lt gray clayey SAND w/ layer of ~~cla~~ sandy CLAY ~0.4 Alternating layers ~0.2-0.4' thick of SP, SC + CL | of clay (SP) gravel sized unknown particles in slough | |
| – | 85 | 15 | 1100 | 18 | 20 | SPT | S7 | 8 1.1 9 20 | 5 5 12 | (17) Md. dense, same as above seams of CLAY tr. shells | | SP |

Attachment Figure A.1-1

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SSGB001 Date 10/27/10 Sheet 2 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 90°F

Drilled By TRIANGLE RESOURCES (DSI) JOE/CHARLES

Drill Type/ Method ROTARY

Sampling Method 2' SPT / 2' ST ATD Water

Bottom of Boring 60' Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 70 | 30 | 1140 | 23 | 25 | SPT | S8 | 1.4' | 7, 6, 10 | (16) Md. dense, wet, lt gray clayey SAND (SC), ALTERNATING LAYERS/SEAMS upto 0.1' of silty gray CLAY + lt gray Medium grained SAND tr. shells | Digging trench for drilling water | SC/SP |
| 15 | 35 | 50 | 1125 | 28 | 30 | SPT | S9 | 1.6 | 5, 4, 6 | (10) Soft, moist, gray sl. sandy CLAY to 0.8' (CH) reddish brown 0.8 to sampler shoe (soft) clay and gravel - sand (transition) to shells sampler shoe medium stiff lt bluish gray CLAY (Beaumont) | | CH, transition, Beaumont |
| 5 | 45 | 95 | 1130 | 33 | 35 | ST NR SPT | S10 | 1' | 12, 20, 23 | ST NR. USE SPT (43) V. HARD, damp, reddish brown CLAY w/ tr. gravel | TRY w/ ST Rig could only push 1FT NR. clean out hole, add mud, + resample w/SPT | |
| 10 | – | 90 | 1145 | 38 | 40 | SPT | S11 | 1.2' | 5, 10, 12 | (22) Hard, damp, reddish brown, CLAY w/ seam of gravel @ 0.5' | Rough Drilling | |

Attachment Figure A.1-2

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGB001 Date 10/27/10 Sheet 3 of 3 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather SUNNY 92°F |
| | Drilled By TRIANGLE RESOURCES PSI |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method 2'SPT / ST ATD Water |
| Obs. Well Install. Yes No | Bottom of Boring 60FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 40 | | | Rough Drilling bit is stopped occassionally Rig Shaking | |
| | | | | | | | | 1 | | | | Benamed |
| | | | | | | | | 2 | | | | |
| – | – | 100 | 1220 | 43 | 45 | SPT | S12 | 3 | 7 | (20) Stiff, damp, reddish brown w/ tr. lt blue gray mottling CLAY | | |
| | | | | | | | | 4 | 10 | | | |
| | | | | | | | | | 10 | | | |
| | | | | | | | | 5 | | | Unable to drive ST | color change |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | CL |
| – | 25 | 75 | 1240 | 48 | 50 | SPT | S13 | 8 1.1' | 10 | (47) Very hard, ~~no~~ damp, lt bluish gray, sandy silty CLAY. | G.S. | |
| | | | | | | | | 9 | 23 | grades to very sandy to clayey SAND. At bottom | | |
| | | | | | | | | | 24 | | | |
| | | | | | | | | 50 | | | | |
| | | | | | | | | 1 | | F.g. Sand. | | |
| | | | | | | | | 2 | | | | |
| – | 5 | 95 | 1330 | 53 | 55 | SPT | S14 | 3 | 23 | (42) V. Hard, dry, lt. bluish gray clayey SILT (MH) | | MH |
| | | | | | | | | 4 | 24 | | | |
| | | | | | | | | | 18 | tr. fine grained SAND | | |
| | | | | | | | | 5 | | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | |
| – | 5 | 95 | 1345 | 58 | 60 | SPT | S15 | 8 1' | 4 | (54) V. hard dry to damp, lt bluish gray | | |
| | | | | | | | | 9 | 27 | | | |
| | | | | | | | | | 27 | SAME AS ABOVE | | |
| | | | | | | | | 60 | | BOTTOM OF BORING @ 60' | | |

1400 10/27/10

Attachment Figure A.1-3

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:
2.6' FROM WATER TO MUDLINE
3.2' FROM DECK TO MUDLINE

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB002 Date 5/9/10 Sheet 1 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By WES MACDONALD Weather CLOUDY 65°F
Drilled By TRIANGLE RESOURCES (3)
Drill Type/ Method ROTARY
Sampling Method SPT/ST ATD Water
Bottom of Boring 59.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 10 | 90 | 0840 | 0 | 2 | ST/SPT | S1 | 0 | NR | 1st ATTEMPTS w/ SHELBY TUBE. NR. TRY WITH SPT. STRONG CHEMICAL-LIKE ODOR | | |
| | | | | | | | | 1 | | NO RECOVERY IN ST OR SPT IN UPPER 4 FT. | | |
| | | | | 2 | 4 | ST/SPT | | 2 | NR | S1 is taken from shovel sample off of surface | | |
| | | | | | | | | 3 | | S1 is V. SOFT, WET DK OLIVE GRAY ORGANIC SILT w/STRONG CHEM LIKE ODOR. TRACE SAND. | | |
| – | 10 | 90 | 0830 | 4 | 5.5 | SPT | S2 | 4 | 0 | WOH V. SOFT, wet, DK olive gray mod the organic silt OL @ 0.2 ft gray, like odor | OL | |
| | | | | | | | | 0.9 5 | | soft, laminated, sandy SILT. w/ black layer separating | ML | |
| | | | | | | | | 6 | 5 | (7) MS stiff, damp, lt gray w/lt brown | | |
| – | 15 | 55 | 0835 | 6 | 7.5 | SPT | S3 | 0.8 7 | 4 | + greenish gray mottling sand, CLAY (CL) | CL | |
| | | | | | | | | | 3 | | | |
| | | | | | | | | 8 | | | | |
| | | | 0840 | 8 | 10 | ST | S4 | 2' 9 | | | | |
| | | | | | | | | 10 | | | | |
| | | | | | | | | 11 | | | | |
| | | | | | | | | 12 | | | | |
| | | | | | | | | 13 | 4 | (2) Loose, wet, gray, silty, clayey SAND (SM) w/ slight chem-like odor | | |
| – | 85 | 15 | 0850 | 13 | 14.5 | SPT | S5 | 0.4 14 | 1 | | | |
| | | | | | | | | | 2 | | | |
| | | | | | | | | 15 | | | | |
| | | | | | | | | 16 | | | | |
| | | | | | | | | 17 | | | | |
| | | | | | | | | 18 | 3 | (14) MS dense, wet, lt gray SAND trace silt fine grained sand | | |
| – | 95 | 5 | 0900 | 18 | 19.5 | SPT | S6 | 1.3 19 | 5 | pocket of dk gray clay w/ chem-like odor (possible slough) @ ~ 1.1 ft | | |
| | | | | | | | | | 9 | (not in sample) | | |
| | | | | | | | | 20 | | | | |

Attachment Figure A.1-4

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJ GB0052 Date 5/9/10 Sheet 2 of 3 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT / ST ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 59.5 Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 20 | | | | |
| | | | | | | | | 21 | | | | |
| | | | | | | | | 22 | | | | |
| – | 80 | 20 | 0910 | 23 | 24.5 | SPT | S7 | 23 | 4 | (19) Md. dense, wet, lt gray w/ black specs, SAND w/ gray clay interbeds | SP | |
| | | | | | | | | 24 | 6 | | | |
| | | | | | | | | | 13 | | | |
| | | | | | | | | 25 | | | | |
| | | | | | | | | 26 | | | | |
| | | | | | | | | 27 | | | | |
| – | 85 | 15 | 915 | 28 | 29.5 | SPT | S8 | 28 | 3 | (19) Md. dense, wet, lt gray w/ black red, + some shell grains, SAND w interbeds of gray CLAY LAYER OF Gray clay in bottom 0.2' | SP - SC | |
| | | | | | | | | 2' | 4 | | | |
| | | | | | | | | 29 | 15 | | | |
| | | | | | | | | 30 | | | | |
| | | | | | | | | 31 | | | | |
| | | | | | | | | 32 | | | SP | |
| – | 35 | 65 | 925 | 33 | 34.5 | SPT | S9 | 33 | 10 | (39) Md. dense, wet, lt gray sand to ABUNDANT SHELLS IN between layers Hard, lt bluish gray, sl. sandy CLAY (CH) @ 0.9' (beaumont Form) (sample taken is only clay) | CH | |
| | | | | | | | | 1.4 | 15 | | | |
| | | | | | | | | 34 | 24 | | | |
| | | | | | | | | 35 | | | | |
| | | | | | | | | 36 | | | | |
| | | | | | | | | 37 | | | | |
| 5 | 5 | 90 | 935 | 38 | 39.5 | SPT | S10 | 38 | 12 | (45) HARD, damp, lt bluish gray + lt reddish brown, CLAY w trace gravel + sand (beaumont) | | |
| | | | | | | | | 2' | 17 | | | |
| | | | | | | | | 39 | 28 | | | |
| | | | | | | | | 40 | | | | |

Attachment Figure A.1-5

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB002 Date 5/9/10 Sheet 3 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather CLOUDY 70°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT/ST ATD Water
Bottom of Boring 59.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 945 | 43 | 45 | ST | S11 | | | | | |
| — | — | 100 | 1000 | 48 | 49.5 | SPT | S12 | 1.4 | 10<br>19<br>20 | (45) HARD, damp, lt reddish-brown w/ gray + black mottling, CLAY w/ occassional chert | | (CH) |
| — | — | 100 | 1015 | 53 | 54.5 | SPT | S13 | 1.7 | 14<br>18<br>22 | (40) HARD, damp, lt bluish-gray w/ lt reddish brown throughout CLAY (CH) | | (CH) |
| — | — | | 1030 | 58 | 59.5 | SPT | S14 | 2' | 28<br>50/4" | (50/4") Bottom 0.9' collected HARD, damp, lt bluish-gray CLAY F to M grained gray SAND in sample head BOTTOM OF BORING AT 59.5 FT | BORING COMPLETED | CH<br>SP |

Attachment Figure A.1-6

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: 10.7' DEPTH TO MUDLINE FROM WATER; 11.4' " " DECK | Boring SJ GB003 Date 5/8/10 Sheet 1 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather CLOUDY 75°F |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT / ST ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 119.5 Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 815 | 0 | 2 | SPT ST | S1 | 0 2' 1 | | Appears to be soft gray sandy SILT w/ WOOD | | |
| – | 60 | 40 | 820 | 2 | 3.5 | SPT | S2 | 2 3 | 0 | WOH @ VERY LOOSE, WET GRAY v. silty SAND (SM) | | |
| – | 50 | 50 | 825 | 6 | 7.5 | SPT | S3 | 6 2' 7 | 1 0 1 | ① Very loose wet gray silty SAND (SM) w/ shells + H2S odor. to grading to soft wet gray sandy SILT to sandy CLAY (MH-CH) | | |
| | | | 835 | 10 | 12 | ST | S4 | 10 1.9 11 12 | | | | |
| – | 30 | 70 | 900 | 13 | 14.5 | SPT | S5 | 13 1.6 14 | 2 4 6 | ⑩ M. STIFF, wet to moist, gray CLAY W LAYERS of light gray SAND F-M grained @ 0.3 ft reddish-brown stiff clay. (BEAUMONT FORM) | (RECENT SED.) gray clay SILT/SAND RED CLAY | |
| – | 5 | 95 | 925 | 18 | 19.5 | SPT | S6 | 18 1.8 19 | 3 6 12 | top 0.7' slough bottom ⑱ stiff, dump, reddish brown CLAY w/ layers + pockets of white CLAY | | |
| | | | | | | | | 20 | | SLOUGH WAS LT GRAY, COARSE, SUB ROUND SAND (OTTAWA?) | | |

Attachment Figure A.1-7

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGB003 Date 5/8/10 Sheet 2 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather CLOUDY 75°F |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT/ST ATD Water |
| Obs. Well Install. Yes No | Bottom of Boring 119.5 Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 20 | | | | |
| | | | | | | | | 21 | | | | |
| | | | | | | | | 22 | | | | |
| – | <5 | 95 | 926 | 23 | 24.5 | SPT | S7 | 23 1.7 24 | 8 14 20 | (34) STIFF, MOIST, very LT gray to white CLAY (CH) w/ TRACE Lt yellowish brown fg. SAND | CH | |
| | | | | | | | | 25 | | | | |
| | | | | | | | | 26 | | | | |
| | | | | | | | | 27 | | ~~overpushed? large amount of sand~~ mmm tube v. slightly damaged yellow + red CLAY | | |
| | | | 935 | 28 | 30 | ST | S8 | 28 21 29 | | | | |
| | | | | | | | | 30 | | | | |
| | | | | | | | | 31 | | | | |
| | | | | | | | | 32 | | | NT | |
| 5 | 5 | 90 | 940 | 33 | 34.5 | SPT | S9 | 33 34 | 8 10 11 | (21) poor recovery poor sample (md. stiff, moist/damp, lt gray clay w trace of reddish brown clay (CL) | | |
| | | | | | | | | 35 | | | | |
| | | | | | | | | 36 | | | | |
| | | | | | | | | 37 | | | | |
| – | – | 100 | 945 | 38 | 39.5 | SPT | S10 | 38 1.5 39 | 10 15 24 | 39 red clay STIFF, DAMP, lt reddish-brown, CLAY w/ pockets of lt gray CLAY (CH) | | |
| | | | | | | | | 40 | | | | |

Attachment Figure A.1-8

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SSGB023 Date 5/8/10 Sheet 3 of 6
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather P. CLOUDY WINDY 75°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT/ ST ATD Water
Bottom of Boring 119.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 40 | | | | |
| | | | | | | | | 41 | | | | |
| | | | | | | | | 42 | | 1.2 ft good sample, remainder slough | | |
| – | – | 100 | 1000 | 43 / 53 | 44.5 / 54.5 | SPT | S11 | 43 / 2' / 44 | 12 / 21 / 35 | (56) Vi, STIFF, DAMP, M. reddish brown to M blue gray CLAY (Beaumont) | | |
| | | | | | | | | 45 | | | | |
| | | | | | | | | 46 | | | | |
| | | | | | | | | 47 | | | | |
| – | – | 96 / 100 | 1000 | 48 | 49.5 | SPT | S12 | 48 / 1.4 / 49 | 11 / 17 / 21 | Good sample (38) STIFF, DAMP, M. blue gray CLAY (Beaumont) | | |
| | | | | | | | | 50 | | | | |
| | | | | | | | | 51 | | | | |
| | | | | | | | | 52 | | | | |
| – | – | 100 | 1020 | 53 | 54.5 | SPT | S13 | 53 / 42 / 54 | 6 / 6 / 8 | (19) SOFT, STIFF, DAMP, M gray CLAY more plastic - containing occasional wood fibers + debris w/ depth grades to darker (Beaumont) brown gray w/ wood content + depth | | AL |
| | | | | | | | | 55 | | | | |
| | | | | | | | | 56 | | | | |
| | | | | | | | | 57 | | | | |
| – | 10 | 90 | 1030 | 58 | 59.5 | SPT | S14 | 58 / 1.5 / 59 | 8 / 12 / 20 | (32) STIFF, DAMP, M gray sl. fine grained slightly CLAY w/ Trace wood fragments. | | |
| | | | | | | | | 60 | | | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB003 Date 2/5/10 Sheet 4 of 6
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather P.cloudy 75°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT/ST ATD Water
Bottom of Boring 119.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | 5 | 95 | 1040 | 63 | 64.5 | SPT | S15 | 1.5 | 5 8 15 | (23) STIFF, damp, lt. gray CLAY w/ trace f. gravel SAND + trace wood fragments (Beaumont?) | | |
| — | 45 | 95 | 1055 | 68 | 69.5 | SPT | S16 | 5 | 11 17 28 | (45) sample overpenetrated (full of slough) slough is top 0.5'+ SAME AS ABOVE | | |
| — | — | 100 | 1105 | 73 | 74.5 | SPT | S17 | 2' | 6 11 15 | top 0.5' was slough (26) STIFF, damp, dark gray CLAY w/ trace of wood fragments | | |
| | | | 1150 | 77 | 79 | ST | S18 | 2' | | | switched drillers + cathead pullers | |

Attachment Figure A.1-10

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGE003 Date 5/8/10 Sheet 5 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather CLOUDY 75° WINDY FROM N |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT/ST ATD Water |
| Obs. Well Install. Yes / No | Bottom of Boring 119.5 Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 80 | | | | |
| | | | | | | | | 81 | | | | |
| | | | | | | | | 82 | | | | |
| — | 40 | 60 | 1200 | 83 | 84.5 | SPT | S19 | 83 0.6 84 | 14 22 26 | (48) ENTIRE sample appears to be slough; a mix of the layers above. red clay, gray sand etc. | | NT |
| | | | | | | | | 85 | | | | |
| | | | | | | | | 86 | | | SM | |
| | | | | | | | | 87 | | | | |
| — | 15 | 85 | ~~1245~~ 1210 | 88 | 89.5 | SPT | S20 | 88 89 | 14 22 26 | WM 5/8 (48) 50/5" v. dense, MOIST, sl. silty to silty SAND (SM) F. grained sand | | |
| | | | | | | | | 90 | | | | |
| | | | | | | | | 91 | | | | |
| | | | | | | | | 92 | | | | |
| | | | 1230 | 93 | 94.5 | SPT | S21 | 93 2' 94 | 11 17 25 | top 0.1' slough (42) from 1.9 to 1.2 ft & Dense, Moist, lt gray f. to m. grained silty SAND SP w/ silt in pockets. From 0 to 1.2 ft: stiff, damp, dk gray CLAY w/ trace wood fragments + moderate pockets of lt. gray chert. | (sample from lower portion f.g.) | SP CL |
| | | | | | | | | 95 | | | | |
| | | | | | | | | 96 | | | | |
| | | | | | | | | 97 | | | | |
| — | — | 100 | 1245 | 98 | 99.5 | SPT | S22 | 98 2' 99 | 24 50/4" | 50/4" Driven 10" but 2' of sample bottom 0.6' is stiff, damp, dark brown to black organic silt to pt. | OL/pt | |
| | | | | | | | | 100 | | material in upper sampler is gray mg sand w/ red gray clay | | |

Attachment Figure A.1-11

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGB003 Date 5/8/10 Sheet 6 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather P. CLOUDY 75°F WIND FROM N |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT/ST ATD Water |
| Obs. Well Install. Yes ~~No~~ | Bottom of Boring 119.5 Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 100 | | | | |
| | | | | | | | | 101 | | | | |
| | | | | | | | | 102 | | | | |
| | | | | | | | | 103 | | 2' OF MAT. IN sample (32) stiff, damp, lt. bluish gray CLAY (CH) | | |
| – | – | 100 | 1305 | 103 | 104.5 | SPT | S23 | 1.6 | 10 12 22 | | | |
| | | | | | | | | 104 | | | | |
| | | | | | | | | 105 | | | | |
| | | | | | | | | 106 | | | | |
| | | | | | | | | 107 | | | | |
| | | | | | | | | 108 | | (39) SAME AS ABOVE | | |
| – | – | 100 | 1325 | 108 | 109.5 | SPT | S24 | 2' | 15 15 24 | | | |
| | | | | | | | | 109 | | | | |
| | | | | | | | | 110 | | | | |
| | | | | | | | | 111 | | | | |
| | | | | | | | | 112 | | | | |
| | | | | | | | | 113 | | (50/4") v. DENSE (mo. dense), wet, lt bluish gray f. grained silty SAND (SM) | | |
| – | 70 | 30 | 1340 | 113 | 114.5 | SPT | S25 | 1.1 | 30 50/4" | slough has sand clay + lard gravel | SM | |
| | | | | | | | | 114 | | | | |
| | | | | | | | | 115 | | | | |
| | | | | | | | | 116 | | | | |
| | | | | | | | | 117 | | | | |
| | | | | | | | | 118 | | 0.7 good sample rest was slow | | |
| – | 80 | 20 | 1400 | 118 | 119.5 | SPT | S26 | 0.7 | 15 30 45 | (75) v. dense, gray f.g. silty SAND (SM) | | |
| | | | | | | | | 119 | | | | |
| | | | | | | | | 120 | | | | |

Attachment Figure A.1-12

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: 5.6 FT TO MUDLINE | Boring SSGB004 Date ~~5/9/10~~ 5/11/10 |
| | Sheet 1 of 3 |
| | Job San Jacinto Waste Pits |
| | Job No. 090557-01 |
| | Logged By WES MACDONALD |
| | Weather SUNNY WIND FROM S |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT - ST |
| | ATD Water Level Depth |
| Obs. Well Install. Yes (No) | Bottom of Boring 59.5 |

| Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 20 | 80 | 1315 | 0 | 1.5 | SPT | S1 | 0 / 0.4 / 1 | 6 / 2 / 2 | poor recovery · catcher in backwards @ soft, wet, dk gray sl. sandy SILT w trace shells + organic debris (wood) | | NT |
| – | 15 | 80 | 1330 | 2 | 3.5 | SPT | S2 | 2 / 3 / 0.1 | 1 / 1 / 1 | poor recovery · catcher in backwards SAME AS ABOVE | | NT |
| – | <5 | 100 | 1345 | 4 | 6 | ST push | S3 | 4 / 2' / 5 | | SHELBY TUBE WAS EXTRUDED ON BOARD SOFT, WET, GRAY TO DK GRAY SILTY CLAY w/ thin sand lens | | GS AL |
| – | <5 | 100 | 1350 | 6 | 7.5 | SPT | S4 | 6 / 2' / 7 | 0 / 0 / 0 | WOR V. SOFT, WET, DK GRAY CLAY w/ TR. SILT + sand | CH | |
| – | 10 | 90 | 1355 | 8 | 9.5 | SPT | S5 | 8 / 2' / 9 | 0 / 0 / 0 | WOR V. SOFT, WET, DK GRAY CLAY w/ TR SAND LAYERS, gray | | |
| | | | 1400 | 10 | 12 | ST push | S6 | 10 / 2' / 11 / 12 | | | | |
| – | 35 | 65 | 1410 | 13 | 14.5 | SPT | S7 | 13 / 2' / 14 | 0 / 0 / 0 | WOH @ 14 ft change V. SOFT, WET, DK GRAY CLAY to Md. dense, wet, lt gray SAND w black specks Fine to med grained | CH / SP | |
| – | 35 | 65 | 1420 | 18 | 19.5 | SPT | S8 | 18 / 1.4 / 19 / 20 | 5 / 9 / 9 | change at 19.1 ft ! (18) SOFT, wet DK gray CLAY to lt gray w/ black specks SAND | CH / SP | |

Attachment Figure A.1-13

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB004 Date 5/11/10 Sheet 2 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 85° WINDY

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT / ST ATD Water

Bottom of Boring 59.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1430 | 23 | 24.5 | SPT | SJ9 | 23 | 8 | (30) No Recovery shoe of sampler was lost in ground | | |
| | | | | | | | | 24 | 15 | | | |
| | | | | | | | | | 15 | | | |
| 5 | - | 95 | 1440 | 28 | 29.5 | SPT | SJ10 | 28 | 7 | (38) V. HARD, damp, lt reddish brown & CLAY w/ fine gravel | CH | |
| | | | | | | | | 1.3 | 12 | | | |
| | | | | | | | | 29 | 20 | | | |
| - | - | 100 | 1455 | 33 | 34.5 | SPT | SJ11 | 33 | 10 | Upper 1.4 of sample appears to be slough (CH gray sand w/ pockets of gray & red-brown silty clay) | CH | |
| | | | | | | | | 34 | 12 | (27) HARD, damp to dry, lt reddish-brown w/ black & lt gray splotches CLAY | | |
| | | | | | | | | | 15 | | | |
| | | | | | | | | | | Upper 1.4 slough | | |
| - | - | 100 | 1505 | 38 | 39.5 | SPT | SJ12 | 38 | 8 | (26) HARD, damp & same as above fewer to no splotches & other color | | |
| | | | | | | | | 8.6 | 11 | trace gravel @ sample top (slough?) | | |
| | | | | | | | | 39 | 17 | | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB004 Date 5/11/10 Sheet 3 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By Wes MacDonald Weather Sunny Winds SE

Drilled By Triangle Resources Heavy from SE

Drill Type/ Method Rotary

Sampling Method SPT/ST ATD Water

Bottom of Boring 59.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1535 | 43 | 45 | ST | S13 | 43 γ 44 | | | | |
| — | 25 | 75 | 1550 | 48 | 49.5 | SPT | S14 | 48 W3 49 | 12 50/6" | (50/6") V. Hard, moist, lt. bluish gray sl. f-g sandy CLAY. bottom 0.2 ft lt bluish gry, wet silty SAND | (CL) | |
| — | 10 | 90 | 1550 | 53 | 54.5 | SPT | S15 | 53 1.5 54 | 8 12 22 | (34) V. HARD, wet to moist, lt. bluish-gray sl. sandy CLAY | | |
| — | 10 | 90 | 1605 | 58 | 59.5 | SPT | S16 | 58 1.4 59 | 8 12 20 | (32) V. Hard, moist, lt. bluish gray sl. sandy CLAY | (CL) | |
| | | | | | | | | 60 | | BOTTOM OF BORING 59.5' @ 5/11/10 | 1625 | |

Attachment Figure A.1-15

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:
Water level 5.4 ft to deck
1006 5-6-10

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB005 Date 5/6/10 Sheet 1 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By Laplante / MacDonald Weather Clear 85°
Drilled By Triangle Resources
Drill Type/ Method Rotary
Sampling Method SPT & Push ATD Water
Bottom of Boring 61.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | 100 | | 0 | 2 | | SJGB005-S1 | 0 | | (Soft), wet, brown organic SILT with abundant wood fibers | | |
| - | 95 | 5 | | | | | | 1 | | | | |
| | | | | | | | | 2 | | | | |
| | | | | | | | | 3 | | SILT, wet, gray, fine to medium SAND | | |
| - | 40 | 60 | 1040 | 4 | 5.5 | SPT | S2 | 4 | 9 | V. SOFT, WET, GRAY V. SANDY CLAY (CL) MOD. w/ ALTERNATING LAYERS OF CLAY & SAND | | |
| | | | | | | | | 5 | | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | |
| | | | | | | | | 8 | | | | |
| | | | | | | | | 9 | | | | |
| - | 20 | 80 | 1058 | 10 | 11.5 | SPT | S3 | 10 | 0 | WT. OF HAMMER V. SOFT, WET, GRAY, SANDY CLAY w/ # OCCASIONAL ALTERNATING LAYERS OF CLAY & SAND | OVER-PUSHED 6" | |
| | | | | | | | | 11 | 0 | | | |
| | | | | | | | | 12 | 0 | | | |
| | | | | | | | | 13 | | | | |
| | | | | | | | | 14 | | | | |
| - | 40 | 60 | 1105 | 15 | 16.5 | SPT | S4 | 15 | 4 | (15) SOFT, WET. GRAY CLAY w LAYERS OF WT LT GRAY poorly graded rounded SAND LAYERS OF CLAY & SAND WERE 4-6" ea) | | |
| | | | | | | | | 16' | 3 | | | |
| | | | | | | | | 16 | 12 | | | |
| | | | | | | | | 17 | | | | |
| | | | | | | | | 18 | | | | |
| | | | | | | | | 19 | | | | |
| | | | | | | | | 20 | | | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB005 Date 5/6/10 Sheet 2 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By LAPLANTE / MACDONALD Weather Clear 85°
Drilled By TRIANGLE RESOURCES
Drill Type/ Method Rotary
Sampling Method SPT & Shelby ATD Water
Bottom of Boring 101.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 90 | 10 | 1120 | 20 | 21.5 | X | S5 | 20 | 6 | (10) Loose to M. dense, moist, lt. gray fine to coarse SAND | | |
| | | | | | | | | 21 | 4 | | | |
| | | | | | | | | | 6 | | | |
| | | | | | | | | 22 | | | | |
| | | | | | | | | 23 | | | | |
| | | | | | | | | 24 | | | | |
| 0 | 90 | 10 | 1122 | 25 | 26.5 | X | S6 | 25 | 11 | (50) Dense to v. dense, moist lt. gray F-C SAND | | |
| | | | | | | | | 26 | 20 | | | |
| 0 | 5 | 95 | | | | | | | 30 | Hard, damp, brown and gray CLAY (Beaumont) | | |
| | | | | | | | | 27 | | | | |
| | | | | | | | | 28 | | | | |
| | | | | | | | | 29 | | | | |
| | | | | | | | | 30 | 15 | (51) Hard, damp gray transitioning to brown CLAY (Beaumont) | | |
| 0 | 5 | 95 | 1130 | 30 | 30.5 | X | S7 | 31 | 20 | | | |
| | | | | | | | | | 31 | | | |
| | | | | | | | | 32 | | | | |
| | | | | | | | | 33 | | | | |
| | | | | | | | | 34 | | | | |
| | | | | | | | | 35 | 6 | (35) Hard, damp, red brown CLAY (Beaumont) | | |
| 0 | 10 | 90 | 1140 | 35 | 36.5 | X | S8 | 36 | 8 | | | |
| | | | | | | | | | 27 | | | |
| | | | | | | | | 37 | | | | |
| | | | | | | | | 38 | | | | |
| | | | | | | | | 39 | | | | |
| | | | | | | | | 40 | | | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB005 Date 5/6/10 Sheet 3 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By LAPLANTE/MACDONALD Weather Clear 85°
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT & PUSH ATD Water
Bottom of Boring 61.5 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 10 | 90 | 1145 | 40 | 41.5 | X | S-9 | 40 | 10 | (41) Hard, damp, red brown CLAY (Beaumont) with lt. gray mottling | | |
| | | | | | | | | 41 | 16 | | | |
| | | | | | | | | | 25 | | | |
| | | | | | | | | 42 | | | | |
| | | | | | | | | 43 | | | | |
| | | | | | | | | 44 | | | | |
| 0 | 15 | 85 | 1155 | 45 | 46.5 | X | S-10 | 45 | 14 | (40) Hard, damp, gray sl. sandy, silty CLAY | | |
| | | | | | | | | 46 | 18 | | | |
| | | | | | | | | | 22 | | | |
| | | | | | | | | 47 | | | | |
| | | | | | | | | 48 | | | | |
| | | | | | | | | 49 | | | | |
| | | | | | | | | 50 | 50 | (50/5½") Dense to hard, gray, damp, silty, clayey SAND to sandy, silty CLAY | fine | |
| 0 | 50 | 50 | 1205 | 50 | 51.5 | X | S-11 | 50 | 50 | /5½" | | |
| | | | | | | | | 51 | | | | |
| | | | | | | | | 52 | | | | |
| | | | | | | | | 53 | | | | |
| | | | | | | | | 54 | | | | |
| | | | | | | | | 55 | 16 | (48) Hard, damp, gray silty CLAY | | |
| 0 | 10 | 90 | 1220 | 55 | 56.5 | X | S-12 | 56 | 16 | | | |
| | | | | | | | | | 32 | | | |
| | | | | | | | | 57 | | | DRILLER INDICATES CHANGE IN ACTION | |
| | | | | | | | | 58 | | | | |
| | | | | | | | | 59 | | | | |
| | | | | | | | | 60 | 15 | (92/10") Very dense, moist, gray fine to coarse SAND | | |
| 0 | 90 | 10 | 1230 | 60 | 61.5 | X | S-13 | 61 | 42 | | | |
| | | | | | | | | | 50/4 | | | |

BOTTOM OF HOLE AT 61.5 ft 1240 5/6/10

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGB006 Date 10/29/10 Sheet 1 of 2 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather SUNNY 65°F |
| | Drilled By TRIANGLE RESOURCES (PSI) Mash Buggy |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method 2' SPT ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 30 FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | <5 | 100 | 1030 | 0-6" | | ST | CR1-A | 0 | | (Soft to mdr stiff) 0 to 0.4 Brown ~~moist to~~ damp SILT w/ abundant roots | 2 STs TAKEN + COMPOSITED FOR 0-2' | Topsoil |
| | | | 1035 | 6"-12" | 0-2' | | CR1-B | 1.3' | | 0.4' to end ~~gray, moist~~ brownish gray moist w/ silt ~~gray~~ patches, blocky low plasticity w/ occassional roots SILT | | Rolp waste |
| | | | 1040 | 12"-24" 0' | 2' | | S1 | 2 | | | | |
| | | | 1100 | | | SPT | | 0.8' | 0 | (2) soft brown SILT | | |
| (5) | — | 100 | | 2 | 4 | | S2 | 3 | 0 2 2 | @ 0.3' dark gray v. soft, moist CLAY (muck) w/ small unknown gravel sized particles | | muck (waste?) |
| - | - | - | 1110 | 4 | 6 | ST | S3 | 4 2' 5 | | shelby tube | | |
| - | 30 | 70 | 1120 | 6 | 8 | SPT | S4 | 6 1.5' 7 | 11 7 8 9 | (15) stiff, damp to moist, gray sandy CLAY (CL) ~~sandy~~ clayey sand in upper 0.3' tr. shells + yellow mottling. | | CL |
| - | - | - | 1130 | 8 | 10 | ST | S5 | 8 1.5 9 10 | | | | |
| - | 25 | 75 | 1140 | 13 | 15 | SPT | S6 | 3 1.9' 4 5 | 0 0 0 0 | (0) WOH v. soft, wet to moist, gray, sandy silty CLAY (CL) @ 0.9 v. soft moist gray clay (CH) w/ trace organics @ transition | | |
| - | 75 | 25 | 1150 | 18 | 20 | SPT | S7 | 8 1.2' 9 20 | 3 7 14 14 | (28) Md dense, tt gray, moist m to f grained clayey SAND sc w/ SP containing layers of gray soft clay. | | SP-SC |

Attachment Figure A.1-19

# Soil Boring Processing Log

ANCHOR QEA

Boring Location: CATHEAD MINNOW POLL HAMMER

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB006 Date 10/29/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 65°F

Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY

Drill Type/ Method ROTARY 4 1/4" BIT

Sampling Method 2' SPT / 2' ST ATD Water

Bottom of Boring 30FT Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 20 | | | | |
| | | | | | | | | 1 | | | | |
| | | | | | | | | 2 | | | | |
| — | 95 | 5 | 1200 | 23 | 25 | SPT | S8 | 3 | 10 | (53) V. Dense, moist, lt gray, med to fine grained SAND (SP) w/ tr. pockets of clay w/ gr | | |
| | | | | | | | | 14 4 | 18 | | | |
| | | | | | | | | | 35 | | | |
| | | | | | | | | 5 | 50/5" | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | |
| — | 100 | 45 | 1210 | 28 | 30 | SPT | S9 | 8 | 15 | (45) M Dense, wet, lt gray, coarse grained SAND (SP) rounded to subrounded particles | | |
| | | | | | | | | 2' 9 | 18 | | | |
| | | | | | | | | | 27 | red/black gray white yellow grains | | |
| | | | | | | | | 30 | 38 | | | |
| | | | | | | | | 1 | | BOTTOM OF BORING, FILLING UP WITH MD. BENTONITE CHIPS | | |
| | | | | | | | | 2 | | | | |
| | | | | | | | | 3 | | | | |
| | | | | | | | | 4 | | | | |
| | | | | | | | | 5 | | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | |
| | | | | | | | | 8 | | | | |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 0 | | | | |

Attachment Figure A.1-20

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: LL WATER DEPTH 5' 5.6' FROM DECK TO MUDLINE @ 0830 | Boring SJGB007 Date 5/7/16 Sheet 1 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather P. SUNNY 70°F |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT + SHELBY ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 119.5FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0830 | 0 | ~~0~~ 2 | ~~2~~ ST | S1 | 0–2 | | APPEARS TO BE SOFT, WET GRAY SANDY SILT | | |
| – | ~~40~~ 45 | 55 | 0835 | 2 | ~~2~~ 3.5 | ~~3.5~~ SPT | S2 | 2–3 (2') | 0 | WOH V. SOFT, GRAY, WET V. SANDY SILT (ML) w/ OCCASSIONAL WOOD DEBRIS | | |
| – | 55 | 45 | 0840 | 6 | ~~8~~ 7.5 | SPT | S3 | 6–7 (2') | 1, 1, 2 | (3) LOOSE, WET, GRAY, V. SILTY SAND (SM) w/ OCCASSIONAL TO MOD. WOOD DEBRIS | ML/SM | |
| | | | | | | | | | | | CC | |
| – | 15 | 85 | 0905 | 10 | 11.5 | SPT | S4 | 10–11 (2') | 1, 1, 1 | (2) SOFT, WET, GRAY CLAY w OCCASIONAL INTERBEDS OF GRAY SAND | | |
| | | | 910 | 13 | 15 | ST | S5 | 13–15 (2.2) | | | | |
| – | 100 | ~~0912~~ – | 0912 | 18 | 19.5 | ST | S6 | 18–19 (2.2') | 1, 16, 14 | (30) MD. DENSE, WET, GRAY LT GRAY w/ BLACK SPECS SAND (SP) w 2x 4"–6" Dk gray CLAY/SILT LAYERS SOFT (CH) | (Lower sample in double picture) | |
| – | – | 100 | | | | | | | | | | |

NOTE: - NO DRY ERASE MARKER, PICTURES OF SAMPLES ARE TAKEN IN ORDER SOME ST SAMPLE pictures are omitted.

- SPT samples have extra material in upper 0.5'. THIS MATERIAL IS CONSIDERED TO be fallen slough here.

Attachment Figure A.1-21

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB007 Date 5/7/10 Sheet 2 of 6
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather P. SUNNY 75°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT / ST ATD Water
Bottom of Boring 119.5FT Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 20 | | | | |
| | | | | | | | | 21 | | | | |
| | | | | | | | | 22 | | | (BEAUMONT FORM) | |
| – | 5 | 95 | 425 | 23 | 24.5 | SPT | S7 | 23 2' 24 | 13 18 24 | (40) HARD, DRY, LT bluish gray, SL. SANDY CLAY (CL) | | |
| | | | | | | | | 25 | | | | |
| | | | | | | | | 26 | | | | |
| | | | | | | | | 27 | | | | |
| – | 10 | 90 | 0945 | 28 | 29.5 | SPT | S8 | 28 1.5 29 | 11 47 50 | (97) V. HARD, DAMP, LT bluish gray w/ RED BROWN MOTTLING, SL. SANDY CLAY (CL-CH) | 1ST PICTURE ON BOARD | |
| | | | | | | | | 30 | | | | |
| | | | | | | | | 31 | | | COLOR CHANGE | |
| | | | | | | | | 32 | | | | |
| – | – | 100 | 955 | 33 | 34.5 | SPT | S9 | 33 2' 34 | 11 15 26 | (41) HARD, MOIST, REDDISH BROWN w/ GRAY/WHITE VEINS & MOTTLING CLAY (CH) sand is overlying material | | |
| | | | | | | | | 35 | | | | |
| | | | | | | | | 36 | | | | |
| | | | | | | | | 37 | | | | |
| – | – | 100 | 1000 | 38 | 39.5 | SPT | S10 | 38 2' 39 | 11 14 18 | (32) HARD, MOIST to damp, REDDISH BROWN CLAY gray-brown clay in | | |
| | | | | | | | | 40 | | | | |

Attachment Figure A.1-22

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: PICTUR | Boring SJGB Date 5/7/10 Sheet 3 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT/ST ATD Water |
| Obs. Well Install. Yes No | Bottom of Boring 119.5 FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 40 | | | | |
| | | | | | | | | 41 | | | | |
| | | | | | | | | 42 | | | | |
| | | | 1010 | 43 | 45 | ST | S11 | 43 2.2 | | Appears to be sl. sandy bluish lt gray CLAY | | |
| | | | | | | | | 44 | | | ~~gr. transition~~ | |
| | | | | | | | | 45 | | | | |
| | | | | | | | | 46 | | | | |
| | | | | | | | | 47 | | | | |
| | | | | | | | | 48 | | (51) HARD, MOIST, lt bluish gray F.G. sandy CLAY (CL) Low to No Plasticity | | |
| – | 20 | 80 | 1020 | 48 | 49.5 | SPT | S12 | 2' 49 | 20 20 31 | | | |
| | | | | | | | | 50 | | | ~~gr. transition~~ gr. transition | |
| | | | | | | | | 51 | | | | |
| | | | | | | | | 52 | | | | |
| – | 90 | 5/10 | 1030 | 53 | 54.5 | SPT | S13 | 53 1.2 | 18 26 32 | (50) V. DENSE, moist to wet, lt gray fine to med.-grained SAND SP, sl. silty soft clay/SAND mix | | |
| | | | | | | | | 54 | | | | |
| | | | | | | | | 55 | | | ~~gr. transition~~ | |
| | | | | | | | | 56 | | | | |
| | | | | | | | | 57 | | | | |
| – | 80 | 20 | 1040 | 58 | 59.5 | SPT | S14 | 58 1.1 | ~~10~~ 15 ~~20~~ 26 ~~32~~ 31 | ~~(58)~~ (57) V. DENSE, wet, lt. gray silty F to M-grained SAND (SM) | | |
| | | | | | | | | 59 | | | | |
| | | | | | | | | 60 | | | | |

Attachment Figure A.1-23

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGB007 Date 5/7/10 Sheet 4 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD W Weather P-SUNNY 75°F |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT/ST ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 119.5 FT Level Depth |

162631

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | S | | 60 | | | | |
| | | | | | | | | 61 | | | | |
| | | | | | | | | 62 | | | | |
| — | 45 | 55 | 1050 | 63 | 64.5 | SPT | S15 | 63 1.4 64 | 15 5 14 | (19) MD. DENSE, WET, LT gray SILTY FG SAND TO (SM) STIFF, DAMP, Lt gray to Lt bluish gray f.g. sandy CLAY (CL) | | |
| | | | | | | | | 65 | | | color darkens + st. mat change | |
| | | | | | | | | 66 | | | | |
| | | | | | | | | 67 | | | | |
| | | | 1100 | 68 | 69.5 | SPT | S16 | 68 1.3 69 | 18 40 50/4" | 90/10 V. DENSE, MOIST, GRAY, clayey SAND SC FG SAND | | |
| | | | | | | | | 70 | | | | |
| | | | | | | | | 71 | | | | |
| | | | | | | | | 72 | | | | NT |
| ~ | 50 | 50 | 1115 | 73 | 74.5 | SPT | S17 | 73 0.7 74 | 26 40 36 | (76) poor recovery sample missing from bottom. Recovery Mat. possibly slough, Des. of recov. lt gray sand to gray + red-brown clay | ? | |
| | | | | | | | | 75 | | | | |
| | | | | | | | | 76 | | | | |
| | | | | | | | | 77 | | | | NT |
| | | | 1130 | 78 | 79.5 | SPT | S18 | 78 0.5 79 | 26 50/5" | (50/5") poor recovery Mat rec likely slough but sampled anyway. SAME AS ABOVE gray sand w/ clay | | |
| | | | | | | | | 80 | | | | |

Attachment Figure A.1-24

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB007 Date 5/7/10 Sheet 5 of 6

Job San Jacinto Waste Pits Job No. 090557-01

Logged By MACDONALD Weather SUNNY 85°F

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 119.5 ft Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | 85 | 15 | 1328 not on COC | 83 | 89.5 | SPT | S19 | 80 | 83 1.8 84 | (28) M. DENSE, WET LT GREY to Black grn (accessory) (approx mix of dirty sand - sub rounded f-m grained SAND w occasional pockets of clay. ↓ grey to red-brown mottled | | |
| | | | | | | | | | 36 47 32 36 46 | | | |
| | | | | | | | | 85 | | | | |
| | | | | | | | | 86 | | | color/texture change | |
| | | | | | | | | 87 | | | | |
| — | 60 | 40 | 1335 | 88 | 89.5 | SPT | S20 | 88 1.1' | 40 50/5" | (50/5") MD. Dense, MOIST, grey fg - clayey SAND (SC) grades from clayey to fg SAND @ bottom | | |
| | | | | | | | | 89 | | | | |
| | | | | | | | | 90 | | | | |
| | | | | | | | | 91 | | | | |
| | | | | | | | | 92 | | | | |
| - | - | 100 | 1350 | 93 | 94.5 | SPT | S21 | 93 2' 94 | 10 10 10 | (20) STIFF, MOIST TO DAMP, GRAY CLAY (CH) | | |
| | | | | | | | | 95 | | | | |
| | | | | | | | | 96 | | | | |
| | | | | | | | | 97 | | | | |
| - | - | 100 | 1405 | 98 | 99.5 | SPT | S22 | 98 2' 99 | 10 17 18 | (35) STIFF, DAMP DARK GRAYISH BROWN silty CLAY w moderate wood fragments to ~0.7' ML. stiff, moist, gray CLAY w/ occasional wood fragments | | |
| | | | | | | | | 100 | | | | |

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGB007 Date 5/7/10 Sheet 6 of 6 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather SUNNY 90°F |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT ST ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 119.5 FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 100 | | | | |
| | | | | | | | | 101 | | | | |
| | | | | | | | | 102 | | | | |
| - | - | 100 | 1420 | 103 | 104.5 | SPT | S23 | 103 1.3 104 | 15 24 26 | (50) V. STIFF, MOIST, Lt bluish gray CLAY (CH) (MATERIAL was pulled back through outlet on retrieval) | | |
| | | | | | | | | 105 | | | | |
| | | | | | | | | 106 | | | | |
| | | | | | | | | 107 | | | | |
| - | 5 | 95 | 1425 | 108 | 109.5 | SPT | S24 | 108 2' 109 | 13 50/5" | (50/5") TOP 1.2' Appeared to be slough V. STIFF, DAMP, lt bluish gray tan gray sl. sandy silty CLAY. (CL) | | |
| | | | | | | | | 110 | | | | |
| | | | | | | | | 111 | | | | |
| | | | | | | | | 112 | | | | |
| 65? - | 30 | 70 | 1450 | 113 | 114.5 | SPT | S25 | 113 1.9 114 | 16 18 28 | (46) only 1.6 was sample 0.3 - slough "mid stiff" - stiff moist, gray F.g. sandy CLAY w/ LAYERS of clayey sand (CL) | | |
| | | | | | | | | 115 | | | | |
| | | | | | | | | 116 | | | | |
| | | | | | | | | 117 | | | | |
| - | 10 | 90 | 1510 | 118 | 119.5 | SPT | S26 | 118 2' 119 | 50/4" | POOR RECOVERY MOST OF SAMPLE IS SLOUGH BOTTOM 0.4 SOFT, GRAY, MOIST ~~CLAY~~ CH ~~W SAND~~ sandy CLAY | (High blow counts + soft sample sample may not be indicative | |
| | | | | | | | | 120 | | BOTTOM OF BORING AT 119.5 FT 5/7/10 | | |

Attachment Figure A.1-26

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

WATER DEPTH 5.0 Ft to Deck 1315 5/6/10

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB008 Date 5/6/10 Sheet 1 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By Laplante / MacDonald Weather Clear 85°

Drilled By Triangle Resources - Joe Luder

Drill Type/ Method Rotary

Sampling Method SPT & Push ATD Water

Bottom of Boring Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 60 | 40 | 1320 | 0 | 1.5 | X | S-1 | 0 | 0 | (0) very loose, moist to wet, dark gray clayey silty SAND with organics | | |
| | | | | | | | | 1 | 0 | | | |
| | | | | | | | | | 0 | | | |
| | | | | | | | | 2 | | | | |
| | | | | | | | | 3 | | | | |
| 0 | 75 | 25 | 1325 | 4 | 5.5 | X | S-2 | 4 | 0 | (0) v. loose, moist to wet, dark gray slightly clayey to clayey SAND. | | |
| | | | | | | | | | 0 | | | |
| | | | | | | | | 5 | 0 | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | |
| 0 | 55 | 45 | 1330 | 8 | 9.5 | X | S-3 | 8 | 1 | (1) very loose, moist, dark gray clayey SAND | | |
| | | | | | | | | 9 | 0 | | | |
| | | | | | | | | | 1 | | | |
| | | | | | | | | 10 | | | | |
| | | | | | | | | 11 | | | | |
| | | | | | | | | 12 | | | | |
| 0 | 40 60 | 60 40 | 1335 | 13 | 14.5 | X | S-4 | 13 | 1 | (3) Soft ~~very loose~~, moist to wet, dark gray ~~clayey~~ fine SANDY CLAY | | |
| | | | | | | | | | 1 | | | |
| | | | | | | | | 14 | 2 | | | |
| | | | | | | | | 15 | | | | |
| | | | | | | | | 16 | | | | |
| | | | | | | | | 17 | | | | |
| 0 | 10 | 90 | 1340 | 18 | 19.5 | X | S-5 | 18 | 1 | (4) soft, moist to wet, dark gray CLAY | | |
| | | | | | | | | | 1 | | | |
| | | | | | | | | 19 | 3 | | | |
| | | | | | | | | 20 | | | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB008 Date 5/6/10 Sheet 2 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By Laplante/ MacDonald Weather Clear 90°
Drilled By Triangle Resources
Drill Type/ Method Rotary
Sampling Method SPT ATD Water
Bottom of Boring Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 10 | 85 | 1345 | 23 | 24.5 | X | S-6 | 20–40 | 9, 9, 13 | (22) Very stiff, moist, blue gray CLAY with brown mottling. (Beaumont) | | |
| 0 | 5 | 95 | 1400 | 28 | 29.5 | X | S-7 | 20–40 | 11, 12, 20 | (32) Hard, damp to moist, blue gray and brown CLAY (Beaumont) | Gray – Brown | |
| 0 | 5 | 95 | 1405 | 33 | 34.5 | X | S-8 | 20–40 | 8, 17, 19 | (33) Hard, damp, brown & red CLAY (Beaumont) with scattered black clasts | | |
| 0 | 5 | 95 | 1415 | 38 | 39.5 | X | S-9 | 20–40 | 12, 14, 17 | (31) Hard, damp, brown and red CLAY (Beaumont) | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring STGB008 Date 5/6/10 Sheet 3 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By Laplante / MacDonald Weather Clear 90°
Drilled By Triangle Resources
Drill Type/ Method Rotary
Sampling Method SPT-R ATD Water
Bottom of Boring Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 40 | | | | |
| | | | | | | | | 41 | | | | |
| | | | | | | | | 42 | | | | |
| | | | | | | | | 43 | 21 | (68) Very dense, moist lt gray clayey fine SAND | | |
| 0 | 80 | 20 | 1425 | 43 | 44.5 | X | S-10 | 44 | 32 36 | | | |
| | | | | | | | | 45 | | | | |
| | | | | | | | | 46 | | | | |
| | | | | | | | | 47 | | — ? — ? — ? — ? — ? — ? — | | |
| | | | | | | | | 48 | 15 | (35) moist blue-gray, Hard, sl. sandy silty CLAY | | |
| 0 | 10 | 90 | 1430 | 48 | 49.5 | X | S-11 | 49 | 15 20 | | | |
| | | | | | | | | 50 | | | | |
| | | | | | | | | 51 | | | | |
| | | | | | | | | 52 | | | | |
| | | | | | | | | 53 | 16 | (52) Hard, moist, blue-gray, sl. sandy silty CLAY | | |
| 0 | 10 | 90 | 1440 | 53 | 54.5 | X | S-12 | 54 | 18 34 | | | |
| | | | | | | | | 55 | | | | |
| | | | | | | | | 56 | | | | |
| | | | | | | | | 57 | | | | |
| | | | | | | | | 58 | 12 | (60) Very dense, moist, blue gray clayey SAND | | |
| 0 | 80 | 20 | 1450 | 58 | 59.5 | X | S-13 | 59 | 14 46 | | | |
| | | | | | | | | 60 | | BOTTOM OF HOLE 59.5 FT | | |

1450 5/6/10

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: Pull Cathead Rope SPT MANUAL | Boring #SSCB009 Date 10/26/10 Sheet 1 of 2 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather SUNNY |
| | Drilled By TRIANGLE RESOURCES Joe Kelly, Mark (PSI) Charles |
| | Drill Type/ Method ~~[illegible]~~ ROTARY |
| Elevation: Datum: | Sampling Method 2' SPT 2' ST ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 30 FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 5 | 95 | ~~1115~~ 1120 1130 1130 | 0 | 2 | ST | CR1-A CR1-B S1 | 0 1.8' | | SOFT, MOIST, GRAY, PULP WASTE (soft) w/ H2S ODOR sl. sandy no plasticity, blocky @1.3 dk brownish gray, ~~silty~~ SILT (ML) w/ wet increased plasticity / w/ hair-like fibers w/ H2S ODOR tr organics (drugdown?) | #2 samples taken ~6" apart for chemchap | PULP WASTE (ML) |
| – | 5 | 95 | 1150 | 2 | 4 | SPT | S2 | 2' | 0 0 0 0 | WOR @ WOR, v. soft, gray to dk gray, wet silty CLAY tr. sand + @0.4' LARGE amount of organics (OL) @ bottom w/ strong chemical-like odor TR organics + ~~shells~~ (drugdown) | | |
| – | 5 | 95 | 1200 | 4 | 6 | SPT | S3 | 1.5' | 0 0 0 0 | | | |
| – | ~~7~~ | 95 | 1215 | 6 | 8 | SPT | S4 | 1.6' | 0 1 2 | WOR ⓪ V. soft, wet, dk gray, silty CLAY w/ tr. sand w/ moderate chemical-like odor tr organics in the form of small wood chunks | S4 from bottom of sample | (CH) |
| – | 15 | 85 | | | | | | | | | | |
| – | 15 | 85 | 1230 | 8 | 10 | SPT | S5 | 1.3 | 1 3 3 | 6-8 ② Soft, same as above @ 0.6' soft, moist, gray w/ black splotches, sandy (fine to md grained) CLAY | Shelby tube attempted @ 8' (No Recovery) Resample w/ SPT | SP |
| – | 85 | 15 | | | | S(NR) | | | | | | |
| | | | 1245 | 10 | 12 | SPT | S6 | | | | | |
| | | WMM | | | | | | | | ⑥ V. soft, moist gray w/ black splotches sl. sandy CLAY (CH) | sample S5 from lower portion (SP) | |
| – | ~~30~~ 40 | ~~70~~ 60 | 1310 | 13 | 15 | SPT | S6 | 1.1' | 0 1 0 | @ 0.7 loose, wet, lt gray SAND slightly clayey Md. grained SP to SC 13-15' | no sample @ 10' ST NR | SP |
| | | | | | | | | | | ① Soft, wet lt. gray, m.g. sandy CLAY w/ alternating layers of CLAY + SAND clayey SAND towards bottom | *problem w/ R16 SPT Hoist | CL |
| 5 | 85 | 10 | 1430 | 18 | 20 | SPT | S7 | 1.2' | 10 13 25 | (38) Dense, moist, lt gray coarse to M.G. sand w/ tr. fine gravel + occassional pockets of gray tr. fine shells | Rig hoist temp. fixed perhaps not 30" fall | |

Attachment Figure A.1-30

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: SPT CATHEAD MANUAL PULL | Boring SJGB009 Date 10/26/10 Sheet 2 of 2 |
| N | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather Mo. Sunny 90°F |
| | Drilled By TRIANGLE RESOURCES (PSI) Marsh Buggy |
| | Drill Type/ Method ROTARY (MUD) NO CIRCULATION |
| Elevation: Datum: | Sampling Method 2' SPT / 2' ST ATD Water |
| Obs. Well Install. Yes No | Bottom of Boring 30 FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 20 | | | | |
| | | | | | | | | 1 | | | | |
| | | | | | | | | 2 | | | | |
| – | 70 | 30 | 1500 | 23 | 24.5 | SPT | S8 | 3 1.7' | 9 18 23 | (41) Dense, wet, lt gray, clayey SAND SC SAND w/ pockets/layers of Clay 0.6' FT LAYER OF Gray SOFT CLAY @ 0.3' subrounded wht, black + brown grains. | Sample had larger amount of Clay | (SC) |
| | | | | | | | | 4 | | | | |
| | | | | | | | | 5 | | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | blow counts may be overestimated due to manual pulling (not 30° + hammer not pulling directly over rods consistently | (SP) |
| – 10 | 95 90 | 5 – | 1520 | 28 | 29.5' | SPT | S9 | 8 1.7' | 6 12 23 | (35) Dense, moist, lt gray, fine to med grained SAND (SP) @ 0.3' grades to Coarse grained SAND w/ Fine gravel | | |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 30 | | | | |
| | | | | | | | | 1 | | | | |
| | | | | | | | | 2 | | BOTTOM OF BORING 29.5' 1530 10/26/10 | | |
| | | | | | | | | 3 | | | | |
| | | | | | | | | 4 | | | | |
| | | | | | | | | 5 | | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | |
| | | | | | | | | 8 | | | | |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 0 | | | | |

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: drilling @ sl. angle | Boring SJGB010 Date 10/28/10 Sheet 1 of 1 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather SUNNY WINDY 80°F |
| | Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY |
| | Drill Type/ Method ROTARY 4 1/4" BIT |
| Elevation: Datum: | Sampling Method 2' SPT / 2' ST ATD Water |
| Obs. Well Install. Yes No | Bottom of Boring 15 FT Level Depth |

| Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | 15 | 85 | 1500 1505 1510 | 0 | 2 | ST | CR1-A CR1-B S1 | 0 1.4' 1 2 | | 0' to 0.2' (V. soft) brown, moist organic SILT w/ abundant roots tr. H2S odor 0.2' to bottom (V. soft), gray, pulp waste sandy material w/ abundant roots & large woody debris up to 3" long tr. black @ bottom | | OL PULP WASTE |
| - | 5 | 95 | 1540 | 2 | 4 | SPT | S2 | 1.7 3 4 | 0 0 0 0 | (0) V. soft, wet, black, SILTY CLAY tr. unknown odor (much) tr. sand in sampler shoe Md. dense moist. gray SAND | | black MUCK |
| - | - | - | 1600 | 4 | 6 | SPT | S3 | 0' 5 6 | 4 6 8 10 | (14) No RECOVERY | | |
| - | 70 | 30 | 1610 1630 | 6 | 8 | SPT | S4 | 1.2' 7 8 | 7 8 8 10 | (16) Md. dense, wet, lt. gray to gray SAND SP fine to medium grained 0.5' to 0.9' soft, wet, gray sandy clay tr. unknown odor @ top Layer of shell hash (0.1') @ 0.6' Shells throughout (fragments) top to 0.5' | | SP |
| - | 90 | 10 | 1615 | 8 | 10 | SPT | S5 | 1.1' 9 10 | 3 4 4 5 | (8) Loose, wet, lt gray to lt gray sl. silty f to m SAND (SP) layer of shells from 0.6 to 0.7' | | |
| - | 90 | 10 | 1620 | 10 | 12 | SPT | S6 | 1.2' 1 2 | 3 4 5 7 | (9) loose, wet, lt. gray, f to m SAND (SP) w/ tr. silt/clay pockets towards bottom layer of shells from 0.7 to 0.8' | | |
| | | | 1625 | 13 | 15 | SPT | S7 | 13 1.3' 4 15 | 5 4 9 16 | (15) Md. dense, wet to moist, lt gray (13) f to m gr. SAND (SP) w/ seams of gray clay w/ tr. shells in clay BOTTOM OF BORING 15', FILLING HOLE w/ MED. BENTONITE CHIPS <5' below "paper mill waste" DONE 1630 10/28/10 | | |
| | | | | | | | | 6 7 8 9 20 | | | | |

Attachment Figure A.1-32

# Soil Boring Processing Log

ANCHOR QEA

Boring Location: SJGB011

Boring SJGB011 Date 10/29/10 Sheet 1 of 1
Job San Jacinto Waste Pits Job No. 090557-01
Logged By WES MACDONALD Weather SUNNY 55°F
Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY
Drill Type/ Method ROTARY 4¼" BIT
Sampling Method 2'SPT / 2'ST ATD Water
Bottom of Boring 20' Level Depth
Elevation: Datum:
Obs. Well Install. Yes (No)

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 5 | 95 | 830 | 0 | 6" | ST | CRU-A | 0 | | (V. soft), moist, gray to lt gray, sl. sandy SILT, block texture, occassional root, plastic w/ trace organics + occassional small shells, | 2 SHELBY TUBES TAKEN FROM 0-2' DIRECTLY NEXT TO EACH OTHER FOR SAMPLE VOLUME BOTH COMPOSITED | RUP WASTE |
| | | | 835 | 0 | 2 | | CRU-B | 2' 1 | | | | |
| | | | | | | | S1 | | | | | |
| | | | 840 | 1 | 2 | | | 2 | | @ 1.9' black, (v.s oft) moist clay. | | |
| – | <5 | 100 | 850 | 2 | 4 | SPT | S2 | 1.9' 3 | | lt gray to silver pockets moderate in upper 6" sl. H2S ODOR | | MUCK |
| | | | | | | | | 2.4' 4 | | @ WOR, v. soft, wet, gray to dk gray silty CLAY (mud) w/ unknown odor | | |
| – | – | – | 900 | 4 | 6 | ST | S3 | 1.6' 5 | | | | |
| – | <5 | 100 | | | | SPT | | 4-6 | | Shelby Tube No Recovery Sampling w/ SPT | | |
| – | <5 | 100 | 910 | 6 | 8 | SPT | S4 | 1.4' 7 | | @ WOR, v. soft, same as above black to gray w/ flat fibrous chunk ~½" w/ unknown odor | | |
| 60 | 60 | 40 | | | | | | 6.8 8 | | @ v. s oft same as above w ~1.1' M. dense, moist, lt gray sand w/ layers (0.1') of grey w/ black patches, CLAY | 054 large shell, hand chunks of debris in upper clay SAMPLE + sluff | CL |
| – | 50 | 50 | 920 | 8 | 10 | SPT | S5 | 1.9 9 | | | | SC |
| – | 85 | 15 | 930 | 10 | 12 | SPT | S6 | 8-10 10 | | (2) soft, moist, gray w/ patches of brown, V. sandy silty CLAY (CL) w alternating layers of Clay + Sand lt gray w/ 2 layers of wood @ 1+ 0.2' (each thick) | | Sand w/ clay |
| | | | | | | | | 1.2' 1 | | | | SC/SP |
| | | | | | | | | 2 | | | | SP/SC |
| – | 85 | 15 | 940 | 13 | 15 | SPT | S7 | 1.0' 3 | | tr. organics throughout (?) (9) Loose, wet, lt gray, clayey SAND (SC) w/ layers of clay (0.1') in (SP) f to m. grained sand | | |
| | | | | | | | | 1.4' 4 | | | | |
| | | | | | | | | 5 | | | | |
| | | | | | | | | 6 | | 13-15 (12) M. dense same as above | | |
| | | | | | | | | 7 | | | | |
| – | 95 | 5 | 950 | 18 | 20 | SPT | S8 | 8 | | (21) Md. dense, wet, lt gray, M-f grained sl clayey SAND (SP) tr. pockets of clay w/ tr. fine gravel | | SP |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 1.2' 14 | | @ 0.1 fine grained silty sand | | |
| | | | | | | | | 20 13 | | BOTTOM OF BORING 20 FT | | |

BACKFILLED w/ 4 BAGS OF MED. BENTONITE CHIPS
10/29/10 1086

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: | Boring SJGB012 Date 10/28/10 Sheet 1 of 1 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather SUNNY 70°F WINDY |
| | Drilled By TRIANGLE RESOURCES (PSI) |
| | Drill Type/ Method ROTARY MARSH BUGGY |
| Elevation: Datum: | Sampling Method 2' SPT 2' ST ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 20 FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 5 | 95 | 0930 935 940 | 0 | 2 | ST | CRI-A CRI-B S1 | 0 2.2' 1 2 | | Soft, moist, gray to brown, Sandy SILT w/ abundant organics roots some silt like material consistency w/ H2S ODOR @ 0.8' LAYER OF ORGANICS @ sample bottom 2.2' wet (v. soft) black | 2 BTS taken directly next to each other | PUCP WASTE/ PPSOIL |
| – | 10 | 90 | 1245 | 2 | 4 | SPT | S2 | 2' 3 4 | 0 0 0 0 | @ WOR. v. soft, wet, Black or sl. sandy CLAY w/ (MUCH) w/ unknown odor | live fiddler crab at surface | MUCH BLACK CL |
| – | <5 | 100 | 1330 | 4 | 6 | SPT | S3 | 1.5' 5 6 | 0 0 0 0 | WOR @ SAME AS ABOVE w/ pocket of gray unknown round debris @ 0.3' tr. hairline fibers (unknown) | After S1 rig moved to assist w/ Vibecoring + haul Benchmarks pattern across site | |
| – | – | – | 1345 | 6 | 8 | ST | S4 | 2' 7 8 | 0 0 | SHELBY TUBE | | |
| – | 35 | 65 | 1350 | 8 | 10 | SPT | S5 | 1.4' 9 10 | 0 0 3 7 | (3) Soft, wet, gray sandy CLAY w/ unknown particles (flat + rounded) (similar to OO1). w/ unknown odor @ 0.5 Md dense, wet, lt gray SAND m grained SP | resume on location @1245 10/28/10 | SP |
| – | 100 | <5 | | | | | | | | | | |
| – | 80 | 20 | 1400 | 10 | 12 | SPT | S6 | 1 1.9 2 | 7 6 9 13 | (15) Md. dense, wet, lt gray, clayey silty SAND Fine to medium grained SAND (SM-SC) w/ pocket + ~~layers~~ seams up to 1cm w/ occasional organics (wood debris) | | |
| – | 95 | 5 | 1410 | 13 | 15 | SPT | S7 | 3 1' 4 5 | 0 0 13 11 | (13) Md. dense, moist, lt gray sl. silty SAND SP w/ tr. pockets of Clay. w/ flat metal shavings in sampler that appear to be flakes off of SPT split spoon sampler | | |
| – | 95 | 5 | 1420 | 18 | 20 | SPT | S8 | 8 1.5' 9 20 | 6 16 28 32 | (44) V. dense, moist to wet, lt gray SAND (SP) m-f grained sand w/ tr. seams of ~~clay~~ sandy CLAY | | |

BOTTOM OF BORING 20'. FILLING UP HOLE w/ MD. BENTONITE CHIPS (7 bags)
DONE 10/28/10 1450

Attachment Figure A.1-34

# Soil Boring Processing Log

ANCHOR QEA

Boring Location: 12.3' MUDLINE

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB013 Date 5/11/10 Sheet 1 of 1

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 90°F

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 10 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 0 | | 0 to 2.0 Very soft, wet, dark gray w/ occasional gray pockets, sl sandy silty CLAY w/ trace organic fibers + shells, trace H2S/ch + chem-like odor when initially broken. Layer of whole shells near (0.2') surface | | |
| – | 5 | 95 | 1045 | 0 | 2 | ST push | S1 | 2' 1 | | | ML/OL | |
| | | | | | | | | 2 | | 2.0 to 3.5 Very soft, wet, dk gray w/ pockets of gray, sl. sandy SILT + CLAY w occasional organic debris, decreasing moisture + increasing cons. w/ depth to moist + med. stiff. | | |
| – | 5 | 95 | 1100 | 2 | 4 | ST push | S2 | 2' 3 | | | | |
| – | 80 | 20 | | | | | | | | 3.5 to 4 FT Loose, wet, gray SAND w occasional silt + clay pockets. | SP | |
| – | 5 | 95 | 1150 | 4 | 6 | ST PUSH | S3 | 4 | | SAMPLE was very disturbed upon extrusion | | |
| | | | | | | | | 2' 5 | | 4 to 5.6 Very soft, wet dark gray/tan pockets of gray, sl. sandy SILT, trace | | |
| – | 85 | 15 | | | | | | | | 5.6 to 6 MD. dense, wet, gray sl silty SAND | | |
| | | | 1210 | | | ST | | 6 | | | | |
| | | | | 6 | 8 | | S4 | 7 | | | | |
| – | | | | | | | | 8 | 5 | 0% recovery in ST. SPT sample | | |
| – | 95 | 5 | 1230 | | | SPT | | 1.5 | 7 | (14) MD. Dense, wet, gray sl silty fine to med grained SAND sub rounded | | |
| | | | | 8 | 10 | | S5 | 9 | | | | |
| | | | | | | | | 10 | | BOTTOM OF BORING 10 ft COMPLETED 12:30 5/11/10 | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location: depth to mudline 2.6 FT

Elevation: Datum:

Obs. Well Install. Yes / No

Boring SJGB014 Date 5/10/10 Sheet 1 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By ~~MM~~ WES MACDONNELL Weather P.SUNNY/WINDY 80°F

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 12 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1000 | 0 | 2 | ST | NR | 0 | 2 | 1ST ATTEMPT W/ TUBE, NO RECOVERY TRY AGAIN WITH SPLIT SPOON | | |
| | | | | 0 | 1.5 | SS DPT | | NR | 1 | No recovery w/ split spoon strong chemical-like odor (similar to CO2) from sampling equipment | | |
| | | | | | | | | 1 | 3 | | | |
| — | 5 | 95 | 1015 | 2 | 4 | ST | S2 | 2 | | SOFT, MOIST DARK GRAY TO OLIVE GRAY cl. SANDY SILT W/ TRACE ORGANICS 0 to 1.8 to 0.3 ft STRONG H2S ODOR | | |
| | | | | | | | | 1.8' | | | | |
| | | | | | | | | 3 | | 0.4 0.3 ft, Gray, ST wet silty sand | | |
| — | 55 | 45 | | | | | | | | | | |
| | | | | | | | | 4 | | 0' to 1.3' appears to be soft dk gray wet, sandy SILT (possible sloughs from drag down + fallen. CLAM SHELL observed at material boundary wood fibers | | |
| — | 85 15 | 15 85 | 1030 | 4 | 6 | ST | S3 | 1.9 | | 1.3 to 1.9' (loose) wet, gray sl. silty SAND | | |
| — | 5 95 | 5 | | | | | | 5 | | | | |
| | | | | | | | | 6 | 1 | 0 to ② Loose, wet, gray, silty SAND w/ dark gray silt w/ some wood fragment in silt. | | |
| — | 70 | 30 | 1035 | 6 8 | 8 | SPT | S4 | 0.8' | 1 | | | |
| | | | | | | | | 7 | 1 | | | |
| | | | | | | | | 8 | | SHELBY TUBE FOR GEOTECH | | |
| | | | 1140 | 8 | 10 | ST | S5 | | | | | |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 10 | | | | |

Attachment Figure A.1-36

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB00 c/14 Date 5/10/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By MACDONALD Weather SUNNY 80°F WIND FROM SOUTH

Drilled By TRIANGLE

Drill Type/ Method Rotary

Sampling Method SPT / ST ATD Water

Bottom of Boring 12 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 40 | 60 | 1150 | 10 | 12 | ST | S6 | 0 to 12 | | SOFT, WET, DK gray sandy SILT w/ trace shell fragments | | |
| | | | | | | | | | | BOTTOM OF BORING 12' COMPLETED 5/10/10 1150 | | |

# Soil Boring Processing Log

ANCHOR QEA

Boring Location: MUDLINE 7.4 FT

Elevation: Datum:

Obs. Well Install. Yes / No

Boring SJGB015 Date 5/10/10 Sheet 1 of 1

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 85°F WIND 9 KTS SOUTH

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water Level Depth

Bottom of Boring 10 FT

| Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 15/5 | 1515 | | | PUSH | | 0 | | SOFT, MOIST GRAY SANDY SILT | | |
| — | 20 | 80 | | 0 | 2 | PUSH ST | S1 | | | w/ occasional layers of SAND (<0.1") | | |
| | | | | | | | | 1 | | + brown silty wood @ 1.1 TO 0.8 (<0.1") | | |
| | | | | | | | | | | sl. H2S odor. | | |
| | | | 1525 | | | ST | | 2 | | SOFT, DAMP, gray to dk gray sandy | | |
| — | 15 | 85 | | 2 | 4 | PUSH | S2 | 1.8 | | SILT | | |
| | | | | | | | | 3 | | w/ occasional pockets of CLAY | | |
| | | | | | | | | 4 | | INITIAL TRY WITH ST resulted in NR | | |
| | | | 1540 | | | SPT | S3 | | 0 | TRY W/ SPT | | |
| — | 15 | 85 | | 4 | 6 | | | 1.5 | 0 | WOH SAME AS ABOVE | | |
| | | | | | | | | 5 | 0 | | | |
| | | | | | | | | 6 | 0 | NO RECOVERY INC ST. TRY SPT | | |
| | | | 1600 | | | SPT | | | 0 | WOH SOFT, WET, GRAY TO DK GRAY | | |
| — | 10 | 90 | | 6 | 8 | | S4 | 0.9 | | SANDY CLAY (CL) | | |
| | | | | | | | | 7 | 0 | | | |
| | | | | | | | | | 0 | | | |
| | | | 1625 | | | ST | | 8 | | Not extruded. Shelby tube for geotech | | |
| | | | | | | | | 8' | | | | |
| | | | | 8 | 10 | | S5 | 9 | | | | |
| | | | | | | | | 10 | | BOTTOM OF BORING 5/10/10 1625 | | |

Attachment Figure A.1-38

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: 3.5 Depth from water to mudline 12:10 | Boring SJGB016 Date ~~5/9/10~~ 5/10/10 Sheet 1 of 2 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By MACDONALD Weather SUNNY 80°F wind from S |
| | Drilled By TRIANGLE RESOURCES |
| | Drill Type/ Method ROTARY |
| Elevation: Datum: | Sampling Method SPT + ST ATD Water |
| Obs. Well Install. Yes No | Bottom of Boring 12FT Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1210 | 0 | 2 | ST | S1 | 0 | | 0 to 0.1 loose, wet, grave sl. silty SAND w/ trace wood debris | This sample was logged in reverse order from bottom to top | |
| – | 5 | 95 | | | | | | 2' | | 0.1 to 1.1 soft, moist, dk gray to black CLAY w/ trace wood debris (CH OH) | | |
| | | | | | | | | 1 | | 1.1 to 1.4 soft, moist dk brown to dk gray organic silt w/ moderate wood debris + mod. chem-like odor | | |
| | | | | | | | | | | 1.4 to 2 soft, moist, gray clayey SILT w/ mod. chem-like odor | | |
| – | 30 | 70 | 1230 | 2 | 4 | ST | S2 | 2 | | 1.1 0.8 ~~1.7~~ to ~~1.9~~ dk gray, soft sandy silt, damp | | |
| | | | | | | | | 1.1 | | 0.8 0.6 ~~1.9~~ to ~~0.8~~ lt gray, wet, SAND loose | | |
| | | | | | | | | 3 | | ~~0.8~~ 0.6 to 0.4 dk brown, damp, SILT w/ wood debris | | |
| | | | | | | | | | | 0.4 to 0.8 Md. dense, dk lt. gray SAND w/ occasional silt pockets | | |
| | | | 1350 | 4 | 6 | ST | S3 | 4 | | NOT EXTRUDED (geotech) | | |
| | | | | | | | | 2' | | | | |
| | | | | | | | | 5 | | | | |
| – | 20 | 80 | 1400 | 6 | 8 | ST | S4 | 6 | | STIFF, MOIST, GRAY sandy SILT w/ occasional pockets + Layer of lt. gray SAND | | |
| | | | | | | | | 2' | | | | |
| | | | | | | | | 7 | | | | |
| | | | 1410 | 8 | 10 | ST | S5 | 8 | | SOFT, WET, GRAY SANDY SILT w/ LAYERS of sand | | |
| | | | | | | | | 2' | | occasional ~~Nut~~ shell AT 0.2FT intact trace shells throughout | | |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 10 | | | | |

Attachment Figure A.1-39

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB 016 Date 5/10/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By Wes MacDonald Weather SUNNY 85°F WIND FROM S

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water Level Depth

Bottom of Boring 12 FT

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1425 | 10 | 12 | ST | S6 | 10 2' 11 12 | | Not extruded<br>GEOTECH BORING<br>BORING TERMINATED | | |

3 4 5 6 7 8 9 10

Attachment Figure A.1-40

# Soil Boring Processing Log

ANCHOR QEA

| | |
|---|---|
| Boring Location: 2.9' Depth from water to mudline; 3.7 " " deck " " | Boring SJGB017 Date 5/11/10 Sheet 1 of 2 |
| | Job San Jacinto Waste Pits Job No. 090557-01 |
| | Logged By WES MACDONALD Weather SUNNY 80°F |
| | Drilled By TRIANGLE RESOURCES (J) |
| | Drill Type/ Method Rotary |
| Elevation: Datum: | Sampling Method SPT/ST ATD Water |
| Obs. Well Install. Yes (No) | Bottom of Boring 12 Level Depth |

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | DEPTH To | SAMPLE Type | SAMPLE Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| – | 10 | 90 | 0830 | 0 | 2 | ST push | S1 | 0 | | 0 to 0.3 Loose, wet, gray silty SAND | Wood in sand wood on the border of two soils | |
| | | | | | | | | 2' | | 0.3 to 2 Soft, moist to damp, dk gray to black CLAY to SILT w/ trace organic fibers | | |
| | | | | | | | | 1 | | Long, shinny clam at soil border horizon (intact) | | |
| – | <5 | 100 | 0845 | 2 | 4 | ST push | S2 | 2 | | 0 to 1.7 soft to md. stiff, dk gray to blk, damp CLAY | | |
| | | | | | | | | 2.2' | | thin gray sand layer @ 1.7' 1.7' to 2.2' soft, dk brownish-gray CLAY w/ moderate organic fibers | | |
| | | | | | | | | 3 | | | | |
| – | 25 | 75 | 0900 | 4 | 6 | SPT | S3 | 4 | 0 | ATTEMPTS TO OBTAIN SAMPLE w/ PUSH TUBE FAILED. SAMPLE OBTAINED w/ SPT. | | |
| | | | | | | | | 1.5 | 0 | WOH SOFT, WET, GRAY, sandy SILT w/ occasional interbeds of black CLAY | | |
| | | | | | | | | 5 | 0 | | | |
| | | | | | | | | 6 | 0 | ATTEMPTS OF ST FAILED. SPT used. WOH | | |
| – | 20 | 80 | 0915 | 6 | 8 | SPT | S4 | 1.4 | 0 | SAME AS ABOVE | | |
| | | | | | | | | 7 | 0 | | | |
| | | | 0930 | 8 | 10 | | S5 | 8 | | Not extruded | | |
| | | | | | | | | 2' | | Geotech sample | | |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 10 | | | | |

Attachment Figure A.1-41

# Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGBB17 Date 5/11/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By W. MACDONALD Weather SUNNY 85° 11. breeze SE

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 12 Level Depth

| Grain size (%) Gravel | Sand | Fines | Time/ PID | DEPTH From | To | SAMPLE Type | Number | DEPTH/ SAMPLE RECOVERY | Penetration Resistance | DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc. | REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc. | SUMM. LOG (Water & Date) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| — | 90 | 10 | 1045 | 10 | 12 | SPT | S6 | 10 | 0 | ATTEMPTED SAMPLE w/ pust ST. NO Recovery sample obtained via SPT | | |
| | | | | | | | | 11 | 0 | for recovery. (WOH) (MD dense) wet, lt gray sl. silty SAND in sampler head. | | |
| | | | | | | | | 0.3 | 0 | | | |
| | | | | | | | | 12 | | BOTTOM OF BORING 12' 10:20 5/11/10 | | |
| | | | | | | | | 3 | | | | |
| | | | | | | | | 4 | | | | |
| | | | | | | | | 5 | | | | |
| | | | | | | | | 6 | | | | |
| | | | | | | | | 7 | | | | |
| | | | | | | | | 8 | | | | |
| | | | | | | | | 9 | | | | |
| | | | | | | | | 10 | | | | |

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannalas
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB18
DATE BEGAN 12/3/18
DATE COMPLETED 12/3/18
TOTAL DEPTH 52'
PAGE 1 OF 3

Field location of boring
Water depth to MLLW: 20 ft

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 1 | SJGB018-G01 | .4 | 0-2' | 1 | | very soft, wet, black slimy silt with small gravel | 10 | | 90 |
| ↓ | WOH | SL0860 | | | | | | | | |
| ↓ | 1050 | | | | 2 | | Casing sunk in this material to a depth of 8' | | | |
| | | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | | | | |
| | | | | | 6 | | | | | |
| | | | | | 7 | | | | | |
| | | | | | 8 | | | | | |
| SS | 4 | SJGB018-G02 | 1.0 | 8'-10' | | | @ 8.8': black slime | | | |
| ↓ | 2 | SL0861 | | | 9 | | @ 9': very loose wet light grey fine SAND grades to silty SAND @ 9.6' | ~~100~~ 93 | ~~50~~ 50 | 100 90 |
| | WOH | 1120 | | | | | | | | |
| ↓ | WOH | | | | 0 | | | | | |
| SS | WOH | SJGB018-G03 | 1.9 | 10-12 | | | | | | |
| ↓ | WOH | SL0862 | | (30-32) | 1 | | very soft light grey moist SILT with clay | | | 100 |
| ↓ | WOH | 1135 | | | | | | | | |
| ST | PUSH | SJGB018-G04 | 2 | 12-14 | 2 | | | | | |
| ↓ | ↓ | SL0863 | | | | | | | | |
| | | 1150 | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | | | | |
| SS | WOH | SJGB018-G05 | 1.4 | ~~14~~ 15-16 | | | loose, wet, coarse SAND with | 5 | 60 | ~~35~~ |
| ↓ | 2 | SL0864 | | | 6 | | CLAY laminations, CLAY at 15.8' | | | |
| ↓ | 7 | 1300 | | | | | | | | |
| | 8 | | | | 7 | | | | | |
| SS | 4 | SJGB018-G06 | 1.7 | 16-18' | | CL | stiff, damp to dry, bluish grey CLAY | | | 100 |
| ↓ | 9 | SL0865 | | | 8 | | | | | |
| ↓ | 13 | 1315 | | | | | | | | |
| | 17 | | | | 9 | | | | | |
| | | | | | 0 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-1

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Gimaker
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB018
DATE BEGAN 12/3
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 5 | SJGB018-G07 | 1.8 | ~~38-20~~ | 1 | | SAA @ 16': Color changes to yellowish brown CLAY | | | 100 |
| | 8 | SL0866 | | (40-42) | | | | | | |
| | 14 | 1330 | | | 2 | | SAA to 21' | | | |
| | 17 | | | | | | | | | |
| SS | 1 | SJGB018-G08 | 2.0 | 20-22' | 3 | | 21': orangish brown damp CLAY with gravel | 5 | | 95 |
| | 3 | SL0867 | | | | | | | | |
| | 9 | 1345 | | | 4 | | | | | |
| | 17 | | | | | | | | | |
| | | | | | 25 | | | | | |
| ST | PUSH | SJGB018-G09 | 2.0 | 25-27' | 26 | | SAA @ 21' | | | |
| | | SL0868 | | 45-47 | | | | | | |
| | | 1405 | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| S | | S | | | 30 | | | | | |
| SS | 5 | SJGB018-G10 | 2.0 | 30-32' | 31 | CL | V Stiff reddish brown dry CLAY | | | 100 |
| | 13 | SL0869 | | 50-52 | | | PP: 4.5 TSF | | | |
| | 18 | 1435 | | | 32 | | VT: .6 ksf/cm² | | | |
| | 25 | | | | | | | | | |
| | | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | ~~40-42'~~ | 35 | → | driller pushed to 40' from 30' skipping 35' by mistake. | | | |
| SS | 20 | SJGB018-G11 | | ~~35-37'~~ | 36 | | | | | |
| | 44 | SL0870 | | 55-57 | | | | | | |
| | 48 | 1510 | | | 37 | | | | | |
| | 50 | | | | | | | | | |
| | | | | | 38 | | | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-2

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches
SAMPLING METHOD: in. by ft

BORING # SJGB018
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF 3

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 20 | SJGB018-G11 | 2.0 | 40-42 | 1 | | very dense dry light grey SILTY FINE SAND with clay lamination | | 60 | 40 |
| ↓ | 44 | SL0870 | | | | | | | | |
| | 48 | 1510 | | | 2 | | | | | |
| ↓ | 50 | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | | | | |
| ST | Push | SJGB018-G12 | 2.3 | 45-47' | | | SAA @ 40', wood fragment at 45' | | | |
| ↓ | ↓ | SL0871 | | | 6 | | | | | |
| | | 1545 | | | 7 | | | | | |
| | | | | | 8 | | | | | |
| | | | | | 9 | | | | | |
| | | | | | 0 | | | | | |
| SS | WOH | SJGB018-G13 | | 50-52' | 1 | | stiff, dry to damp, light grey SILTY CLAY. | | | 100 |
| ↓ | 4 | SL0872 | | | | | | | | |
| | 11 | 16 | | | 2 | | Boring complete @1405 | | | |
| | 16 | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | | | | |
| | | | | | 6 | | | | | |
| | | | | | 7 | | | | | |
| | | | | | 8 | | | | | |
| | | | | | 9 | | | | | |
| | | | | | 0 | | | | | |

narks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-3

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakis
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB019
DATE BEGAN 12/2
DATE COMPLETED 12/3/18
TOTAL DEPTH ~~57~~ 71
PAGE 1 OF 3

Field location of boring
Water depth to TOC: 20'
Water depth to MH: 16'

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 3 | SJGB019-601 SL0847 1225 | 0.1 | 0-2' ~~(18-20)~~ (20-22) | 1 | | rock in catcher, no sample recovered. Very loose sand (grey) with dark substance | | 58 | 58 |
| | WOH | | | | 2 | | | | | |
| | WOH | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| SS | WOH | SJGB019-602 SL0848 1245 | 0.4 | 4-6' (24-26) | 5 | | rock in catch, minimal recovery. Very soft dark grey CLAY w/ silt | | | 102 |
| SS | WOH | SJGB019-603 SL0849 ~~1255~~ 1300 | .7 | ~~8'-10'~~ ~~6-8~~ SG ~~26-28~~ 28-30 | 6 | | | | | |
| | | | | | 7 | | casing fell under own weight to 10', sample depth actual 8'-10' | | | |
| | | | | | 8 | | Very soft dark grey moist silty CLAY catcher forced inside of SS. | | | 100 |
| | | | | | 9 | | | | | |
| | | | | | 10 | | Casing sunk under weight, 30' casing, 33' hole | | | |
| SS | WOH | SJGB019-604 SL0850 1325 | 2.0 | ~~10-12~~ SG 13-15 (33-35) | 11 | | Very soft, moist, dark grey silty CLAY | | | 102 |
| | 5 | | | | 12 | | @13.6' grades to loose grey. medium Silty SAND with clay lamations | | 60 | 40 |
| ~~ST~~ | ~~PUSH~~ | ~~SJGB019-604 SL0851~~ | | ~~SG 35-37~~ | 13 | | | | | |
| | | | | | 14 | | | | | |
| | | | | | 15 | | | | | |
| ST | PUSH | SJGB019-604 ~~SL0851~~ SG 1345 | | 15-17 (35-37) | 16 | | No Sample recovered, hit rock or gravel? bent Shelby. Sheared off bolts | | | |
| | | | | | 17 | | | | | |
| | | | | | 18 | | | | | |
| | | | | | 19 | | | | | |
| | | | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-4

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB019
DATE BEGAN 12/2
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | WOH | SJGB-019-GO5 | 2.0 | 20-22 | 21 | | Stiff, dry to damp, yellowish brown CLAY | | | 100 |
| | 4 | SL0851 | | (40-42) | | | reddish brown layer @ 20.1' | | | |
| | 8 | 1400 | | | 22 | | PP: 2.25, VT: 4.25 | | | |
| | 11 | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | | | | |
| ST | PUSH | SJGB019-GO6 | 1.0 | 25-27 | 26 | | SAA @ 20' | | | |
| | | SL0852 | | (45-47) | | | | | | |
| | | 1425 | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| SS | 7 | SJGB019-GO7 | 1.7 | 30-32 | | | Sluss on top of sample. | | | |
| | 13 | SL0853 | | | 31 | | Hard, dry. reddish brown CLAY | | | 100 |
| | 20 | 1450 | | | 32 | | | | | |
| | 26 | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | | 35 | | | | | |
| SS | WOH | SJGB019-GO8 | 2.0 | 35-37 | 36 | | Very soft, moist, orange brown | | | 100 |
| | ~~WOH~~ | SL0854 | | | | | mottled with bluish grey clayey SILT | | | |
| | WOH | 1530 | | | 37 | | | | | |
| | 3 | | | | 38 | | | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-5

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: in. by ft

BORING # SJGB019
DATE BEGAN 12/2
DATE COMPLETED 12/3
TOTAL DEPTH ~~62~~ 57'
PAGE 3 OF 3

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | SAMPLING DATA: RECOVERY (ft recovered/ft driven) | SAMPLING DATA: DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Field location of boring | | | | | | | | |
| SS | 7 | SJGB019-09 | 2.0 | 40'-42' | | | | | | |
| ↓ | 11 | SL0855 | | (60-62) | 41 | CL | Hard, dry, reddish brown marbled with bluish grey CLAY | | | 10 |
| ↓ | 17 | 1600 | | | | | | | | |
| ↓ | 26 | | | | 42 | | | | | |
| | | | | | 43 | | | | | |
| | | | | | 44 | | | | | |
| SS | AUGH | SJGB019-G10 | 2.3 | 45-47' | 45 | | SAA @ 40' | | | |
| ↓ | | SL0856 | | (65-67) | | | | | | |
| ↓ | | 1630 | | | 46 | | | | | |
| | | | | | 47 | | | | | |
| | | | | | 48 | | | | | |
| | | | | | 49 | | | | | |
| SS | 6 | SJGB019-G11 | 2.0 | 50-52 | 50 | | Stiff, dry to damp, light bluish grey to dark grey CLAY. Woody fragments when broken apart | | | 10 |
| ↓ | 7 | SL0857 | | | 51 | | | | | |
| ↓ | 10 | 0840 | | | | | | | | |
| ↓ | 14 | ↓ | | ↓ | 52 | | | | | |
| | | | | | 53 | | | | | |
| | | | | | 54 | | | | | |
| SS | 4 | SJGB019-G12 | | 55-57' | 55 | | | | | |
| ↓ | 8 | SL0858 | | | 56 | | Stiff dark grey dry to damp CLAY grades to SILTY CLAY @ 56.5 | | | 10 |
| ↓ | 6 | ~~0920~~ 915 | | | | | | | | |
| ↓ | 13 | | | | 57 | | | | | |
| | | | | | 58 | | | | | |
| SS | | SJGB019-G13 | | ~~60-62~~ 59' | 59 | | Driller hit sand @ ~57', brought up drill head and slurry of WET sand spilled out | | | |
| ↓ | | SL0859 | | | 60 | | Sample w/ approx depth taken, no SPT | | | |
| | | | | | 61 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

light grey SAND w/ very little silt 80:20
end of boring @ 935

Attachment Figure A.2-6

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches

BORING # SJGB020
DATE BEGAN 12/1/2018
DATE COMPLETED 12/2/18
TOTAL DEPTH
PAGE 1 OF 3
SAMPLING METHOD 3 in. by 2 ft

Field location of boring
Water depth to TOD: 10'
Water depth to ML: 6' (WL to TOD: 4')

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 9<br>7<br>11<br>9 | SJGB020-G01<br>~~SL0832~~ SG<br>1245 | 0 | 0-2'<br>(10-12') | 1 | | NO Sample Recovered (rock in catcher)<br>Shell Fragments inside + around spoon. | | | |
| | | | | | 2 | | | | | |
| | | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| SS | 1<br>2<br>WOH<br>WOH | SJGB020-G02<br>SL0832<br>1255 | 1.0 | 4-6'<br>(14-16') | 5 | | very loose, moist to wet, dark grey SAND with gravel (picture labeled G01) | 5 | 90 | 5 |
| SS | WOH<br>WOH<br>WOH<br>WOH | SJGB020-G03<br>SL0833<br>1300 | 2.0 | 6'-8'<br>(16-18) | 7 | | very loose, wet dark silty Sand | | 80 | 20 |
| SS | WOH<br>WOH<br>WOH<br>WOH | SJGB020-G04<br>SL0834<br>1325 | 1.7 | 8'-10'<br>(18-20') | 9 | | very loos, moist, dark grey silty SAND with Clay | 5 | 60 | 35 |
| | | | | | 0 | | | | | |
| ST | PUSH | SJGB020-G05<br>1335 | — | 10'-12'<br>(20-22') | 1 | | NO Sample recovered | | | |
| | | | | | 2 | | | | | |
| ST | PUSH | SJGB020-G06<br>SL0835<br>1350 | 0.4 | 12-14<br>(22-24') | 3 | | ~~SAND~~ Clayey Silt recovered. | | | |
| | | | | | 4 | | | | | |
| SS | WOH<br>WOH<br>WOH | SJGB020-G07<br>SL0836<br>1415 | 2.0 | 15-17<br>(25-27') | 5 | | very soft dark grey, damp silty CLAY<br>grades to silty gravel @15.8' | 5<br>60 | ~~10~~ 85<br>40 | |
| | | | | | 6 | | | | | |
| ST | PUSH | SJGB020-G08<br>SL0837<br>1425 | 0.6 | 17-19 | 7 | | | | | |
| | | | | | 8 | | | | | |
| ~~SS~~ | | ~~SJGB020-G10~~ SG<br>~~SL0838~~ | | | 9 | | | | | |
| | | | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB020
DATE BEGAN 12/1/2018
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | SAMPLING DATA: RECOVERY (ft recovered/ft driven) | SAMPLING DATA: DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 5 | SJGB020-G10 | 2.0 | 20-22 | 21 | | loose, damp to moist light grey, med to | | 100 | |
| ↓ | 6 | SL0838 | | (30-32) | | | coarse SAND. | | | |
| ↓ | 6 | 1435 | | | 22 | | @22'; Beaumont: reddish brown CLAY | | 10 | 90 |
| ↓ | 13 | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| SS | | | | | 25 | | | | | |
| SS | 2 | SJGB020-G11 | 1.9 | 25-27 | 26 | CH | Stiff, damp, Orangish brown + | | | 100 |
| ↓ | 4 | SL0851 | | (35-37) | | | bluish grey CLAY | | | |
| ↓ | 6 | 1505 | | | 27 | | laminations of fine wet SILT @ 26' | | | |
| ↓ | 10 | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | Stiff, damp, yellowish CLAY | | | 100 |
| SS | 1 | SJGB020-G12 | 2.0 | 30-32 | 31 | | | | | |
| ↓ | 6 | SL0840 | | (40-42) | | | | | | |
| ↓ | 6 | 1520 | | | 32 | | | | | |
| ↓ | 8 | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | | 35 | | | | | |
| ST | | | | | | | SAA @ 30' | | | |
| ↓ | PUSH | SJGB020-G13 | 2.0 | 35-37 | 36 | | | | | |
| ↓ | ↓ | SL0841 | | (45-47) | | | | | | |
| ↓ | | 1540 | | | 37 | | | | | |
| | | | | | 38 | | | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-8

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB020
DATE BEGAN 12/11/2018
DATE COMPLETED 12/12/18
TOTAL DEPTH 62'
PAGE 3 OF 3

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 8 | SJGB020-G14 | 2.0 | 40-42 | 41 | | Hard, dry, orangish brown CLAY | | | 10 |
| ↓ | 16 | SL0842 | | | | | ~~OS~~ VT: .7 | | | |
| ↓ | 22 | 1620 | | | 42 | | PP: 74.5 TSF | | | |
| | 29 | | | | 43 | | | | | |
| | | | | | 44 | | | | | |
| | | | | | 45 | | | | | |
| ST | PUSH | SJGB020-G15 | 2.3 | 45-47 | 46 | | SAA @ 40' | | | 100 |
| ↓ | ↓ | SL0843 | | (55-57) | | | | | | |
| | | 0820 (12/12) | | | 47 | | | | | |
| | | | | | 48 | | | | | |
| | | | | | 49 | | | | | |
| SS | | | | | 50 | | | | | |
| ↓ | WOH | SJGB020-G16 | 2.0 | 50-52 | 51 | | SAA @ 40' | | | |
| ↓ | ⊥ | SL0844 | | (60-62) | | | | | | |
| ↓ | 11 | 0840 | | | 52 | | | | | 100 |
| | | | | | 53 | | | | | |
| | | | | | 54 | | | | | |
| | | | | | 55 | | | | | |
| SS | 5 | SJGB020-G17 | 2.0 | 55-57 | 56 | | very stiff, dry to damp, greenish gray CLAY | | | |
| ↓ | 8 | SL0845 | | | | | @ 56.3' grades to Silty CLAY | | | |
| ↓ | 12 | 0920 | | | 57 | | | | | 100 |
| | 23 | | | | ~~58~~ 60 | | | | | |
| SS | | SSGB020-G18 | | (60'-62' | ~~59~~ | | SAA @ 56' | | | |
| ↓ | | SL0846 | | | 61 | | | | | |
| | | 0950 | | | ~~60~~ 62 | | end of boring @ 1000 | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-9

ANCHOR QEA

**SOIL BORING LOG**

1130 Start

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB021
DATE BEGAN 11/30/18
DATE COMPLETED 12/1
TOTAL DEPTH
PAGE 1 OF 3

Field location of boring
Water Depth = 11' to TOD
WL to ML = ~~8~~ 7.5' (WL to TOD = 3.5')

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 16 | SJGB021-G01 | 0.4 | 0-2 | 1 | SC | ~~OH~~ 0-1': V. soft, wet, black SILT w/ substantial shell hash. | - | - | 100 |
| | 2 | SL0821 | | (11-13) | 2 | | 1-2': soft, wet, gray, clayey SAND (fine) | - | 70 | 30 |
| | 3 | 1145 | | | 3 | | | | | |
| | 1 | | | | 4 | | | | | |
| SS | WOH | SJGB021-G02 | 0.7 | 4-6' ~~15-17~~ | | CL | SA 1-2' above. ~~V. Cly~~ | | ~~60~~ | ~~40~~ |
| | | SL0822 | | 15-17 | 5 | | Grades to V. silty, sandy CLAY | - | 30 | 70 |
| | | 1155 | | | | | | | | |
| SS | 1 | SJGB021-G03 | ~~0.5~~ | 6'-8' (17'-19') | 6 | | | | | |
| | 3 | SL0823 | 1.0 | | 7 | | G-8: ~~SAA~~ Grades to slightly sandy CLAY | | ~~42~~ | 95 |
| | WOH | 1220 | | | | | | | | |
| | WOH | | | | 8 | | @ 8': Rock blocking shoe. | | | |
| ST | Push | SJGB021-G04 | 0 | 8-10 | | | | | | |
| | | Tube Damaged | | 19-21 | 9 | | | | | |
| | | 1330 | | | | | | | | |
| | | | | | 10 | | | | | |
| | | Casing fell | | | | | | | | |
| | | | | | 11 | | | | | |
| | | | | | 12 | | | | | |
| ST | Push | SJGB021-G05 | 0.9 | 12-14 | | | | | | |
| | | SL0824 | | (23-25) | 13 | | SA 6-8' above | | | |
| | | 1345 | | | | | | | | |
| | | | | | 14 | | | | | |
| SS | WOH | SJGB021-G06 | 2.0 | 14-16 | | | | | | |
| | 3 | SL0825 | | (25-27) | 15 | | V soft, moist, dark grey CLAY to 14.9' | | 5 | 95 |
| | 3 | 1400 | | | | | @ 14.9': ~~laminations of~~ 36 fine to med sand with laminations of CLAY | | 70 | 30 |
| | 5 | | | | 16 | | | | | |
| | | | | | 17 | | | | | |
| | | | | | 18 | | | | | |
| SS | 2 | SJGB021-G07 | 1.4' | 50 19-21 | 19 | | very loose moist grey sand, clean SAND | | ~~100~~ 95 | 5 |
| | 1 | SL0826 | | (30-32) | | | | | | |
| | 1 | 1415 | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # 021
DATE BEGAN 11/30
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 6 | SL0826 | 1.4 | 19-21 | 21 | | See previous page | | | |
| | | | | | 22 | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| SS | 9 | SJGB021-G08 | — | 24-26' | 25 | | No sample recovered, Hammer fell 29'-31' | | | |
| | 26 | ~~SL0827~~ SG | | (35-37) | | | | | | |
| | 25 | 1435 | | | 26 | | | | | |
| | 21 | | | | | | | | | |
| | | | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| SS | 7 | SJGB021-G09 | 1.7' | 29-31 | 30 | | very stiff, damp to dry, orangish to reddish brown CLAY | | | 108 |
| | 12 | SL0827 | | (40-42) | | | | | | |
| | 17 | 1455 | | | 31 | | PP: 74.5, 4.0 TSF | | | |
| | 25 | | | | | | VT: 5.75 | | | |
| | | | | | 32 | | | | | |
| | | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| SS | 6 | SJGB021-G010 | | 34-36 | 35 | | SAA @ 29' | | | 100 |
| | 9 | SL0828 | | (45-47) | | | | | | |
| | 16 | 1530 | | | 36 | | | | | |
| | 20 | | | | | | | | | |
| | | | | | 37 | | | | | |
| | | | | | 38 | | | | | |
| ST | PUSH | SJGB021-G011 | 2.3 | 39-41 | 39 | | @ Top SAA @ 29' | | | |
| | | SL0829 | | (50-52) | | | graded to bluish grey CLAY at bottom | | | |
| | | 1550 | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB021
DATE BEGAN 11/30
DATE COMPLETED 12/1
TOTAL DEPTH 56'
PAGE 43 OF 43

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| ST | PUSH | SL0829 | | | 41 | | | | | |
| | | | | | 42 | | | | | |
| | | | | | 43 | | | | | |
| | | | | | 44 | | | | | |
| SS | 11 | SJGB021-G12 | 2.0 | 44'-46' | 45 | MH | SG [redacted], Hard, damp, light grey SILT | | | 10 |
| ↓ | 21 | SL0830 | | (55-57) | | | | | | |
| | 37 | 1630 | | | | | | | | |
| | 39 | | | | 46 | | | | | |
| | | | | | 47 | | | | | |
| | | | | | 48 | | | | | |
| ~~SS~~ | | ~~SJGB021-G13~~ SG | 2.0 | 49-51' | 49 | | SAA @ 44', grades to fine sandy grey SILT | | 10 | 90 |
| SS | 12 | SL0831 | | | 50 | | | | | |
| ↓ | 21 | SJGB021-G13 | | | | | | | | |
| | 33 | 0830 | | | 51 | | | | | |
| | 32 | | | | | | | | | |
| | | | | | 52 | | | | | |
| | | | | | 53 | | | | | |
| ~~ST~~ SG | | | | | | | | | | |
| ST | PUSH | SJGB021-G14 | | ~~54-56'~~ 54-56' | 54 | | No sample recovered | | | |
| ↓ | ↓ | | | | 55 | | | | | |
| | | | | | 56 | | ---- end of bore @ 1000 | | | |
| | | | | | 57 | | | | | |
| | | | | | 58 | | | | | |
| | | | | | 59 | | | | | |
| | | | | | 60 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-12

ANCHOR QEA

# SOIL BORING LOG

1300 Start

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB022
DATE BEGAN 11/29/18
DATE COMPLETED 11/30/18
TOTAL DEPTH 21 BML
PAGE 1 OF 3

Field location of boring: Mudline @ −11 ft from WL @1200 & 14 ft TOD

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 1 | SJGB022-G01 | 0 | 0-2 | 1 | CL | No Recovery | | | |
| ↓ | 4 | ~~SL0811~~ CT | | | | | | | | |
| | 10 | 1310 | | | | | | | | |
| ↓ | 33 | | | | 2 | | @1.5' → hammer bouncing → | | | |
| | | | | CT 2-4 | | | | | | |
| | | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | 5-6.8 | | | |
| SS | WOH | SJGB022-G02 | 1.6 | 5-7 | | | V. Soft, wet, olive gray slightly silty CLAY | – | 5 | 95 |
| ↓ | ↓ | SL0811 | | 19-21 | 6 | | | | | |
| | | 1340 | | | | | 6.8-7: Lense | | | |
| ST | Push | SJGB022-G03 | 1,8 | 7-9' | 7 | SM | V loose, wet, olive gray, V. silty F. SAND | – | 60 | 40 |
| ↓ | ↓ | SL0812 | | | 8 | CL | ST: Top + Bot: ~~½~~ soft, wet, grey CLAY | | | |
| | | 1400 | | | | | as 5-6.8' above | | | |
| | | | | | 9 | | | | | |
| | | | | | 10 | | | | | |
| SS | WOH | SJGB022-G04 | 2.0 | 10-12 | | | | | | |
| ↓ | ↓ | SL0813 | | (24-26) | 11 | | SAA CLAY. silty. No plasticity, Moist | – | – | 100 |
| | | 1420 | | | 12 | | | | | |
| | | | | | 13 | | | | | |
| | | | | | 14 | | | | | |
| ~~SS~~ | ~~WOH~~ | ~~Slough~~ CT | | | | | 14.5-15 Slough | | | |
| SS | WOH | SJGB022-G05 | 2.0 | 15-16.5 | 15 | | 15-16.5: SAA. | | | |
| | ↓ | SL0814 | | (29-31.5) | 16 | | | | | |
| | | 1455 | | | | | | | | |
| | | | | | 17 | | | | | |
| | | | | | 18 | | | | | |
| | | | | | 19 | | | | | |
| | | | | | 20 | CH | @19.5': Beaumont CLAY | | | |

Remarks: No O = No Odor  AOPP = As on Previous Page  SAA = Same as above  Δ = change

Notes:

Attachment Figure A.2-13

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB022
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 5 | SJGB022-606 | 1.8 | 20-22 | 21 | CH | V. Stiff, damp, bluish-gray Beaumont CLAY | | | |
| ↓ | 10 | SL0815 | | | | | @21.1': grades to bluish-gray & L. brown mottling | | | |
| ↓ | 17 | 1530 | | | 22 | | @21.9': grades to gravelly | | | |
| ↓ | 29 | | | | 23 | | @20.7': lense of silty f-m SAND. Gray | | | |
| | | | | | | | PP = 3.75 - 4.5+ TSF | | | |
| | | | | | 24 | | VT = 1.25; 1.225, kg/cm² | | | |
| | | | | | 25 | | | | | |
| SS | 9 | SJGB022-607 | 1.9 | 25-27 | | | Hard, damp to dry, orangish brown CLAY | - | - | 100 |
| ↓ | 14 | SL0816 | | | 26 | | | | | |
| ↓ | 21 | 1620 | | | 27 | | - @27' end day 11/29 | | | |
| ↓ | 27 | | | | | | resume 11/30 | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| ST | Push | SJGB022-608 | 2.3 | 30-32 (44-46) | 31 | | SAA | | | |
| ↓ | ↓ | SL0817 | | | 32 | | | | | |
| | | 0825 | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| SS | 5 | SJGB022-609 | 2.0 | 35-37 (49-51) | 35 | CH | Hard, damp to dry, orangish brown CLAY | - | - | 100 |
| ↓ | 13 | SL0818 | | | 36 | | SG PP: 3 to 3.5 TSF | | | |
| ↓ | 18 | 0855 | | | 37 | | VT = .675 x 2.5 | | | |
| | | | | | 38 | | | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches
SAMPLING METHOD: in. by ft

BORING # SJGB022
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF 3

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | SAMPLING DATA: RECOVERY (ft recovered/ft driven) | SAMPLING DATA: DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 ← 55 | | SJGB022-G10 | 2.0 | 40-42 | 40 | CH | very stiff, damp to dry, bluish gray CLAY | – | – | 100 |
| 10 → | | SL0819 | | (54-56) | 41 | | PP: 3.25 TSF | | | |
| 14 → | | 0930 | | | 42 | | VT: .275 x 2.5 = | | | |
| 21 → 50/1 | | | | | 43 | | | | | |
| | | | | | 44 | | | | | |
| SS | 6 | SJGB022-G11 | 2.0 | 45-47 | 45 | SC | ~~SILTY SAND~~ SC, damp, greenish gray | – | 90 | 10 |
| ↓ | 9 | SL0820 | | (59-61) | | | loose to med dense CLAYEY SAND | | | |
| | 9 | 1000 | | | 46 | | Slightly more clayey sand grades to 90% sand 10% fns at 46'. | | | |
| | 10 | | | | 47 | | | | | |
| | | | | | 48 | | End @ 47' 11/30/18 @ 1015 | | | |
| | | | | | 49 | | | | | |
| | | | | | 50 | | | | | |
| | | | | | 51 | | | | | |
| | | | | | 2 | | | | | |
| | | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | | | | |
| | | | | | 6 | | | | | |
| | | | | | 7 | | | | | |
| | | | | | 8 | | | | | |
| | | | | | 9 | | | | | |
| | | | | | 0 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-15

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJGB023
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN 12/4
GEOLOGIST/ENGINEER Sam Giannakos DATE COMPLETED 12/4
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD Sonic SHEET 1 OF 3
HOLE DIAMETER 6in Sample: 3" diam, 2' long

Field location of boring
depth to TOP: 7'
water: 3 ft

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SS | SJGB | 023 | | WOH | 0-2 | | | black shiny grades to soft silty CLAY |
| | | | | 6-01 | | WOH | (7-9) | 1 | | odorous damp to moist, @ .5' |
| | | | SL08 | 73 | | 2 | | | | |
| | | | | 1000 | | 3 | | 2 | | |
| | | SS | SJGB | 23 | 1.6 | WOH | 2-4 | | | SAA @ .5 ft |
| | | | | 602 | | 3 | (9-11) | 3 | | |
| | | | SL08 | 74 | | 3 | | | | |
| | | | | 1010 | | 4 | | 4 | | |
| | | SS | SJGB | 023 | 1.6 | WOH | 4-6 | | | Soft, damp, light grey fine sandy SILT |
| | | | | 603 | | 3 | (11-13) | 5 | | |
| | | | SL08 | 75 | | 5 | | | | |
| | | | | 1020 | | 7 | | 6 | | |
| | | SS | SJGB | 023 | 2.0 | WOH | 6-8 | | | SAA to 6.7' |
| | | | | 604 | | 3 | (13-15) | 7 | | @ 7' grades to loose wet silty SAND |
| | | | SL08 | 76 | | 1 | | | | light grey |
| | | | | 1030 | | WOH | | 8 | | |
| | | SS | SJGB | 023 | | WOH | 8-10 | | | loose, damp to moist, light grey silty SAND |
| | | | | 605 | 1.8 | 1 | (15-17) | 9 | | |
| | | | SL08 | 77 | | 2 | | | | |
| | | | | 1040 | | 4 | | 10 | | |
| | | ST | PUSH | SJGB02 606 SL08 78 | 1.7 | / | 10-12 | | | fine light grey wet SAND |
| | | | | | | / | (17-19) | 11 | | |
| | | | | 1055 | | / | | | | |
| | | | | | | / | | 12 | | |
| | | SS | SJGB | 023 | 2.0 | 5 | 12-14 | | | loose moist light grey fine to med SAND |
| | | | | 607 | | 8 | (19-21) | 13 | | with pockets of clay |
| | | | SL08 | 79 | | 5 | | | | |
| | | | | 1115 | | 3 | | 14 | | |
| | | | | | | | | | | |
| | | | | | | | | 15 | | |
| | | SS | SJGB | 023 | 3 | 1, 4 | 18-20 | | | loose, SAA @ 12' |
| | | | | 80 | 3 | | (25-27) | 16 | | |
| | | | SL08 | 608 | 2 | | | | | |
| | | | | 1130 | 5 | | | 17 | | |
| | | | | | | | | 18 | | |
| | | | | | | | | 19 | | |
| | | | | | | | | 20 | | |

Remarks:

Attachment Figure A.2-16

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJGB023
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN
GEOLOGIST/ENGINEER DATE COMPLETED
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD SHEET 2 OF 3
HOLE DIAMETER

Field location of boring

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SS | SJGB | 023 | SG | | 7 | | | |
| | | | | 609 | | | | 21 | | |
| | | | SL08 | 81 | | | | | | |
| | | | | | | | | 22 | | |
| | | SS | | | | | | 23 | | |
| | | | SJGB | 023 609 | 1.0 | 8 | 23-25 | | | med dense, wet, med grain clean SAND 100/ |
| | | | SL08 | 81 | | 10 | | 24 | | |
| | | | | 1145 | | 10 | | | | |
| | | | | | | 10 | | 25 | | |
| | | | | | | | | 26 | | |
| | | | | | | | | 27 | | |
| | | | | | | | | 28 | | |
| | | SS | SJGB | 023 | 2.0 | 11 | 28-30' | | | med dense, moist, light grey coarse sand 100, |
| | | | | 610 | | 15 | | 29 | | layer above stiff bluish CLAY (dry) @29.6' 0, 10 |
| | | | SL08 | 82 83 | | 12 | | | | |
| | | | | 1200 | | 13 | | 30 | | SJGB023G10A: 28-29.6' (SL0882) |
| | | | | | | | | | | SJGB023G10B: 29.6-30' (SL0883) |
| | | | | | | | | 31 | | |
| | | | | | | | | 32 | | |
| | | | | | | | | 33 | | |
| | | ST | SJGB | 023 | 1.8 | PUSH | PUSH | | | SAA @ 29.6' |
| | | | | 611 | | | 33-35 | 34 | | |
| | | | SL08 | 84 | | | | | | |
| | | | | 1410 | | | | 35 | | |
| | | | | | | | | 36 | | |
| | | | | | | | | 37 | | |
| | | | | | | | | 38 | | Stiff, dry, orangish brown CLAY 0,0,100 |
| | | SS | SJGB | 023 | 2.0 | 6 | 38-40' | | | VT: 0.25 |
| | | | | 612 | | 10 | | 39 | | PP: 4.25 TSF |
| | | | SL08 | 85 | | 13 | | | | |
| | | | | 1425 | | 20 | | 40 | | |

Remarks:

Attachment Figure A.2-17

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJGB023
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN
GEOLOGIST/ENGINEER DATE COMPLETED
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD SHEET 3 OF 3
HOLE DIAMETER

Field location of boring

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SS | SJGB023 | 023 | 2.0 | 2 | 43-45 | 41 | | V. stiff dry reddish orange grading to bluish grey CLAY (damp) 0 0 100 |
| | | | | 618 | | 9 | | | | |
| | | | SL08 | 86 | | 12 | | 42 | | |
| | | | | 1445 | | 17 | | | | |
| | | | | | | | | 43 | | |
| | | | | | | | | 44 | | |
| | | | | | | | | 45 | | |
| | | | | | | | | 46 | | |
| | | | | | | | | 47 | | |
| | | | | | | | | 48 | | |
| | | SS | | | | | | | | |
| | | | SJGB | 023 | 2.0 | 9 | 48-50 | 49 | | V stiff, dry, bluish grey silty CLAY 0,0,100 |
| | | | | G14 | | 12 | | | | grades to higher silt content w/ depth |
| | | | SL08 | 87 | | 18 | | | | |
| | | | | 1515 | | 24 | | 50 | | |
| | | | | | | | | 51 | | |
| | | | | | | | | 52 | | |
| | | | | | | | | 53 | | |
| | | ST | SJGB | 023 | 1.6 | PUSH | 53-55 | | | SAA @ 49' |
| | | | | G15 | | | | 54 | | Full sample (2.0) ~4in crumbled off |
| | | | SL08 | [illegible] | | | | | | of bottom before recovery; silty |
| | | | | 1355 | | | | 55 | | |
| | | | | | | | | 56 | | |
| | | | | | | | | 57 | | |
| | | | | | | | | 58 | | |
| | | SS | SJGB | 023 | 1.6 | 1 | 58-60 | | | SAA, clayey dry SILT, grades to 0 0 100 |
| | | | | G16 | | 14 | | 59 | | wet fine light grey Sand @ 59.5' 0 100 0 |
| | | | SL08 | 88+89 | | 20 | | | | SJGB023 G16A, SL0588 @ 58-59.3 |
| | | | | 1415 | | 16 | | 60 | | SJGB023 G16B, SL0589 @ 59.3-60 |

Remarks:

End of boring at 1615

Attachment Figure A.2-18

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB028
DATE BEGAN 11-19-18
DATE COMPLETED 11/19/18
TOTAL DEPTH 37
PAGE 1 OF 2

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Field location of boring | | | |
| SS | 80 | SJSB028-G01 | 1.0 | 0-2 | 1 | Fill | 0-0.8: brown, damp, v. dense sandy silty GRAVEL | 70 | 10 | 20 |
| ↓ | 7 | 0850 | | | | ML | 0.8-2: stiff, moist, dk brown slightly sandy SILT | | | |
| ↓ | 16 | SL0699 | | | 2 | | | | | |
| ↓ | 16 11 | | | | | | | | | |
| SS | 1 | SJSB028-G02 | 1.6 | 2-4 | 3 | CL | 2-13.2: soft, moist, gray CLAY w/ trace organic matter + trace gravel, silty. | 5 | 5 | 90 |
| ↓ | 2 | 1085 | | | | | | | | |
| ↓ | 4 | SL0800 | | | 4 | | | | | |
| ↓ | 26 | | | | | | | | | |
| SS | 1 | SJSB028-G03 | 0.8 | 4-6 | 5 | | 4-6 SAA | | | |
| ↓ | 2 | 1015 | | | | | | | | |
| ↓ | 1 | SL0801 | | | 6 | | | | | |
| ↓ | 2 | | | | | | | | | |
| SS | 2 | SJSB028-G04 | 2.0 | 6-8 | 7 | | 6-8: SAA. Thin laminations of v. silty f. SAND and sandy CLAY. moist to wet | | | |
| ↓ | 1 | 1030 | | | | | | | | |
| ↓ | 3 | SL0802 | | | 8 | | SAA | | | |
| ↓ | 2 | | | | | | @ 8.6: ~~sub~~moderate organic fibers. | | | |
| SS | 2 | SJSB028-G05 | 2.0 | 8-10 | 9 | | | | | |
| ↓ | 1 | 1045 | | | | | | | | |
| ↓ | 1 | SL0803 | | | 10 | | Substantial organic fibers @ 10.3' + 10.6' | | | |
| ↓ | 1 | SG, GS, AL | | | | | | | | |
| SS | 2 | SJSB028-G06 | 2.0 | 10-12 | 11 | | @ 11-11.5: 2 thin lam. of l. brn silty f. SAND | | | |
| ↓ | 1 | 1100 | | | | | | | | |
| ↓ | WOR | | | | 12 | | | | | |
| ↓ | 1 | | | | | | | | | |
| SS | 2 | SJSB028-G07 | 2.0 | 12-14 | 13 | | | | | |
| ↓ | 1 | 1115 | | | | | | | | |
| ↓ | 1 | | | | 14 | ML | 13.2-13.9: l. olive gray, v. soft, moist v. sandy SILT. | — | 35 | 65 |
| ↓ | 1 | | | | | CL | 13.9-14.6: SA 2-13.2' above | | | |
| SS | 1 | SJSB028-G08 | 2.0 | 14-16 | 15 | SM | 14.6-16.9: l. gray, moist, v. loose, v. silty f. SAND. Trace lam. of gray CLAY | — | 70 | 30 |
| ↓ | 1 | 1130 | | | | | | | | |
| ↓ | 1 | SL0804 | | | 16 | | | | | |
| ↓ | 1 | | | | | | | | | |
| SS | WOH | SJSB028-G09 | 1.7 | 16-18 | 17 | CL | 16.9-20' v. soft, moist, gray, no plasticity CLAY. | — | — | 100 |
| ↓ | ↓ | 1140 | | | | | | | | |
| ↓ | ↓ | | | | 18 | | | | | |
| | | | | | 19 | | | | | |
| | | | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: 1600 → Push ST 5-9' → driller over-pushed, Confirm as Clay is compact @ Top + Bottom. Try ST 9-11' instead.

1610 → Push ST 9-11' → Gray, Soft CLAY @ bottom. 1.5' recovery. ~~SL0804~~ CJ SL0810

Attachment Figure A.3-1

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB028
DATE BEGAN 11/19/18
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| ST | Push | SJSB028-G10<br>1335<br>SL0805 | 1.8 | 20-22 | 21 | ML | Gray, moist, soft, v. sandy, clayey SILT | - | 30 | 70 |
| | | | | | 22 | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | | | | |
| SS | WOH | SJSB028-G11<br>SL0806<br>1355<br>GS, SG, AL | 2.0 | 25-27 | 26 | CL | AOPP 16-20' | | | |
| | | | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| SS | WOH | SJSB028-G12<br>1420<br>SL0807<br>~~11~~ | 2.0 | 30-32 | 31 | | SAA | | | |
| | | | | | 32 | | | | | |
| | | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | | 35 | | 35-35.7' SAA | | | |
| SS | 2<br>8<br>12<br>16 | SJSB028-G13<br>1435<br>SL0808<br>SL0809 | 2.0 | 35-37 | 36 | CH | 35.7-37': Beaumont CLAY | | | |
| | | | | | 37 | | | | | |
| | | | | | 38 | | End @ 37' @ 1445 | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-2

(TW014)

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Torell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING #: SB029
DATE BEGAN: 11/6/18
DATE COMPLETED: 11/6/18
TOTAL DEPTH: 40'
SHEET 1 OF 2

Field location of boring

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SONIC | ~~0505~~ | 0600 | | | | | | DK BRN - BL PEAT, ROOTS MOIST SILT SOME CLAY & VF SAND MOIST |
| | | CRT | | | | | | 1 | | |
| | | CRT | | | | | | 2 | | |
| | | | ~~0507~~ | 0601 | | | | | | |
| | | | | | | | | 3 | | |
| | | CRT | | | | | | | | AHEAD ON 11/7/18 (moved over feet to shelby tube 5-7' SL 0612) |
| | | ~~0502~~ | ~~0502~~ | 0602 | | | | 4 | ST PULL | WET @ 5' |
| | | | | | | | | 5 | SL 0612 | SAND VF LIGHT GREY |
| | | CRT | | | | | | 6 | | Some silt, little clay, clayer lense 5.5-6.0 |
| | | | ~~0503~~ | 0603 | | | | | | |
| | | | | | | | | 7 | | as 0-5 occ thin 1" sandier zones |
| | | CRT | | | | | | 8 | | |
| | | | ~~0504~~ | 0604 | | | | | | As ~~6-8~~ 5-6 CRT |
| | | | | | | | | 9 | | |
| | | CRT | | | | | | 10 | | |
| | | | ~~0505~~ | 0605 | | | | | | AS 0-5 |
| | | | | | | | | 11 | | |
| | | | | | | | | 12 | | |
| | | | | | | | | 13 | | |
| | | | | | | | | | | CRT |
| | | | | | | | | 14 | | |
| | | | | | | | | 15 | | SAND LIGHT GREY f-m little silt trace clay & rootlets 12.5-15 |
| | GS, SG | | | 0606 | | | | | | |
| | | | | | | | | 16 | | |
| | | | | | | | | 17 | | Same as 12.5-15 |
| | | | | | | | | 18 | | Dk brn black clay & silt some vf sand & shells plastic |
| | | | | | | | | 19 | | |
| | | | | | | | | 20 | | |

Remarks:

Attachment Figure A.3-3

TW014

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Torell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING # SB029
DATE BEGAN 11/6/18
DATE COMPLETED 11/6/18
TOTAL DEPTH 40'
SHEET 2 OF 2

Field location of boring: See pg 1

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | SG, AL | | 0607 | | | | | 21 | | as 17.5-20, 2" sand lenses @ 20.7 & 21.5 |
| | | | | | | | | 22 | | |
| | | | | | | | | 23 | | |
| | | | | | | | | 24 | | heaving material fry 30-33 |
| | | | | | | | | 25 | | |
| | | | 0608 | | | | | 26 | | SHELBY TUBE |
| | | | | | | | | 27 | | |
| | | | | | | | | 28 | | saa 25-27.5 saa soupy |
| | | | | | | | | 29 | | |
| | | | | | | | | 30 | | |
| | | | 0609 | | | | | 31 | | SHELBY TUBE 1450 |
| | | | | | | | | 32 | | saa |
| | | | | | | | | 33 | | |
| | | | | | | | | 34 | | |
| | | | | | | | | 35 | | 34.9-35 co light brn sand |
| | GS | | 0610 | 35-36.5 | | | | 36 | | co sand & gravel shells |
| | AL | | | | | | | 37 | | grey green v hard clay |
| | | | | | | | | 38 | | grading to tan-brn @ 39 |
| | | | | | | | | 39 | | |
| | | | 0611 | | 39.5-40 | | | 40 | | BEAUMONT CLAY |

NOTE: INTERGRAL TOOK PHOTOS OF 0-10 AQ 22' + 16'

Remarks:

Attachment Figure A.3-4

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB030
DATE BEGAN 11/18/18
DATE COMPLETED 11/18/18
TOTAL DEPTH 40
PAGE 1 OF 2

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 19 | SJSB030-G01 | 2.0 | 0-2 | 1 | Fill GM | 0-1.8: damp, dense, brown, silty sandy GRAVEL | 60 | 15 | 25 |
| | 24 | 1050 | | | | | | | | |
| | 29 | SL0688 | | | 2 | | | | | |
| | 21 | | | | | ML | 1.8-4.6: damp to dry, ~~hard~~ V. stiff, slightly sandy SILT | - | 10 | 90 |
| SS | 2 | SJSB030-G02 | 0.9 | 2-4 | 3 | | | | | |
| | 7 | 1055 | | | | | @3.6: grades to intermixed w/ yellowish-brown, dry, v. silty F. SAND. | | | |
| | 12 | SL0689 | | | 4 | ML/SM | | | | |
| | 15 | | | | | ML | 4.6-5.2: loose of damp, light olive brown, v. sandy SILT | - | 30 | 70 |
| SS | 1 | SJSB030-G03 | 2.0 | 4-6 | 5 | CL | 5.2-6 dk gray, moist, stiff, sandy silty, low plasticity CLAY. | | | |
| | 4 | 1120 | | | | ML | 6-6.4: SA 1.8-4.6' above, moist | | | |
| | 8 | SL0690 | | | 6 | CL | 6.4-7.1: dk olive gray, moist, m. stiff CLAY | - | - | 100 |
| | 9 | | | | | ML | 7.1-11.4: dk brown, damp, stiff, sandy SILT | - | 20 | 80 |
| SS | 2 | SJSB030-G04 | 2.0 | 6-8 | 7 | | | | | |
| | 4 | 1125 | | | | | 8-10 SAA. grades to olive gray. | | | |
| | 5 | SL0691 | | | 8 | | @9.7-10': substantial shell hash. | | | |
| | 8 | | | | | | | | | |
| SS | WOH | SJSB030-G05 | 1.8 | 8-10 | 9 | | | | | |
| | ↓ | 1135 | | | | | | | | |
| | 2 | SL0692 | | | 10 | | | | | |
| | 6 | AL, SG | | | | | | | | |
| SS | 3 | SJSB030-G06 | 2.0 | 10-12 | 11 | | | | | |
| | 7 | 1150 | | | | | | | | |
| | 8 | | | | 12 | SM | 11.4-14.6: moist, m. dense, l. gray w/ l. brown mottling; v. silty SAND (v. fine SAND) | - | 60 | 40 |
| | 9 | | | | | | | | | |
| SS | WOH | SJSB030-G07 | 1.7 | 12-14 | 13 | | 12-14: SAA | | | |
| | 9 | 1200 | | | | | | | | |
| | 10 | | | | 14 | | | | | |
| | 10 | | | | | | | | | |
| SS | WOH | SJSB030-G08 | 2.0 | 14-16 | 15 | CL | 14.6-15.1: lense of gray, moist soft, CLAY | - | - | 100 |
| | 2 | 1215 | | | | SP/SM | 15.1-16; wet, louse, l. gray v. fine silty Sand. occassional laminations of gray & dk gray CLAY throughout | - | 80 | 20 |
| | 4 | SL0693 | | | 16 | SM | | | | |
| | 4 | GS | | | | CL | 16-16.5: SA 11.4-14.6' above | | | |
| SS | WOH | SJSB030-G09 | 2.0 | 16-18 | 17 | | | | | |
| | 1 | 1225 | | | | AAA | 16.5-20: dk gray grading to gray; v. soft, moist slightly sandy CLAY. Truce organic fibers. | - | 5 | 95 |
| | 1 | ~~SL0694-CT~~ | | | 18 | | | | | |
| | 2 | | | | | | | | | |
| | | | | | 19 | | | | | |
| | | | | | | | | | | |
| | | | | | 20 | | | | | |

marks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: SL0698 → ST → 8-10', 11/18/18;

Attachment Figure A.3-5

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches

BORING #
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH: 40'
PAGE 2 OF 2
SAMPLING METHOD: 3 in. by 2 ft

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| ST | Push | SJSB030-G10 1340 SL0694 | 2.0 | 20-22 | 21 | SM | Gray v. silty F. SAND in ST | | | |
| | | | | | 22 | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | | | | |
| SS | 12 | SJSB030-G11 1400 SL0695 | 0.3 | 25-27 | 26 | SM | Wet, m. dense, gray silty F. SAND Heaving sands → replaced catchers in SPTs | – | 90 | 10 |
| | 15 | | | | | | | | | |
| | 13 | | | | | | | | | |
| | 13 | | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| SS | 10 | SJSB030-G12 1415 SL0696 SG, AL, GS | 0.5 | 30-32 | 31 | | SAA | | | |
| | 15 | | | | | | | | | |
| | 15 | | | | 32 | | | | | |
| | 13 | | | | | | | | | |
| | | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | | 35 | | | | | |
| SS | 10 | SJSB030-G13 SL0697 1430 | | 35-37 | 36 | | | | | |
| | 29 | | | | | | | | | |
| | 11 | | | | 37 | | | | | |
| | 9 | | | | | | | | | |
| | | | | | 38 | | Beaumont CLAY (v. stiff, damp, l brown) | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | End @ 40' @ 1445. | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

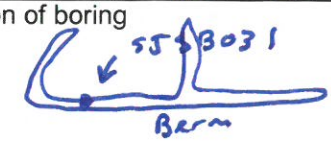
Notes:

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJSB031/TW01
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN 11/8/18
GEOLOGIST/ENGINEER Torell DATE COMPLETED
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD 4x6 sonic + AUTO HAMMER SHEET 1 OF
HOLE DIAMETER 6"

Field location of boring




| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | 910 | SS | 0613 | | | 12 | | | | TAN BRN f-m sand, some clean |
| | | | | | | 15 | | 1 | | fill gravel little silt + clay |
| | | | | | | 16 | | | | grading to brn at 2' |
| | | | | | | 15 | | 2 | | |
| | 920 | | 0614 | | | 9 | | | | as above integral |
| | | | | | | 13 | | 3 | | has 0-18 |
| | | | | | | 15 | | | | pics |
| | | | | | | 9 | | 4 | | |
| | 930 | SS | 0615 | | | 4 | | | RRT | as above grading to grey |
| | | | | | | 4 | | 5 | | 5.5-6.0 black peat, roots |
| | | | | | | 4 | | | | ~~Shelby tube 11/10/18 SL0627~~ |
| | | | | | | 5 | | 6 | | ~~pull ahead~~ |
| | 945 | SS | 0616 | | | 7 | | | | as 4.0-5.5 occ rootlets, interbedded |
| | | | | | | 5 | | 7 | | wet, bedding decreasing w/ depth |
| | 955 | | | | | 4 | | | | ST T24, 5-7 poor recovery |
| | | | | | | 5 | | 8 | | 0800 SL0627 |
| SG | 300# hammer | SS | 0617 | | | 5 | | | | as above |
| GS | | | | | | 5 | | 9 | | |
| AL | | | | HOLD | | 8 | | | | |
| | | | | | | 13 | | 0 | | |
| | 1015 | SS | 0618 | | WEIGHT OF HAMMER | | | | | as above |
| | | | | | 3 | ~~WOH~~ | CRT | 1 1 | | |
| | | | | HOLD | | 5 | | | | TAN BRN F-M SAND TRACE |
| | 11/9/18 | | | | | 11 | | 1 2 | | SILT, WET |
| | ~~1025~~ | SS | 0619 | | | ? | | | | saa, wet |
| | 830 | | | | | ? | | 1 3 | | |
| | | | | | | 6 | | | | |
| | | | | | | 9 | | 1 4 | | |
| | 840 | SS | 0620 | | | 4 | | | | saa, dkbrn 14-15, tanbrn |
| | | | | | | 8 | | 1 5 | | 15-16 |
| | | | | | | 13 | | | | |
| | | | | | | 9 | | 1 6 | | |
| | 905 | SS | 0621 | | | WOH | | | | saa tan brn dkbrn |
| | | | | | | WOH | | 1 7 | | 16.8-17.2 greying w/ |
| | | | | | | 1 | | | | depth |
| | | | | | | 4 | | 1 8 | | |
| | | NS | | | NS | | | | | |
| | | | | | | | | 1 9 | | |
| | | | | | | | | 2 0 | | |

Remarks:

Attachment Figure A.3-7

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Terell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 4x6 Sonic 300# auto hammer
HOLE DIAMETER: 6"
BORING #: SJSB031/MW01
DATE BEGAN: 11/8/18
DATE COMPLETED:
TOTAL DEPTH:
SHEET 2 OF

Field location of boring

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| SG | | SS | 0622 | | | 2 | | | | SAND GREY med Some fine sand |
| GS | | | | | | 1 | | 2 1 | | trace silt wet |
| AL | | | | | | WOH | | | | |
| | | | | | | 2 | | 2 2 | | |
| | | | | | | | | 2 3 | | |
| | | | | | | | | 2 4 | | |
| | | | | | | | | 2 5 | | |
| | | SS | 0623 | | | 9 | | | | poor recovery (~8") saa |
| | | | | | | 18 | | 2 6 | | |
| | | | | | | 19 | | | | |
| | | | | | | 15 | | 2 7 | | |
| | | | | | | | | 2 8 | | |
| | | | | | | | | 2 9 | | |
| | | SS | | | | | | 3 0 | | |
| | 1140 | SS | 0624 | | | 3 | | | | saa |
| | | | | | | 5 | | 3 1 | | |
| | | | | | | 7 | | | | |
| | | | | | | 4 | | 3 2 | | |
| | | | | | | | | 3 3 | | |
| | | | | | | | | 3 4 | | |
| | 1200 | SS | 0625 | | | | | 3 5 | | saa greyplastic clay large 2" thick @ 36' |
| | | | | | | 26 | | | | |
| | | | | | | 27 | | 3 6 | | |
| | | | | | | 21 | | | | |
| | | | | | | 24 | | 3 7 | | |
| | 1345 | ST | 0626 | | | | | | | Attempt shelby tube 37-39 |
| | | | | | | | | 3 8 | | as above in top |
| | | | | | | | | 3 9 | | |
| | | | | | | | | 4 0 | | Beaumont in tip set well at 38' |

Remarks:

have to overdrill to 40' to seal hole, backfill w/ pellets 40-38

ANCHOR QEA

# SOIL BORING LOG

1400 Start

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB032
DATE BEGAN 11/17/18
DATE COMPLETED
TOTAL DEPTH
PAGE 1 OF

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 3 | SJSB032-G01 | 1.2 | 0-2 | 1 | Fill GM | 0-1.5': d moist, med. dense, brown, silty Sandy Gravel (Fill). | 60 | 15 | 25 |
| | 8 | 1405 | | | | | | | | |
| | 10 | SL0675 | | | | | | | | |
| | 7 | | | | 2 | ML | @ 1.5': grades to dk gray to black, damp, mod. stiff SILT. | – | 5 | 95 |
| SS | 4 | SJSB032-G02 | 1.7 | 2-4 | | | @2.0': Liner (fabric, geotextile, fabric) | | | |
| | 6 | 1410 | | | 3 | SM | 2-2.7 SAA | | | |
| | 9 | SL0676 | | | | | 2.7-4.3 brown, damp to dry, m. dense, very silty f. SAND. PP = 2.25 to 3.0 tsf | – | 70 | 30 |
| | 10 | | | | 4 | | | | | |
| SS | 5 | SJSB032-G03 | 2.0 | 4-6 | | CL | 4.3-~~5.0~~ 4.7': dk brown, damp, stiff sandy CLAY | – | 30 | 70 |
| | 6 | 1420 | | | 5 | SC | 4.7-5.0': grades to clayey SAND | – | 60 | 40 |
| | 12 | SL0677 | | | | CL | 5-5.3': m. dense, damp, gray silty SAND | | | |
| | 21 | | | | 6 | | 5.3-5.9': v. stiff, gray, damp sandy CLAY | | | |
| SS | WOH | SJSB032-G04 | 2.0 | 6-8 | | CL/OL | @ 5.6 grades to dk. gray | | | |
| | 4 | 1435 | | | 7 | CH | 5.9-6.9': dk gray, moist, CLAY w/ mod. organic fibers (Peat) | – | 15 | 85 |
| | 5 | SL0678 | | | | | 6.9-~~7.0~~': v. stiff, damp, gray sandy silty CLAY w/ ~~higher~~ plasticity (6.9-10.6) | | | |
| | 7 | | | | 8 | | ~~9': light gray~~ CT | | | |
| SS | 4 | SJSB032-G05 | 2.0 | 8-10 | 9 | | | | | |
| | 7 | 1445 | | | | | | | | |
| | 7 | SL0679 | | | 10 | | | | | |
| | 10 | AL, SG | | | | | 10.6- | | | |
| SS | 1 | SJSB032-G06 | 2.0 | 10-12 | 11 | SM | E. gray, damp, m. dense, v. silty F. SAND | – | 70 | 30 |
| | 5 | 1505 | | | | | | | | |
| | 6 | ~~SL0680~~ GS | | | 12 | | | | | |
| | 8 | | | | | | | | | |
| SS | 2 | SJSB032-G07 | 1.5 | 12-14 | | | SAA, Grades to loose, moist. | | | |
| | 2 | 1515 | | | 13 | | @ 13.5-13.8': lense of soft, moist, dk gray SILT | | | |
| | 3 | | | | | | | | | |
| | 4 | | | | 14 | | | | | |
| SS | WOH | SJSB032-G08 | 1.1 | 14-16 | | SM | @ 14': grades to V. loose, wet, silty F. SAND (heaving) | – | 90 | 10 |
| | ↓ | 1530 | | | 15 | | | | | |
| | 3 | SL0680 | | | | | | | | |
| | 3 | GS | | | 16 | | | | | |
| SS | 3 | SJSB032-G09 | 2.0 | 16-18 | | | 16-18 SAA | | | |
| | 1 | 1546 | | | 17 | | | | | |
| | 1 | | | | | | | | | |
| | 3 | | | | 18 | | | | | |
| | | | | | | | | | | |
| | | | | | 19 | | | | | |
| | | | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: SL0686, 5-7', 11/18/18 0850, 2.3', sandy CLAY @ bottom.
SL0687 10-12' 11/18/18 0905, clayey, silty SAND @ bottom.

Attachment Figure A.3-9

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB032
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 4 | SJSB032-G10 | 1.7 | 20-22 | 21 | SM | AOPP. Shell fragments (trace) | | | |
| | 4 | 1550 | | | | | | | | |
| | 8 | SL0681 | | | 22 | | | | | |
| | 7 | | | | | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | | | | |
| SS | 10 | SJSB032-G11 | 1.7 | 25-27 | | | SAA | | | |
| | 8 | 1610 | | | 26 | | | | | |
| | 5 | SL0682 | | | 27 | | | | | |
| | 7 | | | | | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| SS | 7 | SJSB032-G12 | 1. | 30-32 | | | SAA. | | | |
| | 12 | 1635 | | | 31 | | | | | |
| | 10 | SL0683 | | | 32 | | | | | |
| | 8 | | | | | | | | | |
| | | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | | 35 | | | | | |
| SS | 4 | SJSB032-G13 | 1.6 | 35-37 | | | SAA. Shell fragments + halves (trace). | | | |
| | 5 | 1650 | | | 36 | | | | | |
| | 6 | SL0684 | | | 37 | | | | | |
| | 9 | GS | | | | | | | | |
| | | | | | 38 | ? | Beaumont CLAY. Driller estimates interface @ 38' based on casing resistance. | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-10

ANCHOR QEA

# SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SBSD032
DATE BEGAN 11/17/18
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | SAMPLING DATA: RECOVERY (ft recovered/ft driven) | SAMPLING DATA: DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 7 | SJSB032-G14 | | 40-42 | 41 | | Beaumont CLAY. V. Stiff, damp, orangish-brown, high plasticity CLAY. | - | - | 100 |
| ↓ | 8 | 1705 | | | | | | | | |
| | 14 | SL0685 | | | 42 | | | | | |
| ↓ | 17 | SG, AL | | | | | | | | |
| | | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | | | | |
| | | | | | 6 | | | | | |
| | | | | | 7 | | | | | |
| | | | | | 8 | | | | | |
| | | | | | 9 | | | | | |
| | | | | | 0 | | | | | |
| | | | | | 1 | | | | | |
| | | | | | 2 | | | | | |
| | | | | | 3 | | | | | |
| | | | | | 4 | | | | | |
| | | | | | 5 | | | | | |
| | | | | | 6 | | | | | |
| | | | | | 7 | | | | | |
| | | | | | 8 | | | | | |
| | | | | | 9 | | | | | |
| | | | | | 0 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-11

ANCHOR QEA

# SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 8 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB033
DATE BEGAN 11-12-18
DATE COMPLETED 11-14-18
TOTAL DEPTH 40
PAGE 1 OF 2

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 2 | SJSB033-G01 | 0.6 | 0-2 | | SP | Damp, brown, m. dense f-c SAND. Trace silt ~~clay~~ cg. | - | 80 | 20 |
| | 5 | ~~SL0640 No Sample~~ | | | 1 | | Trace organic roots/fibers | | | |
| | 9 | 1540 SL0640 | | | | | | | | |
| | 42 | 11-15-18 0820 | | | 2 | | 2-2.5: moist, v. loose, brn f. SAND | - | 95 | 5 |
| SS | 1 | SJSB033-G02 | 2.0 | 2-4 | | | | | | |
| | 1 | SL0641 | | | 3 | SC | 2.5-4: moist, loose, gray clayey f. SAND | - | 80 | 20 |
| | 2 | 1550 | | | | | | | | |
| | 3 | | | | 4 | | 4-4.2: Rock, 4.2-4.5: dk gray, moist, soft CLAY | | | |
| SS | 4 | SJSB033-G03 | 1.3 | 4-6 | | | 4.5: m. stiff, moist, grays, sandy CLAY. | | | |
| | 3 | SL0642 | | | 5 | CL | occasional organic material. Trace f. sand | | | |
| | 2 | 1605 | | | | | Laminations | | | |
| | 2 | | | | 6 | | | | | |
| SS | 6 | SJSB033-G04 | 1.8 | 6-8 | SL0649 0900 | | SAA | | | |
| | 7 | SL0643 | | | 7 | | | | | |
| | 3 | 1625 | | | | | | | | |
| | 4 | SG, AL | | | 8 | | | | | |
| SS | 2 | SJSB033-G05 | 1.9 | 8-10 | | | SAA. Trace Org. mat. | | | |
| | 2 | SL0644 | | | 9 | | | | | |
| | 3 | 1635 | | | | | | | | |
| | 3 | | | | 10 | SC | @9.5: grades to loose clayey SAND | - | 60 | 40 |
| SS | 18 | SJSB033-G06 | 1.7 | 10-12 | | ~~SC~~ | @10: grades to dk gray to brn-gray slightly sandy | | | |
| | 15 | 1655 | | | 11 | CL | CLAY. | | | |
| | 10 | | | | | | @11.2: Gravel up to 0.2' | | | |
| | 10 | | | | 12 | SM | | | | |
| SS | 4 | SJSB033-G07 | | 12-14 | | | 11.4-14.6: damp, m. dense, l. gray w/ brown mottling | | | |
| | 4 | 1705 | | | 13 | | slightly silty f. SAND. | - | 90 | 10 |
| | 4 | | | | | | 12-14: SAA | | | |
| | 8 | | | | 14 | | 14-14.6 SAA | | | |
| SS | 15 | SJSB033-G08 | 1.9 | 14-16 | | | 14.6-16 grades to light gray. | | | |
| | 14 | SL0645 | | | 15 | | Sandy CLAY laminations @ 14.7' & 15.6' | | | |
| | 5 | 1035 | | | | | | | | |
| | 5 | SG AL GS | | | 16 | | | | | |
| SS | ~~3~~ 5 | SJSB033-G09 | 2.0 | 16-18 | | | SAA light gray to gray, wet, loose sand, clayey/silty | - | 90 | 10 |
| | 4 | 1045 | | | 17 | | | | | |
| | 3 | | | | | | | | | |
| | 2 | | | | 18 | | | | | |
| | | | | | 19 | | | | | |
| | | | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: SL0649, 5-7', 0900, 2.3/2, gray sandy CLAY @ bottom

SL0650, 10-12', 0920, 2.3/2, brown silty SAND @ bottom

Attachment Figure A.3-12

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER 8 inches
SAMPLING METHOD 3 in. by 2 ft

BORING # SJSB033
DATE BEGAN 11/12/18
DATE COMPLETED 11/14/18
TOTAL DEPTH 40.
PAGE 2 OF 2

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring<br>LITHOLOGIC DESCRIPTION<br>Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 25 | SJSB033-G10 | 1.1 | 20-22 | 21 | SM | Try ST @ 20' → no penetration. ST Dented AOPP. One 1½" x 2" gravel | | | |
| ↓ | 10 | SL0646 | | | | | | | | |
| | 9 | 1135 | | | 22 | | | | | |
| ↓ | 13 | | | | | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | Try ST @ 25-27' → cannot penetrate. | | | |
| SS | 50/5" | SJSB033-G11 | 0 | 0.4 | 26 | | | | | |
| | | 1200 | | | | | | | | |
| | | No Recovery | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| SS | 5 | SJSB033-G12 | 0.6 | 30-32 | 31 | SM | wet, m.dense, gray, f-c, silty gravelly SAND, trace shells. 3"x2" gravel conglomerate of sand + f. gravel | 15 | 70 | 15 |
| ↓ | 13 | 1320 | | | | | | | | |
| | 17 | SL0647 | | | 32 | | | | | |
| ↓ | 9 | GS | | | | | | | | |
| | | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | | 35 | | | | | |
| SS | 1 | SJSB033-G13 | | 35-37 | 36 | | SAA. No gravel. Shell fragments | | | |
| ↓ | 7 | | | | | | | | | |
| | 20 CT | | | | 37 | | | | | |
| ↓ | 32 | | | | | | | | | |
| DP | | ~~SJS~~ CT | | | 38 | | | | | |
| | | | | | | CH | Beaumont CLAY. | | | |
| | | | | | 39 | | Bluish gray degrading to greenish brown | | | |
| | | SL0648 | | | 40 | | PP = 2.0 tsf | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-13

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 | BORING # SJSB034/TW017
PROJECT NUMBER: 180557-01.01 Task 03 | DATE BEGAN 11/10/18
GEOLOGIST/ENGINEER TORELL | DATE COMPLETED
DRILLING CONTRACTOR: Cascade | TOTAL DEPTH
DRILLING METHOD 8" sonic | SHEET 1 OF
HOLE DIAMETER 8"

Field location of boring: SJSB034/TW017

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING DATA: SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1250 | SS | 0628 | | | 10 | | 1 | SP | sand f some m sand & silt occ roots brn, grey, dk brn mottled |
| | | | | | | 11 | | | | |
| | | | | | | 9 | | 2 | | |
| | | | | | | 8 | | | | |
| | 1300 | SS | 0629 | | | 5 | | 3 | | as above, little clay |
| | | | | | | 6 | | | | |
| | | | | | | 5 | | 4 | | |
| | | | | | | 5 | | | | |
| | 1315 | SS | 0630 | | | 2 | | 5 | | as above occ shell |
| | | | | | | 5 | | | | |
| | | | | | | 4 | | 6 | | |
| | | | | | | 3 | | | | |
| | 1330 | SS | 0631 | | 2 | 4 | | 7 | SM ML | vf sand & silt little clay, roots, shells dk brn/black peaty wet |
| | | | | | 1 | 7 | | | | |
| | | | | | 2 | | | 8 | | loose |
| | | | | | 7 | | | | | |
| | 1345 | SS | 0632 | | | 4 | | 9 | | 8-9 as above, shells layer |
| | | | 0633 | | | 2 | | | SP | 9-10 grey m sand some f sand & little silt wet |
| | | | | | | 5 | | 10 | | ST SL 0639 11/11/18 1015 |
| | | | | | | 7 | | | OL | 10-11 peaty clay & silt some roots & shells plastic occ |
| | 1400 | SS | | | | WOH | | 11 | SM | 11-12 as 9-10 above, shells |
| | | | | | | 2 | | | | |
| | | | | | | 4 | | 12 | | |
| | | | | | | 15 | | | OL | as 10-11, lower 3" grey med sand well, little f sand & silt |
| | 1410 | SS | 0634 | | | WOH | | 13 | | |
| | | | | | | | | | | |
| | | | | | | 9 | | 14 | | |
| | 1420 | SS | 0634 | | | 9 | | | SP | sand f-m red brn, little silt & clay tight |
| | | | | | | 12 | | 15 | | |
| | | | | | | 15 | | | | |
| | | | | | | 16 | | 16 | | |
| | 1440 | SS | | | | 4 | | | | as above, grey @ 17.5 |
| | | | | | | 5 | | 17 | | |
| | | | | | | 5 | | | | |
| | | | | | | 7 | | 18 | | |
| | | WS | | | | WS | | | | |
| | | | | | | | | 19 | | |
| | | | | | | | | 20 | | |

Remarks:

Integral has pics 0-14

Attachment Figure A.3-14

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: TORELL
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING #: SJSB034/TW017
DATE BEGAN: 11/10/18
DATE COMPLETED:
TOTAL DEPTH:
SHEET 2 OF

Field location of boring

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1500 | SS | 0635 | | | WOH | | | SP | grey f sand, little med sand & silt |
| | | | | | | | | 2 1 | | gray clay dense 1.5-1.7 |
| | | | | | | 1 | | | | |
| | | | | | | 2 | | 2 | | |
| | | NS | | | | NS | | | | |
| | | | | | | | | 3 | | |
| | | | | | | | | 4 | | |
| | | | | | | | | 25 | | 25-26.2 |
| | 1520 | SS | 0636 | | | WOH | | | CL | ~~35-36.2~~ clay & f sand |
| | | | | | | WOH | | 6 | | interbeds, grey PP = 0.25 tsf |
| | | | | | | 4 | | | SP | 36.2-37 grey med sand |
| | | | | | | 3 | | 7 | | |
| | | NS | | | | NS | | | | try ST ~~27-29~~ 30-32 cont |
| | | | | | | | | 8 | | |
| | | | | | | | | 9 | | |
| | | | | | | | | 3 0 | | |
| | 1550 | ST | 0637 | | | ST | | | | SHELBY TUBE |
| | | | | | | | | 1 | | |
| | | | | | | | | 2 | | |
| | | NS | | | | NS | | | | |
| | | | | | | | | 3 | | |
| | | | | | | | | 4 | | |
| | | | | | | | | 3 5 | | |
| | 1615 | SS | ~~0638~~ cont | | | 1 | | | | No Recovery, <1" Med-coarse gravel in spoon |
| | | | | | | 1 | | 6 | | |
| | | | | | | 2 | | | | |
| | | | | | | 3 | | 7 | | |
| | | | | | | | | 8 | | |
| | | | | | | | | 9 | | |
| | | | | | | | | 0 | | |

Remarks:

casey has pics

Attachment Figure A.3-15

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Torell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING # SJSB034/TW017
DATE BEGAN: 11/10/18
DATE COMPLETED:
TOTAL DEPTH:
SHEET 3 OF

Field location of boring

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1705 | SJ | 0638 | | | 3 | | 4 | GP | 40-40.8 f-m gravels & shells |
| | | | | | | 5 | | 1 | | 40.8-42 BEAUMONT CLAY |
| | | | | gravel only | | 12 | | | CH | GREY TO REDBND |
| | | | | | | 20 | | 2 | | 4.7 Tons/Ft² |
| | | | | | | | | 3 | | Set well @ 41' right on top of BEAUMONT |
| | | | | | | | | 4 | | |
| | | | | | | | | 5 | | |
| | | | | | | | | 6 | | |
| | | | | | | | | 7 | | |
| | | | | | | | | 8 | | |
| | | | | | | | | 9 | | |
| | | | | | | | | 0 | | |
| | | | | | | | | 1 | | |
| | | | | | | | | 2 | | |
| | | | | | | | | 3 | | |
| | | | | | | | | 4 | | |
| | | | | | | | | 5 | | |
| | | | | | | | | 6 | | |
| | | | | | | | | 7 | | |
| | | | | | | | | 8 | | |
| | | | | | | | | 9 | | |
| | | | | | | | | 0 | | |

Remarks:

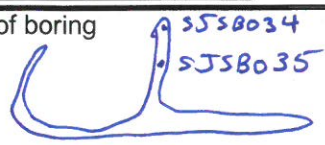
Attachment Figure A.3-16

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 | BORING # SJSB035
PROJECT NUMBER: 180557-01.01 Task 03 | DATE BEGAN 11/1/18
GEOLOGIST/ENGINEER TOLL | DATE COMPLETED
DRILLING CONTRACTOR: Cascade | TOTAL DEPTH
DRILLING METHOD 4"x6" SONIC | SHEET 1 OF
HOLE DIAMETER 6"

Field location of boring




| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1305 | SS | 0640 | | | 17 | | | | dk brn S+G some silt + clay, rocks |
| | | ↓ | | | | 15 | | 1 | | full moist grading to grey f sand little silt |
| | | | | | | 14 | | | | |
| | | ↓ | | | | 12 | | 2 | | |
| | 1315 | SS | SLO640 | | | 3 | | | | dk brn clay + some silt, little |
| | | ↓ | | | | 5 | | 3 | | f sand coarsens w/ depth |
| | | | | | | 6 | | | | |
| | | ↓ | | | | 9 | | 4 | | |
| | 1325 | SS | 0642 | | | 4 | | | | Tan brn f sand + silt some clay |
| | | ↓ | | | | 4 | | 5 | | |
| | | | | | | 4 | | | | |
| | | ↓ | | | | 4 | | 6 | | |
| | 1340 | SS | 0643 | | 1.3 | 1 | 2 | | | SAA. |
| | | ↓ | | | | 1 | | 7 | | |
| | | | | | | WOH | | | | @ 7.5: 0.2 x 0.1' gravel |
| | | ↓ | | | | 1 | | 8 | | @ 7.8: grades to V. soft moist, ~~black~~ gray sandy |
| SG | 1350 | SS | 0644 | | 2 | 6 | 2 | | | clay w/ shells |
| GS | | ↓ | | | | 3 | | 9 | | as 4-6 greying with depth |
| AL | | | | | | 5 | | | | |
| ↓ | | ↓ | | | | 6 | | 10 | | |
| | | SS | | | | 1 | | | | 10.0 - 11.5 saa |
| | | ↓ | | | | 2 | | 1 | | 11.5 - 12 dk grey f sand + trace |
| | | | | | | 3 | | | | silt + clay |
| | | ↓ | | | | 5 | | 2 | | |
| | 1410 | SS | | | | 7 | | | | SAA to 12.5 |
| | | ↓ | | | | 7 | | 3 | | 12.5 - 14 tan brn f sand little silt |
| | | | | | | 13 | | | | + mud sand |
| | | ↓ | | | | 14 | | 4 | | |
| | 1420 | SS | SLO645 | | | 4 | | | | SAA occ clayier lenses ≤ 1" |
| | | ↓ | | | | 6 | | 5 | | |
| | | | | | | 5 | | | | |
| | | ↓ | | | | 3 | | 6 | | |
| | | SS | | | | 5 | | | | SAA, occ shells |
| | | ↓ | | | | 7 | | 7 | | |
| | | | | | | 4 | | | | |
| | | ↓ | | | | 3 | | 8 | | |
| | | NS | | | | NS | | | | |
| | | ↓ | | | | ↓ | | 9 | | |
| | | ↓ | | | | | | 20 | | |

Remarks:

Interval was 0-18 pictures

Attachment Figure A.3-17

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJSB035

PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN

GEOLOGIST/ENGINEER DATE COMPLETED

DRILLING CONTRACTOR: Cascade TOTAL DEPTH

DRILLING METHOD SHEET 2 OF

HOLE DIAMETER

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING DATA: SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring / LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1445 | SS | 0646 | | WOH | 3 | | | | SAA |
| | | ↓ | ↓ | | 3 | 5 | CM | 2 1 | | @ 21.8 grey plastic clay |
| | | | 21.8-23 | | 1 | → | | | | |
| | | ↓ | only | | 1 | → | | 2 | | |
| | | NS | | | NS | | | | | |
| | | ↓ | | | ↓ | | | 3 | | |
| | | | | | | | | | | |
| | | | | | | | | 4 | | |
| | | | | | | | | | | |
| | | ↓ | | | ↓ | | | 5 | | |
| | 1500 | SS | 0647 | | | 4 | | | | SA upper above |
| | | ↓ | | | | 2 | | 6 | | |
| | | | | | | 6 | | | | |
| | | ↓ | | | | 11 | | 7 | | |
| | | NS | | | | NS | | | | |
| | | ↓ | | | | ↓ | | 8 | | |
| | | | | | | | | | | |
| | | | | | | | | 9 | | |
| | | | | | | | | | | |
| | | ↓ | | | | ↓ | | 3 0 | | |
| | 1545 | SS | 0648 | | | 3 | | | | occ f-m sand grey, silts |
| | | ↓ | | | | 4 | | 1 | | |
| | | | | | | 4 | | | | |
| | | ↓ | | | | 4 | | 2 | | |
| | | NS | | | | NS | | | | |
| | | ↓ | | | | ↓ | | 3 | | |
| | | | | | | | | | | |
| | | | | | | | | 4 | | |
| | | | | | | | | | | |
| | | ↓ | | | | ↓ | | 5 | | |
| | 1600 | ST | | | | ST | | | | TRY SHELBY TUBE |
| | | ↓ | | | | ↓ | | 6 | | ST EMPTY 50 to 40' |
| | | | | | | | | | | |
| | | ↓ | | | | ↓ | | 7 | | heaving sands |
| | | NS | | | | NS | | | | |
| | | ↓ | | | | ↓ | | 8 | | |
| | | | | | | | | | | |
| | | | | | | | | 9 | | |
| | | | | | | | | | | |
| | | ↓ | | | | ↓ | | 4 0 | | |

Remarks:

Attachment Figure A.3-18

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJSB035

PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN

GEOLOGIST/ENGINEER DATE COMPLETED 11/12/18

DRILLING CONTRACTOR: Cascade TOTAL DEPTH

DRILLING METHOD SHEET OF

HOLE DIAMETER

Field location of boring

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING DATA: SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1625 | ss | 0649 | | | 1 | | 41 | | clean out from 37-40 had 39-40 green gray clay some mottled red brn v hard BEAUMONT check w/ split spoon 40-42 |
| | | ↓ | 41-42 | | | 7 | | | | |
| | | | | | | 8 | | 2 | | |
| | | | | | | 9 | | | | |
| | | | | | | | | 3 | | |
| | | | | | | | | 4 | | 40-42 green gray clay fradus to red brn clay |
| | | | | | | | | 5 | | 2" gravel layers 40.4 41.0 coarse |
| | | | | | | | | 6 | | grout borings |
| | | | | | | | | 7 | | |
| | | | | | | | | 8 | | |
| | | | | | | | | 9 | | |
| | | | | | | | | 0 | | |
| | | | | | | | | 1 | | |
| | | | | | | | | 2 | | |
| | | | | | | | | 3 | | |
| | | | | | | | | 4 | | |
| | | | | | | | | 5 | | |
| | | | | | | | | 6 | | |
| | | | | | | | | 7 | | |
| | | | | | | | | 8 | | |
| | | | | | | | | 9 | | |
| | | | | | | | | 0 | | |

Remarks:

Attachment Figure A.3-19

ANCHOR QEA

# SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB036-GAB
DATE BEGAN 11/16/18
DATE COMPLETED 11/17/18
TOTAL DEPTH 35'
PAGE 1 OF 3

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 3 | SJSB036-G01 | 1.4 | 0-2.6 | | Waste | Overpenetrate by 7". V. soft | — | — | 100 |
| ↓ | WOH | SL0664 | | | 1 | | V. soft, moist, bluish-gray to blue, CLAY (waste). | | | |
| ↓ | ↓ | 1430 | | | | | @ 1.3: grades to dk brown. Hydrocarbon odor | | | |
| ↓ | WOH | | | ~~2-4~~ | 2 | | | | | |
| SS | WOH | SJSB036-G02 | 2.0 | 2.6-4 | 3 | | SAA. Trace gravel, Bluish-gray, dk brown, + black lenses. | | | |
| ↓ | ↓ | SL0665 | | | | | | | | |
| ↓ | ↓ | 1435 GS, AL, SG | | | 4 | | @ 3.6: Moderate organic fibers + yellow wood debris | | | |
| SS | 5 | SJSB036-G03 | 2.0 | 4-6 | | | | | | |
| ↓ | 8 | SL0666 | | | 5 | CH | 4-4.7: SAA (v. soft, moist to wet, gray to black silty CLAY) Strong hydroC odor. | — | — | 100 |
| ↓ | 7 | 1445 | | | | | | | | |
| ↓ | ~~8~~ | | | | 6 | | 4.7-11.3 Stiff, damp, ~~dk~~ brownish gray CLAY. ~~Strong odor, (hydroC)~~ Trace hydroC odor to 5.6 ft. Mod. organic fibers @ 4.9' | | | |
| SS | WOH | SJSB036-G04 | 1.7 | 6-8 | 7 | | | | | |
| ↓ | 1 | SL0667 | | | | | | | | |
| ↓ | 4 | 1540 | | | | | | | | |
| ↓ | 4 | SG, AL | | | 8 | | @ 5.7 grades to light/med gray. High Plast. | | | |
| SS | 2 | SJSB036-G05 | 2.0 | 8-10 | | | @ 6' grades to med. stiff | | | |
| ↓ | 2 | 1600 | | | 9 | | 8-10 SAA | | | |
| ↓ | 4 | SL0668 | | | | | | | | |
| ↓ | 7 | | | | 10 | | 10-11.3 SAA | | | |
| SS | WOH | SJSB036-G06 | 2.0 | 10-12 | | | | | | |
| ↓ | 3 | 1615 | | | 11 | | | | | |
| ↓ | 10 | ~~SL~~ CT | | | | | | | | |
| ↓ | 10 | | | | 12 | SC / CH | 11.3- light gray, med dense, moist to damp clayey f. SAND. | — | 80 | 20 |
| SS | 1 | SJSB036-G07 | 2.0 | 12-14 | | | 12-13.2: dk gray, moist, v. soft CLAY | — | — | 100 |
| ↓ | 1 | 1630 | | | 13 | | | | | |
| ↓ | 5 | ~~SL~~ CT | | | | SP | 13.2- ; moist, loose, gray f. SAND (silty) | — | 75 | 25 |
| ↓ | 4 | | | | 14 | | | | | |
| | | | | | 15 | | ST @ 15': No Recovery. | | | |
| ST | SS WOH | SJSB036-G08 | 1.5 | 15-17 | | | | | | |
| ↓ | 2 | 1650 | | | 16 | | SAA | | | |
| ↓ | 3 | SL0669 | | | | | | | | |
| ↓ | ↓ 5 | | | | 17 | | END @ 17' on 11/16. Resume 11/17 | | | |
| | | | | | 18 | | | | | |
| | | | | | 19 | | | | | |
| | | | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-20

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # STSB036
DATE BEGAN 11/16/18
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 7 | STSB036-G09 | 1.6 | 20-22 | 21 | SM | AOPP. Thin laminations of gray silt + gray clay throughout. | – | 85 | 15 |
| ↓ | 7 | 0815 | | | | | | | | |
| | 7 | SL0670 | | | | | | | | |
| ↓ | 8 | GS | | | 22 | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | | | | |
| SS | 4 | STSB036-G10 | 1.7 | 25-27 | | | SAA. Lense of dk gray silt @ 27' (1") thick | | | |
| ↓ | 9 | 0830 | | | 26 | | | | | |
| | 13 | SL0671 | | | | | | | | |
| ↓ | 7 | | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| SS | 8 | STSB036-G11 | 0 | 30-32 | | | No recovery. Silty f-c Sand in shoe. | | | |
| ↓ | 6 | 0845 | | | 31 | | | | | |
| | 7 | ~~SL0672~~ CJ | | | | | | | | |
| ↓ | 9 | | | | 32 | | | | | |
| | | | | | 33 | CH | clean-out casing 30-35': Beaumont CLAY observed from 32-35'. No sample | | | |
| | | | | | 34 | | from 35-37' needed. | | | |
| | | | | | 35 | | | | | |
| ~~SS~~ | ~~5~~ | ~~STSB036-G12CJ~~ | | ~~35-37~~ CJ | | | END @ 35' 0905 | | | |
| ↓ | | | | | 36 | | | | | |
| ↓ | | | | | 37 | | | | | |
| | | | | | 38 | | | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-21

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches

BORING # SJSB036 B
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF 3
SAMPLING METHOD: in. by ft

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| ST | | SJSB036-G12 1035 | 0 | 0-2 | 1 | | | | | |
| ST | | SJSB036-G13 1050 SL0672 | 2.2 | 2-4 | 3 | | | | | |
| ST | Push | SJSB036-G14 1100 SL0673 | 2.3 | 6-8 | 7 | | | | | |
| | Push | SJSB036-G15 1110 SL0674 | 2.1 | 8-10 | 9 | | | | | |
| | | | | | 10 | | End @ 10' @ 1120 | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-22

ANCHOR QEA

# SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB037
DATE BEGAN 11-15-18
DATE COMPLETED 11-16-18
TOTAL DEPTH 37'
PAGE 1 OF

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 3 | SJSB037-G01 | 1.6 | 0-2 | 1 | Fill | moist, dk brown, v. soft gravelly silt. Occasional organic material. (FILL) | 15 | 20 | 65 |
| | WOH | SL0651 | | | | | | | | |
| | WOH | 1450 | | | 2 | Waste | @1.2': grades to bluish silt (waste). | — | — | 100 |
| | WOH | | | | | | @1.8 grades back to dk gray brown. | | | |
| SS | WOH | SJSB037-G02 | 2.0 | 2-4 | | | 2-4: laminations of dk brown, black, bluish, + dk gray waste. Hydrocarbon odor. | | | |
| | | SL0652 | | | 3 | | @3.8: wood fibers (waste) | | | |
| | | 1455 | | | | | | | | |
| | | SG, AL, GS | | | 4 | | 4-5: Waste, med stiff ~~stiff~~ CJ, moist, CLAY w/ odor | | | |
| SS | 3 | SJSB037-G03 | 2.0 | 4-6' | | | Munsell: 2.5Y (2.5/1) + 7.5YR (3/2) | | | |
| | 6 | CJ 1451D | | | 5 | | @5.2': grades to stiff (0.75 to 1.25 tsf w/PP) CLAY w/ odor | | | |
| | 7 | SL0653 | | | | | | | | |
| | 8 | | | | 6 | | contact | | | |
| SS | 4 | SJSB037-G04 | 2.0 | 6-8 | 6.1 | | | | | |
| | 3 | 1535 | | | 7 | CL | 6.1- stiff, damp, bluish gray sandy CLAY | | | |
| | 7 | SL0654 | | | | | Native. Black mottling throughout. | | | |
| | 7 | | | | 8 | | Munsell: GLEY 2 (6/10B and to 3/10B). | | | |
| SS | 4 | SJSB037-G05 | 1.4 | 8-10 | | | | | | |
| | 5 | 1545 | | | 9 | | SAA. No black mottling | | | |
| | 6 | SL0655 | | | | | | | | |
| | 6 | AL, SG | | | 10 | | | | | |
| SS | WOH | SJSB037-G06 | | 10-12 | | | | | | |
| | | 1640 | | | 11 | | SAA. | | | |
| | | ~~SL0656~~ CJ | | | | | 11-12: laminations of black, v. soft SILT ~1/4" thick | | | |
| | 2 | | | | 12 | | | | | |
| SS | 1 | SJSB037-G07 | | | | | 12-12.6 SAA SILT | | | |
| | 2 | 1650 | | | 13 | | 12.6: grades to dk gray laminations w/in bluish-gray sandy CLAY. | | | |
| | 1 | SL0656 | | | | | | | | |
| | 2 | | | | 14 | | | | | |
| ~~AS~~ | | | | | | | | | | |
| | | | | | 15 | | | | | |
| ST | Push | SJSB037-G08 | 2.1 | 15-17 | | | ST: Gray, wet, soft sandy CLAY @ T+B. | | | |
| | | 1705 | | | 16 | | | | | |
| | | SL0657 | | | | | | | | |
| | | | | | 17 | | End @ 17' 11-15-18. | | | |
| | | | | | 18 | | | | | |
| | | | | | 19 | | | | | |
| | | | | | 20 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:
Contact potentially @ ~5.5' & stiff clay stained dk. brown + dk gray

Attachment Figure A.3-23

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches
BORING #:
DATE BEGAN:
DATE COMPLETED:
TOTAL DEPTH:
PAGE ____ OF ____
SAMPLING METHOD: in. by ft

Field location of boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLING DATA: SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS |
|---|---|---|---|---|---|---|---|---|---|---|
| SS | 6 | SJSB037-G09 | 1.4 | 20-22 | 21 | SM | Wet, loose, gray silty f-m. SAND | – | 85 | 15 |
| | 3 | 0805 | | | | | | | | |
| | 6 | SL0658 | | | | | | | | |
| | 10 | | | | 22 | | | | | |
| | | | | | 23 | | | | | |
| | | | | | 24 | | | | | |
| | | | | | 25 | | | | | |
| ST | 4 | SJSB037-G10 | 1.6 | 25-27 | | SP | ST: No Recovery. Do SS. | – | 95 | 5 |
| ↓ | 8 | 0845 | | | 26 | | SAA | | | |
| | 11 | SL0659 | | | | | | | | |
| ↓ | 12 | GS | | | 27 | | | | | |
| | | | | | 28 | | | | | |
| | | | | | 29 | | | | | |
| | | | | | 30 | | | | | |
| SS | 1 | SJSB037-G11 | 0.7 | 30-32 | | | SAA, Shell halves + pieces (trace). | | | |
| ↓ | 2 | 0900 | | | 31 | | | | | |
| | 1 | SL0660 | | | | | | | | |
| ↓ | 2 | | | | 32 | | | | | |
| | | | | | 33 | | | | | |
| | | | | | 34 | | | | | |
| | | | | | 35 | | | | | |
| SS | 2 | SJSB037-G12 | | | 36 | | | | | |
| ↓ | 3 | 0915 | | | | | 36.5-37: Beaumont CLAY. Stiff, damp, L. brn. | | | |
| | 6 | SL0661 | | | 37 | CH | | | | |
| ↓ | 6 | | | | | | End @ 37'. 0930 | | | |
| | | | | | 38 | | | | | |
| | | | | | 39 | | | | | |
| | | | | | 40 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-24

ANCHOR QEA

**SOIL BORING LOG**

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches

BORING # STSB037B
DATE BEGAN 11-16-18
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF
SAMPLING METHOD 3 in. by 2 ft

Field location of boring: 1 ft N of original boring

| SAMPLING METHOD | BLOW COUNTS (140-Lb Hammer) | SAMPLE ID | RECOVERY (ft recovered/ft driven) | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil | GRVL % | SND % | FNS % |
|---|---|---|---|---|---|---|---|---|---|---|
| ST | PUSH | No Recovery<br>1030<br>STSB037-G13 | 0 | 0-2 | 1 | | | | | |
| ST | Push | 1075 50<br>SL0662<br>STSB037-G14 | 1.8 | 2-4 | 2<br>3<br>4 | | | | | |
| SS | WOH | 1100<br>STSB037-G15<br>No Sample | 1.6 | 4-6 | 5 | | Wet to moist, v. soft, dk brown CLAY (waste). Occassional to moderate wood debris. | | | |
| ST | Push | No Recovery<br>STSB037-G16 | 0 | 6-8 | 6<br>7 | | | | | |
| ST | Push | STSB037-G17<br>1120<br>SL0663 | 1.2 | 8-10 | 8<br>9<br>10 | | Bottom: Native, sandy CLAY, moist, dk greenish-gray<br>End @ 10' | - | 15 | 85 |
| | | | | | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0 | | | | | |

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-25

SJSB038

ANCHOR QEA

**LOG OF EXPLORATORY BORING**

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 | BORING # ~~SJSB038~~
PROJECT NUMBER: 180557-01.01 Task 03 | DATE BEGAN 12/9/18
GEOLOGIST/ENGINEER Sam Giannakos | DATE COMPLETED 12/9
DRILLING CONTRACTOR: Cascade | TOTAL DEPTH @ 36'
DRILLING METHOD Sonic | SHEET 1 OF 2
HOLE DIAMETER 6", 2' by 3" Samples

Field location of boring: East cell

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SJGB | 038 | | 1.0 | 14 | 0-2' | | | Wet, black, gravels with medium sand. |
| | | | ~~G015~~ | | | 33 | (0-1) | 1 | | geotextile fragments; 1'-2' below cap |
| | | ~~SJGB~~ | ~~890~~ | | | 18 | | | | |
| | | | | | | 12 | | 2 | | |
| | | SJGB | 038 | | 0.1 | 2 | 2-4' | | | gravel (large) with sand (no sample) |
| | | | ~~G014~~ | | | 2 | (1-3) | 3 | | |
| | | ~~SJGB~~ | ~~891~~ | | | 3 | | | | |
| | | | | | | WOH | | 4 | | |
| | | SJGB | 038 | | 0 | 1 | 4-6 | | | NO Sample recovered. |
| | | | ~~G013~~ G034 | | | WOH | (3-5) | 5 | | |
| | | ~~SLO~~ | | | | 1 | | | | |
| | | | | | | WOH | | 6 | | |
| | | | | | 0 | | 6-8' | | | Soft → casing at 6', bailed at 8' - no sample |
| | | | | | | | (5'-7) | 7 | | |
| | | | | | | | | | | |
| | | | | | | | | 8 | | |
| | | SJGB | ~~038~~ | | 0.6 | WOH | 8-10 | | | Oily - hydrocarbon odor (Chem sample) |
| | | | G04 | | | WOH | (7-9) | 9 | | waste: black ooze |
| | | | 1130 | | | 1 | | | | |
| | | | | | | WOH | | 0 | | |
| | | SJGB | 038 | | 1.0 | 1 | 10-12 | | | grading out of waste: |
| | | | G05 | | | 1 | (9-11) | 1 | | light grey, moist to wet silt-like with |
| | | | 1150 | | | WOH | | | | fine grains |
| | | | | | | WOH | | 2 | | |
| | | SJGB | 038 | | 2.0 | WOH | 12-14 | | | damp, grey, V. soft SILT w/ pockets of |
| | | | G06 | | | | | 3 | | fine grey sand |
| | | SLO8 | 890 | | | | | | | |
| | | | 1200 | | | | | 4 | | |
| | | SJGB | 038 | | 2.0 | WOH | 14-16 | | | SAA @ 12' |
| | | | G07 | | | | (13-15) | 5 | | |
| | | SLO8 | 891 | | | | | | | |
| | | | 1315 | | | | | 6 | | |
| | | SJGB | G08 | | 2.0 | WOH | 19'-21' | | | Very loose, grey, med. SILTY SAND 64&90 |
| | | SLO | 892 | | | | | 7 | | |
| | | | 1325 | | | | | | | |
| | | | | | | | | 8 | | |
| | | | | | | | | | | |
| | | | | | | | | 9 | | |
| | | | | | | | | | | |
| | | | | | | | | 0 | | |

Remarks: Sonic: 0-10' (1-9): recovered dark gray/black silty waste with gravel fragments and strong odor

Attachment Figure A.3-26

ANCHOR QEA

# LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # ST 38038

PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN

GEOLOGIST/ENGINEER DATE COMPLETED

DRILLING CONTRACTOR: Cascade TOTAL DEPTH

DRILLING METHOD SHEET 2 OF 2

HOLE DIAMETER

| OTHER* | WELL OR PIEZOMETER DETAILS | SAMPLING DATA: SAMPLING METHOD | SAMPLE NUMBER | FID / PID (ppm) | RECOVERY (feet) | BLOWS / 6 INCHES | DEPTH SAMPLED | DEPTH IN FEET | SOIL GROUP SYMBOL (USCS) | Field location of boring / LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 21 | | |
| | | | | | | | | 22 | | |
| | | | | | | | | 23 | | |
| | | | | | | | | 24 | | |
| SS | | SGSB | 038 | | 2.0 | 4 | 24-26' | | | loose, grey, moist fine to coarse SAND 90% |
| | | | G09 | | | 3 | | 25 | | laminations of clay in cap. |
| | | SLOB | 93 | | | 2 | | | | |
| | | | 1335 | | | 2 | | 26 | | |
| | | | | | | | | 27 | | |
| | | | | | | | | 28 | | |
| | | | | | | | | 29 | | wet |
| SS | | SGSB | 038 | | 1.3 | 3 | 29-31 | | | med. dense, moist, light grey coarse 100% SAND |
| | | | G10 | | | 7 | | 30 | | |
| | | SLO | 894 | | | 12 | | | | |
| | | | 1345 | | | 8 | | 31 | | |
| | | | | | | | | 32 | | |
| | | | | | | | | 33 | | |
| | | | | | | | | 34 | | |
| ST | | SJSB | 038 | | 2.3' | A/H | 34-36 | | | Beaumont |
| | | | G11 | | | | | 35 | | |
| | | SLO | 895 | | | | | 36 | | |
| | | | | | | | | 37 | | |
| | | | | | | | | 38 | | |
| | | | | | | | | 39 | | |
| | | | | | | | | 40 | | |

Remarks: ST taken from 11-13' BML at additional note w/ 1.0 ft recovery

Attachment Figure A.3-27

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 486380 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB018 | SL0860 | 0-2 ft | Moist, dark grayish brown clay | 65.4 |
| SJGB018 | SL0861 | 8-10 ft | Moist, gray clay with sand | 24.8 |
| SJGB018 | SL0862 | 10-12 ft | Moist, very dark gray clay | 26.0 |
| SJGB018 | SL0864 | 14-16 ft | Moist, reddish brown silty sand | 23.6 |
| SJGB018 | SL0865 | 16-18 ft | Moist, light yellowish brown clay | 18.7 |
| SJGB018 | SL0866 | 18-20 ft | Moist, mottled light yellowish brown and gray clay | 17.6 |
| SJGB018 | SL0867 | 20-22 ft | Moist, brownish yellow clay | 17.0 |
| SJGB018 | SL0869 | 30-32 ft | Moist, mottled yellowish red and light gray clay | 29.7 |
| SJGB018 | SL0870 | 40-42 ft | Moist, light brownish gray silty sand | 19.1 |
| SJGB018 | SL0872 | 50-52 ft | Moist, gray clay | 20.3 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:04:58 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 485090 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB019 | SL0847 | 0-2' | Moist, dark yeollowish brown sand | 36.4 |
| SJGB019 | SL0848 | 4-6' | Moist, dark olive brown sand with silt | 37.1 |
| SJGB019 | SL0849 | 8-10' | Moist, dark gray clay | 30.1 |
| SJGB019 | SL0850 | 13-15' | Moist dark grayish brown silty sand | 27.3 |
| SJGB019 | SL0851 | 20-22' | Moist, light yellowish brown clay | 20.9 |
| SJGB019 | SL0853 | 30-32' | Moist, mottled reddish yellow and light gray clay | 28.1 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:06:29 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 486370 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB019 | SL0854 | 35-37' | Moist, brownish yellow clayey sand | 22.0 |
| SJGB019 | SL0855 | 40-42' | Moist, mottled reddish yellow and light gray clay | 29.7 |
| SJGB019 | SL0857 | 50-52 ft | Moist, gray clay | 28.2 |
| SJGB019 | SL0858 | 55-57 ft | Moist, very dark brown clay | 29.8 |
| SJGB019 | SL0859 | ~59-60 ft | Moist, gray clay with sand | 32.9 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:06:51 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 485079 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB020 | SL0832 | 4-6' | Moist, brown sand with silt and gravel | 22.3 |
| SJGB020 | SL0833 | 6-8' | Moist, dark olive brown sand | 25.5 |
| SJGB020 | SL0834 | 8-10' | Moist, dark gray sand with silt | 32.2 |
| SJGB020 | SL0836 | 15-17' | Moist, gray clay with gravel | 34.1 |
| SJGB020 | SL0838 | 20-22' | Moist, dark grayish brown silty sand | 18.0 |
| SJGB020 | SL0839 | 25-27' | Moist, mottled reddish yellow and gray clay | 31.9 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:07:29 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 485084 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB020 | SL0840 | 30-32' | Moist, light yellowish brown clay | 21.6 |
| SJGB020 | SL0842 | 40-42' | Moist, yellowish red clay | 27.1 |
| SJGB020 | SL0844 | 50-52' | Moist, yellowish red clay | 30.4 |
| SJGB020 | SL0845 | 55-57' | Moist, light gray clay | 23.4 |
| SJGB020 | SL0846 | 60-62' | Moist, grayish brown clay | 26.8 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:07:48 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 485150 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB021 | SL0821 | 0'-2' | Moist, reddish brown sand with silt | 37.4 |
| SJGB021 | SL0822 | 4'-6' | Moist, dark grayish brown silty sand | 39.9 |
| SJGB021 | SL0823 | 6'-8' | Wet, dark brown clay with sand | 51.4 |
| SJGB021 | SL0825 | 14'-16' | Moist, reddish gray sand with clay | 43.3 |
| SJGB021 | SL0826 | 19'-21' | Moist, light brown sand | 19.2 |
| SJGB021 | SL0827 | 29'-31' | Moist, mottled reddish yellow and gray clay | 45.1 |
| SJGB021 | SL0828 | 34'-36' | Moist, reddish yellow clay | 30.5 |
| SJGB021 | SL0830 | 44'-46' | Moist, light brownish gray sandy silt | 19.7 |
| SJGB021 | SL0831 | 49'-51' | Moist, light gray sand with silt | 19.3 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:08:10 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 485141 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB022 | SL0811 | 5'-7' | Moist, reddish brown sand with silt | 47.6 |
| SJGB022 | SL0813 | 10'-12' | Moist, reddish brown sand with silt | 50.2 |
| SJGB022 | SL0814 | 15'-17' | Moist, dark gray clay | 56.6 |
| SJGB022 | SL0815 | 20'-22' | Moist, mottled pinkish gray and yellow clay | 18.8 |
| SJGB022 | SL0816 | 25'-27' | Moist, yellowish red clay | 25.2 |
| SJGB022 | SL0818 | 35'-37' | Moist, reddish brown clay | 24.0 |
| SJGB022 | SL0819 | 40'-42' | Moist, light gray clay | 21.0 |
| SJGB022 | SL0820 | 45'-47' | Moist, light brownish gray silty sand | 21.8 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:08:41 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 486362 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB023G01 | SL0873 | 0-2 ft | Moist, dark gray clay | 29.8 |
| SJGB023G02 | SL0874 | 2-4 ft | Moist, dark brown clay | 25.6 |
| SJGB023G03 | SL0875 | 4-6 ft | Moist, olive brown silty sand | 23.0 |
| SJGB023G04 | SL0876 | 6-8 ft | Moist, gray clay | 24.7 |
| SJGB023G05 | SL0877 | 8-10 ft | Moist, dark gray clay | 27.6 |
| SJGB023G07 | SL0879 | 12-14 ft | Moist, dark gray clay | 23.1 |
| SJGB023G08 | SL0880 | 18-20 ft | Moist, dark yellowish brown silty sand | 21.7 |
| SJGB023G09 | SL0881 | 23-25 ft | Moist, dark grayish brown sand with silt | 16.4 |
| SJGB023G10A | SL0882 | 28-29.5 ft | Moist, light brown sand | 15.8 |
| SJGB023G10B | SL0883 | 29.5-30 ft | Moist, light gray clay | 20.0 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:09:15 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | md |
| Sample ID: | --- | Test Date: | 02/28/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 493238 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJGB023G12 | SL0884 | 38-40 ft | Moist, yellowish red clay | 30.5 |
| SJGB023G13 | SL0885 | 43-45 ft | Moist, mottled yellowish red and light gray clay | 34.2 |
| SJGB023G14 | SL0886 | 48-50 ft | Moist, light gray clay | 19.6 |
| SJGB023G16A | SL0888 | 58-59.3 ft | Moist, very pale brown clay | 22.3 |
| SJGB023G16B | SL0889 | 59.3-60 ft | Moist, light brownish gray silty sand | 16.9 |
| SJGB038 | SL0896 | 11-13 ft | Moist, dark gray clay | 48.8 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:10:35 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482773 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB008-E1 | SL1025 | 0-2 ft | Moist, mottled yellowish brown sand dark grayish brown clay | 27.2 |
| SJSB008-E1 | SL1026 | 2-4 ft | Moist, dark yellowish brown clay with sand | 25.9 |
| SJSB008-E1 | SL1027 | 4-6 ft | Moist, mottled dark grayish brown and yellowish brown clay | 26.1 |
| SJSB008-E1 | SL1028 | 6-8 ft | Moist, mottled brown and dark gray clay | 23.9 |
| SJSB008-E1 | SL1029 | 8-10 ft | Moist, very dark gray clay | 63.7 |
| SJSB008-E1 | SL1030 | 14-16 ft | Moist, mottled very dark gray and gray clay | 36.7 |
| SJSB008-E1 | SL1031 | 19-21 ft | Moist, mottled dark gray and light brownish gray clay | 25.8 |
| SJSB008-E1 | SL1032 | 21-23 ft | Moist, dark gray clay | 26.1 |
| SJSB008-E1 | SL1034 | 25-27 ft | Moist, light brownish gray silty sand | 25.1 |
| SJSB008-E1 | SL1035 | 29-31 ft | Moist, grayish brown sand | 24.3 |

Notes: Temperature of Drying : 110° Celsius

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 01/06/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 482959 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB012-W1 | SL1046 | 0-2 ft | Moist, dark brownish gray clay with sand | 30.9 |
| SJSB012-W1 | SL1047 | 2-4 ft | Moist, dark brown sand with gravel | 21.4 |
| SJSB012-W1 | SL1048 | 10-12 ft | Moist, very dark gray clay | 36.5 |
| SJSB012-W1 | SL1050 | 15-17 ft | Moist, grayish brown silty, clayey sand | 23.9 |
| SJSB012-W1 | SL1051 | 20-22 ft | Moist, very dark gray clay | 22.0 |
| SJSB012-W1 | SL1052 | 25-27 ft | Moist, dark gray clay with sand | 31.5 |
| SJSB012-W1 | SL1053 | 30-32 ft | Moist, grayish brown sand with silt | 19.5 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:11:40 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/06/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482748 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB019-E1 | SL1000 | 0-2 ft | Moist, dark grayish brown silty clay with gravel | 27.1 |
| SJSB019-E1 | SL1001 | 2-4 ft | Moist, mottled grayish brown and yellowish brown clay | 40.6 |
| SJSB019-E1 | SL1002 | 4-6 ft | Moist, mottled yellowish brown and dark grayish brown clay with gravel | 43.5 |
| SJSB019-E1 | SL1003 | 6-8 ft | Moist, mottled light brownish gray and very dark gray clay | 49.1 |
| SJSB019-E1 | SL1004 | 8-10 ft | Moist, very dark gray clay | 47.2 |
| SJSB019-E1 | SL1005 | 14-15 ft | Moist, dark grayish brown silty sand | 22.1 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:12:20 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/07/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482753 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB019-E1 | SL1006 | 15-16 ft | Moist, very dark gray clay | 65.5 |
| SJSB019-E1 | SL1008 | 19-21 ft | Moist, very dark gray clay | 30.3 |
| SJSB019-E1 | SL1009 | 24-26 ft | Moist, dark grayish brown sandy silt | 32.2 |
| SJSB019-E1 | SL1010 | 29-31 ft | Moist, light brownish gray sand | 22.0 |
| SJSB019-E1 | SL1011 | 34-36 ft | Moist, gray sand | 23.4 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:12:35 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482763 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB023-E1 | SL1013 | 0-2 ft | Moist, very dark gray sandy clay | 14.5 |
| SJSB023-E1 | SL1014 | 2-4 ft | Moist, very dark gray silty clay | 46.1 |
| SJSB023-E1 | SL1015 | 4-6 ft | Moist, very dark gray clay | 70.2 |
| SJSB023-E1 | SL1016 | 6-8 ft | Moist, mottled dark grayish brown and very dark gray clay | 52.9 |
| SJSB023-E1 | SL1017 | 10-12 ft | Moist, dark grayish brown silty sand | 22.3 |
| SJSB023-E1 | SL1018 | 14-14.8 ft | Moist, gray sand | 22.2 |
| SJSB023-E1 | SL1019 | 14.8-16 ft | Moist, mottled very dark gray and gray clay | 46.2 |
| SJSB023-E1 | SL1020 | 19-21 ft | Moist, mottled gray and dark gray clay | 26.8 |
| SJSB023-E1 | SL1022 | 24-26 ft | Moist, dark grayish brown clayey sand | 28.2 |
| SJSB023-E1 | SL1023 | 29-31 ft | Moist, gray sand | 22.6 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:12:59 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482780 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB025-1W | SL1037 | 2-4 ft | Moist, mottled very dark gray and brown clay | 27.2 |
| SJSB025-1W | SL1039 | 6-8 ft | Moist, mottled light brownish gray and dark grayish brown clay with sand | 25.8 |
| SJSB025-1W | SL1040 | 8-10 ft | Moist, very dark grayish brown sandy clay | 34.7 |
| SJSB025-1W | SL1041 | 14-16 ft | Moist, light brownish gray sand with silt | 20.6 |
| SJSB025-1W | SL1043 | 19-21 ft | Moist, gray clay | 30.8 |
| SJSB025-1W | SL1044 | 24-26 ft | Moist, gray silty sand | 21.3 |
| SJSB025-1W | SL1045 | 29-31 ft | Moist, grayish brown sand | 23.8 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:13:29 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 01/11/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483630 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB028 | SL0699 | 0-2 ft | Moist, dark gray clay with gravel | 25.1 |
| SJSB028 | SL0800 | 2-4 ft | Moist, dark brown clay | 30.3 |
| SJSB028 | SL0801 | 4-6 ft | Moist, very dark gray clay | 25.0 |
| SJSB028 | SL0802 | 6-8 ft | Moist, dark brown clay | 26.9 |
| SJSB028 | SL0803 | 8-10 ft | Moist, very dark brown clay | 41.1 |
| SJSB028 | SL0804 | 14-16 ft | Moist, grayish brown silty clay | 32.5 |
| SJSB028 | SL0806 | 25-27 ft | Moist, very dark brown clay with sand | 49.9 |
| SJSB028 | SL0807 | 30-32 ft | Moist, dark gray clay | 55.3 |
| SJSB028 | SL0808 | 35-35.7 ft | Moist, dark gray clay | 55.0 |
| SJSB028 | SL0809 | 35.7-37 ft | Moist, gray clay | 18.2 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:13:55 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482786 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB029 | SL0600 | 0-2 ft | Moist, very dark brown clay | 32.2 |
| SJSB029 | SL0601 | 2-4 ft | Moist, very dark grayish brown clay | 34.7 |
| SJSB029 | SL0602 | 4-6 ft | Moist, mottled very dark gray and grayish brown clay | 41.9 |
| SJSB029 | SL0603 | 6-8 ft | Moist, very dark gray clay | 63.6 |
| SJSB029 | SL0604 | 8-10 ft | Moist, very dark grayish brown clay with sand | 35.3 |
| SJSB029 | SL0605 | 10-12 ft | Moist, very dark grayish brown clay | 65.7 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:14:20 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482791 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB029 | SL0606 | 15-17 ft | Moist, dark grayish brown silty sand | 27.0 |
| SJSB029 | SL0607 | 20-22 ft | Moist, dark grayish brown clay | 44.9 |
| SJSB029 | SL0608 | 25-27 ft | Moist, dark gray silt | 45.1 |
| SJSB029 | SL0610 | 35-36.5 ft | Moist, very dark grayish brown sand with silt | 19.7 |
| SJSB029 | SL0611 | 39.5-40 ft | Moist, mottled yellowish brown and very dark grayish brown clay | 17.6 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:14:42 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 01/11/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483620 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB030 | SL0688 | 0-2 ft | Moist, dark brown silt with gravel | 14.1 |
| SJSB030 | SL0689 | 2-4 ft | Moist, dark brown clay | 16.0 |
| SJSB030 | SL0690 | 4-6 ft | Moist, dark grayish brown clay | 21.4 |
| SJSB030 | SL0691 | 6-8 ft | Moist, dark grayish brown clay | 26.1 |
| SJSB030 | SL0692 | 8-10 ft | Moist, dark brown silty clay with gravel | 21.0 |
| SJSB030 | SL0693 | 14-16 ft | Moist, dark grayish brown clayey sand | 26.9 |
| SJSB030 | SL0695 | 25-27 ft | Moist, dark gray silty sand | 21.8 |
| SJSB030 | SL0696 | 30-32 ft | Moist, brownish gray sand with silt | 21.8 |
| SJSB030 | SL0697 | 35-37 ft | Moist, dark gray sand | 20.2 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:15:07 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | --- | Test Id: | 482801 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB031 | SL0613 | 0-2 ft | Moist, olive brown silty sand with gravel | 14.0 |
| SJSB031 | SL0614 | 2-4 ft | Moist, mottled olive brown and dark gray clay with sand | 19.1 |
| SJSB031 | SL0615 | 4-6 ft | Moist, mottled dark grayish brown, gray, and yellowish brown clay | 25.5 |
| SJSB031 | SL0616 | 6-8 ft | Moist, very dark grayish brown clay | 21.9 |
| SJSB031 | SL0617 | 8-10 ft | Moist, very dark grayish brown clayey sand | 20.7 |
| SJSB031 | SL0620 | 14-16 ft | Moist, mottled yellowish brown and grayish brown clay with sand | 18.2 |
| SJSB031 | SL0622 | 20-22 ft | Moist, grayish brown sand | 21.3 |
| SJSB031 | SL0623 | 25-27 ft | Moist, dark gray sand | 23.5 |
| SJSB031 | SL0624 | 30-32 ft | Moist, grayish brown sand | 20.0 |
| SJSB031 | SL0625 | 35-37 ft | Moist, grayish brown sandy silt | 33.3 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:15:34 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483606 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB032 | SL0675 | 0-2 ft | Moist, light grayish brown and very dark gray clay with gravel | 13.8 |
| SJSB032 | SL0676 | 2-4 ft | Moist, very dark gray and very dark grayish brown clay | 40.7 |
| SJSB032 | SL0677 | 4-6 ft | Moist, very dark grayish brown clay with sand | 18.8 |
| SJSB032 | SL0678 | 6-8 ft | Moist, very dark grayish brown clay | 25.6 |
| SJSB032 | SL0679 | 8-10 ft | Moist, dark gray clay | 27.8 |
| SJSB032 | SL0680 | 14-16 ft | Moist, dark grayish brown sand with silt | 25.3 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:16:00 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483611 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB032 | SL0681 | 20-22 ft | Moist, dark gray sand | 23.8 |
| SJSB032 | SL0682 | 25-27 ft | Moist, gray sand | 18.5 |
| SJSB032 | SL0683 | 30-32 ft | Moist, dark grayish brown sand | 20.4 |
| SJSB032 | SL0684 | 35-37 ft | Moist, grayish brown sand | 20.5 |
| SJSB032 | SL0685 | 38-40 ft | Moist, yellowish brown clay | 21.9 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:16:23 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/11/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483582 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB033 | SL0640 | 0-2 ft | Moist, light brownish gray sandy clay with gravel | 15.2 |
| SJSB033 | SL0641 | 2-4 ft | Moist, very dark brown sand | 25.0 |
| SJSB033 | SL0642 | 4-6 ft | Moist, very dark brown clay | 24.9 |
| SJSB033 | SL0643 | 6-8 ft | Moist, dark grayish brown silty clay with sand | 21.0 |
| SJSB033 | SL0644 | 8-10 ft | Moist, very dark gray clay | 24.5 |
| SJSB033 | SL0645 | 14-16 ft | Moist, grayish brown silty sand | 23.8 |
| SJSB033 | SL0646 | 20-22 ft | Moist, dark gray sand | 21.0 |
| SJSB033 | SL0647 | 30-32 ft | Moist, grayish brown sand with gravel | 15.2 |
| SJSB033 | SL0648 | 35-37 ft | Moist, dark gray sand | 17.9 |
| SJSB033 | SL0649 | 38-40 ft | Moist, light olive brown clay | 19.2 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:17:04 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 01/06/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 482952 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB034 | SL0628 | 0-2 ft | Moist, dark olive brown silt with sand | 14.6 |
| SJSB034 | SL0629 | 2-4 ft | Moist, dark grayish brown clay | 18.7 |
| SJSB034 | SL0630 | 4-6 ft | Moist, dark gray clay | 20.5 |
| SJSB034 | SL0631 | 6-8 ft | Moist, very dark brown sandy clay | 25.2 |
| SJSB034 | SL0632 | 8-9 ft | Moist, very dark gray clay with gravel | 25.7 |
| SJSB034 | SL0633 | 9-10 ft | Moist, pale brown sand | 19.5 |
| SJSB034 | SL0634 | 14-16 ft | Moist, light yellowish brown silty sand | 18.9 |
| SJSB034 | SL0635 | 20-22 ft | Moist, very dark gray clay with silt and sand | 28.5 |
| SJSB034 | SL0636 | 25-27 ft | Moist, very dark gray clay with sand | 35.4 |
| SJSB034 | SL0638 | 40-40.8 ft | Moist, dark grayish brown silty sand | 12.1 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:17:28 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 01/03/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 482942 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB035 | SL0640 | 0-2 ft | Moist, mottled dark gray and brown clay | 15.0 |
| SJSB035 | SL0641 | 2-4 ft | Moist, grayish brown clay | 18.6 |
| SJSB035 | SL0642 | 4-6 ft | Moist, mottled light yellowish brown and grayish brown clay | 21.3 |
| SJSB035 | SL0643 | 6-8 ft | Moist, very dark gray clay with gravel | 29.6 |
| SJSB035 | SL0644 | 8-10 ft | Moist, very dark grayish brown sandy clay | 24.8 |
| SJSB035 | SL0645 | 14-16 ft | Moist, mottled grayish brown and light olive brown clay | 25.6 |
| SJSB035 | SL0646 | 21.8-22 ft | Moist, very dark gray clay | 42.8 |
| SJSB035 | SL0647 | 25-27 ft | Moist, dark gray silty sand | 24.5 |
| SJSB035 | SL0648 | 30-32 ft | Moist, dark gray silty sand | 16.9 |
| SJSB035 | SL0649 | 40-42 ft | Moist, yellowish brown clay | 19.8 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:17:52 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/11/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483600 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB036 | SL0664 | 0-2.6 ft | Wet, black clay | 82.4 |
| SJSB036 | SL0665 | 2.6-4 ft | Moist, very dark grayish brown sandy clay | 77.5 |
| SJSB036 | SL0666 | 4-6 ft | Moist, very dark gray clay | 30.0 |
| SJSB036 | SL0667 | 6-8 ft | Moist, very dark grayish brown clay | 28.4 |
| SJSB036 | SL0668 | 8-10 ft | Moist, mottled very dark gray and gray clay | 23.4 |
| SJSB036 | SL0669 | 15-17 ft | Moist, gray sandy clay | 29.3 |
| SJSB036 | SL0670 | 20-22 ft | Moist, dark gray sand with silt | 22.0 |
| SJSB036 | SL0671 | 25-27 ft | Moist, gray sand | 19.9 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:18:14 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/11/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483592 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB037 | SL0651 | 0-2 ft | Moist, dark gray and light brownish gray clay | 48.4 |
| SJSB037 | SL0652 | 2-4 ft | Moist, very dark gray sandy clay | 105.2 |
| SJSB037 | SL0653 | 4-6 ft | Wet, black clay | 70.2 |
| SJSB037 | SL0654 | 6-8 ft | Moist, gray clay | 21.1 |
| SJSB037 | SL0655 | 8-10 ft | Moist, dark grayish brown clay | 28.5 |
| SJSB037 | SL0656 | 12-14 ft | Wet, very dark gray clay | 39.8 |
| SJSB037 | SL0658 | 20-22 ft | Moist, very dark gray silty sand | 24.6 |
| SJSB037 | SL0659 | 25-27 ft | Moist, grayish brown sand with silt | 18.7 |
| SJSB037 | SL0660 | 30-32 ft | Moist, light brownish grey sand | 16.5 |
| SJSB037 | SL0661 | 35-37 ft | Moist, light brownish gray clay | 20.5 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:18:36 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 02/25/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 486506 | | |

# Moisture Content of Soil and Rock - ASTM D2216

| Boring ID | Sample ID | Depth | Description | Moisture Content, % |
|---|---|---|---|---|
| SJSB038 | SL0890 | 11-13 ft | Moist, very dark grayish brown clay | 41.7 |
| SJSB038 | SL0891 | 13-15 ft | Moist, very dark grayish brown sandy clay | 47.6 |
| SJSB038 | SL0892 | 19-21 ft | Moist, very dark brown silt with sand | 25.2 |
| SJSB038 | SL0893 | 24-26 ft | Moist, dark brown sand with silt | 22.3 |
| SJSB038 | SL0894 | 29-31 ft | Moist, light yellowish brown silt | 13.9 |

Notes: Temperature of Drying : 110° Celsius

printed 3/15/2019 12:19:02 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | md |
| Sample ID: | --- | Test Date: | 02/28/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 493256 | | |

# Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

| Boring ID | Sample ID | Depth | Visual Description | Bulk Density pcf | Moisture Content % | Dry Density pcf | * |
|---|---|---|---|---|---|---|---|
| SJGB022 | SL0812 | 7-9 ft | Moist, grayish brown clay | 102.5 | 39.69 | 73.40 | (1) |
| SJGB038 | SL0896 | 11-13 ft | Moist, dark gray clay | 110.9 | 48.82 | 74.53 | (2) |

* Sample Comments

(1): Method B-Cylinder, Intact

(2): Method B-Cylinder, Intact

Notes: Moisture Content determined by ASTM D2216.

printed 3/15/2019 1:54:53 PM

GeoTesting EXPRESS

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | md |
| Sample ID: | --- | Test Date: | 02/28/19 | Checked By: | bfs |
| Depth : | --- | Test Id: | 493254 | | |

# Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

| Boring ID | Sample ID | Depth | Visual Description | Bulk Density pcf | Moisture Content % | Dry Density pcf | * |
|---|---|---|---|---|---|---|---|
| JSB012-W | SL1054 | 8-10 ft | Moist, dark gray clay | 108.4 | 34.90 | 80.38 | (1) |
| SJSB019 | SL1012 | 4-6 ft | Moist, brown clay with sand and gravel | 125.3 | 18.56 | 105.7 | (2) |
| SJSB023 | SL1024 | 8-10 ft | Moist, gray clay with sand | 114.3 | 36.57 | 83.72 | (3) |
| SJSB025 | SL1038 | 4-6' | Moist, grayish brown sandy clay | 107.2 | 51.89 | 70.55 | (4) |
| SJSB036 | SL0672 | 2-4' | Moist, brown clay | 81.85 | 80.10 | 45.45 | (5) |
| SJSB037 | SL0662 | 2-4' | Wet, gray silty clay | 83.75 | 107.9 | 40.29 | (6) |

* Sample Comments

(1): Method B-Cylinder, Intact

(2): Method B-Cylinder, Intact

(3): Method B-Cylinder, Intact

(4): Method B-Cylinder, Intact

(5): Method B-Cylinder, Intact

(6): Method B-Cylinder, Intact

Notes: Moisture Content determined by ASTM D2216.

printed 3/15/2019 1:55:10 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | njf |
| Sample ID: | --- | Test Date: | 03/05/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 485156 | | |

# Specific Gravity of Soils by ASTM D854

| Boring ID | Sample ID | Depth | Visual Description | Specific Gravity | Comment |
|---|---|---|---|---|---|
| SJGB018 | SL0866 | 18-20 ft | Moist, mottled light yellowish brown and gray clay | 2.64 | |
| SJGB018 | SL0870 | 40-42 ft | Moist, light brownish gray silty sand | 2.66 | |
| SJGB019 | SL0851 | 20-22' | Moist, light yellowish brown clay | 2.67 | |
| SJGB019 | SL0854 | 35-37' | Moist, brownish yellow clayey sand | 2.68 | |
| SJGB020 | SL0840 | 30-32' | Moist, light yellowish brown clay | 2.66 | |
| SJGB020 | SL0846 | 60-62' | Moist, grayish brown clay | 2.68 | |
| SJGB021 | SL0823 | 6'-8' | Wet, dark brown clay with sand | 2.64 | |
| SJGB021 | SL0830 | 44'-46' | Moist, light brownish gray sandy silt | 2.69 | |
| SJGB022 | SL0818 | 35'-37' | Moist, reddish brown clay | 2.65 | |
| SJGB022 | SL0820 | 45'-47' | Moist, light brownish gray silty sand | 2.70 | |

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

printed 3/15/2019 12:38:37 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | ckg |
| Sample ID: | --- | Test Date: | 01/10/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 482716 | | |

# Specific Gravity of Soils by ASTM D854

| Boring ID | Sample ID | Depth | Visual Description | Specific Gravity | Comment |
|---|---|---|---|---|---|
| SJGB023G09 | SL0881 | 23-25 ft | Moist, dark grayish brown sand with silt | 2.67 | |
| SJGB023G16B | SL0889 | 59.3-60 ft | Moist, light brownish gray silty sand | 2.70 | |
| SJSB008-E1 | SL1026 | 2-4 ft | Moist, dark yellowish brown clay with sand | 2.66 | |
| SJSB008-E1 | SL1029 | 8-10 ft | Moist, very dark gray clay | 2.62 | |
| SJSB019-E1 | SL1004 | 8-10 ft | Moist, very dark gray clay | 2.64 | |
| SJSB019-E1 | SL1008 | 19-21 ft | Moist, very dark gray clay | 2.66 | |
| SJSB023-E1 | SL1015 | 4-6 ft | Moist, very dark gray clay | 2.66 | |
| SJSB023-E1 | SL1022 | 24-26 ft | Moist, dark grayish brown clayey sand | 2.69 | |
| SJSB025-1W | SL1040 | 8-10 ft | Moist, very dark grayish brown sandy clay | 2.65 | |
| SJSB025-1W | SL1043 | 19-21 ft | Moist, gray clay | 2.68 | |

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

printed 3/15/2019 12:41:33 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | njf |
| Sample ID: | --- | Test Date: | 03/07/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483648 | | |

# Specific Gravity of Soils by ASTM D854

| Boring ID | Sample ID | Depth | Visual Description | Specific Gravity | Comment |
|---|---|---|---|---|---|
| SJSB028 | SL0803 | 8-10 ft | Moist, very dark brown clay | 2.63 | |
| SJSB028 | SL0806 | 25-27 ft | Moist, very dark brown clay with sand | 2.67 | |
| SJSB029 | SL0606 | 15-17 ft | Moist, dark grayish brown silty sand | 2.69 | |
| SJSB029 | SL0607 | 20-22 ft | Moist, dark grayish brown clay | 2.64 | |
| SJSB030 | SL0692 | 8-10 ft | Moist, dark brown silty clay with gravel | 2.66 | |
| SJSB030 | SL0696 | 30-32 ft | Moist, brownish gray sand with silt | 2.69 | |
| SJSB031 | SL0617 | 8-10 ft | Moist, very dark grayish brown clayey sand | 2.68 | |
| SJSB031 | SL0622 | 20-22 ft | Moist, grayish brown sand | 2.71 | |
| SJSB032 | SL0679 | 8-10 ft | Moist, dark gray clay | 2.67 | |
| SJSB032 | SL0685 | 38-40 ft | Moist, yellowish brown clay | 2.68 | |

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

printed 3/15/2019 12:42:08 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | njf |
| Sample ID: | --- | Test Date: | 03/05/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 483644 | | |

# Specific Gravity of Soils by ASTM D854

| Boring ID | Sample ID | Depth | Visual Description | Specific Gravity | Comment |
|---|---|---|---|---|---|
| SJSB033 | SL0643 | 6-8 ft | Moist, dark grayish brown silty clay with sand | 2.70 | |
| SJSB033 | SL0645 | 14-16 ft | Moist, grayish brown silty sand | 2.68 | |
| SJSB034 | SL0634 | 14-16 ft | Moist, light yellowish brown silty sand | 2.70 | |
| SJSB034 | SL0638 | 40-40.8 ft | Moist, dark grayish brown silty sand | 2.70 | |
| SJSB035 | SL0641 | 2-4 ft | Moist, grayish brown clay | 2.69 | |
| SJSB035 | SL0644 | 8-10 ft | Moist, very dark grayish brown sandy clay | 2.69 | |
| SJSB036 | SL0665 | 2.6-4 ft | Moist, very dark grayish brown sandy clay | 2.61 | |
| SJSB036 | SL0667 | 6-8 ft | Moist, very dark grayish brown clay | 2.66 | |
| SJSB037 | SL0652 | 2-4 ft | Moist, very dark gray sandy clay | 2.67 | |
| SJSB037 | SL0655 | 8-10 ft | Moist, dark grayish brown clay | 2.69 | |

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

printed 3/15/2019 12:42:36 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | njf |
| Sample ID: | --- | Test Date: | 03/05/19 | Checked By: | emm |
| Depth : | --- | Test Id: | 486510 | | |

# Specific Gravity of Soils by ASTM D854

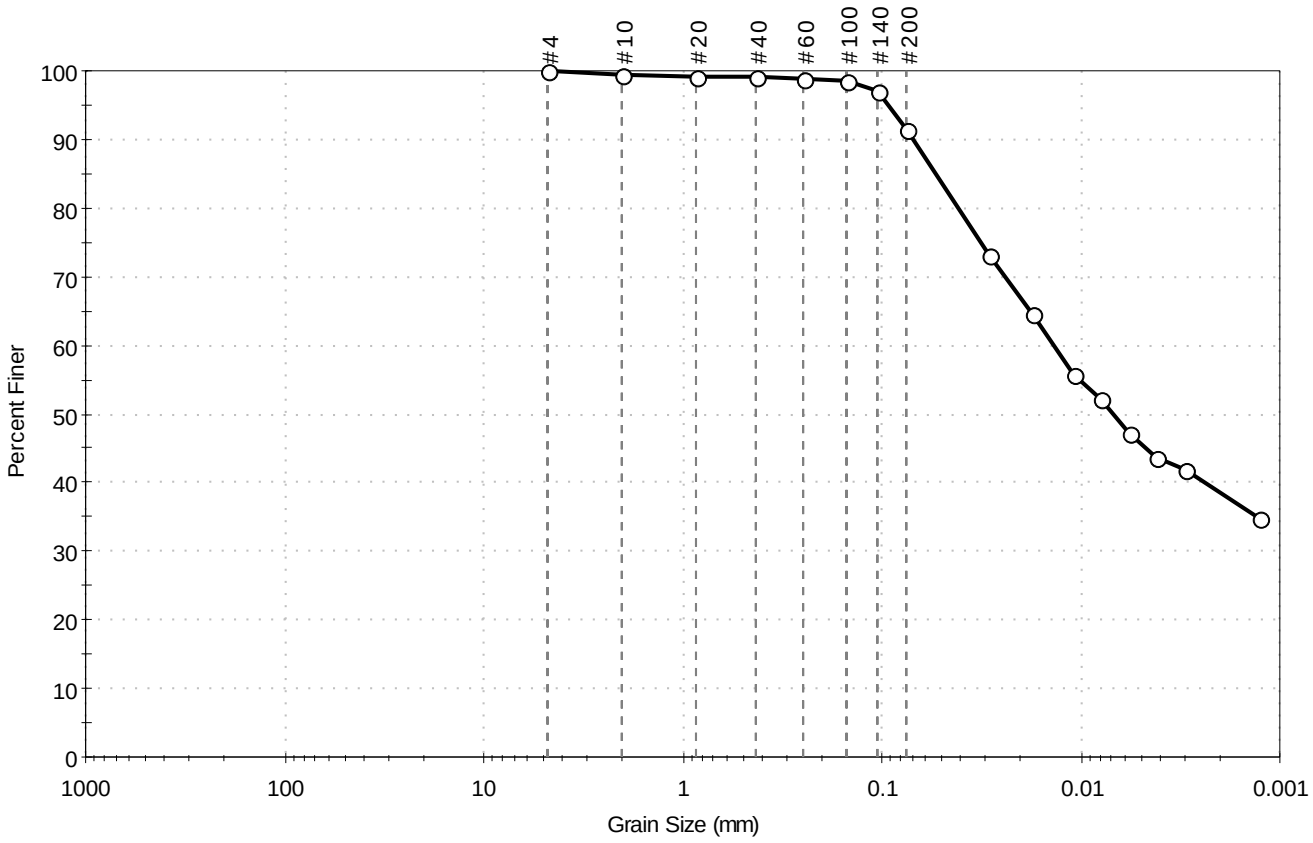
| Boring ID | Sample ID | Depth | Visual Description | Specific Gravity | Comment |
|---|---|---|---|---|---|
| SJSB038 | SL0891 | 13-15 ft | Moist, very dark grayish brown sandy clay | 2.64 | |
| SJSB038 | SL0893 | 24-26 ft | Moist, dark brown sand with silt | 2.68 | |

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

printed 3/15/2019 12:42:53 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB018 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0866 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 18-20 ft | Test Id: | 486394 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, mottled light yellowish brown and gray clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 8.5 | 91.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 99 | | |
| #140 | 0.11 | 97 | | |
| #200 | 0.075 | 91 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0287 | 73 | | |
| --- | 0.0177 | 65 | | |
| --- | 0.0108 | 56 | | |
| --- | 0.0079 | 52 | | |
| --- | 0.0057 | 47 | | |
| --- | 0.0042 | 44 | | |
| --- | 0.0030 | 42 | | |
| --- | 0.0013 | 35 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0533 mm | $D_{30}$ = N/A |
| $D_{60}$ = 0.0138 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0069 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-7-6 (26))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

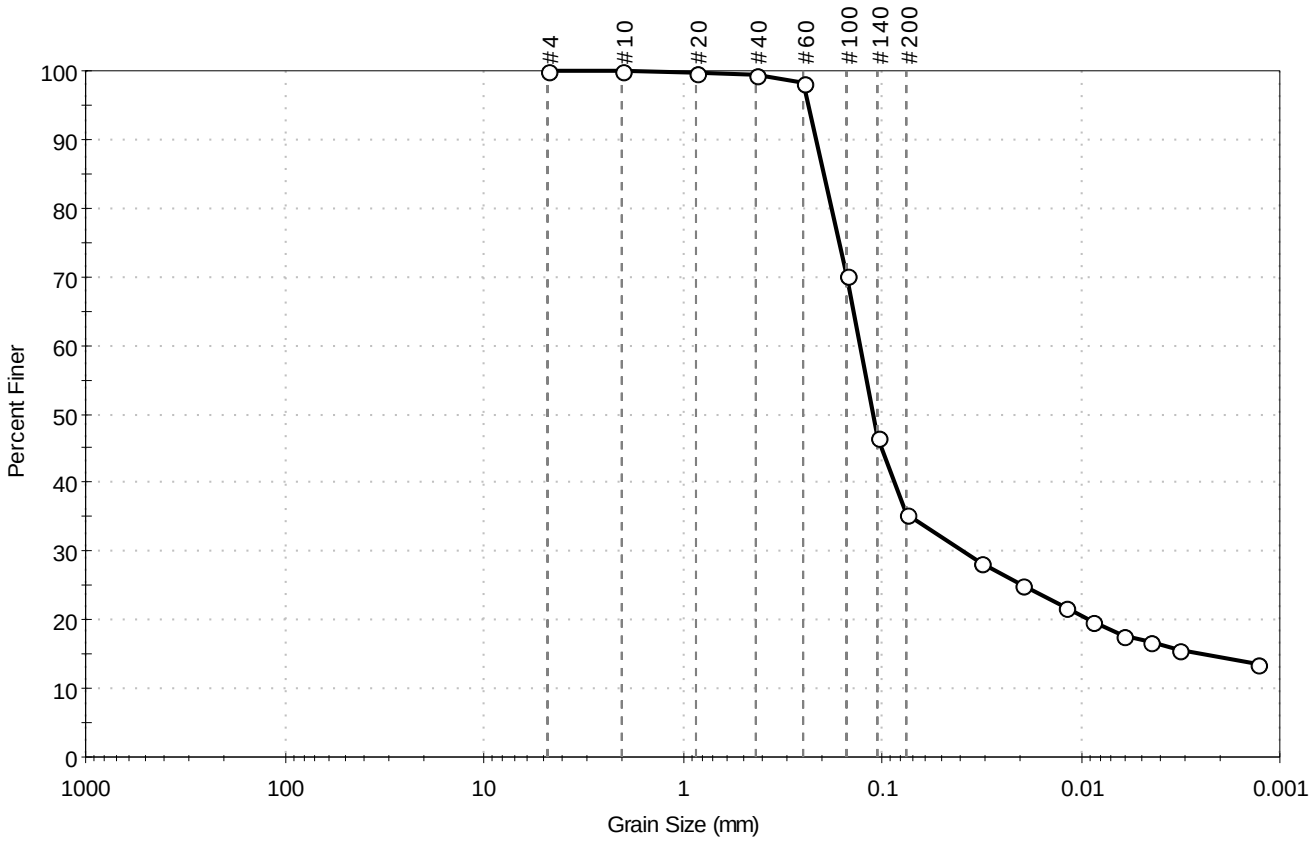
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:43:55 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB018 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0870 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 40-42 ft | Test Id: | 486395 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 64.7 | 35.3 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 70 | | |
| #140 | 0.11 | 47 | | |
| #200 | 0.075 | 35 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0319 | 28 | | |
| --- | 0.0199 | 25 | | |
| --- | 0.0120 | 22 | | |
| --- | 0.0088 | 20 | | |
| --- | 0.0062 | 18 | | |
| --- | 0.0045 | 17 | | |
| --- | 0.0032 | 16 | | |
| --- | 0.0013 | 14 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1963 mm | $D_{30}$ = 0.0395 mm |
| $D_{60}$ = 0.1289 mm | $D_{15}$ = 0.0024 mm |
| $D_{50}$ = 0.1113 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Silty SAND (SM)

AASHTO Silty Soils (A-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

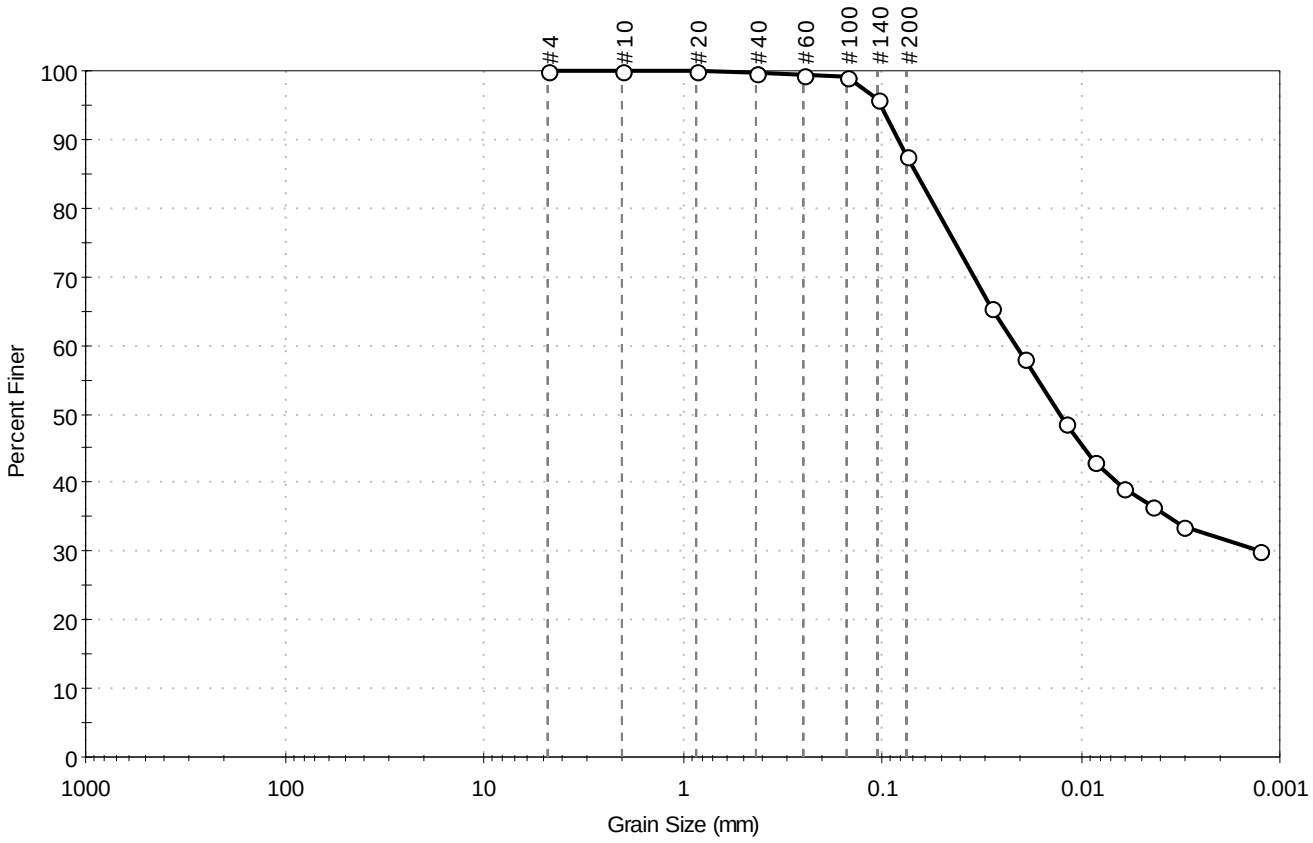
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:43:56 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB019 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0851 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 20-22' | Test Id: | 485119 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light yellowish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 12.3 | 87.7 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 99 | | |
| #140 | 0.11 | 96 | | |
| #200 | 0.075 | 88 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0284 | 66 | | |
| --- | 0.0194 | 58 | | |
| --- | 0.0119 | 49 | | |
| --- | 0.0086 | 43 | | |
| --- | 0.0061 | 39 | | |
| --- | 0.0044 | 37 | | |
| --- | 0.0030 | 34 | | |
| --- | 0.0013 | 30 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0666 mm | $D_{30}$ = 0.0013 mm |
| $D_{60}$ = 0.0214 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0128 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (21))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

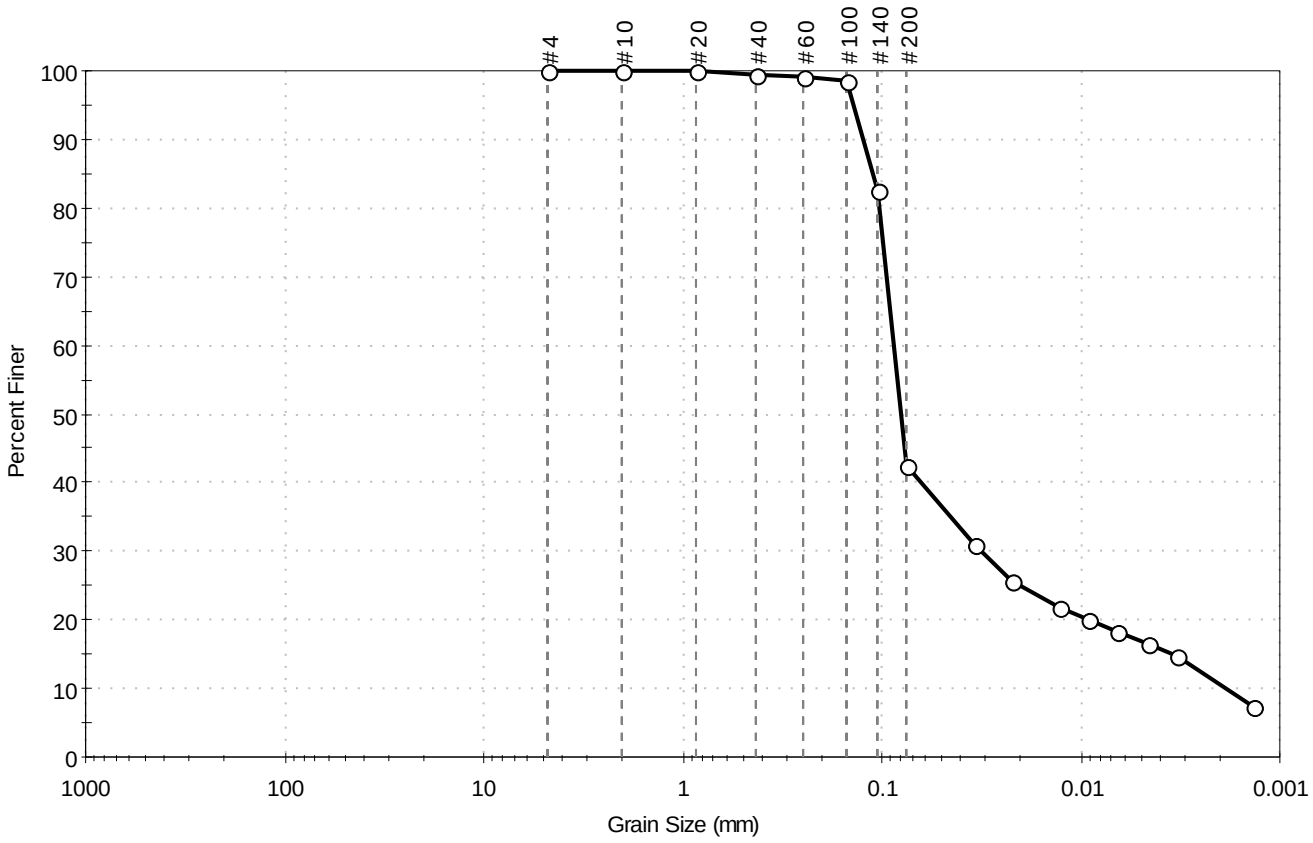
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 1:58:24 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB019 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0854 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 35-37' | Test Id: | 485120 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, brownish yellow clayey sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.1 | 57.4 | 42.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 99 | | |
| #140 | 0.11 | 83 | | |
| #200 | 0.075 | 43 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0339 | 31 | | |
| --- | 0.0223 | 26 | | |
| --- | 0.0129 | 22 | | |
| --- | 0.0093 | 20 | | |
| --- | 0.0066 | 18 | | |
| --- | 0.0047 | 16 | | |
| --- | 0.0033 | 15 | | |
| --- | 0.0014 | 7 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1118 mm | $D_{30}$ = 0.0313 mm |
| $D_{60}$ = 0.0872 mm | $D_{15}$ = 0.0035 mm |
| $D_{50}$ = 0.0800 mm | $D_{10}$ = 0.0019 mm |
| $C_u$ = 45.895 | $C_c$ = 5.913 |

**Classification**

ASTM Clayey SAND (SC)

AASHTO Silty Soils (A-4 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

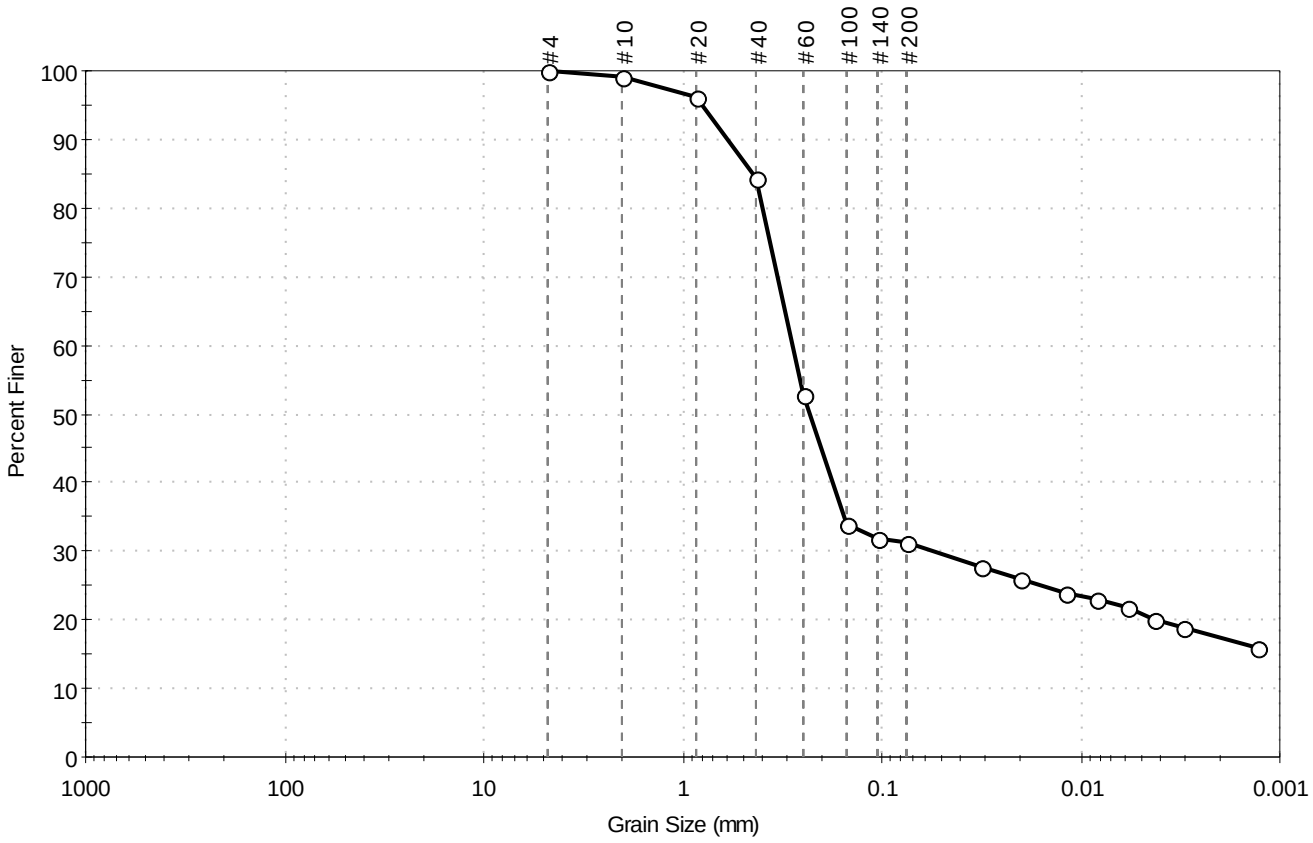
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:43:58 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB020 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0838 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 20-22' | Test Id: | 485117 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 68.7 | 31.3 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 96 | | |
| #40 | 0.42 | 84 | | |
| #60 | 0.25 | 53 | | |
| #100 | 0.15 | 34 | | |
| #140 | 0.11 | 32 | | |
| #200 | 0.075 | 31 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0317 | 28 | | |
| --- | 0.0204 | 26 | | |
| --- | 0.0119 | 24 | | |
| --- | 0.0083 | 23 | | |
| --- | 0.0059 | 22 | | |
| --- | 0.0043 | 20 | | |
| --- | 0.0031 | 19 | | |
| --- | 0.0013 | 16 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.4396 mm | $D_{30}$ = 0.0542 mm |
| $D_{60}$ = 0.2823 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.2321 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

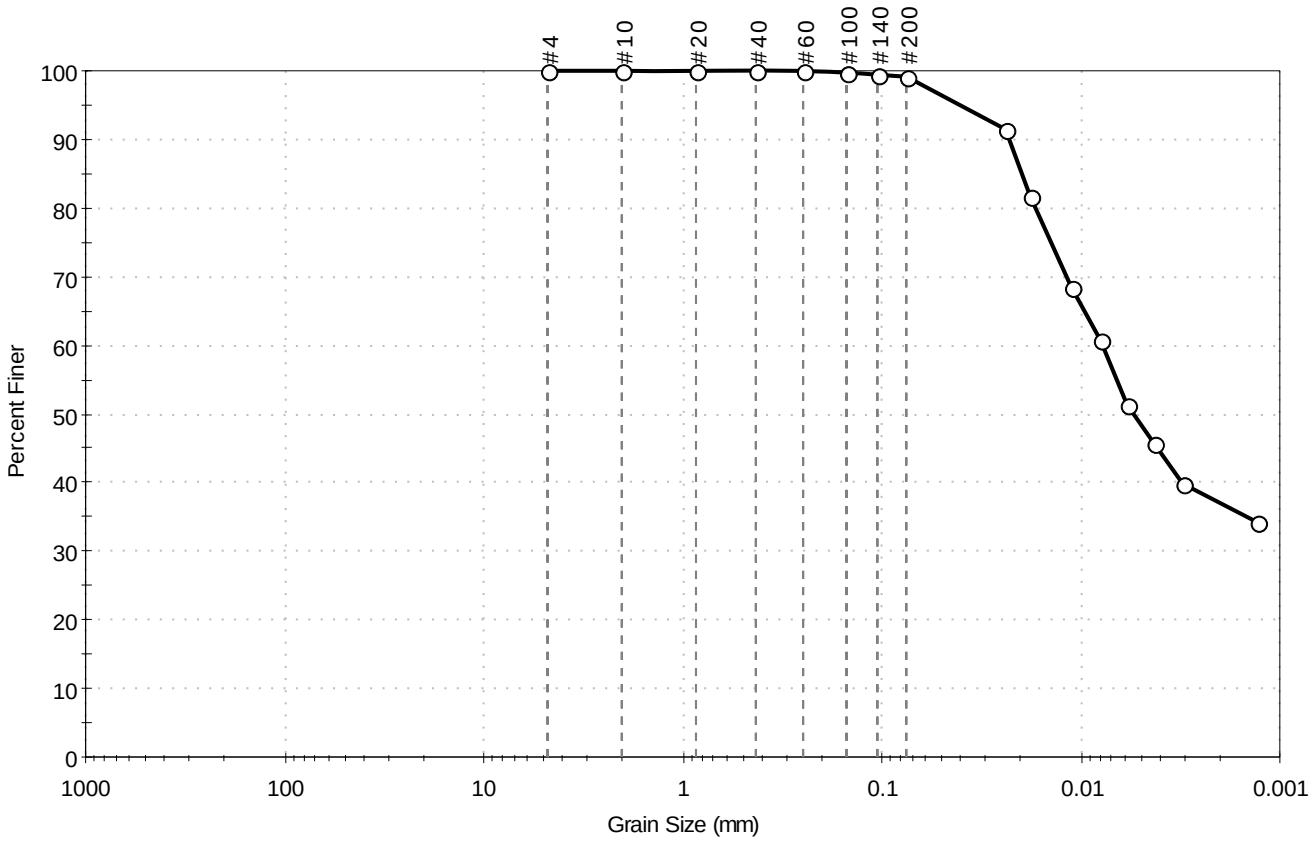
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 1:59:30 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB020 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0846 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 60-62' | Test Id: | 485118 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 0.9 | 99.1 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 100 | | |
| #100 | 0.15 | 100 | | |
| #140 | 0.11 | 99 | | |
| #200 | 0.075 | 99 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0241 | 91 | | |
| --- | 0.0180 | 82 | | |
| --- | 0.0111 | 68 | | |
| --- | 0.0080 | 61 | | |
| --- | 0.0058 | 51 | | |
| --- | 0.0043 | 46 | | |
| --- | 0.0031 | 40 | | |
| --- | 0.0013 | 34 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0199 mm | $D_{30}$ = N/A |
| $D_{60}$ = 0.0078 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0054 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (42))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

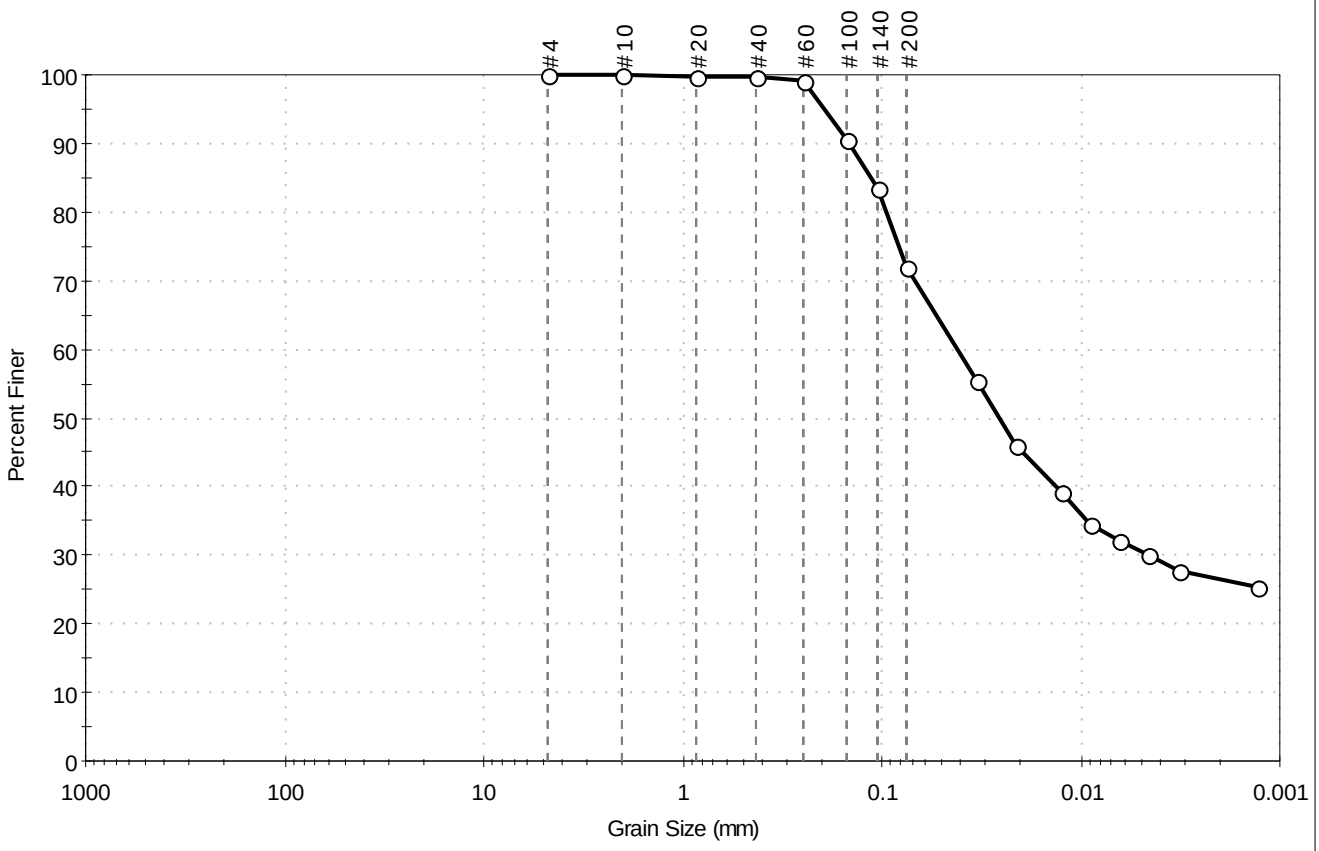
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:00 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB021 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0823 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 6'-8' | Test Id: | 485161 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Wet, dark brown clay with sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 27.9 | 72.1 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 91 | | |
| #140 | 0.11 | 83 | | |
| #200 | 0.075 | 72 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0331 | 55 | | |
| --- | 0.0210 | 46 | | |
| --- | 0.0126 | 39 | | |
| --- | 0.0091 | 35 | | |
| --- | 0.0064 | 32 | | |
| --- | 0.0046 | 30 | | |
| --- | 0.0032 | 28 | | |
| --- | 0.0013 | 25 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1147 mm | $D_{30}$ = 0.0046 mm |
| $D_{60}$ = 0.0416 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0255 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Lean CLAY with Sand (CL)

AASHTO Clayey Soils (A-7-6 (20))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

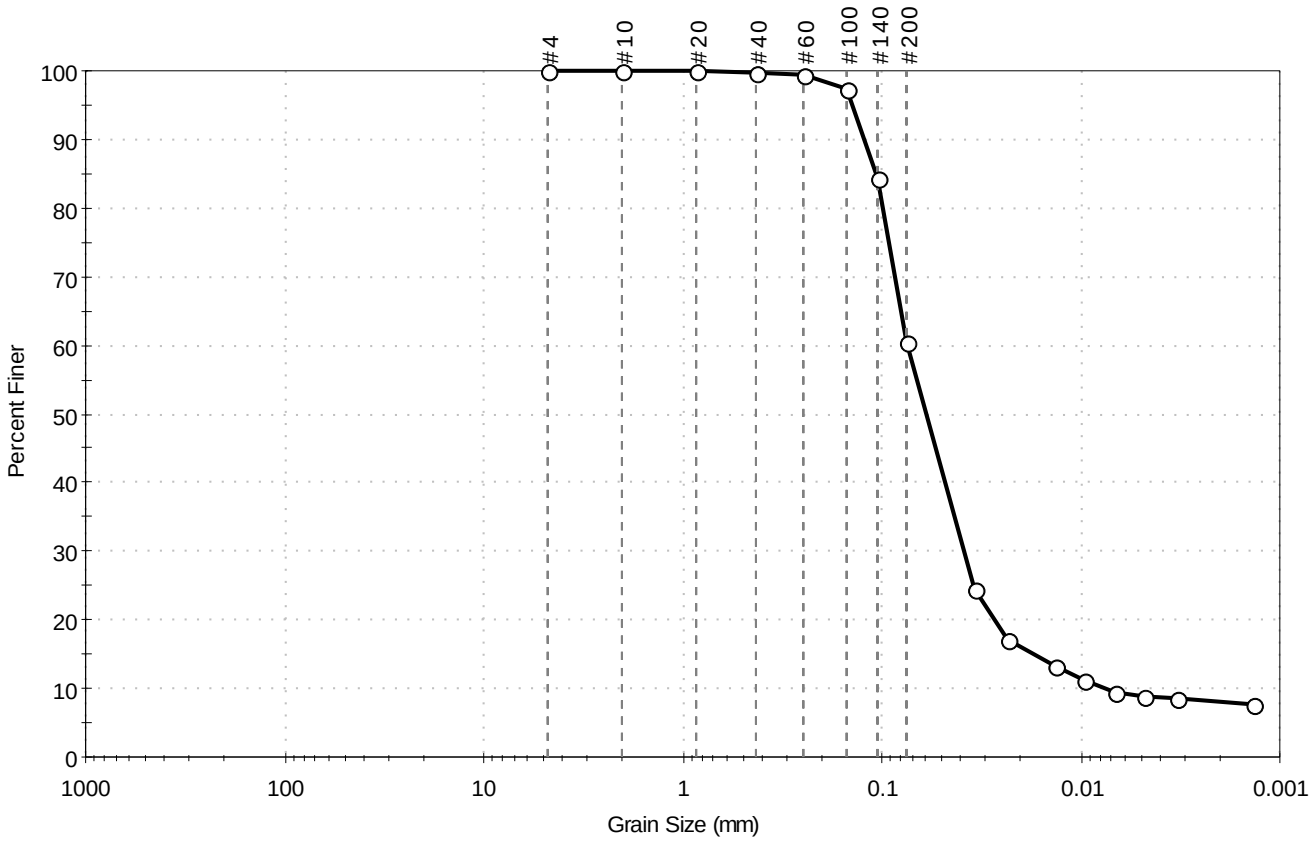
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:00:13 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB021 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0830 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 44'-46' | Test Id: | 485162 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray sandy silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 39.6 | 60.4 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 97 | | |
| #140 | 0.11 | 84 | | |
| #200 | 0.075 | 60 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0342 | 25 | | |
| --- | 0.0231 | 17 | | |
| --- | 0.0135 | 13 | | |
| --- | 0.0096 | 11 | | |
| --- | 0.0068 | 9 | | |
| --- | 0.0048 | 9 | | |
| --- | 0.0033 | 9 | | |
| --- | 0.0014 | 8 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1075 mm | $D_{30}$ = 0.0385 mm |
| $D_{60}$ = 0.0744 mm | $D_{15}$ = 0.0174 mm |
| $D_{50}$ = 0.0598 mm | $D_{10}$ = 0.0075 mm |
| $C_u$ = 9.920 | $C_c$ = 2.656 |

**Classification**

ASTM Sandy SILT (ML)

AASHTO Silty Soils (A-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

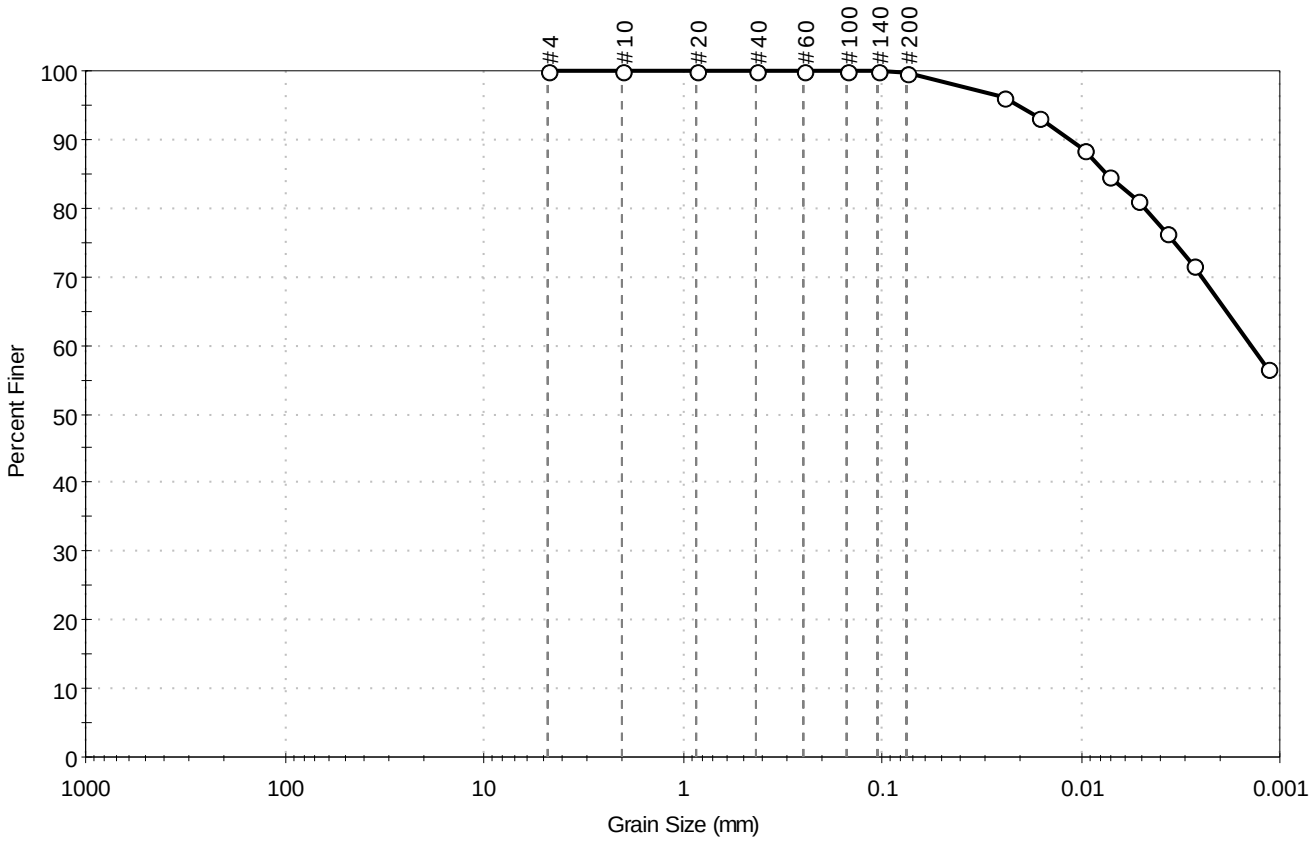
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:01:23 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB022 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0818 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 35'-37' | Test Id: | 485159 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, reddish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 0.2 | 99.8 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 100 | | |
| #100 | 0.15 | 100 | | |
| #140 | 0.11 | 100 | | |
| #200 | 0.075 | 100 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0243 | 96 | | |
| --- | 0.0163 | 93 | | |
| --- | 0.0097 | 89 | | |
| --- | 0.0072 | 85 | | |
| --- | 0.0052 | 81 | | |
| --- | 0.0038 | 76 | | |
| --- | 0.0027 | 72 | | |
| --- | 0.0012 | 57 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0073 mm | $D_{30}$ = N/A |
| $D_{60}$ = 0.0014 mm | $D_{15}$ = N/A |
| $D_{50}$ = N/A | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (50))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

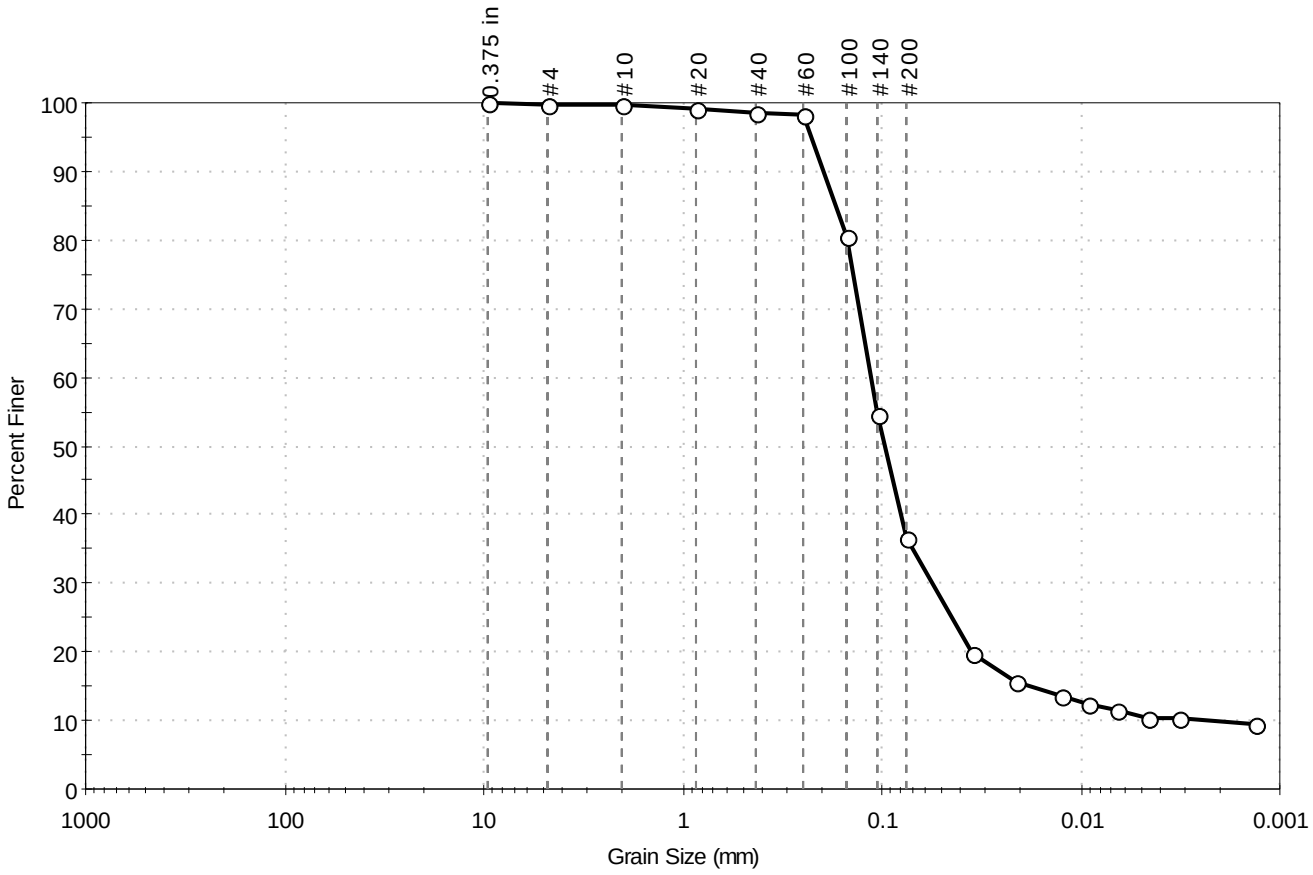
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:02:34 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB022 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0820 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 45'-47' | Test Id: | 485160 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.3 | 63.0 | 36.7 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 81 | | |
| #140 | 0.11 | 55 | | |
| #200 | 0.075 | 37 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0347 | 20 | | |
| --- | 0.0214 | 16 | | |
| --- | 0.0127 | 14 | | |
| --- | 0.0092 | 12 | | |
| --- | 0.0065 | 11 | | |
| --- | 0.0046 | 10 | | |
| --- | 0.0032 | 10 | | |
| --- | 0.0013 | 9 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1708 mm | $D_{30}$ = 0.0553 mm |
| $D_{60}$ = 0.1140 mm | $D_{15}$ = 0.0183 mm |
| $D_{50}$ = 0.0970 mm | $D_{10}$ = 0.0023 mm |
| $C_u$ = 49.565 | $C_c$ = 11.663 |

**Classification**

ASTM Silty SAND (SM)

AASHTO Silty Soils (A-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

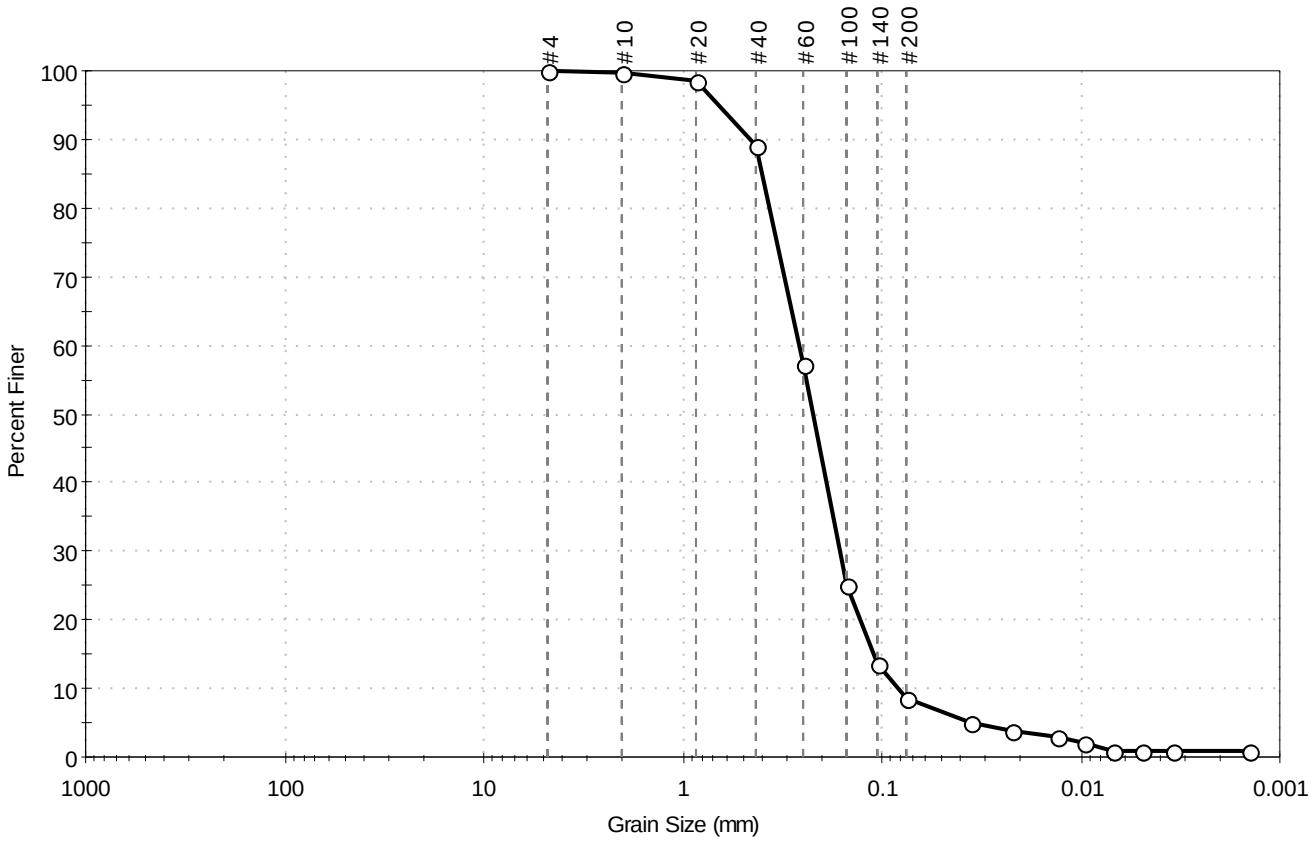
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:03 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB023G09 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0881 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 23-25 ft | Test Id: | 486391 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 91.5 | 8.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 89 | | |
| #60 | 0.25 | 57 | | |
| #100 | 0.15 | 25 | | |
| #140 | 0.11 | 13 | | |
| #200 | 0.075 | 8.5 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0359 | 5 | | |
| --- | 0.0225 | 4 | | |
| --- | 0.0133 | 3 | | |
| --- | 0.0097 | 2 | | |
| --- | 0.0069 | 1 | | |
| --- | 0.0049 | 1 | | |
| --- | 0.0035 | 1 | | |
| --- | 0.0014 | 1 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.3975 mm | $D_{30}$ = 0.1621 mm |
| $D_{60}$ = 0.2623 mm | $D_{15}$ = 0.1109 mm |
| $D_{50}$ = 0.2231 mm | $D_{10}$ = 0.0831 mm |
| $C_u$ = 3.156 | $C_c$ = 1.205 |

**Classification**

ASTM Poorly graded SAND with Silt (SP-SM)

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

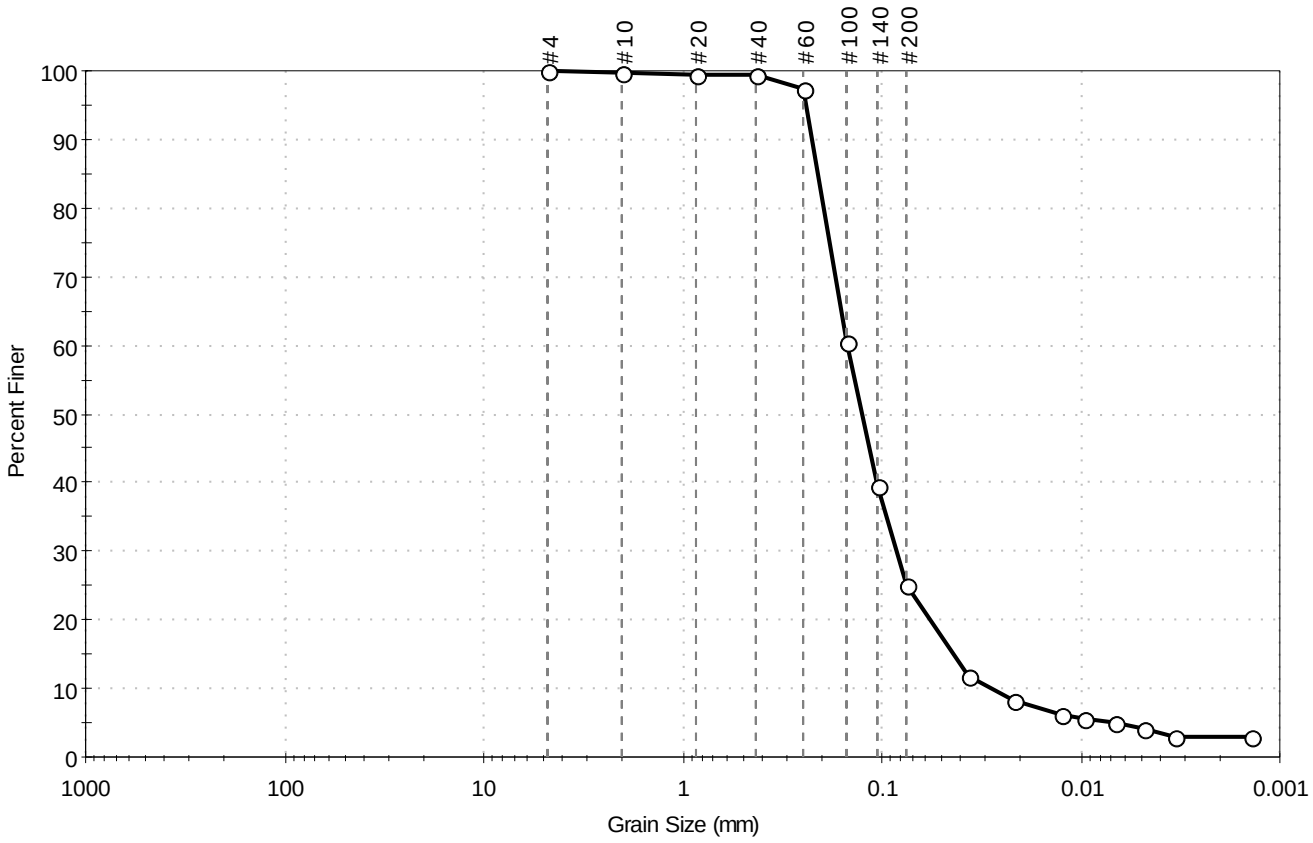
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:03 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB023G16B | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0889 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 59.3-60 ft | Test Id: | 486393 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 75.1 | 24.9 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 97 | | |
| #100 | 0.15 | 61 | | |
| #140 | 0.11 | 39 | | |
| #200 | 0.075 | 25 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0367 | 12 | | |
| --- | 0.0218 | 8 | | |
| --- | 0.0126 | 6 | | |
| --- | 0.0096 | 6 | | |
| --- | 0.0068 | 5 | | |
| --- | 0.0048 | 4 | | |
| --- | 0.0034 | 3 | | |
| --- | 0.0014 | 3 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.2106 mm | $D_{30}$ = 0.0846 mm |
| $D_{60}$ = 0.1487 mm | $D_{15}$ = 0.0437 mm |
| $D_{50}$ = 0.1261 mm | $D_{10}$ = 0.0284 mm |
| $C_u$ = 5.236 | $C_c$ = 1.695 |

**Classification**

ASTM Silty SAND (SM)

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

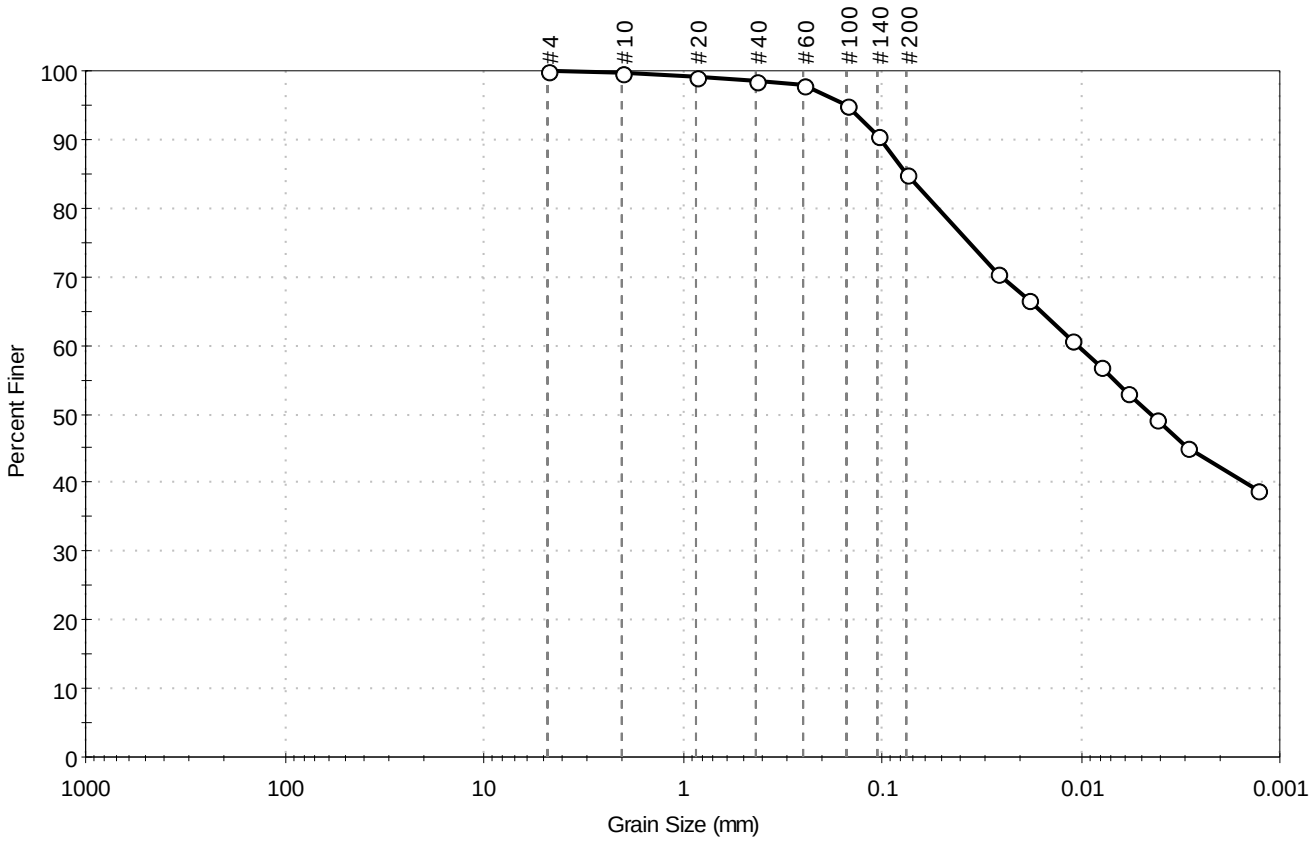
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:04 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB008-E1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1026 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 2-4 ft | Test Id: | 482725 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark yellowish brown clay with sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 15.1 | 84.9 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 95 | | |
| #140 | 0.11 | 91 | | |
| #200 | 0.075 | 85 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0264 | 70 | | |
| --- | 0.0185 | 67 | | |
| --- | 0.0111 | 61 | | |
| --- | 0.0080 | 57 | | |
| --- | 0.0058 | 53 | | |
| --- | 0.0042 | 49 | | |
| --- | 0.0029 | 45 | | |
| --- | 0.0013 | 39 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0753 mm | $D_{30}$ = N/A |
| $D_{60}$ = 0.0104 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0045 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Lean CLAY with Sand (CL)

AASHTO Clayey Soils (A-7-6 (29))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

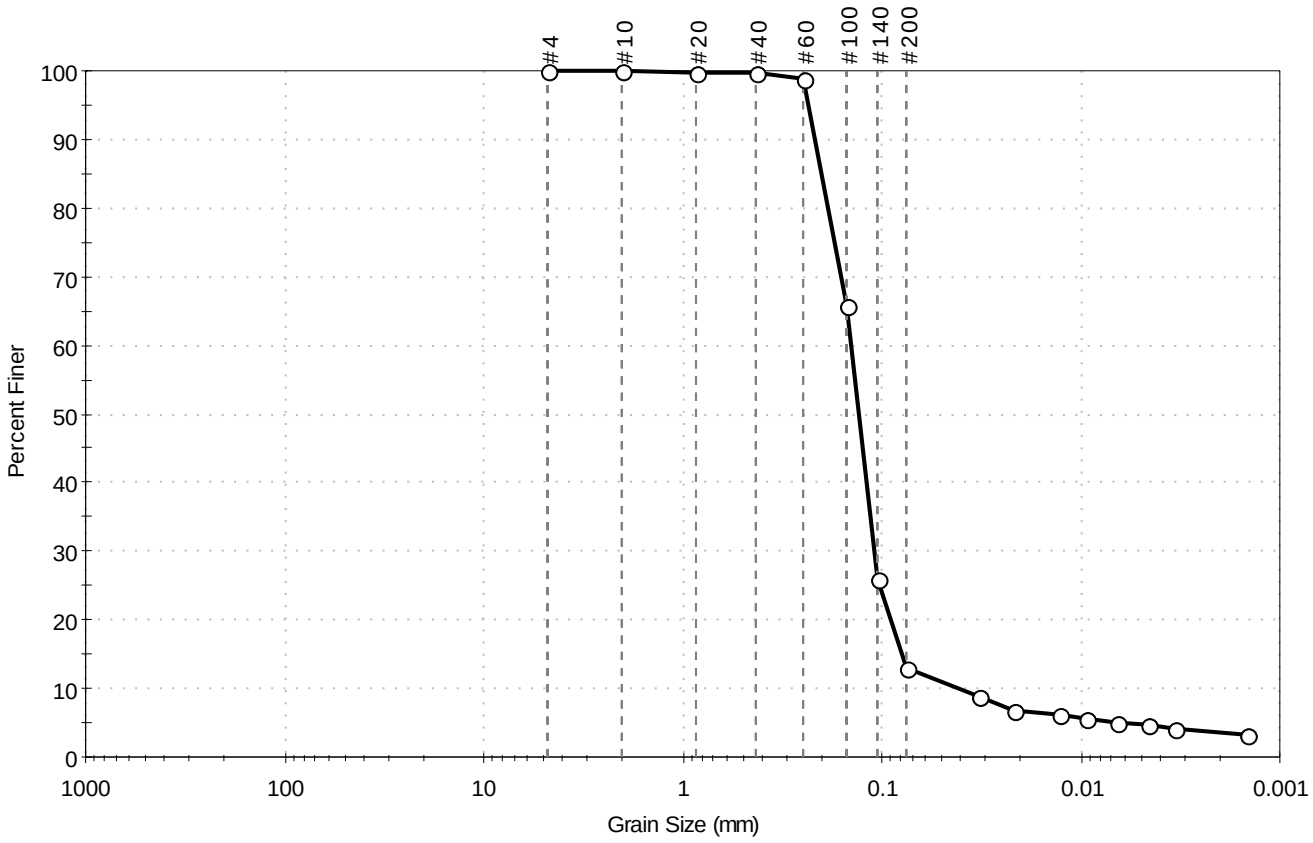
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:05 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB008-E1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1034 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 25-27 ft | Test Id: | 482726 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 86.9 | 13.1 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 66 | | |
| #140 | 0.11 | 26 | | |
| #200 | 0.075 | 13 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0328 | 9 | | |
| --- | 0.0219 | 7 | | |
| --- | 0.0129 | 6 | | |
| --- | 0.0095 | 6 | | |
| --- | 0.0066 | 5 | | |
| --- | 0.0046 | 5 | | |
| --- | 0.0033 | 4 | | |
| --- | 0.0015 | 3 | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.2019 mm  $D_{30}$ = 0.1098 mm
$D_{60}$ = 0.1425 mm  $D_{15}$ = 0.0789 mm
$D_{50}$ = 0.1306 mm  $D_{10}$ = 0.0408 mm
$C_u$ = 3.493  $C_c$ = 2.074

**Classification**

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

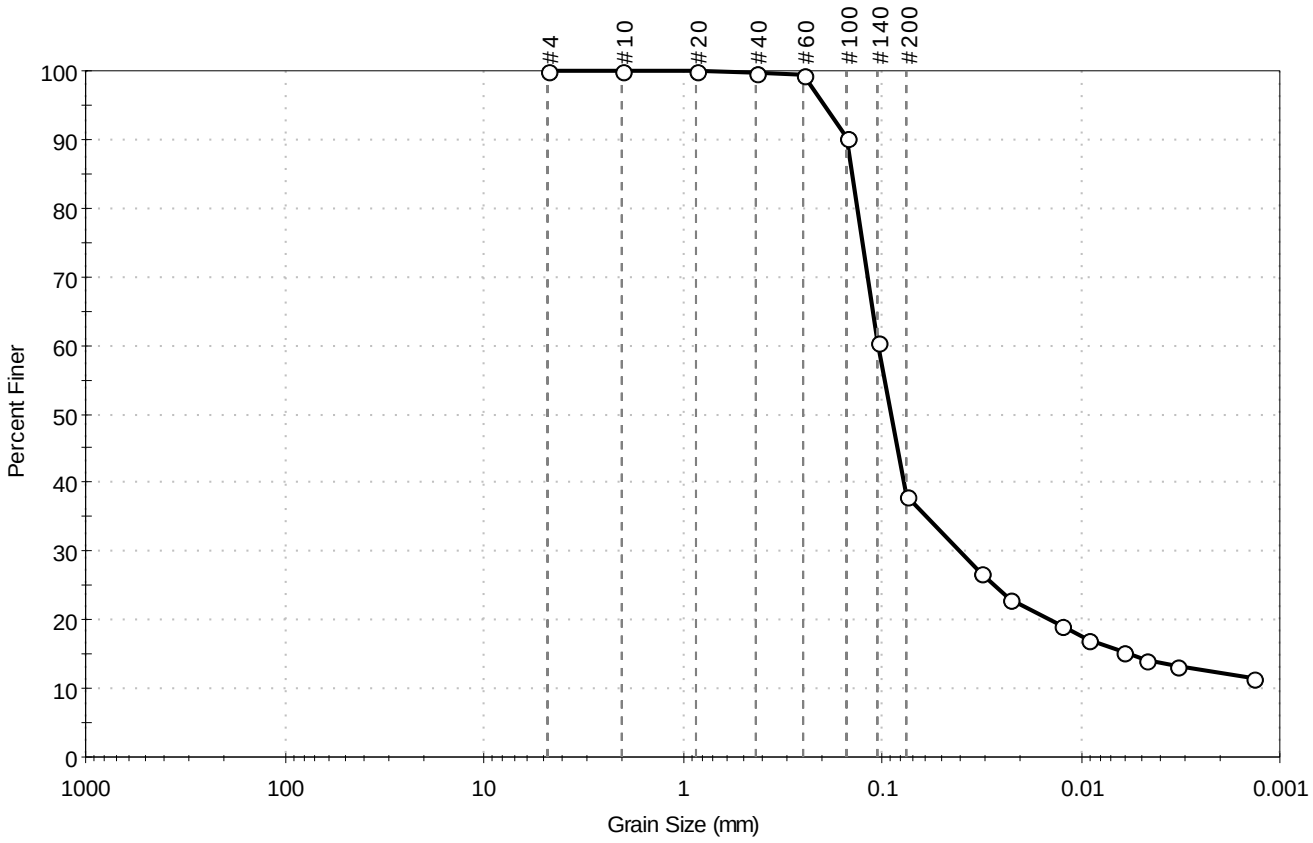
**Sample / Test Description**

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:05 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB012-W1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1050 | Test Date: | 01/21/19 | Checked By: | emm |
| Depth : | 15-17 ft | Test Id: | 482973 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown silty, clayey sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 62.1 | 37.9 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 90 | | |
| #140 | 0.11 | 61 | | |
| #200 | 0.075 | 38 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0317 | 27 | | |
| --- | 0.0227 | 23 | | |
| --- | 0.0125 | 19 | | |
| --- | 0.0092 | 17 | | |
| --- | 0.0062 | 15 | | |
| --- | 0.0047 | 14 | | |
| --- | 0.0033 | 13 | | |
| --- | 0.0013 | 11 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1412 mm | $D_{30}$ = 0.0407 mm |
| $D_{60}$ = 0.1052 mm | $D_{15}$ = 0.0058 mm |
| $D_{50}$ = 0.0902 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Silty, Clayey SAND (SC-SM)

AASHTO Silty Soils (A-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

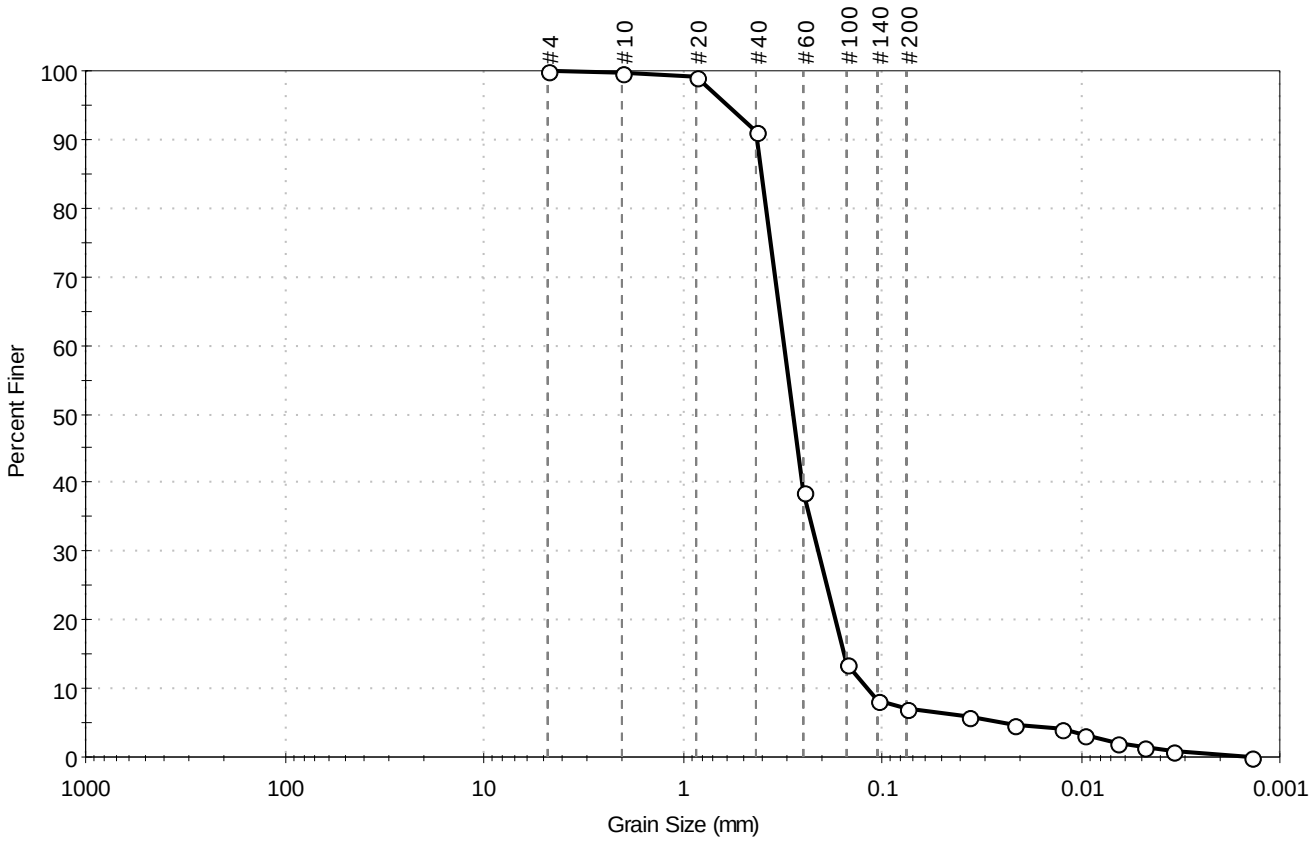
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:06 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB012-W1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1053 | Test Date: | 01/21/19 | Checked By: | emm |
| Depth : | 30-32 ft | Test Id: | 482974 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 92.9 | 7.1 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 91 | | |
| #60 | 0.25 | 39 | | |
| #100 | 0.15 | 14 | | |
| #140 | 0.11 | 8 | | |
| #200 | 0.075 | 7.1 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0369 | 6 | | |
| --- | 0.0218 | 5 | | |
| --- | 0.0125 | 4 | | |
| --- | 0.0097 | 3 | | |
| --- | 0.0067 | 2 | | |
| --- | 0.0048 | 1 | | |
| --- | 0.0035 | 1 | | |
| --- | 0.0014 | 0 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.3995 mm | $D_{30}$ = 0.2093 mm |
| $D_{60}$ = 0.3100 mm | $D_{15}$ = 0.1544 mm |
| $D_{50}$ = 0.2802 mm | $D_{10}$ = 0.1183 mm |
| $C_u$ = 2.620 | $C_c$ = 1.195 |

**Classification**

ASTM N/A

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

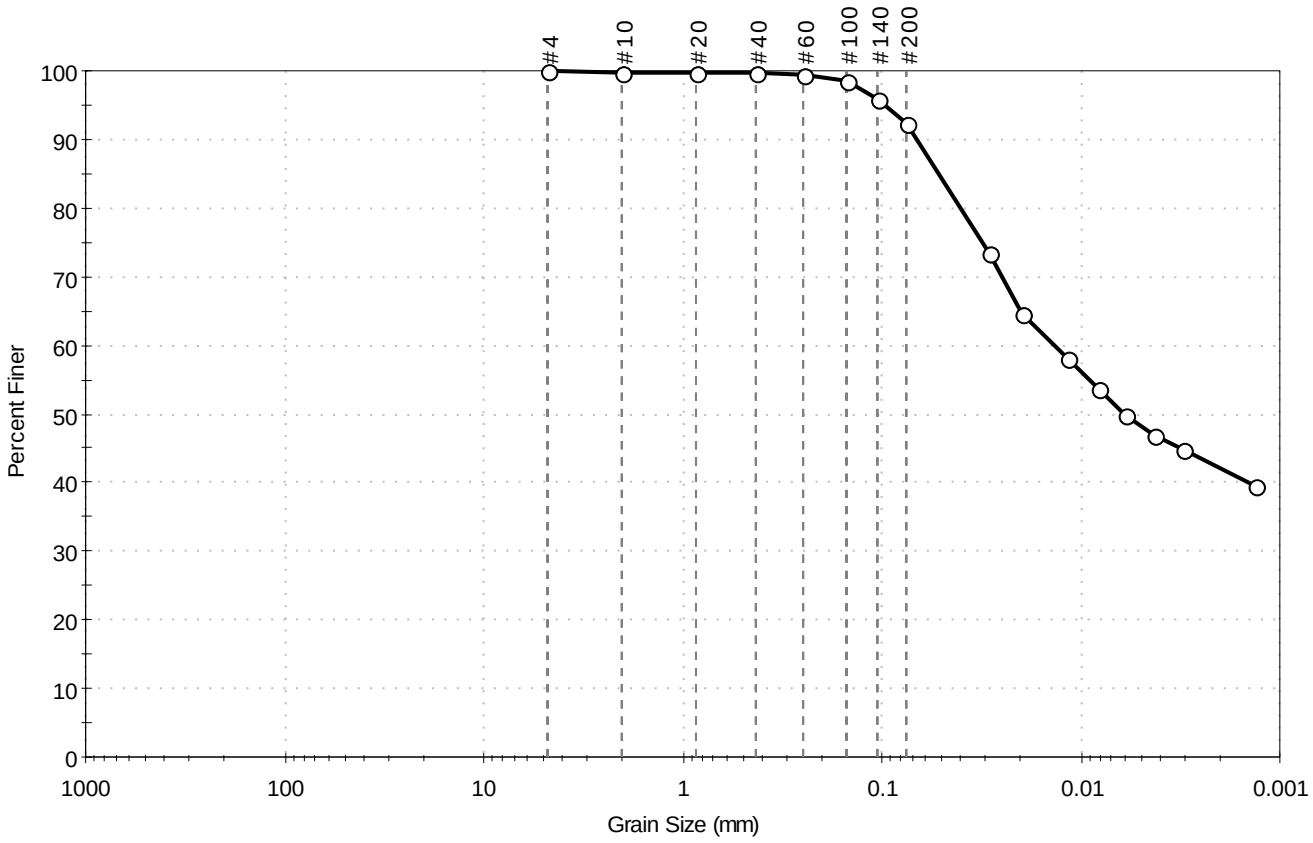
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:03:45 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB019-E1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1004 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482721 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 7.6 | 92.4 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 98 | | |
| #140 | 0.11 | 96 | | |
| #200 | 0.075 | 92 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0288 | 73 | | |
| --- | 0.0197 | 65 | | |
| --- | 0.0116 | 58 | | |
| --- | 0.0082 | 54 | | |
| --- | 0.0059 | 50 | | |
| --- | 0.0042 | 47 | | |
| --- | 0.0030 | 45 | | |
| --- | 0.0013 | 40 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0517 mm | $D_{30}$ = N/A |
| $D_{60}$ = 0.0136 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0061 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (69))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

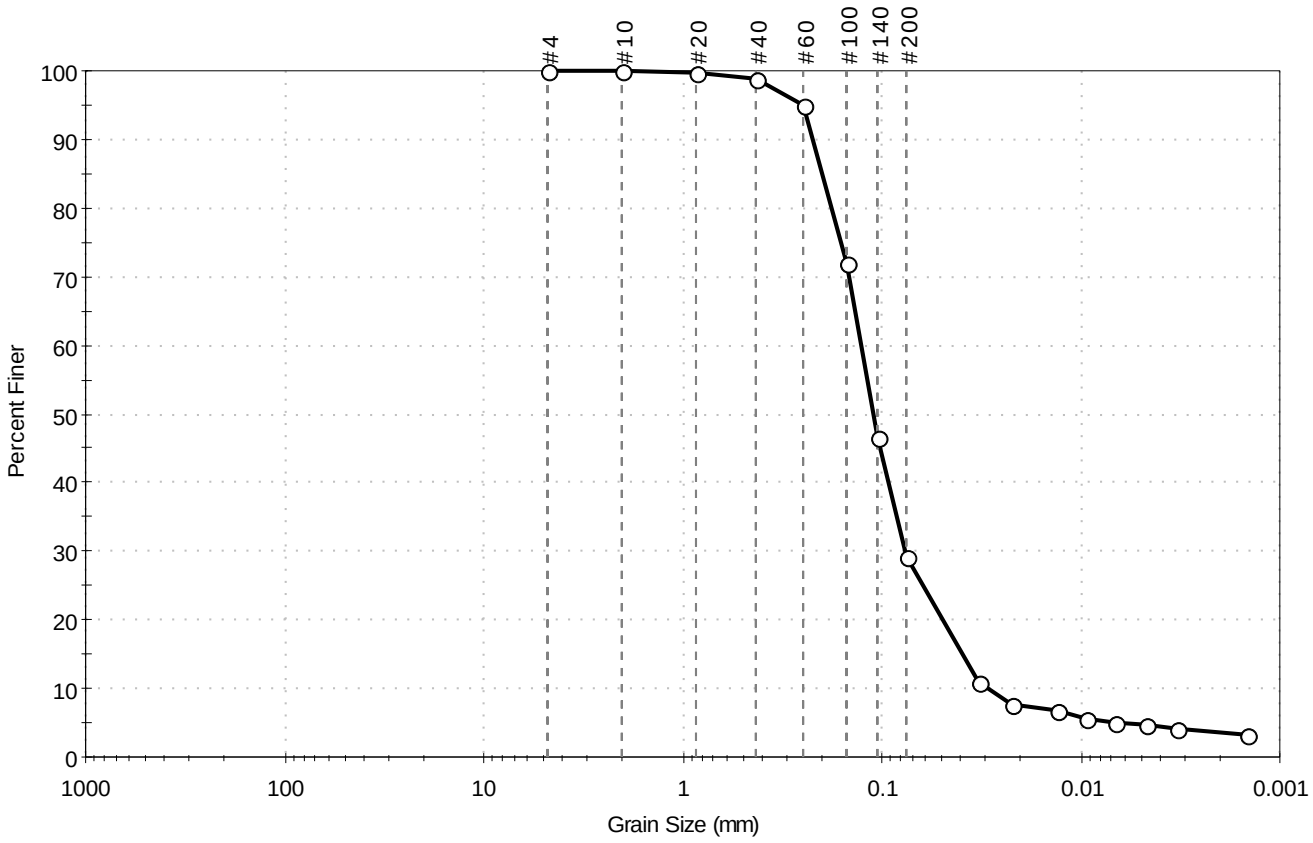
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:07 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB019-E1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1005 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 14-15 ft | Test Id: | 482722 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 70.8 | 29.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 95 | | |
| #100 | 0.15 | 72 | | |
| #140 | 0.11 | 47 | | |
| #200 | 0.075 | 29 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0324 | 11 | | |
| --- | 0.0223 | 8 | | |
| --- | 0.0130 | 7 | | |
| --- | 0.0095 | 6 | | |
| --- | 0.0067 | 5 | | |
| --- | 0.0048 | 5 | | |
| --- | 0.0033 | 4 | | |
| --- | 0.0015 | 3 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.2005 mm | $D_{30}$ = 0.0762 mm |
| $D_{60}$ = 0.1274 mm | $D_{15}$ = 0.0391 mm |
| $D_{50}$ = 0.1111 mm | $D_{10}$ = 0.0291 mm |
| $C_u$ = 4.378 | $C_c$ = 1.566 |

**Classification**

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

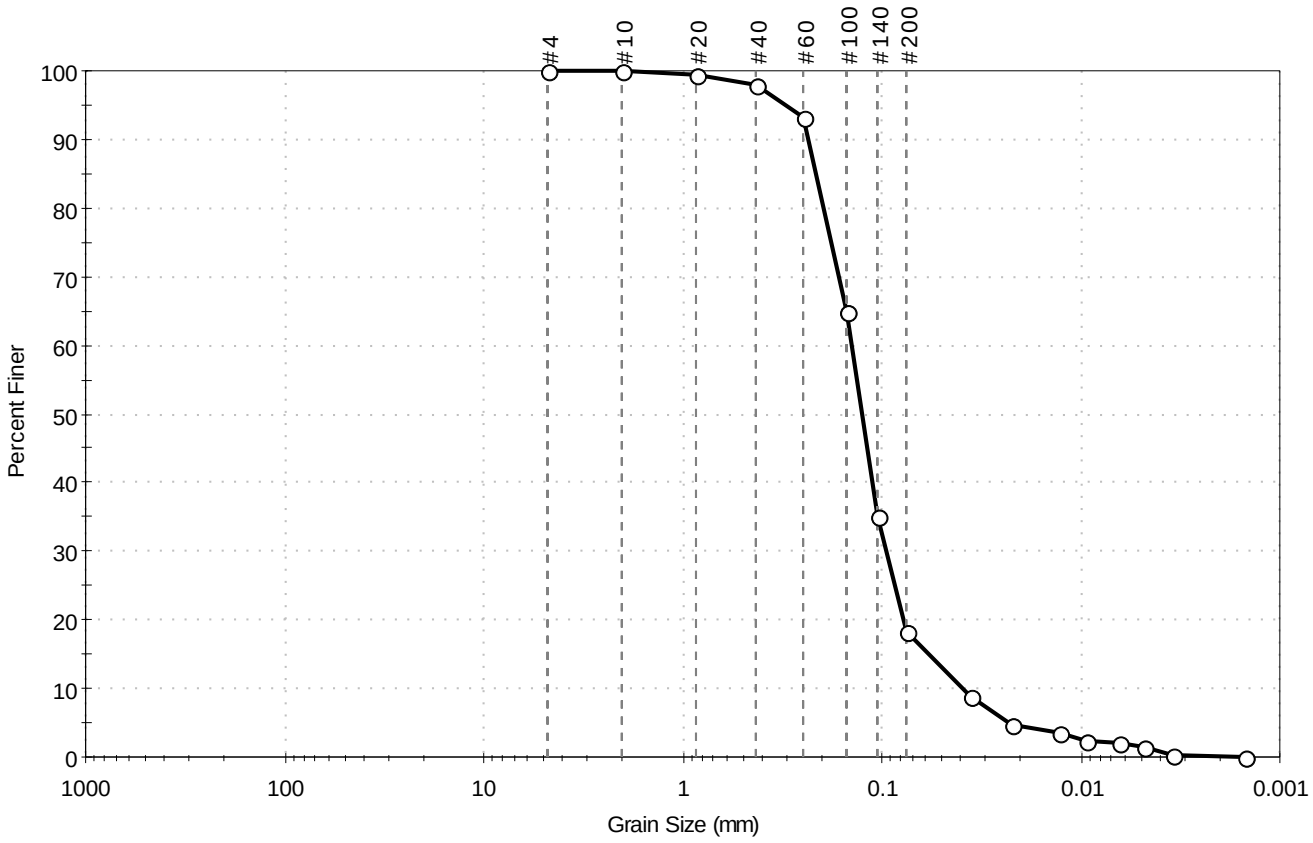
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:08 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB023-E1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1017 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 10-12 ft | Test Id: | 482723 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 81.8 | 18.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 98 | | |
| #60 | 0.25 | 93 | | |
| #100 | 0.15 | 65 | | |
| #140 | 0.11 | 35 | | |
| #200 | 0.075 | 18 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0358 | 9 | | |
| --- | 0.0224 | 5 | | |
| --- | 0.0128 | 4 | | |
| --- | 0.0095 | 2 | | |
| --- | 0.0065 | 2 | | |
| --- | 0.0048 | 1 | | |
| --- | 0.0034 | 0 | | |
| --- | 0.0015 | 0 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.2152 mm | $D_{30}$ = 0.0955 mm |
| $D_{60}$ = 0.1416 mm | $D_{15}$ = 0.0582 mm |
| $D_{50}$ = 0.1260 mm | $D_{10}$ = 0.0393 mm |
| $C_u$ = 3.603 | $C_c$ = 1.639 |

**Classification**

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

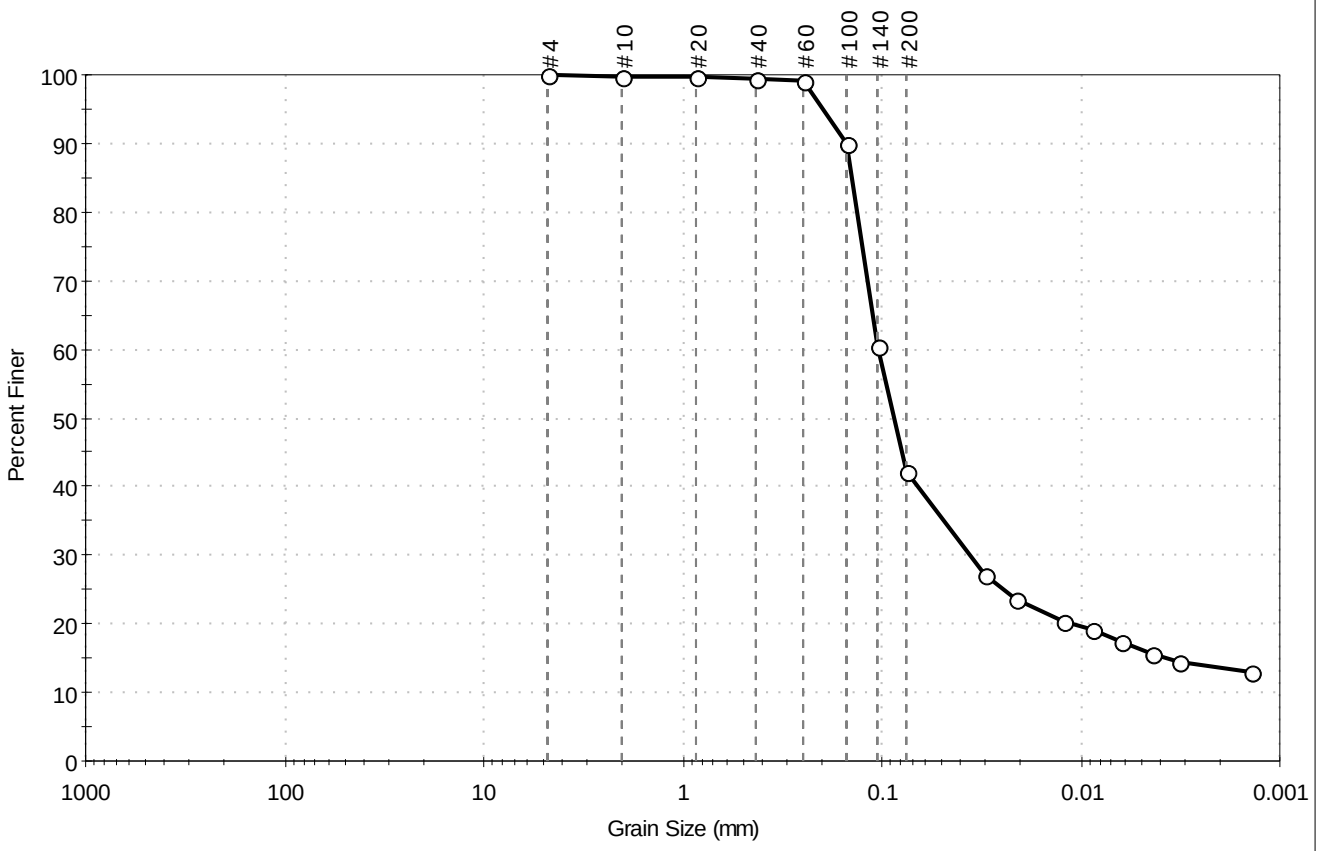
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:09 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB023-E1 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1022 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 24-26 ft | Test Id: | 482724 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown clayey sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 57.9 | 42.1 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 90 | | |
| #140 | 0.11 | 60 | | |
| #200 | 0.075 | 42 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0301 | 27 | | |
| --- | 0.0210 | 24 | | |
| --- | 0.0123 | 20 | | |
| --- | 0.0087 | 19 | | |
| --- | 0.0062 | 17 | | |
| --- | 0.0044 | 16 | | |
| --- | 0.0032 | 14 | | |
| --- | 0.0014 | 13 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1417 mm | $D_{30}$ = 0.0357 mm |
| $D_{60}$ = 0.1053 mm | $D_{15}$ = 0.0038 mm |
| $D_{50}$ = 0.0871 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Clayey SAND (SC)

AASHTO Silty Soils (A-4 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

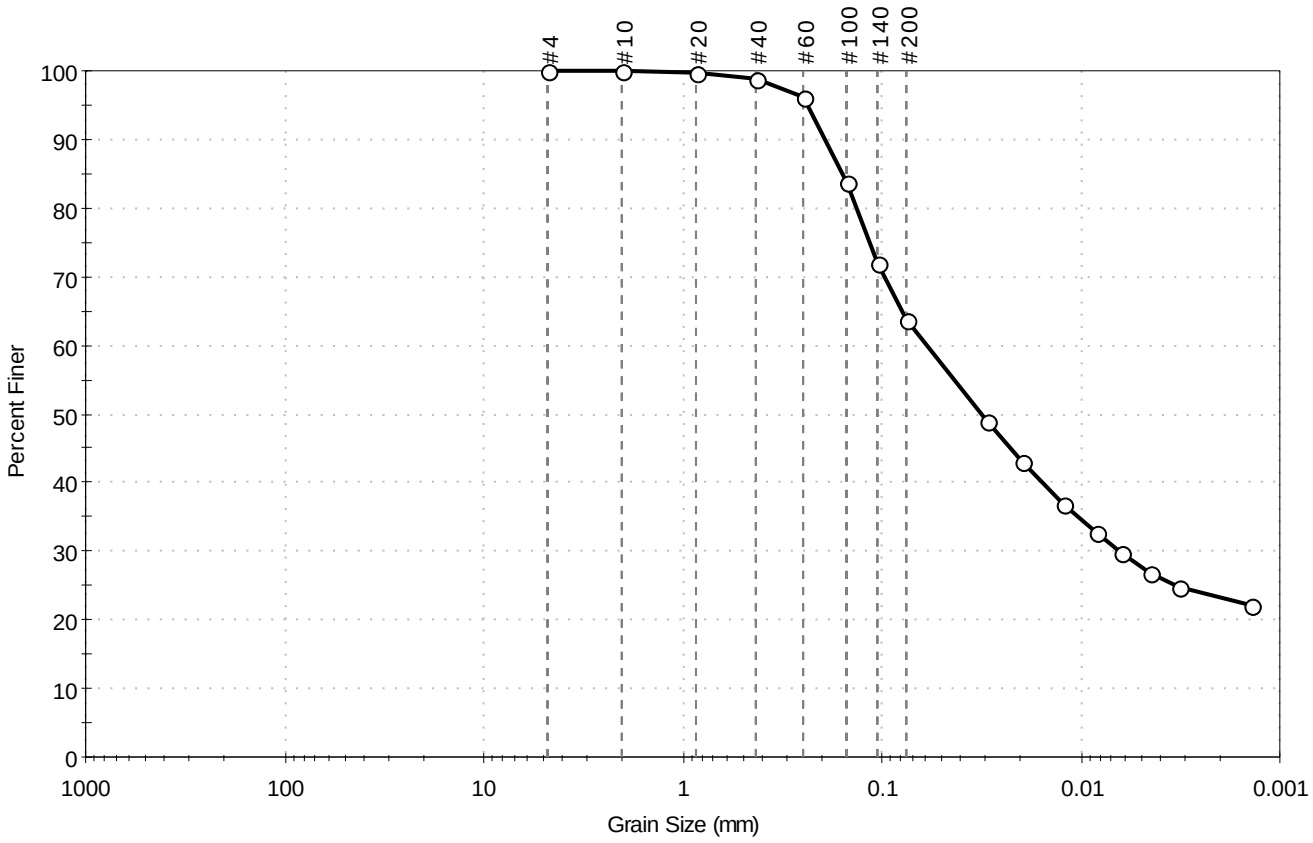
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:09 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB025-1W | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1040 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482727 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 36.3 | 63.7 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 96 | | |
| #100 | 0.15 | 84 | | |
| #140 | 0.11 | 72 | | |
| #200 | 0.075 | 64 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0293 | 49 | | |
| --- | 0.0197 | 43 | | |
| --- | 0.0123 | 37 | | |
| --- | 0.0084 | 33 | | |
| --- | 0.0063 | 30 | | |
| --- | 0.0045 | 27 | | |
| --- | 0.0032 | 25 | | |
| --- | 0.0014 | 22 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1576 mm | $D_{30}$ = 0.0064 mm |
| $D_{60}$ = 0.0591 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0313 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Sandy Lean CLAY (CL)

AASHTO Clayey Soils (A-7-6 (18))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

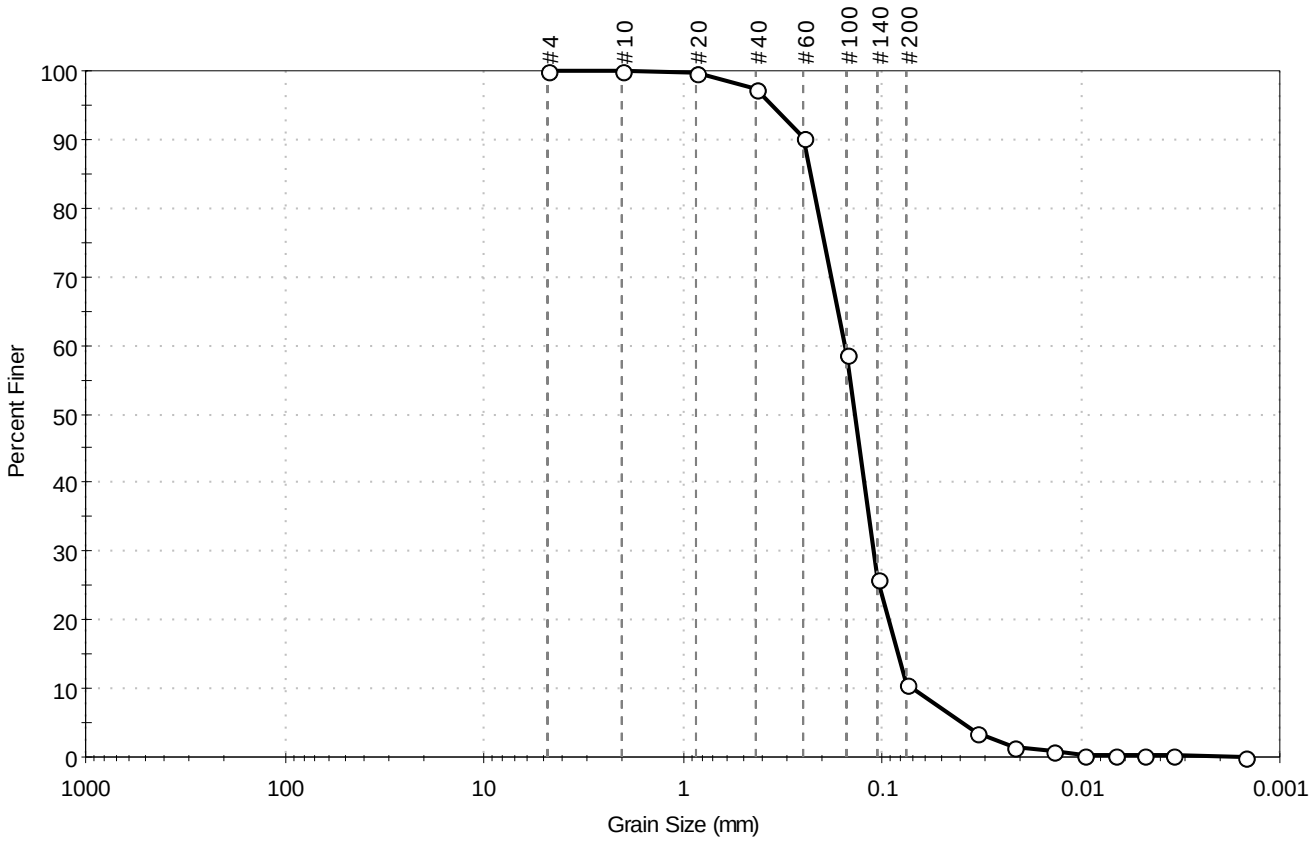
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:10 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB025-1W | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL1041 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 14-16 ft | Test Id: | 482728 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 89.5 | 10.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 97 | | |
| #60 | 0.25 | 90 | | |
| #100 | 0.15 | 59 | | |
| #140 | 0.11 | 26 | | |
| #200 | 0.075 | 10 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0330 | 4 | | |
| --- | 0.0215 | 1 | | |
| --- | 0.0138 | 1 | | |
| --- | 0.0096 | 0 | | |
| --- | 0.0068 | 0 | | |
| --- | 0.0048 | 0 | | |
| --- | 0.0034 | 0 | | |
| --- | 0.0015 | 0 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.2296 mm | $D_{30}$ = 0.1106 mm |
| $D_{60}$ = 0.1532 mm | $D_{15}$ = 0.0829 mm |
| $D_{50}$ = 0.1367 mm | $D_{10}$ = 0.0707 mm |
| $C_u$ = 2.167 | $C_c$ = 1.129 |

**Classification**

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

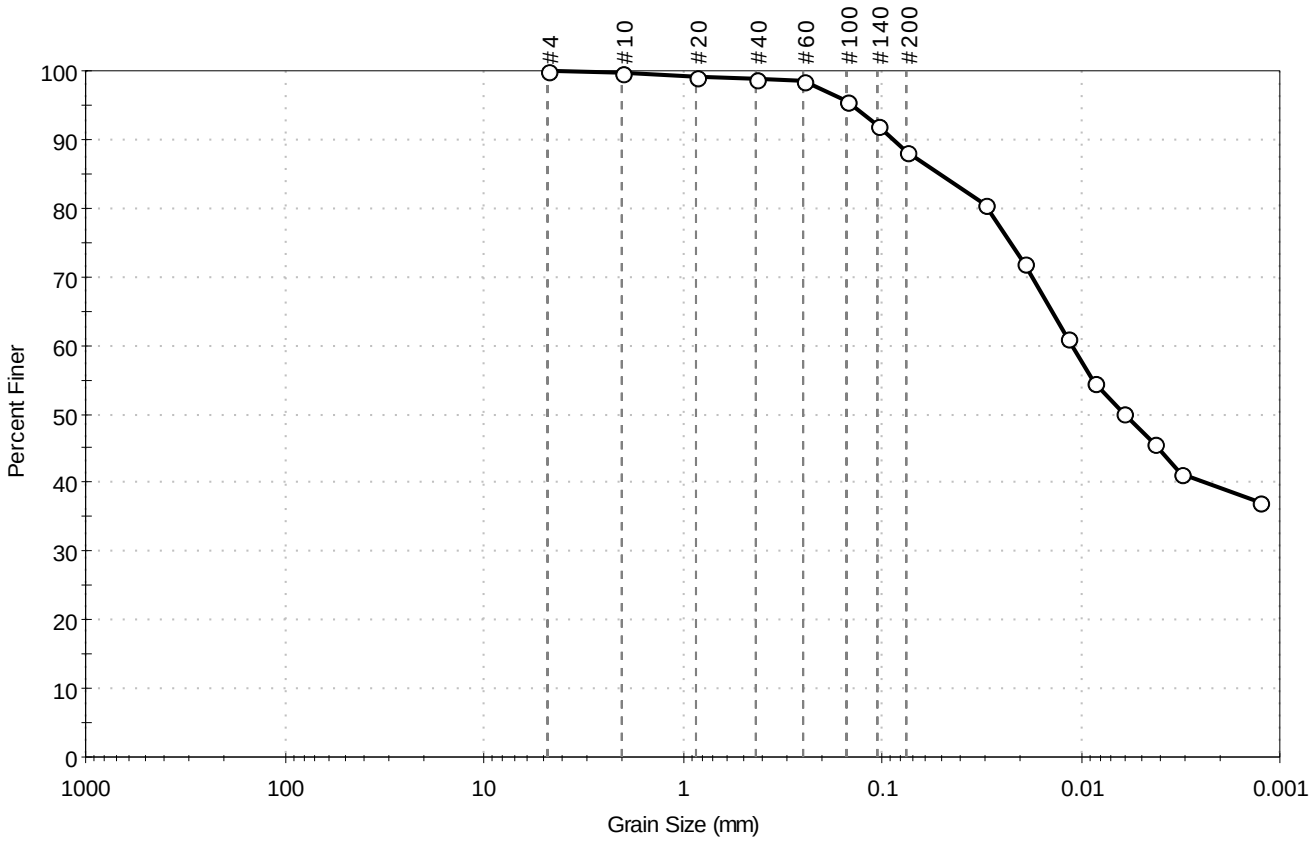
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:11 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB028 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0803 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 8-10 ft | Test Id: | 483656 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark brown clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.1 | 11.6 | 88.3 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 96 | | |
| #140 | 0.11 | 92 | | |
| #200 | 0.075 | 88 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0302 | 81 | | |
| --- | 0.0194 | 72 | | |
| --- | 0.0117 | 61 | | |
| --- | 0.0085 | 54 | | |
| --- | 0.0061 | 50 | | |
| --- | 0.0043 | 46 | | |
| --- | 0.0031 | 41 | | |
| --- | 0.0013 | 37 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0506 mm | $D_{30}$ = N/A |
| $D_{60}$ = 0.0111 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0060 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (46))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

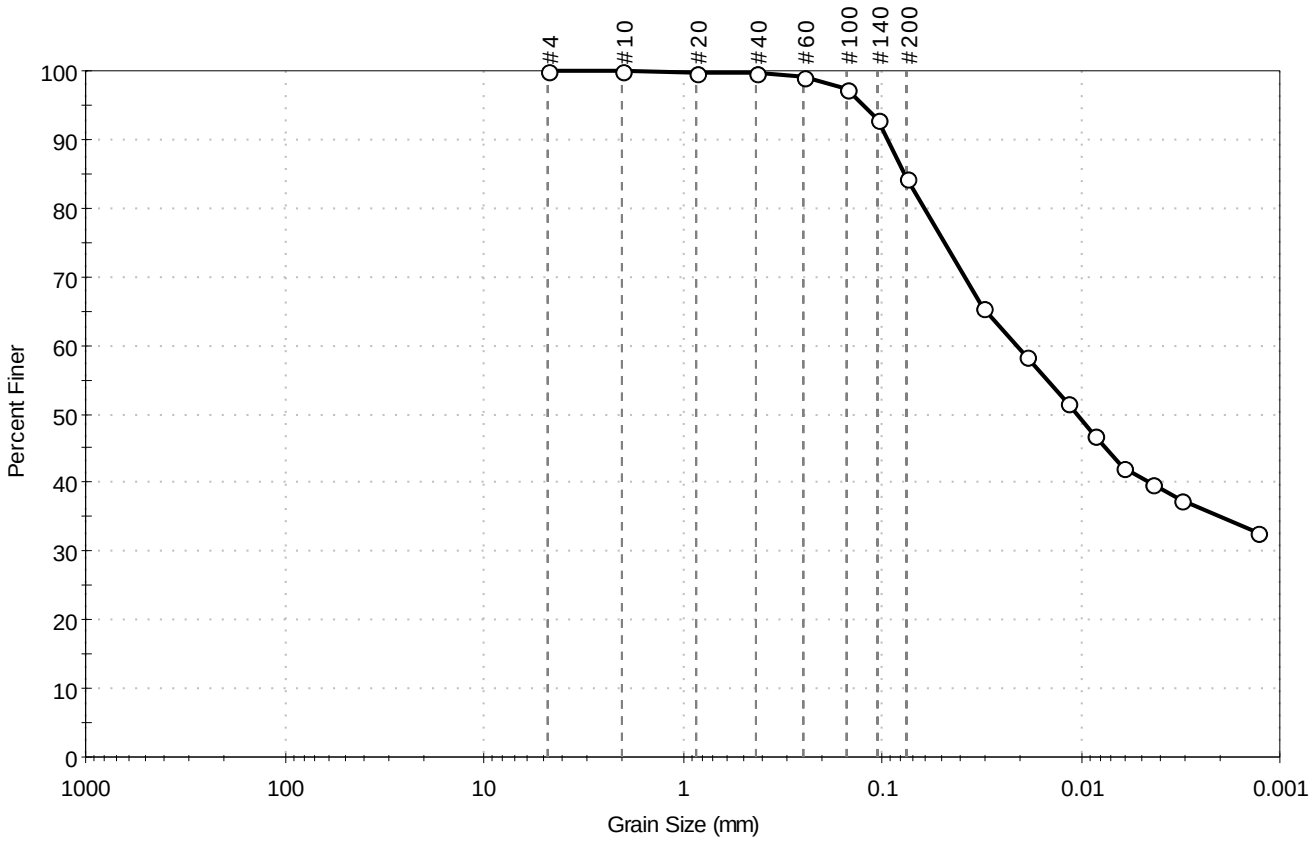
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:12 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB028 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0806 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 25-27 ft | Test Id: | 483657 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark brown clay with sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 15.6 | 84.4 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 99 | | |
| #100 | 0.15 | 97 | | |
| #140 | 0.11 | 93 | | |
| #200 | 0.075 | 84 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0314 | 66 | | |
| --- | 0.0189 | 58 | | |
| --- | 0.0116 | 51 | | |
| --- | 0.0086 | 47 | | |
| --- | 0.0061 | 42 | | |
| --- | 0.0044 | 40 | | |
| --- | 0.0031 | 37 | | |
| --- | 0.0013 | 33 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.0768 mm | $D_{30}$ = N/A |
| $D_{60}$ = 0.0211 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0105 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Fat CLAY with Sand (CH)

AASHTO Clayey Soils (A-7-6 (44))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

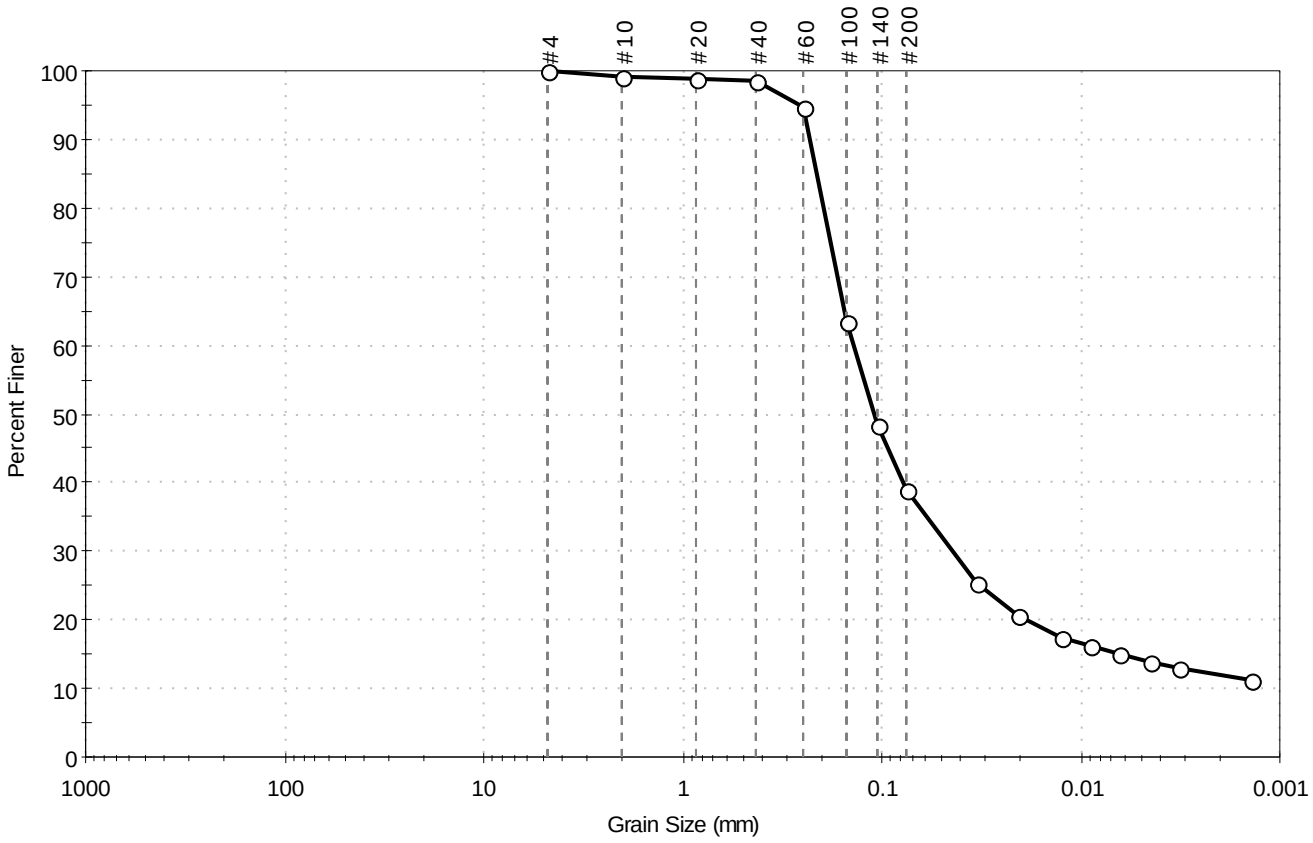
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:04:59 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB029 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0606 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 15-17 ft | Test Id: | 482729 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 61.0 | 39.0 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 95 | | |
| #100 | 0.15 | 63 | | |
| #140 | 0.11 | 48 | | |
| #200 | 0.075 | 39 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0334 | 25 | | |
| --- | 0.0208 | 21 | | |
| --- | 0.0126 | 17 | | |
| --- | 0.0090 | 16 | | |
| --- | 0.0064 | 15 | | |
| --- | 0.0045 | 14 | | |
| --- | 0.0032 | 13 | | |
| --- | 0.0014 | 11 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.2137 mm | $D_{30}$ = 0.0441 mm |
| $D_{60}$ = 0.1385 mm | $D_{15}$ = 0.0061 mm |
| $D_{50}$ = 0.1098 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM N/A

AASHTO Silty Soils (A-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

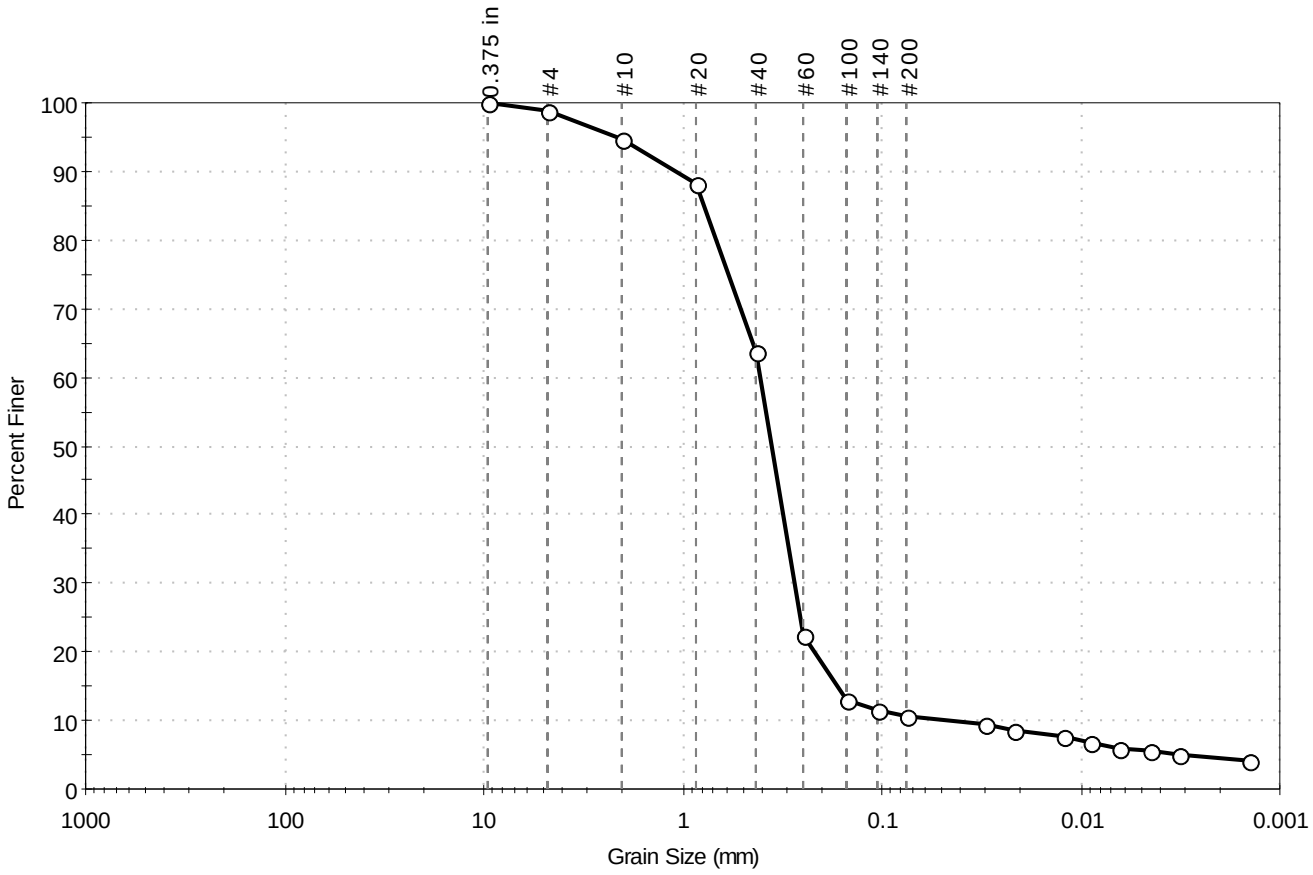
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:13 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB029 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0610 | Test Date: | 01/21/19 | Checked By: | emm |
| Depth : | 35-36.5 ft | Test Id: | 482730 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sand with silt | | | | |
| Sample Comment: | Sample contains shells | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 1.2 | 88.2 | 10.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 99 | | |
| #10 | 2.00 | 95 | | |
| #20 | 0.85 | 88 | | |
| #40 | 0.42 | 64 | | |
| #60 | 0.25 | 22 | | |
| #100 | 0.15 | 13 | | |
| #140 | 0.11 | 11 | | |
| #200 | 0.075 | 11 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0302 | 10 | | |
| --- | 0.0216 | 9 | | |
| --- | 0.0121 | 8 | | |
| --- | 0.0089 | 7 | | |
| --- | 0.0064 | 6 | | |
| --- | 0.0045 | 6 | | |
| --- | 0.0032 | 5 | | |
| --- | 0.0014 | 4 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.7778 mm | $D_{30}$ = 0.2756 mm |
| $D_{60}$ = 0.4049 mm | $D_{15}$ = 0.1680 mm |
| $D_{50}$ = 0.3562 mm | $D_{10}$ = 0.0444 mm |
| $C_u$ = 9.119 | $C_c$ = 4.225 |

**Classification**

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

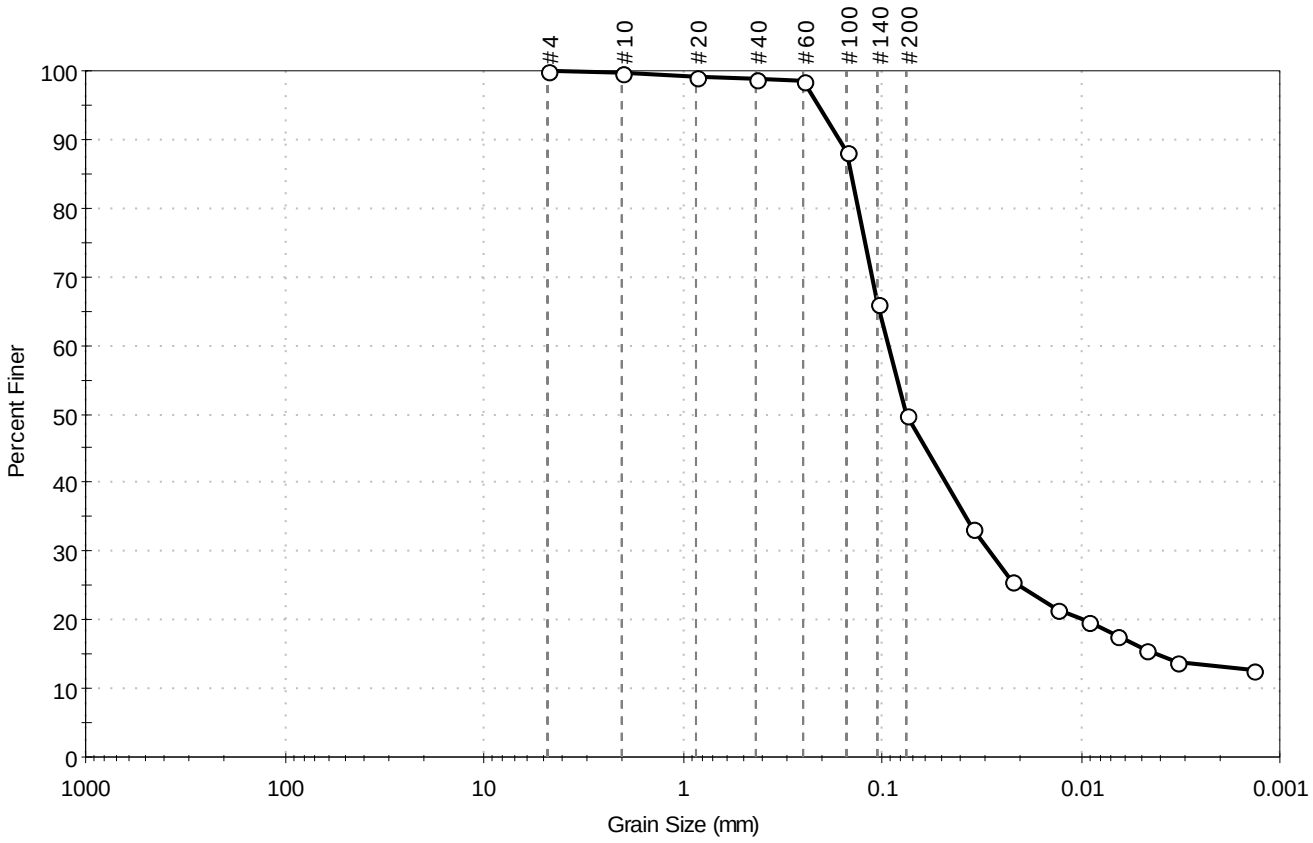
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:14 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB030 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0693 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 14-16 ft | Test Id: | 483654 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown clayey sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 50.2 | 49.8 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 88 | | |
| #140 | 0.11 | 66 | | |
| #200 | 0.075 | 50 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0350 | 33 | | |
| --- | 0.0223 | 26 | | |
| --- | 0.0132 | 22 | | |
| --- | 0.0092 | 20 | | |
| --- | 0.0065 | 18 | | |
| --- | 0.0047 | 16 | | |
| --- | 0.0033 | 14 | | |
| --- | 0.0014 | 13 | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.1426 mm
$D_{30}$ = 0.0288 mm
$D_{60}$ = 0.0931 mm
$D_{15}$ = 0.0041 mm
$D_{50}$ = 0.0753 mm
$D_{10}$ = N/A
$C_u$ = N/A
$C_c$ = N/A

**Classification**

ASTM N/A

AASHTO Silty Soils (A-4 (0))

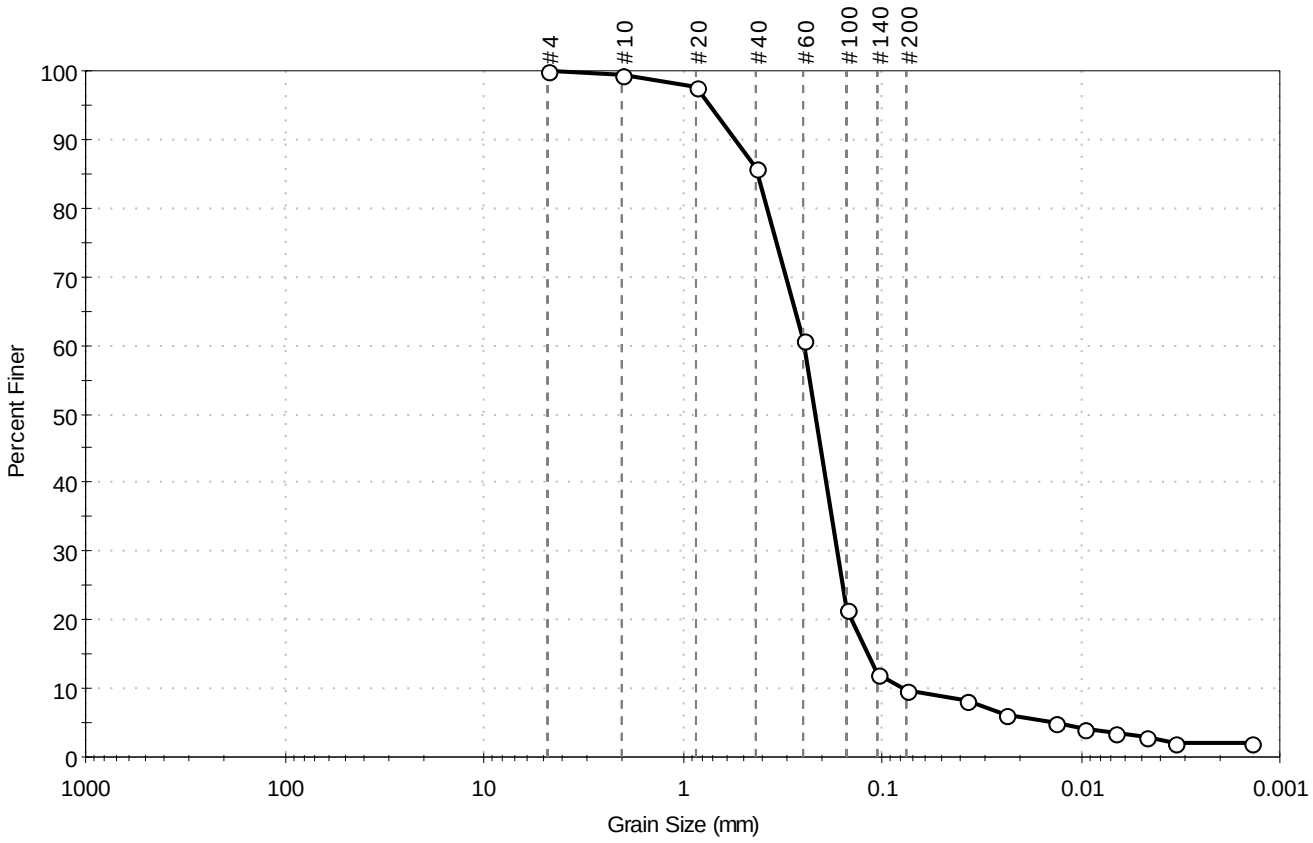
**Sample / Test Description**

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:14 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB030 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0696 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 30-32 ft | Test Id: | 483655 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, brownish gray sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 90.3 | 9.7 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 98 | | |
| #40 | 0.42 | 86 | | |
| #60 | 0.25 | 61 | | |
| #100 | 0.15 | 21 | | |
| #140 | 0.11 | 12 | | |
| #200 | 0.075 | 9.7 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0372 | 8 | | |
| --- | 0.0237 | 6 | | |
| --- | 0.0134 | 5 | | |
| --- | 0.0095 | 4 | | |
| --- | 0.0068 | 4 | | |
| --- | 0.0047 | 3 | | |
| --- | 0.0034 | 2 | | |
| --- | 0.0014 | 2 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.4178 mm | $D_{30}$ = 0.1677 mm |
| $D_{60}$ = 0.2480 mm | $D_{15}$ = 0.1184 mm |
| $D_{50}$ = 0.2176 mm | $D_{10}$ = 0.0781 mm |
| $C_u$ = 3.175 | $C_c$ = 1.452 |

**Classification**

ASTM Poorly graded SAND with Silt (SP-SM)

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

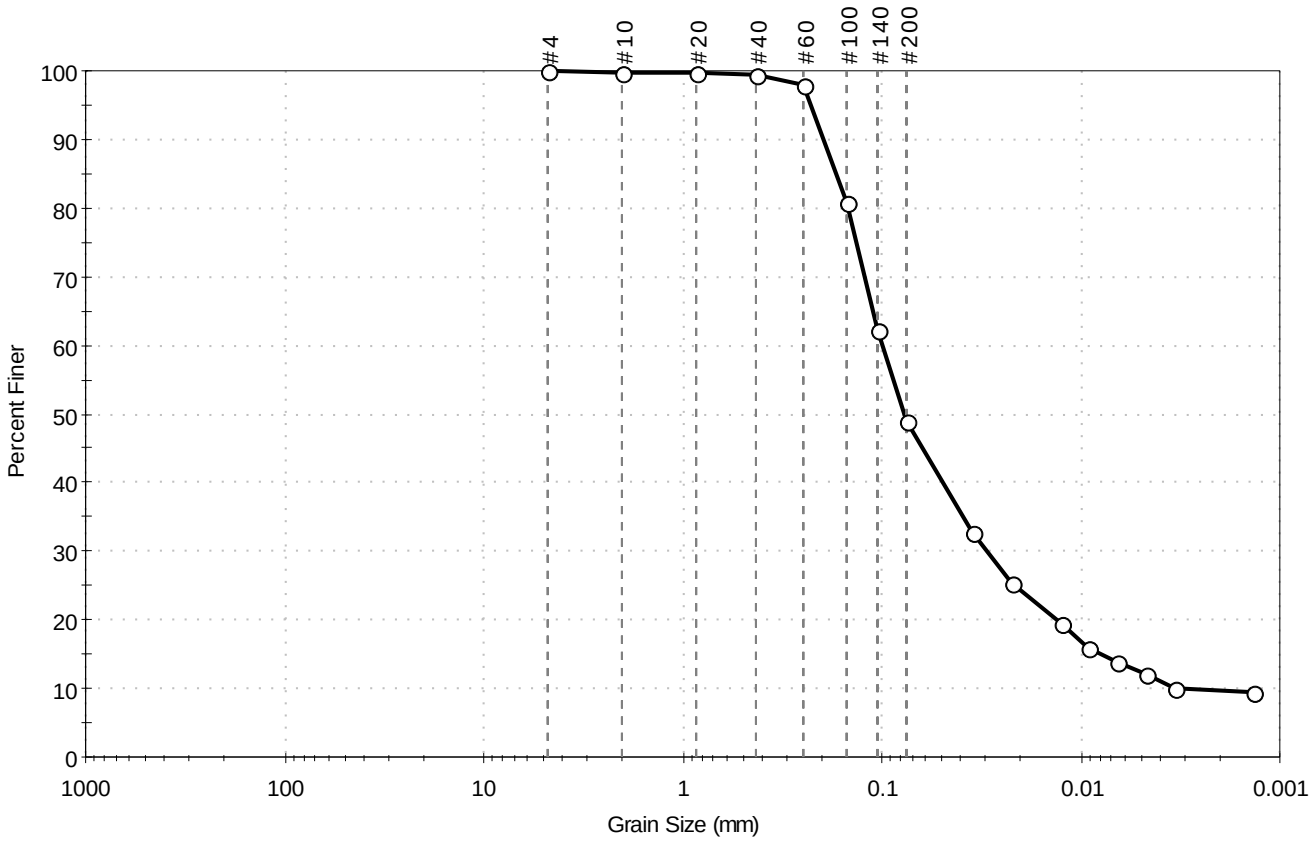
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:15 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB031 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0617 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482923 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown clayey sand | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 51.2 | 48.8 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 81 | | |
| #140 | 0.11 | 62 | | |
| #200 | 0.075 | 49 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0349 | 33 | | |
| --- | 0.0224 | 25 | | |
| --- | 0.0126 | 20 | | |
| --- | 0.0092 | 16 | | |
| --- | 0.0066 | 14 | | |
| --- | 0.0047 | 12 | | |
| --- | 0.0033 | 10 | | |
| --- | 0.0014 | 9 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1698 mm | $D_{30}$ = 0.0296 mm |
| $D_{60}$ = 0.1003 mm | $D_{15}$ = 0.0080 mm |
| $D_{50}$ = 0.0773 mm | $D_{10}$ = 0.0029 mm |
| $C_u$ = 34.586 | $C_c$ = 3.012 |

**Classification**

ASTM Clayey SAND (SC)

AASHTO Clayey Soils (A-6 (5))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

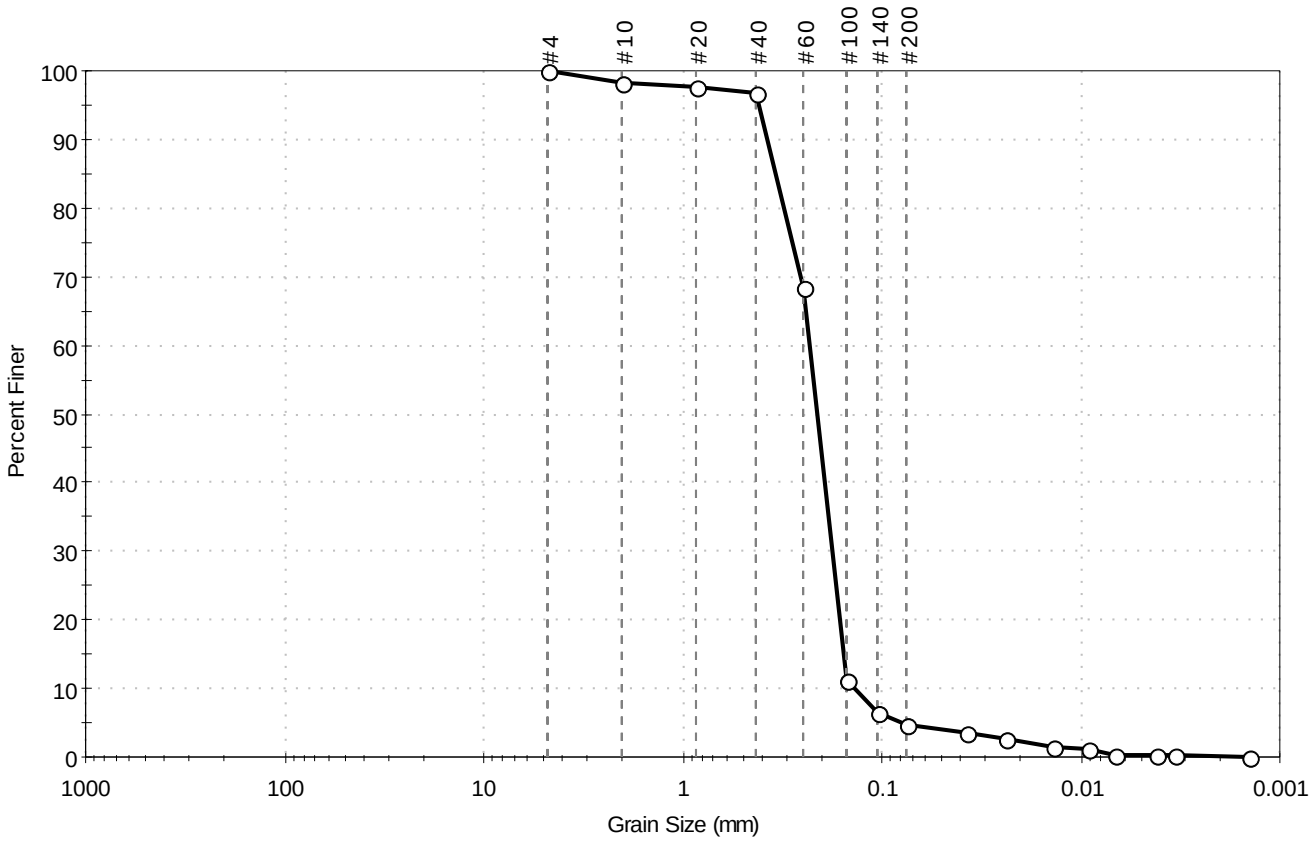
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:07:09 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB031 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0622 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 20-22 ft | Test Id: | 482924 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 95.2 | 4.8 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 98 | | |
| #20 | 0.85 | 98 | | |
| #40 | 0.42 | 97 | | |
| #60 | 0.25 | 68 | | |
| #100 | 0.15 | 11 | | |
| #140 | 0.11 | 6 | | |
| #200 | 0.075 | 4.8 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0377 | 3 | | |
| --- | 0.0238 | 3 | | |
| --- | 0.0136 | 1 | | |
| --- | 0.0092 | 1 | | |
| --- | 0.0068 | 0 | | |
| --- | 0.0042 | 0 | | |
| --- | 0.0034 | 0 | | |
| --- | 0.0014 | 0 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.3406 mm | $D_{30}$ = 0.1774 mm |
| $D_{60}$ = 0.2318 mm | $D_{15}$ = 0.1552 mm |
| $D_{50}$ = 0.2120 mm | $D_{10}$ = 0.1374 mm |
| $C_u$ = 1.687 | $C_c$ = 0.988 |

**Classification**

ASTM Poorly graded SAND (SP)

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

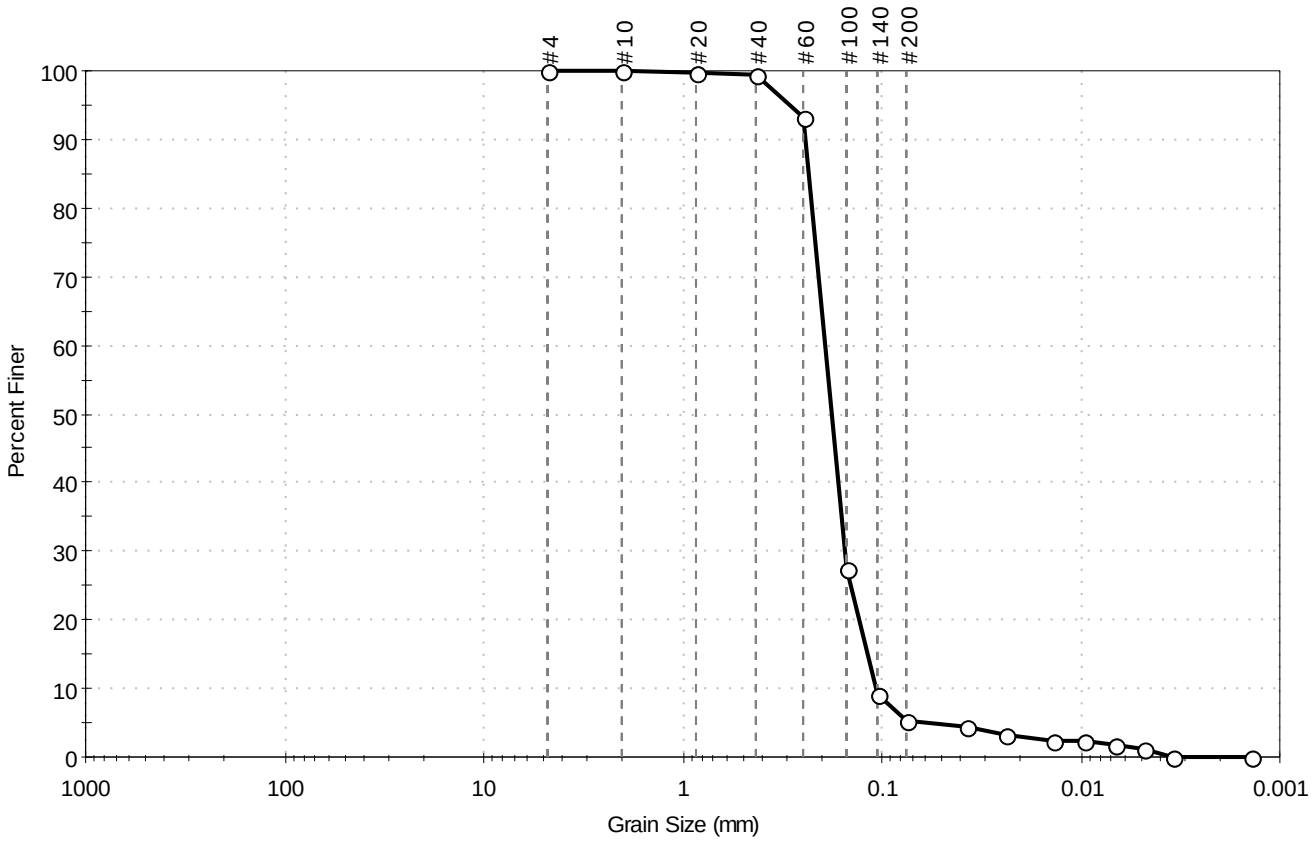
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:16 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB032 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0680 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 14-16 ft | Test Id: | 483684 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 94.7 | 5.3 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 100 | | |
| #60 | 0.25 | 93 | | |
| #100 | 0.15 | 27 | | |
| #140 | 0.11 | 9 | | |
| #200 | 0.075 | 5.3 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0376 | 4 | | |
| --- | 0.0238 | 3 | | |
| --- | 0.0138 | 2 | | |
| --- | 0.0097 | 2 | | |
| --- | 0.0067 | 2 | | |
| --- | 0.0049 | 1 | | |
| --- | 0.0035 | 0 | | |
| --- | 0.0014 | 0 | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.2346 mm  $D_{30}$ = 0.1530 mm
$D_{60}$ = 0.1932 mm  $D_{15}$ = 0.1186 mm
$D_{50}$ = 0.1787 mm  $D_{10}$ = 0.1079 mm
$C_u$ = 1.791  $C_c$ = 1.123

**Classification**

ASTM N/A

AASHTO Fine Sand (A-3 (1))

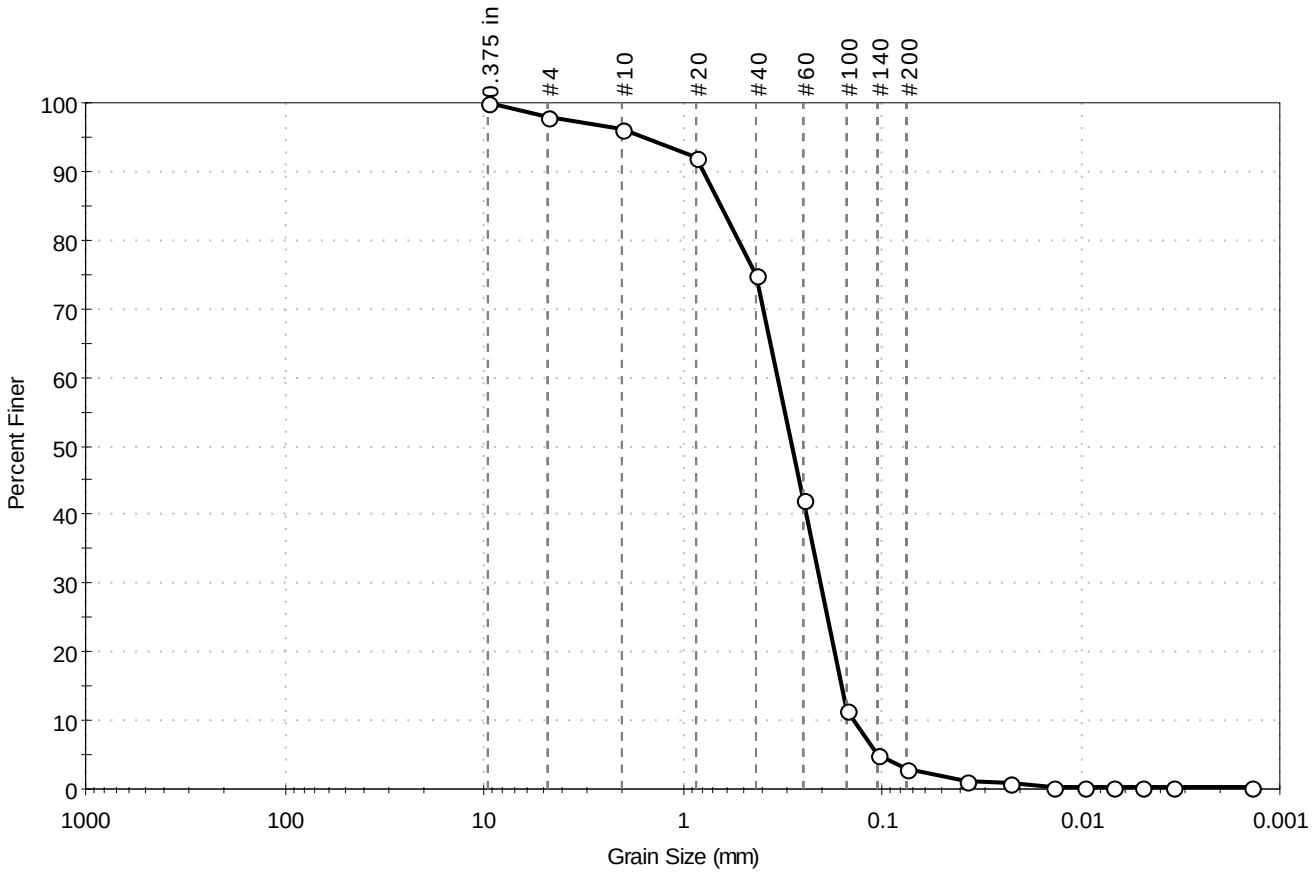
**Sample / Test Description**

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:17 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB032 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0684 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 35-37 ft | Test Id: | 483653 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 2.1 | 95.0 | 2.9 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 98 | | |
| #10 | 2.00 | 96 | | |
| #20 | 0.85 | 92 | | |
| #40 | 0.42 | 75 | | |
| #60 | 0.25 | 42 | | |
| #100 | 0.15 | 11 | | |
| #140 | 0.11 | 5 | | |
| #200 | 0.075 | 2.9 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0376 | 1 | | |
| --- | 0.0229 | 1 | | |
| --- | 0.0139 | 0 | | |
| --- | 0.0098 | 0 | | |
| --- | 0.0070 | 0 | | |
| --- | 0.0049 | 0 | | |
| --- | 0.0034 | 0 | | |
| --- | 0.0014 | 0 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.6387 mm | $D_{30}$ = 0.2039 mm |
| $D_{60}$ = 0.3337 mm | $D_{15}$ = 0.1591 mm |
| $D_{50}$ = 0.2834 mm | $D_{10}$ = 0.1386 mm |
| $C_u$ = 2.408 | $C_c$ = 0.899 |

**Classification**

ASTM Poorly graded SAND (SP)

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

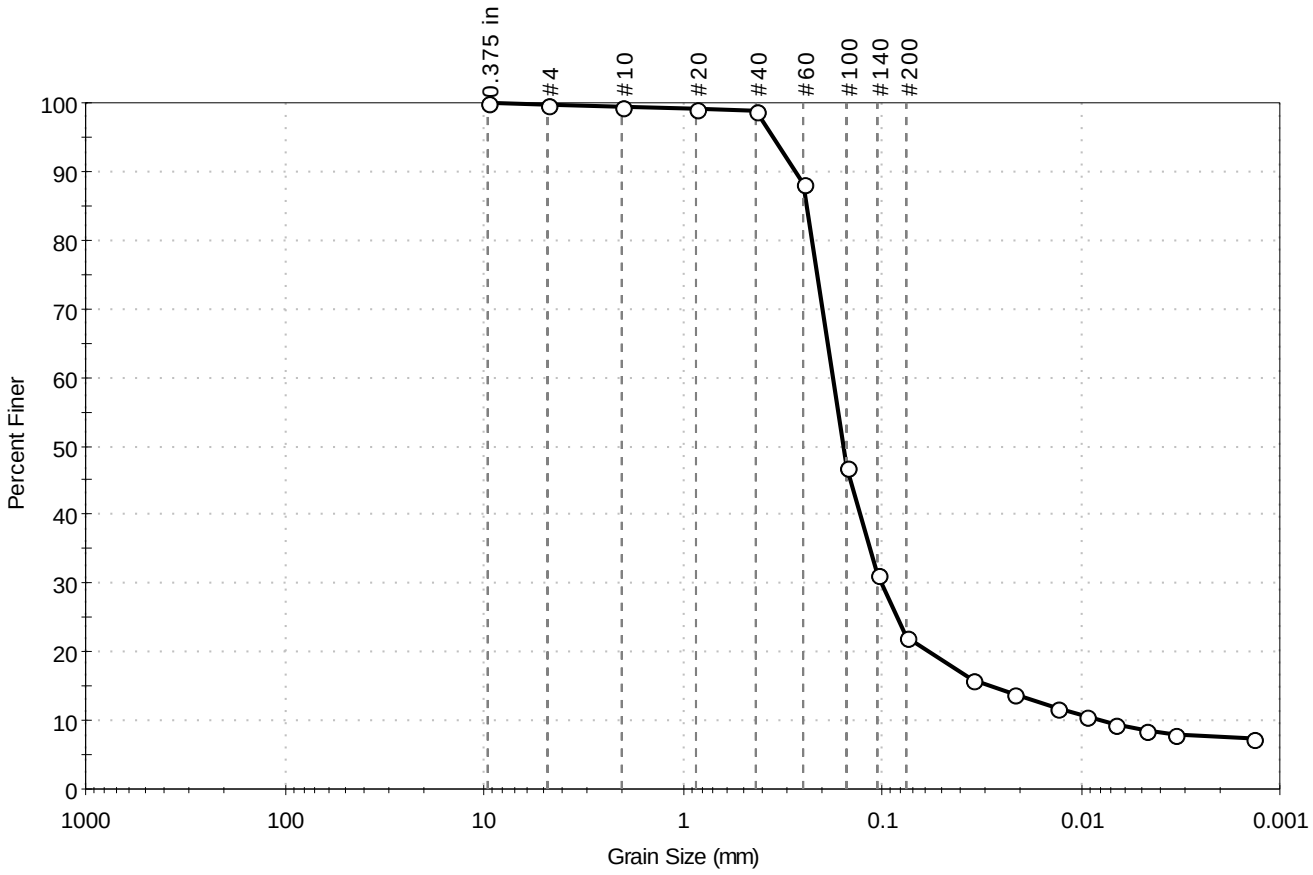
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:08:40 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB033 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0645 | Test Date: | 03/08/19 | Checked By: | bfs |
| Depth : | 14-16 ft | Test Id: | 483678 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 0.3 | 77.6 | 22.1 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 88 | | |
| #100 | 0.15 | 47 | | |
| #140 | 0.11 | 31 | | |
| #200 | 0.075 | 22 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0351 | 16 | | |
| --- | 0.0219 | 14 | | |
| --- | 0.0130 | 12 | | |
| --- | 0.0094 | 11 | | |
| --- | 0.0067 | 10 | | |
| --- | 0.0047 | 8 | | |
| --- | 0.0034 | 8 | | |
| --- | 0.0013 | 7 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.2404 mm | $D_{30}$ = 0.1006 mm |
| $D_{60}$ = 0.1765 mm | $D_{15}$ = 0.0285 mm |
| $D_{50}$ = 0.1560 mm | $D_{10}$ = 0.0077 mm |
| $C_u$ = 22.922 | $C_c$ = 7.447 |

**Classification**

ASTM Silty SAND (SM)

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

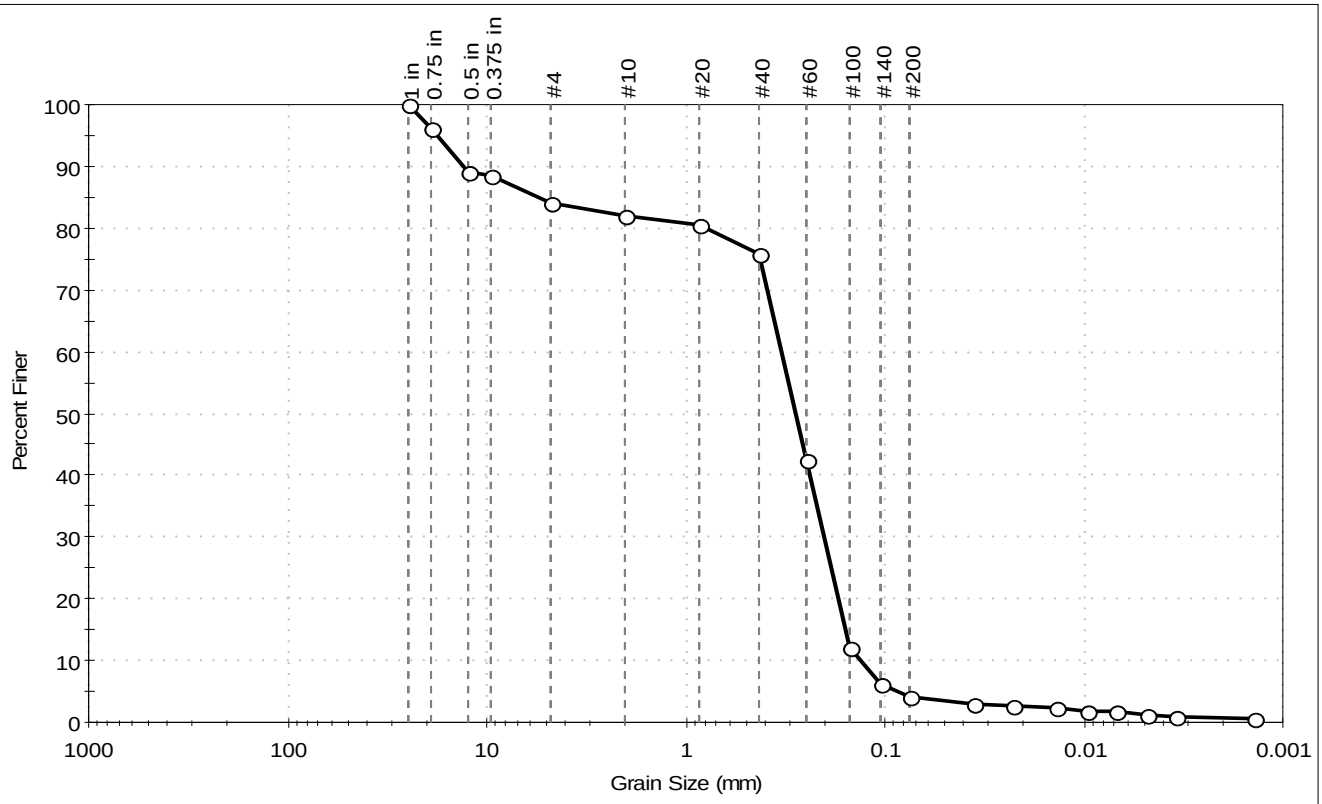
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:18 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB033 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0647 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 30-32 ft | Test Id: | 483679 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown sand with gravel | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 16.0 | 79.8 | 4.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 1 in | 25.00 | 100 | | |
| 0.75 in | 19.00 | 96 | | |
| 0.5 in | 12.50 | 89 | | |
| 0.375 in | 9.50 | 88 | | |
| #4 | 4.75 | 84 | | |
| #10 | 2.00 | 82 | | |
| #20 | 0.85 | 81 | | |
| #40 | 0.42 | 76 | | |
| #60 | 0.25 | 42 | | |
| #100 | 0.15 | 12 | | |
| #140 | 0.11 | 6 | | |
| #200 | 0.075 | 4.2 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0358 | 3 | | |
| --- | 0.0228 | 3 | | |
| --- | 0.0138 | 2 | | |
| --- | 0.0097 | 2 | | |
| --- | 0.0069 | 2 | | |
| --- | 0.0048 | 1 | | |
| --- | 0.0035 | 1 | | |
| --- | 0.0014 | 1 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 5.5346 mm | $D_{30}$ = 0.2028 mm |
| $D_{60}$ = 0.3305 mm | $D_{15}$ = 0.1576 mm |
| $D_{50}$ = 0.2820 mm | $D_{10}$ = 0.1329 mm |
| $C_u$ = 2.487 | $C_c$ = 0.936 |

**Classification**

ASTM Poorly graded SAND with Gravel (SP)

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

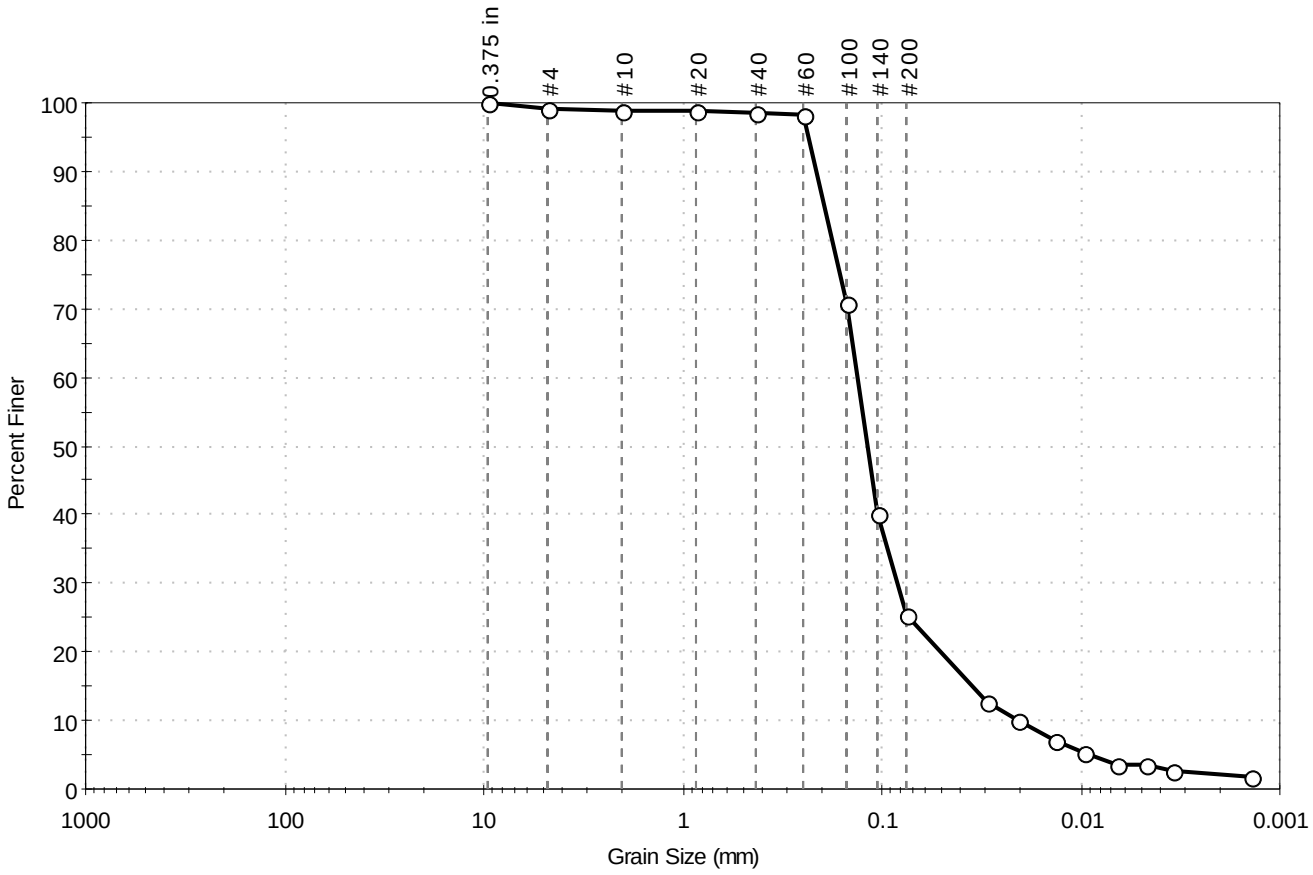
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:10:04 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB034 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0634 | Test Date: | 01/21/19 | Checked By: | emm |
| Depth : | 14-16 ft | Test Id: | 482971 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light yellowish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 1.0 | 73.5 | 25.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 99 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 71 | | |
| #140 | 0.11 | 40 | | |
| #200 | 0.075 | 25 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0293 | 13 | | |
| --- | 0.0207 | 10 | | |
| --- | 0.0136 | 7 | | |
| --- | 0.0097 | 5 | | |
| --- | 0.0066 | 4 | | |
| --- | 0.0048 | 4 | | |
| --- | 0.0034 | 3 | | |
| --- | 0.0014 | 2 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1956 mm | $D_{30}$ = 0.0835 mm |
| $D_{60}$ = 0.1329 mm | $D_{15}$ = 0.0348 mm |
| $D_{50}$ = 0.1186 mm | $D_{10}$ = 0.0209 mm |
| $C_u$ = 6.359 | $C_c$ = 2.510 |

**Classification**

ASTM Silty SAND (SM)

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

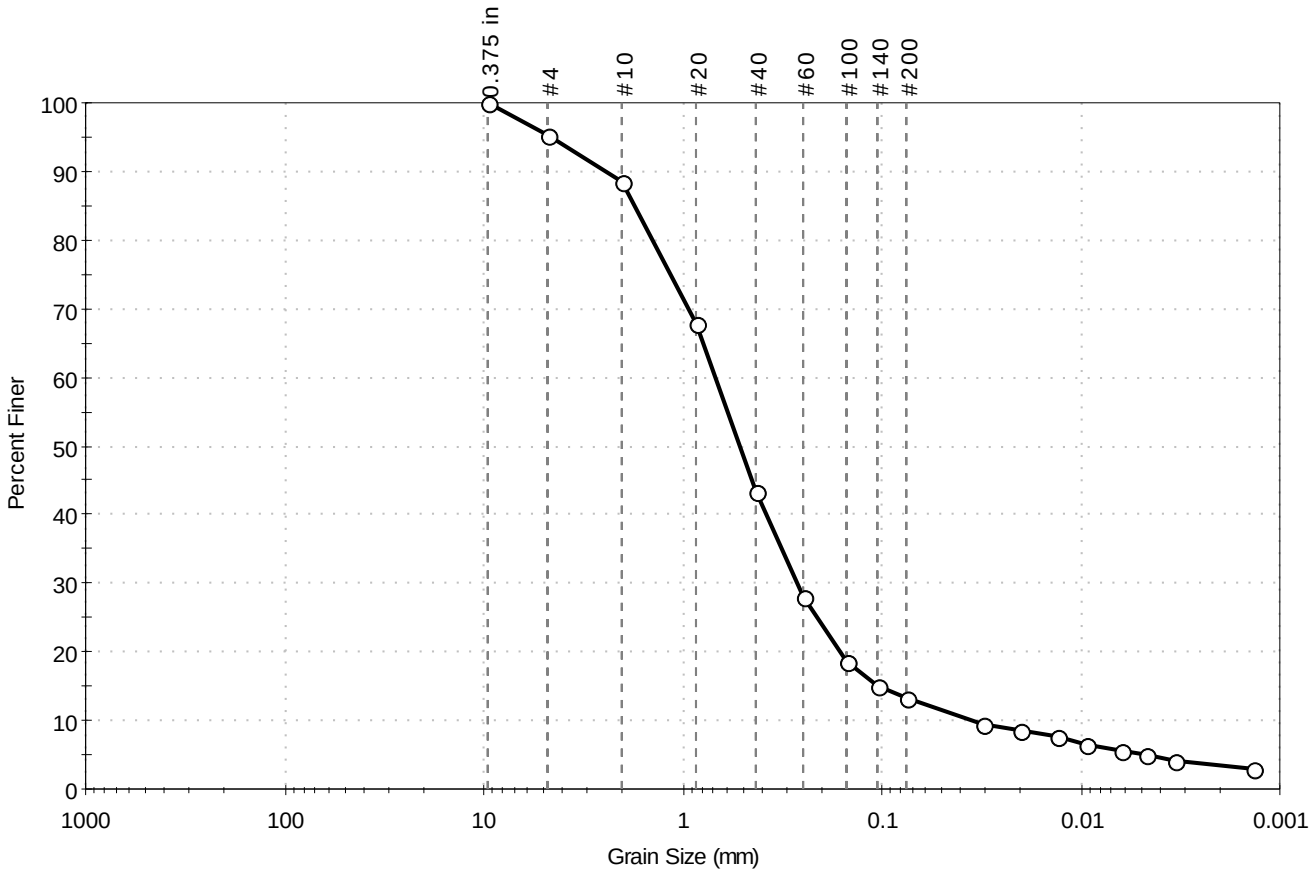
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:20 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB034 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0638 | Test Date: | 01/21/19 | Checked By: | emm |
| Depth : | 40-40.8 ft | Test Id: | 482972 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown silty sand | | | | |
| Sample Comment: | Sample contains shells | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 4.8 | 82.0 | 13.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 95 | | |
| #10 | 2.00 | 88 | | |
| #20 | 0.85 | 68 | | |
| #40 | 0.42 | 43 | | |
| #60 | 0.25 | 28 | | |
| #100 | 0.15 | 19 | | |
| #140 | 0.11 | 15 | | |
| #200 | 0.075 | 13 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0308 | 9 | | |
| --- | 0.0203 | 8 | | |
| --- | 0.0132 | 8 | | |
| --- | 0.0094 | 7 | | |
| --- | 0.0063 | 6 | | |
| --- | 0.0048 | 5 | | |
| --- | 0.0034 | 4 | | |
| --- | 0.0014 | 3 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 1.7309 mm | $D_{30}$ = 0.2672 mm |
| $D_{60}$ = 0.6806 mm | $D_{15}$ = 0.1048 mm |
| $D_{50}$ = 0.5123 mm | $D_{10}$ = 0.0353 mm |
| $C_u$ = 19.280 | $C_c$ = 2.972 |

**Classification**

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

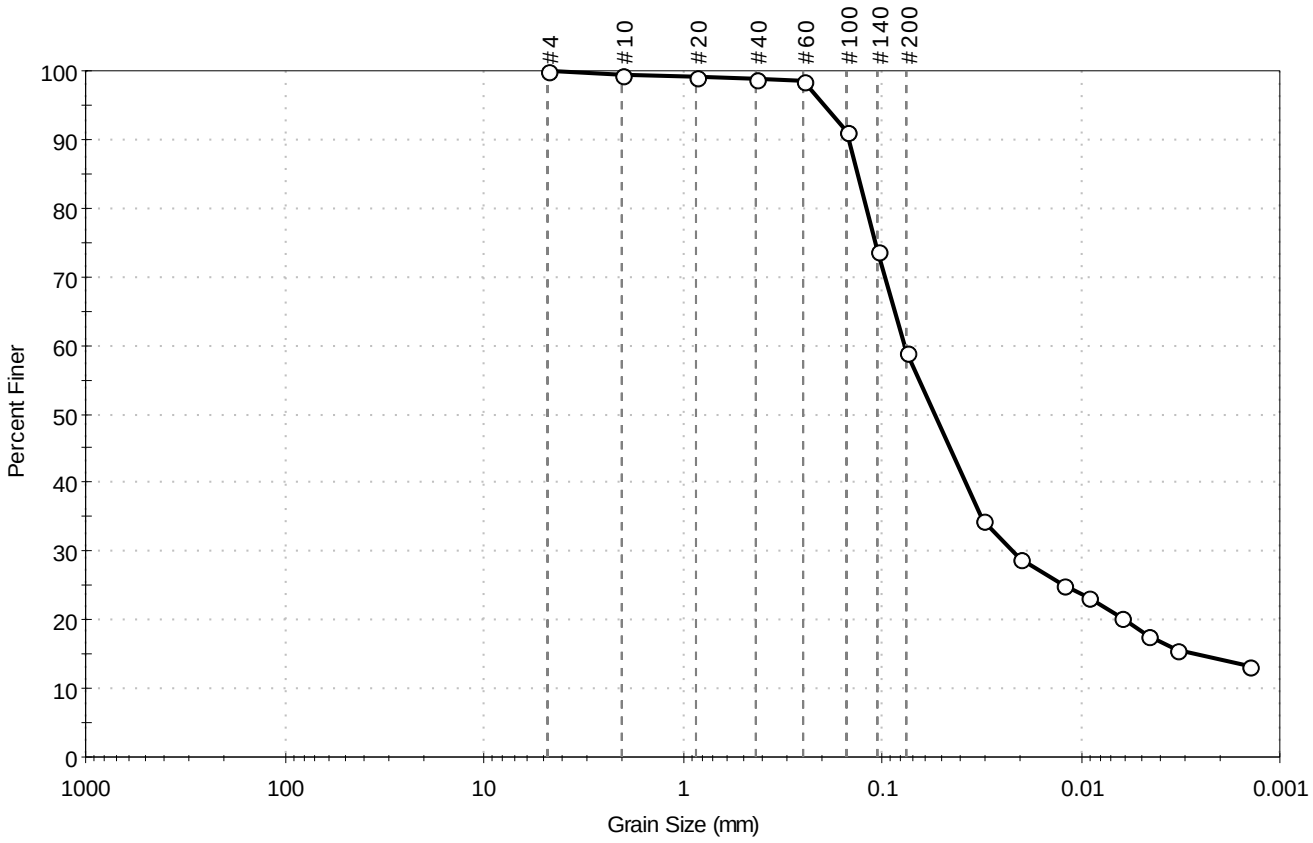
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:20 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB035 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0644 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482969 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 41.1 | 58.9 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 99 | | |
| #20 | 0.85 | 99 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 98 | | |
| #100 | 0.15 | 91 | | |
| #140 | 0.11 | 74 | | |
| #200 | 0.075 | 59 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0308 | 35 | | |
| --- | 0.0200 | 29 | | |
| --- | 0.0123 | 25 | | |
| --- | 0.0091 | 23 | | |
| --- | 0.0064 | 20 | | |
| --- | 0.0046 | 18 | | |
| --- | 0.0033 | 16 | | |
| --- | 0.0014 | 13 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1324 mm | $D_{30}$ = 0.0217 mm |
| $D_{60}$ = 0.0770 mm | $D_{15}$ = 0.0026 mm |
| $D_{50}$ = 0.0542 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Sandy Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (5))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

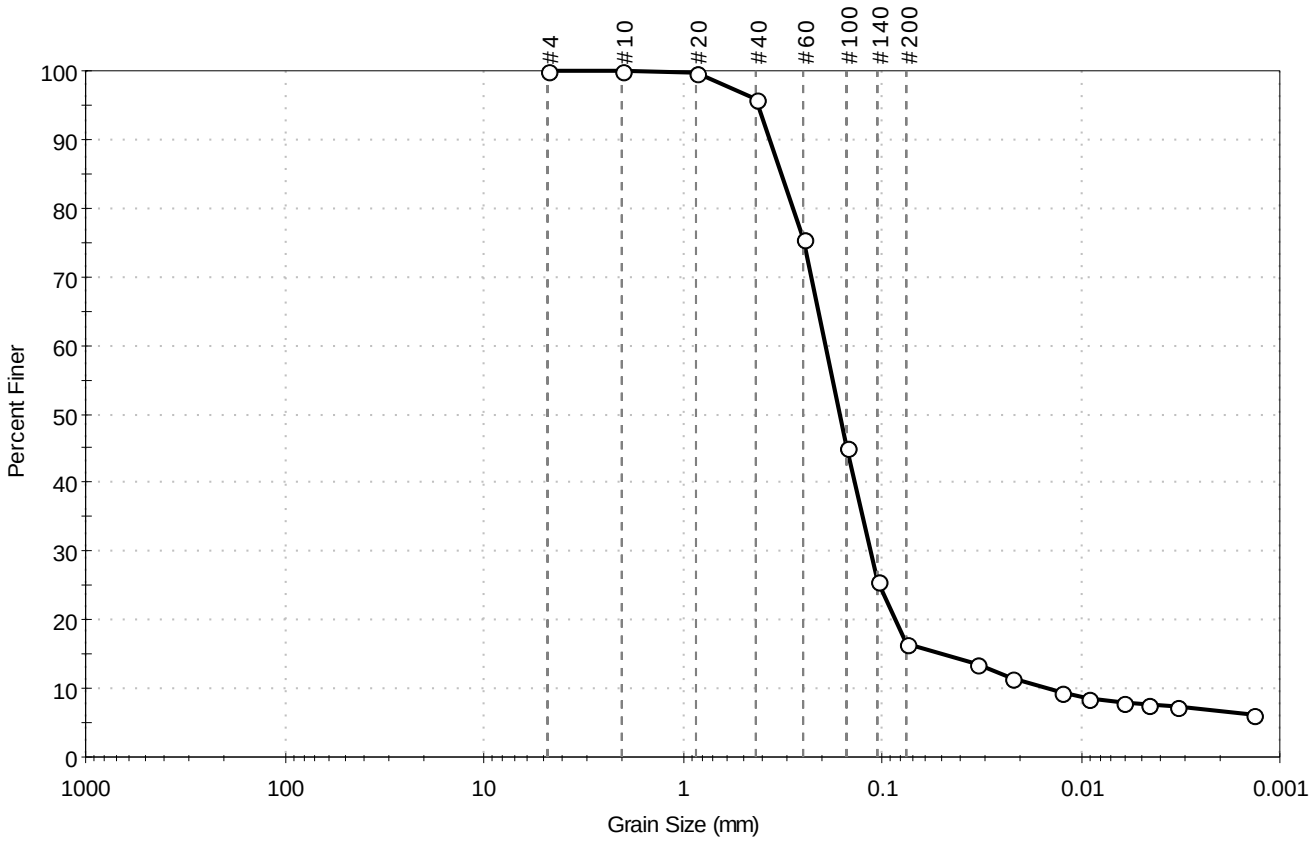
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:21 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB035 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0647 | Test Date: | 01/21/19 | Checked By: | emm |
| Depth : | 25-27 ft | Test Id: | 482970 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 83.4 | 16.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 96 | | |
| #60 | 0.25 | 75 | | |
| #100 | 0.15 | 45 | | |
| #140 | 0.11 | 26 | | |
| #200 | 0.075 | 17 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0332 | 14 | | |
| --- | 0.0221 | 12 | | |
| --- | 0.0126 | 9 | | |
| --- | 0.0092 | 8 | | |
| --- | 0.0061 | 8 | | |
| --- | 0.0046 | 8 | | |
| --- | 0.0033 | 7 | | |
| --- | 0.0014 | 6 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.3208 mm | $D_{30}$ = 0.1146 mm |
| $D_{60}$ = 0.1927 mm | $D_{15}$ = 0.0477 mm |
| $D_{50}$ = 0.1627 mm | $D_{10}$ = 0.0145 mm |
| $C_u$ = 13.290 | $C_c$ = 4.700 |

**Classification**

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

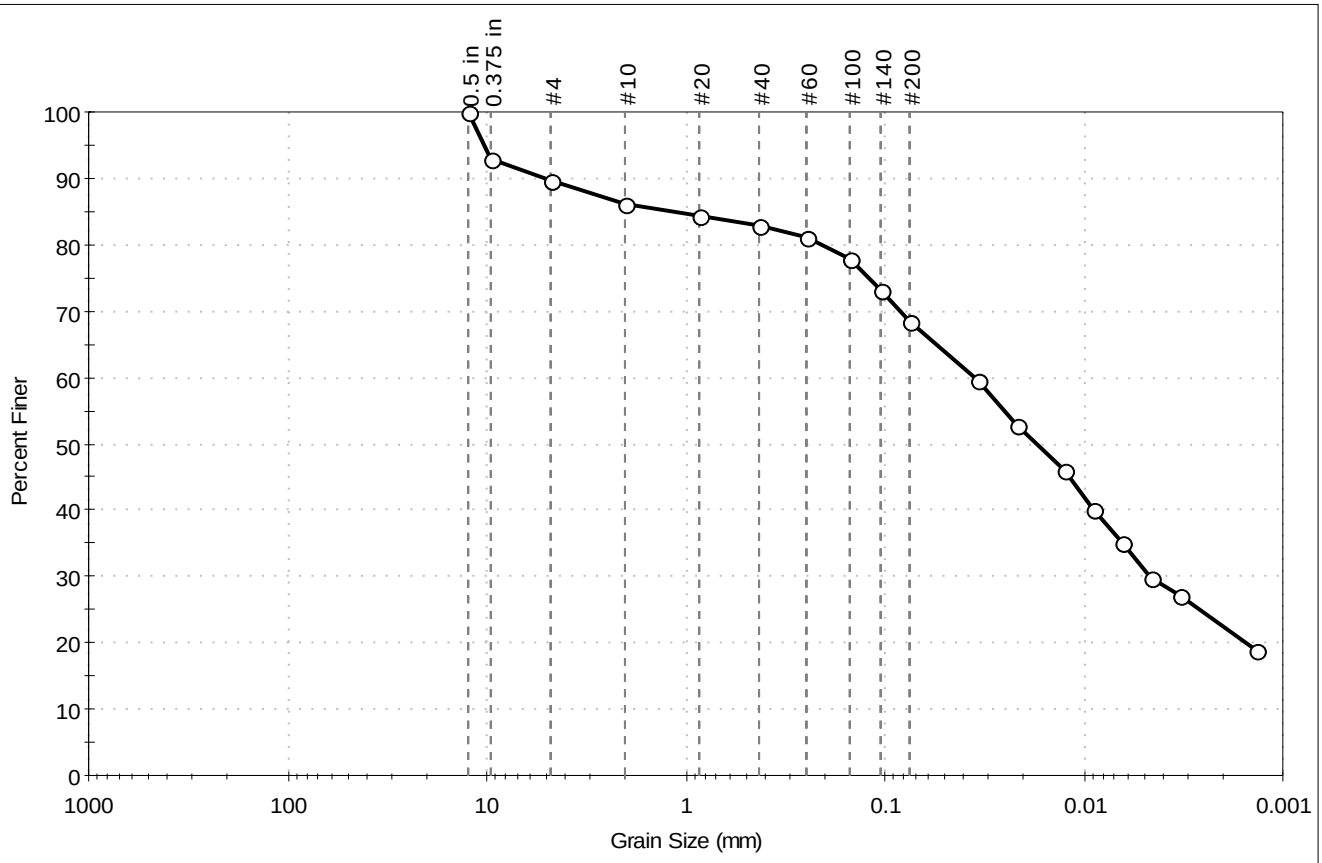
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:22 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB036 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0665 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 2.6-4 ft | Test Id: | 483682 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 10.2 | 21.3 | 68.5 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.5 in | 12.50 | 100 | | |
| 0.375 in | 9.50 | 93 | | |
| #4 | 4.75 | 90 | | |
| #10 | 2.00 | 86 | | |
| #20 | 0.85 | 84 | | |
| #40 | 0.42 | 83 | | |
| #60 | 0.25 | 81 | | |
| #100 | 0.15 | 78 | | |
| #140 | 0.11 | 73 | | |
| #200 | 0.075 | 68 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0343 | 60 | | |
| --- | 0.0216 | 53 | | |
| --- | 0.0127 | 46 | | |
| --- | 0.0090 | 40 | | |
| --- | 0.0064 | 35 | | |
| --- | 0.0046 | 30 | | |
| --- | 0.0033 | 27 | | |
| --- | 0.0014 | 19 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 1.1351 mm | $D_{30}$ = 0.0046 mm |
| $D_{60}$ = 0.0355 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0172 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Sandy Fat CLAY (CH)

AASHTO Clayey Soils (A-7-5 (42))

**Sample / Test Description**

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

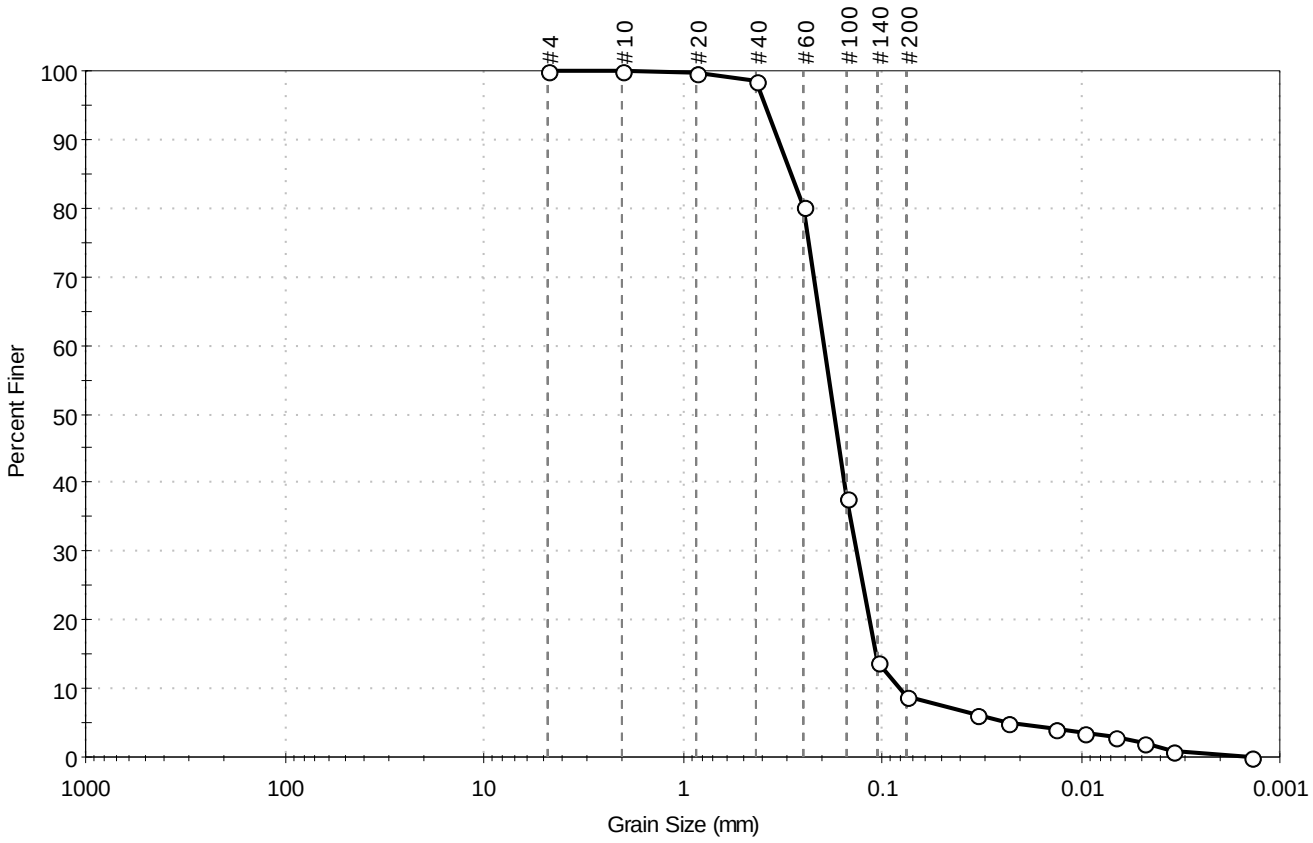
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:12:12 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB036 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0670 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 20-22 ft | Test Id: | 483683 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark gray sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 91.2 | 8.8 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 80 | | |
| #100 | 0.15 | 38 | | |
| #140 | 0.11 | 14 | | |
| #200 | 0.075 | 8.8 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0332 | 6 | | |
| --- | 0.0232 | 5 | | |
| --- | 0.0134 | 4 | | |
| --- | 0.0097 | 4 | | |
| --- | 0.0067 | 3 | | |
| --- | 0.0048 | 2 | | |
| --- | 0.0034 | 1 | | |
| --- | 0.0014 | 0 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.2878 mm | $D_{30}$ = 0.1339 mm |
| $D_{60}$ = 0.1962 mm | $D_{15}$ = 0.1075 mm |
| $D_{50}$ = 0.1739 mm | $D_{10}$ = 0.0812 mm |
| $C_u$ = 2.416 | $C_c$ = 1.125 |

**Classification**

ASTM N/A

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

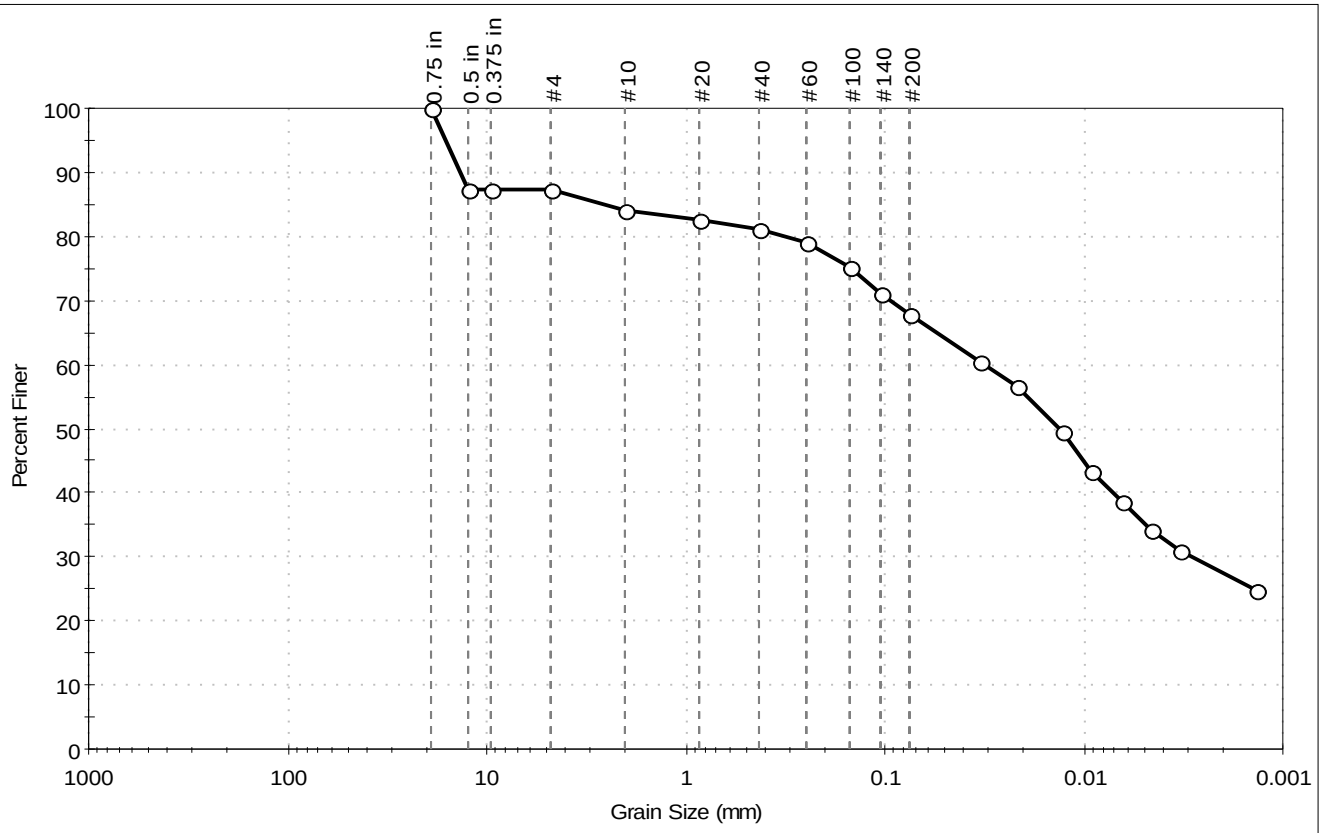
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:12:56 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB037 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0652 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 2-4 ft | Test Id: | 483680 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 12.8 | 19.4 | 67.8 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.75 in | 19.00 | 100 | | |
| 0.5 in | 12.50 | 87 | | |
| 0.375 in | 9.50 | 87 | | |
| #4 | 4.75 | 87 | | |
| #10 | 2.00 | 84 | | |
| #20 | 0.85 | 83 | | |
| #40 | 0.42 | 81 | | |
| #60 | 0.25 | 79 | | |
| #100 | 0.15 | 75 | | |
| #140 | 0.11 | 71 | | |
| #200 | 0.075 | 68 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0334 | 60 | | |
| --- | 0.0217 | 57 | | |
| --- | 0.0128 | 50 | | |
| --- | 0.0092 | 43 | | |
| --- | 0.0065 | 39 | | |
| --- | 0.0047 | 34 | | |
| --- | 0.0033 | 31 | | |
| --- | 0.0013 | 25 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 2.5542 mm | $D_{30}$ = 0.0029 mm |
| $D_{60}$ = 0.0319 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0132 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Sandy Fat CLAY (CH)

AASHTO Clayey Soils (A-7-5 (54))

**Sample / Test Description**

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

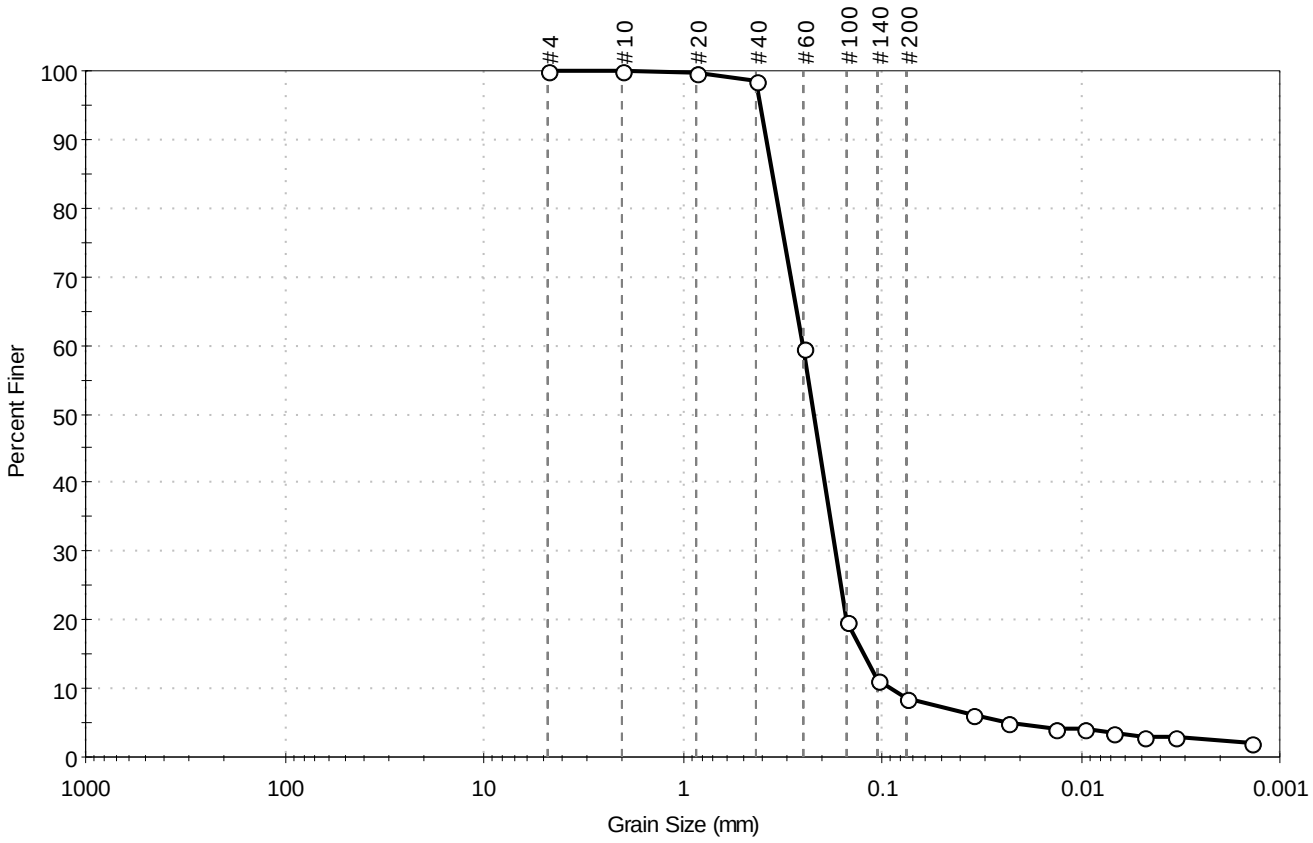
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:13:48 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB037 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0659 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 25-27 ft | Test Id: | 483681 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 91.4 | 8.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 98 | | |
| #60 | 0.25 | 60 | | |
| #100 | 0.15 | 20 | | |
| #140 | 0.11 | 11 | | |
| #200 | 0.075 | 8.6 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0351 | 6 | | |
| --- | 0.0234 | 5 | | |
| --- | 0.0135 | 4 | | |
| --- | 0.0097 | 4 | | |
| --- | 0.0069 | 4 | | |
| --- | 0.0048 | 3 | | |
| --- | 0.0034 | 3 | | |
| --- | 0.0014 | 2 | | |
| | | | | |

**Coefficients**

$D_{85}$ = 0.3537 mm  $D_{30}$ = 0.1711 mm
$D_{60}$ = 0.2514 mm  $D_{15}$ = 0.1237 mm
$D_{50}$ = 0.2211 mm  $D_{10}$ = 0.0901 mm
$C_u$ = 2.790  $C_c$ = 1.292

**Classification**

ASTM N/A

AASHTO Fine Sand (A-3 (1))

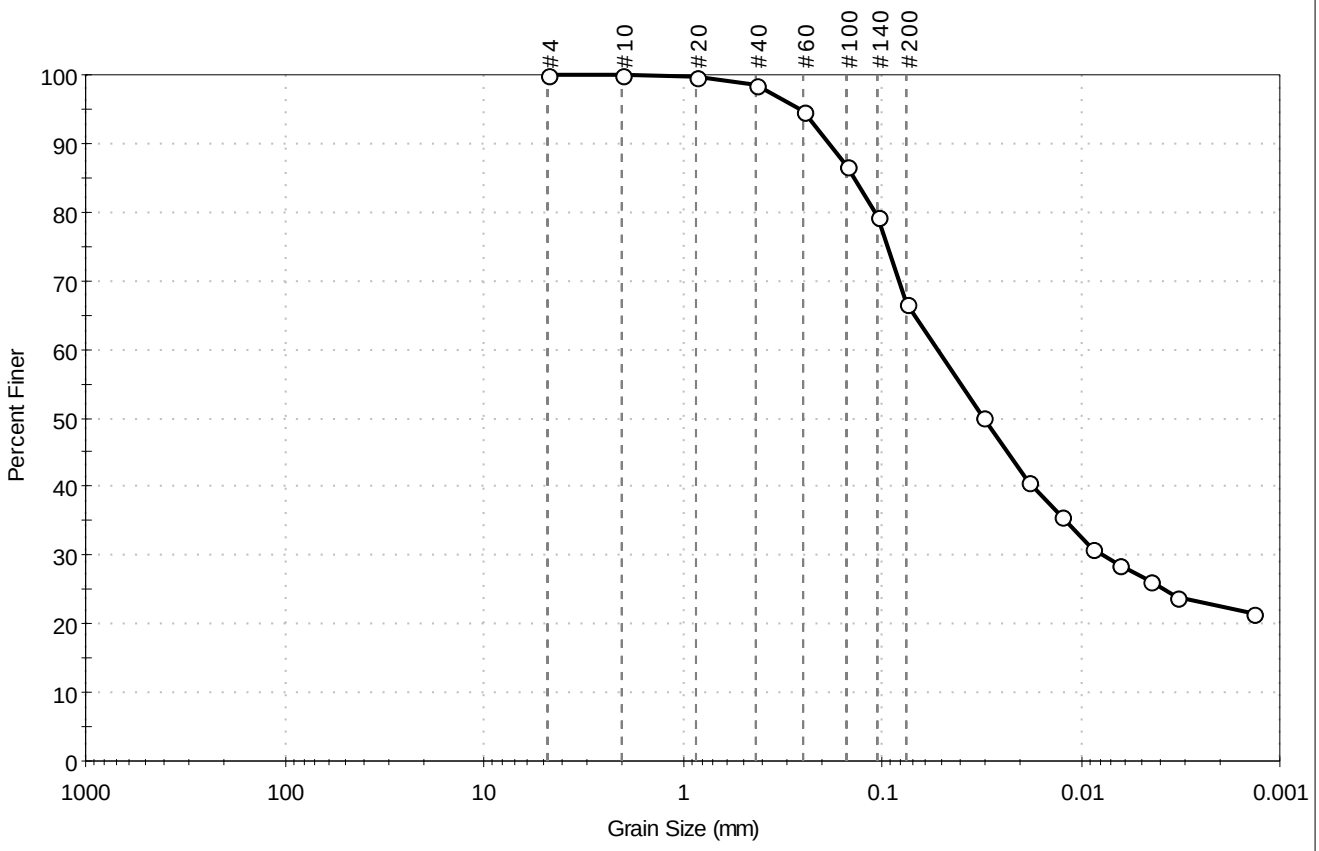
**Sample / Test Description**

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 3/15/2019 2:14:38 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB038 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0891 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 13-15 ft | Test Id: | 486511 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 0.0 | 33.4 | 66.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 99 | | |
| #60 | 0.25 | 95 | | |
| #100 | 0.15 | 87 | | |
| #140 | 0.11 | 79 | | |
| #200 | 0.075 | 67 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0308 | 50 | | |
| --- | 0.0183 | 41 | | |
| --- | 0.0127 | 36 | | |
| --- | 0.0087 | 31 | | |
| --- | 0.0065 | 29 | | |
| --- | 0.0045 | 26 | | |
| --- | 0.0033 | 24 | | |
| --- | 0.0014 | 21 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.1376 mm | $D_{30}$ = 0.0077 mm |
| $D_{60}$ = 0.0526 mm | $D_{15}$ = N/A |
| $D_{50}$ = 0.0306 mm | $D_{10}$ = N/A |
| $C_u$ = N/A | $C_c$ = N/A |

**Classification**

ASTM Sandy Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (10))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

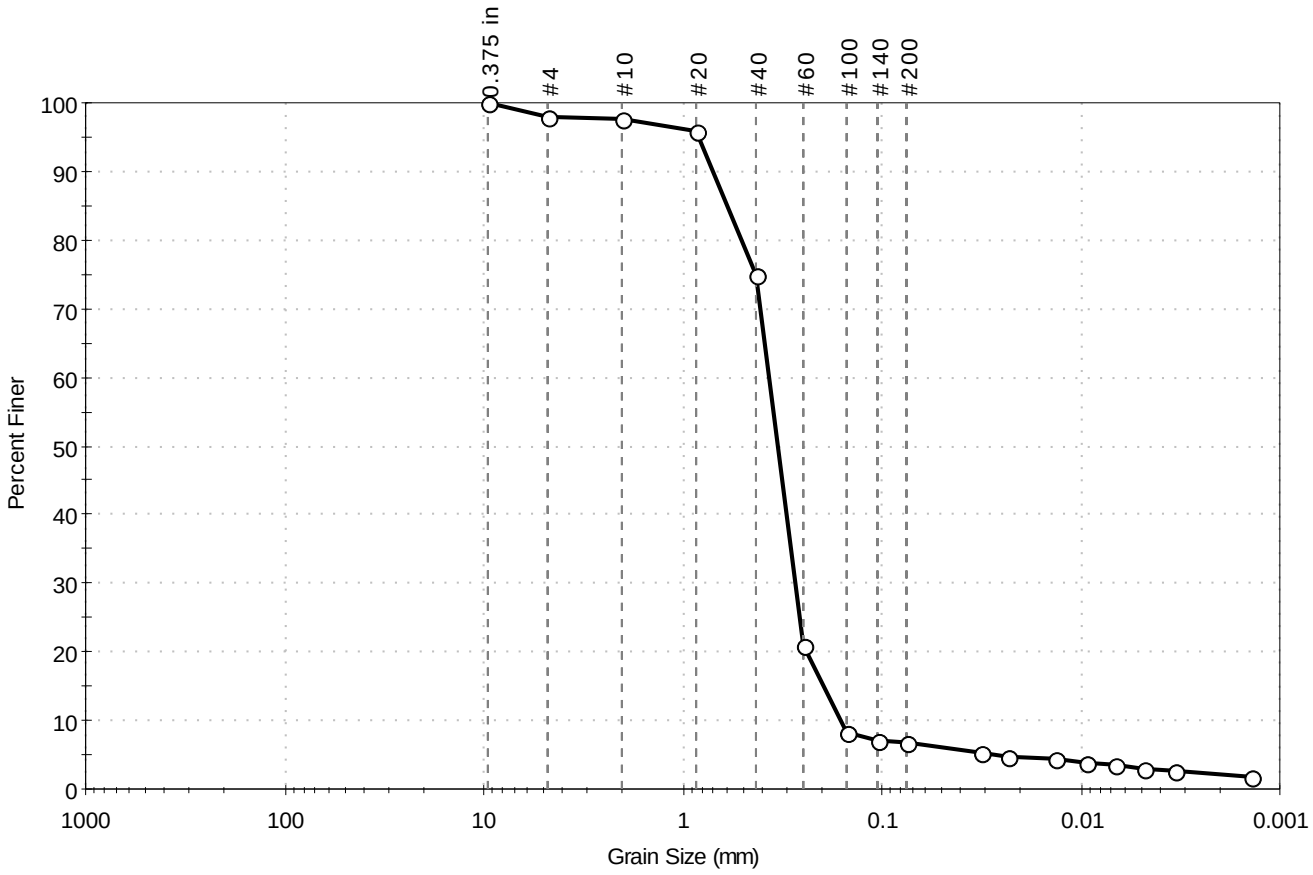
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 12:44:25 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB038 | Sample Type: | bag | Tested By: | ckg |
| Sample ID: | SL0893 | Test Date: | 02/25/19 | Checked By: | bfs |
| Depth : | 24-26 ft | Test Id: | 486512 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark brown sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Particle Size Analysis - ASTM D6913/D7928




| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| --- | 2.0 | 91.4 | 6.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 98 | | |
| #10 | 2.00 | 98 | | |
| #20 | 0.85 | 96 | | |
| #40 | 0.42 | 75 | | |
| #60 | 0.25 | 21 | | |
| #100 | 0.15 | 8 | | |
| #140 | 0.11 | 7 | | |
| #200 | 0.075 | 6.6 | | |
| Hydrometer | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| --- | 0.0315 | 5 | | |
| --- | 0.0231 | 5 | | |
| --- | 0.0133 | 4 | | |
| --- | 0.0095 | 4 | | |
| --- | 0.0067 | 4 | | |
| --- | 0.0048 | 3 | | |
| --- | 0.0034 | 3 | | |
| --- | 0.0014 | 2 | | |
| | | | | |

**Coefficients**

| | |
|---|---|
| $D_{85}$ = 0.5909 mm | $D_{30}$ = 0.2732 mm |
| $D_{60}$ = 0.3667 mm | $D_{15}$ = 0.1962 mm |
| $D_{50}$ = 0.3324 mm | $D_{10}$ = 0.1603 mm |
| $C_u$ = 2.288 | $C_c$ = 1.270 |

**Classification**

ASTM Poorly graded SAND with Silt (SP-SM)

AASHTO Fine Sand (A-3 (1))

**Sample / Test Description**

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

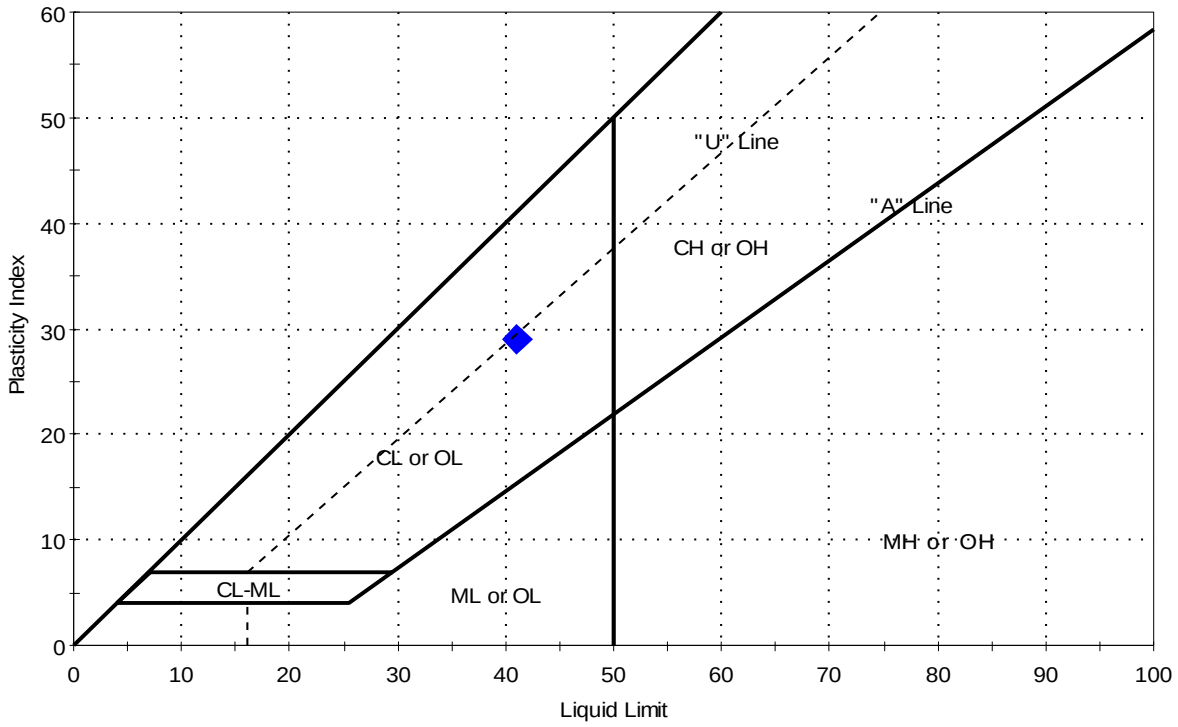
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 3/15/2019 2:15:33 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB018 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0866 | Test Date: | 03/06/19 | Checked By: | bfs |
| Depth : | 18-20 ft | Test Id: | 486384 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, mottled light yellowish brown and gray clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0866 | SJGB018 | 18-20 ft | 18 | 41 | 12 | 29 | 0.2 | Lean CLAY (CL) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:15 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB018 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0870 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 40-42 ft | Test Id: | 486385 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

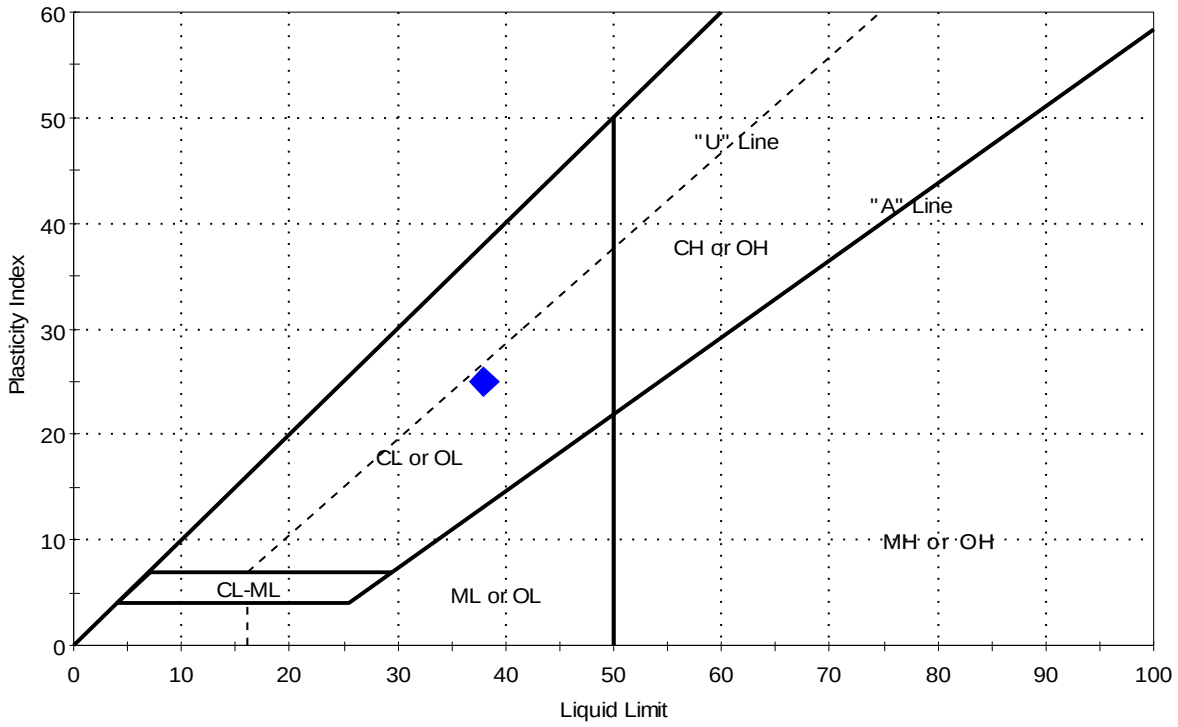
| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0870 | SJGB018 | 40-42 ft | 19 | n/a | n/a | n/a | n/a | Silty SAND (SM) |

1% Retained on #40 Sieve
Dry Strength: LOW
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:15 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB019 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0851 | Test Date: | 03/01/19 | Checked By: | bfs |
| Depth : | 20-22' | Test Id: | 485095 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light yellowish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



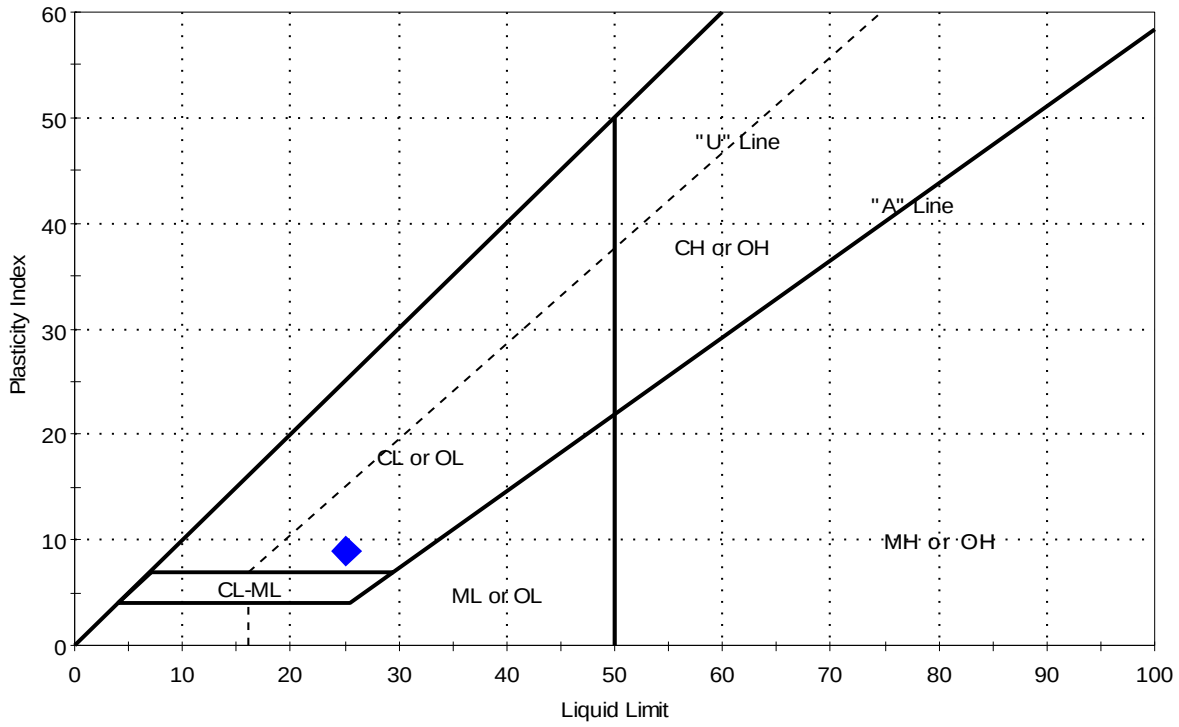

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0851 | SJGB019 | 20-22' | 21 | 38 | 13 | 25 | 0.3 | Lean CLAY (CL) |

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:16 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB019 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0854 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 35-37' | Test Id: | 485096 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, brownish yellow clayey sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



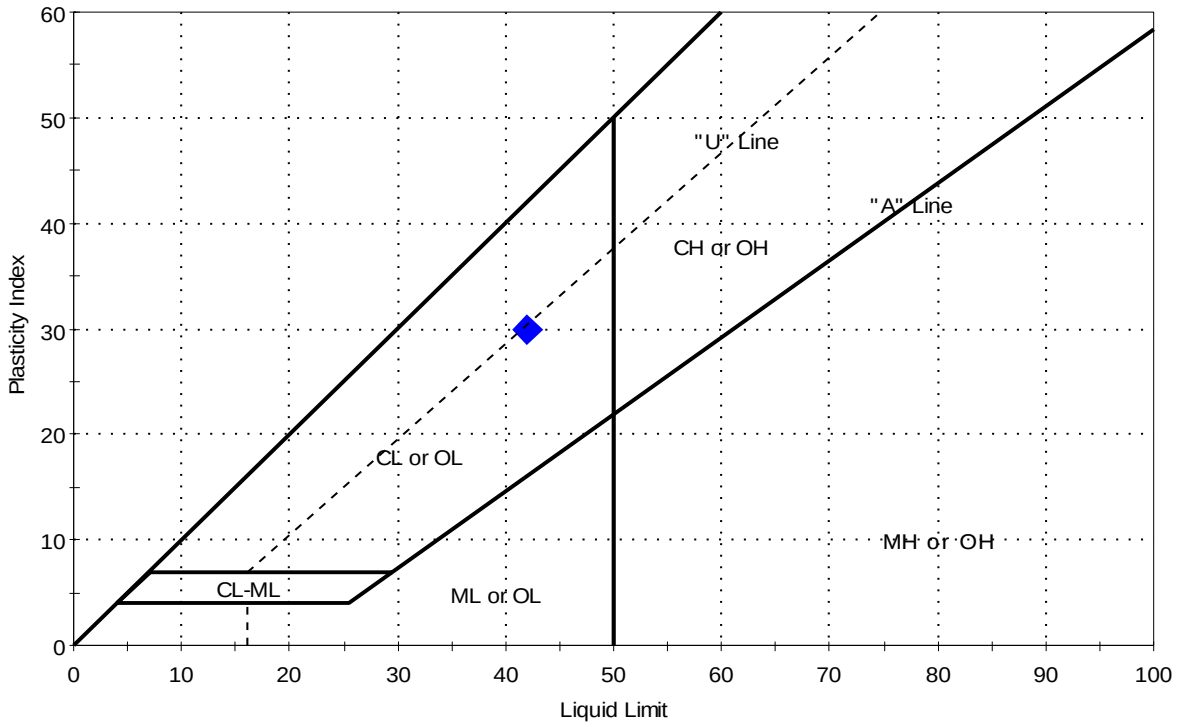

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0854 | SJGB019 | 35-37' | 22 | 25 | 16 | 9 | 0.7 | Clayey SAND (SC) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:16 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB020 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0840 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 30-32' | Test Id: | 485093 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light yellowish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0840 | SJGB020 | 30-32' | 22 | 42 | 12 | 30 | 0.3 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

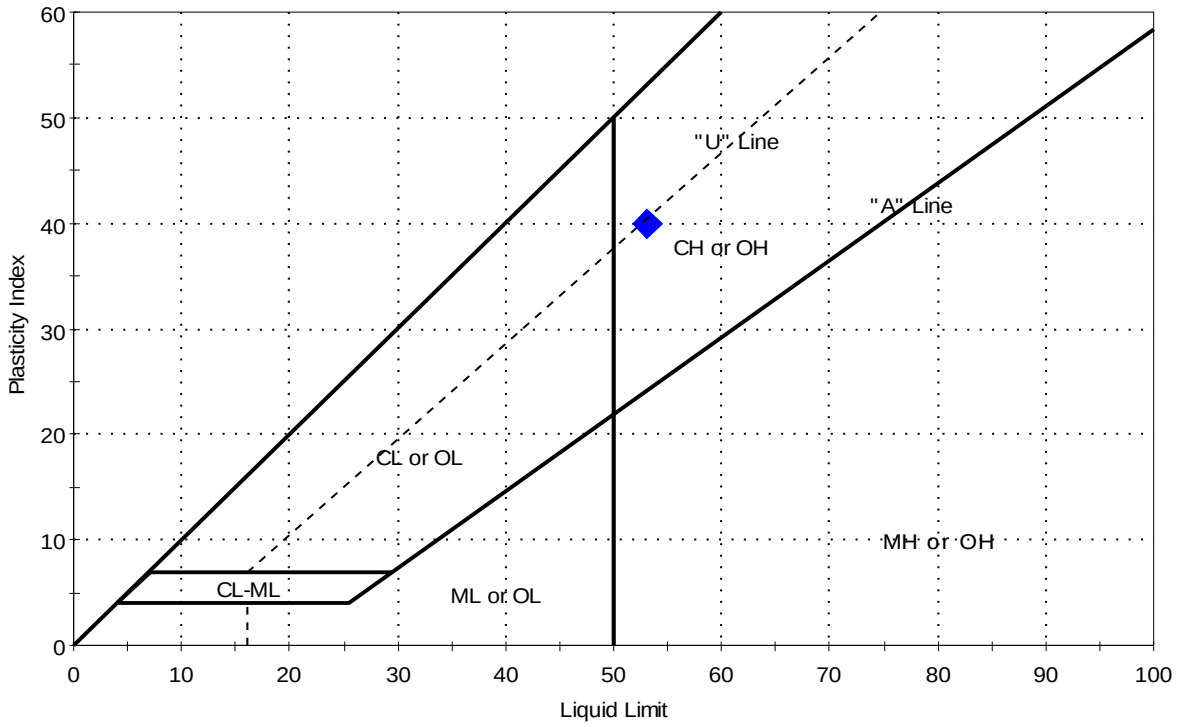
Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:17 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB020 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0846 | Test Date: | 03/06/19 | Checked By: | bfs |
| Depth : | 60-62' | Test Id: | 485094 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



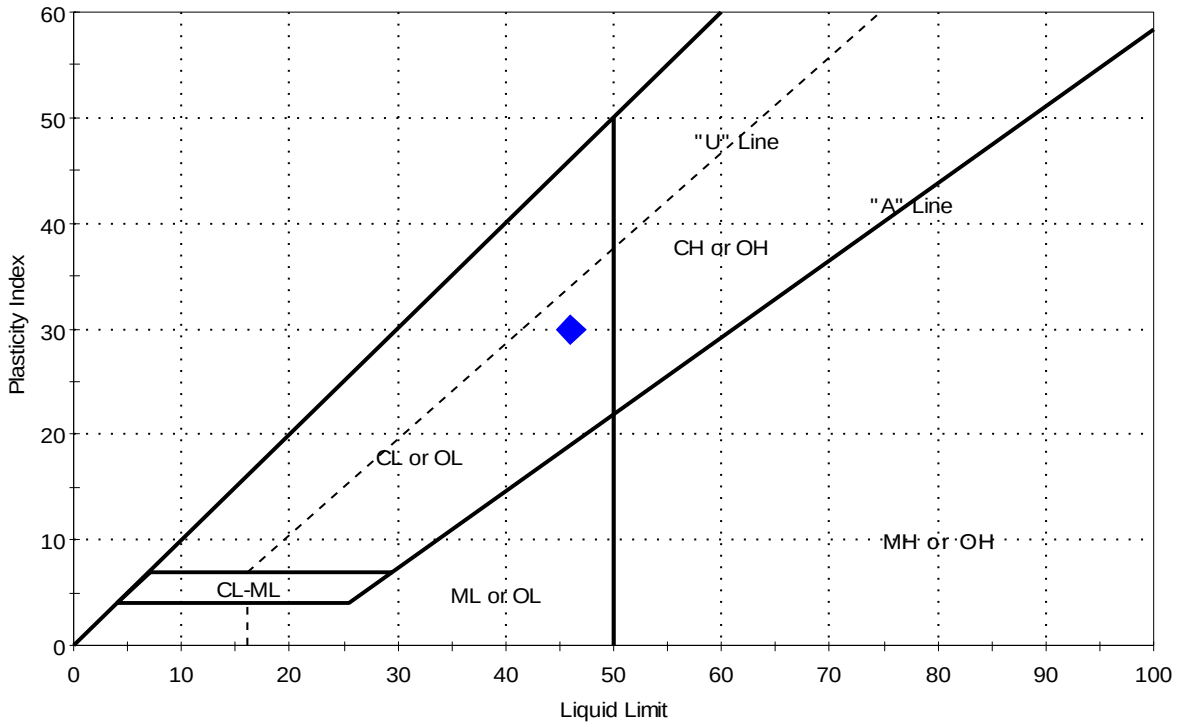

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0846 | SJGB020 | 60-62' | 27 | 53 | 13 | 40 | 0.3 | Fat CLAY (CH) |

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:17 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB021 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0823 | Test Date: | 02/28/19 | Checked By: | bfs |
| Depth : | 6'-8' | Test Id: | 485153 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Wet, dark brown clay with sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0823 | SJGB021 | 6'-8' | 51 | 46 | 16 | 30 | 1.2 | Lean CLAY with Sand (CL) |

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:18 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB021 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0830 | Test Date: | 02/27/19 | Checked By: | bfs |
| Depth : | 44'-46' | Test Id: | 485154 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray sandy silt | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

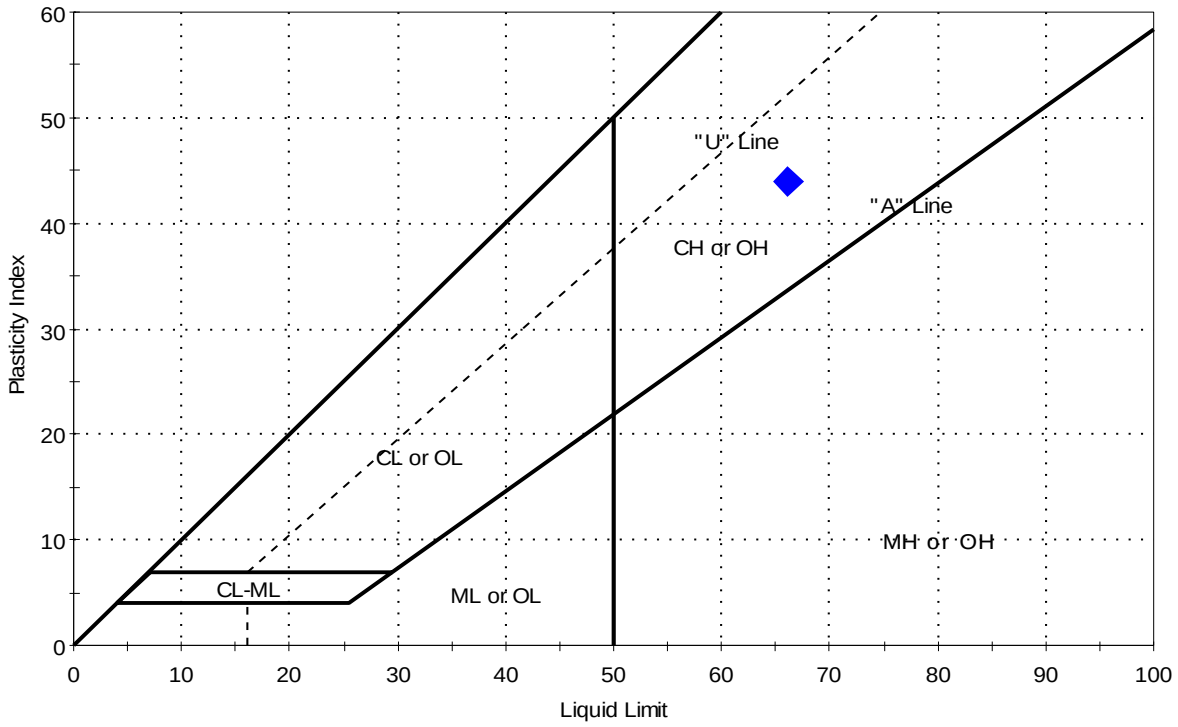
| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0830 | SJGB021 | 44'-46' | 20 | n/a | n/a | n/a | n/a | Sandy SILT (ML) |

0% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:18 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB022 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0818 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 35'-37' | Test Id: | 485151 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, reddish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0818 | SJGB022 | 35'-37' | 24 | 66 | 22 | 44 | 0 | Fat CLAY (CH) |

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: MEDIUM

printed 3/15/2019 12:35:19 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB022 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0820 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 45'-47' | Test Id: | 485152 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0820 | SJGB022 | 45'-47' | 22 | n/a | n/a | n/a | n/a | Silty SAND (SM) |

1% Retained on #40 Sieve
Dry Strength: LOW
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:20 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB023G09 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0881 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 23-25 ft | Test Id: | 486381 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0881 | JGB023G0 | 23-25 ft | 16 | n/a | n/a | n/a | n/a | Poorly graded SAND with Silt (SP-SM) |

11% Retained on #40 Sieve

Dry Strength: MEDIUM

Dilatancy: RAPID

Toughness: n/a

The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:20 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJGB023G16B | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0889 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 59.3-60 ft | Test Id: | 486383 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light brownish gray silty sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

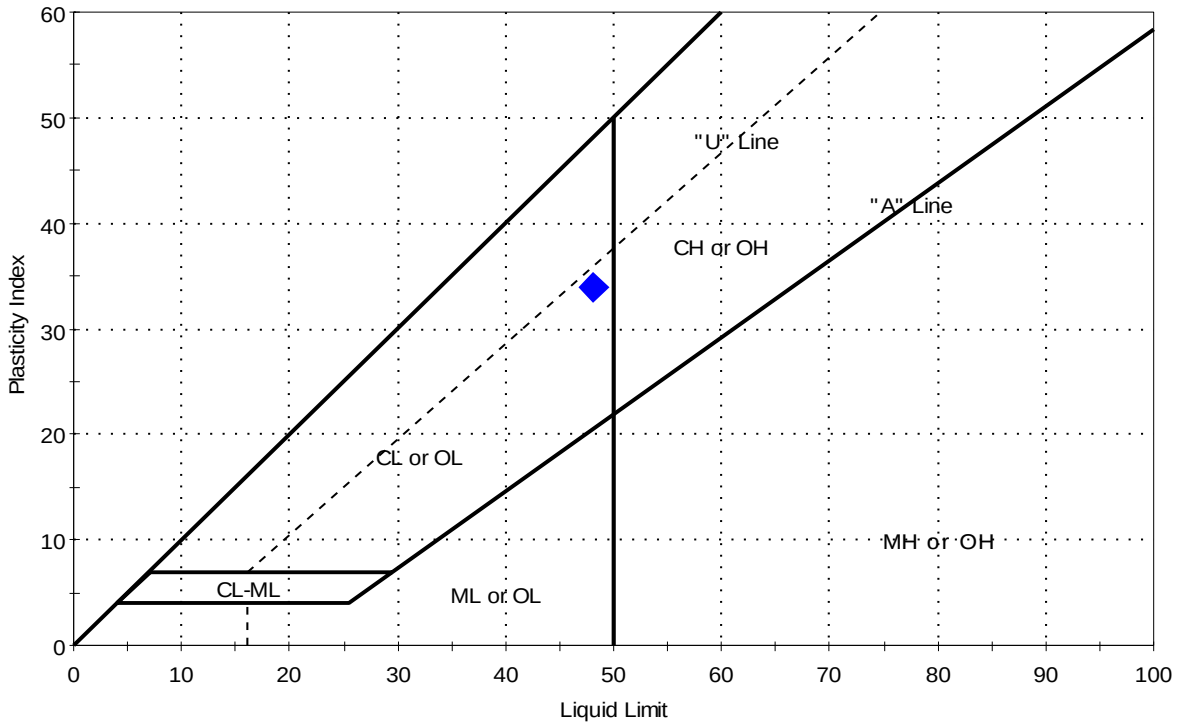
| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0889 | GB023G1 | 59.3-60 ft | 17 | n/a | n/a | n/a | n/a | Silty SAND (SM) |

1% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:21 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB008-E1 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1026 | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | 2-4 ft | Test Id: | 482735 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark yellowish brown clay with sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



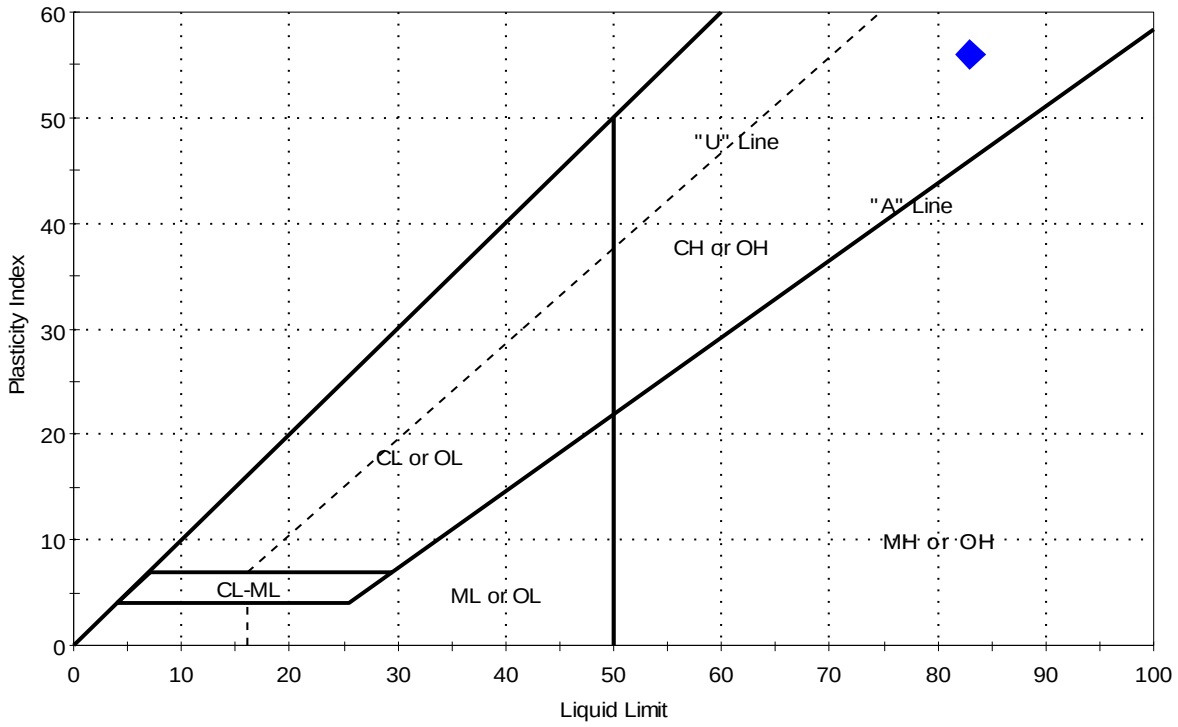

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1026 | JSB008-E | 2-4 ft | 26 | 48 | 14 | 34 | 0.3 | Lean CLAY with Sand (CL) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:21 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB008-E1 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1029 | Test Date: | 12/28/18 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482736 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1029 | JSB008-E | 8-10 ft | 64 | 83 | 27 | 56 | 0.7 | |

Sample Prepared using the WET method

Dry Strength: HIGH

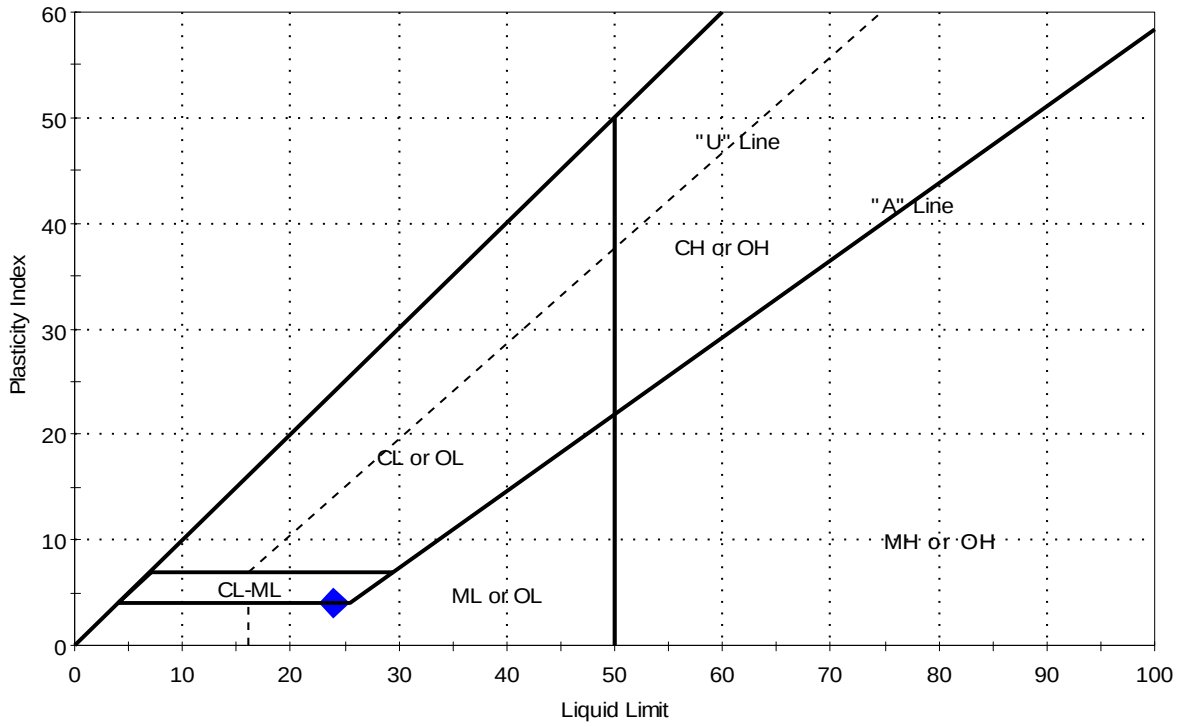
Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:22 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB012-W1 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1050 | Test Date: | 01/05/19 | Checked By: | emm |
| Depth : | 15-17 ft | Test Id: | 482979 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown silty, clayey sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1050 | JSB012-W | 15-17 ft | 24 | 24 | 20 | 4 | 1 | Silty, Clayey SAND (SC-SM) |

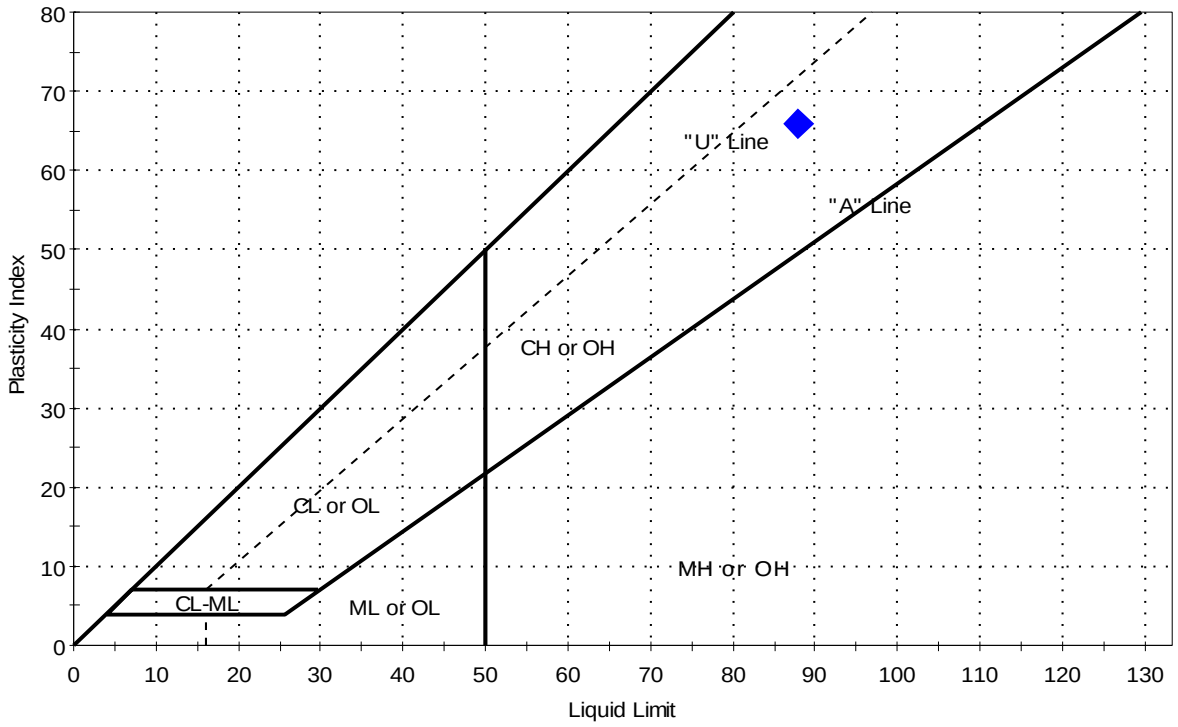
Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: RAPID
Toughness: LOW

printed 3/15/2019 12:35:22 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB019-E1 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1004 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482731 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Plasticity Chart**



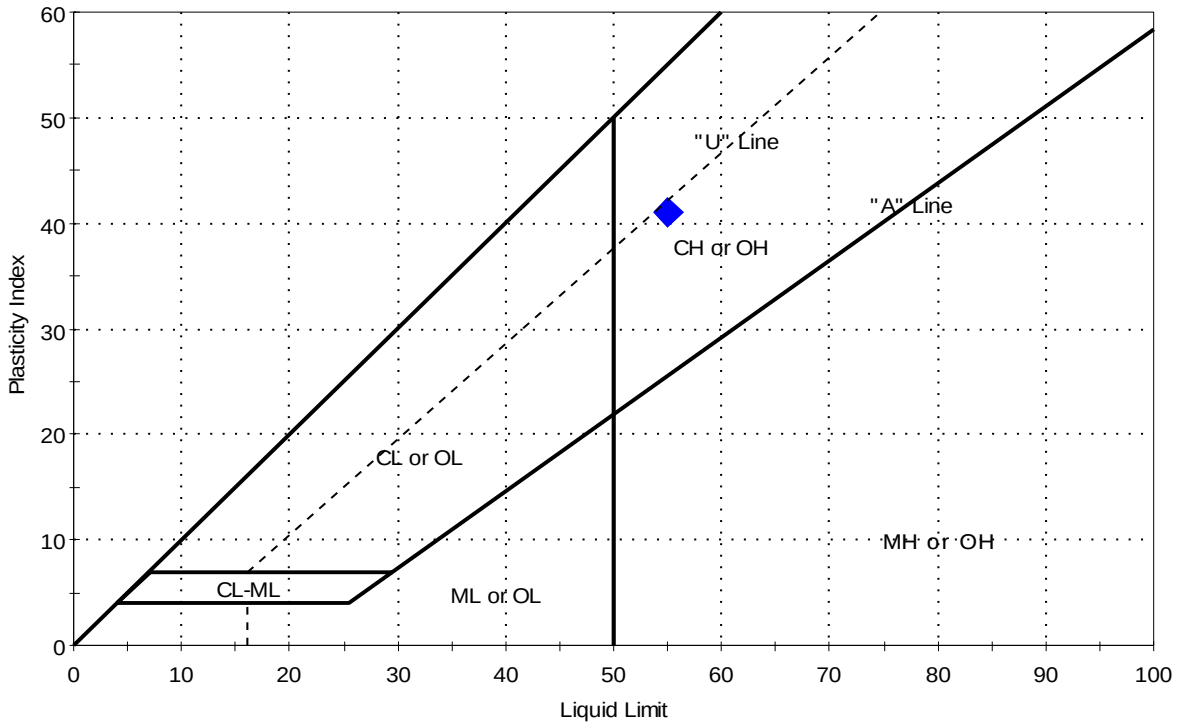

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1004 | JSB019-E | 8-10 ft | 47 | 88 | 22 | 66 | 0.4 | Fat CLAY (CH) |

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: MEDIUM

printed 3/15/2019 12:35:23 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB019-E1 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1008 | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | 19-21 ft | Test Id: | 482732 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1008 | JSB019-E | 19-21 ft | 30 | 55 | 14 | 41 | 0.4 | |

Sample Prepared using the WET method

Dry Strength: HIGH

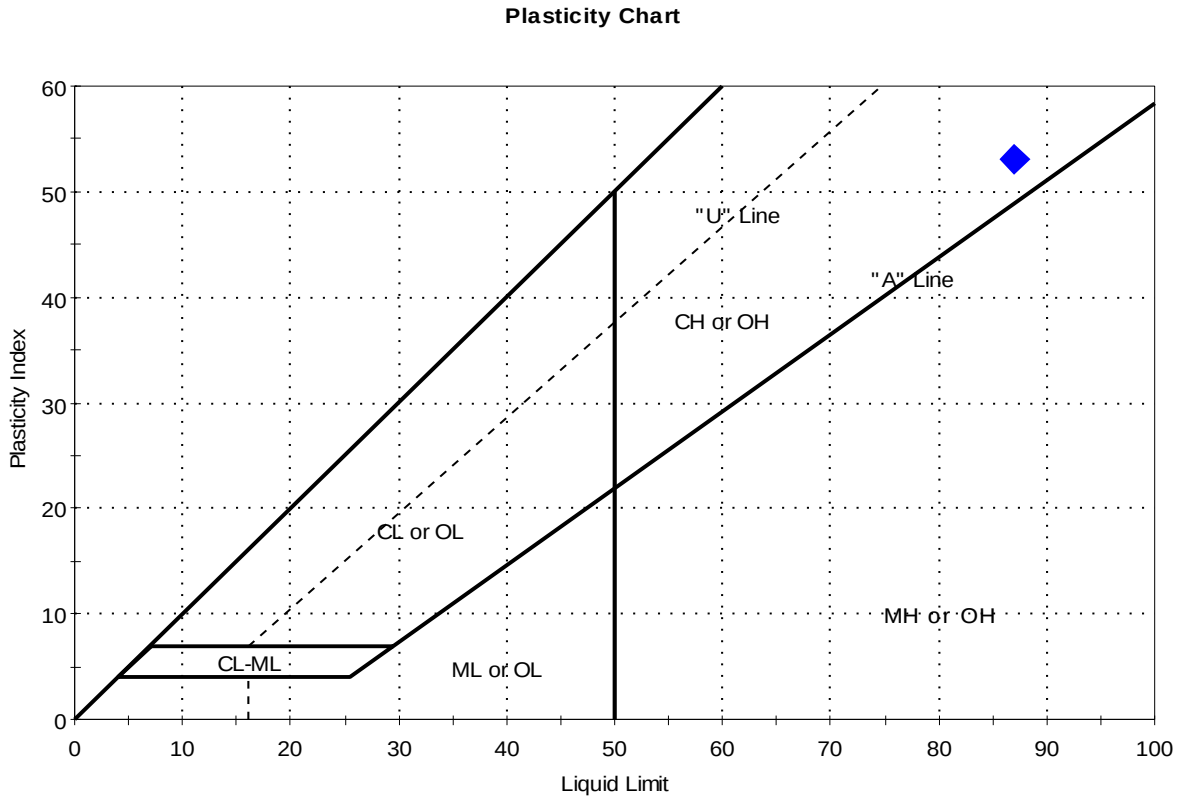
Dilatancy: SLOW

Toughness: MEDIUM

printed 3/15/2019 12:35:23 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB023-E1 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1015 | Test Date: | 12/19/18 | Checked By: | emm |
| Depth : | 4-6 ft | Test Id: | 482733 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1015 | JSB023-E | 4-6 ft | 70 | 87 | 34 | 53 | 0.7 | |

Sample Prepared using the WET method

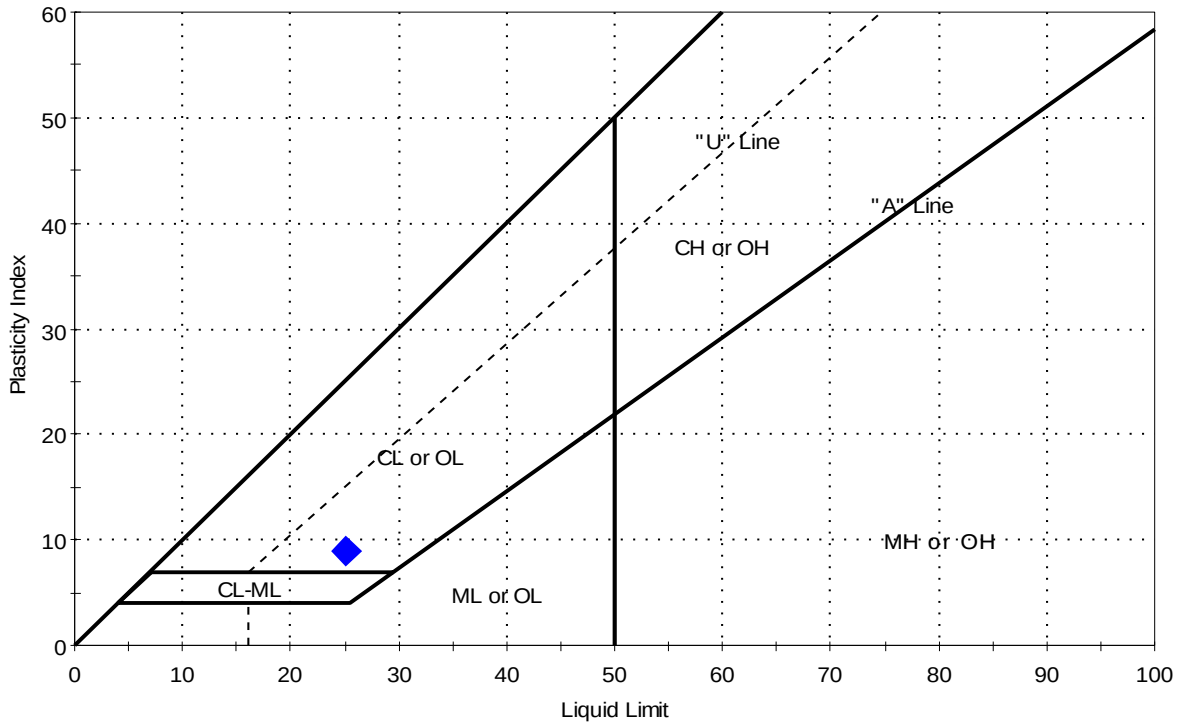
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB023-E1 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1022 | Test Date: | 12/19/18 | Checked By: | emm |
| Depth : | 24-26 ft | Test Id: | 482734 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown clayey sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



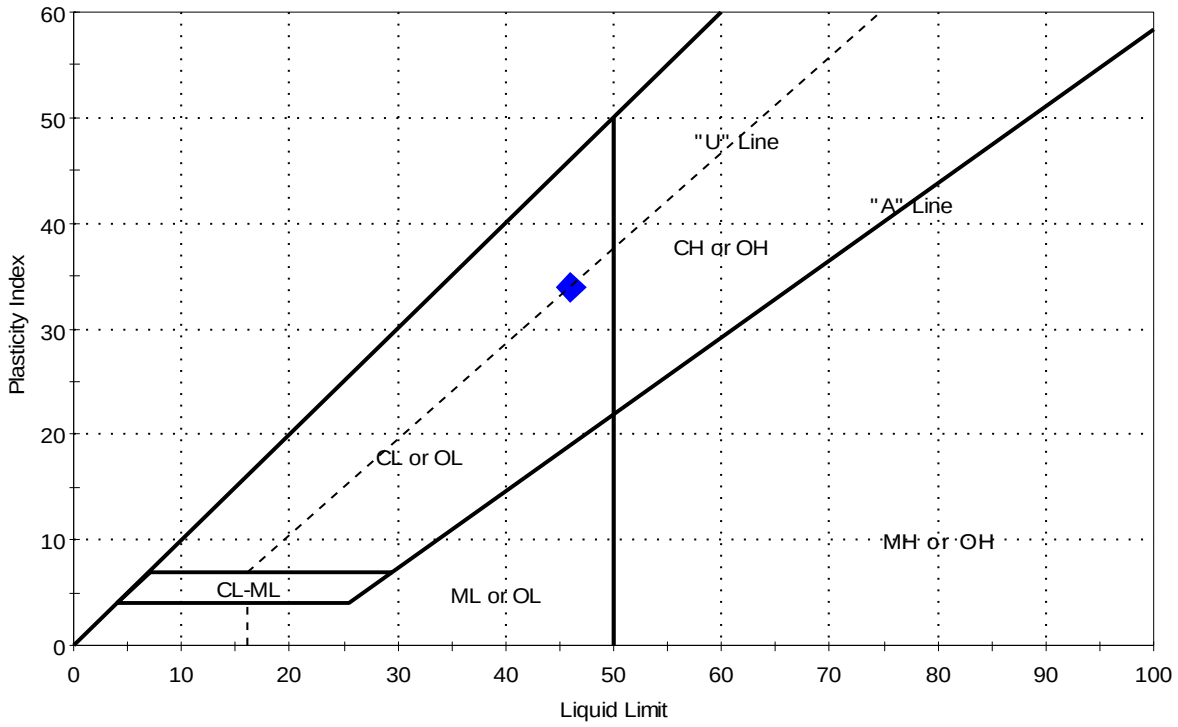

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1022 | JSB023-E | 24-26 ft | 28 | 25 | 16 | 9 | 1.4 | Clayey SAND (SC) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: RAPID
Toughness: LOW

printed 3/15/2019 12:35:24 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB025-1W | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1040 | Test Date: | 12/19/18 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482737 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



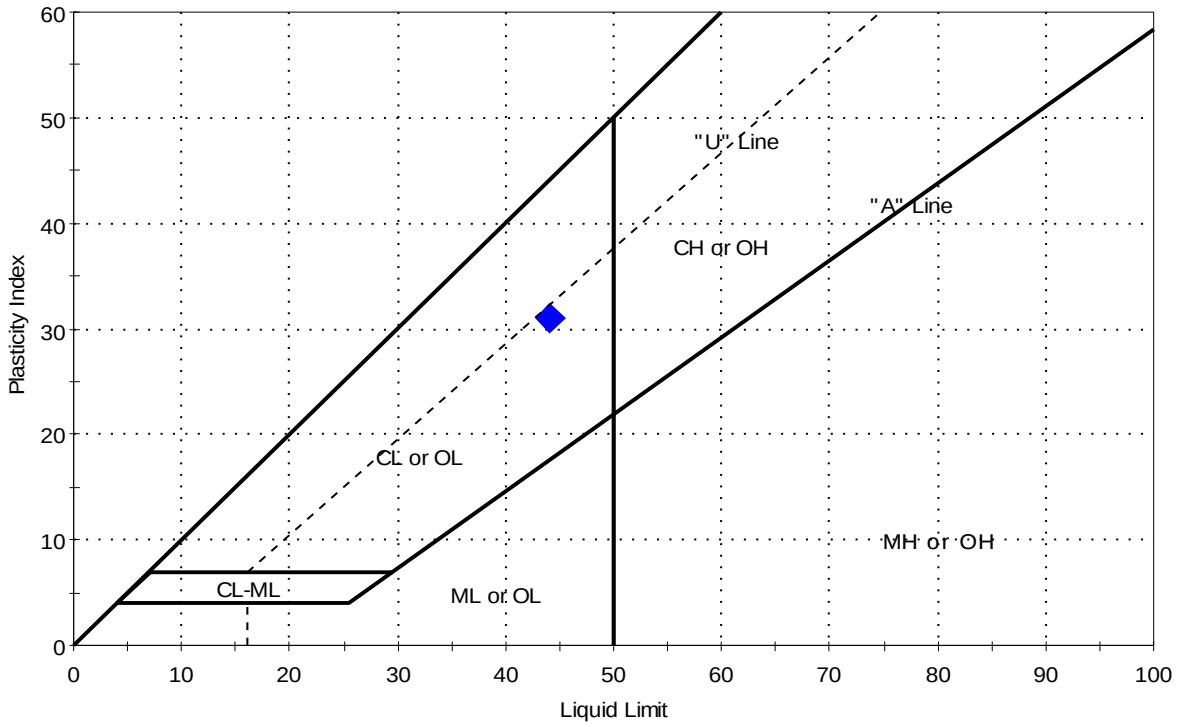

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1040 | JSB025-1 | 8-10 ft | 35 | 46 | 12 | 34 | 0.7 | Sandy Lean CLAY (CL) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: MEDIUM

printed 3/15/2019 12:35:25 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB025-1W | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL1043 | Test Date: | 12/10/18 | Checked By: | emm |
| Depth : | 19-21 ft | Test Id: | 482738 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, gray clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL1043 | JSB025-1 | 19-21 ft | 31 | 44 | 13 | 31 | 0.6 | |

Sample Prepared using the WET method

Dry Strength: HIGH

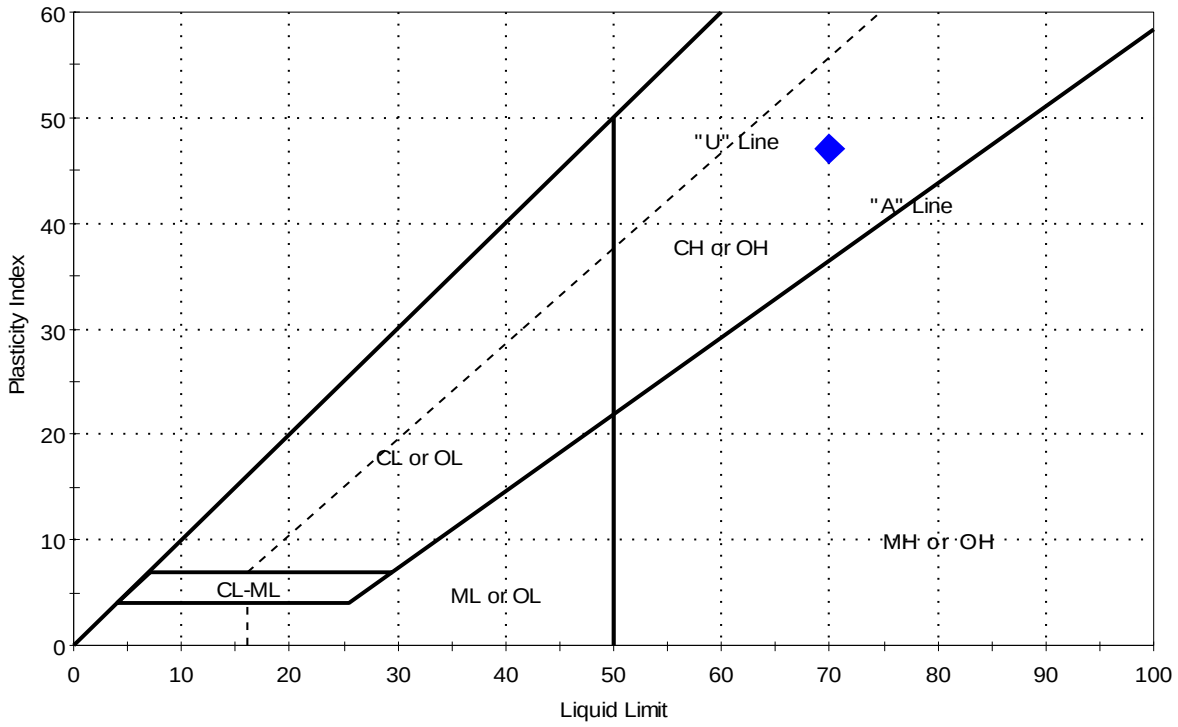
Dilatancy: SLOW

Toughness: MEDIUM

printed 3/15/2019 12:35:25 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB028 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0803 | Test Date: | 03/01/19 | Checked By: | bfs |
| Depth : | 8-10 ft | Test Id: | 483640 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark brown clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318



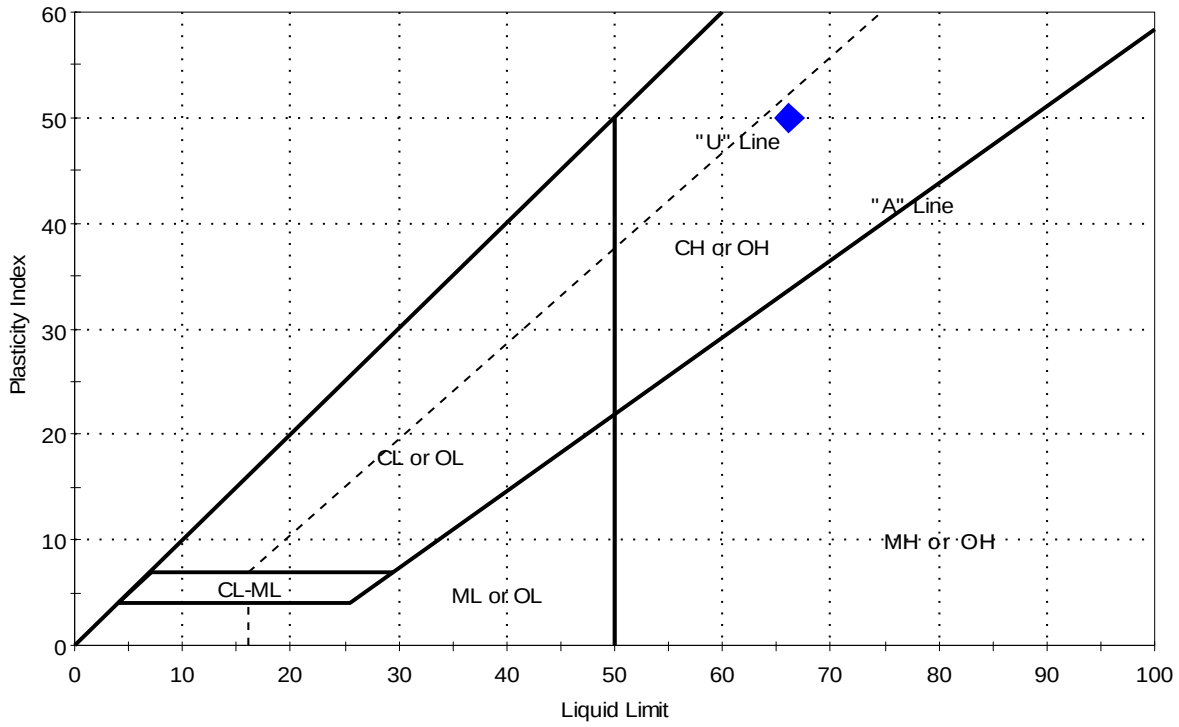

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0803 | SJSB028 | 8-10 ft | 41 | 70 | 23 | 47 | 0.4 | Fat CLAY (CH) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:26 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB028 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0806 | Test Date: | 03/02/19 | Checked By: | bfs |
| Depth : | 25-27 ft | Test Id: | 483641 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark brown clay with sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



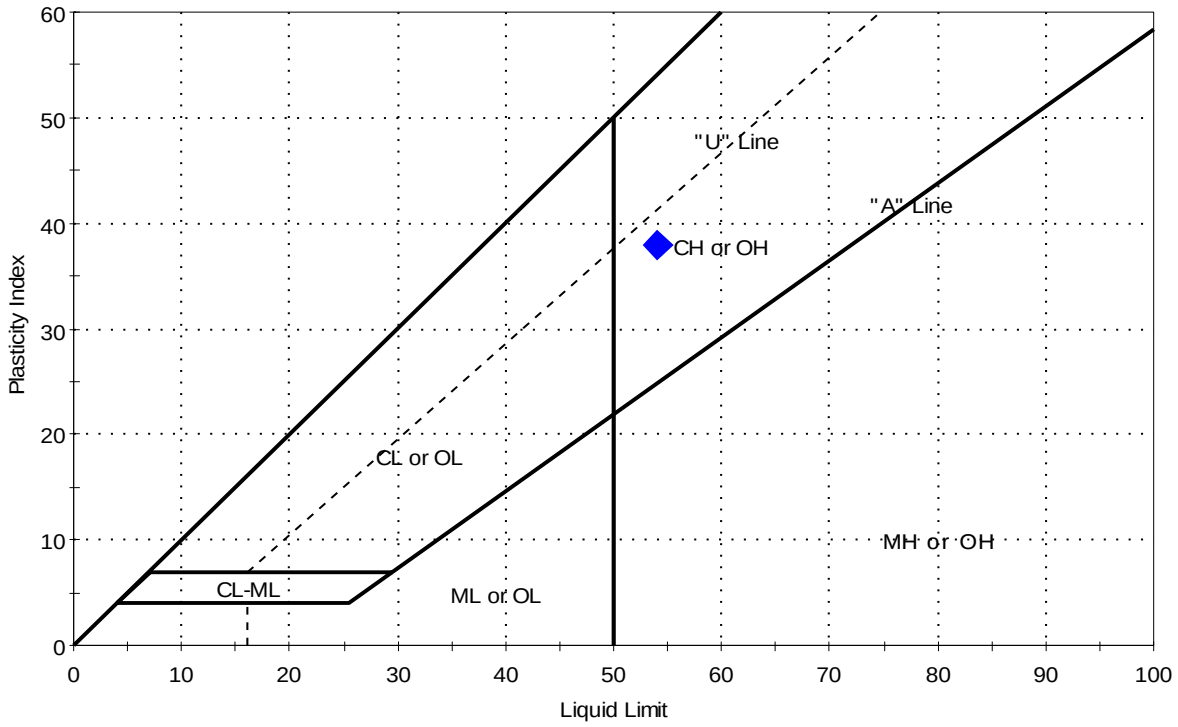

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0806 | SJSB028 | 25-27 ft | 50 | 66 | 16 | 50 | 0.7 | Fat CLAY with Sand (CH) |

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:26 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB029 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0607 | Test Date: | 12/11/18 | Checked By: | emm |
| Depth : | 20-22 ft | Test Id: | 482739 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0607 | SJSB029 | 20-22 ft | 45 | 54 | 16 | 38 | 0.8 | |

Sample Prepared using the WET method

Dry Strength: HIGH

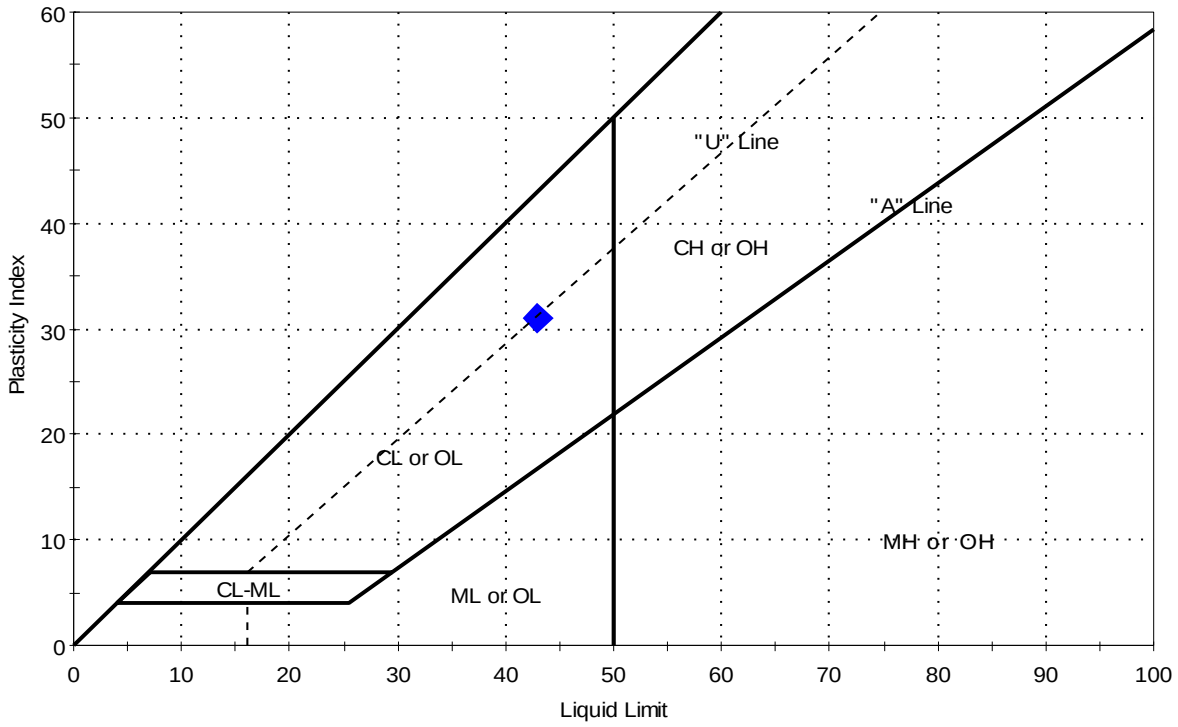
Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:27 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB029 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0611 | Test Date: | 01/02/19 | Checked By: | emm |
| Depth : | 39.5-40 ft | Test Id: | 482740 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, mottled yellowish brown and very dark grayish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0611 | SJSB029 | 39.5-40 ft | 18 | 43 | 12 | 31 | 0.2 | |

Sample Prepared using the WET method

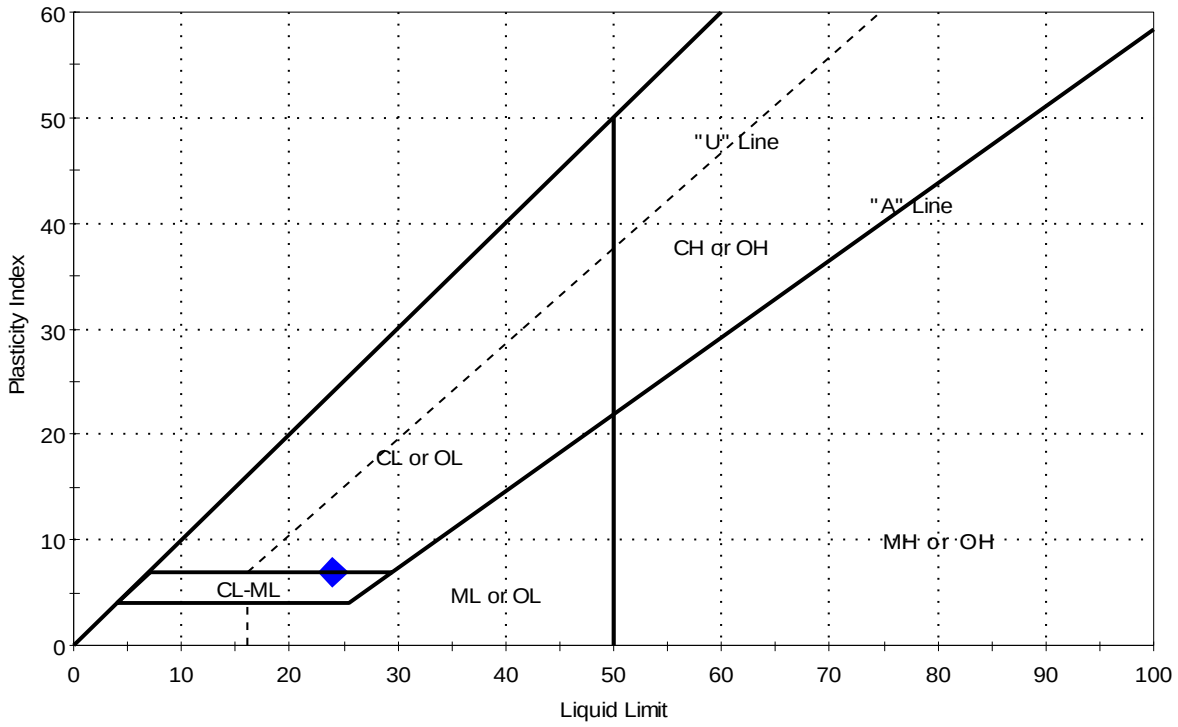
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB030 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0692 | Test Date: | 03/05/19 | Checked By: | bfs |
| Depth : | 8-10 ft | Test Id: | 483638 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark brown silty clay with gravel | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0692 | SJSB030 | 8-10 ft | 21 | 24 | 17 | 7 | 0.6 | |

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:27 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB030 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0696 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 30-32 ft | Test Id: | 483639 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, brownish gray sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0696 | SJSB030 | 30-32 ft | 22 | n/a | n/a | n/a | n/a | Poorly graded SAND with Silt (SP-SM) |

14% Retained on #40 Sieve

Dry Strength: LOW

Dilatancy: RAPID

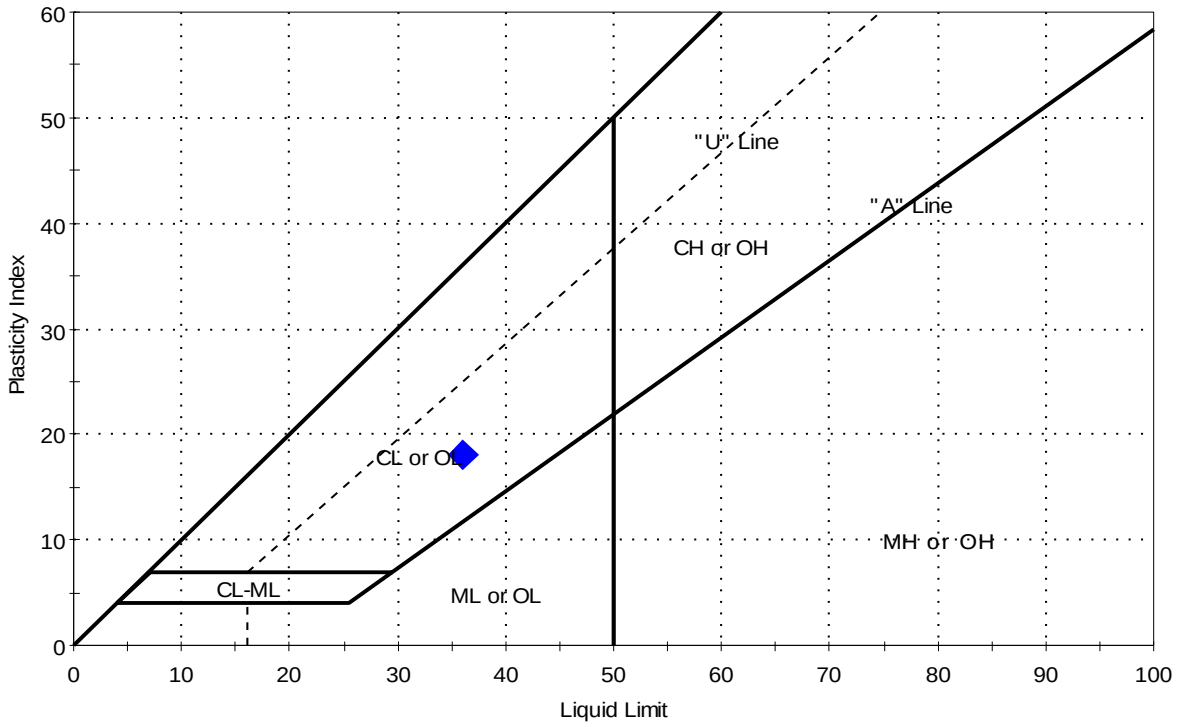
Toughness: n/a

The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:28 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB031 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0617 | Test Date: | 12/11/18 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482741 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown clayey sand | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318



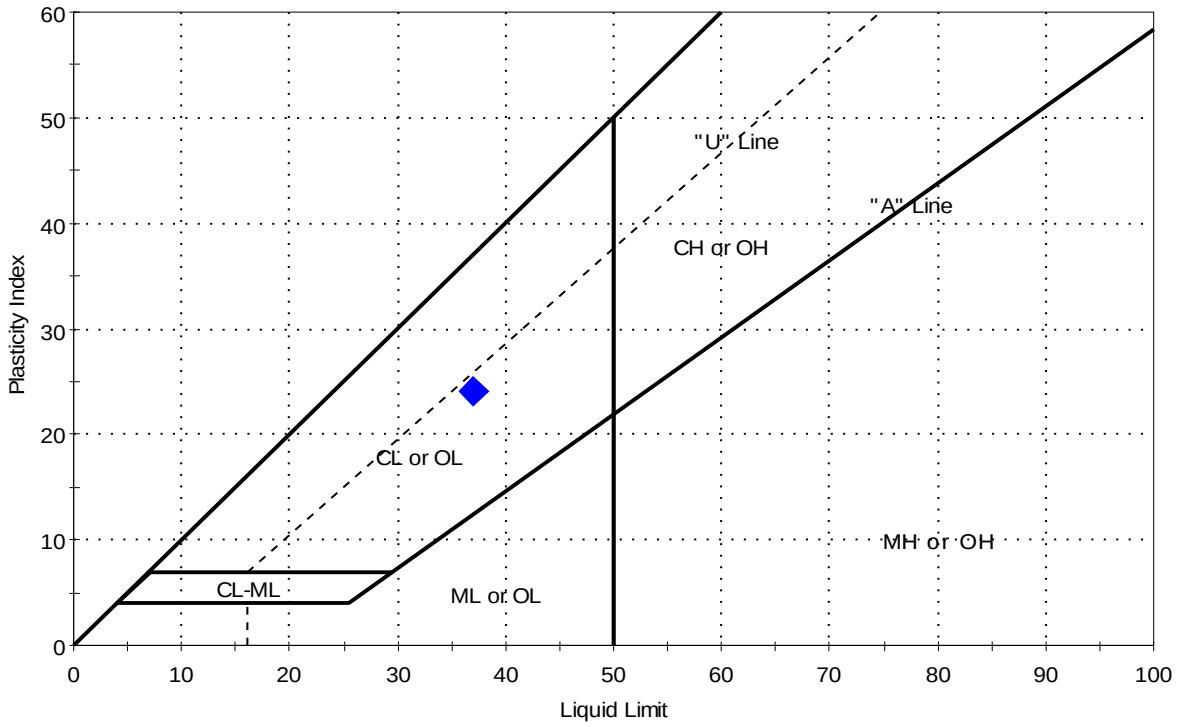

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0617 | SJSB031 | 8-10 ft | 21 | 36 | 18 | 18 | 0.2 | Clayey SAND (SC) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: RAPID
Toughness: LOW

printed 3/15/2019 12:35:28 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB032 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0679 | Test Date: | 02/28/19 | Checked By: | bfs |
| Depth : | 8-10 ft | Test Id: | 483636 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark gray clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0679 | SJSB032 | 8-10 ft | 28 | 37 | 13 | 24 | 0.6 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

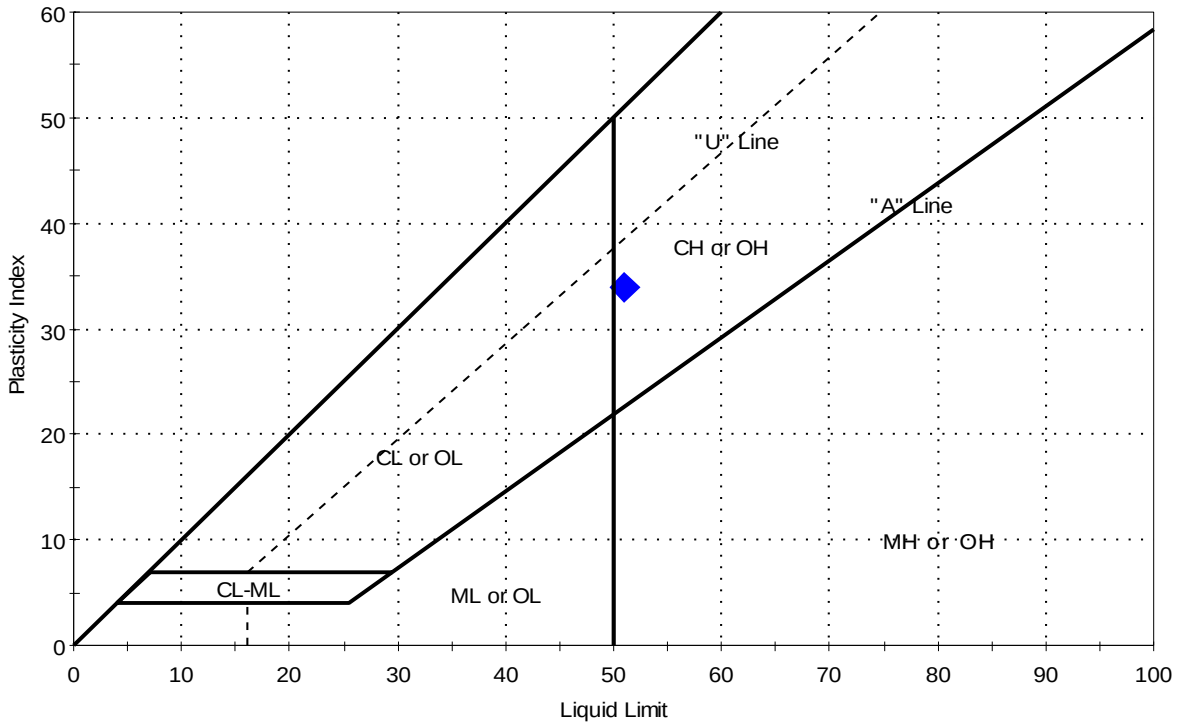
Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:29 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB032 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0685 | Test Date: | 02/28/19 | Checked By: | bfs |
| Depth : | 38-40 ft | Test Id: | 483637 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, yellowish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0685 | SJSB032 | 38-40 ft | 22 | 51 | 17 | 34 | 0.1 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

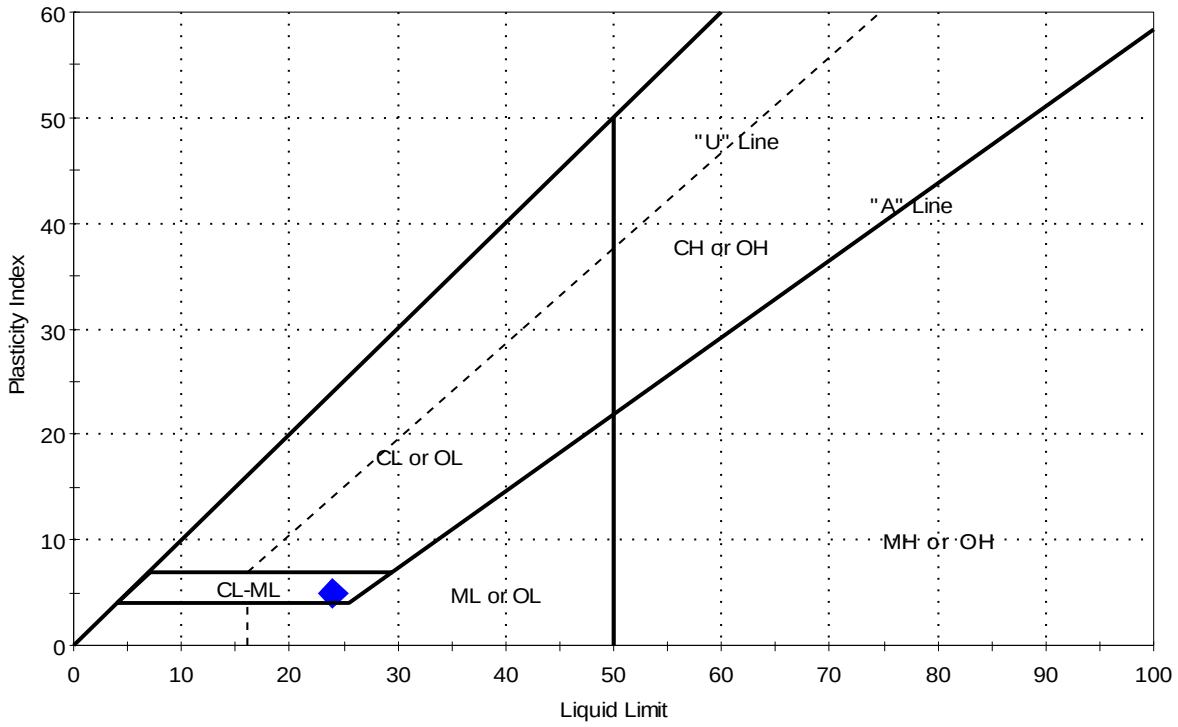
Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:29 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB033 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0643 | Test Date: | 01/05/19 | Checked By: | emm |
| Depth : | 6-8 ft | Test Id: | 482980 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown silty clay with sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0643 | SJSB033 | 6-8 ft | 21 | 24 | 19 | 5 | 0.4 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: RAPID

Toughness: LOW

printed 3/15/2019 12:35:29 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB033 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0645 | Test Date: | 02/26/19 | Checked By: | bfs |
| Depth : | 14-16 ft | Test Id: | 483631 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

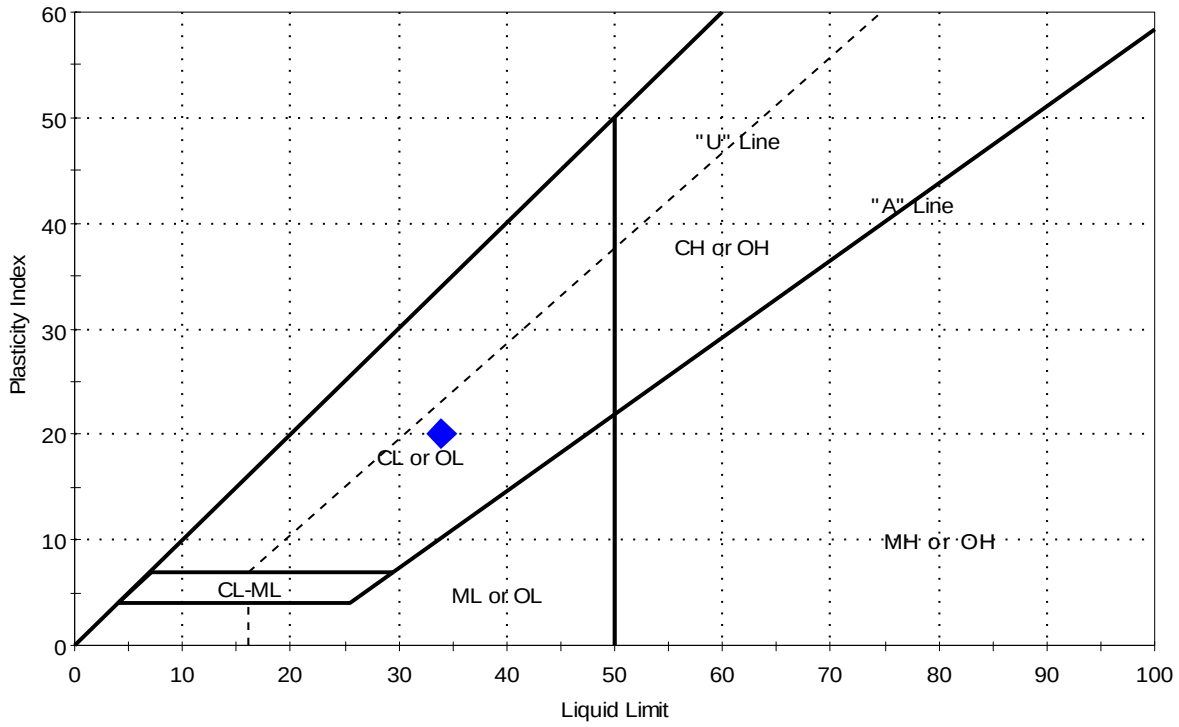
| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0645 | SJSB033 | 14-16 ft | 24 | n/a | n/a | n/a | n/a | Silty SAND (SM) |

1% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:30 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB034 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0631 | Test Date: | 01/07/19 | Checked By: | emm |
| Depth : | 6-8 ft | Test Id: | 482977 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark brown sandy clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0631 | SJSB034 | 6-8 ft | 25 | 34 | 14 | 20 | 0.6 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:30 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB034 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0634 | Test Date: | 01/04/19 | Checked By: | emm |
| Depth : | 14-16 ft | Test Id: | 482978 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, light yellowish brown silty sand | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

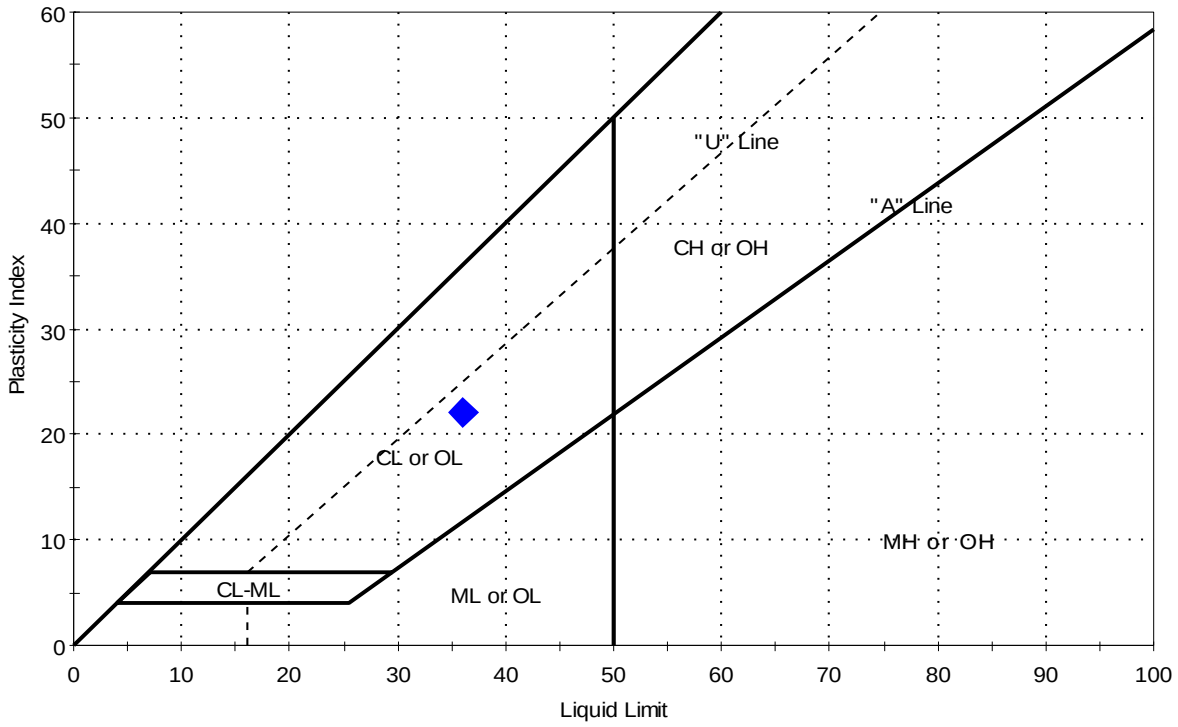
| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0634 | SJSB034 | 14-16 ft | 19 | n/a | n/a | n/a | n/a | Silty SAND (SM) |

1% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:31 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB035 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0641 | Test Date: | 12/28/18 | Checked By: | emm |
| Depth : | 2-4 ft | Test Id: | 482975 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, grayish brown clay | | | | |
| Sample Comment: | Sample contains organics | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0641 | SJSB035 | 2-4 ft | 19 | 36 | 14 | 22 | 0.2 | |

Sample Prepared using the WET method

Dry Strength: HIGH

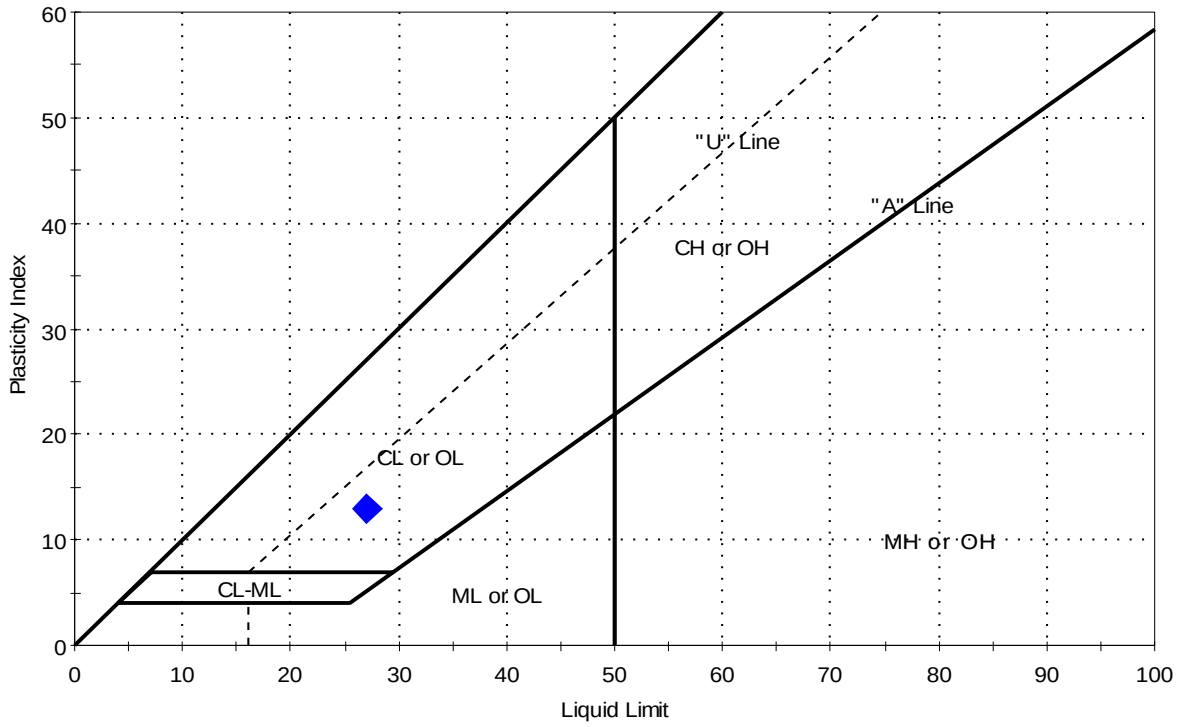
Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:31 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB035 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0644 | Test Date: | 12/11/18 | Checked By: | emm |
| Depth : | 8-10 ft | Test Id: | 482976 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



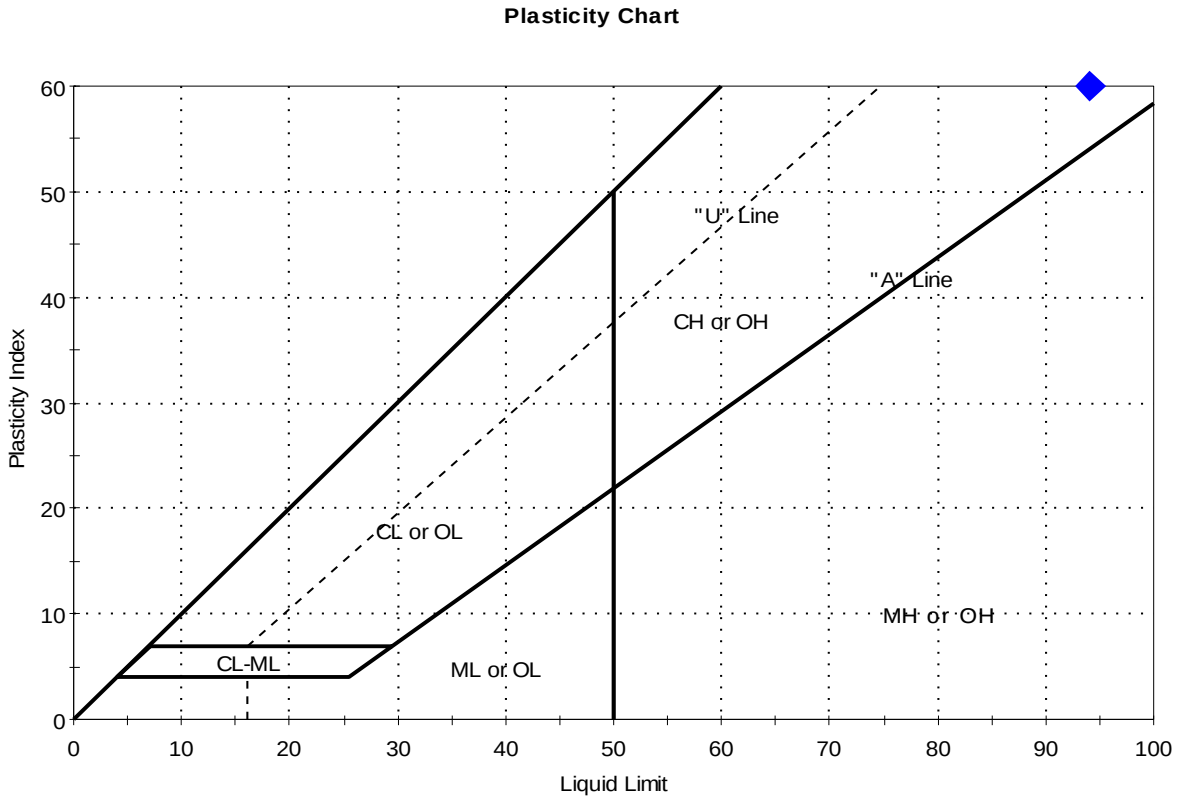

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0644 | SJSB035 | 8-10 ft | 25 | 27 | 14 | 13 | 0.8 | Sandy Lean CLAY (CL) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: RAPID
Toughness: LOW

printed 3/15/2019 12:35:32 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB036 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0665 | Test Date: | 02/28/19 | Checked By: | bfs |
| Depth : | 2.6-4 ft | Test Id: | 483634 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318



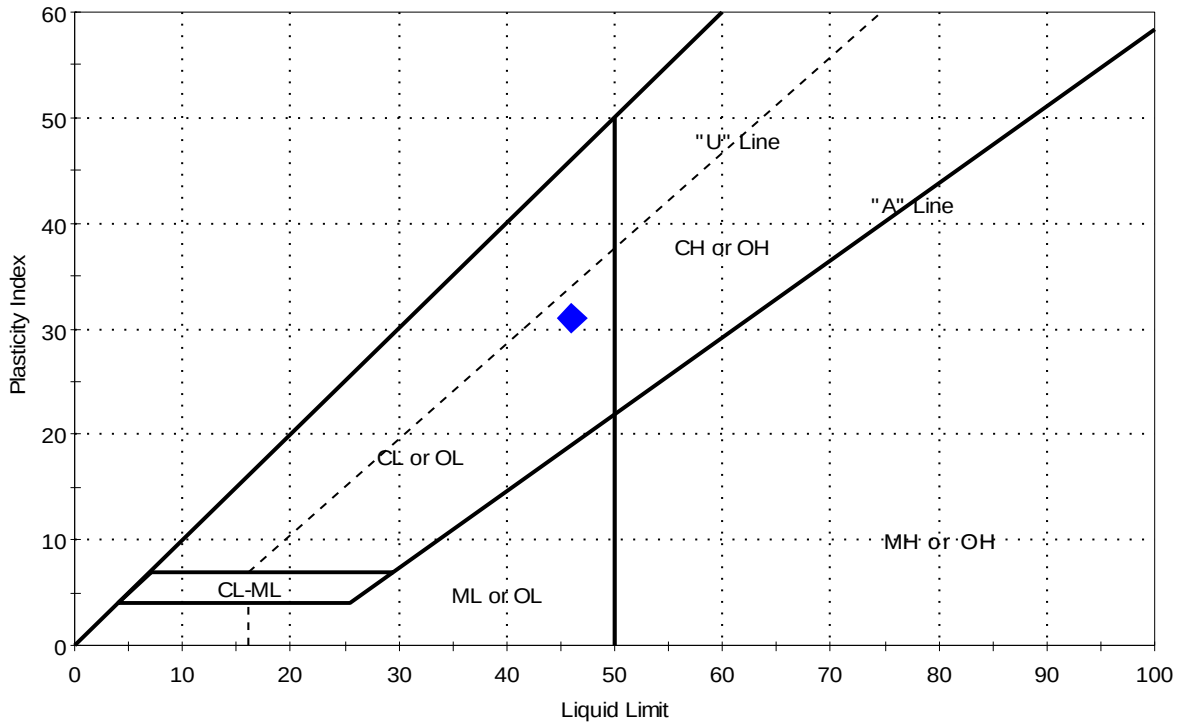

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0665 | SJSB036 | 2.6-4 ft | 77 | 94 | 34 | 60 | 0.7 | Sandy Fat CLAY (CH) |

Sample Prepared using the WET method
17% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:32 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB036 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0667 | Test Date: | 03/01/19 | Checked By: | bfs |
| Depth : | 6-8 ft | Test Id: | 483635 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0667 | SJSB036 | 6-8 ft | 28 | 46 | 15 | 31 | 0.4 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

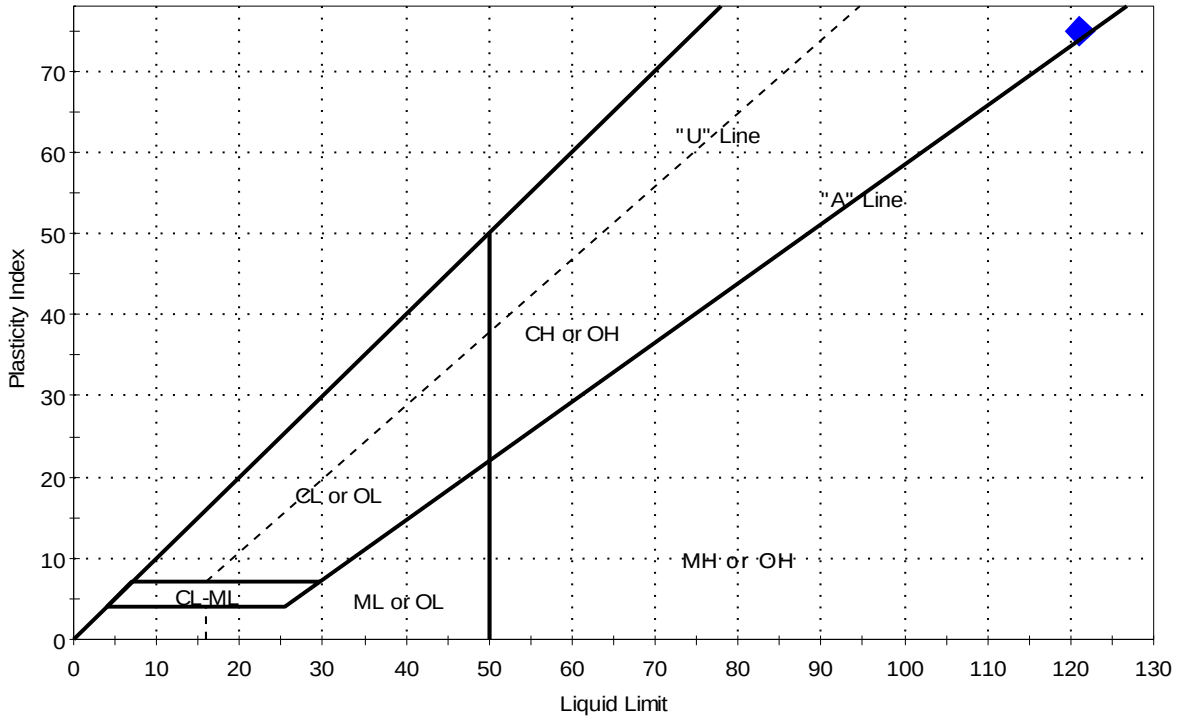
Toughness: LOW

printed 3/15/2019 12:35:33 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB037 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0652 | Test Date: | 03/01/19 | Checked By: | bfs |
| Depth : | 2-4 ft | Test Id: | 483632 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark gray sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Plasticity Chart**



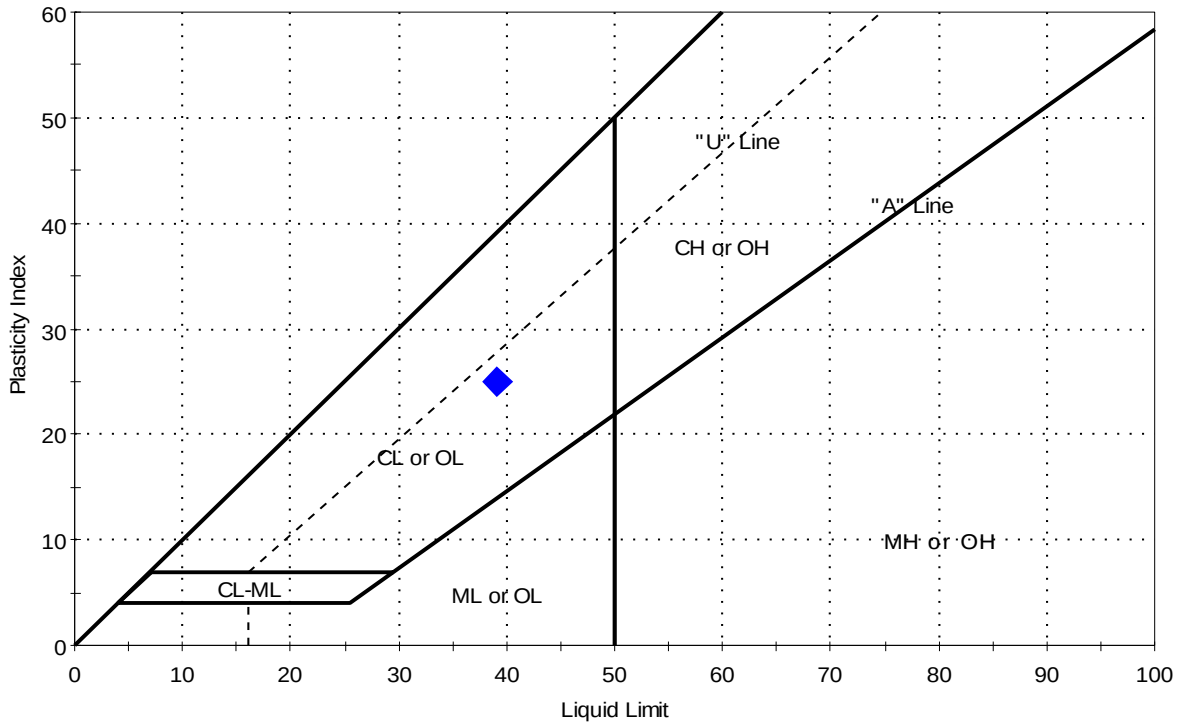

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0652 | SJSB037 | 2-4 ft | 105 | 121 | 46 | 75 | 0.8 | Sandy Fat CLAY (CH) |

Sample Prepared using the WET method
19% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:33 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB037 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0655 | Test Date: | 03/01/19 | Checked By: | bfs |
| Depth : | 8-10 ft | Test Id: | 483633 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark grayish brown clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0655 | SJSB037 | 8-10 ft | 29 | 39 | 14 | 25 | 0.6 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

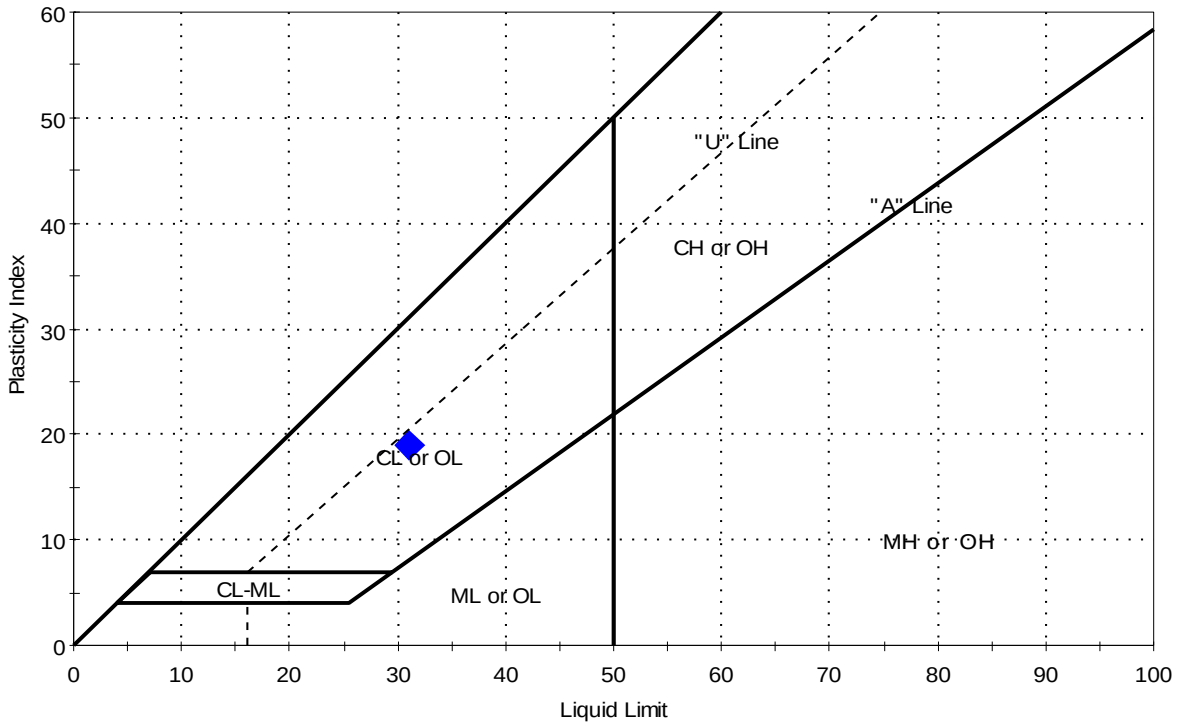
Dilatancy: SLOW

Toughness: LOW

printed 3/15/2019 12:35:34 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB038 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0891 | Test Date: | 03/02/19 | Checked By: | bfs |
| Depth : | 13-15 ft | Test Id: | 486507 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, very dark grayish brown sandy clay | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318




| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0891 | SJSB038 | 13-15 ft | 48 | 31 | 12 | 19 | 1.9 | Sandy Lean CLAY (CL) |

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

printed 3/15/2019 12:35:34 PM

| | | | | | |
|---|---|---|---|---|---|
| Client: | Anchor QEA, LLC | | | | |
| Project: | San Jacinto Pre-Design Investigation | | | | |
| Location: | | | | Project No: | GTX-309154 |
| Boring ID: | SJSB038 | Sample Type: | bag | Tested By: | cam |
| Sample ID: | SL0893 | Test Date: | 02/27/19 | Checked By: | bfs |
| Depth : | 24-26 ft | Test Id: | 486508 | | |
| Test Comment: | --- | | | | |
| Visual Description: | Moist, dark brown sand with silt | | | | |
| Sample Comment: | --- | | | | |

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | SL0893 | SJSB038 | 24-26 ft | 22 | n/a | n/a | n/a | n/a | Poorly graded SAND with Silt (SP-SM) |

25% Retained on #40 Sieve
Dry Strength: LOW
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:35 PM

| | | | |
|---|---|---|---|
| Client: | Anchor QEA, LLC | | |
| Project Name: | San Jacinto Pre-Design Investigation | | |
| Project Location: | --- | | |
| GTX #: | 309154 | | |
| Start Date: | 2/15/2019 | Tested By: | jlw |
| End Date: | 2/27/2019 | Checked By: | emm |
| Boring #: | SJSB037 | | |
| Sample #: | SLO657 | | |
| Depth: | 15-17 | | |
| Visual Description: | Moist, dark gray clay | | |

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

## Constant Gradient

| | | | |
|---|---|---|---|
| Sample Type: | Intact | Permeant Fluid: | De-aired Distilled water |
| Orientation: | Vertical | Cell #: | --- |

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 36.6%.

Assumed Specific Gravity: 2.70

| Parameter | Initial | Final |
|---|---|---|
| Height, in | 2.62 | 2.56 |
| Diameter, in | 2.81 | 2.87 |
| Area, $in^2$ | 6.21 | 6.45 |
| Volume, $in^3$ | 16.3 | 16.5 |
| Mass, g | 497.4 | 496.0 |
| Bulk Density, pcf | 116.2 | 114.3 |
| Moisture Content, % | 36.2 | 35.8 |
| Dry Density, pcf | 85.3 | 84.1 |
| Degree of Saturation, % | 100 | 96 |

**B COEFFICIENT DETERMINATION**

| | | | | | |
|---|---|---|---|---|---|
| Cell Pressure, psi: | 89.99 | Increased Cell Pressure, psi: | 94.98 | Cell Pressure Increment, psi: | 4.99 |
| Sample Pressure, psi: | 87.00 | Corresponding Sample Pressure, psi: | 91.70 | Sample Pressure Increment, p | 4.70 |
| | | | | B Coefficient: | 0.94 |

B-value did not increase with increase in pressure. Final degree of saturation >95%.

**FLOW DATA**

| Date | Time, sec | Pressure, psi Cell | Inlet | Outlet | Gradient | Flow Volume, cc In | Out | Δ In | Δ Out | Temp, °C | $R_t$ | Permeability K @ 20 °C, cm/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/26 | --- | 90.0 | 87.5 | 86.7 | 8.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/26 | 3545 | 90.0 | 87.5 | 86.7 | 8.7 | 7.30 | 13.90 | 0.30 | 0.10 | 19.5 | 1.013 | 1.6E-07 |
| 2/26 | ---- | 90.0 | 87.5 | 86.7 | 8.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/26 | 3901 | 90.0 | 87.5 | 86.7 | 8.7 | 7.30 | 13.70 | 0.30 | 0.30 | 19.5 | 1.013 | 2.2E-07 |
| 2/26 | ---- | 90.0 | 87.5 | 86.7 | 8.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/26 | 3604 | 90.0 | 87.5 | 86.7 | 8.7 | 7.20 | 13.80 | 0.20 | 0.20 | 19.5 | 1.013 | 1.6E-07 |
| 2/26 | ---- | 90.0 | 87.5 | 86.7 | 8.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/26 | 3634 | 90.0 | 87.5 | 86.7 | 8.7 | 7.30 | 13.80 | 0.30 | 0.20 | 19.5 | 1.013 | 1.9E-07 |

**PERMEABILITY AT 20° C: 1.8 x $10^{-7}$ cm/sec (@ 3 psi effective stress)**

| | | | |
|---|---|---|---|
| Client: | Anchor QEA, LLC | | |
| Project Name: | San Jacinto Pre-Design Investigation | | |
| Project Location: | --- | | |
| GTX #: | 309154 | | |
| Start Date: | 2/15/2019 | Tested By: | jlw |
| End Date: | 2/28/2019 | Checked By: | emm |
| Boring #: | SJSB036 | | |
| Sample #: | SLO674 | | |
| Depth: | 8-10 ft | | |
| Visual Description: | Moist, gray clay with sand | | |

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

## Constant Gradient

| | | | |
|---|---|---|---|
| Sample Type: | Intact | Permeant Fluid: | De-aired Distilled water |
| Orientation: | Vertical | Cell #: | --- |

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 58.4%.

Assumed Specific Gravity: 2.70

| Parameter | Initial | Final |
|---|---|---|
| Height, in | 2.41 | 2.35 |
| Diameter, in | 2.85 | 2.86 |
| Area, $in^2$ | 6.36 | 6.41 |
| Volume, $in^3$ | 15.3 | 15.0 |
| Mass, g | 394.7 | 395.4 |
| Bulk Density, pcf | 97.9 | 100.0 |
| Moisture Content, % | 58.9 | 59.1 |
| Dry Density, pcf | 61.6 | 62.9 |
| Degree of Saturation, % | 92 | 95 |

**B COEFFICIENT DETERMINATION**

| | | | | | |
|---|---|---|---|---|---|
| Cell Pressure, psi: | 89.99 | Increased Cell Pressure, psi: | 95.02 | Cell Pressure Increment, psi: | 5.03 |
| Sample Pressure, psi: | 88.04 | Corresponding Sample Pressure, psi: | 92.12 | Sample Pressure Increment, p | 4.08 |
| | | | | B Coefficient: | 0.81 |

B-value did not increase with increase in pressure. Final degree of saturation >95%.

**FLOW DATA**

| Date | Time, sec | Pressure, psi Cell | Inlet | Outlet | Gradient | Flow Volume, cc In | Out | Δ In | Δ Out | Temp, °C | $R_t$ | Permeability K @ 20 °C, cm/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/25 | --- | 90.0 | 88.5 | 87.5 | 11.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/25 | 2488 | 90.0 | 88.5 | 87.5 | 11.8 | 7.30 | 13.80 | 0.30 | 0.20 | 19.5 | 1.013 | 2.1E-07 |
| 2/25 | ---- | 90.0 | 88.5 | 87.5 | 11.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/25 | 2804 | 90.0 | 88.5 | 87.5 | 11.8 | 7.30 | 13.80 | 0.30 | 0.20 | 19.5 | 1.013 | 1.9E-07 |
| 2/25 | ---- | 90.0 | 88.5 | 87.5 | 11.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/25 | 3007 | 90.0 | 88.5 | 87.5 | 11.8 | 7.30 | 13.80 | 0.30 | 0.20 | 19.5 | 1.013 | 1.7E-07 |
| 2/26 | ---- | 90.0 | 88.5 | 87.5 | 11.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/26 | 3209 | 90.0 | 88.5 | 87.5 | 11.8 | 7.30 | 13.80 | 0.30 | 0.20 | 19.5 | 1.013 | 1.6E-07 |

**PERMEABILITY AT 20° C: 1.8 x $10^{-7}$ cm/sec (@ 2 psi effective stress)**

| | | | |
|---|---|---|---|
| Client: | Anchor QEA, LLC | | |
| Project Name: | San Jacinto Pre-Design Investigation | | |
| Project Location: | --- | | |
| GTX #: | 309154 | | |
| Start Date: | 2/12/2019 | Tested By: | jlw |
| End Date: | 2/27/2019 | Checked By: | emm |
| Boring #: | SJGB022 | | |
| Sample #: | SLO817 | | |
| Depth: | 30-32 ft | | |
| Visual Description: | Moist, light red clay | | |

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

## Constant Gradient

| | | | |
|---|---|---|---|
| Sample Type: | Intact | Permeant Fluid: | De-aired Distilled water |
| Orientation: | Vertical | Cell #: | --- |

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 28.5%.

Assumed Specific Gravity: 2.70

| Parameter | Initial | Final |
|---|---|---|
| Height, in | 3.84 | 3.80 |
| Diameter, in | 2.79 | 2.85 |
| Area, $in^2$ | 6.11 | 6.38 |
| Volume, $in^3$ | 23.5 | 24.2 |
| Mass, g | 765.3 | 774.1 |
| Bulk Density, pcf | 123.9 | 121.4 |
| Moisture Content, % | 27.1 | 28.6 |
| Dry Density, pcf | 97.5 | 94.4 |
| Degree of Saturation, % | 100 | 98 |

**B COEFFICIENT DETERMINATION**

| | | | | | |
|---|---|---|---|---|---|
| Cell Pressure, psi: | 89.99 | Increased Cell Pressure, psi: | 95.02 | Cell Pressure Increment, psi: | 5.03 |
| Sample Pressure, psi: | 85.00 | Corresponding Sample Pressure, psi: | 89.07 | Sample Pressure Increment, p | 4.07 |
| | | | | B Coefficient: | 0.81 |

B-value did not increase with increase in pressure. Final degree of saturation >95%.

**FLOW DATA**

| Date | Time, sec | Pressure, psi Cell | Inlet | Outlet | Gradient | Flow Volume, cc In | Out | Δ In | Δ Out | Temp, °C | $R_t$ | Permeability K @ 20 °C, cm/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/19 | --- | 90.0 | 85.5 | 84.5 | 7.3 | 0.00 | 25.00 | --- | --- | --- | --- | --- |
| 2/19 | 10690 | 90.0 | 85.5 | 84.5 | 7.3 | 0.20 | 24.80 | 0.20 | 0.20 | 19.5 | 1.013 | 6.3E-08 |
| 2/19 | ---- | 90.0 | 85.5 | 84.5 | 7.3 | 0.00 | 25.00 | --- | --- | --- | --- | --- |
| 2/19 | 11730 | 90.0 | 85.5 | 84.5 | 7.3 | 0.20 | 24.80 | 0.20 | 0.20 | 19.5 | 1.013 | 5.8E-08 |
| 2/20 | ---- | 90.0 | 85.5 | 84.5 | 7.3 | 0.00 | 25.00 | --- | --- | --- | --- | --- |
| 2/20 | 11210 | 90.0 | 85.5 | 84.5 | 7.3 | 0.20 | 24.80 | 0.20 | 0.20 | 19.5 | 1.013 | 6.0E-08 |
| 2/20 | ---- | 90.0 | 85.5 | 84.5 | 7.3 | 0.00 | 25.00 | --- | --- | --- | --- | --- |
| 2/20 | 9186 | 90.0 | 85.5 | 84.5 | 7.3 | 0.20 | 24.80 | 0.20 | 0.20 | 19.5 | 1.013 | 7.4E-08 |

**PERMEABILITY AT 20° C: 6.4 x $10^{-8}$ cm/sec (@ 5 psi effective stress)**

| | | | |
|---|---|---|---|
| Client: | Anchor QEA, LLC | | |
| Project Name: | San Jacinto Pre-Deisgn Investigation | | |
| Project Location: | --- | | |
| GTX #: | 309154 | | |
| Start Date: | 3/5/2019 | Tested By: | jlw |
| End Date: | 3/11/2019 | Checked By: | emm |
| Boring #: | SJGB019 | | |
| Sample #: | SLO852 | | |
| Depth: | 25-27ft | | |
| Visual Description: | Moist, pale brown clay | | |

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084
## Constant Gradient

| | | | |
|---|---|---|---|
| Sample Type: | Intact | Permeant Fluid: | De-aired Distilled water |
| Orientation: | Vertical | Cell #: | --- |

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 20.5%.

Assumed Specific Gravity: 2.70

| Parameter | Initial | Final |
|---|---|---|
| Height, in | 2.87 | 2.82 |
| Diameter, in | 2.82 | 2.80 |
| Area, $in^2$ | 6.25 | 6.16 |
| Volume, $in^3$ | 17.9 | 17.4 |
| Mass, g | 586.1 | 589.8 |
| Bulk Density, pcf | 124.3 | 129.1 |
| Moisture Content, % | 20.3 | 21.1 |
| Dry Density, pcf | 103.3 | 106.6 |
| Degree of Saturation, % | 87 | 98 |

**B COEFFICIENT DETERMINATION**

| | | | | | |
|---|---|---|---|---|---|
| Cell Pressure, psi: | 90.00 | Increased Cell Pressure, psi: | 95.03 | Cell Pressure Increment, psi: | 5.03 |
| Sample Pressure, psi: | 85.96 | Corresponding Sample Pressure, psi: | 89.91 | Sample Pressure Increment, p | 3.95 |
| | | | | B Coefficient: | 0.79 |

**FLOW DATA**

| Date | Time, sec | Pressure, psi Cell | Inlet | Outlet | Gradient | Flow Volume, cc In | Out | Δ In | Δ Out | Temp, °C | $R_t$ | Permeability K @ 20 °C, cm/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/7 | --- | 90.0 | 86.5 | 85.5 | 9.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 3/7 | 3600 | 90.0 | 86.5 | 85.5 | 9.8 | 7.30 | 13.50 | 0.30 | 0.50 | 19.5 | 1.013 | 2.9E-07 |
| 3/7 | ---- | 90.0 | 86.5 | 85.5 | 9.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 3/7 | 3600 | 90.0 | 86.5 | 85.5 | 9.8 | 7.30 | 13.50 | 0.30 | 0.50 | 19.5 | 1.013 | 2.9E-07 |
| 3/7 | ---- | 90.0 | 86.5 | 85.5 | 9.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 3/7 | 3660 | 90.0 | 86.5 | 85.5 | 9.8 | 7.30 | 13.60 | 0.30 | 0.40 | 19.5 | 1.013 | 2.5E-07 |
| 3/7 | ---- | 90.0 | 86.5 | 85.5 | 9.8 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 3/7 | 3600 | 90.0 | 86.5 | 85.5 | 9.8 | 7.30 | 13.50 | 0.30 | 0.50 | 19.5 | 1.013 | 2.9E-07 |

**PERMEABILITY AT 20° C: 2.8 x $10^{-7}$ cm/sec (@ 4 psi effective stress)**

| | | | |
|---|---|---|---|
| Client: | Anchor QEA, LLC | | |
| Project Name: | San Jacinto Pre-Design Investigation | | |
| Project Location: | --- | | |
| GTX #: | 309154 | | |
| Start Date: | 2/15/2019 | Tested By: | jlw |
| End Date: | 2/26/2019 | Checked By: | emm |
| Boring #: | SJGB038 | | |
| Sample #: | SL0896 | | |
| Depth: | 11-13 ft | | |
| Visual Description: | Moist, dark gray clay | | |

# Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

## Constant Gradient

| | | | |
|---|---|---|---|
| Sample Type: | Intact | Permeant Fluid: | De-aired Distilled water |
| Orientation: | Vertical | Cell #: | --- |

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 48.8%.

Assumed Specific Gravity: 2.70

| Parameter | Initial | Final |
|---|---|---|
| Height, in | 2.66 | 2.59 |
| Diameter, in | 2.81 | 2.79 |
| Area, $in^2$ | 6.20 | 6.11 |
| Volume, $in^3$ | 16.5 | 15.8 |
| Mass, g | 480.3 | 471.2 |
| Bulk Density, pcf | 110.7 | 113.1 |
| Moisture Content, % | 43.6 | 40.9 |
| Dry Density, pcf | 77.1 | 80.3 |
| Degree of Saturation, % | 99 | 100 |

**B COEFFICIENT DETERMINATION**

| | | | | | |
|---|---|---|---|---|---|
| Cell Pressure, psi: | 89.98 | Increased Cell Pressure, psi: | 95.04 | Cell Pressure Increment, psi: | 5.06 |
| Sample Pressure, psi: | 88.03 | Corresponding Sample Pressure, psi: | 92.75 | Sample Pressure Increment, p | 4.72 |
| | | | | B Coefficient: | 0.93 |

B-value did not increase with increase in pressure. Final degree of saturation >95%.

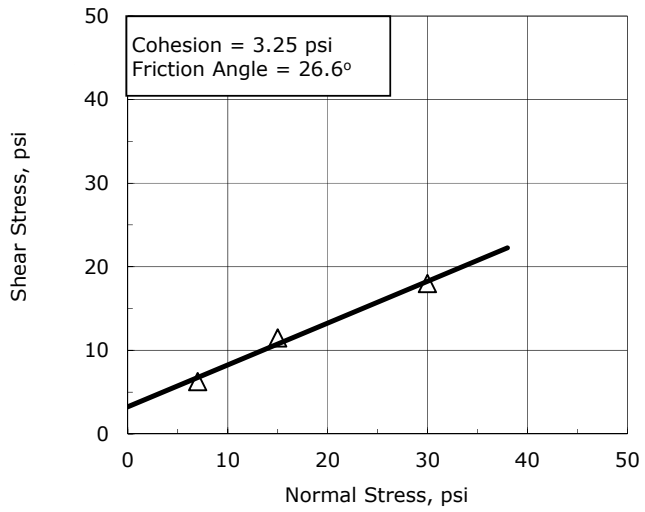
**FLOW DATA**

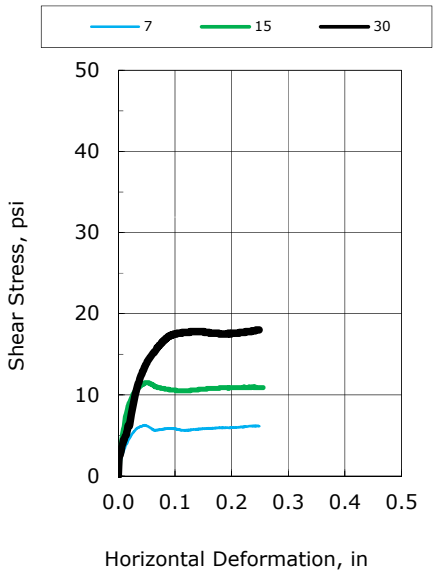
| Date | Time, sec | Pressure, psi Cell | Inlet | Outlet | Gradient | Flow Volume, cc In | Out | Δ In | Δ Out | Temp, °C | $R_t$ | Permeability K @ 20 °C, cm/sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/25 | --- | 90.0 | 88.5 | 87.5 | 10.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/25 | 3708 | 90.0 | 88.5 | 87.5 | 10.7 | 7.60 | 13.50 | 0.60 | 0.50 | 19.5 | 1.013 | 3.6E-07 |
| 2/25 | ---- | 90.0 | 88.5 | 87.5 | 10.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/25 | 3967 | 90.0 | 88.5 | 87.5 | 10.7 | 7.50 | 13.60 | 0.50 | 0.40 | 19.5 | 1.013 | 2.7E-07 |
| 2/25 | ---- | 90.0 | 88.5 | 87.5 | 10.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/25 | 2900 | 90.0 | 88.5 | 87.5 | 10.7 | 7.40 | 13.60 | 0.40 | 0.40 | 19.5 | 1.013 | 3.3E-07 |
| 2/25 | ---- | 90.0 | 88.5 | 87.5 | 10.7 | 7.00 | 14.00 | --- | --- | --- | --- | --- |
| 2/25 | 3062 | 90.0 | 88.5 | 87.5 | 10.7 | 7.40 | 13.60 | 0.40 | 0.40 | 19.5 | 1.013 | 3.1E-07 |

**PERMEABILITY AT 20° C: 3.2 x $10^{-7}$ cm/sec (@ 2 psi effective stress)**

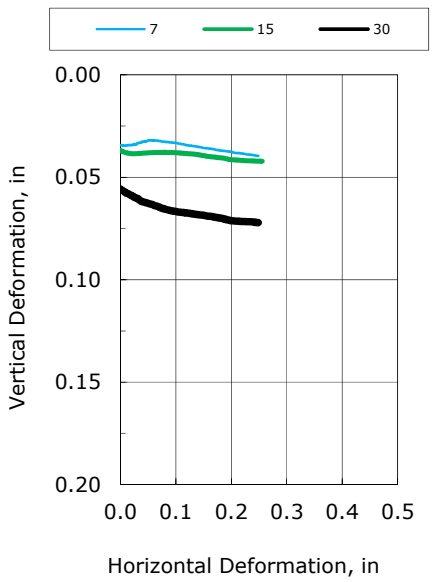
| | |
|---|---|
| Client: | Anchor QEA, LLC |
| Project Name: | San Jacinto Pre-Design Investigation |
| Project Location: | --- |
| GTX #: | 309154 |
| Test Date: | 01/21/19 |
| Tested By: | md |
| Checked By: | njh |
| Boring ID: | SJGB018 |
| Sample ID: | SL0871 |
| Depth, ft: | 45-47 |
| Visual Description: | Moist, blueish gray clay |

# Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080




| Test No.: | DS-16 | DS-17 | DS-18 |
|---|---|---|---|
| Initial Diameter, in: | 2.5 | 2.5 | 2.5 |
| Initial Height, in: | 1.0 | 1.0 | 1.0 |
| Initial Mass, grams: | 159 | 161 | 159 |
| Initial Dry Density, pcf: | 102.2 | 102.8 | 101.4 |
| Initial Moisture Content, %: | 20.8 | 21.3 | 21.9 |
| Initial Bulk Density, pcf: | 123 | 125 | 124 |
| Initial Degree of Saturation: | 86.7 | 90.0 | 89.3 |
| Initial Void Ratio: | 0.65 | 0.64 | 0.66 |
| Final Dry Density, pcf: | 106.5 | 107.4 | 109.3 |
| Final Moisture Content, %: | 22.2 | 23.6 | 21.5 |
| Final Bulk Density, pcf: | 130 | 133 | 133 |
| Normal Stress, psi: | 7.0 | 15 | 30 |
| Maximum Shear Stress, psi: | 6.3 | 12 | 18 |
| Shear Rate, in/min: | 0.0003 | 0.0003 | 0.0003 |
| | | | |




| | |
|---|---|
| Sample Type: | intact |
| Estimated Specific Gravity: | 2.70 |
| Liquid Limit: | --- |
| Plastic Limit: | --- |
| Plasticity Index: | --- |
| % Passing #200 sieve: | --- |
| Soil Classification: | --- |
| Group Symbol: | --- |

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

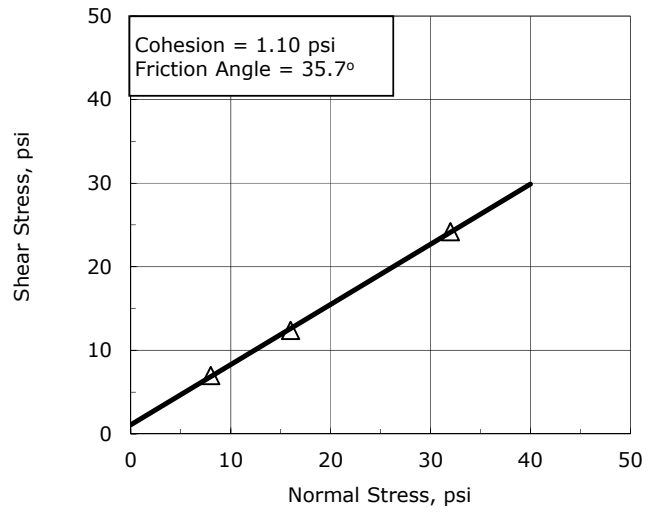
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

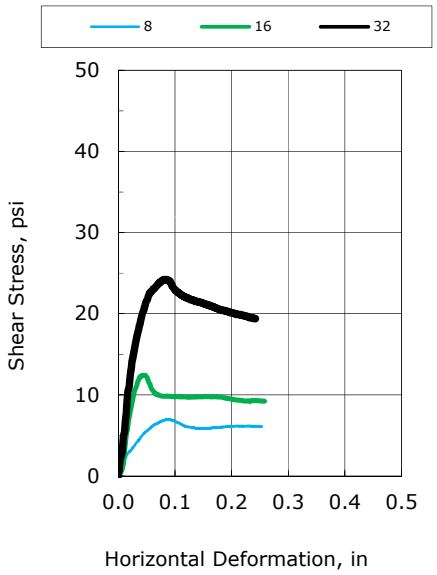
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

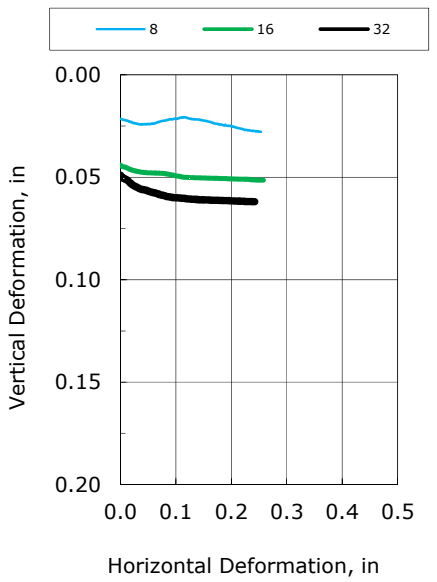
| | |
|---|---|
| Client: | Anchor QEA, LLC |
| Project Name: | San Jacinto Pre-Design Investigation |
| Project Location: | --- |
| GTX #: | 309154 |
| Test Date: | 01/18/19 |
| Tested By: | md |
| Checked By: | njh |
| Boring ID: | SJGB019 |
| Sample ID: | SL0856 |
| Depth, ft: | 45-47 |
| Visual Description: | Moist, light gray clay |

# Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080




| Test No.: | DS-13 | DS-14 | DS-15 |
|---|---|---|---|
| Initial Diameter, in: | 2.5 | 2.5 | 2.5 |
| Initial Height, in: | 1.0 | 1.0 | 1.0 |
| Initial Mass, grams: | 154 | 157 | 155 |
| Initial Dry Density, pcf: | 99.0 | 100.4 | 96.9 |
| Initial Moisture Content, %: | 20.5 | 21.6 | 24.6 |
| Initial Bulk Density, pcf: | 119 | 122 | 121 |
| Initial Degree of Saturation: | 78.8 | 85.8 | 89.6 |
| Initial Void Ratio: | 0.70 | 0.68 | 0.74 |
| Final Dry Density, pcf: | 101.9 | 105.9 | 103.3 |
| Final Moisture Content, %: | 23.5 | 23.7 | 23.7 |
| Final Bulk Density, pcf: | 126 | 131 | 128 |
| Normal Stress, psi: | 8.0 | 16 | 32 |
| Maximum Shear Stress, psi: | 7.0 | 12 | 24 |
| Shear Rate, in/min: | 0.0003 | 0.0003 | 0.0003 |
| | | | |




| | |
|---|---|
| Sample Type: | intact |
| Estimated Specific Gravity: | 2.70 |
| Liquid Limit: | --- |
| Plastic Limit: | --- |
| Plasticity Index: | --- |
| % Passing #200 sieve: | --- |
| Soil Classification: | --- |
| Group Symbol: | --- |

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

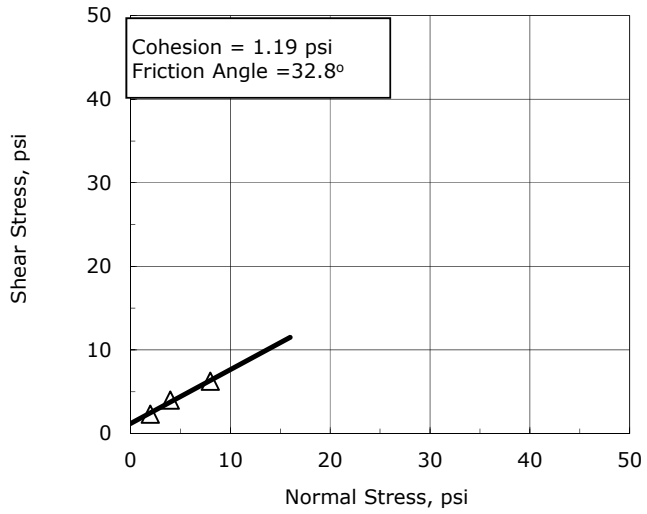
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

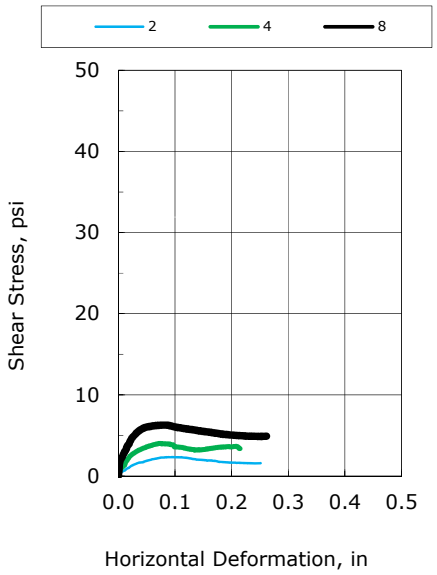
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

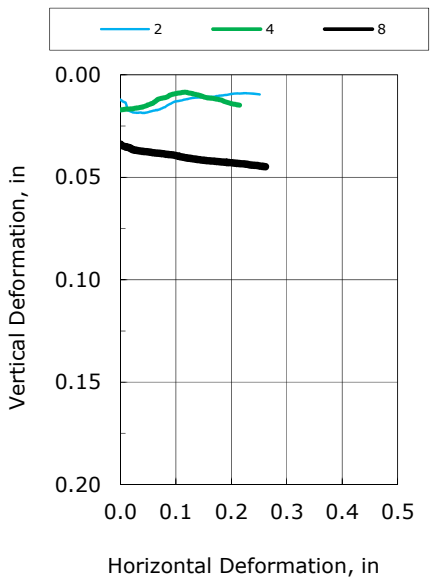
| | |
|---|---|
| Client: | Anchor QEA, LLC |
| Project Name: | San Jacinto Pre-Design Investigation |
| Project Location: | --- |
| GTX #: | 309154 |
| Test Date: | 01/18/19 |
| Tested By: | md |
| Checked By: | njh |
| Boring ID: | SJGB023 |
| Sample ID: | SL0878 |
| Depth, ft: | 10-12 |
| Visual Description: | Moist, gray sand with shells |

# Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080




| Test No.: | DS-10 | DS-11 | DS-12 |
|---|---|---|---|
| Initial Diameter, in: | 2.5 | 2.5 | 2.5 |
| Initial Height, in: | 1.0 | 1.0 | 1.0 |
| Initial Mass, grams: | 153 | 153 | 152 |
| Initial Dry Density, pcf: | 96.9 | 99.7 | 96.9 |
| Initial Moisture Content, %: | 22.3 | 19.2 | 21.4 |
| Initial Bulk Density, pcf: | 118 | 119 | 118 |
| Initial Degree of Saturation: | 83.4 | 77.0 | 80.1 |
| Initial Void Ratio: | 0.71 | 0.66 | 0.71 |
| Final Dry Density, pcf: | 97.8 | 101.2 | 101.5 |
| Final Moisture Content, %: | 25.0 | 25.3 | 24.6 |
| Final Bulk Density, pcf: | 122 | 127 | 126 |
| Normal Stress, psi: | 2.0 | 4.0 | 8.0 |
| Maximum Shear Stress, psi: | 2.3 | 4.0 | 6.3 |
| Shear Rate, in/min: | 0.002 | 0.002 | 0.002 |
| | | | |




| | |
|---|---|
| Sample Type: | intact |
| Estimated Specific Gravity: | 2.65 |
| Liquid Limit: | --- |
| Plastic Limit: | --- |
| Plasticity Index: | --- |
| % Passing #200 sieve: | --- |
| Soil Classification: | --- |
| Group Symbol: | --- |

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

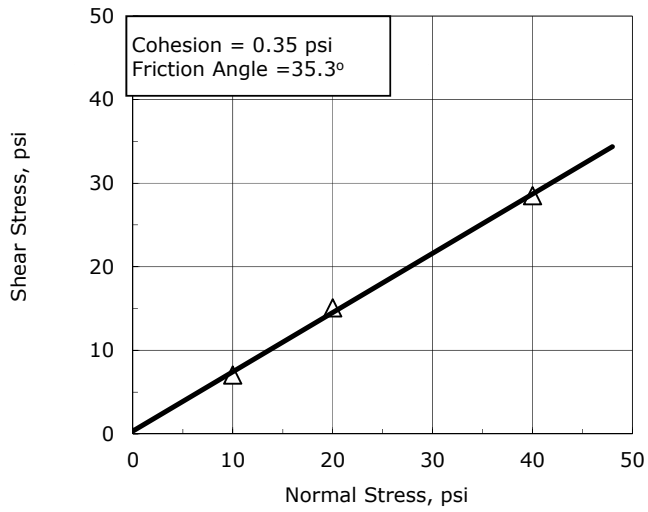
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

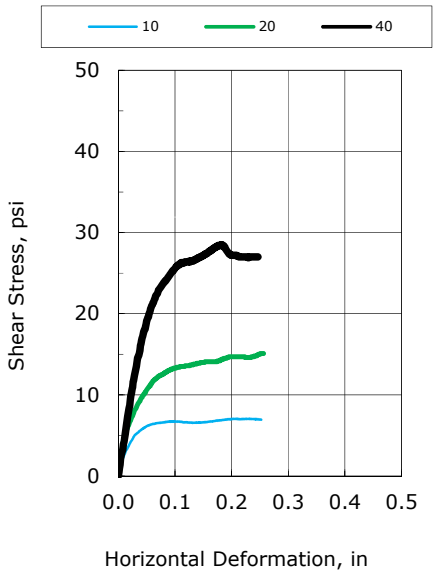
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

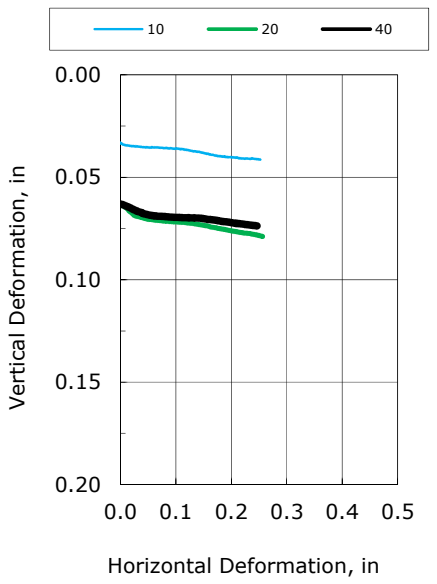
| | |
|---|---|
| Client: | Anchor QEA, LLC |
| Project Name: | San Jacinto Pre-Design Investigation |
| Project Location: | --- |
| GTX #: | 309154 |
| Test Date: | 01/18/19 |
| Tested By: | md |
| Checked By: | njh |
| Boring ID: | SJGB023 |
| Sample ID: | SL0887 |
| Depth, ft: | 53-55 |
| Visual Description: | Moist, light gray clay |

# Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080




| Test No.: | DS-7 | DS-8 | DS-9 |
|---|---|---|---|
| Initial Diameter, in: | 2.5 | 2.5 | 2.5 |
| Initial Height, in: | 1.0 | 1.0 | 1.0 |
| Initial Mass, grams: | 155 | 158 | 159 |
| Initial Dry Density, pcf: | 99.6 | 102.0 | 103.0 |
| Initial Moisture Content, %: | 20.7 | 20.2 | 19.7 |
| Initial Bulk Density, pcf: | 120 | 123 | 123 |
| Initial Degree of Saturation: | 80.8 | 83.8 | 83.3 |
| Initial Void Ratio: | 0.69 | 0.65 | 0.64 |
| Final Dry Density, pcf: | 103.9 | 110.7 | 111.2 |
| Final Moisture Content, %: | 23.1 | 22.1 | 21.1 |
| Final Bulk Density, pcf: | 128 | 135 | 135 |
| Normal Stress, psi: | 10 | 20 | 40 |
| Maximum Shear Stress, psi: | 7.1 | 15 | 29 |
| Shear Rate, in/min: | 0.0004 | 0.0004 | 0.0004 |
| | | | |




| | |
|---|---|
| Sample Type: | intact |
| Estimated Specific Gravity: | 2.70 |
| Liquid Limit: | --- |
| Plastic Limit: | --- |
| Plasticity Index: | --- |
| % Passing #200 sieve: | --- |
| Soil Classification: | --- |
| Group Symbol: | --- |

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

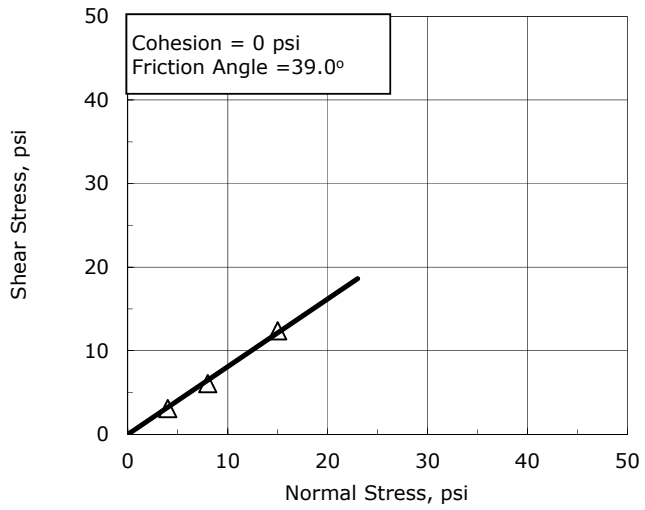
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

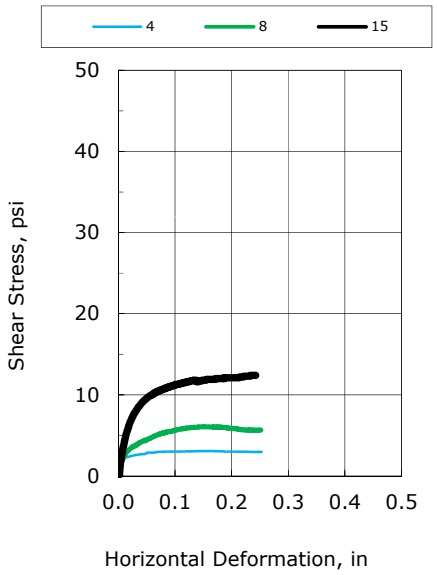
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

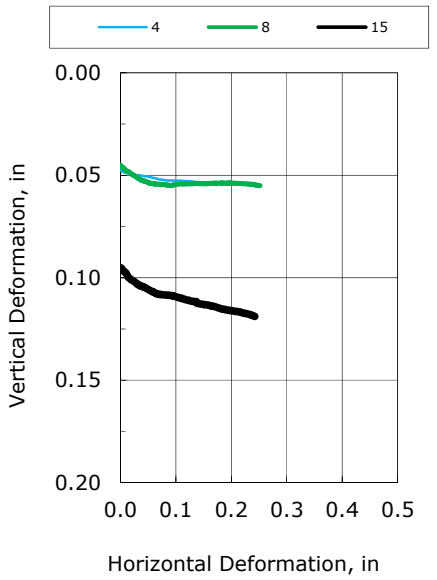
| | |
|---|---|
| Client: | Anchor QEA, LLC |
| Project Name: | San Jacinto Pre-Design Investigation |
| Project Location: | --- |
| GTX #: | 309154 |
| Test Date: | 12/28/18 |
| Tested By: | md |
| Checked By: | njh |
| Boring ID: | SJSB028 |
| Sample ID: | SL0805 |
| Depth, ft: | 20-22 |
| Visual Description: | Wet, gray sand with clay |

# Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080




| Test No.: | DS-1 | DS-2 | DS-3 |
|---|---|---|---|
| Initial Diameter, in: | 2.5 | 2.5 | 2.5 |
| Initial Height, in: | 1.0 | 1.0 | 1.0 |
| Initial Mass, grams: | 146 | 151 | 144 |
| Initial Dry Density, pcf: | 85.1 | 91.9 | 88.3 |
| Initial Moisture Content, %: | 33.3 | 27.9 | 31.3 |
| Initial Bulk Density, pcf: | 113 | 118 | 116 |
| Initial Degree of Saturation: | 93.5 | 92.3 | 88.3 |
| Initial Void Ratio: | 0.94 | 0.80 | 0.94 |
| Final Dry Density, pcf: | 90.1 | 97.3 | 96.9 |
| Final Moisture Content, %: | 28.9 | 24.2 | 27.4 |
| Final Bulk Density, pcf: | 116 | 121 | 123 |
| Normal Stress, psi: | 4.0 | 8 | 15 |
| Maximum Shear Stress, psi: | 3.1 | 6 | 12 |
| Shear Rate, in/min: | 0.0004 | 0.0004 | 0.0004 |
| | | | |




| | |
|---|---|
| Sample Type: | intact |
| Estimated Specific Gravity: | 2.65 |
| Liquid Limit: | --- |
| Plastic Limit: | --- |
| Plasticity Index: | --- |
| % Passing #200 sieve: | --- |
| Soil Classification: | --- |
| Group Symbol: | --- |

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

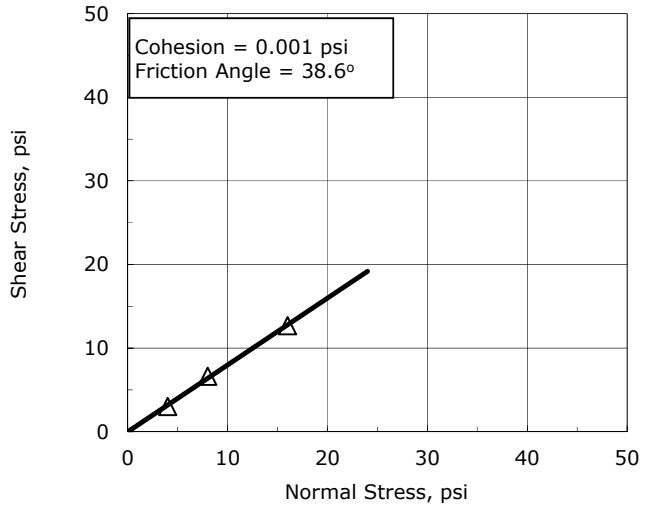
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

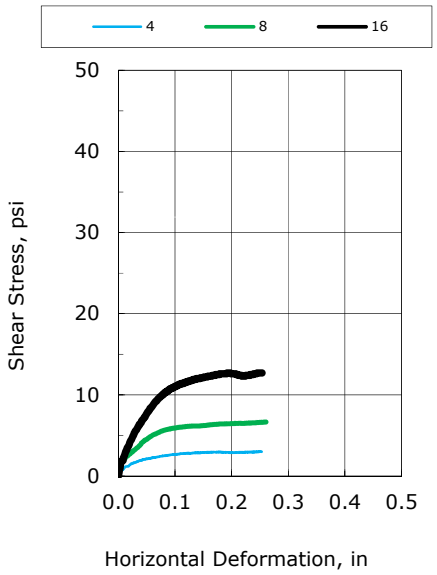
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

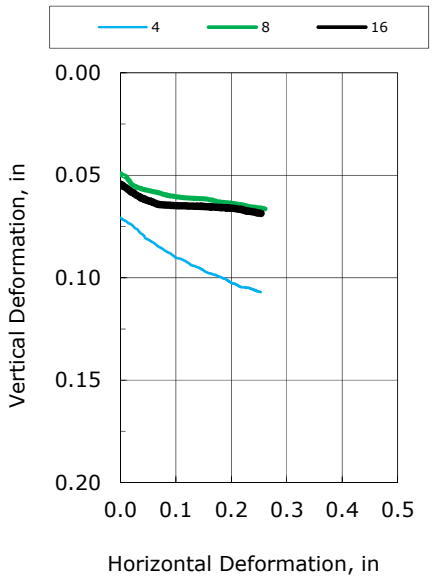
| | |
|---|---|
| Client: | Anchor QEA, LLC |
| Project Name: | San Jacinto Pre-Design Investigation |
| Project Location: | --- |
| GTX #: | 309154 |
| Test Date: | 01/04/19 |
| Tested By: | md |
| Checked By: | njh |
| Boring ID: | SJSB030 |
| Sample ID: | SL00694 |
| Depth, ft: | 20-22 |
| Visual Description: | Moist, gray sand with clay |

# Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080




| Test No.: | DS-4 | DS-5 | DS-6 |
|---|---|---|---|
| Initial Diameter, in: | 2.5 | 2.5 | 2.5 |
| Initial Height, in: | 1.0 | 1.0 | 1.0 |
| Initial Mass, grams: | 137 | 148 | 151 |
| Initial Dry Density, pcf: | 83.1 | 89.0 | 91.3 |
| Initial Moisture Content, %: | 28.0 | 29.4 | 28.6 |
| Initial Bulk Density, pcf: | 106 | 115 | 117 |
| Initial Degree of Saturation: | 74.8 | 90.7 | 93.2 |
| Initial Void Ratio: | 0.99 | 0.86 | 0.95 |
| Final Dry Density, pcf: | 93.1 | 95.4 | 98.0 |
| Final Moisture Content, %: | 38.5 | 26.1 | 25.7 |
| Final Bulk Density, pcf: | 129 | 120 | 123 |
| Normal Stress, psi: | 4.0 | 8.0 | 16 |
| Maximum Shear Stress, psi: | 3.0 | 6.7 | 13 |
| Shear Rate, in/min: | 0.0003 | 0.0003 | 0.0003 |
| | | | |




| | |
|---|---|
| Sample Type: | intact |
| Estimated Specific Gravity: | 2.65 |
| Liquid Limit: | --- |
| Plastic Limit: | --- |
| Plasticity Index: | --- |
| % Passing #200 sieve: | --- |
| Soil Classification: | --- |
| Group Symbol: | --- |

Notes:

Moisture content obtained before shear from sample trimmings

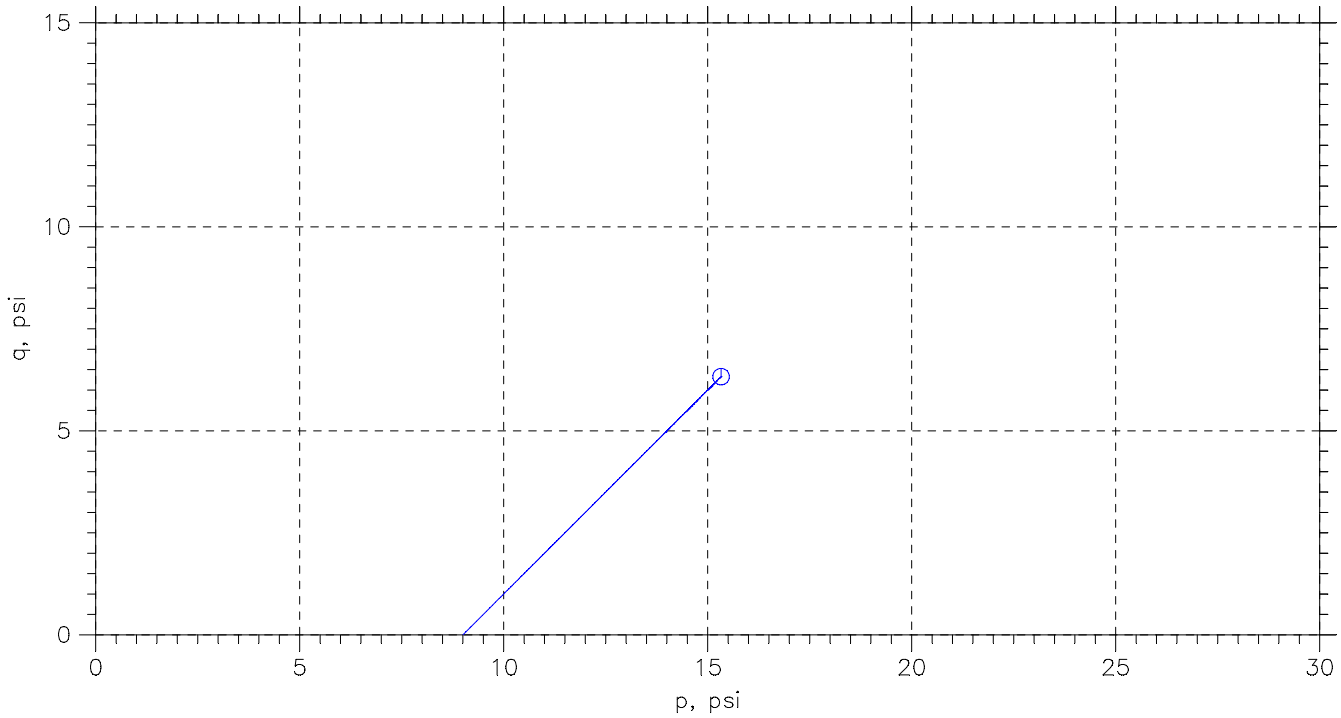
Moisture Content determined by ASTM D2216

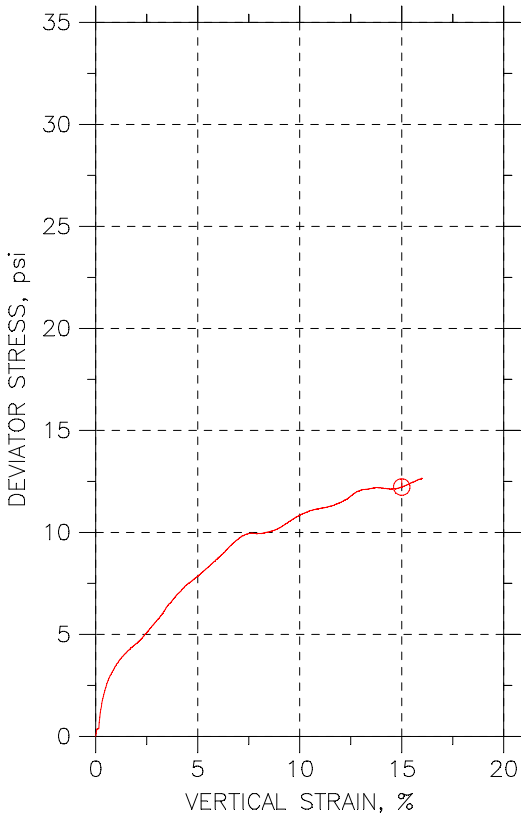
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | | | |
|---|---|---|---|---|
| Sample No. | SL0852 | | | |
| Test No. | UU-21-1 | | | |
| Depth | 25-27 ft | | | |
| Tested by | trm | | | |
| Test Date | 3/6/19 | | | |
| Checked by | njh | | | |
| Check Date | 3/14/19 | | | |
| Diameter, in | 2.86 | | | |
| Height, in | 6.45 | | | |
| Water Content, % | 23.3 | | | |
| Dry Density, pcf | 96.39 | | | |
| Saturation, % | 84.1 | | | |
| Void Ratio | 0.749 | | | |
| Confining Stress, psi | 9 | | | |
| Undrained Strength, psi | 6.113 | | | |
| Max. Dev. Stress, psi | 12.23 | | | |
| Strain at Failure, % | 15 | | | |
| Strain Rate, %/min | 1 | | | |
| Estimated Specific Gravity | 2.7 | | | |
| Liquid Limit | --- | | | |
| Plastic Limit | --- | | | |
| Plasticity Index | --- | | | |

GeoTesting EXPRESS

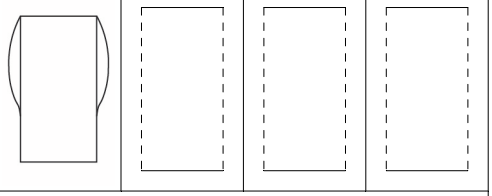
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB019

Sample Type: intact



Description: Moist, pale brown clay

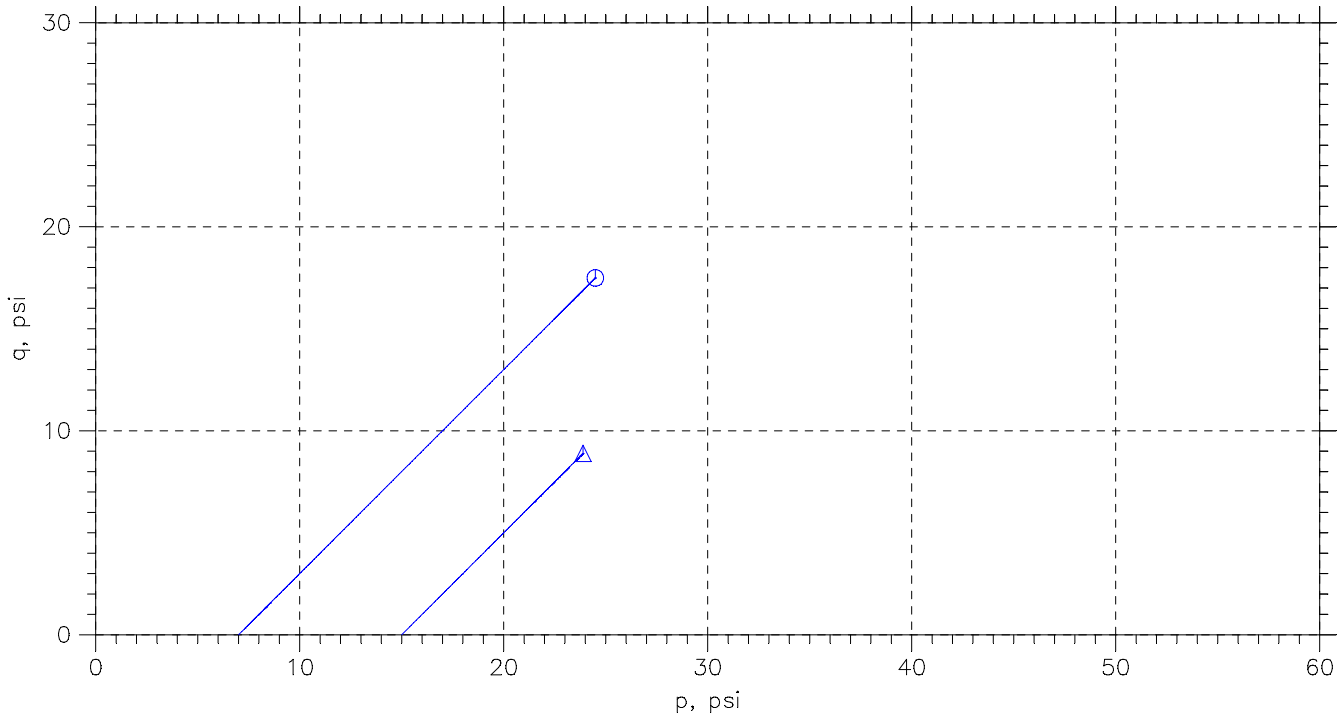
Remarks: System W

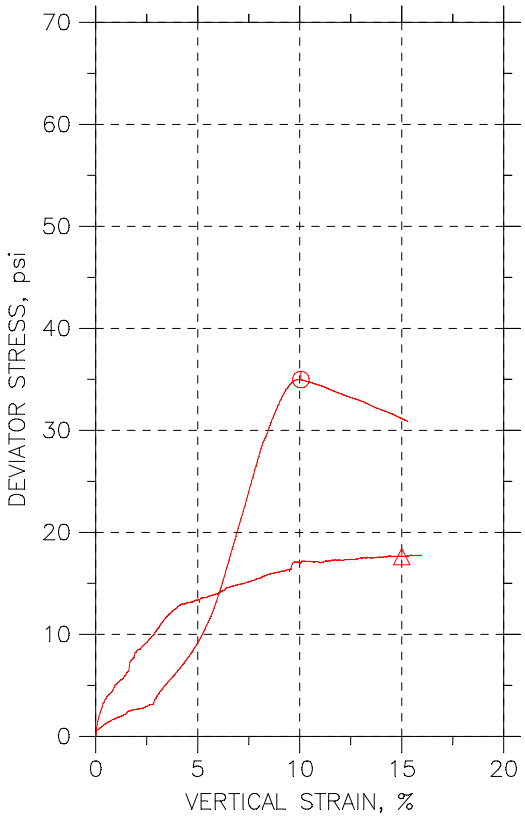
Phase calculations based on start and end of test.

Attachment Figure A.4-133

Thu, 14-MAR-2019 13:49:09

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0856 | SL0856 | | |
| Test No. | UU-16-1 | UU-16-2 | | |
| Depth | 45-47 ft | 45-47 ft | | |
| Tested by | trm | trm | | |
| Test Date | 1/30/19 | 1/30/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/14/19 | 3/14/19 | | |
| Diameter, in | 2.87 | 2.83 | | |
| Height, in | 6.15 | 6.35 | | |
| Water Content, % | 22.0 | 25.0 | | |
| Dry Density, pcf | 95.45 | 95.23 | | |
| Saturation, % | 77.5 | 87.6 | | |
| Void Ratio | 0.766 | 0.77 | | |
| Confining Stress, psi | 7 | 15 | | |
| Undrained Strength, psi | 17.49 | 8.816 | | |
| Max. Dev. Stress, psi | 34.98 | 17.63 | | |
| Strain at Failure, % | 10.1 | 15 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

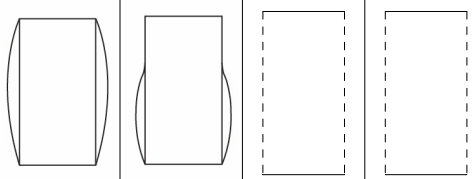
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB019

Sample Type: intact



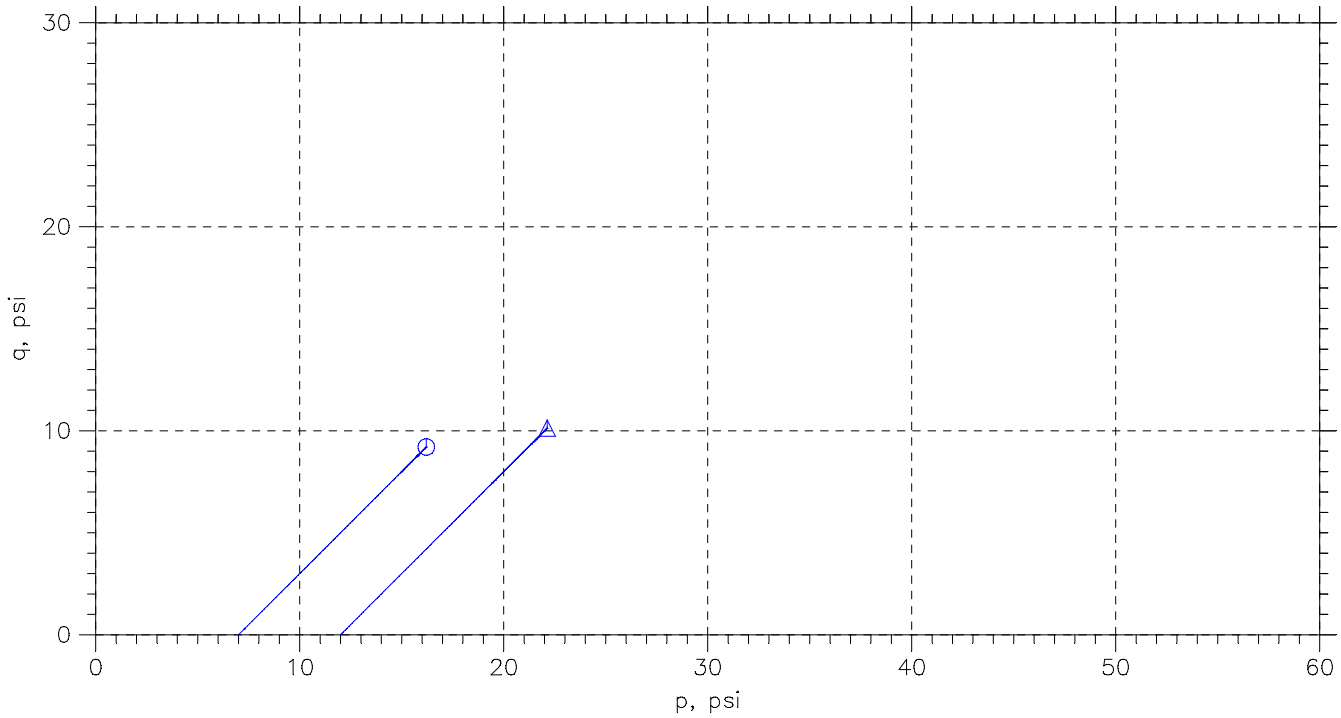
Description: Moist, light gray clay and silt

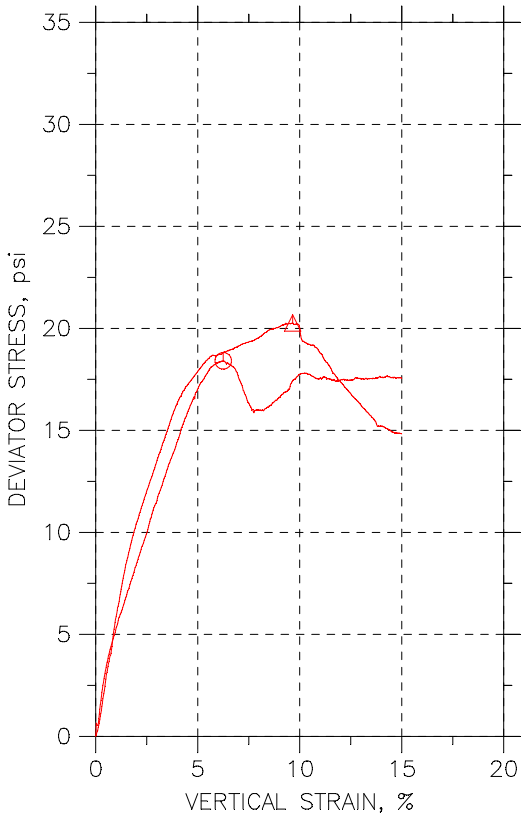
Remarks: System LL

Phase calculations based on start and end of test.

Attachment Figure A.4-134

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0841 | SL0841 | | |
| Test No. | UU-11-1 | UU-11-2 | | |
| Depth | 35-37 | 35-37 | | |
| Tested by | trm | trm | | |
| Test Date | 1/25/19 | 1/25/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/13/19 | 3/13/19 | | |
| Diameter, in | 2.85 | 2.85 | | |
| Height, in | 6 | 5.95 | | |
| Water Content, % | 21.3 | 18.7 | | |
| Dry Density, pcf | 105. | 103.8 | | |
| Saturation, % | 94.8 | 81.1 | | |
| Void Ratio | 0.606 | 0.624 | | |
| Confining Stress, psi | 7 | 12 | | |
| Undrained Strength, psi | 9.204 | 10.13 | | |
| Max. Dev. Stress, psi | 18.41 | 20.26 | | |
| Strain at Failure, % | 6.25 | 9.65 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

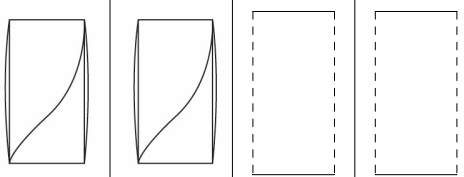
Project No.: GTX-309154

Boring No.: SJGB020

Sample Type: Intact

Description: Moist, light gray and light brown clay and silt

Remarks: System R

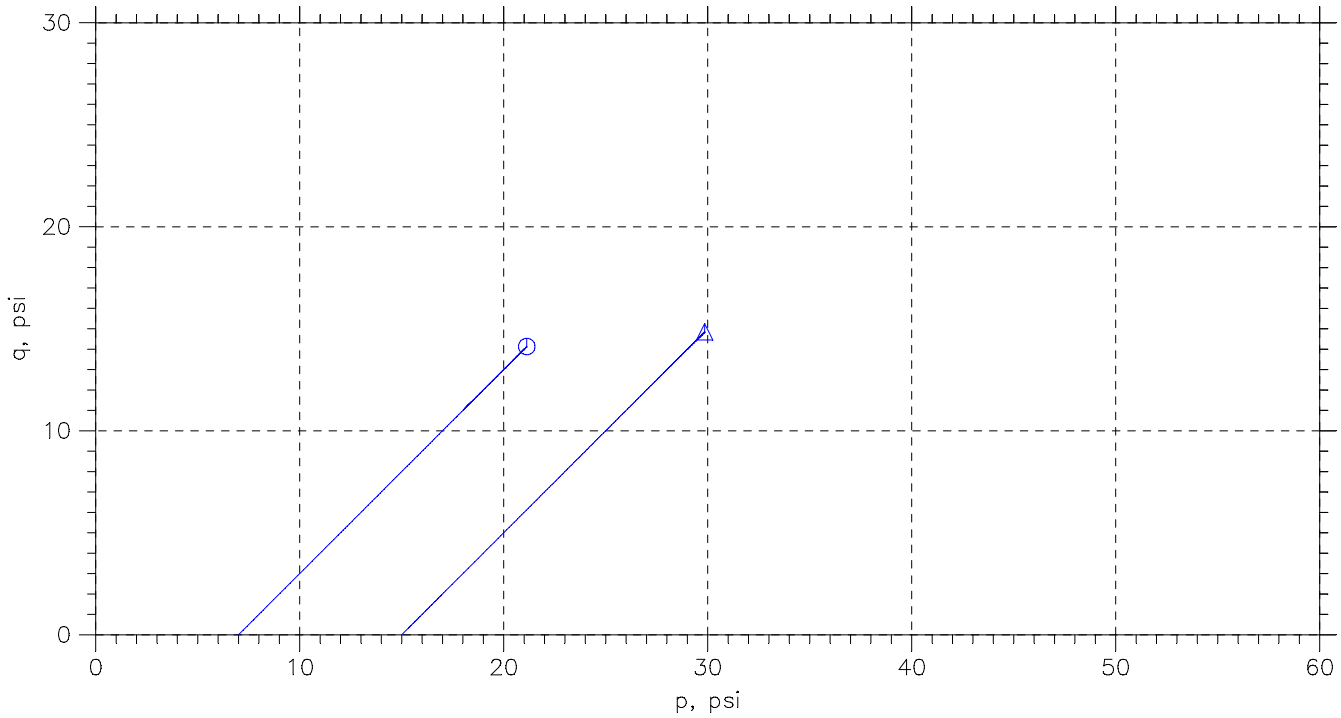


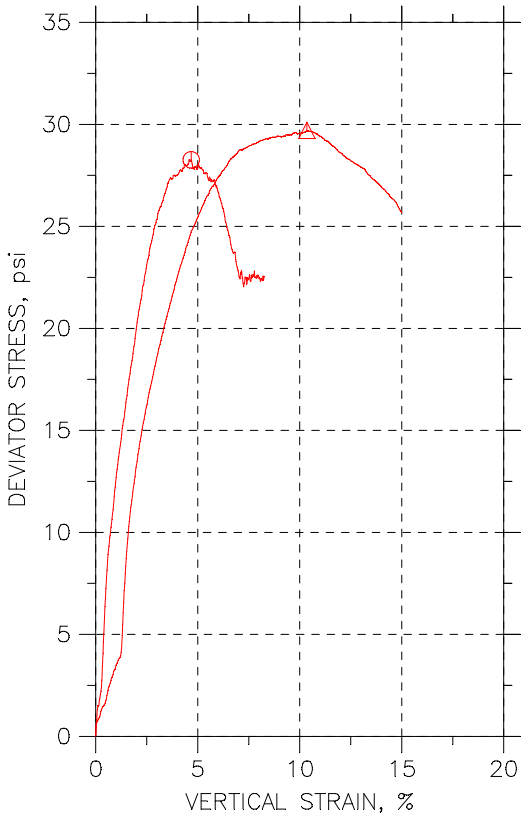
Phase calculations based on start and end of test.

Attachment Figure A.4-135

Wed, 13-MAR-2019 13:17:14

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0843 | SL0843 | | |
| Test No. | UU-10-1 | UU-10-2 | | |
| Depth | 45-47 | 45-47 | | |
| Tested by | trm | trm | | |
| Test Date | 1/25/19 | 1/25/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/13/19 | 3/13/19 | | |
| Diameter, in | 2.87 | 2.87 | | |
| Height, in | 5.95 | 6.6 | | |
| Water Content, % | 30.7 | 28.1 | | |
| Dry Density, pcf | 90.69 | 95.86 | | |
| Saturation, % | 96.7 | 99.9 | | |
| Void Ratio | 0.859 | 0.758 | | |
| Confining Stress, psi | 7 | 15 | | |
| Undrained Strength, psi | 14.13 | 14.85 | | |
| Max. Dev. Stress, psi | 28.26 | 29.71 | | |
| Strain at Failure, % | 4.68 | 10.4 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

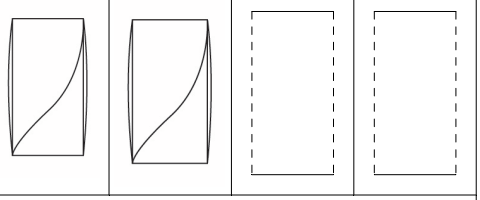
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB020

Sample Type: intact



Description: Moist, light brown clay

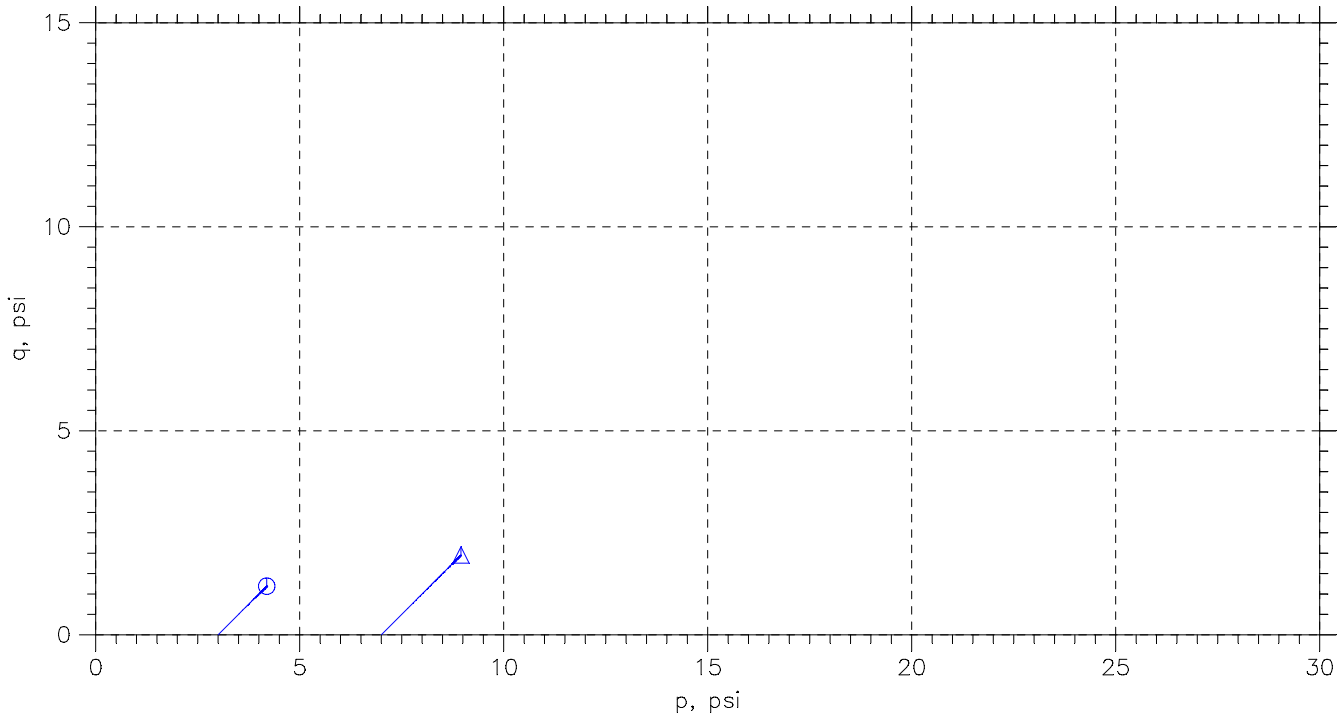
Remarks: System R

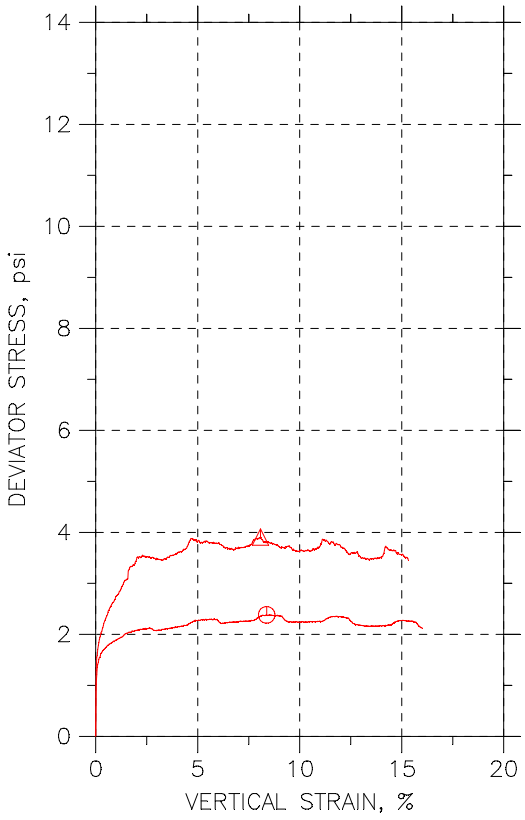
Phase calculations based on start and end of test.

Attachment Figure A.4-136

Wed, 13-MAR-2019 12:43:14

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0812 | SL0812 | | |
| Test No. | UU-17-1 | UU-17-2 | | |
| Depth | 7-9 ft | 7-9 ft | | |
| Tested by | trm | trm | | |
| Test Date | 1/30/19 | 1/30/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/14/19 | 3/14/19 | | |
| Diameter, in | 2.84 | 2.83 | | |
| Height, in | 6 | 6.05 | | |
| Water Content, % | 39.7 | 58.6 | | |
| Dry Density, pcf | 73.4 | 65.08 | | |
| Saturation, % | 82.7 | 99.5 | | |
| Void Ratio | 1.3 | 1.59 | | |
| Confining Stress, psi | 3 | 7 | | |
| Undrained Strength, psi | 1.191 | 1.953 | | |
| Max. Dev. Stress, psi | 2.382 | 3.907 | | |
| Strain at Failure, % | 8.38 | 8.08 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

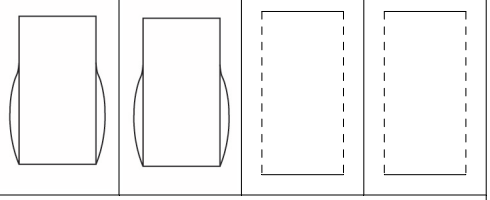
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB022

Sample Type: intact



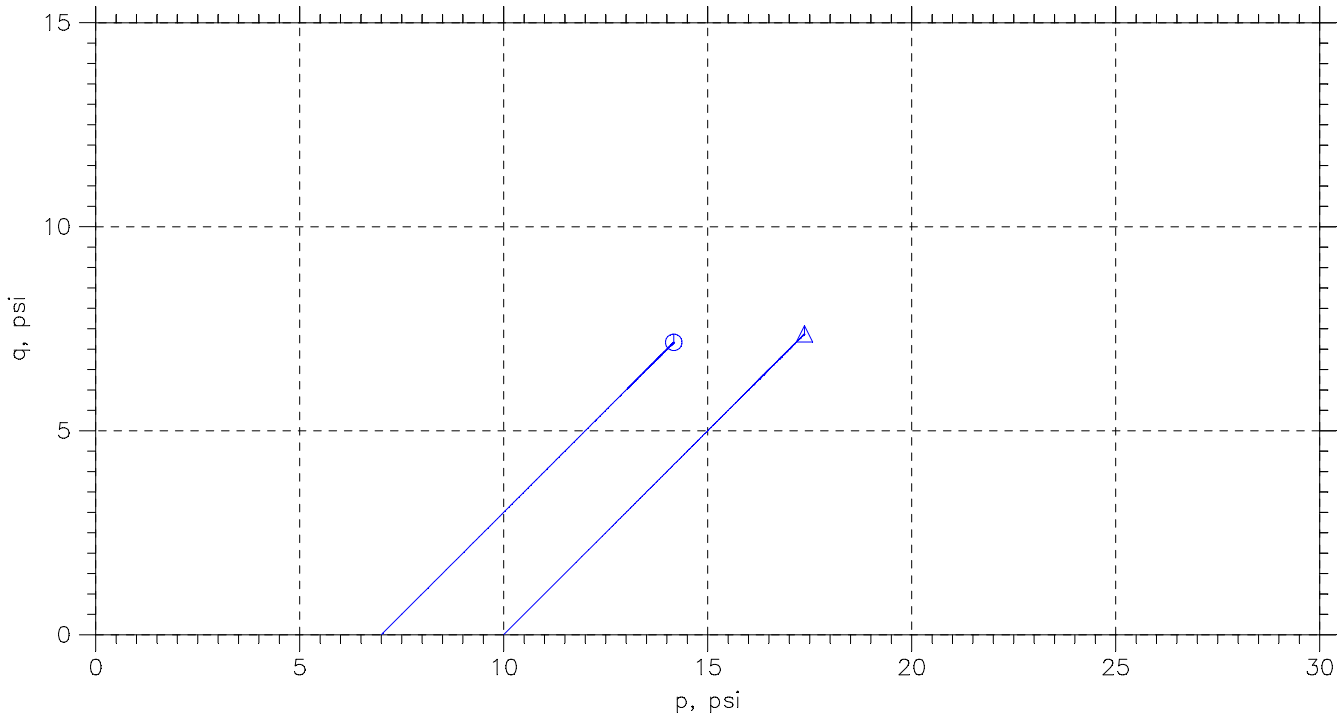
Description: Moist, grayish brown clay

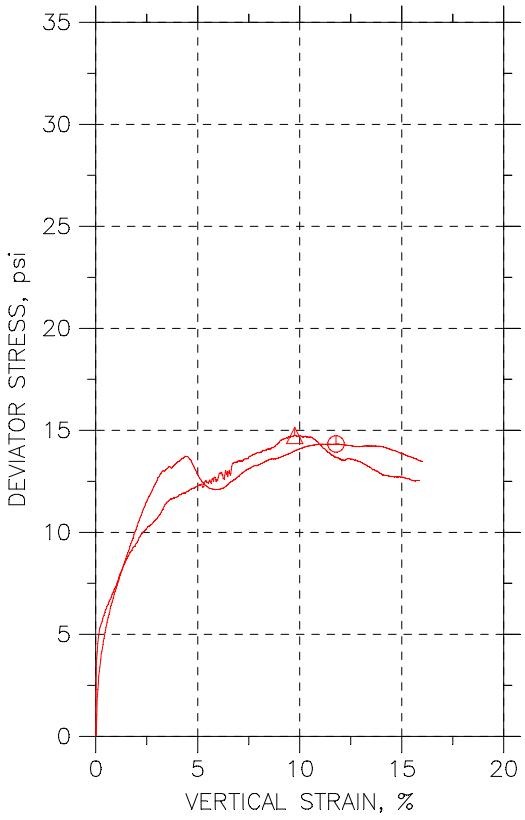
Remarks: System LL

Phase calculations based on start and end of test.

Attachment Figure A.4-137

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0817 | SL0817 | | |
| Test No. | UU-15-1 | UU-15-2 | | |
| Depth | 30-32 ft | 30-32 ft | | |
| Tested by | trm | trm | | |
| Test Date | 1/30/19 | 1/30/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/14/19 | 3/14/19 | | |
| Diameter, in | 2.85 | 2.85 | | |
| Height, in | 6 | 6.1 | | |
| Water Content, % | 28.3 | 33.2 | | |
| Dry Density, pcf | 92.53 | 85.06 | | |
| Saturation, % | 93.1 | 91.2 | | |
| Void Ratio | 0.822 | 0.982 | | |
| Confining Stress, psi | 7 | 10 | | |
| Undrained Strength, psi | 7.167 | 7.373 | | |
| Max. Dev. Stress, psi | 14.33 | 14.75 | | |
| Strain at Failure, % | 11.8 | 9.75 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

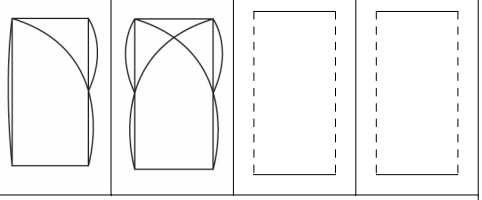
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB022

Sample Type: intact



Description: Moist, reddish brown clay

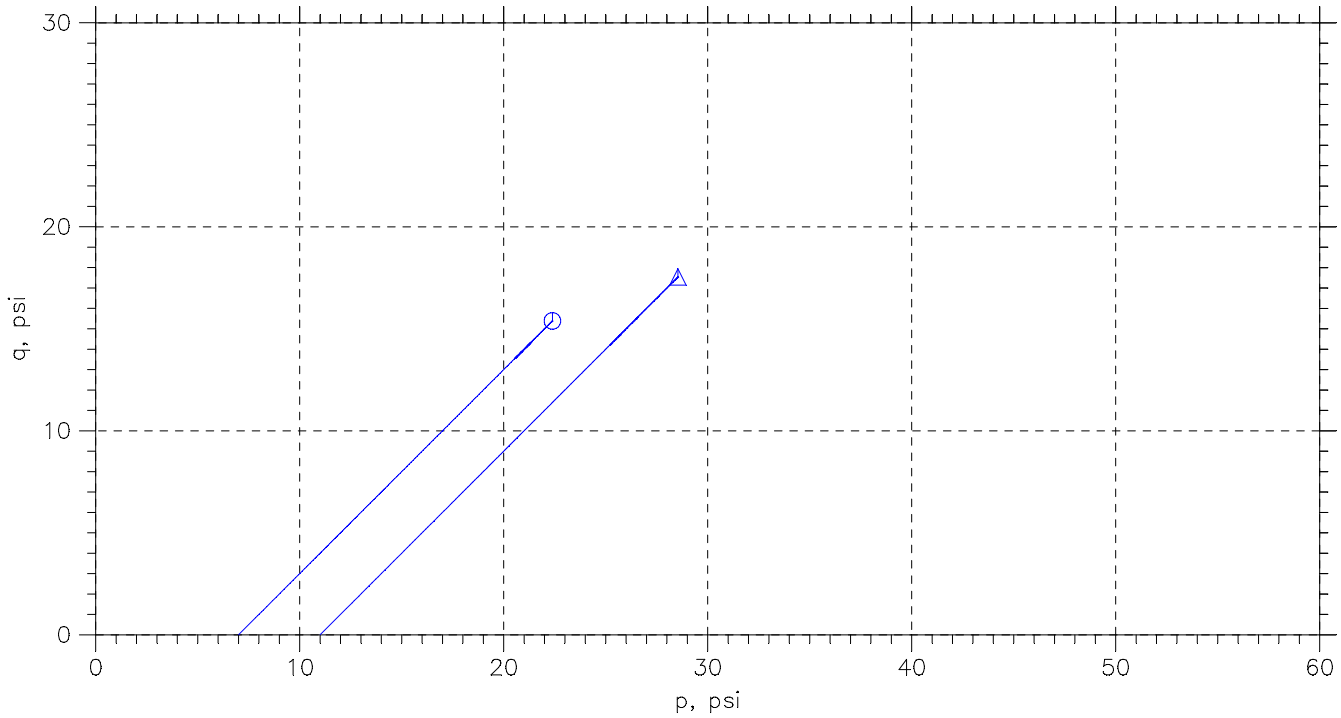
Remarks: System LL

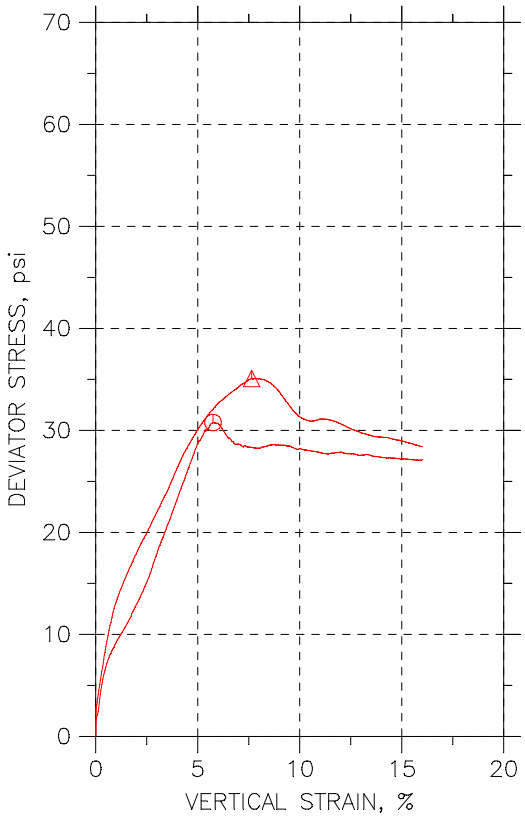
Phase calculations based on start and end of test.

Attachment Figure A.4-138

Thu, 14-MAR-2019 11:11:36

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0884 | SL0884 | | |
| Test No. | UU-12-1 | UU-12-2 | | |
| Depth | 33-35 ft | 33-35 ft | | |
| Tested by | trm | trm | | |
| Test Date | 1/29/19 | 1/29/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/13/19 | 3/13/19 | | |
| Diameter, in | 2.86 | 2.87 | | |
| Height, in | 5.95 | 6 | | |
| Water Content, % | 20.0 | 23.0 | | |
| Dry Density, pcf | 102.8 | 100. | | |
| Saturation, % | 84.2 | 90.8 | | |
| Void Ratio | 0.64 | 0.685 | | |
| Confining Stress, psi | 7 | 11 | | |
| Undrained Strength, psi | 15.39 | 17.54 | | |
| Max. Dev. Stress, psi | 30.77 | 35.09 | | |
| Strain at Failure, % | 5.75 | 7.65 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

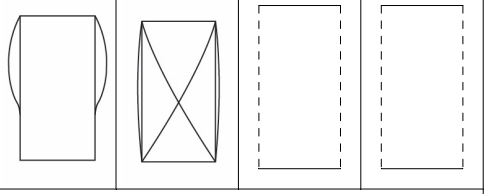
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB023

Sample Type: intact



Description: Moist, light brown and light gray clay

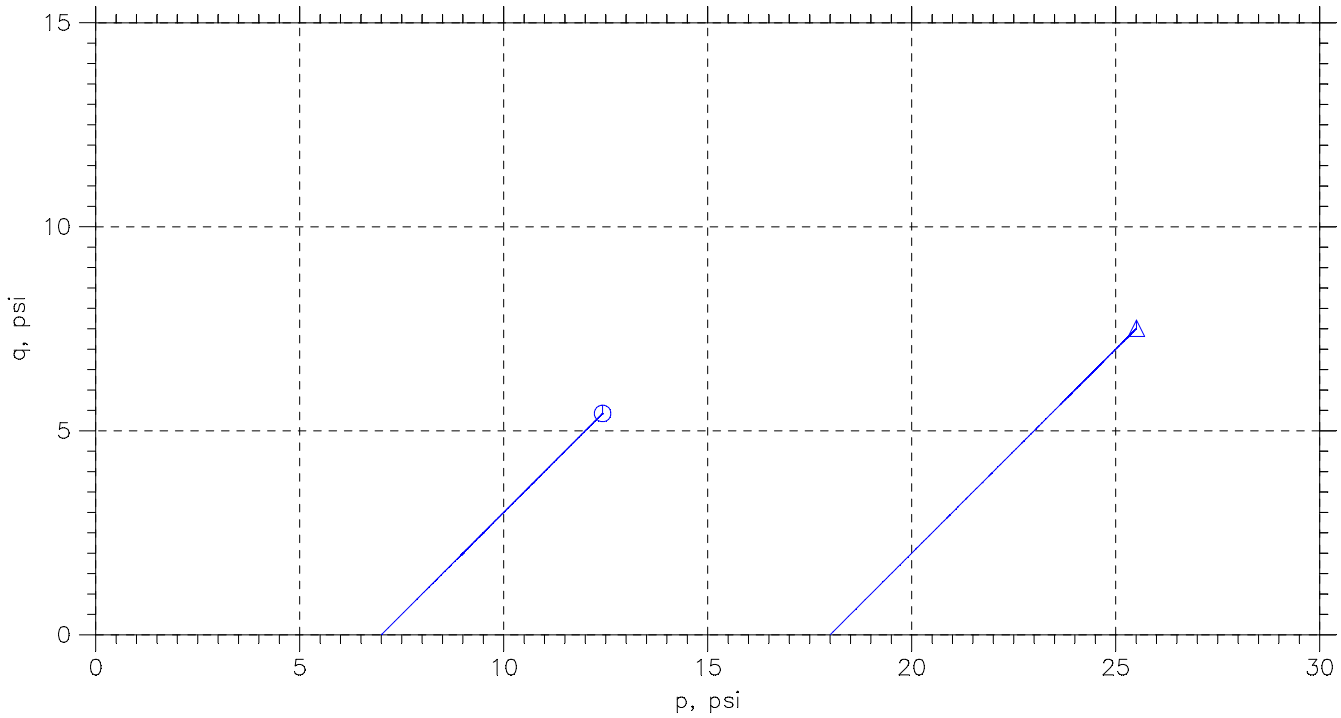
Remarks: System Q

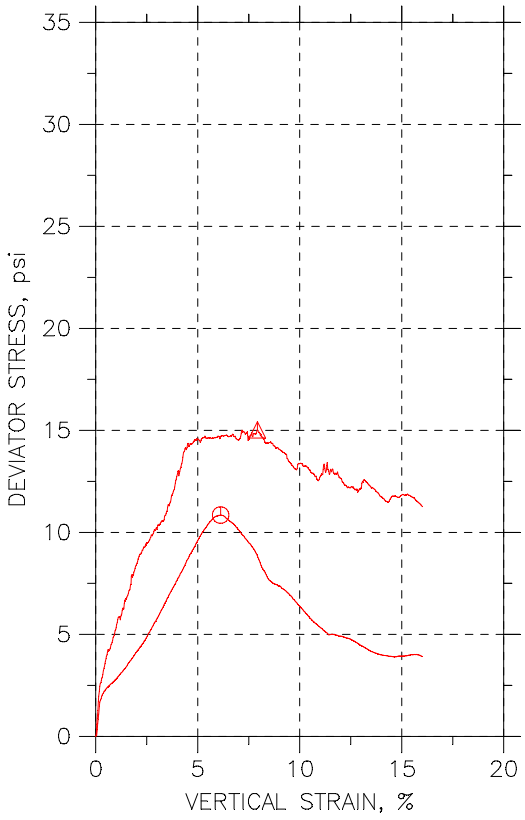
Phase calculations based on start and end of test.

Attachment Figure A.4-139

Wed, 13-MAR-2019 13:47:00

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0887 | SL0887 | | |
| Test No. | UU-18-1 | UU-18-2 | | |
| Depth | 53-55 ft | 53-55 ft | | |
| Tested by | trm | trm | | |
| Test Date | 1/28/19 | 1/28/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/14/19 | 3/14/19 | | |
| Diameter, in | 2.85 | 2.85 | | |
| Height, in | 6.15 | 6.1 | | |
| Water Content, % | 21.0 | 19.0 | | |
| Dry Density, pcf | 105.6 | 103. | | |
| Saturation, % | 95.4 | 80.5 | | |
| Void Ratio | 0.595 | 0.636 | | |
| Confining Stress, psi | 7 | 18 | | |
| Undrained Strength, psi | 5.424 | 7.511 | | |
| Max. Dev. Stress, psi | 10.85 | 15.02 | | |
| Strain at Failure, % | 6.12 | 7.93 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

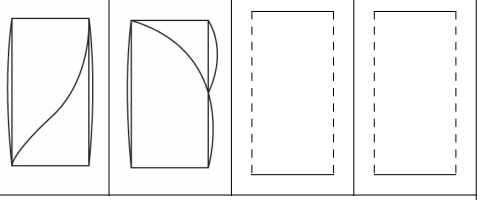
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB023

Sample Type: intact



Description: Moist, llight gray sand and clay

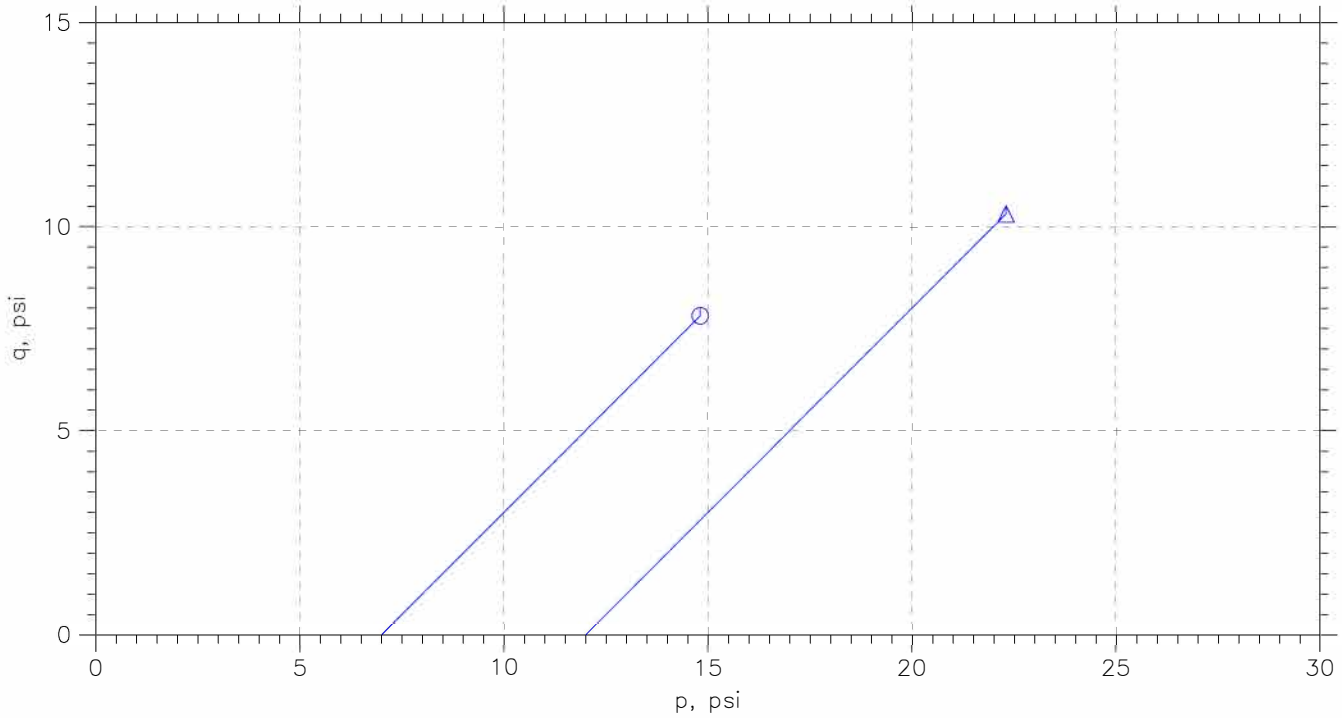
Remarks: System X

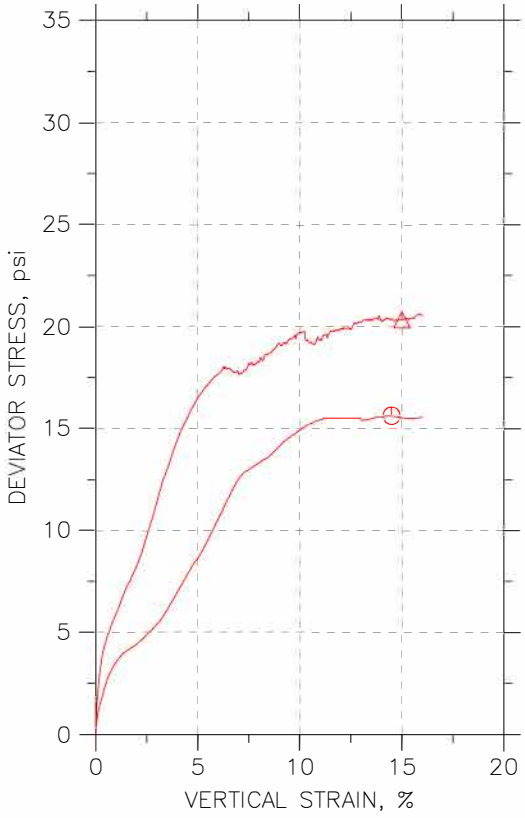
Phase calculations based on start and end of test.

Attachment Figure A.4-140

Thu, 14-MAR-2019 12:10:58

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0895 | SL0895 | | |
| Test No. | UU-14-1 | UU-14-2 | | |
| Depth | 34-36 ft | 34-36 ft | | |
| Tested by | trm | trm | | |
| Test Date | 1/29/19 | 1/29/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/13/19 | 3/13/19 | | |
| Diameter, in | 2.85 | 2.84 | | |
| Height, in | 6 | 6 | | |
| Water Content, % | 21.5 | 19.9 | | |
| Dry Density, pcf | 100.3 | 105.1 | | |
| Saturation, % | 85.5 | 88.9 | | |
| Void Ratio | 0.68 | 0.604 | | |
| Confining Stress, psi | 7 | 12 | | |
| Undrained Strength, psi | 7.811 | 10.16 | | |
| Max. Dev. Stress, psi | 15.62 | 20.33 | | |
| Strain at Failure, % | 14.5 | 15 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

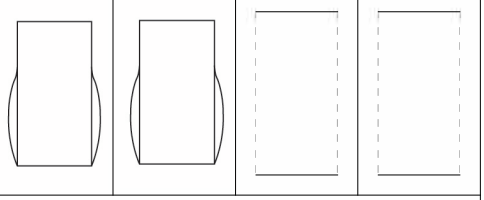
Project No.: GTX-309154

Boring No.: SJGB038

Sample Type: intact

Description: Moist, brown and reddish brown clay

Remarks: System Q

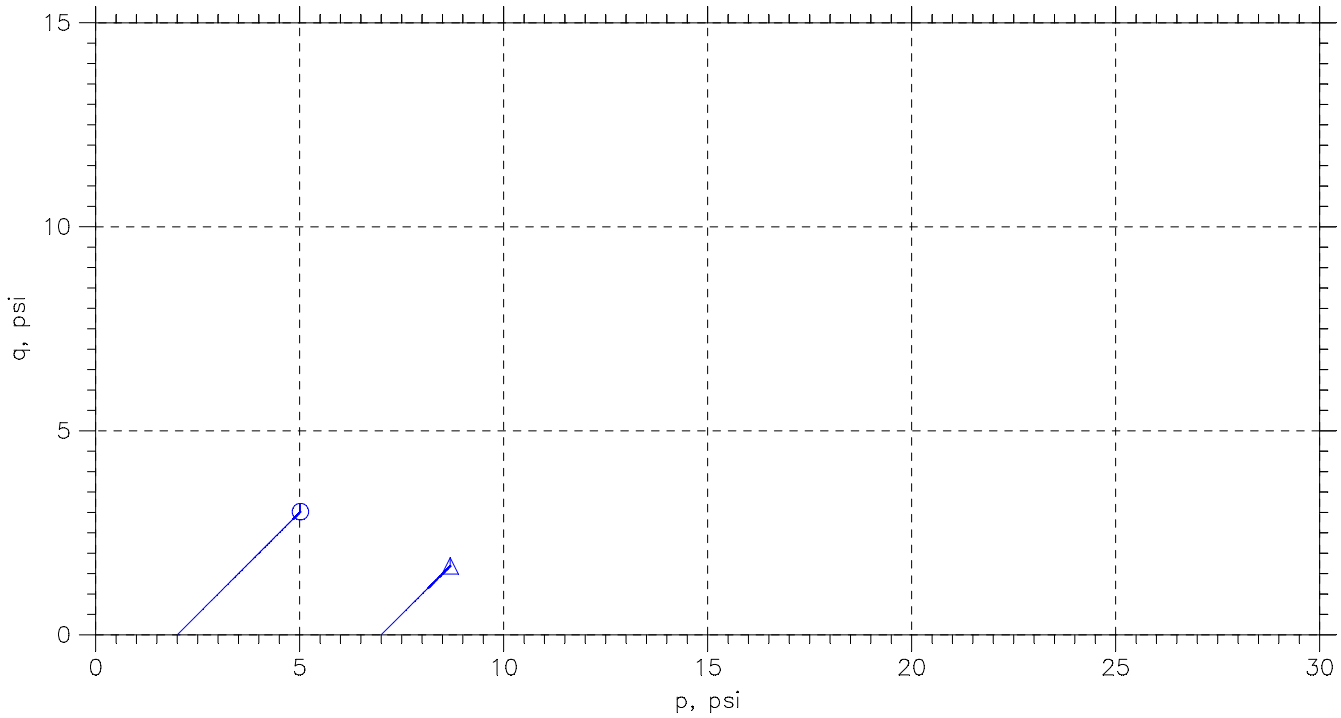


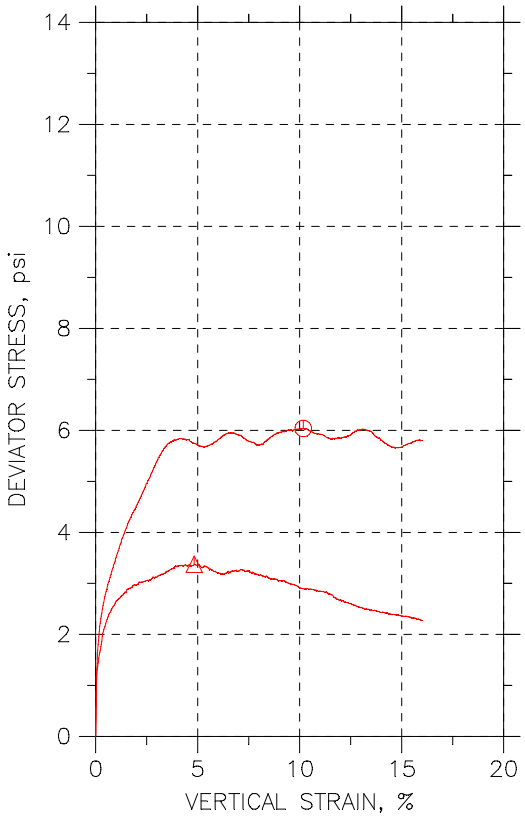
Phase calculations based on start and end of test.

Attachment Figure A.4-141

Wed, 13-MAR-2019 16:38:45

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL1038 | SL1038 | | |
| Test No. | UU-4-1 | UU-4-2 | | |
| Depth | 4-6 ft | 4-6 ft | | |
| Tested by | trm | trm | | |
| Test Date | 12/26/18 | 12/26/18 | | |
| Checked by | njh | njh | | |
| Check Date | 2/28/19 | 2/28/19 | | |
| Diameter, in | 2.86 | 2.83 | | |
| Height, in | 6.25 | 5.85 | | |
| Water Content, % | 29.4 | 20.9 | | |
| Dry Density, pcf | 82.8 | 87.81 | | |
| Saturation, % | 76.7 | 61.5 | | |
| Void Ratio | 1.04 | 0.92 | | |
| Confining Stress, psi | 2 | 7 | | |
| Undrained Strength, psi | 3.018 | 1.688 | | |
| Max. Dev. Stress, psi | 6.037 | 3.375 | | |
| Strain at Failure, % | 10.2 | 4.83 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

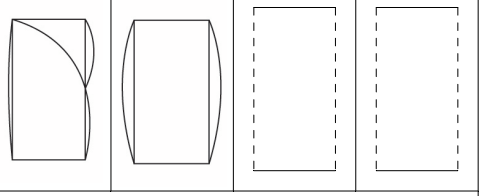
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB025

Sample Type: intact



Description: Moist, grayish brown sandy clay

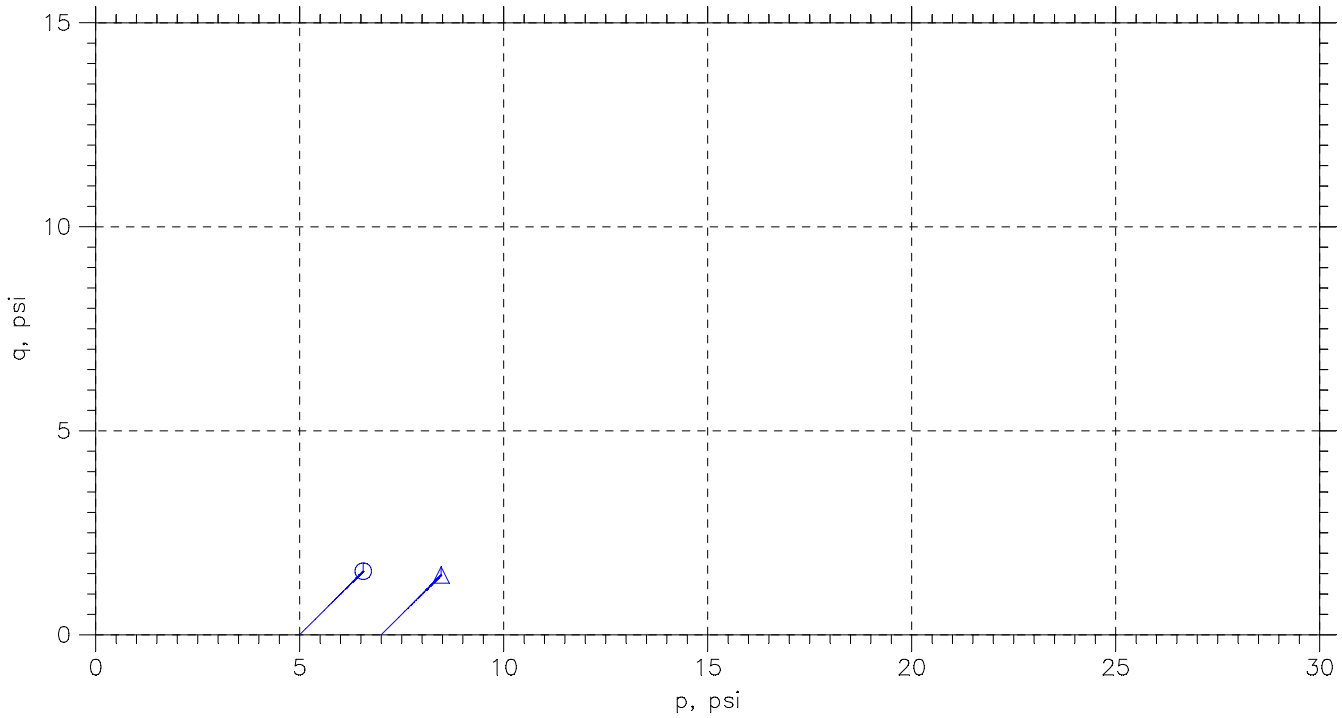
Remarks: System W

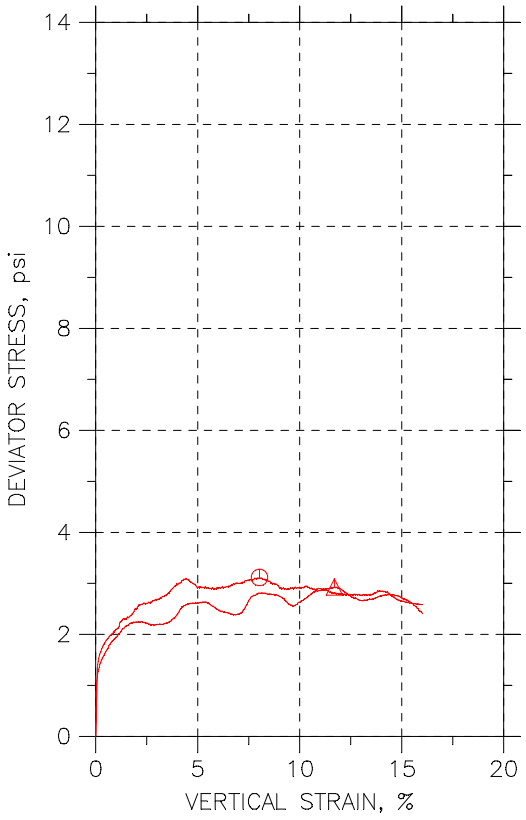
Phase calculations based on start and end of test.

Attachment Figure A.4-142

Thu, 28-FEB-2019 15:37:41

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0805 | SL0805 | | |
| Test No. | UU-7-1 | UU-7-2 | | |
| Depth | 20-22 ft | 20-22 ft | | |
| Tested by | trm | trm | | |
| Test Date | 12/27/18 | 12/27/18 | | |
| Checked by | njh | njh | | |
| Check Date | 3/1/19 | 3/1/19 | | |
| Diameter, in | 2.83 | 2.83 | | |
| Height, in | 6.45 | 6.05 | | |
| Water Content, % | 31.0 | 43.1 | | |
| Dry Density, pcf | 81.79 | 77.78 | | |
| Saturation, % | 78.9 | 99.8 | | |
| Void Ratio | 1.06 | 1.17 | | |
| Confining Stress, psi | 5 | 7 | | |
| Undrained Strength, psi | 1.558 | 1.464 | | |
| Max. Dev. Stress, psi | 3.116 | 2.929 | | |
| Strain at Failure, % | 8.03 | 11.7 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

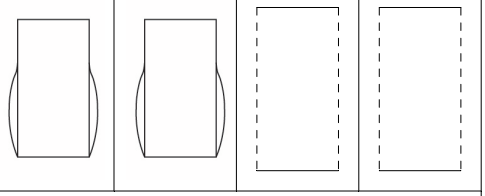
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB028

Sample Type: intact



Description: Moist, gray sandy clay

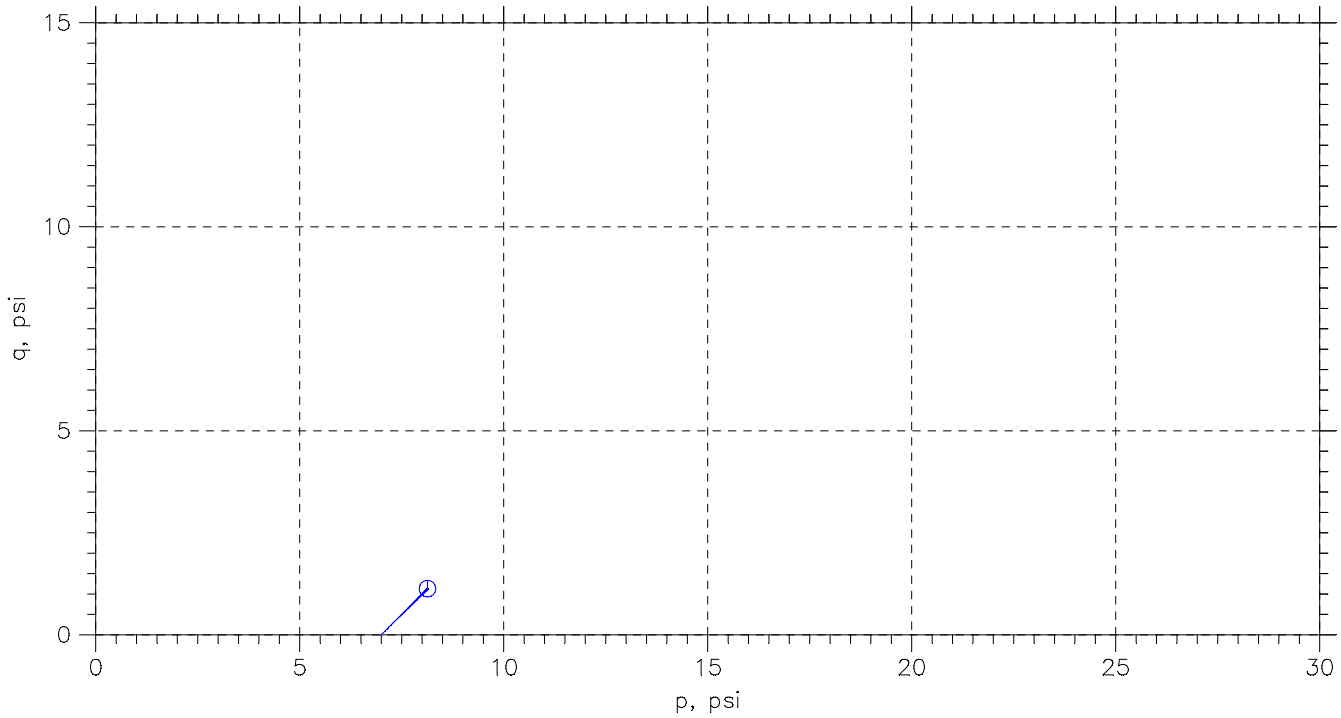
Remarks: System W

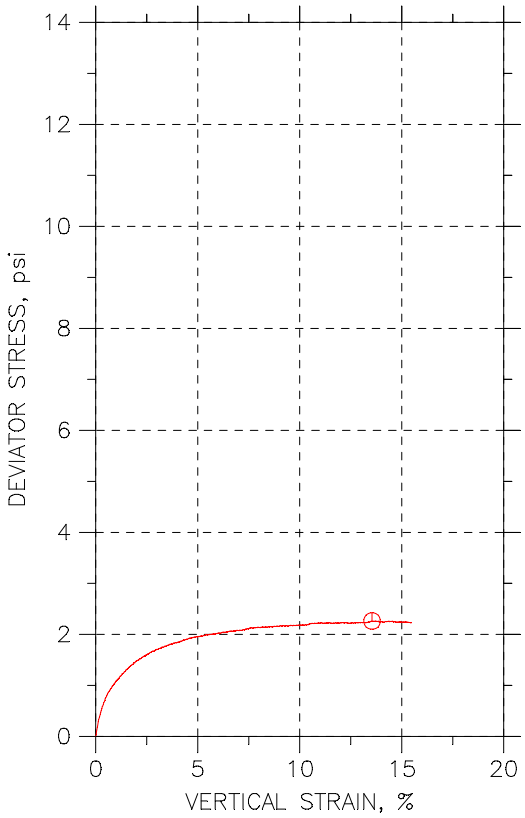
Phase calculations based on start and end of test.

Attachment Figure A.4-143

Fri, 01-MAR-2019 12:26:24

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | | | |
|---|---|---|---|---|
| Sample No. | SL0612 | | | |
| Test No. | UU-9 | | | |
| Depth | 5-7 ft | | | |
| Tested by | trm | | | |
| Test Date | 1/2/19 | | | |
| Checked by | njh | | | |
| Check Date | 3/1/19 | | | |
| Diameter, in | 2.82 | | | |
| Height, in | 6.6 | | | |
| Water Content, % | 29.8 | | | |
| Dry Density, pcf | 86.92 | | | |
| Saturation, % | 85.7 | | | |
| Void Ratio | 0.939 | | | |
| Confining Stress, psi | 7 | | | |
| Undrained Strength, psi | 1.131 | | | |
| Max. Dev. Stress, psi | 2.262 | | | |
| Strain at Failure, % | 13.5 | | | |
| Strain Rate, %/min | 1 | | | |
| Estimated Specific Gravity | 2.7 | | | |
| Liquid Limit | --- | | | |
| Plastic Limit | --- | | | |
| Plasticity Index | --- | | | |

GeoTesting EXPRESS

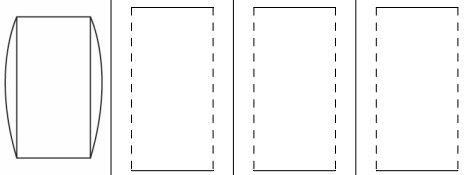
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB029

Sample Type: intact



Description: Moist, gray sandy clay

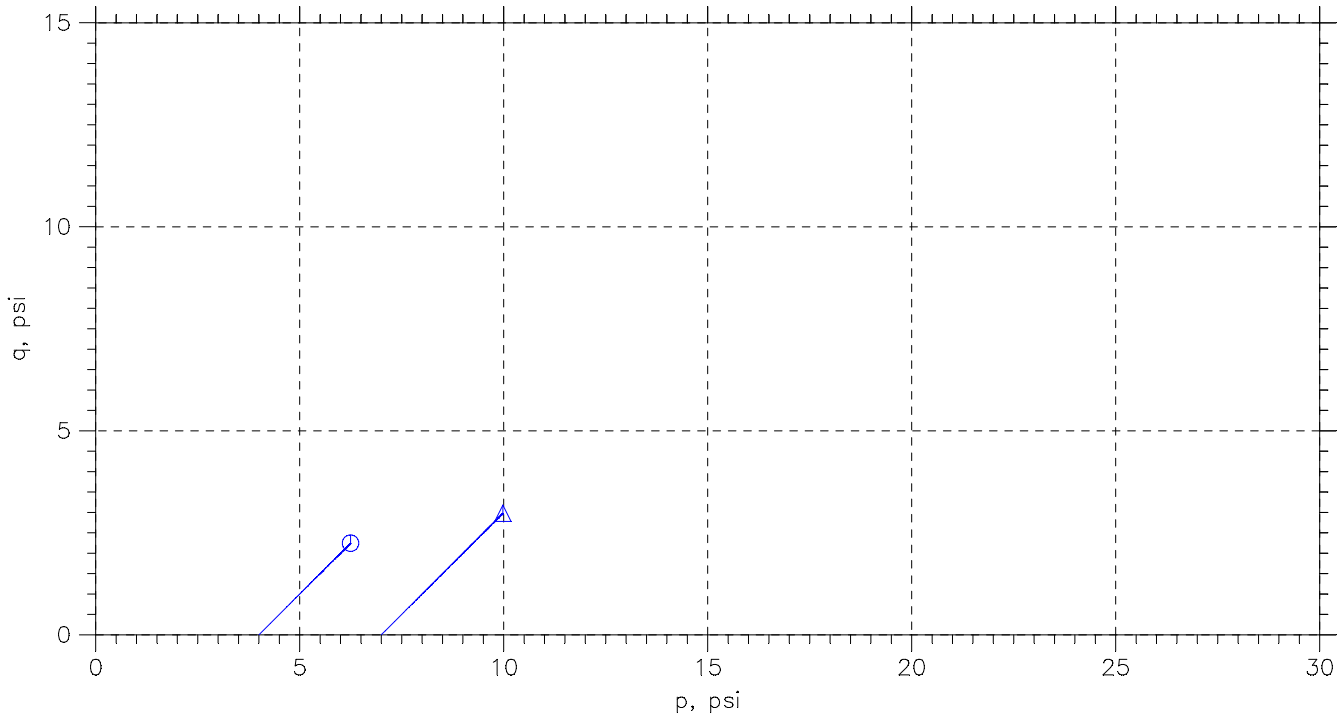
Remarks: System II

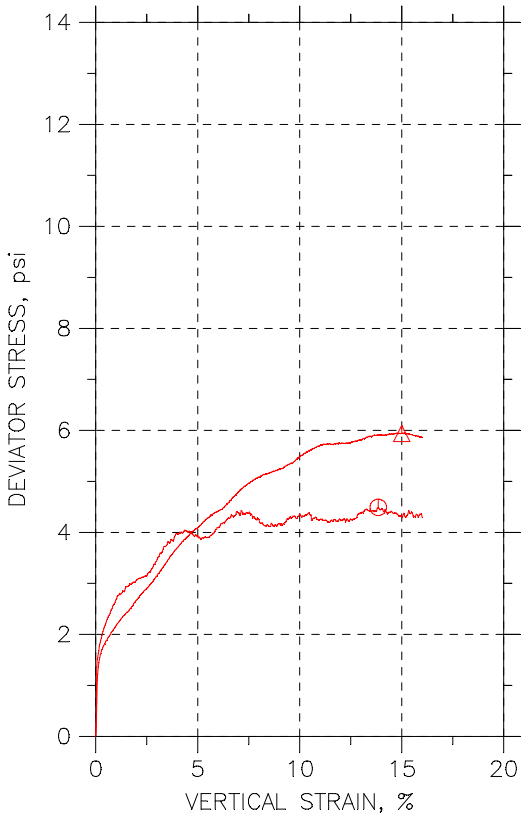
Phase calculations based on start and end of test.

Attachment Figure A.4-144

Fri, 01-MAR-2019 12:47:58

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0698 | SL0698 | | |
| Test No. | UU-8-1 | UU-8-2 | | |
| Depth | 8-10 ft | 8-10 ft | | |
| Tested by | trm | trm | | |
| Test Date | 12/27/18 | 12/27/18 | | |
| Checked by | njh | njh | | |
| Check Date | 3/1/19 | 3/1/19 | | |
| Diameter, in | 2.85 | 2.84 | | |
| Height, in | 6.2 | 5.95 | | |
| Water Content, % | 21.4 | 21.4 | | |
| Dry Density, pcf | 92.42 | 101.7 | | |
| Saturation, % | 70.2 | 88.1 | | |
| Void Ratio | 0.824 | 0.657 | | |
| Confining Stress, psi | 4 | 7 | | |
| Undrained Strength, psi | 2.245 | 2.97 | | |
| Max. Dev. Stress, psi | 4.491 | 5.941 | | |
| Strain at Failure, % | 13.9 | 15 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

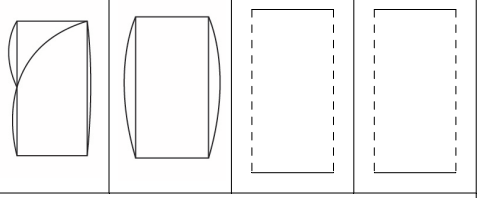
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB030

Sample Type: intact



Description: Moist, brownish gray sandy clay

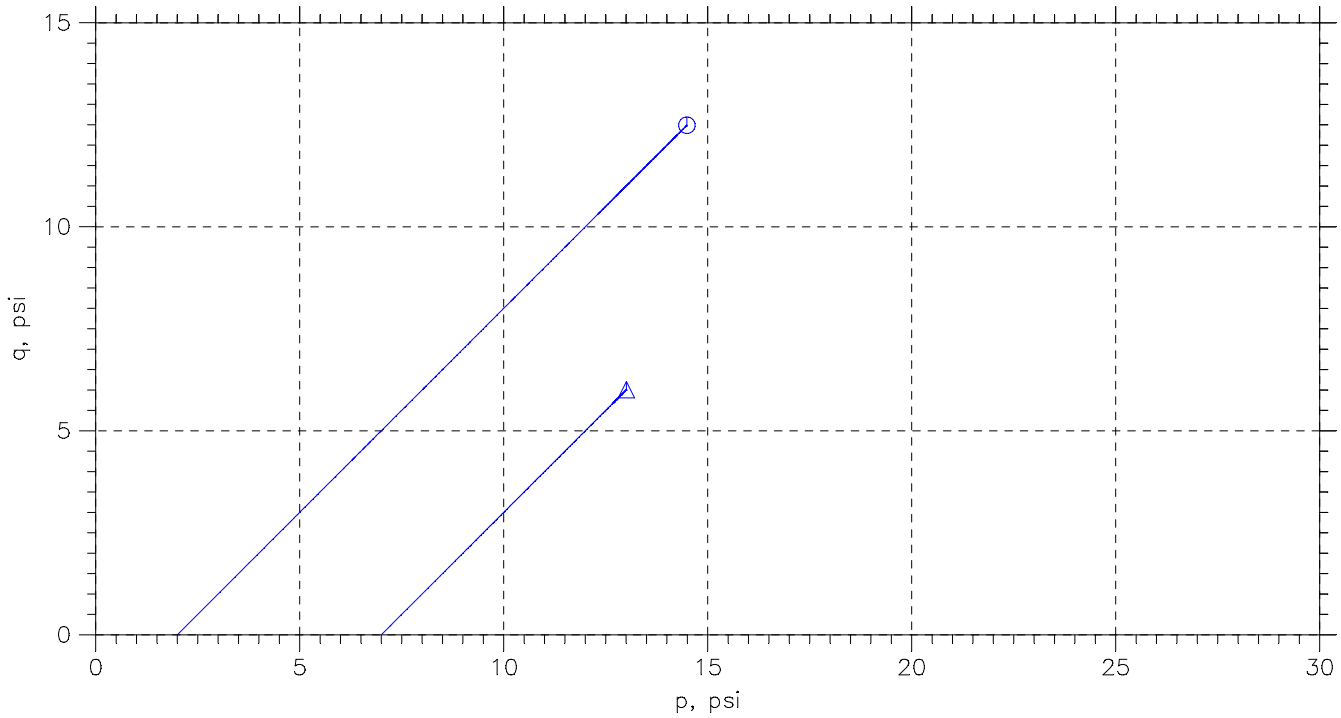
Remarks: System W

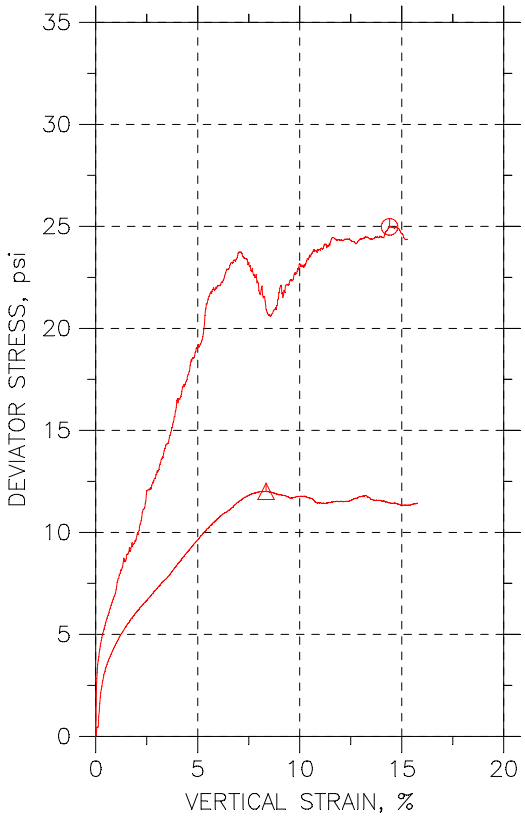
Phase calculations based on start and end of test.

Attachment Figure A.4-145

Fri, 01-MAR-2019 12:41:39

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0626 | SL0626 | | |
| Test No. | UU-13-1 | UU-13-2 | | |
| Depth | --- | --- | | |
| Tested by | trm | trm | | |
| Test Date | 1/29/19 | 1/29/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/13/19 | 3/13/19 | | |
| Diameter, in | 2.86 | 2.83 | | |
| Height, in | 6 | 6.6 | | |
| Water Content, % | 20.8 | 20.9 | | |
| Dry Density, pcf | 101.6 | 100.8 | | |
| Saturation, % | 85.3 | 84.2 | | |
| Void Ratio | 0.659 | 0.672 | | |
| Confining Stress, psi | 2 | 7 | | |
| Undrained Strength, psi | 12.49 | 6.006 | | |
| Max. Dev. Stress, psi | 24.98 | 12.01 | | |
| Strain at Failure, % | 14.4 | 8.35 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

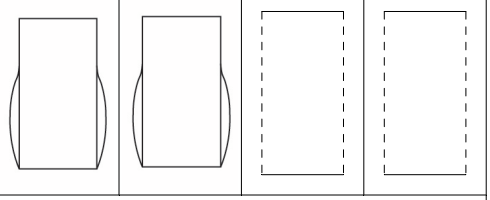
Project No.: GTX-309154

Boring No.: SJSB031

Sample Type: intact

Description: Moist, brown clay with sand

Remarks: System Q

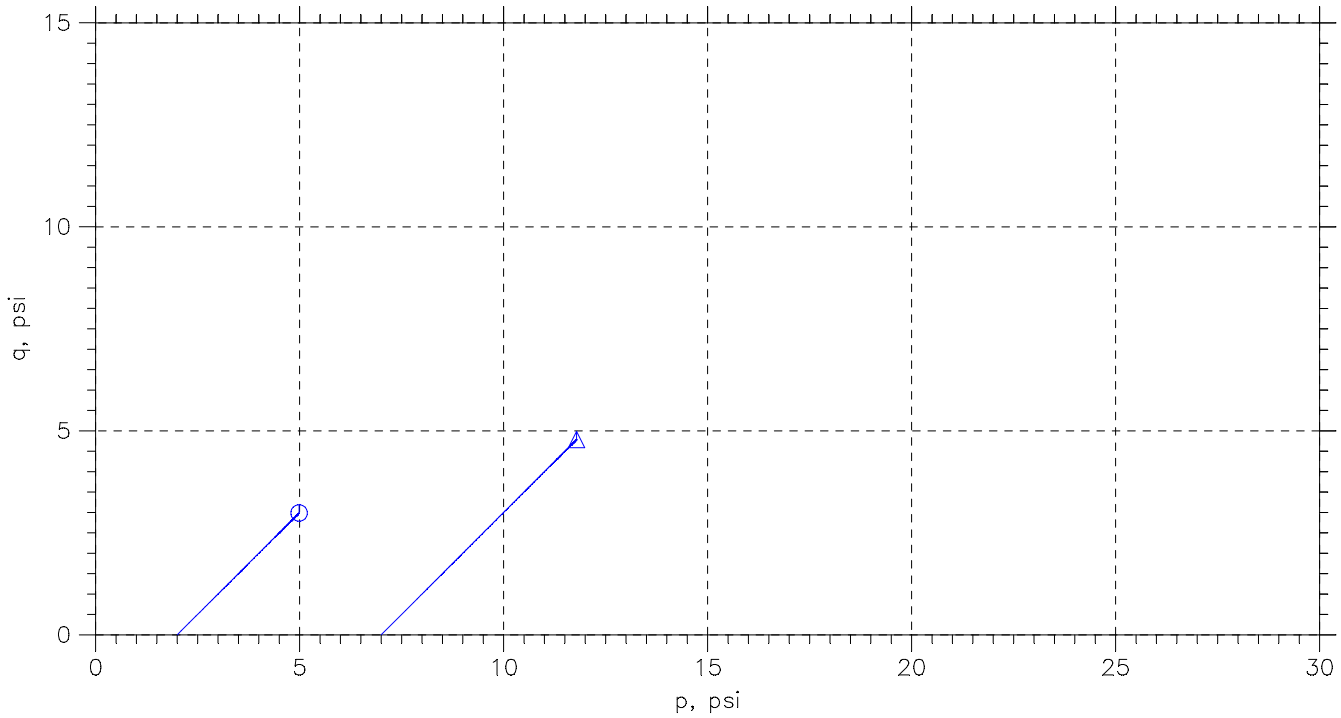


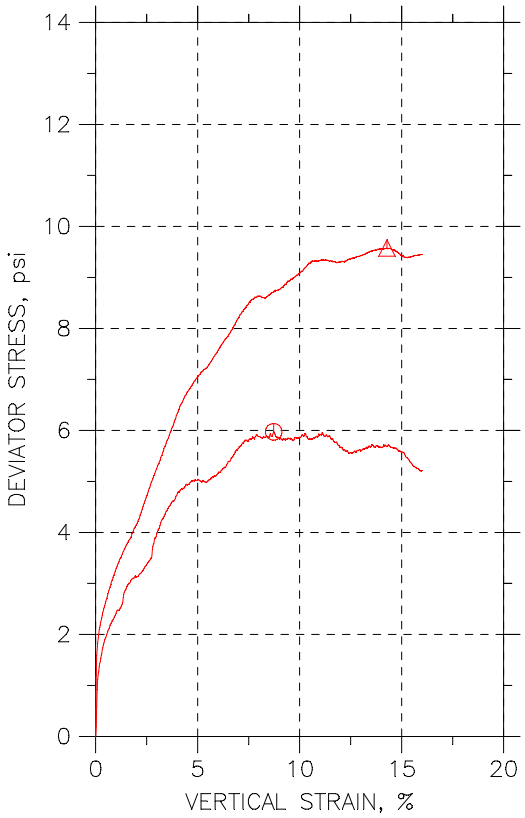
Phase calculations based on start and end of test.

Attachment Figure A.4-146

Wed, 13-MAR-2019 16:11:11

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0686 | SL0686 | | |
| Test No. | UU-5-1 | UU-5-2 | | |
| Depth | 5-7 ft | 5-7 ft | | |
| Tested by | trm | trm | | |
| Test Date | 12/27/18 | 12/27/18 | | |
| Checked by | njh | njh | | |
| Check Date | 2/28/19 | 2/28/19 | | |
| Diameter, in | 2.85 | 2.85 | | |
| Height, in | 6.05 | 6.12 | | |
| Water Content, % | 27.8 | 17.8 | | |
| Dry Density, pcf | 82.18 | 109.2 | | |
| Saturation, % | 71.4 | 88.6 | | |
| Void Ratio | 1.05 | 0.543 | | |
| Confining Stress, psi | 2 | 7 | | |
| Undrained Strength, psi | 2.987 | 4.788 | | |
| Max. Dev. Stress, psi | 5.973 | 9.576 | | |
| Strain at Failure, % | 8.73 | 14.3 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

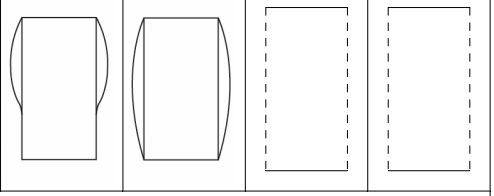
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB032

Sample Type: intact



Description: Moist, gray clay

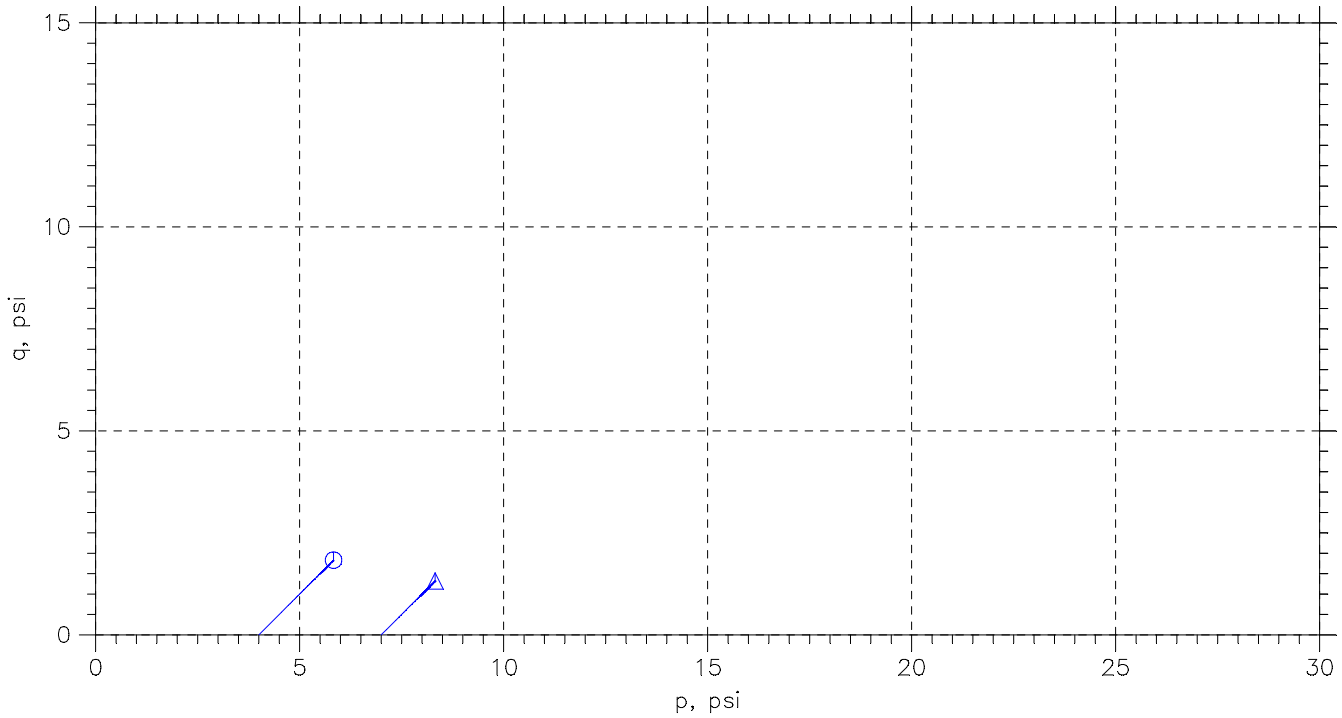
Remarks: System W

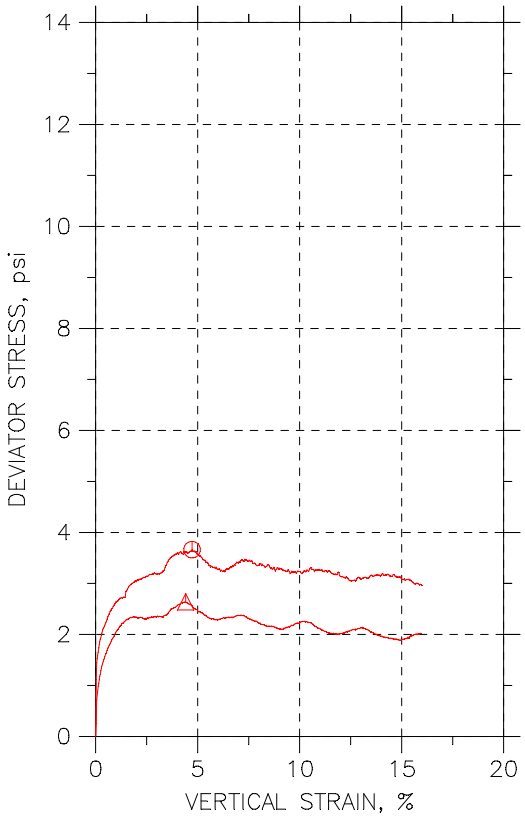
Phase calculations based on start and end of test.

Attachment Figure A.4-147

Thu, 28-FEB-2019 15:48:49

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0687 | SL0687 | | |
| Test No. | UU-6-1 | UU-6-2 | | |
| Depth | 10-12 ft | 10-12 ft | | |
| Tested by | trm | trm | | |
| Test Date | 12/27/18 | 12/27/18 | | |
| Checked by | njh | njh | | |
| Check Date | 2/28/19 | 2/28/19 | | |
| Diameter, in | 2.83 | 2.83 | | |
| Height, in | 6.25 | 6.8 | | |
| Water Content, % | 29.2 | 31.8 | | |
| Dry Density, pcf | 91.86 | 90.61 | | |
| Saturation, % | 94.5 | 99.9 | | |
| Void Ratio | 0.835 | 0.86 | | |
| Confining Stress, psi | 4 | 7 | | |
| Undrained Strength, psi | 1.831 | 1.32 | | |
| Max. Dev. Stress, psi | 3.662 | 2.64 | | |
| Strain at Failure, % | 4.73 | 4.41 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

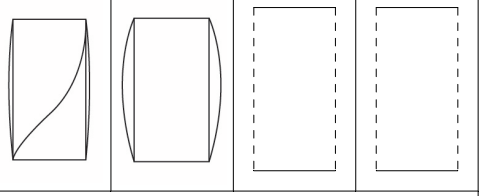
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB032

Sample Type: intact



Description: Moist, gray sandy clay

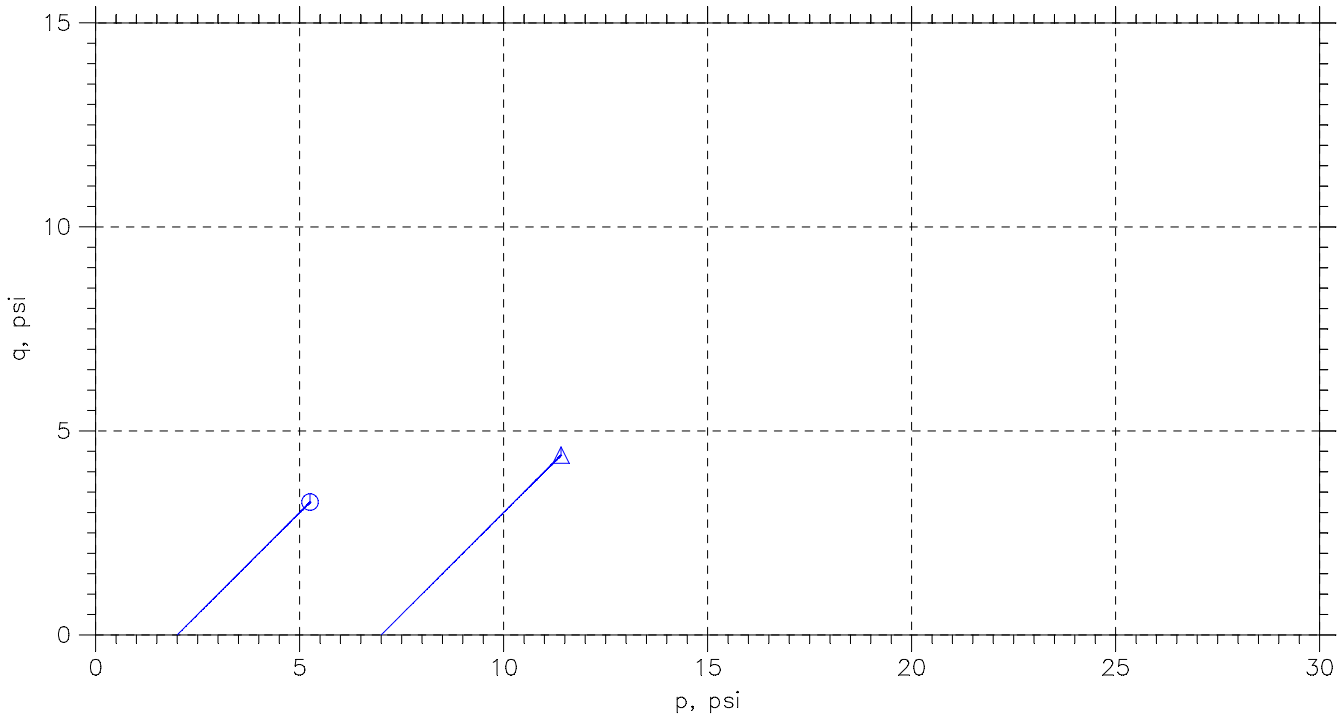
Remarks: System W

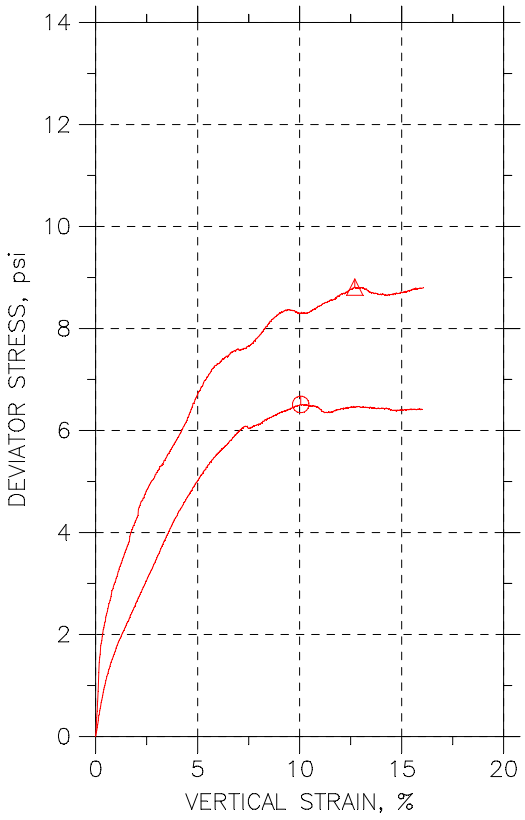
Phase calculations based on start and end of test.

Attachment Figure A.4-148

Thu, 28-FEB-2019 15:59:12

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0649 | SL0649 | | |
| Test No. | UU-1-1 | UU-1-2 | | |
| Depth | --- | --- | | |
| Tested by | trm | trm | | |
| Test Date | 12/26/18 | 12/26/18 | | |
| Checked by | njh | njh | | |
| Check Date | 2/28/19 | 2/28/19 | | |
| Diameter, in | 2.85 | 2.83 | | |
| Height, in | 6 | 5.8 | | |
| Water Content, % | 22.5 | 20.6 | | |
| Dry Density, pcf | 103.3 | 106.4 | | |
| Saturation, % | 96.0 | 95.0 | | |
| Void Ratio | 0.632 | 0.585 | | |
| Confining Stress, psi | 2 | 7 | | |
| Undrained Strength, psi | 3.255 | 4.405 | | |
| Max. Dev. Stress, psi | 6.511 | 8.81 | | |
| Strain at Failure, % | 10.1 | 12.7 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

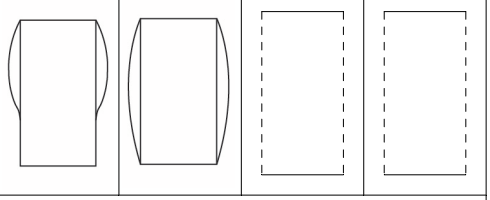
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB033

Sample Type: intact



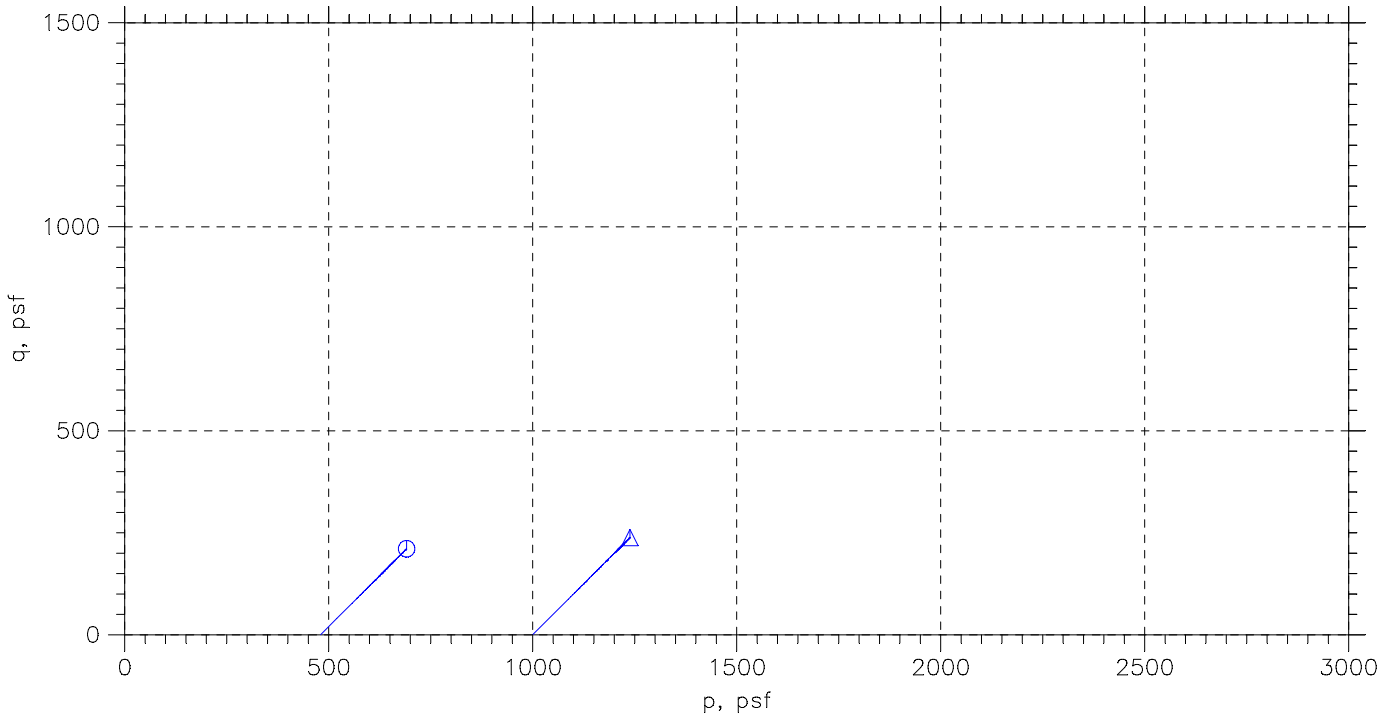
Description: Moist, gray sandy clay

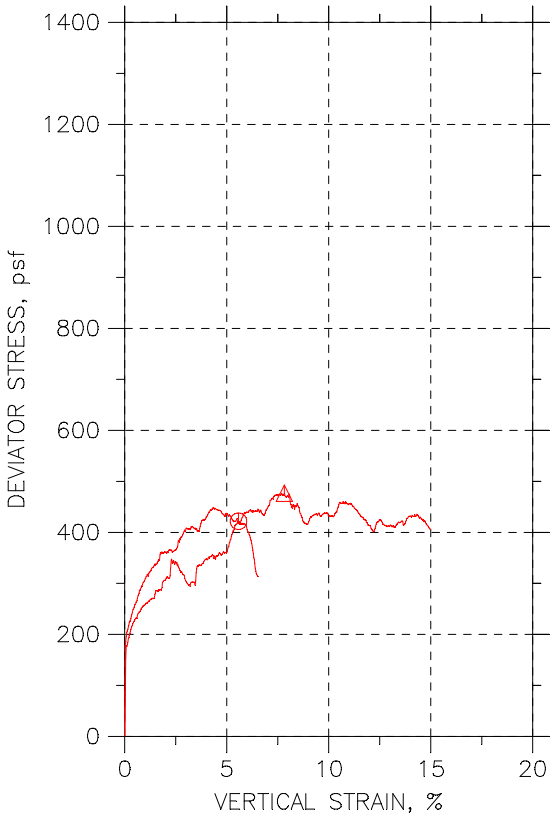
Remarks: System W

Phase calculations based on start and end of test.

Attachment Figure A.4-149

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0672 | SL0672 | | |
| Test No. | UU-19-1 | UU-19-2 | | |
| Depth | 2-4 ft | 2-4 ft | | |
| Tested by | trm | trm | | |
| Test Date | 2/11/19 | 2/11/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/14/19 | 3/14/19 | | |
| Diameter, in | 2.84 | 2.84 | | |
| Height, in | 5.9 | 6 | | |
| Water Content, % | 80.1 | 71.8 | | |
| Dry Density, pcf | 45.45 | 53.38 | | |
| Saturation, % | 79.8 | 89.9 | | |
| Void Ratio | 2.71 | 2.16 | | |
| Confining Stress, psf | 480 | 1000 | | |
| Undrained Strength, psf | 210.9 | 238.3 | | |
| Max. Dev. Stress, psf | 421.8 | 476.6 | | |
| Strain at Failure, % | 5.58 | 7.83 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

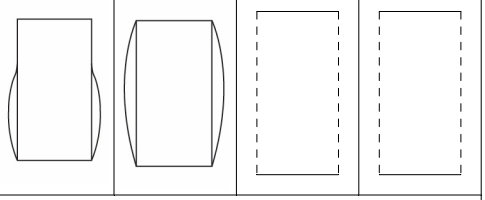
Project No.: GTX-309154

Boring No.: SJSB036

Sample Type: intact

Description: Moist, brown clay

Remarks: System II

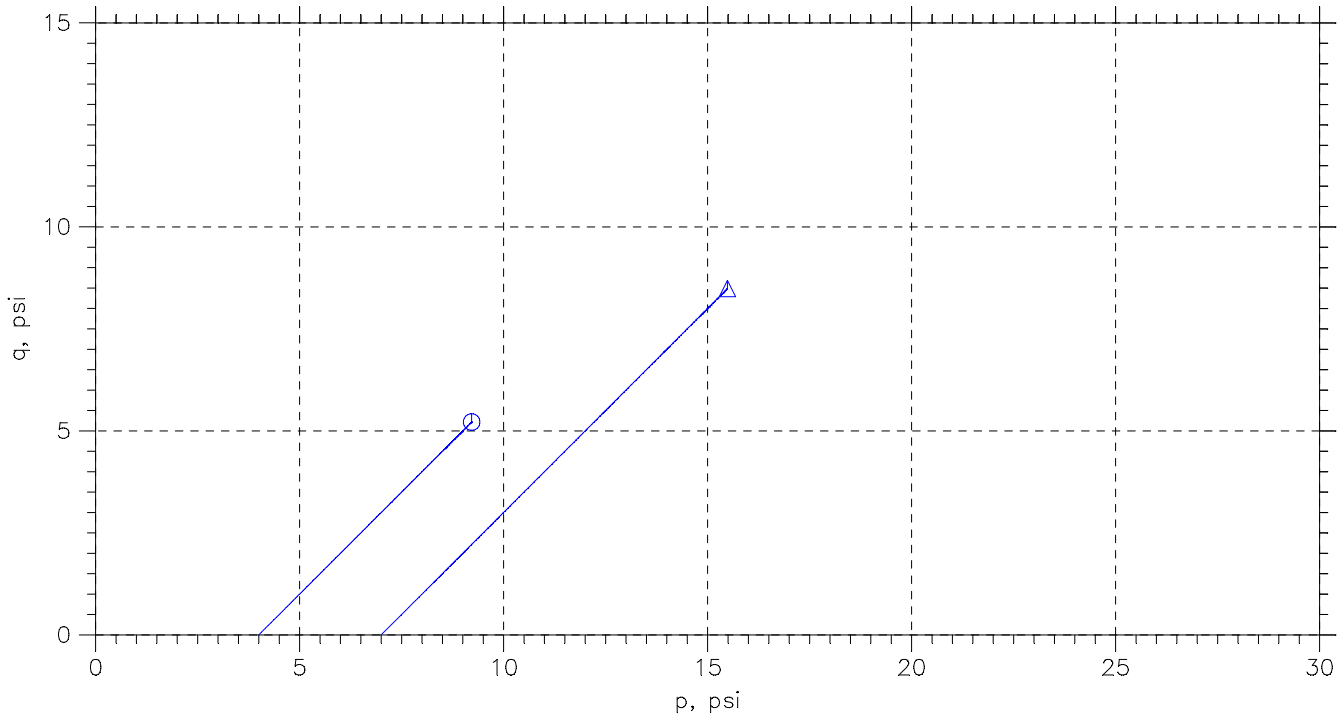


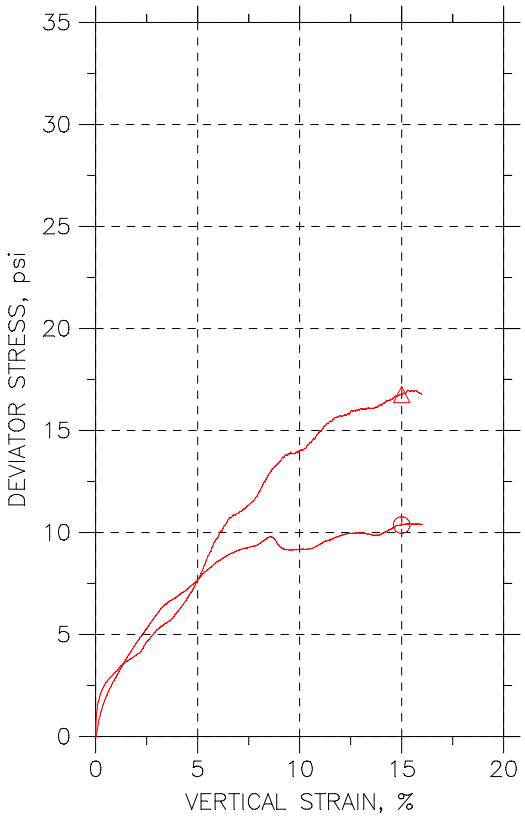
Phase calculations based on start and end of test.

Attachment Figure A.4-150

Thu, 14-MAR-2019 12:58:46

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0673 | SL0673 | | |
| Test No. | UU-2-1 | UU-2-2 | | |
| Depth | 6-8 ft | 6-8 ft | | |
| Tested by | trm | trm | | |
| Test Date | 12/26/18 | 12/26/18 | | |
| Checked by | njh | njh | | |
| Check Date | 2/28/19 | 2/28/19 | | |
| Diameter, in | 2.85 | 2.83 | | |
| Height, in | 6.6 | 6.9 | | |
| Water Content, % | 18.1 | 17.9 | | |
| Dry Density, pcf | 106.3 | 102.7 | | |
| Saturation, % | 83.6 | 75.5 | | |
| Void Ratio | 0.586 | 0.641 | | |
| Confining Stress, psi | 4 | 7 | | |
| Undrained Strength, psi | 5.184 | 8.382 | | |
| Max. Dev. Stress, psi | 10.37 | 16.76 | | |
| Strain at Failure, % | 15 | 15 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

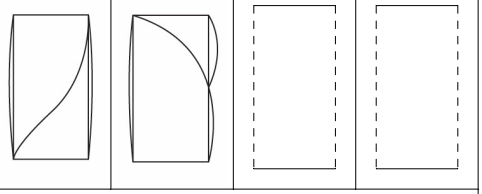
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB036

Sample Type: intact



Description: Moist, gray sandy clay

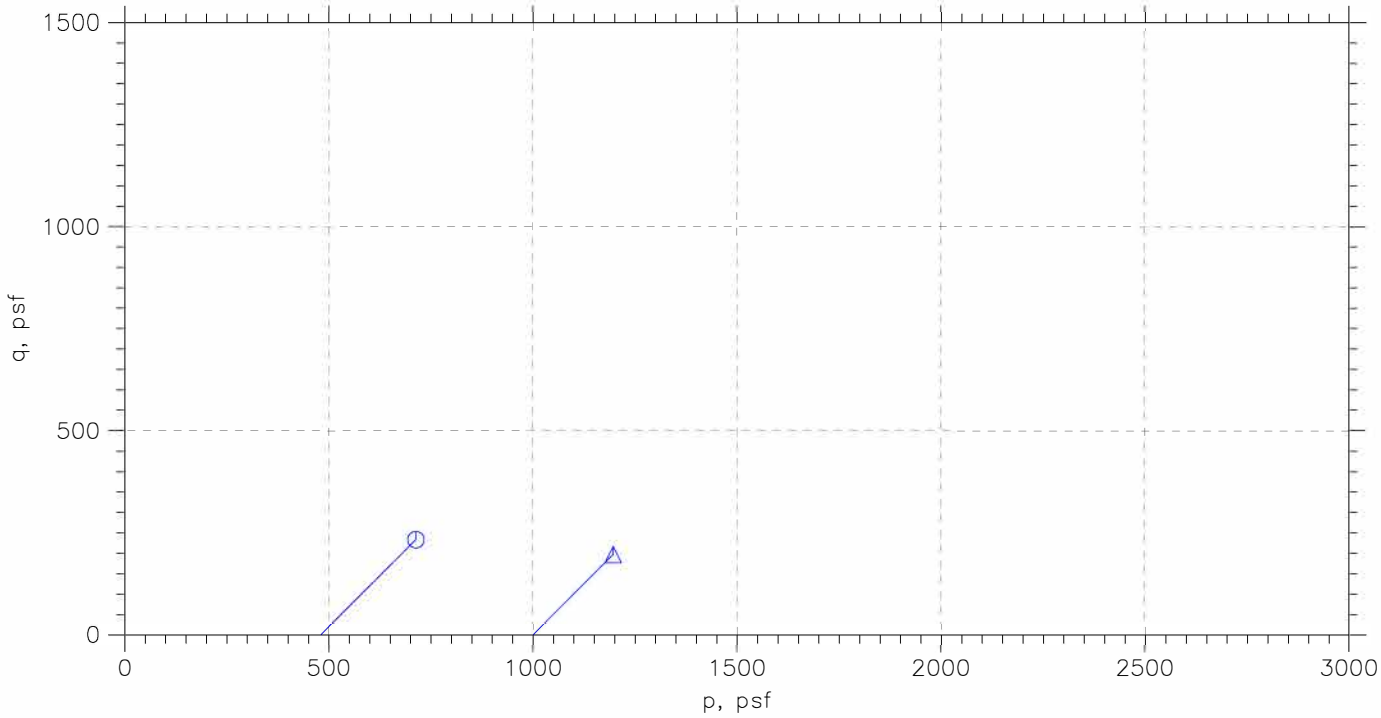
Remarks: System W

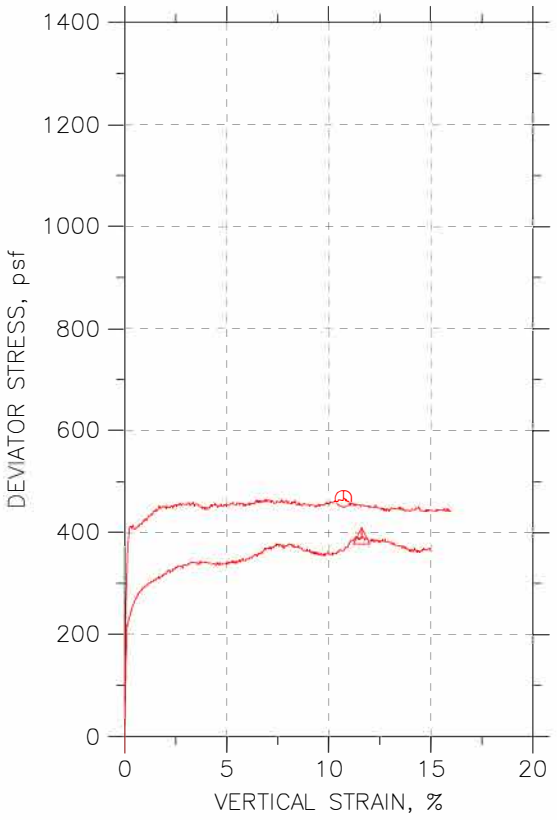
Phase calculations based on start and end of test.

Attachment Figure A.4-151

Thu, 28-FEB-2019 09:36:56

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0662 | SL-0662 | | |
| Test No. | UU-20-1 | UU-20-2 | | |
| Depth | 2-4 ft | 2-4 ft | | |
| Tested by | trm | trm | | |
| Test Date | 2/11/19 | 2/11/19 | | |
| Checked by | njh | njh | | |
| Check Date | 3/14/19 | 3/14/19 | | |
| Diameter, in | 1.93 | 1.93 | | |
| Height, in | 4.4 | 4.52 | | |
| Water Content, % | 107.9 | 119.0 | | |
| Dry Density, pcf | 40.29 | 38.15 | | |
| Saturation, % | 91.5 | 94.0 | | |
| Void Ratio | 3.18 | 3.42 | | |
| Confining Stress, psf | 480 | 1000 | | |
| Undrained Strength, psf | 233.2 | 196.6 | | |
| Max. Dev. Stress, psf | 466.4 | 393.1 | | |
| Strain at Failure, % | 10.7 | 11.6 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

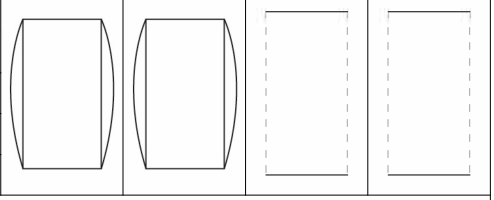
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB037

Sample Type: intact



Description: Wet, gray silty clay

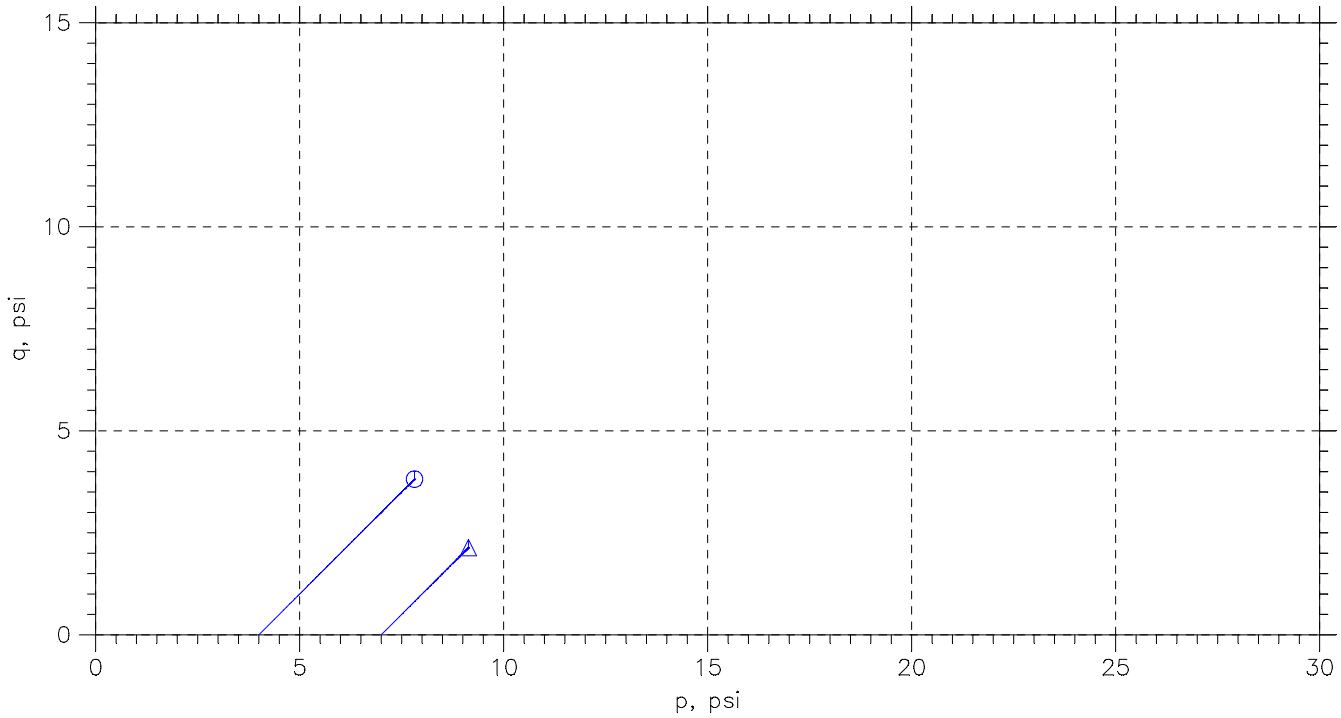
Remarks: System II

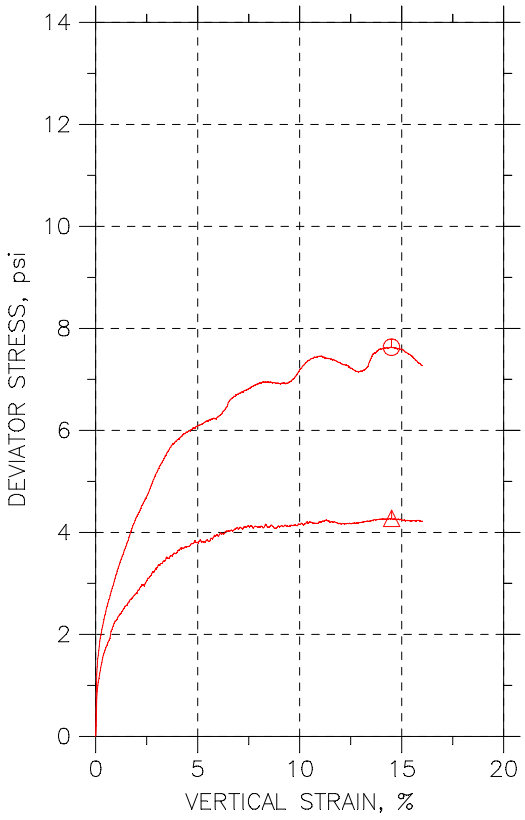
Phase calculations based on start and end of test.

Attachment Figure A.4-152

Thu, 14-MAR-2019 13:30:21

# UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850




| Symbol | ⏲ | △ | | |
|---|---|---|---|---|
| Sample No. | SL0663 | SL0663 | | |
| Test No. | UU-3-1 | UU-3-2 | | |
| Depth | 8-10 ft | 8-10 ft | | |
| Tested by | trm | trm | | |
| Test Date | 12/26/18 | 12/26/18 | | |
| Checked by | njh | njh | | |
| Check Date | 2/28/19 | 2/28/19 | | |
| Diameter, in | 2.83 | 2.84 | | |
| Height, in | 5.75 | 5.95 | | |
| Water Content, % | 25.9 | 24.1 | | |
| Dry Density, pcf | 94.44 | 94.21 | | |
| Saturation, % | 89.0 | 82.6 | | |
| Void Ratio | 0.785 | 0.789 | | |
| Confining Stress, psi | 4 | 7 | | |
| Undrained Strength, psi | 3.815 | 2.137 | | |
| Max. Dev. Stress, psi | 7.63 | 4.273 | | |
| Strain at Failure, % | 14.5 | 14.5 | | |
| Strain Rate, %/min | 1 | 1 | | |
| Estimated Specific Gravity | 2.7 | 2.7 | | |
| Liquid Limit | --- | --- | | |
| Plastic Limit | --- | --- | | |
| Plasticity Index | --- | --- | | |

GeoTesting EXPRESS

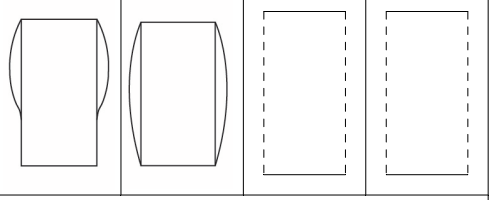
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB037

Sample Type: intact



Description: Moist, gray sandy clay

Remarks: System W

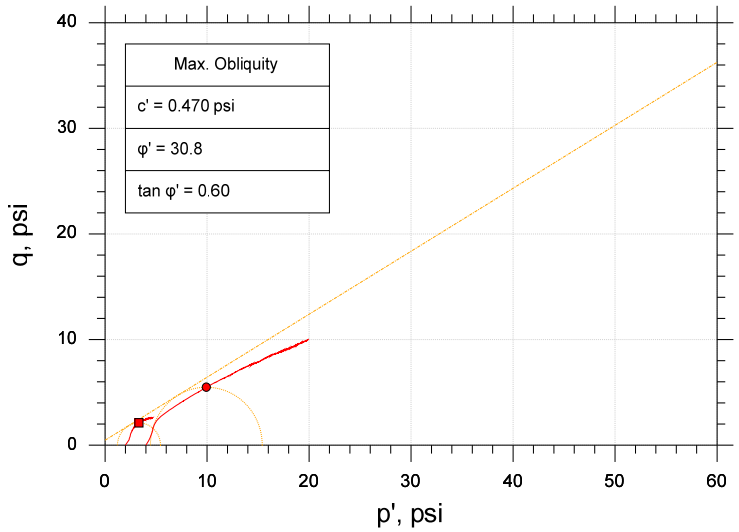
Phase calculations based on start and end of test.

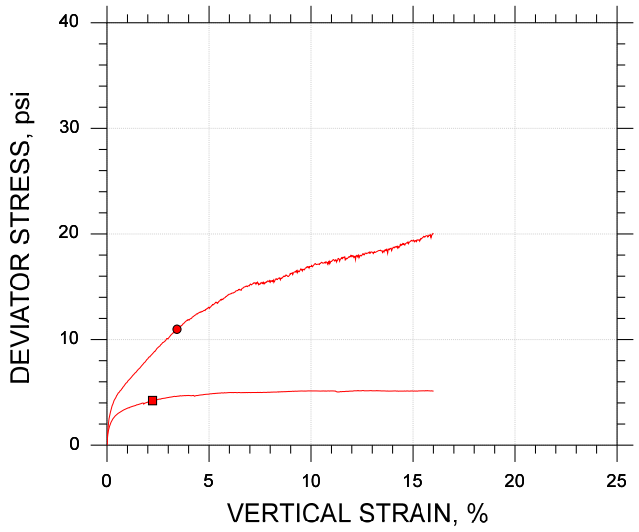
Attachment Figure A.4-153

Thu, 28-FEB-2019 11:05:41

| | |
|---|---|
| Client: Anchor QEA, LLC | |
| Project Name: San Jacinto Pre-Design | |
| Project Location: --- | |
| Project Number: GTX-309154 | |
| Tested By: trm | Checked By: njh |
| Boring ID: SJGB018 | |
| Preparation: Intact | |
| Description: Moist, gray clay with sand | |
| Classification: --- | |
| Group Symbol: --- | |
| Liquid Limit: --- | Plastic Limit: --- |
| Plasticity Index: --- | Estimated Specific Gravity: 2.7 |

## CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

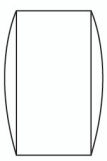


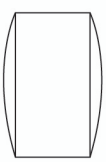




| | | | | | |
|---|---|---|---|---|---|
| Symbol | | ■ | ● | | |
| Sample ID | | SL0863 | SL0863 | | |
| Depth, ft | | 12-14 | 12-14 | | |
| Test Number | | CU-7-1 | CU-7-2 | | |
| Initial | Height, in | 6.100 | 6.070 | | |
| | Diameter, in | 2.870 | 2.880 | | |
| | Moisture Content (from Cuttings), % | 13.6 | 10.6 | | |
| | Dry Density, pcf | 104. | 111. | | |
| | Saturation (Wet Method), % | 58.8 | 54.4 | | |
| | Void Ratio | 0.623 | 0.524 | | |
| Before Shear | Moisture Content, % | 23.0 | 19.3 | | |
| | Dry Density, pcf | 104. | 111. | | |
| | Cross-sectional Area (Method A), in² | 6.450 | 6.499 | | |
| | Saturation, % | 100.0 | 100.0 | | |
| | Void Ratio | 0.620 | 0.520 | | |
| | Back Pressure, psi | 126.9 | 145.0 | | |
| Vertical Effective Consolidation Stress, psi | | 1.996 | 4.000 | | |
| Horizontal Effective Consolidation Stress, psi | | 1.994 | 3.997 | | |
| Vertical Strain after Consolidation, % | | -0.002507 | 0.04992 | | |
| Volumetric Strain after Consolidation, % | | 0.4965 | 0.2225 | | |
| Time to 50% Consolidation, min | | --- | 0.2500 | | |
| Shear Strength, psi | | 2.108 | 5.487 | | |
| Strain at Failure, % | | 2.23 | 3.43 | | |
| Strain Rate, %/min | | 0.01600 | 0.01600 | | |
| Deviator Stress at Failure, psi | | 4.217 | 10.97 | | |
| Effective Minor Principal Stress at Failure, psi | | 1.220 | 4.437 | | |
| Effective Major Principal Stress at Failure, psi | | 5.437 | 15.41 | | |
| B-Value | | 0.95 | 0.95 | | |

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

Remarks:

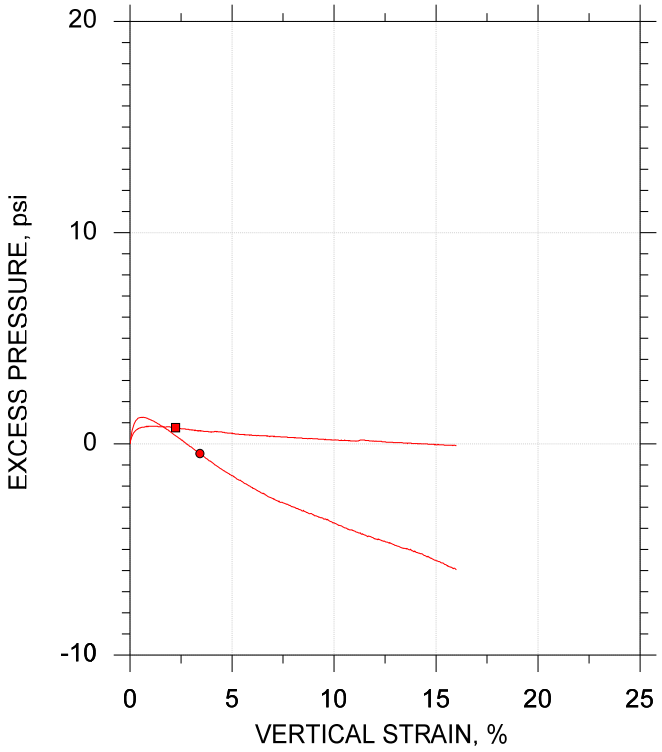


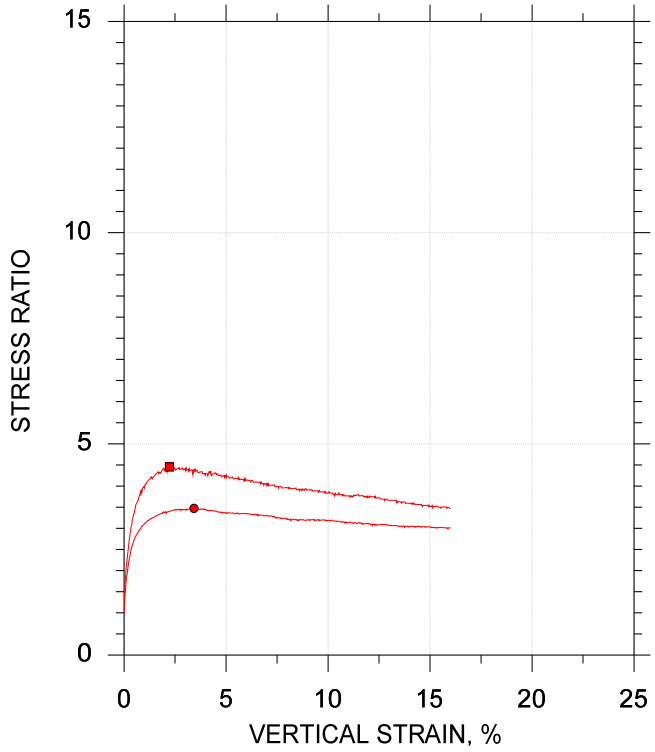


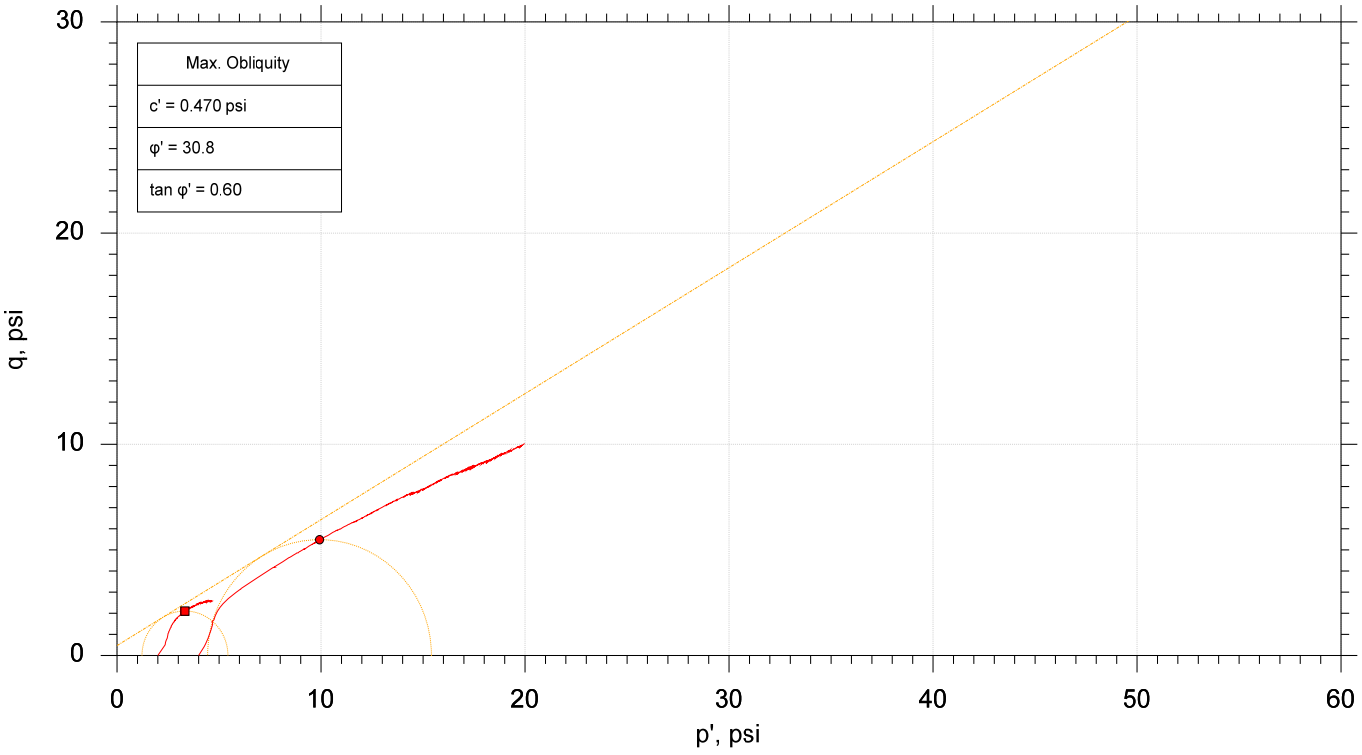
System T

Attachment Figure A.4-154

# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | Sample No. | Test No. | Depth | Tested By | Test Date | Checked By | Check Date | Test File |
|---|---|---|---|---|---|---|---|---|
| ■ | SL0863 | CU-7-1 | 12-14 | trm | 3/7/19 | njh | --- | 309154-CU-7-1n.dat |
| ● | SL0863 | CU-7-2 | 12-14 | trm | 3/7/19 | njh | 3/14/19 | 309154-CU-7-2n.dat |
| | | | | | | | | |
| | | | | | | | | |

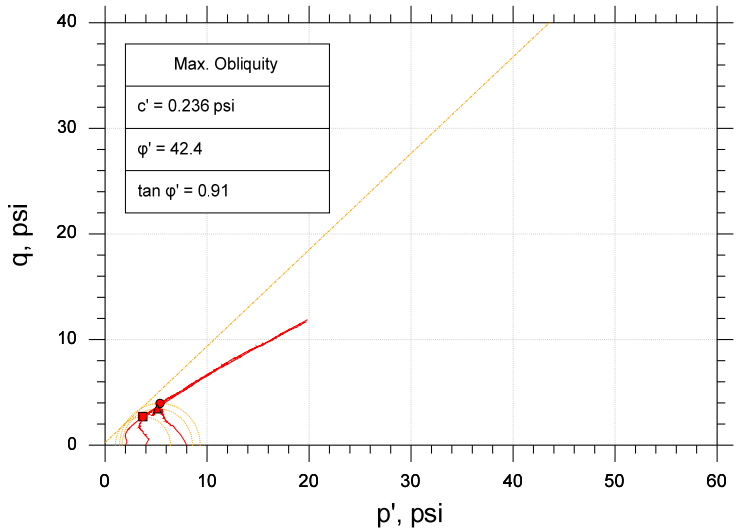
GeoTesting EXPRESS

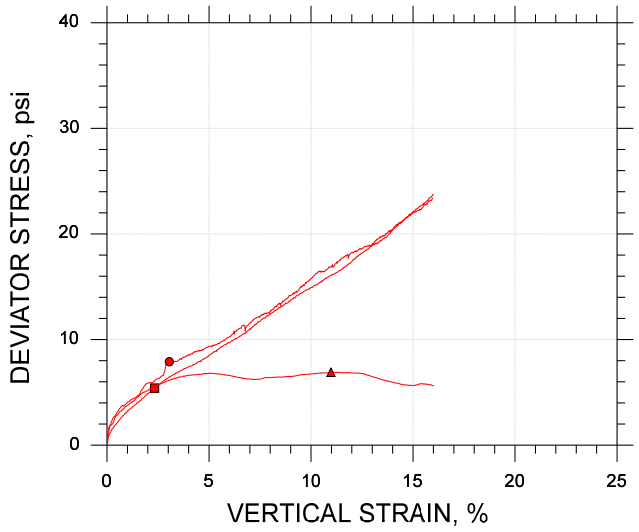
| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Sample Type: Intact | |
| Description: Moist, gray clay with sand | | |
| Remarks: System T | | |

Attachment Figure A.4-155

| | |
|---|---|
| Client: Anchor QEA, LLC | |
| Project Name: San Jacinto Pre-Design | |
| Project Location: --- | |
| Project Number: GTX-309154 | |
| Tested By: md | Checked By: njh |
| Boring ID: SJGB021 | |
| Preparation: intact | |
| Description: Moist, gray clayey sand | |
| Classification: --- | |
| Group Symbol: --- | |
| Liquid Limit: --- | Plastic Limit: --- |
| Plasticity Index: --- | Estimated Specific Gravity: 2.65 |

## CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

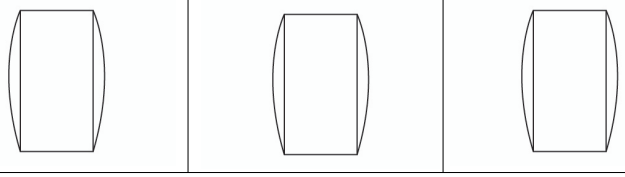



| | | | | | |
|---|---|---|---|---|---|
| Symbol | | ■ | ● | ▲ | |
| Sample ID | | SL0824 | SL0824 | SL0824 | |
| Depth, ft | | 12-14 | 12-14 | 12-14 | |
| Test Number | | CU-6-1 | CU-6-2 | CU-6-3 | |
| Initial | Height, in | 3.000 | 3.310 | 2.820 | |
| | Diameter, in | 1.410 | 1.410 | 1.410 | |
| | Moisture Content (from Cuttings), % | 22.2 | 27.5 | 65.1 | |
| | Dry Density, pcf | 104. | 95.0 | 60.7 | |
| | Saturation (Wet Method), % | 99.7 | 98.3 | 99.9 | |
| | Void Ratio | 0.590 | 0.741 | 1.73 | |
| Before Shear | Moisture Content, % | 21.6 | 21.5 | 57.2 | |
| | Dry Density, pcf | 105. | 105. | 65.8 | |
| | Cross-sectional Area (Method A), in² | 1.552 | 1.452 | 1.502 | |
| | Saturation, % | 100.0 | 100.0 | 100.0 | |
| | Void Ratio | 0.574 | 0.570 | 1.52 | |
| | Back Pressure, psi | 114.5 | 149.9 | 150.7 | |
| Vertical Effective Consolidation Stress, psi | | 1.976 | 3.972 | 7.683 | |
| Horizontal Effective Consolidation Stress, psi | | 1.993 | 3.968 | 7.965 | |
| Vertical Strain after Consolidation, % | | 0.1773 | 0.007624 | 2.436 | |
| Volumetric Strain after Consolidation, % | | 0.2409 | 0.7632 | 2.804 | |
| Time to 50% Consolidation, min | | --- | --- | 90.00 | |
| Shear Strength, psi | | 2.703 | 3.947 | 3.451 | |
| Strain at Failure, % | | 2.33 | 3.05 | 11.0 | |
| Strain Rate, %/min | | 0.01600 | 0.01600 | 0.01600 | |
| Deviator Stress at Failure, psi | | 5.405 | 7.895 | 6.902 | |
| Effective Minor Principal Stress at Failure, psi | | 1.006 | 1.430 | 1.666 | |
| Effective Major Principal Stress at Failure, psi | | 6.411 | 9.325 | 8.568 | |
| B-Value | | 0.97 | 0.95 | 0.95 | |

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

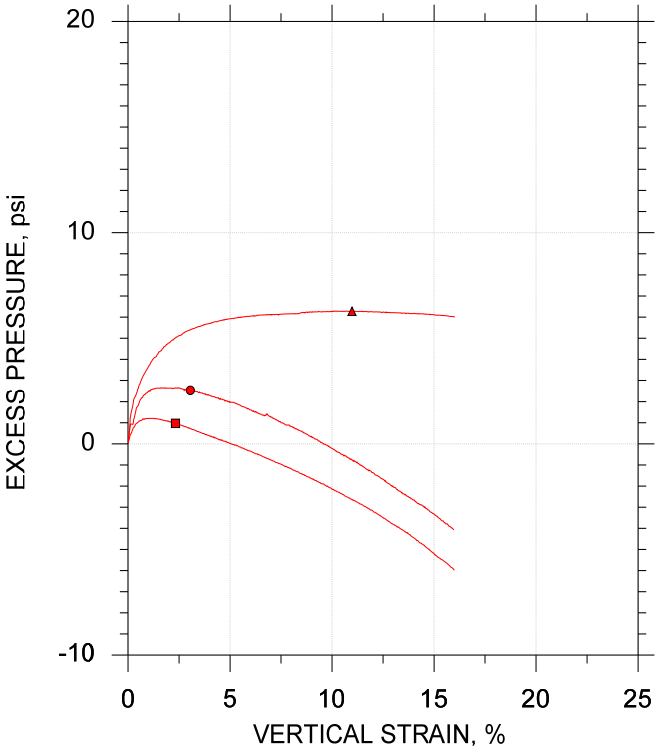
Remarks:

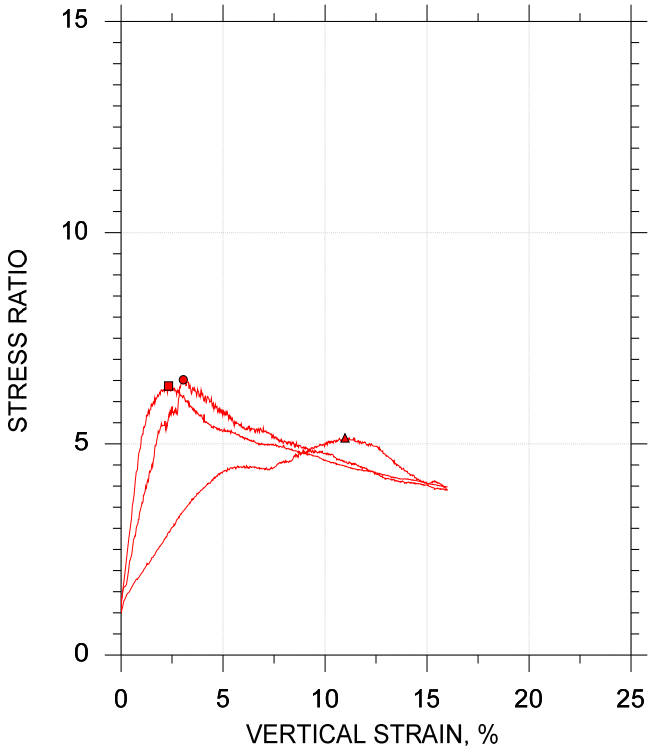


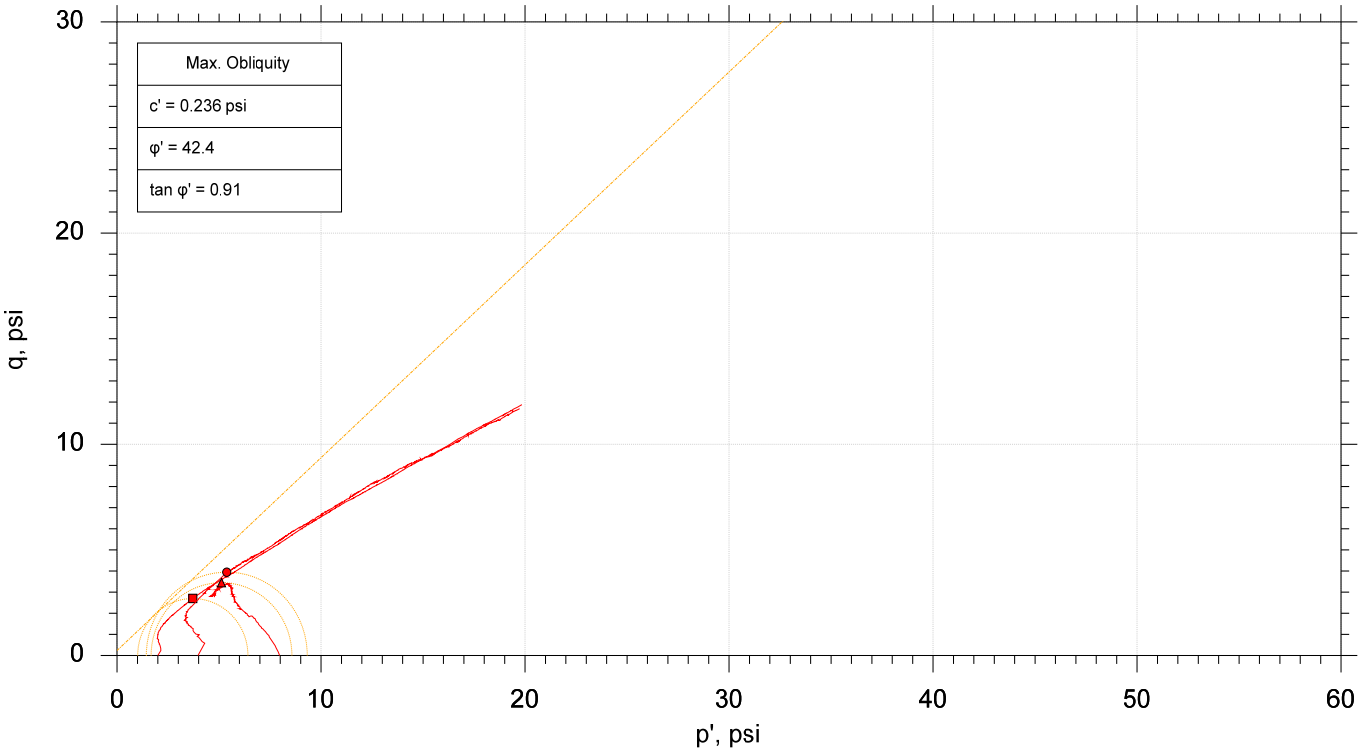
System E

Attachment Figure A.4-156

# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | Sample No. | Test No. | Depth | Tested By | Test Date | Checked By | Check Date | Test File |
|---|---|---|---|---|---|---|---|---|
| ■ | SL0824 | CU-6-1 | 12-14 | md | 01/15/19 | njh | 2/5/19 | 309154-CU-6-1n.dat |
| ● | SL0824 | CU-6-2 | 12-14 | md | 01/15/19 | njh | 2/5/19 | 309154-CU-6-2n.dat |
| ▲ | SL0824 | CU-6-3 | 12-14 | md | 01/15/19 | njh | 2/5/19 | 309154-CU-6-3n.dat |
| | | | | | | | | |

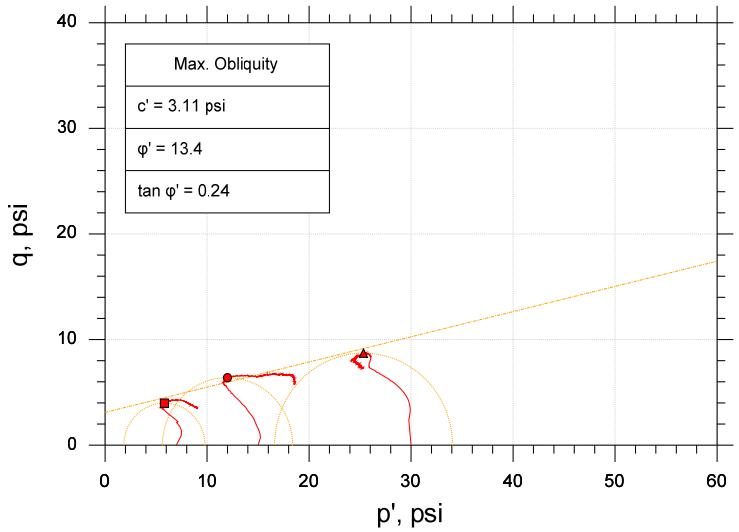
GeoTesting EXPRESS

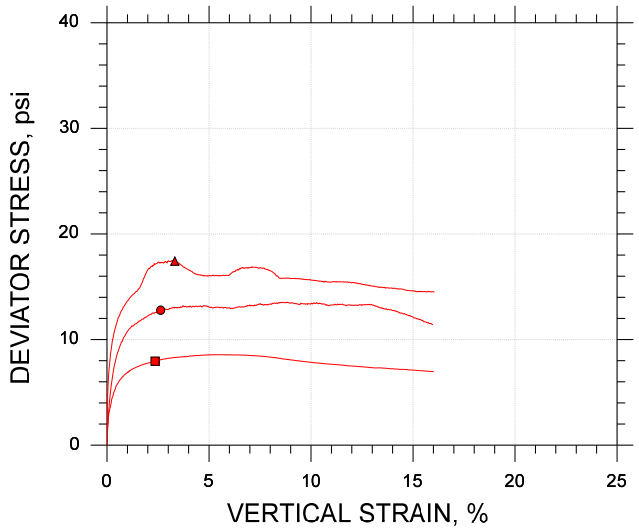
| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Sample Type: intact | |
| Description: Moist, gray clayey sand | | |
| Remarks: System E | | |

Attachment Figure A.4-157

| | |
|---|---|
| Client: Anchor QEA, LLC | |
| Project Name: San Jacinto Pre-Design | |
| Project Location: --- | |
| Project Number: GTX-309154 | |
| Tested By: md | Checked By: njh |
| Boring ID: SJGB-021 | |
| Preparation: intact | |
| Description: Moist , reddish brown and gray clay | |
| Classification: --- | |
| Group Symbol: --- | |
| Liquid Limit: --- | Plastic Limit: --- |
| Plasticity Index: --- | Estimated Specific Gravity: 2.7 |

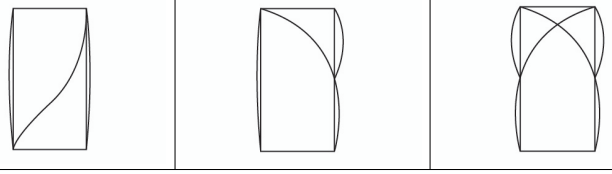
# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | | | | | |
|---|---|---|---|---|---|
| Symbol | | ■ | ● | ▲ | |
| Sample ID | | SL0829 | SL0829 | SL0829 | |
| Depth, ft | | 39-41 | 39-41 | 39-41 | |
| Test Number | | CU-5-1 | CU-5-2 | CU-5-3 | |
| Initial | Height, in | 4.400 | 4.420 | 4.470 | |
| | Diameter, in | 2.030 | 2.020 | 1.990 | |
| | Moisture Content (from Cuttings), % | 36.7 | 35.0 | 36.0 | |
| | Dry Density, pcf | 84.1 | 81.2 | 80.2 | |
| | Saturation (Wet Method), % | 98.7 | 87.9 | 88.4 | |
| | Void Ratio | 1.00 | 1.07 | 1.10 | |
| Before Shear | Moisture Content, % | 37.1 | 37.7 | 39.0 | |
| | Dry Density, pcf | 84.2 | 83.5 | 82.1 | |
| | Cross-sectional Area (Method A), in² | 3.236 | 3.139 | 3.071 | |
| | Saturation, % | 100.0 | 100.0 | 100.0 | |
| | Void Ratio | 1.00 | 1.02 | 1.05 | |
| | Back Pressure, psi | 150.7 | 150.7 | 150.6 | |
| Vertical Effective Consolidation Stress, psi | | 6.975 | 14.99 | 29.94 | |
| Horizontal Effective Consolidation Stress, psi | | 6.991 | 14.99 | 30.00 | |
| Vertical Strain after Consolidation, % | | 0.2258 | 0.03834 | 0.6596 | |
| Volumetric Strain after Consolidation, % | | 0.3596 | 0.7104 | 1.078 | |
| Time to 50% Consolidation, min | | --- | --- | 72.00 | |
| Shear Strength, psi | | 3.976 | 6.388 | 8.717 | |
| Strain at Failure, % | | 2.35 | 2.63 | 3.32 | |
| Strain Rate, %/min | | 0.01600 | 0.01600 | 0.01600 | |
| Deviator Stress at Failure, psi | | 7.953 | 12.78 | 17.43 | |
| Effective Minor Principal Stress at Failure, psi | | 1.840 | 5.616 | 16.62 | |
| Effective Major Principal Stress at Failure, psi | | 9.793 | 18.39 | 34.05 | |
| B-Value | | 0.95 | 0.95 | 0.94 | |

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

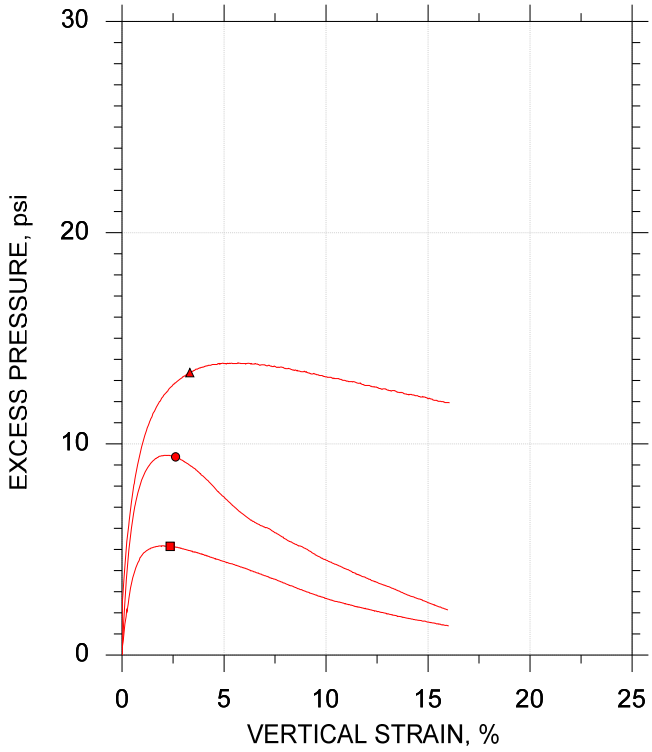


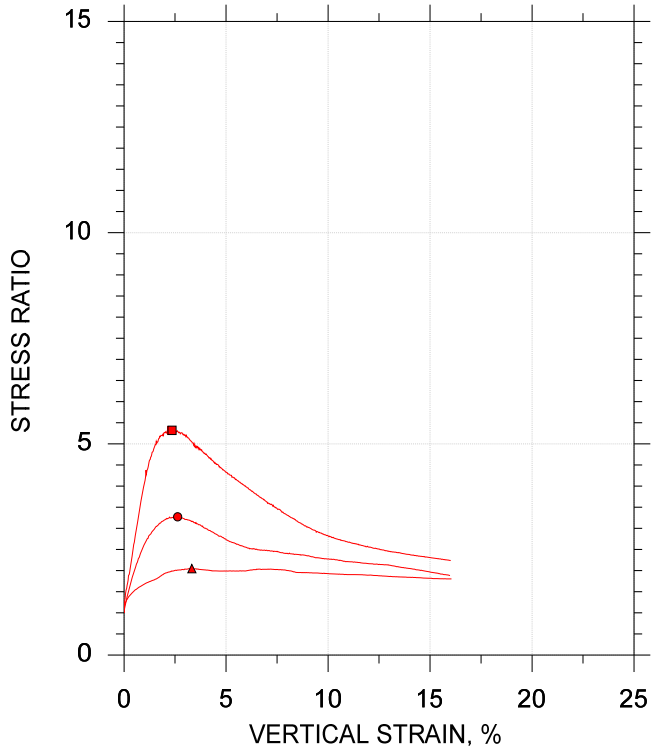
Remarks:

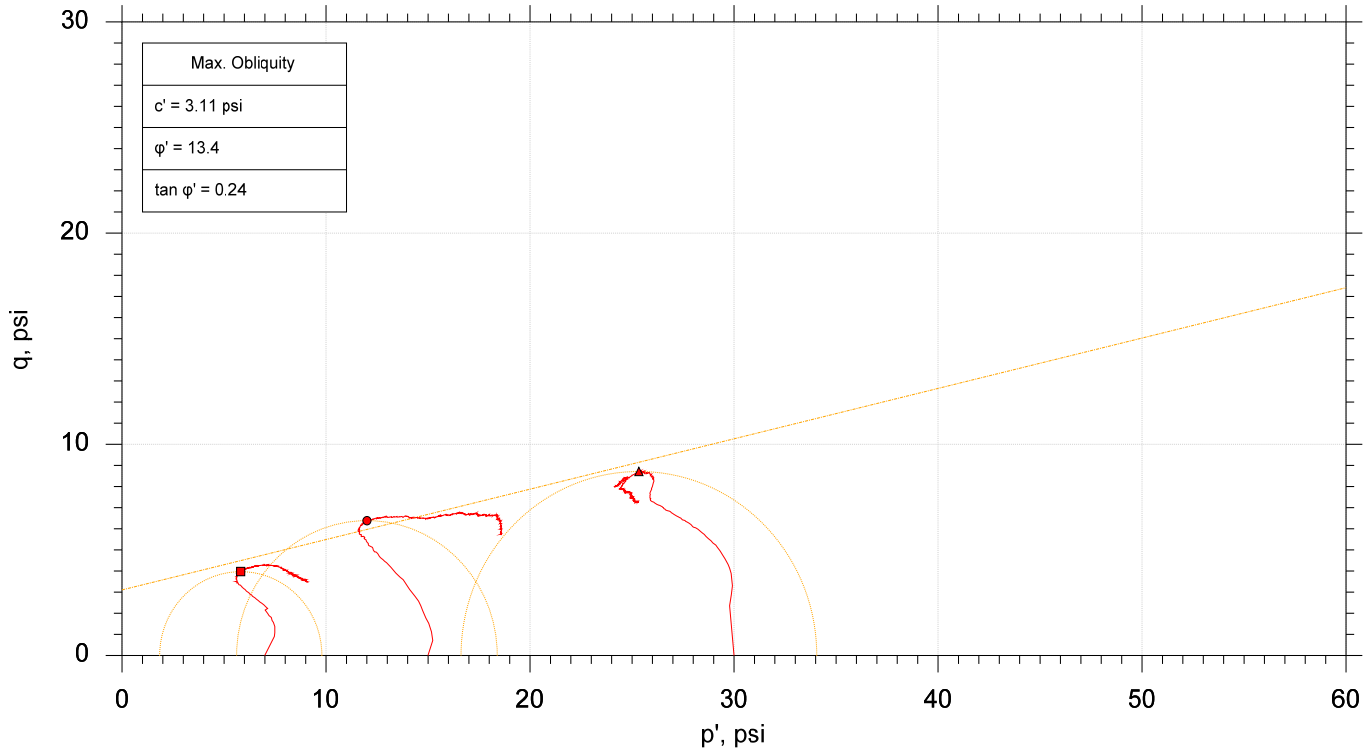
System Q

Attachment Figure A.4-158

# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | Sample No. | Test No. | Depth | Tested By | Test Date | Checked By | Check Date | Test File |
|---|---|---|---|---|---|---|---|---|
| ■ | SL0829 | CU-5-1 | 39-41 | md | 01/15/19 | njh | 2/5/19 | 309154-CU-5-1n.dat |
| ● | SL0829 | CU-5-2 | 39-41 | md | 01/15/19 | njh | 2/5/19 | 309154-CU-5-2n.dat |
| ▲ | SL0829 | CU-5-3 | 39-41 | md | 01/11/19 | njh | 2/5/19 | 309154-CU-5-3n.dat |
| | | | | | | | | |

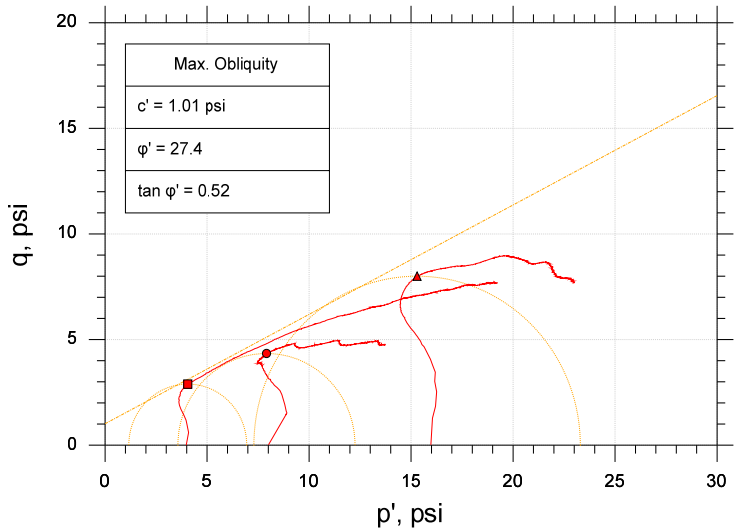
GeoTesting EXPRESS

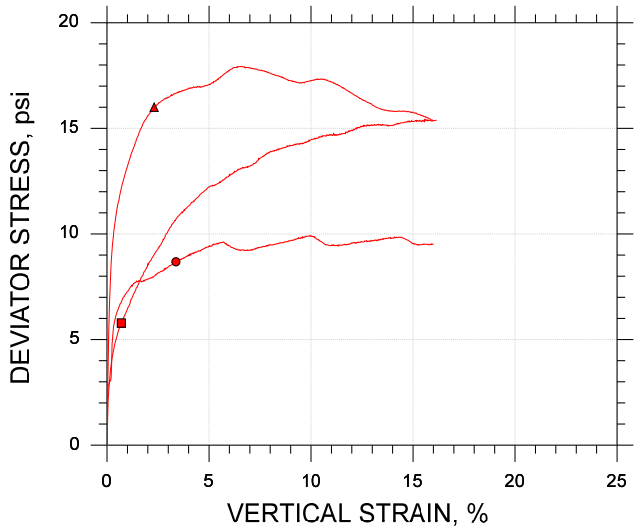
| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB-021 | Sample Type: intact | |
| Description: Moist , reddish brown and gray clay | | |
| Remarks: System Q | | |

Attachment Figure A.4-159

| | |
|---|---|
| Client: Anchor QEA, LLC | |
| Project Name: San Jacinto Pre-Design | |
| Project Location: --- | |
| Project Number: GTX-309154 | |
| Tested By: md | Checked By: njh |
| Boring ID: SJGB018 | |
| Preparation: intact | |
| Description: Moist, reddish brown clay | |
| Classification: --- | |
| Group Symbol: --- | |
| Liquid Limit: --- | Plastic Limit: --- |
| Plasticity Index: --- | Estimated Specific Gravity: 2.7 |

## CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

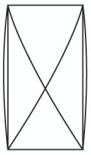



| | | | | |
|---|---|---|---|---|
| Symbol | | ■ | ● | ▲ |
| Sample ID | | SL0868 | SL0868 | SL0868 |
| Depth, ft | | 25-27 | 25-27 | 25-27 |
| Test Number | | CU-4-1 | CU-4-2 | CU-4-3 |
| Initial | Height, in | 4.500 | 4.520 | 4.600 |
| | Diameter, in | 2.020 | 2.030 | 2.030 |
| | Moisture Content (from Cuttings), % | 25.7 | 27.0 | 28.9 |
| | Dry Density, pcf | 97.5 | 92.1 | 90.4 |
| | Saturation (Wet Method), % | 95.0 | 87.7 | 90.2 |
| | Void Ratio | 0.729 | 0.831 | 0.865 |
| Before Shear | Moisture Content, % | 26.1 | 31.2 | 31.3 |
| | Dry Density, pcf | 98.8 | 91.6 | 91.4 |
| | Cross-sectional Area (Method A), in² | 3.176 | 3.243 | 3.215 |
| | Saturation, % | 100.0 | 100.0 | 100.0 |
| | Void Ratio | 0.705 | 0.841 | 0.845 |
| | Back Pressure, psi | 163.3 | 150.4 | 150.7 |
| Vertical Effective Consolidation Stress, psi | | 3.976 | 8.020 | 15.96 |
| Horizontal Effective Consolidation Stress, psi | | 3.980 | 7.998 | 15.96 |
| Vertical Strain after Consolidation, % | | 0.09279 | 0.001025 | 0.3482 |
| Volumetric Strain after Consolidation, % | | 0.2028 | 0.5529 | 0.7681 |
| Time to 50% Consolidation, min | | --- | --- | 90.00 |
| Shear Strength, psi | | 2.892 | 4.341 | 8.001 |
| Strain at Failure, % | | 0.700 | 3.38 | 2.31 |
| Strain Rate, %/min | | 0.01600 | 0.01600 | 0.01600 |
| Deviator Stress at Failure, psi | | 5.783 | 8.682 | 16.00 |
| Effective Minor Principal Stress at Failure, psi | | 1.161 | 3.572 | 7.293 |
| Effective Major Principal Stress at Failure, psi | | 6.944 | 12.25 | 23.29 |
| B-Value | | 0.97 | 0.95 | 0.97 |

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

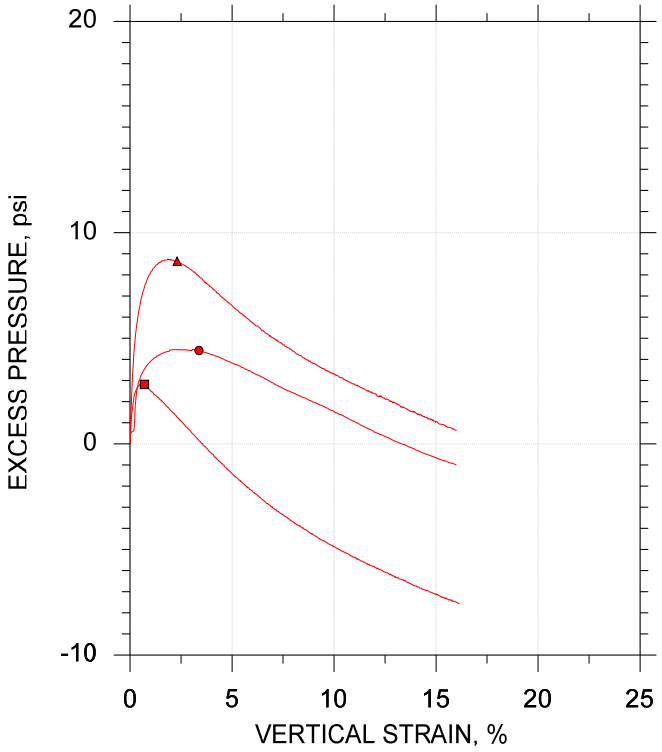
Remarks:

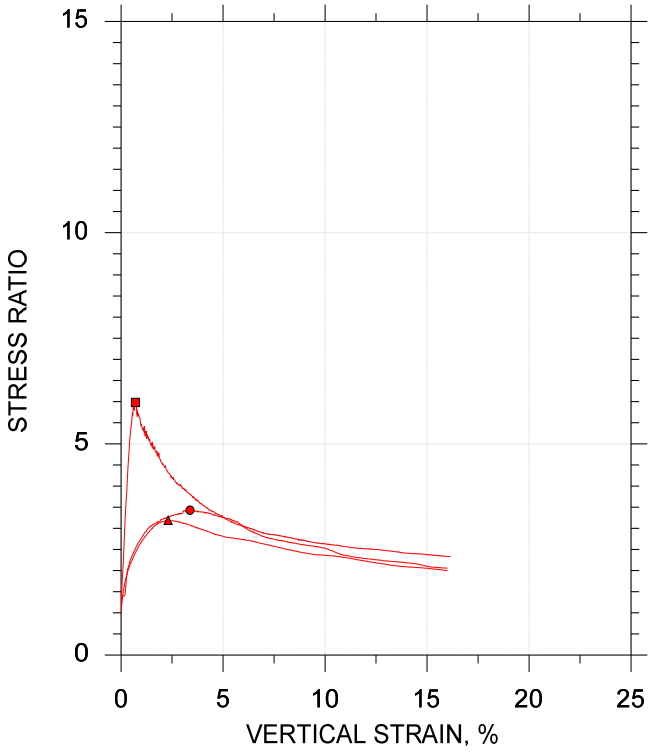


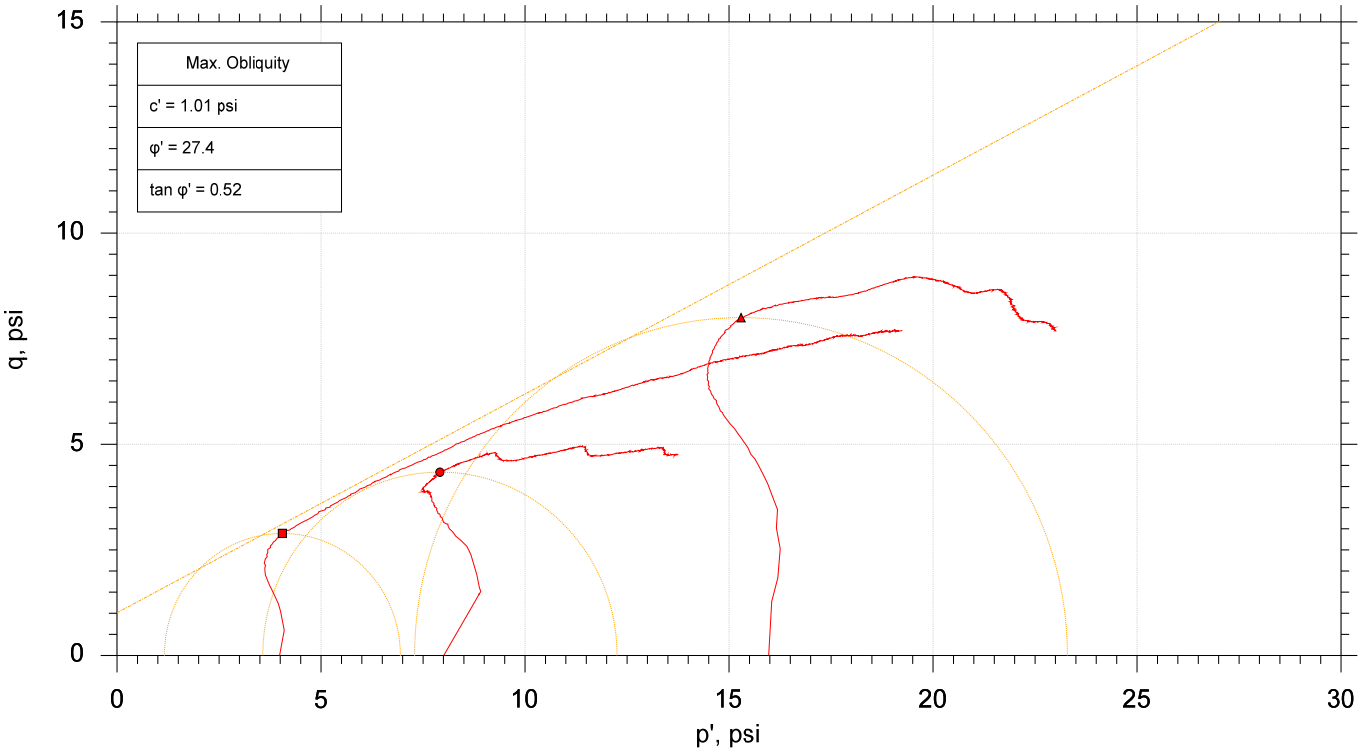
System LL

Attachment Figure A.4-160

# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | Sample No. | Test No. | Depth | Tested By | Test Date | Checked By | Check Date | Test File |
|---|---|---|---|---|---|---|---|---|
| ■ | SL0868 | CU-4-1 | 25-27 | md | 01/11/19 | njh | 2/5/19 | 309154-CU-4-1n.dat |
| ● | SL0868 | CU-4-2 | 25-27 | md | 01/11/19 | njh | 2/5/19 | 309154-CU-4-2n.dat |
| ▲ | SL0868 | CU-4-3 | 25-27 | md | 01/11/19 | njh | 2/5/19 | 309154-CU-4-3n.dat |
| | | | | | | | | |

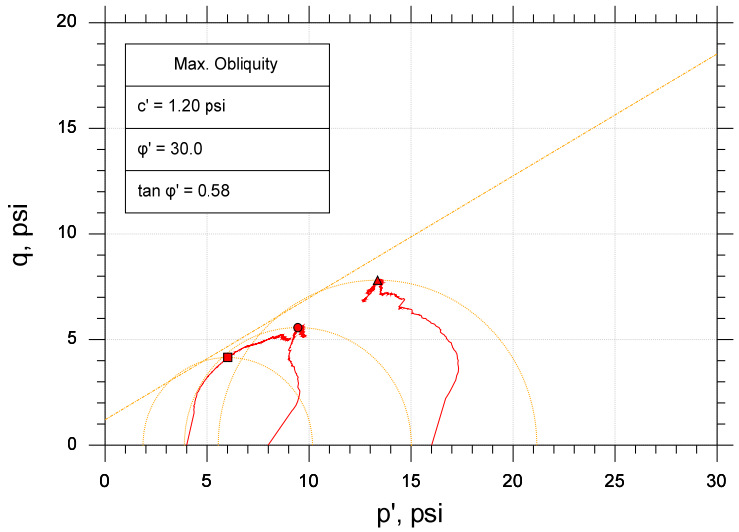
GeoTesting EXPRESS

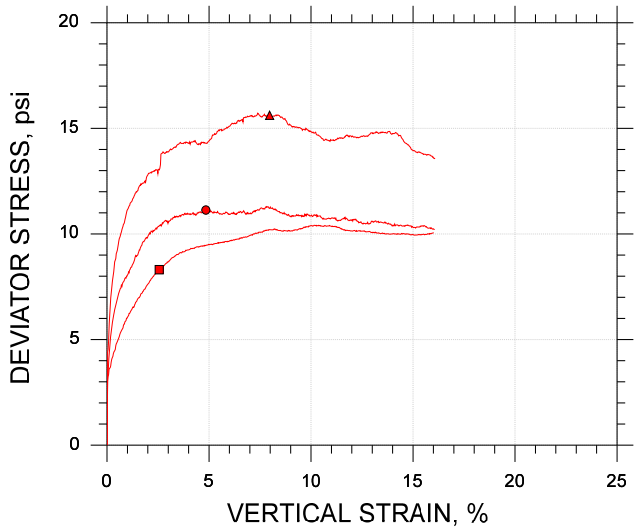
| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Sample Type: intact | |
| Description: Moist, reddish brown clay | | |
| Remarks: System LL | | |

Attachment Figure A.4-161

| | |
|---|---|
| Client: Anchor QEA, LLC | |
| Project Name: San Jacinto Pre-Design | |
| Project Location: --- | |
| Project Number: GTX-309154 | |
| Tested By: md | Checked By: njh |
| Boring ID: SJSB025 | |
| Preparation: intact | |
| Description: Moist, black clay | |
| Classification: --- | |
| Group Symbol: --- | |
| Liquid Limit: --- | Plastic Limit: --- |
| Plasticity Index: --- | Estimated Specific Gravity: 2.8 |

# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

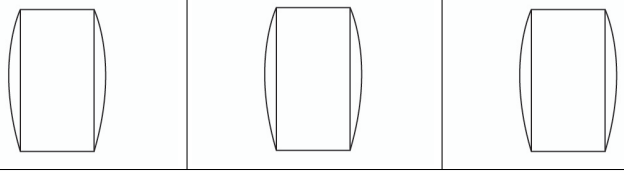



| | | | | | |
|---|---|---|---|---|---|
| Symbol | | ■ | ● | ▲ | |
| Sample ID | | SL1042 | SL1042 | SL1042 | |
| Depth, ft | | 16-18 | 16-18 | 16-18 | |
| Test Number | | CU-3-1 | CU-3-2 | CU-3-3 | |
| Initial | Height, in | 3.080 | 3.250 | 3.240 | |
| | Diameter, in | 1.410 | 1.410 | 1.410 | |
| | Moisture Content (from Cuttings), % | 39.7 | 37.3 | 38.4 | |
| | Dry Density, pcf | 82.7 | 85.3 | 84.2 | |
| | Saturation (Wet Method), % | 99.9 | 99.6 | 99.8 | |
| | Void Ratio | 1.11 | 1.05 | 1.08 | |
| Before Shear | Moisture Content, % | 39.6 | 37.1 | 37.6 | |
| | Dry Density, pcf | 82.9 | 85.8 | 85.2 | |
| | Cross-sectional Area (Method A), in² | 1.560 | 1.560 | 1.552 | |
| | Saturation, % | 100.0 | 100.0 | 100.0 | |
| | Void Ratio | 1.11 | 1.04 | 1.05 | |
| | Back Pressure, psi | 149.8 | 150.7 | 150.4 | |
| Vertical Effective Consolidation Stress, psi | | 3.972 | 7.956 | 15.96 | |
| Horizontal Effective Consolidation Stress, psi | | 3.997 | 7.994 | 16.01 | |
| Vertical Strain after Consolidation, % | | 0.2295 | 0.3525 | 0.4944 | |
| Volumetric Strain after Consolidation, % | | 0.5639 | 0.2645 | 0.9214 | |
| Time to 50% Consolidation, min | | --- | --- | 56.00 | |
| Shear Strength, psi | | 4.153 | 5.566 | 7.810 | |
| Strain at Failure, % | | 2.56 | 4.84 | 7.97 | |
| Strain Rate, %/min | | 0.01600 | 0.01600 | 0.01600 | |
| Deviator Stress at Failure, psi | | 8.305 | 11.13 | 15.62 | |
| Effective Minor Principal Stress at Failure, psi | | 1.863 | 3.882 | 5.546 | |
| Effective Major Principal Stress at Failure, psi | | 10.17 | 15.01 | 21.17 | |
| B-Value | | 0.95 | 0.95 | 0.94 | |

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

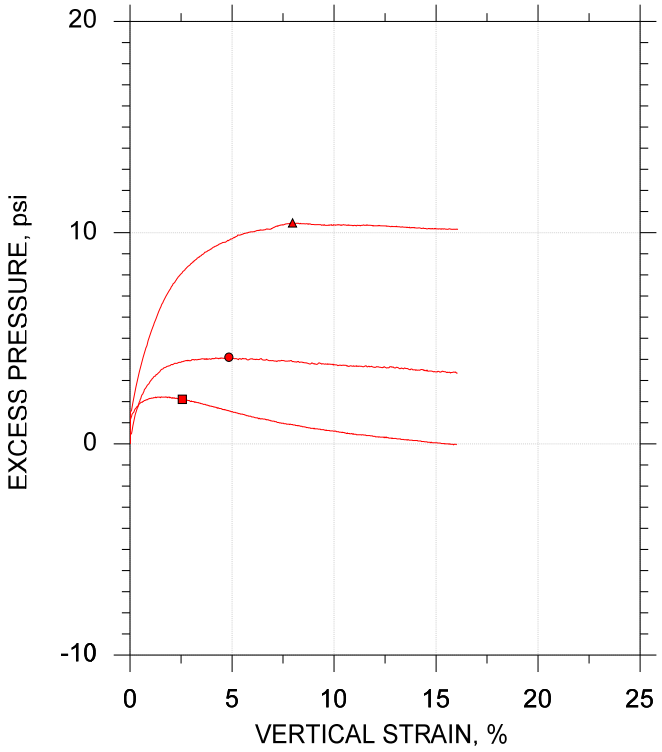
Remarks:

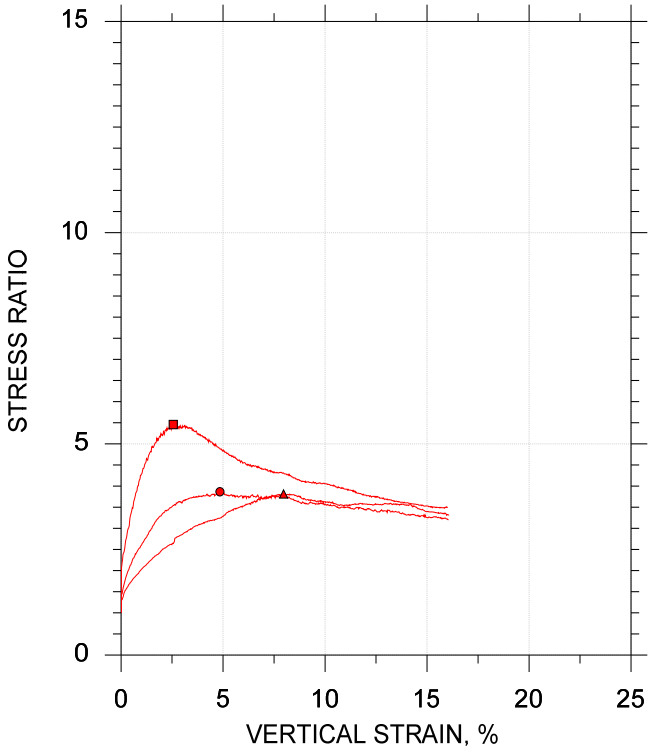


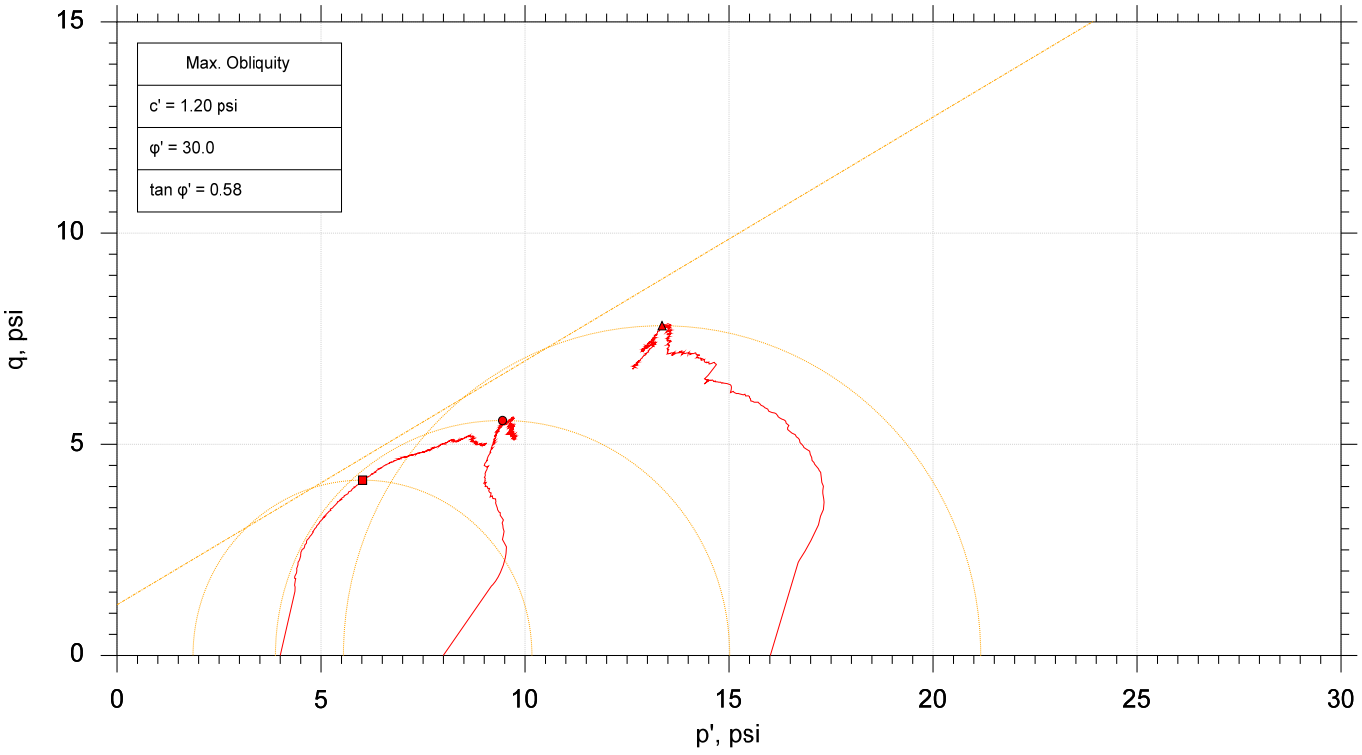
System K

Attachment Figure A.4-162

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | Sample No. | Test No. | Depth | Tested By | Test Date | Checked By | Check Date | Test File |
|---|---|---|---|---|---|---|---|---|
| ■ | SL1042 | CU-3-1 | 16-18 | md | 01/04/19 | njh | 2/5/19 | 309154-CU-3-1n.dat |
| ● | SL1042 | CU-3-2 | 16-18 | md | 01/04/19 | njh | 2/5/19 | 309154-CU-3-2n.dat |
| ▲ | SL1042 | CU-3-3 | 16-18 | md | 01/04/19 | njh | 2/5/19 | 309154-CU-3-3n.dat |
| | | | | | | | | |

GeoTesting EXPRESS

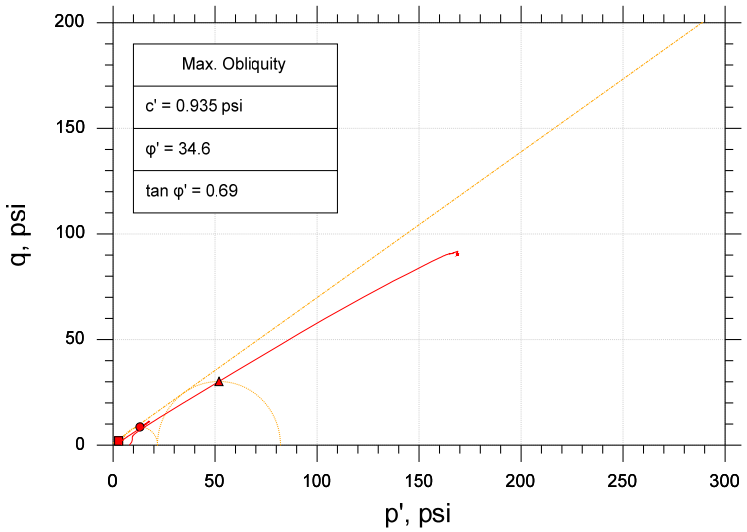
| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB025 | Sample Type: intact | |
| Description: Moist, black clay | | |
| Remarks: System K | | |

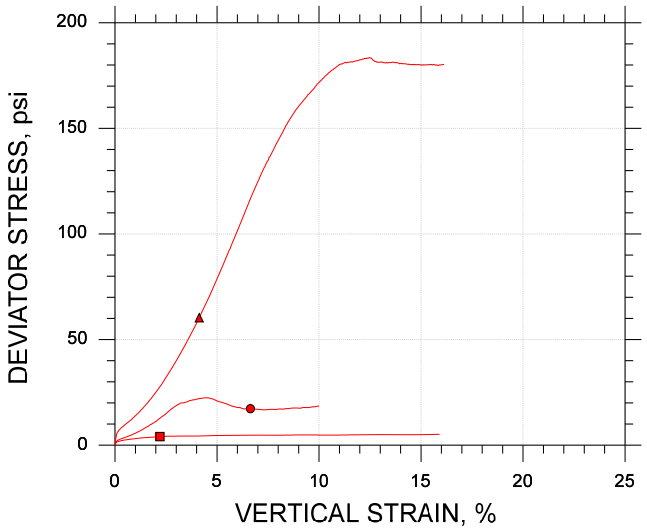
Attachment Figure A.4-163

GeoTesting EXPRESS

| | |
|---|---|
| Client: Anchor QEA, LLC | |
| Project Name: San Jacinto Pre-Design | |
| Project Location: --- | |
| Project Number: GTX-309154 | |
| Tested By: trm | Checked By: njh |
| Boring ID: SJSB034 | |
| Preparation: intact | |
| Description: Moist, gray sand with clay and shells | |
| Classification: --- | |
| Group Symbol: --- | |
| Liquid Limit: --- | Plastic Limit: --- |
| Plasticity Index: --- | Estimated Specific Gravity: 2.7 |

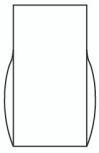
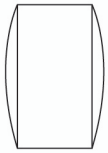
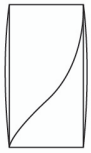
# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | | | | | |
|---|---|---|---|---|---|
| Symbol | | ■ | ● | ▲ | |
| Sample ID | | SL0639 | SL0639 | SL0639 | |
| Depth, ft | | 10-12 | 10-12 | 10-12 | |
| Test Number | | CU-1-1 | CU-1-2 | CU-1-3 | |
| Initial | Height, in | 6.100 | 6.350 | 6.250 | |
| | Diameter, in | 2.860 | 2.870 | 2.860 | |
| | Moisture Content (from Cuttings), % | 19.1 | 13.5 | 23.7 | |
| | Dry Density, pcf | 98.8 | 108. | 103. | |
| | Saturation (Wet Method), % | 73.0 | 64.8 | 99.9 | |
| | Void Ratio | 0.707 | 0.561 | 0.642 | |
| Before Shear | Moisture Content, % | 25.7 | 23.0 | 23.5 | |
| | Dry Density, pcf | 99.5 | 104. | 103. | |
| | Cross-sectional Area (Method A), in² | 6.374 | 6.721 | 6.392 | |
| | Saturation, % | 100.0 | 100.0 | 100.0 | |
| | Void Ratio | 0.694 | 0.622 | 0.634 | |
| | Back Pressure, psi | 87.95 | 38.99 | 151.0 | |
| Vertical Effective Consolidation Stress, psi | | 2.056 | 4.006 | 8.011 | |
| Horizontal Effective Consolidation Stress, psi | | 2.052 | 4.005 | 8.003 | |
| Vertical Strain after Consolidation, % | | 0.001646 | 0.02871 | 0.0007690 | |
| Volumetric Strain after Consolidation, % | | 0.8510 | -3.807 | 0.6056 | |
| Time to 50% Consolidation, min | | --- | --- | 0.3600 | |
| Shear Strength, psi | | 2.023 | 8.633 | 30.17 | |
| Strain at Failure, % | | 2.20 | 6.63 | 4.13 | |
| Strain Rate, %/min | | 0.01600 | 0.01600 | 0.01600 | |
| Deviator Stress at Failure, psi | | 4.046 | 17.27 | 60.35 | |
| Effective Minor Principal Stress at Failure, psi | | 0.7033 | 4.555 | 21.75 | |
| Effective Major Principal Stress at Failure, psi | | 4.750 | 21.82 | 82.09 | |
| B-Value | | 0.95 | 0.95 | 0.96 | |

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

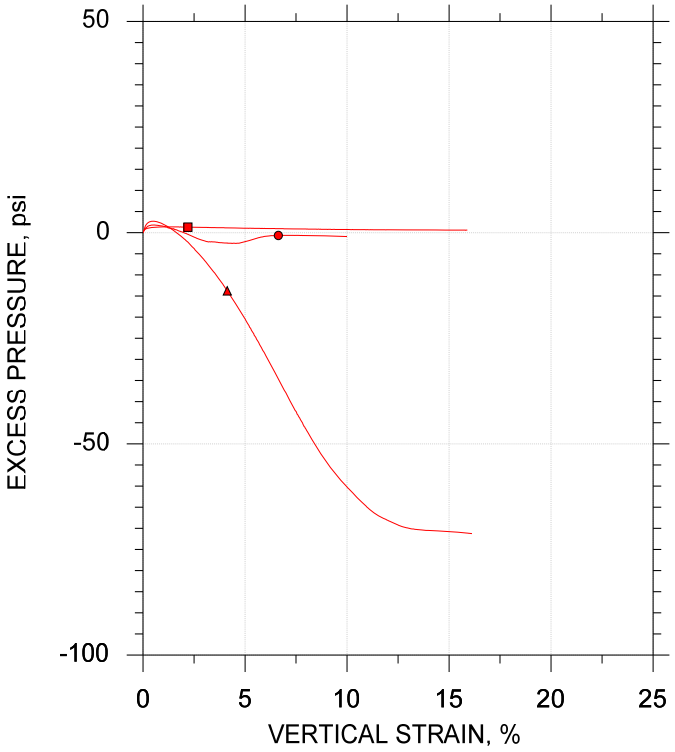




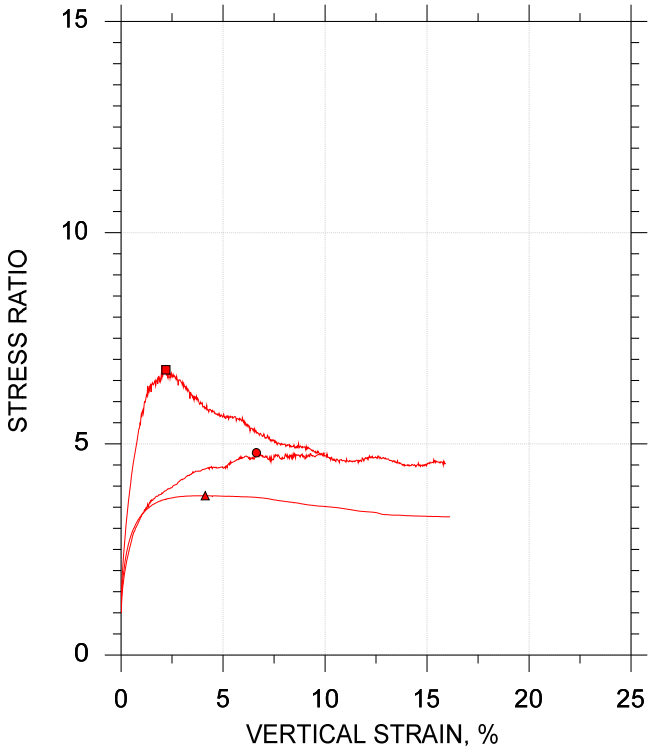
Remarks:

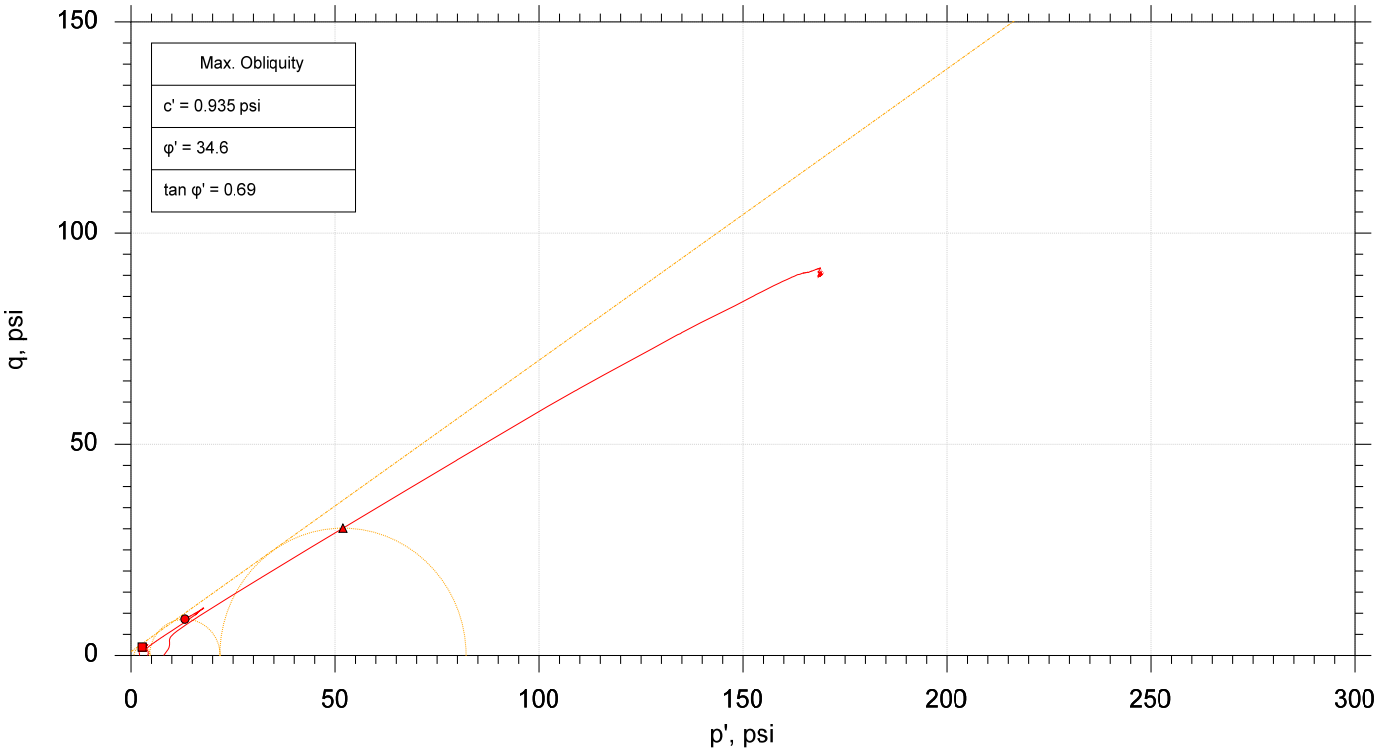
System Q

Attachment Figure A.4-164

# CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767




| | Sample No. | Test No. | Depth | Tested By | Test Date | Checked By | Check Date | Test File |
|---|---|---|---|---|---|---|---|---|
| ■ | SL0639 | CU-1-1 | 10-12 | trm | 12/26/18 | njh | 2/5/19 | 309154-CU-1-1n.dat |
| ● | SL0639 | CU-1-2 | 10-12 | trm | 12/26/18 | njh | 2/5/19 | 309154-CU-1-2n.dat |
| ▲ | SL0639 | CU-1-3 | 10-12 | trm | 12/26/18 | njh | 2/5/19 | 309154-CU-1-3n.dat |
| | | | | | | | | |

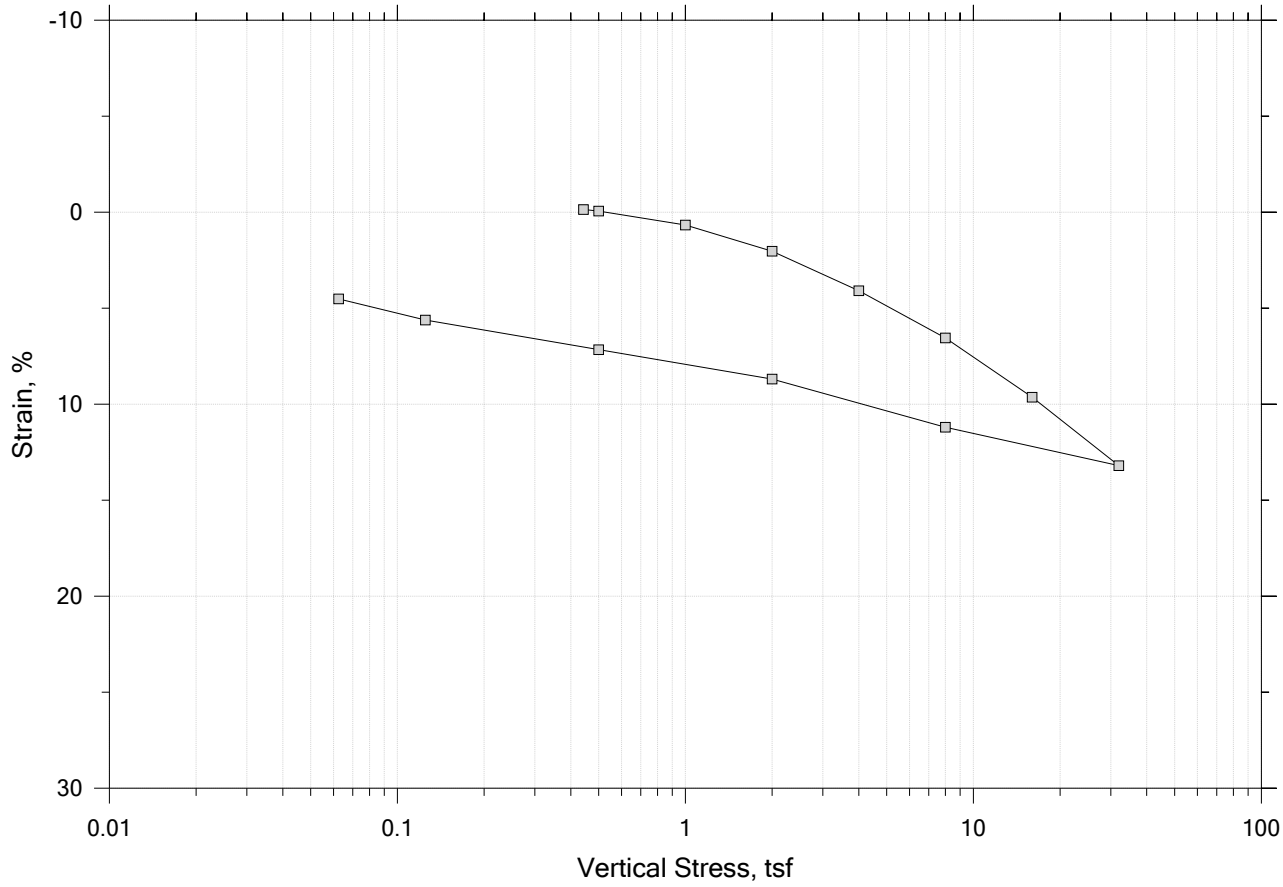
GeoTesting EXPRESS

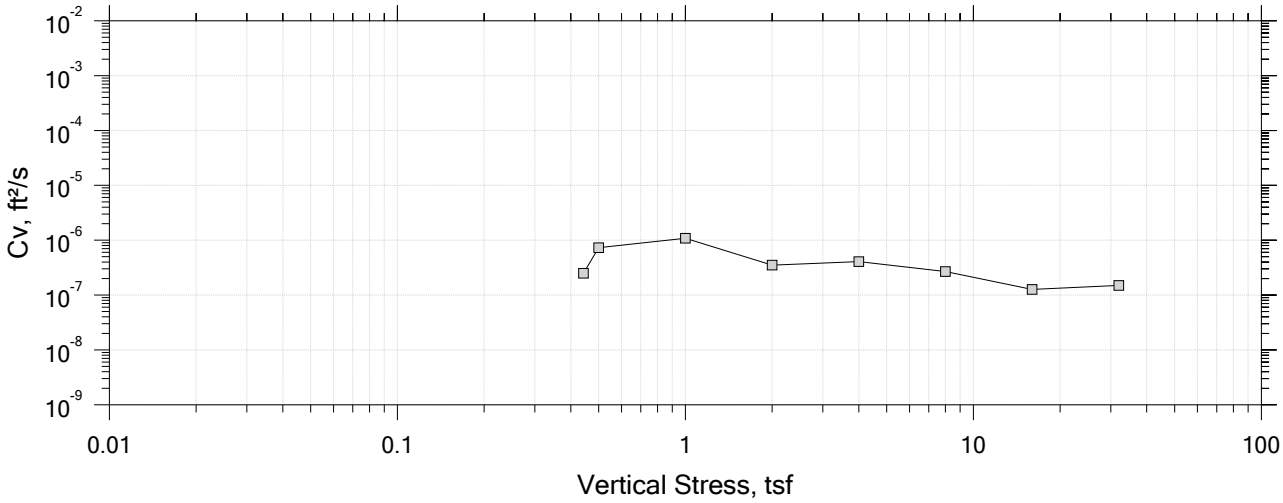
| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB034 | Sample Type: intact | |
| Description: Moist, gray sand with clay and shells | | |
| Remarks: System Q | | |

Attachment Figure A.4-165

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report



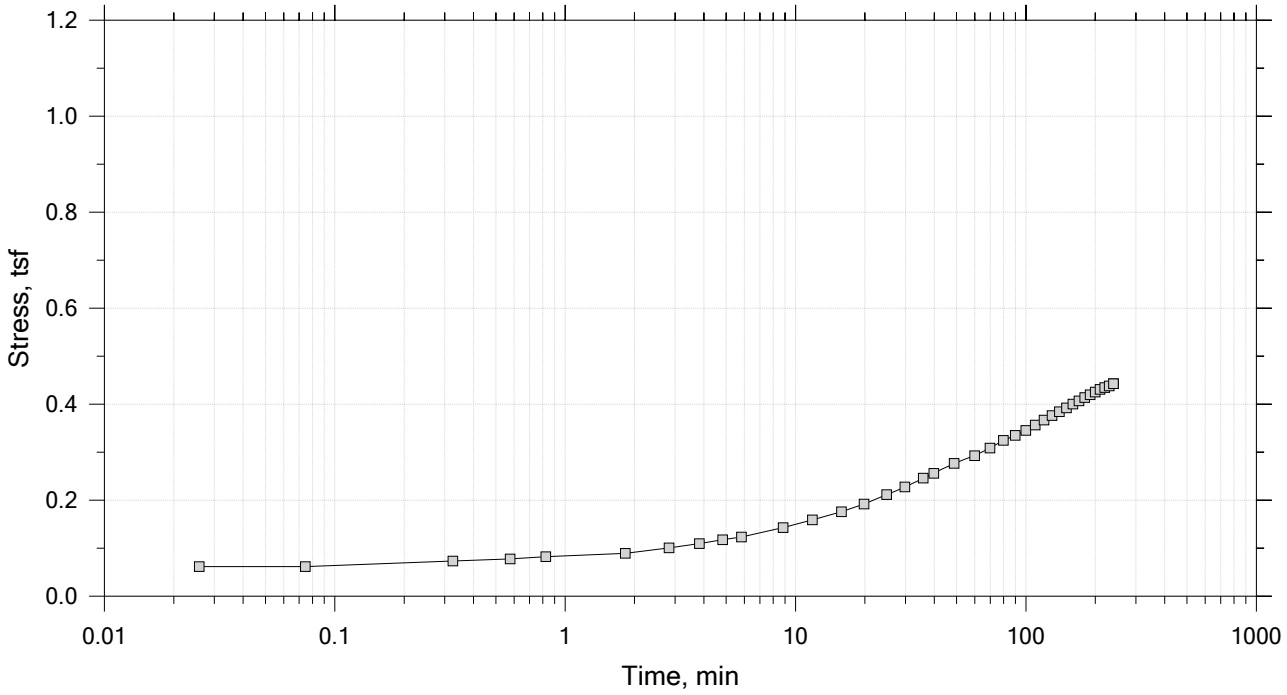

| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |
| | Displacement at End of Increment | | |

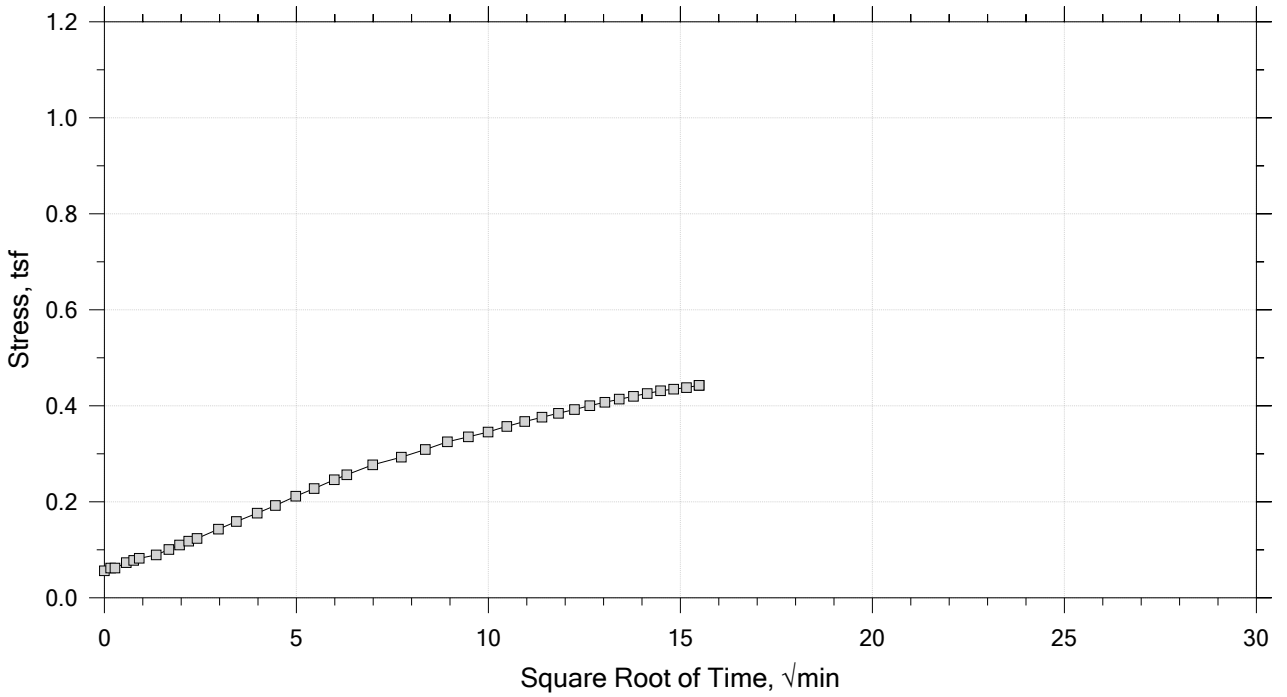
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 13

Constant Volume Step

Stress: 0.443 tsf



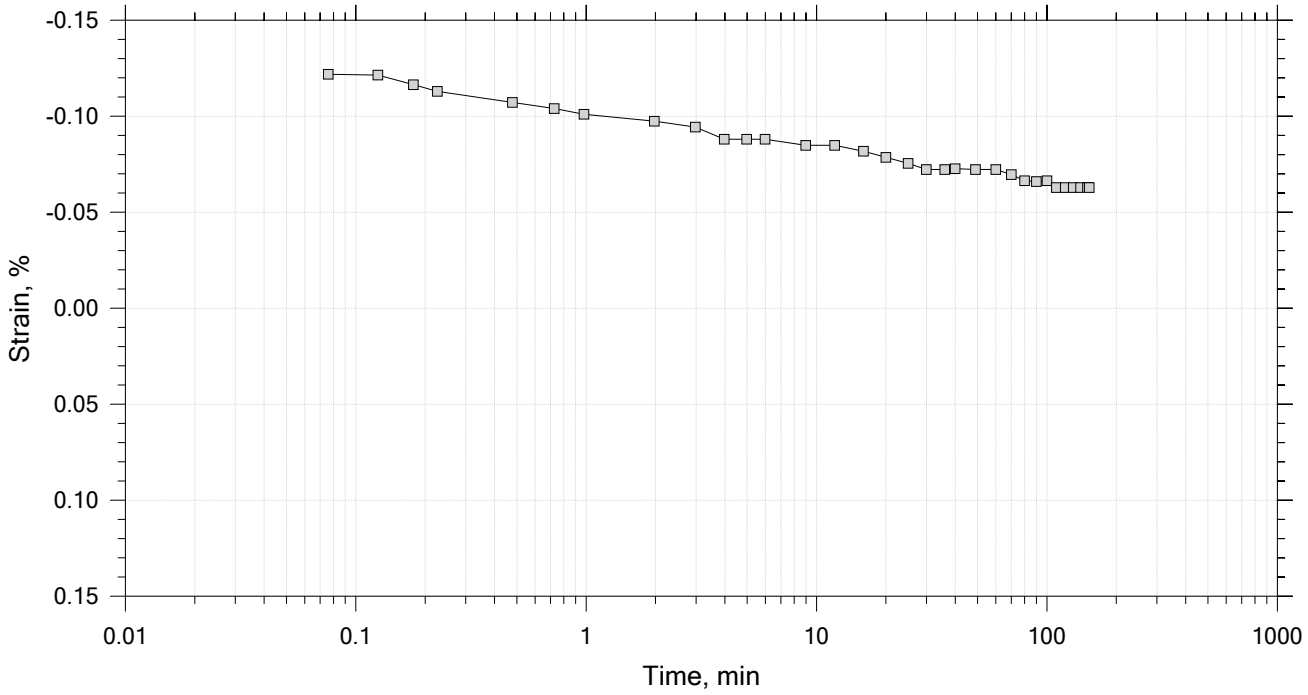

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

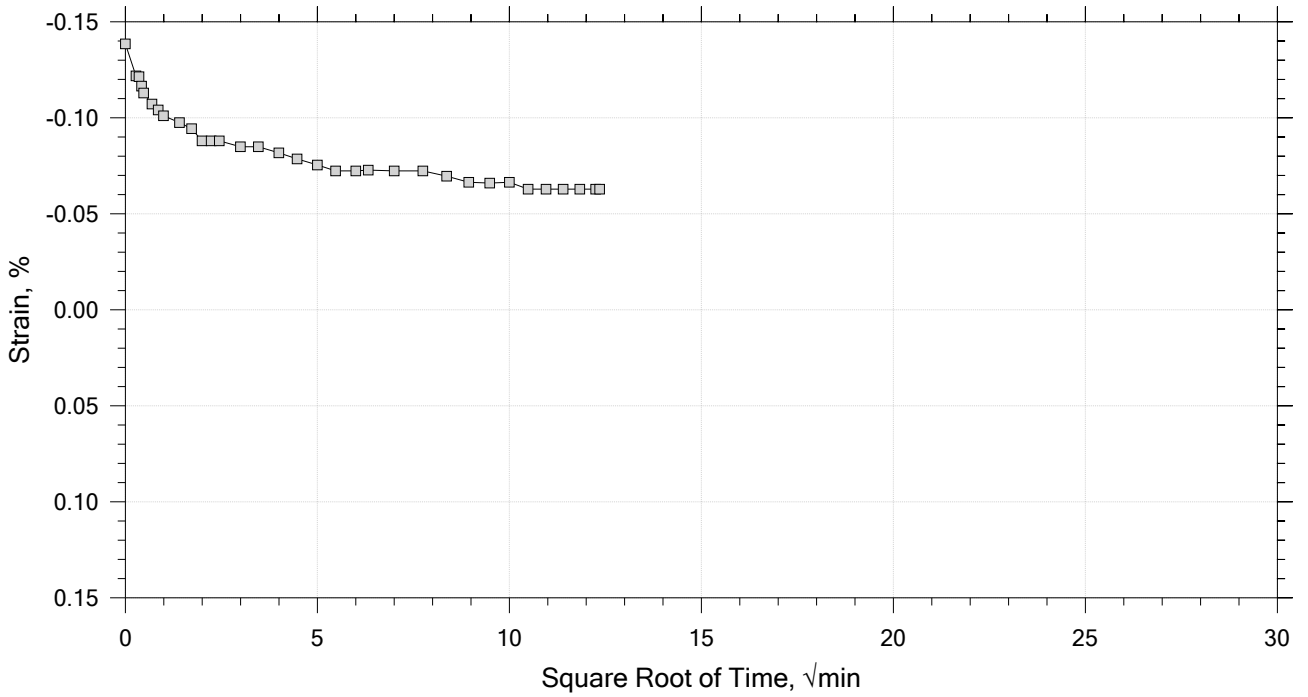
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 13

Constant Load Step

Stress: 0.5 tsf



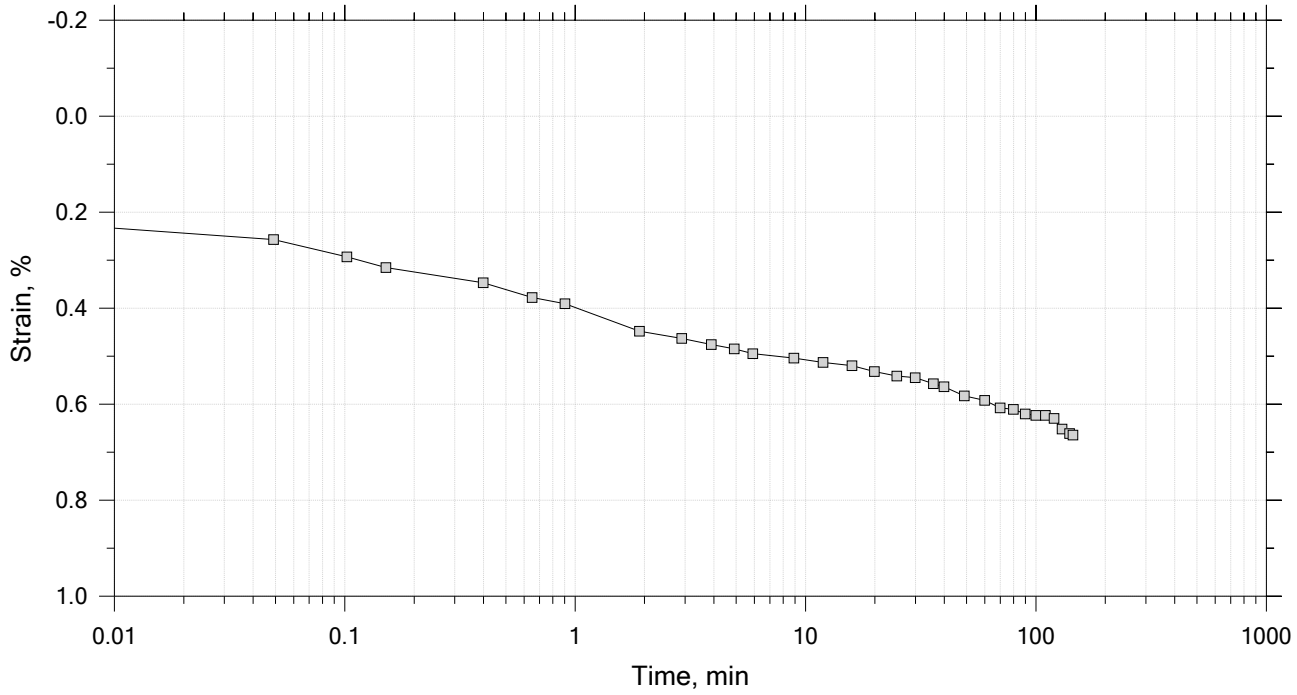

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| Description: Moist, reddish brown clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

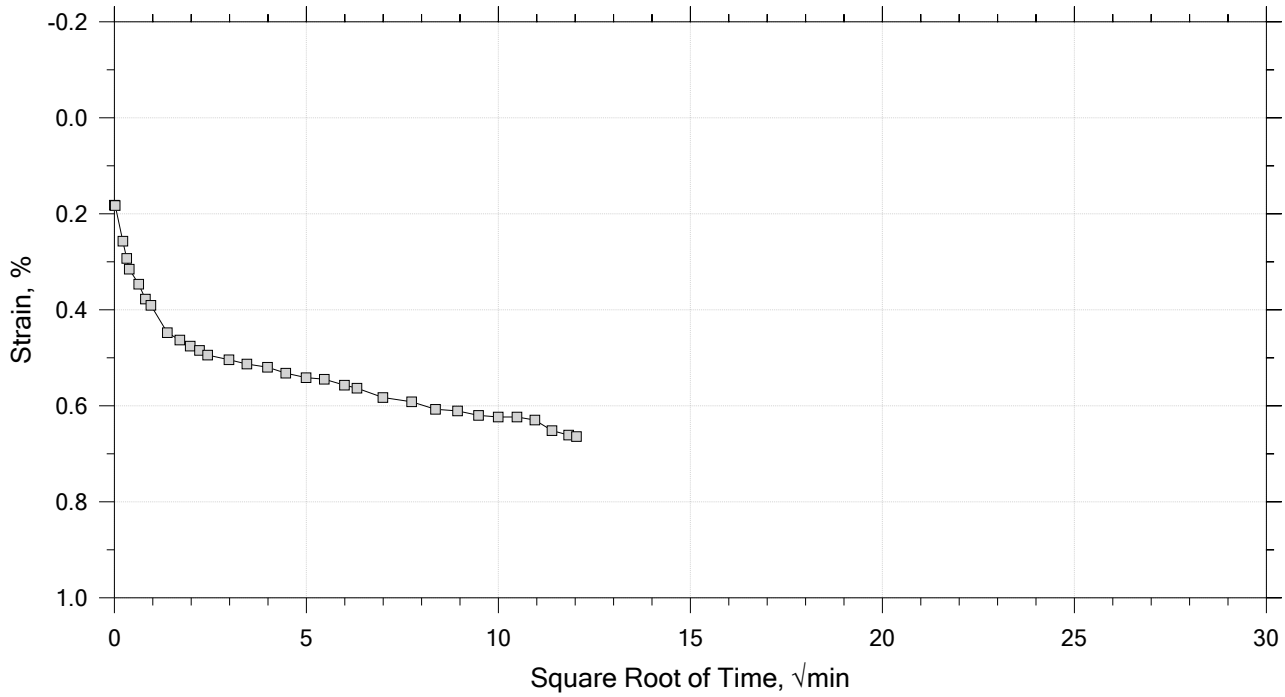
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 13

Constant Load Step

Stress: 1 tsf

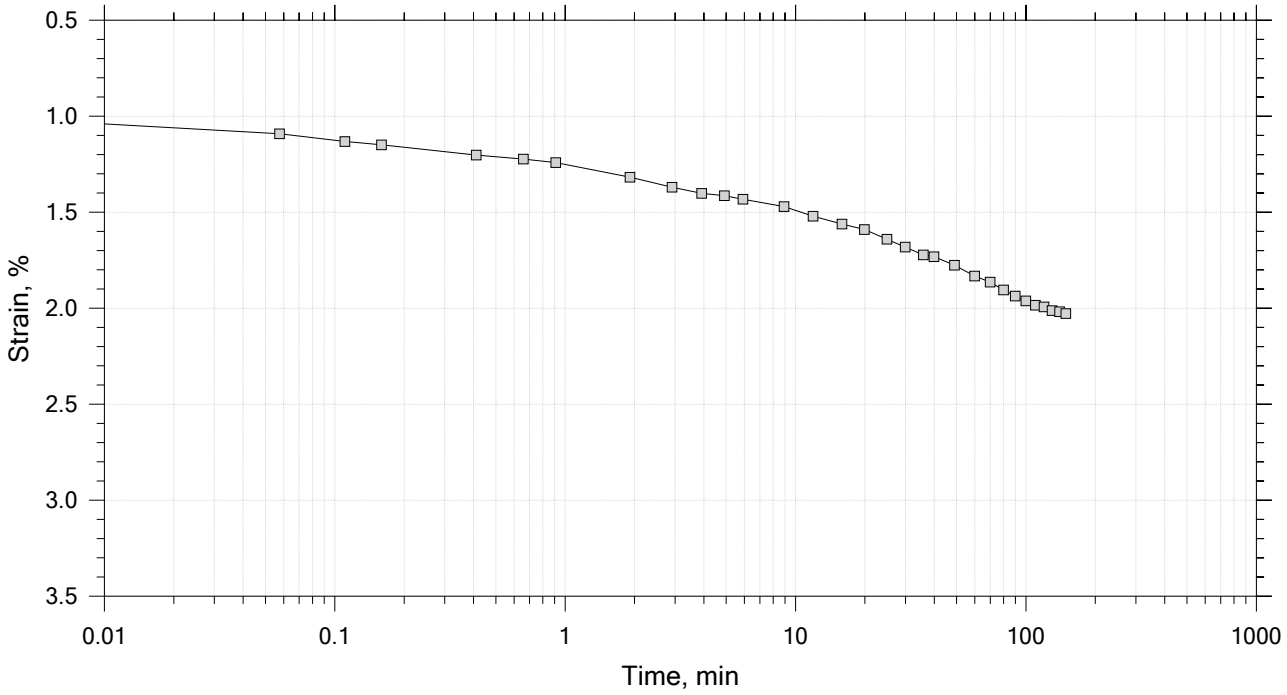


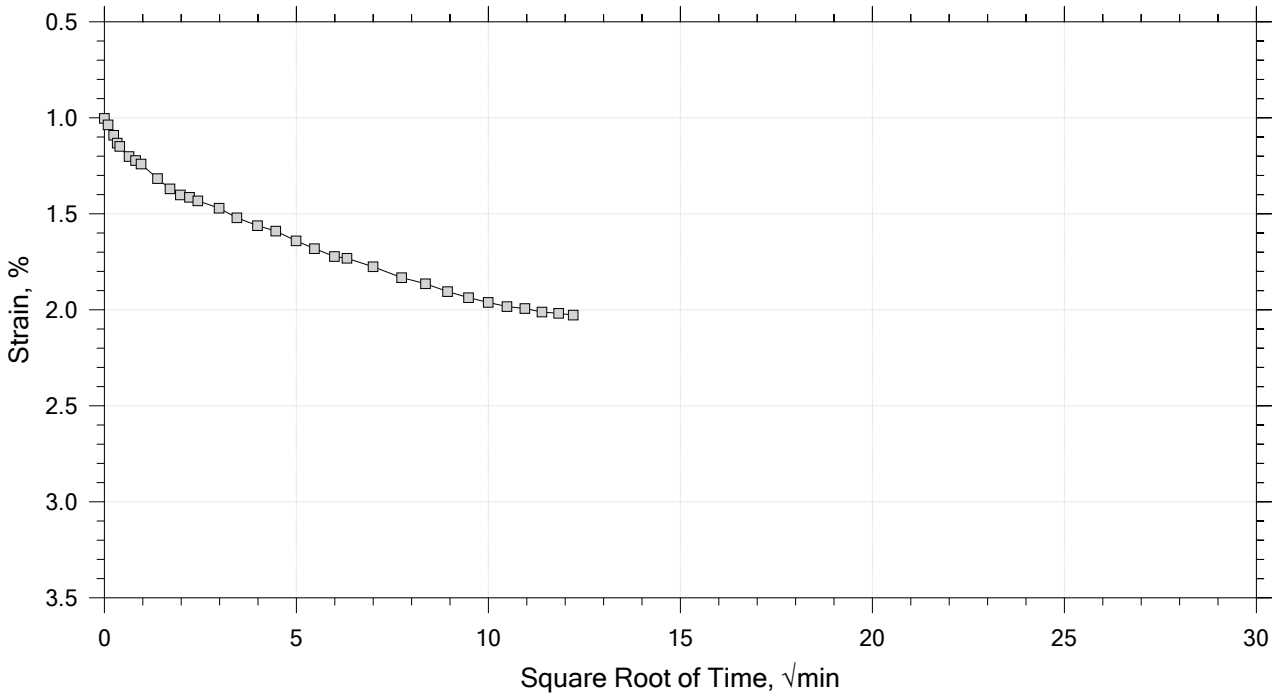




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 13
Constant Load Step
Stress: 2 tsf

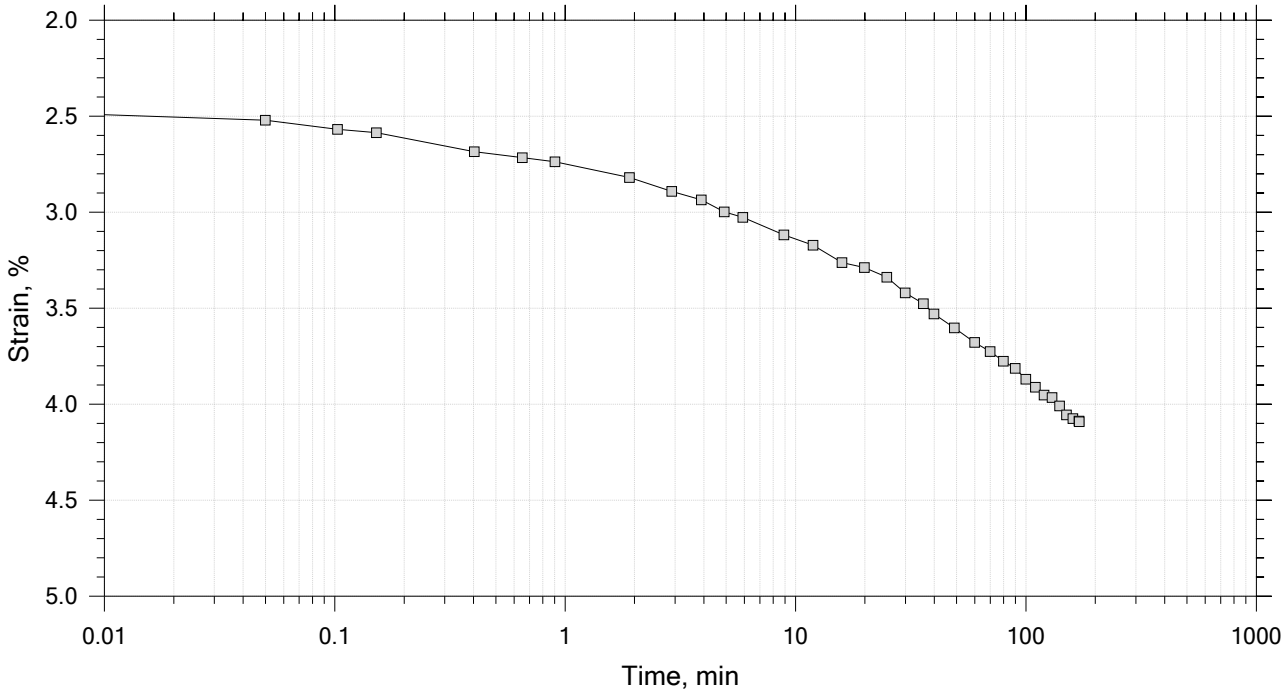


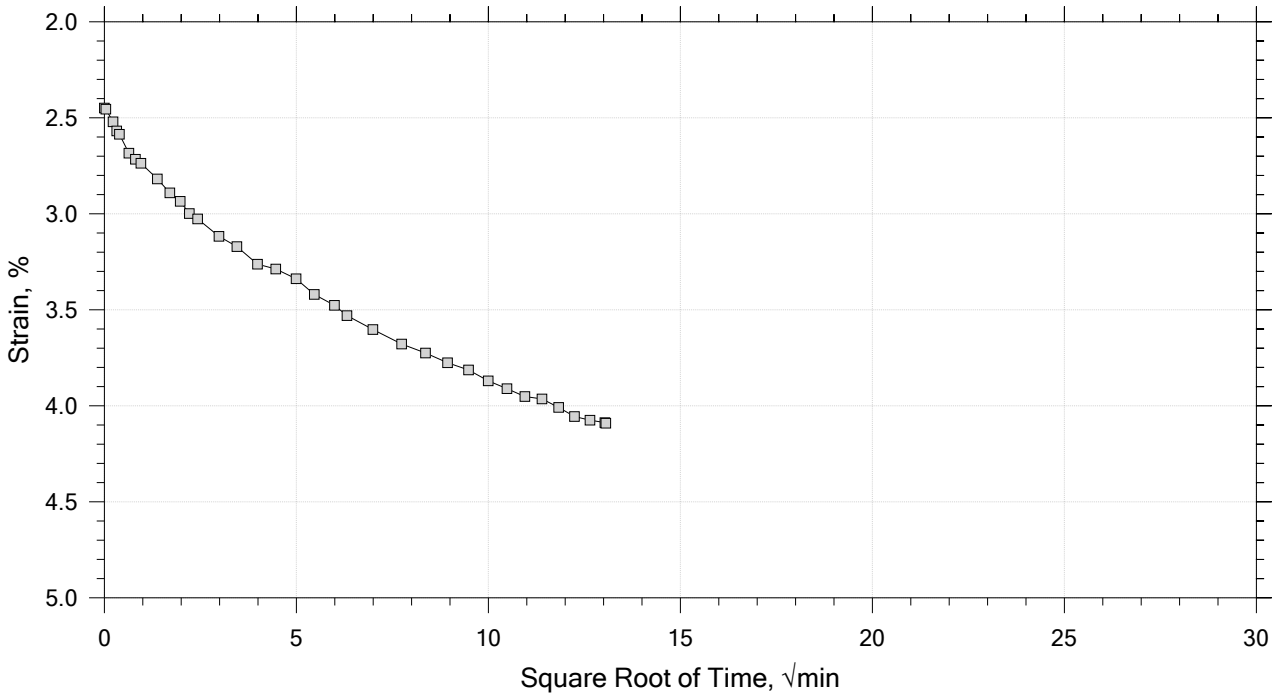




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| Description: Moist, reddish brown clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 13
Constant Load Step
Stress: 4 tsf



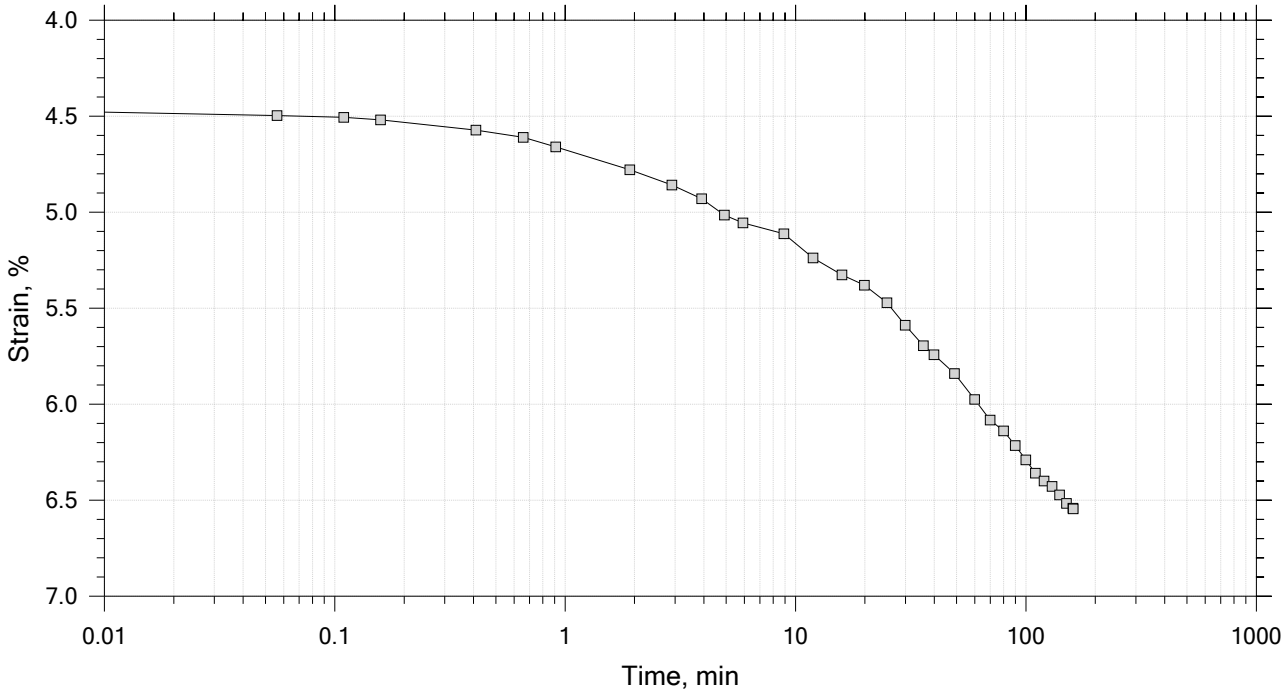

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

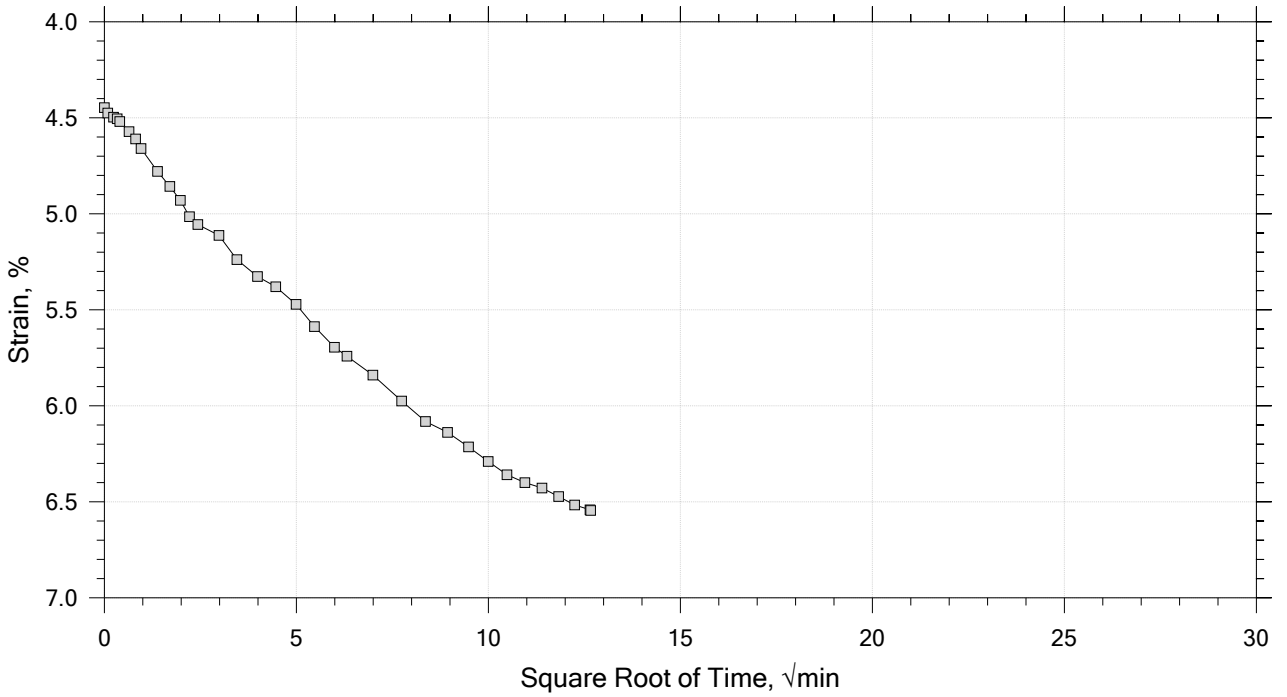
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 13

Constant Load Step

Stress: 8 tsf



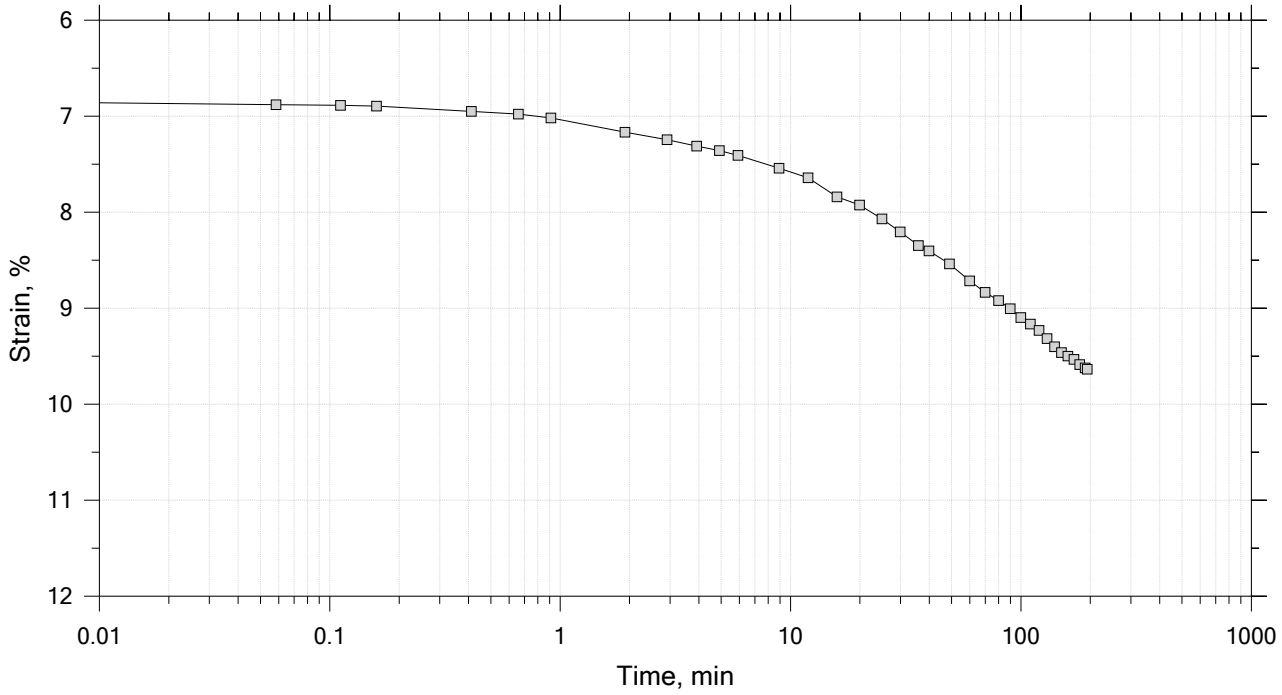

| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

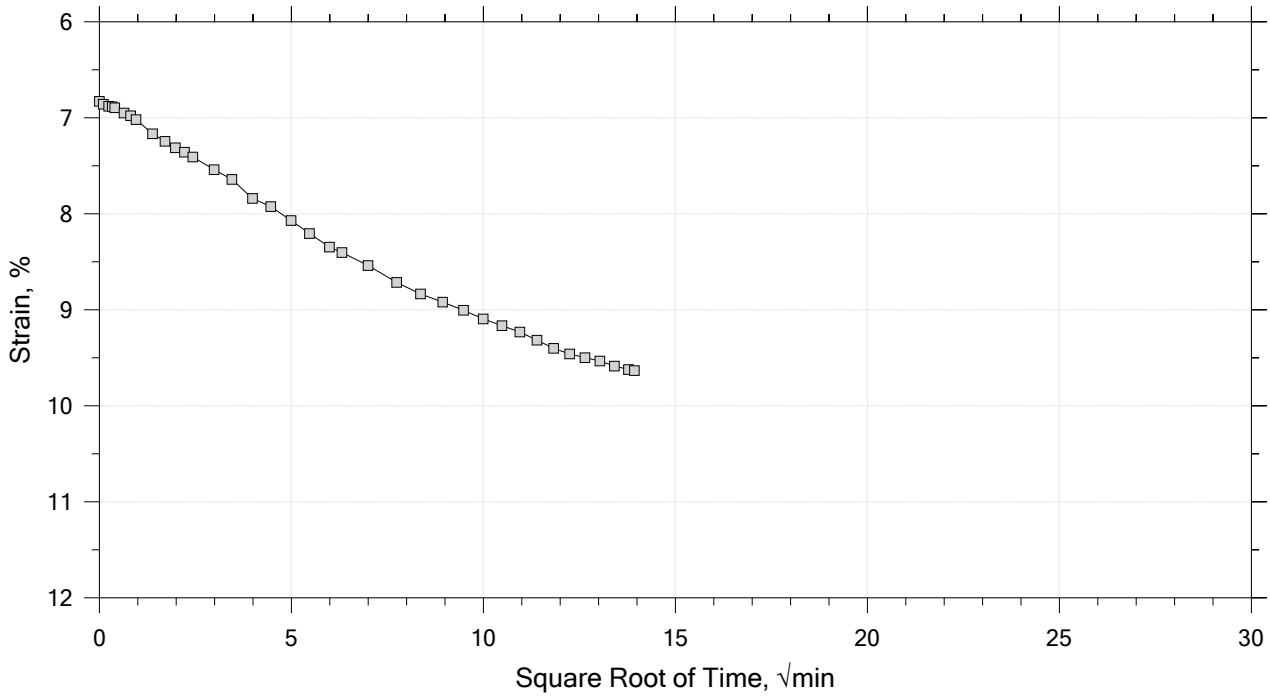
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 13

Constant Load Step

Stress: 16 tsf

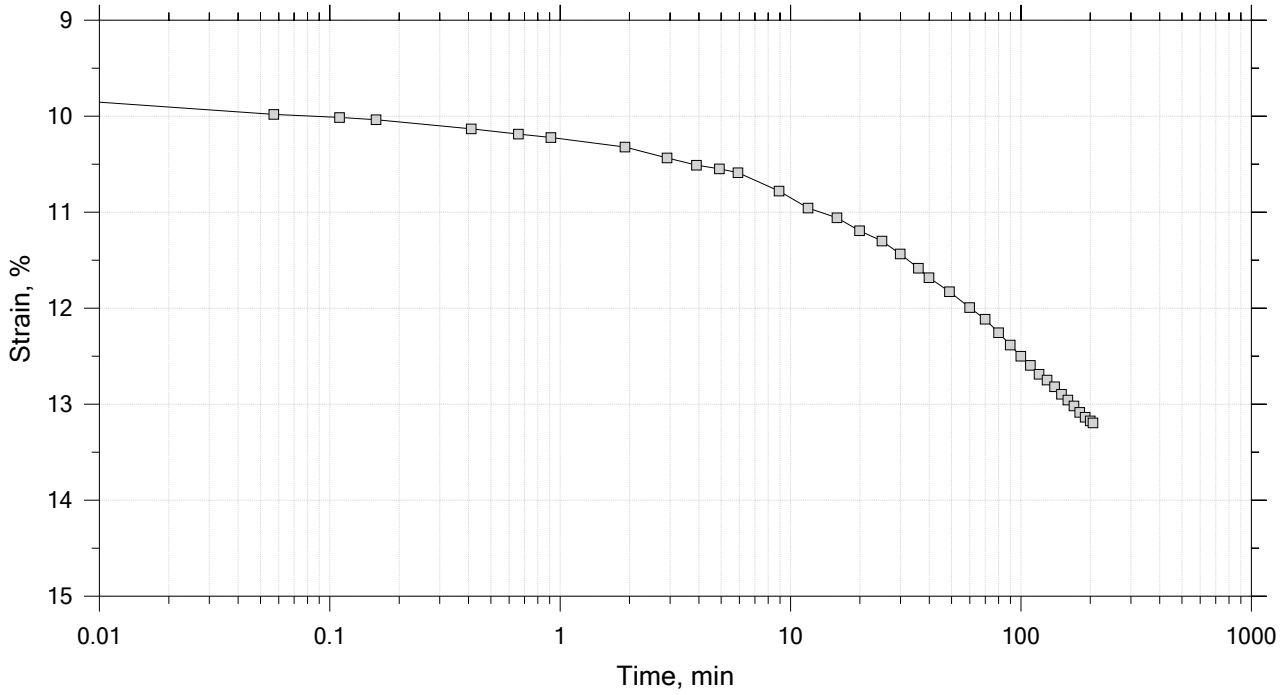


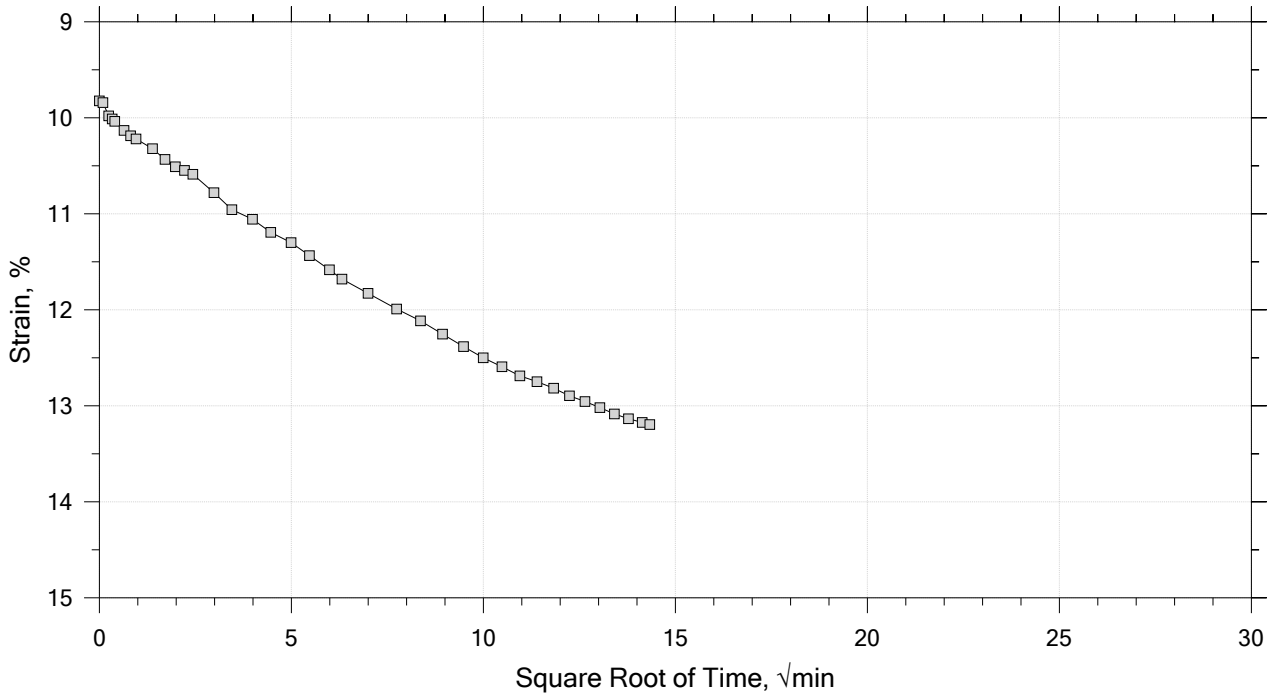




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 13
Constant Load Step
Stress: 32 tsf

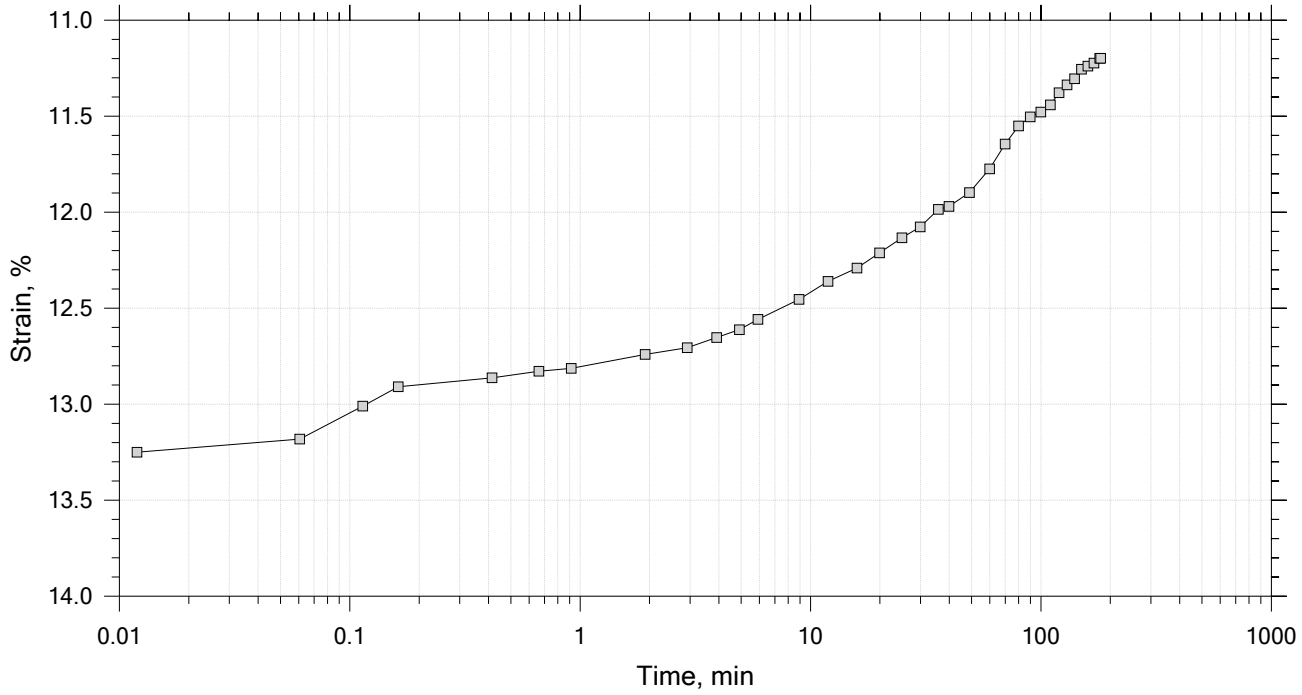


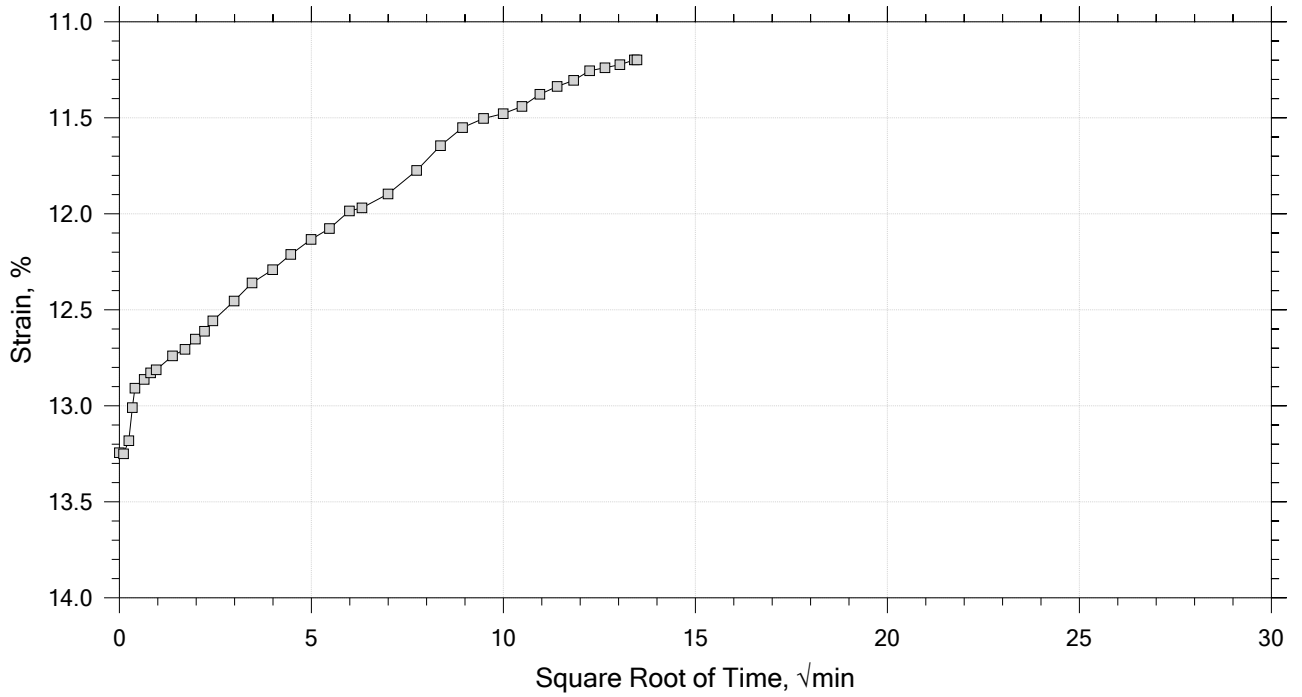




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 13
Constant Load Step
Stress: 8 tsf

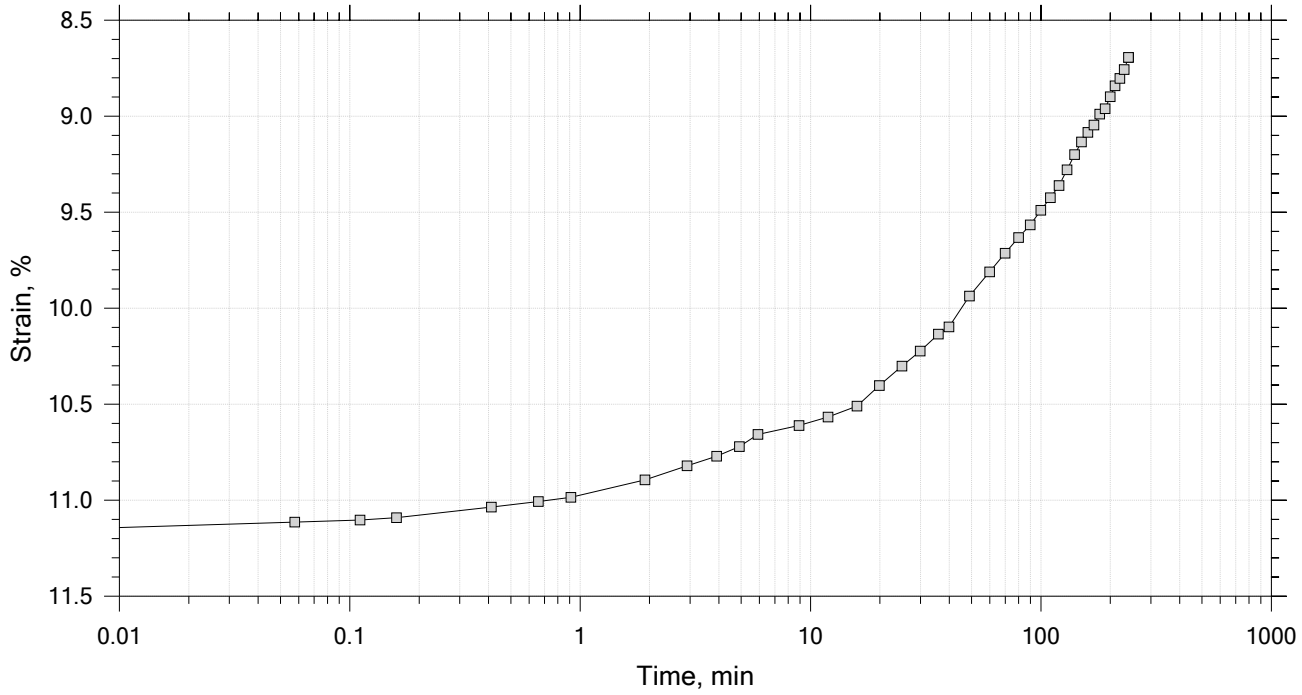


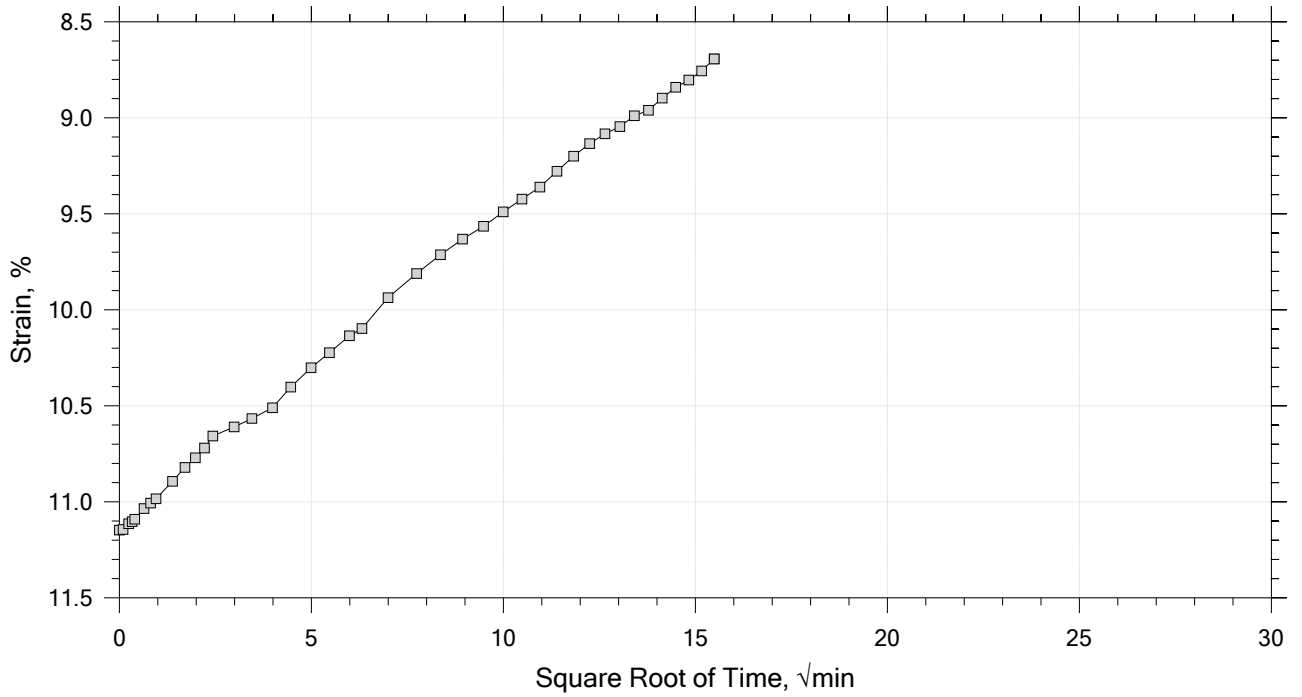




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| Description: Moist, reddish brown clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 13
Constant Load Step
Stress: 2 tsf

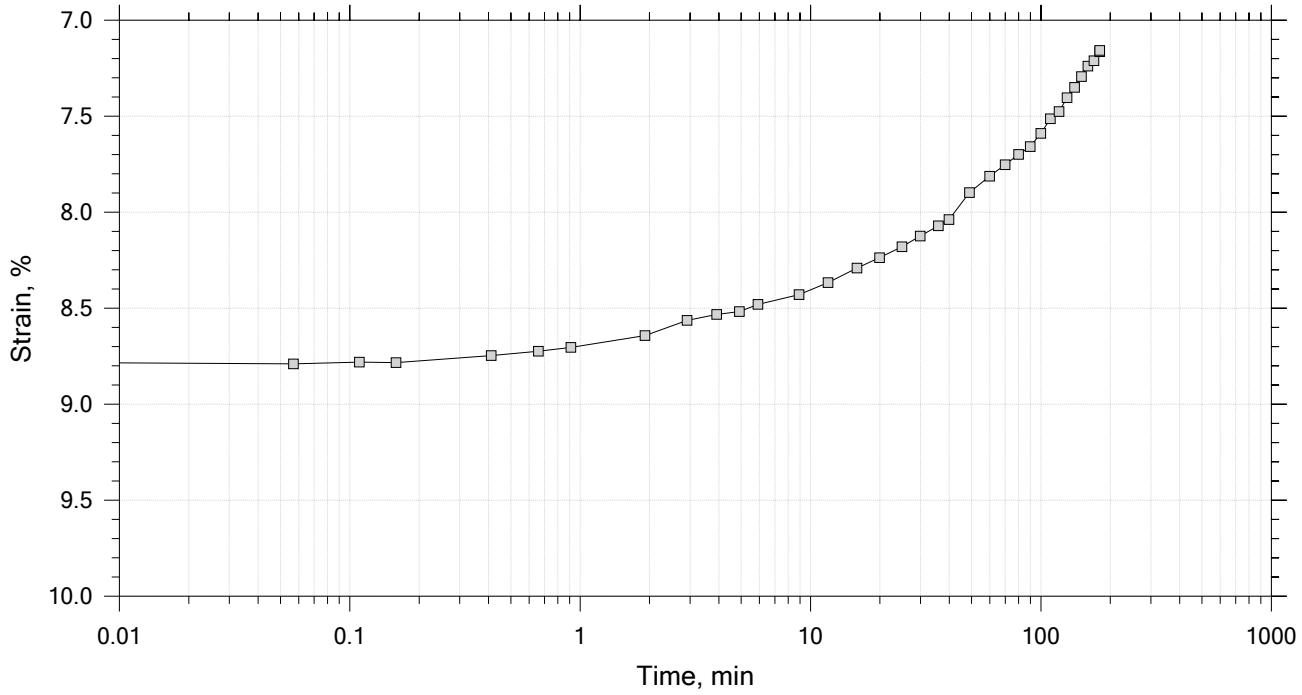


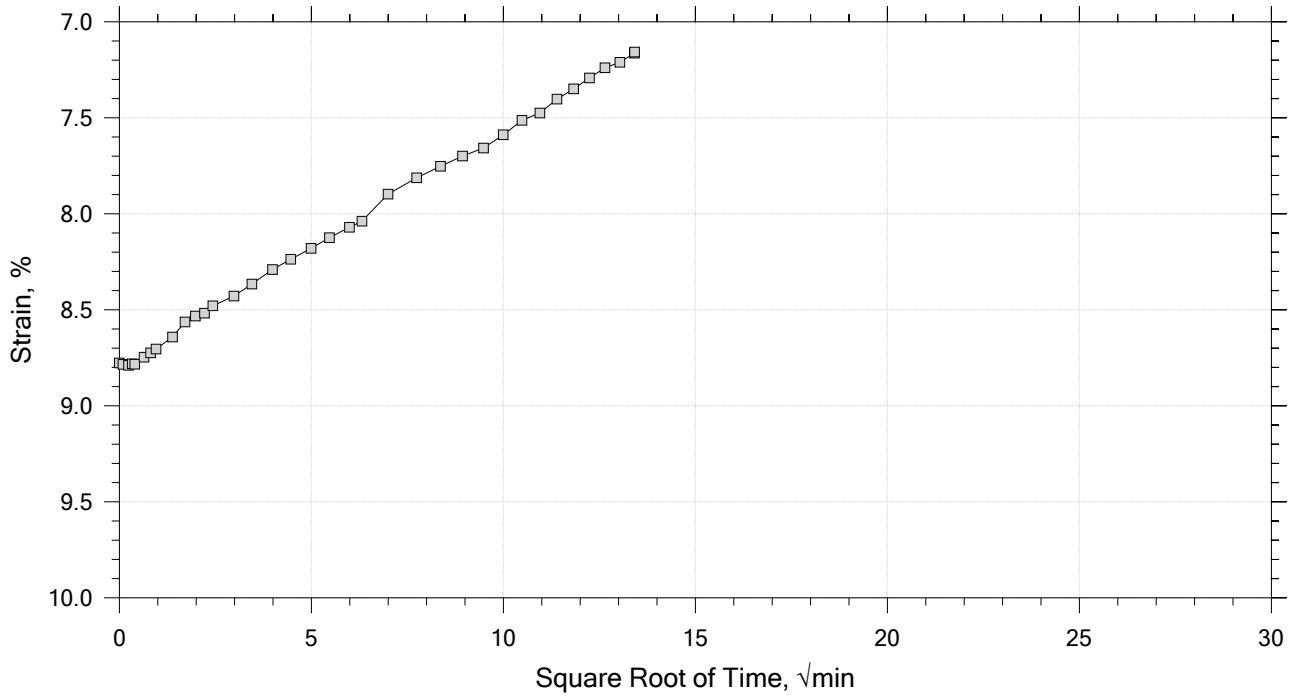




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| Description: Moist, reddish brown clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 13
Constant Load Step
Stress: 0.5 tsf

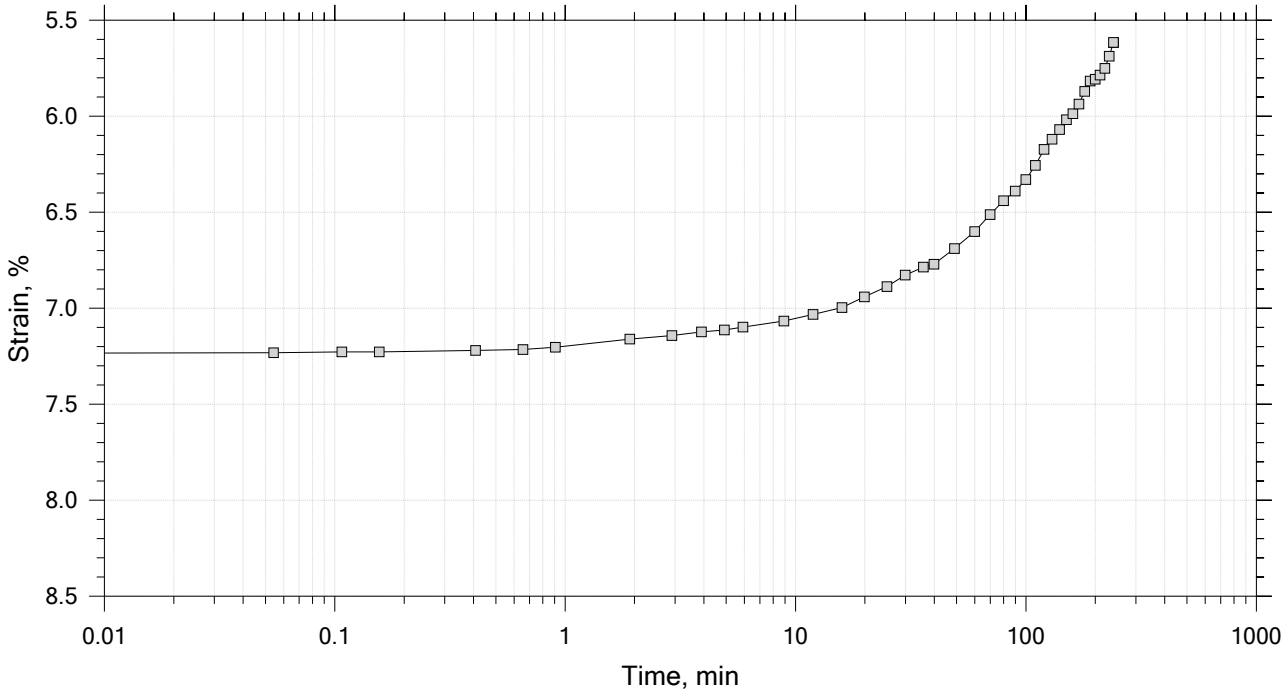


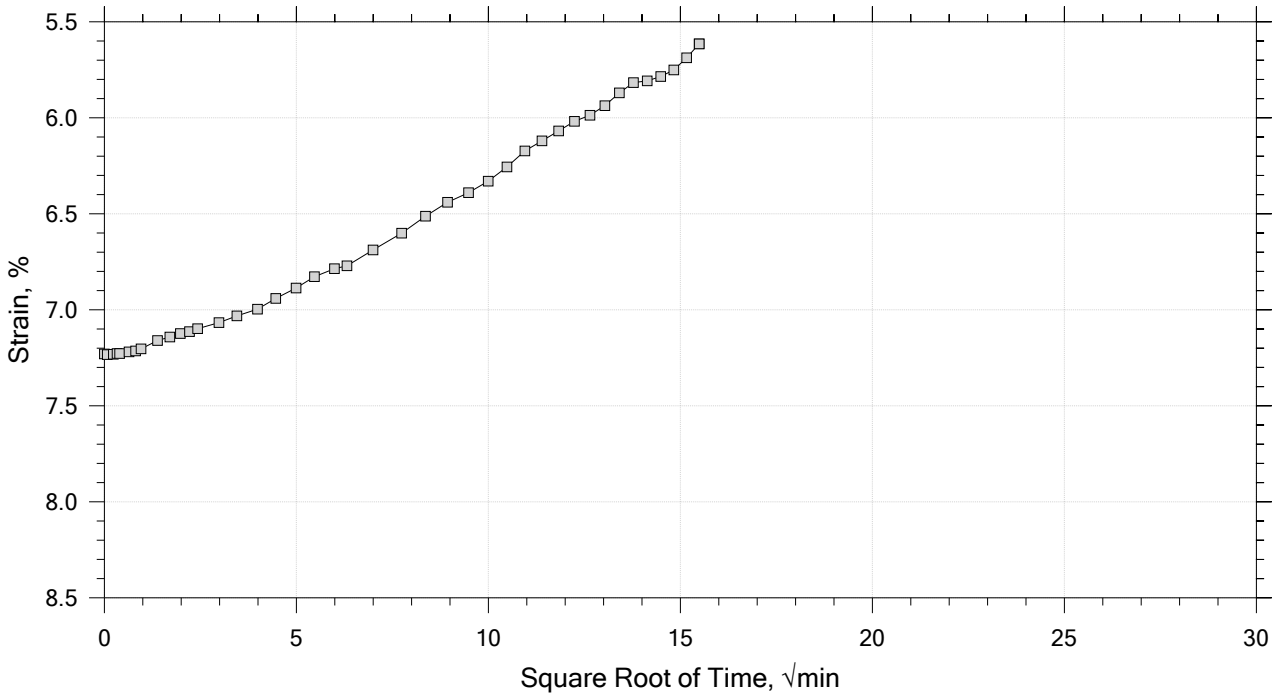




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| Description: Moist, reddish brown clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 13
Constant Load Step
Stress: 0.125 tsf

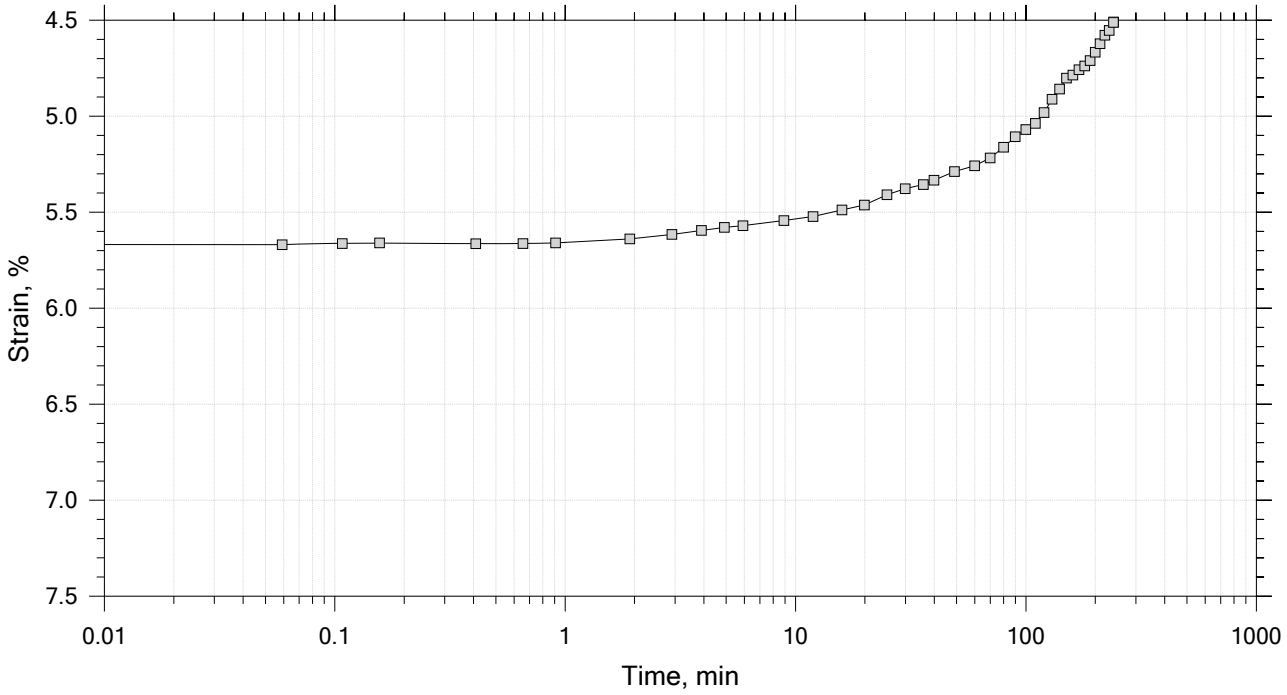


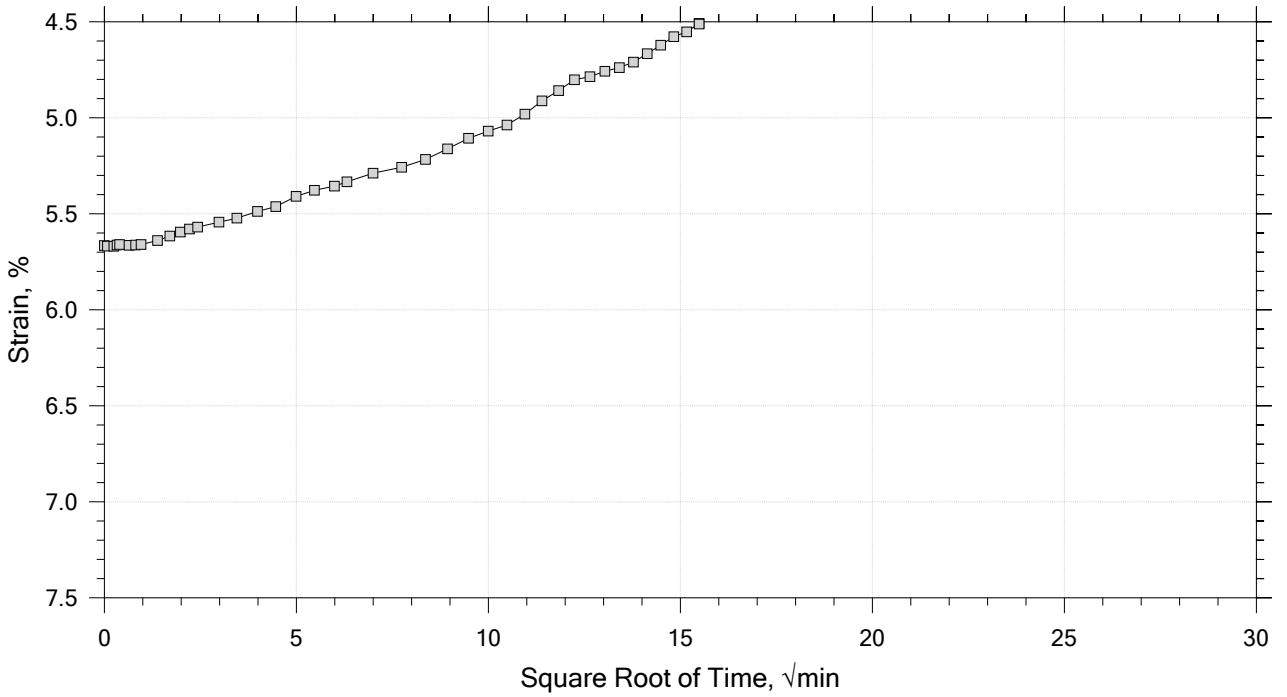




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| Description: Moist, reddish brown clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 13
Constant Load Step
Stress: 0.0625 tsf




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.81 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 0.918 | Plastic Limit: --- |
| Final Height: 0.95 in | Final Void Ratio: 0.822 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | A-1367 | RING | | D2620 |
| Mass Container, gm | 8.21 | 107.89 | 107.89 | 8.28 |
| Mass Container + Wet Soil, gm | 195.96 | 263.43 | 260.38 | 162.37 |
| Mass Container + Dry Soil, gm | 153.75 | 225.9 | 225.9 | 127.53 |
| Mass Dry Soil, gm | 145.54 | 118.01 | 118.01 | 119.25 |
| Water Content, % | 29.00 | 31.80 | 29.22 | 29.22 |
| Void Ratio | --- | 0.92 | 0.82 | --- |
| Degree of Saturation, % | --- | 97.48 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 91.587 | 96.407 | --- |

Warning: The change in the sample wet weight during the test is not consistent with the change in the moisture content.

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.443 | -0.001474 | 0.921 | -0.147 | 0.000 | 0.00e+00 | -3.33e-03 | -0.00e+00 | 0.00e+00 |
| 2 | 0.500 | -0.0006285 | 0.919 | -0.0628 | 0.000 | 0.00e+00 | 1.47e-02 | 0.00e+00 | 0.00e+00 |
| 3 | 1.00 | 0.006642 | 0.905 | 0.664 | 0.000 | 0.00e+00 | 1.45e-02 | 0.00e+00 | 0.00e+00 |
| 4 | 2.00 | 0.02028 | 0.879 | 2.03 | 0.000 | 0.00e+00 | 1.36e-02 | 0.00e+00 | 0.00e+00 |
| 5 | 4.00 | 0.04091 | 0.840 | 4.09 | 0.000 | 0.00e+00 | 1.03e-02 | 0.00e+00 | 0.00e+00 |
| 6 | 8.00 | 0.06545 | 0.792 | 6.55 | 0.000 | 0.00e+00 | 6.14e-03 | 0.00e+00 | 0.00e+00 |
| 7 | 16.0 | 0.09634 | 0.733 | 9.63 | 0.000 | 0.00e+00 | 3.86e-03 | 0.00e+00 | 0.00e+00 |
| 8 | 32.0 | 0.1320 | 0.665 | 13.2 | 0.000 | 0.00e+00 | 2.23e-03 | 0.00e+00 | 0.00e+00 |
| 9 | 8.00 | 0.1120 | 0.703 | 11.2 | 0.000 | 0.00e+00 | 8.32e-04 | 0.00e+00 | 0.00e+00 |
| 10 | 2.00 | 0.08693 | 0.751 | 8.69 | 0.000 | 0.00e+00 | 4.17e-03 | 0.00e+00 | 0.00e+00 |
| 11 | 0.500 | 0.07157 | 0.781 | 7.16 | 0.000 | 0.00e+00 | 1.02e-02 | 0.00e+00 | 0.00e+00 |
| 12 | 0.125 | 0.05615 | 0.810 | 5.62 | 0.000 | 0.00e+00 | 4.11e-02 | 0.00e+00 | 0.00e+00 |
| 13 | 0.0625 | 0.04512 | 0.831 | 4.51 | 0.000 | 0.00e+00 | 1.77e-01 | 0.00e+00 | 0.00e+00 |

GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| Description: Moist, reddish brown clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

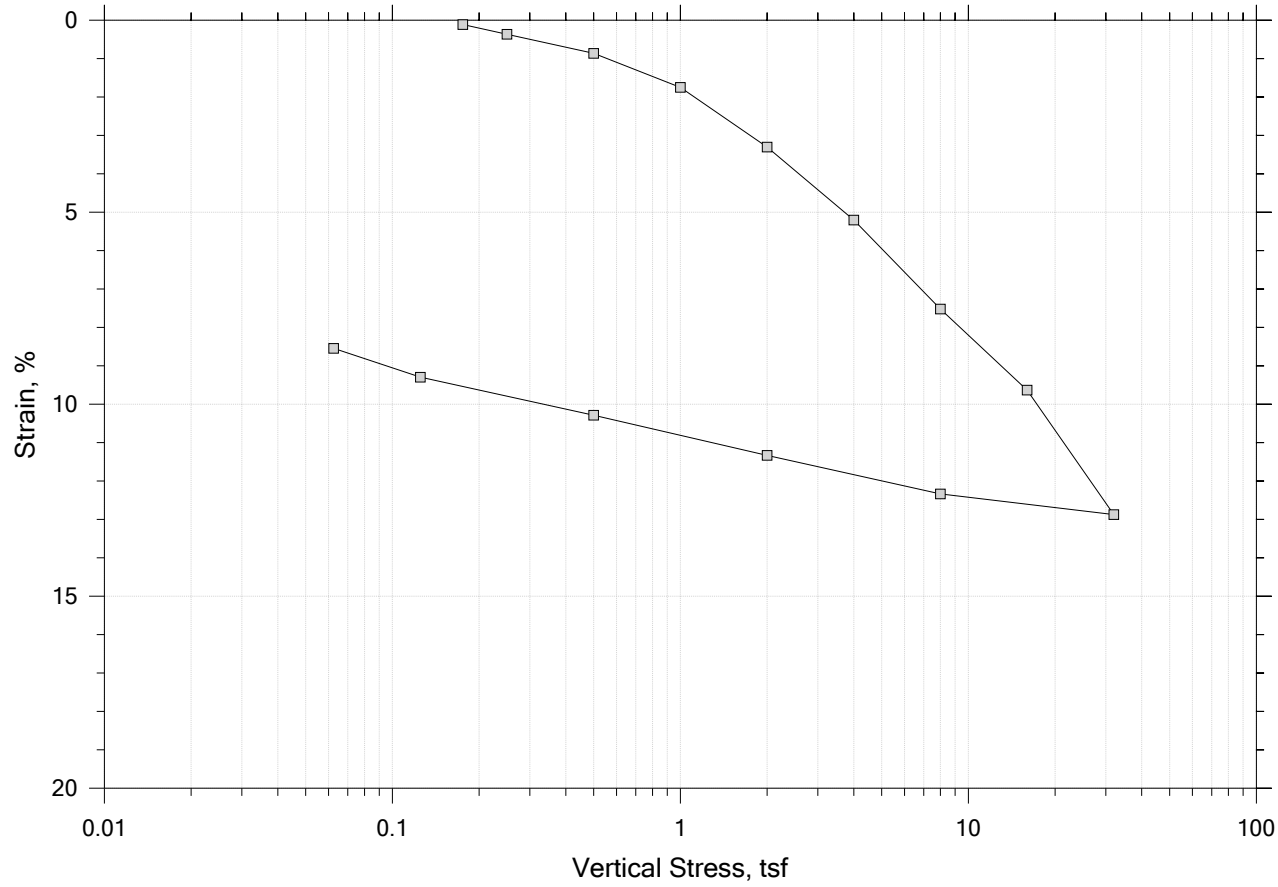
## Square Root of Time Coefficients

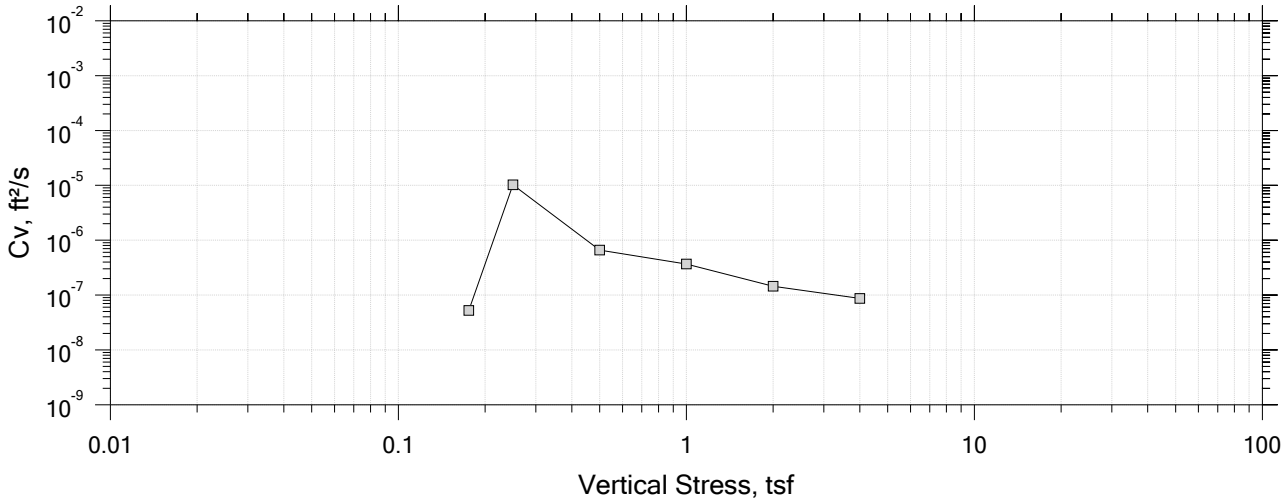
| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.443 | -0.001474 | 0.921 | -0.147 | 89.042 | 2.76e-07 | -3.33e-03 | -2.48e-06 |
| 2 | 0.500 | -0.0006285 | 0.919 | -0.0628 | 29.471 | 8.34e-07 | 1.47e-02 | 3.31e-05 |
| 3 | 1.00 | 0.006642 | 0.905 | 0.664 | 25.071 | 9.73e-07 | 1.45e-02 | 3.82e-05 |
| 4 | 2.00 | 0.02028 | 0.879 | 2.03 | 63.686 | 3.75e-07 | 1.36e-02 | 1.38e-05 |
| 5 | 4.00 | 0.04091 | 0.840 | 4.09 | 54.943 | 4.20e-07 | 1.03e-02 | 1.17e-05 |
| 6 | 8.00 | 0.06545 | 0.792 | 6.55 | 68.357 | 3.22e-07 | 6.14e-03 | 5.33e-06 |
| 7 | 16.0 | 0.09634 | 0.733 | 9.63 | 167.241 | 1.24e-07 | 3.86e-03 | 1.29e-06 |
| 8 | 32.0 | 0.1320 | 0.665 | 13.2 | 117.365 | 1.64e-07 | 2.23e-03 | 9.85e-07 |
| 9 | 8.00 | 0.1120 | 0.703 | 11.2 | 86.170 | 2.20e-07 | 8.32e-04 | 4.93e-07 |
| 10 | 2.00 | 0.08693 | 0.751 | 8.69 | 205.876 | 9.67e-08 | 4.17e-03 | 1.09e-06 |
| 11 | 0.500 | 0.07157 | 0.781 | 7.16 | 136.653 | 1.52e-07 | 1.02e-02 | 4.20e-06 |
| 12 | 0.125 | 0.05615 | 0.810 | 5.62 | 0.000 | 0.00e+00 | 4.11e-02 | 0.00e+00 |
| 13 | 0.0625 | 0.04512 | 0.831 | 4.51 | 0.000 | 0.00e+00 | 1.77e-01 | 0.00e+00 |

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB018 | Tested By: md | Checked By: njh |
| | Sample No.: SL0868 | Test Date: 01/09/19 | Depth: 25-27 ft |
| | Test No.: IP-4 | Sample Type: intact | Elevation: --- |
| | Description: Moist, reddish brown clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.443 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report



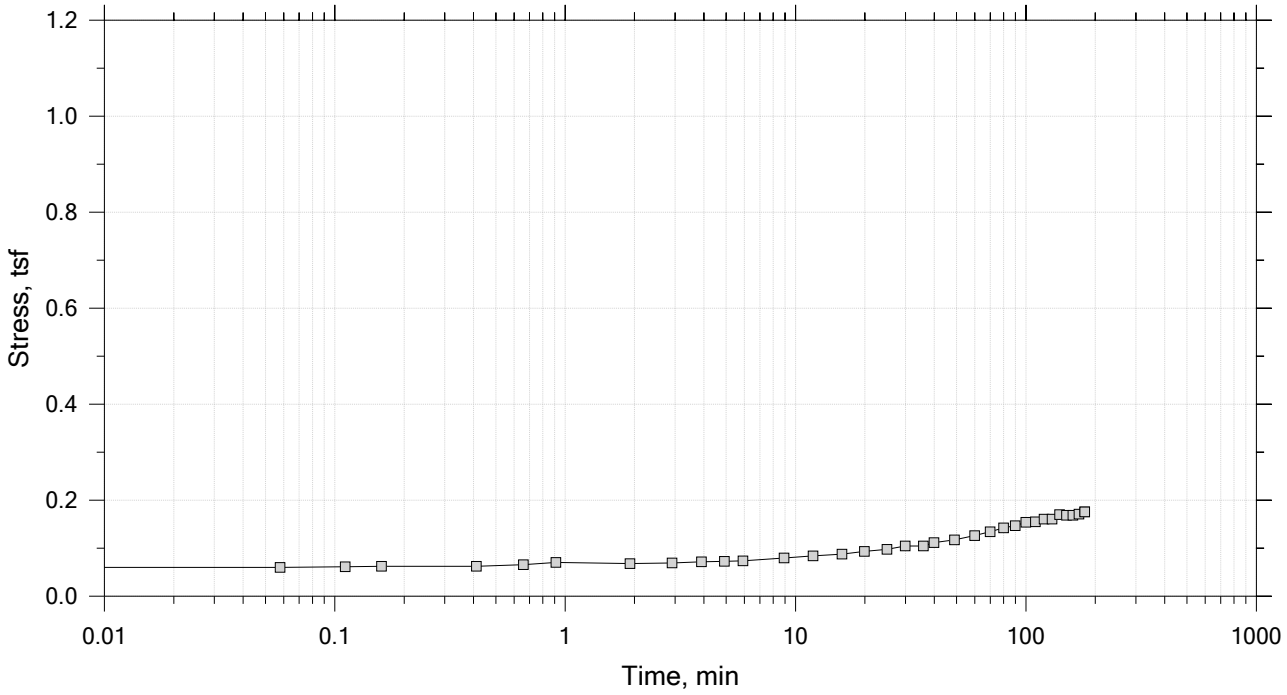

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |
| | Displacement at End of Increment | | |

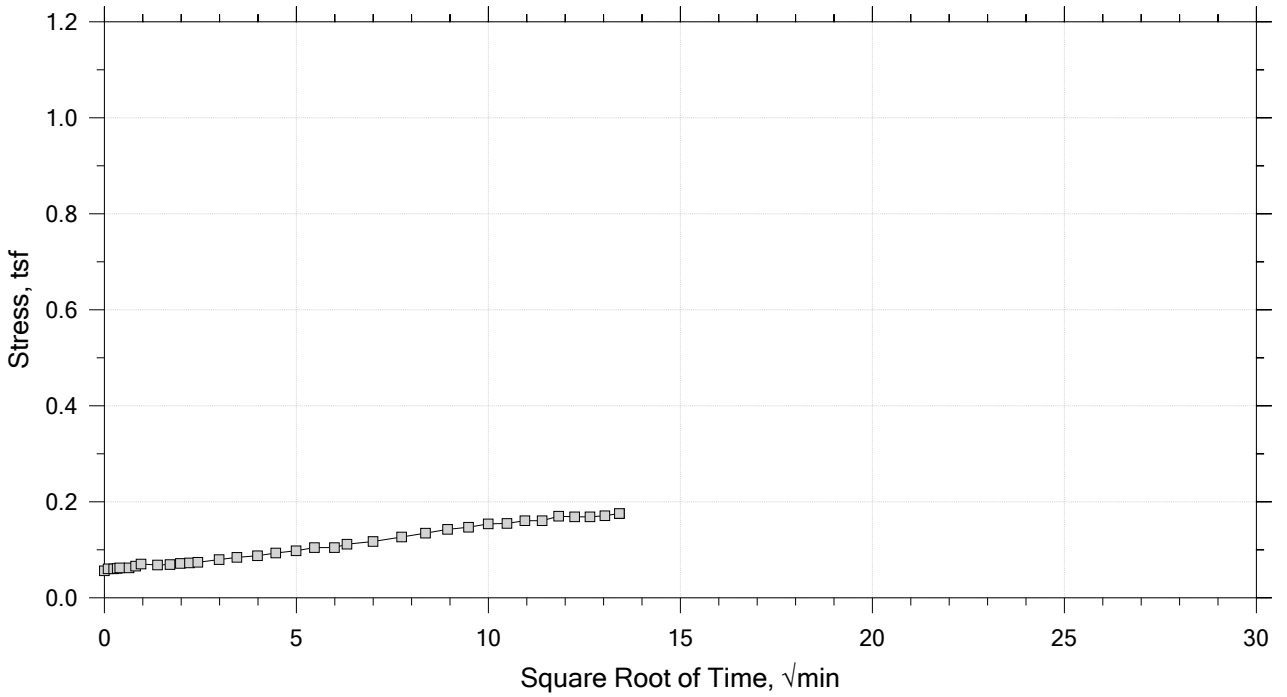
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 14

Constant Volume Step

Stress: 0.176 tsf

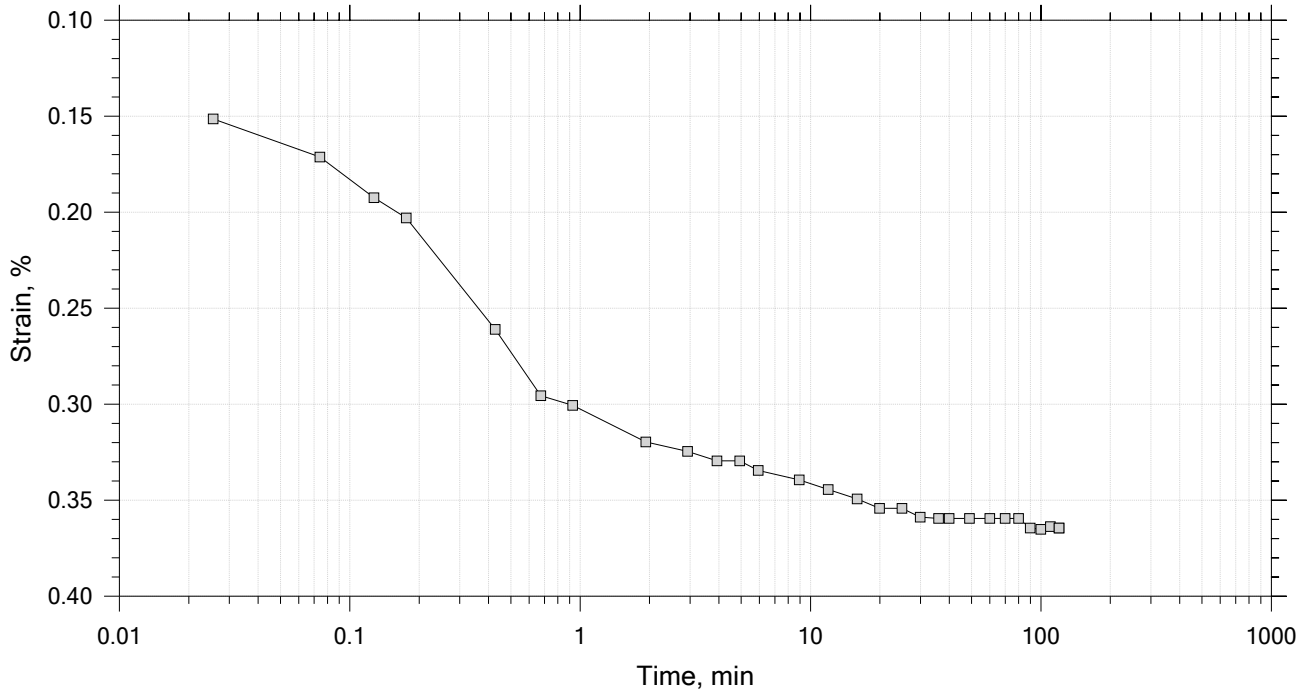


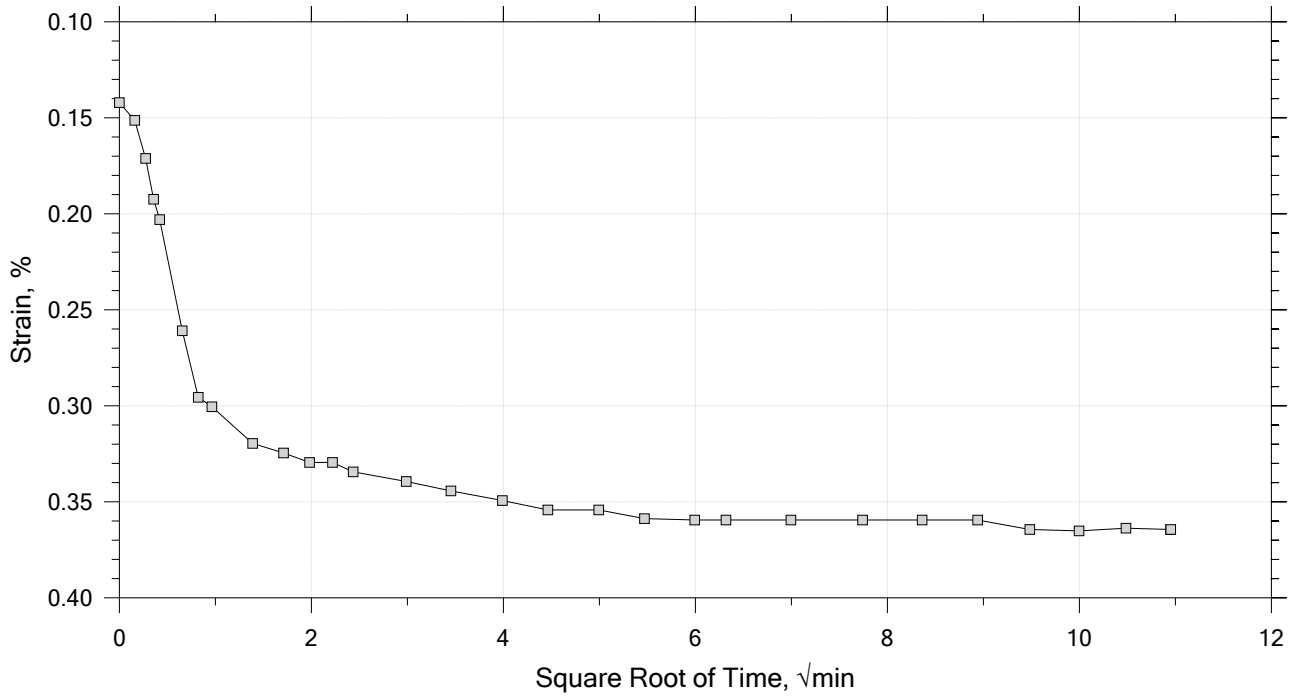




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 14
Constant Load Step
Stress: 0.25 tsf

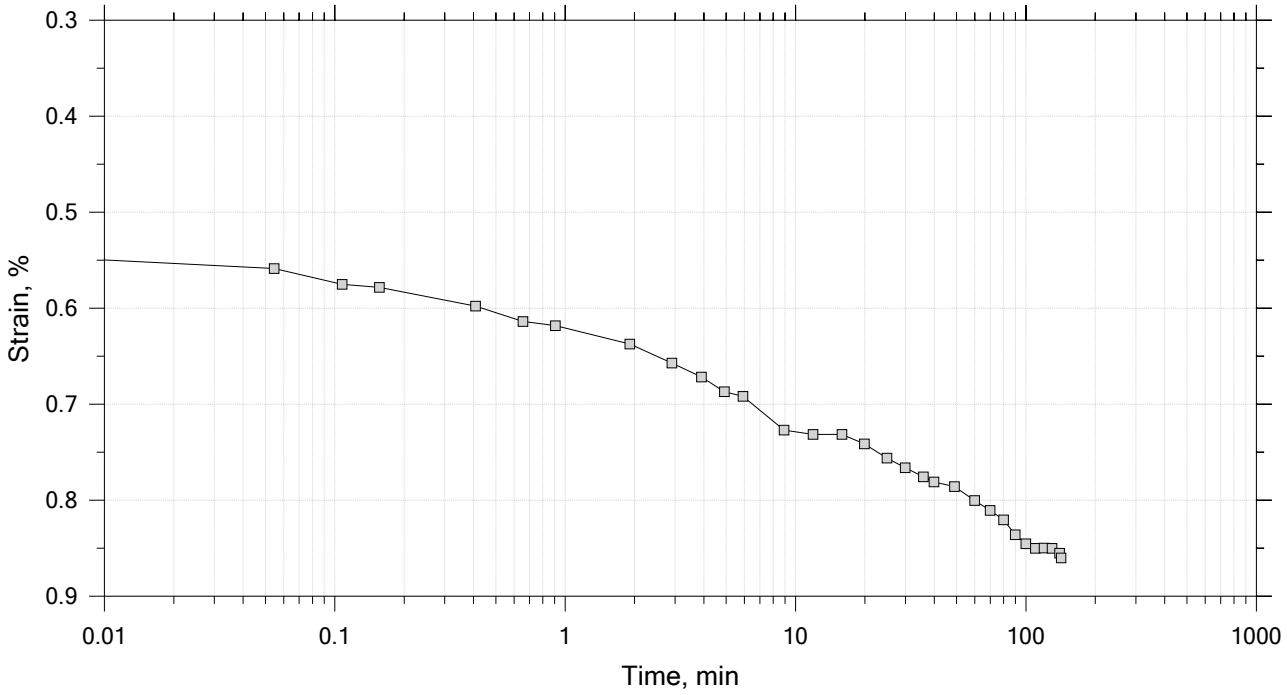


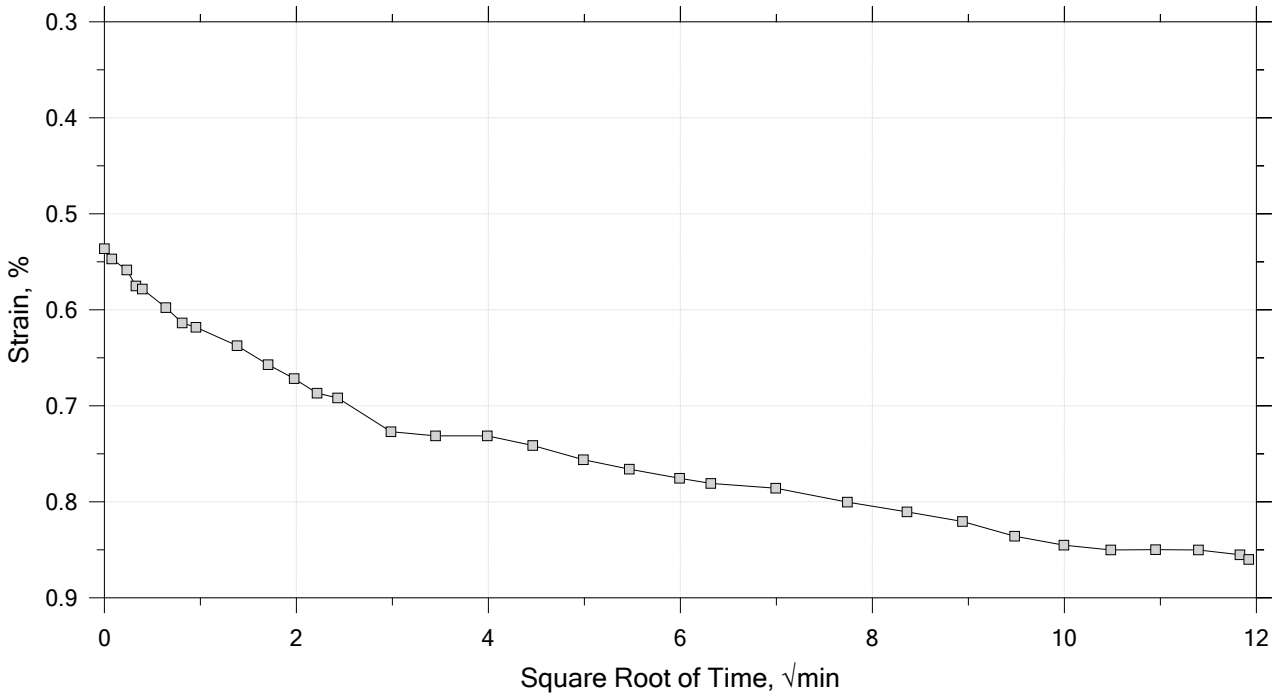




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 14
Constant Load Step
Stress: 0.5 tsf

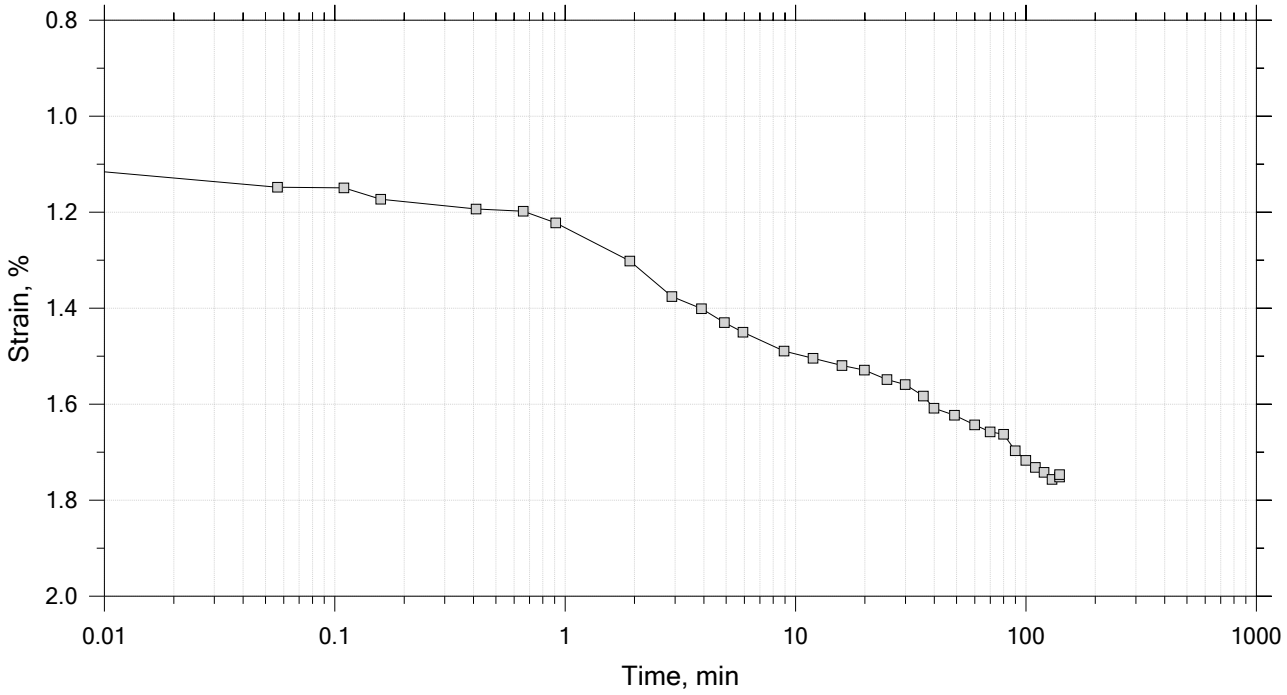


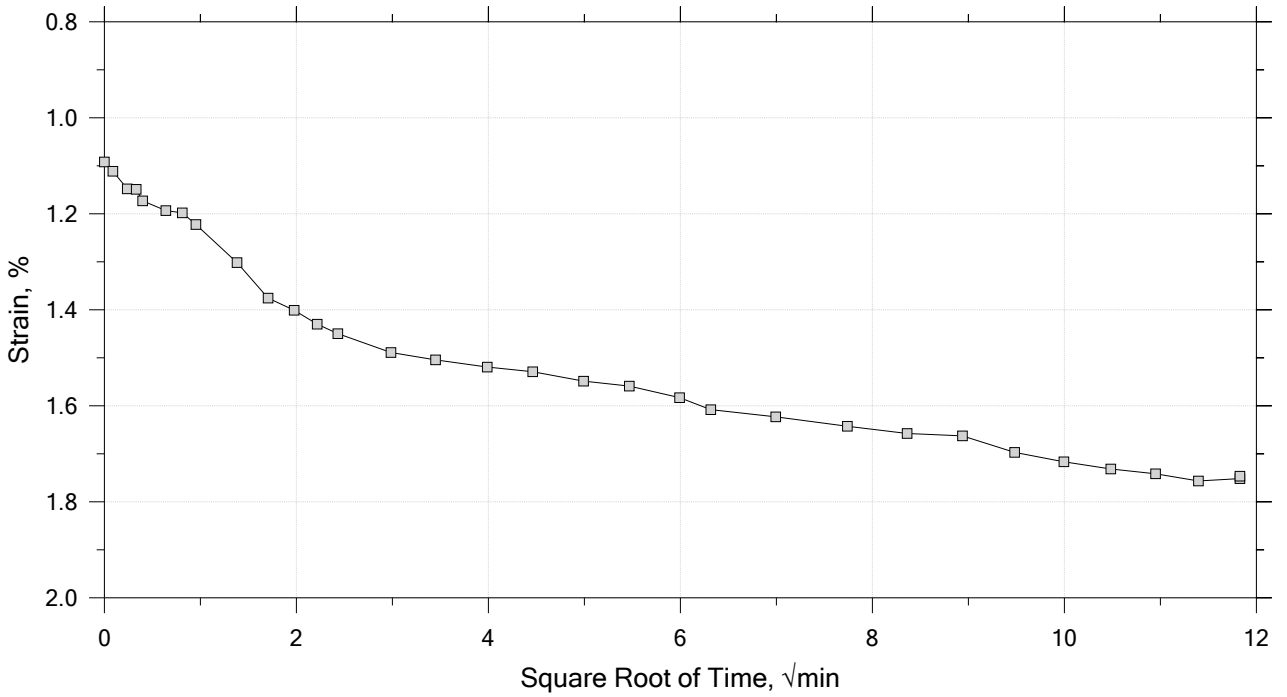




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 14
Constant Load Step
Stress: 1 tsf

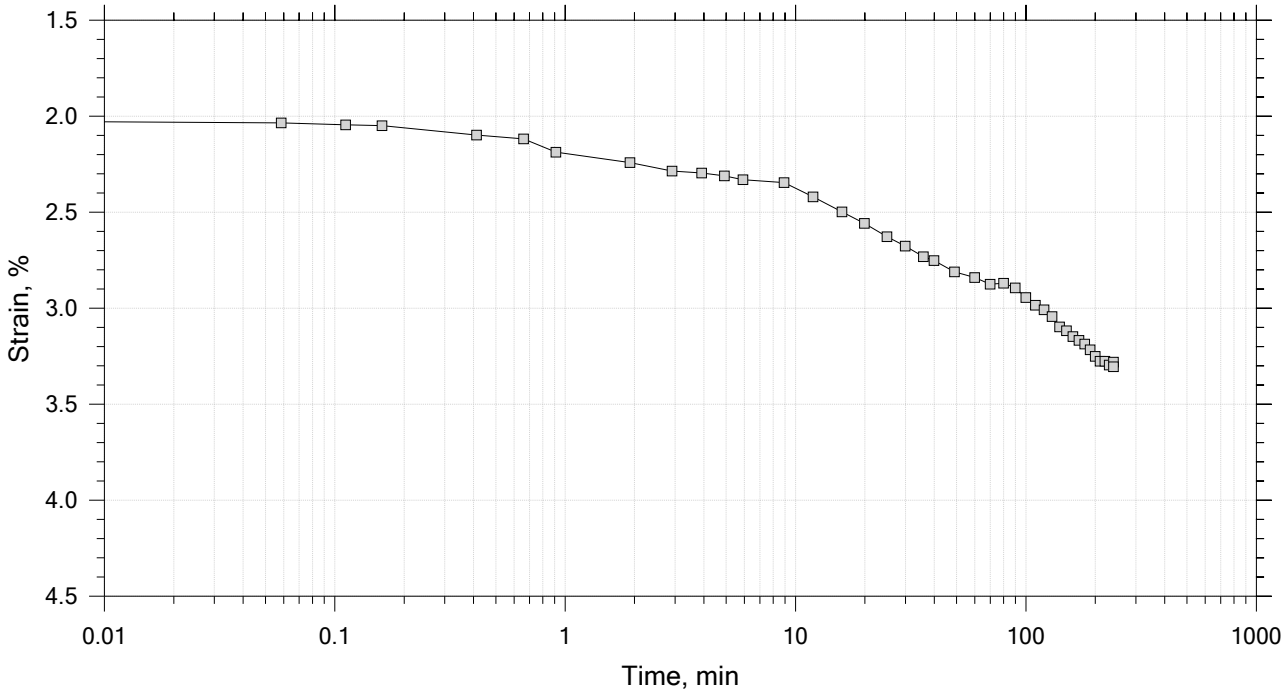


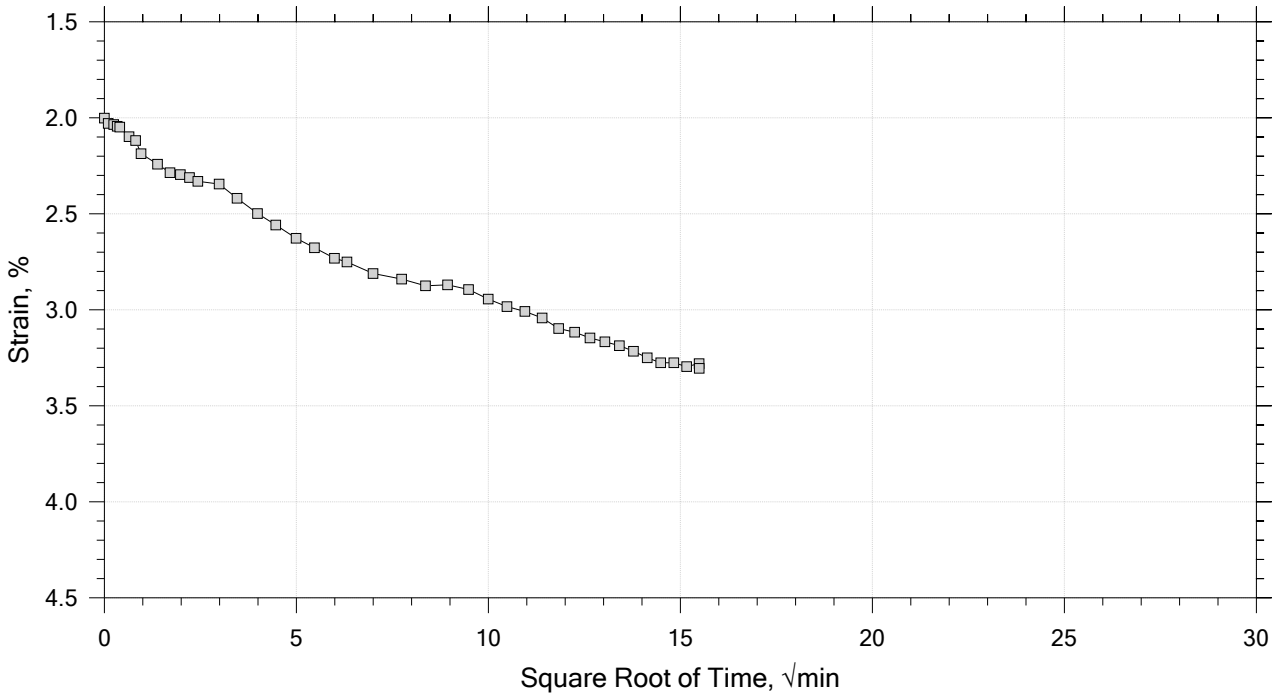




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 14
Constant Load Step
Stress: 2 tsf

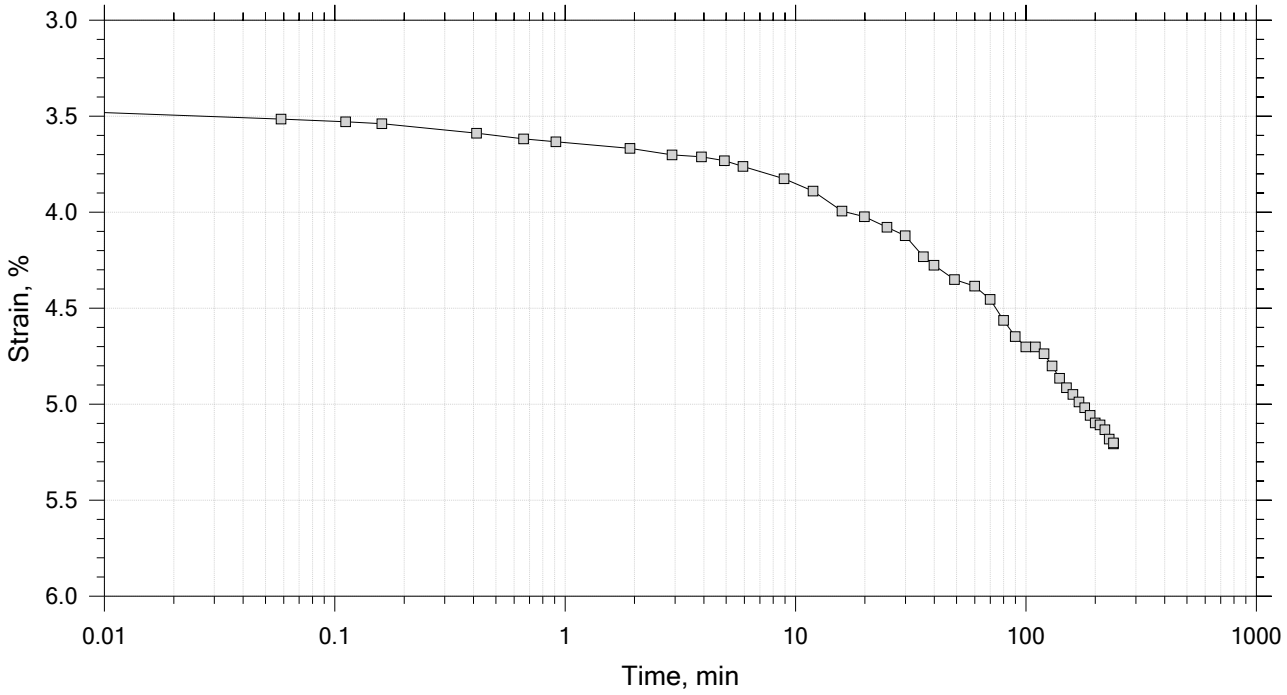


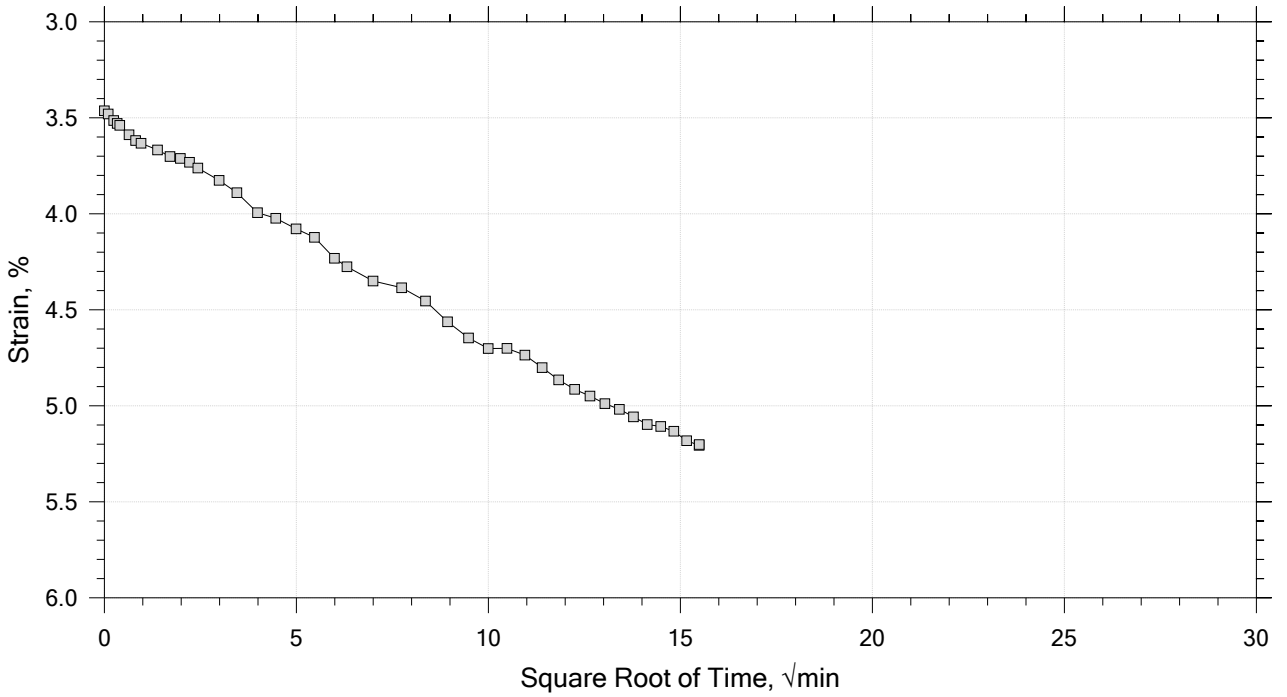




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 14
Constant Load Step
Stress: 4 tsf

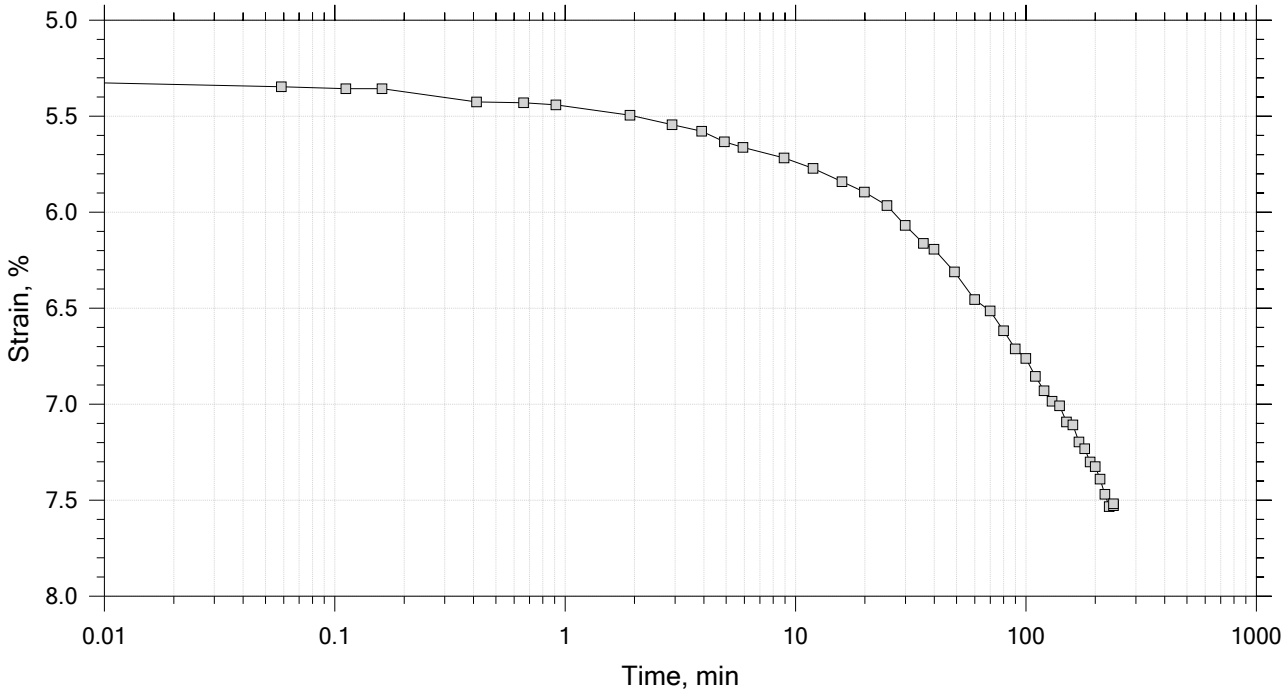


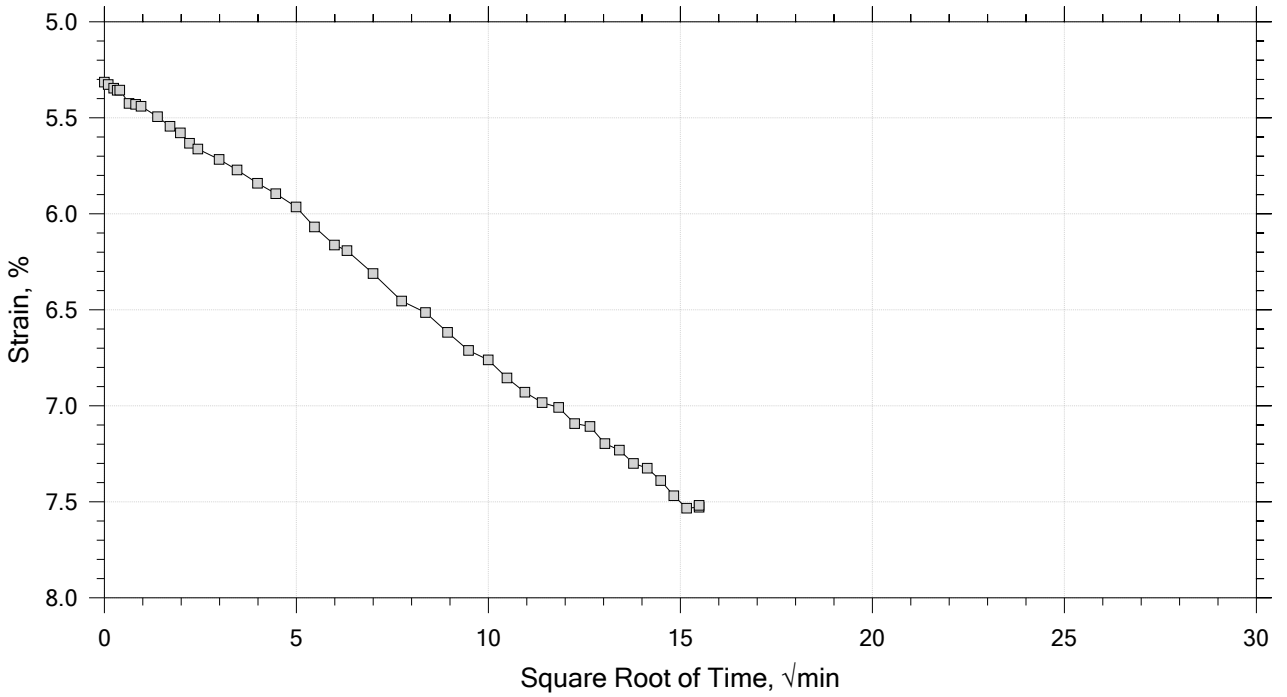




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 14
Constant Load Step
Stress: 8 tsf

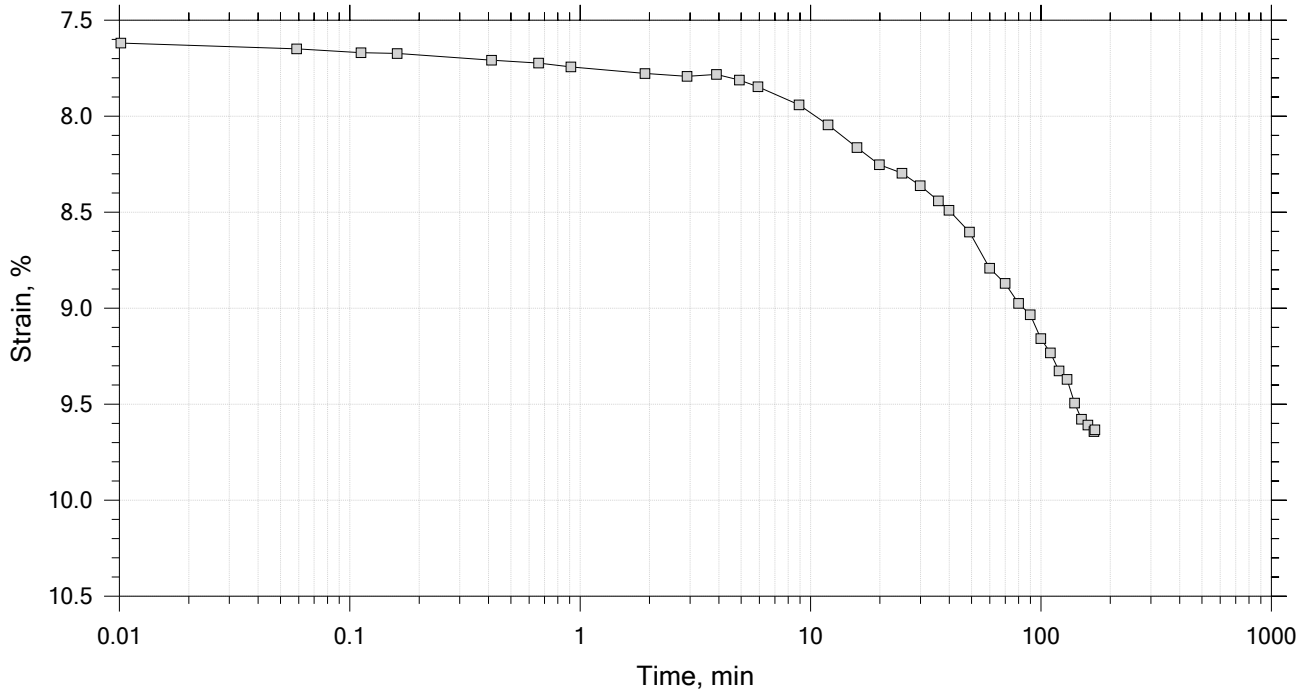


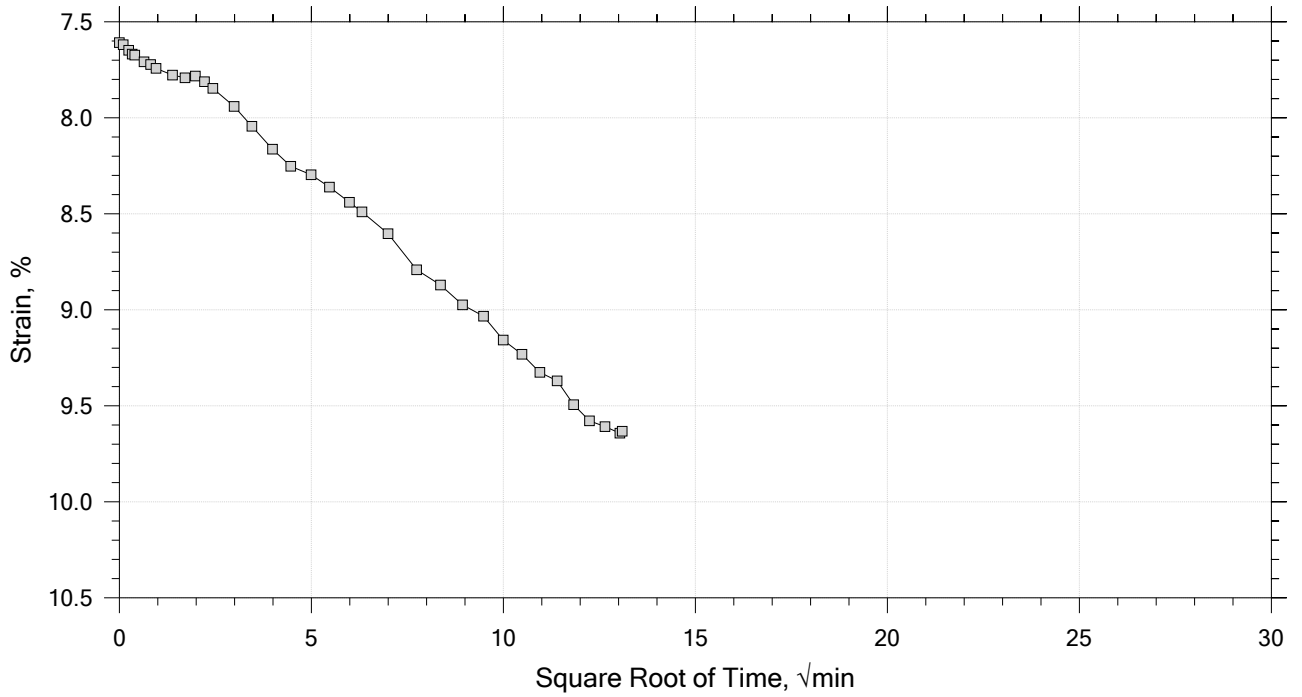




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 14
Constant Load Step
Stress: 16 tsf

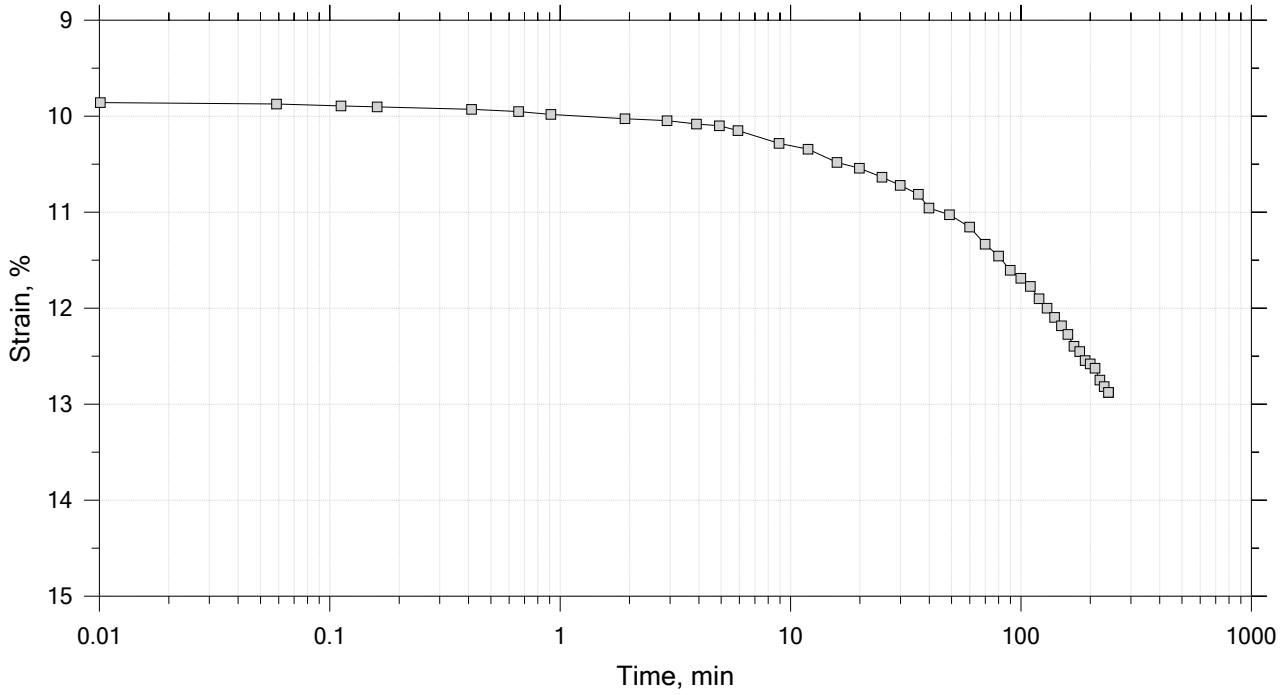


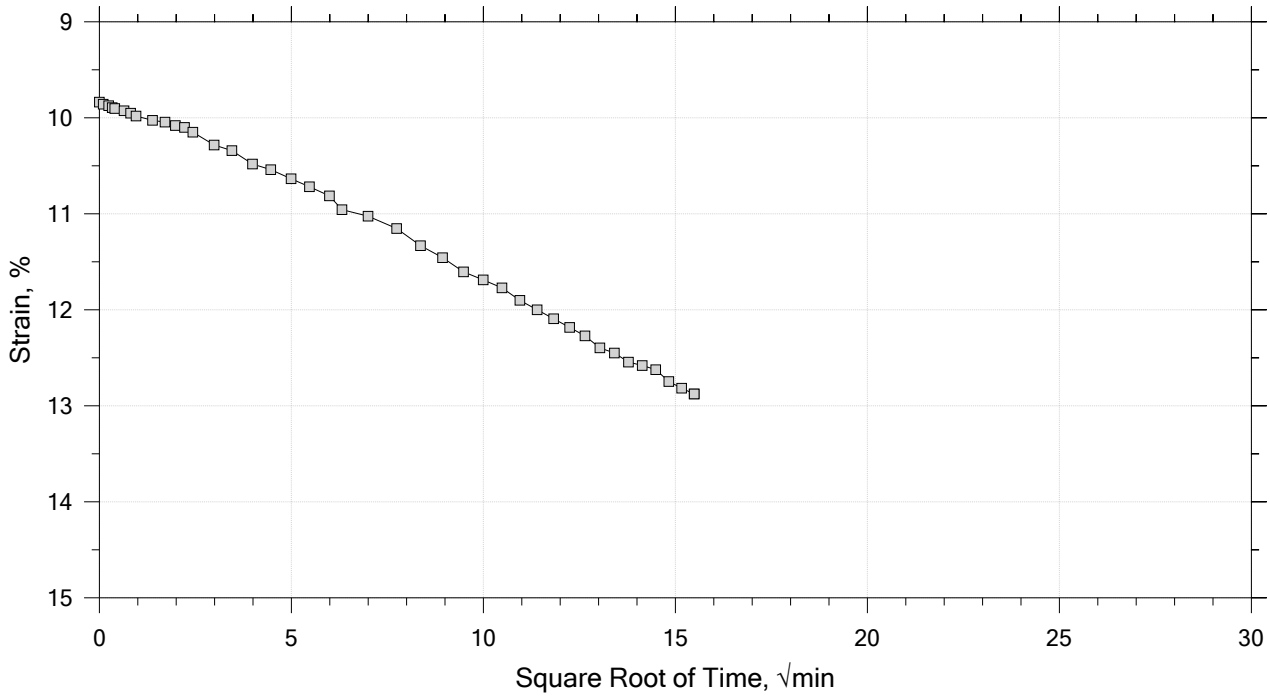




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 14
Constant Load Step
Stress: 32 tsf

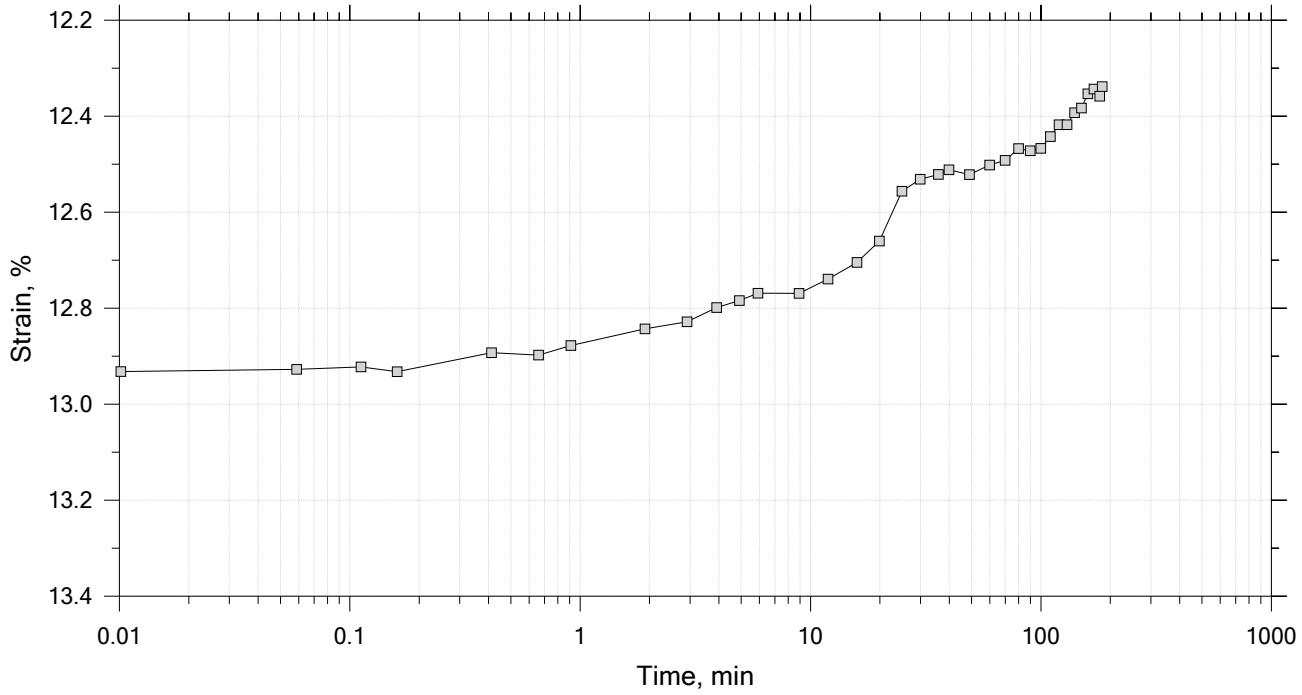


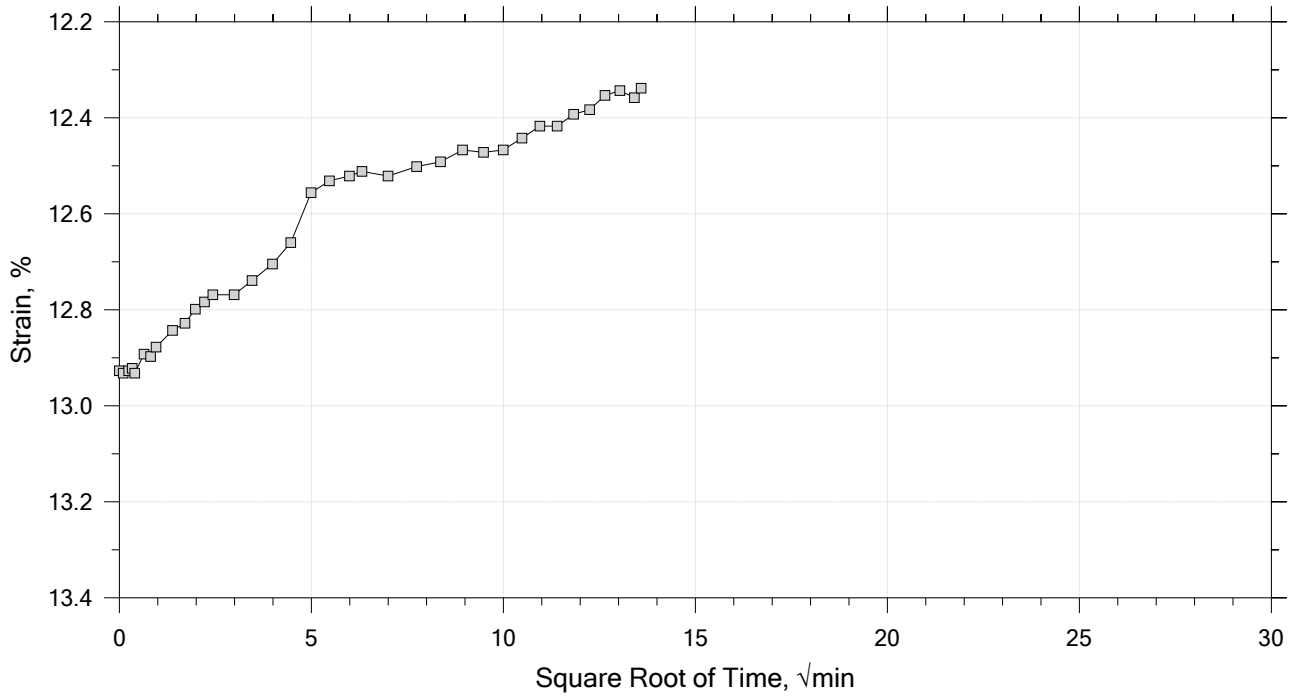




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 14
Constant Load Step
Stress: 8 tsf

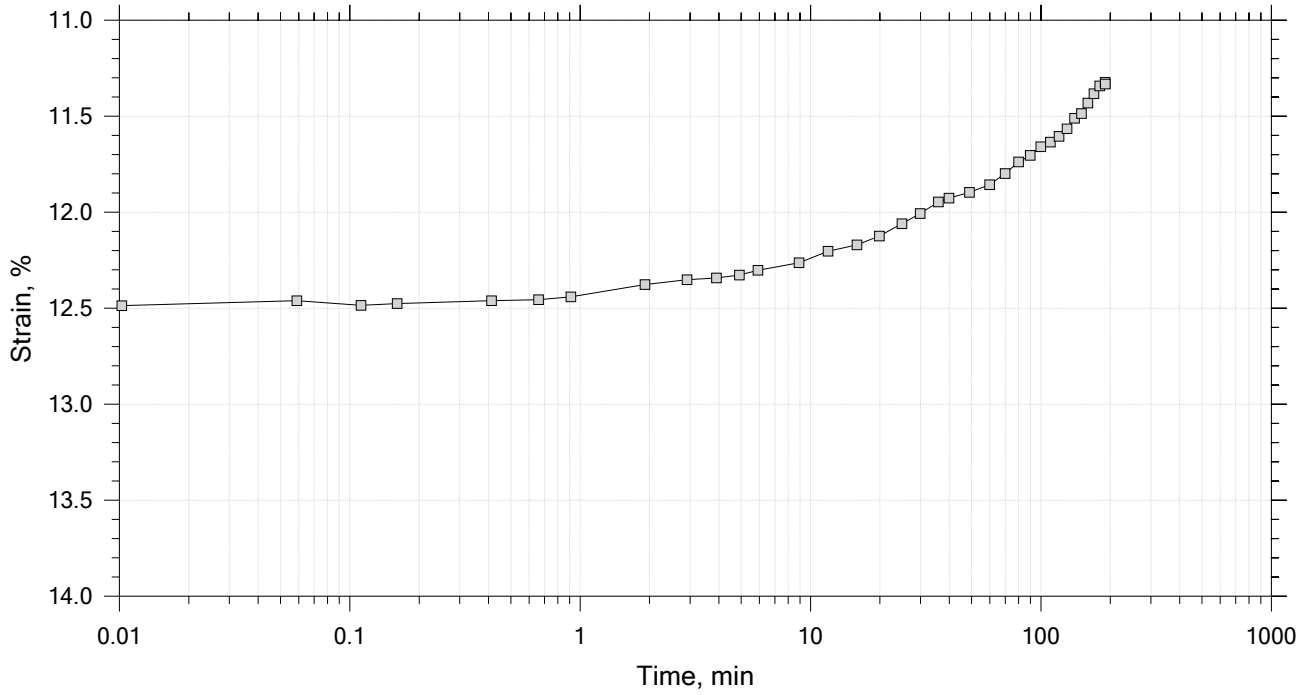


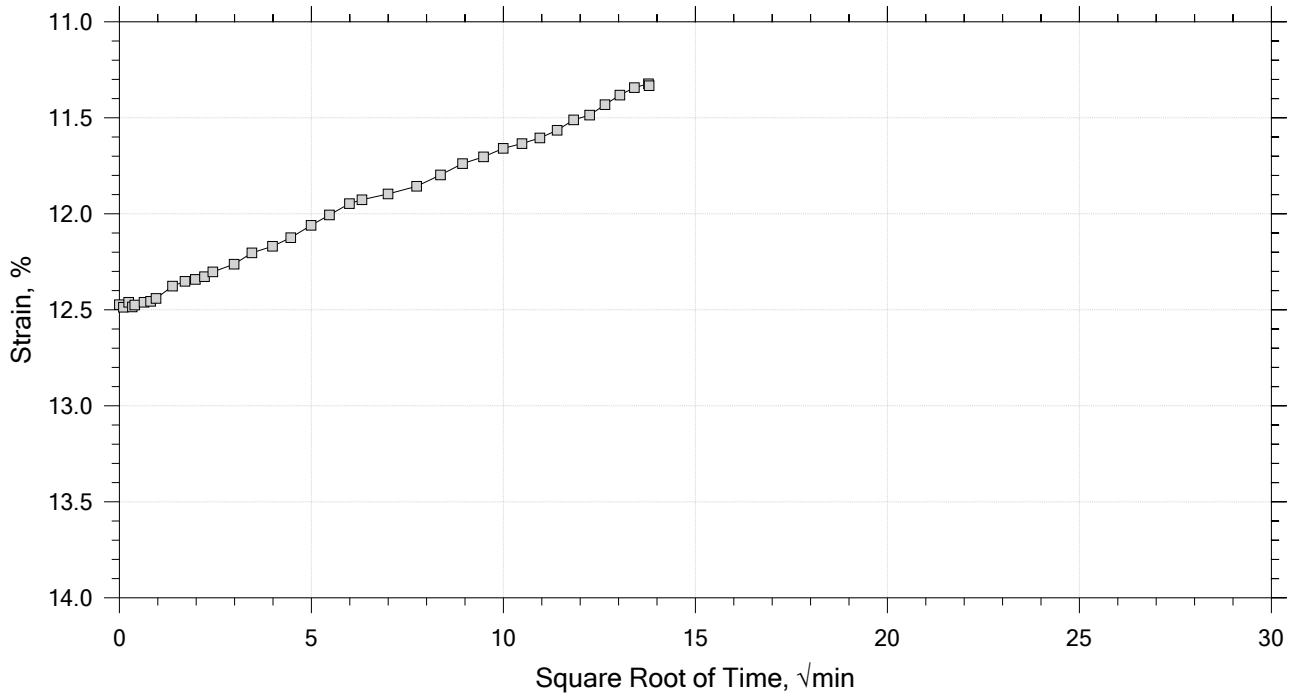




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 14
Constant Load Step
Stress: 2 tsf

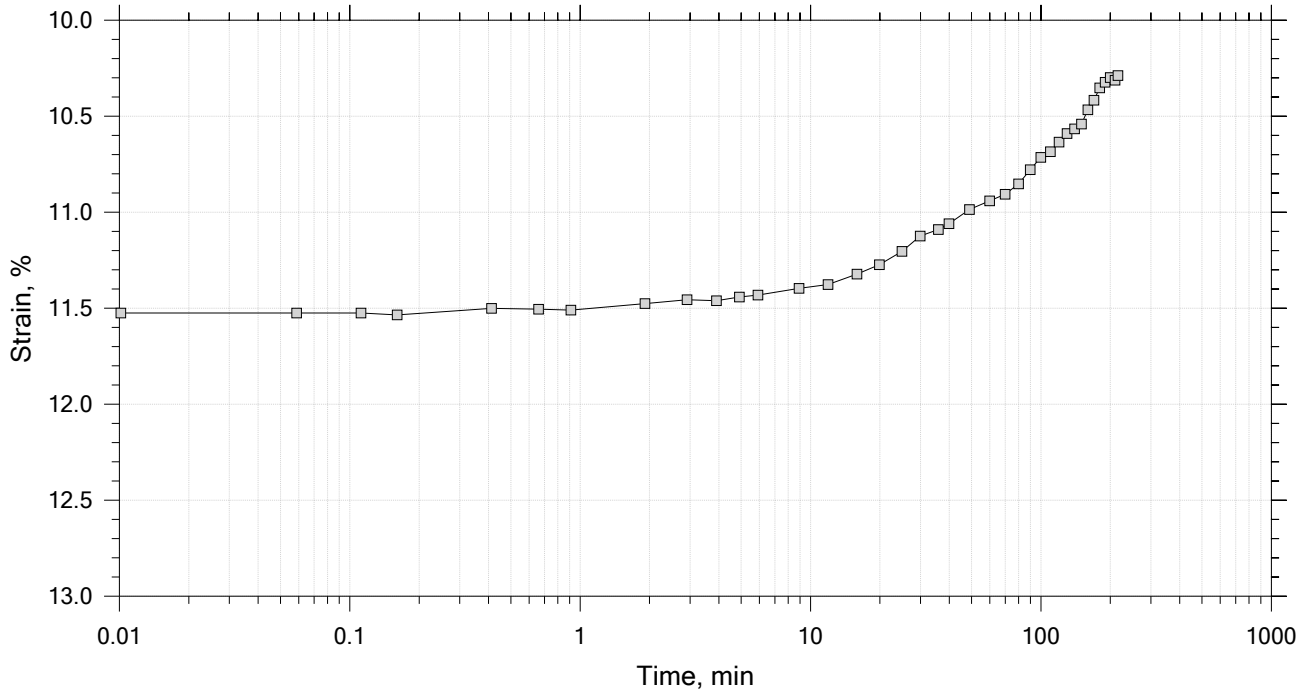


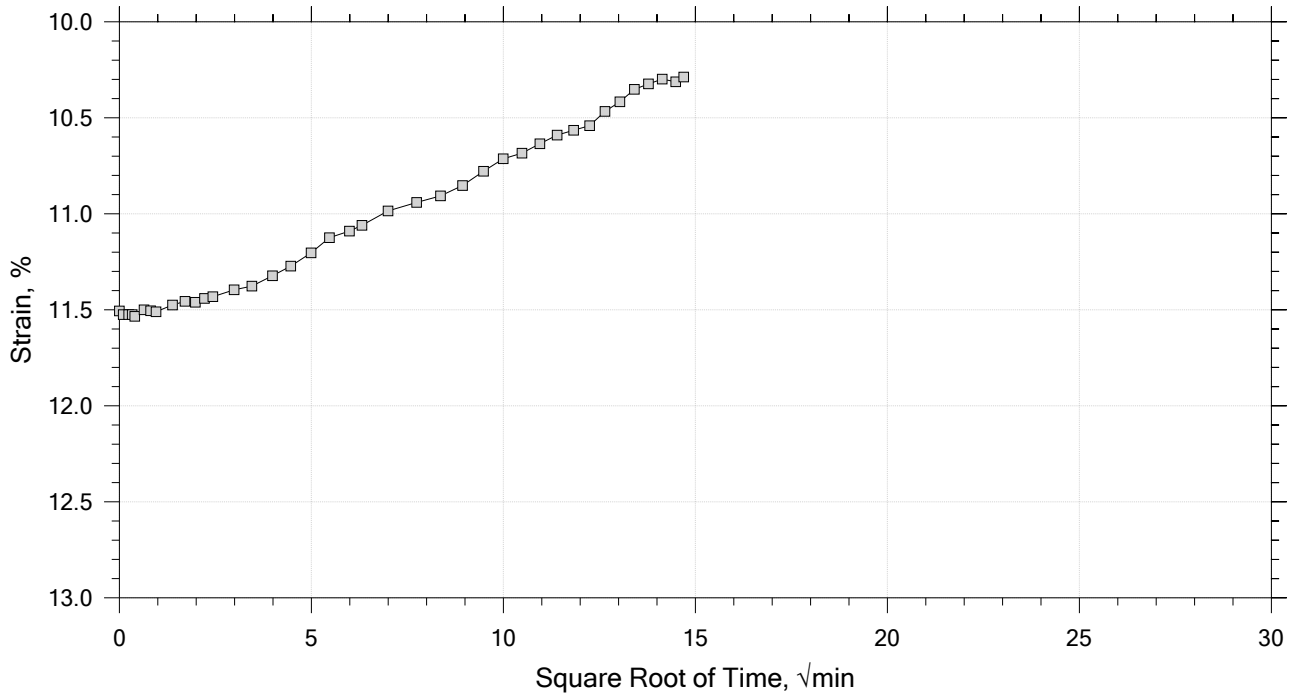




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 14
Constant Load Step
Stress: 0.5 tsf

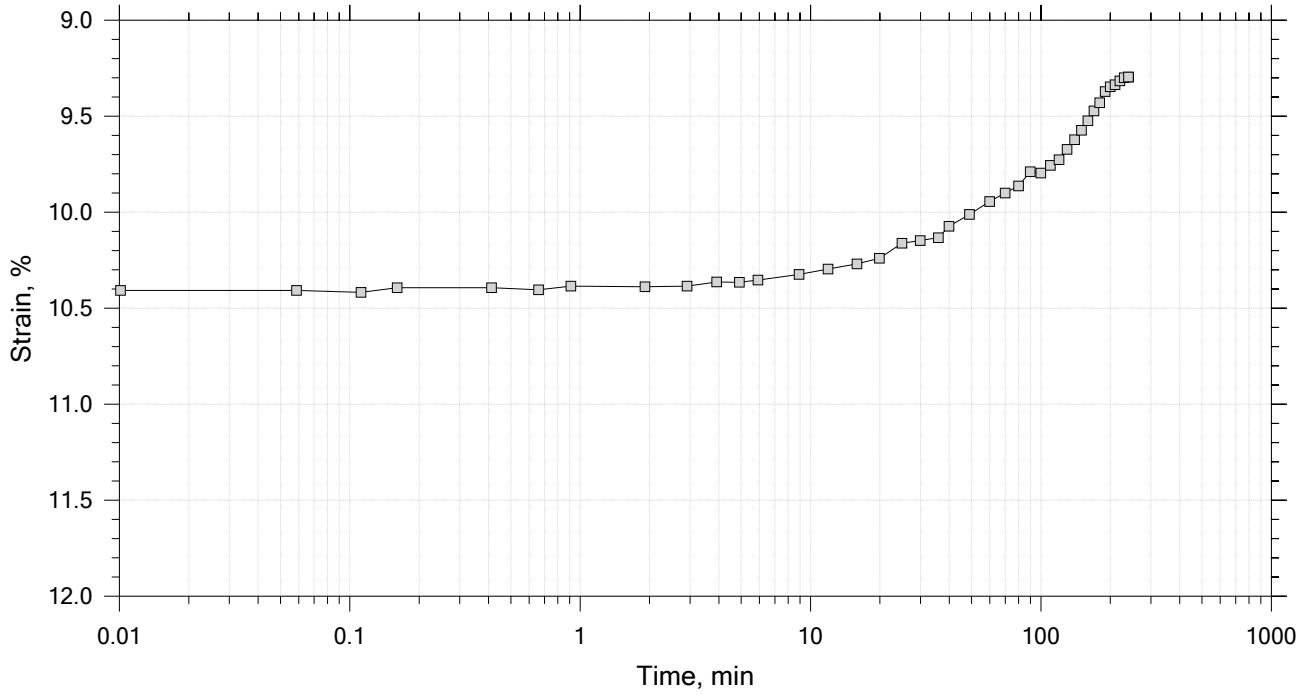


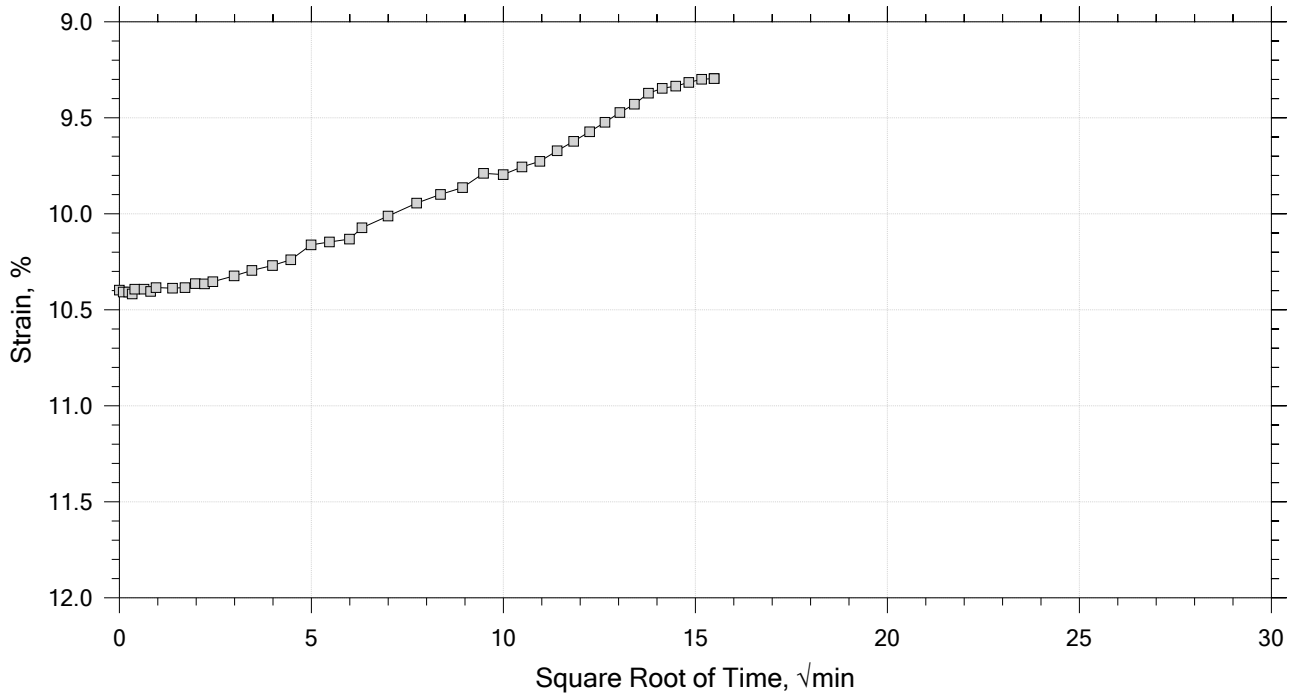




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 14
Constant Load Step
Stress: 0.125 tsf

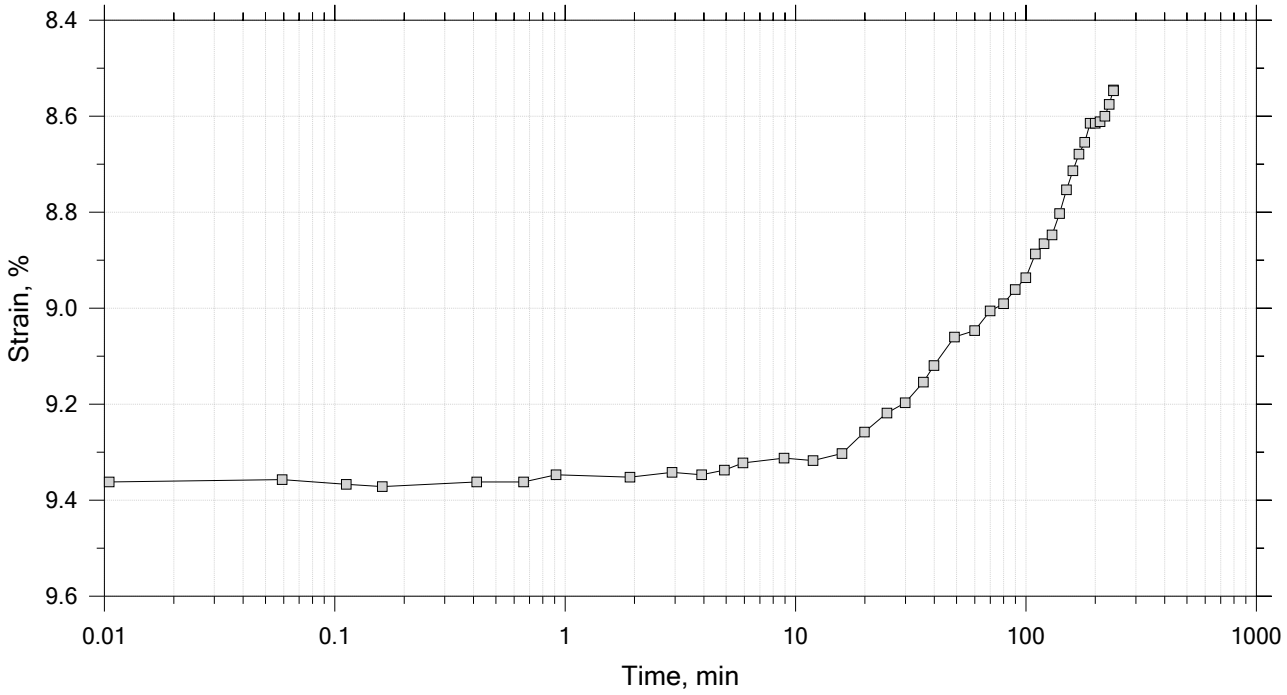


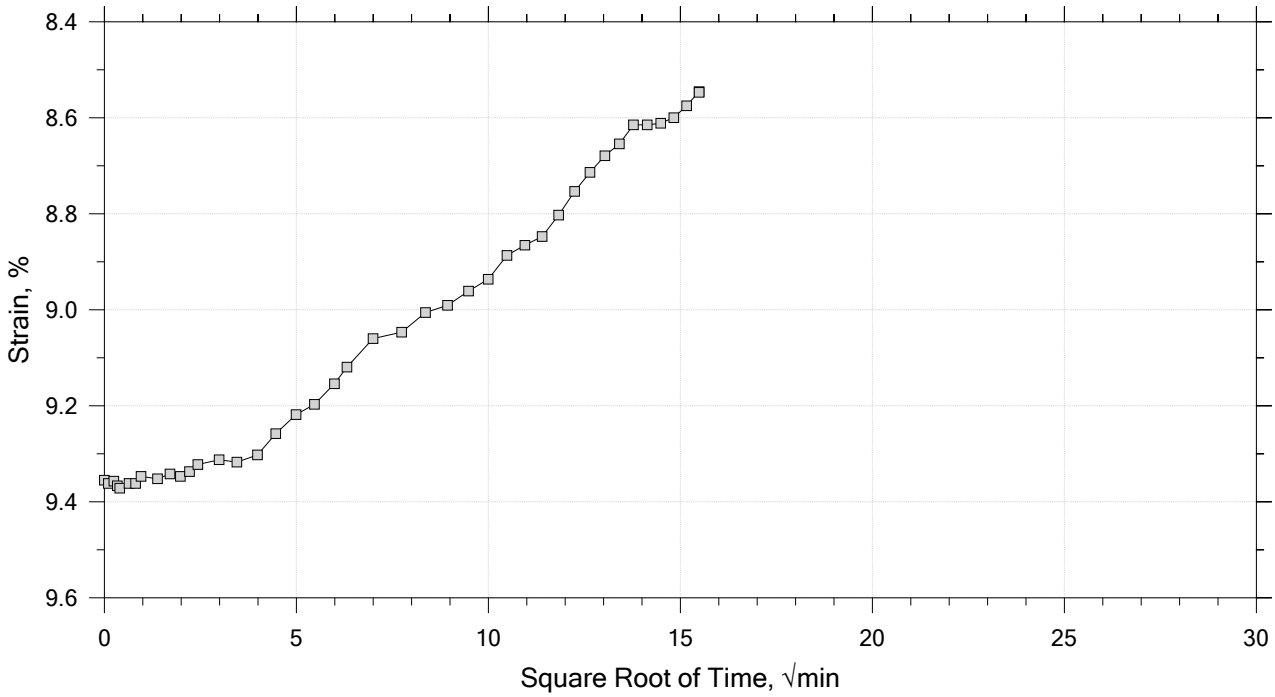




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 14
Constant Load Step
Stress: 0.0625 tsf




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| | Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| | Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light blueish gray clay | | |
| | Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.70 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 0.614 | Plastic Limit: --- |
| Final Height: 0.95 in | Final Void Ratio: 0.533 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | A-2457 | RING | | Z-0213 |
| Mass Container, gm | 8.24 | 111.27 | 111.27 | 8.13 |
| Mass Container + Wet Soil, gm | 243.31 | 276.07 | 272.19 | 168.54 |
| Mass Container + Dry Soil, gm | 200.7 | 245.61 | 245.61 | 142.04 |
| Mass Dry Soil, gm | 192.46 | 134.34 | 134.34 | 133.91 |
| Water Content, % | 22.14 | 22.68 | 19.79 | 19.79 |
| Void Ratio | --- | 0.61 | 0.53 | --- |
| Degree of Saturation, % | --- | 99.54 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 104.26 | 109.74 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.176 | 0.001093 | 0.612 | 0.109 | 86.786 | 6.56e-08 | 6.23e-03 | 1.10e-06 | 0.00e+00 |
| 2 | 0.250 | 0.003645 | 0.608 | 0.364 | 0.000 | 0.00e+00 | 3.43e-02 | 0.00e+00 | 0.00e+00 |
| 3 | 0.500 | 0.008601 | 0.600 | 0.860 | 0.000 | 0.00e+00 | 1.98e-02 | 0.00e+00 | 0.00e+00 |
| 4 | 1.00 | 0.01747 | 0.586 | 1.75 | 0.000 | 0.00e+00 | 1.77e-02 | 0.00e+00 | 0.00e+00 |
| 5 | 2.00 | 0.03305 | 0.561 | 3.31 | 0.000 | 0.00e+00 | 1.56e-02 | 0.00e+00 | 0.00e+00 |
| 6 | 4.00 | 0.05202 | 0.530 | 5.20 | 0.000 | 0.00e+00 | 9.48e-03 | 0.00e+00 | 0.00e+00 |
| 7 | 8.00 | 0.07518 | 0.493 | 7.52 | 0.000 | 0.00e+00 | 5.79e-03 | 0.00e+00 | 0.00e+00 |
| 8 | 16.0 | 0.09633 | 0.459 | 9.63 | 0.000 | 0.00e+00 | 2.64e-03 | 0.00e+00 | 0.00e+00 |
| 9 | 32.0 | 0.1288 | 0.406 | 12.9 | 0.000 | 0.00e+00 | 2.03e-03 | 0.00e+00 | 0.00e+00 |
| 10 | 8.00 | 0.1234 | 0.415 | 12.3 | 0.000 | 0.00e+00 | 2.24e-04 | 0.00e+00 | 0.00e+00 |
| 11 | 2.00 | 0.1133 | 0.431 | 11.3 | 0.000 | 0.00e+00 | 1.68e-03 | 0.00e+00 | 0.00e+00 |
| 12 | 0.500 | 0.1029 | 0.448 | 10.3 | 0.000 | 0.00e+00 | 6.96e-03 | 0.00e+00 | 0.00e+00 |
| 13 | 0.125 | 0.09296 | 0.464 | 9.30 | 0.000 | 0.00e+00 | 2.65e-02 | 0.00e+00 | 0.00e+00 |
| 14 | 0.0625 | 0.08547 | 0.476 | 8.55 | 0.000 | 0.00e+00 | 1.20e-01 | 0.00e+00 | 0.00e+00 |

GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Square Root of Time Coefficients

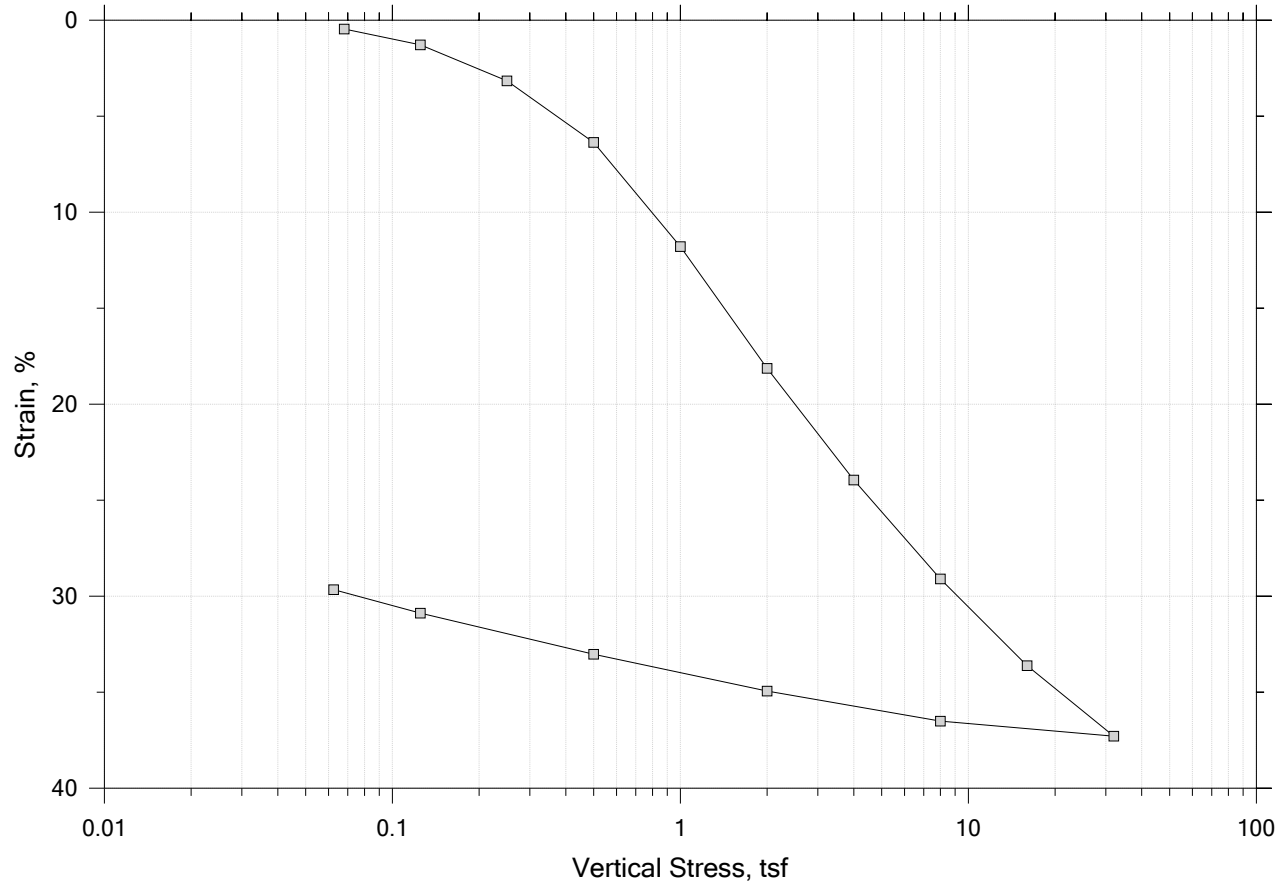
| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.176 | 0.001093 | 0.612 | 0.109 | 134.307 | 1.82e-07 | 6.23e-03 | 3.06e-06 |
| 2 | 0.250 | 0.003645 | 0.608 | 0.364 | 2.424 | 1.01e-05 | 3.43e-02 | 9.32e-04 |
| 3 | 0.500 | 0.008601 | 0.600 | 0.860 | 51.117 | 4.74e-07 | 1.98e-02 | 2.54e-05 |
| 4 | 1.00 | 0.01747 | 0.586 | 1.75 | 66.429 | 3.60e-07 | 1.77e-02 | 1.72e-05 |
| 5 | 2.00 | 0.03305 | 0.561 | 3.31 | 189.697 | 1.23e-07 | 1.56e-02 | 5.16e-06 |
| 6 | 4.00 | 0.05202 | 0.530 | 5.20 | 198.474 | 1.13e-07 | 9.48e-03 | 2.90e-06 |
| 7 | 8.00 | 0.07518 | 0.493 | 7.52 | 0.000 | 0.00e+00 | 5.79e-03 | 0.00e+00 |
| 8 | 16.0 | 0.09633 | 0.459 | 9.63 | 0.000 | 0.00e+00 | 2.64e-03 | 0.00e+00 |
| 9 | 32.0 | 0.1288 | 0.406 | 12.9 | 0.000 | 0.00e+00 | 2.03e-03 | 0.00e+00 |
| 10 | 8.00 | 0.1234 | 0.415 | 12.3 | 140.239 | 1.34e-07 | 2.24e-04 | 8.08e-08 |
| 11 | 2.00 | 0.1133 | 0.431 | 11.3 | 0.000 | 0.00e+00 | 1.68e-03 | 0.00e+00 |
| 12 | 0.500 | 0.1029 | 0.448 | 10.3 | 0.000 | 0.00e+00 | 6.96e-03 | 0.00e+00 |
| 13 | 0.125 | 0.09296 | 0.464 | 9.30 | 182.122 | 1.10e-07 | 2.65e-02 | 7.82e-06 |
| 14 | 0.0625 | 0.08547 | 0.476 | 8.55 | 179.159 | 1.14e-07 | 1.20e-01 | 3.67e-05 |

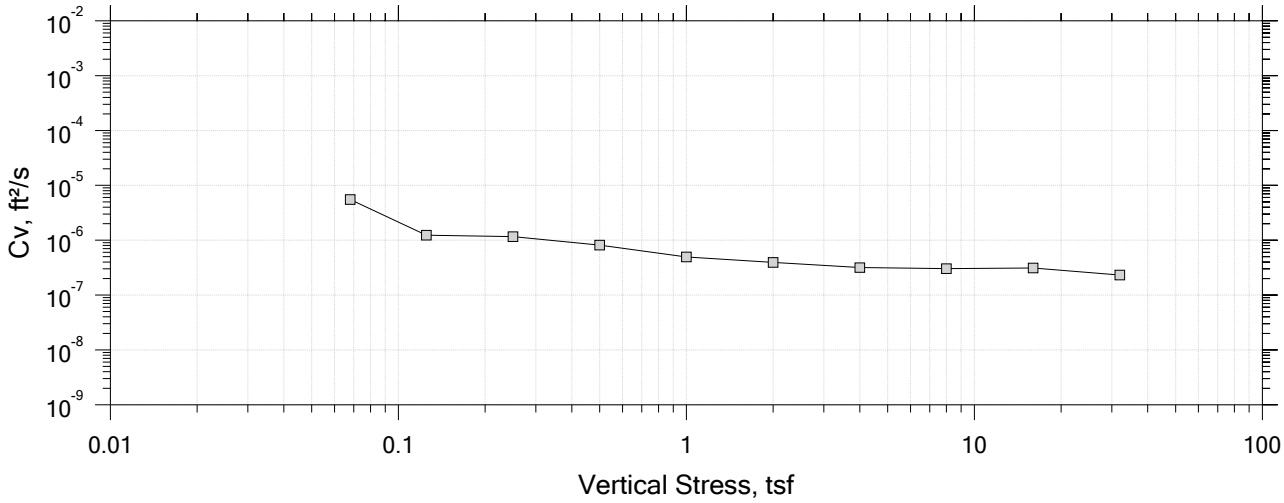
GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB021 | Tested By: md | Checked By: njh |
| Sample No.: SL0829 | Test Date: 01/10/19 | Depth: 39-41 ft |
| Test No.: IP-5 | Sample Type: intact | Elevation: --- |
| Description: Moist, light blueish gray clay | | |
| Remarks: System X, Swell Pressure = 0.176 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report



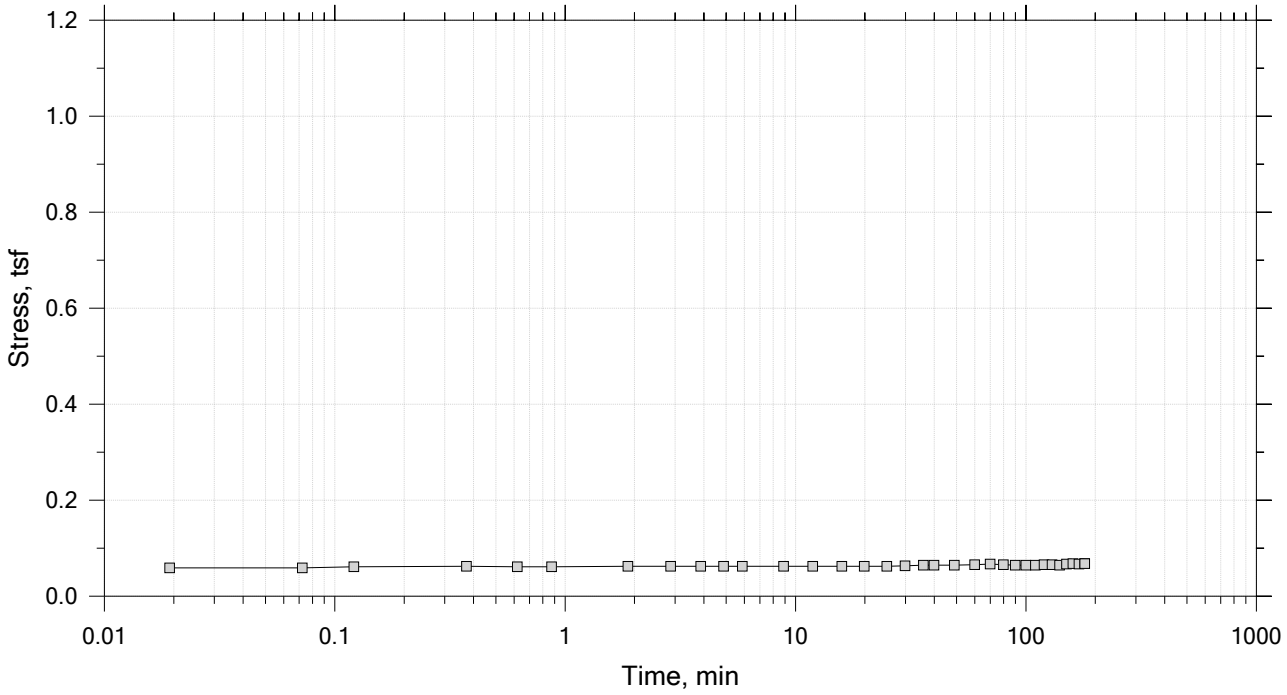

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |
| | Displacement at End of Increment | | |

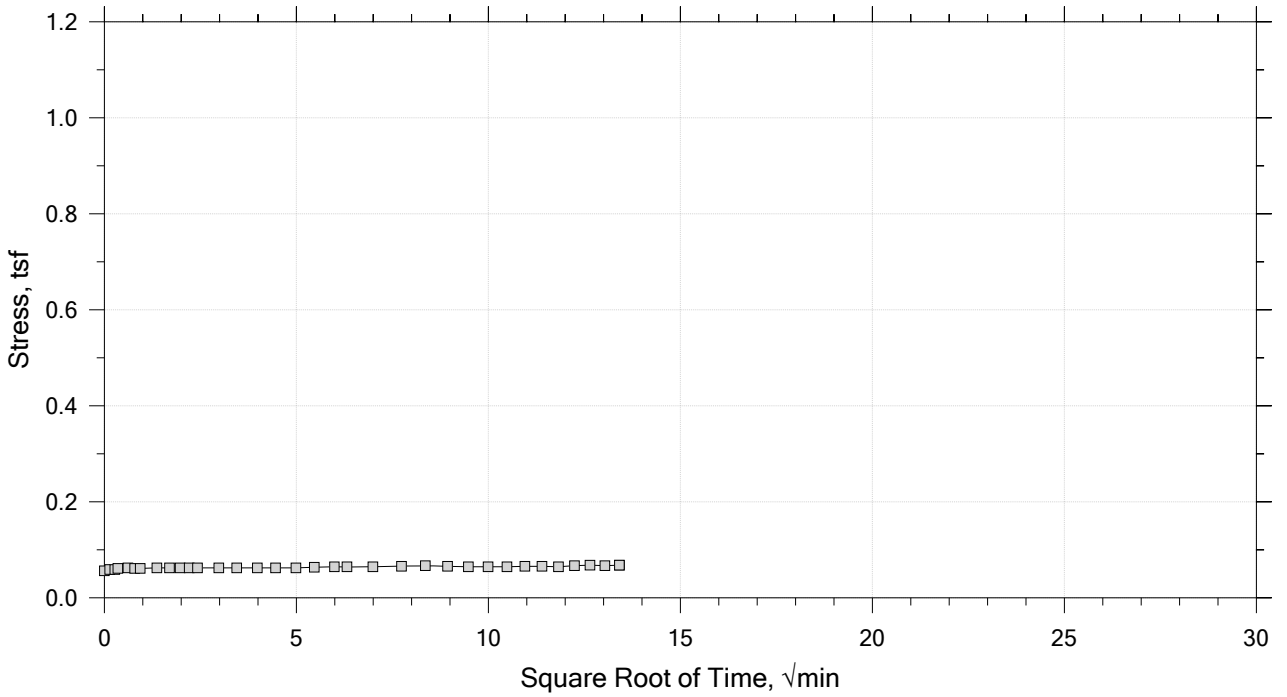
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.068 tsf

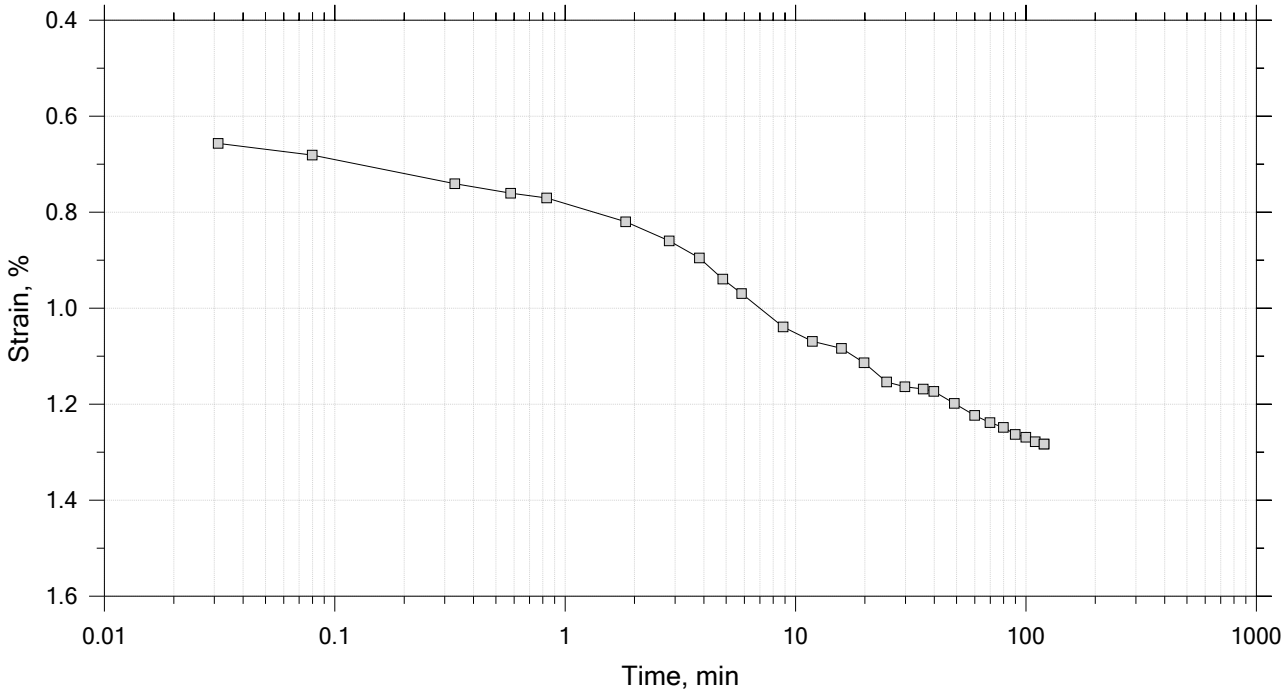


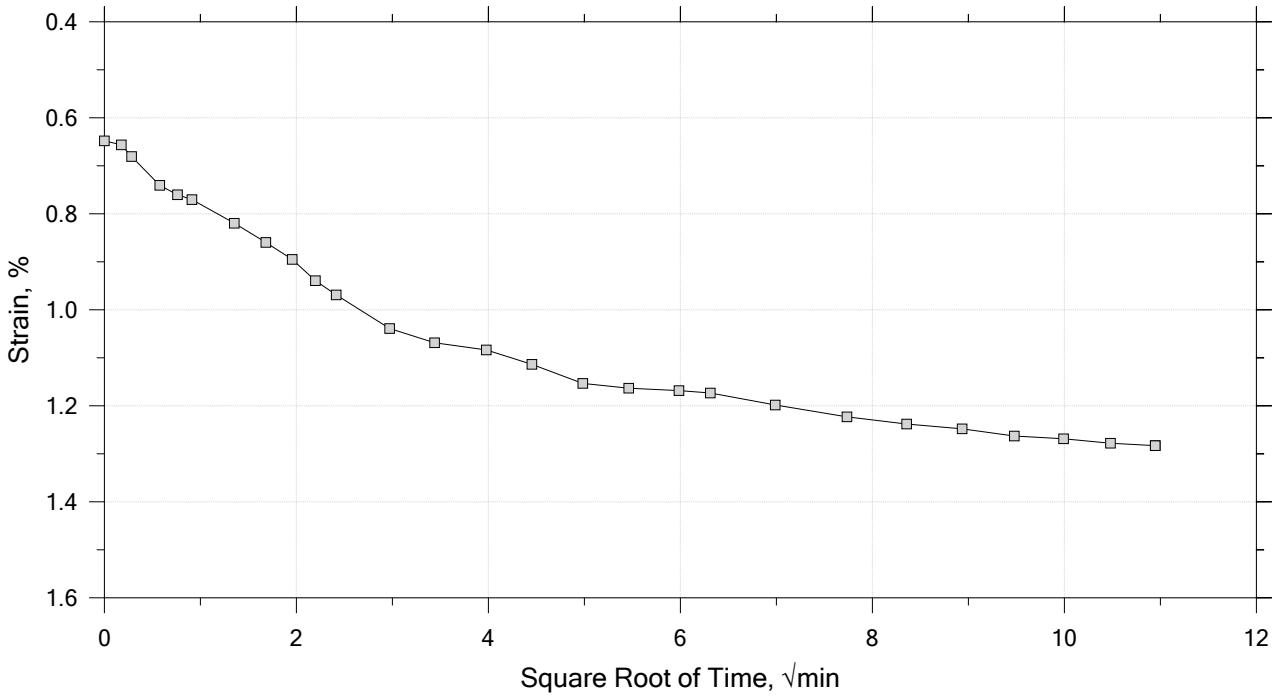




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

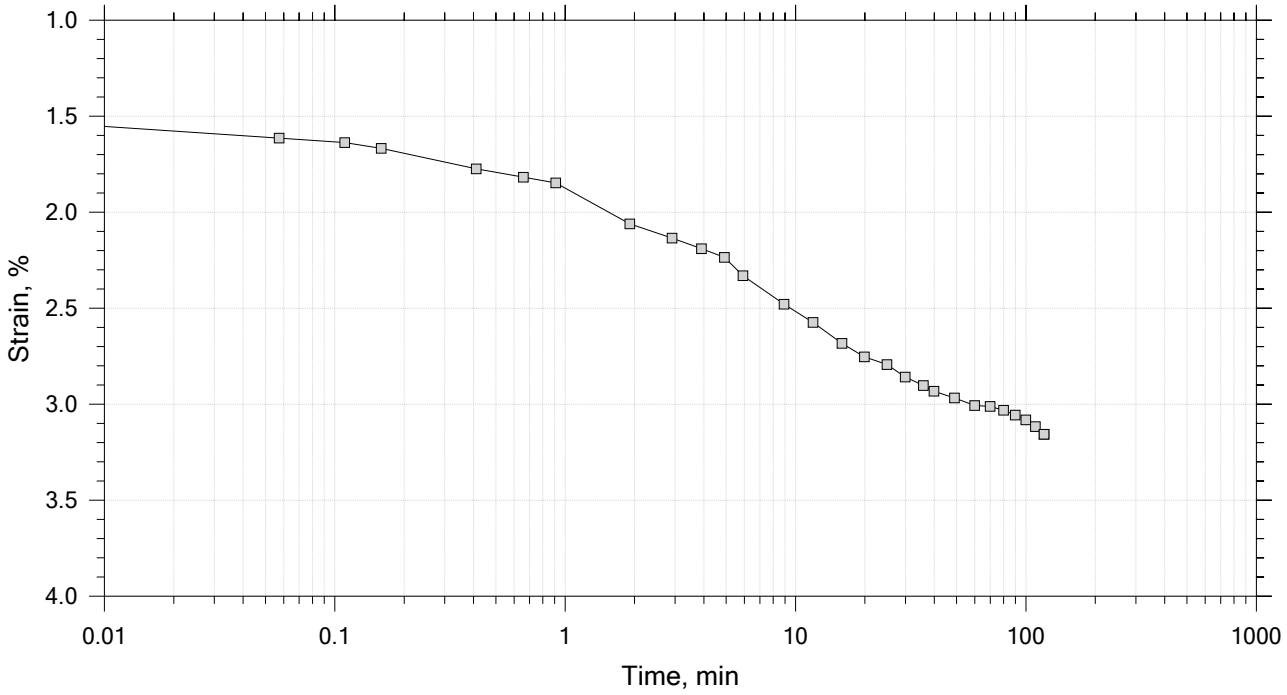


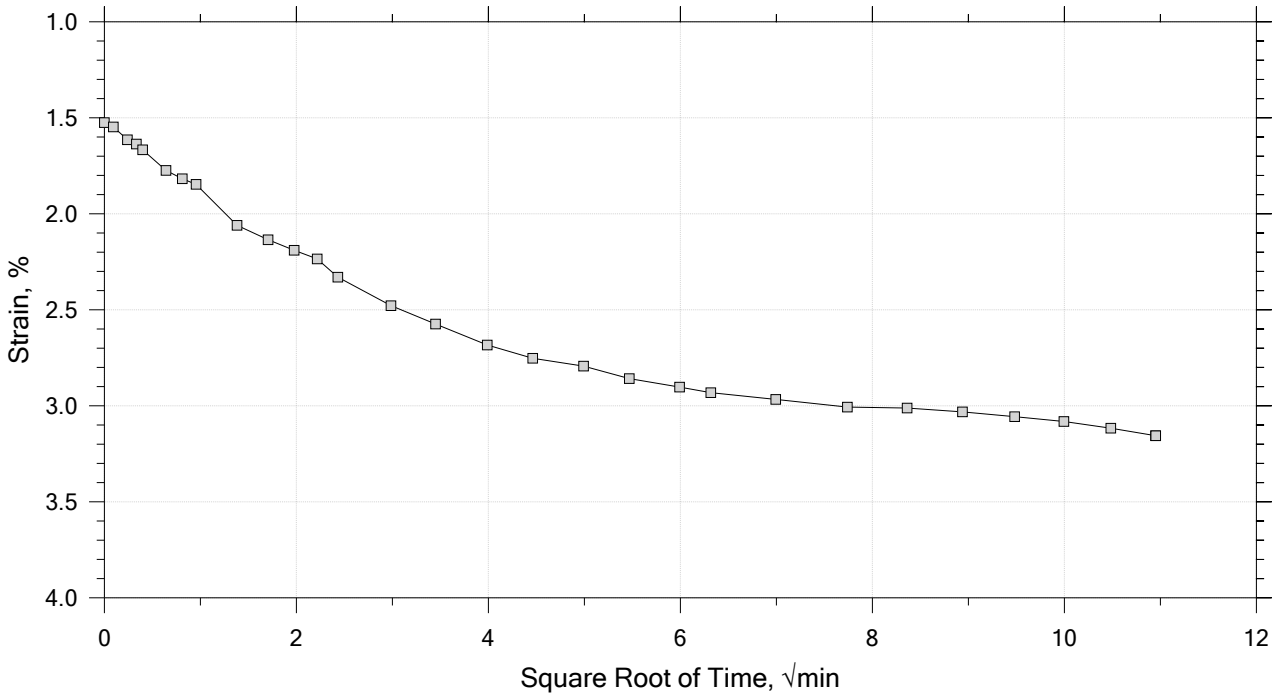




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf



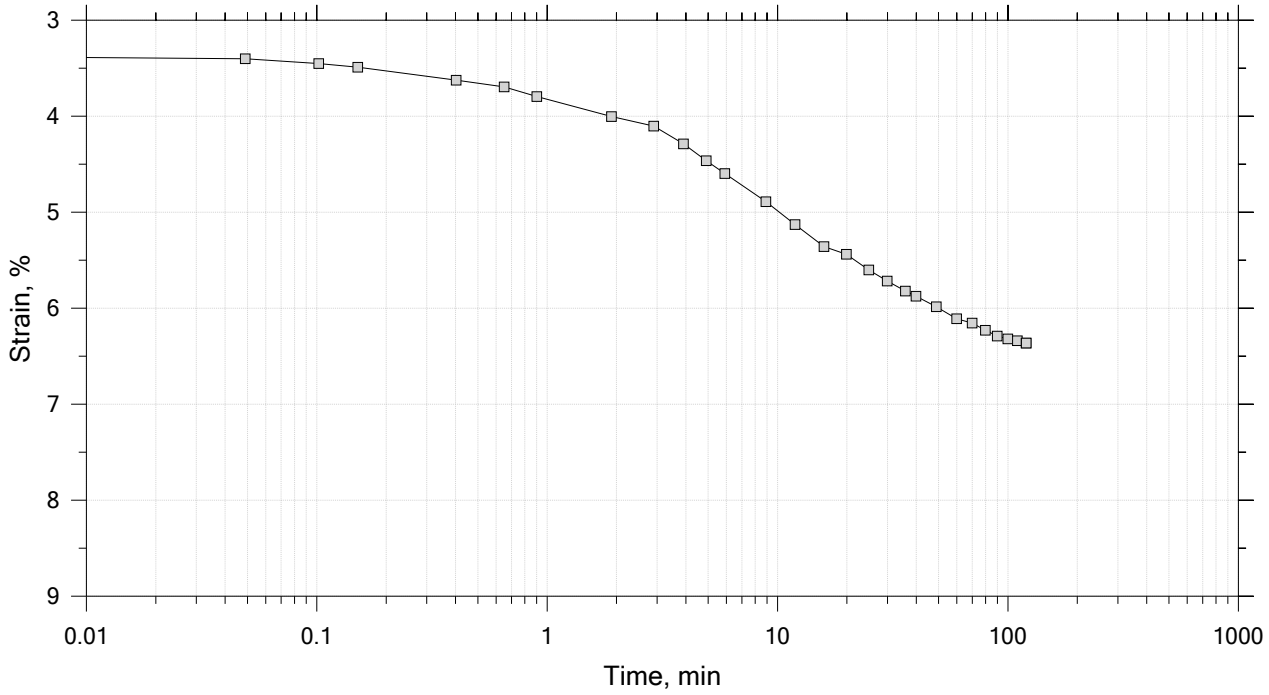

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| Description: Moist, brown and gray clay | | |
| Remarks: System K, Swell Pressure = 0.068 tsf | | |

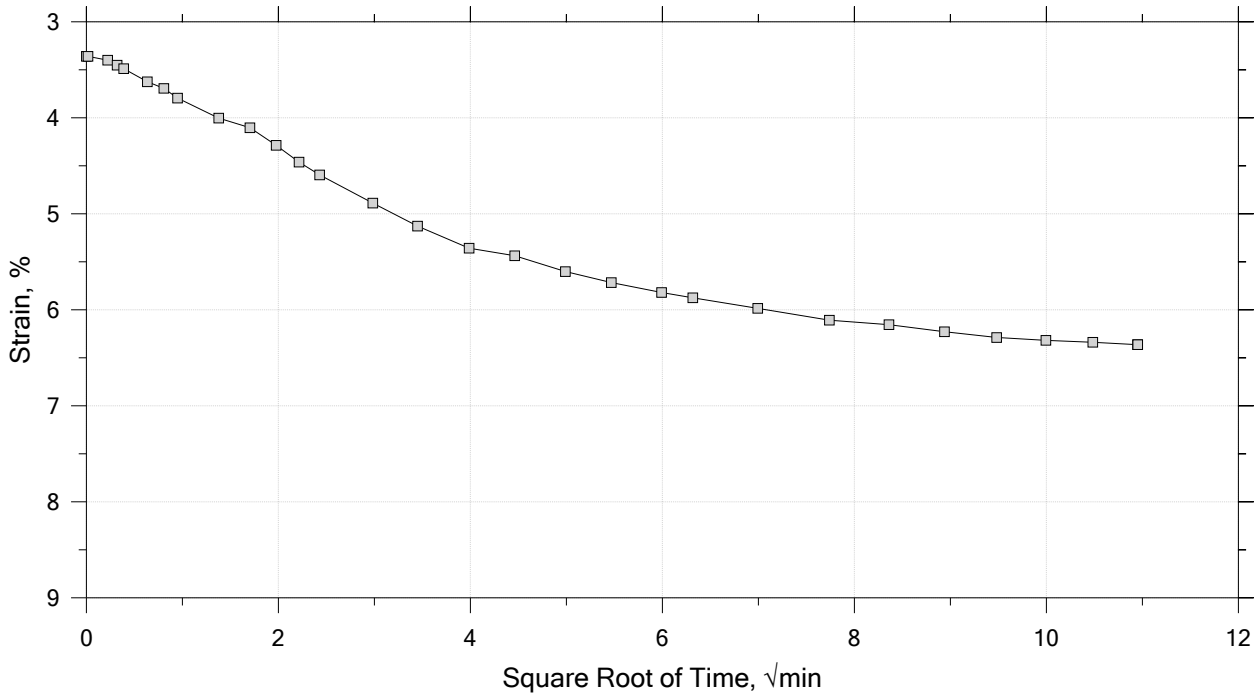
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.5 tsf



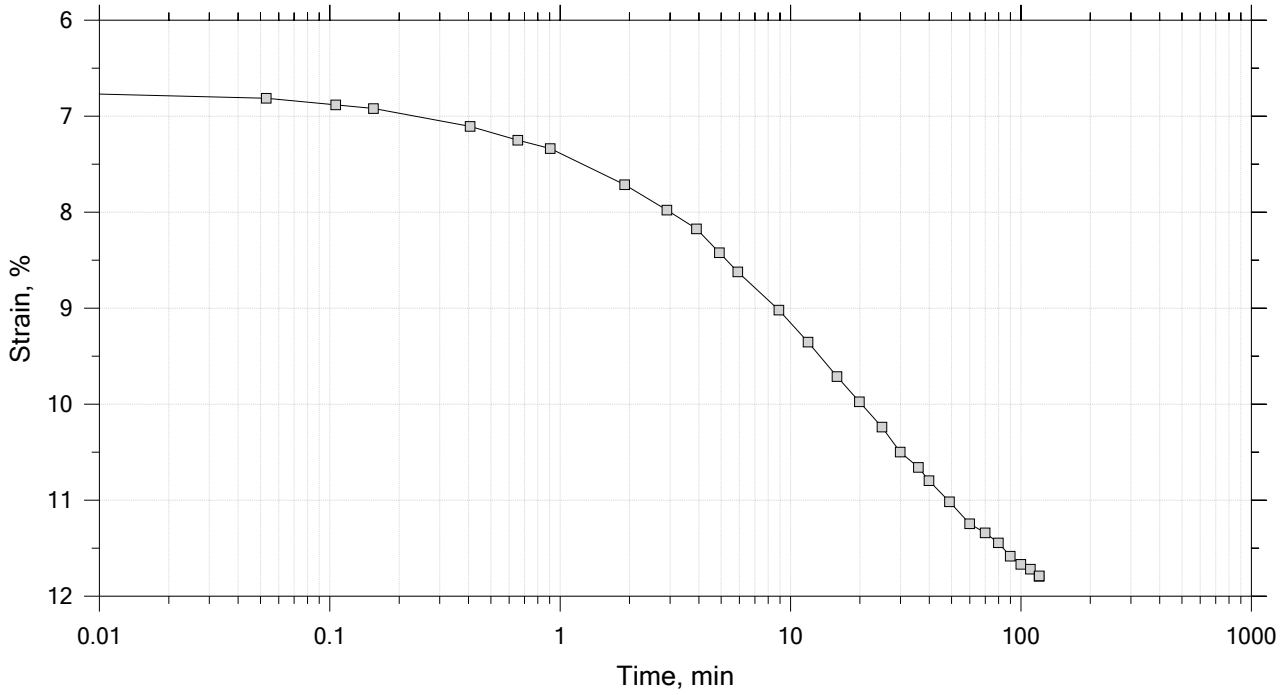

| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

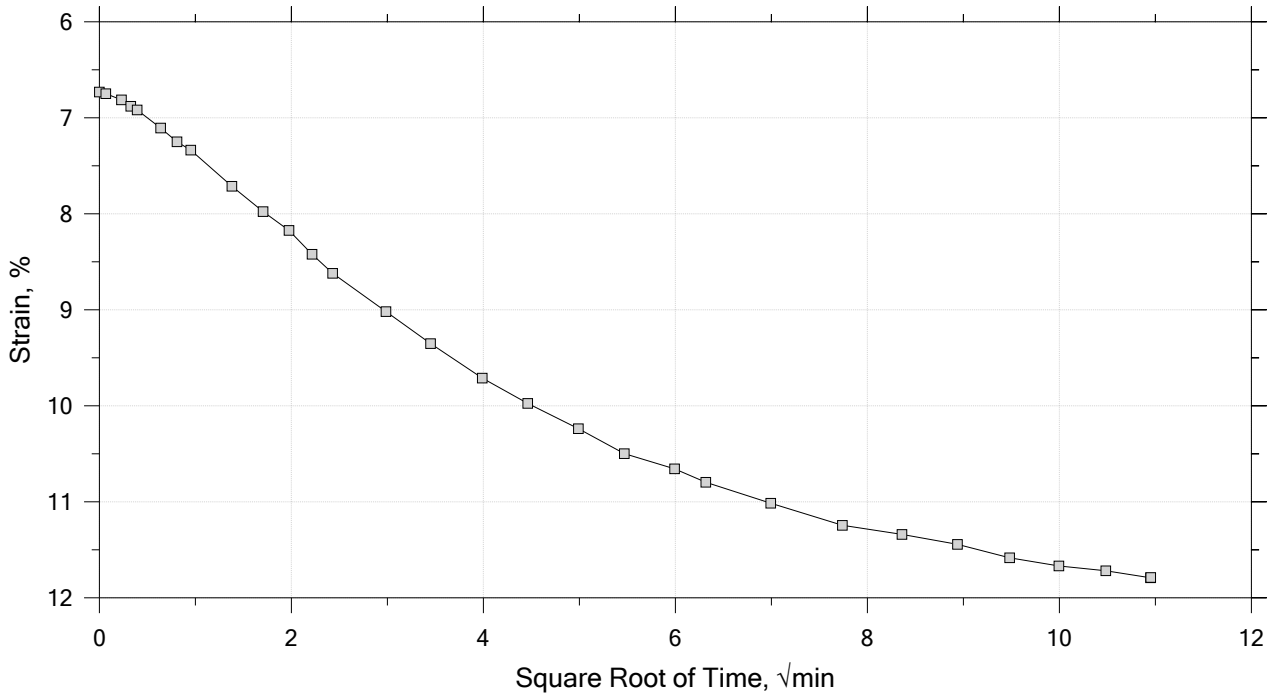
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 1 tsf

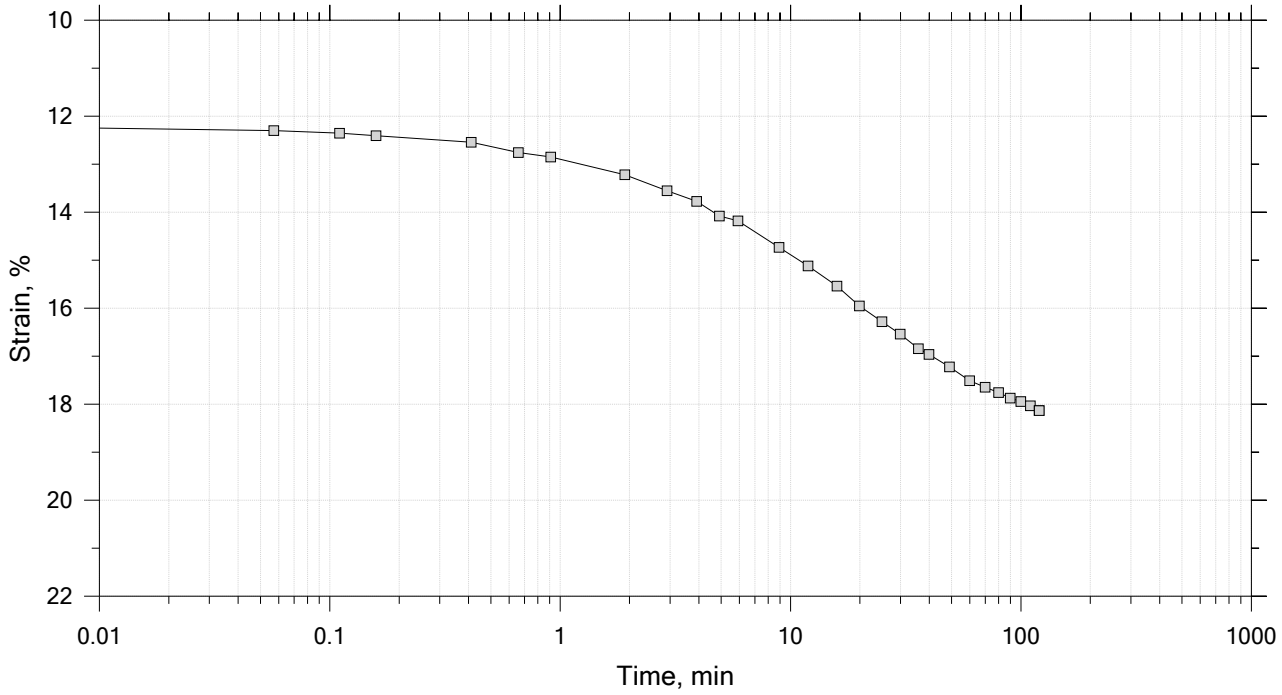


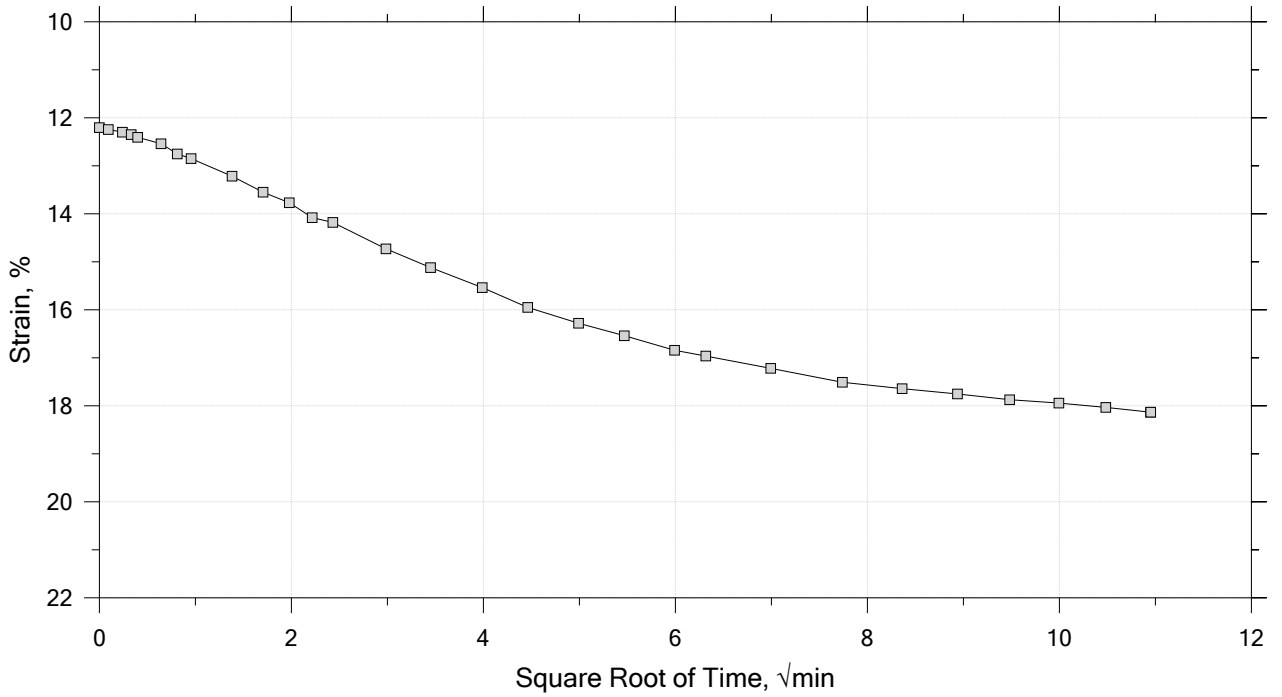




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15
Constant Load Step
Stress: 2 tsf



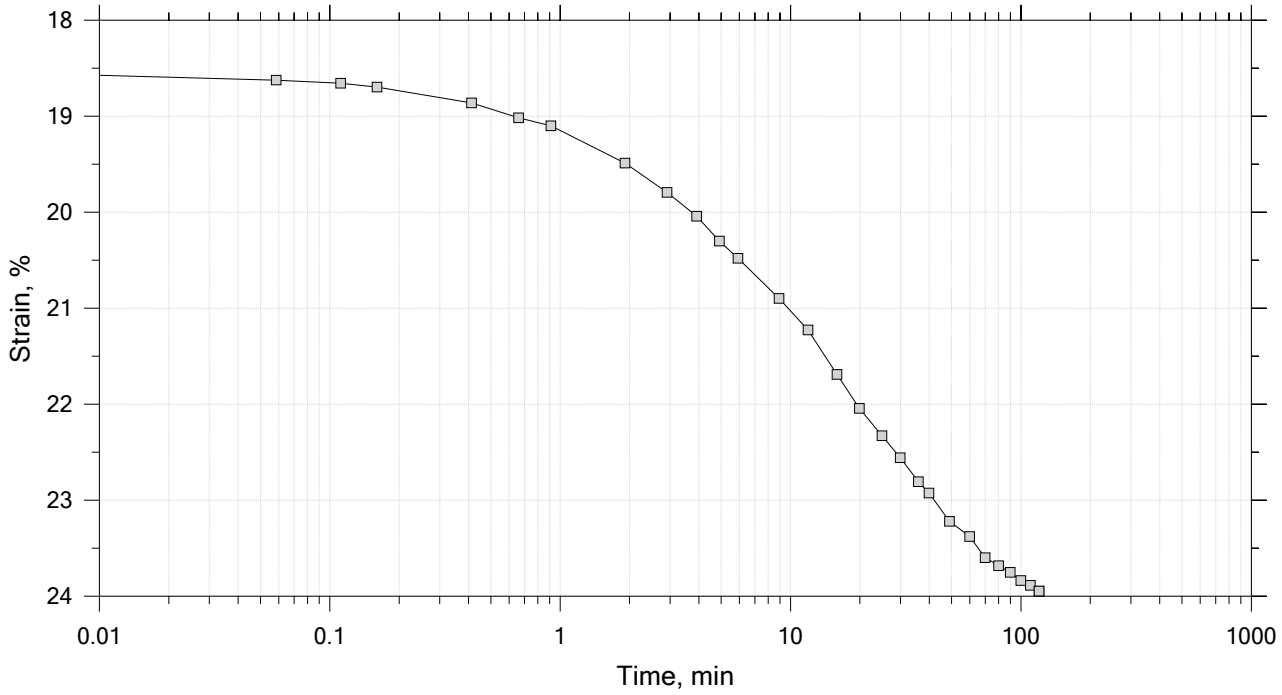

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

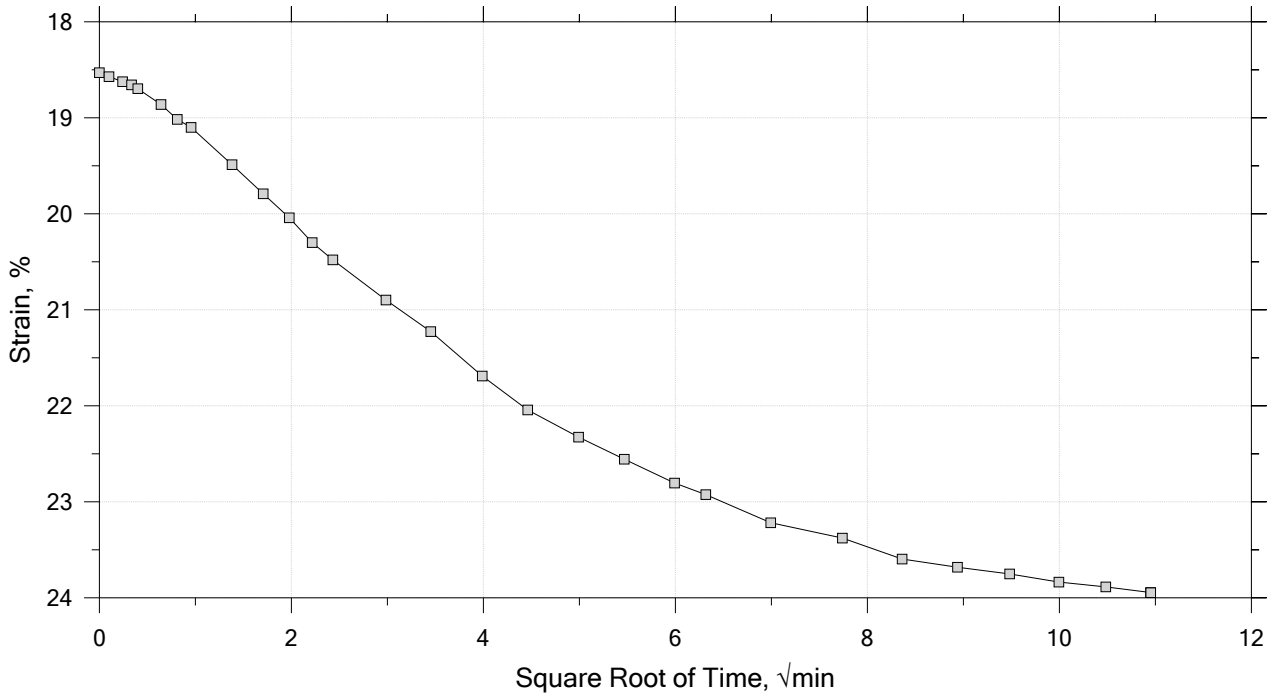
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf



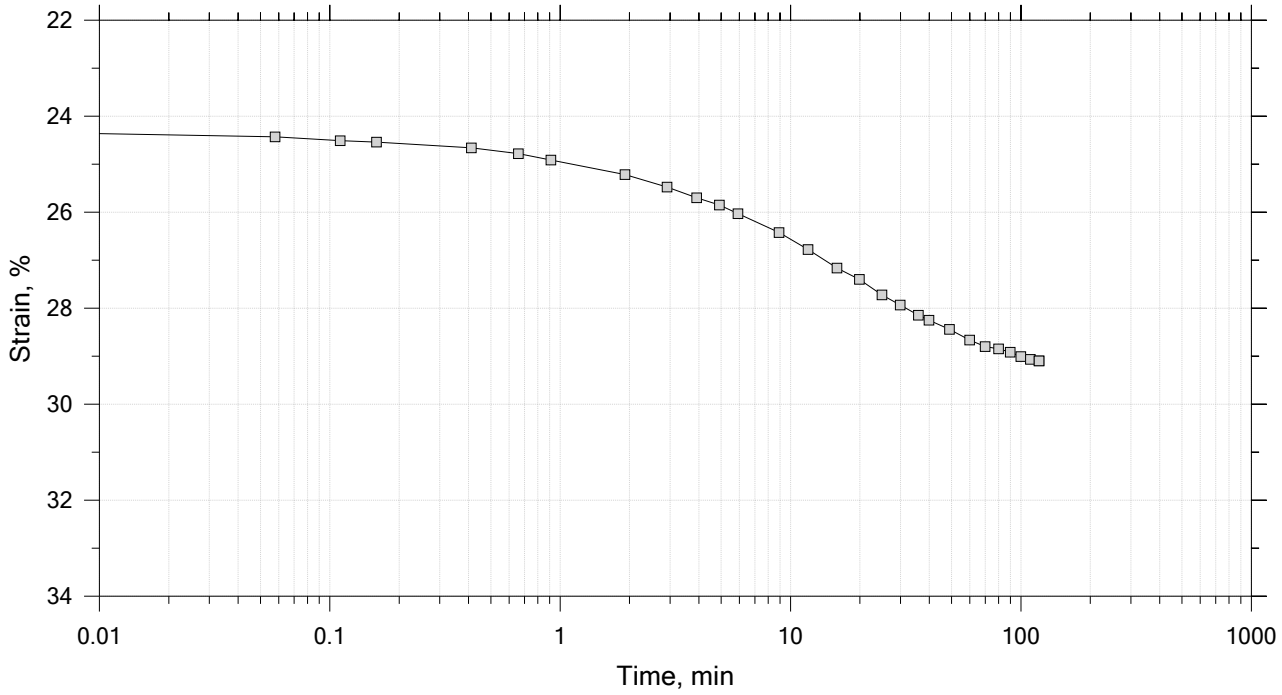

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

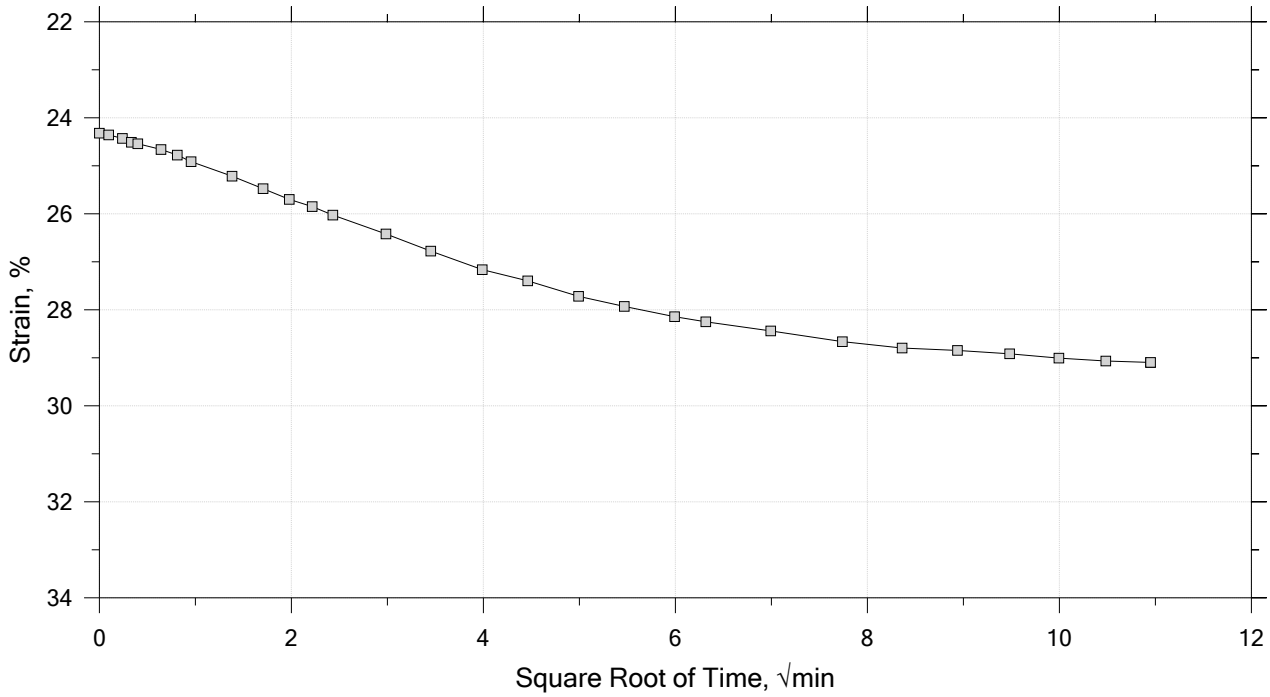
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 8 tsf

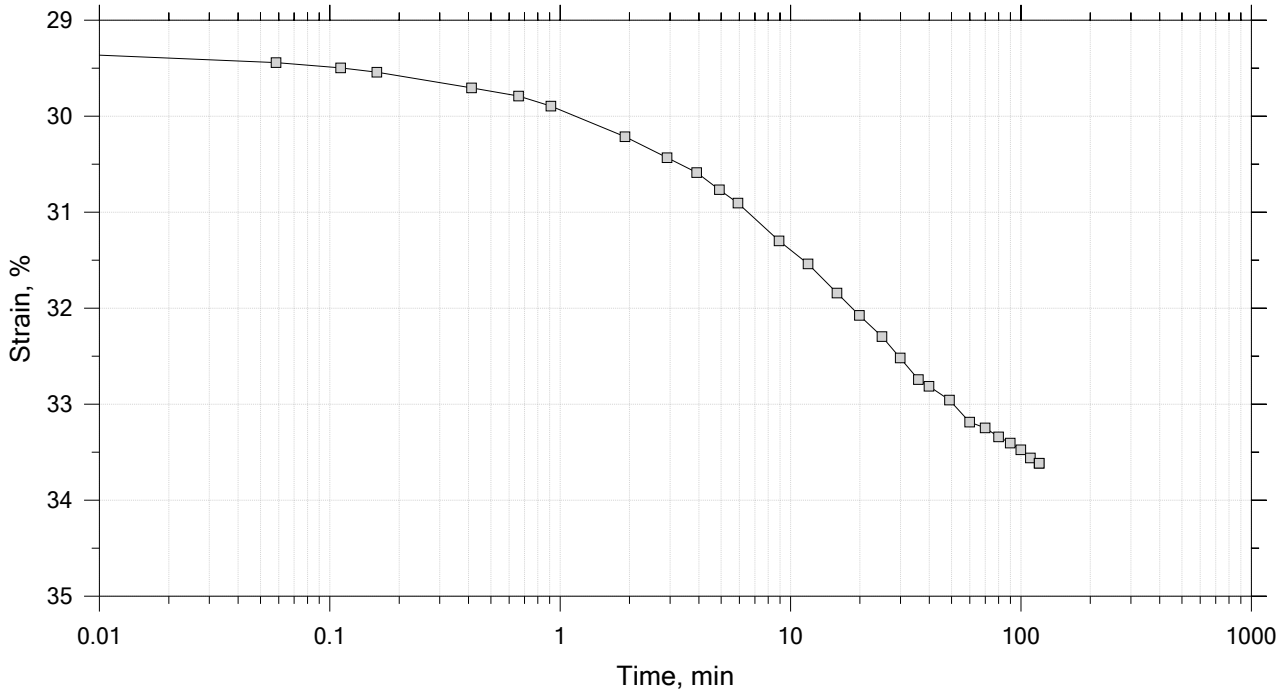


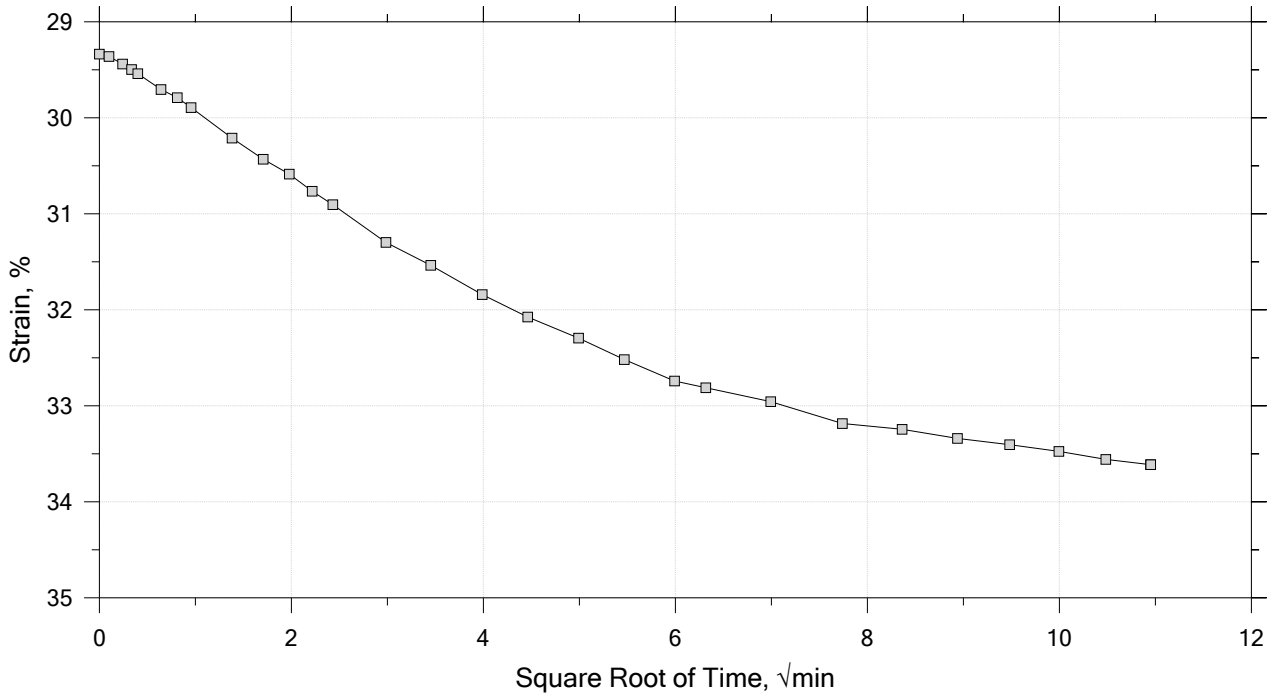




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

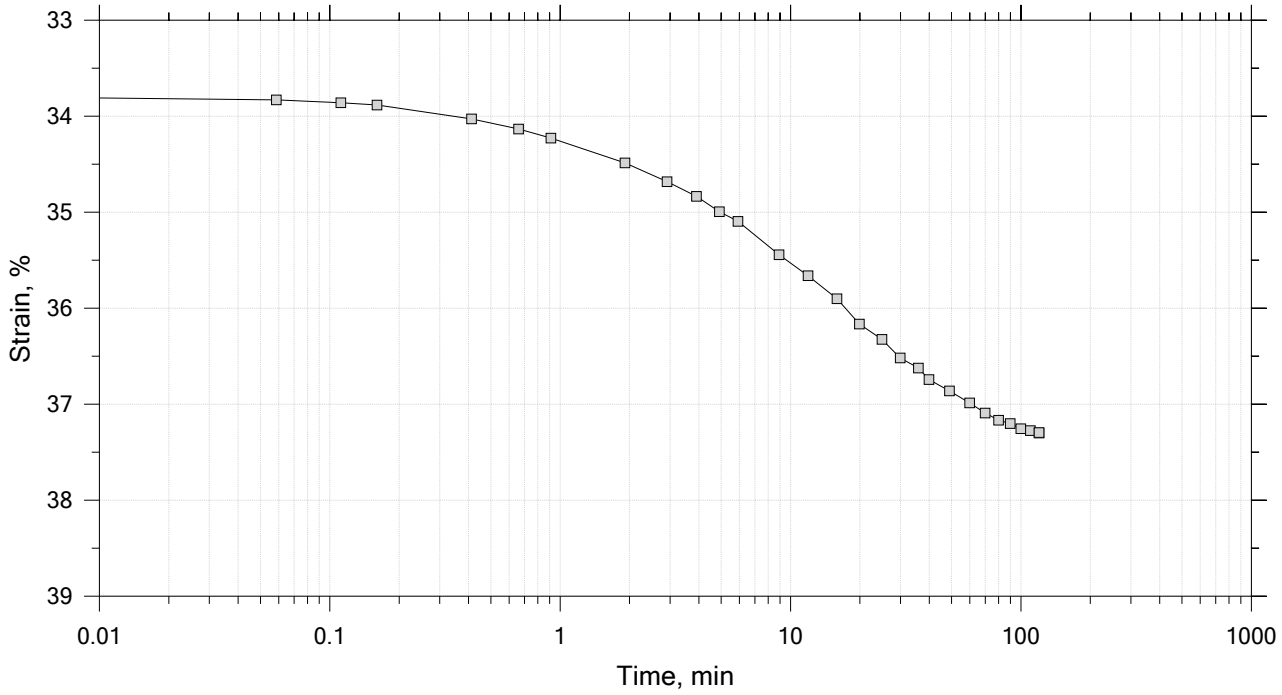


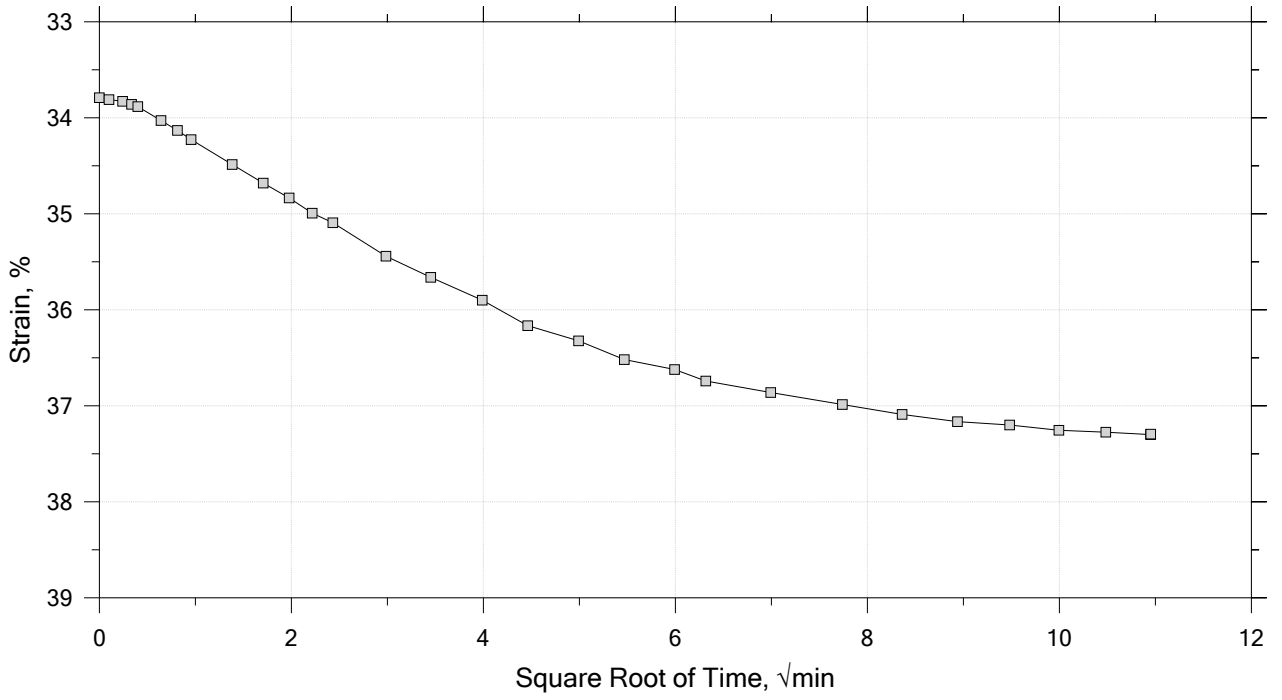




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

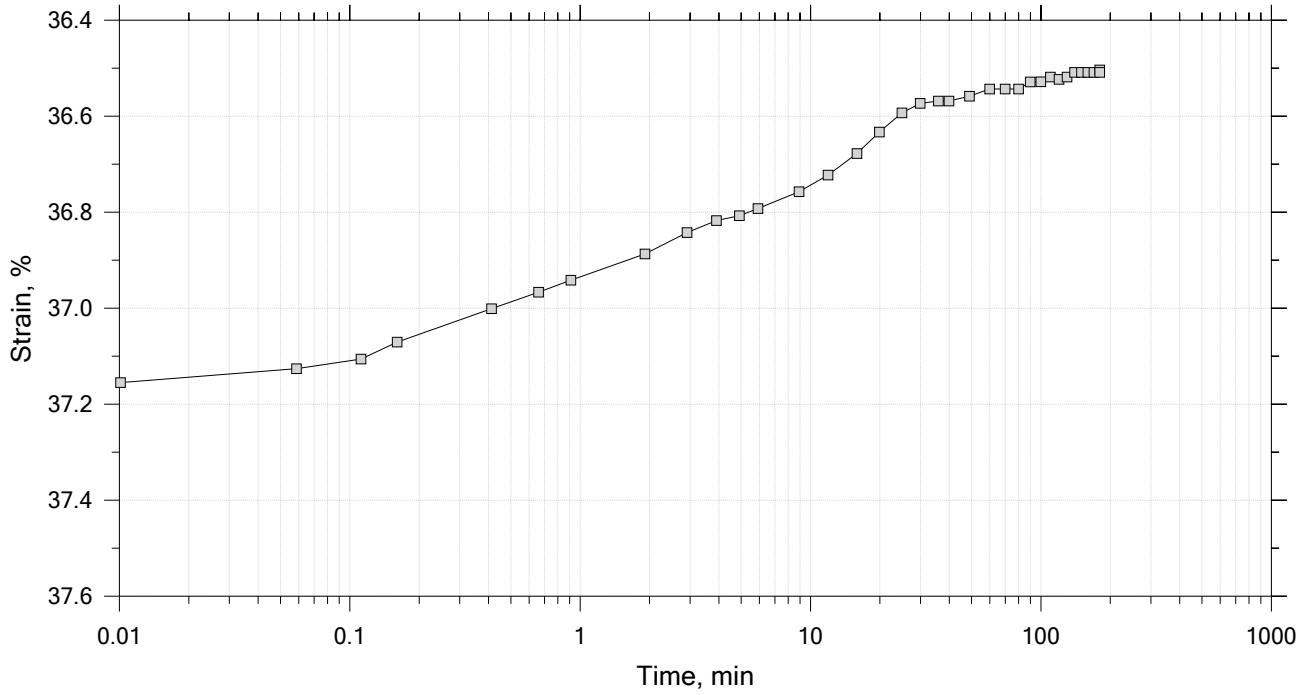


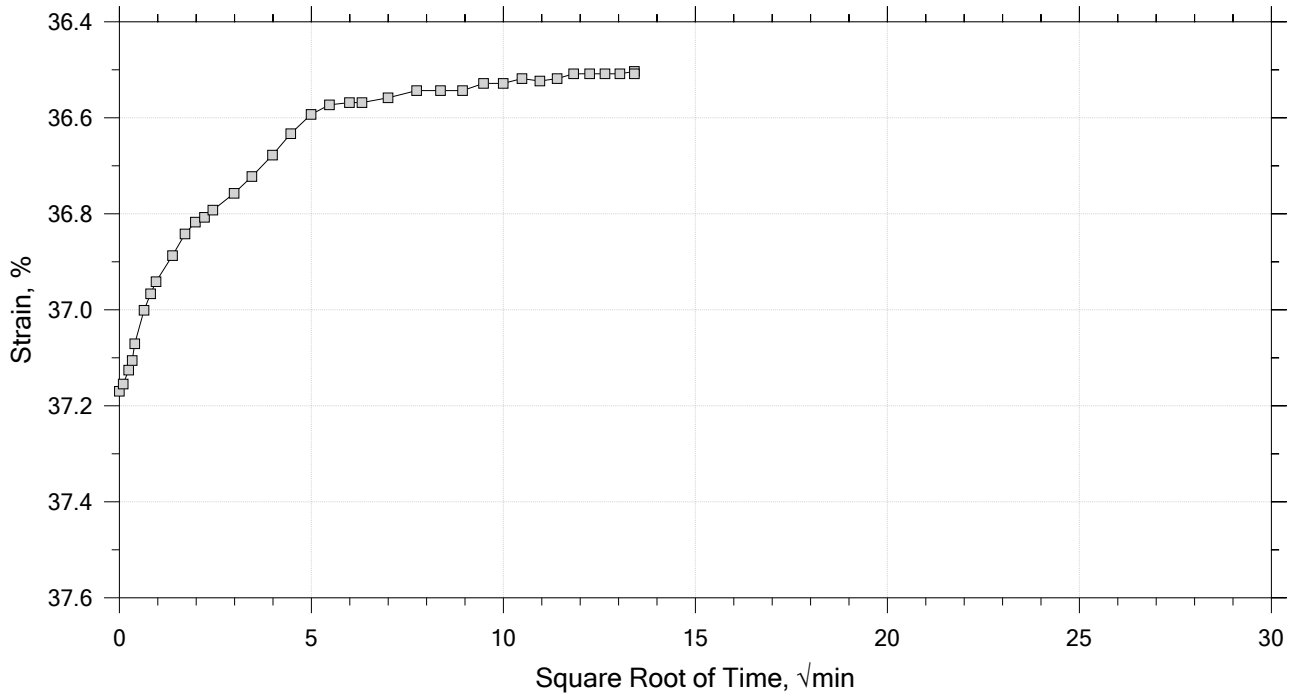




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

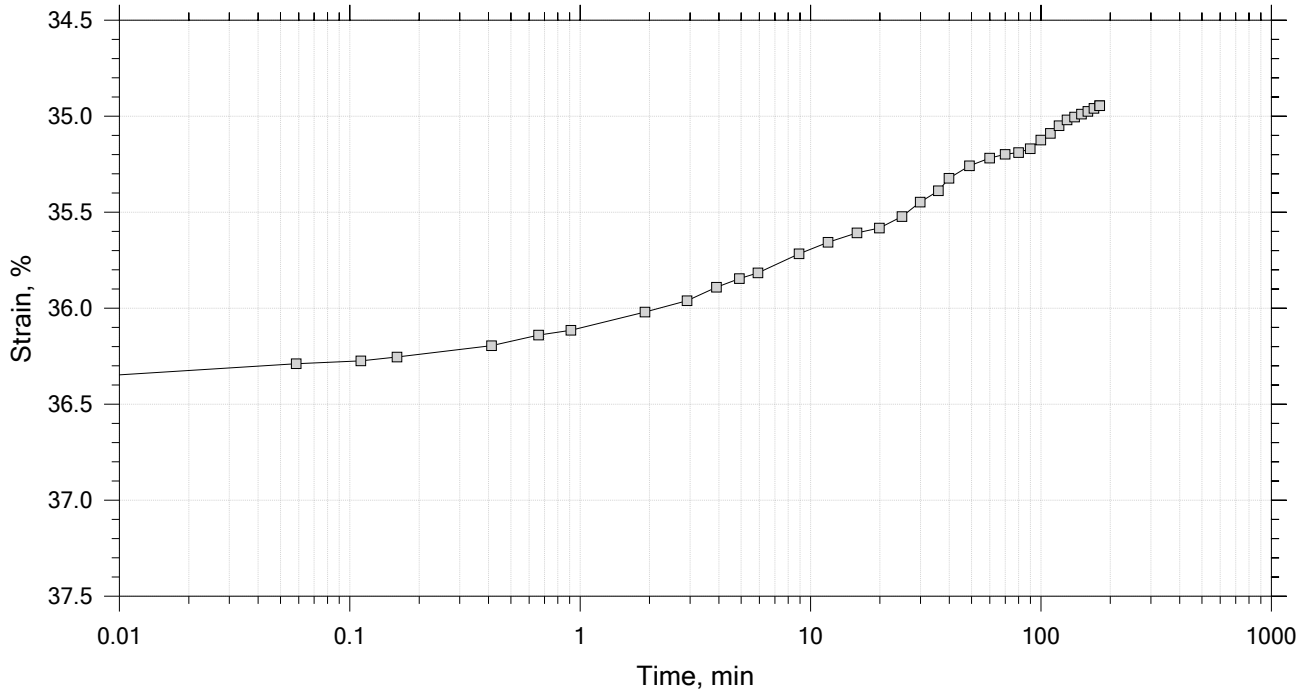


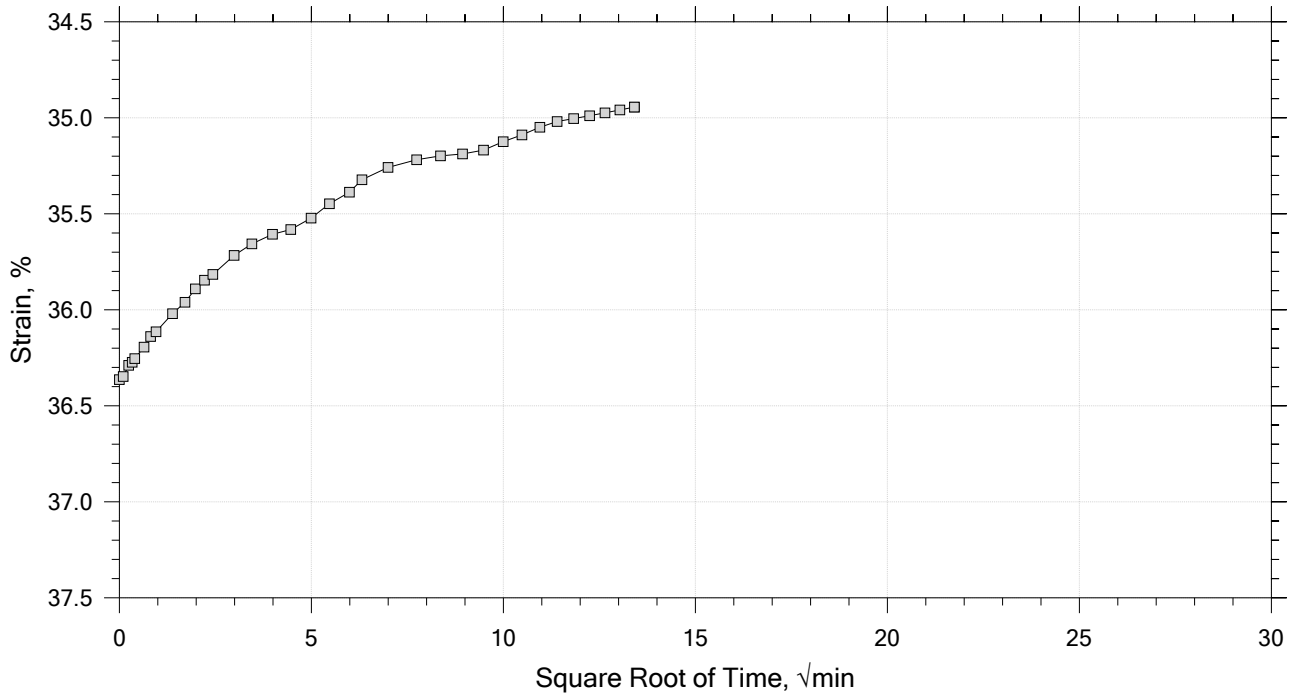




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| Description: Moist, brown and gray clay | | |
| Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

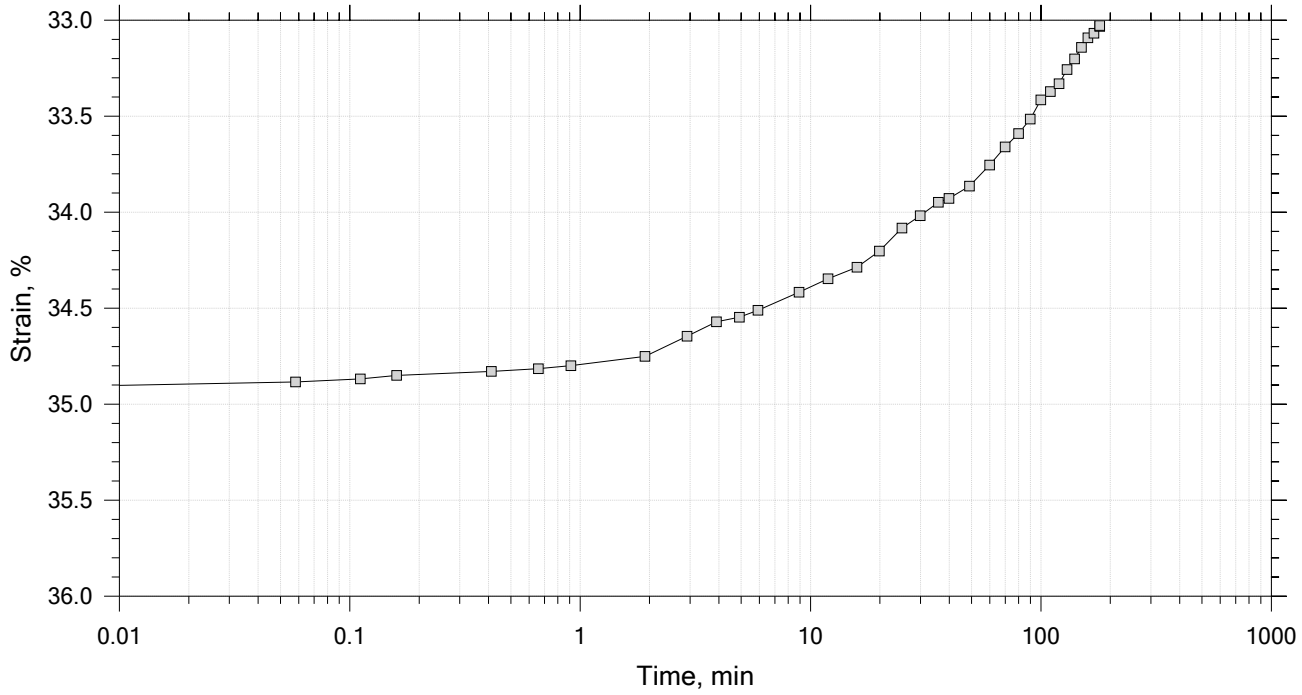


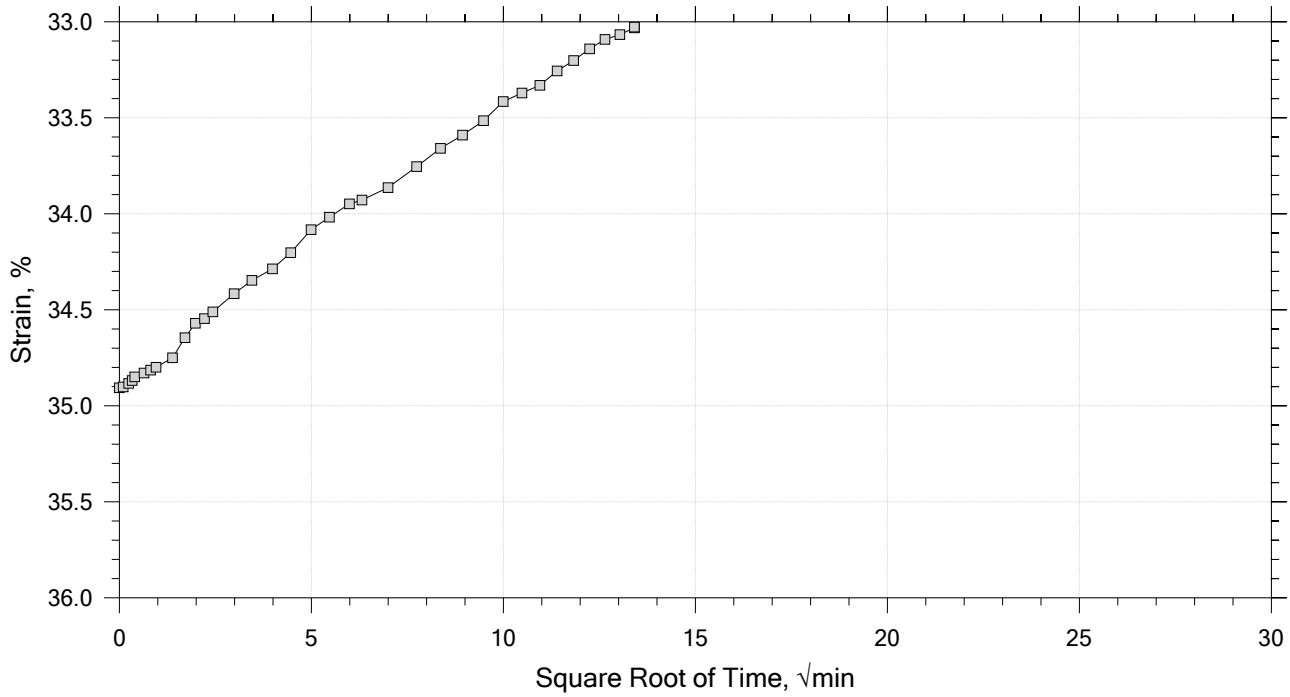




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| Description: Moist, brown and gray clay | | |
| Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

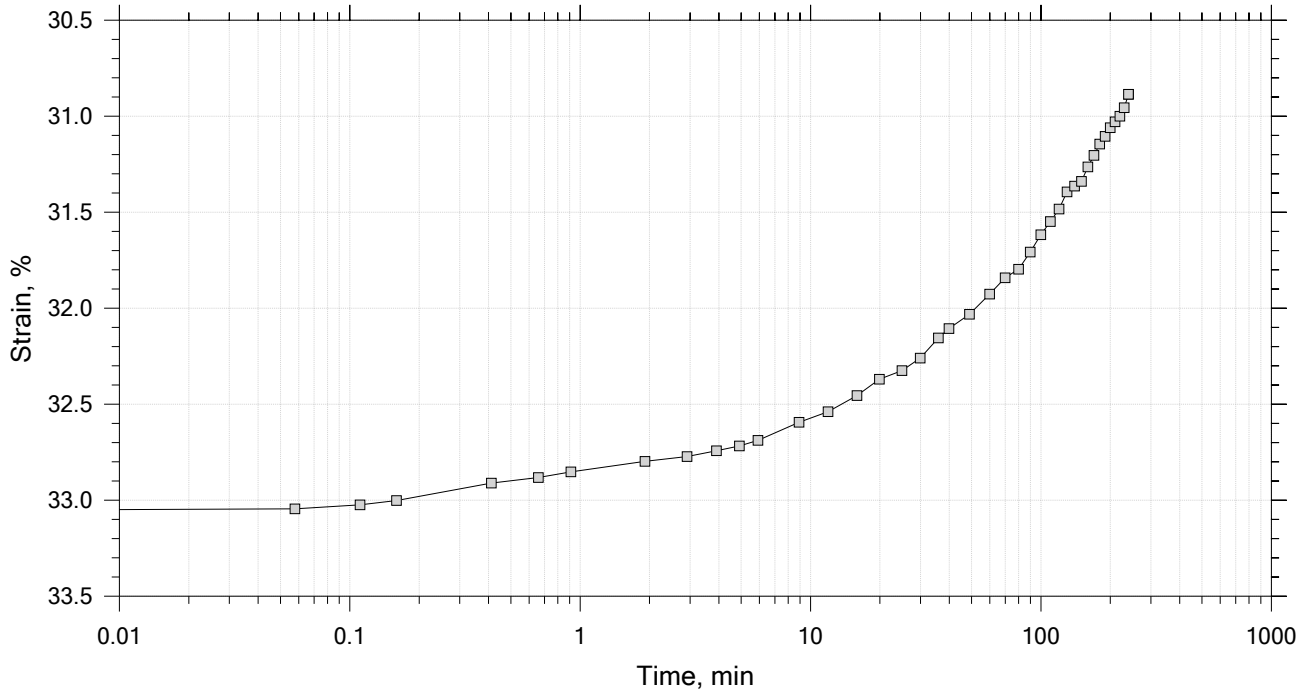


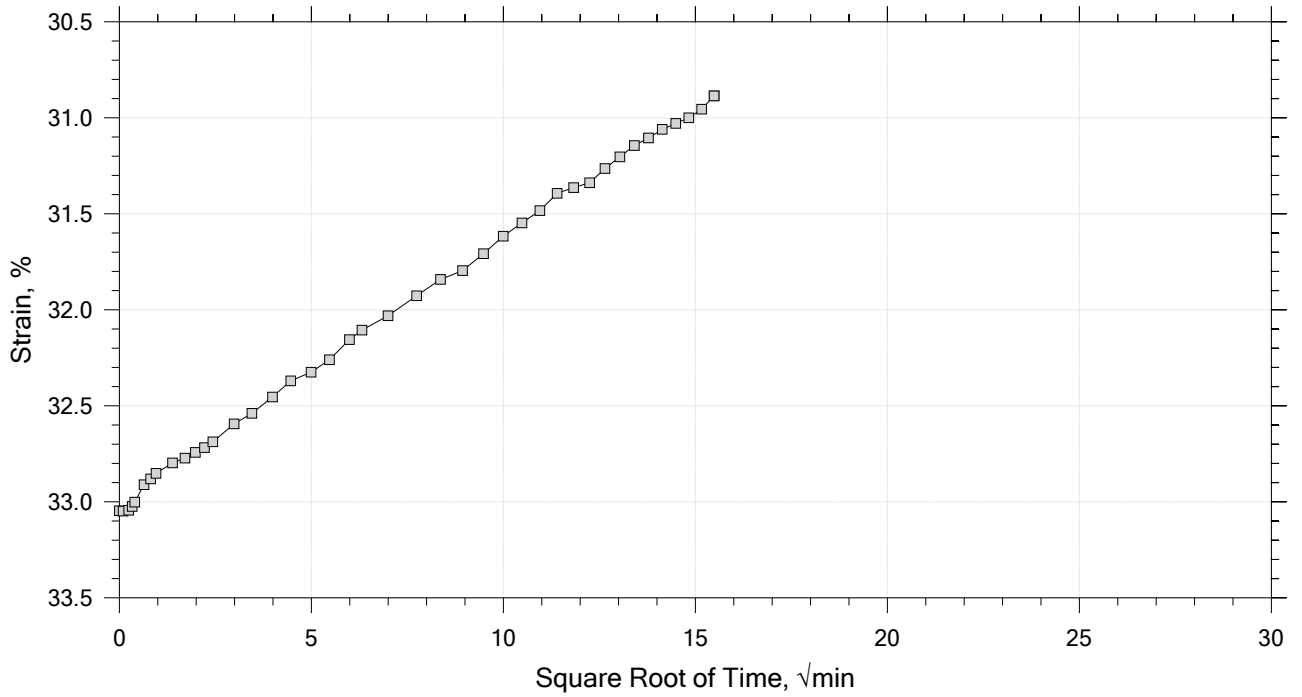




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| Description: Moist, brown and gray clay | | |
| Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

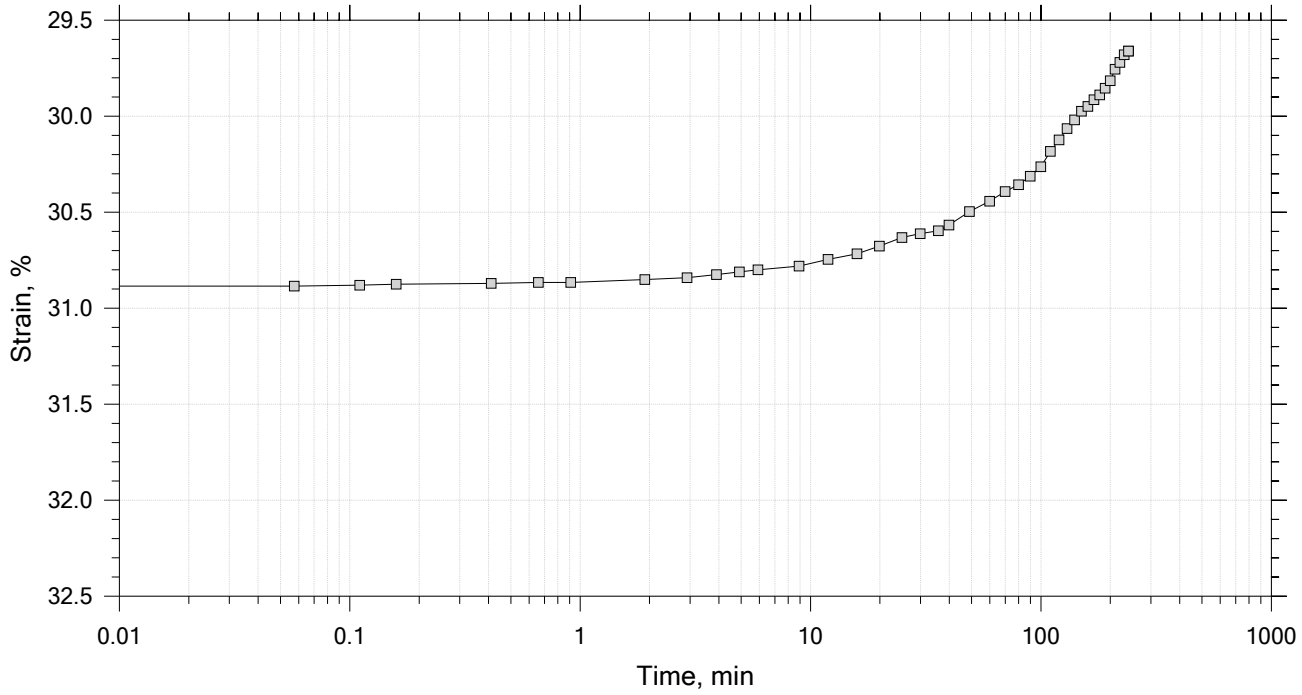


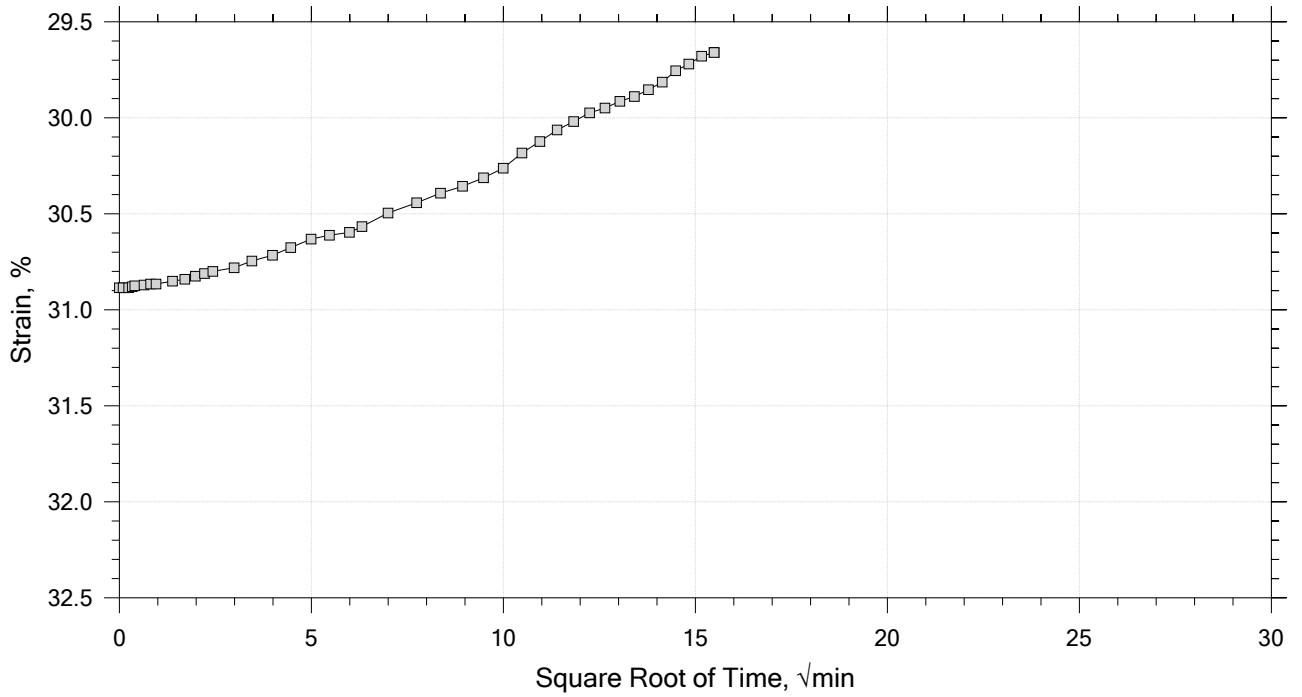




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| Description: Moist, brown and gray clay | | |
| Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.70 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 1.38 | Plastic Limit: --- |
| Final Height: 0.72 in | Final Void Ratio: 0.711 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | D-1518 | RING | | Z-0240 |
| Mass Container, gm | 8.28 | 110.04 | 110.04 | 8.4 |
| Mass Container + Wet Soil, gm | 255.54 | 246.78 | 225.55 | 123.48 |
| Mass Container + Dry Soil, gm | 180.37 | 201.48 | 201.48 | 99.5 |
| Mass Dry Soil, gm | 172.09 | 91.44 | 91.44 | 91.1 |
| Water Content, % | 43.68 | 49.54 | 26.32 | 26.32 |
| Void Ratio | --- | 1.38 | 0.71 | --- |
| Degree of Saturation, % | --- | 97.22 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 70.965 | 98.563 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| | Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| | Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| | Description: Moist, brown and gray clay | | |
| | Remarks: System K, Swell Pressure = 0.068 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0680 | 0.004598 | 1.37 | 0.460 | 1.052 | 5.39e-06 | 6.76e-02 | 9.84e-04 | 0.00e+00 |
| 2 | 0.125 | 0.01283 | 1.35 | 1.28 | 4.591 | 1.22e-06 | 1.44e-01 | 4.75e-04 | 0.00e+00 |
| 3 | 0.250 | 0.03156 | 1.30 | 3.16 | 4.391 | 1.24e-06 | 1.50e-01 | 5.02e-04 | 0.00e+00 |
| 4 | 0.500 | 0.06364 | 1.23 | 6.36 | 6.133 | 8.43e-07 | 1.28e-01 | 2.92e-04 | 0.00e+00 |
| 5 | 1.00 | 0.1179 | 1.10 | 11.8 | 10.804 | 4.36e-07 | 1.08e-01 | 1.28e-04 | 0.00e+00 |
| 6 | 2.00 | 0.1813 | 0.946 | 18.1 | 10.043 | 4.10e-07 | 6.35e-02 | 7.02e-05 | 0.00e+00 |
| 7 | 4.00 | 0.2395 | 0.807 | 23.9 | 10.207 | 3.48e-07 | 2.91e-02 | 2.73e-05 | 0.00e+00 |
| 8 | 8.00 | 0.2910 | 0.685 | 29.1 | 9.732 | 3.16e-07 | 1.29e-02 | 1.10e-05 | 0.00e+00 |
| 9 | 16.0 | 0.3361 | 0.578 | 33.6 | 0.000 | 0.00e+00 | 5.65e-03 | 0.00e+00 | 0.00e+00 |
| 10 | 32.0 | 0.3730 | 0.490 | 37.3 | 11.065 | 2.15e-07 | 2.30e-03 | 1.33e-06 | 0.00e+00 |
| 11 | 8.00 | 0.3651 | 0.509 | 36.5 | 0.000 | 0.00e+00 | 3.28e-04 | 0.00e+00 | 0.00e+00 |
| 12 | 2.00 | 0.3494 | 0.546 | 34.9 | 0.000 | 0.00e+00 | 2.61e-03 | 0.00e+00 | 0.00e+00 |
| 13 | 0.500 | 0.3303 | 0.592 | 33.0 | 0.000 | 0.00e+00 | 1.28e-02 | 0.00e+00 | 0.00e+00 |
| 14 | 0.125 | 0.3089 | 0.643 | 30.9 | 0.000 | 0.00e+00 | 5.71e-02 | 0.00e+00 | 0.00e+00 |
| 15 | 0.0625 | 0.2966 | 0.672 | 29.7 | 0.000 | 0.00e+00 | 1.96e-01 | 0.00e+00 | 0.00e+00 |

GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| Description: Moist, brown and gray clay | | |
| Remarks: System K, Swell Pressure = 0.068 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Square Root of Time Coefficients

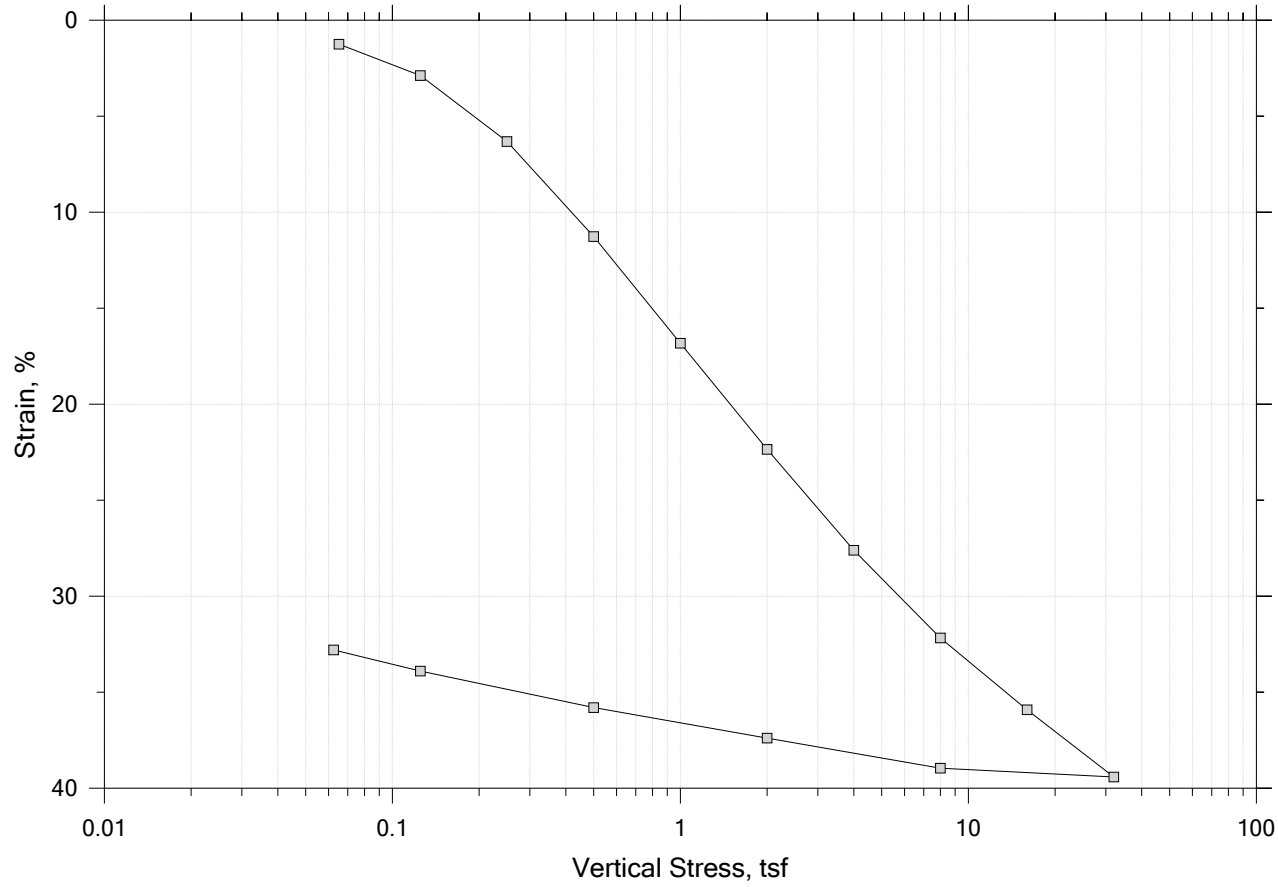
| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0680 | 0.004598 | 1.37 | 0.460 | 4.741 | 5.15e-06 | 6.76e-02 | 9.40e-04 |
| 2 | 0.125 | 0.01283 | 1.35 | 1.28 | 17.245 | 1.40e-06 | 1.44e-01 | 5.45e-04 |
| 3 | 0.250 | 0.03156 | 1.30 | 3.16 | 20.331 | 1.15e-06 | 1.50e-01 | 4.66e-04 |
| 4 | 0.500 | 0.06364 | 1.23 | 6.36 | 27.914 | 7.97e-07 | 1.28e-01 | 2.76e-04 |
| 5 | 1.00 | 0.1179 | 1.10 | 11.8 | 35.443 | 5.72e-07 | 1.08e-01 | 1.67e-04 |
| 6 | 2.00 | 0.1813 | 0.946 | 18.1 | 46.813 | 3.79e-07 | 6.35e-02 | 6.49e-05 |
| 7 | 4.00 | 0.2395 | 0.807 | 23.9 | 51.081 | 2.99e-07 | 2.91e-02 | 2.35e-05 |
| 8 | 8.00 | 0.2910 | 0.685 | 29.1 | 45.375 | 2.92e-07 | 1.29e-02 | 1.01e-05 |
| 9 | 16.0 | 0.3361 | 0.578 | 33.6 | 38.323 | 3.02e-07 | 5.65e-03 | 4.59e-06 |
| 10 | 32.0 | 0.3730 | 0.490 | 37.3 | 42.053 | 2.43e-07 | 2.30e-03 | 1.51e-06 |
| 11 | 8.00 | 0.3651 | 0.509 | 36.5 | 20.804 | 4.70e-07 | 3.28e-04 | 4.15e-07 |
| 12 | 2.00 | 0.3494 | 0.546 | 34.9 | 72.455 | 1.40e-07 | 2.61e-03 | 9.83e-07 |
| 13 | 0.500 | 0.3303 | 0.592 | 33.0 | 172.403 | 6.20e-08 | 1.28e-02 | 2.14e-06 |
| 14 | 0.125 | 0.3089 | 0.643 | 30.9 | 179.686 | 6.32e-08 | 5.71e-02 | 9.74e-06 |
| 15 | 0.0625 | 0.2966 | 0.672 | 29.7 | 0.000 | 0.00e+00 | 1.96e-01 | 0.00e+00 |

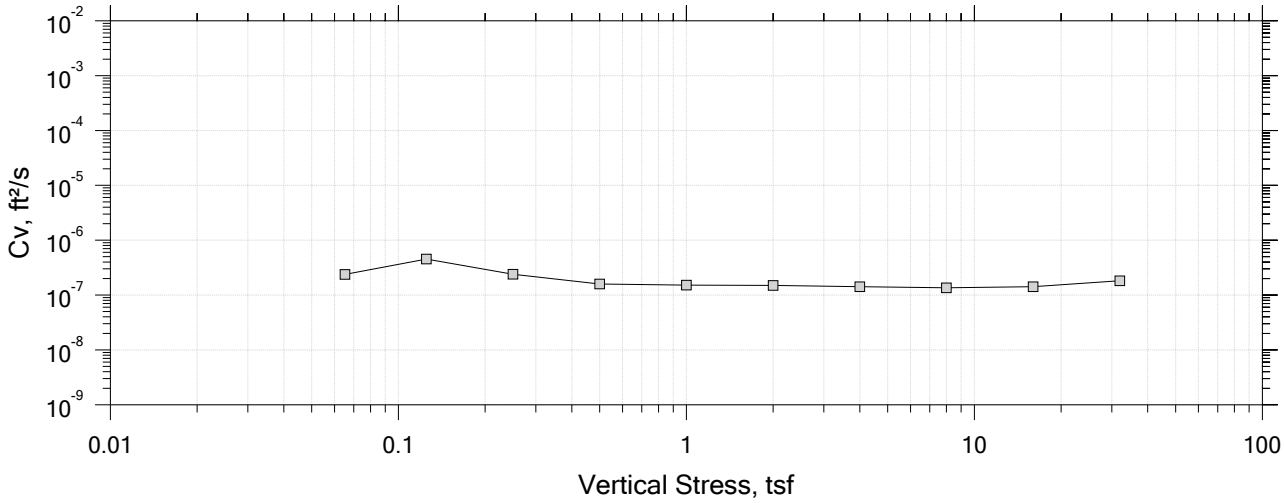
GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB022 | Tested By: md | Checked By: njh |
| Sample No.: SL0812 | Test Date: 01/10/19 | Depth: 7-9 ft |
| Test No.: IP-6 | Sample Type: intact | Elevation: --- |
| Description: Moist, brown and gray clay | | |
| Remarks: System K, Swell Pressure = 0.068 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report



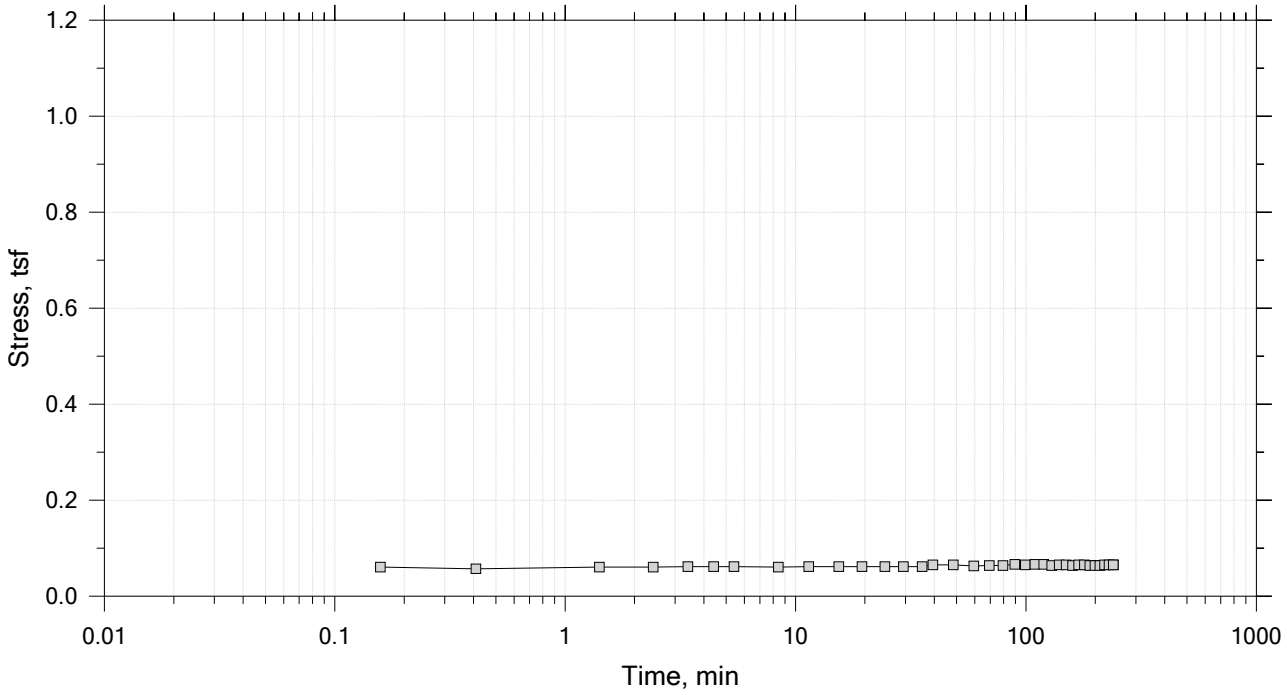

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |
| | Displacement at End of Increment | | |

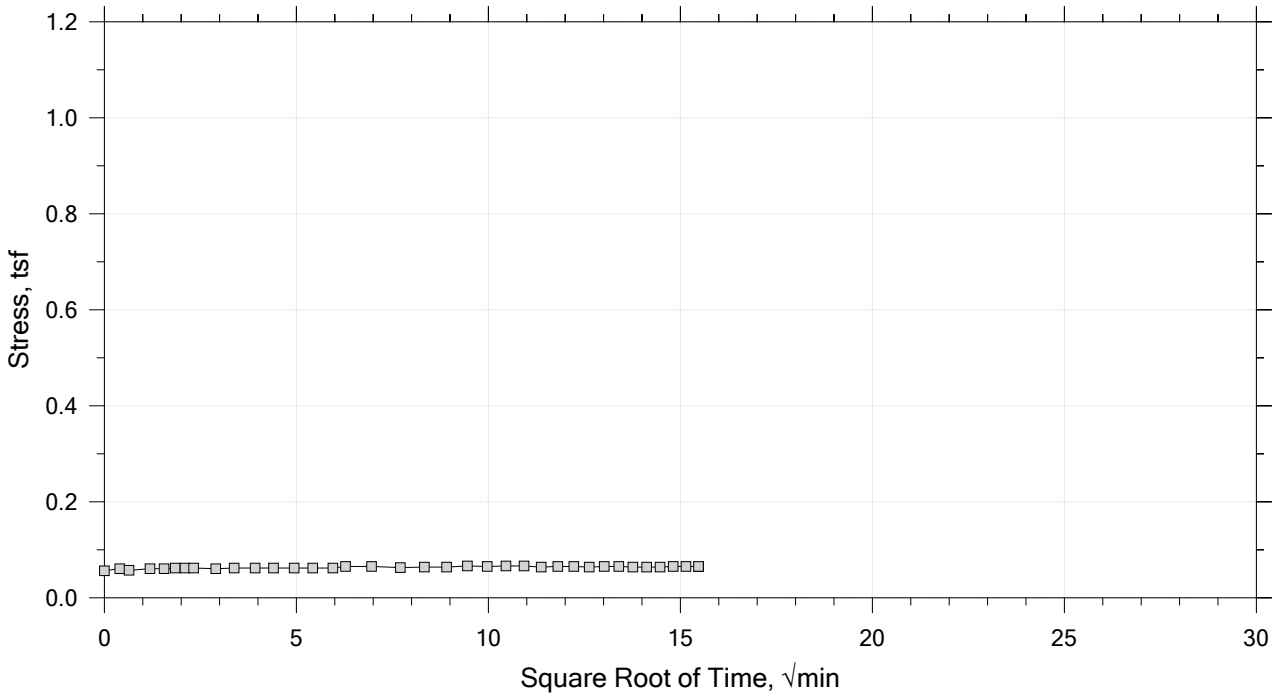
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0652 tsf

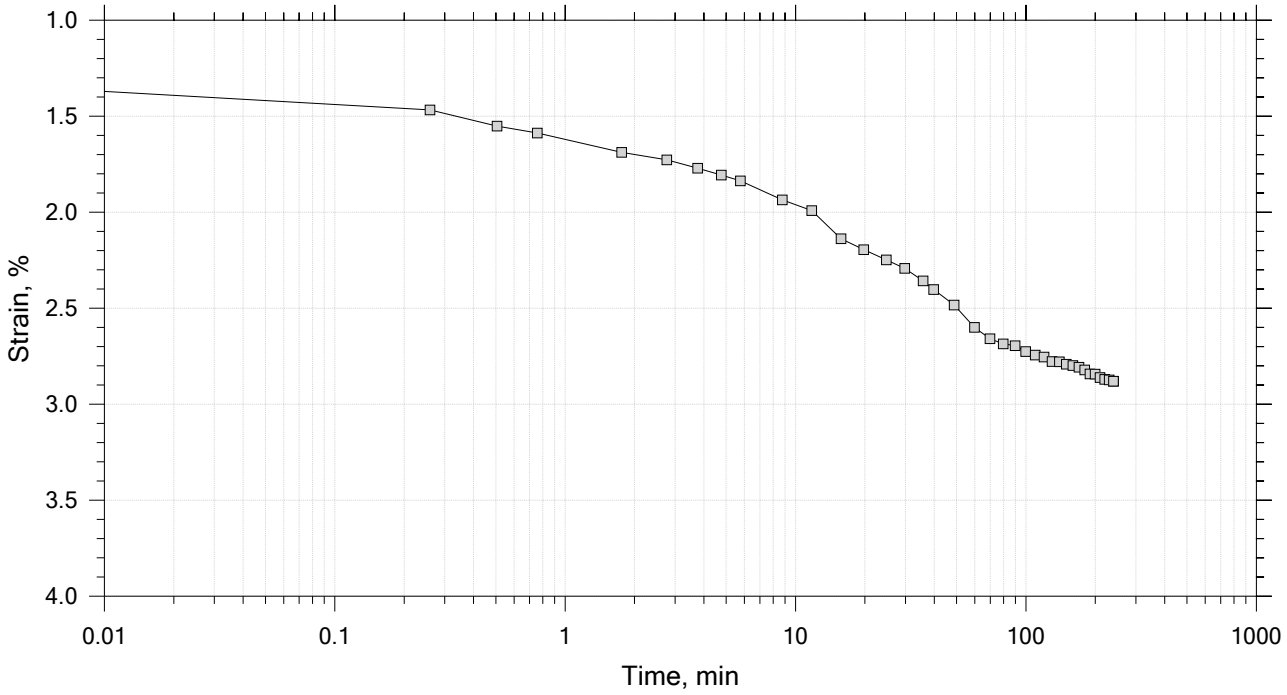


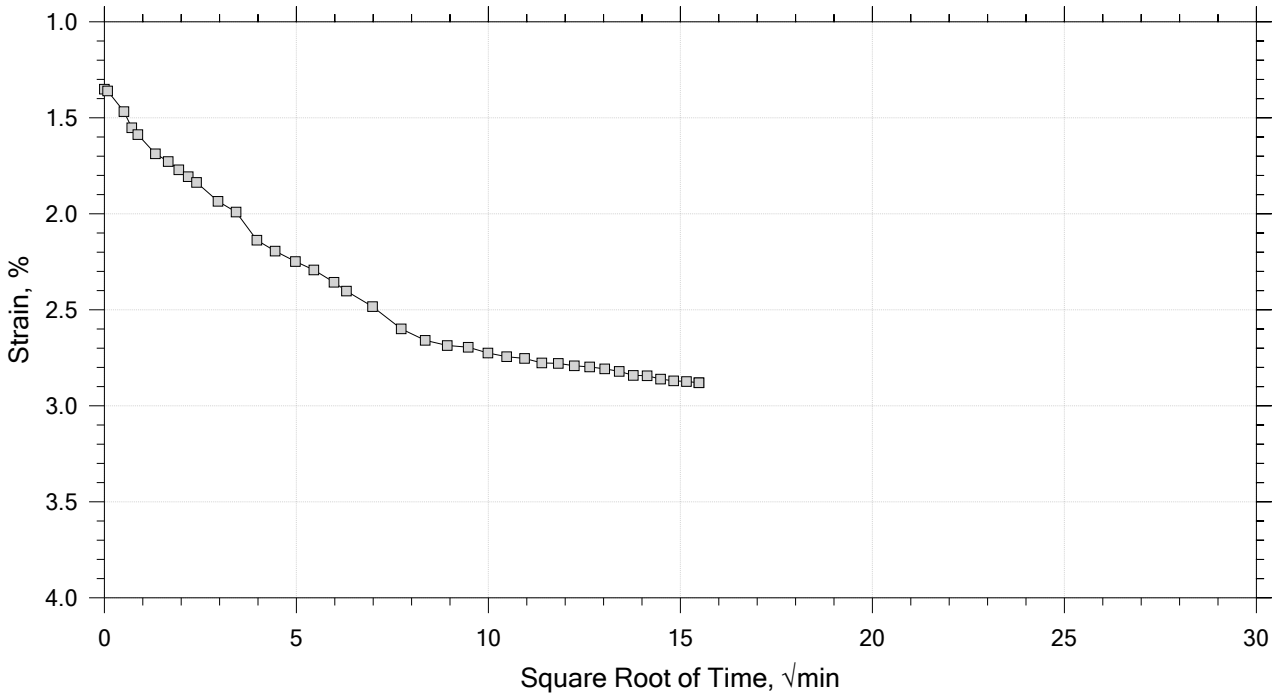




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf



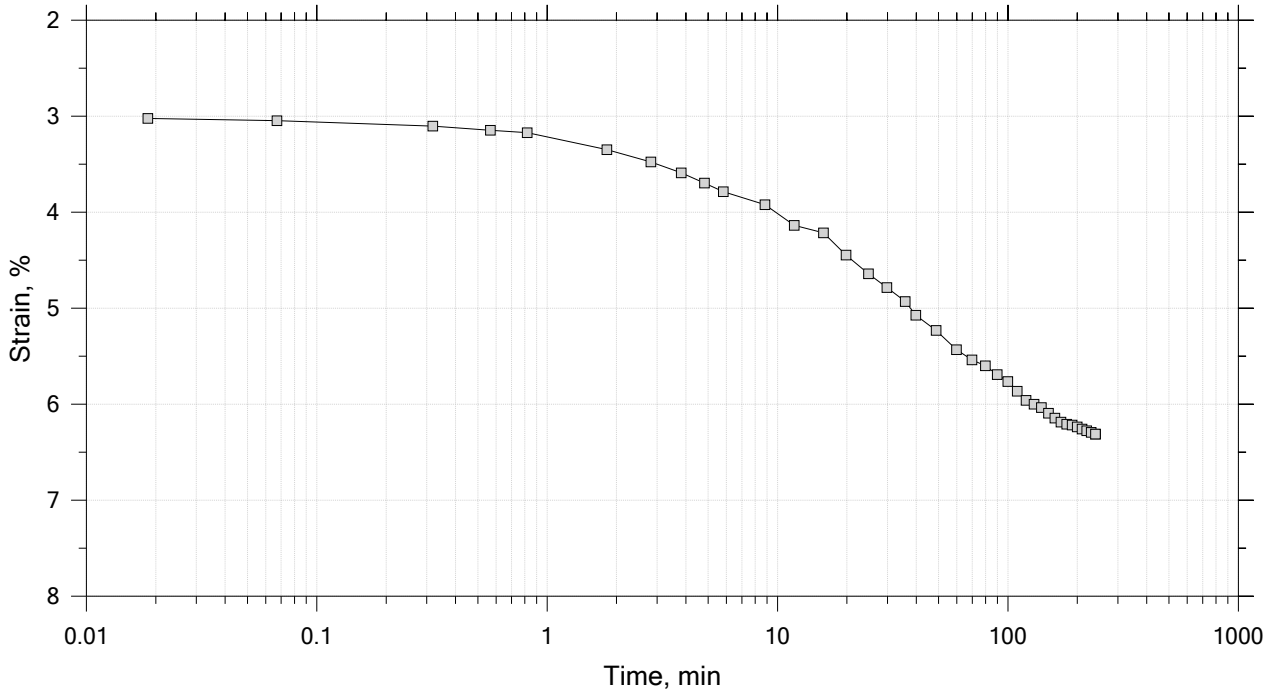

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

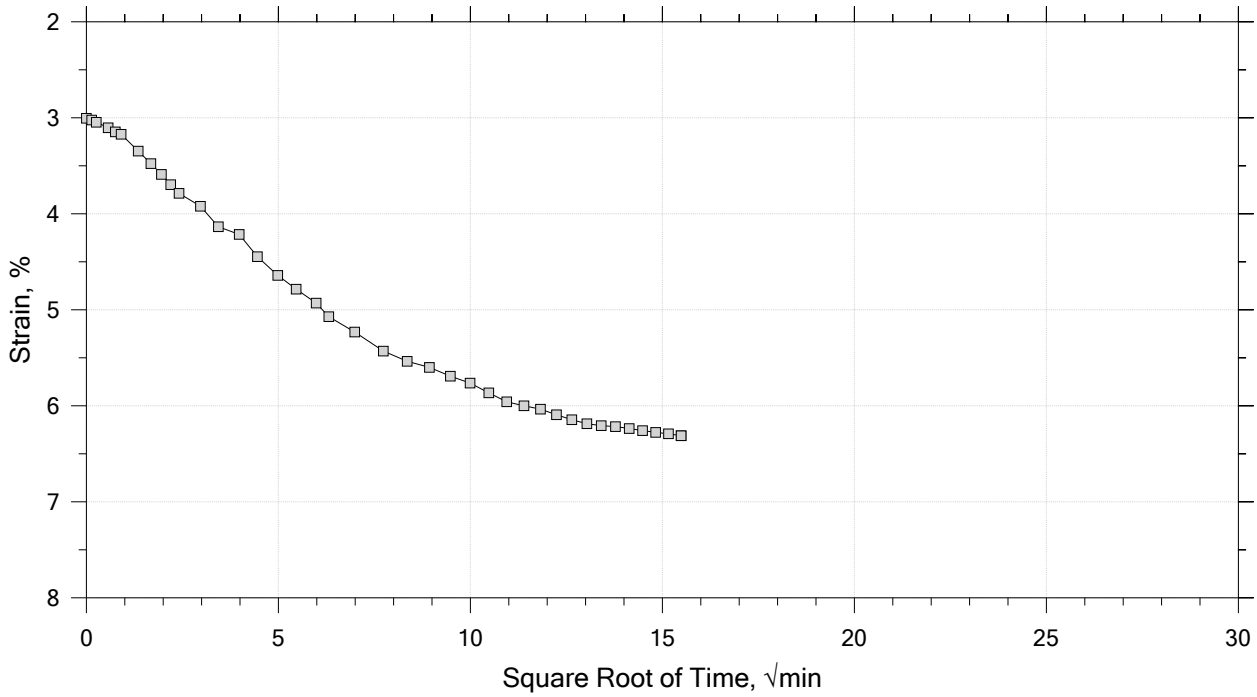
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15

Constant Load Step

Stress: 0.25 tsf



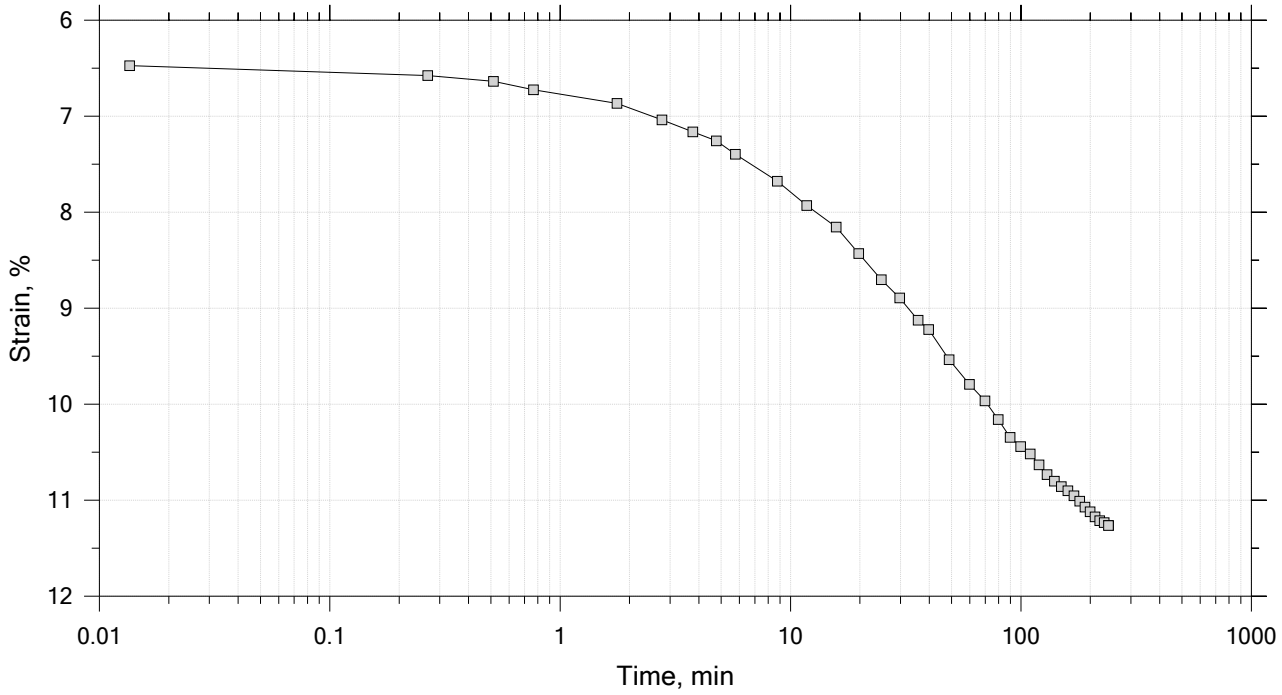

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

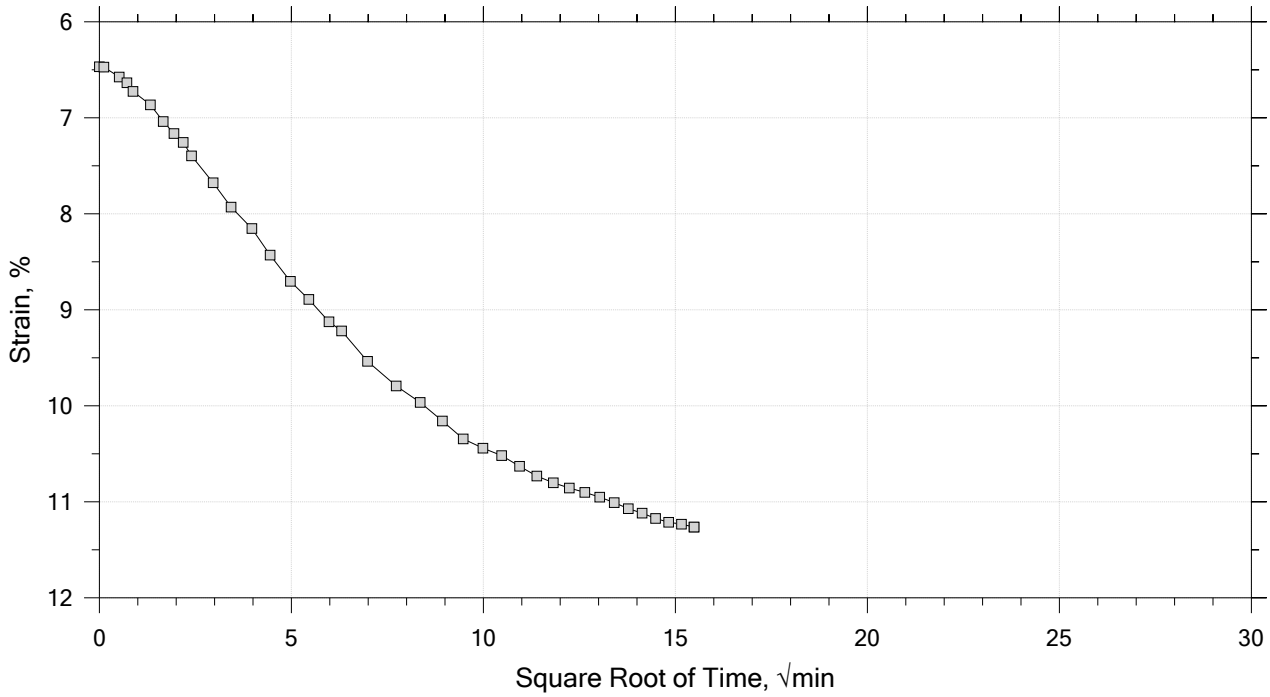
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.5 tsf

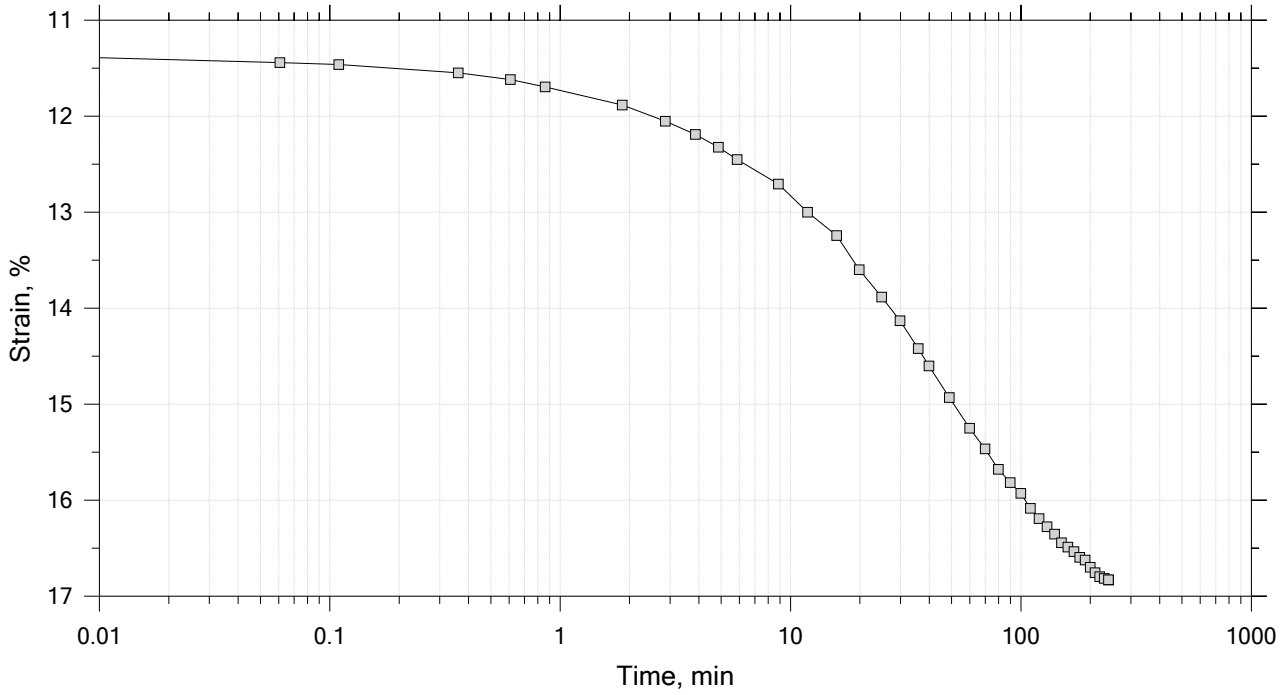


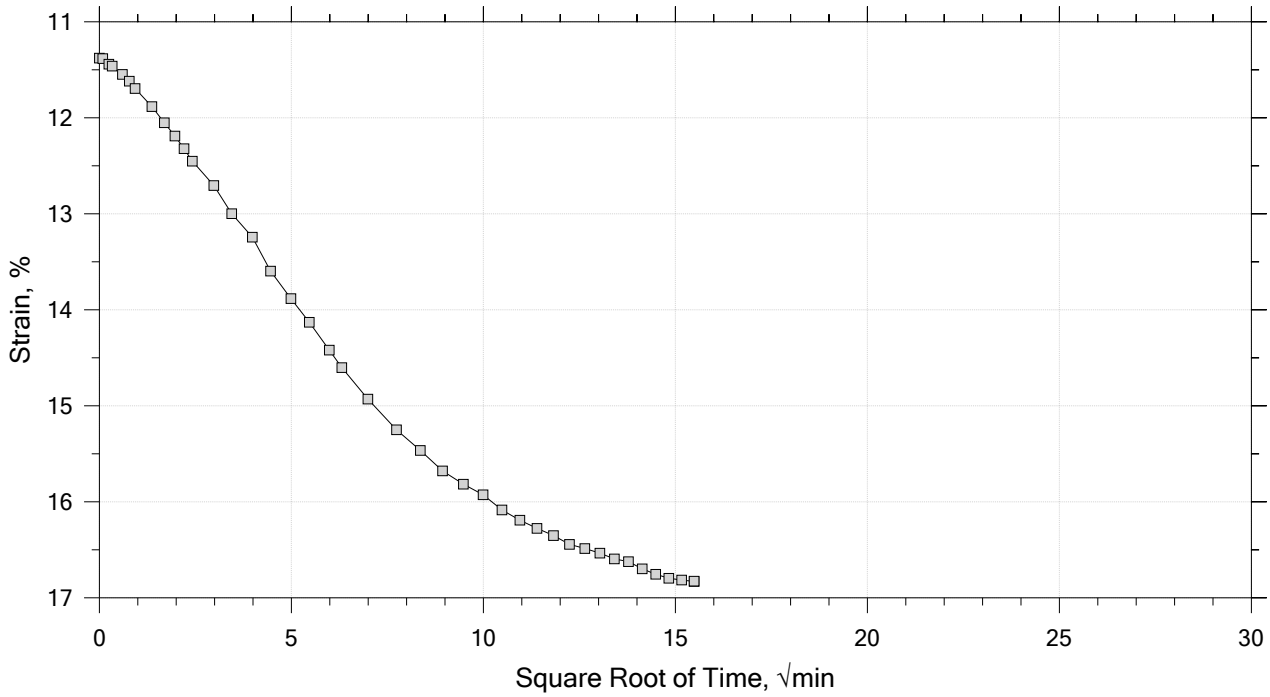




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15
Constant Load Step
Stress: 1 tsf



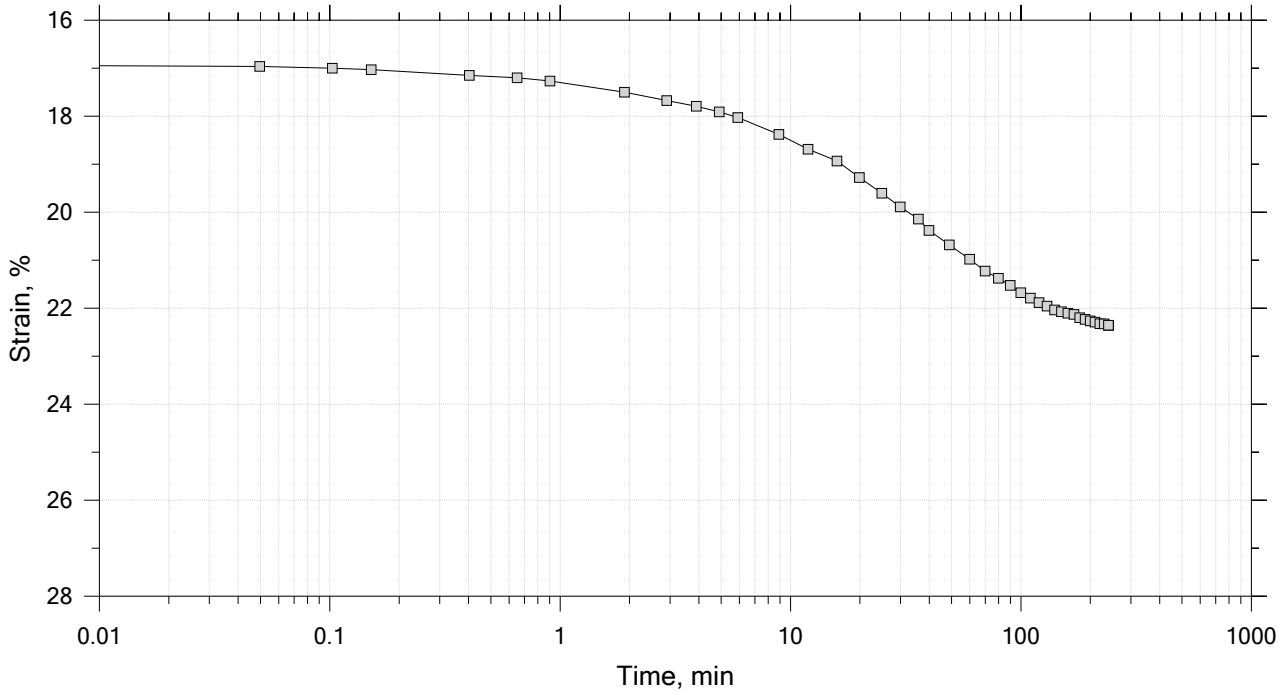

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

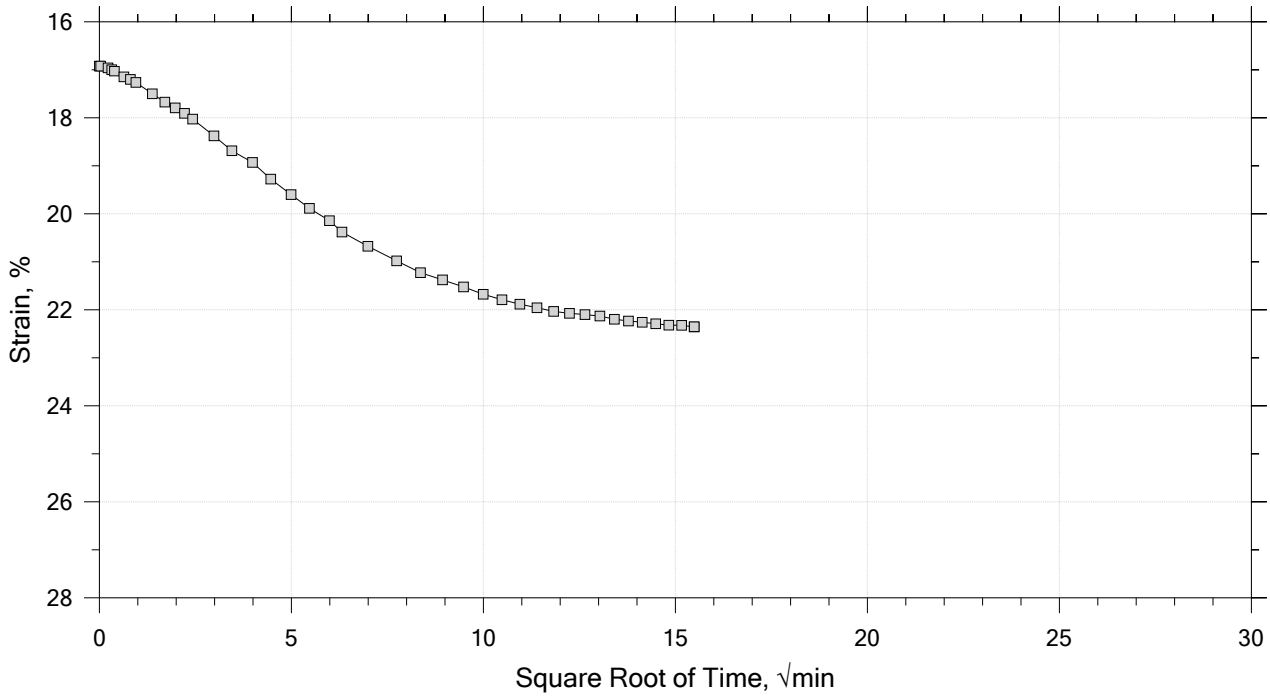
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf



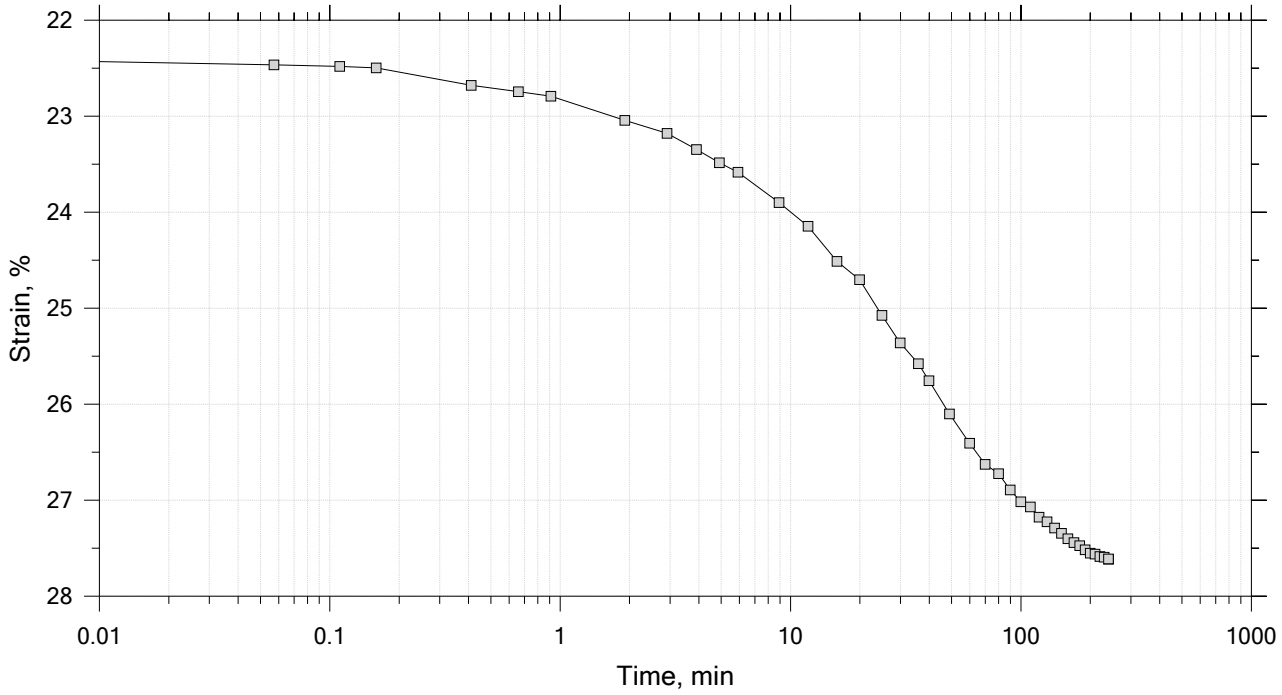

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

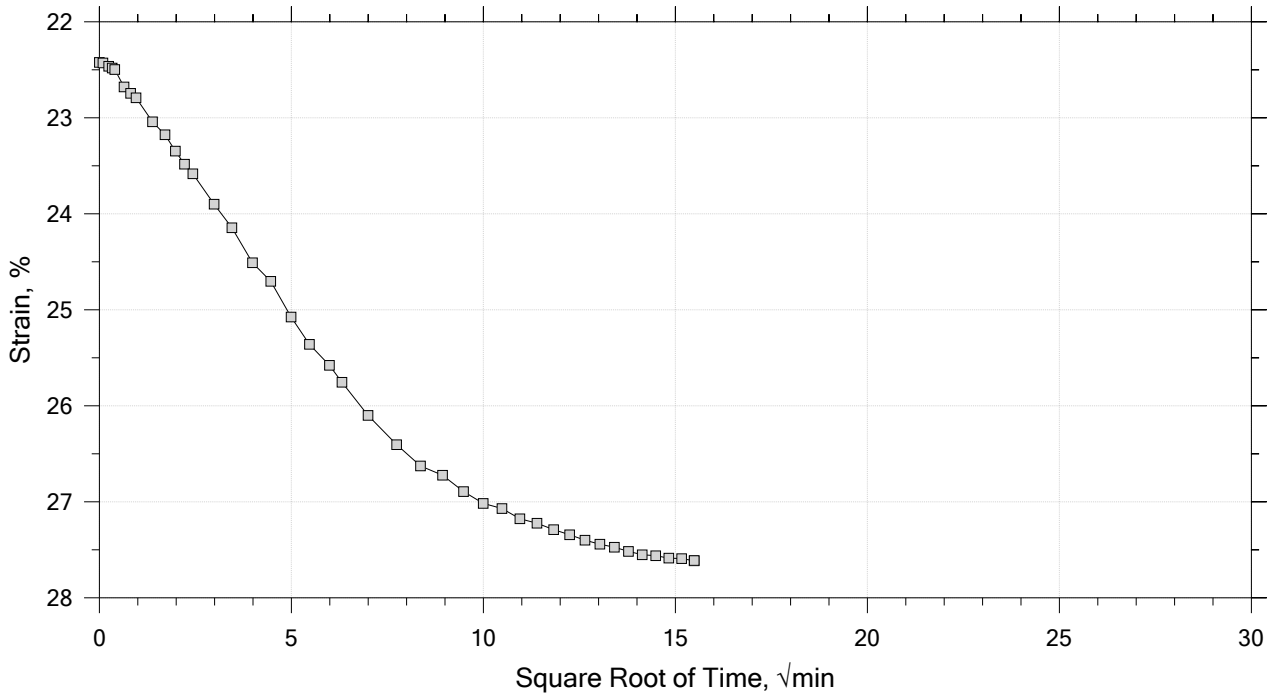
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf

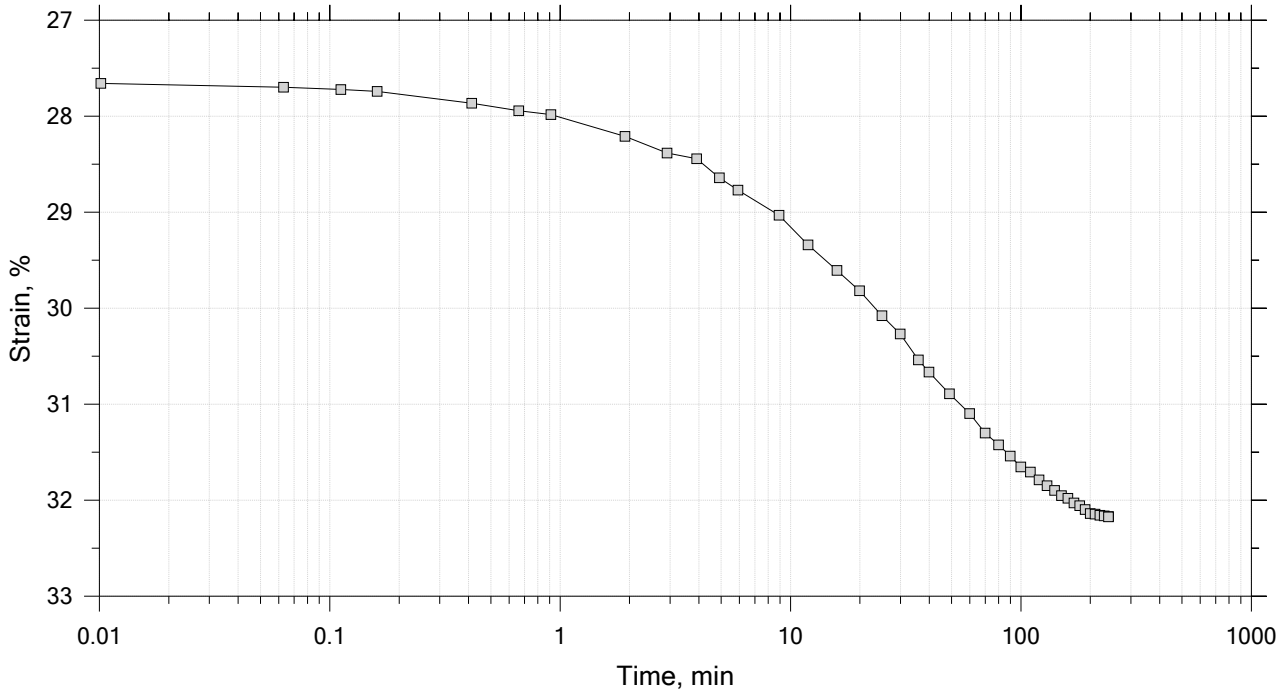


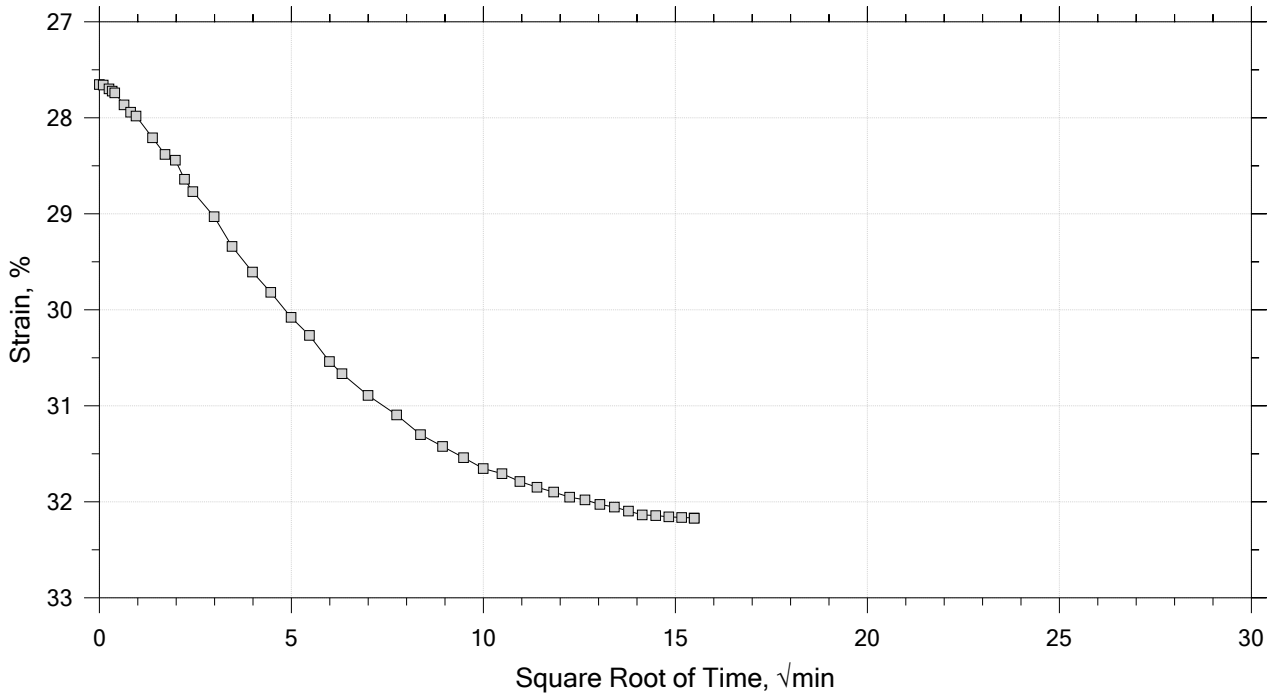




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf



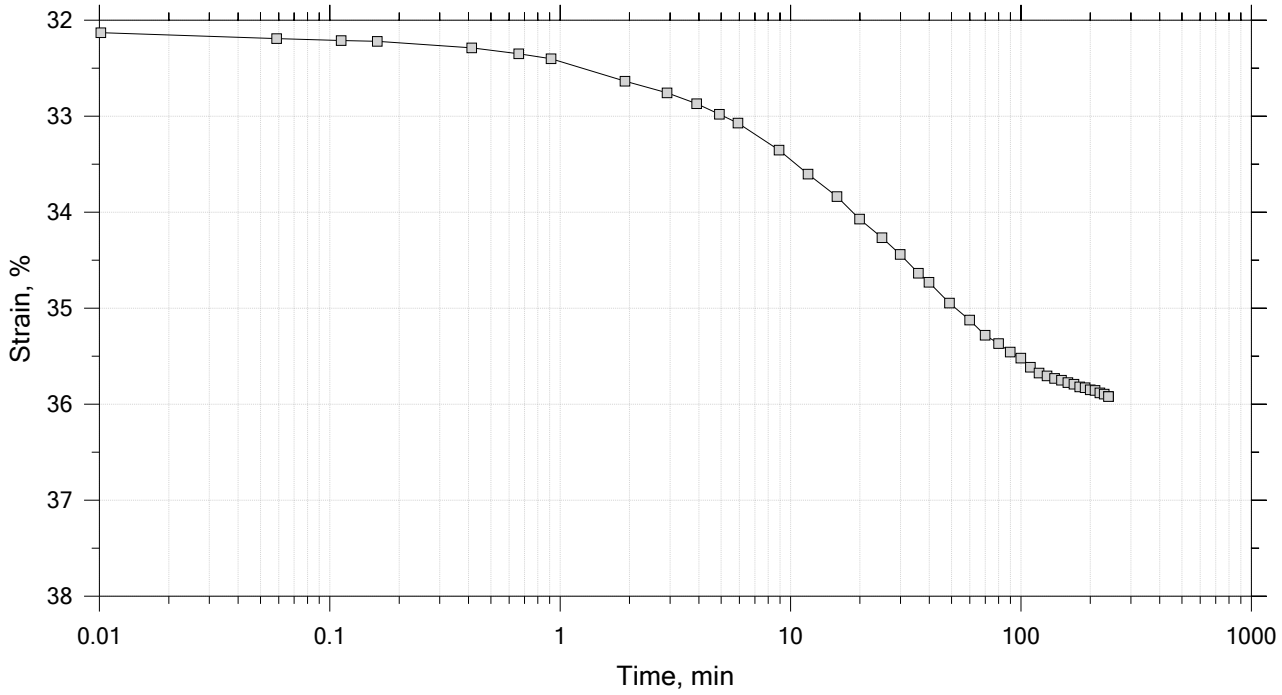

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

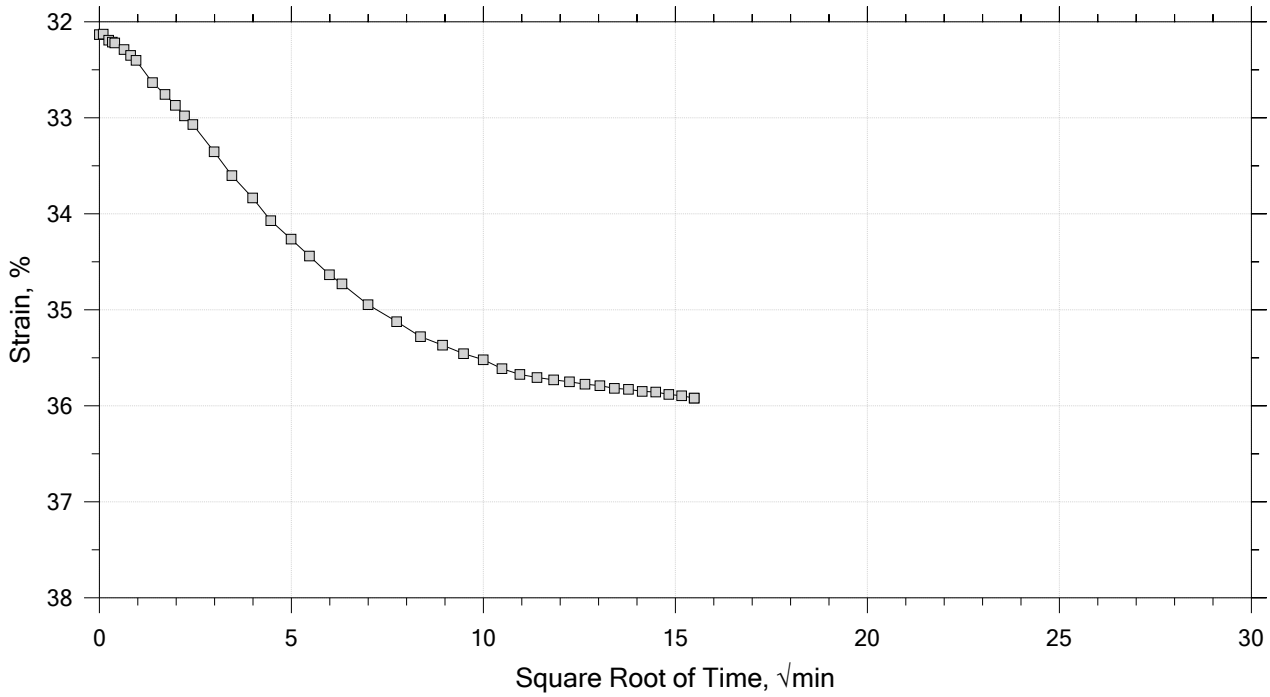
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15

Constant Load Step

Stress: 16 tsf

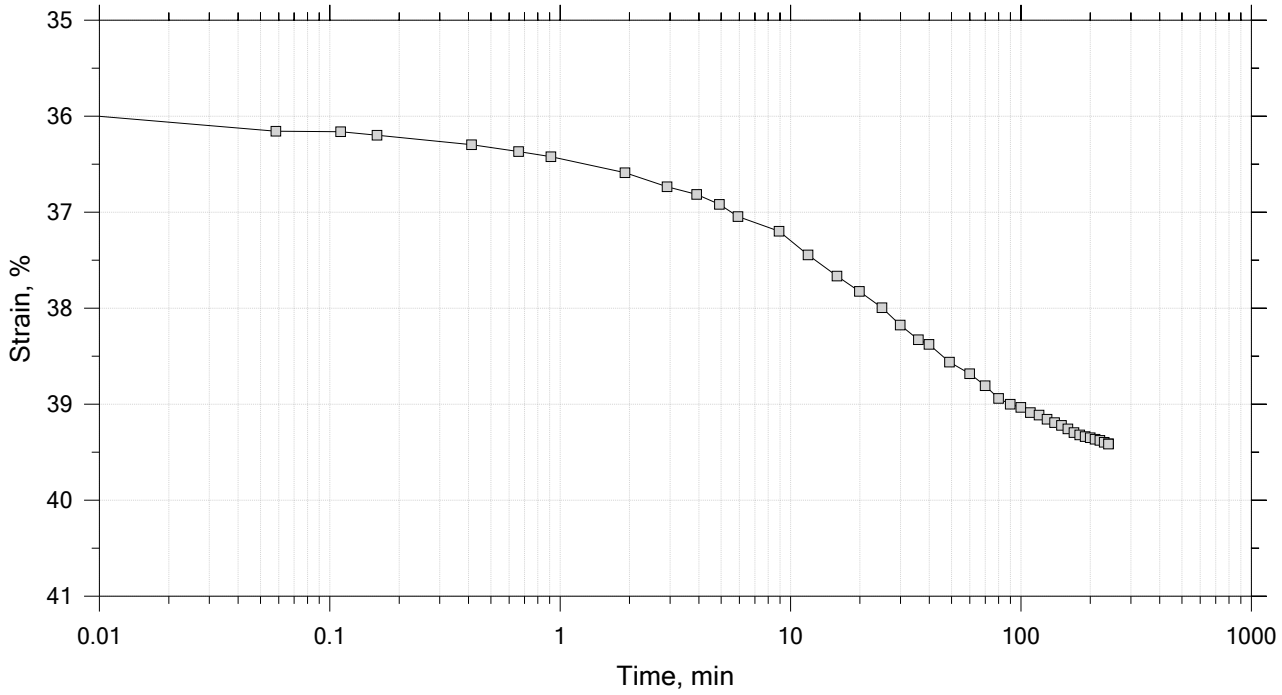


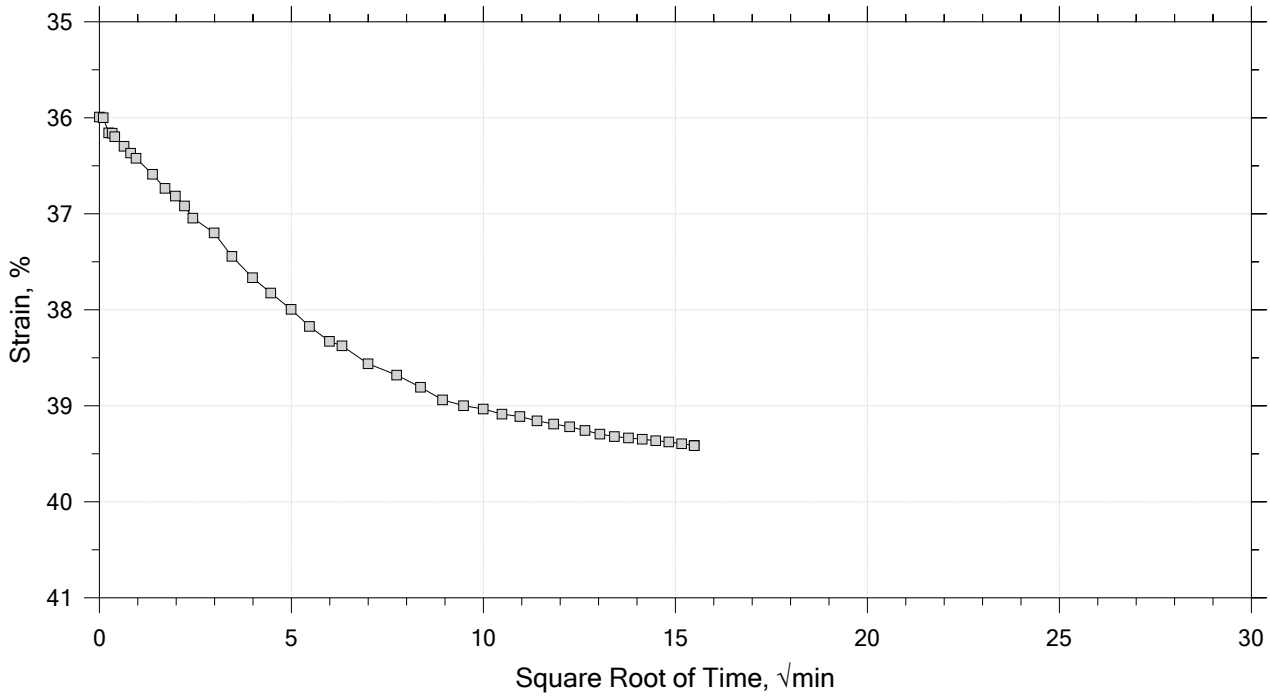




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

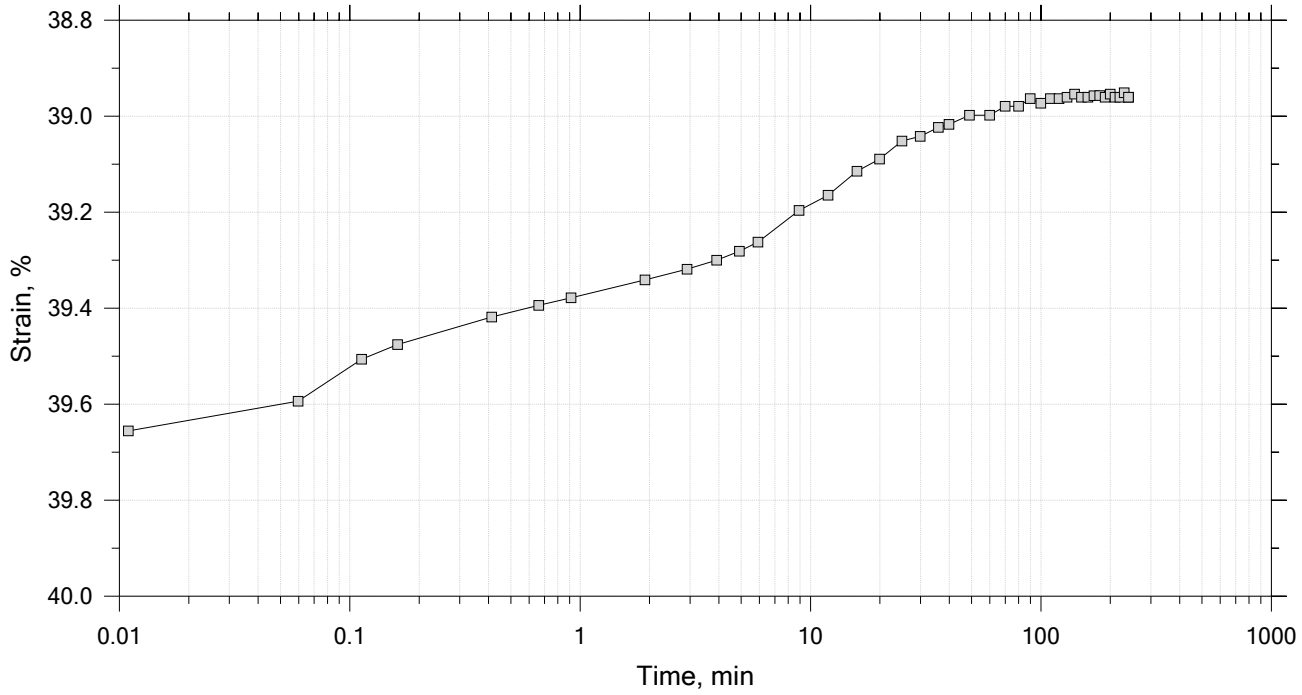


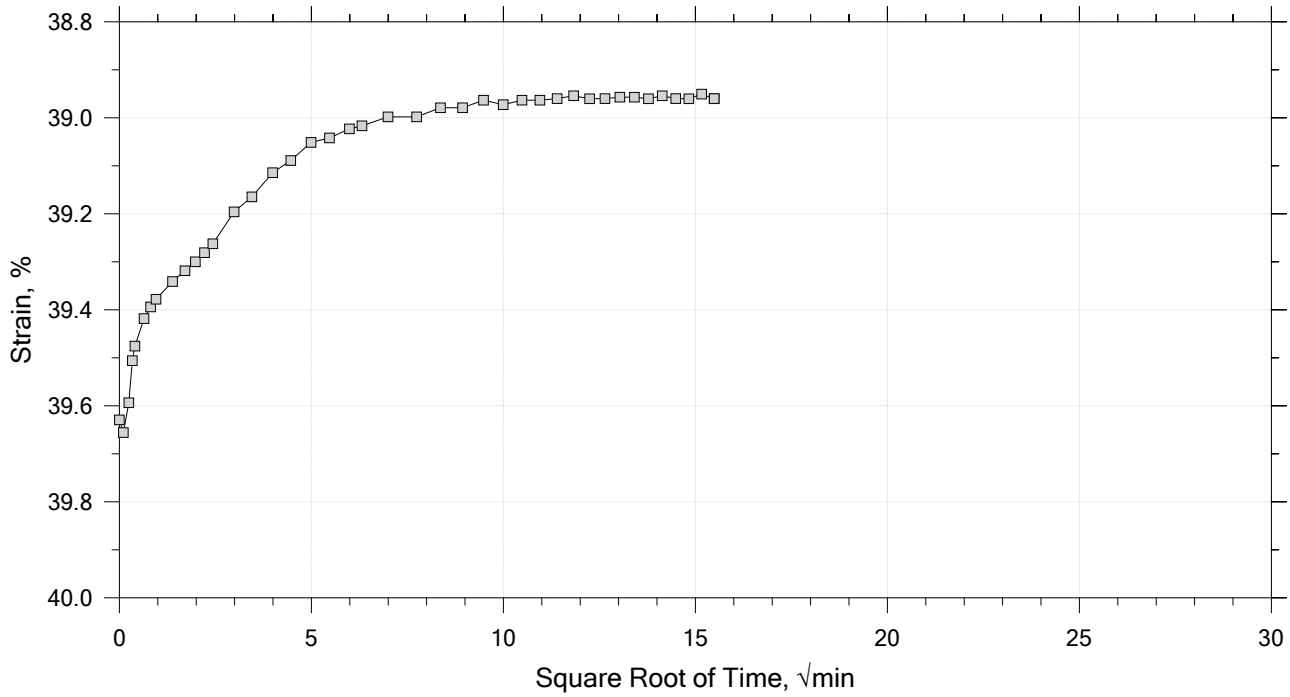




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

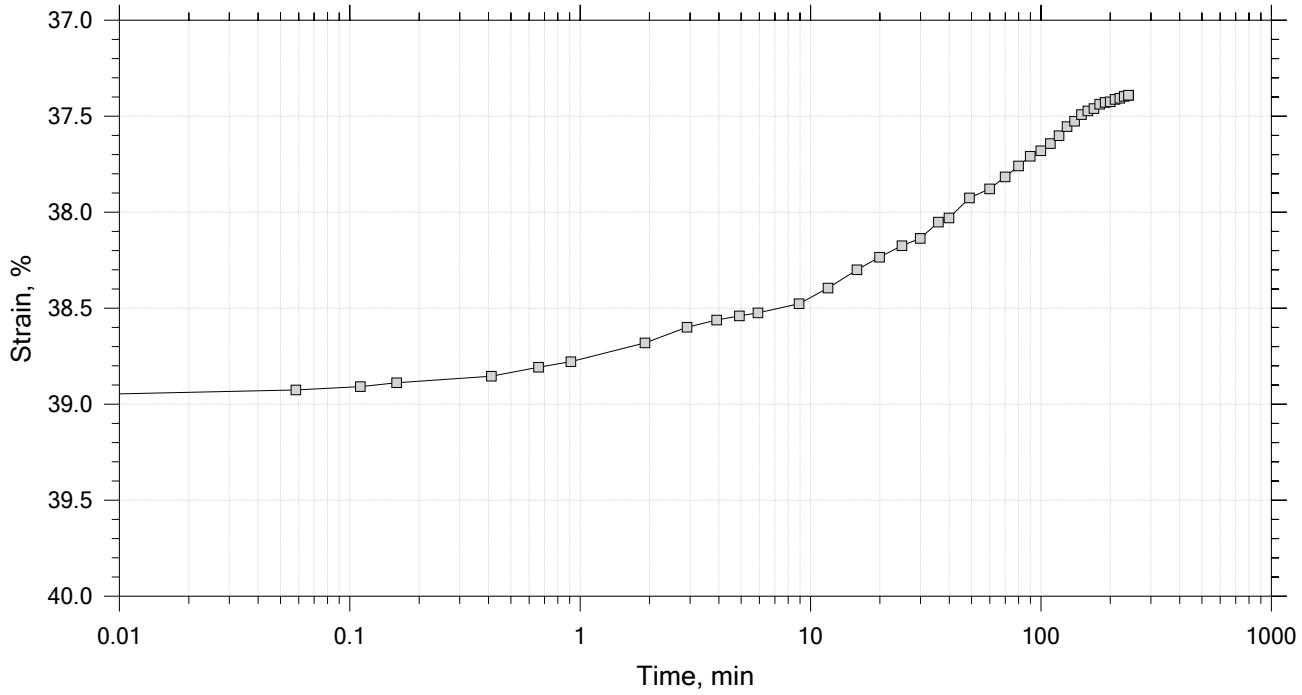


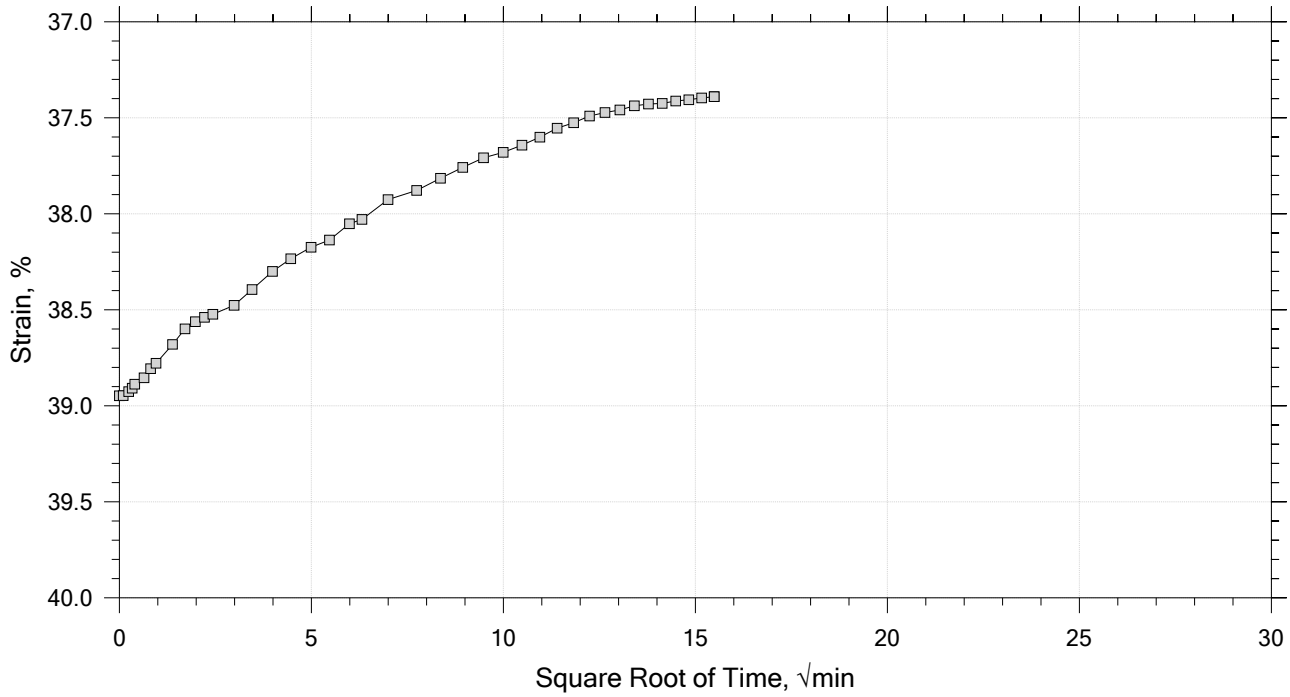




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

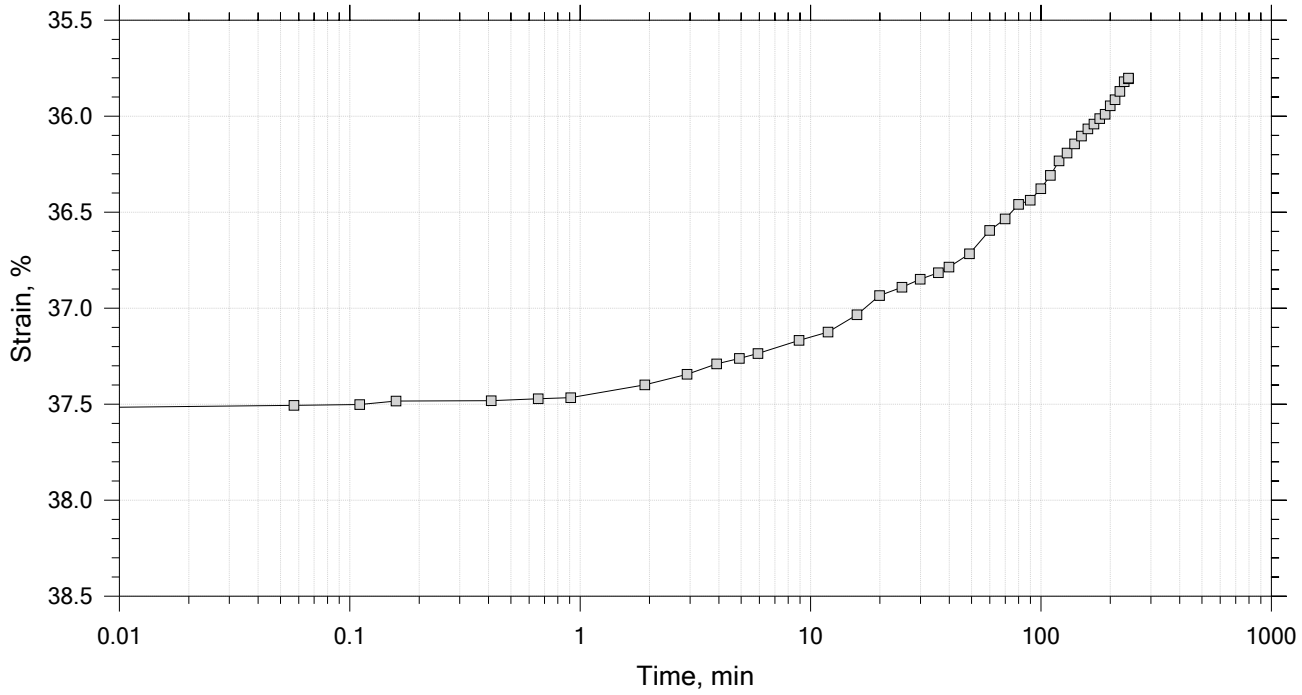


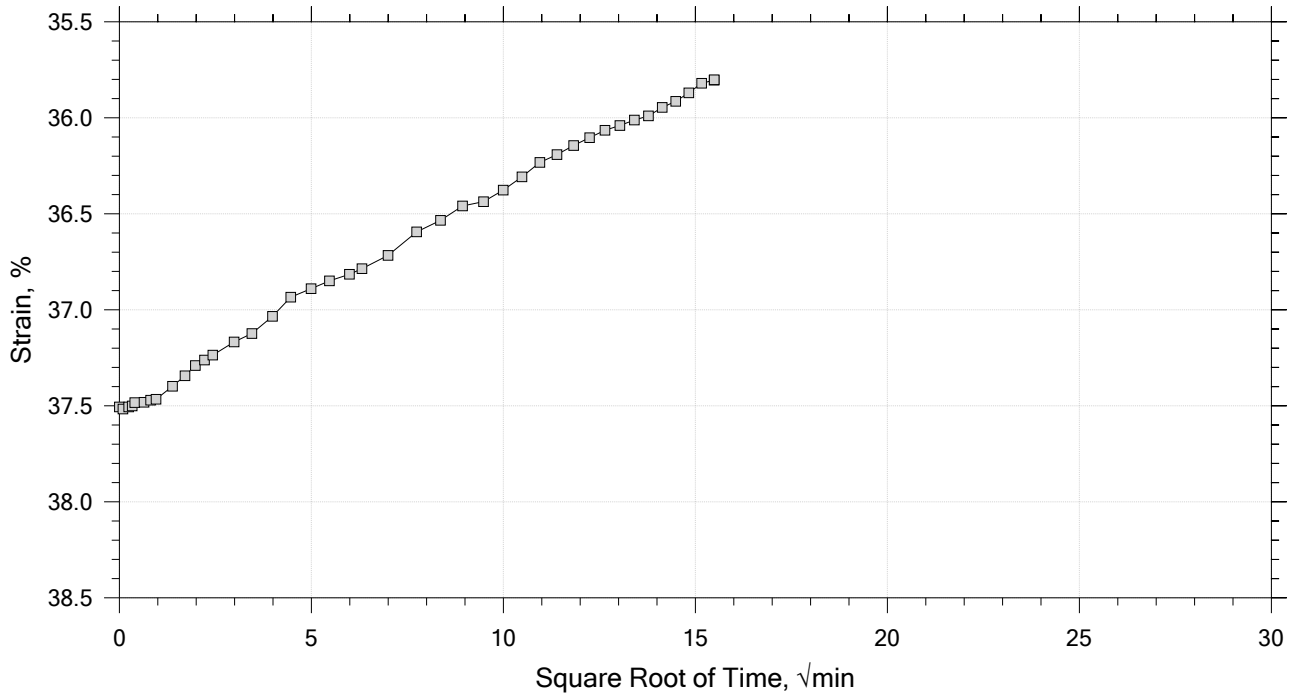




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

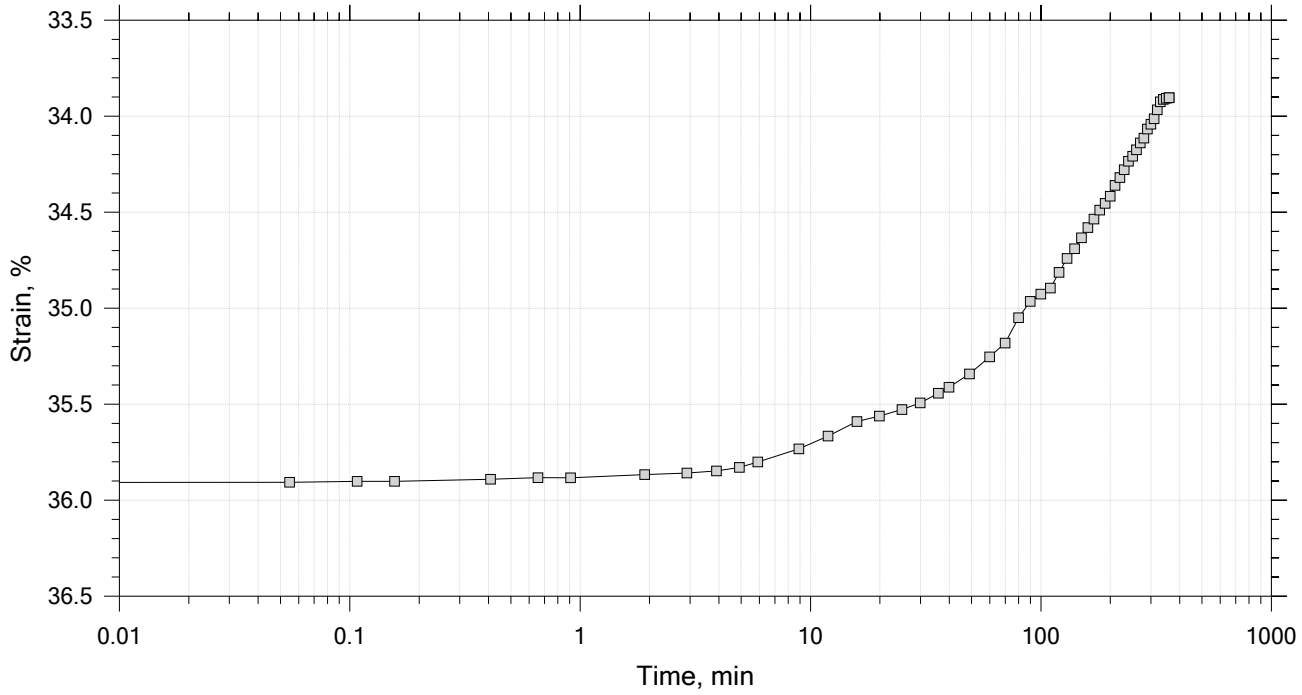


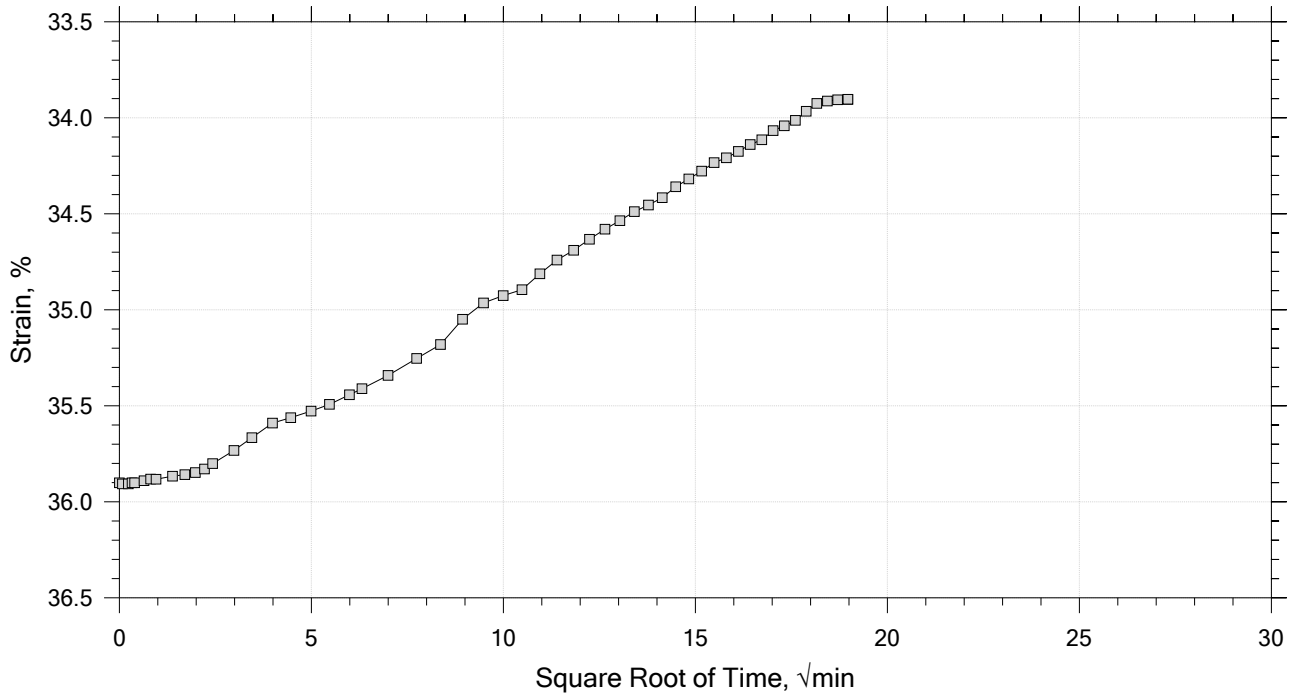




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

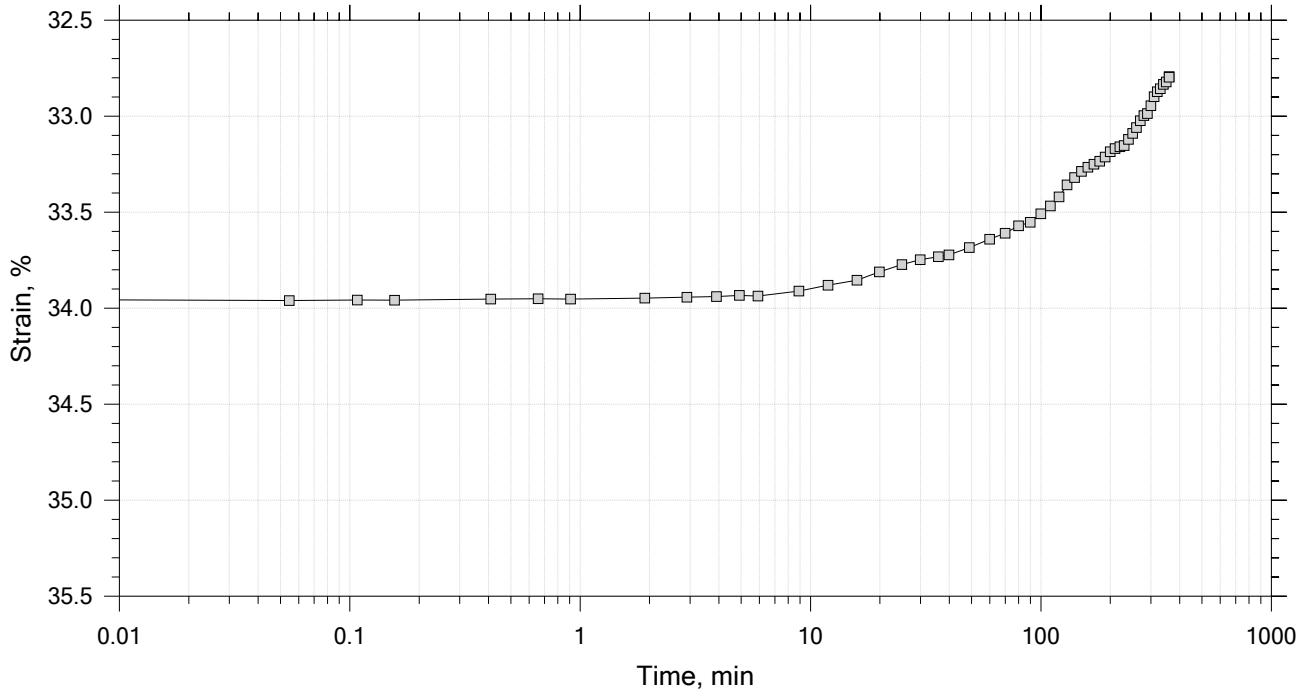


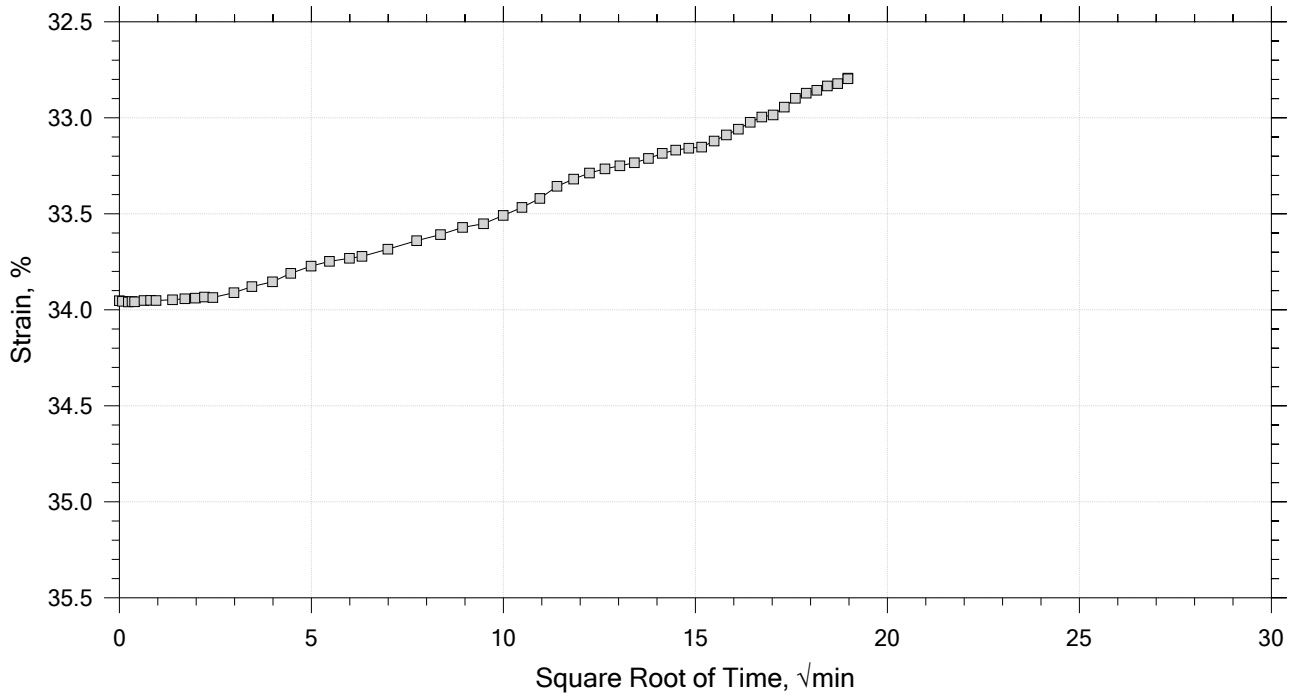




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.70 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 1.51 | Plastic Limit: --- |
| Final Height: 0.70 in | Final Void Ratio: 0.756 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | A-2879 | RING | | D-2631 |
| Mass Container, gm | 8.34 | 112.4 | 112.4 | 8.31 |
| Mass Container + Wet Soil, gm | 175.43 | 247.41 | 223.28 | 116.9 |
| Mass Container + Dry Soil, gm | 115.34 | 199.03 | 199.03 | 93.15 |
| Mass Dry Soil, gm | 107 | 86.629 | 86.629 | 84.84 |
| Water Content, % | 56.16 | 55.85 | 27.99 | 27.99 |
| Void Ratio | --- | 1.51 | 0.76 | --- |
| Degree of Saturation, % | --- | 100.00 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 67.231 | 96.045 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| | Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| | Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| | Description: Moist, dark gray clay | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0652 | 0.01249 | 1.48 | 1.25 | 0.000 | 0.00e+00 | 1.92e-01 | 0.00e+00 | 0.00e+00 |
| 2 | 0.125 | 0.02880 | 1.44 | 2.88 | 0.000 | 0.00e+00 | 2.73e-01 | 0.00e+00 | 0.00e+00 |
| 3 | 0.250 | 0.06312 | 1.35 | 6.31 | 20.753 | 2.50e-07 | 2.75e-01 | 1.85e-04 | 0.00e+00 |
| 4 | 0.500 | 0.1126 | 1.23 | 11.3 | 31.560 | 1.50e-07 | 1.98e-01 | 8.03e-05 | 0.00e+00 |
| 5 | 1.00 | 0.1683 | 1.09 | 16.8 | 25.477 | 1.65e-07 | 1.11e-01 | 4.96e-05 | 0.00e+00 |
| 6 | 2.00 | 0.2235 | 0.948 | 22.4 | 21.548 | 1.71e-07 | 5.53e-02 | 2.55e-05 | 0.00e+00 |
| 7 | 4.00 | 0.2761 | 0.816 | 27.6 | 21.161 | 1.52e-07 | 2.63e-02 | 1.07e-05 | 0.00e+00 |
| 8 | 8.00 | 0.3217 | 0.702 | 32.2 | 19.651 | 1.43e-07 | 1.14e-02 | 4.38e-06 | 0.00e+00 |
| 9 | 16.0 | 0.3592 | 0.608 | 35.9 | 17.225 | 1.44e-07 | 4.68e-03 | 1.82e-06 | 0.00e+00 |
| 10 | 32.0 | 0.3941 | 0.520 | 39.4 | 13.738 | 1.61e-07 | 2.18e-03 | 9.50e-07 | 0.00e+00 |
| 11 | 8.00 | 0.3896 | 0.532 | 39.0 | 0.000 | 0.00e+00 | 1.89e-04 | 0.00e+00 | 0.00e+00 |
| 12 | 2.00 | 0.3739 | 0.571 | 37.4 | 0.000 | 0.00e+00 | 2.62e-03 | 0.00e+00 | 0.00e+00 |
| 13 | 0.500 | 0.3580 | 0.611 | 35.8 | 0.000 | 0.00e+00 | 1.06e-02 | 0.00e+00 | 0.00e+00 |
| 14 | 0.125 | 0.3390 | 0.659 | 33.9 | 0.000 | 0.00e+00 | 5.06e-02 | 0.00e+00 | 0.00e+00 |
| 15 | 0.0625 | 0.3280 | 0.686 | 32.8 | 0.000 | 0.00e+00 | 1.77e-01 | 0.00e+00 | 0.00e+00 |

GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Square Root of Time Coefficients

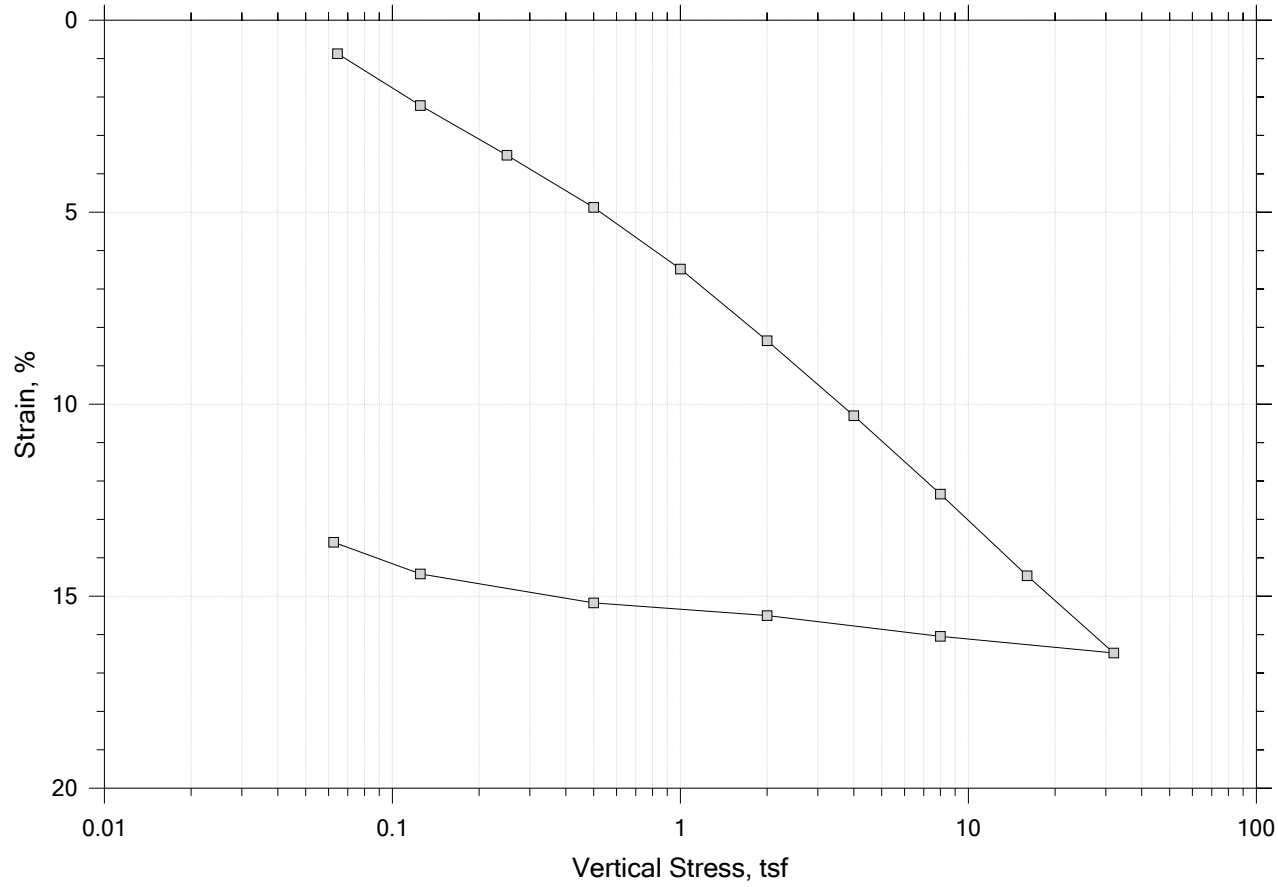
| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0652 | 0.01249 | 1.48 | 1.25 | 96.629 | 2.51e-07 | 1.92e-01 | 1.30e-04 |
| 2 | 0.125 | 0.02880 | 1.44 | 2.88 | 47.949 | 4.91e-07 | 2.73e-01 | 3.61e-04 |
| 3 | 0.250 | 0.06312 | 1.35 | 6.31 | 97.171 | 2.30e-07 | 2.75e-01 | 1.70e-04 |
| 4 | 0.500 | 0.1126 | 1.23 | 11.3 | 121.893 | 1.67e-07 | 1.98e-01 | 8.95e-05 |
| 5 | 1.00 | 0.1683 | 1.09 | 16.8 | 127.922 | 1.42e-07 | 1.11e-01 | 4.25e-05 |
| 6 | 2.00 | 0.2235 | 0.948 | 22.4 | 119.701 | 1.33e-07 | 5.53e-02 | 1.98e-05 |
| 7 | 4.00 | 0.2761 | 0.816 | 27.6 | 103.320 | 1.34e-07 | 2.63e-02 | 9.48e-06 |
| 8 | 8.00 | 0.3217 | 0.702 | 32.2 | 94.051 | 1.28e-07 | 1.14e-02 | 3.94e-06 |
| 9 | 16.0 | 0.3592 | 0.608 | 35.9 | 79.373 | 1.34e-07 | 4.68e-03 | 1.70e-06 |
| 10 | 32.0 | 0.3941 | 0.520 | 39.4 | 41.670 | 2.29e-07 | 2.18e-03 | 1.35e-06 |
| 11 | 8.00 | 0.3896 | 0.532 | 39.0 | 11.565 | 7.85e-07 | 1.89e-04 | 4.01e-07 |
| 12 | 2.00 | 0.3739 | 0.571 | 37.4 | 88.400 | 1.06e-07 | 2.62e-03 | 7.49e-07 |
| 13 | 0.500 | 0.3580 | 0.611 | 35.8 | 193.701 | 5.09e-08 | 1.06e-02 | 1.45e-06 |
| 14 | 0.125 | 0.3390 | 0.659 | 33.9 | 275.794 | 3.78e-08 | 5.06e-02 | 5.16e-06 |
| 15 | 0.0625 | 0.3280 | 0.686 | 32.8 | 0.000 | 0.00e+00 | 1.77e-01 | 0.00e+00 |

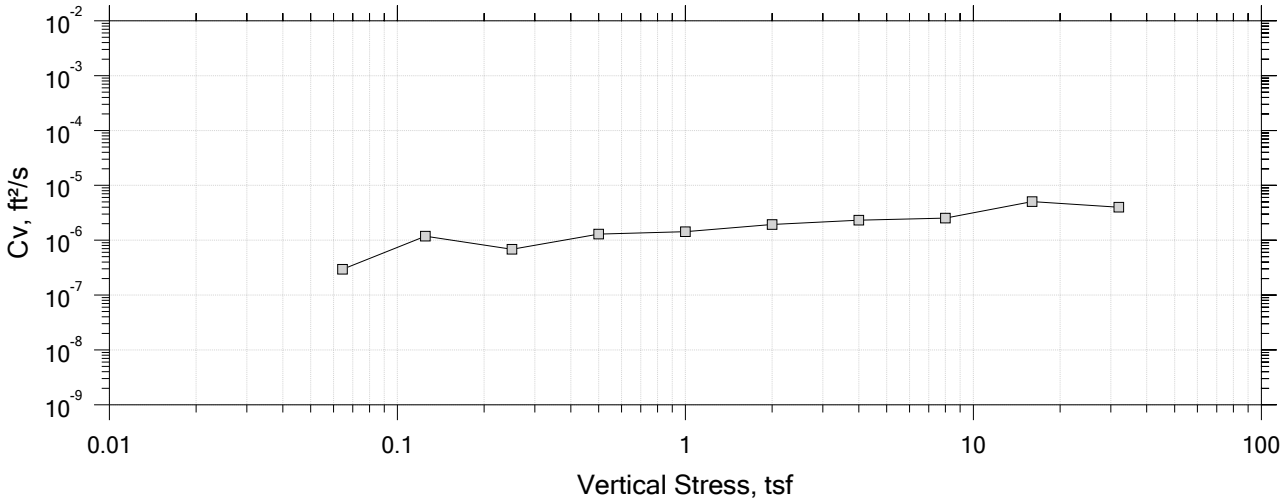
GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB038 | Tested By: md | Checked By: njh |
| Sample No.: SL0896 | Test Date: 02/14/19 | Depth: 11-13 ft |
| Test No.: IP-7 | Sample Type: intact | Elevation: --- |
| Description: Moist, dark gray clay | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report



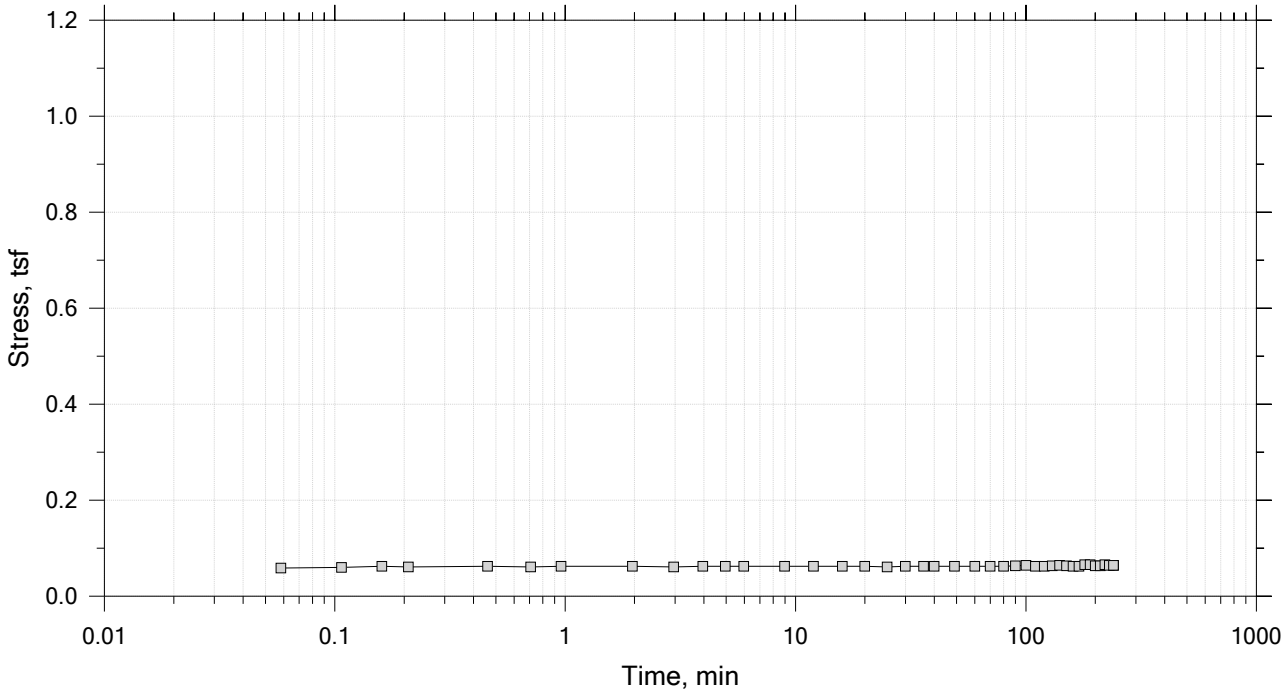

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| | Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| | Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| | Description: Wet, gray sandy clay | | |
| | Remarks: System F, Swell Pressure = 0.0644 tsf | | |
| | Displacement at End of Increment | | |

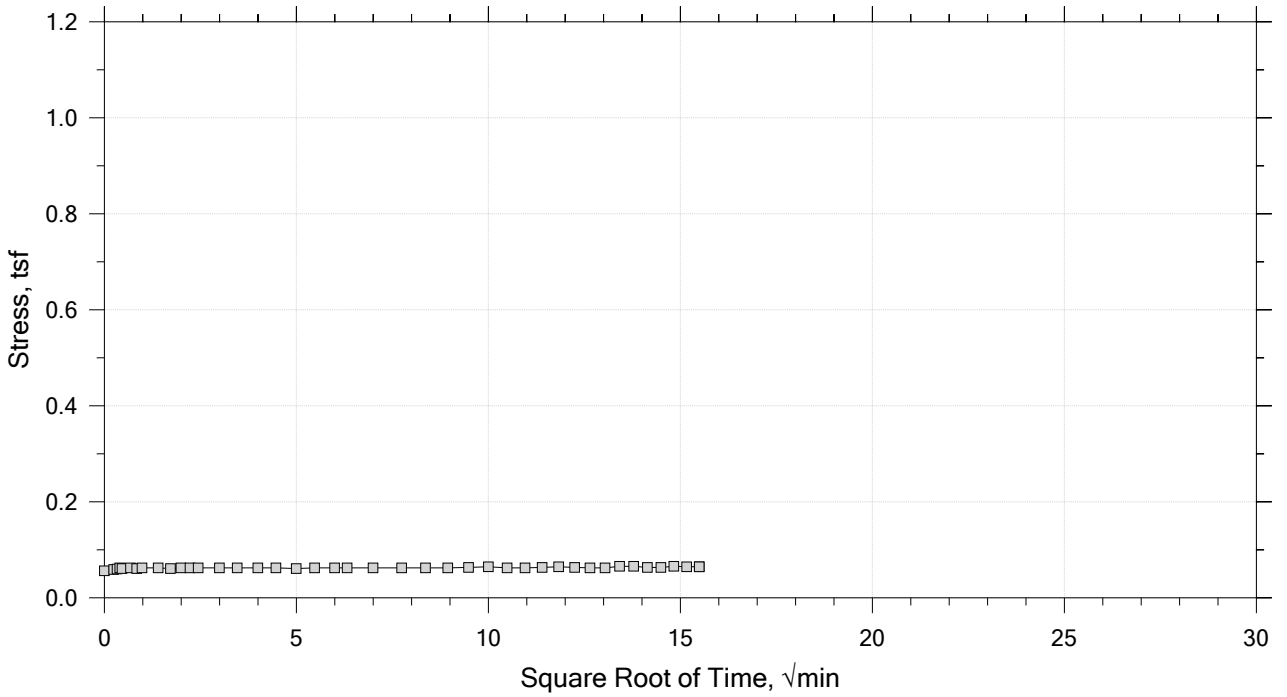
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0644 tsf

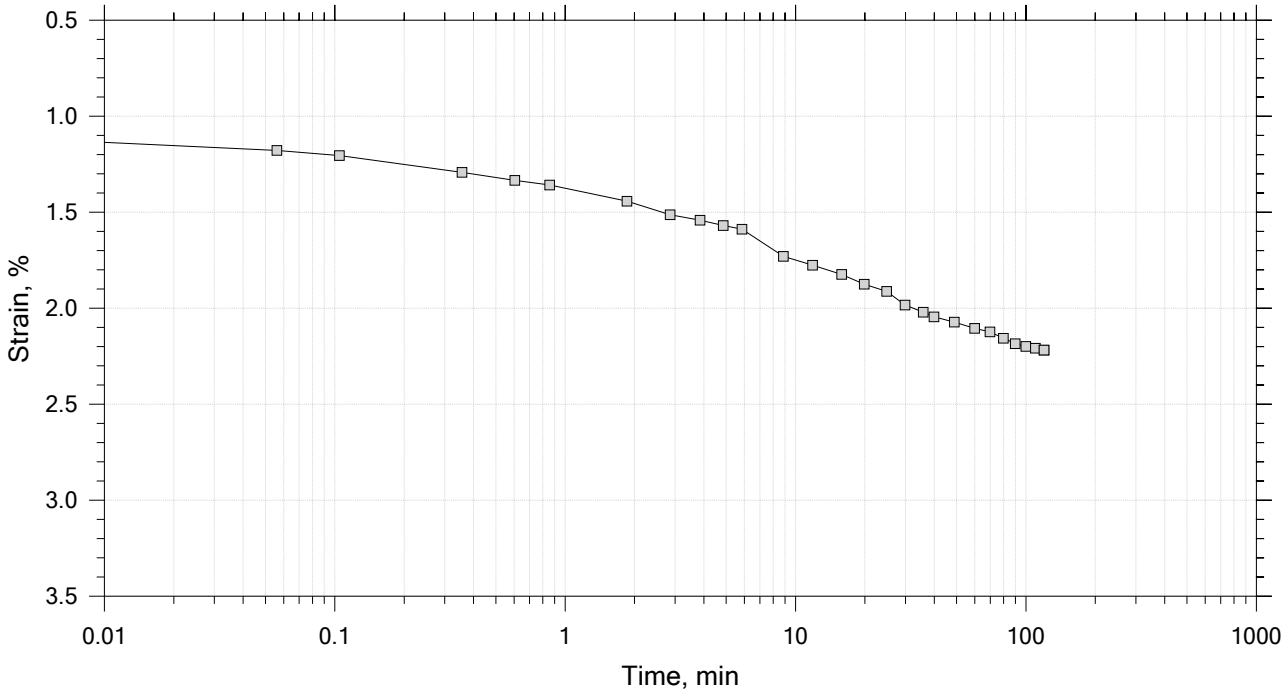


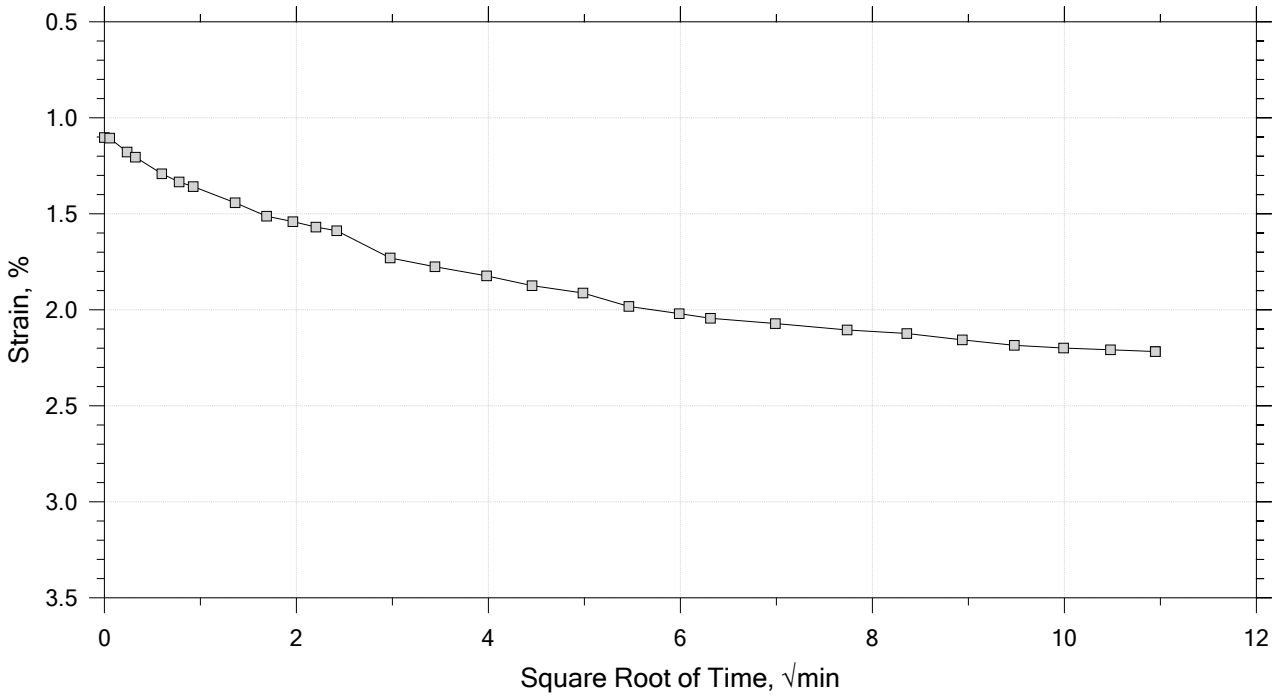




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

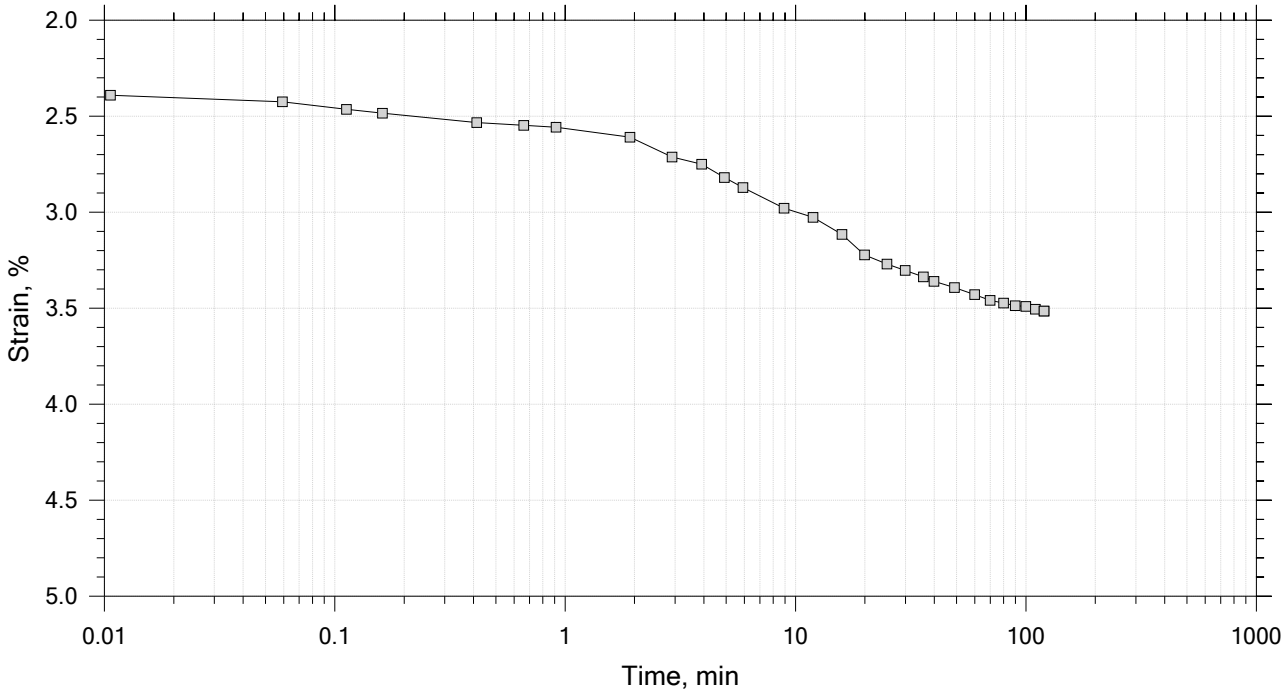


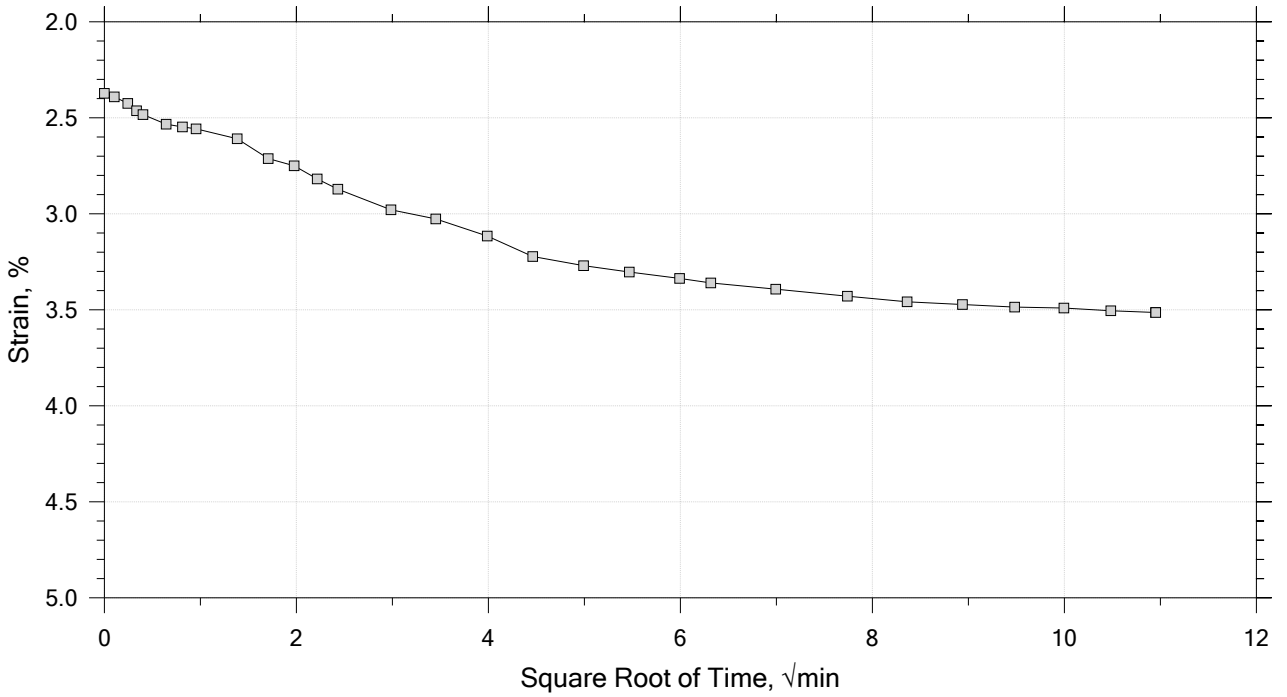




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| | Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| | Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| | Description: Wet, gray sandy clay | | |
| | Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf



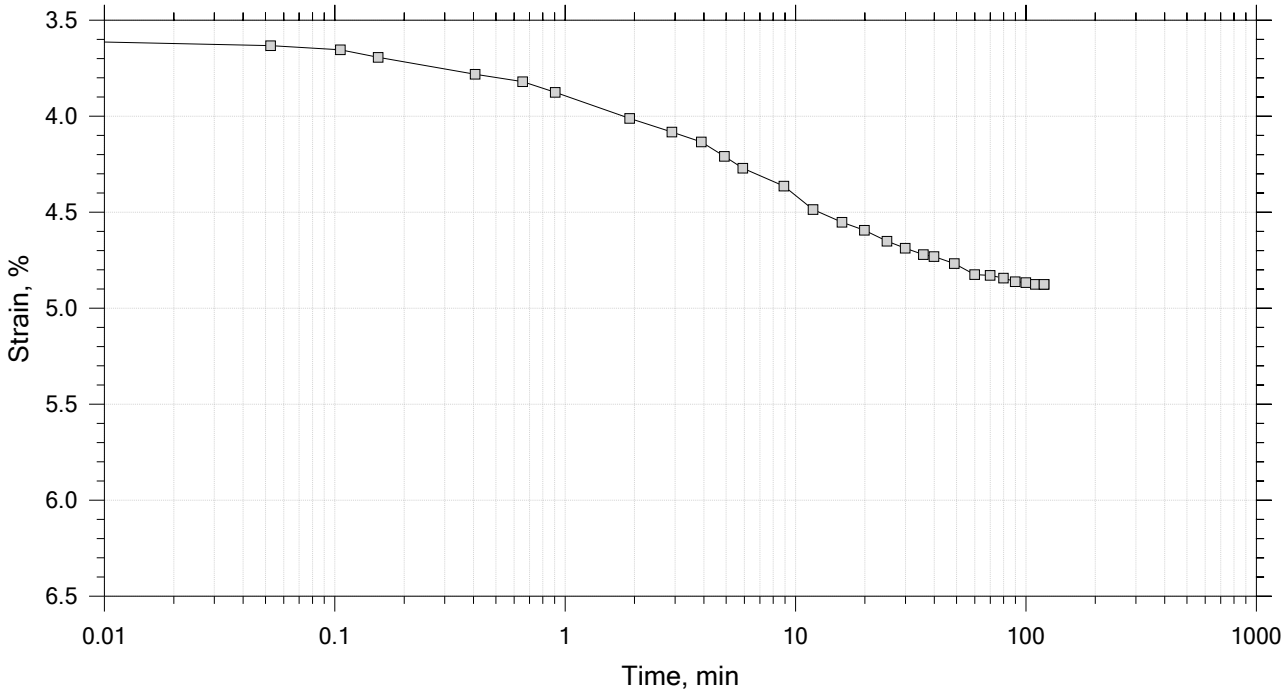

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

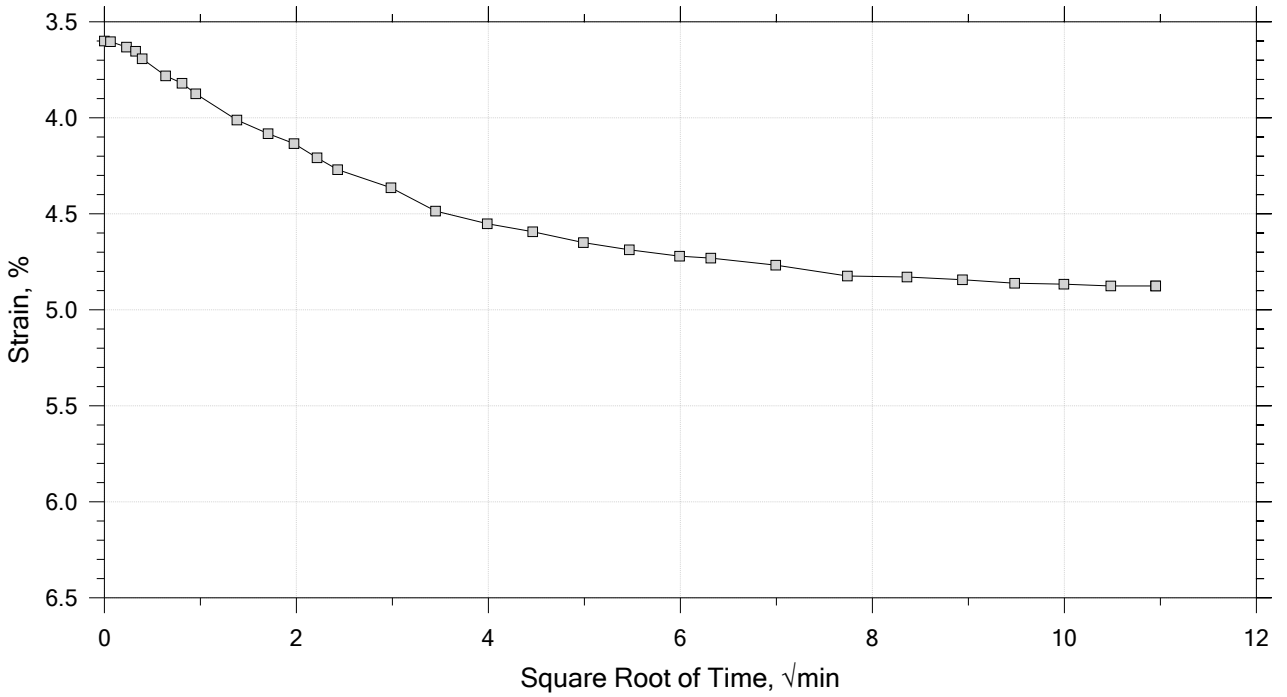
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.5 tsf

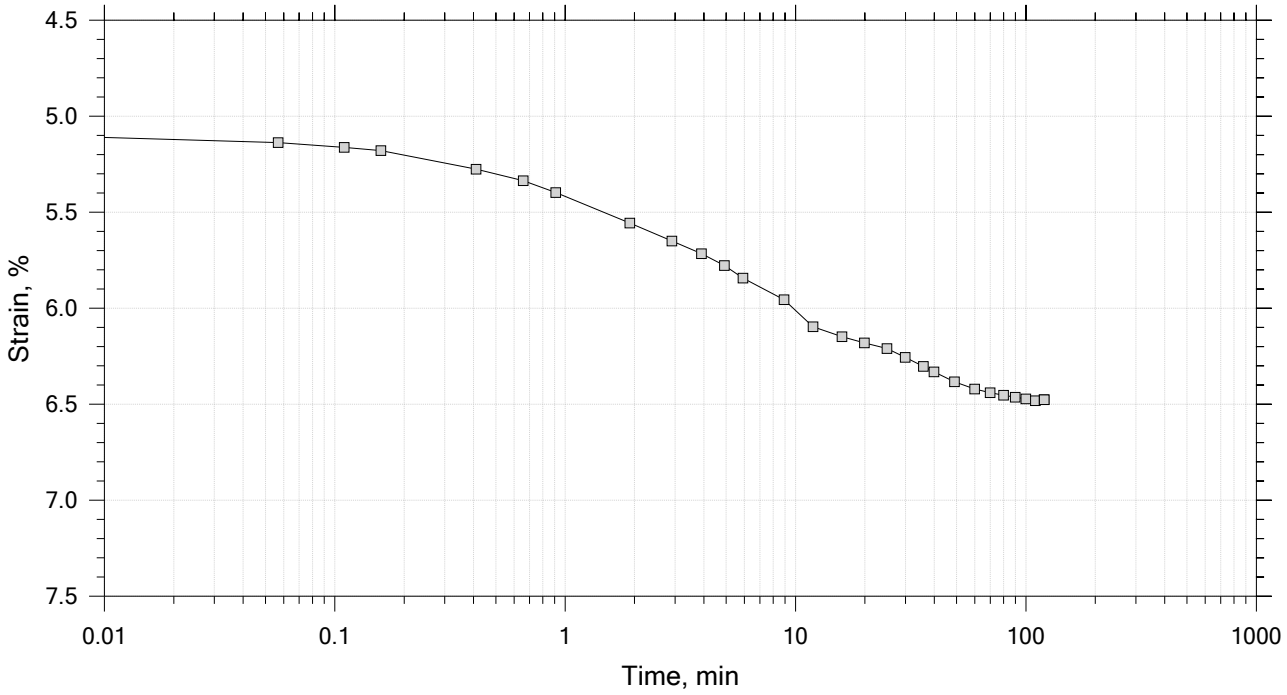


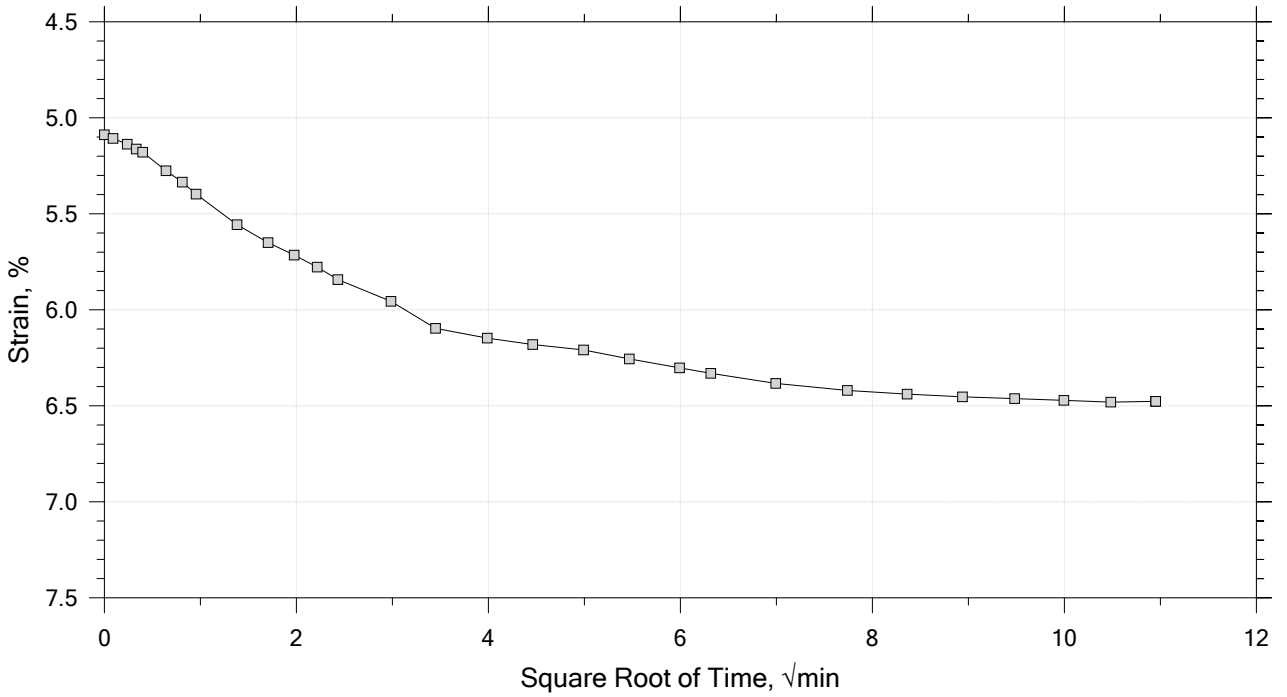




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15
Constant Load Step
Stress: 1 tsf



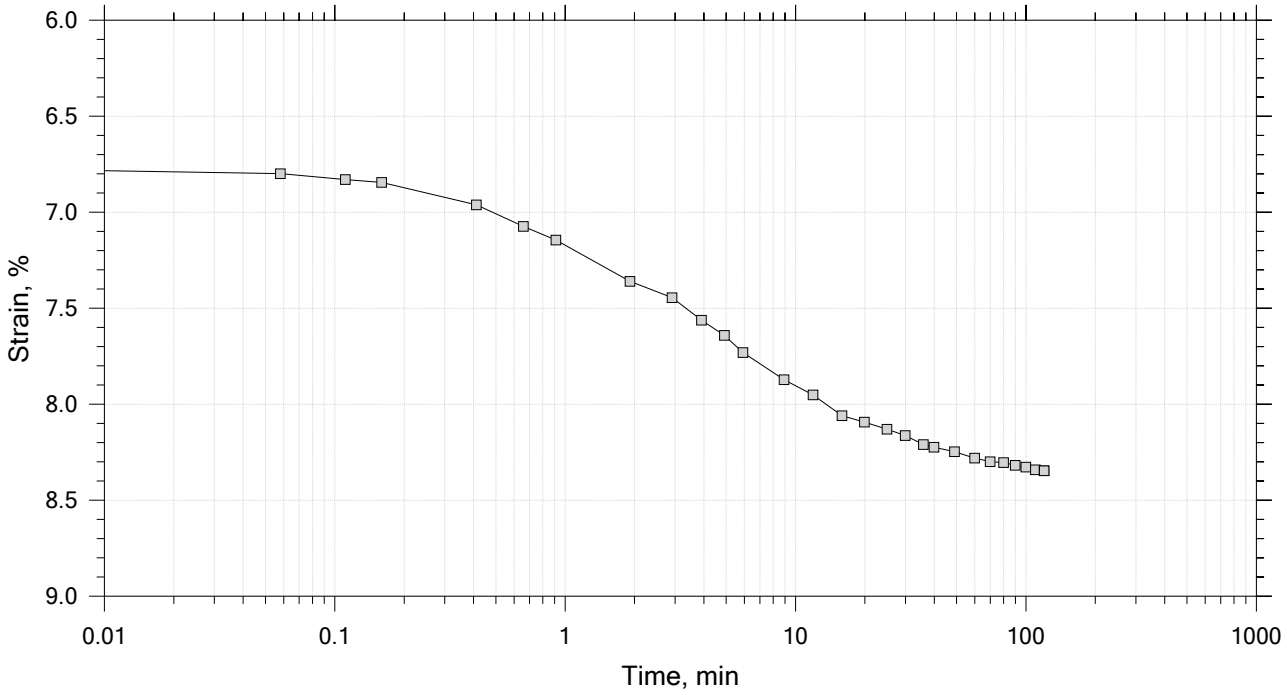

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

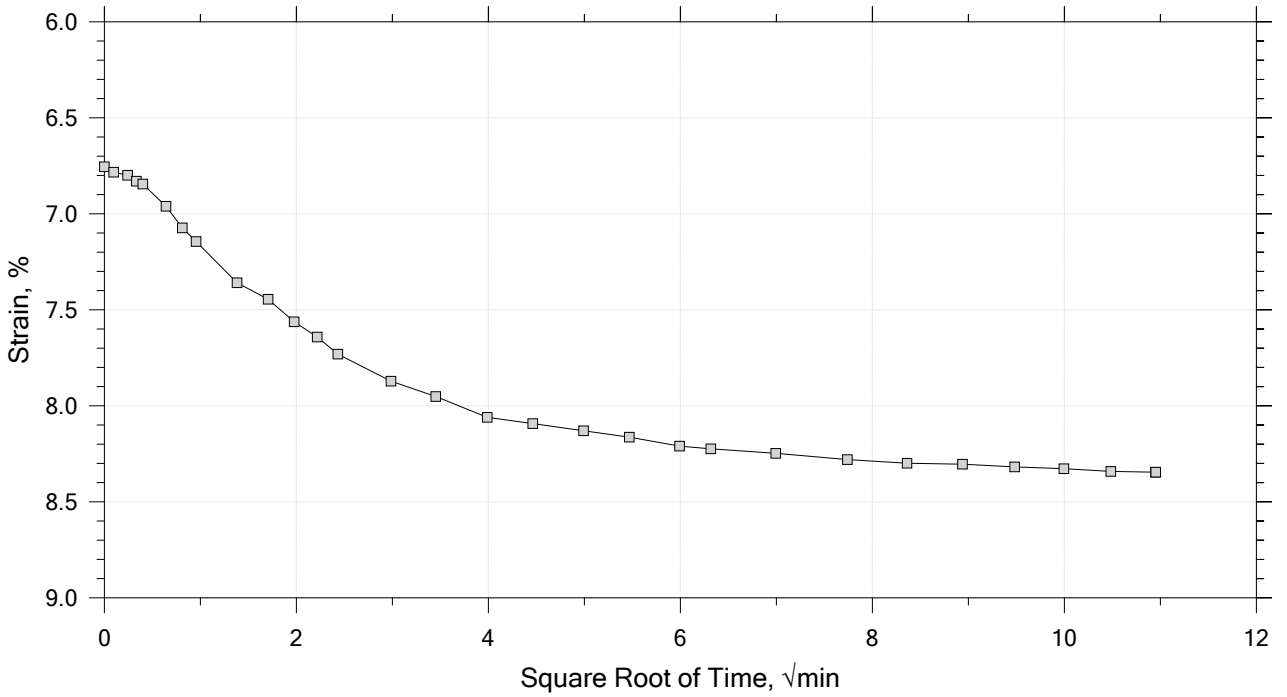
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf

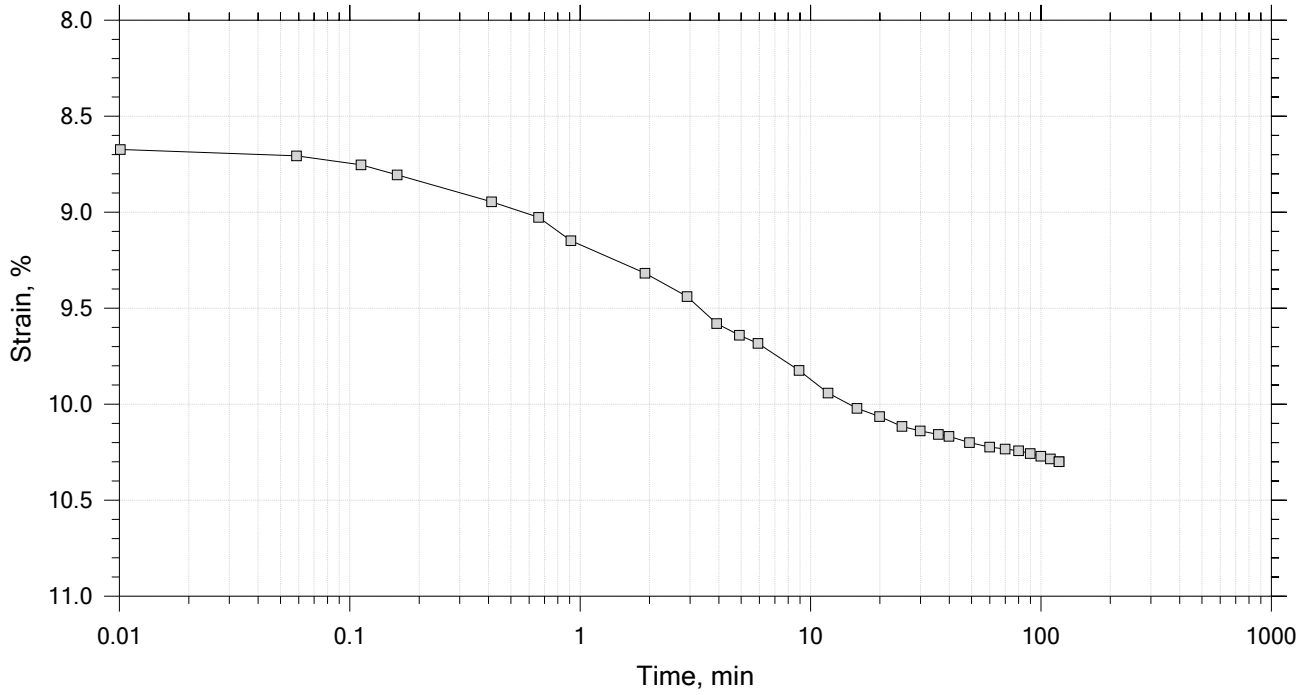


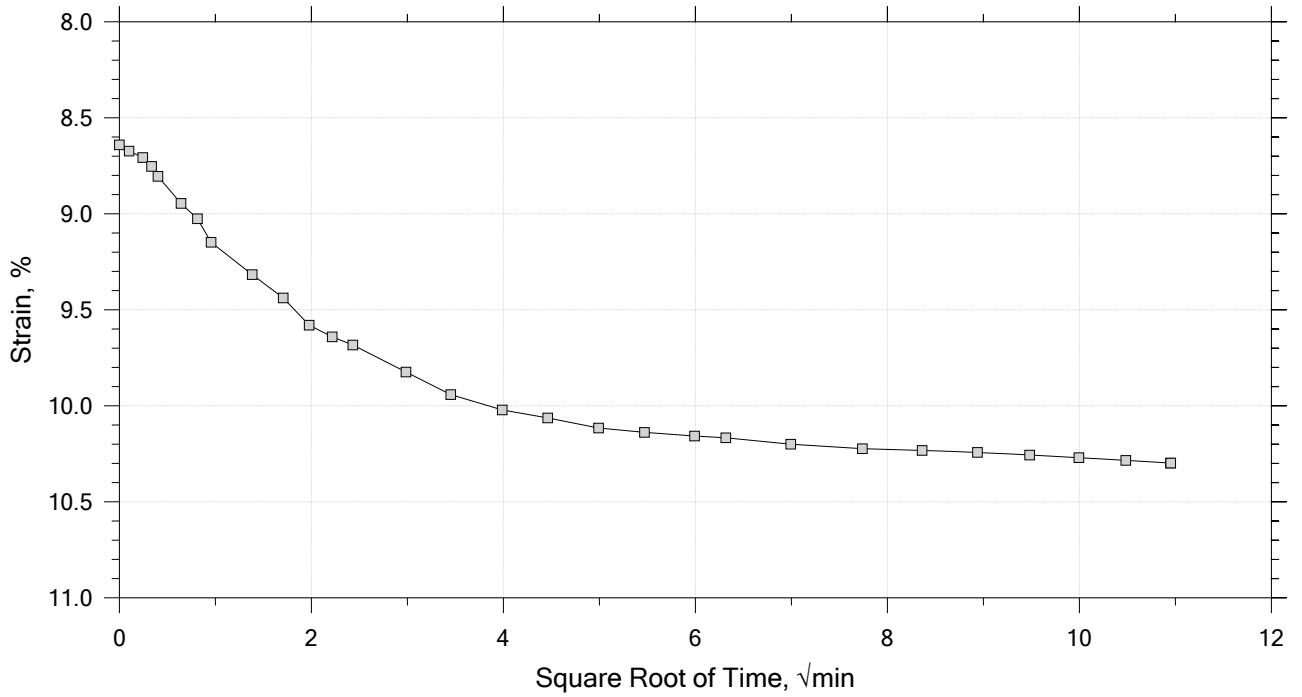




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| | Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| | Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| | Description: Wet, gray sandy clay | | |
| | Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15
Constant Load Step
Stress: 4 tsf

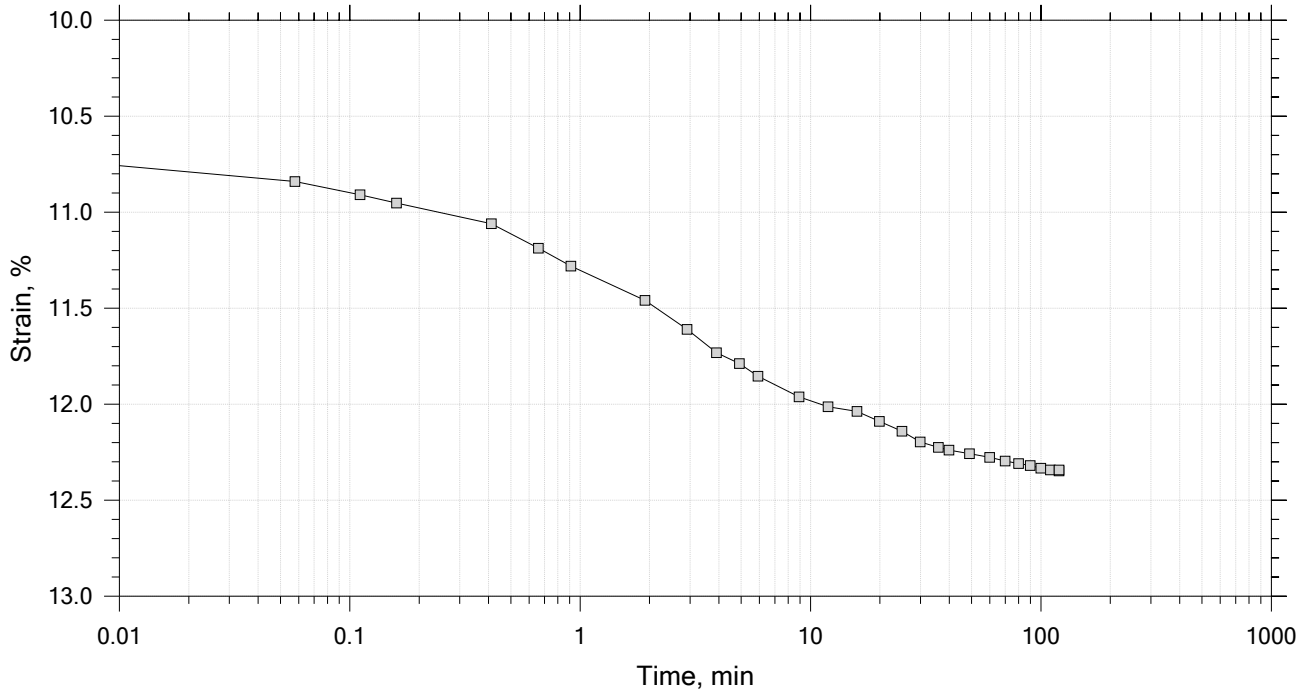


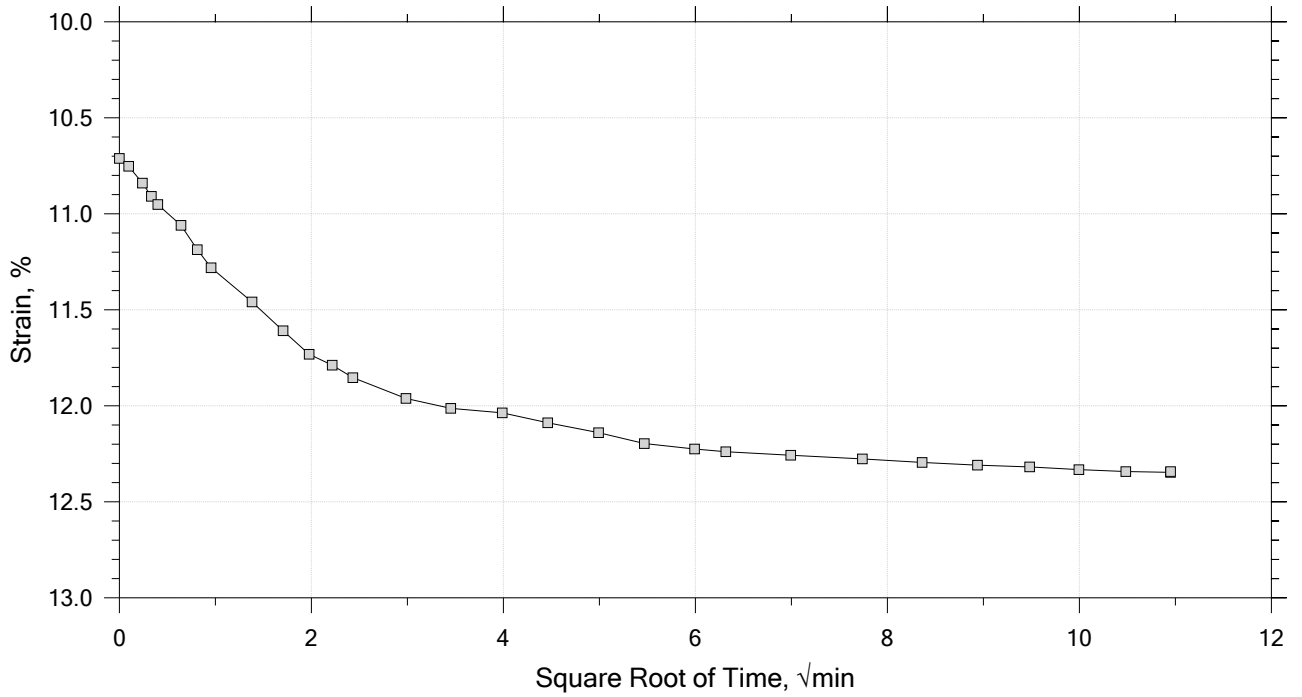




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf

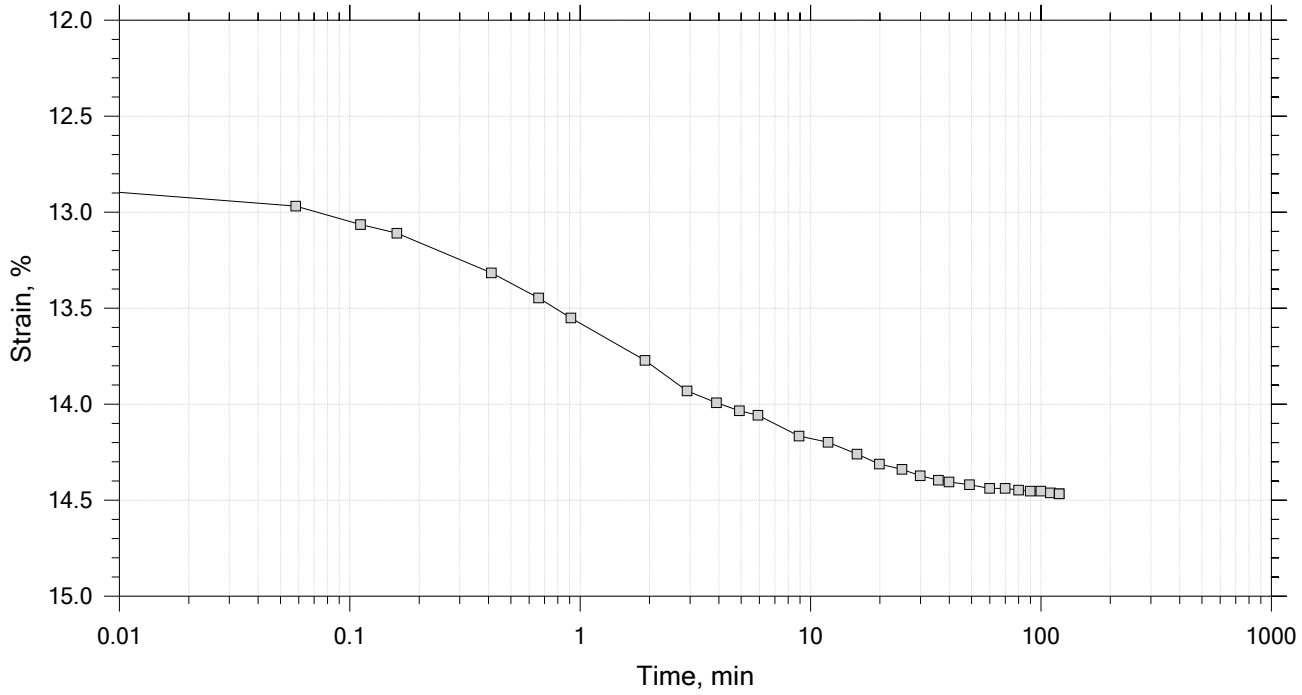


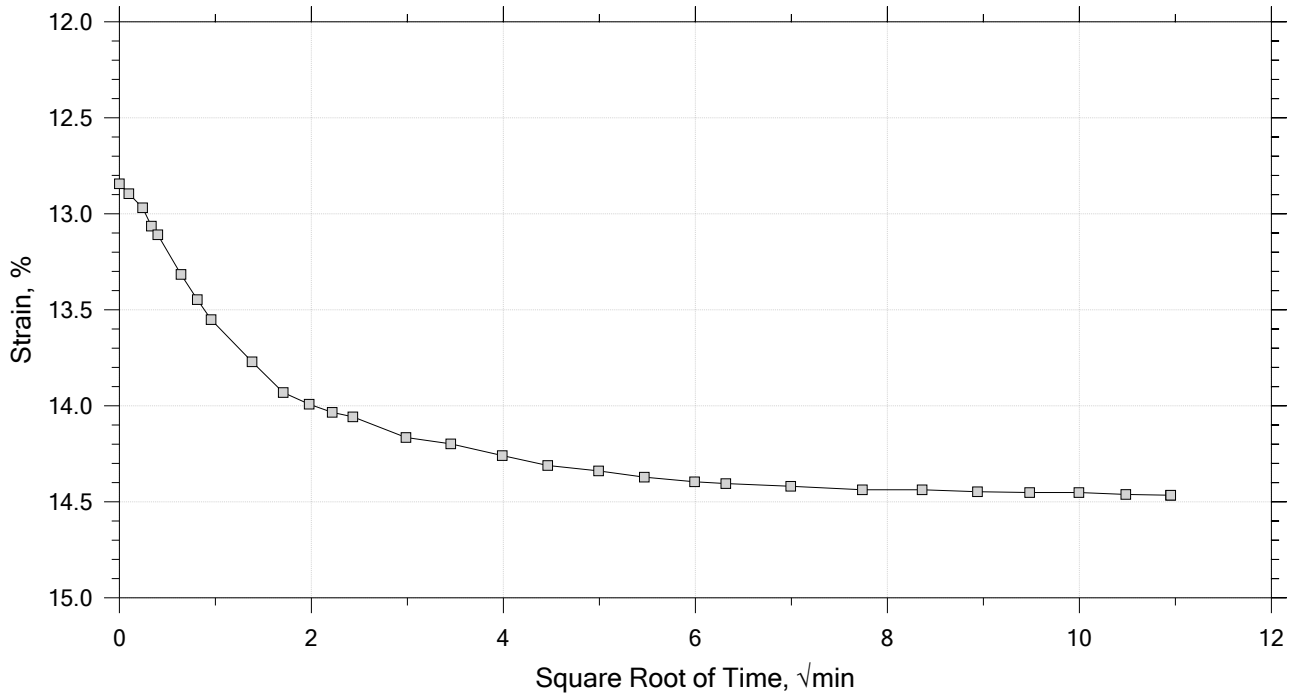




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

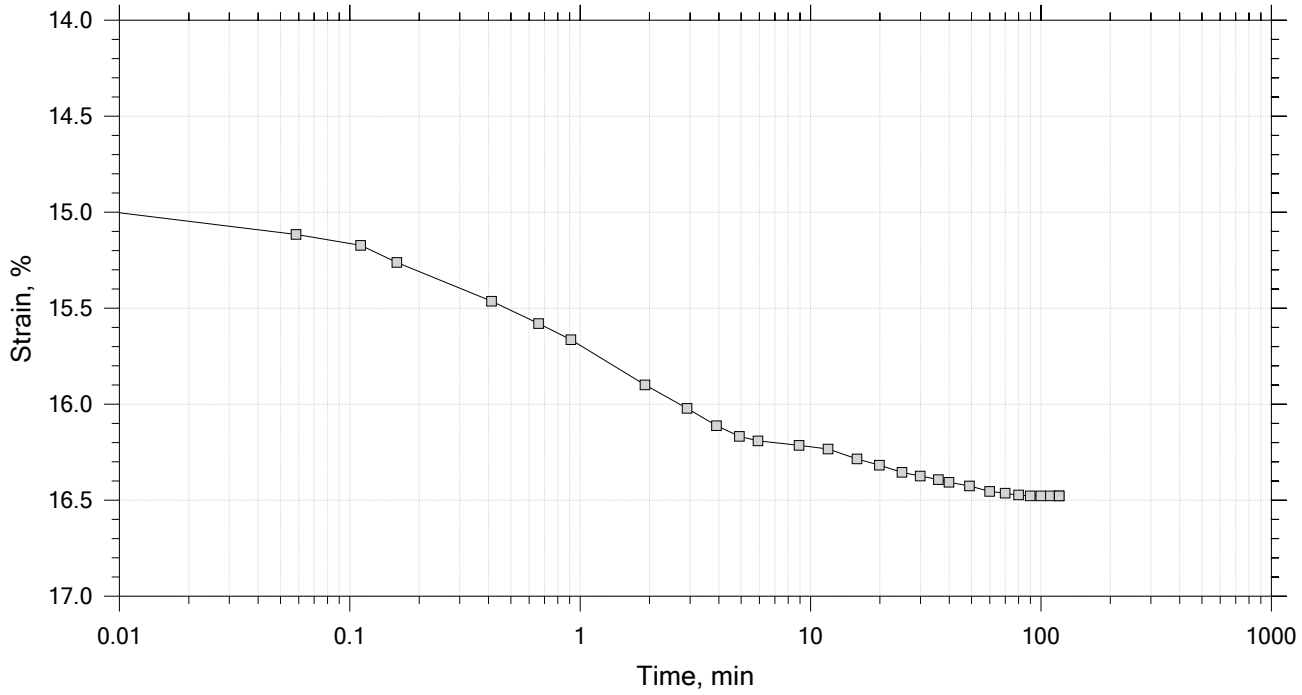


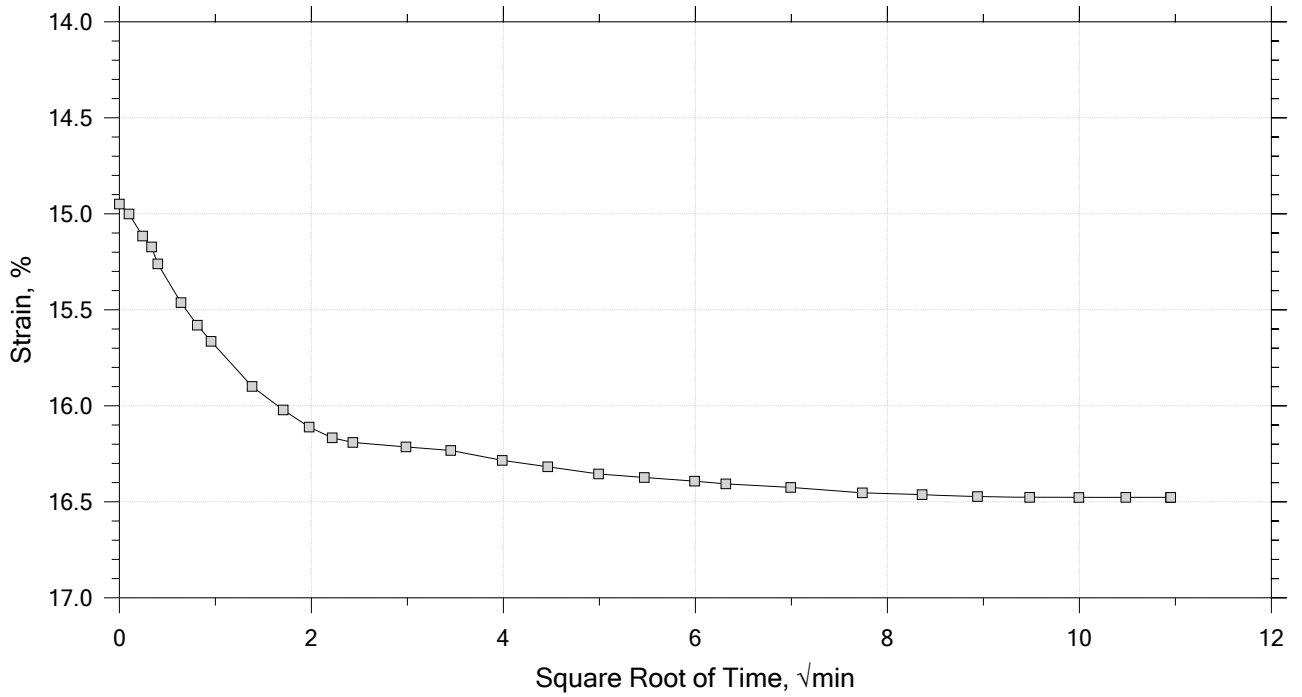




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

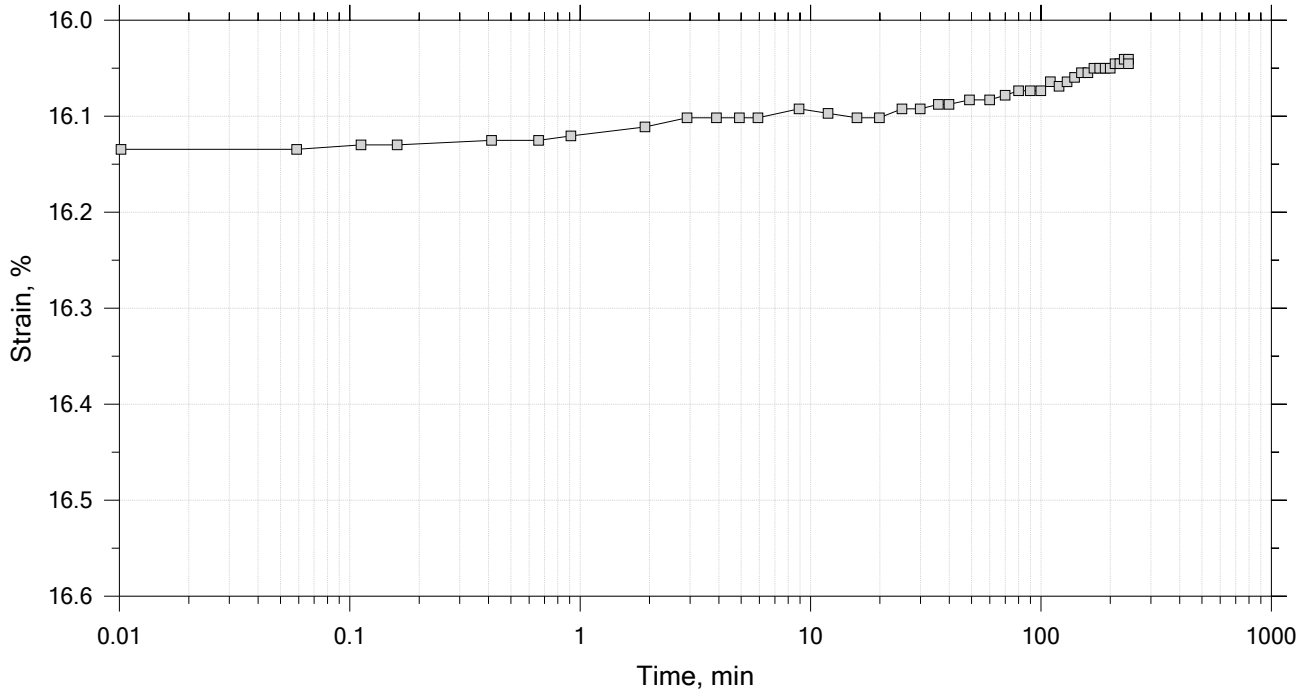


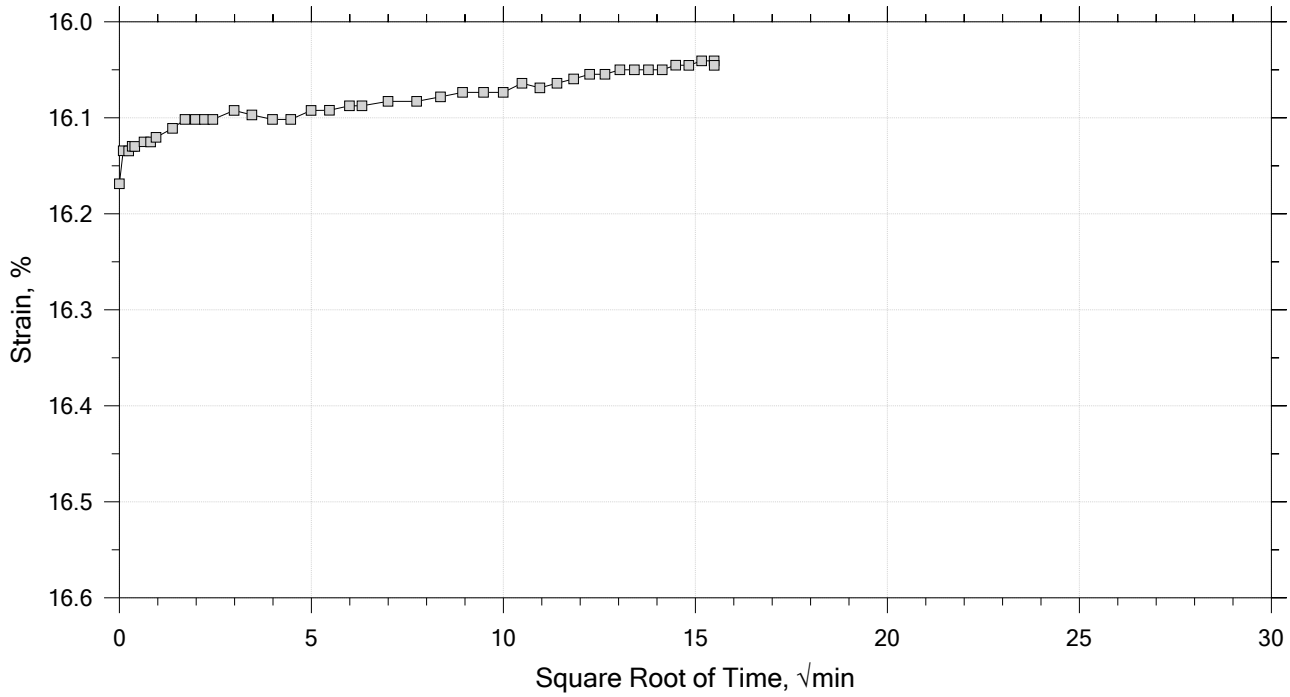




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

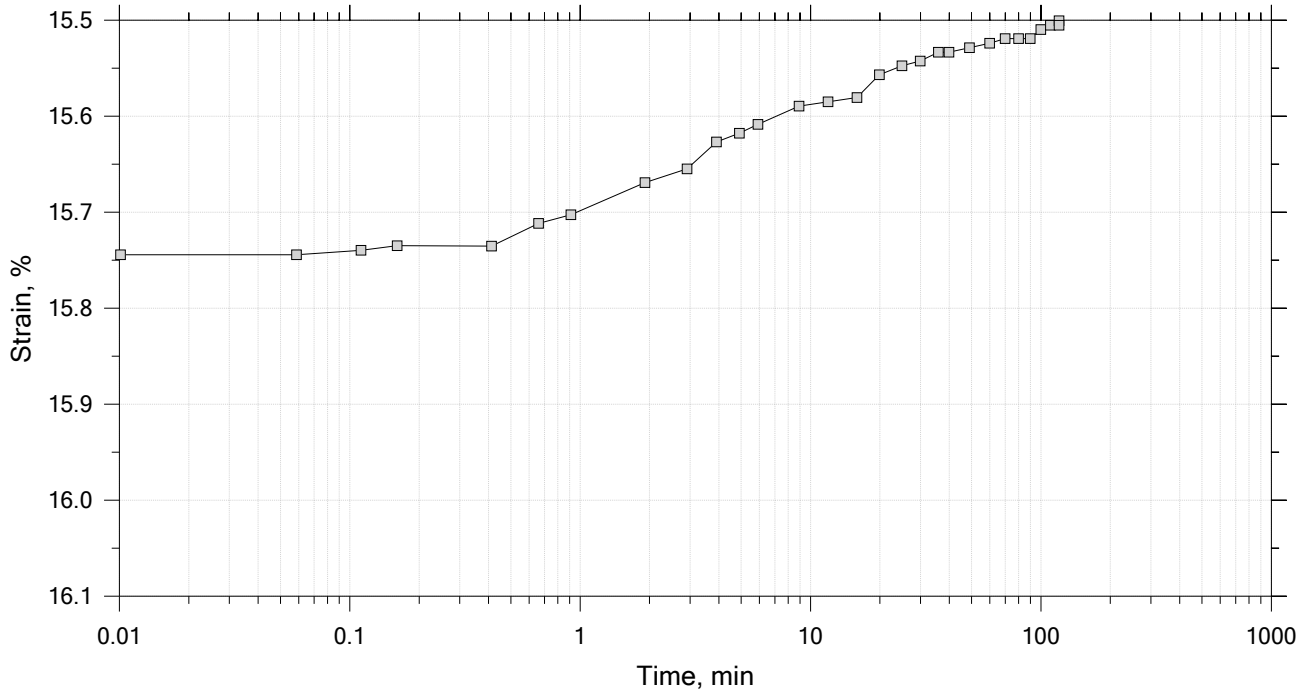


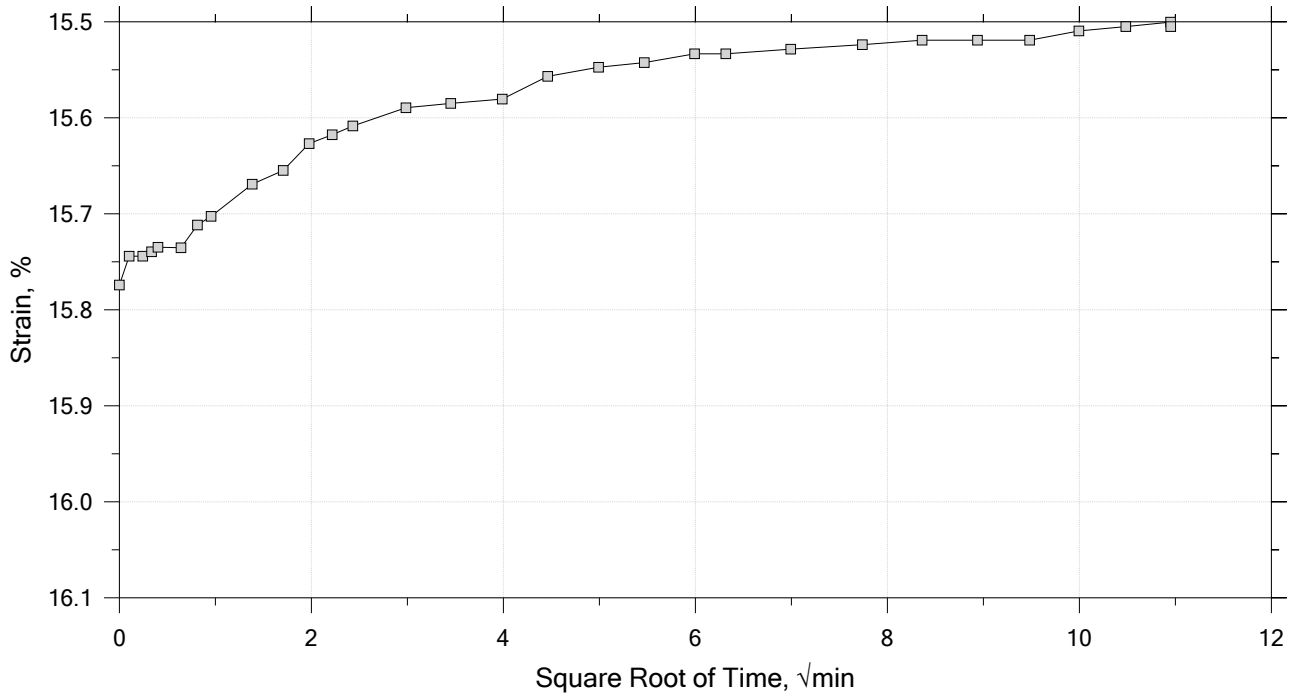




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

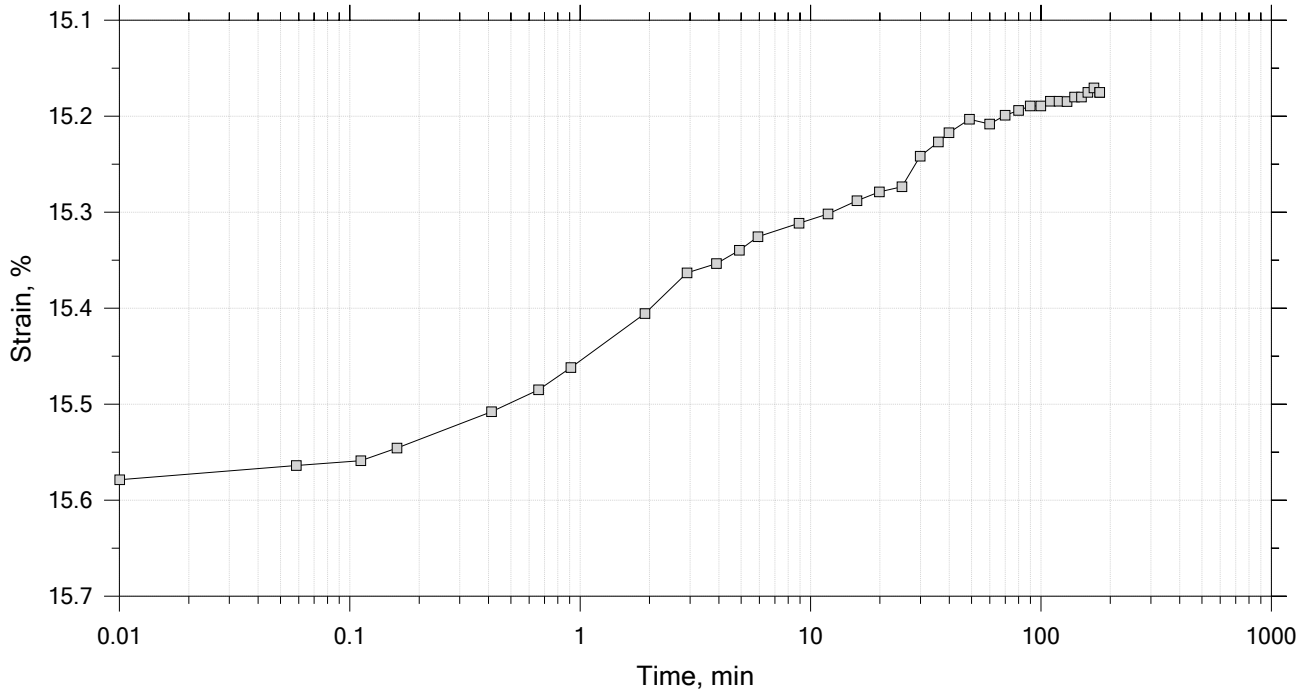


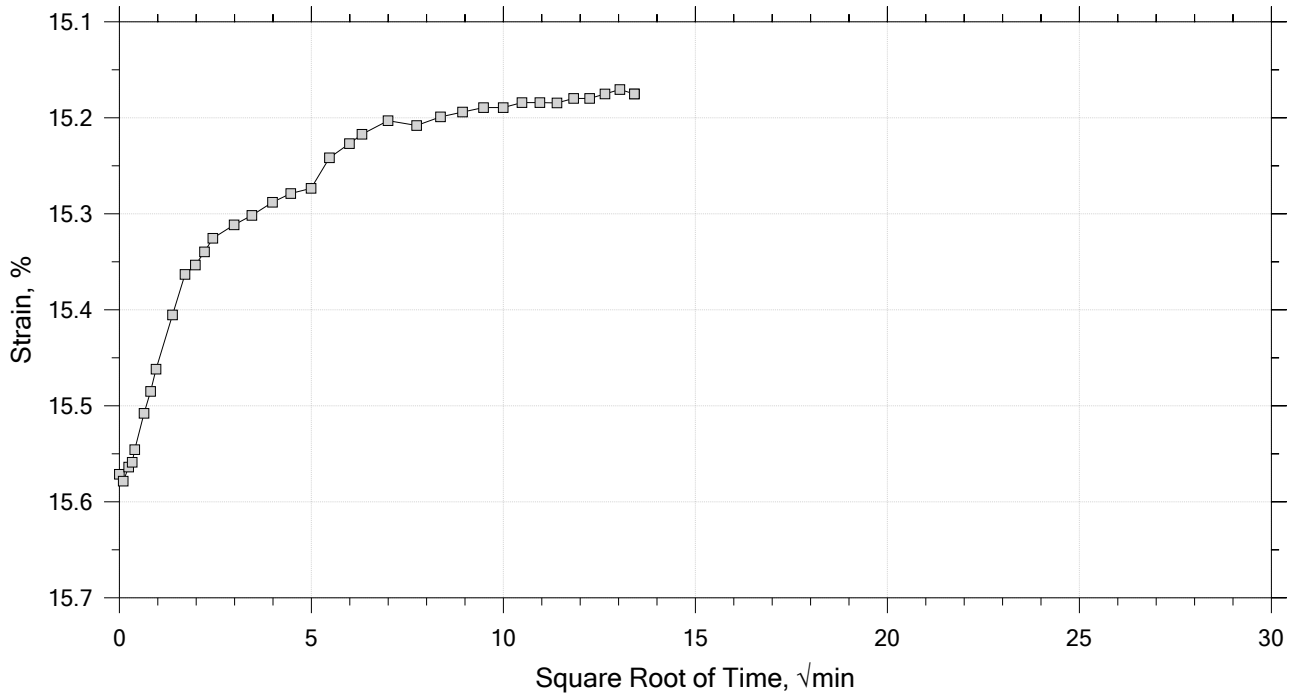




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| | Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| | Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| | Description: Wet, gray sandy clay | | |
| | Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

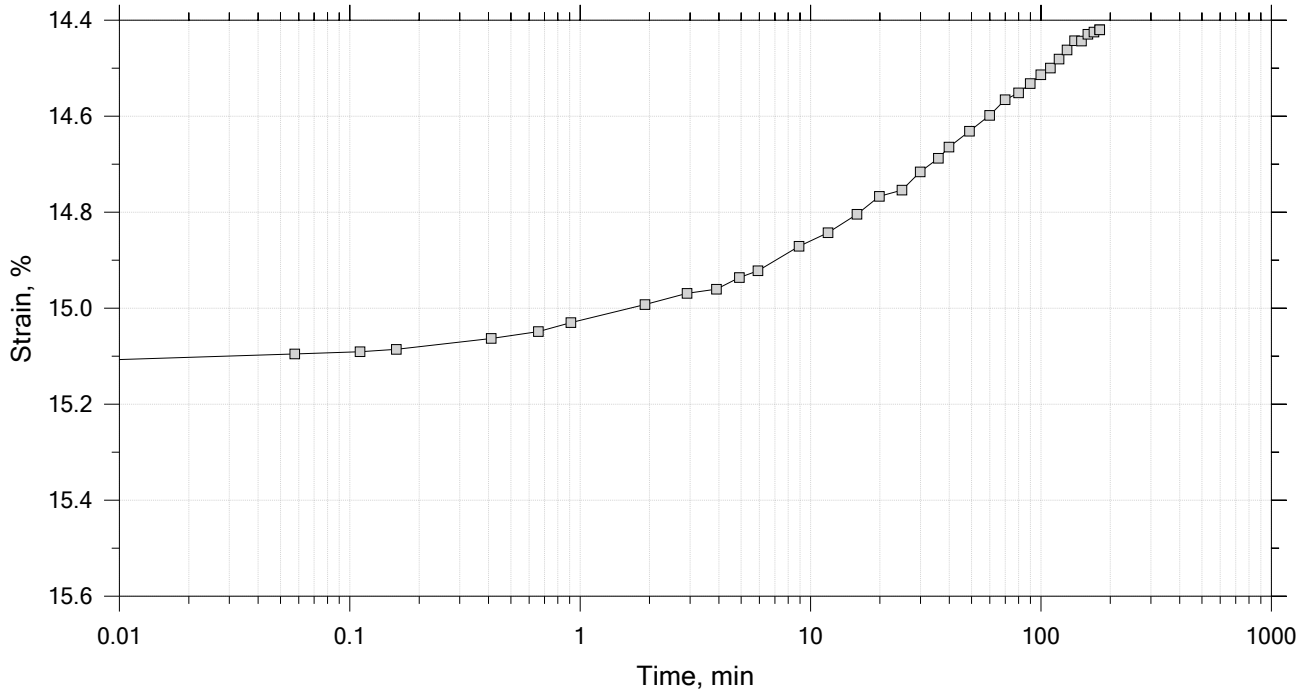


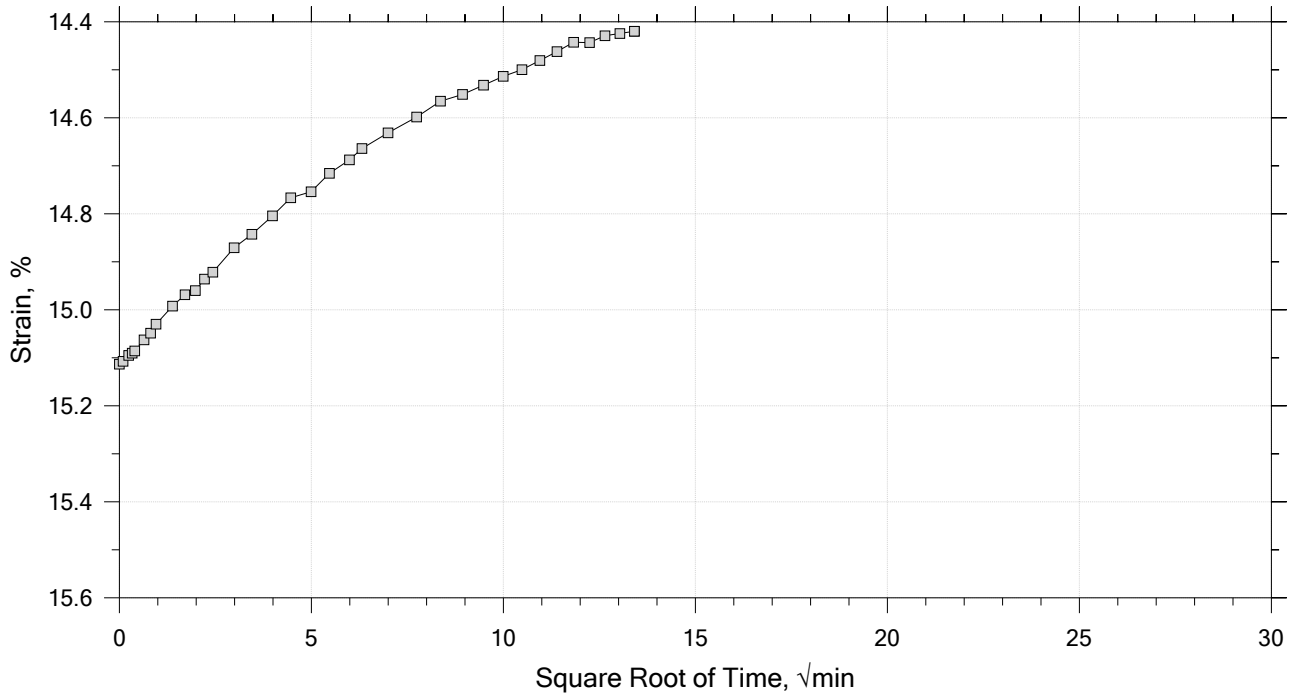




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

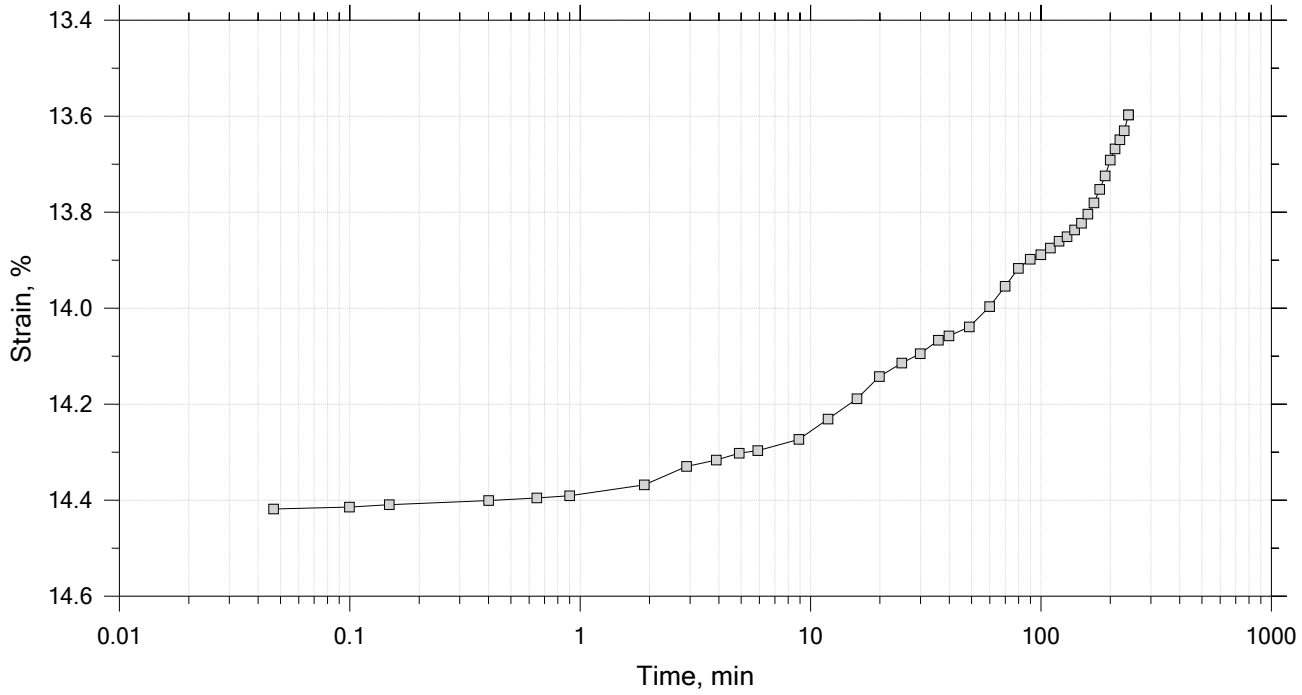


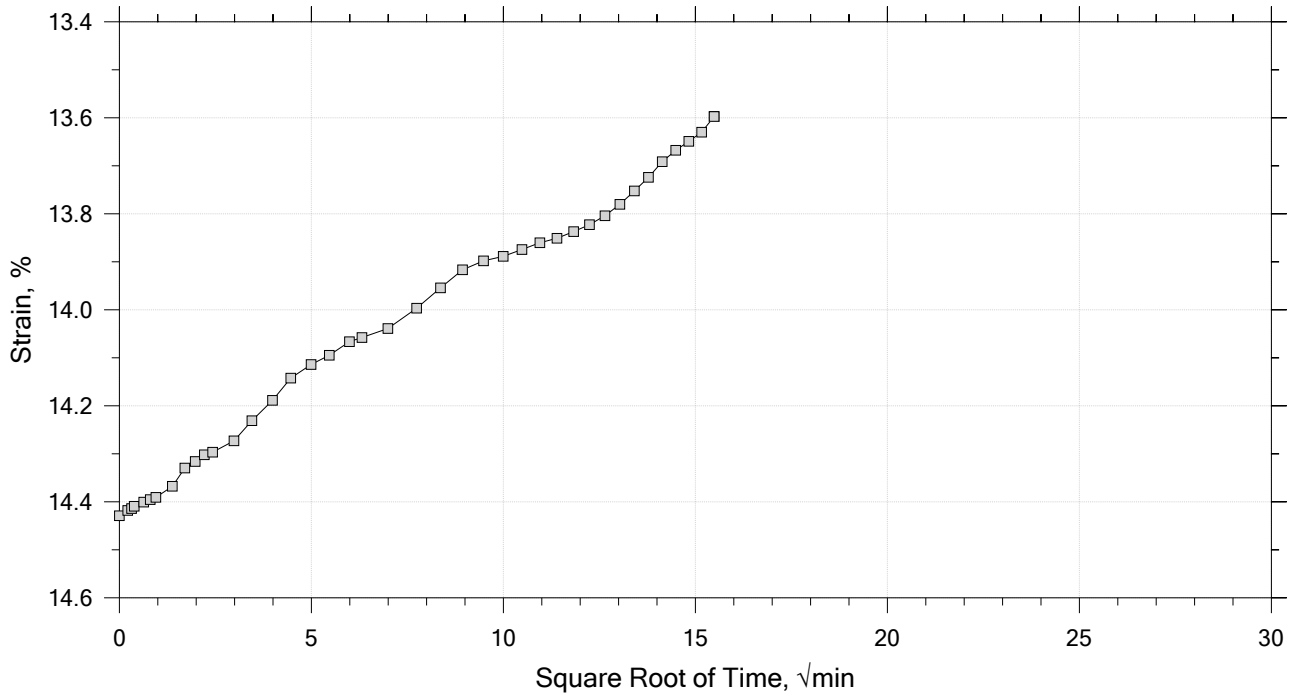




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| | Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| | Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| | Description: Wet, gray sandy clay | | |
| | Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.65 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 0.627 | Plastic Limit: --- |
| Final Height: 0.90 in | Final Void Ratio: 0.464 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | D-1465 | RING | | D-1501 |
| Mass Container, gm | 8.62 | 111.25 | 111.25 | 8.34 |
| Mass Container + Wet Soil, gm | 272.44 | 273 | 265.28 | 160.75 |
| Mass Container + Dry Soil, gm | 217.06 | 242.32 | 242.32 | 138.03 |
| Mass Dry Soil, gm | 208.44 | 131.07 | 131.07 | 129.69 |
| Water Content, % | 26.57 | 23.41 | 17.52 | 17.52 |
| Void Ratio | --- | 0.63 | 0.46 | --- |
| Degree of Saturation, % | --- | 98.96 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 101.72 | 113.02 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| Description: Wet, gray sandy clay | | |
| Remarks: System F, Swell Pressure = 0.0644 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0644 | 0.008683 | 0.613 | 0.868 | 14.352 | 3.94e-07 | 1.35e-01 | 1.43e-04 | 0.00e+00 |
| 2 | 0.125 | 0.02218 | 0.591 | 2.22 | 0.000 | 0.00e+00 | 2.23e-01 | 0.00e+00 | 0.00e+00 |
| 3 | 0.250 | 0.03515 | 0.570 | 3.51 | 0.000 | 0.00e+00 | 1.04e-01 | 0.00e+00 | 0.00e+00 |
| 4 | 0.500 | 0.04876 | 0.548 | 4.88 | 4.056 | 1.29e-06 | 5.45e-02 | 1.89e-04 | 0.00e+00 |
| 5 | 1.00 | 0.06477 | 0.522 | 6.48 | 3.867 | 1.31e-06 | 3.20e-02 | 1.13e-04 | 0.00e+00 |
| 6 | 2.00 | 0.08346 | 0.491 | 8.35 | 2.288 | 2.14e-06 | 1.87e-02 | 1.08e-04 | 0.00e+00 |
| 7 | 4.00 | 0.1030 | 0.460 | 10.3 | 1.937 | 2.42e-06 | 9.76e-03 | 6.37e-05 | 0.00e+00 |
| 8 | 8.00 | 0.1234 | 0.426 | 12.3 | 1.854 | 2.42e-06 | 5.11e-03 | 3.33e-05 | 0.00e+00 |
| 9 | 16.0 | 0.1447 | 0.392 | 14.5 | 0.831 | 5.14e-06 | 2.65e-03 | 3.68e-05 | 0.00e+00 |
| 10 | 32.0 | 0.1648 | 0.359 | 16.5 | 1.122 | 3.63e-06 | 1.26e-03 | 1.23e-05 | 0.00e+00 |
| 11 | 8.00 | 0.1605 | 0.366 | 16.0 | 0.000 | 0.00e+00 | 1.80e-04 | 0.00e+00 | 0.00e+00 |
| 12 | 2.00 | 0.1551 | 0.375 | 15.5 | 0.000 | 0.00e+00 | 9.00e-04 | 0.00e+00 | 0.00e+00 |
| 13 | 0.500 | 0.1518 | 0.380 | 15.2 | 0.000 | 0.00e+00 | 2.20e-03 | 0.00e+00 | 0.00e+00 |
| 14 | 0.125 | 0.1442 | 0.393 | 14.4 | 0.000 | 0.00e+00 | 2.01e-02 | 0.00e+00 | 0.00e+00 |
| 15 | 0.0625 | 0.1360 | 0.406 | 13.6 | 0.000 | 0.00e+00 | 1.32e-01 | 0.00e+00 | 0.00e+00 |

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| | Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| | Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| | Description: Wet, gray sandy clay | | |
| | Remarks: System F, Swell Pressure = 0.0644 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

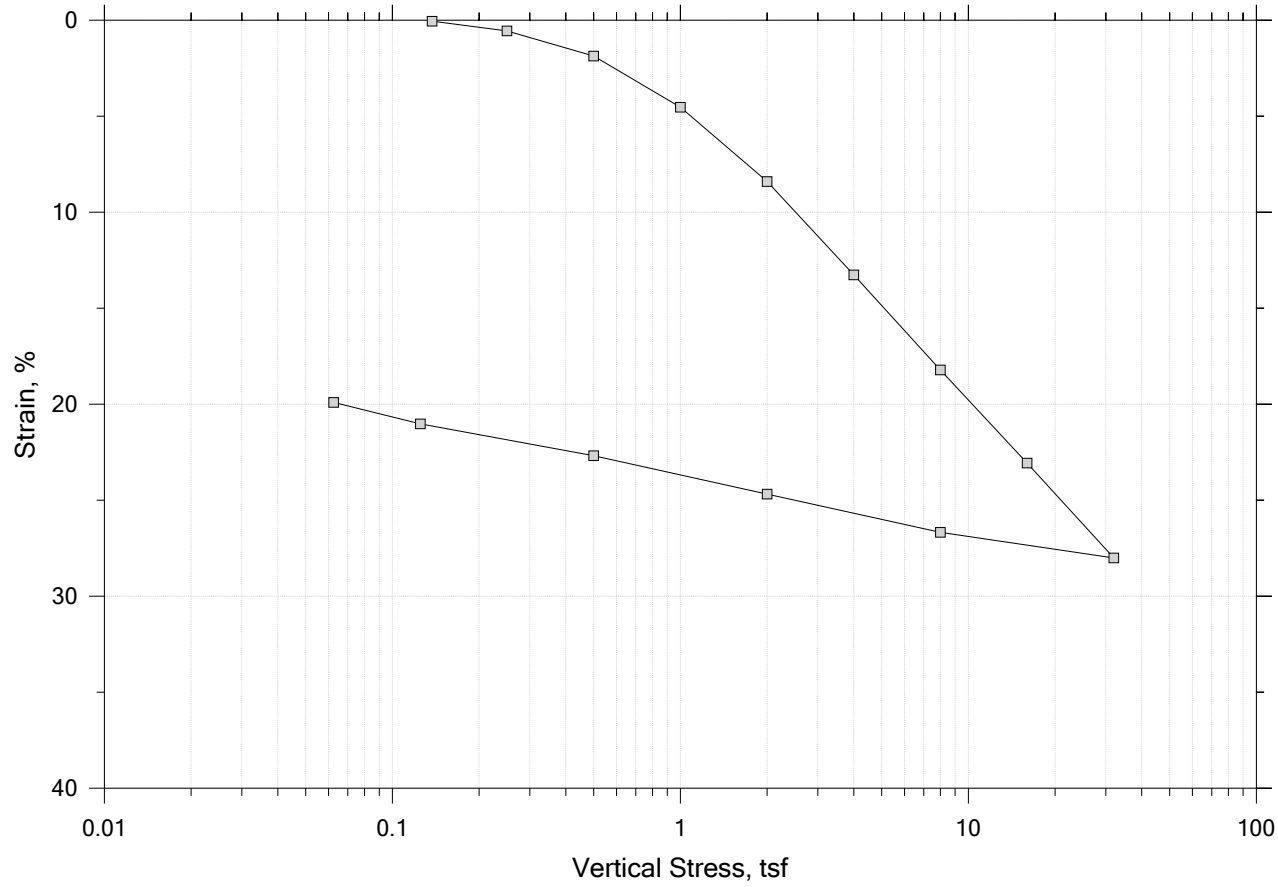
## Square Root of Time Coefficients

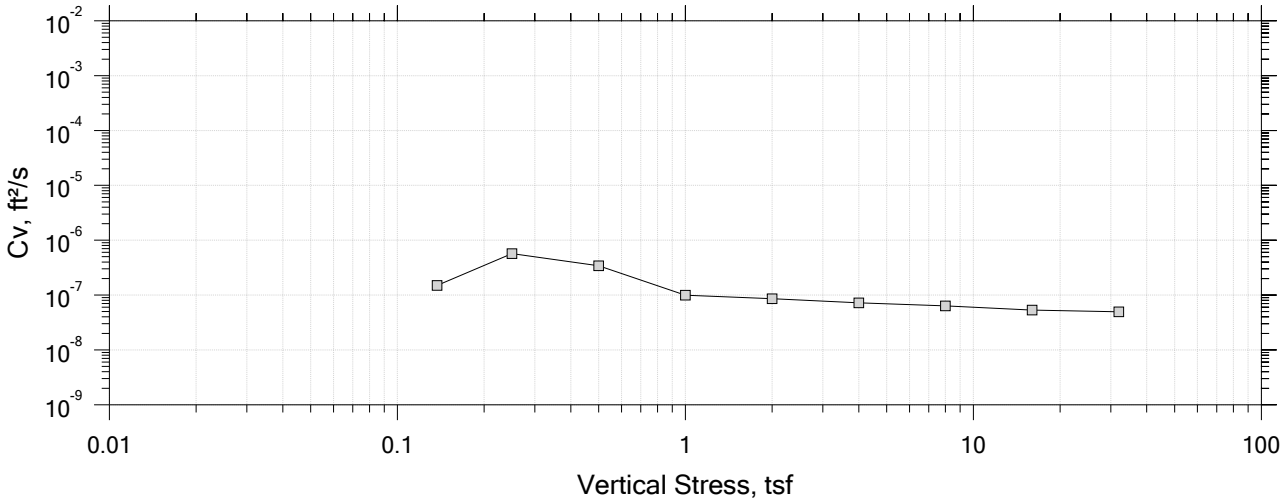
| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0644 | 0.008683 | 0.613 | 0.868 | 101.978 | 2.39e-07 | 1.35e-01 | 8.67e-05 |
| 2 | 0.125 | 0.02218 | 0.591 | 2.22 | 20.692 | 1.15e-06 | 2.23e-01 | 6.91e-04 |
| 3 | 0.250 | 0.03515 | 0.570 | 3.51 | 35.822 | 6.46e-07 | 1.04e-01 | 1.81e-04 |
| 4 | 0.500 | 0.04876 | 0.548 | 4.88 | 16.684 | 1.35e-06 | 5.45e-02 | 1.98e-04 |
| 5 | 1.00 | 0.06477 | 0.522 | 6.48 | 13.926 | 1.57e-06 | 3.20e-02 | 1.35e-04 |
| 6 | 2.00 | 0.08346 | 0.491 | 8.35 | 11.941 | 1.76e-06 | 1.87e-02 | 8.88e-05 |
| 7 | 4.00 | 0.1030 | 0.460 | 10.3 | 8.888 | 2.27e-06 | 9.76e-03 | 5.98e-05 |
| 8 | 8.00 | 0.1234 | 0.426 | 12.3 | 7.297 | 2.64e-06 | 5.11e-03 | 3.64e-05 |
| 9 | 16.0 | 0.1447 | 0.392 | 14.5 | 3.960 | 4.65e-06 | 2.65e-03 | 3.33e-05 |
| 10 | 32.0 | 0.1648 | 0.359 | 16.5 | 4.062 | 4.32e-06 | 1.26e-03 | 1.46e-05 |
| 11 | 8.00 | 0.1605 | 0.366 | 16.0 | 168.249 | 1.02e-07 | 1.80e-04 | 4.96e-08 |
| 12 | 2.00 | 0.1551 | 0.375 | 15.5 | 40.157 | 4.33e-07 | 9.00e-04 | 1.05e-06 |
| 13 | 0.500 | 0.1518 | 0.380 | 15.2 | 45.769 | 3.84e-07 | 2.20e-03 | 2.28e-06 |
| 14 | 0.125 | 0.1442 | 0.393 | 14.4 | 58.791 | 3.03e-07 | 2.01e-02 | 1.65e-05 |
| 15 | 0.0625 | 0.1360 | 0.406 | 13.6 | 0.000 | 0.00e+00 | 1.32e-01 | 0.00e+00 |

| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB012 | Tested By: md | Checked By: njh |
| | Sample No.: SL1049 | Test Date: 12/21/18 | Depth: 13-15 ft |
| | Test No.: IP-2 | Sample Type: intact | Elevation: --- |
| | Description: Wet, gray sandy clay | | |
| | Remarks: System F, Swell Pressure = 0.0644 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report

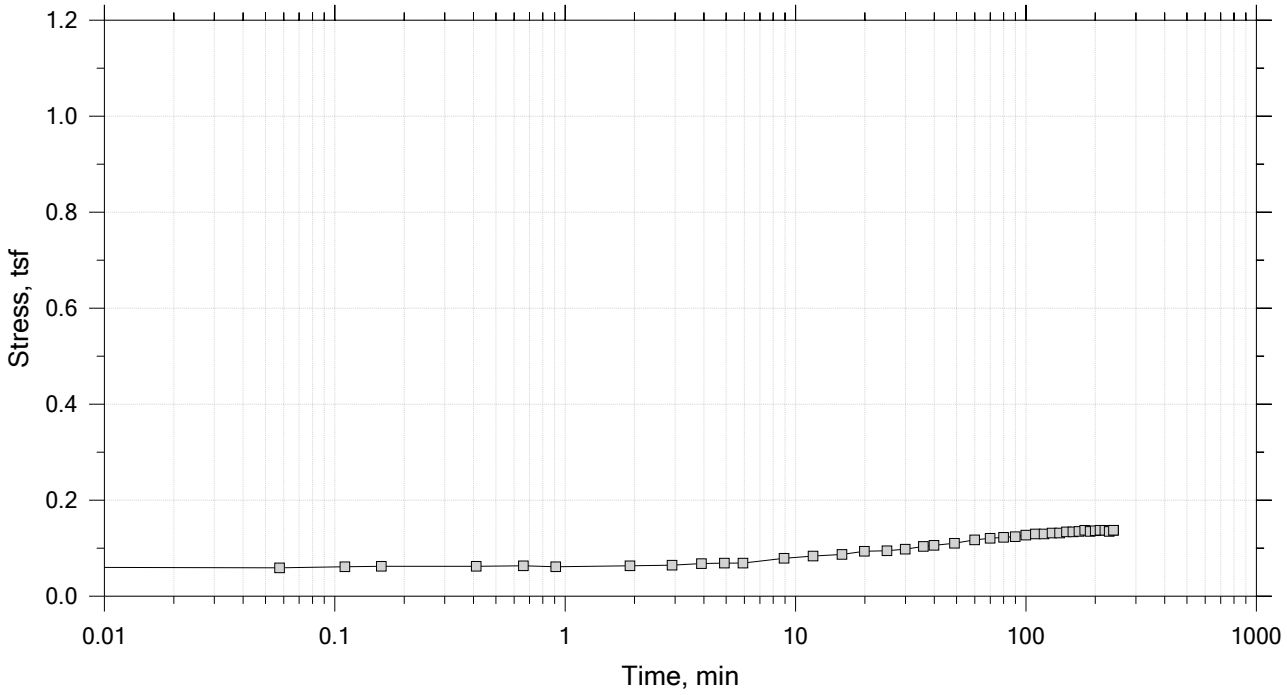


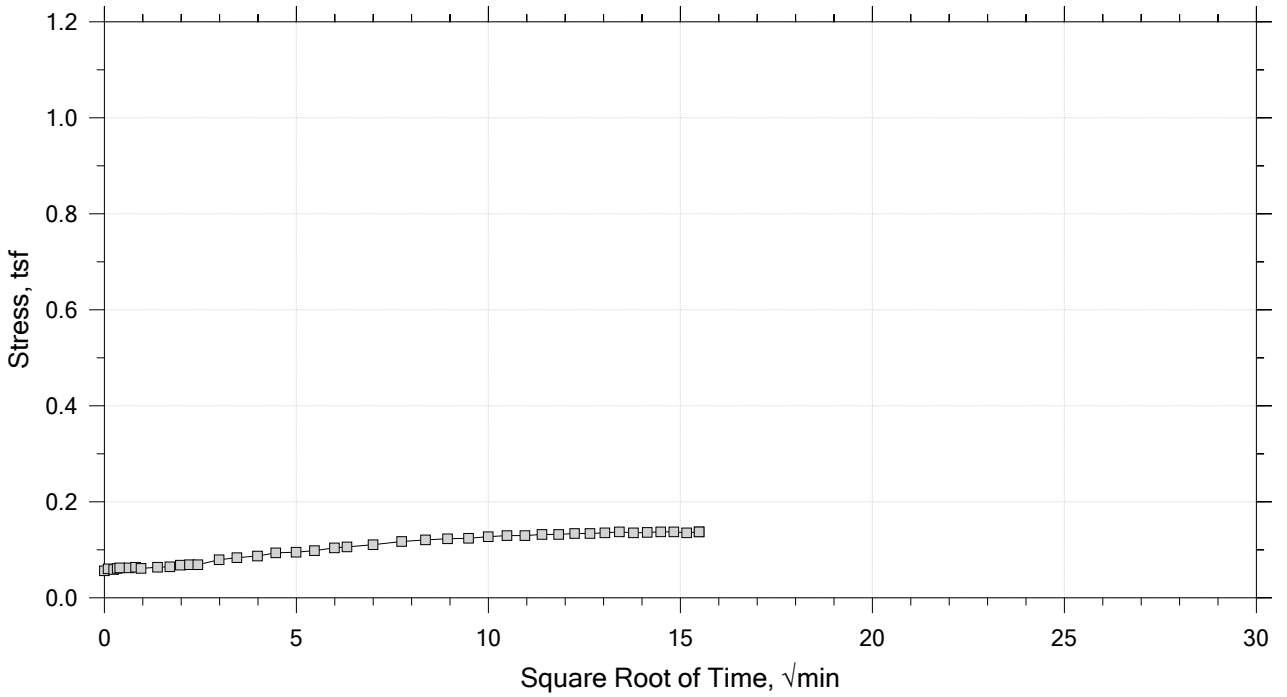




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 14
Constant Volume Step
Stress: 0.137 tsf

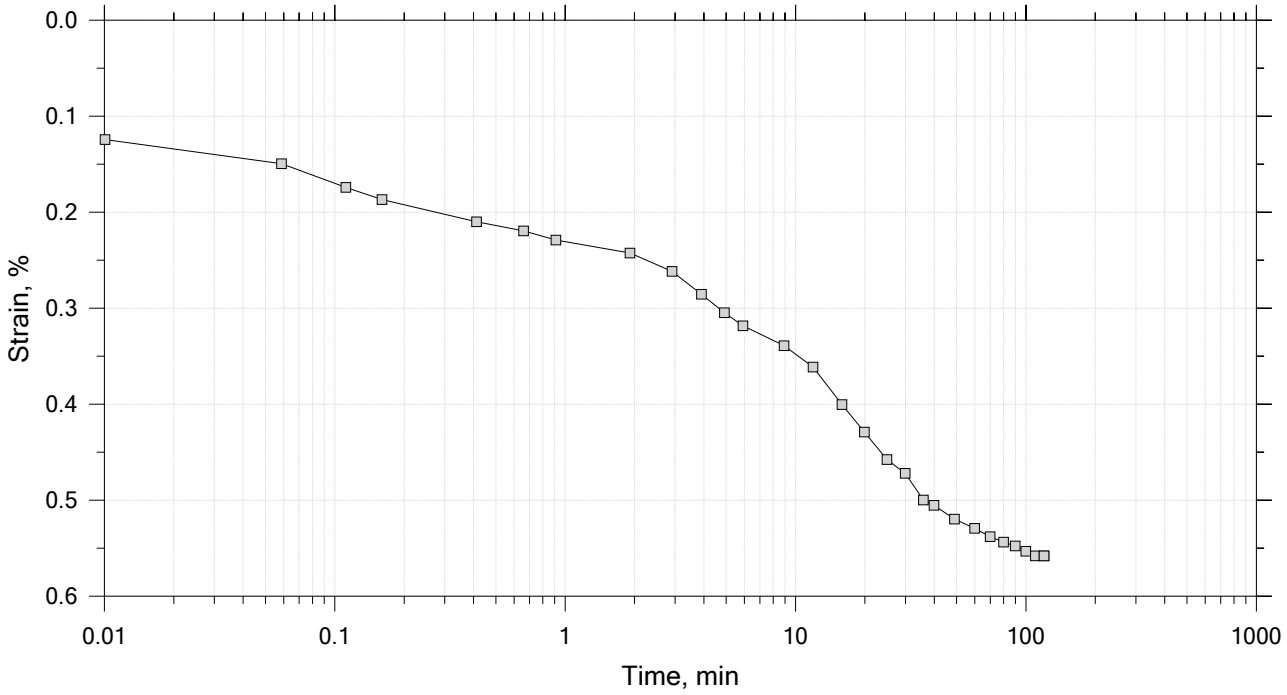


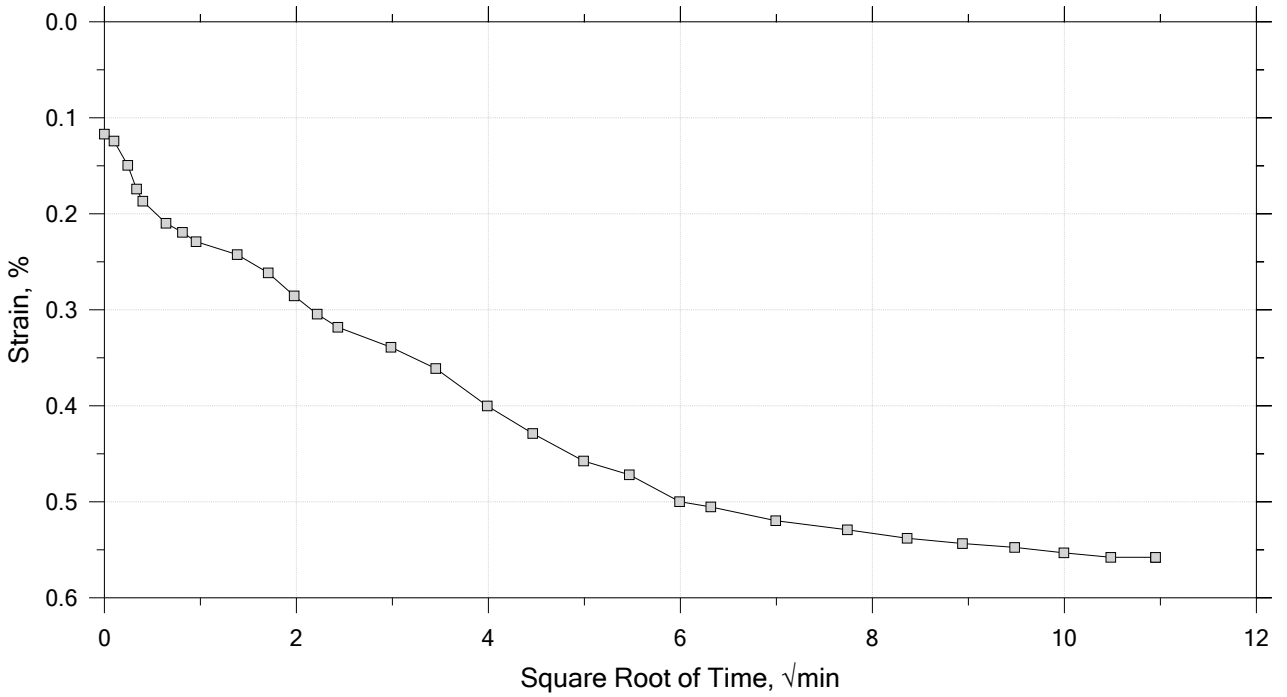




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 14
Constant Load Step
Stress: 0.25 tsf



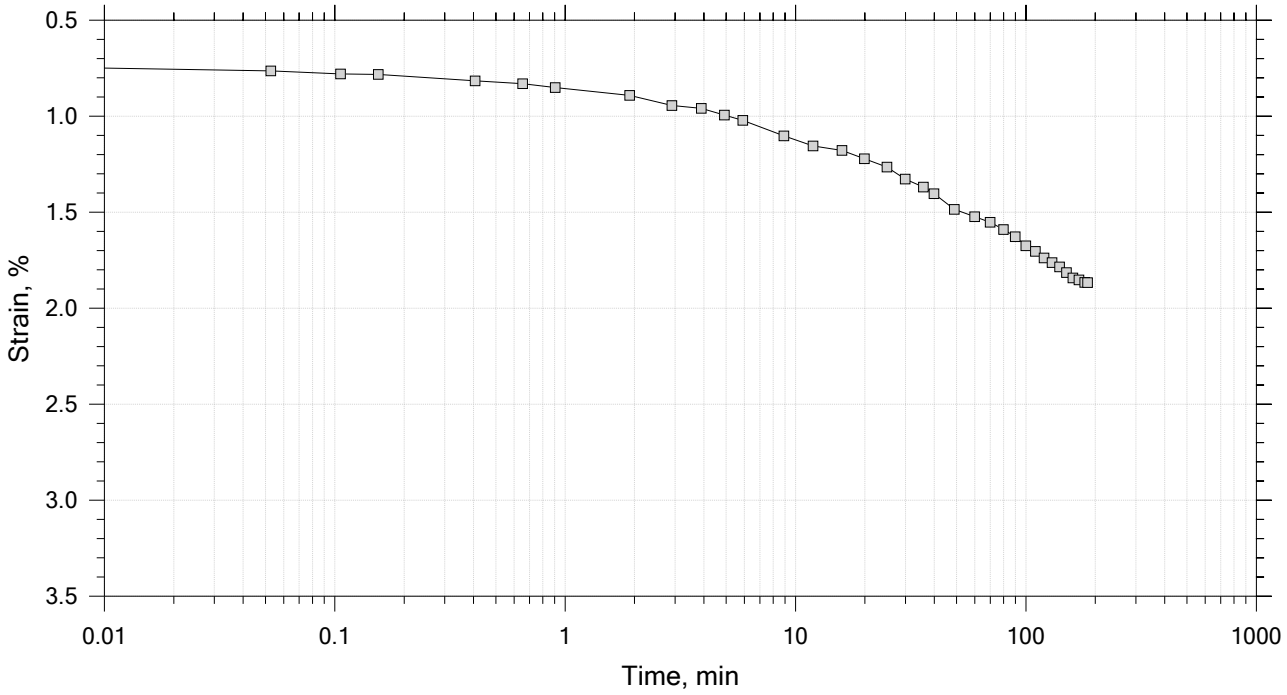

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

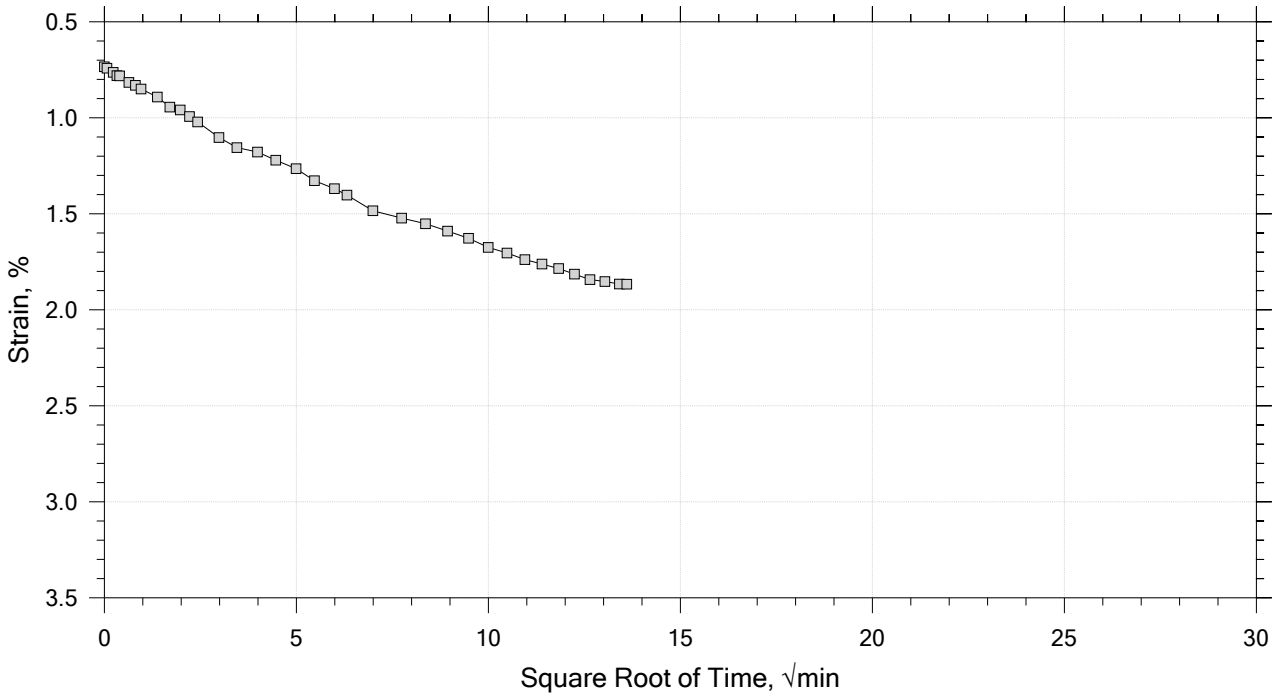
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 14

Constant Load Step

Stress: 0.5 tsf



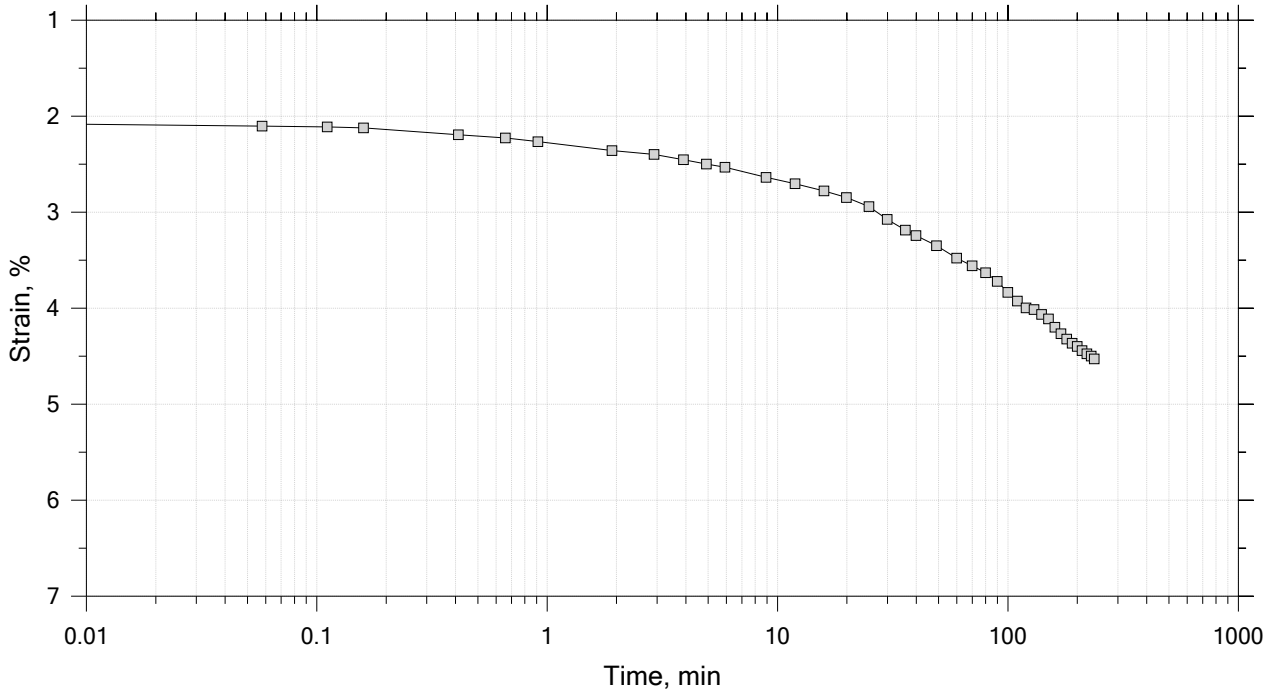

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| Description: Moist, black clay | | |
| Remarks: System E, Swell Pressure = 0.137 tsf | | |

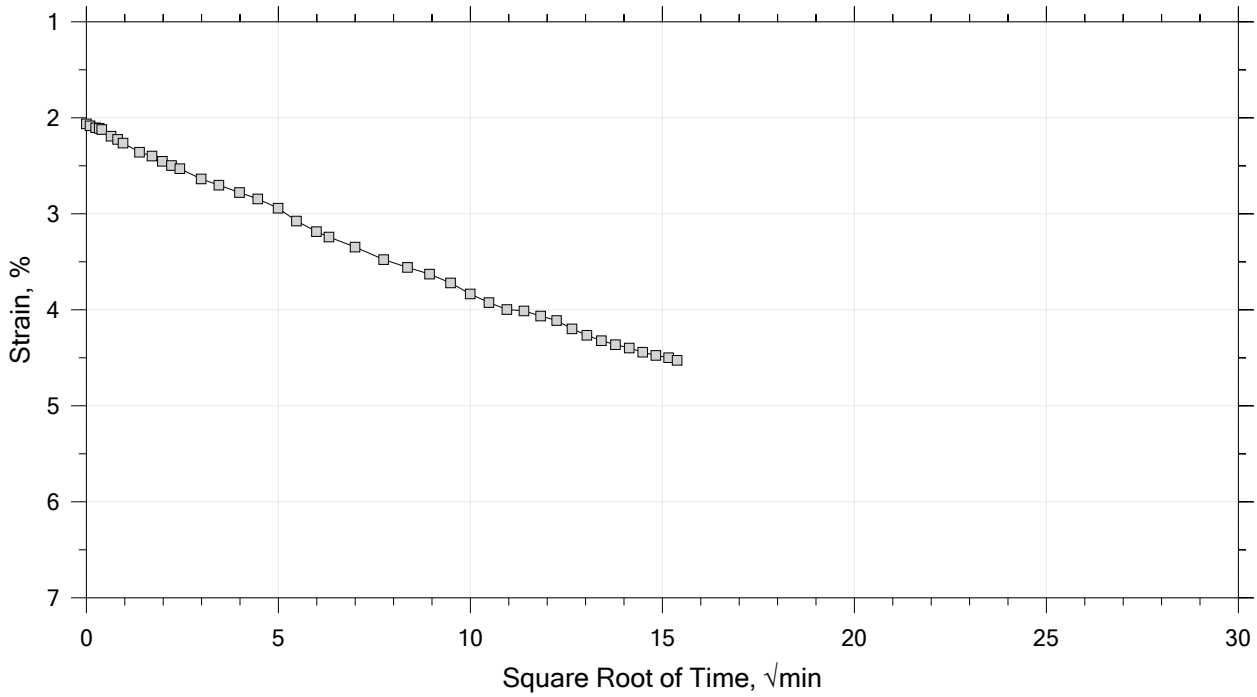
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 14

Constant Load Step

Stress: 1 tsf

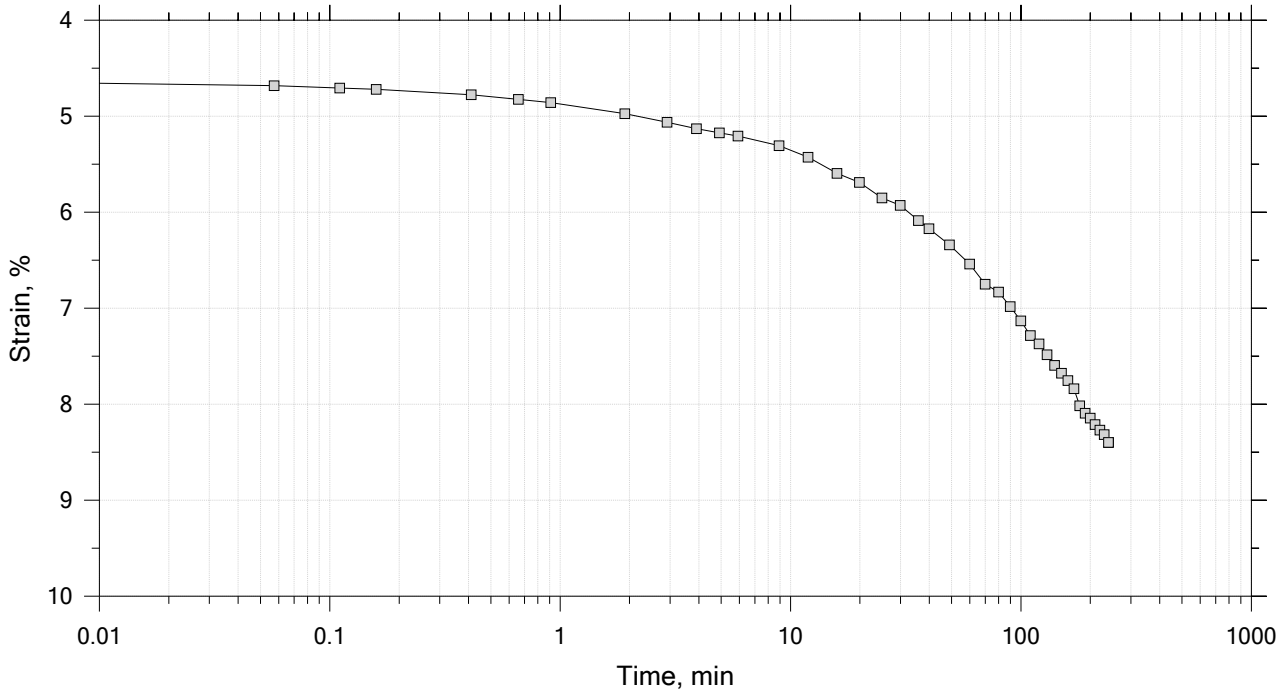


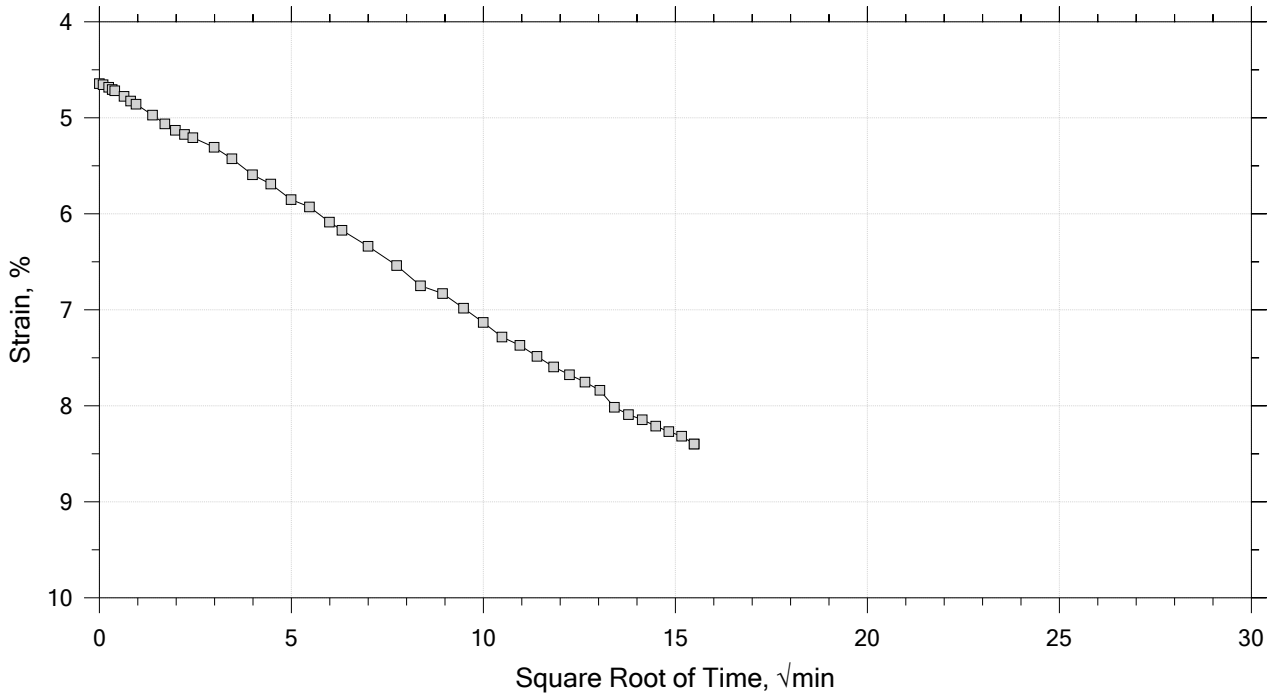




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 14
Constant Load Step
Stress: 2 tsf

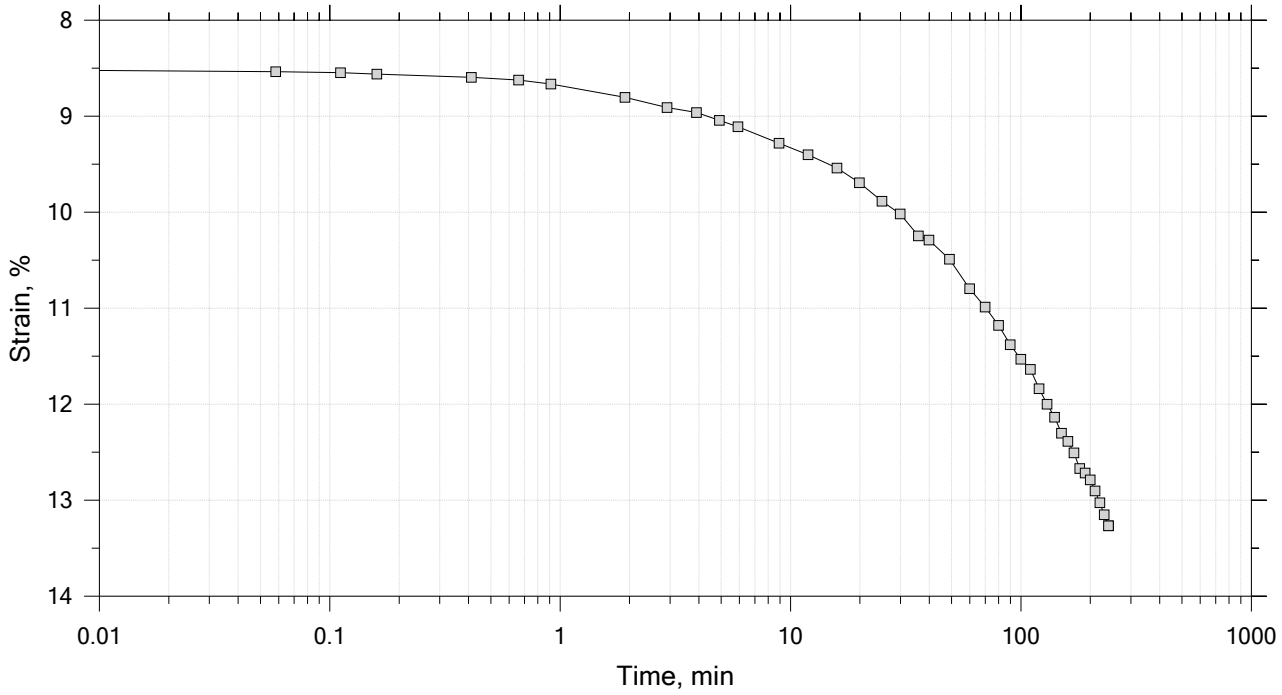


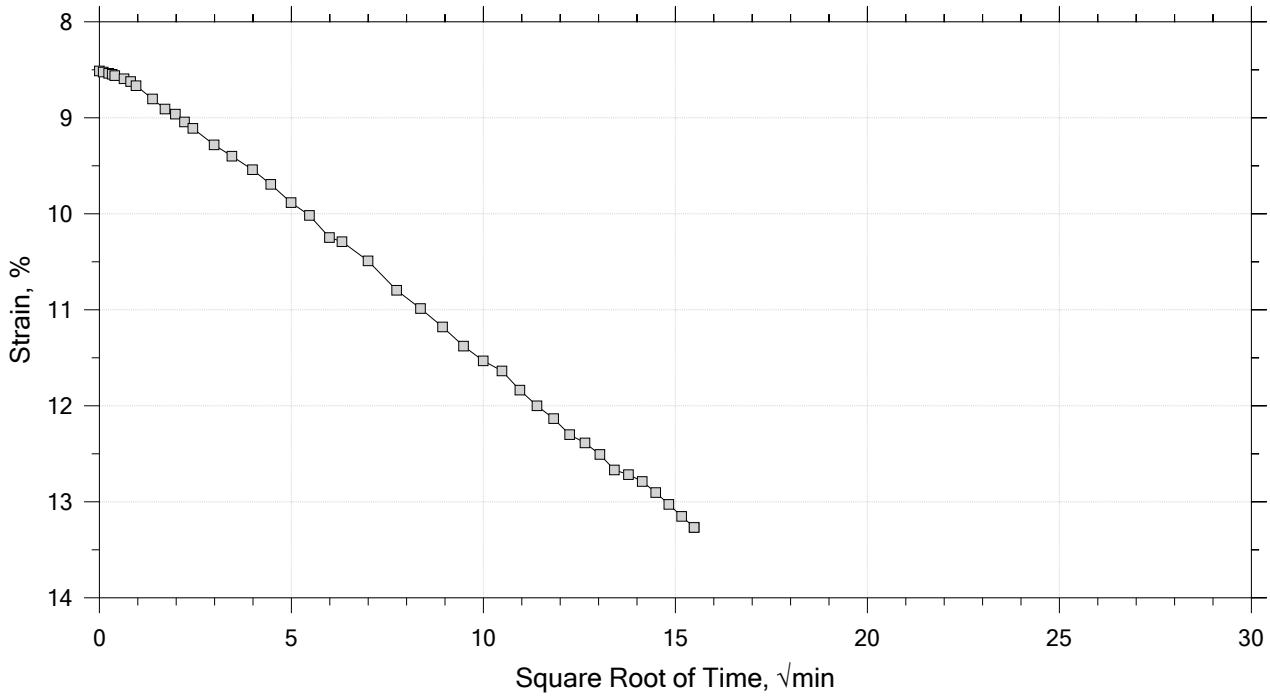




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 14
Constant Load Step
Stress: 4 tsf



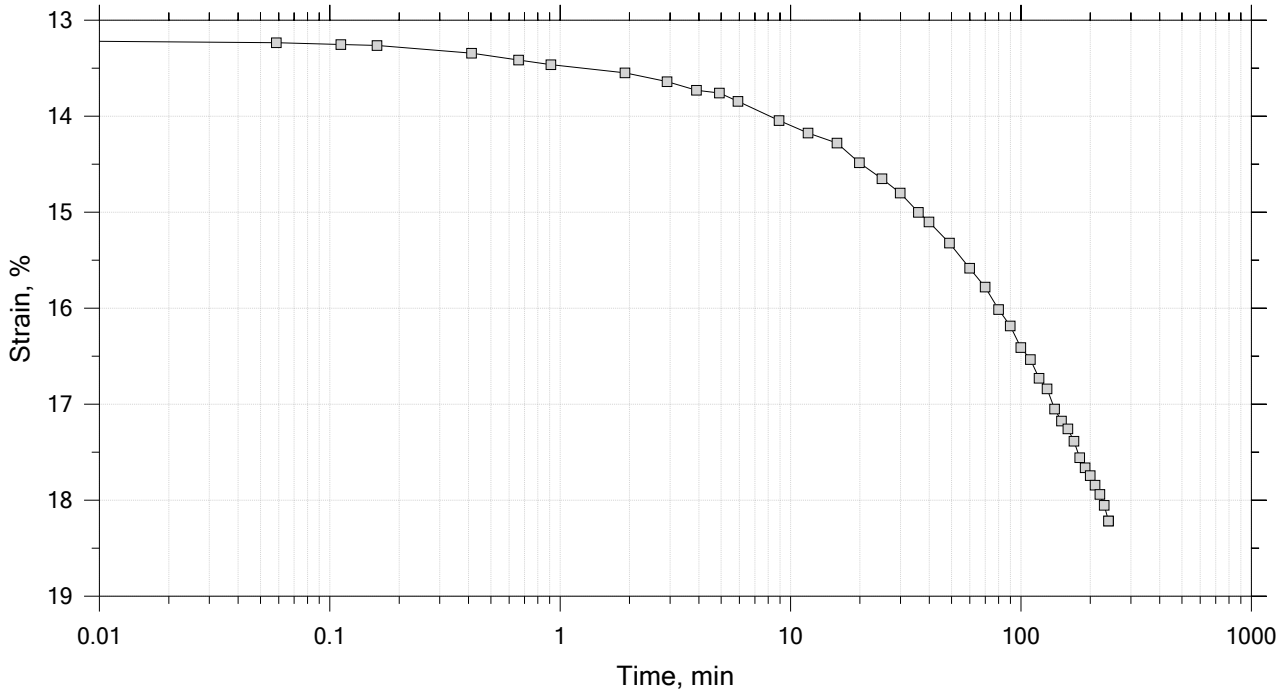

| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

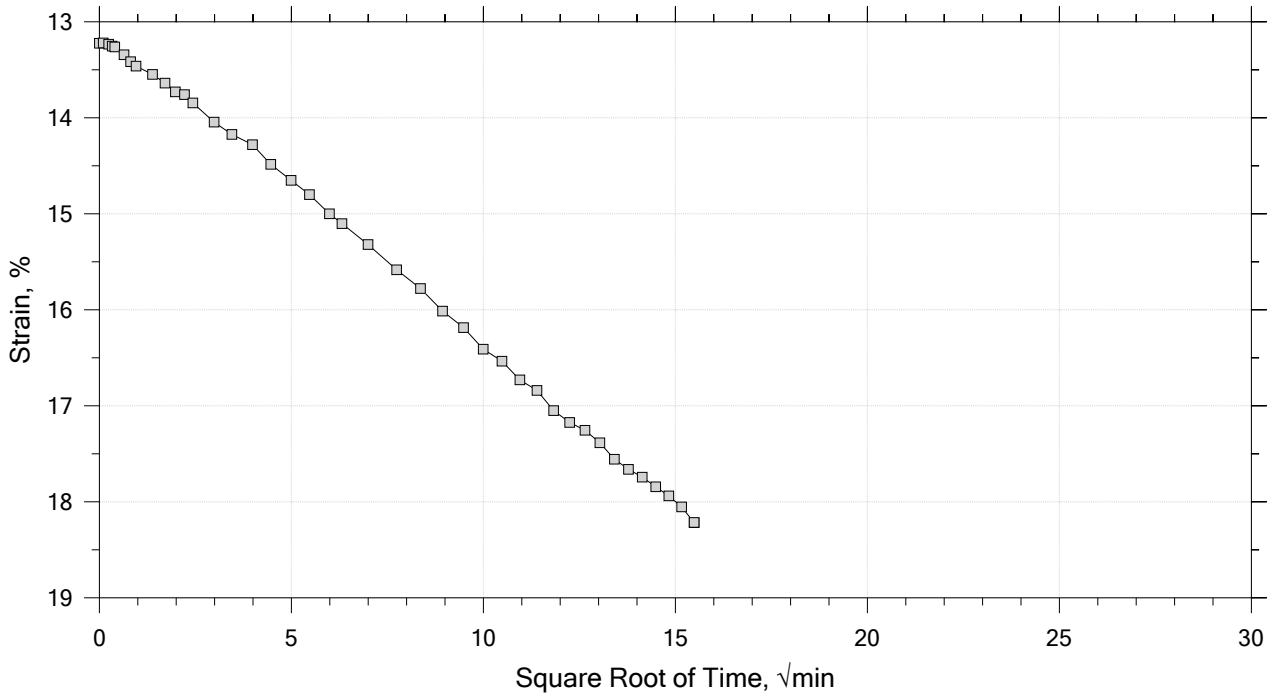
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 14

Constant Load Step

Stress: 8 tsf

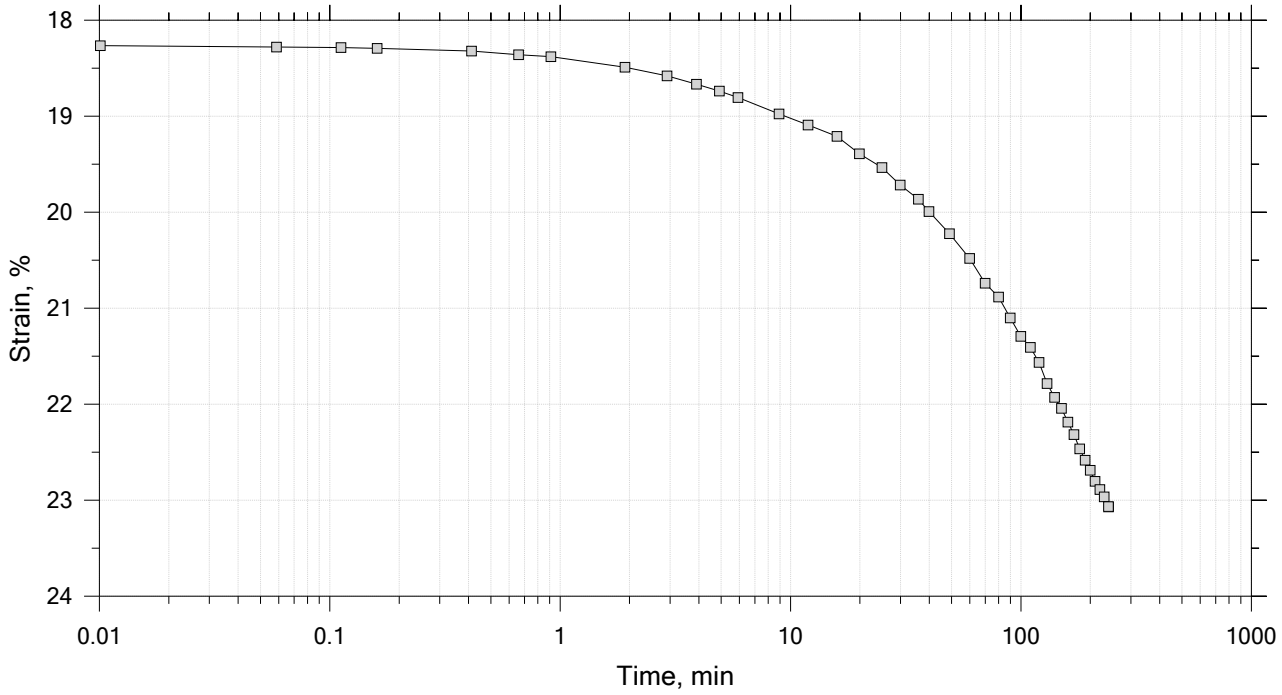


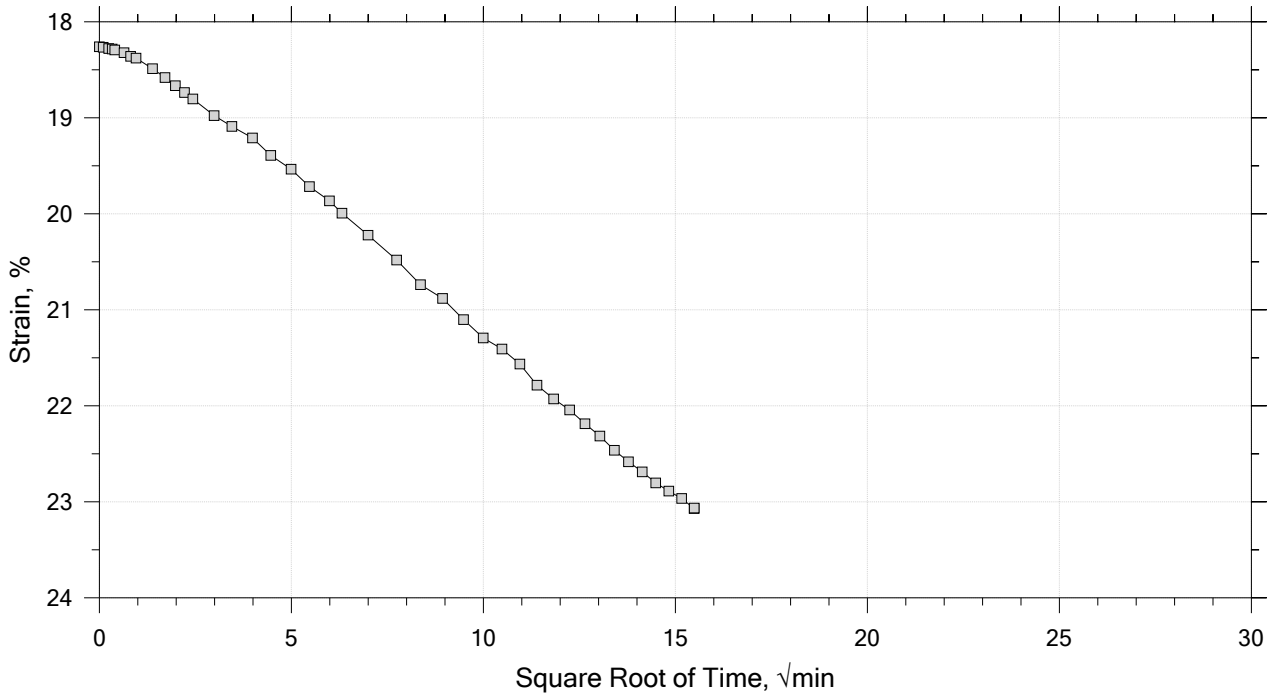




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 14
Constant Load Step
Stress: 16 tsf

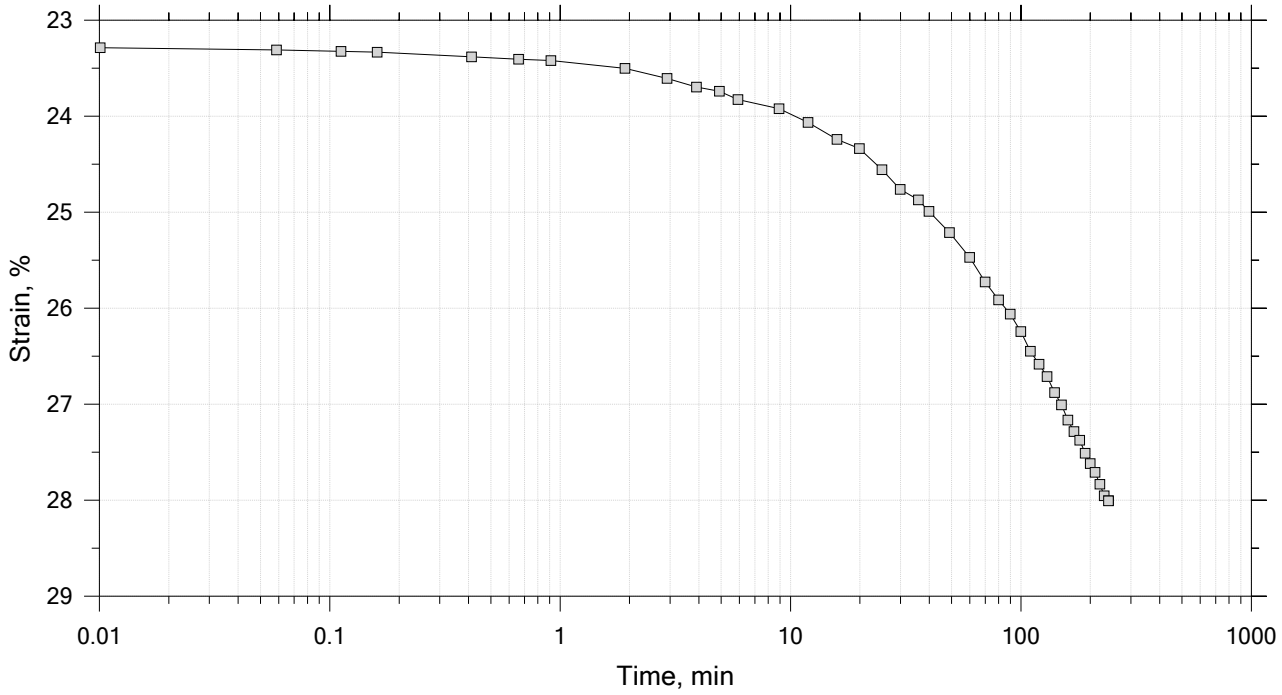


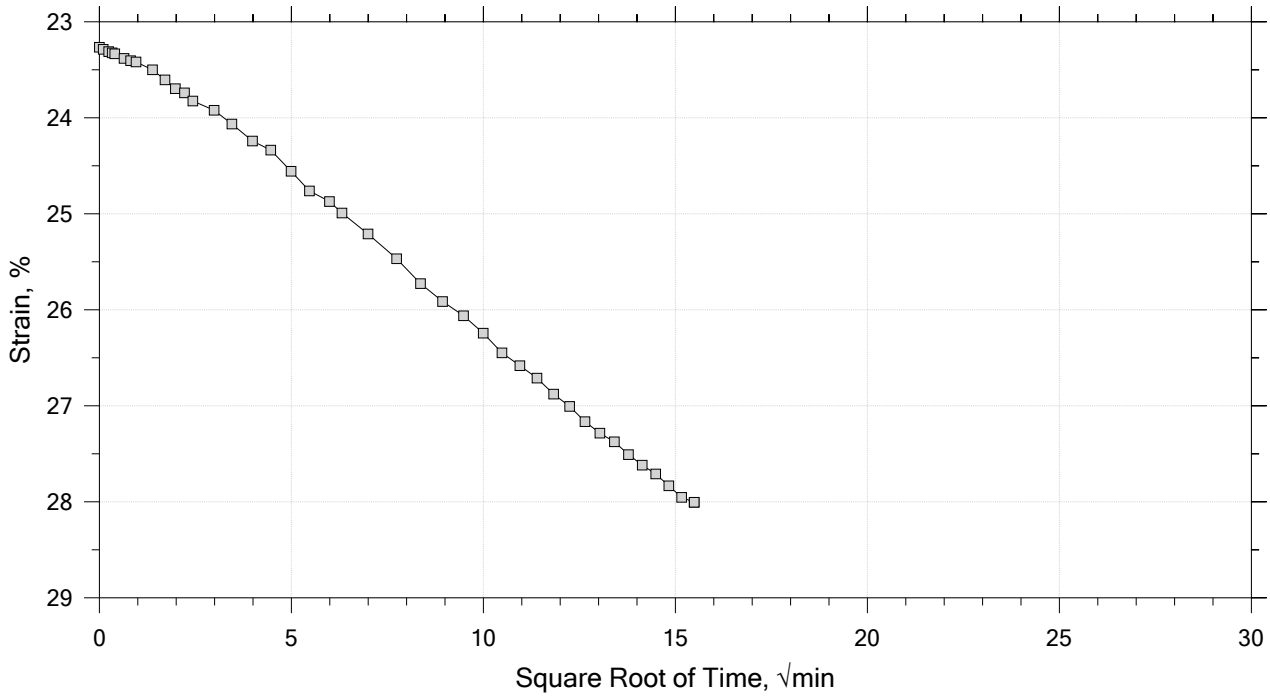




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 14
Constant Load Step
Stress: 32 tsf

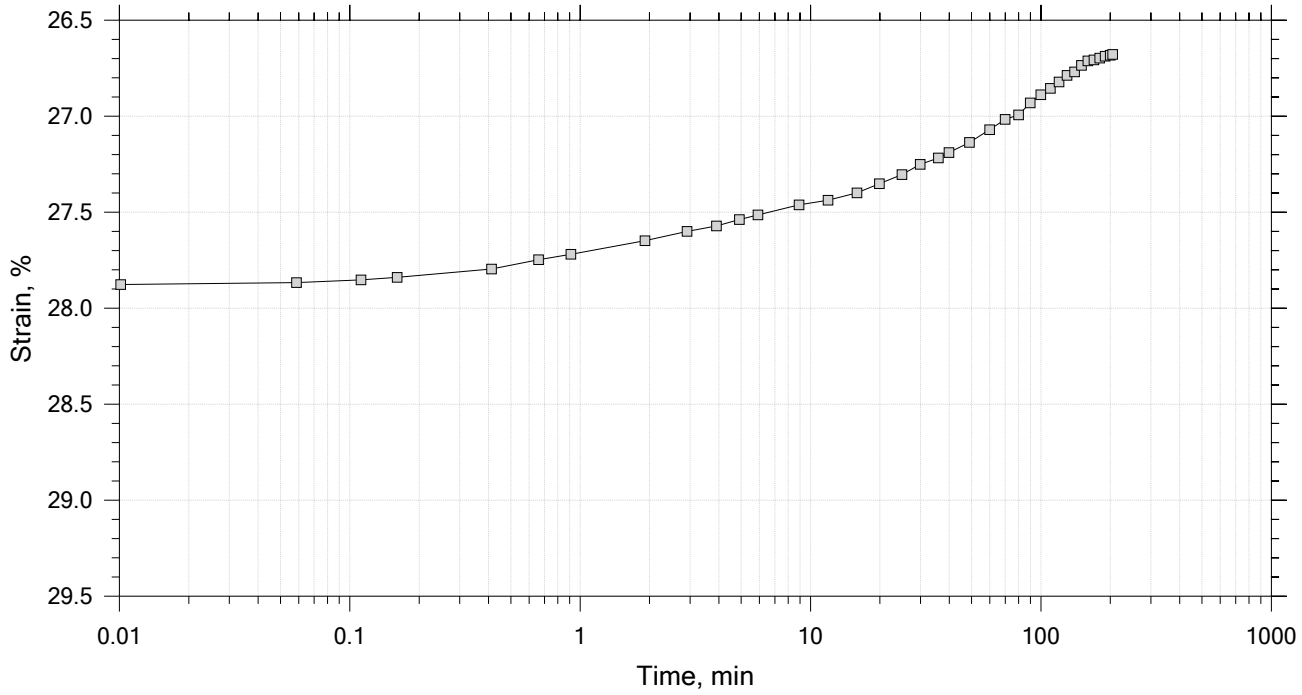


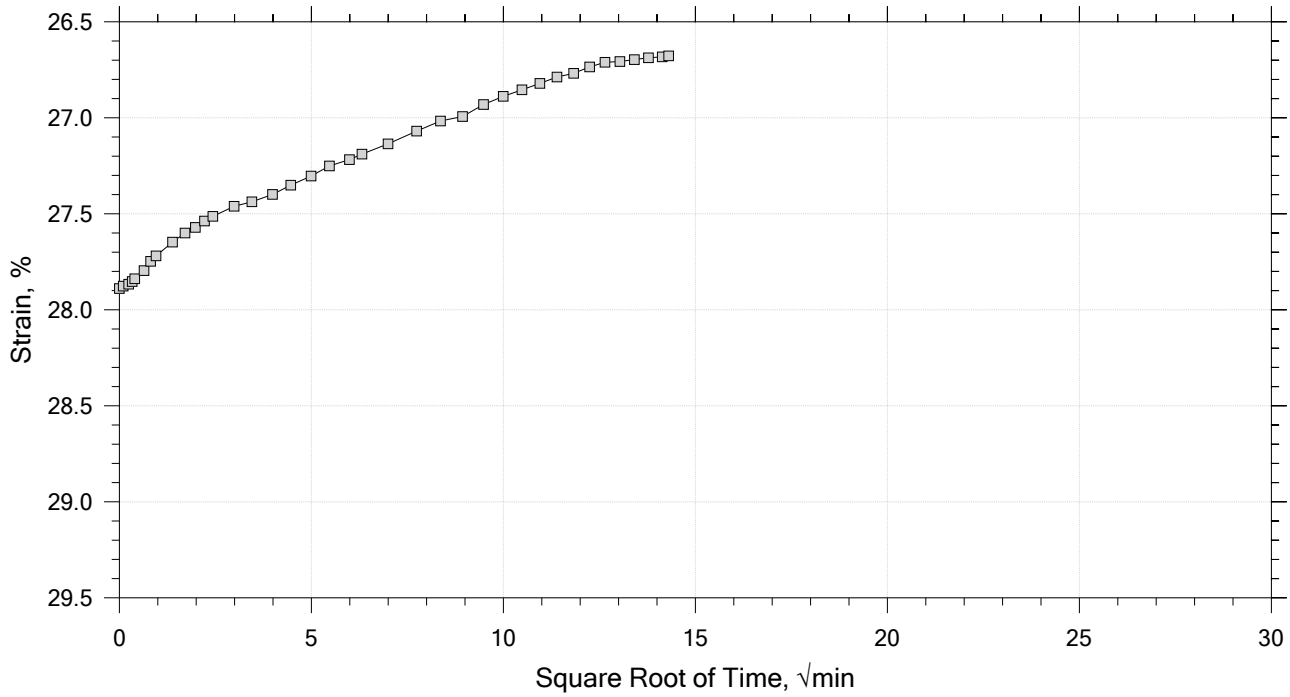




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 14
Constant Load Step
Stress: 8 tsf

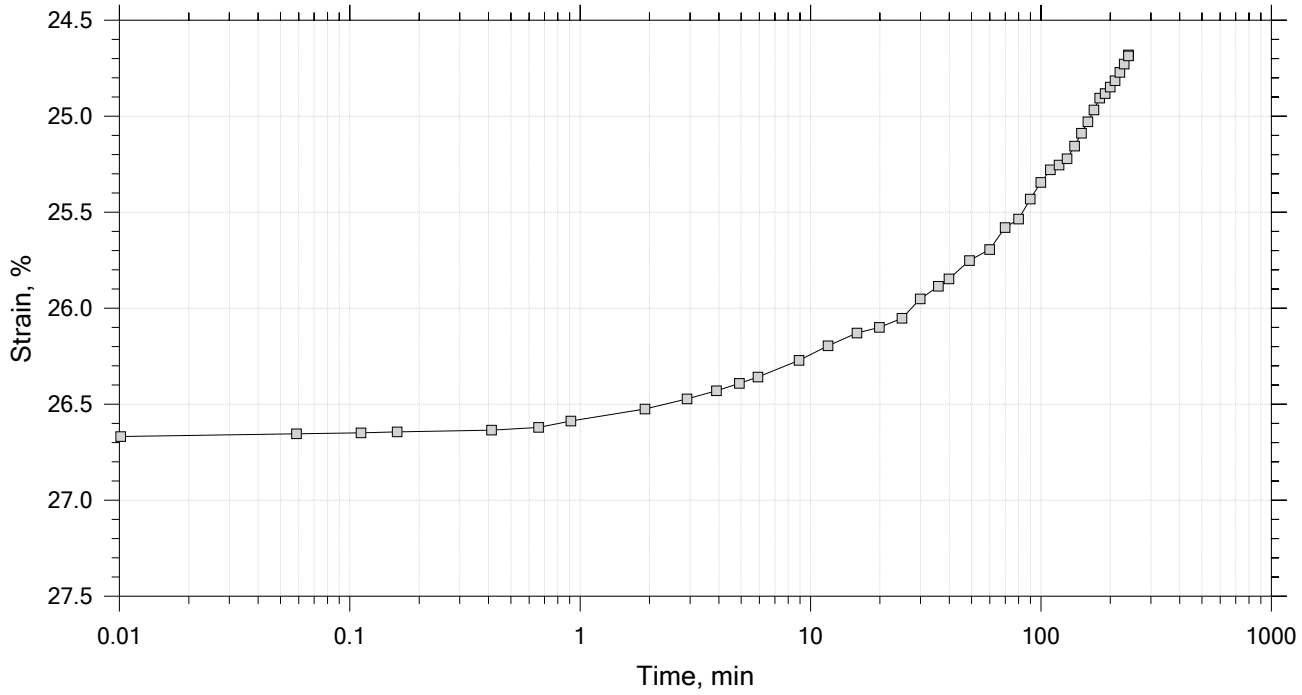


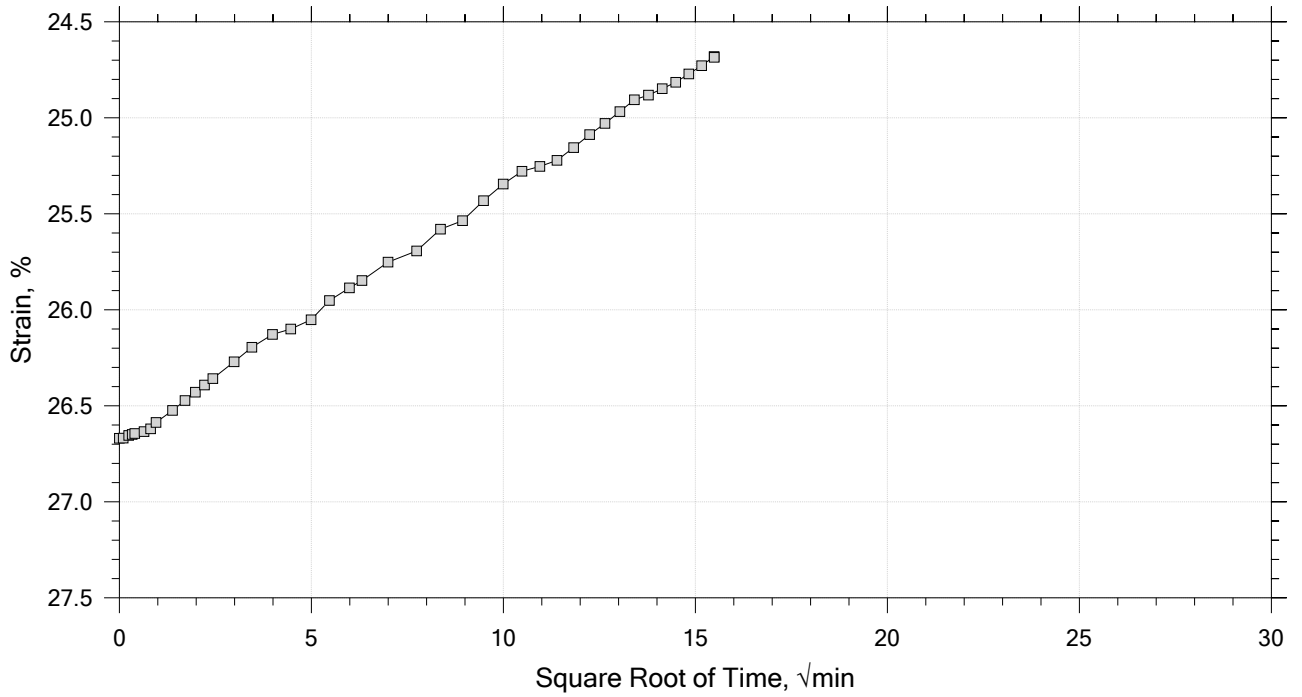




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 14
Constant Load Step
Stress: 2 tsf

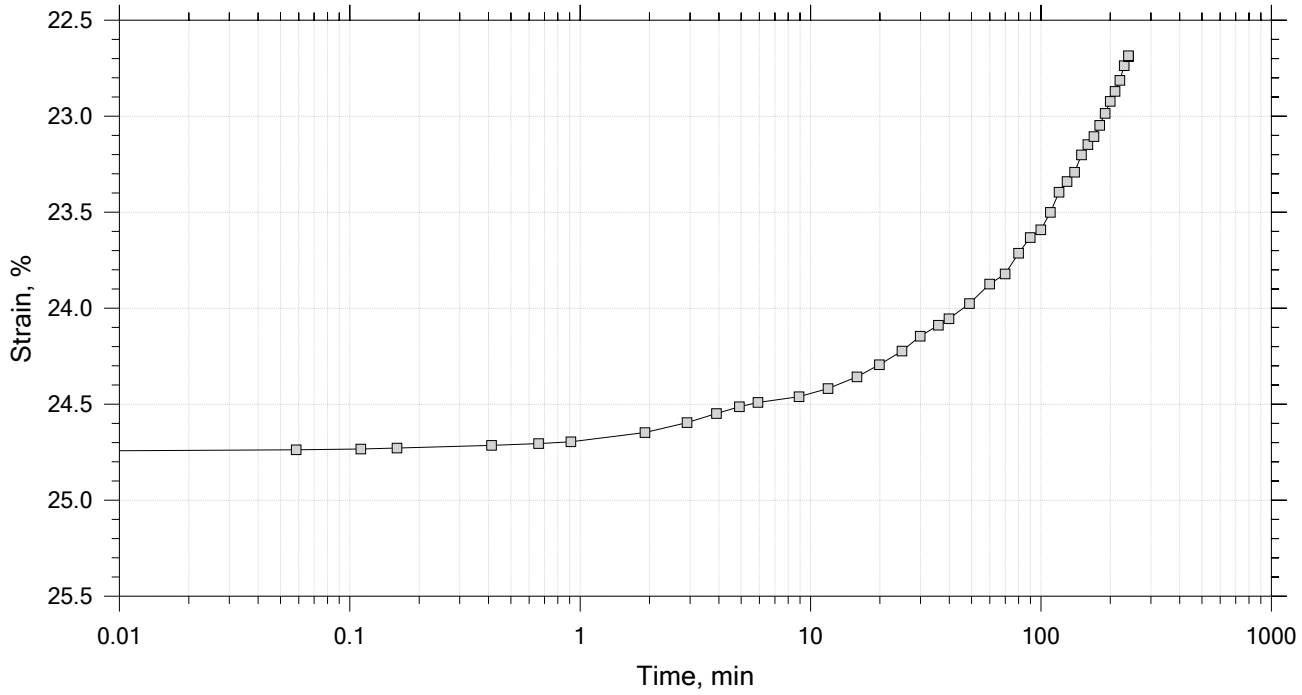


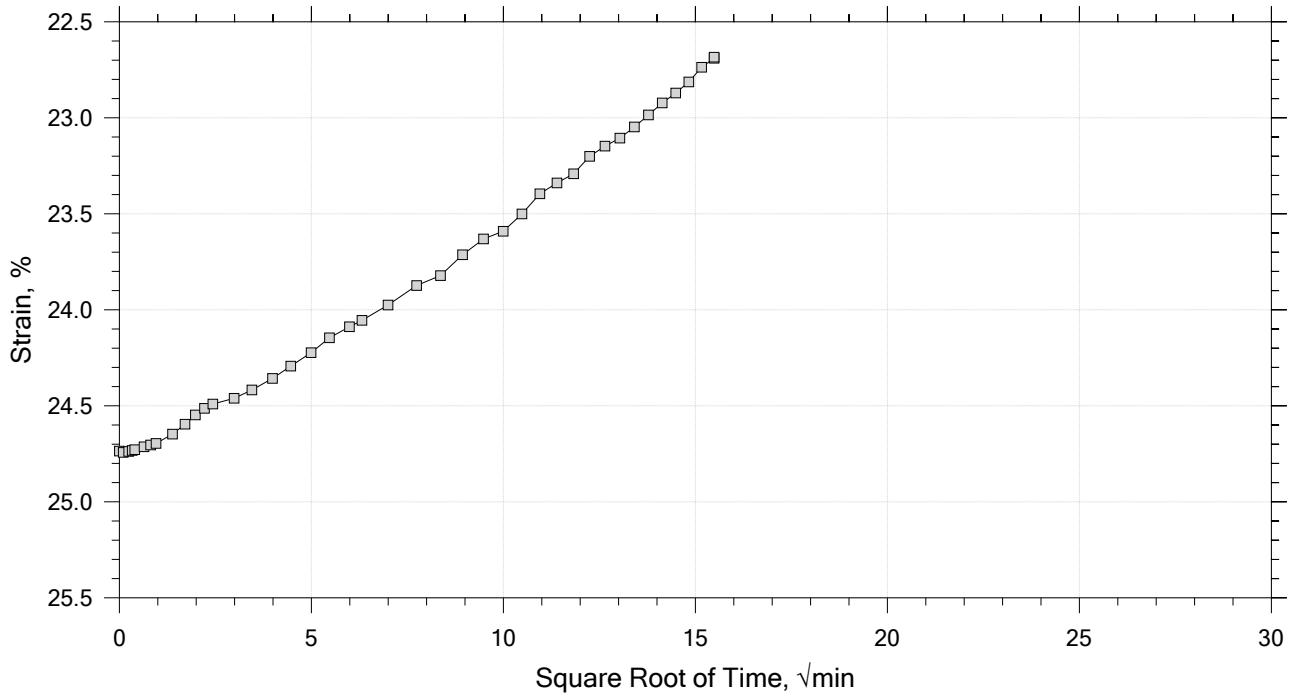




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| Description: Moist, black clay | | |
| Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 14
Constant Load Step
Stress: 0.5 tsf

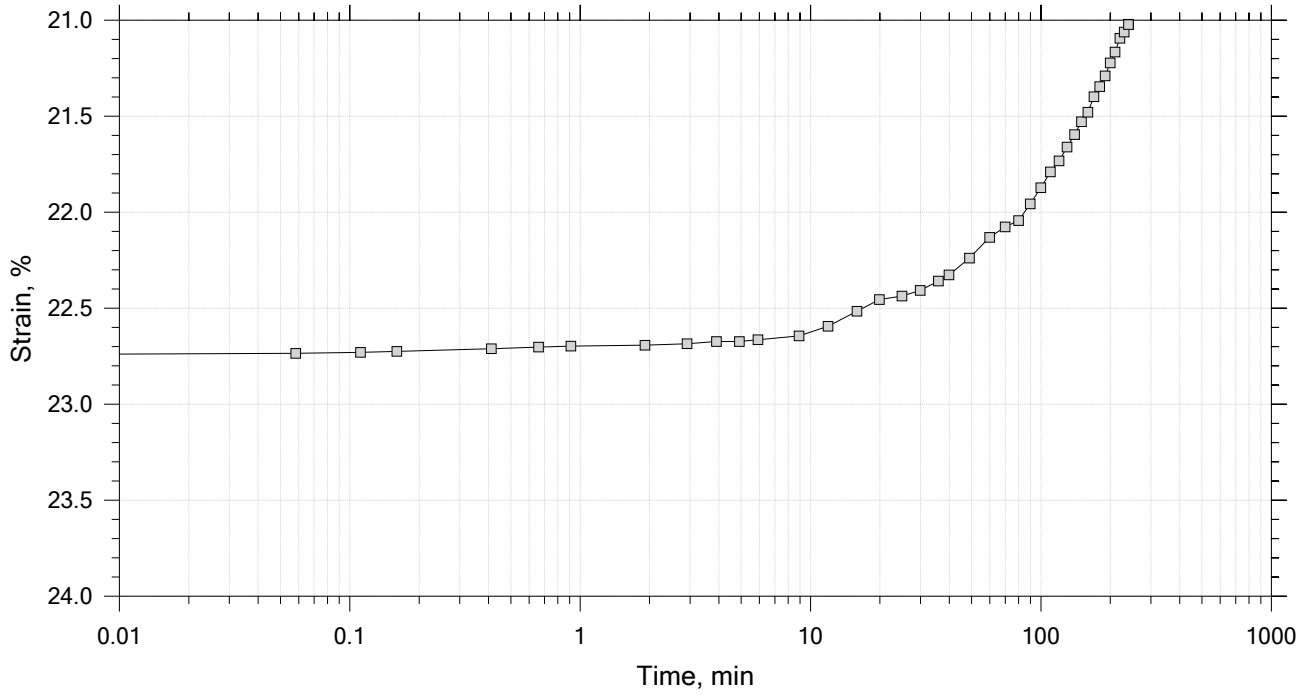


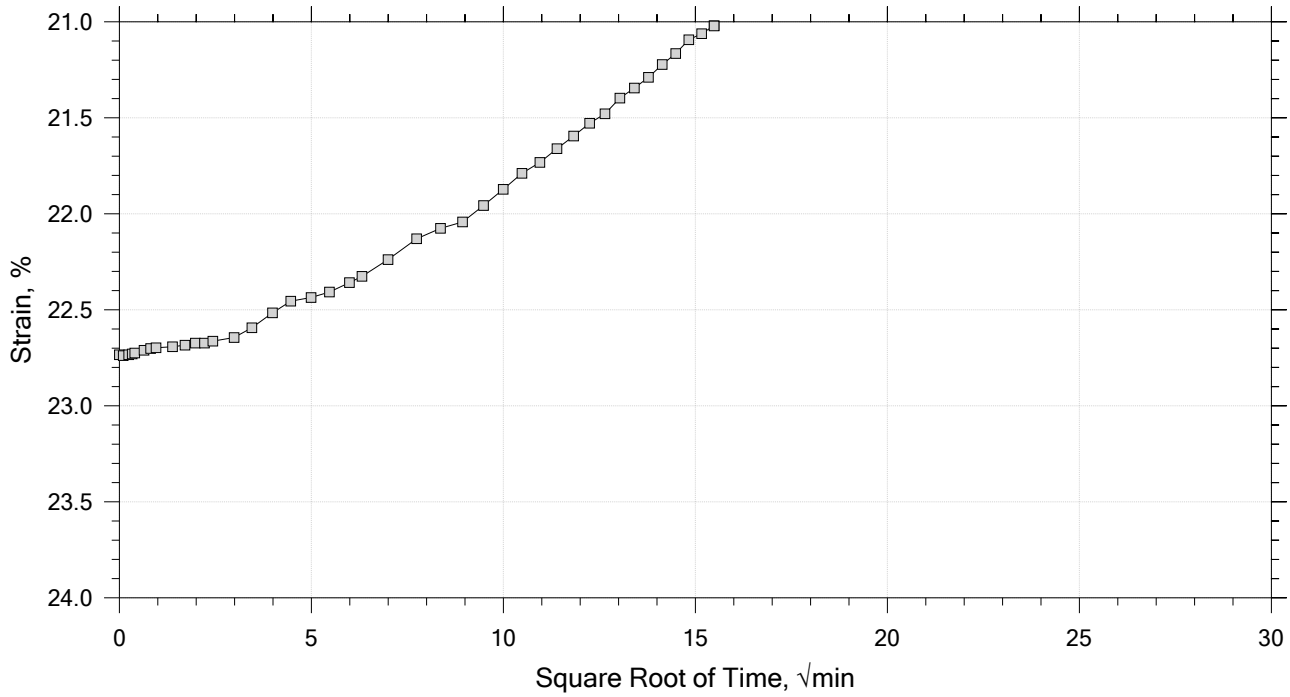




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| Description: Moist, black clay | | |
| Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 14
Constant Load Step
Stress: 0.125 tsf

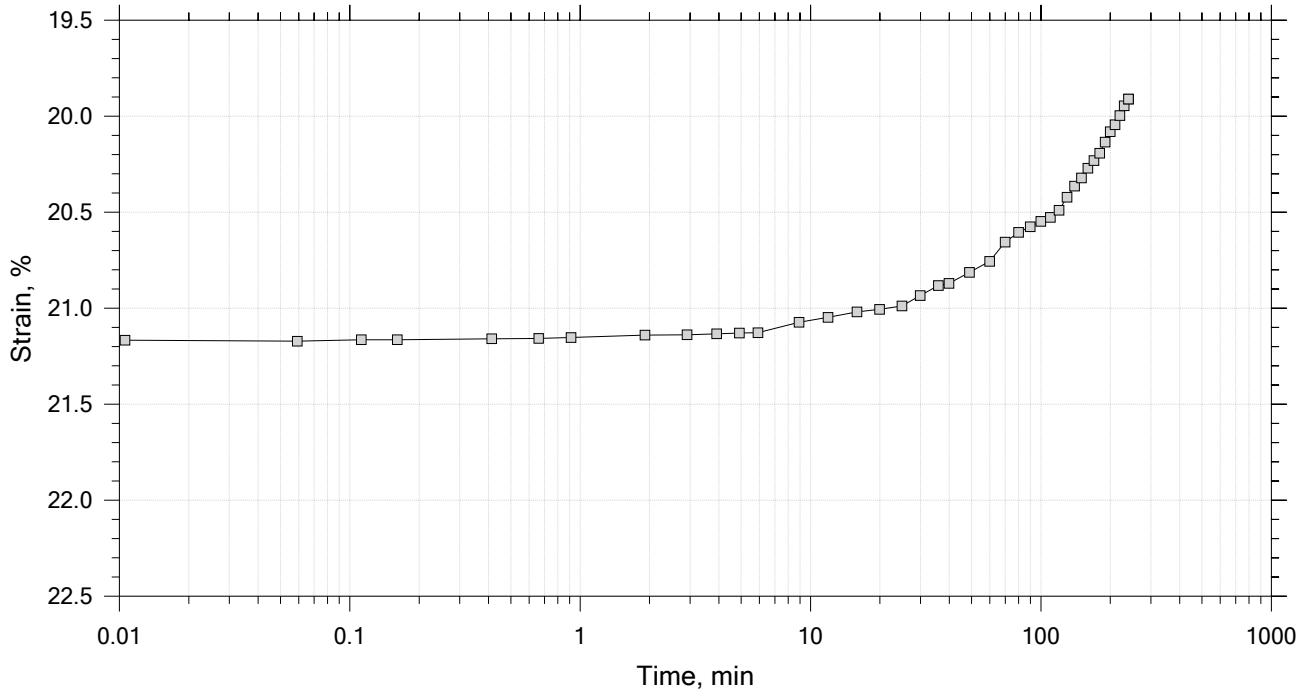


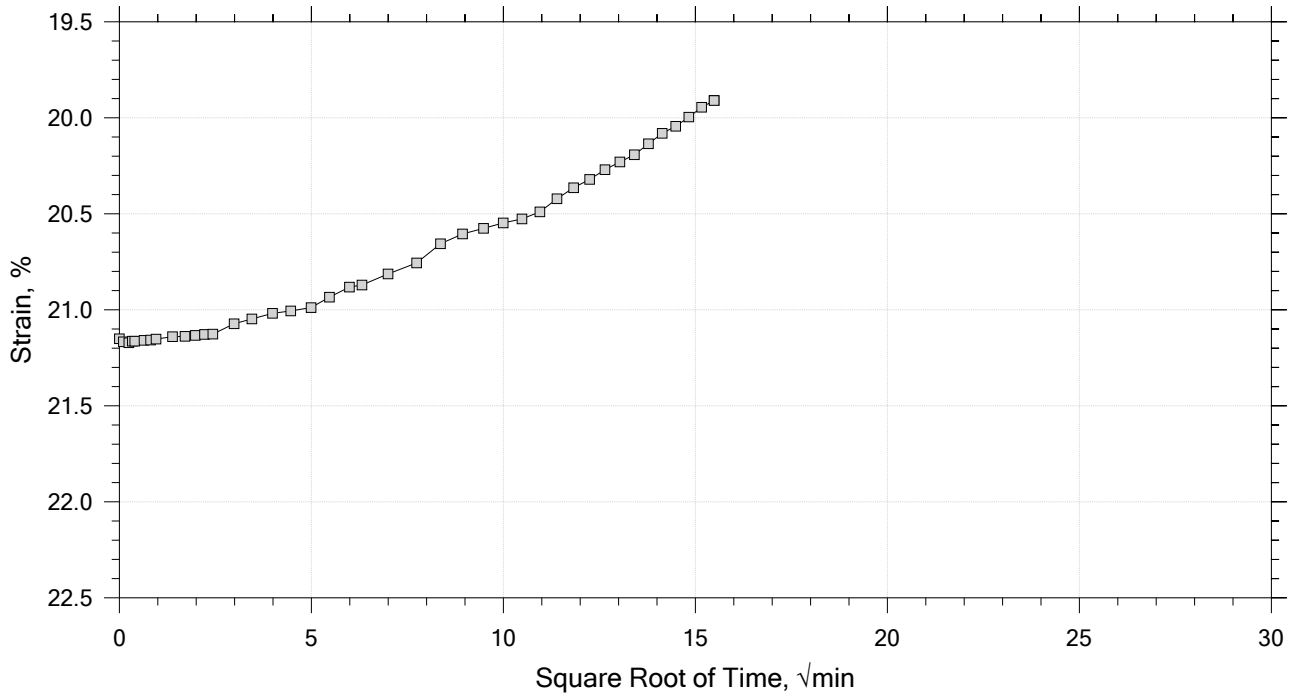




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 14
Constant Load Step
Stress: 0.0625 tsf




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.80 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 1.21 | Plastic Limit: --- |
| Final Height: 0.79 in | Final Void Ratio: 0.744 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | C-164 | RING | | B-1998 |
| Mass Container, gm | 8.43 | 110.53 | 110.53 | 8.27 |
| Mass Container + Wet Soil, gm | 240.89 | 256.57 | 239.7 | 139.95 |
| Mass Container + Dry Soil, gm | 172.99 | 212.59 | 212.59 | 112.31 |
| Mass Dry Soil, gm | 164.56 | 102.06 | 102.06 | 104.04 |
| Water Content, % | 41.26 | 43.10 | 26.57 | 26.57 |
| Void Ratio | --- | 1.21 | 0.74 | --- |
| Degree of Saturation, % | --- | 99.95 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 79.205 | 100.26 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.137 | 0.0005068 | 1.21 | 0.0507 | 0.000 | 0.00e+00 | 3.69e-03 | 0.00e+00 | 0.00e+00 |
| 2 | 0.250 | 0.005579 | 1.20 | 0.558 | 9.256 | 6.12e-07 | 4.50e-02 | 7.44e-05 | 0.00e+00 |
| 3 | 0.500 | 0.01867 | 1.17 | 1.87 | 0.000 | 0.00e+00 | 5.24e-02 | 0.00e+00 | 0.00e+00 |
| 4 | 1.00 | 0.04528 | 1.11 | 4.53 | 0.000 | 0.00e+00 | 5.32e-02 | 0.00e+00 | 0.00e+00 |
| 5 | 2.00 | 0.08398 | 1.02 | 8.40 | 0.000 | 0.00e+00 | 3.87e-02 | 0.00e+00 | 0.00e+00 |
| 6 | 4.00 | 0.1327 | 0.915 | 13.3 | 0.000 | 0.00e+00 | 2.43e-02 | 0.00e+00 | 0.00e+00 |
| 7 | 8.00 | 0.1822 | 0.806 | 18.2 | 0.000 | 0.00e+00 | 1.24e-02 | 0.00e+00 | 0.00e+00 |
| 8 | 16.0 | 0.2307 | 0.699 | 23.1 | 0.000 | 0.00e+00 | 6.06e-03 | 0.00e+00 | 0.00e+00 |
| 9 | 32.0 | 0.2801 | 0.589 | 28.0 | 0.000 | 0.00e+00 | 3.09e-03 | 0.00e+00 | 0.00e+00 |
| 10 | 8.00 | 0.2668 | 0.619 | 26.7 | 0.000 | 0.00e+00 | 5.54e-04 | 0.00e+00 | 0.00e+00 |
| 11 | 2.00 | 0.2469 | 0.663 | 24.7 | 0.000 | 0.00e+00 | 3.32e-03 | 0.00e+00 | 0.00e+00 |
| 12 | 0.500 | 0.2268 | 0.707 | 22.7 | 0.000 | 0.00e+00 | 1.33e-02 | 0.00e+00 | 0.00e+00 |
| 13 | 0.125 | 0.2102 | 0.744 | 21.0 | 0.000 | 0.00e+00 | 4.43e-02 | 0.00e+00 | 0.00e+00 |
| 14 | 0.0625 | 0.1991 | 0.768 | 19.9 | 0.000 | 0.00e+00 | 1.78e-01 | 0.00e+00 | 0.00e+00 |

GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| Description: Moist, black clay | | |
| Remarks: System E, Swell Pressure = 0.137 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

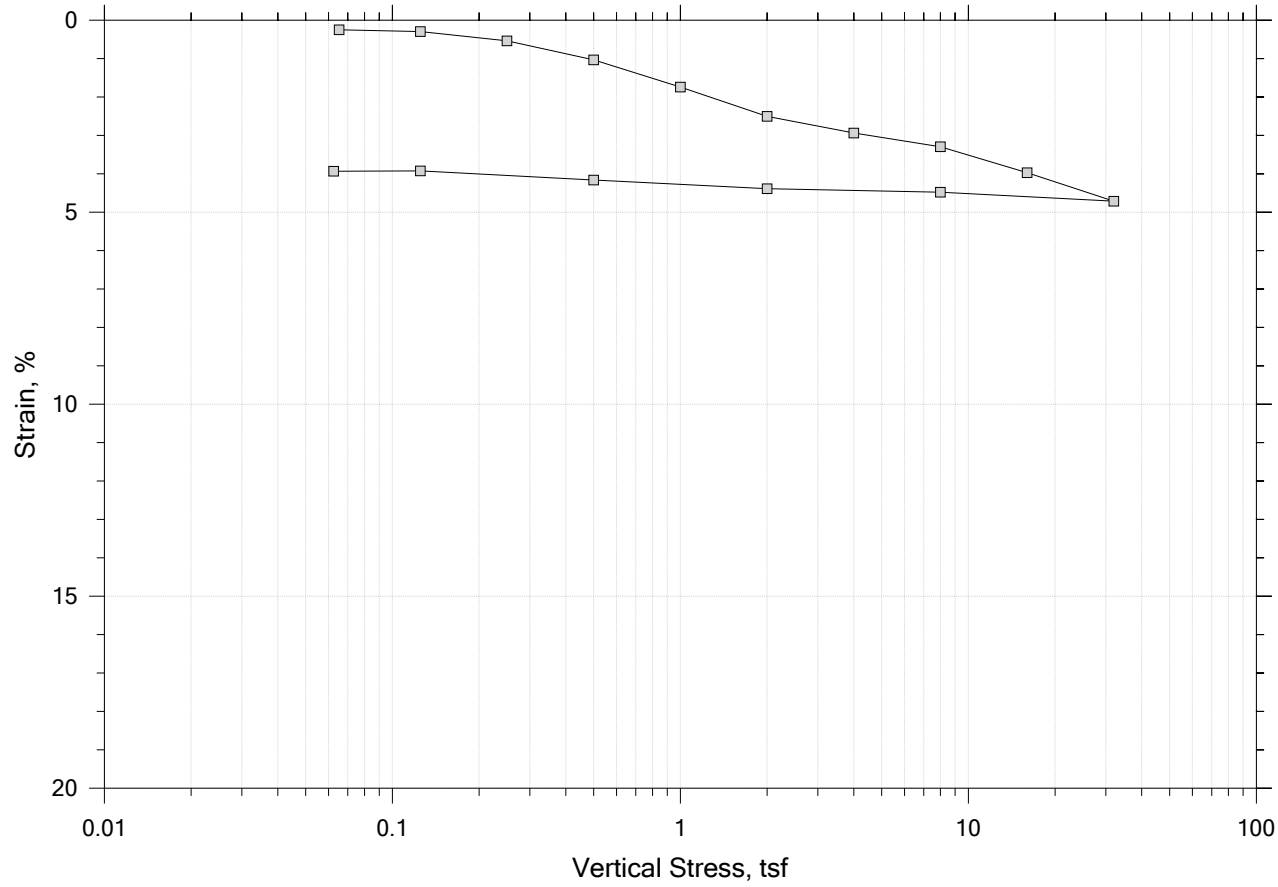
## Square Root of Time Coefficients

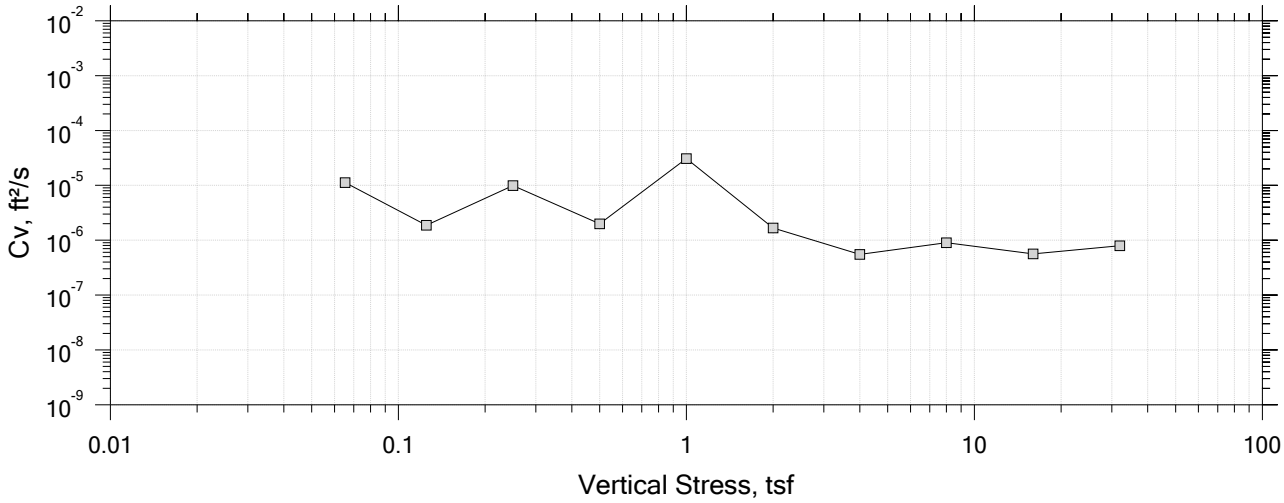
| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.137 | 0.0005068 | 1.21 | 0.0507 | 97.980 | 2.50e-07 | 3.69e-03 | 2.49e-06 |
| 2 | 0.250 | 0.005579 | 1.20 | 0.558 | 45.482 | 5.36e-07 | 4.50e-02 | 6.51e-05 |
| 3 | 0.500 | 0.01867 | 1.17 | 1.87 | 63.155 | 3.79e-07 | 5.24e-02 | 5.35e-05 |
| 4 | 1.00 | 0.04528 | 1.11 | 4.53 | 203.581 | 1.13e-07 | 5.32e-02 | 1.62e-05 |
| 5 | 2.00 | 0.08398 | 1.02 | 8.40 | 178.049 | 1.21e-07 | 3.87e-02 | 1.26e-05 |
| 6 | 4.00 | 0.1327 | 0.915 | 13.3 | 177.706 | 1.10e-07 | 2.43e-02 | 7.21e-06 |
| 7 | 8.00 | 0.1822 | 0.806 | 18.2 | 179.019 | 9.73e-08 | 1.24e-02 | 3.25e-06 |
| 8 | 16.0 | 0.2307 | 0.699 | 23.1 | 180.850 | 8.54e-08 | 6.06e-03 | 1.40e-06 |
| 9 | 32.0 | 0.2801 | 0.589 | 28.0 | 182.440 | 7.46e-08 | 3.09e-03 | 6.21e-07 |
| 10 | 8.00 | 0.2668 | 0.619 | 26.7 | 182.867 | 7.08e-08 | 5.54e-04 | 1.06e-07 |
| 11 | 2.00 | 0.2469 | 0.663 | 24.7 | 176.543 | 7.68e-08 | 3.32e-03 | 6.87e-07 |
| 12 | 0.500 | 0.2268 | 0.707 | 22.7 | 0.000 | 0.00e+00 | 1.33e-02 | 0.00e+00 |
| 13 | 0.125 | 0.2102 | 0.744 | 21.0 | 0.000 | 0.00e+00 | 4.43e-02 | 0.00e+00 |
| 14 | 0.0625 | 0.1991 | 0.768 | 19.9 | 0.000 | 0.00e+00 | 1.78e-01 | 0.00e+00 |

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB025 | Tested By: md | Checked By: njh |
| | Sample No.: SL1042 | Test Date: 12/21/18 | Depth: 16-18 ft |
| | Test No.: IP-3 | Sample Type: intact | Elevation: --- |
| | Description: Moist, black clay | | |
| | Remarks: System E, Swell Pressure = 0.137 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report

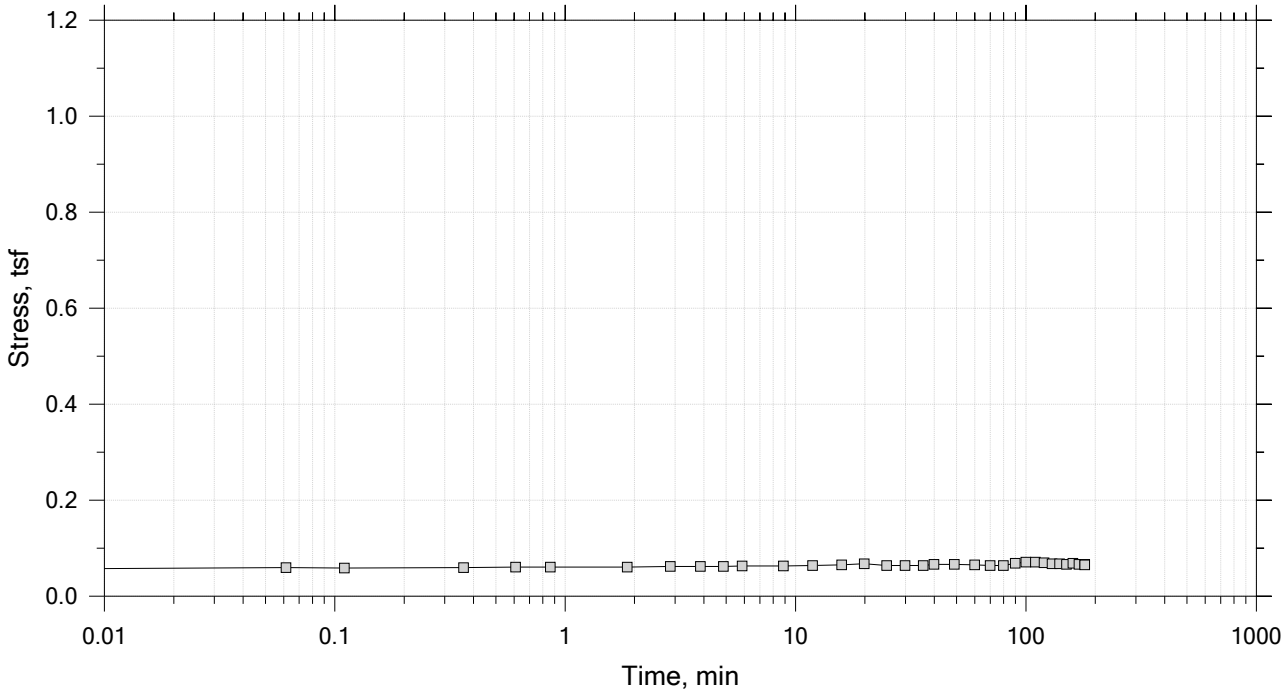


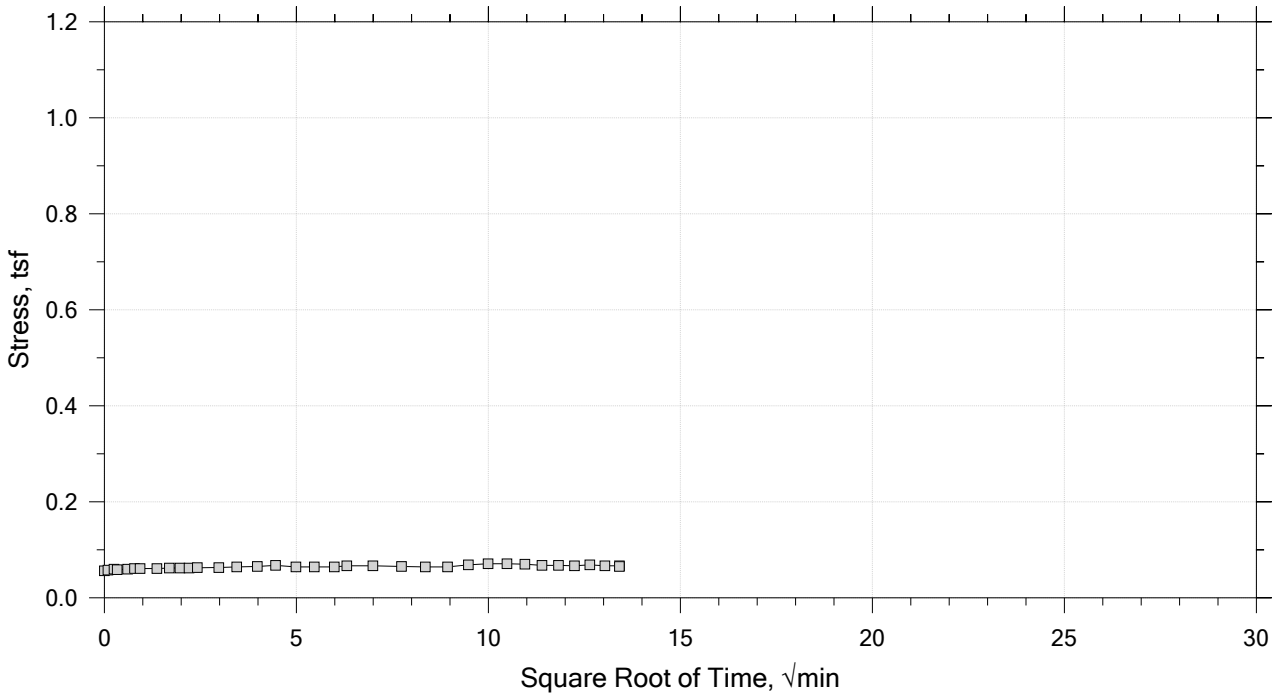




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15
Constant Volume Step
Stress: 0.0653 tsf

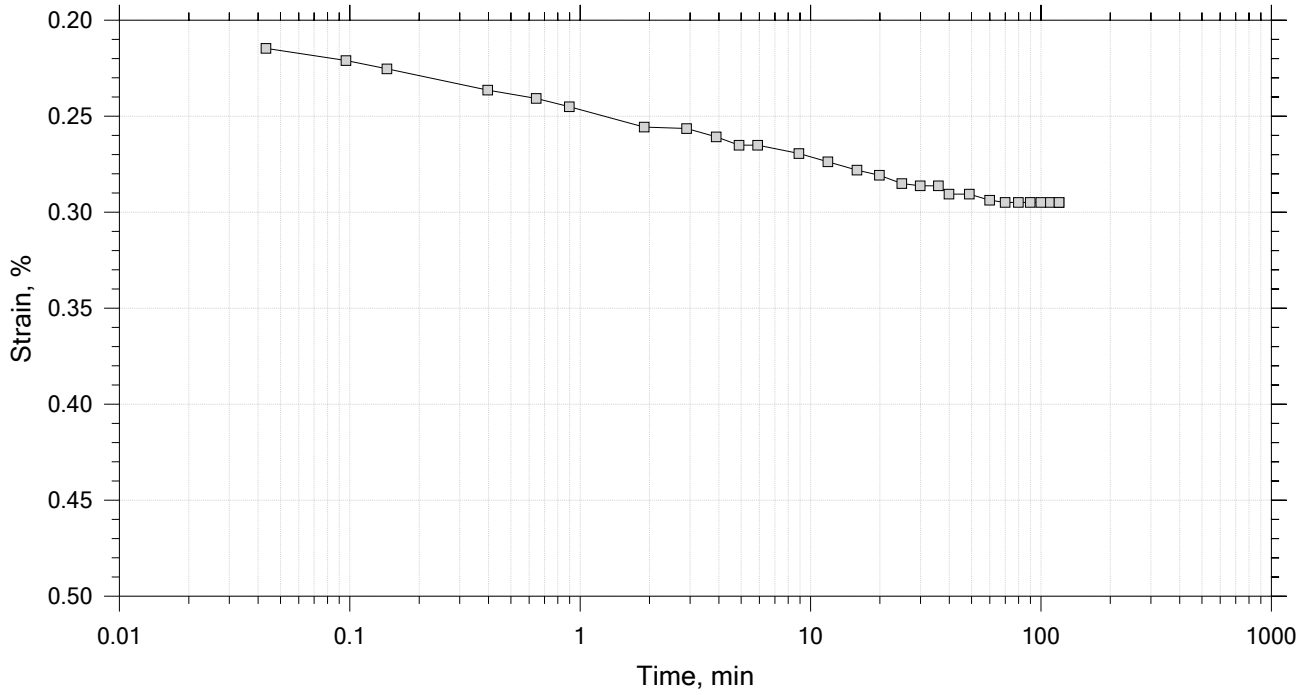


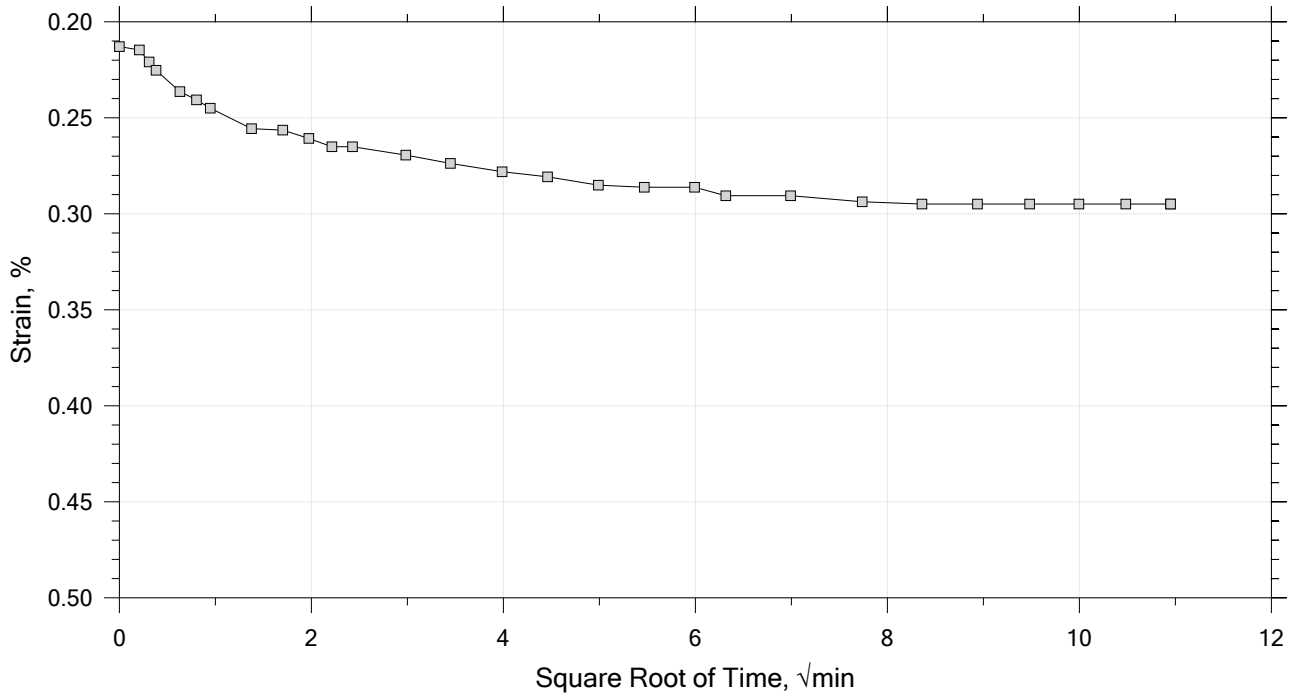




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

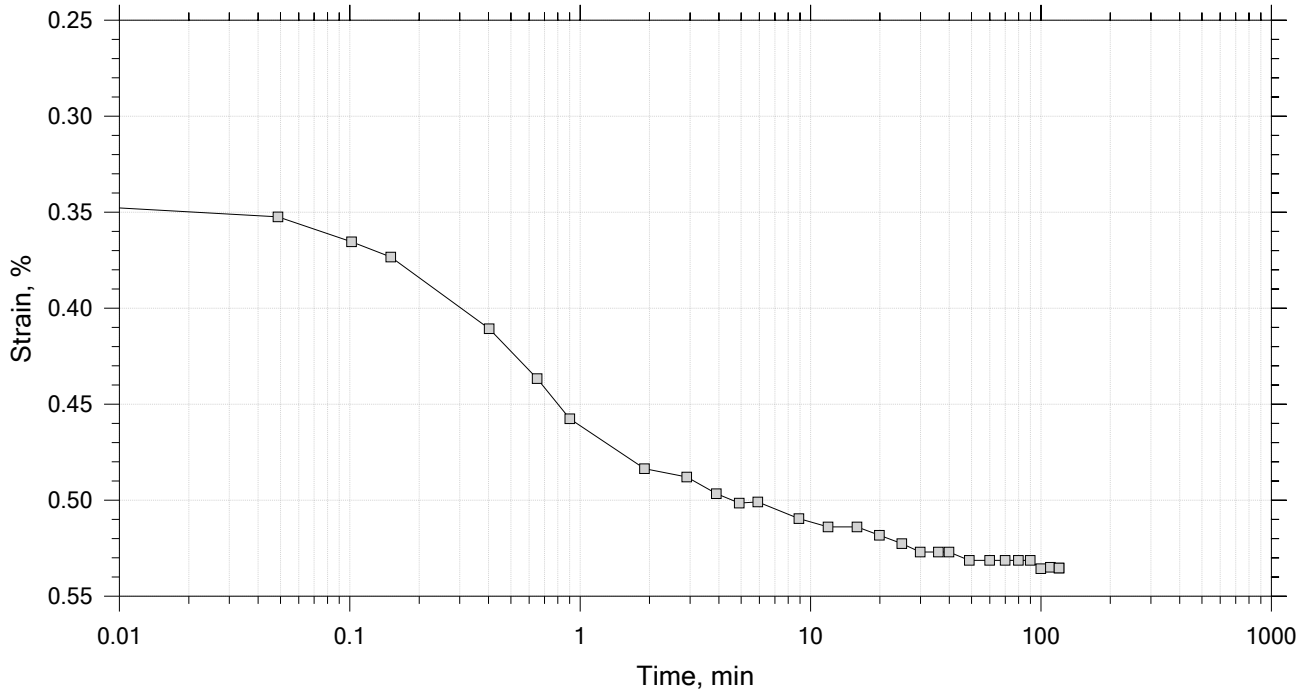


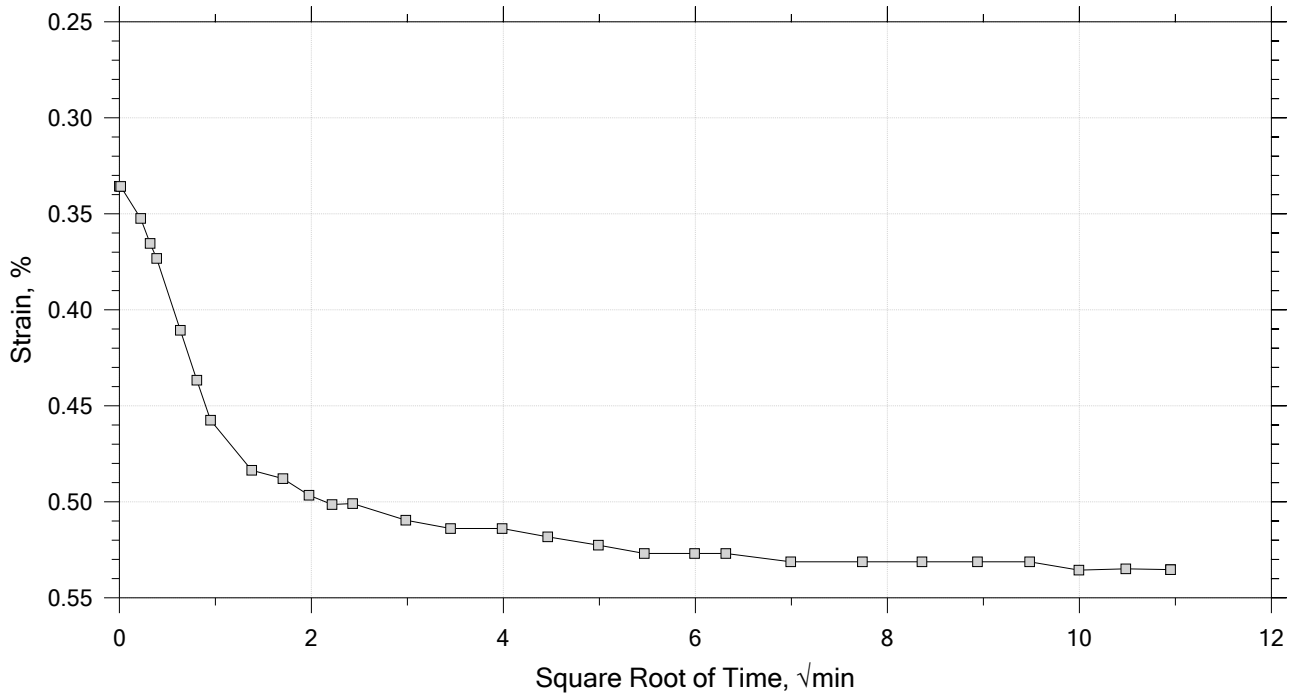




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf

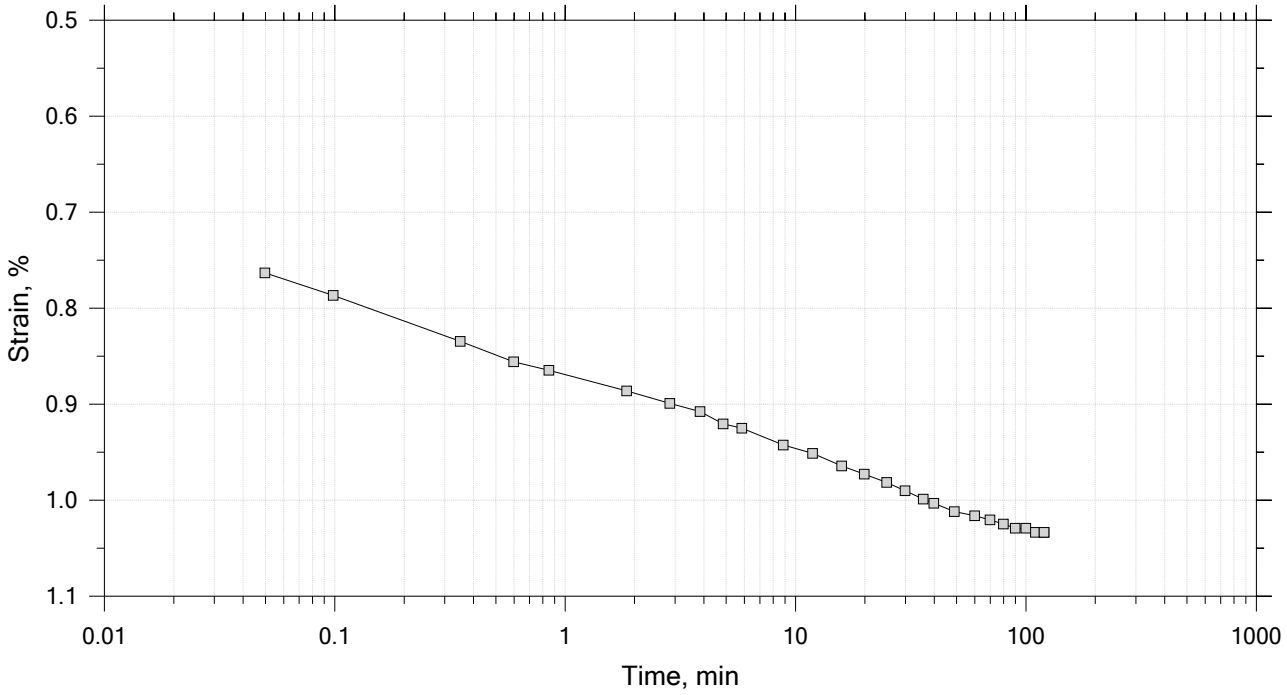


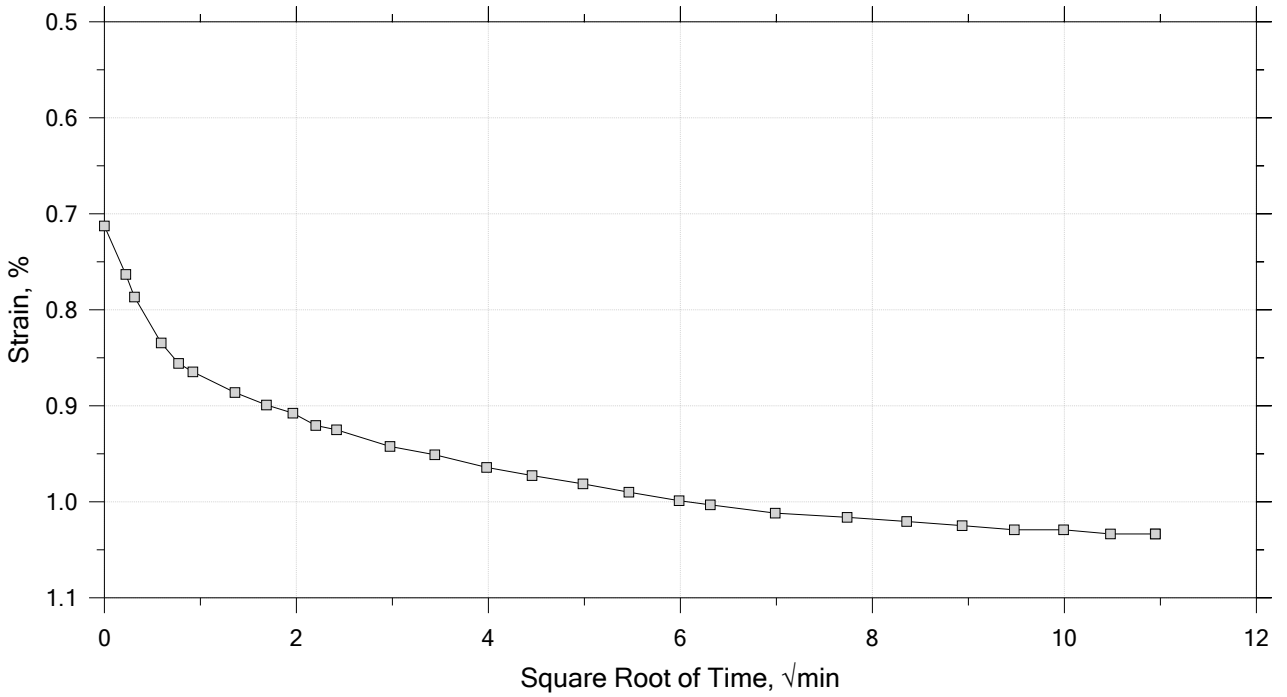




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.5 tsf

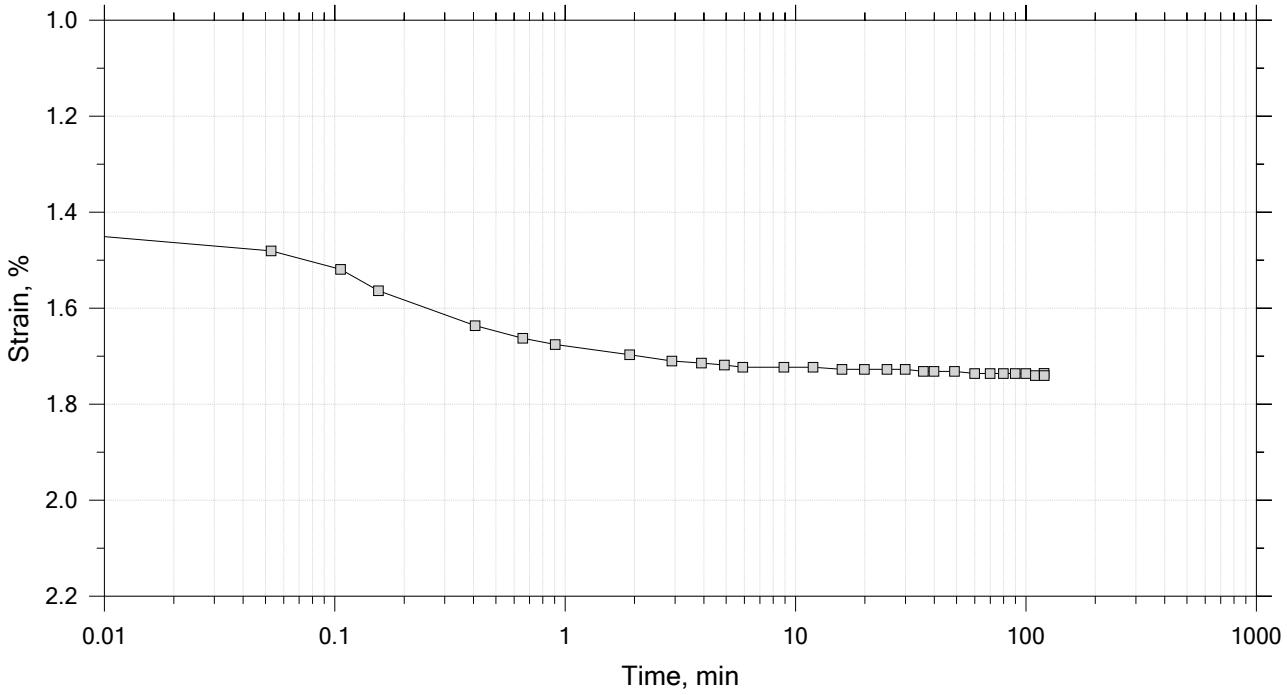


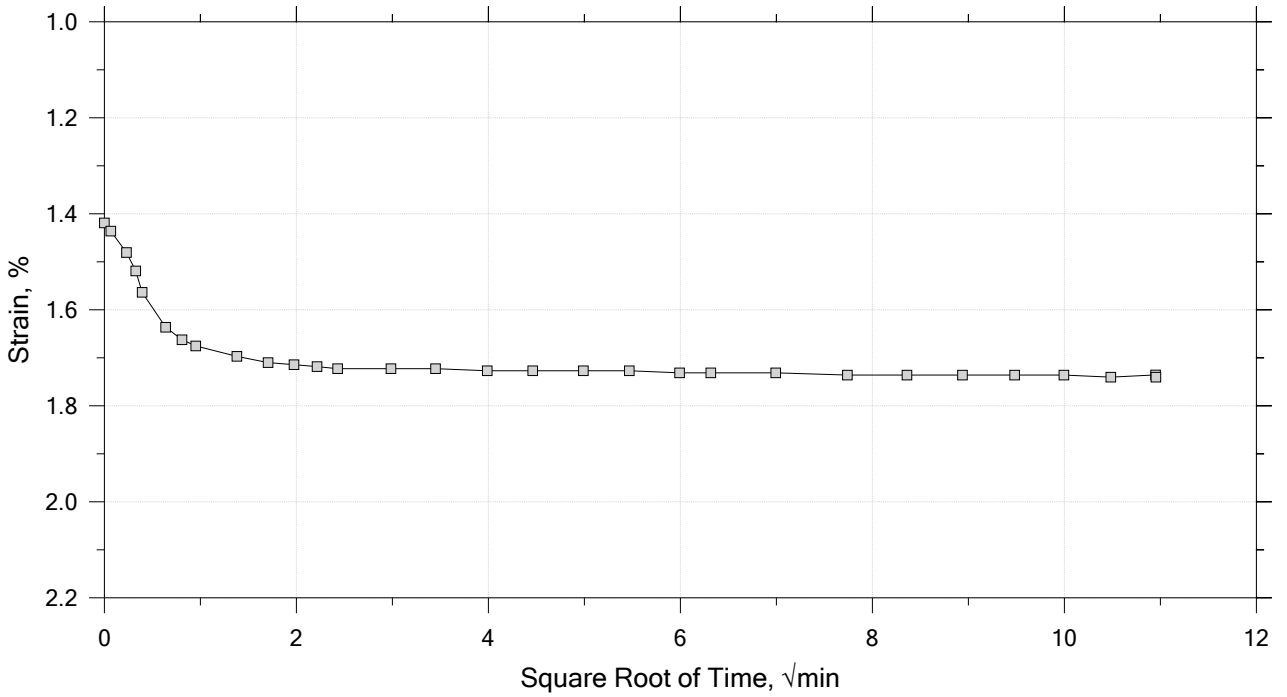




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15
Constant Load Step
Stress: 1 tsf



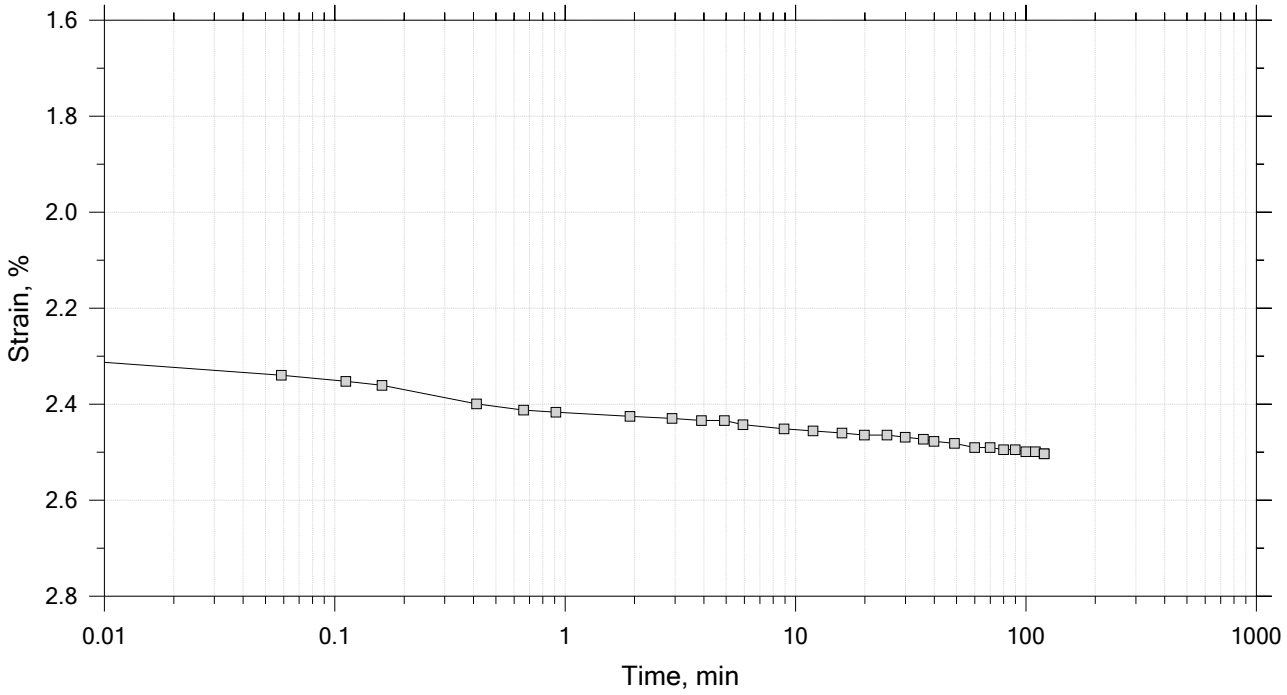

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

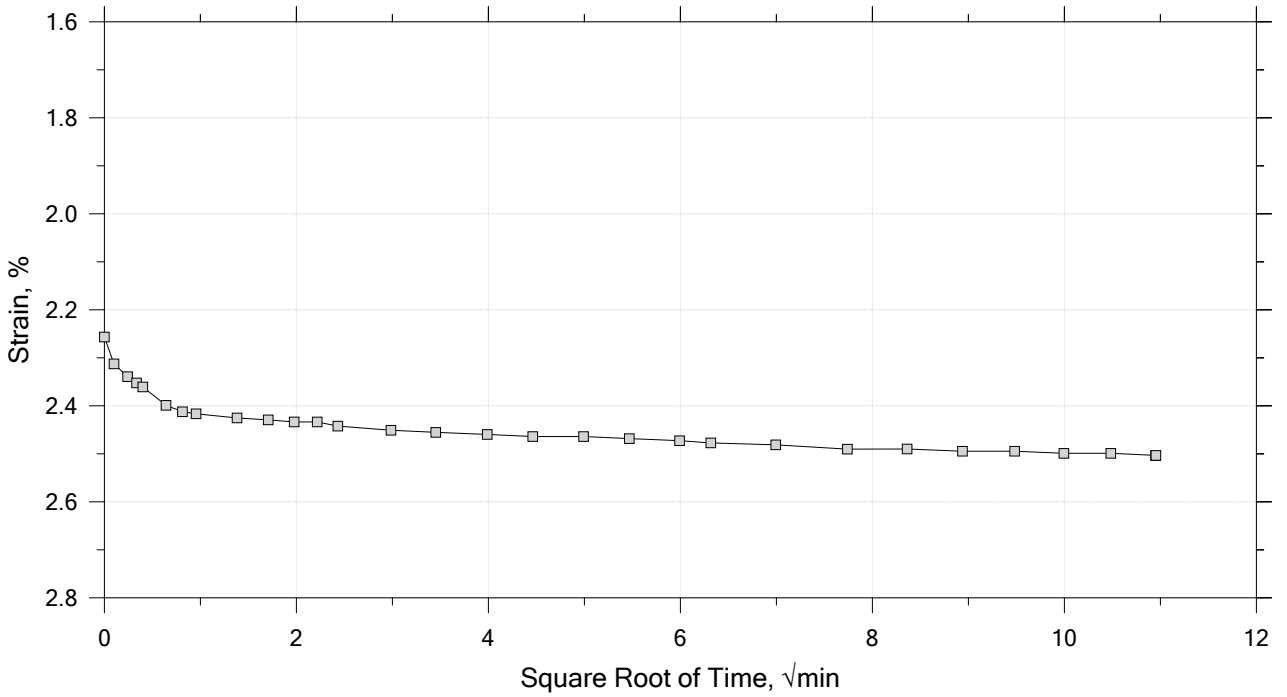
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf



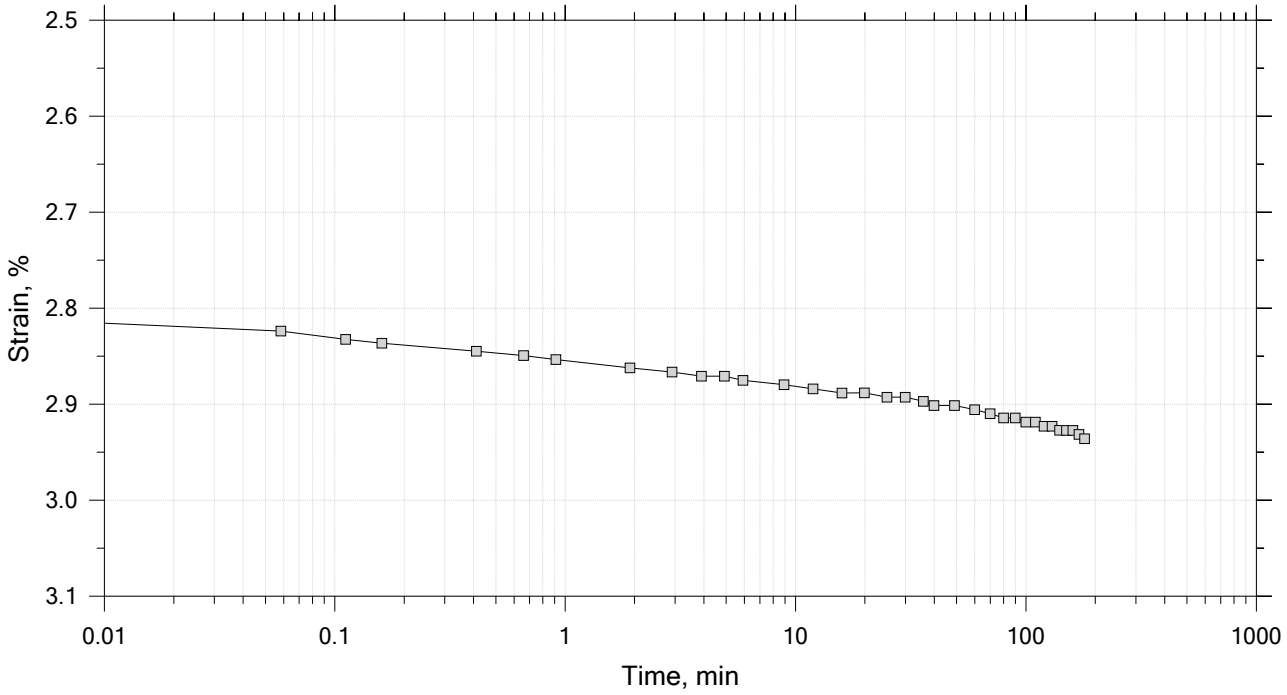

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

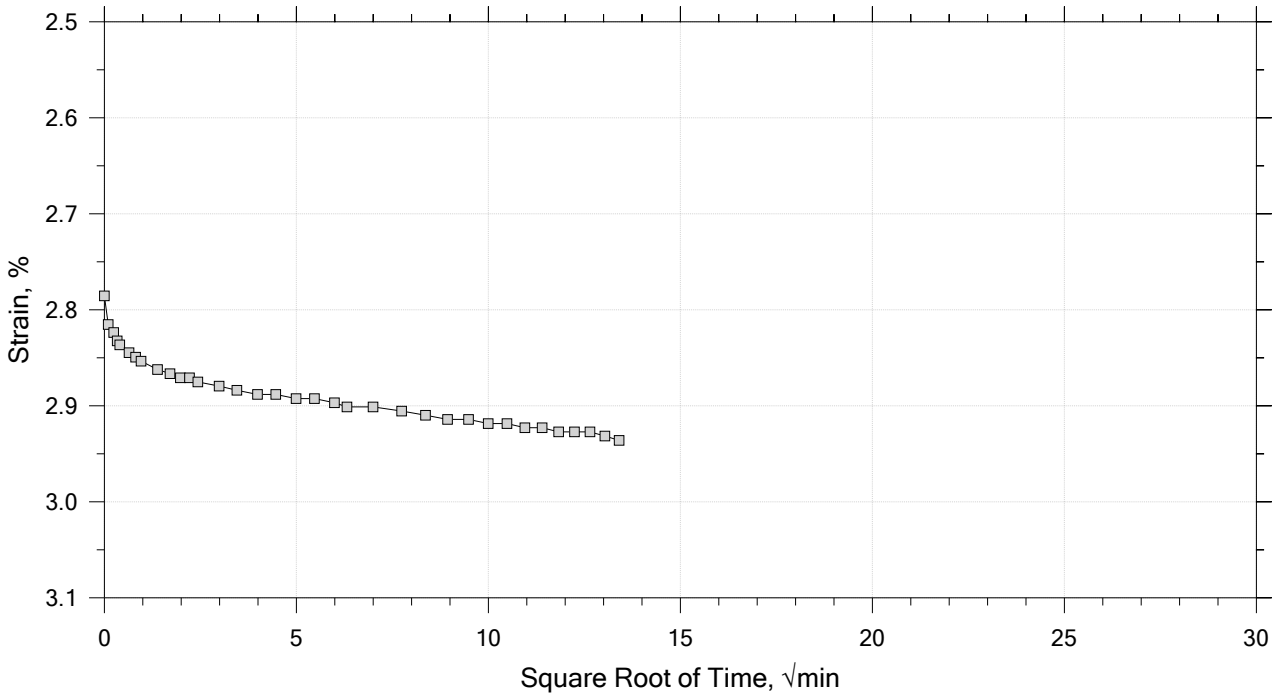
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf

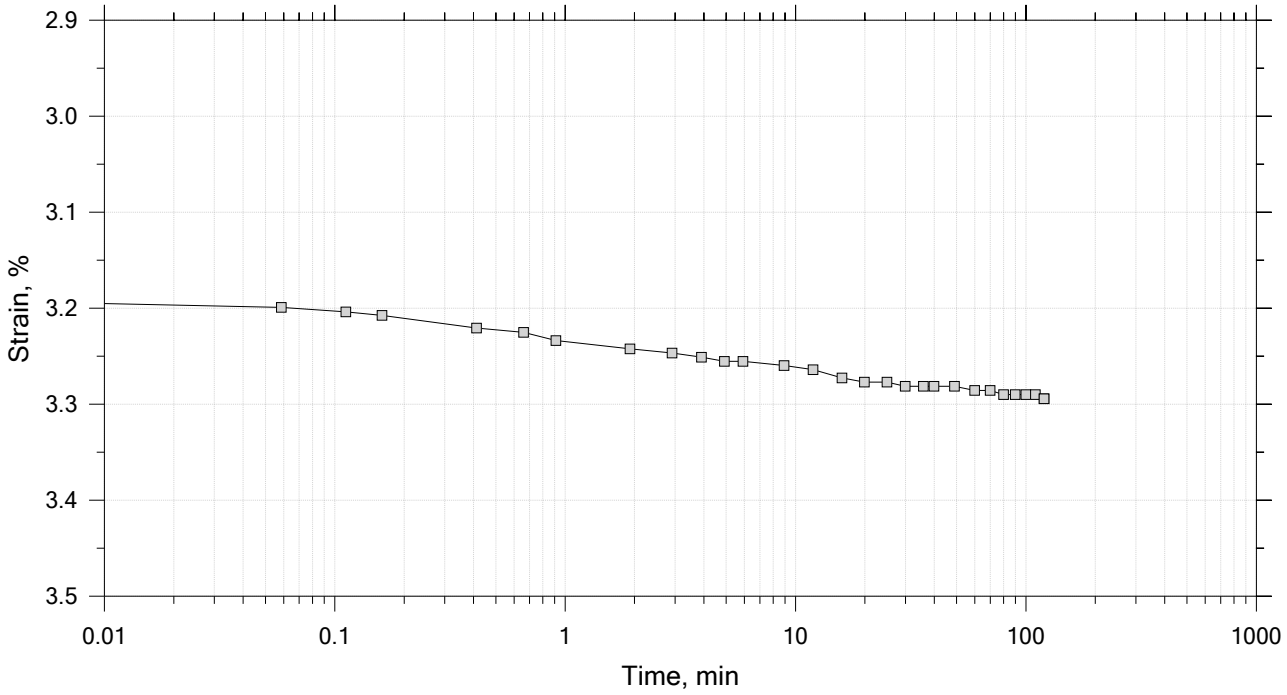


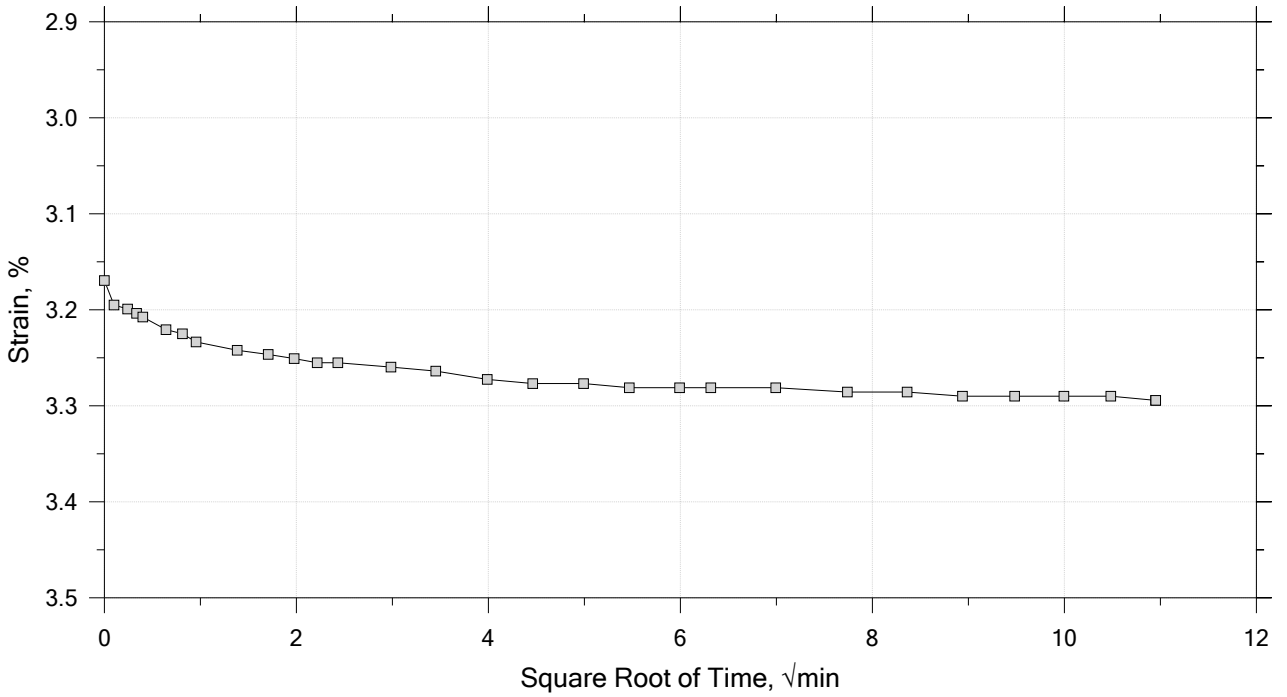




| | | | |
|---|---|---|---|
| GeoTesti EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf

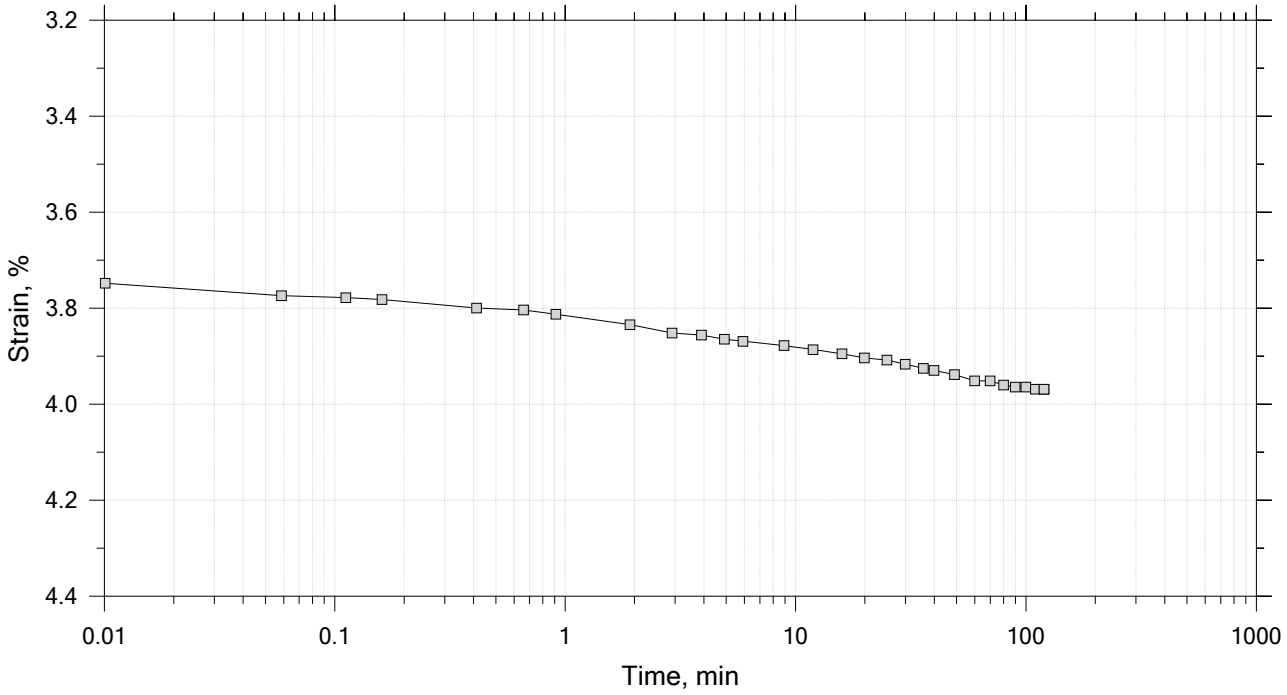


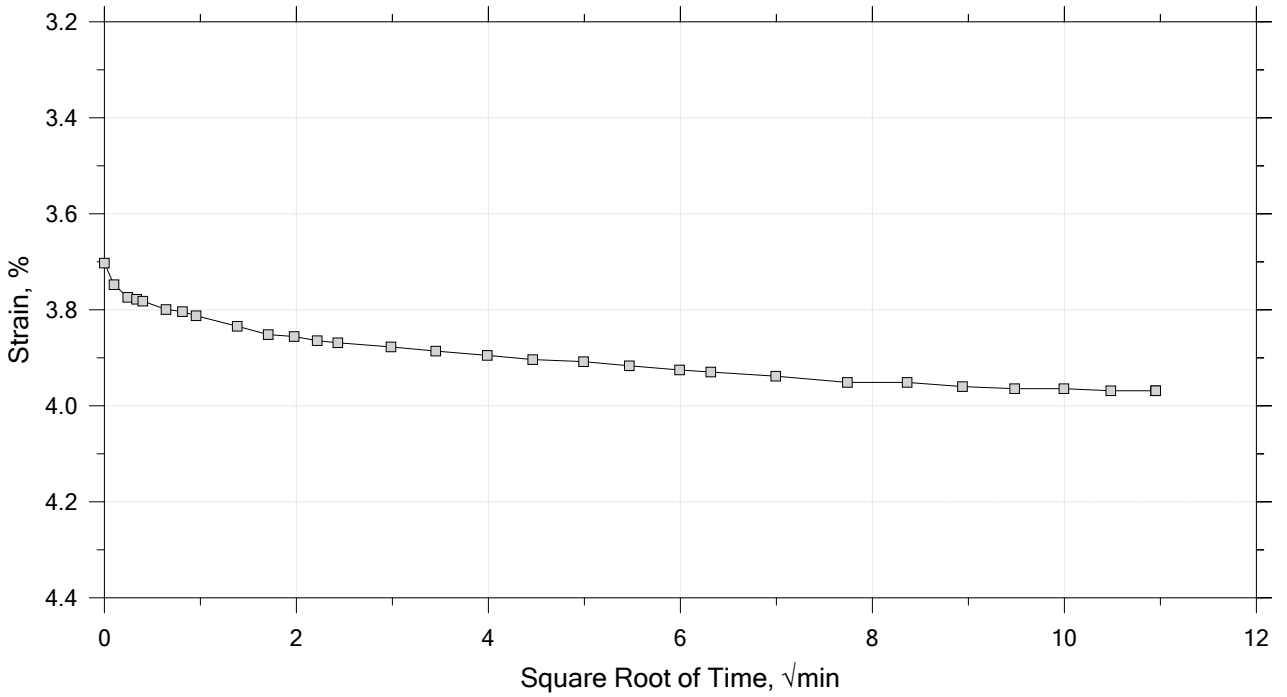




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

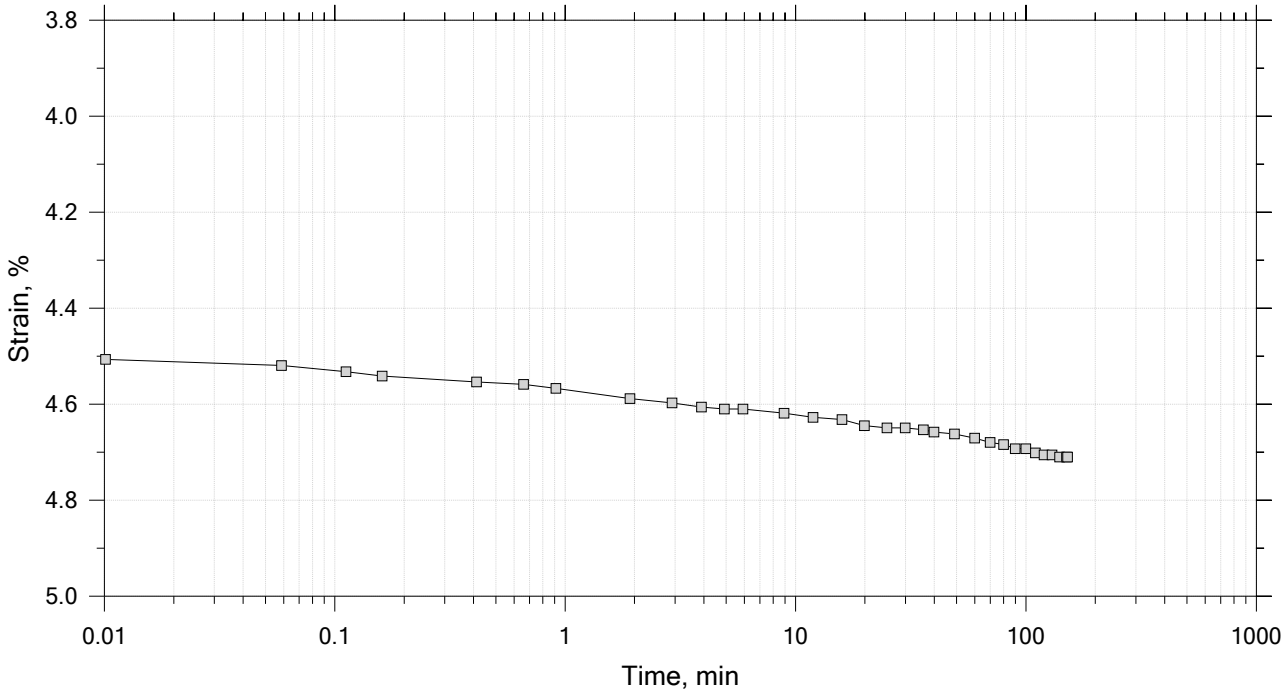


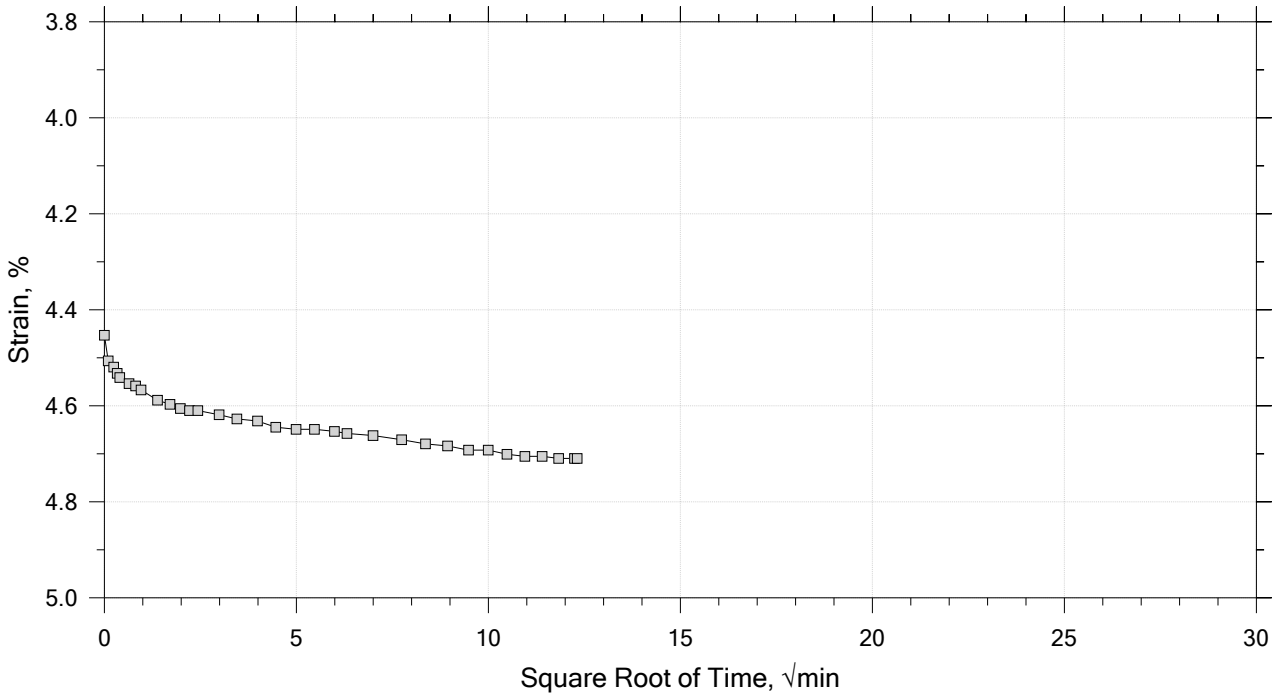




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf



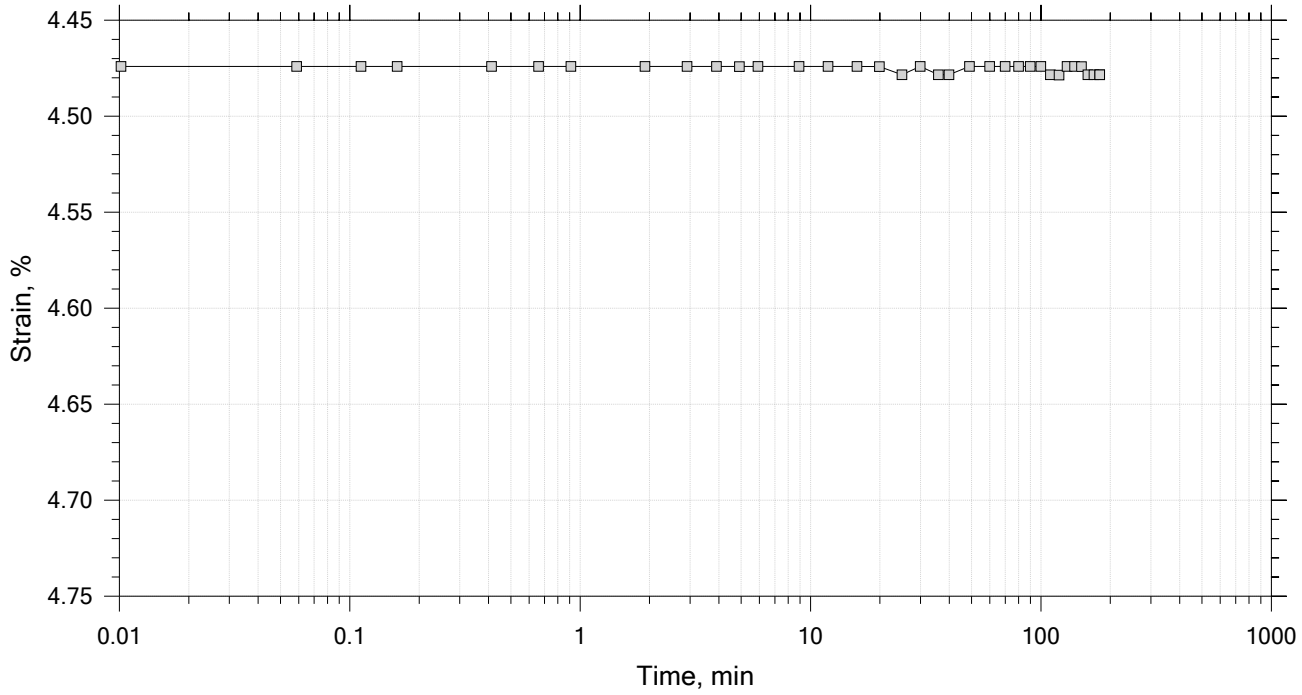

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

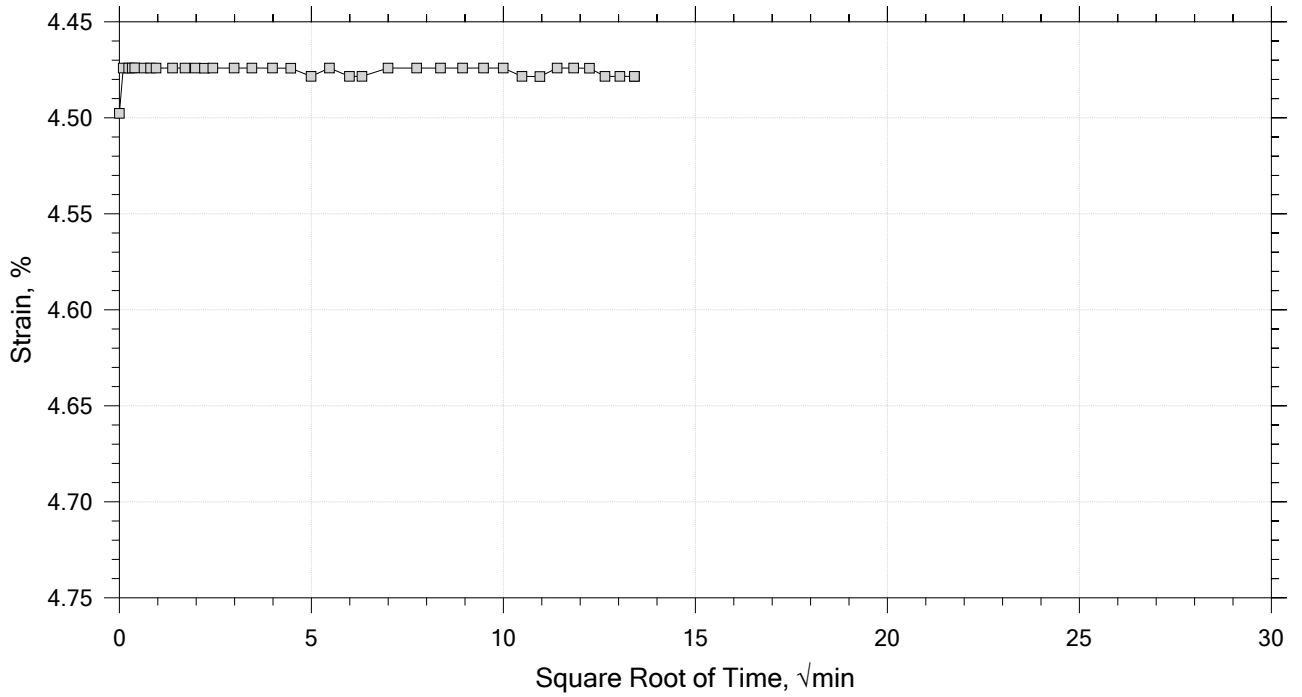
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15

Constant Load Step

Stress: 8 tsf

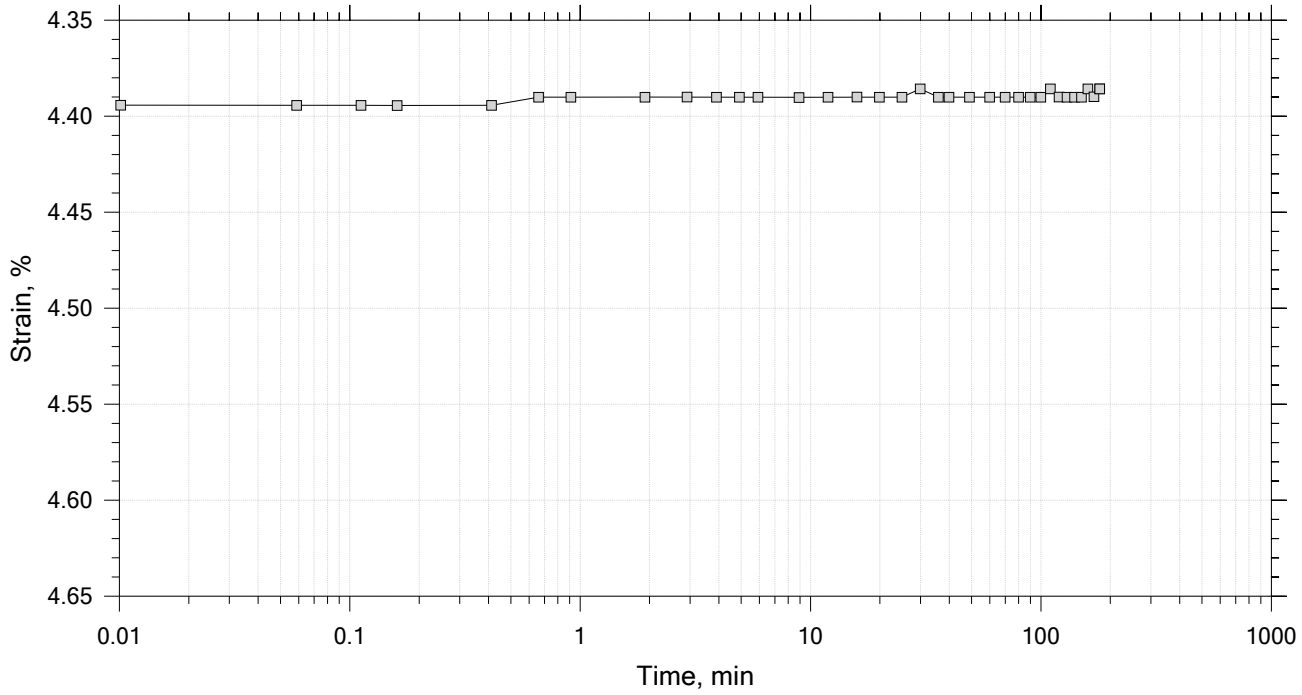


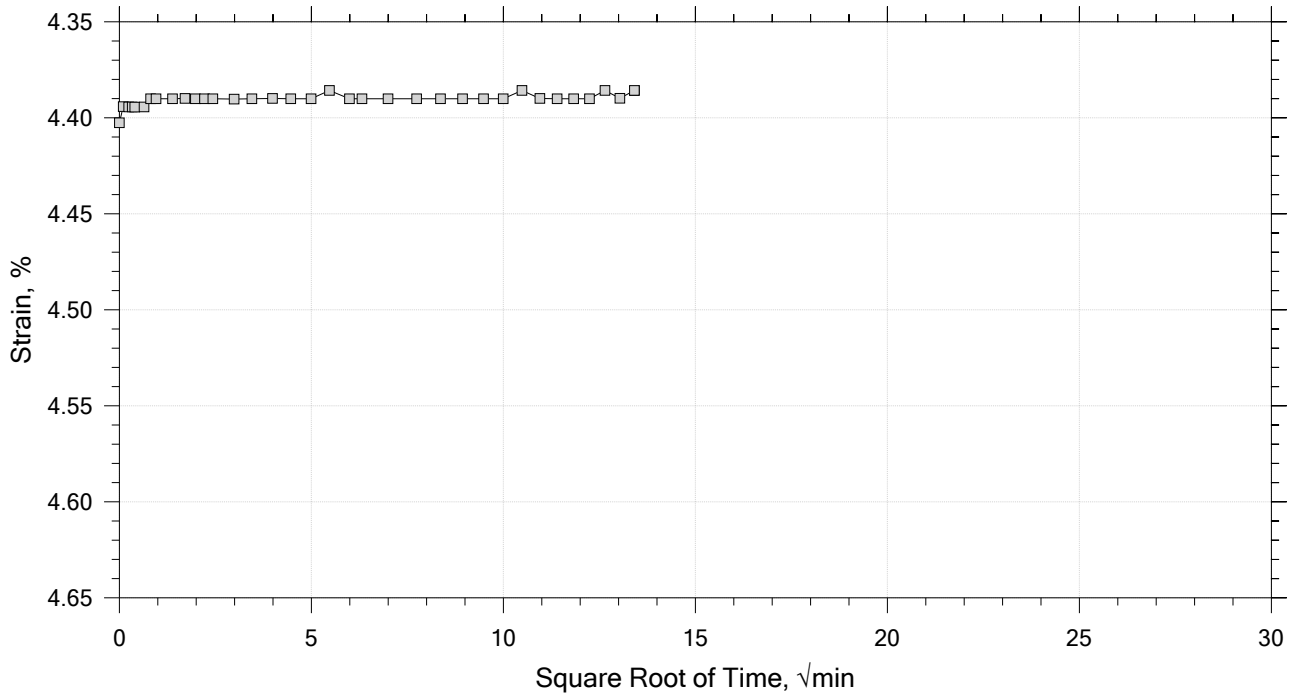




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

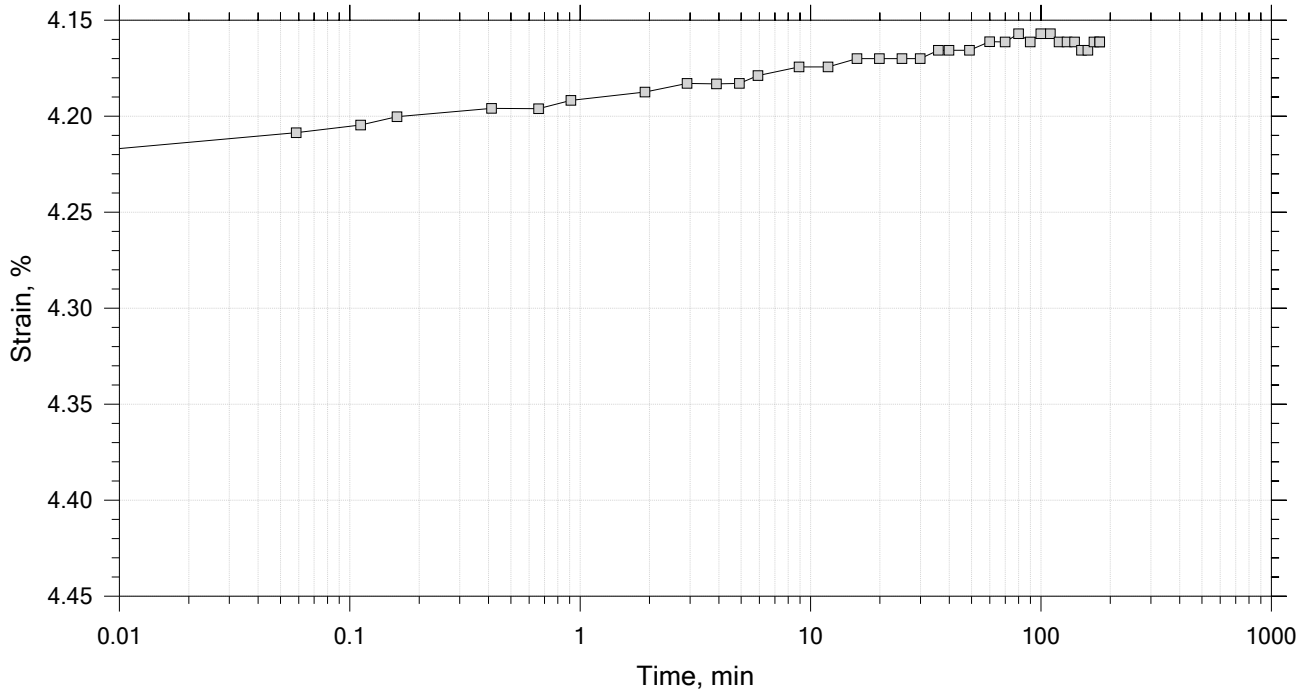


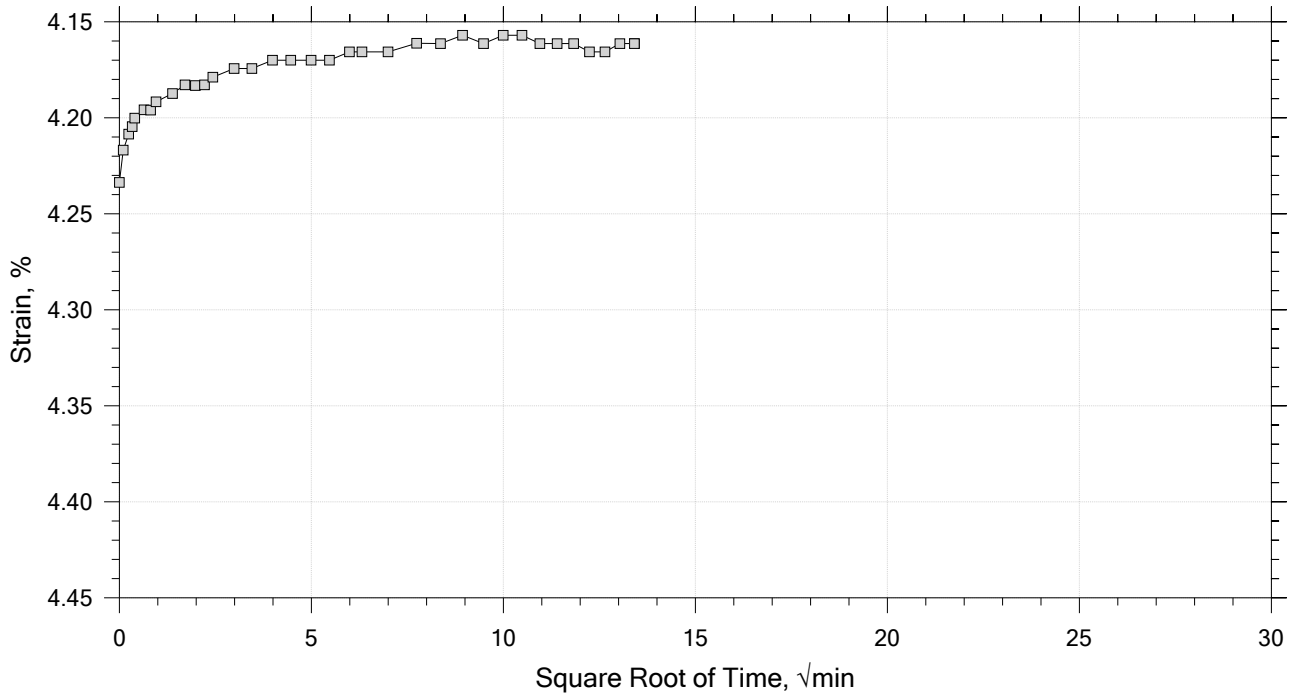




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

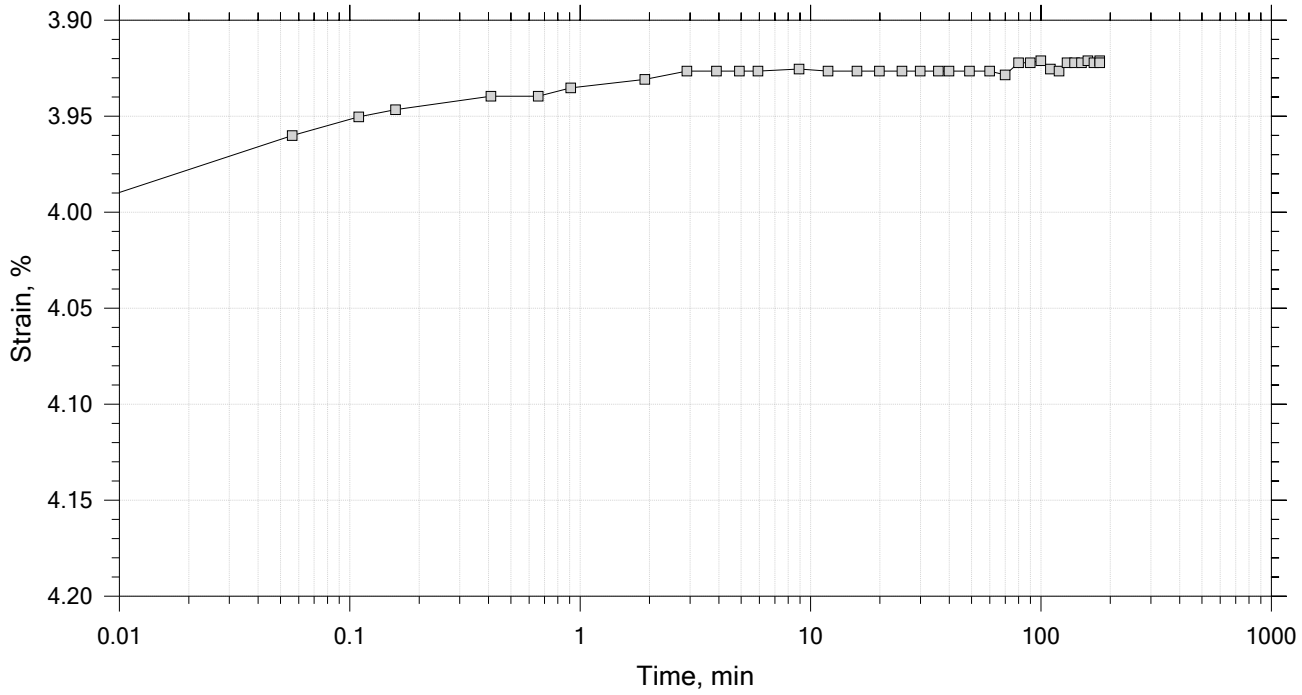


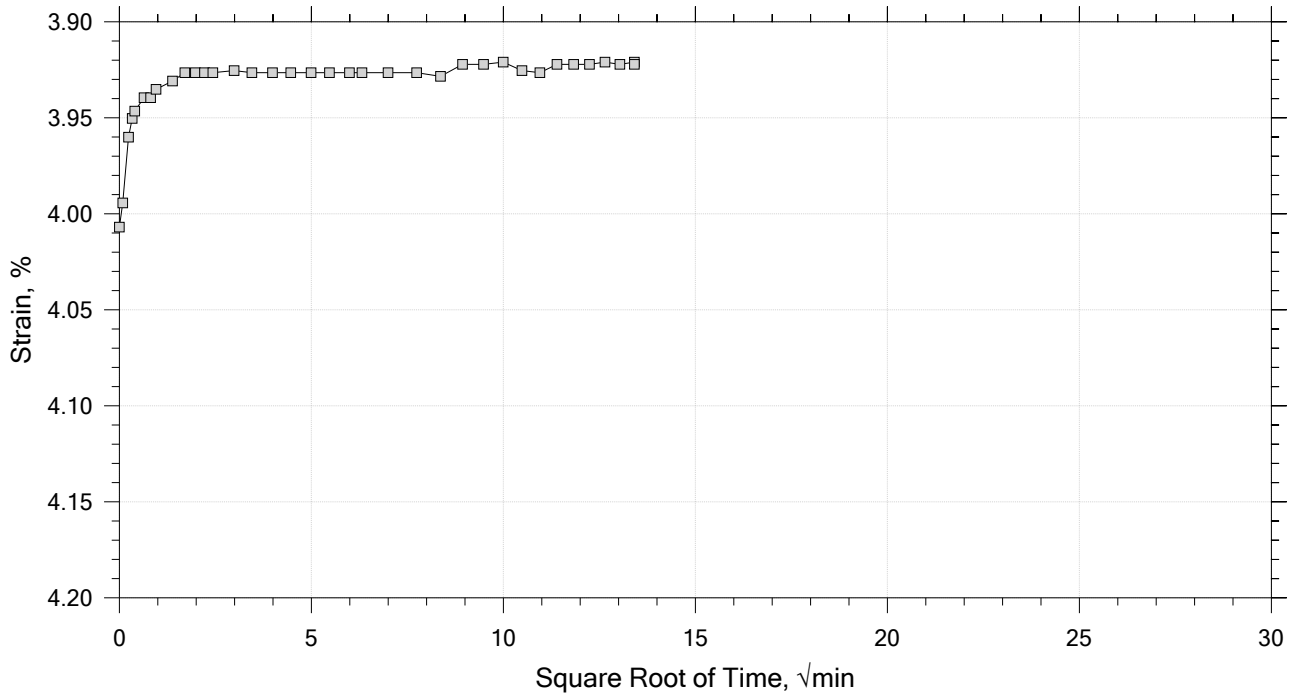




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

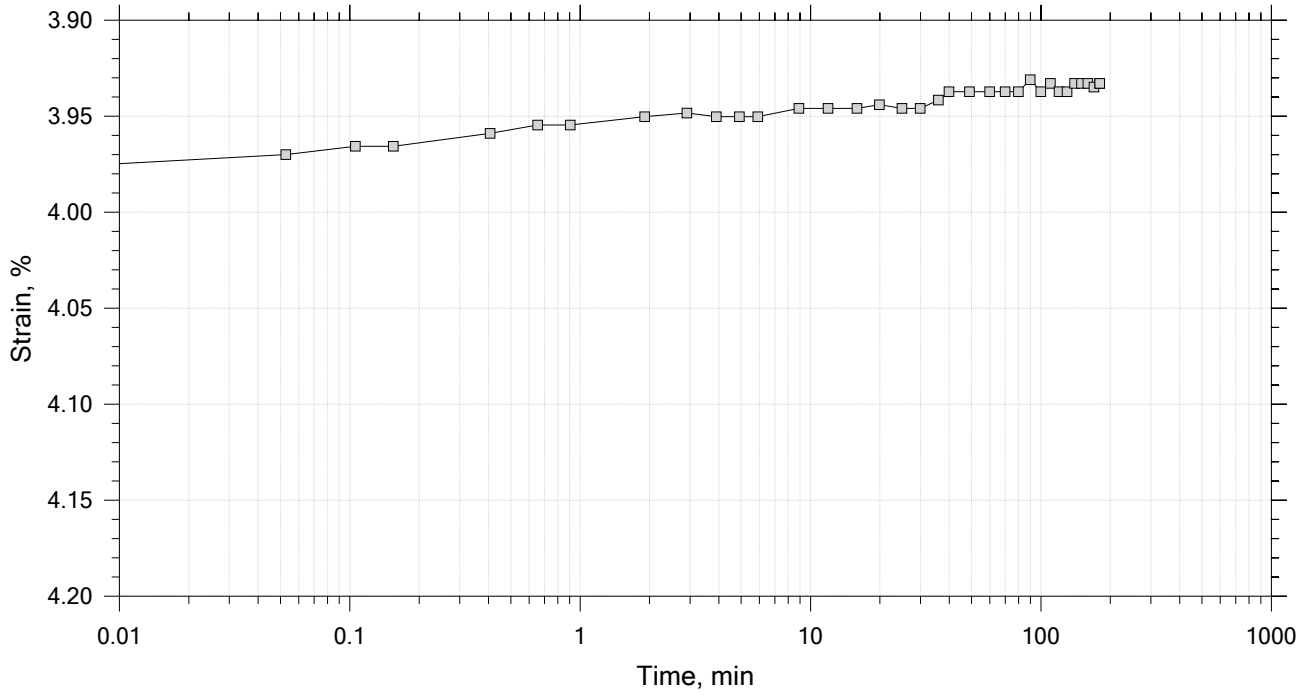


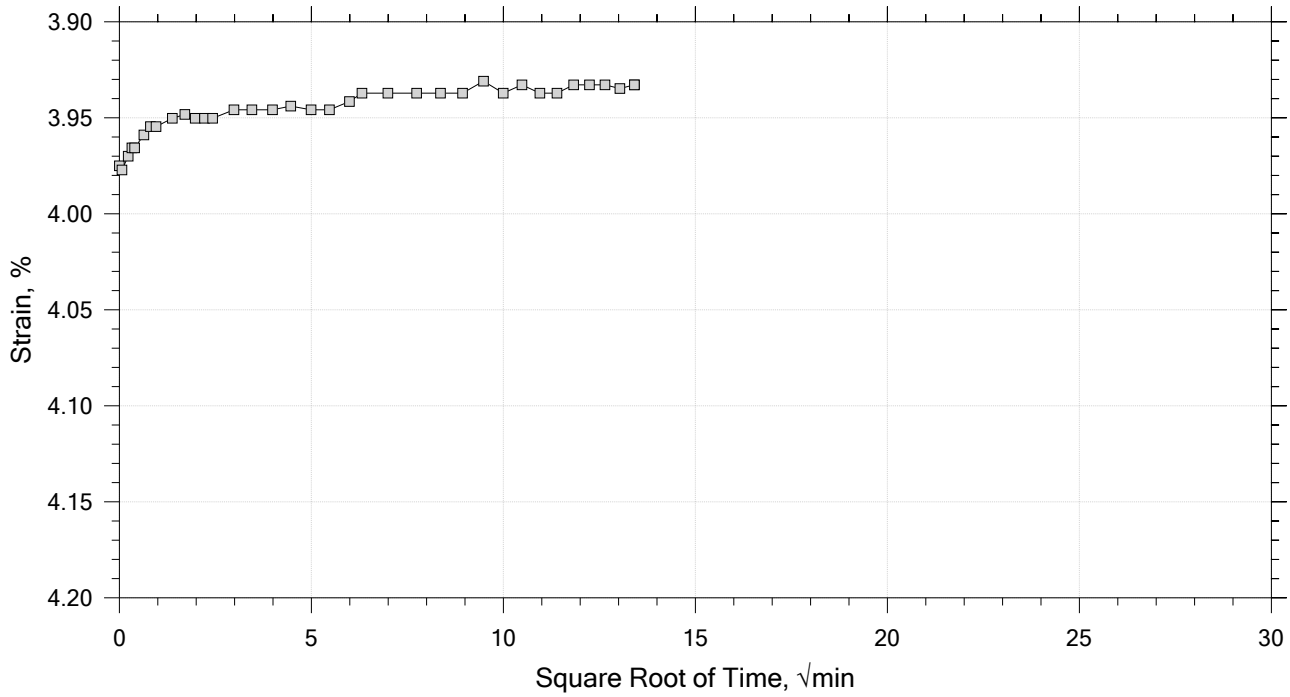




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.77 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 0.561 | Plastic Limit: --- |
| Final Height: 0.95 in | Final Void Ratio: 0.483 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | C-350 | RING | | A-2465 |
| Mass Container, gm | 8.39 | 109.53 | 109.53 | 8.16 |
| Mass Container + Wet Soil, gm | 138.52 | 277.67 | 277.1 | 175.22 |
| Mass Container + Dry Soil, gm | 118.18 | 252.21 | 252.21 | 150.41 |
| Mass Dry Soil, gm | 109.79 | 142.68 | 142.68 | 142.25 |
| Water Content, % | 18.53 | 17.84 | 17.44 | 17.44 |
| Void Ratio | --- | 0.56 | 0.48 | --- |
| Degree of Saturation, % | --- | 88.06 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 110.73 | 116.56 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0653 | 0.002490 | 0.557 | 0.249 | 0.000 | 0.00e+00 | 3.81e-02 | 0.00e+00 | 0.00e+00 |
| 2 | 0.125 | 0.002949 | 0.556 | 0.295 | 0.000 | 0.00e+00 | 7.68e-03 | 0.00e+00 | 0.00e+00 |
| 3 | 0.250 | 0.005354 | 0.553 | 0.535 | 0.000 | 0.00e+00 | 1.92e-02 | 0.00e+00 | 0.00e+00 |
| 4 | 0.500 | 0.01034 | 0.545 | 1.03 | 0.000 | 0.00e+00 | 1.99e-02 | 0.00e+00 | 0.00e+00 |
| 5 | 1.00 | 0.01740 | 0.534 | 1.74 | 0.190 | 2.92e-05 | 1.41e-02 | 1.11e-03 | 0.00e+00 |
| 6 | 2.00 | 0.02503 | 0.522 | 2.50 | 0.000 | 0.00e+00 | 7.63e-03 | 0.00e+00 | 0.00e+00 |
| 7 | 4.00 | 0.02936 | 0.515 | 2.94 | 0.000 | 0.00e+00 | 2.16e-03 | 0.00e+00 | 0.00e+00 |
| 8 | 8.00 | 0.03294 | 0.510 | 3.29 | 0.000 | 0.00e+00 | 8.96e-04 | 0.00e+00 | 0.00e+00 |
| 9 | 16.0 | 0.03969 | 0.499 | 3.97 | 0.000 | 0.00e+00 | 8.43e-04 | 0.00e+00 | 0.00e+00 |
| 10 | 32.0 | 0.04710 | 0.487 | 4.71 | 0.000 | 0.00e+00 | 4.63e-04 | 0.00e+00 | 0.00e+00 |
| 11 | 8.00 | 0.04478 | 0.491 | 4.48 | 0.000 | 0.00e+00 | 9.64e-05 | 0.00e+00 | 0.00e+00 |
| 12 | 2.00 | 0.04386 | 0.493 | 4.39 | 0.000 | 0.00e+00 | 1.54e-04 | 0.00e+00 | 0.00e+00 |
| 13 | 0.500 | 0.04161 | 0.496 | 4.16 | 0.000 | 0.00e+00 | 1.50e-03 | 0.00e+00 | 0.00e+00 |
| 14 | 0.125 | 0.03922 | 0.500 | 3.92 | 0.000 | 0.00e+00 | 6.38e-03 | 0.00e+00 | 0.00e+00 |
| 15 | 0.0625 | 0.03933 | 0.500 | 3.93 | 0.000 | 0.00e+00 | -1.71e-03 | -0.00e+00 | 0.00e+00 |

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| | Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| | Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| | Description: Moist, light brown sandy clay | | |
| | Remarks: System Y, Swell Pressure = 0.0653 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Square Root of Time Coefficients

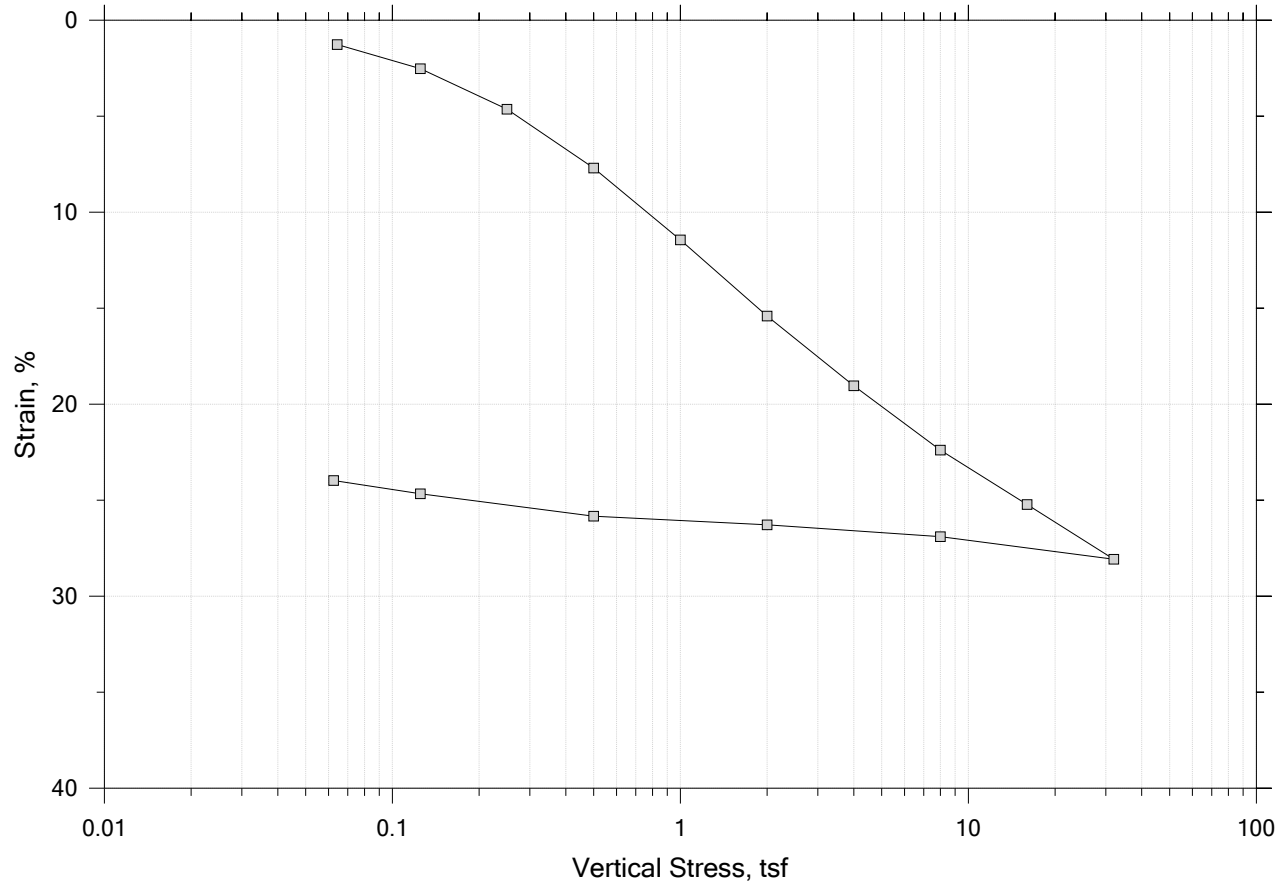
| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0653 | 0.002490 | 0.557 | 0.249 | 3.227 | 7.59e-06 | 3.81e-02 | 7.80e-04 |
| 2 | 0.125 | 0.002949 | 0.556 | 0.295 | 12.428 | 1.96e-06 | 7.68e-03 | 4.07e-05 |
| 3 | 0.250 | 0.005354 | 0.553 | 0.535 | 2.426 | 1.00e-05 | 1.92e-02 | 5.20e-04 |
| 4 | 0.500 | 0.01034 | 0.545 | 1.03 | 12.207 | 1.98e-06 | 1.99e-02 | 1.06e-04 |
| 5 | 1.00 | 0.01740 | 0.534 | 1.74 | 0.877 | 2.72e-05 | 1.41e-02 | 1.04e-03 |
| 6 | 2.00 | 0.02503 | 0.522 | 2.50 | 15.578 | 1.51e-06 | 7.63e-03 | 3.11e-05 |
| 7 | 4.00 | 0.02936 | 0.515 | 2.94 | 39.909 | 5.82e-07 | 2.16e-03 | 3.39e-06 |
| 8 | 8.00 | 0.03294 | 0.510 | 3.29 | 29.911 | 7.70e-07 | 8.96e-04 | 1.86e-06 |
| 9 | 16.0 | 0.03969 | 0.499 | 3.97 | 38.679 | 5.89e-07 | 8.43e-04 | 1.34e-06 |
| 10 | 32.0 | 0.04710 | 0.487 | 4.71 | 24.912 | 9.01e-07 | 4.63e-04 | 1.13e-06 |
| 11 | 8.00 | 0.04478 | 0.491 | 4.48 | 0.000 | 0.00e+00 | 9.64e-05 | 0.00e+00 |
| 12 | 2.00 | 0.04386 | 0.493 | 4.39 | 0.000 | 0.00e+00 | 1.54e-04 | 0.00e+00 |
| 13 | 0.500 | 0.04161 | 0.496 | 4.16 | 8.912 | 2.52e-06 | 1.50e-03 | 1.02e-05 |
| 14 | 0.125 | 0.03922 | 0.500 | 3.92 | 0.410 | 5.51e-05 | 6.38e-03 | 9.48e-04 |
| 15 | 0.0625 | 0.03933 | 0.500 | 3.93 | 86.782 | 2.61e-07 | -1.71e-03 | -1.20e-06 |

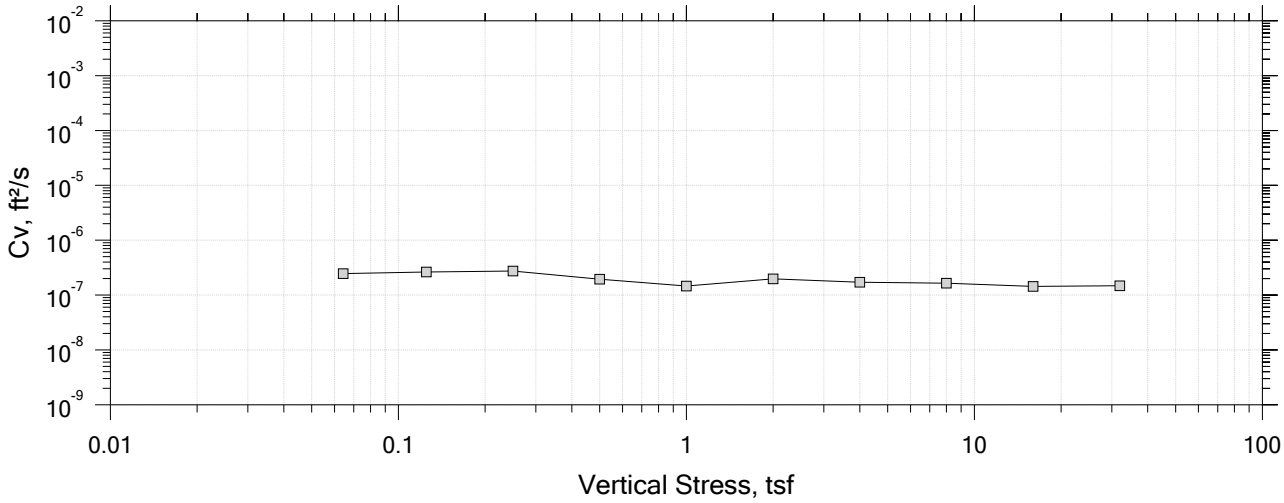
GeoTesting EXPRESS

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB033 | Tested By: md | Checked By: njh |
| Sample No.: SL0650 | Test Date: 12/21/18 | Depth: 5-7 ft |
| Test No.: IP-1 | Sample Type: intact | Elevation: --- |
| Description: Moist, light brown sandy clay | | |
| Remarks: System Y, Swell Pressure = 0.0653 tsf | | |
| Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report



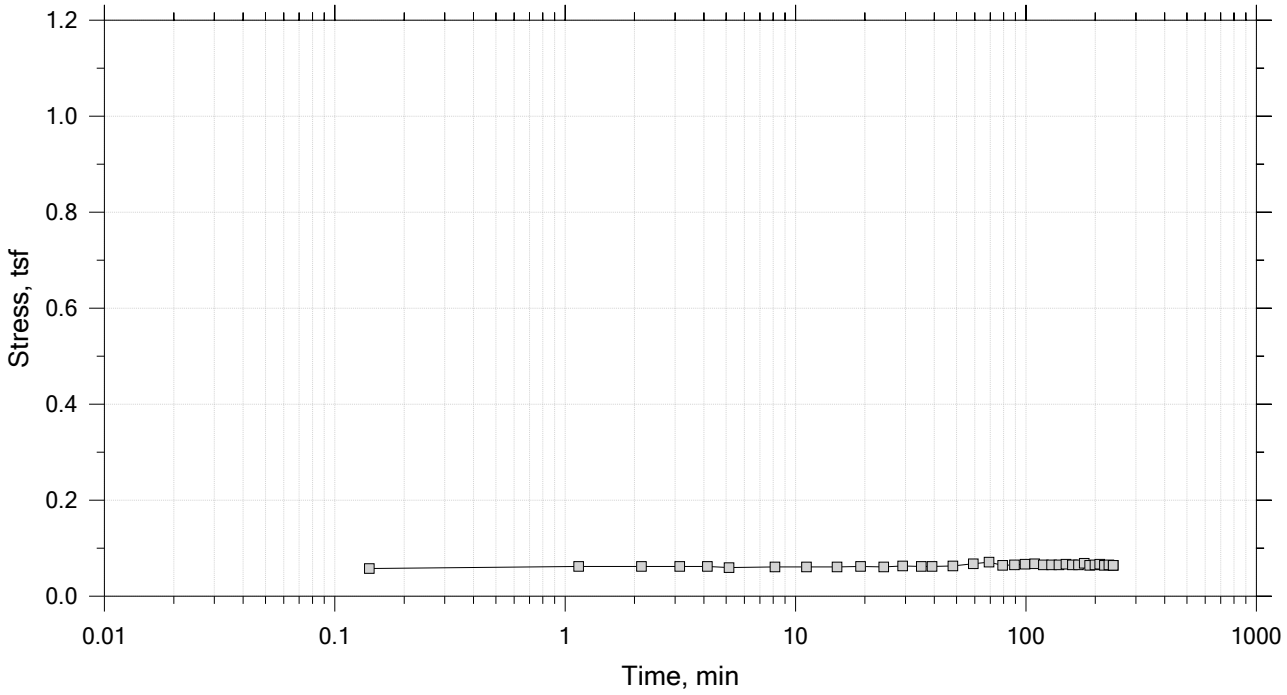

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |
| | Displacement at End of Increment | | |

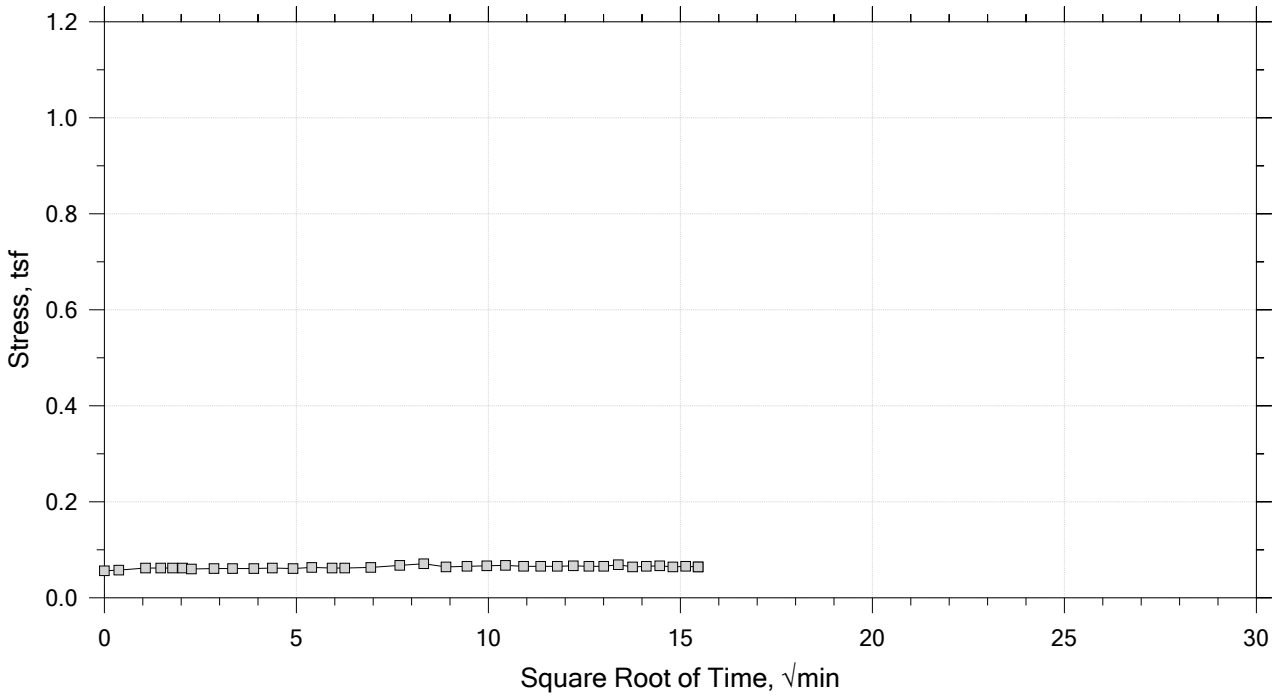
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0643 tsf

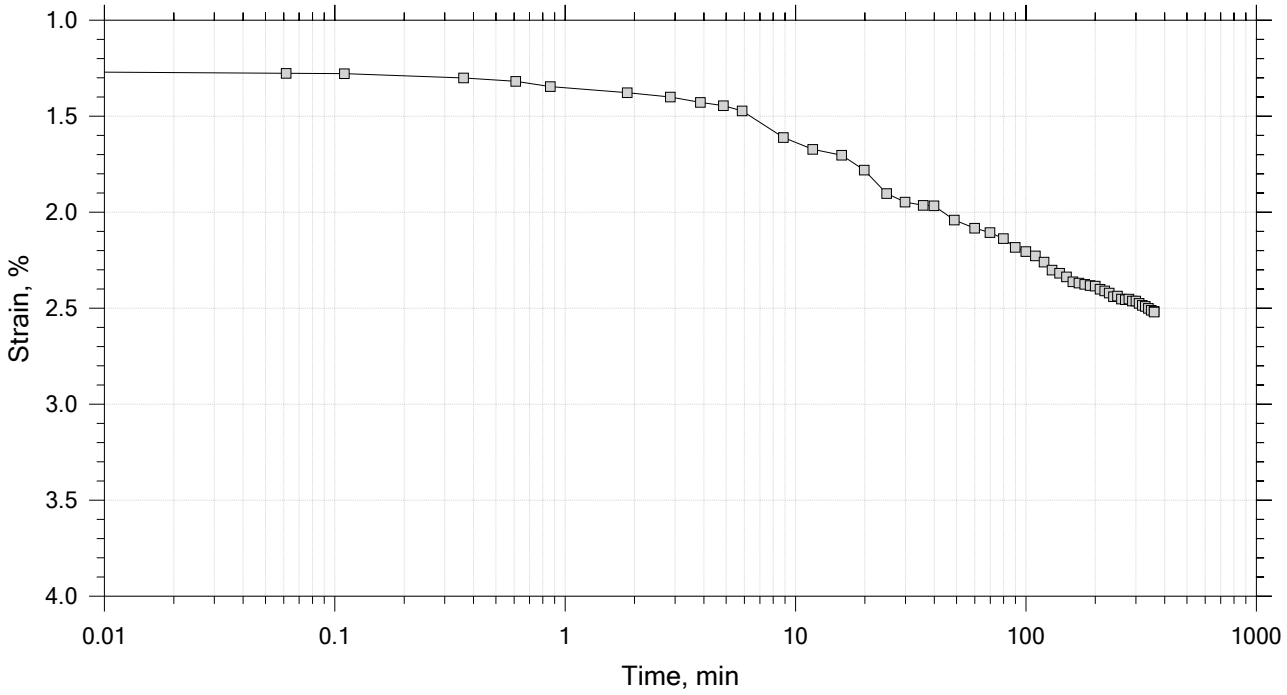


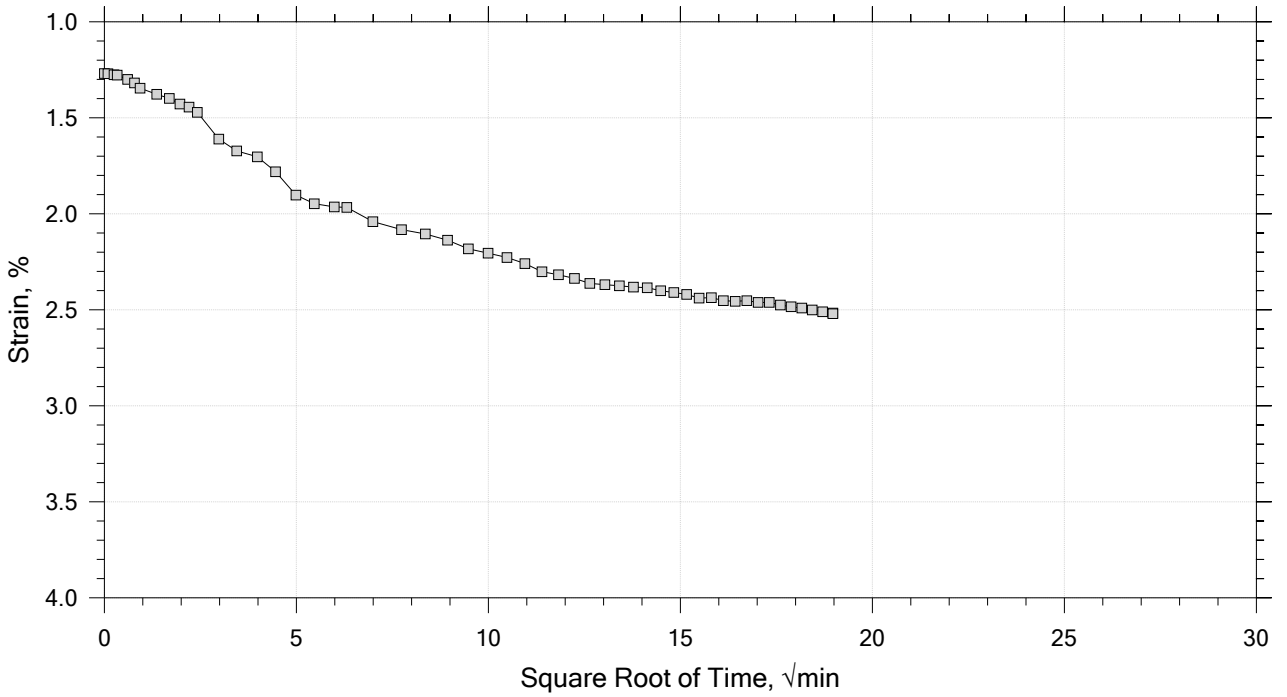




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

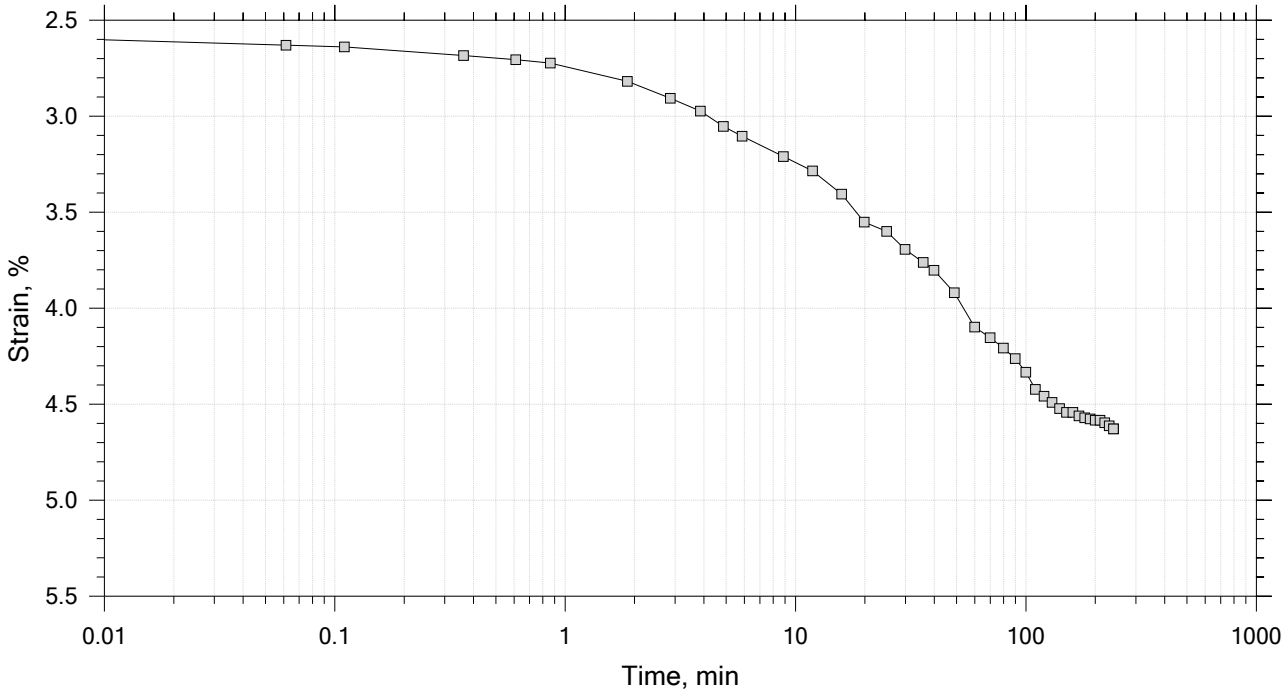


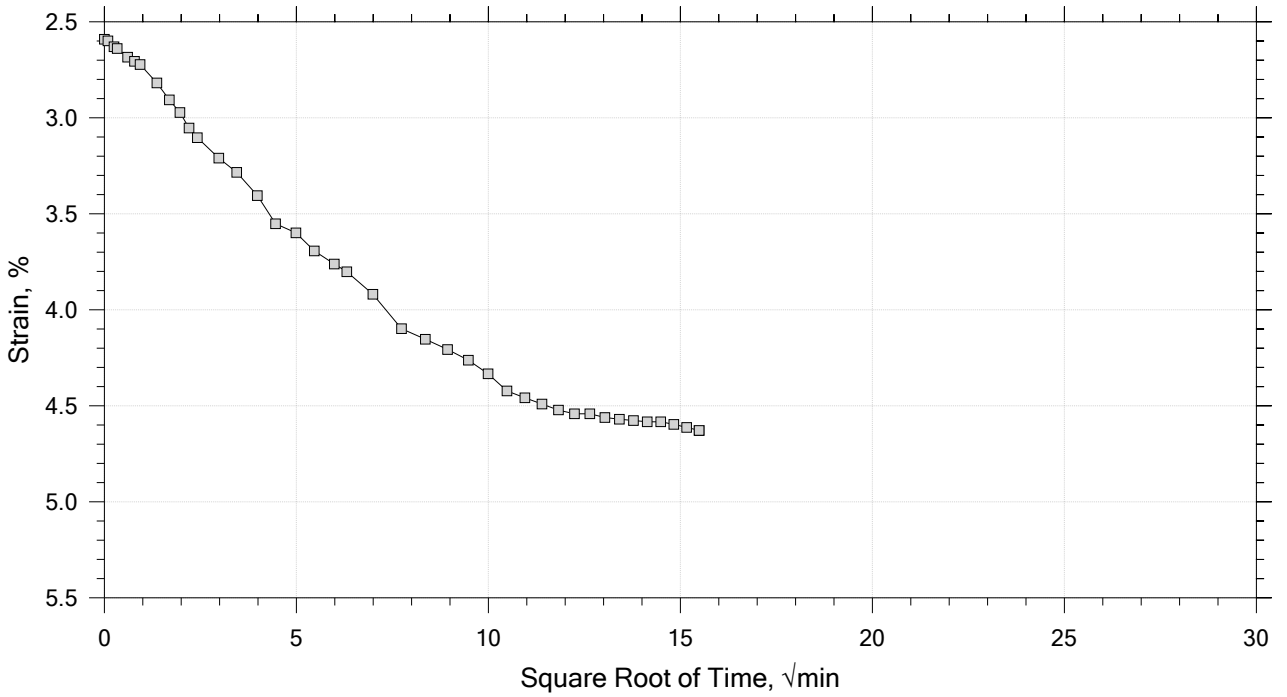




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf

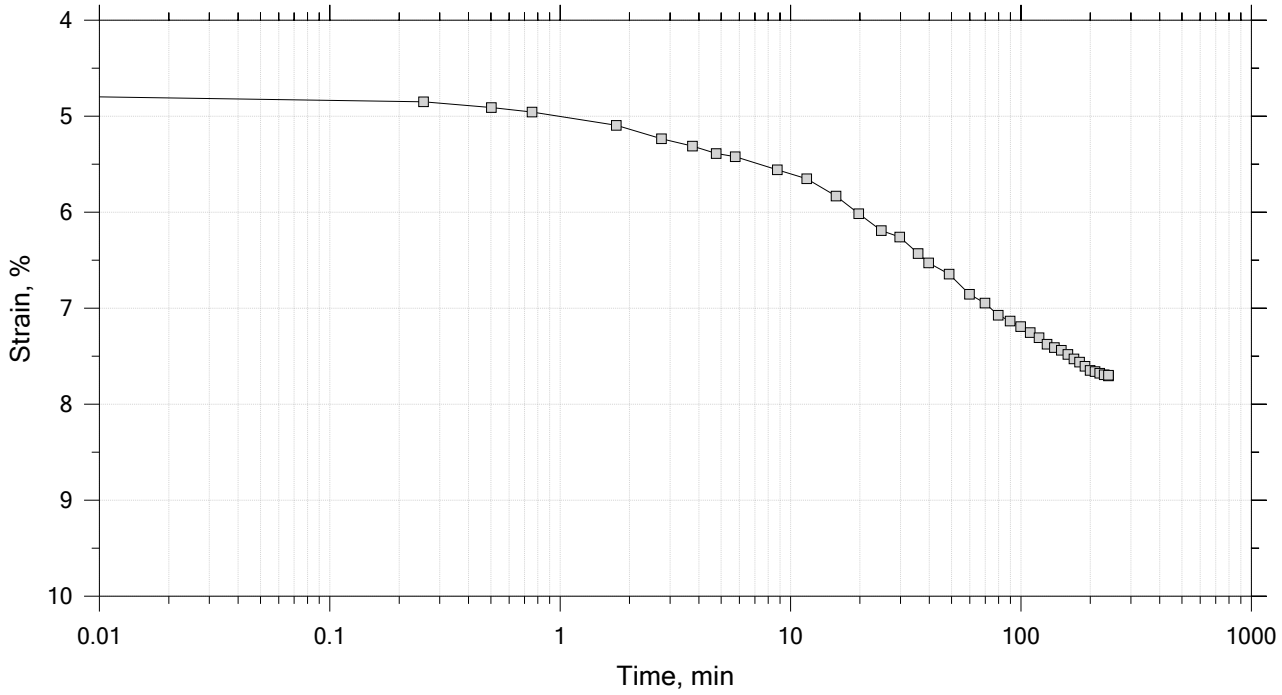


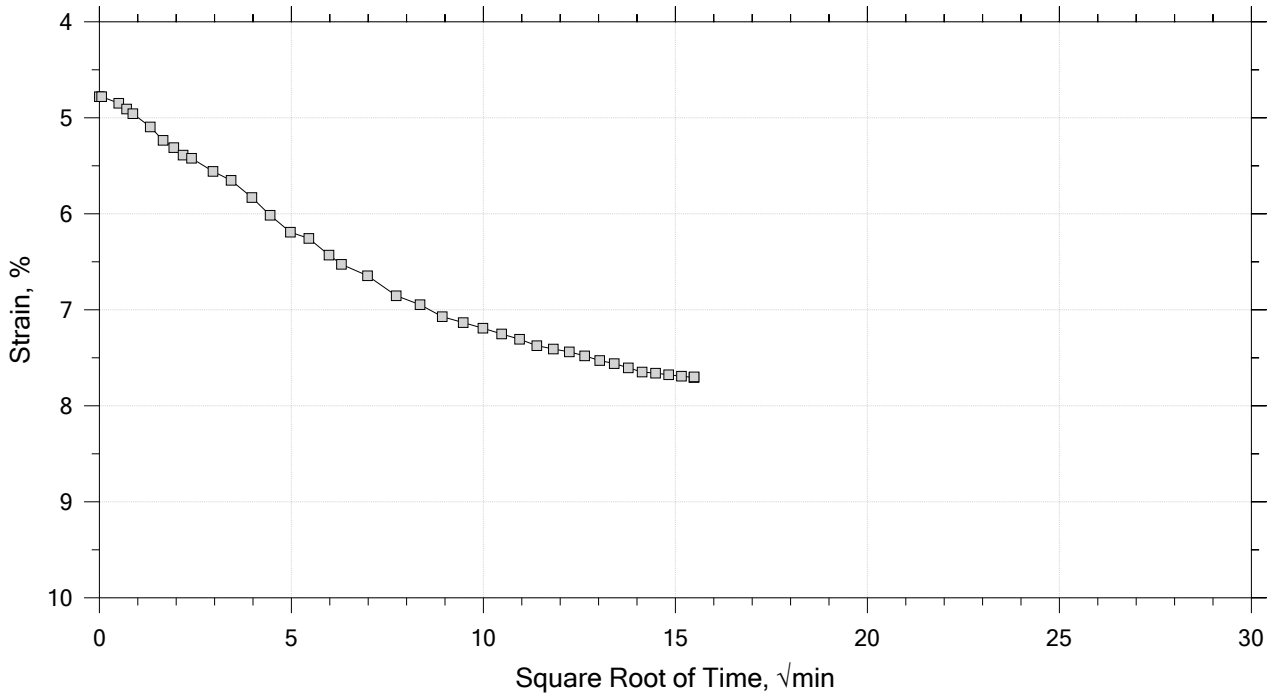




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.5 tsf



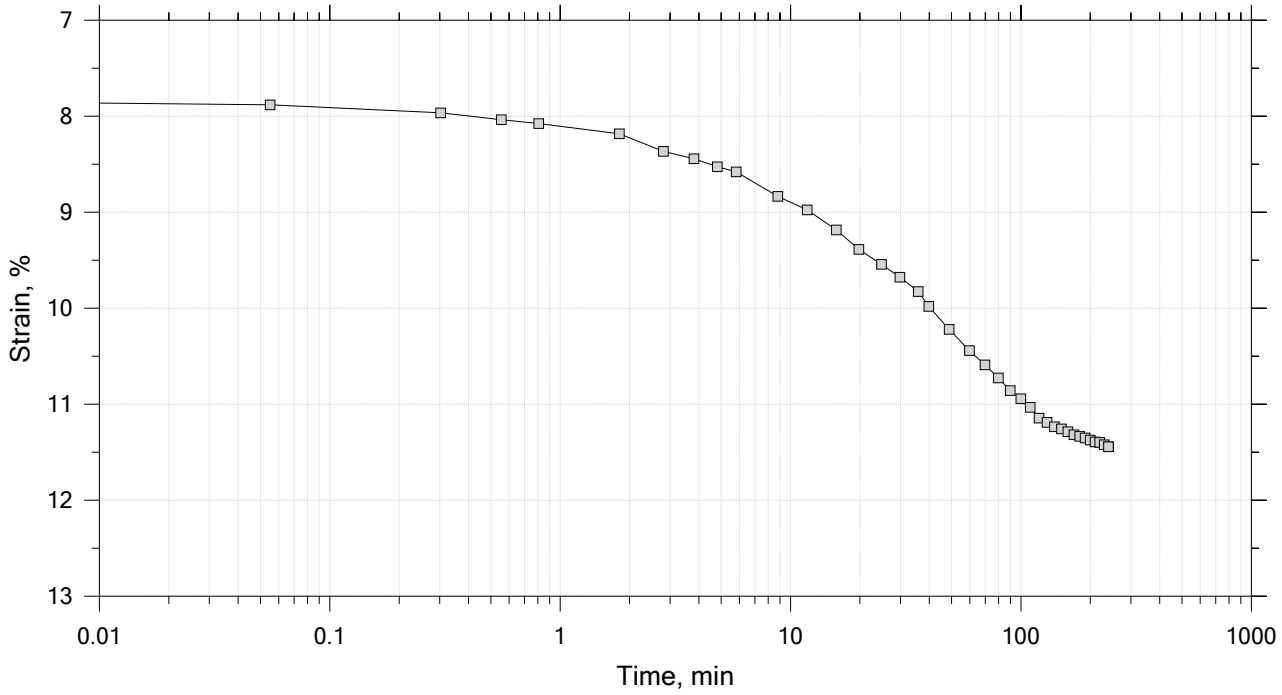

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

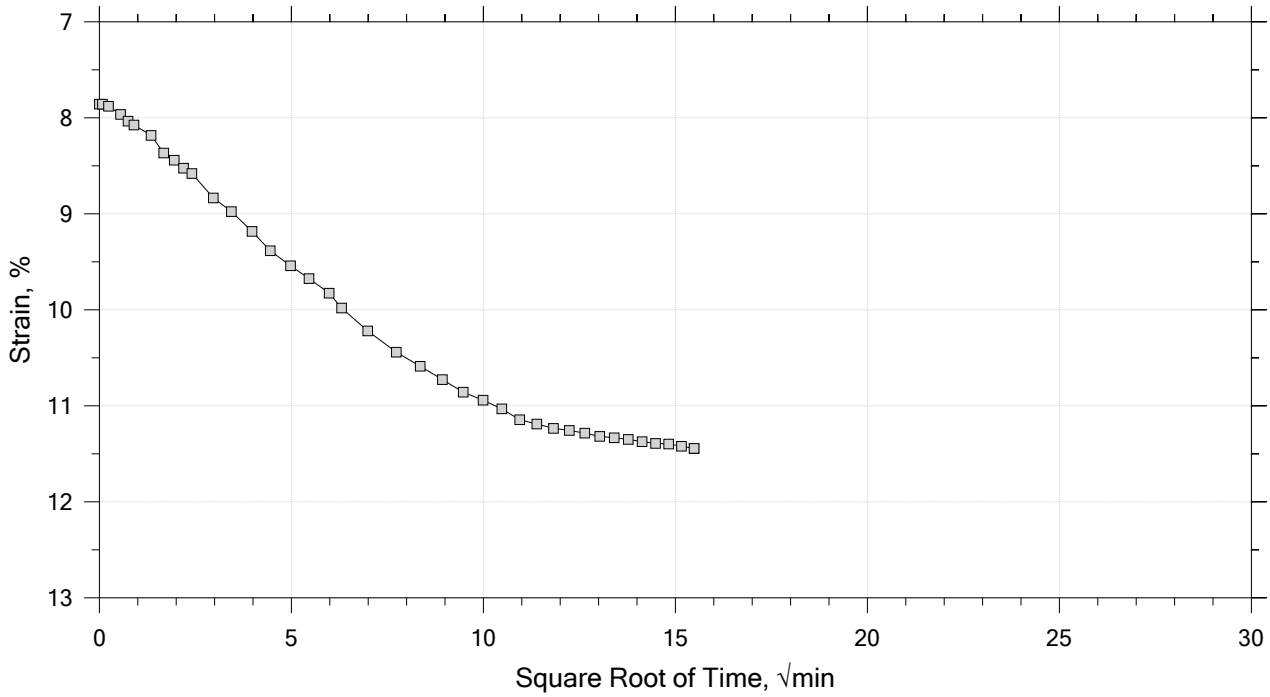
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 1 tsf



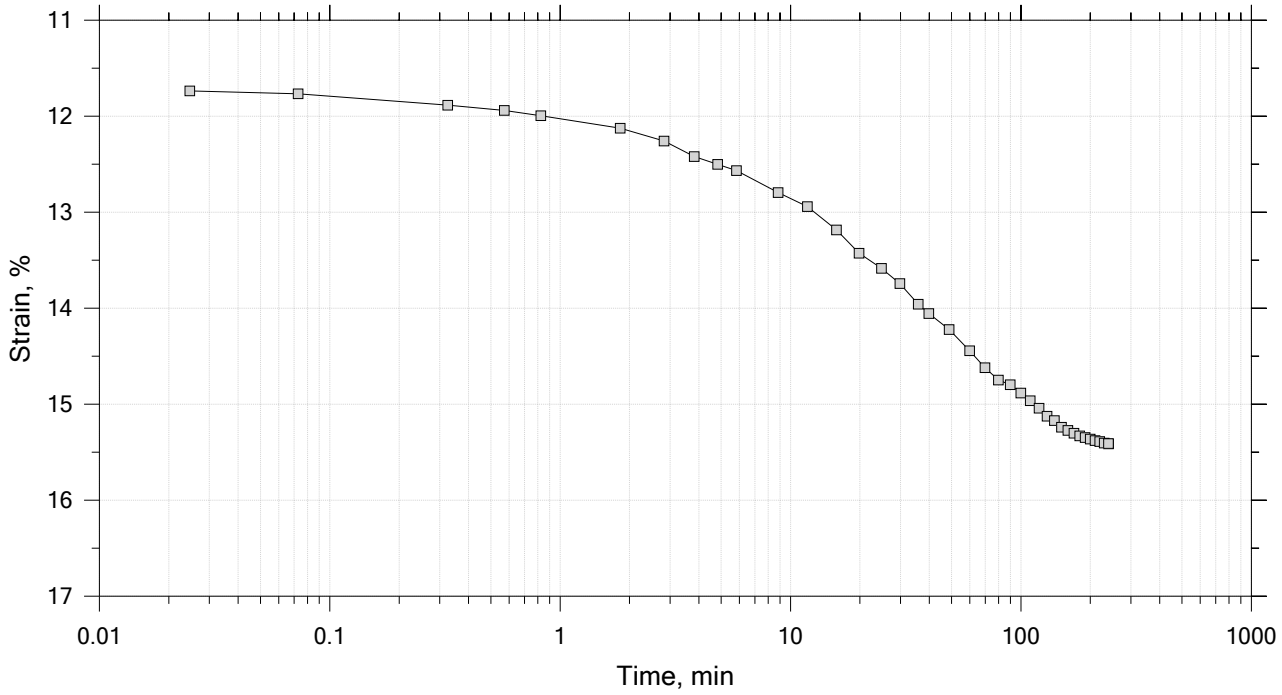

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

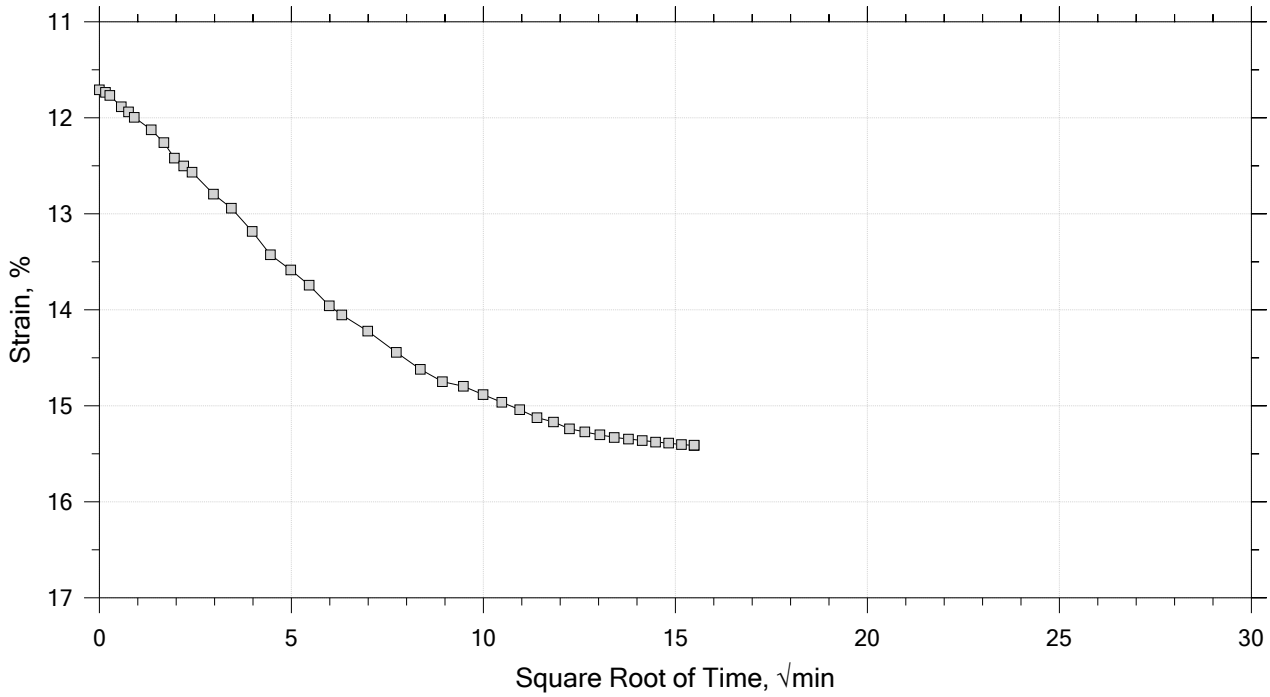
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf



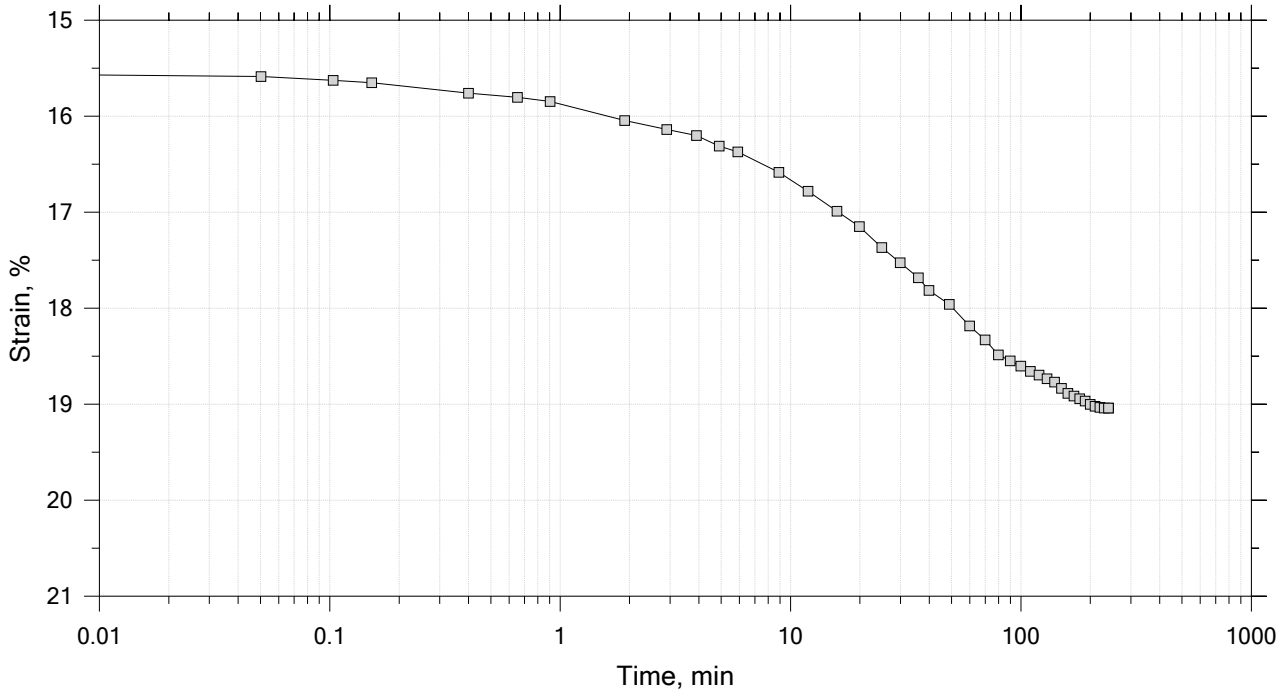

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

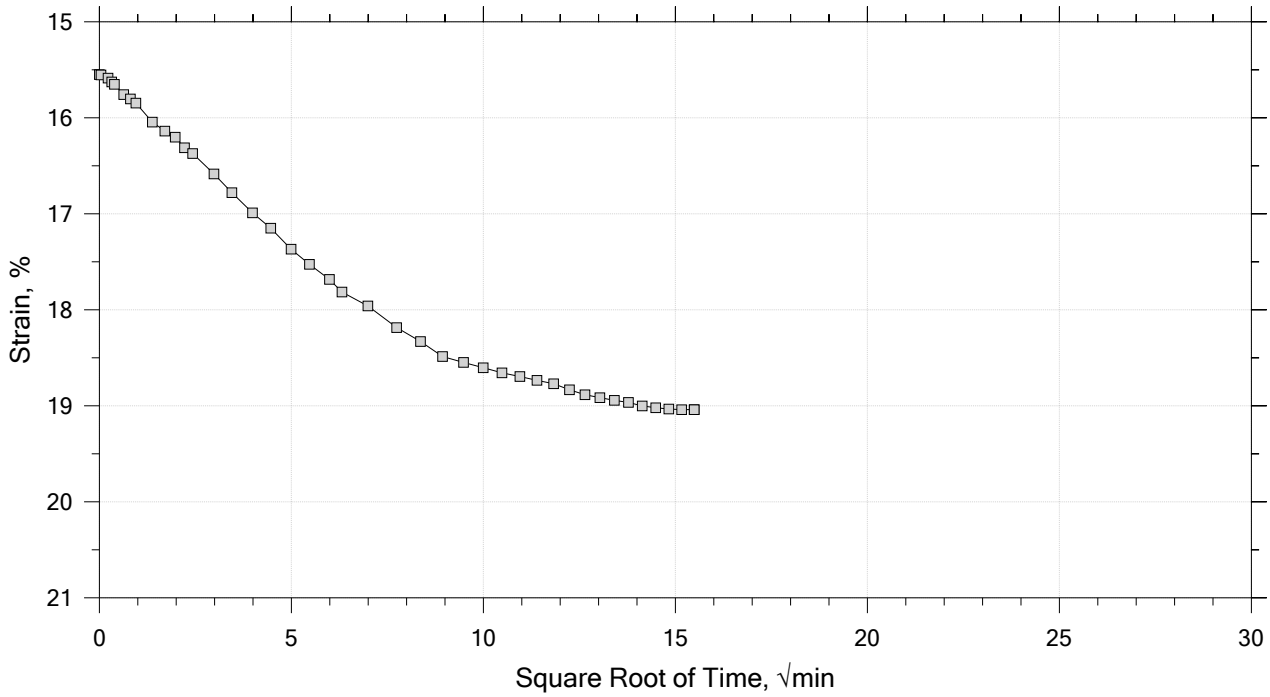
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf

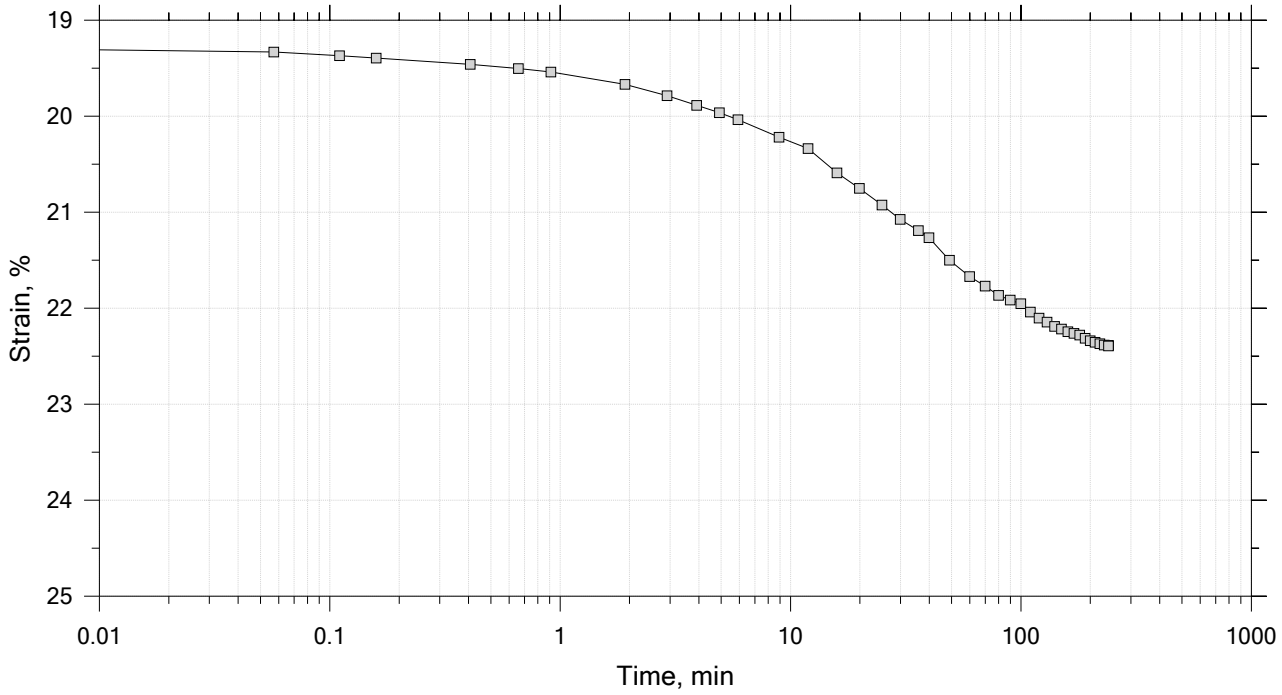


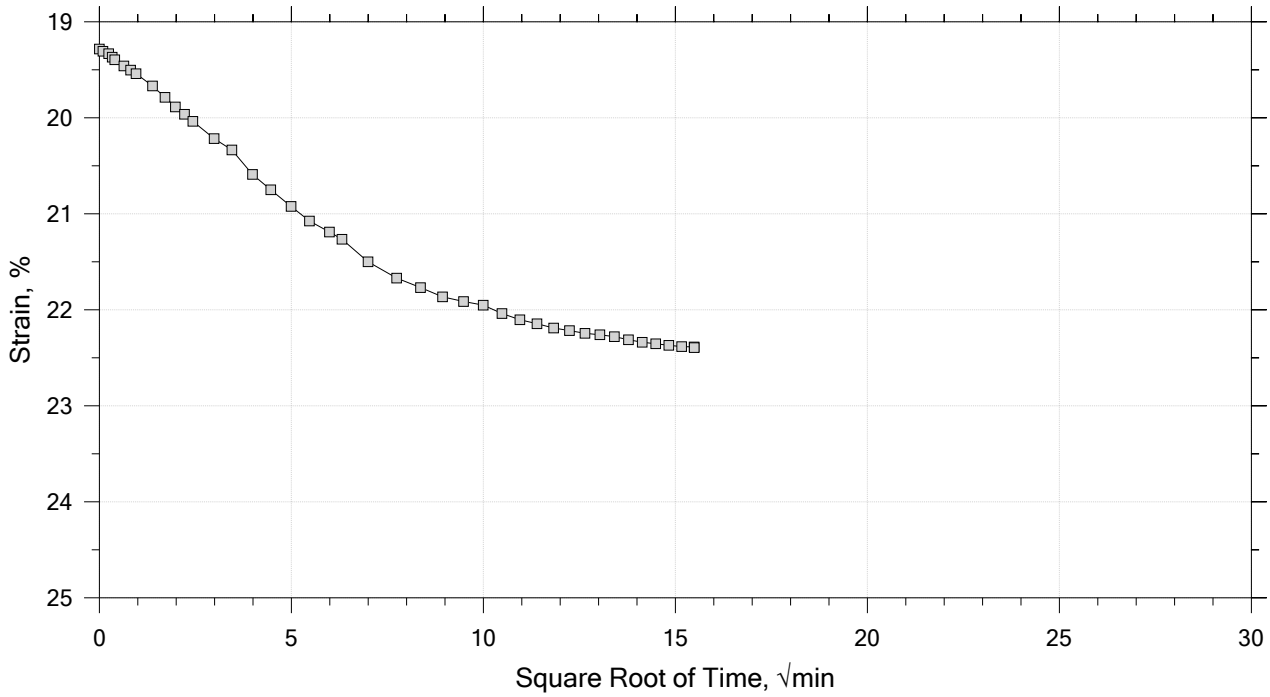




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf



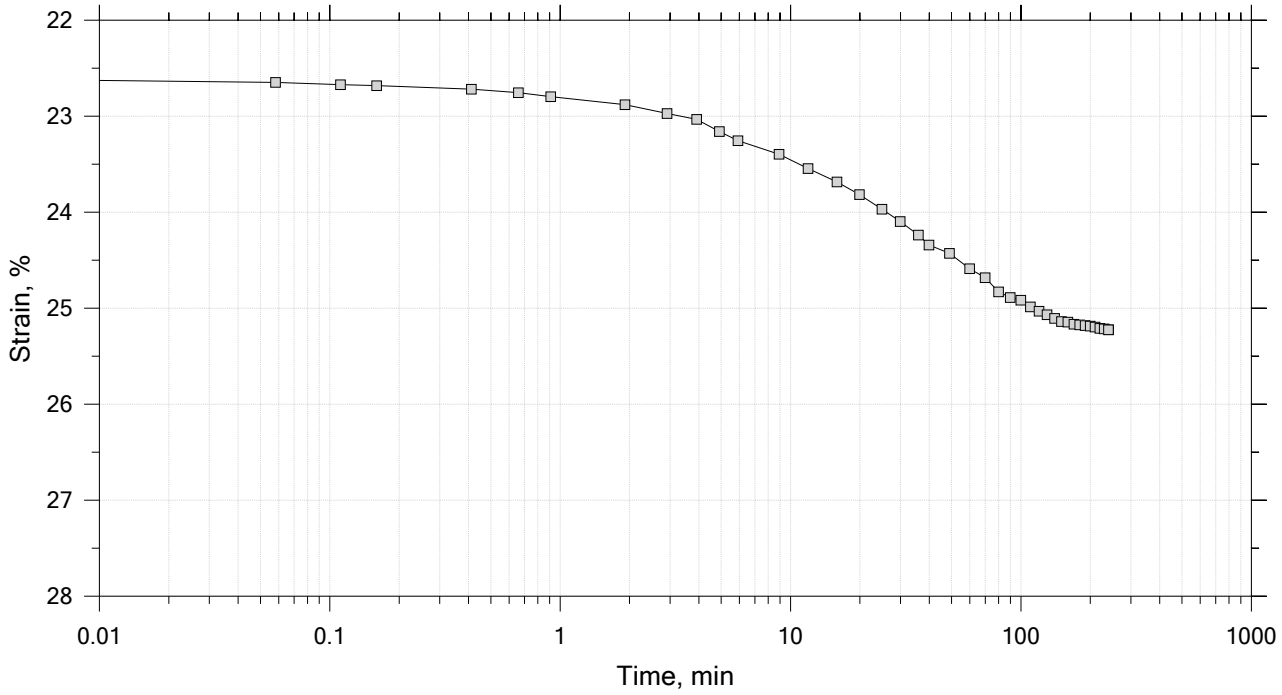

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

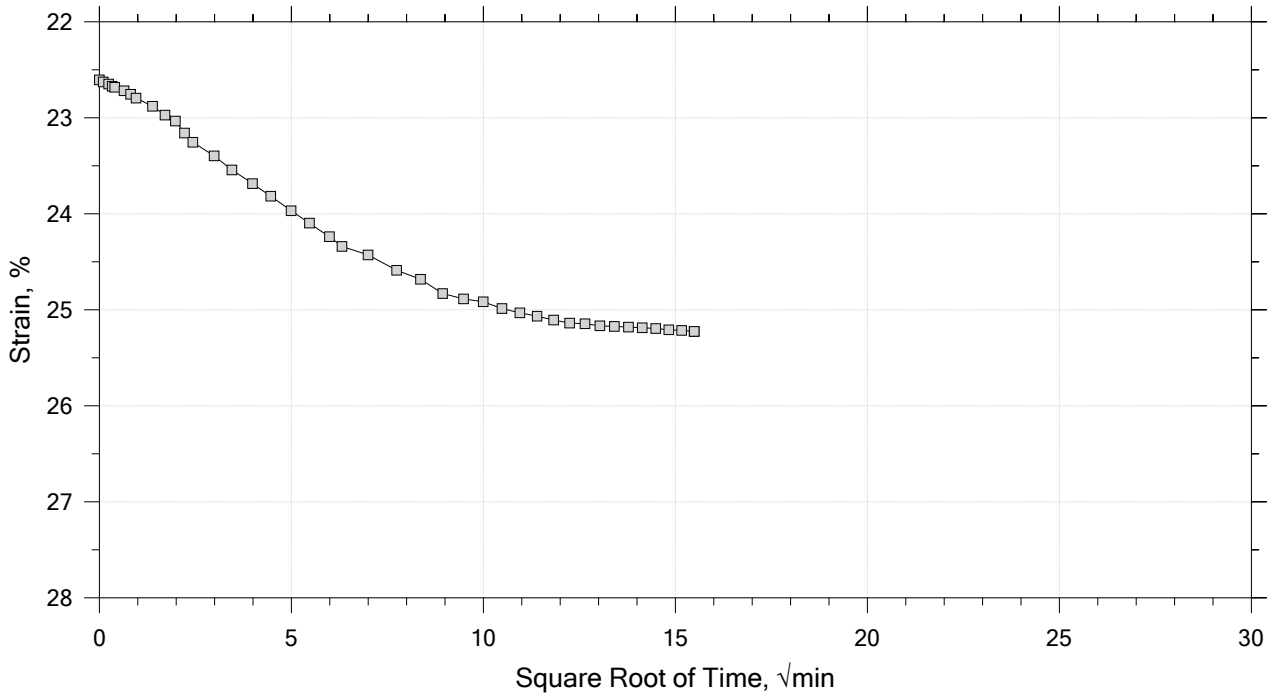
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15

Constant Load Step

Stress: 16 tsf

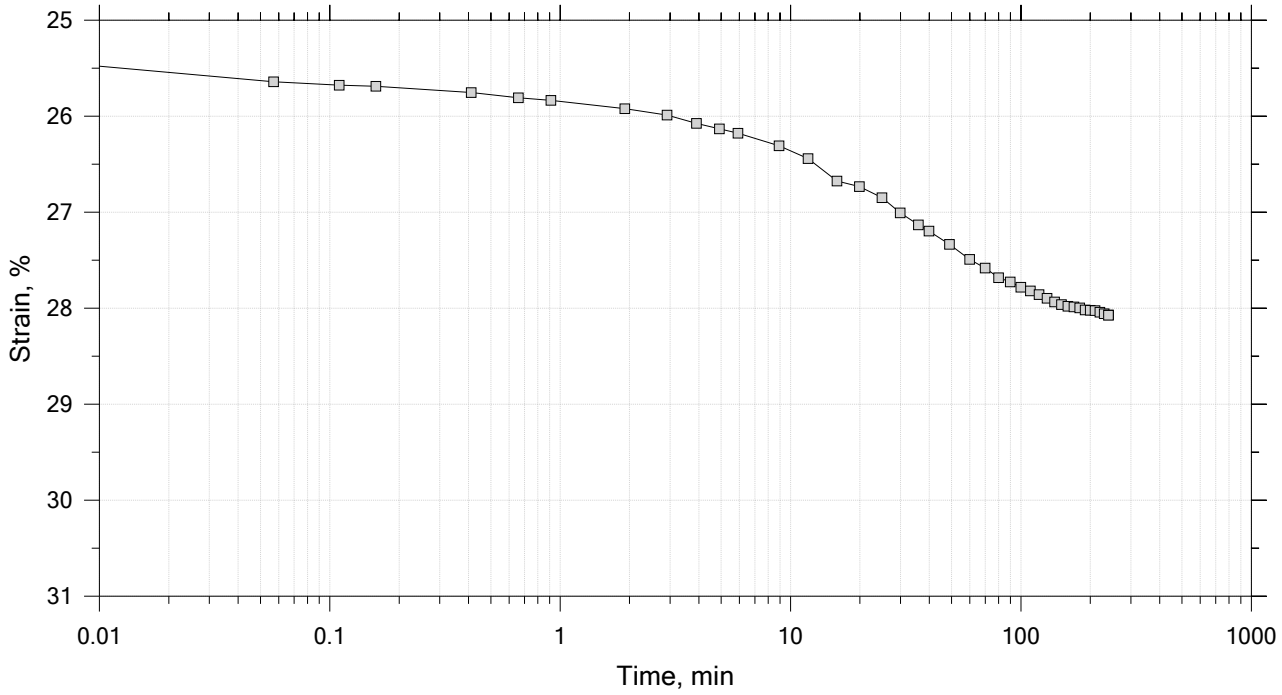


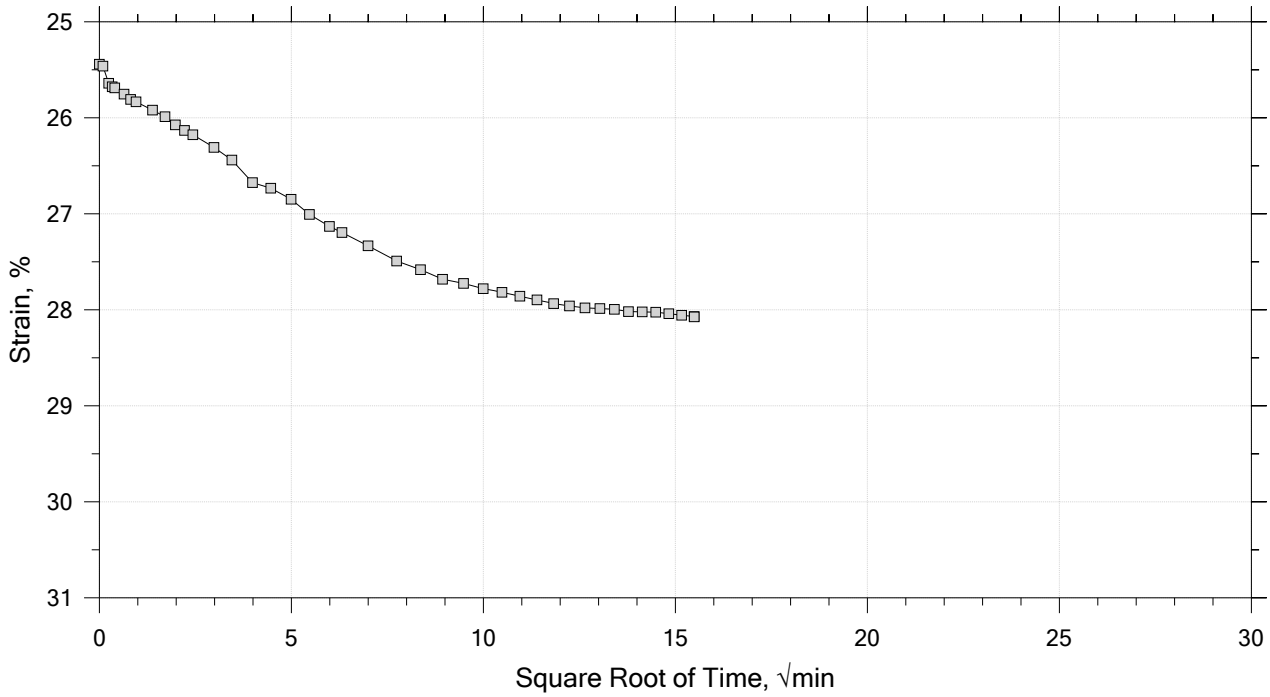




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

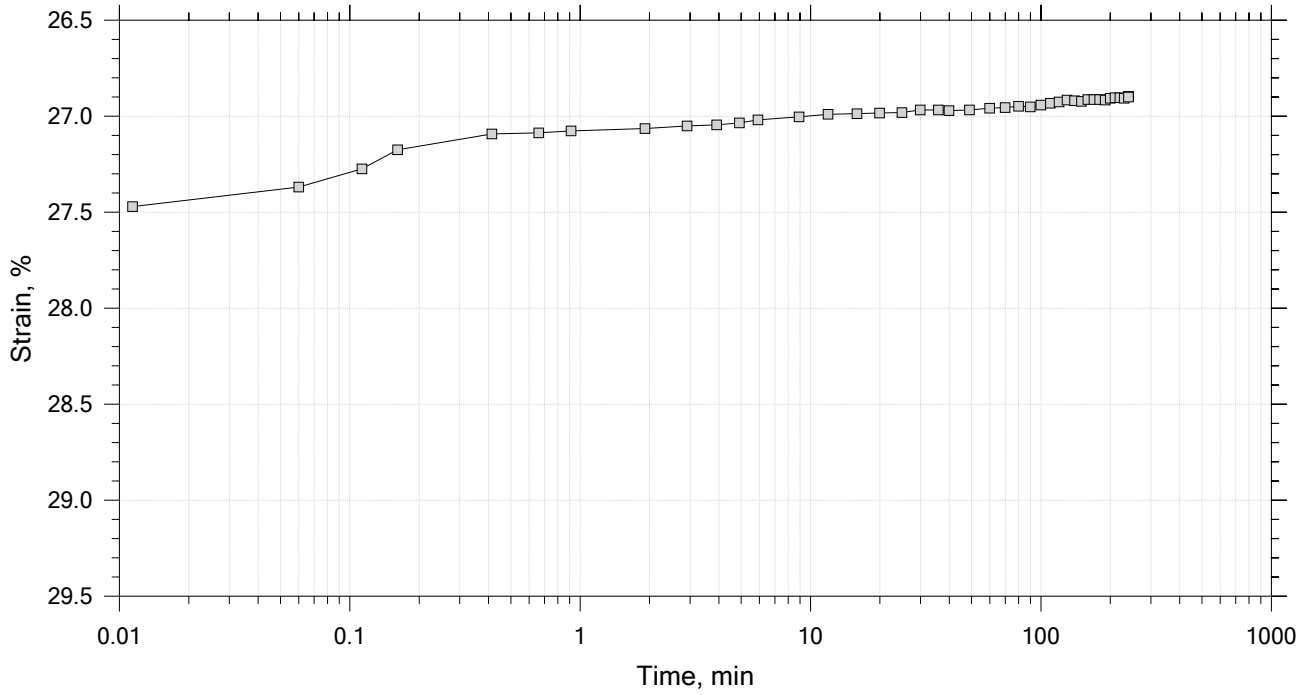


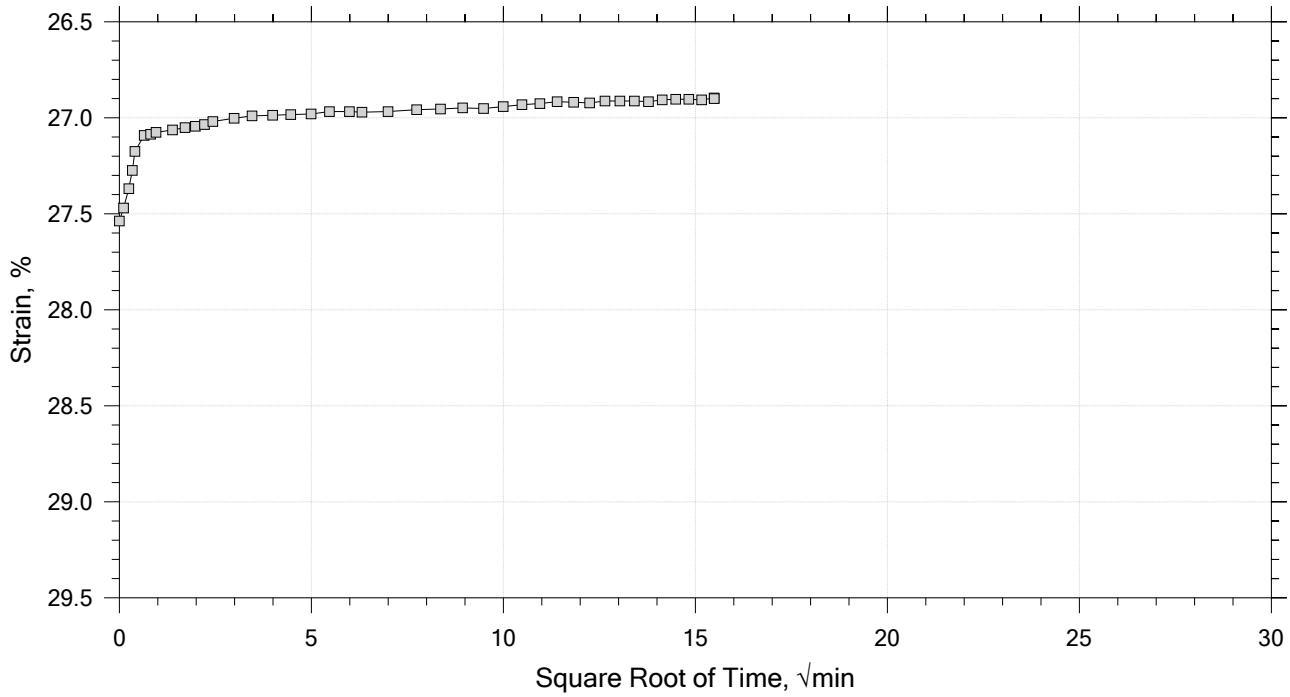




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf



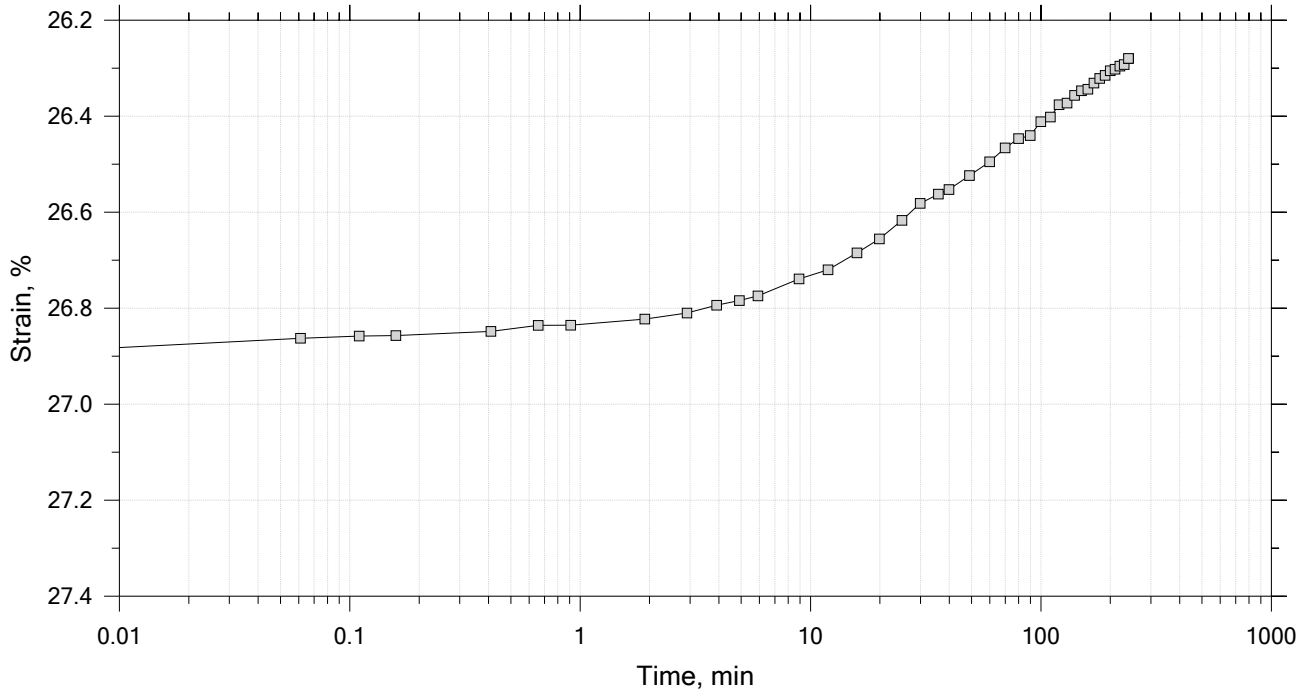

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

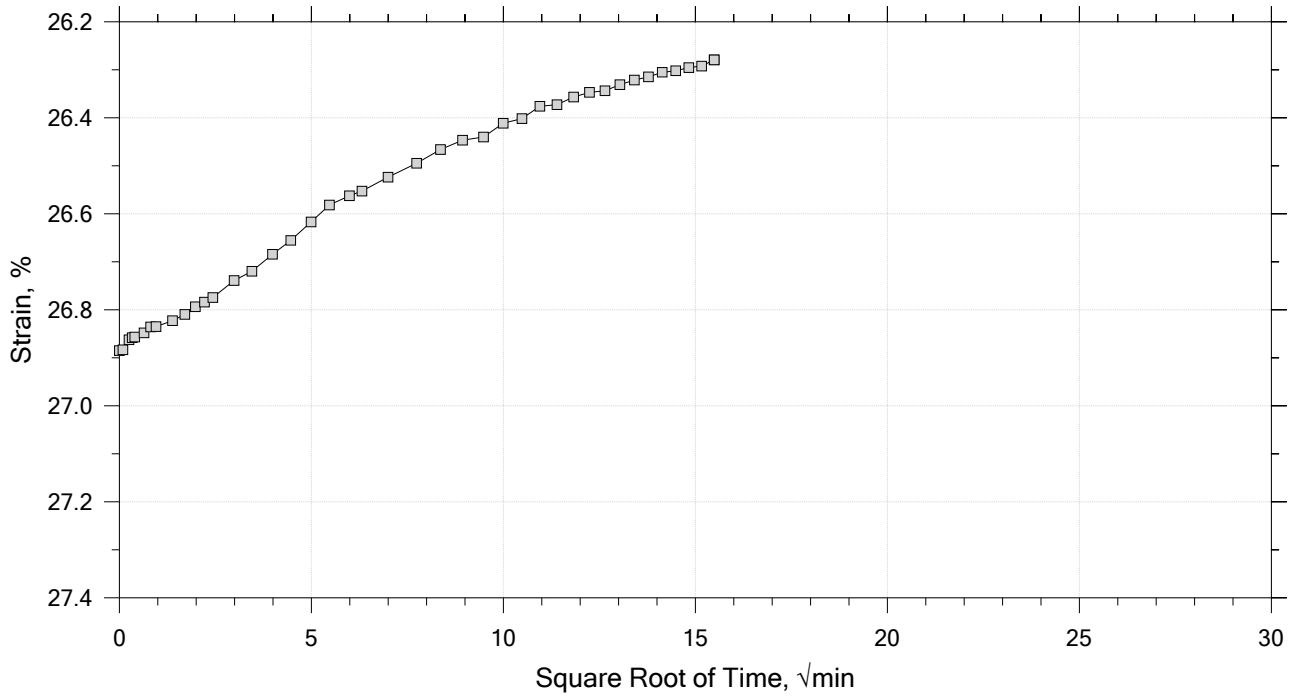
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15

Constant Load Step

Stress: 2 tsf

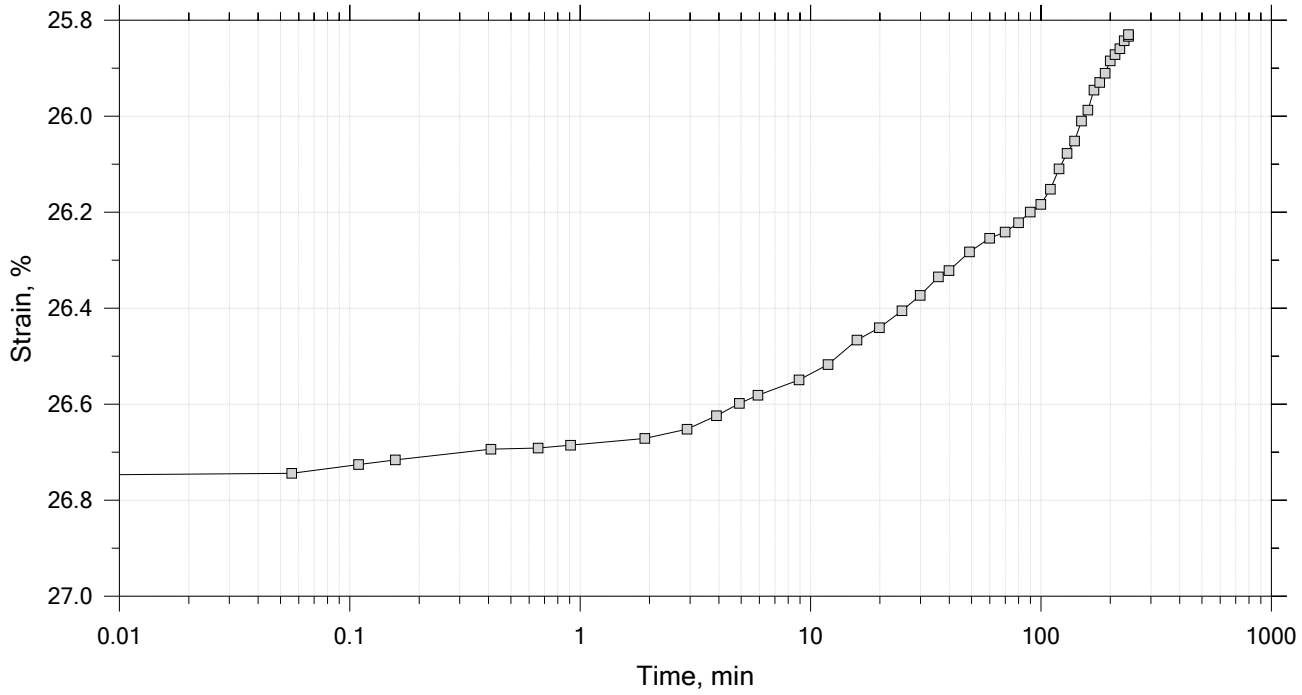


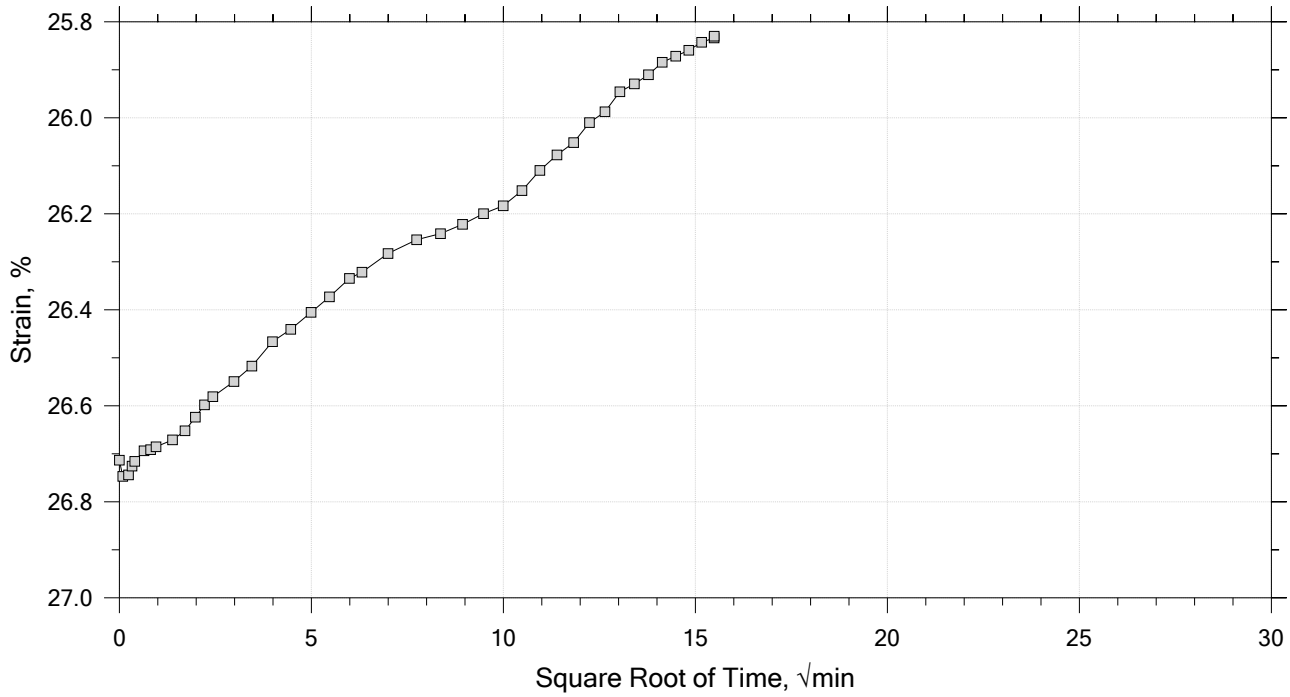




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf



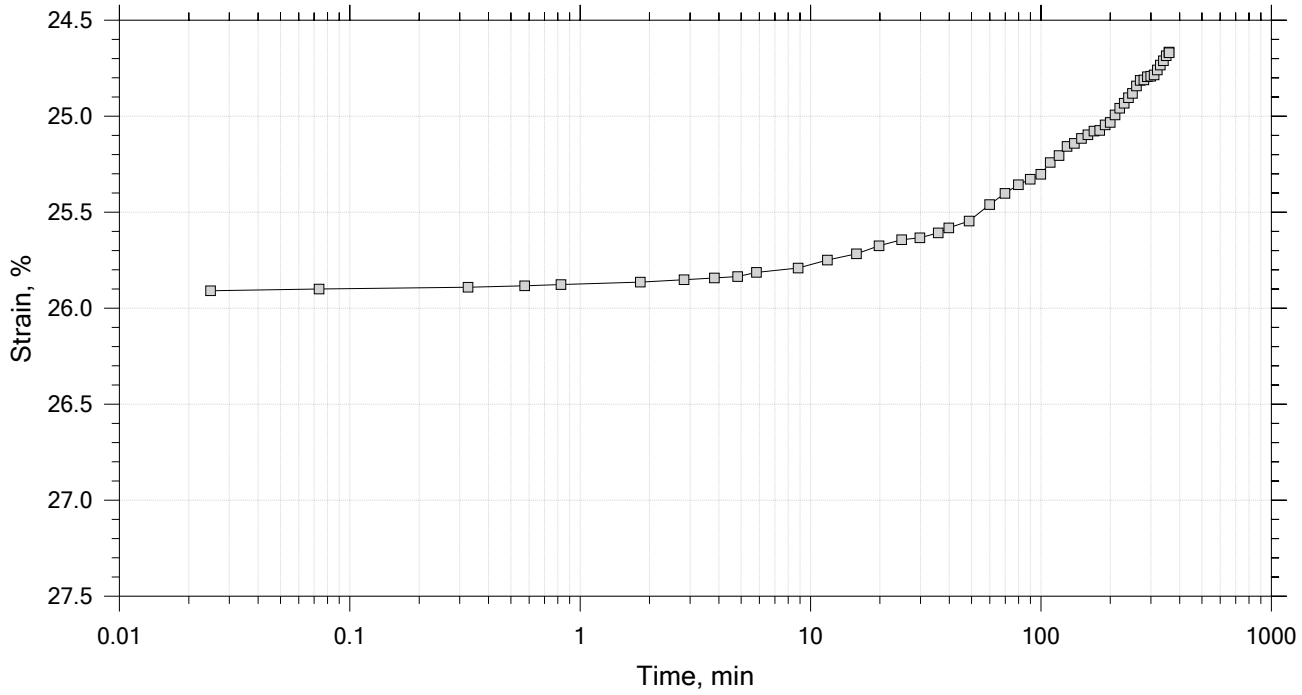

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

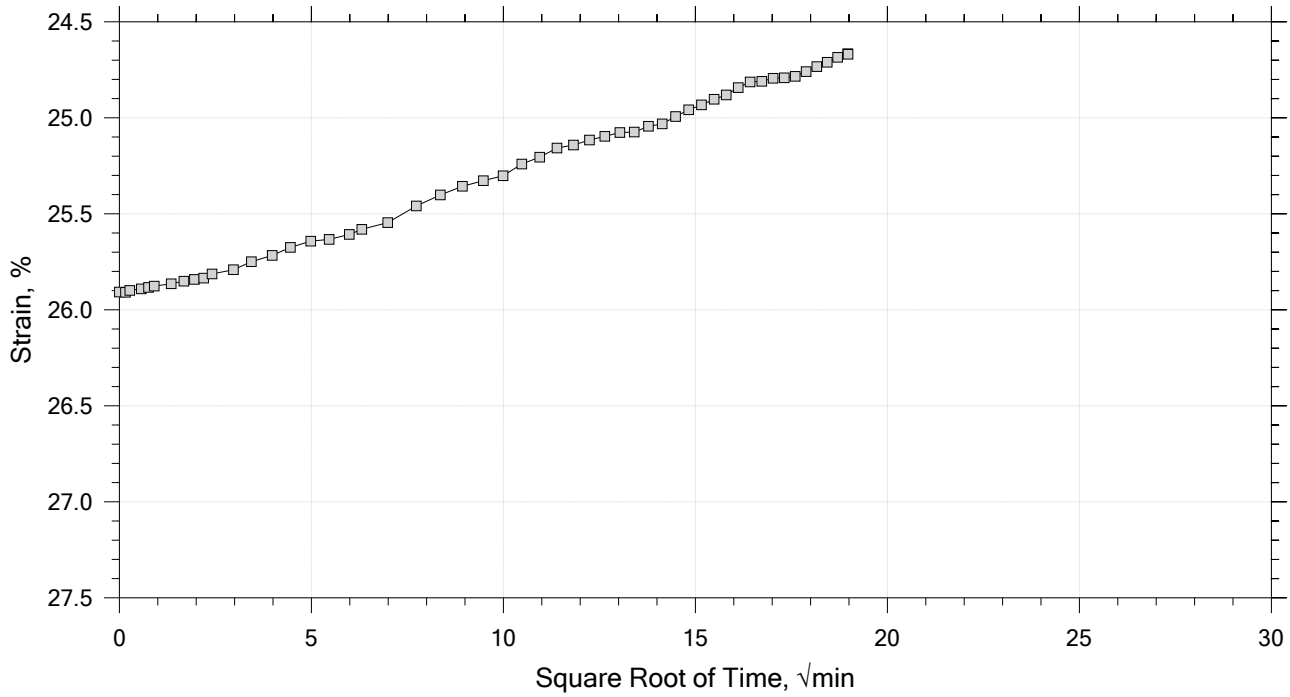
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15

Constant Load Step

Stress: 0.125 tsf

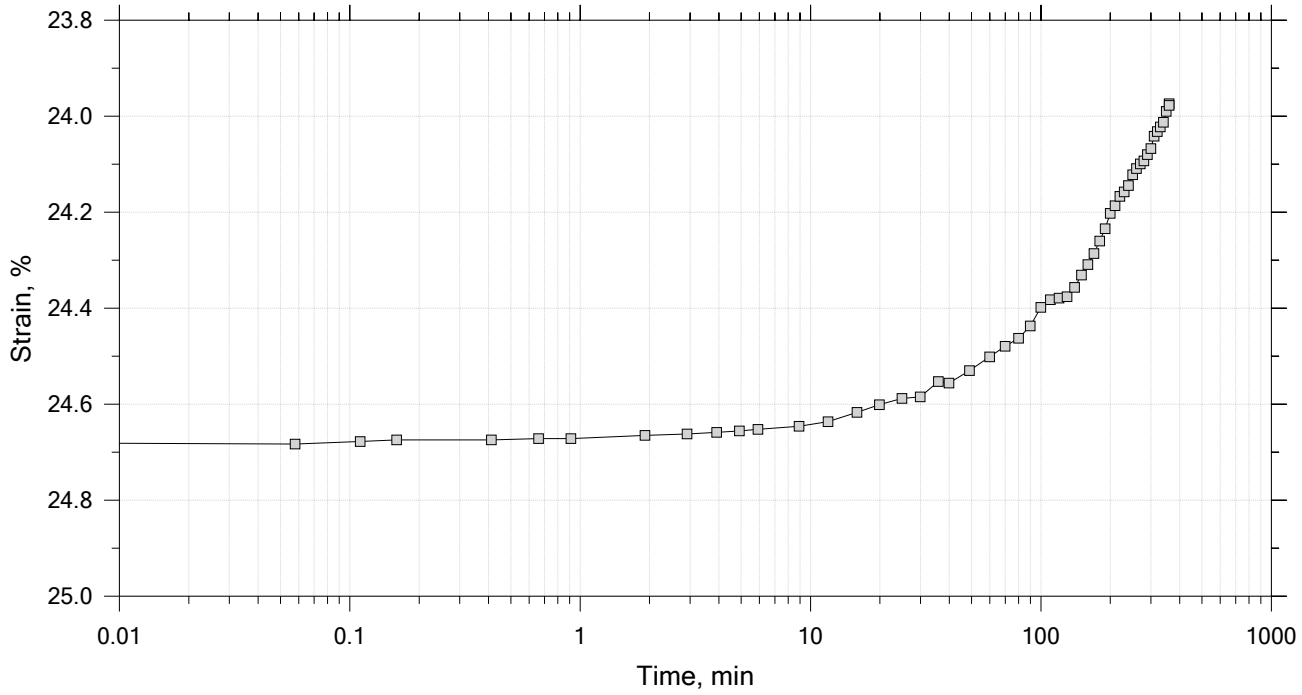


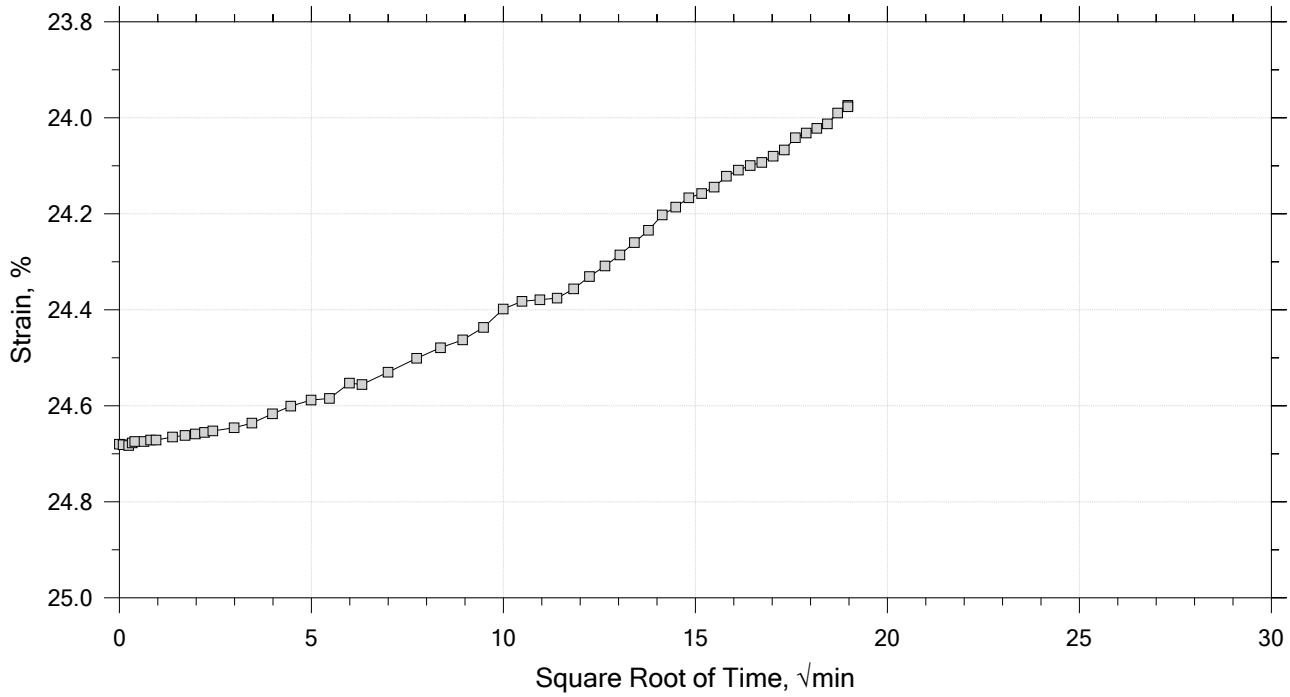




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.67 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 0.953 | Plastic Limit: --- |
| Final Height: 0.77 in | Final Void Ratio: 0.504 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | A2541 | RING | | A-1376 |
| Mass Container, gm | 8.24 | 110.88 | 110.88 | 8.21 |
| Mass Container + Wet Soil, gm | 238.58 | 259.95 | 241.45 | 138.22 |
| Mass Container + Dry Soil, gm | 181.51 | 220.69 | 220.69 | 117.55 |
| Mass Dry Soil, gm | 173.27 | 109.81 | 109.81 | 109.34 |
| Water Content, % | 32.94 | 35.75 | 18.90 | 18.90 |
| Void Ratio | --- | 0.95 | 0.50 | --- |
| Degree of Saturation, % | --- | 100.00 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 85.222 | 110.68 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0643 | 0.01265 | 0.929 | 1.26 | 20.960 | 2.69e-07 | 1.97e-01 | 1.42e-04 | 0.00e+00 |
| 2 | 0.125 | 0.02520 | 0.904 | 2.52 | 0.000 | 0.00e+00 | 2.07e-01 | 0.00e+00 | 0.00e+00 |
| 3 | 0.250 | 0.04628 | 0.863 | 4.63 | 0.000 | 0.00e+00 | 1.69e-01 | 0.00e+00 | 0.00e+00 |
| 4 | 0.500 | 0.07699 | 0.803 | 7.70 | 22.369 | 2.24e-07 | 1.23e-01 | 7.43e-05 | 0.00e+00 |
| 5 | 1.00 | 0.1144 | 0.730 | 11.4 | 30.831 | 1.51e-07 | 7.49e-02 | 3.05e-05 | 0.00e+00 |
| 6 | 2.00 | 0.1541 | 0.652 | 15.4 | 22.336 | 1.91e-07 | 3.97e-02 | 2.05e-05 | 0.00e+00 |
| 7 | 4.00 | 0.1904 | 0.581 | 19.0 | 22.559 | 1.73e-07 | 1.81e-02 | 8.47e-06 | 0.00e+00 |
| 8 | 8.00 | 0.2239 | 0.516 | 22.4 | 23.317 | 1.54e-07 | 8.38e-03 | 3.47e-06 | 0.00e+00 |
| 9 | 16.0 | 0.2523 | 0.461 | 25.2 | 22.954 | 1.44e-07 | 3.54e-03 | 1.38e-06 | 0.00e+00 |
| 10 | 32.0 | 0.2807 | 0.405 | 28.1 | 22.624 | 1.36e-07 | 1.78e-03 | 6.51e-07 | 0.00e+00 |
| 11 | 8.00 | 0.2690 | 0.428 | 26.9 | 0.147 | 2.03e-05 | 4.89e-04 | 2.68e-05 | 0.00e+00 |
| 12 | 2.00 | 0.2628 | 0.440 | 26.3 | 0.000 | 0.00e+00 | 1.03e-03 | 0.00e+00 | 0.00e+00 |
| 13 | 0.500 | 0.2583 | 0.449 | 25.8 | 0.000 | 0.00e+00 | 3.00e-03 | 0.00e+00 | 0.00e+00 |
| 14 | 0.125 | 0.2467 | 0.472 | 24.7 | 0.000 | 0.00e+00 | 3.10e-02 | 0.00e+00 | 0.00e+00 |
| 15 | 0.0625 | 0.2398 | 0.485 | 24.0 | 0.000 | 0.00e+00 | 1.11e-01 | 0.00e+00 | 0.00e+00 |

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| | Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| | Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Square Root of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0643 | 0.01265 | 0.929 | 1.26 | 100.137 | 2.42e-07 | 1.97e-01 | 1.28e-04 |
| 2 | 0.125 | 0.02520 | 0.904 | 2.52 | 92.019 | 2.57e-07 | 2.07e-01 | 1.43e-04 |
| 3 | 0.250 | 0.04628 | 0.863 | 4.63 | 91.011 | 2.51e-07 | 1.69e-01 | 1.14e-04 |
| 4 | 0.500 | 0.07699 | 0.803 | 7.70 | 120.783 | 1.79e-07 | 1.23e-01 | 5.92e-05 |
| 5 | 1.00 | 0.1144 | 0.730 | 11.4 | 138.043 | 1.45e-07 | 7.49e-02 | 2.94e-05 |
| 6 | 2.00 | 0.1541 | 0.652 | 15.4 | 93.298 | 1.97e-07 | 3.97e-02 | 2.11e-05 |
| 7 | 4.00 | 0.1904 | 0.581 | 19.0 | 100.794 | 1.67e-07 | 1.81e-02 | 8.16e-06 |
| 8 | 8.00 | 0.2239 | 0.516 | 22.4 | 90.617 | 1.70e-07 | 8.38e-03 | 3.85e-06 |
| 9 | 16.0 | 0.2523 | 0.461 | 25.2 | 99.063 | 1.44e-07 | 3.54e-03 | 1.37e-06 |
| 10 | 32.0 | 0.2807 | 0.405 | 28.1 | 81.349 | 1.62e-07 | 1.78e-03 | 7.79e-07 |
| 11 | 8.00 | 0.2690 | 0.428 | 26.9 | 1.429 | 9.03e-06 | 4.89e-04 | 1.19e-05 |
| 12 | 2.00 | 0.2628 | 0.440 | 26.3 | 135.930 | 9.73e-08 | 1.03e-03 | 2.71e-07 |
| 13 | 0.500 | 0.2583 | 0.449 | 25.8 | 179.034 | 7.49e-08 | 3.00e-03 | 6.06e-07 |
| 14 | 0.125 | 0.2467 | 0.472 | 24.7 | 264.522 | 5.18e-08 | 3.10e-02 | 4.33e-06 |
| 15 | 0.0625 | 0.2398 | 0.485 | 24.0 | 0.000 | 0.00e+00 | 1.11e-01 | 0.00e+00 |

GeoTesting EXPRESS

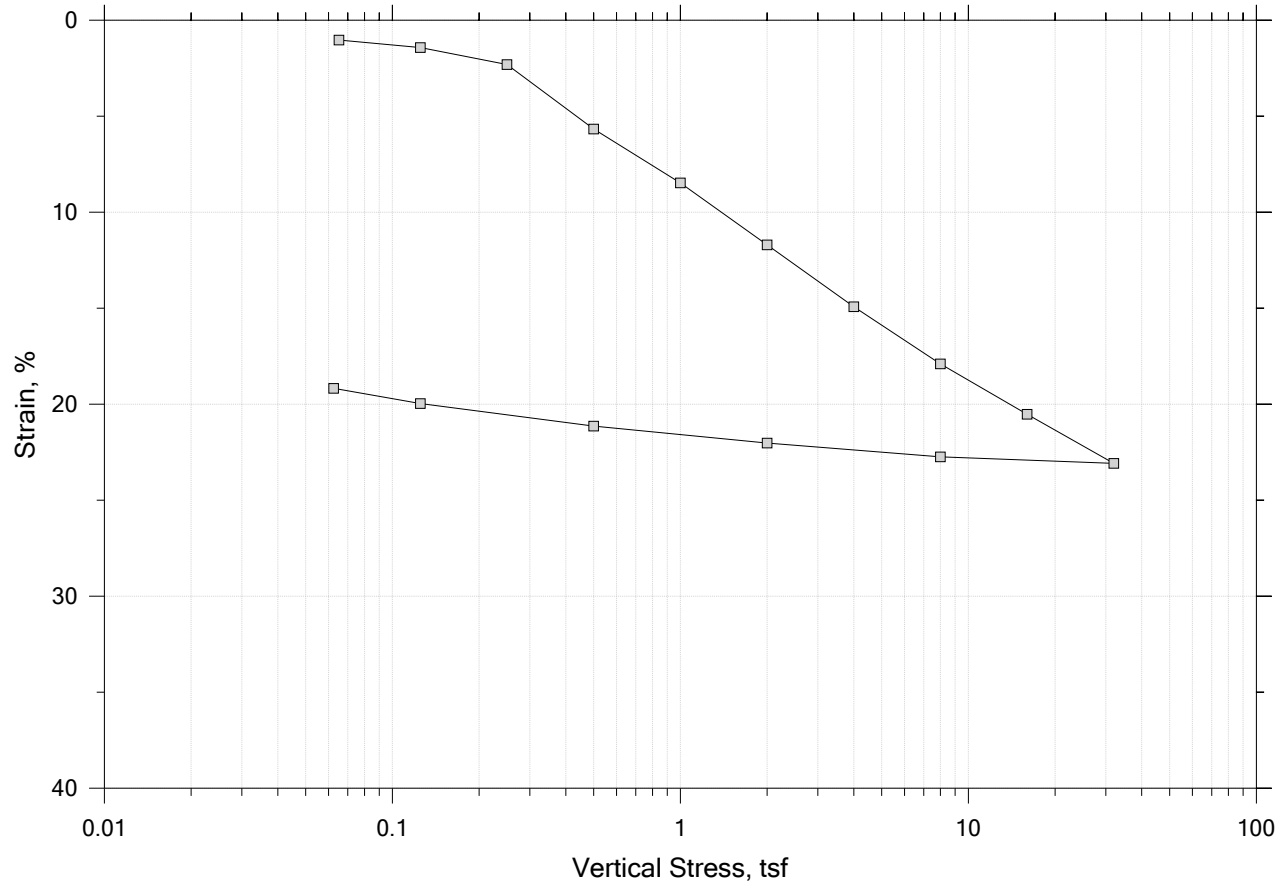
| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJSB036 | Tested By: trm | Checked By: njh |
| Sample No.: SL0674 | Test Date: 2/25/19 | Depth: 8-10 ft |
| Test No.: IP-8 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf | | |
| Displacement at End of Increment | | |

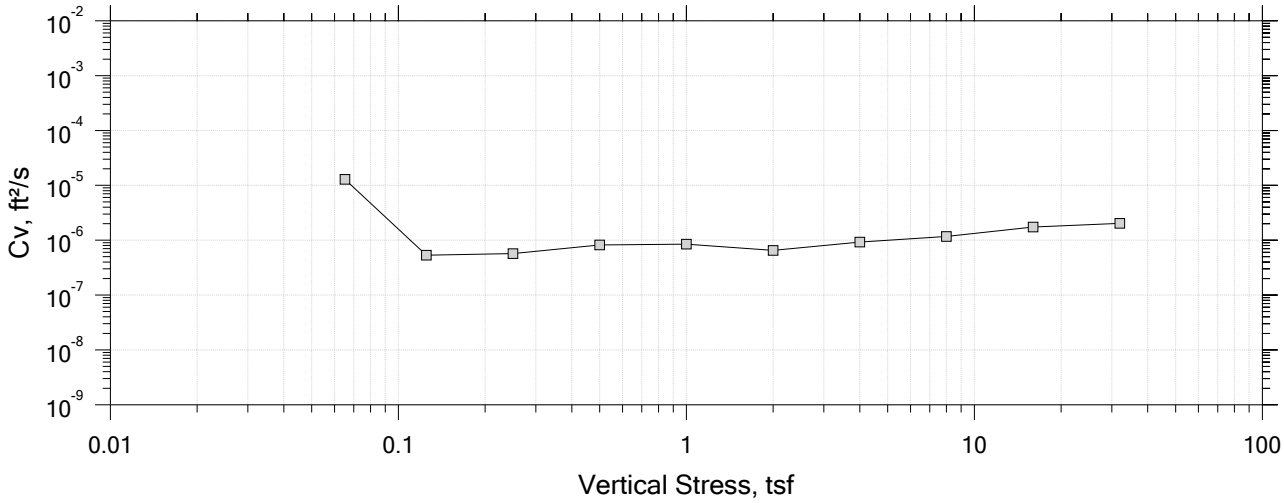


Attachment Figure A.4-313

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Summary Report

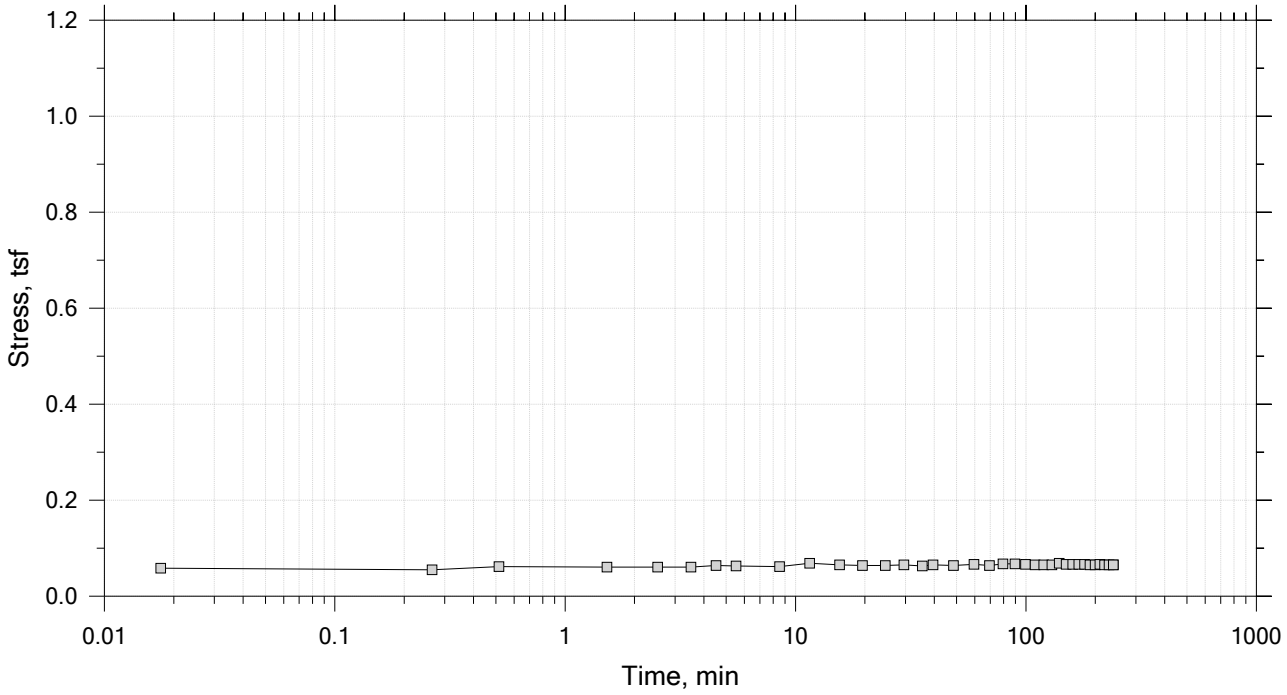


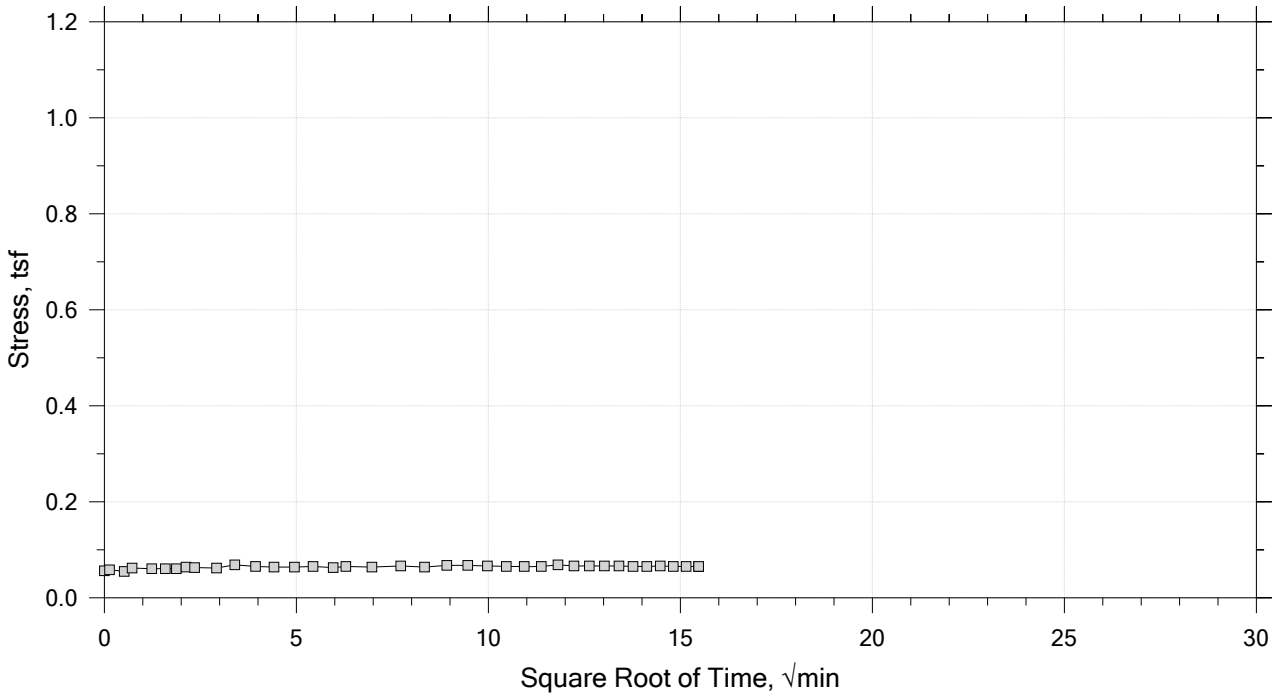




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15
Constant Volume Step
Stress: 0.0652 tsf



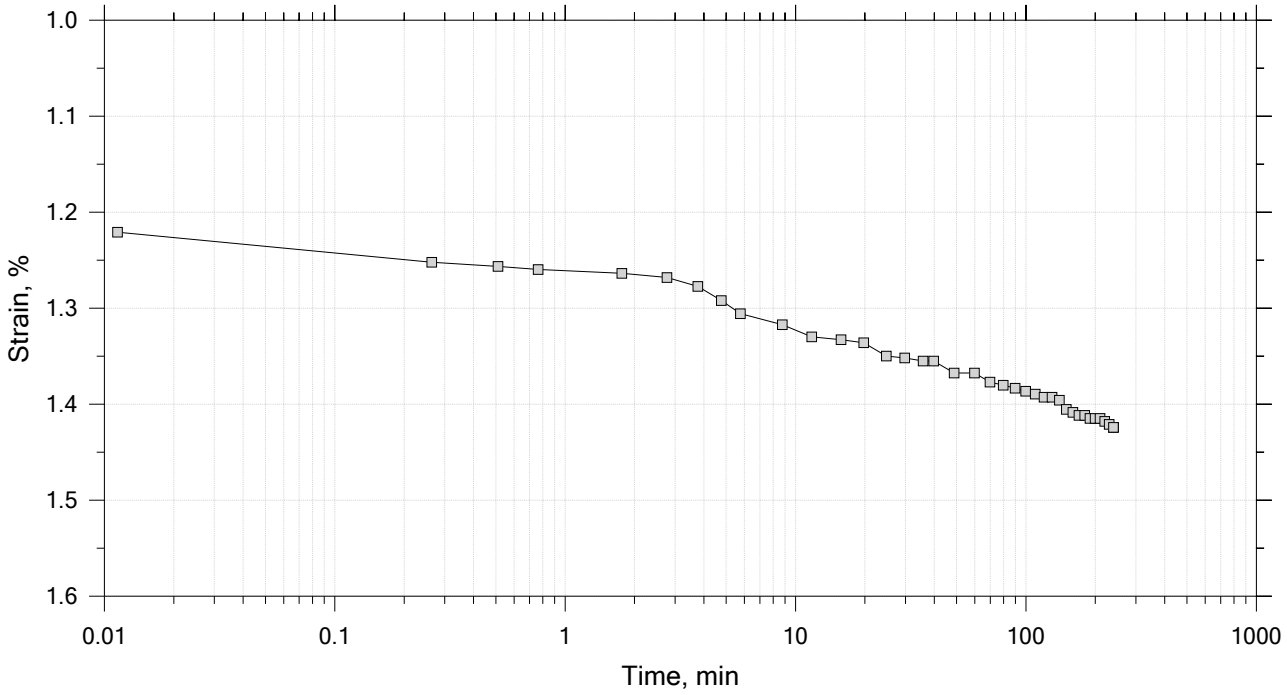

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

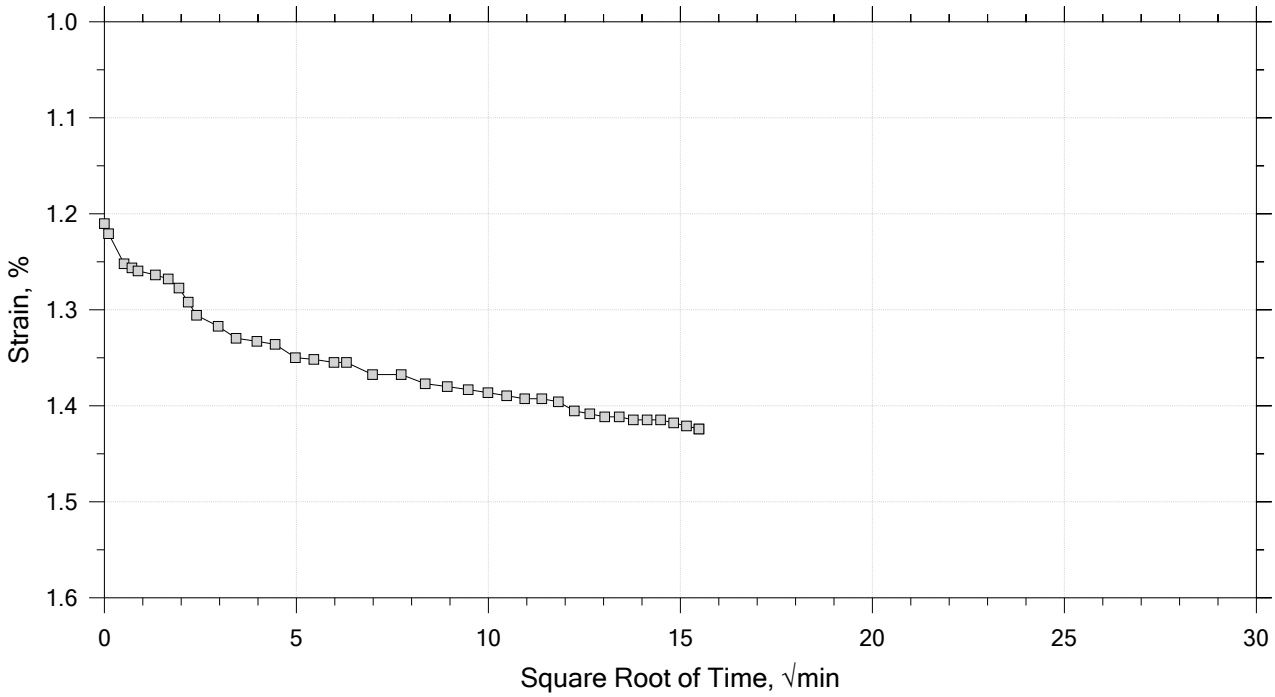
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15

Constant Load Step

Stress: 0.125 tsf

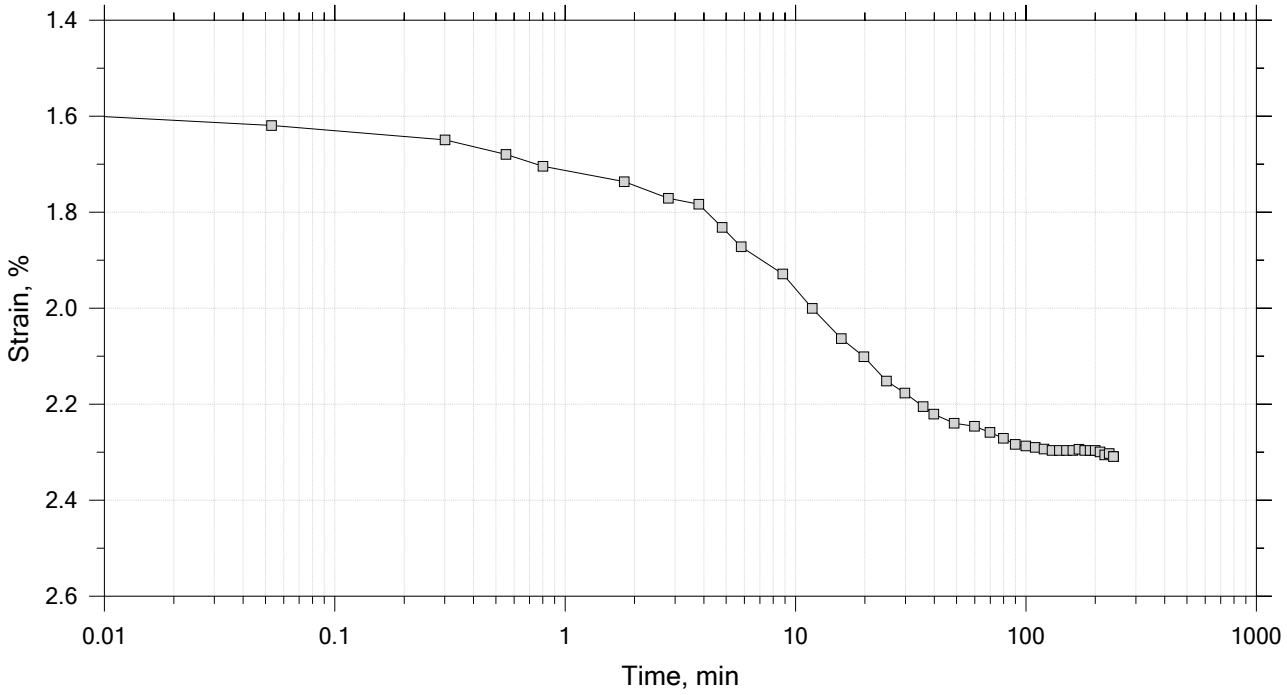


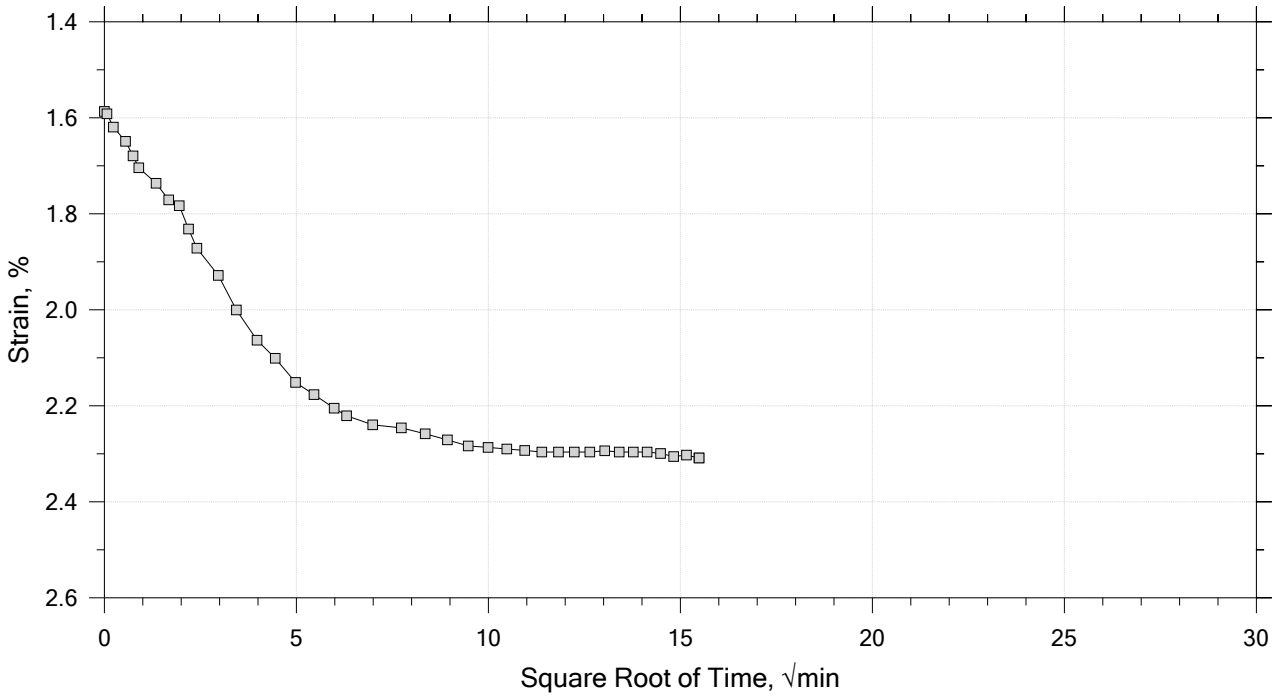




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf

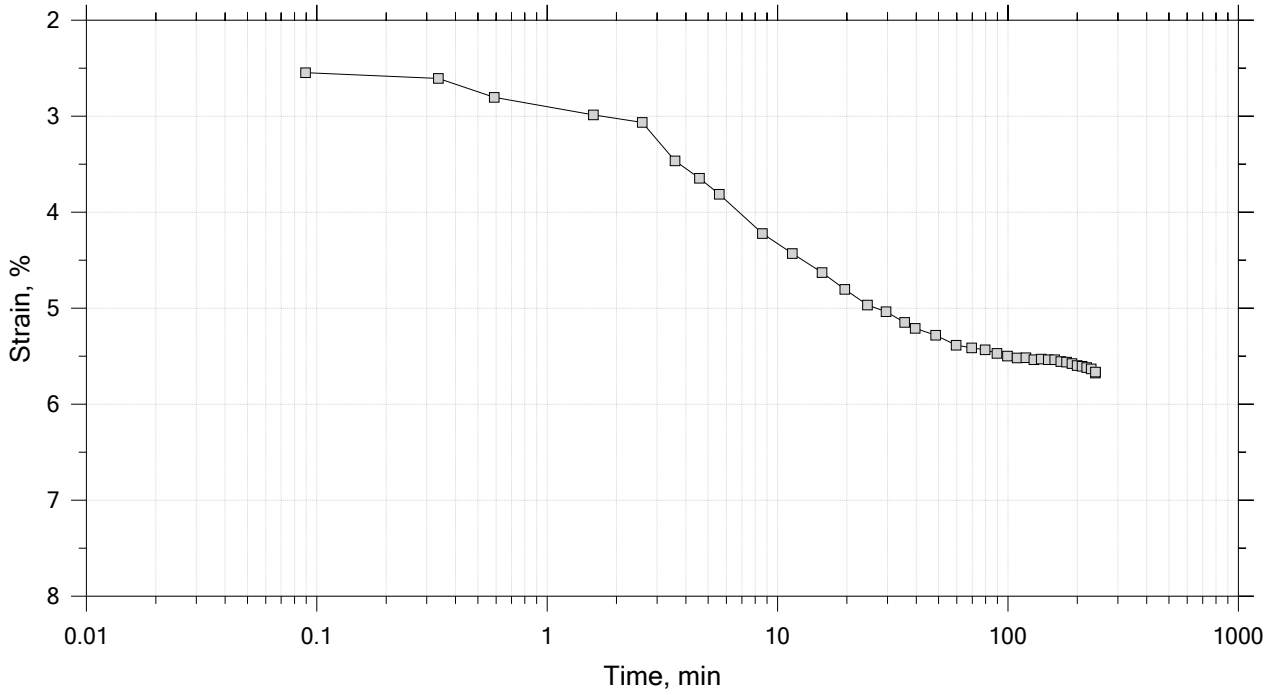


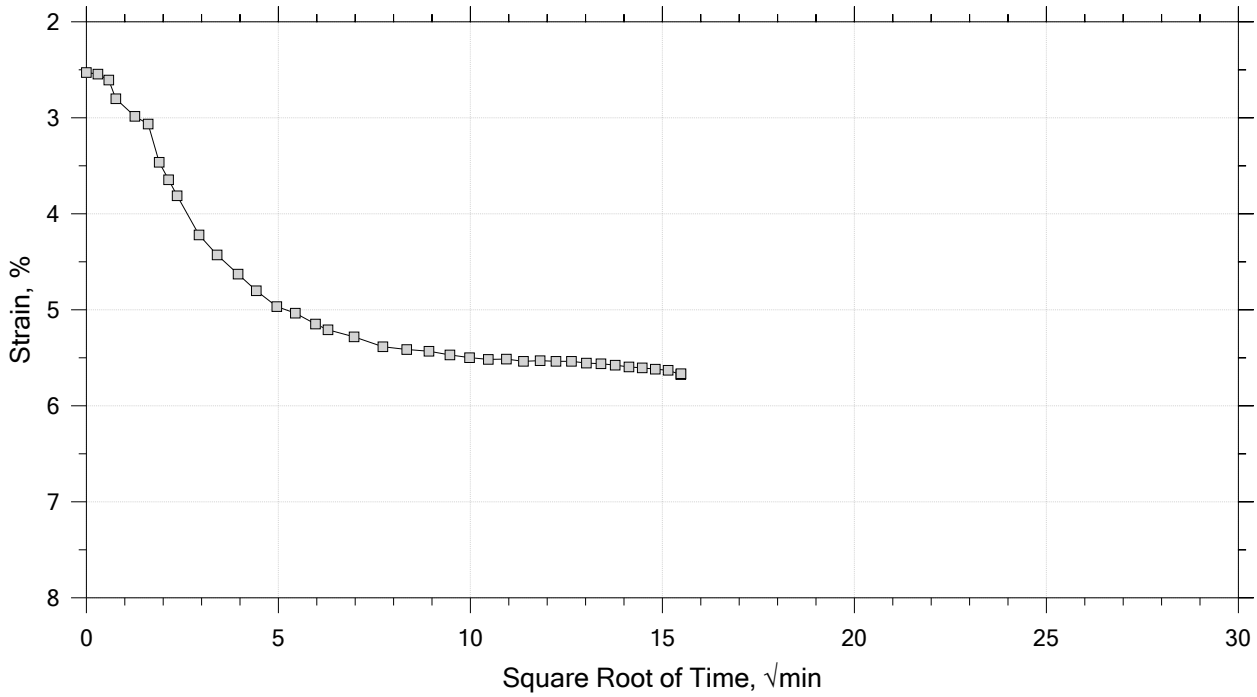




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.5 tsf



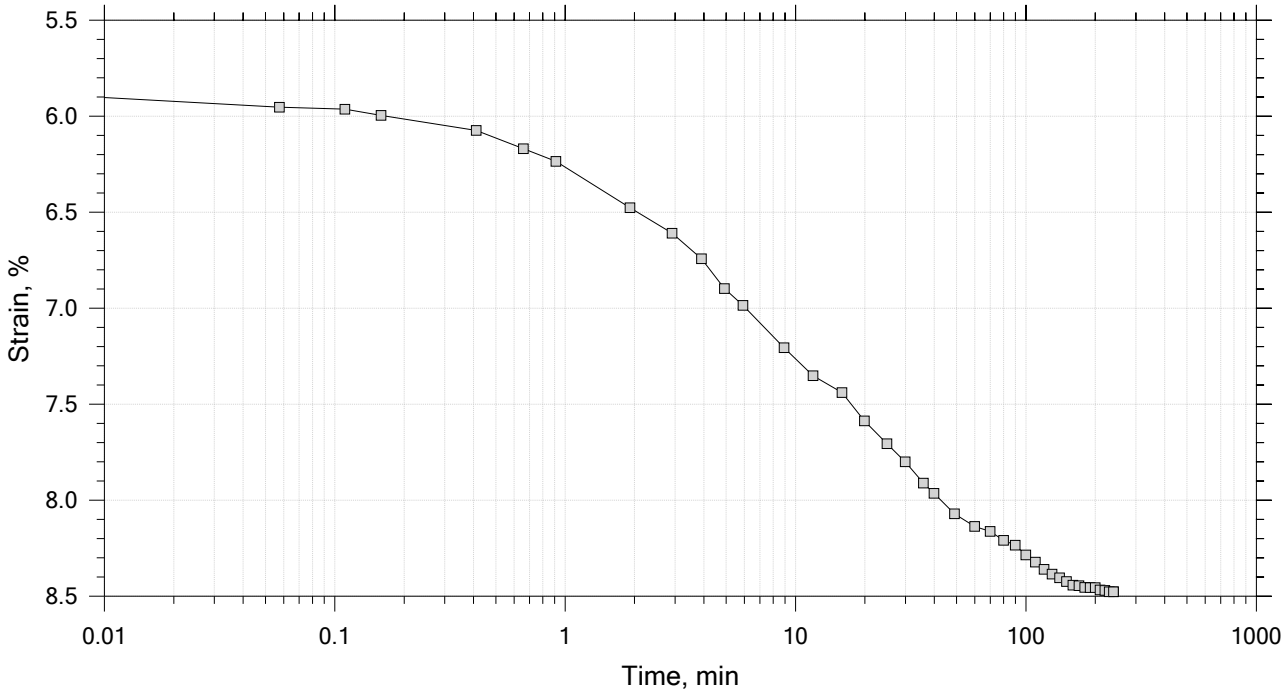

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

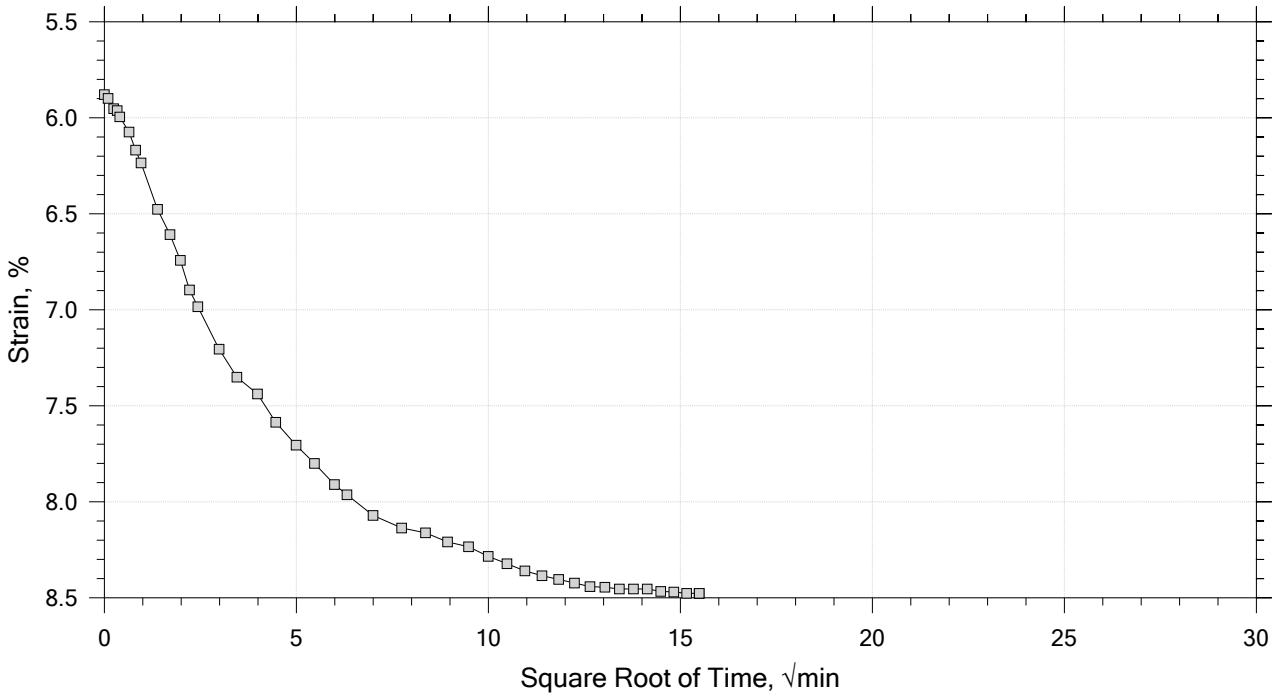
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 1 tsf



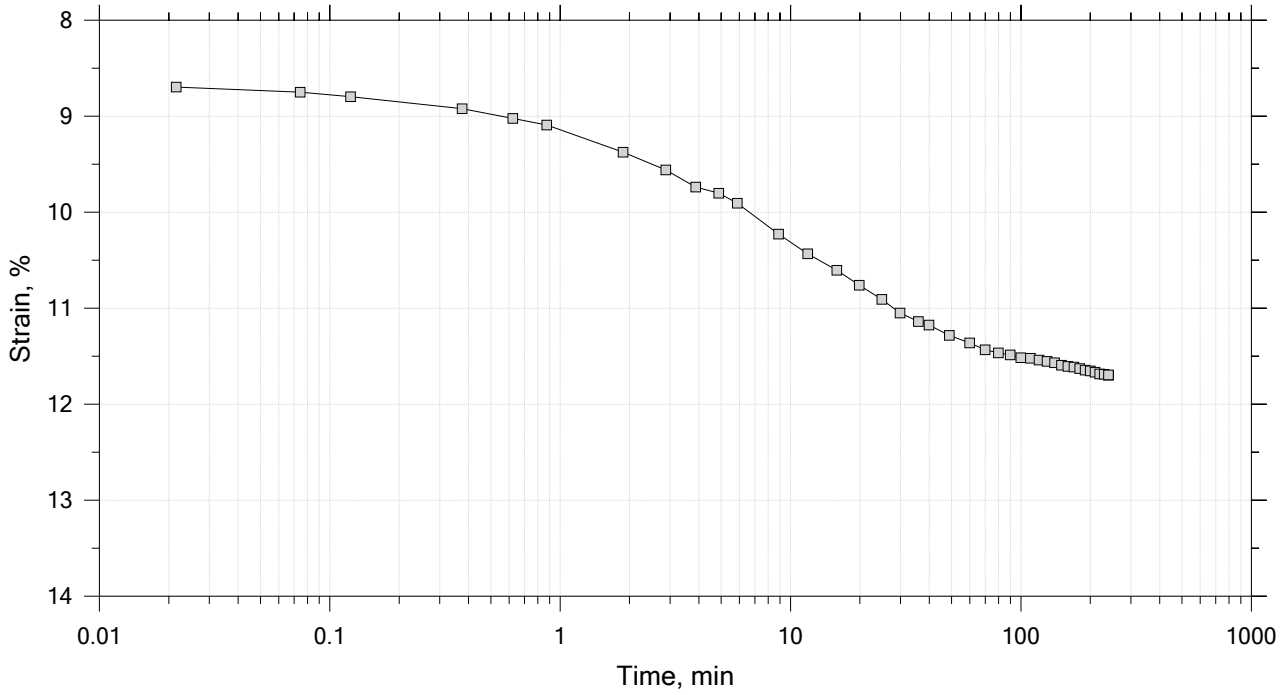

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

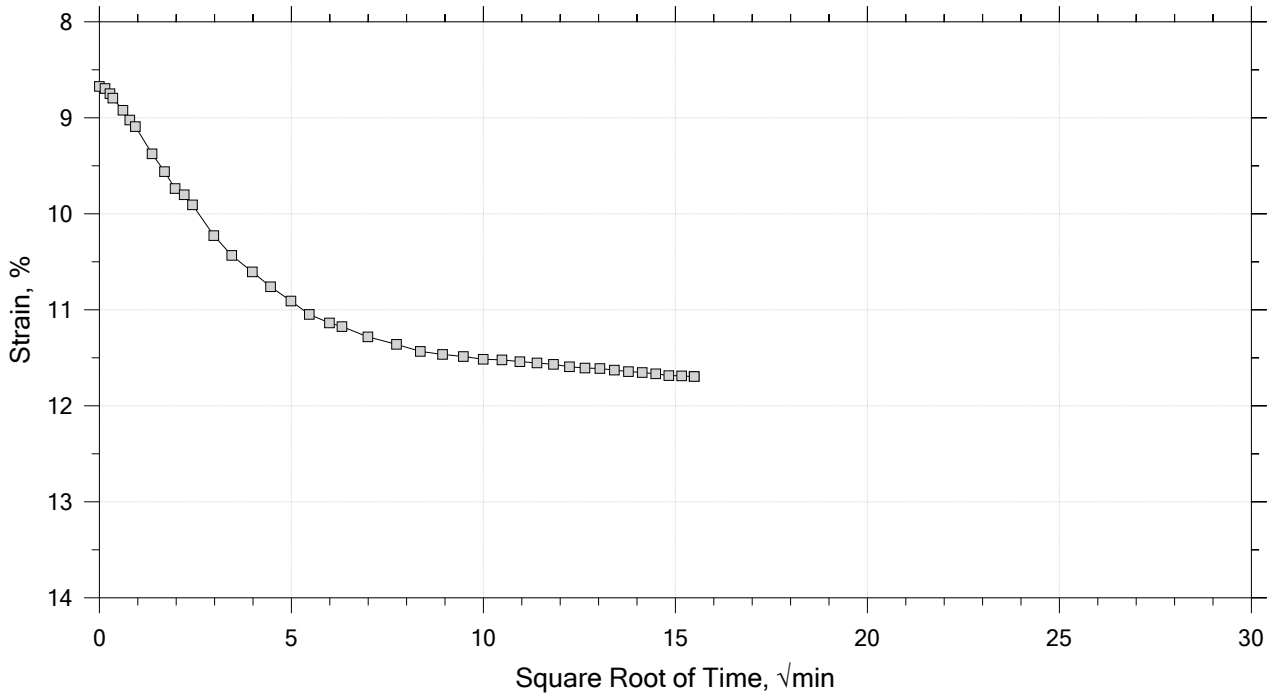
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf

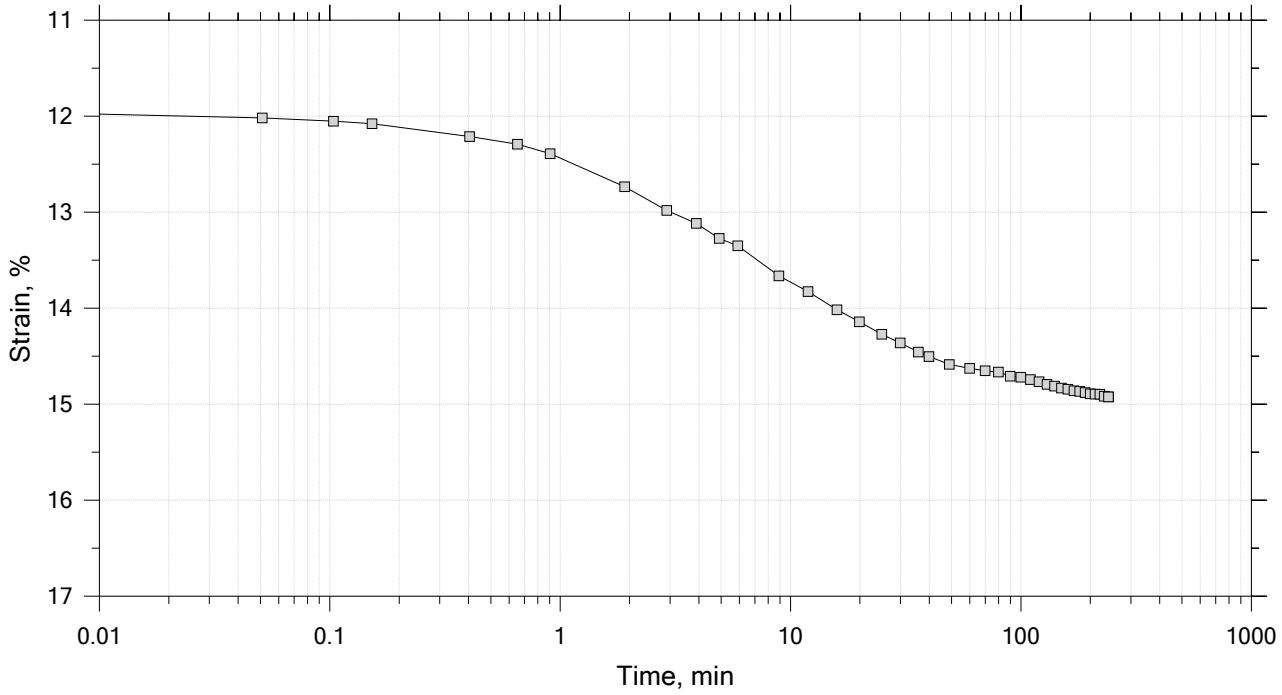


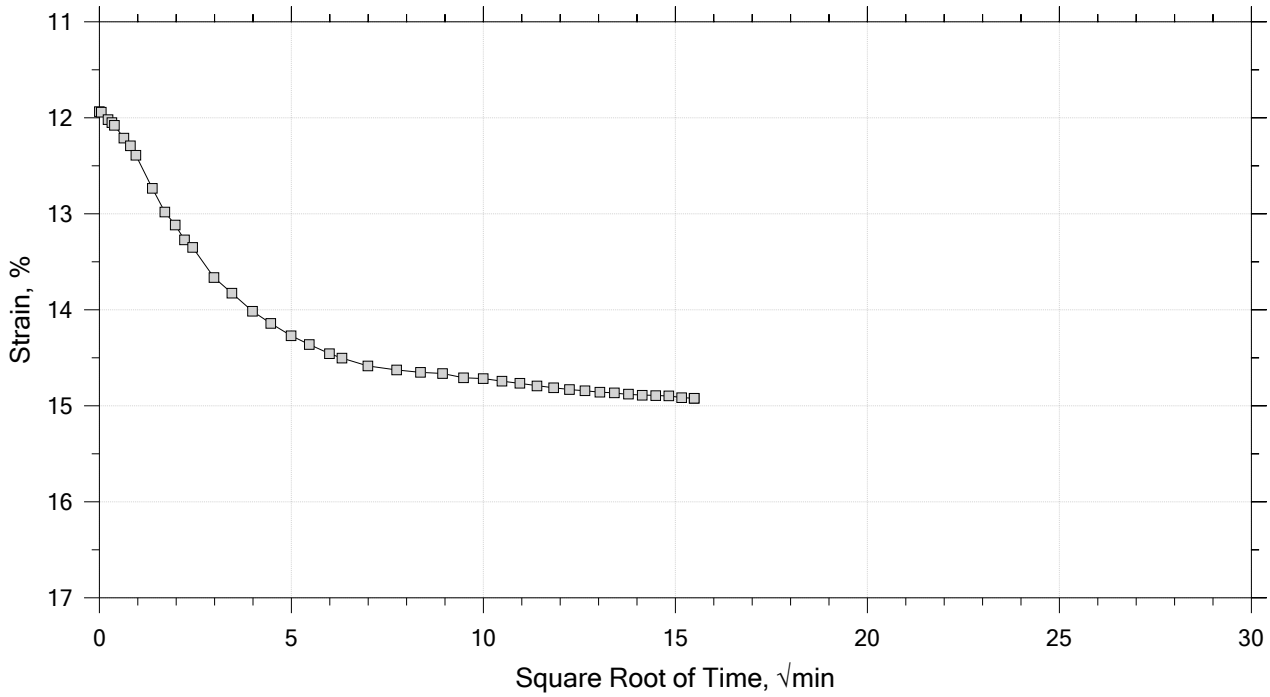




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15
Constant Load Step
Stress: 4 tsf



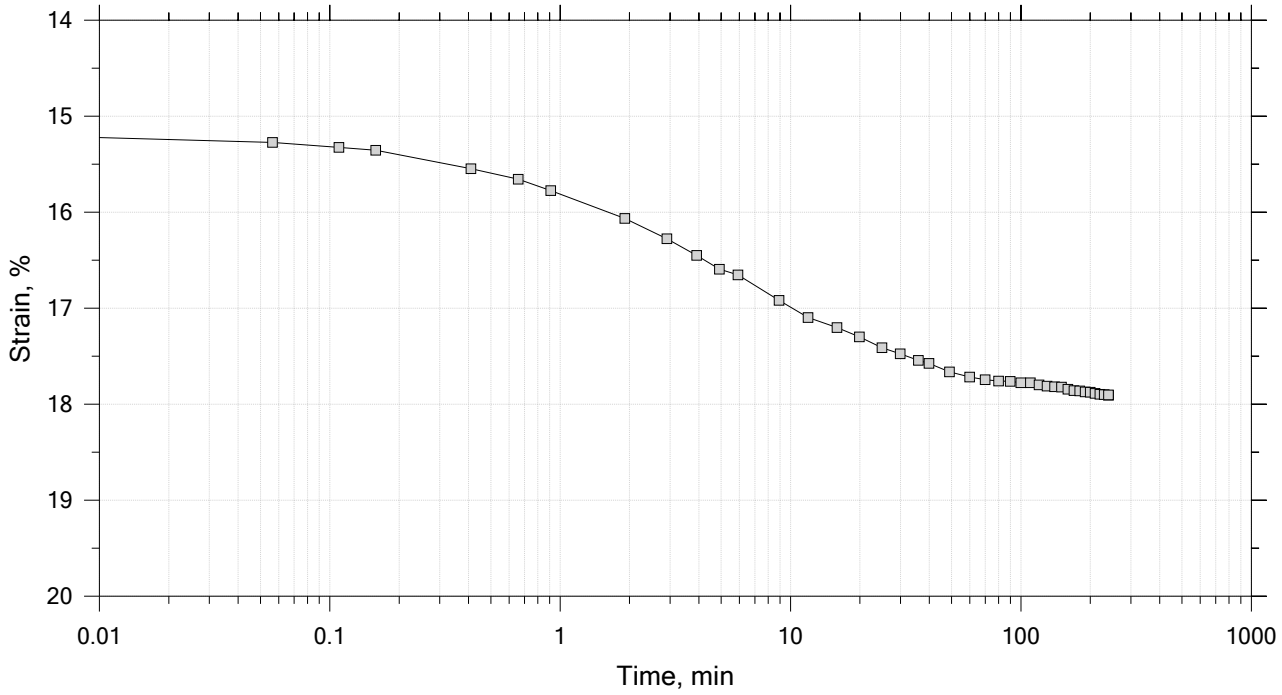

| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

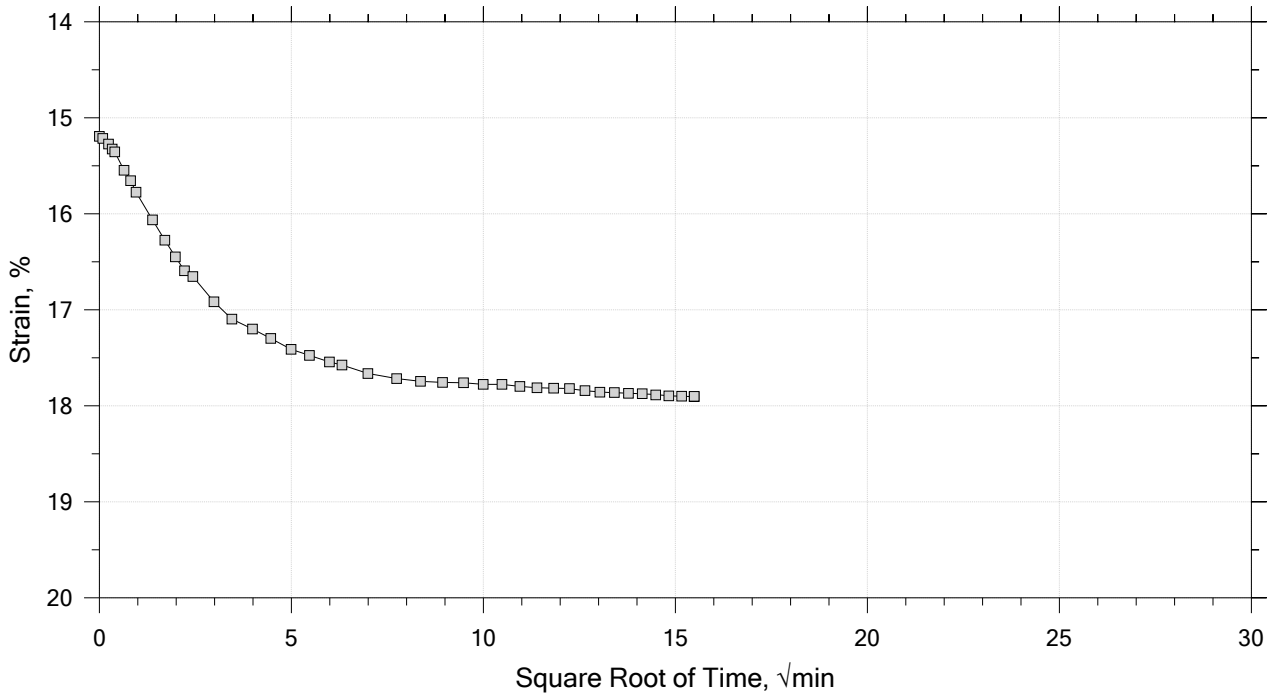
# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 8 tsf

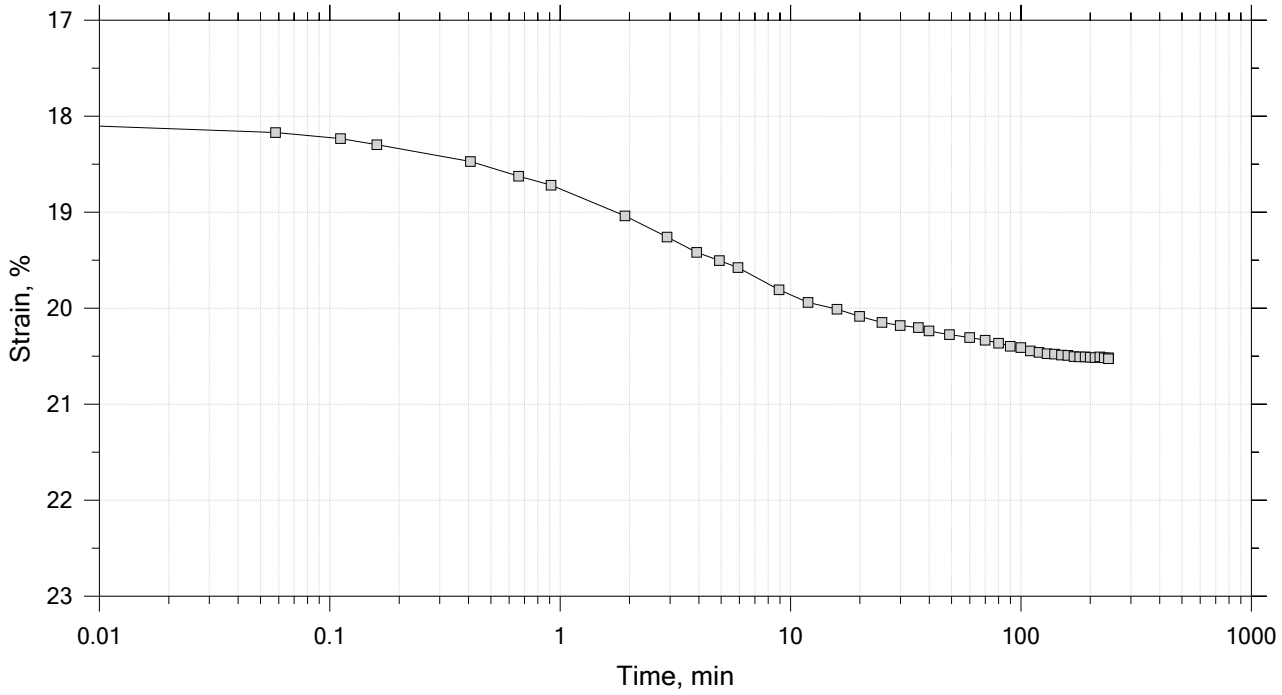


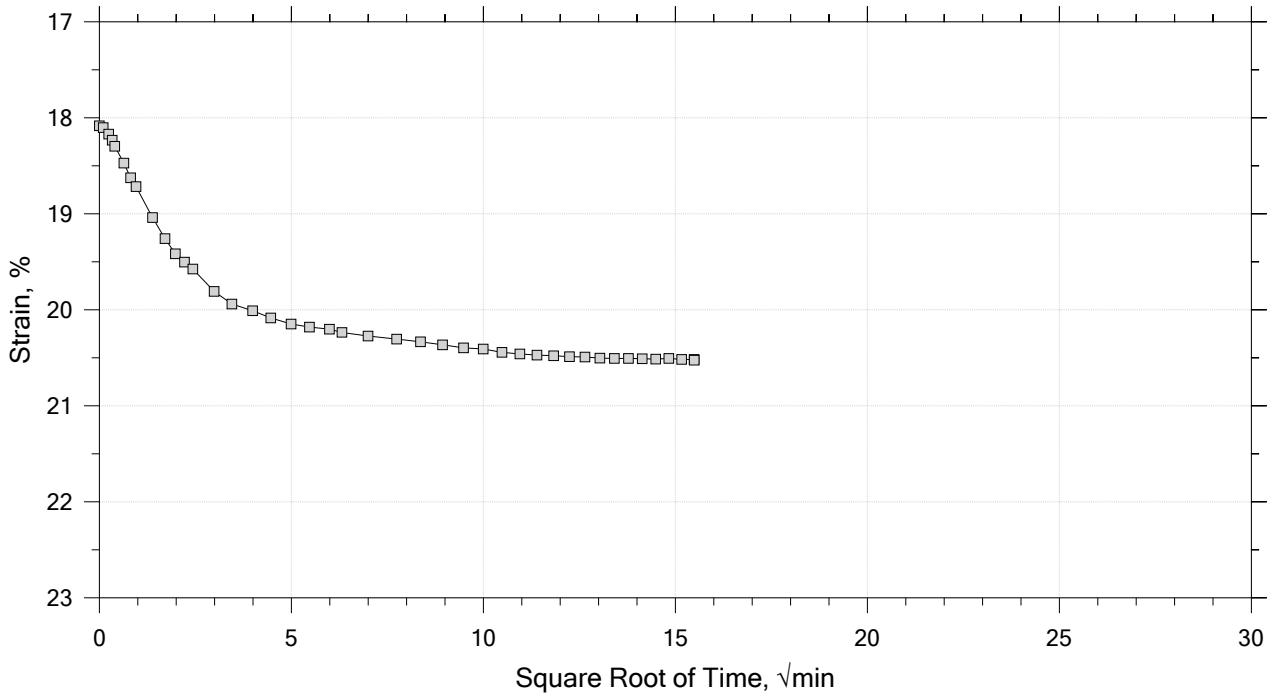




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

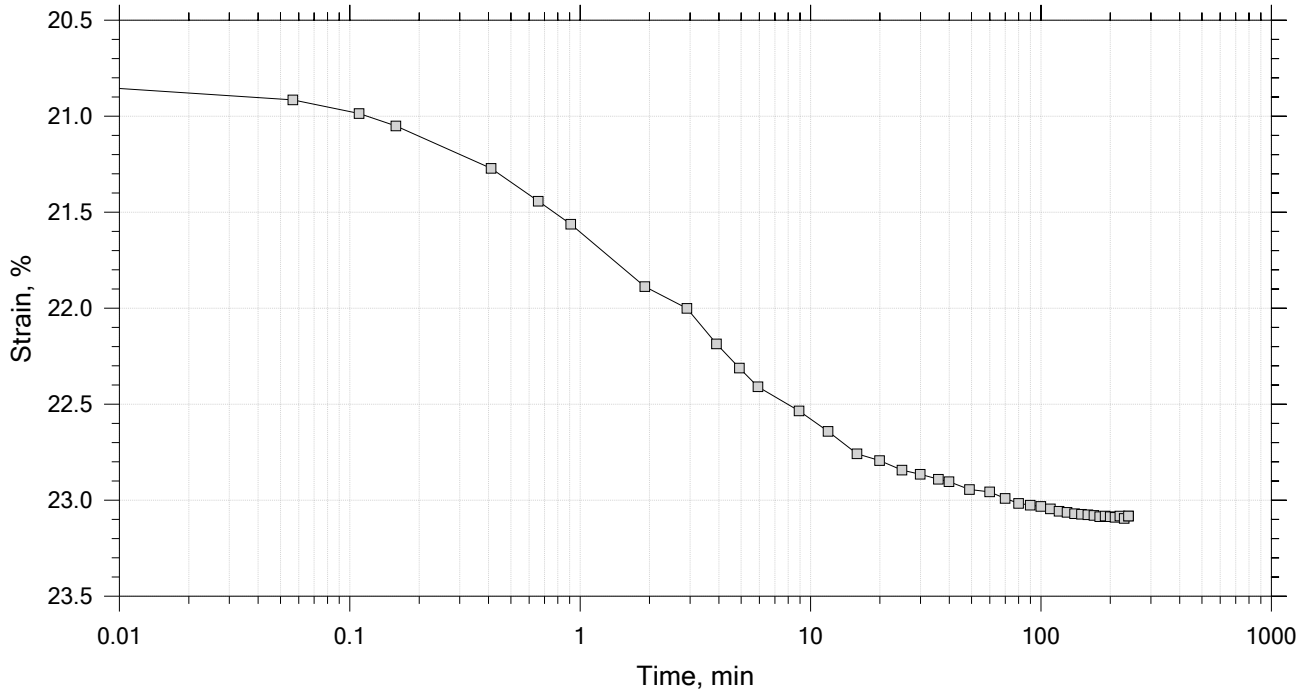


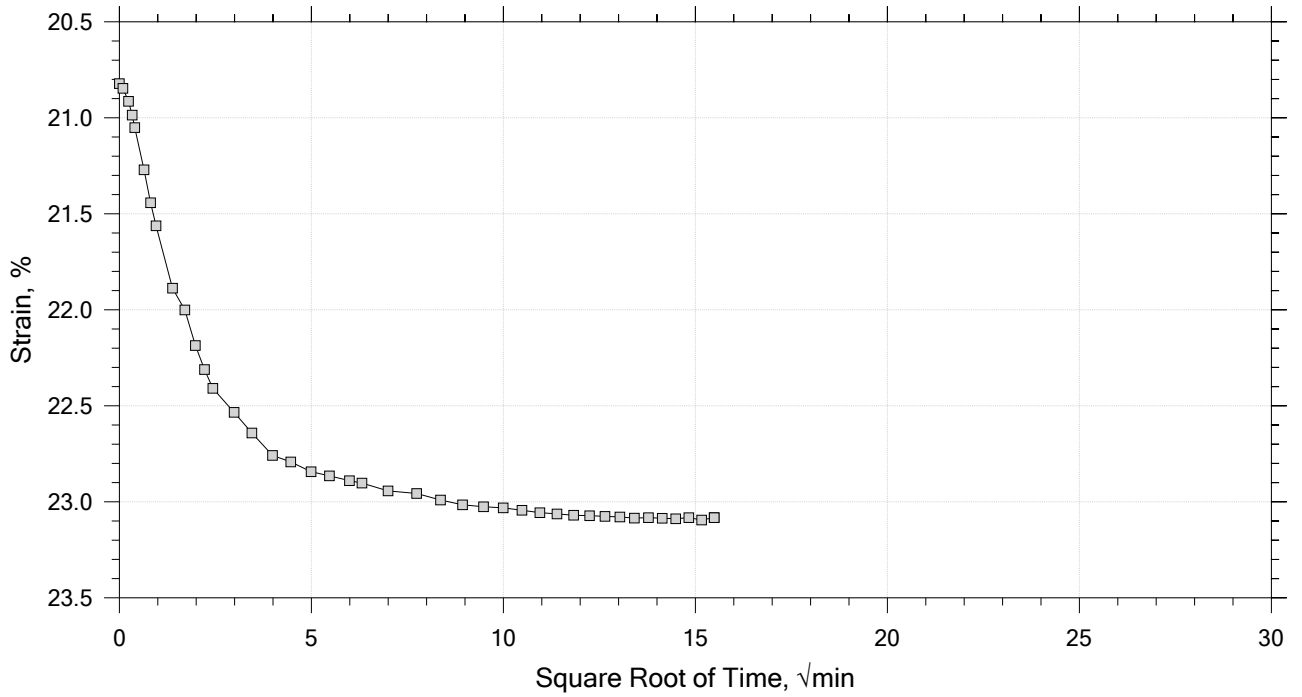




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

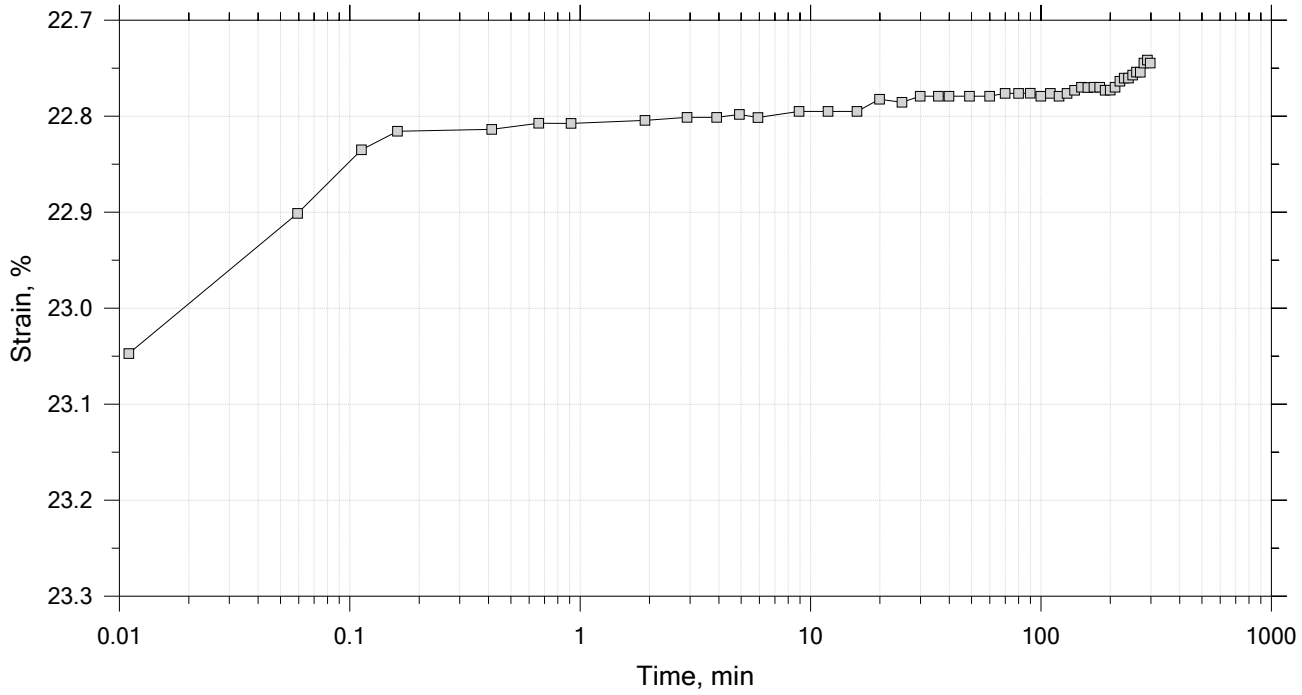


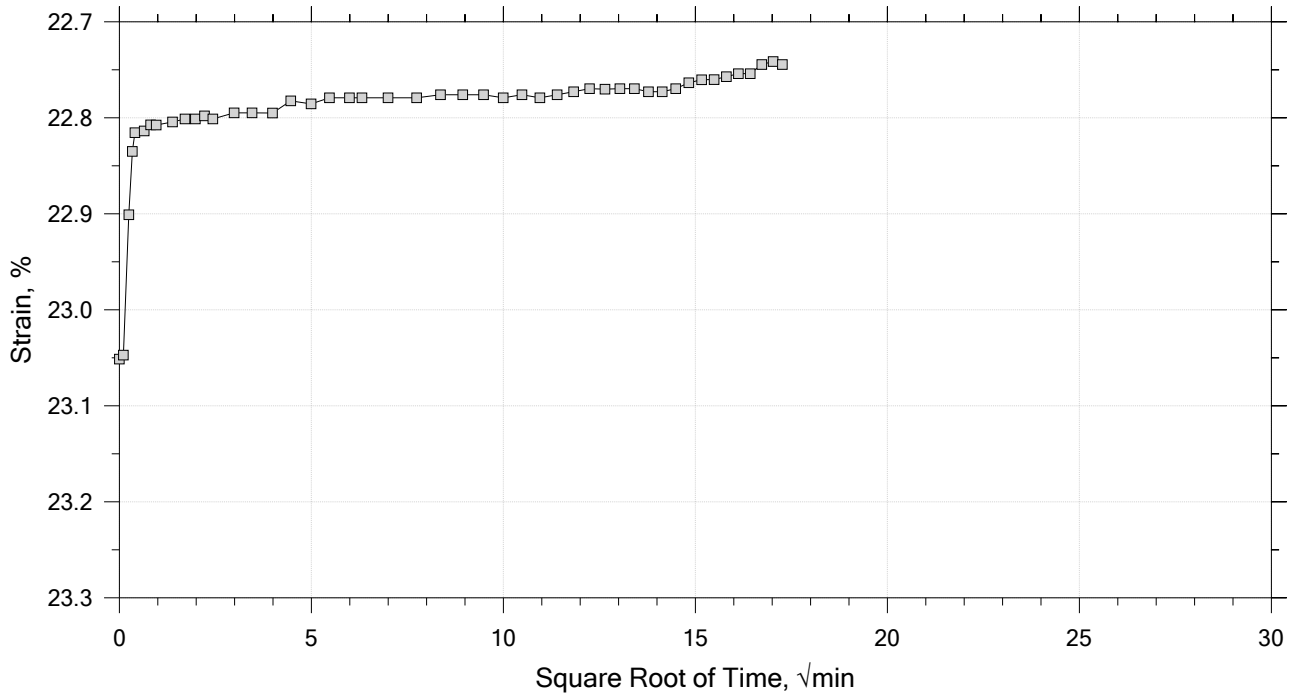




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

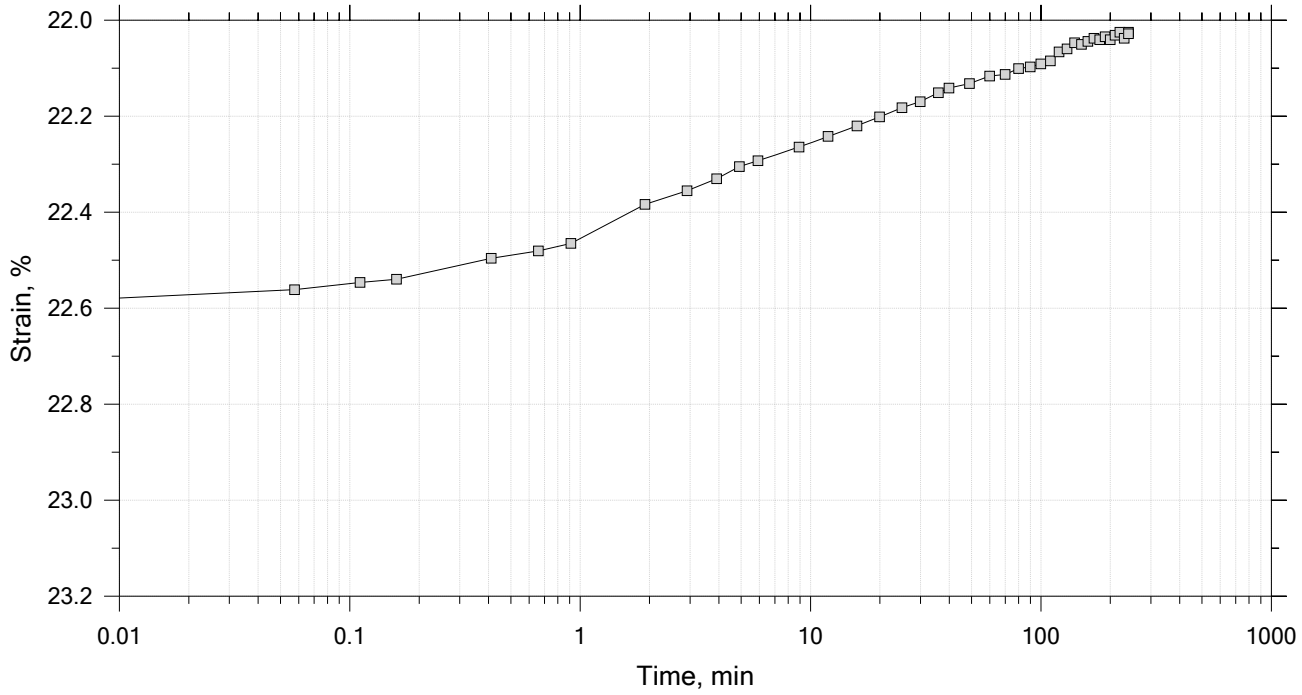


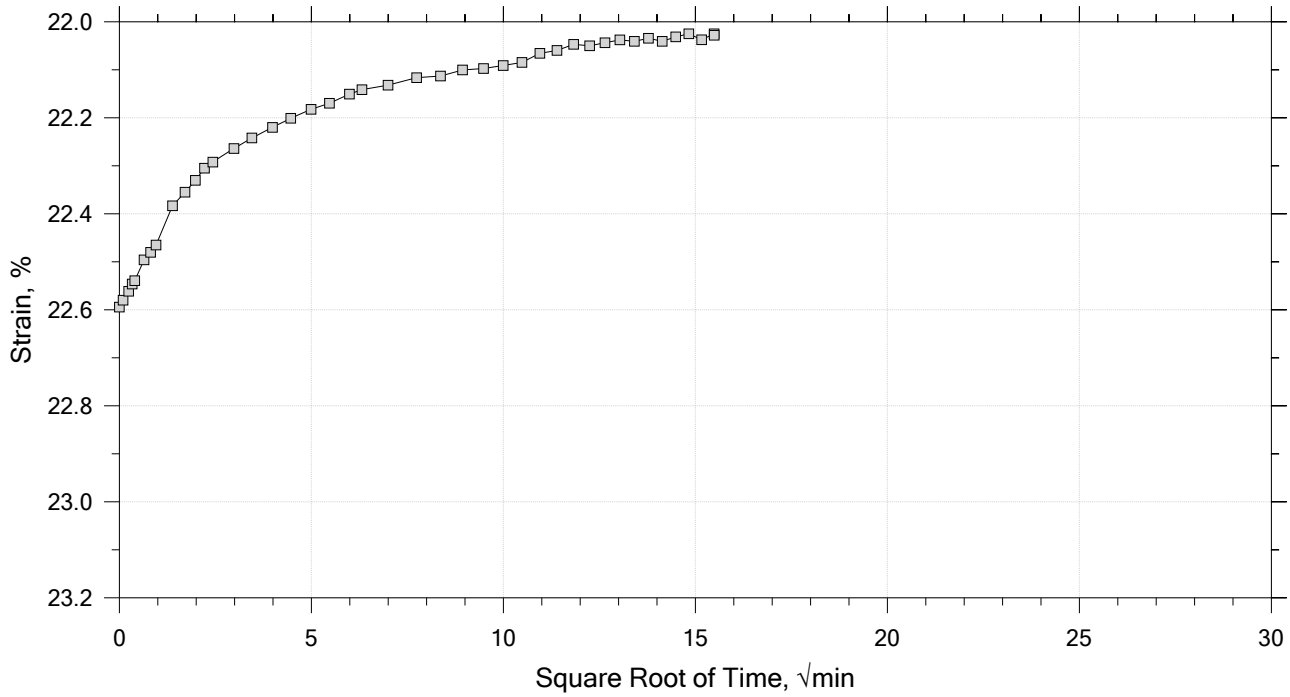




| | | |
|---|---|---|
| Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| Description: Moist, gray clay with sand | | |
| Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

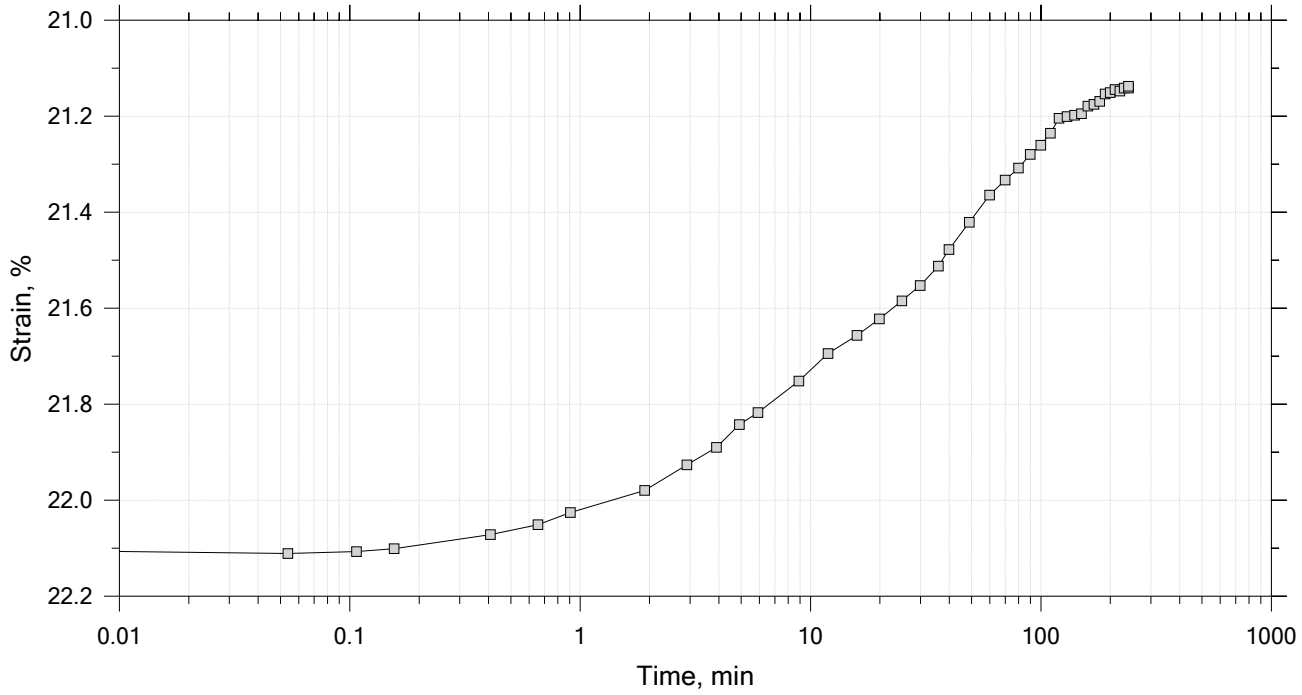


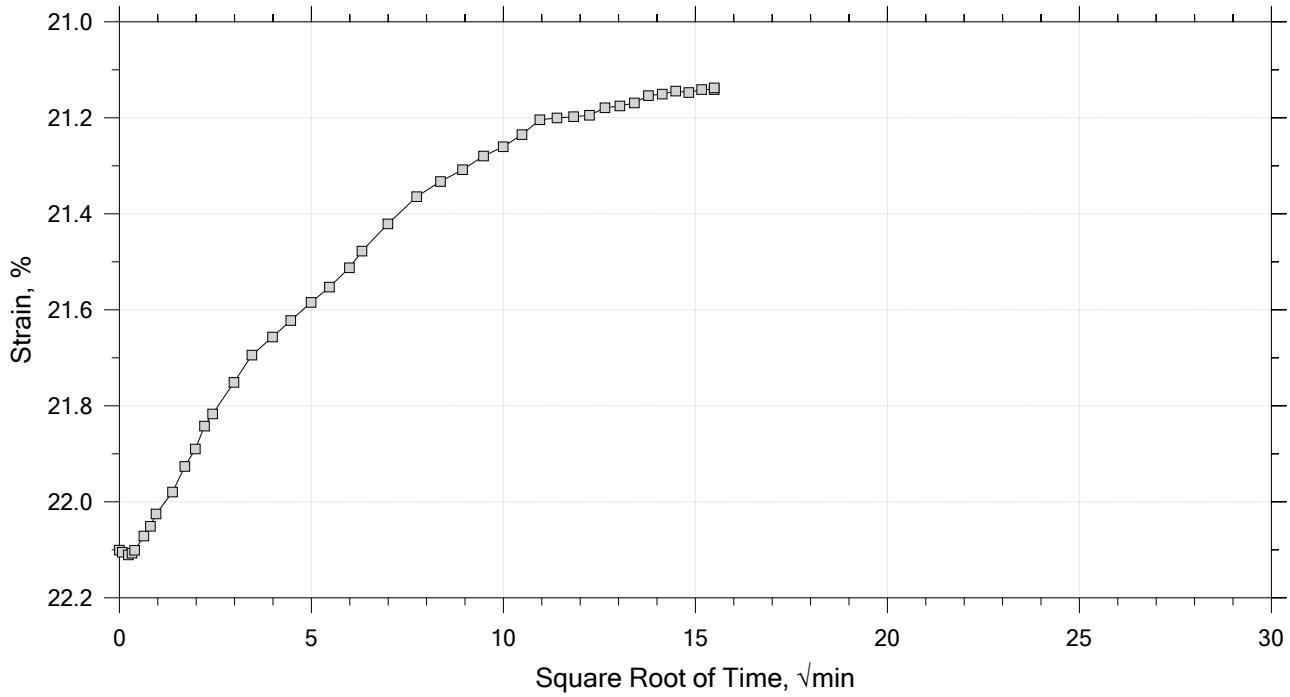




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

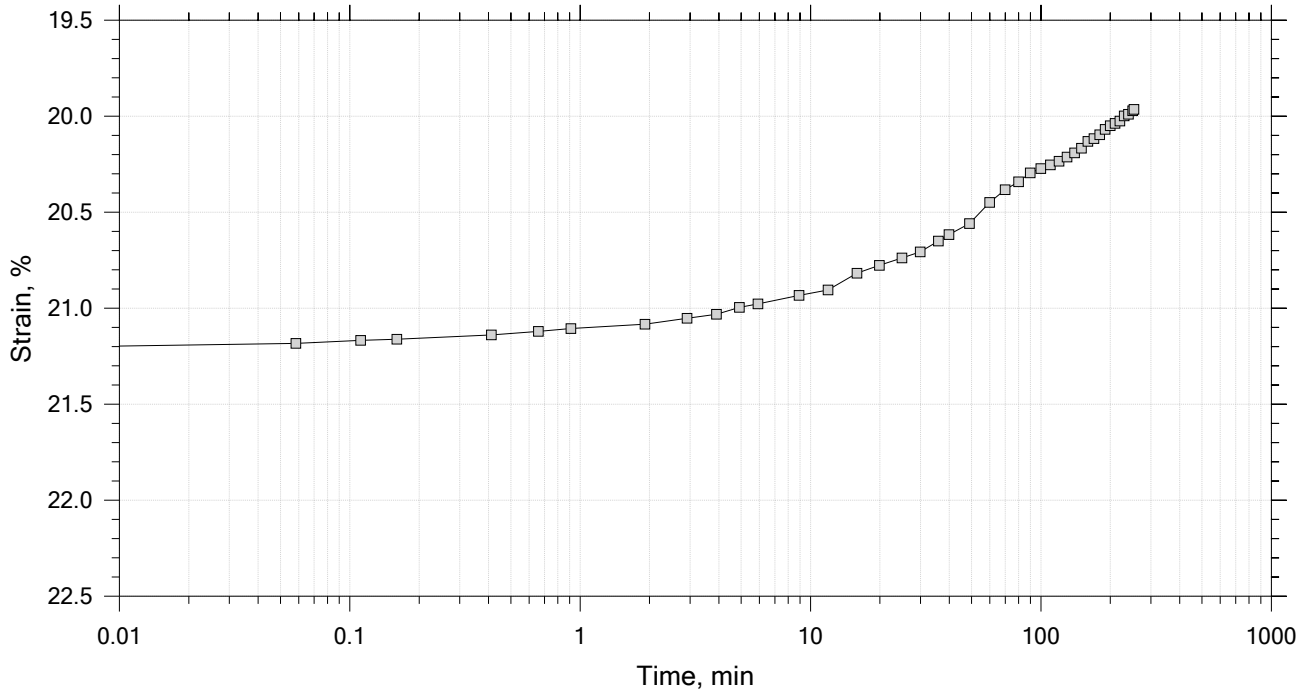


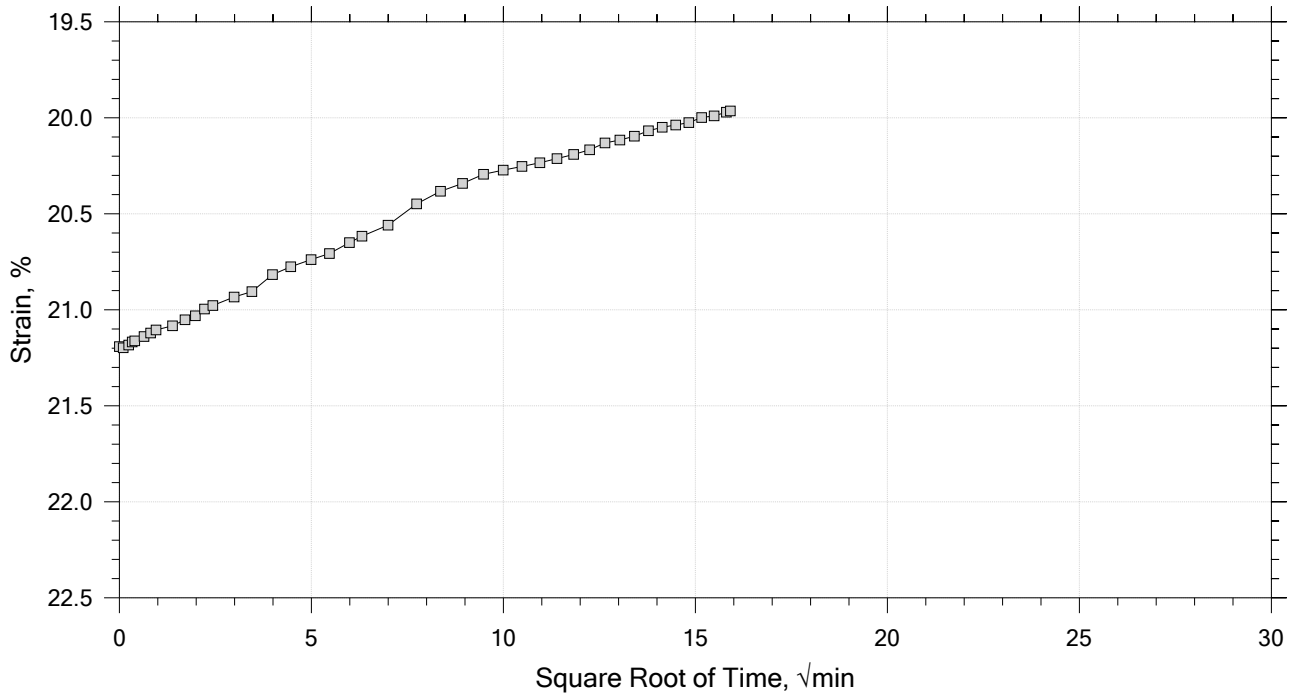




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

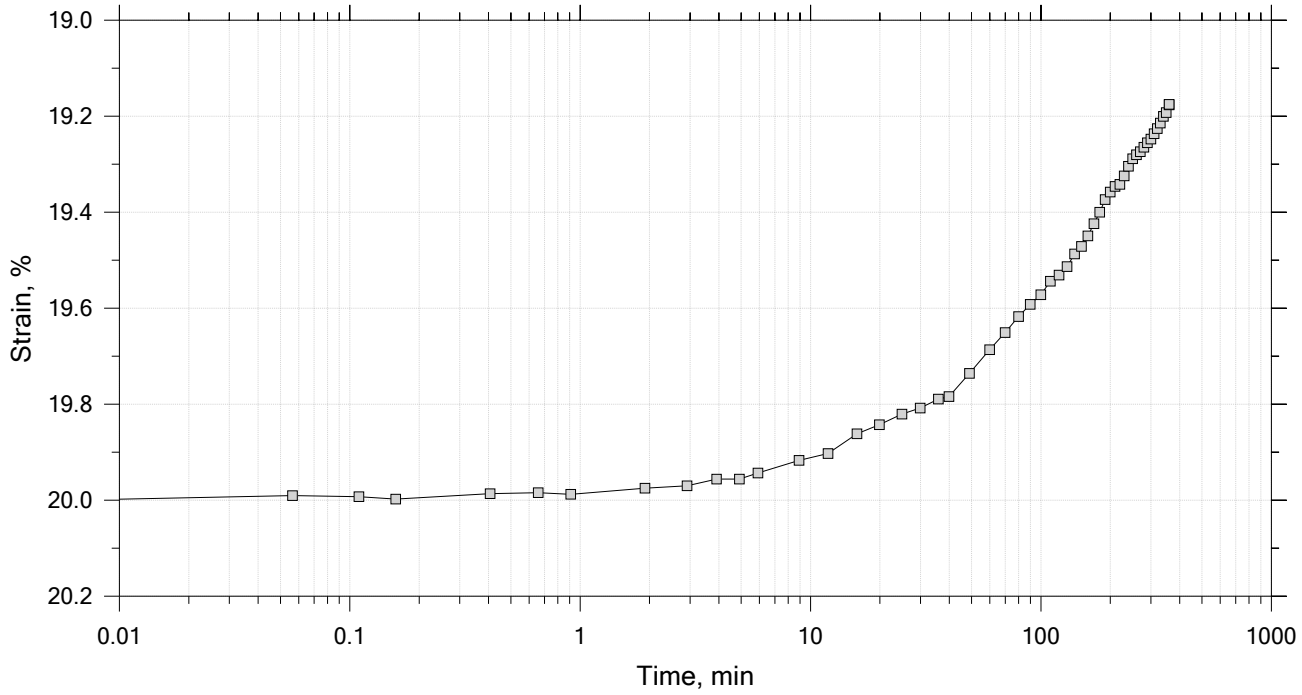


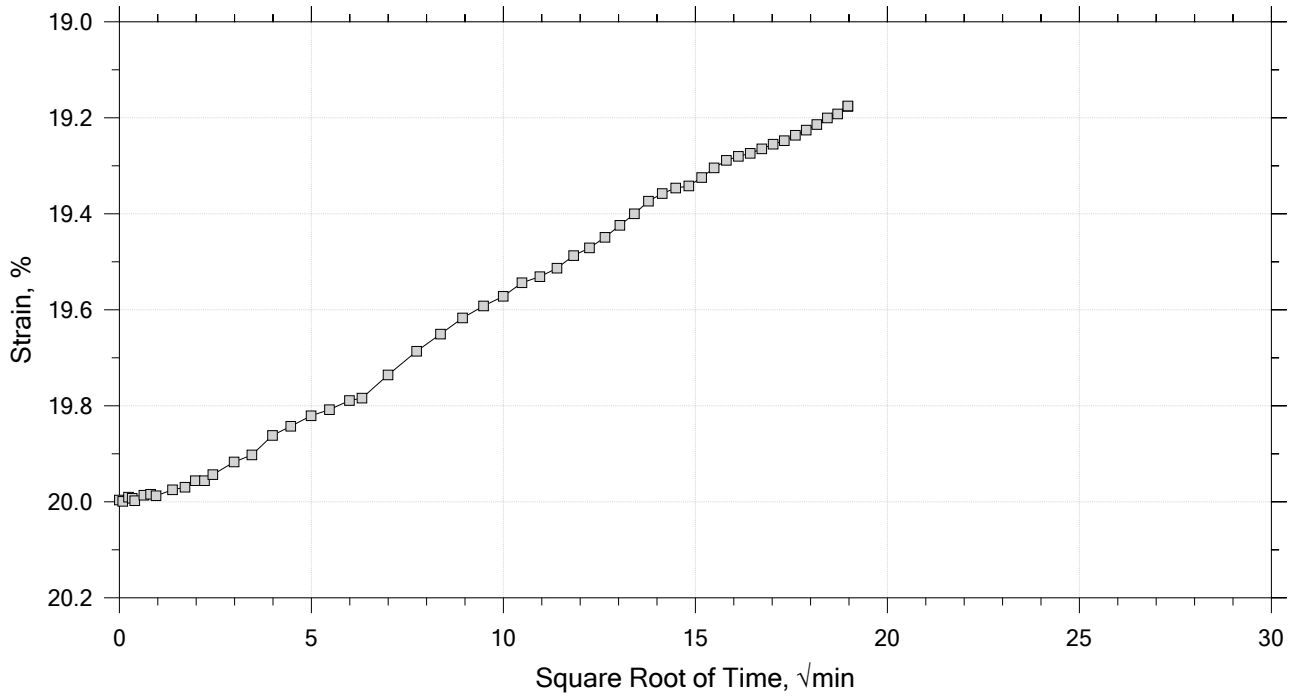




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf




| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

| | | |
|---|---|---|
| Specimen Diameter: 2.50 in | Estimated Specific Gravity: 2.70 | Liquid Limit: --- |
| Initial Height: 1.00 in | Initial Void Ratio: 0.911 | Plastic Limit: --- |
| Final Height: 0.81 in | Final Void Ratio: 0.548 | Plasticity Index: --- |

| | Before Test Trimmings | Before Test Specimen | After Test Specimen | After Test Trimmings |
|---|---|---|---|---|
| Container ID | A3073 | RING | | D1599 |
| Mass Container, gm | 8.35 | 108.06 | 108.06 | 8.59 |
| Mass Container + Wet Soil, gm | 232.79 | 257.49 | 244.6 | 144.76 |
| Mass Container + Dry Soil, gm | 194.74 | 221.53 | 221.53 | 121.75 |
| Mass Dry Soil, gm | 186.39 | 113.47 | 113.47 | 113.16 |
| Water Content, % | 20.41 | 31.69 | 20.33 | 20.33 |
| Void Ratio | --- | 0.91 | 0.55 | --- |
| Degree of Saturation, % | --- | 93.76 | 100.00 | --- |
| Dry Unit Weight, pcf | --- | 88.06 | 108.72 | --- |

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Log of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Log T50 min | Cv ft²/s | Mv 1/tsf | k ft/day | Ca % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0652 | 0.01031 | 0.892 | 1.03 | 0.000 | 0.00e+00 | 1.58e-01 | 0.00e+00 | 0.00e+00 |
| 2 | 0.125 | 0.01424 | 0.884 | 1.42 | 0.000 | 0.00e+00 | 6.58e-02 | 0.00e+00 | 0.00e+00 |
| 3 | 0.250 | 0.02309 | 0.867 | 2.31 | 0.000 | 0.00e+00 | 7.08e-02 | 0.00e+00 | 0.00e+00 |
| 4 | 0.500 | 0.05665 | 0.803 | 5.67 | 6.067 | 8.66e-07 | 1.34e-01 | 3.14e-04 | 0.00e+00 |
| 5 | 1.00 | 0.08477 | 0.749 | 8.48 | 0.000 | 0.00e+00 | 5.62e-02 | 0.00e+00 | 0.00e+00 |
| 6 | 2.00 | 0.1169 | 0.688 | 11.7 | 7.151 | 6.44e-07 | 3.22e-02 | 5.59e-05 | 0.00e+00 |
| 7 | 4.00 | 0.1492 | 0.626 | 14.9 | 5.089 | 8.42e-07 | 1.61e-02 | 3.66e-05 | 0.00e+00 |
| 8 | 8.00 | 0.1790 | 0.569 | 17.9 | 3.792 | 1.05e-06 | 7.45e-03 | 2.11e-05 | 0.00e+00 |
| 9 | 16.0 | 0.2053 | 0.519 | 20.5 | 2.160 | 1.72e-06 | 3.28e-03 | 1.52e-05 | 0.00e+00 |
| 10 | 32.0 | 0.2308 | 0.470 | 23.1 | 1.948 | 1.79e-06 | 1.60e-03 | 7.71e-06 | 0.00e+00 |
| 11 | 8.00 | 0.2274 | 0.477 | 22.7 | 0.000 | 0.00e+00 | 1.41e-04 | 0.00e+00 | 0.00e+00 |
| 12 | 2.00 | 0.2203 | 0.490 | 22.0 | 0.000 | 0.00e+00 | 1.19e-03 | 0.00e+00 | 0.00e+00 |
| 13 | 0.500 | 0.2114 | 0.507 | 21.1 | 0.000 | 0.00e+00 | 5.94e-03 | 0.00e+00 | 0.00e+00 |
| 14 | 0.125 | 0.1996 | 0.530 | 20.0 | 0.000 | 0.00e+00 | 3.13e-02 | 0.00e+00 | 0.00e+00 |
| 15 | 0.0625 | 0.1918 | 0.545 | 19.2 | 100.192 | 3.68e-08 | 1.26e-01 | 1.25e-05 | 0.00e+00 |

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |
| | Displacement at End of Increment | | |

# One-Dimensional Consolidation by ASTM D2435 - Method B

## Square Root of Time Coefficients

| Step | Applied Stress tsf | Final Displacement in | Void Ratio | Strain at End % | Sq.Rt. T90 min | Cv ft²/s | Mv 1/tsf | k ft/day |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0652 | 0.01031 | 0.892 | 1.03 | 3.449 | 7.04e-06 | 1.58e-01 | 3.00e-03 |
| 2 | 0.125 | 0.01424 | 0.884 | 1.42 | 48.762 | 4.91e-07 | 6.58e-02 | 8.71e-05 |
| 3 | 0.250 | 0.02309 | 0.867 | 2.31 | 40.470 | 5.84e-07 | 7.08e-02 | 1.11e-04 |
| 4 | 0.500 | 0.05665 | 0.803 | 5.67 | 30.142 | 7.50e-07 | 1.34e-01 | 2.72e-04 |
| 5 | 1.00 | 0.08477 | 0.749 | 8.48 | 27.988 | 7.57e-07 | 5.62e-02 | 1.15e-04 |
| 6 | 2.00 | 0.1169 | 0.688 | 11.7 | 30.880 | 6.42e-07 | 3.22e-02 | 5.57e-05 |
| 7 | 4.00 | 0.1492 | 0.626 | 14.9 | 19.279 | 9.56e-07 | 1.61e-02 | 4.16e-05 |
| 8 | 8.00 | 0.1790 | 0.569 | 17.9 | 14.095 | 1.22e-06 | 7.45e-03 | 2.44e-05 |
| 9 | 16.0 | 0.2053 | 0.519 | 20.5 | 10.081 | 1.59e-06 | 3.28e-03 | 1.40e-05 |
| 10 | 32.0 | 0.2308 | 0.470 | 23.1 | 7.593 | 1.98e-06 | 1.60e-03 | 8.52e-06 |
| 11 | 8.00 | 0.2274 | 0.477 | 22.7 | 1.249 | 1.17e-05 | 1.41e-04 | 4.43e-06 |
| 12 | 2.00 | 0.2203 | 0.490 | 22.0 | 26.504 | 5.58e-07 | 1.19e-03 | 1.80e-06 |
| 13 | 0.500 | 0.2114 | 0.507 | 21.1 | 49.703 | 3.04e-07 | 5.94e-03 | 4.86e-06 |
| 14 | 0.125 | 0.1996 | 0.530 | 20.0 | 203.840 | 7.60e-08 | 3.13e-02 | 6.41e-06 |
| 15 | 0.0625 | 0.1918 | 0.545 | 19.2 | 284.207 | 5.59e-08 | 1.26e-01 | 1.90e-05 |

| | | | |
|---|---|---|---|
| GeoTesting EXPRESS | Project: San Jacinto Pre-Design | Location: --- | Project No.: GTX-309154 |
| | Boring No.: SJGB037 | Tested By: md | Checked By: njh |
| | Sample No.: SL0657 | Test Date: 2/19/19 | Depth: 15-17 ft |
| | Test No.: IP-9 | Sample Type: intact | Elevation: --- |
| | Description: Moist, gray clay with sand | | |
| | Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf | | |
| | Displacement at End of Increment | | |

## Attachment B. PDI-2 BORING LOGS AND GEOTECHNICAL TESTING RESULTS

This Attachment contains the following:
(Digital Copies Only)

B.1 Field Logs (Northern Impoundment) – TWE

B.2 Lab Testing Data (Northern Impoundment) – TWE

B.3 Soil Boring Logs (Northern Impoundment) - Ardaman

# BORING LOG

Project: 11187072 San Jacinto
Client: IPC/MIMC
No. SJGB024
File No.:
Date: 9/7/19
Drilling Co.: TWE
Supervisor: Nick Groves
Type Rig: Tracked Geoprobe/Auger
Logged by: Breanna North

| LABORATORY TEST DATA | | | | | FIELD DATA | | | | | BORING DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volumetric Moisture Content | Atterberg Test: Liquid Limit (%) | Atterberg Test: Plastic Index (%) | % Finer than #200 Sieve | Other Rec: | Organic Vapor Meter (1) (ppm) | Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot) | Sampling | Depth (feet) | Water Level | Screen Interval | Start Time: 1115 Finish Time: 1610 |
| | | | | 45% | | med. push | ST | | | | Dark black-brown soil w/organics - cohesive |
| | | | | 75% | | med/stiff push | ST | | | | Dark black-brown soil w/organics - cohesive (evidence of liner) |
| | | | | 90% | | med/stiff push | ST | 5 | | | Dark black-brown clayey, w/minor traces of brown-tan clay - cohesive |
| | | | | 90% | | med/stiff push | ST | | | | Dark grey, wet, clayey, silty-sands |
| | | | | 100% | | med/stiff push | ST | | | | Dark grey, wet, clayey, silty-sands |
| | | | | 100% | | med/stiff push | ST | 10 | | | Dark-grey, wet, clayey, silty-sands |
| | | | | 100% | | med/stiff push | ST | | | | Dark grey, wet, clayey silty sands |
| | | | | 100% | | med/stiff push | ST | 15 | | | Grey, wet, ~~sandy clay~~ BN clayey, silty sand |
| | | | | 100% | | soft/med push | ST | 20 | | | Grey, very wet, clayey silty sands |
| | | | | 100% | | soft/med push | ST | 25 | | | Grey, very wet, ~~silty sands~~ BN clayey silty sands |
| | | | | 100% | | med push | ST | 30 | | | Grey clay - cohesive |

TD @ 30'

Note:
Visual description from bottom of Shelby Tubes.

Shelby Tube
Direct-Push Sampler
Auger Cuttings
No Recovery

PID:

Water First Noted
Level After min
NP Non Plastic
* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure
**GHD Services, Inc.**

# BORING LOG

Project: 11187072 San Jacinto

Client: IPC/MIMC

No. SJGB025

File No.:
Date: 9/10/19
Drilling Co.: TWE
Supervisor: Nick Groves (GHD), Keith
Type Rig: Tracked Geoprobe/Auger
Logged by: Breanna North

| LABORATORY TEST DATA | | | | | FIELD DATA | | | | | BORING DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volumetric Moisture Content | Atterberg Test: Liquid Limit (%) | Atterberg Test: Plastic Index (%) | % Finer than #200 Sieve | Other Rec: | Organic Vapor Meter (1) (ppm) | Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot) | Sampling | Depth (feet) | Water Level | Screen Interval | Start Time: 0925 Finish Time: 1415 |
| | | | | 75% | | 30,18,9 | SS | | | | grey/tan loose sands, some gravel |
| | | | | 100% | | med push | ST | | | | dark grey clayey sand wet BN damp, cohesive |
| | | | | 100% | | med push | ST | 5 | | | dark grey clayey sand, damp, cohesive |
| | | | | 100% | | med/stiff push | ST | | | | grey clayey sand, damp |
| | | | | 100% | | med/stiff push | ST | | | | grey clayey sand, damp |
| | | | | 100% | | stiff push | ST | 10 | | | grey clayey sand, ~~damp~~ wet BN |
| | | | | 95% | | med push | ST | | | | grey clayey sand, wet |
| | | | | 30% | | med push | ST | 15 | | | grey clayey sand, very wet |
| | | | | 0% | | med push | ST | 20 | | | No recovery – evidence of grey sand, very wet |
| | | | | 100% | | 6,14,30 | SS | | | | Flow back to approx. 18'-20'. Took SS sample. BN Grey sands, wet, very loose |
| | | | | 9% | | 2,2,4 | SS | | | | Flow back to approx. 20-22'. Took SS sample. Grey sands, wet, very loose |
| | | | | 90% | | 1,2,3 | SS | 25 | | | Grey sands, wet, very loose |
| | | | | | | | | | | | Hit significant water, Water flowing out of top of augers as drill bit being raised |
| | | | | 90% | | 5,7,11 | SS | 30 | | | Grey sands, wet, Loose |
| | | | | | | | | | | | TD = 30' |
| | | | | | | | | | | | Note: Visual description from bottom of Shelby tubes. |

■ Shelby Tube = ST

⊠ Direct-Push Sampler — Split Spoon = SS

▯ Auger Cuttings

▨ No Recovery

PID:

▽ Water First Noted

▼ Level After min

NP Non Plastic

* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

**GHD Services, Inc.**

Attachment Figure B.1-2

# BORING LOG

Project: 11187072 San Jacinto
Client: IPC / MIMC
No. SJGB026
File No.:
Date: 9/9/19
Drilling Co.: TWE
Supervisor: Nick Graves
Type Rig: Tracked Geoprobe / Auger
Logged by: Breanna North

| LABORATORY TEST DATA | | | | | FIELD DATA | | | | | BORING DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volumetric Moisture Content | Atterberg Test: Liquid Limit (%) | Atterberg Test: Plastic Index (%) | % Finer than #200 Sieve | Other | Organic Vapor Meter (1) (ppm) | Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot) | Sampling | Depth (feet) | Water Level | Screen Interval | Start Time: 0910 Finish Time: 1425 |
| | | | | Rec: 75% | | med push | ST | | | | light grey, sandy clay, damp |
| | | | | 75% | | med push | ST | | | | light grey, some tan, sandy clay, wet |
| | | | | 75% | | med push | ST | 5 | | | light/med grey, some tan, sandy clay wet |
| | | | | 100% | | Med/stiff Push | ST | | | | dark grey sandy clay, wet |
| | | | | 75% | | med push | ST | | | | med grey clayey sands, wet |
| | | | | 80% | | med push | ST | 10 | | | grey clayey sands, wet |
| | | | | 100% | | med push | ST | | | | grey clayey sands, wet |
| | | | | 0% | ↓ 1/3 1/3 | stiff push soft push | | 15 | | | No recovery (grey wet residue inside tube |
| | | | | 0% | | soft push set for 20 mins | ST | 20 | | | No recovery (grey sand, wet observed on drill bit from drill down 18'-20') |
| | | | | 100% | | 4,3,3 | SS | | | | Dark grey/brown sand, wet |
| | | | | | | | | | | | TD: 22' |

Note: Visual description from bottom of Shelby Tubes.

Shelby Tube = ST
Direct-Push Sampler
Split Spoon = SS
Auger Cuttings
No Recovery

PID:

Water First Noted
Level After min
NP Non Plastic
* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

**GHD Services, Inc.**

Attachment Figure B.1-3

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJGB027
DATE COMPLETED: 12/4/19 -
DRILLING METHOD: Auger/Mud Rotary (truck mounted)
FIELD PERSONNEL: B. North (GHD); Keith,
DRILLING COMPANY SUPERVISOR: Keith Barge (TWE)

SJGB027

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | | DEPTH ft BGS | SAMPLE NUMBER / Blow counts | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE | SAMPLE Pocket pen PID (ppm) (tsf) |
|---|---|---|---|---|---|---|---|---|
| 0 | (0'-2') Dark grey sandy clay | ST | 0'-2' | | | 10% | | |
| 2 | (2'-4') Dark grey sandy soft clay w/some organics | ST | 2'-4' | | | 90% | | |
| 4 | (4'-6') Dark grey sandy clay w/some organics | ST | 4'-6' | | | 100% | | |
| 6 | (6'-8') Dark grey sandy clay w/some organics, shells | ST | 6'-8' | | | 100% | | |
| 8 | (8'-10') Dark Grey sandy clay w/some organics, shells | ST | 8'-10' | | | 90% | | |
| 10 | (10'-12') Dark grey BN clayey sands | ST | 10-12' | | | 80% | | |
| 12 | (12'-14') Dark grey clayey sands, fine-med, slightly cohesive | SS | 12'-14' | wt. of hammer | | 70% | | |
| 14 | (14'-16') Dark grey fine-med sands | SS | 14'-16' | wt. of hammer | | 40% | | |
| 16 | | | | | | | | |
| 18 | (18'-20') Dark grey clayey sands, fine-med, some cohesiveness | SS | 18'-20' | hammer, 2,2 | | 40% | | |
| 20 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | (23'-25') Grey clayey sands, fine-med, loose | SS | 23'-25' | 1,1,1 | | 50% | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 28 | (28'-30') Grey clayey sands-fine-med, some cohesiveness in clay | SS | 28'-30' | 2,3,6 | | 40% | | |
| 30 | | | | | | | | |
| 32 | | | | | | | | |
| 33 | (33'-35') Tan Grey sands, med-coarse, some gravel, loose | SS | 33'-35' | 3,4,5 | | 40% | | |
| 34 | (~34.5-40') Grey clay, hard cohesive | | | | | | | |
| 35 | | | | | | | | |
| 36 | | | | | | | | |
| 38 | (38'-40') Tan, Reddish brown-grey sandy clay, some coarse sands, cohesive, some plasticity | ST (E) | 38-40' | | | 90% | | 1.7 |

Observed bottom of Shelby Tube

Auger

Mud Rotary

NOTES: ST = Shelby Tube E = Extruded on site
SS = Split Spoon

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJGB027
DATE COMPLETED: 12/4/19 -
DRILLING METHOD: Mud Rotary (Truck mounted)
FIELD PERSONNEL: B. North (GHD)
DRILLING COMPANY SUPERVISOR

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE | SAMPLE Pocket pen PID (ppm) (tsf) |
|---|---|---|---|---|---|---|---|
| | SJGB027 | | | | | | |
| 42 | | | | | | | |
| 43 | (43'-45') Reddish-brown clay, ~~that~~ Bv w/some organics/shells, hard, cohesive, plasticity ST (E) | 43'-45' | | | 100% | | 2.4 |
| 44 | | | | | | | |
| 45 | | | | | | | |
| 46 | | | | | | | |
| 48 | (48'-50') Reddish-brown clay, hard, cohesive, some plasticity ST (E) | 48'-50' | | | 90% | | 2.7 |
| 50 | | | | | | | |
| 52 | TD @ 50' | | | | | | |
| 54 | | | | | | | |
| 56 | | | | | | | |
| 58 | | | | | | | |
| 60 | | | | | | | |
| 62 | | | | | | | |
| 64 | | | | | | | |
| 66 | | | | | | | |
| 68 | | | | | | | |
| 70 | | | | | | | |
| 72 | | | | | | | |
| 74 | | | | | | | |
| 76 | | | | | | | |
| 78 | | | | | | | |

mud Rotary

NOTES: ST = Shelby Tube E = Extruded on Site
SS = Split Spoon

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: STSB047-G (geotech)
DATE COMPLETED:
DRILLING METHOD: mud rotary geotech on a barge
FIELD PERSONNEL: Stephen Salter
DRILLING COMPANY SUPERVISOR: Keith Barge

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | Type |
|---|---|---|---|---|---|---|---|
| | Brown silty sand to sandy silt, saturated, organics | | | | 50% | WH | SS |
| 2 | -- no recovery | | | | 0% | WH | SS |
| 4 | --continued brown silty sand w/ sandy silt, saturated | | | | 50% | WH | SS |
| 6 7 | | | | | 80% | WH | SS |
| 8 | Brown sandy clay w/ interbedded fine grained sand layers, wet to saturated | | | | | | |
| 9 | Brown silty clay w/ interbedded sand layers, moist to wet (sand) | | | | 100% | WH | SS |
| 10 | -- clay % ↑ w/ depth | | | | | | |
| | -- continued brown silty clay w/ interbedded 1-2 mm sand layers | | | | 100% | WH | SS |
| 12 | | | | | 10 | | |
| | -- SAA | | | | 90% | WH | SS |
| 14 | -- SAA, clay % ↑ w/ depth | | | | 14 | | |
| 16 | | | | | 16 | WH/WH/1 | SS |
| 18 | -- SAA, 1 sand layer @ 19' was ~3 cm thick | | | | 18 | PP 0.25 | ST(E) |
| 20 | | | | | 20 | | |
| 22 | Gray clay with yellowish brown oxidation mottling, moist | | | | 23 | PP 2.5 | ST(E) |
| 24 | -- Slight sand and white gravel nodules | | | | 25 | | |
| 26 | | | | | | | |
| 28 | - SAA | | | | 28 | PP ~1.5 | ST(E) |
| 30 | | | | | 30 | | |
| 32 | | | | | | 33 PP 3.25 | ST(E) |
| 34 | Reddish brown clay with gray inclusions firm | | | | | 3.5 | |
| 36 | | | | | | | |
| 38 | - SAA | | | | | 38 PP 3.0 | ST(E) |
| | | | | | | 40 | |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-6

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: STSB 047 -G (geotech)
DATE COMPLETED:
DRILLING METHOD: Mud rotary geotech on a barge
FIELD PERSONNEL: N. Groves / S. Sailer
DRILLING COMPANY SUPERVISOR Keith Barge

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | PID (ppm) |
|---|---|---|---|---|---|---|---|
| 42 | | | | | | 43 | |
| 44 | gray clay | | | | | 15 / 45 | ST(E) |
| 46 | | | | | | | |
| 48 | light gray clay with interbedded fine sand | | | | | 48 / 35 / 50 | ST(E) |
| 50 | | | | | | | |
| 52 | | | | | | | |
| 54 | light gray fine grain sand with clay | | | 100% | 53 / 55 | 8 8 6 | SS |
| 56 | | | | | | | |
| 58 | light gray fine grain sand | | | 70% | 58 / 60 | 12 16 17 | SS |
| 60 | | | | | | | |
| 62 | | | | | | | |
| 64 | light gray clayey sand fine grain | | | 80% | 63 / 65 | 3 1 1 | SS |
| 66 | | | | | | | |
| 68 | - SAA | | | 100% | 68 / 70 | 4 8 21 | SS |
| 70 | | | | | | | |
| 72 | | | | | | | |
| 74 | - light gray medium grain sand | | | 100% | 73 / 75 | 15 21 30 | SS |
| 76 | | | | | | | |
| 78 | - light gray med-coarse grain sand | | | 100% | 78 / 80 | 25 31 44 | SS |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-7

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB047-G (Geotech)
DATE COMPLETED:
DRILLING METHOD: Mud Rotary geotech on a barge
FIELD PERSONNEL: N. Graves / S. Salter
DRILLING COMPANY SUPERVISOR Keith Bergy

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | PID (ppm) |
|---|---|---|---|---|---|---|---|
| 82 | | | | 17 | 83 | | |
| | | | 100% | 23 | | [illegible] | SS |
| 84 | - light gray Med- coarse grain sand | | | 27 | 85 | | |
| 86 | | | | | 88 | | |
| 88 | - SAA | | | 100% | | 16 23 30 | SS |
| 90 | | | | | 90 | | |
| 92 | | | | | 93 | | |
| 94 | - SAA | | | 100% | | 25 35 30 | SS |
| 96 | | | | | 95 | | |
| 98 | gray clay Firm | | | | 50 FT 2.0 100 | | ST(E) |
| 100 | | | | | | | |
| 102 | | | | | | | |
| 104 | | | | | | | |
| 106 | | | | | | | |
| 108 | | | | | | | |
| 110 | | | | | | | |
| 112 | | | | | | | |
| 114 | | | | | | | |
| 116 | | | | | | | |
| 118 | | | | | | | |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-8

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB050-6 (geotech)
DATE COMPLETED: 11/20/19
DRILLING METHOD: mud rotary geotech on a barge
FIELD PERSONNEL: S. Sk
DRILLING COMPANY SUPERVISOR: K. Barge

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | Type |
|---|---|---|---|---|---|---|---|
| | Brown clayey silt to silty clay, wet, organic rich | | | | 100% | WH | SS |
| 2 | -- clay zone | | | | 2 | — | |
| | -- sandy zone | | | | 50% | WH | SS |
| 4 | continued brown clayey silt, saturated to silty clay | | | | 4 | — / | ST |
| 6 | | | | | 6 | — / | ST |
| 8 | Brown silty clay, moist | | | | 8 | | |
| 9.5 | | | | | 60% | WH | SS |
| 10 | Light gray fine grained sand, saturated | | | | 10 | — | |
| 10.5 | | | | | 50% | WH | SS |
| 12 | Brown silty clay, moist. Rare interbedded sand layers (~2 mm) | | | | 12 | WH | |
| 13.5 | | | | | 100% | WH/WH/1 | SS |
| 14 | ~~-- 6" light gray sand layer~~ Light gray fine grained sand, saturated | | | | 14 | 3/5/5 | SS |
| 16 | | | | | 16 | | |
| 18 | -- slight clay, potential stuff continued lightgray sand, stained | | | | 18 | | |
| 20 | | | | | 20 | 1/1/WH | |
| 22 | TD @ 20' | | | | | | |
| 24 | | | | | | | |
| 26 | | | | | | | |
| 28 | | | | | | | |
| 30 | | | | | | | |
| 32 | | | | | | | |
| 34 | | | | | | | |
| 36 | | | | | | | |
| 38 | | | | | | | |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

# STRATIGRAPHIC LOG



GHD

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB053- Geotech
DATE COMPLETED: Start 11/18/19 End 11/19/19
DRILLING METHOD: Mud rotary on a barge
FIELD PERSONNEL: Stephen Sailer
DRILLING COMPANY SUPERVISOR: Keith Brye

In 9 ft of water at start (~1300 11/18/19)

Drive 6" PVC casing 12 ft into sediment

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | PID (ppm) Type |
|---|---|---|---|---|---|---|---|
| | Brown silty sand w/ organics + slight clay. saturated [SM] | | | | 30% | WH | SS |
| 2 | Brown clayey silt, saturated, shell fragments (sparse) | low rec | | | 20% | WH | SS |
| 4 | -- clay % ↑ w/ depth | | | | | | |
| 6 | -- slight sand, clayey silt to silty clay, loose | | | | 70% | WH | SS |
| 7 | Brown silty clay w/ sand lenses, wet. Intermittent 1-2 mm thick sand lenses | | | | 100% | WH | SS |
| 9 | Gray fine grained sand, saturated [SP] | | | | 60% | 2/6/6 | SS |
| 10 | -- Brown clayey silt, potential sluff | low rec | | | 20% | 1/WH/WH | SS |
| 12 | -- continued sand | | | | | | |
| | Brown clayey silt to silty clay | | | | 60% | WH/WH/1 | SS |
| 13.5 | Gray fine grained sand, saturated [SP] | | | | | | |
| 14 | -- Brown sandy clay, saturated | | | | 30% | WH/WH/1 | SS |
| 15 | gray fine grained sand, saturated [SP] | | | | | | |
| 16 | -- clay | | | | | | |
| 18 | Light gray clay (CH), rare sand pockets from 18-19' moist | | | | 18 100 40 | PP 3.5 | ST(E) |
| 20 | | | | | | | |
| 22 | -- yellowish brown oxidation mottling, rare ~~slight~~ white gravel nodule | | | | 23 100 25 | PP 3.5 | ST(E) |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 26 | -- reddish brown oxidation mottling, -- slightly sandy, rare white nodules | | | | | | |
| 28 | | | | | 29 100 30 | PP 2.5 | ST(E) |
| 30 | -- heavy reddish brown/red oxidation mottling, no sand or nodules [CH] | | | | | | |
| 32 | | | | | 33 100 35 | PP 3.5 | ST(E) |
| 34 | | | | | | | |
| 36 | -- continued heavy reddish brown/red oxidation mottling, [CH] | | | | | | |
| 38 | | | | | 34 100 40 | PP 3.5 | ST(E) |

Switch to 5 ft runs at 16'

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-10

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB053-G
DATE COMPLETED: 11/19/19
DRILLING METHOD: Mud Rotary Geotech on Base
FIELD PERSONNEL: S. Seller
DRILLING COMPANY SUPERVISOR: K. Bange

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | ~~PID (ppm)~~ Type |
|---|---|---|---|---|---|---|---|
| 42 | -- continued light gray clay (CH), low mottling (y. brown), v. slightly moist (close to dry) | | | | 43 100% 45 | PP 2.0 | ST(E) |
| 44 | | | | | | | |
| 46 | -- occasional v. fine grained sand seams, still [CH], gray ~~[illegible]~~ | | | | | | |
| 48 | | | | | 48 100% 50 | PP 1.5 | ST(E) |
| 50 | | | | | | | |
| 52 | wood debris (slight) @ 53' to 53.5' continued gray clay [CH], slightly silty | | | | 53 100% 55 | PP 2.0 | ST(E) |
| 54 | | | | | | | |
| 56 | | | | | | | |
| 58 | Gray v. fine grained sand w/ slight silt, saturated [SP] | | | | 58 30% 60 | 10/11/3 | SS |
| 60 | | | | | 60 | | |
| 62 | -- clayey layers, reddish brown mottling, ~~[illegible]~~ SS | | | | 63 40% 65 | 19/18/47 | SS |
| 64 | continued gray sand, saturated | | | | | | |
| 66 | | | | | | | |
| 68 | -- continued gray fine grained sand, saturated, slight reddish brown mottling w/ clay nodules | | | | 68 100% 70 | 19/28/39 | SS |
| 70 | | | | | | | |
| 72 | -- continued gray fine grained sand, saturated, slightly clayey | | | | 73 100% 75 | 10/11/16 | SS |
| 74 | | | | | | | |
| 76 | | | | | | | |
| 78 | -- continued gray fine grained sand, saturated, slight reddish brown mottling + clay nodules | | | | 78 100% | 12/30/38 | SS |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB053-6
DATE COMPLETED: 11/19/19
DRILLING METHOD: Mud Rotary Geotech on a Barge
FIELD PERSONNEL: S. Salter
DRILLING COMPANY SUPERVISOR: Keith Barge

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | ~~PID (ppm)~~ Type |
|---|---|---|---|---|---|---|---|
| 82 | -- Continued gray sand w/ slight clay, fine grained sand, saturated, slight reddish brown oxidation [illegible] | | | | 83 | 8/12/14 | SS |
| 84 | | | | | 85 | | |
| 86 | | | | | | | |
| 88 | -- continued gray sand, fine grained, saturated | | | | 88 | 10/7/8 | SS |
| 89 | Gray clay to silty clay, moist [CH] | | | | 90 | | |
| 92 | Dark brown / black clayey silt, organic rich, wood and detritus, ~~clay~~ / flaky, moist | | | | 93 | PP 2.0 | ST(E) |
| 94 | | | | | 95 | | |
| 96 | Blueish-gray clay [CH], moist | | | | | | |
| 98 | | | | | 98 | PP 2.5 | ST(E) |
| 100 | TD @ 100' bml | | | | 100 | | |
| 102 | | | | | | | |
| 104 | | | | | | | |
| 106 | | | | | | | |
| 108 | | | | | | | |
| 110 | | | | | | | |
| 112 | | | | | | | |
| 114 | | | | | | | |
| 116 | | | | | | | |
| 118 | | | | | | | |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

# STRATIGRAPHIC LOG



Above Start
2 ft of silt
1 ft sand
1 ft rock

Start 11/6/19

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: STSB057 Geotech
DATE COMPLETED: 11/8/19
DRILLING METHOD: Barge Geotech Rig (mud rotary)
FIELD PERSONNEL: S. Sellers
DRILLING COMPANY SUPERVISOR: Keith Boye

0-16 continuous sampling, any tubes stay in tubes

16+ → 5 ft centers + extend

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | INTERVAL | REC (%) | 'N' VALUE | PID (ppm) |
|---|---|---|---|---|---|---|---|
| | Dark brown / black clayey silt w/ organics, saturated. OL/ML | | | | 100% | WH | SS |
| 2 | -- slightly sandy | | | | | | |
| | Dark brown clayey sand, saturated SC | | | | 80% | 2/1/1 | SS |
| 4 | -- low recovery | | | | | | |
| | Dark brown ~~fine grained~~ clayey sand, saturated | | | | 10% | WH/WH/1 | SS |
| 6 | -- continued clayey sand | | | | | | |
| 7.5 | | | | | 100% | 1/1/1 | SS |
| 8 | Light gray fine to medium grained sand w/ | | | | | | |
| | -- low recovery shell gravel, saturated SW | | | | 5% | WH/WH/1 | SS |
| 10 | Medium to coarse grained sand w/ lithic gravel, saturated SW | | | | | | |
| 11.5 | -- sandy gravel at bst 3" of contact GW | | | | 100% | 3/4/6 | SS |
| 12 | Reddish brown clay, moist heavy oxidation mottling | | | | | | |
| | Gray clay, moist, oxidation mottling CH | | | | 100% | PP 0.5 | ST |
| 14 | | | | | | | |
| | -- slight sluff gravel | | | | 100% | PP 1.25 | ST |
| 16 | -- sand (sluff | | | | | | |
| 18 | Continued gray clay, moist, oxidation mottling (yellowish brown) | | | | | | |
| | | | | | 100% | PP 3.0 | ST(E) |
| 20 | | | | | | | |
| 22 | Continued gray clay, reddish brown ore mottling | | | | | | |
| 24 | | | | | 100% | PP 2.5 | ST(E) |
| 26 | -- color transition to red w/ slight gray | | | | | | |
| | heavy reddish brown to red mottling (Red clay) | | | | | | |
| 28 | | | | | 100% | PP 3.5 | ST(E |
| 30 | | | | | | | |
| 32 | -- Red clay CH | | | | | | |
| 34 | | | | | 100% | PP 3.0 | ST(E) |
| 36 | | | | | | | |
| 38 | -- color shift back to gray w/ reddish mottling | | | | 100% | PP 3.0 | ST(E) |

continues → start on 11/7

Switch to 5 ft centers @ 16', will extrude

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-13

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB057-6 (Geotech)
DATE COMPLETED: 11/8/19
DRILLING METHOD: Barge Geotech Rig mud rotary
FIELD PERSONNEL: S.S/K.S
DRILLING COMPANY SUPERVISOR: Keith Boyce

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | SAMPLE INTERVAL | SAMPLE REC (%) | SAMPLE 'N' VALUE | SAMPLE PID (ppm) |
|---|---|---|---|---|---|---|---|
| 42 | gray clay, slightly sandy CH | | | | | | ST(E) |
| 44 | | | | | 100% | PP 2.5 | ST(E) |
| 46 | -- dark gray clay, small black organic nodules/chips | | | | | | |
| 48 | | | | | 100% | PP 1.5 | ST(E) |
| 50 | | | | | | | |
| 52 | -- dark gray clay, small black organic nodules/chips | | | | | | |
| 54 | | | | | 100 | PP 1.5 | ST(E) |
| 56 | dark gray clay w/ sand - small sand lenses, with sand % w/ depth | | | | | | |
| 58 | | | | | | | |
| 60 | | | | | 100% | PP 1.0 | ST(E) |
| 62 | Brown fine grained sand, SP saturated | | | | | | |
| 64 | | | | | 20% | 4/2/2 | SS |
| 66 | -- color change to gray fine to medium grained sand, saturated | | | | | | |
| 68 | | | | | 50% | 15/24 | SS |
| 70 | Gray clayey sand to sandy clay, saturated SC | | | | | | |
| 72 | --clay % w/ depth | | | | 80% | 4/6/7 | SS |
| 74 | | | | | | | |
| 76 | Gray fine grained sand w/ slight clay, saturated SP | | | | | | |
| 78 | | | | | 70% | 15/35/42 | SS |
| 80 | | | | | | | |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

# STRATIGRAPHIC LOG



PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB057-6 (Geotech)
DATE COMPLETED: 11/8/19
DRILLING METHOD: Mud rotary geotech on Barge
FIELD PERSONNEL: Sailor, K. Weibel
DRILLING COMPANY SUPERVISOR Keith Barge

| DEPTH ft BGS | STRATIGRAPHIC DESCRIPTION & REMARKS | DEPTH ft BGS | SAMPLE NUMBER | SAMPLE INTERVAL | REC (%) | 'N' VALUE | PID (ppm) | |
|---|---|---|---|---|---|---|---|---|
| 82 | -- Continued gray fine grained sand ~~w/ slightly clay, grained~~ SS wet to moist x v. fine grained | | | | | | | 83 |
| 84 | | | | | 50% | 15/33/55 | SS | 13/33/55 85 |
| 86 | | | | | | | | |
| 88 | Black organic-rich silty clay to clayey silt, moist flaky/brittle (friable) 0 | | | | 100% | 4/16/15 | SS | 88 4/16/15 |
| 90 | | | | | | | | 90 |
| 92 | Gray clay CH, moist | | | | | PP 1.5 | ST(E) | 93 |
| 94 | | | | | | tsf | | 95 |
| 96 | | | | | | | | |
| 98 | Continued gray clay, organic odor, moist | | | | | PP | ST(E) | 98 |
| 100 | | | | | | | | 100 |
| 102 | TD @ 100' | | | | | | | |
| 104 | | | | | | | | |
| 106 | | | | | | | | |
| 108 | | | | | | | | |
| 110 | | | | | | | | |
| 112 | | | | | | | | |
| 114 | | | | | | | | |
| 116 | | | | | | | | |
| 118 | | | | | | | | |

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

# BORING LOG

Project: 11187072 San Jacinto

Client: IPC / MIMC

No. SJSB058 (Geotech)

File No.:
Date: 10/13/19
Drilling Co.: TWE
Supervisor: Nick Graves (GHD), Keith Barge (TWE)
Type Rig: Tracked Geoprobe (Hollow Stem Augers)
Logged by: Breanna North

| LABORATORY TEST DATA | | | | | FIELD DATA | | | | | BORING DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volumetric Moisture Content | Atterberg Test: Liquid Limit (%) | Atterberg Test: Plastic Index (%) | % Finer than #200 Sieve | Other | Organic Vapor Meter (1) (ppm) | Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot) | Sampling | Depth (feet) | Water Level | Screen Interval | Start Time: 1025 Finish Time: 1445 |
| | | | | Rec: 80% | | med push | ST | | | | Brown/Tan - grey silty sands |
| | | | | 0% | | Refusal | ↓ | | | | (Drilled down ↓ to 2') |
| | | | | 100% | | med push | ST | | | | Dark grey clayey sands, (moist) |
| | | | | 75% | | med/ push stiff | ST | 5 | | | Dark grey sandy clay, w/ organics (moist) |
| | | | | 70% | | med/stiff push | ST | | | | Dark grey sandy clay (wet) |
| | | | | 70% | | soft/med push | ST | | | | Dark grey sandy clay (wet) |
| | | | | | | | | 10 | | | |
| | | | | | | med push | ST | | | | Dark grey sandy clay (wet) |
| | | | | 100% | | 18"/24" 1,1,6 | SS | | | | Grey clayey sands (wet) |
| | | | | 100% | | 18"/24" 1,1,2 | SS | 15 | | | Grey silty sands (wet) |
| — | — | — | — | — | — | — | ↓ | | ~~ | | Drilled down to 18'-20' ~~ |
| | | | | 75% | | 18"/24" 6,17,30 | SS | | | | Grey silty sands (wet) |
| | | | | | | | | 20 | | | |

Sands began to flowback into augers

TD@20'

Note:
Soils observed from top and/or bottom of Shelby tubes.

■ Shelby Tube = SS  Split spoon = SS  PID:

⊠ Direct-Push Sampler

▯ Auger Cuttings

▨ No Recovery

▽ Water First Noted

▼ Level After ___ min

NP Non Plastic

* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

**GHD Services, Inc.**

Attachment Figure B.1-16

# BORING LOG

Project: 11187072 San Jacinto

Client: IPC / MIMC

No. SJSB058 (Direct Push) Analytical

File No.:
Date: 10/14/19
Drilling Co.: TWE
Supervisor: Nick Groves (GHD), Keith Barge (TWE)
Type Rig: Tracked Geoprobe (5' Liners)
Logged by: Breanna North

| LABORATORY TEST DATA | | | | | FIELD DATA | | | | | BORING DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volumetric Moisture Content | Atterberg Test: Liquid Limit (%) | Atterberg Test: Plastic Index (%) | % Finer than #200 Sieve | Other Rec: | Organic Vapor Meter (1) (ppm) | Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot) | Sampling | Depth (feet) | Water Level | Screen Interval | Start Time: 1250 Finish Time: 1325 |
| | | | | 30% | | | | | | | Tan/brown, gray clayey sands, w/some gravels (wet) |
| | | | | 25% | | | | | | | Grey, brown sandy clay, slightly cohesive (damp) |
| | | | | 80% | | | | | | | |
| | | | | 80% | | | | 5 | | | Grey sandy clay, slightly cohesive (wet), w/some organics |
| | | | | 80% | | | | | | | Grey sandy clay, cohesive (damp), some organics |
| | | | | 80% | | | | | | | |
| | | | | 50% | | | | 10 | | | Grey sandy clay, cohesive (damp) |
| | | | | | | | | | | | Grey, brown sandy clay, cohesive (wet) |
| | | | | 50% | | | | | | | Dark Grey sandy clay, cohesive, w/some organics (wet) |
| | | | | | | | | 15 | | | Tan/Grey clayey sands, loose (wet) |
| | | | | 50% | | | | | | | Grey sandy clay, slightly cohesive (wet) |
| | | | | | | | | 20 | | | TD @ 18' |

Shelby Tube

Direct-Push Sampler

Auger Cuttings

No Recovery

PID:

Water First Noted

Level After min

NP Non Plastic

* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

**GHD Services, Inc.**

Attachment Figure B.1-17

# SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

| Boring No. | Sample No. | Depth (ft) | Pocket Pen. (tsf) | Torvane (tsf) | Soil Description | USCS | Water Content (%) | Dry Density (pcf) | Liquid Limit | Plastic Limit | Plast. Index | Finer than #200 Sieve (%) | pH | Lab Vane Shear (tsf) | Uc/UU. Compr. (tsf) | Failure Strain (%) | Conf. Pres. (psi) | Failure Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SJGB024 | | | | | | | | | | | | | | | | | | |
| | | 0-2 | | | Brown LEAN CLAY with SAND | CL | 18.6 | 103.7 | | | | | | | 1.31 | 9.3 | 0.3 | Bulge |
| | | 2-4 | 1.50 | | Brown and black FAT CLAY | CH | 27.8 | 89.0 | | | | | | | 0.91 | 14.6 | 1.0 | Bulge |
| | | 4-6 | | | Brown and black FAT CLAY | CH | 29.2 | 90.1 | 86 | 31 | 55 | | | | 0.56 | 11.6 | 1.7 | Bulge |
| | | 6-8 | | | | CH | 31.4 | | 78 | 23 | 55 | 94.2 | | | | | | |
| | | 8-10 | 0.50 | | Brown CLAYEY SAND | SC | 29.1 | 89.2 | | | | 43.2 | | | 0.21 | 11.8 | 3.1 | Bulge |
| | | 10-12 | 0.50 | | Brown FAT CLAY; organics | CH | 75.3 | 53.7 | 133 | 51 | 82 | 91.0 | | | 3.34 | 8.3 | 3.8 | Bulge |
| | | 12-14 | 0.50 | | Brown and black FAT CLAY | CH | 31.7 | 82.6 | | | | 76.2 | | | 0.22 | 14.8 | 4.5 | Bulge |
| | | 14-16 | 0.25 | | Brown CLAYEY SAND | SC | 26.5 | 91.7 | 32 | 19 | 13 | 44.4 | | | 0.44 | 14.9 | 5.2 | Bulge |
| | | 18-20 | 0.50 | | Brown SILTY CLAYEY SAND | SC-SM | 24.9 | 98.4 | | | | 25.5 | | | 0.94 | 15.0 | 6.6 | Bulge |
| | | 23-25 | 0.50 | | Brown FAT CLAY | CH | 49.5 | 66.4 | | | | 92.1 | | | 0.39 | 6.6 | 8.3 | Bulge |
| | | 28-30 | 0.25 | | Brown FAT CLAY | CH | 61.3 | 59.0 | 122 | 58 | 64 | | | | 0.28 | 11.3 | 10.1 | Bulge |
| SJGB025 | | | | | | | | | | | | | | | | | | |
| | | 0-2 | | | | SM | 13.5 | | | | | 24.8 | | | | | | |
| | | 2-4 | 4.50 | | Brown LEAN CLAY with SAND | CL | 15.5 | 115.8 | 36 | 18 | 18 | 81.8 | | | 1.05 | 14.8 | 1.0 | Bulge |
| | | 4-6 | 2.50 | | Gray SANDY LEAN CLAY | | 18.8 | 112.5 | 34 | 17 | 17 | | | | 0.84 | 14.6 | 1.7 | Multiple Shear |
| | | 6-8 | | | | SP | 19.5 | | | | | | | | | | | |
| | | 8-10 | 1.25 | | Gray LEAN CLAY with SAND | CL | 20.1 | 107.0 | 43 | 16 | 27 | 84.2 | | | | | | Too Short |
| | | 10-12 | | | | SC | 21.4 | | | | | 46.5 | | | | | | |
| | | 12-14 | 1.00 | | Brown SANDY LEAN CLAY | CL | 18.6 | 114.9 | 33 | 17 | 16 | 55.6 | | | 1.68 | 15.0 | 4.5 | Bulge |
| | | 14-16 | | | | ML | 23.6 | | | | | 61.5 | | | | | | |
| | | 20-22 | | | | SM | 21.7 | | | | | 21.9 | | | | | | |
| | | 22-24 | | | | SM | 34.4 | | | | | 43.9 | | | | | | |
| | | 24-26 | | | | SP | 33.6 | | NV | NP | NP | | | | | | | |
| | | 28-30 | | | | SM | 23.4 | | | | | 30.9 | | | | | | |
| SJGB026 | | | | | | | | | | | | | | | | | | |
| | | 0-2 | 1.25 | | Brown SILT with SAND | ML | 13.4 | 111.4 | NV | NP | NP | 80.9 | | | | | | Too short |
| | | 2-4 | 1.50 | | Gray LEAN CLAY | CL | 20.6 | 128.5 | | | | 98.4 | | | | | | Too short |
| | | 4-6 | 1.50 | | Tan and Gray LEAN CLAY with SAND | CL | 19.1 | 104.8 | 41 | 18 | 23 | 84.3 | | | 1.42 | 5.3 | 1.7 | Vertical |
| | | 6-8 | 2.00 | | Gray LEAN CLAY | CL | 19.1 | 104.8 | | | | 96.9 | | | 0.69 | 3.5 | 2.4 | Multiple Shear |
| | | 8-10 | 1.50 | | Gray and brown LEAN CLAY with SAND | CL | 21.4 | 103.8 | 35 | 17 | 18 | 82.6 | | | 0.87 | 13.6 | 3.1 | Multiple Shear |
| | | 10-12 | | | | SC | 23.0 | | | | | 49.8 | | | | | | |
| | | 12-14 | 1.00 | | Tan and Gray SANDY SILT | ML | 20.6 | 109.4 | NV | NP | NP | 65.5 | | | 1.72 | 14.9 | 4.5 | Bulge |
| | | 20-22 | | | | ML | 26.1 | | | | | 55.4 | | | | | | |

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, without our prior written approval.

# SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

| Boring No. | Sample No. | Depth (ft) | Pocket Pen. (tsf) | Torvane (tsf) | Soil Description | USCS | Water Content (%) | Dry Density (pcf) | Liquid Limit | Plastic Limit | Plast. Index | Finer than #200 Sieve (%) | pH | Lab Vane Shear (tsf) | Uc/UU. Compr. (tsf) | Failure Strain (%) | Conf. Pres. (psi) | Failure Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SJGB027 | | | | | | | | | | | | | | | | | | |
| | | 0 | | | | GP-GM | 10.6 | | | | | | | | | | | |
| | | 2 | 0.50 | | Black FAT CLAY; Organics | CH | 139.8 | 32.6 | 151 | 44 | 107 | 80.5 | | | 0.17 | 7.6 | 2.0 | Bulge |
| | | 4 | 1.75 | | Gray CLAYEY SAND | SC | 22.7 | 104.3 | 41 | 21 | 20 | 43.6 | | | 0.18 | 7.6 | 3.5 | Bulge |
| | | 6 | 1.25 | | Gray SANDY LEAN CLAY | CL | 20.3 | 107.6 | 37 | 17 | 20 | 55.5 | | | 1.15 | 14.8 | 4.0 | Bulge |
| | | 8 | 1.25 | | Gray LEAN CLAY | CL | 17.9 | 111.3 | 39 | 18 | 21 | | | | 0.73 | 14.8 | 5.0 | Bulge |
| | | 10 | | | | CL | 22.5 | 106.8 | 30 | 17 | 13 | 80.6 | | | | | | |
| | | 12 | | | | CL | 32.0 | | 49 | 19 | 30 | 31.4 | | | | | | |
| | | 14 | | | | SM | 26.9 | | 24 | 16 | 8 | 27.3 | | | | | | |
| | | 16 | | | | | | | | | | | | | | | | |
| | | 18 | | | | SC-SM | 28.3 | | NV | NP | NP | 40.1 | | | | | | |
| | | 23 | | | | SP-SM | 21.4 | | NV | NP | NP | 7.8 | | | | | | |
| | | 28 | | | | SC-SM | 21.9 | | 26 | 16 | 10 | 11.3 | | | | | | |
| | | 33 | | | | SC | 16.0 | | 32 | 17 | 15 | 36.0 | | | | | | |
| | | 38 | 3.00 | | | CL | 19.5 | 107.4 | 40 | 18 | 22 | 79.1 | | | | | | |
| | | 43 | 3.00 | | Reddish-brown LEAN CLAY; calcareous | CL | 32.3 | 89.5 | 49 | 19 | 30 | | | | | | | |
| | | 48 | 3.50 | | Tan FAT CLAY | CH | 31.2 | 92.1 | 59 | 21 | 38 | | | | 1.95 | 6.3 | 21.0 | Slickensid |
| SJGB028 | | | | | | | | | | | | | | | | | | |
| | | 0 | | | | CL | 16.2 | 112.2 | 37 | 16 | 21 | 57.4 | | | | | | |
| | | 2 | | | | SC | 60.7 | 81.2 | 39 | 17 | 22 | 44.4 | | | | | | |
| | | 4 | 1.75 | | Black LEAN CLAY with SAND; sand seams and organics | SC | 13.3 | 115.9 | 32 | 15 | 17 | 79.0 | | | 0.79 | 14.8 | 2.5 | Bulge |
| | | 6 | | | | OH | 198.4 | | | | | | | | | | | |
| | | 8 | | | | OH | 137.6 | | | | | | | | | | | |
| | | 10 | | | | SM | 27.6 | | | | | | | | | | | |
| | | 12 | | | | | | | | | | | | | | | | |
| | | 14 | | | | CH | 44.7 | | 58 | 20 | 38 | 64.9 | | | | | | |
| | | 18 | 1.25 | | Gray SANDY LEAN CLAY | CL | 27.8 | 94.3 | 41 | 18 | 23 | | | | 0.72 | 14.8 | 8.3 | Bulge |
| | | 23 | | | | SC-SM | 25.9 | | NV | NP | NP | 28.6 | | | | | | |
| | | 28 | | | Gray poorly graded SAND with SILT | SP-SM | 18.5 | | | | | 8.8 | | | | | | |
| | | 33 | | | Gray poorly graded SAND with SILT | SP-SM | 22.8 | | | | | 8.3 | | | | | | |
| | | 34 | | | | | | | | | | | | | | | | |
| | | 38 | | | Gray poorly graded SAND with SILT | SP-SM | 18.3 | | | | | 6.0 | | | | | | |
| | | 43 | | | Gray poorly graded SAND | SP | 19.6 | | | | | 4.6 | | | | | | |
| | | 48 | 3.75 | | Reddish-brown FAT CLAY | CH | 26.1 | 97.8 | 70 | 23 | 47 | 98.4 | | | 2.00 | 3.2 | 20.8 | Slickensid |
| | | 53 | 3.25 | | Reddish-brown FAT CLAY | CH | 31.5 | 91.0 | 75 | 23 | 52 | 96.3 | | | 1.19 | 8.3 | 23.0 | Slickensid |
| | | 58 | 3.25 | | Light gray and tan LEAN CLAY | CL | 19.4 | 106.3 | 26 | 16 | 10 | 97.9 | | | | | | |

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, without our prior written approval.

# SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

| Boring No. | Sample No. | Depth (ft) | Pocket Pen. (tsf) | Torvane (tsf) | Soil Description | USCS | Water Content (%) | Dry Density (pcf) | Liquid Limit | Plastic Limit | Plast. Index | Finer than #200 Sieve (%) | pH | Lab Vane Shear (tsf) | Uc/UU. Compr. (tsf) | Failure Strain (%) | Conf. Pres. (psi) | Failure Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 63 | 3.75 | | Tan and gray LEAN CLAY with SAND | CL | 16.6 | 115.4 | 30 | 16 | 14 | 75.8 | | | 4.22 | 14.8 | 27.0 | Bulge |
| | | 68 | 4.50 | | Gray SANDY LEAN CLAY | CL | 18.0 | 113.5 | 28 | 16 | 12 | 50.4 | | | 5.64 | 15.0 | 29.0 | Multiple shear |
| | | 73 | | | | SC | 22.8 | | 26 | 17 | 9 | 39.3 | | | | | | |
| SJGB029 | | | | | | | | | | | | | | | | | | |
| | | 1 | | | | GP-GM | 12.5 | | | | | | | | | | | |
| | | 2 | | | | CH | 14.5 | 106.9 | NV | NP | NP | | | | | | | |
| | | 4 | | | | CH | 33.8 | | | | | | | | | | | |
| | | 6 | | | | CL | 36.6 | | | | | | | | | | | |
| | | 8 | | | | CH | 108.7 | | 70 | 22 | 48 | | | | | | | |
| | | 10 | | | | SC | 36.7 | | | | | 36.6 | | | | | | |
| | | 12 | | | | CH | 71.9 | | 74 | 24 | 50 | | | | | | | |
| | | 14 | 0.75 | | Gray and tan FAT CLAY; organics | CH | 28.6 | 98.5 | 62 | 21 | 41 | | | | | | | |
| | | 18 | | | | CL | 25.7 | 95.4 | 45 | 17 | 28 | 77.7 | | | | | | |
| | | 23 | | | Gray poorly graded SAND with SILT | SP-SM | 29.3 | | | | | 8.6 | | | | | | |
| | | 28 | | | Gray SILTY SAND | SM | 61.5 | | | | | 13.2 | | | | | | |
| | | 33 | | | Gray poorly graded SAND with SILT | SP-SM | 19.8 | | | | | 6.9 | | | | | | |
| | | 38 | | | Gray poorly graded SAND with SILT | SP-SM | 19.6 | | | | | 6.1 | | | | | | |
| | | 43 | | | Gray poorly graded SAND with SILT | SP-SM | 20.6 | | | | | 7.7 | | | | | | |
| | | 48 | | | Gray FAT CLAY | CH | 27.3 | | | | | 99.6 | | | | | | |
| | | 53 | 4.25 | | Gray FAT CLAY | CH | 26.4 | 100.0 | 70 | 22 | 48 | 99.2 | | | 2.33 | 5.5 | 22.5 | Multiple shear |
| | | 58 | 4.50 | | Tan and gray LEAN CLAY | CL | 16.8 | 111.6 | 33 | 17 | 16 | | | | 1.85 | 9.1 | 24.5 | Bulge |
| | | 63 | 4.50 | | Gray SANDY LEAN CLAY | CL | 17.7 | 113.0 | 36 | 17 | 19 | | | | 4.15 | 14.6 | 26.6 | Vertical shear |
| | | 68 | | | | SC | 20.3 | | 29 | 16 | 13 | 38.4 | | | | | | |
| | | 73 | | | | CL | 22.5 | | 38 | 17 | 21 | 95.0 | | | | | | |
| SJGB047 | | | | | | | | | | | | | | | | | | |
| | | 0 | | | | CL-ML | 30.6 | | | | | 97.3 | | | | | | |
| | | 2 | | | | ML | 36.7 | | | | | | | | | | | |
| | | 4 | | | | ML | 42.9 | | | | | 94.2 | | | | | | |
| | | 8 | | | Dark gray SANDY LEAN CLAY | CL | 29.5 | | | | | 70.0 | | | | | | |
| | | 10 | | | | CL | 38.8 | | 39 | 20 | 19 | 73.8 | | | | | | |
| | | 12 | | | | CL | 64.1 | | | | | | | | | | | |
| | | 14 | | | | ML | 57.7 | | | | | 96.5 | | | | | | |
| | | 18 | 0.50 | | Dark gray SANDY FAT CLAY; sand pockets | CH | 37.6 | 72.1 | 79 | 24 | 55 | 55.6 | | | 0.29 | 7.3 | 6.6 | 60 Degree |
| | | 23 | 2.00 | | Gray LEAN CLAY with SAND | CL | 20.1 | 113.6 | 42 | 18 | 24 | 73.3 | | | 1.44 | 13.9 | 8.3 | Bulge |

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, without our prior written approval.

# SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

| Boring No. | Sample No. | Depth (ft) | Pocket Pen. (tsf) | Torvane (tsf) | Soil Description | USCS | Water Content (%) | Dry Density (pcf) | Liquid Limit | Plastic Limit | Plast. Index | Finer than #200 Sieve (%) | pH | Lab Vane Shear (tsf) | Uc/UU. Compr. (tsf) | Failure Strain (%) | Conf. Pres. (psi) | Failure Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 28 | | | Reddish-brown SANDY SILTY CLAY | CL-ML | 15.6 | 107.1 | 27 | 21 | 6 | 59.6 | | | | | | |
| | | 33 | 4.00 | | Reddish Brown FAT CLAY | CH | 29.0 | 96.5 | 59 | 39 | 20 | 98.4 | | | 1.00 | 1.3 | 11.8 | 60 degree |
| | | 38 | 3.75 | | Reddish Brown FAT CLAY | CH | 31.3 | 96.0 | 74 | 34 | 40 | 99.5 | | | 1.73 | 14.6 | 13.5 | Slickensli |
| | | 43 | 4.00 | | Gray LEAN CLAY with SAND | CL | 18.6 | 116.0 | 42 | 18 | 24 | 84.3 | | | 3.36 | 14.8 | 15.3 | Bulge |
| | | 48 | | | Gray LEAN CLAY with SAND | CL | 17.9 | | 30 | 19 | 11 | 75.5 | | | | | | |
| | | 53 | | | | ML | 20.4 | | | | | 92.9 | | | | | | |
| | | 58 | | | | ML | 23.0 | | | | | 91.5 | | | | | | |
| | | 63 | | | | ML | 27.4 | | NV | NP | NP | 93.4 | | | | | | |
| | | 68 | | | | ML | 25.9 | | | | | 97.5 | | | | | | |
| | | 73 | | | | ML | 22.6 | | | | | 81.7 | | | | | | |
| | | 78 | | | | ML | 21.8 | | | | | 68.4 | | | | | | |
| | | 83 | | | | SM | 19.3 | | NV | NP | NP | 46.4 | | | | | | |
| | | 88 | | | | SM | 18.4 | | | | | 39.2 | | | | | | |
| | | 93 | | | | SM | 17.6 | | NV | NP | NP | 26.3 | | | | | | |
| | | 98 | 3.50 | | Tan and gray FAT CLAY | CH | 21.4 | 98.0 | 73 | 23 | 50 | | | | 0.33 | 5.3 | 35.0 | Multiple shear |
| SJGB050 | | | | | | | | | | | | | | | | | | |
| | | 0-2 | | | | CH | 100.4 | | | | | 98.1 | | | | | | |
| | | 2-4 | | | | SC | 81.8 | | | | | 41.2 | | | | | | |
| | | 4-6 | 0.50 | | Dark gray FAT CLAY | SC | 28.6 | 85.0 | 32 | 16 | 16 | | | | 0.30 | 14.8 | 1.7 | Bulge |
| | | 6-8 | 0.50 | | Dark gray CLAYEY SAND | SC | 32.8 | 85.3 | 34 | 17 | 17 | 43.3 | | | 0.08 | 12.6 | 2.4 | Bulge |
| | | 8-10 | | | | CL | 55.8 | | | | | 86.3 | | | | | | |
| | | 10-12 | | | | CL | 48.5 | | 41 | 18 | 23 | 82.6 | | | | | | |
| | | 12-14 | | | | CL | 46.7 | | | | | 70.4 | | | | | | |
| | | 14-16 | | | | ML | 22.6 | | | | | 51.5 | | | | | | |
| | | 18-20 | | | | SP-SM | 36.9 | | | | | 9.8 | | | | | | |
| SJGB053 | | | | | | | | | | | | | | | | | | |
| | | 0 | | | | SC | 31.0 | | | | | 41.0 | | | | | | |
| | | 2 | | | | CL | 57.0 | | | | | | | | | | | |
| | | 4 | | | | CL | 65.5 | | | | | | | | | | | |
| | | 6 | | | | CH | 60.8 | | 55 | 22 | 33 | 59.8 | | | | | | |
| | | 8 | | | | SC | 44.2 | | 36 | 20 | 16 | | | | | | | |
| | | 10 | | | | CL | 41.7 | | | | | | | | | | | |
| | | 12 | | | | CL | 70.9 | | | | | 77.9 | | | | | | |
| | | 14 | | | | SC | 31.2 | | | | | 47.2 | | | | | | |
| | | 18 | 4.25 | | Gray LEAN CLAY with SAND | CL | 17.3 | 116.3 | 45 | 22 | 23 | | | | 3.27 | 14.3 | 6.6 | Bulge |
| | | 23 | 4.00 | | Tan LEAN CLAY with SAND | CL | 17.3 | 116.2 | 46 | 21 | 25 | | | | 3.32 | 12.1 | 8.3 | Bulge |

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, without our prior written approval.

# SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

| Boring No. | Sample No. | Depth (ft) | Pocket Pen. (tsf) | Torvane (tsf) | Soil Description | USCS | Water Content (%) | Dry Density (pcf) | Liquid Limit | Plastic Limit | Plast. Index | Finer than #200 Sieve (%) | pH | Lab Vane Shear (tsf) | Uc/UU. Compr. (tsf) | Failure Strain (%) | Conf. Pres. (psi) | Failure Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 28 | 3.00 | | | CL | 16.4 | | | | | | | | | | | |
| | | 33 | 4.25 | | Reddish-brown FAT CLAY | CH | 28.4 | 96.0 | 70 | 37 | 33 | | | | 1.43 | 2.0 | 11.8 | Slickenslic |
| | | 38 | 4.50 | | Tan FAT CLAY | CH | 23.5 | | 69 | 24 | 45 | 99.6 | | | | | | |
| | | 43 | 3.75 | | Gray FAT CLAY | CH | 27.0 | 96.9 | 71 | 35 | 36 | | | | 1.87 | 3.6 | 15.3 | Slickenslic |
| | | 48 | 2.00 | | Gray LEAN CLAY | CL | 20.5 | 106.7 | 47 | 21 | 26 | | | | 1.87 | 3.9 | 16.9 | 60 degree |
| | | 53 | 3.00 | | | CL | 17.7 | | | | | | | | | | | |
| | | 58 | | | Tan CLAYEY SAND | SC | 24.2 | | | | | 41.6 | | | | | | |
| | | 63 | | | | SC | 23.8 | | | | | 34.3 | | | | | | |
| | | 68 | | | | SM | 20.9 | | | | | 15.0 | | | | | | |
| | | 73 | | | | SC | 23.5 | | | | | 46.8 | | | | | | |
| | | 78 | | | Gray CLAYEY SAND | SC | 18.0 | | | | | 42.9 | | | | | | |
| | | 83 | | | | SC | 18.1 | | | | | 35.1 | | | | | | |
| | | 88 | | | | CL | 24.7 | | 64 | 24 | 40 | 62.3 | | | | | | |
| | | 93 | 3.25 | | Black FAT CLAY | MH | 111.5 | 41.7 | 144 | 78 | 66 | 89.5 | | | 3.33 | 4.8 | 32.6 | Bulge |
| | | 98 | 2.25 | | Gray FAT CLAY | CH | 24.3 | 101.6 | 71 | 23 | 48 | | | | 2.59 | 10.1 | 34.4 | Bulge |
| SJGB057 | | | | | | | | | | | | | | | | | | |
| | | 0 | | | | SC | 109.2 | | 102 | 64 | 38 | 46.0 | | | | | | |
| | | 2 | | | | SC | 94.2 | | 51 | 24 | 27 | 28.4 | | | | | | |
| | | 4 | | | | SC | 59.9 | | | | | 18.3 | | | | | | |
| | | 6 | | | | SC | 37.3 | | 66 | 21 | 45 | 18.7 | | | | | | |
| | | 8 | | | | CL | 89.0 | | | | | | | | | | | |
| | | 10 | | | | SC | 23.1 | | | | | 49.2 | | | | | | |
| | | 12 | 3.50 | | Gray and brown FAT CLAY | CH | 20.4 | 111.0 | 66 | 23 | 43 | 85.1 | | | 2.29 | 15.0 | 3.8 | Bulge |
| | | 14 | 0.75 | | | SC | 11.8 | 109.0 | | | | | | | | | | |
| | | 18 | 3.75 | | Tan SANDY LEAN CLAY | CL | 18.7 | 112.8 | 45 | 16 | 29 | 67.7 | | | 2.27 | 14.6 | 6.6 | 60 degree |
| | | 23 | 3.00 | | | CL | 17.5 | 114.8 | | | | | | | | | | |
| | | 28 | 4.00 | | | CH | 28.2 | | | | | | | | | | | |
| | | 33 | 4.00 | | Reddish Brown FAT CLAY | CH | 26.8 | 98.3 | 65 | 22 | 43 | 99.7 | | | 2.31 | 3.5 | 10.8 | Slickenslic |
| | | 38 | 4.50 | | | CH | 25.9 | 100.7 | | | | | | | | | | |
| | | 43 | 4.00 | | Gray FAT CLAY | CH | 20.7 | 105.2 | 56 | 19 | 37 | 97.5 | | | 3.70 | 3.8 | 13.6 | Slickenslic |
| | | 48 | 2.25 | | Gray FAT CLAY | CH | 35.6 | 92.5 | 52 | 19 | 33 | 98.2 | | | 1.67 | 5.1 | 15.0 | Slickenslic |
| | | 53 | | | | CL | 26.9 | | | | | | | | | | | |
| | | 58 | 1.25 | | Gray FAT CLAY with SAND | CH | 24.4 | 106.0 | 52 | 20 | 32 | 84.4 | | | 1.49 | 10.6 | 20.5 | Bulge |
| | | 63 | | | | SM | 19.1 | | | | | 24.7 | | | | | | |
| | | 68 | | | | SC | 23.0 | | | | | 34.6 | | | | | | |

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, without our prior written approval.

# SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

| Boring No. | Sample No. | Depth (ft) | Pocket Pen. (tsf) | Torvane (tsf) | Soil Description | USCS | Water Content (%) | Dry Density (pcf) | Liquid Limit | Plastic Limit | Plast. Index | Finer than #200 Sieve (%) | pH | Lab Vane Shear (tsf) | Uc/UU. Compr. (tsf) | Failure Strain (%) | Conf. Pres. (psi) | Failure Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 73 | | | | CL-ML | 22.2 | | 23 | 18 | 5 | 64.6 | | | | | | |
| | | 78 | | | | CL | 19.5 | | | | | 54.4 | | | | | | |
| | | 83 | | | | CL | 19.6 | | | | | 71.4 | | | | | | |
| | | 88 | | | | OH | 95.3 | | 169 | 92 | 77 | 43.5 | | | | | | |
| | | 93 | 2.00 | | Gray LEAN CLAY | CL | 26.1 | 100.3 | 41 | 18 | 23 | 97.8 | | | 1.67 | 9.8 | 32.6 | Bulge |
| | | 98 | 3.50 | | | CH | 22.1 | | | | | 98.8 | | | | | | |
| SJGB058 | | | | | | | | | | | | | | | | | | |
| | | 0-2 | 0.50 | | | SP | 14.9 | | | | | | | | | | | |
| | | 2-4 | 1.00 | | | CL | 65.6 | | 30 | 16 | 14 | 53.3 | | | | | | |
| | | 4-6 | 1.50 | | Dark brown LEAN CLAY | CL | 25.5 | 89.3 | | | | 97.1 | | | 0.92 | 14.6 | 1.7 | Bulge |
| | | 6-8 | 1.50 | | Dark brown LEAN CLAY | CL | 34.9 | 86.7 | 42 | 18 | 24 | 95.5 | | | 1.21 | 8.8 | 2.6 | Multiple shear |
| | | 8-10 | 0.50 | | Dark brown FAT CLAY | CL | 30.5 | 87.8 | | | | 96.0 | | | 0.85 | 10.3 | 3.1 | Bulge |
| | | 10-12 | | | | CL | 32.9 | | 44 | 17 | 27 | 93.4 | | | | | | |
| | | 12-14 | | | | SM | 24.2 | | NV | NP | NP | 41.7 | | | | | | |
| | | 14-16 | | | | SM | 24.2 | | NV | NP | NP | 43.3 | | | | | | |
| | | 18-20 | | | | SM | 19.8 | | | | | 43.7 | | | | | | |
| SJRF-01 | | | | | | | | | | | | | | | | | | |
| | | 0 | | | | CL | 19.6 | | | | | | | | | | | |
| | | 2 | | | | SM | 9.0 | | | | | | | | | | | |
| | | 4 | | | | SC-SM | 15.0 | | | | | | | | | | | |
| | | 6 | | | | CL | 16.5 | 116.9 | | | | | | | | | | |
| | | 8 | | | | SP-SM | 20.3 | | | | | | | | | | | |
| | | 13 | | | | CL | 21.2 | | | | | | | | | | | |
| | | 18 | | | | CL | 17.3 | | | | | | | | | | | |
| | | 23 | | | | SC | 25.0 | | | | | 32.0 | | | | | | |
| | | 28 | | | | SP-SM | 25.2 | | | | | 10.1 | | | | | | |
| | | 33 | | | | SP-SM | 22.2 | | | | | 6.9 | | | | | | |
| | | 38 | | | | SM | 22.1 | | | | | 21.7 | | | | | | |
| | | 43 | | | | CL | 33.6 | | | | | 55.7 | | | | | | |
| | | 48 | 4.25 | | Reddish-brown FAT CLAY | CH | 24.9 | 102.2 | 60 | 25 | 35 | 95.3 | | | 0.26 | 1.7 | 20.8 | Slickensid |
| | | 53 | 3.00 | | Tan and light gray FAT CLAY | CH | 28.5 | 94.4 | 63 | 26 | 37 | 99.7 | | | | | | |
| | | 58 | 4.25 | | Gray and reddish-brown LEAN CLAY | CL | 20.5 | 106.2 | 45 | 17 | 28 | 90.7 | | | 0.35 | 7.6 | 25.0 | Slickensid |
| | | 63 | 2.50 | | | CL | 16.8 | | | | | 53.6 | | | | | | |
| | | 68 | | | | CL | 21.2 | | 28 | 16 | 12 | 78.1 | | | | | | |
| | | 73 | 4.50 | | | CL | 14.9 | | 36 | 17 | 19 | 96.2 | | | | | | |
| SJRF- | | | | | | | | | | | | | | | | | | |

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, without our prior written approval.

Tolunay-Wong Engineers, Inc.

# Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
# ASTM D 2974 (Method C)

Project No.: 19.15.131 Project Name: San Jacinto River Waste Pit Superfund Site

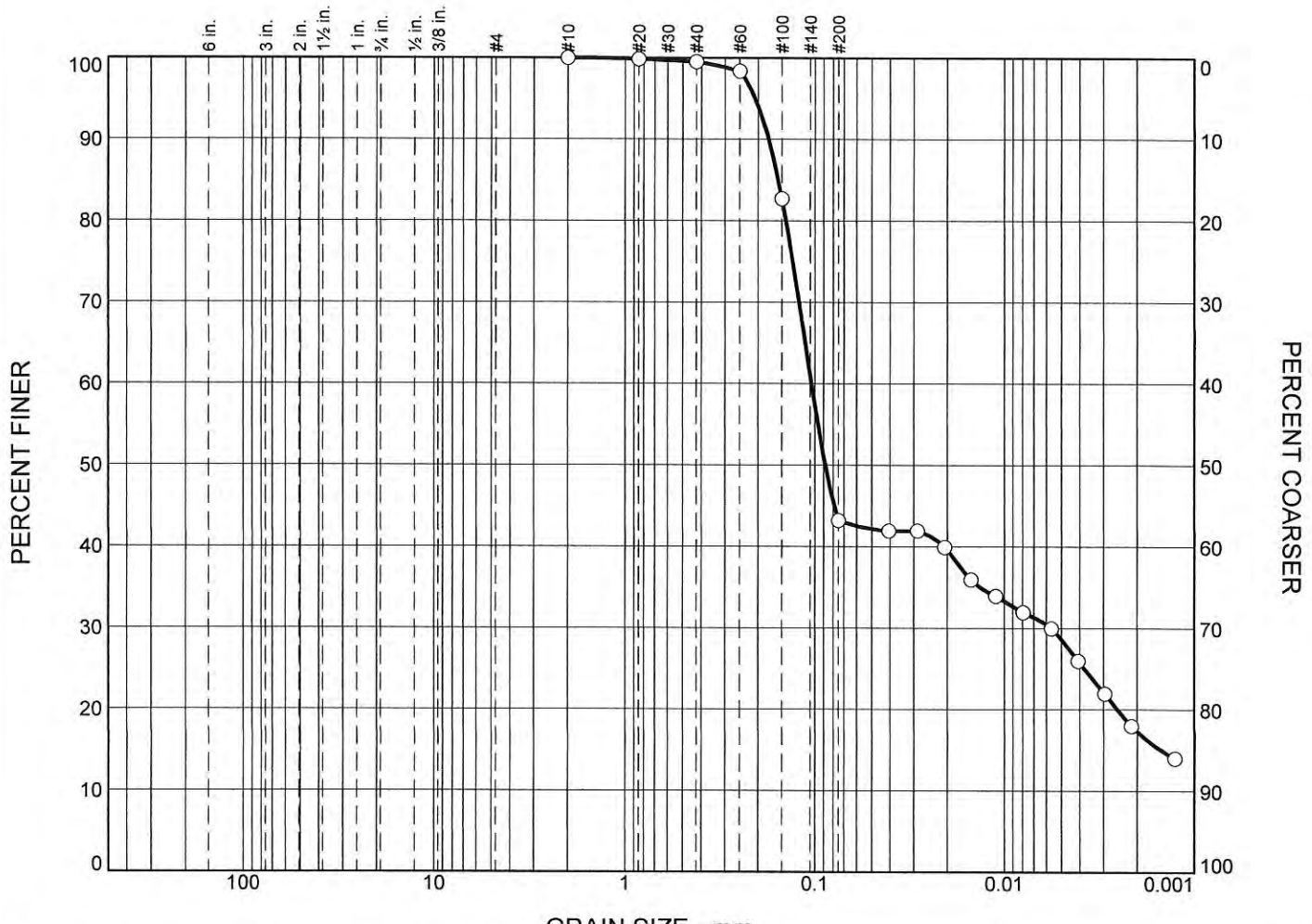
| | | | | | |
|---|---|---|---|---|---|
| | Boring No. | SJGB053 | | | |
| | Sample No. | | | | |
| | Depth | 93-95' | | | |
| | Soil Description | CH | | | |
| Water Content | Tare No. | 70 | | | |
| | Wet Weight + Tare (a), g | 93.32 | | | |
| | Dry Weight + Tare (b), g | 60.46 | | | |
| | Tare Weight (c), g | 30.98 | | | |
| Organic Content | Tare No. | A | | | |
| | Oven Dried + Tare (d), g | 63.11 | | | |
| | Ash+ Tare (e), g | 54.50 | | | |
| | Tare Weight, gm (f), g | 33.63 | | | |
| Summary | Furnace Temperature, C | 440 | 440 | 440 | 440 |
| | Ash Content (h), % ((e-f)*100)/(d-f) | 70.8 | | | |
| | Organic Content (g), % 100-d | 29.2 | | | |
| | Water, % by dry mass ((a-b)/(b-c))*100 | 111 | | | |
| | Water, % by total mass ((a-b)/a-c))*100 | 52.7 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Tested By: | LO | | | | |
| Date: | 2/8/20 | Scale | Ohaus | E1821119172- | 743 |
| Computed By: | TB | Oven | Quincy Lab | B-0001 | |
| Date: | 2/13/20 | Furance | FURN-1-10 | 1049000031735 | -8-14 |
| Checked By: | EEH | | | | |
| Date: | 2/13/20 | | | | |

Our letters and reports are for the exclusive use of the CLIENT. This document shall not be reproduced, except in full, with out our prior written approval. Our letters and reports apply only to the material(s) tested and/or inspected and are not necessarily indicative of the quality of apparently identical material(s).

10710 S. Sam Houston Parkway W., Suite 100 - Houston, Texas 77031 - (713) 722-7064

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 56.3 | 14.6 | 28.6 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB024 | | 8-10 | Brown CLAYEY SAND | SC |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

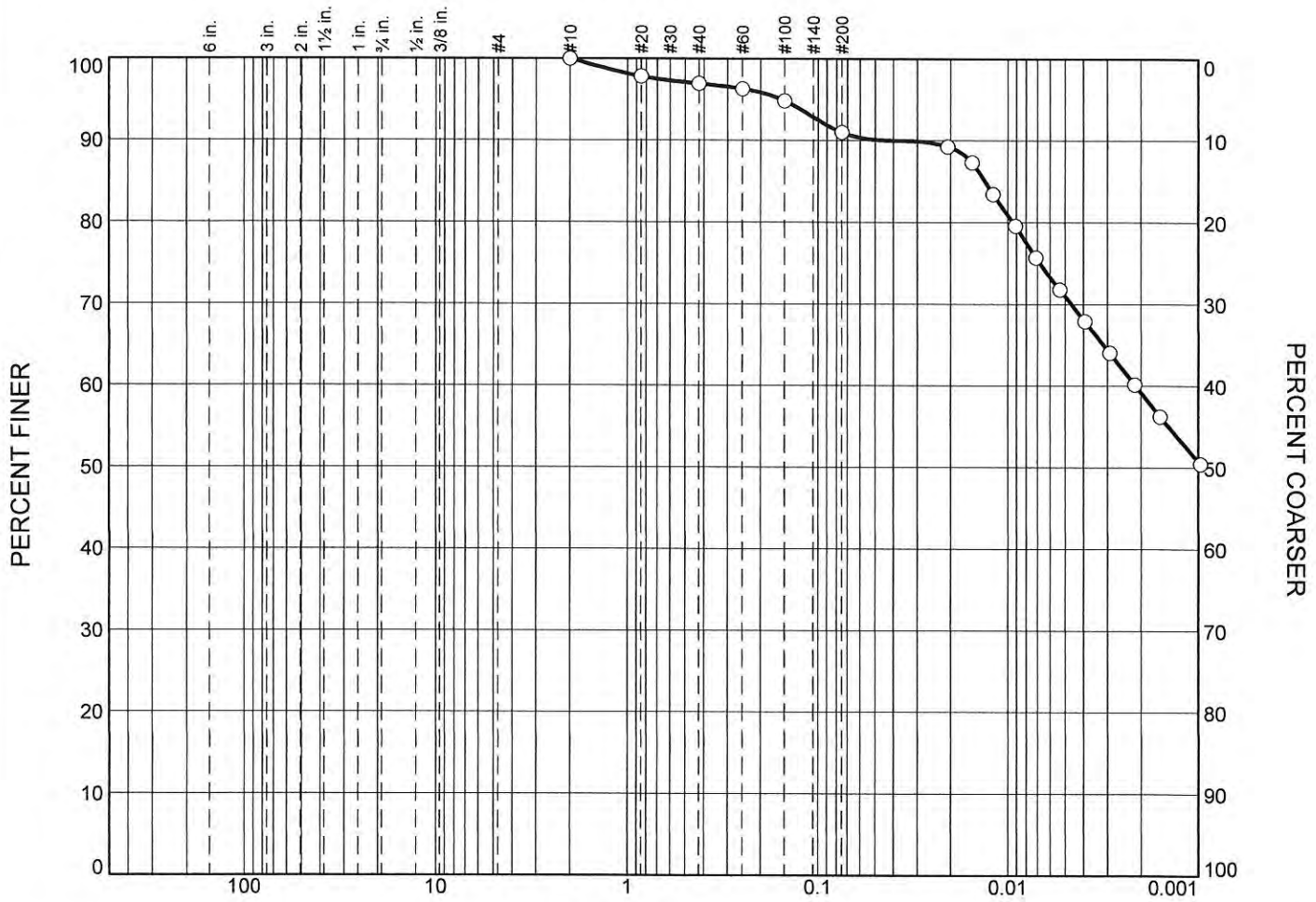
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131 **Figure**

Attachment Figure B.2-8

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 3.1 | 5.9 | 20.0 | 71.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB024 | | 10-12 | Brown FAT CLAY | CH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

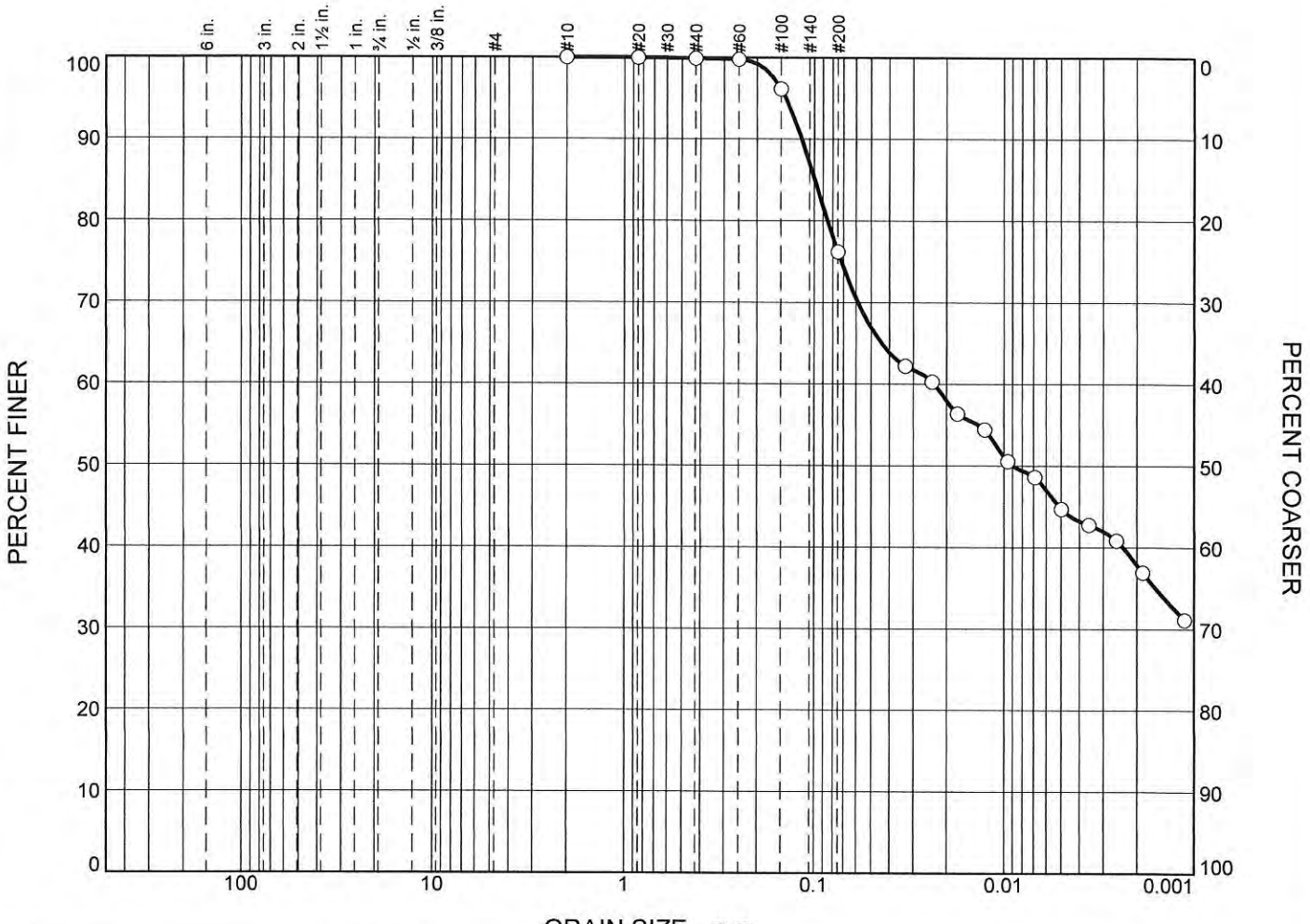
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-9

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 23.7 | 31.4 | 44.8 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB024 | | 12-14 | Brown and black LEAN CLAY | CH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

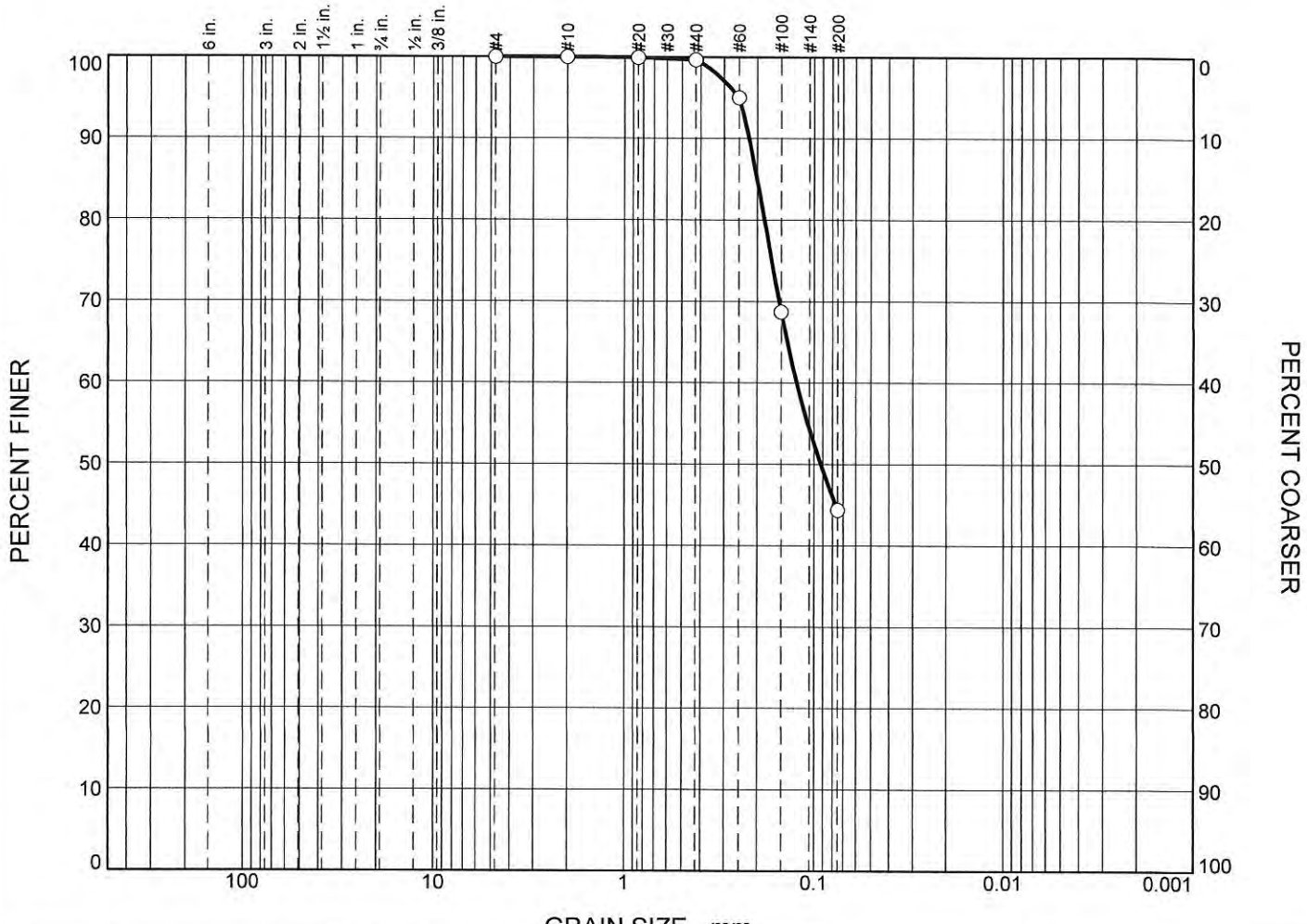
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131 **Figure**

Attachment Figure B.2-10

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 55.3 | 44.4 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB024 | | 14-16 | Brown CLAYEY SAND | SC |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

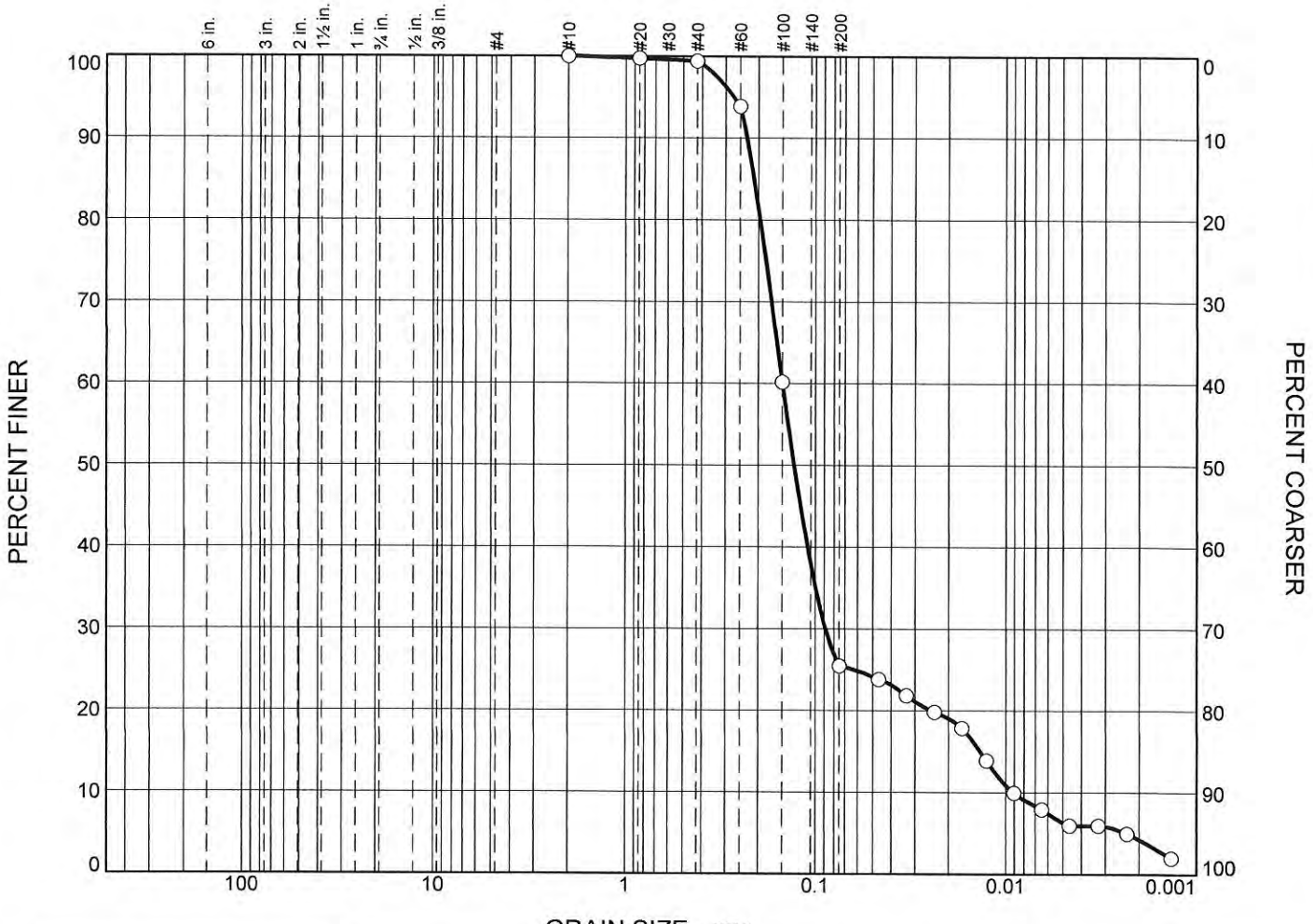
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-11

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 73.9 | 19.2 | 6.3 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB024 | | 18-20 | Brown SILTY CLAYEY SAND | SC-SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

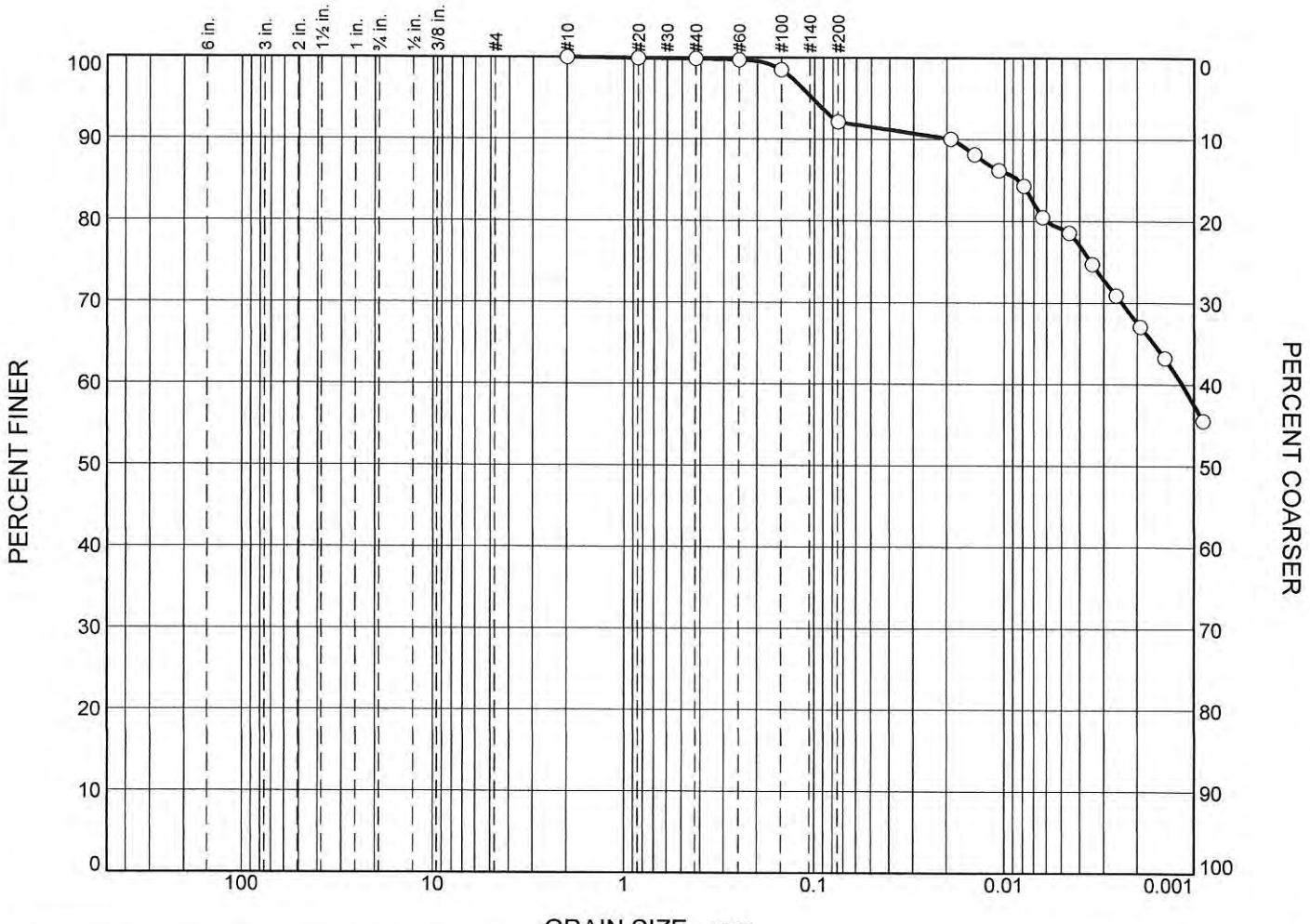
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-12

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 7.7 | 13.0 | 79.1 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB024 | | 23-25 | Brown FAT CLAY | CH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

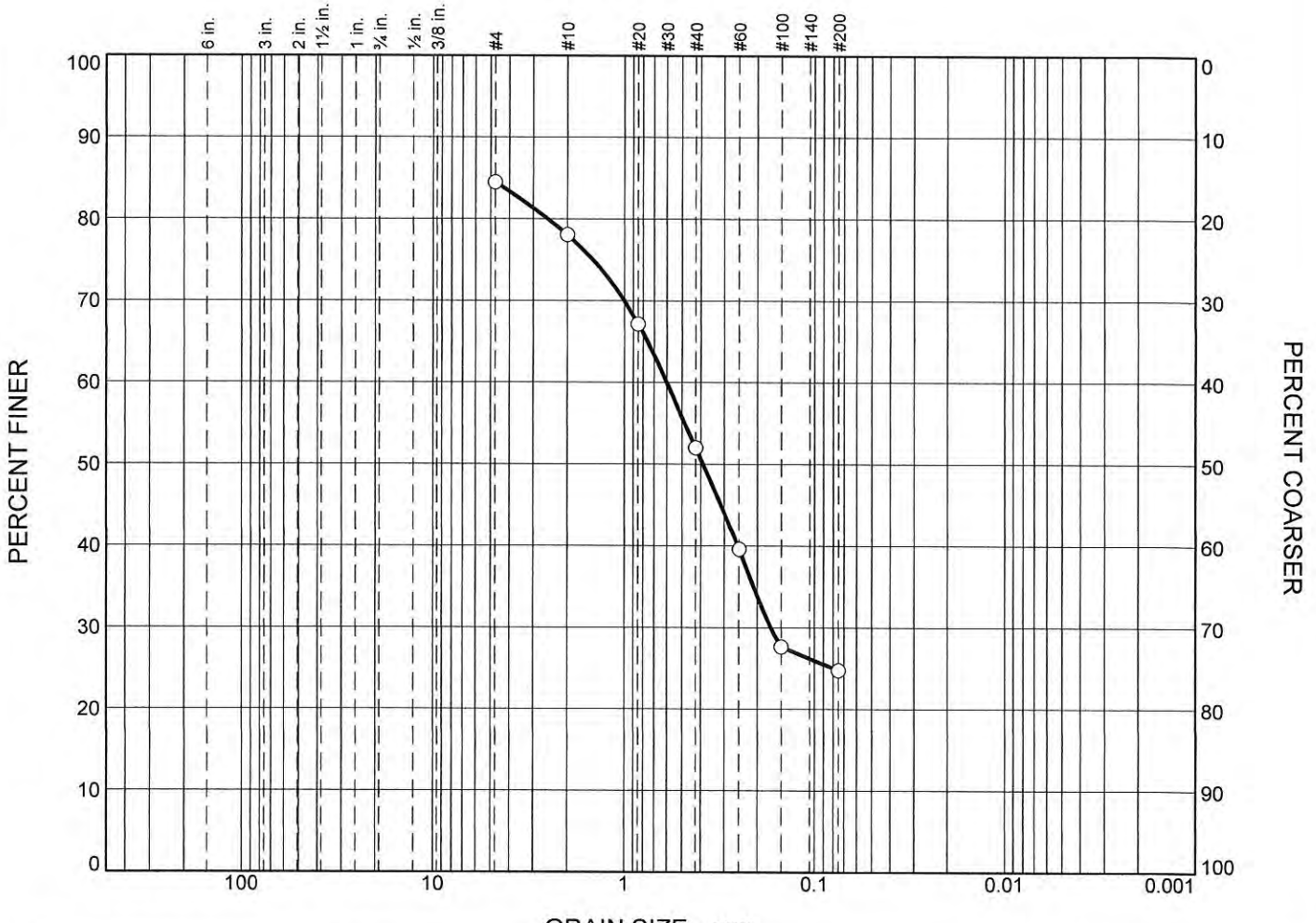
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-13

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | | | | 6.5 | 26.0 | 27.2 | 24.8 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB025 | | 0-2 | | SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

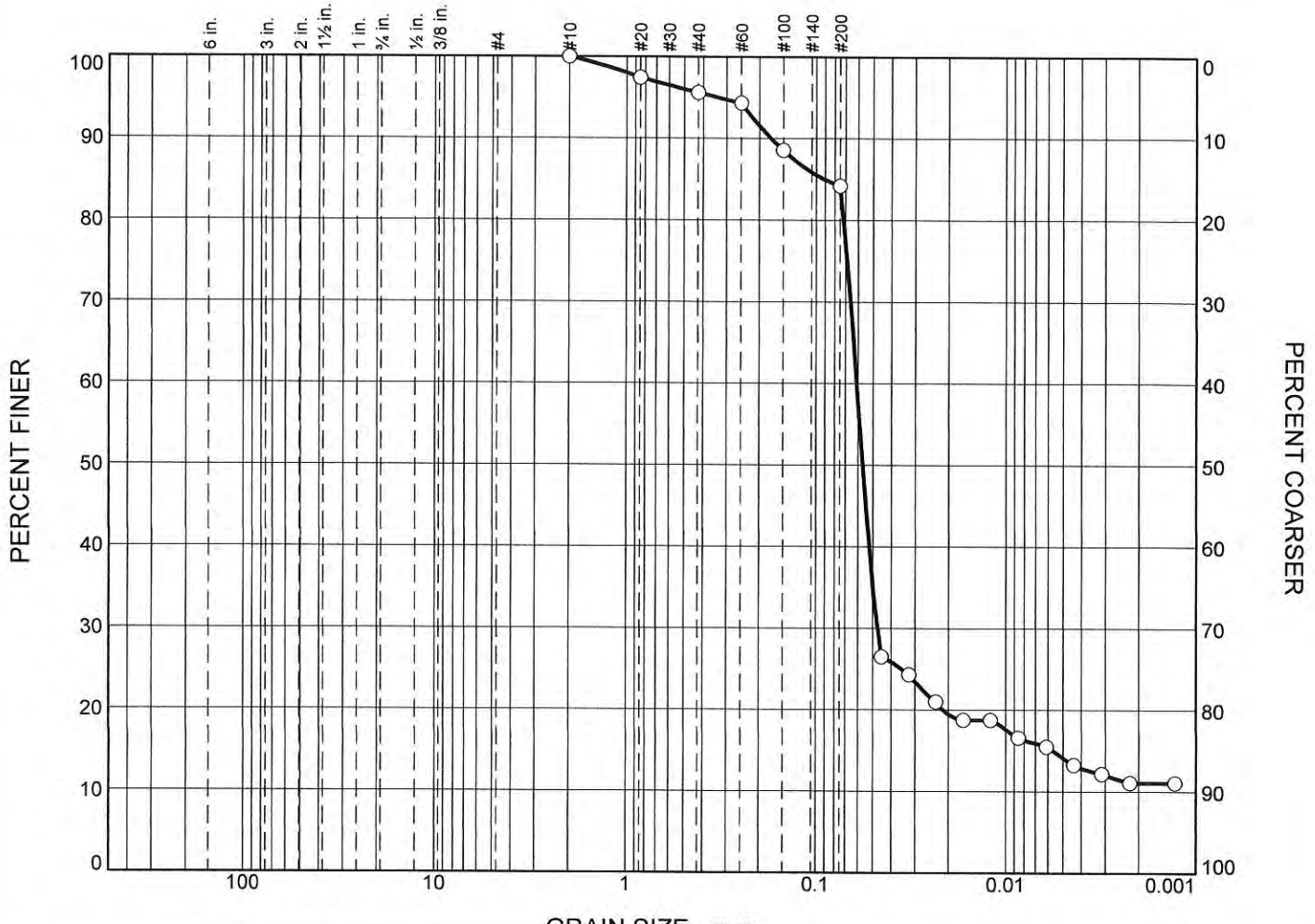
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-14

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 11.4 | 70.1 | 14.1 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB025 | | 8-10 | Gray LEAN CLAY with SAND | CL |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

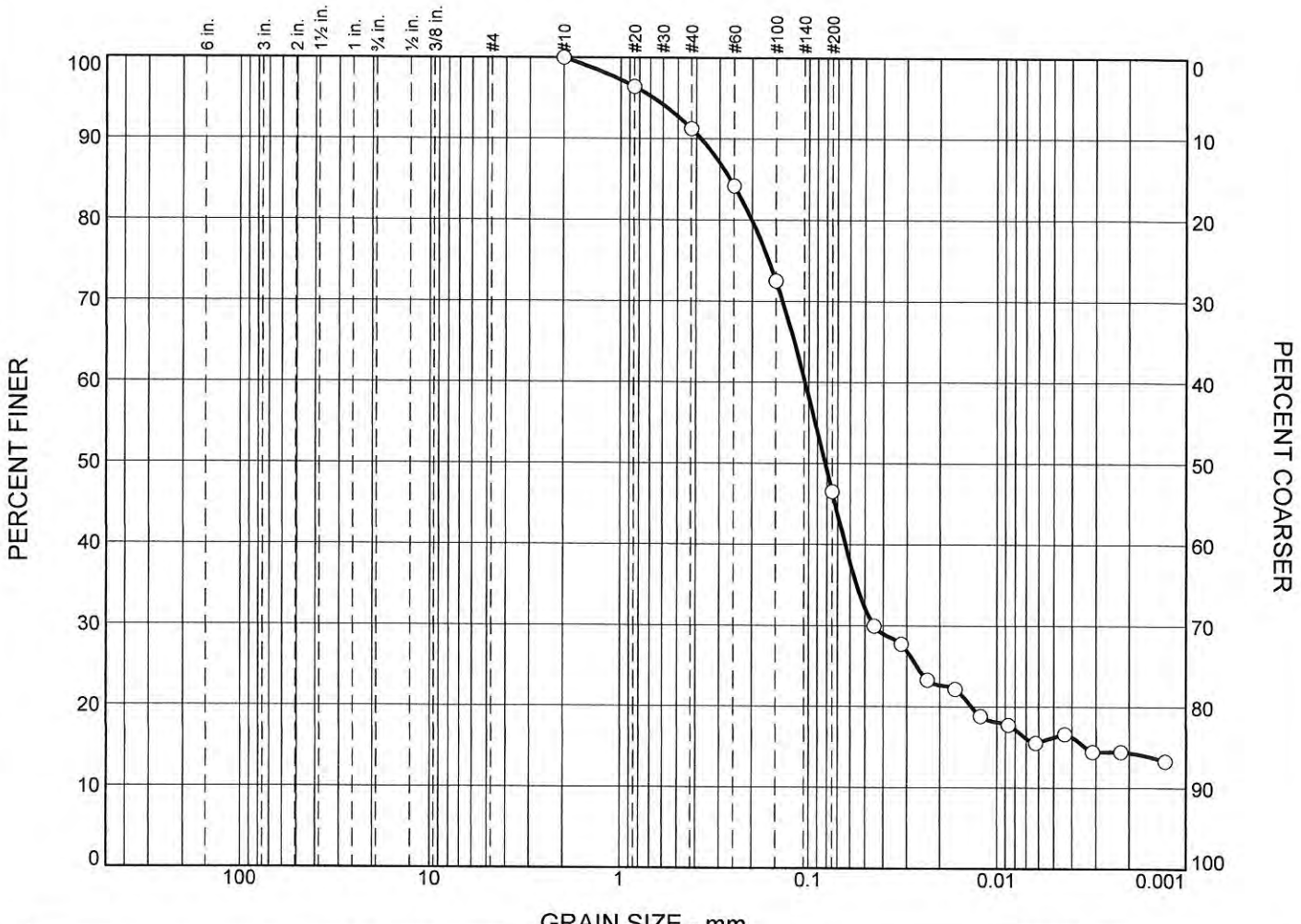
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-15

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 8.8 | 44.7 | 30.3 | 16.2 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB025 | | 10-12 | | SC |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

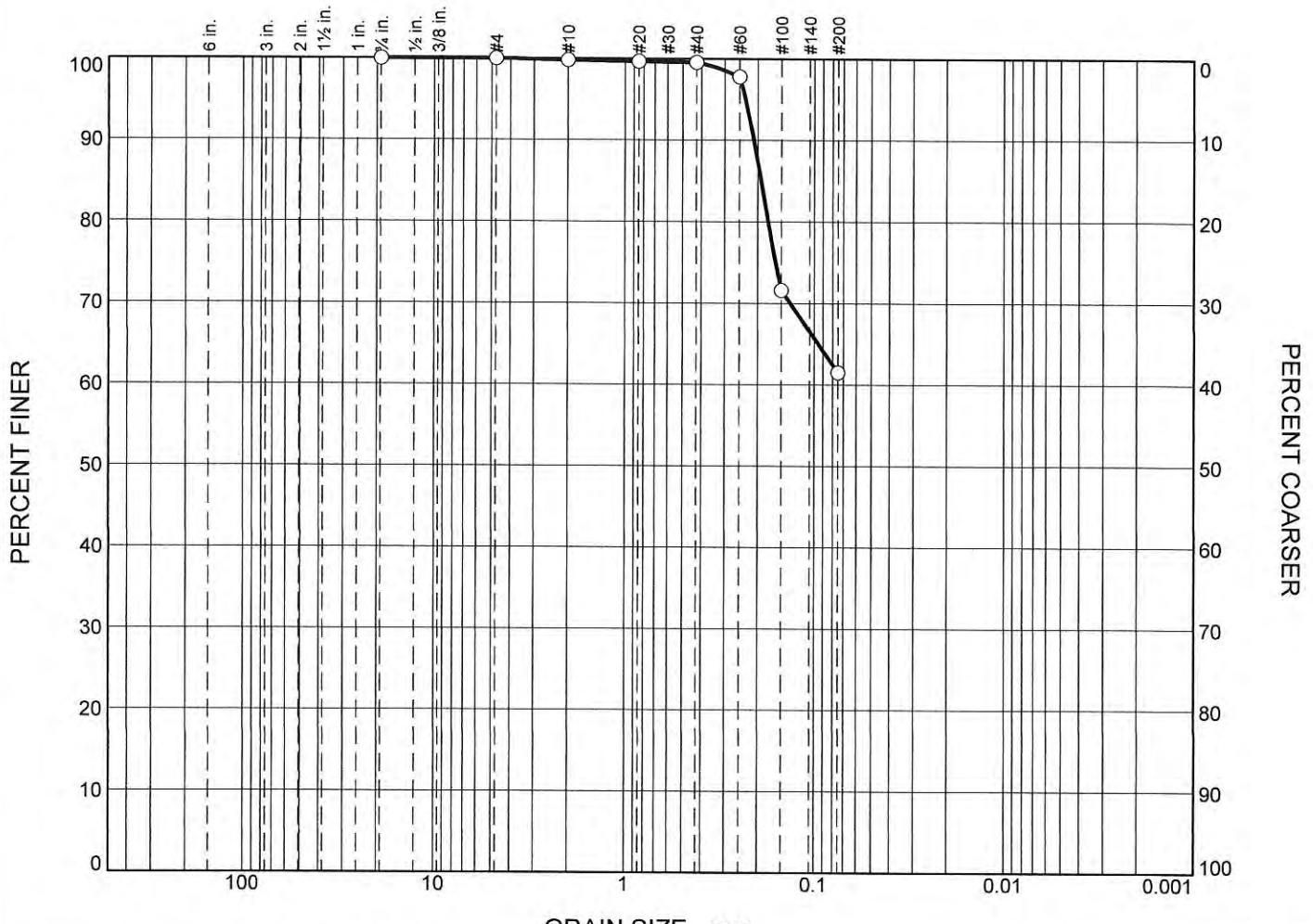
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-16

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 38.0 | 61.5 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB025 | | 14-16 | | ML |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

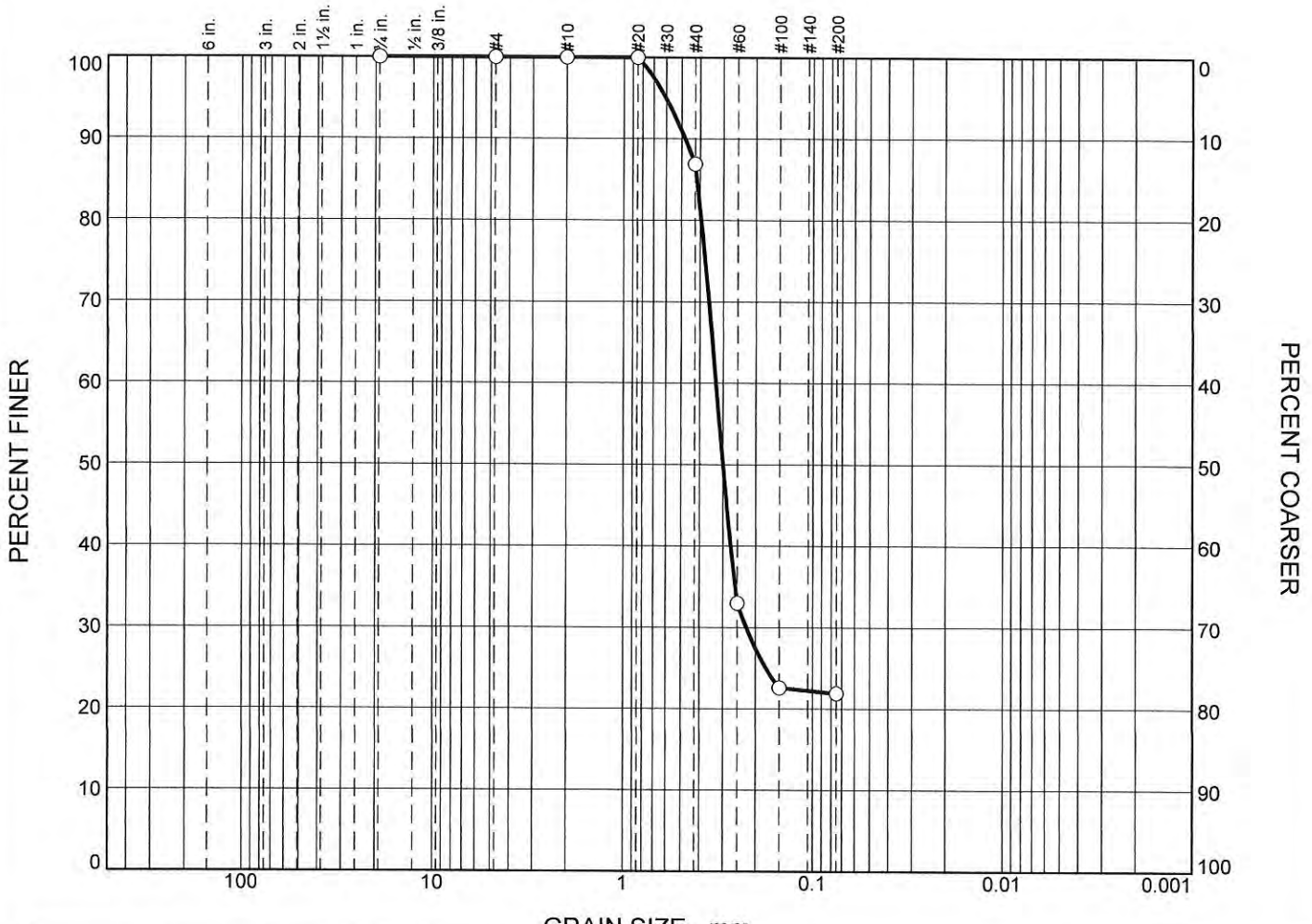
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-17

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 13.1 | 65.0 | 21.9 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB025 | | 20-22 | | SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

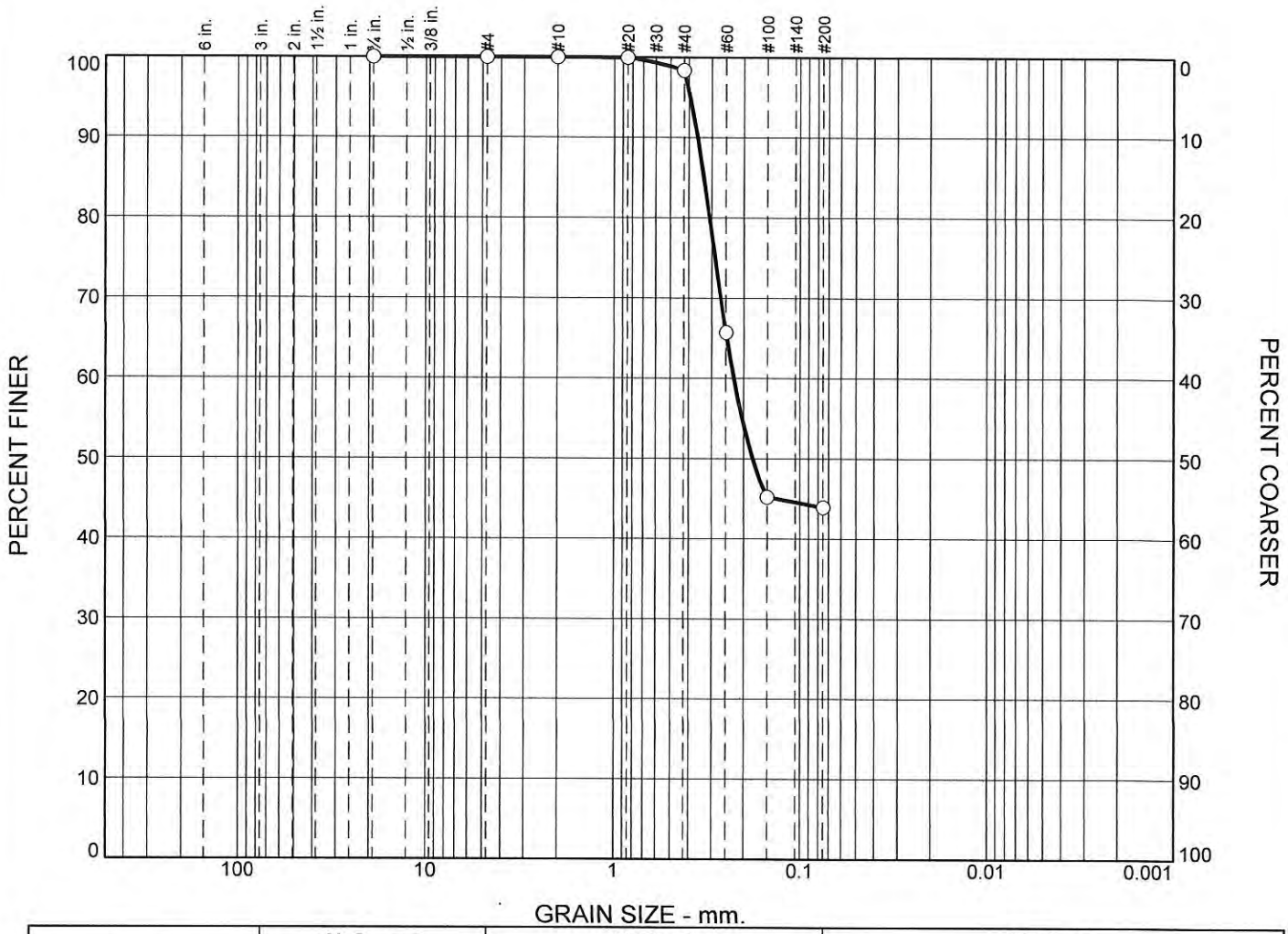
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-18

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 54.5 | 43.9 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB025 | | 22-24 | | SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

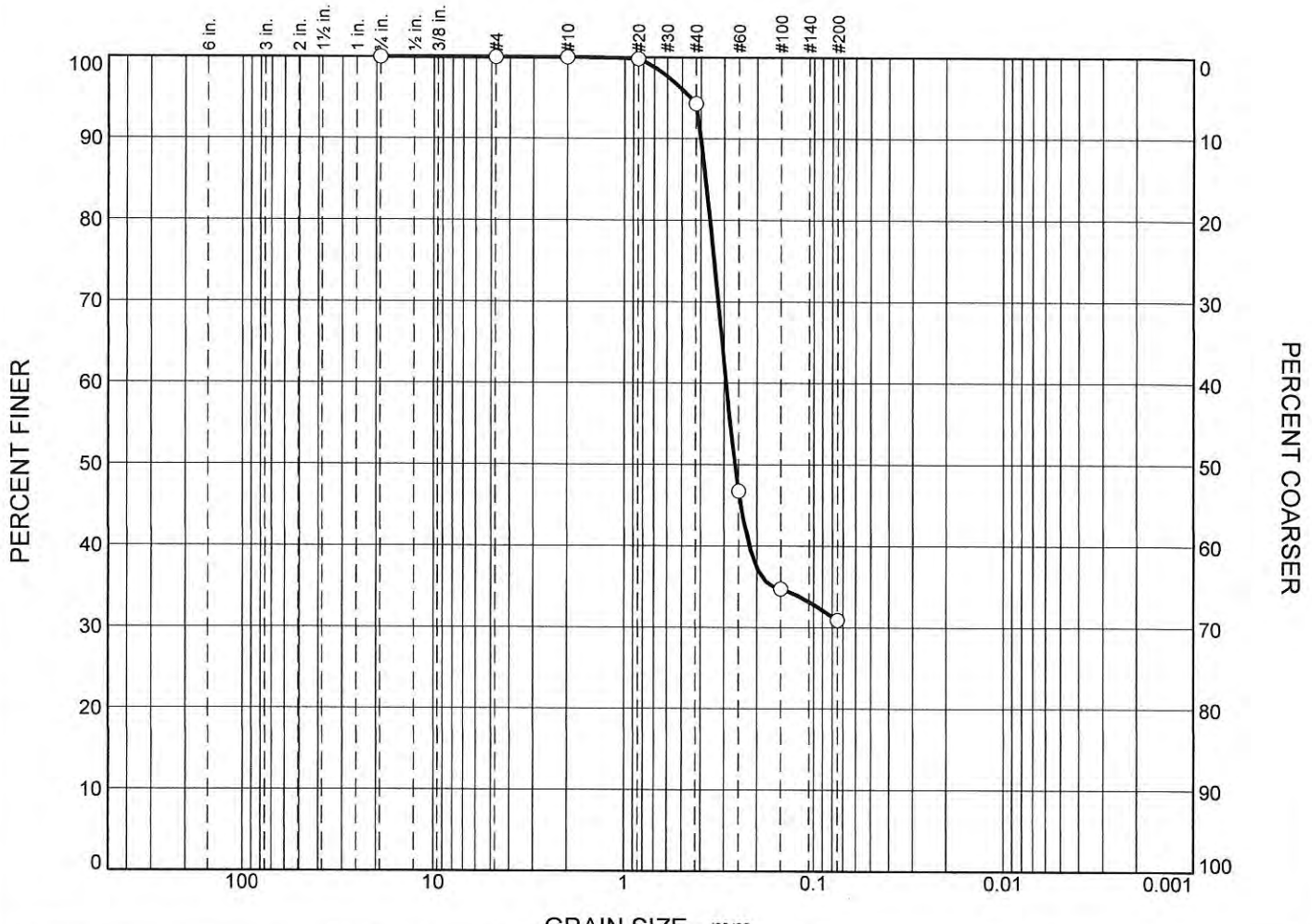
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-19

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 5.7 | 63.4 | 30.9 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB025 | | 28-30 | | SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

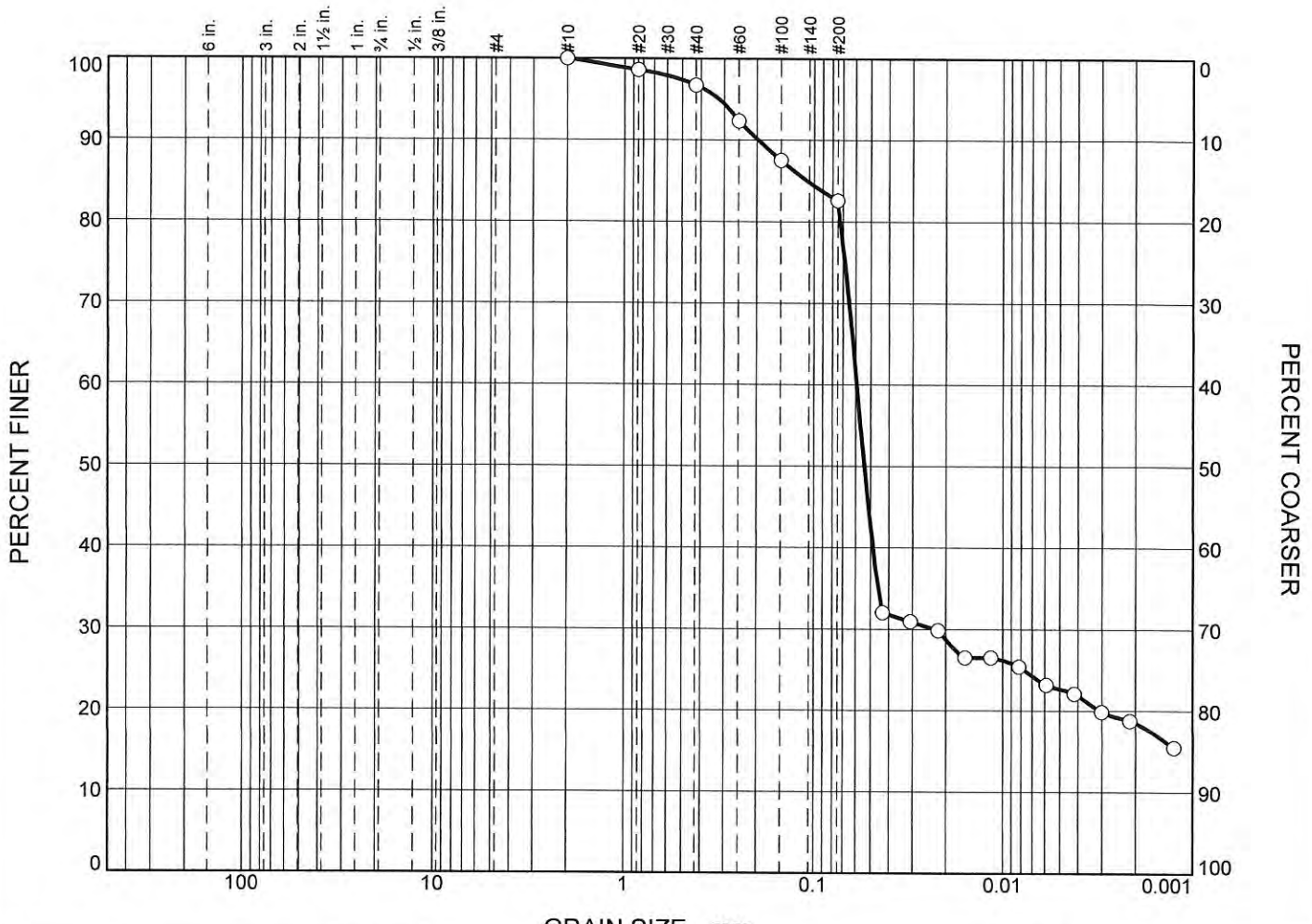
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-20

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 14.1 | 59.9 | 22.7 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB026 | | 8-10 | Gray and brown LEAN CLAY with SAND | CL |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

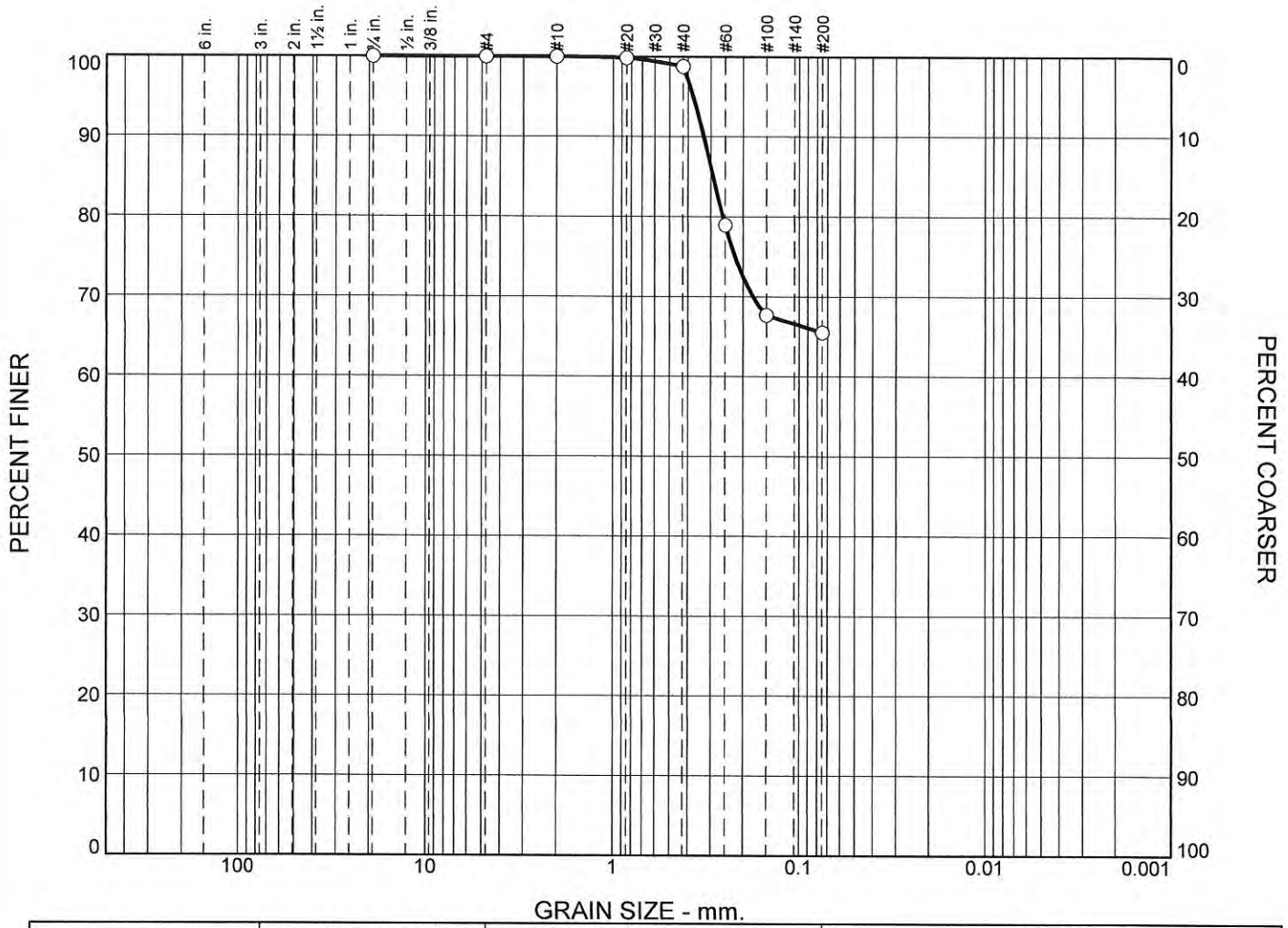
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-21

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 33.3 | 65.5 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB026 | | 12-14 | Tan and Gray SAND | ML |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

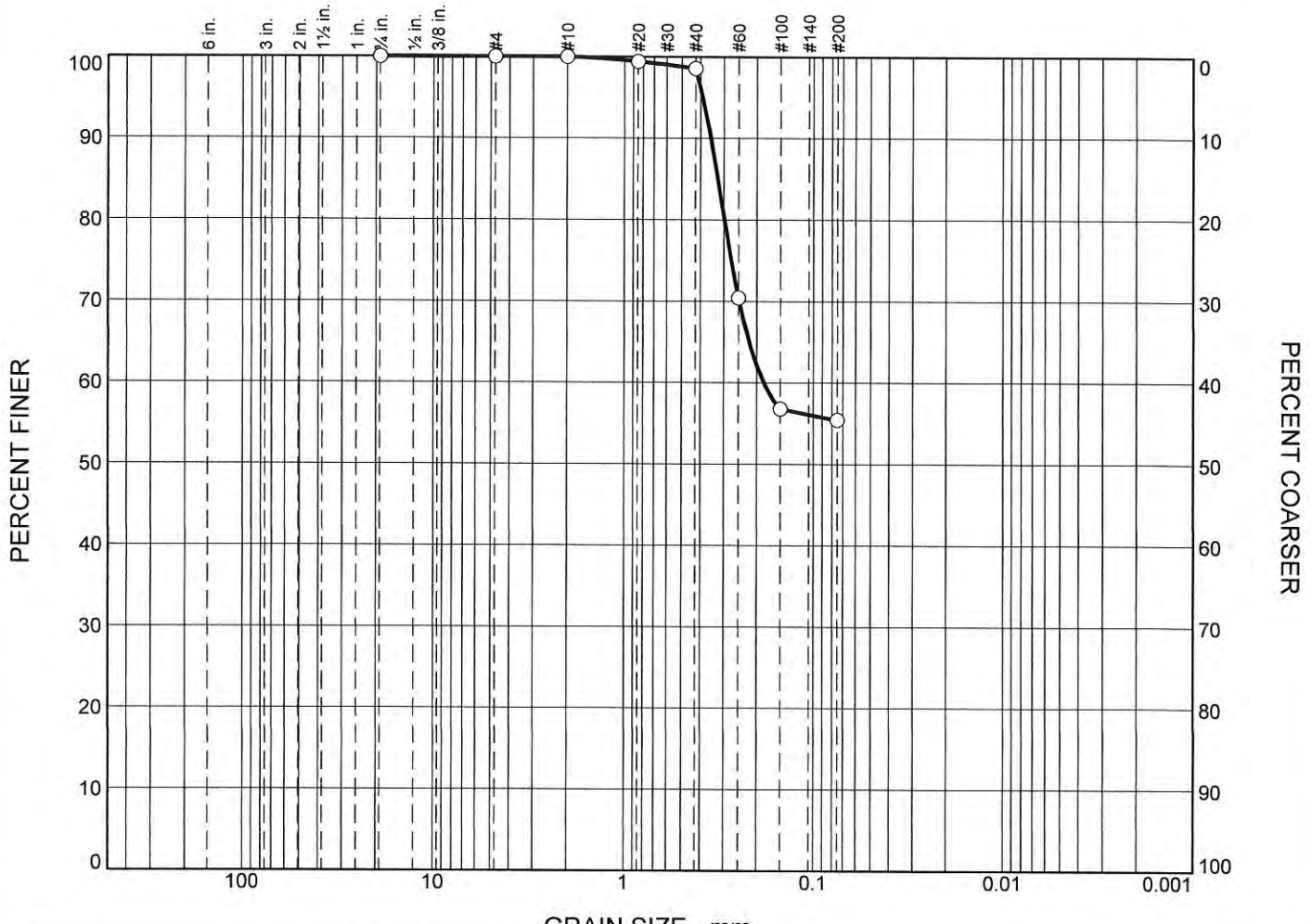
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-22

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 43.2 | 55.4 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB026 | | 20-22 | | ML |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

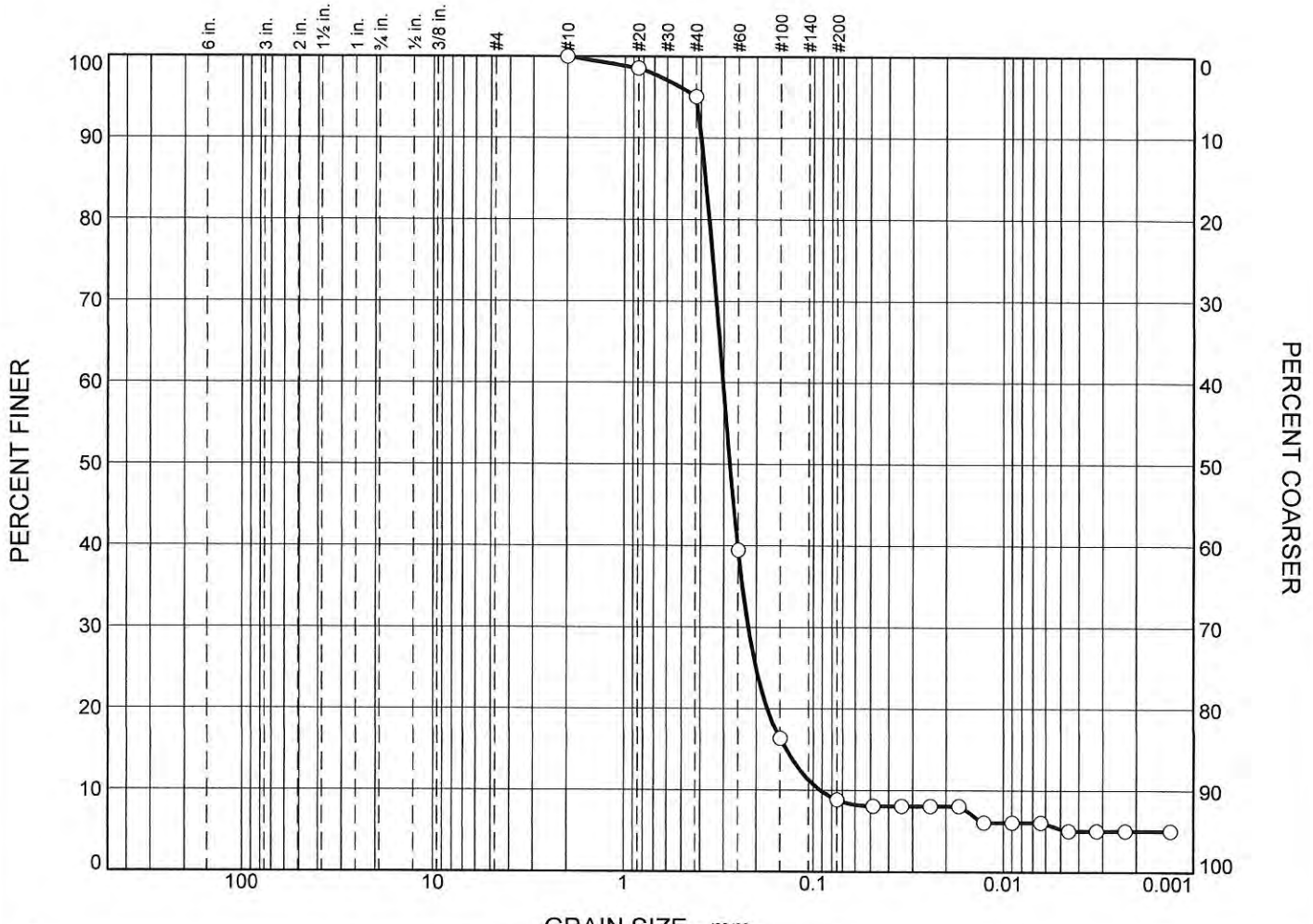
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-23

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 4.9 | 86.3 | 3.5 | 5.3 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB028 | | 28 | Gray poorly graded SAND with SILT | SP-SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

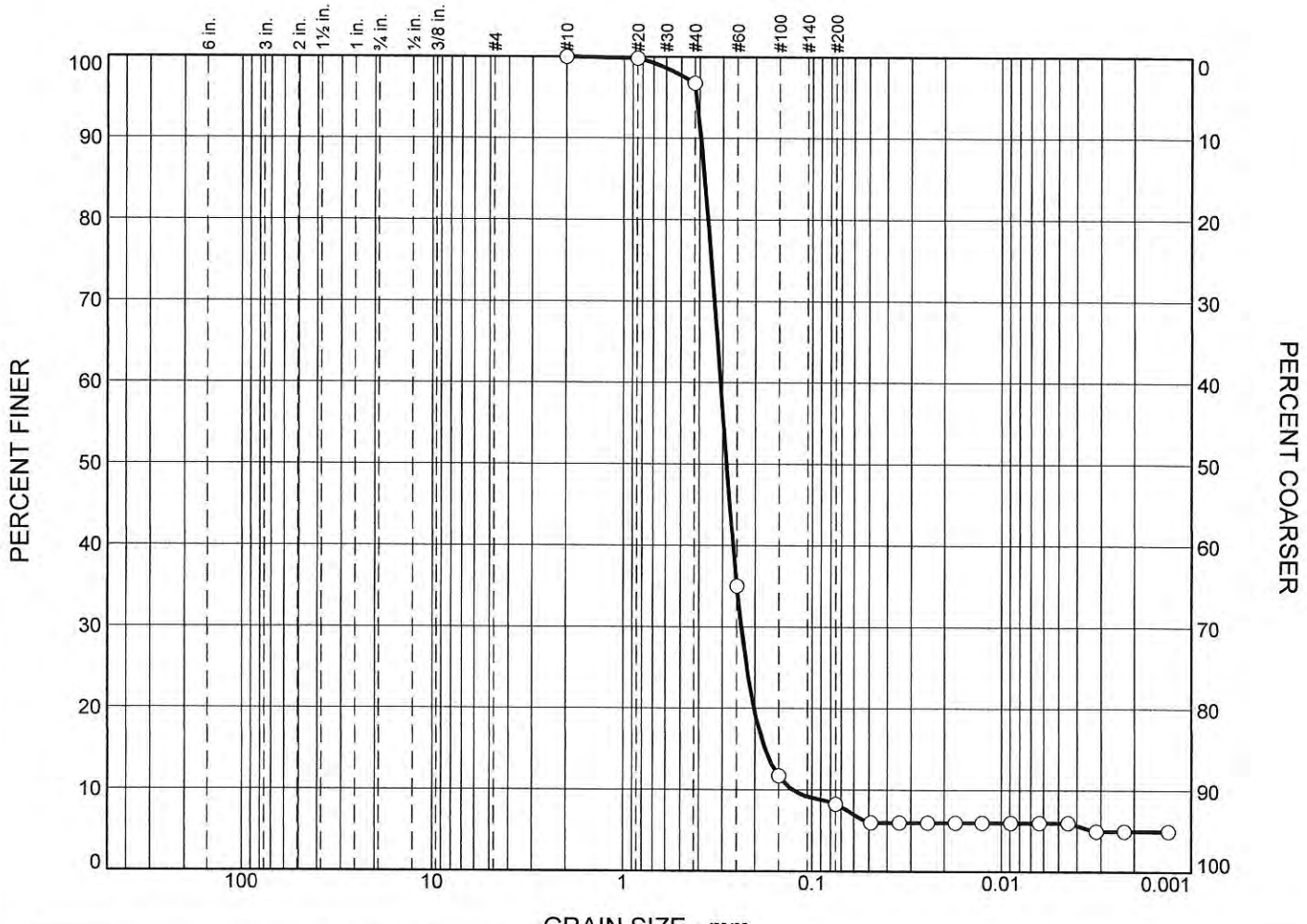
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-24

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 88.5 | 3.3 | 5.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB028 | | 33 | Gray poorly graded SAND with SILT | SP-SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

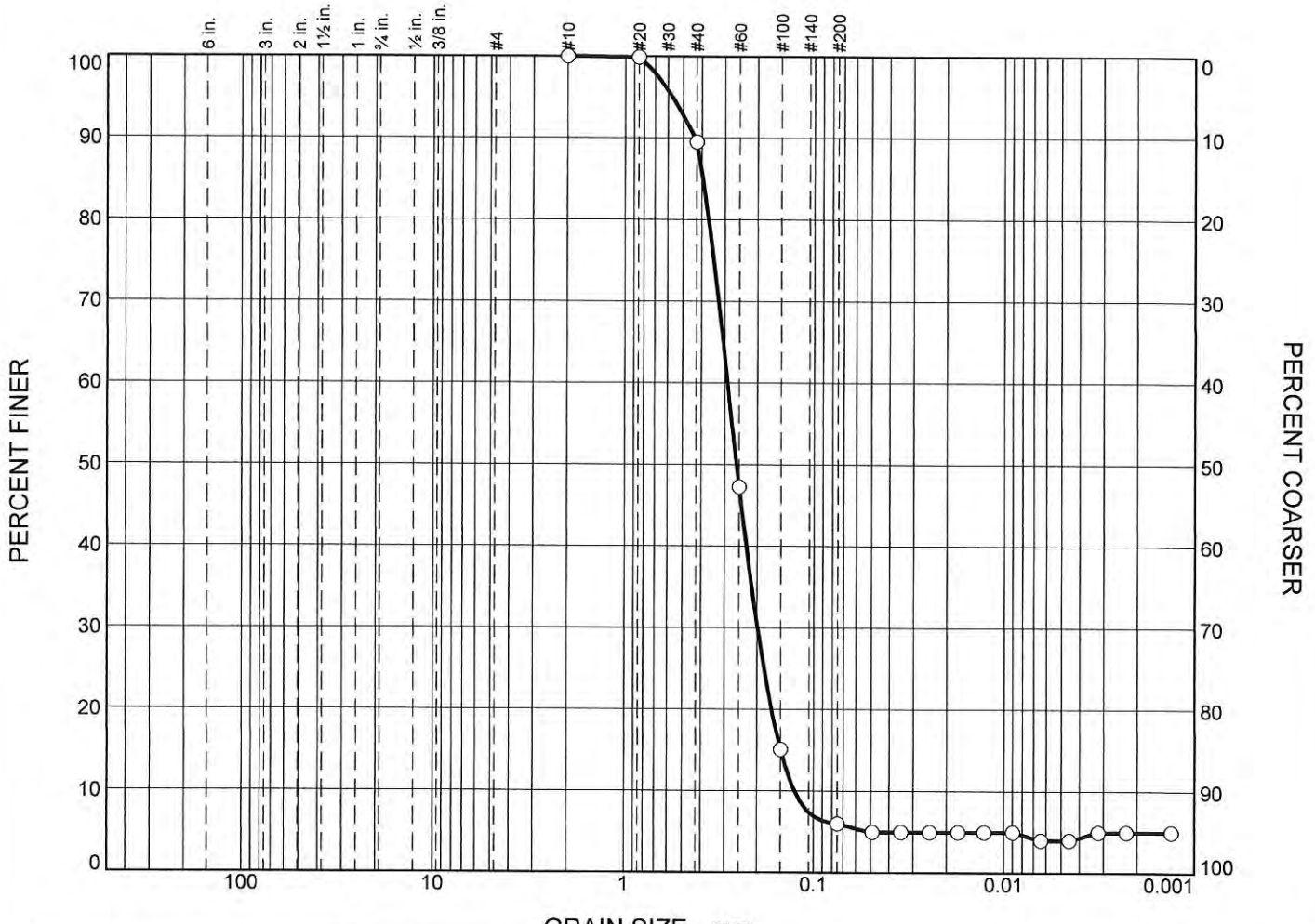
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-25

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 10.5 | 83.5 | 1.0 | 5.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB028 | | 38 | Gray poorly graded SAND with SILT | SP-SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

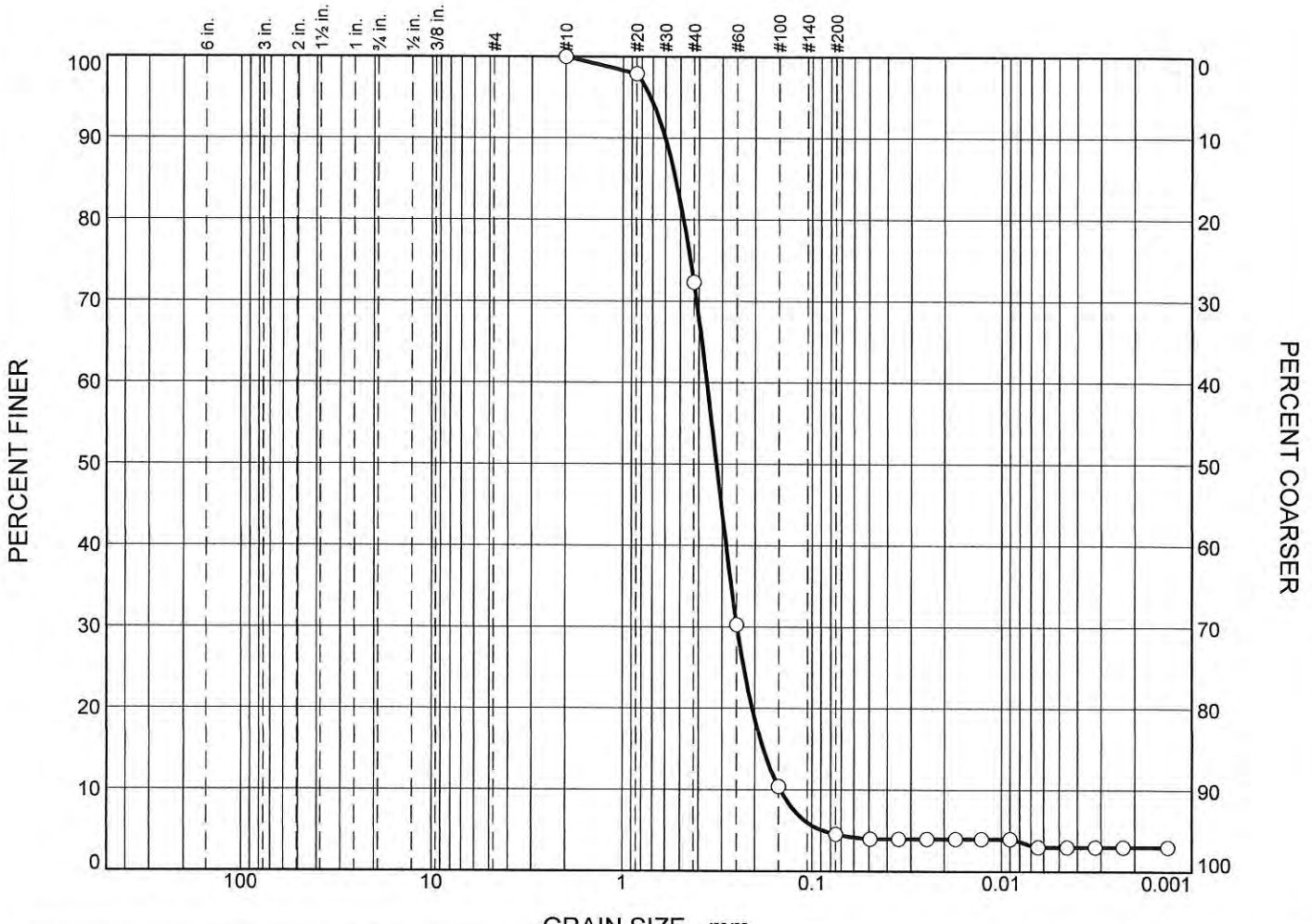
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-26

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 27.7 | 67.7 | 1.6 | 3.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB028 | | 43 | Gray poorly graded SAND | SP |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

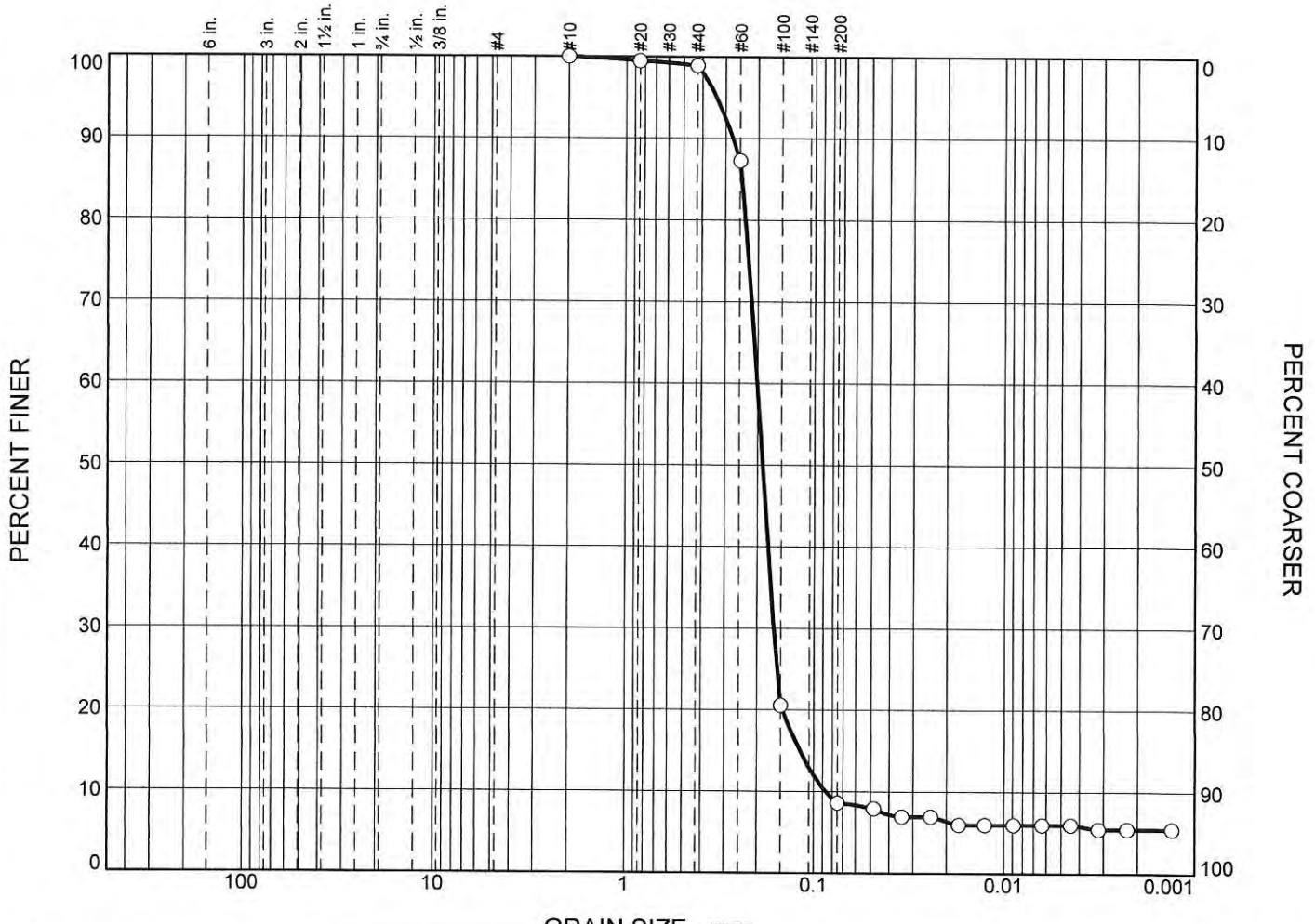
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131 **Figure**

Attachment Figure B.2-27

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 90.3 | 3.2 | 5.4 |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB029 | | 23 | Gray poorly graded SAND with SILT | SP-SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

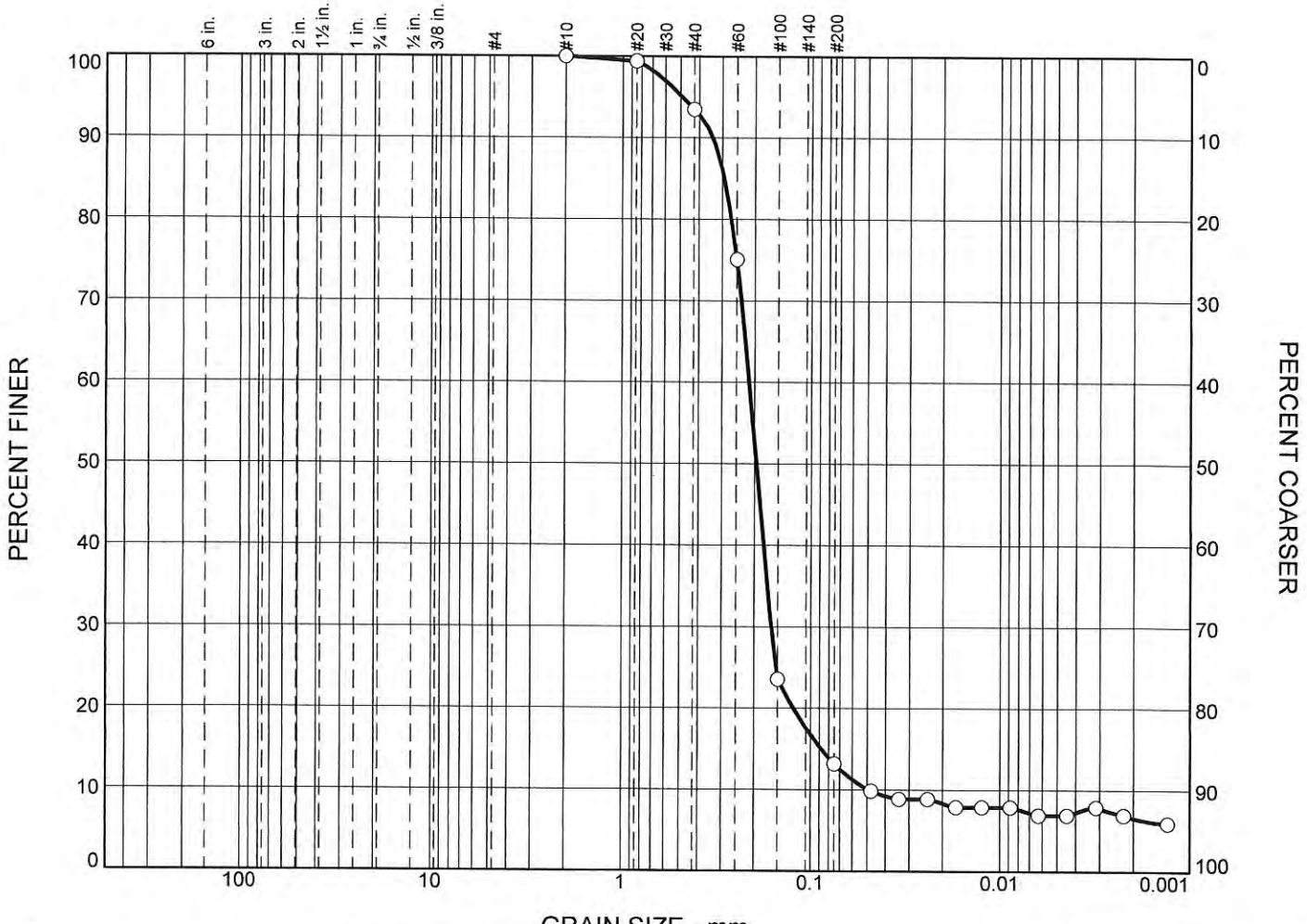
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-28

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 80.3 | 6.7 | 6.5 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB029 | | 28 | Gray SILTY SAND | SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

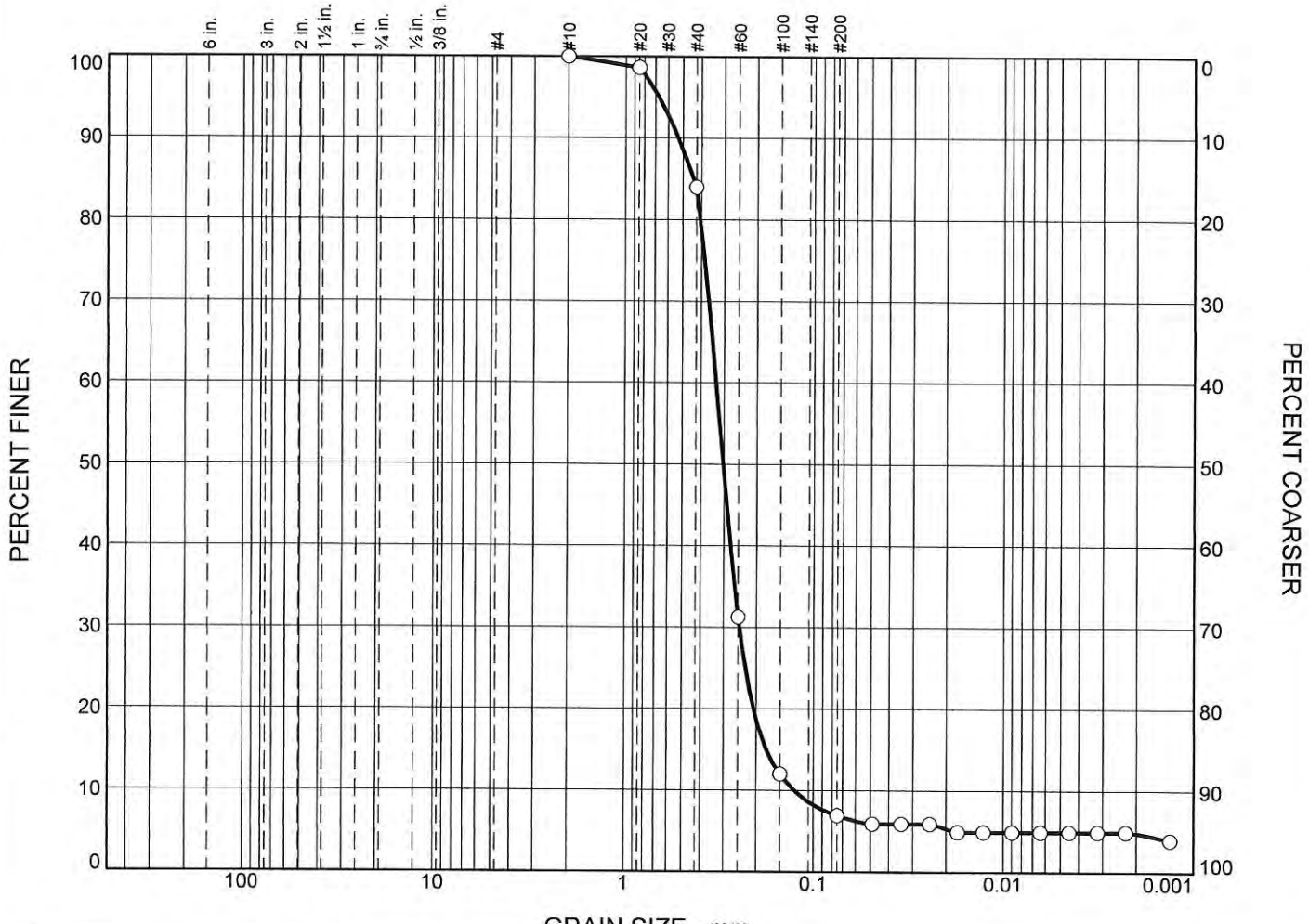
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-29

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 16.0 | 77.1 | 2.1 | 4.8 |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB029 | | 33 | Gray poorly graded SAND with SILT | SP-SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

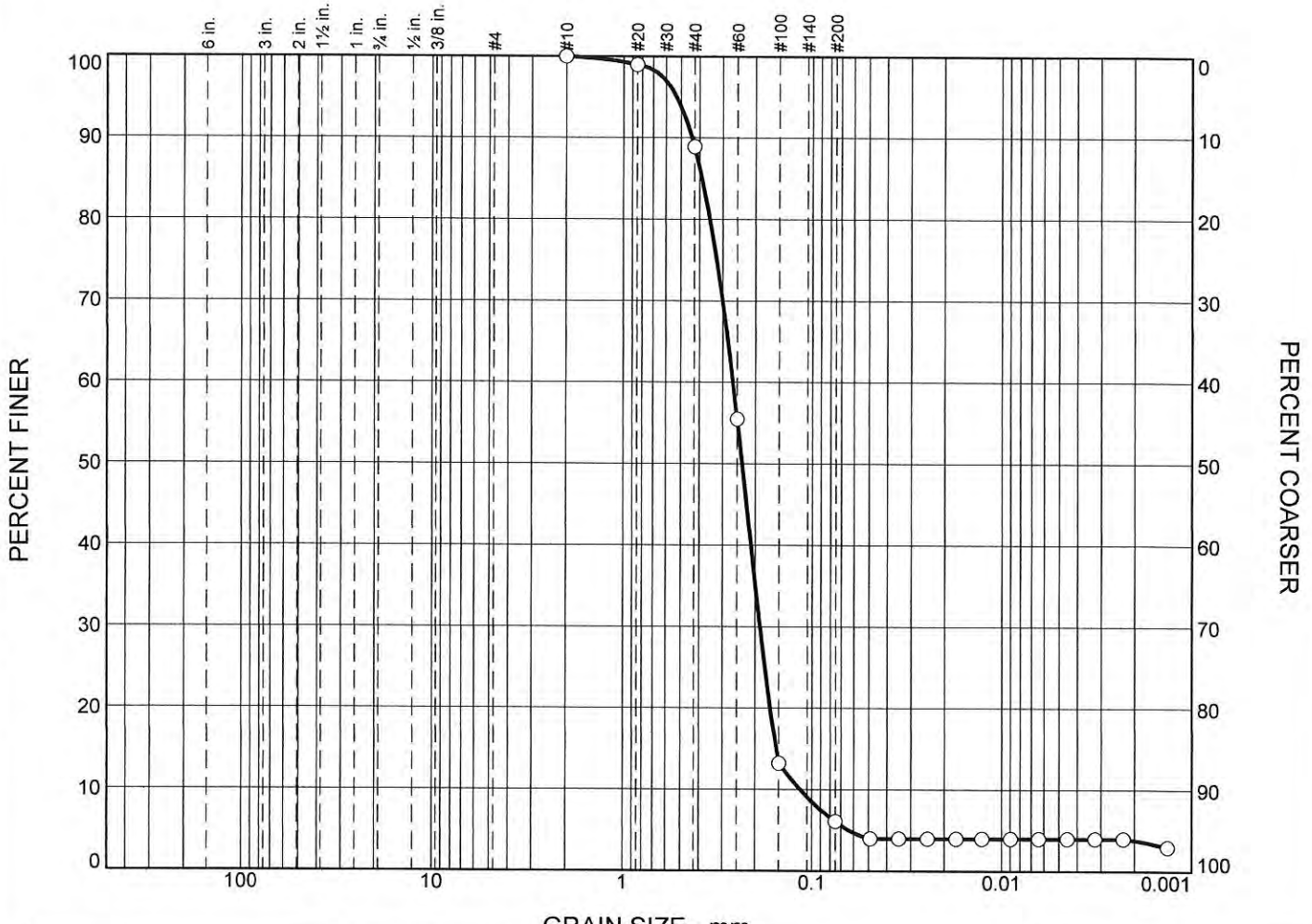
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-30

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 11.1 | 82.8 | 2.3 | 3.8 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB029 | | 38 | Gray poorly graded SAND with SILT | SP-SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

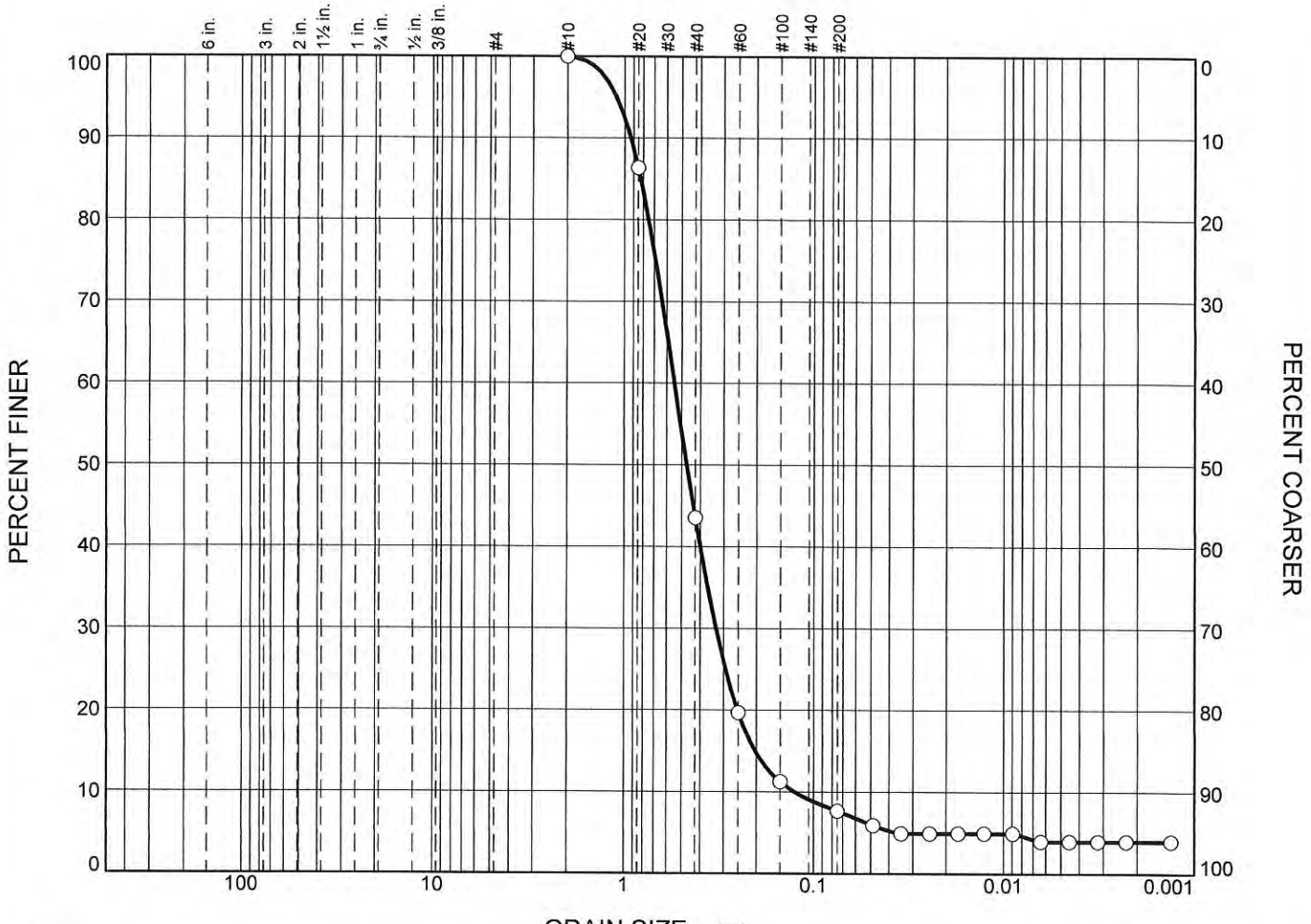
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-31

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 56.5 | 35.8 | 3.8 | 3.9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB029 | | 43 | Gray poorly graded SAND with SILT | SP-SM |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

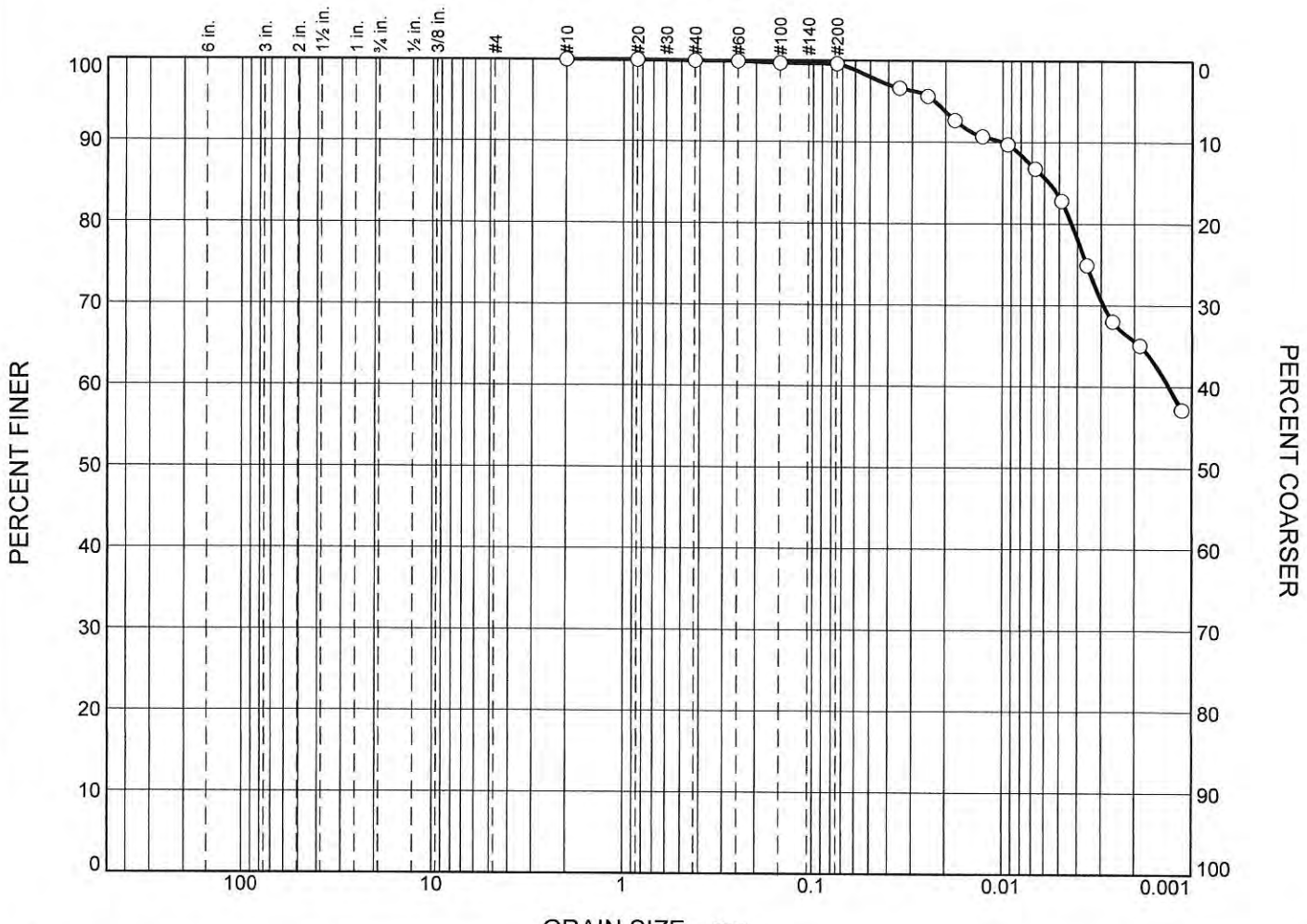
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-32

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 34.0 | 65.6 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB029 | | 48 | Gray FAT CLAY | CH |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

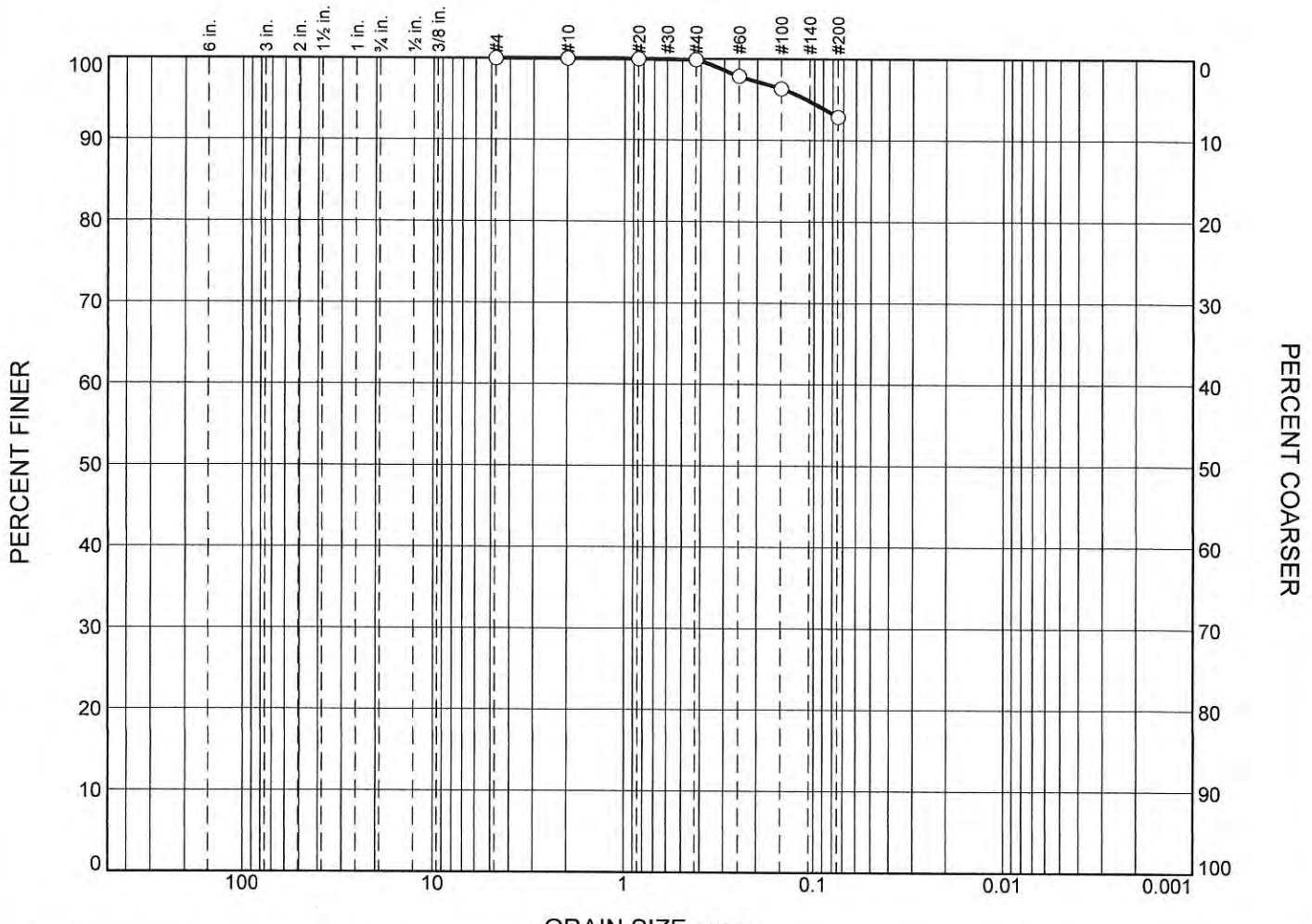
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-33

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 7.0 | 92.9 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB047 | | 53 | | ML |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

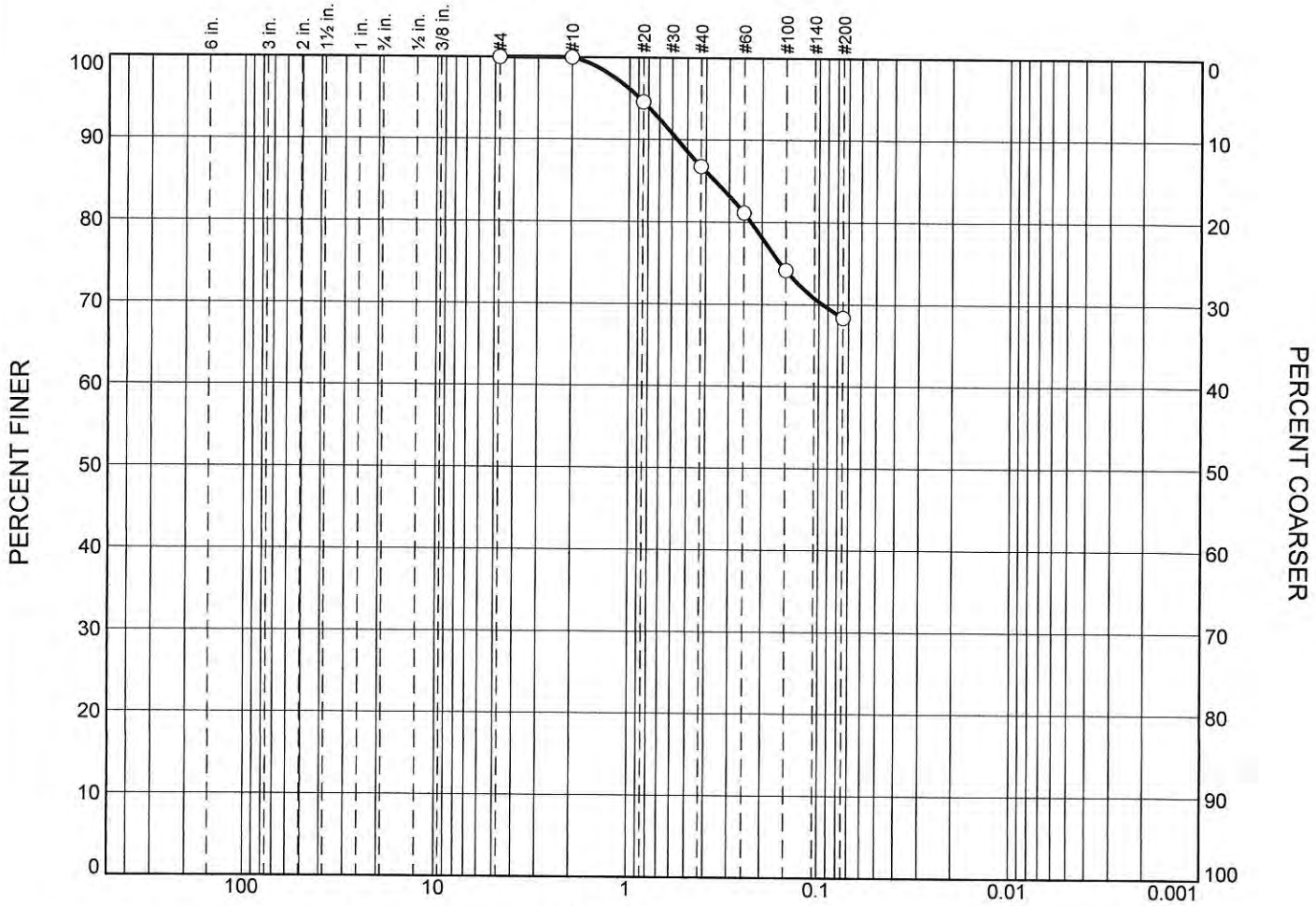
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-34

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 13.2 | 18.4 | 68.4 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB047 | | 78 | | ML |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

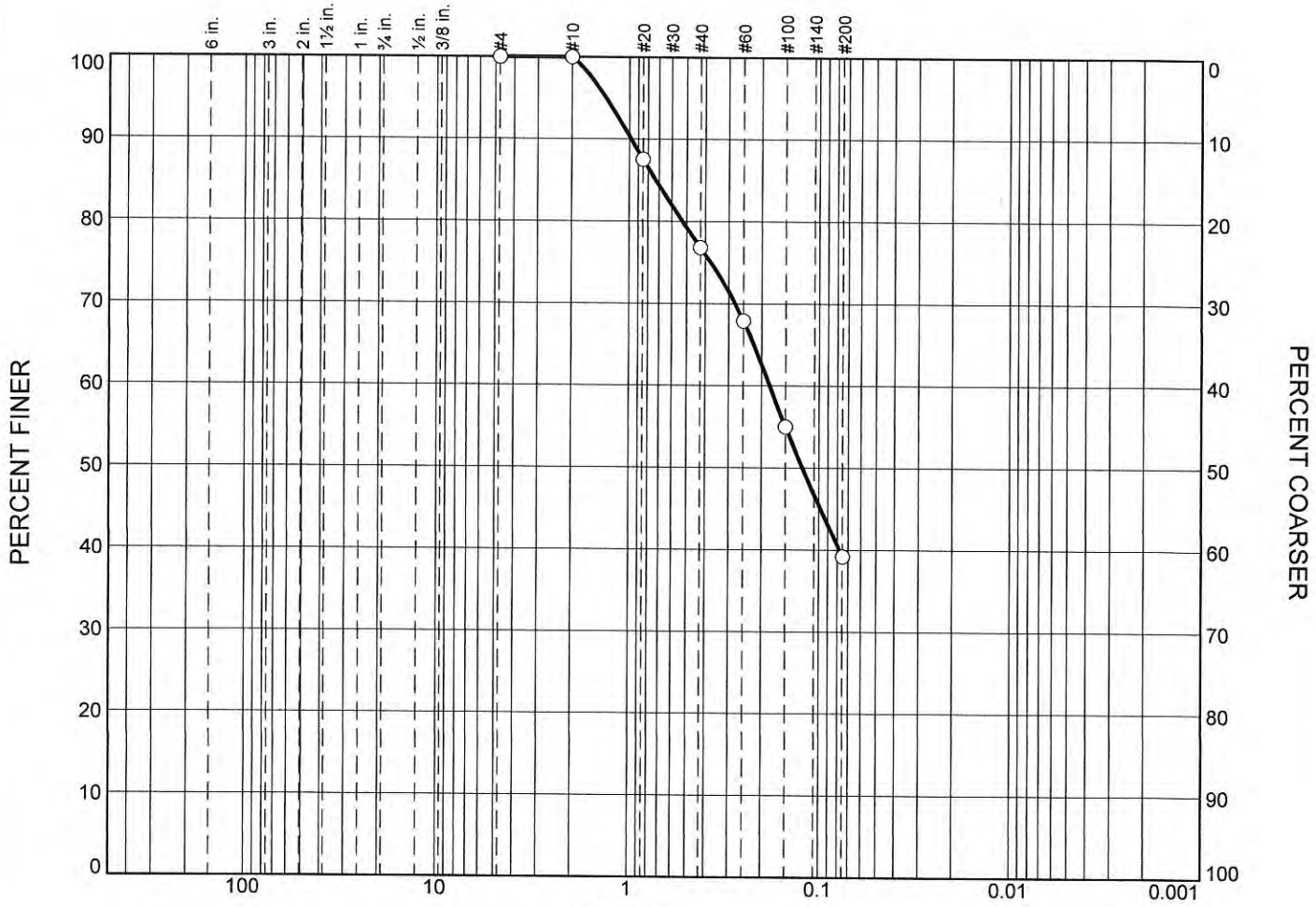
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-35

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 23.2 | 37.6 | 39.2 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB047 | | 88 | | SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

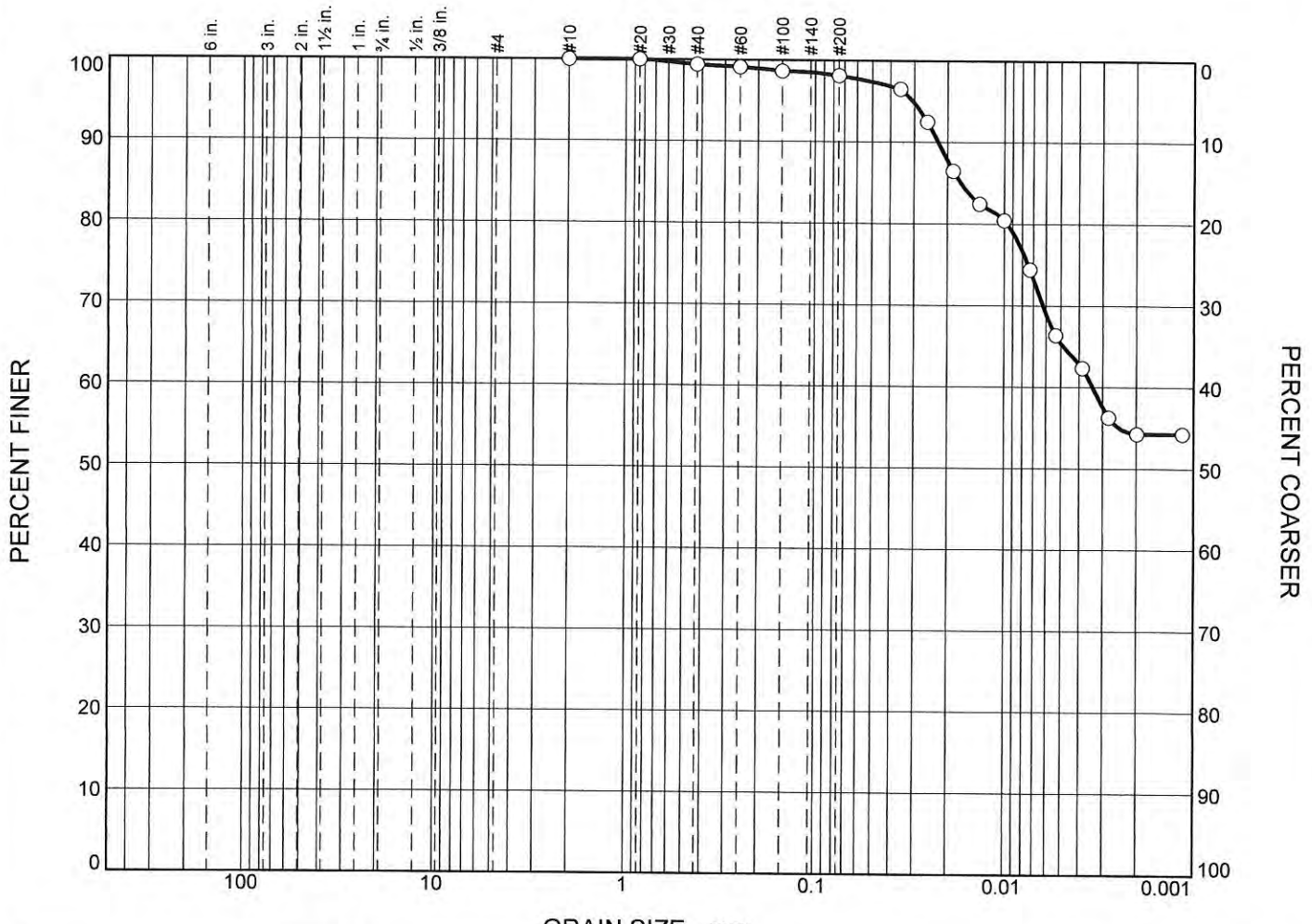
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-36

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 1.3 | 32.7 | 65.4 |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB050 | | 0-2 | | CH |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

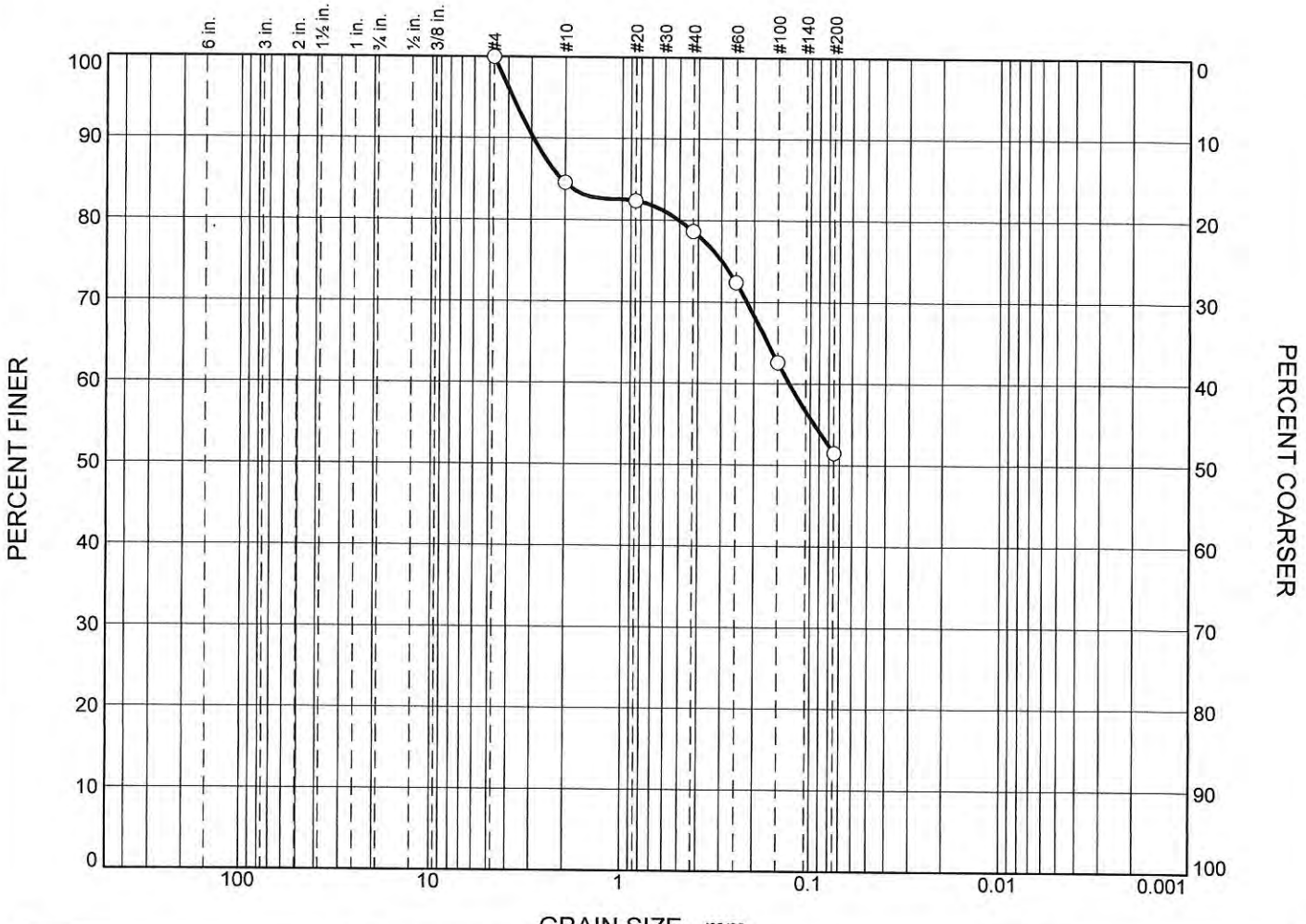
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-37

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 15.4 | 5.9 | 27.2 | 51.5 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB050 | | 14-16 | | ML |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

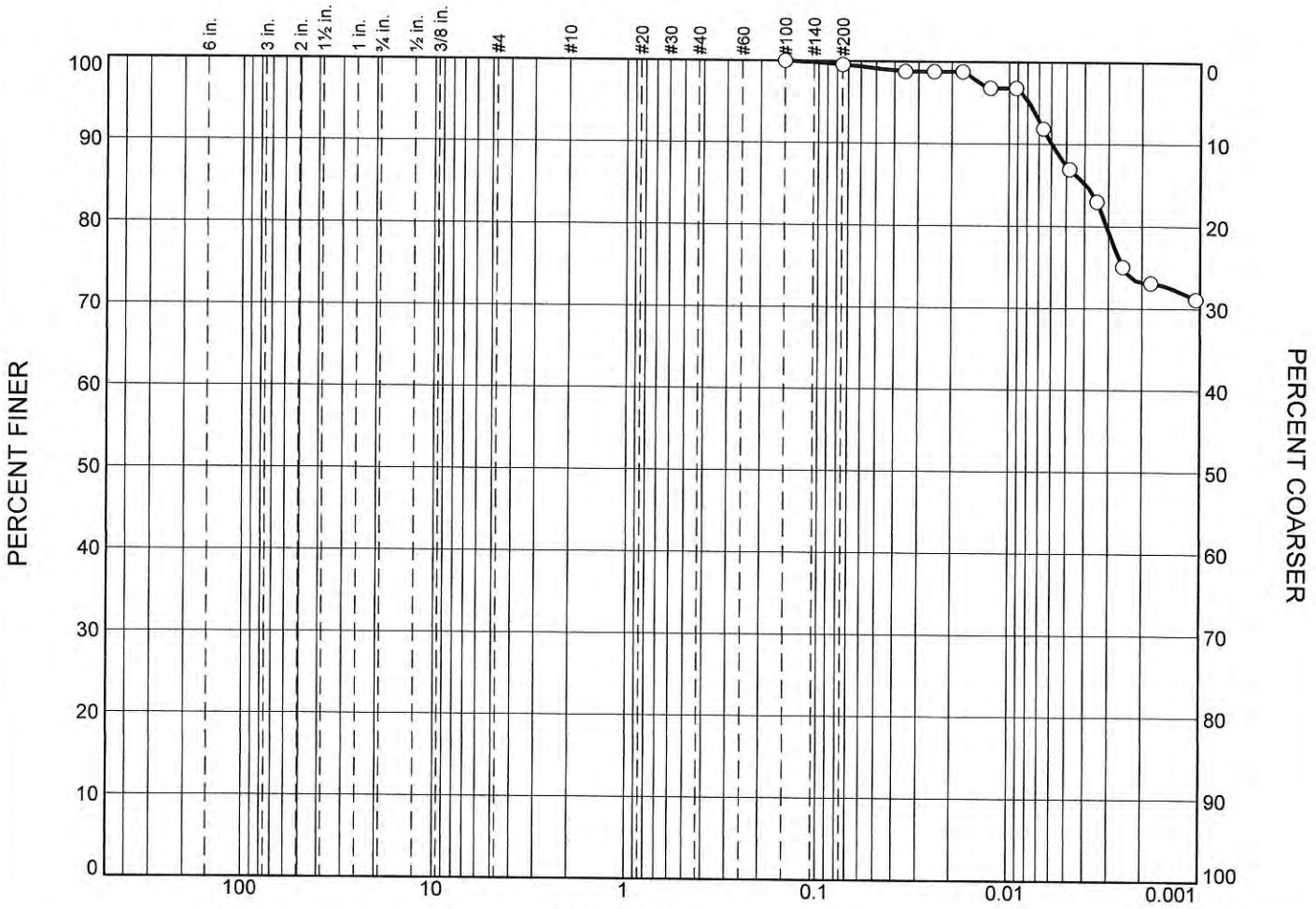
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-38

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 26.4 | 73.2 |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB053 | | 38 | Tan FAT CLAY | CH |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

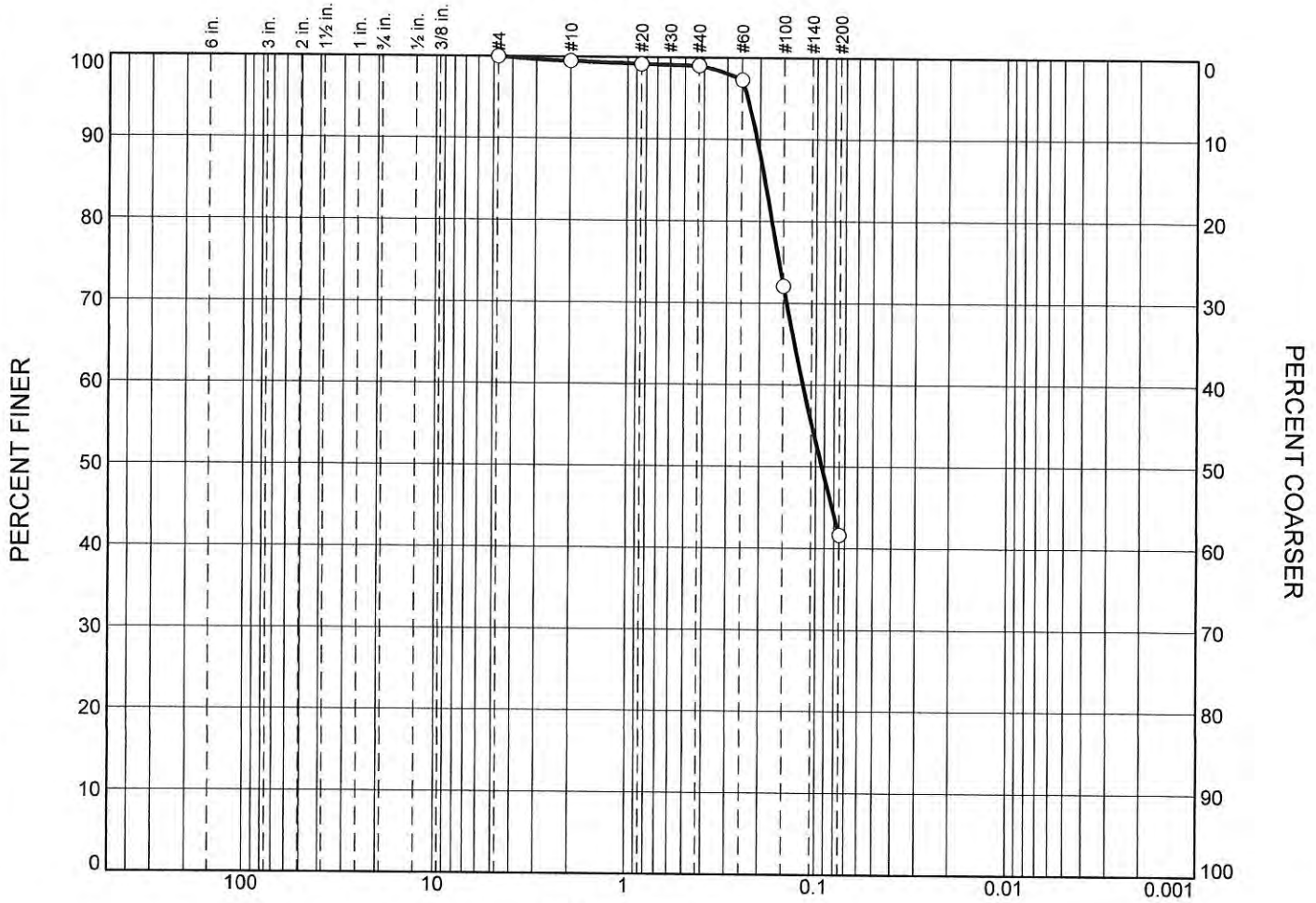
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-39

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 | 57.4 | 41.6 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB053 | | 58 | Tan CLAYEY SAND | SC |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

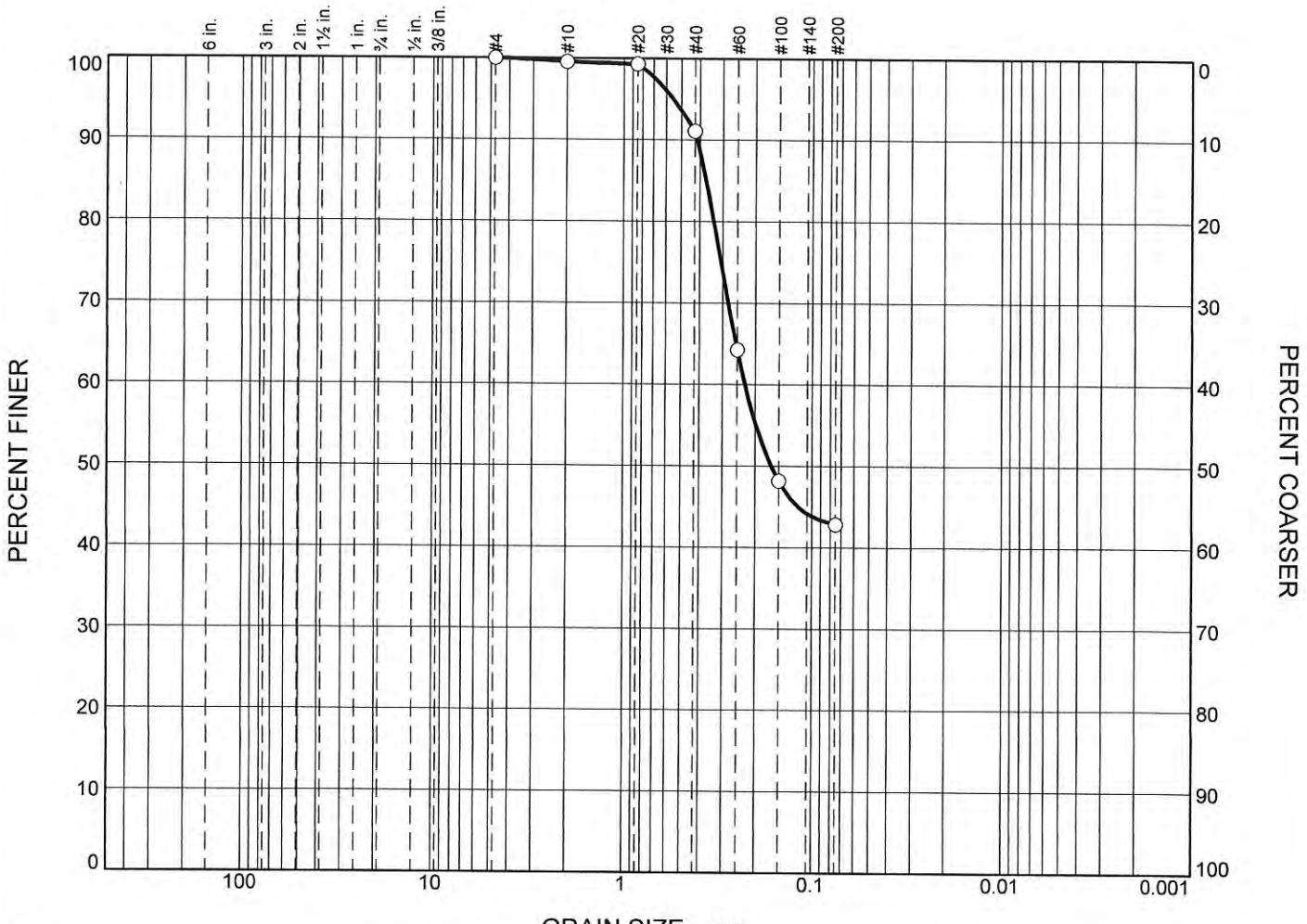
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-40

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.4 | 8.5 | 48.2 | 42.9 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB053 | | 78 | Gray CLAYEY SAND | SC |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

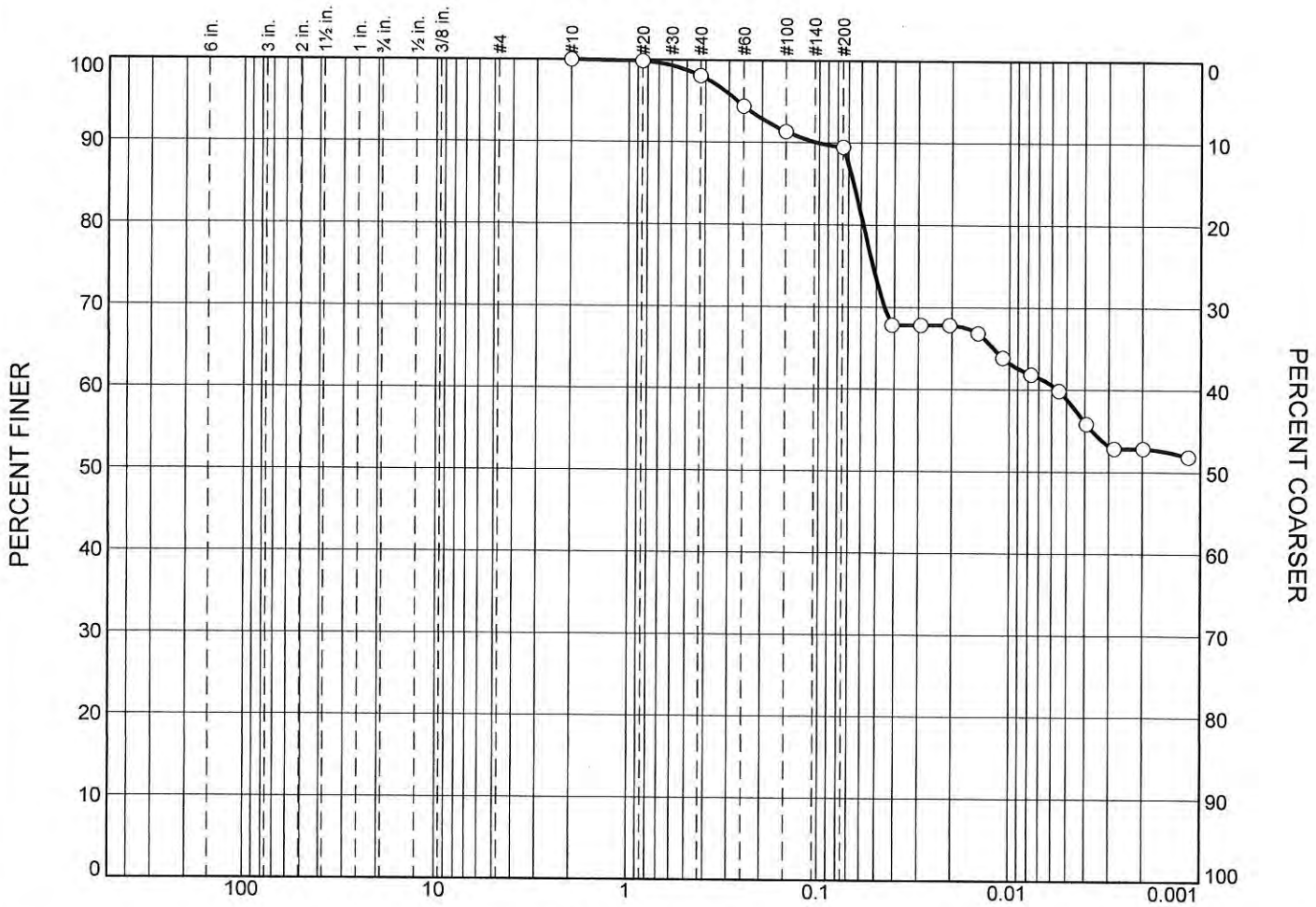
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-41

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 8.6 | 36.6 | 52.9 |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB053 | | 93 | Black FAT CLAY; organics | MH |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

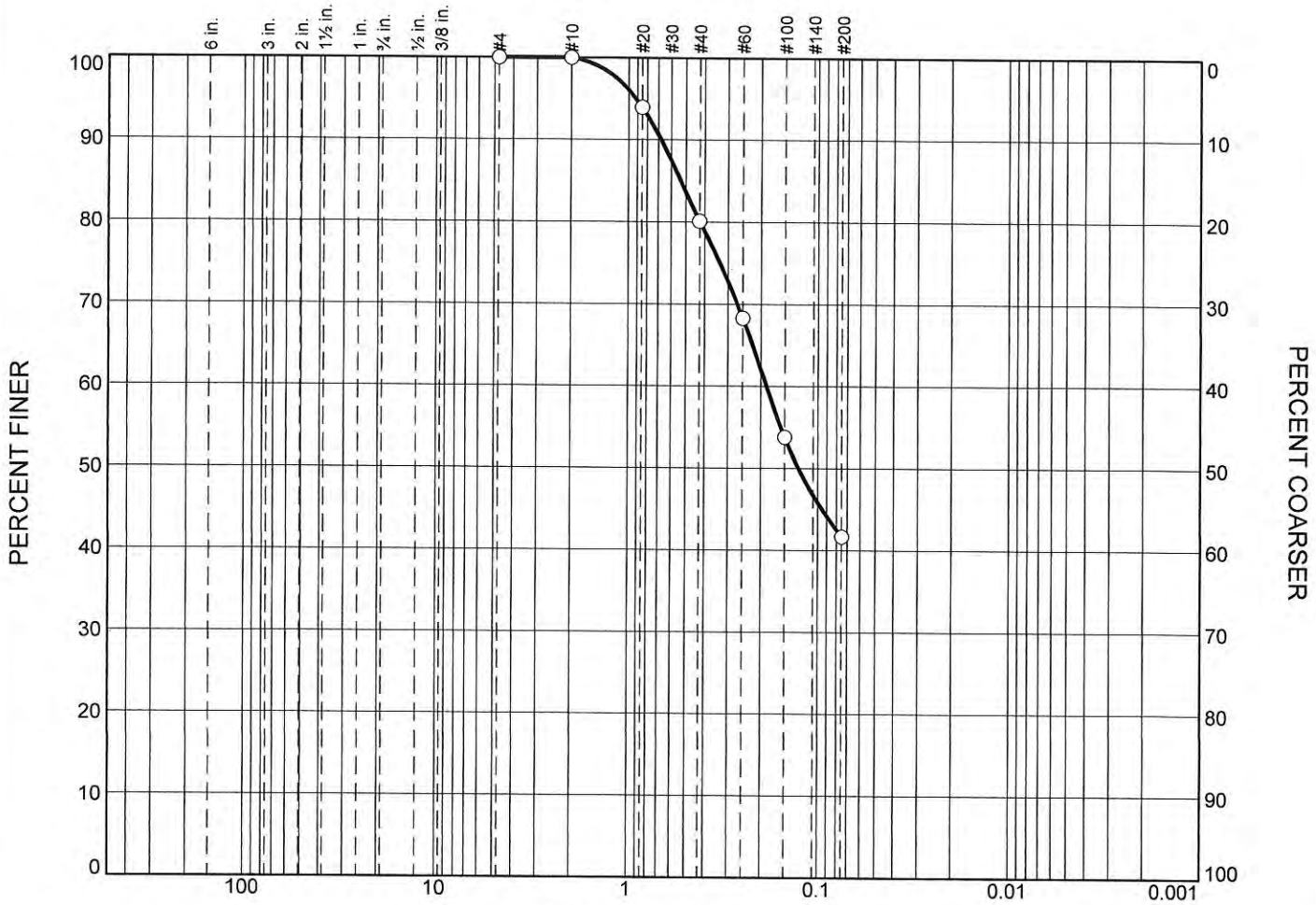
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-42

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 19.9 | 38.4 | 41.7 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB058 | | 12-14 | | SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

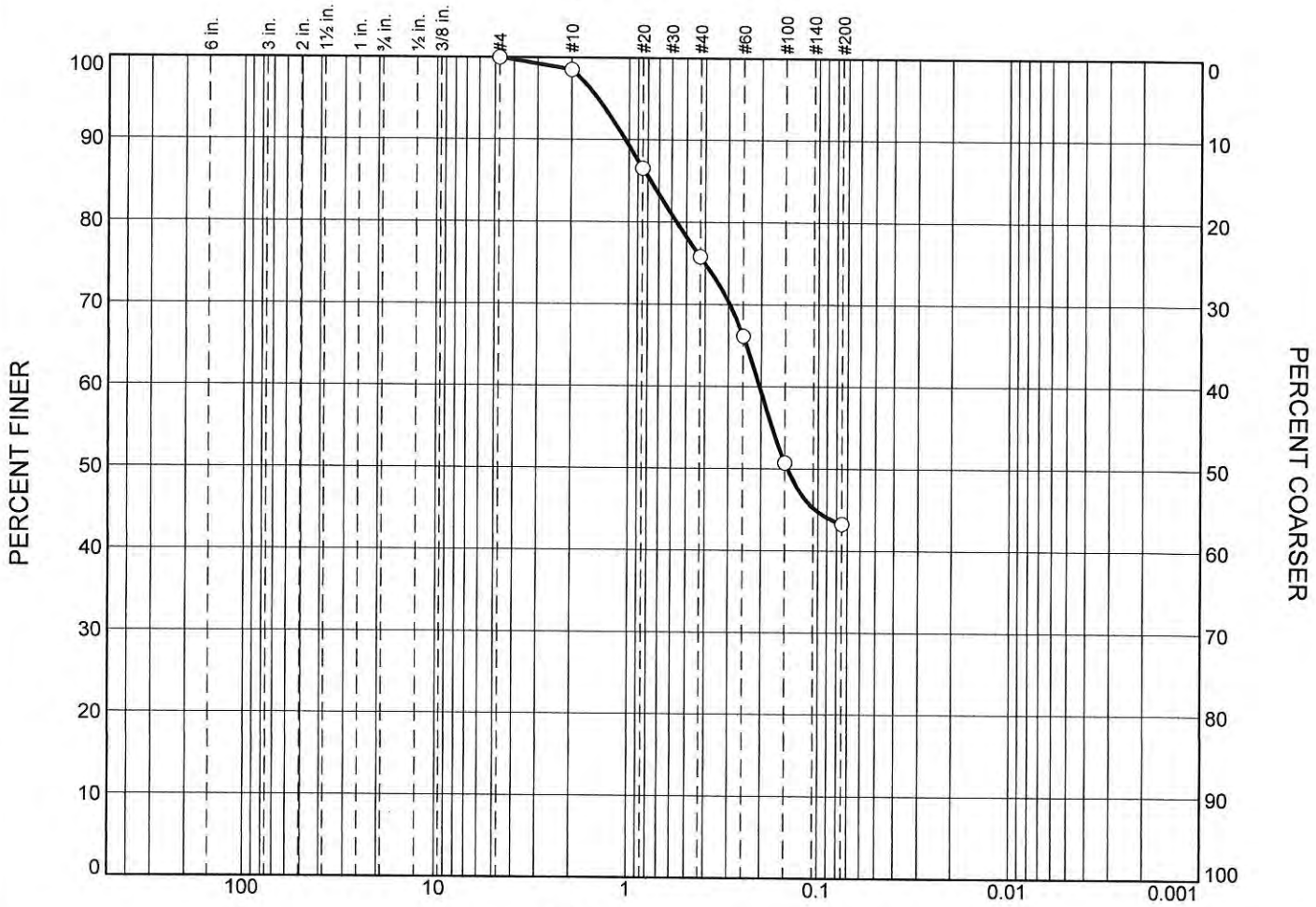
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-43

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 1.5 | 22.7 | 32.5 | 43.3 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB058 | | 14-16 | | SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

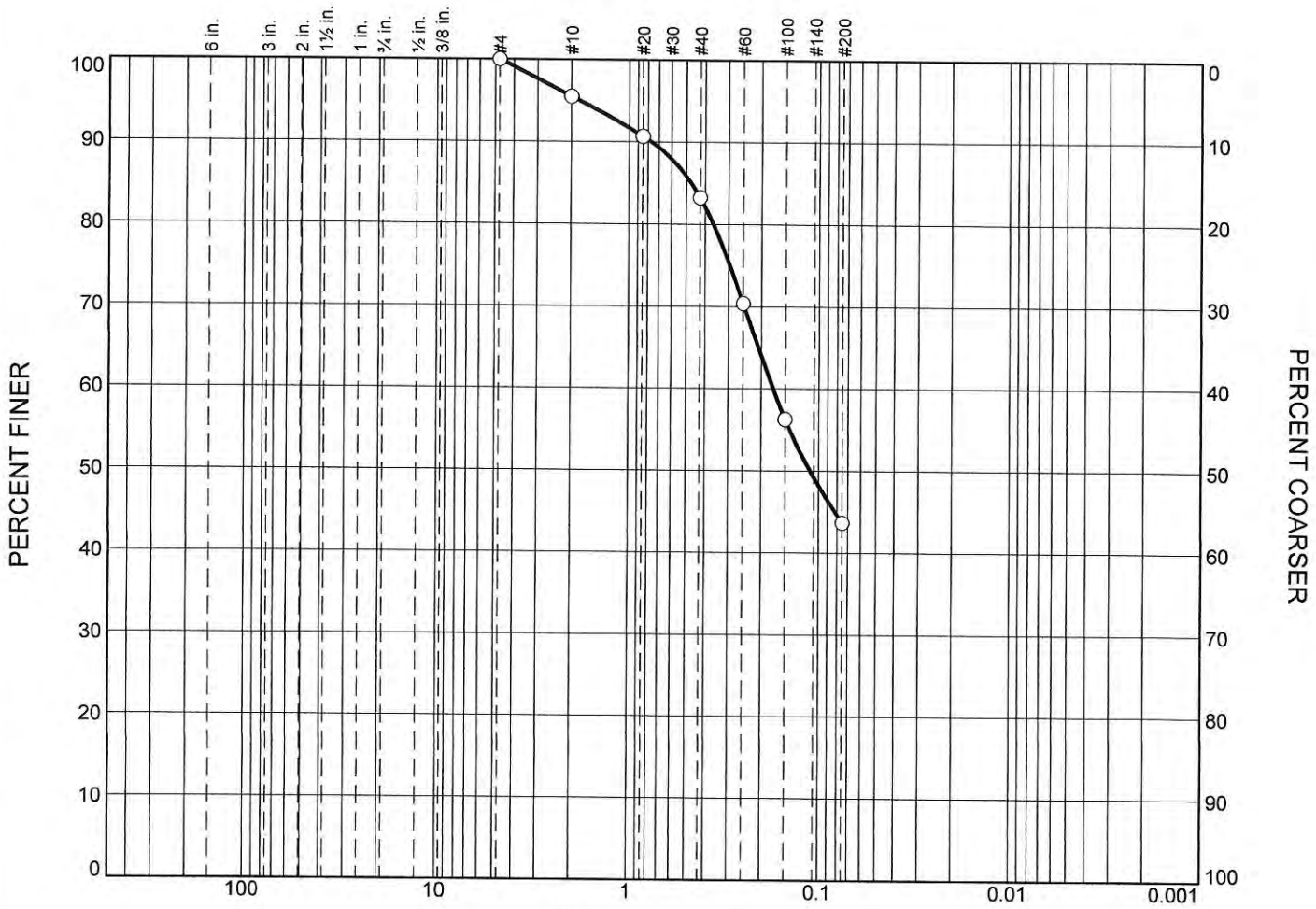
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-44

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 4.5 | 12.2 | 39.6 | 43.7 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJGB058 | | 18-20 | | SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

**Client:**

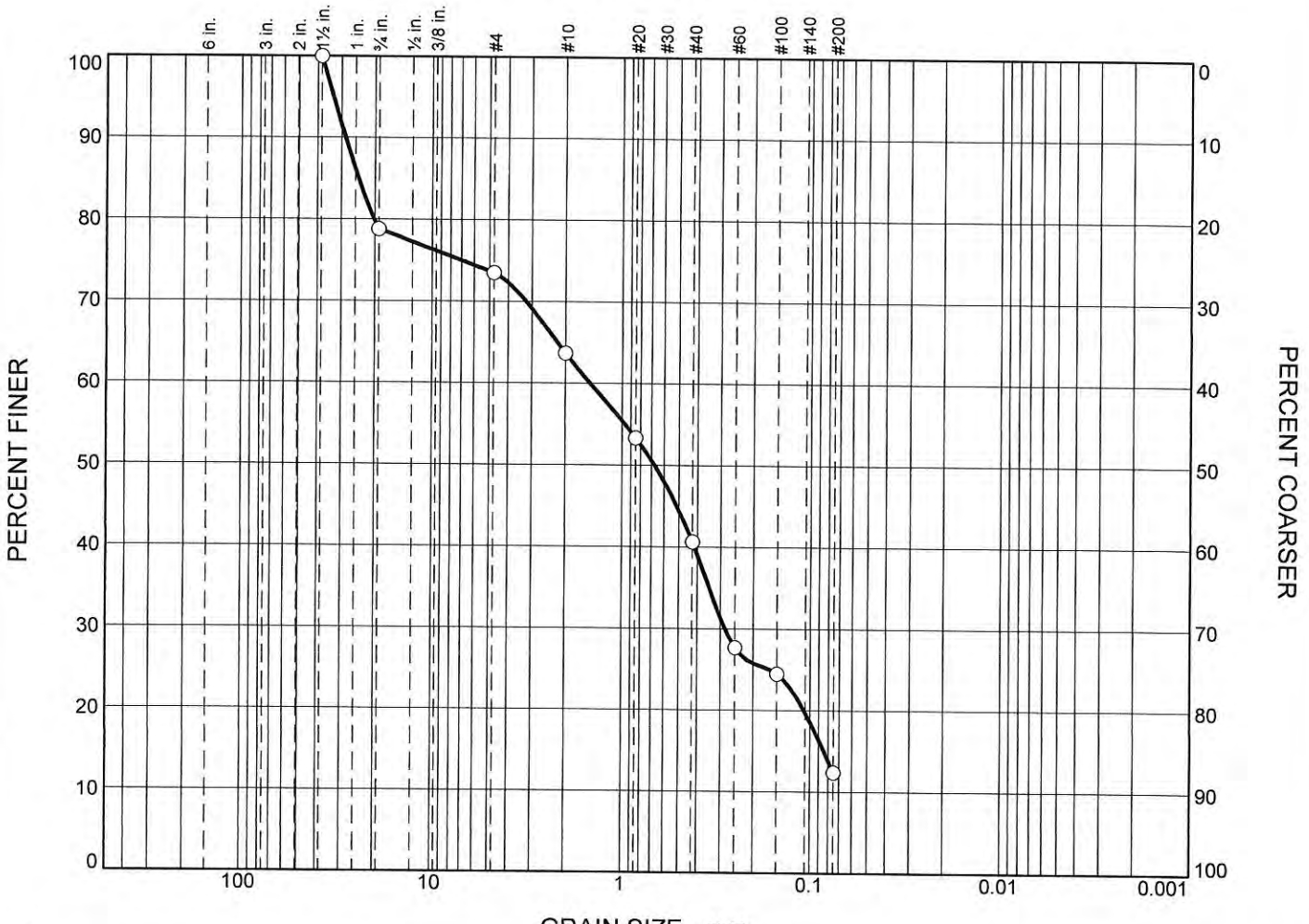
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-45

# ASTM D 422




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 21.2 | 5.3 | 9.8 | 23.1 | 28.2 | 12.4 | |

## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH (ft.) | Material Description | USCS |
|---|---|---|---|---|---|
| ○ | SJRF-04 | | 0-2 | | SM |

**Tolunay-Wong Engineers, Inc.**
**Houston, Texas**

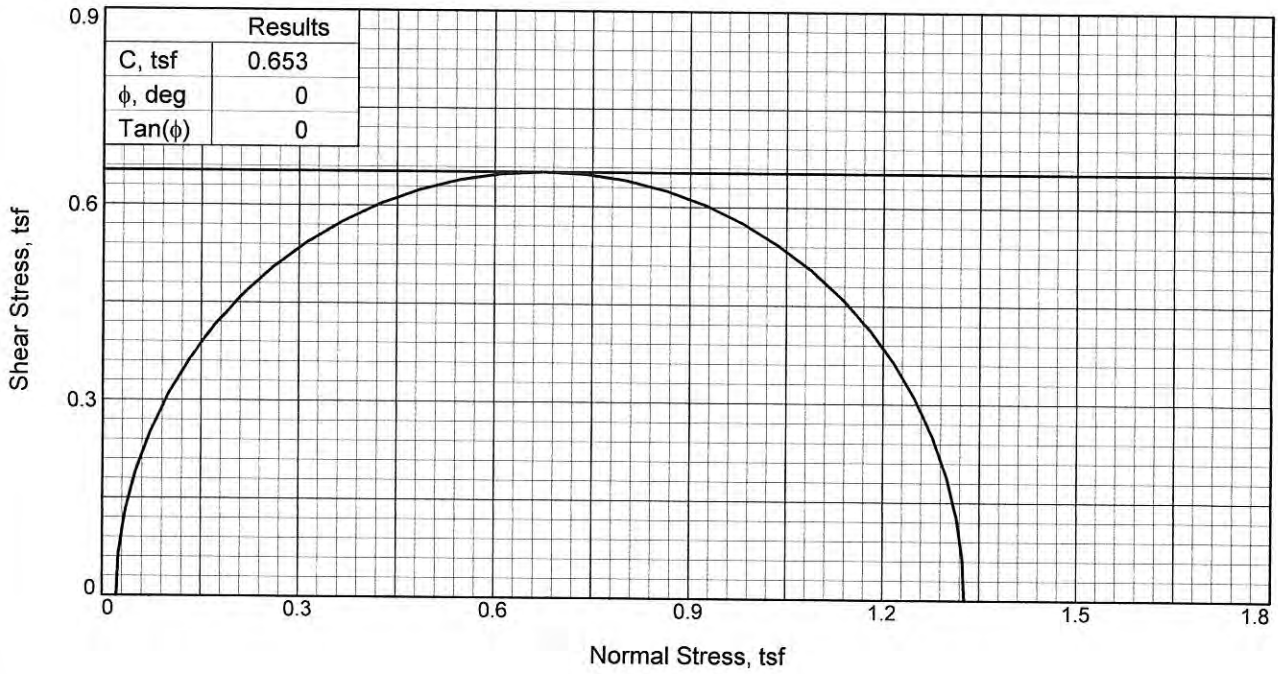
**Client:**

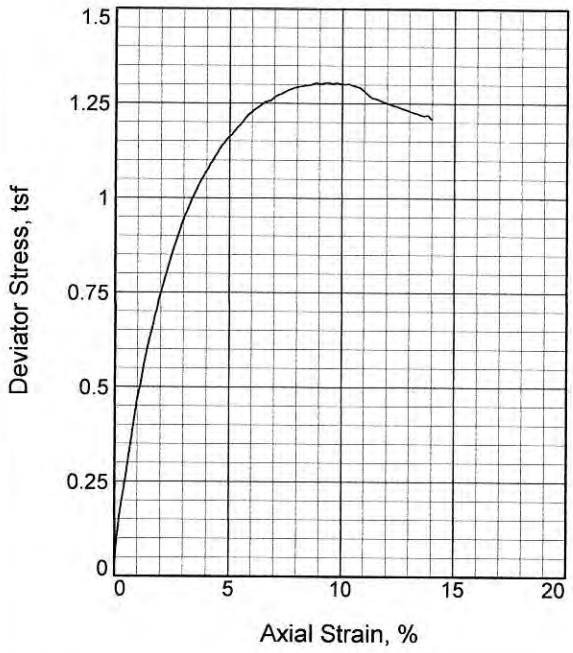
**Project:** San Jacinto River Waste Pit Superfund Site

**Project No.:** 19.15.131

**Figure**

Attachment Figure B.2-46




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 18.6 |
| | Dry Density, pcf | 103.7 |
| | Saturation, % | 80.2 |
| | Void Ratio | 0.6256 |
| | Diameter, in. | 2.83 |
| | Height, in. | 5.79 |
| At Test | Water Content, % | 19.9 |
| | Dry Density, pcf | 103.7 |
| | Saturation, % | 85.8 |
| | Void Ratio | 0.6256 |
| | Diameter, in. | 2.83 |
| | Height, in. | 5.79 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 0.30 |
| Fail. Stress, tsf | | 1.31 |
| Strain, % | | 9.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.33 |
| $\sigma_3$ Failure, tsf | | 0.02 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown LEAN CLAY with SAND

**Assumed Specific Gravity=** 2.70

**Remarks:**

**Figure** _____

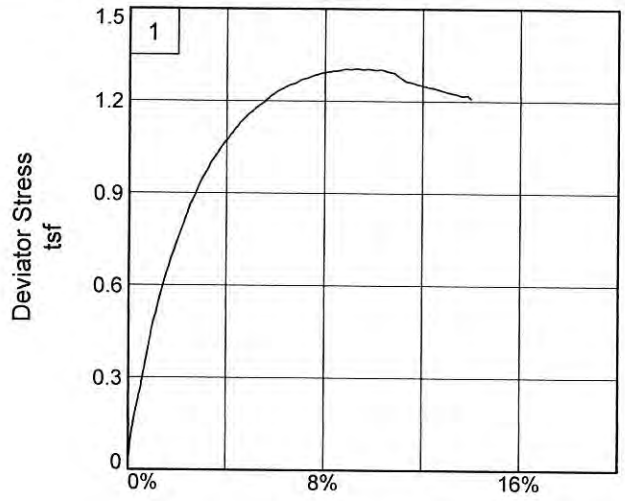
**Client:**

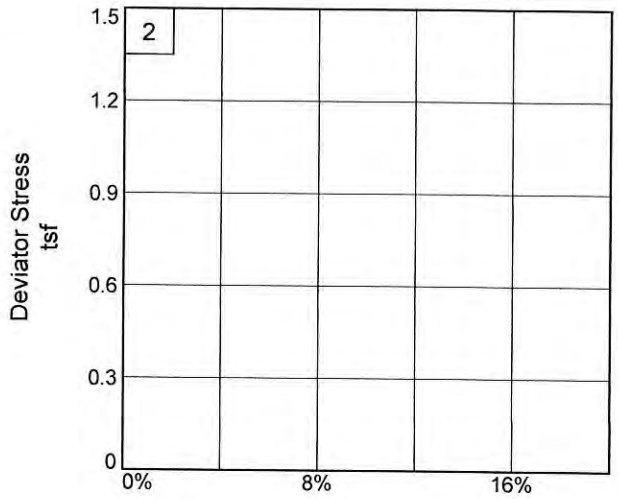
**Project:** San Jacinto River Waste Pit Superfund Site

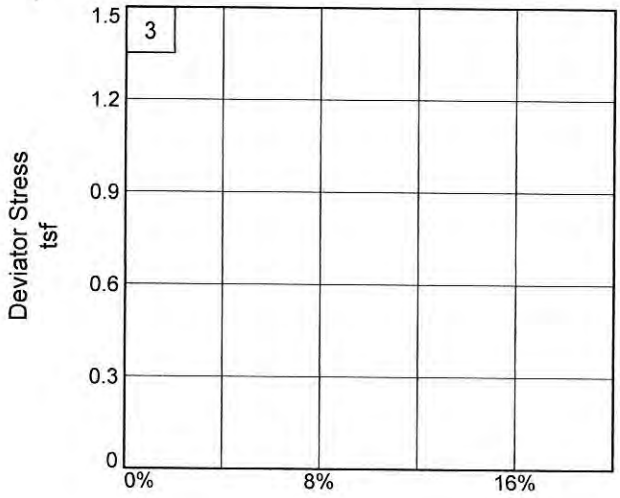
**Source of Sample:** SJGB024 **Depth:** 0-2

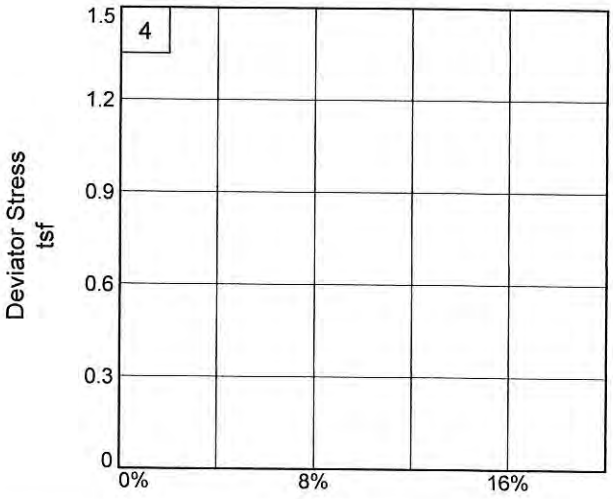
**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

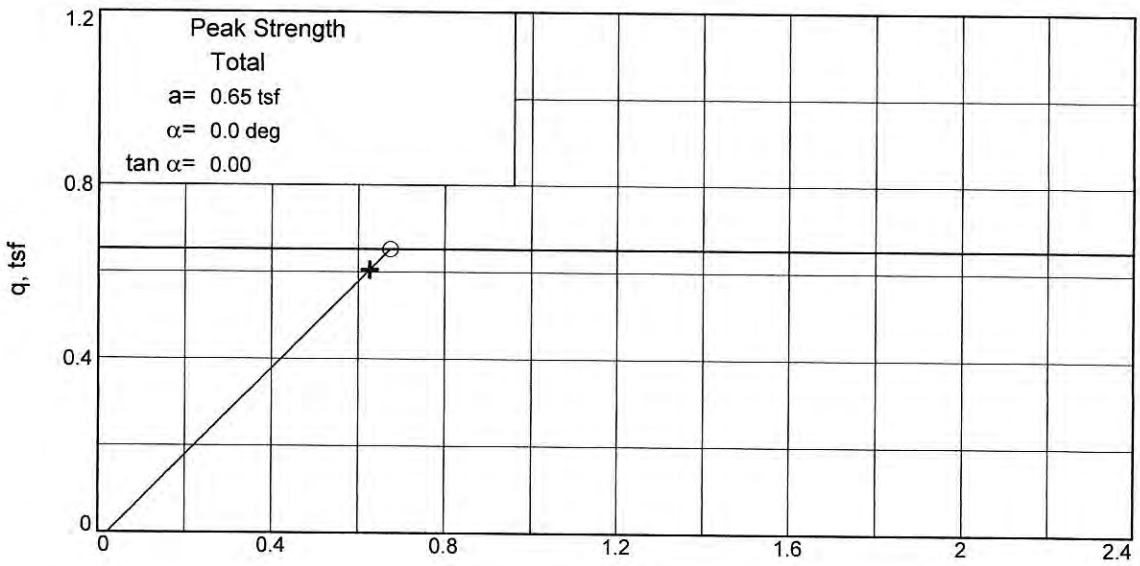
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

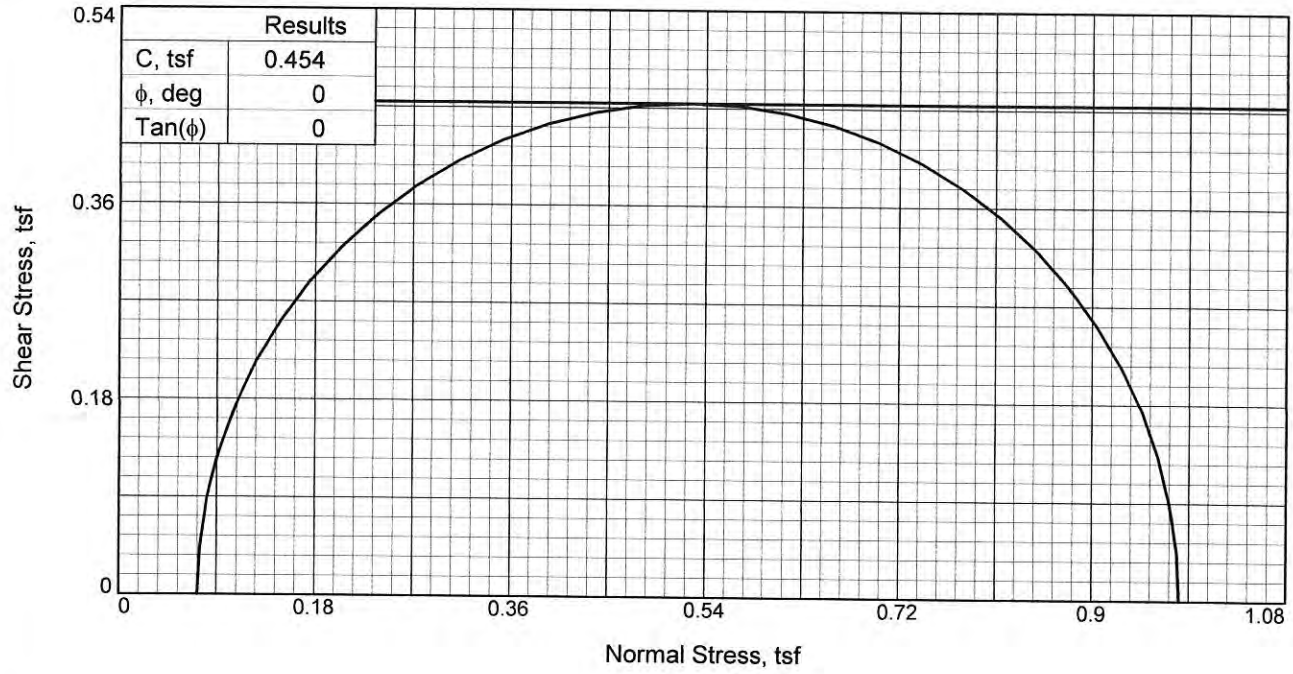
**Client:**

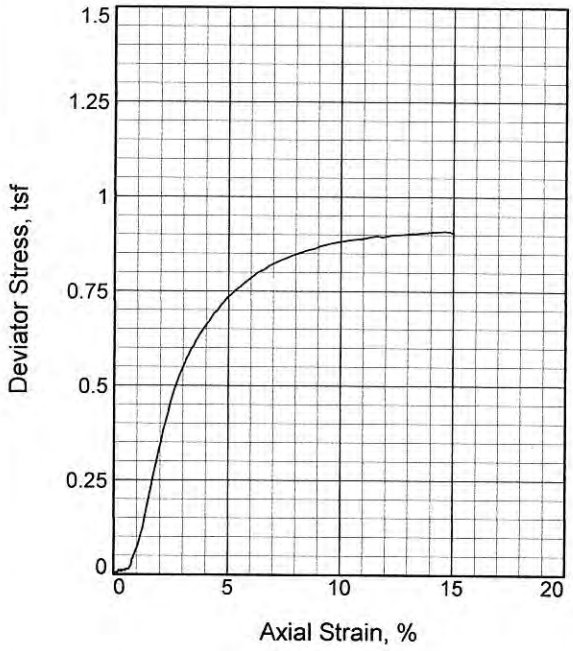
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 0-2

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 27.8 |
| | Dry Density, pcf | 89.0 |
| | Saturation, % | 84.0 |
| | Void Ratio | 0.8934 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.82 |
| At Test | Water Content, % | 28.0 |
| | Dry Density, pcf | 89.0 |
| | Saturation, % | 84.6 |
| | Void Ratio | 0.8934 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.82 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 1.00 |
| Fail. Stress, tsf | | 0.91 |
| Strain, % | | 14.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.98 |
| $\sigma_3$ Failure, tsf | | 0.07 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown and black FAT CLAY

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

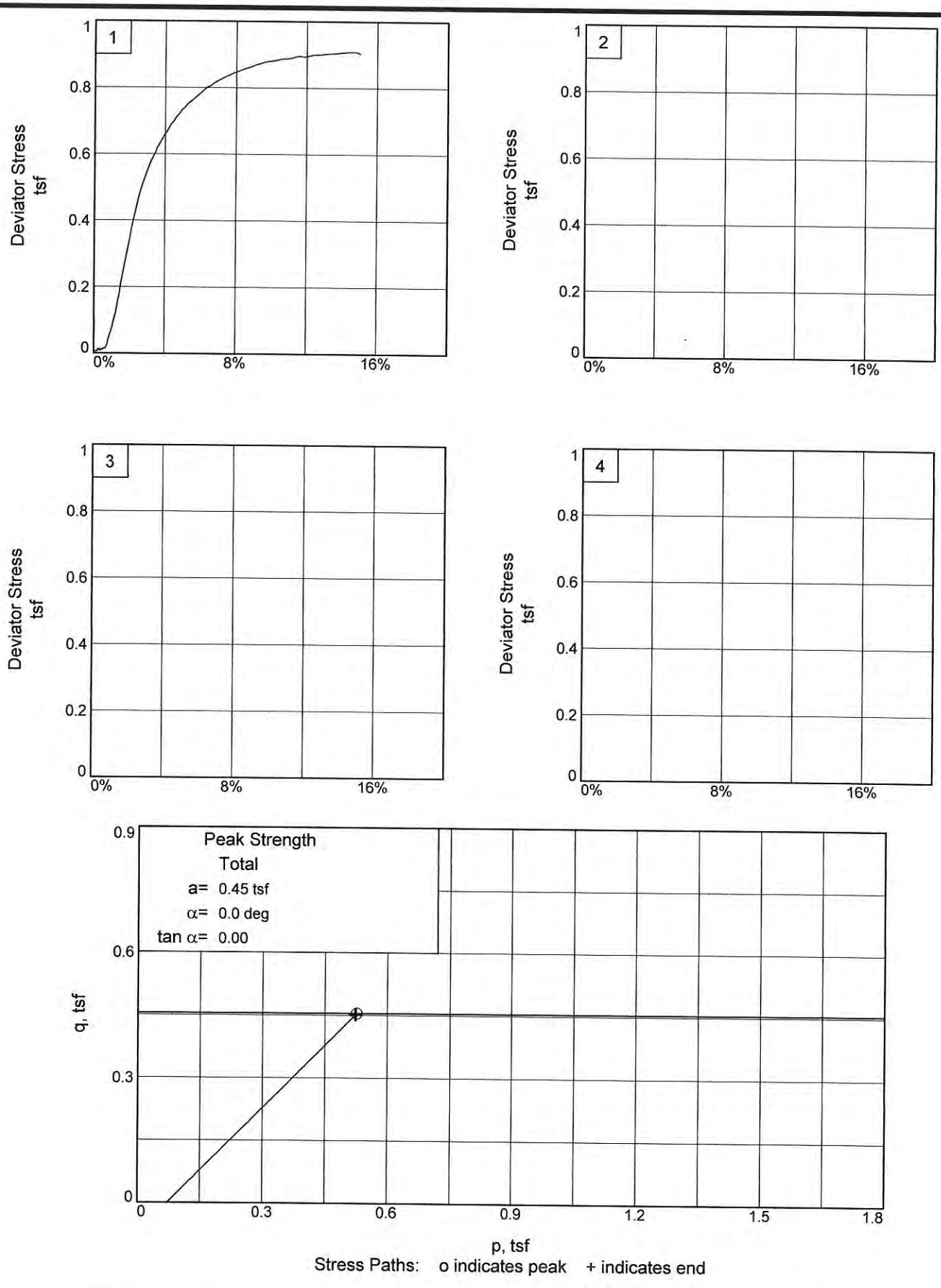
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 2-4

**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



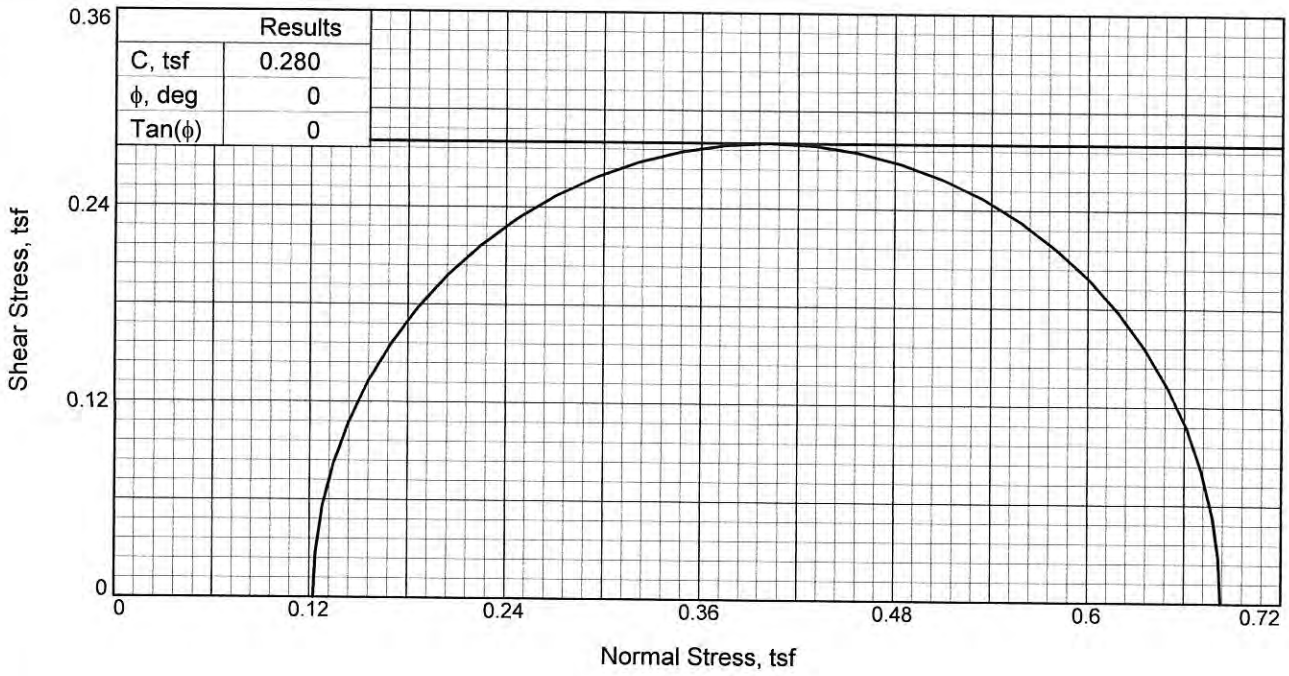

**Client:**

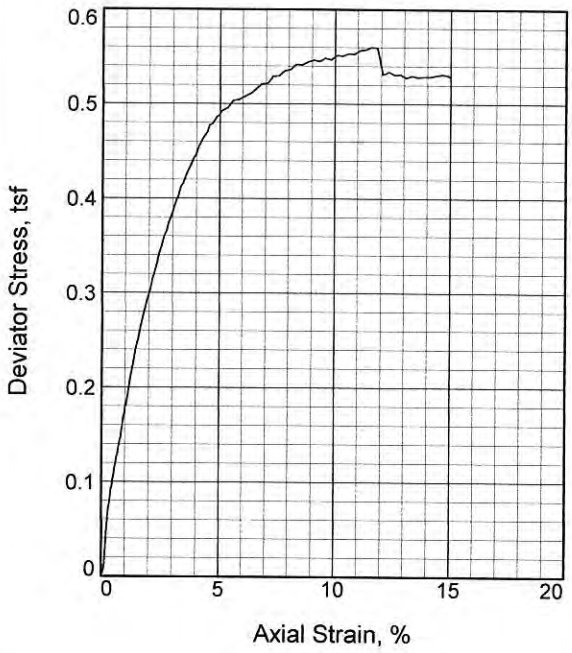
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 2-4

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 29.2 |
| | Dry Density, pcf | 90.1 |
| | Saturation, % | 90.6 |
| | Void Ratio | 0.8712 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.78 |
| At Test | Water Content, % | 31.2 |
| | Dry Density, pcf | 90.1 |
| | Saturation, % | 96.6 |
| | Void Ratio | 0.8712 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.78 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 1.70 |
| Fail. Stress, tsf | | 0.56 |
| Strain, % | | 11.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.68 |
| $\sigma_3$ Failure, tsf | | 0.12 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Brown and black FAT CLAY

**LL=** 86 **PL=** 31 **PI=** 55
**Assumed Specific Gravity=** 2.70
**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

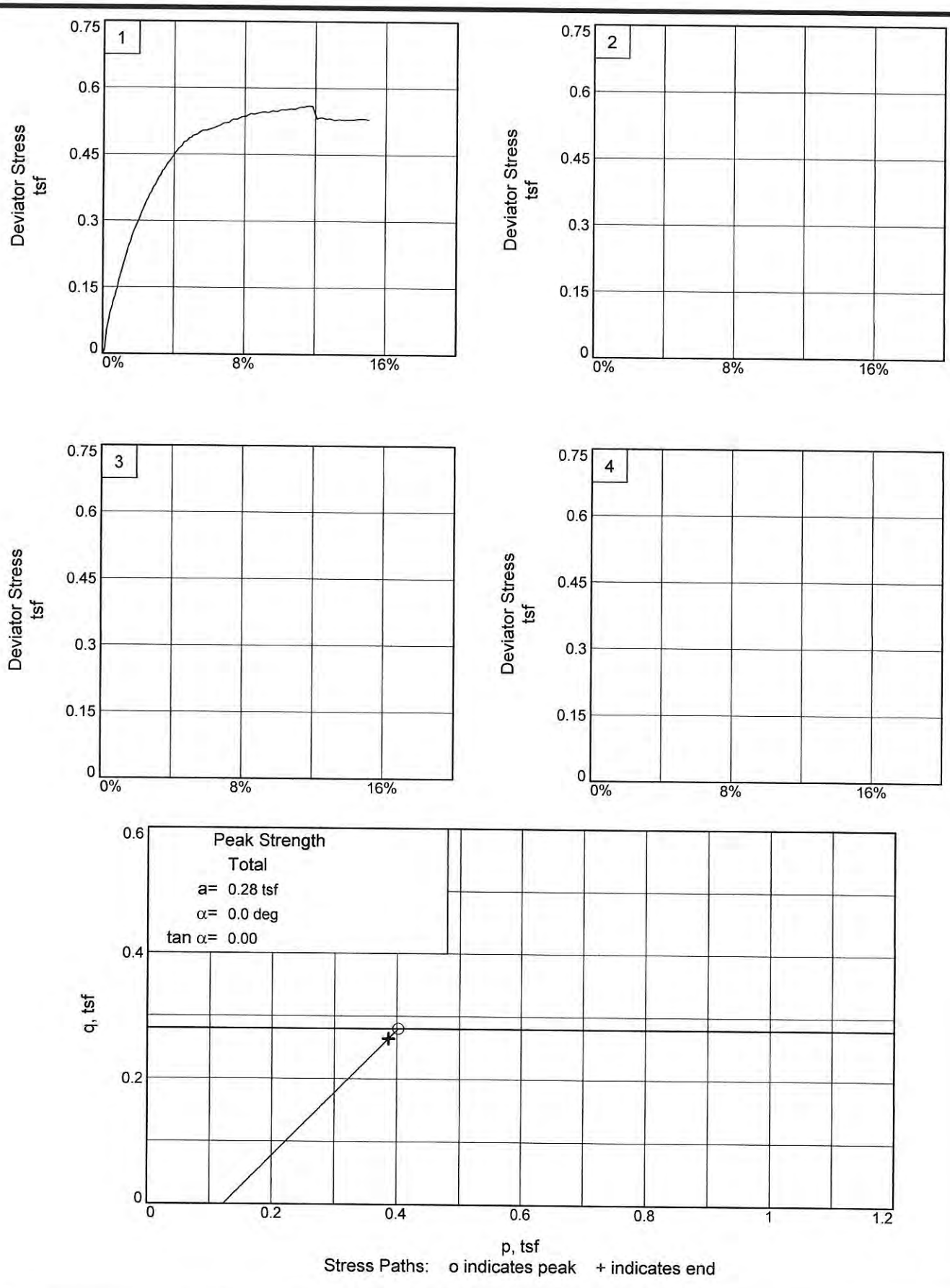
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 4-6

**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



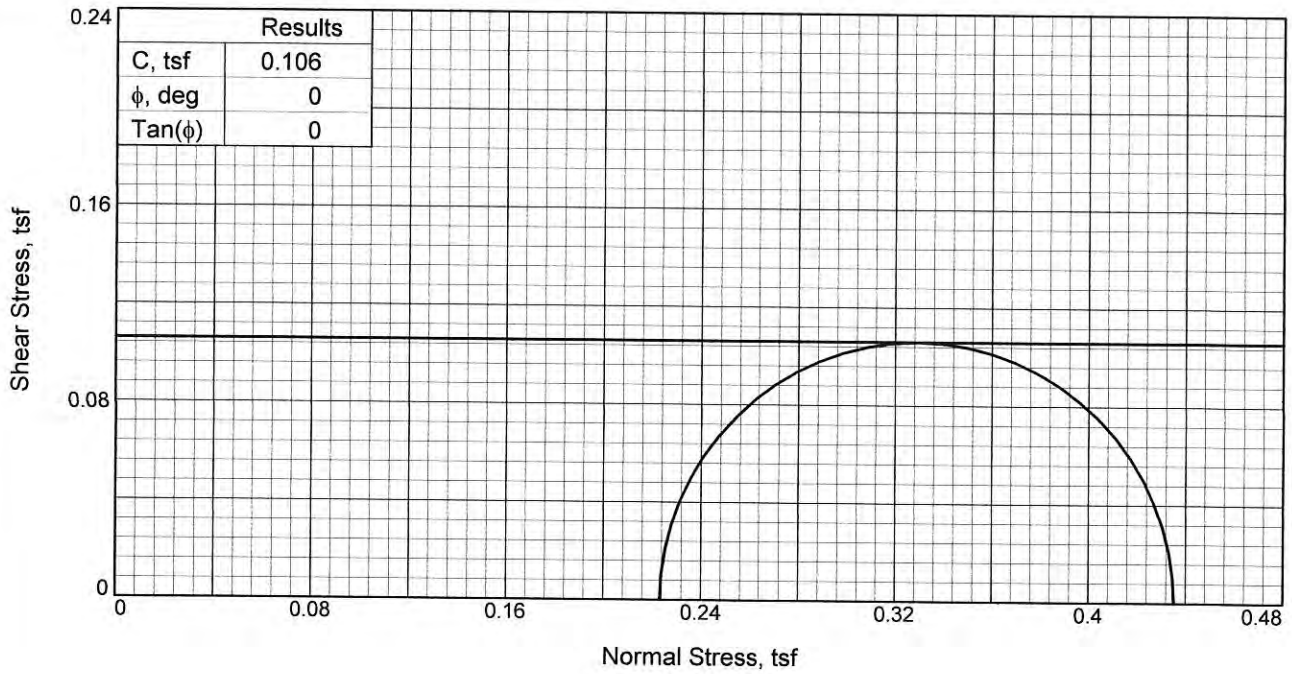

**Client:**

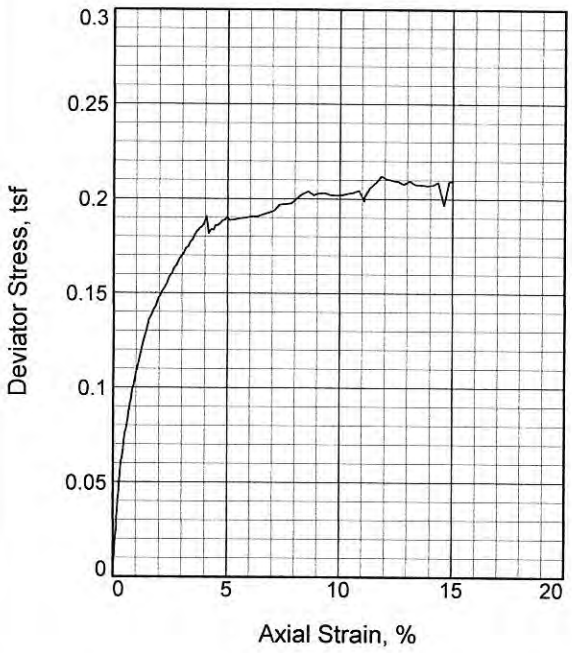
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 4-6

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 29.1 |
| | Dry Density, pcf | 89.2 |
| | Saturation, % | 88.4 |
| | Void Ratio | 0.8890 |
| | Diameter, in. | 2.83 |
| | Height, in. | 5.54 |
| At Test | Water Content, % | 28.5 |
| | Dry Density, pcf | 89.2 |
| | Saturation, % | 86.5 |
| | Void Ratio | 0.8890 |
| | Diameter, in. | 2.83 |
| | Height, in. | 5.54 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 3.10 |
| Fail. Stress, tsf | | 0.21 |
| Strain, % | | 11.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.44 |
| $\sigma_3$ Failure, tsf | | 0.22 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown CLAYEY SAND

**Assumed Specific Gravity=** 2.70

**Remarks:**

**Figure** _____

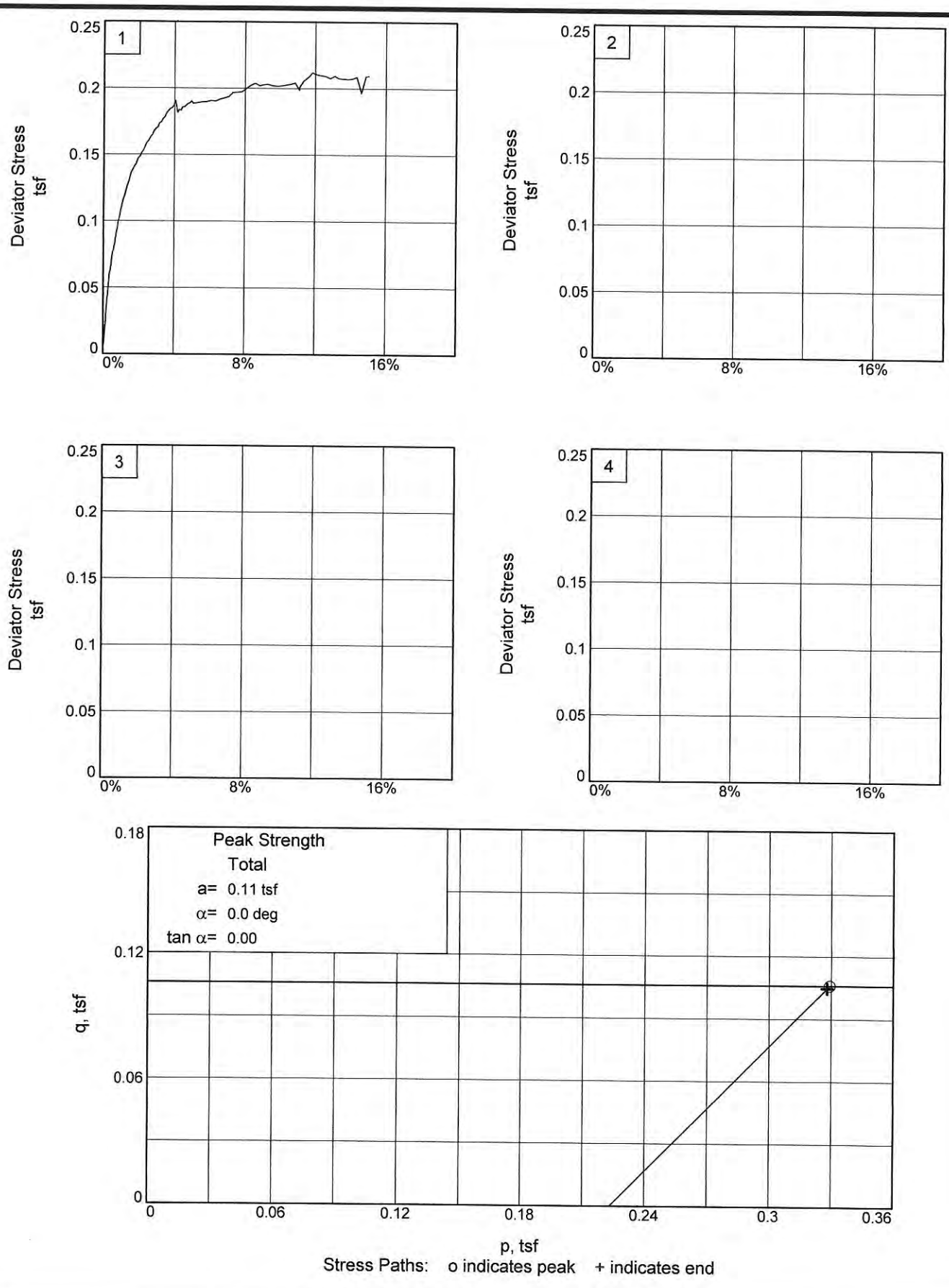
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 8-10

**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



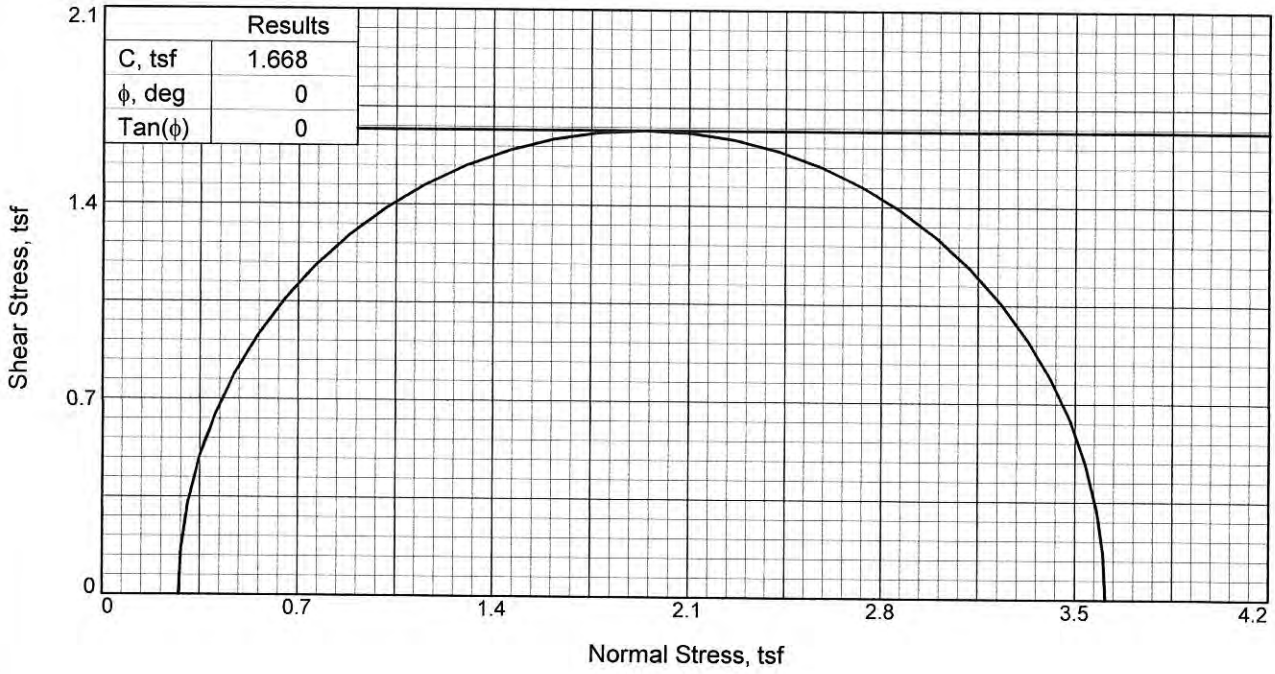

**Client:**

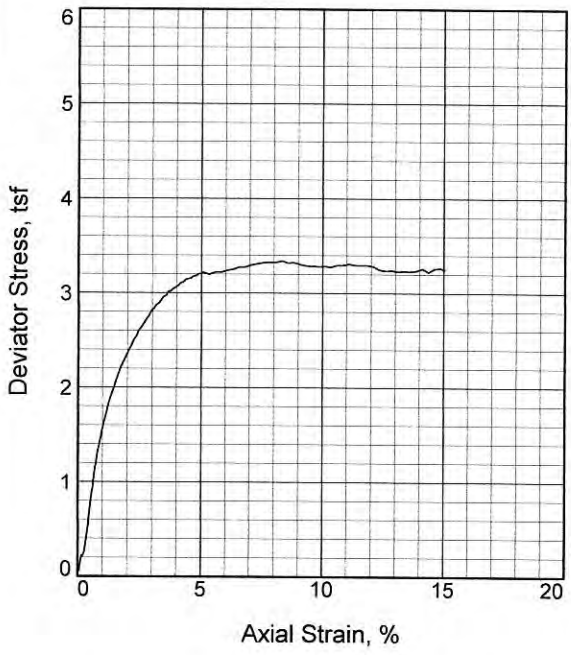
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 8-10

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 75.3 |
| | Dry Density, pcf | 53.7 |
| | Saturation, % | 95.1 |
| | Void Ratio | 2.1393 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.73 |
| At Test | Water Content, % | 76.5 |
| | Dry Density, pcf | 53.7 |
| | Saturation, % | 96.5 |
| | Void Ratio | 2.1393 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.73 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 3.80 |
| Fail. Stress, tsf | | 3.34 |
| Strain, % | | 8.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.61 |
| $\sigma_3$ Failure, tsf | | 0.27 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown FAT CLAY

**LL=** 133 **PL=** 51 **PI=** 82

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

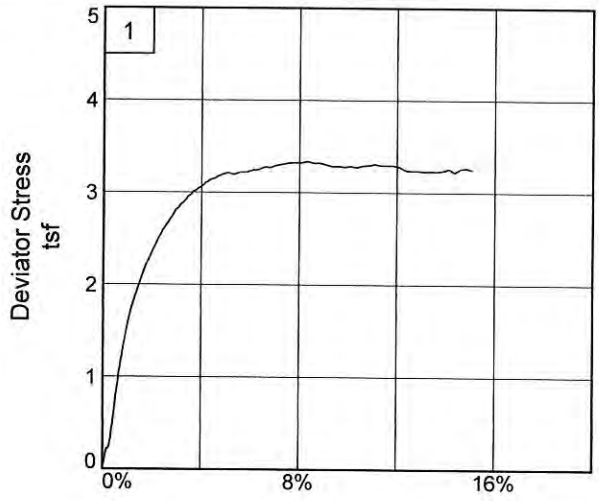
**Client:**

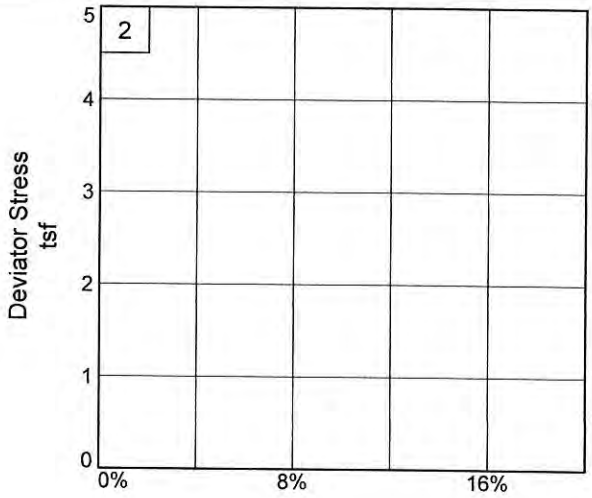
**Project:** San Jacinto River Waste Pit Superfund Site

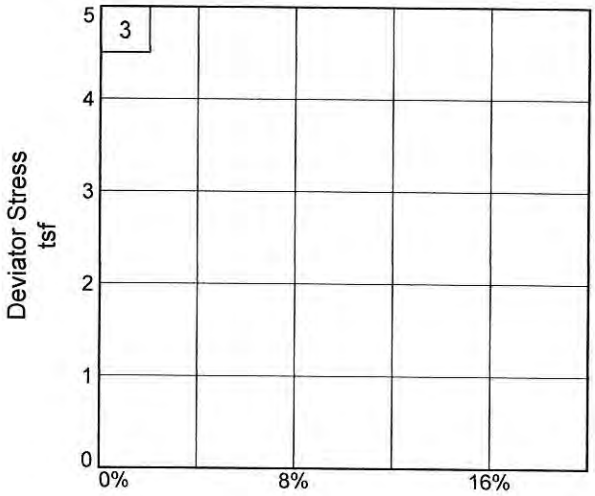
**Source of Sample:** SJGB024 **Depth:** 10-12

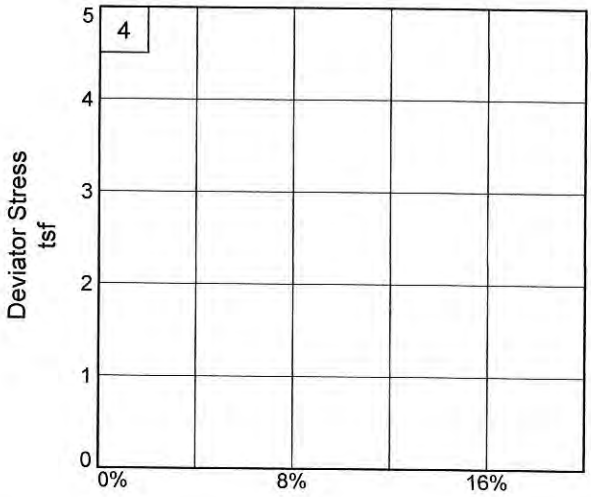
**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

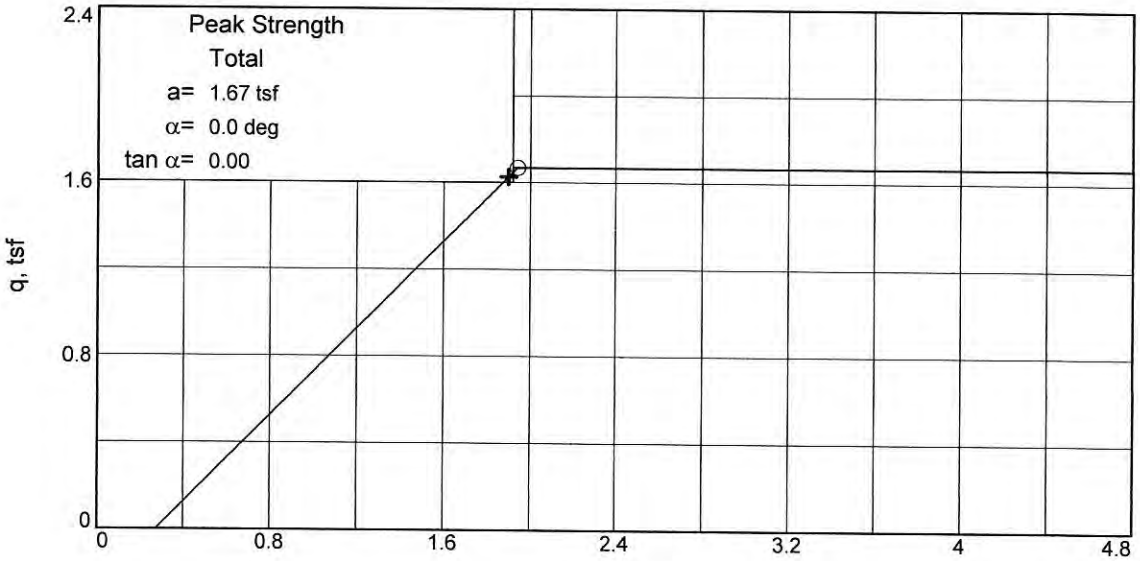
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

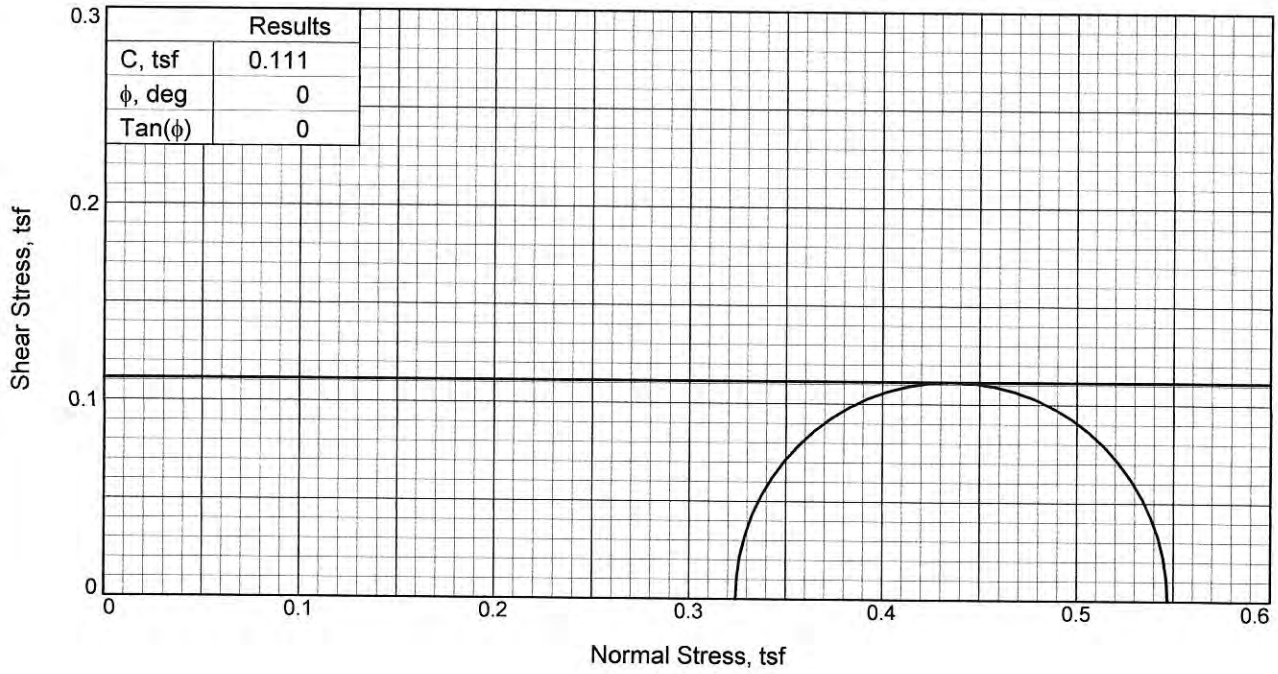
**Client:**

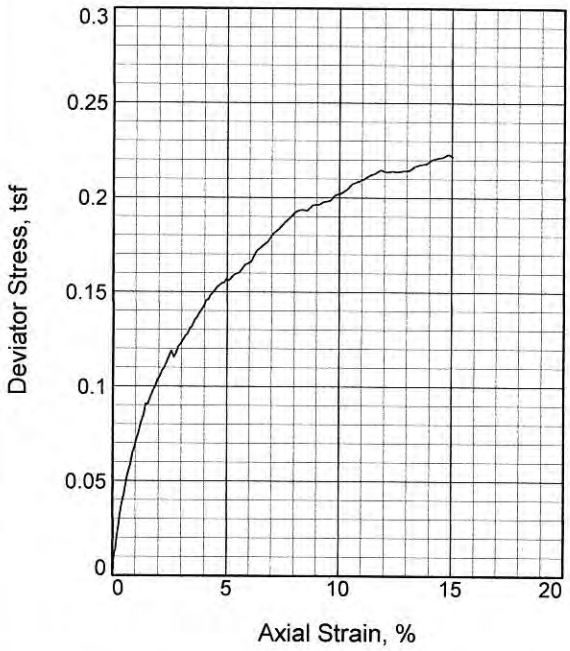
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 10-12

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 31.7 |
| | Dry Density, pcf | 82.6 |
| | Saturation, % | 82.3 |
| | Void Ratio | 1.0402 |
| | Diameter, in. | 2.87 |
| | Height, in. | 5.67 |
| At Test | Water Content, % | 37.0 |
| | Dry Density, pcf | 82.6 |
| | Saturation, % | 96.1 |
| | Void Ratio | 1.0402 |
| | Diameter, in. | 2.87 |
| | Height, in. | 5.67 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 4.50 |
| Fail. Stress, tsf | | 0.22 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.55 |
| $\sigma_3$ Failure, tsf | | 0.32 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown and black LEAN CLAY

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

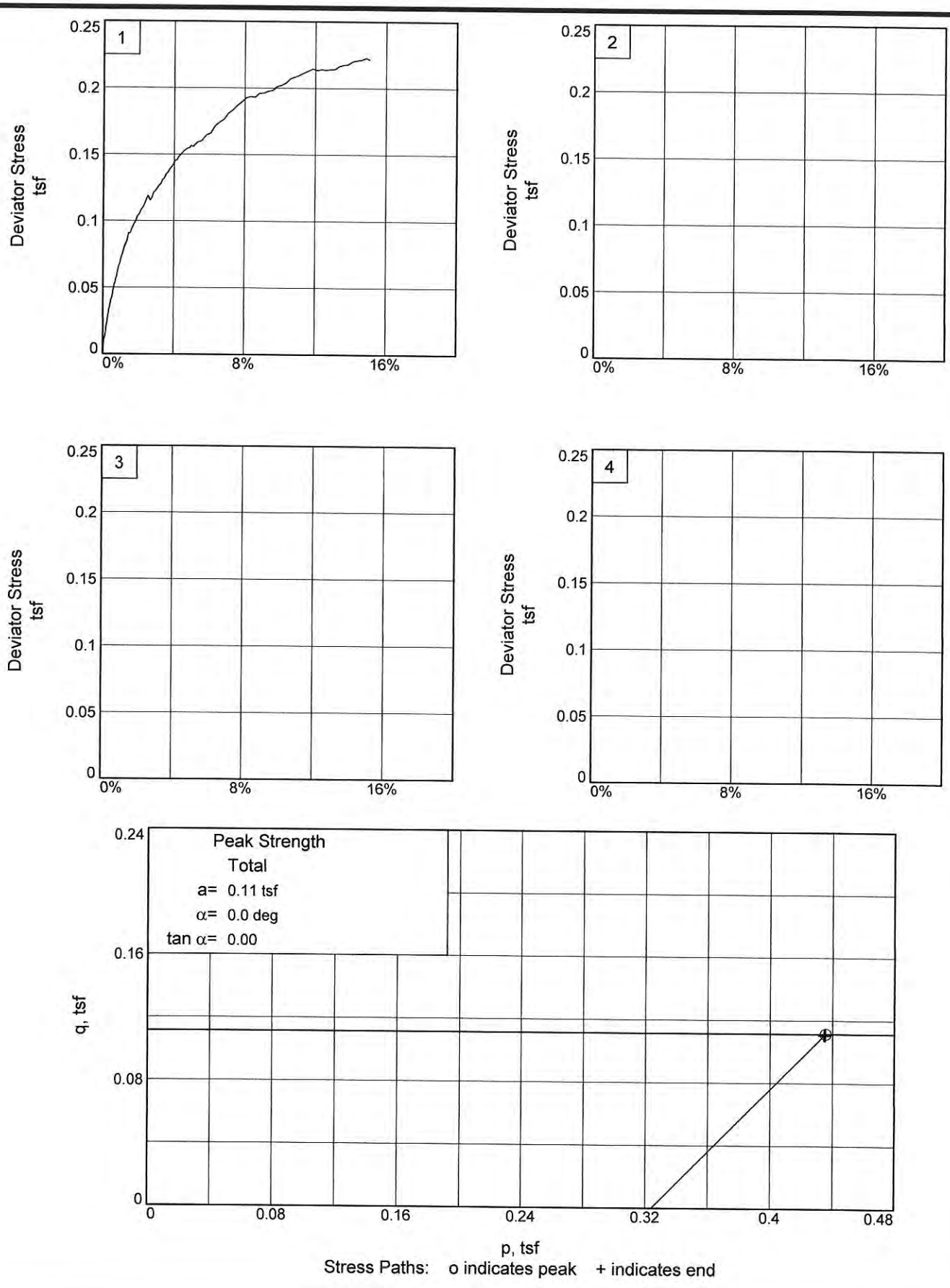
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 12-14

**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



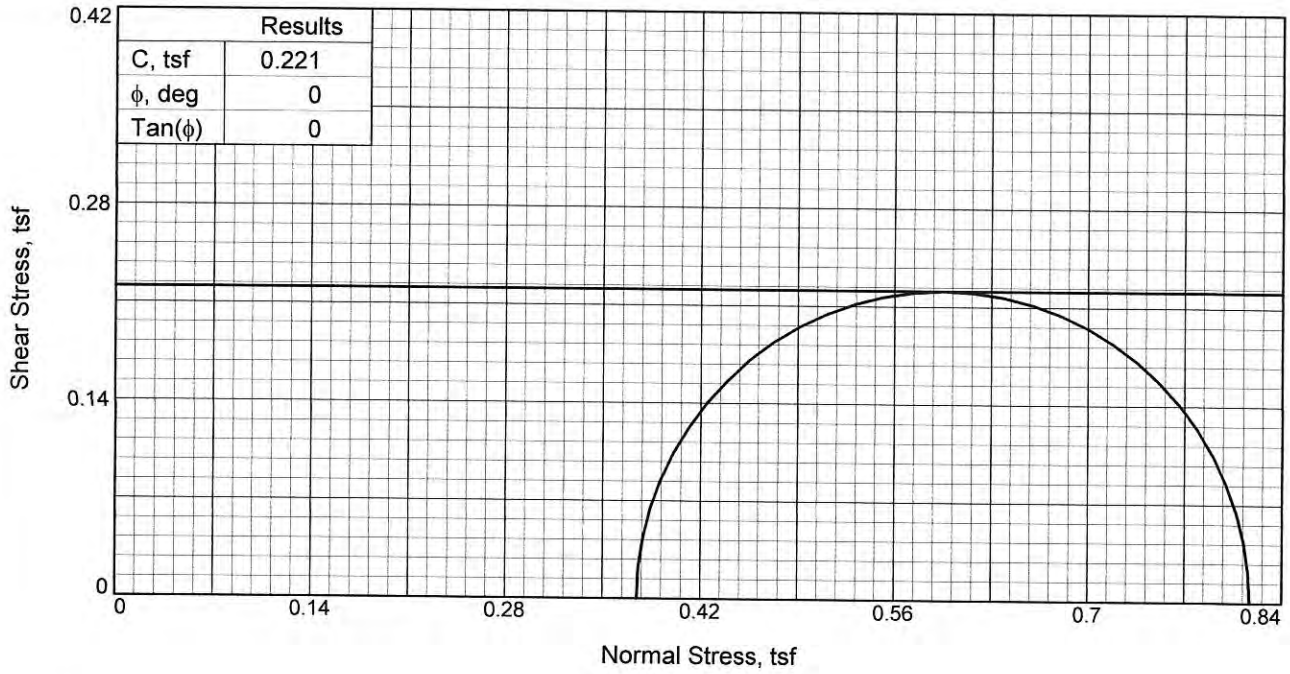

**Client:**

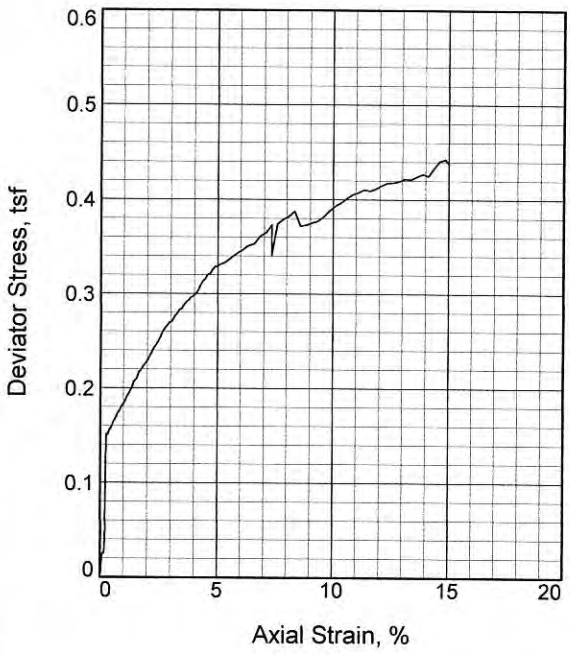
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 12-14

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 26.5 |
| | Dry Density, pcf | 91.7 |
| | Saturation, % | 85.5 |
| | Void Ratio | 0.8375 |
| | Diameter, in. | 2.87 |
| | Height, in. | 5.77 |
| At Test | Water Content, % | 29.7 |
| | Dry Density, pcf | 91.7 |
| | Saturation, % | 95.9 |
| | Void Ratio | 0.8375 |
| | Diameter, in. | 2.87 |
| | Height, in. | 5.77 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 5.20 |
| Fail. Stress, tsf | | 0.44 |
| Strain, % | | 14.9 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.82 |
| $\sigma_3$ Failure, tsf | | 0.37 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown CLAYEY SAND

**LL=** 32 **PL=** 19 **PI=** 13

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

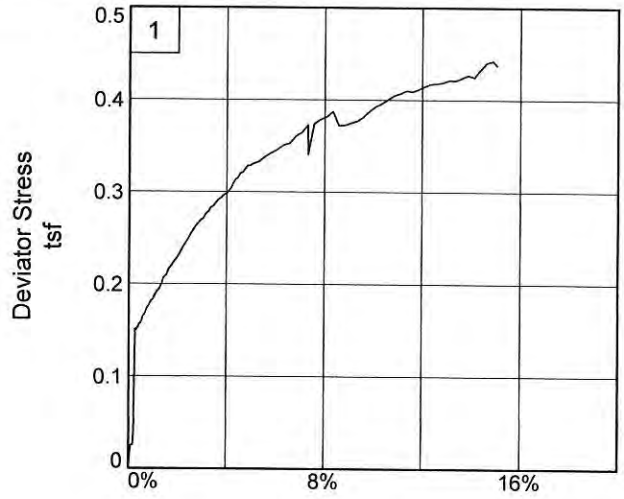
**Client:**

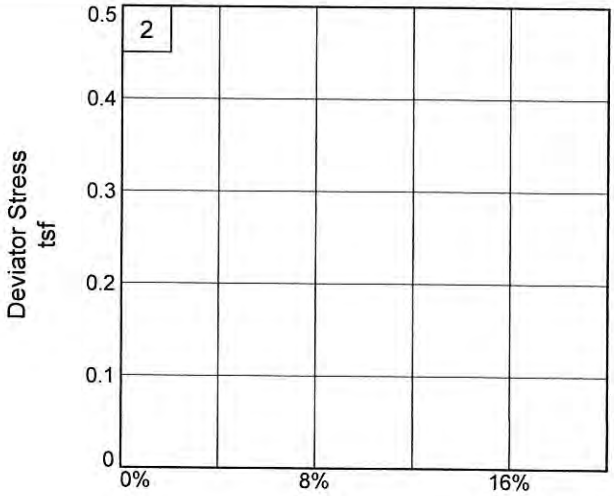
**Project:** San Jacinto River Waste Pit Superfund Site

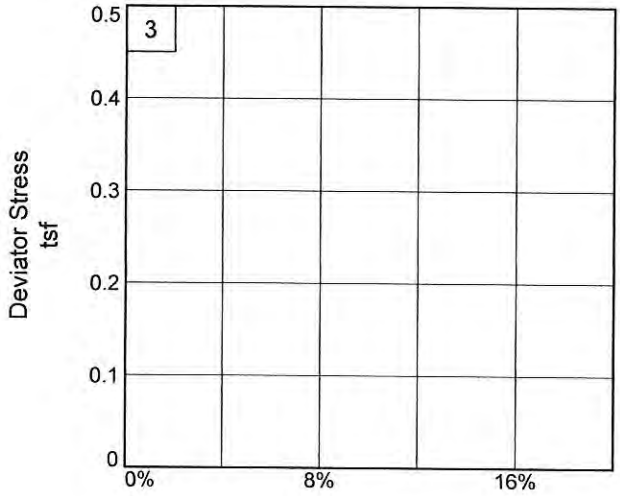
**Source of Sample:** SJGB024 **Depth:** 14-16

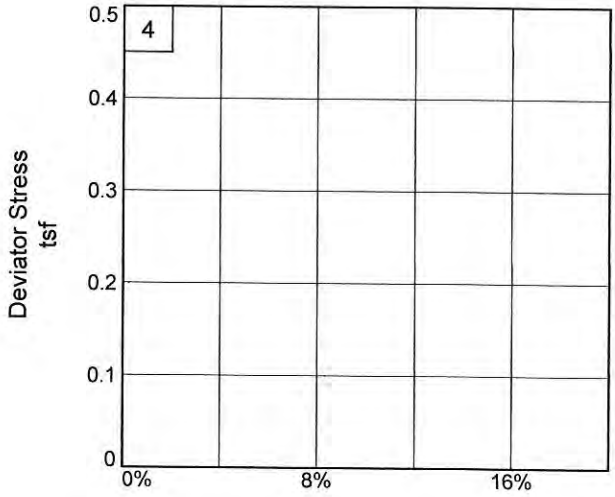
**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

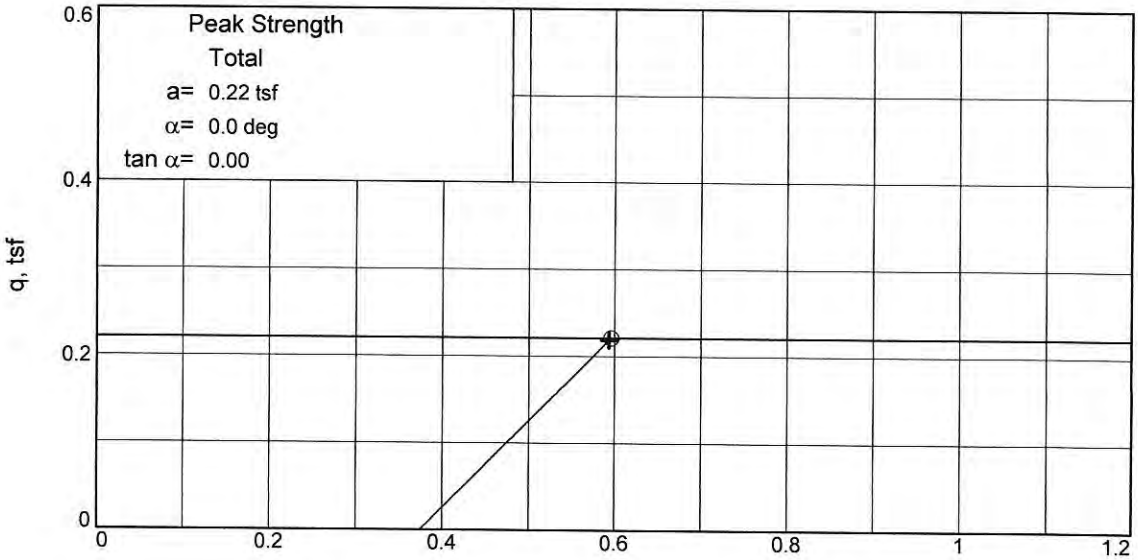
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

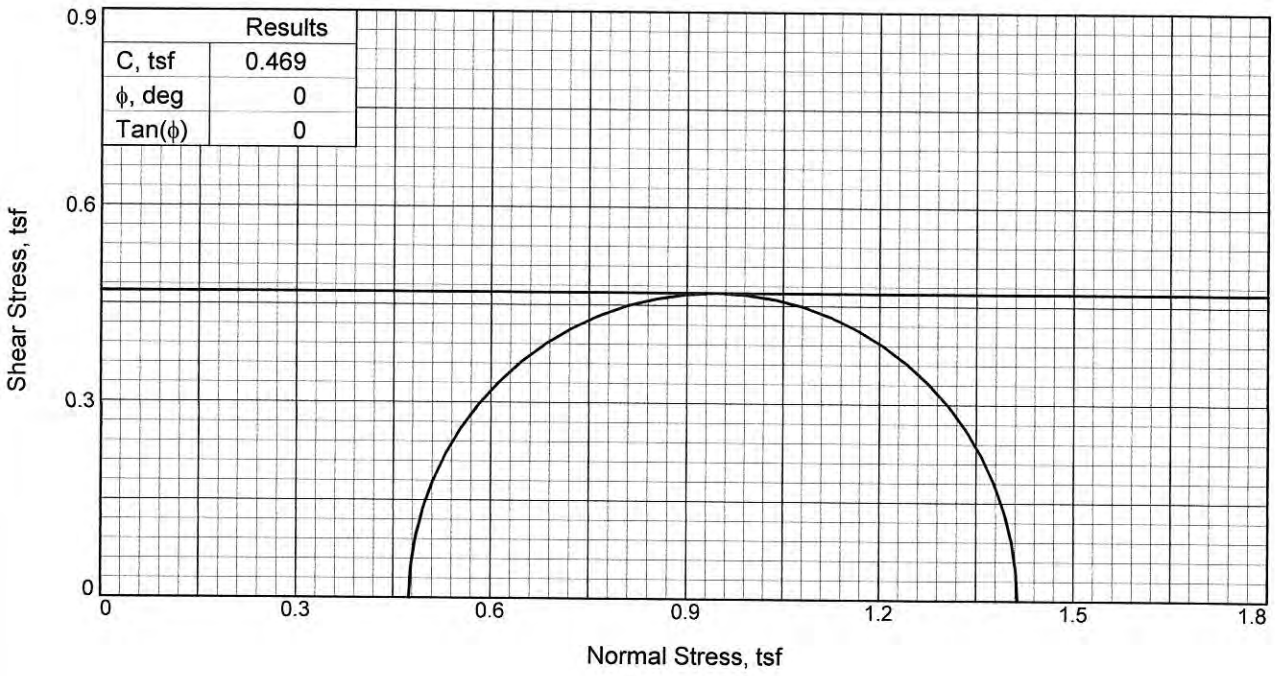
**Client:**

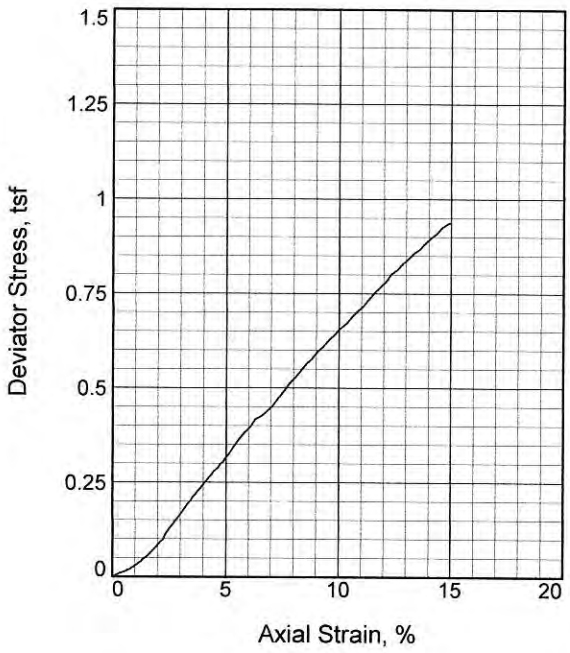
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 14-16

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 24.9 |
| | Dry Density, pcf | 98.4 |
| | Saturation, % | 94.2 |
| | Void Ratio | 0.7124 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.79 |
| At Test | Water Content, % | 24.3 |
| | Dry Density, pcf | 98.4 |
| | Saturation, % | 92.2 |
| | Void Ratio | 0.7124 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.79 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 6.60 |
| Fail. Stress, tsf | | 0.94 |
| Strain, % | | 15.0 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.41 |
| $\sigma_3$ Failure, tsf | | 0.48 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Brown SILTY CLAYEY SAND

**Assumed Specific Gravity=** 2.70
**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

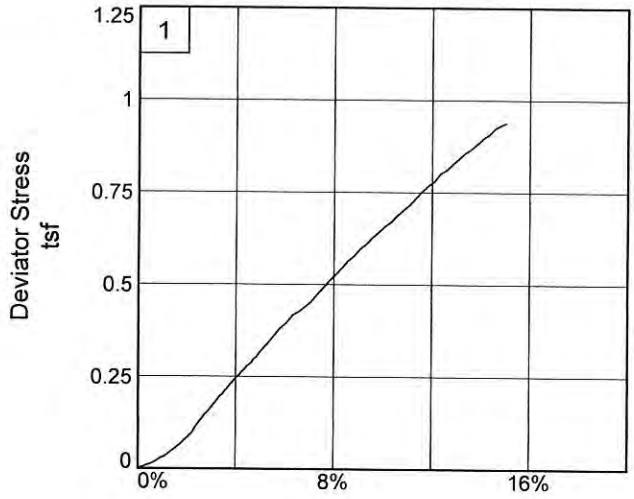
**Client:**

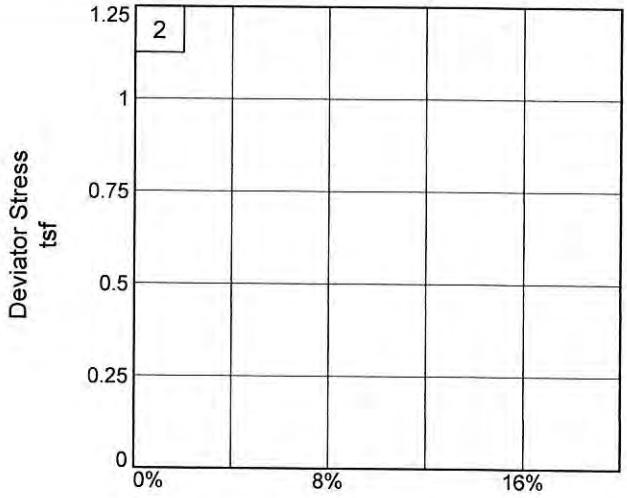
**Project:** San Jacinto River Waste Pit Superfund Site

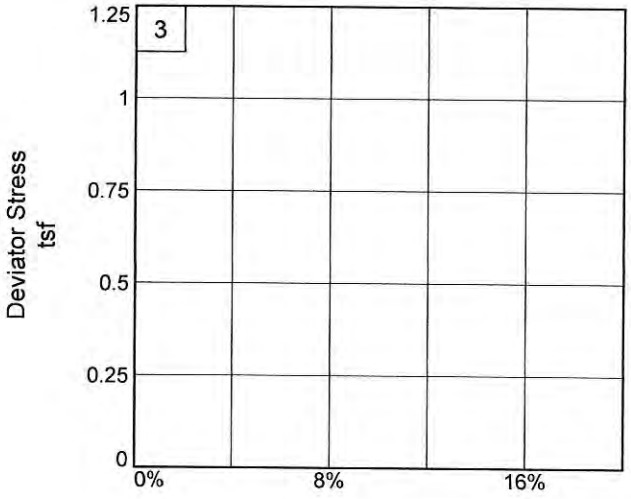
**Source of Sample:** SJGB024 **Depth:** 18-20

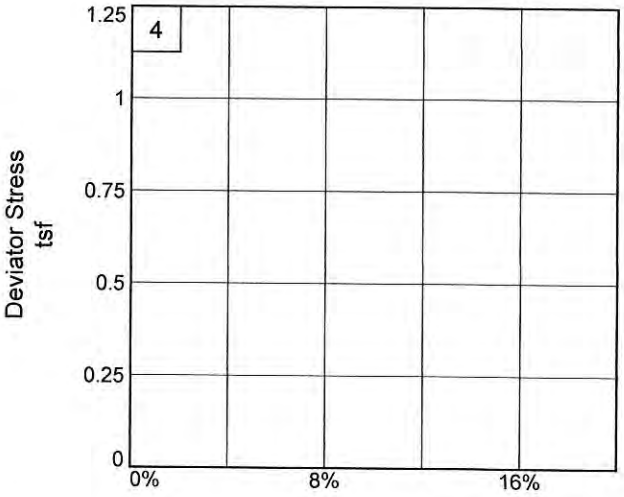
**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

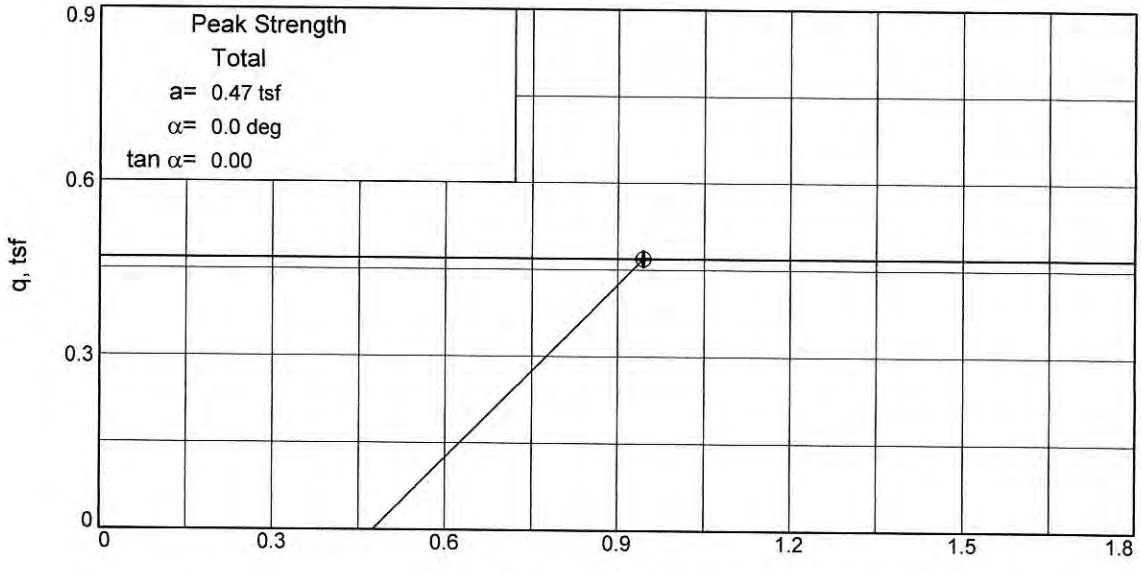
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

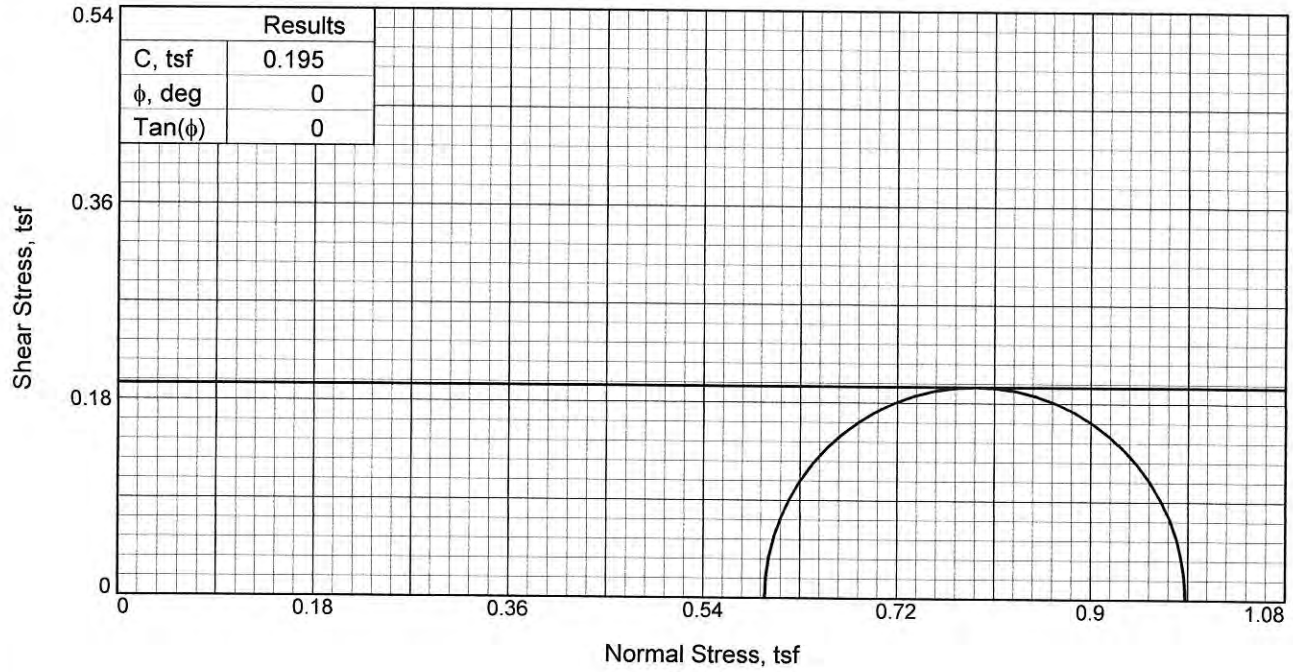
**Client:**

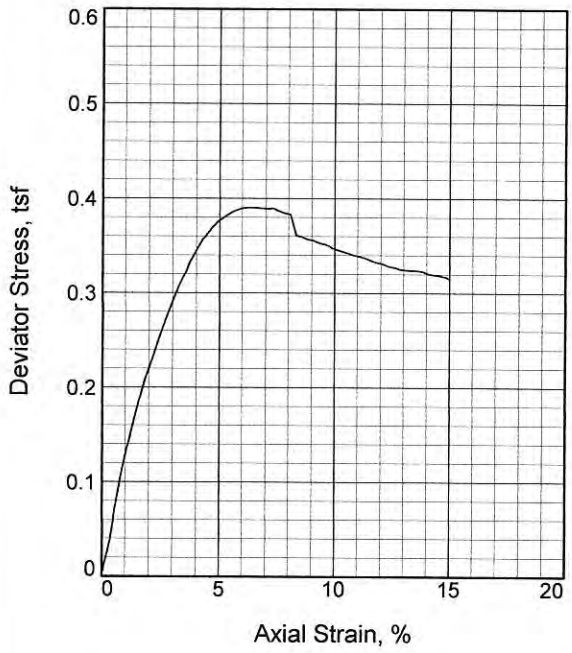
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 18-20

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 49.5 |
| | Dry Density, pcf | 66.4 |
| | Saturation, % | 86.8 |
| | Void Ratio | 1.5390 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.76 |
| At Test | Water Content, % | 52.1 |
| | Dry Density, pcf | 66.4 |
| | Saturation, % | 91.4 |
| | Void Ratio | 1.5390 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.76 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 8.30 |
| Fail. Stress, tsf | | 0.39 |
| Strain, % | | 6.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.99 |
| $\sigma_3$ Failure, tsf | | 0.60 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown FAT CLAY

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

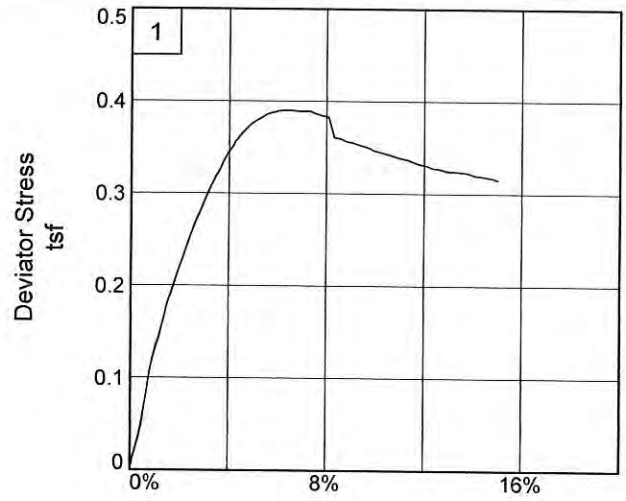
**Client:**

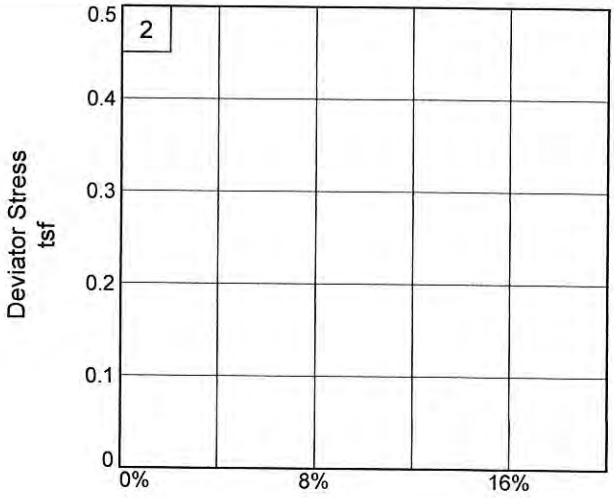
**Project:** San Jacinto River Waste Pit Superfund Site

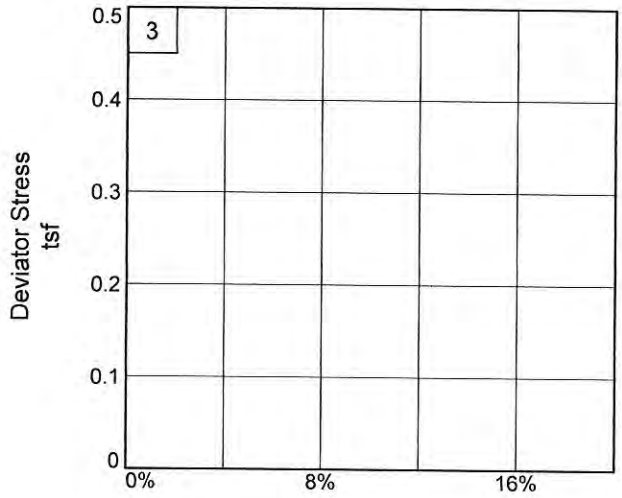
**Source of Sample:** SJGB024 **Depth:** 23-25

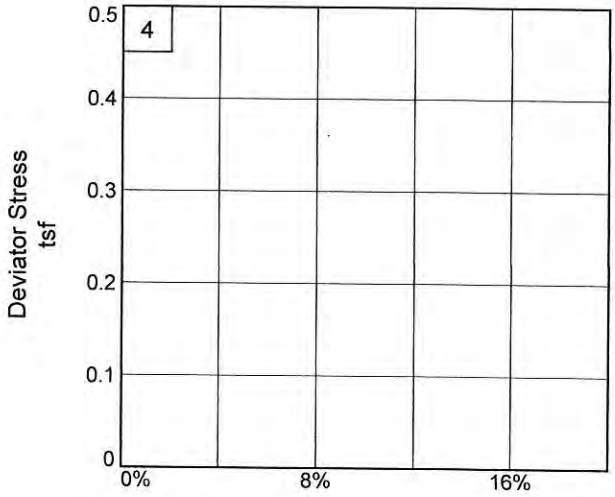
**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

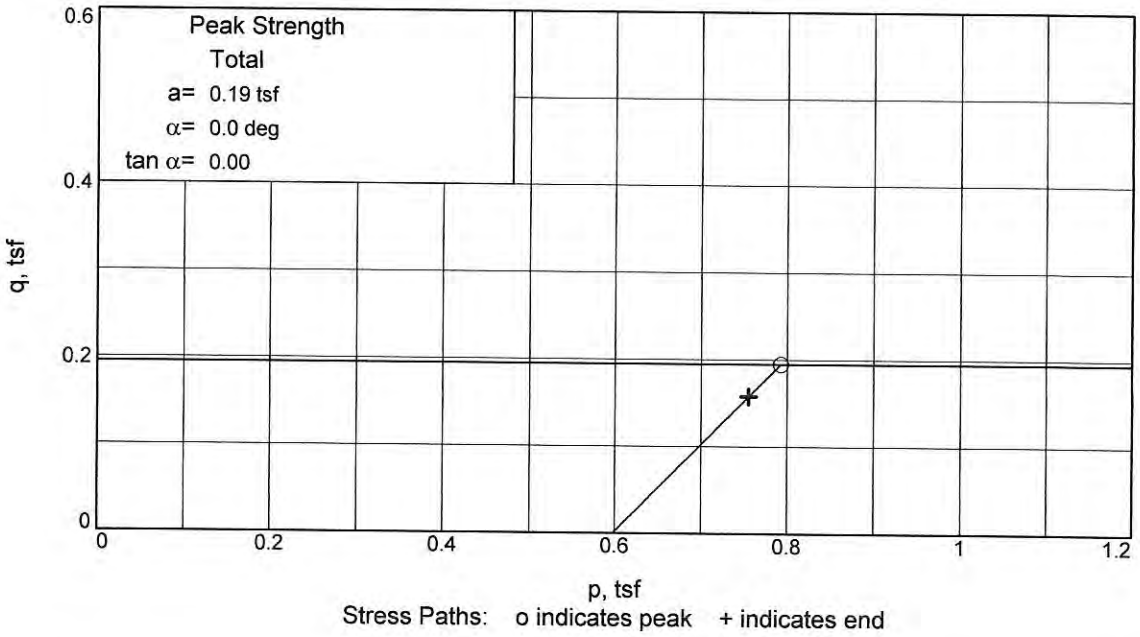
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

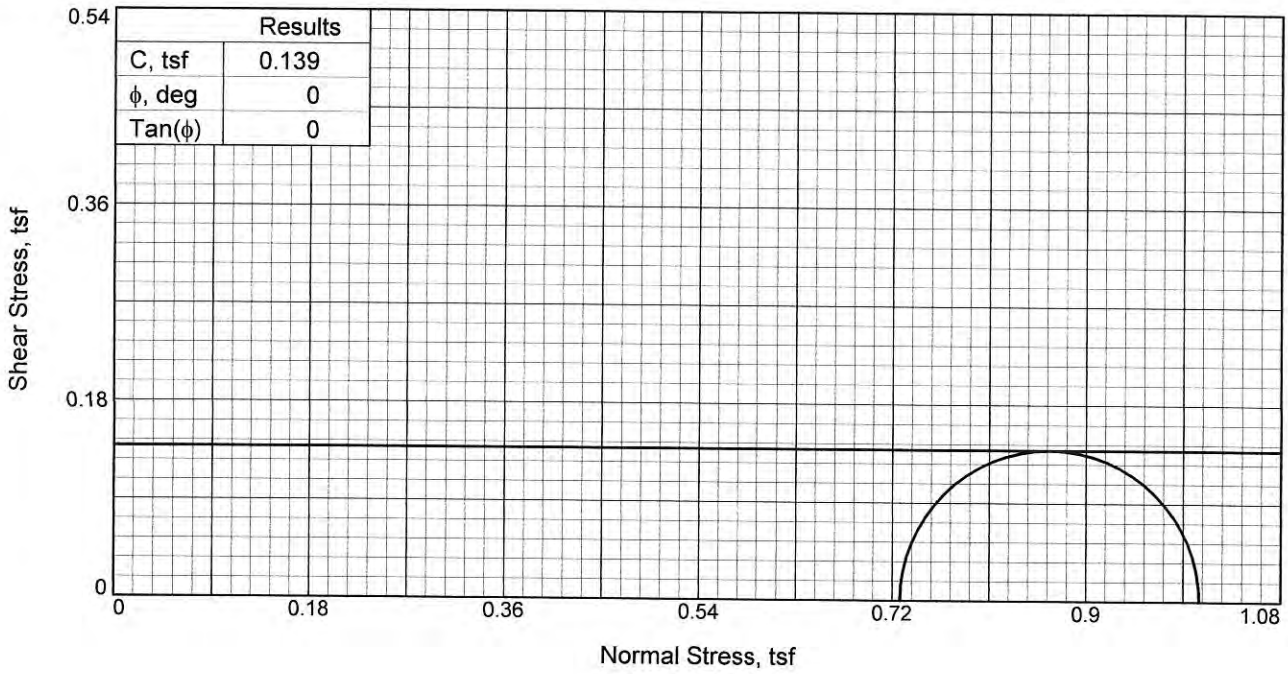
**Client:**

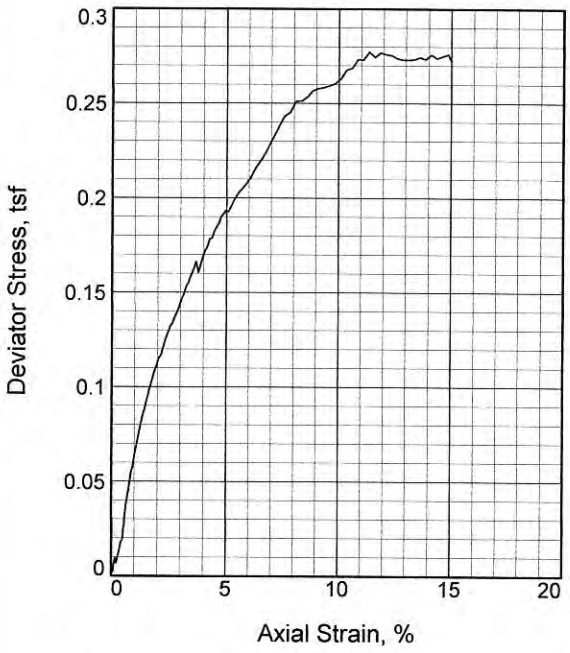
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 23-25

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 61.3 |
| | Dry Density, pcf | 59.0 |
| | Saturation, % | 89.2 |
| | Void Ratio | 1.8553 |
| | Diameter, in. | 2.93 |
| | Height, in. | 5.79 |
| At Test | Water Content, % | 47.6 |
| | Dry Density, pcf | 59.0 |
| | Saturation, % | 69.2 |
| | Void Ratio | 1.8553 |
| | Diameter, in. | 2.93 |
| | Height, in. | 5.79 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 10.10 |
| Fail. Stress, tsf | | 0.28 |
| Strain, % | | 11.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.00 |
| $\sigma_3$ Failure, tsf | | 0.73 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Brown FAT CLAY

**LL=** 122 **PL=** 58 **PI=** 64
**Assumed Specific Gravity=** 2.70
**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

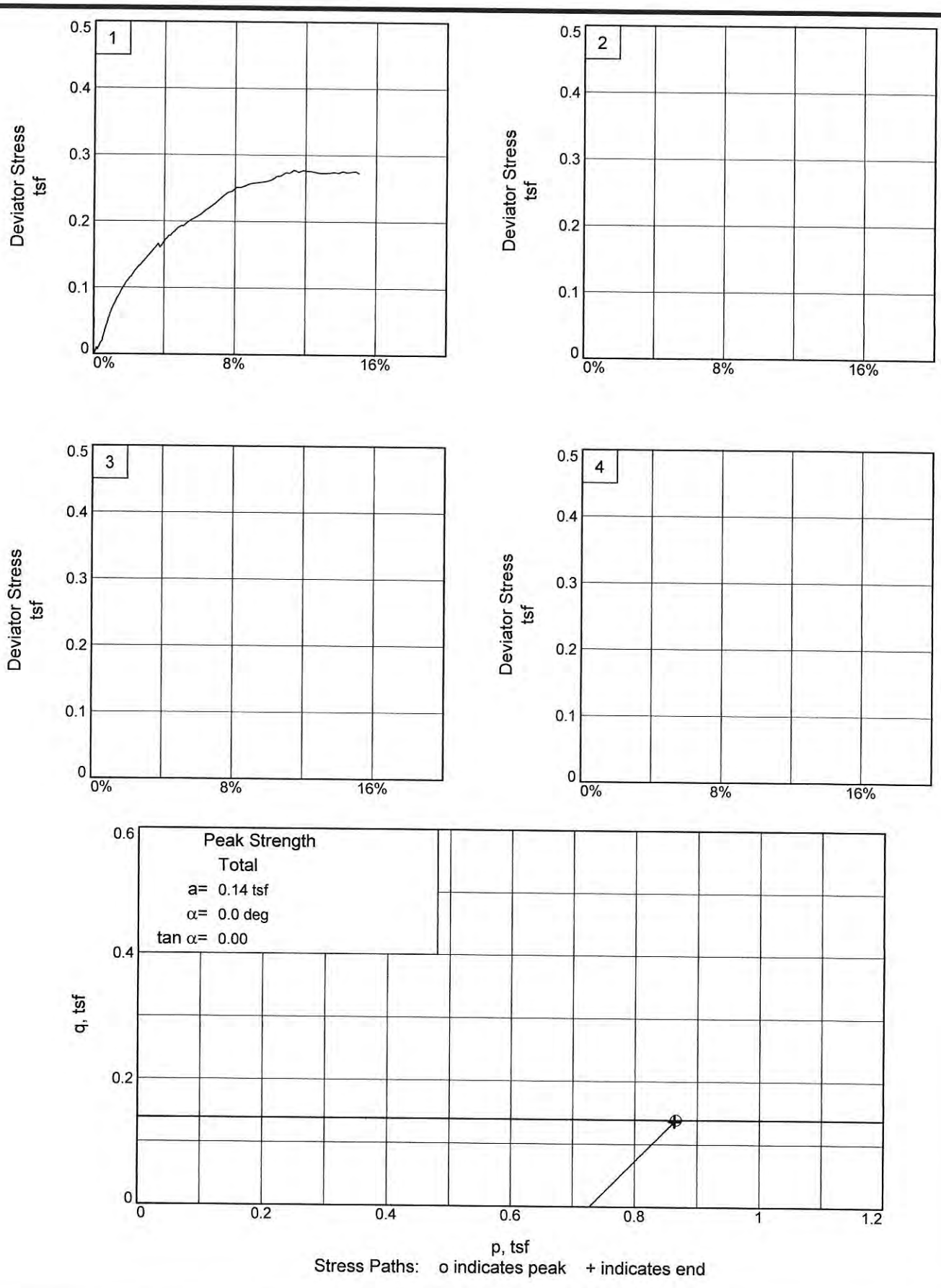
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 28-30

**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



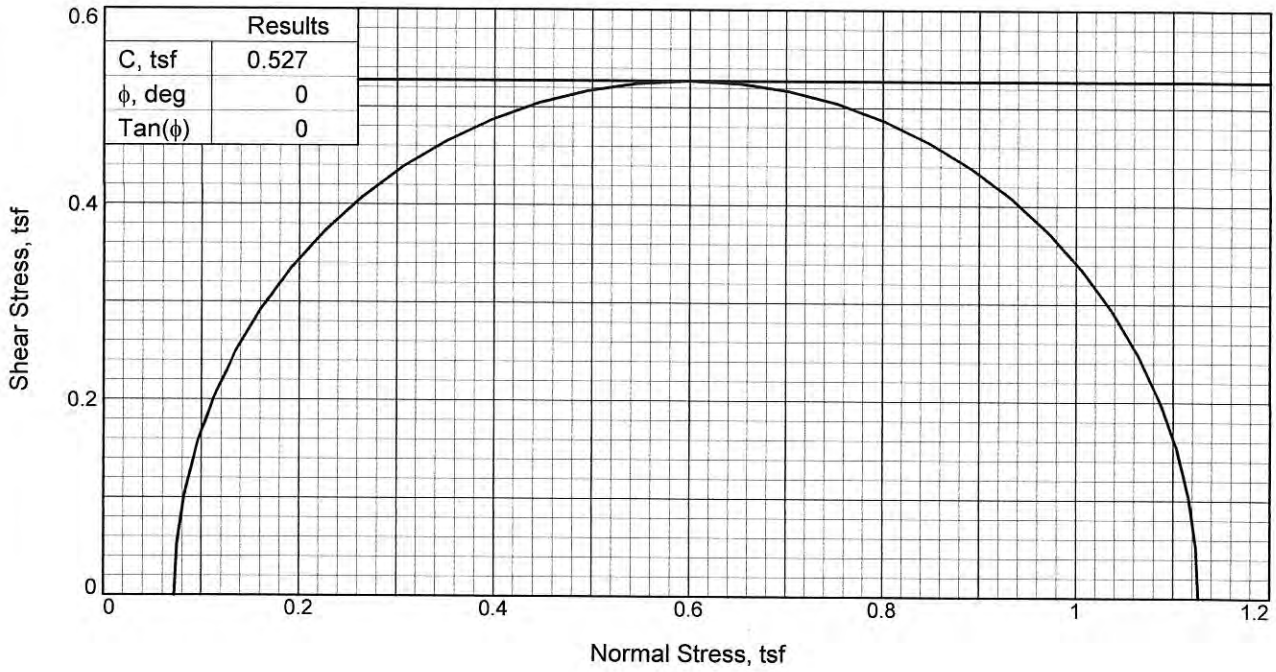

**Client:**

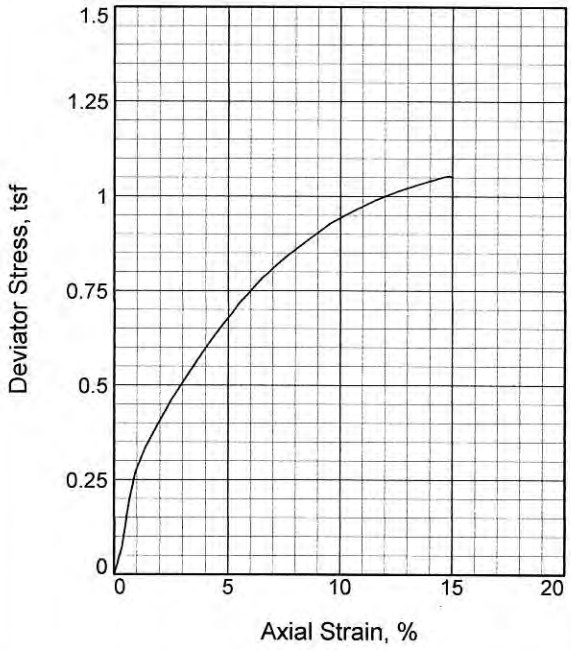
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB024 **Depth:** 28-30

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 15.5 |
| | Dry Density, pcf | 115.8 |
| | Saturation, % | 91.8 |
| | Void Ratio | 0.4558 |
| | Diameter, in. | 2.80 |
| | Height, in. | 5.70 |
| At Test | Water Content, % | 15.5 |
| | Dry Density, pcf | 115.8 |
| | Saturation, % | 91.7 |
| | Void Ratio | 0.4558 |
| | Diameter, in. | 2.80 |
| | Height, in. | 5.70 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 1.00 |
| Fail. Stress, tsf | | 1.05 |
| Ult. Stress, tsf | | |
| $\sigma_1$ Failure, tsf | | 1.13 |
| $\sigma_3$ Failure, tsf | | 0.07 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown LEAN CLAY with SAND

**LL=** 36 **PL=** 18 **PI=** 18

**Specific Gravity=** 2.7

**Remarks:**
Test Method: ASTM D2850
Failure Type: Bulge

**Figure** _____

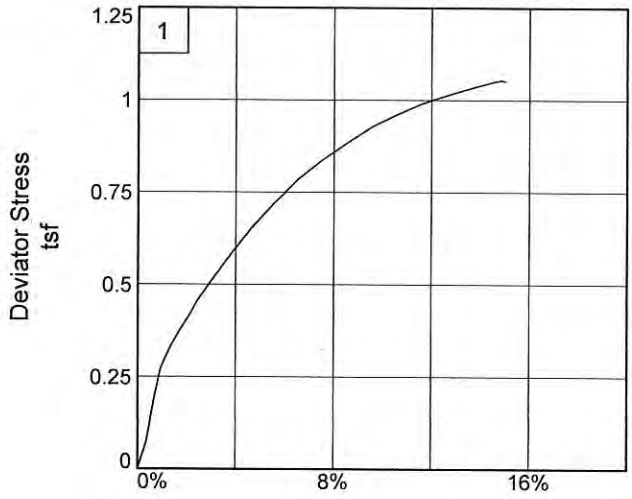
**Client:**

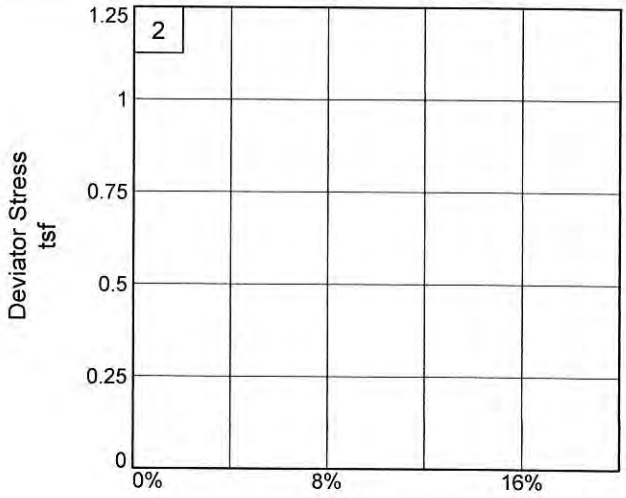
**Project:** San Jacinto River Waste Pit Superfund Site

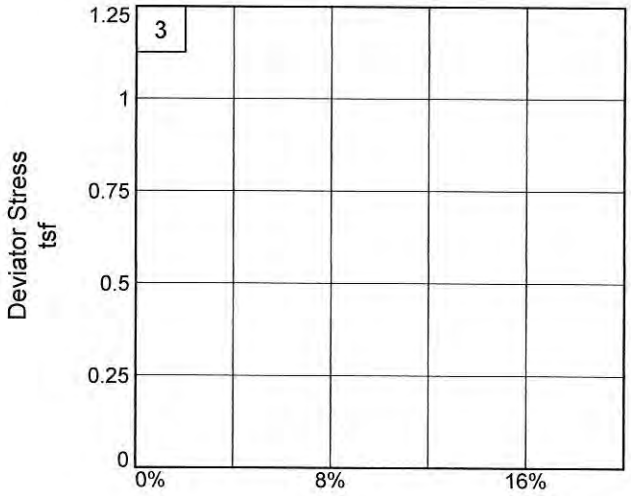
**Source of Sample:** SJGB025 **Depth:** 2-4

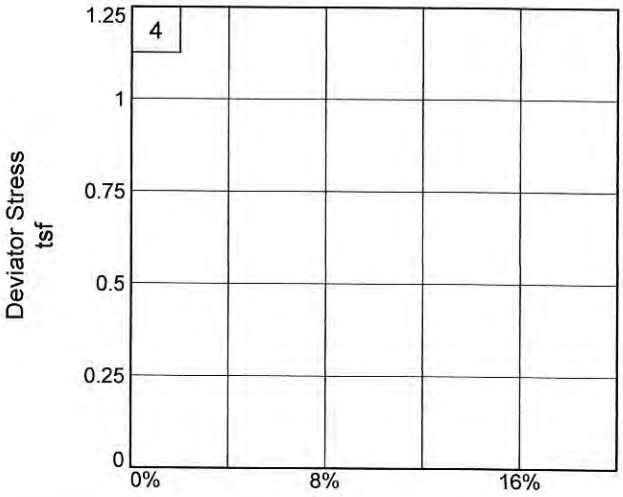
**Proj. No.:** 19.15.131 **Date Sampled:** 9/18/19

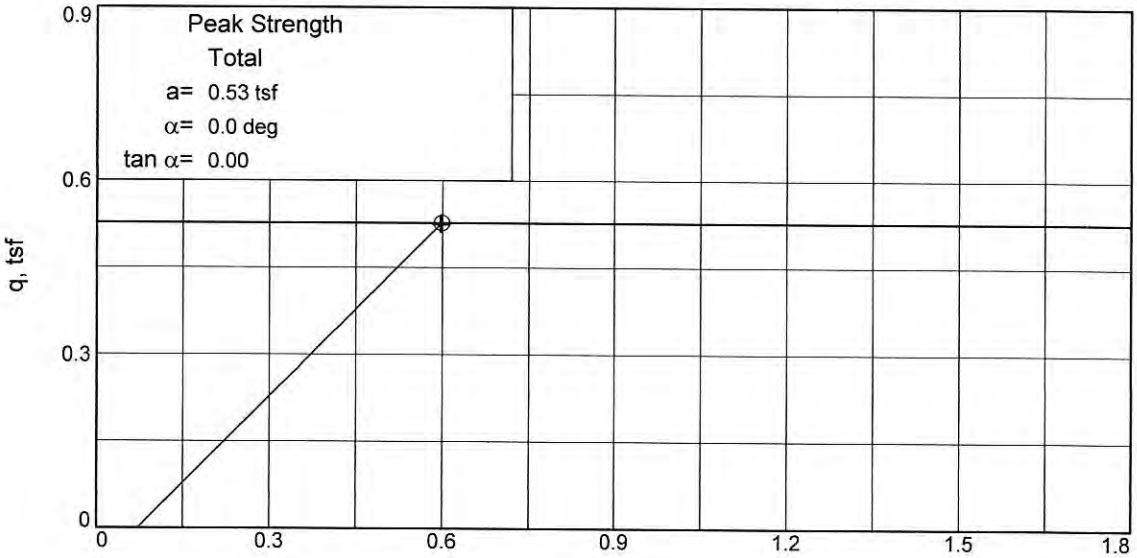
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

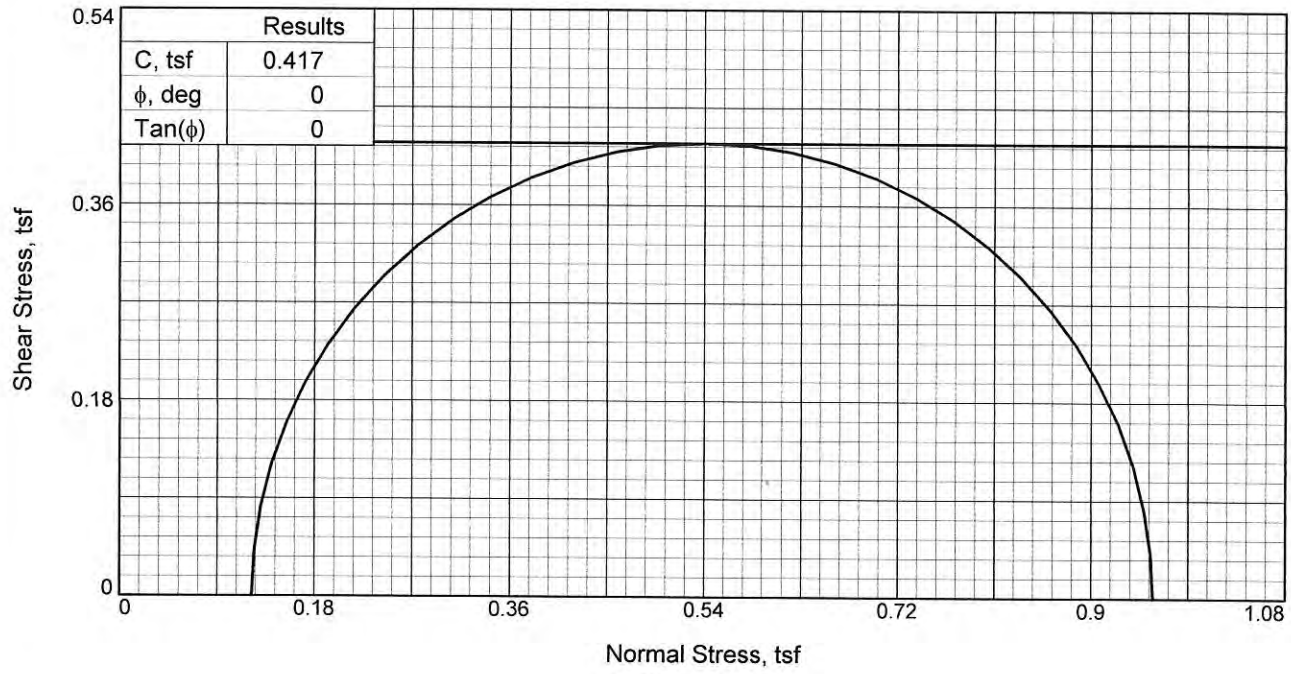
**Client:**

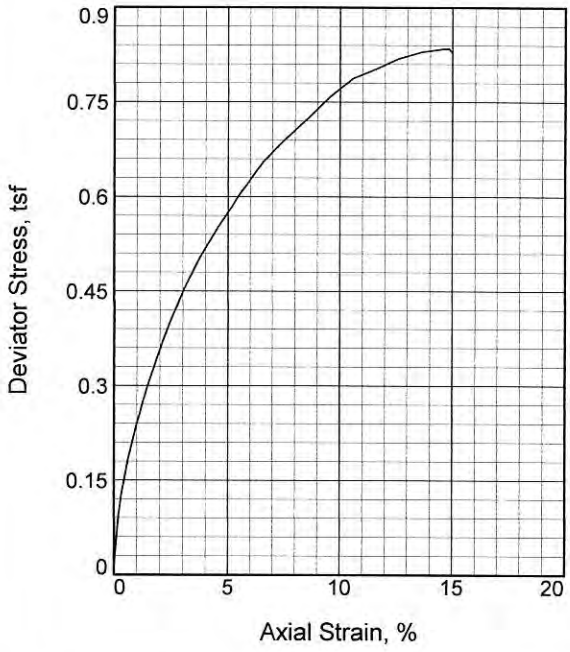
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB025 **Depth:** 2-4

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 18.8 |
| | Dry Density, pcf | 112.5 |
| | Saturation, % | 98.1 |
| | Void Ratio | 0.5258 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.72 |
| At Test | Water Content, % | 18.4 |
| | Dry Density, pcf | 112.5 |
| | Saturation, % | 96.4 |
| | Void Ratio | 0.5258 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.72 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 1.70 |
| Fail. Stress, tsf | | 0.83 |
| Ult. Stress, tsf | | |
| $\sigma_1$ Failure, tsf | | 0.96 |
| $\sigma_3$ Failure, tsf | | 0.12 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray SANDY LEAN CLAY

**LL=** 34 **PL=** 17 **PI=** 17

**Specific Gravity=** 2.75

**Remarks:**
Test Method: ASTM D2850
Failure Type:Multiple Shear

**Figure** _____

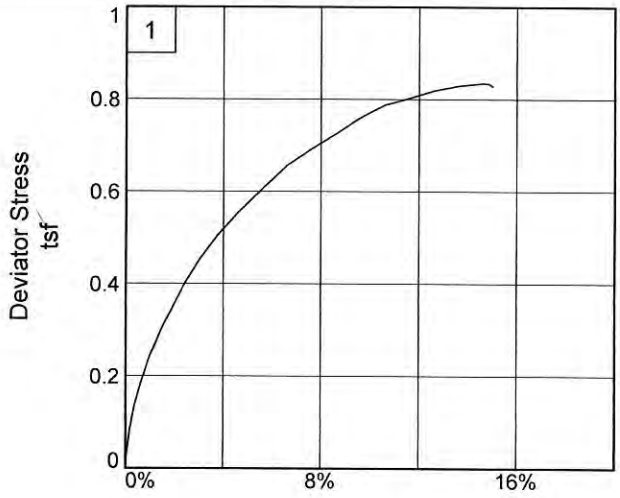
**Client:**

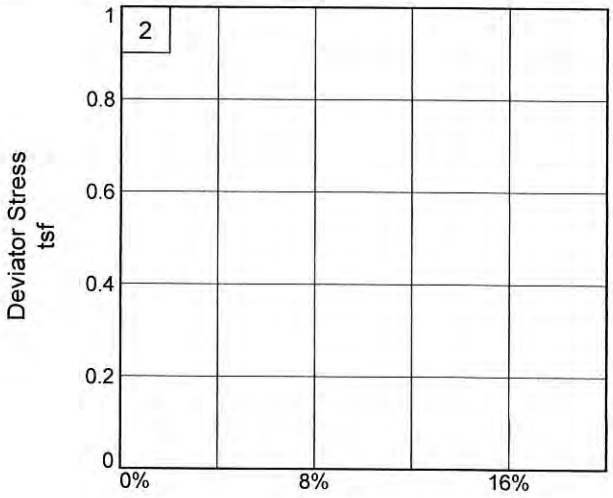
**Project:** San Jacinto River Waste Pit Superfund Site

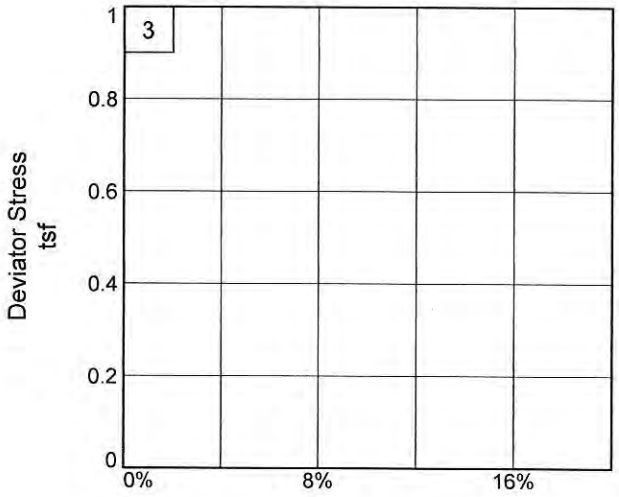
**Source of Sample:** SJGB025 **Depth:** 4-6

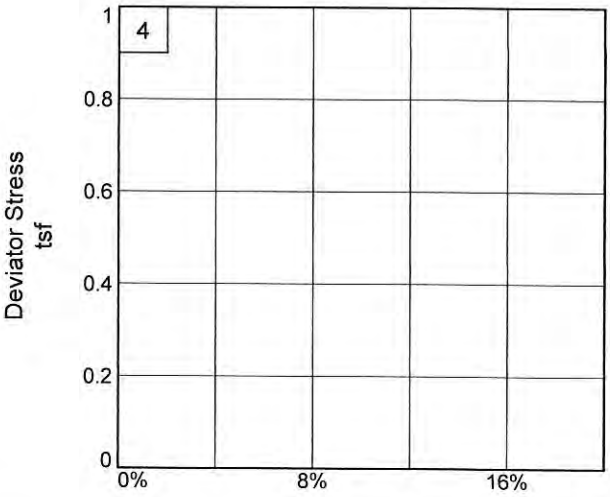
**Proj. No.:** 19.15.131 **Date Sampled:** 9/19/19

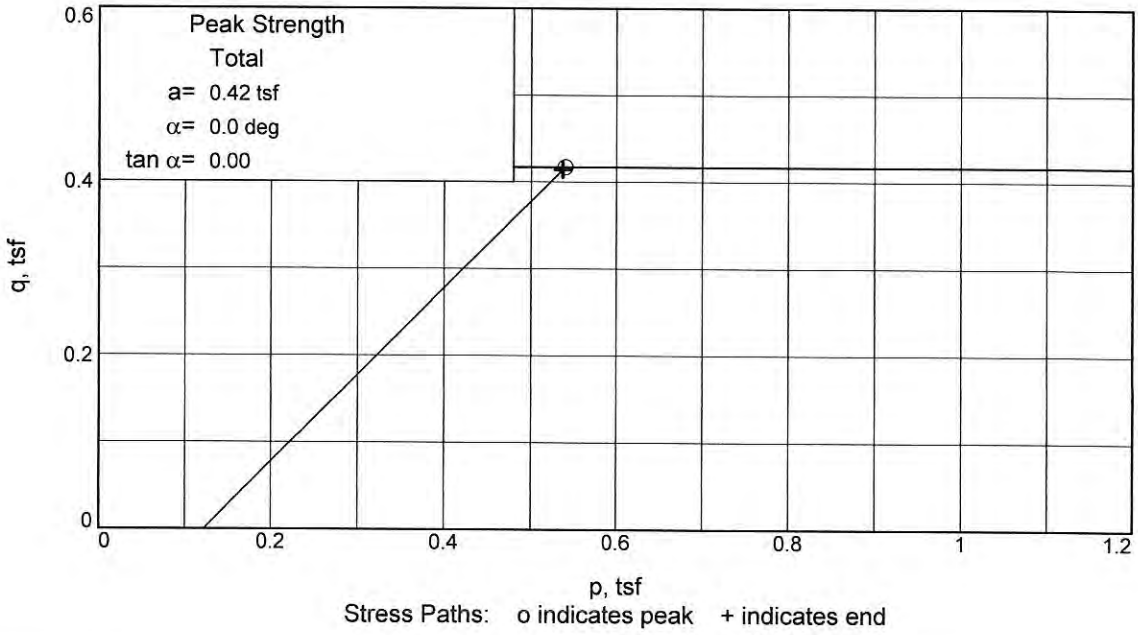
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

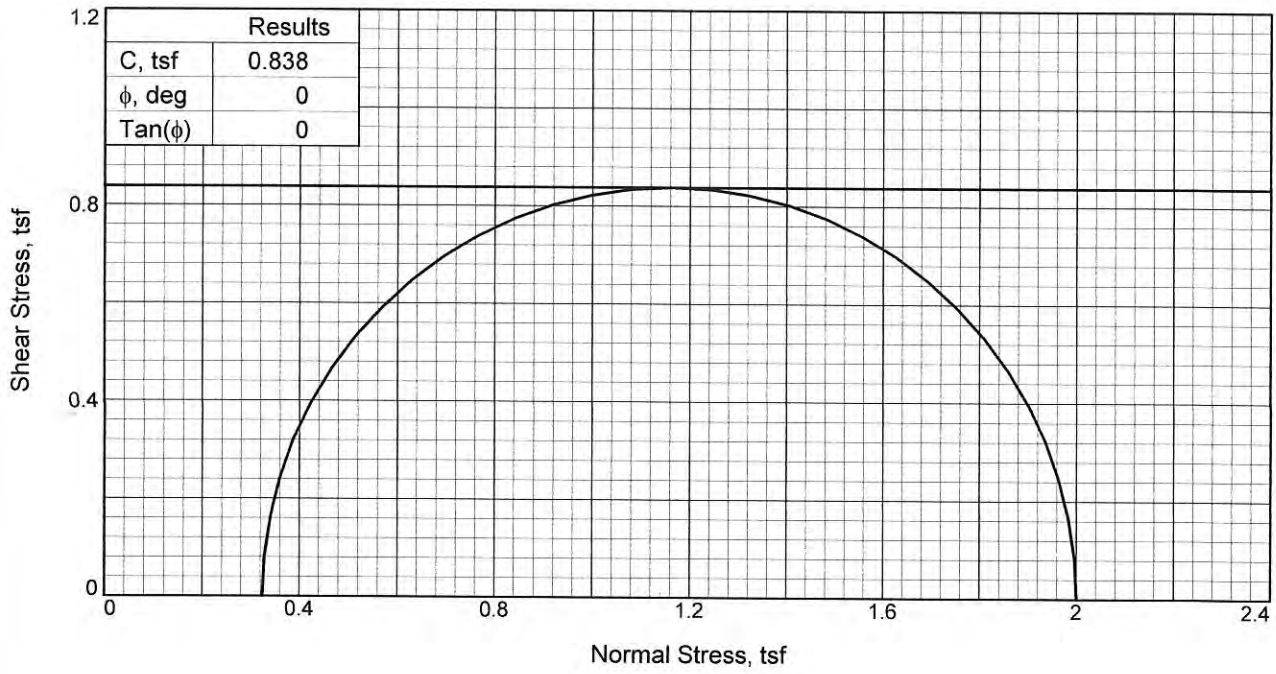
**Client:**

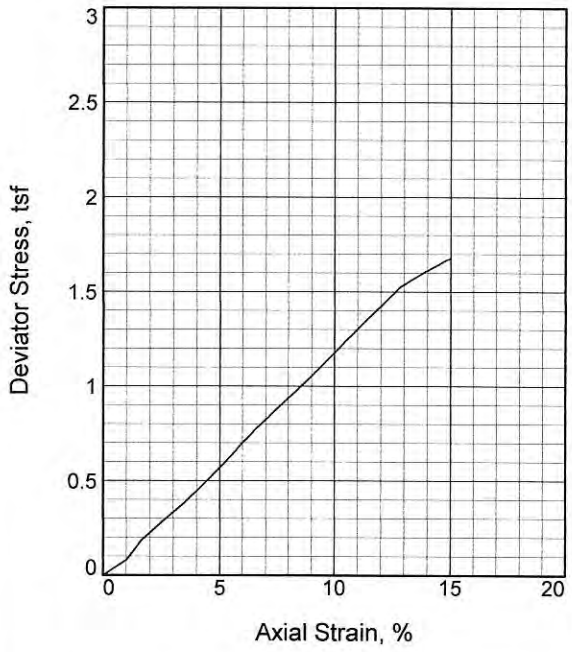
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB025 **Depth:** 4-6

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 18.6 |
| | Dry Density, pcf | 114.9 |
| | Saturation, % | 99.9 |
| | Void Ratio | 0.5208 |
| | Diameter, in. | 2.77 |
| | Height, in. | 5.19 |
| At Test | Water Content, % | 20.4 |
| | Dry Density, pcf | 114.9 |
| | Saturation, % | 109.8 |
| | Void Ratio | 0.5208 |
| | Diameter, in. | 2.77 |
| | Height, in. | 5.19 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 4.50 |
| Fail. Stress, tsf | | 1.68 |
| Ult. Stress, tsf | | |
| $\sigma_1$ Failure, tsf | | 2.00 |
| $\sigma_3$ Failure, tsf | | 0.32 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Brown SANDY LEAN CLAY

**LL=** 33 **PL=** 17 **PI=** 16

**Specific Gravity=** 2.8

**Remarks:**
Test Method: ASTM D2850
Failure Type: Bulge

**Figure** _____

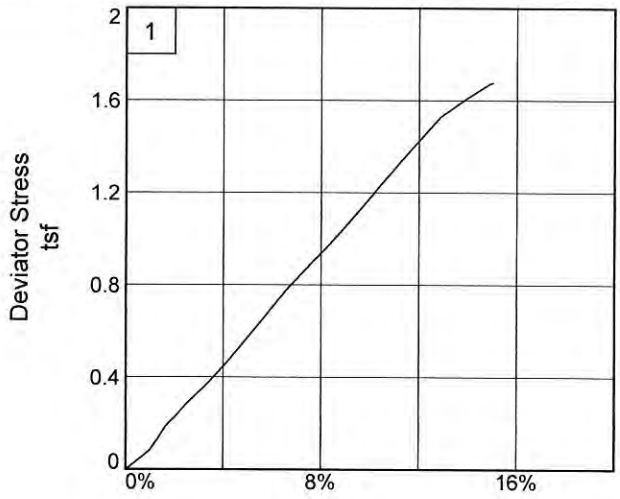
**Client:**

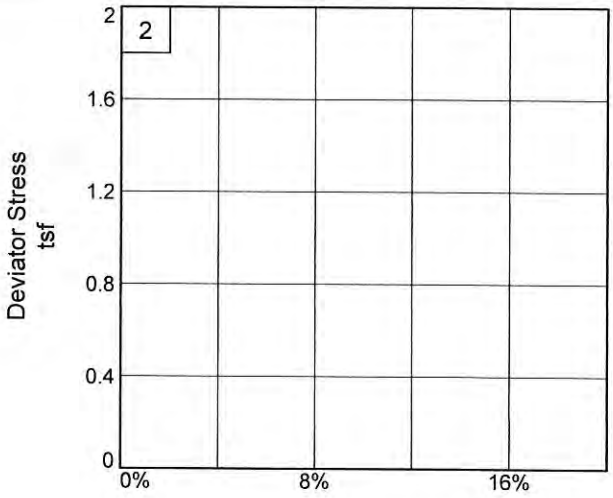
**Project:** San Jacinto River Waste Pit Superfund Site

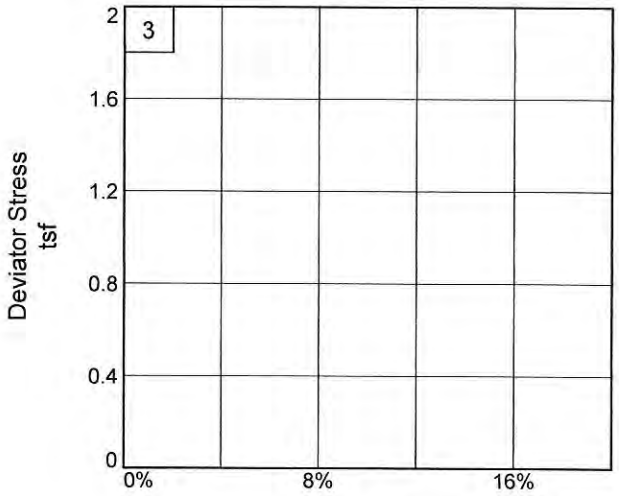
**Source of Sample:** SJGB025 **Depth:** 12-14

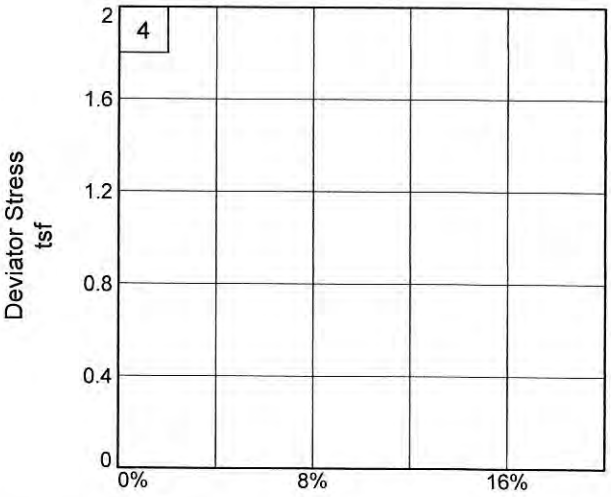
**Proj. No.:** 19.15.131 **Date Sampled:** 9/19/19

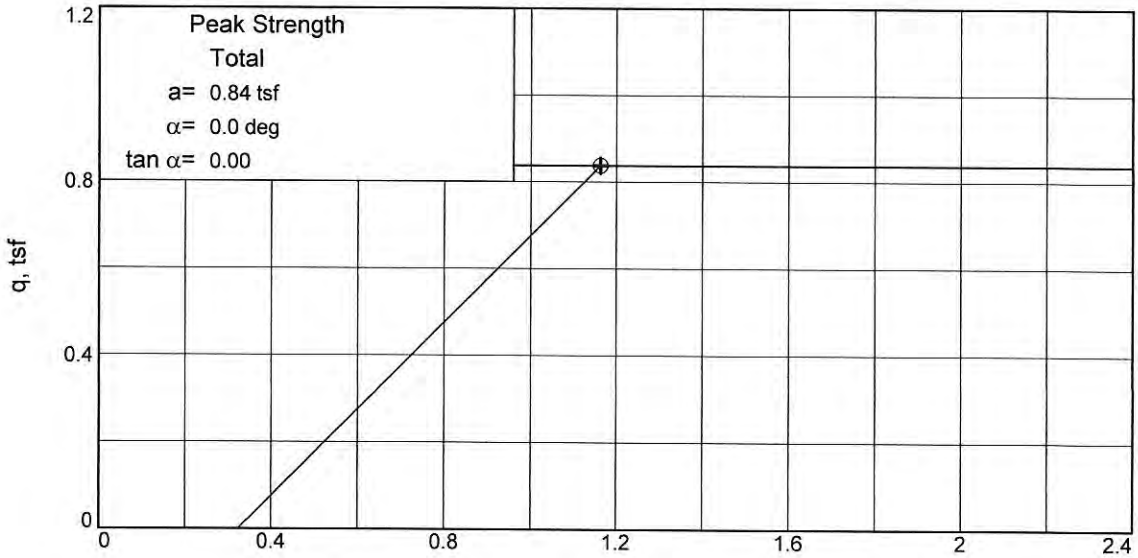
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

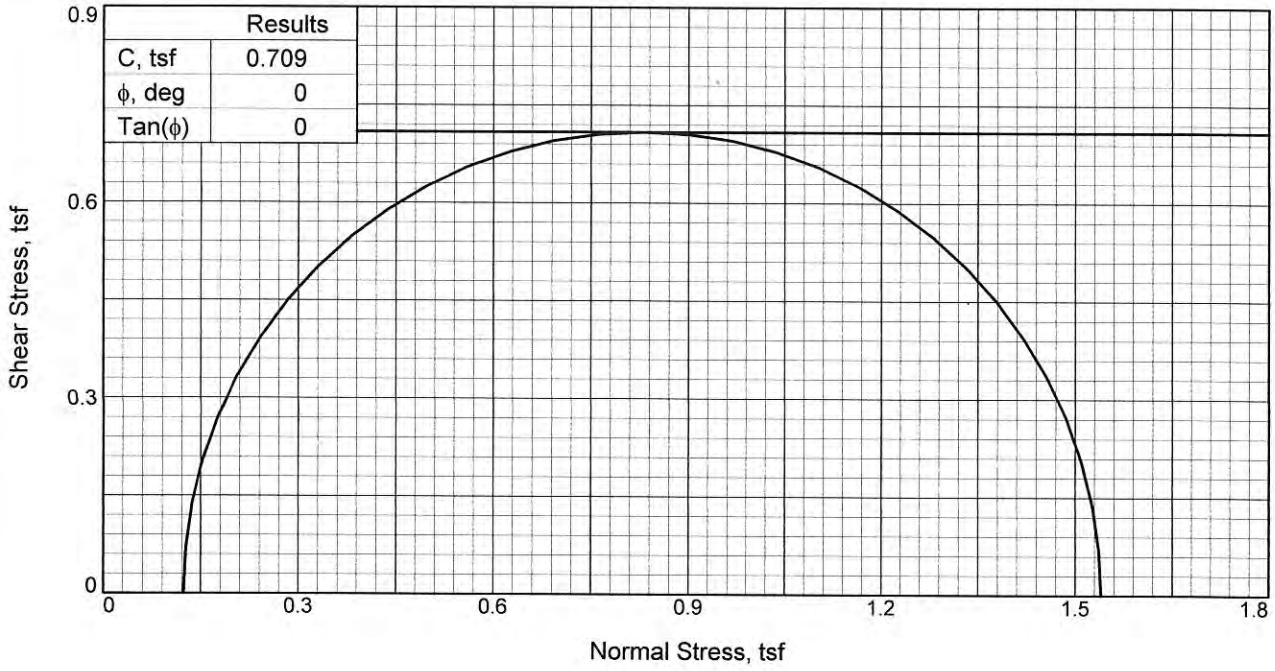
**Client:**

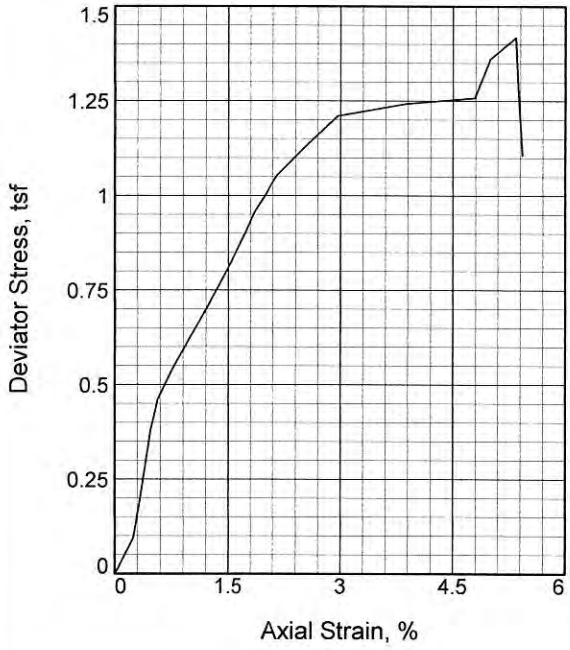
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB025 **Depth:** 12-14

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 19.1 |
| | Dry Density, pcf | 104.9 |
| | Saturation, % | 84.8 |
| | Void Ratio | 0.6074 |
| | Diameter, in. | 2.80 |
| | Height, in. | 5.66 |
| At Test | Water Content, % | 20.9 |
| | Dry Density, pcf | 104.9 |
| | Saturation, % | 93.0 |
| | Void Ratio | 0.6074 |
| | Diameter, in. | 2.80 |
| | Height, in. | 5.66 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 1.70 |
| Fail. Stress, tsf | | 1.42 |
| Ult. Stress, tsf | | |
| $\sigma_1$ Failure, tsf | | 1.54 |
| $\sigma_3$ Failure, tsf | | 0.12 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Tan and Gray LEAN CLAY with SAND

**LL=** 41 **PL=** 18 **PI=** 23

**Specific Gravity=** 2.7

**Remarks:**
Test Method: ASTM D2850
Failure Type: Vertical

**Figure** _____

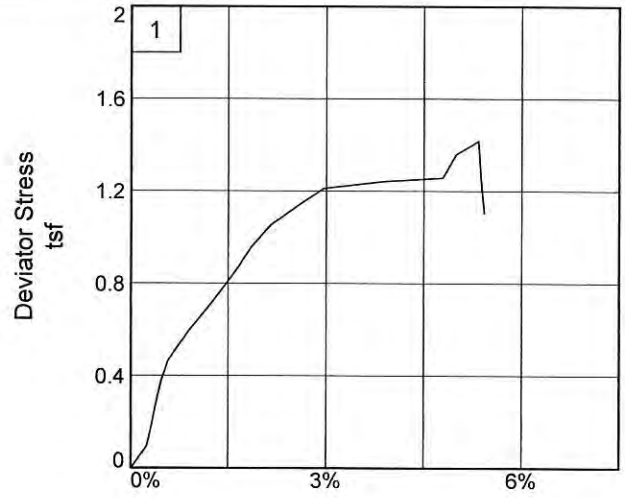
**Client:**

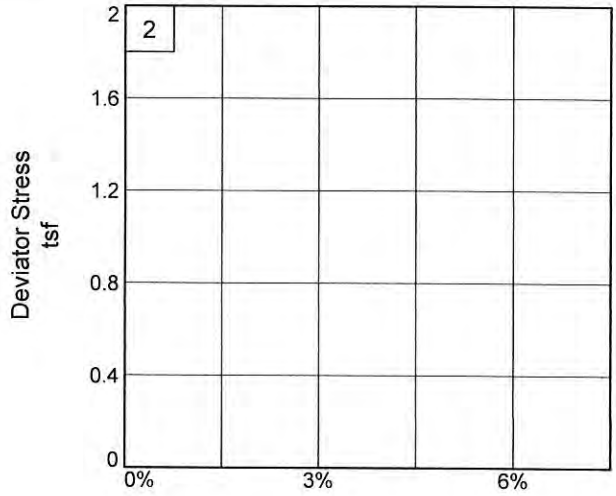
**Project:** San Jacinto River Waste Pit Superfund Site

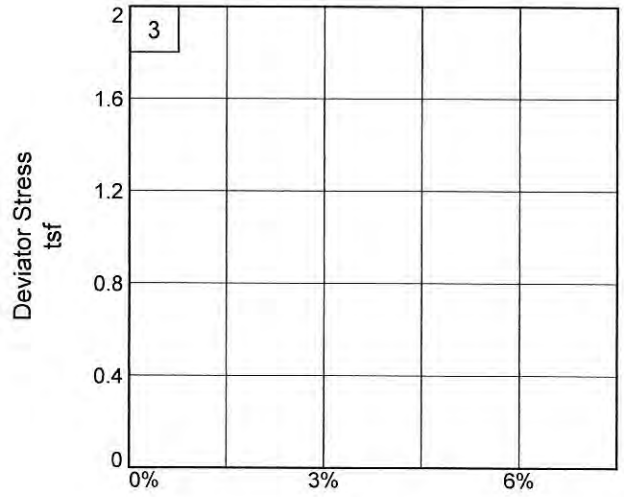
**Source of Sample:** SJGB026 **Depth:** 4-6

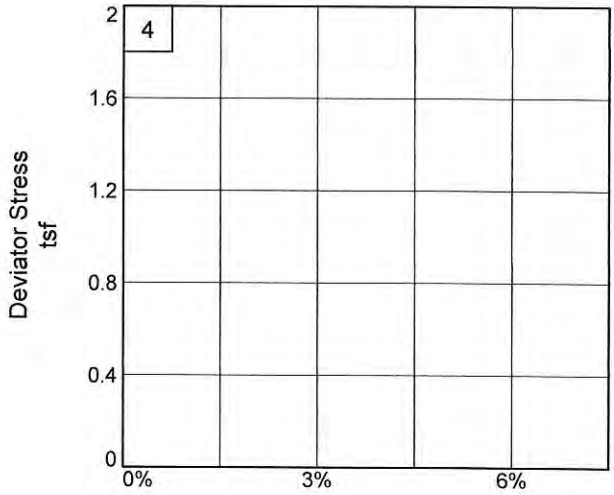
**Proj. No.:** 19.15.131 **Date Sampled:**

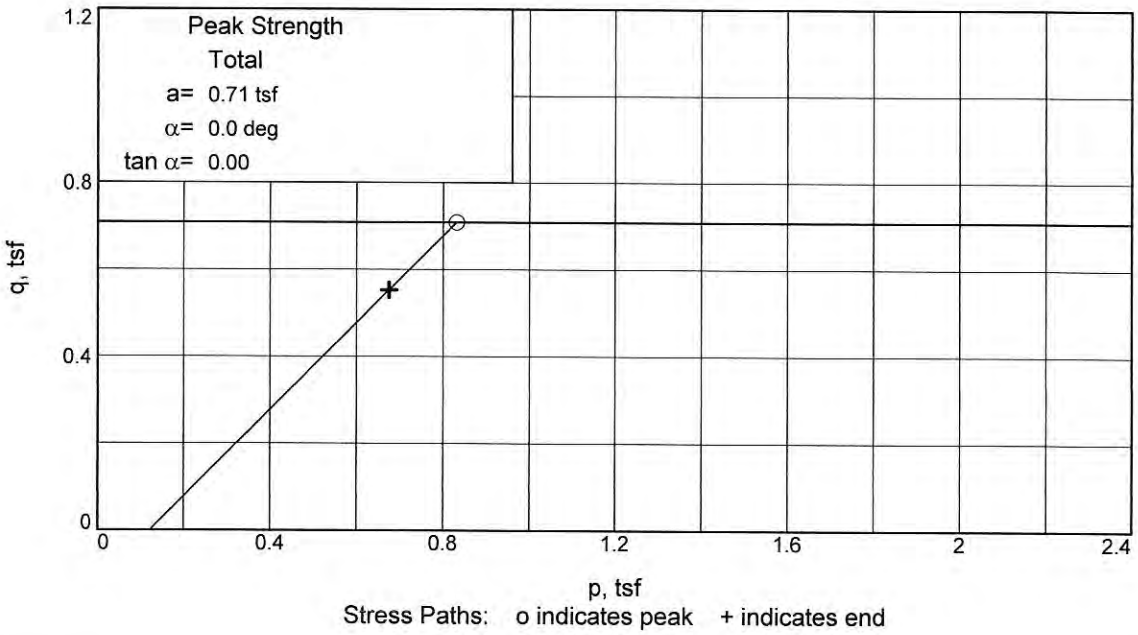
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

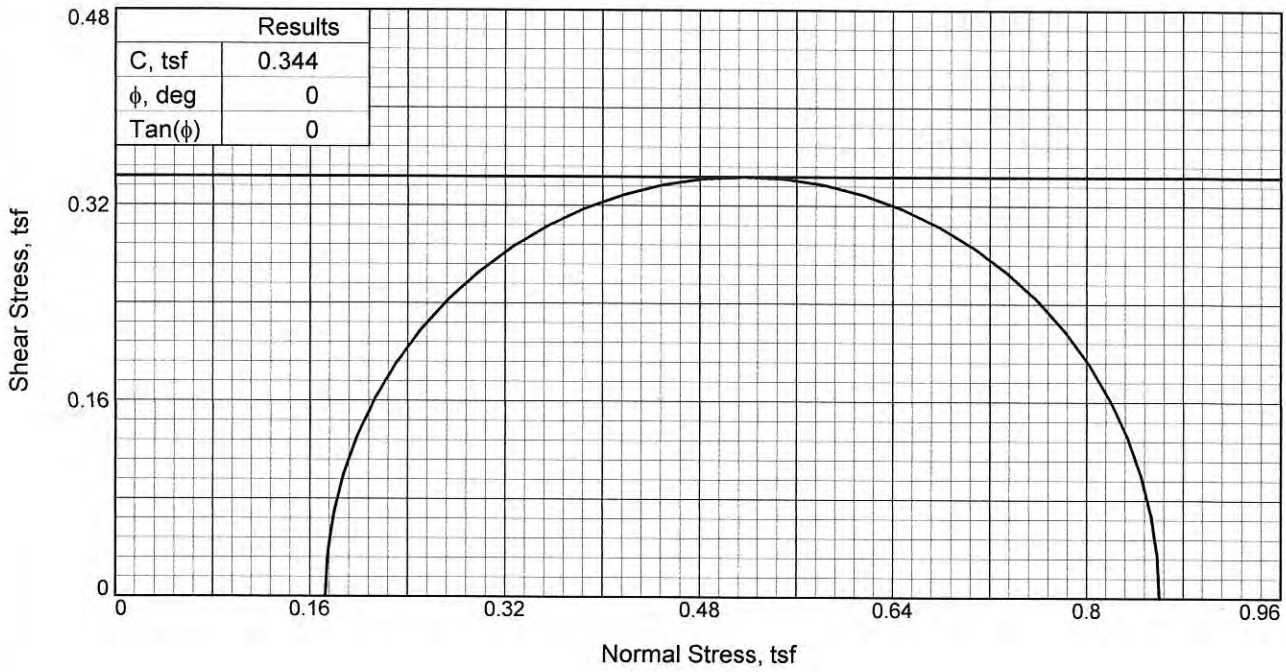
**Client:**

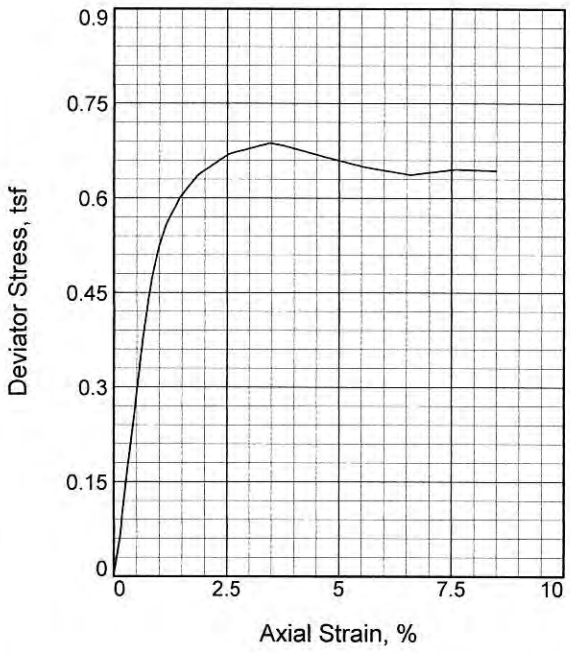
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB026 **Depth:** 4-6

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 19.1 |
| | Dry Density, pcf | 104.8 |
| | Saturation, % | 84.7 |
| | Void Ratio | 0.6086 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.64 |
| At Test | Water Content, % | 20.4 |
| | Dry Density, pcf | 104.8 |
| | Saturation, % | 90.7 |
| | Void Ratio | 0.6086 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.64 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 2.40 |
| Fail. Stress, tsf | | 0.69 |
| Ult. Stress, tsf | | |
| $\sigma_1$ Failure, tsf | | 0.86 |
| $\sigma_3$ Failure, tsf | | 0.17 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY

**Specific Gravity=** 2.7

**Remarks:**
Test Method: ASTM D2850
Failure Type: Multiple Shear

**Figure** _____

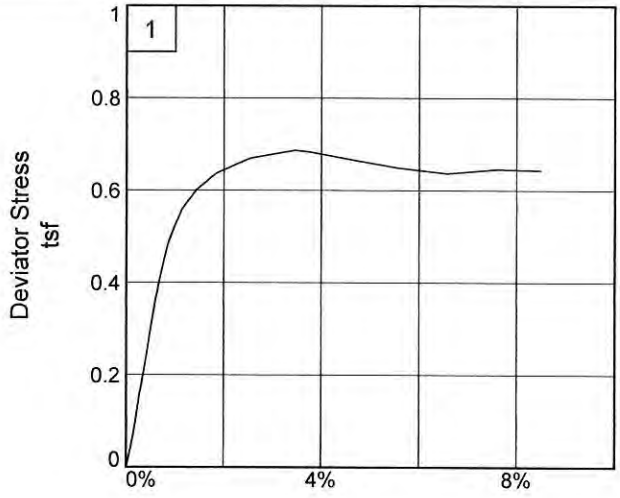
**Client:**

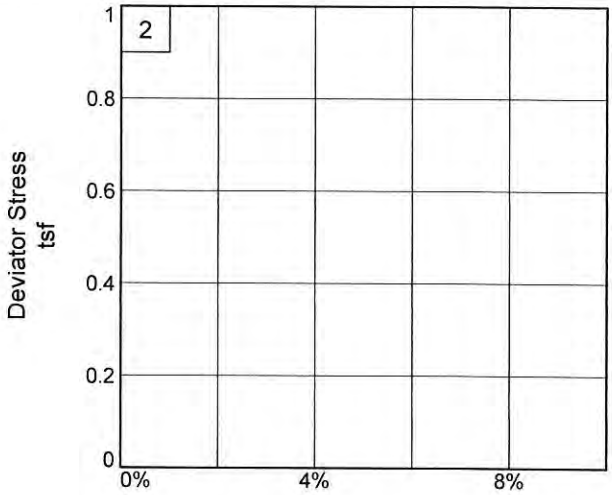
**Project:** San Jacinto River Waste Pit Superfund Site

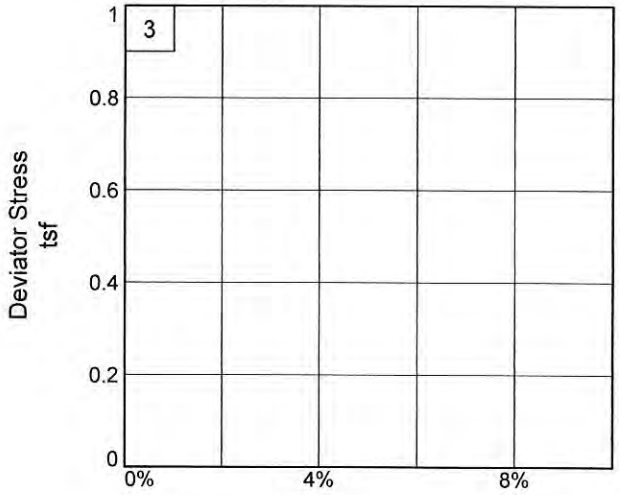
**Source of Sample:** SJGB026 **Depth:** 6-8

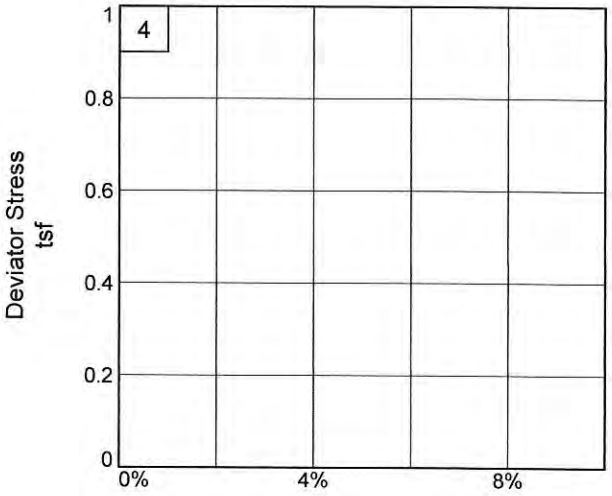
**Proj. No.:** 19.15.131 **Date Sampled:**

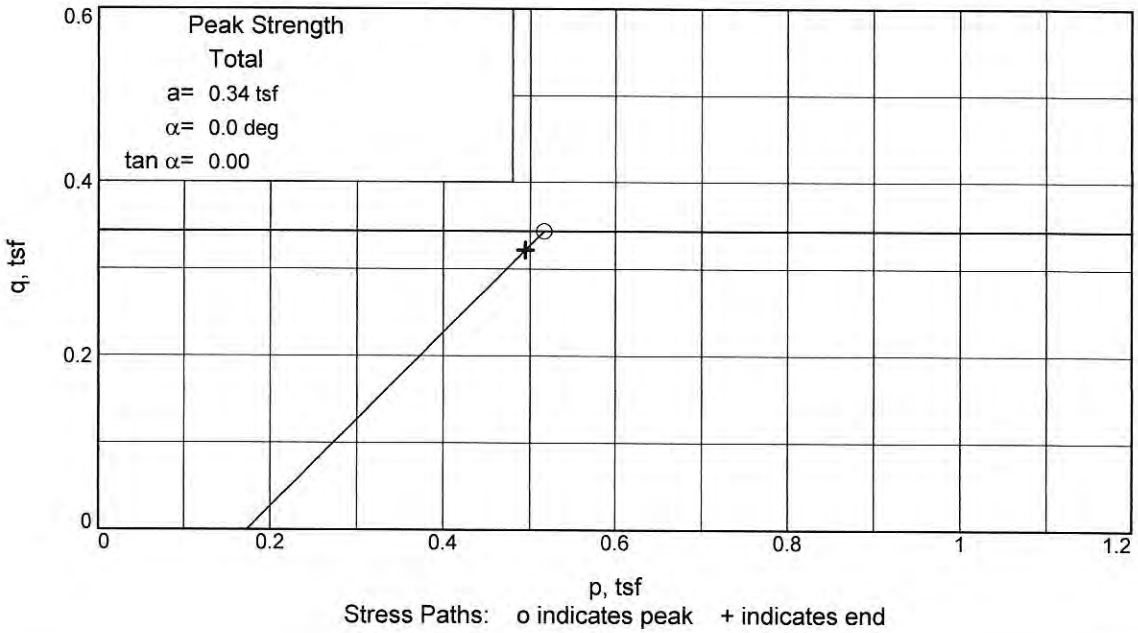
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

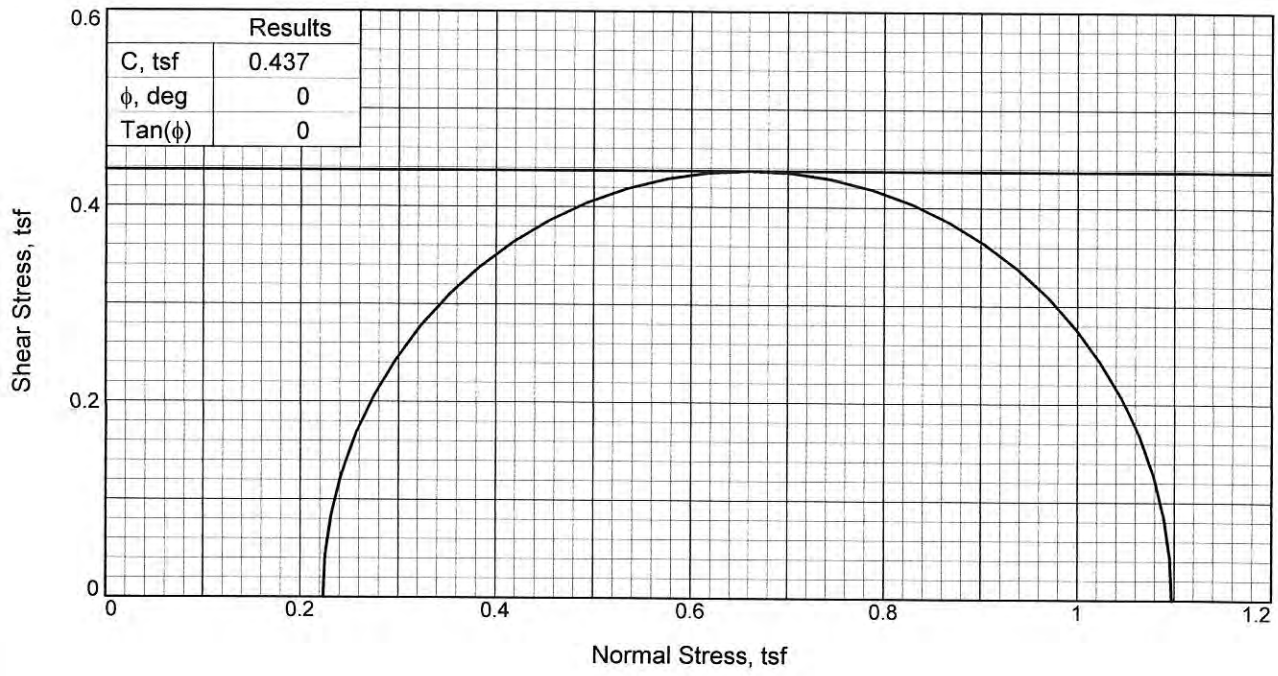
**Client:**

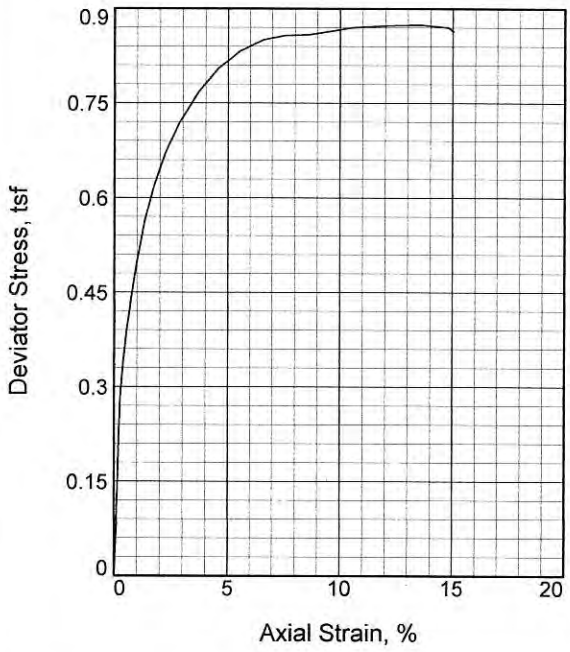
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB026 **Depth:** 6-8

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 21.4 |
| | Dry Density, pcf | 103.8 |
| | Saturation, % | 92.7 |
| | Void Ratio | 0.6242 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.70 |
| At Test | Water Content, % | 21.3 |
| | Dry Density, pcf | 103.8 |
| | Saturation, % | 92.1 |
| | Void Ratio | 0.6242 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.70 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 3.10 |
| Fail. Stress, tsf | | 0.87 |
| Ult. Stress, tsf | | |
| $\sigma_1$ Failure, tsf | | 1.10 |
| $\sigma_3$ Failure, tsf | | 0.22 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray and brown LEAN CLAY with SAND

**LL=** 35 **PL=** 17 **PI=** 18

**Specific Gravity=** 2.7

**Remarks:**
Test Method: ASTM D2850
Failure Type: Multiple Shear

**Figure** _____

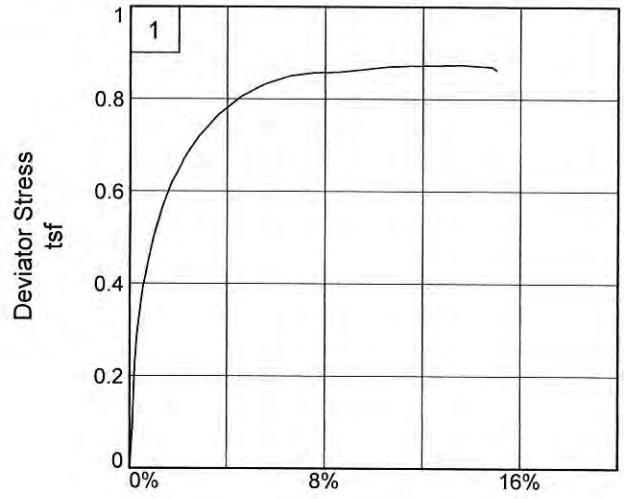
**Client:**

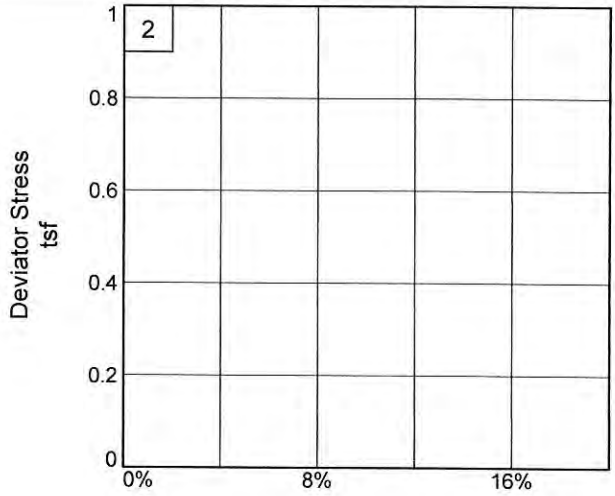
**Project:** San Jacinto River Waste Pit Superfund Site

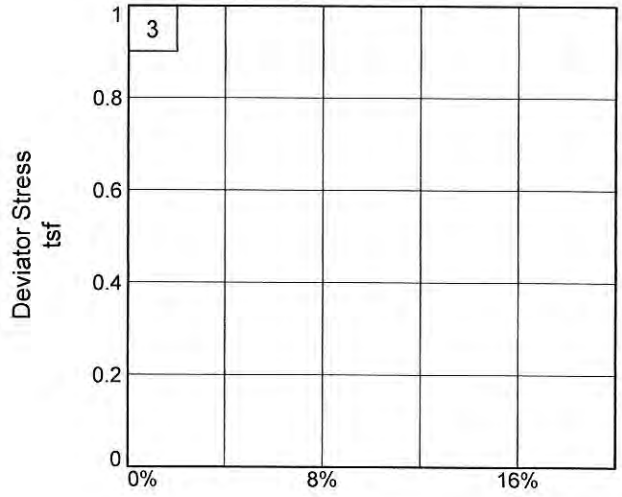
**Source of Sample:** SJGB026 **Depth:** 8-10

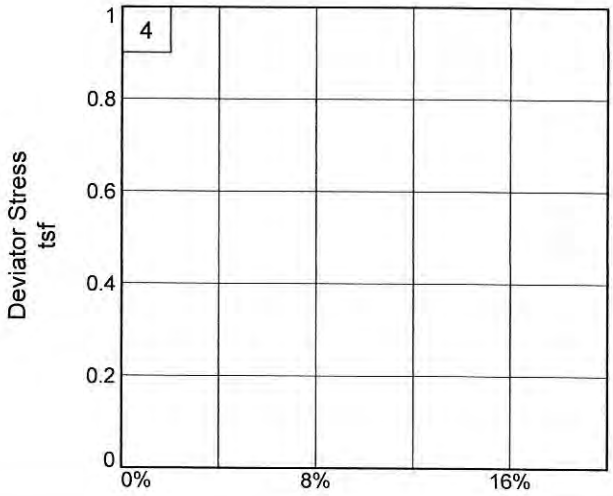
**Proj. No.:** 19.15.131 **Date Sampled:**

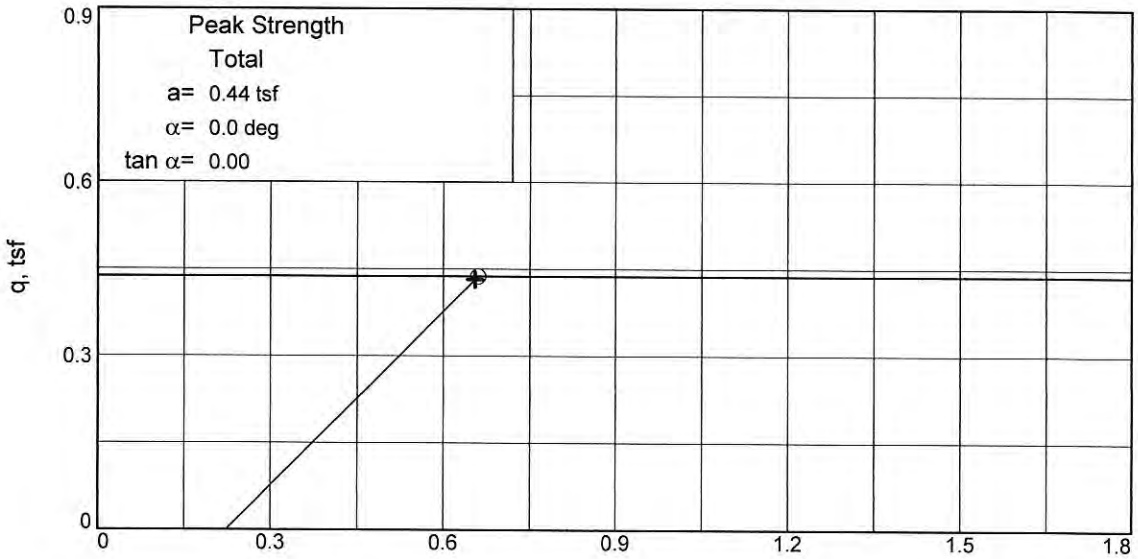
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

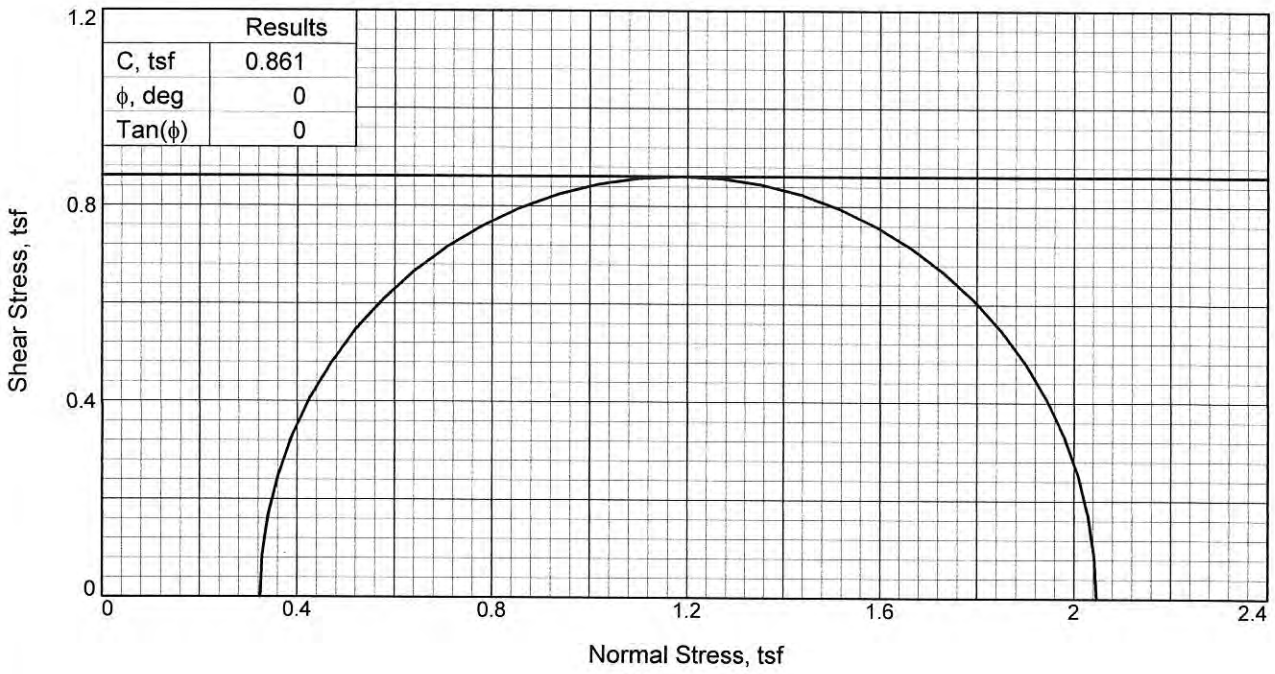
**Client:**

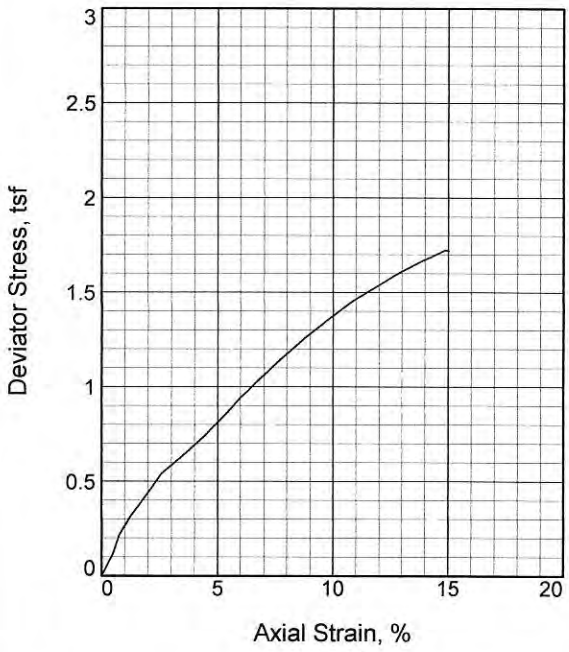
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB026 **Depth:** 8-10

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 20.6 |
| | Dry Density, pcf | 109.5 |
| | Saturation, % | 99.6 |
| | Void Ratio | 0.5685 |
| | Diameter, in. | 2.77 |
| | Height, in. | 5.74 |
| At Test | Water Content, % | 21.3 |
| | Dry Density, pcf | 109.5 |
| | Saturation, % | 103.1 |
| | Void Ratio | 0.5685 |
| | Diameter, in. | 2.77 |
| | Height, in. | 5.74 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 4.50 |
| Fail. Stress, tsf | | 1.72 |
| Ult. Stress, tsf | | |
| $\sigma_1$ Failure, tsf | | 2.05 |
| $\sigma_3$ Failure, tsf | | 0.32 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Tan and Gray SAND

**LL=** NV **PI=** NP

**Specific Gravity=** 2.75

**Remarks:**
Test Method: ASTM D2850
Failure Type: Bulge

**Figure** _____

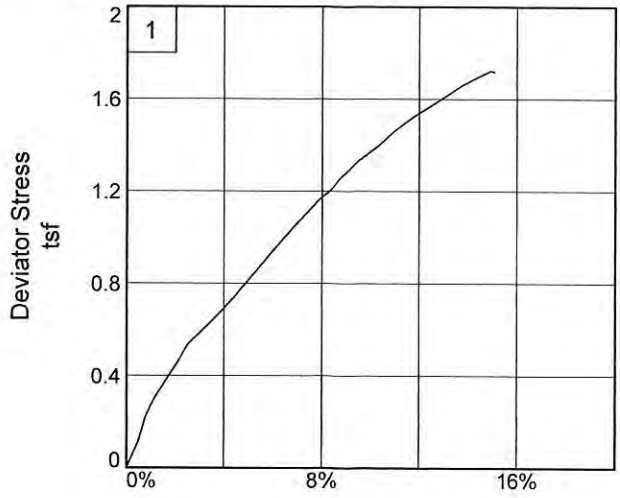
**Client:**

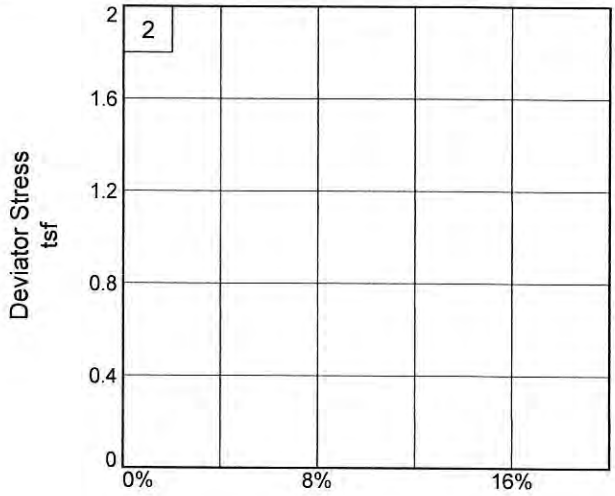
**Project:** San Jacinto River Waste Pit Superfund Site

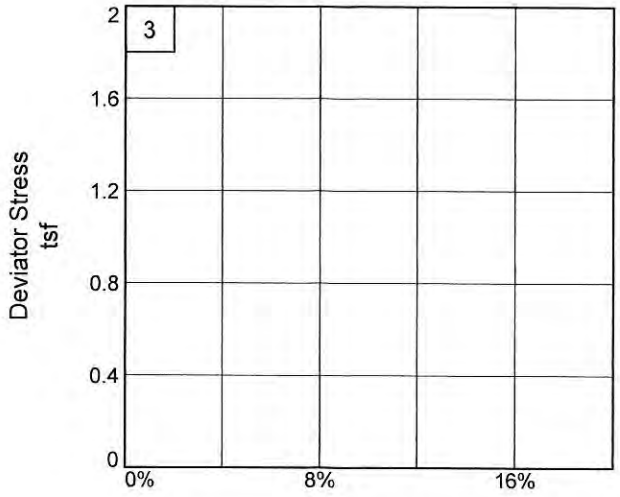
**Source of Sample:** SJGB026 **Depth:** 12-14

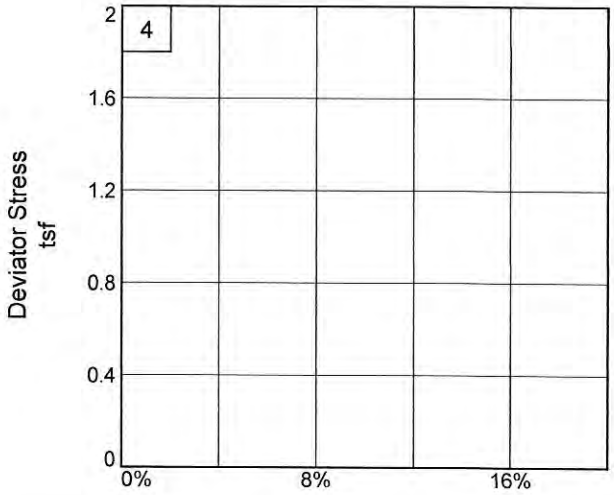
**Proj. No.:** 19.15.131 **Date Sampled:**

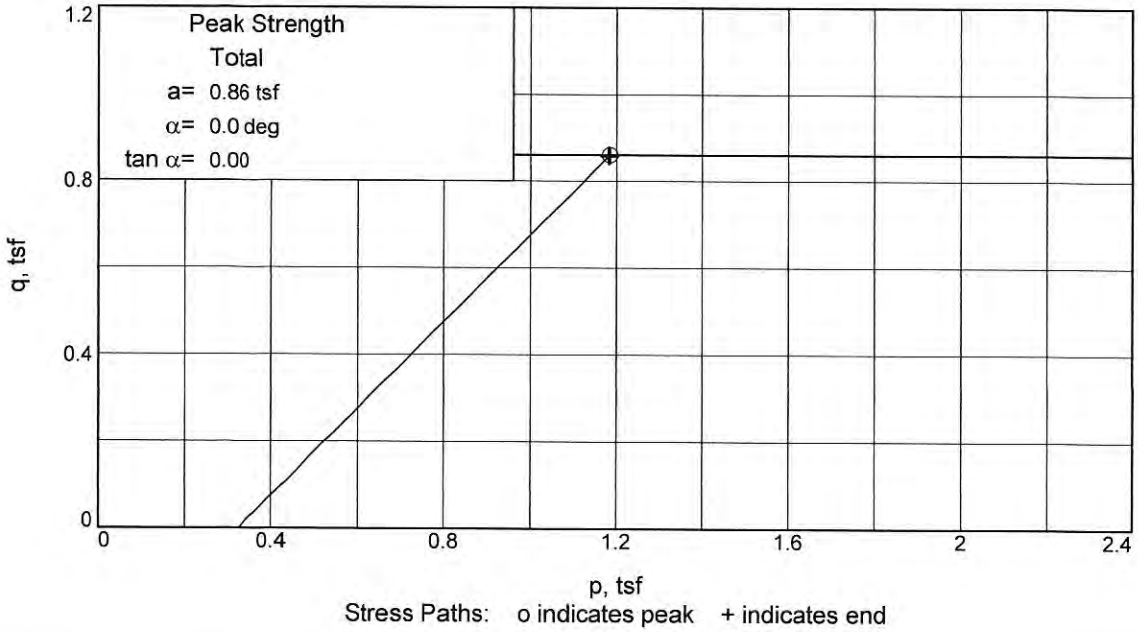
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

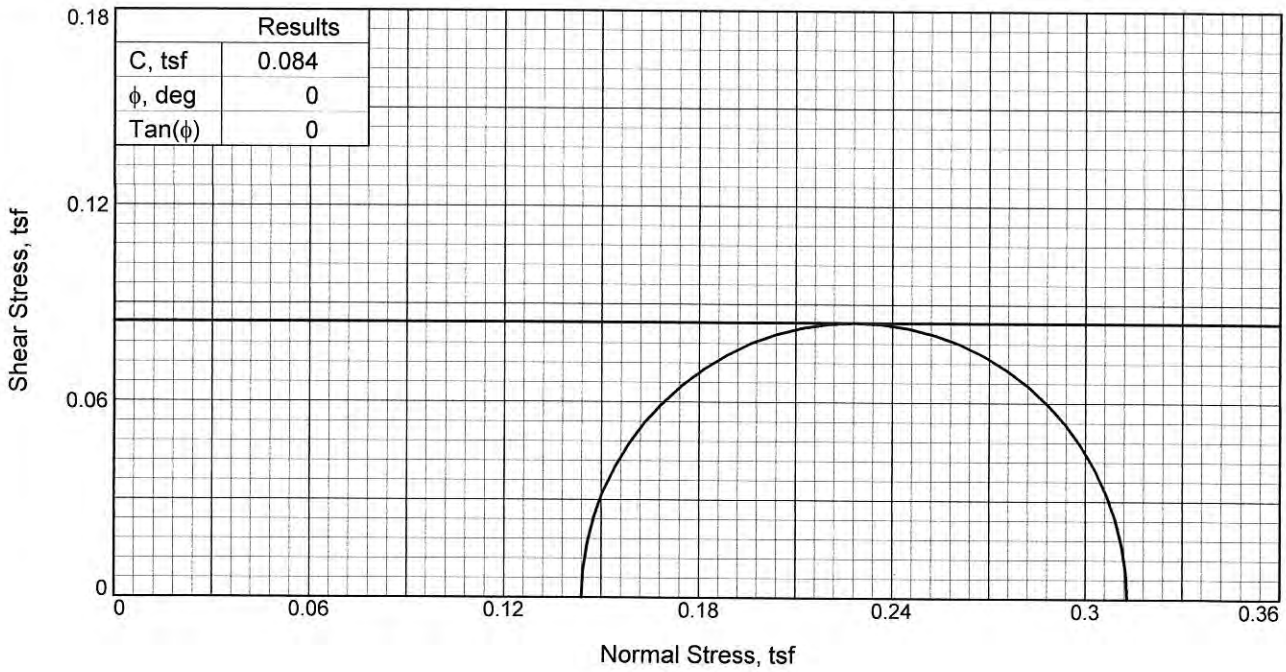
**Client:**

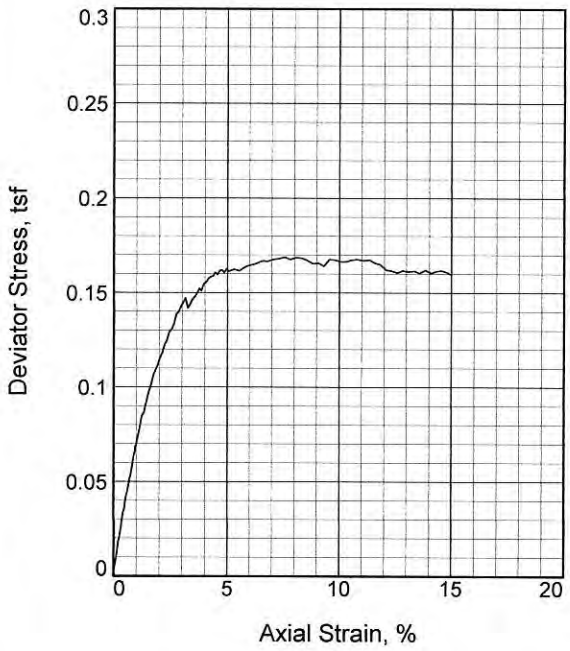
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB026 **Depth:** 12-14

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 139.7 |
| | Dry Density, pcf | 32.6 |
| | Saturation, % | 90.4 |
| | Void Ratio | 4.1710 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.84 |
| At Test | Water Content, % | 141.8 |
| | Dry Density, pcf | 32.6 |
| | Saturation, % | 91.8 |
| | Void Ratio | 4.1710 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.84 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 2.00 |
| Fail. Stress, tsf | | 0.17 |
| Strain, % | | 7.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.31 |
| $\sigma_3$ Failure, tsf | | 0.14 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Black FAT CLAY; Organics

**LL=** 151 **PL=** 44 **PI=** 107

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

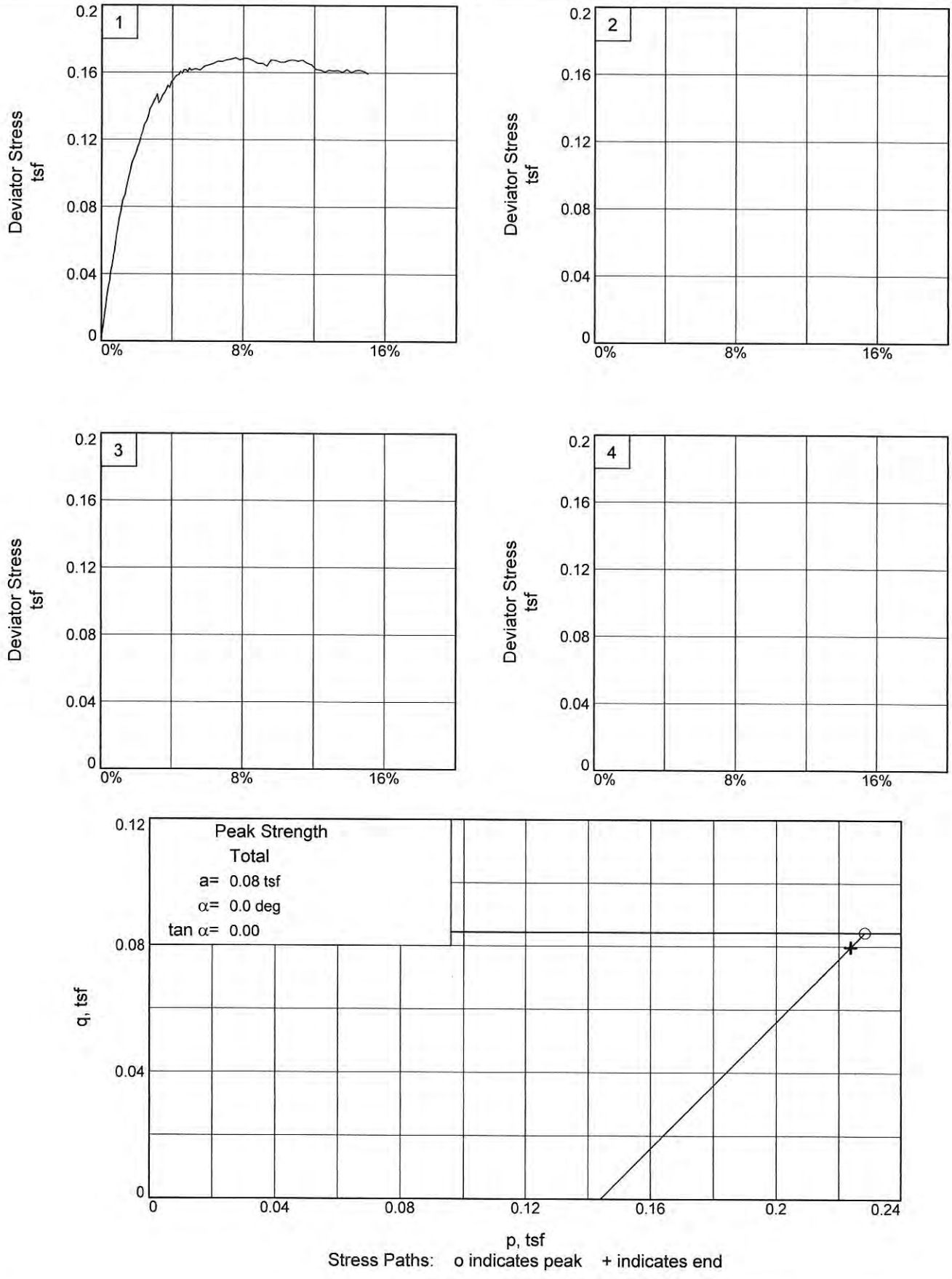
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB027 **Depth:** 2

**Proj. No.:** 19.15.131 **Date Sampled:** 1/29/20

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




**Client:**

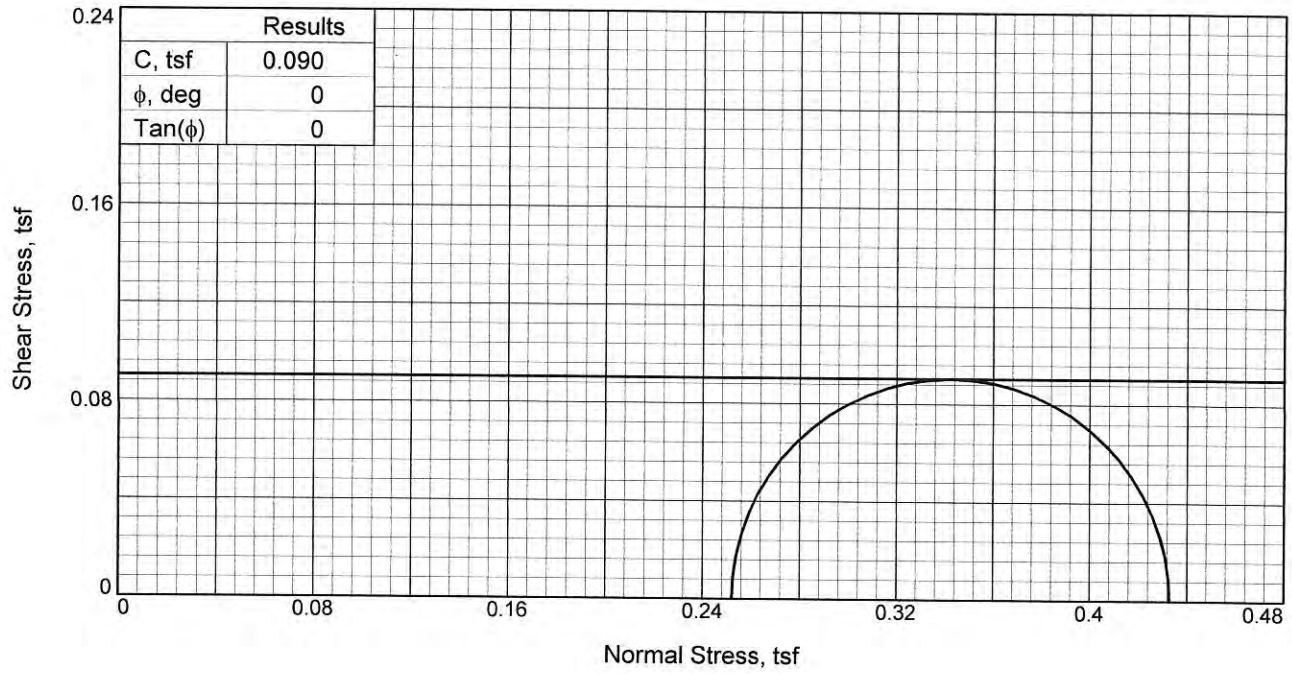
**Project:** San Jacinto River Waste Pit Superfund Site

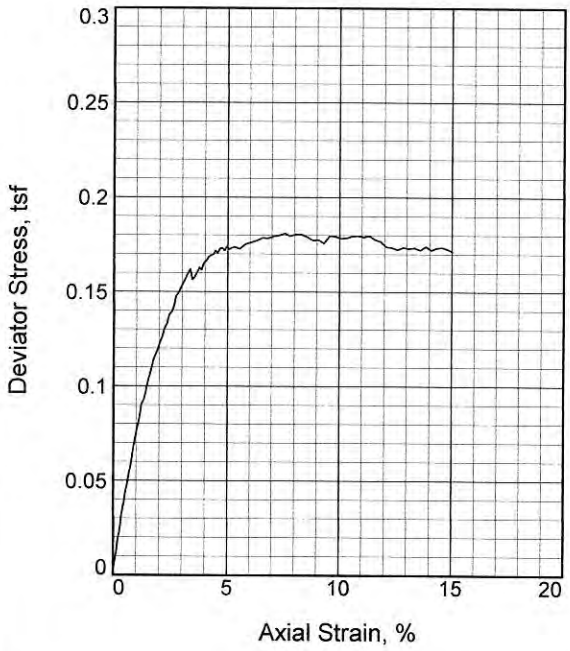
**Source of Sample:** SJGB027 **Depth:** 2

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**

Attachment Figure B.2-82




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 22.4 |
| | Dry Density, pcf | 104.5 |
| | Saturation, % | 98.6 |
| | Void Ratio | 0.6123 |
| | Diameter, in. | 2.75 |
| | Height, in. | 5.84 |
| At Test | Water Content, % | 25.2 |
| | Dry Density, pcf | 104.5 |
| | Saturation, % | 111.0 |
| | Void Ratio | 0.6123 |
| | Diameter, in. | 2.75 |
| | Height, in. | 5.84 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 3.50 |
| Fail. Stress, tsf | | 0.18 |
| Strain, % | | 7.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.43 |
| $\sigma_3$ Failure, tsf | | 0.25 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Gray CLAYEY SAND

**LL=** 41 **PL=** 21 **PI=** 20
**Assumed Specific Gravity=** 2.70
**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

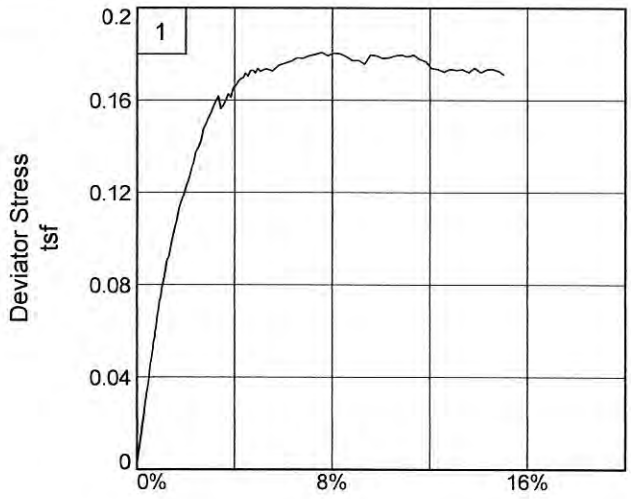
**Client:**

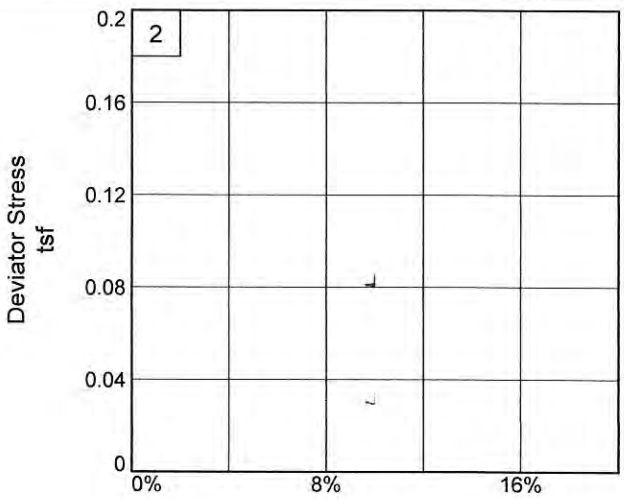
**Project:** San Jacinto River Waste Pit Superfund Site

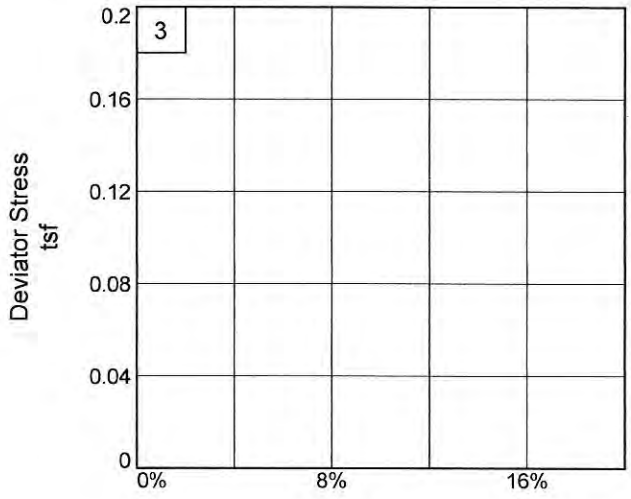
**Source of Sample:** SJGB027 **Depth:** 4

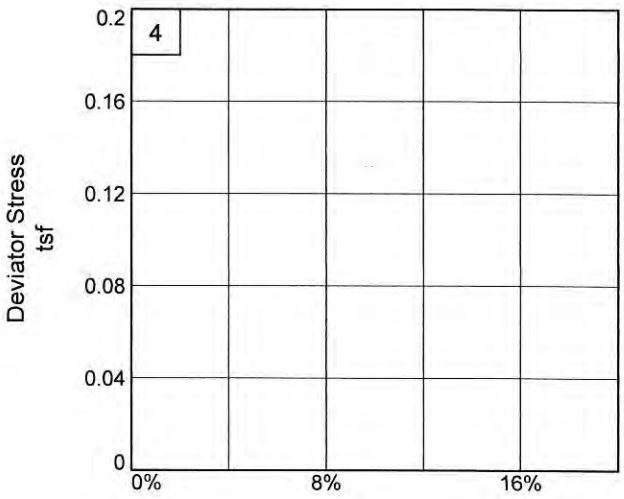
**Proj. No.:** 19.15.131 **Date Sampled:** 1/21/20

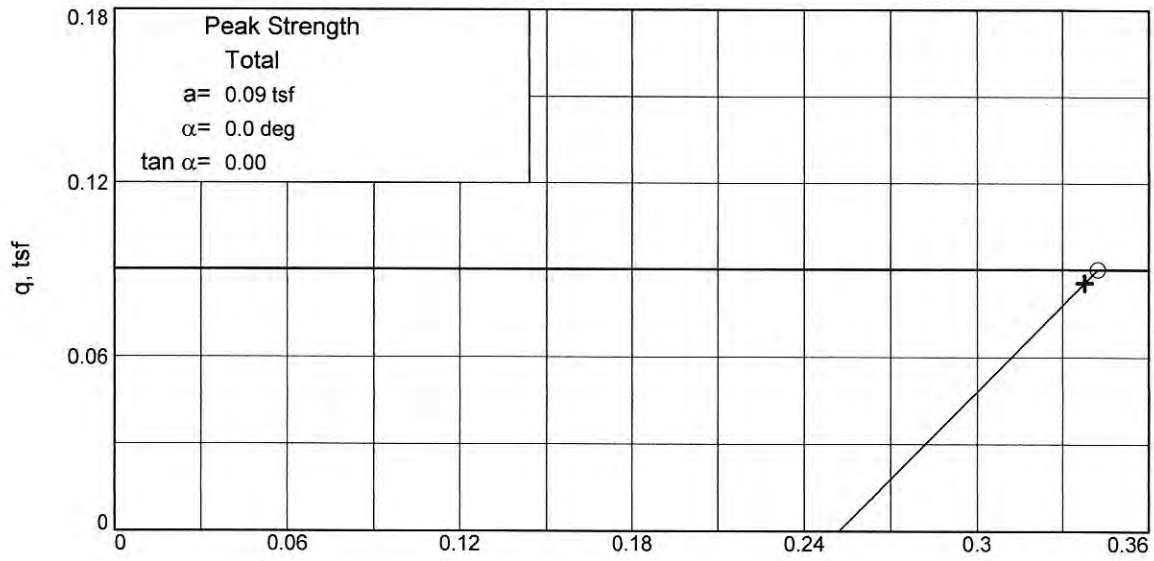
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

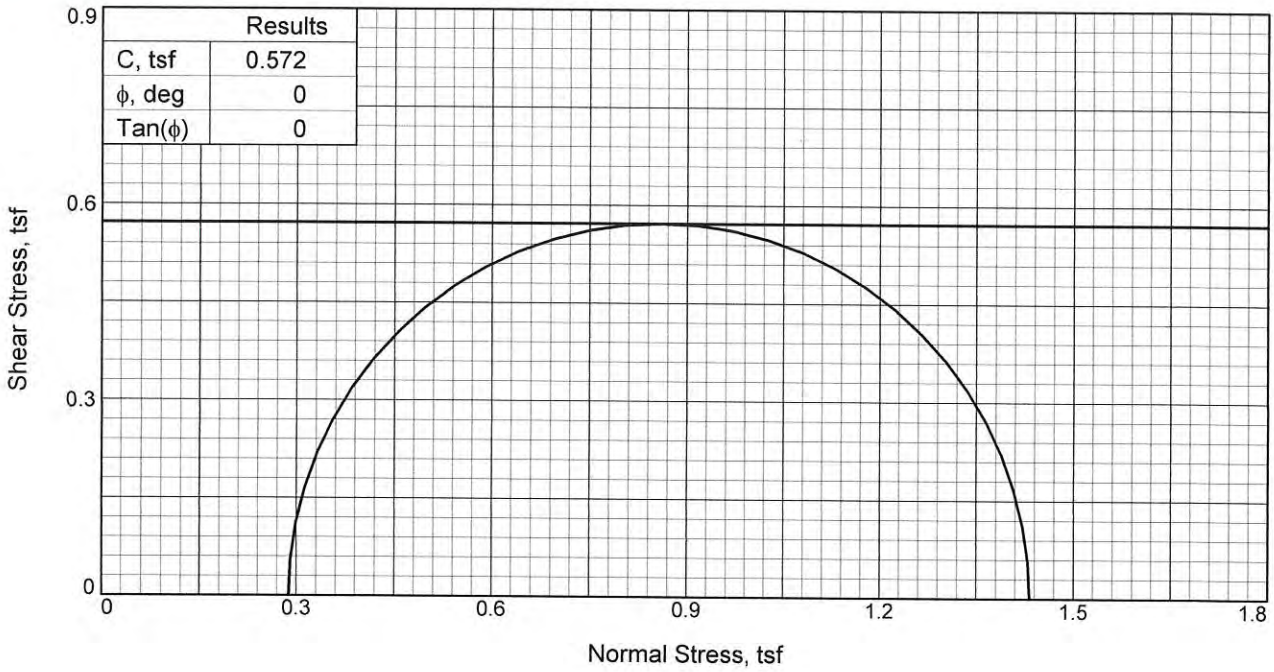
**Client:**

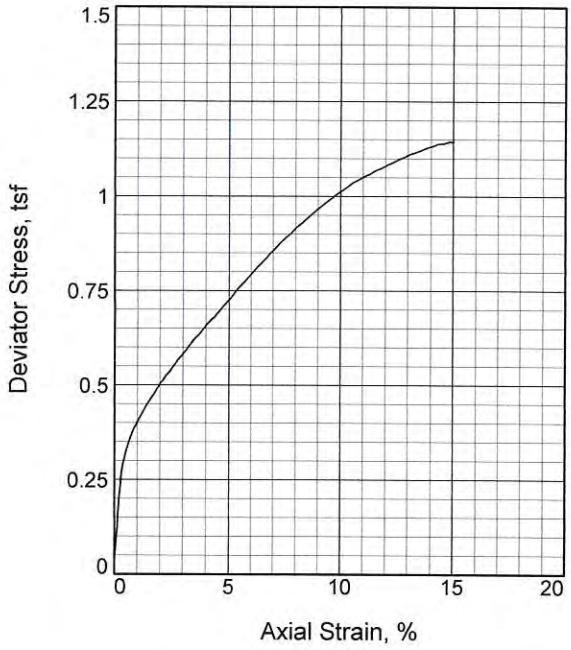
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB027 **Depth:** 4

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 20.3 |
| | Dry Density, pcf | 107.6 |
| | Saturation, % | 96.8 |
| | Void Ratio | 0.5662 |
| | Diameter, in. | 2.76 |
| | Height, in. | 5.85 |
| At Test | Water Content, % | 18.4 |
| | Dry Density, pcf | 107.6 |
| | Saturation, % | 87.8 |
| | Void Ratio | 0.5662 |
| | Diameter, in. | 2.76 |
| | Height, in. | 5.85 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 4.00 |
| Fail. Stress, tsf | | 1.14 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.43 |
| $\sigma_3$ Failure, tsf | | 0.29 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Gray SANDY LEAN CLAY

**LL=** 37 **PL=** 17 **PI=** 20
**Assumed Specific Gravity=** 2.70
**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

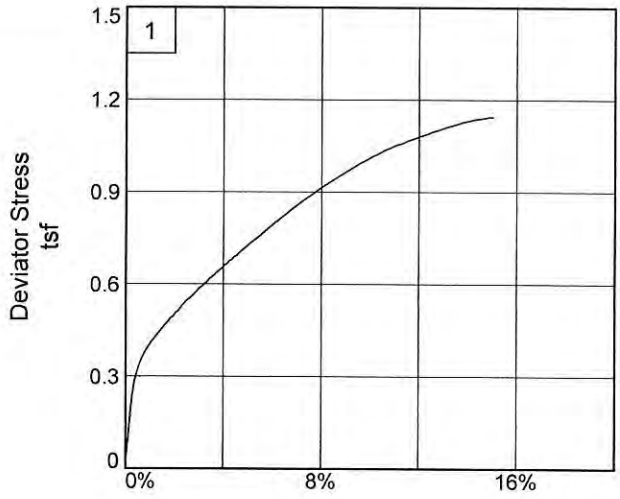
**Client:**

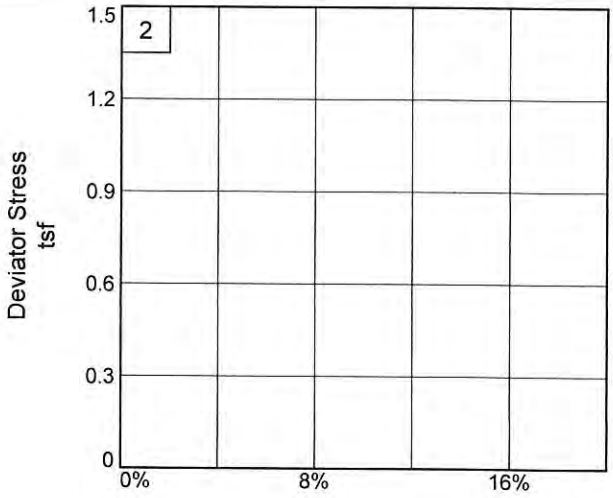
**Project:** San Jacinto River Waste Pit Superfund Site

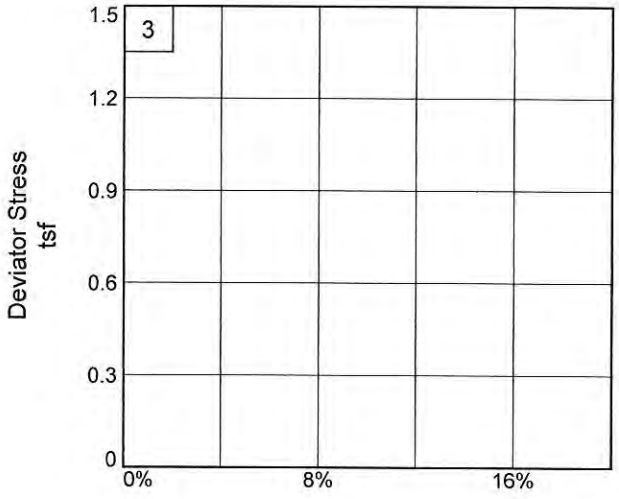
**Source of Sample:** SJGB027 **Depth:** 6

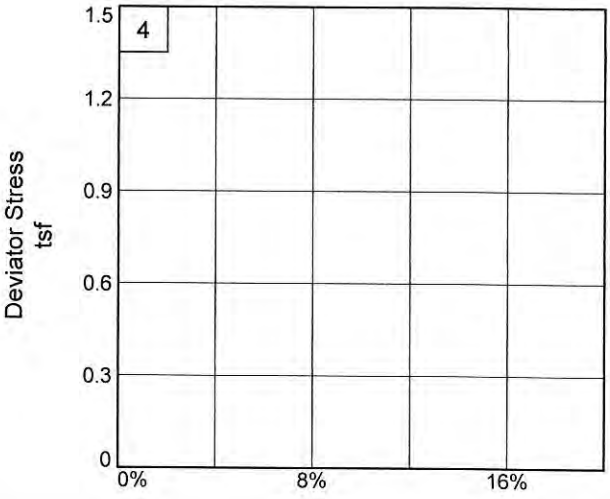
**Proj. No.:** 19.15.131 **Date Sampled:** 1/21/20

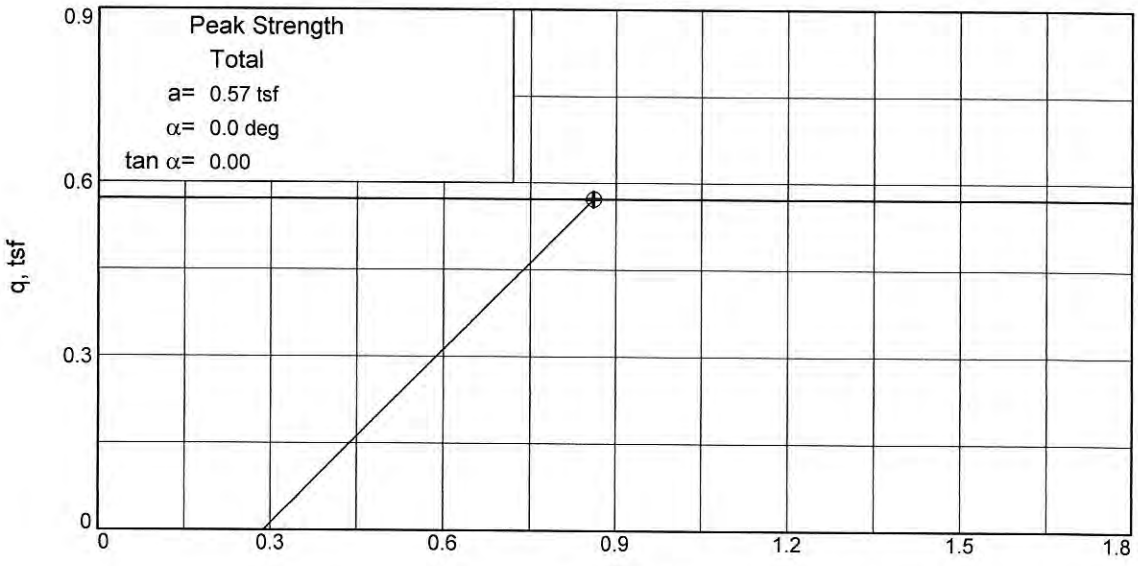
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

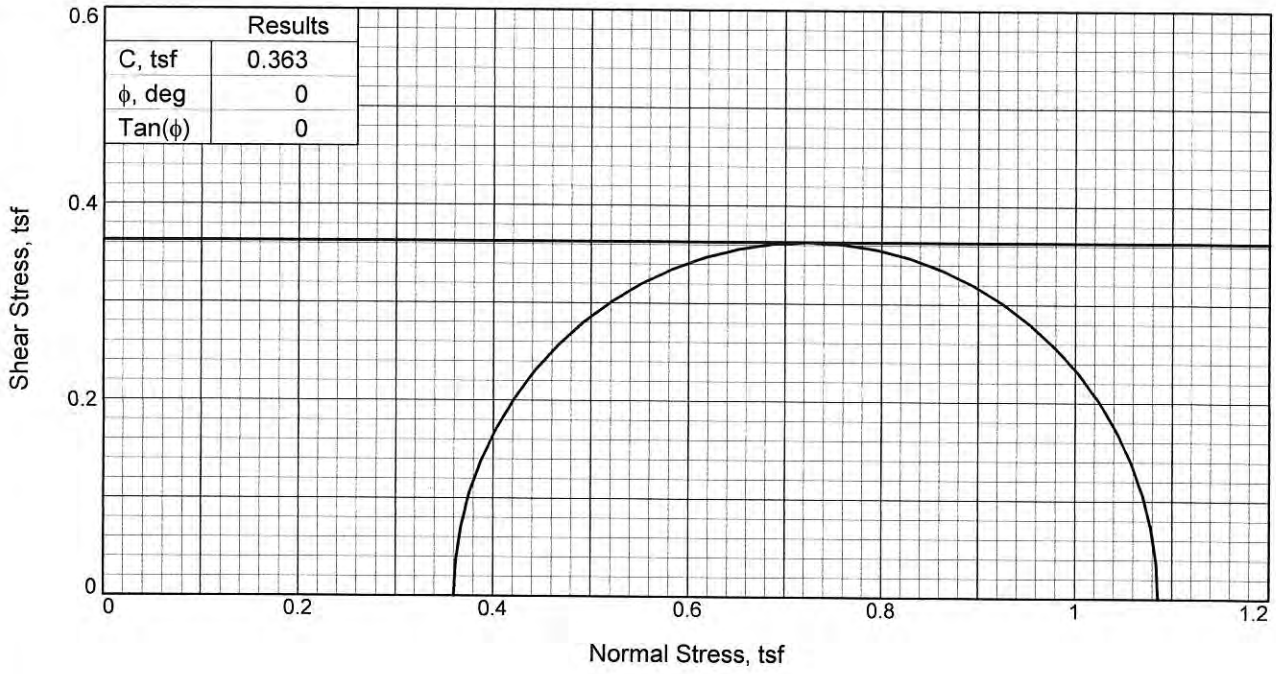
**Client:**

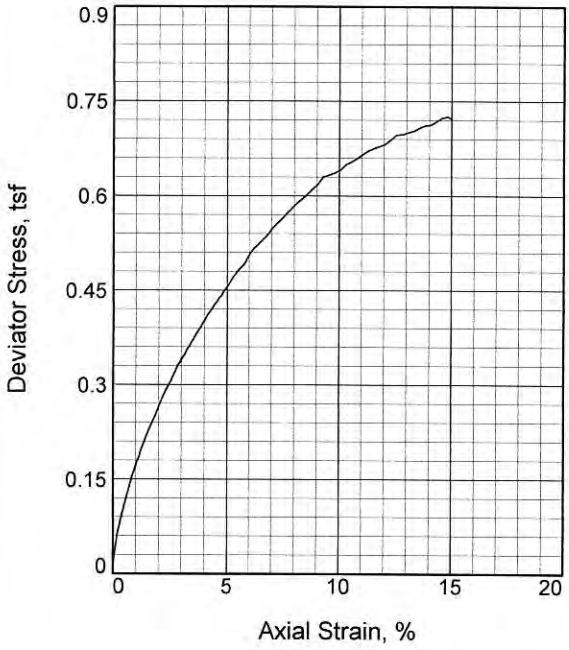
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB027 **Depth:** 6

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 17.9 |
| | Dry Density, pcf | 111.3 |
| | Saturation, % | 93.9 |
| | Void Ratio | 0.5138 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.83 |
| At Test | Water Content, % | 16.7 |
| | Dry Density, pcf | 111.3 |
| | Saturation, % | 87.9 |
| | Void Ratio | 0.5138 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.83 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 5.00 |
| Fail. Stress, tsf | | 0.73 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.09 |
| $\sigma_3$ Failure, tsf | | 0.36 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY

**LL=** 39 **PL=** 18 **PI=** 21

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

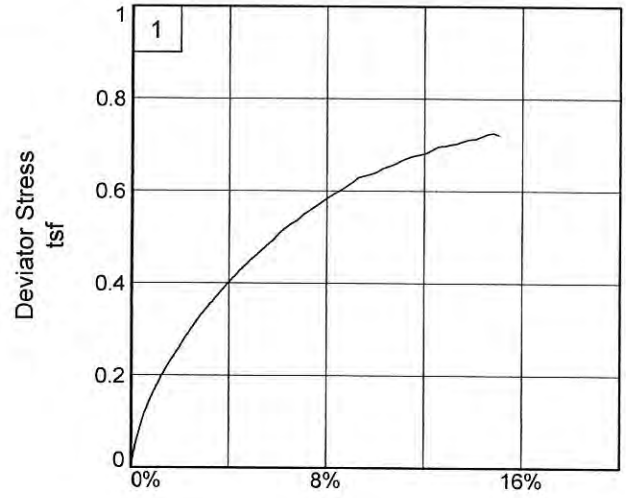
**Client:**

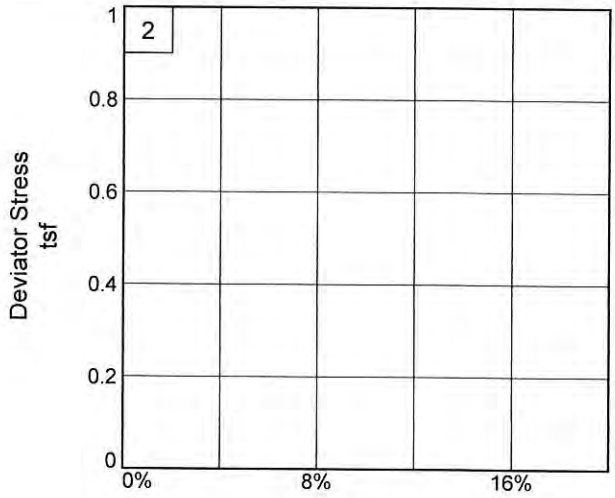
**Project:** San Jacinto River Waste Pit Superfund Site

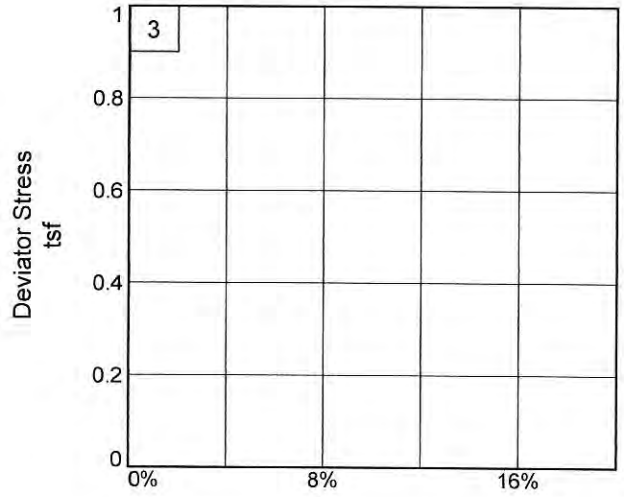
**Source of Sample:** SJGB027 **Depth:** 8

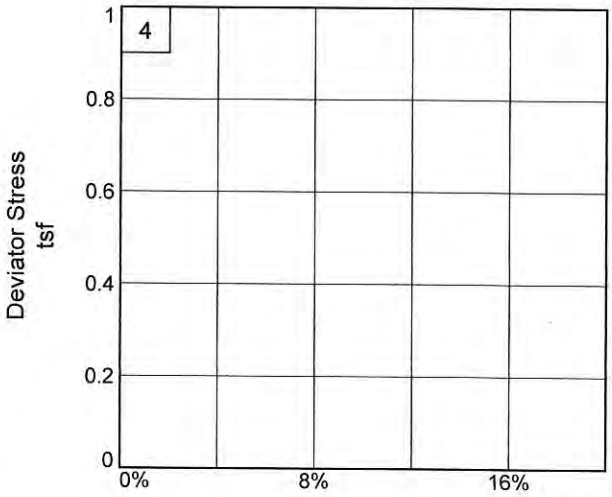
**Proj. No.:** 19.15.131 **Date Sampled:** 1/21/20

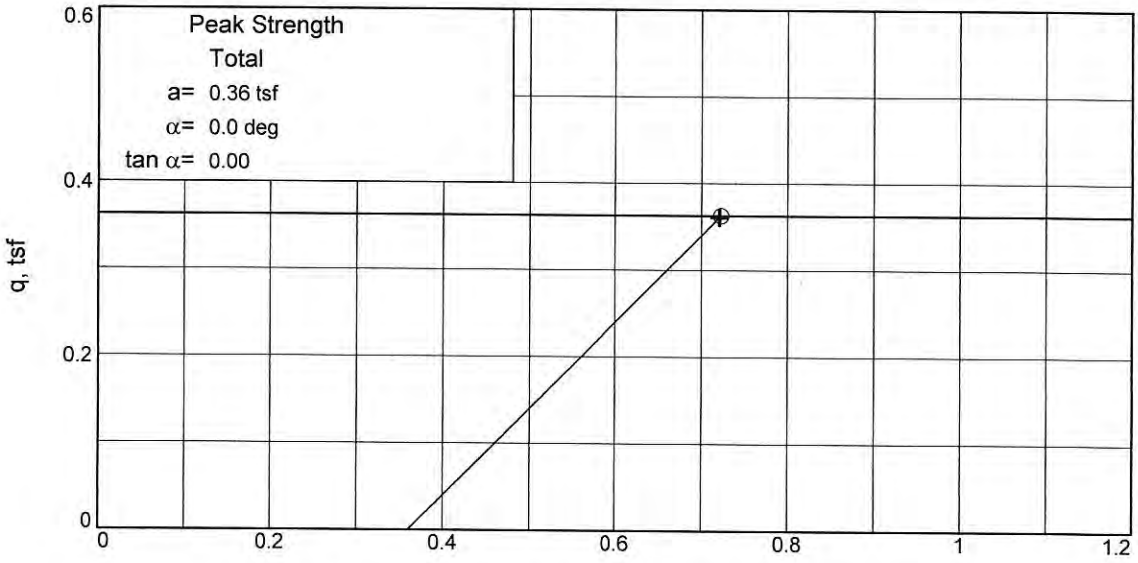
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

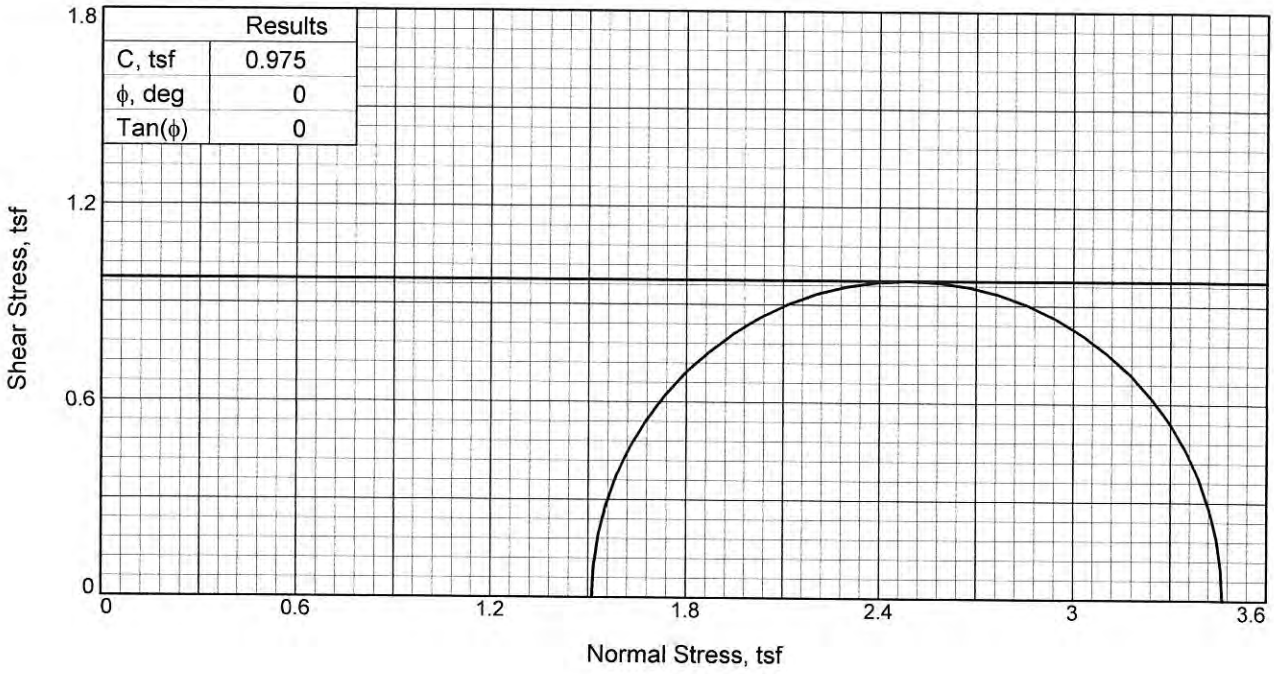
**Client:**

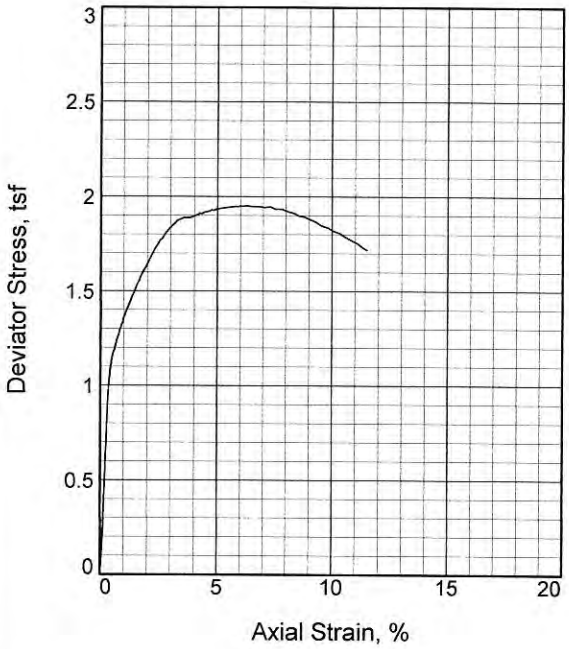
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB027 **Depth:** 8

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 31.2 |
| | Dry Density, pcf | 92.1 |
| | Saturation, % | 99.4 |
| | Void Ratio | 0.8638 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.88 |
| At Test | Water Content, % | 29.1 |
| | Dry Density, pcf | 92.1 |
| | Saturation, % | 92.7 |
| | Void Ratio | 0.8638 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.88 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 21.00 |
| Fail. Stress, tsf | | 1.95 |
| Strain, % | | 6.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.46 |
| $\sigma_3$ Failure, tsf | | 1.51 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Tan FAT CLAY

**LL=** 59 **PL=** 21 **PI=** 38

**Assumed Specific Gravity=** 2.75

**Remarks:**
Test method: ASTM D2850
Failure type: Slickensided

**Figure** _____

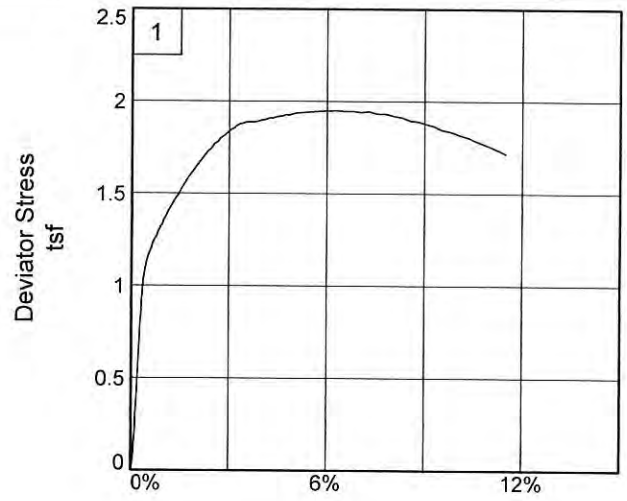
**Client:**

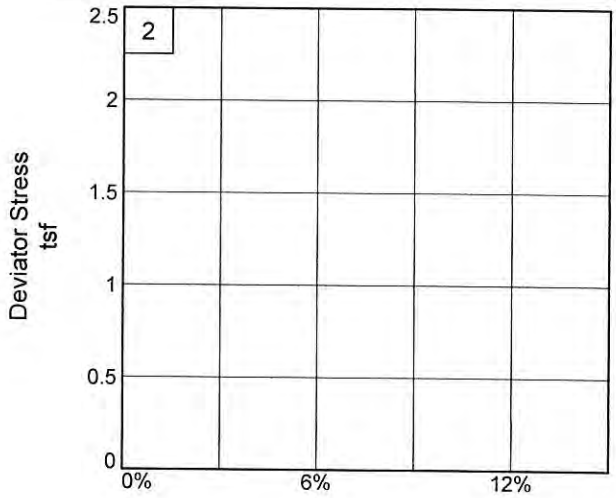
**Project:** San Jacinto River Waste Pit Superfund Site

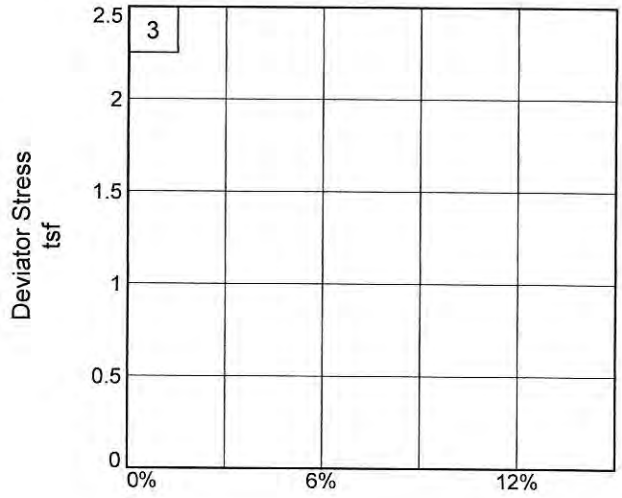
**Source of Sample:** SJGB027 **Depth:** 48

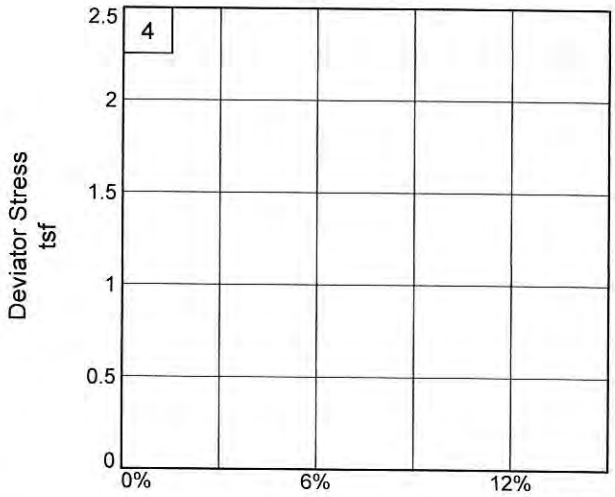
**Proj. No.:** 19.15.131 **Date Sampled:** 1/16/2020

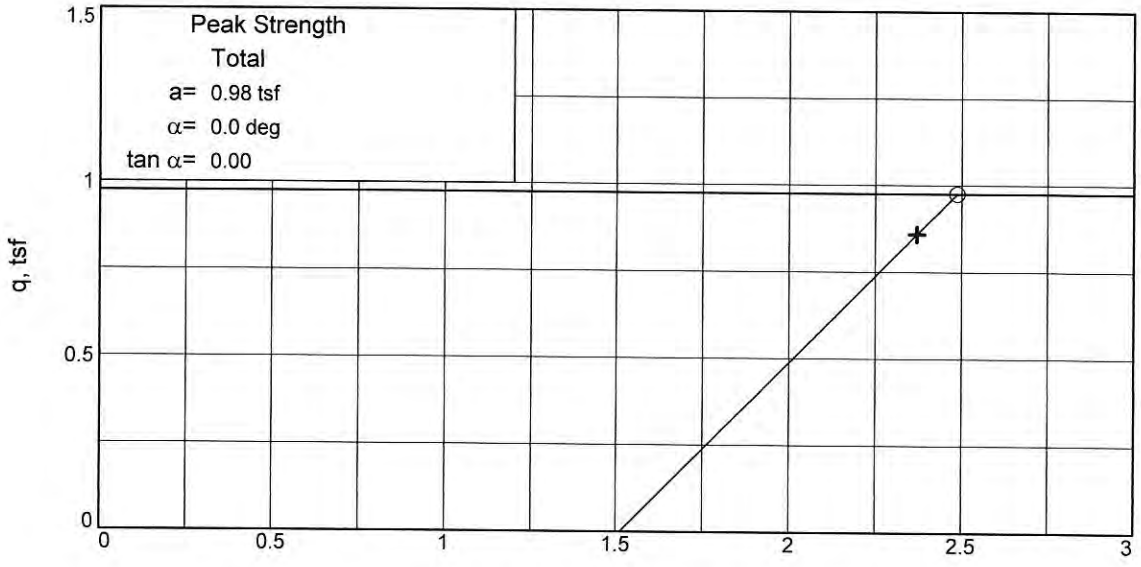
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

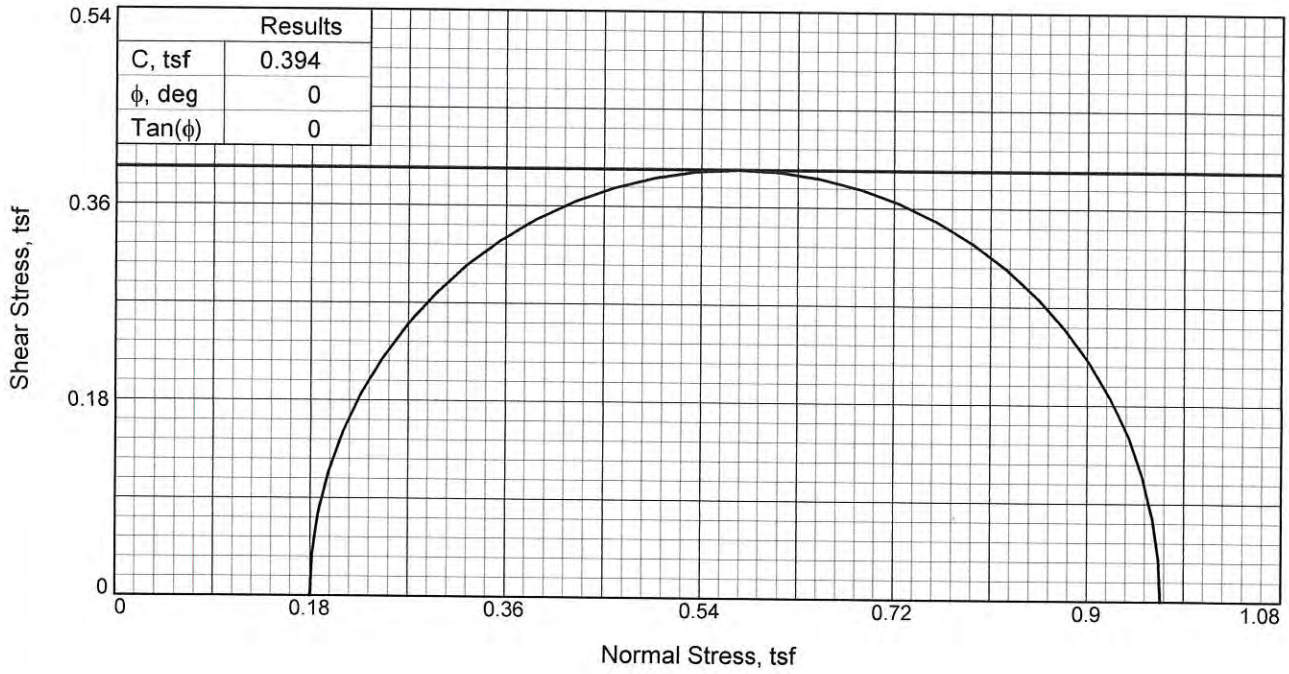
**Client:**

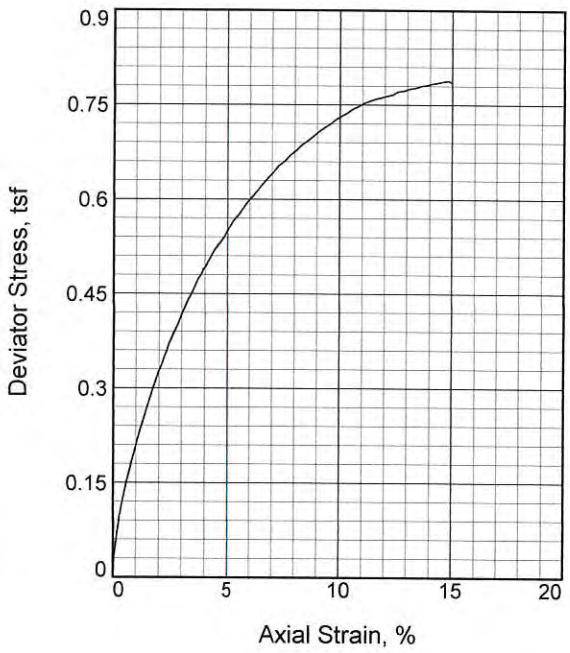
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB027 **Depth:** 48

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 13.3 |
| | Dry Density, pcf | 115.5 |
| | Saturation, % | 78.3 |
| | Void Ratio | 0.4588 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.89 |
| At Test | Water Content, % | 13.2 |
| | Dry Density, pcf | 115.5 |
| | Saturation, % | 77.8 |
| | Void Ratio | 0.4588 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.89 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 2.50 |
| Fail. Stress, tsf | | 0.79 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.97 |
| $\sigma_3$ Failure, tsf | | 0.18 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Black LEAN CLAY with SAND; sand seams and organics

**LL=** 32 **PL=** 15 **PI=** 17

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

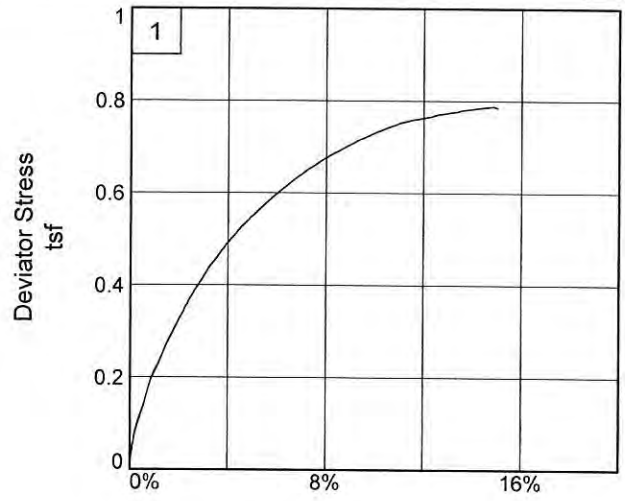
**Client:**

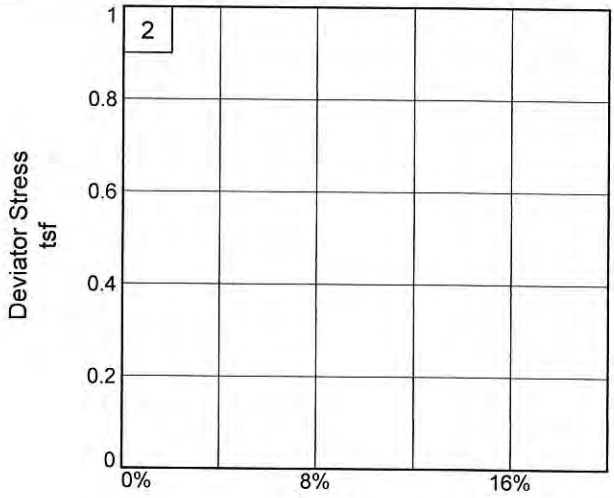
**Project:** San Jacinto River Waste Pit Superfund Site

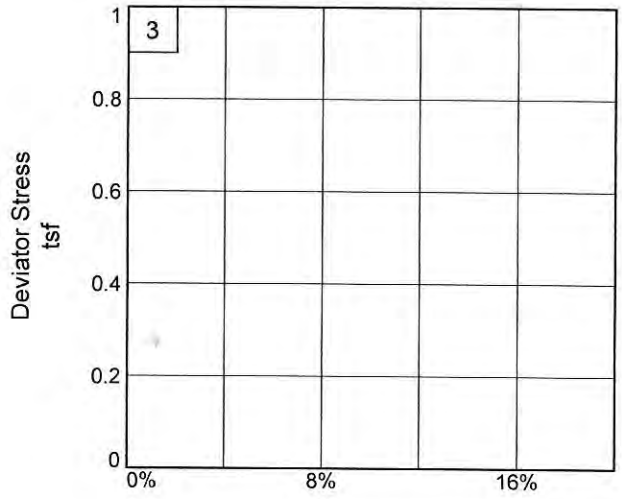
**Source of Sample:** SJGB028 **Depth:** 4

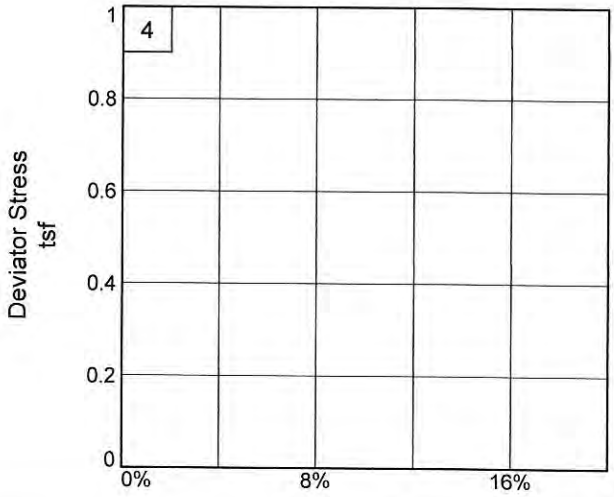
**Proj. No.:** 19.15.131 **Date Sampled:** 1/21/20

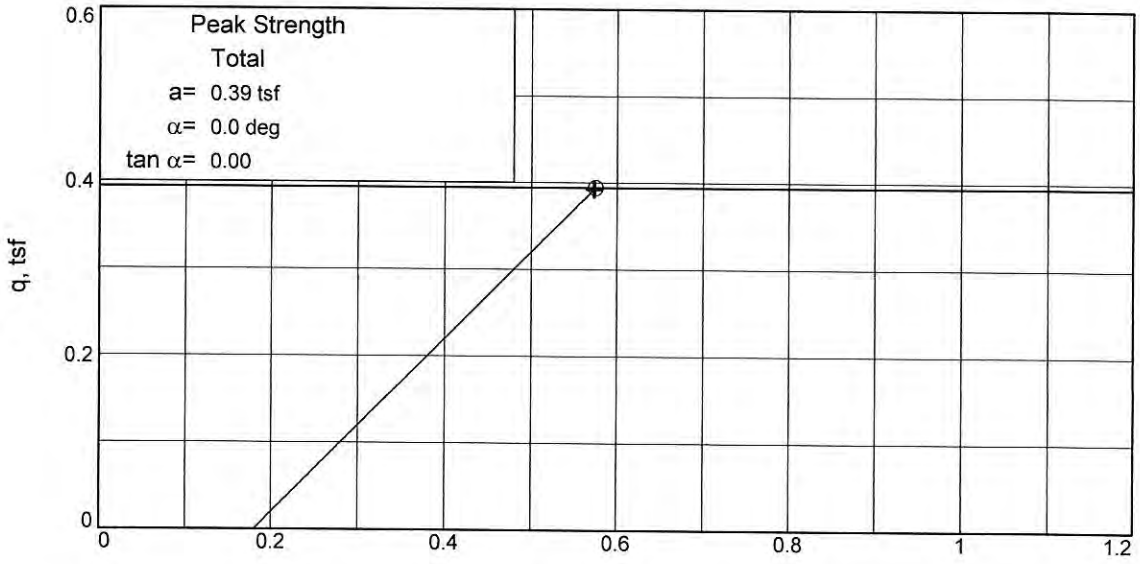
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

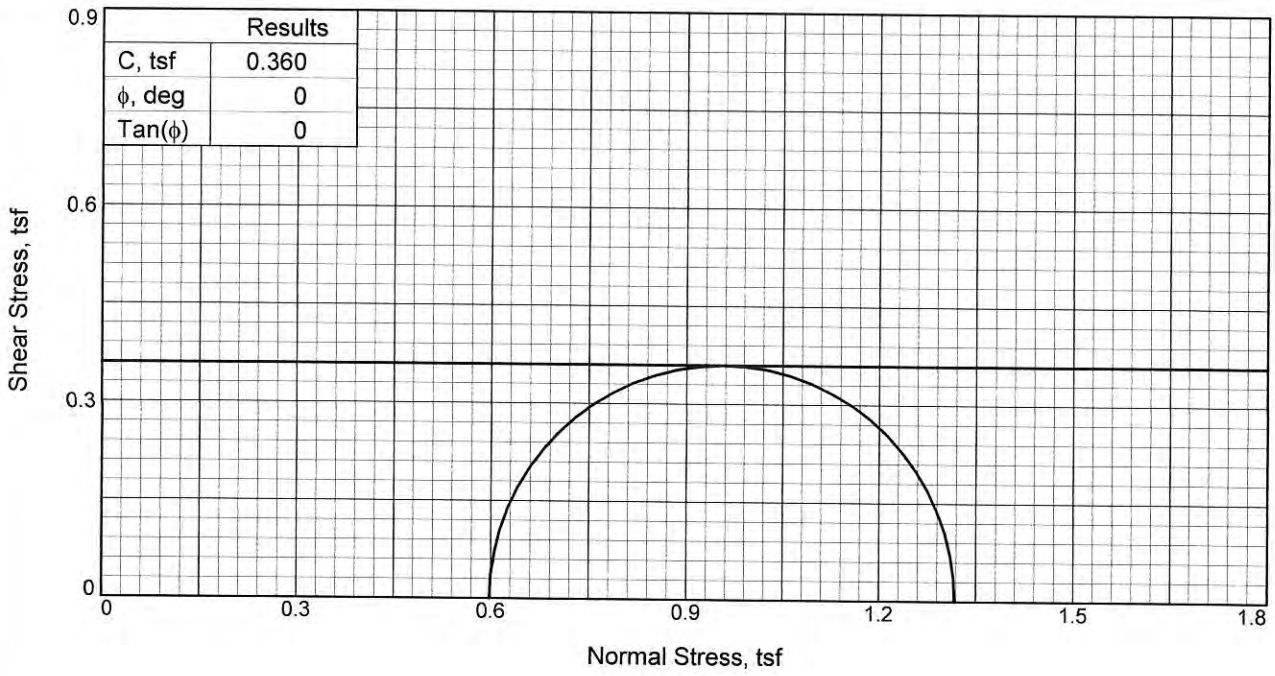
**Client:**

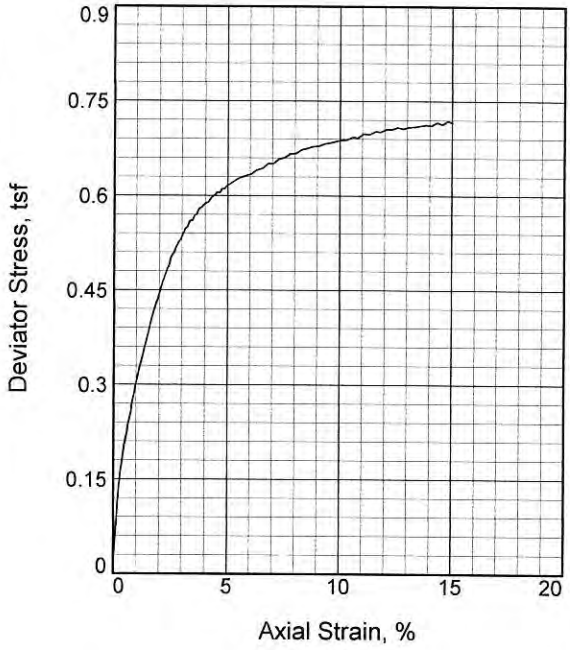
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB028 **Depth:** 4

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 27.8 |
| | Dry Density, pcf | 94.3 |
| | Saturation, % | 95.4 |
| | Void Ratio | 0.7883 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.84 |
| At Test | Water Content, % | 26.0 |
| | Dry Density, pcf | 94.3 |
| | Saturation, % | 89.0 |
| | Void Ratio | 0.7883 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.84 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 8.30 |
| Fail. Stress, tsf | | 0.72 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.32 |
| $\sigma_3$ Failure, tsf | | 0.60 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY with SAND

**LL=** 41 **PL=** 18 **PI=** 23

**Assumed Specific Gravity=** 2.70

**Remarks:**
Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

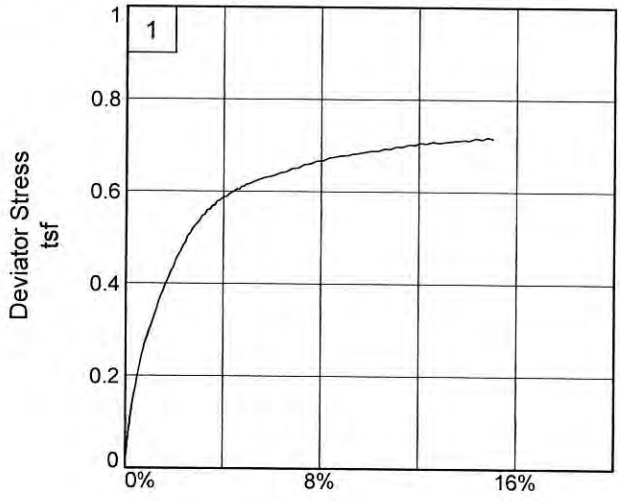
**Client:**

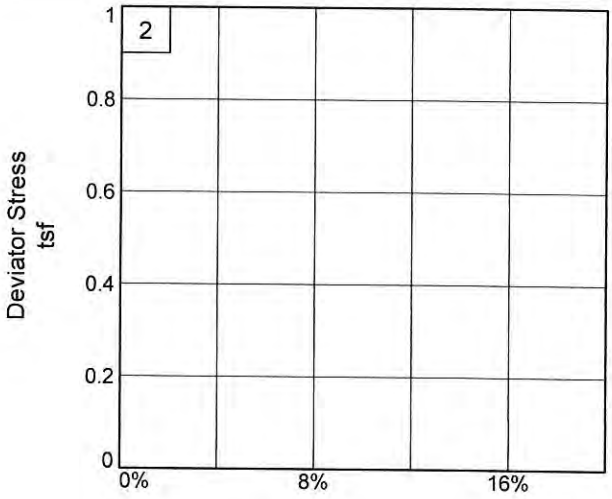
**Project:** San Jacinto River Waste Pit Superfund Site

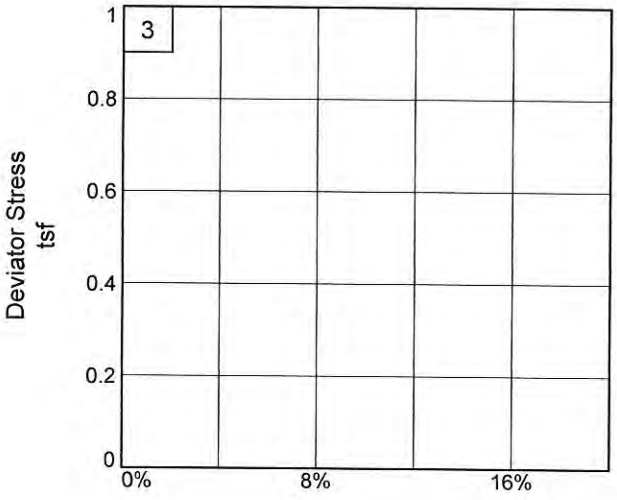
**Source of Sample:** SJGB028 **Depth:** 18

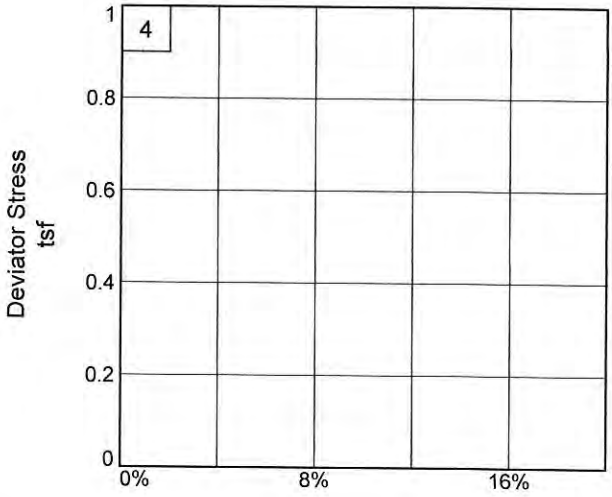
**Proj. No.:** 19.15.131 **Date Sampled:** 1/15/2020

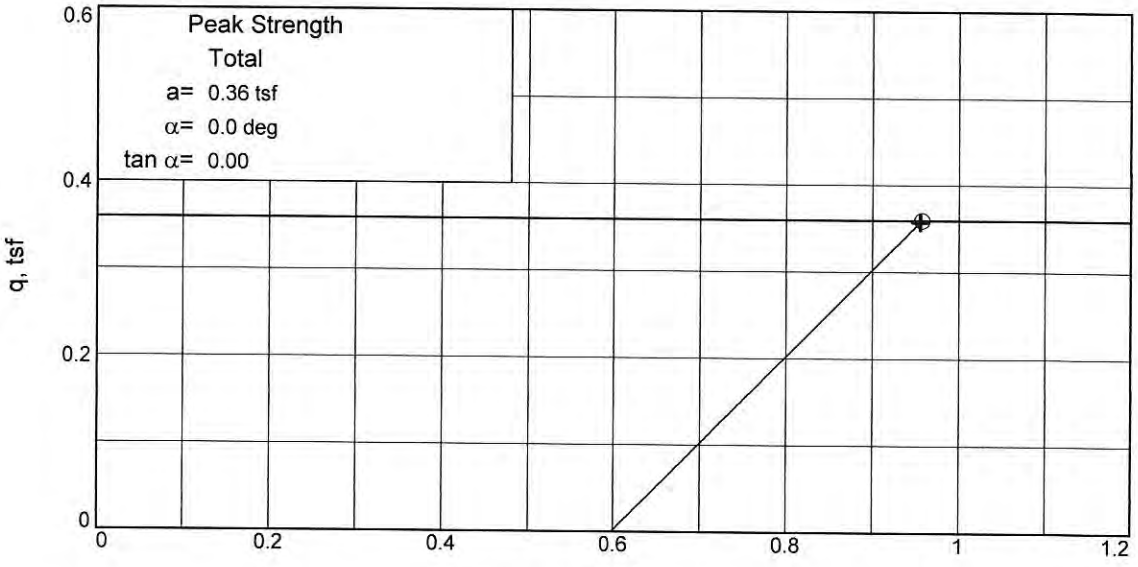
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

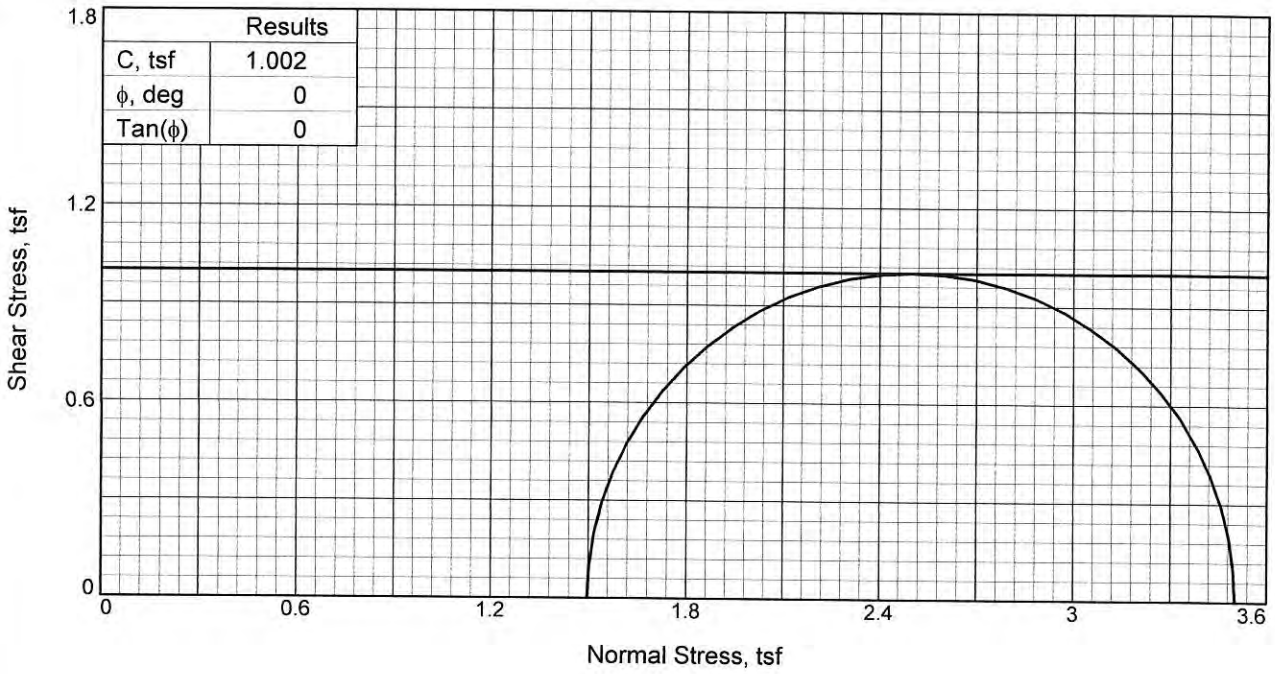
**Client:**

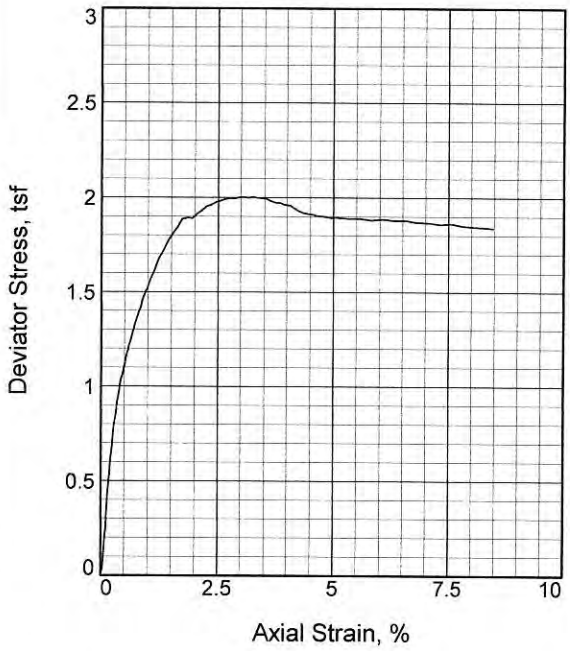
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB028 **Depth:** 18

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 26.1 |
| | Dry Density, pcf | 97.8 |
| | Saturation, % | 97.4 |
| | Void Ratio | 0.7243 |
| | Diameter, in. | 2.86 |
| | Height, in. | 5.99 |
| At Test | Water Content, % | 25.5 |
| | Dry Density, pcf | 97.8 |
| | Saturation, % | 95.1 |
| | Void Ratio | 0.7243 |
| | Diameter, in. | 2.86 |
| | Height, in. | 5.99 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 20.80 |
| Fail. Stress, tsf | | 2.00 |
| Strain, % | | 3.2 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.50 |
| $\sigma_3$ Failure, tsf | | 1.50 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Reddish-brown FAT CLAY

**LL=** 70 **PL=** 23 **PI=** 47

**Assumed Specific Gravity=** 2.70

**Remarks:**
Test method: ASTM D2850
Failure type: Slickensided

**Figure** _____

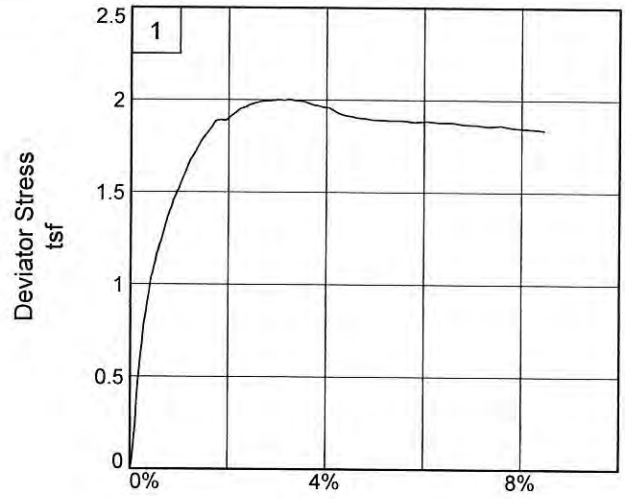
**Client:**

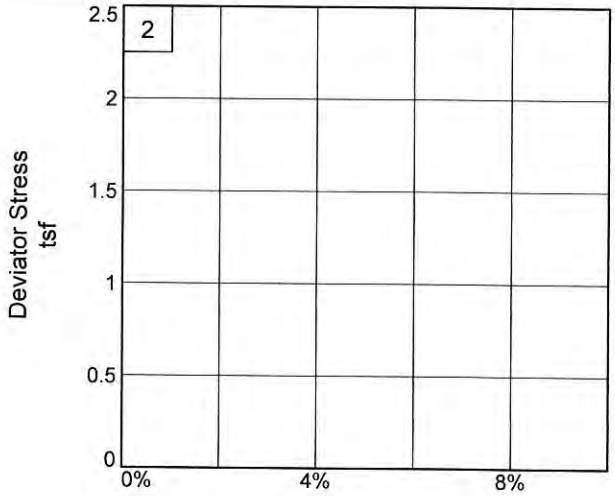
**Project:** San Jacinto River Waste Pit Superfund Site

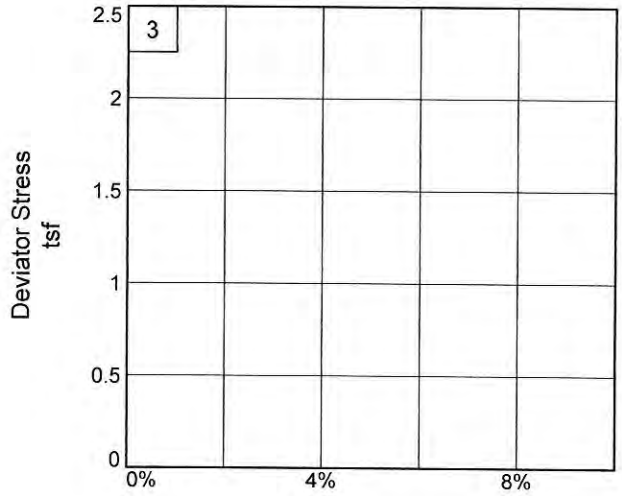
**Source of Sample:** SJGB028 **Depth:** 48

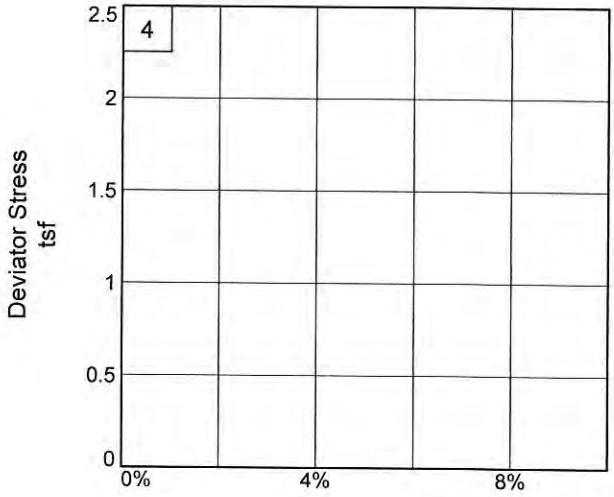
**Proj. No.:** 19.15.131 **Date Sampled:** 1/16/2020

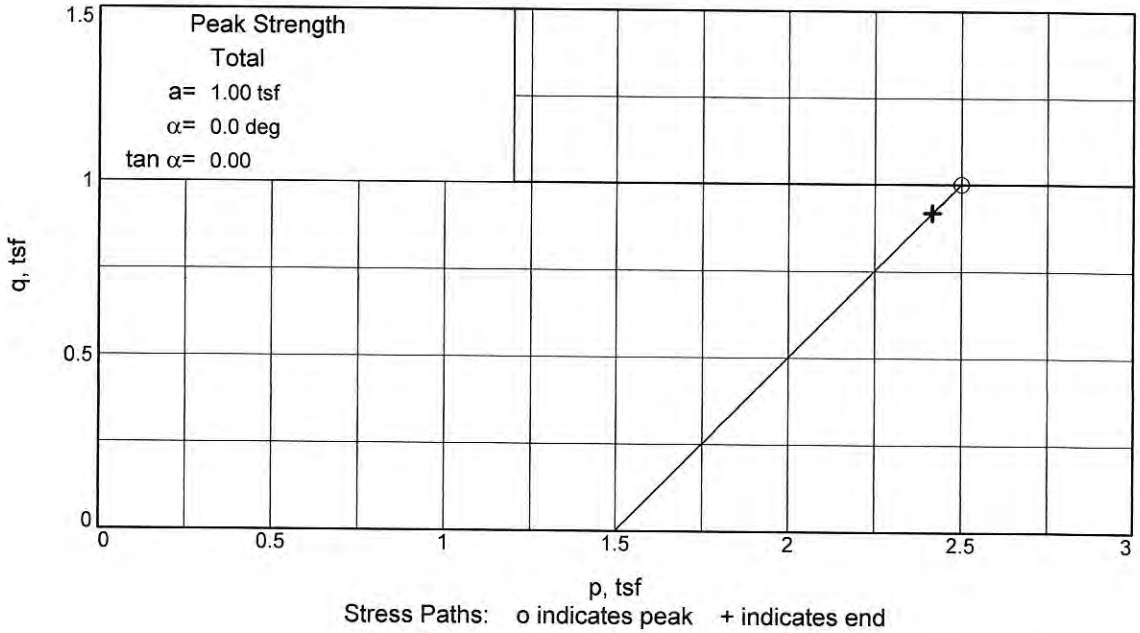
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

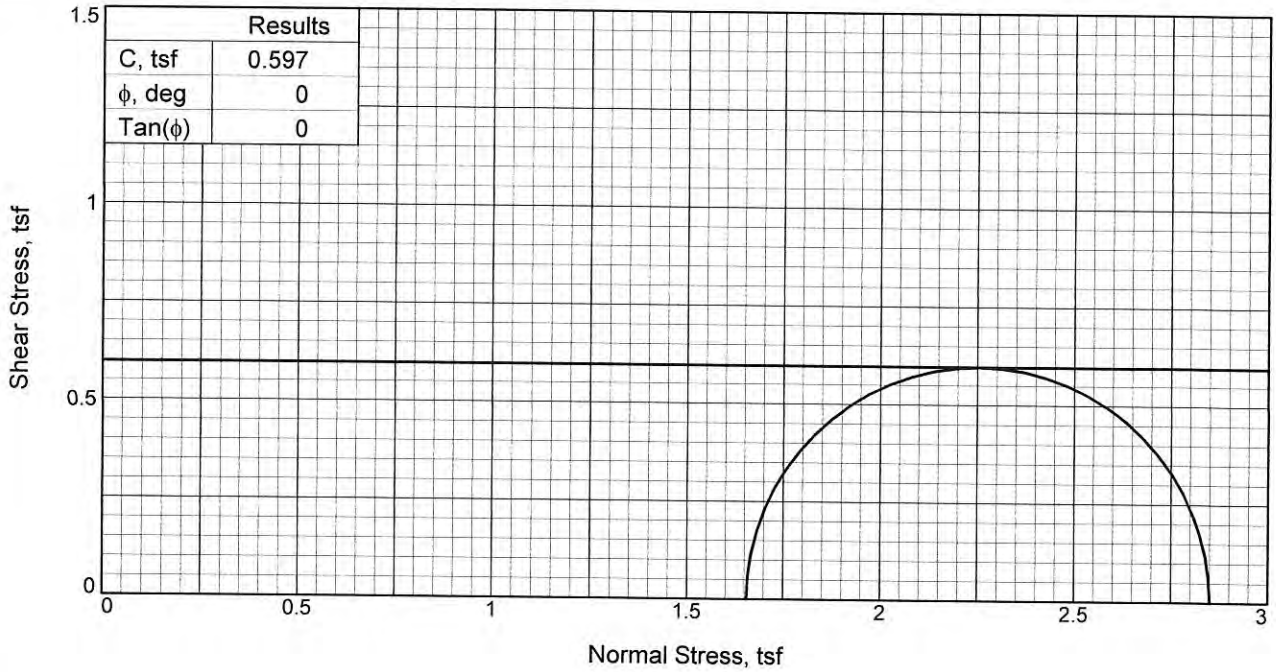
**Client:**

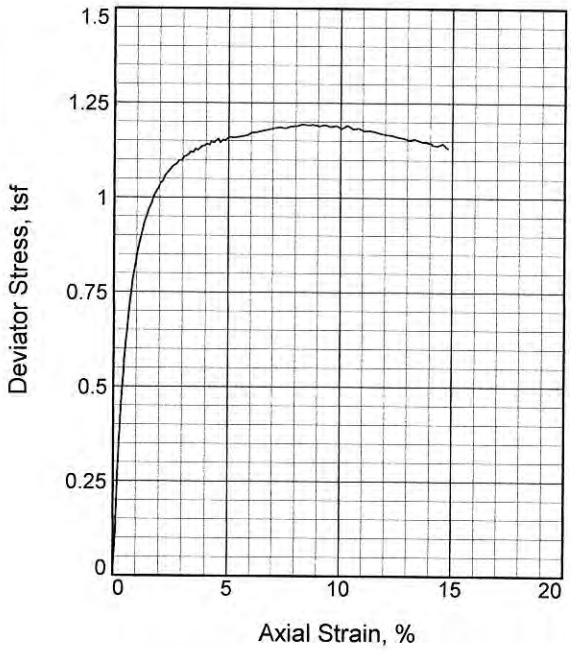
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB028 **Depth:** 48

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 31.5 |
| | Dry Density, pcf | 91.0 |
| | Saturation, % | 99.7 |
| | Void Ratio | 0.8524 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.91 |
| At Test | Water Content, % | 30.5 |
| | Dry Density, pcf | 91.0 |
| | Saturation, % | 96.5 |
| | Void Ratio | 0.8524 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.91 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 23.00 |
| Fail. Stress, tsf | | 1.19 |
| Strain, % | | 8.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.85 |
| $\sigma_3$ Failure, tsf | | 1.66 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Reddish-brown FAT CLAY

**LL=** 75 **PL=** 23 **PI=** 52
**Assumed Specific Gravity=** 2.70
**Remarks:**
Test method: ASTM D2850
Failure type: Slickensided

**Figure** _____

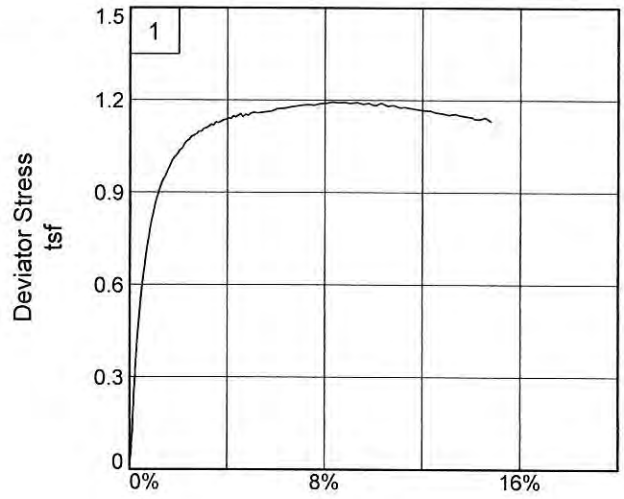
**Client:**

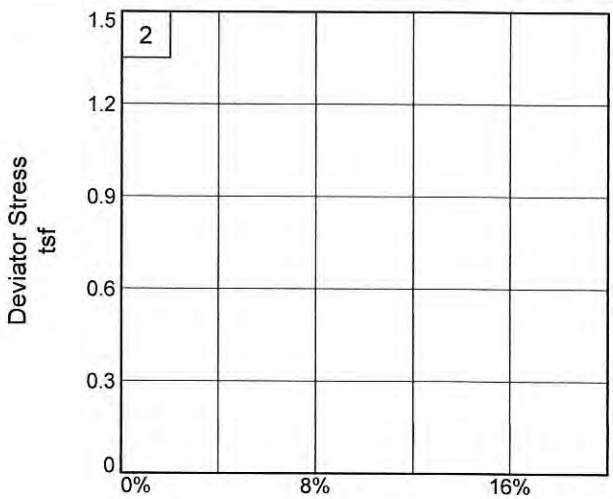
**Project:** San Jacinto River Waste Pit Superfund Site

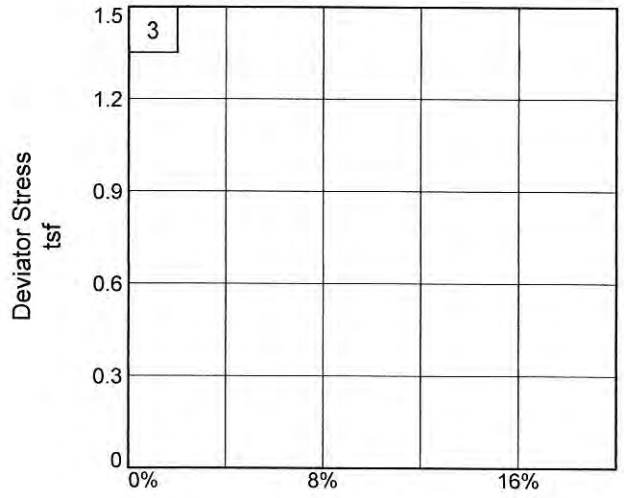
**Source of Sample:** SJGB028 **Depth:** 53

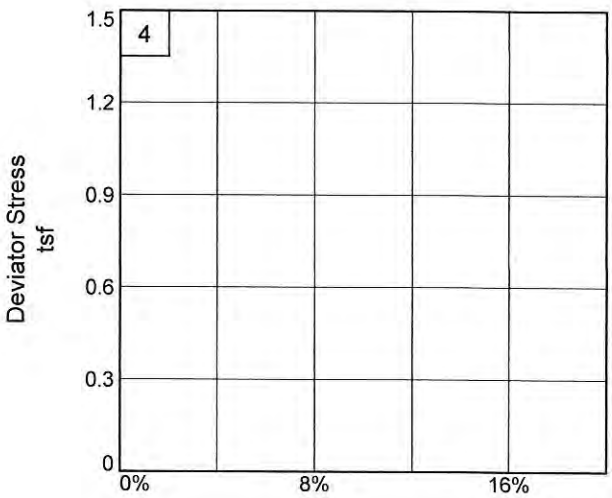
**Proj. No.:** 19.15.131 **Date Sampled:** 1/16/2020

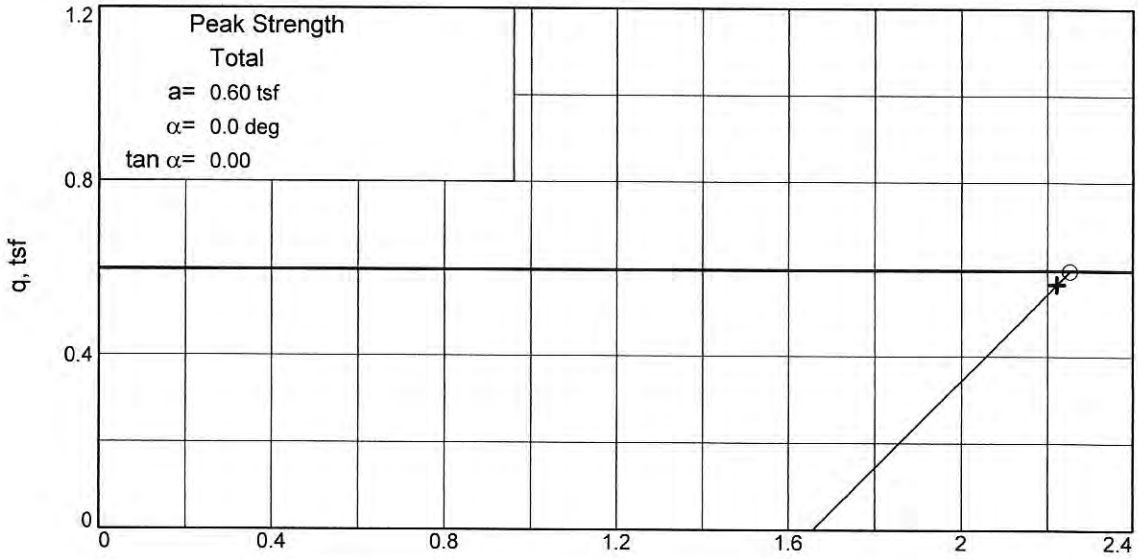
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

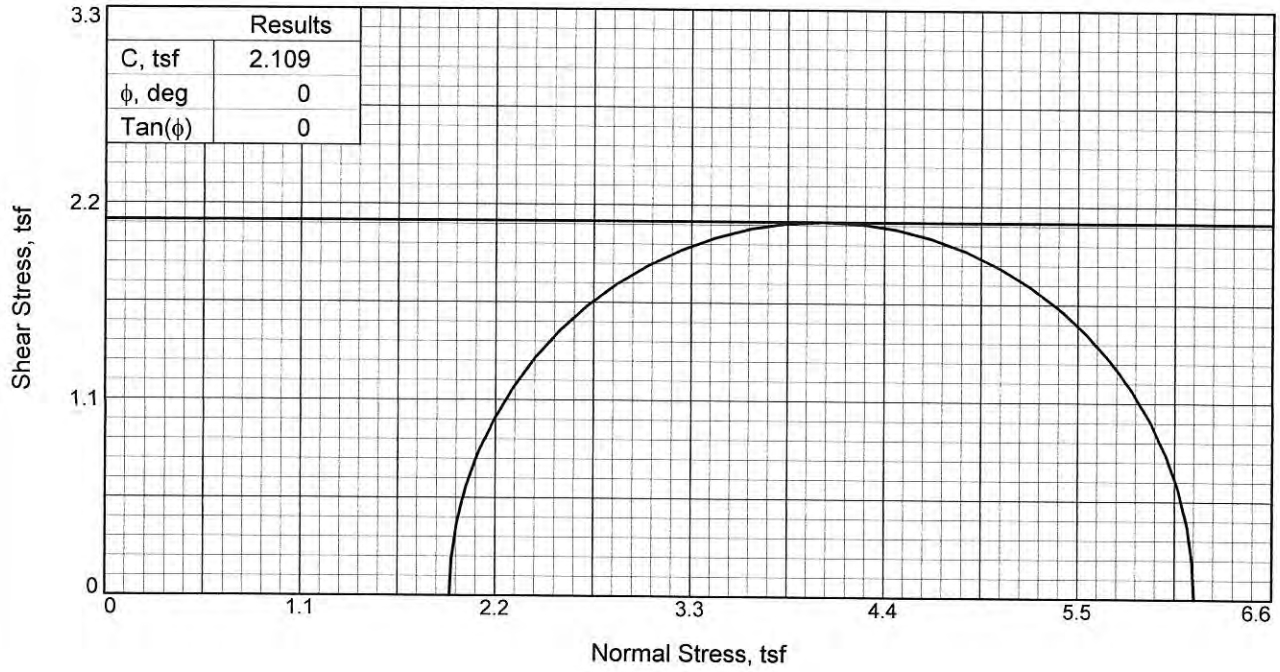
**Client:**

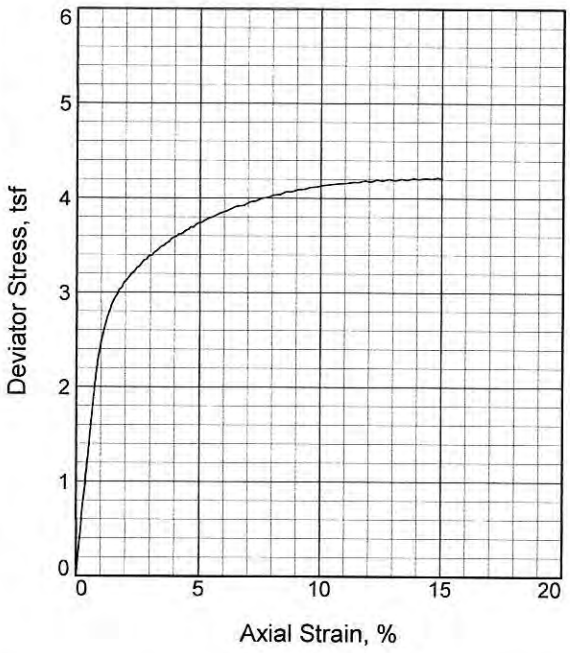
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB028 **Depth:** 53

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 16.6 |
| | Dry Density, pcf | 115.4 |
| | Saturation, % | 97.2 |
| | Void Ratio | 0.4603 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| At Test | Water Content, % | 17.0 |
| | Dry Density, pcf | 115.4 |
| | Saturation, % | 99.9 |
| | Void Ratio | 0.4603 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 27.00 |
| Fail. Stress, tsf | | 4.22 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 6.16 |
| $\sigma_3$ Failure, tsf | | 1.94 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Tan and gray LEAN CLAY with SAND

**LL=** 30 **PL=** 16 **PI=** 14

**Assumed Specific Gravity=** 2.70

**Remarks:**
Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

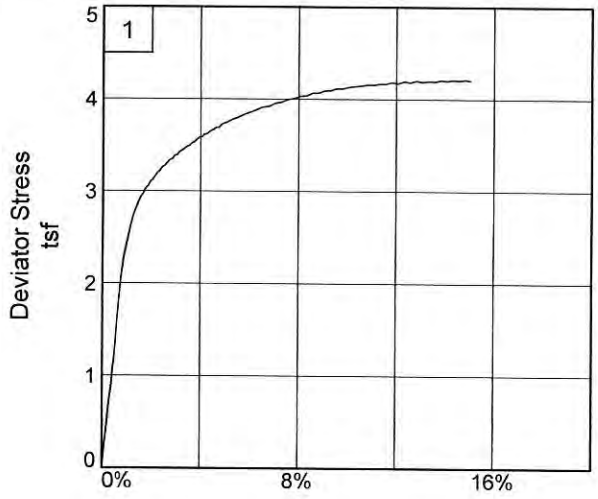
**Client:**

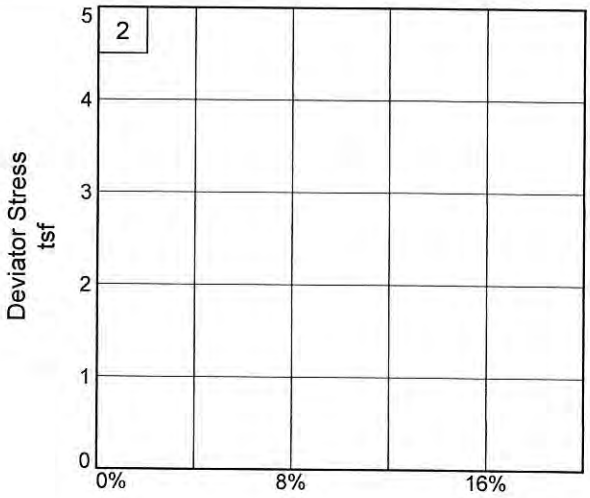
**Project:** San Jacinto River Waste Pit Superfund Site

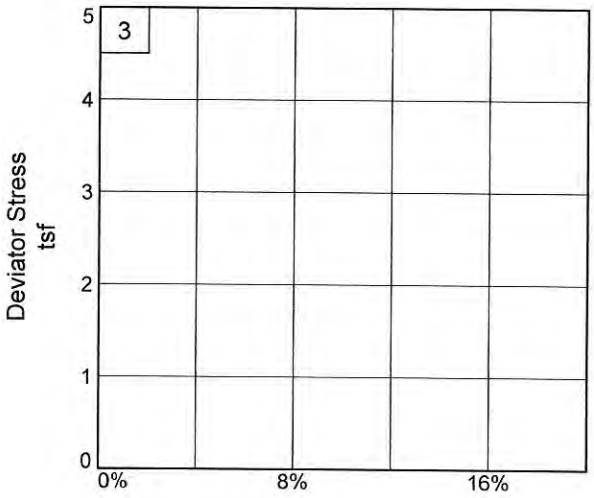
**Source of Sample:** SJGB028 **Depth:** 63

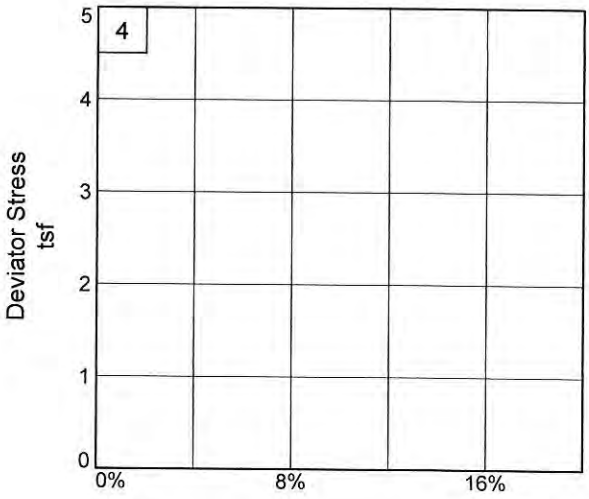
**Proj. No.:** 19.15.131 **Date Sampled:** 1/15/2020

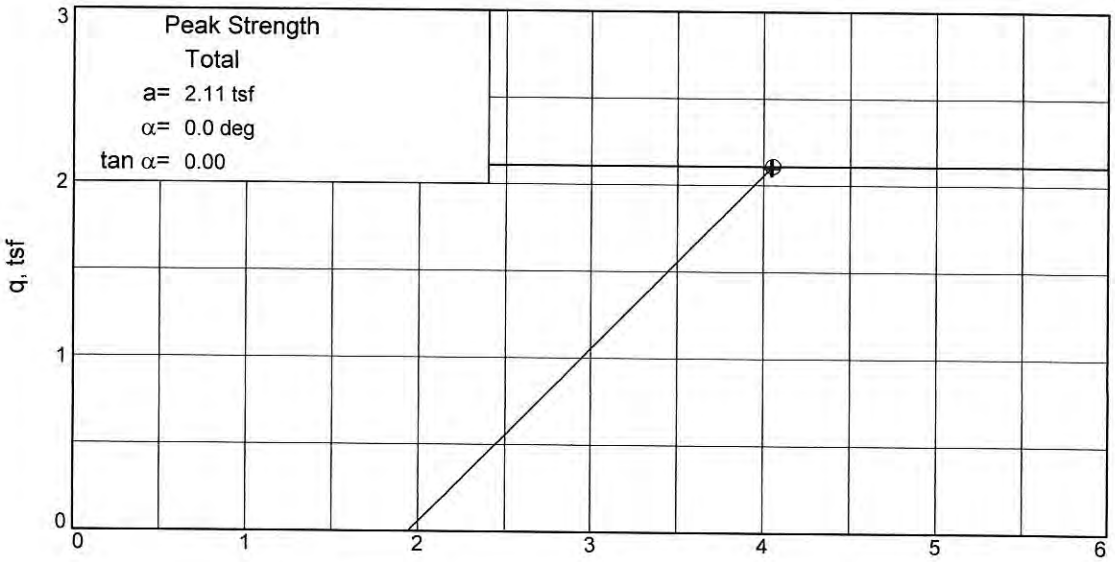
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

**Client:**

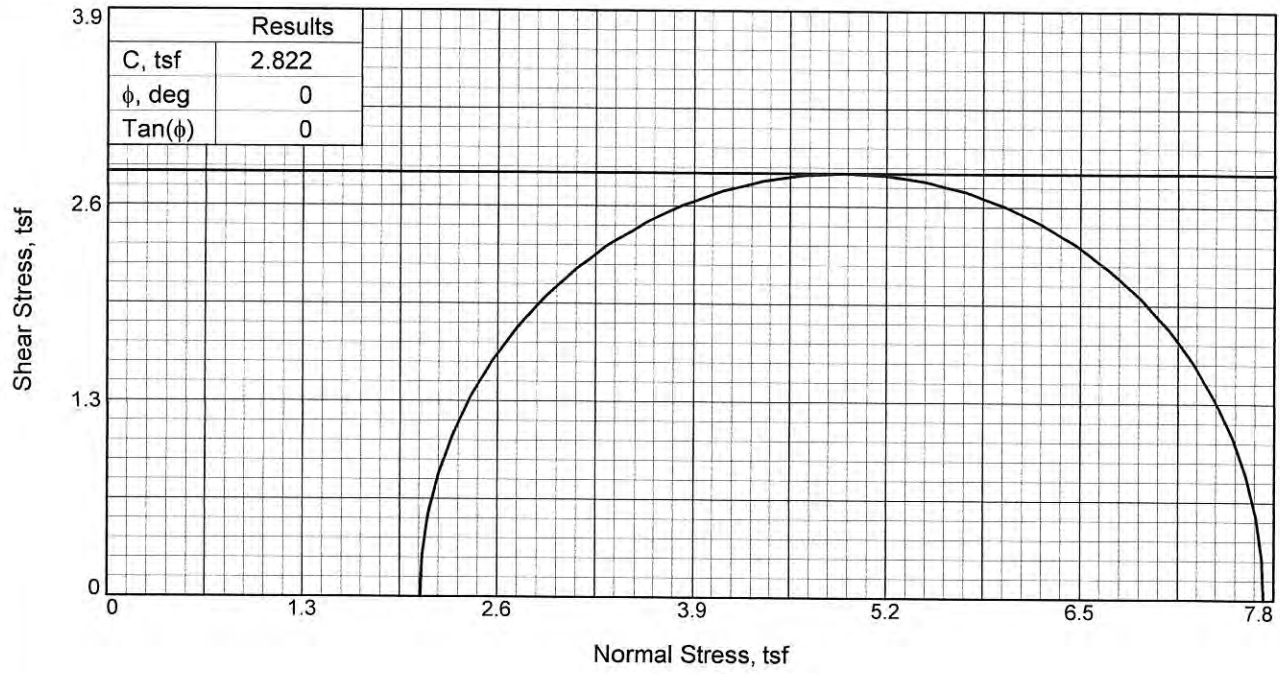
**Project:** San Jacinto River Waste Pit Superfund Site

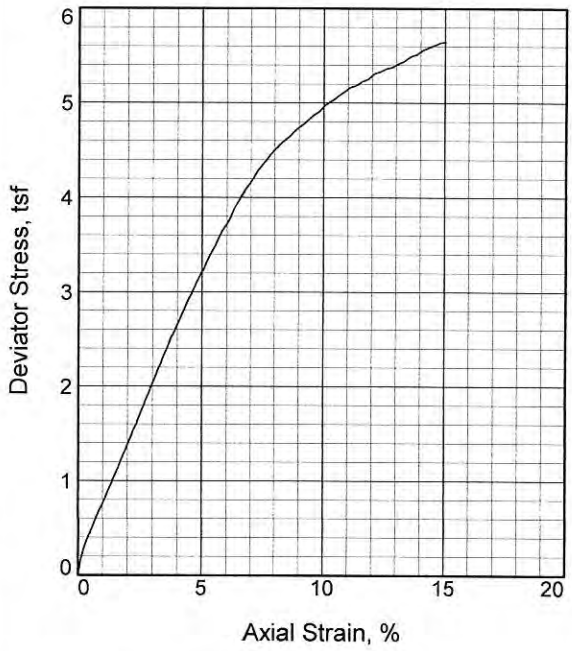
**Source of Sample:** SJGB028 **Depth:** 63

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**

Attachment Figure B.2-100




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 18.0 |
| | Dry Density, pcf | 113.5 |
| | Saturation, % | 96.7 |
| | Void Ratio | 0.5122 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| At Test | Water Content, % | 17.4 |
| | Dry Density, pcf | 113.5 |
| | Saturation, % | 93.4 |
| | Void Ratio | 0.5122 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 29.00 |
| Fail. Stress, tsf | | 5.64 |
| Strain, % | | 15.0 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 7.73 |
| $\sigma_3$ Failure, tsf | | 2.09 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray SANDY LEAN CLAY

**LL=** 28 **PL=** 16 **PI=** 12

**Assumed Specific Gravity=** 2.75

**Remarks:**
Test method: ASTM D2850
Failure type: Multiple shear

**Figure** _____

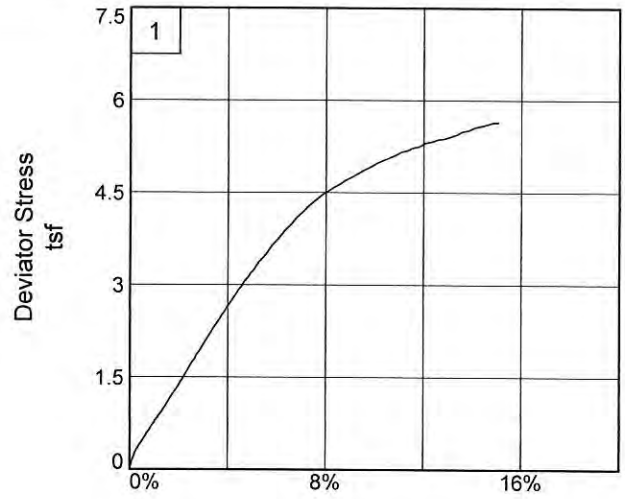
**Client:**

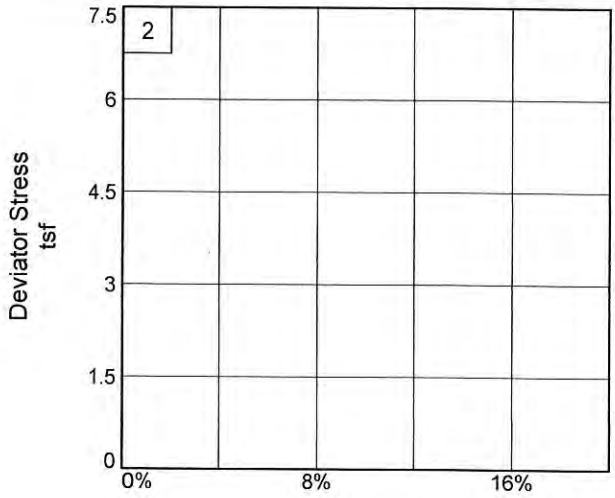
**Project:** San Jacinto River Waste Pit Superfund Site

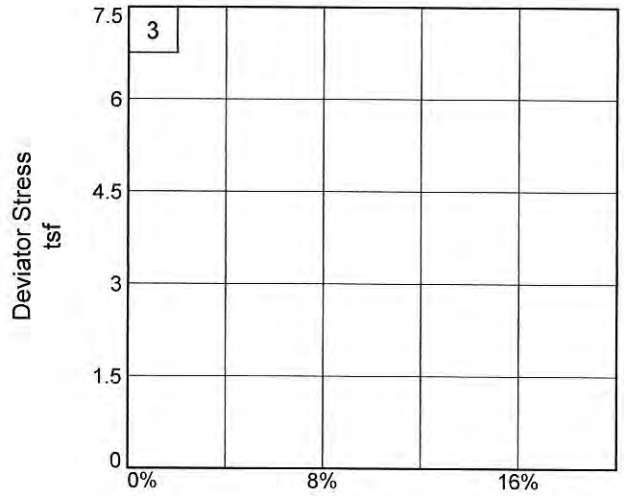
**Source of Sample:** SJGB028 **Depth:** 68

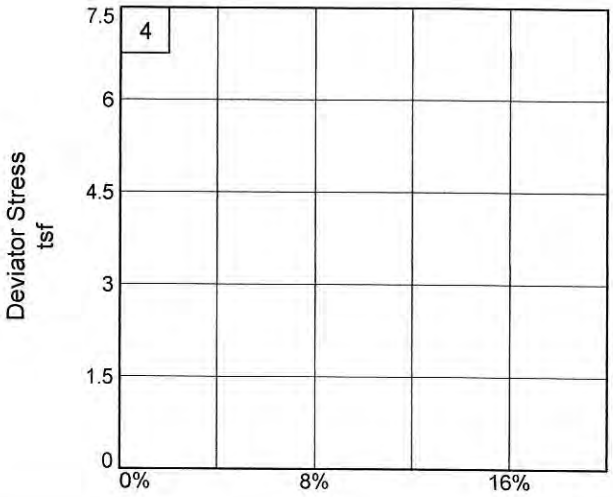
**Proj. No.:** 19.15.131 **Date Sampled:** 1/16/2020

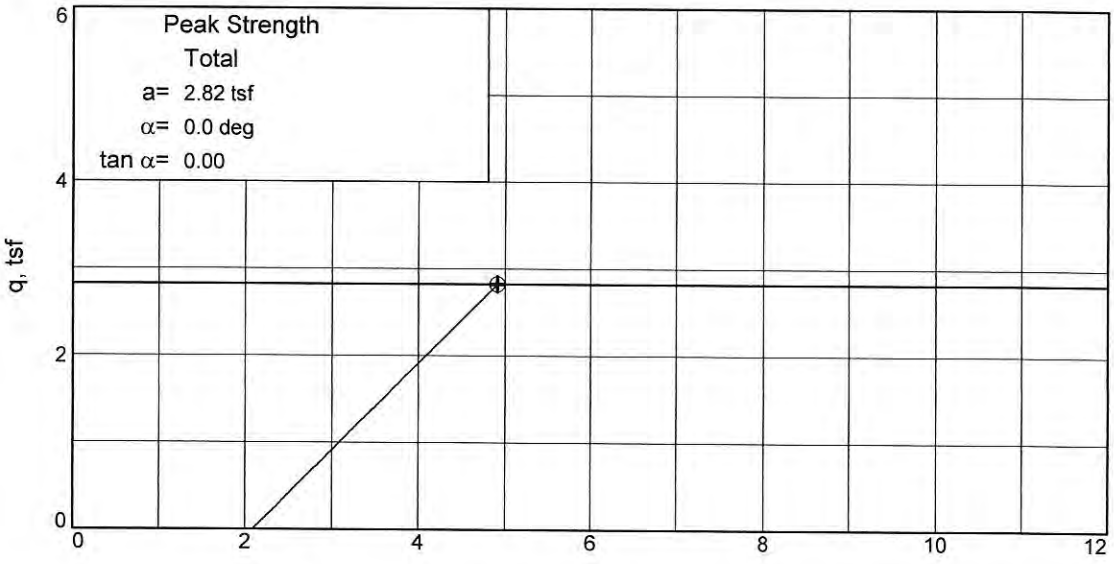
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

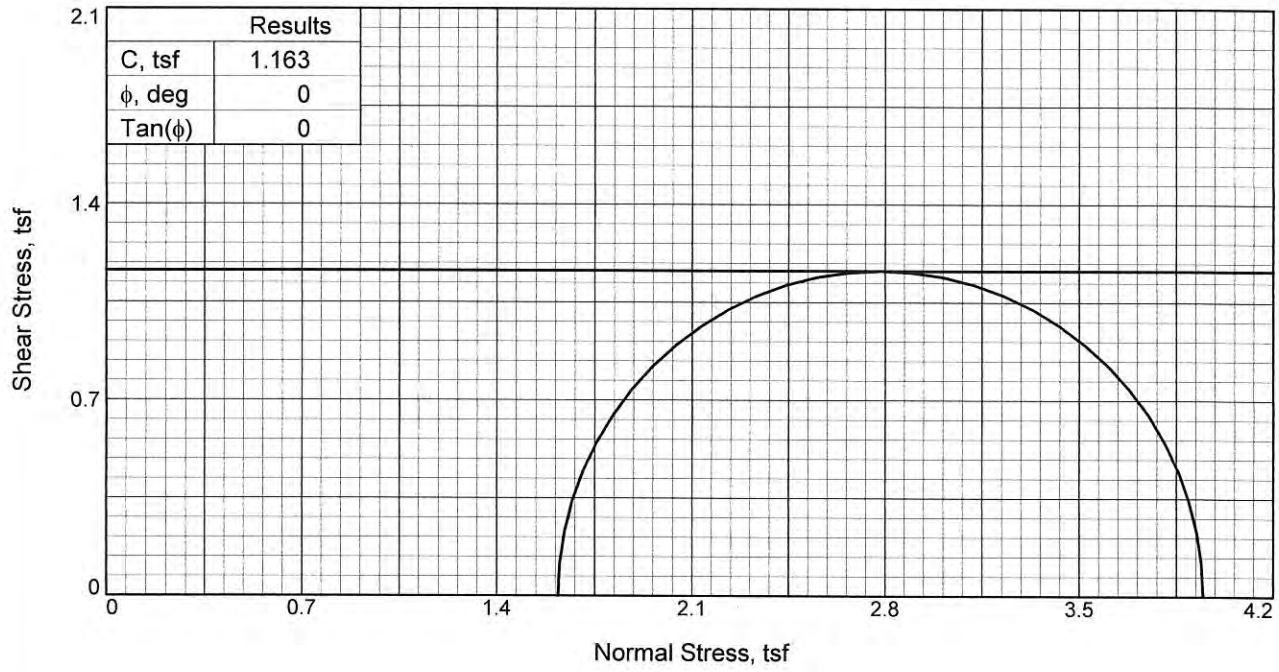
**Client:**

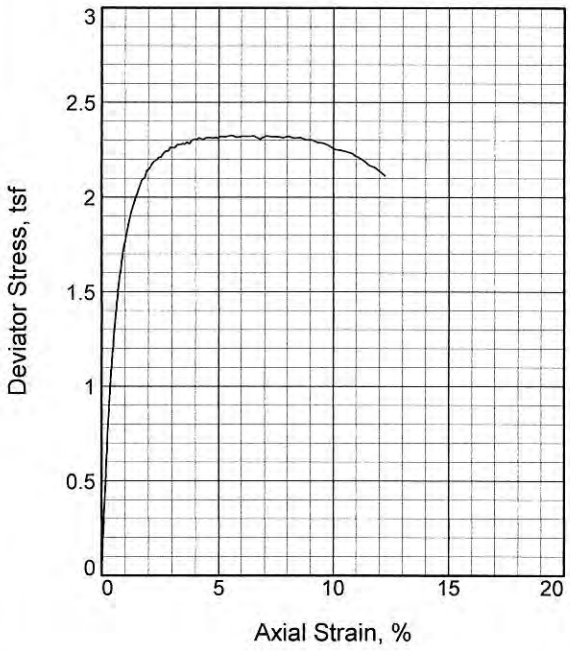
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB028 **Depth:** 68

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 26.4 |
| | Dry Density, pcf | 100.0 |
| | Saturation, % | 98.7 |
| | Void Ratio | 0.7482 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.85 |
| At Test | Water Content, % | 26.6 |
| | Dry Density, pcf | 100.0 |
| | Saturation, % | 99.6 |
| | Void Ratio | 0.7482 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.85 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 22.50 |
| Fail. Stress, tsf | | 2.33 |
| Strain, % | | 5.5 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.95 |
| $\sigma_3$ Failure, tsf | | 1.62 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Gray FAT CLAY

**LL=** 70 **PL=** 22 **PI=** 48
**Assumed Specific Gravity=** 2.80
**Remarks:**
Test method: ASTM D2850
Failure type: Multiple shear

**Figure** _____

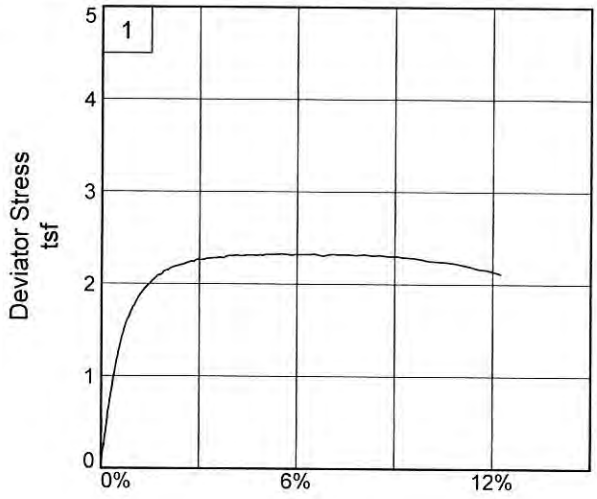
**Client:**

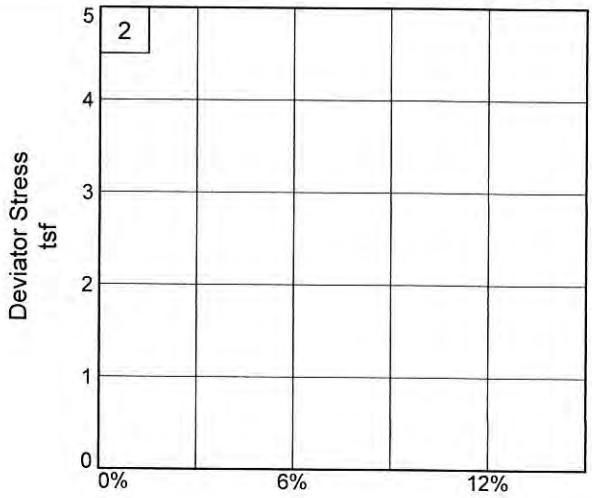
**Project:** San Jacinto River Waste Pit Superfund Site

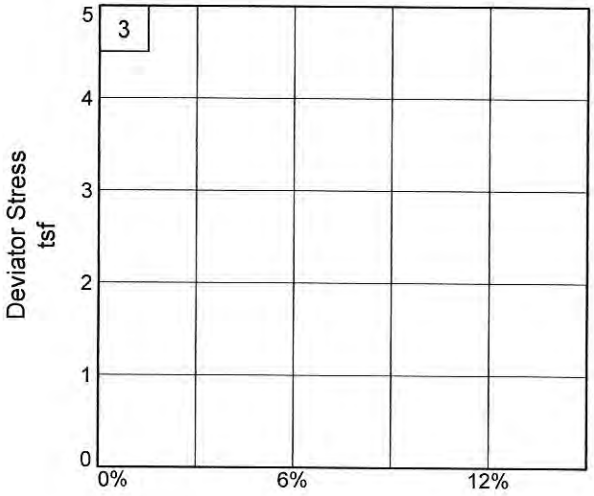
**Source of Sample:** SJGB029 **Depth:** 53

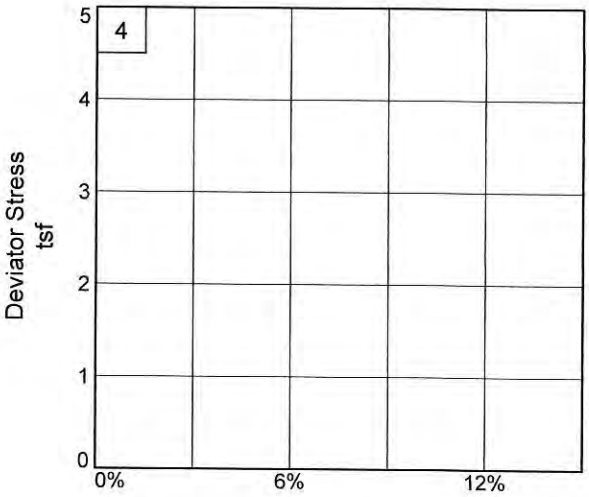
**Proj. No.:** 19.15.131 **Date Sampled:** 1/15/2020

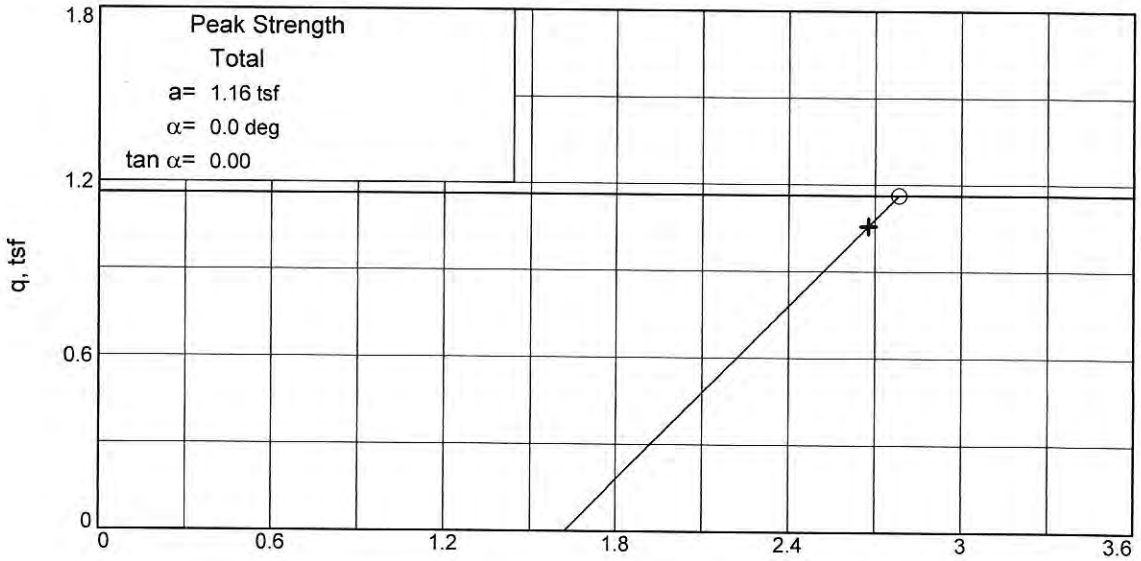
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

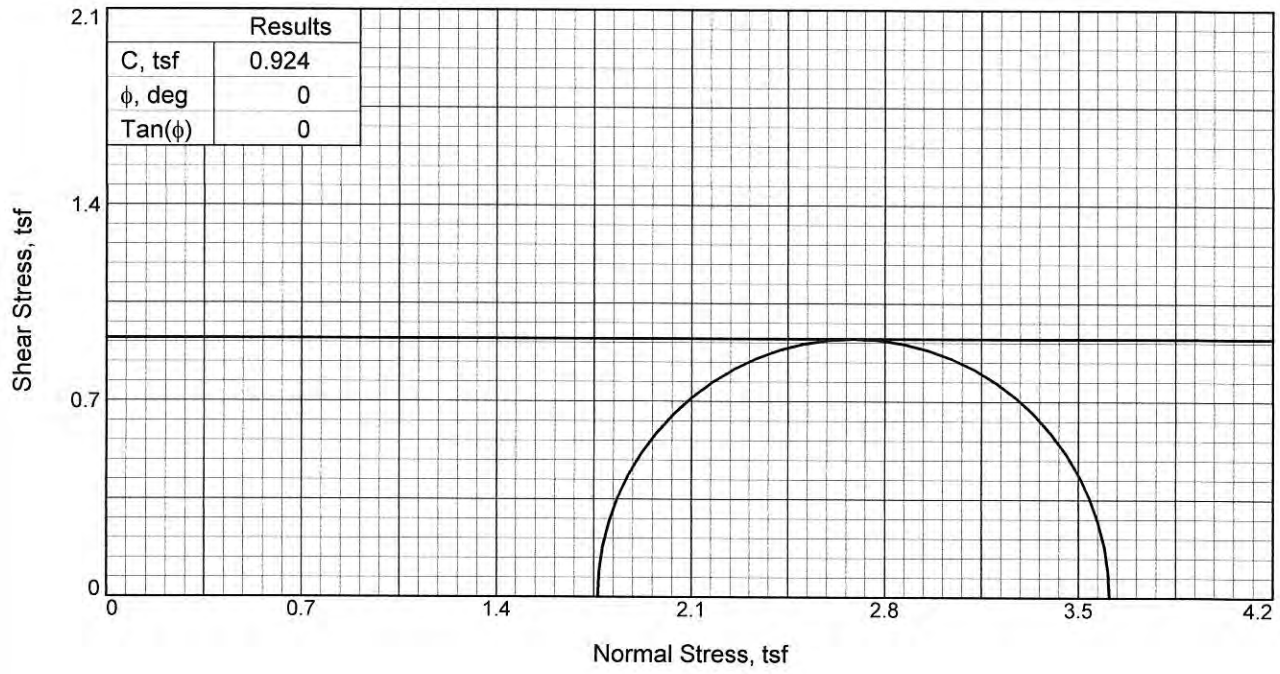
**Client:**

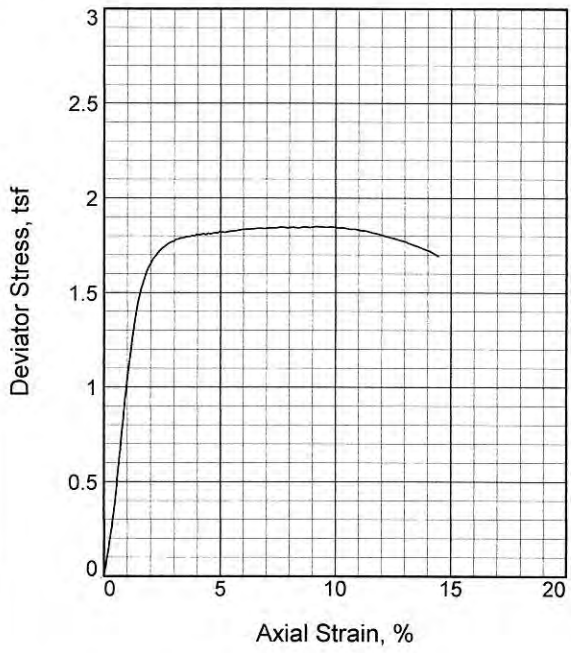
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB029 **Depth:** 53

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 16.8 |
| | Dry Density, pcf | 111.6 |
| | Saturation, % | 88.9 |
| | Void Ratio | 0.5109 |
| | Diameter, in. | 2.89 |
| | Height, in. | 5.92 |
| At Test | Water Content, % | 16.6 |
| | Dry Density, pcf | 111.6 |
| | Saturation, % | 87.5 |
| | Void Ratio | 0.5109 |
| | Diameter, in. | 2.89 |
| | Height, in. | 5.92 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 24.50 |
| Fail. Stress, tsf | | 1.85 |
| Strain, % | | 9.1 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.61 |
| $\sigma_3$ Failure, tsf | | 1.76 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Tan and gray LEAN CLAY

**LL=** 33 **PL=** 17 **PI=** 16

**Assumed Specific Gravity=** 2.70

**Remarks:**
Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

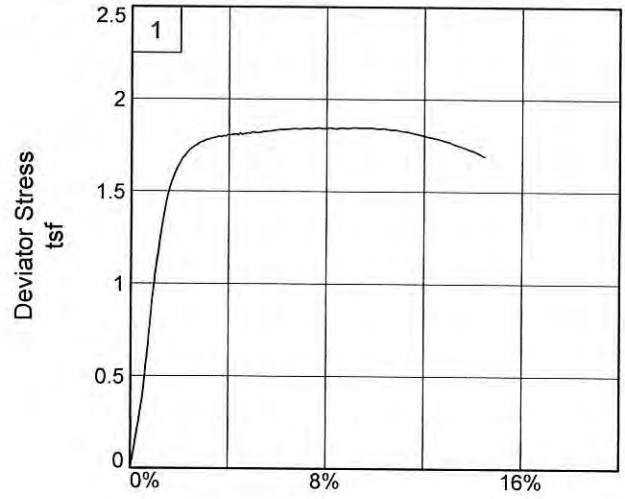
**Client:**

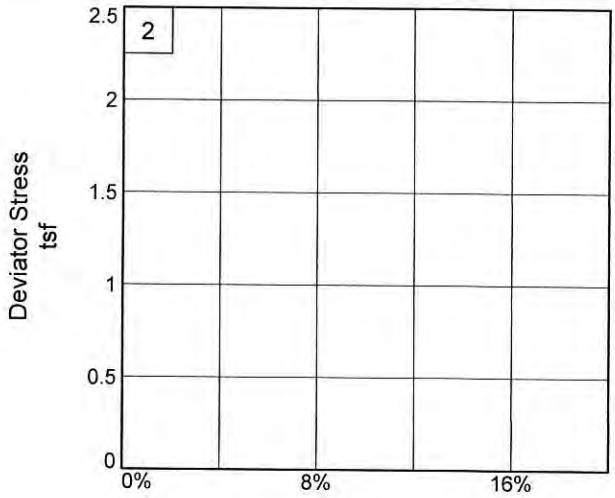
**Project:** San Jacinto River Waste Pit Superfund Site

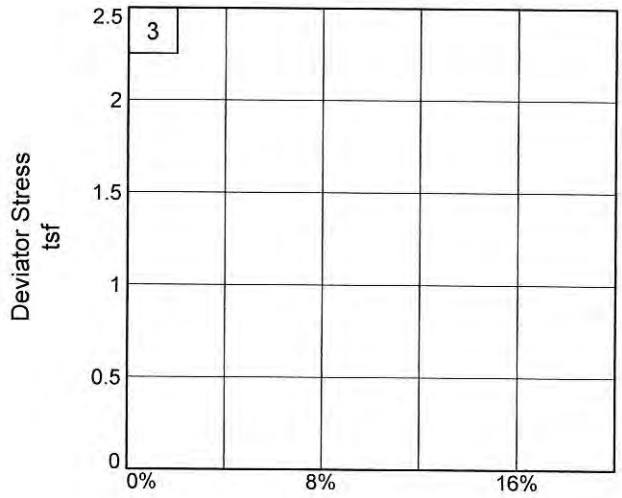
**Source of Sample:** SJGB029 **Depth:** 58

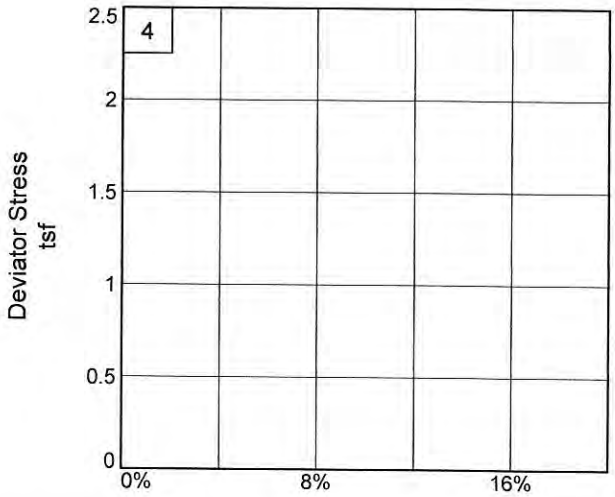
**Proj. No.:** 19.15.131 **Date Sampled:** 1/15/2020

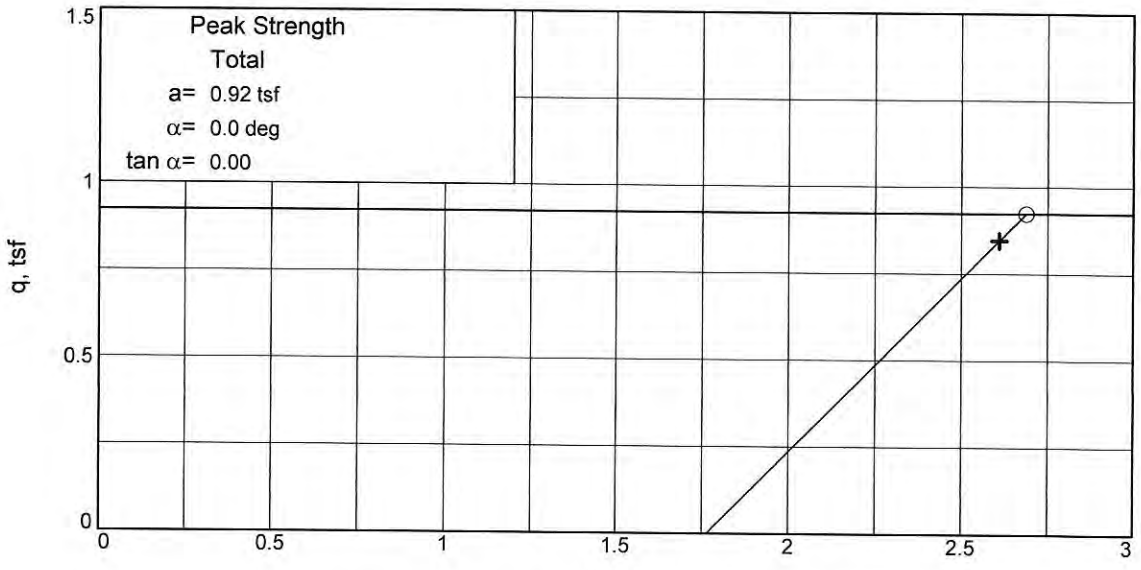
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

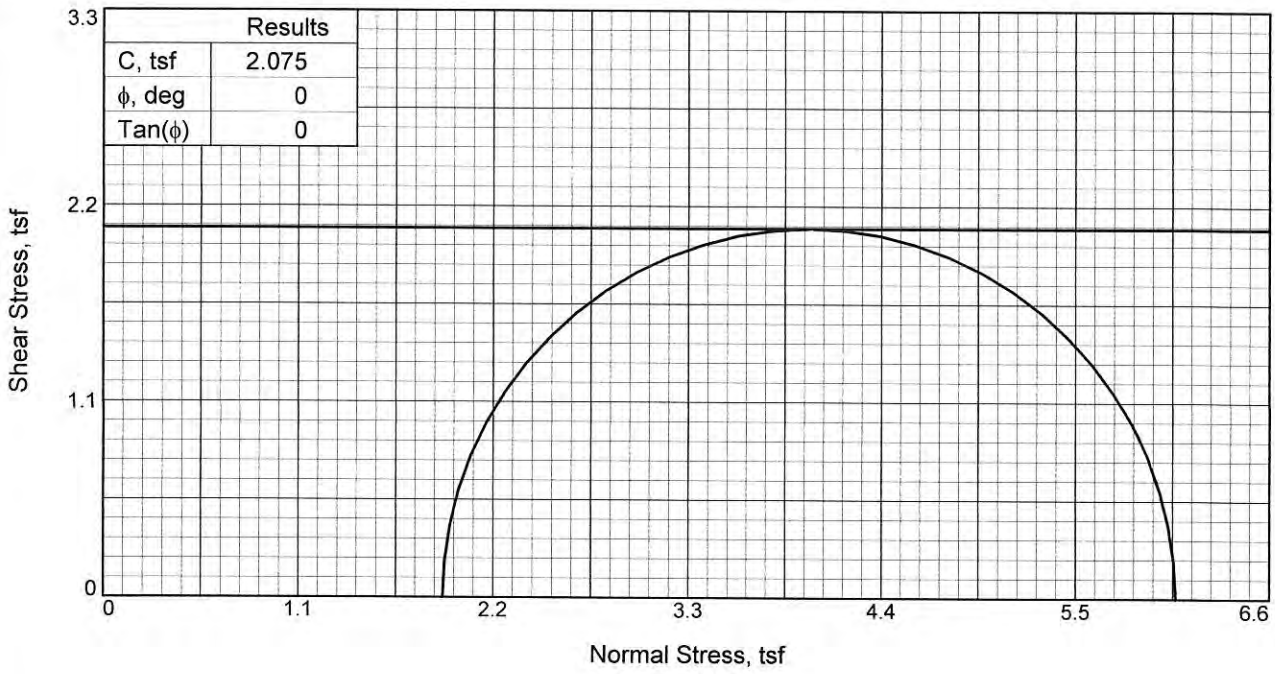
**Client:**

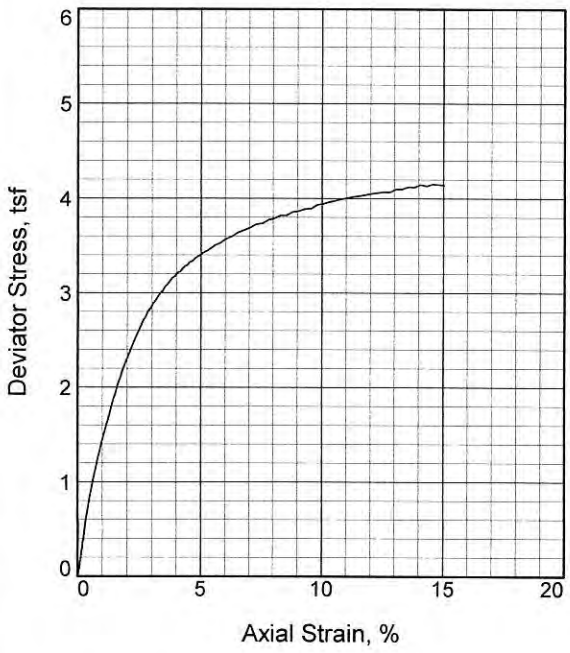
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB029 **Depth:** 58

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 17.7 |
| | Dry Density, pcf | 113.0 |
| | Saturation, % | 97.4 |
| | Void Ratio | 0.4919 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| At Test | Water Content, % | 18.2 |
| | Dry Density, pcf | 113.0 |
| | Saturation, % | 99.8 |
| | Void Ratio | 0.4919 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 26.60 |
| Fail. Stress, tsf | | 4.15 |
| Strain, % | | 14.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 6.07 |
| $\sigma_3$ Failure, tsf | | 1.92 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Gray SANDY LEAN CLAY

**LL=** 36 **PL=** 17 **PI=** 19
**Assumed Specific Gravity=** 2.70
**Remarks:**
Test method: ASTM D2850
Failure type: Vertical shear

**Figure** _____

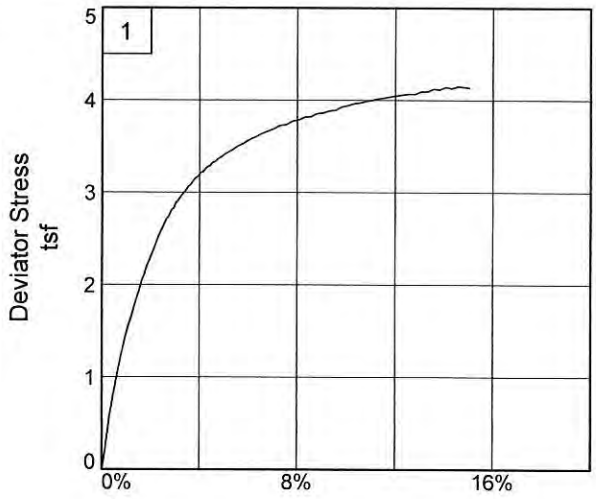
**Client:**

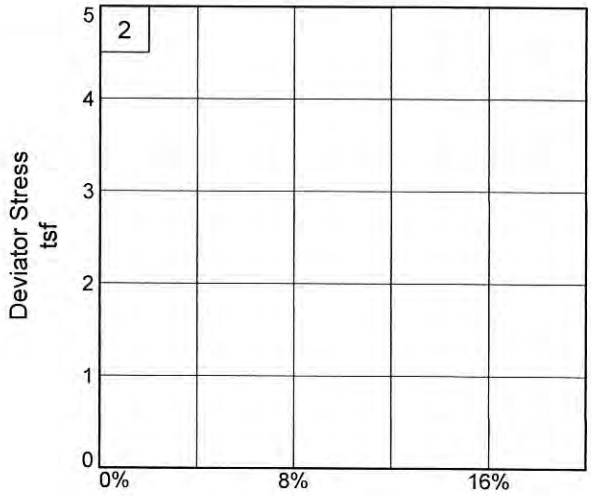
**Project:** San Jacinto River Waste Pit Superfund Site

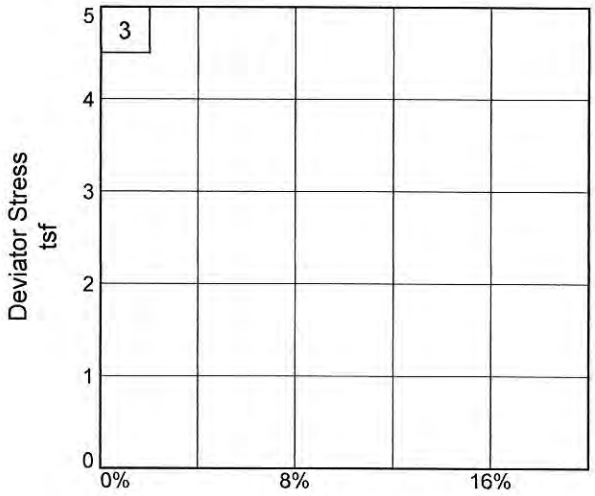
**Source of Sample:** SJGB029 **Depth:** 63

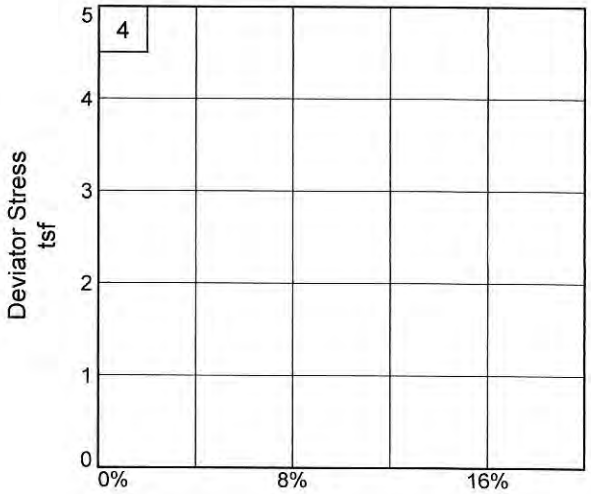
**Proj. No.:** 19.15.131 **Date Sampled:** 1/16/2020

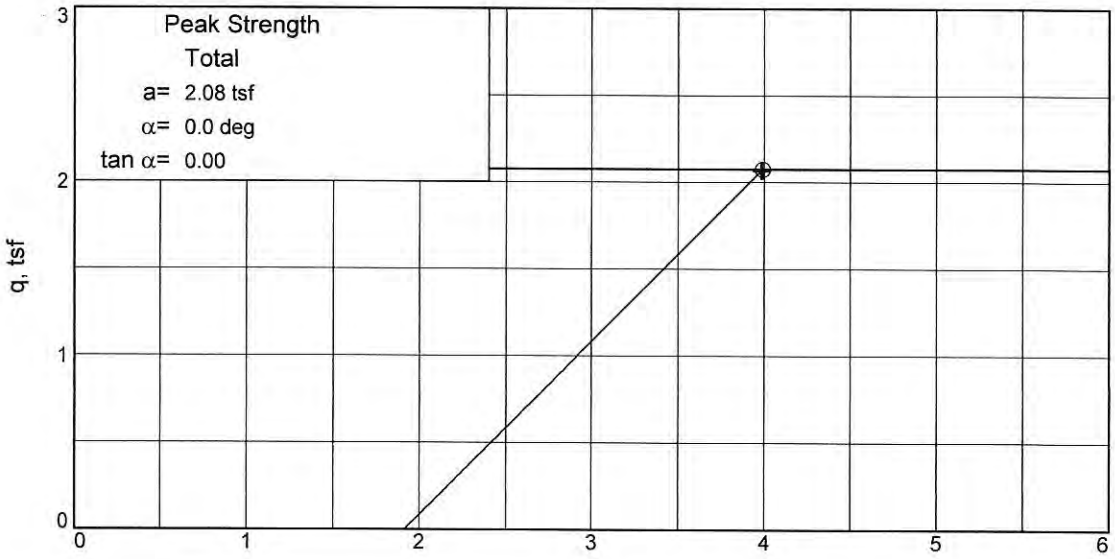
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

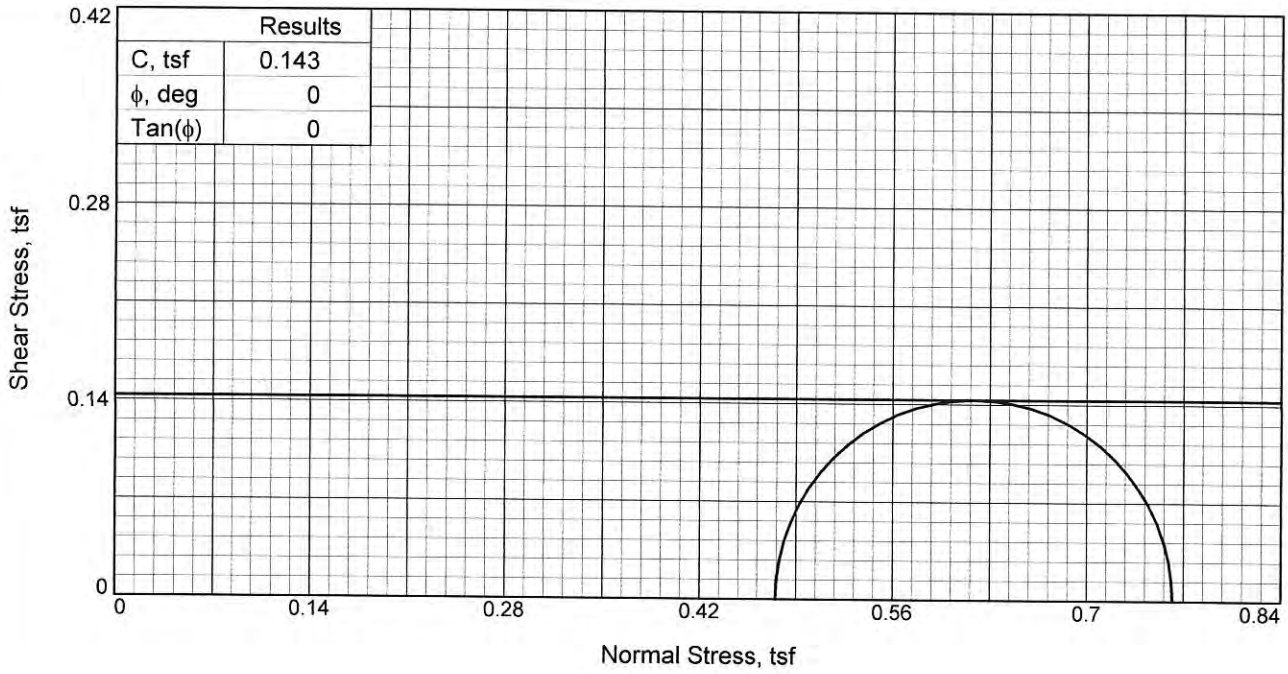
**Client:**

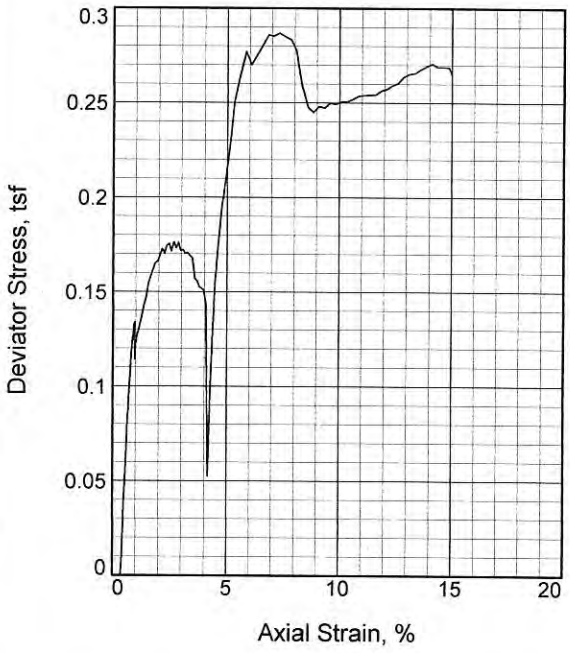
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB029 **Depth:** 63

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 37.6 |
| | Dry Density, pcf | 72.0 |
| | Saturation, % | 80.7 |
| | Void Ratio | 1.1664 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.77 |
| At Test | Water Content, % | 52.0 |
| | Dry Density, pcf | 72.0 |
| | Saturation, % | 111.6 |
| | Void Ratio | 1.1664 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.77 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 6.60 |
| Fail. Stress, tsf | | 0.29 |
| Strain, % | | 7.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.76 |
| $\sigma_3$ Failure, tsf | | 0.48 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Dark gray SANDY FAT CLAY; sand pockets

**LL=** 79 **PL=** 24 **PI=** 55

**Assumed Specific Gravity=** 2.5

**Remarks:** Test Method: ASTM D2850
Failure Type: 60 Degree Shear

**Figure** _____

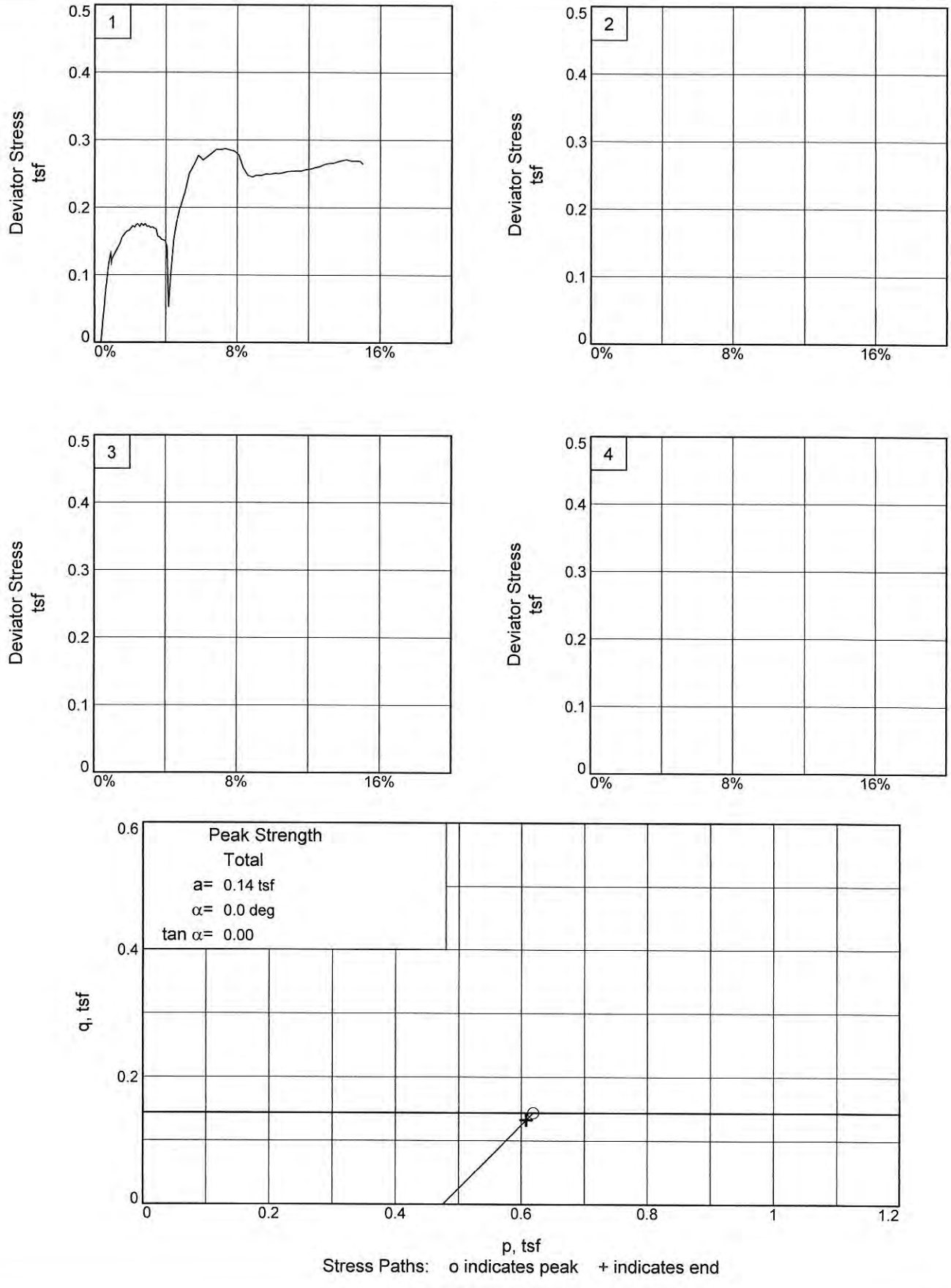
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 18

**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



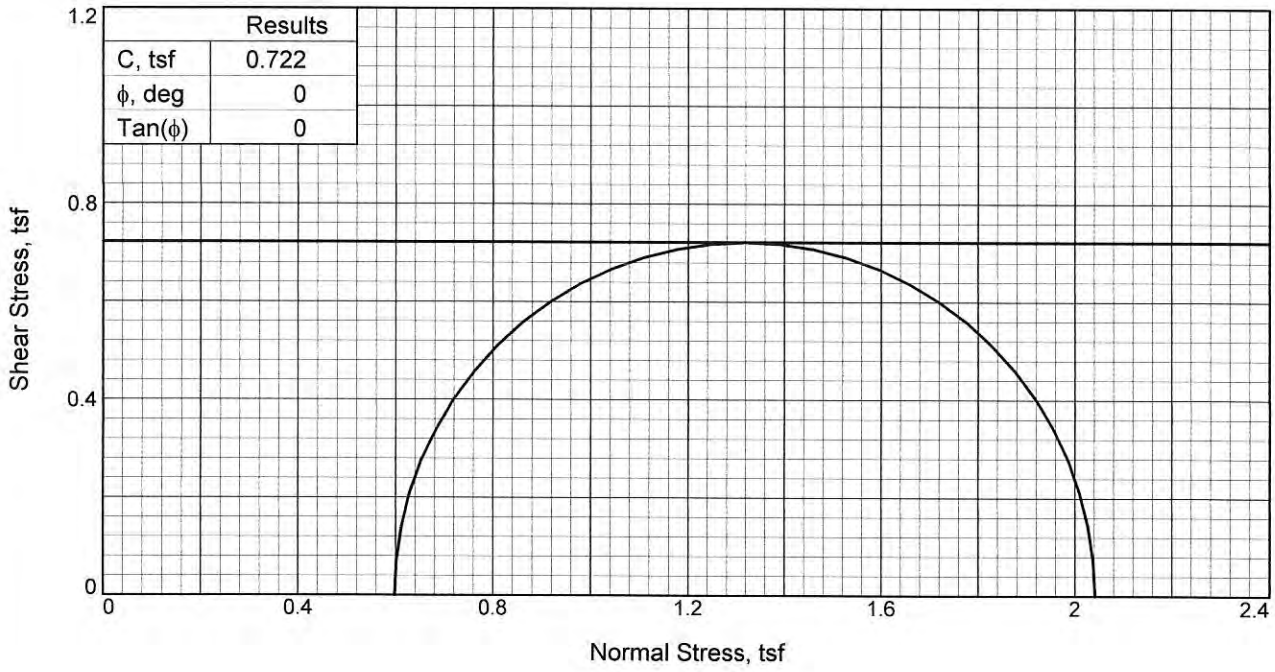

**Client:**

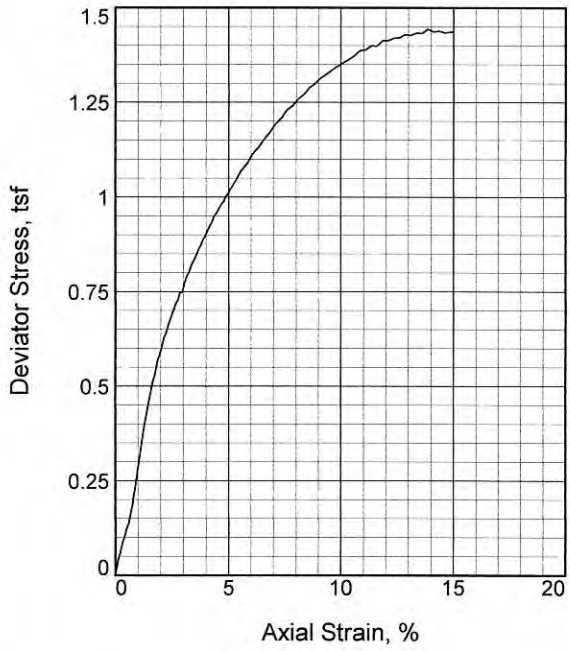
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 18

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 20.1 |
| | Dry Density, pcf | 113.6 |
| | Saturation, % | 100.0 |
| | Void Ratio | 0.5766 |
| | Diameter, in. | 2.76 |
| | Height, in. | 5.86 |
| At Test | Water Content, % | 17.4 |
| | Dry Density, pcf | 113.6 |
| | Saturation, % | 86.8 |
| | Void Ratio | 0.5766 |
| | Diameter, in. | 2.76 |
| | Height, in. | 5.86 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 8.30 |
| Fail. Stress, tsf | | 1.44 |
| Strain, % | | 13.9 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.04 |
| $\sigma_3$ Failure, tsf | | 0.60 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY with SAND

**LL=** 42 **PL=** 18 **PI=** 24

**Assumed Specific Gravity=** 2.87

**Remarks:** Test Method: ASTM D2850
Failure type: Buldge

**Figure** _____

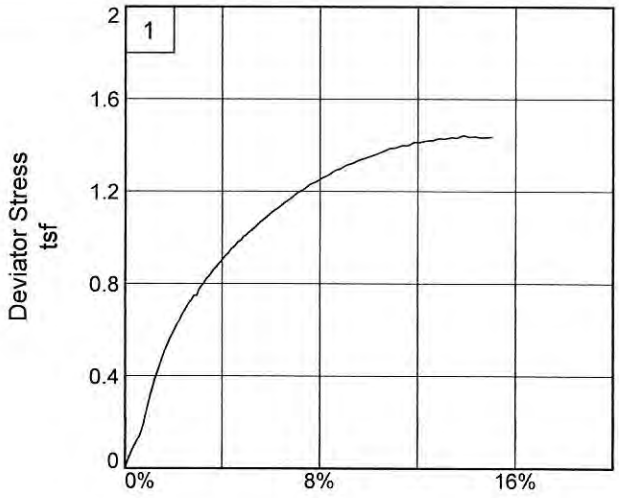
**Client:**

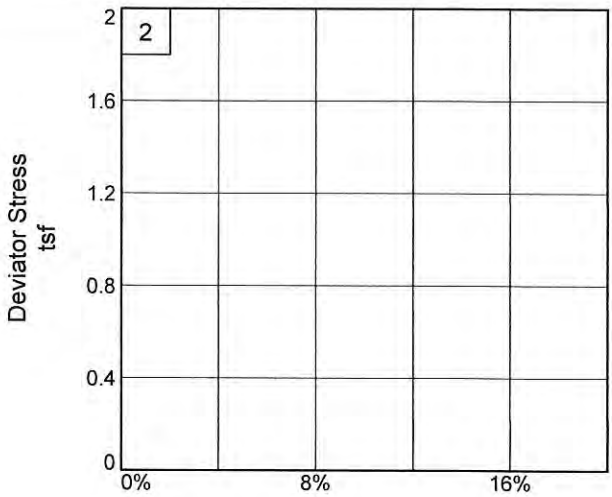
**Project:** San Jacinto River Waste Pit Superfund Site

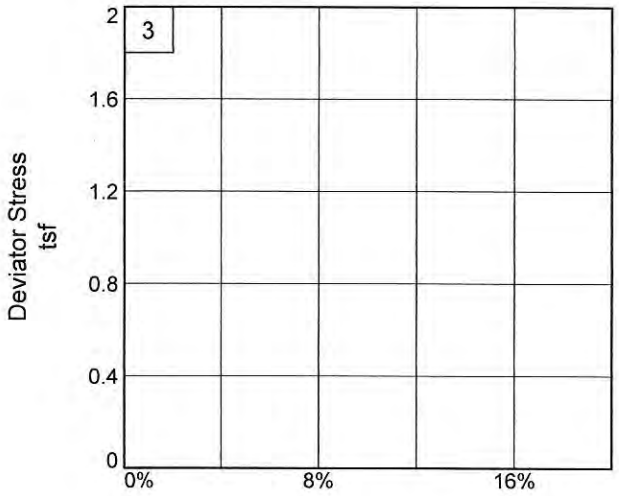
**Source of Sample:** SJGB047 **Depth:** 23

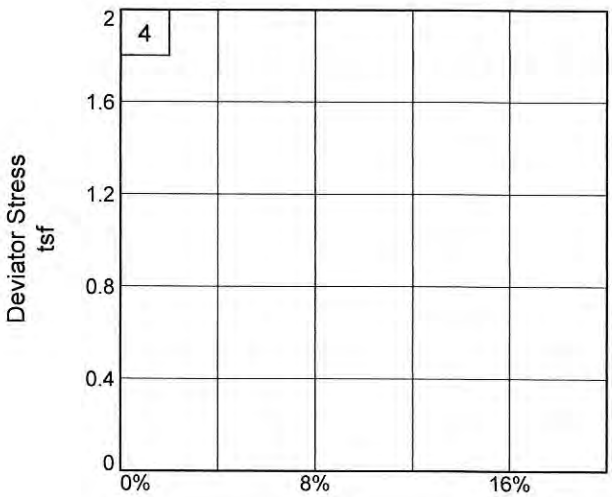
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

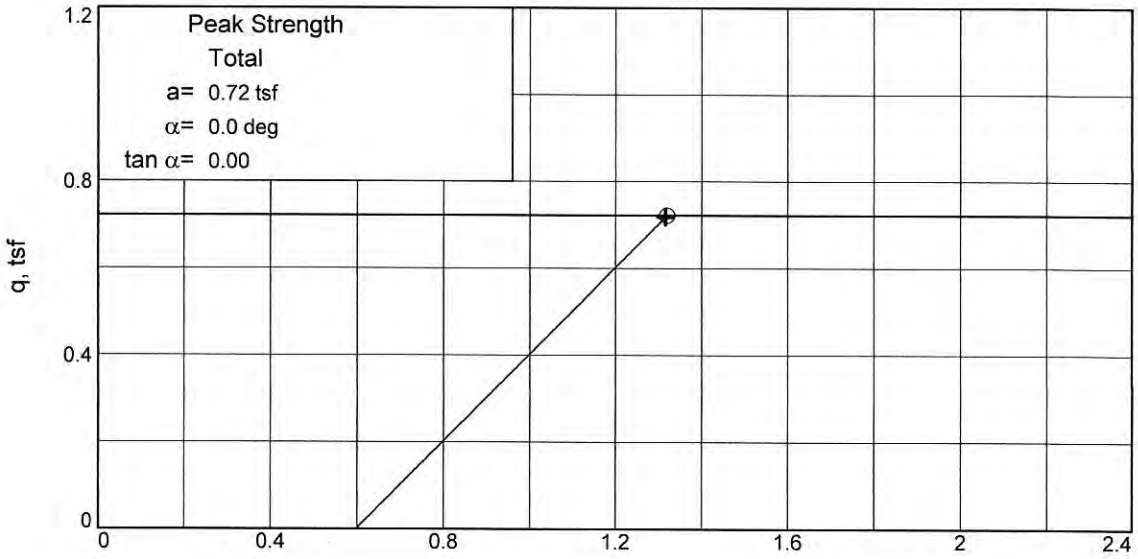
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

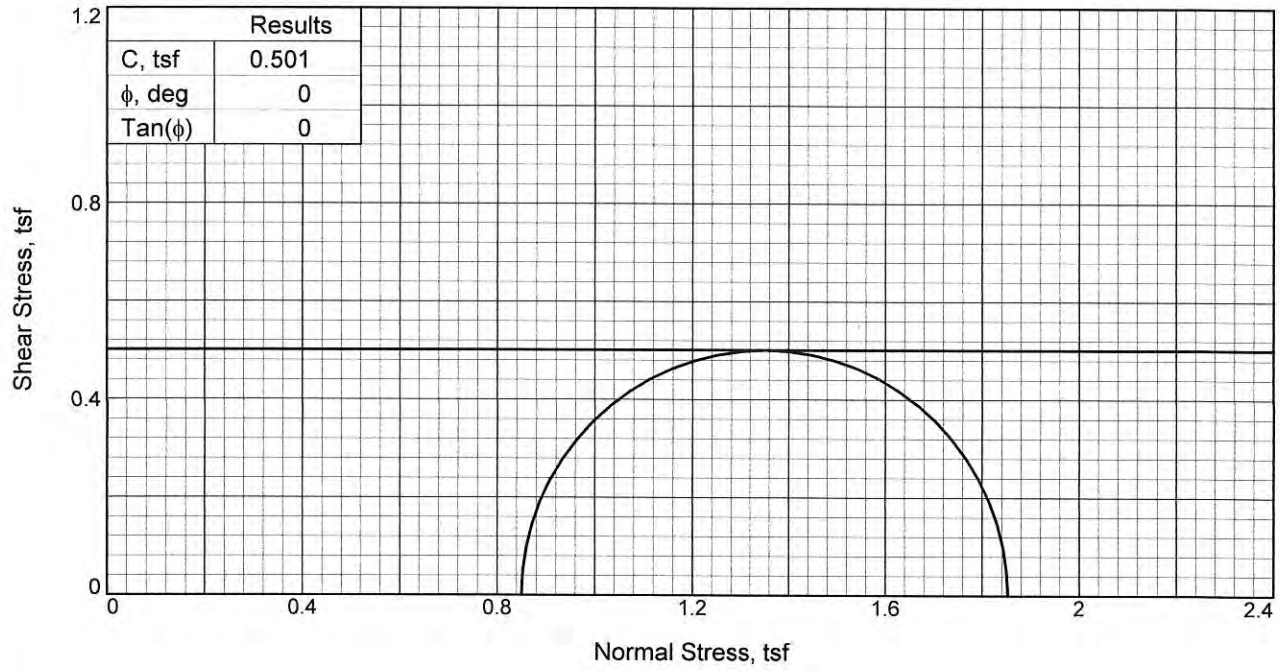
**Client:**

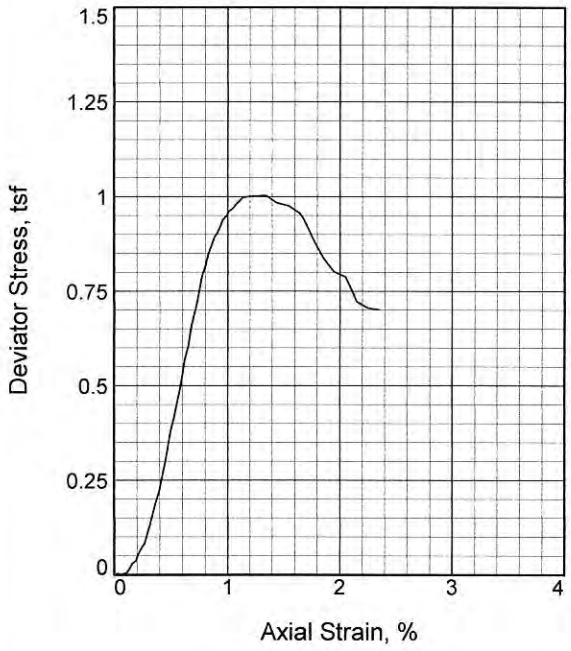
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 23

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 29.0 |
| | Dry Density, pcf | 96.5 |
| | Saturation, % | 99.6 |
| | Void Ratio | 0.8177 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.92 |
| At Test | Water Content, % | 28.8 |
| | Dry Density, pcf | 96.5 |
| | Saturation, % | 98.8 |
| | Void Ratio | 0.8177 |
| | Diameter, in. | 2.81 |
| | Height, in. | 5.92 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 11.80 |
| Fail. Stress, tsf | | 1.00 |
| Strain, % | | 1.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.85 |
| $\sigma_3$ Failure, tsf | | 0.85 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Reddish Brown FAT CLAY

**LL=** 59 **PL=** 39 **PI=** 20

**Assumed Specific Gravity=** 2.81

**Remarks:** Test Method: ASTM D2850
Failure Type: 60 degree

**Figure** _____

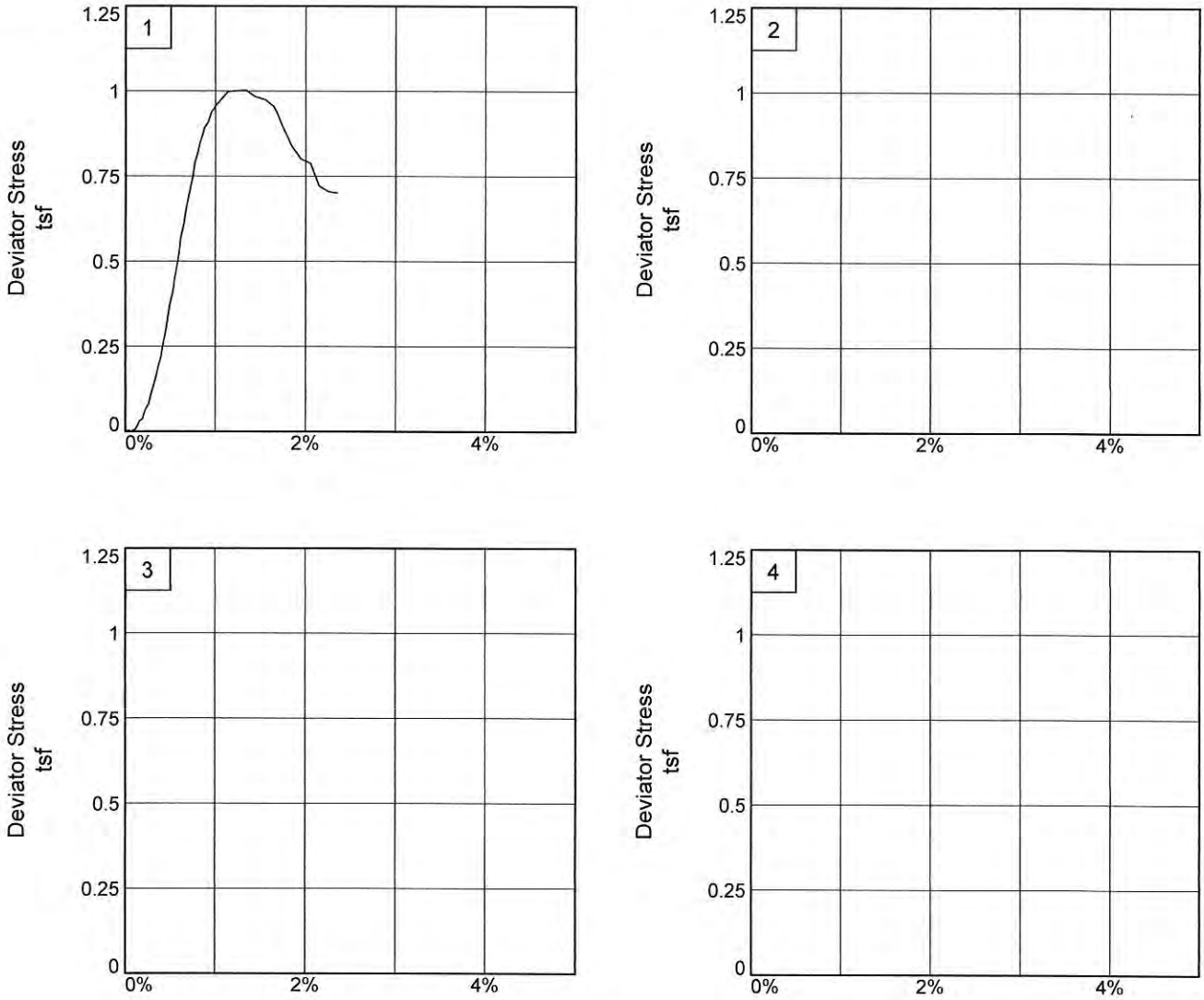
**Client:**

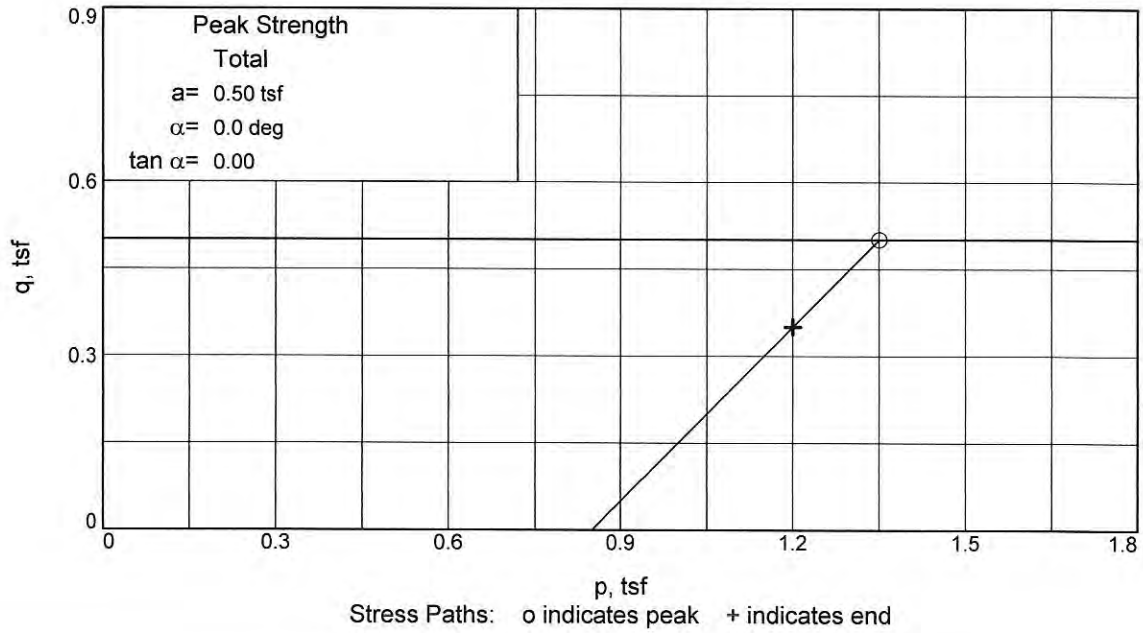
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 33

**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

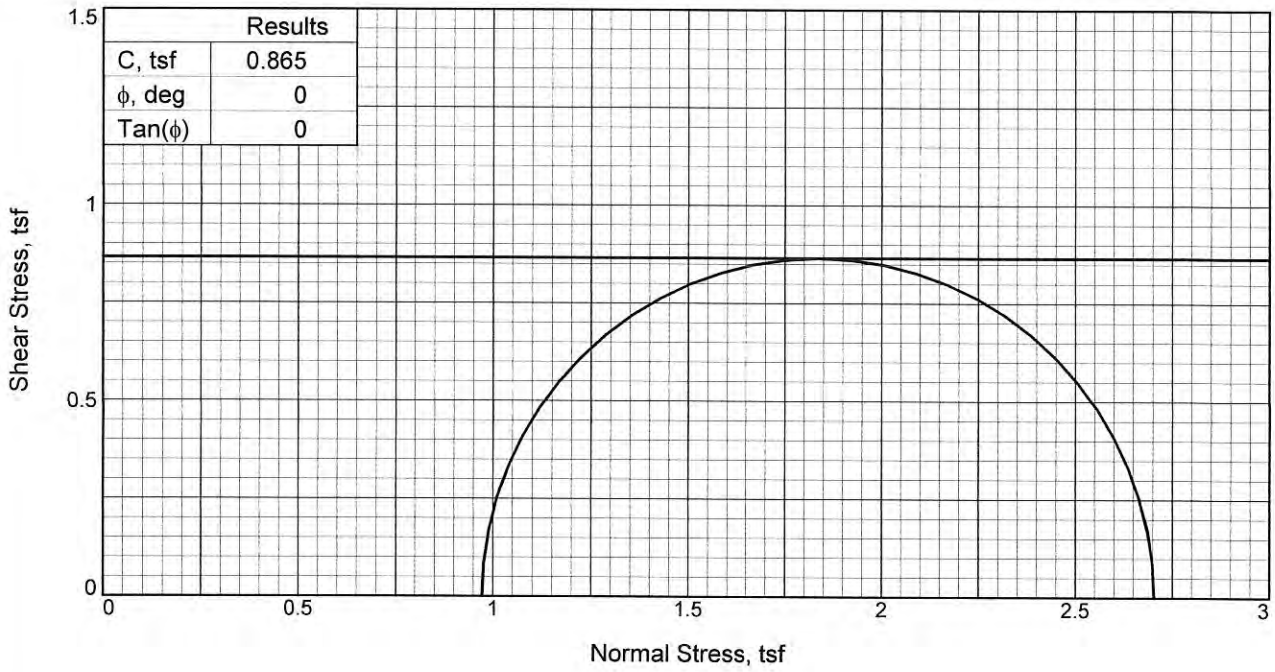
**Client:**

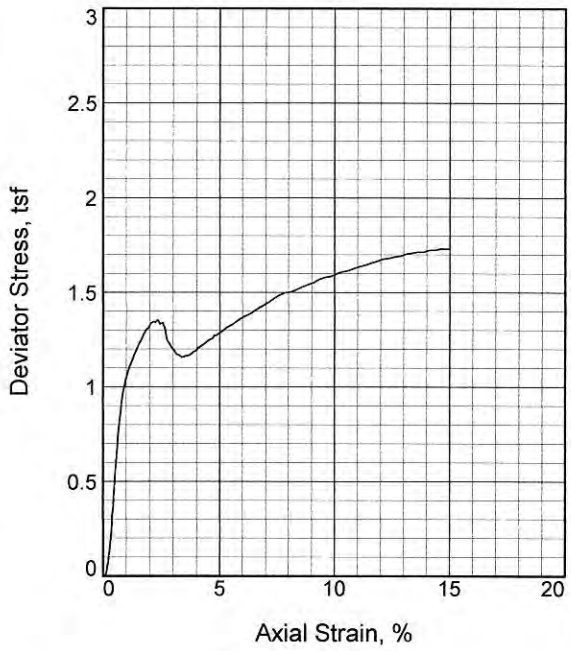
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 33

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 31.3 |
| | Dry Density, pcf | 96.0 |
| | Saturation, % | 99.9 |
| | Void Ratio | 0.9311 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.84 |
| At Test | Water Content, % | 31.4 |
| | Dry Density, pcf | 96.0 |
| | Saturation, % | 100.0 |
| | Void Ratio | 0.9311 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.84 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 13.50 |
| Fail. Stress, tsf | | 1.73 |
| Strain, % | | 14.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.70 |
| $\sigma_3$ Failure, tsf | | 0.97 |

**Type of Test:** Unconsolidated Undrained

**Sample Type:** UU

**Description:** Reddish Brown FAT CLAY

**LL=** 74 **PL=** 34 **PI=** 40

**Specific Gravity=** 2.97

**Remarks:** Test Method: ASTM D2850 Failure Type: Slickenslide

**Figure** _____

**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

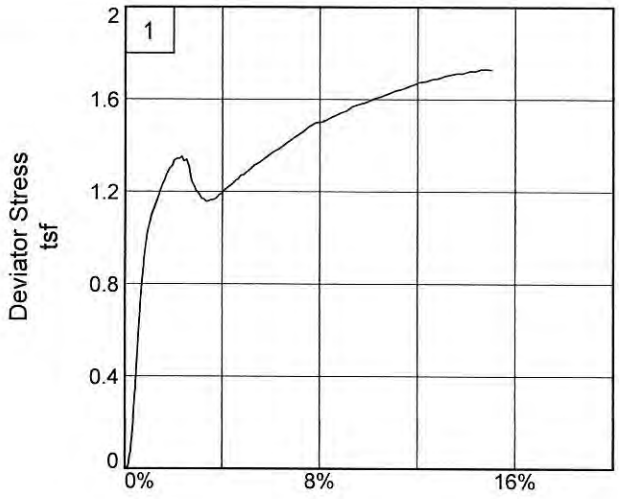
**Source of Sample:** SJGB047 **Depth:** 38

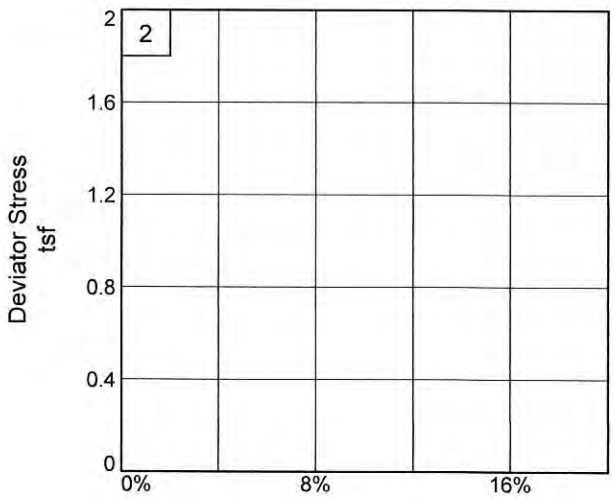
**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

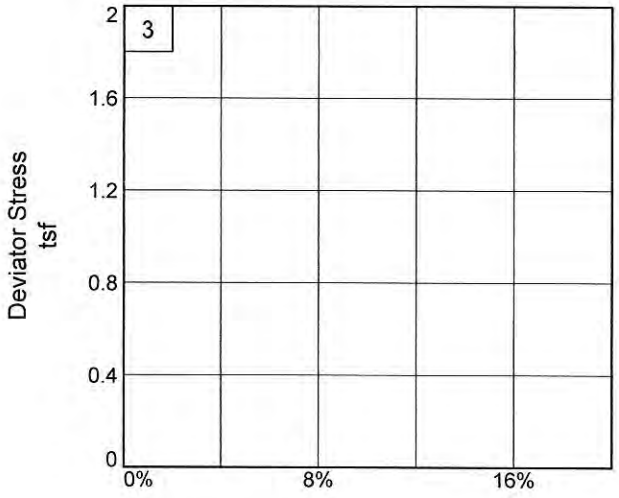
TRIAXIAL SHEAR TEST REPORT

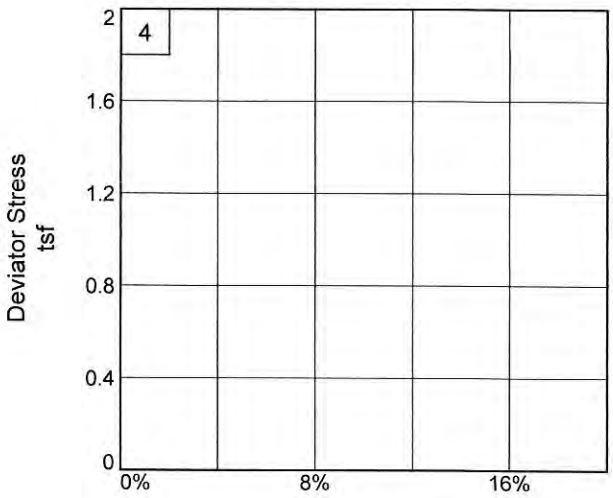
Tolunay-Wong Engineers, Inc.

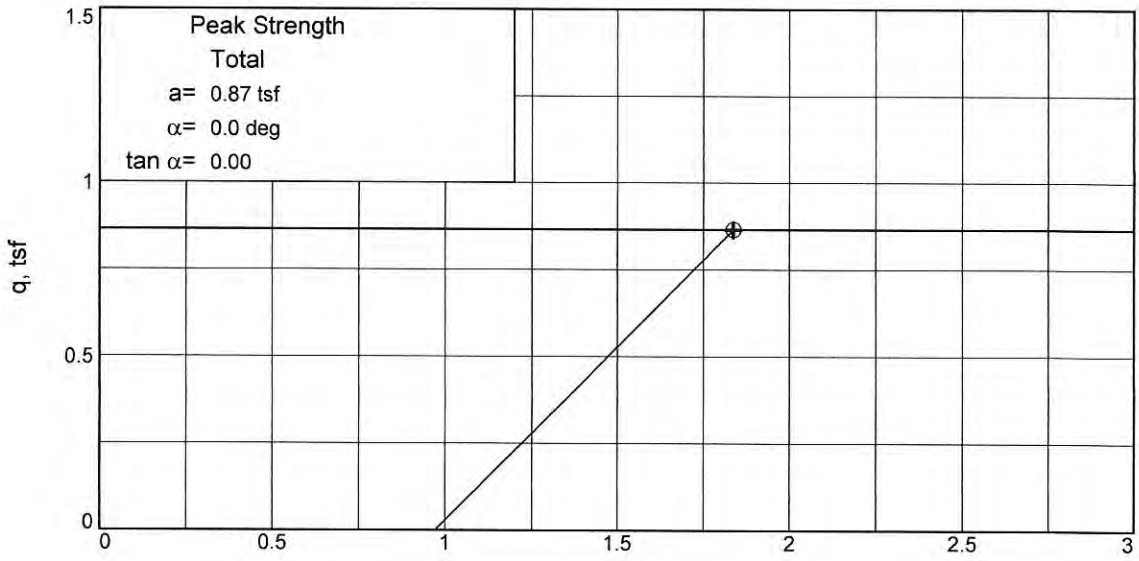
Houston, Texas




Stress Paths: o indicates peak + indicates end

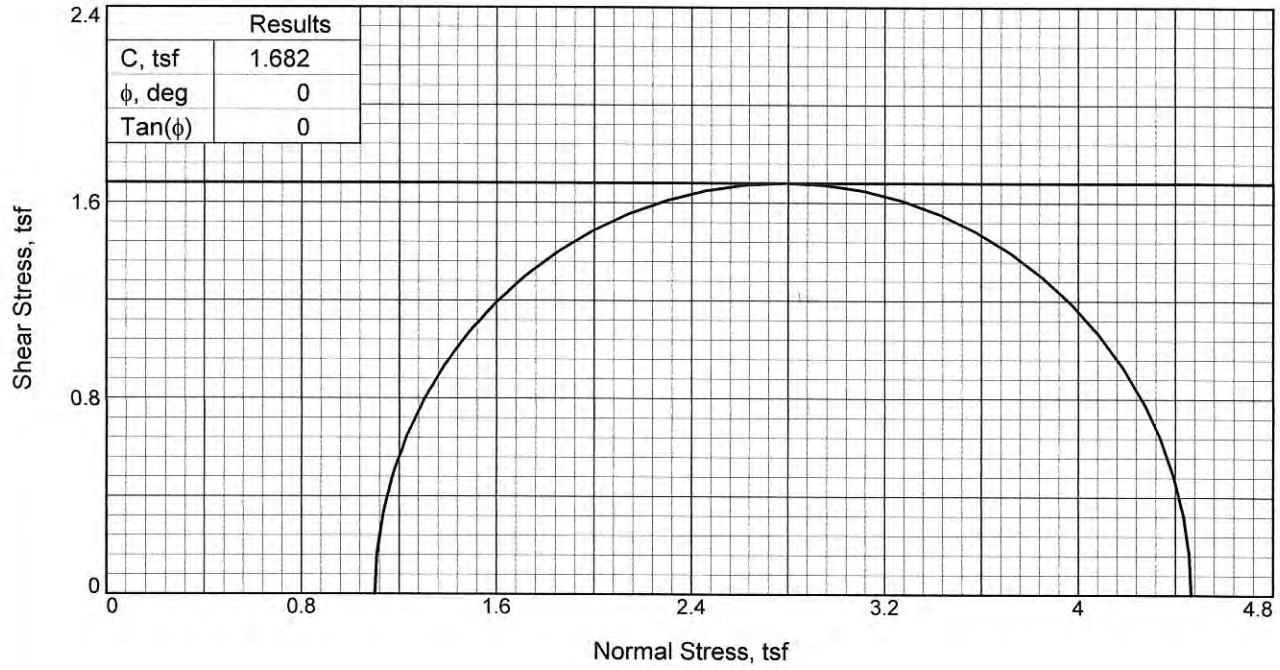
**Client:**

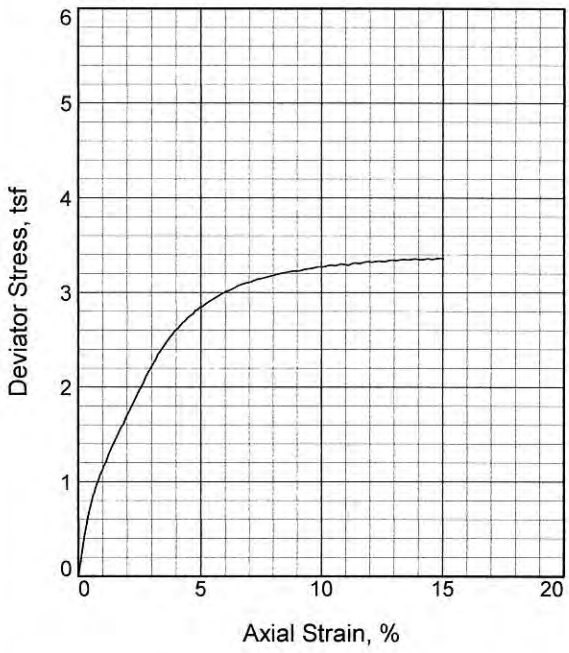
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 38

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 18.6 |
| | Dry Density, pcf | 116.0 |
| | Saturation, % | 99.5 |
| | Void Ratio | 0.5342 |
| | Diameter, in. | 2.78 |
| | Height, in. | 5.95 |
| At Test | Water Content, % | 19.0 |
| | Dry Density, pcf | 116.0 |
| | Saturation, % | 101.2 |
| | Void Ratio | 0.5342 |
| | Diameter, in. | 2.78 |
| | Height, in. | 5.95 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 15.30 |
| Fail. Stress, tsf | | 3.36 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 4.46 |
| $\sigma_3$ Failure, tsf | | 1.10 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY with SAND

**LL=** 42 **PL=** 18 **PI=** 24

**Assumed Specific Gravity=** 2.85

**Remarks:** Test Method: ASTM D2850
Failure Type: Buldge

**Figure** _____

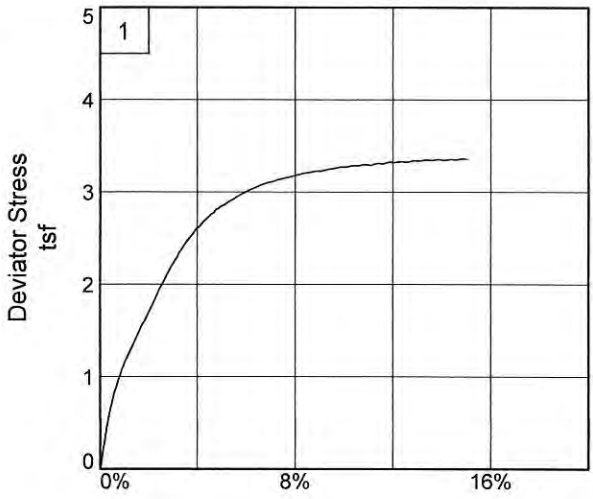
**Client:**

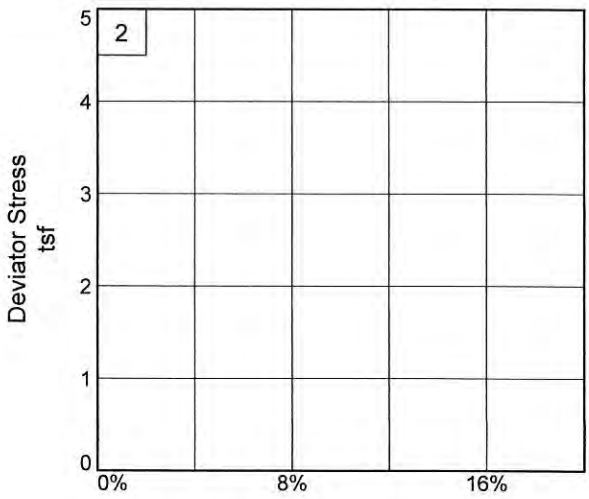
**Project:** San Jacinto River Waste Pit Superfund Site

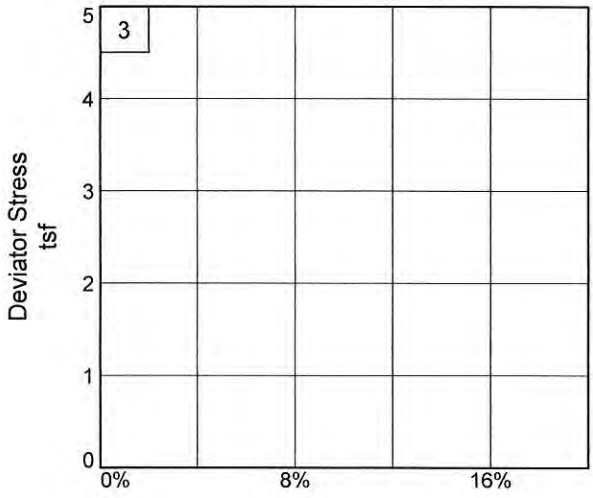
**Source of Sample:** SJGB047 **Depth:** 43

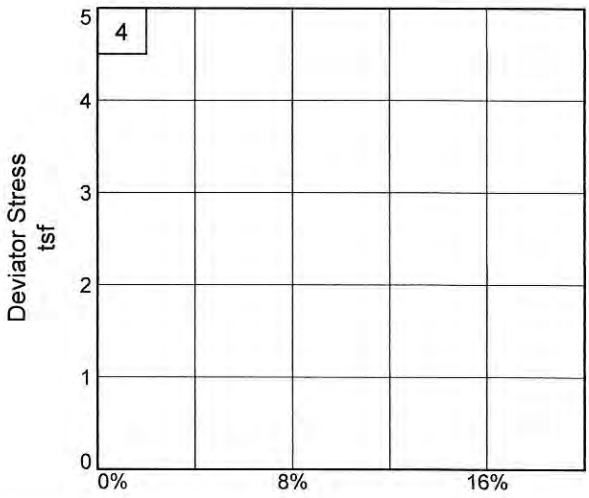
**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

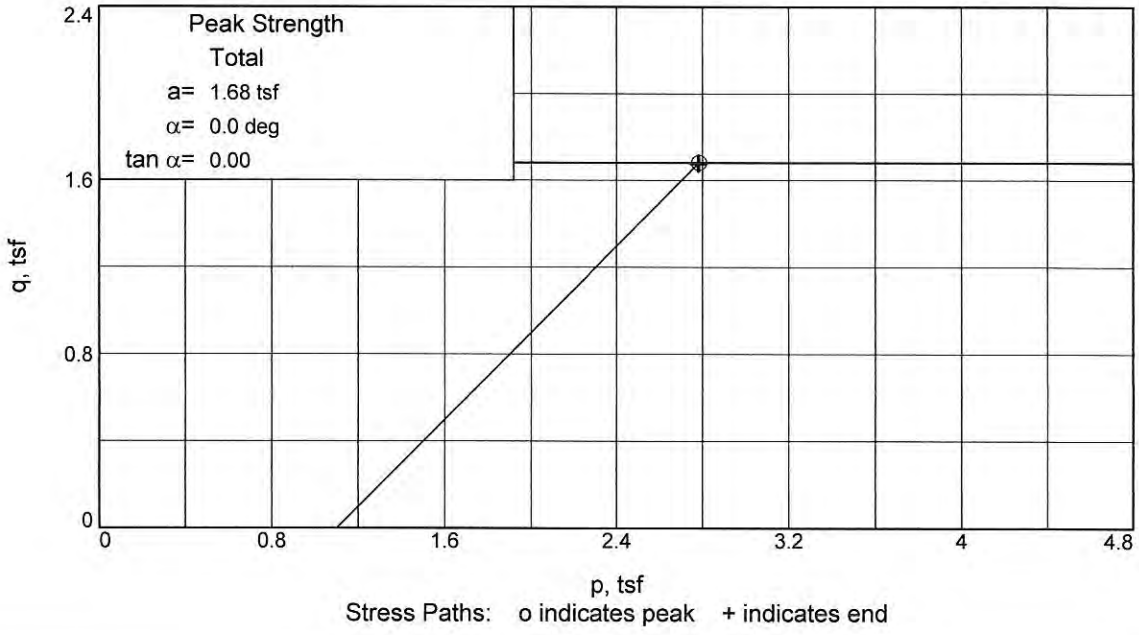
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

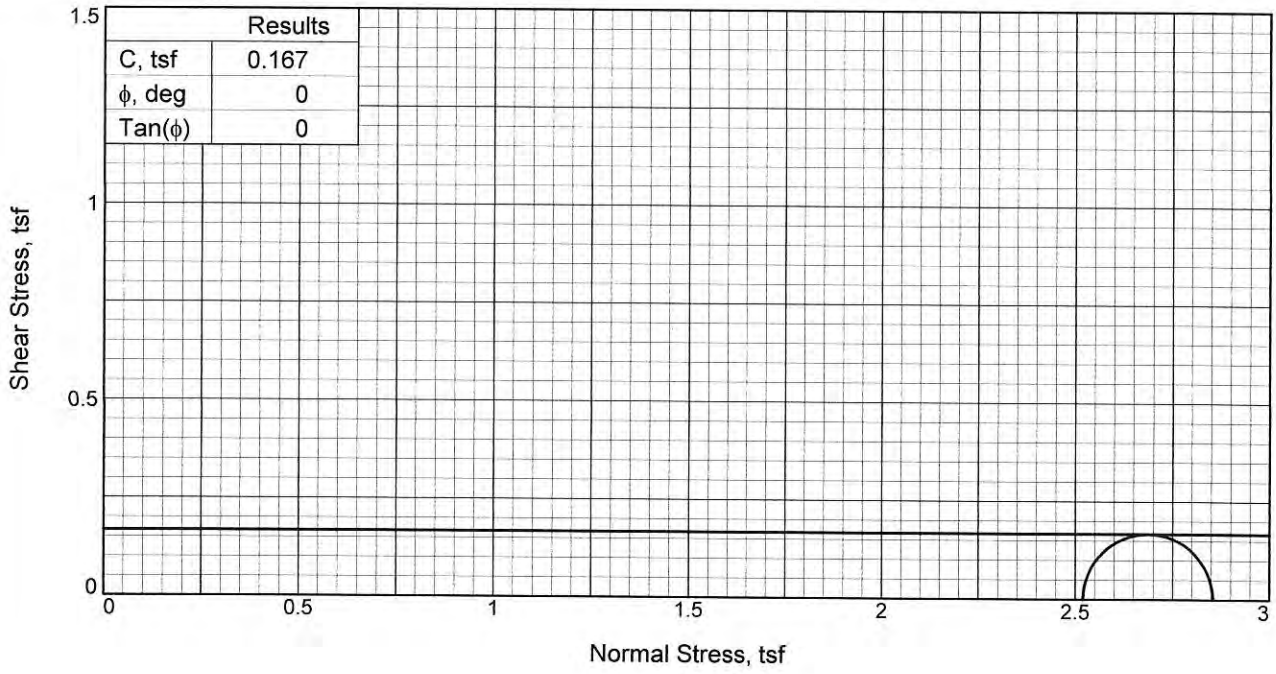
**Client:**

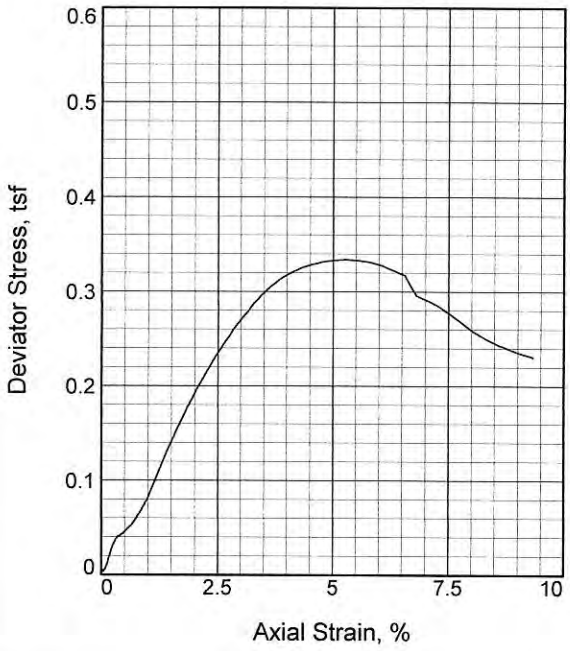
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 43

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 21.4 |
| | Dry Density, pcf | 98.0 |
| | Saturation, % | 80.4 |
| | Void Ratio | 0.7196 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.54 |
| At Test | Water Content, % | 22.5 |
| | Dry Density, pcf | 98.0 |
| | Saturation, % | 84.4 |
| | Void Ratio | 0.7196 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.54 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 35.00 |
| Fail. Stress, tsf | | 0.33 |
| Strain, % | | 5.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.85 |
| $\sigma_3$ Failure, tsf | | 2.52 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Tan and gray FAT CLAY

**LL=** 73 **PL=** 23 **PI=** 50

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Multiple shear

**Figure** _____

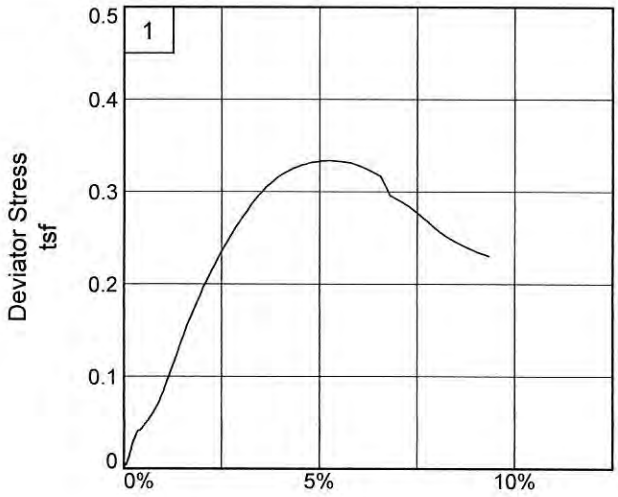
**Client:**

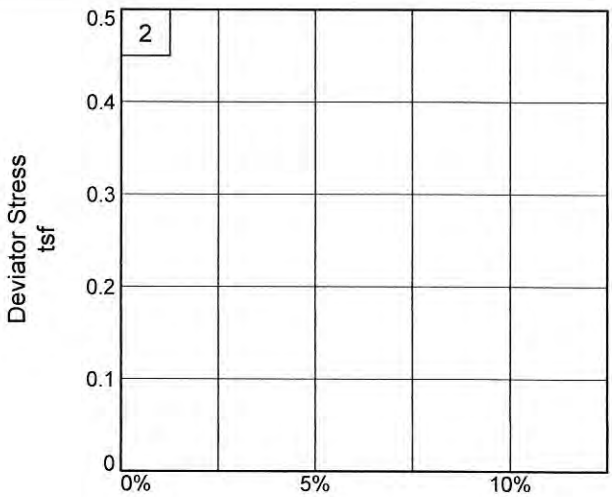
**Project:** San Jacinto River Waste Pit Superfund Site

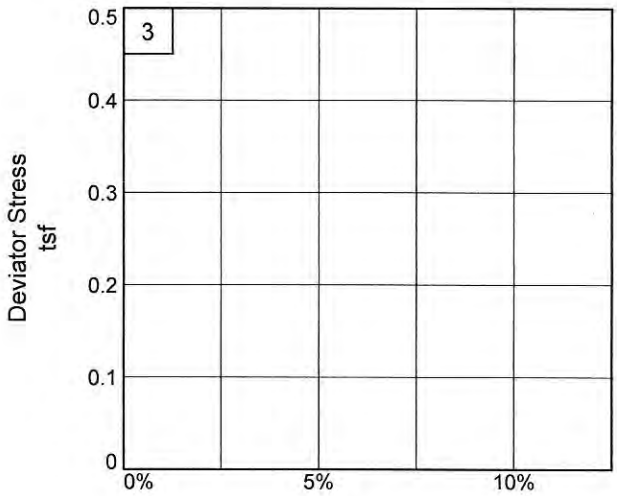
**Source of Sample:** SJGB047 **Depth:** 98

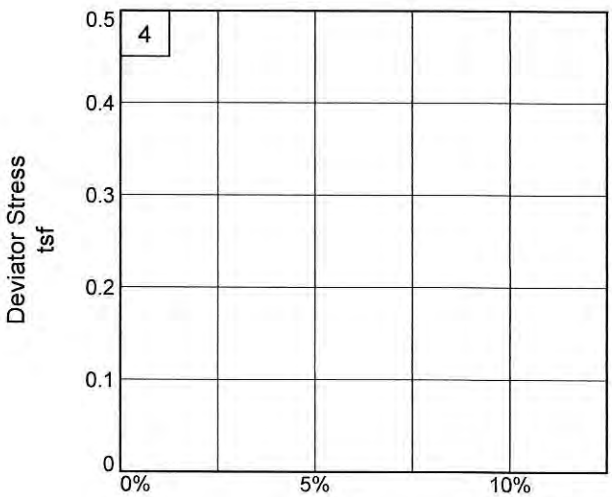
**Proj. No.:** 19.15.131 **Date Sampled:** 3/3/20

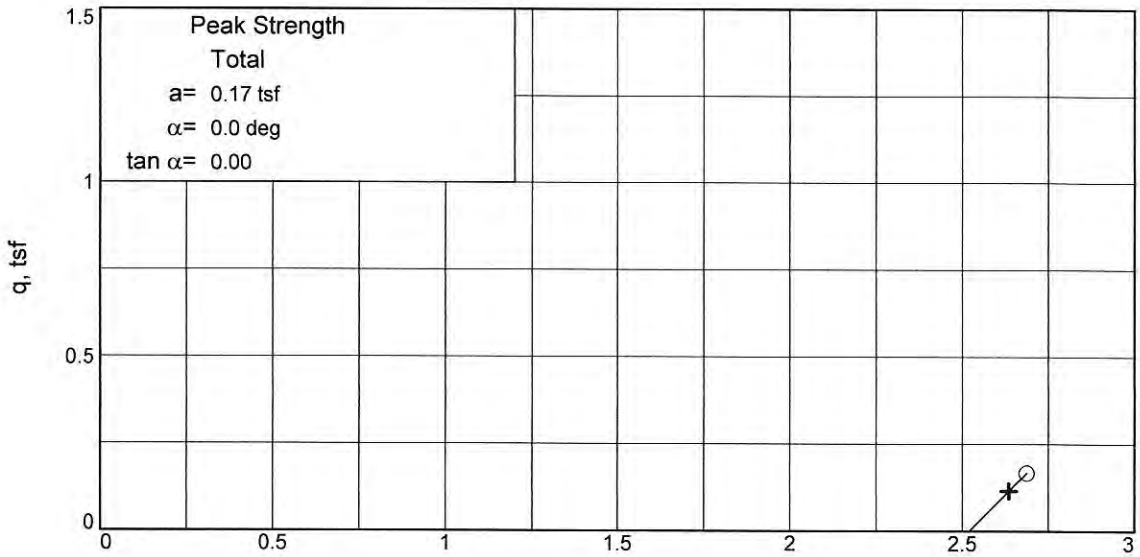
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

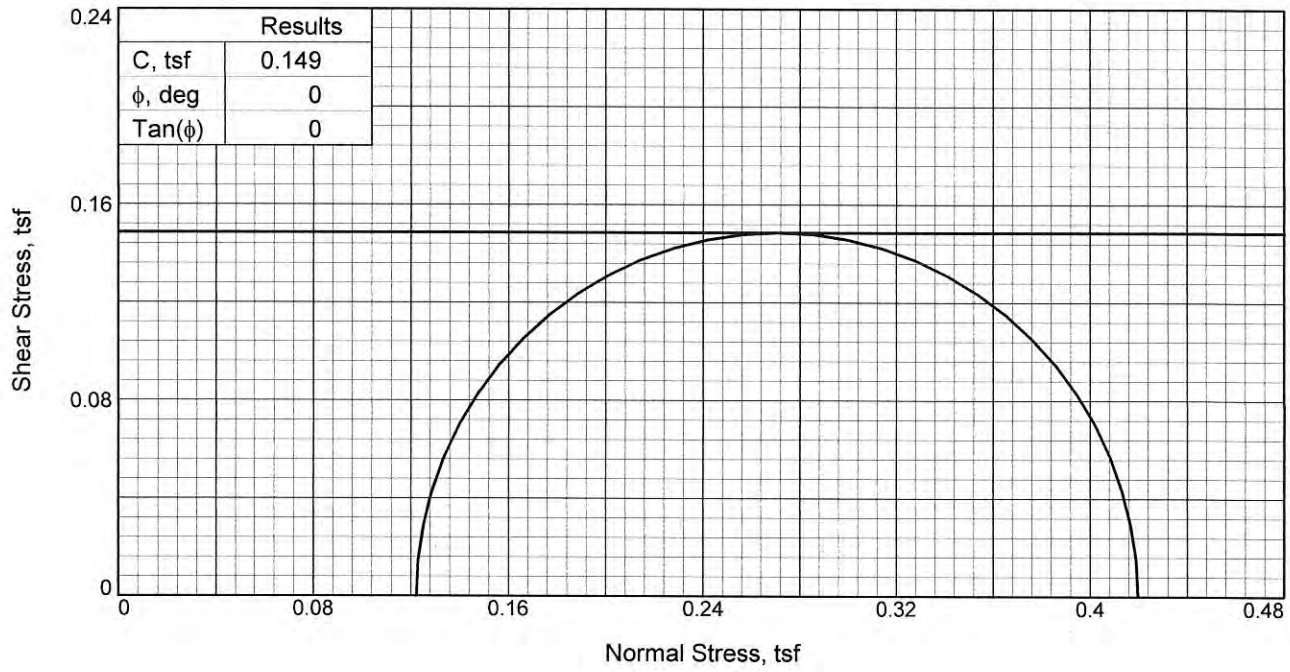
**Client:**

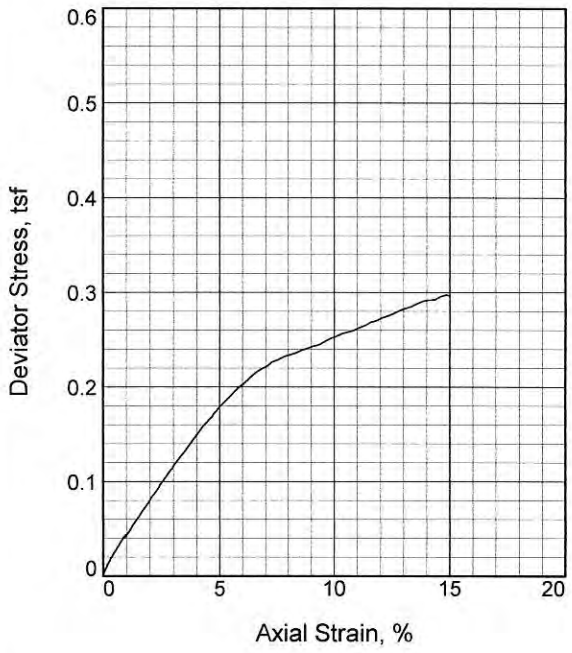
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 98

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 28.6 |
| | Dry Density, pcf | 85.0 |
| | Saturation, % | 78.6 |
| | Void Ratio | 0.9832 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.17 |
| At Test | Water Content, % | 27.8 |
| | Dry Density, pcf | 85.0 |
| | Saturation, % | 76.4 |
| | Void Ratio | 0.9832 |
| | Diameter, in. | 2.85 |
| | Height, in. | 5.17 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 1.70 |
| Fail. Stress, tsf | | 0.30 |
| Strain, % | | 14.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.42 |
| $\sigma_3$ Failure, tsf | | 0.12 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Dark gray FAT CLAY

**LL=** 32 **PL=** 16 **PI=** 16
**Assumed Specific Gravity=** 2.70
**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

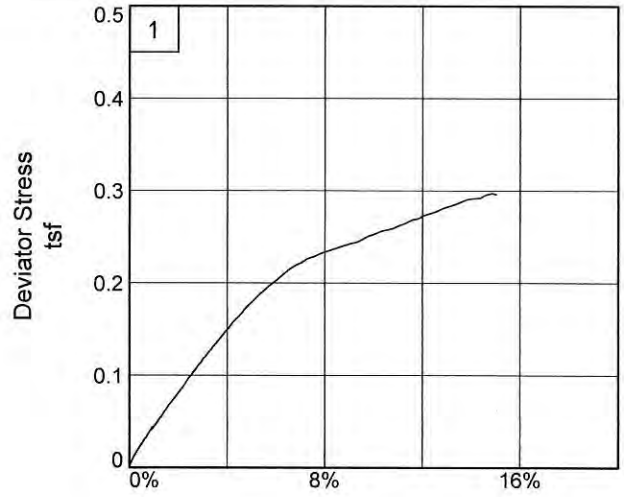
**Client:**

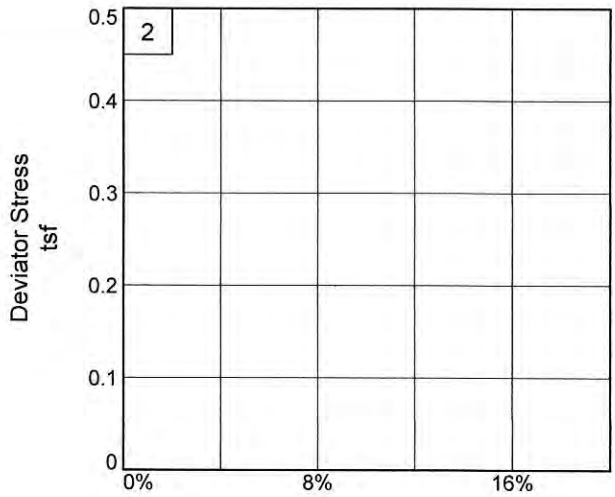
**Project:** San Jacinto River Waste Pit Superfund Site

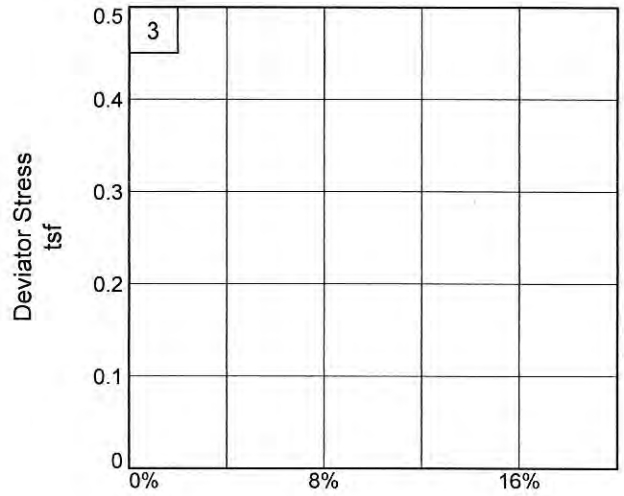
**Source of Sample:** SJGB050 **Depth:** 4-6

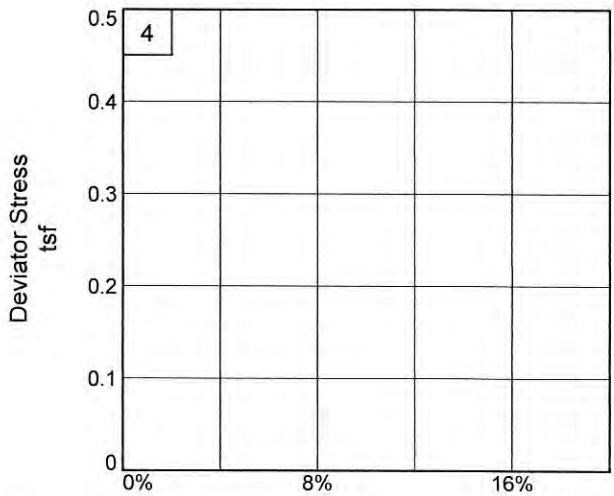
**Proj. No.:** 19.15.131 **Date Sampled:** 2/20/20

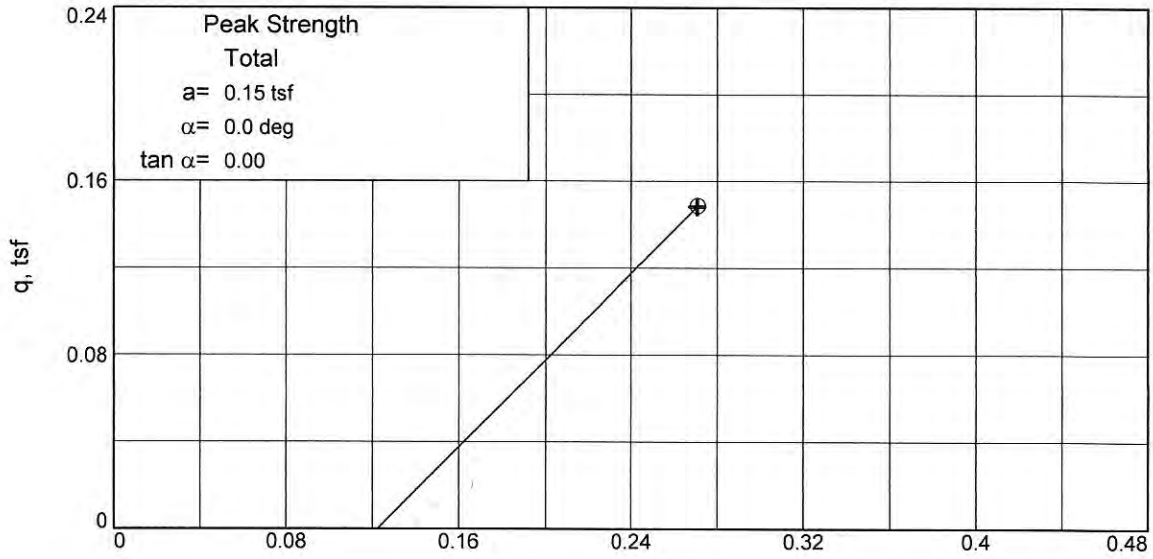
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

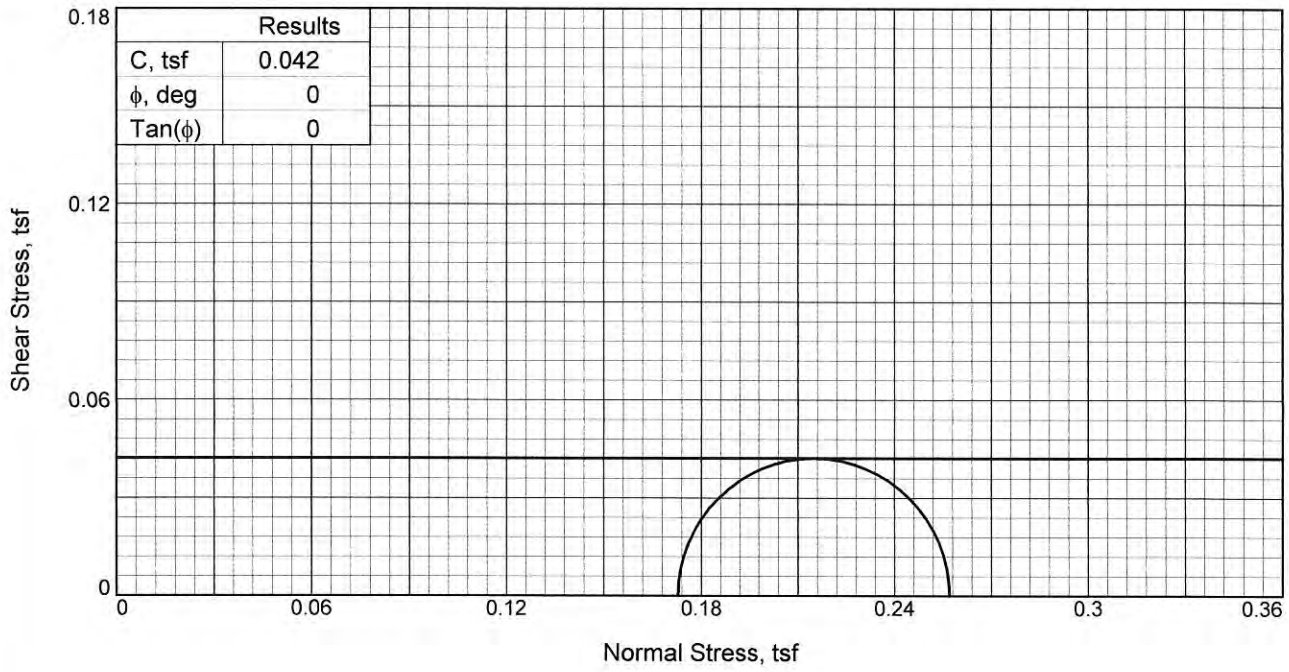
**Client:**

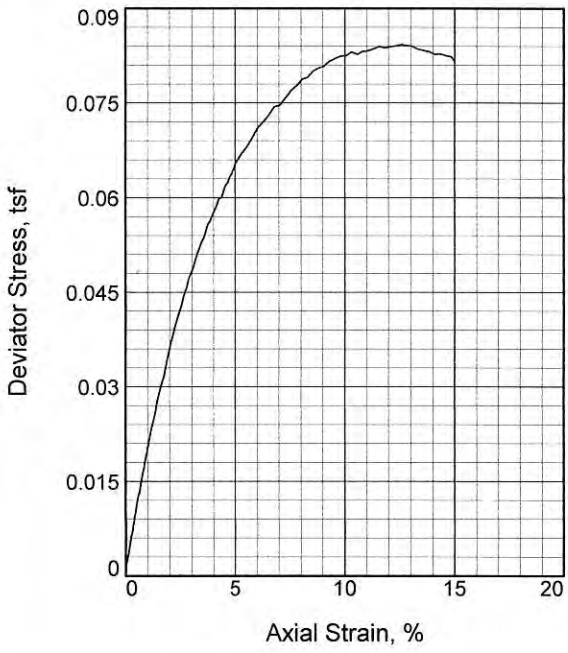
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB050 **Depth:** 4-6

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 32.8 |
| | Dry Density, pcf | 85.3 |
| | Saturation, % | 90.7 |
| | Void Ratio | 0.9761 |
| | Diameter, in. | 2.73 |
| | Height, in. | 5.70 |
| At Test | Water Content, % | 34.1 |
| | Dry Density, pcf | 85.3 |
| | Saturation, % | 94.2 |
| | Void Ratio | 0.9761 |
| | Diameter, in. | 2.73 |
| | Height, in. | 5.70 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 2.40 |
| Fail. Stress, tsf | | 0.08 |
| Strain, % | | 12.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 0.26 |
| $\sigma_3$ Failure, tsf | | 0.17 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Dark gray CLAYEY SAND

**LL=** 34 **PL=** 17 **PI=** 17

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

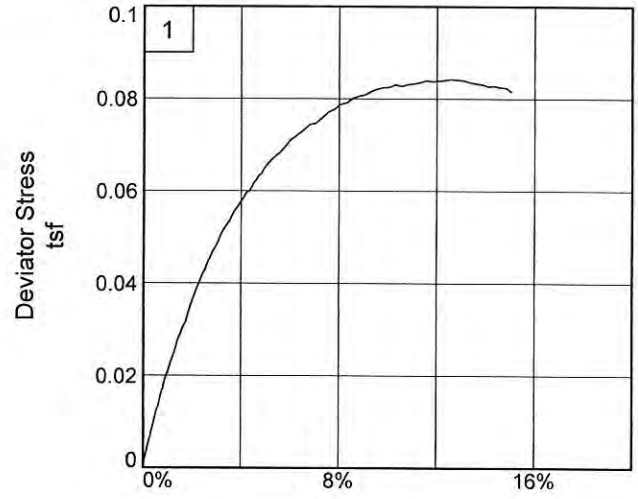
**Client:**

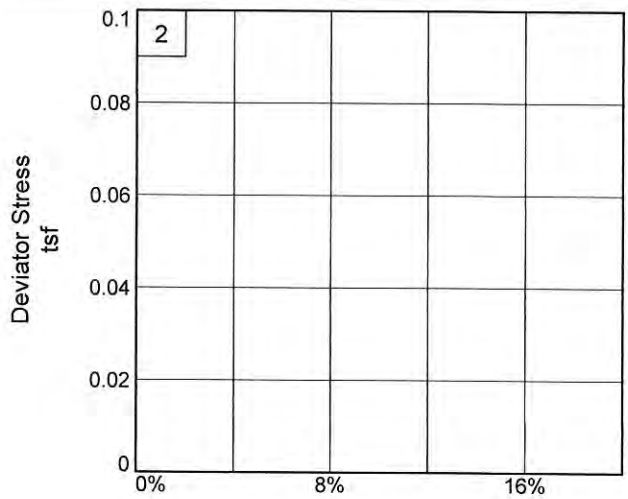
**Project:** San Jacinto River Waste Pit Superfund Site

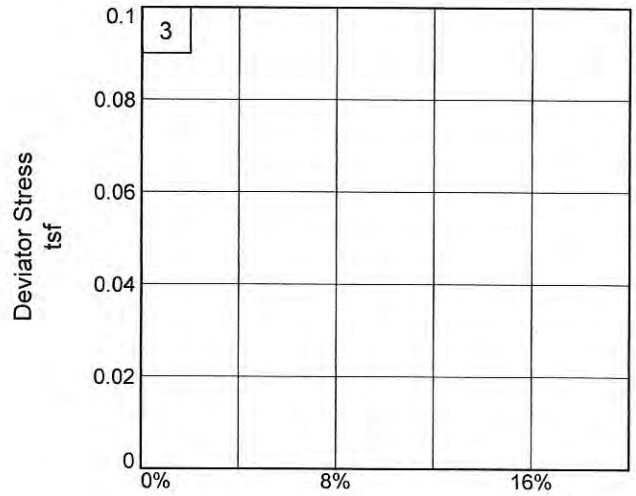
**Source of Sample:** SJGB050 **Depth:** 6-8

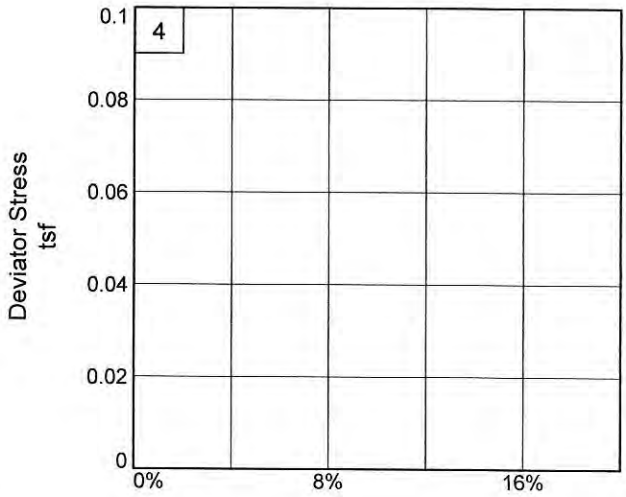
**Proj. No.:** 19.15.131 **Date Sampled:** 2/20/20

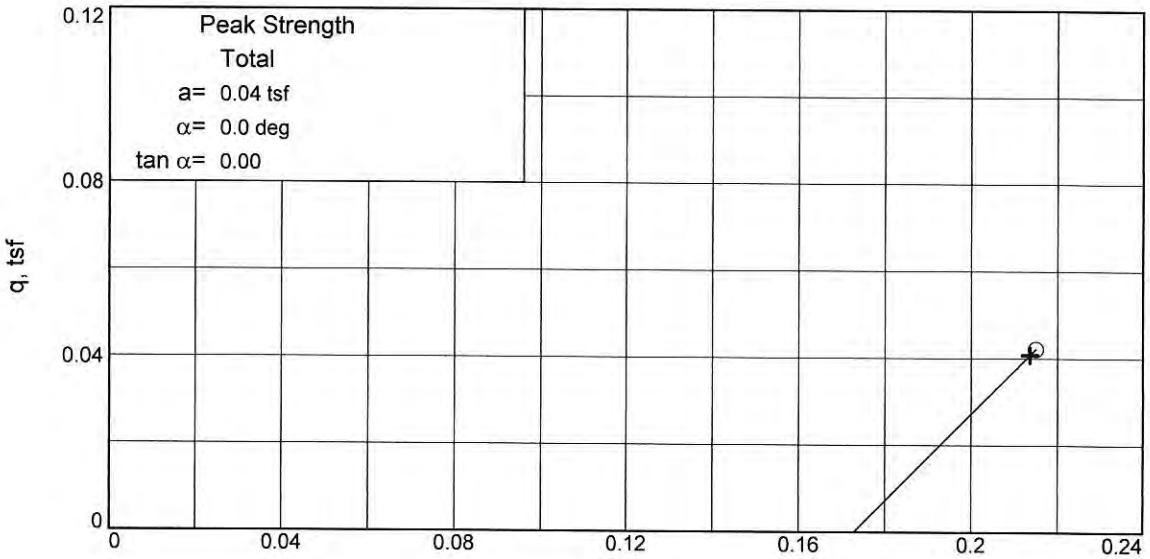
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

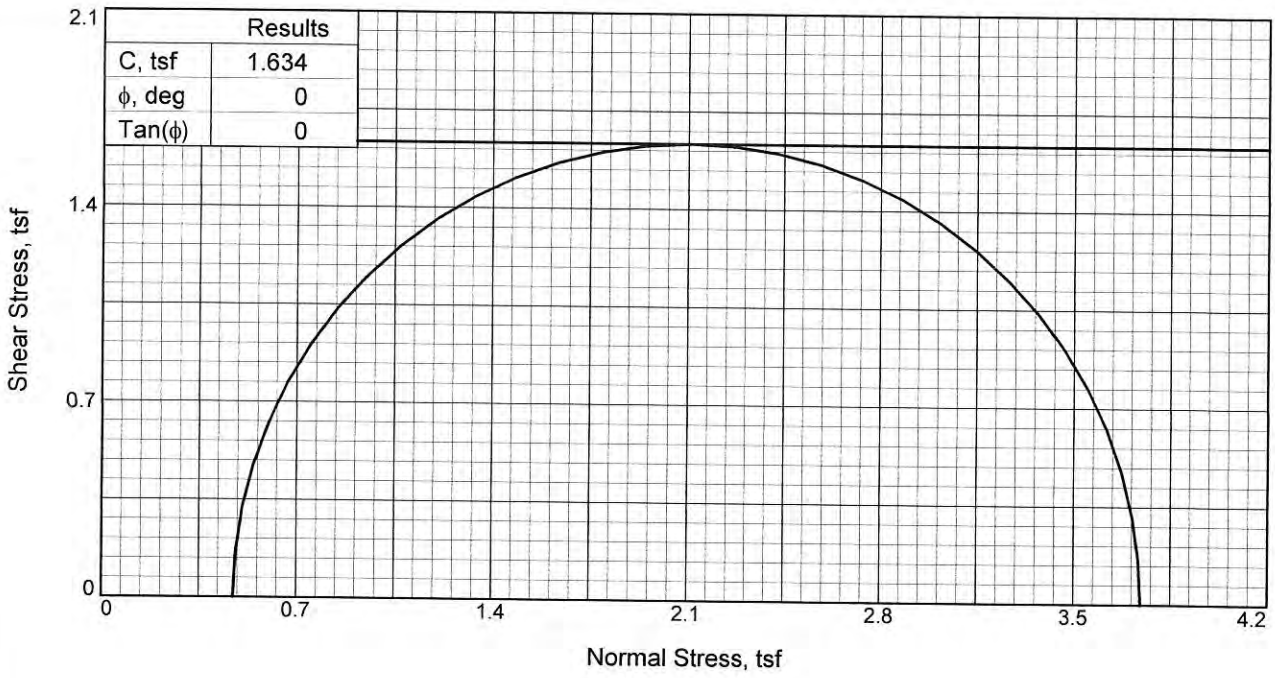
**Client:**

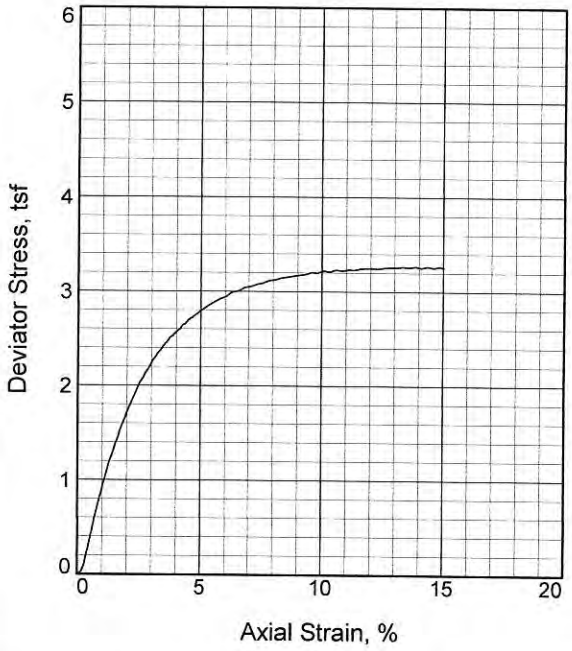
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB050 **Depth:** 6-8

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 17.3 |
| | Dry Density, pcf | 116.3 |
| | Saturation, % | 99.2 |
| | Void Ratio | 0.4816 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.84 |
| At Test | Water Content, % | 17.6 |
| | Dry Density, pcf | 116.3 |
| | Saturation, % | 101.1 |
| | Void Ratio | 0.4816 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.84 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 6.60 |
| Fail. Stress, tsf | | 3.27 |
| Strain, % | | 14.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.74 |
| $\sigma_3$ Failure, tsf | | 0.48 |

**Type of Test:** Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY

**LL=** 45 **PL=** 22 **PI=** 23

**Assumed Specific Gravity=** 2.76

**Remarks:** Test Method: ASTM D2850
Failure Type: Bulge

**Figure** _____

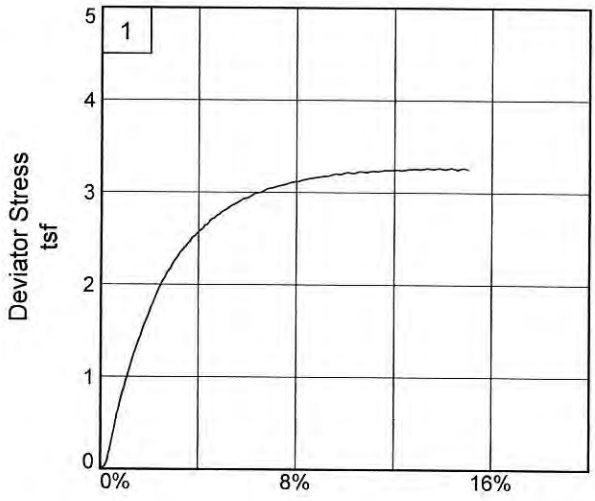
**Client:**

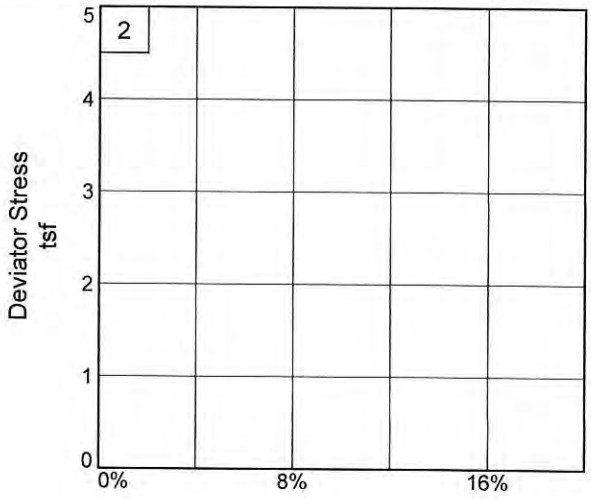
**Project:** San Jacinto River Waste Pit Superfund Site

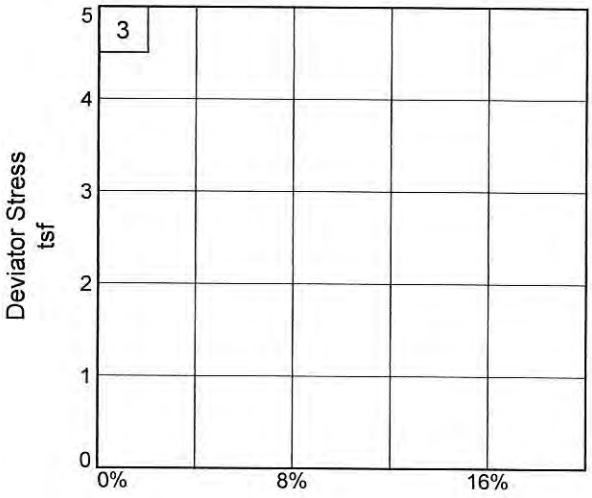
**Source of Sample:** SJGB053 **Depth:** 18

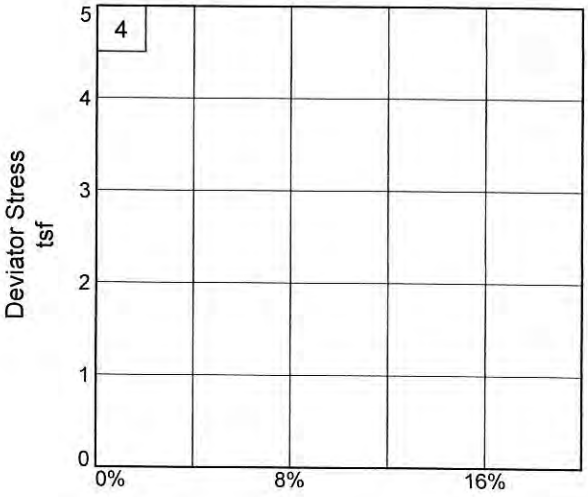
**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

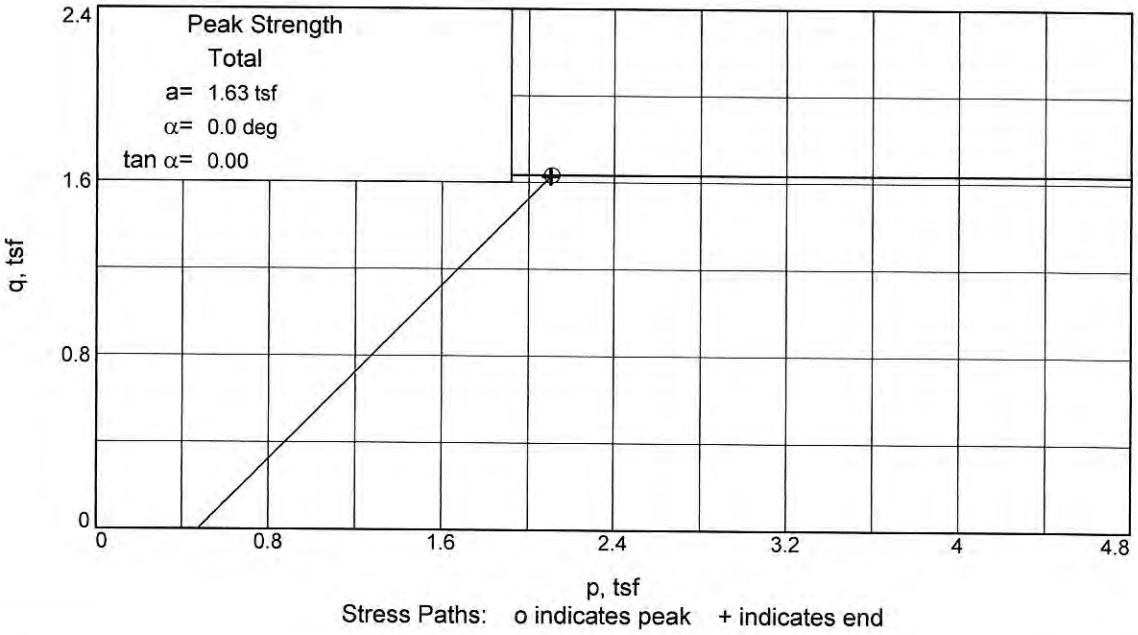
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

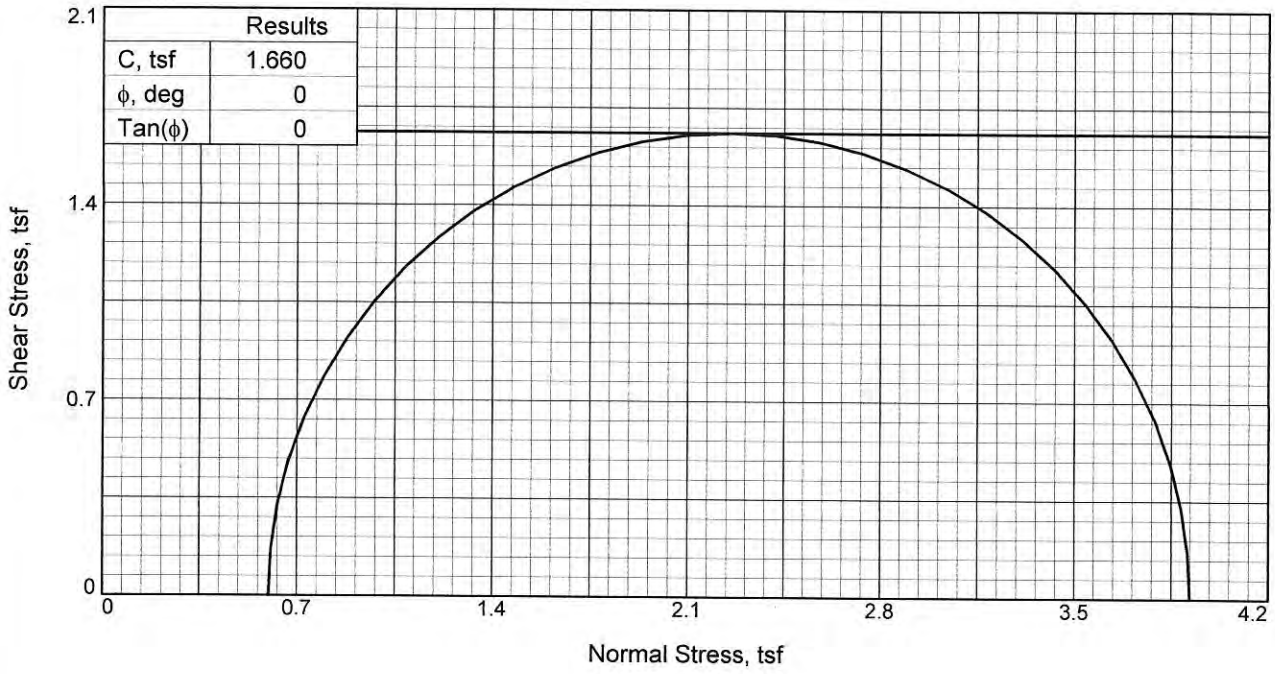
**Client:**

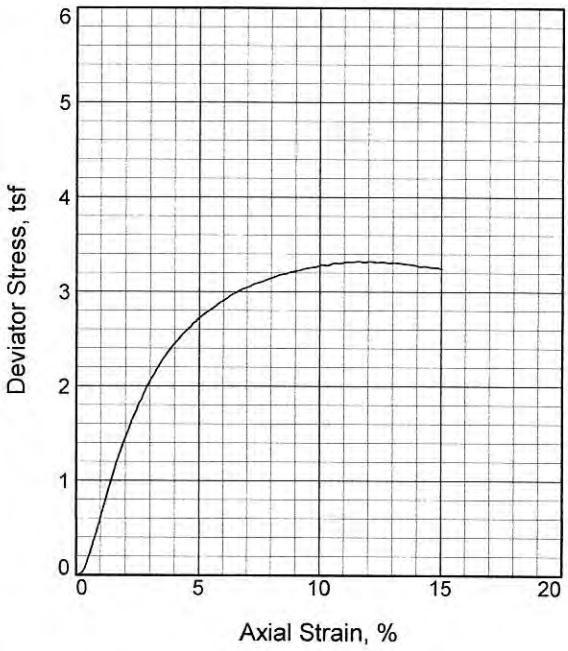
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 18

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 17.5 |
| | Dry Density, pcf | 116.0 |
| | Saturation, % | 99.5 |
| | Void Ratio | 0.4850 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.84 |
| At Test | Water Content, % | 16.9 |
| | Dry Density, pcf | 116.0 |
| | Saturation, % | 96.0 |
| | Void Ratio | 0.4850 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.84 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 8.30 |
| Fail. Stress, tsf | | 3.32 |
| Strain, % | | 12.1 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.92 |
| $\sigma_3$ Failure, tsf | | 0.60 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Tan LEAN CLAY with SAND

**LL=** 46 **PL=** 21 **PI=** 25

**Assumed Specific Gravity=** 2.76

**Remarks:**
Test Method: ASTM D2850
Failure Type: Buldge

**Figure** _____

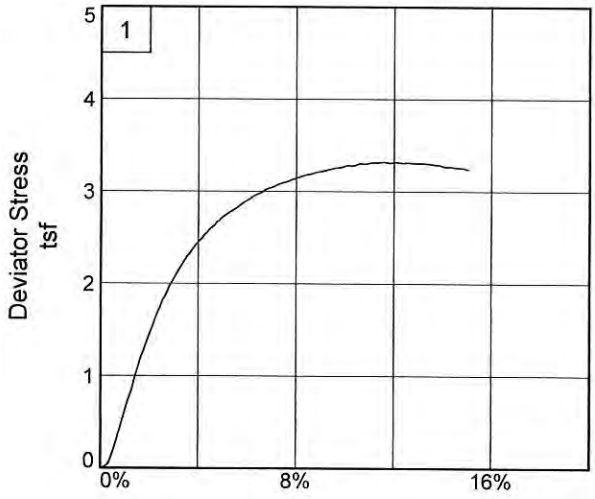
**Client:**

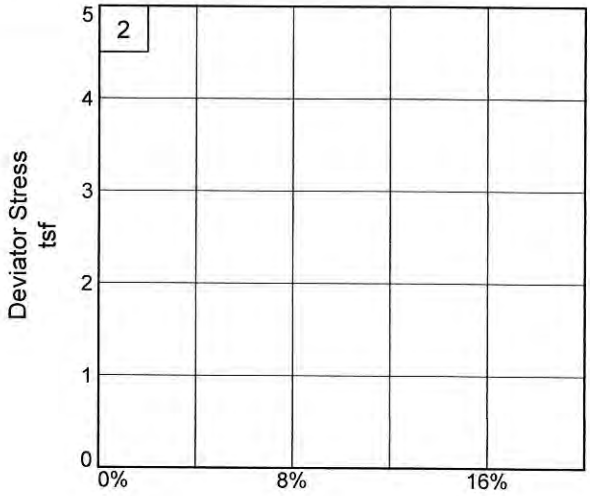
**Project:** San Jacinto River Waste Pit Superfund Site

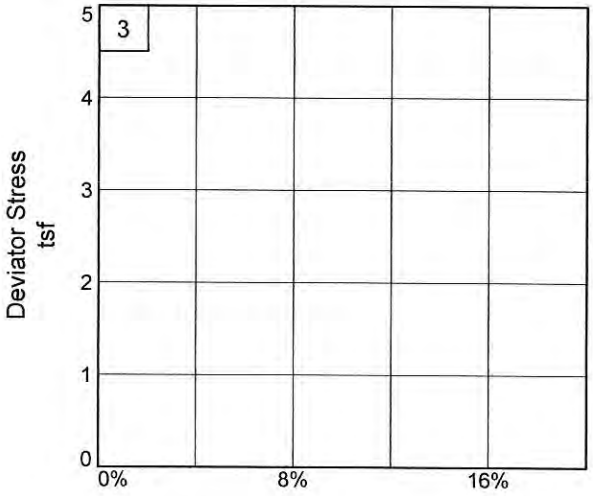
**Source of Sample:** SJGB053 **Depth:** 23

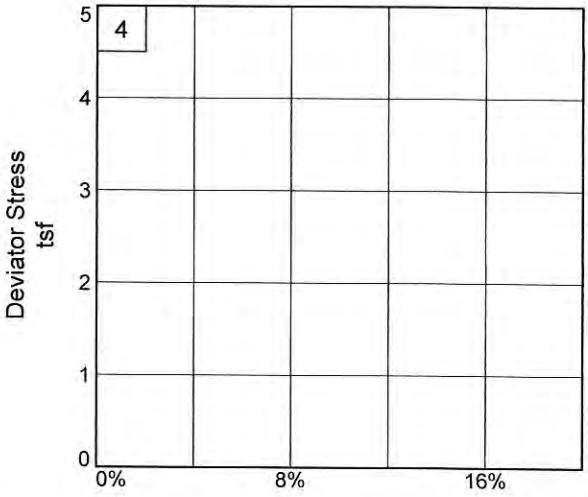
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

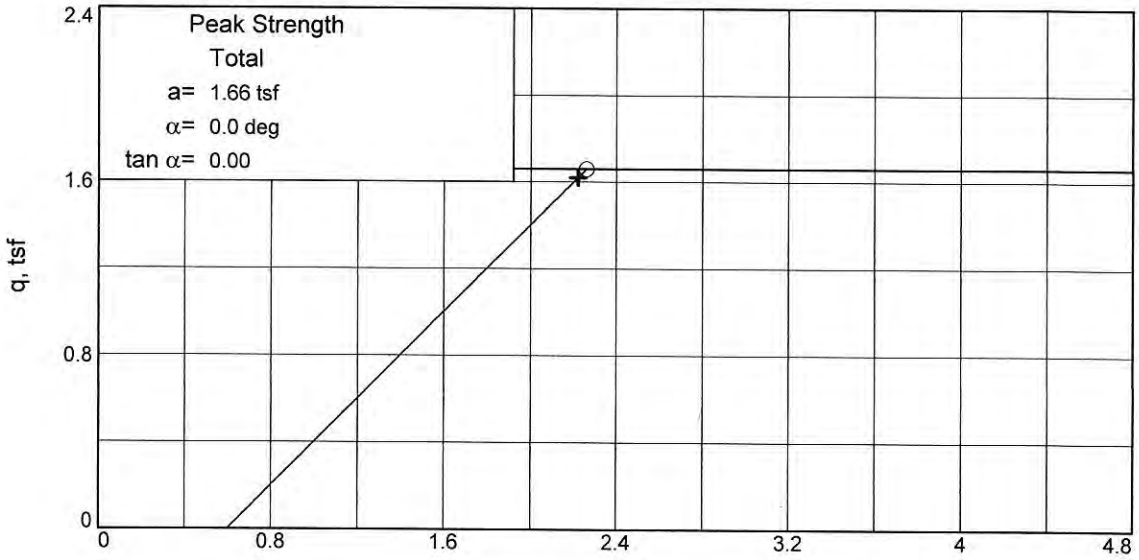
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

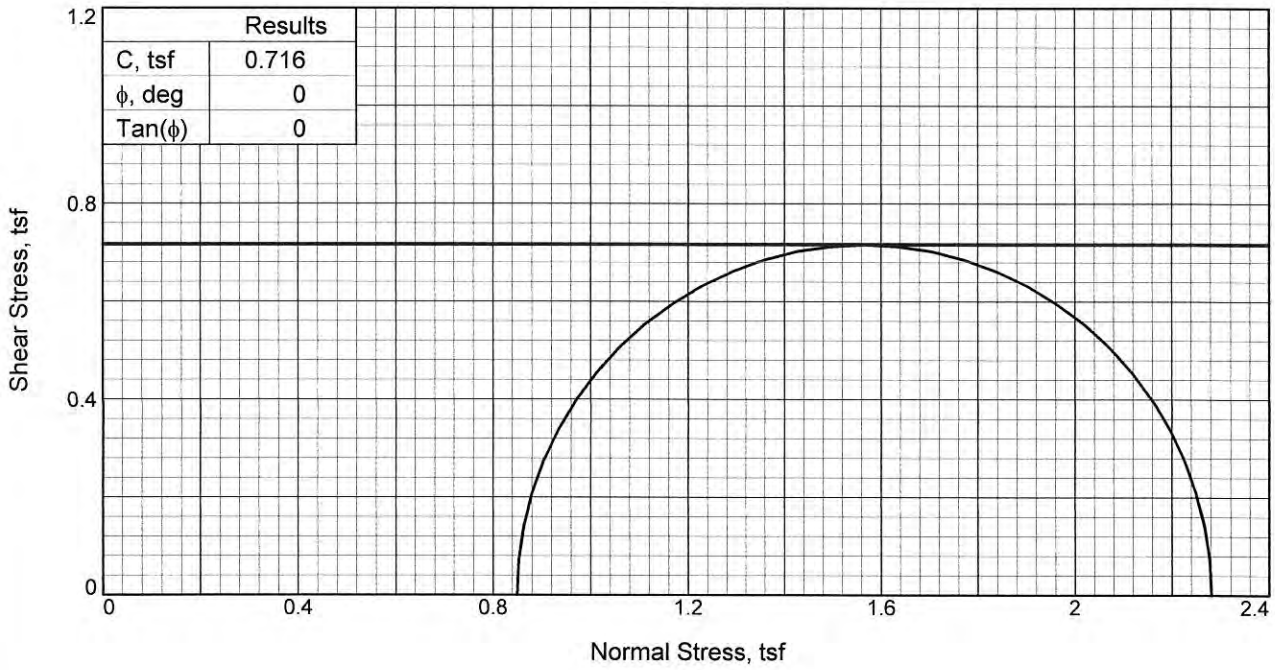
**Client:**

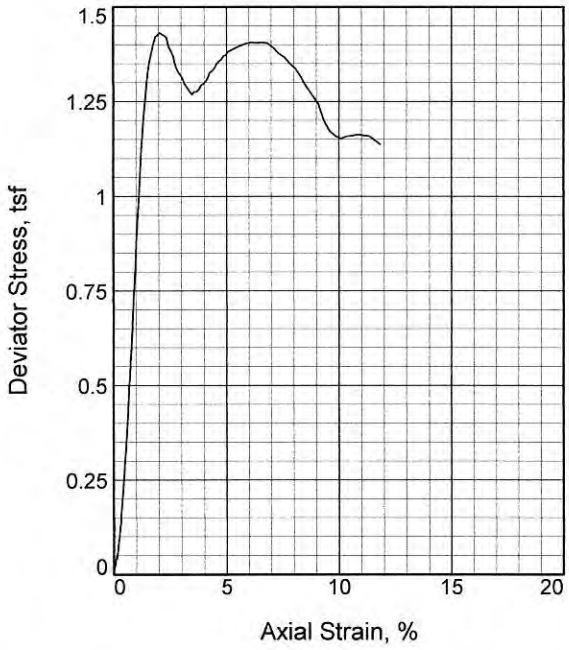
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 23

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 28.4 |
| | Dry Density, pcf | 96.0 |
| | Saturation, % | 99.9 |
| | Void Ratio | 0.7752 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.89 |
| At Test | Water Content, % | 30.8 |
| | Dry Density, pcf | 96.0 |
| | Saturation, % | 108.6 |
| | Void Ratio | 0.7752 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.89 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 11.80 |
| Fail. Stress, tsf | | 1.43 |
| Strain, % | | 2.0 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.28 |
| $\sigma_3$ Failure, tsf | | 0.85 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Reddish Brown FAT CLAY

**LL=** 70 **PL=** 37 **PI=** 33

**Assumed Specific Gravity=** 2.73

**Remarks:** Test Method: ASTM D2850
Failure type: Slickenslide

**Figure** _____

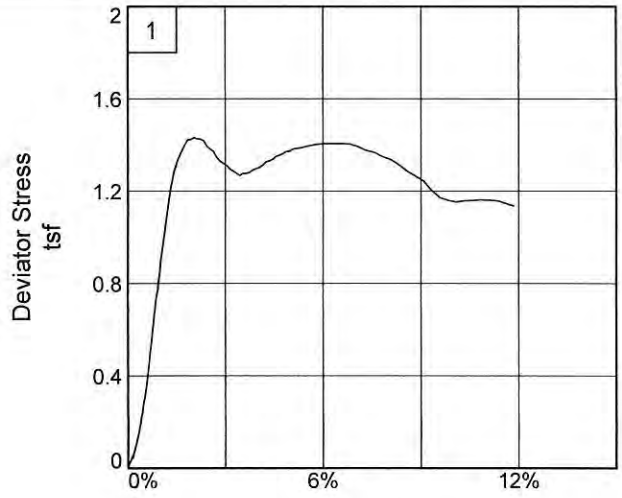
**Client:**

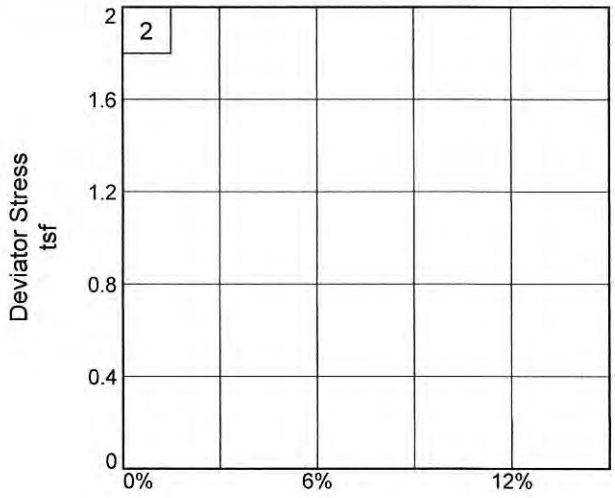
**Project:** San Jacinto River Waste Pit Superfund Site

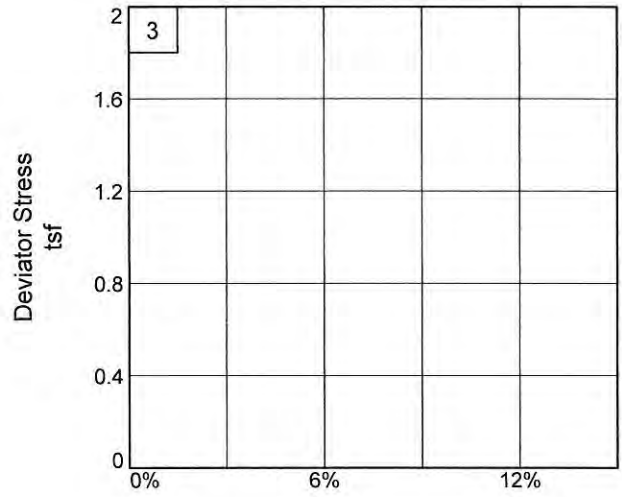
**Source of Sample:** SJGB053 **Depth:** 33

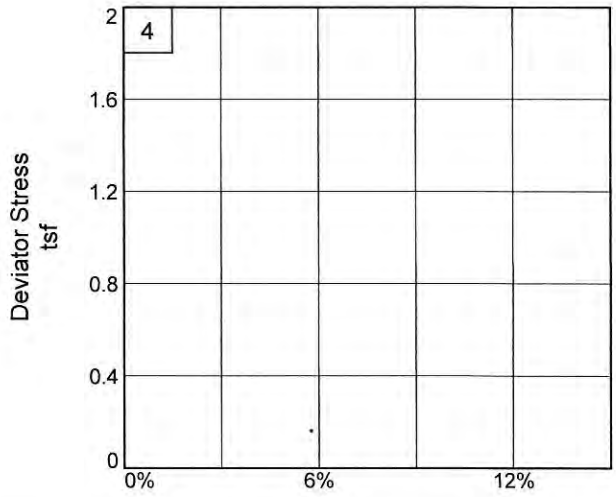
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

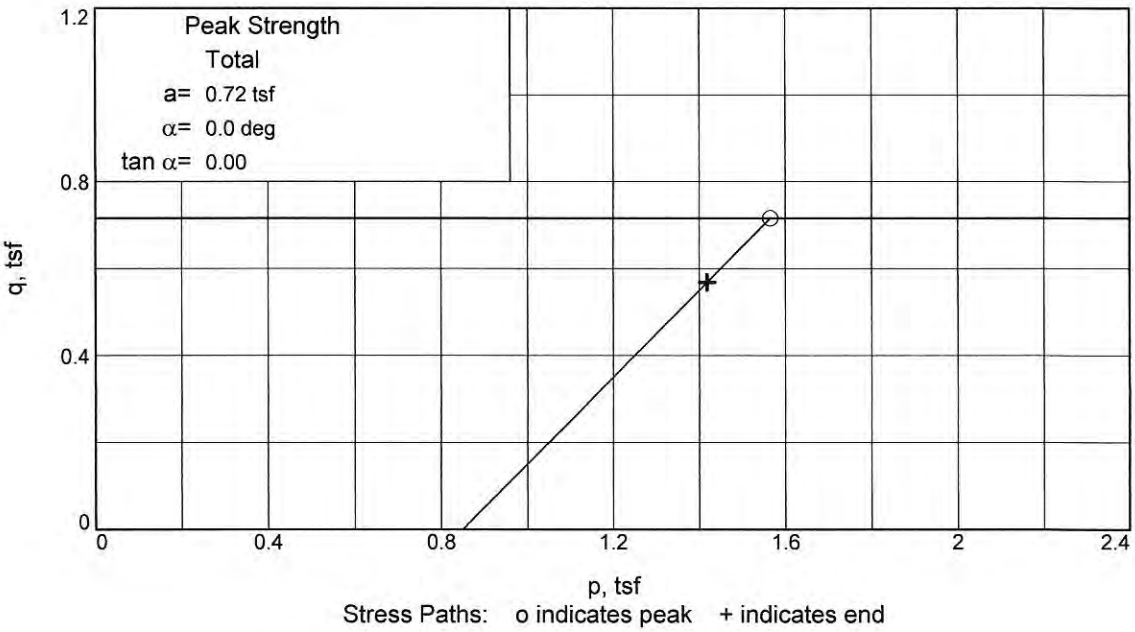
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

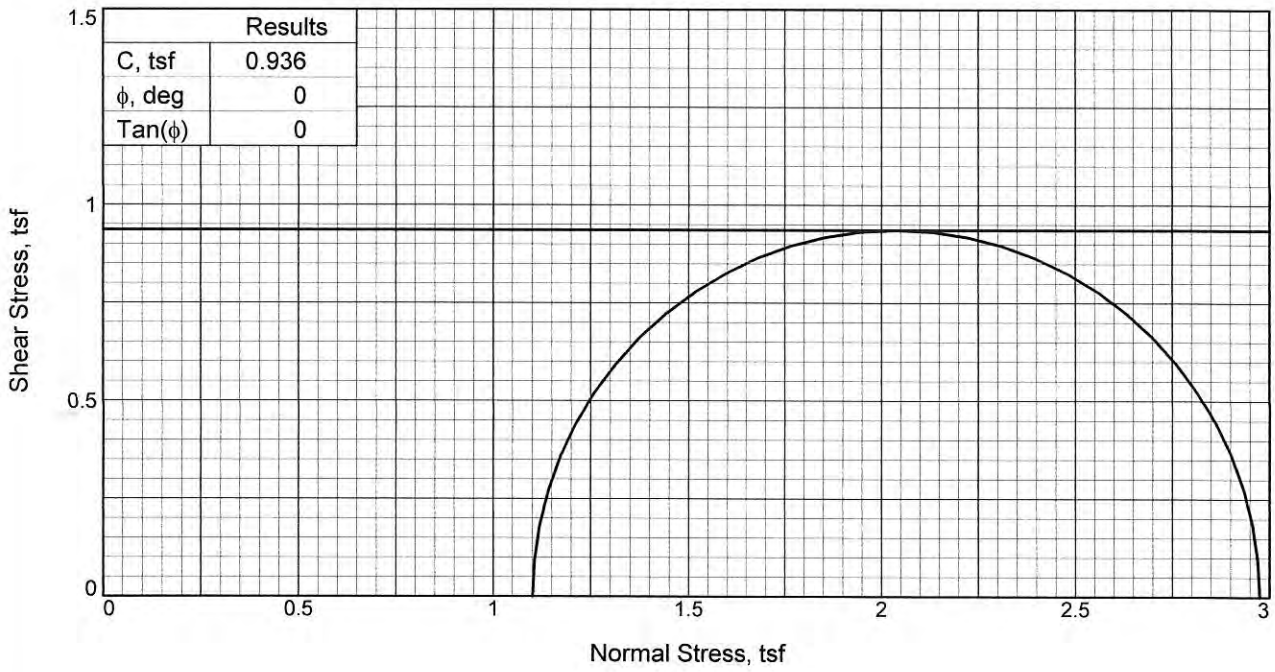
**Client:**

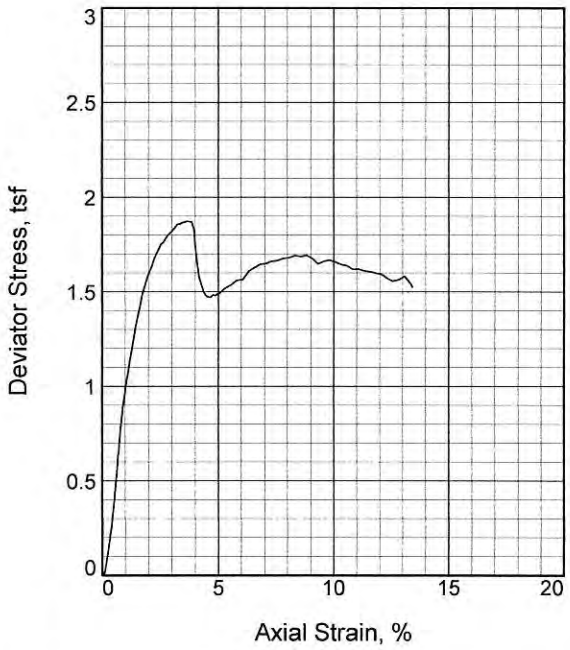
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 33

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 27.0 |
| | Dry Density, pcf | 96.9 |
| | Saturation, % | 99.6 |
| | Void Ratio | 0.7266 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.85 |
| At Test | Water Content, % | 28.3 |
| | Dry Density, pcf | 96.9 |
| | Saturation, % | 104.5 |
| | Void Ratio | 0.7266 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.85 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 15.30 |
| Fail. Stress, tsf | | 1.87 |
| Strain, % | | 3.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.97 |
| $\sigma_3$ Failure, tsf | | 1.10 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray FAT CLAY

**LL=** 71 **PL=** 35 **PI=** 36

**Assumed Specific Gravity=** 2.68

**Remarks:** Test Method: ASTM D2850
Failure type: Slickenslide

**Figure** _____

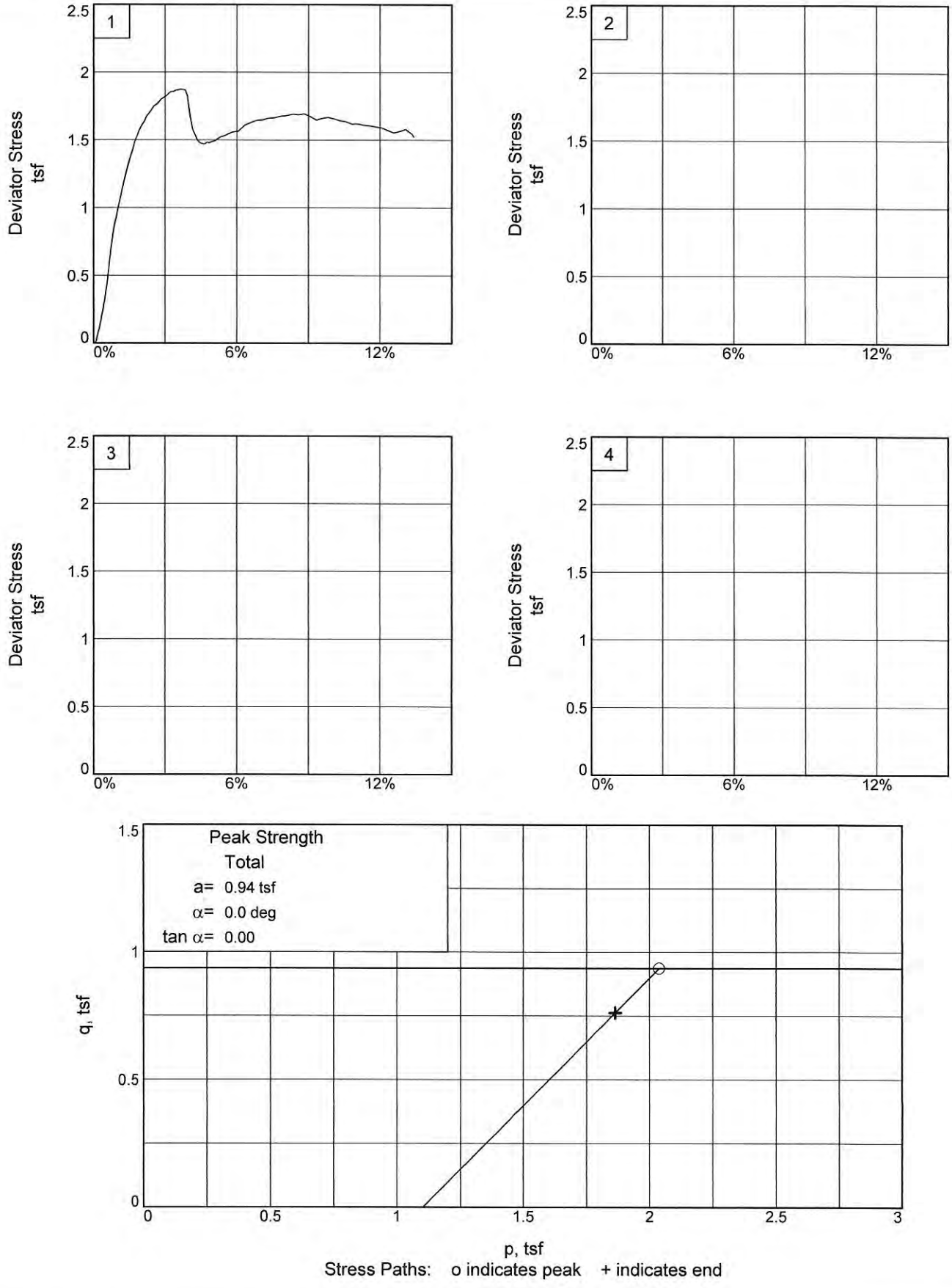
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 43

**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



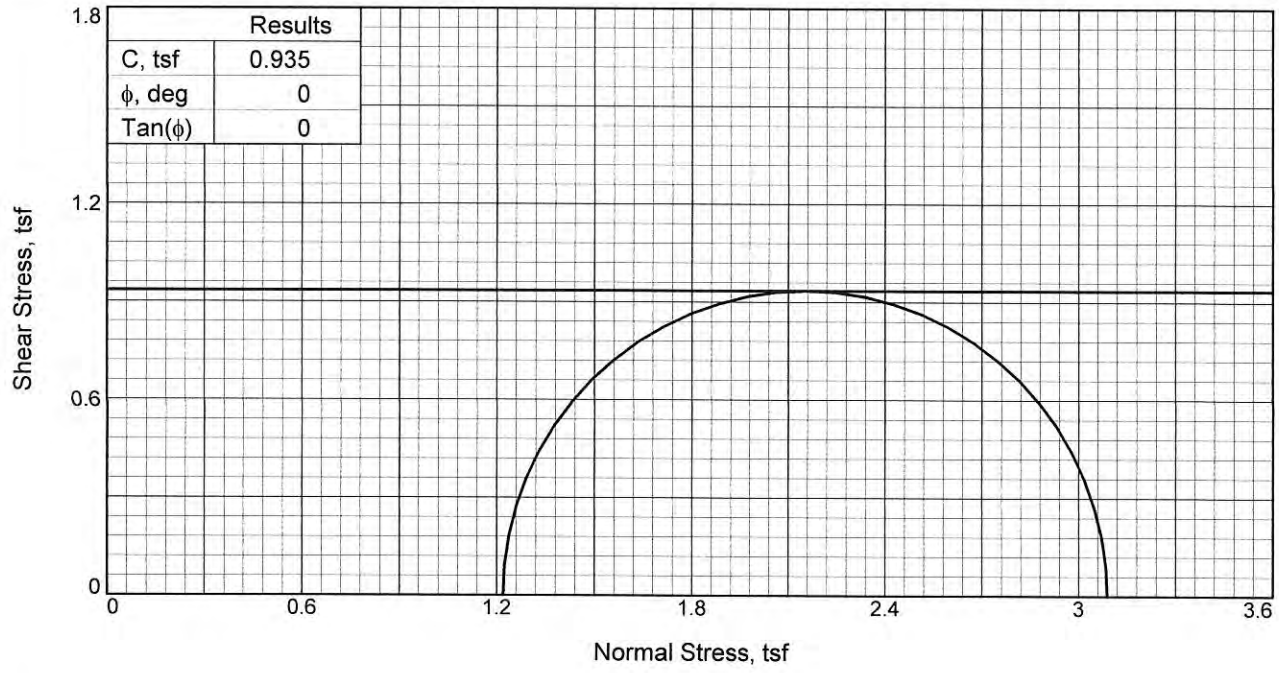

**Client:**

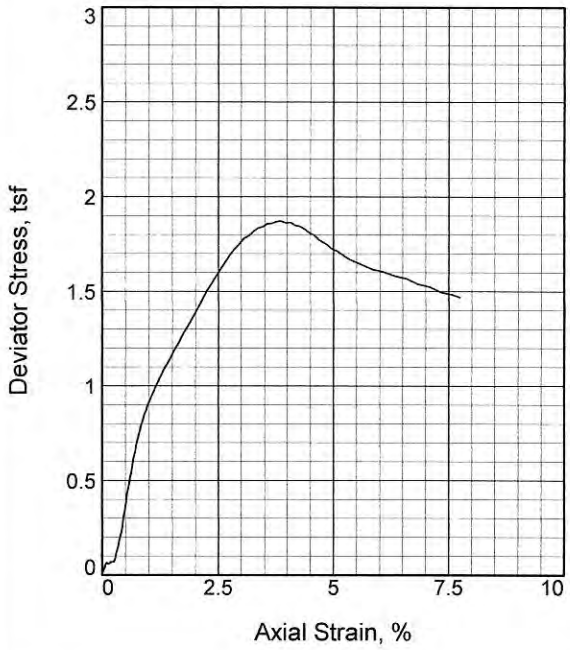
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 43

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 20.5 |
| | Dry Density, pcf | 106.7 |
| | Saturation, % | 99.7 |
| | Void Ratio | 0.5442 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.91 |
| At Test | Water Content, % | 21.3 |
| | Dry Density, pcf | 106.7 |
| | Saturation, % | 103.4 |
| | Void Ratio | 0.5442 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.91 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 16.93 |
| Fail. Stress, tsf | | 1.87 |
| Strain, % | | 3.9 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.09 |
| $\sigma_3$ Failure, tsf | | 1.22 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY

**LL=** 47 **PL=** 21 **PI=** 26

**Assumed Specific Gravity=** 2.64

**Remarks:** Test Method: ASTM D2850
Failure type: 60 degree

**Figure** _____

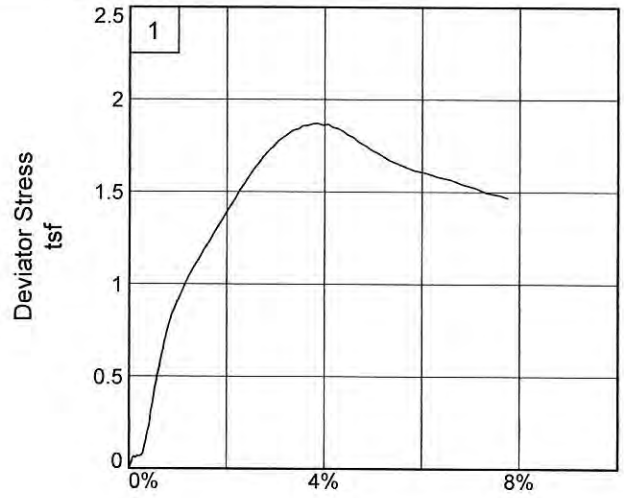
**Client:**

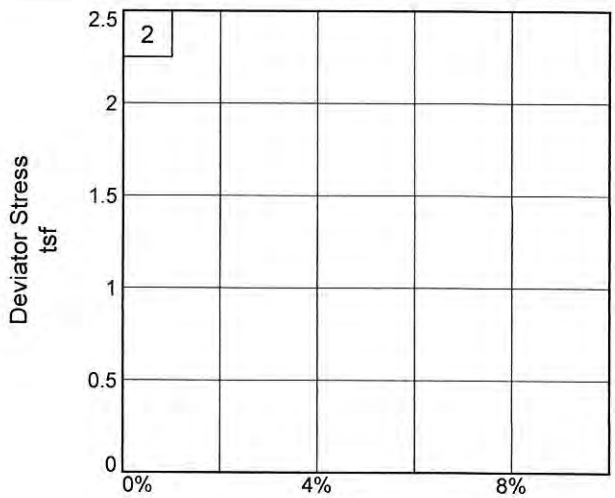
**Project:** San Jacinto River Waste Pit Superfund Site

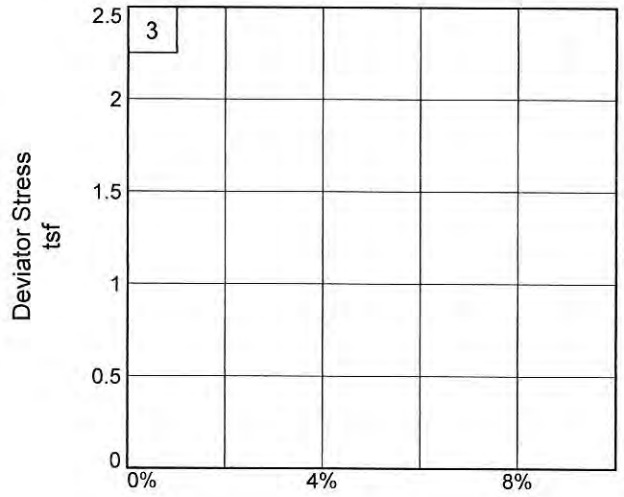
**Source of Sample:** SJGB053 **Depth:** 48

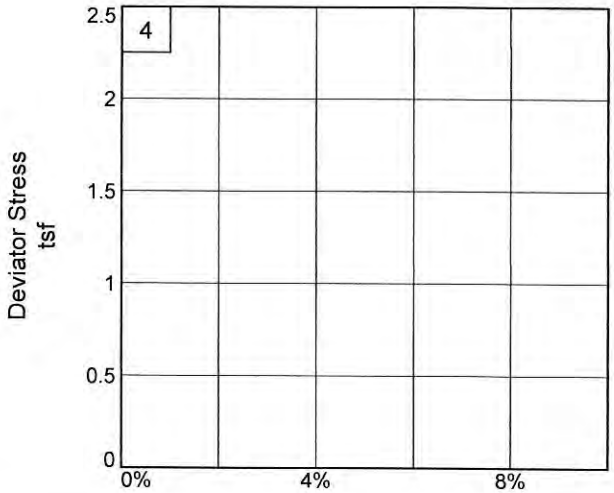
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

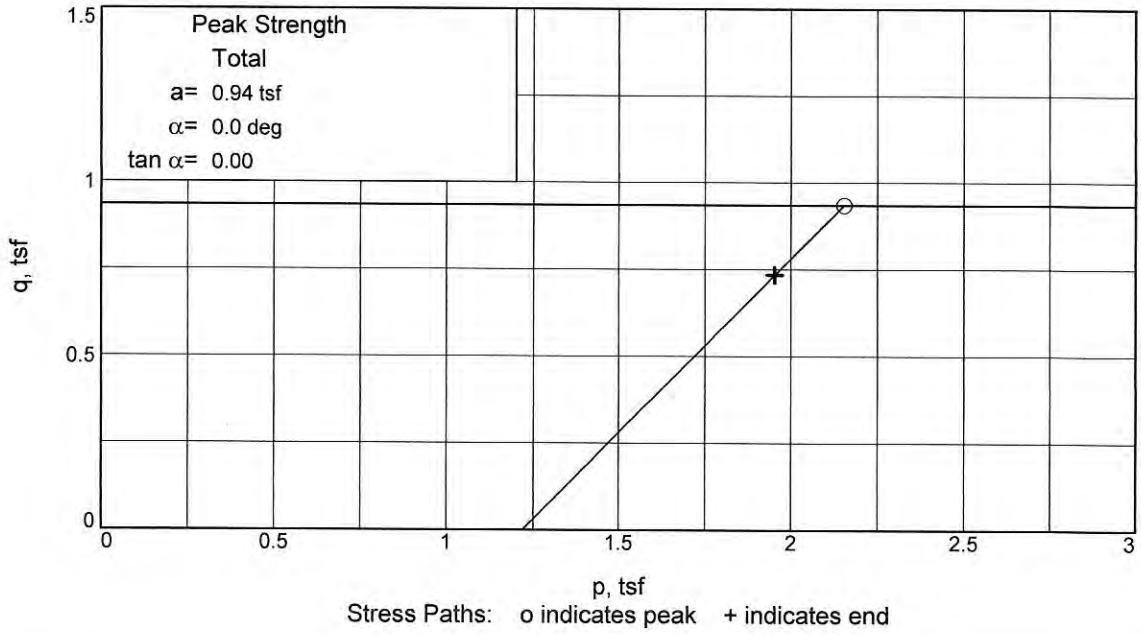
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

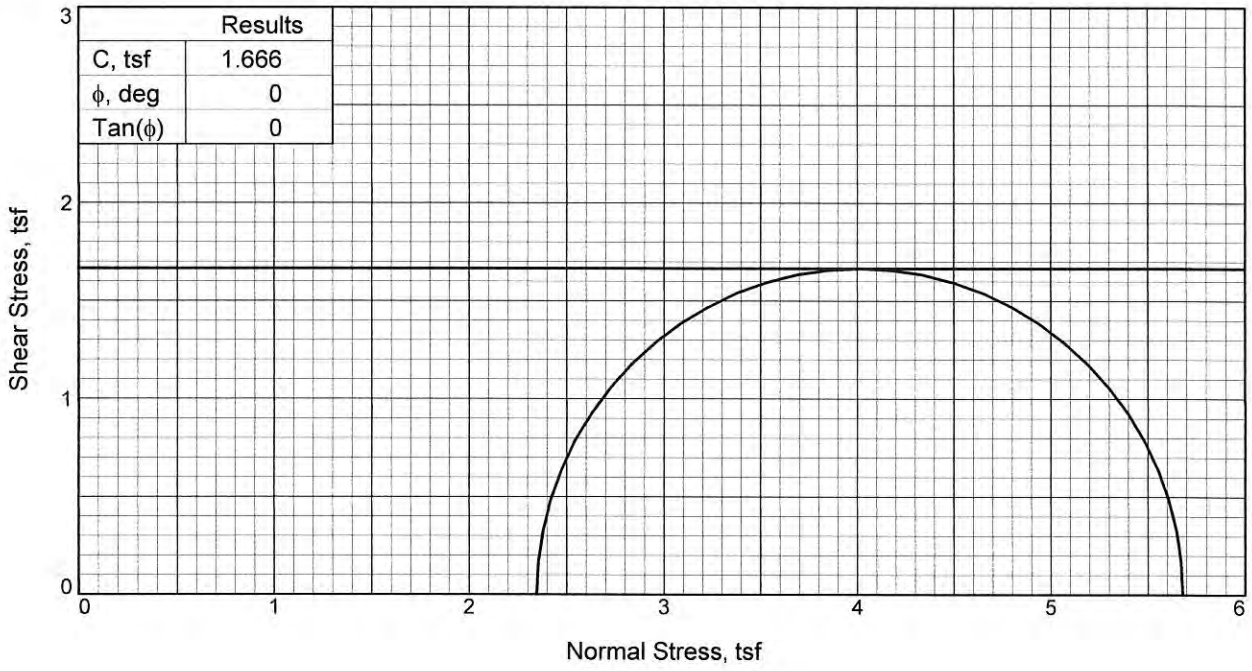
**Client:**

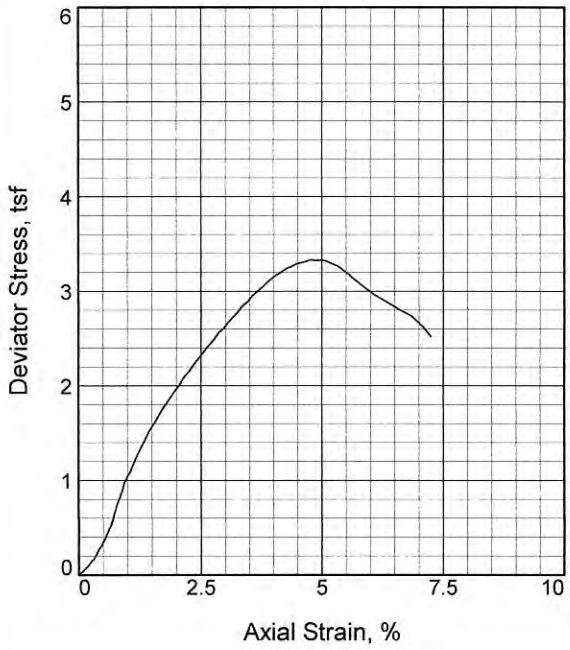
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 48

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 111.5 |
| | Dry Density, pcf | 41.7 |
| | Saturation, % | 100.0 |
| | Void Ratio | 2.9196 |
| | Diameter, in. | 2.86 |
| | Height, in. | 5.74 |
| At Test | Water Content, % | 111.2 |
| | Dry Density, pcf | 41.7 |
| | Saturation, % | 99.8 |
| | Void Ratio | 2.9196 |
| | Diameter, in. | 2.86 |
| | Height, in. | 5.74 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 32.60 |
| Fail. Stress, tsf | | 3.33 |
| Strain, % | | 4.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 5.68 |
| $\sigma_3$ Failure, tsf | | 2.35 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Black FAT CLAY; organics

**LL=** 144 **PL=** 78 **PI=** 66

**Assumed Specific Gravity=** 2.62

**Remarks:** Test Method: ASTM D2850
Failure Type: Buldge

**Figure** _____

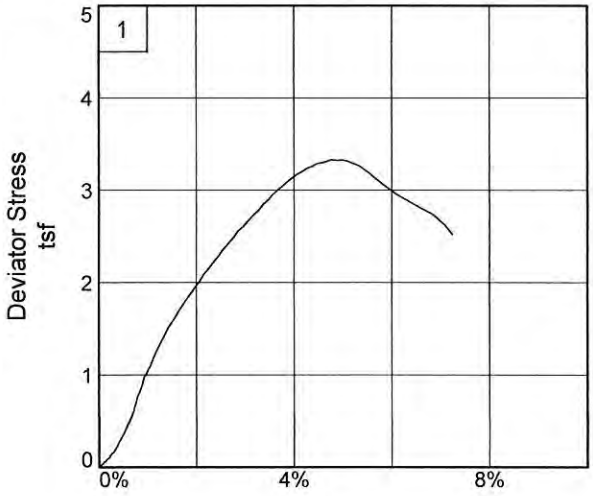
**Client:**

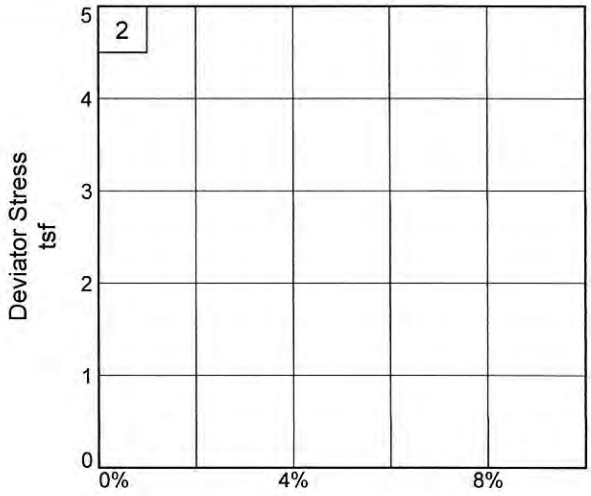
**Project:** San Jacinto River Waste Pit Superfund Site

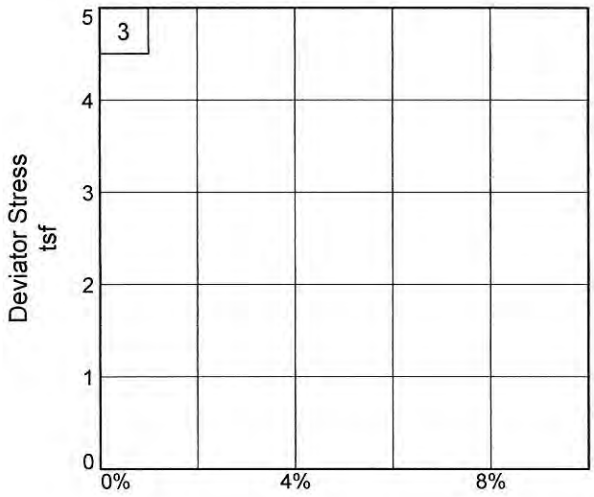
**Source of Sample:** SJGB053 **Depth:** 93

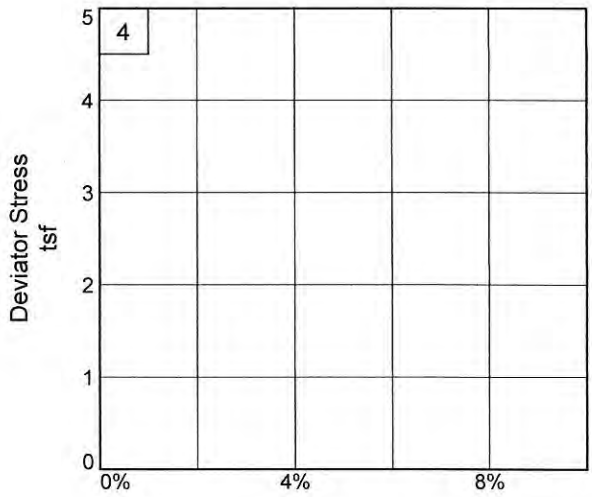
**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

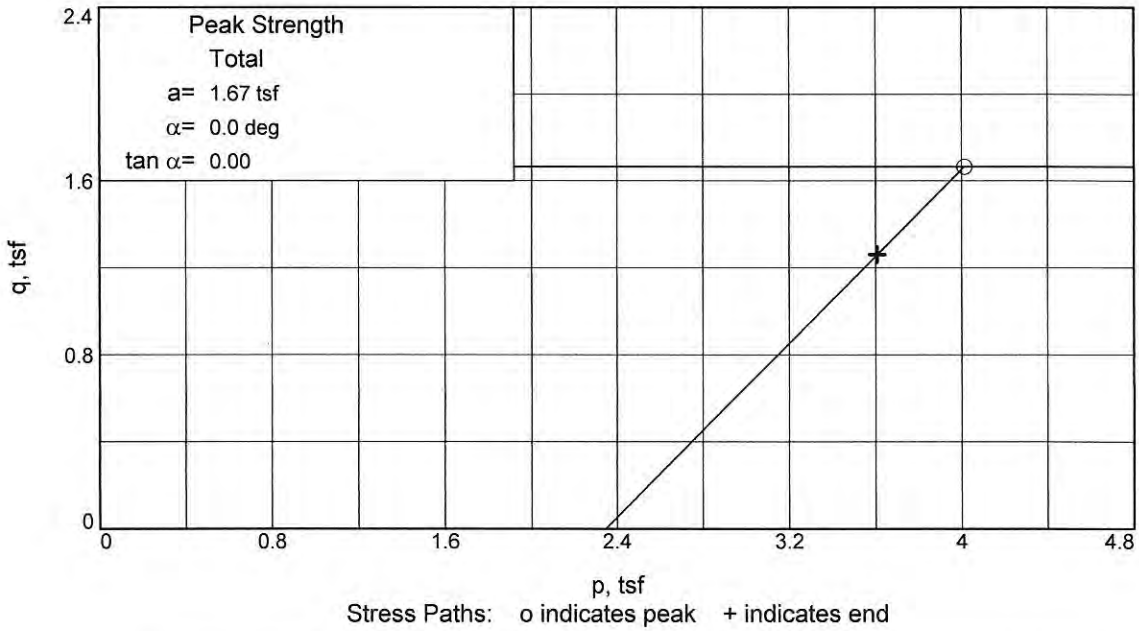
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

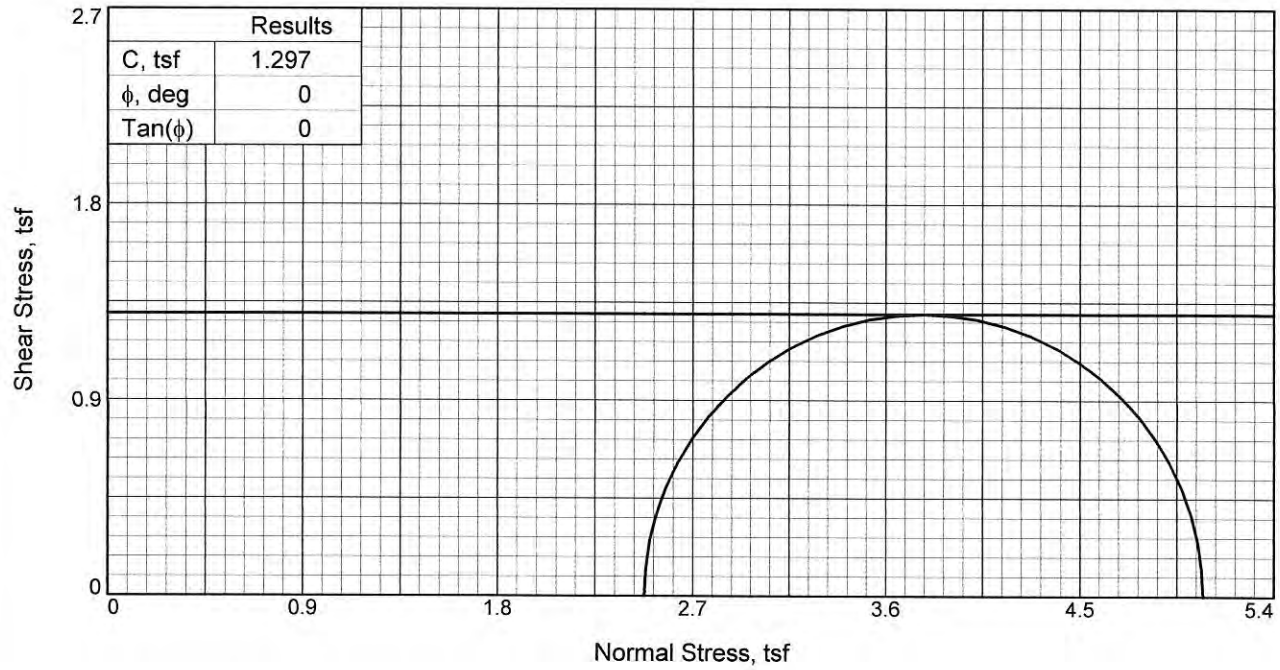
**Client:**

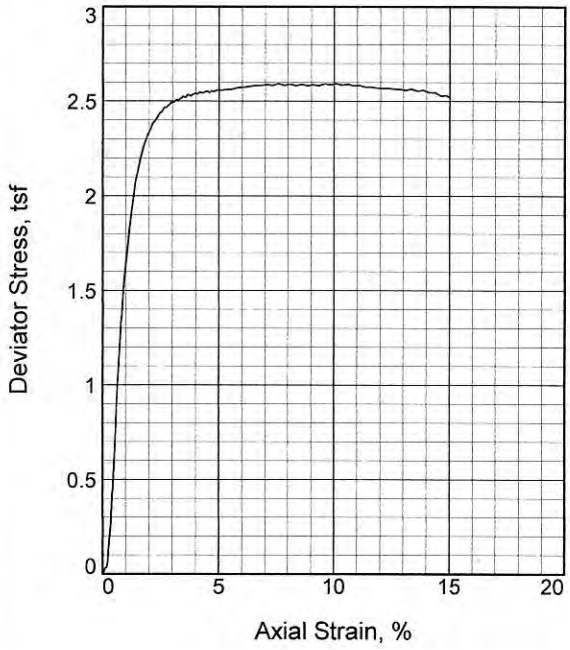
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 93

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 24.3 |
| | Dry Density, pcf | 101.6 |
| | Saturation, % | 99.7 |
| | Void Ratio | 0.6590 |
| | Diameter, in. | 2.83 |
| | Height, in. | 5.88 |
| At Test | Water Content, % | 24.7 |
| | Dry Density, pcf | 101.6 |
| | Saturation, % | 101.2 |
| | Void Ratio | 0.6590 |
| | Diameter, in. | 2.83 |
| | Height, in. | 5.88 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 34.40 |
| Fail. Stress, tsf | | 2.59 |
| Strain, % | | 10.1 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 5.07 |
| $\sigma_3$ Failure, tsf | | 2.48 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Gray FAT CLAY

**LL=** 71 **PL=** 23 **PI=** 48
**Assumed Specific Gravity=** 2.7
**Remarks:** Test Method: ASTM D2850
Failure type: Buldge

**Figure** _____

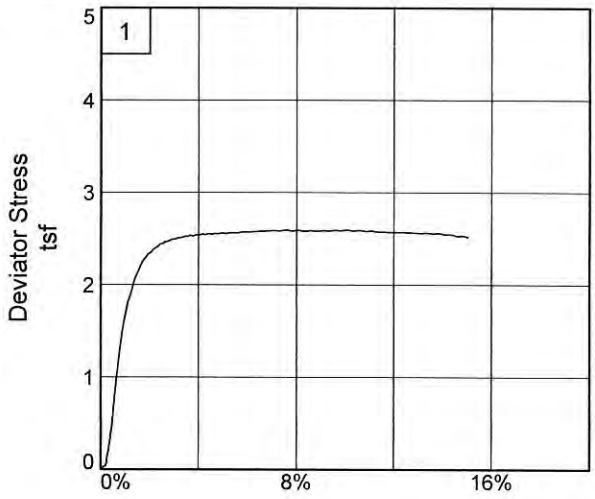
**Client:**

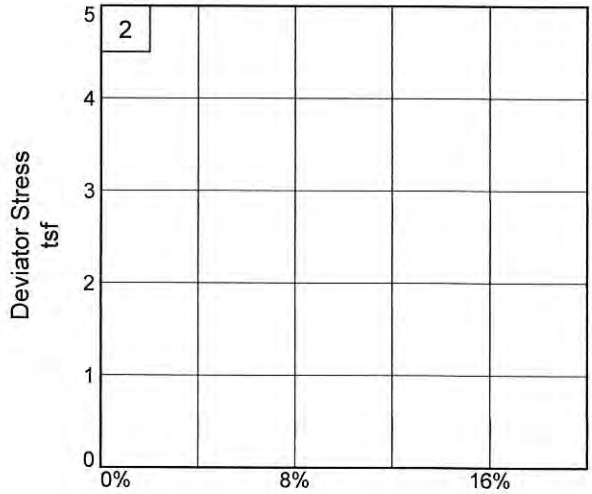
**Project:** San Jacinto River Waste Pit Superfund Site

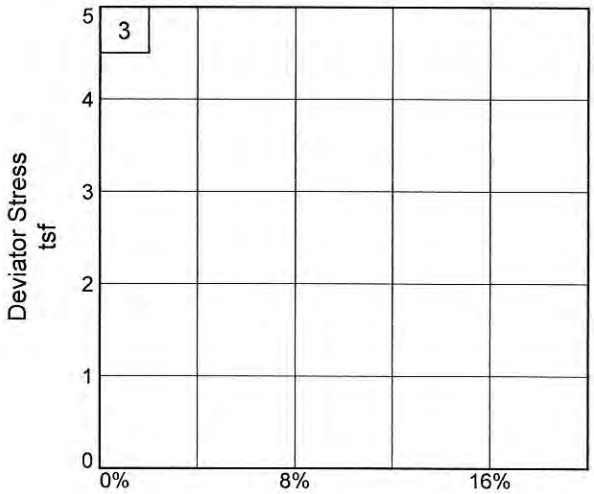
**Source of Sample:** SJGB053 **Depth:** 98

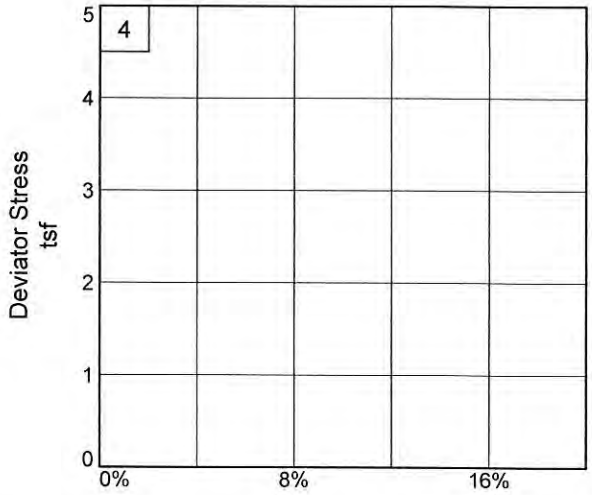
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

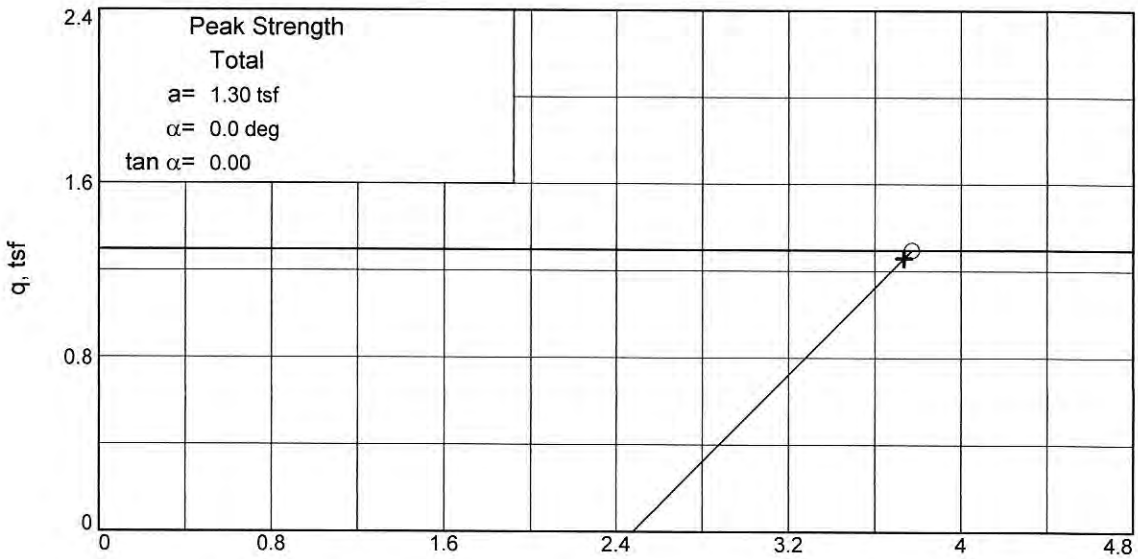
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

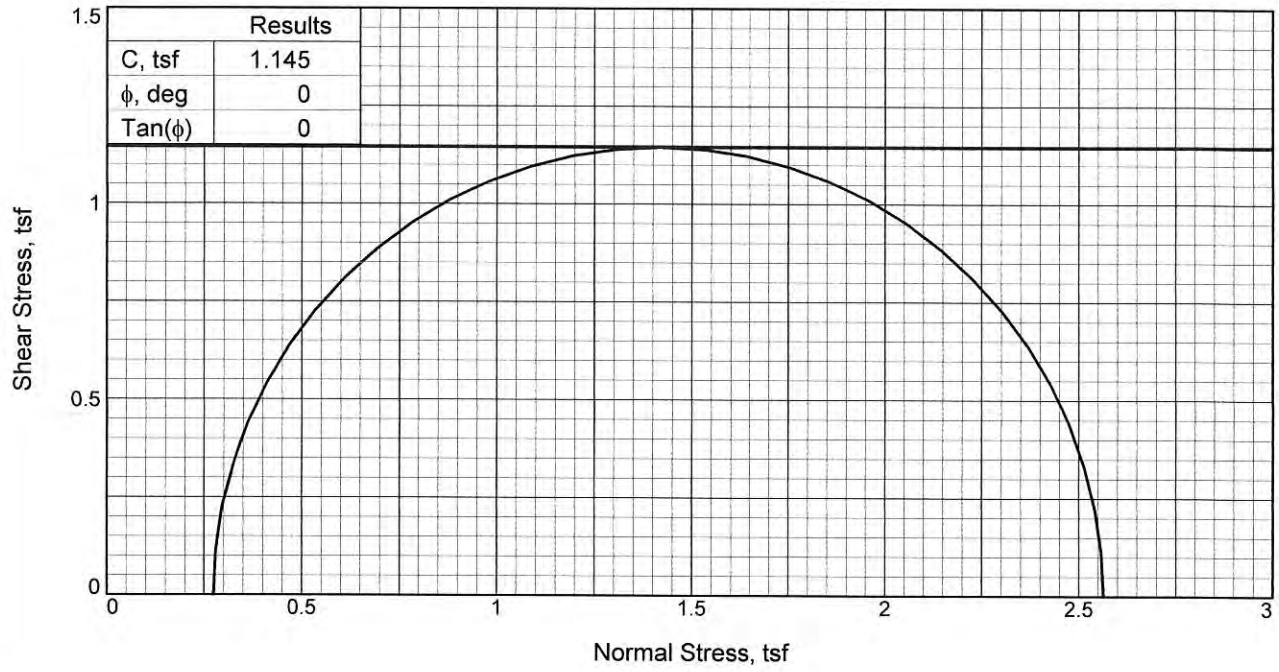
**Client:**

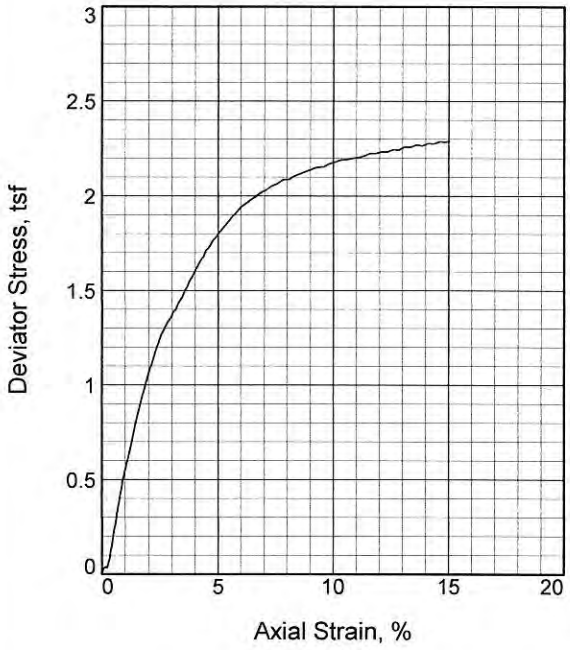
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB053 **Depth:** 98

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 20.4 |
| | Dry Density, pcf | 111.0 |
| | Saturation, % | 100.0 |
| | Void Ratio | 0.5692 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.88 |
| At Test | Water Content, % | 21.6 |
| | Dry Density, pcf | 111.0 |
| | Saturation, % | 105.9 |
| | Void Ratio | 0.5692 |
| | Diameter, in. | 2.79 |
| | Height, in. | 5.88 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 3.80 |
| Fail. Stress, tsf | | 2.29 |
| Strain, % | | 15.0 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.56 |
| $\sigma_3$ Failure, tsf | | 0.27 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray and brown FAT CLAY

**LL=** 66 **PL=** 23 **PI=** 43

**Assumed Specific Gravity=** 2.79

**Remarks:** Test Method: ASTM D2850
Failure Type: Buldge

**Figure** _____

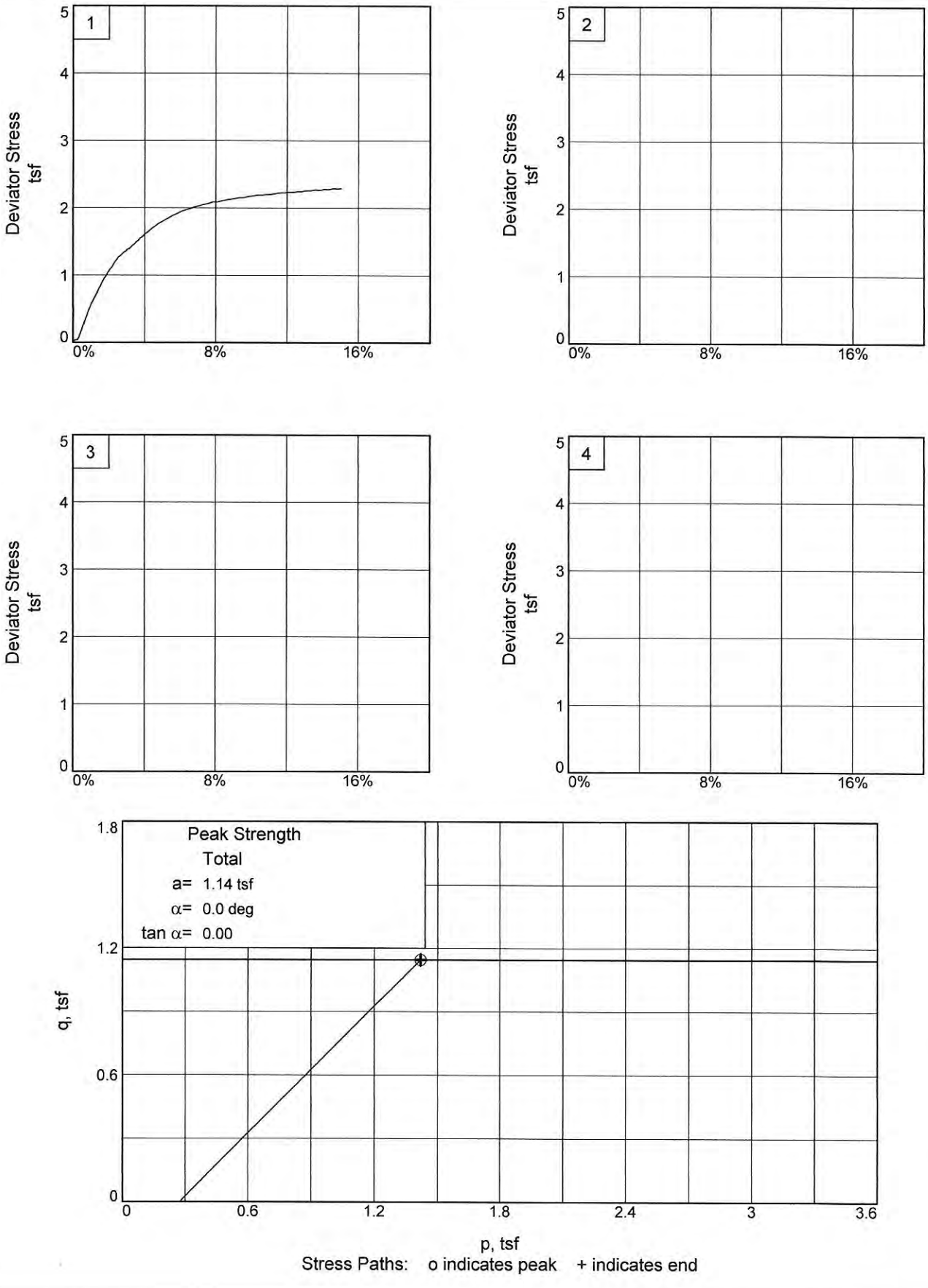
**Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 12

**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



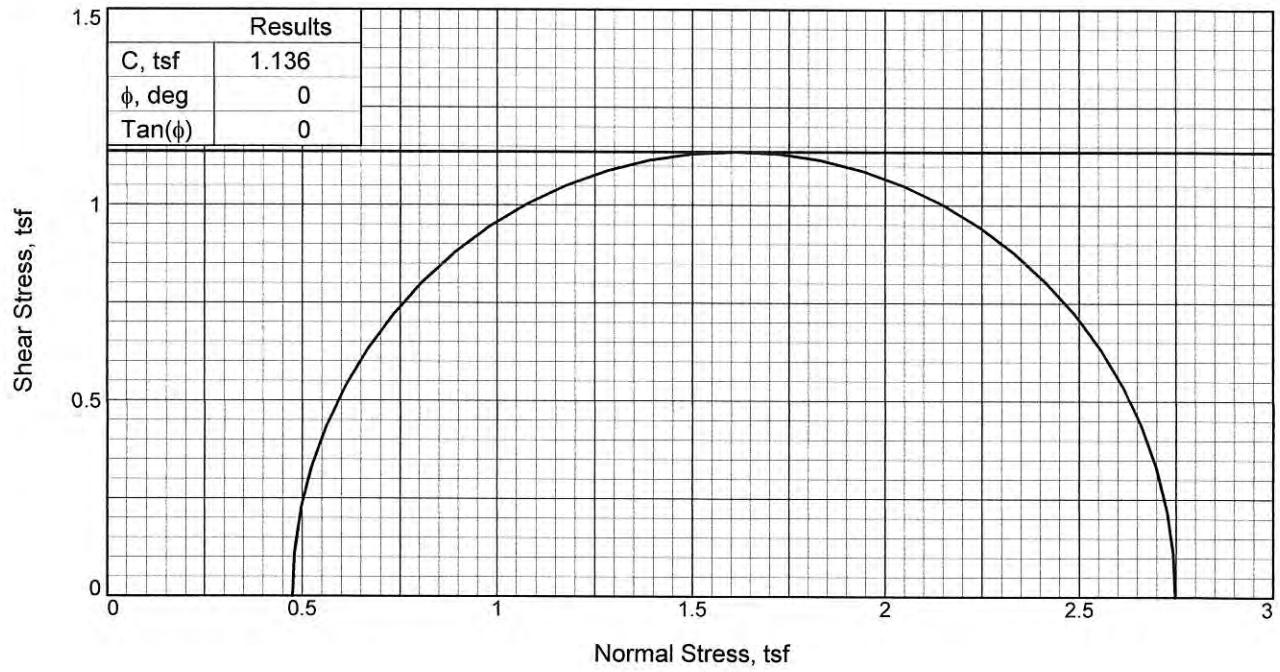

**Client:**

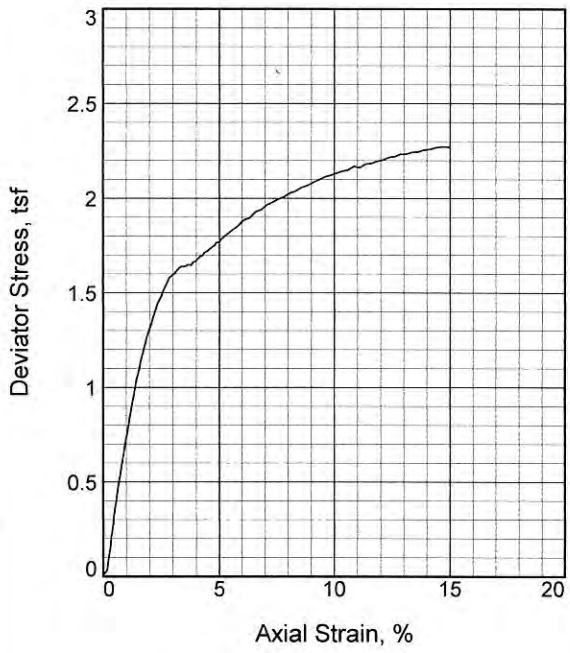
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 12

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 18.7 |
| | Dry Density, pcf | 112.7 |
| | Saturation, % | 99.1 |
| | Void Ratio | 0.5171 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.87 |
| At Test | Water Content, % | 18.8 |
| | Dry Density, pcf | 112.7 |
| | Saturation, % | 99.8 |
| | Void Ratio | 0.5171 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.87 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 6.60 |
| Fail. Stress, tsf | | 2.27 |
| Strain, % | | 14.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.75 |
| $\sigma_3$ Failure, tsf | | 0.48 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Tan SANDY LEAN CLAY

**LL=** 45 **PL=** 16 **PI=** 29
**Assumed Specific Gravity=** 2.74
**Remarks:** Test Method: ASTM D2850
Failure Type: Slickenslide

**Figure** _____

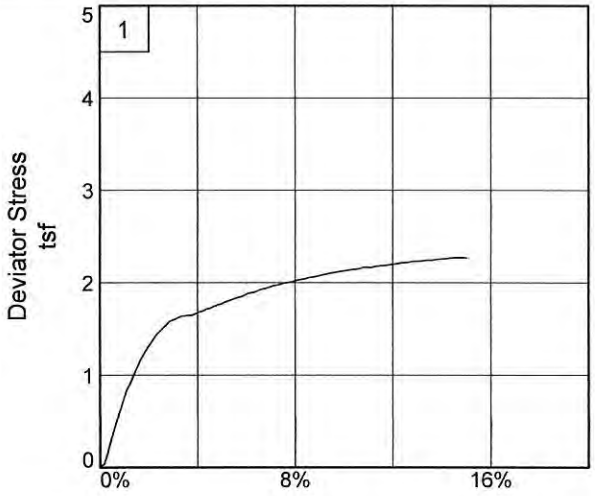
**Client:**

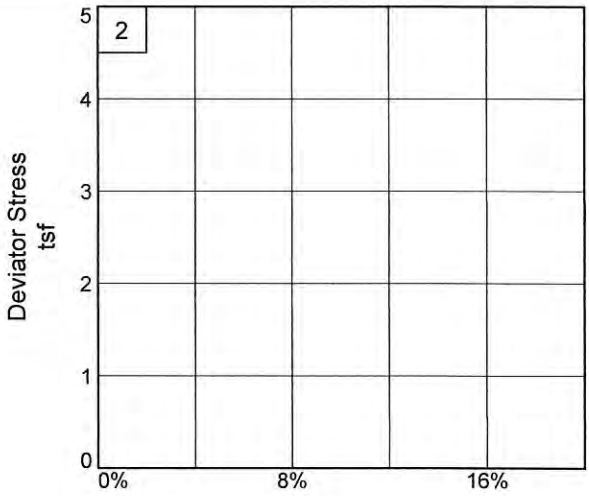
**Project:** San Jacinto River Waste Pit Superfund Site

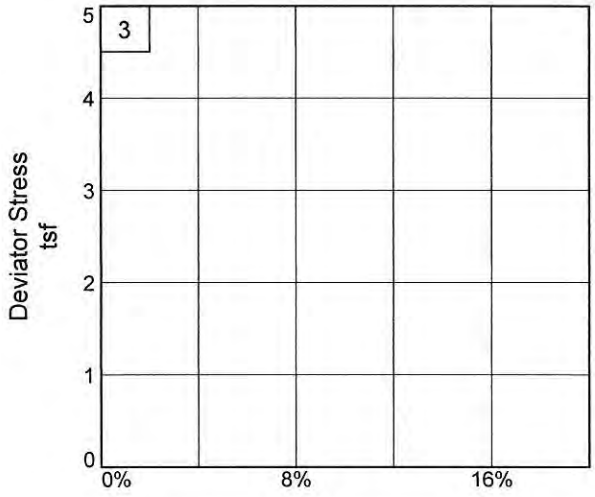
**Source of Sample:** SJGB057 **Depth:** 18

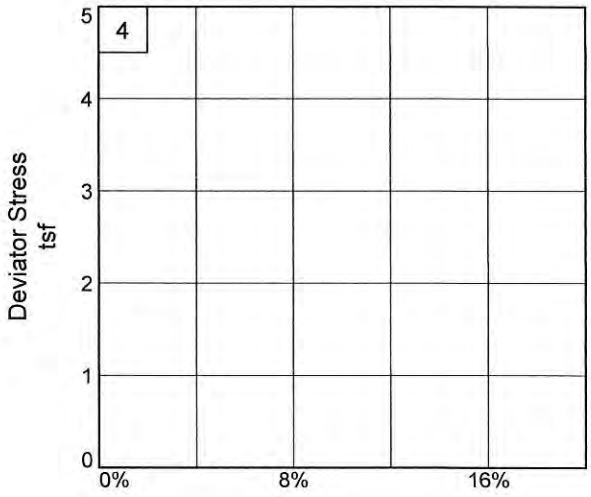
**Proj. No.:** 19.15.131 **Date Sampled:** 2-89-2020

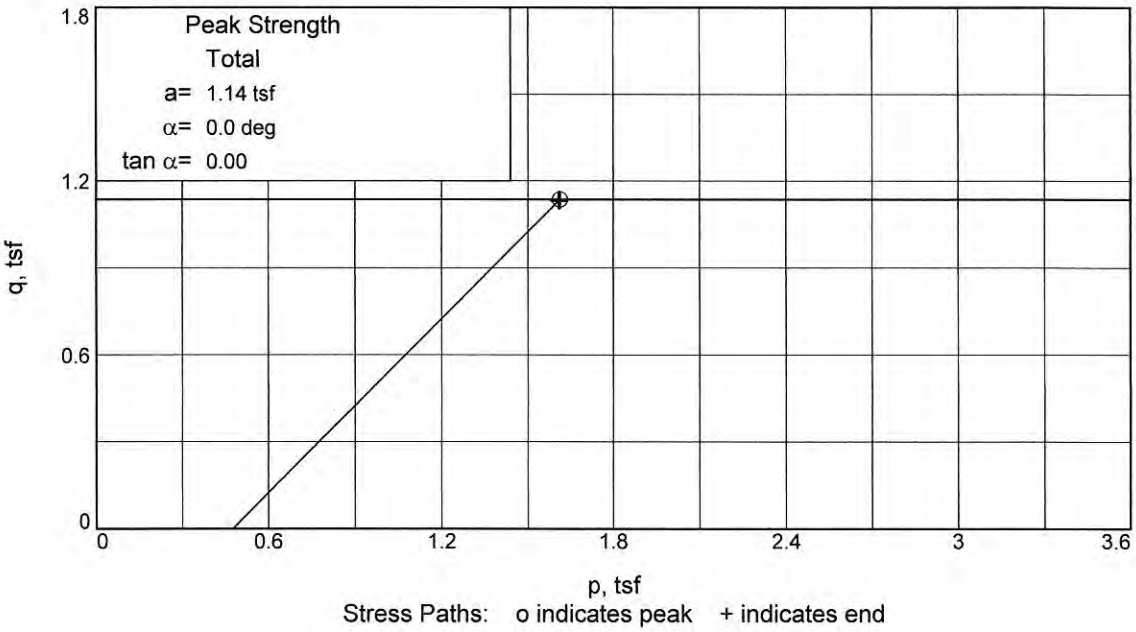
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

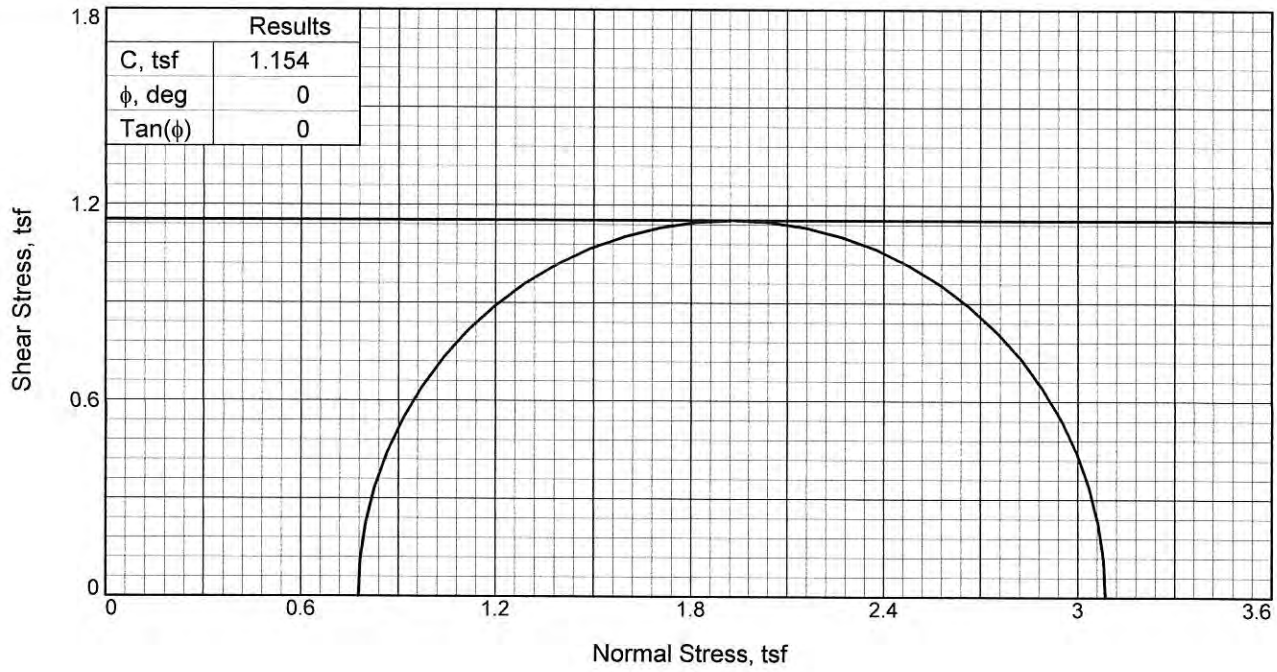
**Client:**

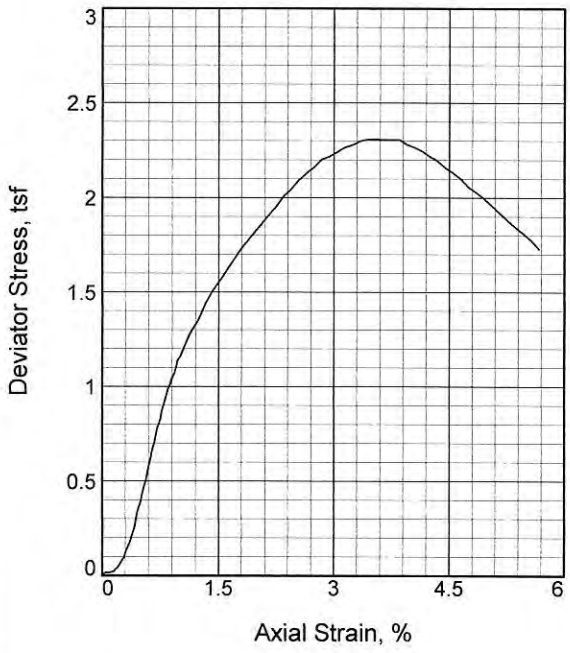
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 18

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 26.8 |
| | Dry Density, pcf | 96.2 |
| | Saturation, % | 95.4 |
| | Void Ratio | 0.7644 |
| | Diameter, in. | 2.87 |
| | Height, in. | 5.87 |
| At Test | Water Content, % | 26.7 |
| | Dry Density, pcf | 96.2 |
| | Saturation, % | 95.1 |
| | Void Ratio | 0.7644 |
| | Diameter, in. | 2.87 |
| | Height, in. | 5.87 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 10.80 |
| Fail. Stress, tsf | | 2.31 |
| Strain, % | | 3.5 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 3.09 |
| $\sigma_3$ Failure, tsf | | 0.78 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Reddish-brown FAT CLAY

**LL=** 65 **PL=** 22 **PI=** 43

**Assumed Specific Gravity=** 2.72

**Remarks:** Test Method: ASTM D2850
Failure Type: Slickenslide

**Figure** _____

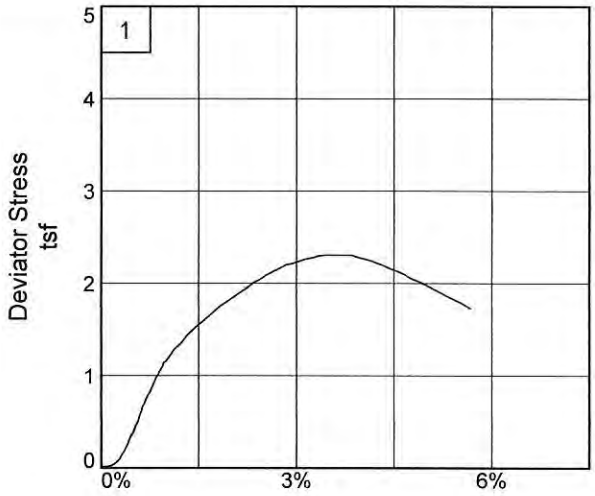
**Client:**

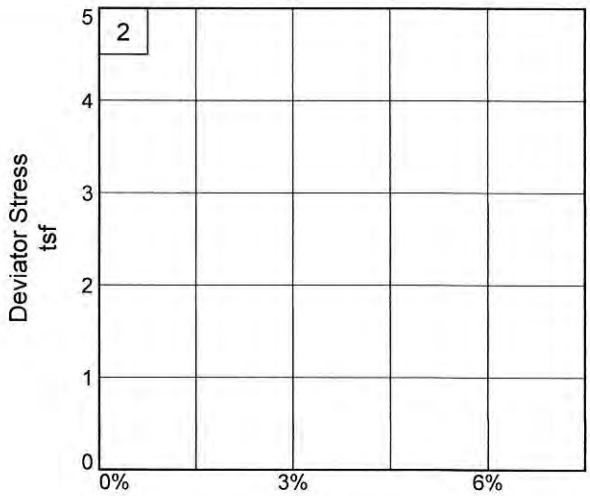
**Project:** San Jacinto River Waste Pit Superfund Site

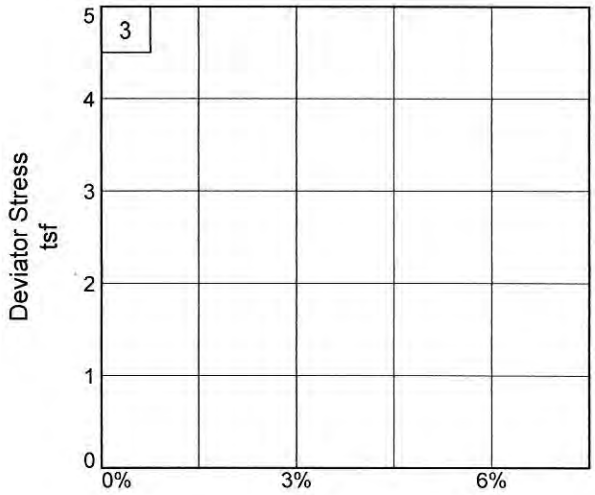
**Source of Sample:** SJGB057 **Depth:** 33

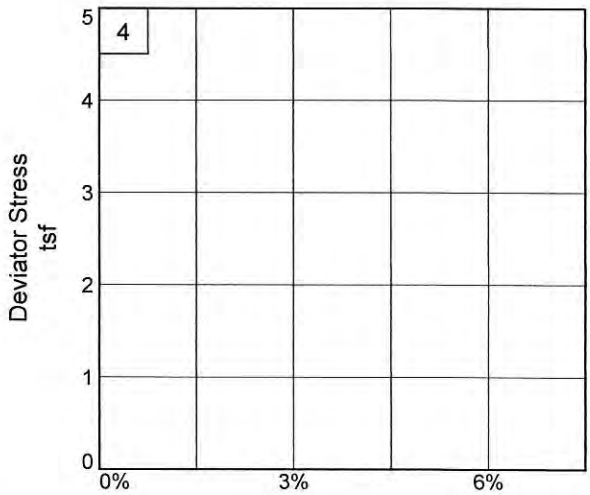
**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

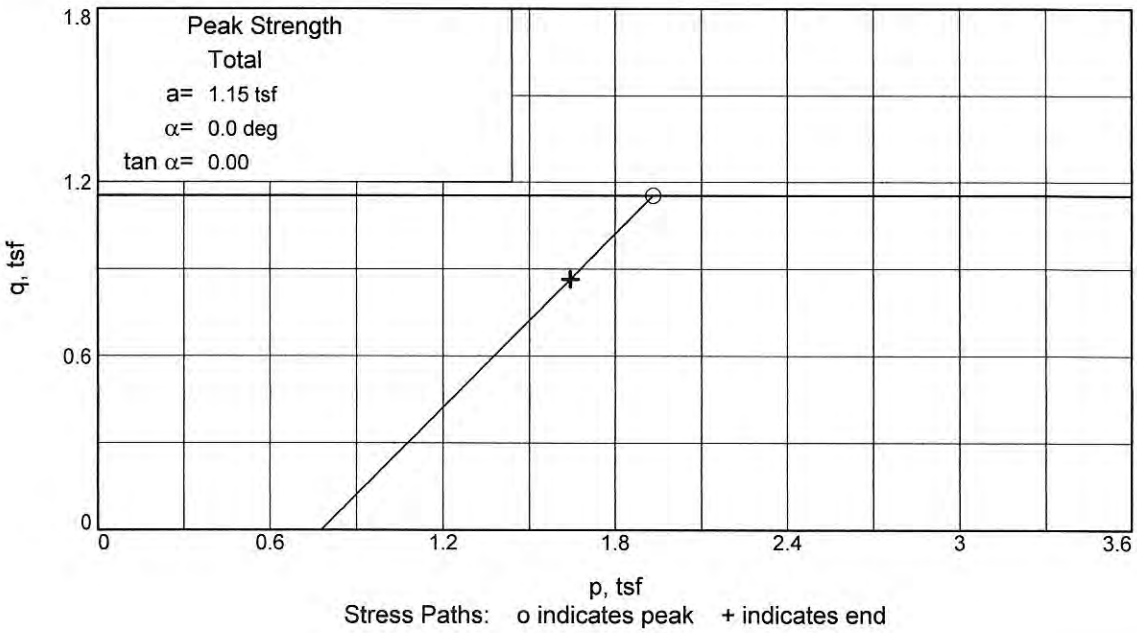
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

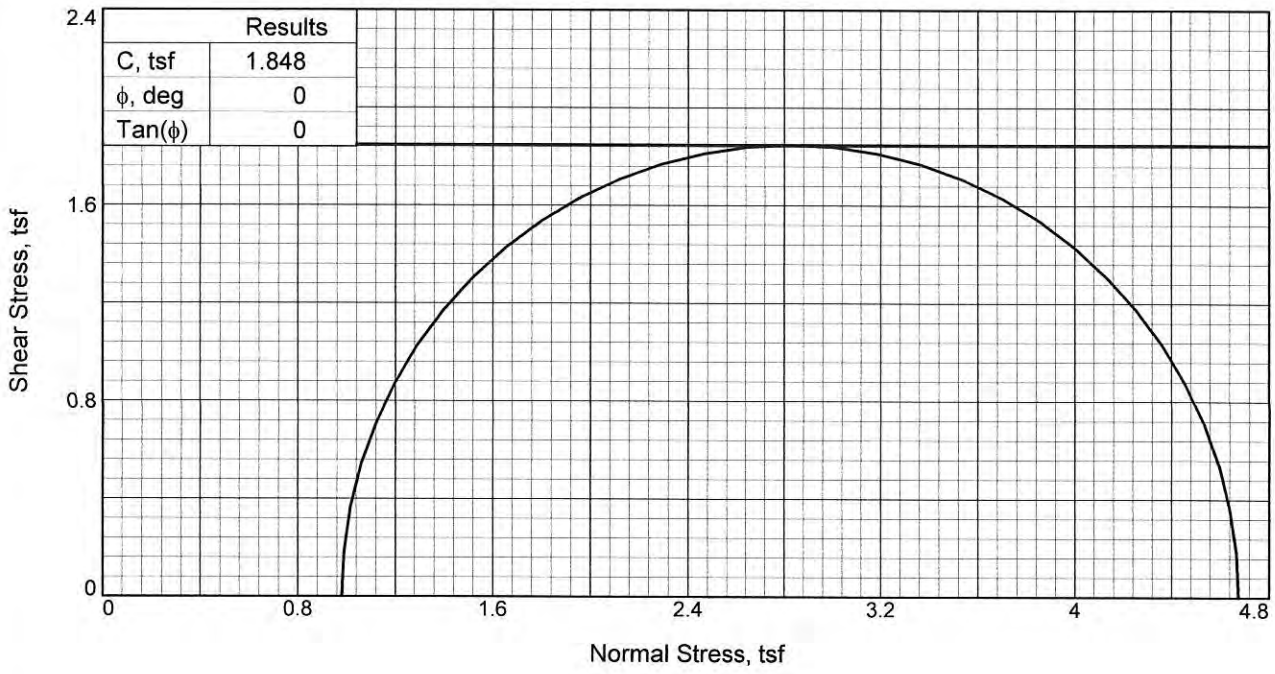
**Client:**

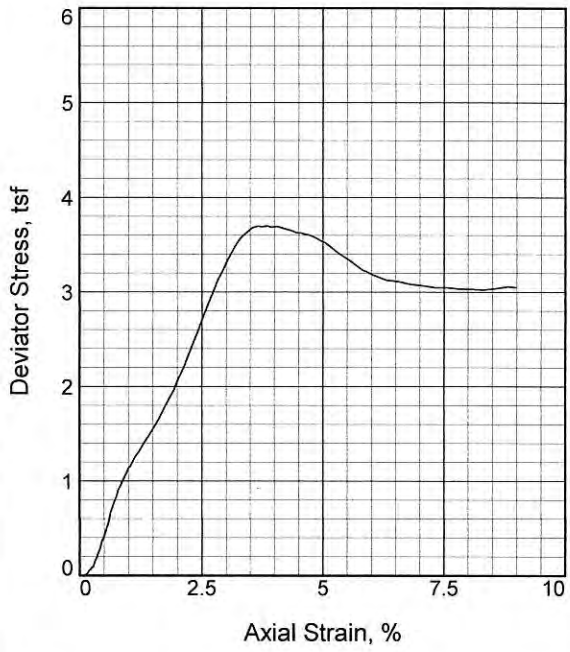
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 33

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 20.7 |
| | Dry Density, pcf | 107.8 |
| | Saturation, % | 99.0 |
| | Void Ratio | 0.5634 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| At Test | Water Content, % | 20.5 |
| | Dry Density, pcf | 107.8 |
| | Saturation, % | 98.1 |
| | Void Ratio | 0.5634 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.87 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 13.60 |
| Fail. Stress, tsf | | 3.70 |
| Strain, % | | 3.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 4.68 |
| $\sigma_3$ Failure, tsf | | 0.98 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray FAT CLAY

**LL=** 56 **PL=** 19 **PI=** 37

**Assumed Specific Gravity=** 2.7

**Remarks:** Test Method: ASTM D2850
Failure type: Slickenslide

**Figure** _____

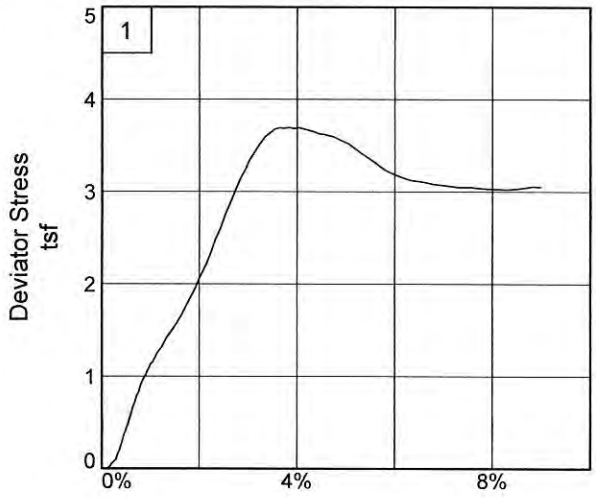
**Client:**

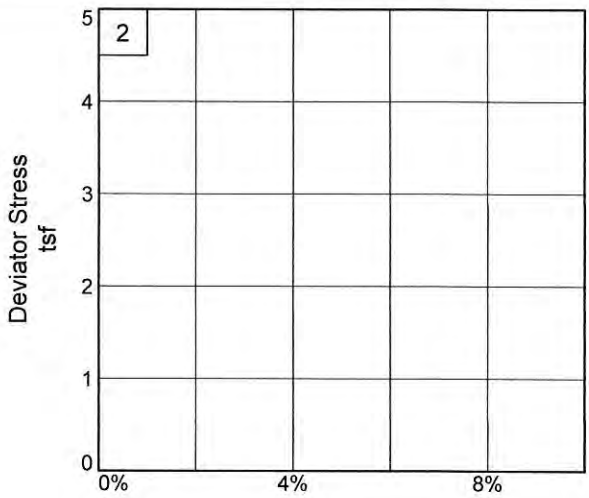
**Project:** San Jacinto River Waste Pit Superfund Site

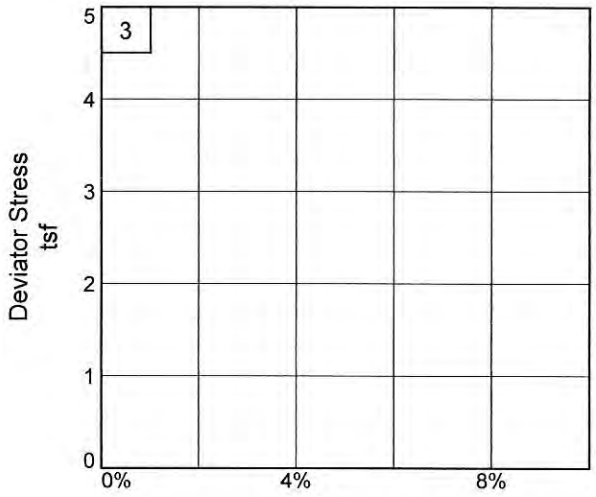
**Source of Sample:** SJGB057 **Depth:** 43

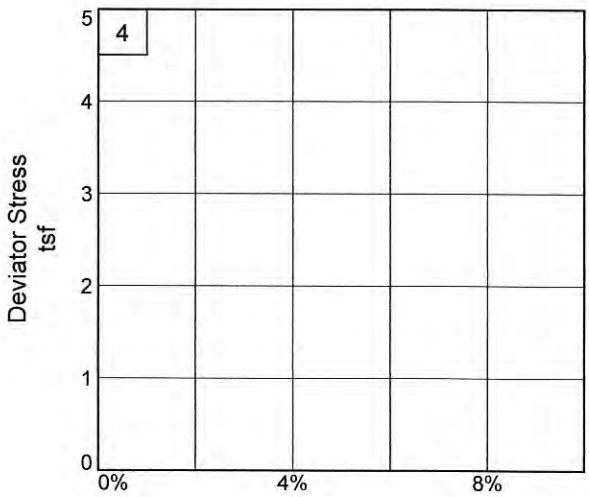
**Proj. No.:** 19.15.131 **Date Sampled:** 2-9-2020

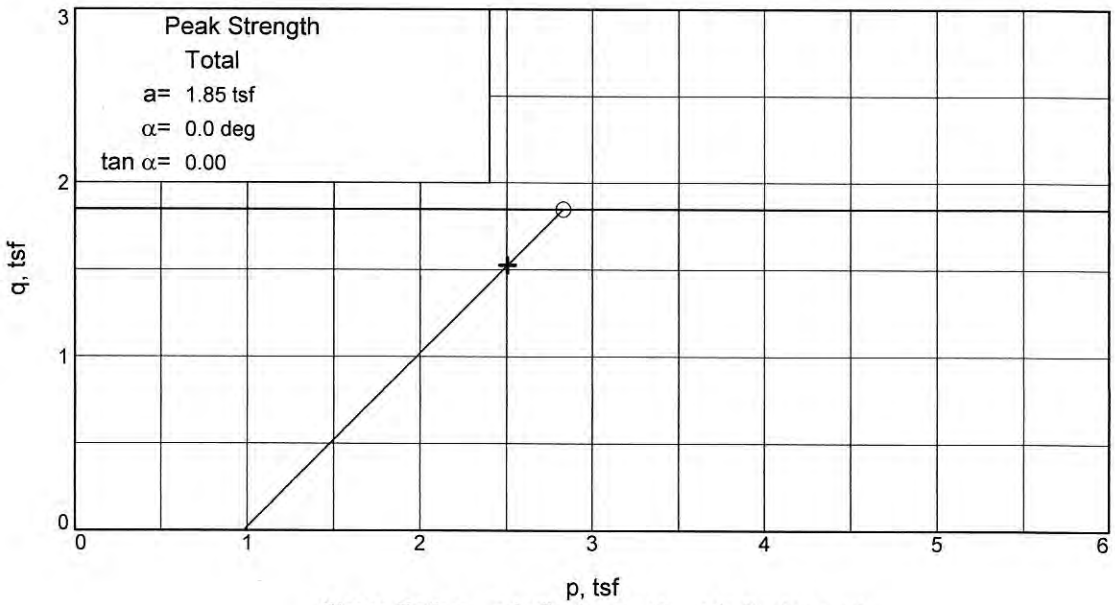
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

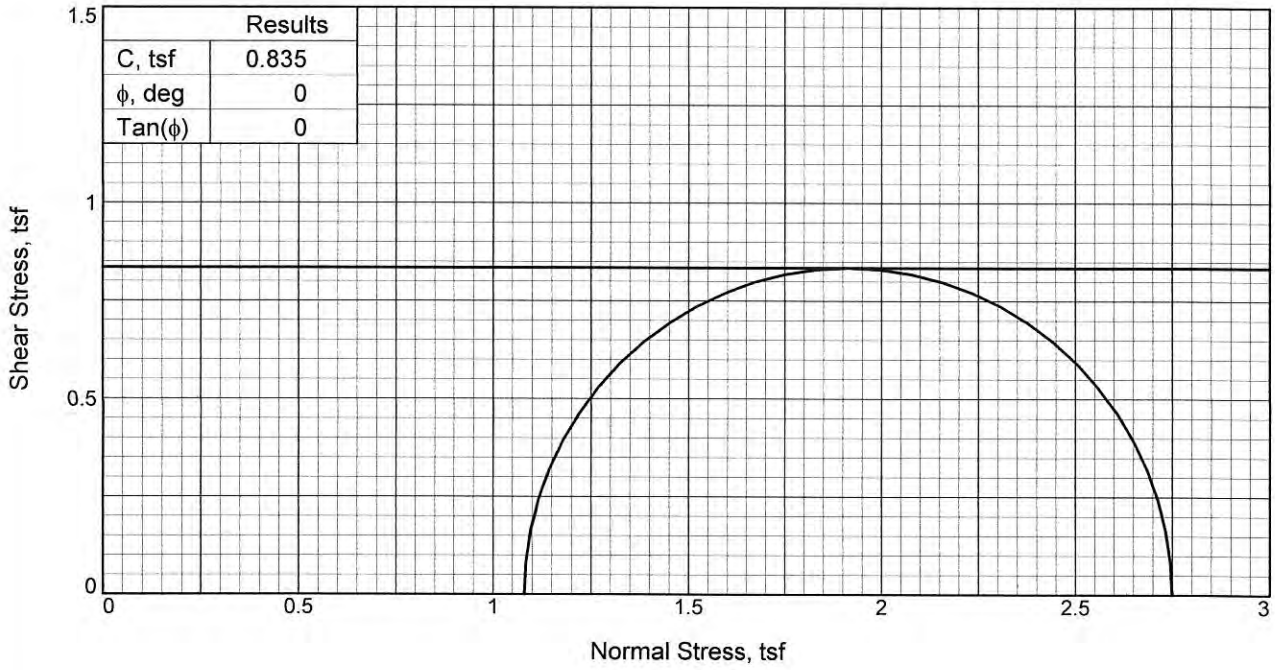
**Client:**

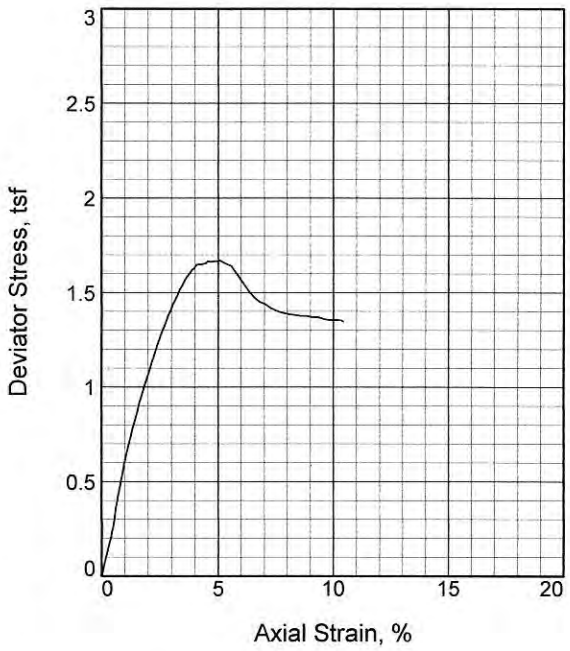
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 43

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| Sample No. | | 1 |
|---|---|---|
| Initial | Water Content, % | 35.6 |
| | Dry Density, pcf | 92.5 |
| | Saturation, % | 99.9 |
| | Void Ratio | 1.1188 |
| | Diameter, in. | 2.78 |
| | Height, in. | 5.84 |
| At Test | Water Content, % | 28.9 |
| | Dry Density, pcf | 92.5 |
| | Saturation, % | 81.2 |
| | Void Ratio | 1.1188 |
| | Diameter, in. | 2.78 |
| | Height, in. | 5.84 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 15.00 |
| Fail. Stress, tsf | | 1.67 |
| Strain, % | | 5.1 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.75 |
| $\sigma_3$ Failure, tsf | | 1.08 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Gray FAT CLAY

**LL=** 52 **PL=** 19 **PI=** 33
**Assumed Specific Gravity=** 3.14
**Remarks:** Test Method: ASTM D2850
Failure type: Slickenslide

**Figure** _____

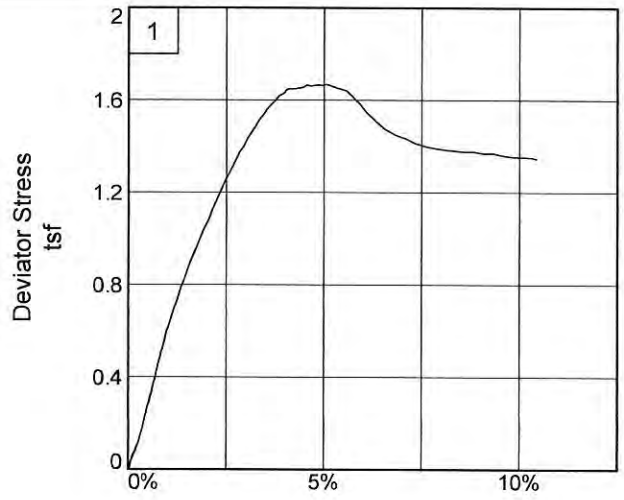
**Client:**

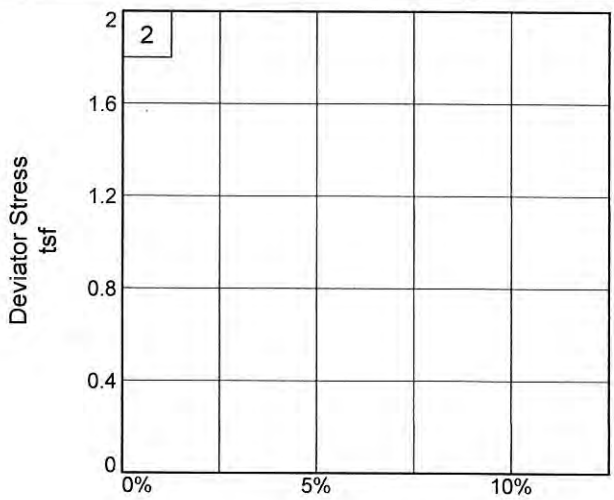
**Project:** San Jacinto River Waste Pit Superfund Site

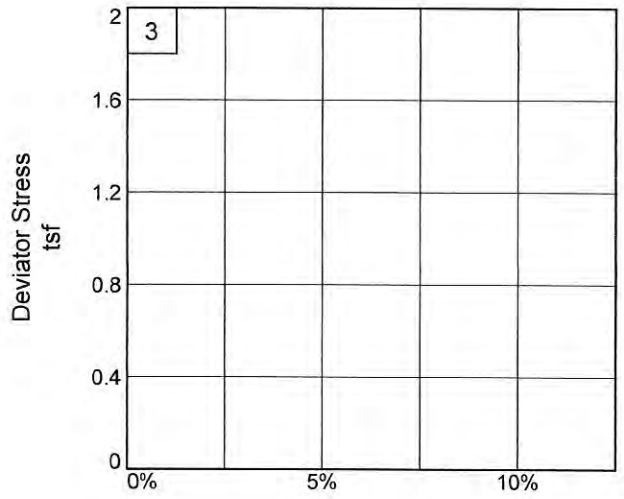
**Source of Sample:** SJGB057 **Depth:** 48

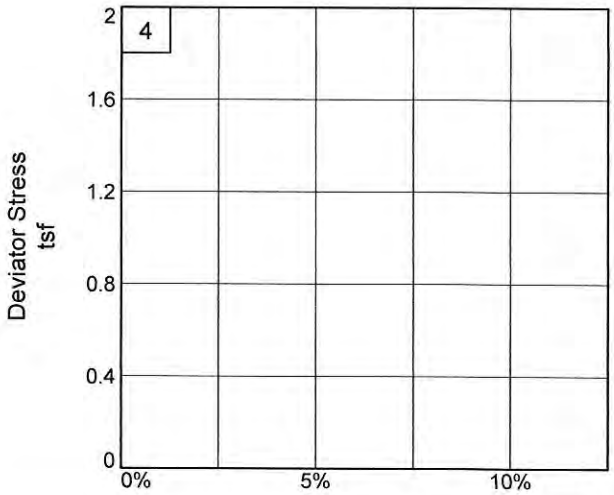
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

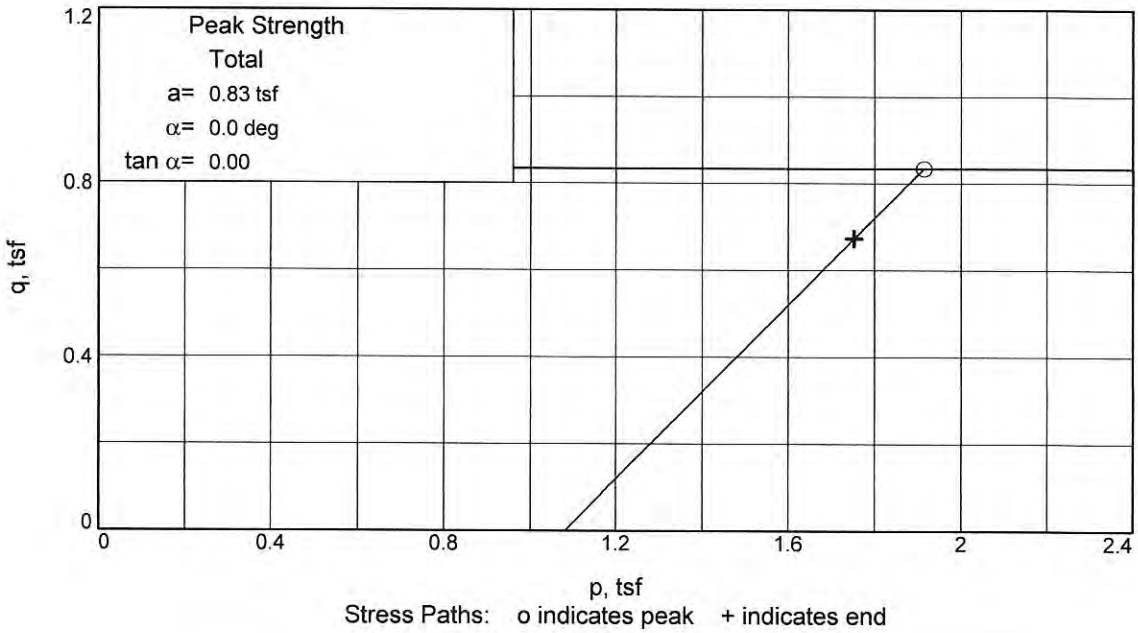
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

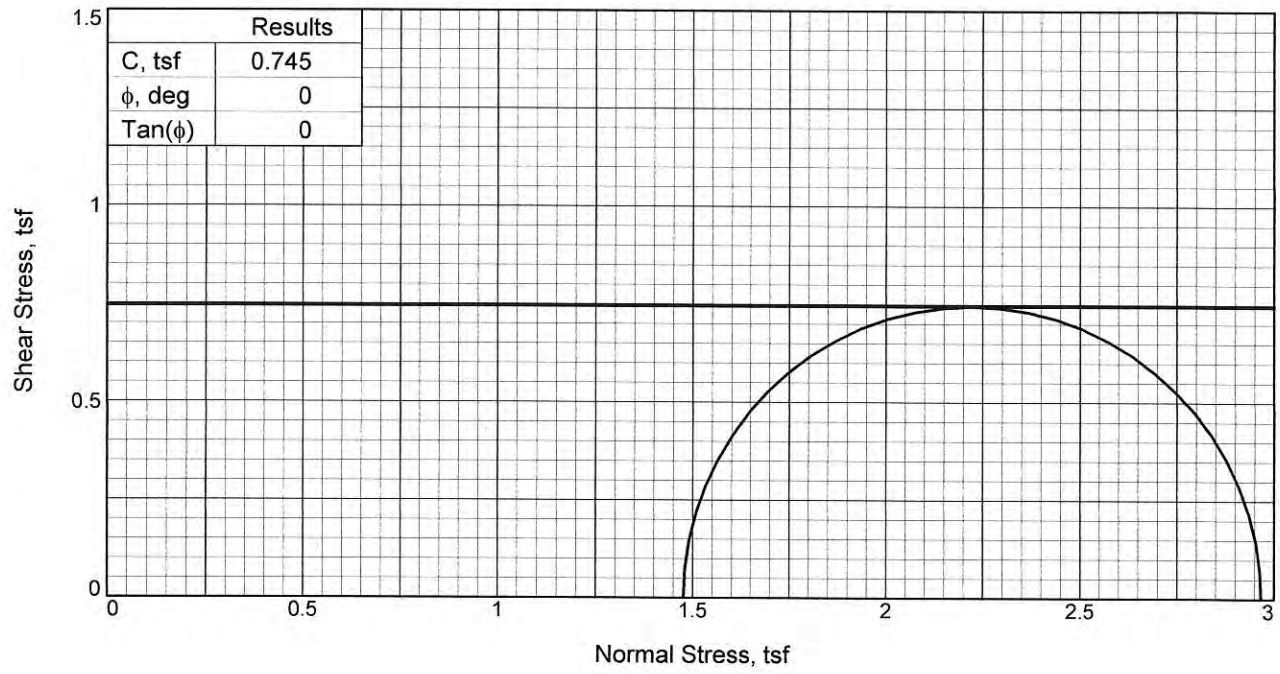
**Client:**

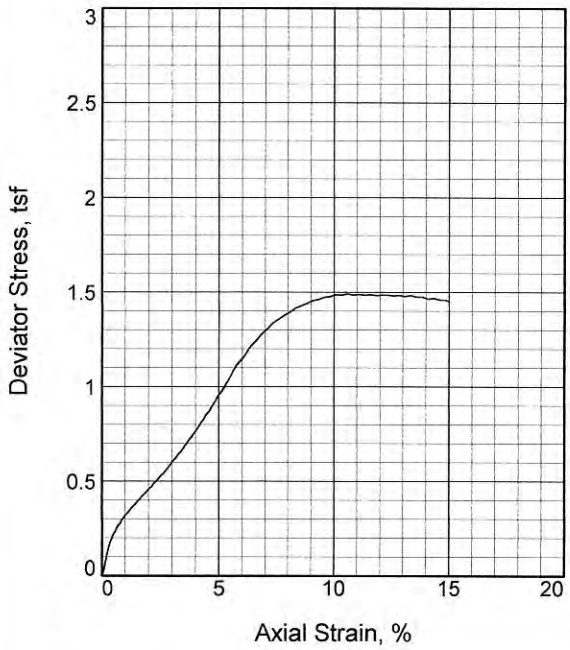
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 48

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 24.4 |
| | Dry Density, pcf | 106.0 |
| | Saturation, % | 99.6 |
| | Void Ratio | 0.7141 |
| | Diameter, in. | 2.80 |
| | Height, in. | 5.83 |
| At Test | Water Content, % | 23.5 |
| | Dry Density, pcf | 106.0 |
| | Saturation, % | 96.0 |
| | Void Ratio | 0.7141 |
| | Diameter, in. | 2.80 |
| | Height, in. | 5.83 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 20.50 |
| Fail. Stress, tsf | | 1.49 |
| Strain, % | | 10.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 2.97 |
| $\sigma_3$ Failure, tsf | | 1.48 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray FAT CLAY with SAND

**LL=** 52 **PL=** 20 **PI=** 32

**Assumed Specific Gravity=** 2.91

**Remarks:** Test Method: ASTM D2850
Failure type: Buldge

**Figure** _____

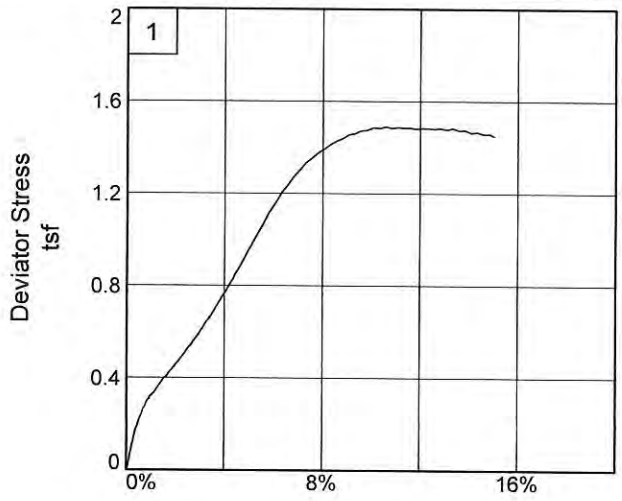
**Client:**

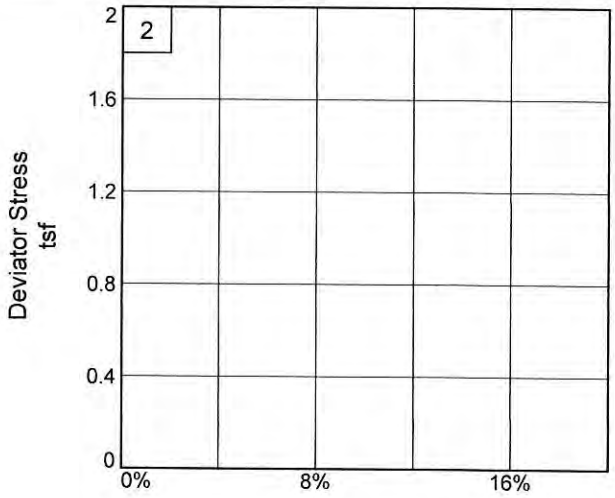
**Project:** San Jacinto River Waste Pit Superfund Site

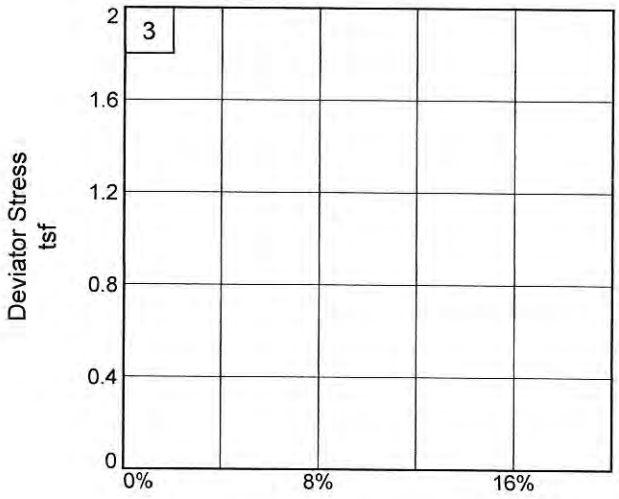
**Source of Sample:** SJGB057 **Depth:** 58

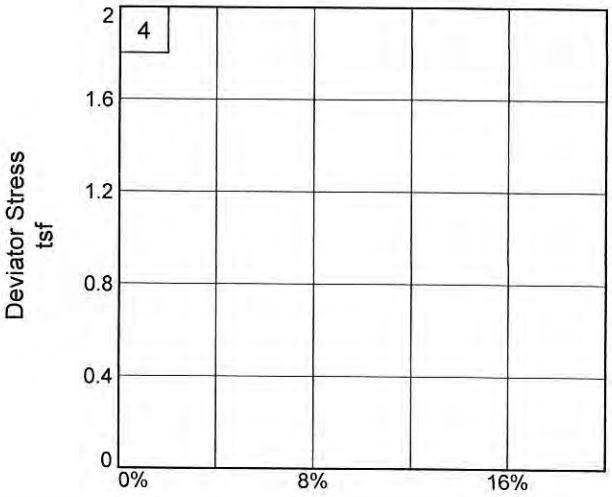
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

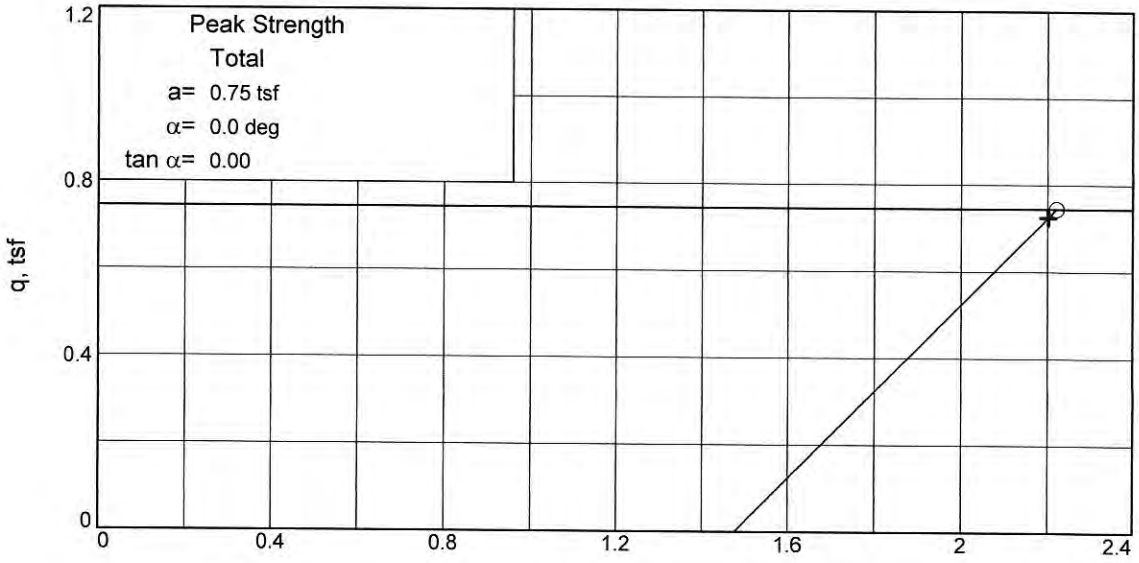
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

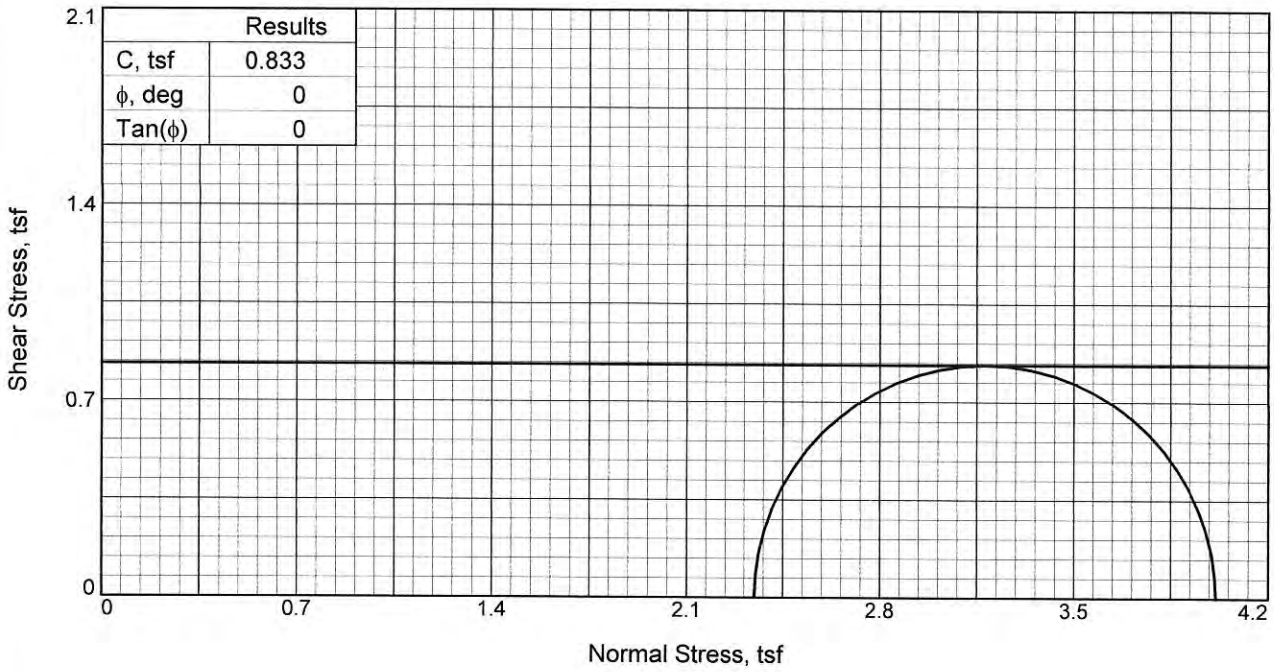
**Client:**

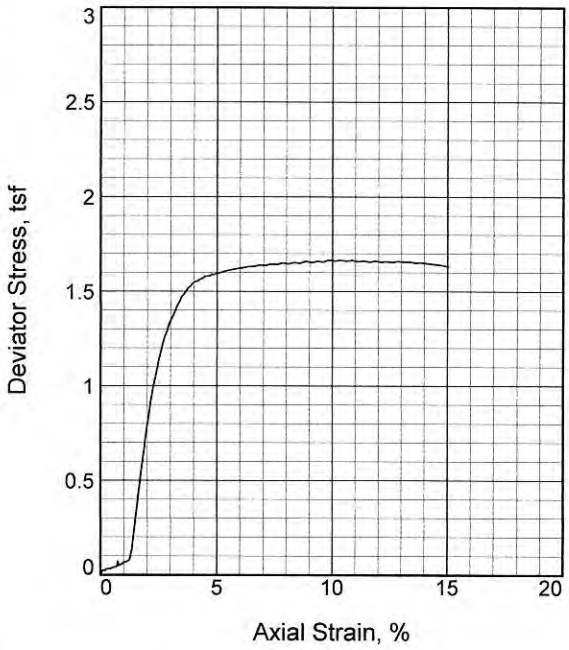
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 58

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 25.2 |
| | Dry Density, pcf | 101.1 |
| | Saturation, % | 99.1 |
| | Void Ratio | 0.6987 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.91 |
| At Test | Water Content, % | 23.4 |
| | Dry Density, pcf | 101.1 |
| | Saturation, % | 91.9 |
| | Void Ratio | 0.6987 |
| | Diameter, in. | 2.82 |
| | Height, in. | 5.91 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 32.60 |
| Fail. Stress, tsf | | 1.67 |
| Strain, % | | 9.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 4.01 |
| $\sigma_3$ Failure, tsf | | 2.35 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Gray LEAN CLAY

**LL=** 41 **PL=** 18 **PI=** 23

**Assumed Specific Gravity=** 2.75

**Remarks:** Test Method: ASTM D2850
Failure type: Buldge

**Figure** _____

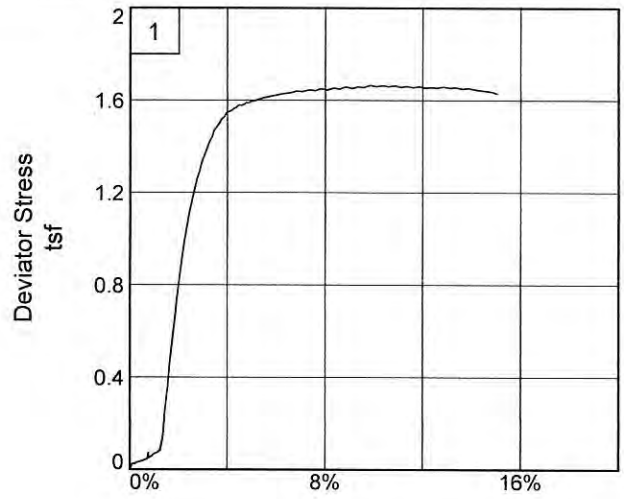
**Client:**

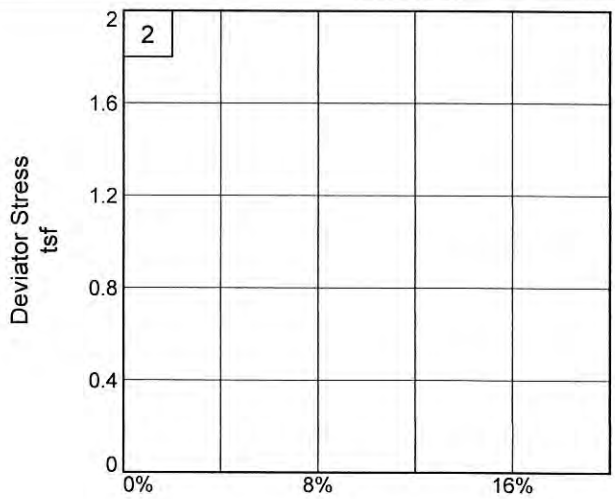
**Project:** San Jacinto River Waste Pit Superfund Site

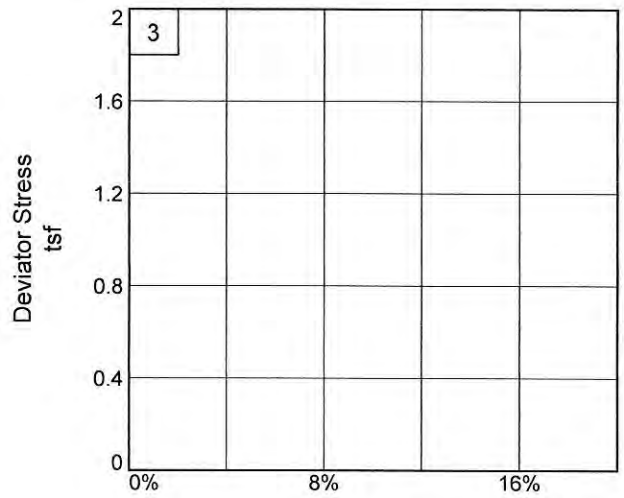
**Source of Sample:** SJGB057 **Depth:** 93

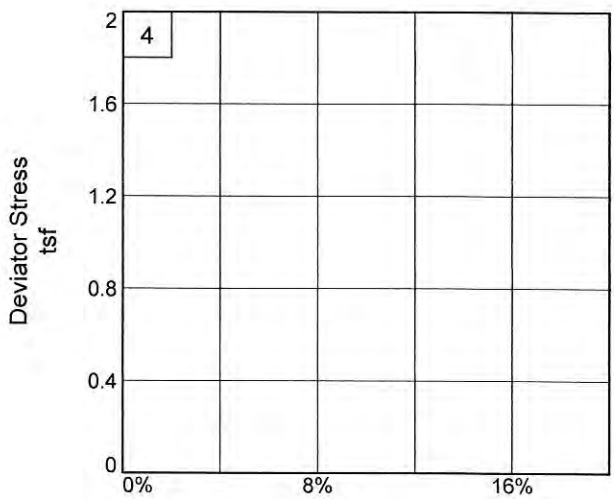
**Proj. No.:** 19.15.131 **Date Sampled:** 2-8-2020

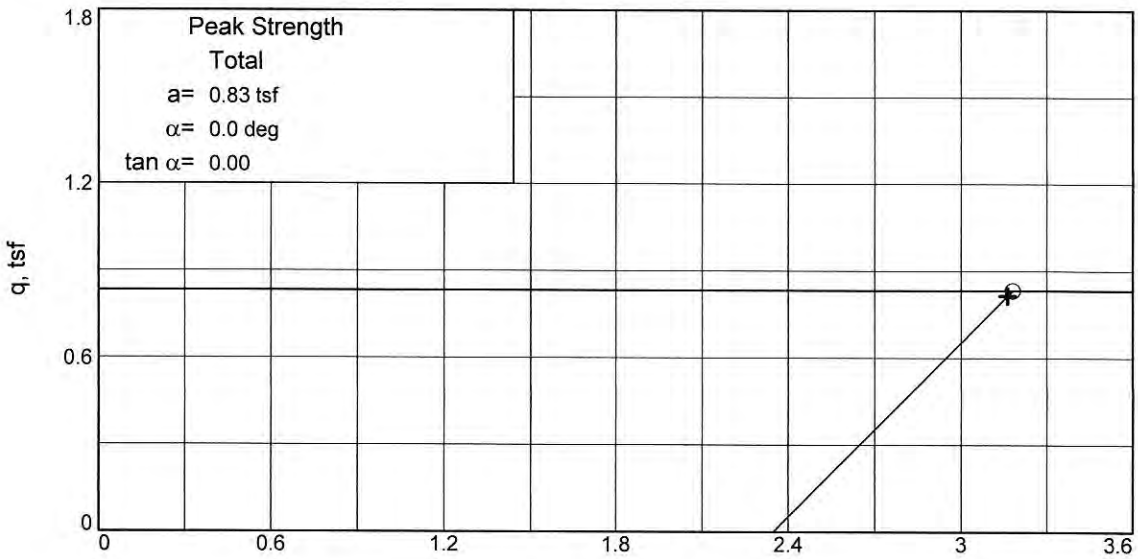
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

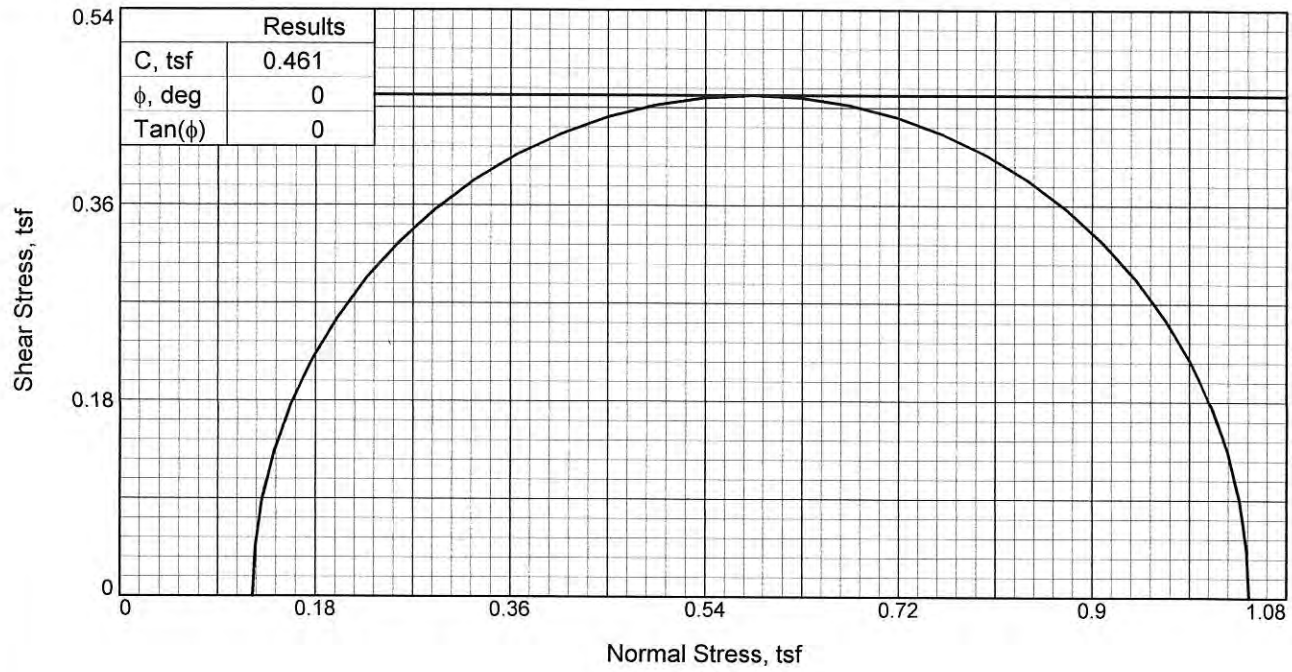
**Client:**

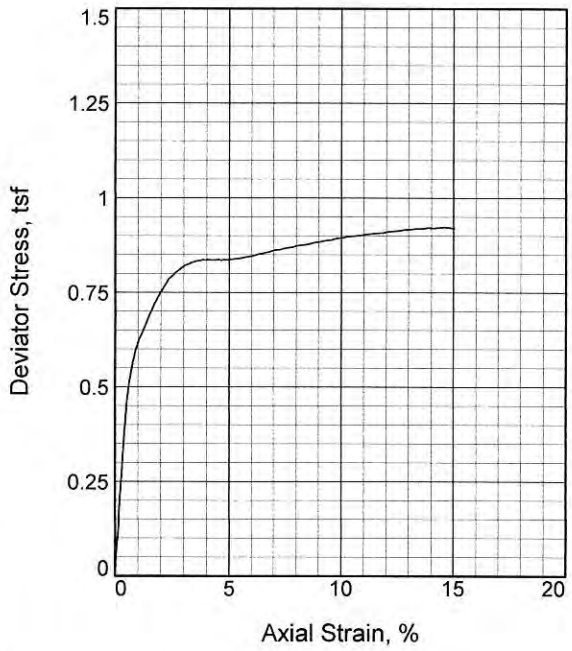
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB057 **Depth:** 93

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 25.5 |
| | Dry Density, pcf | 89.3 |
| | Saturation, % | 77.7 |
| | Void Ratio | 0.8871 |
| | Diameter, in. | 2.89 |
| | Height, in. | 5.70 |
| At Test | Water Content, % | 25.1 |
| | Dry Density, pcf | 89.3 |
| | Saturation, % | 76.3 |
| | Void Ratio | 0.8871 |
| | Diameter, in. | 2.89 |
| | Height, in. | 5.70 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 1.70 |
| Fail. Stress, tsf | | 0.92 |
| Strain, % | | 14.6 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.05 |
| $\sigma_3$ Failure, tsf | | 0.12 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Dark brown LEAN CLAY

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

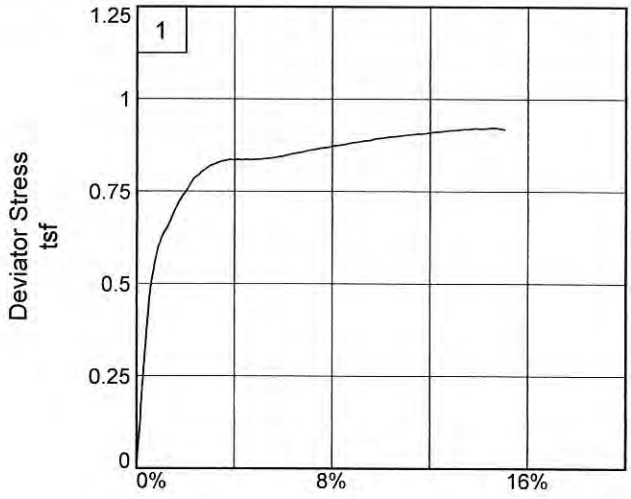
**Client:**

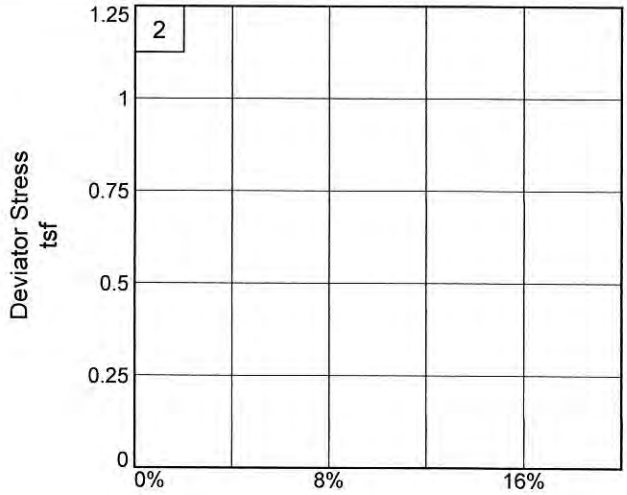
**Project:** San Jacinto River Waste Pit Superfund Site

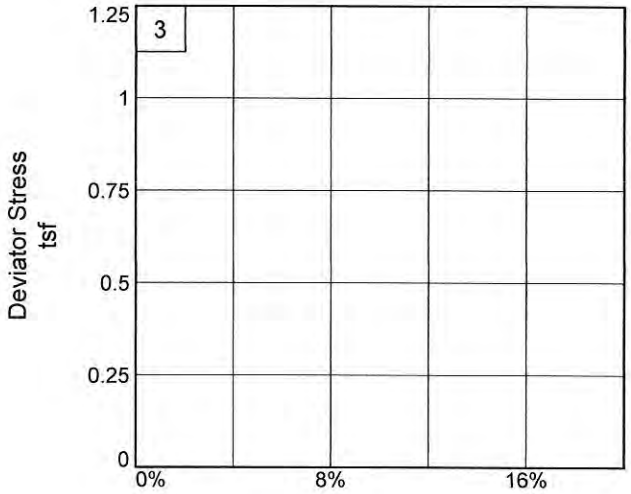
**Source of Sample:** SJGB058 **Depth:** 4-6

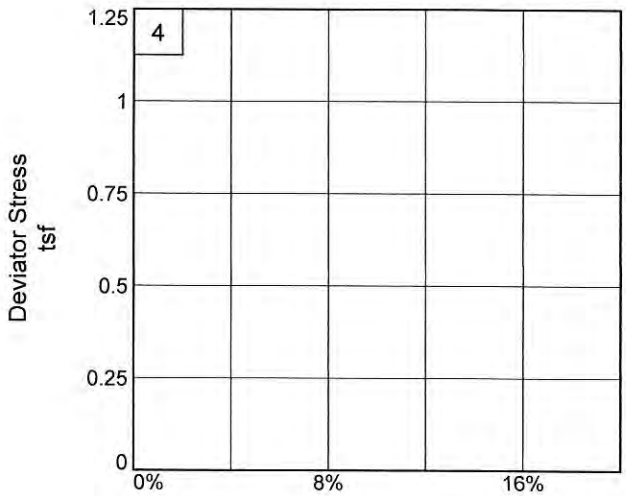
**Proj. No.:** 19.15.131 **Date Sampled:** 2/20/20

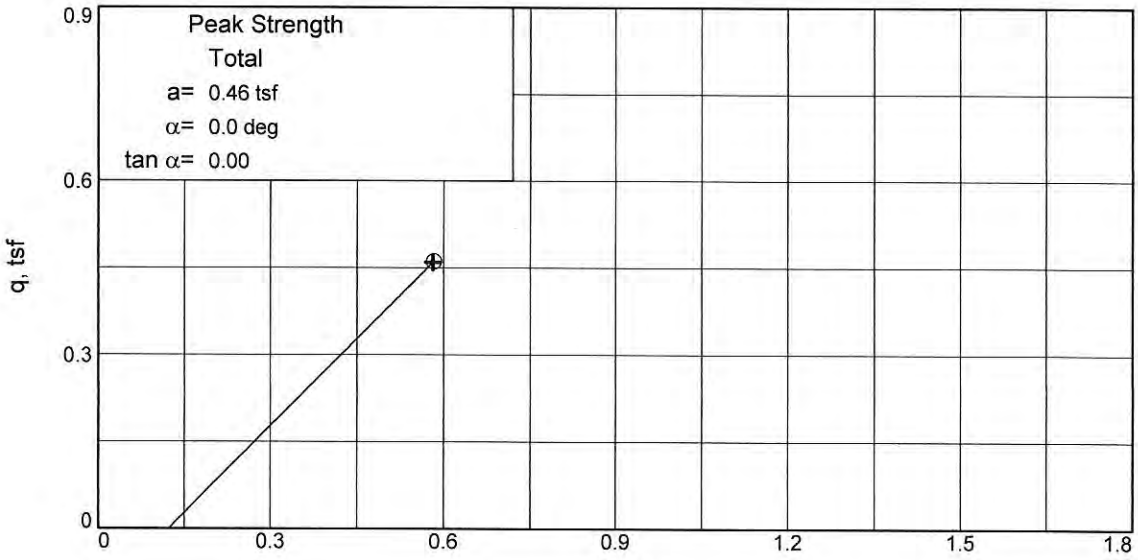
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

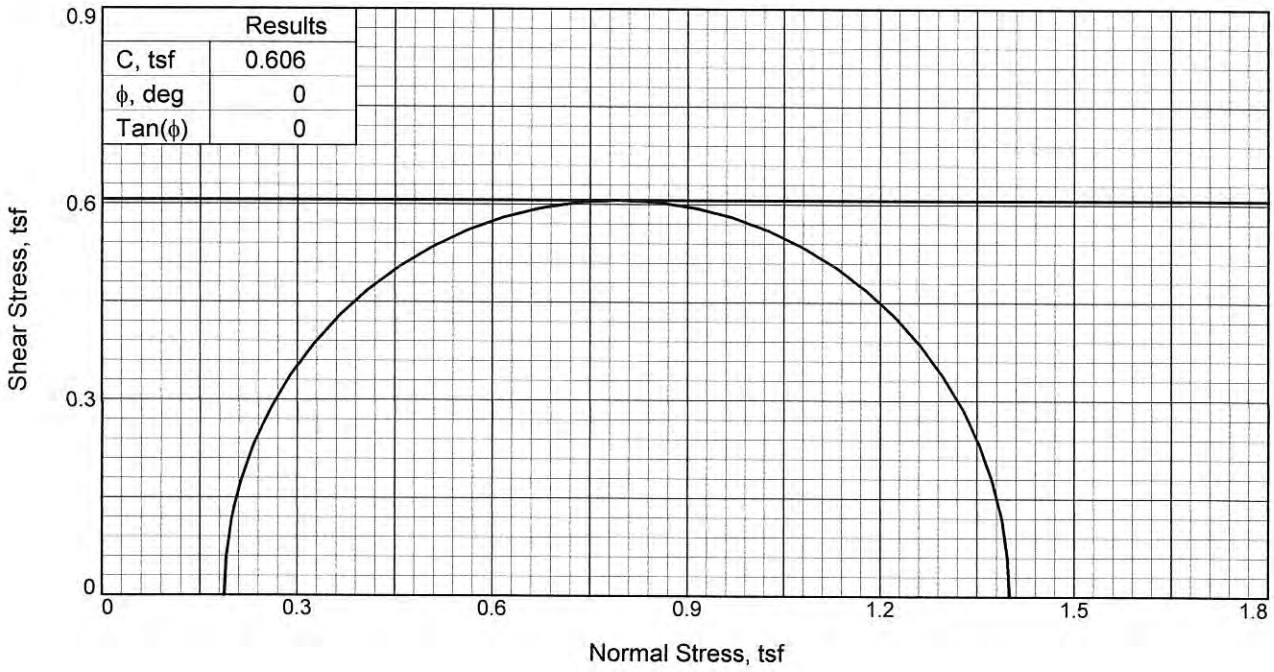
**Client:**

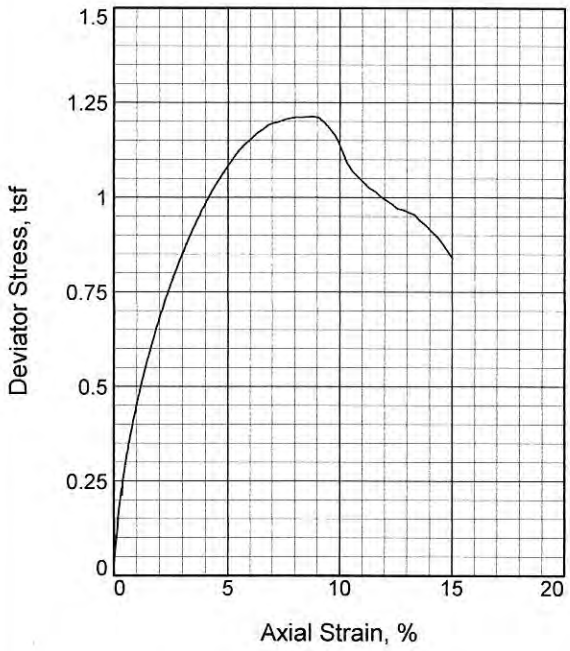
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB058 **Depth:** 4-6

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 34.9 |
| | Dry Density, pcf | 86.6 |
| | Saturation, % | 99.6 |
| | Void Ratio | 0.9459 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.68 |
| At Test | Water Content, % | 31.3 |
| | Dry Density, pcf | 86.6 |
| | Saturation, % | 89.4 |
| | Void Ratio | 0.9459 |
| | Diameter, in. | 2.84 |
| | Height, in. | 5.68 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 2.60 |
| Fail. Stress, tsf | | 1.21 |
| Strain, % | | 8.8 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.40 |
| $\sigma_3$ Failure, tsf | | 0.19 |

**Type of Test:**
Unconsolidated Undrained
**Sample Type:** Undisturbed
**Description:** Dark brown LEAN CLAY

**LL=** 42 **PL=** 18 **PI=** 24
**Assumed Specific Gravity=** 2.70
**Remarks:** Test method: ASTM D2850
Failure type: Multiple shear

**Figure** _____

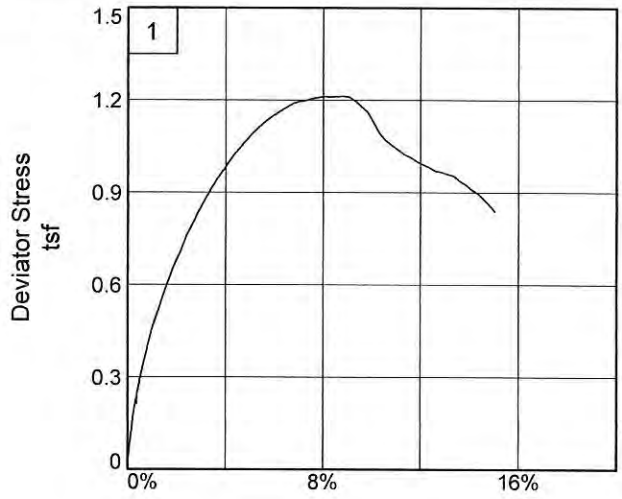
**Client:**

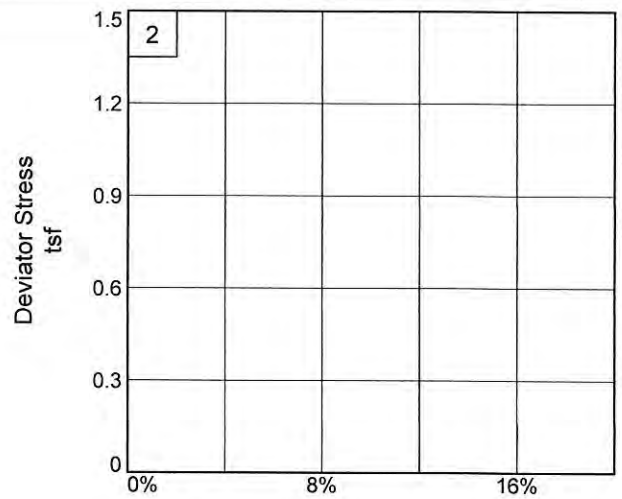
**Project:** San Jacinto River Waste Pit Superfund Site

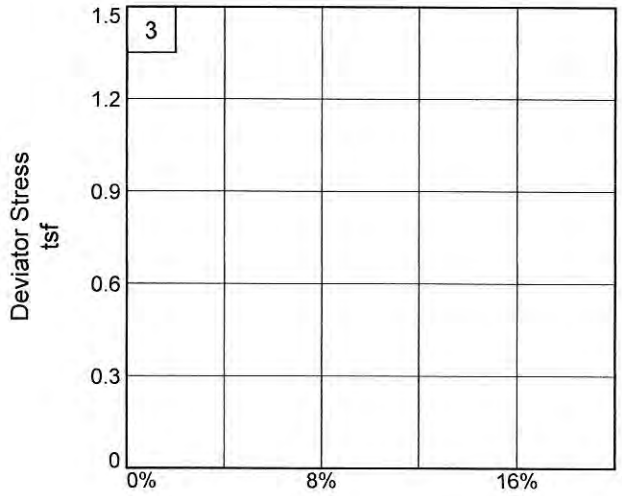
**Source of Sample:** SJGB058 **Depth:** 6-8

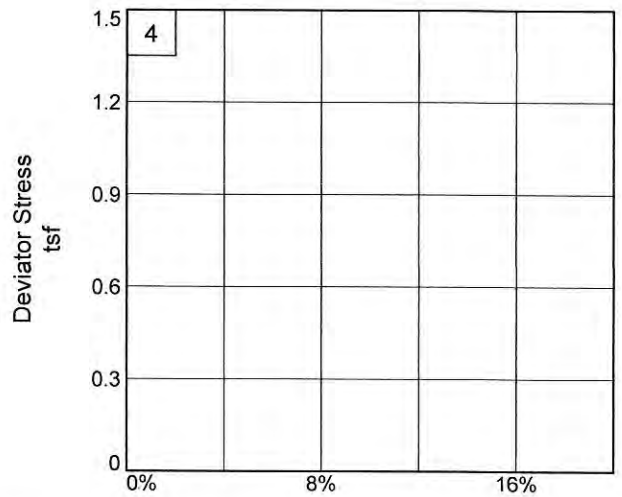
**Proj. No.:** 19.15.131 **Date Sampled:** 2/20/20

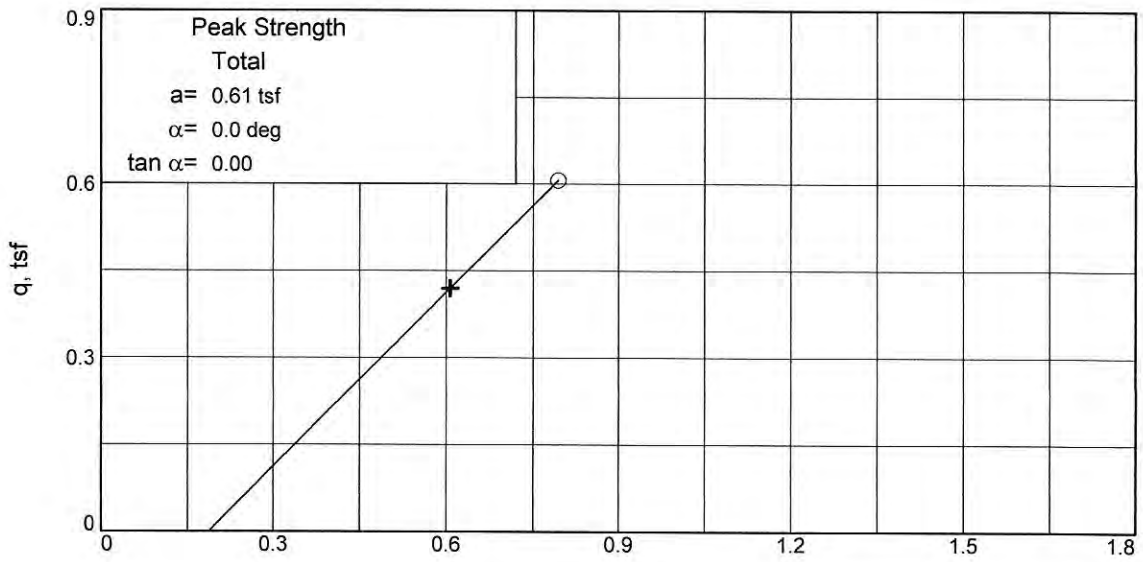
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

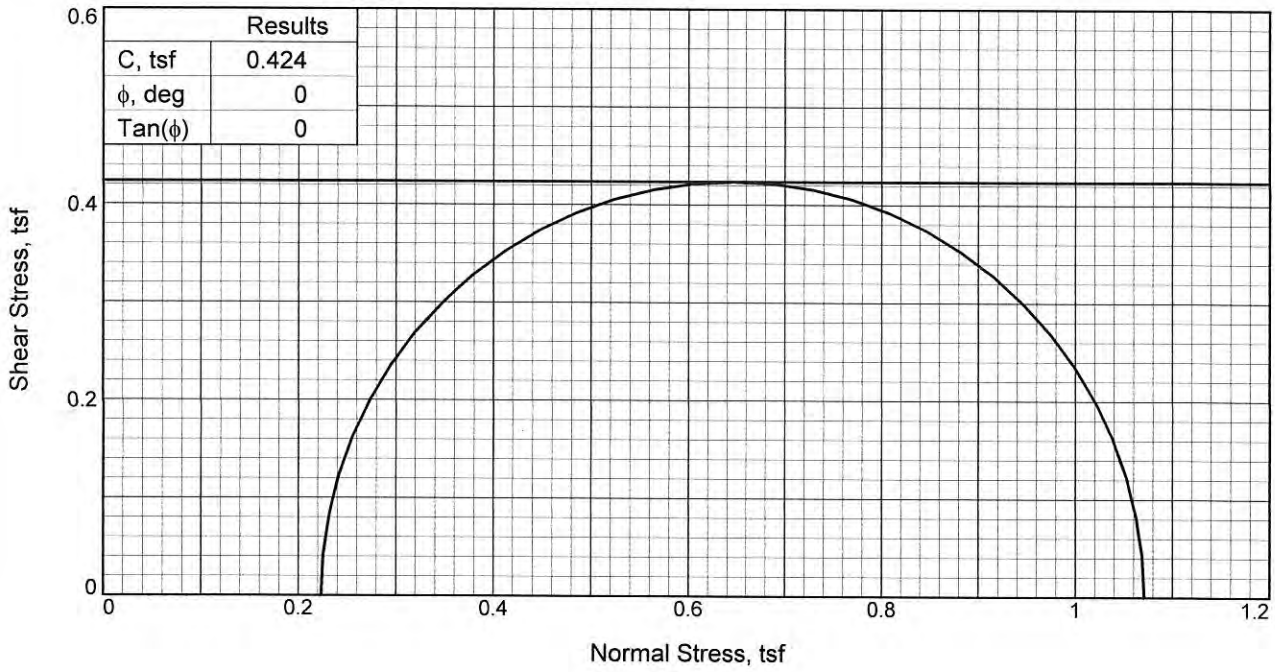
**Client:**

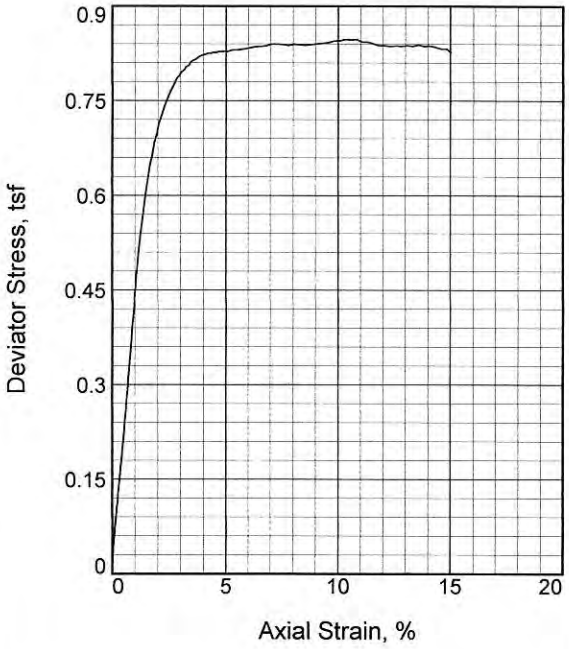
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB058 **Depth:** 6-8

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**




| | | |
|---|---|---|
| Sample No. | | 1 |
| Initial | Water Content, % | 30.5 |
| | Dry Density, pcf | 87.8 |
| | Saturation, % | 89.5 |
| | Void Ratio | 0.9190 |
| | Diameter, in. | 2.89 |
| | Height, in. | 5.77 |
| At Test | Water Content, % | 27.9 |
| | Dry Density, pcf | 87.8 |
| | Saturation, % | 81.9 |
| | Void Ratio | 0.9190 |
| | Diameter, in. | 2.89 |
| | Height, in. | 5.77 |
| Strain rate, %/min. | | 1.00 |
| Back Pressure, psi | | 0.00 |
| Cell Pressure, psi | | 3.10 |
| Fail. Stress, tsf | | 0.85 |
| Strain, % | | 10.3 |
| Ult. Stress, tsf | | |
| Strain, % | | |
| $\sigma_1$ Failure, tsf | | 1.07 |
| $\sigma_3$ Failure, tsf | | 0.22 |

**Type of Test:**
Unconsolidated Undrained

**Sample Type:** Undisturbed

**Description:** Dark brown FAT CLAY

**Assumed Specific Gravity=** 2.70

**Remarks:** Test method: ASTM D2850
Failure type: Bulge

**Figure** _____

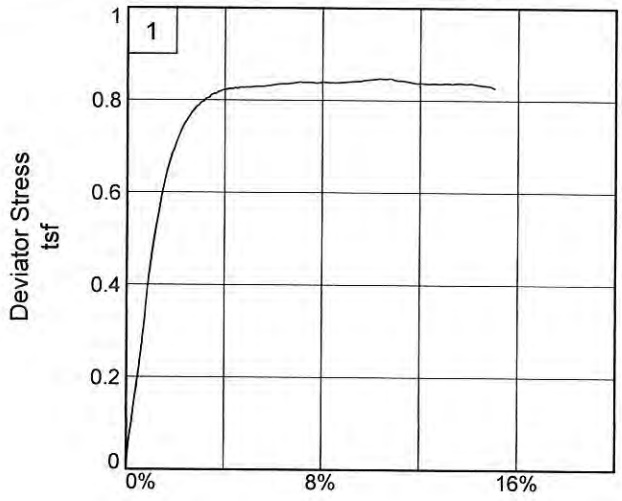
**Client:**

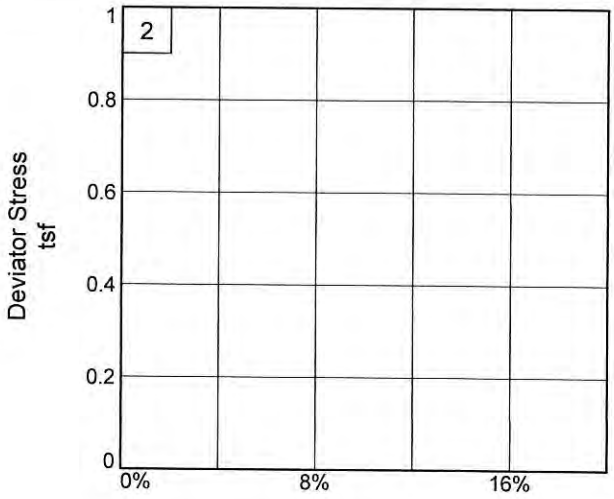
**Project:** San Jacinto River Waste Pit Superfund Site

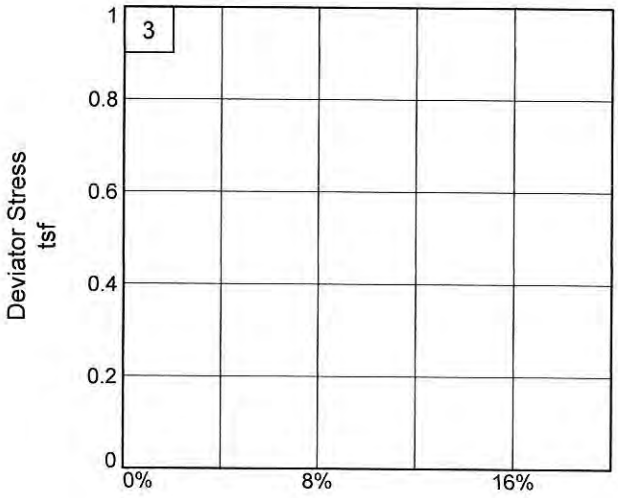
**Source of Sample:** SJGB058 **Depth:** 8-10

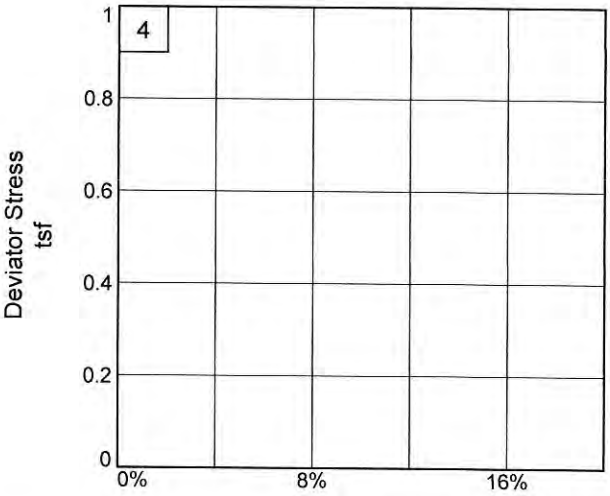
**Proj. No.:** 19.15.131 **Date Sampled:** 2/20/20

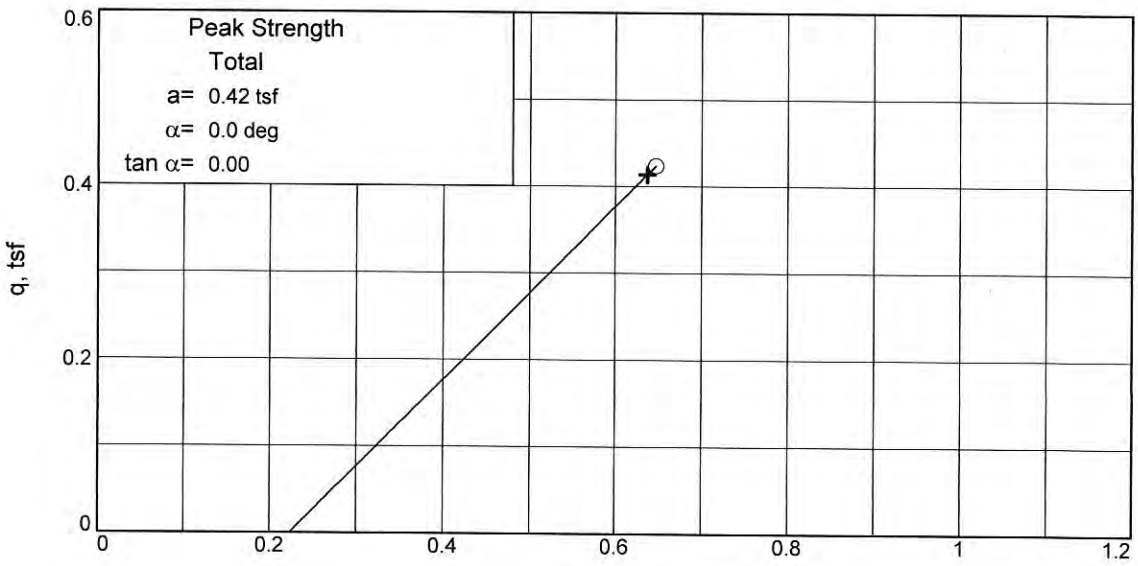
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas




Stress Paths: o indicates peak + indicates end

**Client:**

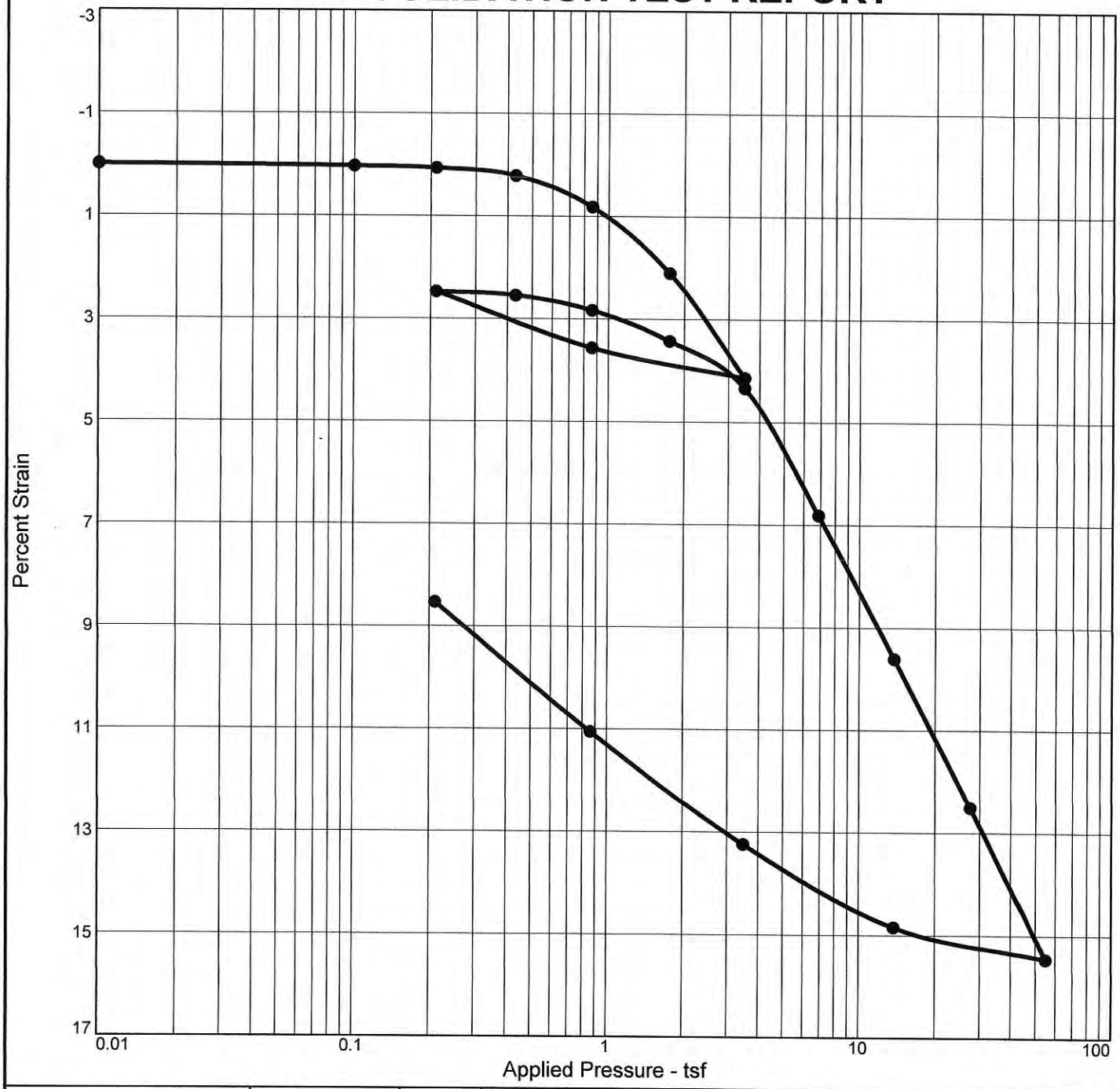
**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB058 **Depth:** 8-10

**Project No.:** 19.15.131 **Figure** _____

**TOLUNAY-WONG ENGINEERS, INC.**

# CONSOLIDATION TEST REPORT




| Natural | | Dry Dens. (pcf) | LL | PI | Sp. Gr. | USCS | AASHTO | Initial Void Ratio |
|---|---|---|---|---|---|---|---|---|
| Saturation | Moisture | | | | | | | |
| 98.0 % | 20.6 % | 107.5 | 37 | 20 | 2.70 | CL | | 0.567 |

**MATERIAL DESCRIPTION**

Gray SANDY LEAN CLAY

**Project No.** 19.15.131 **Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB027 **Depth:** 6

**Tolunay-Wong Engineers, Inc.**

**Houston, Texas**

**Remarks:**

Test method: ASTM D2435
Specific gravity: Assumed

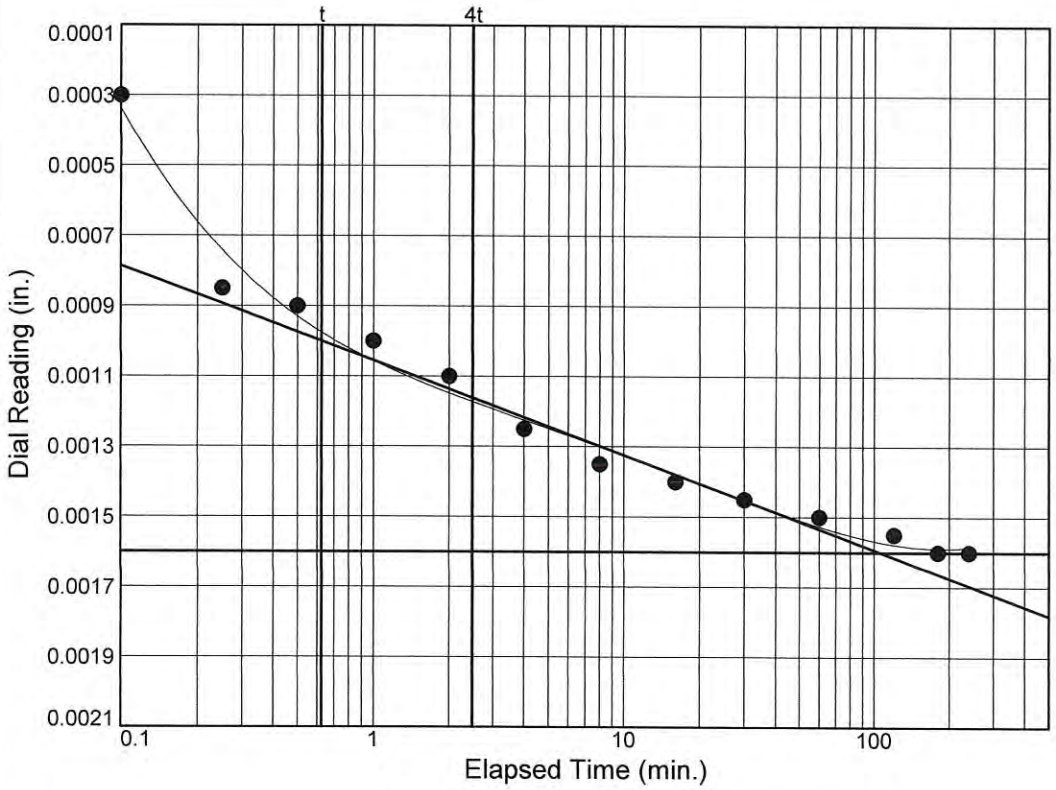
**Figure**

Attachment Figure B.2-159

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

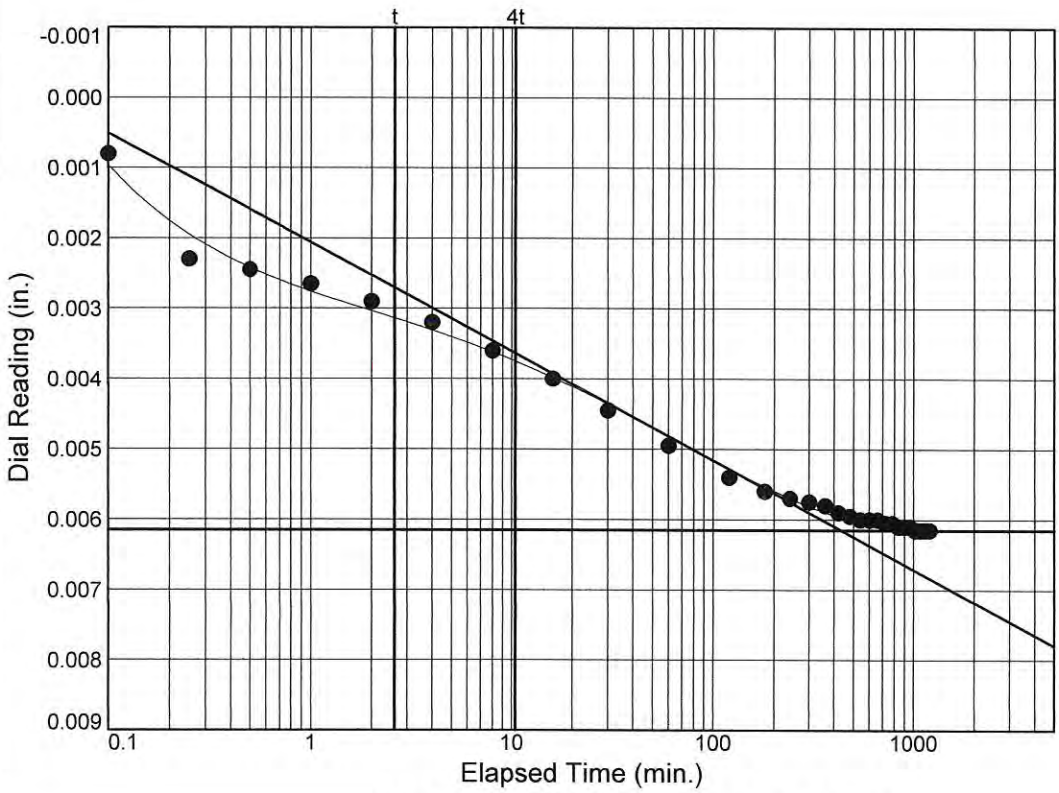
Source of Sample: SJGB027 Depth: 6




Load No.= 4
Load= 0.43 tsf
$D_0$ = 0.0008
$D_{50}$ = 0.0012
$D_{100}$ = 0.0016
$T_{50}$ = 2.86 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 35.3 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 5
Load= 0.86 tsf
$D_0$ = 0.0025
$D_{50}$ = 0.0043
$D_{100}$ = 0.0062
$T_{50}$ = 28.88 min.

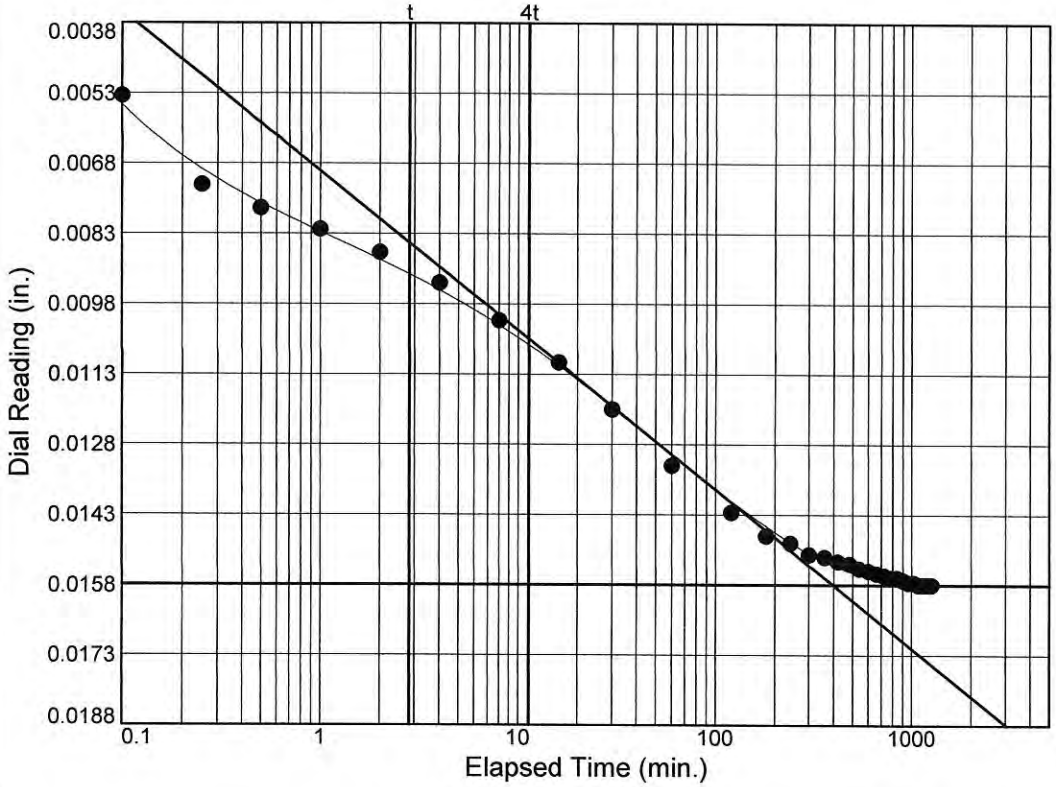
| $C_v$ @ $T_{50}$ |
| --- |
| 3.5 ft.$^2$/yr. |

$C_\alpha$ = 0.000

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

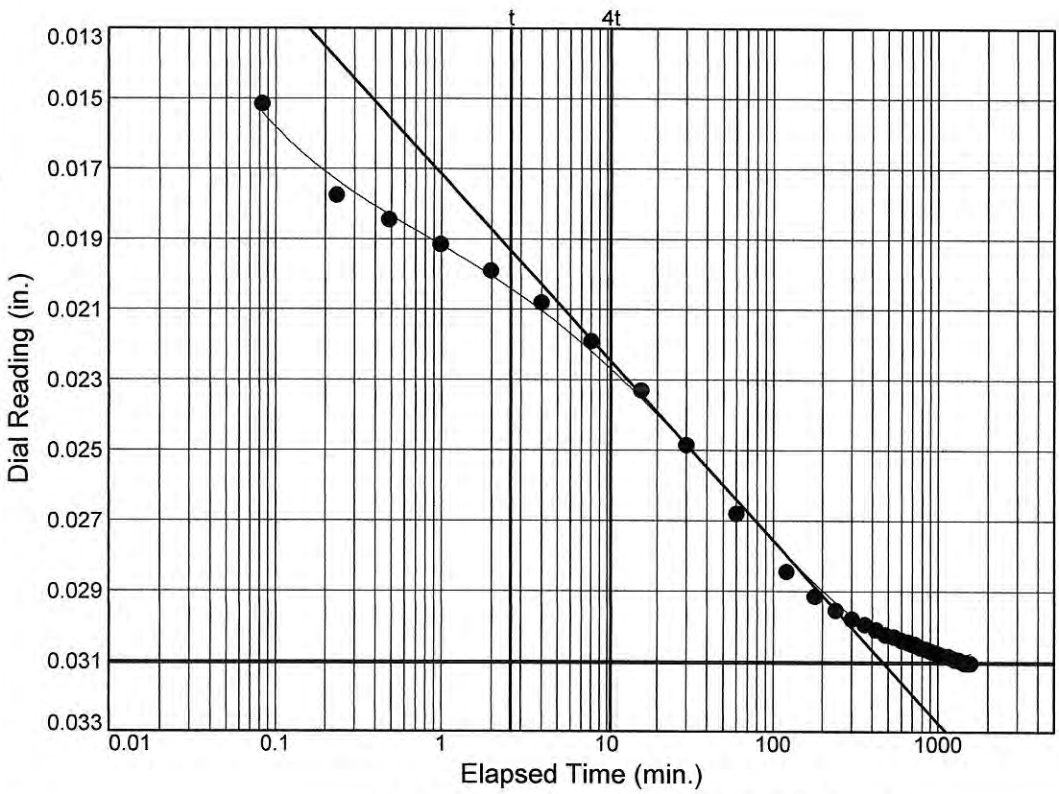
Source of Sample: SJGB027 Depth: 6




Load No.= 6
Load= 1.75 tsf
$D_0$ = 0.0077
$D_{50}$ = 0.0117
$D_{100}$ = 0.0158
$T_{50}$ = 24.96 min.

| $C_v$ @ $T_{50}$ |
|---|
| 3.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 7
Load= 3.49 tsf
$D_0$ = 0.0181
$D_{50}$ = 0.0246
$D_{100}$ = 0.0311
$T_{50}$ = 26.63 min.

| $C_v$ @ $T_{50}$ |
|---|
| 3.6 ft.$^2$/yr. |

$C_\alpha$ = 0.000

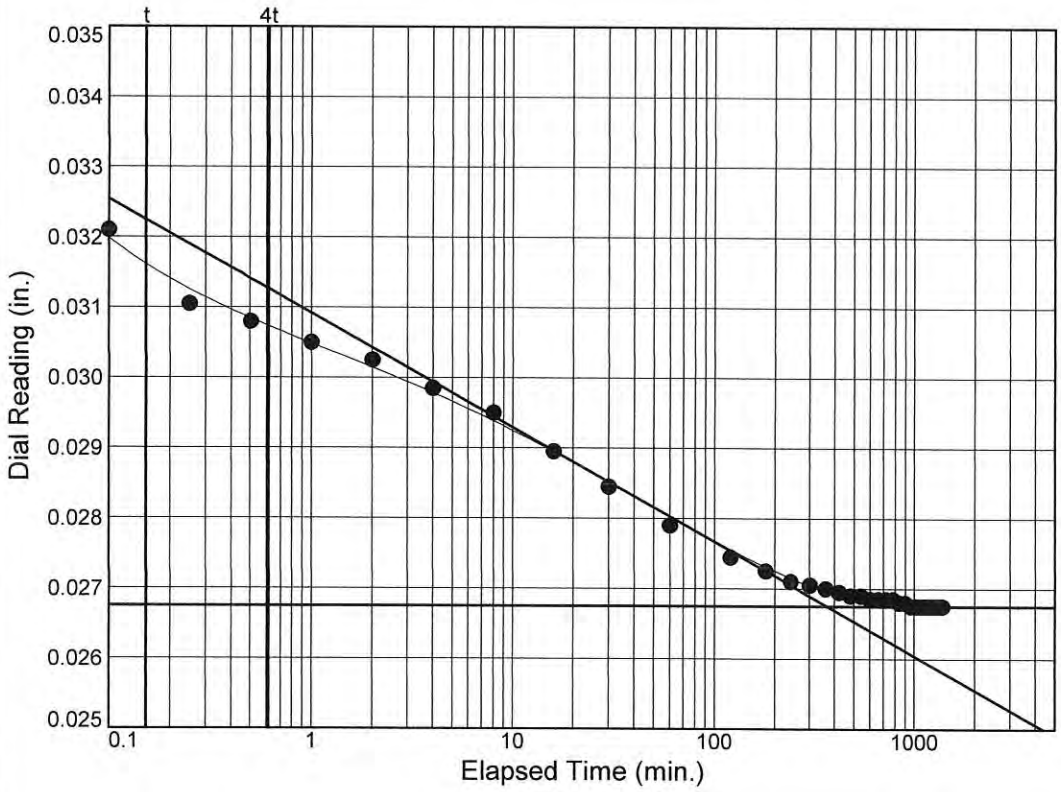
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-161

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

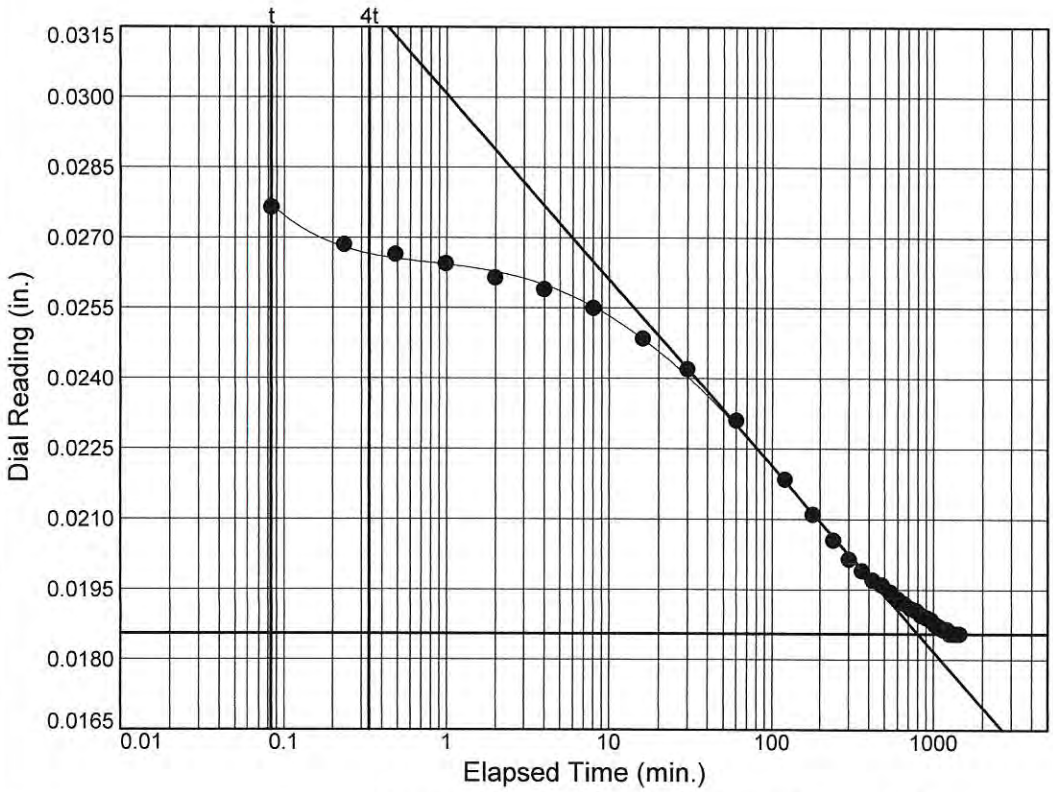
Source of Sample: SJGB027 Depth: 6




Load No.= 8
Load= 0.86 tsf
$D_0$ = 0.0325
$D_{50}$ = 0.0296
$D_{100}$ = 0.0267
$T_{50}$ = 5.38 min.

$C_v$ @ $T_{50}$
17.3 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 9
Load= 0.21 tsf
$D_0$ = 0.0287
$D_{50}$ = 0.0236
$D_{100}$ = 0.0186
$T_{50}$ = 39.47 min.

$C_v$ @ $T_{50}$
2.4 ft.$^2$/yr.

$C_\alpha$ = 0.000

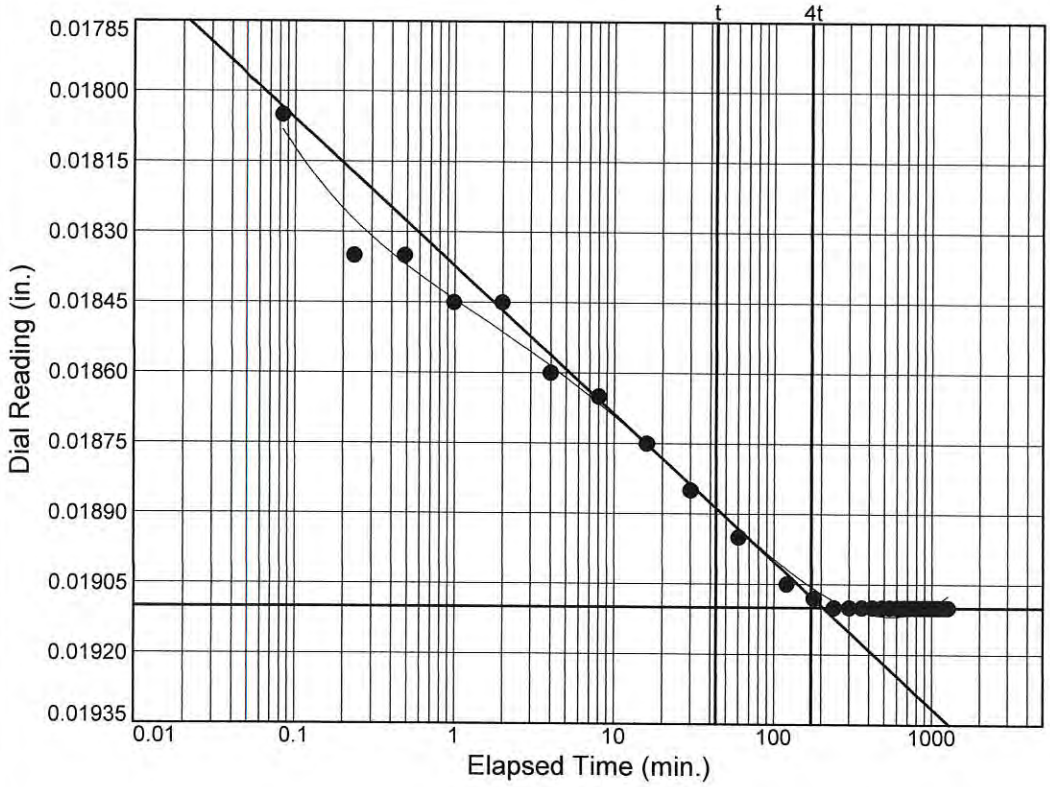
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-162

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

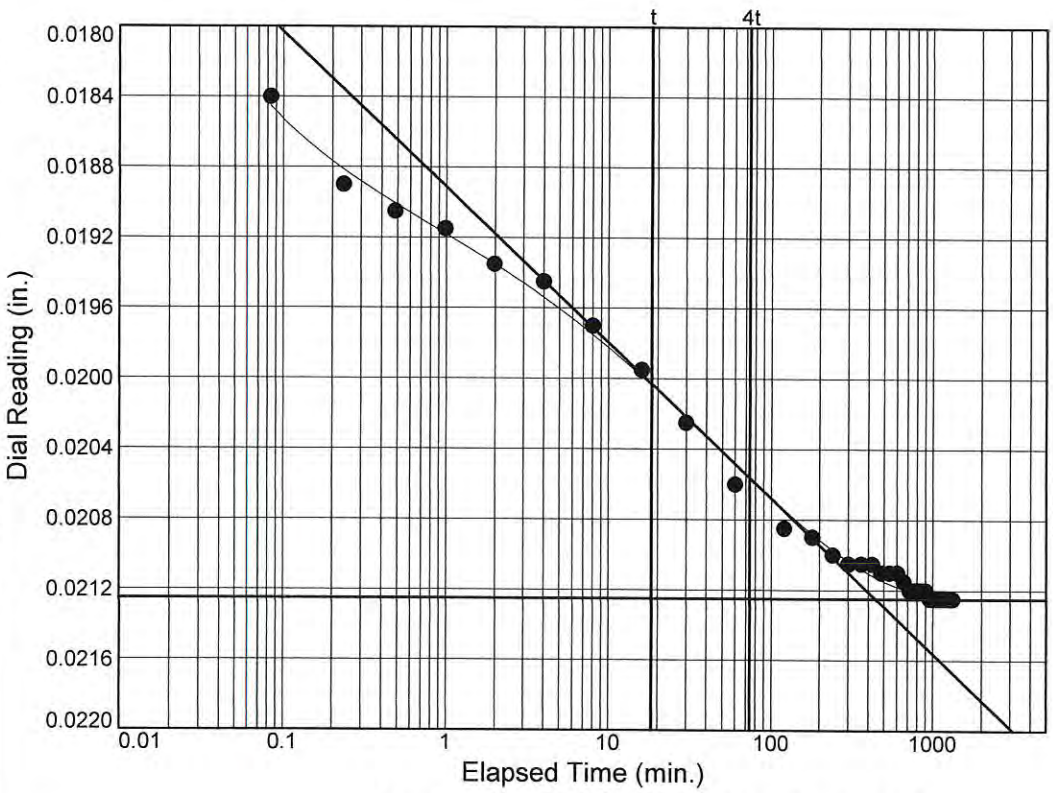
Source of Sample: SJGB027 Depth: 6




Load No.= 10
Load= 0.43 tsf
$D_0$ = 0.0187
$D_{50}$ = 0.0189
$D_{100}$ = 0.0191
$T_{50}$ = 50.94 min.

$C_v$ @ $T_{50}$
1.9 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 11
Load= 0.86 tsf
$D_0$ = 0.0195
$D_{50}$ = 0.0204
$D_{100}$ = 0.0212
$T_{50}$ = 45.95 min.

$C_v$ @ $T_{50}$
2.1 ft.$^2$/yr.

$C_\alpha$ = 0.000

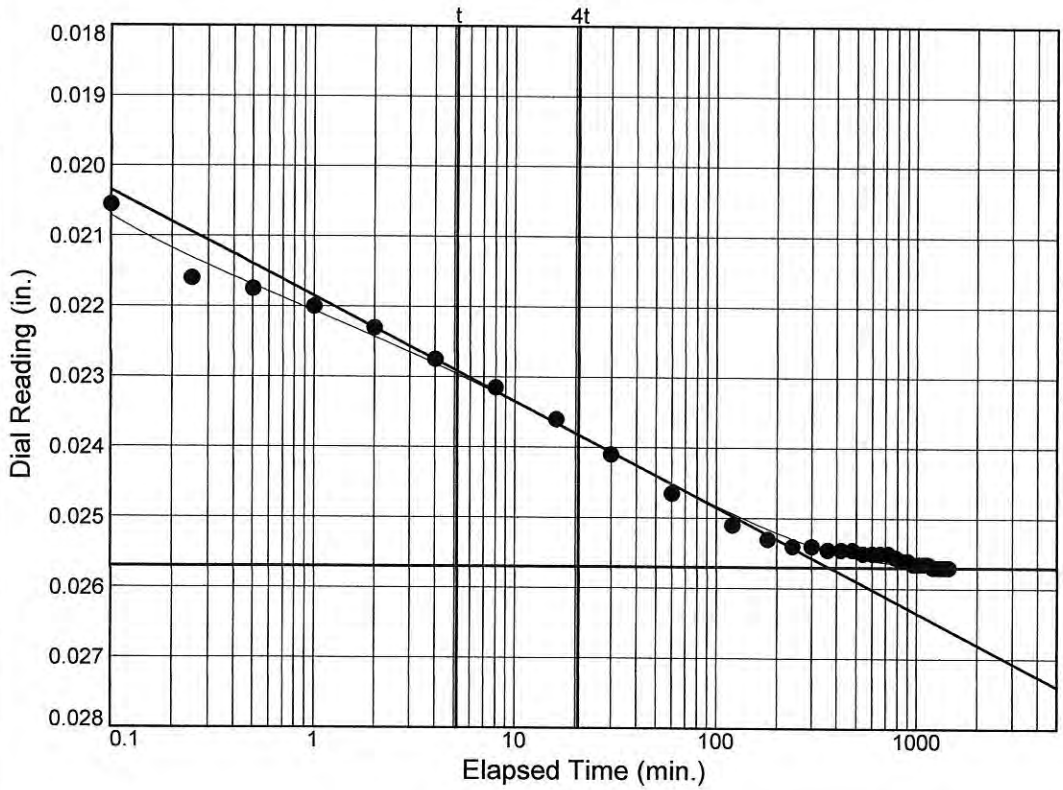
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-163

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

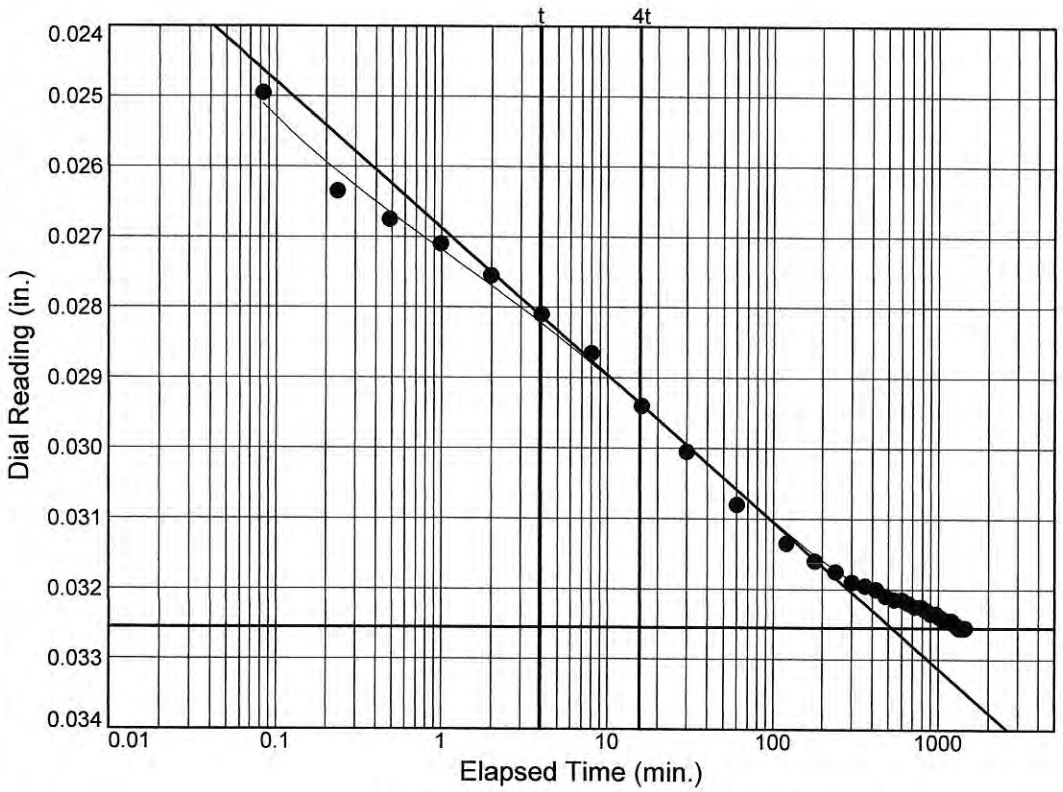
Source of Sample: SJGB027 Depth: 6




Load No.= 12
Load= 1.75 tsf
$D_0$ = 0.0221
$D_{50}$ = 0.0239
$D_{100}$ = 0.0257
$T_{50}$ = 23.24 min.

$C_v$ @ $T_{50}$
4.1 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 13
Load= 3.49 tsf
$D_0$ = 0.0270
$D_{50}$ = 0.0298
$D_{100}$ = 0.0325
$T_{50}$ = 25.16 min.

$C_v$ @ $T_{50}$
3.7 ft.$^2$/yr.

$C_\alpha$ = 0.000

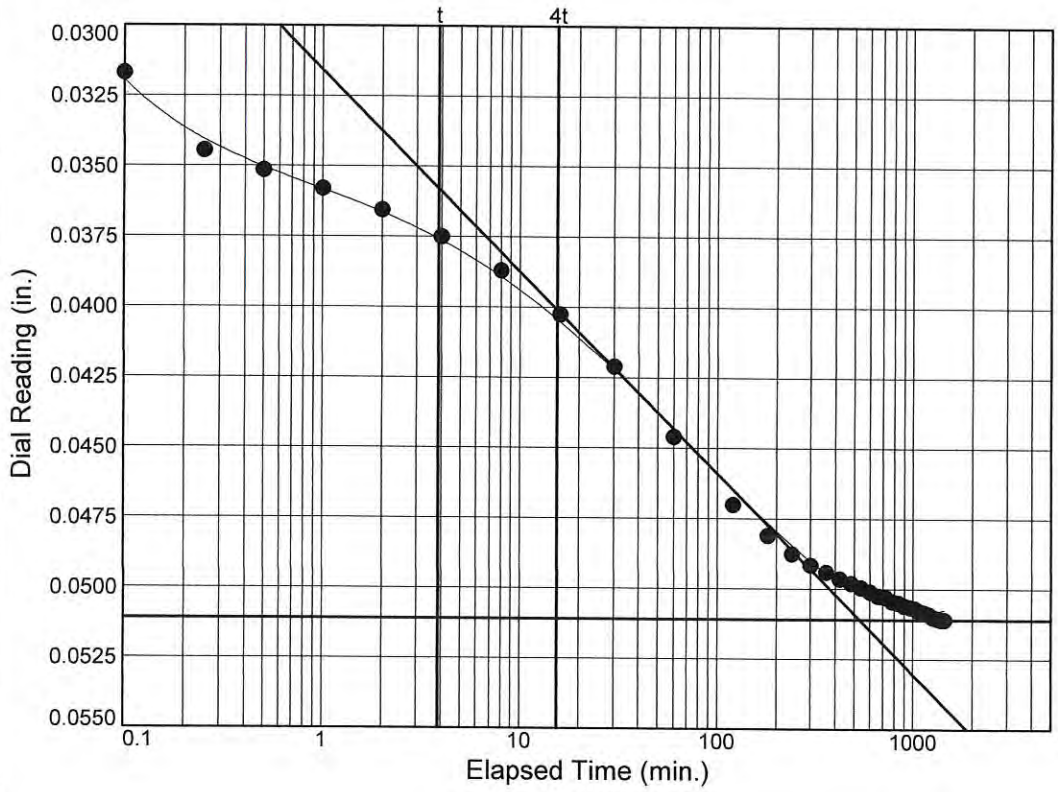
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-164

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

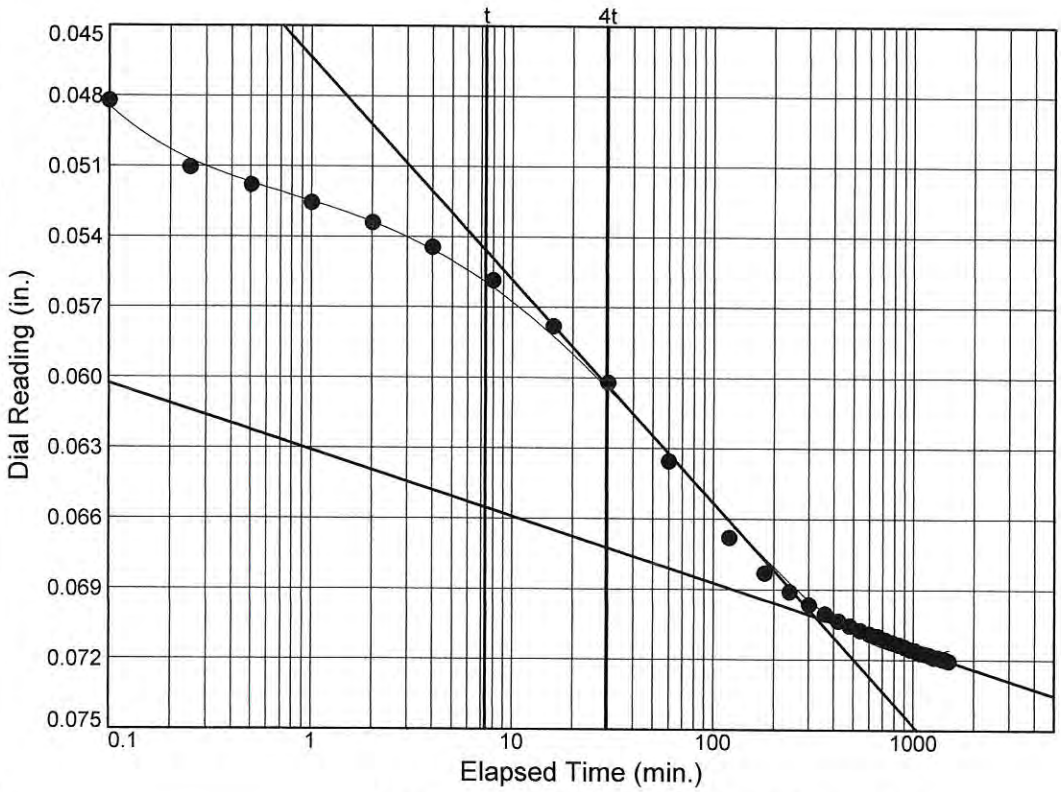
Source of Sample: SJGB027 Depth: 6




Load No.= 14
Load= 6.87 tsf
$D_0$ = 0.0347
$D_{50}$ = 0.0429
$D_{100}$ = 0.0511
$T_{50}$ = 37.82 min.

| $C_v$ @ $T_{50}$ |
|---|
| 2.4 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 15
Load= 13.75 tsf
$D_0$ = 0.0515
$D_{50}$ = 0.0608
$D_{100}$ = 0.0702
$T_{50}$ = 32.86 min.

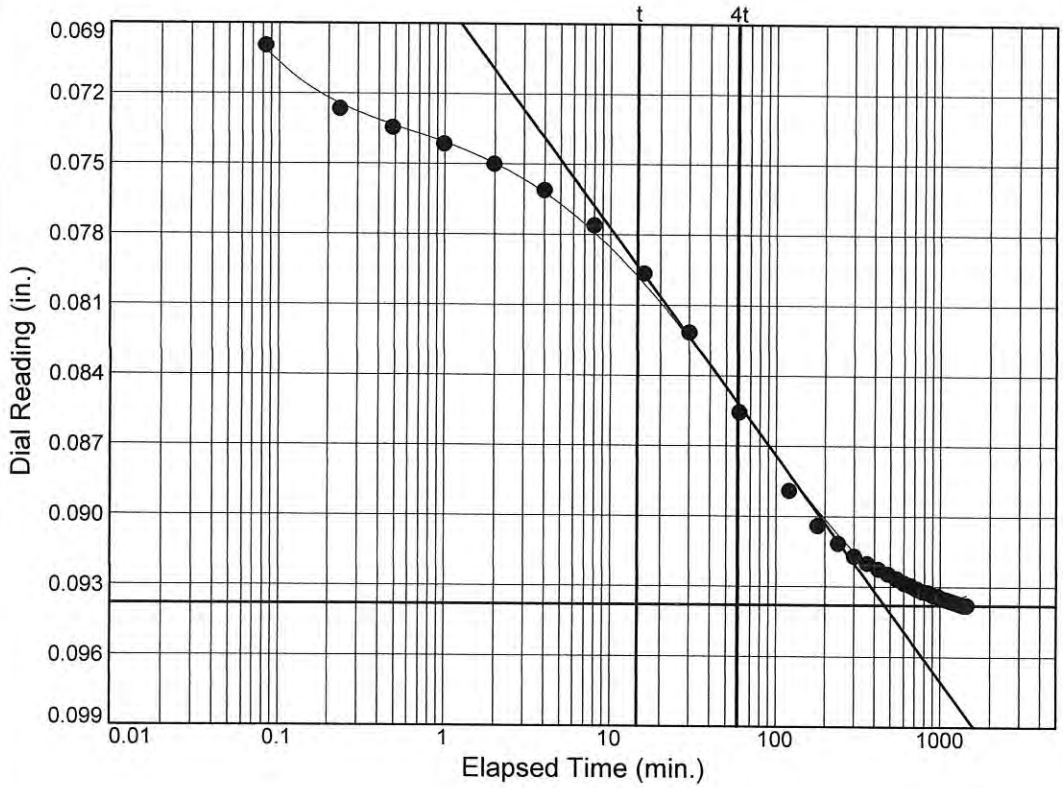
| $C_v$ @ $T_{50}$ |
|---|
| 2.6 ft.$^2$/yr. |

$C_\alpha$ = 0.006

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

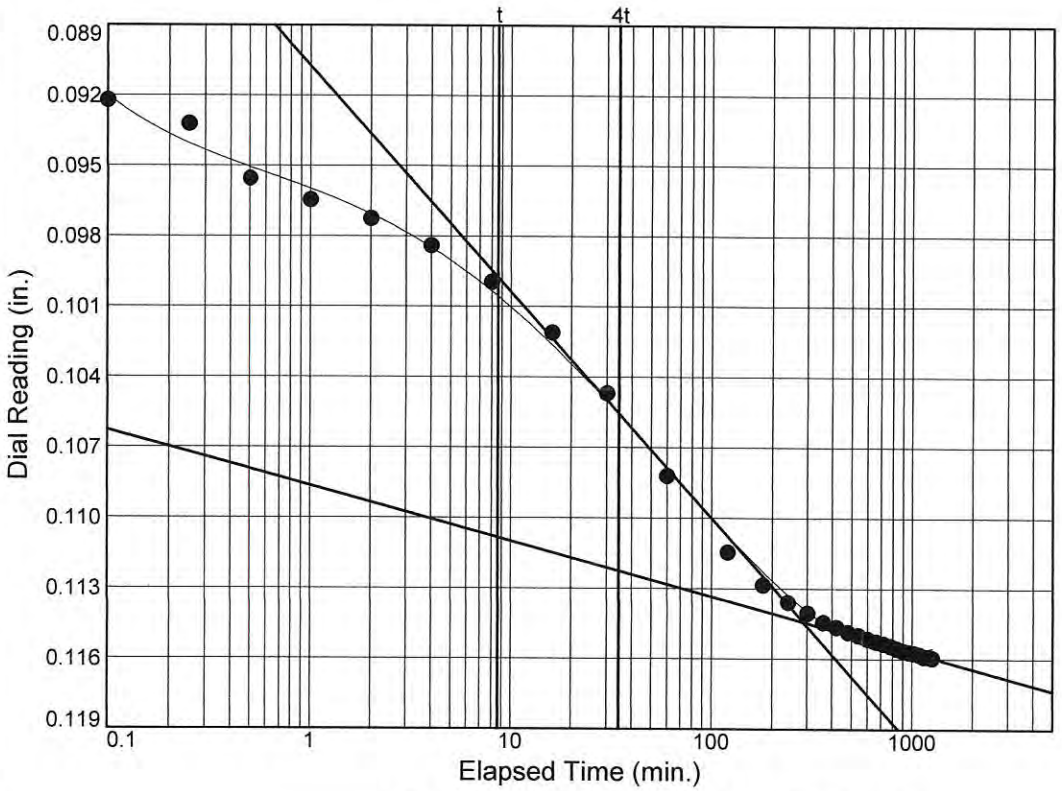
Source of Sample: SJGB027 Depth: 6




Load No.= 16
Load= 27.50 tsf
$D_0$ = 0.0744
$D_{50}$ = 0.0841
$D_{100}$ = 0.0938
$T_{50}$ = 45.65 min.

| $C_v$ @ $T_{50}$ |
|---|
| 1.8 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 17
Load= 54.99 tsf
$D_0$ = 0.0955
$D_{50}$ = 0.1050
$D_{100}$ = 0.1144
$T_{50}$ = 29.67 min.

| $C_v$ @ $T_{50}$ |
|---|
| 2.5 ft.$^2$/yr. |

$C_\alpha$ = 0.005

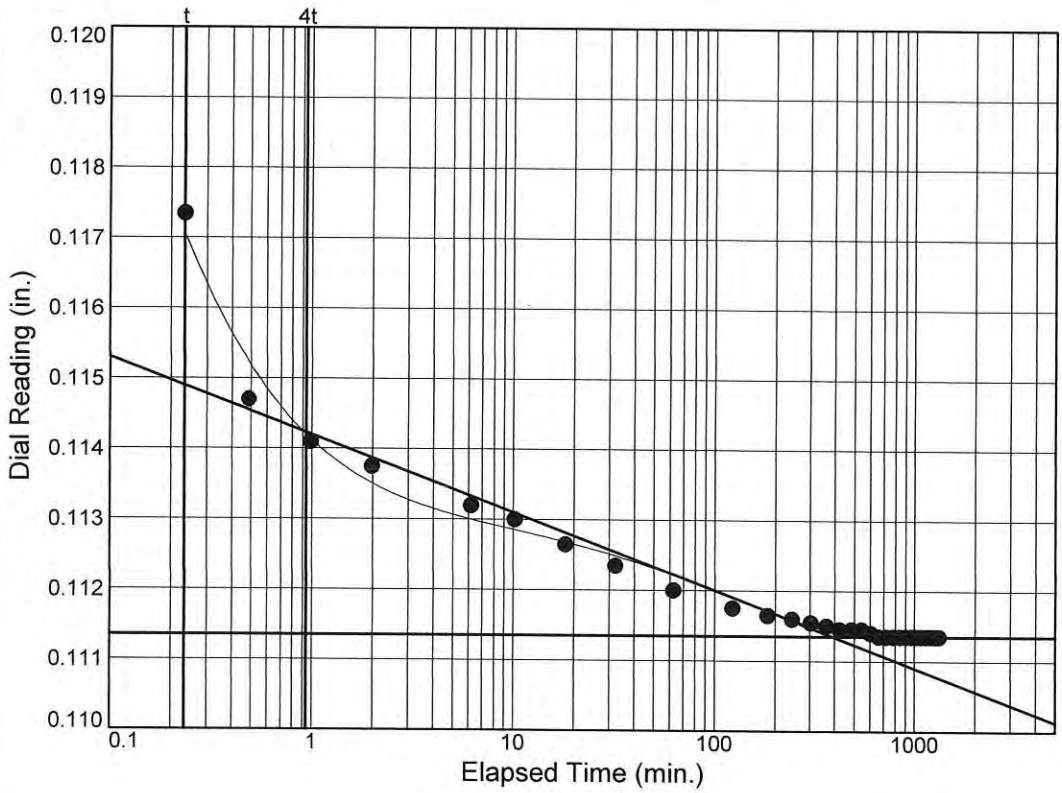
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-166

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

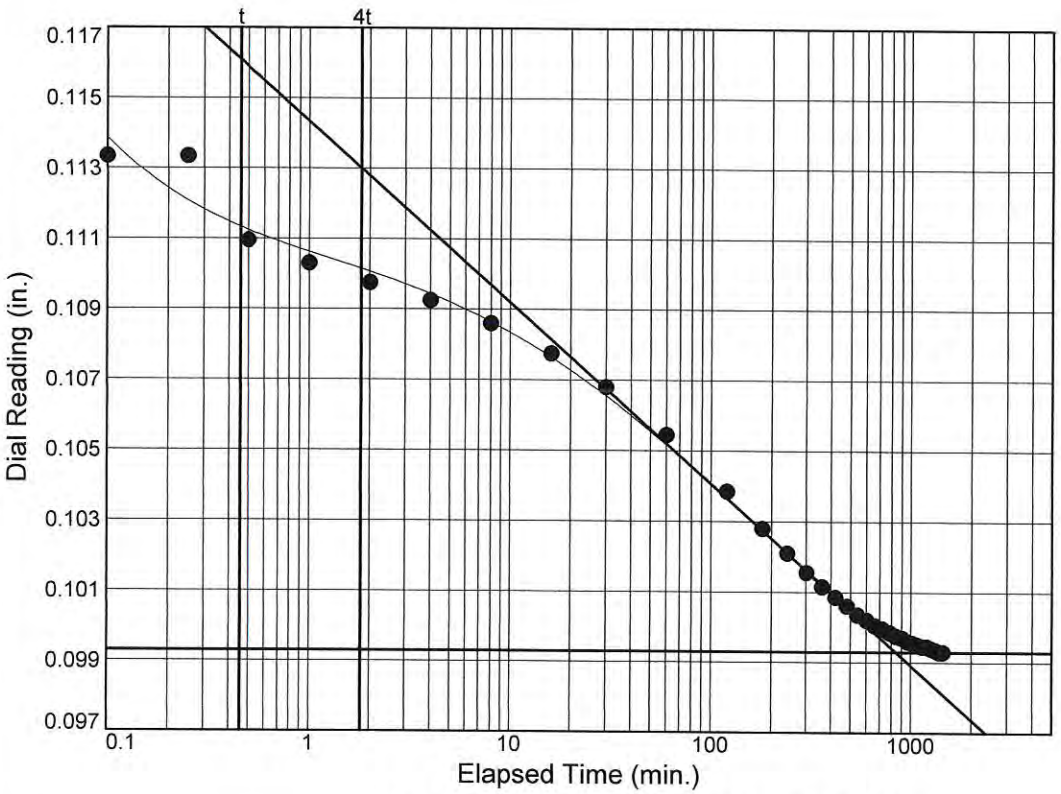
Source of Sample: SJGB027 Depth: 6




Load No.= 18
Load= 13.75 tsf
$D_0$ = 0.1199
$D_{50}$ = 0.1156
$D_{100}$ = 0.1114
$T_{50}$ = 0.40 min.

$C_v$ @ $T_{50}$
181.8 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 19
Load= 3.49 tsf
$D_0$ = 0.1125
$D_{50}$ = 0.1059
$D_{100}$ = 0.0993
$T_{50}$ = 41.67 min.

$C_v$ @ $T_{50}$
1.8 ft.$^2$/yr.

$C_\alpha$ = 0.000

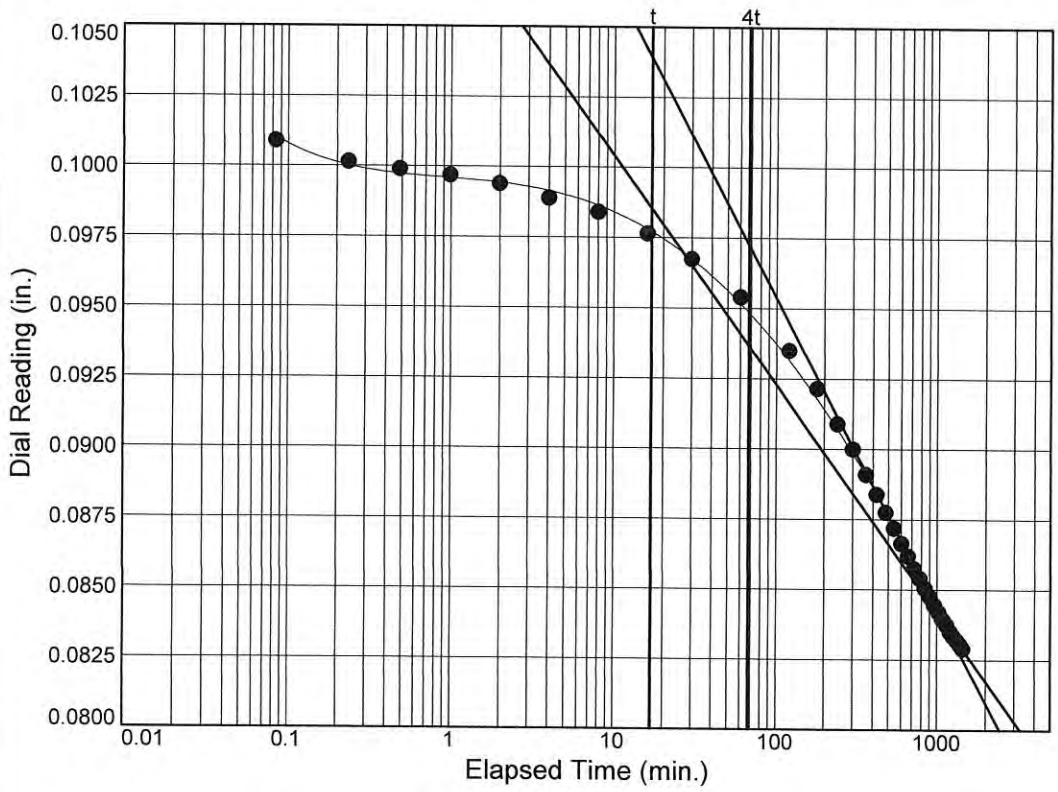
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-167

# Dial Reading vs. Time

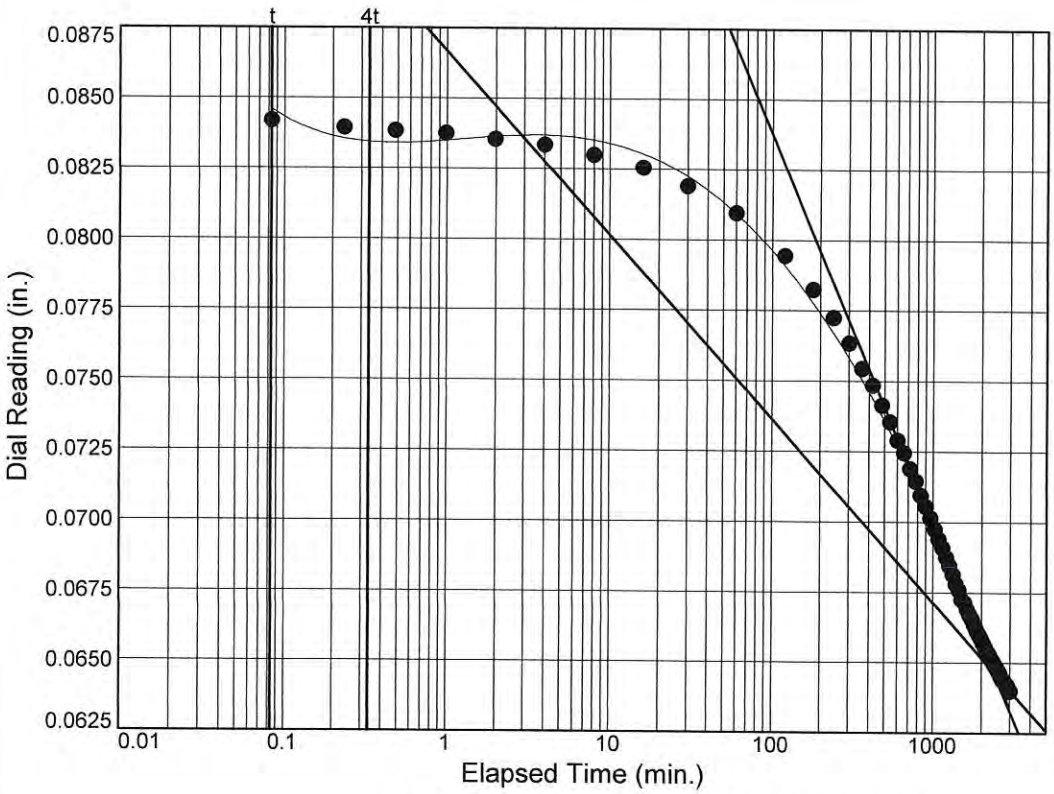
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 Depth: 6




Load No.= 20
Load= 0.86 tsf
$D_0$ = 0.1006
$D_{50}$ = 0.0922
$D_{100}$ = 0.0839
$T_{50}$ = 158.06 min.

| $C_v$ @ $T_{50}$ |
|---|
| 0.5 ft.$^2$/yr. |




Load No.= 21
Load= 0.21 tsf
$D_0$ = 0.0858
$D_{50}$ = 0.0752
$D_{100}$ = 0.0647
$T_{50}$ = 346.90 min.

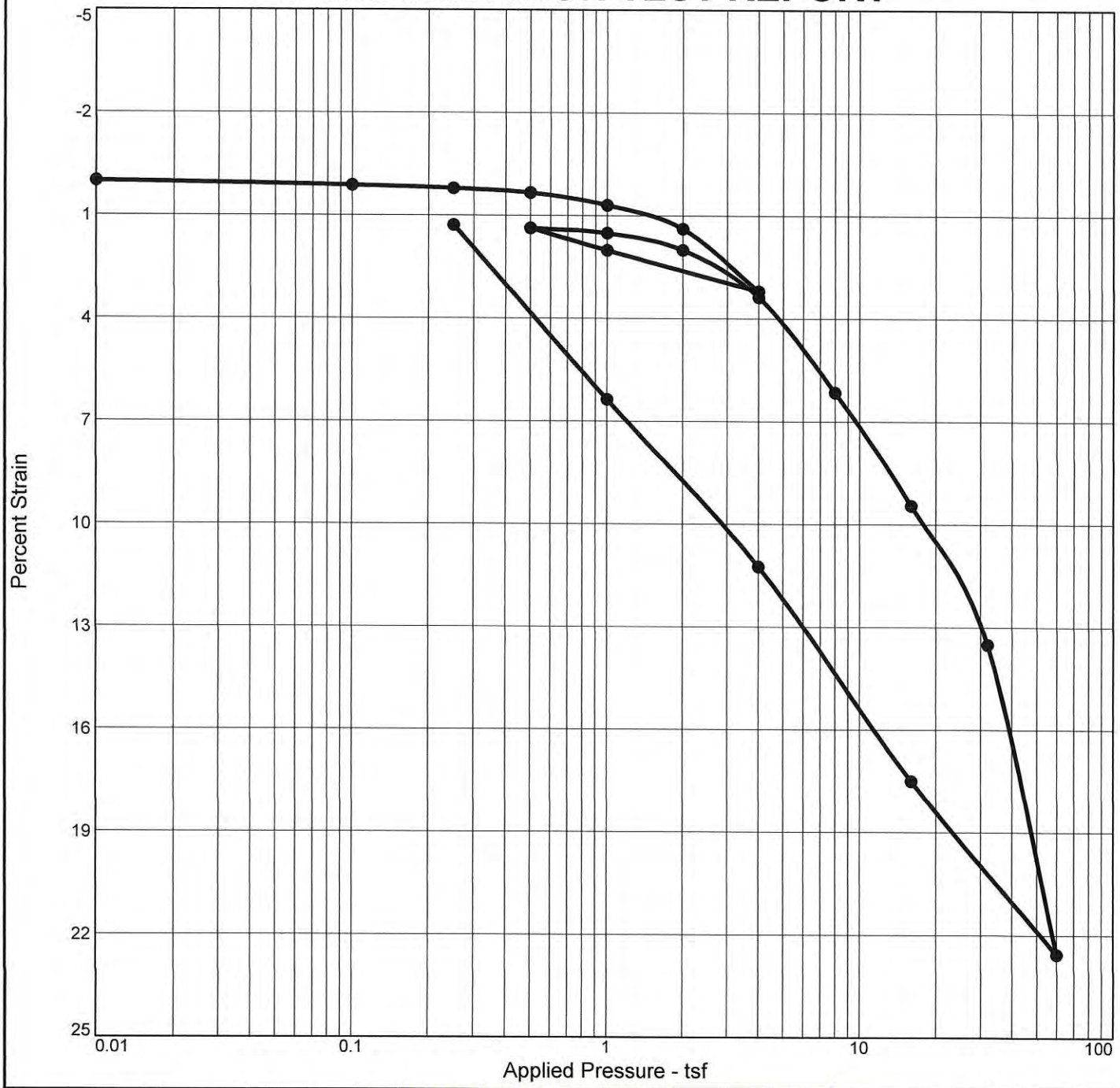
| $C_v$ @ $T_{50}$ |
|---|
| 0.2 ft.$^2$/yr. |

TOLUNAY-WONG ENGINEERS, INC.

Figure

Attachment Figure B.2-168

# CONSOLIDATION TEST REPORT




| Natural | | Dry Dens. (pcf) | LL | PI | Sp. Gr. | USCS | AASHTO | Initial Void Ratio |
|---|---|---|---|---|---|---|---|---|
| Saturation | Moisture | | | | | | | |
| 98.6 % | 32.3 % | 89.5 | 49 | 30 | 2.70 | CL | | 0.884 |

**MATERIAL DESCRIPTION**

Reddish-brown LEAN CLAY; calcareous

**Project No.** 19.15.131 **Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB027 **Depth:** 43

**Tolunay-Wong Engineers, Inc.**

**Houston, Texas**

**Remarks:**

Test method: ASTM D2435
Specific gravity: Assumed

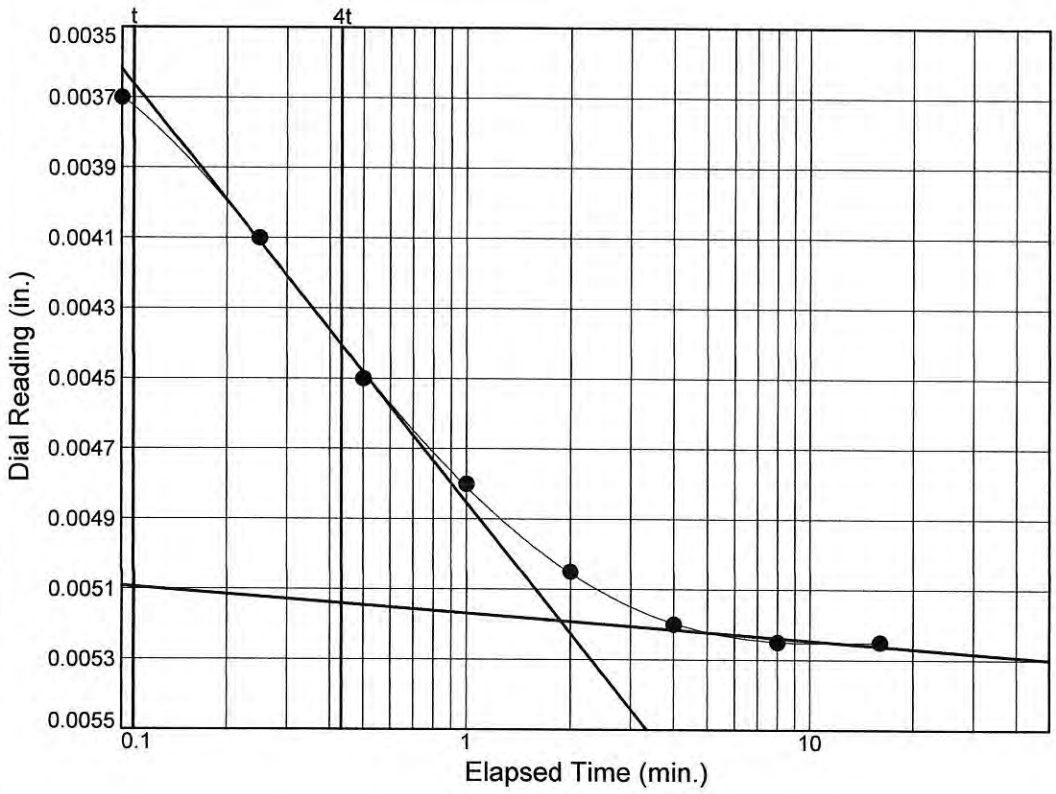
**Figure**

Attachment Figure B.2-169

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

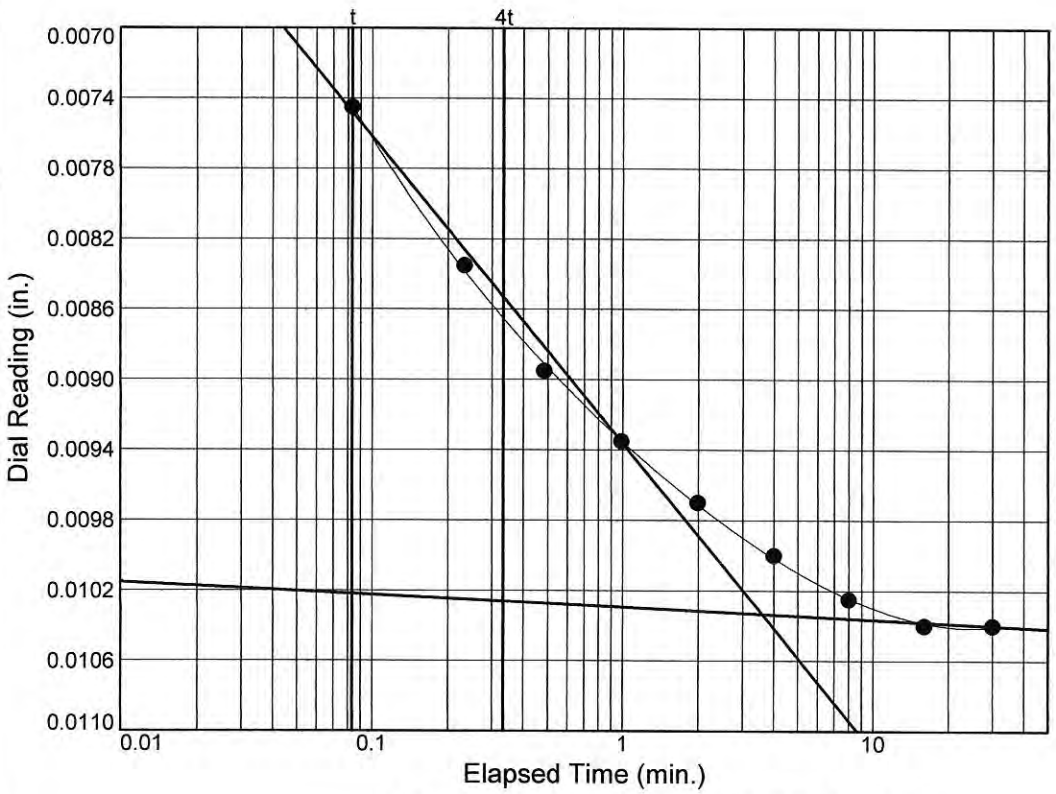
Source of Sample: SJGB027 Depth: 43




Load No.= 5
Load= 1.00 tsf
$D_0$ = 0.0030
$D_{50}$ = 0.0041
$D_{100}$ = 0.0052
$T_{50}$ = 0.25 min.

$C_v$ @ $T_{50}$
395.9 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 6
Load= 2.00 tsf
$D_0$ = 0.0062
$D_{50}$ = 0.0083
$D_{100}$ = 0.0103
$T_{50}$ = 0.21 min.

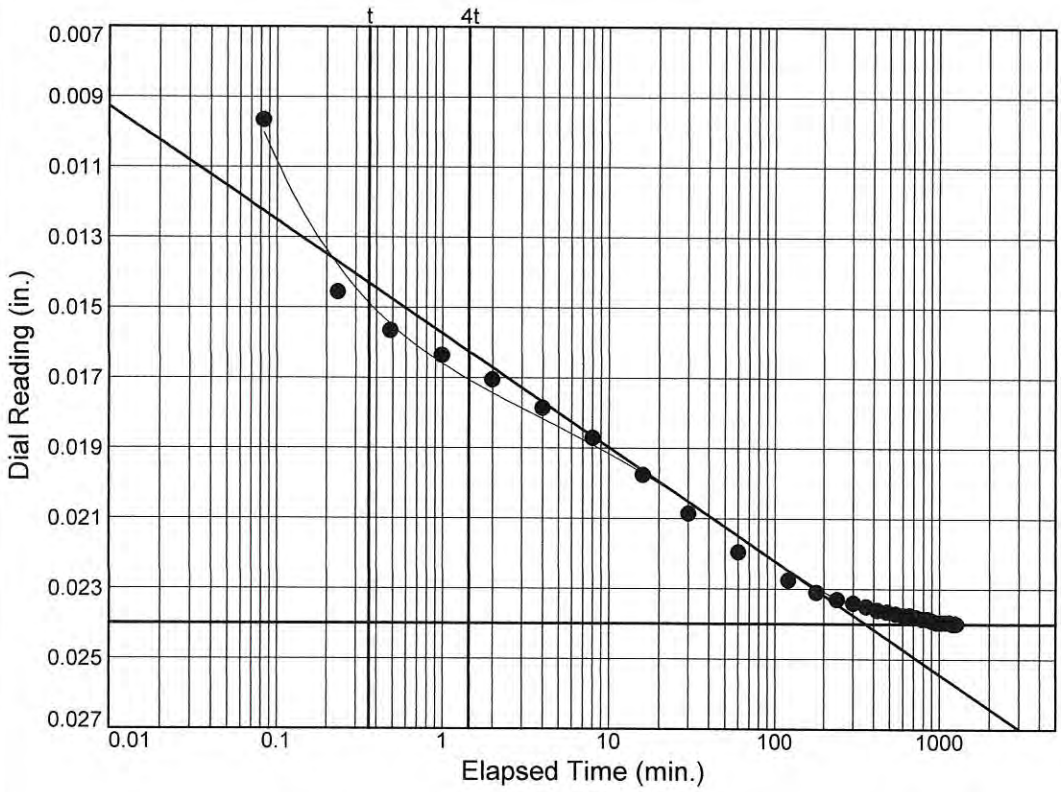
$C_v$ @ $T_{50}$
480.8 ft.$^2$/yr.

$C_\alpha$ = 0.000

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

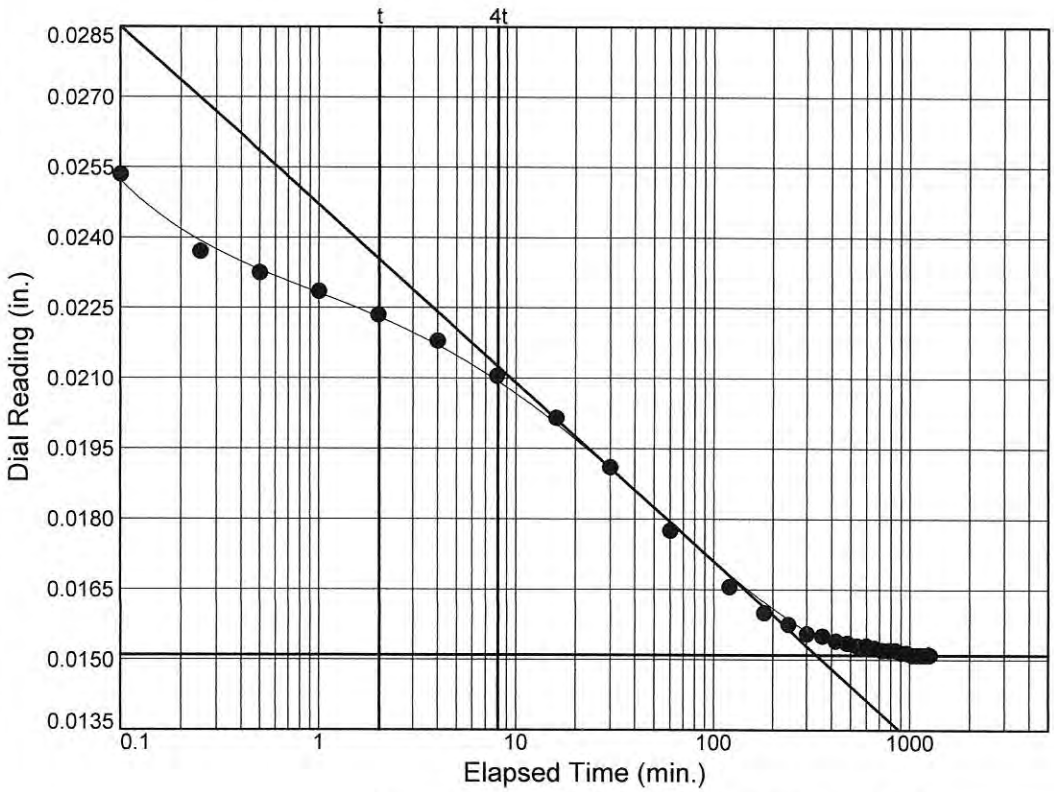
Source of Sample: SJGB027 Depth: 43




Load No.= 7
Load= 4.00 tsf
$D_0$ = 0.0127
$D_{50}$ = 0.0183
$D_{100}$ = 0.0240
$T_{50}$ = 4.76 min.

$C_v$ @ $T_{50}$
20.3 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 8
Load= 1.00 tsf
$D_0$ = 0.0237
$D_{50}$ = 0.0194
$D_{100}$ = 0.0151
$T_{50}$ = 24.57 min.

$C_v$ @ $T_{50}$
3.9 ft.$^2$/yr.

$C_\alpha$ = 0.000

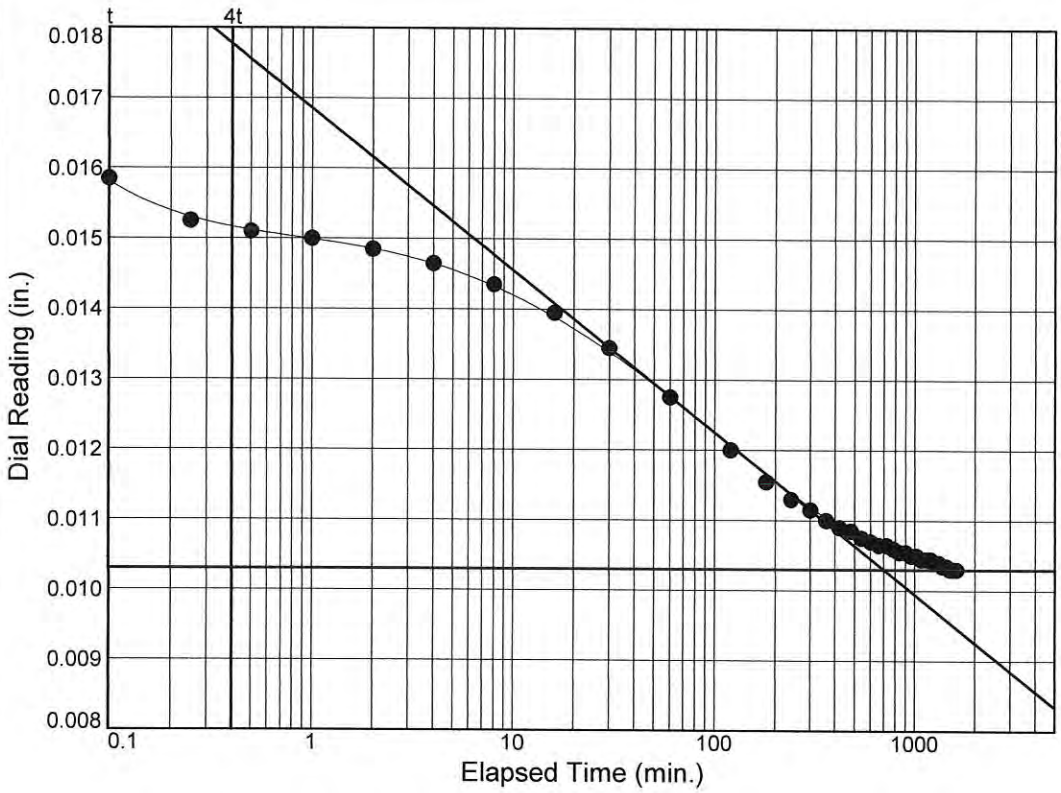
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-171

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

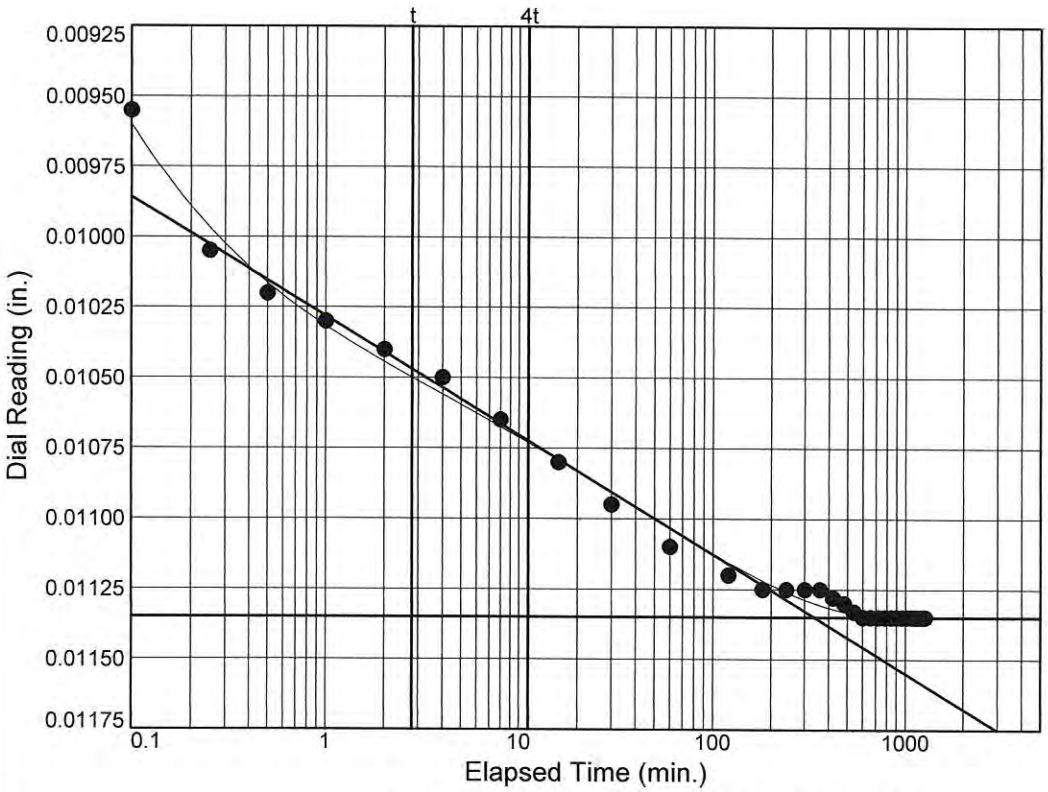
Source of Sample: SJGB027 Depth: 43




Load No.= 9
Load= 0.50 tsf
$D_0$ = 0.0165
$D_{50}$ = 0.0134
$D_{100}$ = 0.0103
$T_{50}$ = 30.43 min.

$C_v$ @ $T_{50}$
3.2 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 10
Load= 1.00 tsf
$D_0$ = 0.0103
$D_{50}$ = 0.0108
$D_{100}$ = 0.0114
$T_{50}$ = 17.52 min.

$C_v$ @ $T_{50}$
5.6 ft.$^2$/yr.

$C_\alpha$ = 0.000

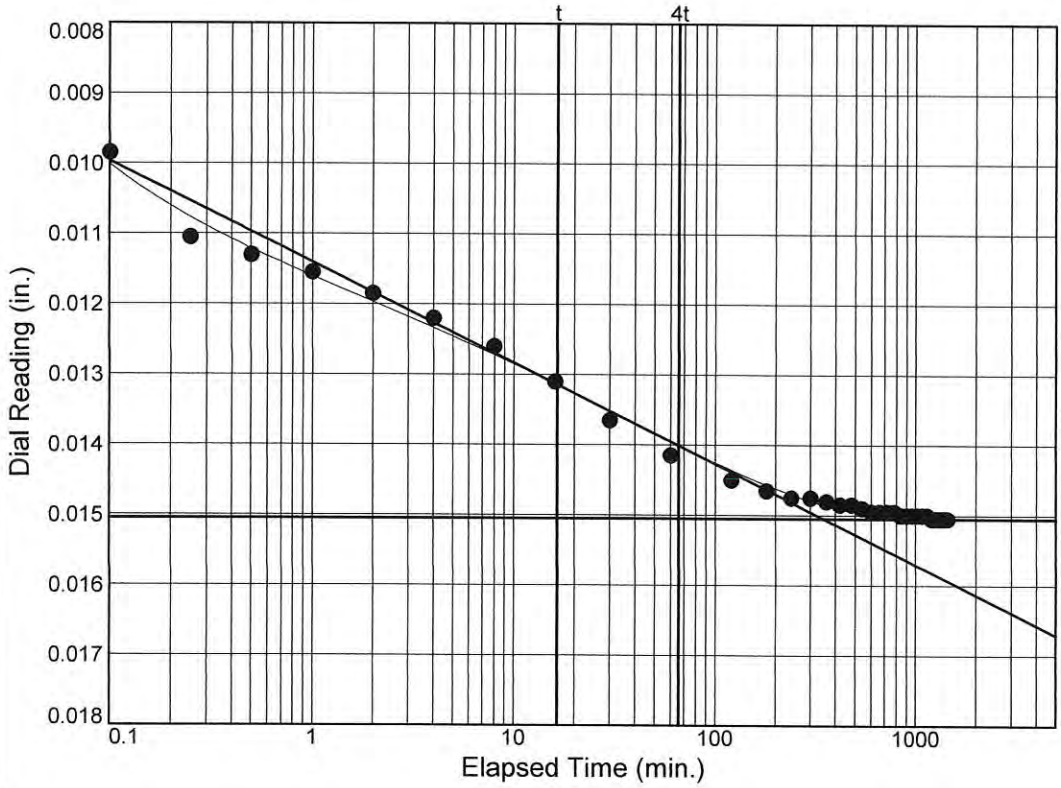
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-172

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

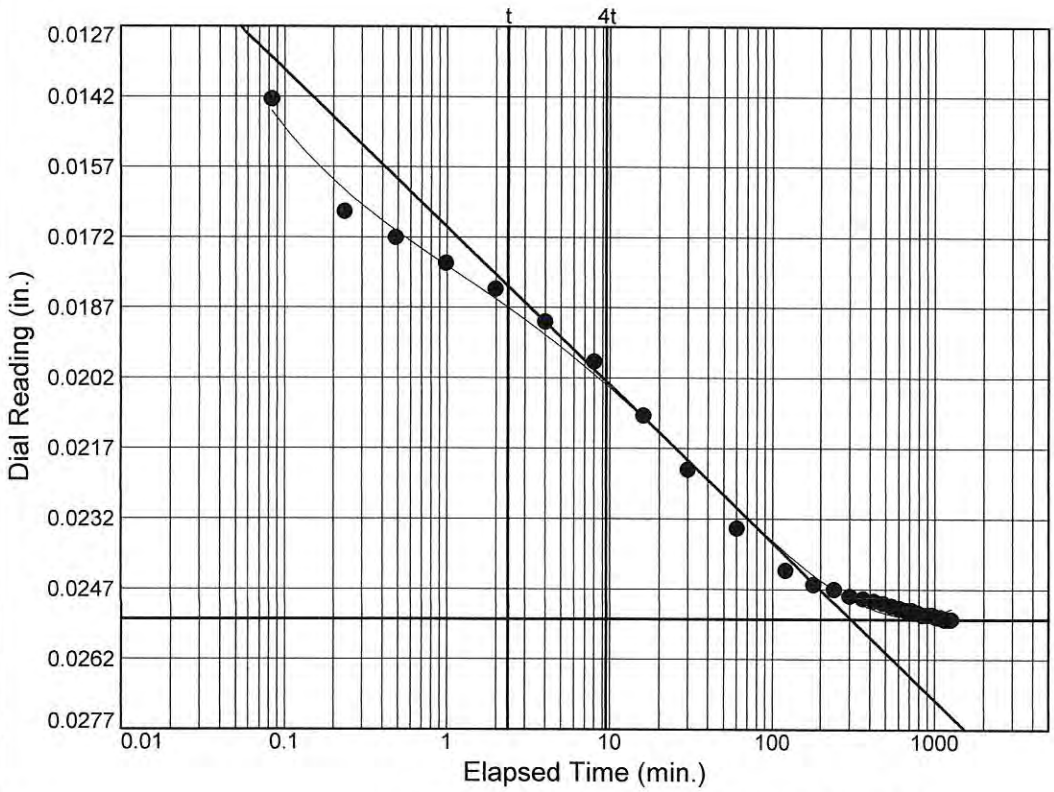
Source of Sample: SJGB027 Depth: 43




Load No.= 11
Load= 2.00 tsf
$D_0$ = 0.0123
$D_{50}$ = 0.0137
$D_{100}$ = 0.0151
$T_{50}$ = 38.22 min.

| $C_v$ @ $T_{50}$ |
|---|
| 2.6 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 12
Load= 4.00 tsf
$D_0$ = 0.0171
$D_{50}$ = 0.0212
$D_{100}$ = 0.0253
$T_{50}$ = 17.82 min.

| $C_v$ @ $T_{50}$ |
|---|
| 5.4 ft.$^2$/yr. |

$C_\alpha$ = 0.000

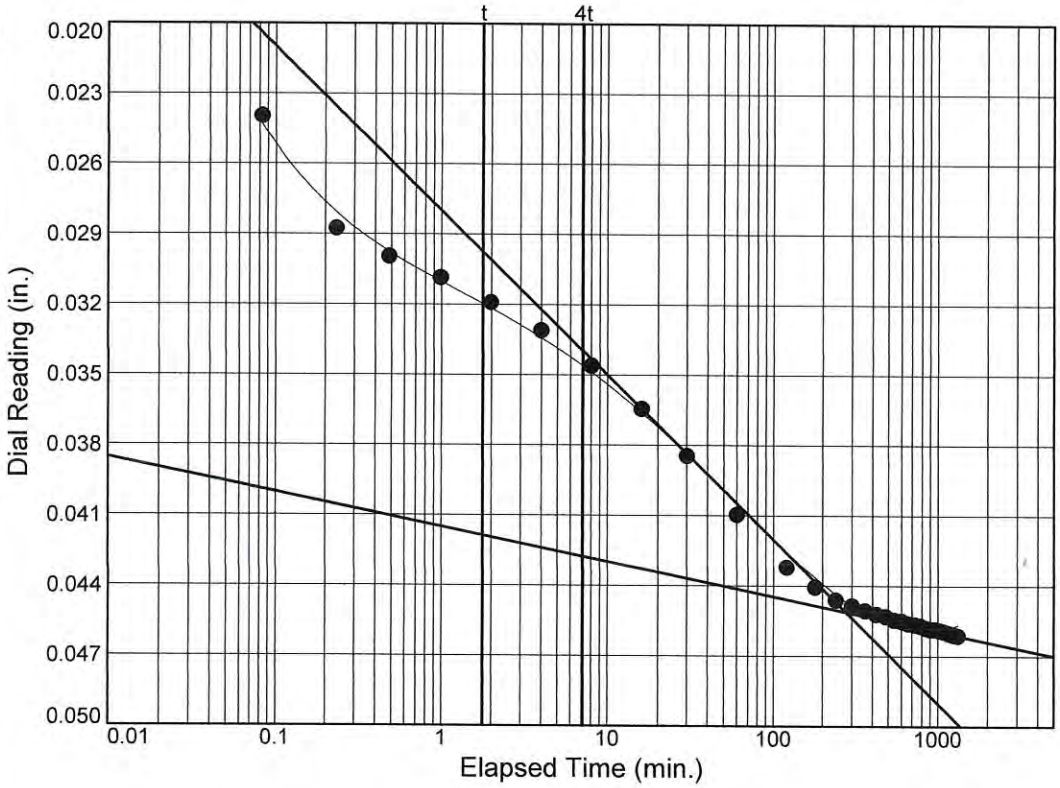
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-173

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

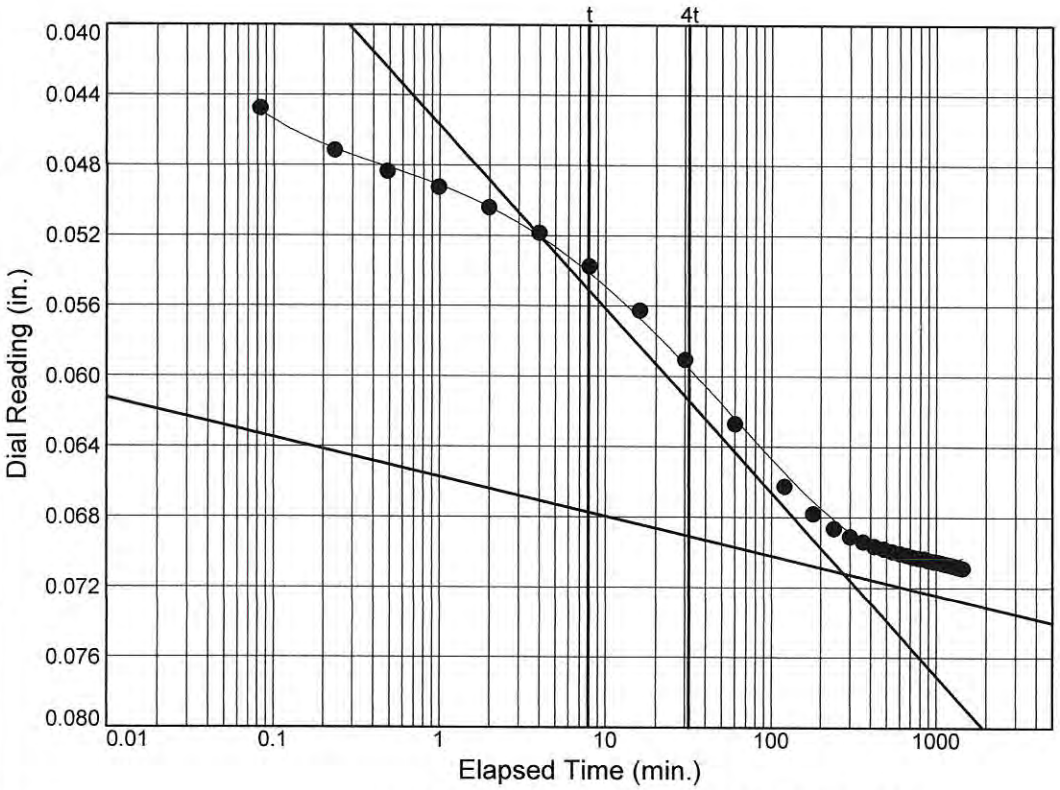
Source of Sample: SJGB027 Depth: 43




Load No.= 13
Load= 8.00 tsf
$D_0$ = 0.0293
$D_{50}$ = 0.0372
$D_{100}$ = 0.0451
$T_{50}$ = 20.04 min.

| $C_v$ @ $T_{50}$ |
|---|
| 4.6 ft.$^2$/yr. |

$C_\alpha$ = 0.004




Load No.= 14
Load= 16.00 tsf
$D_0$ = 0.0486
$D_{50}$ = 0.0599
$D_{100}$ = 0.0712
$T_{50}$ = 34.35 min.

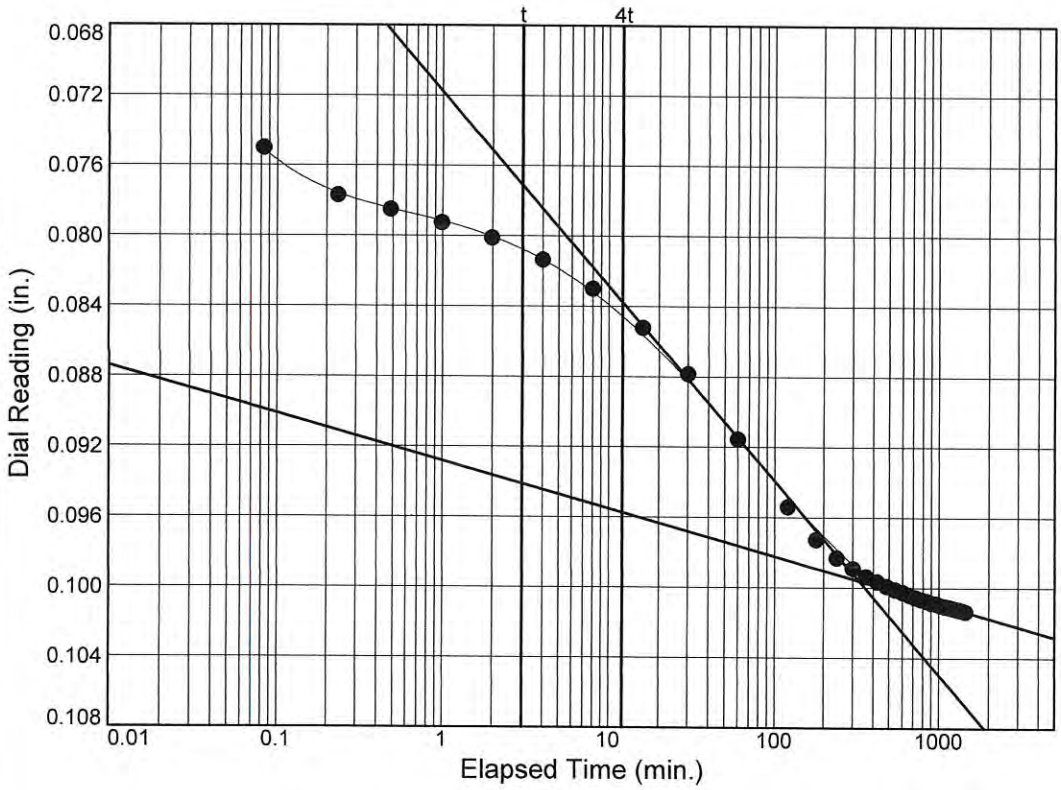
| $C_v$ @ $T_{50}$ |
|---|
| 2.5 ft.$^2$/yr. |

$C_\alpha$ = 0.006

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

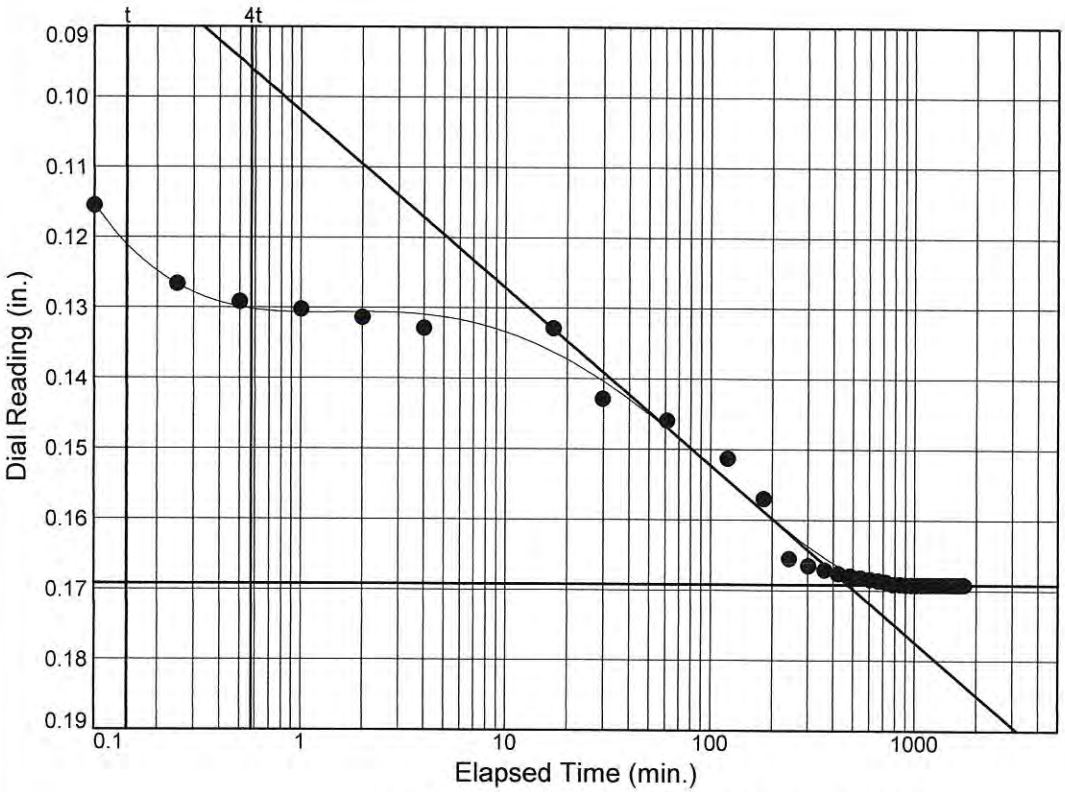
Source of Sample: SJGB027 Depth: 43




Load No.= 15
Load= 32.00 tsf
$D_0$ = 0.0770
$D_{50}$ = 0.0883
$D_{100}$ = 0.0996
$T_{50}$ = 30.32 min.

$C_v$ @ $T_{50}$
2.6 ft.$^2$/yr.

$C_\alpha$ = 0.007




Load No.= 16
Load= 60.00 tsf
$D_0$ = 0.1119
$D_{50}$ = 0.1406
$D_{100}$ = 0.1692
$T_{50}$ = 30.67 min.

$C_v$ @ $T_{50}$
2.2 ft.$^2$/yr.

$C_\alpha$ = 0.000

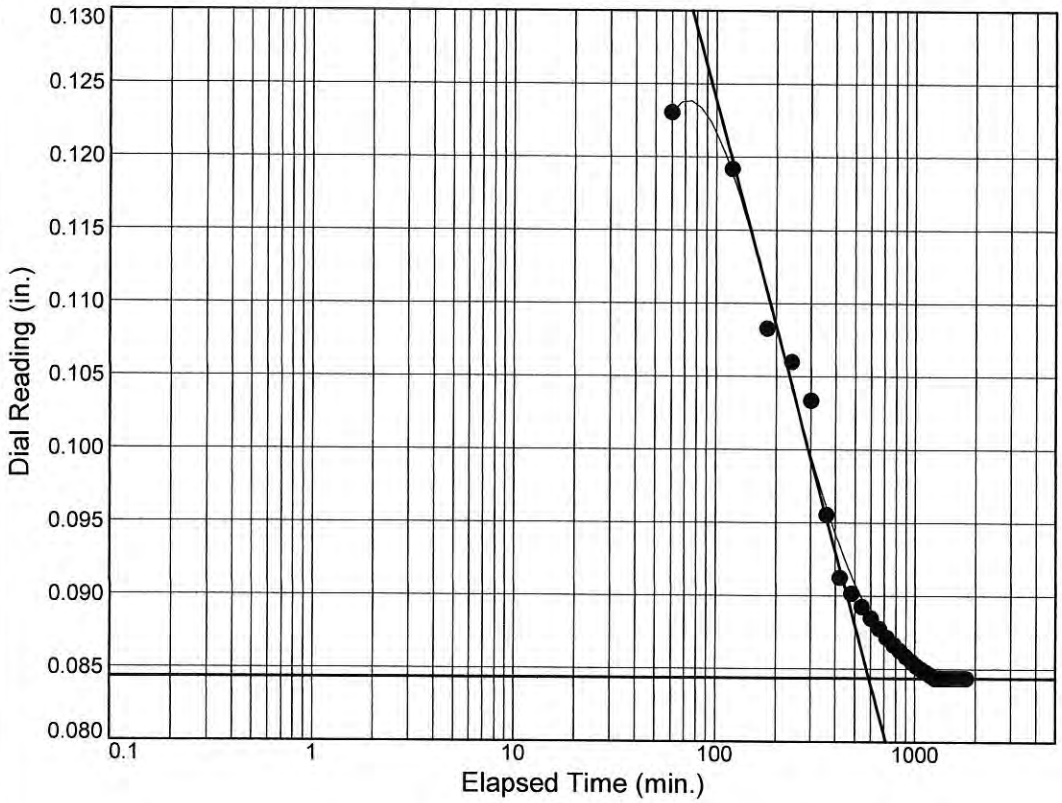
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-175

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 Depth: 43




Load No.= 18
Load= 4.00 tsf
$D_0$ = 0.1313
$D_{50}$ = 0.1078
$D_{100}$ = 0.0844
$T_{50}$ = 205.70 min.

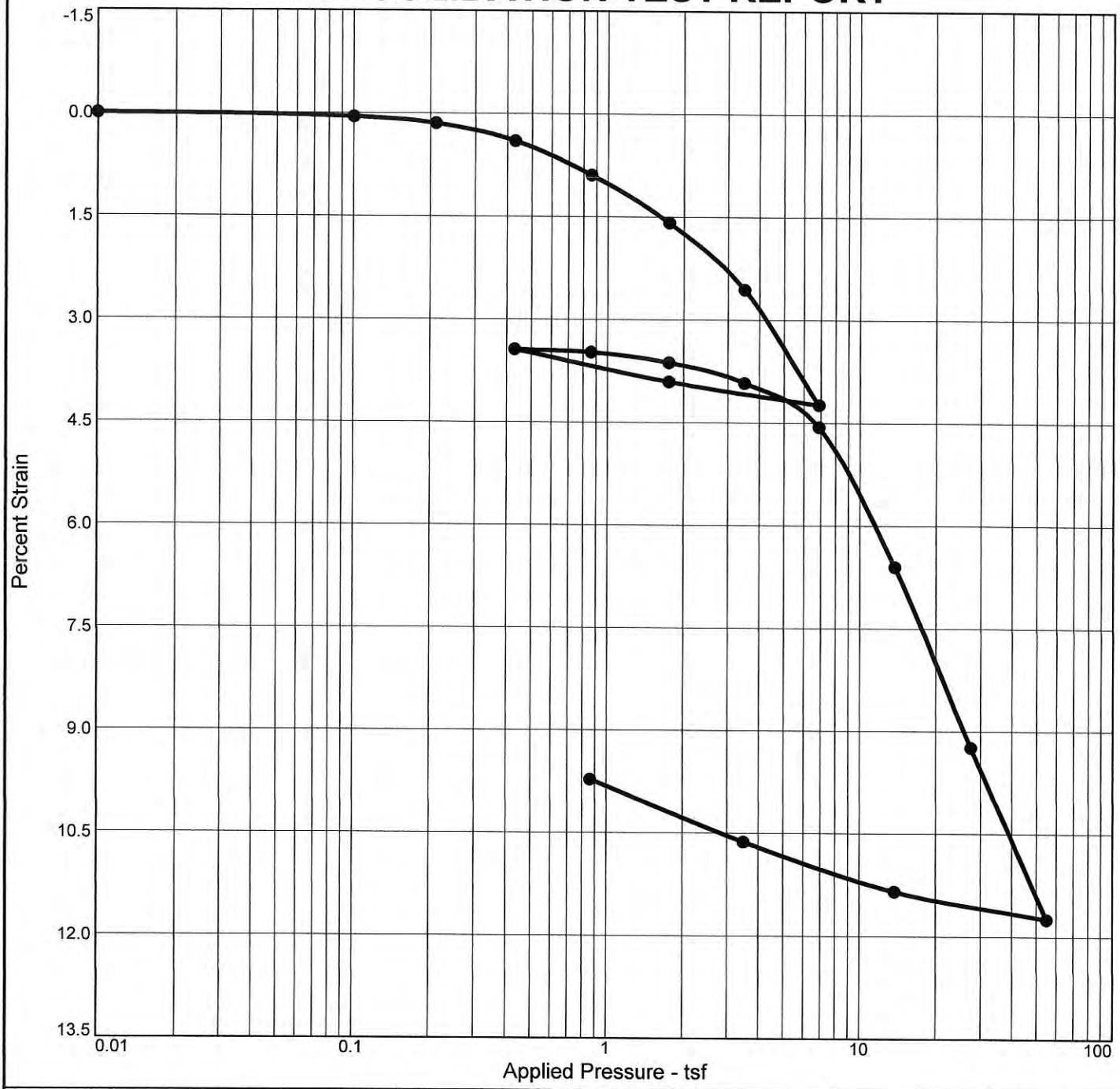
| $C_v$ @ $T_{50}$ |
| --- |
| 0.4 ft.$^2$/yr. |

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-176

# CONSOLIDATION TEST REPORT




| Natural | | Dry Dens. (pcf) | LL | PI | Sp. Gr. | USCS | AASHTO | Initial Void Ratio |
|---|---|---|---|---|---|---|---|---|
| Saturation | Moisture | | | | | | | |
| 89.3 % | 19.4 % | 106.4 | 26 | 10 | 2.70 | CL | | 0.585 |

**MATERIAL DESCRIPTION**

Light gray and tan LEAN CLAY

**Project No.** 19.15.131 **Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB028 **Depth:** 58

**Tolunay-Wong Engineers, Inc.**

**Houston, Texas**

**Remarks:**

Test method: ASTM D2435
Specific gravity: Assumed

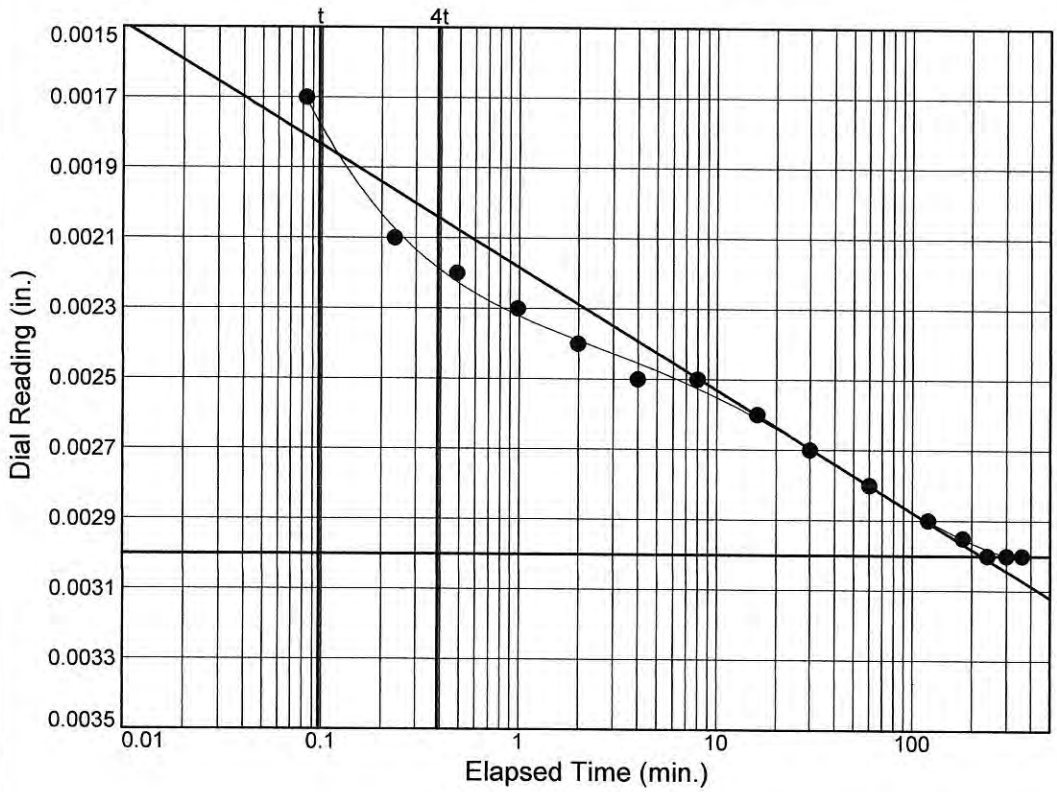
**Figure**

Attachment Figure B.2-177

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

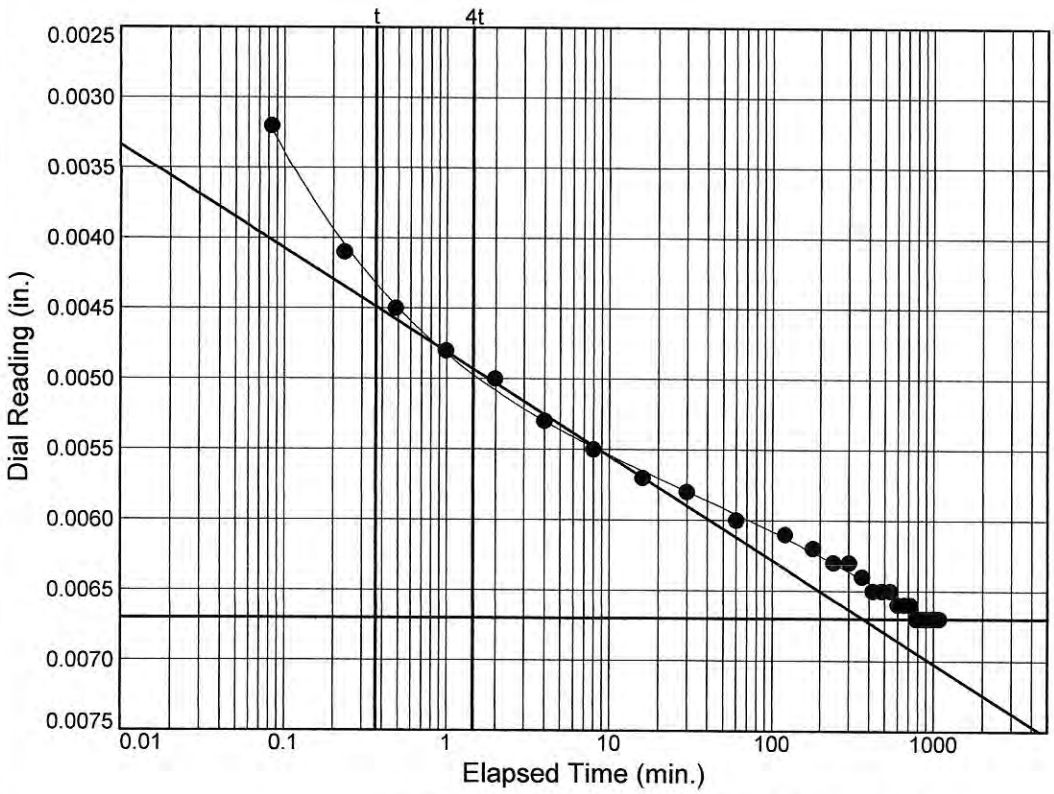
Source of Sample: SJGB028 Depth: 58




Load No.= 4
Load= 0.43 tsf
$D_0$ = 0.0014
$D_{50}$ = 0.0022
$D_{100}$ = 0.0030
$T_{50}$ = 0.38 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 265.2 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 5
Load= 0.86 tsf
$D_0$ = 0.0037
$D_{50}$ = 0.0052
$D_{100}$ = 0.0067
$T_{50}$ = 2.75 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 36.3 ft.$^2$/yr. |

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

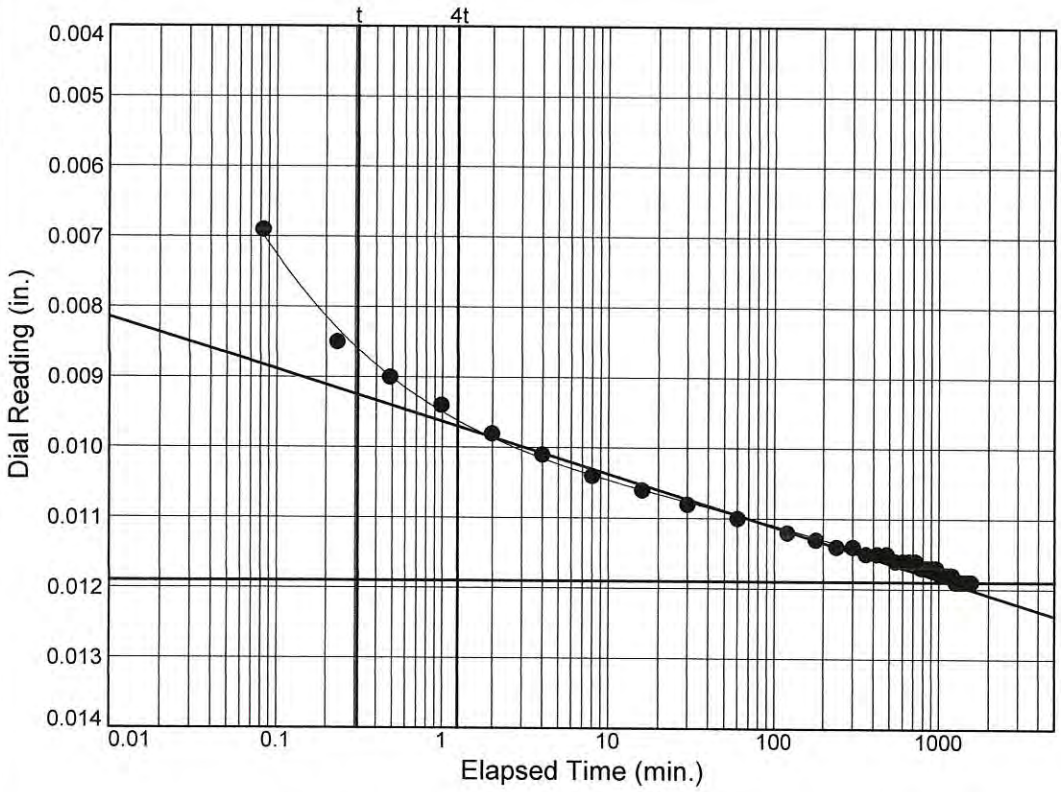
Figure

Attachment Figure B.2-178

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

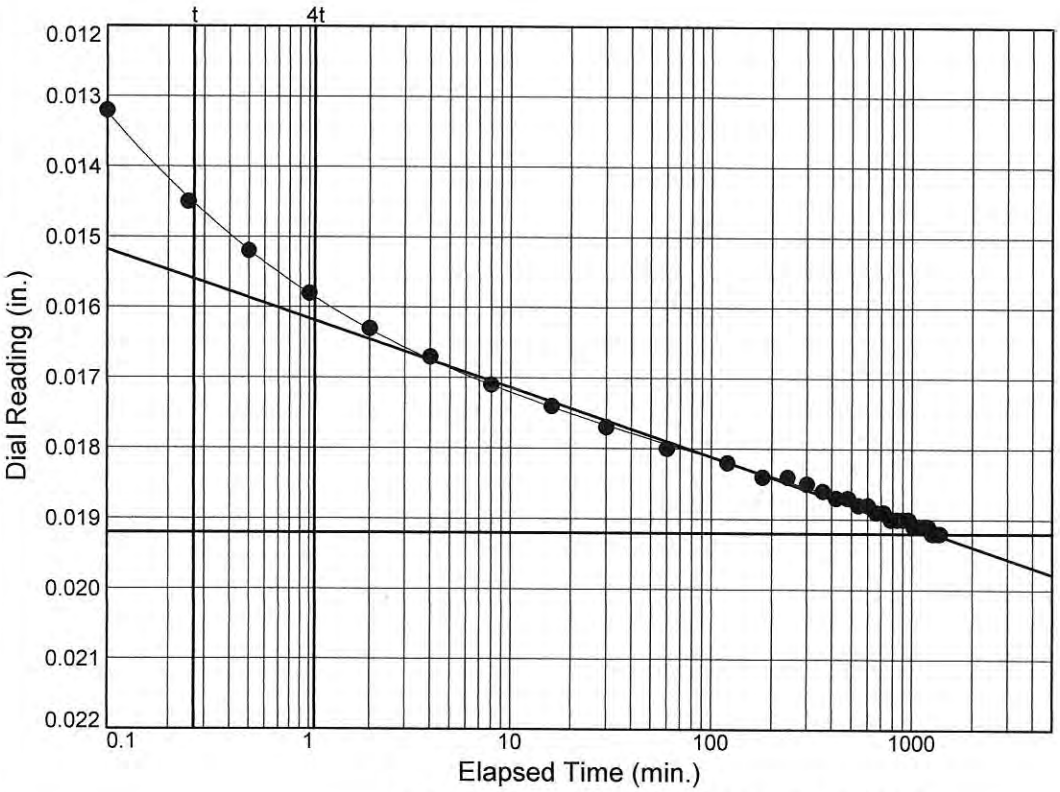
Source of Sample: SJGB028 Depth: 58




Load No.= 6
Load= 1.75 tsf
$D_0$ = 0.0076
$D_{50}$ = 0.0097
$D_{100}$ = 0.0119
$T_{50}$ = 1.55 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 63.5 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 7
Load= 3.49 tsf
$D_0$ = 0.0132
$D_{50}$ = 0.0162
$D_{100}$ = 0.0192
$T_{50}$ = 1.68 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 57.8 ft.$^2$/yr. |

$C_\alpha$ = 0.000

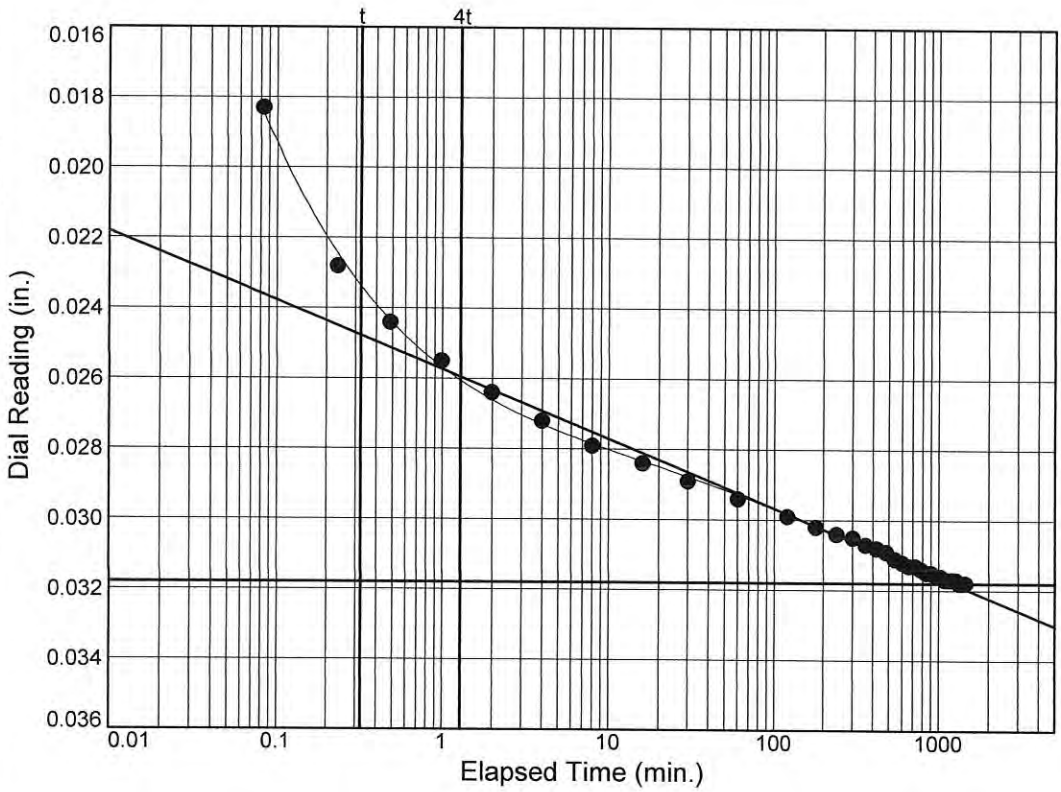
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-179

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

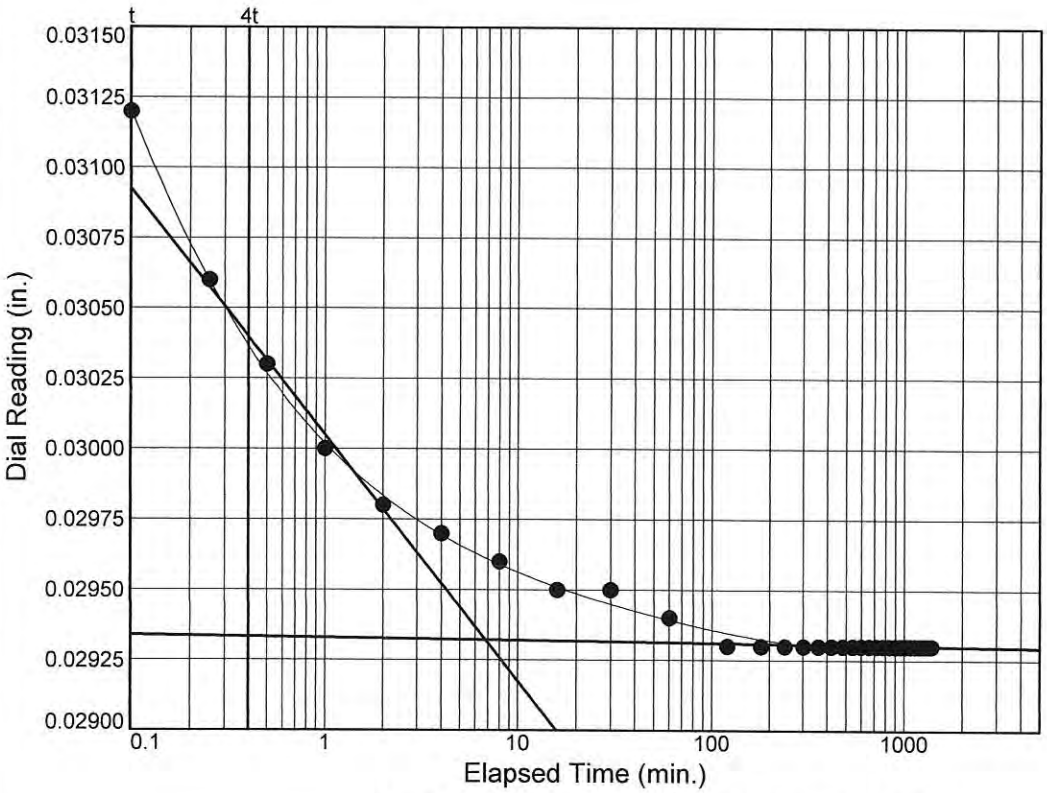
Source of Sample: SJGB028 Depth: 58




Load No.= 8
Load= 6.87 tsf
$D_0$ = 0.0207
$D_{50}$ = 0.0262
$D_{100}$ = 0.0318
$T_{50}$ = 1.47 min.

| $C_v$ @ $T_{50}$ |
|---|
| 64.0 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 9
Load= 1.75 tsf
$D_0$ = 0.0320
$D_{50}$ = 0.0307
$D_{100}$ = 0.0293
$T_{50}$ = 0.21 min.

| $C_v$ @ $T_{50}$ |
|---|
| 433.0 ft.$^2$/yr. |

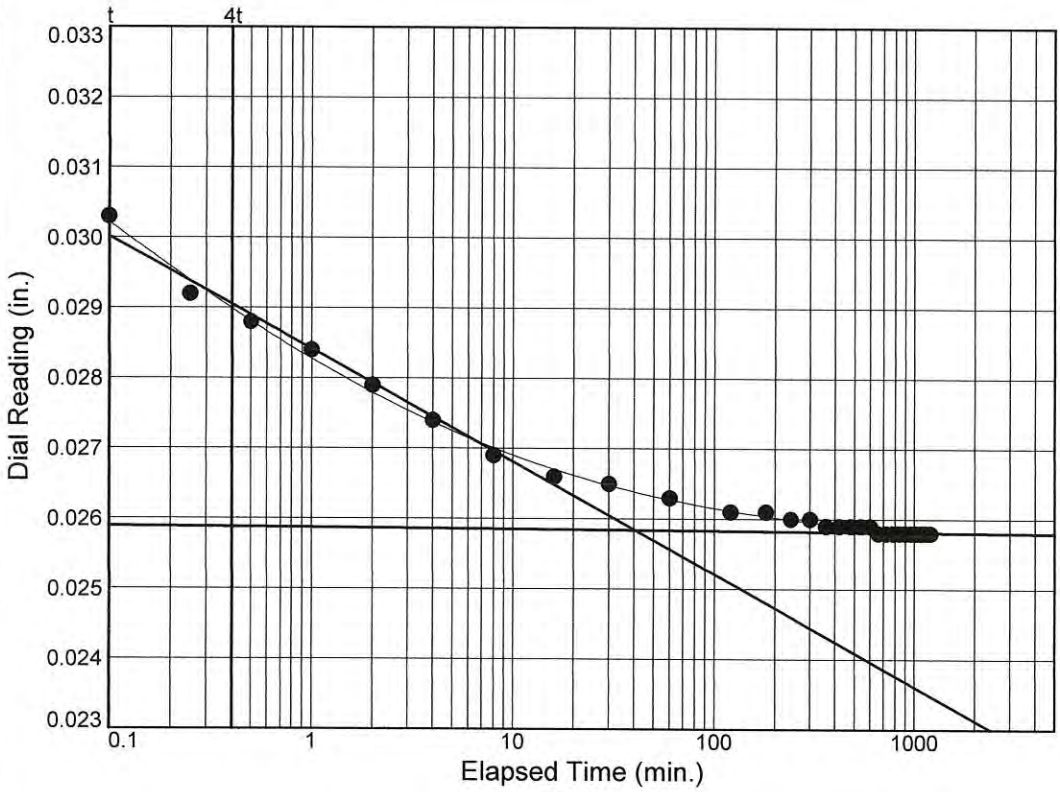
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-180

# Dial Reading vs. Time

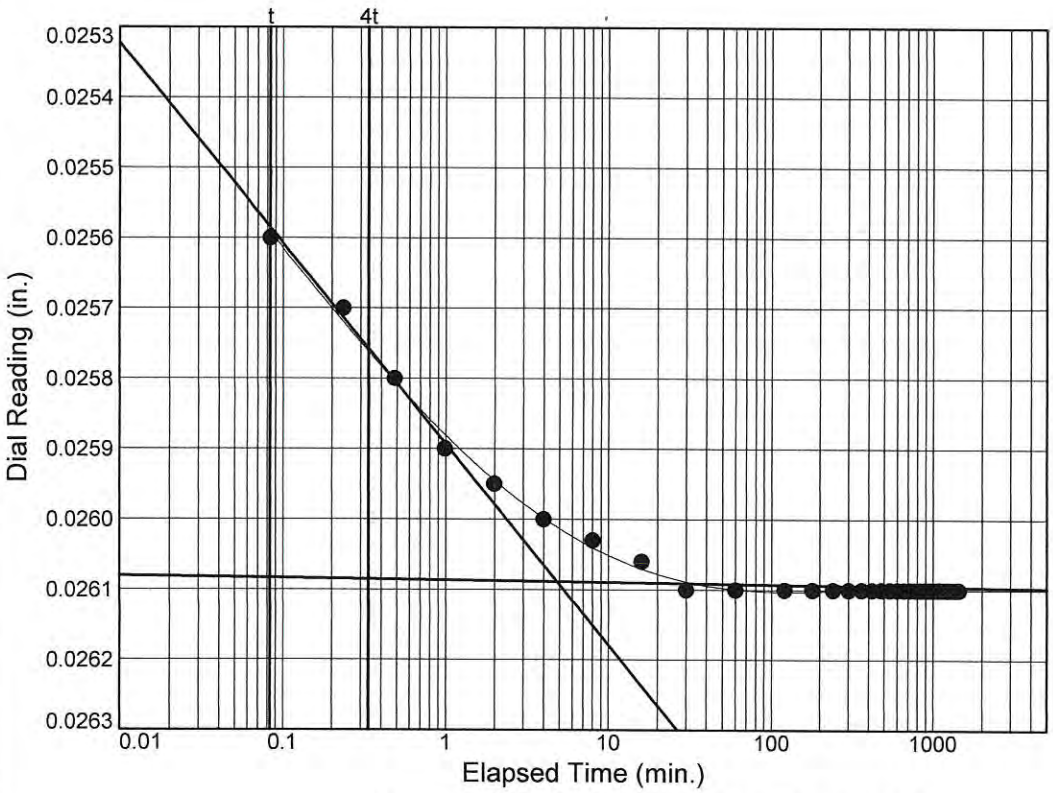
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 Depth: 58




Load No.= 10
Load= 0.43 tsf
$D_0$ = 0.0314
$D_{50}$ = 0.0286
$D_{100}$ = 0.0258
$T_{50}$ = 0.62 min.

$C_v$ @ $T_{50}$
152.2 ft.$^2$/yr.




Load No.= 11
Load= 0.86 tsf
$D_0$ = 0.0254
$D_{50}$ = 0.0258
$D_{100}$ = 0.0261
$T_{50}$ = 0.32 min.

$C_v$ @ $T_{50}$
297.0 ft.$^2$/yr.

$C_\alpha$ = 0.000

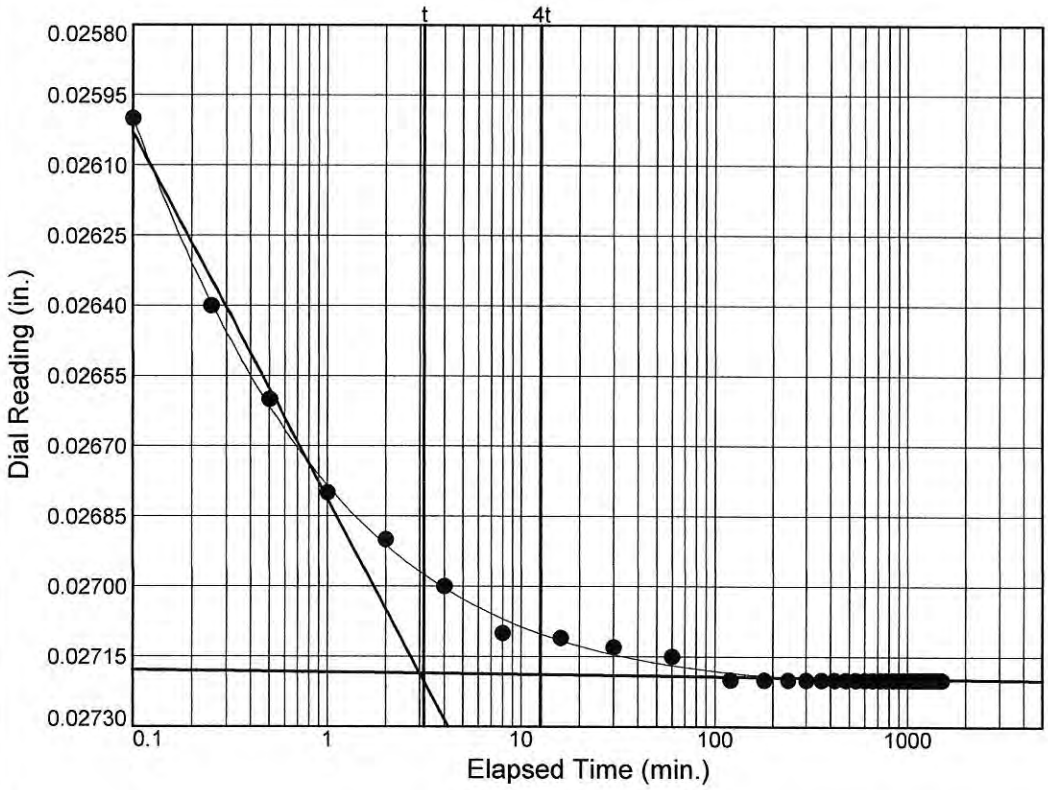
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-181

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

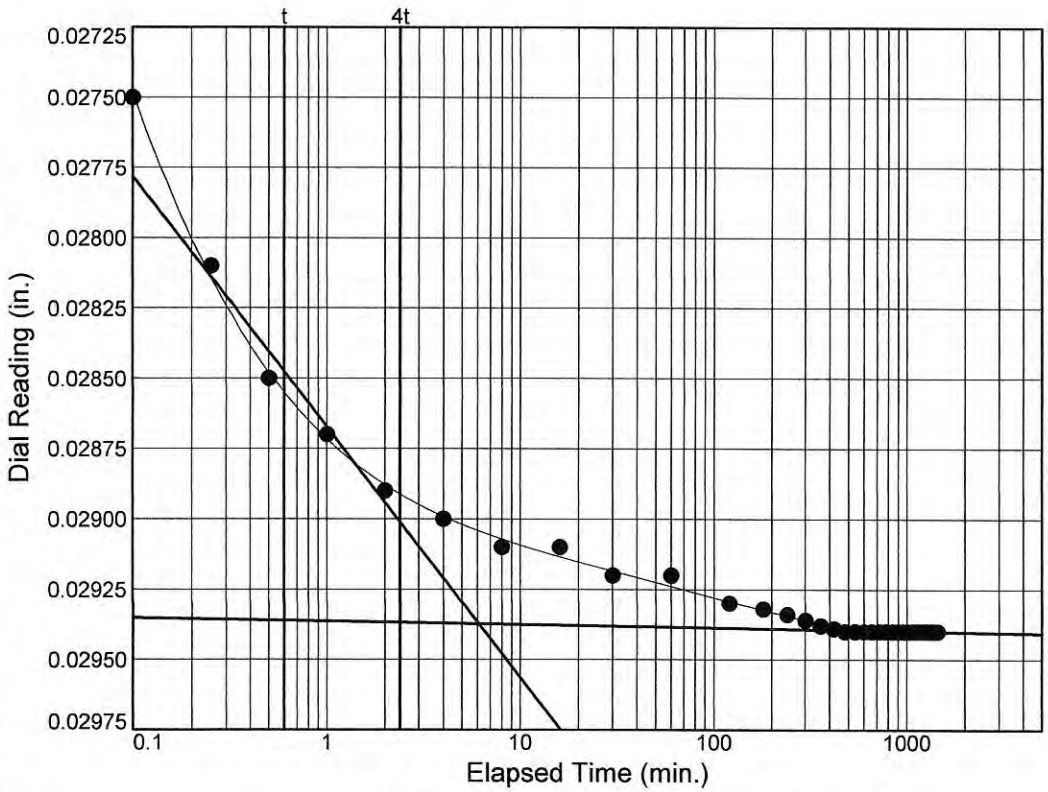
Source of Sample: SJGB028 Depth: 58




Load No.= 12
Load= 1.75 tsf
$D_0$ = 0.0268
$D_{50}$ = 0.0270
$D_{100}$ = 0.0272
$T_{50}$ = 4.52 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 20.8 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 13
Load= 3.49 tsf
$D_0$ = 0.0282
$D_{50}$ = 0.0288
$D_{100}$ = 0.0294
$T_{50}$ = 1.27 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 73.6 ft.$^2$/yr. |

$C_\alpha$ = 0.000

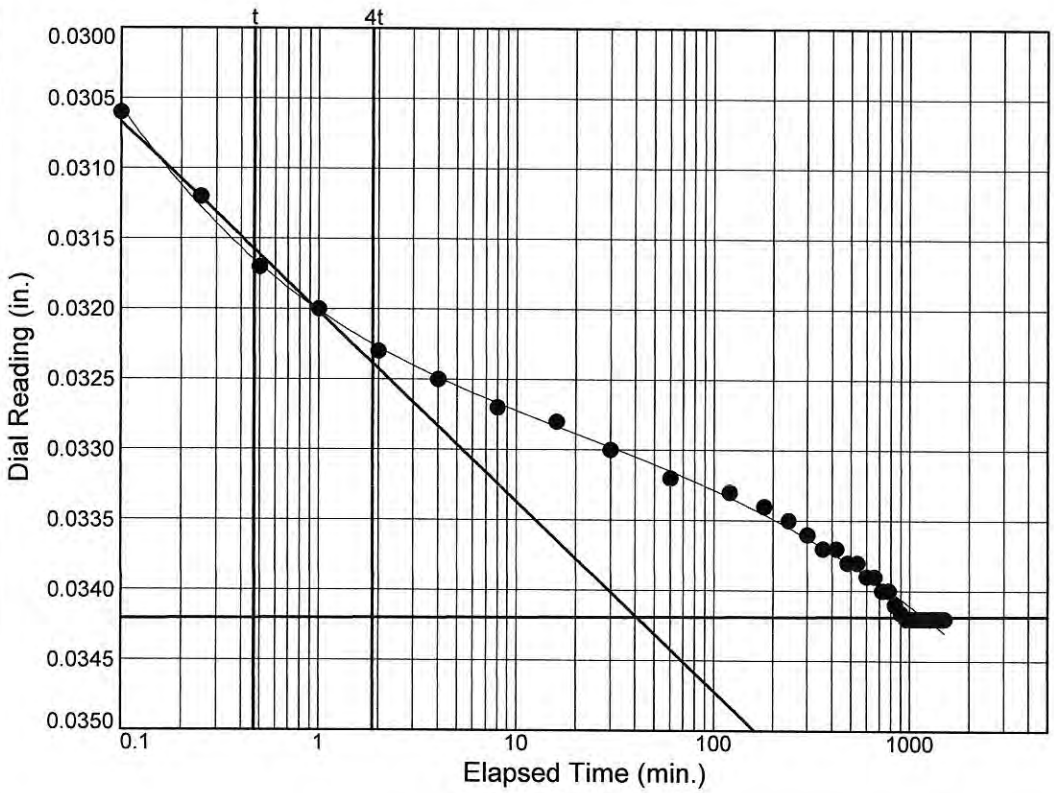
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-182

# Dial Reading vs. Time

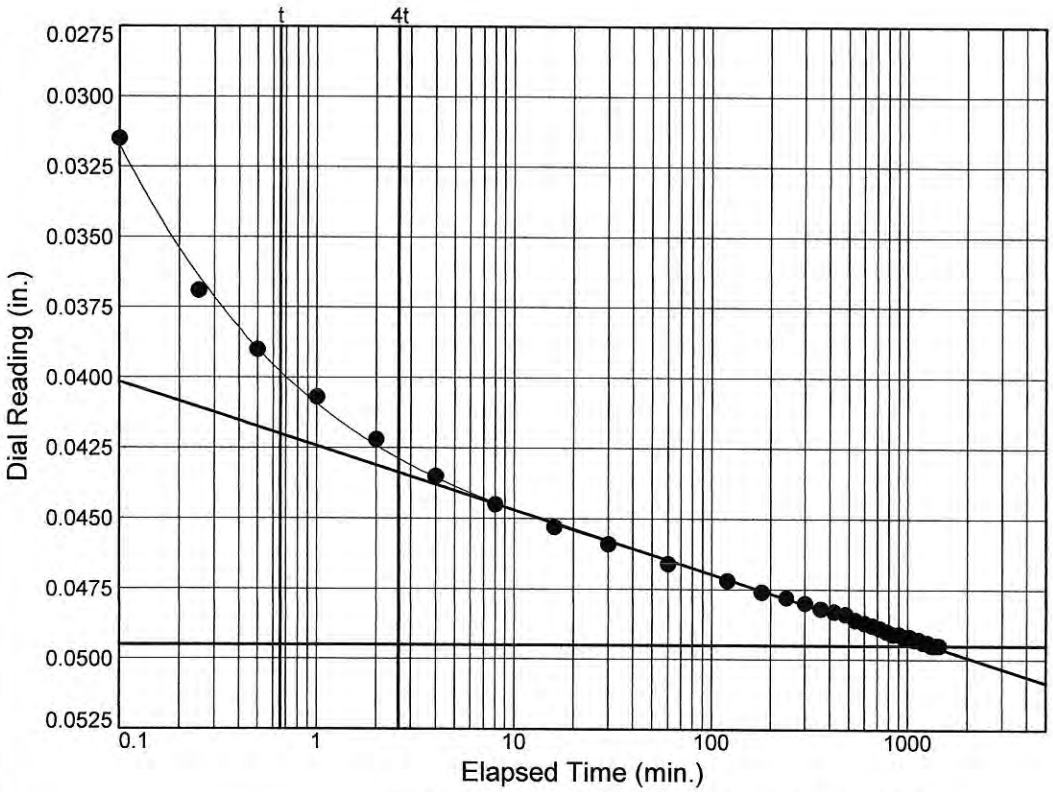
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 Depth: 58




Load No.= 14
Load= 6.87 tsf
$D_0$ = 0.0310
$D_{50}$ = 0.0326
$D_{100}$ = 0.0342
$T_{50}$ = 6.60 min.

| $C_v$ @ $T_{50}$ |
|---|
| 14.0 ft.$^2$/yr. |




Load No.= 15
Load= 13.75 tsf
$D_0$ = 0.0367
$D_{50}$ = 0.0431
$D_{100}$ = 0.0495
$T_{50}$ = 2.99 min.

| $C_v$ @ $T_{50}$ |
|---|
| 30.2 ft.$^2$/yr. |

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

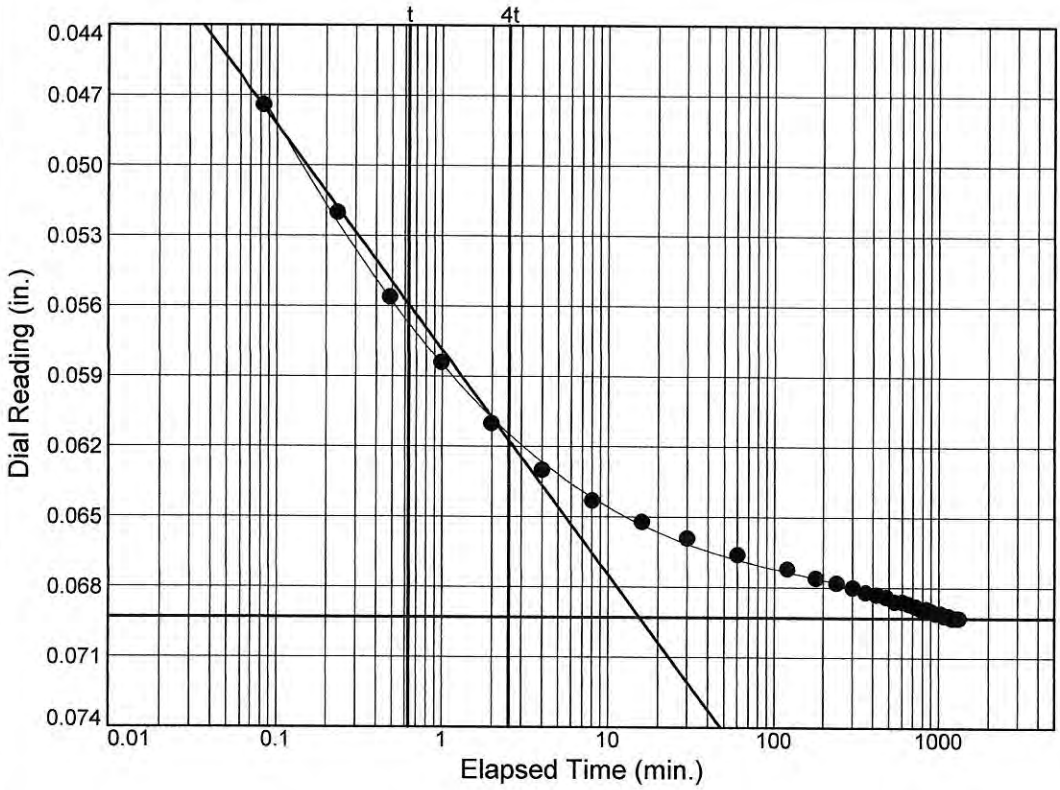
Figure

Attachment Figure B.2-183

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

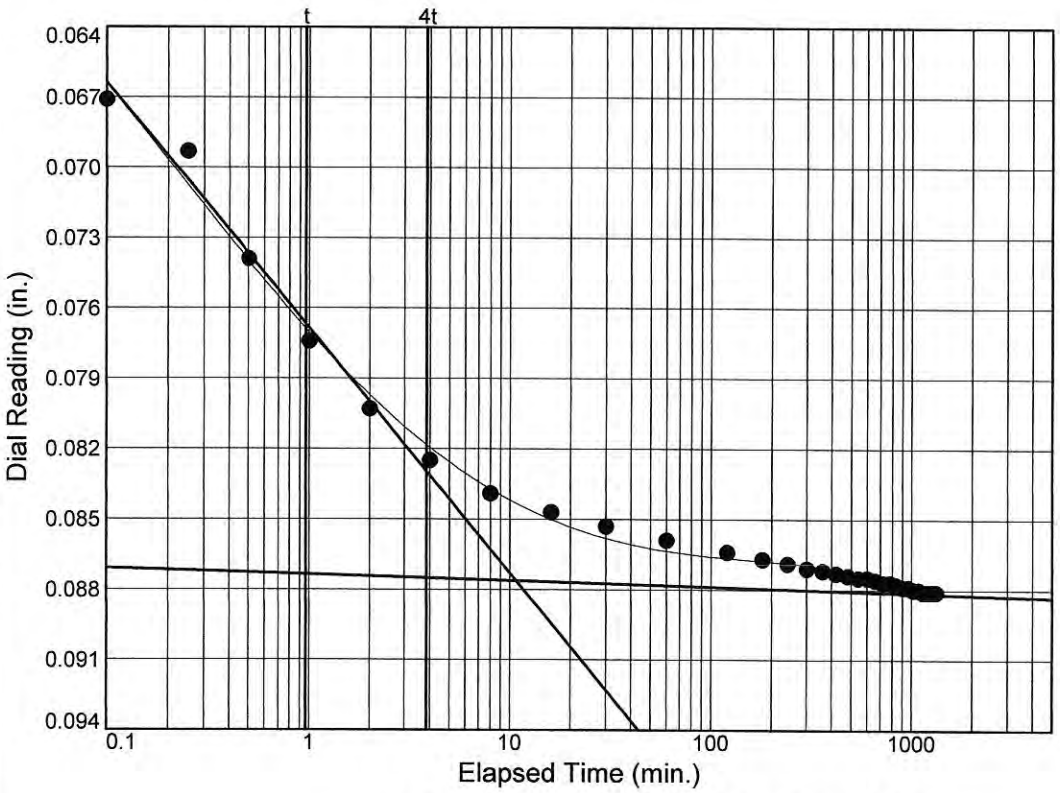
Source of Sample: SJGB028 Depth: 58




Load No.= 16
Load= 27.50 tsf
$D_0$ = 0.0521
$D_{50}$ = 0.0607
$D_{100}$ = 0.0693
$T_{50}$ = 1.94 min.

$C_v$ @ $T_{50}$
44.2 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 17
Load= 54.99 tsf
$D_0$ = 0.0719
$D_{50}$ = 0.0798
$D_{100}$ = 0.0876
$T_{50}$ = 2.04 min.

$C_v$ @ $T_{50}$
39.8 ft.$^2$/yr.

$C_\alpha$ = 0.001

TOLUNAY-WONG ENGINEERS, INC.

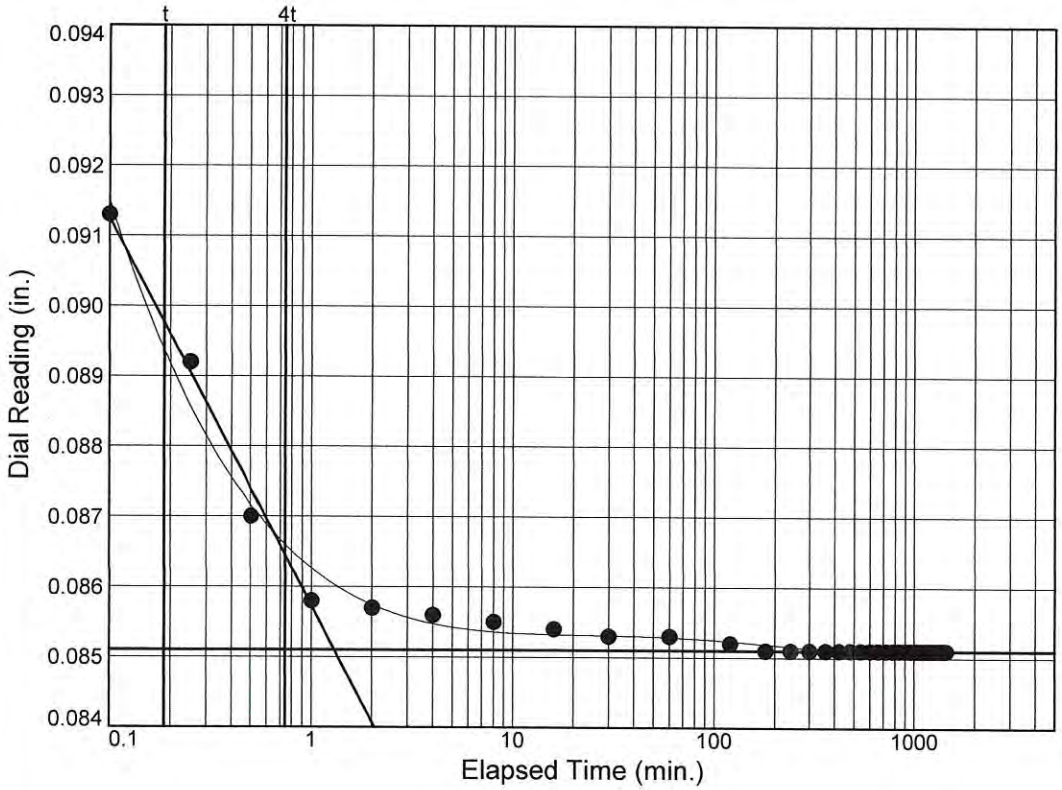
Figure

Attachment Figure B.2-184

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

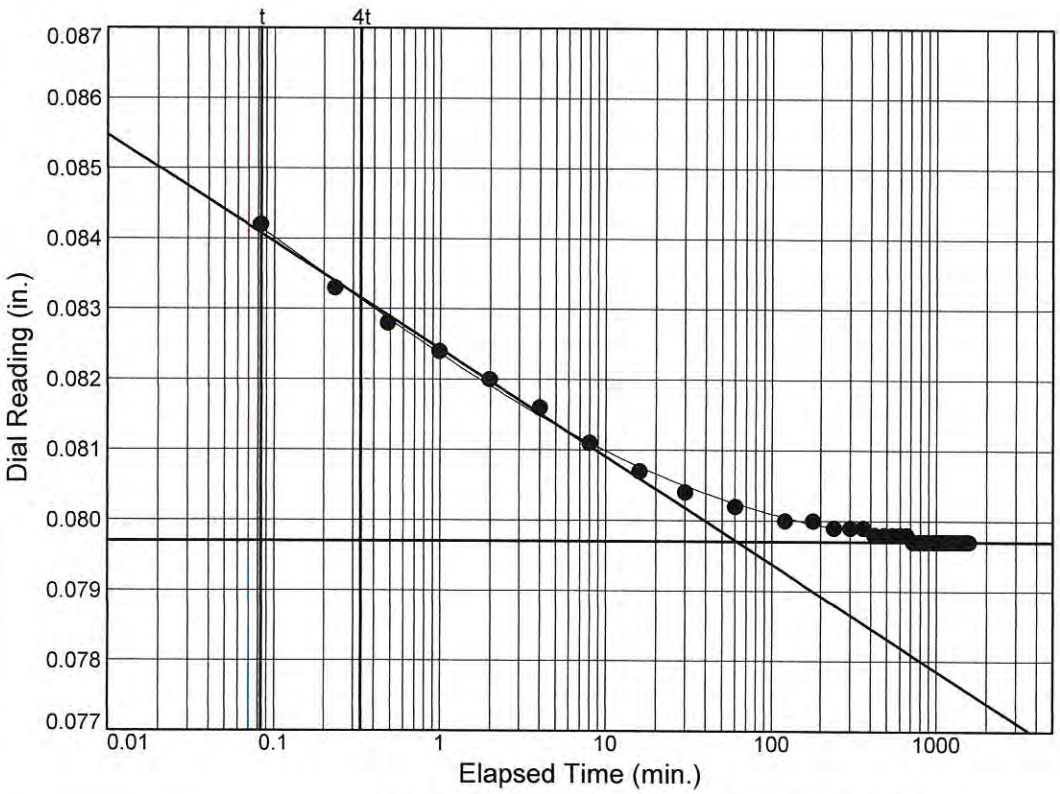
Source of Sample: SJGB028 Depth: 58




Load No.= 18
Load= 13.75 tsf
$D_0$ = 0.0922
$D_{50}$ = 0.0886
$D_{100}$ = 0.0851
$T_{50}$ = 0.24 min.

$C_v$ @ $T_{50}$
323.4 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 19
Load= 3.49 tsf
$D_0$ = 0.0852
$D_{50}$ = 0.0824
$D_{100}$ = 0.0797
$T_{50}$ = 0.91 min.

$C_v$ @ $T_{50}$
88.0 ft.$^2$/yr.

$C_\alpha$ = 0.000

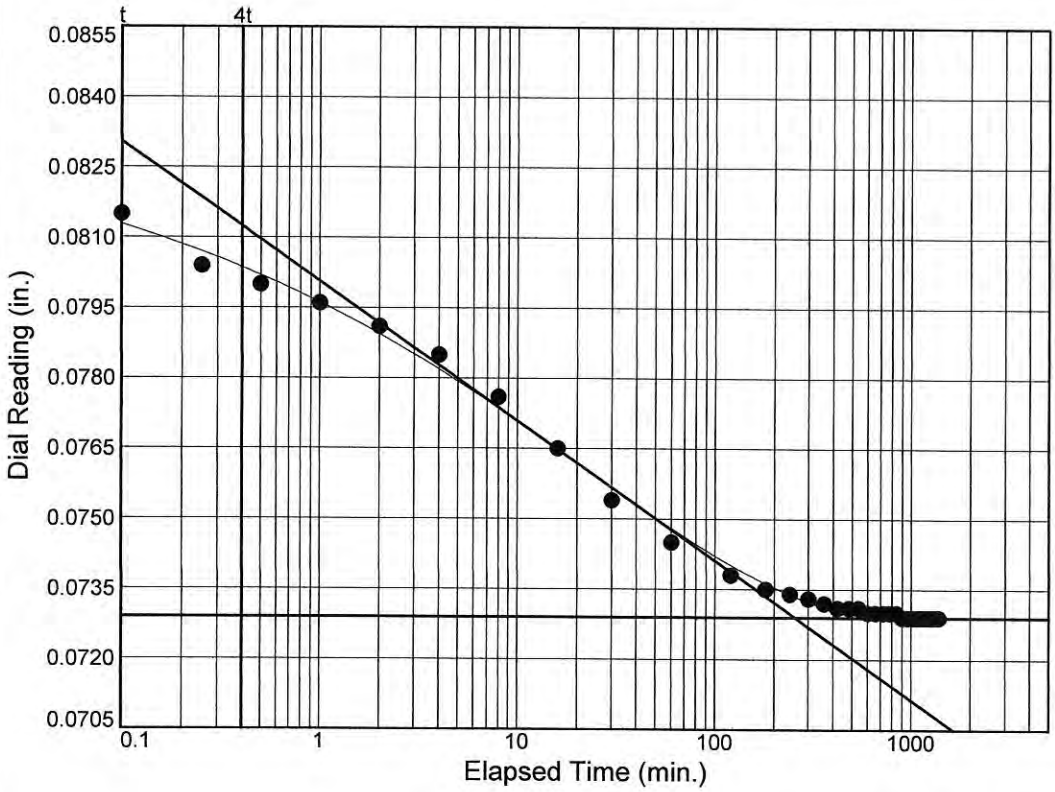
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-185

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 Depth: 58




Load No.= 20

Load= 0.86 tsf

$D_0$ = 0.0822

$D_{50}$ = 0.0776

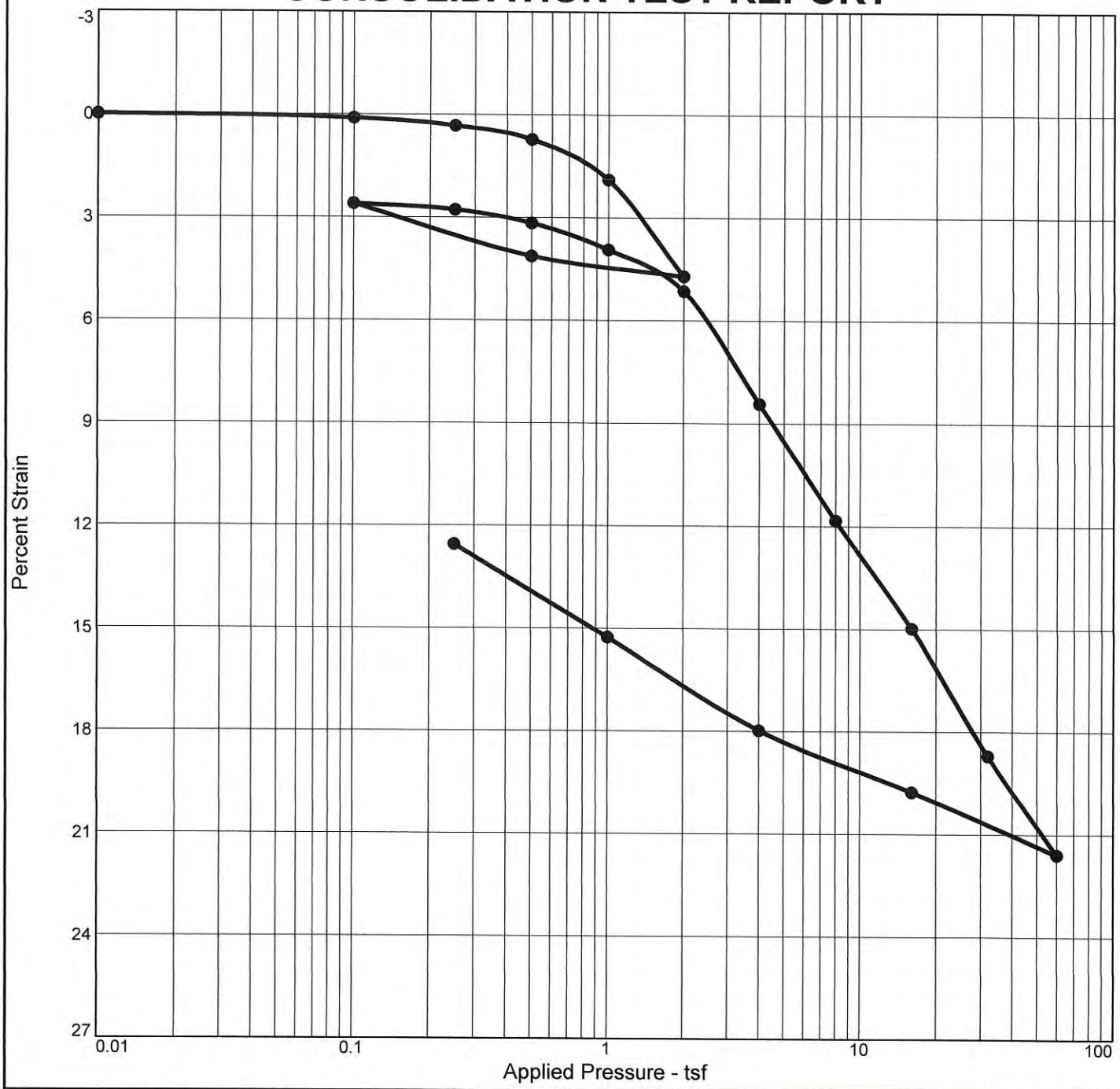
$D_{100}$ = 0.0729

$T_{50}$ = 6.81 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 12.0 ft.$^2$/yr. |

$C_\alpha$ = 0.000

# CONSOLIDATION TEST REPORT




| Natural | | Dry Dens. (pcf) | LL | PI | Sp. Gr. | USCS | AASHTO | Initial Void Ratio |
|---|---|---|---|---|---|---|---|---|
| Saturation | Moisture | | | | | | | |
| 96.0 % | 24.1 % | 100.4 | 62 | 41 | 2.70 | CH | | 0.679 |

**MATERIAL DESCRIPTION**

Gray and tan FAT CLAY; organics

**Project No.** 19.15.131 **Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB029 **Depth:** 14

**Tolunay-Wong Engineers, Inc.**

**Houston, Texas**

**Remarks:**

Test method: ASTM D2435
Specific gravity: Assumed

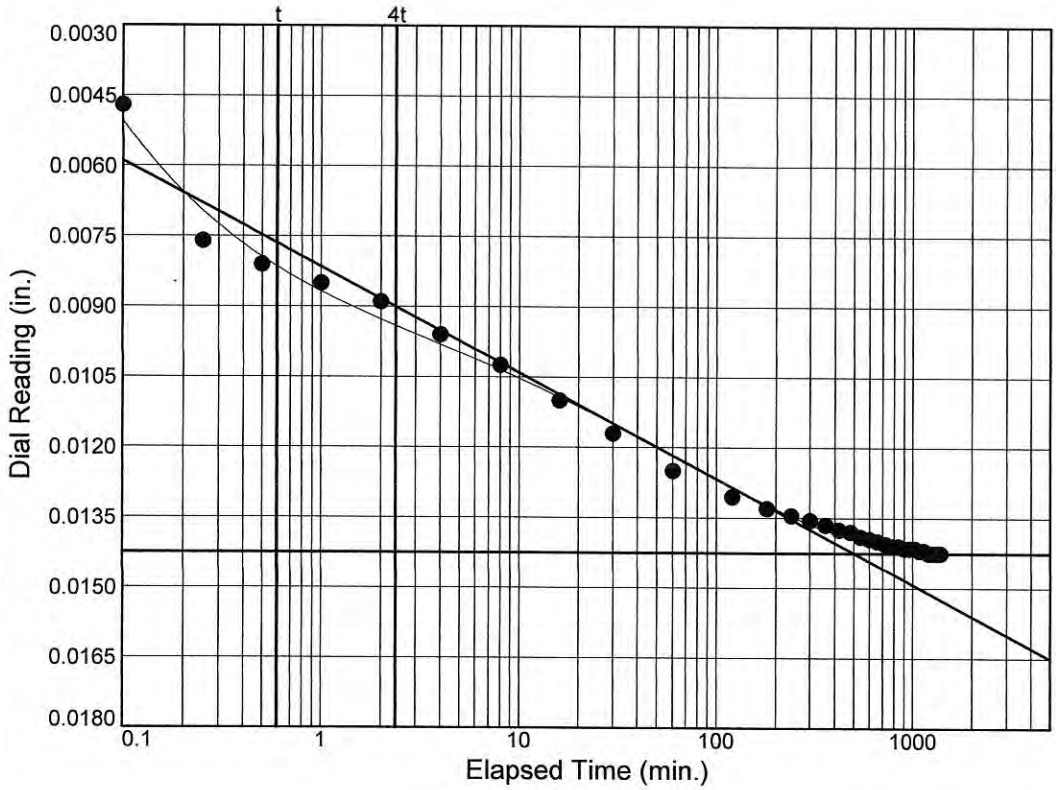
**Figure**

Attachment Figure B.2-187

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

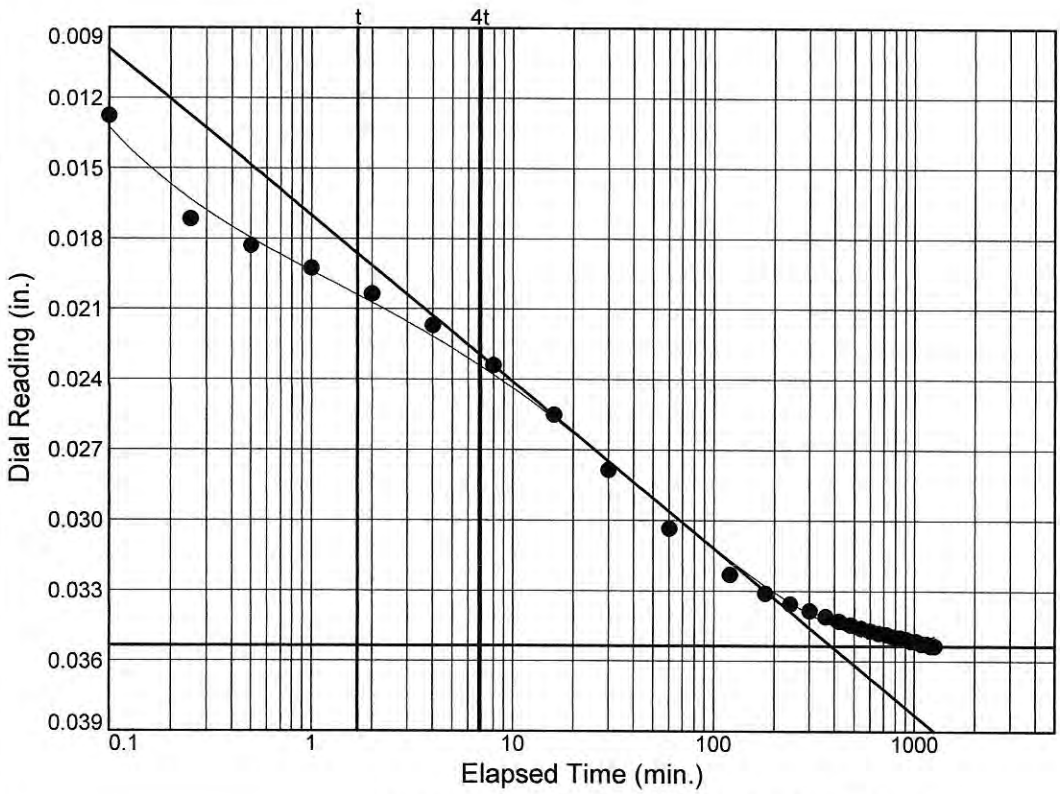
Source of Sample: SJGB029 Depth: 14




Load No.= 5
Load= 1.00 tsf
$D_0$ = 0.0069
$D_{50}$ = 0.0106
$D_{100}$ = 0.0143
$T_{50}$ = 10.49 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 9.4 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 6
Load= 2.00 tsf
$D_0$ = 0.0174
$D_{50}$ = 0.0264
$D_{100}$ = 0.0353
$T_{50}$ = 20.59 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 4.6 ft.$^2$/yr. |

$C_\alpha$ = 0.000

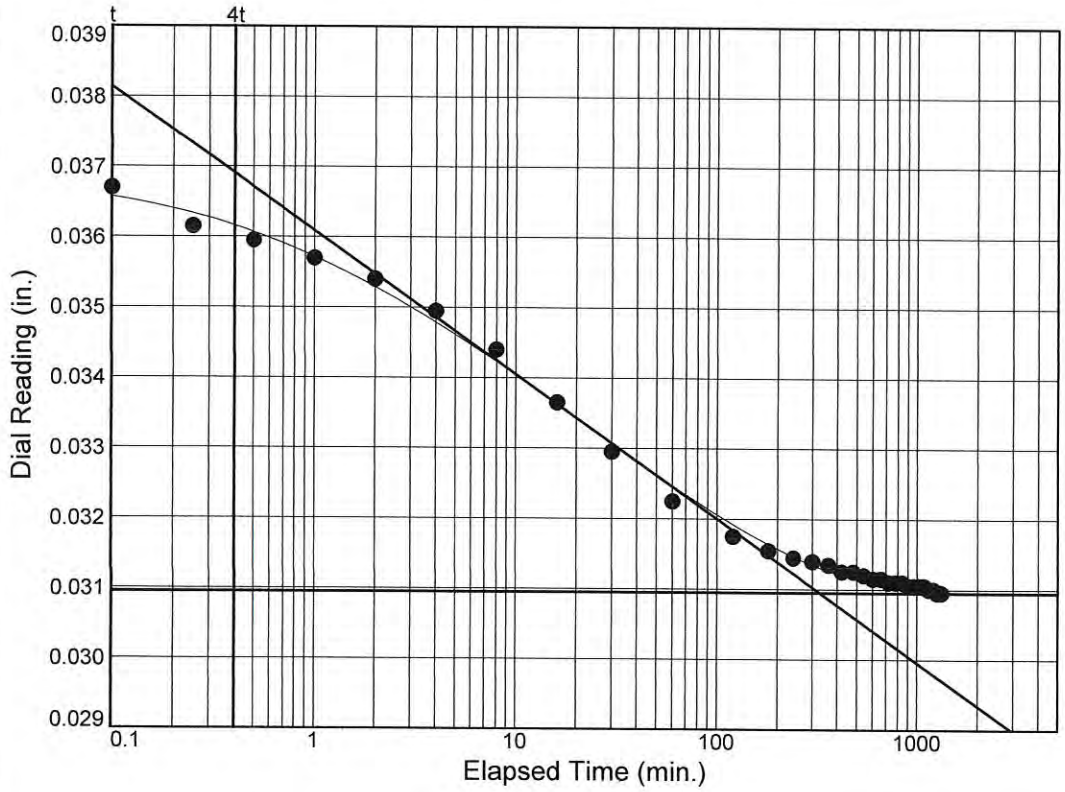
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-188

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

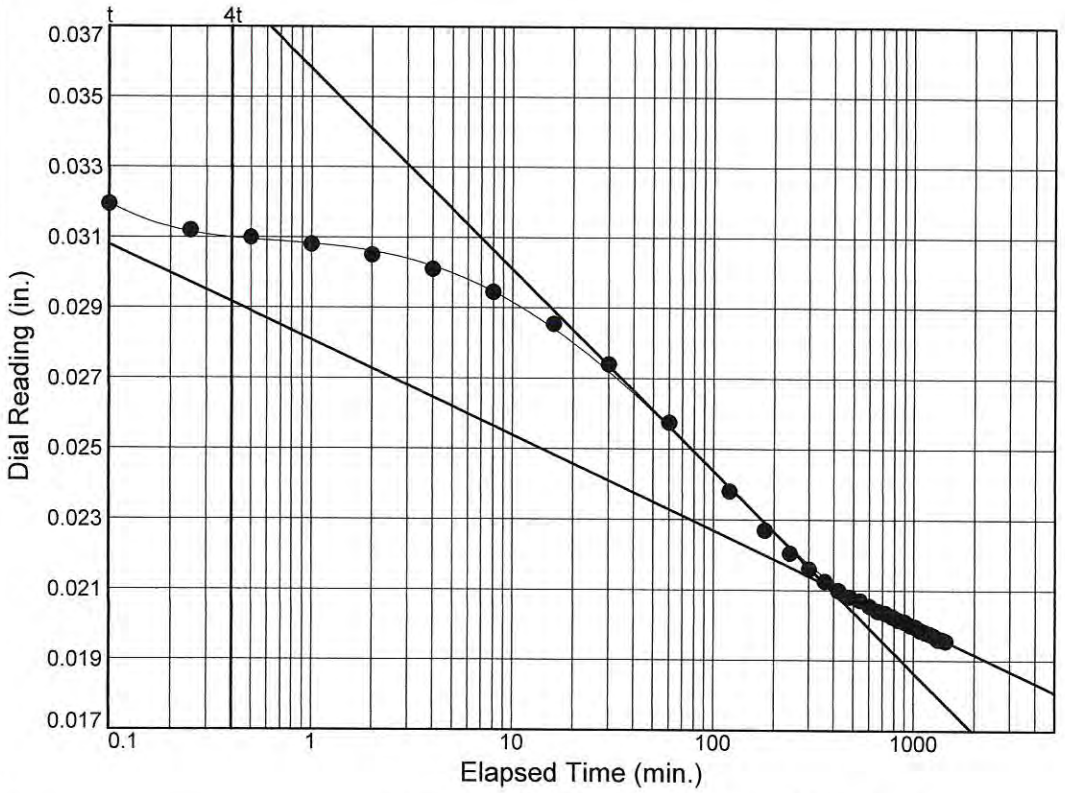
Source of Sample: SJGB029 Depth: 14




Load No.= 7
Load= 0.50 tsf
$D_0$ = 0.0370
$D_{50}$ = 0.0340
$D_{100}$ = 0.0310
$T_{50}$ = 10.92 min.

| $C_v$ @ $T_{50}$ |
|---|
| 8.5 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 8
Load= 0.10 tsf
$D_0$ = 0.0330
$D_{50}$ = 0.0271
$D_{100}$ = 0.0212
$T_{50}$ = 31.91 min.

| $C_v$ @ $T_{50}$ |
|---|
| 3.0 ft.$^2$/yr. |

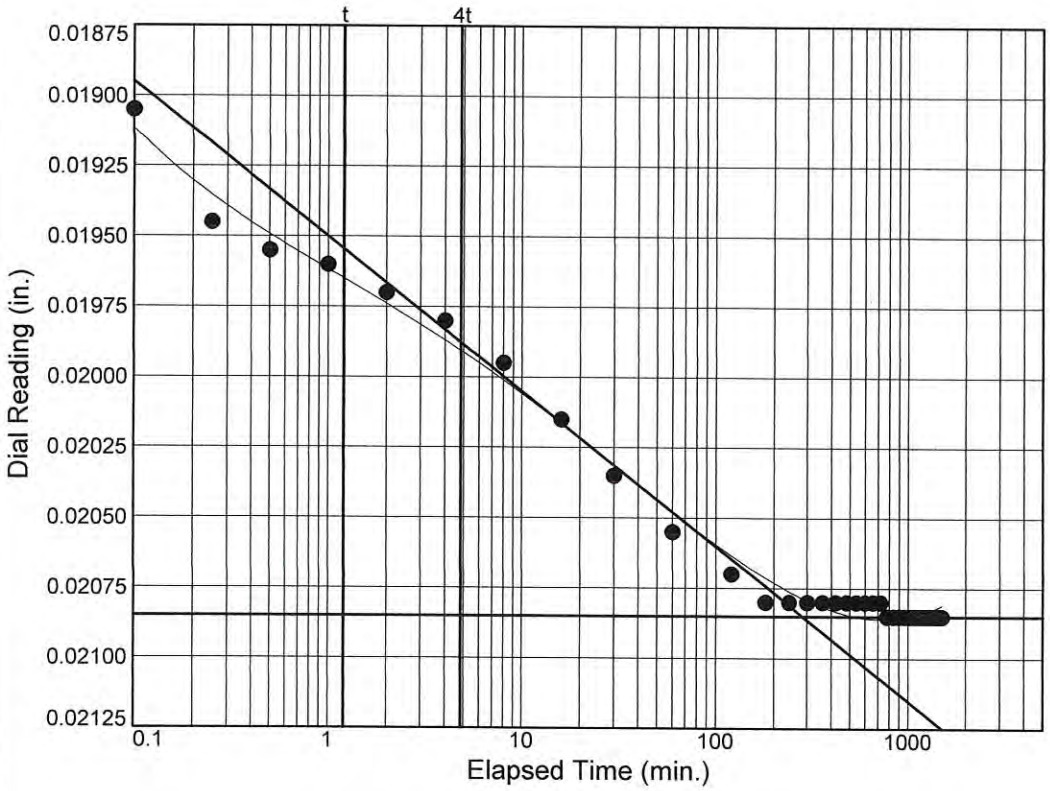
**TOLUNAY-WONG ENGINEERS, INC.**

Figure
Attachment Figure B.2-189

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

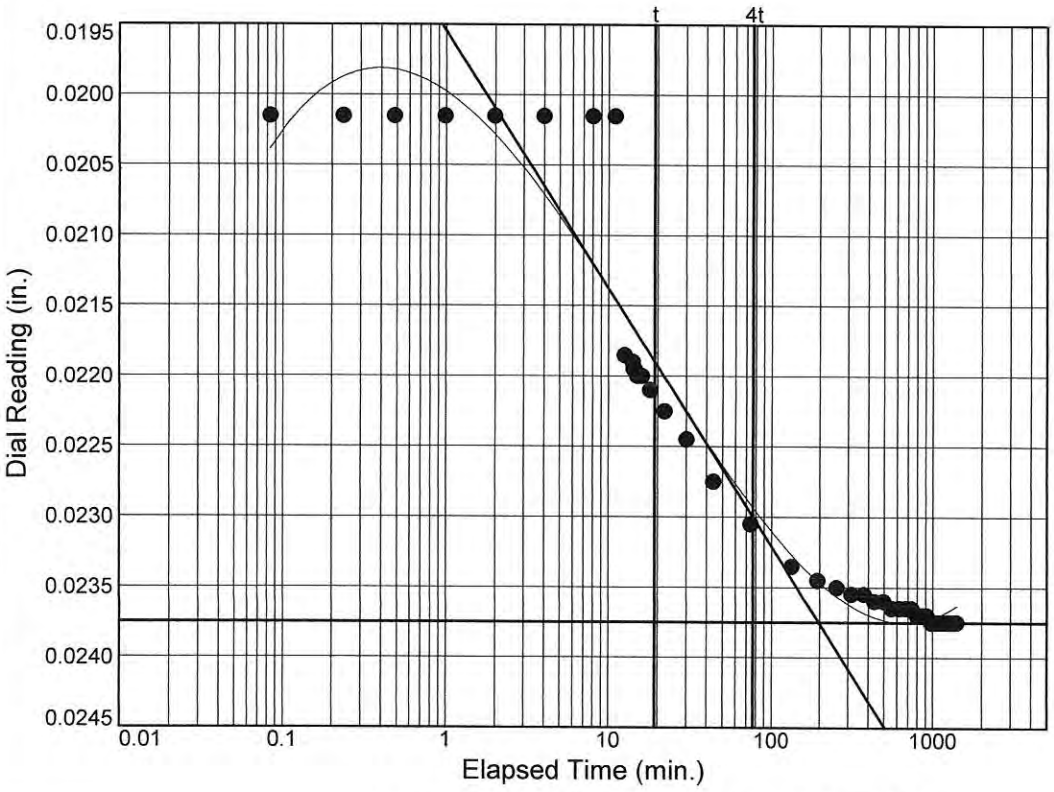
Source of Sample: SJGB029 Depth: 14




Load No.= 9
Load= 0.25 tsf
$D_0$ = 0.0194
$D_{50}$ = 0.0201
$D_{100}$ = 0.0209
$T_{50}$ = 13.24 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 7.2 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 10
Load= 0.50 tsf
$D_0$ = 0.0209
$D_{50}$ = 0.0223
$D_{100}$ = 0.0238
$T_{50}$ = 32.32 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 2.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000

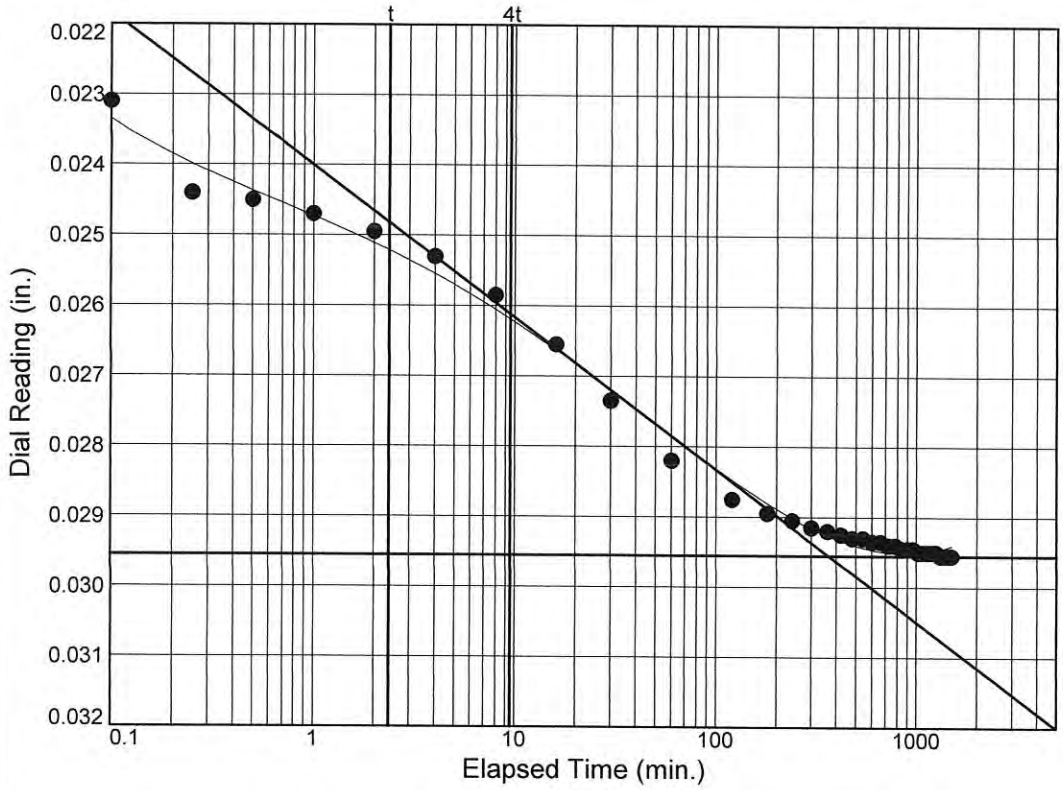
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-190

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

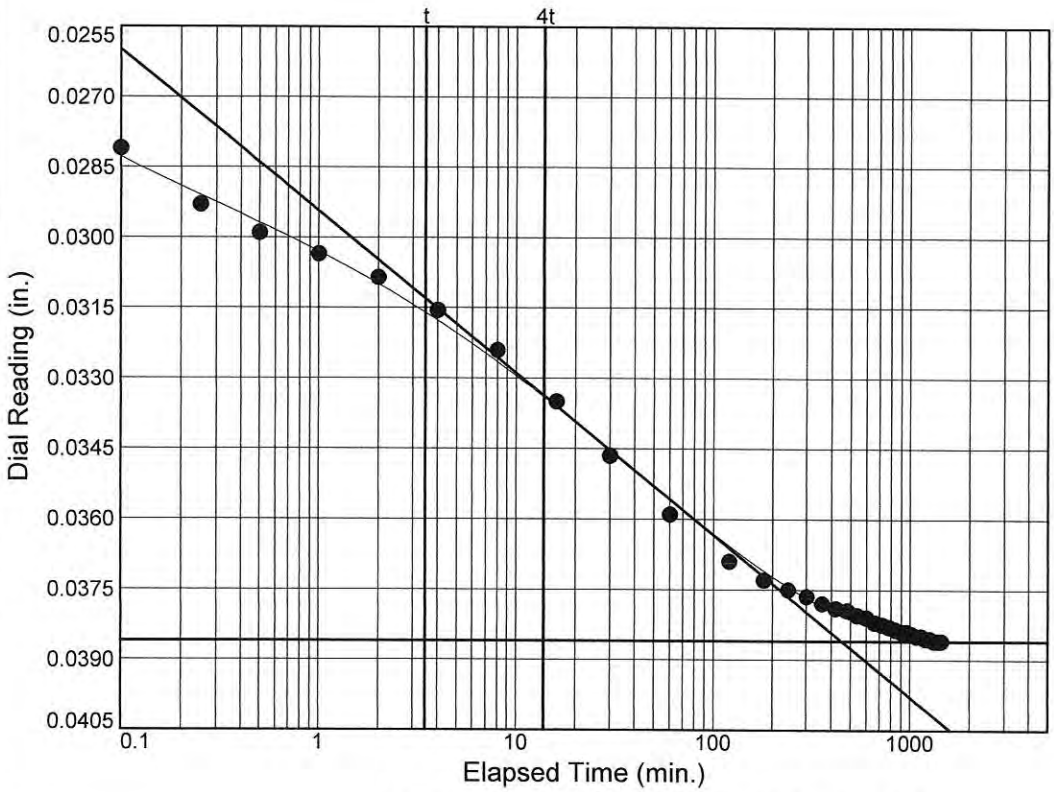
Source of Sample: SJGB029 Depth: 14




Load No.= 11
Load= 1.00 tsf
$D_0$ = 0.0242
$D_{50}$ = 0.0269
$D_{100}$ = 0.0295
$T_{50}$ = 21.47 min.

| $C_v$ @ $T_{50}$ |
|---|
| 4.4 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 12
Load= 2.00 tsf
$D_0$ = 0.0298
$D_{50}$ = 0.0342
$D_{100}$ = 0.0386
$T_{50}$ = 23.92 min.

| $C_v$ @ $T_{50}$ |
|---|
| 3.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000

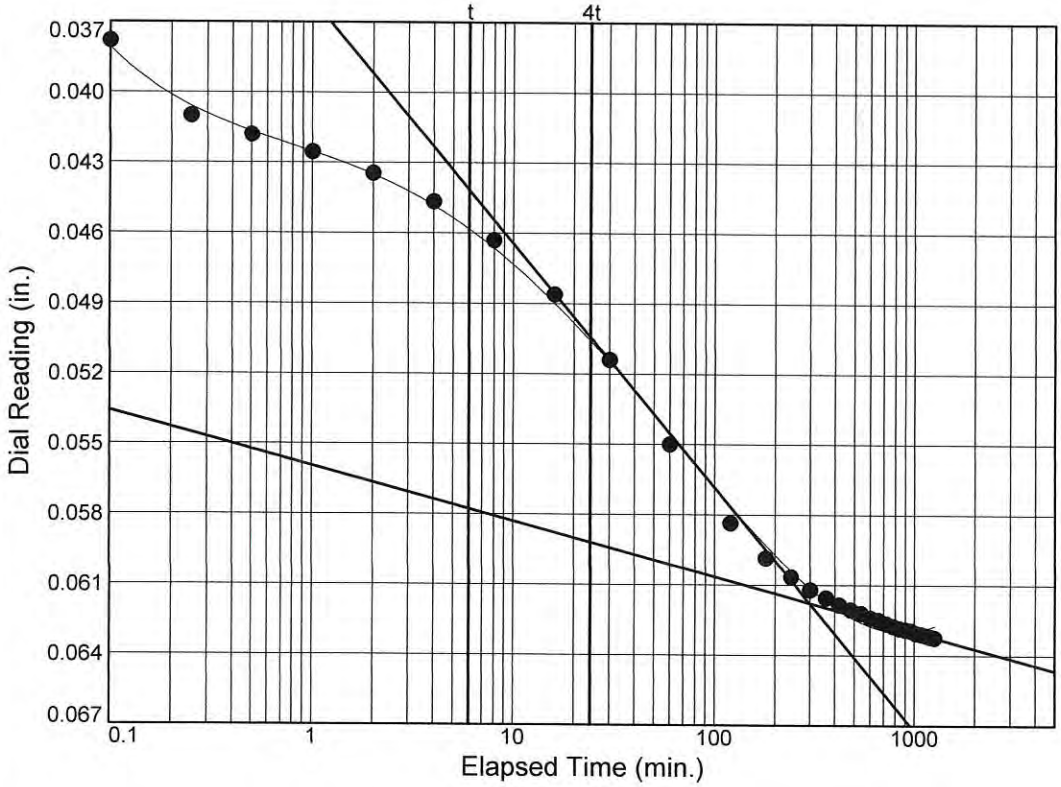
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-191

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

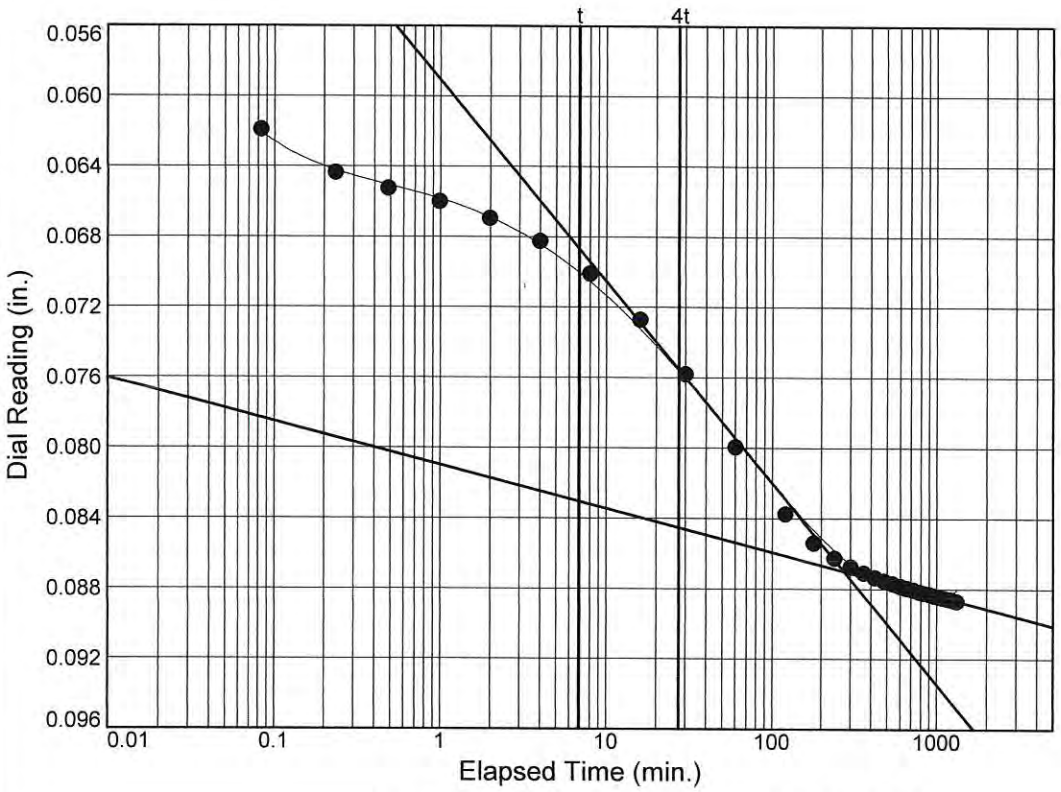
Source of Sample: SJGB029 Depth: 14




Load No.= 13
Load= 4.00 tsf
$D_0$ = 0.0411
$D_{50}$ = 0.0514
$D_{100}$ = 0.0618
$T_{50}$ = 29.70 min.

| $C_v$ @ $T_{50}$ |
|---|
| 3.0 ft.$^2$/yr. |

$C_\alpha$ = 0.005




Load No.= 14
Load= 8.00 tsf
$D_0$ = 0.0644
$D_{50}$ = 0.0757
$D_{100}$ = 0.0870
$T_{50}$ = 27.88 min.

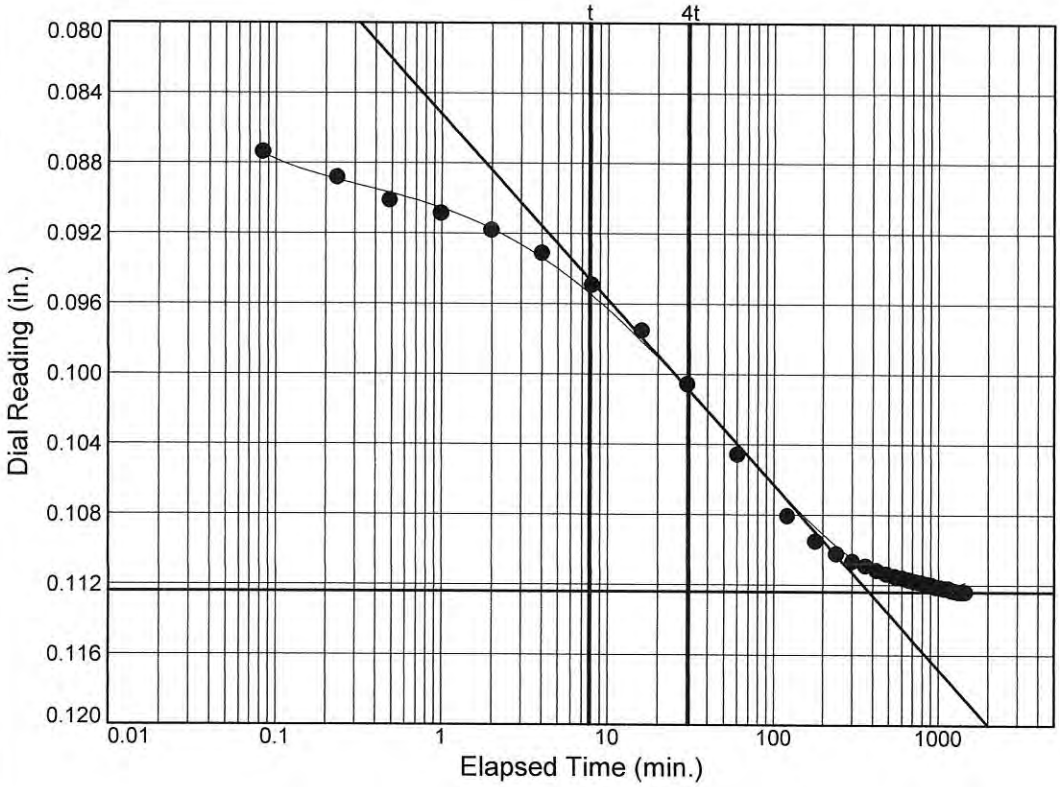
| $C_v$ @ $T_{50}$ |
|---|
| 2.9 ft.$^2$/yr. |

$C_\alpha$ = 0.006

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

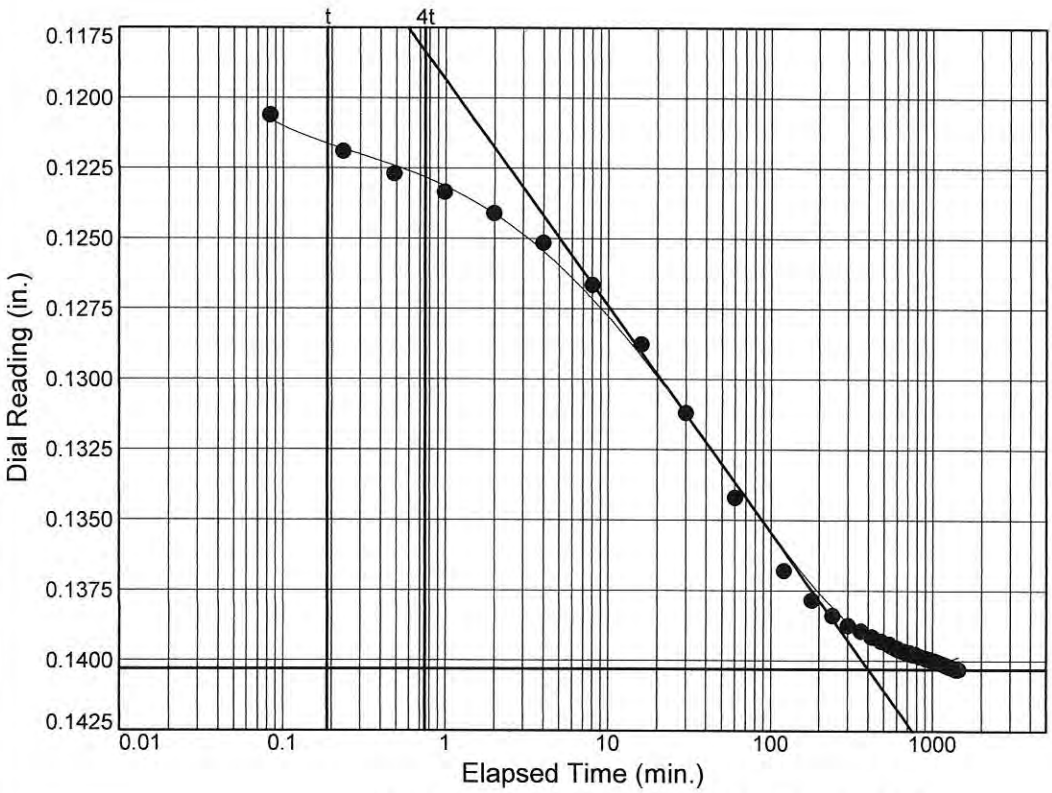
Source of Sample: SJGB029 Depth: 14




Load No.= 15
Load= 16.00 tsf
$D_0$ = 0.0898
$D_{50}$ = 0.1011
$D_{100}$ = 0.1124
$T_{50}$ = 32.22 min.

$C_v$ @ $T_{50}$
2.4 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 16
Load= 32.00 tsf
$D_0$ = 0.1204
$D_{50}$ = 0.1304
$D_{100}$ = 0.1403
$T_{50}$ = 23.02 min.

$C_v$ @ $T_{50}$
3.0 ft.$^2$/yr.

$C_\alpha$ = 0.000

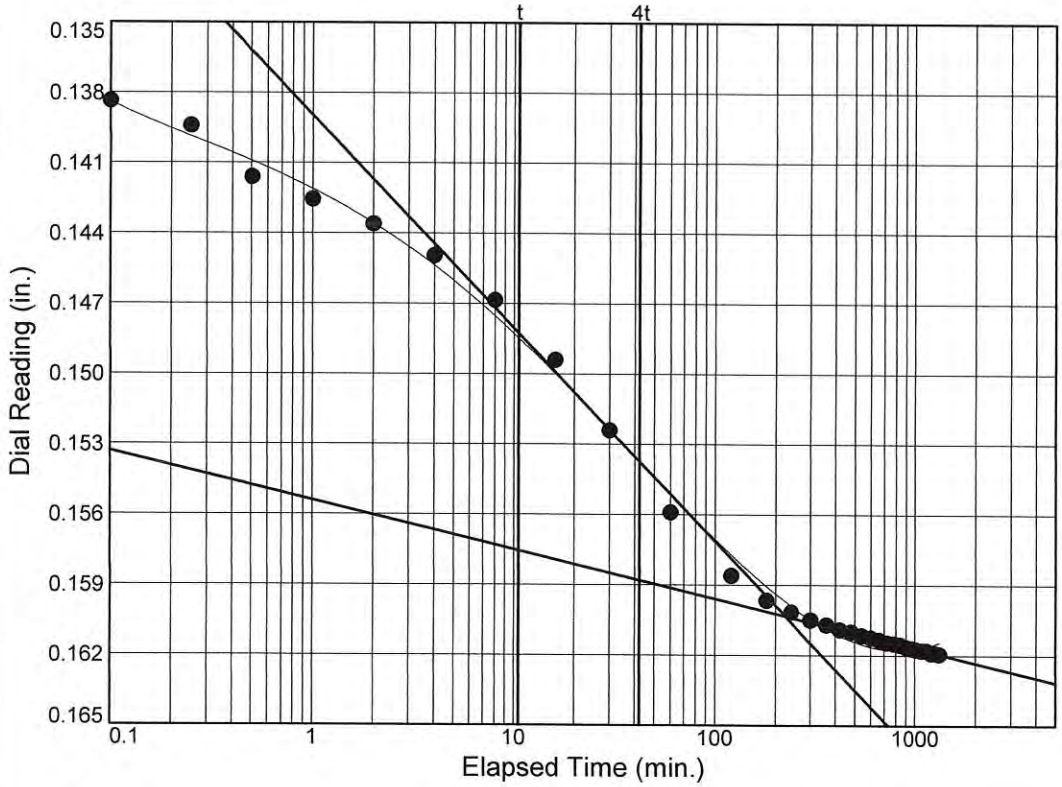
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-193

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

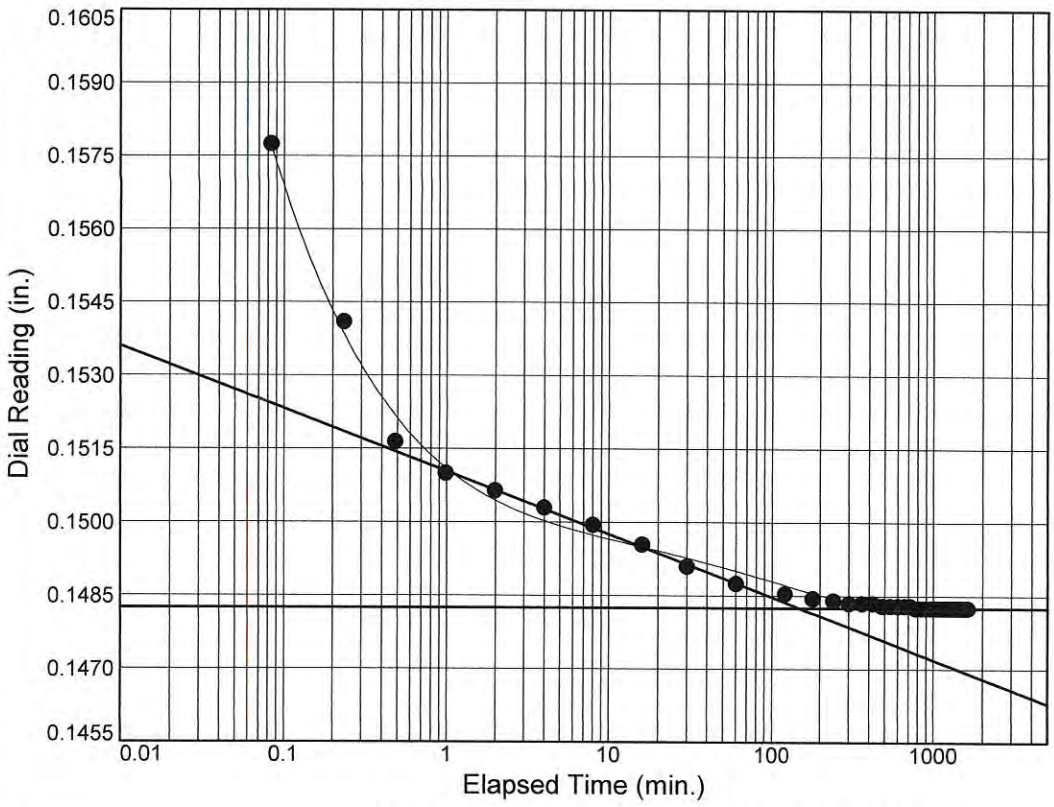
Source of Sample: SJGB029 Depth: 14




Load No.= 17
Load= 60.00 tsf
$D_0$ = 0.1432
$D_{50}$ = 0.1518
$D_{100}$ = 0.1603
$T_{50}$ = 25.54 min.

| $C_v$ @ $T_{50}$ |
|---|
| 2.5 ft.$^2$/yr. |

$C_\alpha$ = 0.005




Load No.= 18
Load= 16.00 tsf
$D_0$ = 0.1619
$D_{50}$ = 0.1551
$D_{100}$ = 0.1482
$T_{50}$ = 0.16 min.

| $C_v$ @ $T_{50}$ |
|---|
| 404.0 ft.$^2$/yr. |

$C_\alpha$ = 0.000

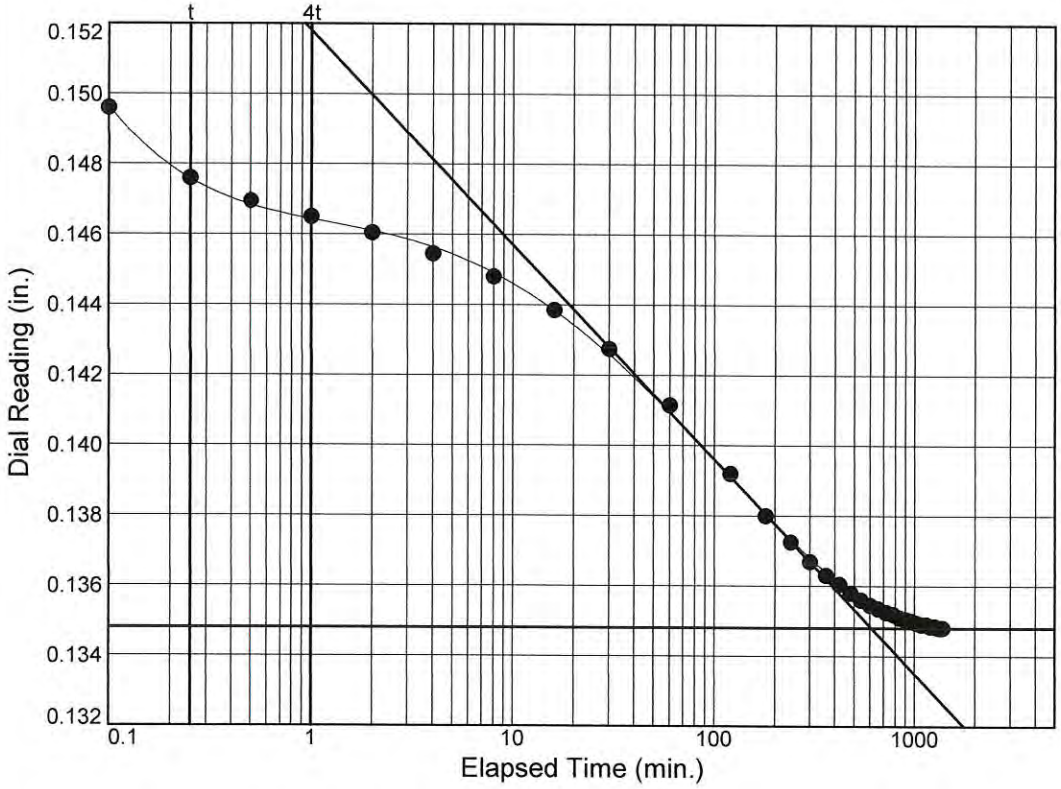
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-194

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

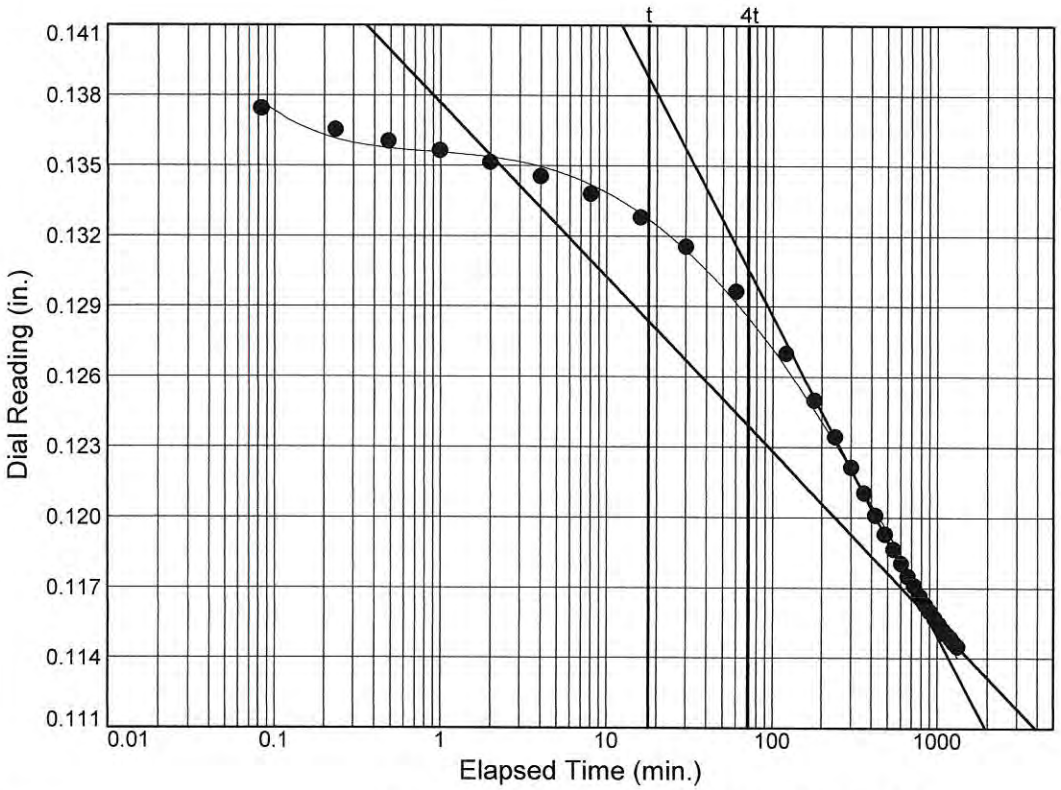
Source of Sample: SJGB029 Depth: 14




Load No.= 19
Load= 4.00 tsf
$D_0$ = 0.1487
$D_{50}$ = 0.1418
$D_{100}$ = 0.1348
$T_{50}$ = 43.00 min.

| $C_v$ @ $T_{50}$ |
|---|
| 1.5 ft.$^2$/yr. |

$C_\alpha$ = 0.000



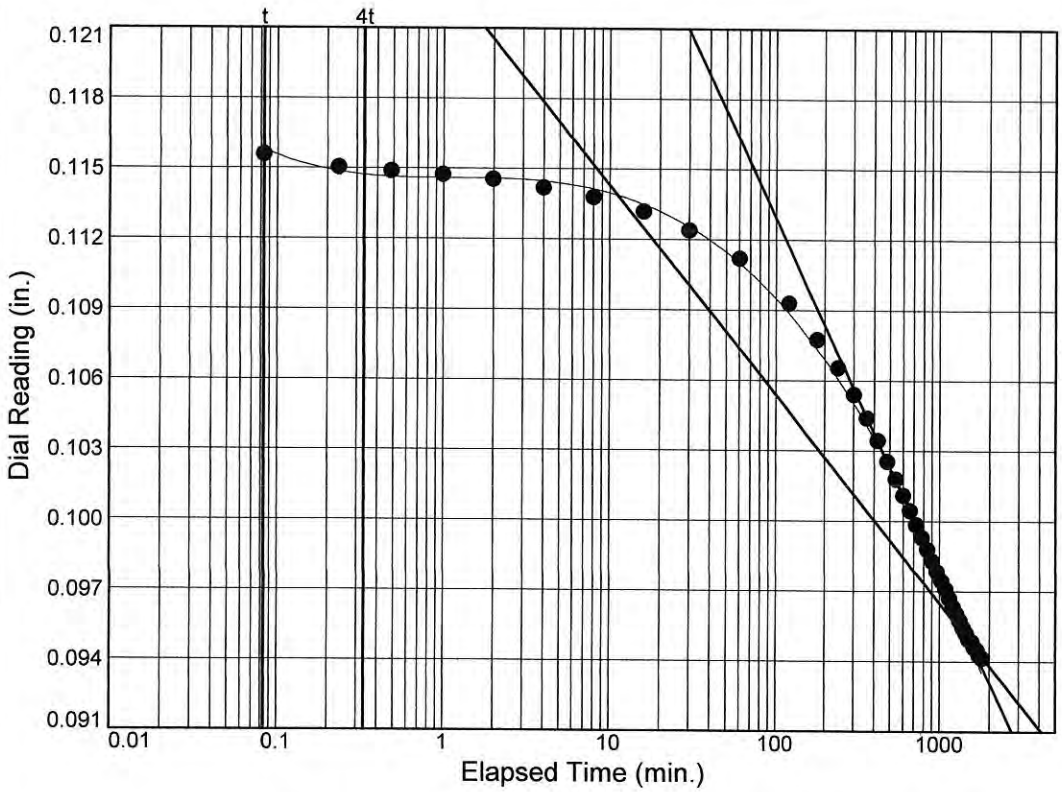

Load No.= 20
Load= 1.00 tsf
$D_0$ = 0.1369
$D_{50}$ = 0.1264
$D_{100}$ = 0.1160
$T_{50}$ = 119.20 min.

| $C_v$ @ $T_{50}$ |
|---|
| 0.6 ft.$^2$/yr. |

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB029 Depth: 14



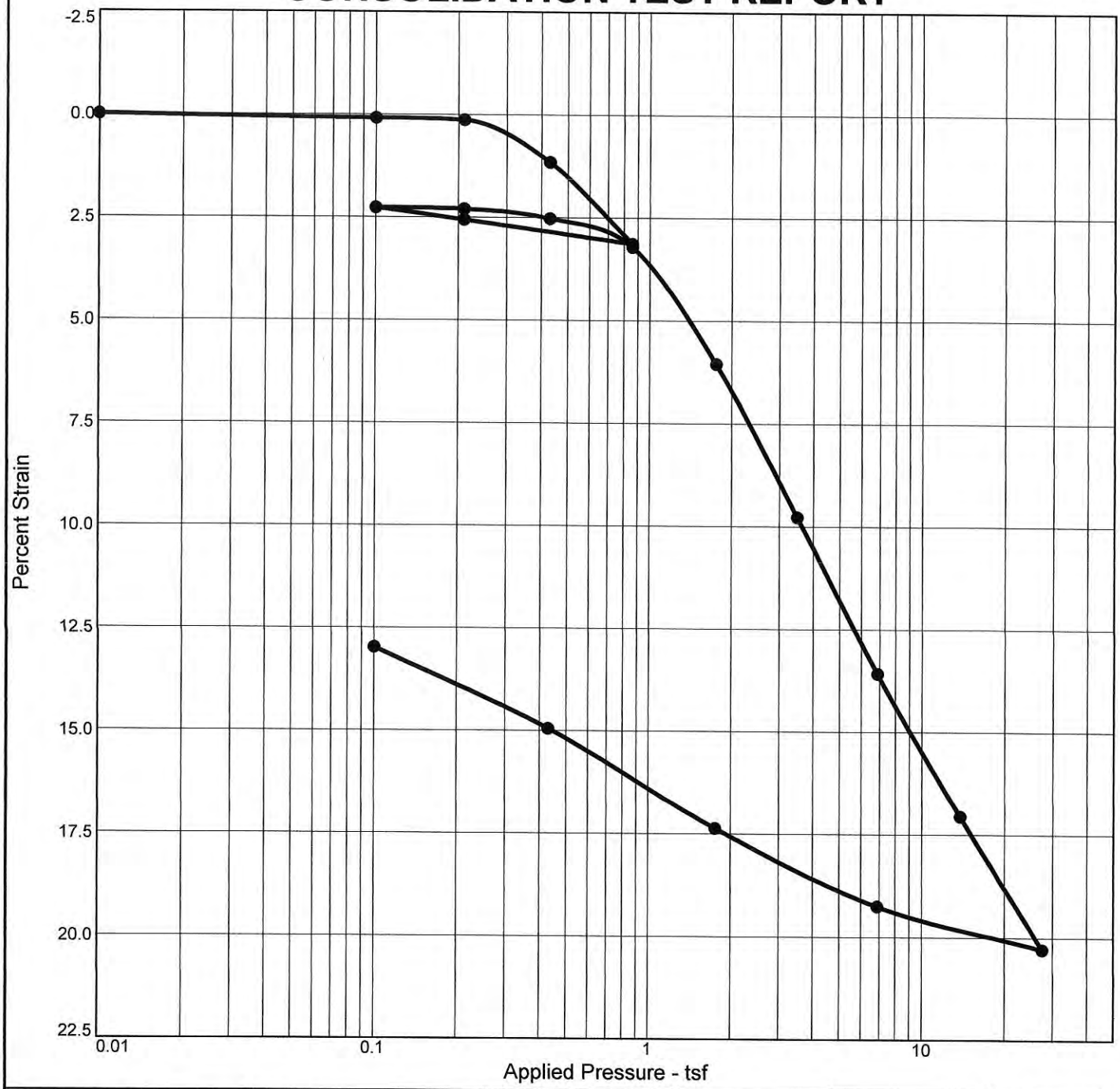

Load No.= 21
Load= 0.25 tsf
$D_0$ = 0.1169
$D_{50}$ = 0.1059
$D_{100}$ = 0.0948
$T_{50}$ = 252.37 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 0.3 ft.$^2$/yr. |

TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-196

# CONSOLIDATION TEST REPORT




| Natural | | Dry Dens. (pcf) | LL | PI | Sp. Gr. | USCS | AASHTO | Initial Void Ratio |
|---|---|---|---|---|---|---|---|---|
| Saturation | Moisture | | | | | | | |
| 98.8 % | 28.9 % | 96.1 | 27 | 6 | 2.80 | CL-ML | | 0.819 |

**MATERIAL DESCRIPTION**

Reddish Brown SANDY SILTY CLAY

**Project No.** 19.15.131 **Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 28

**Tolunay-Wong Engineers, Inc.**

**Houston, Texas**

**Remarks:**

Test method: ASTM D2435
Specific gravity: Assumed

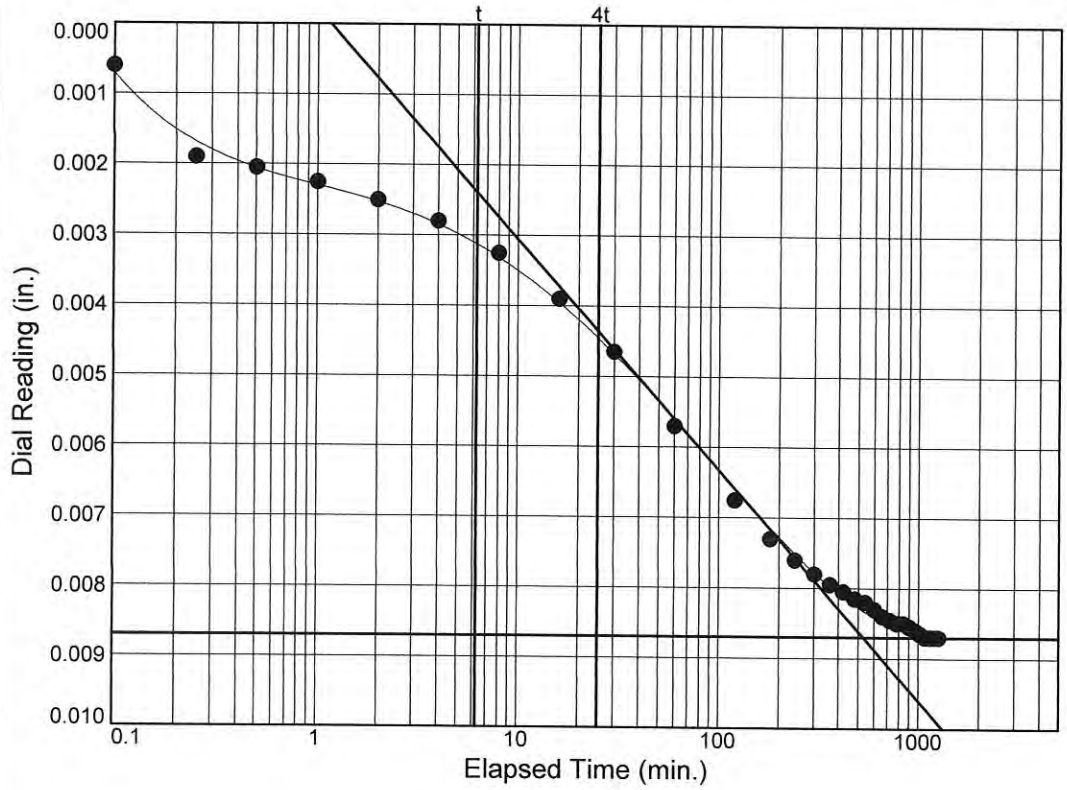
**Figure**

Attachment Figure B.2-197

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

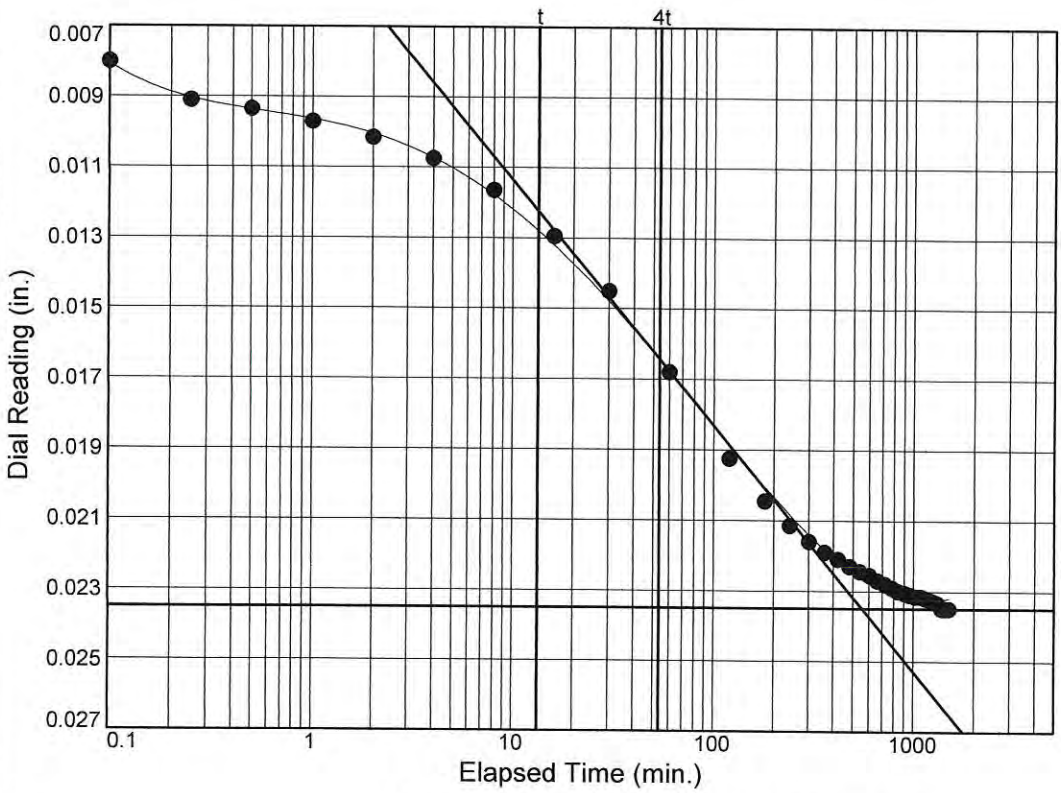
Source of Sample: SJGB047 Depth: 28




Load No.= 4
Load= 0.43 tsf
$D_0$ = 0.0018
$D_{50}$ = 0.0052
$D_{100}$ = 0.0087
$T_{50}$ = 46.27 min.

| $C_v$ @ $T_{50}$ |
|---|
| 2.2 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 5
Load= 0.86 tsf
$D_0$ = 0.0092
$D_{50}$ = 0.0163
$D_{100}$ = 0.0235
$T_{50}$ = 51.48 min.

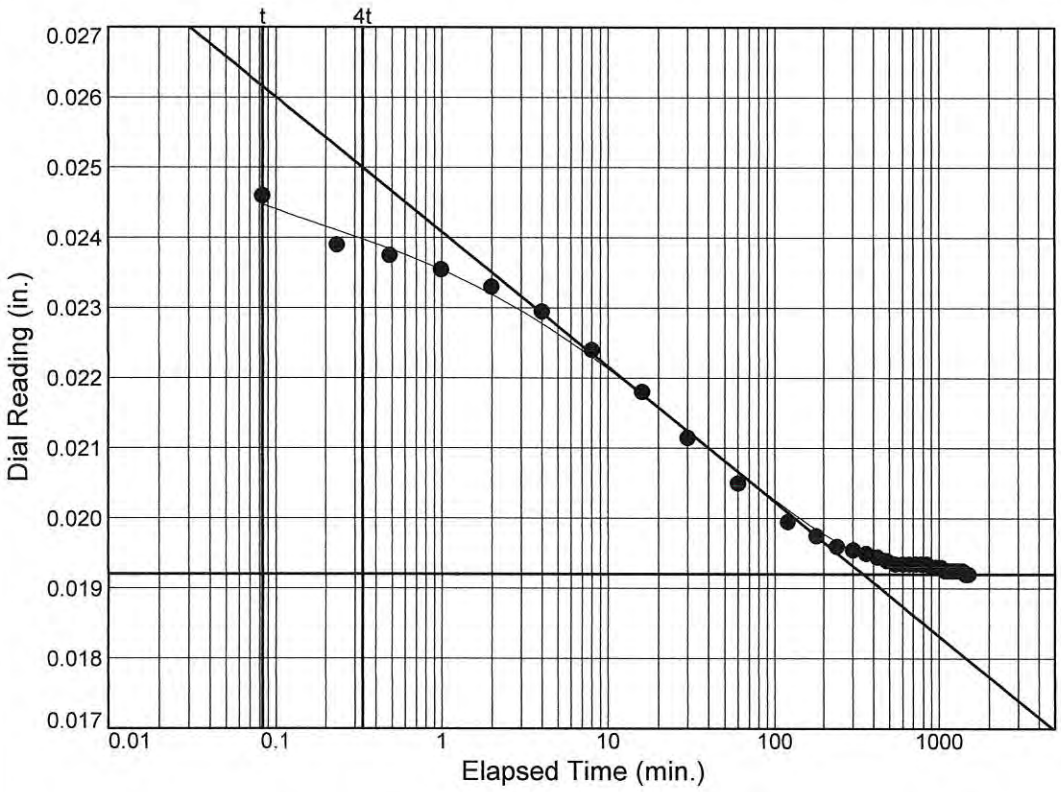
| $C_v$ @ $T_{50}$ |
|---|
| 1.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

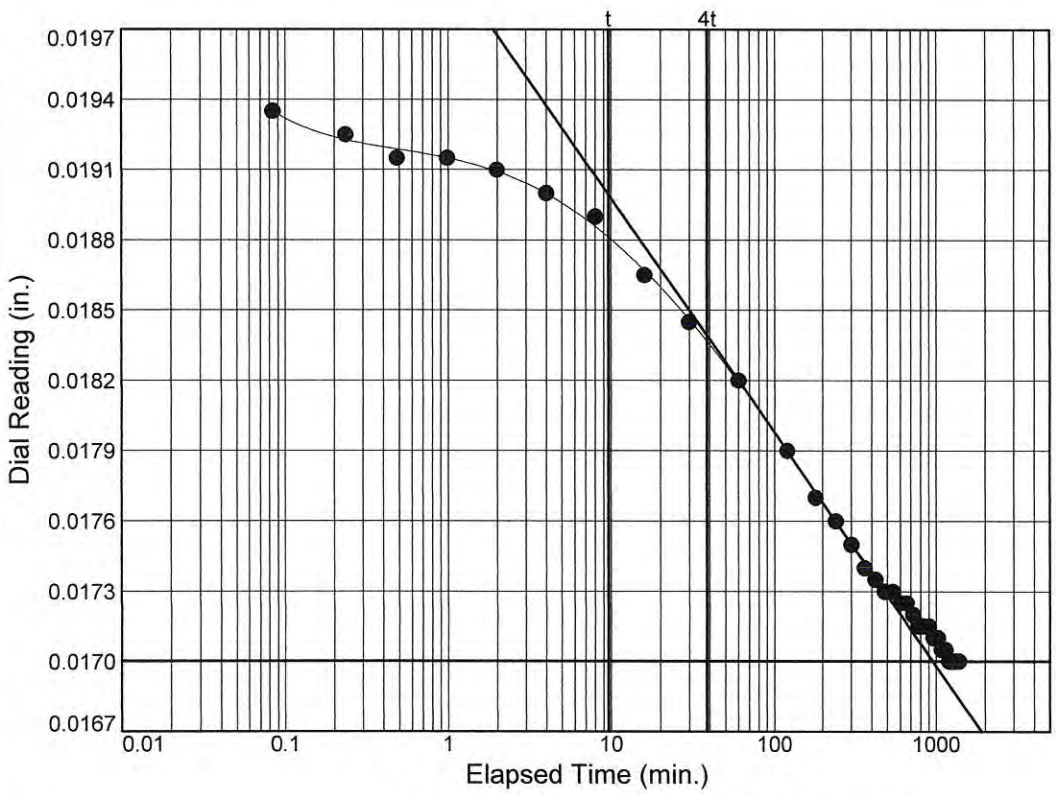
Source of Sample: SJGB047 Depth: 28




Load No.= 6
Load= 0.21 tsf
$D_0$ = 0.0250
$D_{50}$ = 0.0221
$D_{100}$ = 0.0192
$T_{50}$ = 10.56 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 9.0 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 7
Load= 0.10 tsf
$D_0$ = 0.0193
$D_{50}$ = 0.0181
$D_{100}$ = 0.0170
$T_{50}$ = 69.80 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 1.4 ft.$^2$/yr. |

$C_\alpha$ = 0.000

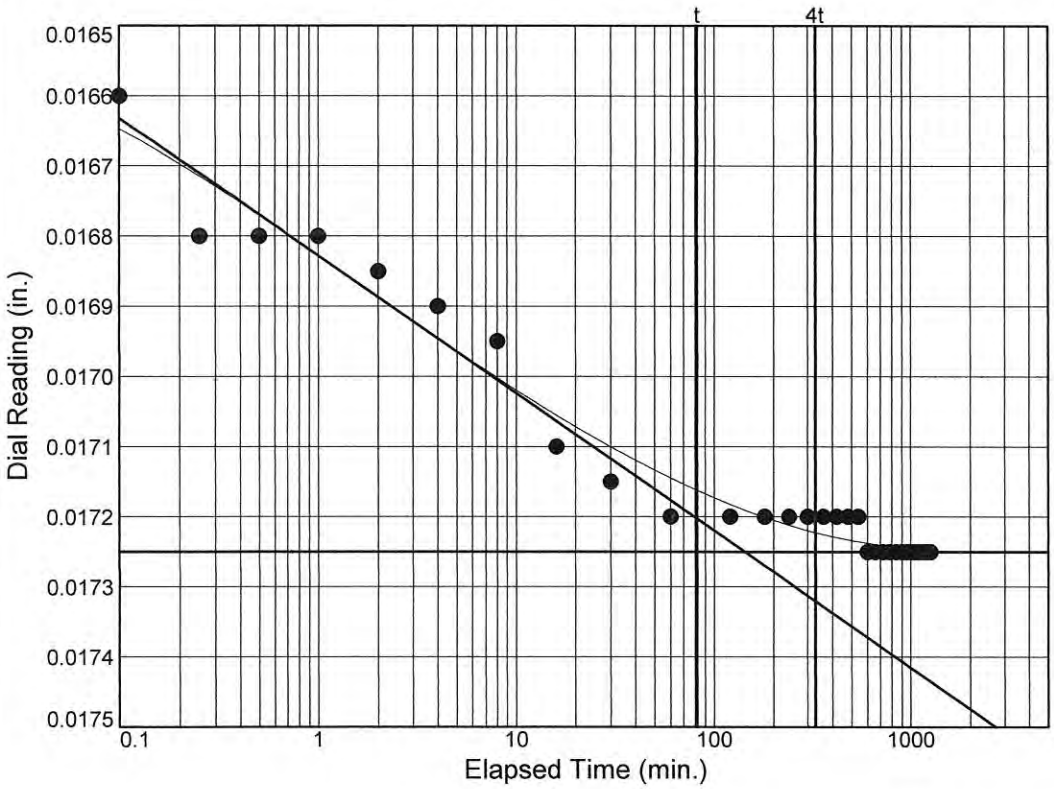
Figure

TOLUNAY-WONG ENGINEERS, INC.

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

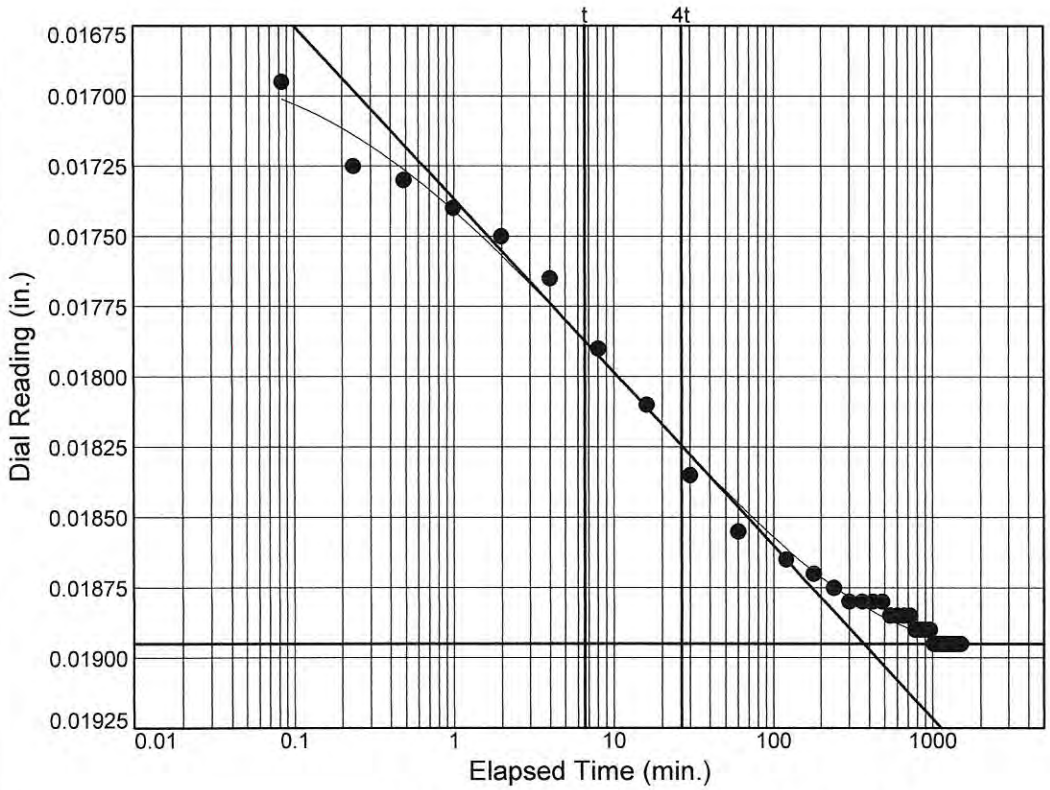
Source of Sample: SJGB047 Depth: 28




Load No.= 8
Load= 0.21 tsf
$D_0$ = 0.0171
$D_{50}$ = 0.0172
$D_{100}$ = 0.0172
$T_{50}$ = 105.96 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 0.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 9
Load= 0.43 tsf
$D_0$ = 0.0175
$D_{50}$ = 0.0182
$D_{100}$ = 0.0190
$T_{50}$ = 24.96 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 3.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

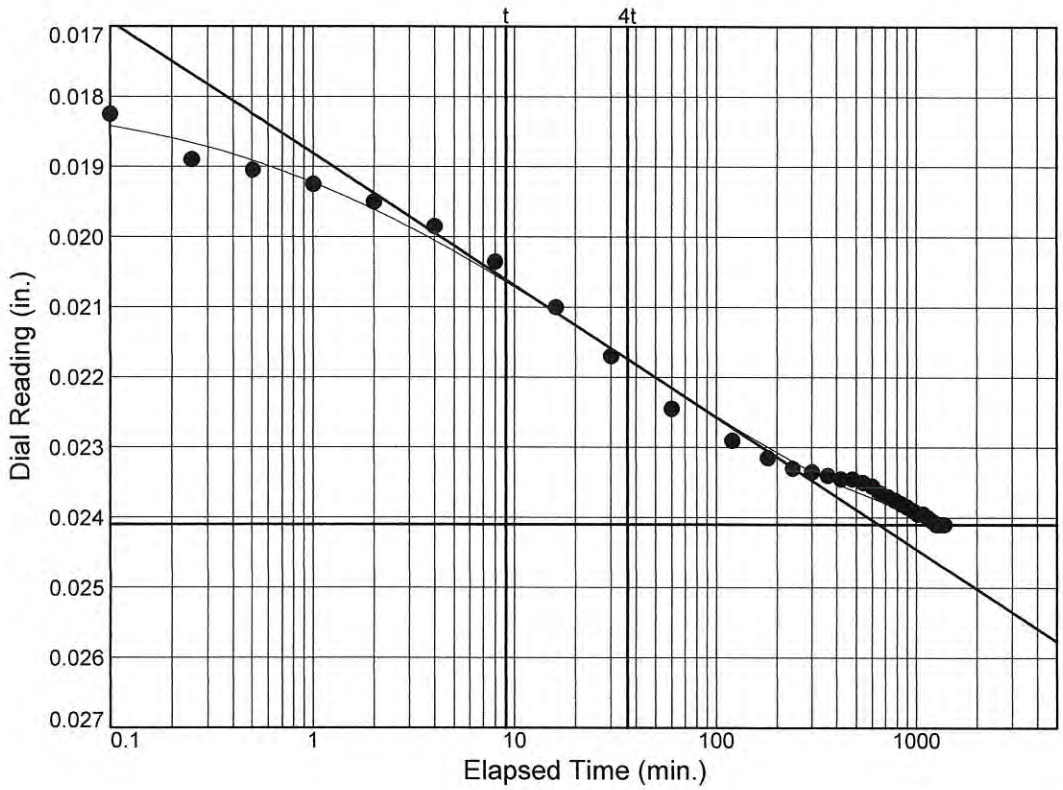
Figure

Attachment Figure B.2-200

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

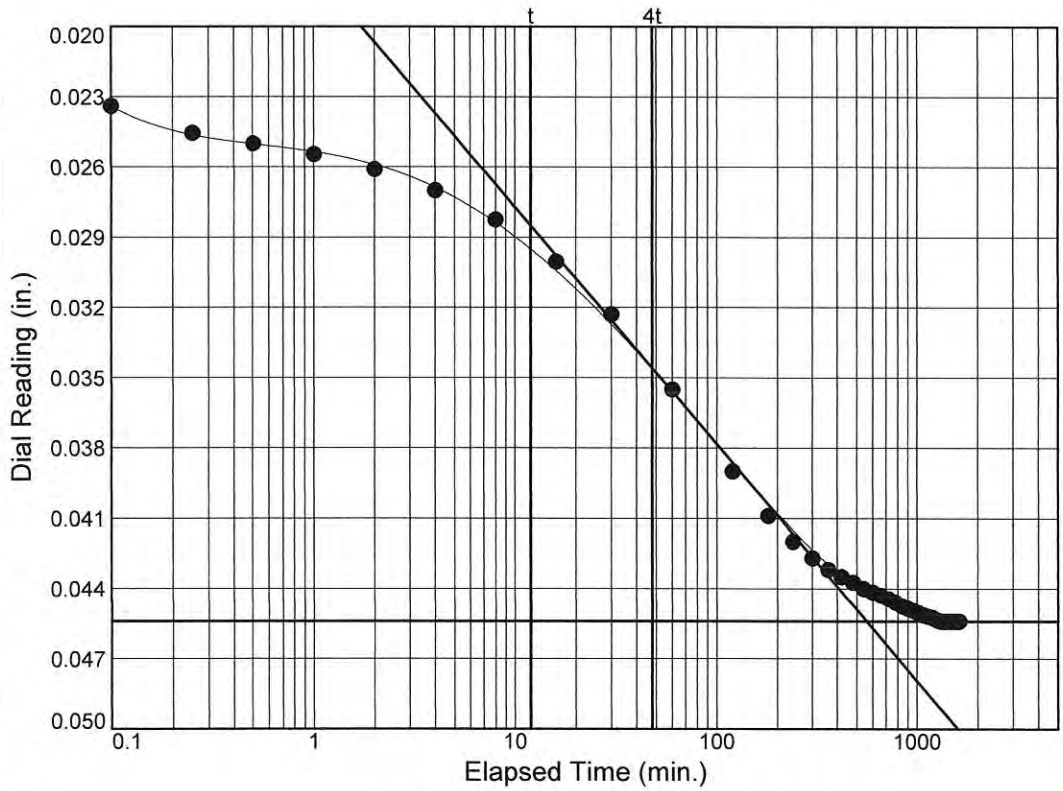
Source of Sample: SJGB047 Depth: 28




Load No.= 10
Load= 0.86 tsf
$D_0$ = 0.0195
$D_{50}$ = 0.0218
$D_{100}$ = 0.0241
$T_{50}$ = 39.71 min.

$C_v$ @ $T_{50}$
2.4 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 11
Load= 1.75 tsf
$D_0$ = 0.0244
$D_{50}$ = 0.0349
$D_{100}$ = 0.0454
$T_{50}$ = 50.73 min.

$C_v$ @ $T_{50}$
1.8 ft.$^2$/yr.

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

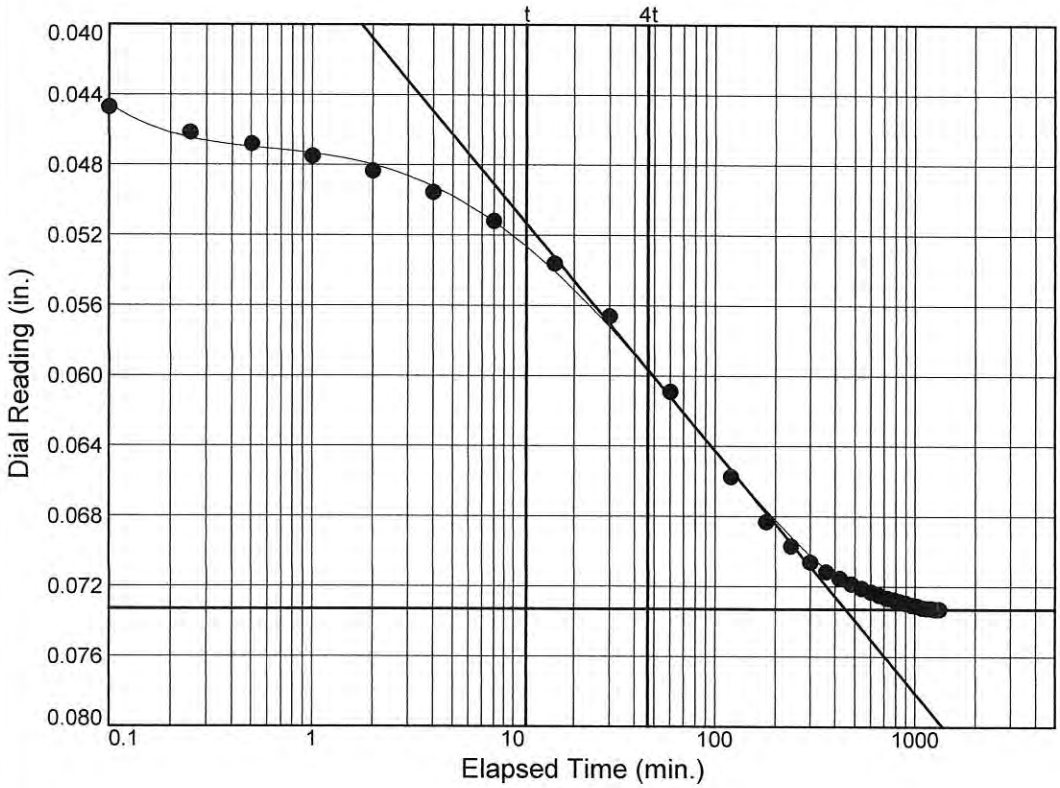
Figure

Attachment Figure B.2-201

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

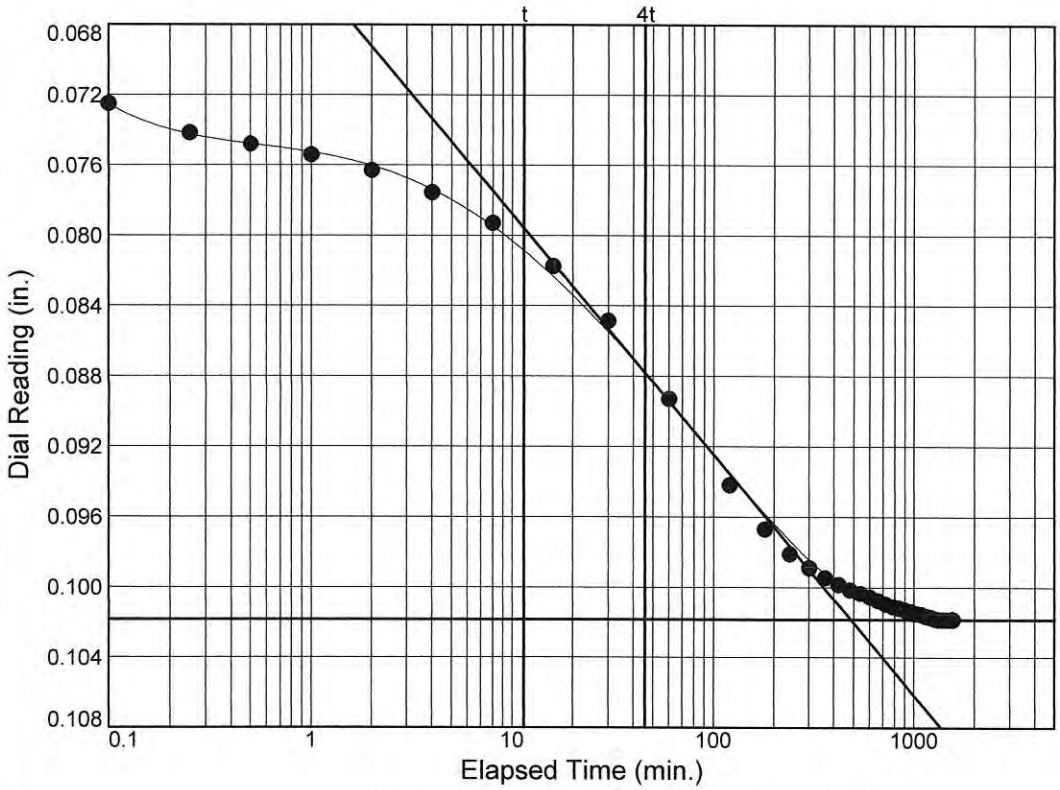
Source of Sample: SJGB047 Depth: 28




Load No.= 12
Load= 3.49 tsf
$D_0$ = 0.0456
$D_{50}$ = 0.0595
$D_{100}$ = 0.0733
$T_{50}$ = 44.60 min.

| $C_v$ @ $T_{50}$ |
|---|
| 1.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 13
Load= 6.87 tsf
$D_0$ = 0.0739
$D_{50}$ = 0.0879
$D_{100}$ = 0.1018
$T_{50}$ = 45.75 min.

| $C_v$ @ $T_{50}$ |
|---|
| 1.7 ft.$^2$/yr. |

$C_\alpha$ = 0.000

**TOLUNAY-WONG ENGINEERS, INC.**

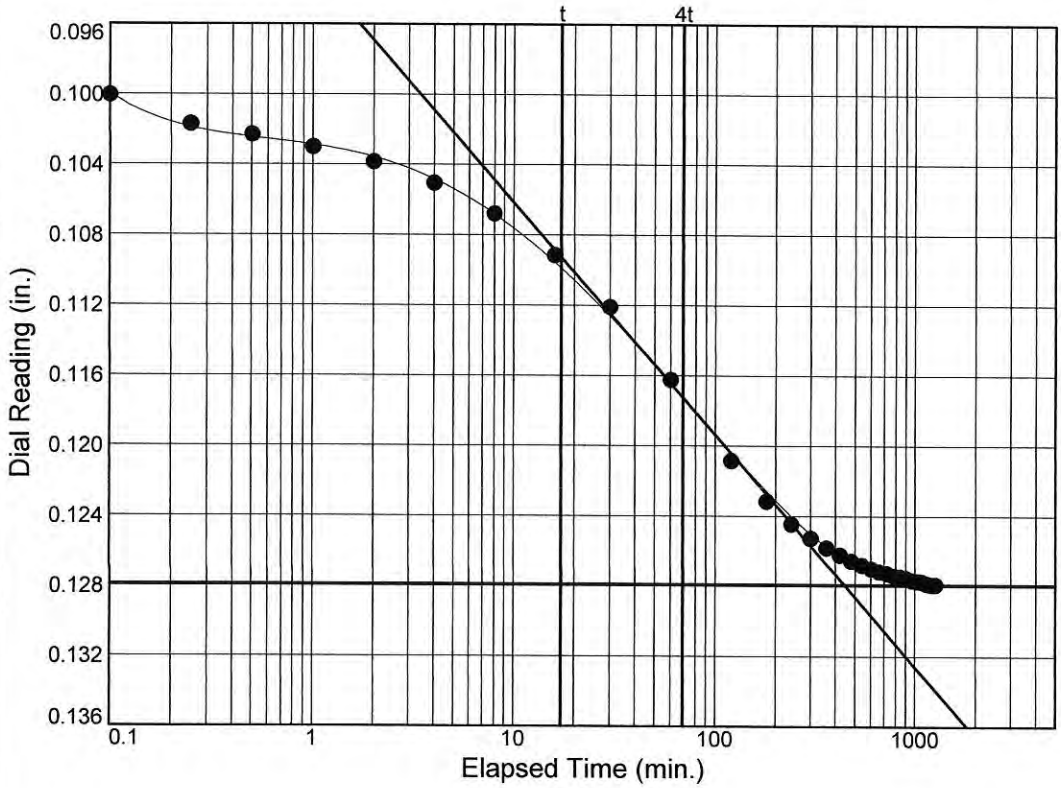
Figure

Attachment Figure B.2-202

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

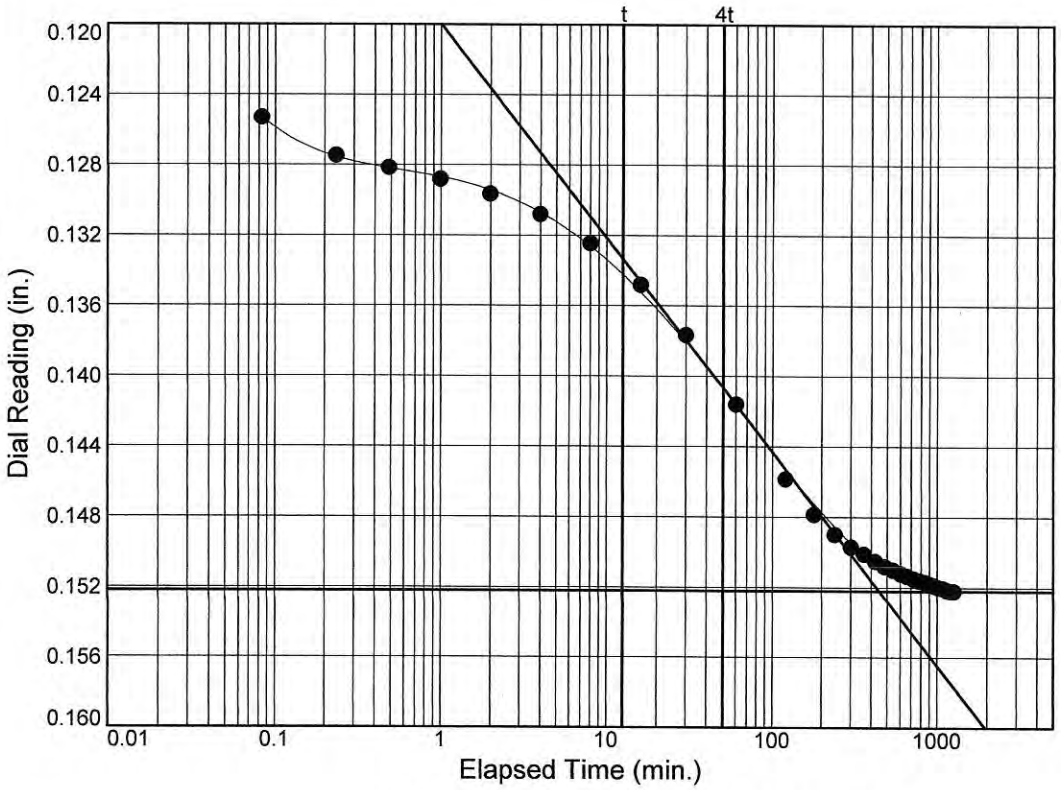
Source of Sample: SJGB047 Depth: 28




Load No.= 14
Load= 13.75 tsf
$D_0$ = 0.1025
$D_{50}$ = 0.1152
$D_{100}$ = 0.1279
$T_{50}$ = 48.41 min.

| $C_v$ @ $T_{50}$ |
|---|
| 1.5 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 15
Load= 27.50 tsf
$D_0$ = 0.1278
$D_{50}$ = 0.1400
$D_{100}$ = 0.1522
$T_{50}$ = 43.98 min.

| $C_v$ @ $T_{50}$ |
|---|
| 1.5 ft.$^2$/yr. |

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

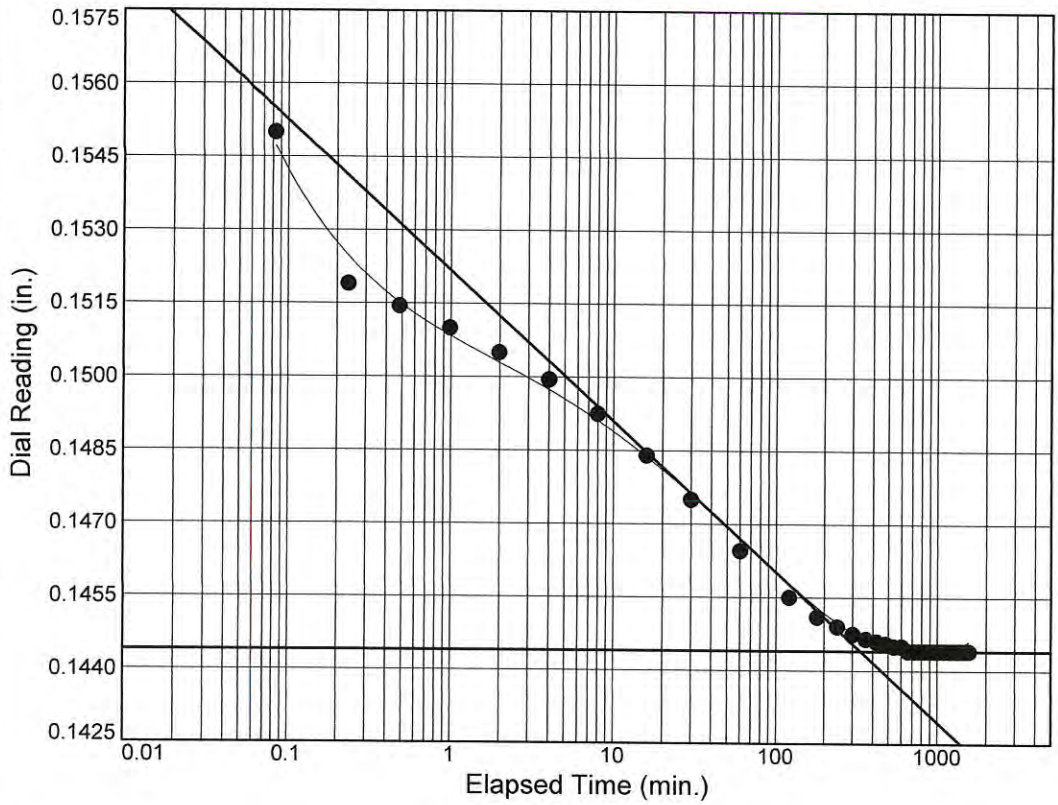
Figure

Attachment Figure B.2-203

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

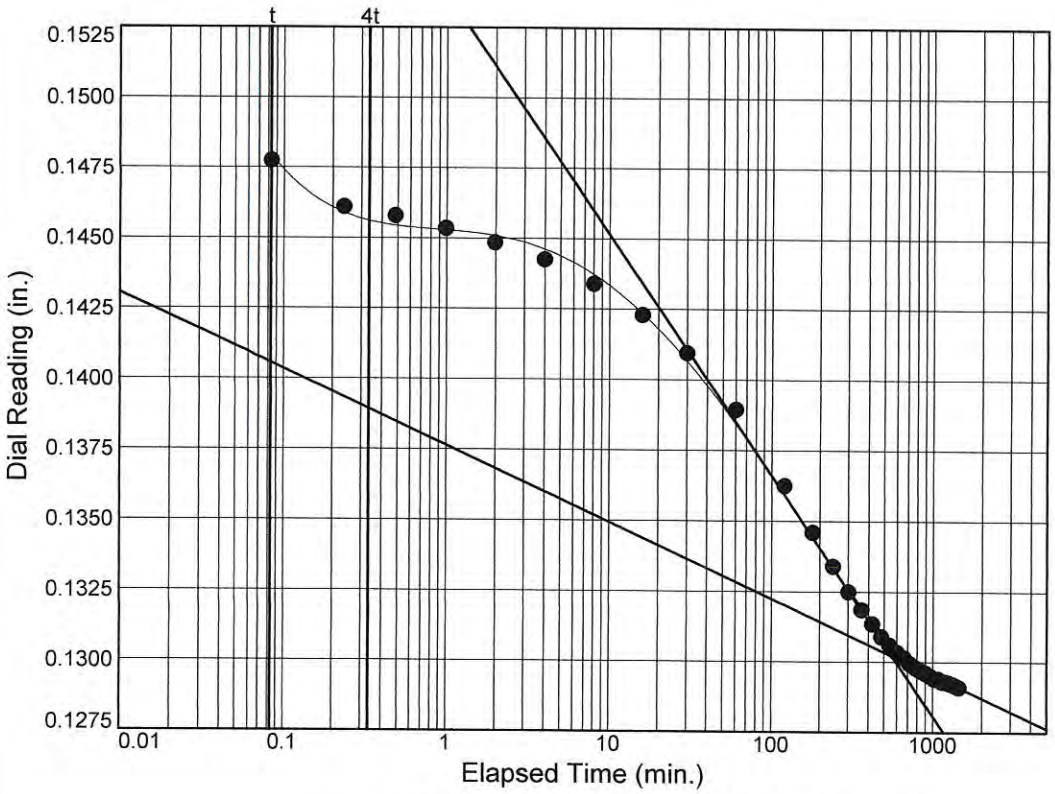
Source of Sample: SJGB047 Depth: 28




Load No.= 16
Load= 6.87 tsf
$D_0$ = 0.1550
$D_{50}$ = 0.1497
$D_{100}$ = 0.1444
$T_{50}$ = 4.20 min.

$C_v$ @ $T_{50}$
15.4 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 17
Load= 1.75 tsf
$D_0$ = 0.1503
$D_{50}$ = 0.1402
$D_{100}$ = 0.1302
$T_{50}$ = 34.60 min.

$C_v$ @ $T_{50}$
1.9 ft.$^2$/yr.

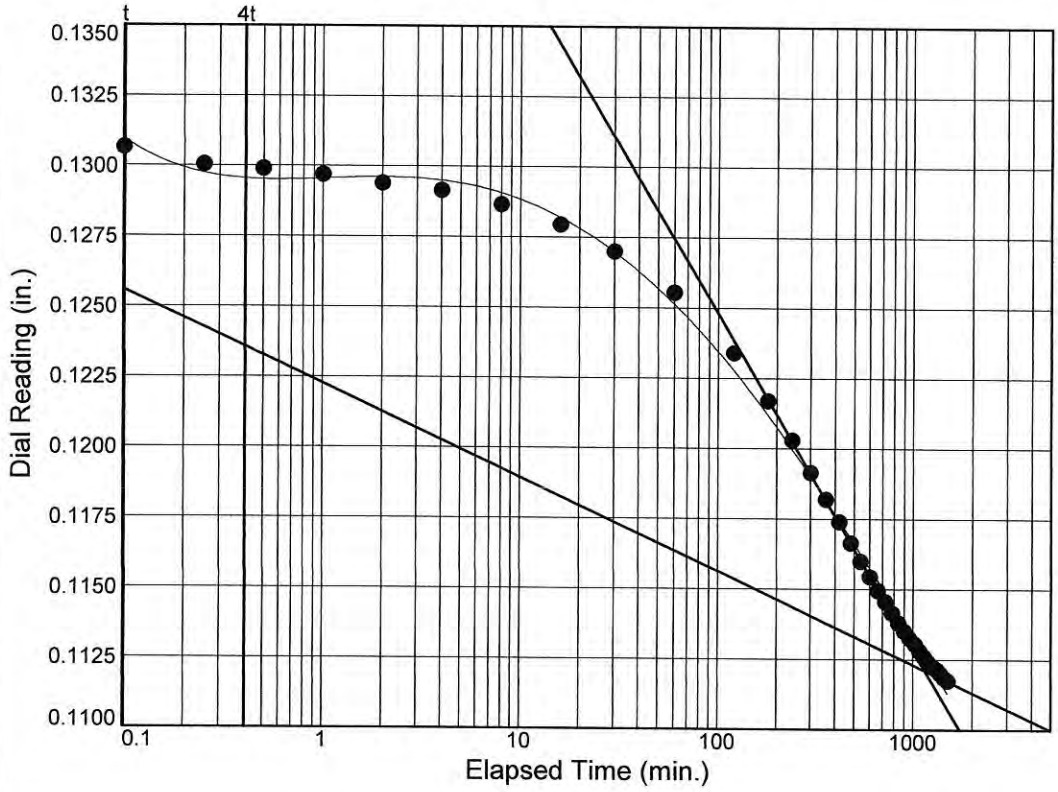
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-204

# Dial Reading vs. Time

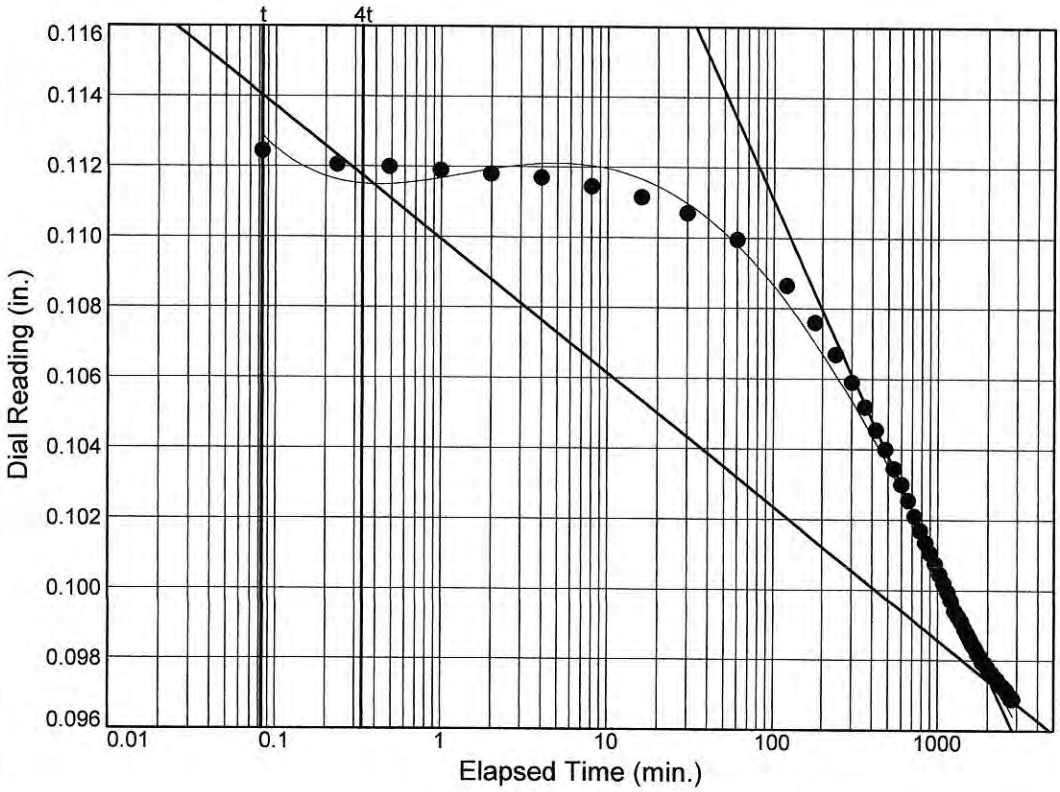
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 Depth: 28




Load No.= 18
Load= 0.43 tsf
$D_0$ = 0.1323
$D_{50}$ = 0.1222
$D_{100}$ = 0.1121
$T_{50}$ = 139.92 min.

| $C_v$ @ $T_{50}$ |
|---|
| 0.5 ft.$^2$/yr. |




Load No.= 19
Load= 0.10 tsf
$D_0$ = 0.1142
$D_{50}$ = 0.1058
$D_{100}$ = 0.0973
$T_{50}$ = 265.37 min.

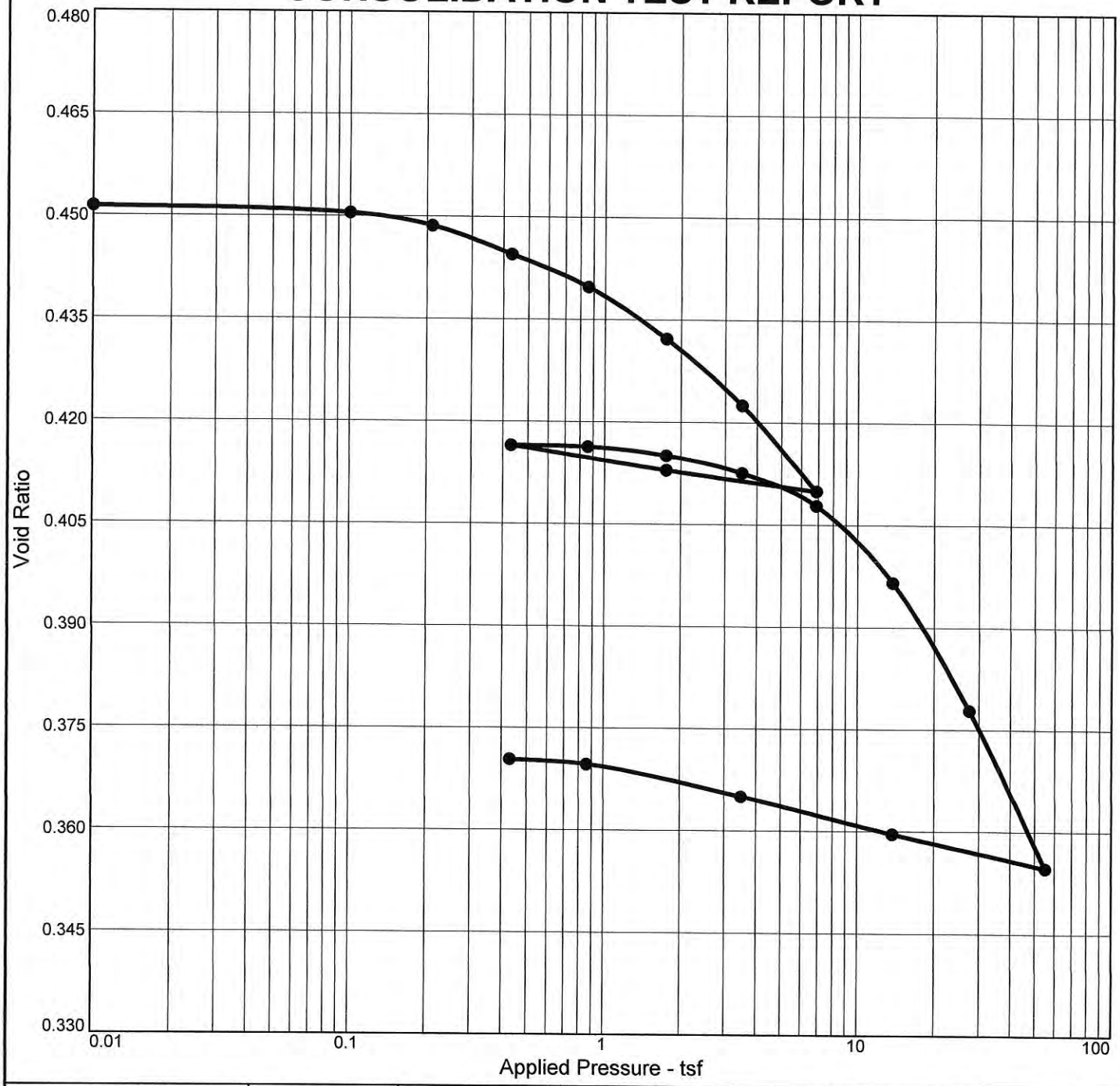
| $C_v$ @ $T_{50}$ |
|---|
| 0.3 ft.$^2$/yr. |

**TOLUNAY-WONG ENGINEERS, INC.**

Figure

Attachment Figure B.2-205

# CONSOLIDATION TEST REPORT




| Natural | | Dry Dens. (pcf) | LL | PI | Sp. Gr. | USCS | AASHTO | Initial Void Ratio |
|---|---|---|---|---|---|---|---|---|
| Saturation | Moisture | | | | | | | |
| 90.9 % | 15.2 % | 116.1 | 30 | 11 | 2.70 | CL | | 0.451 |

**MATERIAL DESCRIPTION**

Grey LEAN CLAY with SAND

**Project No.** 19.15.131 **Client:**

**Project:** San Jacinto River Waste Pit Superfund Site

**Source of Sample:** SJGB047 **Depth:** 48

**Tolunay-Wong Engineers, Inc.**

**Houston, Texas**

**Remarks:**

Test method: ASTM D2435
Specific gravity: Assumed

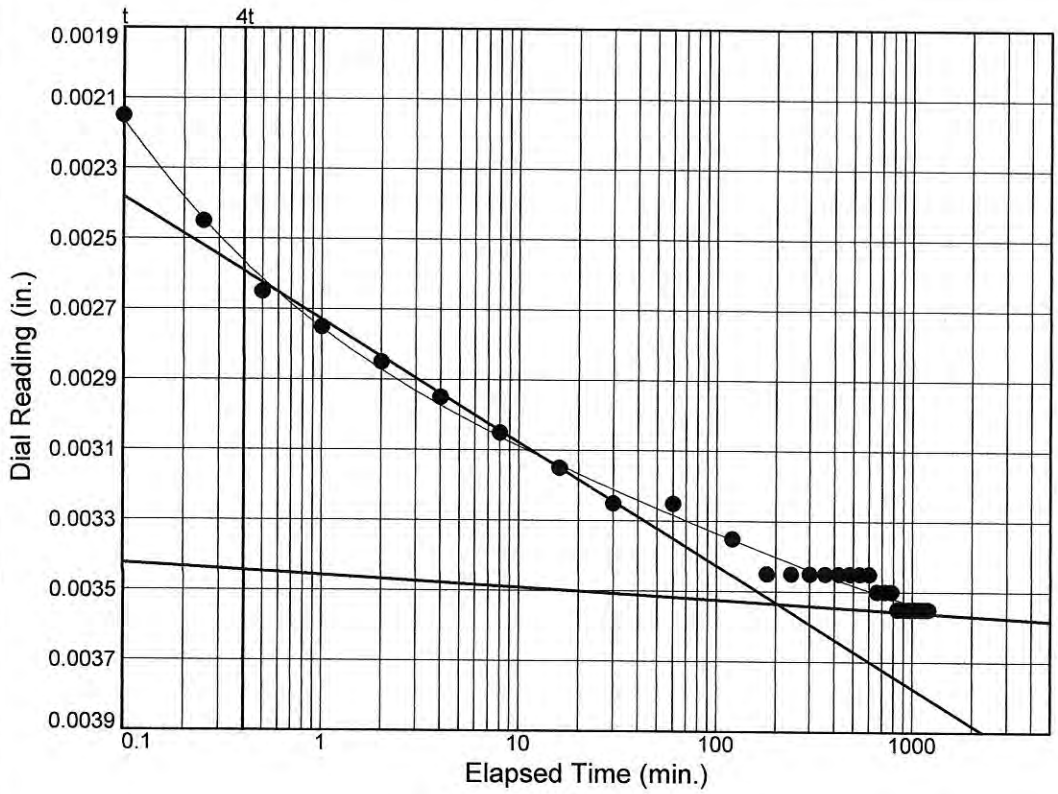
**Figure**

Attachment Figure B.2-206

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

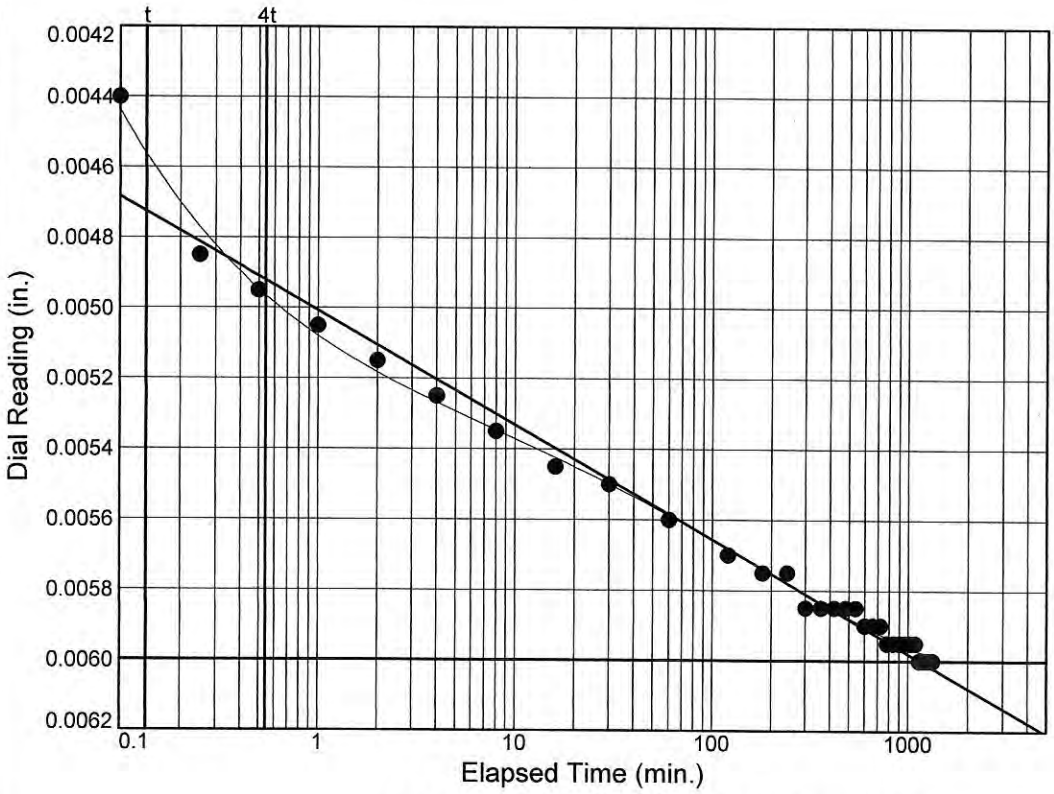
Source of Sample: SJGB047 Depth: 48




Load No.= 4
Load= 0.43 tsf
$D_0$ = 0.0018
$D_{50}$ = 0.0026
$D_{100}$ = 0.0035
$T_{50}$ = 0.59 min.

$C_v$ @ $T_{50}$
170.7 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 5
Load= 0.86 tsf
$D_0$ = 0.0042
$D_{50}$ = 0.0051
$D_{100}$ = 0.0060
$T_{50}$ = 1.00 min.

$C_v$ @ $T_{50}$
99.9 ft.$^2$/yr.

$C_\alpha$ = 0.000

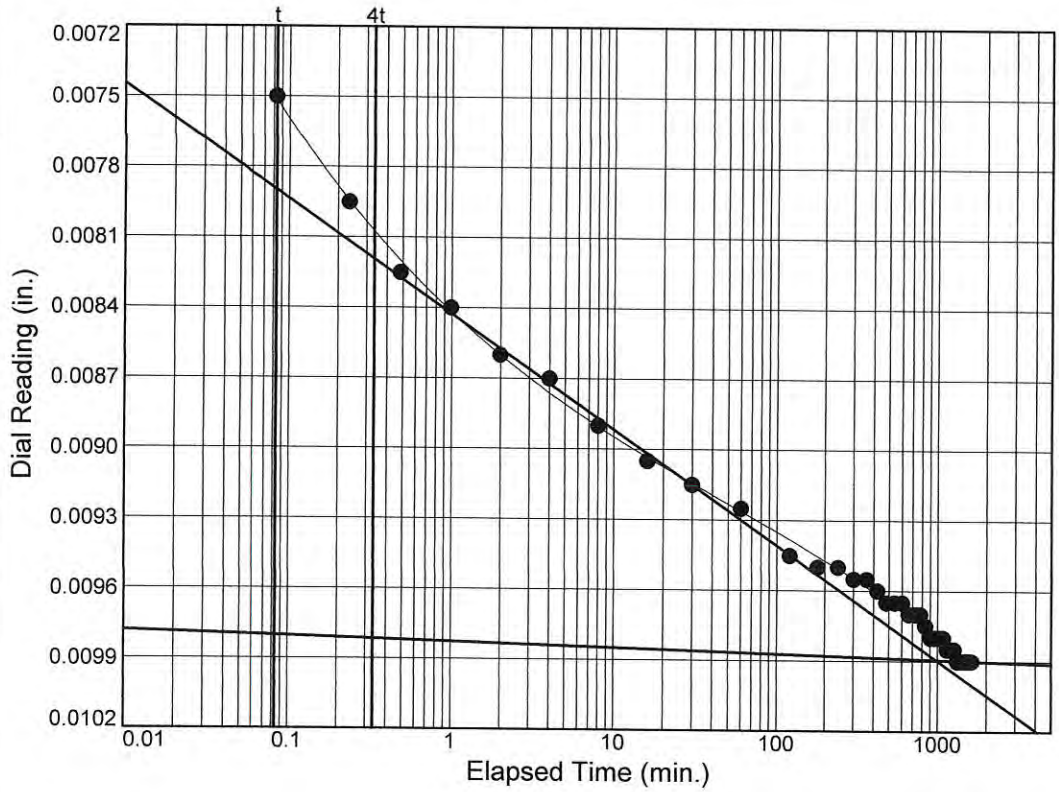
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-207

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

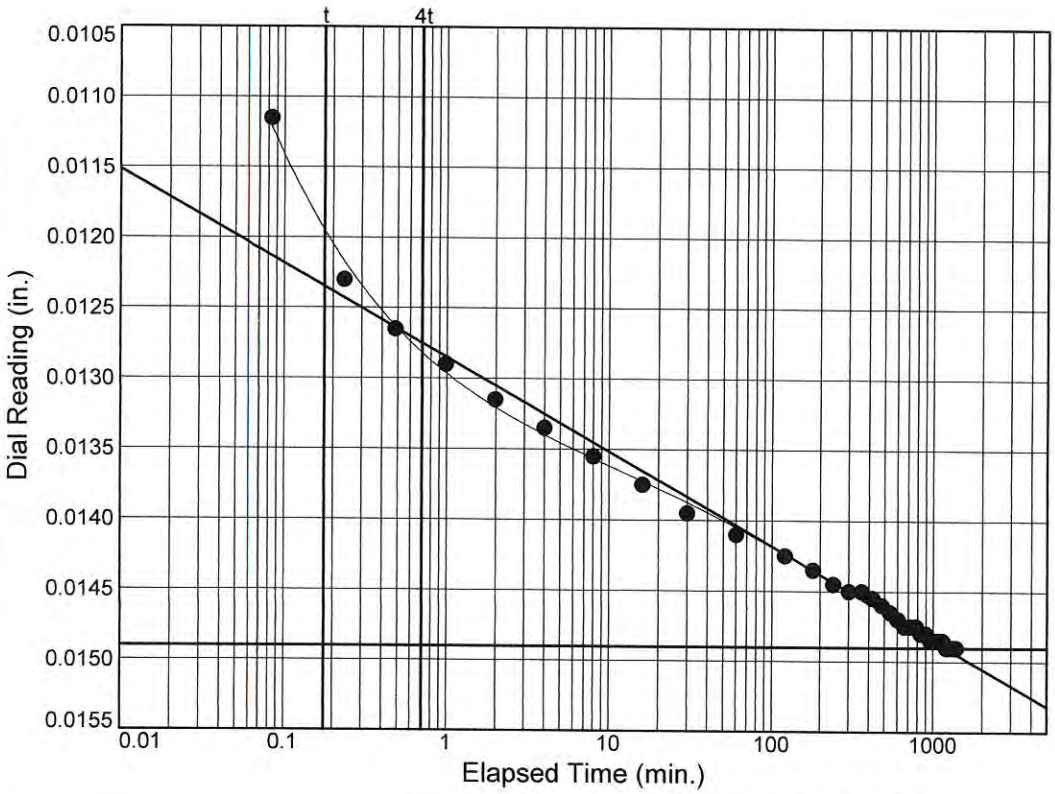
Source of Sample: SJGB047 Depth: 48




Load No.= 6
Load= 1.75 tsf
$D_0$ = 0.0070
$D_{50}$ = 0.0084
$D_{100}$ = 0.0099
$T_{50}$ = 1.02 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 97.0 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 7
Load= 3.49 tsf
$D_0$ = 0.0111
$D_{50}$ = 0.0130
$D_{100}$ = 0.0149
$T_{50}$ = 1.06 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 91.8 ft.$^2$/yr. |

$C_\alpha$ = 0.000

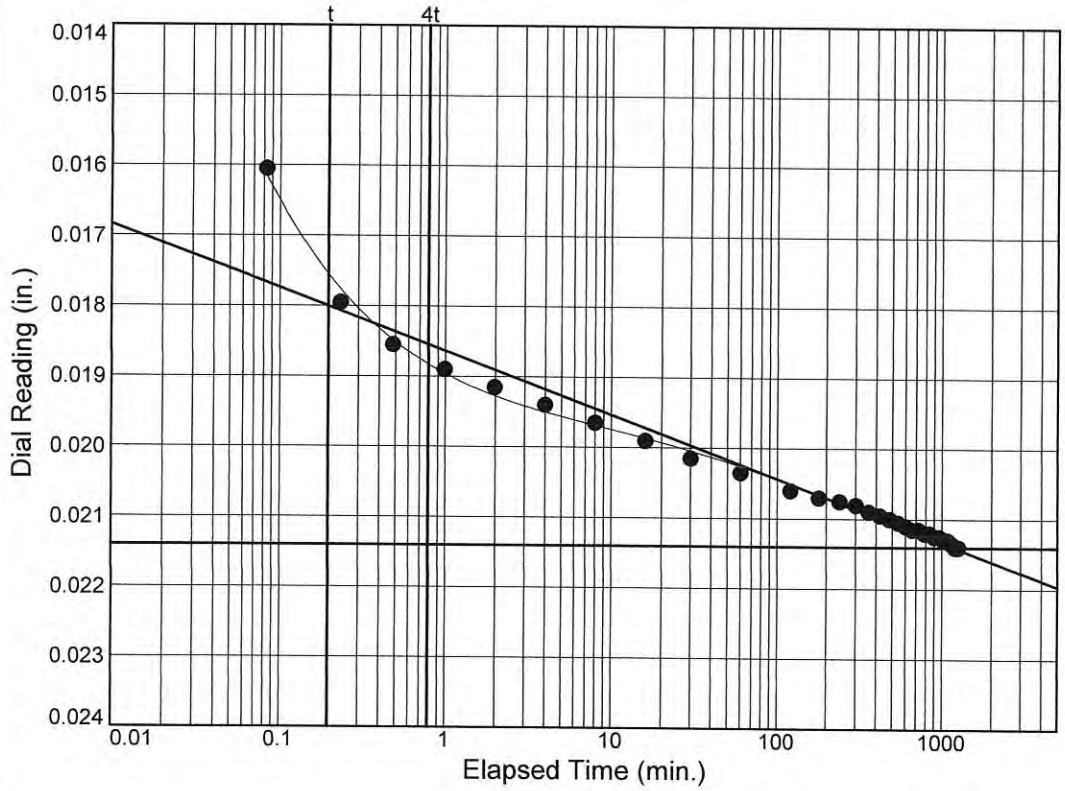
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-208

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

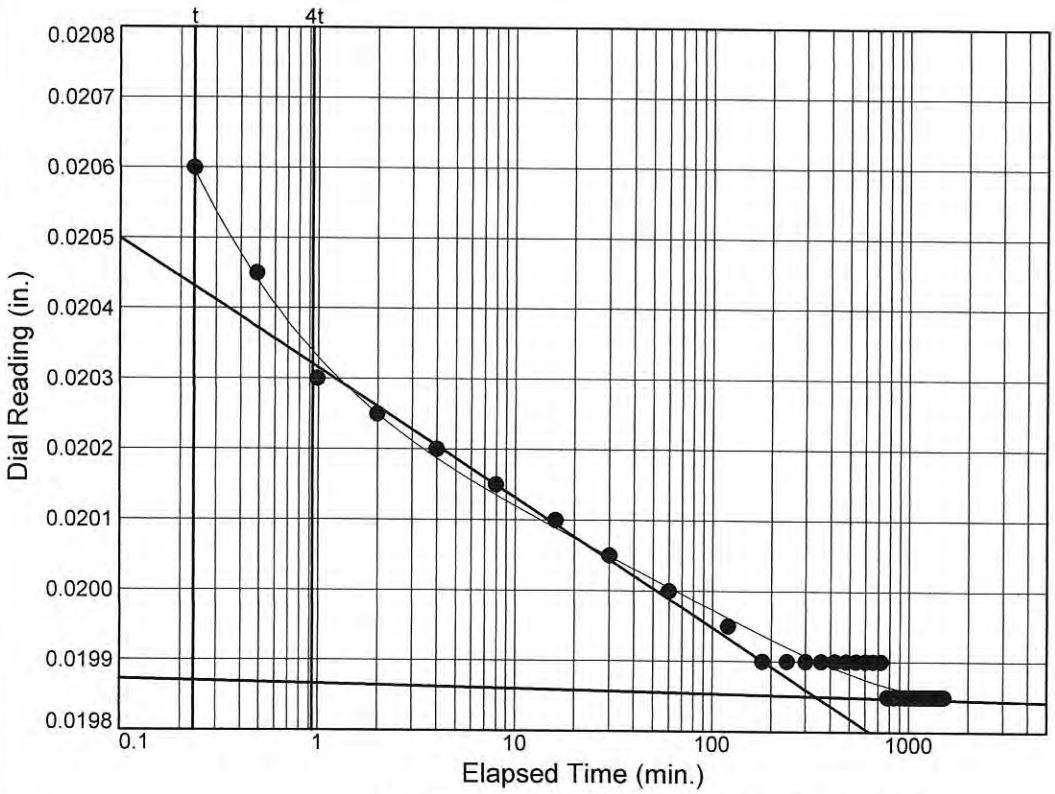
Source of Sample: SJGB047 Depth: 48




Load No.= 8
Load= 6.87 tsf
$D_0$ = 0.0163
$D_{50}$ = 0.0188
$D_{100}$ = 0.0214
$T_{50}$ = 0.80 min.

$C_v$ @ $T_{50}$
120.5 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 9
Load= 1.75 tsf
$D_0$ = 0.0209
$D_{50}$ = 0.0204
$D_{100}$ = 0.0199
$T_{50}$ = 0.86 min.

$C_v$ @ $T_{50}$
111.7 ft.$^2$/yr.

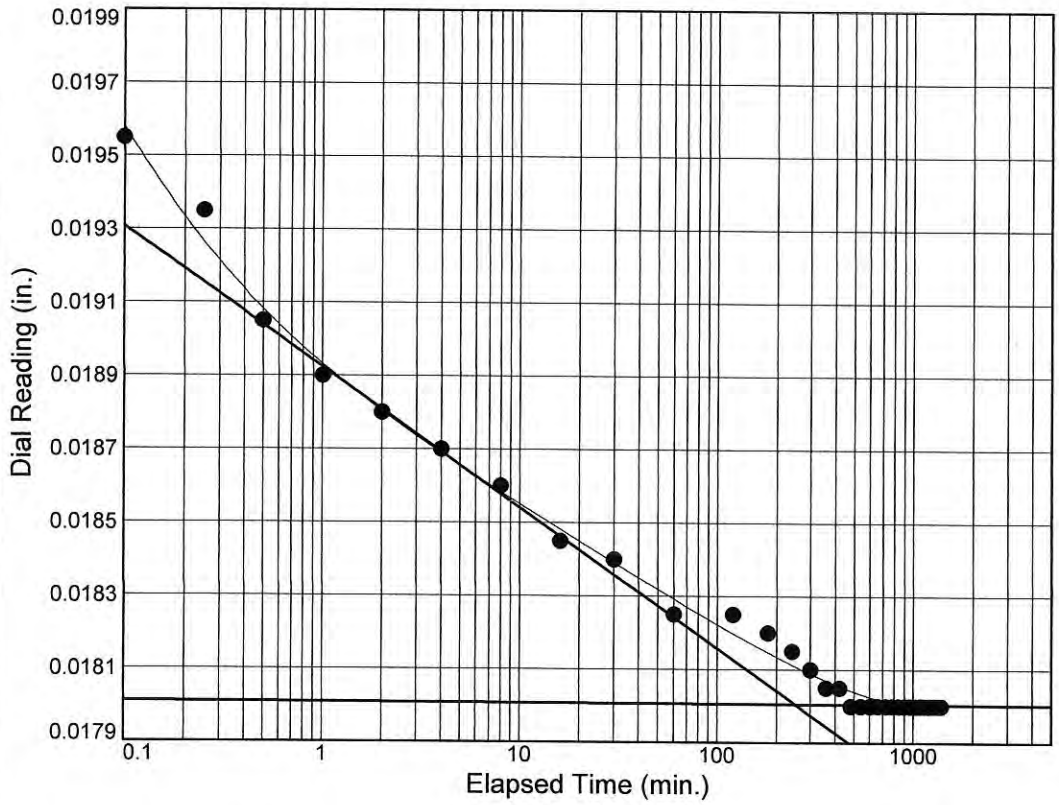
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-209

# Dial Reading vs. Time

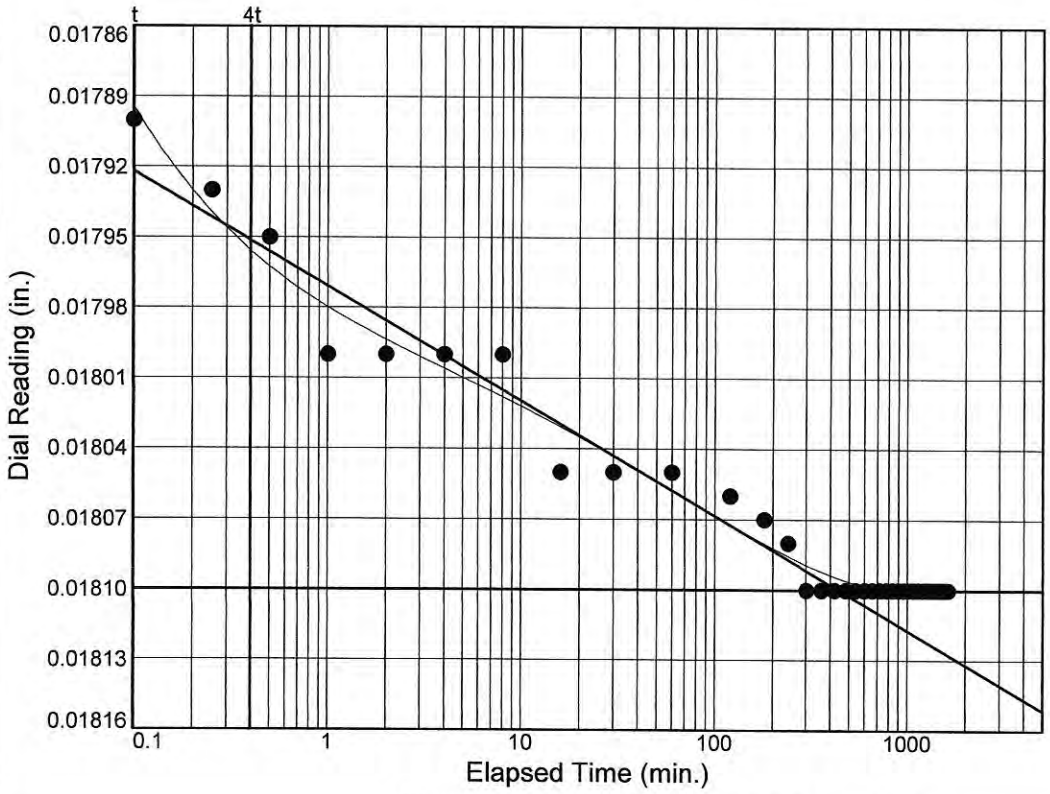
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 Depth: 48




Load No.= 10
Load= 0.43 tsf
$D_0$ = 0.0198
$D_{50}$ = 0.0189
$D_{100}$ = 0.0180
$T_{50}$ = 1.02 min.

$C_v$ @ $T_{50}$
94.0 ft.$^2$/yr.




Load No.= 11
Load= 0.86 tsf
$D_0$ = 0.0178
$D_{50}$ = 0.0180
$D_{100}$ = 0.0181
$T_{50}$ = 0.58 min.

$C_v$ @ $T_{50}$
167.3 ft.$^2$/yr.

$C_\alpha$ = 0.000

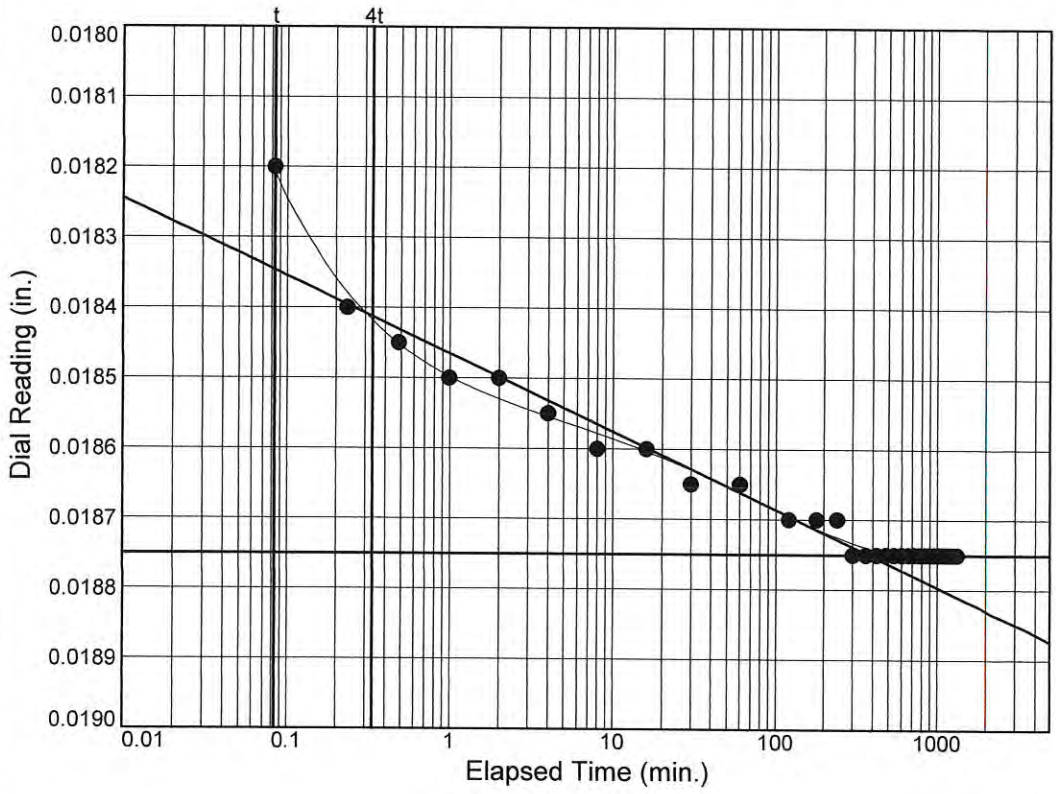
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-210

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

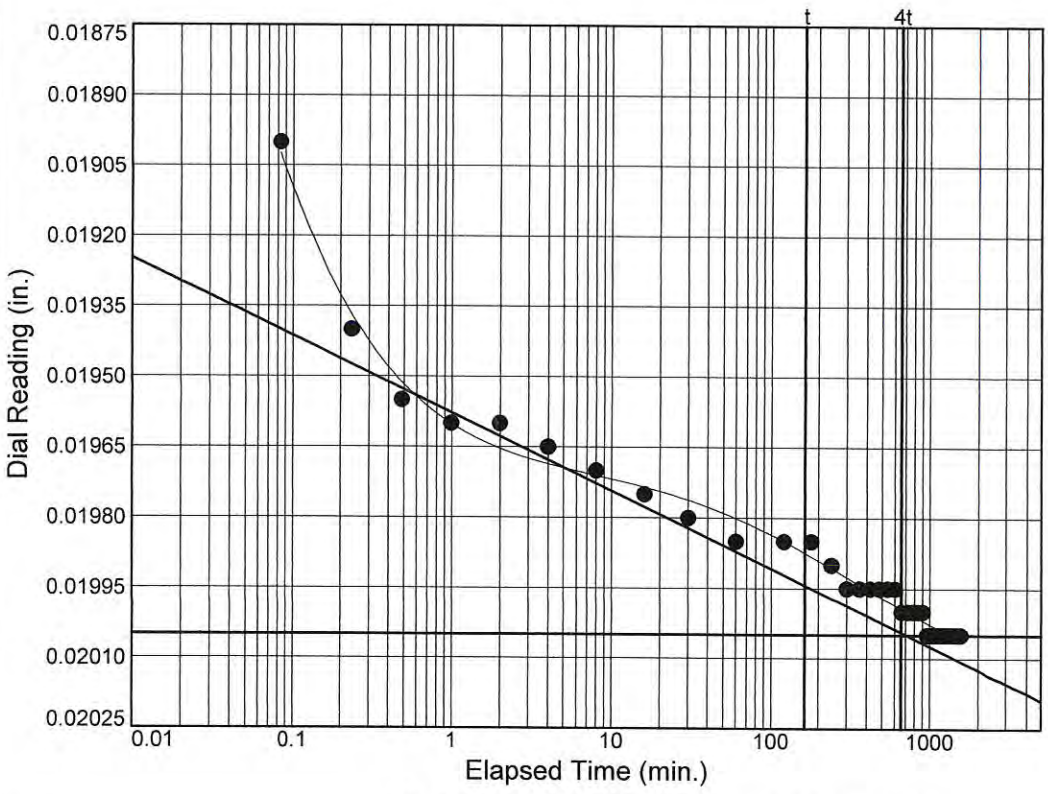
Source of Sample: SJGB047 Depth: 48




Load No.= 12
Load= 1.75 tsf
$D_0$ = 0.0180
$D_{50}$ = 0.0184
$D_{100}$ = 0.0187
$T_{50}$ = 0.22 min.

$C_v$ @ $T_{50}$
429.3 ft.$^2$/yr.

$C_\alpha$ = 0.000




Load No.= 13
Load= 3.49 tsf
$D_0$ = 0.0198
$D_{50}$ = 0.0199
$D_{100}$ = 0.0200
$T_{50}$ = 229.49 min.

$C_v$ @ $T_{50}$
0.4 ft.$^2$/yr.

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

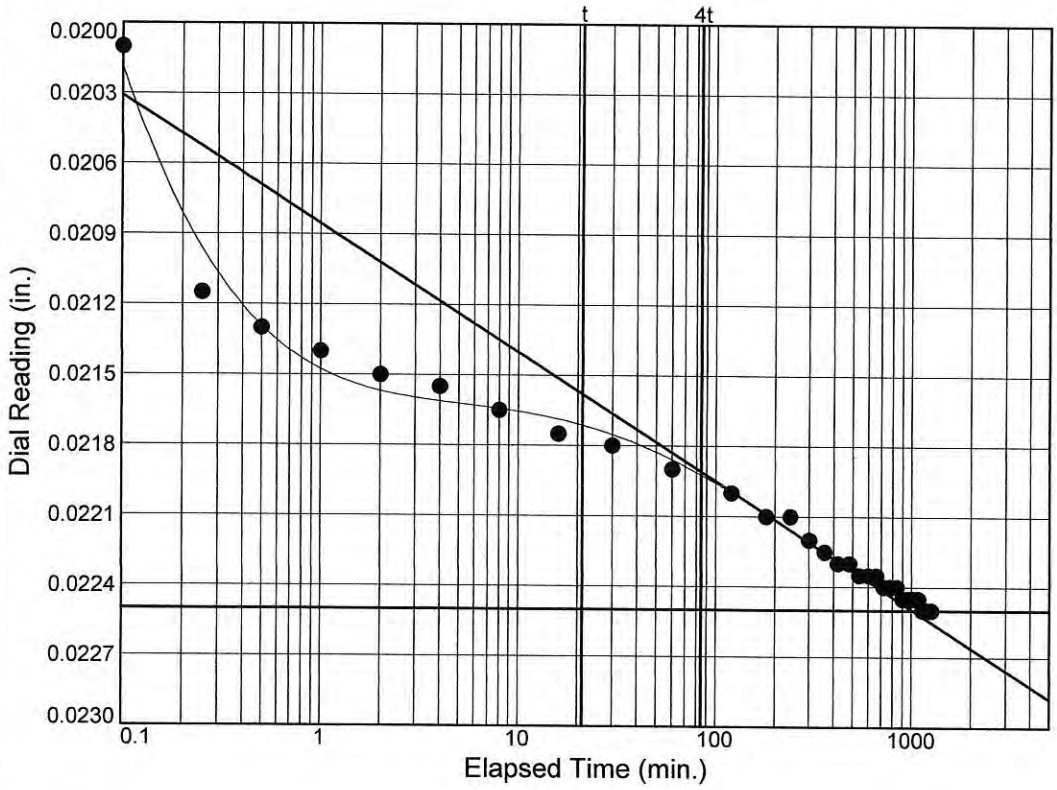
Figure

Attachment Figure B.2-211

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

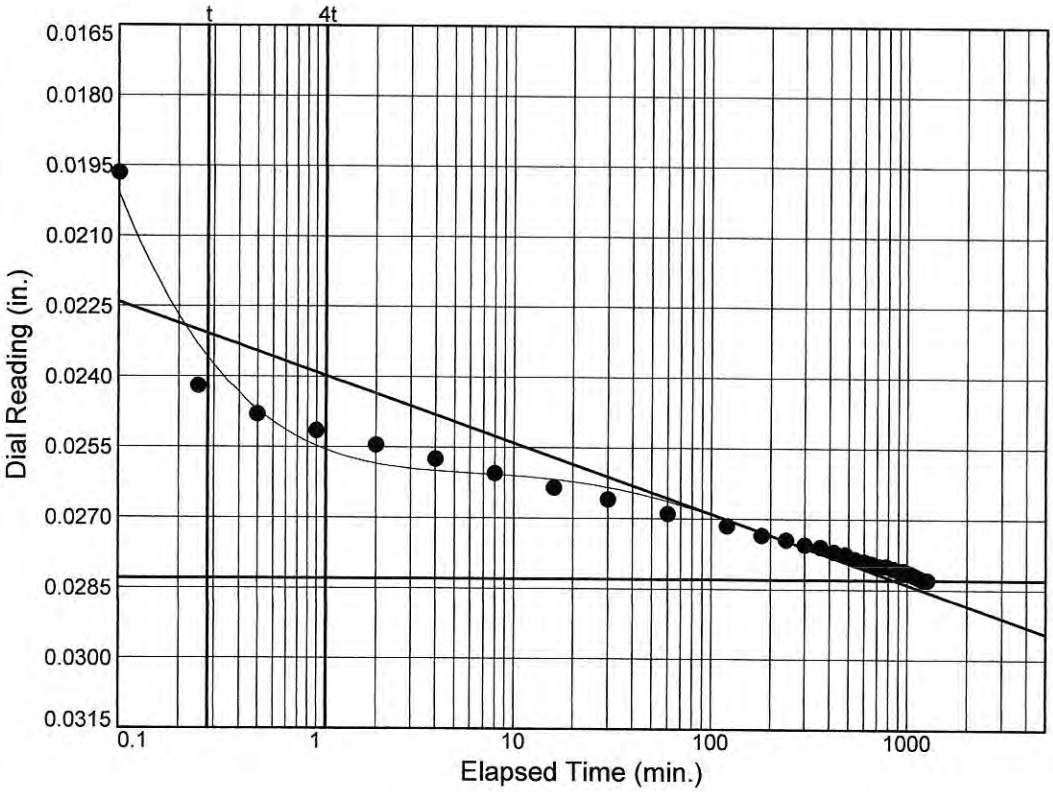
Source of Sample: SJGB047 Depth: 48




Load No.= 14
Load= 6.87 tsf
$D_0$ = 0.0215
$D_{50}$ = 0.0220
$D_{100}$ = 0.0225
$T_{50}$ = 122.02 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 0.8 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 15
Load= 13.75 tsf
$D_0$ = 0.0216
$D_{50}$ = 0.0250
$D_{100}$ = 0.0283
$T_{50}$ = 0.60 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 157.4 ft.$^2$/yr. |

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

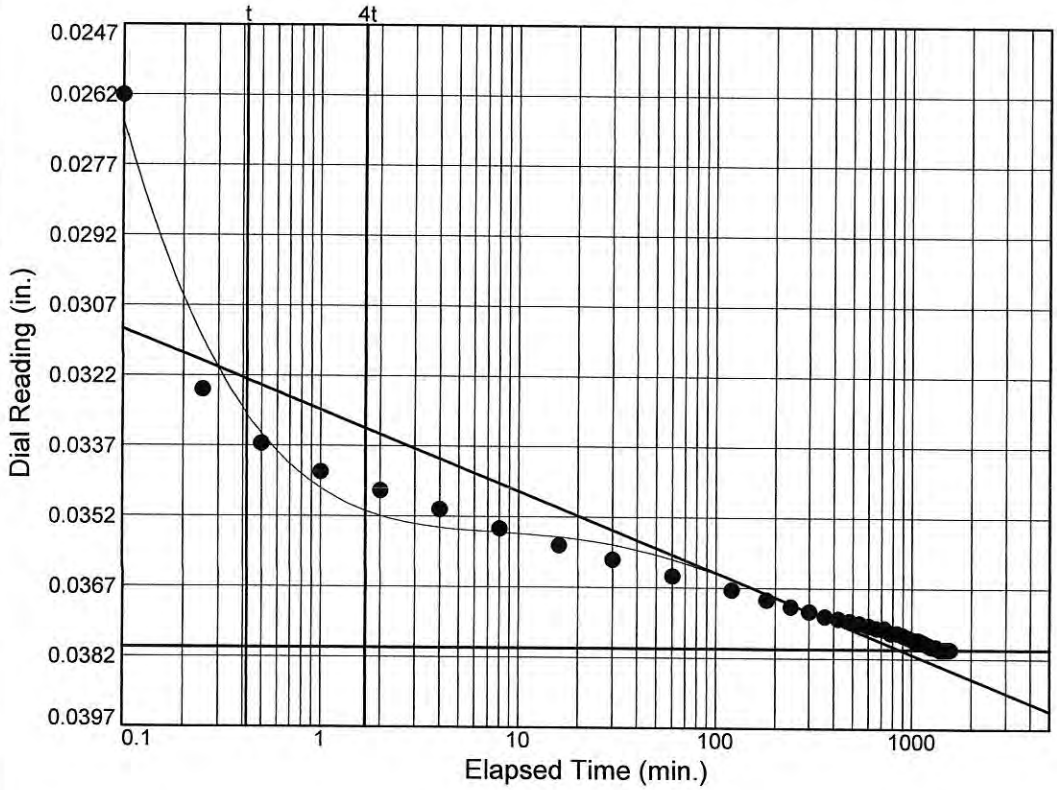
Figure

Attachment Figure B.2-212

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

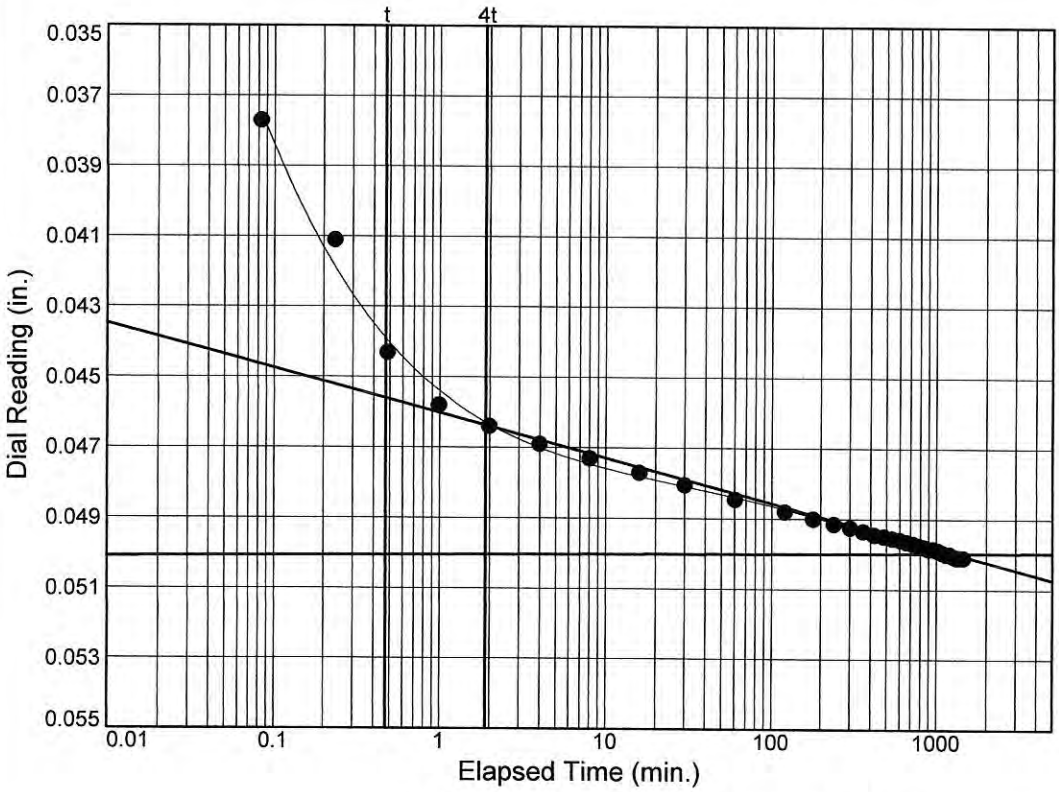
Source of Sample: SJGB047 Depth: 48




Load No.= 16
Load= 27.50 tsf
$D_0$ = 0.0310
$D_{50}$ = 0.0345
$D_{100}$ = 0.0380
$T_{50}$ = 0.91 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 101.3 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 17
Load= 54.99 tsf
$D_0$ = 0.0415
$D_{50}$ = 0.0457
$D_{100}$ = 0.0500
$T_{50}$ = 1.24 min.

| $C_v$ @ $T_{50}$ |
| --- |
| 71.9 ft.$^2$/yr. |

TOLUNAY-WONG ENGINEERS, INC.

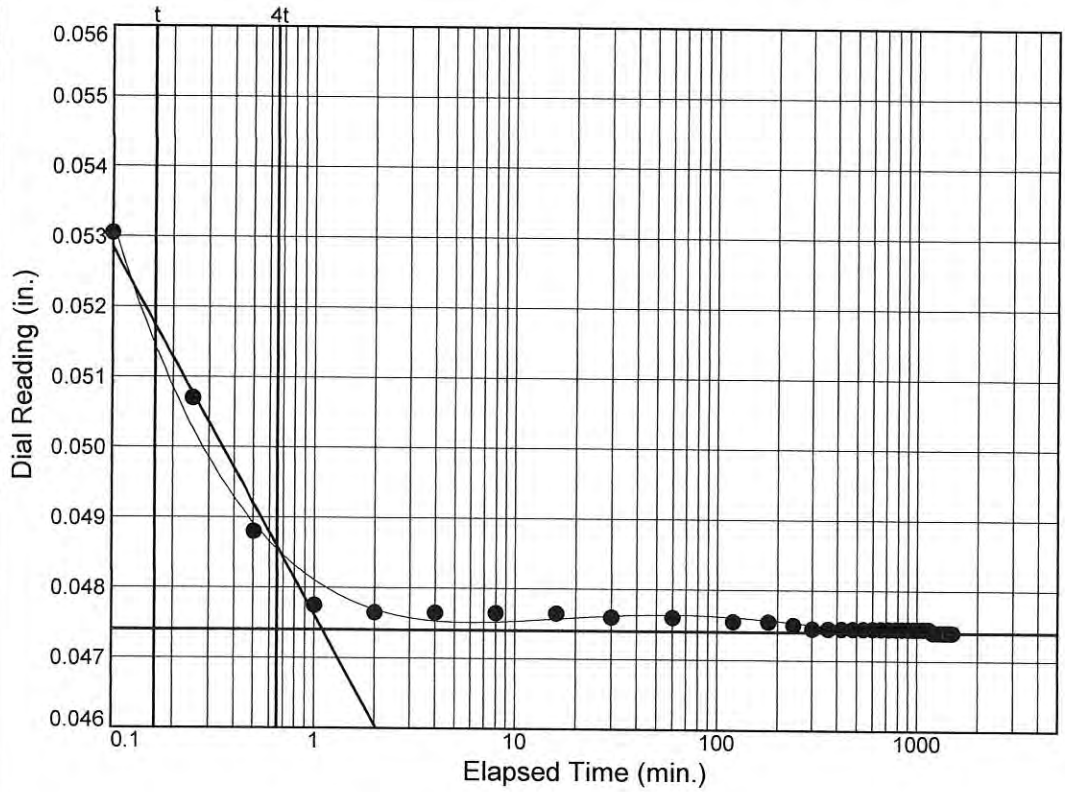
Figure

Attachment Figure B.2-213

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

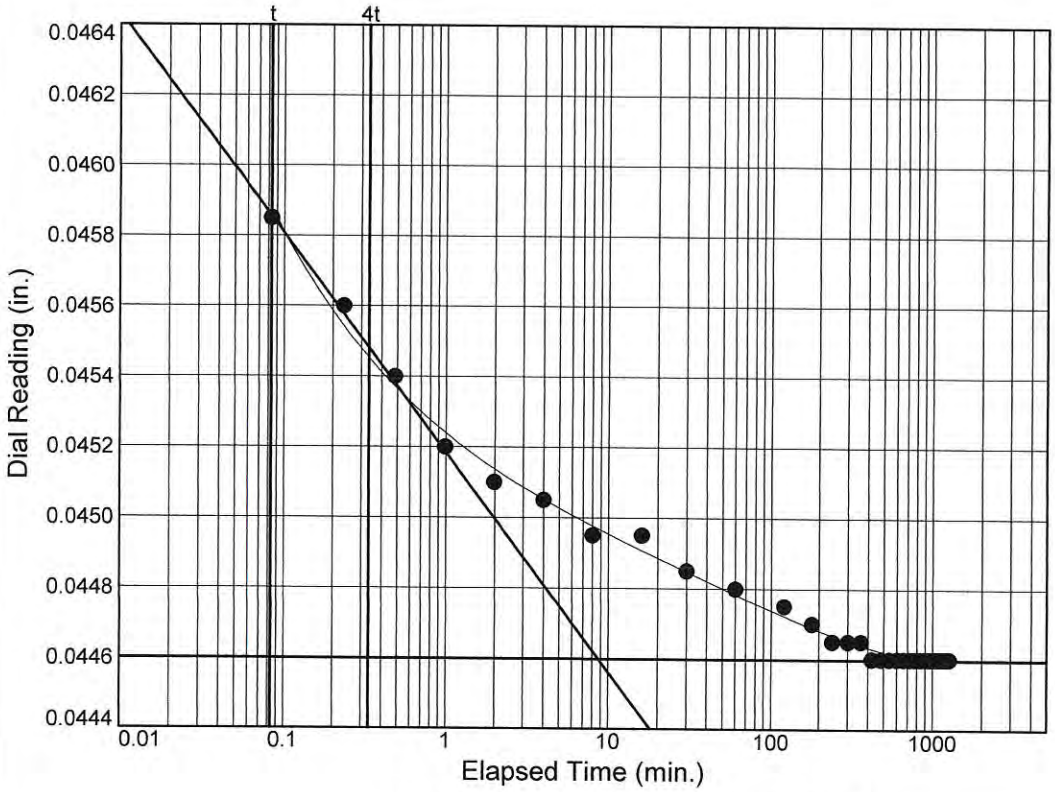
Source of Sample: SJGB047 Depth: 48




Load No.= 18
Load= 13.75 tsf
$D_0$ = 0.0543
$D_{50}$ = 0.0509
$D_{100}$ = 0.0474
$T_{50}$ = 0.20 min.

| $C_v$ @ $T_{50}$ |
|---|
| 444.5 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 19
Load= 3.49 tsf
$D_0$ = 0.0463
$D_{50}$ = 0.0455
$D_{100}$ = 0.0446
$T_{50}$ = 0.34 min.

| $C_v$ @ $T_{50}$ |
|---|
| 265.7 ft.$^2$/yr. |

TOLUNAY-WONG ENGINEERS, INC.

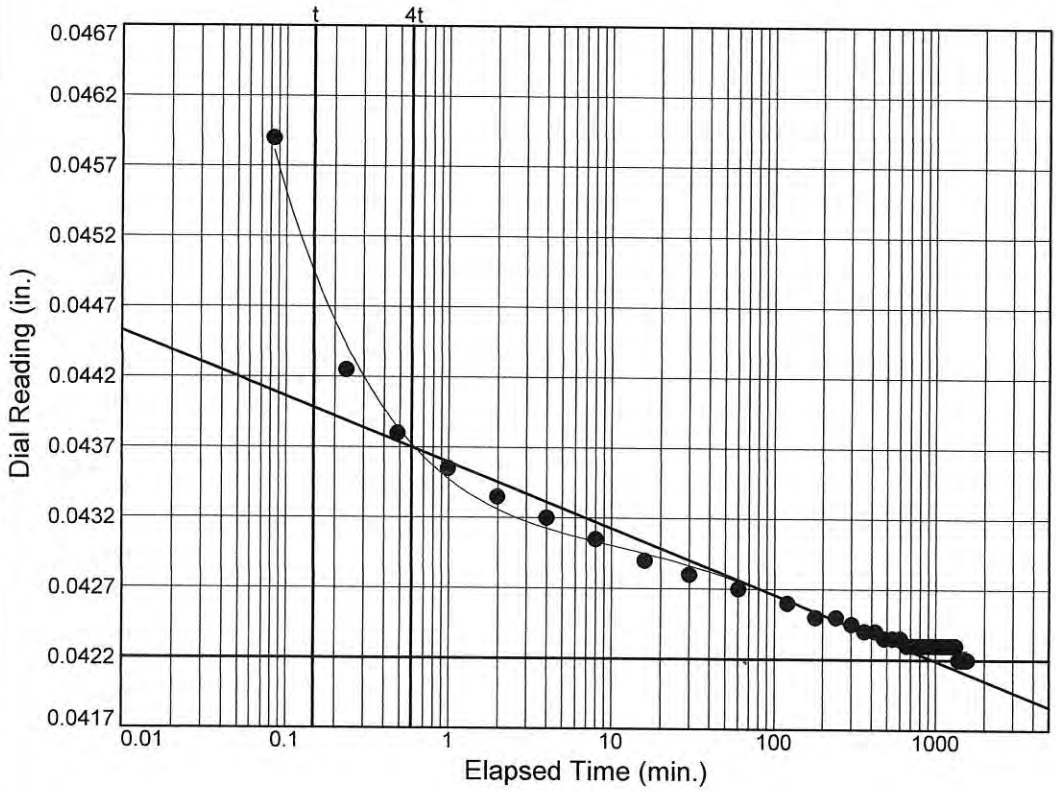
Figure

Attachment Figure B.2-214

# Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

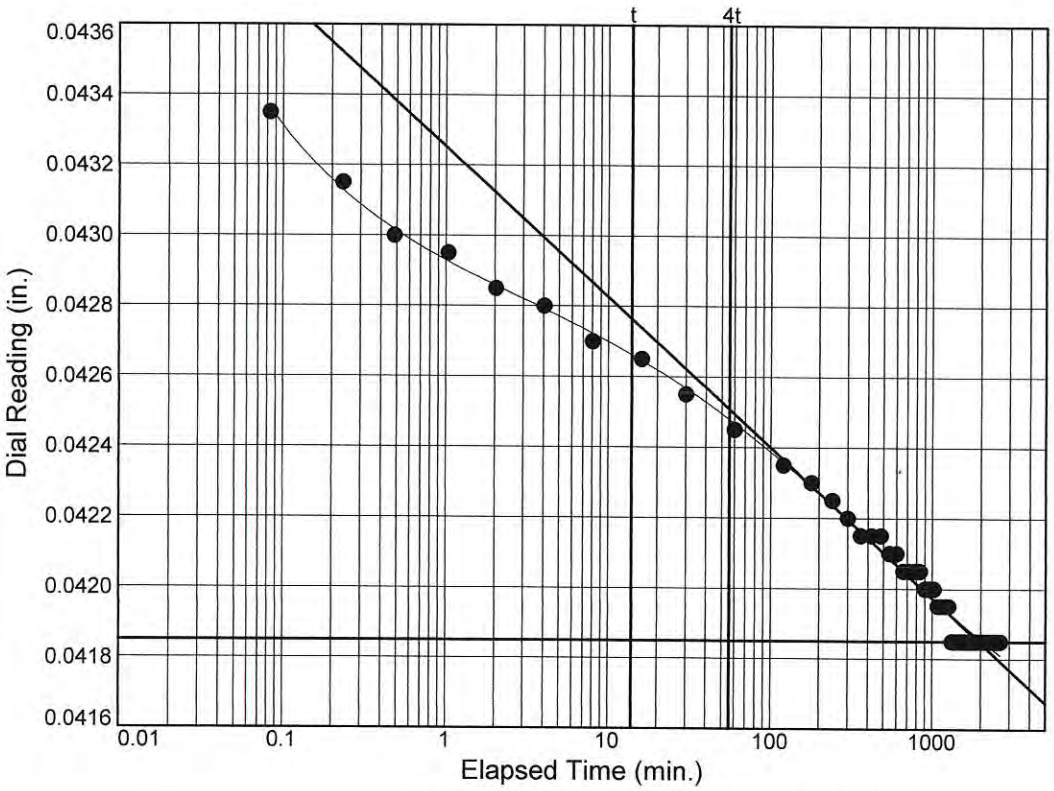
Source of Sample: SJGB047 Depth: 48




Load No.= 20
Load= 0.86 tsf
$D_0$ = 0.0462
$D_{50}$ = 0.0442
$D_{100}$ = 0.0422
$T_{50}$ = 0.30 min.

| $C_v$ @ $T_{50}$ |
|---|
| 295.9 ft.$^2$/yr. |

$C_\alpha$ = 0.000




Load No.= 21
Load= 0.43 tsf
$D_0$ = 0.0428
$D_{50}$ = 0.0423
$D_{100}$ = 0.0418
$T_{50}$ = 126.68 min.

| $C_v$ @ $T_{50}$ |
|---|
| 0.7 ft.$^2$/yr. |

$C_\alpha$ = 0.000

TOLUNAY-WONG ENGINEERS, INC.

Figure

Attachment Figure B.2-215

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJGB024

Ardaman & Associates, Inc.

File: 18-2876
Date: 9/7/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 36.74"
Long. 95° 3' 44.65"
Ground Surface Elevation: 2.64 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | | No (P) | 1.31 t=0.3 | 19 | 123 | | | | | 2.6 | | Medium Stiff to Stiff brown and black FAT CLAY (CH) w/ sand |
| | | | No (P) | 0.91 t=1.0 | 28 | 114 | | | | | | | |
| | 5 | | No (P) | 0.56 t=1.7 | 29 | 116 | 86 | 31 | 55 | | -2.4 | | |
| | | | No (P) | | 31 | | 78 | 23 | 55 | 94 | | | |
| | | | No (P) | 0.21 t=3.1 | 29 | 115 | | | | 43 | -7.4 | | Loose gray and brown CLAYEY SAND (SC) |
| | 10 | | No (P) | 3.34 t=3.8 | 75 | 94 | 133 | 51 | 82 | 91 | | | Very Stiff brown FAT CLAY (CH) |
| | | | No (P) | 0.22 t=4.5 | 32 | 109 | | | | 76 | | | Very Soft black and brown LEAN CLAY (CL) w/ sand |
| | 15 | | No (P) | 0.44 t=5.2 | 27 | 116 | 32 | 19 | 13 | 44 | -12.4 | | Loose gray and brown CLAYEY SAND (SC) |
| | | | No (P) | 0.94 t=6.6 | 25 | 123 | | | | 26 | | | |
| | 20 | | | | | | | | | | -17.4 | | Soft brown FAT CLAY (CH) |
| | 25 | | No (P) | 0.39 t=8.3 | 50 | 99 | | | | 92 | -22.4 | | |
| | | | No (P) | 0.28 t=10.1 | 61 | 95 | 122 | 58 | 64 | | | | |
| | 30 | | | | | | | | | | -27.4 | | Boring completed at 30 ft. |
| | 35 | | | | | | | | | | -32.4 | | |
| | 40 | | | | | | | | | | -37.4 | | |
| | 45 | | | | | | | | | | -42.4 | | |
| | 50 | | | | | | | | | | -47.4 | | |

**Ground Water Level Data**
☒ Free Water not Reported

**Boring Advancement Method**
Hollowstem Auger
0 to 30 ft.

**Boring Abandonment Method**
Not Reported

**Notes**
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-1

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJGB025

Ardaman & Associates, Inc.

File: 18-2876
Date: 9/10/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 38.65"
Long. 95° 3' 48.91"
Ground Surface Elevation: 4.98 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | X | 27 b/f 30-18-9 | | 14 | | | | | 25 | 5.0 | | Medium Dense gray and tan SILTY SAND (SM) w/ gravel |
| | | | No (P) | 1.05 t=1.0 | 16 | 134 | 36 | 18 | 18 | 82 | | | Stiff brown LEAN CLAY (CL) w/ sand |
| | 5 | | No (P) | 0.84 t=1.7 | 19 | 134 | 34 | 17 | 17 | | 0.0 | | Medium Stiff gray LEAN CLAY (CL) w/ sand |
| | | | No (P) | | 20 | | | | | | | | |
| | | | No (P) | | 20 | 129 | 43 | 16 | 27 | 84 | | | |
| | 10 | | No (P) | | 21 | | | | | 47 | -5.0 | | Loose gray CLAYEY SAND (SC) |
| | | | No (P) | 1.68 t=4.5 | 19 | 136 | 33 | 17 | 16 | 56 | | | Medium Stiff to Stiff brown SANDY LEAN CLAY (CLs) |
| | 15 | | No (P) | | 24 | | | | | 62 | -10.0 | | |
| | | ○ | | | | | | | | | | | No Recovery |
| | 20 | X | 34 b/f 6-14-20 | | 22 | | | | | 22 | -15.0 | | Dense gray SILTY SAND (SM) |
| | | X | 6 b/f 2-2-4 | | 34 | | | | | 44 | | | Loose gray SILTY SAND (SC) |
| | 25 | X | 5 b/f 1-2-3 | | 34 | | NP | NP | NP | | -20.0 | | |
| | | X | 18 b/f 5-7-11 | | 23 | | | | | 31 | | | Medium Dense gray CLAYEY SAND (SC) |
| | 30 | | | | | | | | | | -25.0 | | Boring completed at 29.5 ft. |
| | 35 | | | | | | | | | | -30.0 | | |
| | 40 | | | | | | | | | | -35.0 | | |
| | 45 | | | | | | | | | | -40.0 | | |
| | 50 | | | | | | | | | | -45.0 | | |

**Ground Water Level Data**
☒ Free Water not Reported

**Boring Advancement Method**
Hollowstem Auger
0 to 30 ft.

**Boring Abandonment Method**
Not Reported

**Notes**
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-2

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJGB026

Ardaman & Associates, Inc.

File: 18-2876
Date: 9/9/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 39.24"
Long. 95° 3' 49.86"
Ground Surface Elevation: 5.34 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | | No (P) | | 13 | | NP | NP | NP | 81 | 5.3 | | Loose brown SILT (ML) w/ sand |
| | | | No (P) | | 21 | 129 | | | | 98 | | | Medium Stiff to Stiff tan and gray LEAN CLAY (CL) |
| | 5 | | No (P) | 1.42 t=1.7 | 19 | 125 | 41 | 18 | 23 | 84 | 0.3 | | |
| | | | No (P) | 0.69 t=2.4 | 19 | 125 | | | | 97 | | | |
| | | | No (P) | 0.87 t=3.1 | 21 | 126 | 35 | 17 | 18 | 83 | | | w/ sand |
| | 10 | | No (P) | | 23 | | | | | 50 | -4.7 | | Loose gray CLAYEY SAND (SC) |
| | | | No (P) | 1.72 t=4.5 | 21 | 132 | NP | NP | NP | 66 | | | Stiff tan and gray SANDY SILT (MLs) w/ clay |
| | 15 | | | | | | | | | | -9.7 | | No Recovery |
| | | | | | | | | | | | | | No Recovery |
| | 20 | | 6 b/f 4-3-3 | | 26 | | | | | 55 | -14.7 | | Loose gray and brown SANDY SILT (MLs) |
| | | | | | | | | | | | | | Boring completed at 21.5 ft. |
| | 25 | | | | | | | | | | -19.7 | | |
| | 30 | | | | | | | | | | -24.7 | | |
| | 35 | | | | | | | | | | -29.7 | | |
| | 40 | | | | | | | | | | -34.7 | | |
| | 45 | | | | | | | | | | -39.7 | | |
| | 50 | | | | | | | | | | -44.7 | | |

**Ground Water Level Data**
☒ Free Water not Reported

**Boring Advancement Method**
Hollowstem Auger
0 to 22 ft.

**Boring Abandonment Method**
Not Reported

**Notes**
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-3

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJGB027

Ardaman & Associates, Inc.

File: 18-2876
Date: 12/4/19
Logged by: Breanna North
Driller: TWE
Rig: CME Truck

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 41.34"
Long. 95° 3' 47.36"
Ground Surface Elevation: 3.92 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | | | | 11 | | | | | | 3.9 | | Loose tan SILTY GRAVEL (GM) |
| | | | 0.50 (P) | 0.17 t=2.0 | 140 | 78 | 151 | 44 | 107 | 81 | | | Very Soft dark gray ORGANIC CLAY (OH) w/ sand |
| | 5 | | 1.75 (P) | 0.18 t=3.5 | 23 | 128 | 41 | 21 | 20 | 44 | -1.1 | | Loose gray CLAYEY SAND (SC) |
| | | | 1.25 (P) | 1.15 t=4.0 | 20 | 129 | 37 | 17 | 20 | 56 | | | Medium Stiff dark gray SANDY LEAN CLAY (CLs) |
| | | | 1.25 (P) | 0.73 t=5.0 | 18 | 131 | 39 | 18 | 21 | | | | |
| | 10 | | | | 23 | 131 | 30 | 17 | 13 | 81 | -6.1 | | |
| | | ☒ | 0 b/f | | 32 | | 49 | 19 | 30 | 31 | | | Very Loose dark gray CLAYEY SAND (SC) |
| | 15 | ☒ | 0 b/f | | 27 | | 24 | 16 | 8 | 27 | -11.1 | | |
| | 20 | ☒ | 4 b/f 0-2-2 | | 28 | | NP | NP | NP | 40 | -16.1 | | Very Loose to Loose dark gray SILTY SAND (SM) |
| | 25 | ☒ | 2 b/f 1-1-1 | | 21 | | NP | NP | NP | 8 | -21.1 | | Very Loose gray Sand (SP-SM) w/ silt |
| | 30 | ☒ | 9 b/f 2-3-6 | | 22 | | 26 | 16 | 10 | 11 | -26.1 | | Loose gray SAND (SP-SC) w/ clay |
| | 35 | ☒ | 9 b/f 3-4-5 | | 16 | | 32 | 17 | 15 | 36 | -31.1 | | Loose gray CLAYEY SAND (SC) |
| | 40 | | 1.75 (P) | | 20 | 128 | 40 | 18 | 22 | 79 | -36.1 | | Stiff reddish brown SANDY LEAN CLAY (CLs) |
| | | | 2.50 (P) | | 41 | | 49 | 19 | 30 | | -41.1 | | |
| | 45 | | | | | | | | | | | | Stiff reddish brown FAT CLAY (CH) |
| | | | 2.75 (P) | 1.95 t=21.0 | 31 | 121 | 59 | 21 | 38 | | -46.1 | | Boring completed at 50 ft. |
| | 50 | | | | | | | | | | | | |
| | 55 | | | | | | | | | | -51.1 | | |
| | 60 | | | | | | | | | | -56.1 | | |
| | 65 | | | | | | | | | | -61.1 | | |
| | 70 | | | | | | | | | | -66.1 | | |
| | 75 | | | | | | | | | | -71.1 | | |
| | 80 | | | | | | | | | | -76.1 | | |

**Ground Water Level Data**
☒ No free water encountered

**Boring Advancement Method**
4" Nom. Dia. Short Flight Auger:
0 to 14 ft.
4" Dia. Rotary Wash:
14 to 50 ft.

**Boring Abandonment Method**
Not Reported

**Notes**
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-4

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJSB047-G

Ardaman & Associates, Inc.

File: 18-2876
Date:
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck on Barge

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 38.5" Long. 95° 3' 41.9"
Ground Surface Elevation: -3.4 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 b/f | | 31 | | | | | 97 | -3.4 | | Loose brown SILT (ML) |
| | | | 0 b/f | | 37 | | | | | | | | |
| | 5 | | 0 b/f | | 43 | | | | | 94 | -8.4 | | |
| | | | 0 b/f | | | | | | | | | | Soft brown SANDY LEAN CLAY (CLs) |
| | | | 0 b/f | | 30 | | | | | 70 | | | |
| | 10 | | 0 b/f | | 39 | | 39 | 20 | 19 | 74 | -13.4 | | |
| | | | 0 b/f | | 64 | | | | | | | | Soft brown FAT CLAY (CH) |
| | 15 | | 1 b/f 0-0-1 | | 58 | | | | | 97 | -18.4 | | |
| | | | 0.25 (P) | 0.29 t=6.6 | 38 | 99 | 79 | 24 | 55 | 56 | | | Soft gray SANDY FAT CLAY (CHs) |
| | 20 | | | | | | | | | | -23.4 | | |
| | | | 2.50 (P) | 1.44 t=8.3 | 20 | 136 | 42 | 18 | 24 | 73 | | | Stiff gray LEAN CLAY (CL) w/ sand |
| | 25 | | | | | | | | | | -28.4 | | |
| | | | 1.75 (P) | | 16 | | 27 | 21 | 6 | 60 | | | Stiff reddish brown SANDY SILTY CLAY (CL-ML) |
| | 30 | | | | | | | | | | -33.4 | | |
| | | | 3.25 (P) | 1.00 t=11.8 | 29 | 124 | 59 | 39 | 20 | 98 | | | Stiff reddish brown SILT (MH) |
| | 35 | | | | | | | | | | -38.4 | | |
| | | | 3.00 (P) | 1.73 t=13.5 | 31 | 126 | 74 | 34 | 40 | 100 | | | Stiff reddish brown FAT CLAY (CH) |
| | 40 | | | | | | | | | | -43.4 | | |
| | | | 1.50 (P) | 3.36 t=15.3 | 19 | 138 | 42 | 18 | 24 | 84 | | | Very Stiff reddish brown LEAN CLAY (CL) |
| | 45 | | | | | | | | | | -48.4 | | |
| | | | 3.50 (P) | | 18 | | 30 | 19 | 11 | 76 | | | |
| | 50 | | | | | | | | | | -53.4 | | Medium Dense to Dense gray SILT (ML) |
| | | | 14 b/f 8-8-6 | | 20 | | | | | 93 | | | |
| | 55 | | | | | | | | | | -58.4 | | |
| | | | 33 b/f 12-16-17 | | 23 | | | | | 92 | | | |
| | 60 | | | | | | | | | | -63.4 | | Very Loose gray SILT (ML) |
| | | | 2 b/f 3-1-1 | | 27 | | NP | NP | NP | 93 | | | |
| | 65 | | | | | | | | | | -68.4 | | Medium Dense gray SILT (ML) |
| | | | 29 b/f 4-8-21 | | 26 | | | | | 98 | | | |
| | 70 | | | | | | | | | | -73.4 | | Very Dense gray SILT (ML) w/ sand |
| | | | 51 b/f 15-21-30 | | 23 | | | | | 82 | | | |
| | 75 | | | | | | | | | | -78.4 | | Very Dense gray SANDY SILT (MLs) |
| | | | 75 b/f 25-31-44 | | 22 | | | | | 68 | | | |
| | 80 | | | | | | | | | | -83.4 | | Very Dense gray SILTY SAND (SM) |
| | | | 50 b/f 17-23-27 | | 19 | | NP | NP | NP | 46 | | | |
| | 85 | | | | | | | | | | -88.4 | | |
| | | | 53 b/f 16-23-30 | | 18 | | | | | 39 | | | |
| | 90 | | | | | | | | | | -93.4 | | |
| | | | 65 b/f 25-35-30 | | 18 | | NP | NP | NP | 26 | | | |
| | 95 | | | | | | | | | | -98.4 | | Stiff tan and gray FAT CLAY (CH) |
| | | | 2.00 (P) | 0.33 t=35.0 | 21 | 119 | 73 | 23 | 50 | | | | |
| | 100 | | | | | | | | | | -103.4 | | Boring completed at 100 ft. |
| | 105 | | | | | | | | | | -108.4 | | |

**Ground Water Level Data**

**Boring Advancement Method**

4" Dia. Rotary Wash:
to 100 ft.

**Boring Abandonment Method**

Not Reported

**Notes**

t = Lateral Confining Pressure (psi).

Attachment Figure B.3-5

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJSB050-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 11/20/19
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 41.36"
Long. 95° 3' 40.53"
Ground Surface Elevation: -3.6 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | | 0 b/f | | 100 | | | | | 98 | -3.6 | | Very Soft brown FAT CLAY (CH) |
| | | | 0 b/f | | 82 | | | | | 41 | | | Very Loose brown CLAYEY SAND (SC) |
| | 5 | | | 0.30 t=1.7 | 29 | 109 | 32 | 16 | 16 | | -8.6 | | Very Soft to Soft brown LEAN CLAY (CL) |
| | | | | 0.08 t=2.4 | 33 | 113 | 34 | 17 | 17 | 43 | | | Very Loose gray CLAYEY SAND (SC) |
| | | | 0 b/f | | 56 | | | | | 86 | | | Very Soft to Soft gray LEAN CLAY (CL) |
| | 10 | | 0 b/f | | 49 | | 41 | 18 | 23 | 83 | -13.6 | | |
| | | | 1 b/f 0-0-1 | | 47 | | | | | 70 | | | Very Soft to Soft brown LEAN CLAY (CL) w/ sand |
| | 15 | | 10 b/f 3-5-5 | | 23 | | | | | 52 | -18.6 | | Loose gray SANDY SILTY (MLs) |
| | | | 1 b/f 1-1-0 | | 37 | | | | | 10 | | | Very Loose gray SAND (SP-SM) |
| | 20 | | | | | | | | | | -23.6 | | Boring completed at 19.5 ft. |
| | 25 | | | | | | | | | | -28.6 | | |
| | 30 | | | | | | | | | | -33.6 | | |
| | 35 | | | | | | | | | | -38.6 | | |
| | 40 | | | | | | | | | | -43.6 | | |
| | 45 | | | | | | | | | | -48.6 | | |
| | 50 | | | | | | | | | | -53.6 | | |

**Ground Water Level Data**
☒ Free Water not Reported

**Boring Advancement Method**
4" Dia. Rotary Wash:
to 19.5 ft.

**Boring Abandonment Method**
Not Reported

**Notes**
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-6

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJSB053-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 11/19/19
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck on Barge

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 43.62"
Long. 95° 3' 42.93"
Ground Surface Elevation: -9.7 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | ☒ | 0 b/f | | 31 | | | | | 41 | -9.7 | | Very Loose brown CLAYEY SAND (SC) |
| | | ☒ | 0 b/f | | 57 | | | | | | | | |
| | 5 | ☒ | 0 b/f | | 66 | | | | | | -14.7 | | Very Soft brown SANDY FAT CLAY (CHs) |
| | | ☒ | 0 b/f | | 61 | | 55 | 22 | 33 | 60 | | | |
| | | ☒ | 12 b/f 2-6-6 | | 44 | | 36 | 20 | 16 | | | | |
| | 10 | ☒ | 0 b/f 1-0-0 | | 42 | | | | | | -19.7 | | Medium Dense gray SANDY LEAN CLAY (CLs) |
| | | ☒ | 1 b/f 0-0-1 | | 71 | | | | | 78 | | | Very Soft to Soft brown and gray SANDY LEAN CLAY (CLs) |
| | 15 | ☒ | 1 b/f 0-0-1 | | 31 | | | | | 47 | -24.7 | | Very Loose brown and gray CLAYEY SAND (SC) |
| | 20 | ■ | 3.50 (P) | 3.27 t=6.6 | 17 | 136 | 45 | 22 | 23 | | -29.7 | | Very Stiff gray LEAN CLAY (CL) w/ sand |
| | 25 | ■ | 3.50 (P) | 3.32 t=8.3 | 17 | 136 | 46 | 21 | 25 | | -34.7 | | Very Stiff tan LEAN CLAY (CL) w/ sand |
| | 30 | ■ | 2.50 (P) | | 16 | | | | | | -39.7 | | |
| | 35 | ■ | 3.50 (P) | 1.43 t=11.8 | 28 | 123 | 70 | 37 | 33 | | -44.7 | | Medium Dense reddish brown SILT (MH) |
| | 40 | ■ | 3.50 (P) | | 24 | | 69 | 24 | 45 | 100 | -49.7 | | Medium Stiff reddish brown FAT CLAY (CH) |
| | 45 | ■ | 2.00 (P) | 1.87 t=15.3 | 27 | 123 | 71 | 35 | 36 | | -54.7 | | Medium Dense gray SILT (MH) |
| | 50 | ■ | 1.50 (P) | 1.87 t=16.9 | 21 | 129 | 47 | 21 | 26 | | -59.7 | | Stiff gray LEAN CLAY (CL) |
| | 55 | ■ | 2.00 (P) | | 18 | | | | | | -64.7 | | |
| | 60 | ☒ | 18 b/f 10-11-7 | | 24 | | | | | 42 | -69.7 | | Medium Dense tan CLAYEY SAND (SC) |
| | 65 | ☒ | 65 b/f 19-18-47 | | 24 | | | | | 34 | -74.7 | | Very Dense tan CLAYEY SAND (SC) |
| | 70 | ☒ | 67 b/f 19-28-39 | | 21 | | | | | 15 | -79.7 | | |
| | 75 | ☒ | 27 b/f 10-11-16 | | 24 | | | | | 47 | -84.7 | | Medium Dense to Very Dense gray CLAYEY SAND (SC) |
| | 80 | ☒ | 80 b/f 12-30-50 | | 18 | | | | | 43 | -89.7 | | |
| | 85 | ☒ | 26 b/f 8-12-14 | | 18 | | | | | 35 | -94.7 | | |
| | 90 | ☒ | 15 b/f 10-7-8 | | 25 | | 64 | 24 | 40 | 62 | -99.7 | | Stiff to Very Stiff gray SANDY FAT CLAY (CHs) |
| | 95 | ■ | 2.00 (P) | 3.33 t=32.6 | 112 | 88 | 144 | 78 | 66 | 90 | -104.7 | | Medium Dense brown and black SILT (MH) w/ wood & organics |
| | 100 | ■ | 2.50 (P) | 2.59 t=34.4 | 24 | 126 | 71 | 23 | 48 | | -109.7 | | Very Stiff gray FAT CLAY (CH) |
| | | | | | | | | | | | | | Boring completed at 100 ft. |
| | 105 | | | | | | | | | | -114.7 | | |

**Ground Water Level Data**

☒ Boring performed from barge in open water

**Boring Advancement Method**

4" Dia. Rotary Wash:
to 100 ft.

**Boring Abandonment Method**

Not Reported

**Notes**

t = Lateral Confining Pressure (psi).

- 93-95' Organic Content = 29.2%

Attachment Figure B.3-7

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJSB057-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 11/8/19
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck on Barge

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 45.29"
Long. 95° 3' 46.74"
Ground Surface Elevation: -17.1 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | ☒ | 0 b/f | | 109 | | 102 | 64 | 38 | 46 | -17.1 | | Very Loose dark brown CLAYEY SAND (SC) |
| | | ☒ | 2 b/f 2-1-1 | | 94 | | 51 | 24 | 27 | 28 | | | |
| | 5 | ☒ | 1 b/f 0-0-1 | | 60 | | | | | 18 | -22.1 | | Very Loose brown CLAYEY SAND (SC) |
| | | ☒ | 2 b/f 1-1-1 | | 37 | | 66 | 21 | 45 | 19 | | | |
| | | ☒ | 1 b/f 0-0-1 | | 89 | | | | | | | | |
| | 10 | ☒ | 10 b/f 3-4-6 | | 23 | | | | | 49 | -27.1 | | Very Loose gray CLAYEY SAND (SC) w/ shell fragments |
| | | ■ | 0.50 (P) | 2.29 t=3.8 | 20 | 134 | 66 | 23 | 43 | 85 | | | |
| | 15 | ■ | 1.25 (P) | | 12 | 122 | | | | | -32.1 | | Medium Dense gray SILTY SAND (SM) w/ gravel |
| | | ■ | 3.00 (P) | 2.27 t=6.6 | 19 | 134 | 45 | 16 | 29 | 68 | | | |
| | 20 | | | | | | | | | | -37.1 | | Very Stiff gray and brown FAT CLAY (CH) w/ sand |
| | | ■ | 2.50 (P) | | 18 | 135 | | | | | | | |
| | 25 | | | | | | | | | | -42.1 | | Very Stiff tan SANDY LEAN CLAY (CLs) |
| | | ■ | 3.50 (P) | | 28 | | | | | | | | |
| | 30 | | | | | | | | | | -47.1 | | Very Stiff reddish brown FAT CLAY (CH) |
| | | ■ | 3.00 (P) | 2.31 t=10.8 | 27 | 125 | 65 | 22 | 43 | 100 | | | |
| | 35 | | | | | | | | | | -52.1 | | |
| | | ■ | 3.00 (P) | | 26 | 127 | | | | | | | |
| | 40 | | | | | | | | | | -57.1 | | |
| | | ■ | 2.50 (P) | 3.70 t=13.6 | 21 | 127 | 56 | 19 | 37 | 98 | | | Stiff to Very Stiff gray FAT CLAY (CH) |
| | 45 | | | | | | | | | | -62.1 | | |
| | | ■ | 1.50 (P) | 1.67 t=15.0 | 36 | 125 | 52 | 19 | 33 | 98 | | | |
| | 50 | | | | | | | | | | -67.1 | | |
| | | ■ | 1.50 (P) | | 27 | | | | | | | | |
| | 55 | | | | | | | | | | -72.1 | | |
| | | ■ | 1.00 (P) | 1.49 t=20.5 | 24 | 132 | 52 | 20 | 32 | 84 | | | w/ sand |
| | 60 | | | | | | | | | | -77.1 | | |
| | | ☒ | 77 b/f 14-21-56 | | 19 | | | | | 25 | | | |
| | 65 | | | | | | | | | | -82.1 | | Very Dense brown and gray SILTY SAND (SM) |
| | | ☒ | 65 b/f 15-21-44 | | 23 | | | | | 35 | | | Very Dense brown and gray CLAYEY SAND (SC) |
| | 70 | | | | | | | | | | -87.1 | | |
| | | ☒ | 13 b/f 4-6-7 | | 22 | | 23 | 18 | 5 | 65 | | | Stiff gray SANDY SILTY CLAY (CL-ML) |
| | 75 | | | | | | | | | | -92.1 | | |
| | | ☒ | 97 b/f 15-55-42 | | 20 | | | | | 54 | | | Very Stiff to Hard gray SANDY LEAN CLAY (CLs) |
| | 80 | | | | | | | | | | -97.1 | | |
| | | ☒ | 88 b/f 15-33-55 | | 20 | | | | | 71 | | | |
| | 85 | | | | | | | | | | -102.1 | | |
| | | ☒ | 26 b/f 4-11-15 | | 95 | | 169 | 92 | 77 | 44 | | | Dense gray CLAYEY SAND (SC) |
| | 90 | | | | | | | | | | -107.1 | | |
| | | ■ | 1.50 (P) | 1.67 t=32.6 | 26 | 126 | 41 | 18 | 23 | 98 | | | Stiff gray LEAN CLAY (CL) |
| | 95 | | | | | | | | | | -112.1 | | |
| | | ■ | No (P) | | 22 | | | | | 99 | | | |
| | 100 | | | | | | | | | | -117.1 | | Boring completed at 100 ft. |
| | 105 | | | | | | | | | | -122.1 | | |

**Ground Water Level Data**

☒ Boring performed from barge in open water

**Boring Advancement Method**

4" Dia. Rotary Wash:
to 100 ft.

**Boring Abandonment Method**

Not Reported

**Notes**

t = Lateral Confining Pressure (psi).

Attachment Figure B.3-8

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

# LOG OF SOIL BORING SJSB058-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 10/13/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 42.79"
Long. 95° 3' 48.02"
Ground Surface Elevation: 0.62 (ft., NAVD 88)

| Ground Water Level | Depth (feet) | Samples | Field Test Results | Compressive Strength (tsf) | Water Content (%) | Wet Unit Weight (pcf) | Atterberg Limits LL | Atterberg Limits PL | Atterberg Limits PI | Percent Passing #200 Sieve | Elev. (ft.) | Soil Type | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ☒ | | | No (P) | | 15 | | | | | | 0.6 | | Loose brown and tan SILTY SAND (SM) |
| | | | No (P) | | 66 | | 30 | 16 | 14 | 53 | | | Soft gray SANDY LEAN CLAY (CLs) |
| | 5 | | No (P) | 0.92 t=1.6 | 26 | 112 | | | | 97 | -4.4 | | Medium Stiff to Stiff gray LEAN CLAY (CL) |
| | | | No (P) | 1.21 t=2.6 | 35 | 117 | 42 | 18 | 24 | 96 | | | |
| | | | No (P) | 0.85 t=3.1 | 31 | 115 | | | | 96 | | | |
| | 10 | | No (P) | | 33 | | 44 | 17 | 27 | 93 | -9.4 | | |
| | | | 7 b/f 1-1-6 | | 24 | | NP | NP | NP | 42 | | | Very Loose to Loose gray SILTY SAND (SM) |
| | 15 | | 3 b/f 1-1-2 | | 24 | | NP | NP | NP | 43 | -14.4 | | |
| | | | 47 b/f 6-17-30 | | 20 | | | | | 44 | | | Dense gray SILTY SAND (SM) |
| | 20 | | | | | | | | | | -19.4 | | Boring completed at 20 ft. |
| | 25 | | | | | | | | | | -24.4 | | |
| | 30 | | | | | | | | | | -29.4 | | |
| | 35 | | | | | | | | | | -34.4 | | |
| | 40 | | | | | | | | | | -39.4 | | |

**Ground Water Level Data**
☒ Free Water not Reported

**Boring Advancement Method**
Hollowstem Auger
0 to 20 ft.

**Boring Abandonment Method**
Not Reported

**Notes**
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-9

**Strata Boundaries May Not Be Exact**

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

## Attachment C. CALCULATION PACKAGE

This Attachment contains the following:
(Digital Copies Only)

C.1 Cell #1 Retaining Wall Analyses

C.2 Cell #2 Retaining Wall Analyses

C.3 Cell #3 Retaining Wall Analyses

C.4 Cell #4 Retaining Wall Analyses

C.5 Cell #5 Retaining Wall Analyses

C.6 WEAP Results (SJGB053)

C.7 WEAP Results (SJGB057)

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 0+75)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -92.91 ft., NAVD88

Length of Sheetting = 101.91 ft.

Use = 105.0 ft.

Design Tip Elev. = -96.0 ft., NAVD88

Design Length of Sheeting = 105.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -48.27 | 598.31 | 96.35 | 2.98 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -51.04 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -45.90 | 495.96 | 88.49 | 2.27 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -48.27 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -44.33 | 386.27 | 76.43 | 1.59 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -48.67 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -41.95 | 293.47 | 67.06 | 1.09 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -45.51 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -84.53 | 1,321.17 | 139.52 | 19.61 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -92.91 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -78.08 | 989.14 | 101.22 | 12.70 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -86.46 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -75.50 | 809.50 | 89.30 | 9.54 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -91.62 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -68.40 | 544.40 | 67.97 | 5.34 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -82.59 | -- | -- | -- |
| | | | | | | Governing Value: | -92.91 | 1,321.17 | 139.52 | 19.61 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:09:50 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SP (GS to | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 60 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 0 | 0 | 2290 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 0 | 0 | 2290 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 0 | 0 | 2290 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 0 | 0 | 1650 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 0 | 0 | 1200 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 0 | 0 | 1670 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SP (GS to | 0.4 | - | - | 0.5 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.5 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | 0.1 | 0 | 0.45 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

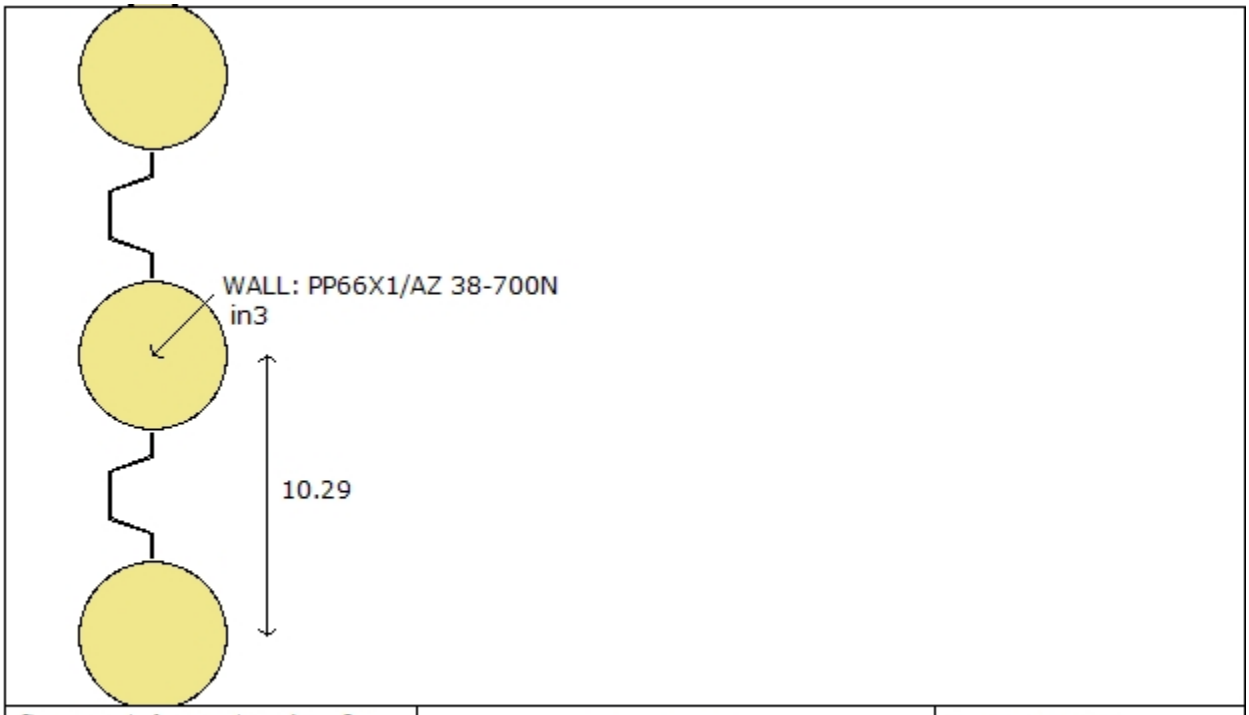
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| -17 | 01- SP (GS to - | 1 | 0.5 |
| -27 | 02- SP (-27 TO | 1 | 0.5 |
| -30 | 03- CH (-30 to | 1 | 1 |
| -34 | 04- CH (-34 TO | 1 | 1 |
| -44 | 05- CH (-44 to | 1 | 0.45 |
| -57 | 06- CH (-57 to | 1 | 1 |
| -80 | 07- SP (-80 to - | 1 | 0.5 |
| -89 | 08- CH (-89 to | 1 | 1 |
| -94 | 09- CH (-94 to | 1 | 1 |
| -103 | 10- SP (-103 to | 1 | 0.5 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.072 | 2.153 | 2.924 |
| Stage 1 | Simple span | N/A | 1.6 | 1.767 | 1.767 | 2.364 |
| Stage 2 | Simple span | N/A | 1.6 | 2.313 | 2.313 | 3.059 |
| Stage 3 | Simple span | N/A | 1.6 | 1.915 | 1.915 | 2.483 |
| Stage 4 | Simple span | N/A | 1.6 | 2.572 | 2.69 | 3.389 |
| Stage 5 | Simple span | N/A | 1.6 | 1.886 | 1.886 | 2.309 |
| Stage 6 | Simple span | N/A | 1.6 | 2.89 | 2.89 | 3.547 |
| Stage 7 | Simple span | N/A | 1.6 | 2.06 | 2.06 | 2.433 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

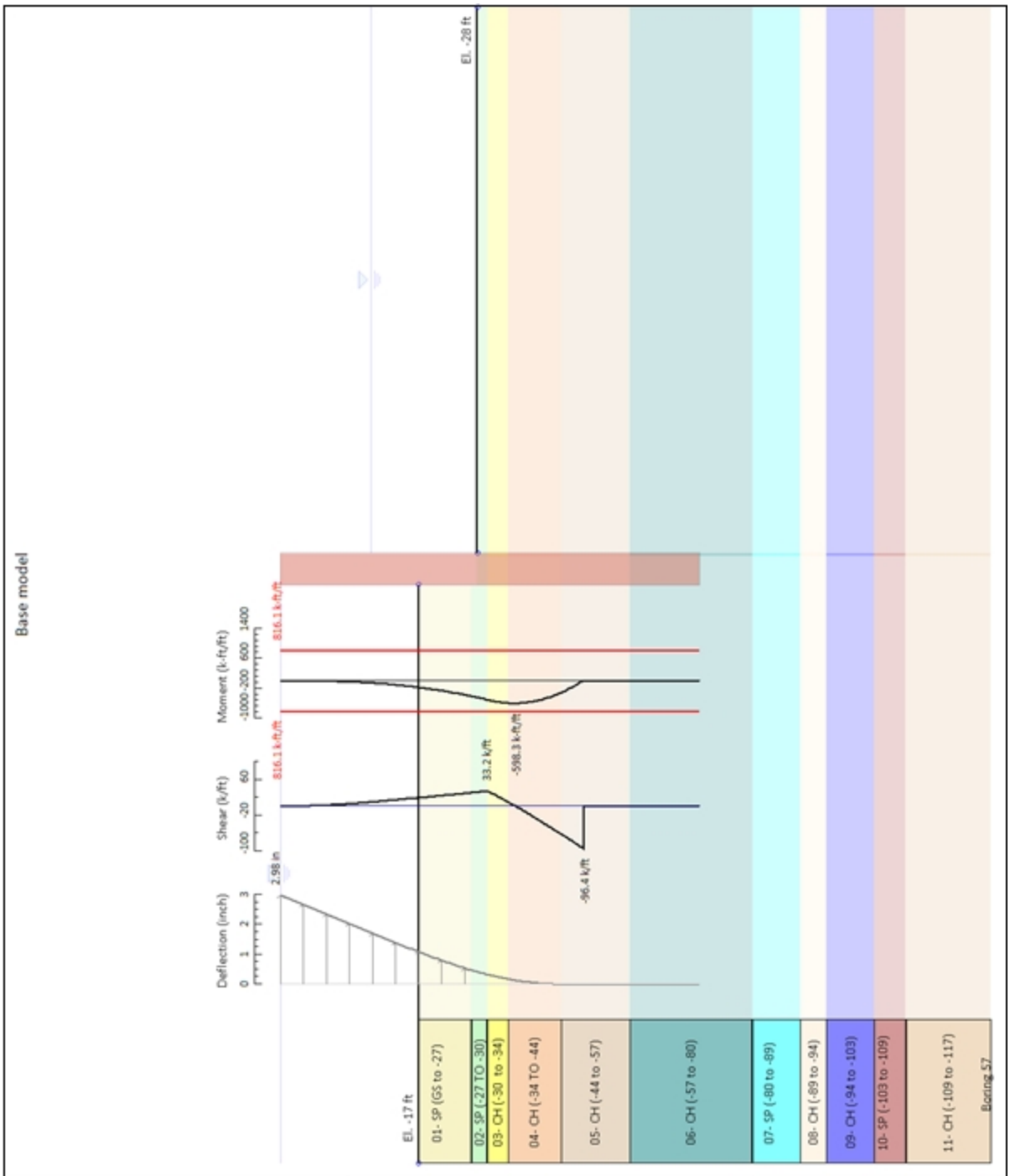
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

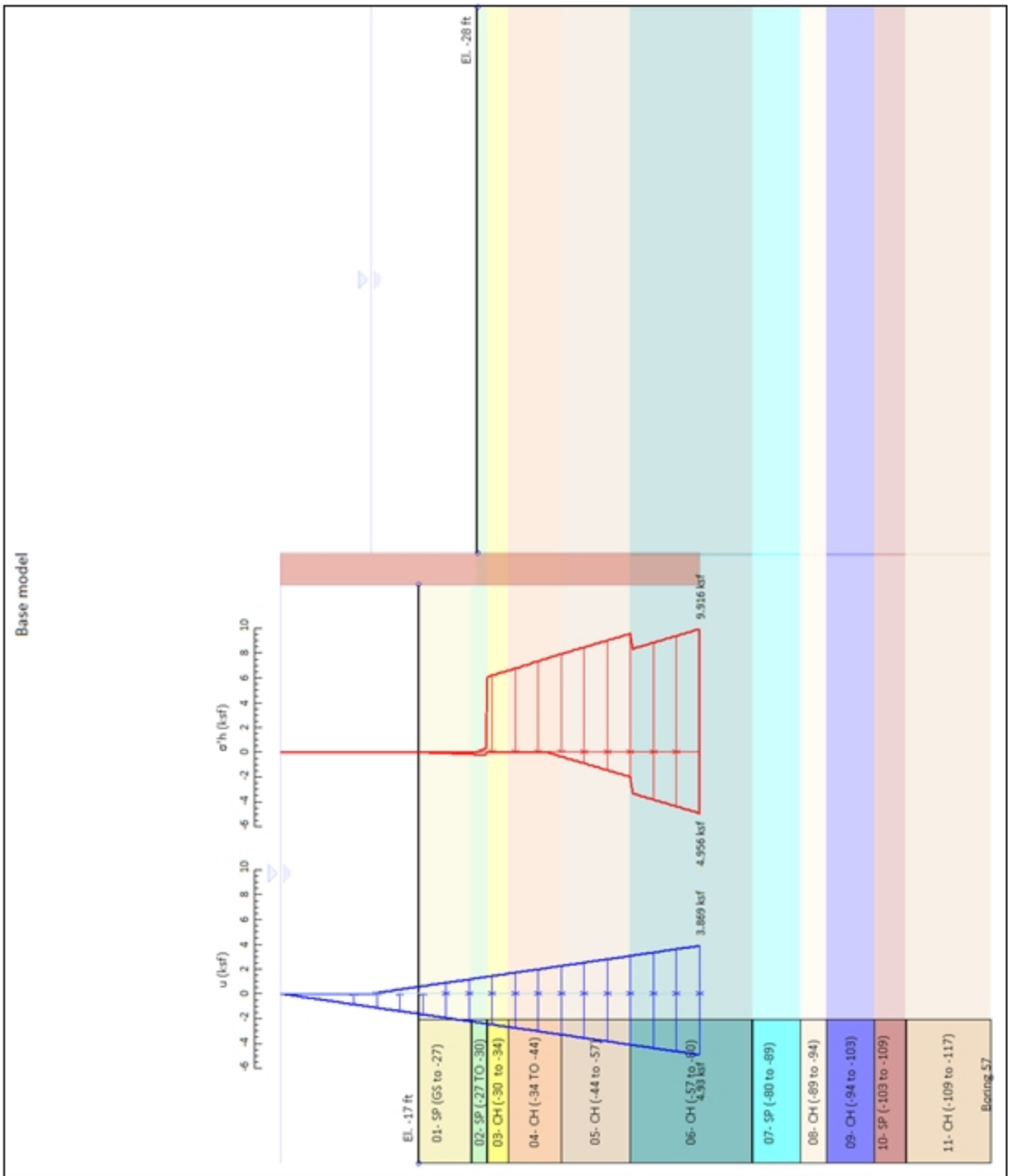
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

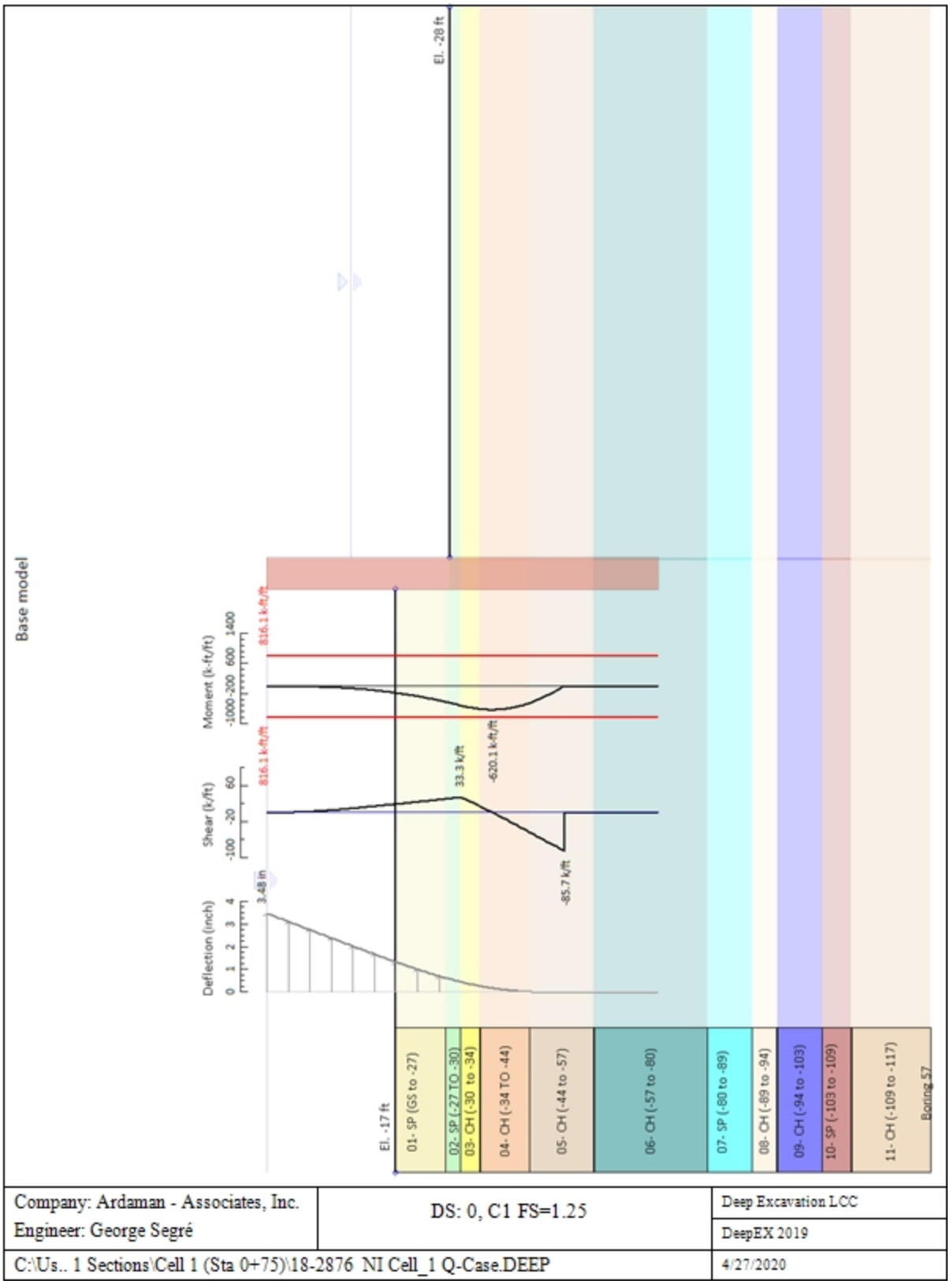
A sequence of figures for each excavation stage is reported



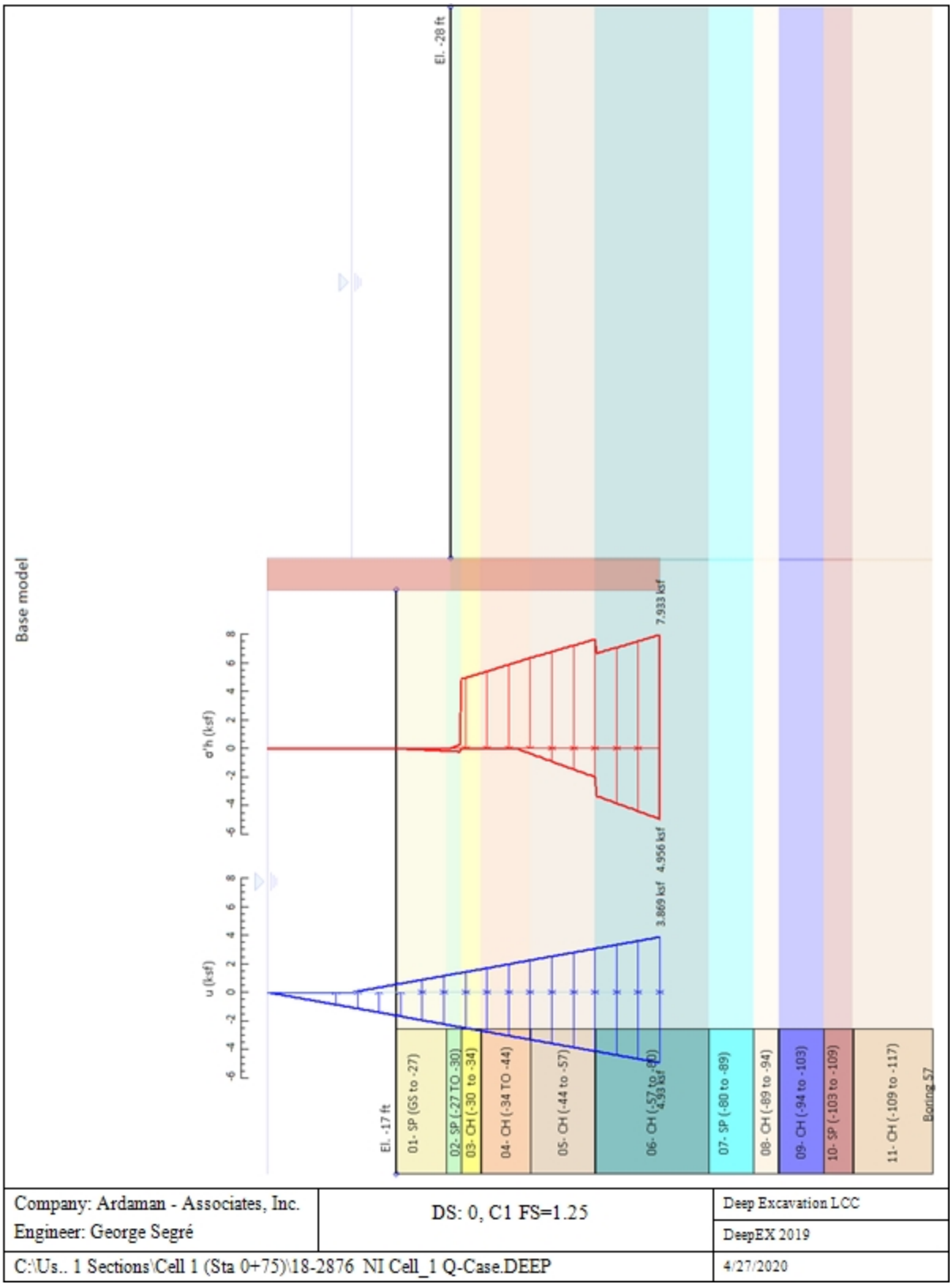

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS=1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |

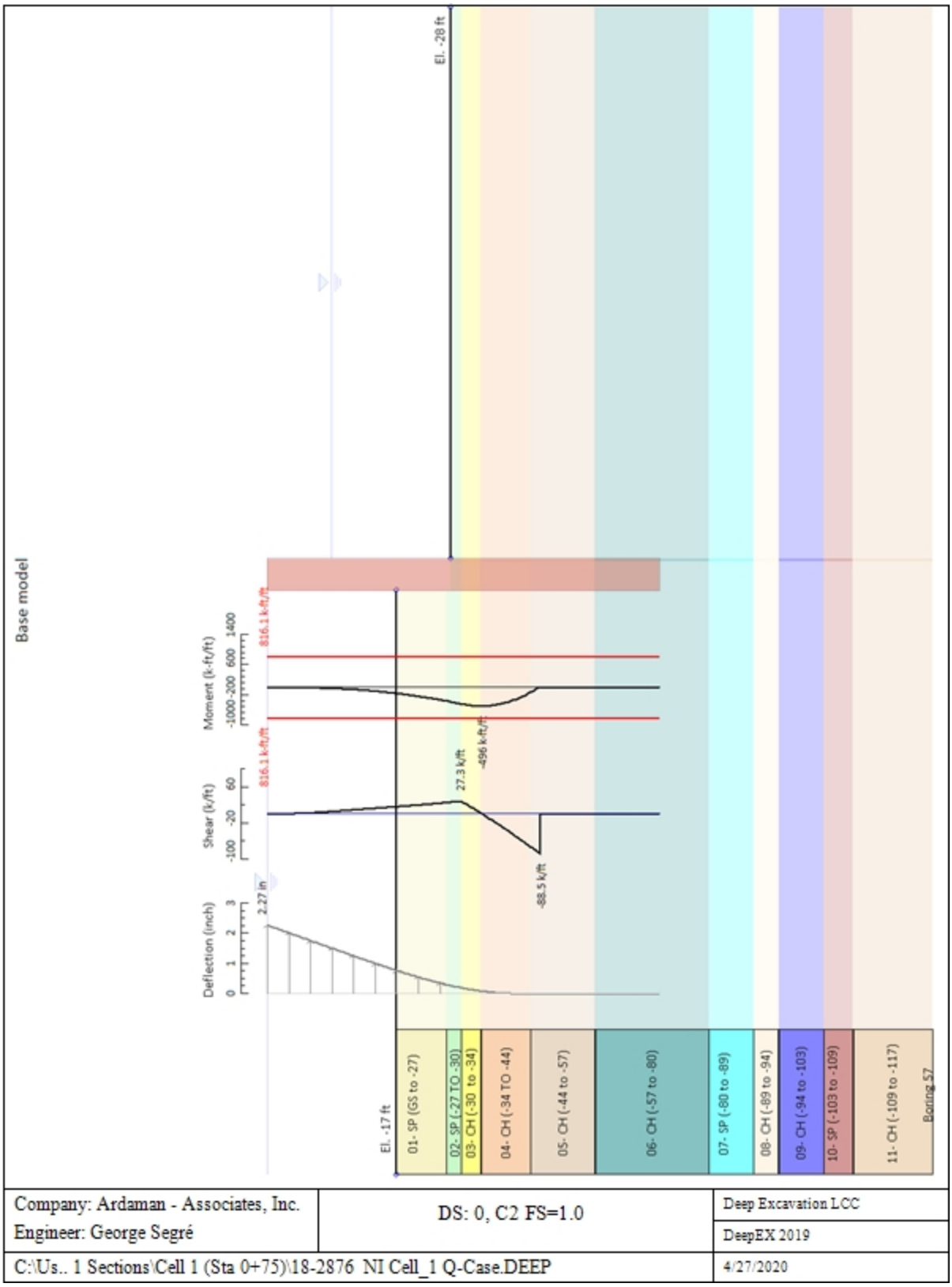



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS=1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |

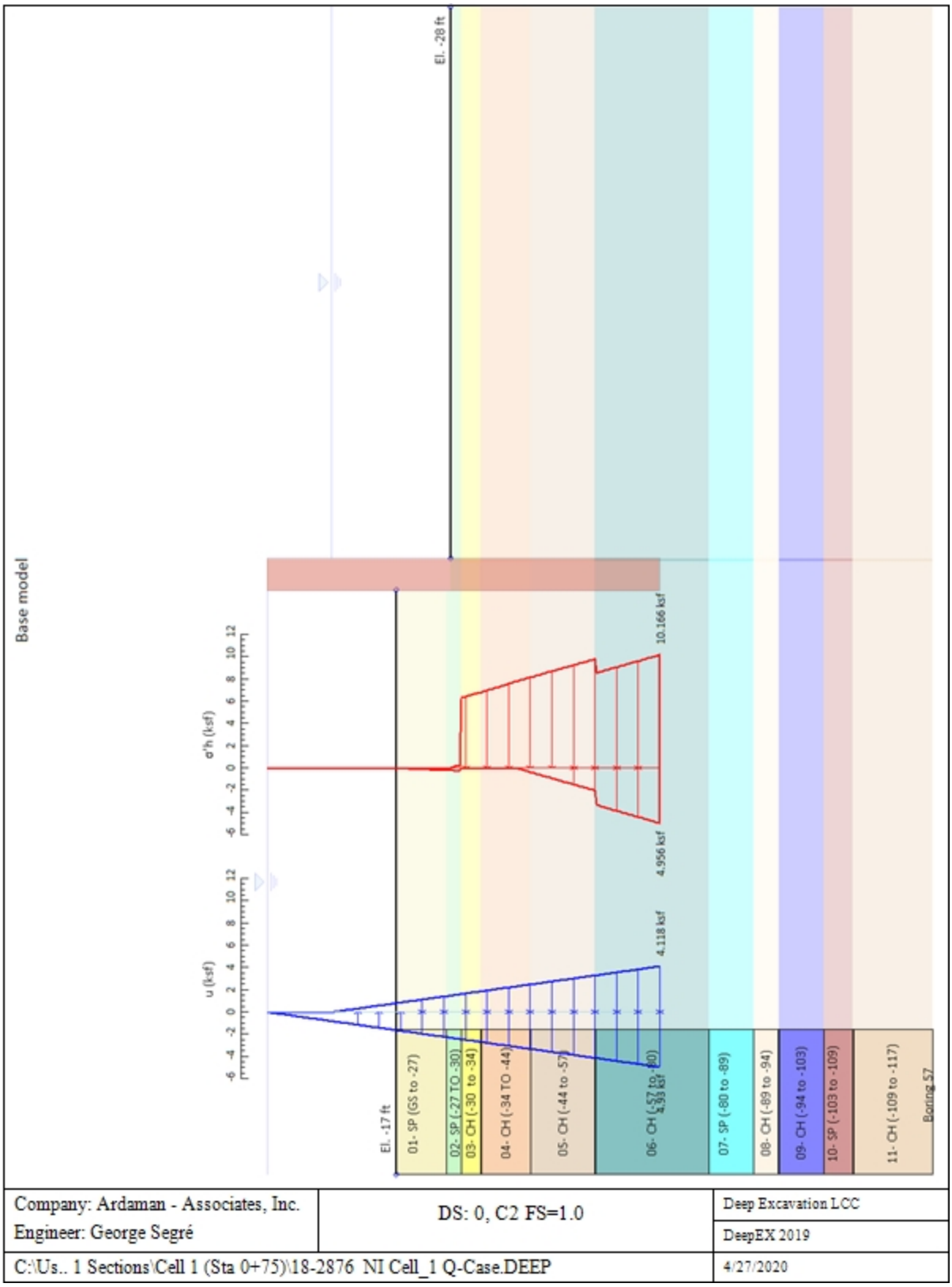


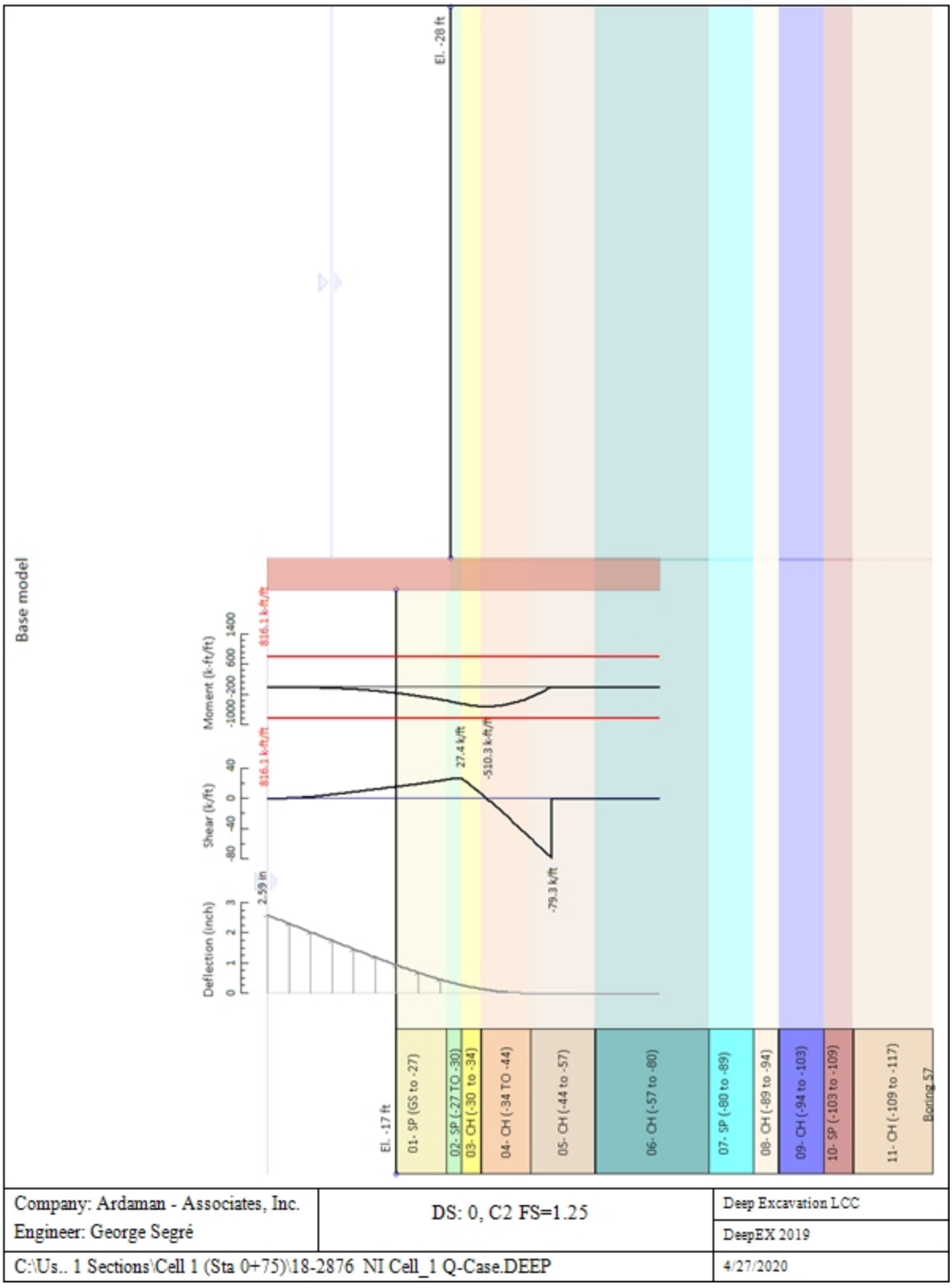

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS=1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
7.933 ksf
4.956 ksf
3.869 ksf
4.93 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS=1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

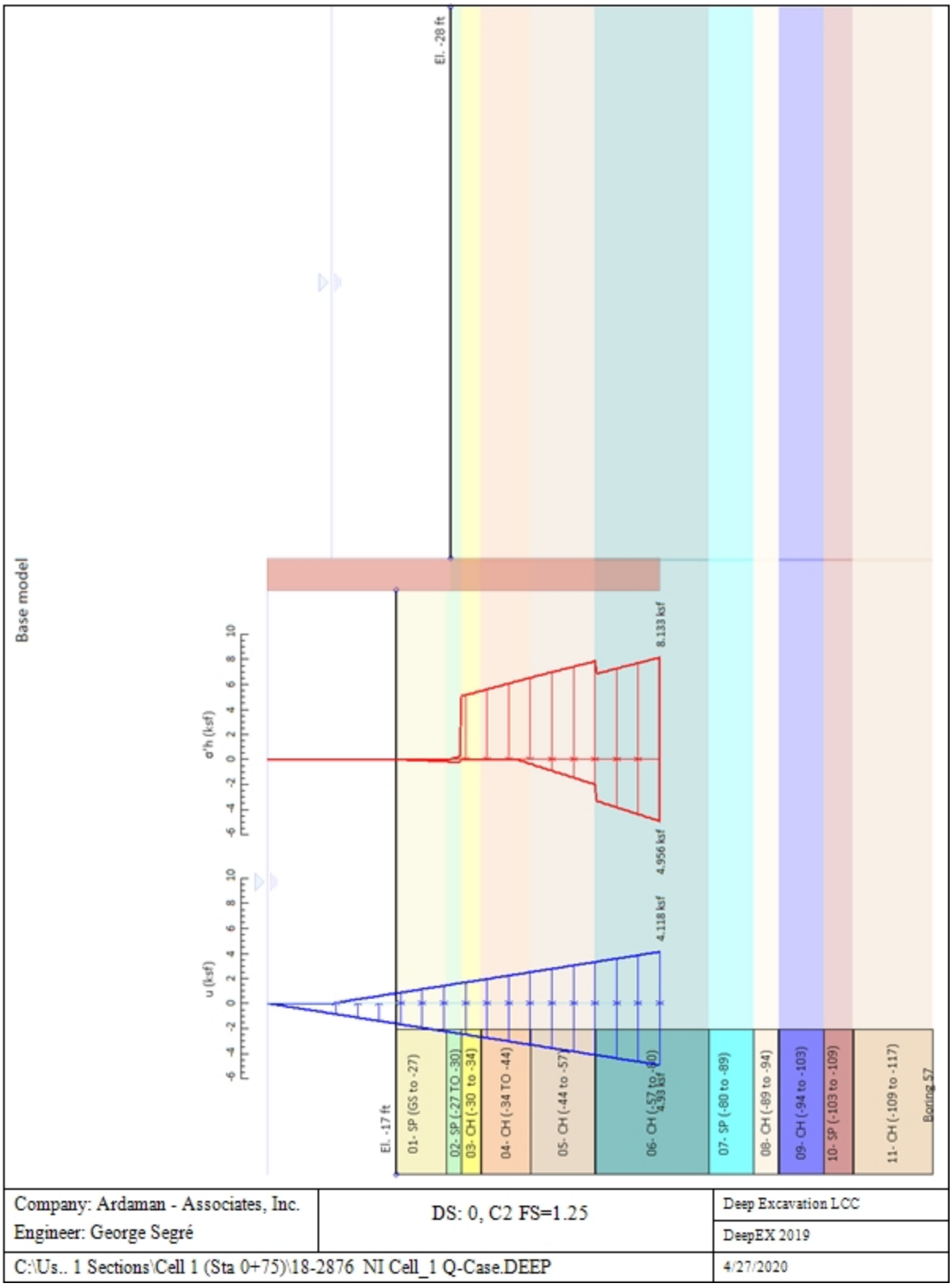


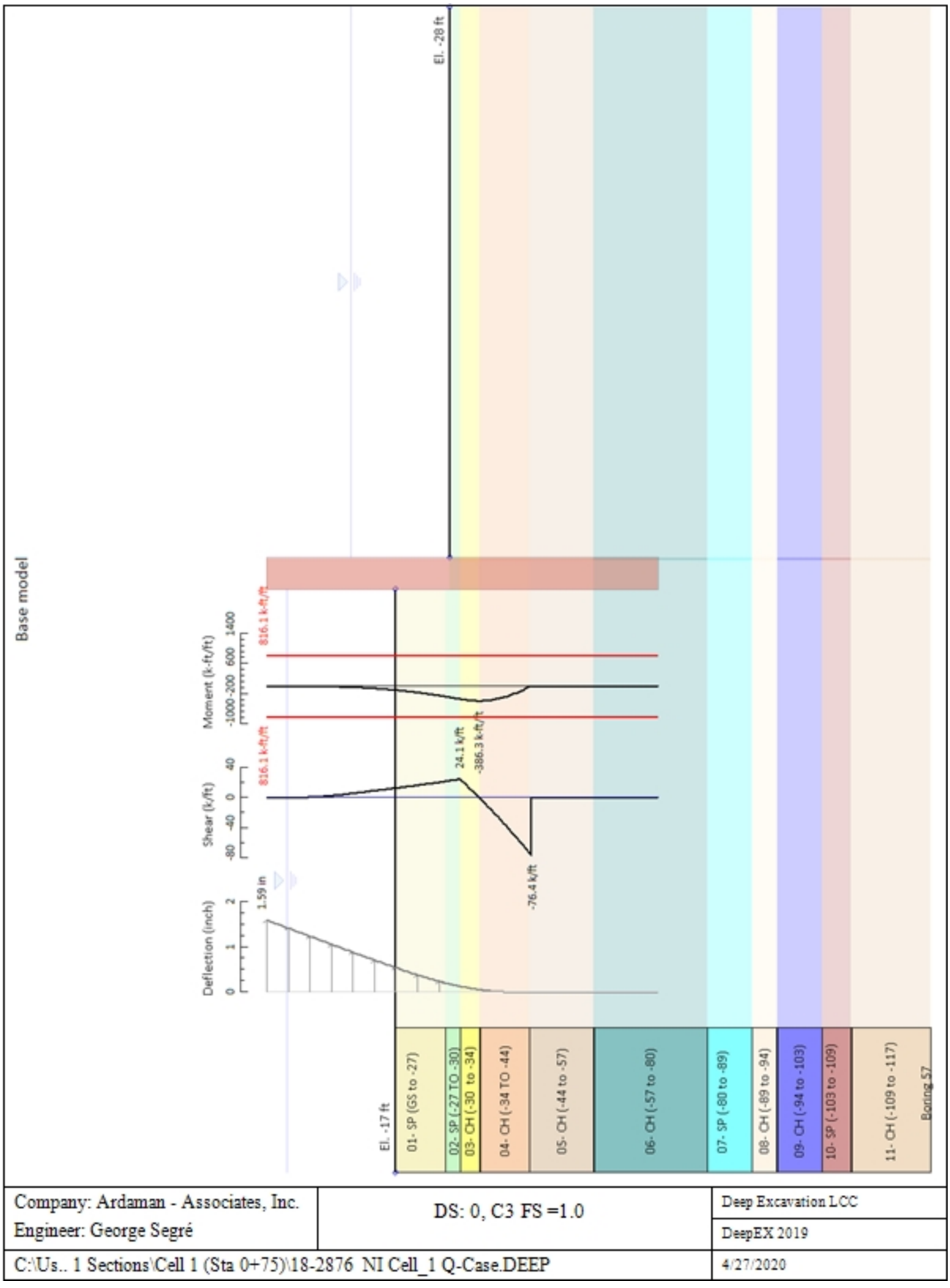

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS=1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
10.166 ksf
4.956 ksf
4.118 ksf
4.193 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS=1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

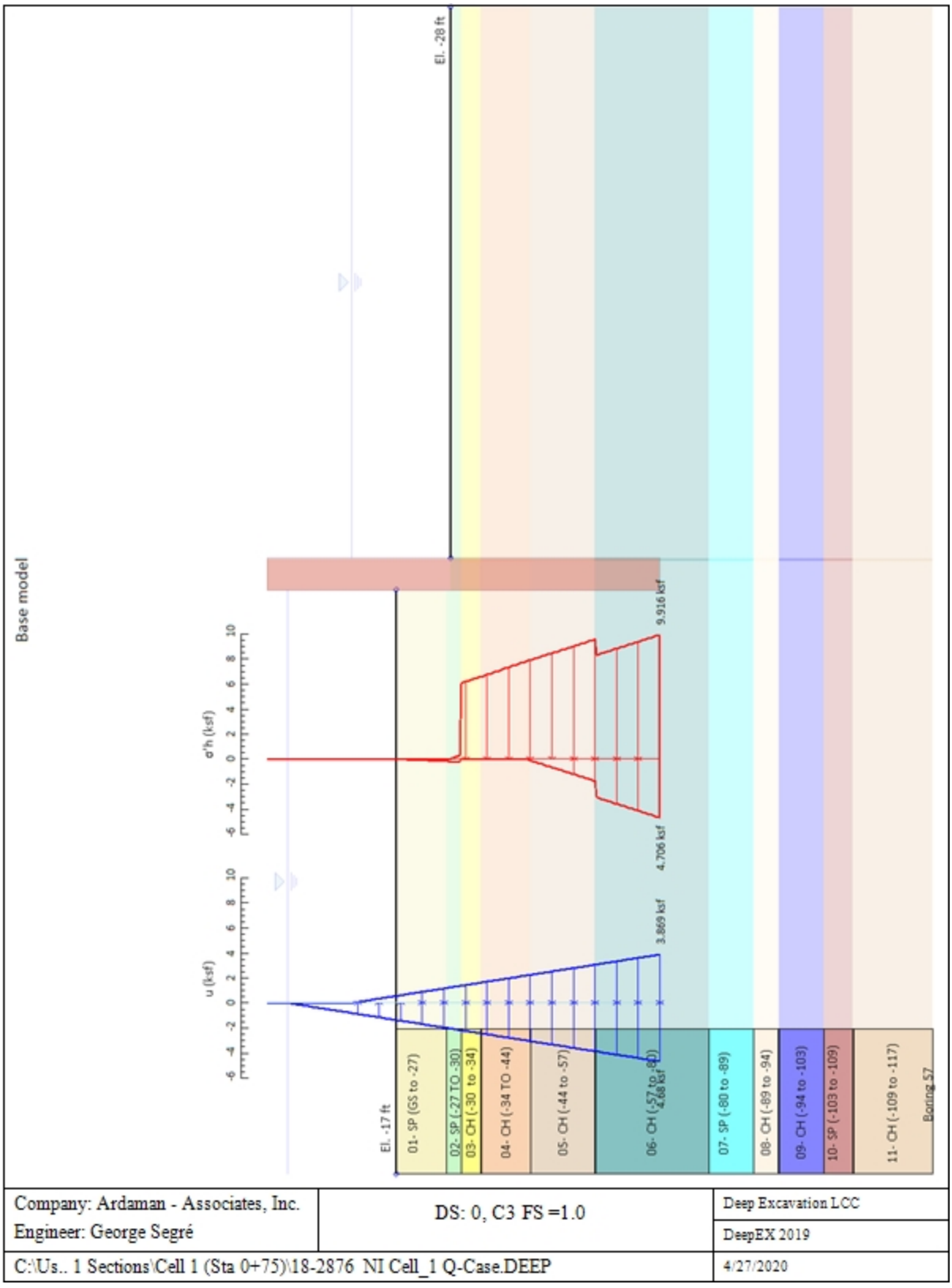


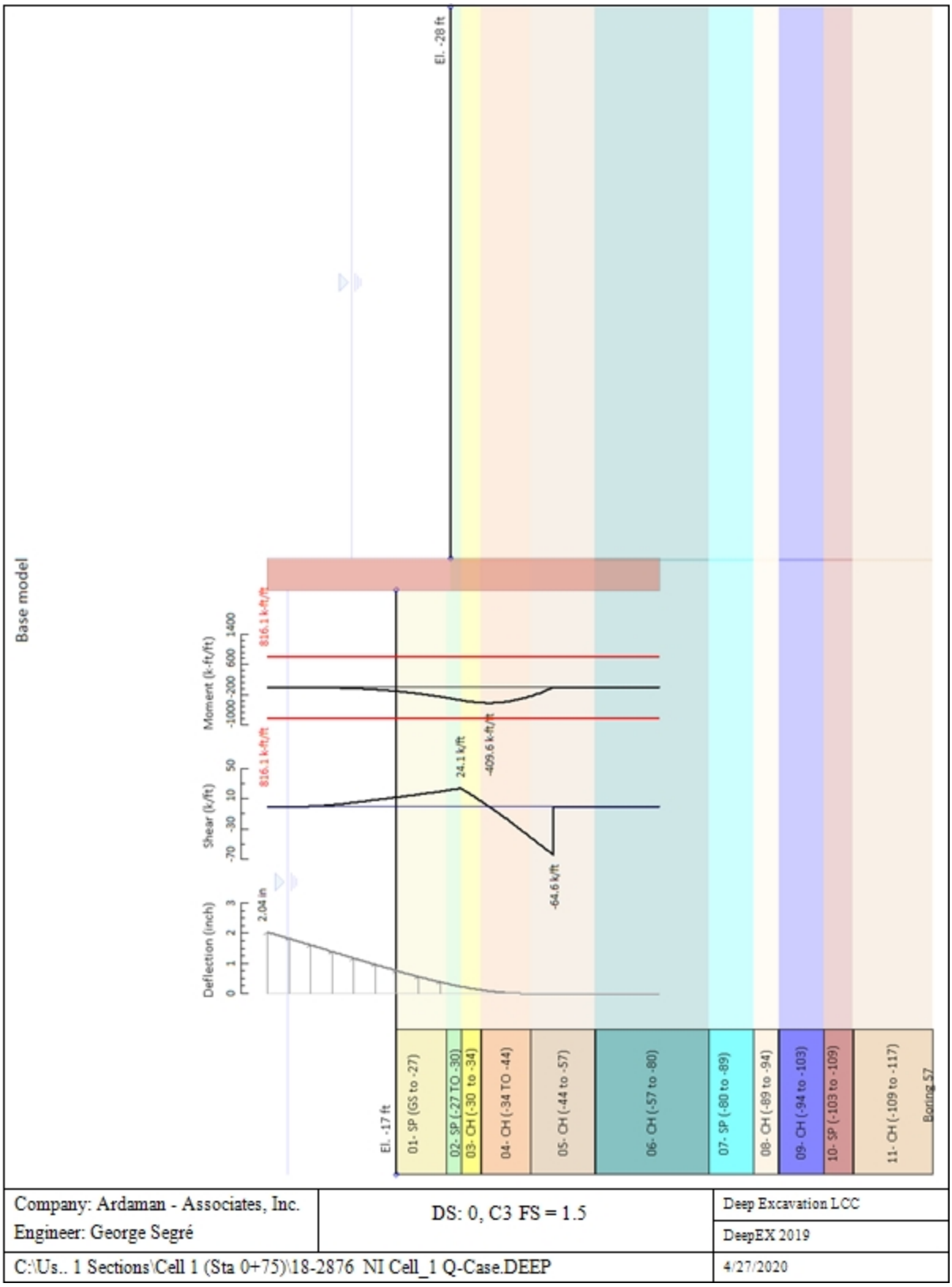

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS=1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
8.133 ksf
4.956 ksf
4.118 ksf
4.93 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS=1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

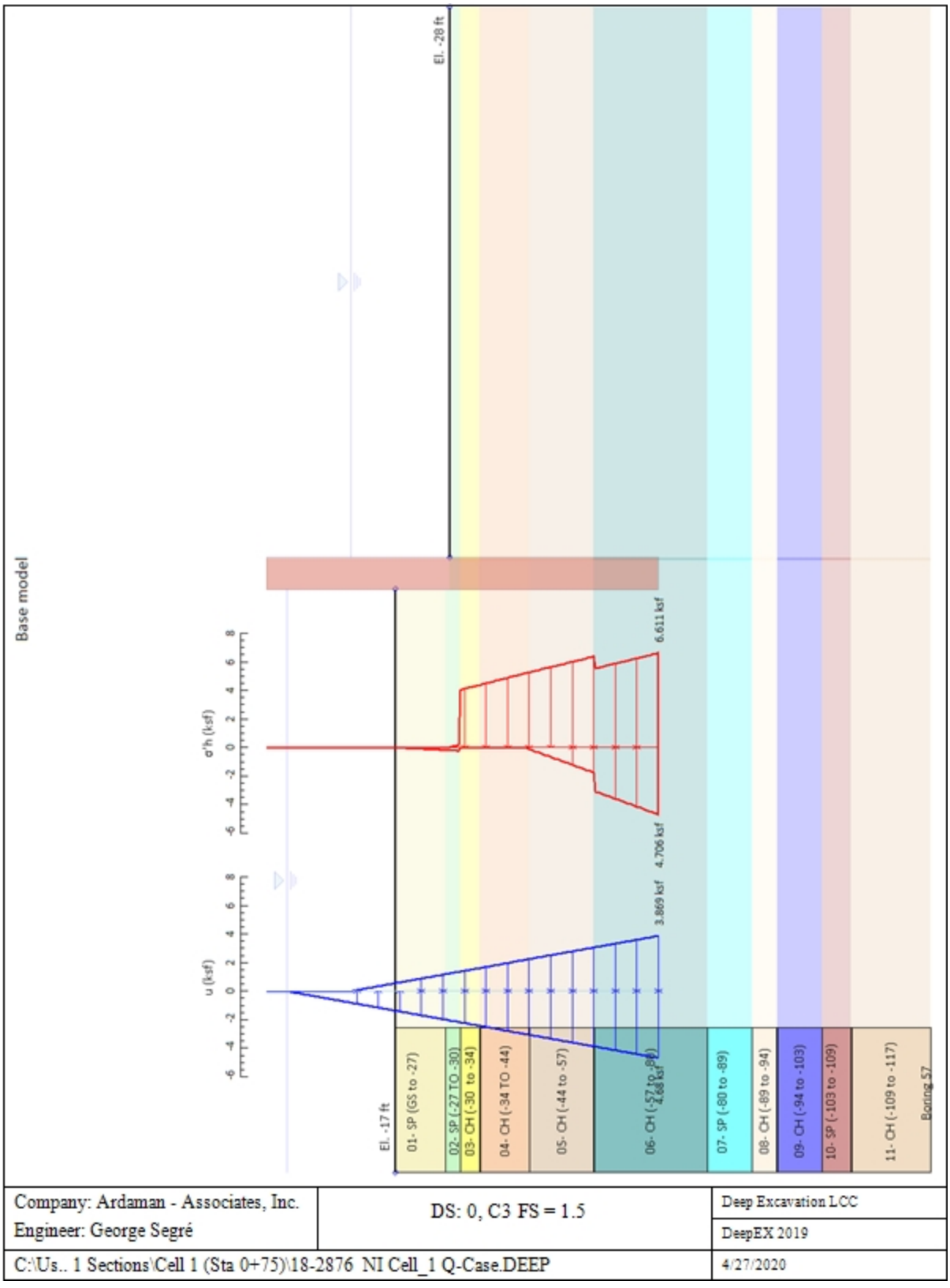


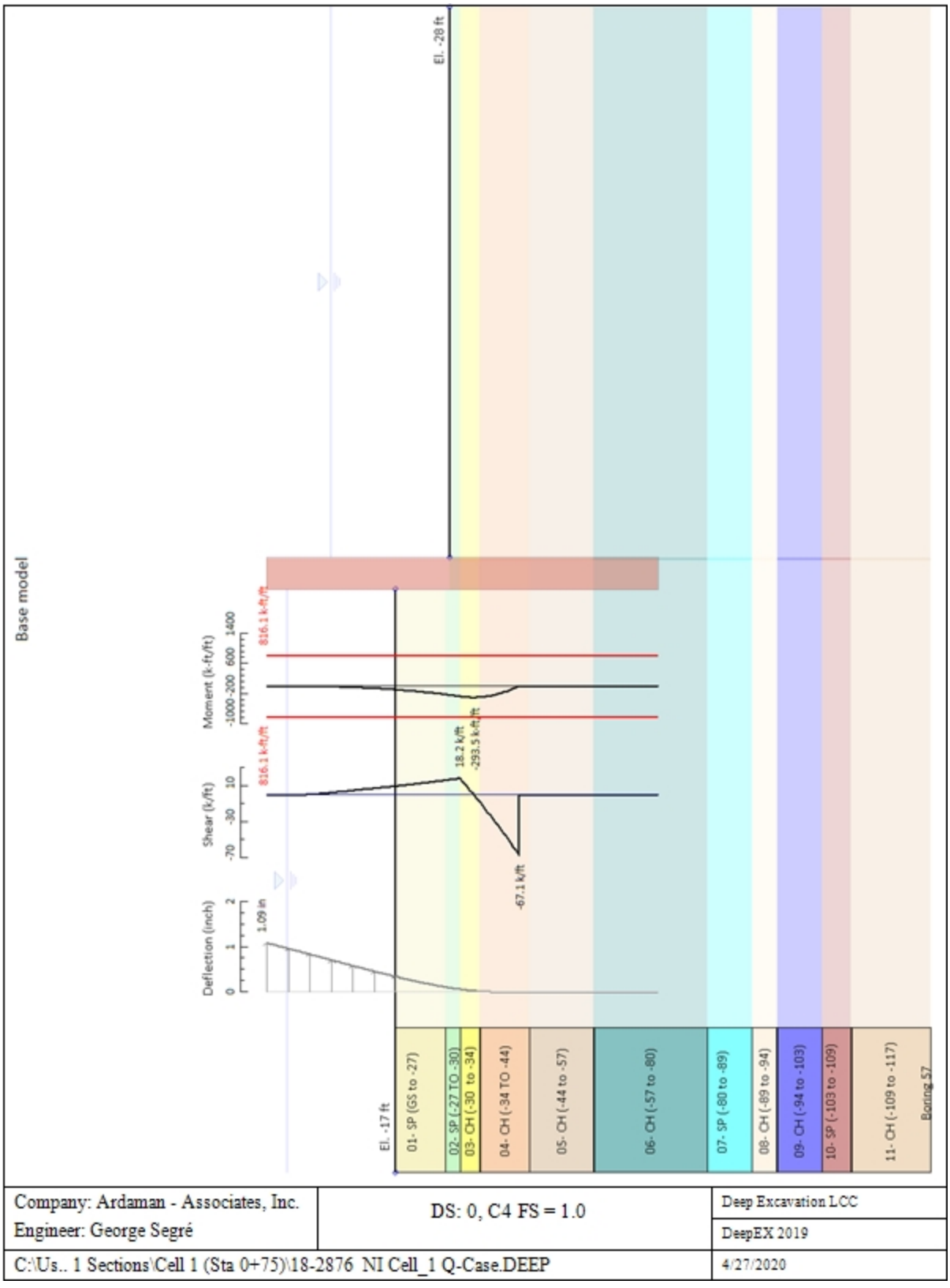

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS =1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
9.916 ksf
4.706 ksf
3.869 ksf
4.88 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS =1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

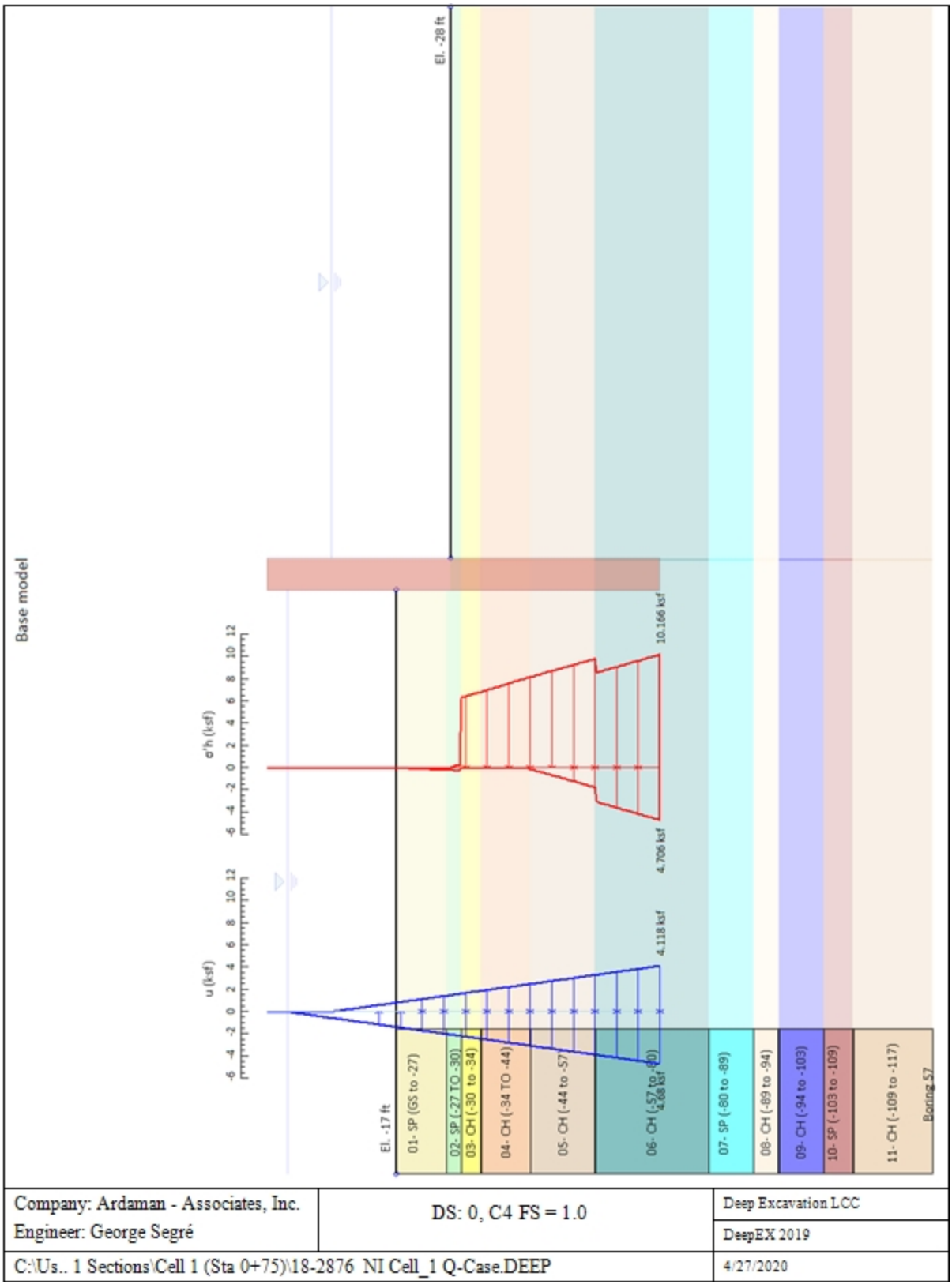


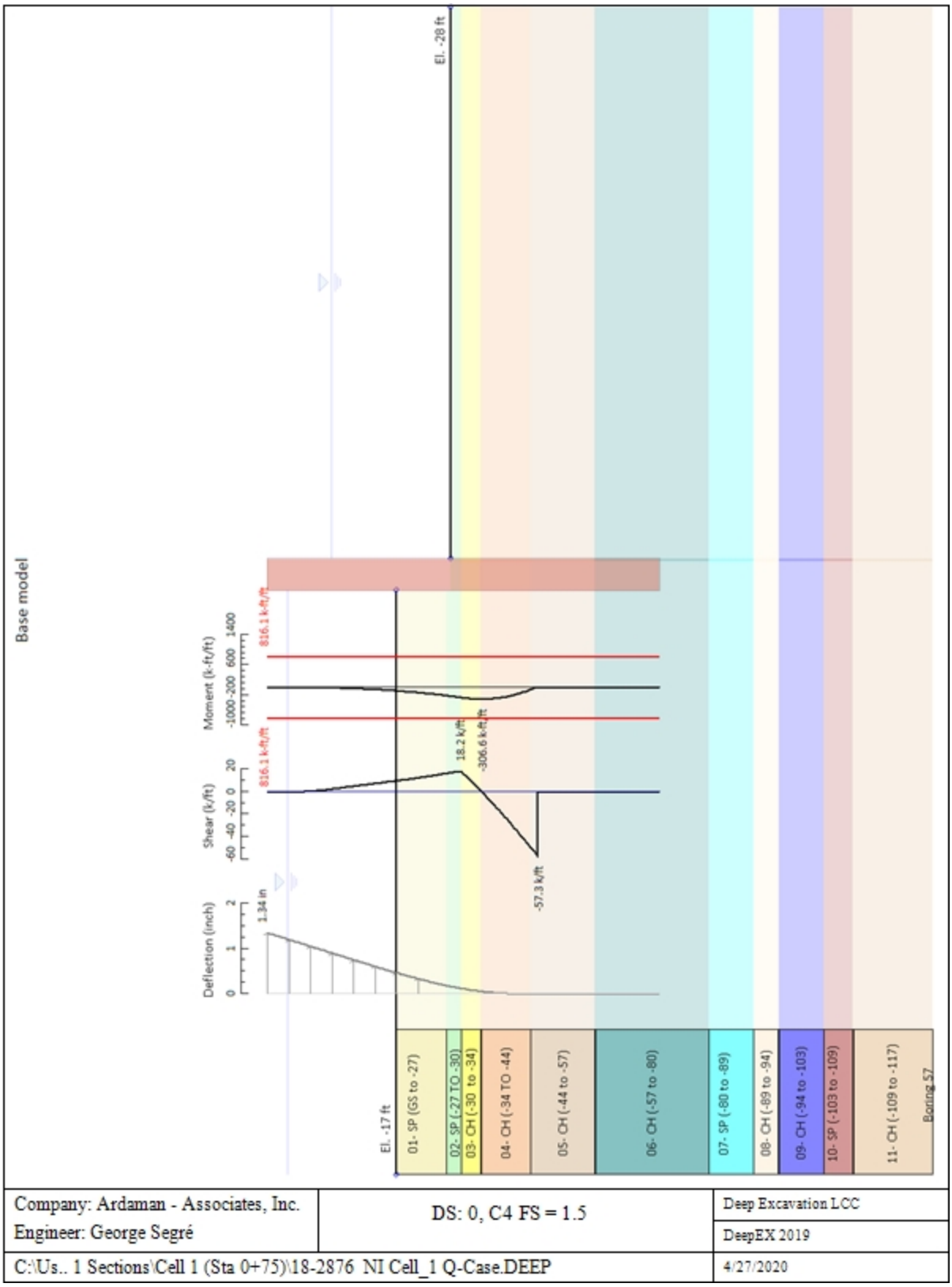

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
6.611 ksf
4.706 ksf
3.869 ksf
4.68 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

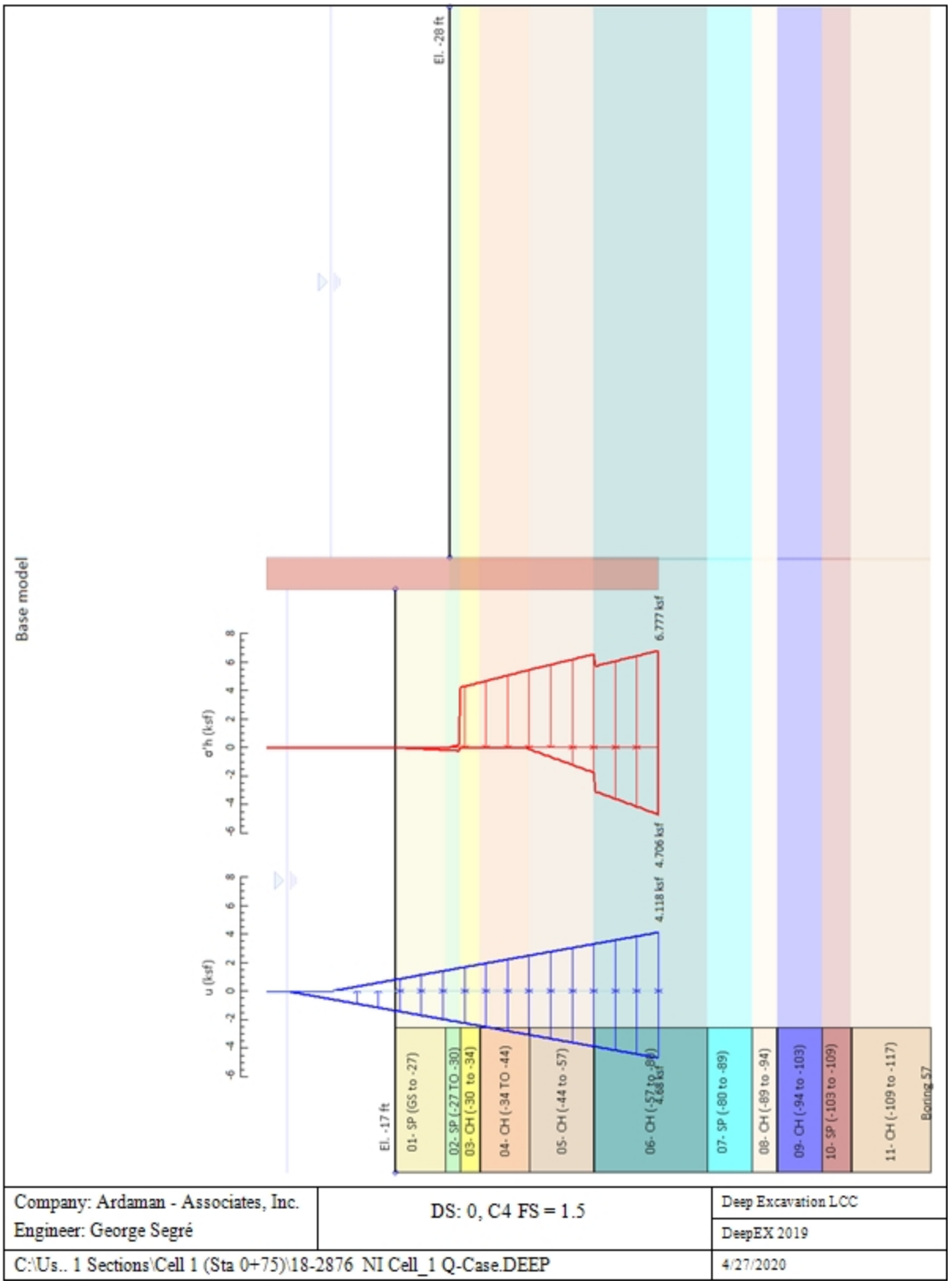



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
10.166 ksf
4.706 ksf
4.118 ksf
4.68 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
6.777 ksf
4.706 ksf
4.118 ksf
4.68 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -89)
07- SP (-89 to -94)
08- CH (-94 to -103)
09- CH (-103 to -109)
10- SP (-109 to -117)
11- CH (-117 to -127)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:14:21 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SP (GS TO | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 60 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 150 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 26 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 26 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SP (GS TO | 0.4 | - | - | 0.455 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.455 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | - | - | 0.562 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | - | - | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | - | - | 0.562 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | - | - | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

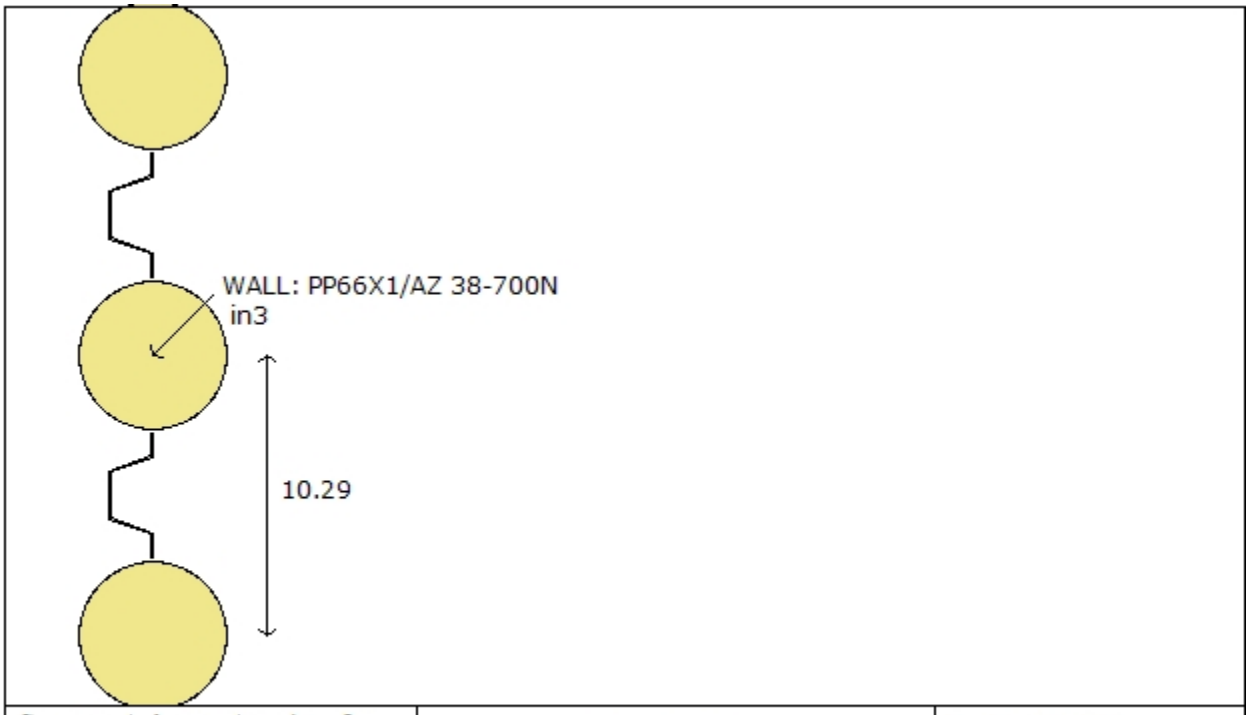
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| -17 | 01- SP (GS TO | 1 | 0.46 |
| -27 | 02- SP (-27 TO | 1 | 0.46 |
| -30 | 03- CH (-30 to | 1 | 0.56 |
| -34 | 04- CH (-34 TO | 1 | 0.56 |
| -44 | 05- CH (-44 to | 1 | 0.56 |
| -57 | 06- CH (-57 to | 1 | 0.56 |
| -80 | 07- SP (-80 to - | 1 | 0.46 |
| -89 | 08- CH (-89 to | 1 | 0.56 |
| -94 | 09- CH (-94 to | 1 | 0.56 |
| -103 | 10- SP (-103 to | 1 | 0.46 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.416 | 1.416 | 1.768 |
| Stage 1 | Simple span | N/A | 1.6 | 1.243 | 1.243 | 1.537 |
| Stage 2 | Simple span | N/A | 1.6 | 1.477 | 1.477 | 1.812 |
| Stage 3 | Simple span | N/A | 1.6 | 1.304 | 1.304 | 1.581 |
| Stage 4 | Simple span | N/A | 1.6 | 1.532 | 1.532 | 1.86 |
| Stage 5 | Simple span | N/A | 1.6 | 1.221 | 1.221 | 1.455 |
| Stage 6 | Simple span | N/A | 1.6 | 1.599 | 1.599 | 1.907 |
| Stage 7 | Simple span | N/A | 1.6 | 1.287 | 1.287 | 1.502 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

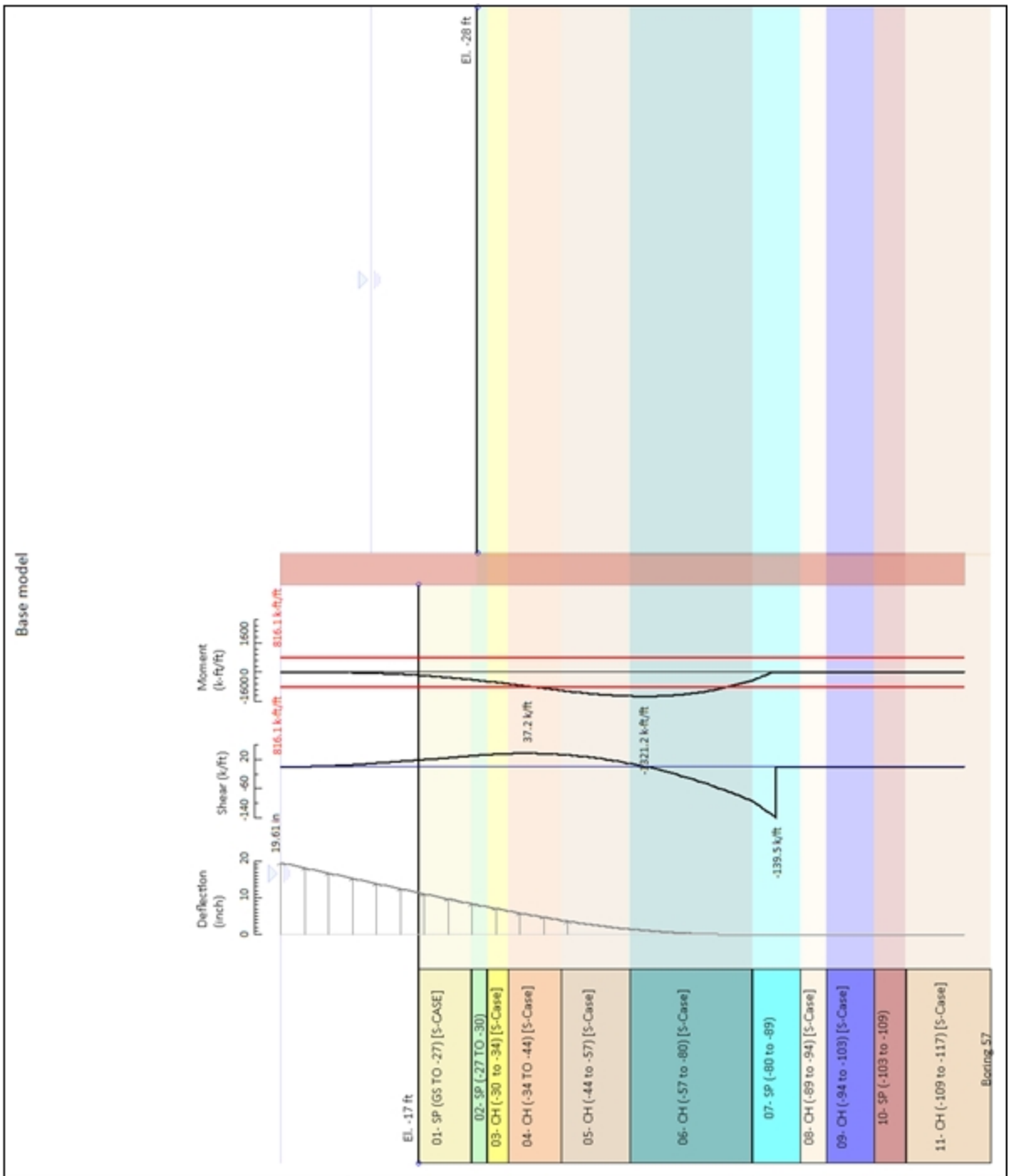
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

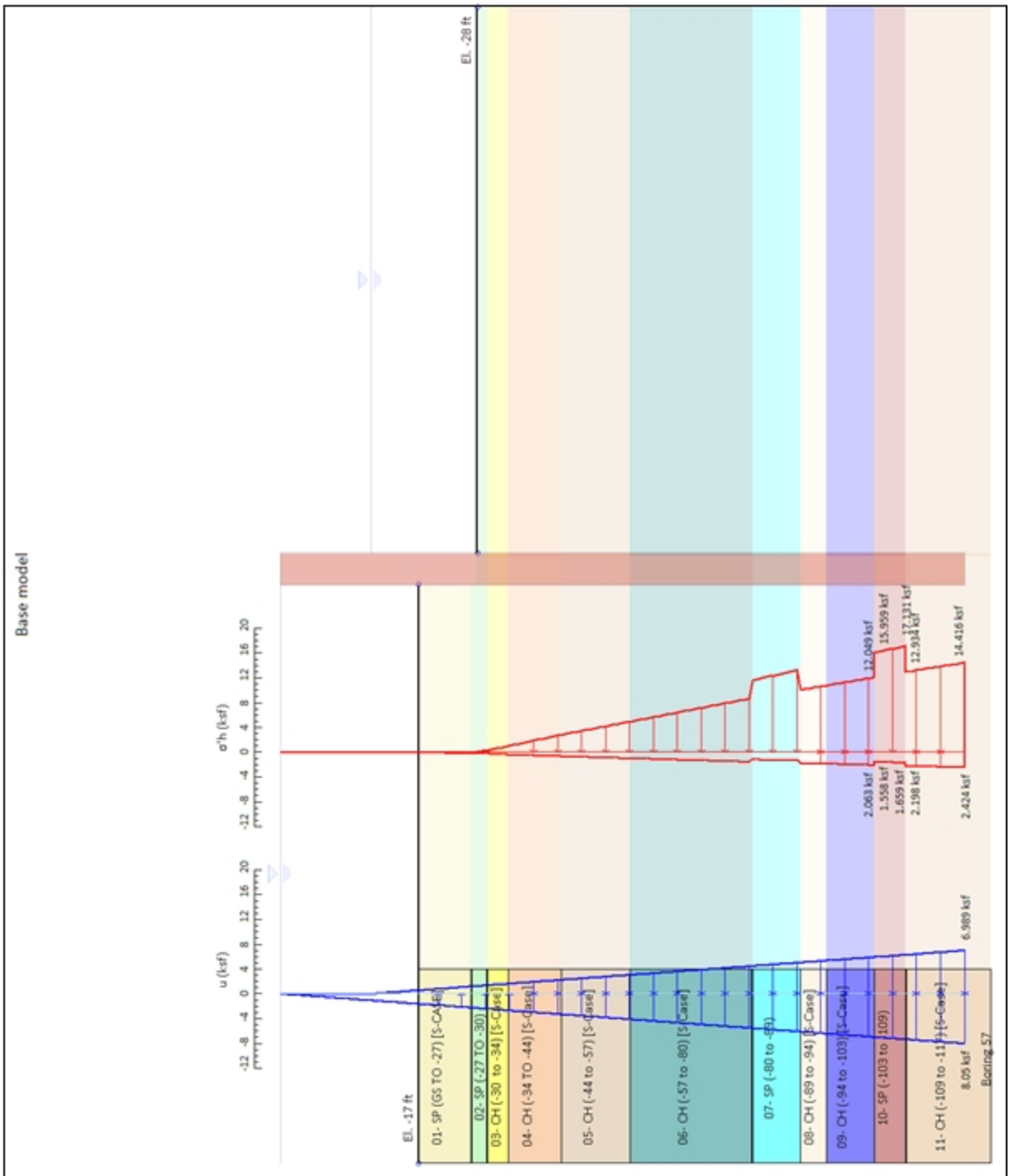
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported

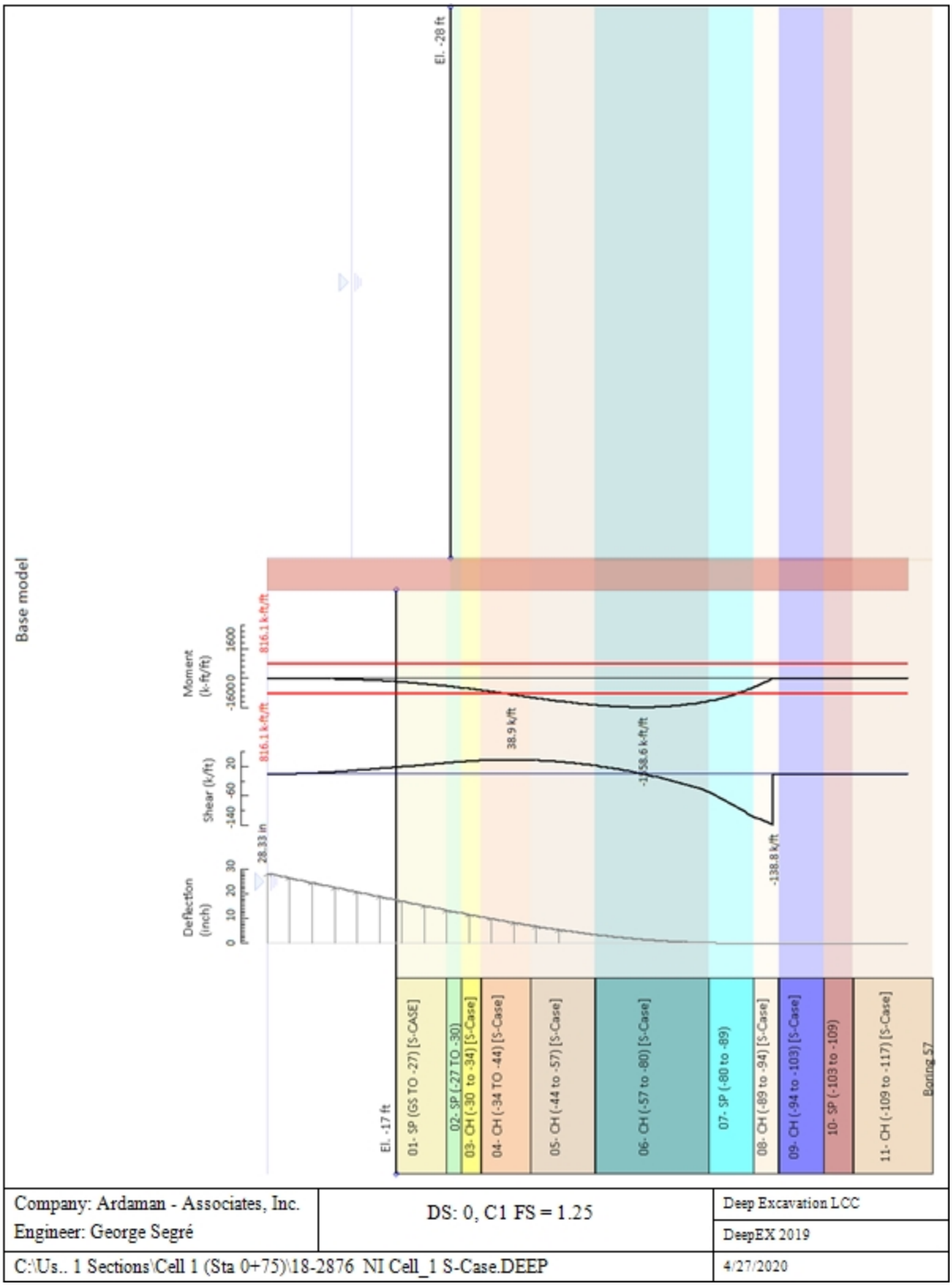


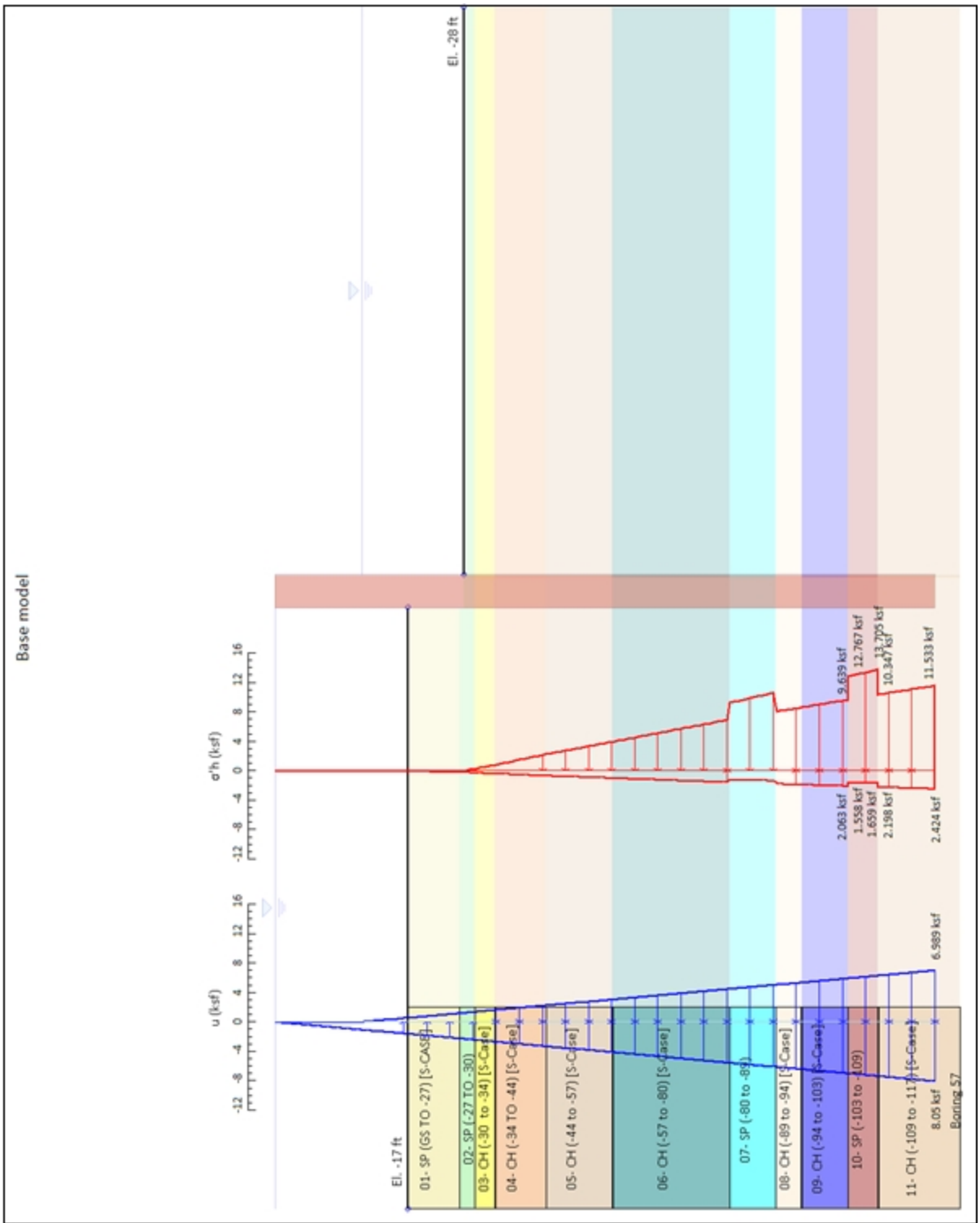

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



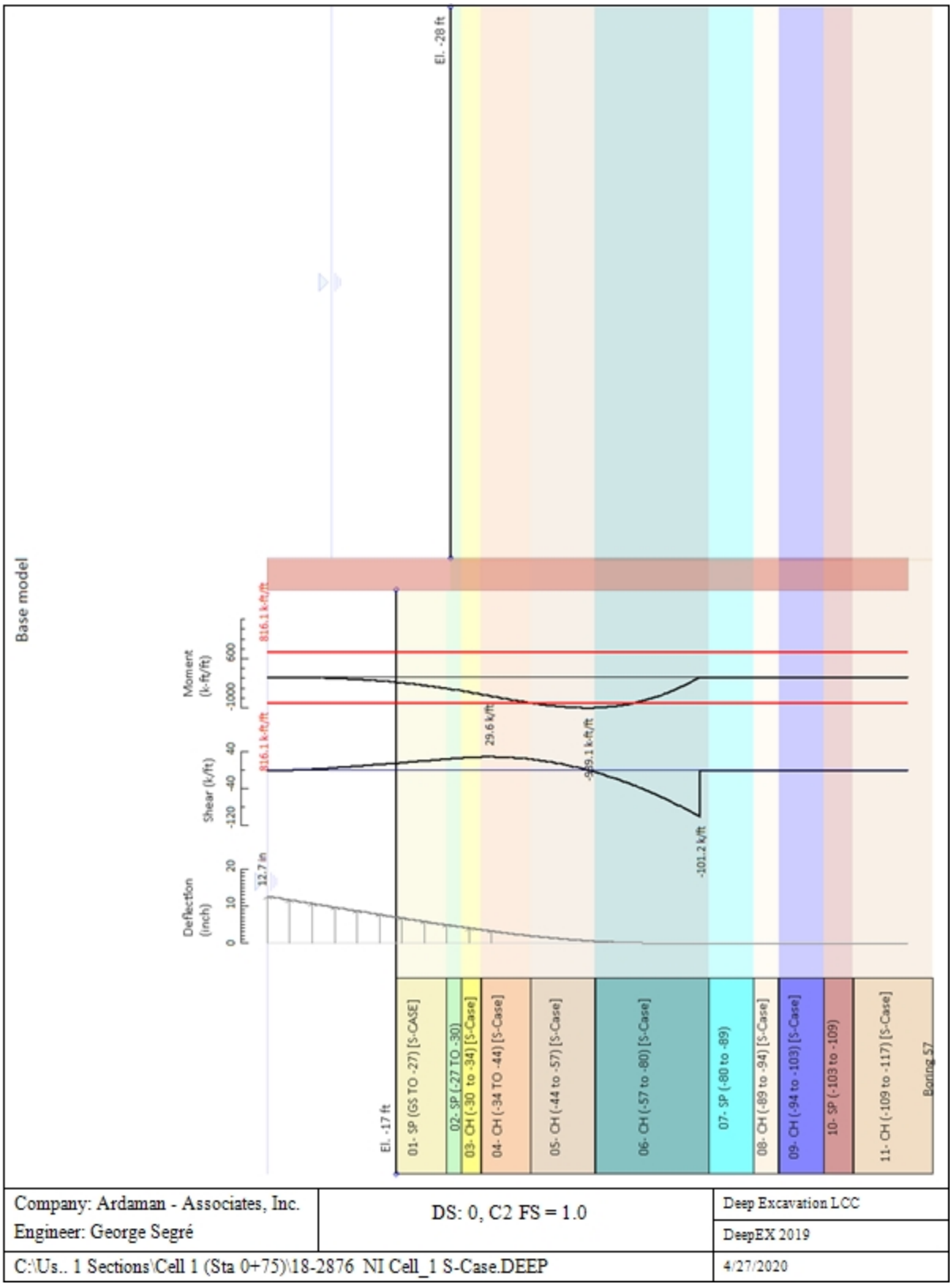

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

Attachment Figure C.1-37

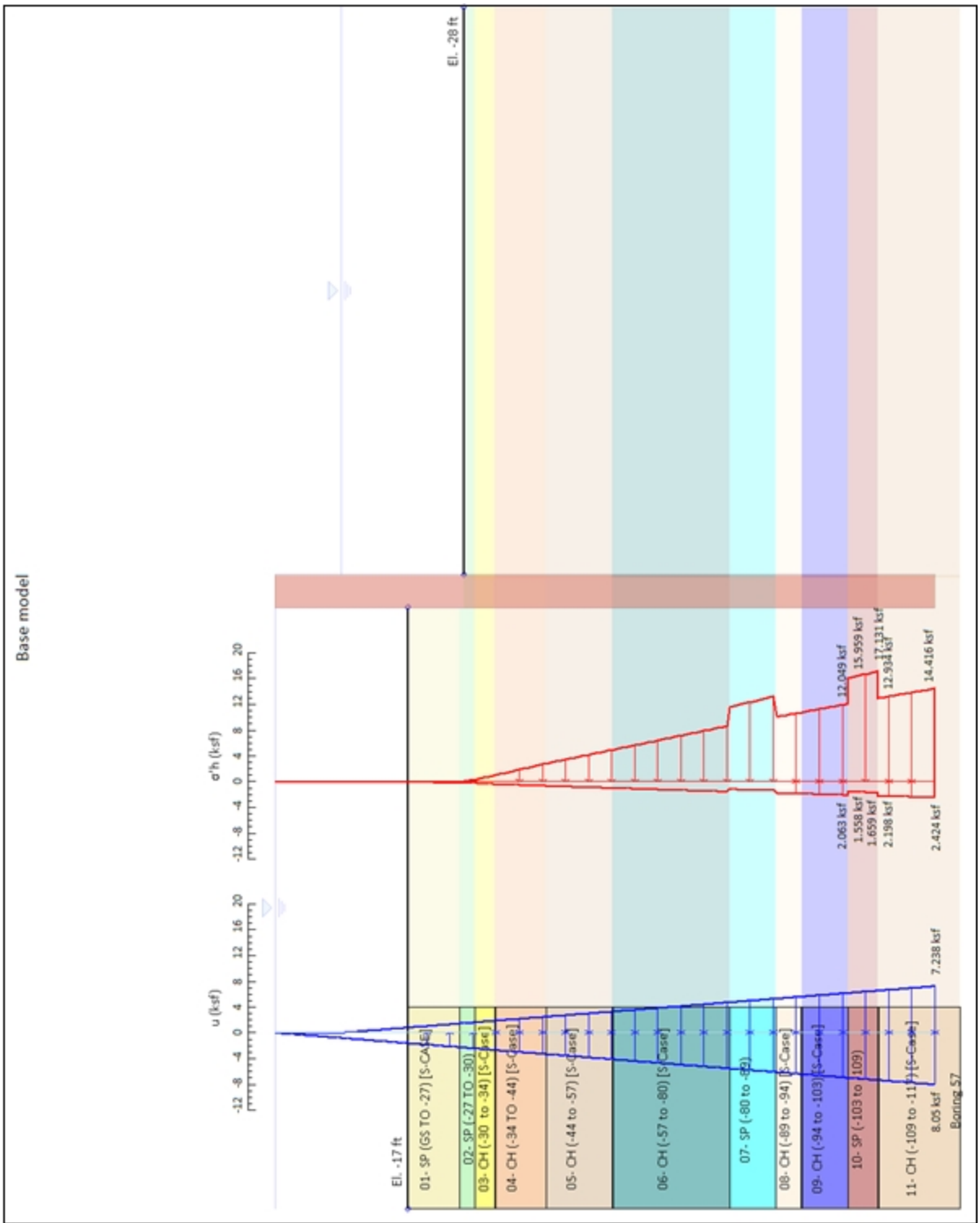

Base model
El. -28 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-140 -60 20
38.9 k/ft
-1158.6 k-ft/ft
-138.8 k/ft
28.33 in
Deflection (inch)
0 10 20 30
El. -17 ft
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP
4/27/2020



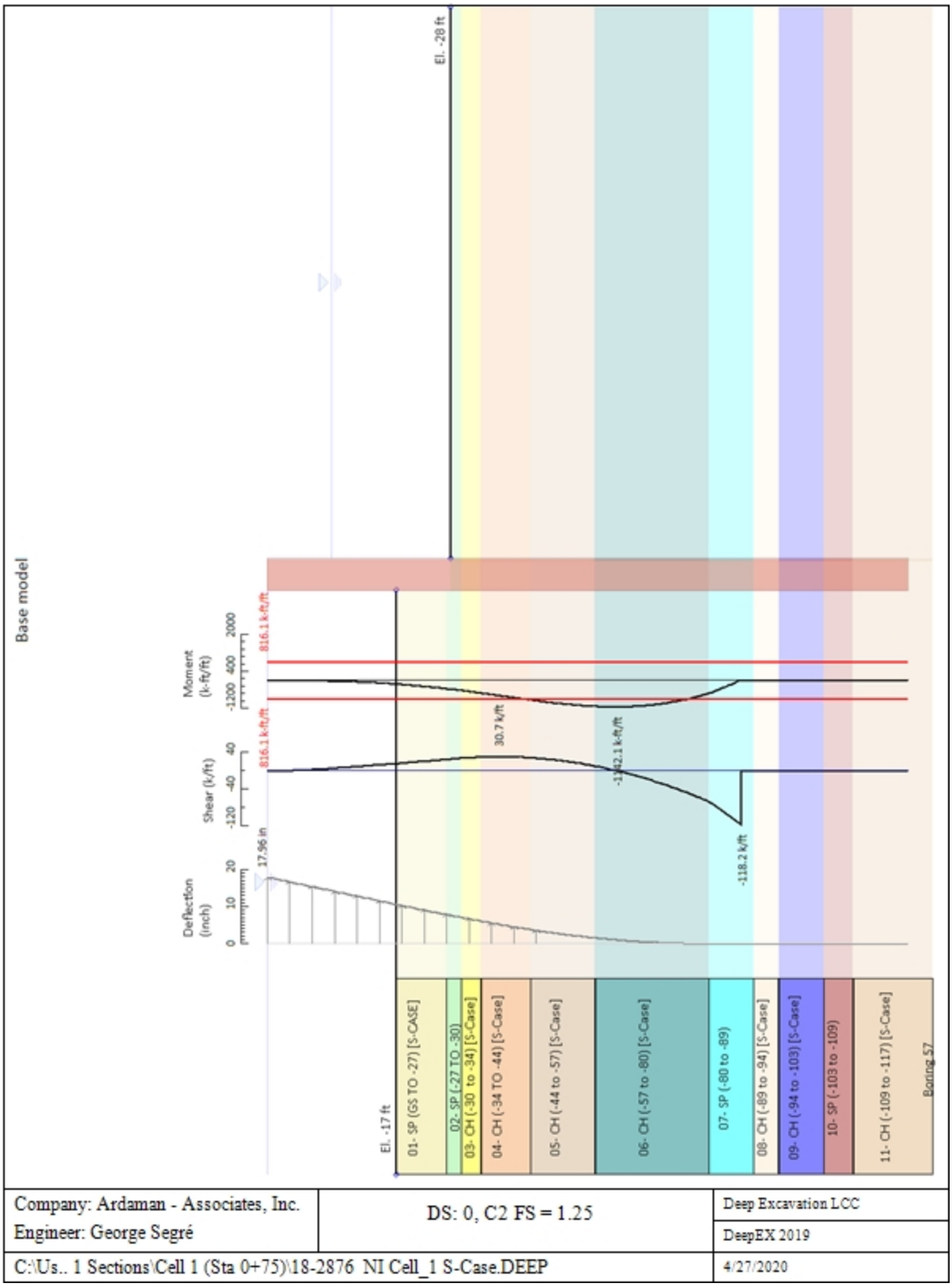

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



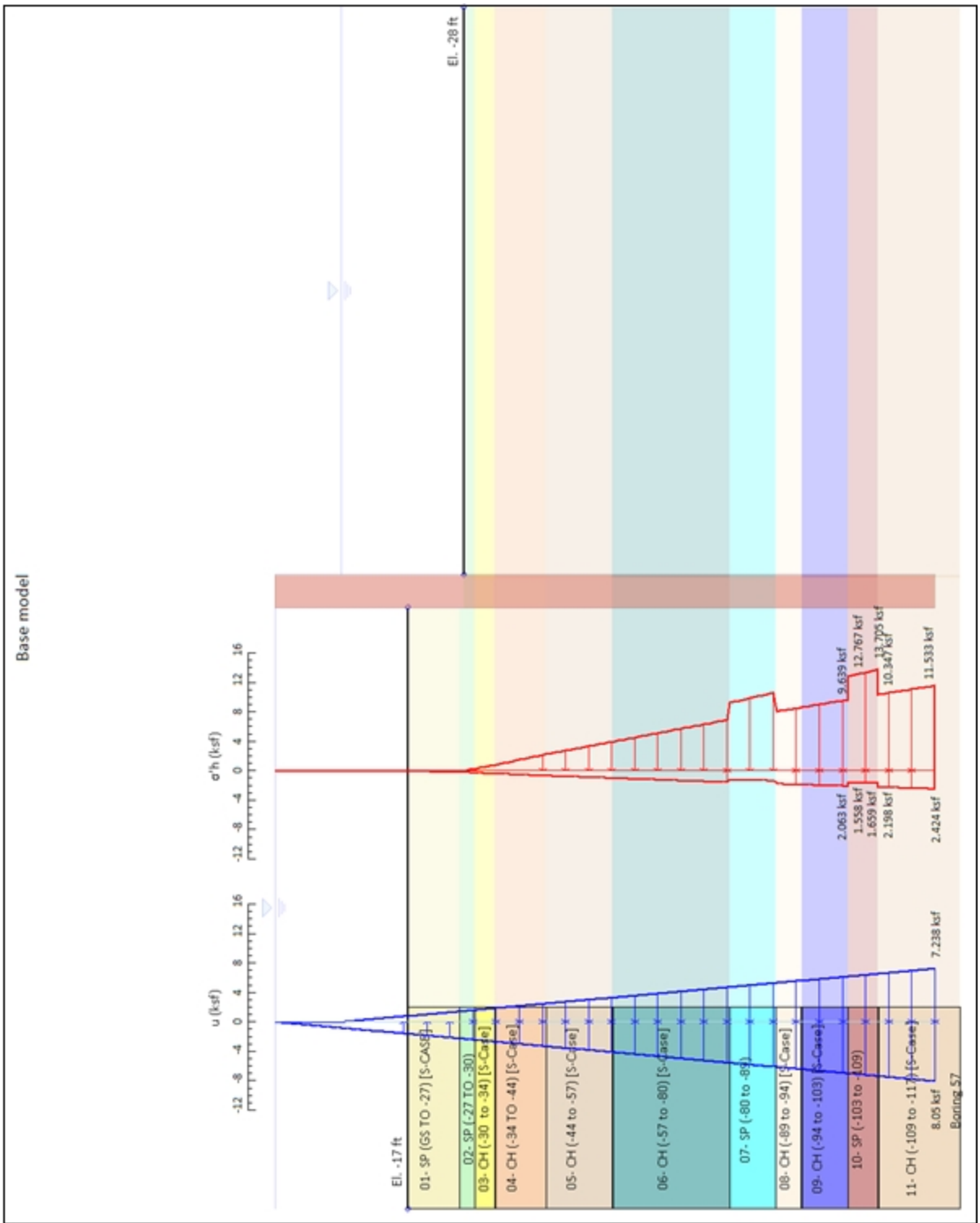

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



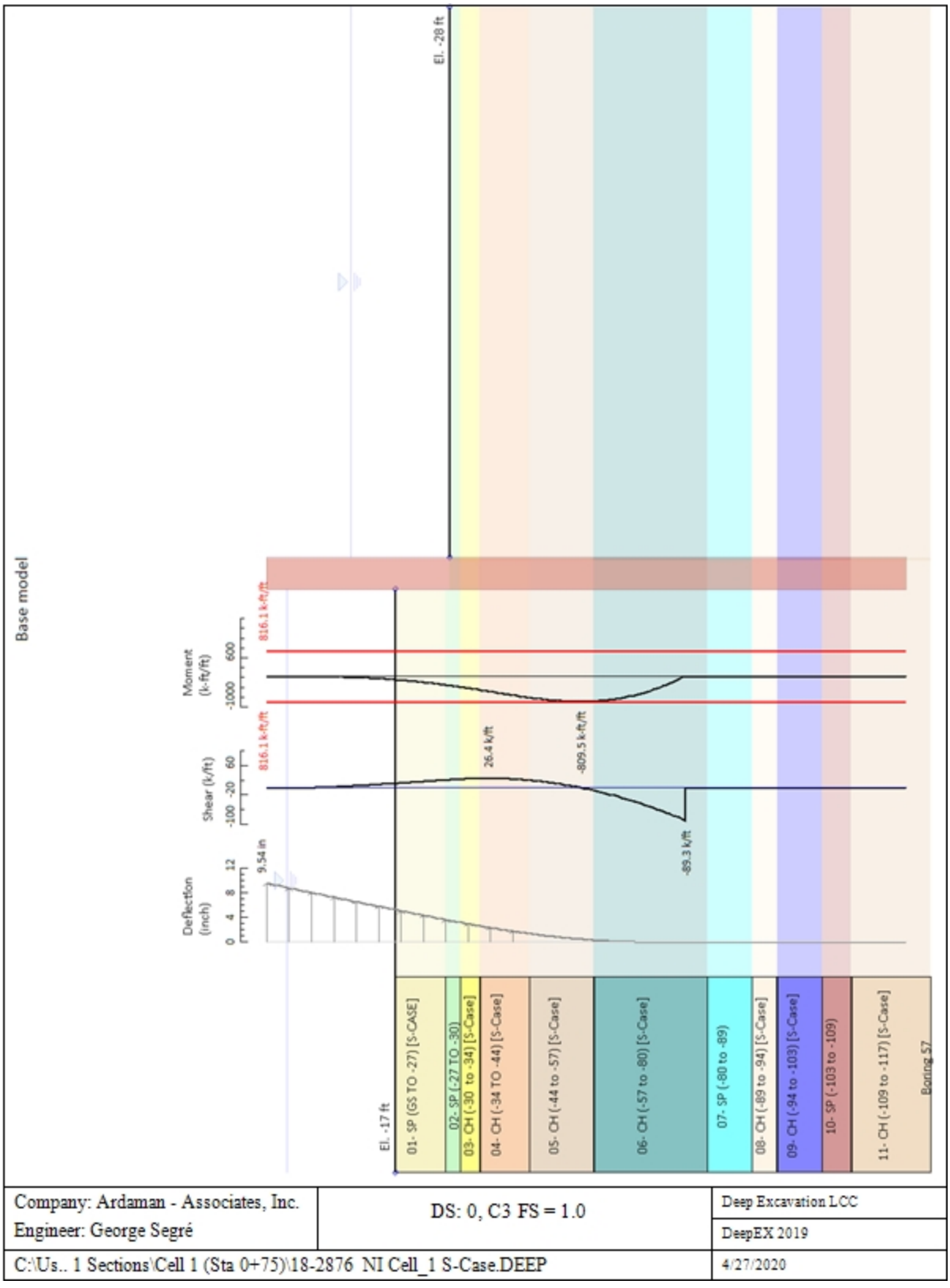

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



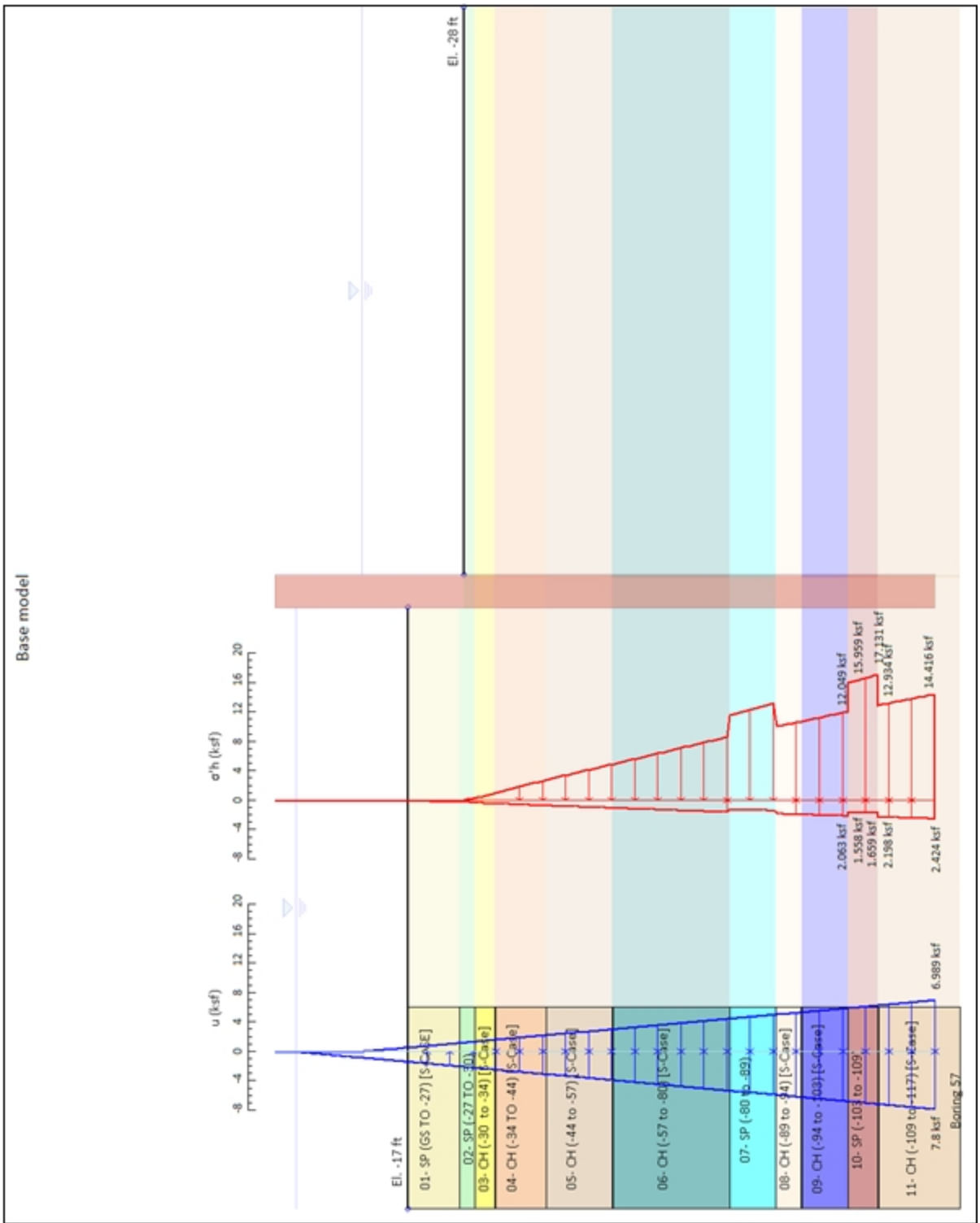

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



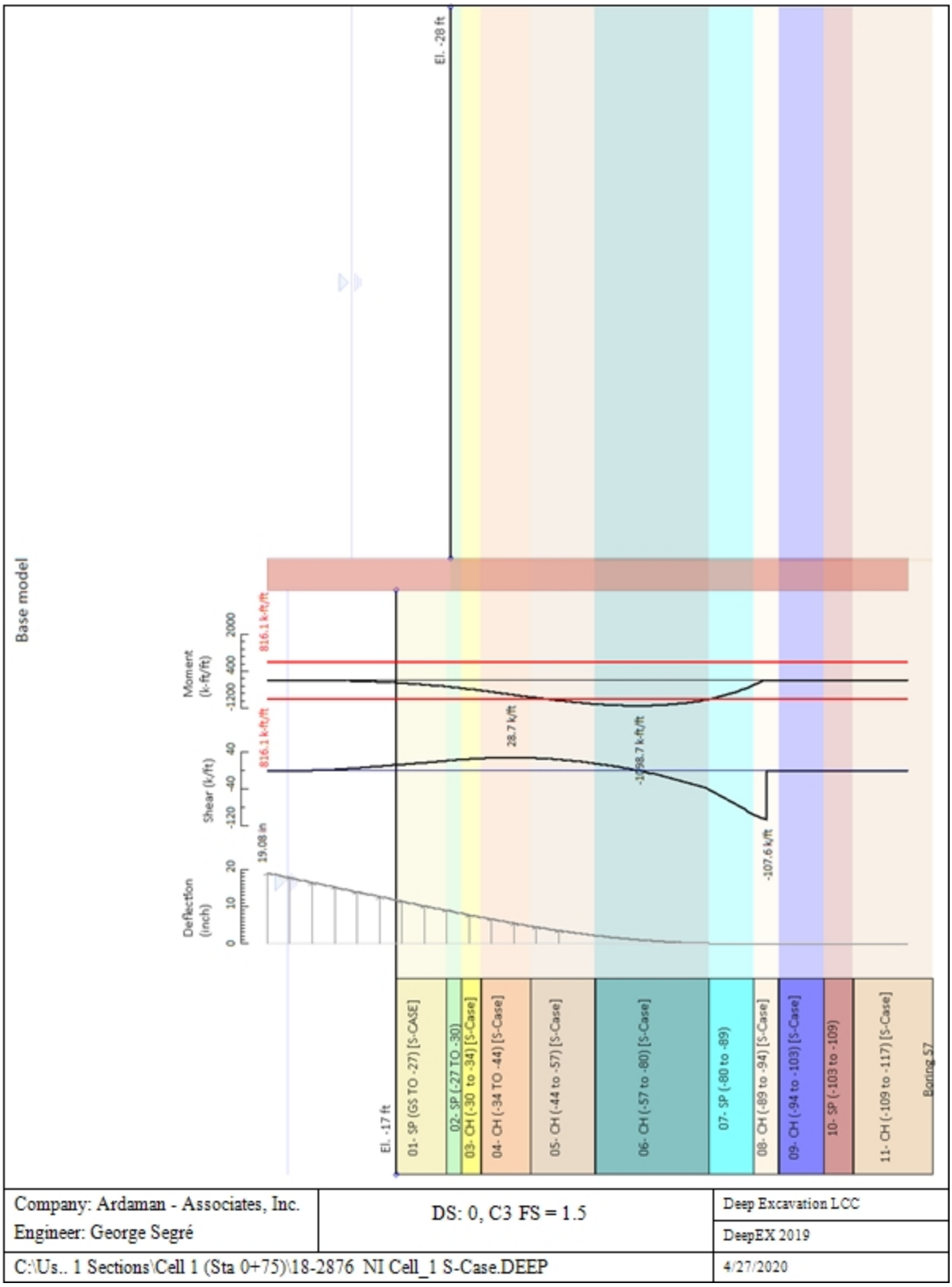

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



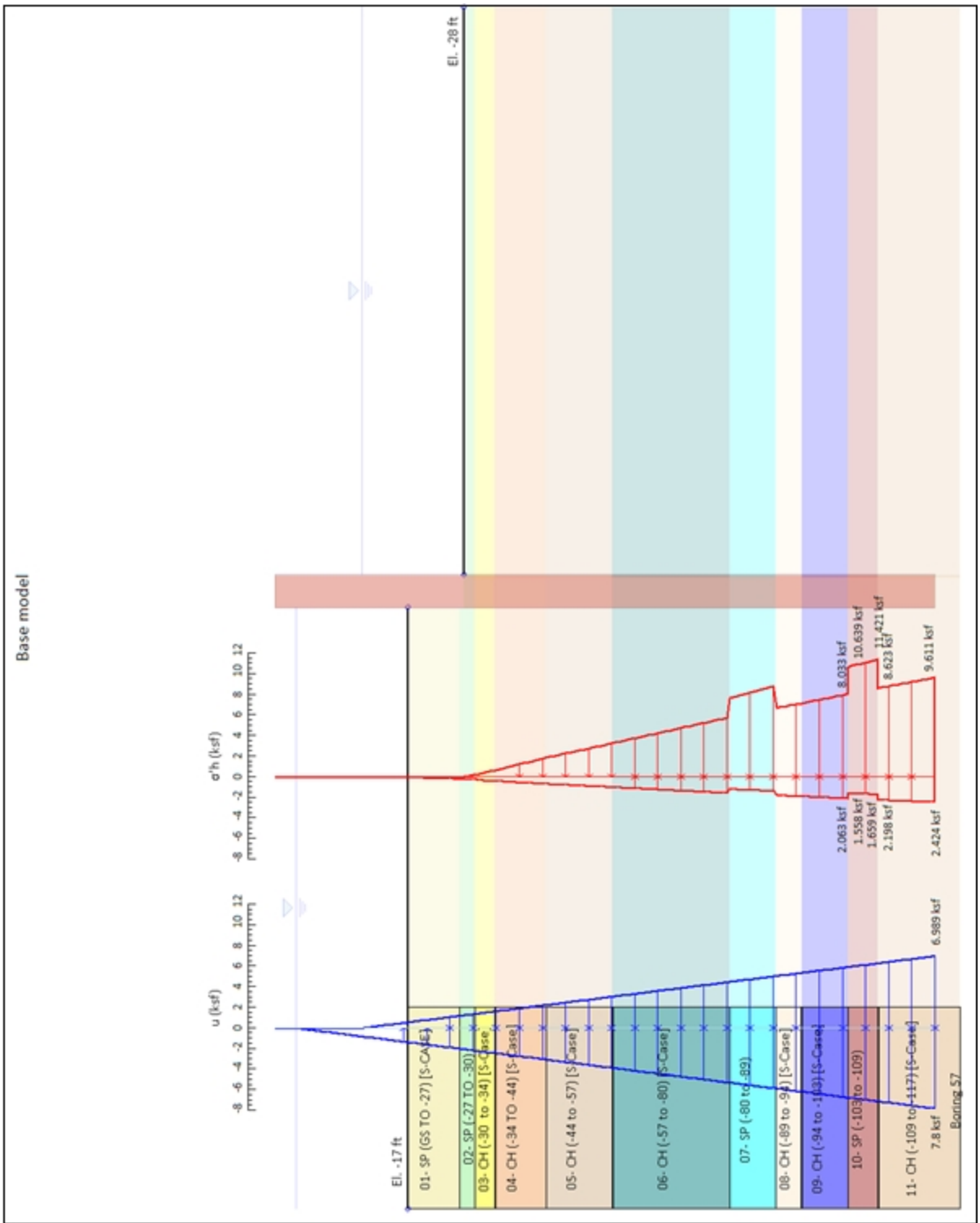

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



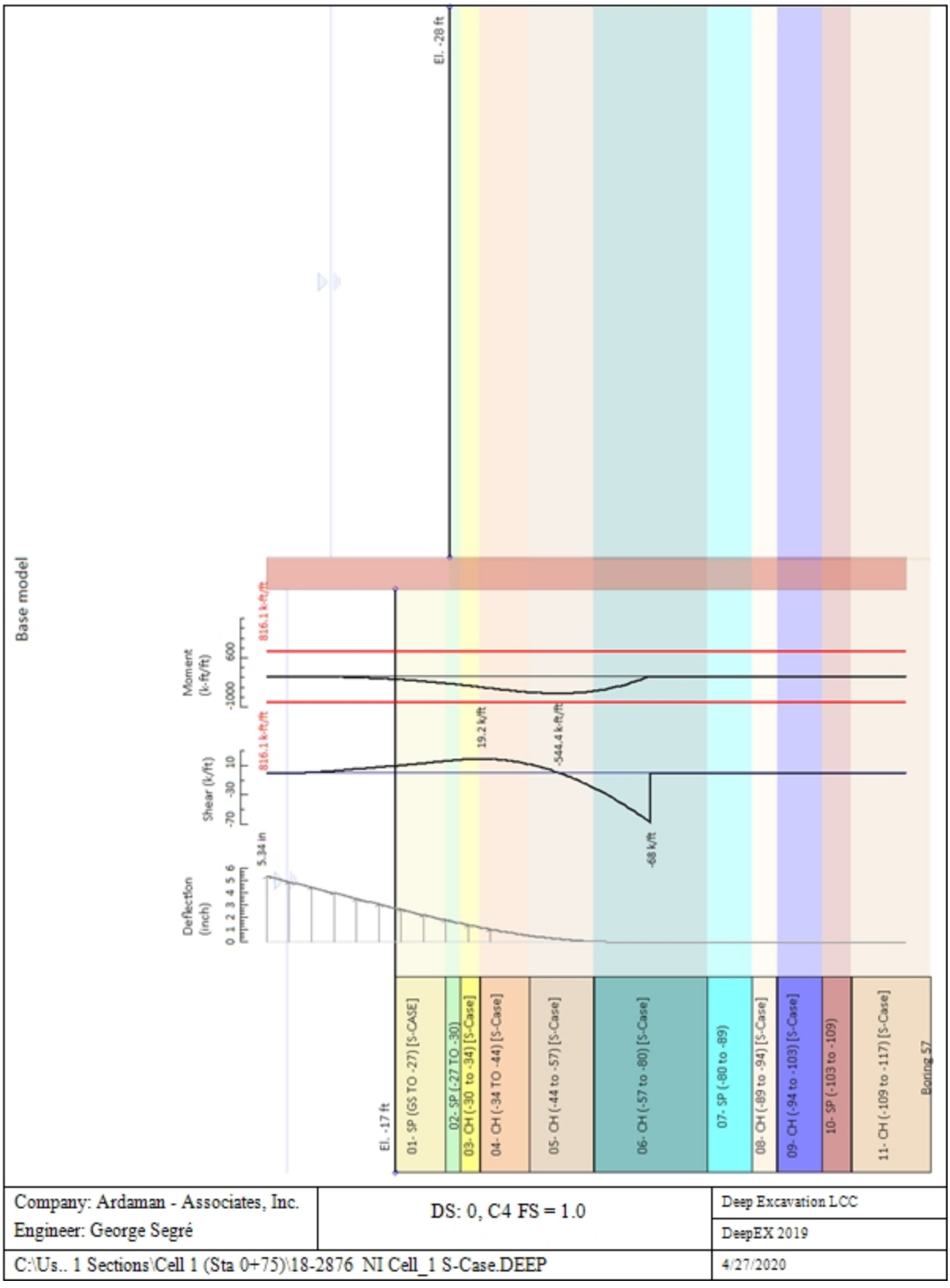

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



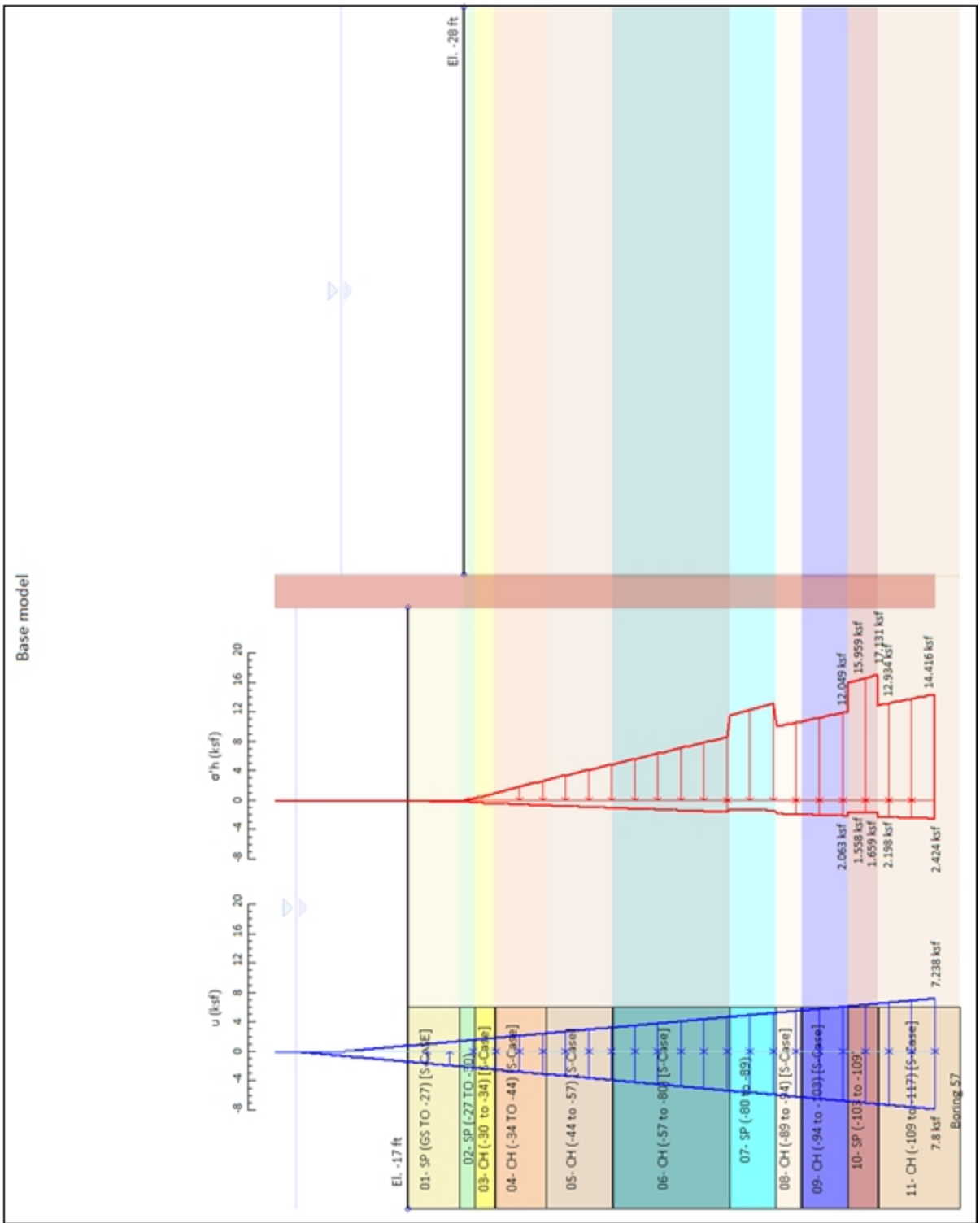

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



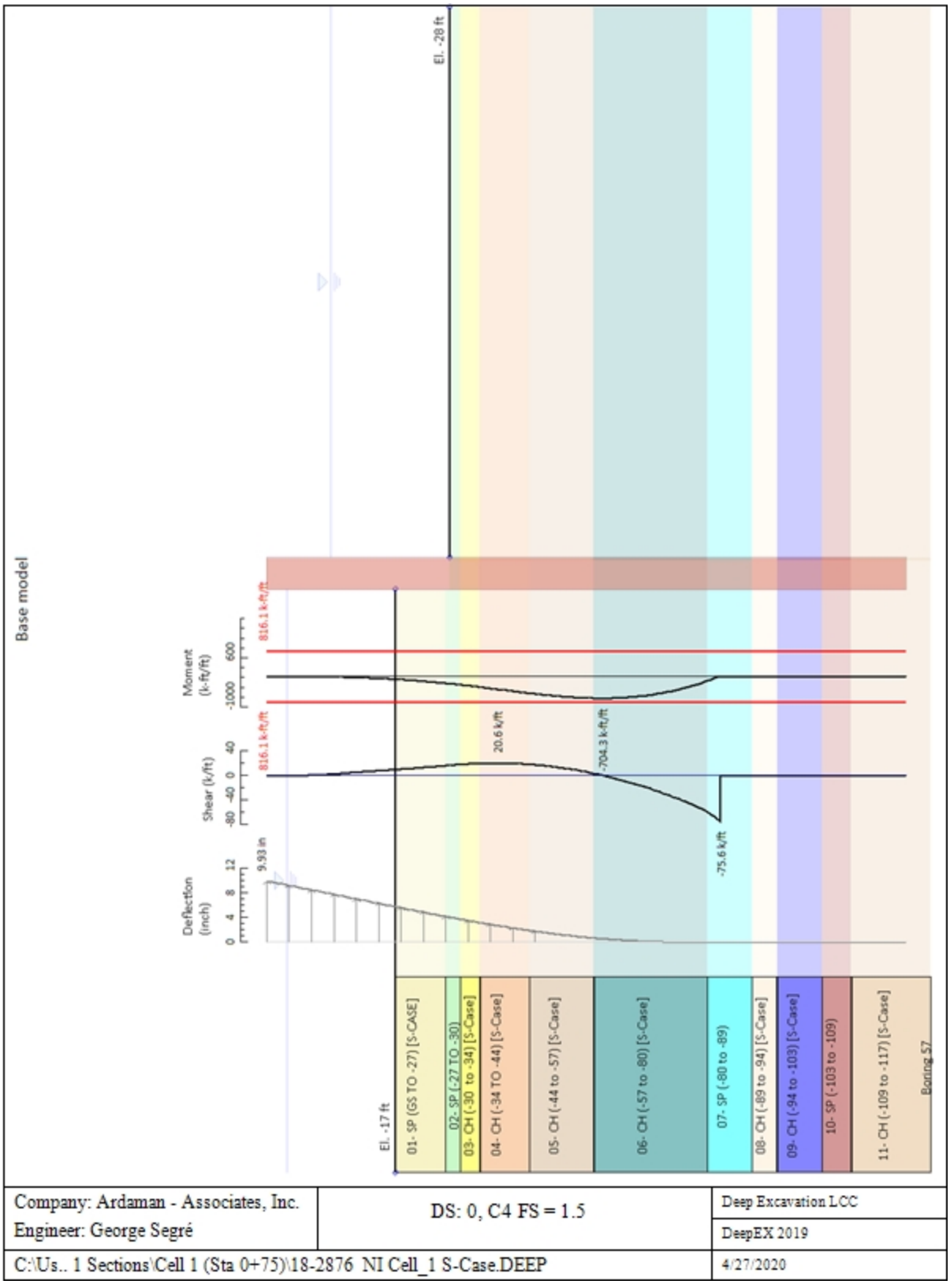

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



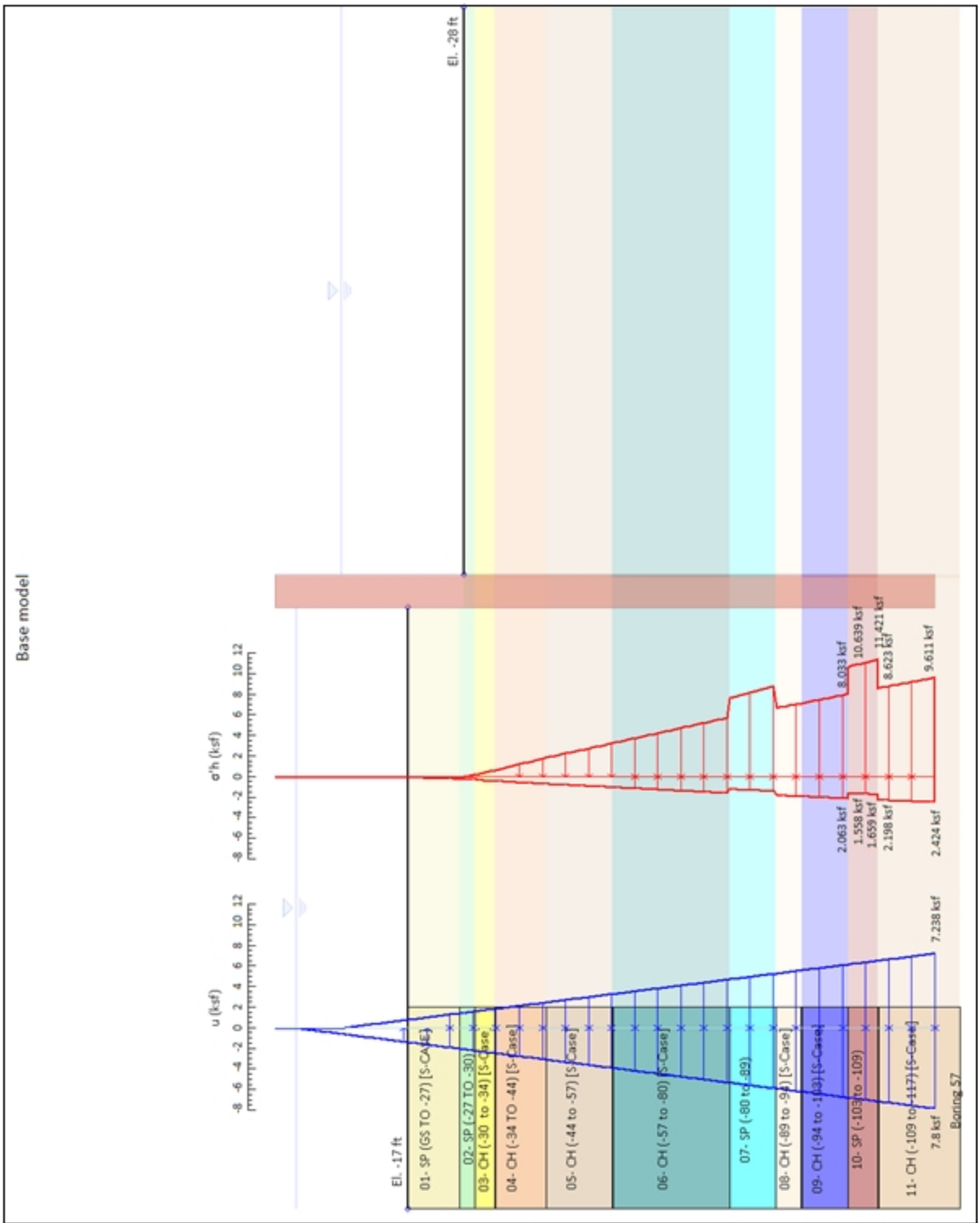

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 2+25)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -99.36 ft., NAVD88

Length of Sheetting = 108.36 ft.

Use = 110.0 ft.

Design Tip Elev. = -101.0 ft., NAVD88

Design Length of Sheeting = 110.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -46.70 | 500.82 | 87.78 | 2.31 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -49.46 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -44.33 | 400.31 | 78.71 | 1.67 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -46.70 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -43.53 | 324.83 | 70.87 | 1.23 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -47.48 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -41.16 | 232.55 | 61.43 | 0.77 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -44.33 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -89.00 | 1,607.73 | 166.42 | 26.49 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -99.36 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -83.24 | 1,227.20 | 126.96 | 17.75 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -92.26 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -81.30 | 1,035.74 | 111.37 | 13.92 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -98.72 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -74.20 | 725.69 | 83.46 | 8.22 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -90.33 | -- | -- | -- |
| | | | | | | Governing Value: | -99.36 | 1,607.73 | 166.42 | 26.49 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:25:30 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 13- CH (GS to | 112 | 112 | 0 | 0 | 800 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 12- SP (-10 to | 112 | 112 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 01- SP (-17 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 60 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 0 | 0 | 2290 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 0 | 0 | 2290 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 0 | 0 | 2290 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 0 | 0 | 1650 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 0 | 0 | 1200 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 0 | 0 | 1670 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 13- CH (GS to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- SP (-10 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 01- SP (-17 T | 0.4 | - | - | 0.5 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.5 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | 0.1 | 0 | 0.45 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

Top Elev= superior SOil level

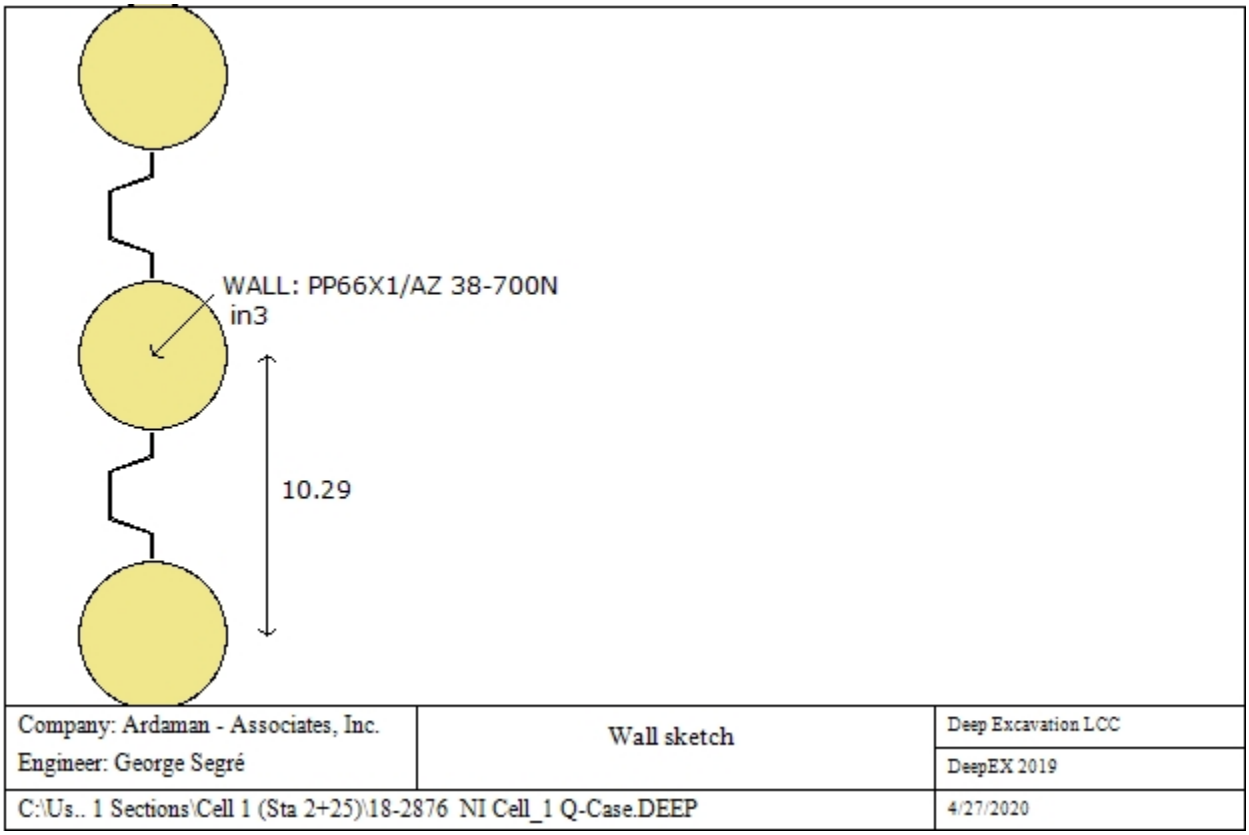
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| -2 | 13- CH (GS to - | 1 | 1 |
| -10 | 12- SP (-10 to - | 1 | 0.5 |
| -17 | 01- SP (-17 TO | 1 | 0.5 |
| -27 | 02- SP (-27 TO | 1 | 0.5 |
| -30 | 03- CH (-30 to | 1 | 1 |
| -34 | 04- CH (-34 TO | 1 | 1 |
| -44 | 05- CH (-44 to | 1 | 0.45 |
| -57 | 06- CH (-57 to | 1 | 1 |
| -80 | 07- SP (-80 to - | 1 | 0.5 |
| -89 | 08- CH (-89 to | 1 | 1 |
| -94 | 09- CH (-94 to | 1 | 1 |
| -103 | 10- SP (-103 to | 1 | 0.5 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall

Top wall El: 9 ft  Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft  Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft  Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi  Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)

rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.246 | 2.766 | 6.475 |
| Stage 1 | Simple span | N/A | 1.6 | 1.957 | 2.27 | 5.236 |
| Stage 2 | Simple span | N/A | 1.6 | 2.572 | 2.972 | 6.775 |
| Stage 3 | Simple span | N/A | 1.6 | 2.246 | 2.459 | 5.499 |
| Stage 4 | Simple span | N/A | 1.6 | 2.704 | 3.393 | 7.605 |
| Stage 5 | Simple span | N/A | 1.6 | 2.156 | 2.379 | 5.18 |
| Stage 6 | Simple span | N/A | 1.6 | 3.19 | 3.645 | 7.958 |
| Stage 7 | Simple span | N/A | 1.6 | 2.572 | 2.598 | 5.46 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

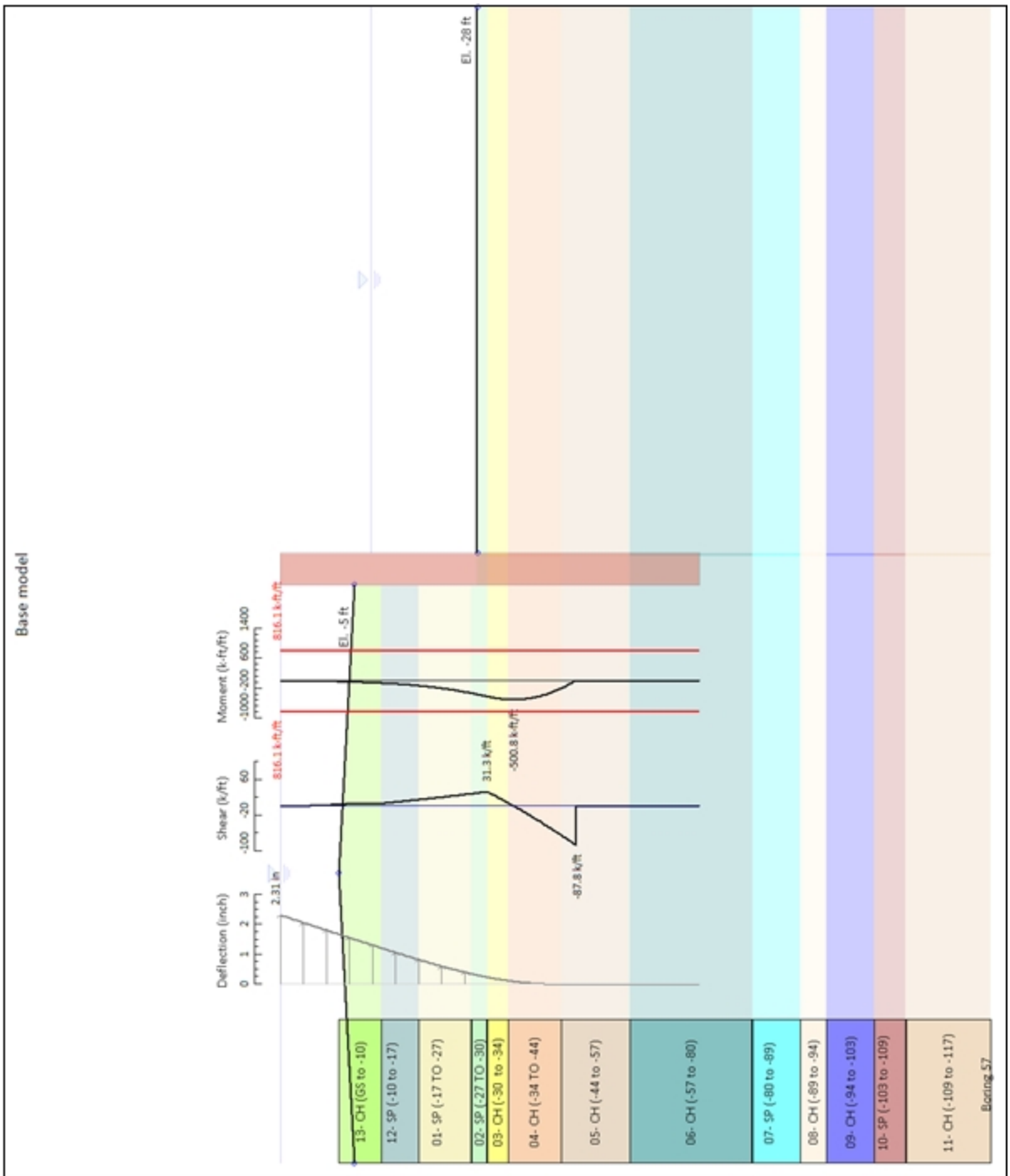
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

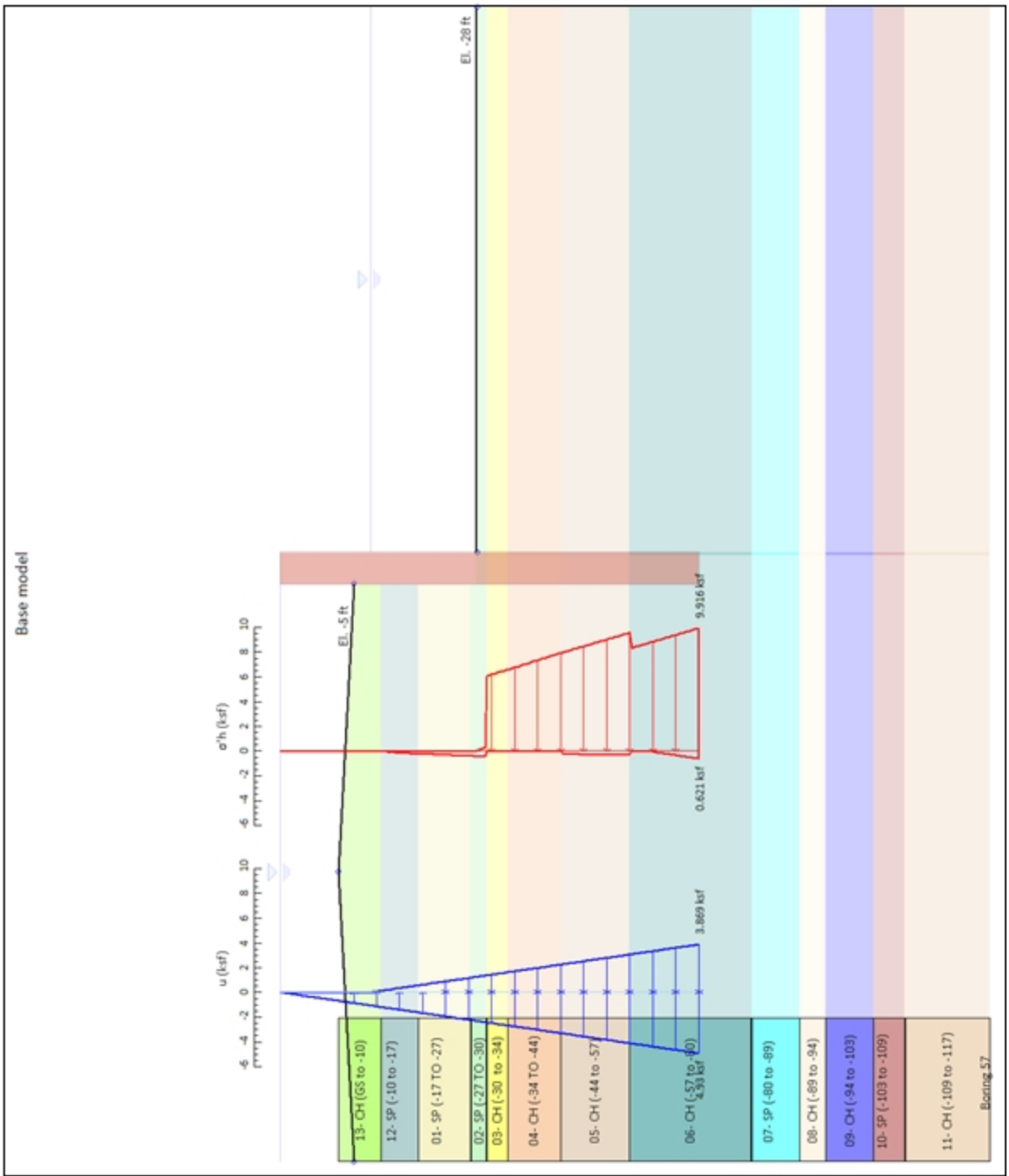
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

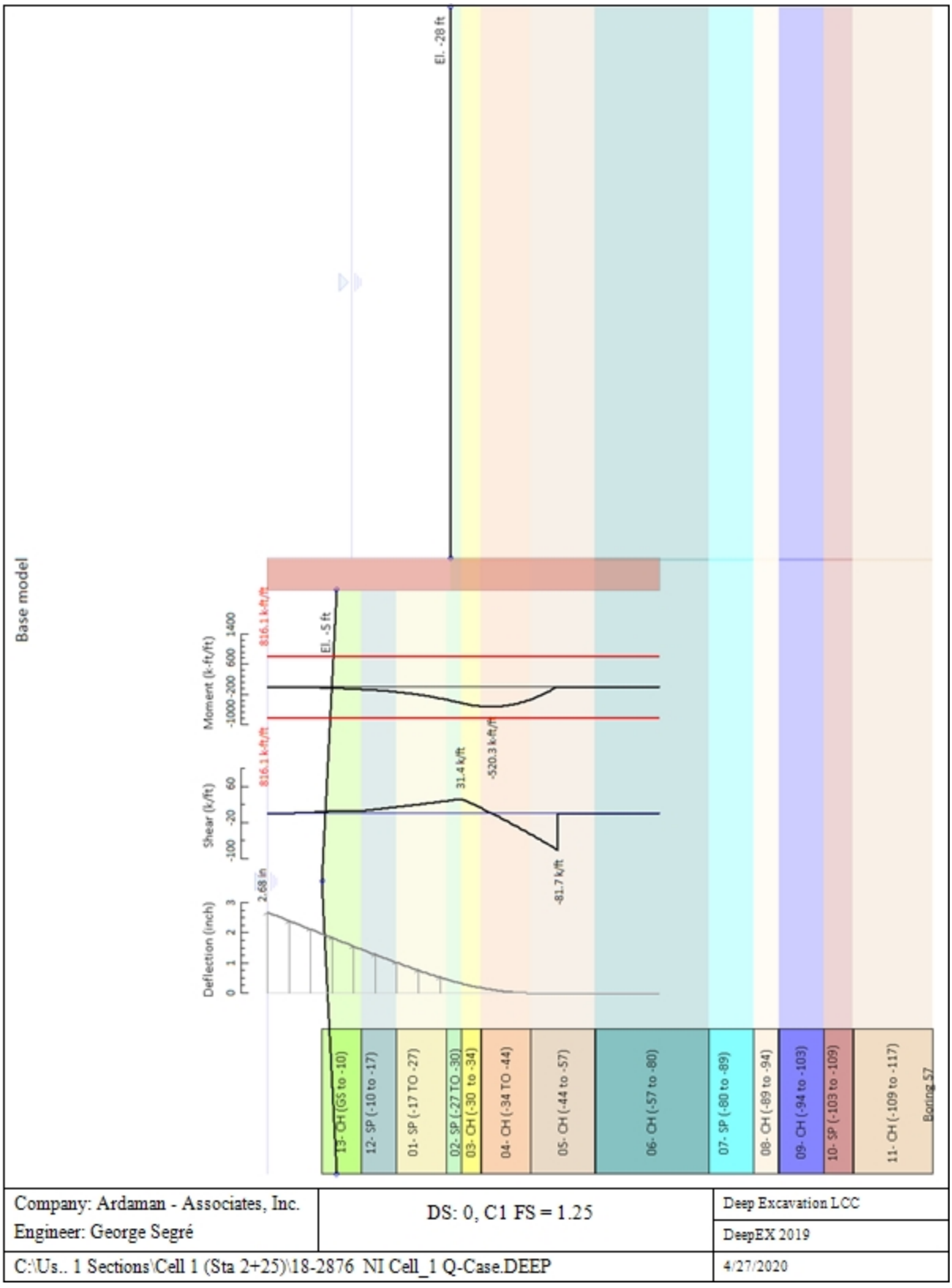
A sequence of figures for each excavation stage is reported



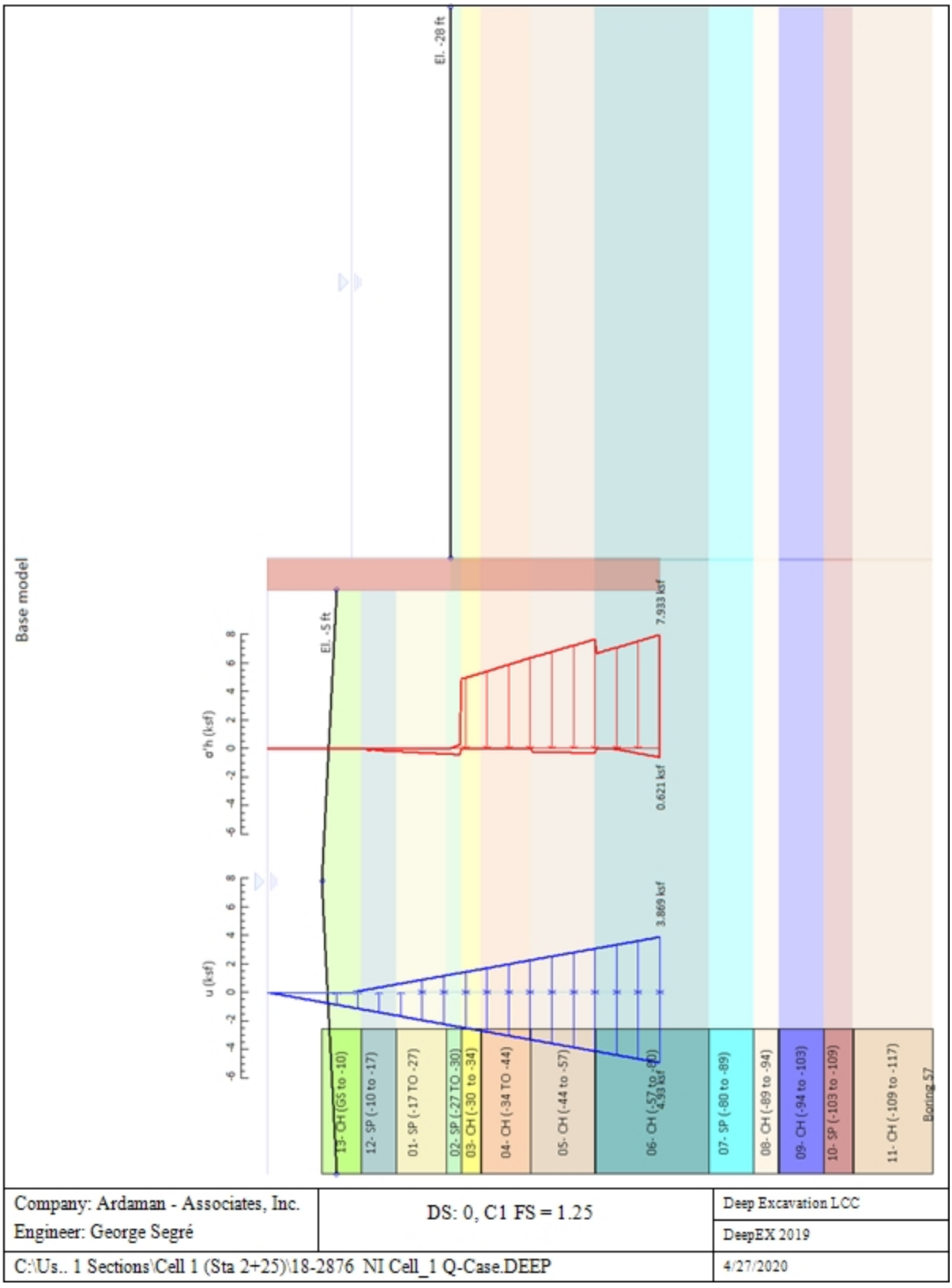

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |

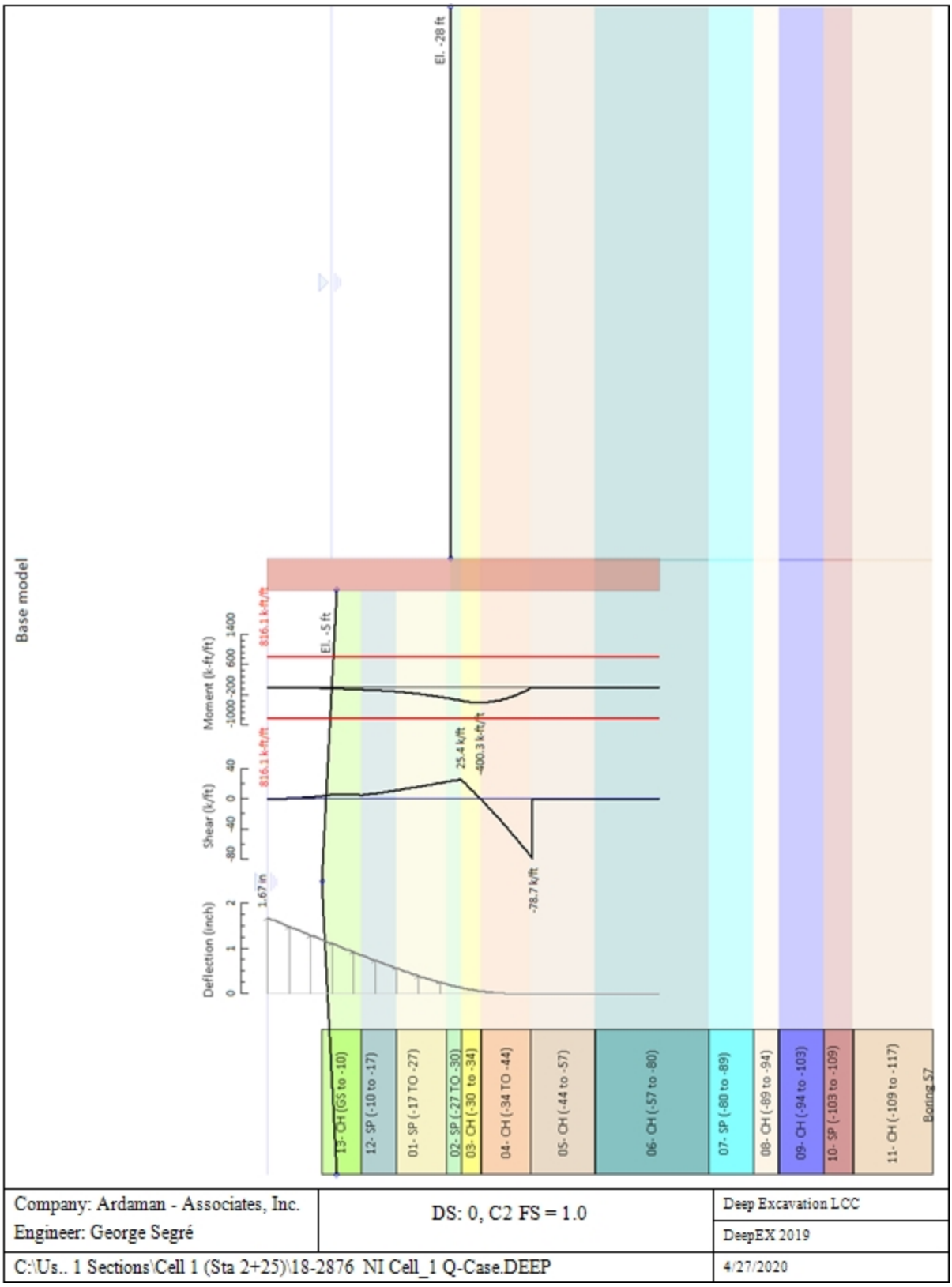



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |

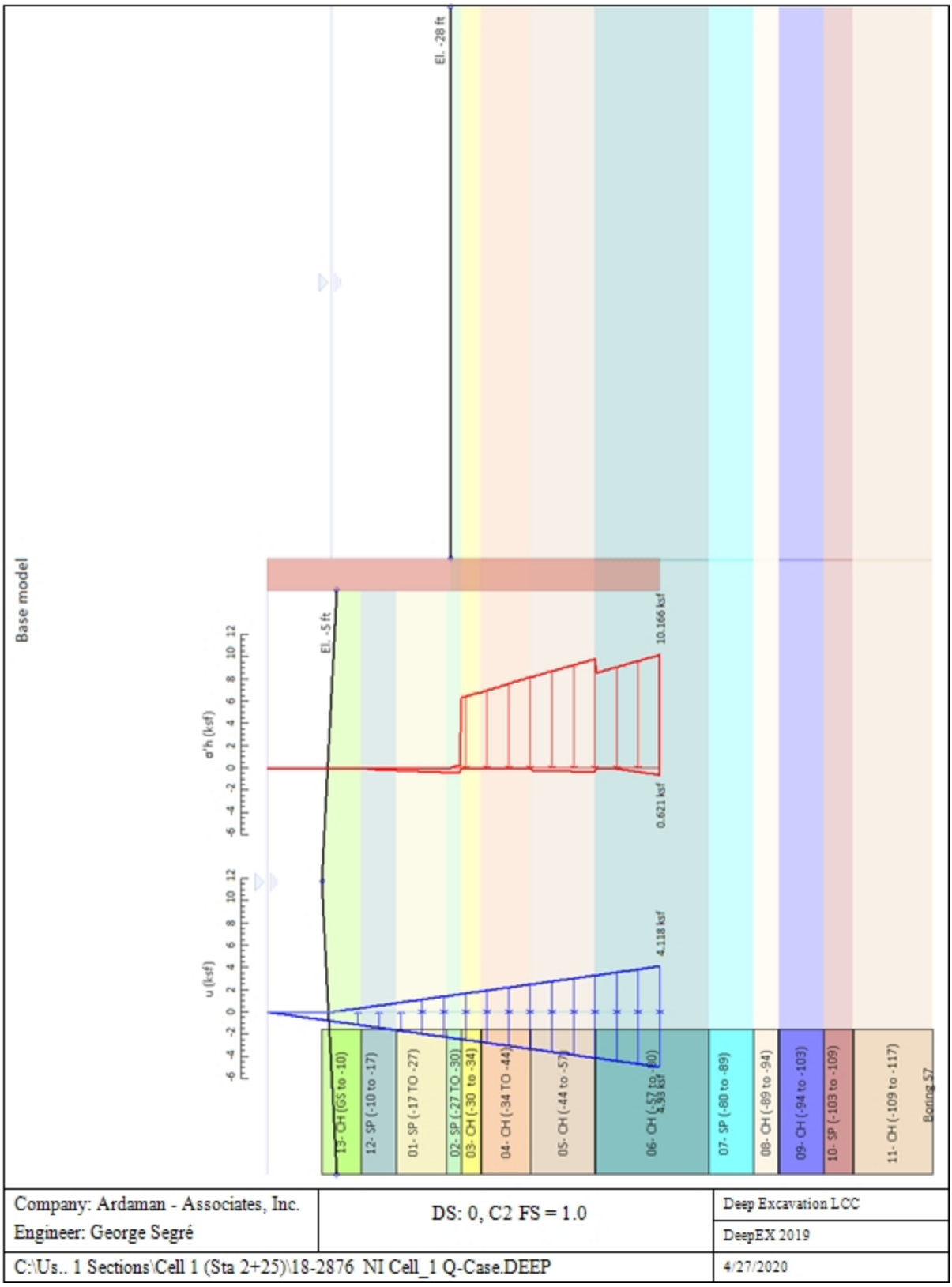


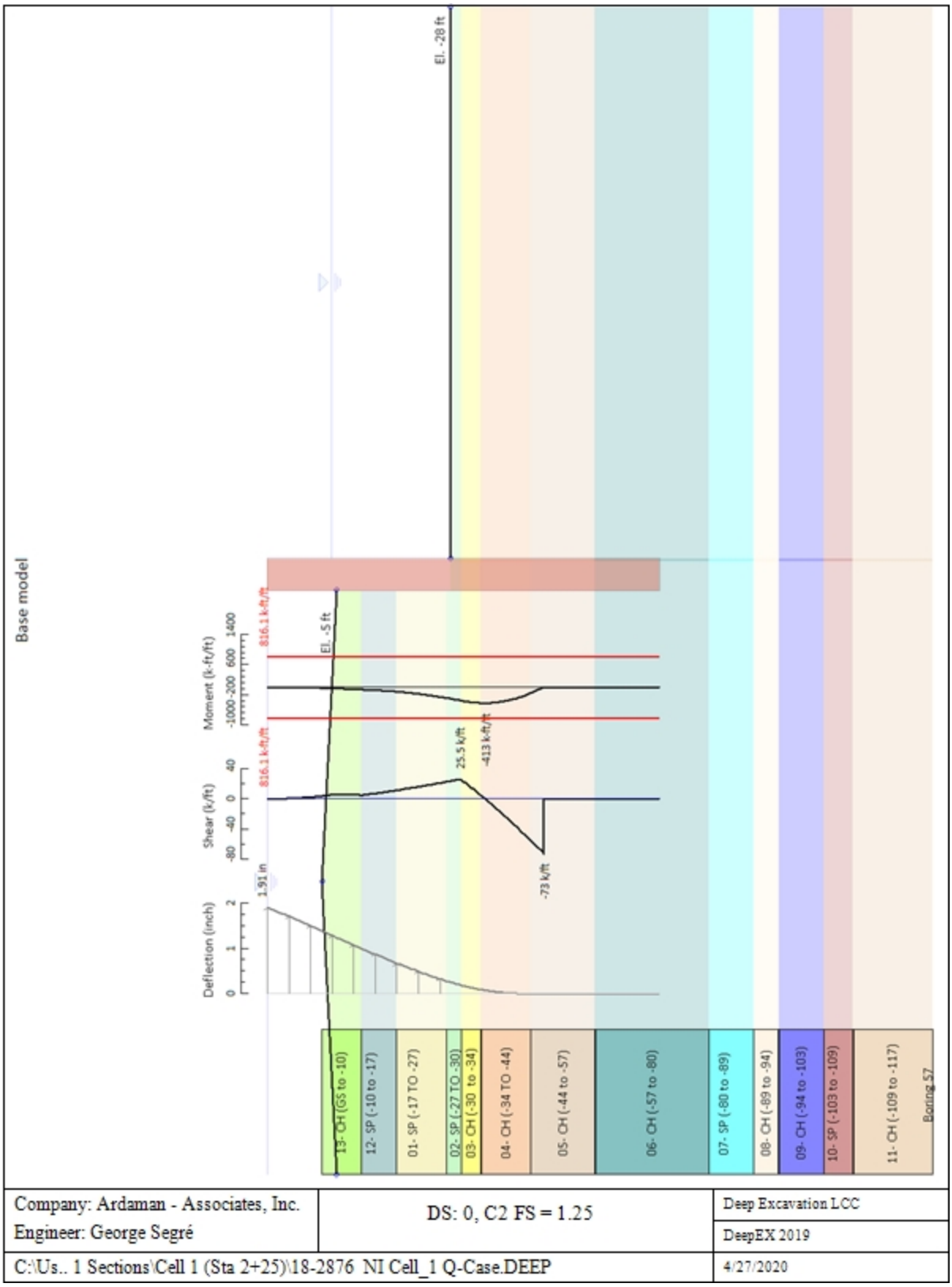

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
7.933 ksf
0.621 ksf
3.869 ksf
4.93 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

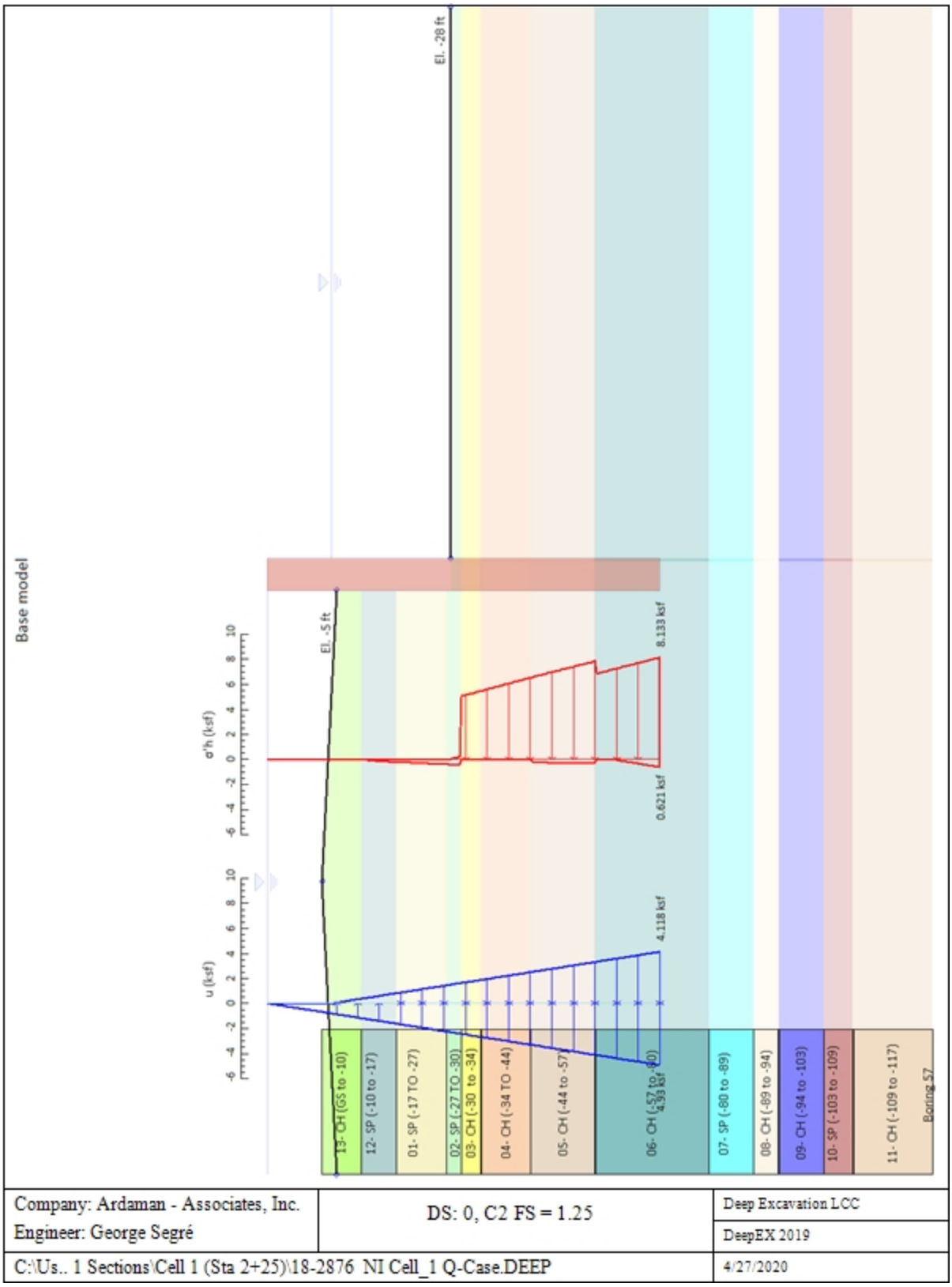


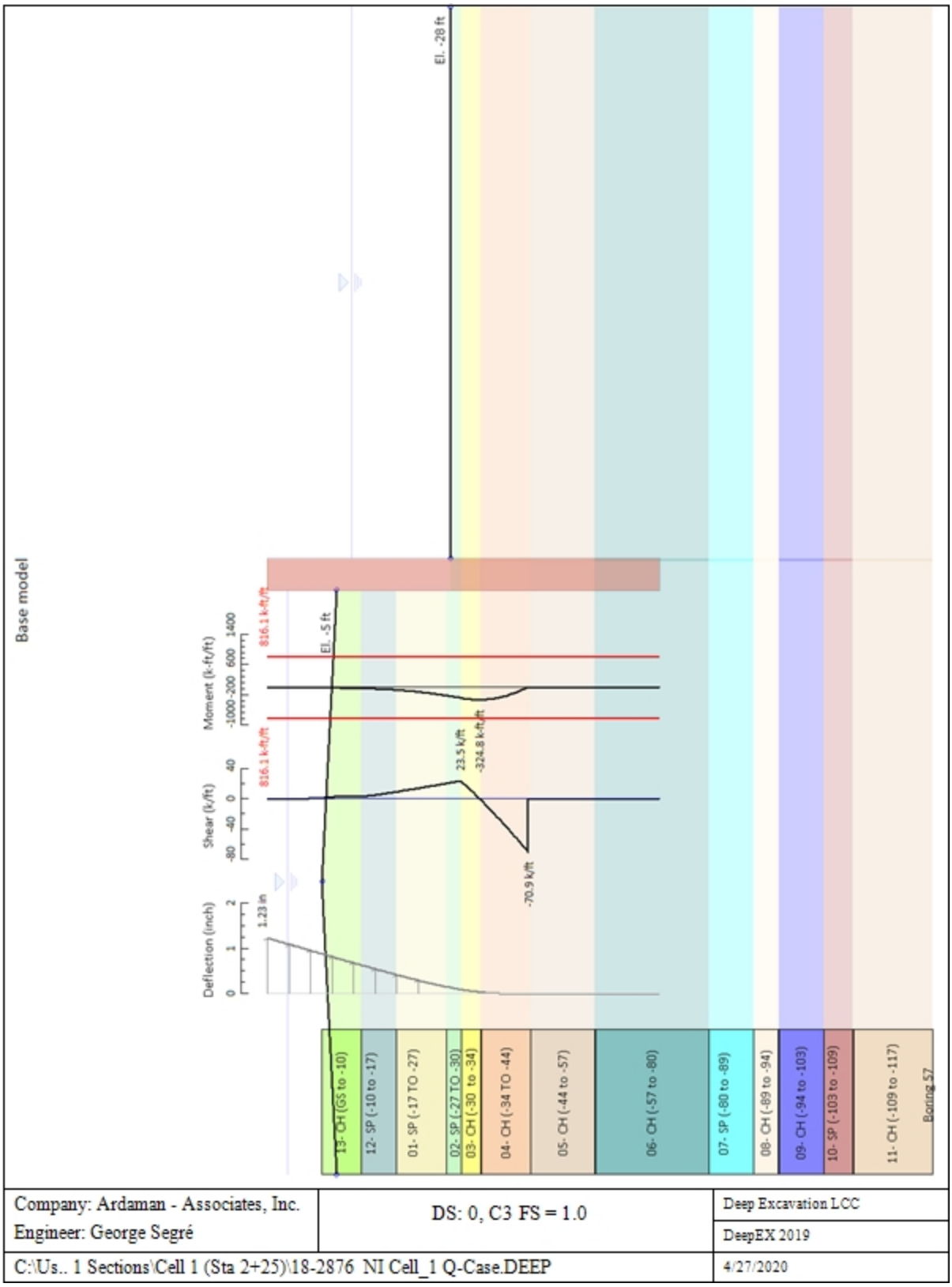

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
10.166 ksf
0.621 ksf
4.118 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

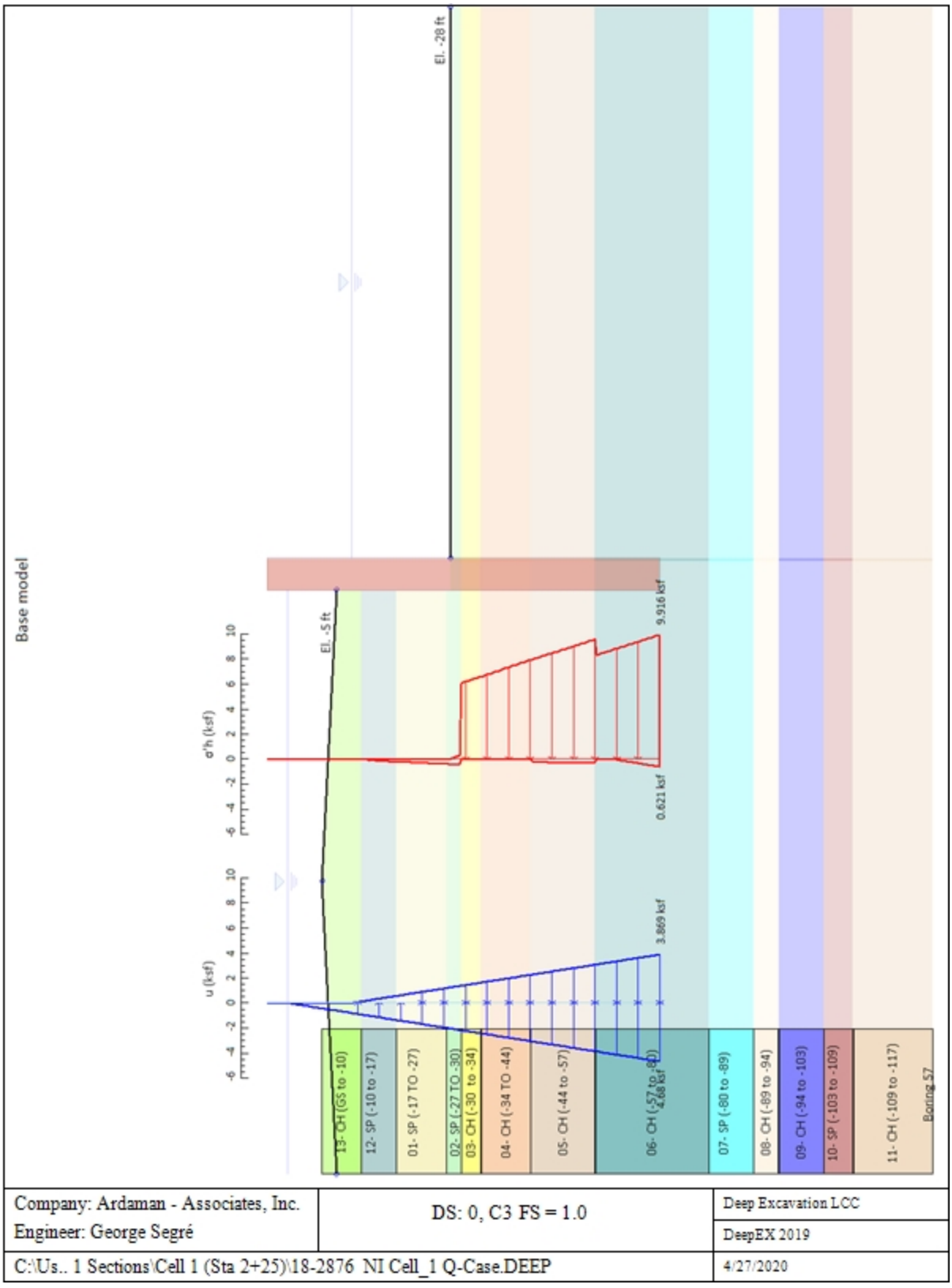


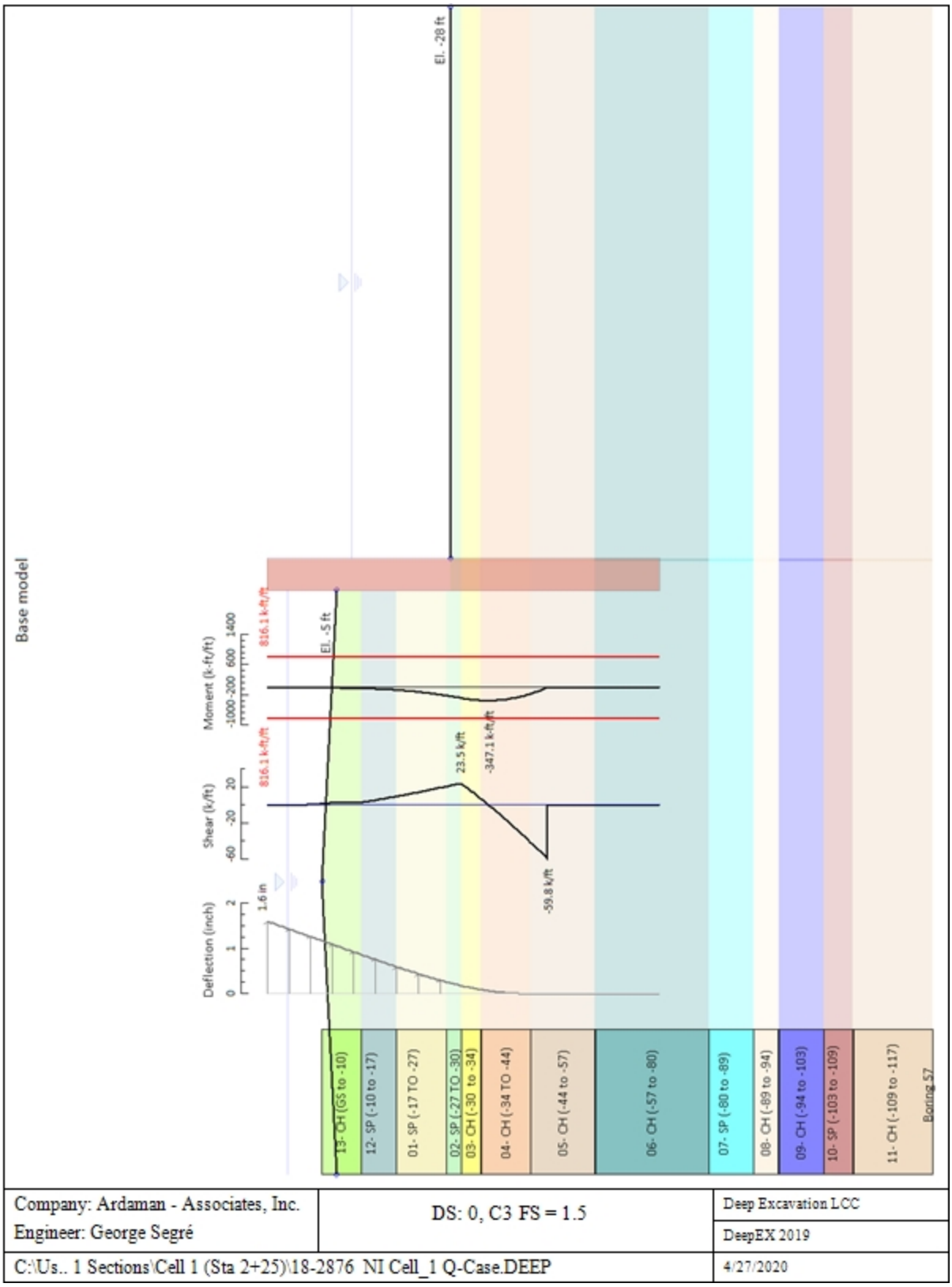

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
8.133 ksf
0.621 ksf
4.118 ksf
4.93 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

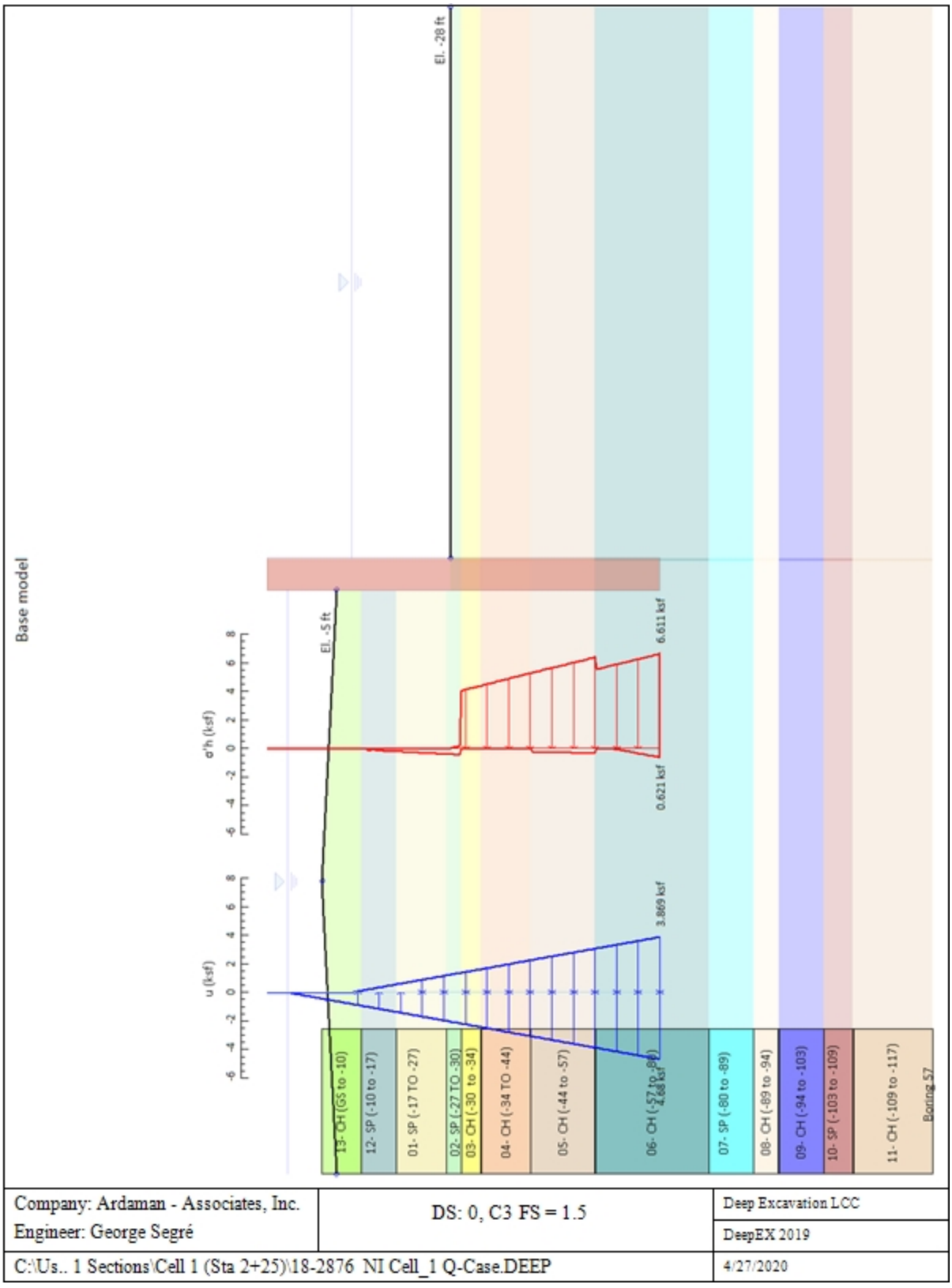



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |

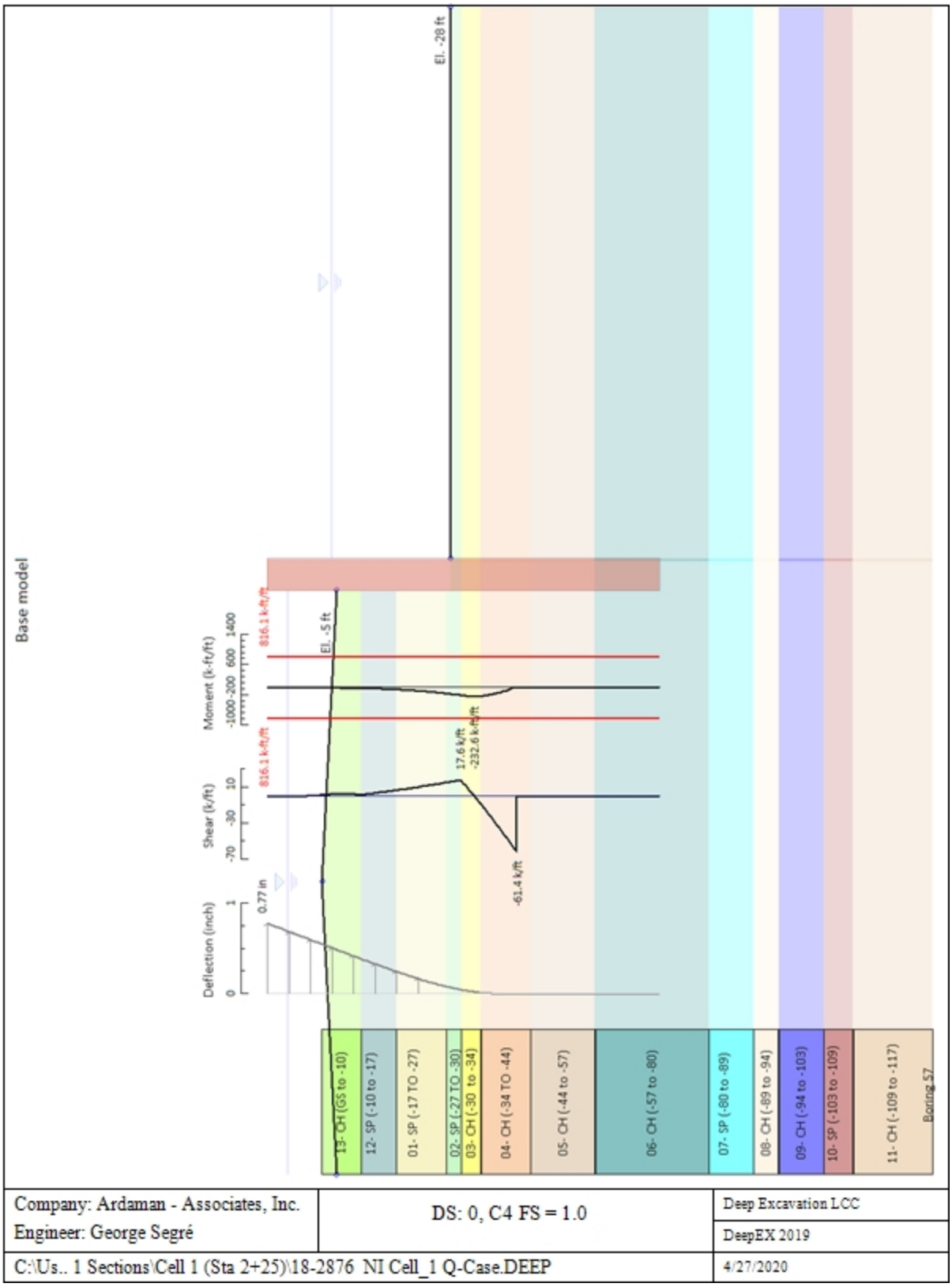

Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
9.916 ksf
0.621 ksf
3.869 ksf
4.88 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



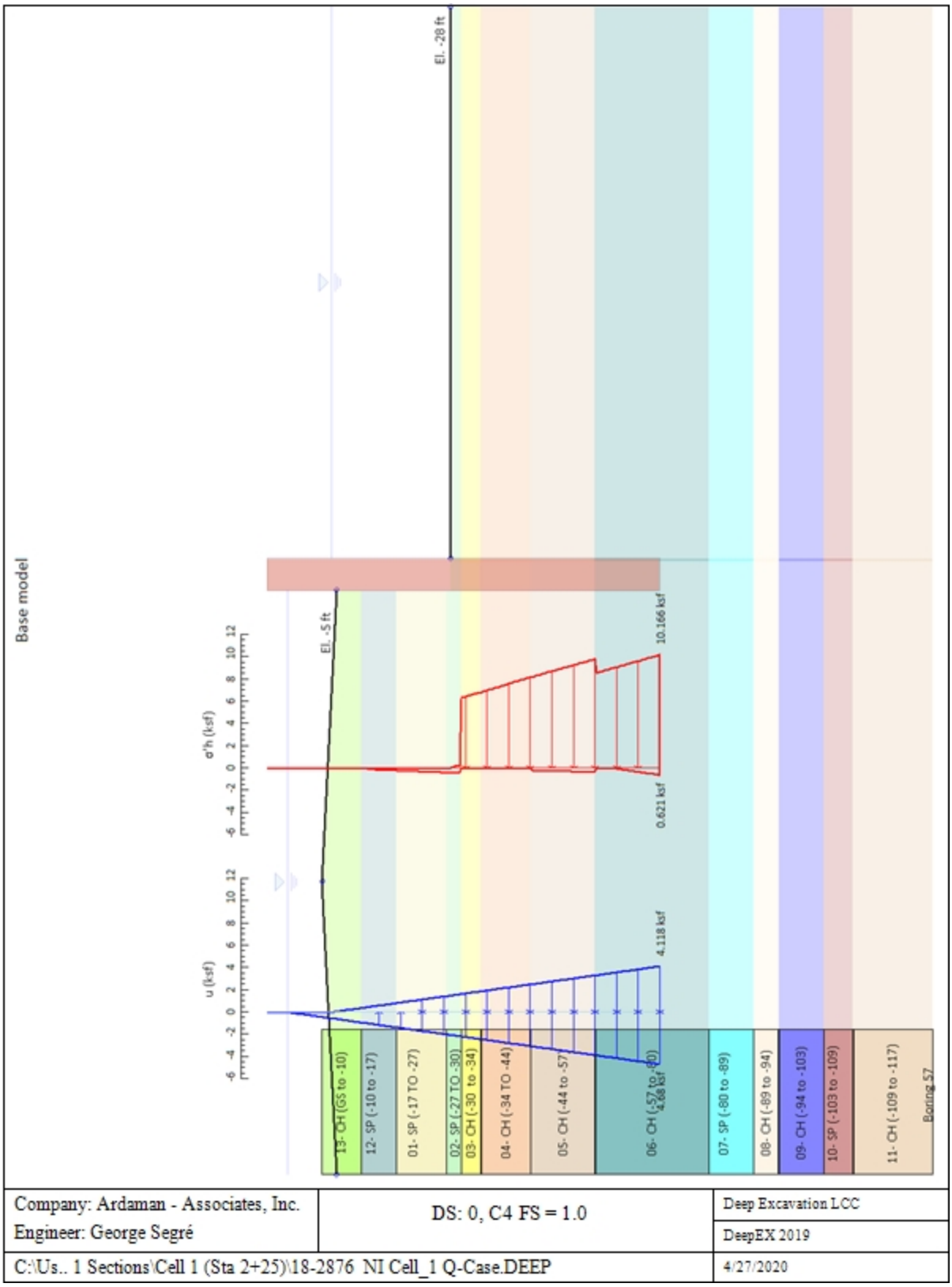

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |

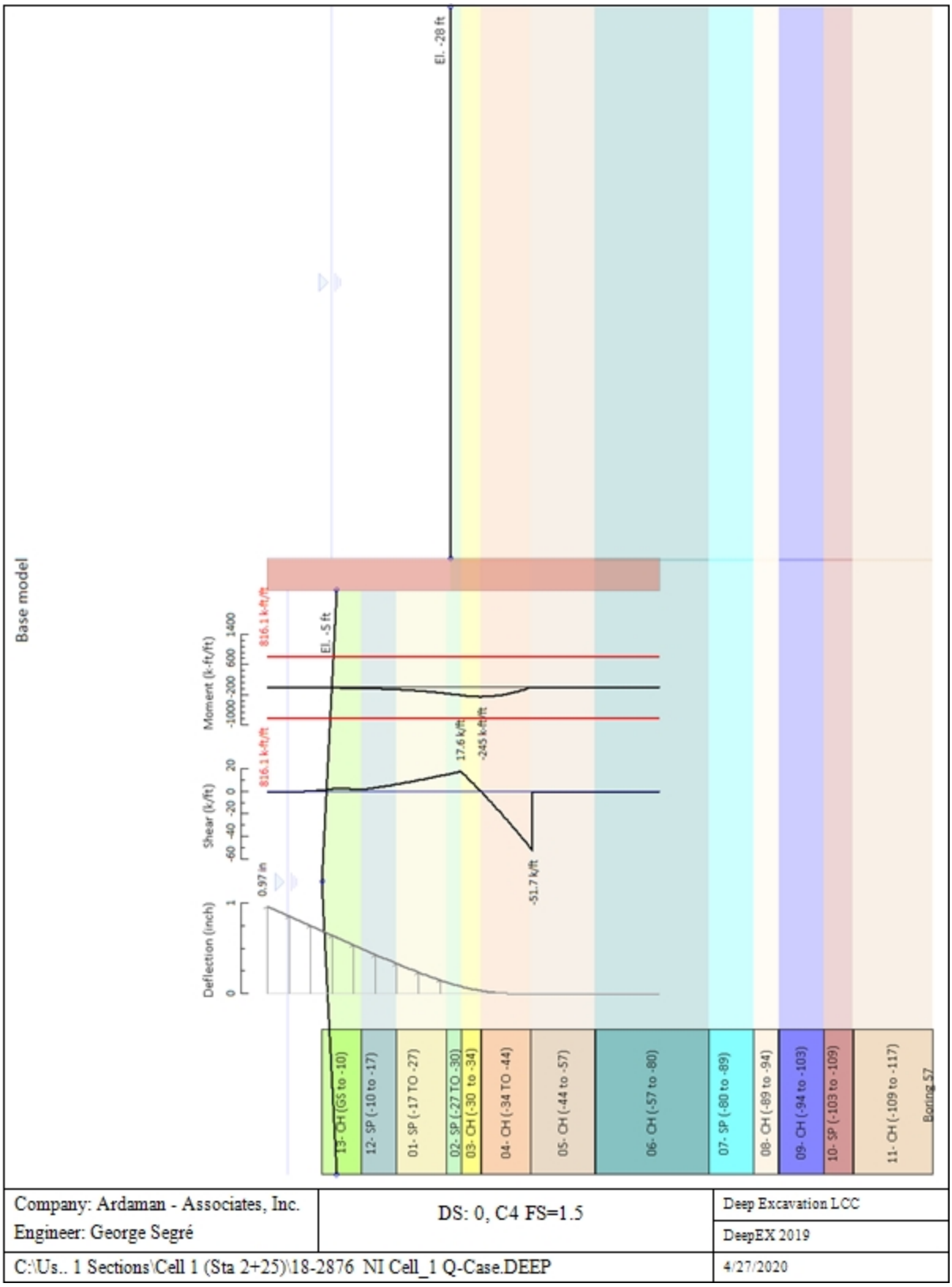



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |

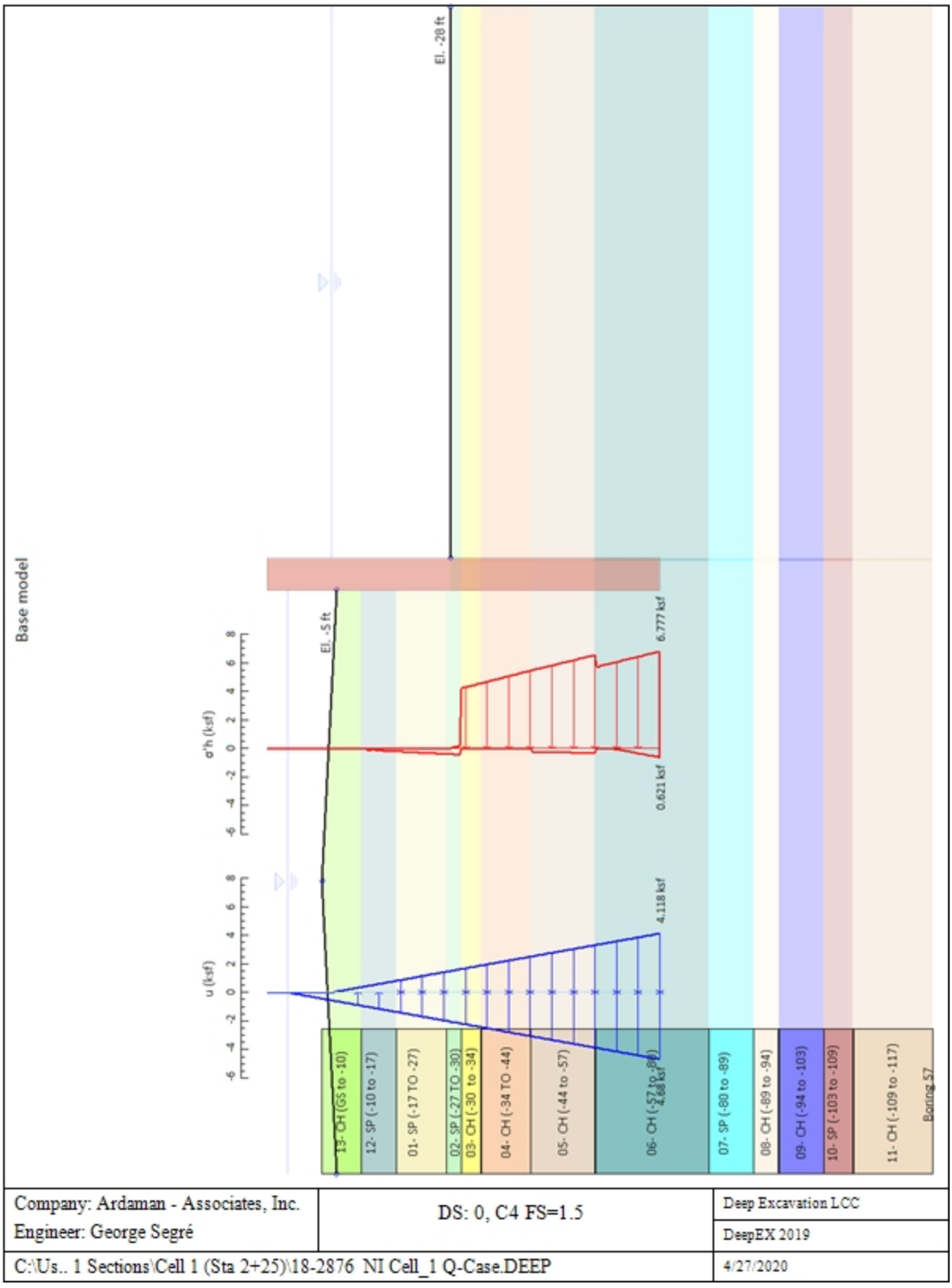



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
10.166 ksf
0.621 ksf
4.118 ksf
4.68 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS=1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP | | 4/27/2020 |


Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
6.777 ksf
0.621 ksf
4.118 ksf
4.68 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS=1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:34:01 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 13- CH (GS to | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 12- SP (-10 to | 112 | 112 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 01- SP (GS TO | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 60 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 150 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 26 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 26 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 13- CH (GS to | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- SP (-10 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 01- SP (GS TO | 0.4 | - | - | 0.455 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.455 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | - | - | 0.562 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | - | - | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | - | - | 0.562 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | - | - | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

Top Elev= superior SOil level

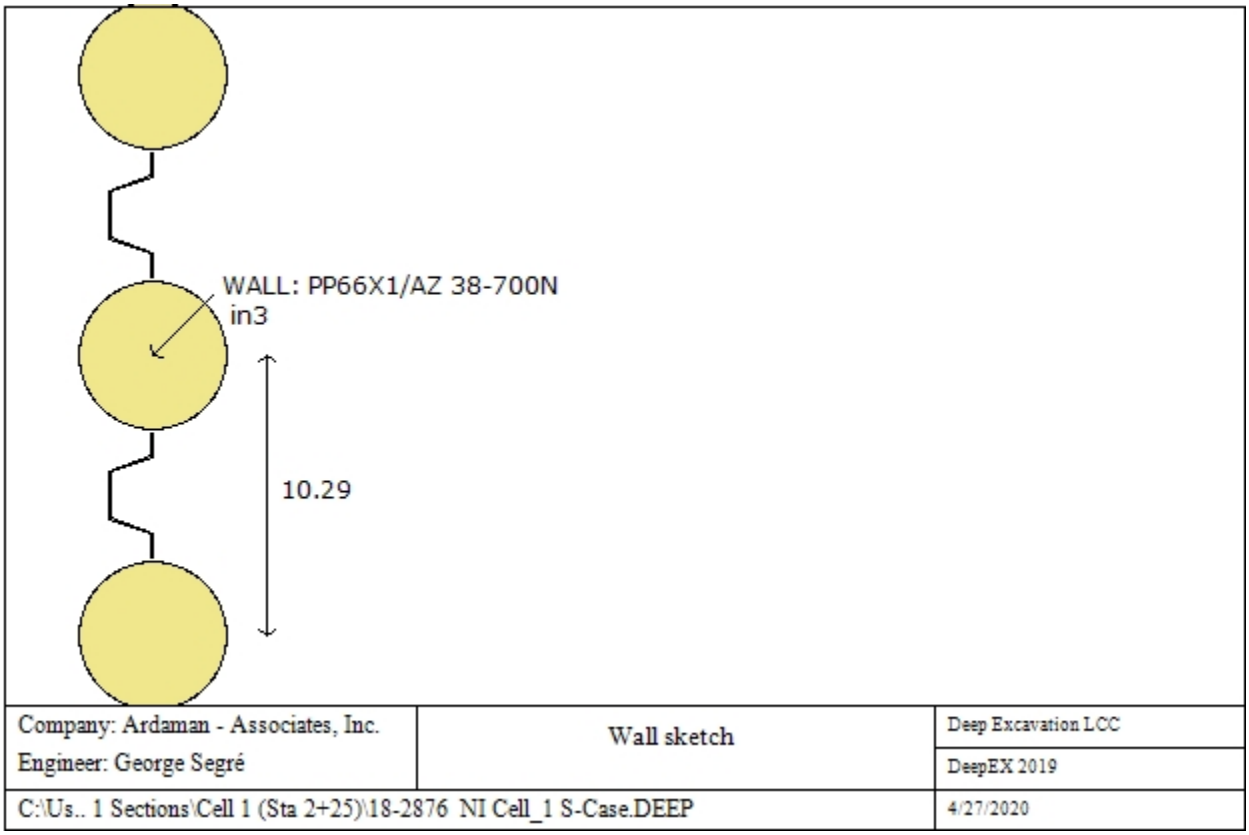
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| -2 | 13- CH (GS to - | 1 | 0.61 |
| -10 | 12- SP (-10 to - | 1 | 0.5 |
| -17 | 01- SP (GS TO | 1 | 0.46 |
| -27 | 02- SP (-27 TO | 1 | 0.46 |
| -30 | 03- CH (-30 to | 1 | 0.56 |
| -34 | 04- CH (-34 TO | 1 | 0.56 |
| -44 | 05- CH (-44 to | 1 | 0.56 |
| -57 | 06- CH (-57 to | 1 | 0.56 |
| -80 | 07- SP (-80 to - | 1 | 0.46 |
| -89 | 08- CH (-89 to | 1 | 0.56 |
| -94 | 09- CH (-94 to | 1 | 0.56 |
| -103 | 10- SP (-103 to | 1 | 0.46 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall

Top wall El: 9 ft  Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft  Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft  Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi  Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)

rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.342 | 1.342 | 1.694 |
| Stage 1 | Simple span | N/A | 1.6 | 1.178 | 1.178 | 1.473 |
| Stage 2 | Simple span | N/A | 1.6 | 1.4 | 1.4 | 1.737 |
| Stage 3 | Simple span | N/A | 1.6 | 1.236 | 1.236 | 1.515 |
| Stage 4 | Simple span | N/A | 1.6 | 1.446 | 1.446 | 1.779 |
| Stage 5 | Simple span | N/A | 1.6 | 1.152 | 1.152 | 1.391 |
| Stage 6 | Simple span | N/A | 1.6 | 1.509 | 1.509 | 1.823 |
| Stage 7 | Simple span | N/A | 1.6 | 1.215 | 1.215 | 1.436 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

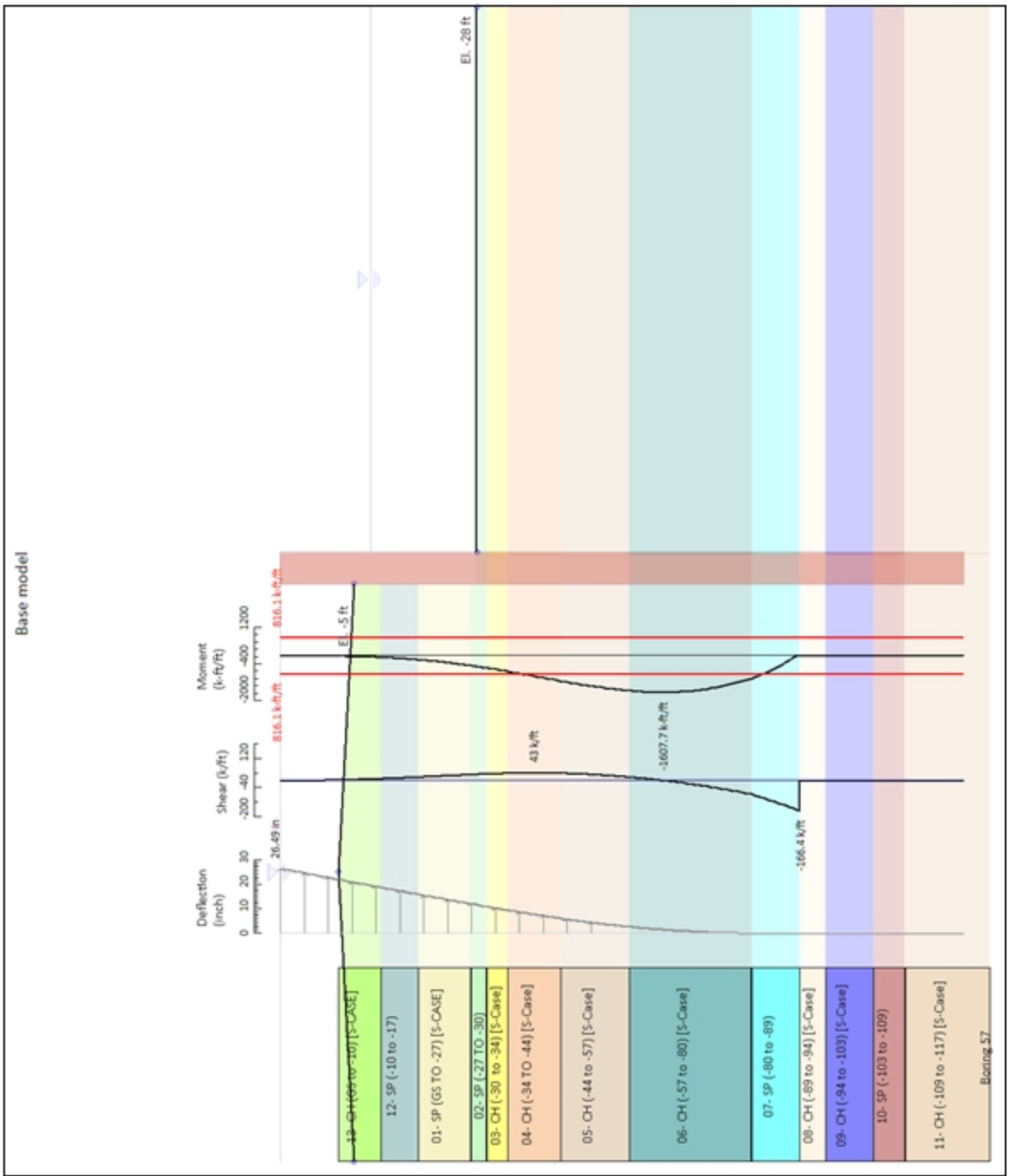
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

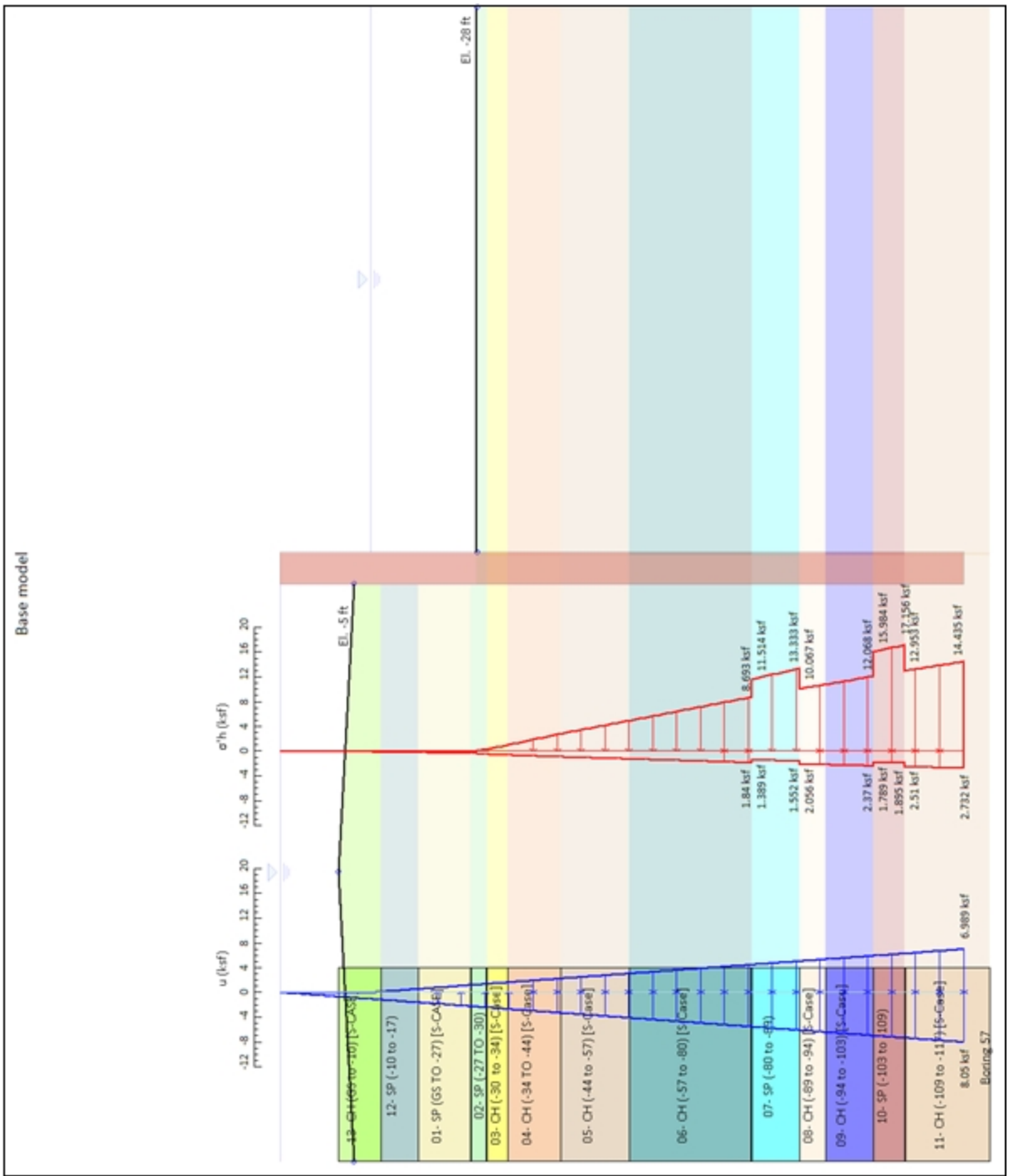
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

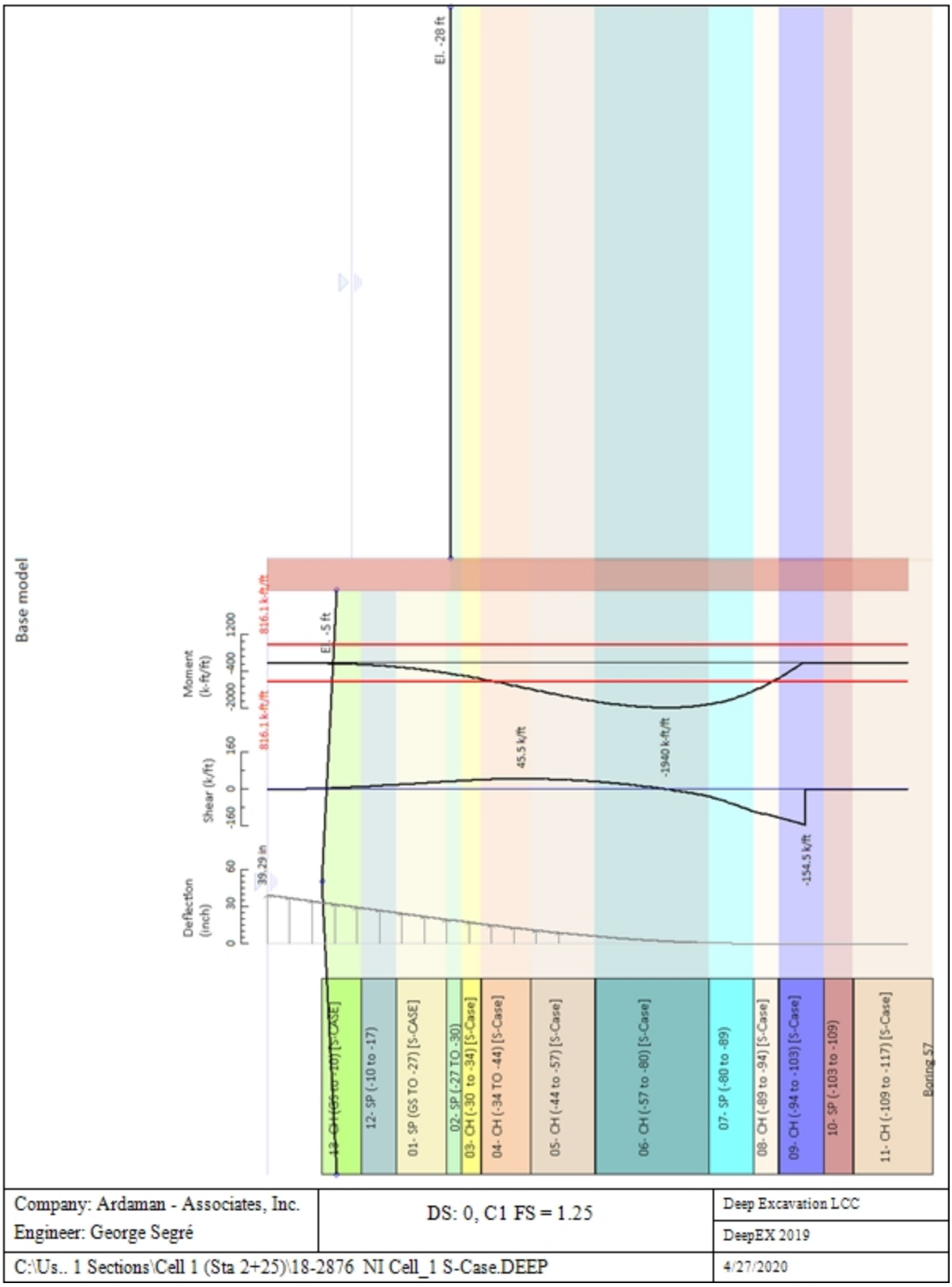
A sequence of figures for each excavation stage is reported



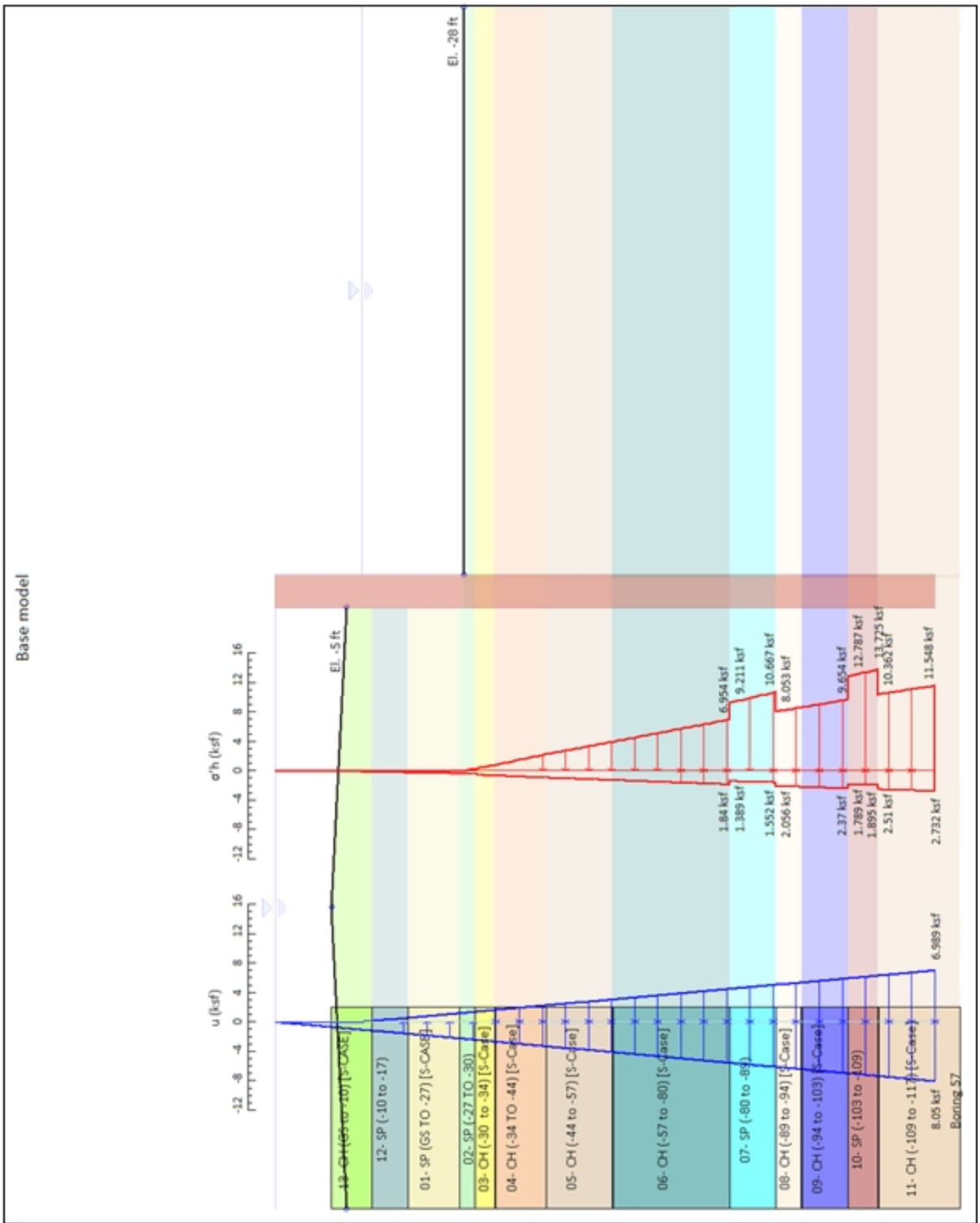

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



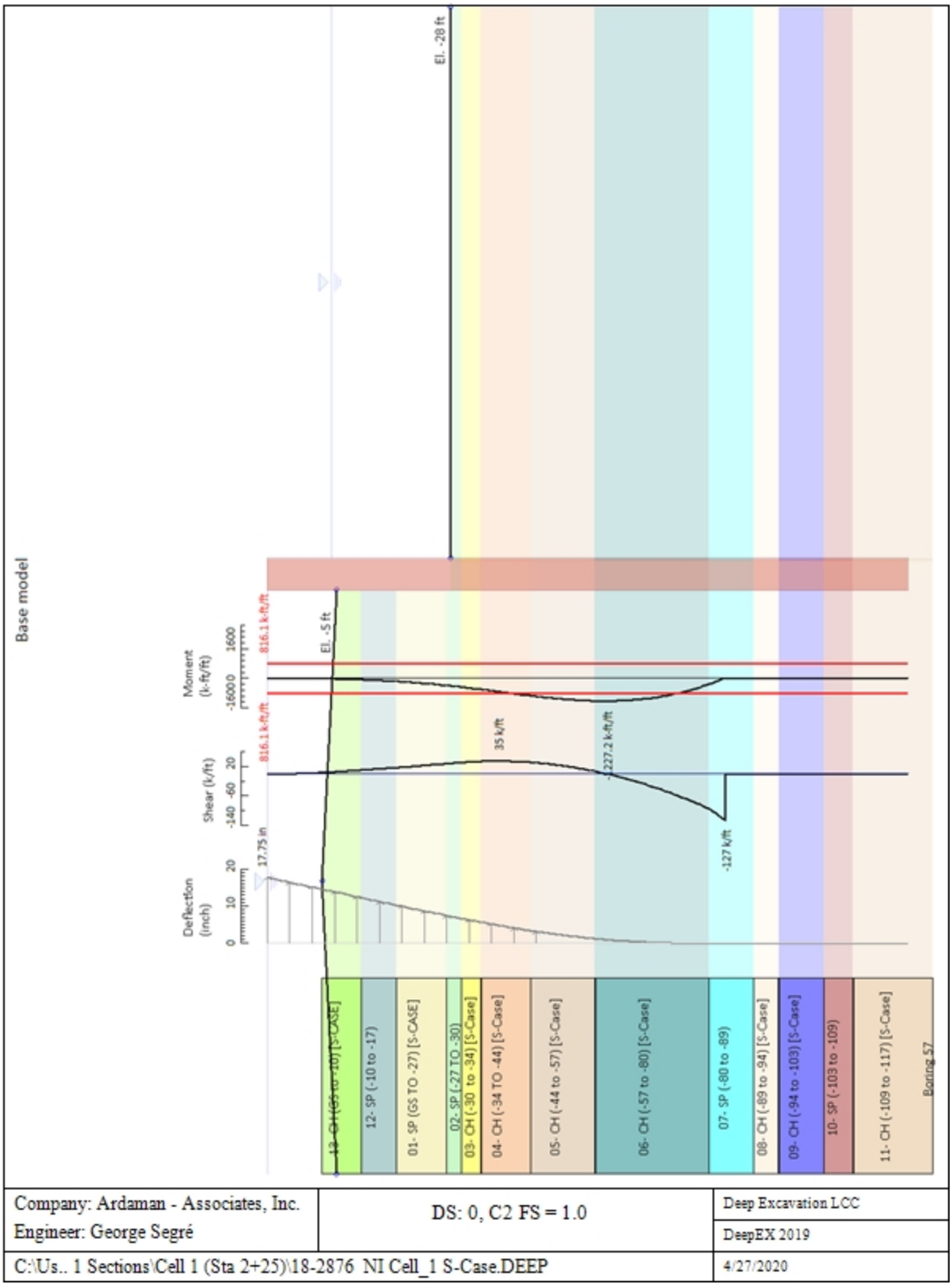

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

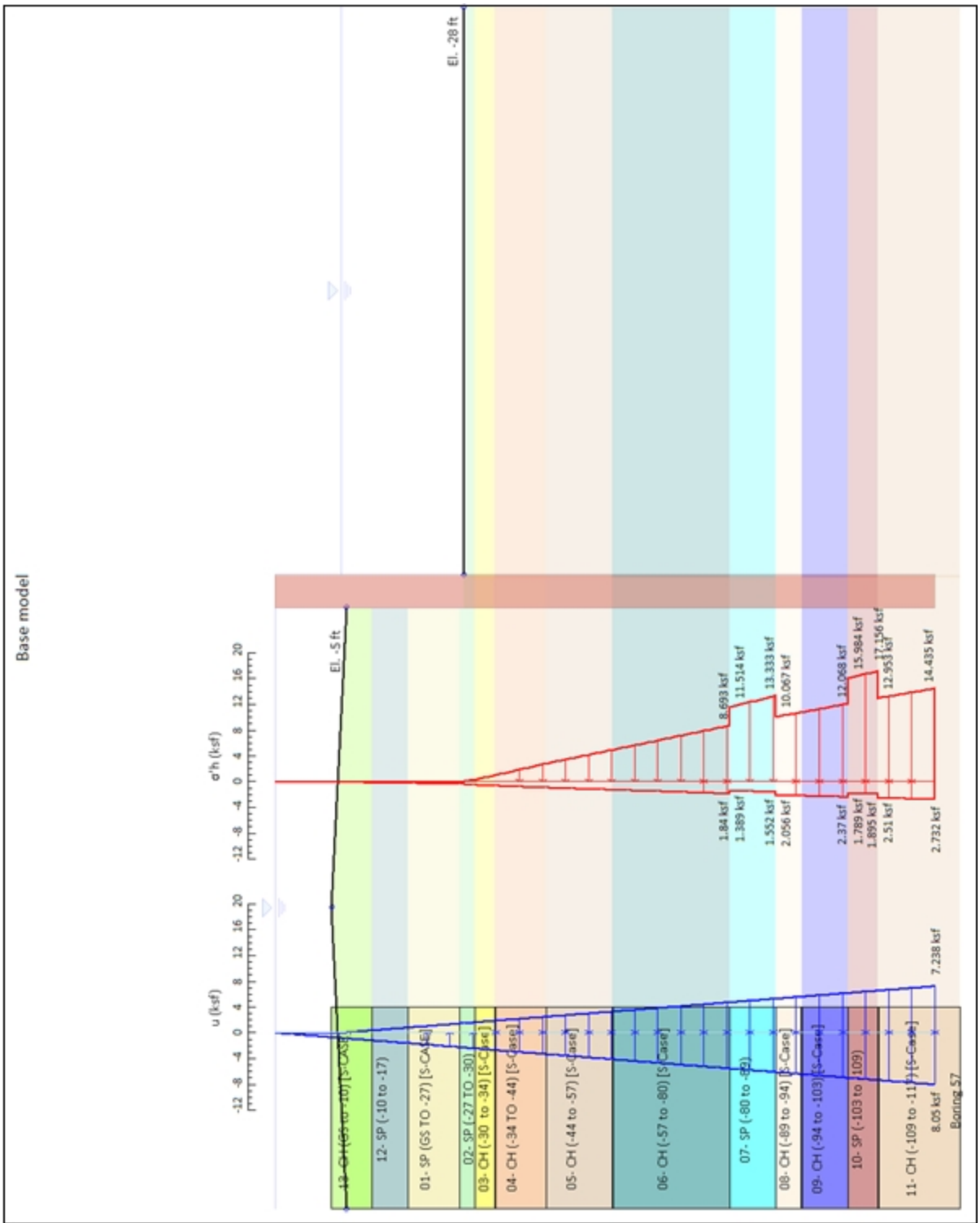



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

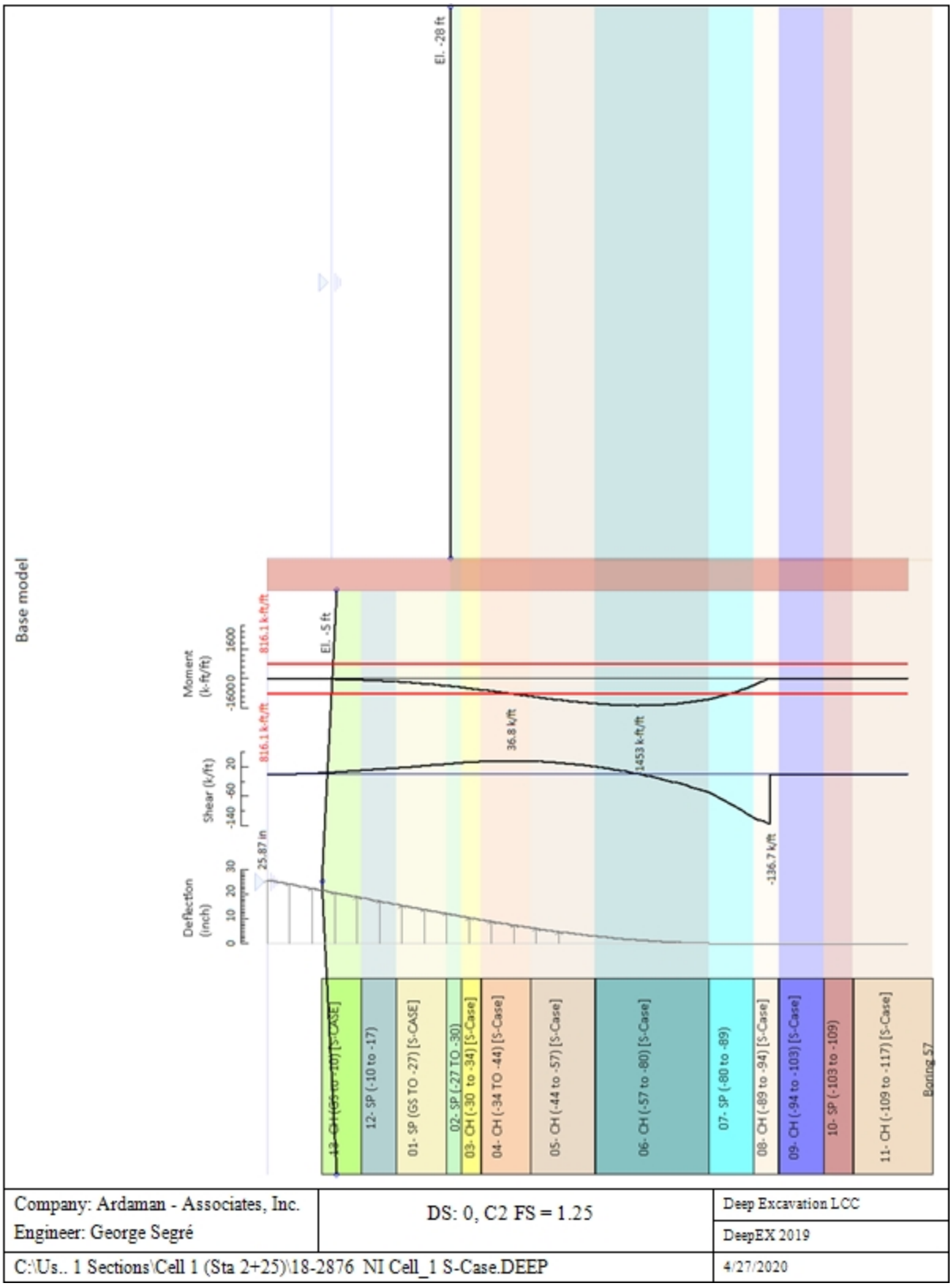



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

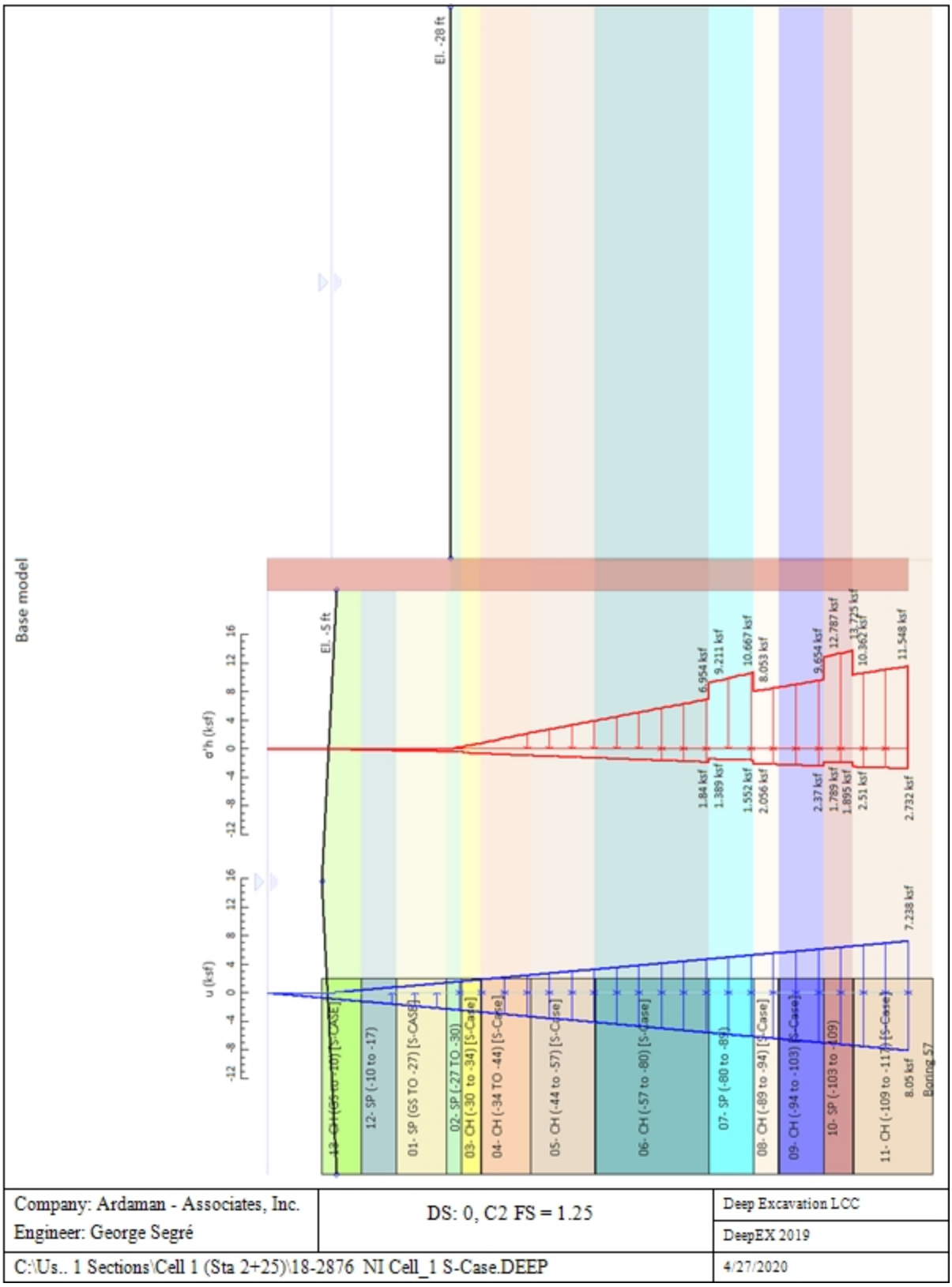

Base model
El. -28 ft
El. -5 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-140 -60 20
35 k/ft
-227.2 k-ft/ft
-127 k/ft
Deflection (inch)
0 10 20
17.75 in
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP
4/27/2020



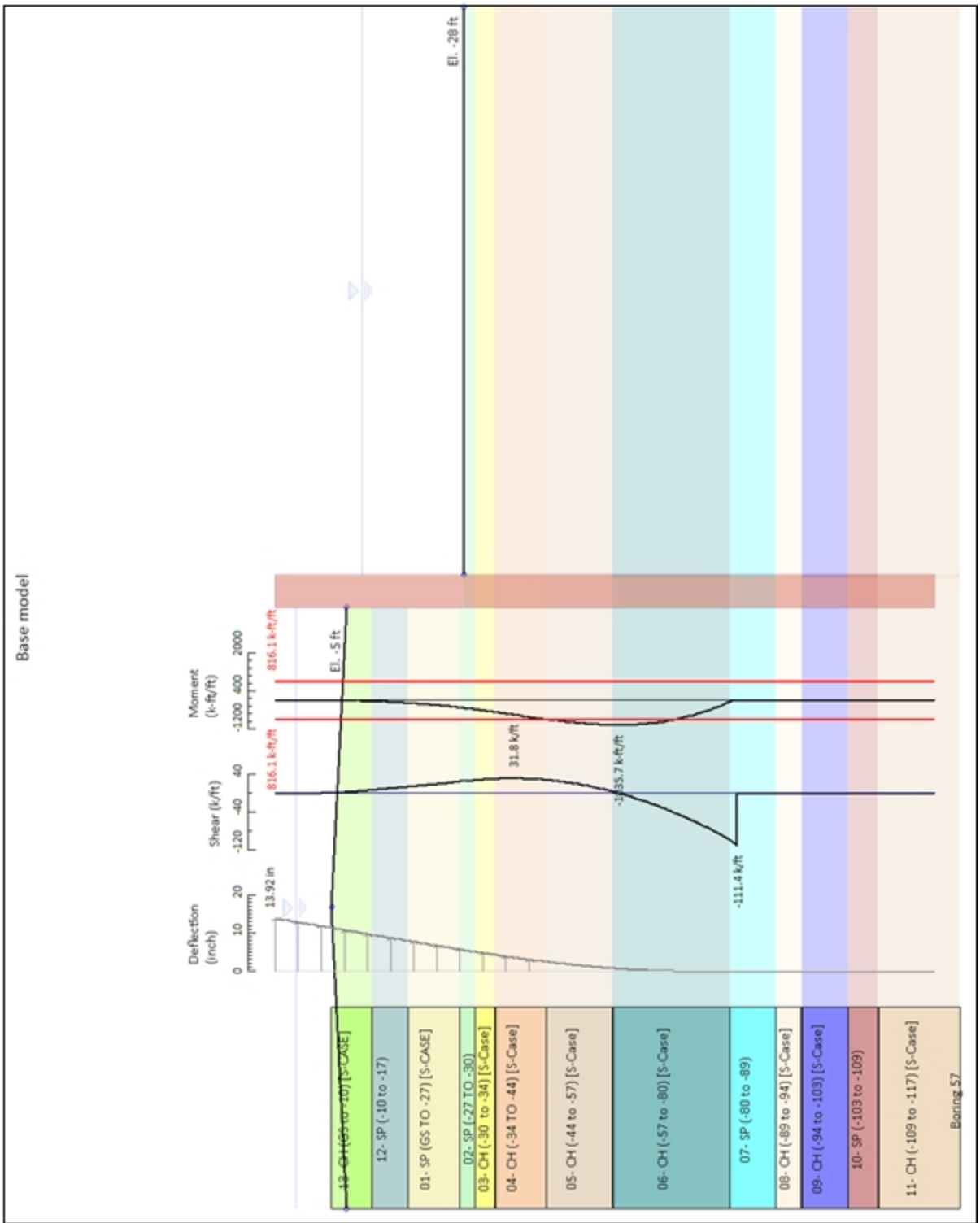

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

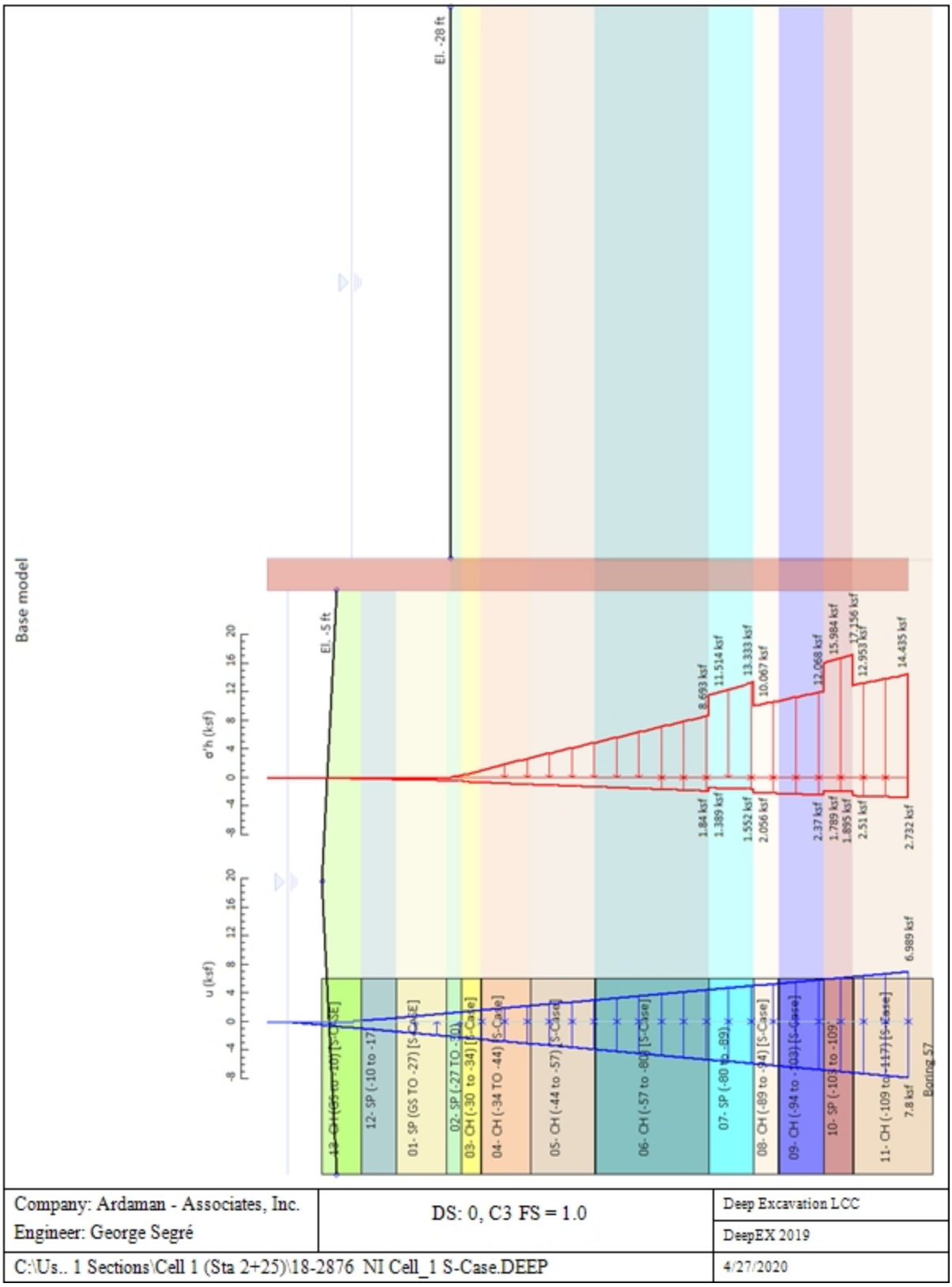



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

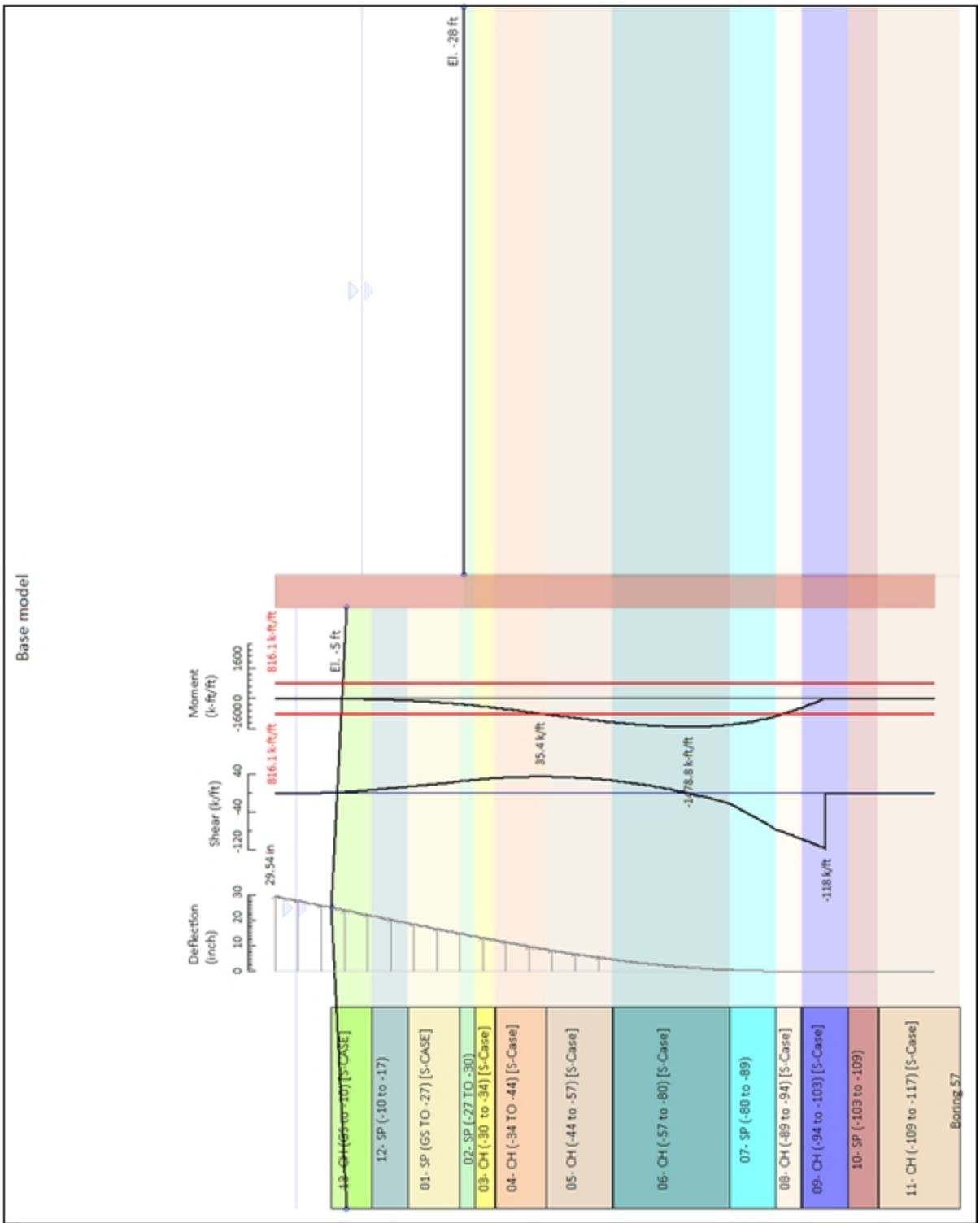



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

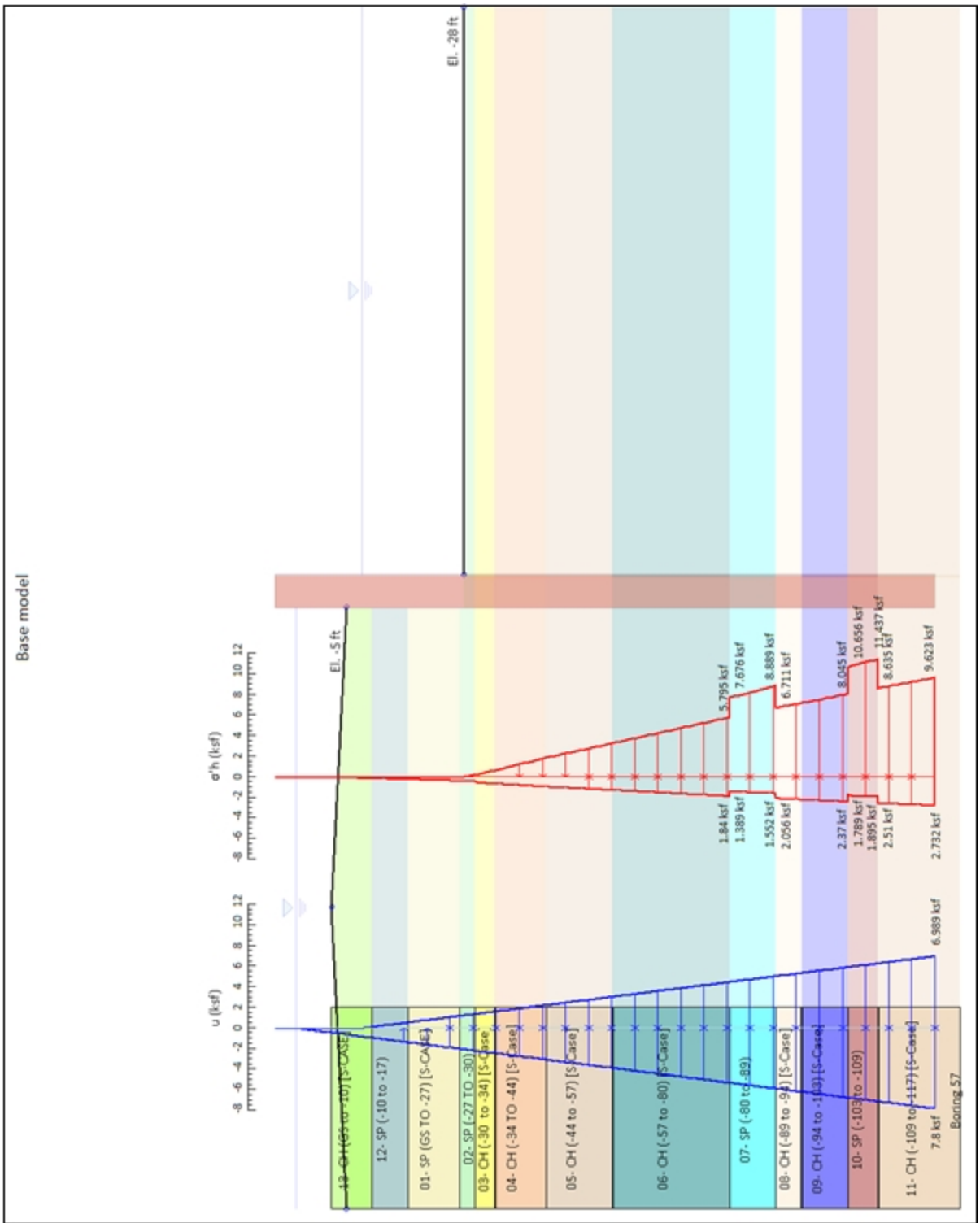

Base model
El. -28 ft
El. -5 ft
Moment (k-ft/ft)
-1200 400 2000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-120 -40 40
31.8 k/ft
-1035.7 k-ft/ft
-111.4 k/ft
Deflection (inch)
0 10 20
13.92 in
13- CH (-85 to -10) [S-CASE]
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP
4/27/2020



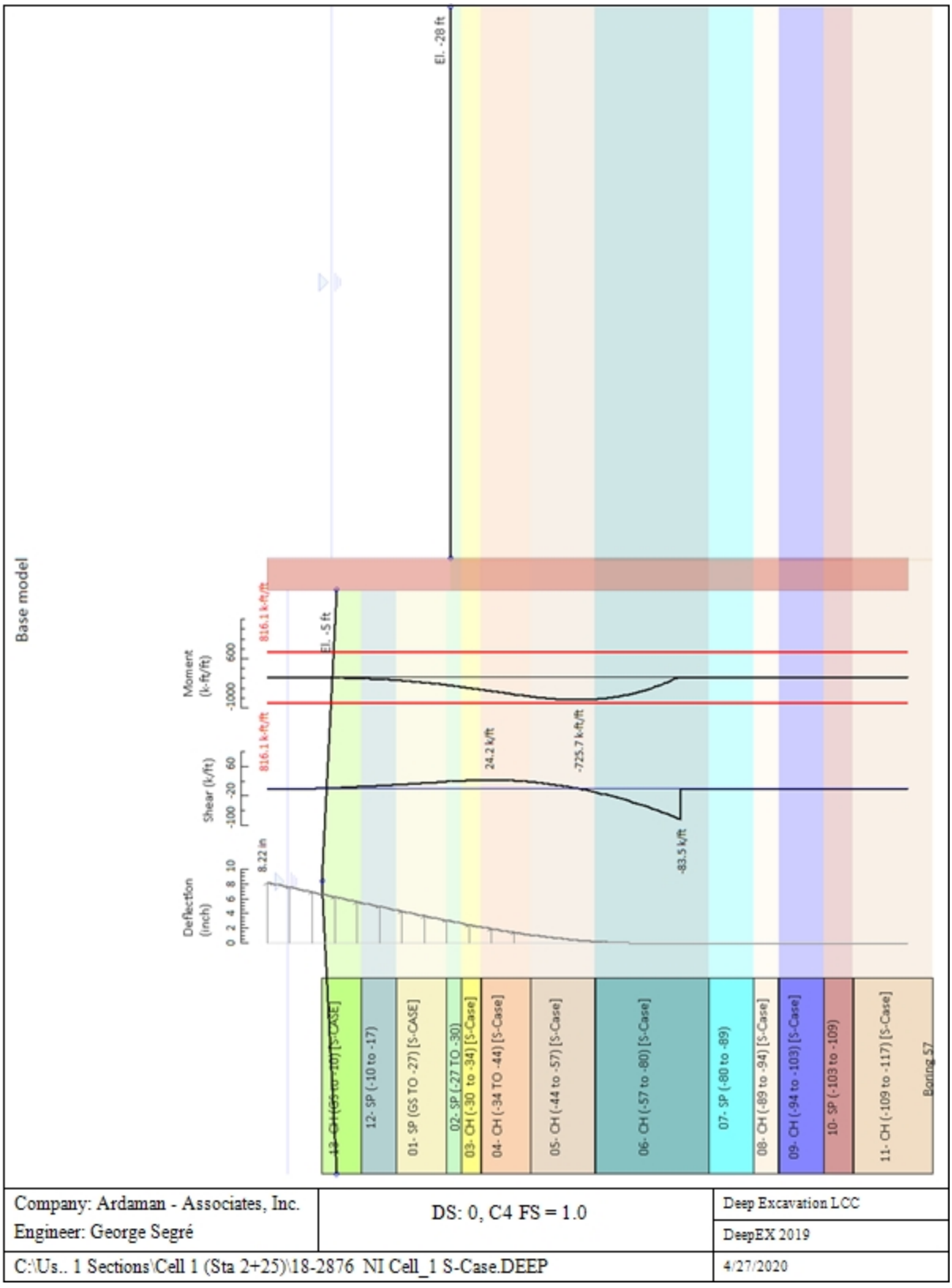

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



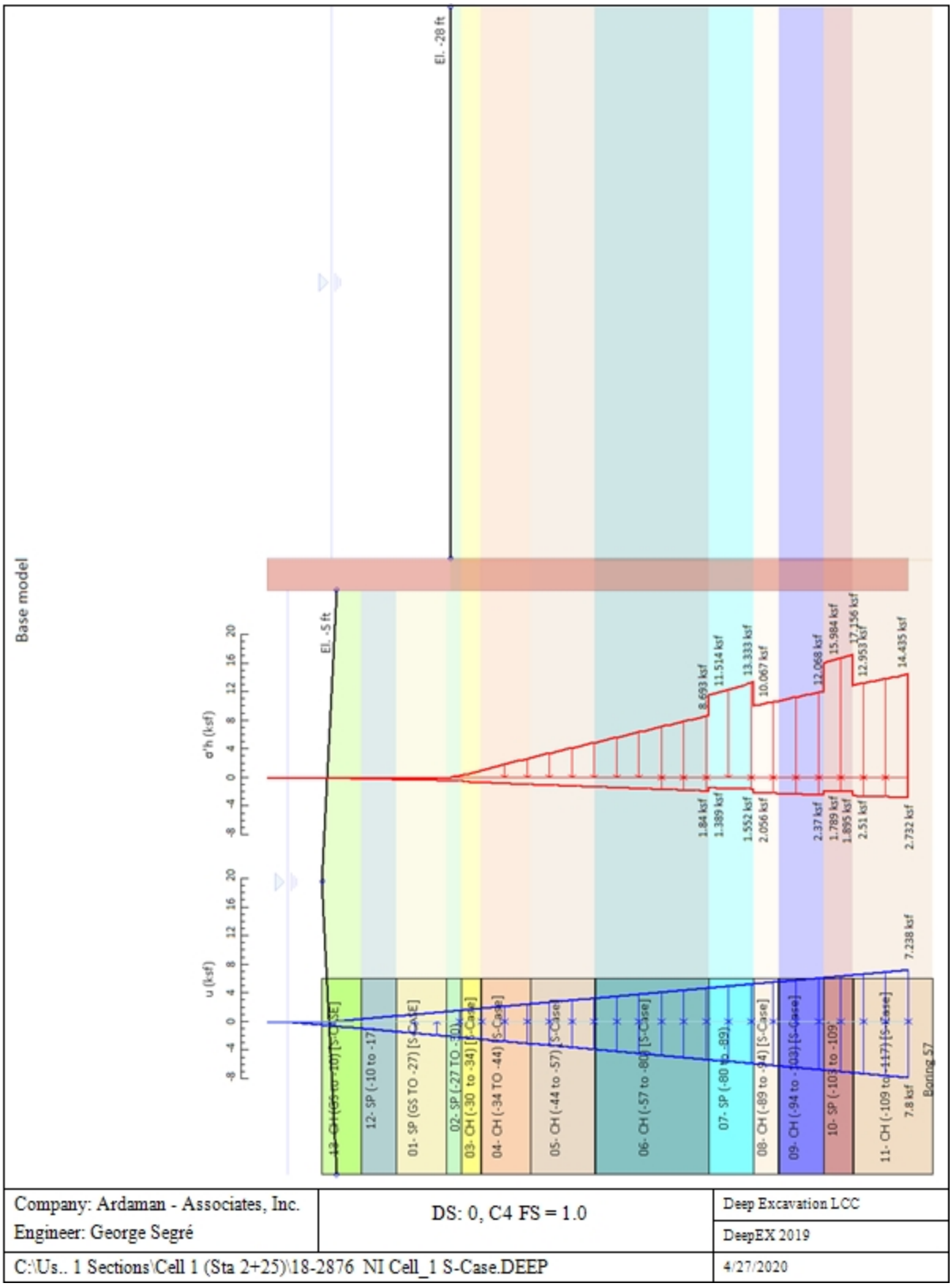

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



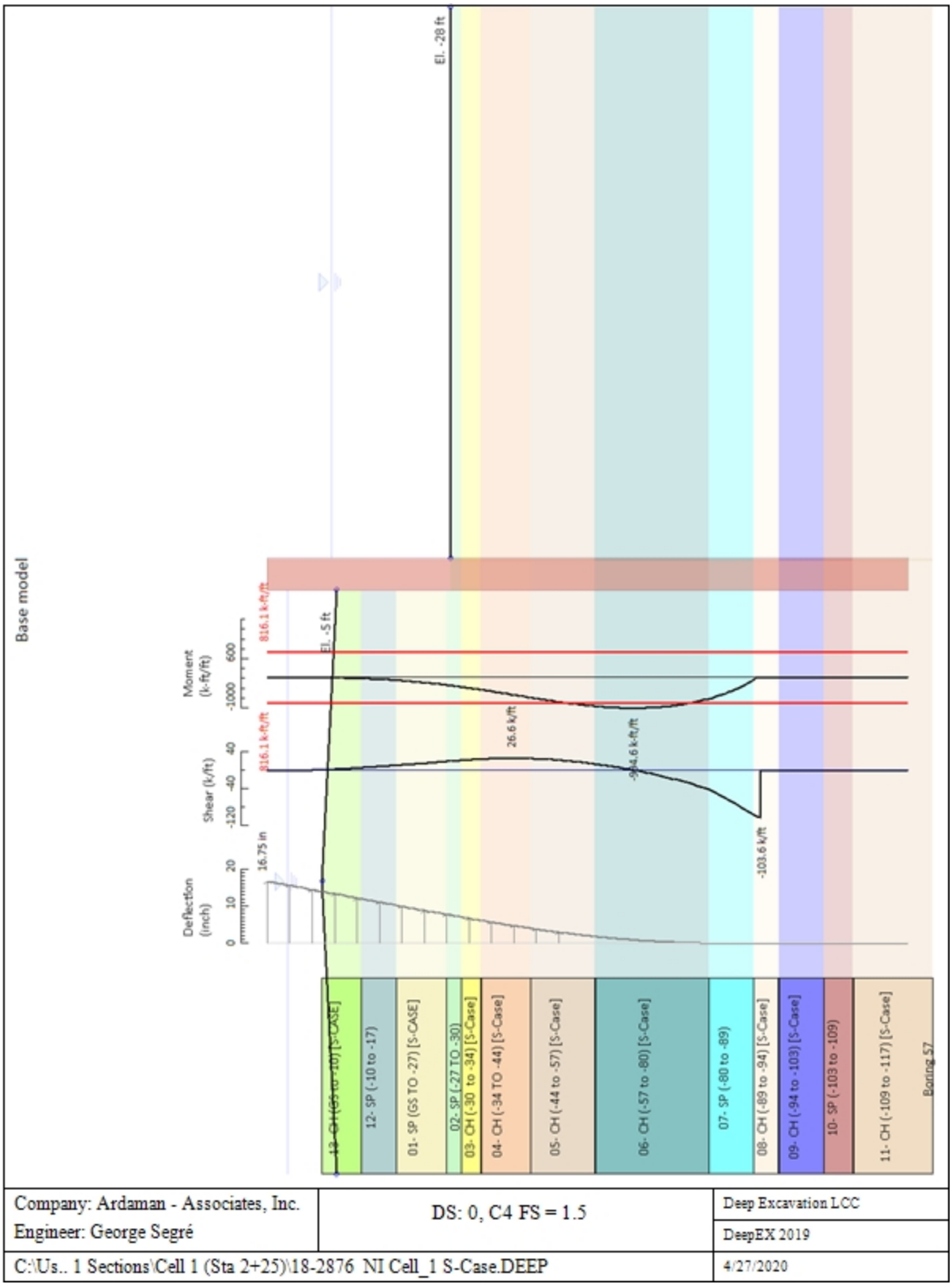

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |



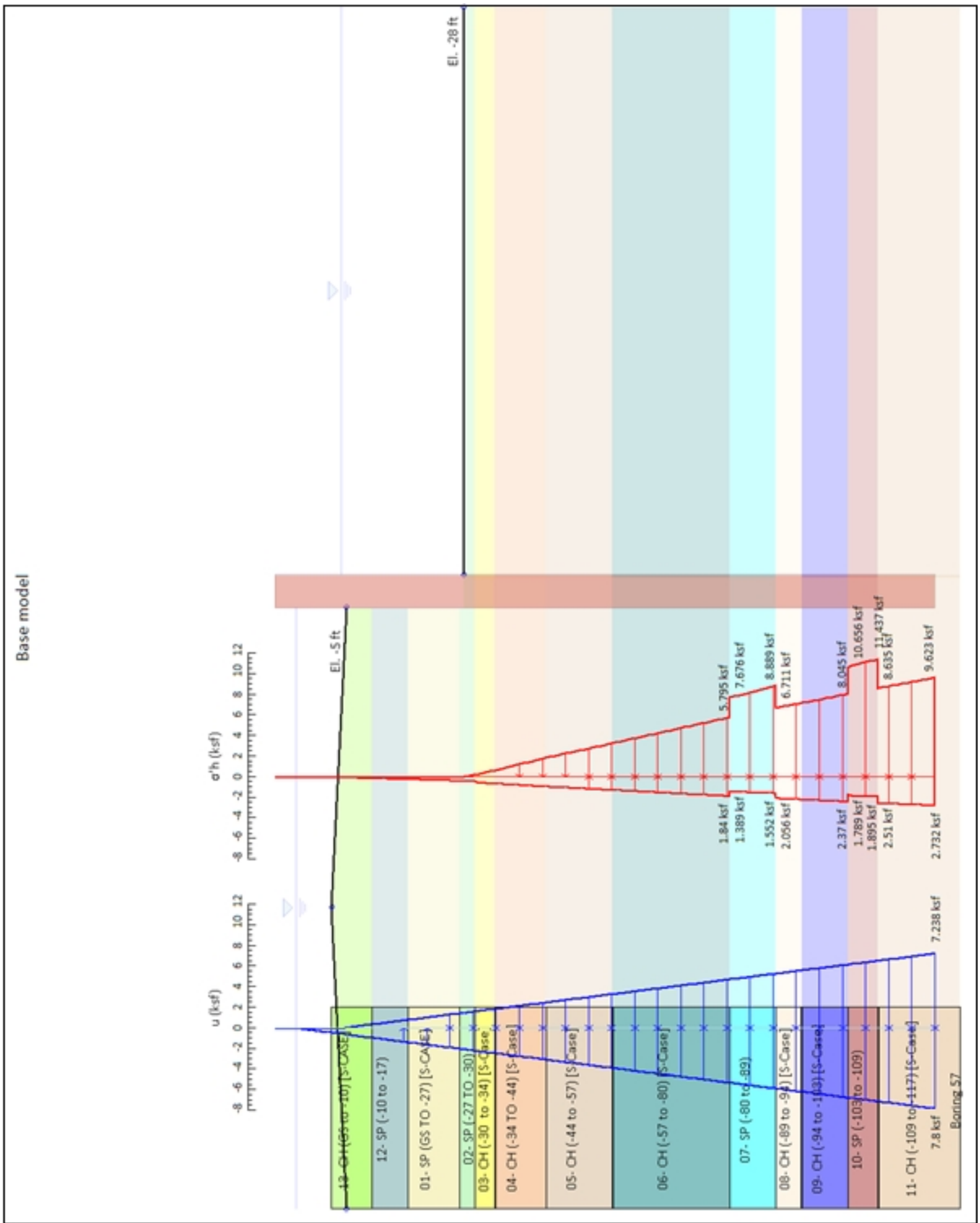

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 3+00)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -80 ft., NAVD88

Length of Sheetting = 89 ft.

Use = 90.0 ft.

Design Tip Elev. = -81.0 ft., NAVD88

Design Length of Sheeting = 90.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -41.56 | 296.83 | 70.92 | 1.07 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -43.93 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -39.19 | 213.97 | 60.12 | 0.70 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -41.16 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -38.40 | 178.42 | 52.29 | 0.52 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -42.35 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -36.03 | 101.44 | 41.71 | 0.26 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -39.19 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -69.00 | 811.51 | 89.59 | 8.49 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -80.00 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -63.28 | 616.43 | 73.78 | 5.56 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -72.64 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -60.16 | 475.74 | 61.76 | 3.85 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -79.40 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -53.92 | 331.22 | 47.26 | 2.23 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -70.04 | -- | -- | -- |
| | | | | | | Governing Value: | -80.00 | 811.51 | 89.59 | 8.49 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:42:11 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 14- GP Fill | 120 | 120 | 34 | 0 | N/A | N/A | N/A | 300 | 3 | 0.28 | 3.54 | N/A | N/A | True | Linear | |
| 13- CH (GS to | 112 | 112 | 0 | 0 | 800 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 12- SP (-10 to | 112 | 112 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 01- SP (-17 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 60 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 0 | 0 | 2290 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 0 | 0 | 2290 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 0 | 0 | 2290 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 0 | 0 | 1650 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 0 | 0 | 1200 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 0 | 0 | 1670 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 14- GP Fill | 0.35 | - | - | 0.441 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- CH (GS to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- SP (-10 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 01- SP (-17 T | 0.4 | - | - | 0.5 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.5 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | 0.1 | 0 | 0.45 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

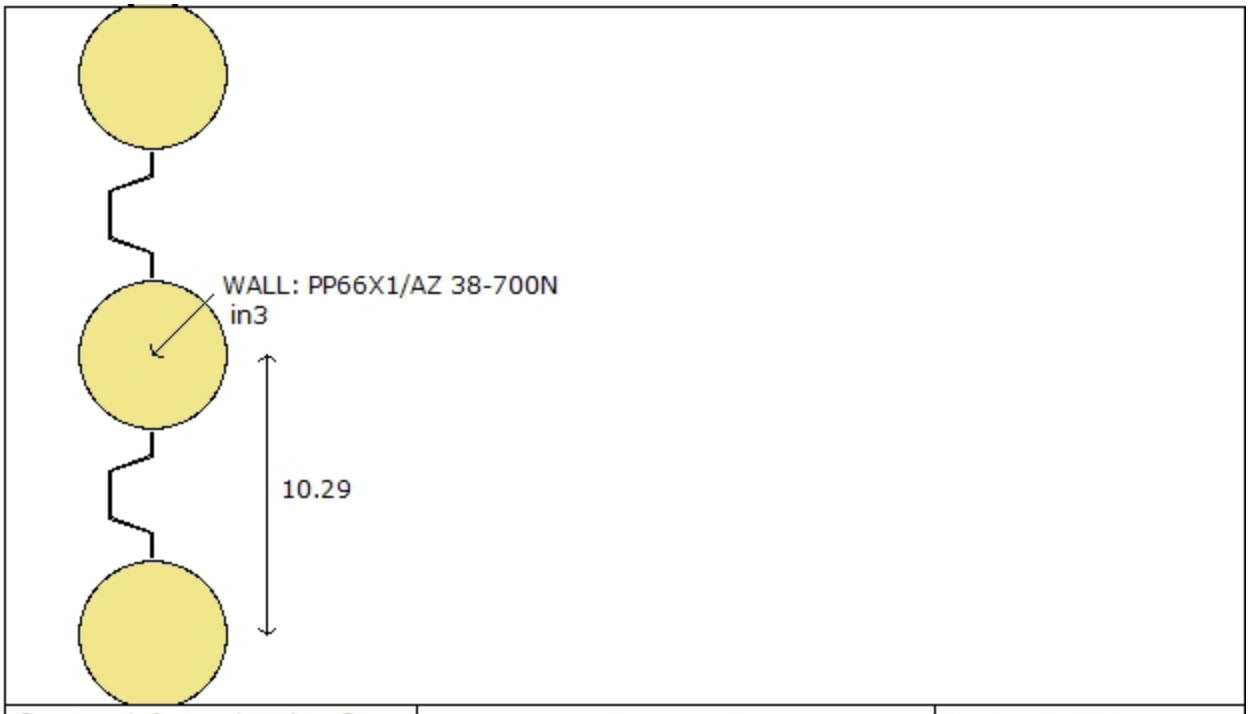
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 14- GP Fill | 1 | 0.44 |
| 0 | 13- CH (GS to - | 1 | 1 |
| -10 | 12- SP (-10 to - | 1 | 0.5 |
| -17 | 01- SP (-17 TO | 1 | 0.5 |
| -27 | 02- SP (-27 TO | 1 | 0.5 |
| -30 | 03- CH (-30 to | 1 | 1 |
| -34 | 04- CH (-34 TO | 1 | 1 |
| -44 | 05- CH (-44 to | 1 | 0.45 |
| -57 | 06- CH (-57 to | 1 | 1 |
| -80 | 07- SP (-80 to - | 1 | 0.5 |
| -89 | 08- CH (-89 to | 1 | 1 |
| -94 | 09- CH (-94 to | 1 | 1 |
| -103 | 10- SP (-103 to | 1 | 0.5 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.113 | 3.34 | 6.735 |
| Stage 1 | Simple span | N/A | 1.6 | 1.933 | 2.731 | 5.441 |
| Stage 2 | Simple span | N/A | 1.6 | 2.329 | 3.553 | 7.015 |
| Stage 3 | Simple span | N/A | 1.6 | 2.146 | 2.927 | 5.686 |
| Stage 4 | Simple span | N/A | 1.6 | 2.411 | 3.952 | 7.627 |
| Stage 5 | Simple span | N/A | 1.6 | 2.049 | 2.751 | 5.184 |
| Stage 6 | Simple span | N/A | 1.6 | 2.696 | 4.204 | 7.944 |
| Stage 7 | Simple span | N/A | 1.6 | 2.329 | 2.97 | 5.435 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

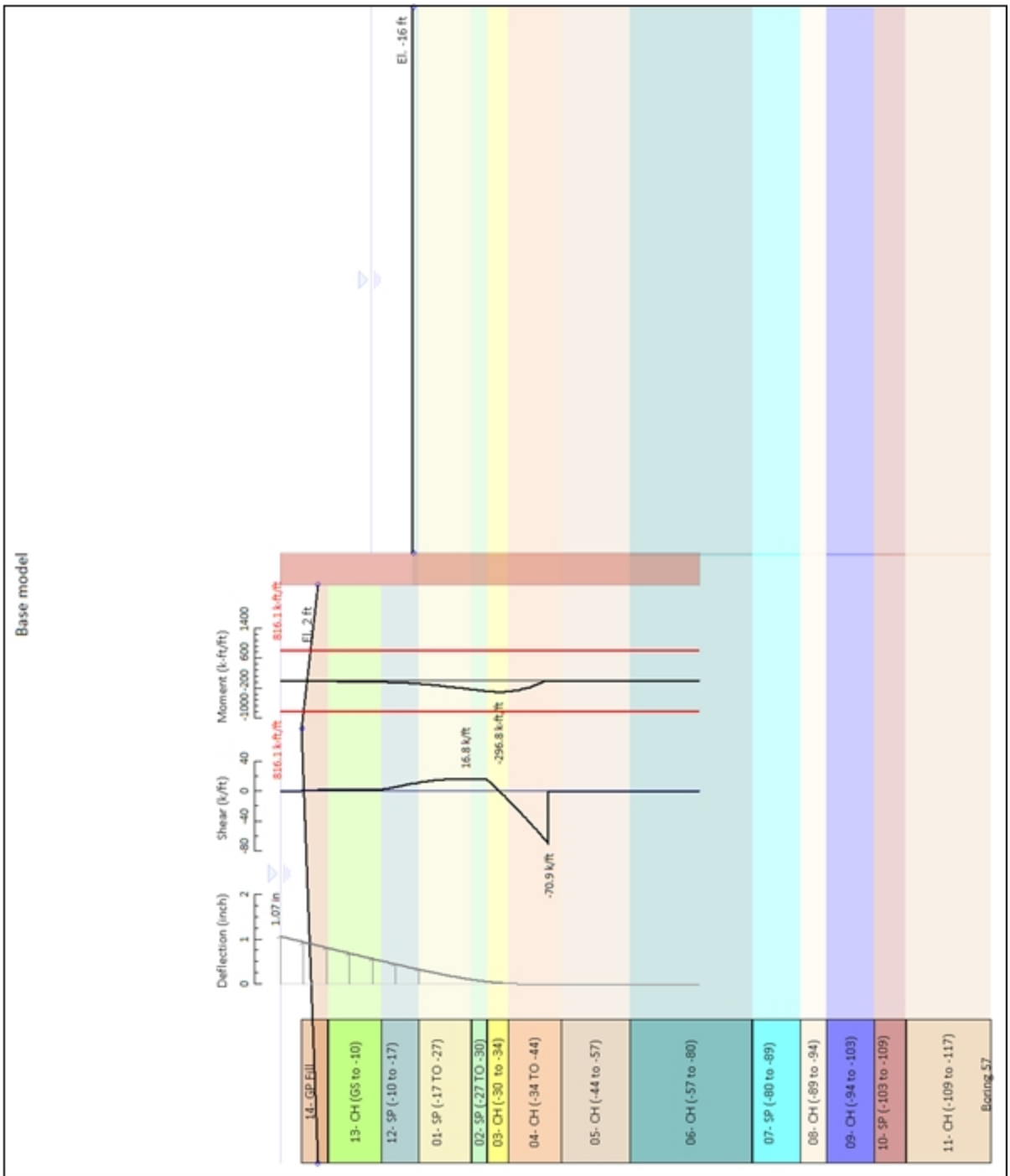
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

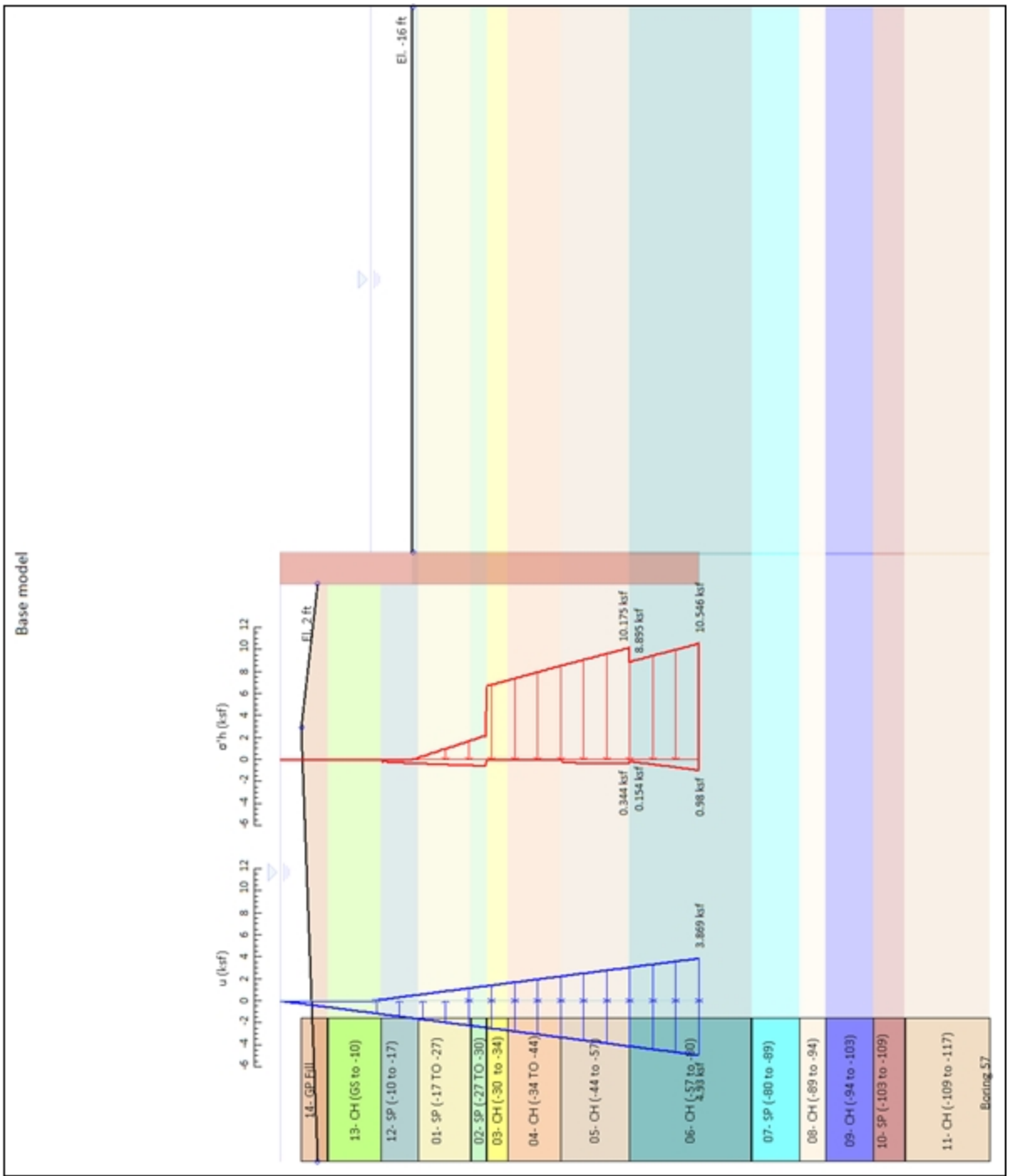
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

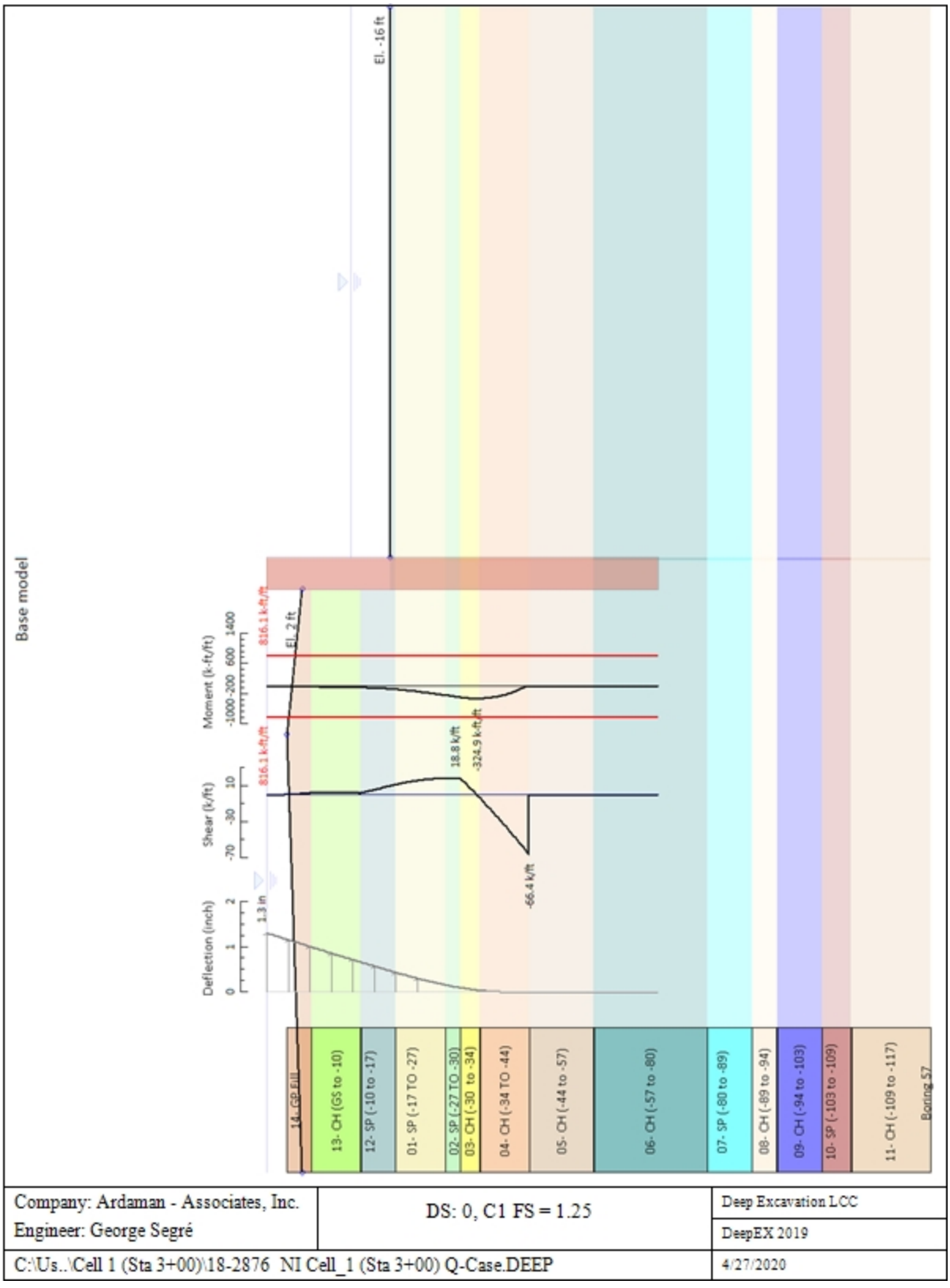
A sequence of figures for each excavation stage is reported



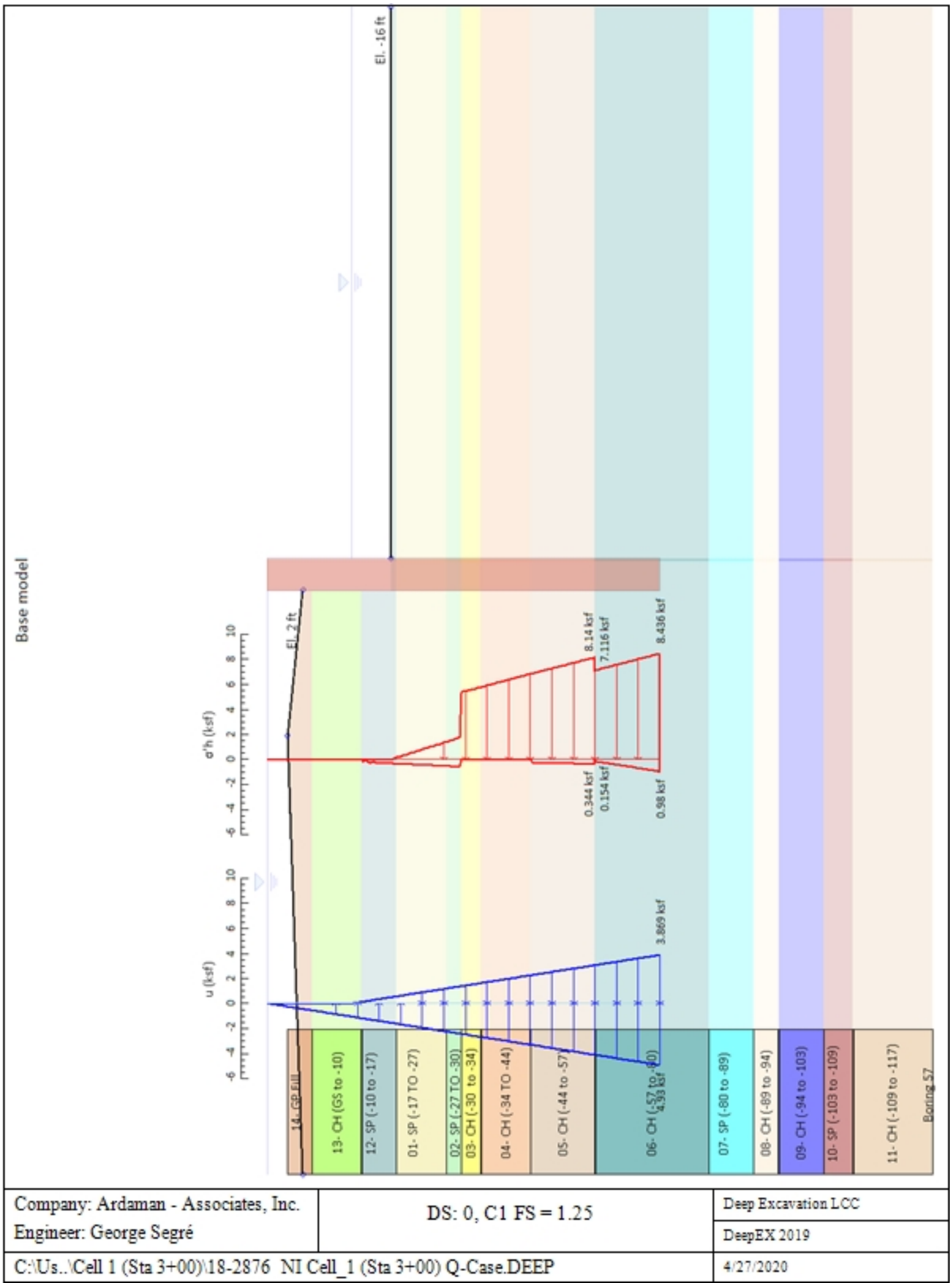

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



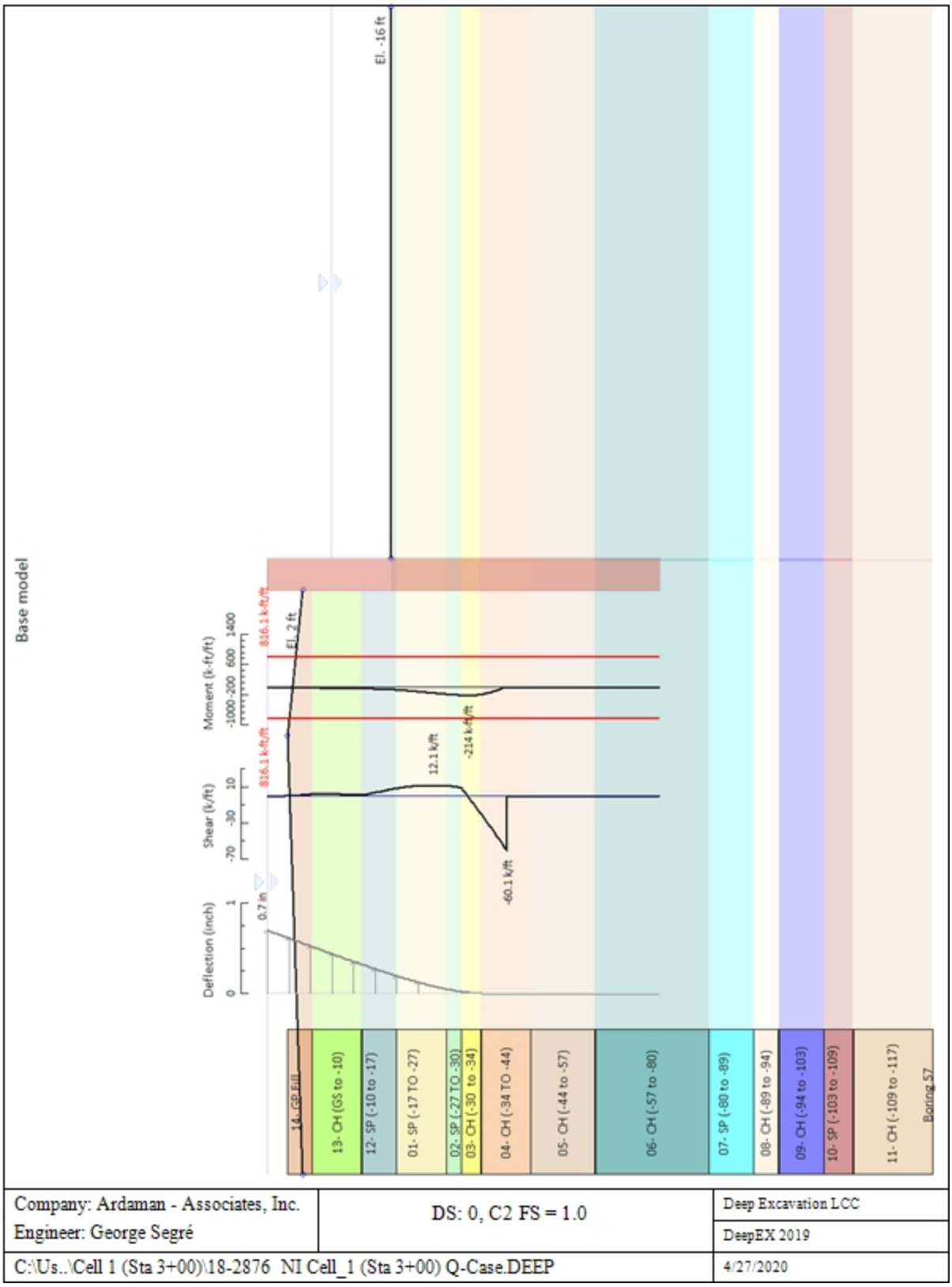

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



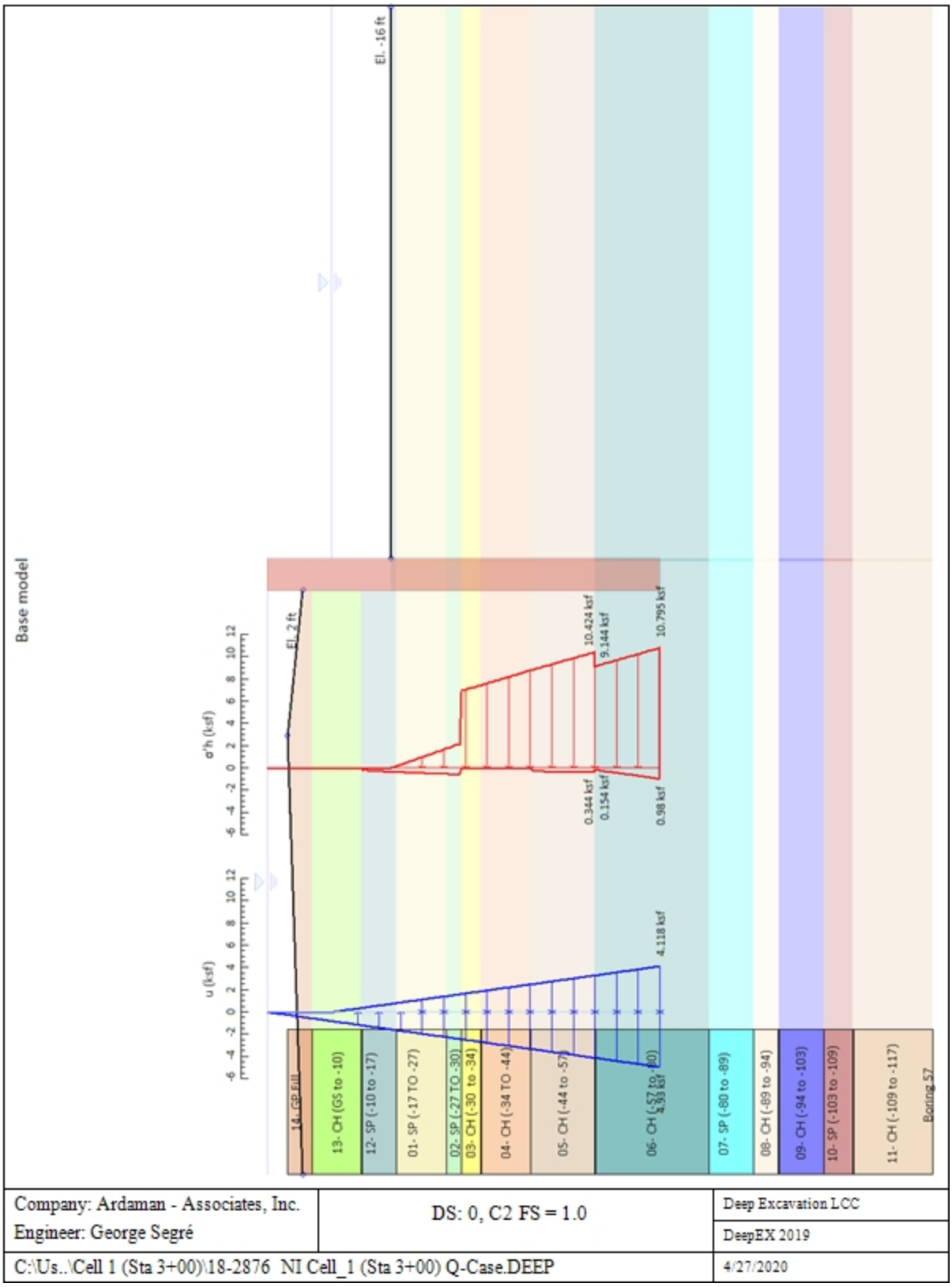

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



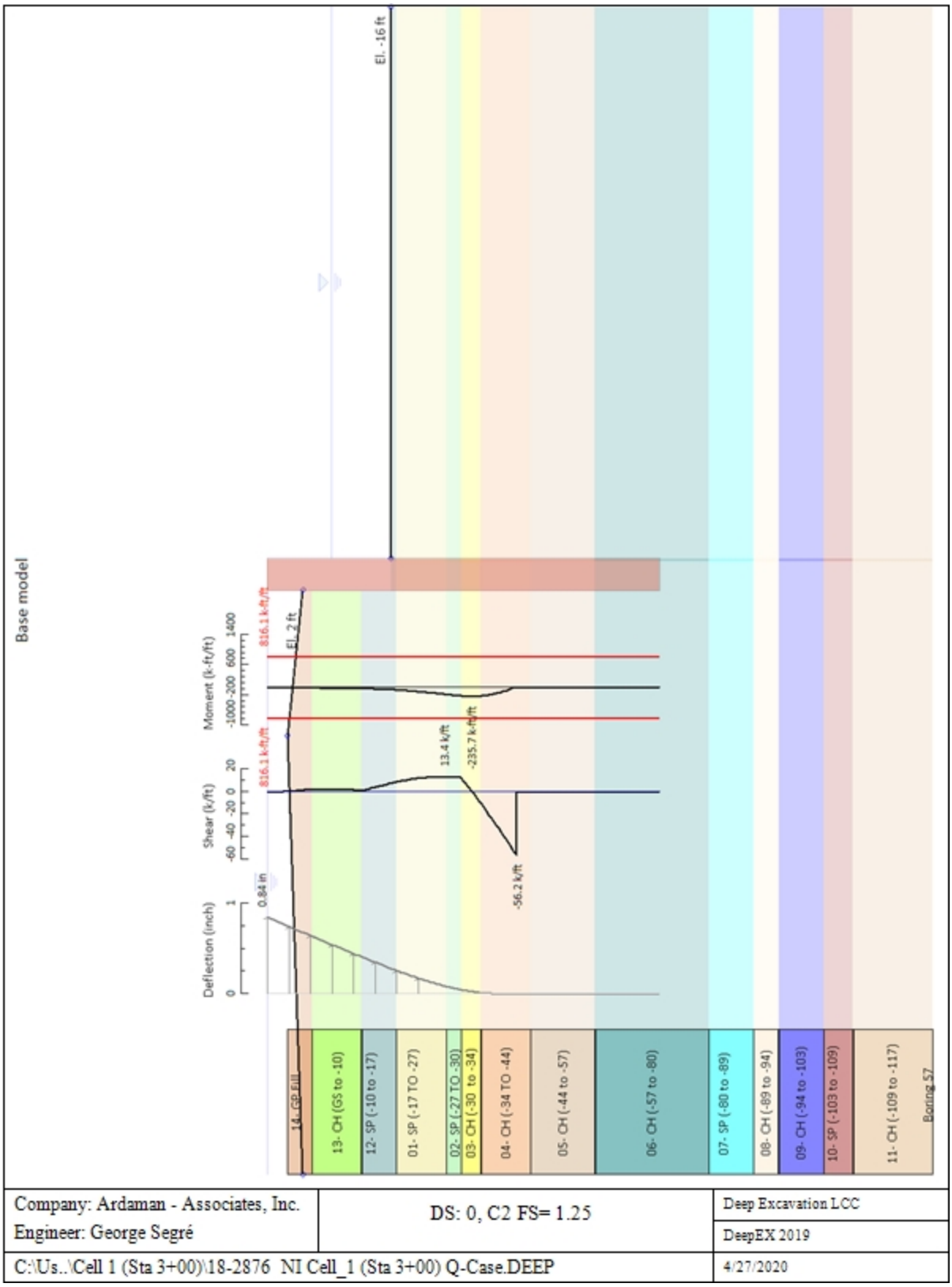

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



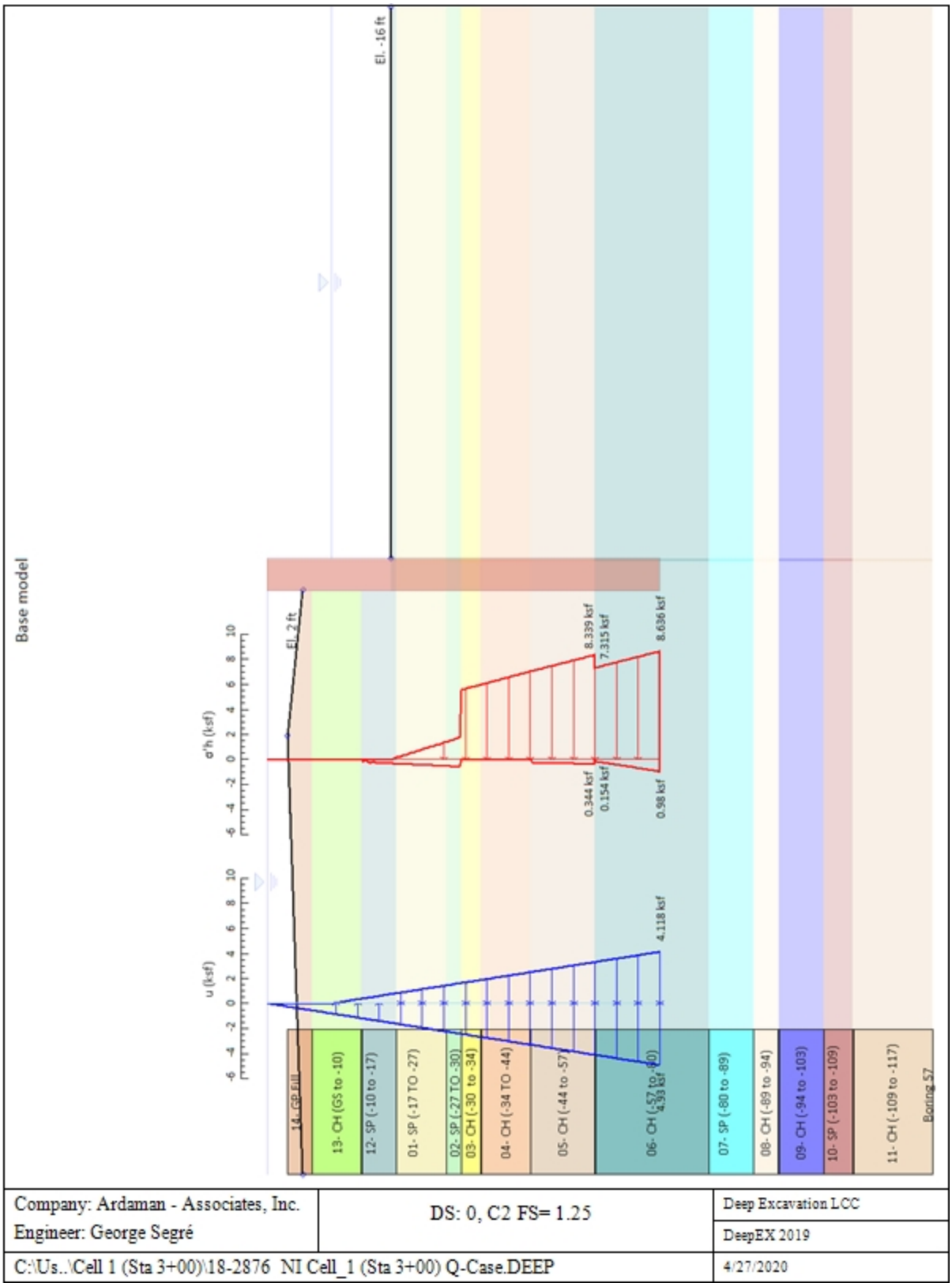

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



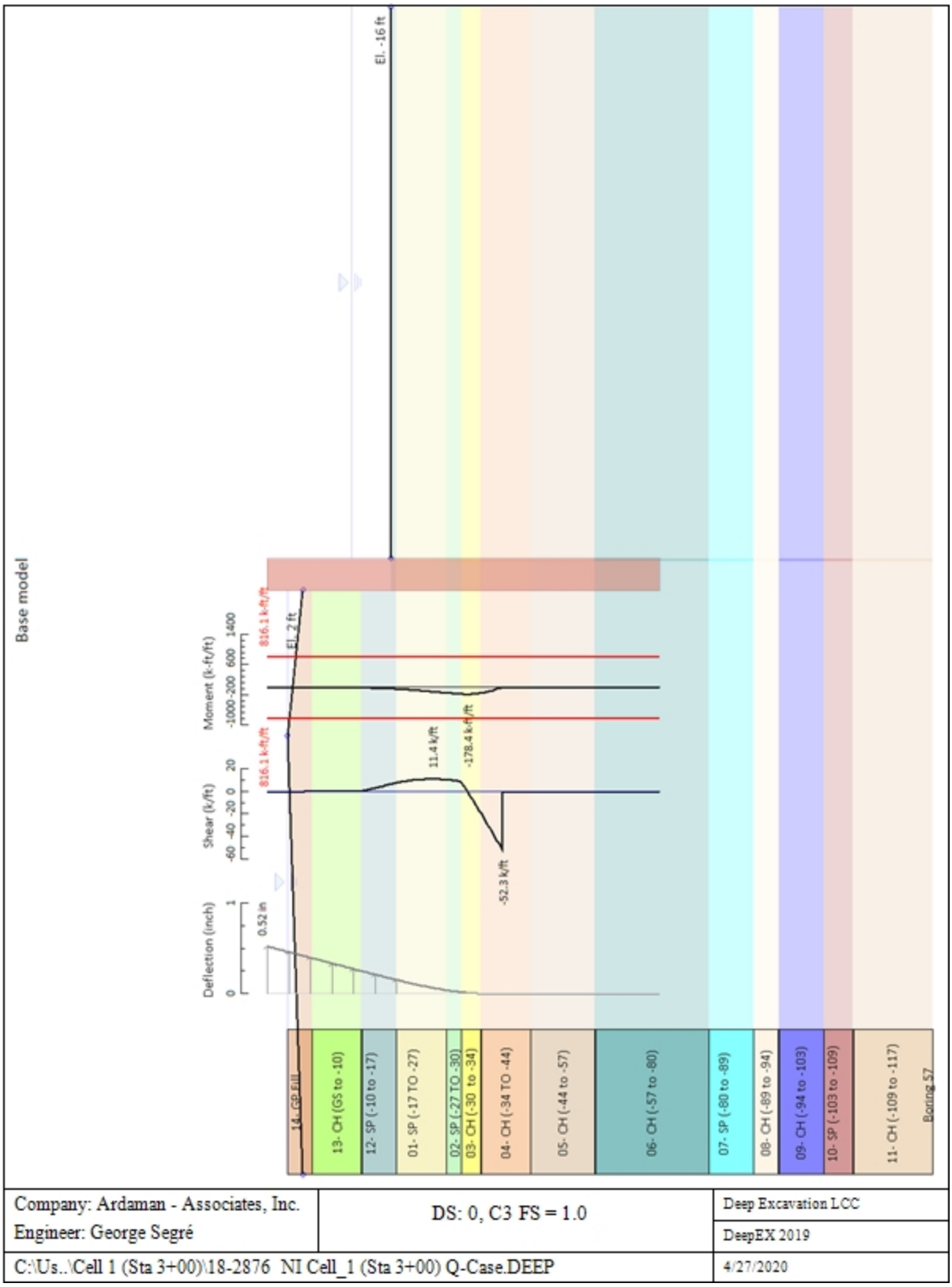

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



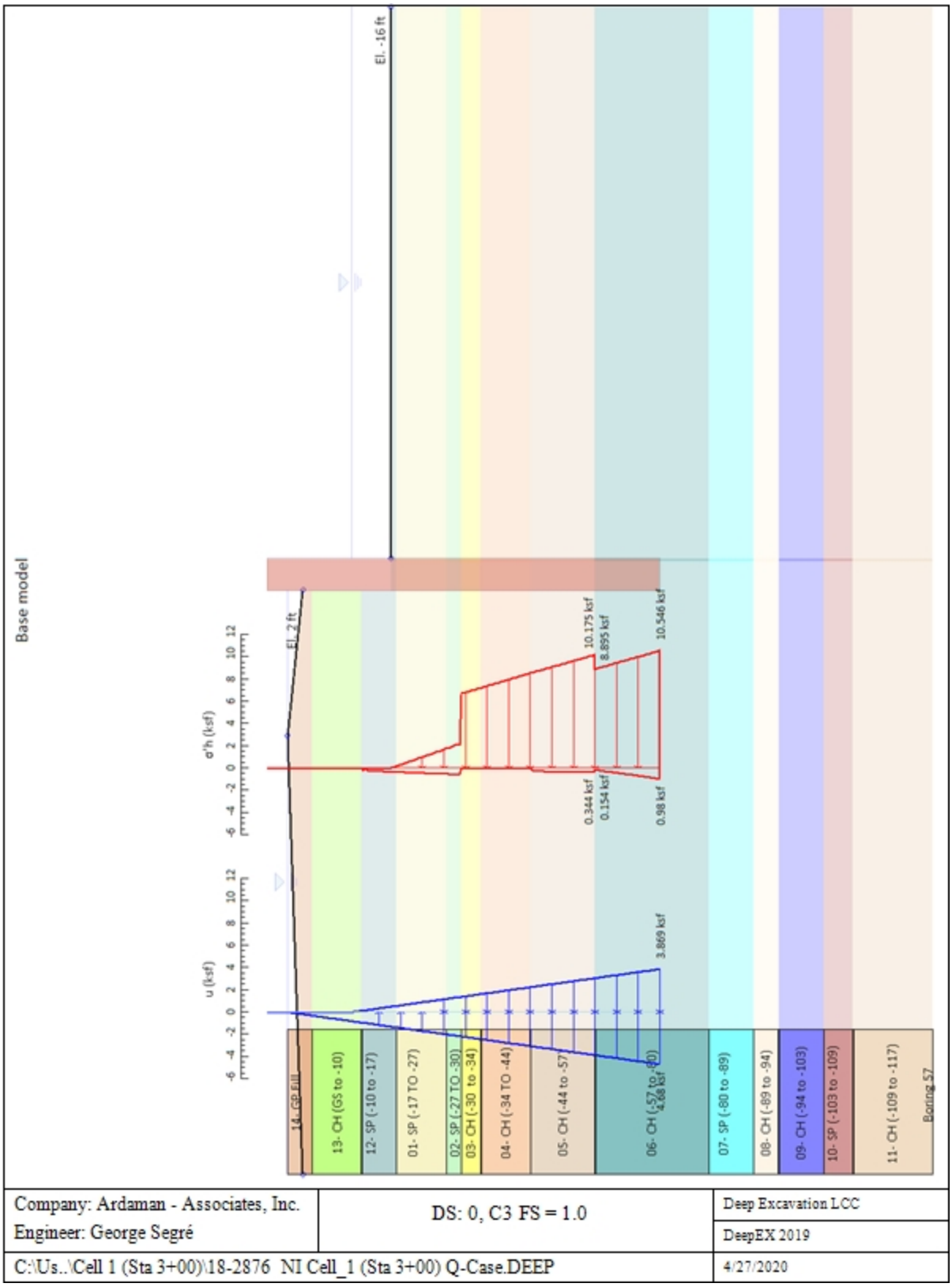

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS= 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



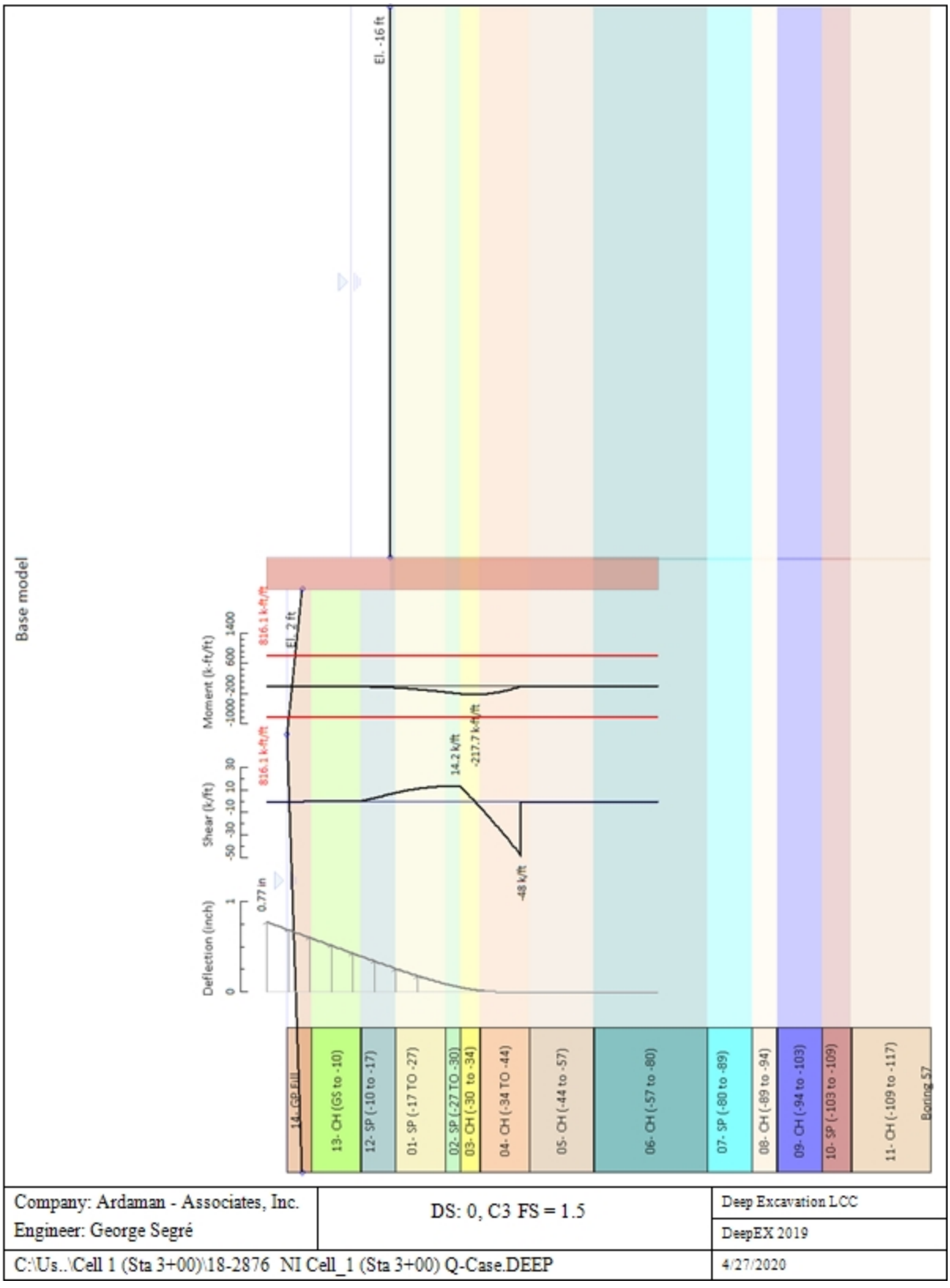

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS= 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |



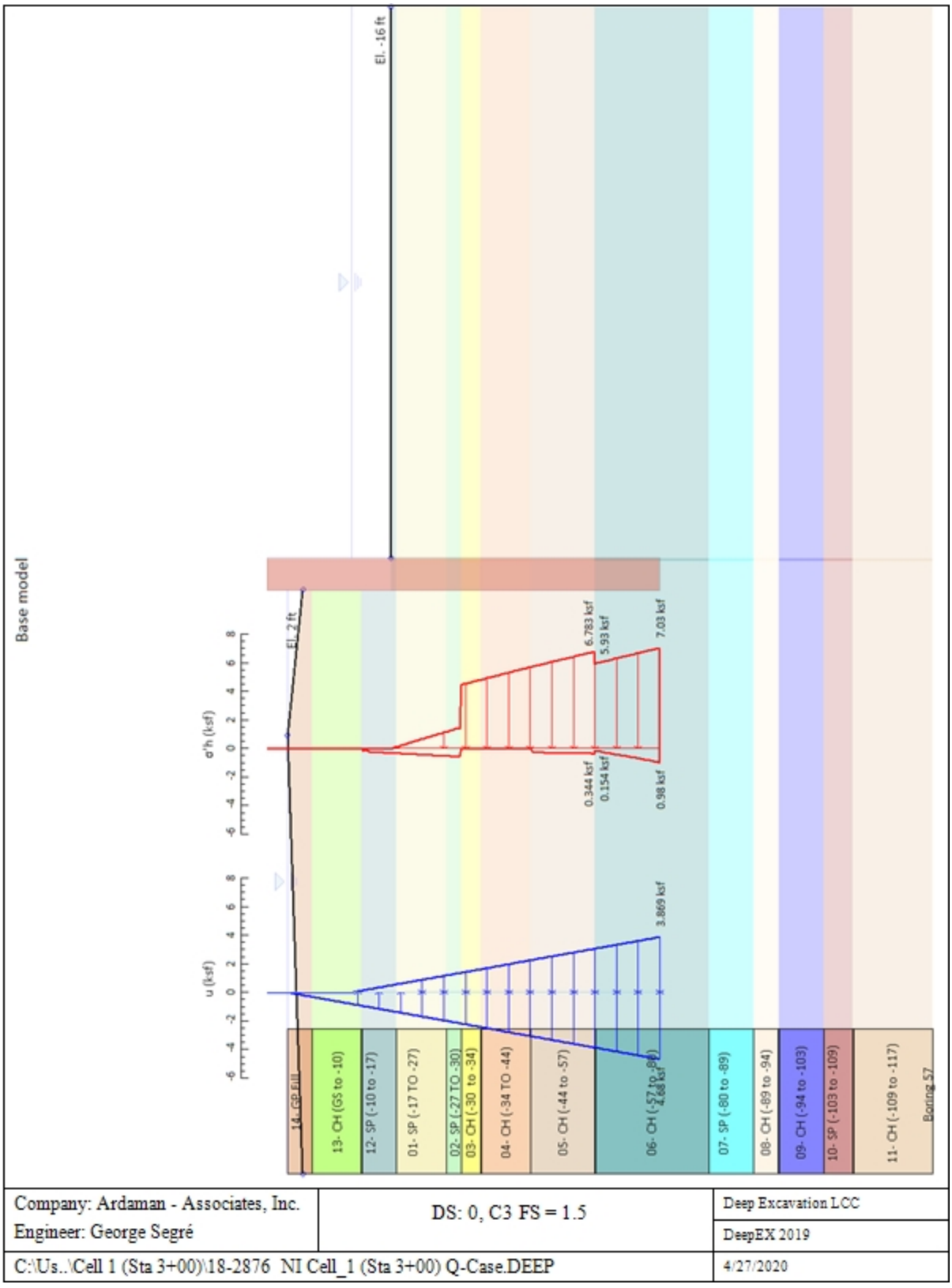

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |

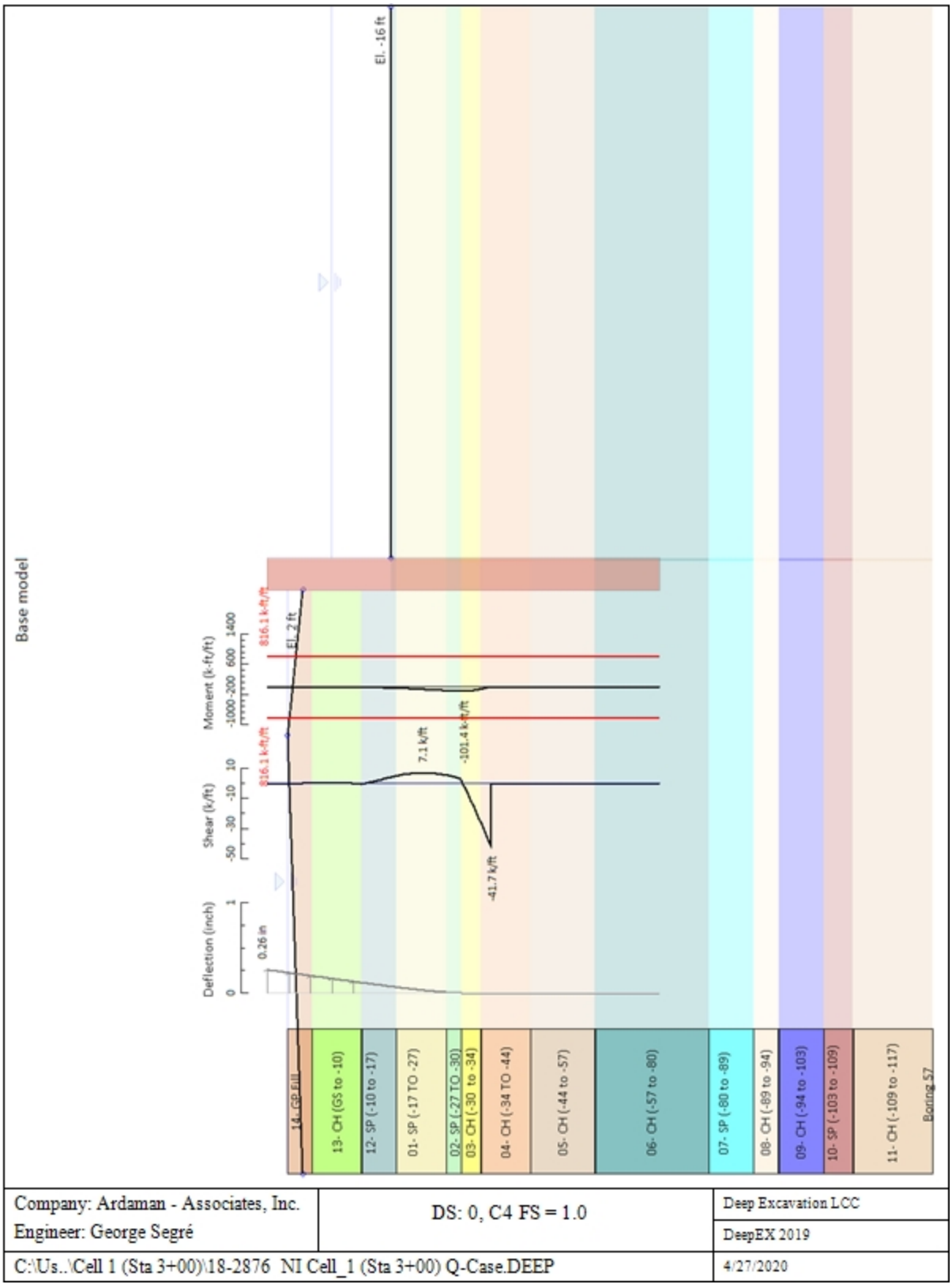



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |

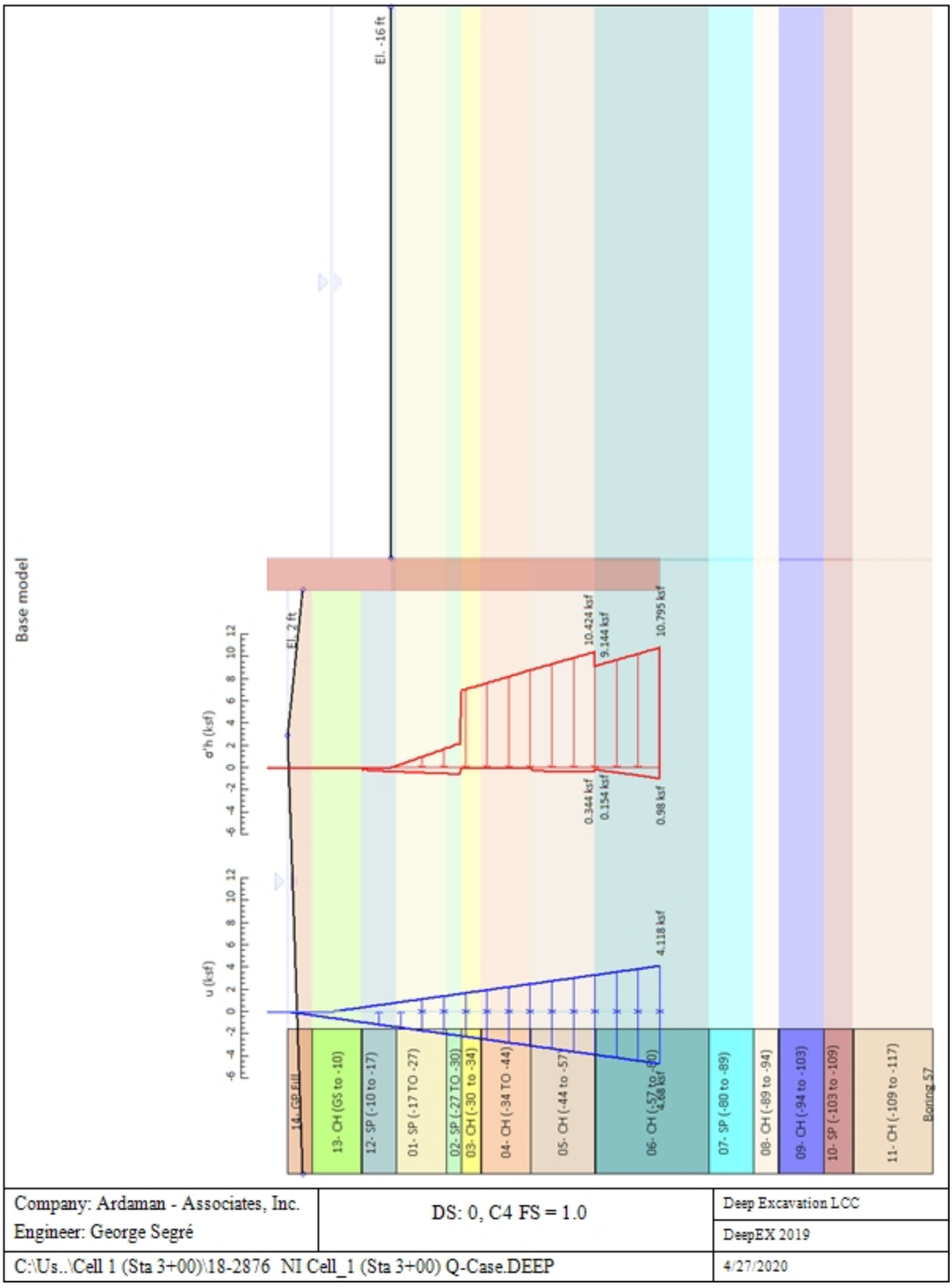



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |

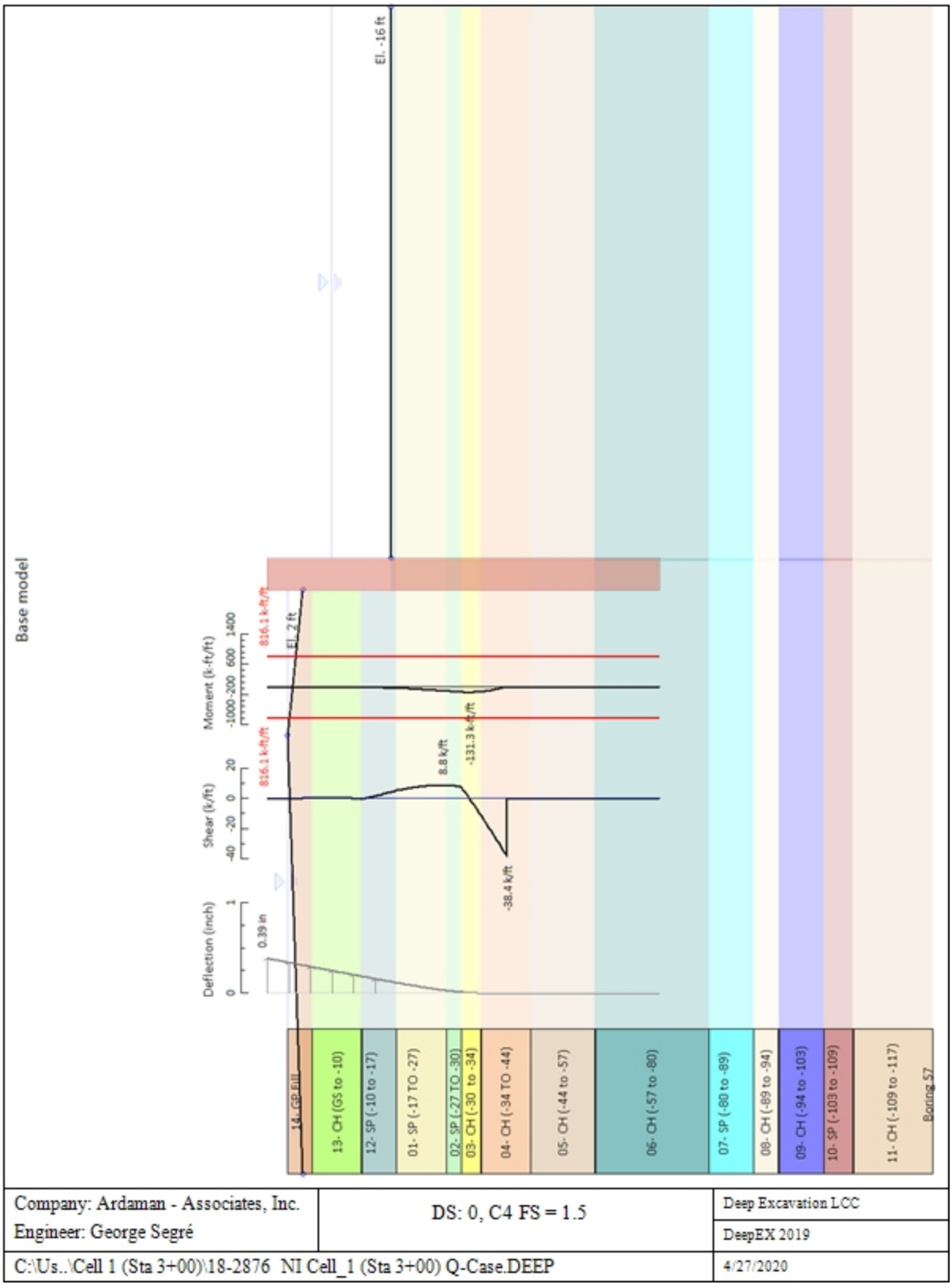

Base model
El. -16 ft
El. 2 ft
σ'h (ksf)
u (ksf)
6.783 ksf
5.93 ksf
7.03 ksf
0.344 ksf
0.154 ksf
0.98 ksf
3.869 ksf
4.68 ksf
14- GP Fill
13- CH (G5 to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -86)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP
4/27/2020



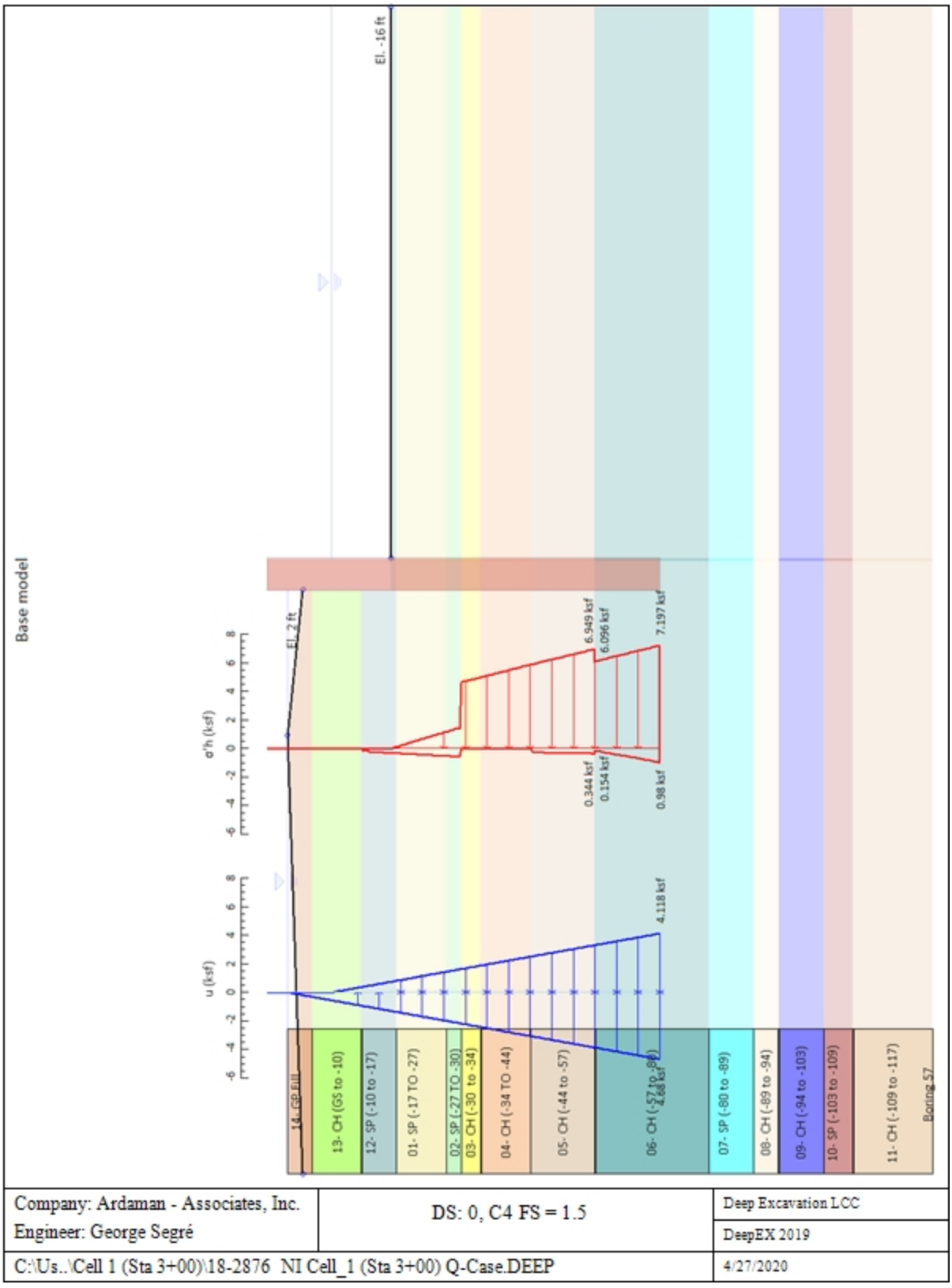

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP | | 4/27/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:49:06 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 14-GP (FILL) | 120 | 120 | 34 | 0 | N/A | N/A | N/A | 300 | 3 | 0.28 | 3.54 | N/A | N/A | True | Linear | |
| 13- CH (GS to | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 12- SP (-10 to | 112 | 112 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 01- SP (GS TO | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 60 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 150 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 26 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 26 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 14-GP (FILL) | 0.35 | - | - | 0.441 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- CH (GS to | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- SP (-10 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 01- SP (GS TO | 0.4 | - | - | 0.455 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.455 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | - | - | 0.562 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | - | - | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | - | - | 0.562 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | - | - | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

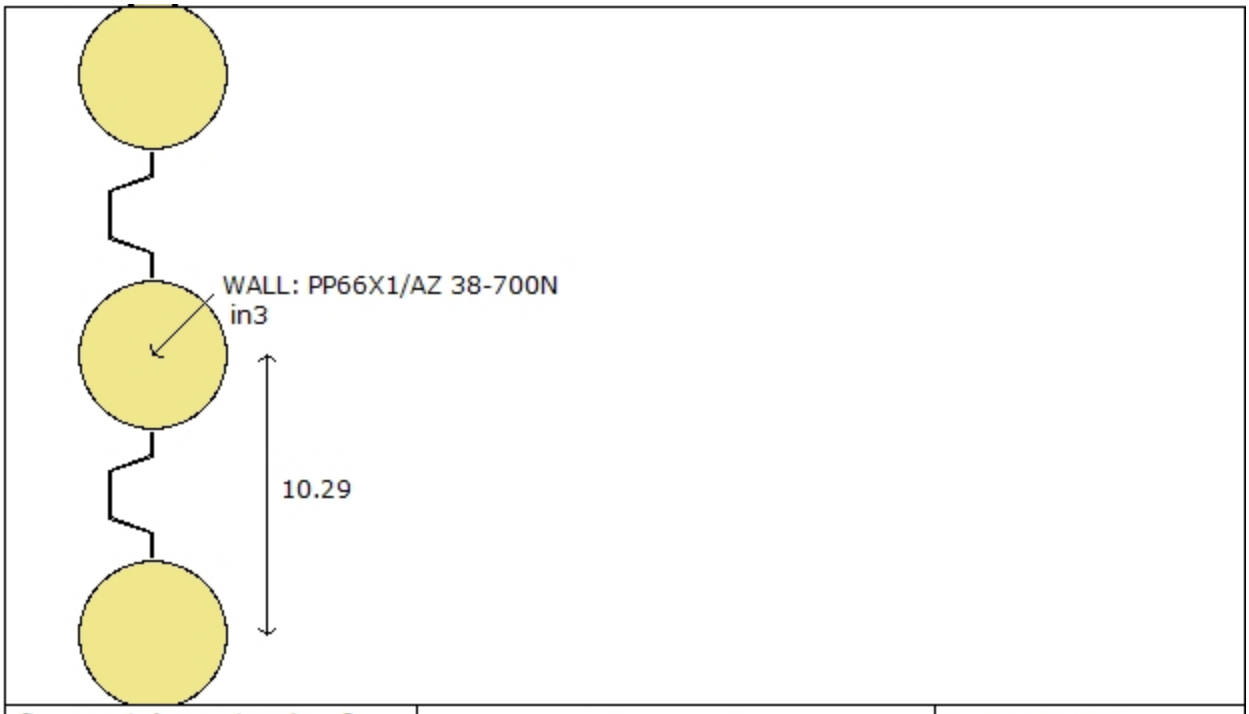
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 14-GP (FILL) | 1 | 0.44 |
| 0 | 13- CH (GS to - | 1 | 0.61 |
| -10 | 12- SP (-10 to - | 1 | 0.5 |
| -17 | 01- SP (GS TO | 1 | 0.46 |
| -27 | 02- SP (-27 TO | 1 | 0.46 |
| -30 | 03- CH (-30 to | 1 | 0.56 |
| -34 | 04- CH (-34 TO | 1 | 0.56 |
| -44 | 05- CH (-44 to | 1 | 0.56 |
| -57 | 06- CH (-57 to | 1 | 0.56 |
| -80 | 07- SP (-80 to - | 1 | 0.46 |
| -89 | 08- CH (-89 to | 1 | 0.56 |
| -94 | 09- CH (-94 to | 1 | 0.56 |
| -103 | 10- SP (-103 to | 1 | 0.46 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | Wall sketch | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -95 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.336 | 1.336 | 1.713 |
| Stage 1 | Simple span | N/A | 1.6 | 1.16 | 1.16 | 1.477 |
| Stage 2 | Simple span | N/A | 1.6 | 1.401 | 1.401 | 1.763 |
| Stage 3 | Simple span | N/A | 1.6 | 1.225 | 1.225 | 1.527 |
| Stage 4 | Simple span | N/A | 1.6 | 1.462 | 1.462 | 1.817 |
| Stage 5 | Simple span | N/A | 1.6 | 1.14 | 1.14 | 1.4 |
| Stage 6 | Simple span | N/A | 1.6 | 1.533 | 1.533 | 1.871 |
| Stage 7 | Simple span | N/A | 1.6 | 1.212 | 1.212 | 1.453 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

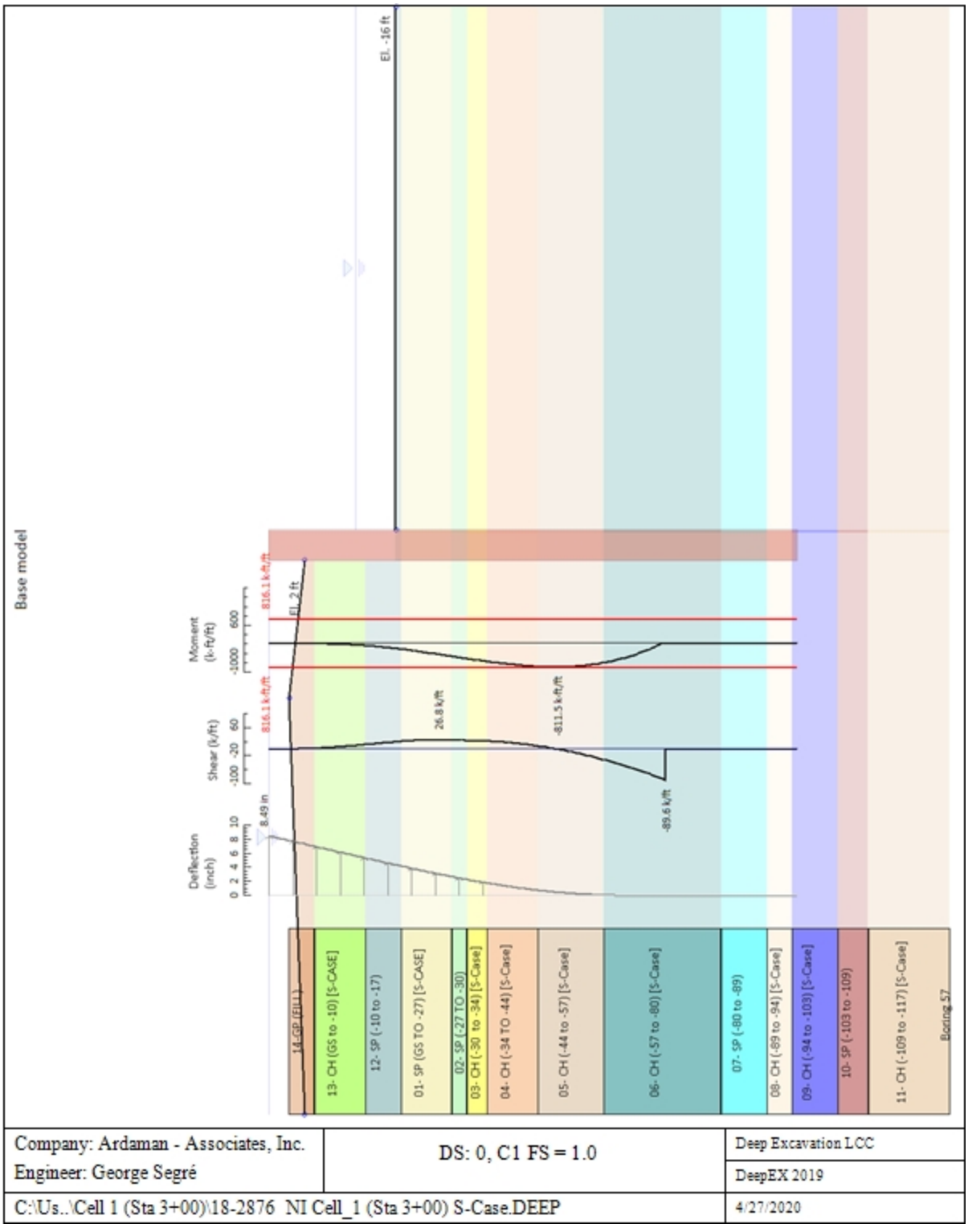
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

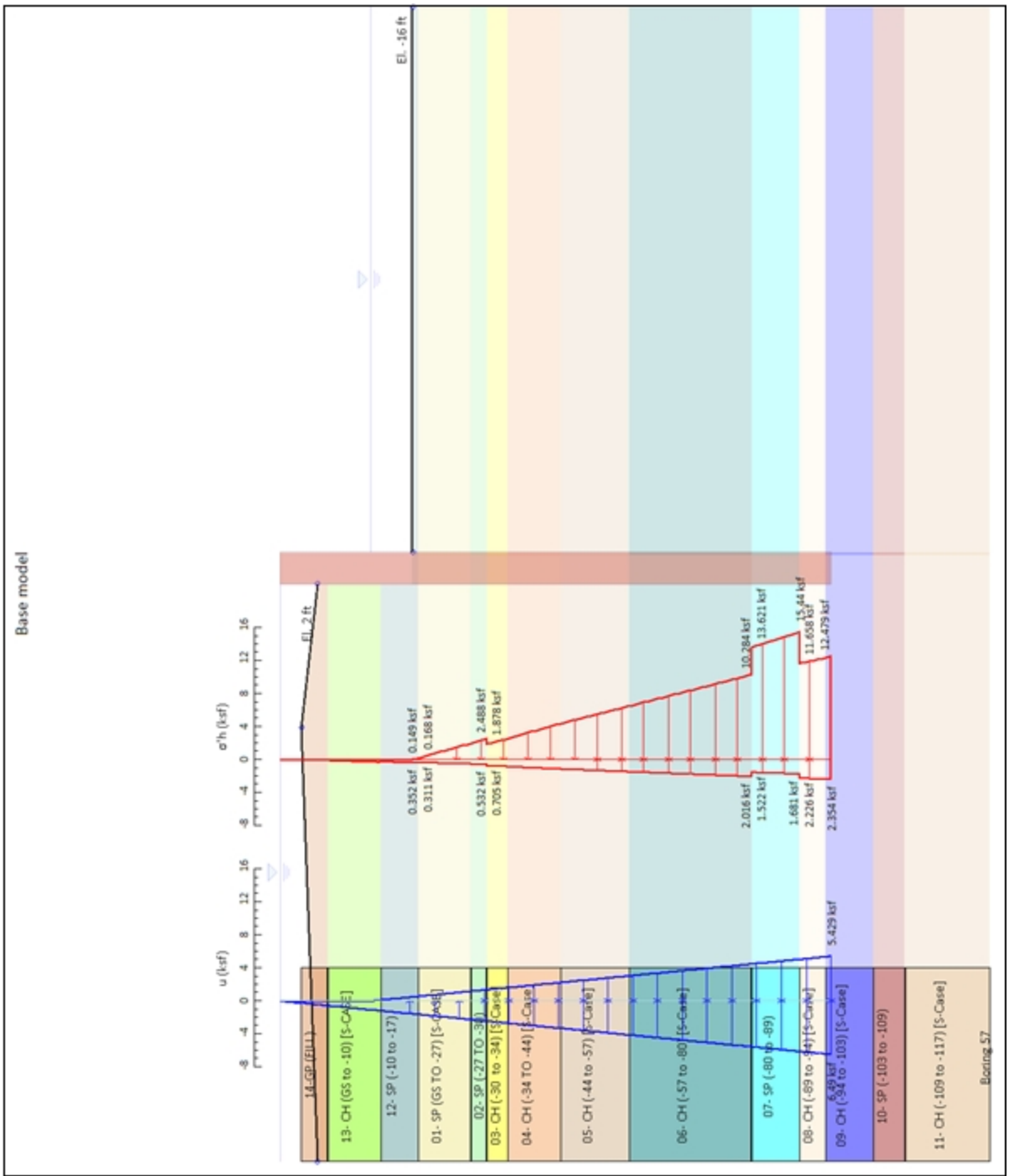
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

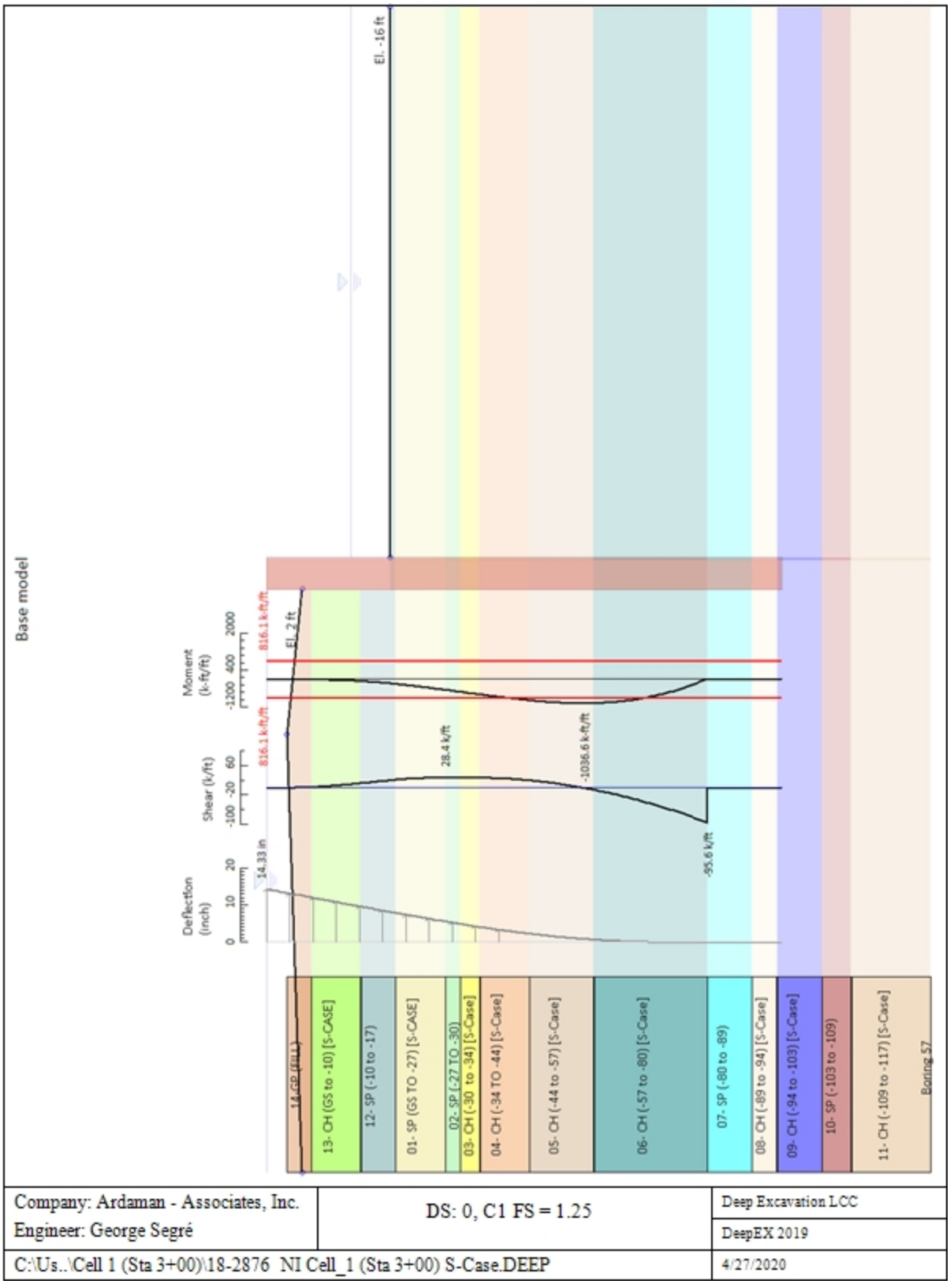
A sequence of figures for each excavation stage is reported



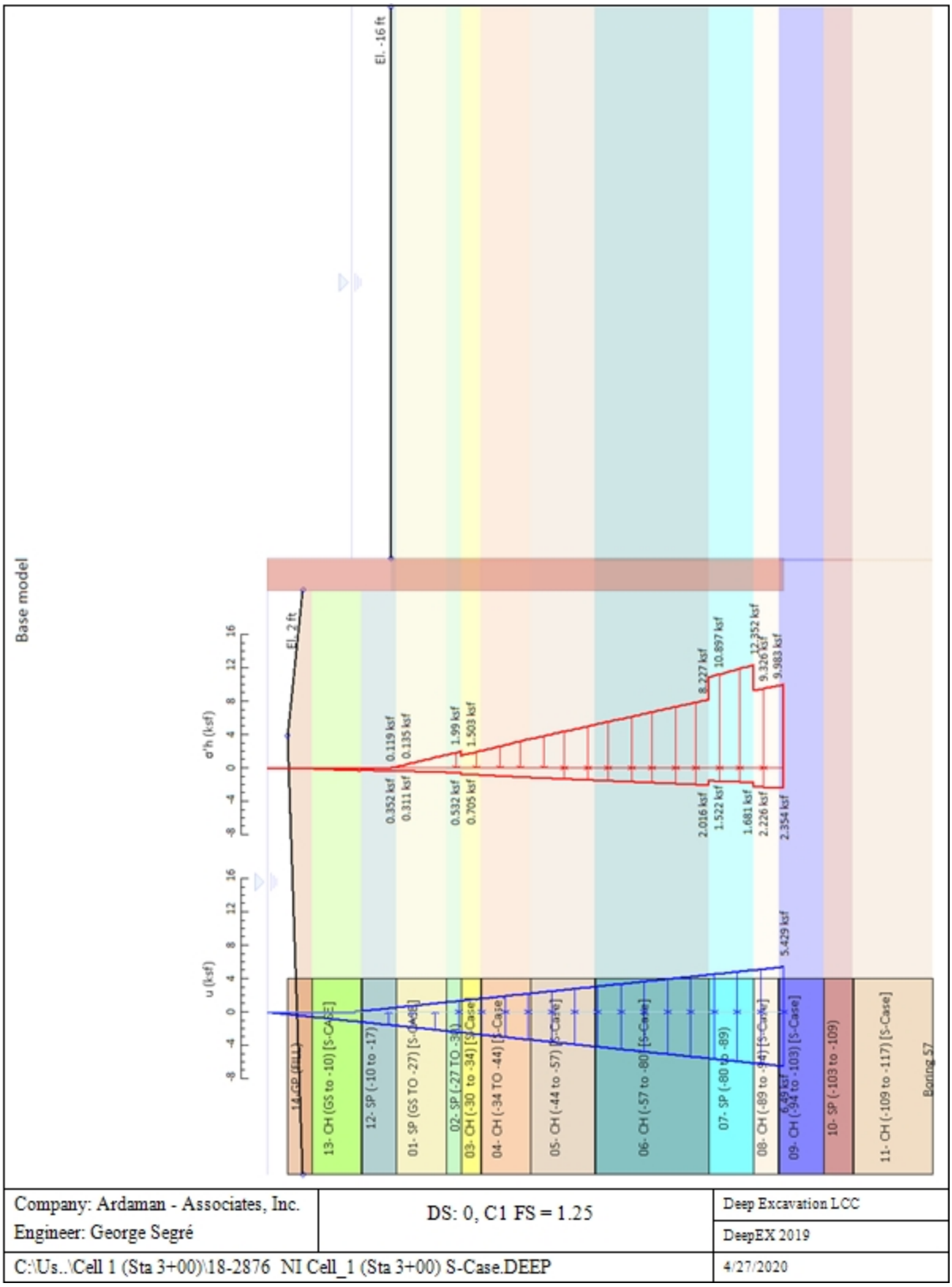

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



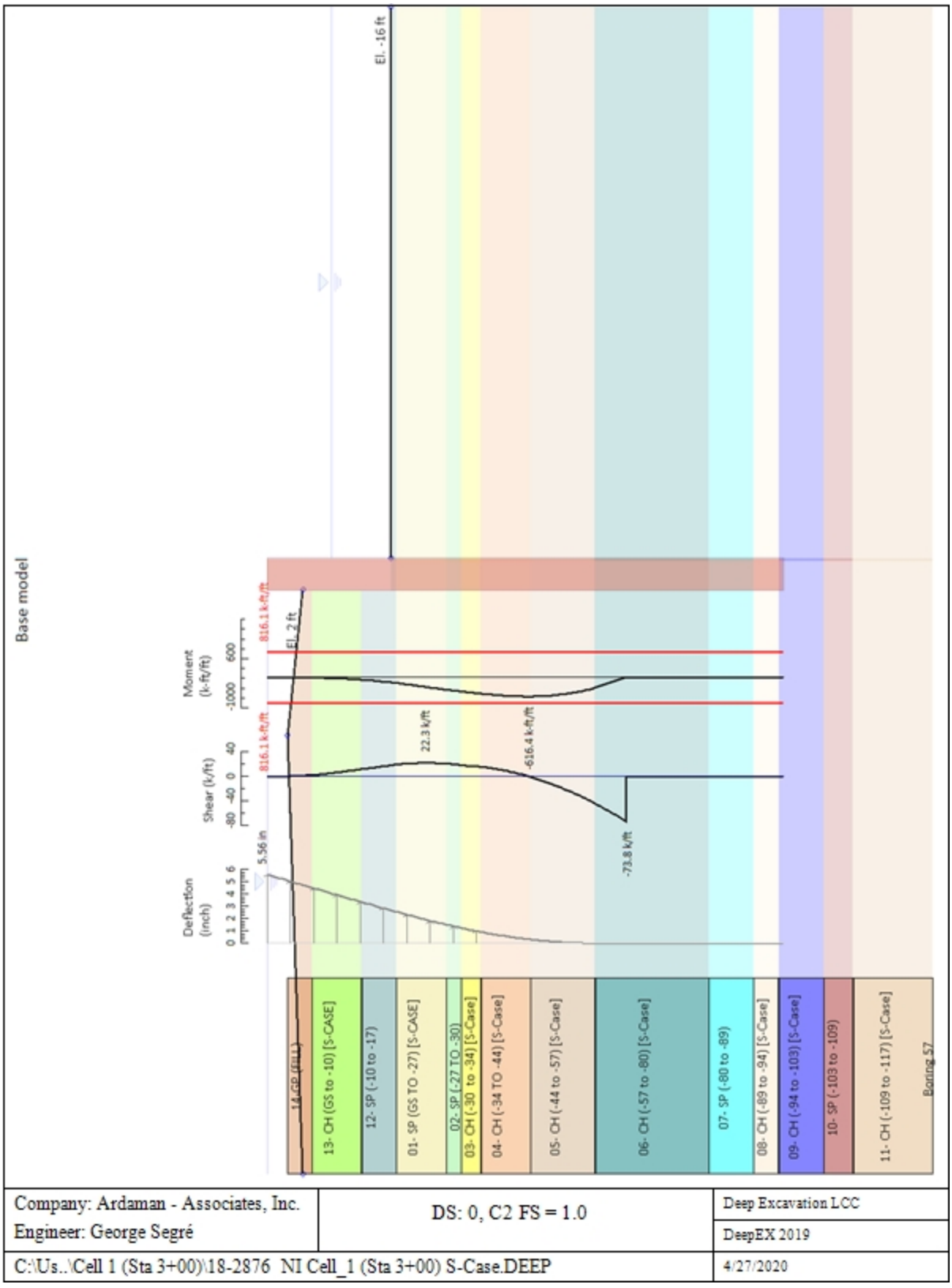

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



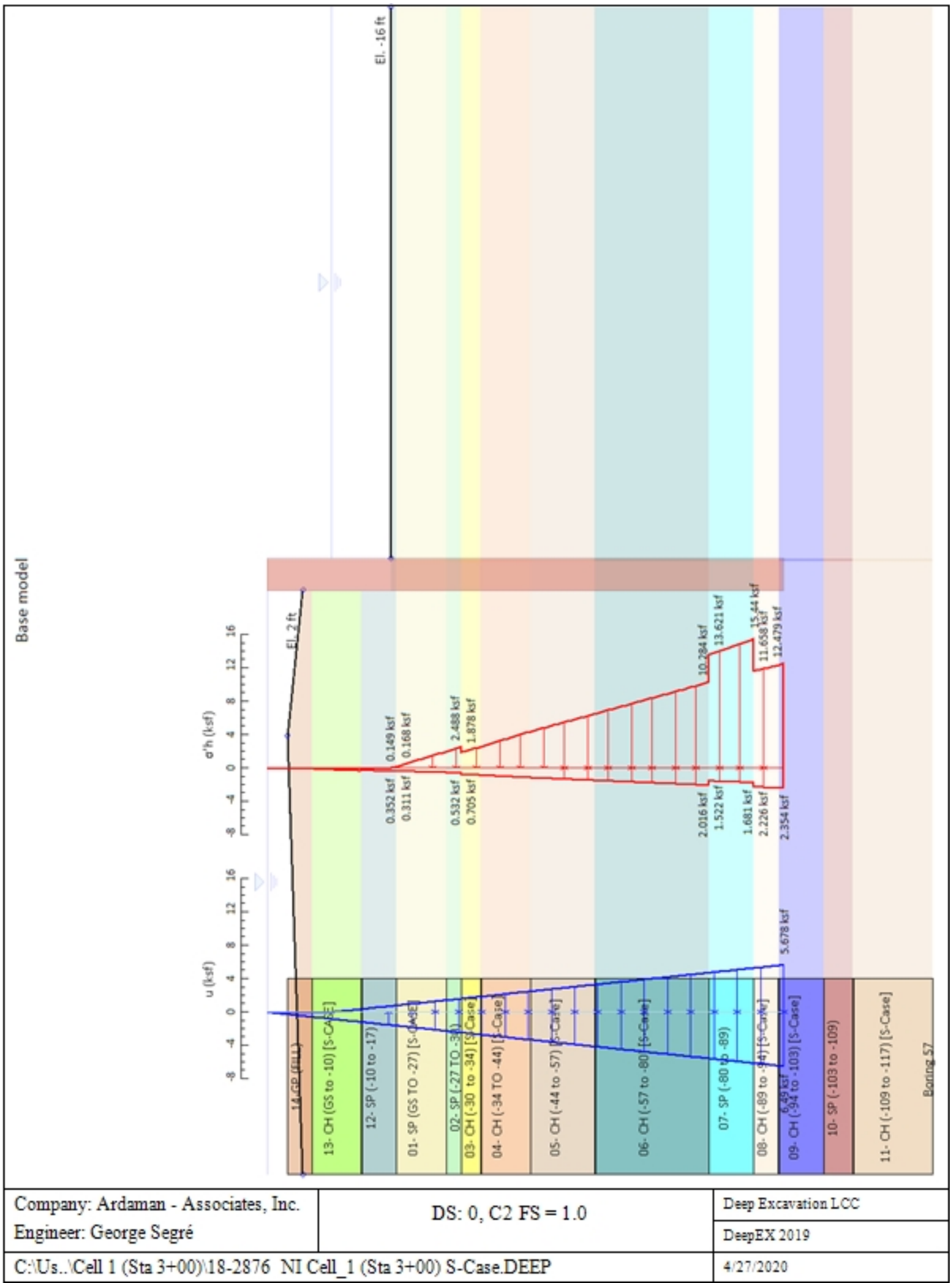

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



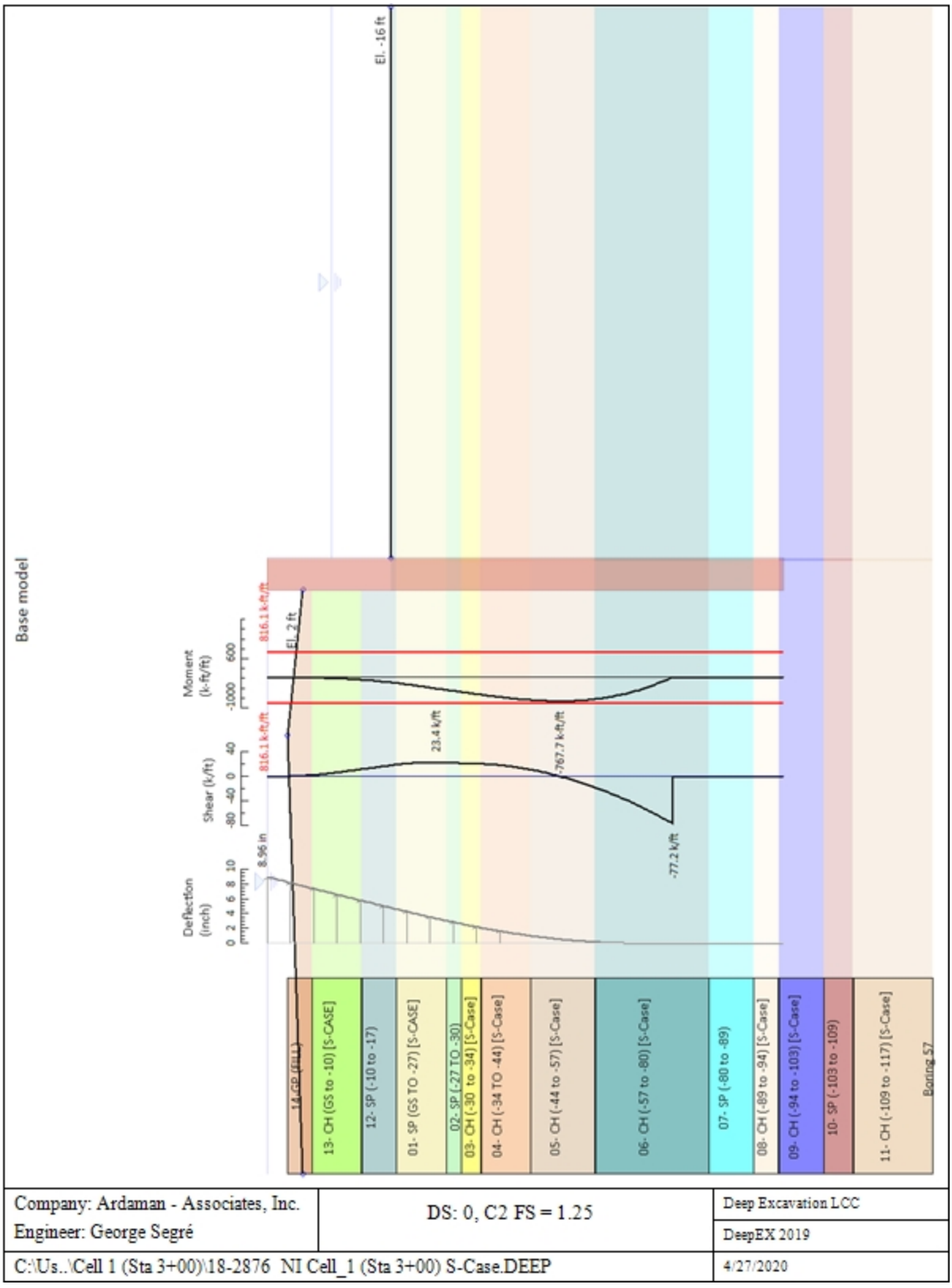

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



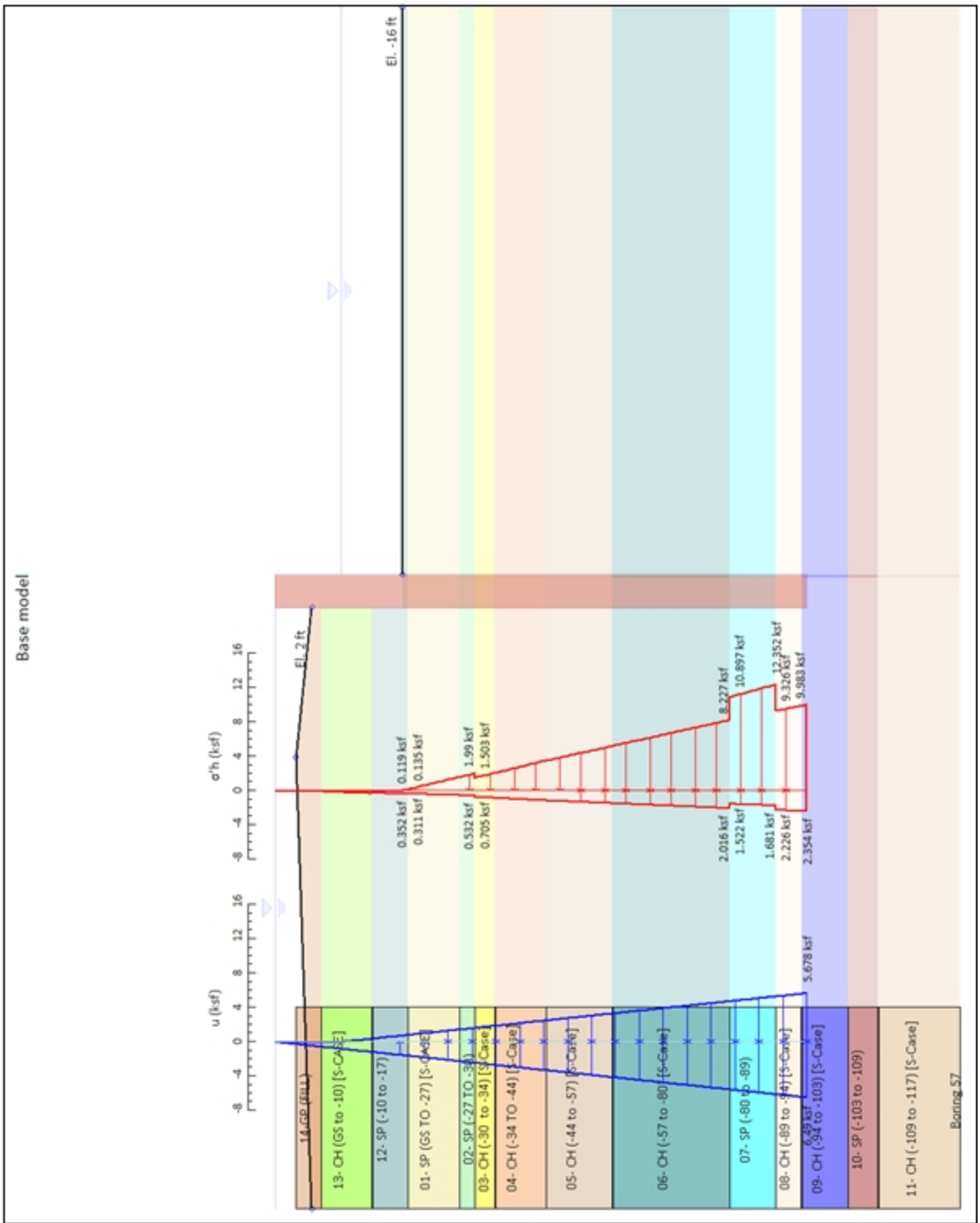

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



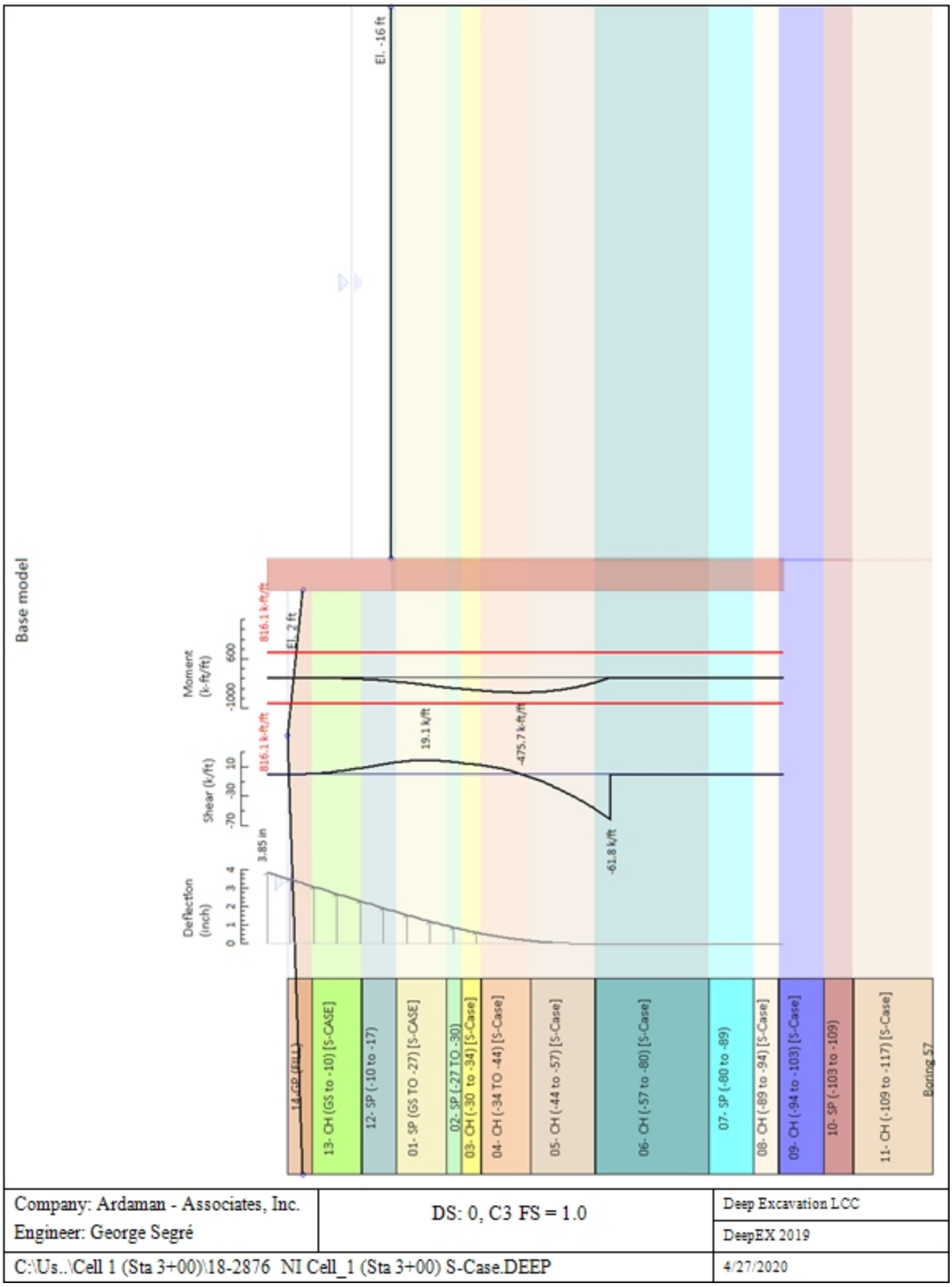

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



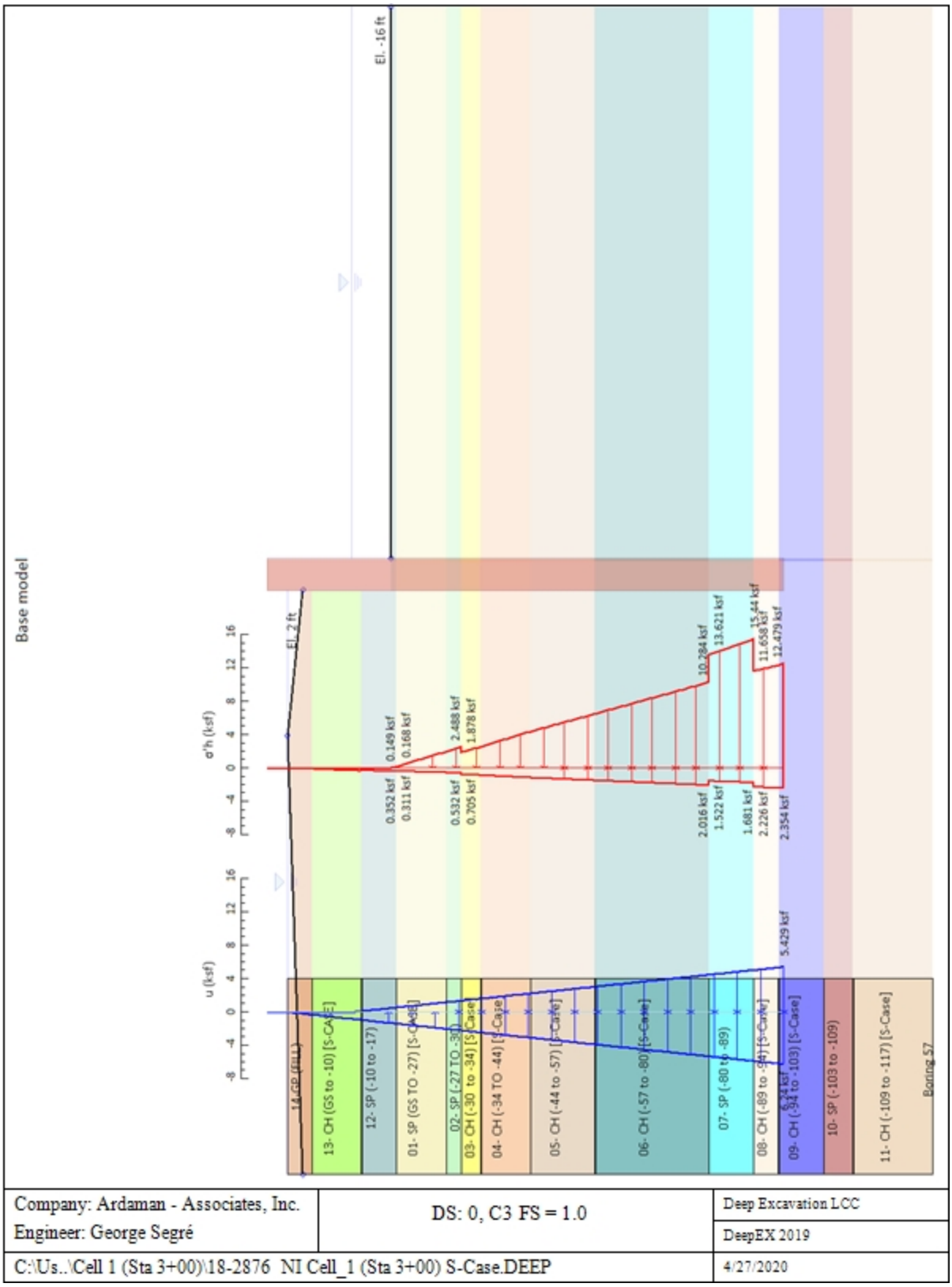

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



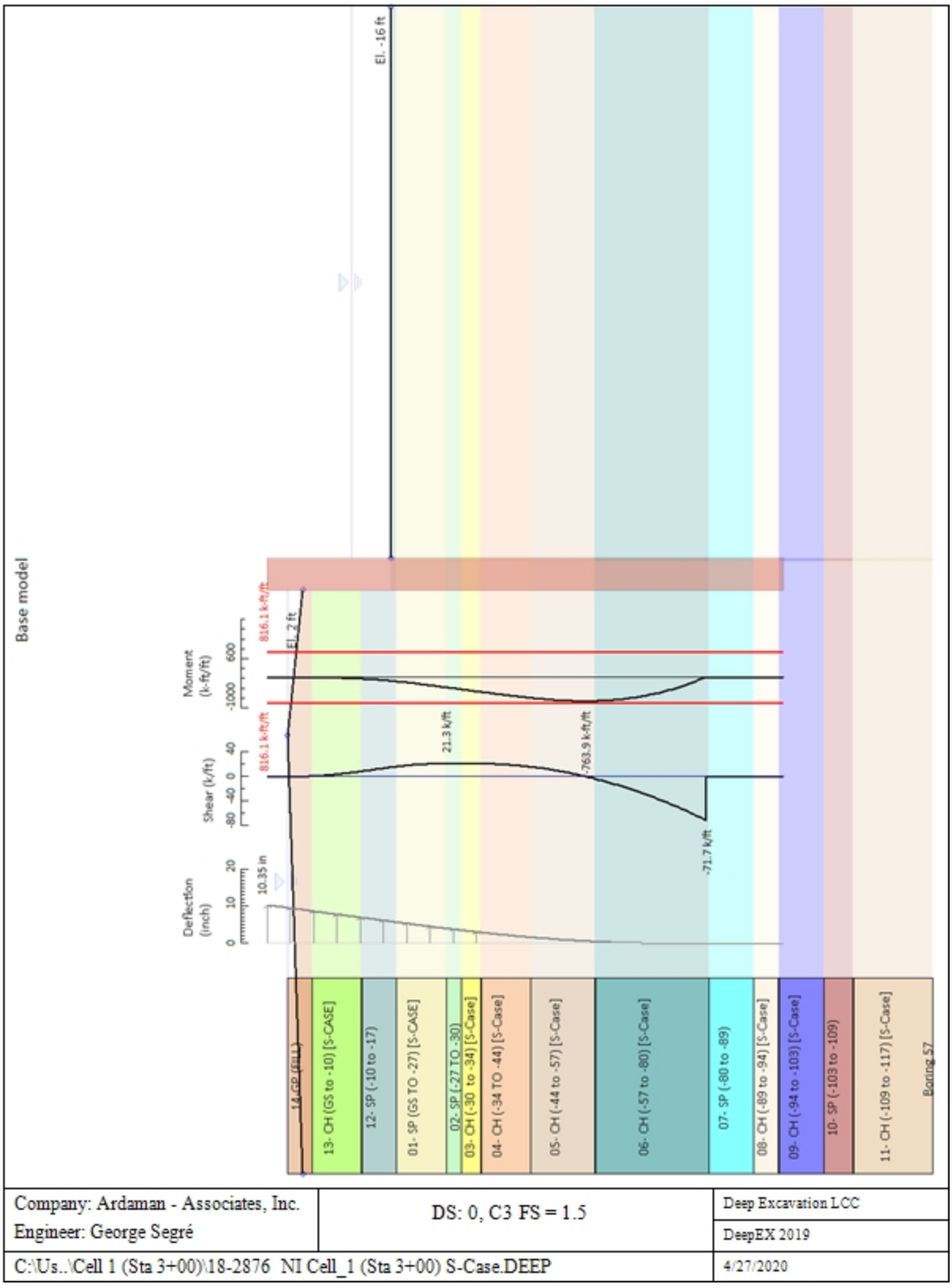

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



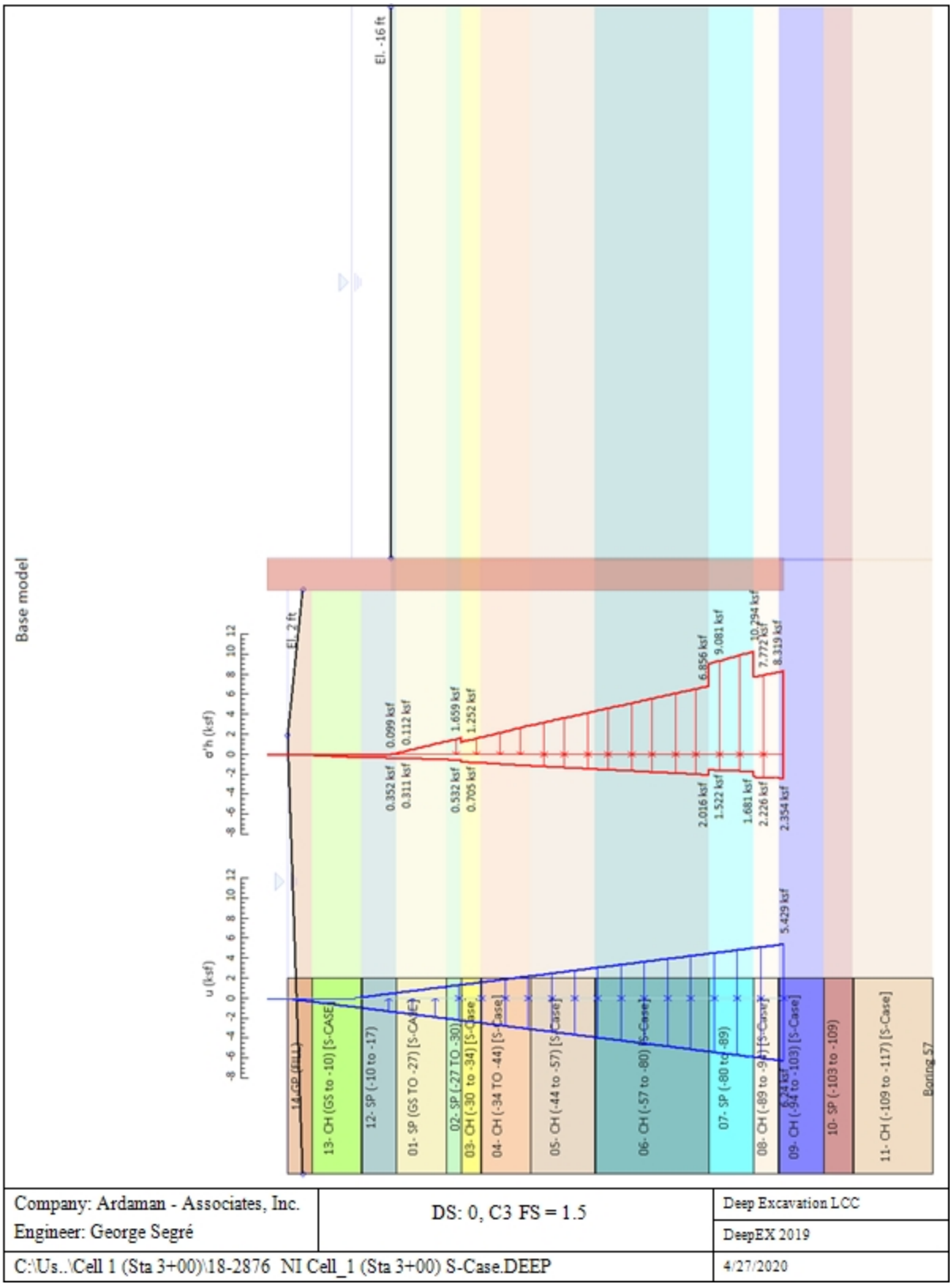

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



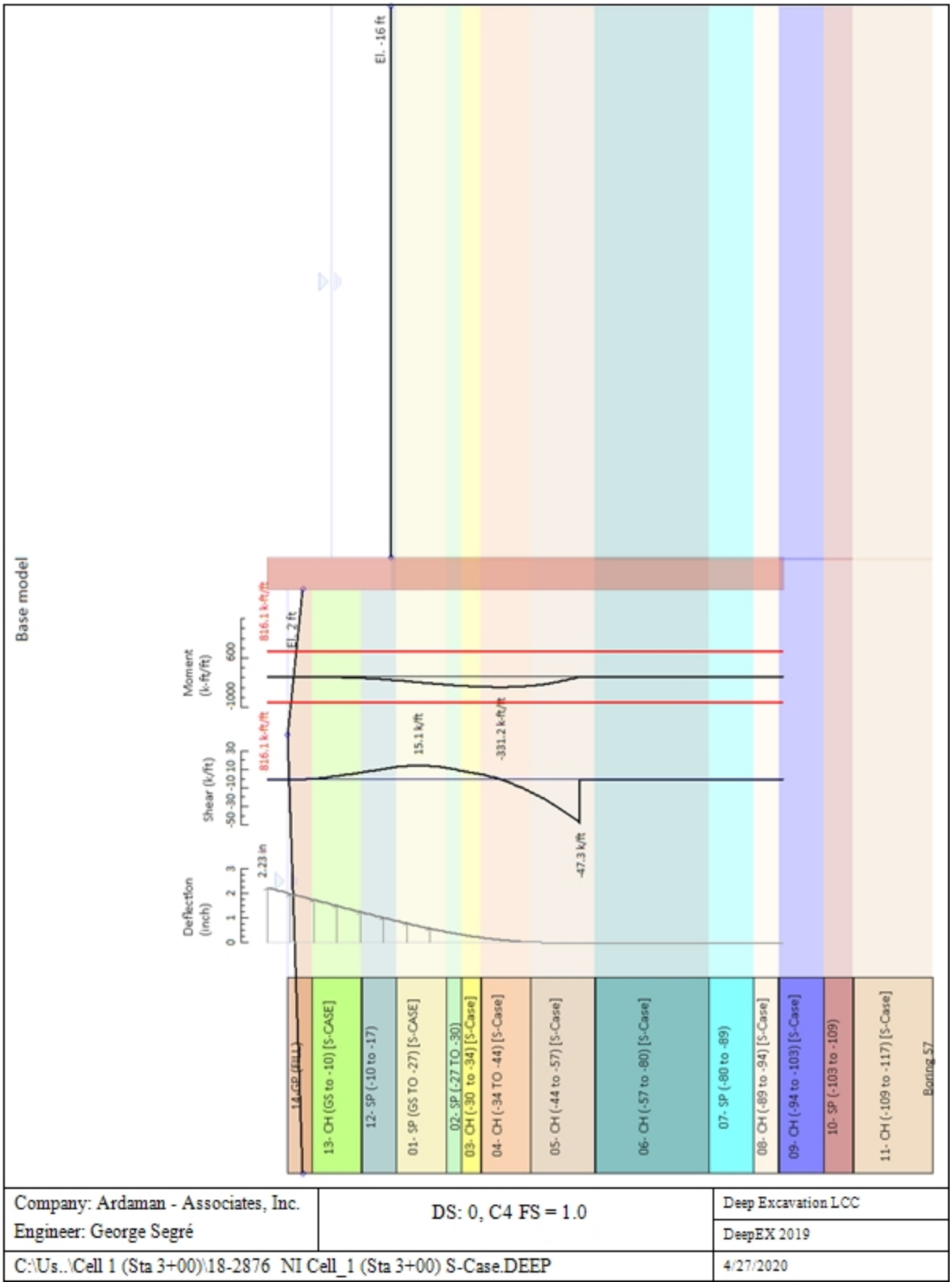

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



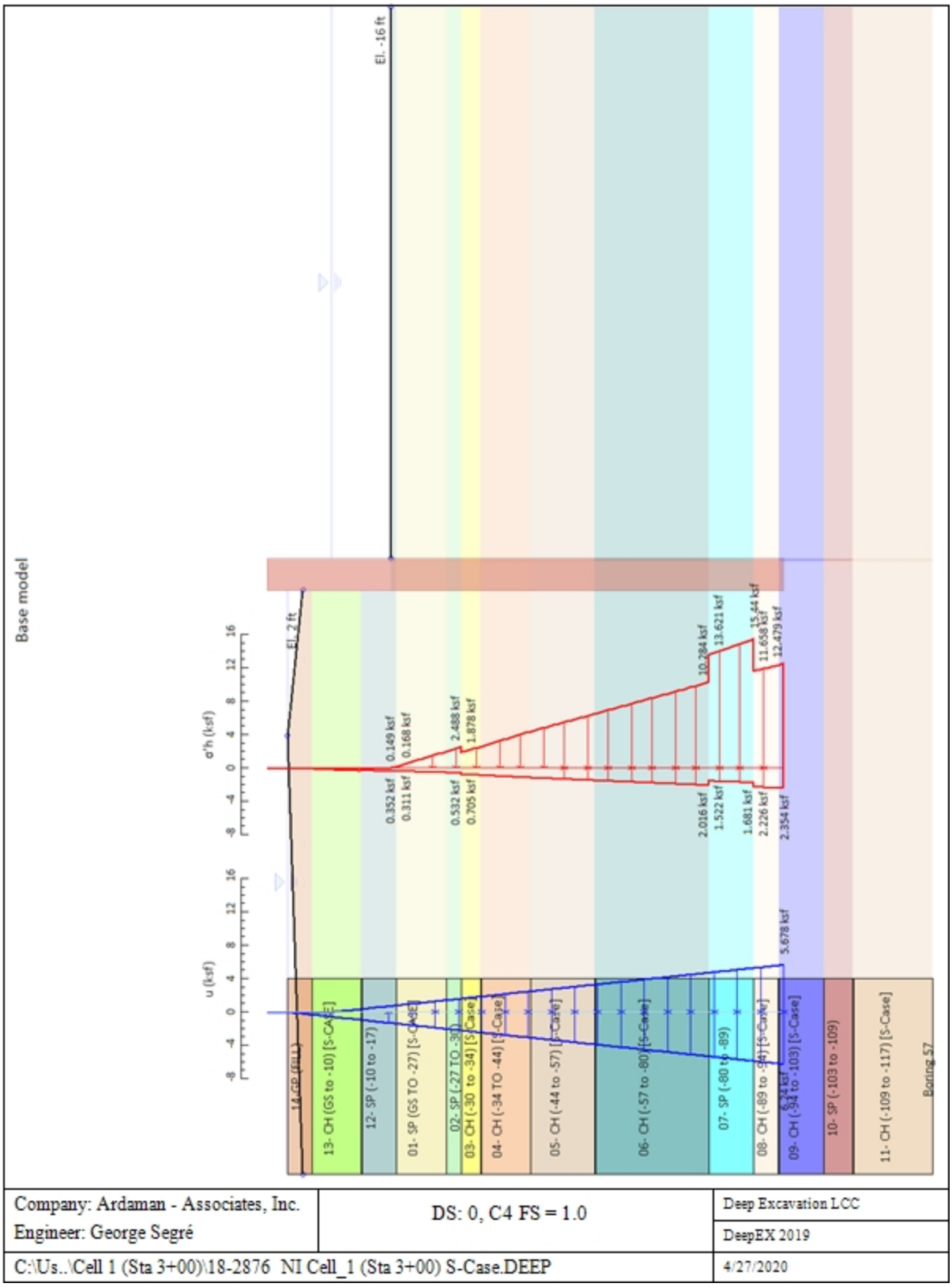

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



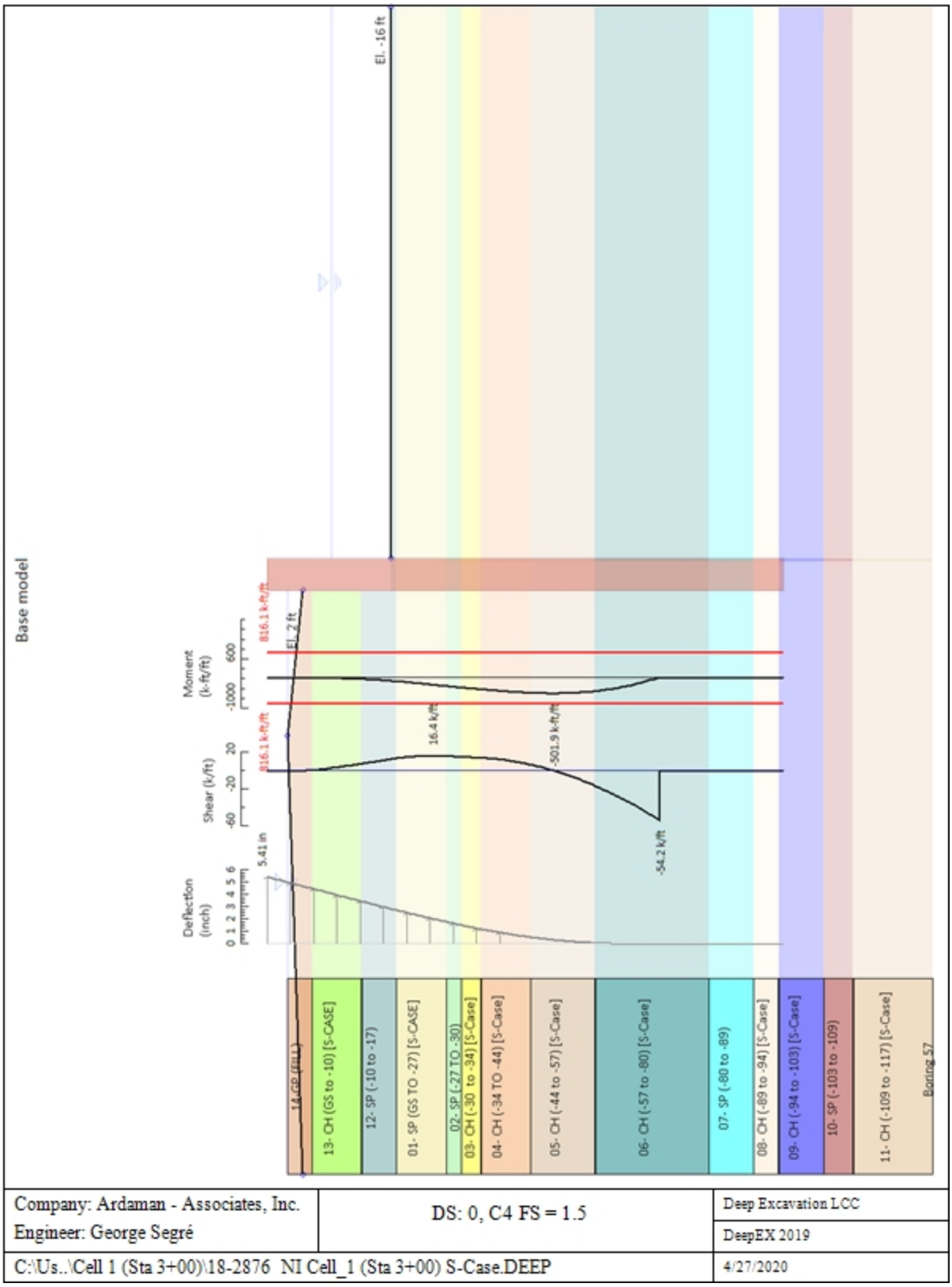

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |



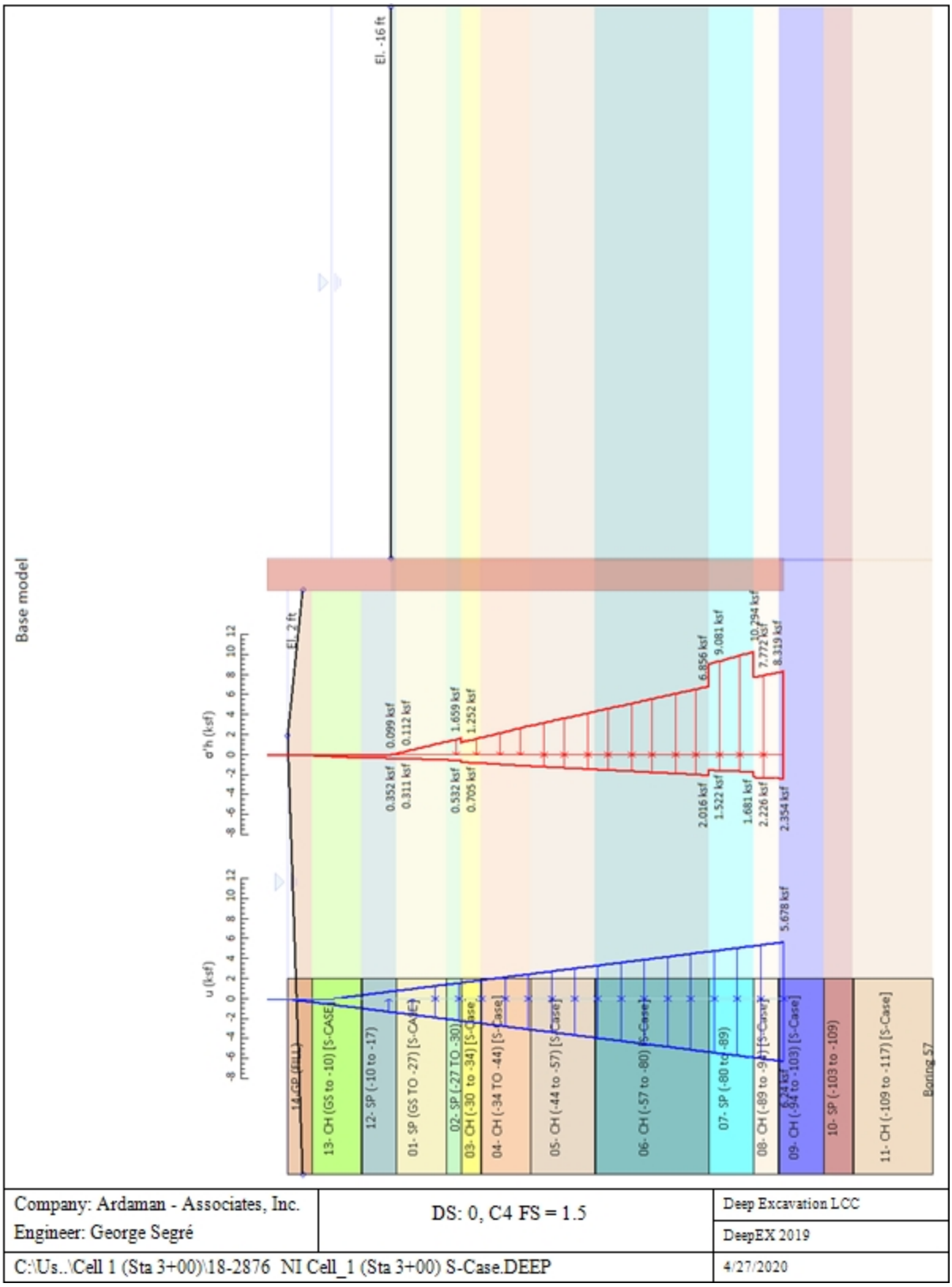

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 3+50)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -72.78 ft., NAVD88

Length of Sheetting = 81.78 ft.

Use = 85.0 ft.

Design Tip Elev. = -76.0 ft., NAVD88

Design Length of Sheeting = 85.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -44.72 | 493.62 | 90.92 | 2.19 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -47.48 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -42.74 | 405.38 | 83.52 | 1.67 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -45.12 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -41.16 | 300.72 | 70.58 | 1.10 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -45.12 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -38.80 | 220.86 | 59.93 | 0.75 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -42.35 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -63.85 | 626.88 | 75.91 | 5.68 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -72.78 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -58.21 | 463.57 | 61.75 | 3.58 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -65.73 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -54.45 | 334.37 | 48.40 | 2.26 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -69.49 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -48.34 | 219.60 | 36.17 | 1.20 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -60.09 | -- | -- | -- |
| | | | | | | Governing Value: | -72.78 | 626.88 | 90.92 | 5.68 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:56:32 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 14- GP Fill | 120 | 120 | 34 | 0 | N/A | N/A | N/A | 300 | 3 | 0.28 | 3.54 | N/A | N/A | True | Linear | |
| 13- CH (GS to | 112 | 112 | 0 | 0 | 800 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 12- SP (-10 to | 112 | 112 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 01- SP (-17 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 60 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 0 | 0 | 2290 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 0 | 0 | 2290 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 0 | 0 | 2290 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 0 | 0 | 1650 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 0 | 0 | 1200 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 0 | 0 | 1670 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 14- GP Fill | 0.35 | - | - | 0.441 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- CH (GS to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- SP (-10 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 01- SP (-17 T | 0.4 | - | - | 0.5 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.5 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | 0.1 | 0 | 0.45 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

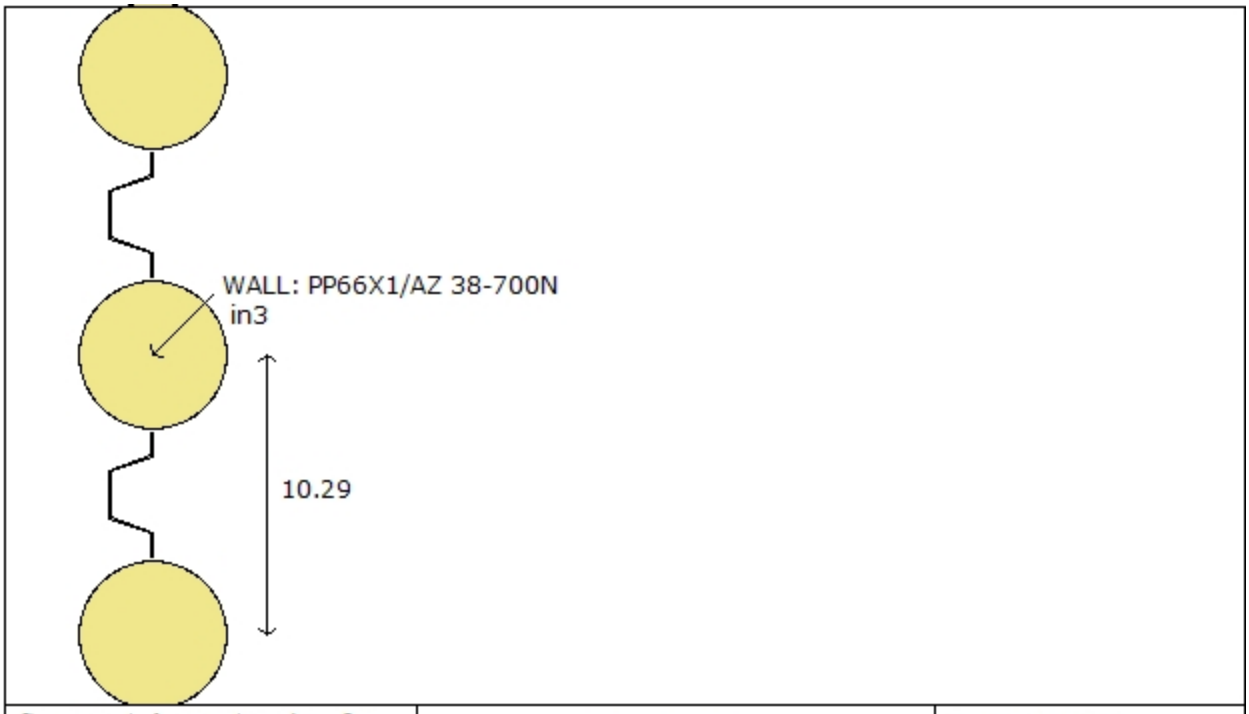
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 14- GP Fill | 1 | 0.44 |
| 0 | 13- CH (GS to - | 1 | 1 |
| -10 | 12- SP (-10 to - | 1 | 0.5 |
| -17 | 01- SP (-17 TO | 1 | 0.5 |
| -27 | 02- SP (-27 TO | 1 | 0.5 |
| -30 | 03- CH (-30 to | 1 | 1 |
| -34 | 04- CH (-34 TO | 1 | 1 |
| -44 | 05- CH (-44 to | 1 | 0.45 |
| -57 | 06- CH (-57 to | 1 | 1 |
| -80 | 07- SP (-80 to - | 1 | 0.5 |
| -89 | 08- CH (-89 to | 1 | 1 |
| -94 | 09- CH (-94 to | 1 | 1 |
| -103 | 10- SP (-103 to | 1 | 0.5 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | Wall sketch | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.912 | 2.962 | 7.188 |
| Stage 1 | Simple span | N/A | 1.6 | 1.739 | 2.423 | 5.808 |
| Stage 2 | Simple span | N/A | 1.6 | 2.059 | 3.154 | 7.49 |
| Stage 3 | Simple span | N/A | 1.6 | 1.885 | 2.599 | 6.072 |
| Stage 4 | Simple span | N/A | 1.6 | 2.193 | 3.712 | 8.71 |
| Stage 5 | Simple span | N/A | 1.6 | 1.885 | 2.586 | 5.922 |
| Stage 6 | Simple span | N/A | 1.6 | 2.431 | 3.952 | 9.076 |
| Stage 7 | Simple span | N/A | 1.6 | 2.091 | 2.795 | 6.211 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

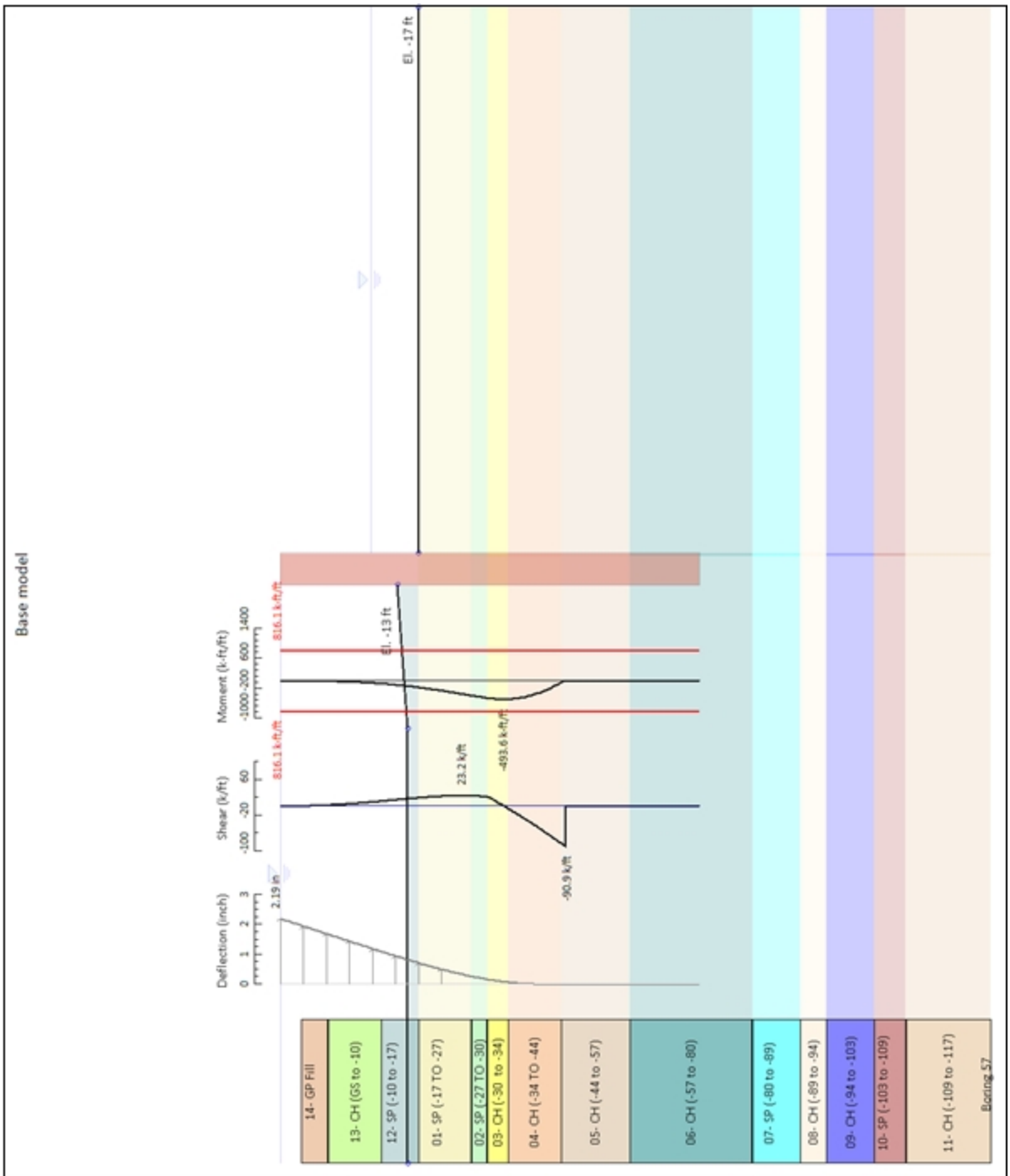
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

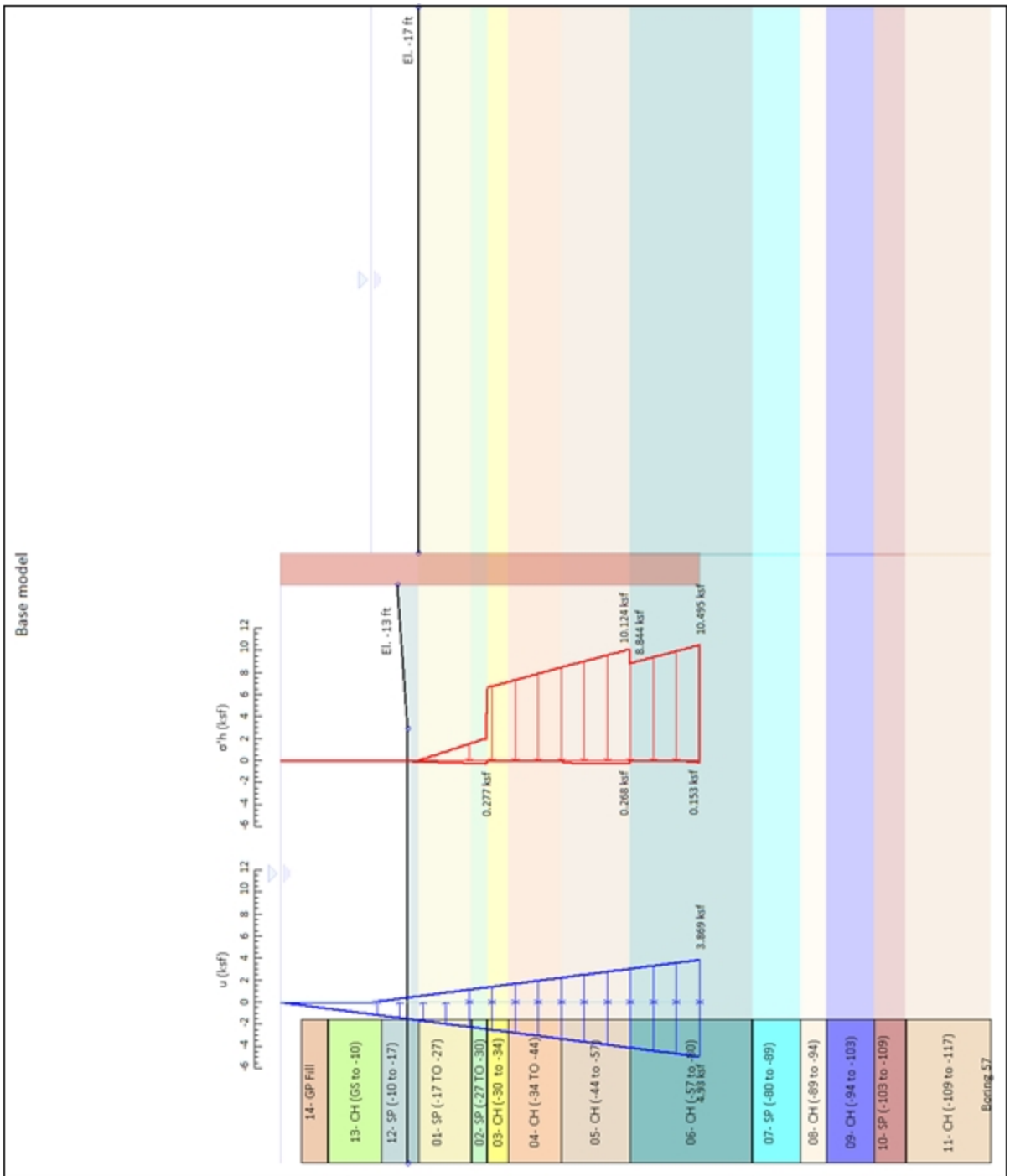
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

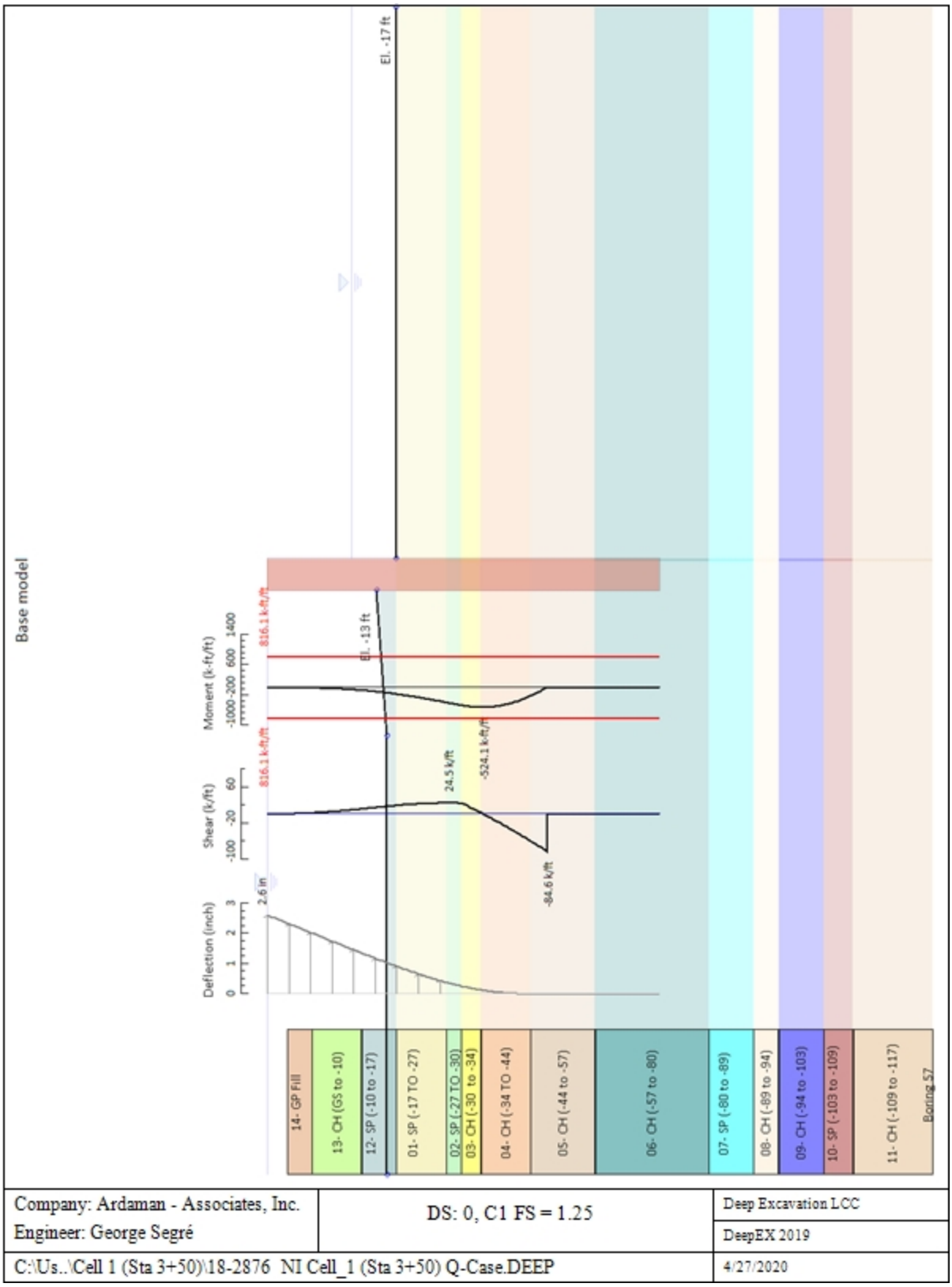
A sequence of figures for each excavation stage is reported



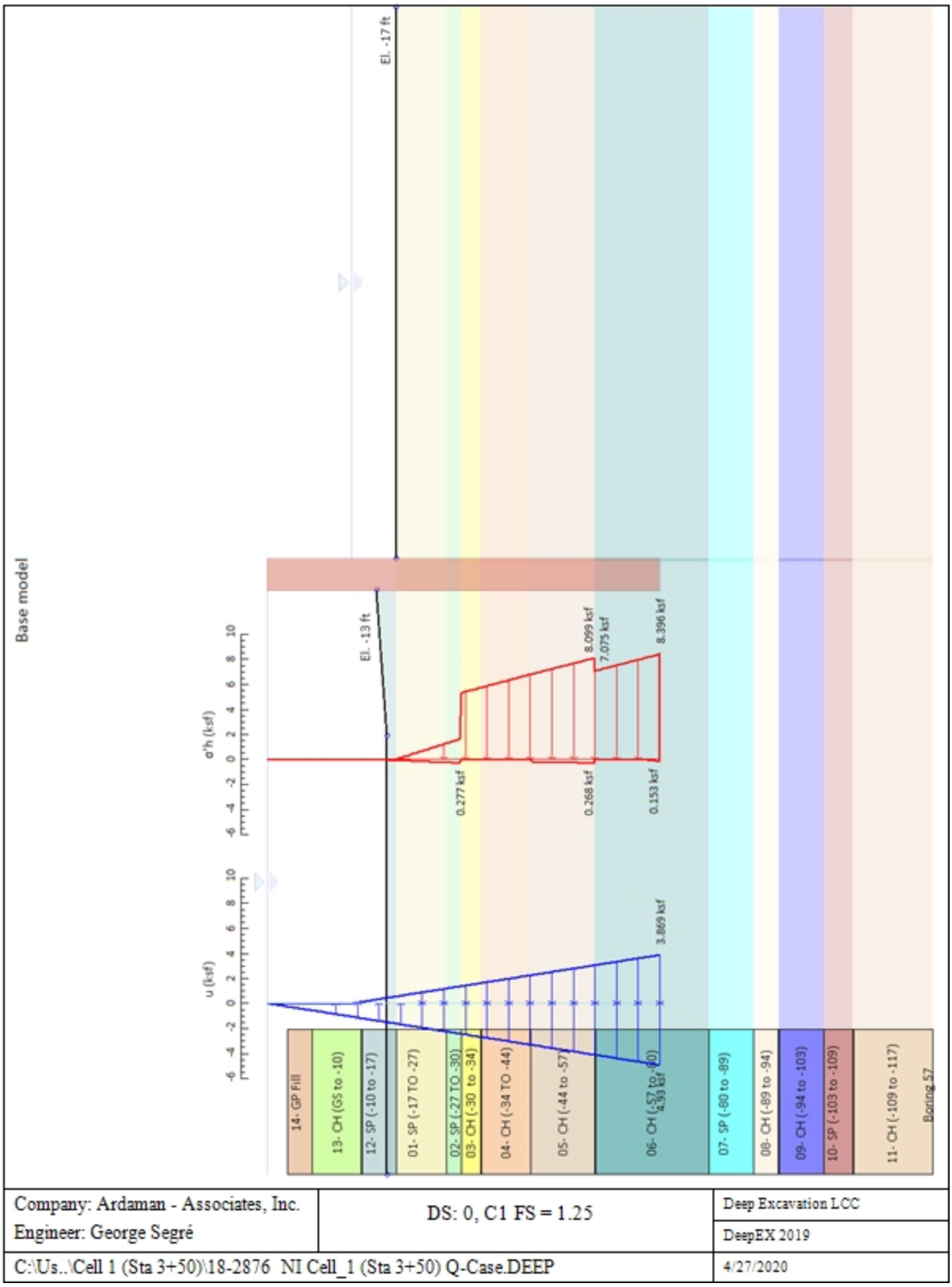

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |



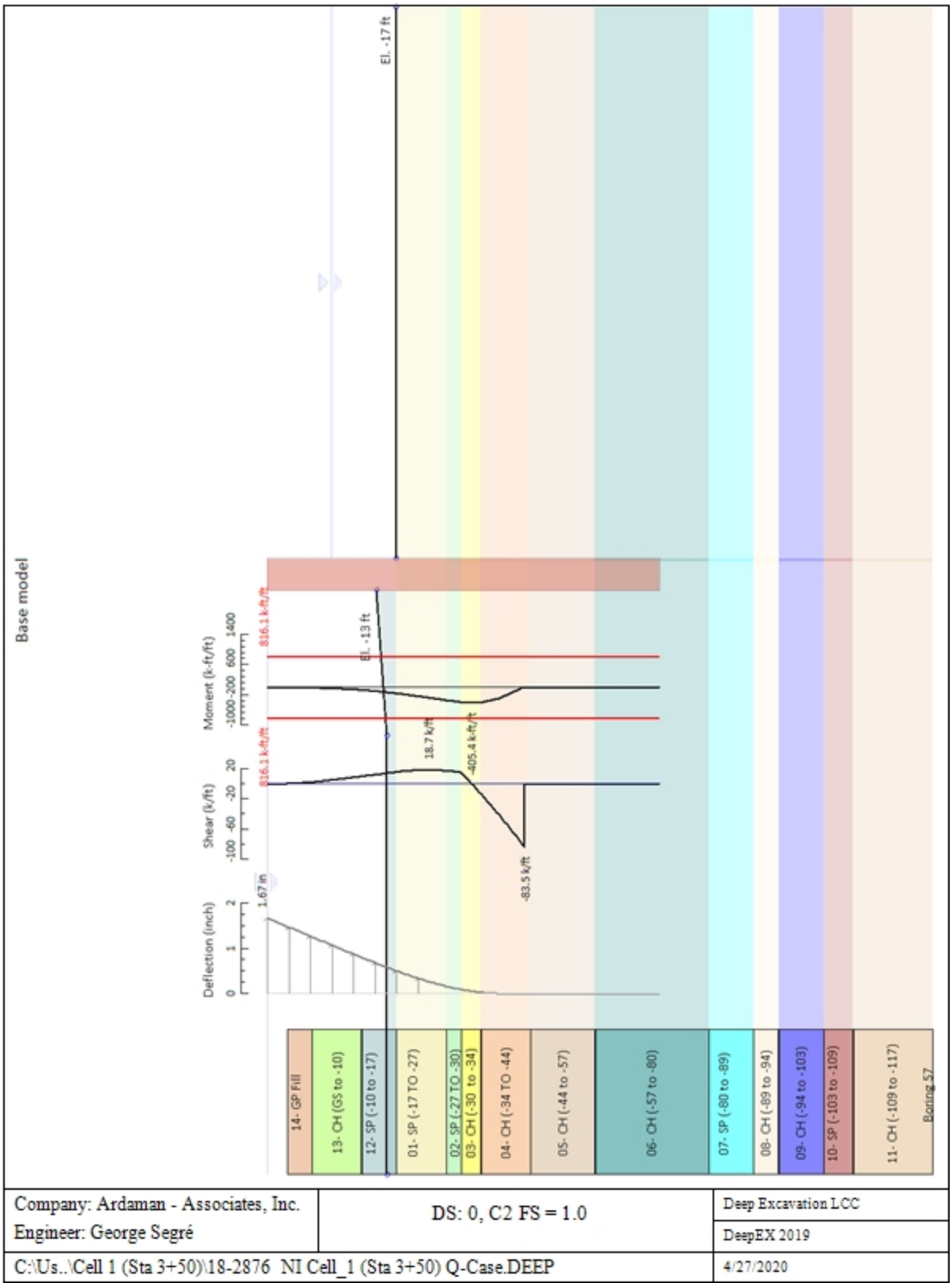

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |



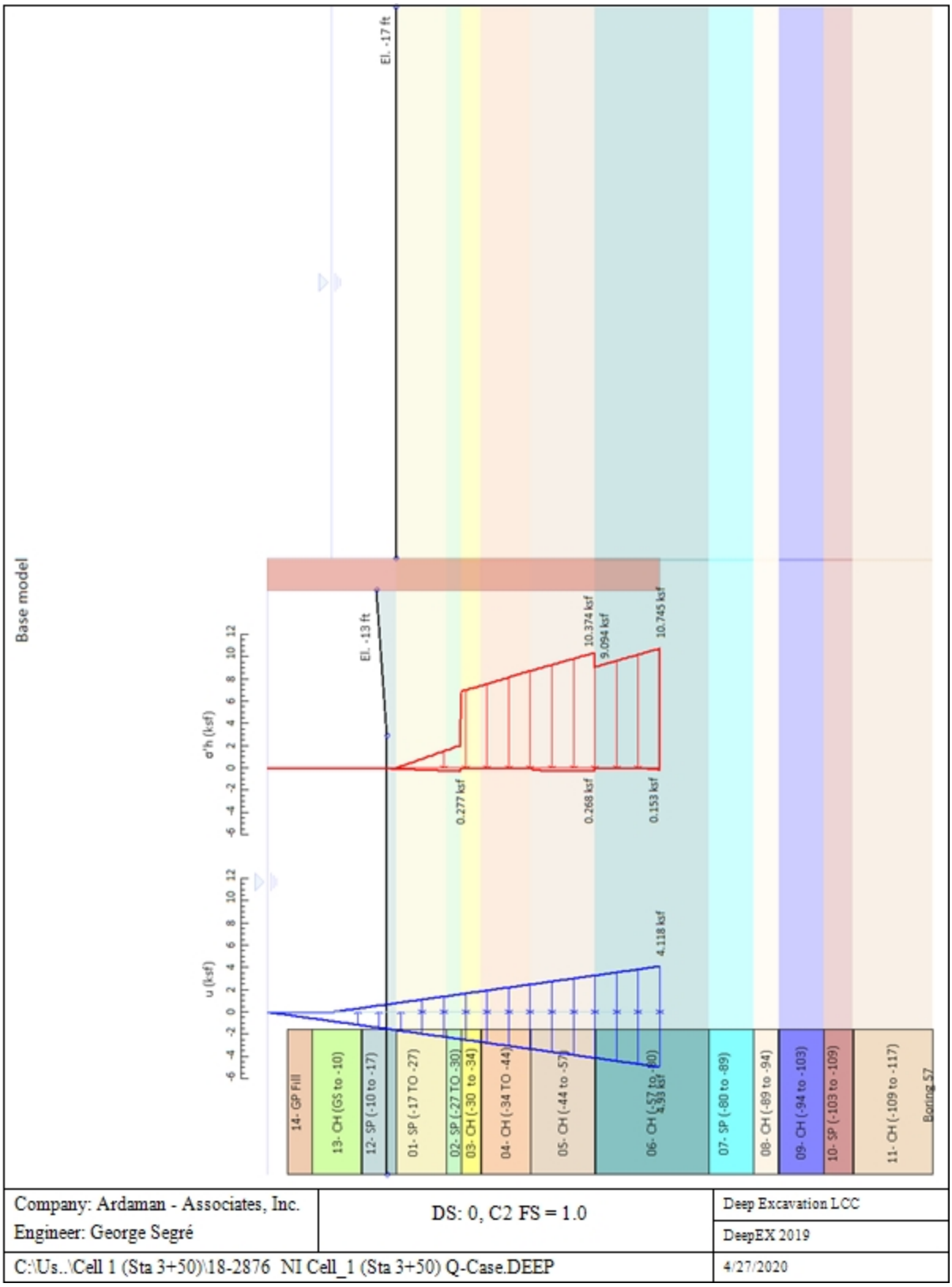

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |



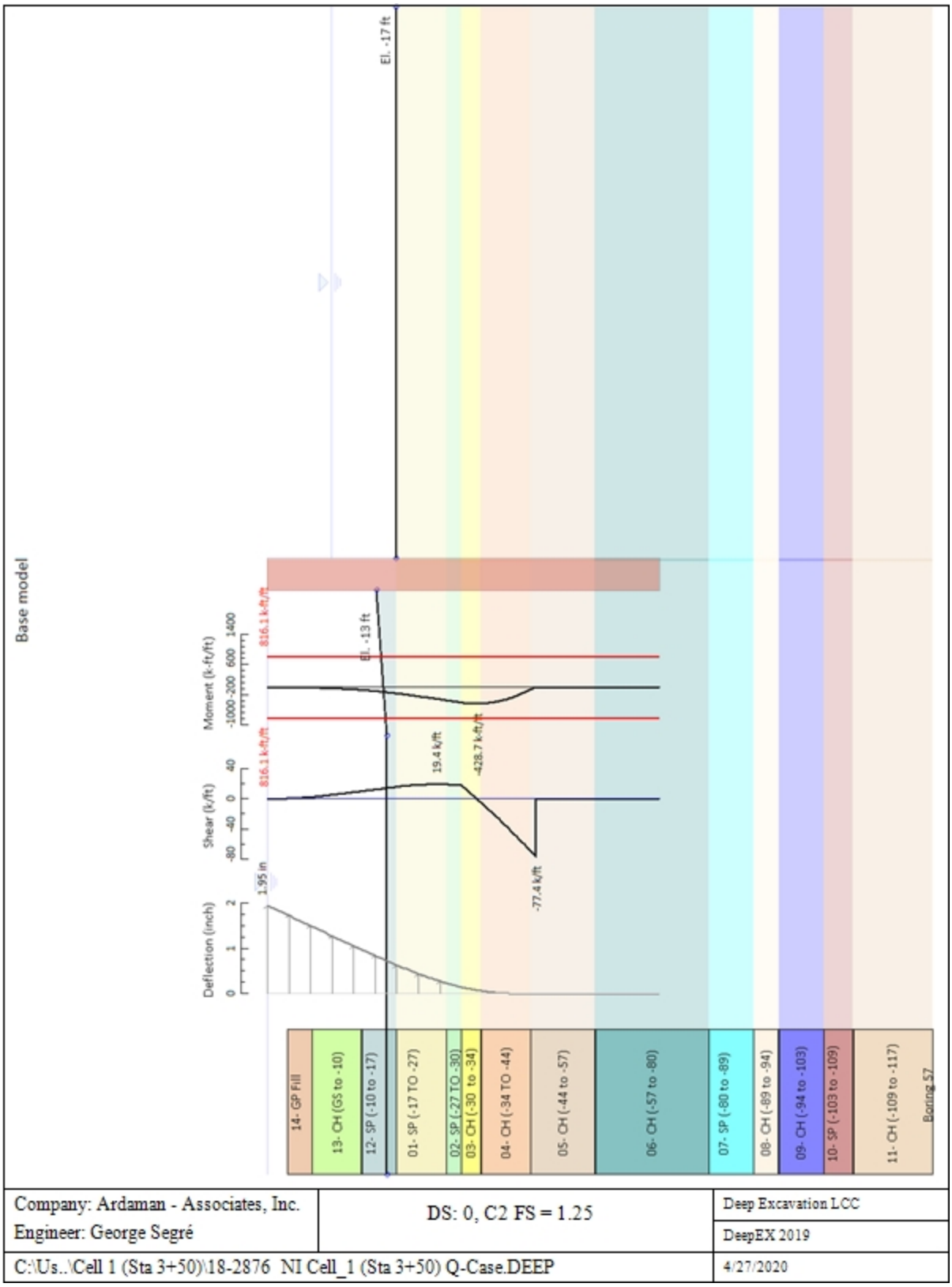

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |



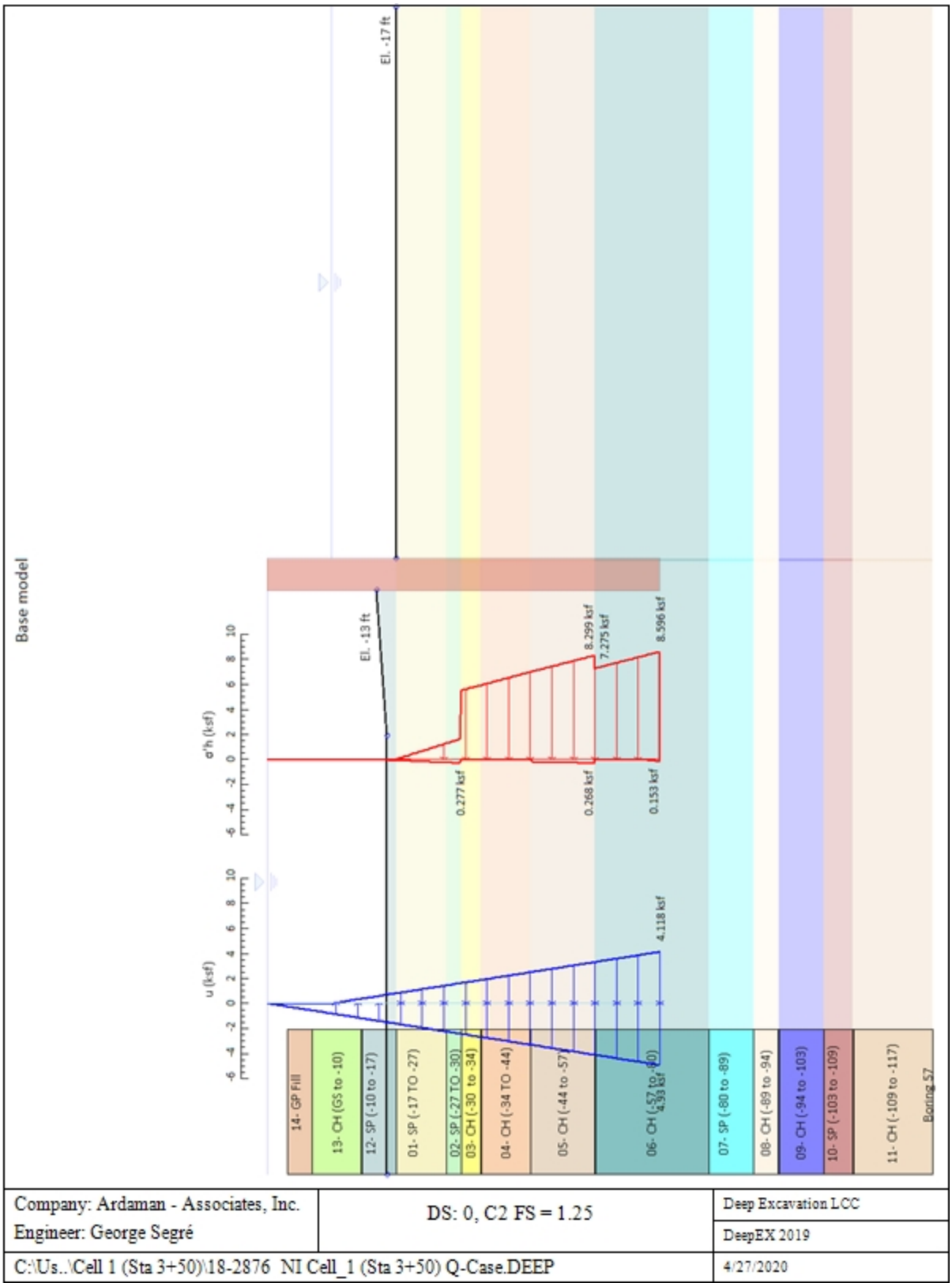

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |



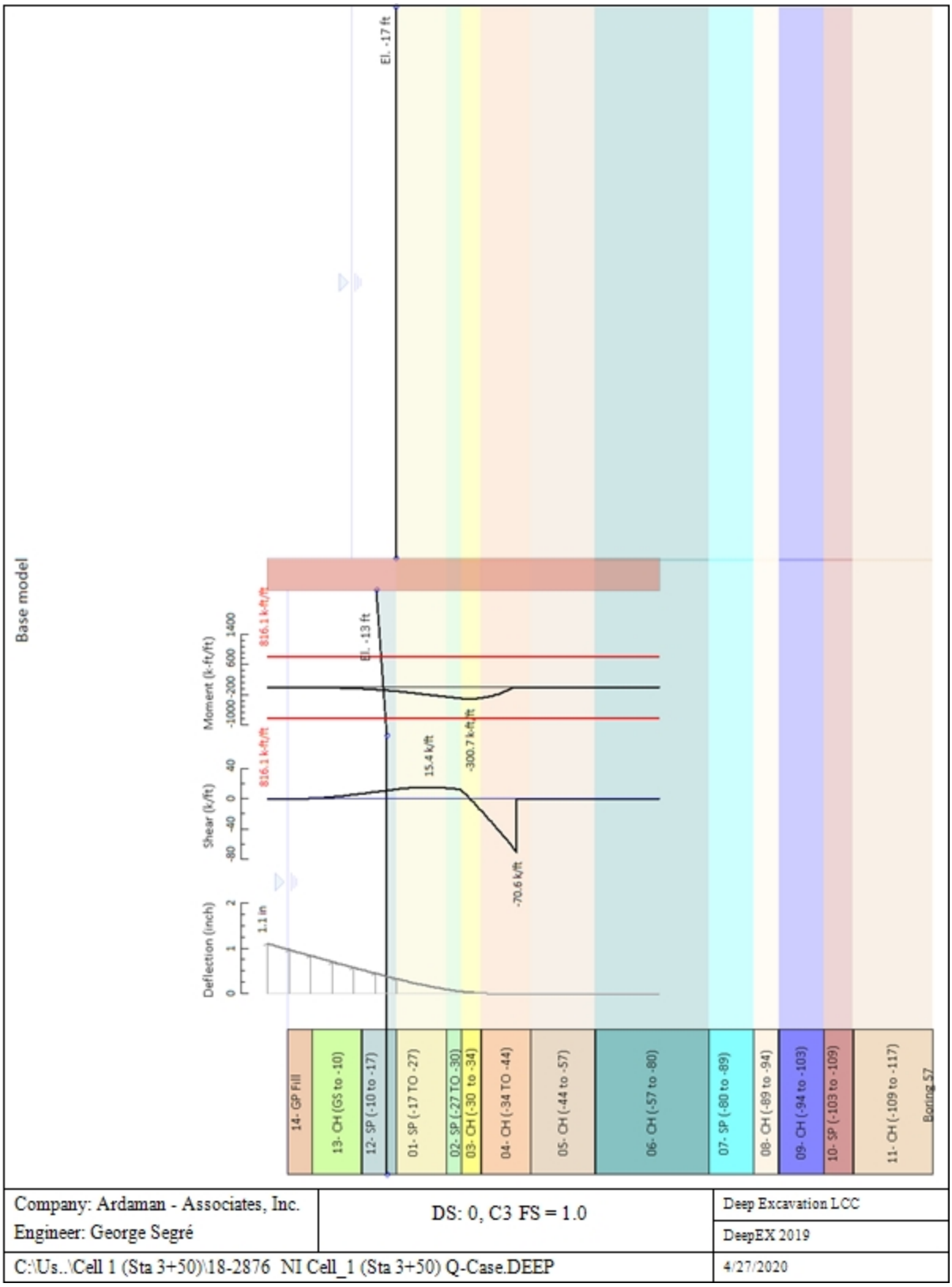

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |

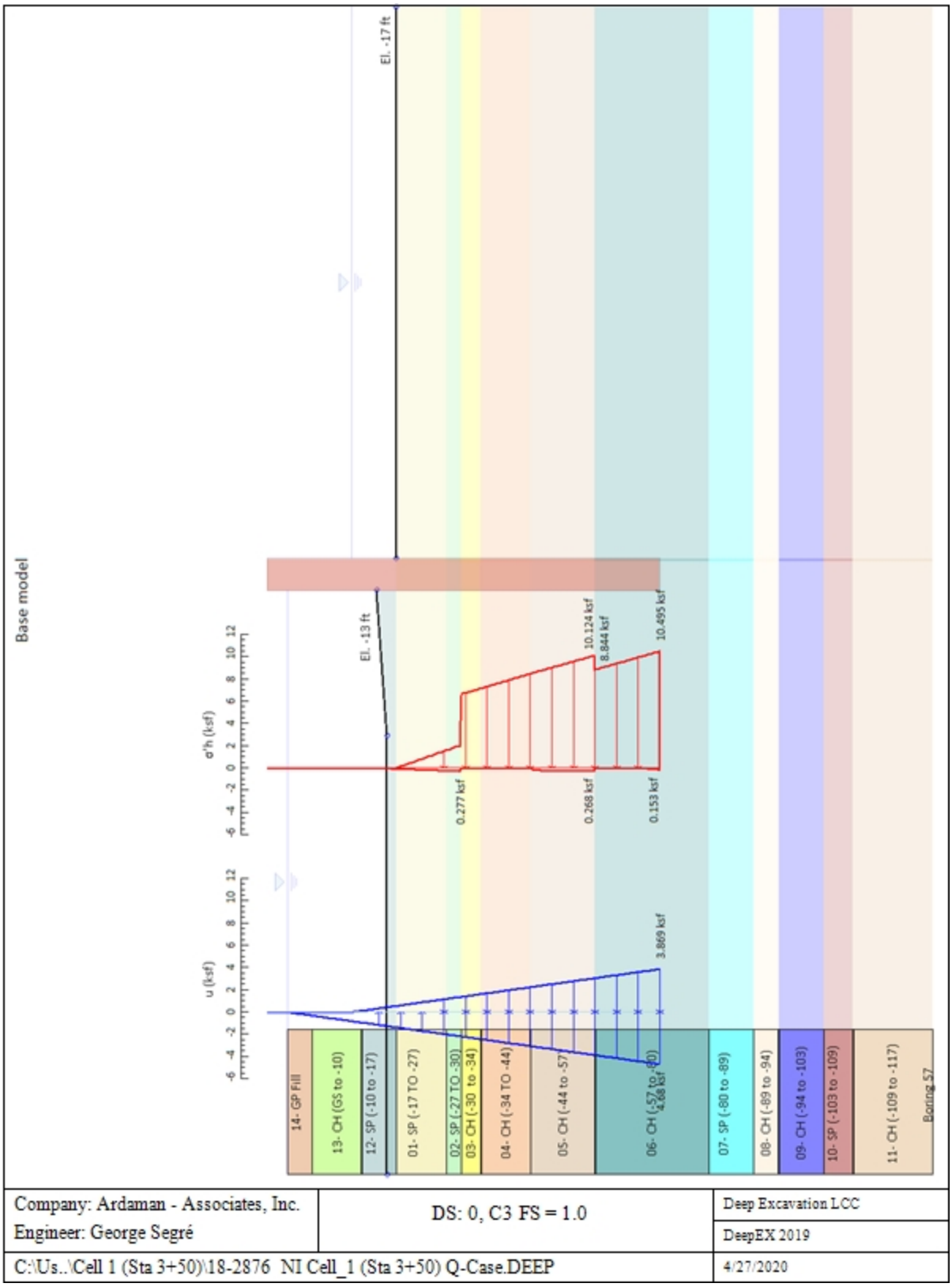



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |

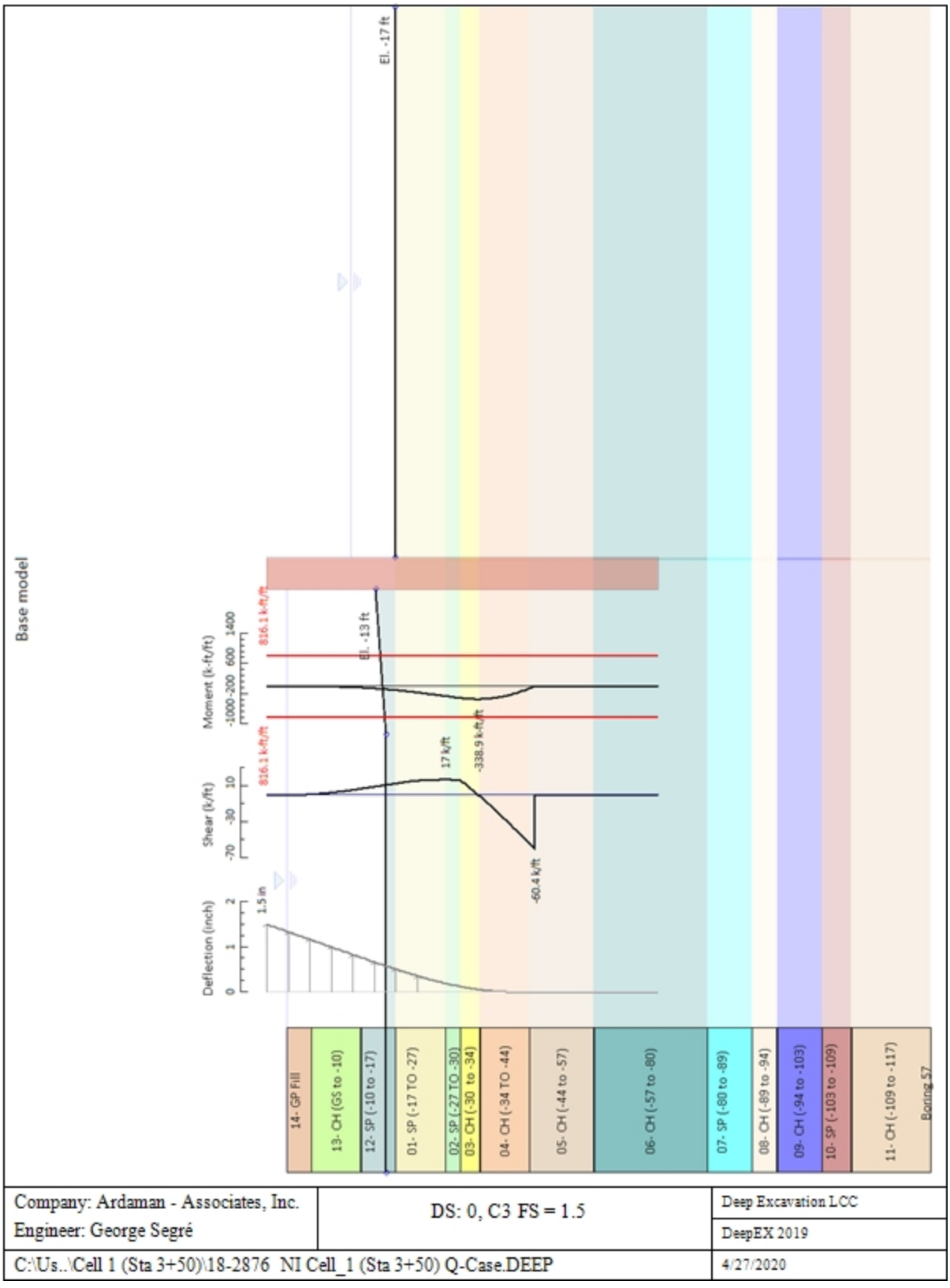



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |

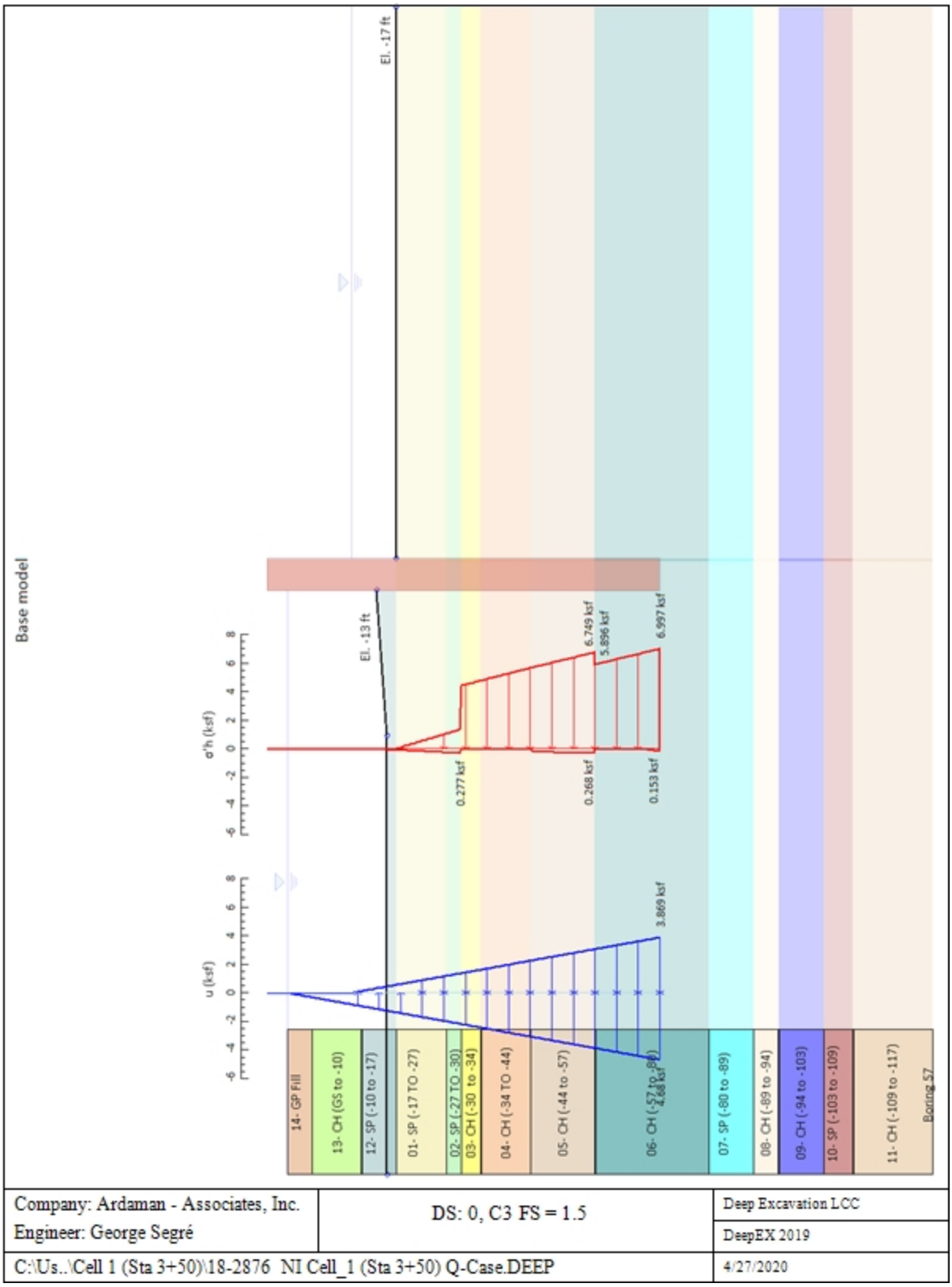

Base model
El. -17 ft
El. -13 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-80 -40 0 40
15.4 k/ft
-300.7 k-ft/ft
-70.6 k/ft
Deflection (inch)
0 1 2
1.1 in
14- GP Fill
13- CH (G5 to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP
4/27/2020

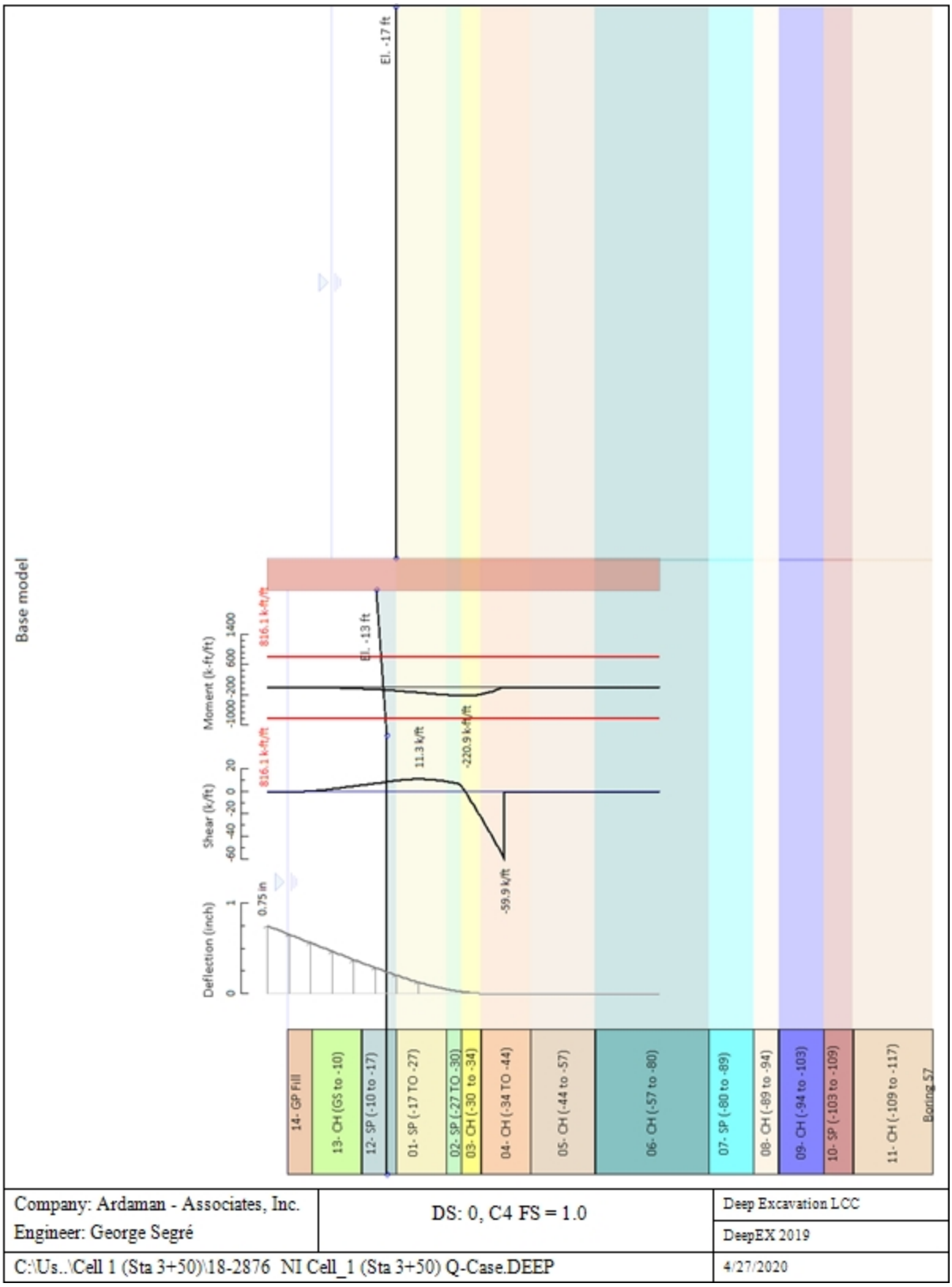


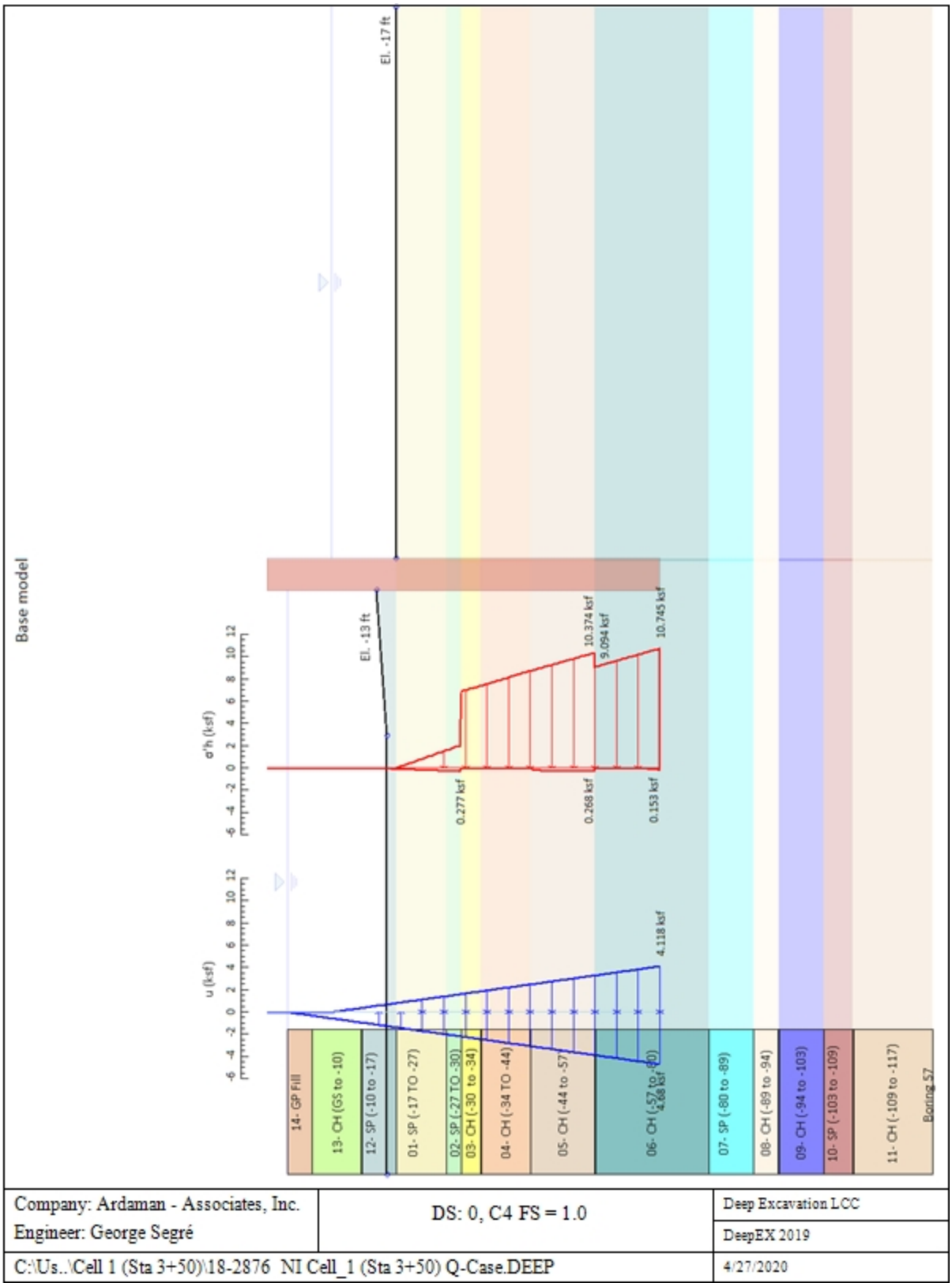

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |



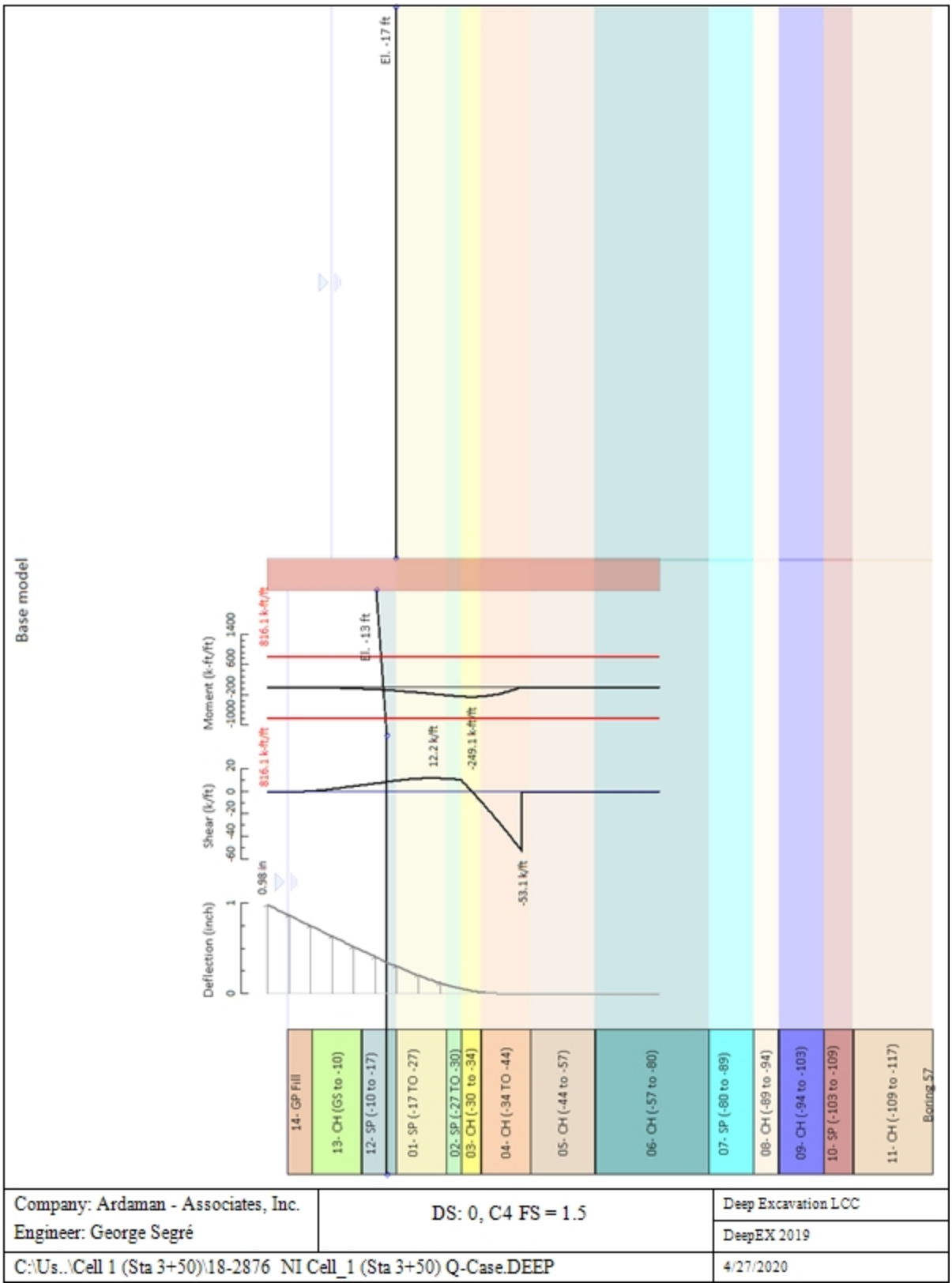

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -17 ft
El. -13 ft
σ'h (ksf)
u (ksf)
6.749 ksf
5.896 ksf
6.997 ksf
0.277 ksf
0.268 ksf
0.153 ksf
3.869 ksf
14- GP Fill
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP
4/27/2020

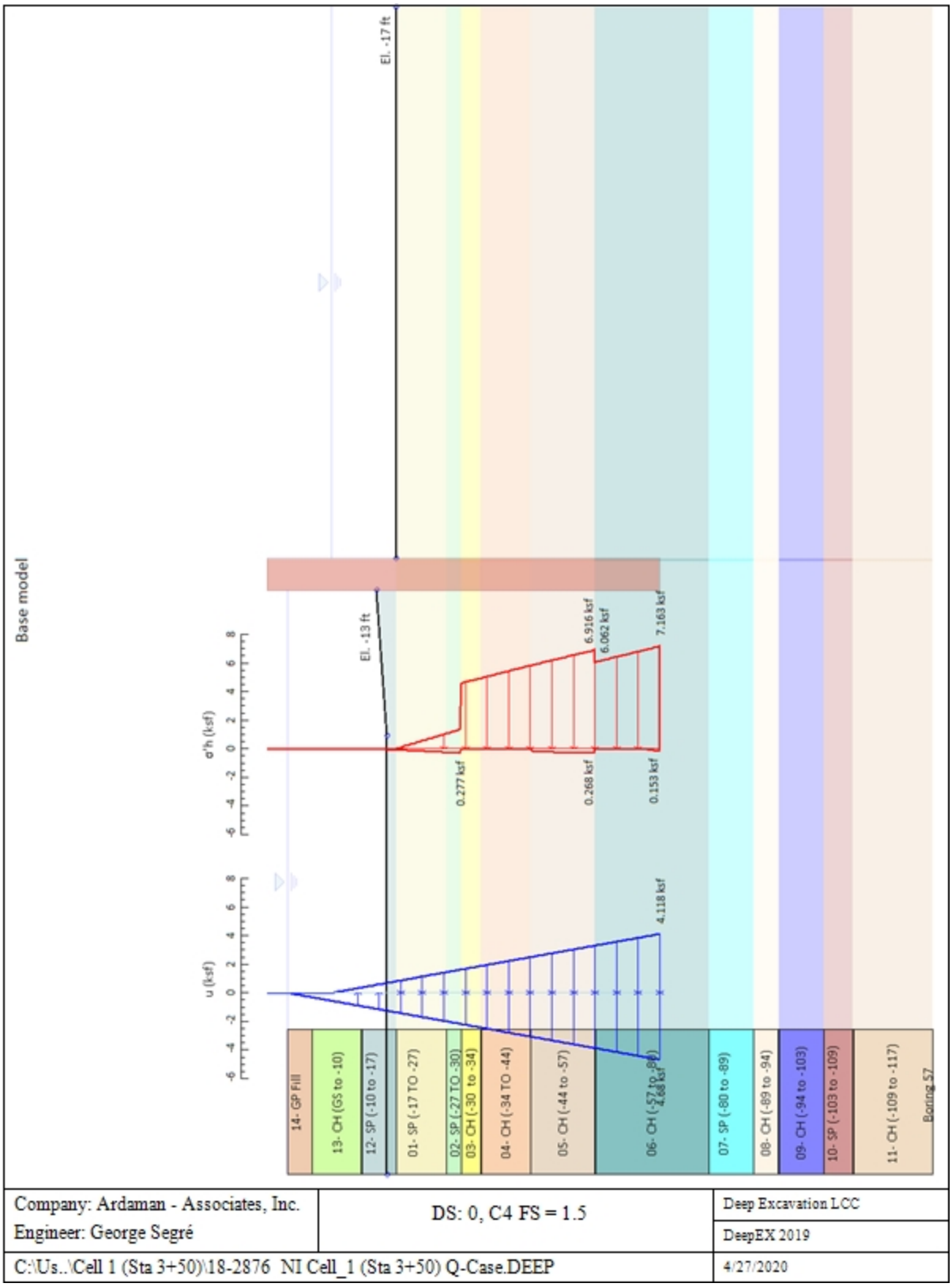

Base model
El. -17 ft
El. -13 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-60 -40 -20 0 20
11.3 k/ft
-220.9 k-ft/ft
-59.9 k/ft
Deflection (inch)
0 1
0.75 in
14- GP Fill
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP | | 4/27/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:01:34 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 14-GP (FILL) | 120 | 120 | 34 | 0 | N/A | N/A | N/A | 300 | 3 | 0.28 | 3.54 | N/A | N/A | True | Linear | |
| 13- CH (GS to | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 12- SP (-10 to | 112 | 112 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 01- SP (GS TO | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 33 | 0 | N/A | N/A | N/A | 60 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 150 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 26 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 26 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 26 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 33 | 0 | N/A | N/A | N/A | 300 | 3 | 0.3 | 3.39 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 14-GP (FILL) | 0.35 | - | - | 0.441 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- CH (GS to | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- SP (-10 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 01- SP (GS TO | 0.4 | - | - | 0.455 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.455 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | - | - | 0.562 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | - | - | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | - | - | 0.562 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | - | - | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.455 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

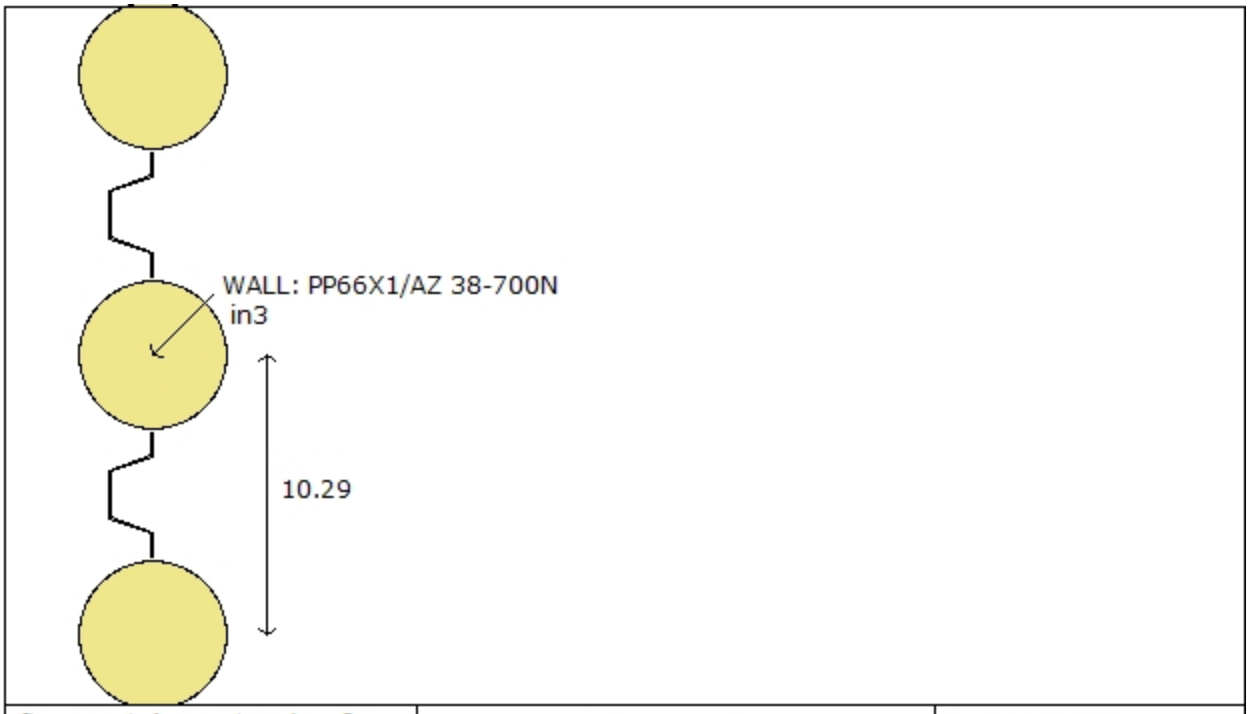
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 14-GP (FILL) | 1 | 0.44 |
| 0 | 13- CH (GS to - | 1 | 0.61 |
| -10 | 12- SP (-10 to - | 1 | 0.5 |
| -17 | 01- SP (GS TO | 1 | 0.46 |
| -27 | 02- SP (-27 TO | 1 | 0.46 |
| -30 | 03- CH (-30 to | 1 | 0.56 |
| -34 | 04- CH (-34 TO | 1 | 0.56 |
| -44 | 05- CH (-44 to | 1 | 0.56 |
| -57 | 06- CH (-57 to | 1 | 0.56 |
| -80 | 07- SP (-80 to - | 1 | 0.46 |
| -89 | 08- CH (-89 to | 1 | 0.56 |
| -94 | 09- CH (-94 to | 1 | 0.56 |
| -103 | 10- SP (-103 to | 1 | 0.46 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | Wall sketch | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -85 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.307 | 1.307 | 1.702 |
| Stage 1 | Simple span | N/A | 1.6 | 1.14 | 1.14 | 1.472 |
| Stage 2 | Simple span | N/A | 1.6 | 1.385 | 1.385 | 1.761 |
| Stage 3 | Simple span | N/A | 1.6 | 1.218 | 1.218 | 1.532 |
| Stage 4 | Simple span | N/A | 1.6 | 1.461 | 1.461 | 1.828 |
| Stage 5 | Simple span | N/A | 1.6 | 1.151 | 1.151 | 1.417 |
| Stage 6 | Simple span | N/A | 1.6 | 1.548 | 1.548 | 1.891 |
| Stage 7 | Simple span | N/A | 1.6 | 1.238 | 1.238 | 1.48 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

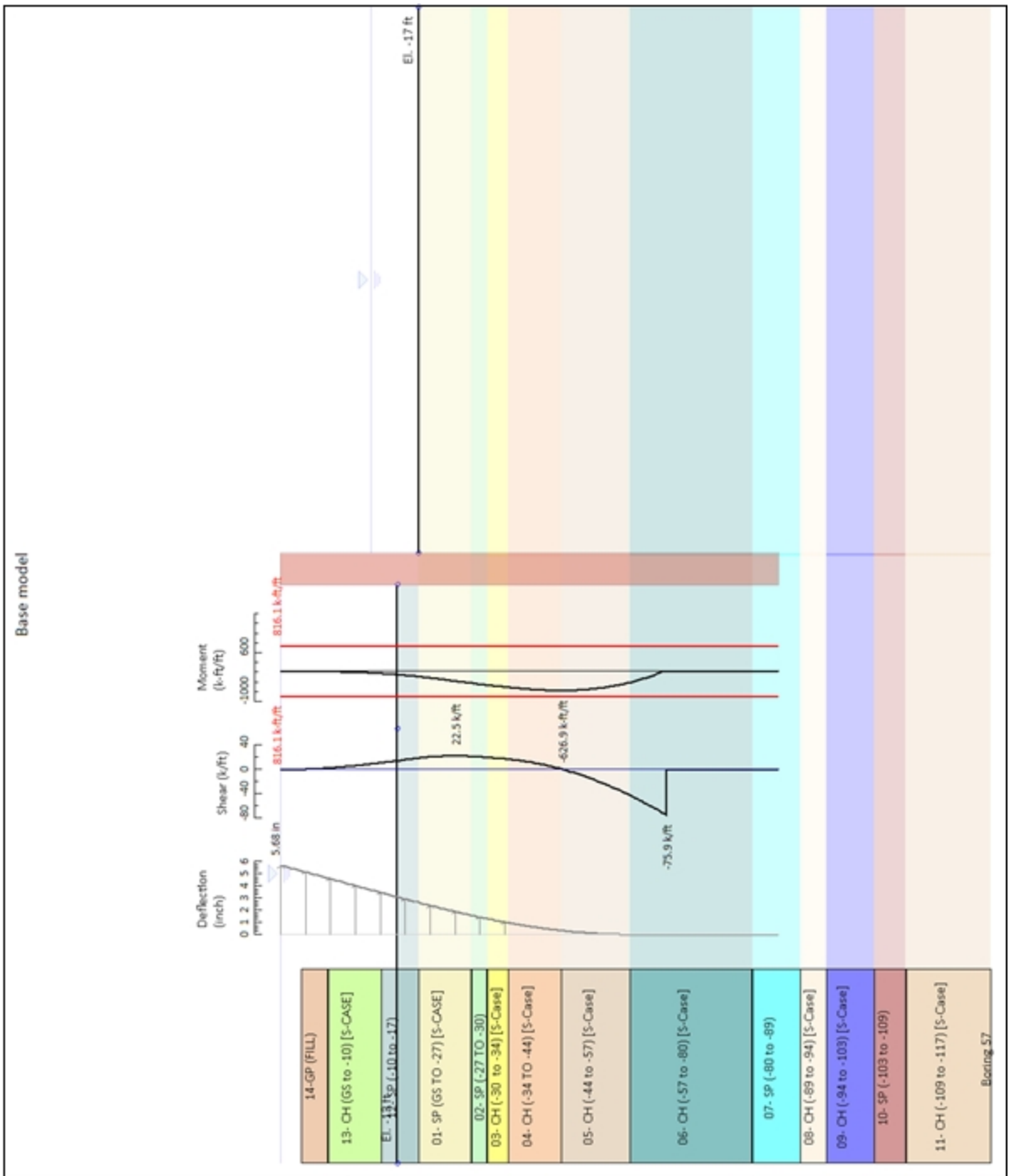
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

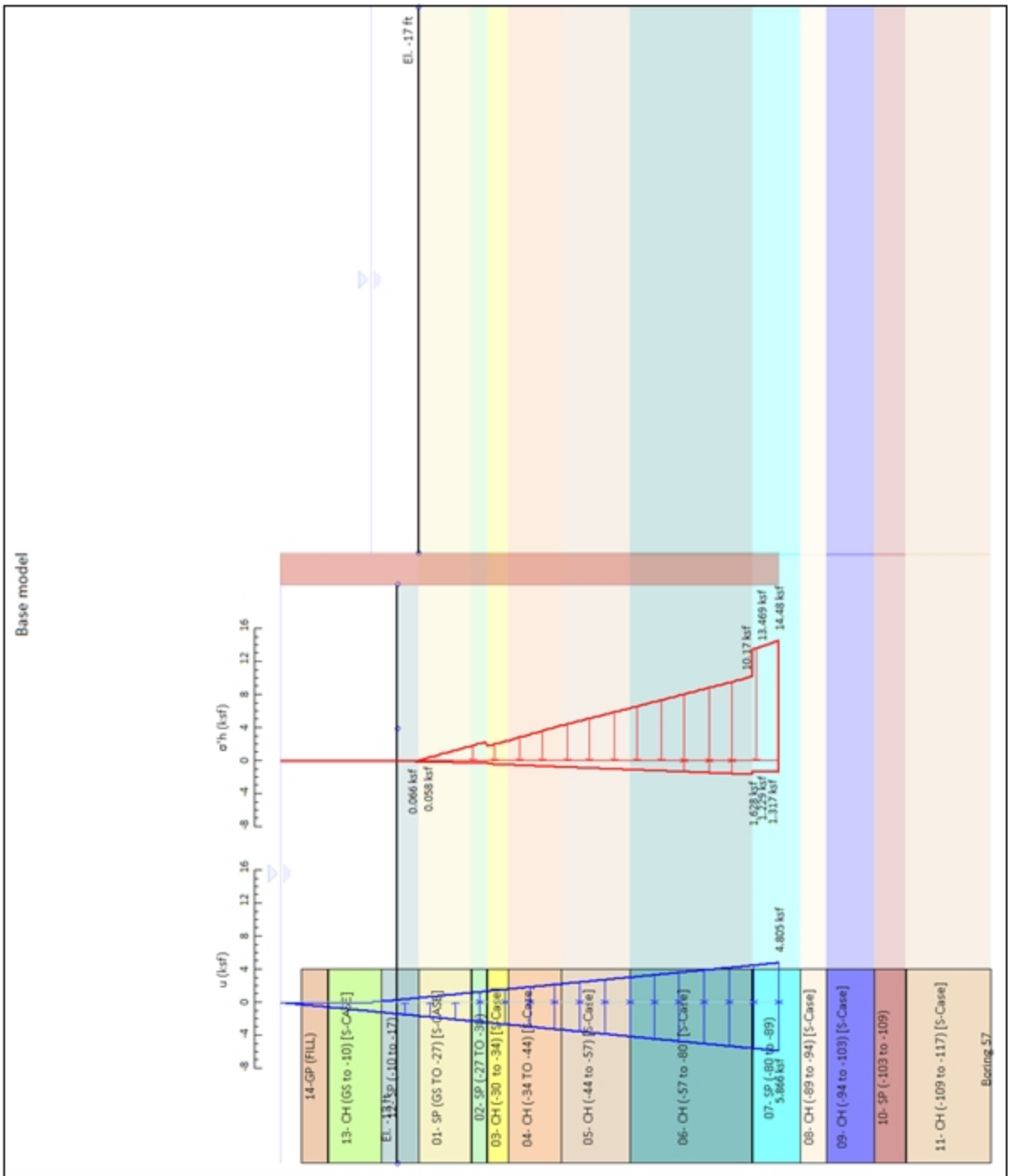
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

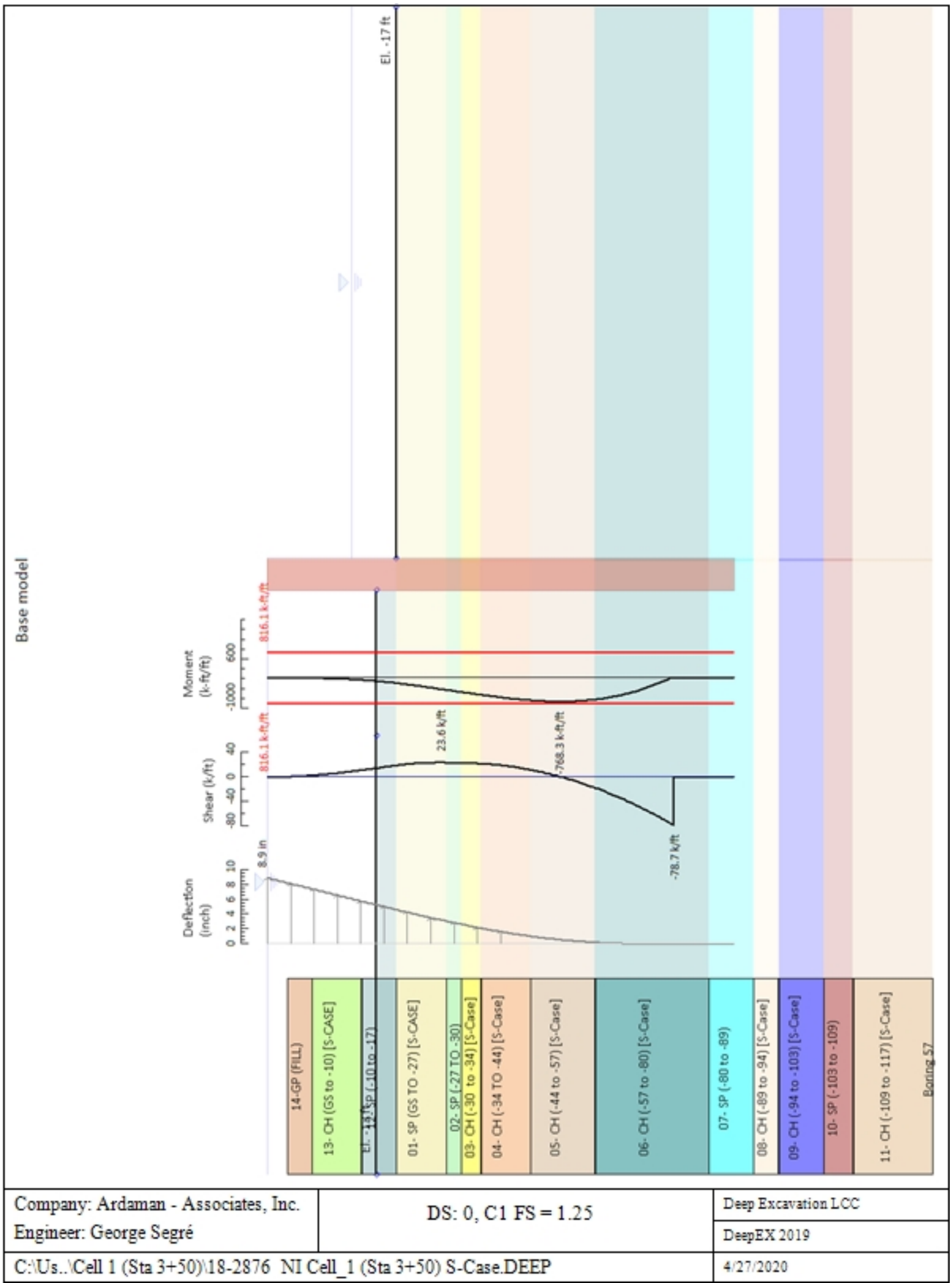
A sequence of figures for each excavation stage is reported



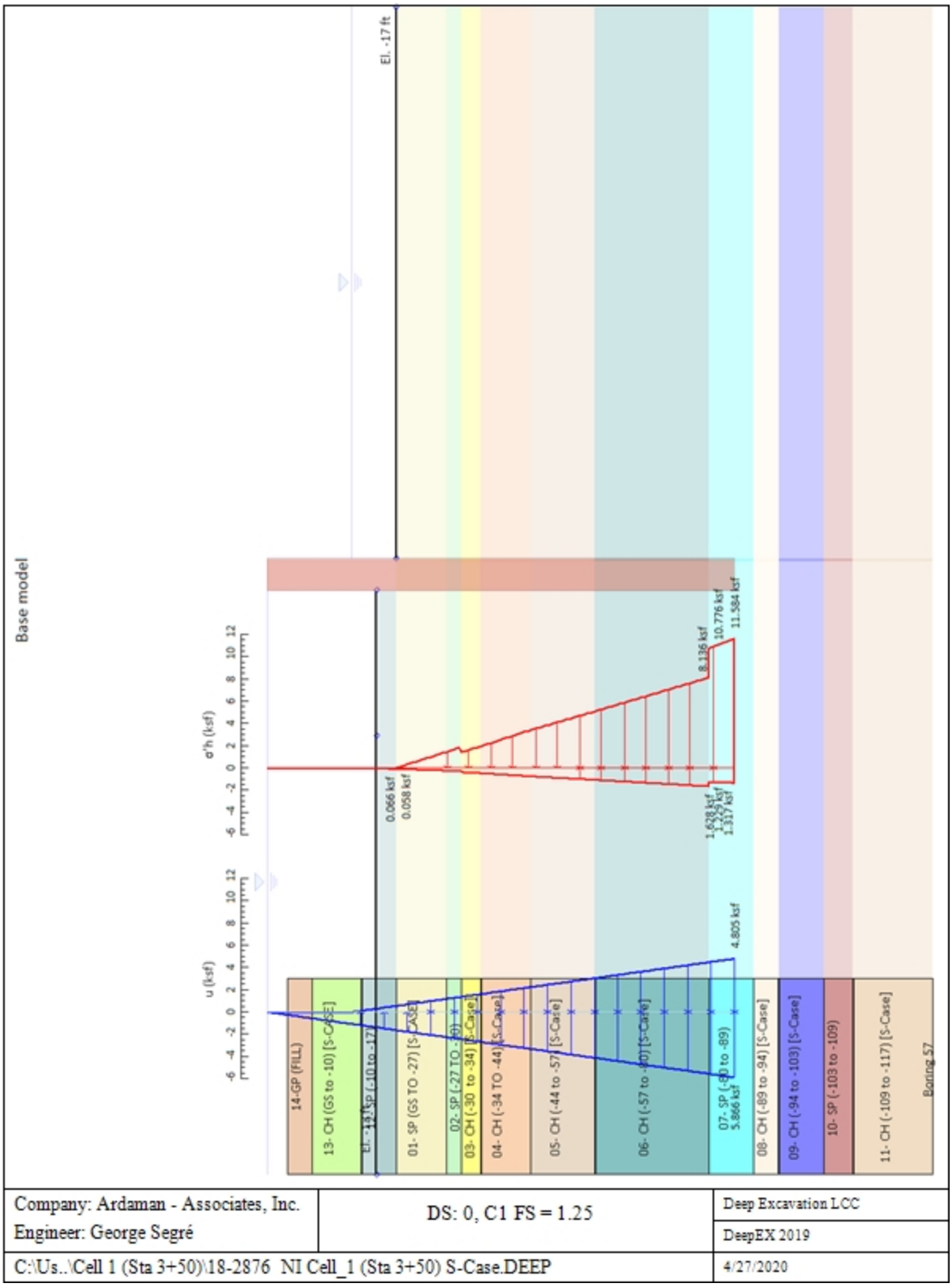

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



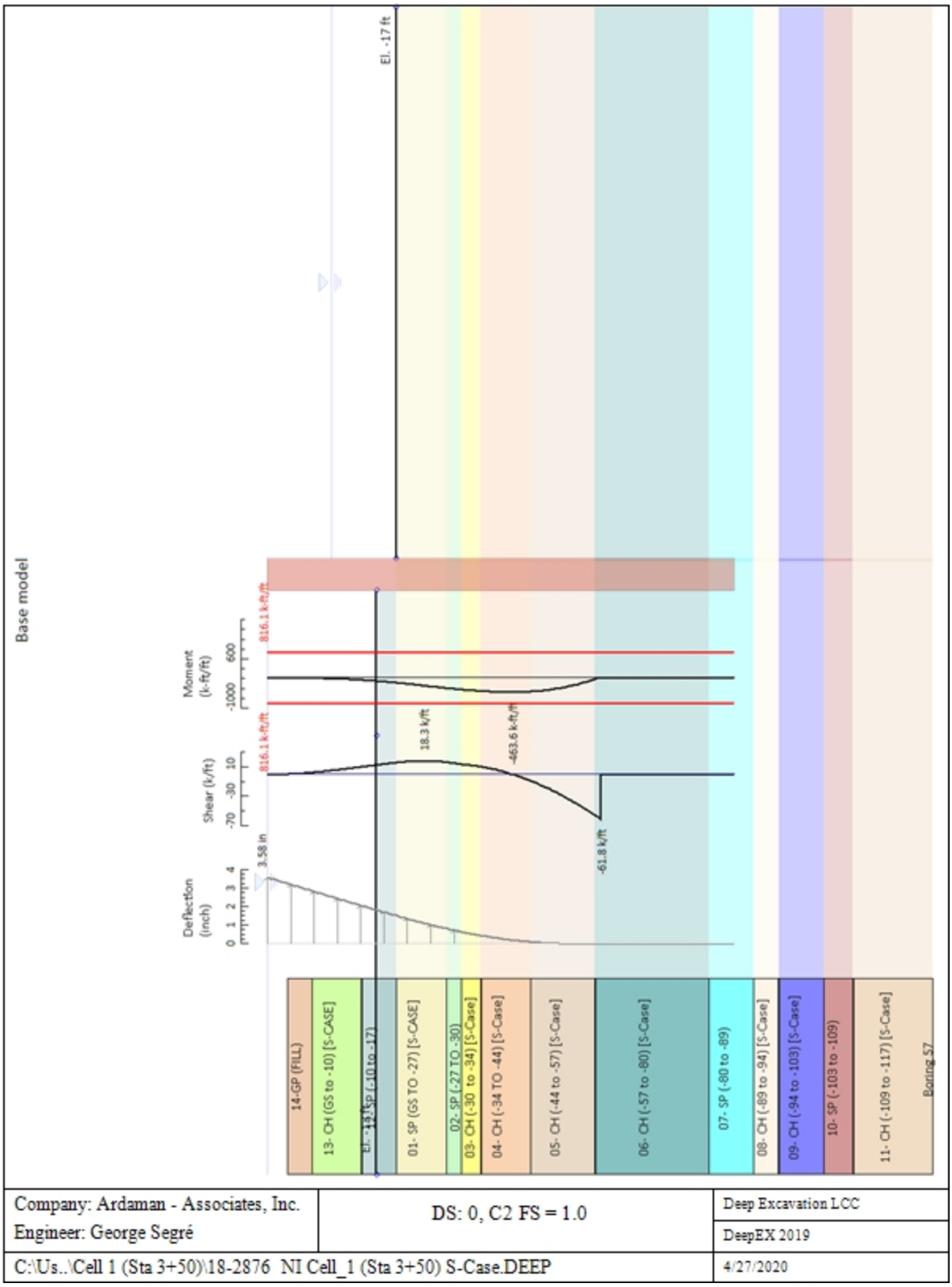

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



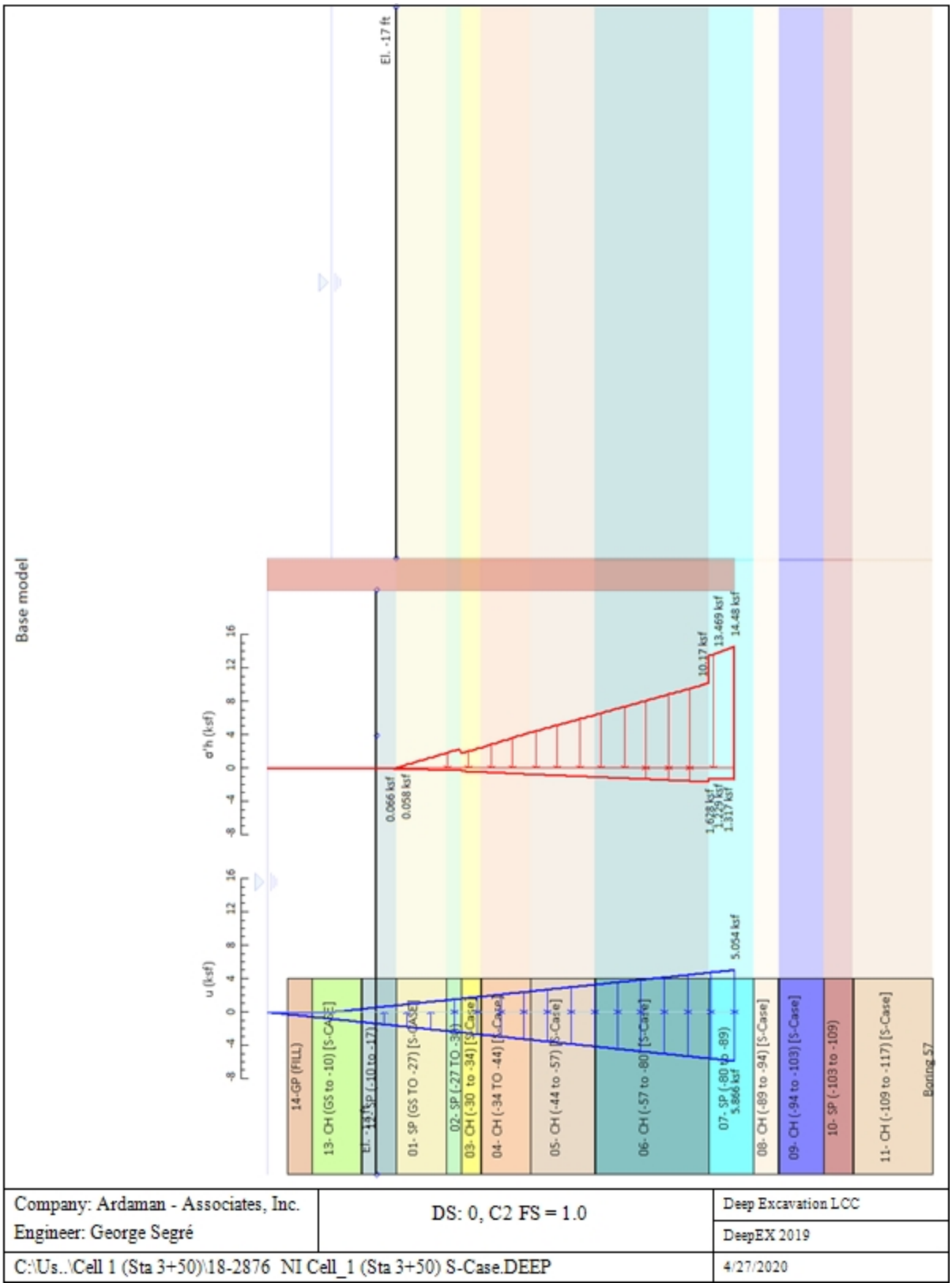

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



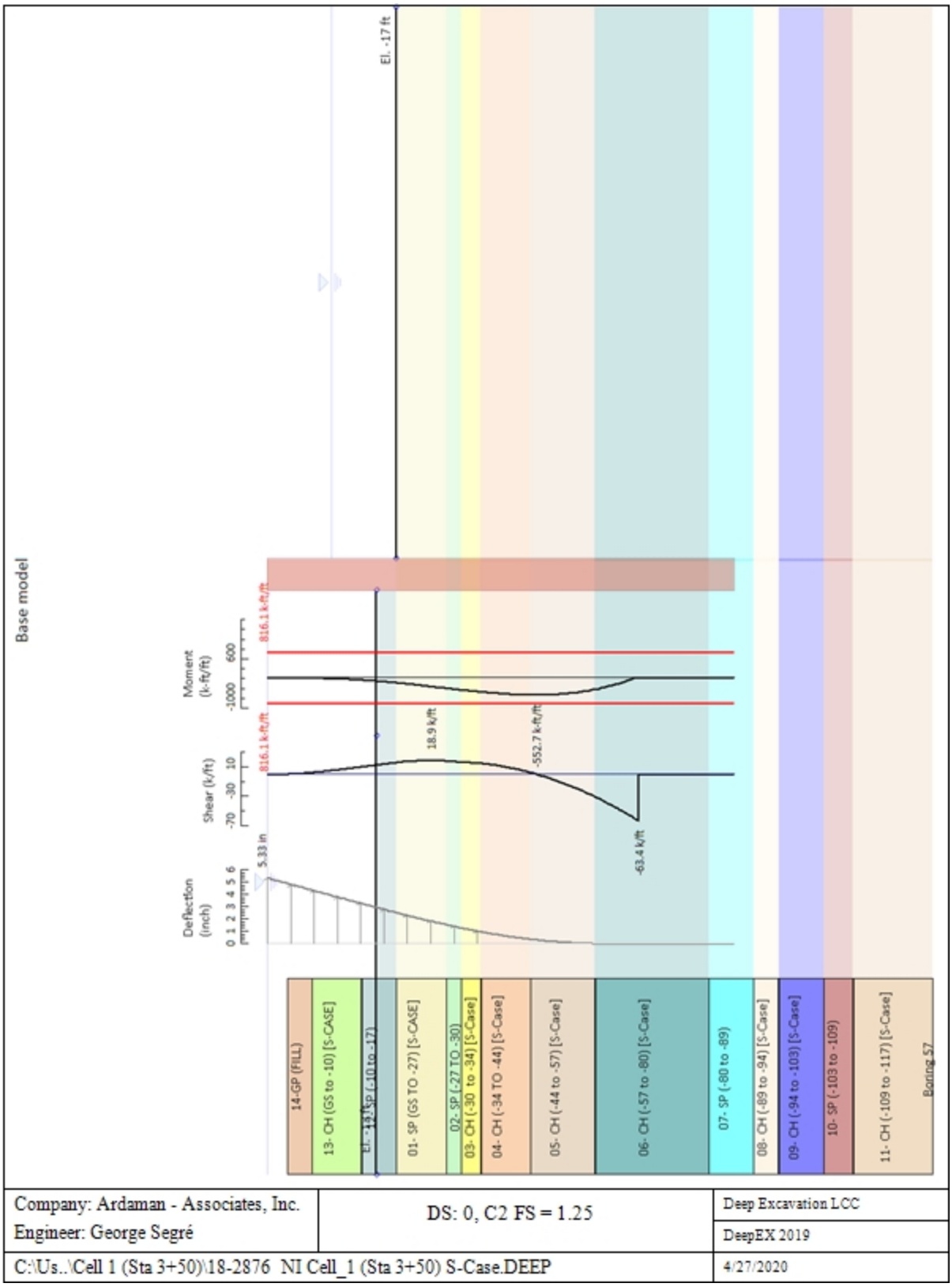

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



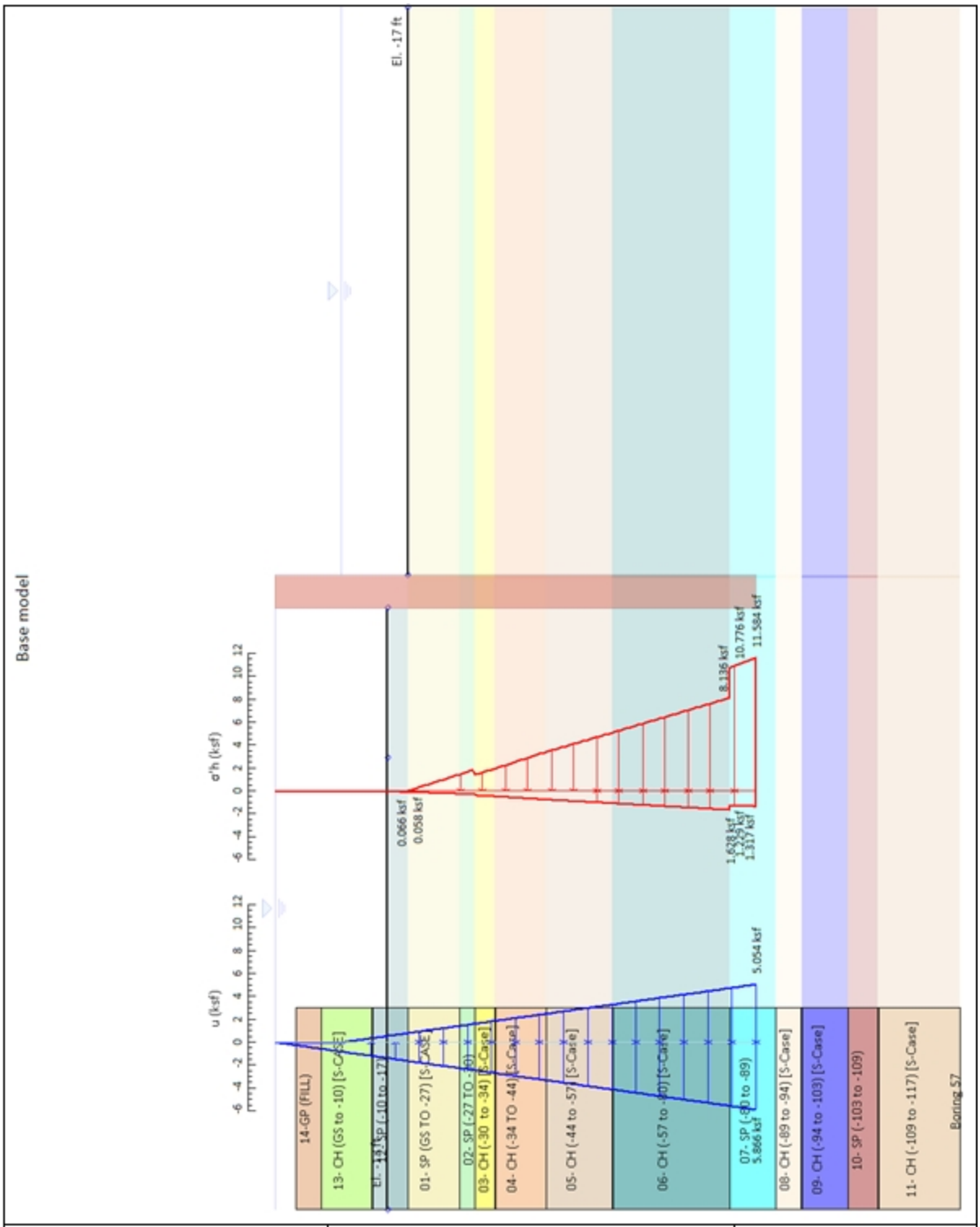

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



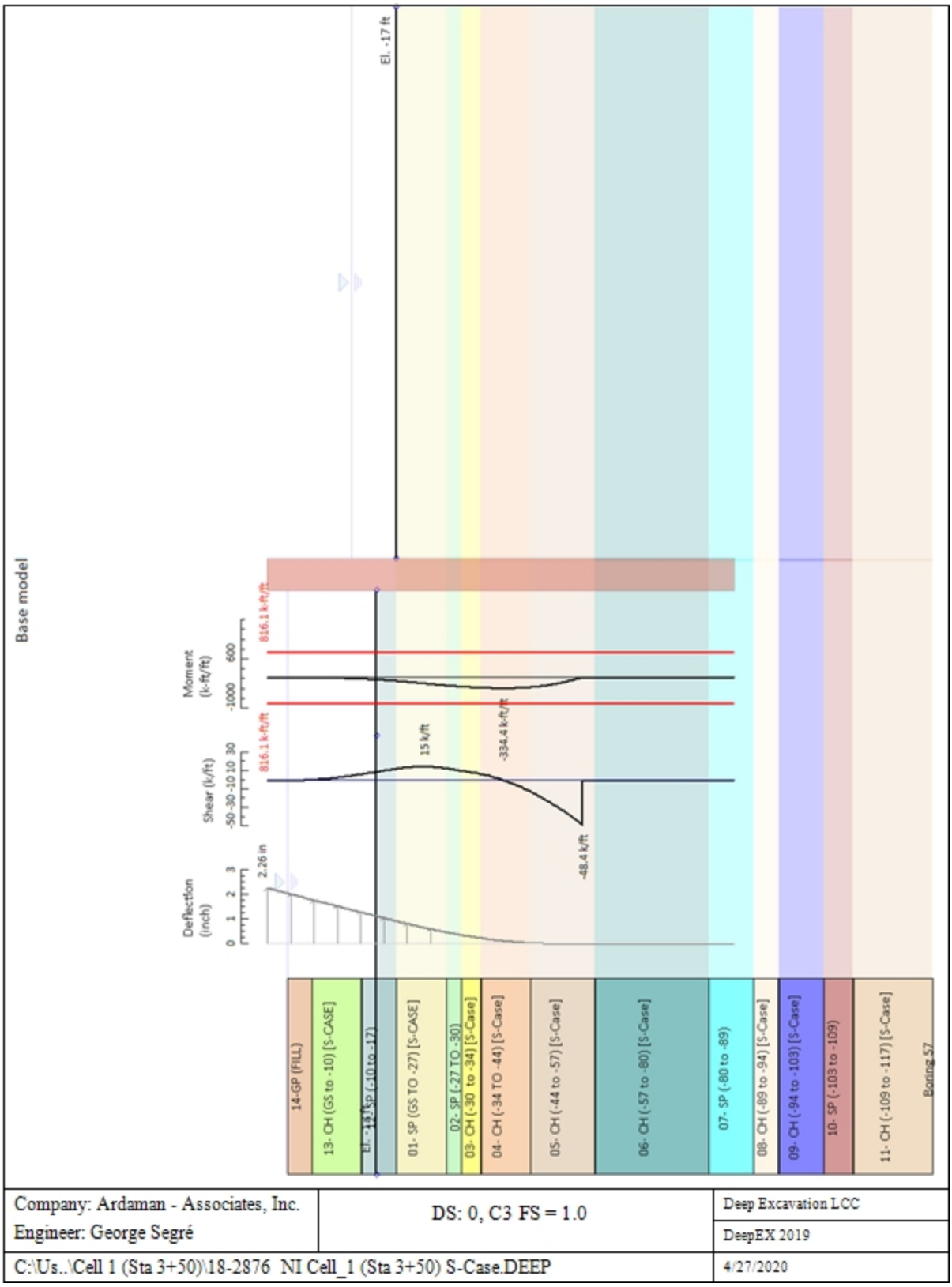

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



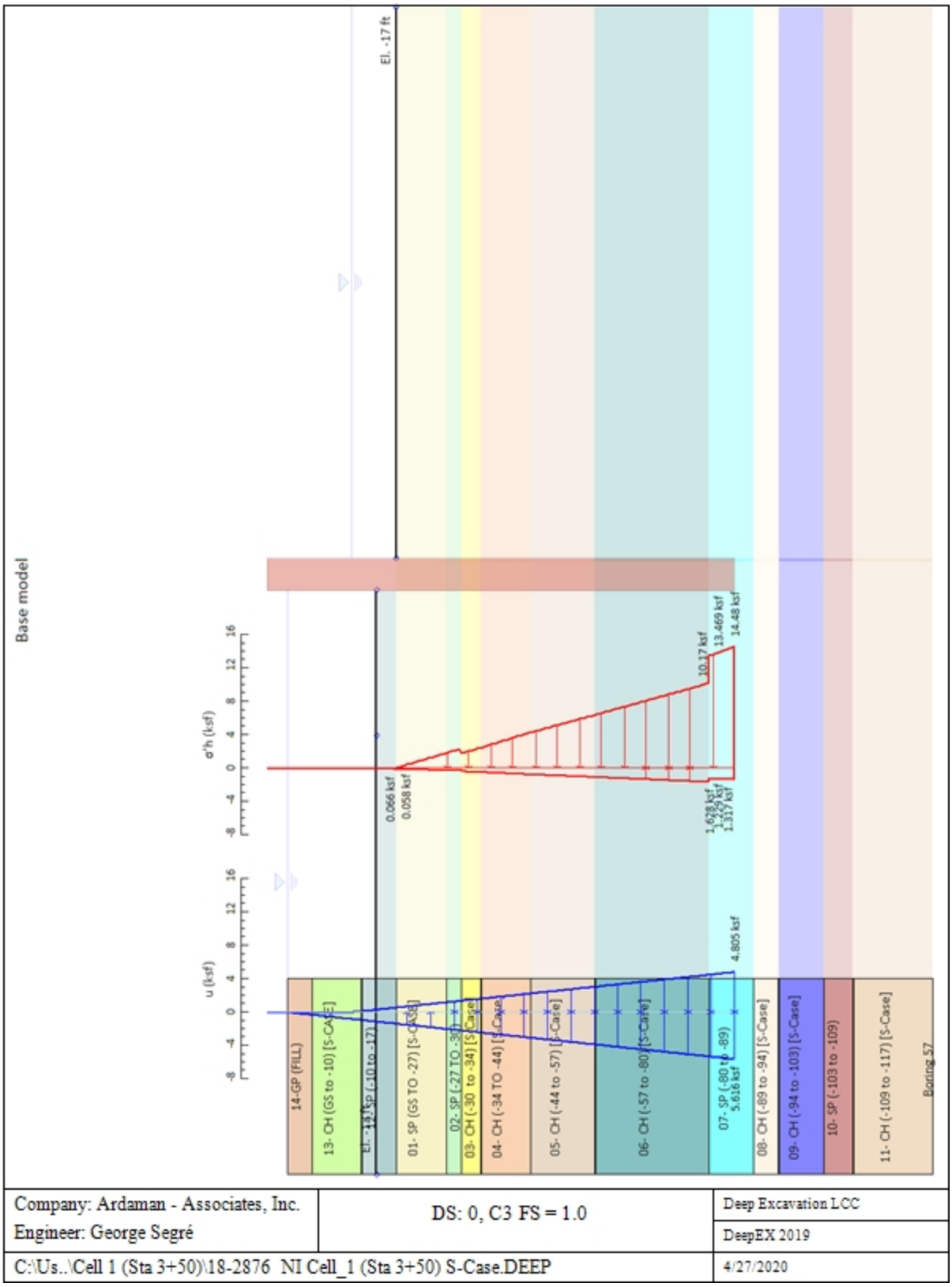

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



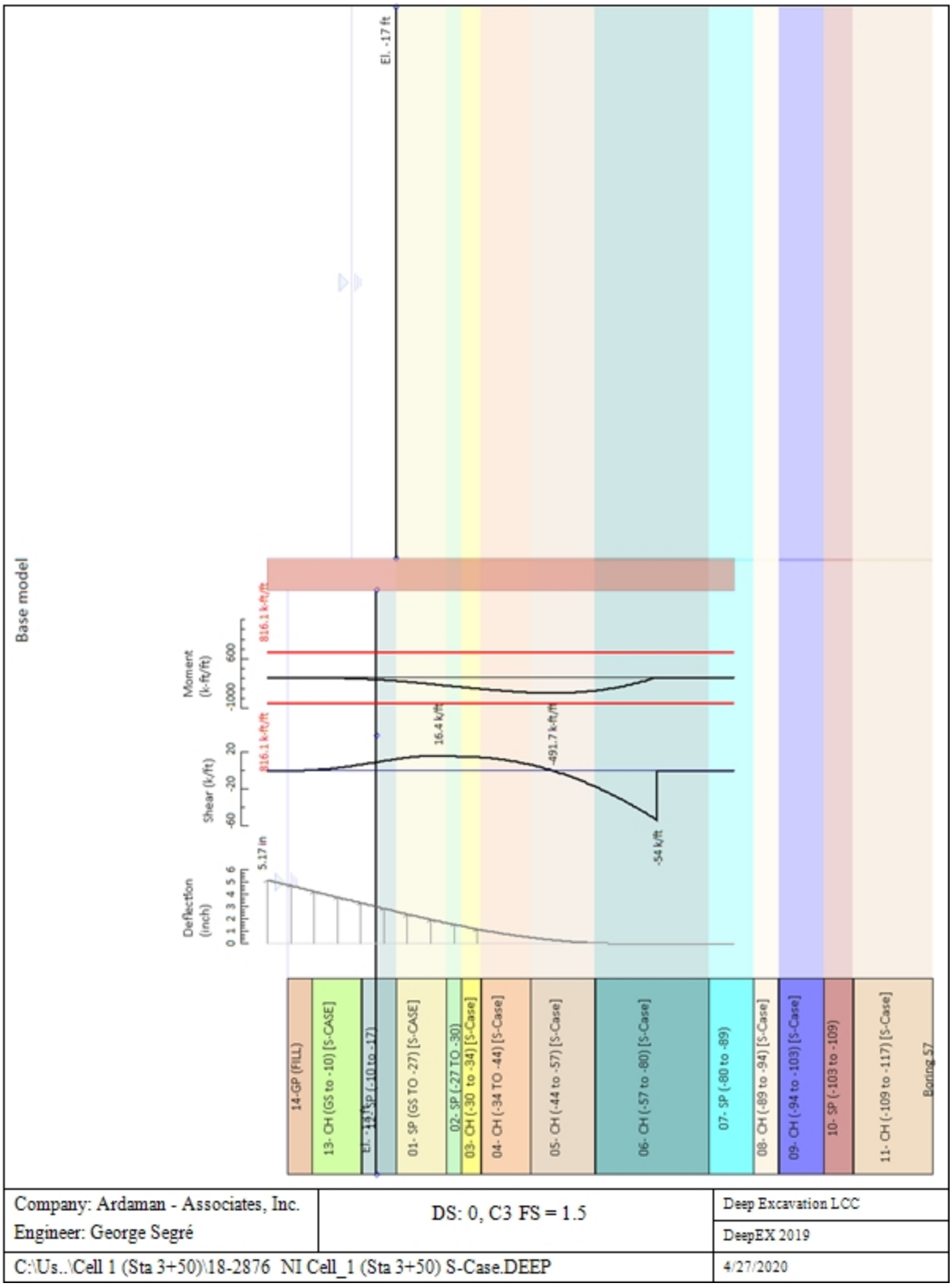

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



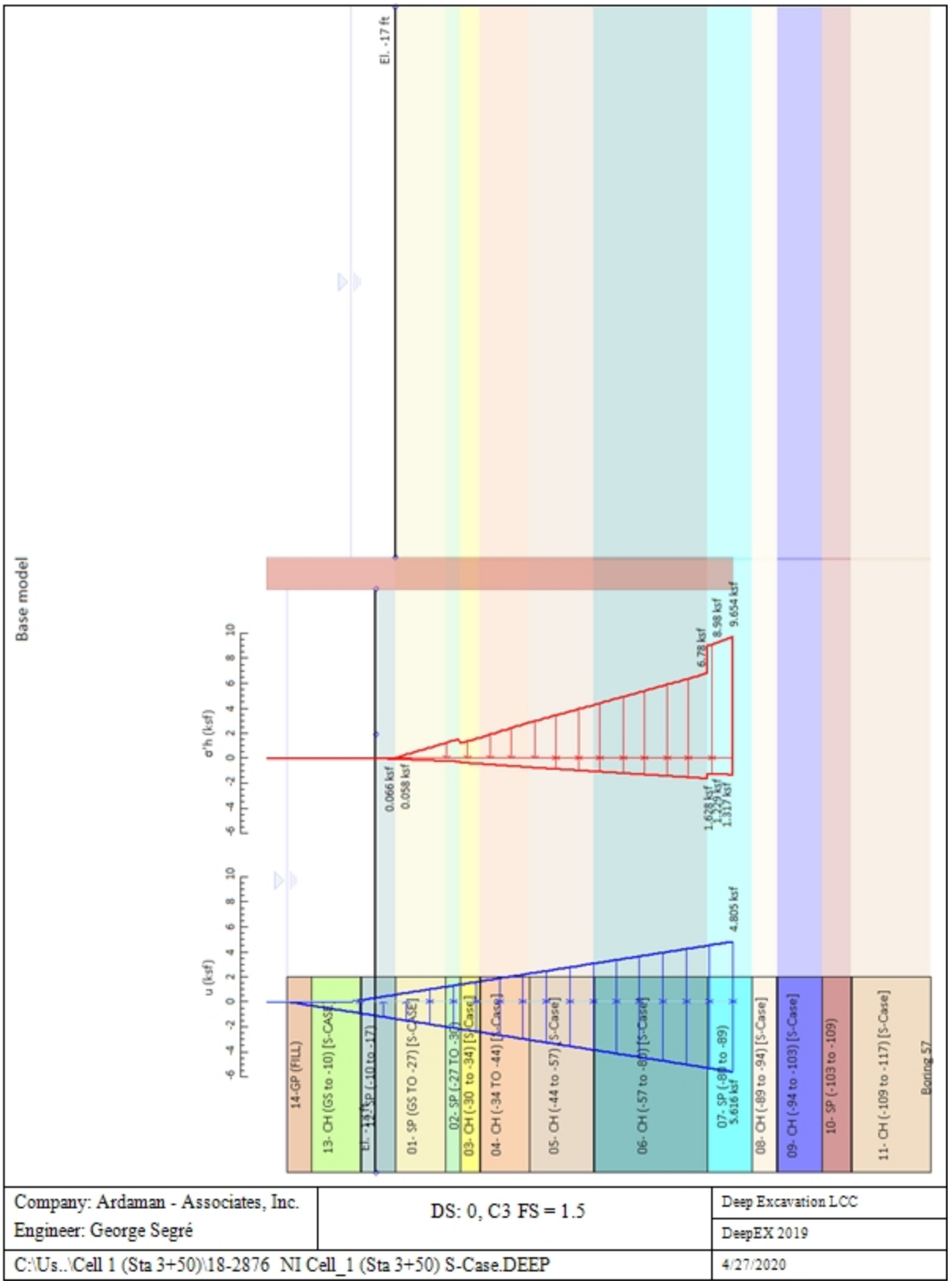

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |



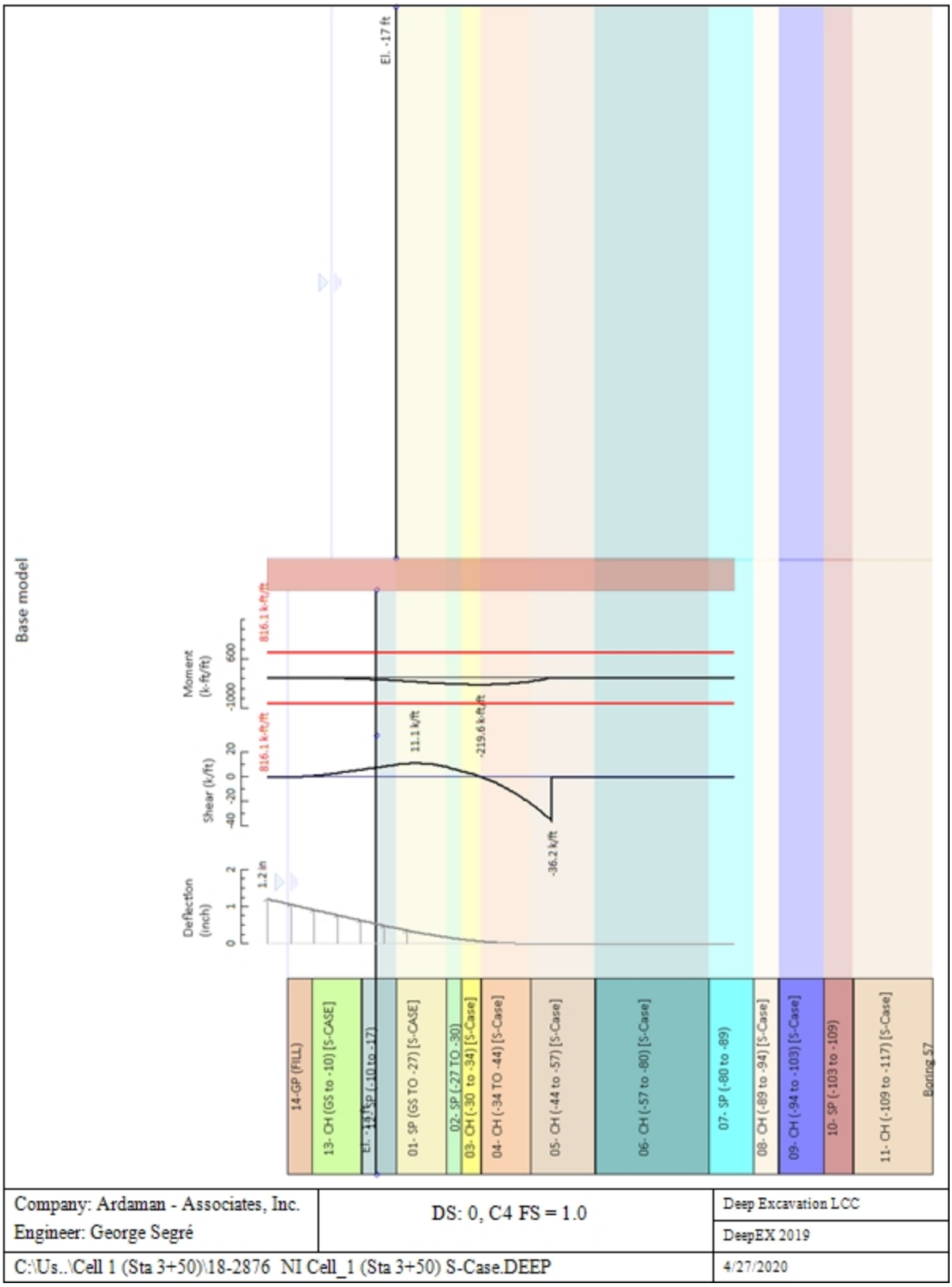

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |

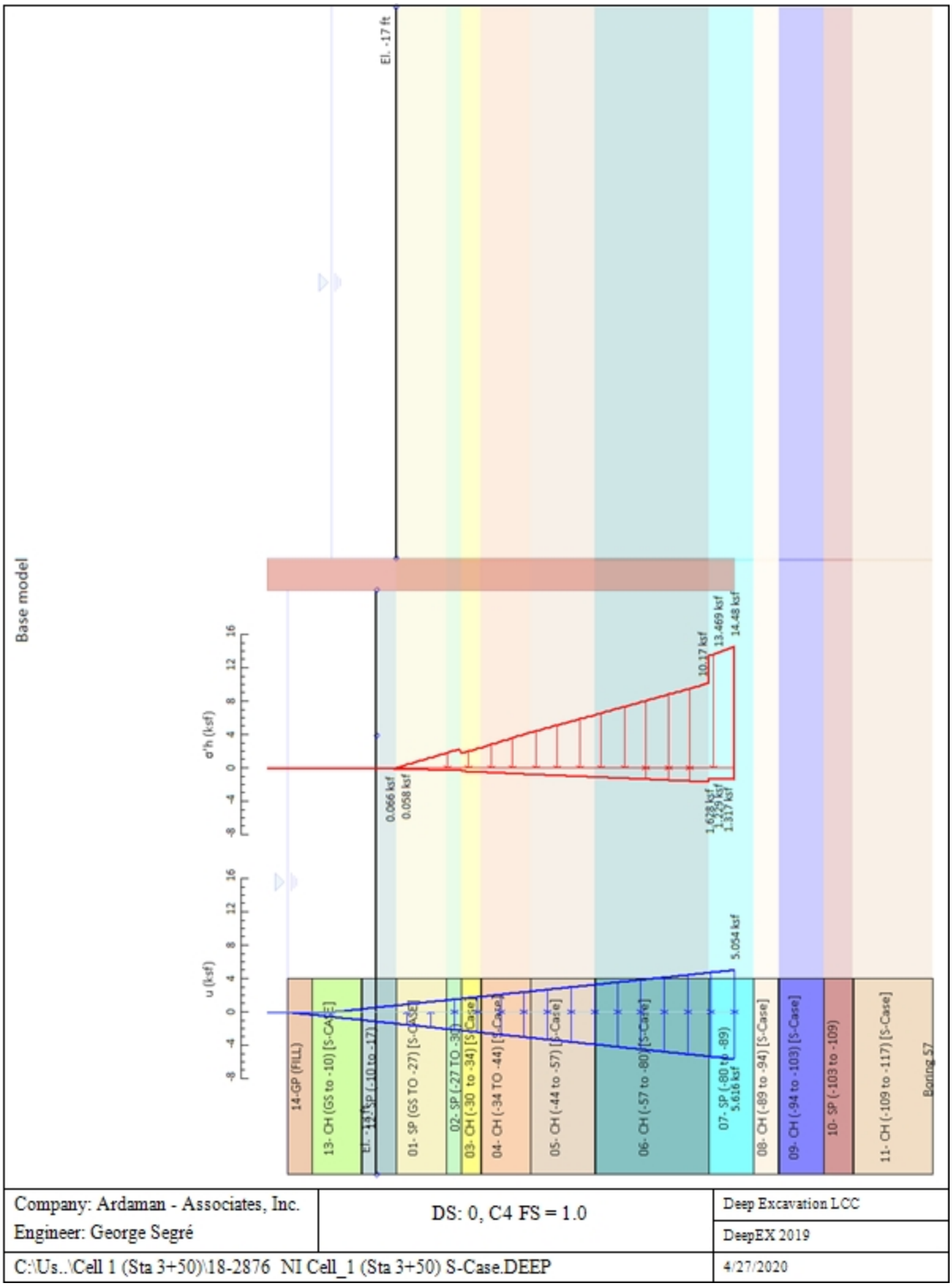



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |

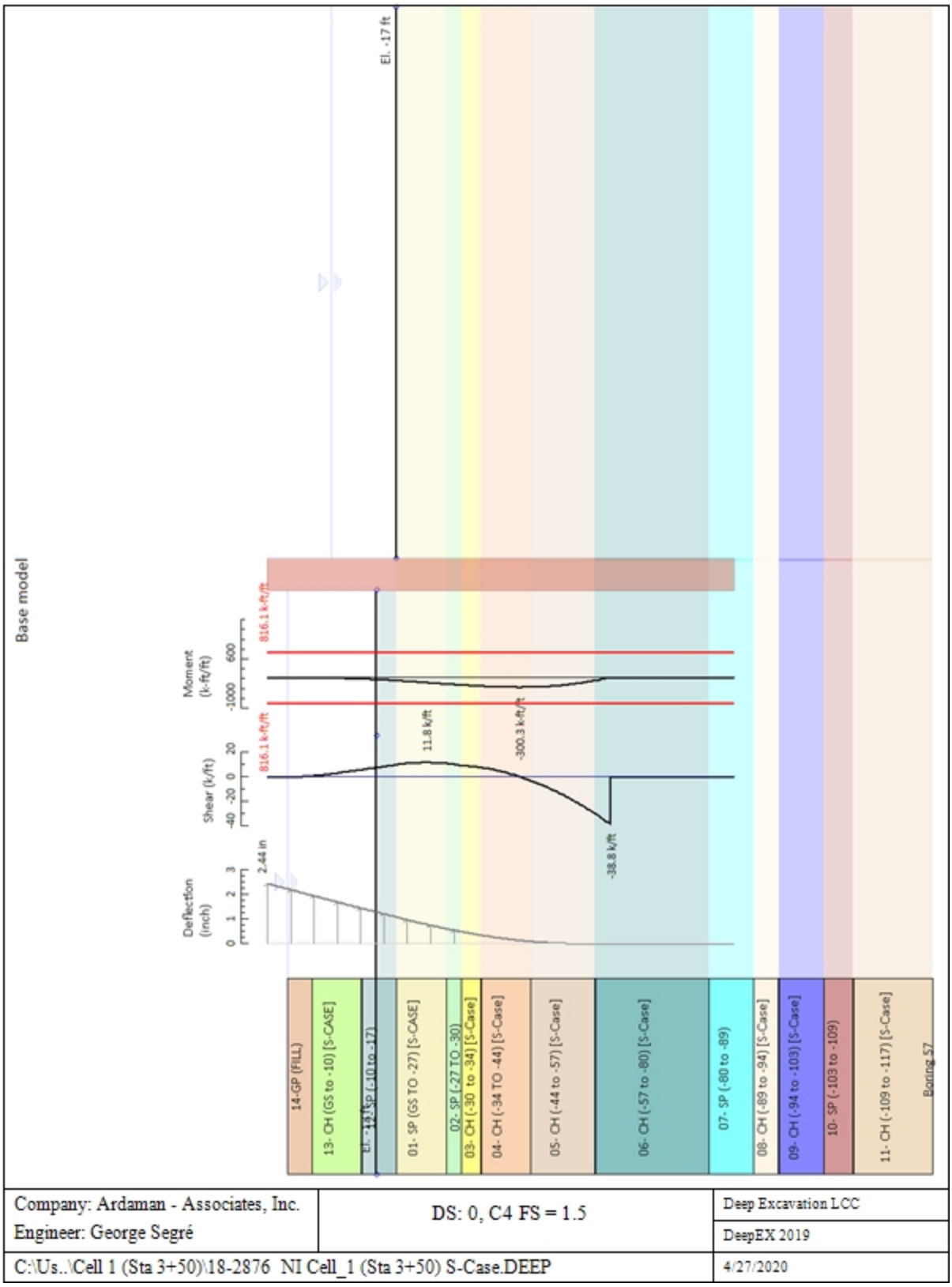


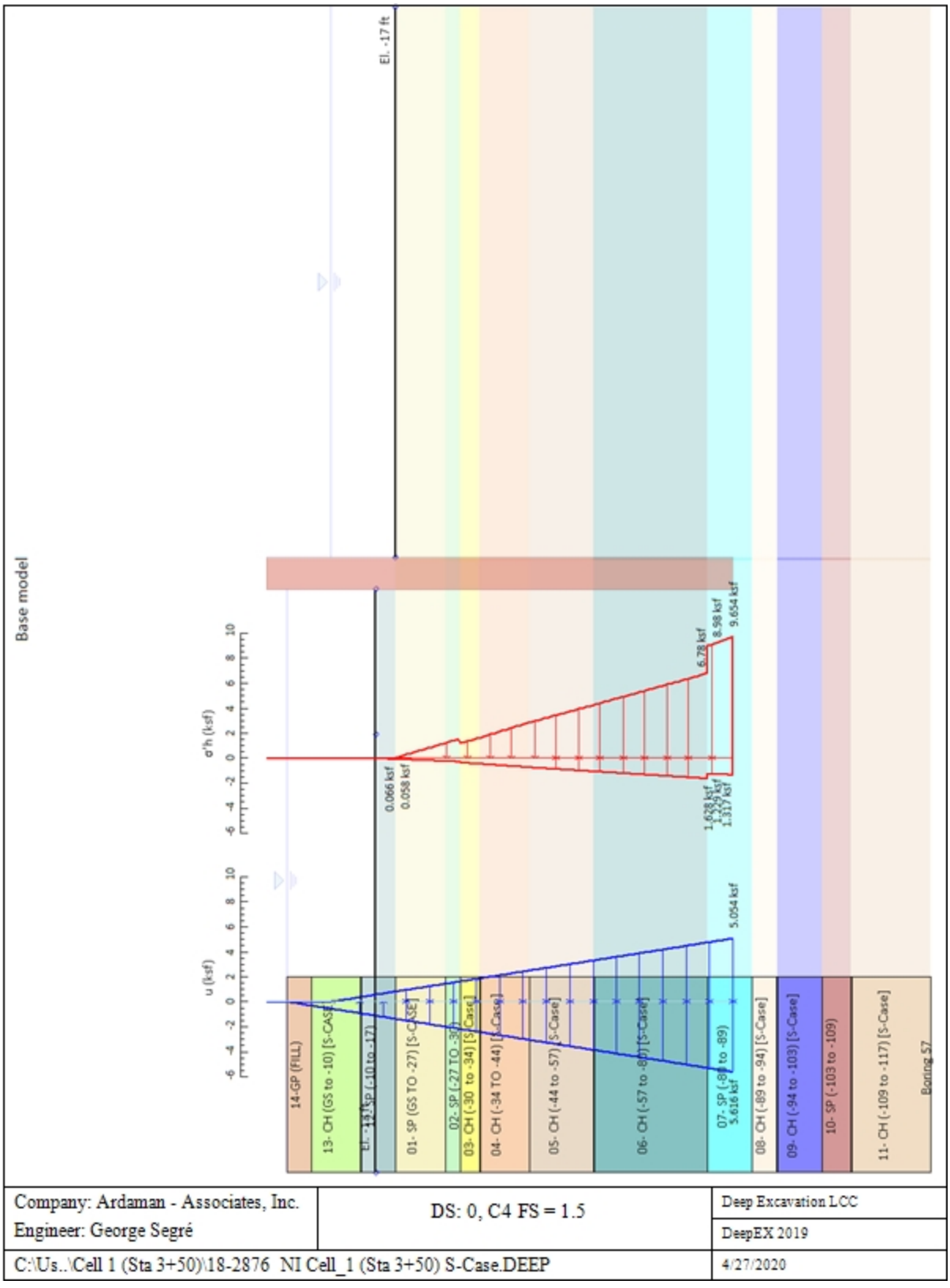

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |


Base model
El. -17 ft
Deflection (inch)
0 1 2
1.2 in
Shear (k/ft)
-40 -20 0 20
816.1 k-ft/ft
-36.2 k/ft
Moment (k-ft/ft)
-1000 600
816.1 k-ft/ft
11.1 k/ft
-219.6 k-ft/ft
14-GP (FILL)
13- CH (GS to -10) [S-CASE]
El. -10 to -17
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |


Base model
El. -17 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-40 -20 0 20
11.8 k/ft
-300.3 k-ft/ft
-38.8 k/ft
Deflection (inch)
0 1 2 3
2.44 in
14-GP (FILL)
13- CH (GS to -10) [S-CASE]
El. -10 to -17
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 3+75)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -81.48 ft., NAVD88

Length of Sheetting = 90.48 ft.

Use = 95.0 ft.

Design Tip Elev. = -86.0 ft., NAVD88

Design Length of Sheeting = 95.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -46.30 | 553.18 | 92.49 | 2.59 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -49.46 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -44.33 | 457.90 | 86.67 | 1.98 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -46.70 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -42.74 | 350.65 | 74.37 | 1.36 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -47.09 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -40.38 | 264.42 | 64.13 | 0.93 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -49.93 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -71.60 | 864.92 | 92.09 | 9.62 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -81.48 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -65.88 | 642.97 | 76.20 | 6.14 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -73.68 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -62.76 | 493.70 | 63.78 | 4.22 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -78.36 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -56.52 | 325.59 | 49.15 | 2.29 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -68.48 | -- | -- | -- |
| | | | | | | Governing Value: | -81.48 | 864.92 | 92.49 | 9.62 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:09:31 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+75)\18-2876 NI Cell_1 (Sta 3+75) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 14- GP Fill | 120 | 120 | 34 | 0 | N/A | N/A | N/A | 300 | 3 | 0.28 | 3.54 | N/A | N/A | True | Linear | |
| 13- CH (GS to | 112 | 112 | 0 | 0 | 800 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 12- SP (-10 to | 112 | 112 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 01- SP (-17 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | EXP | |
| 02- SP (-27 T | 115 | 115 | 30 | 0 | N/A | N/A | N/A | 60 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 03- CH (-30 t | 126 | 126 | 0 | 0 | 2290 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-34 T | 134 | 134 | 0 | 0 | 2290 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-44 to | 126 | 126 | 0 | 0 | 2290 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-57 to | 127 | 127 | 0 | 0 | 1650 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- SP (-80 to | 122 | 122 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 08- CH (-89 to | 115 | 115 | 0 | 0 | 1200 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- CH (-94 to | 120 | 120 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 10- SP (-103 t | 120 | 120 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 11- CH (-109 t | 115 | 115 | 0 | 0 | 1670 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 14- GP Fill | 0.35 | - | - | 0.441 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- CH (GS to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- SP (-10 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 01- SP (-17 T | 0.4 | - | - | 0.5 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- SP (-27 T | 0.4 | - | - | 0.5 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-30 t | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-34 T | 0.3 | 0 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-44 to | 0.45 | 0.1 | 0 | 0.45 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-57 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-80 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-89 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-94 to | 0.25 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-103 t | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-109 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

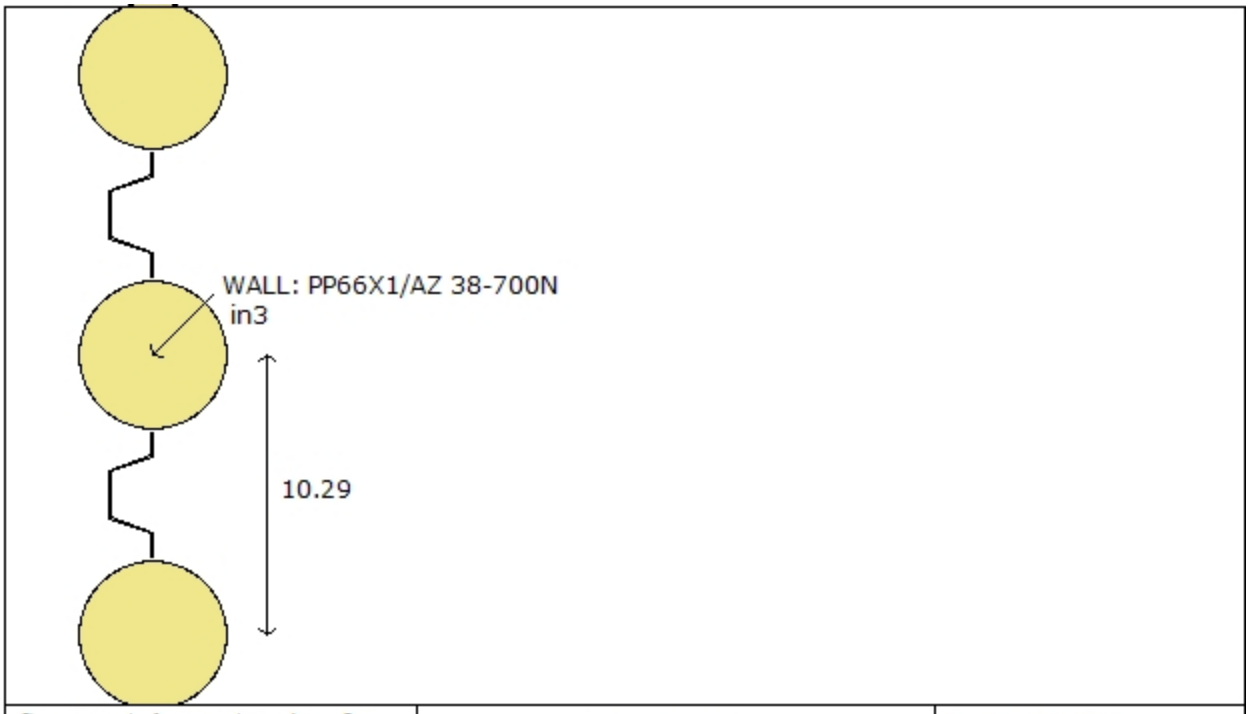
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 14- GP Fill | 1 | 0.44 |
| 0 | 13- CH (GS to - | 1 | 1 |
| -10 | 12- SP (-10 to - | 1 | 0.5 |
| -17 | 01- SP (-17 TO | 1 | 0.5 |
| -27 | 02- SP (-27 TO | 1 | 0.5 |
| -30 | 03- CH (-30 to | 1 | 1 |
| -34 | 04- CH (-34 TO | 1 | 1 |
| -44 | 05- CH (-44 to | 1 | 0.45 |
| -57 | 06- CH (-57 to | 1 | 1 |
| -80 | 07- SP (-80 to - | 1 | 0.5 |
| -89 | 08- CH (-89 to | 1 | 1 |
| -94 | 09- CH (-94 to | 1 | 1 |
| -103 | 10- SP (-103 to | 1 | 0.5 |
| -109 | 11- CH (-109 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | Wall sketch | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 3+75)\18-2876 NI Cell_1 (Sta 3+75) Q-Case.DEEP | | 4/27/2020 |

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.405 | 1.405 | 1.806 |
| Stage 1 | Simple span | N/A | 1.6 | 1.203 | 1.203 | 1.543 |
| Stage 2 | Simple span | N/A | 1.6 | 1.469 | 1.469 | 1.857 |
| Stage 3 | Simple span | N/A | 1.6 | 1.268 | 1.268 | 1.595 |
| Stage 4 | Simple span | N/A | 1.6 | 1.551 | 1.551 | 1.926 |
| Stage 5 | Simple span | N/A | 1.6 | 1.181 | 1.181 | 1.459 |
| Stage 6 | Simple span | N/A | 1.6 | 1.623 | 1.623 | 1.982 |
| Stage 7 | Simple span | N/A | 1.6 | 1.252 | 1.252 | 1.514 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

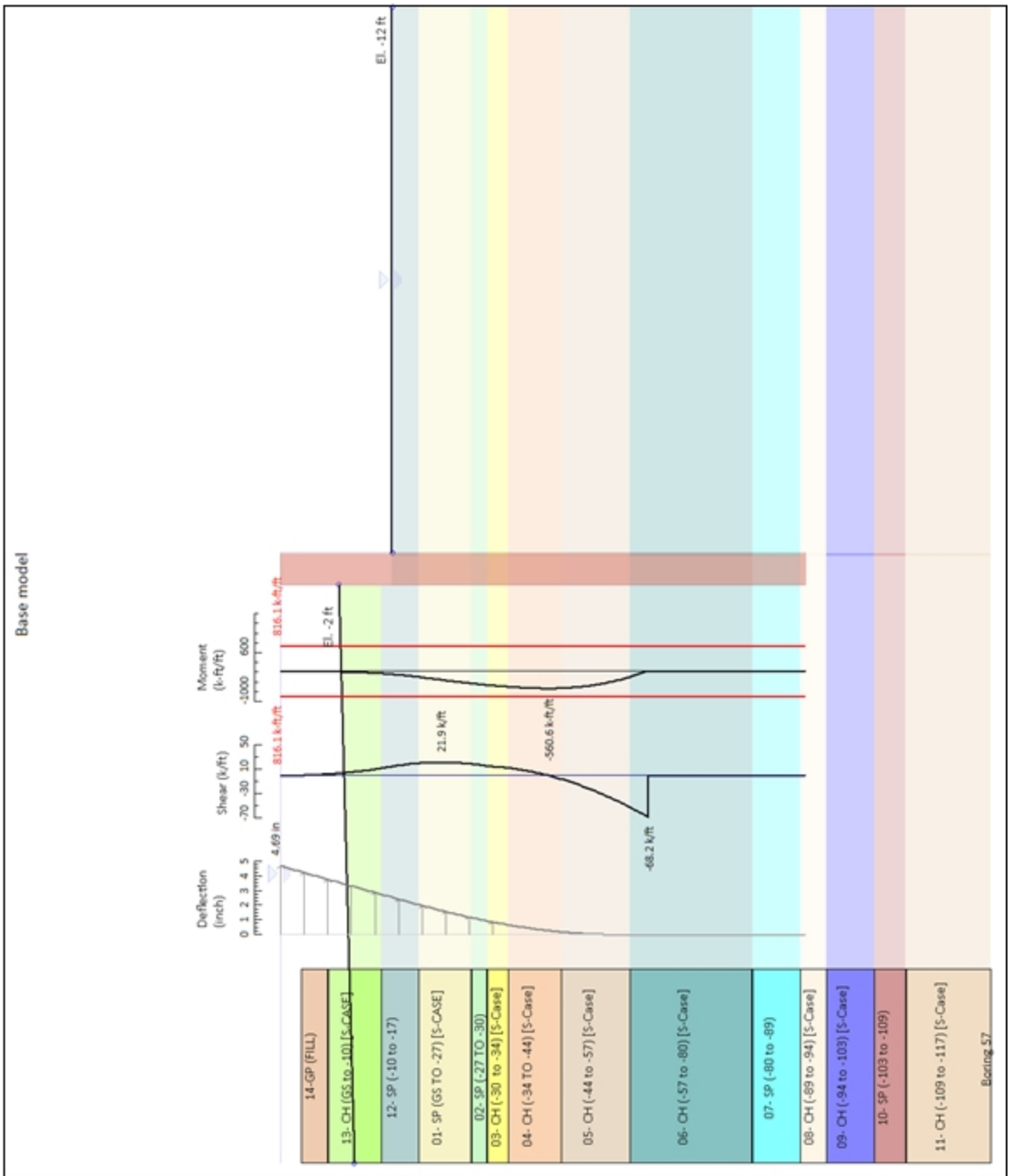
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

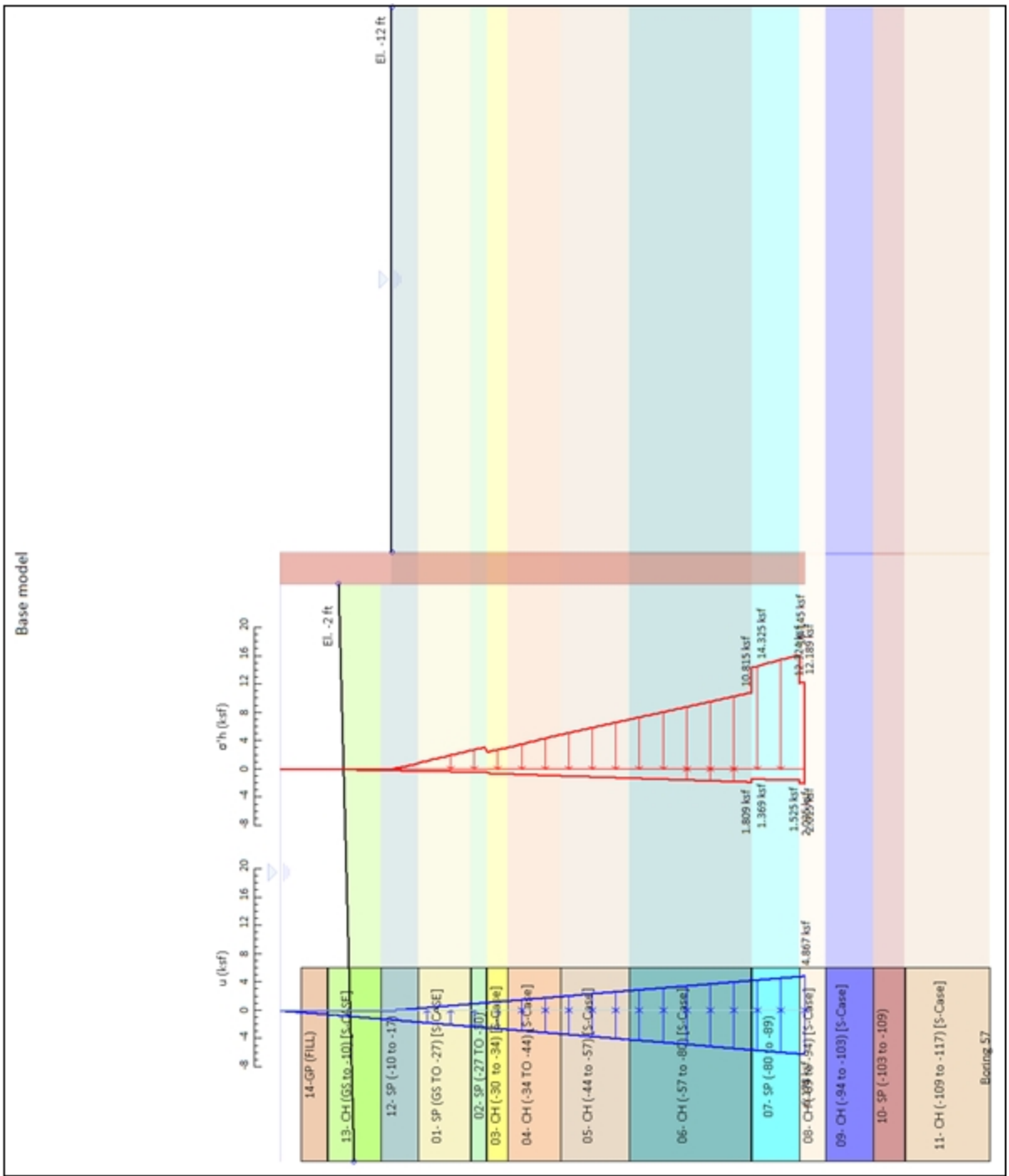
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

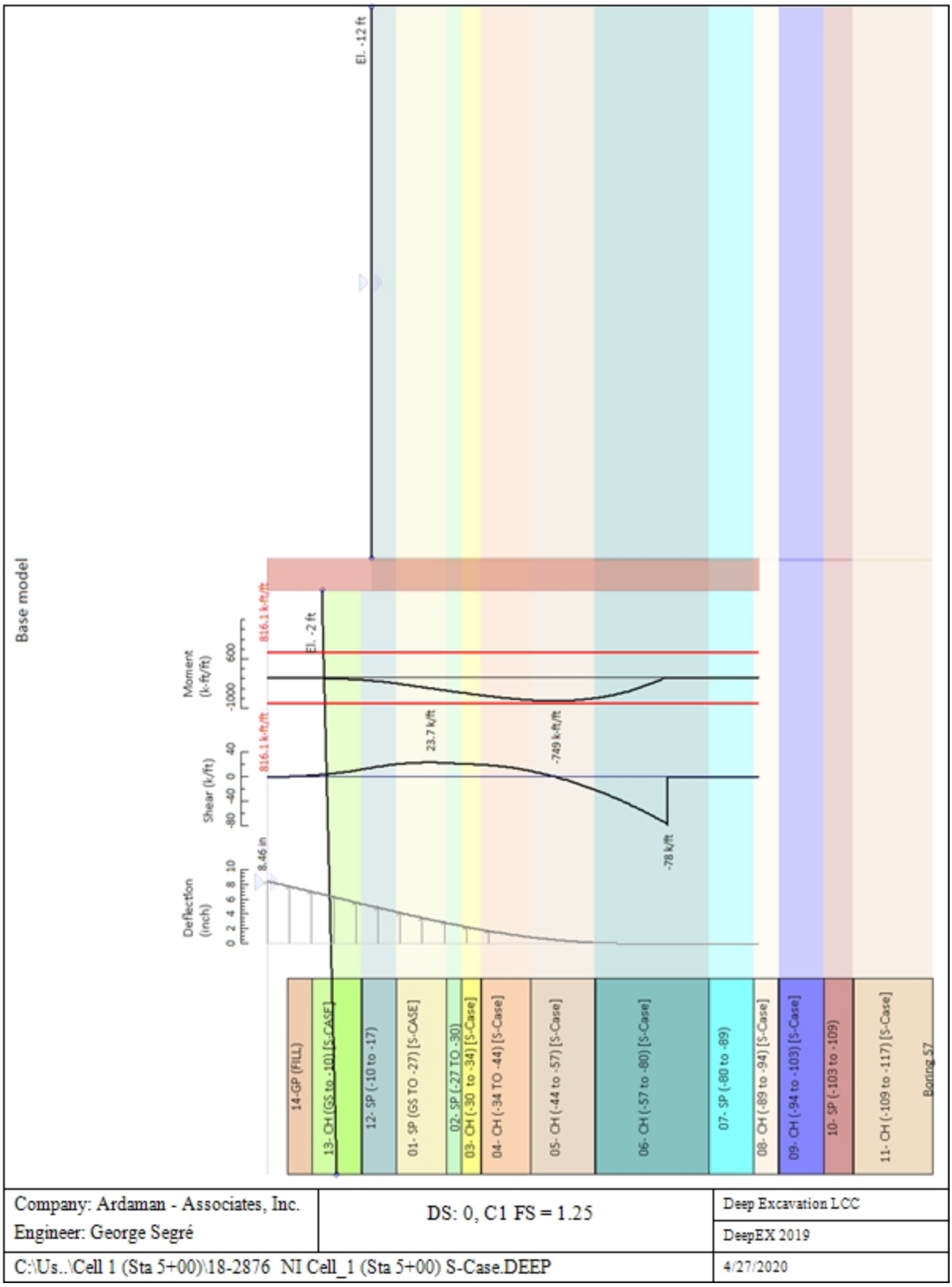
A sequence of figures for each excavation stage is reported



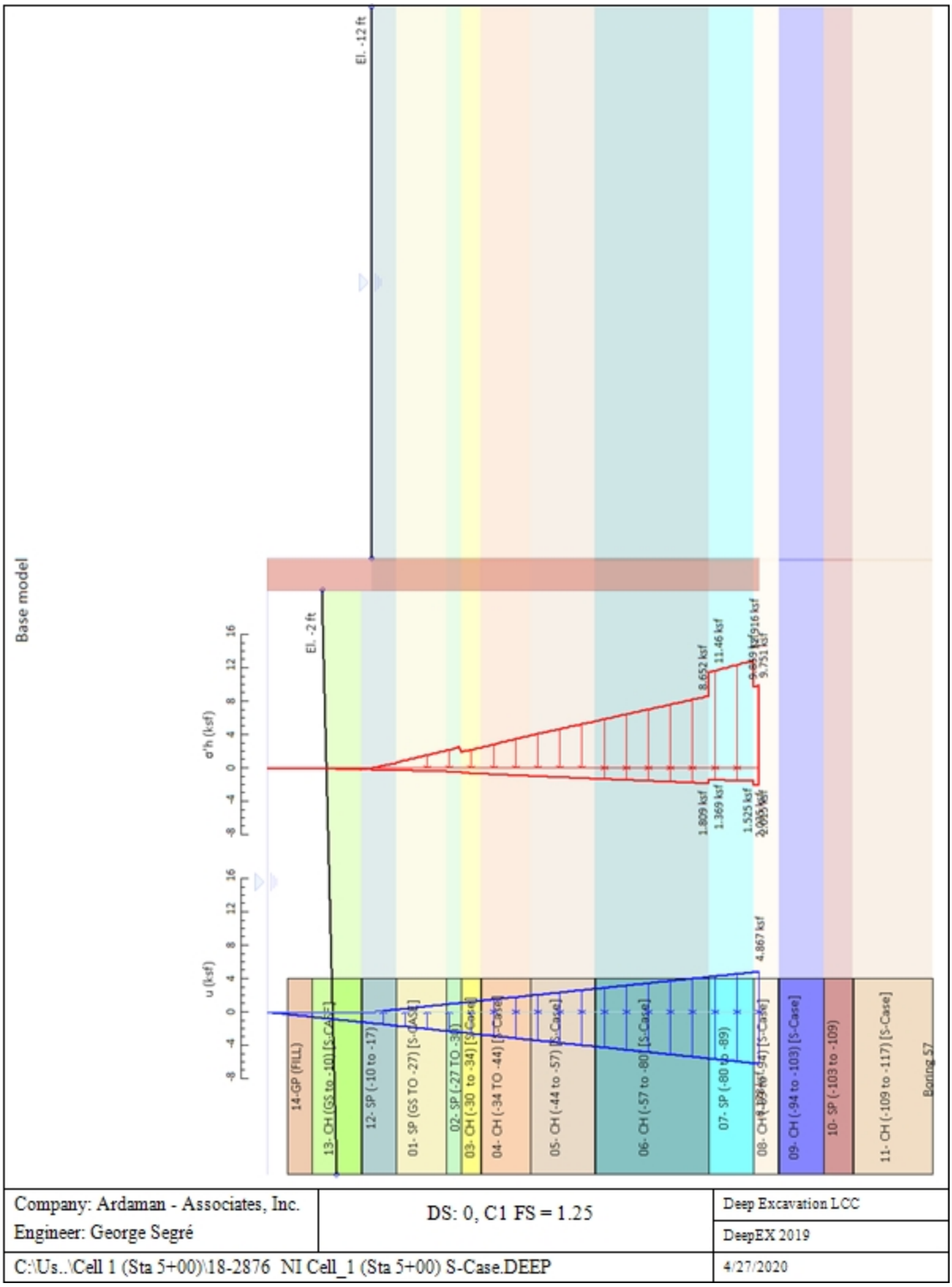

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



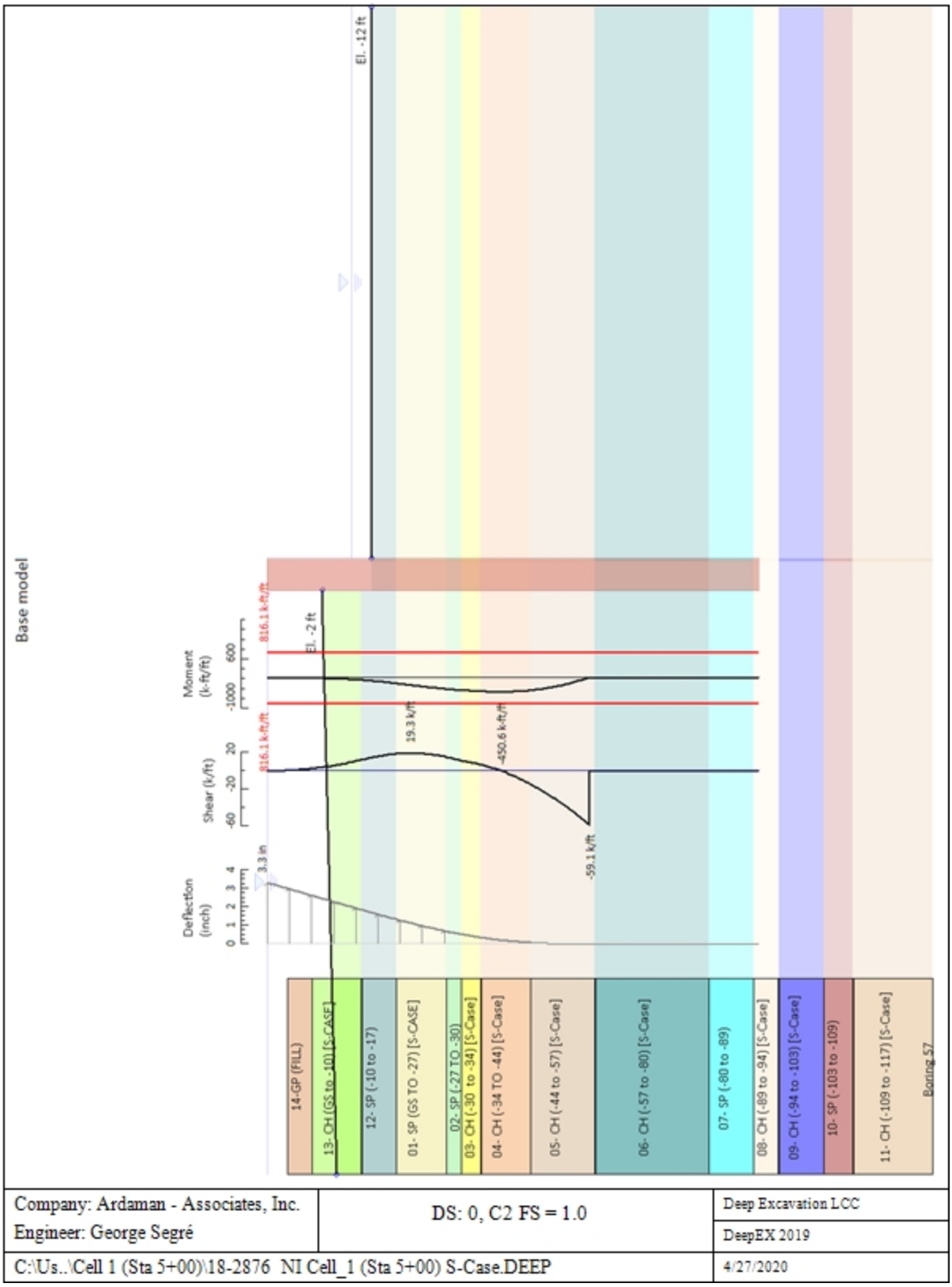

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



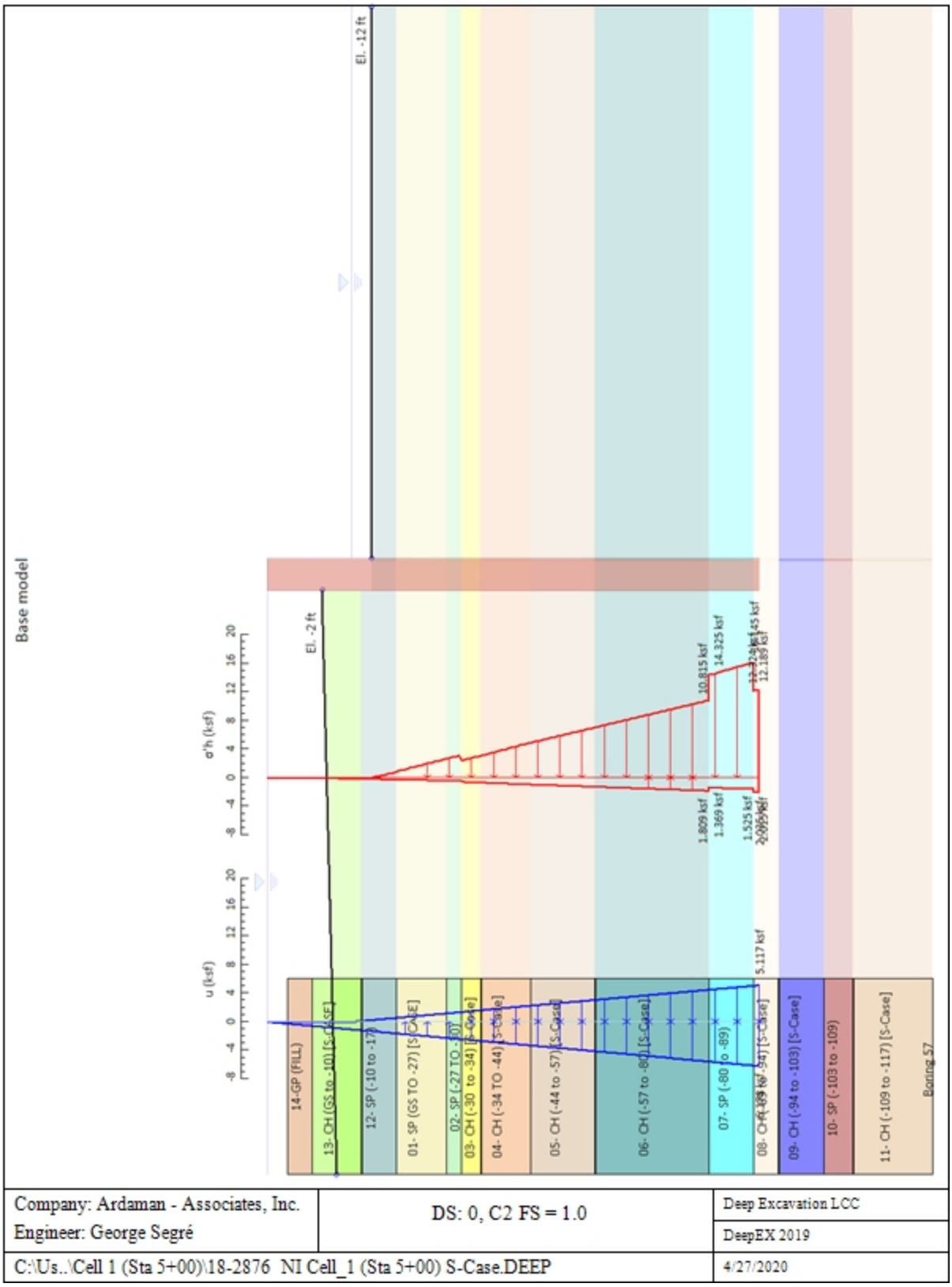

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



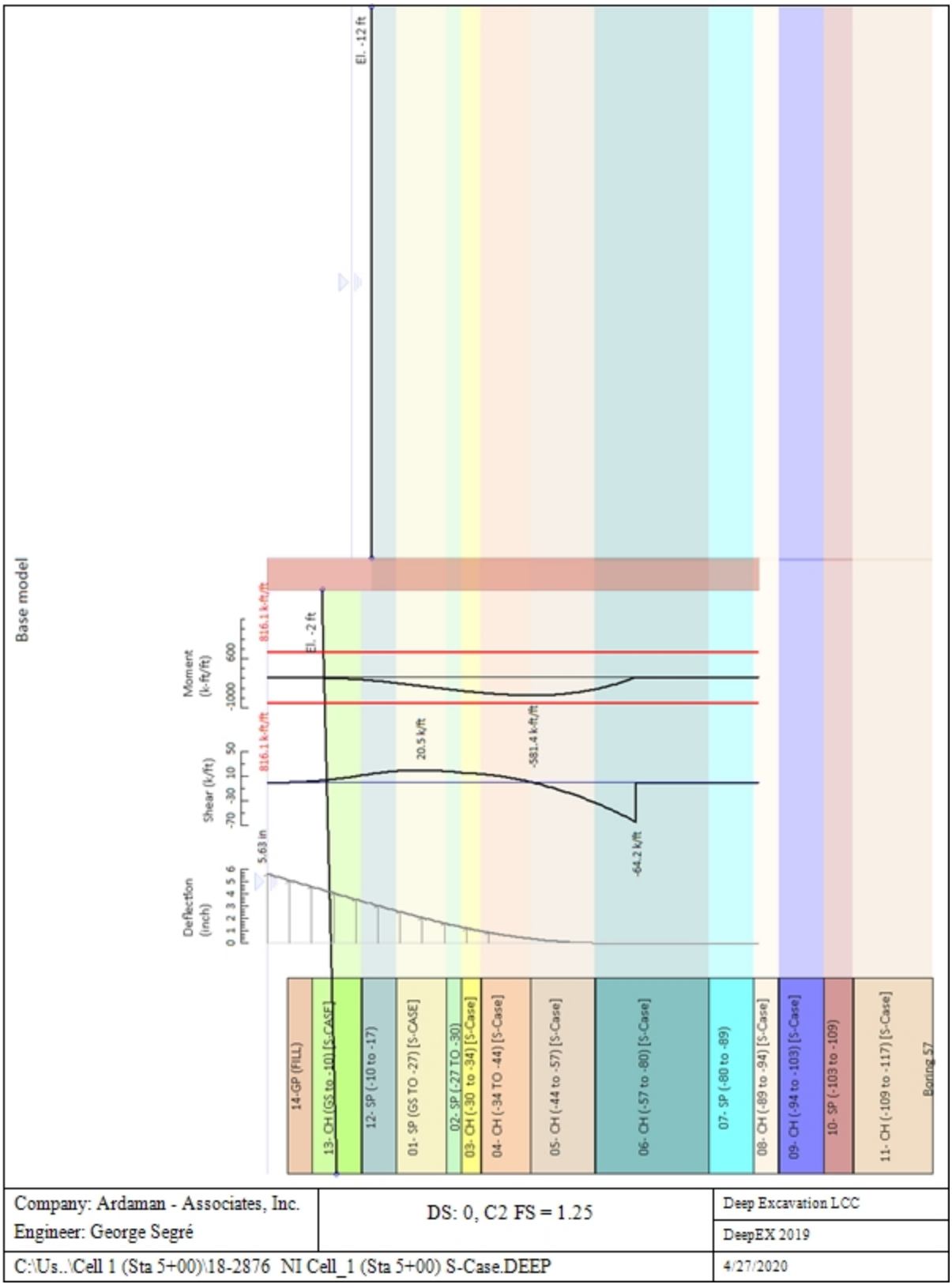

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



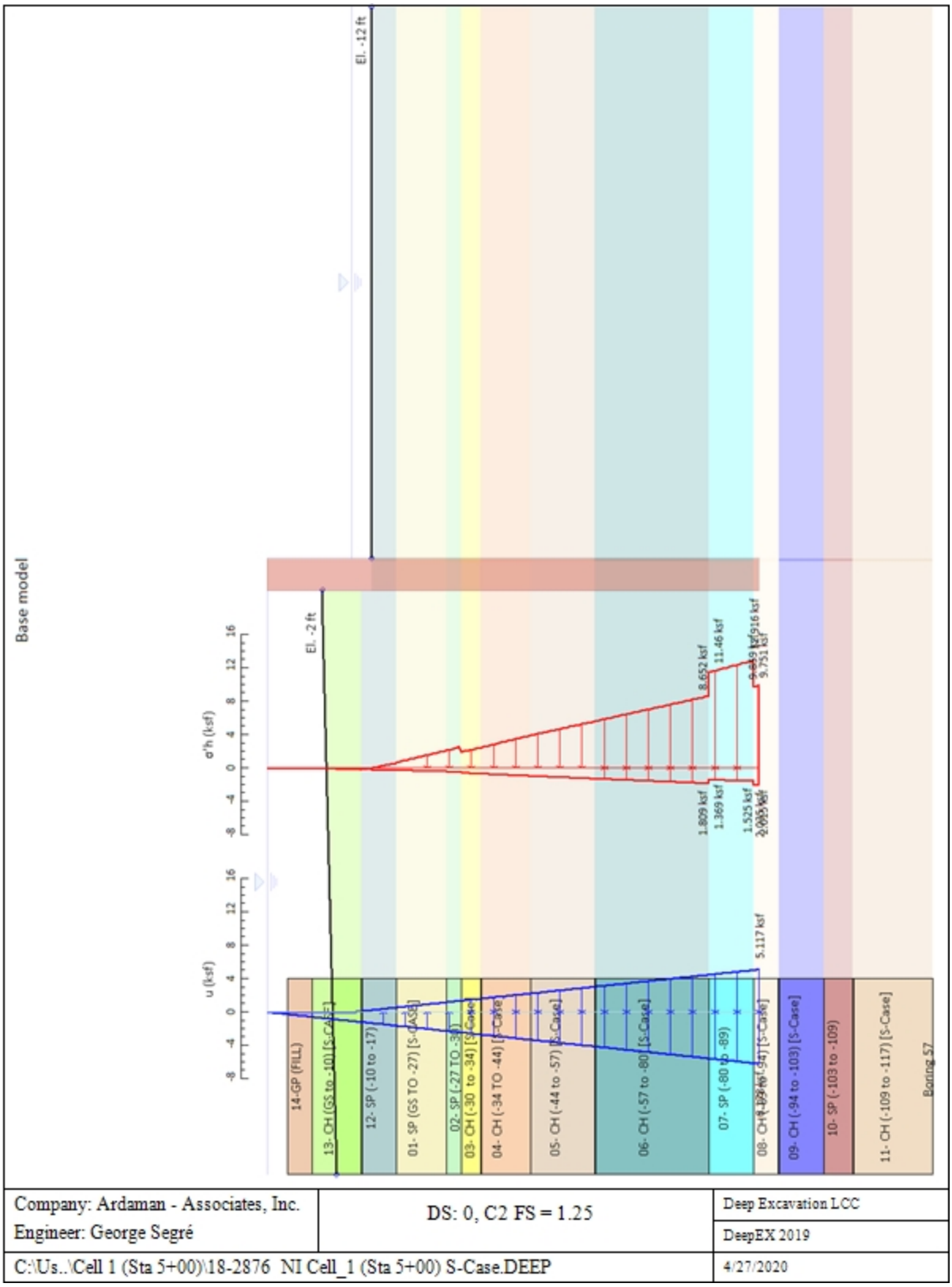

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



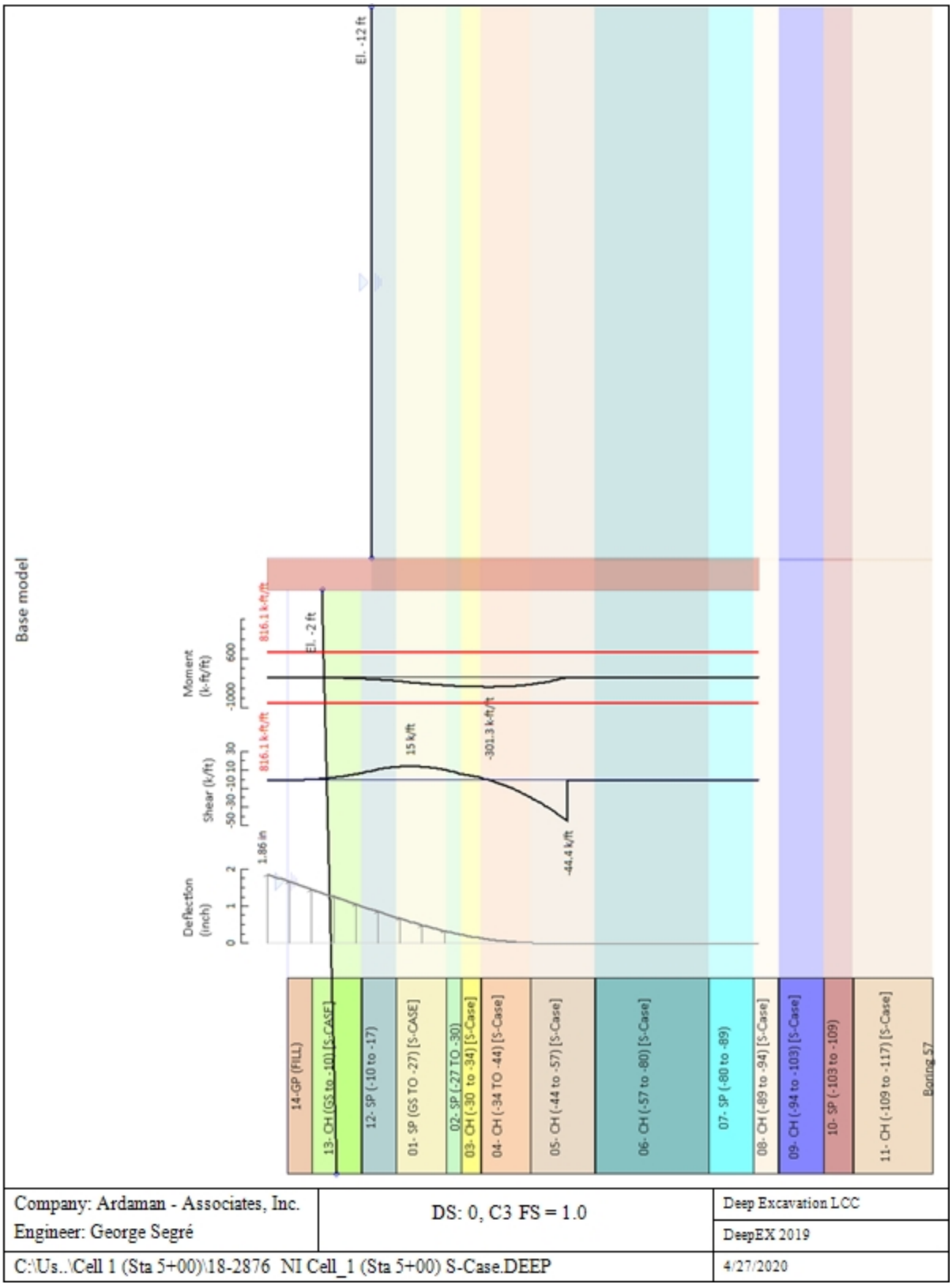

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



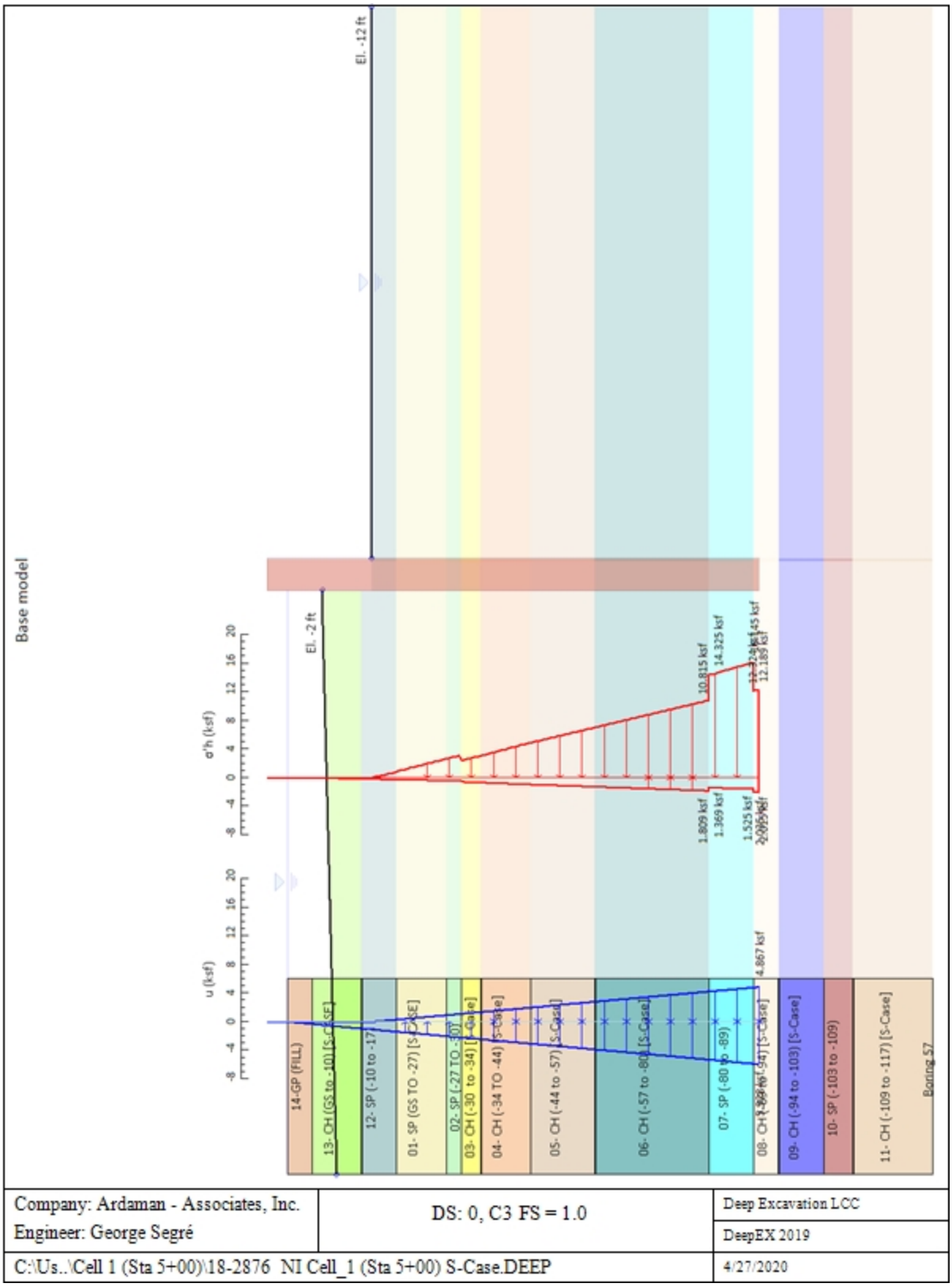

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



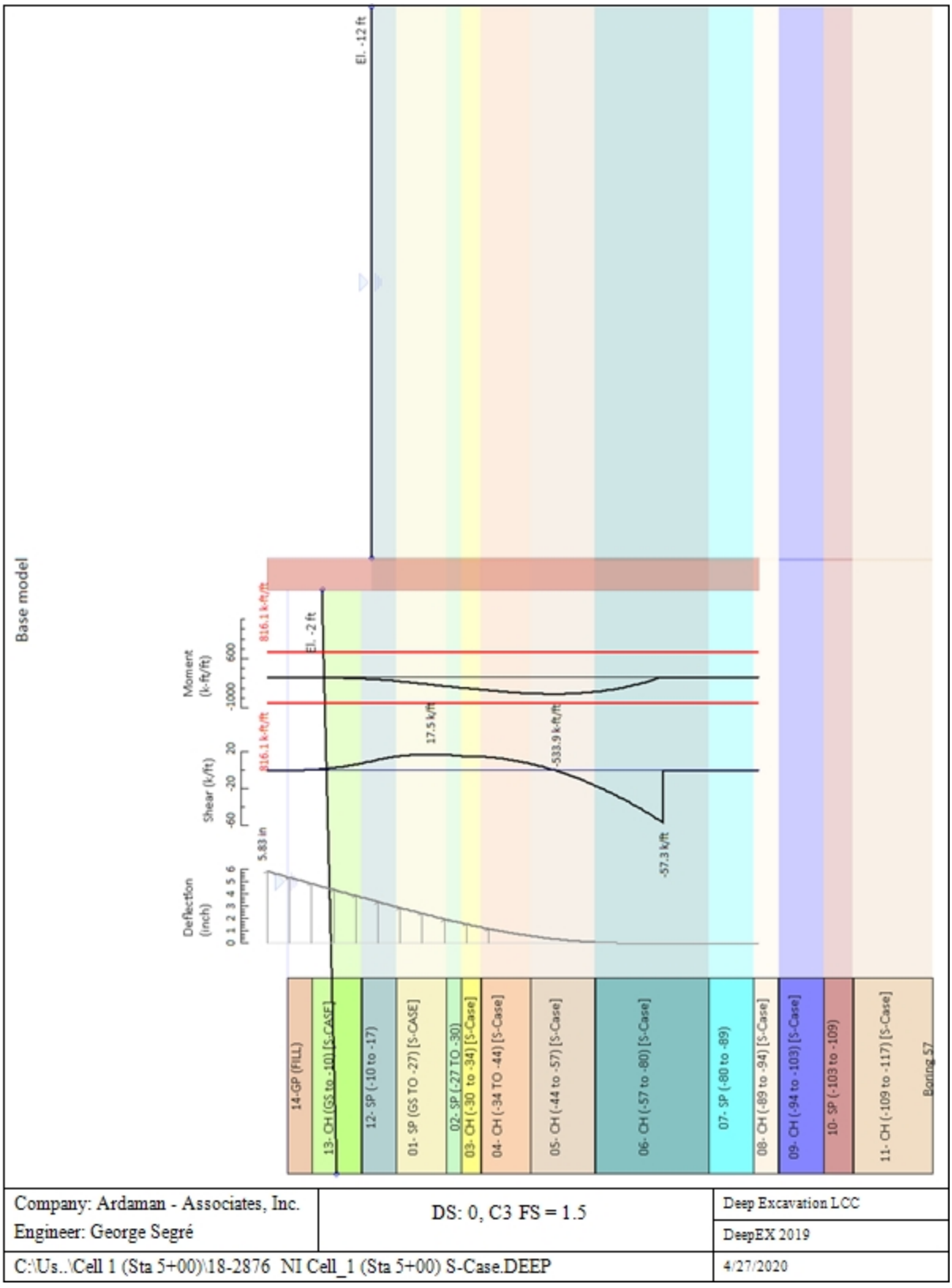

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



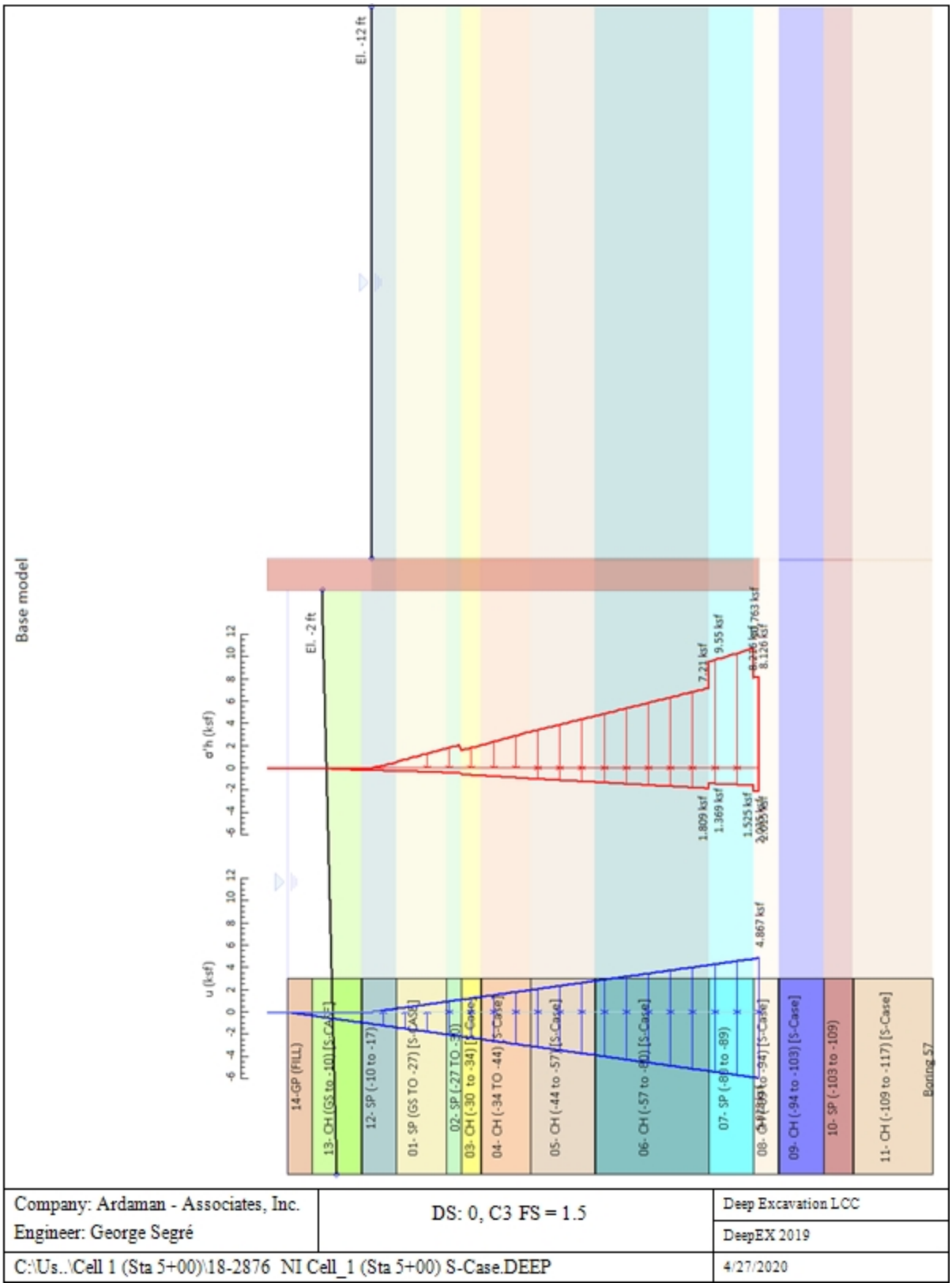

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |



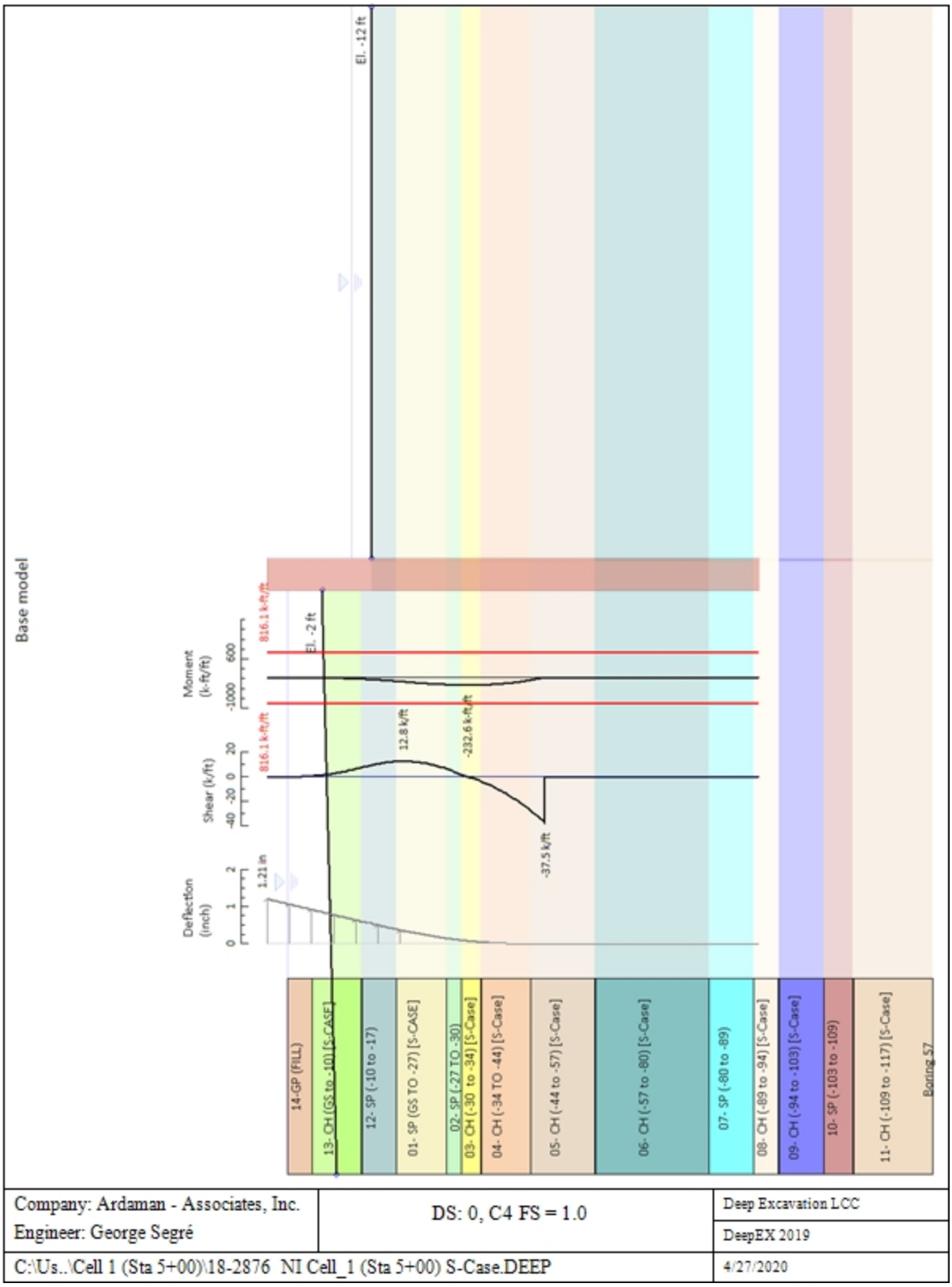

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |

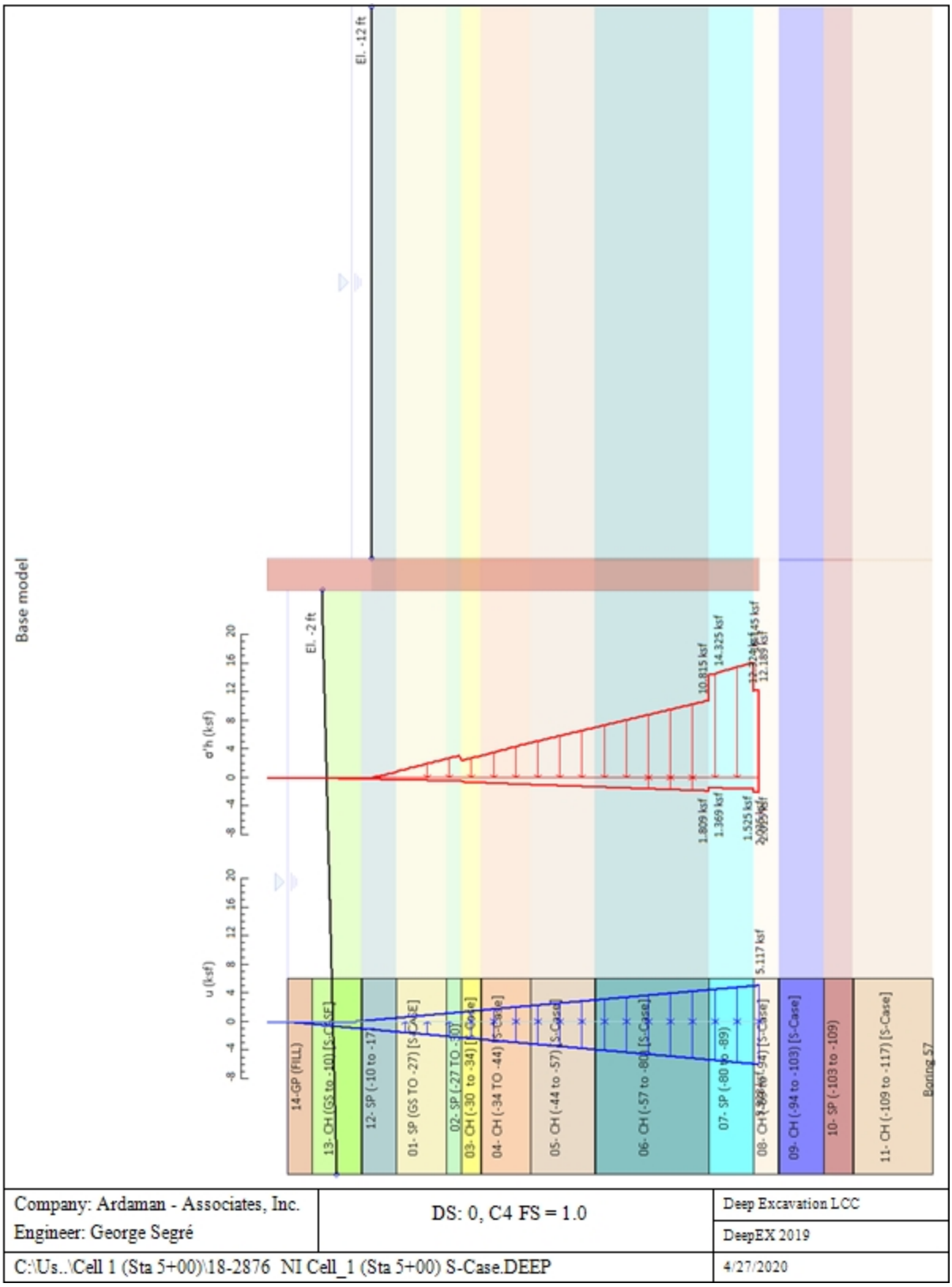



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |

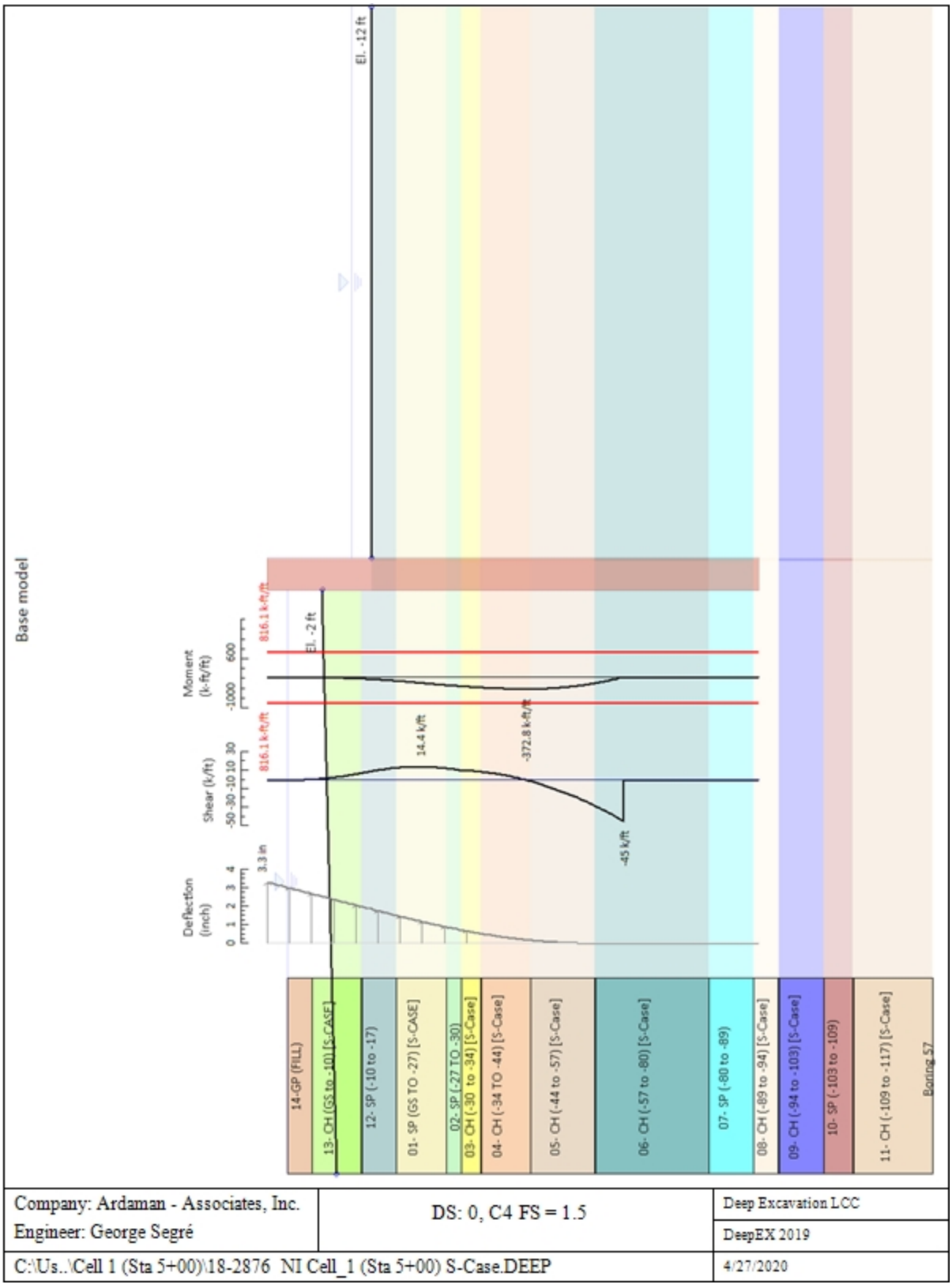



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |

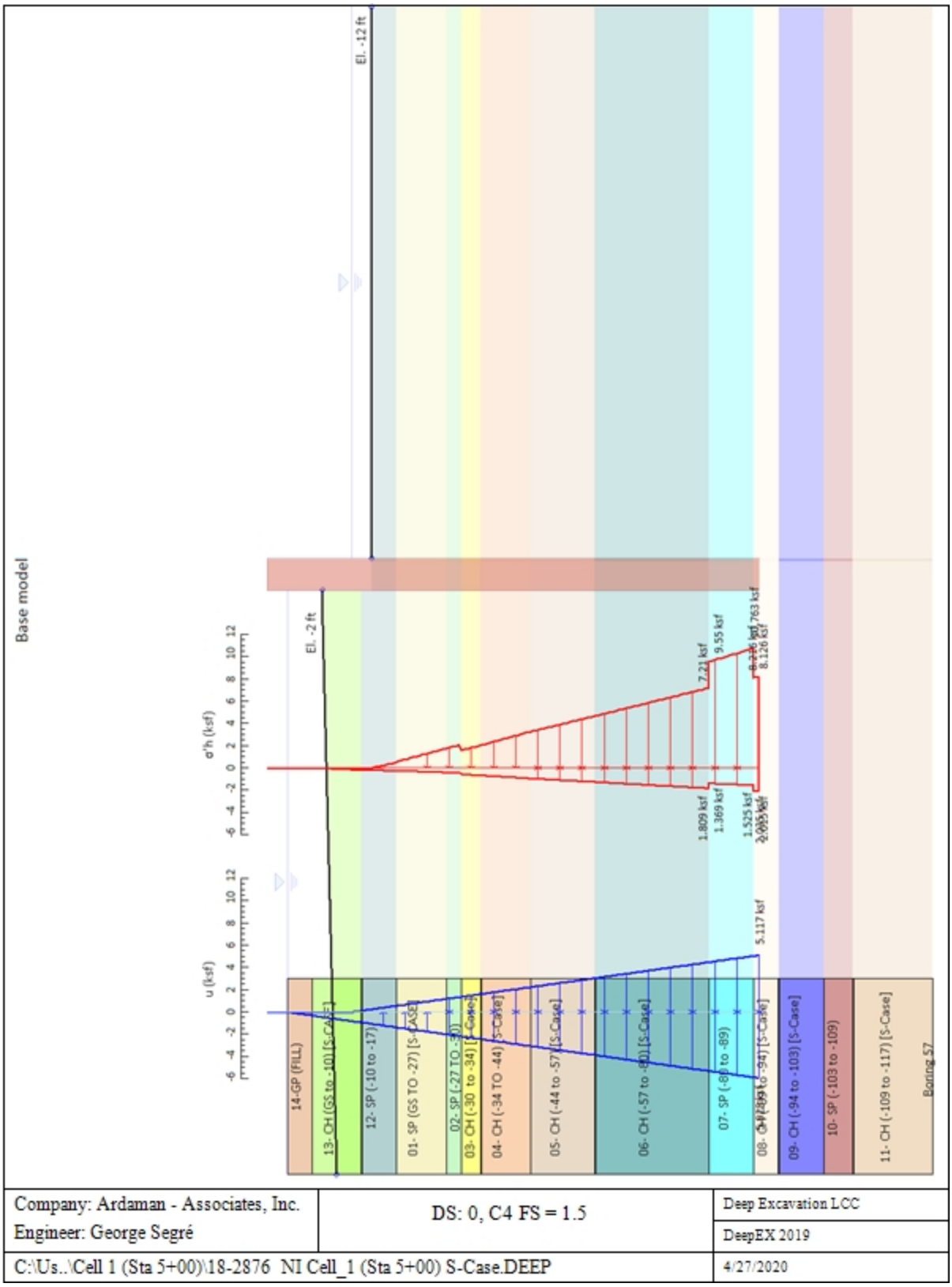

Base model
El. -12 ft
El. -2 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
600
-1000
Shear (k/ft)
20
0
-20
-40
12.8 k/ft
-232.6 k-ft/ft
-37.5 k/ft
Deflection (inch)
2
1
0
1.21 in
14-GP (FILL)
13- CH (GS to -10) [S-CASE]
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 0+25)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -83.56 ft., NAVD88

Length of Sheetting = 92.56 ft.

Use = 95.0 ft.

Design Tip Elev. = -86.0 ft., NAVD88

Design Length of Sheeting = 95.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -24.97 | 90.97 | 19.04 | 0.17 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -27.34 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -23.39 | 77.45 | 23.38 | 0.13 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -24.18 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -21.41 | 39.14 | 16.26 | 0.05 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -22.60 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -19.44 | 28.52 | 13.60 | 0.04 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -20.23 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -72.64 | 839.09 | 96.58 | 9.85 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -83.56 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -67.00 | 616.24 | 73.58 | 6.15 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -76.28 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -63.28 | 468.70 | 58.72 | 4.15 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -82.52 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -56.00 | 309.76 | 41.79 | 2.19 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -73.16 | -- | -- | -- |
| | | | | | | Governing Value: | -83.56 | 839.09 | 96.58 | 9.85 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:41:33 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 0 | 0 | 500 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 0 | 0 | 1000 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 0 | 0 | 3300 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 0 | 0 | 1400 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 0 | 0 | 1850 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 0 | 0 | 1900 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 0 | 0 | 2000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | 0 | 0 | 0.95 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

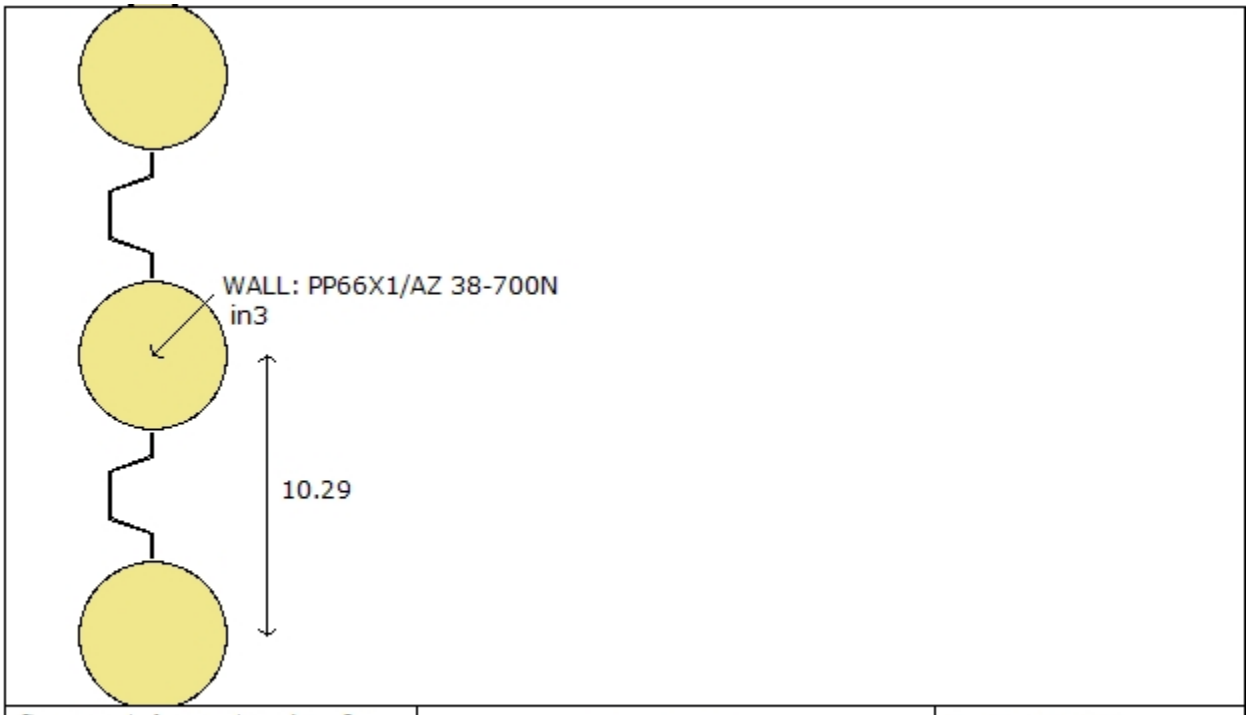
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 1 |
| -11 | 03- CH (-11 to | 1 | 0.95 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 1 |
| -41 | 06- CH (-41 to | 1 | 1 |
| -50 | 07- CH (-50 to | 1 | 1 |
| -58 | 08- CH (-58 to | 1 | 1 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 1 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 5.517 | 9.803 | 11.293 |
| Stage 1 | Simple span | N/A | 1.6 | 4.457 | 7.903 | 9.13 |
| Stage 2 | Simple span | N/A | 1.6 | 6.555 | 10.325 | 11.725 |
| Stage 3 | Simple span | N/A | 1.6 | 5.991 | 8.357 | 9.497 |
| Stage 4 | Simple span | N/A | 1.6 | 8.574 | 13.312 | 12.947 |
| Stage 5 | Simple span | N/A | 1.6 | 7.237 | 9.01 | 8.814 |
| Stage 6 | Simple span | N/A | 1.6 | 12.387 | 14.021 | 13.442 |
| Stage 7 | Simple span | N/A | 1.6 | 9.186 | 9.566 | 9.186 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

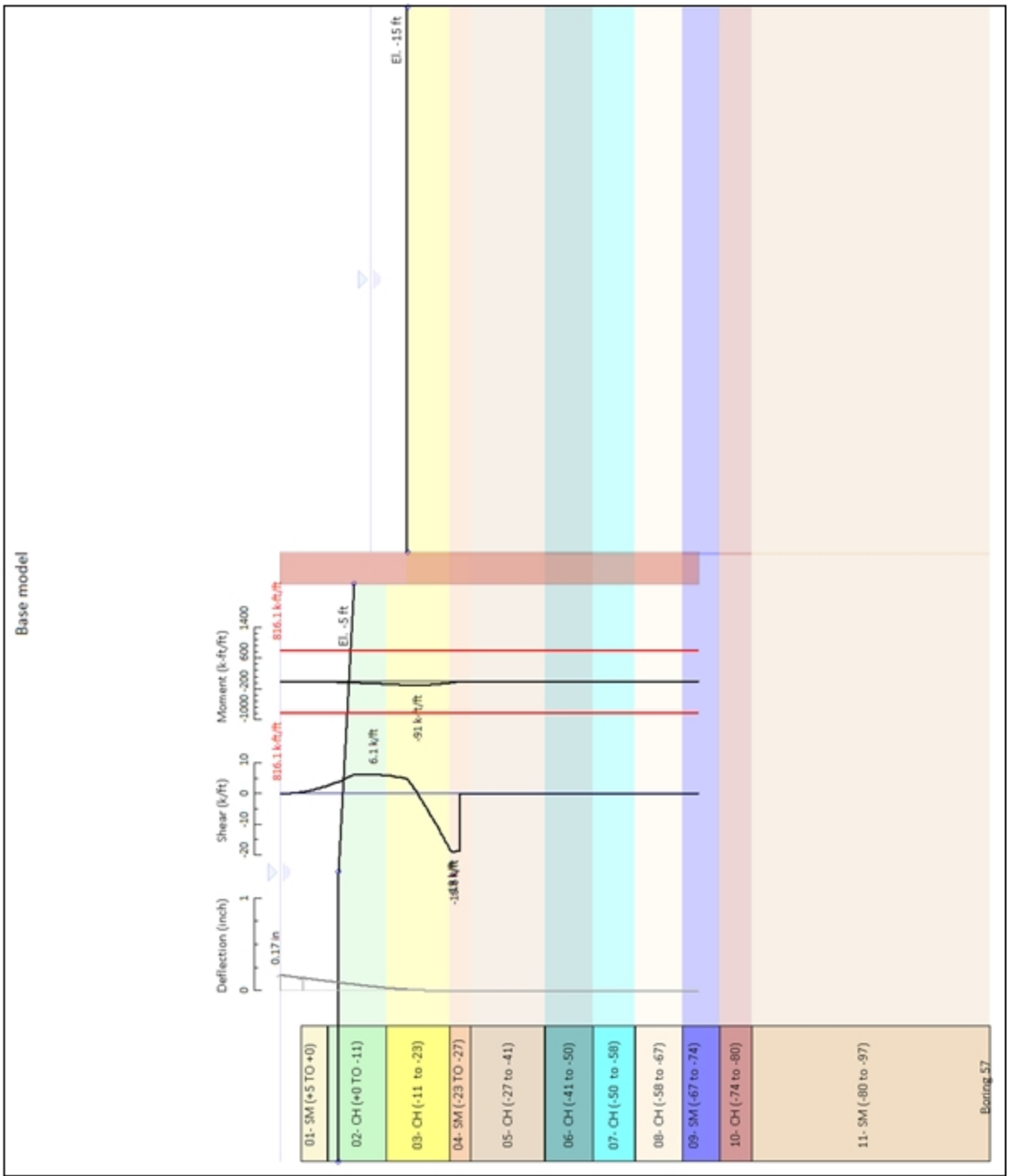
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

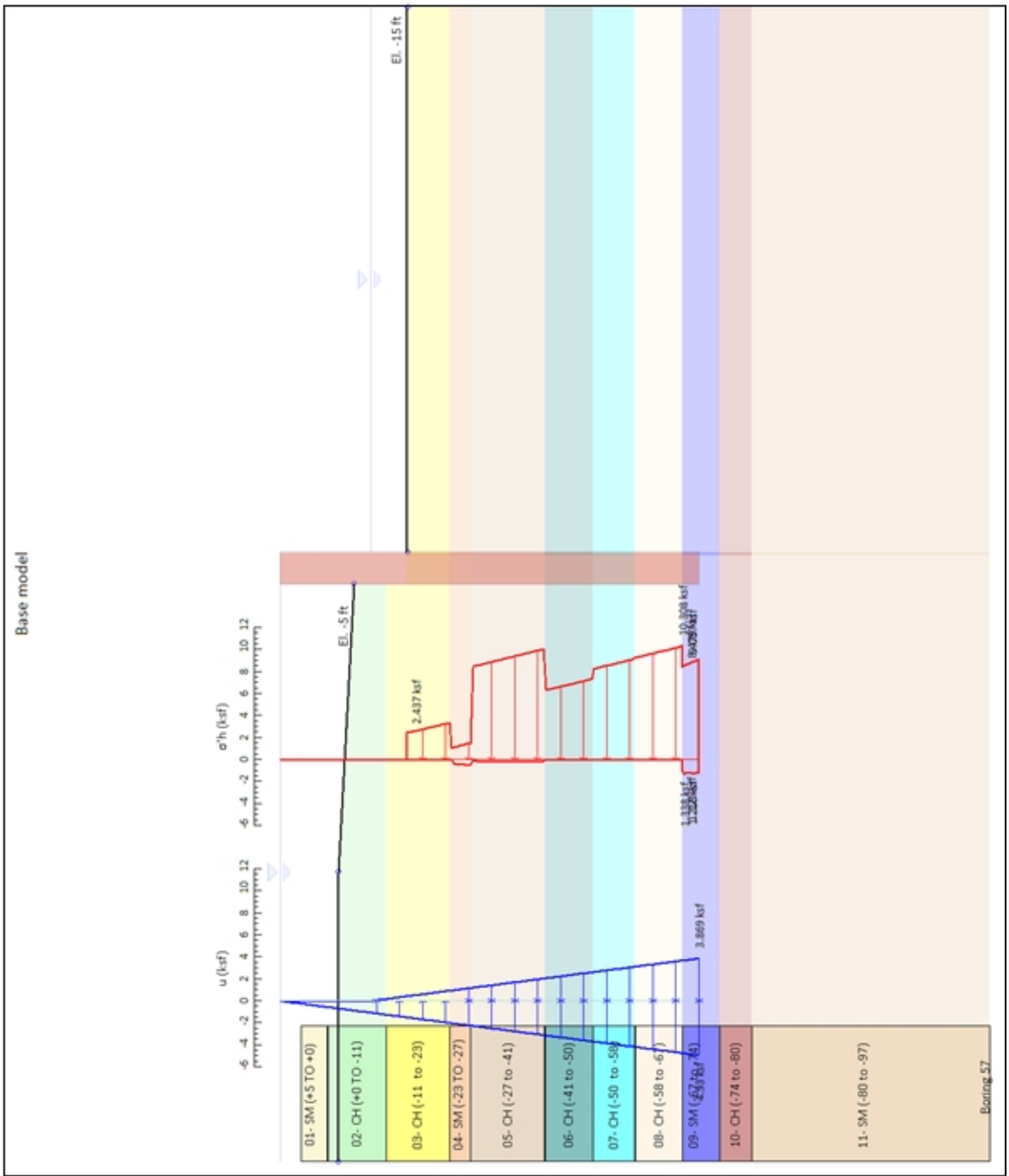
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

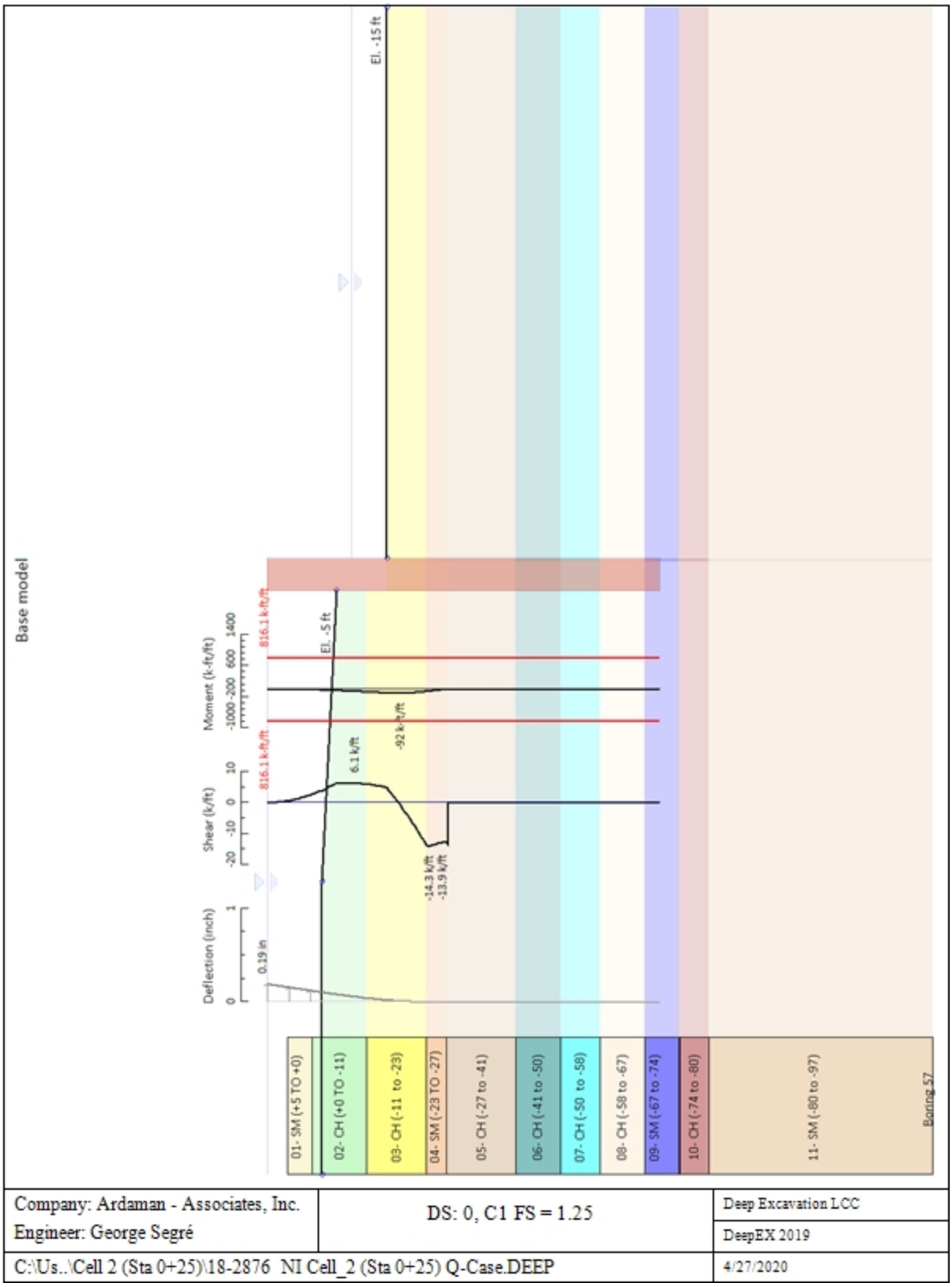
A sequence of figures for each excavation stage is reported

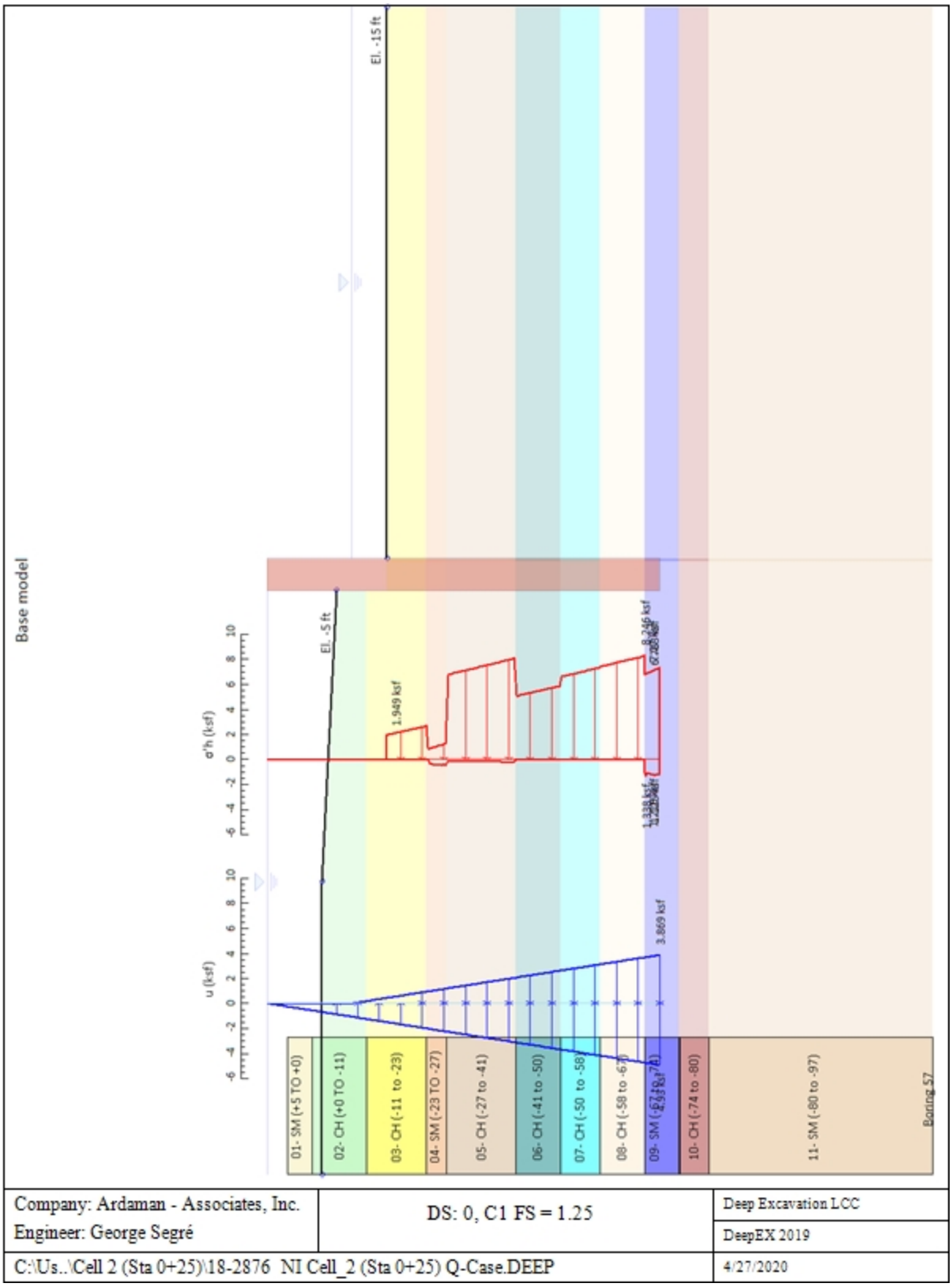


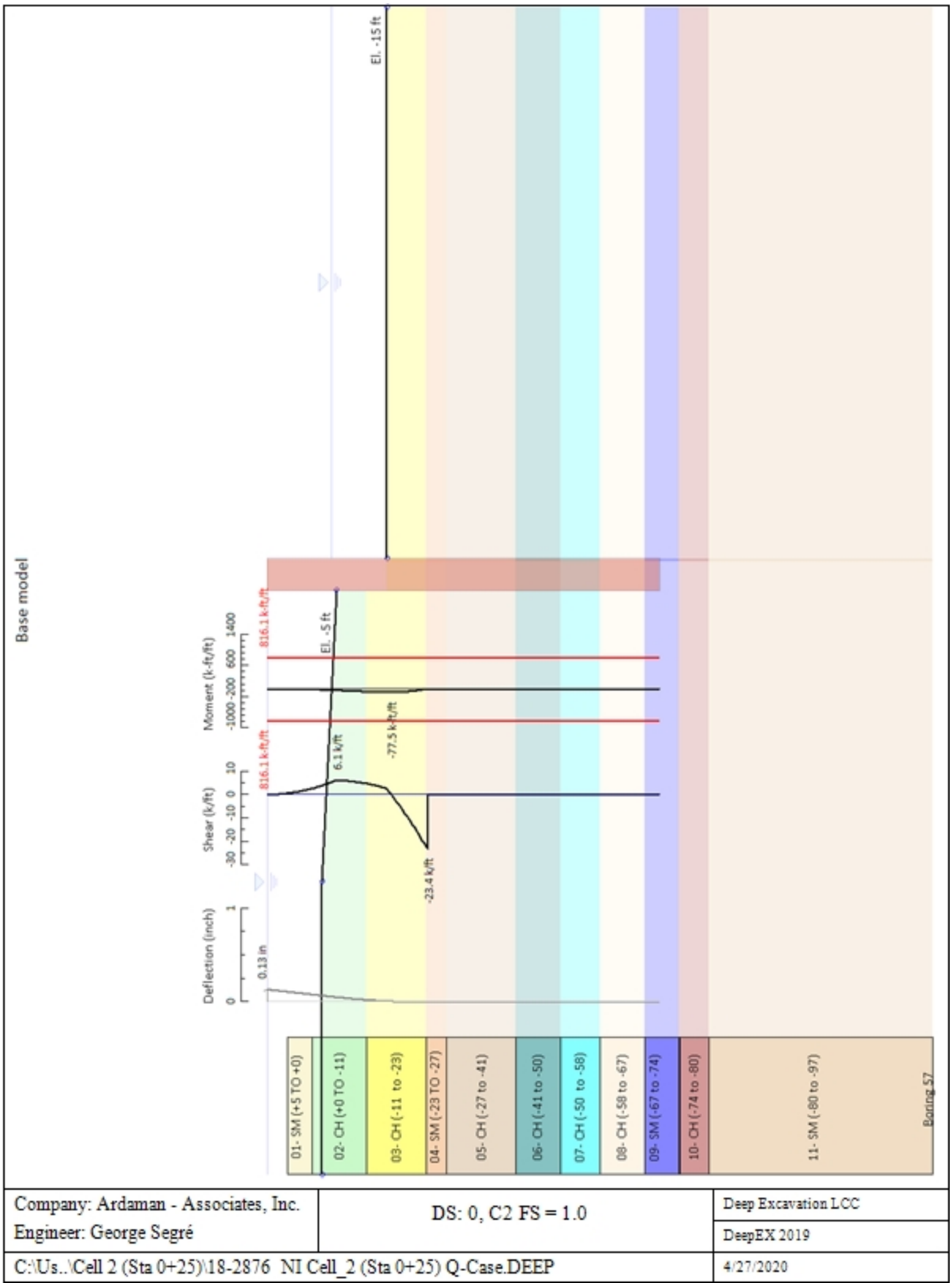

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |

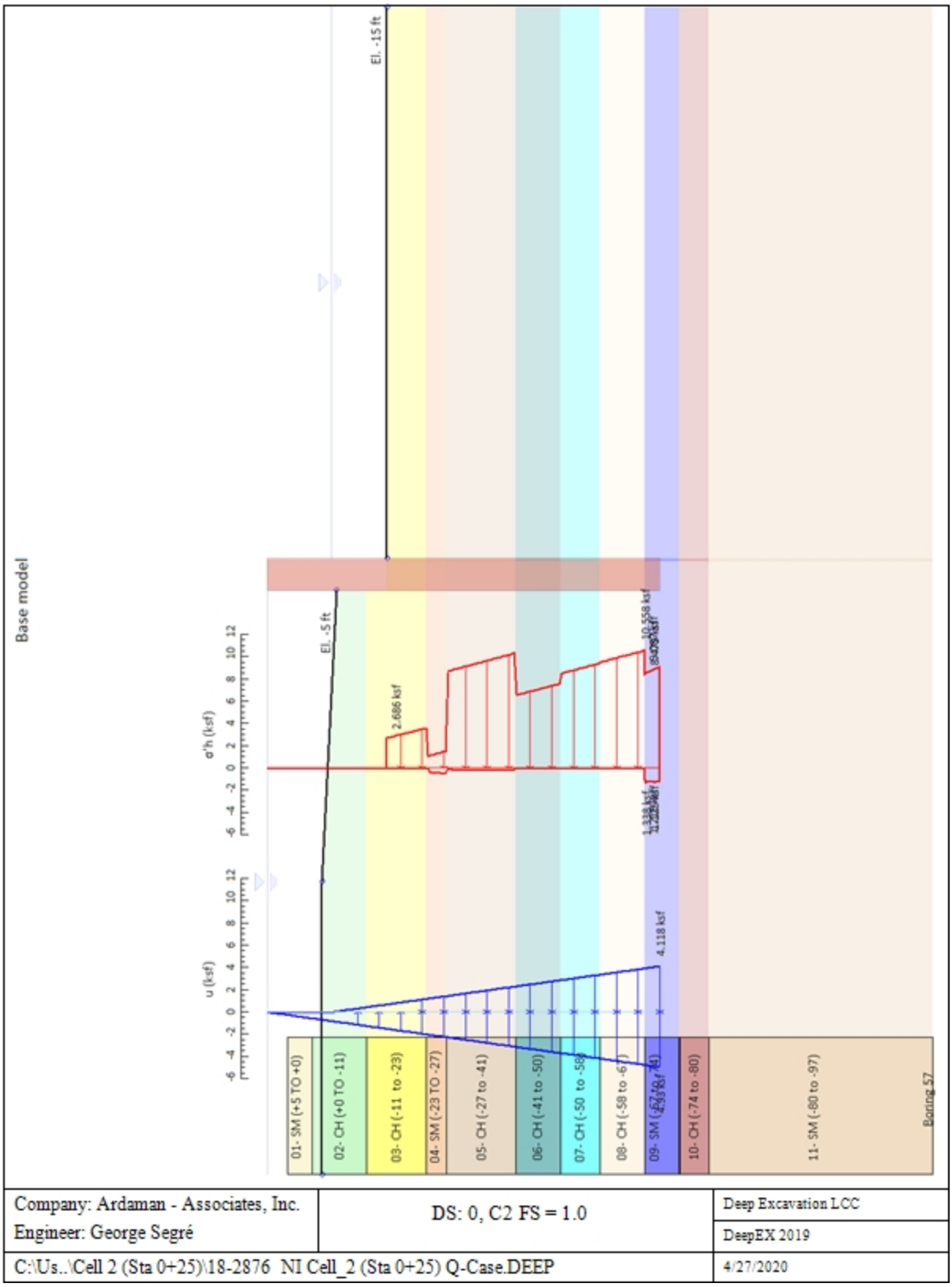


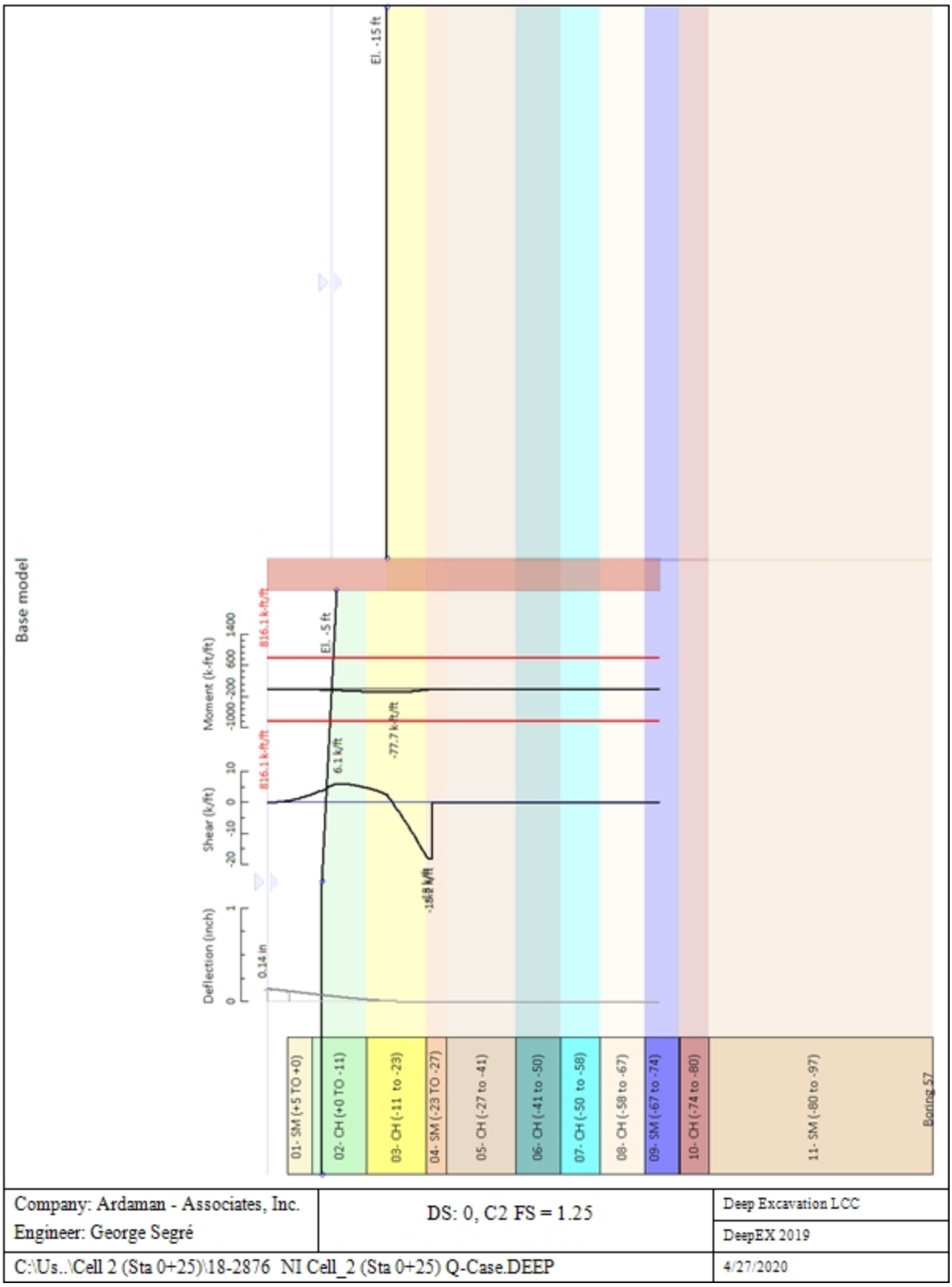

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
El. -5 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-92 k-ft/ft
Shear (k/ft)
-20 -10 0 10
816.1 k-ft/ft
6.1 k/ft
-14.3 k/ft
-13.9 k/ft
Deflection (inch)
0 1
0.19 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

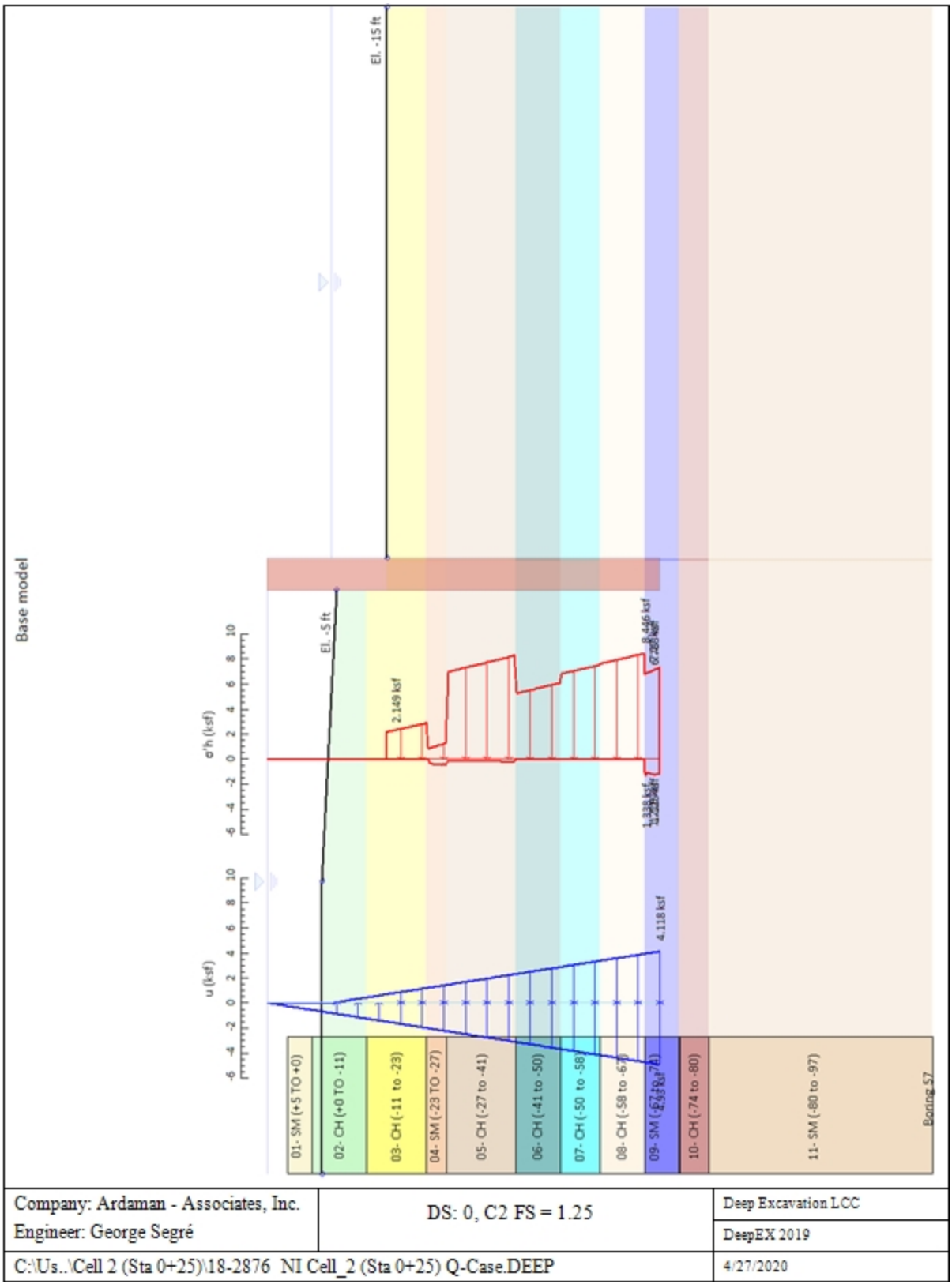

Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
1.949 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

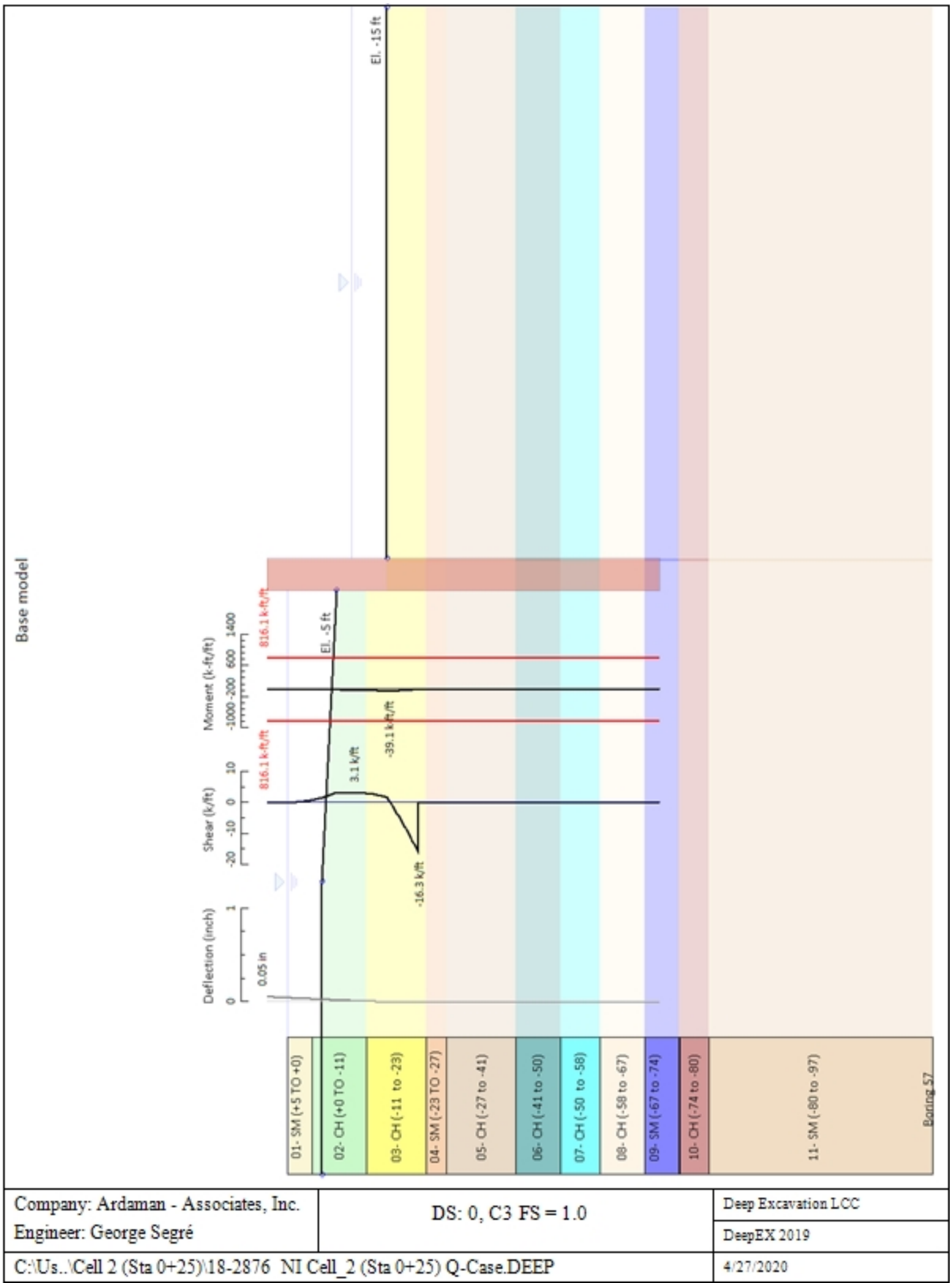

Base model
El. -15 ft
El. -5 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-77.5 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
816.1 k-ft/ft
6.1 k/ft
-23.4 k/ft
Deflection (inch)
0 1
0.13 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

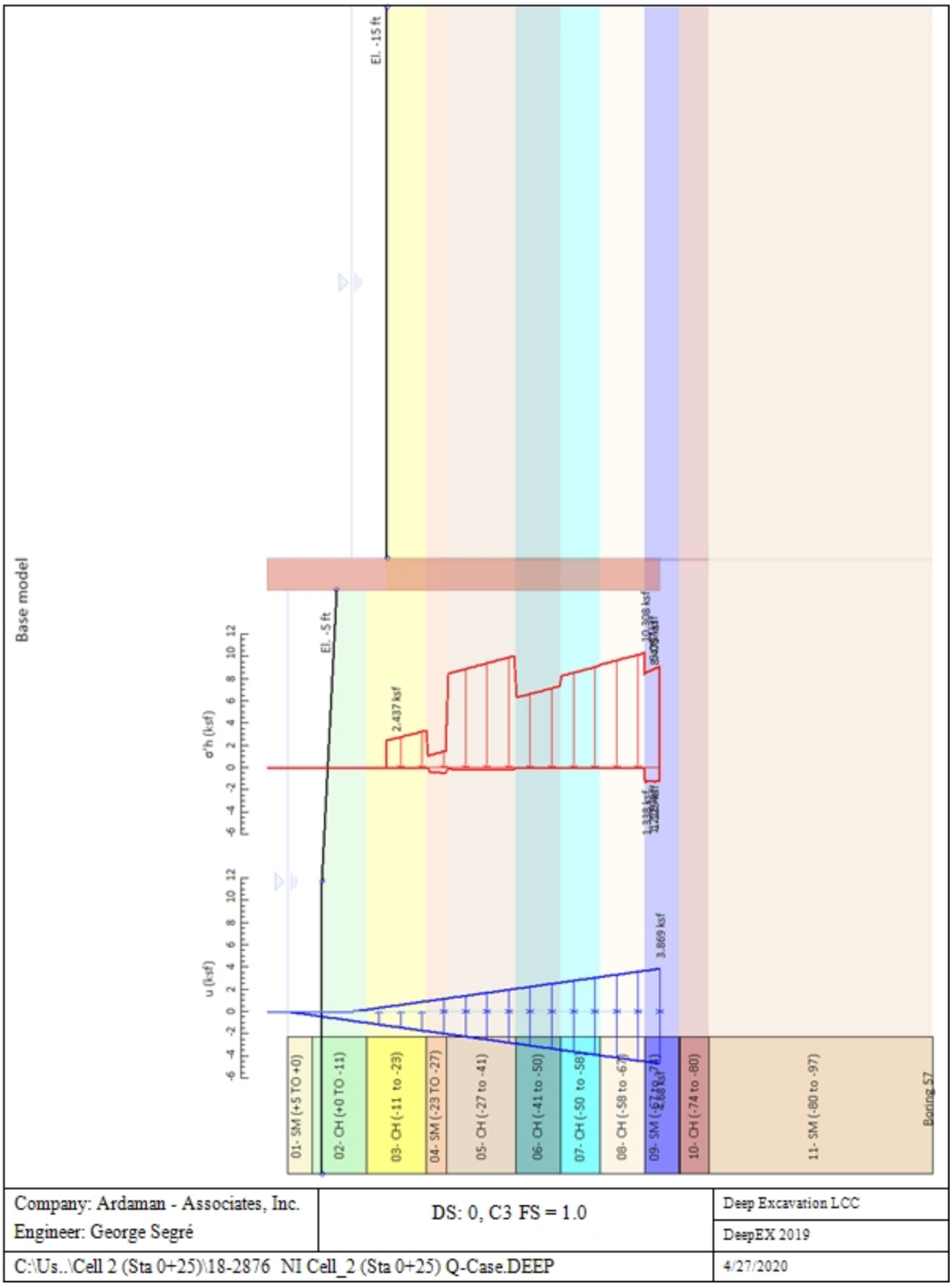


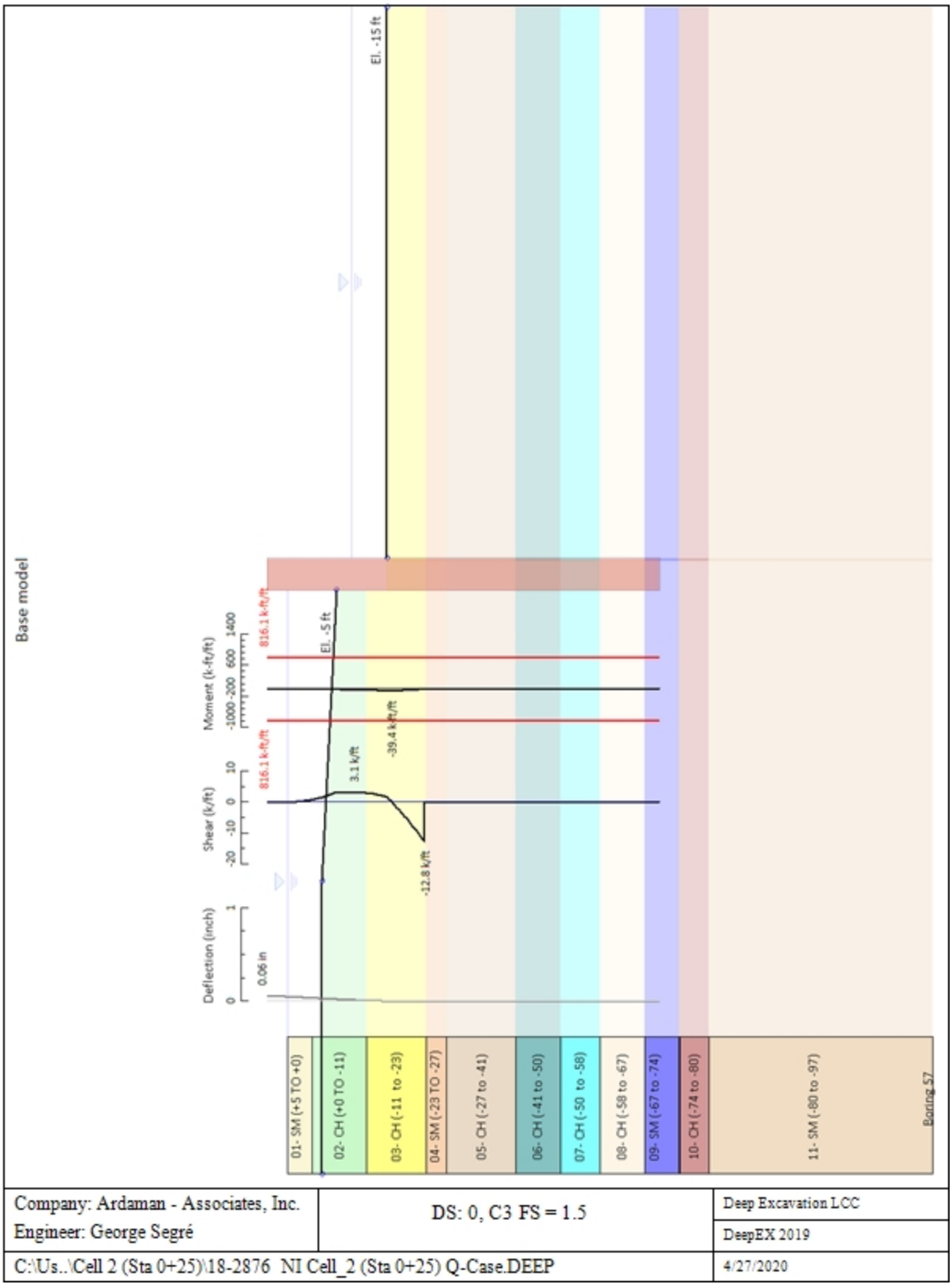

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.149 ksf
8.446 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

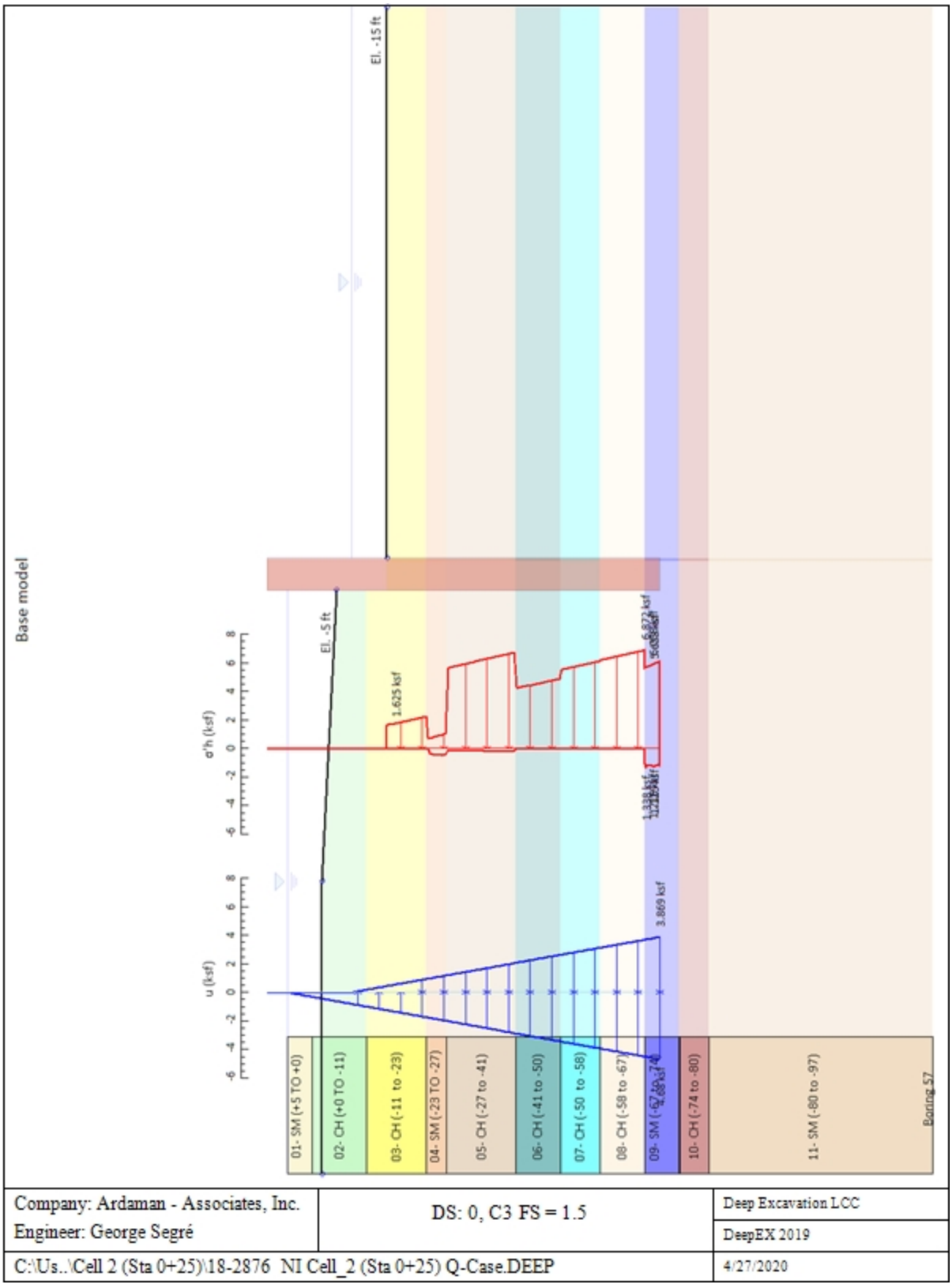



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |

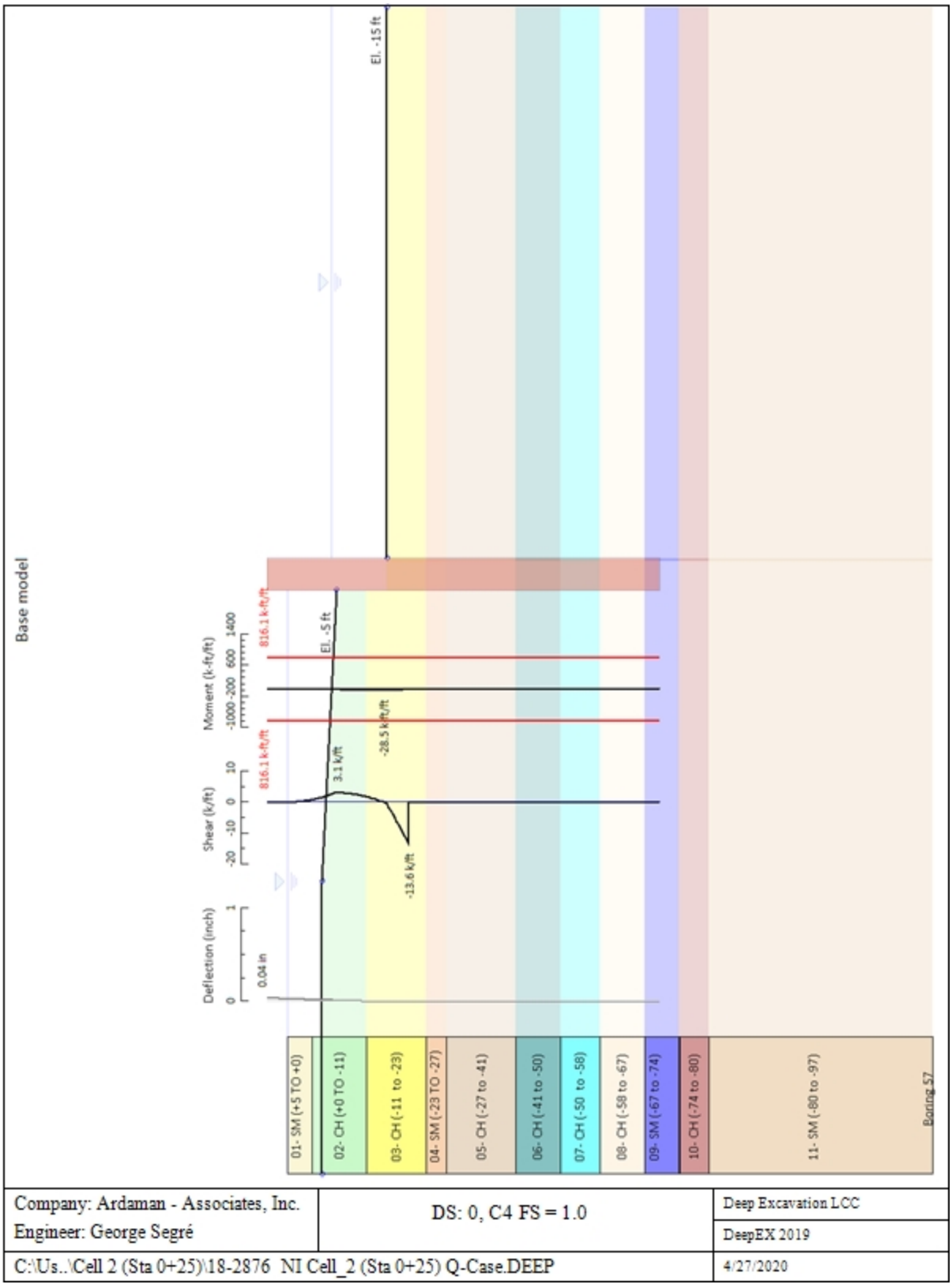

Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.437 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020



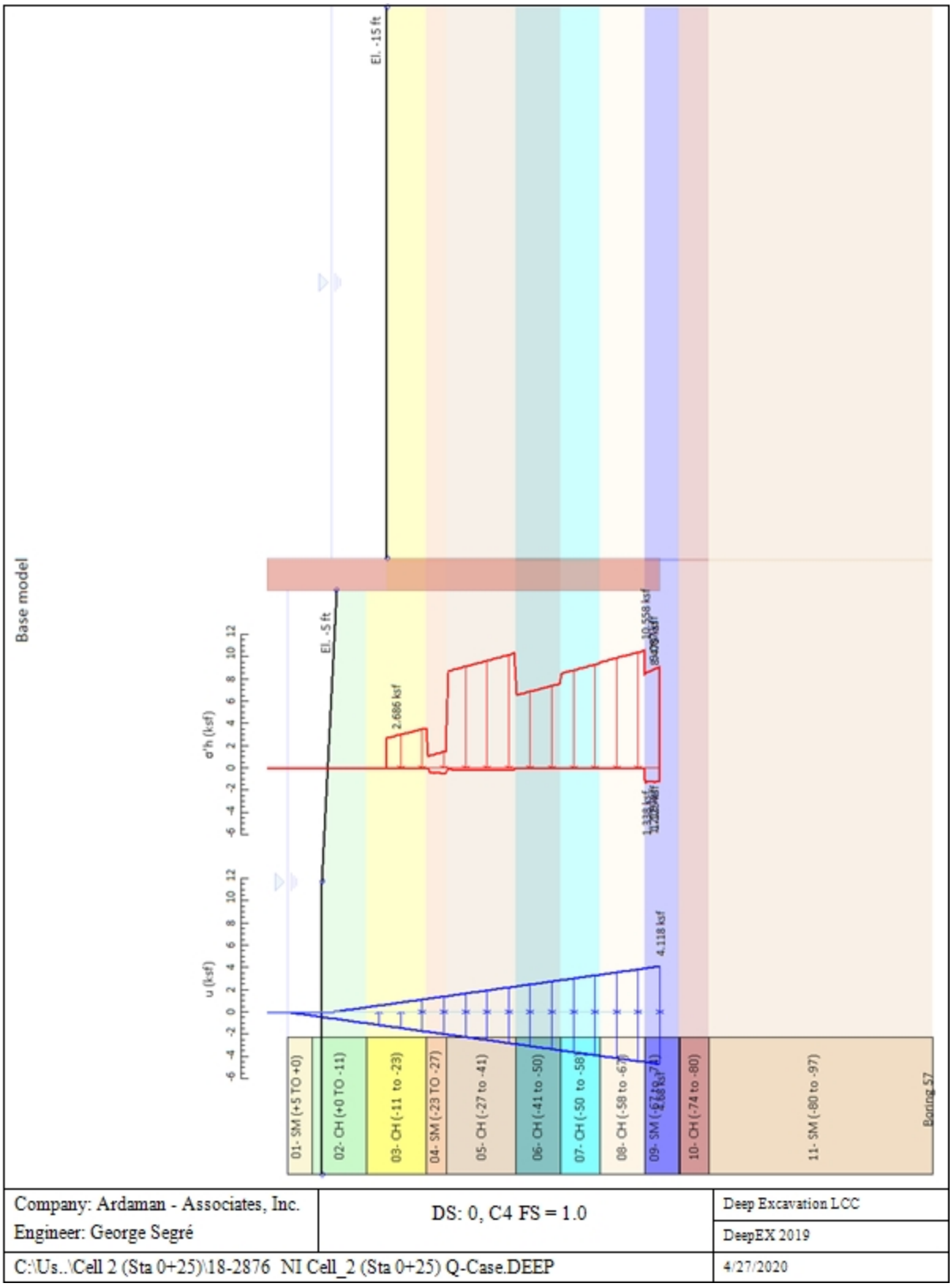

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |

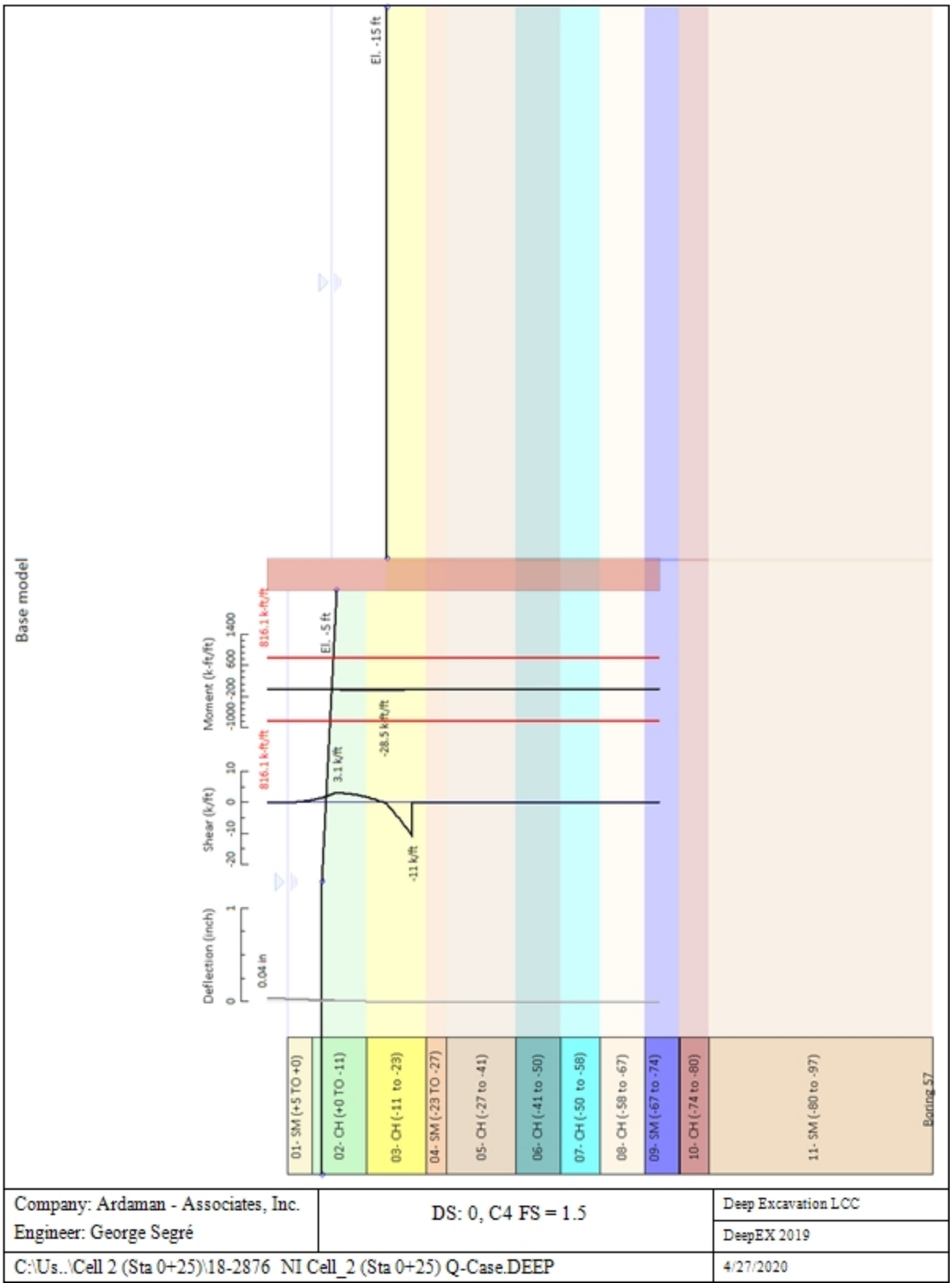



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |

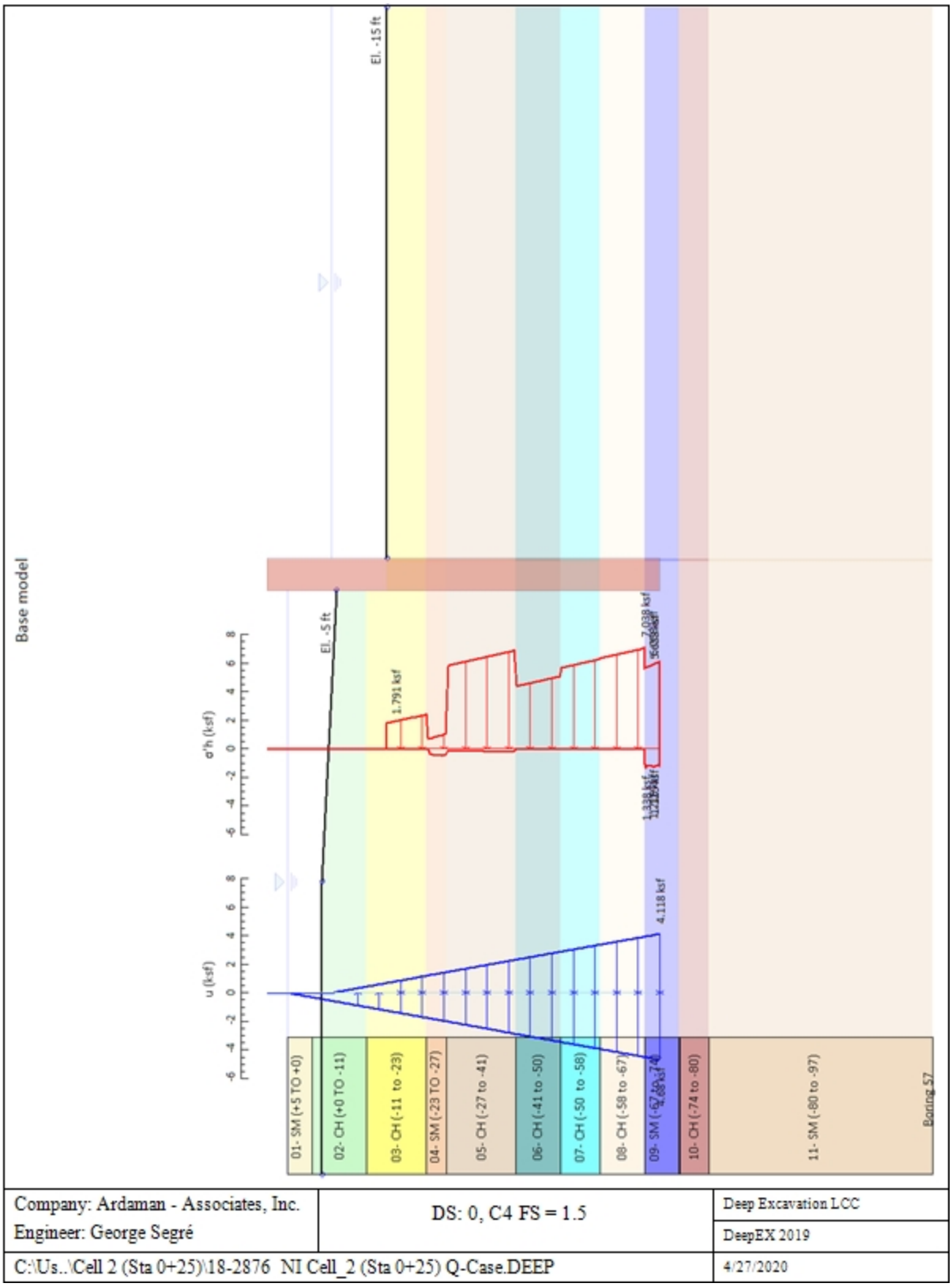



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020




Attachment Figure C.2-25




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP | | 4/27/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:48:49 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 150 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | - | - | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | - | - | 0.609 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

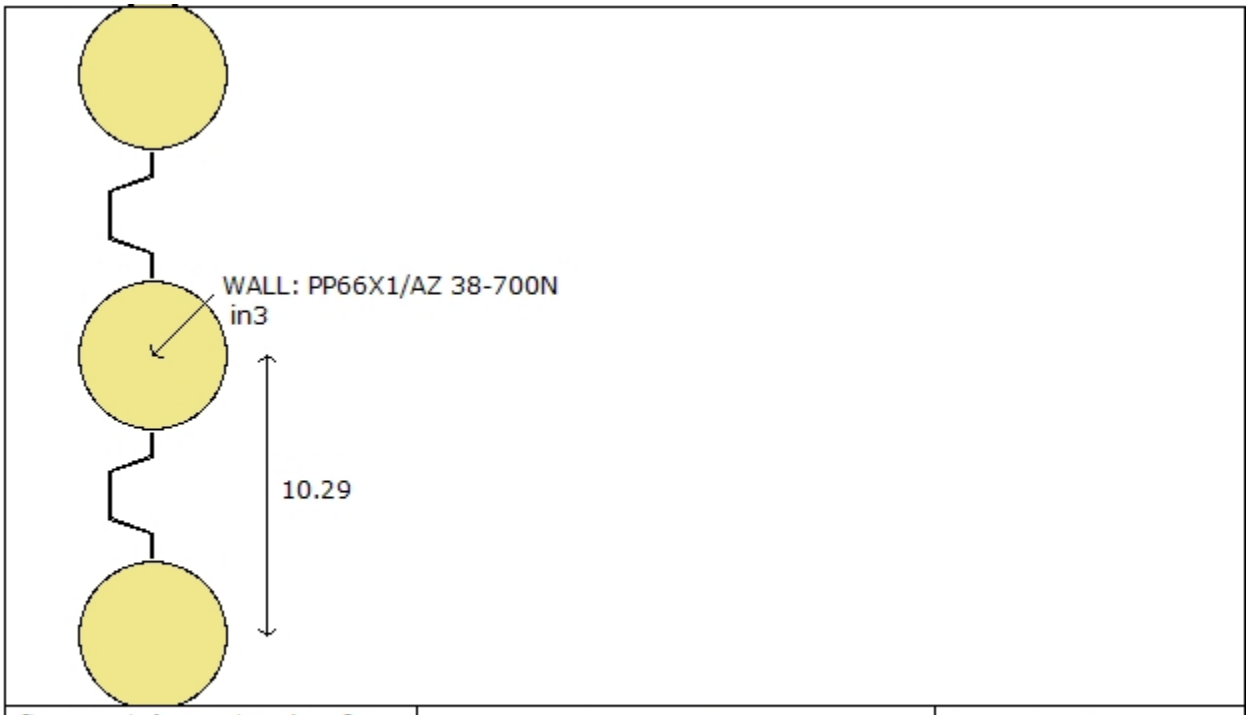
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 0.61 |
| -11 | 03- CH (-11 to | 1 | 0.61 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 0.61 |
| -41 | 06- CH (-41 to | 1 | 0.61 |
| -50 | 07- CH (-50 to | 1 | 0.61 |
| -58 | 08- CH (-58 to | 1 | 0.56 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 0.56 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -95 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.293 | 1.293 | 1.721 |
| Stage 1 | Simple span | N/A | 1.6 | 1.129 | 1.129 | 1.489 |
| Stage 2 | Simple span | N/A | 1.6 | 1.361 | 1.361 | 1.774 |
| Stage 3 | Simple span | N/A | 1.6 | 1.197 | 1.197 | 1.541 |
| Stage 4 | Simple span | N/A | 1.6 | 1.42 | 1.42 | 1.832 |
| Stage 5 | Simple span | N/A | 1.6 | 1.121 | 1.121 | 1.419 |
| Stage 6 | Simple span | N/A | 1.6 | 1.495 | 1.495 | 1.887 |
| Stage 7 | Simple span | N/A | 1.6 | 1.196 | 1.196 | 1.475 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

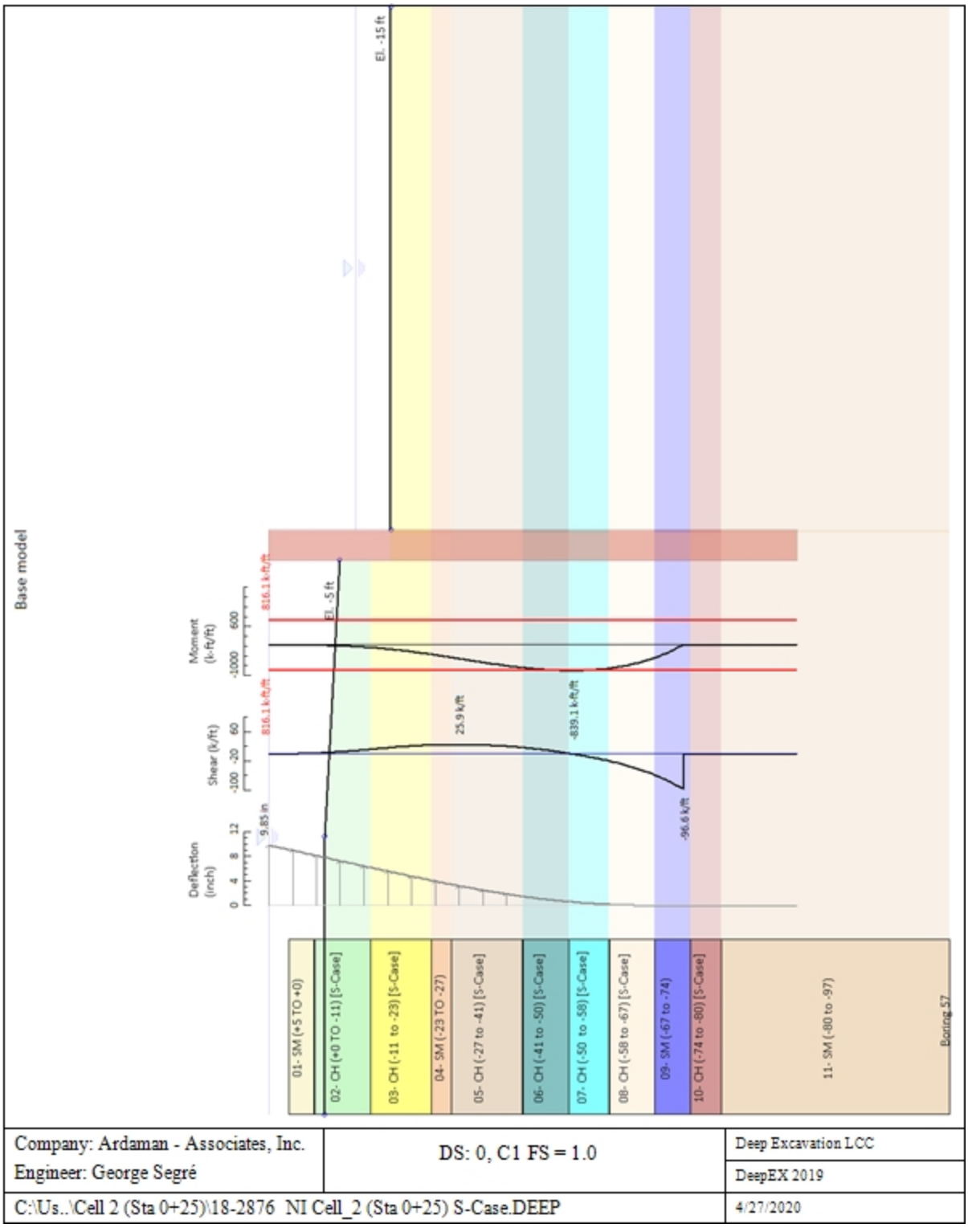
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

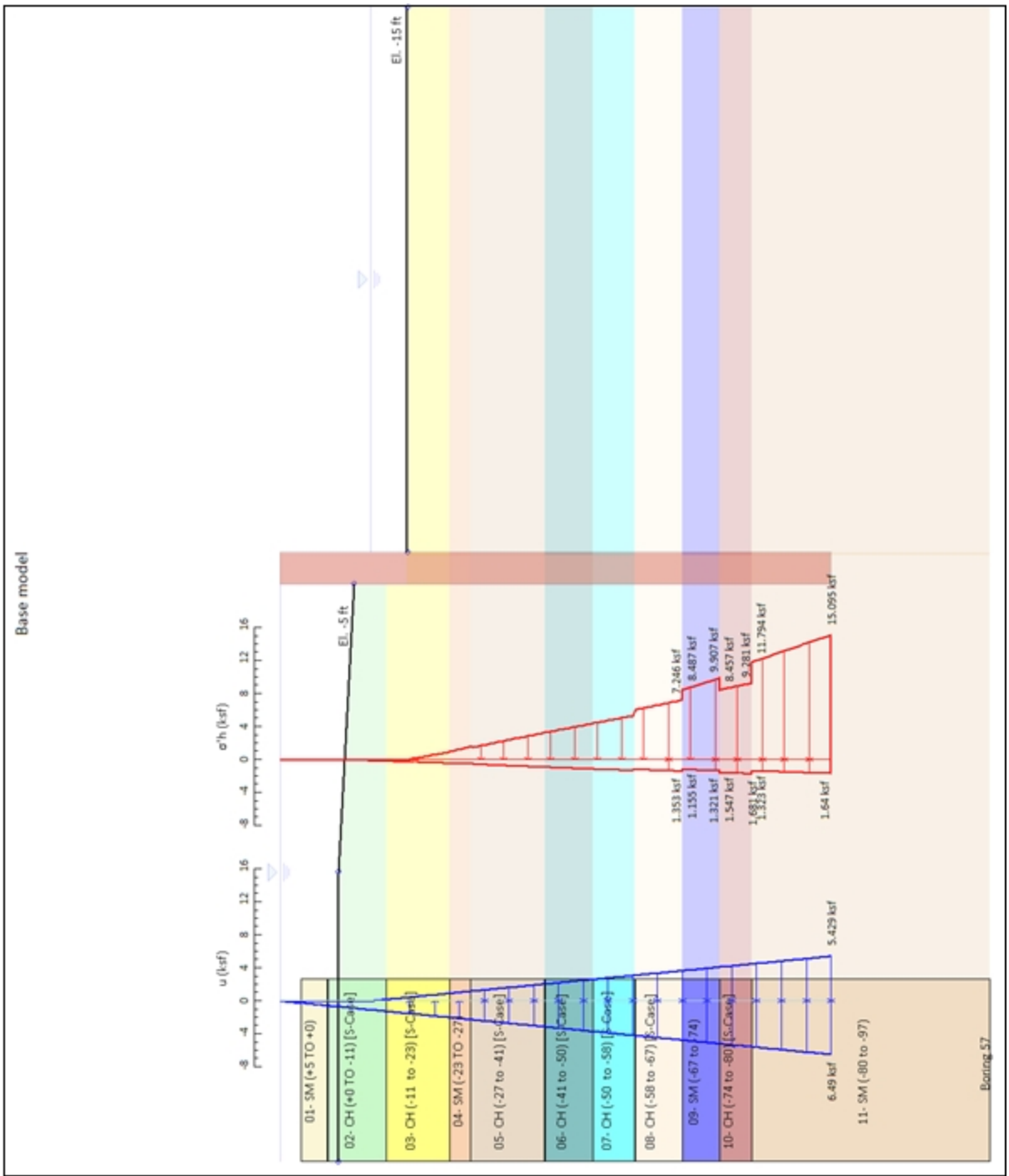
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

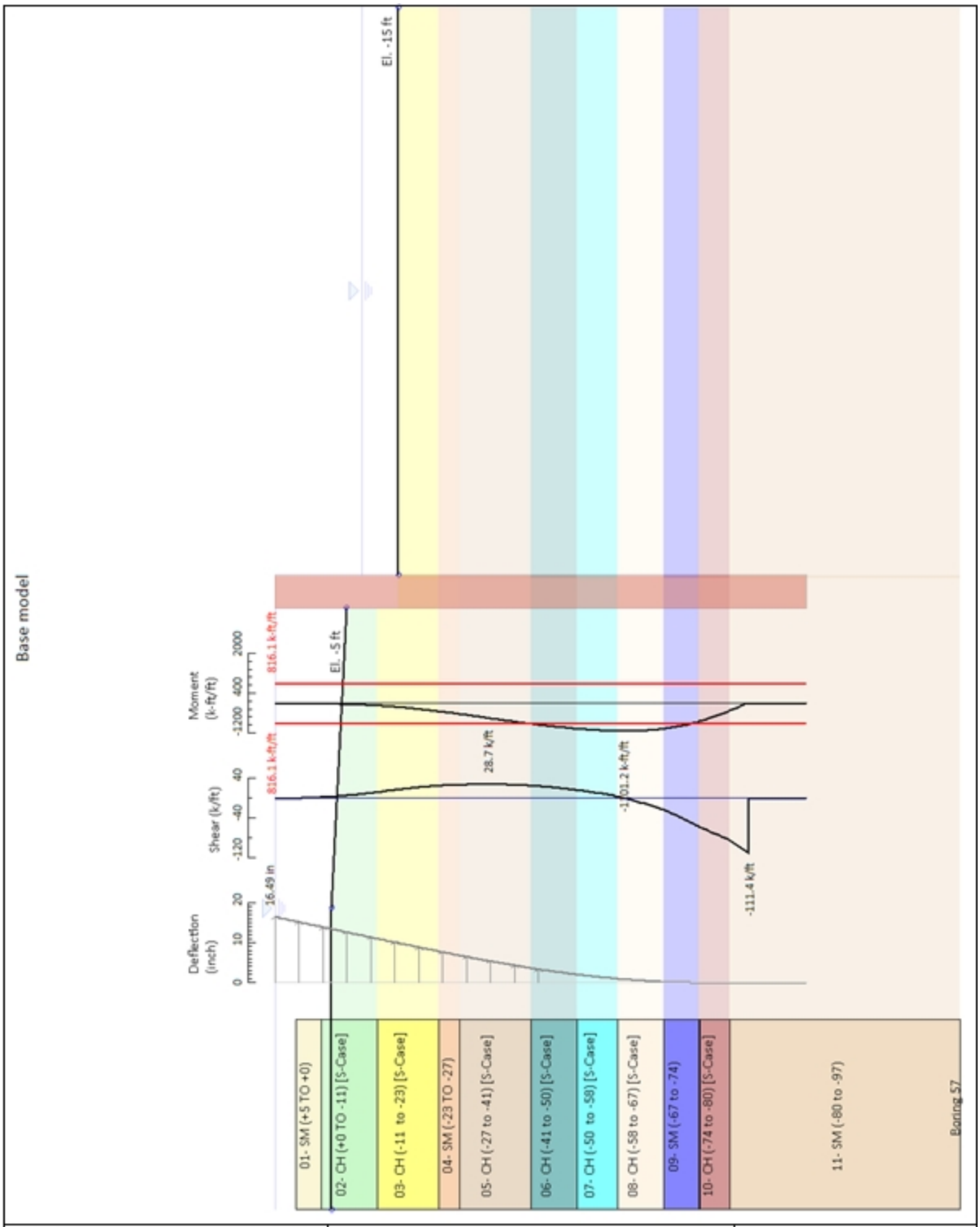
A sequence of figures for each excavation stage is reported



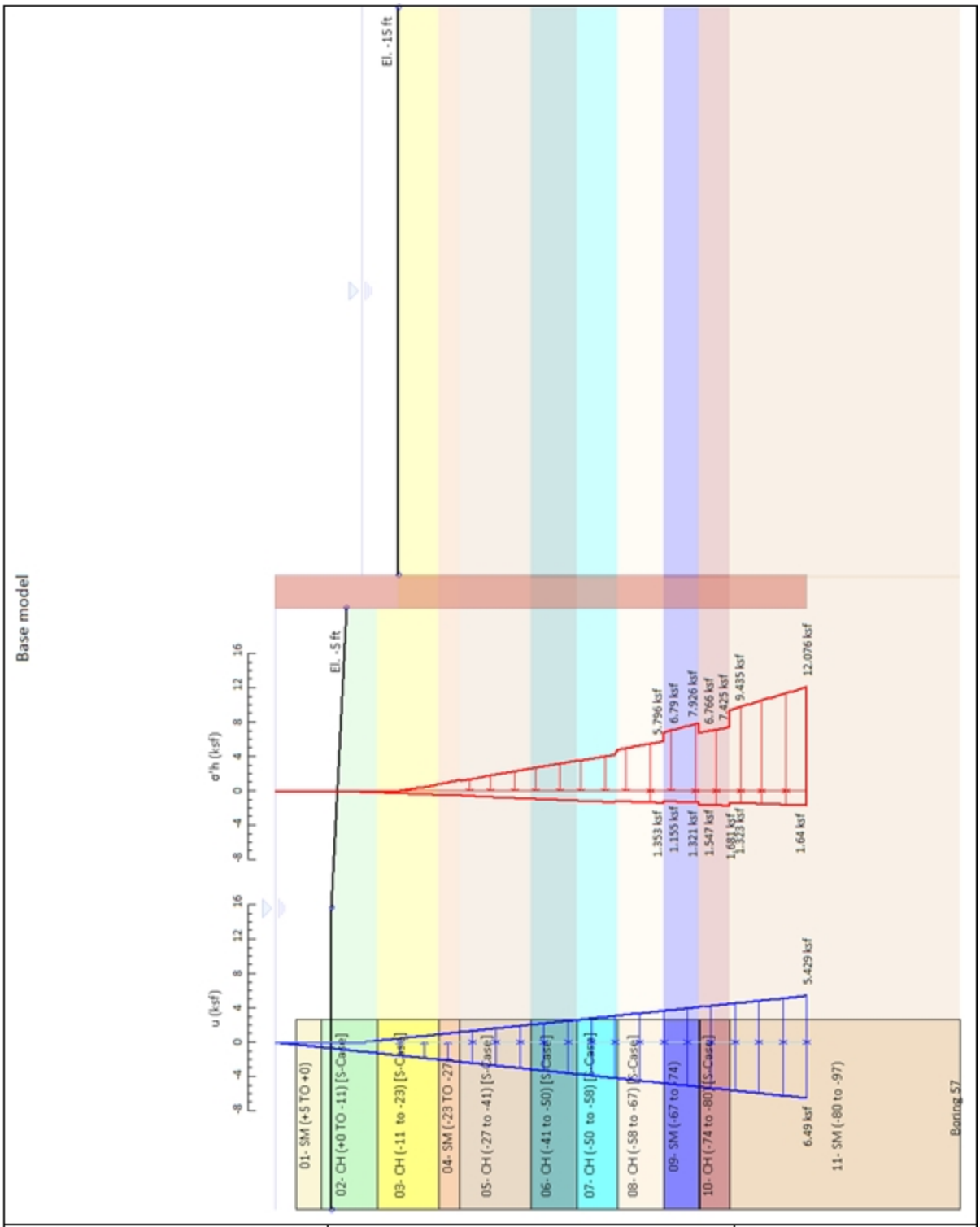

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |



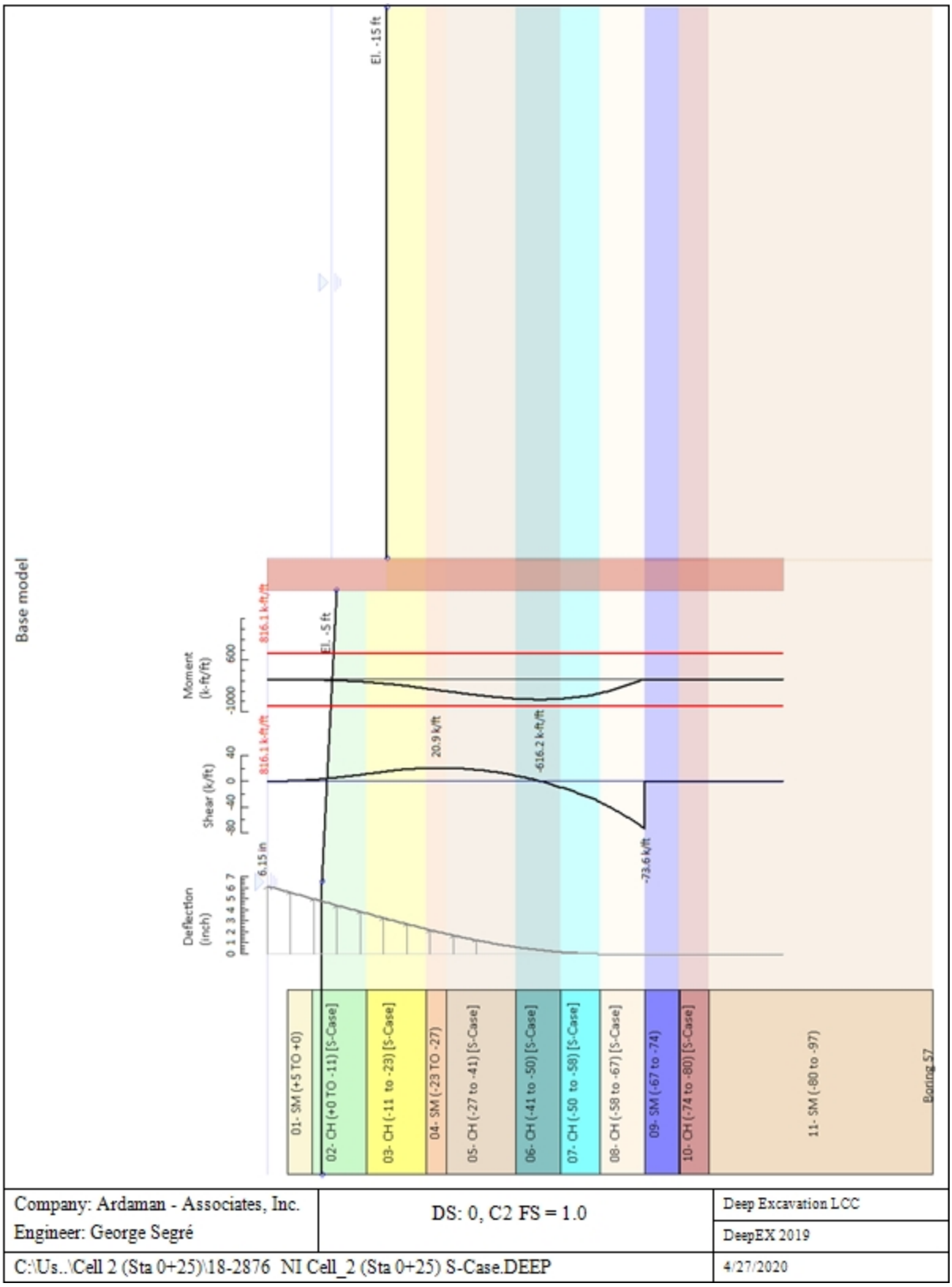

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |



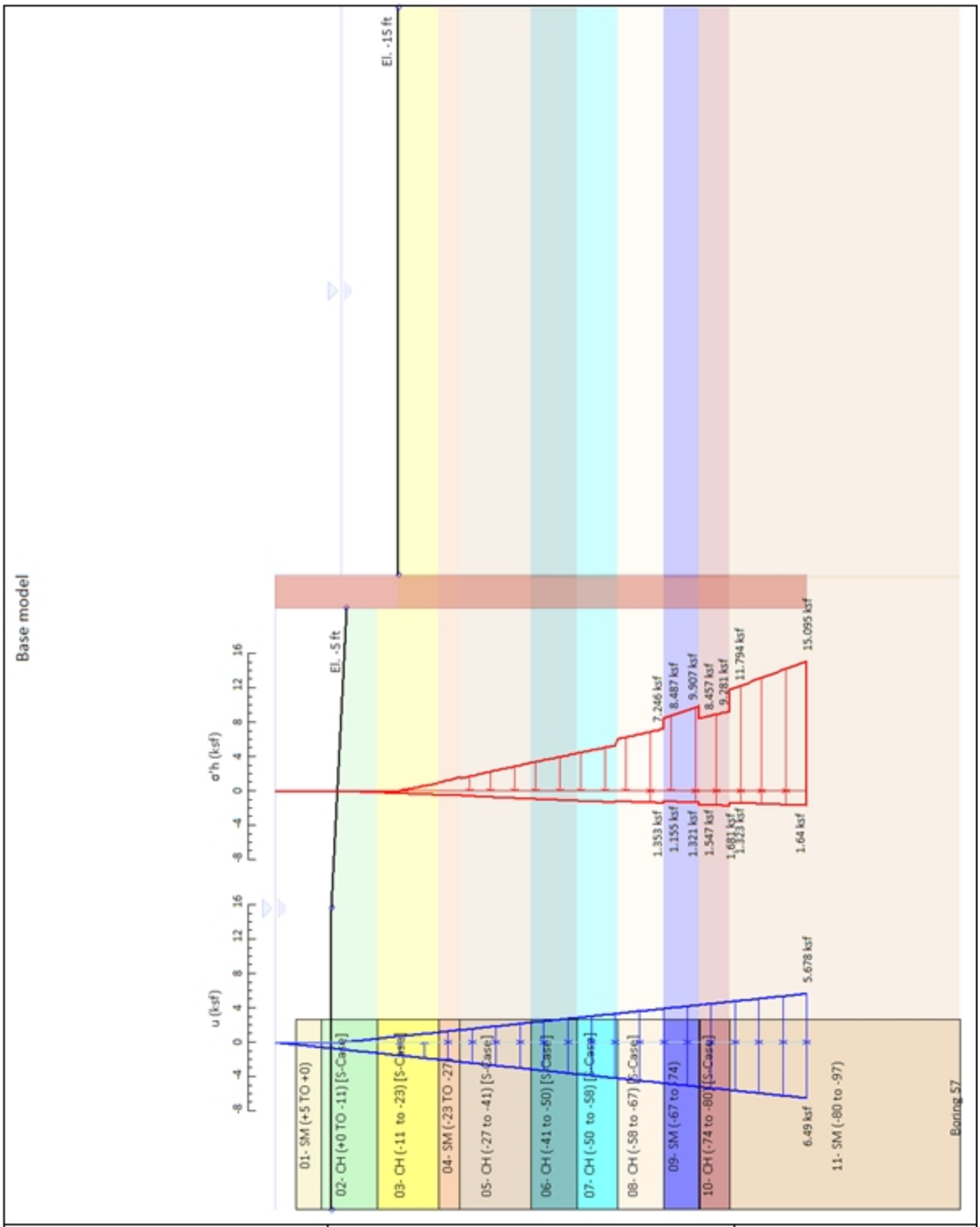

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |



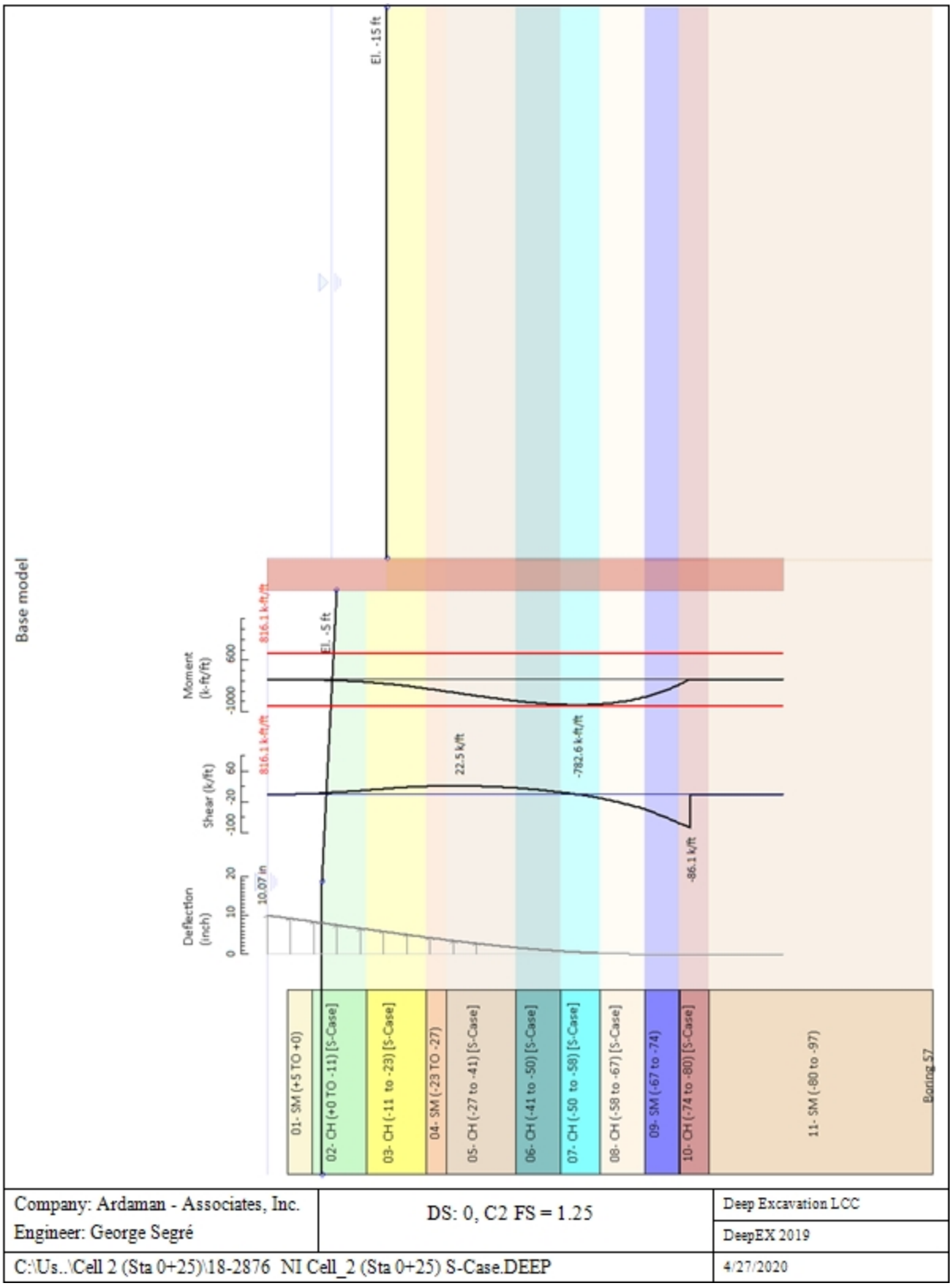

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |



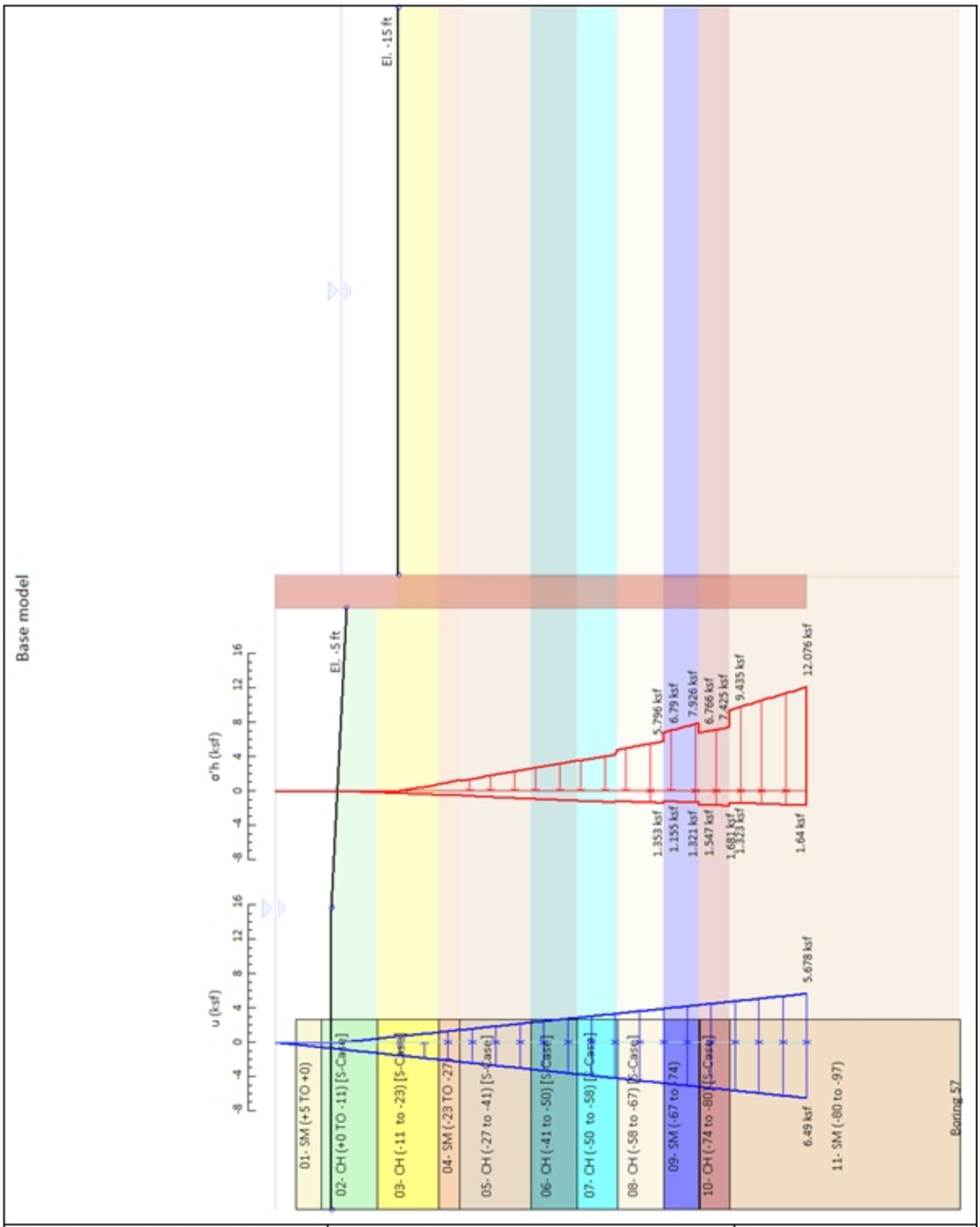

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |



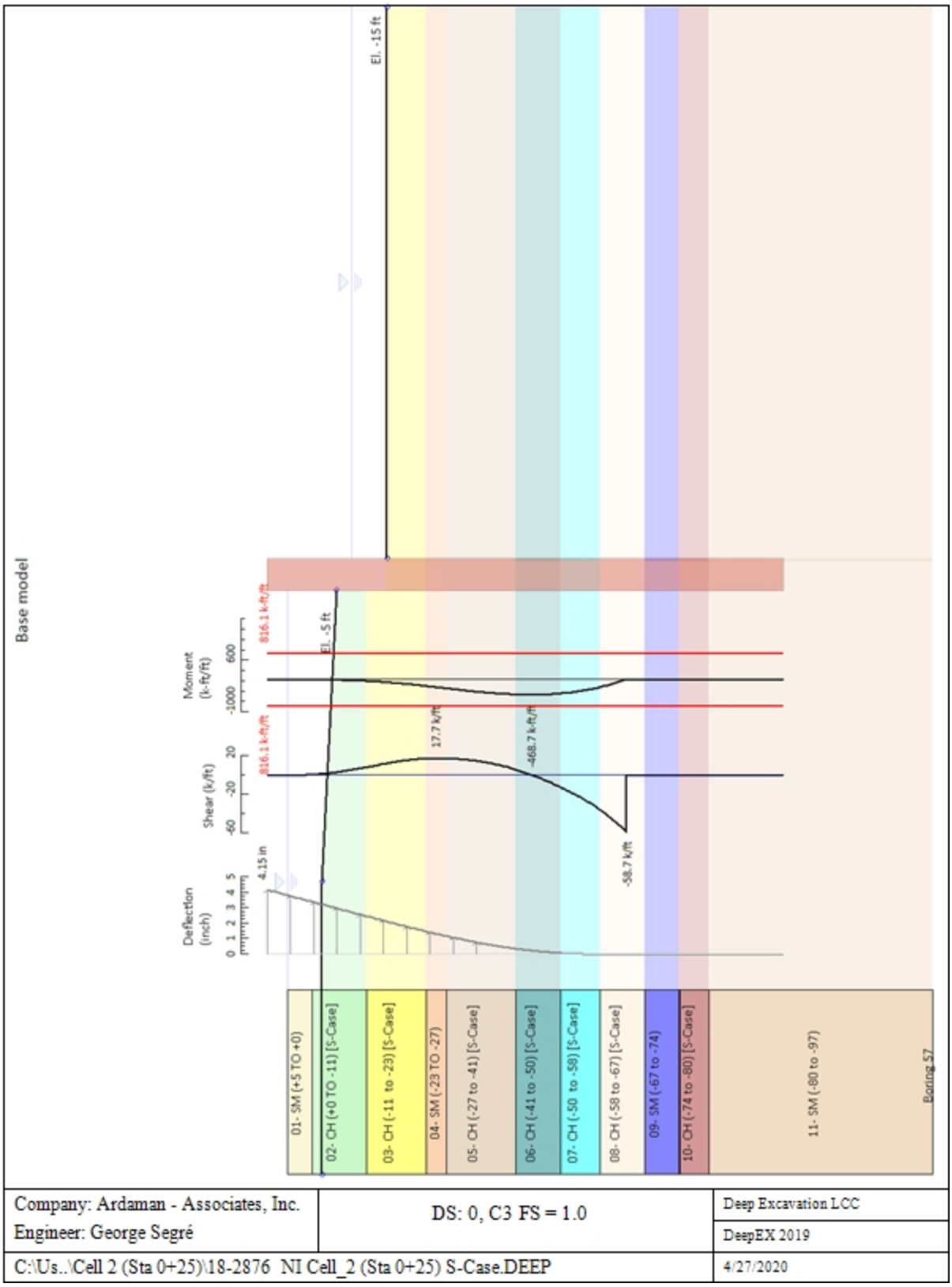

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |

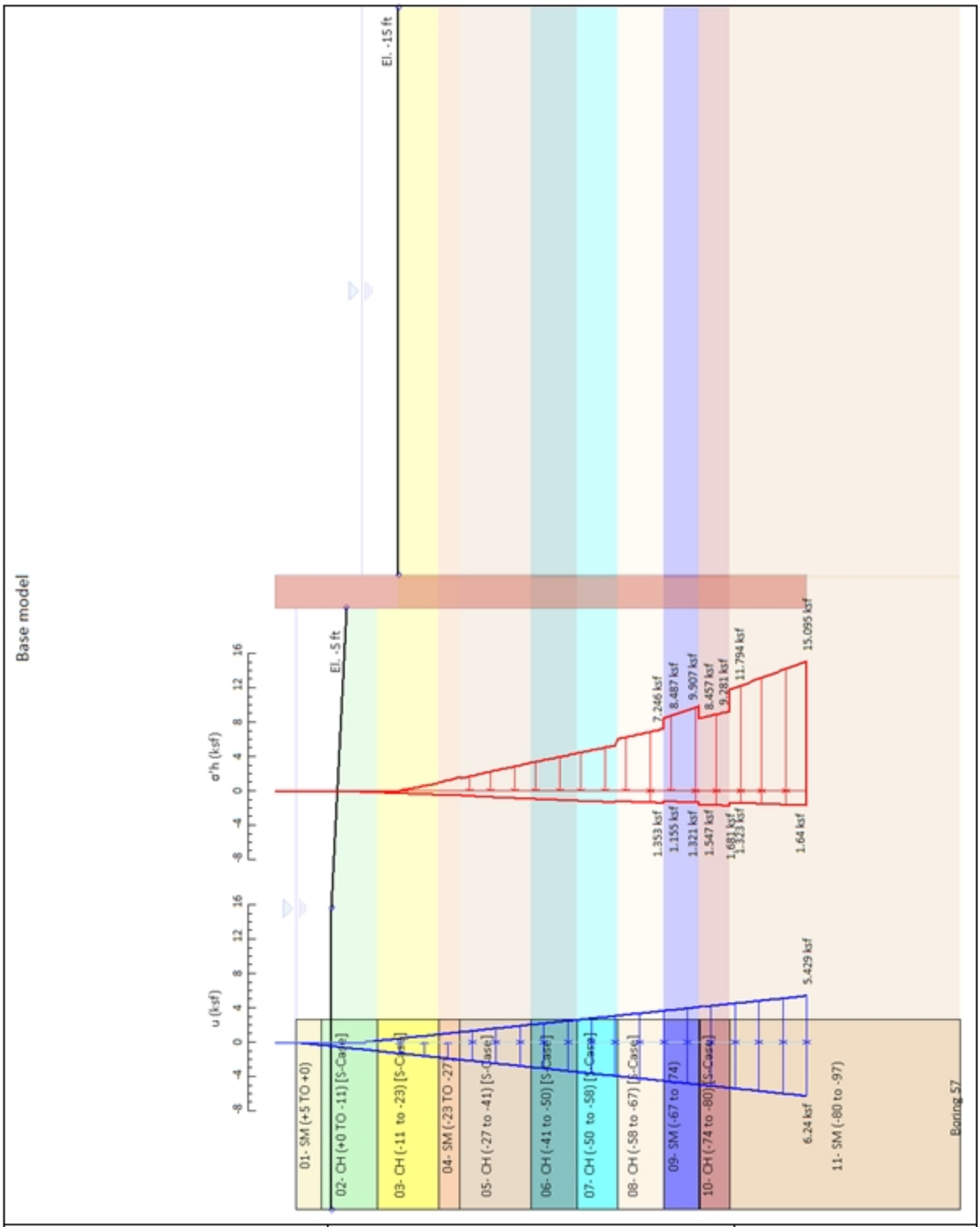



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |

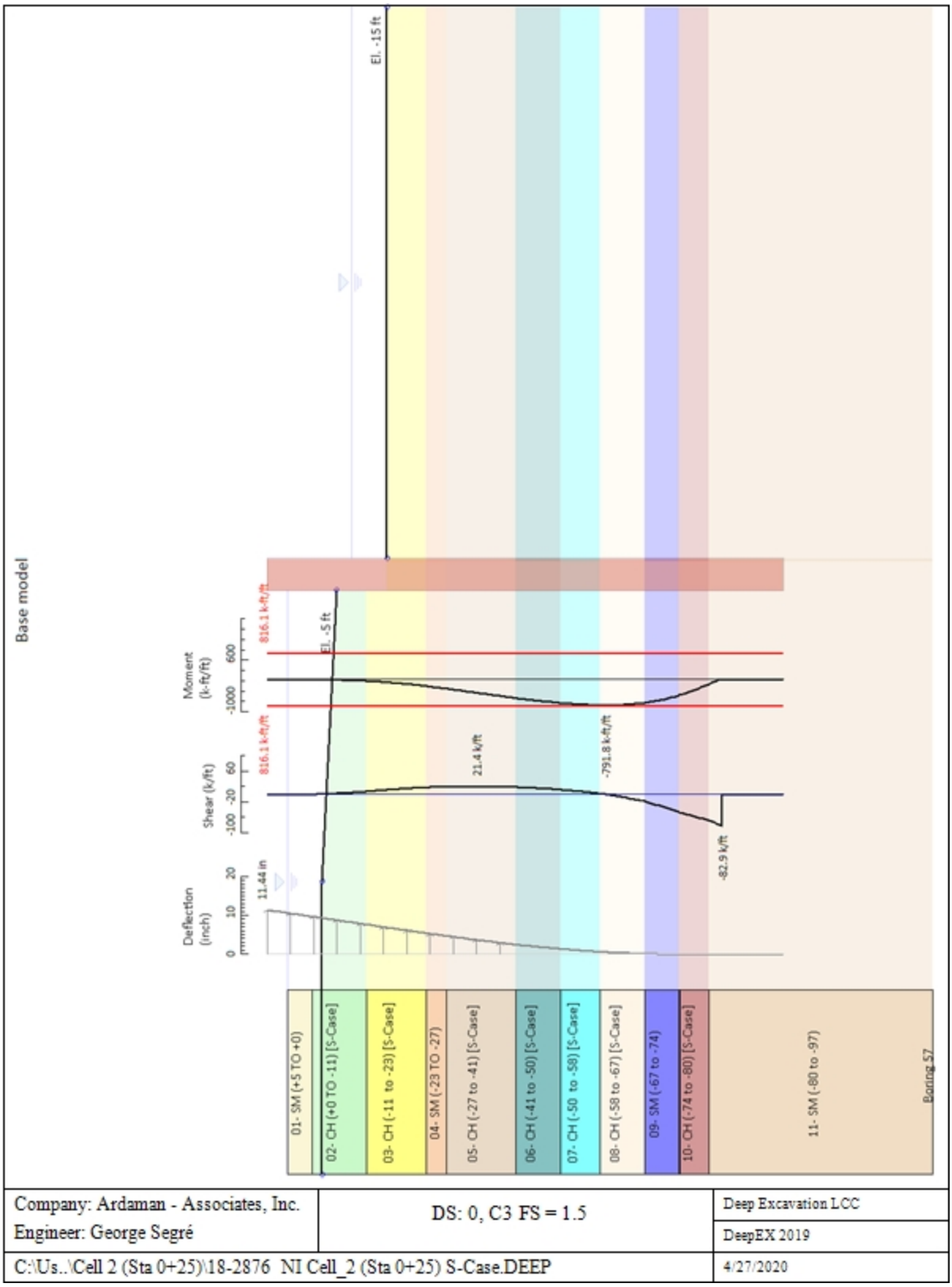


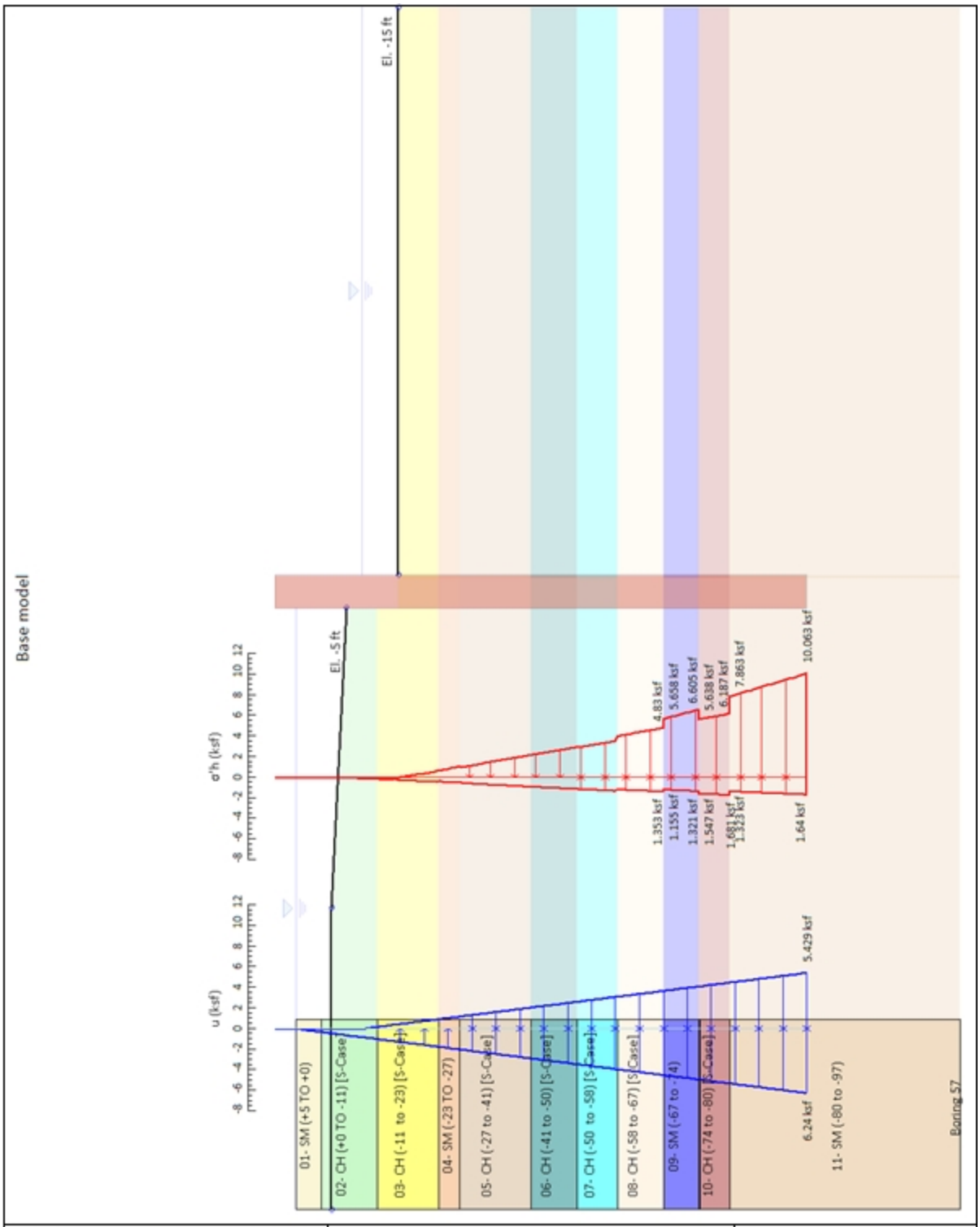

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
El. -5 ft
816.1 k-ft/ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
17.7 k/ft
-468.7 k-ft/ft
Shear (k/ft)
20
-20
-60
4.15 in
Deflection (inch)
0 1 2 3 4 5
-58.7 k/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP
4/27/2020

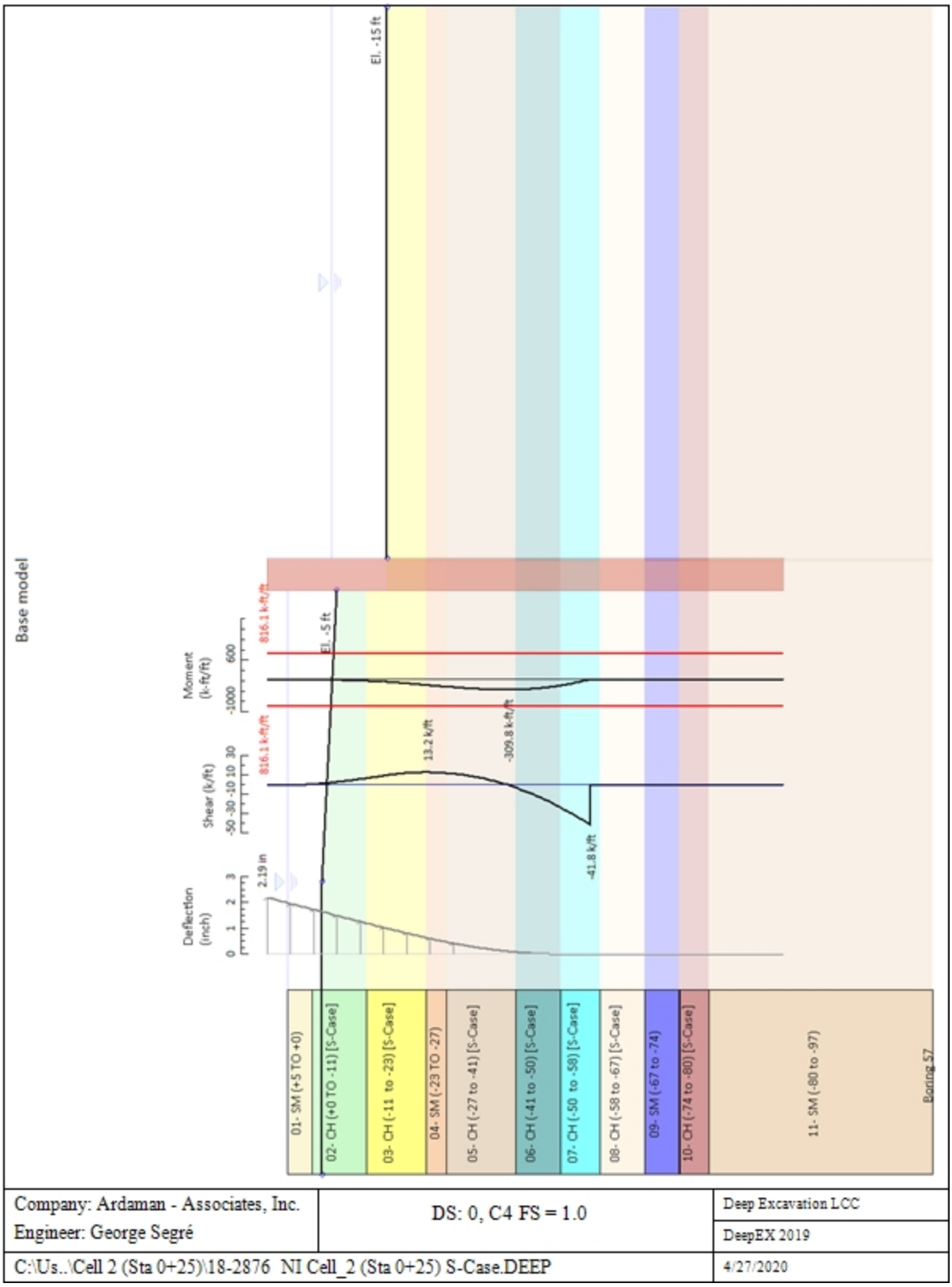



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |

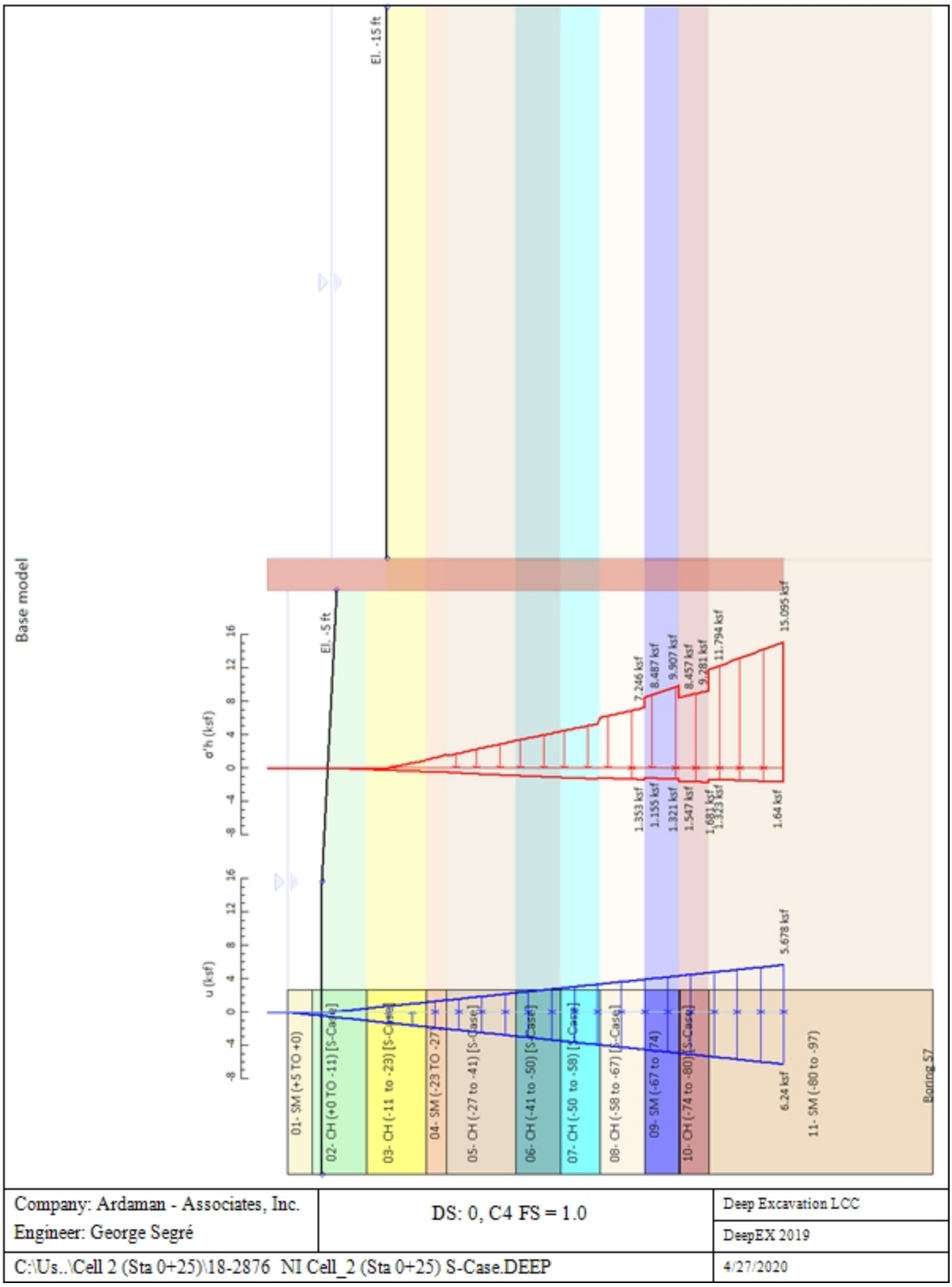

Base model
El. -15 ft
El. -5 ft
816.1 k-ft/ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
Shear (k/ft)
60
-20
-100
21.4 k/ft
-791.8 k-ft/ft
-82.9 k/ft
11.44 in
Deflection (inch)
20
10
0
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP
4/27/2020

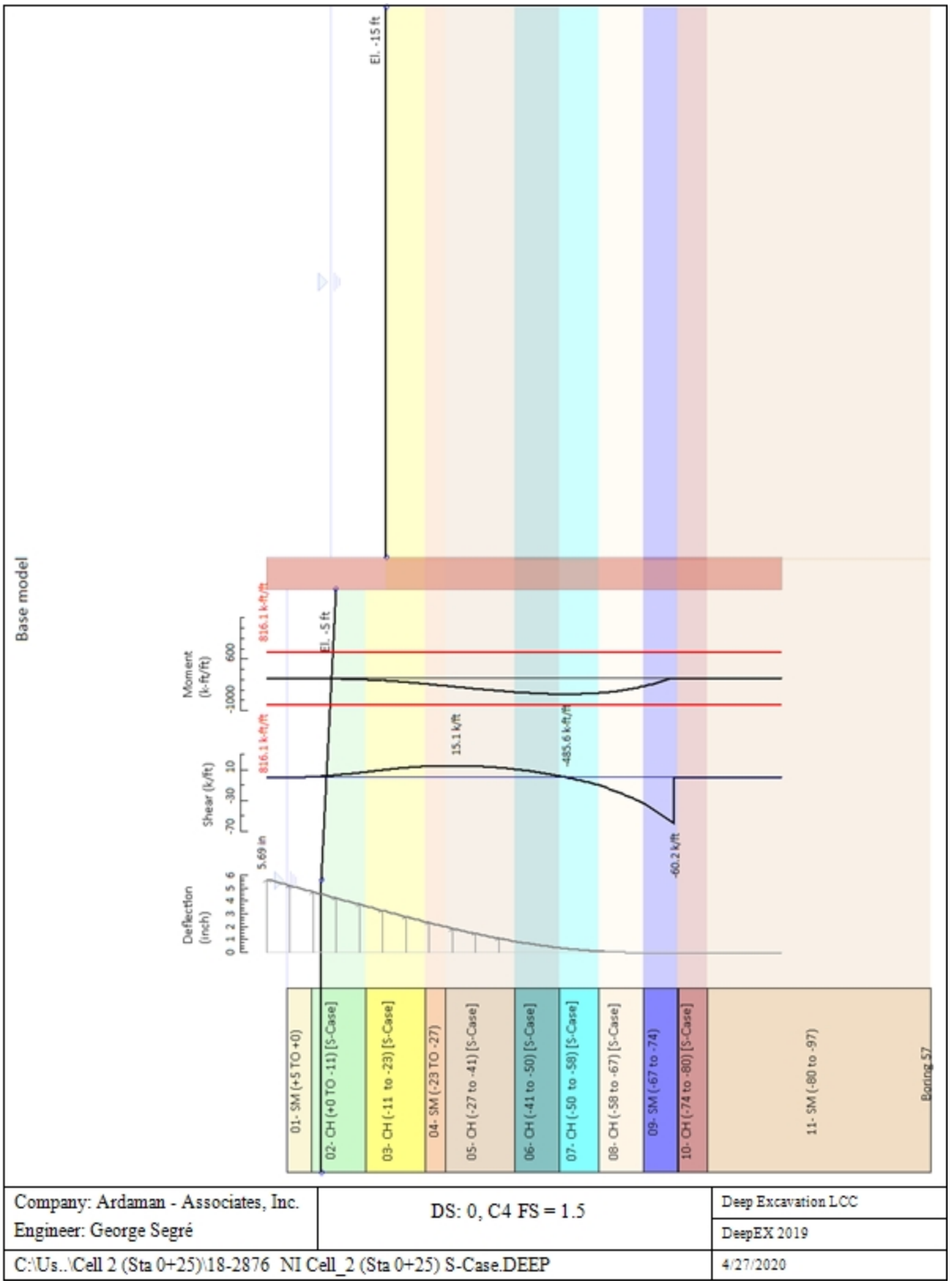



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |

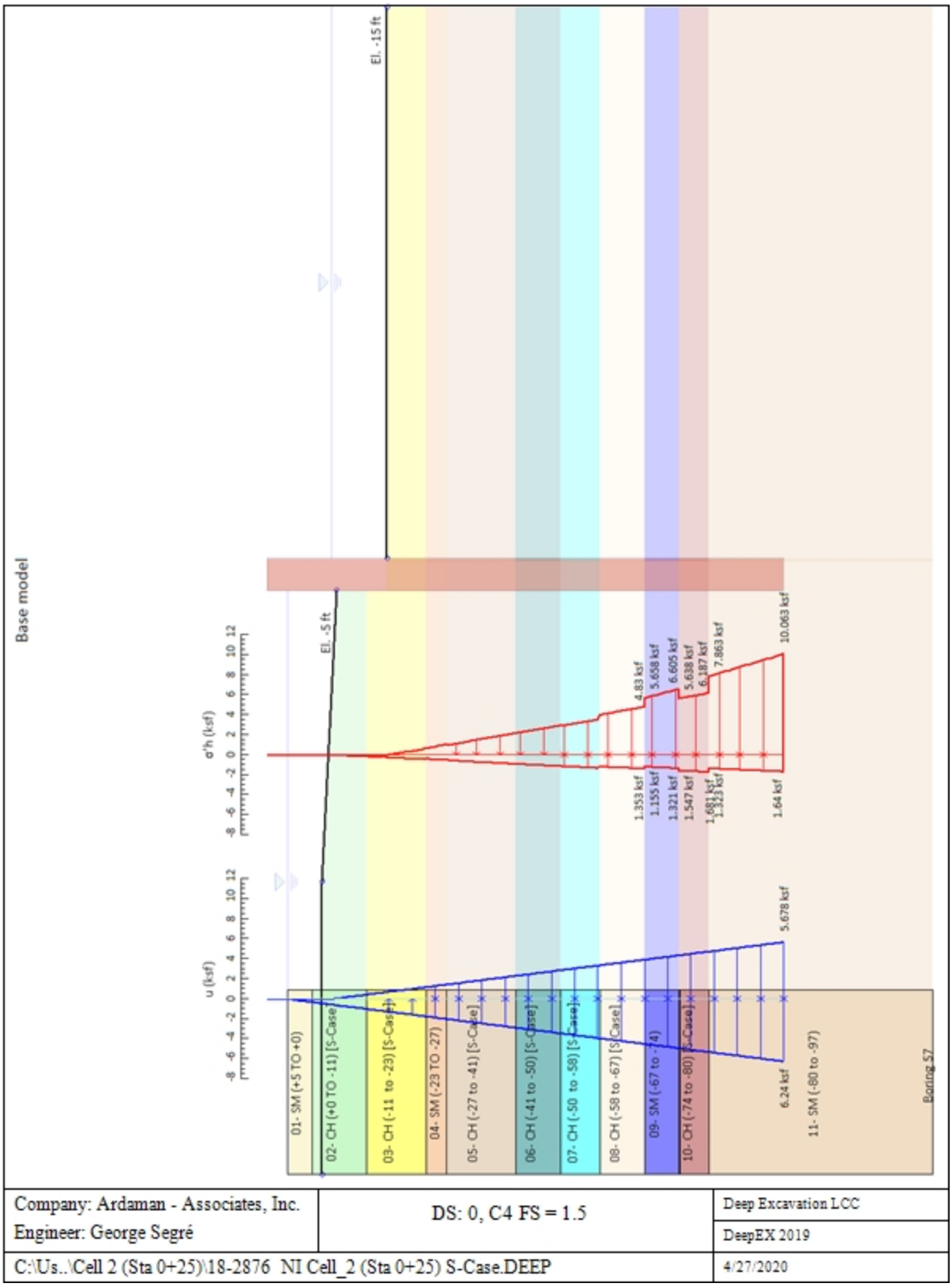



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
7.246 ksf
8.487 ksf
9.907 ksf
8.457 ksf
9.281 ksf
11.794 ksf
15.095 ksf
1.353 ksf
1.155 ksf
1.321 ksf
1.547 ksf
1.681 ksf
1.323 ksf
1.64 ksf
5.678 ksf
6.24 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 0+75)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -79.6 ft., NAVD88

Length of Sheetting = 88.6 ft.

Use = 90.0 ft.

Design Tip Elev. = -81.0 ft., NAVD88

Design Length of Sheeting = 90.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -30.50 | 144.35 | 40.10 | 0.36 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -32.48 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -28.13 | 125.44 | 25.27 | 0.26 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -30.10 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -24.58 | 72.68 | 17.47 | 0.12 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -28.52 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -22.60 | 58.33 | 19.86 | 0.08 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -24.58 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -69.70 | 730.84 | 84.25 | 7.94 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -79.60 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -63.76 | 532.54 | 65.18 | 4.86 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -72.68 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -59.81 | 392.67 | 50.10 | 3.14 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -77.62 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -52.88 | 254.37 | 37.93 | 1.61 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -68.22 | -- | -- | -- |
| | | | | | | Governing Value: | -79.60 | 730.84 | 84.25 | 7.94 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:56:36 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 0 | 0 | 500 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 0 | 0 | 1000 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 0 | 0 | 3300 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 0 | 0 | 1400 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 0 | 0 | 1850 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 0 | 0 | 1900 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 0 | 0 | 2000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | 0 | 0 | 0.95 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

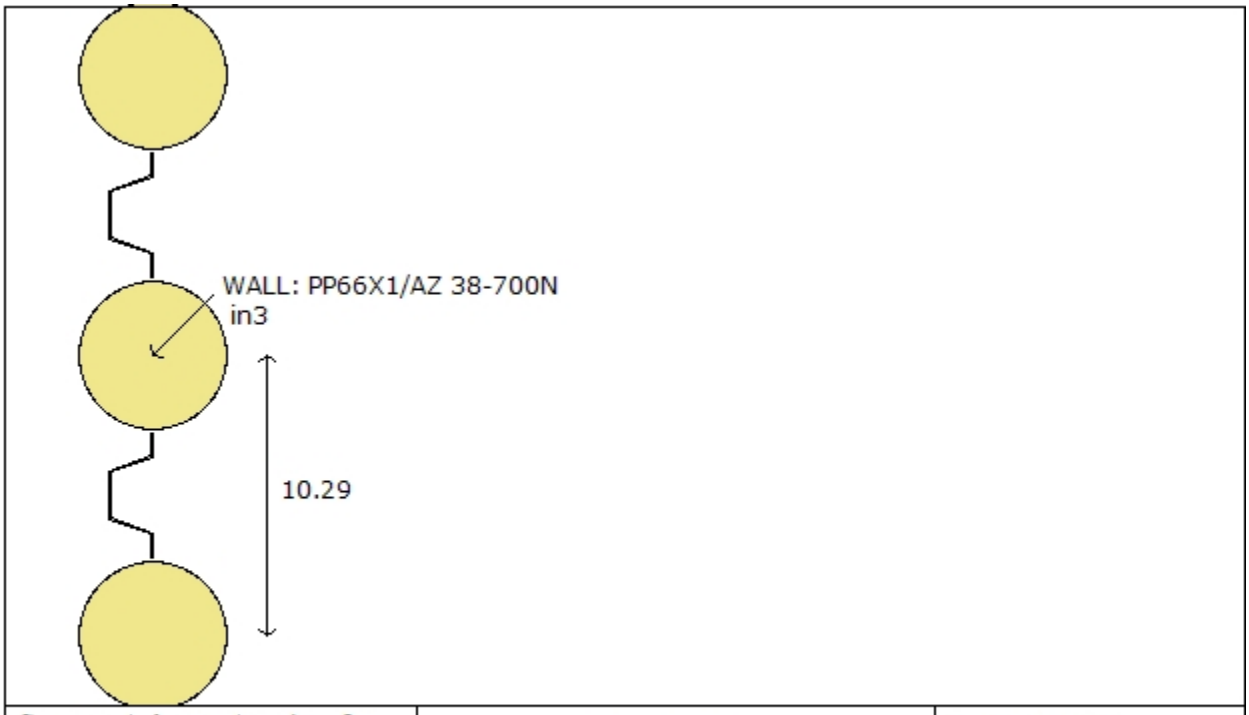
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 1 |
| -11 | 03- CH (-11 to | 1 | 0.95 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 1 |
| -41 | 06- CH (-41 to | 1 | 1 |
| -50 | 07- CH (-50 to | 1 | 1 |
| -58 | 08- CH (-58 to | 1 | 1 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 1 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 3.548 | 3.86 | 3.548 |
| Stage 1 | Simple span | N/A | 1.6 | 2.869 | 3.111 | 2.869 |
| Stage 2 | Simple span | N/A | 1.6 | 3.684 | 4.065 | 3.684 |
| Stage 3 | Simple span | N/A | 1.6 | 2.984 | 3.29 | 2.984 |
| Stage 4 | Simple span | N/A | 1.6 | 4.023 | 4.86 | 4.023 |
| Stage 5 | Simple span | N/A | 1.6 | 2.739 | 3.29 | 2.739 |
| Stage 6 | Simple span | N/A | 1.6 | 4.177 | 5.119 | 4.177 |
| Stage 7 | Simple span | N/A | 1.6 | 2.854 | 3.493 | 2.854 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

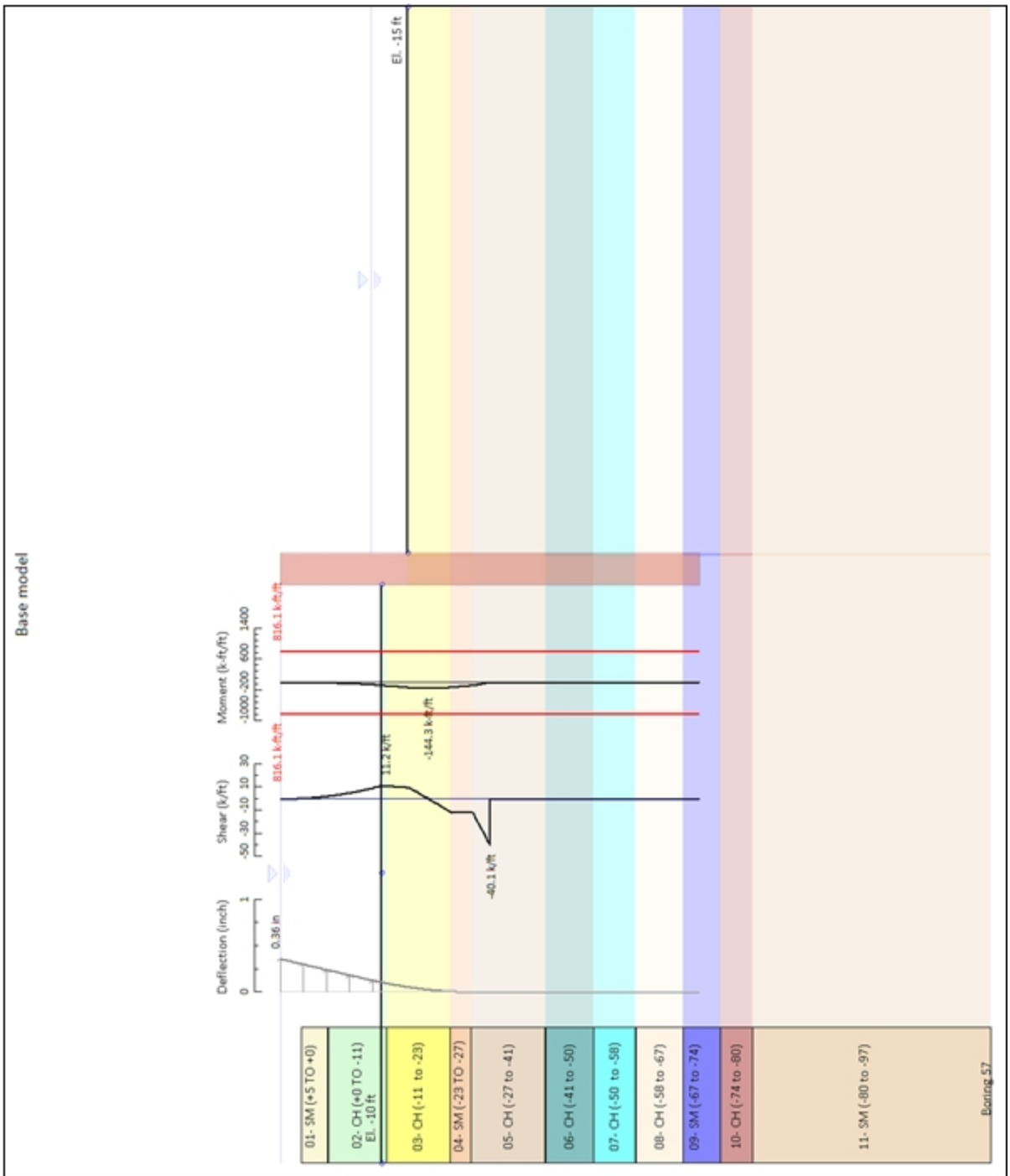
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

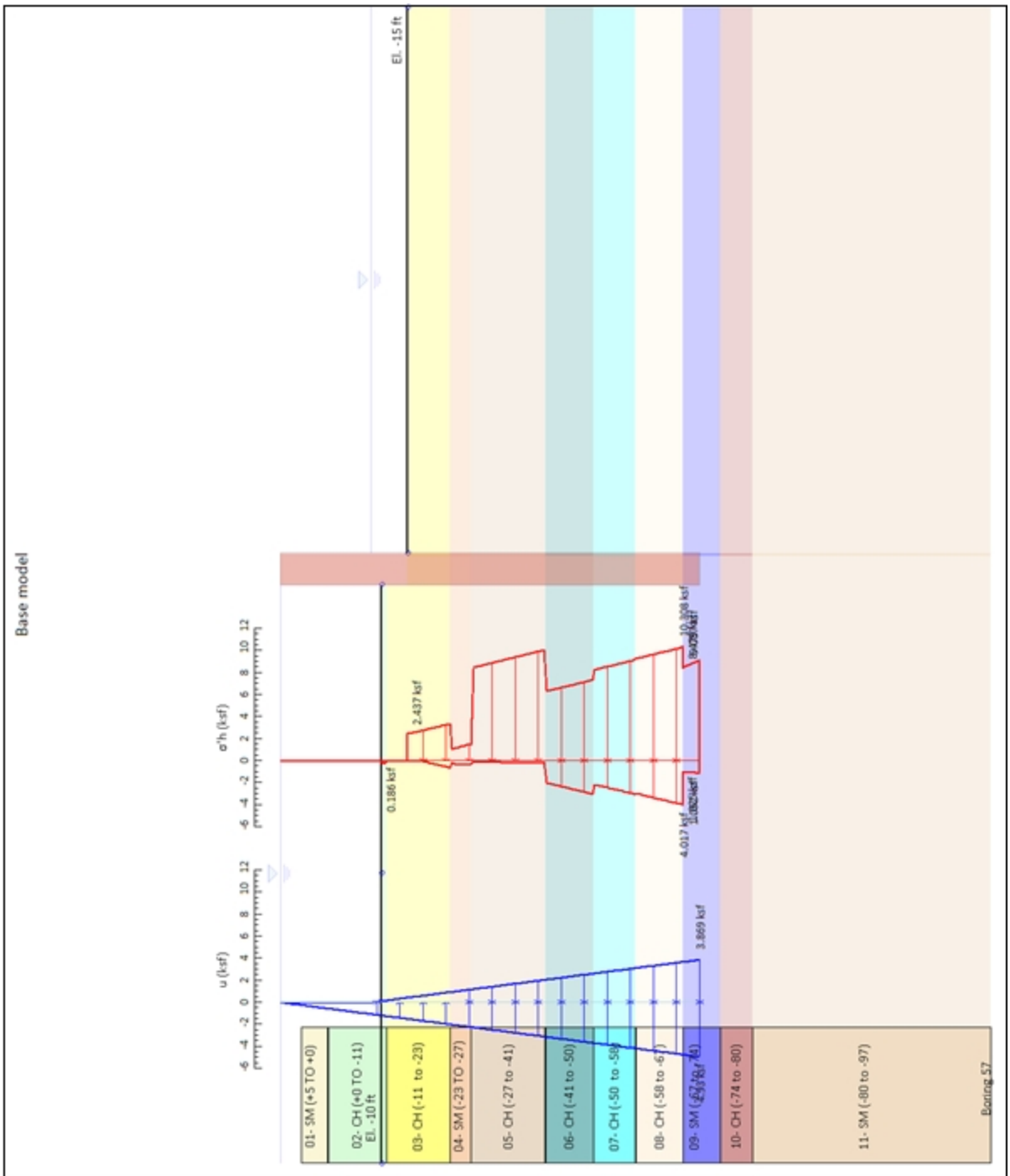
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

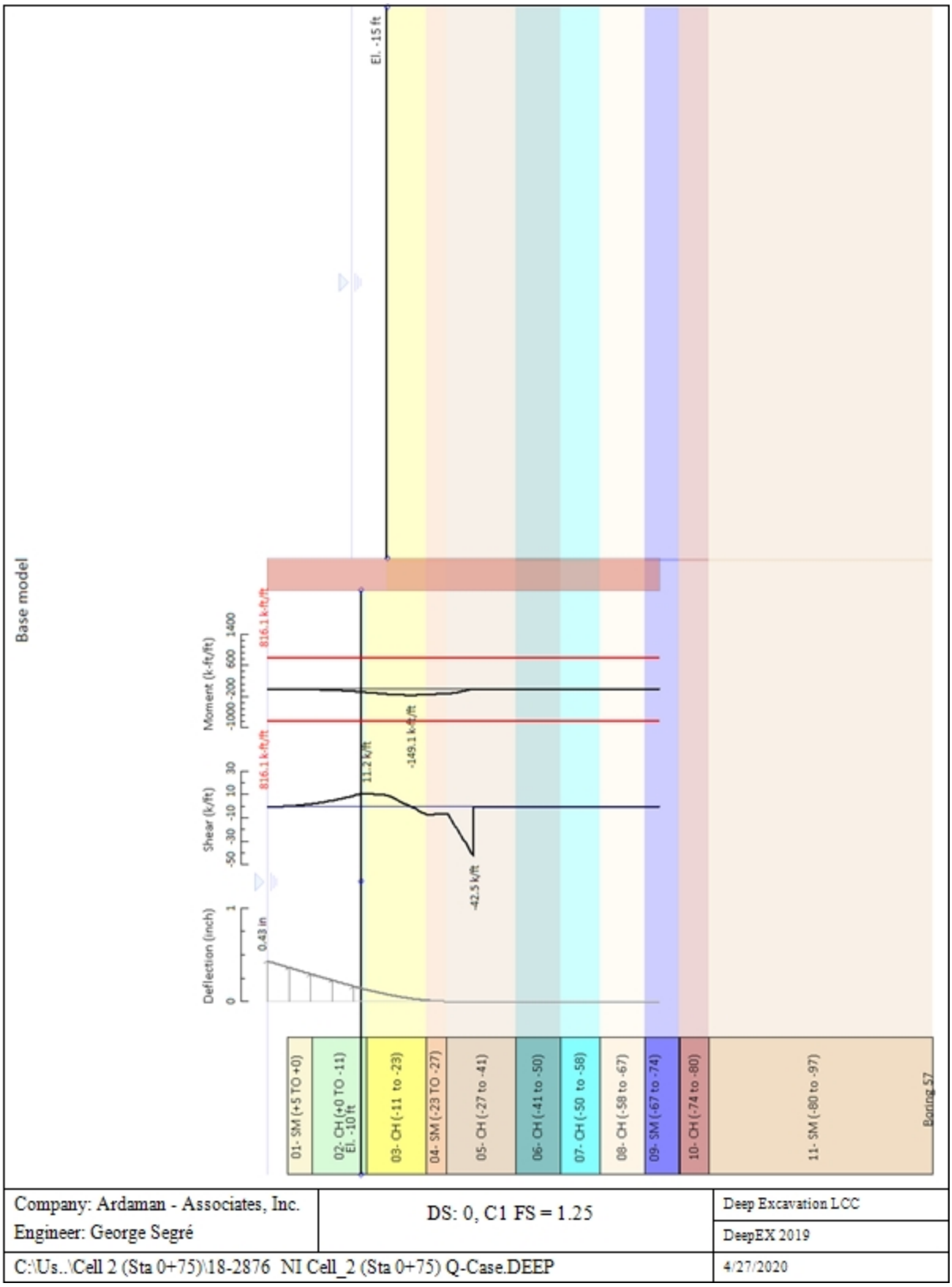
A sequence of figures for each excavation stage is reported

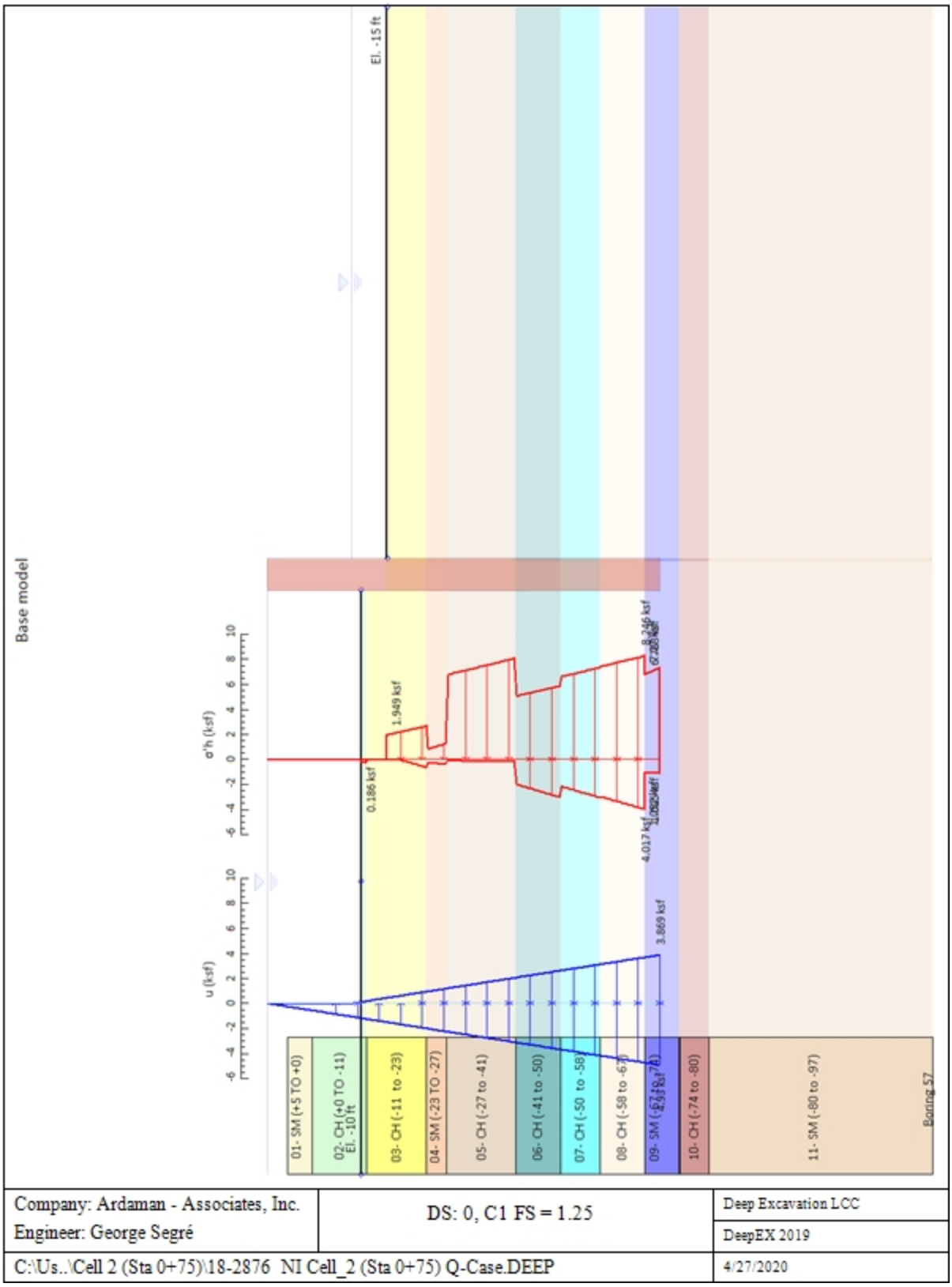


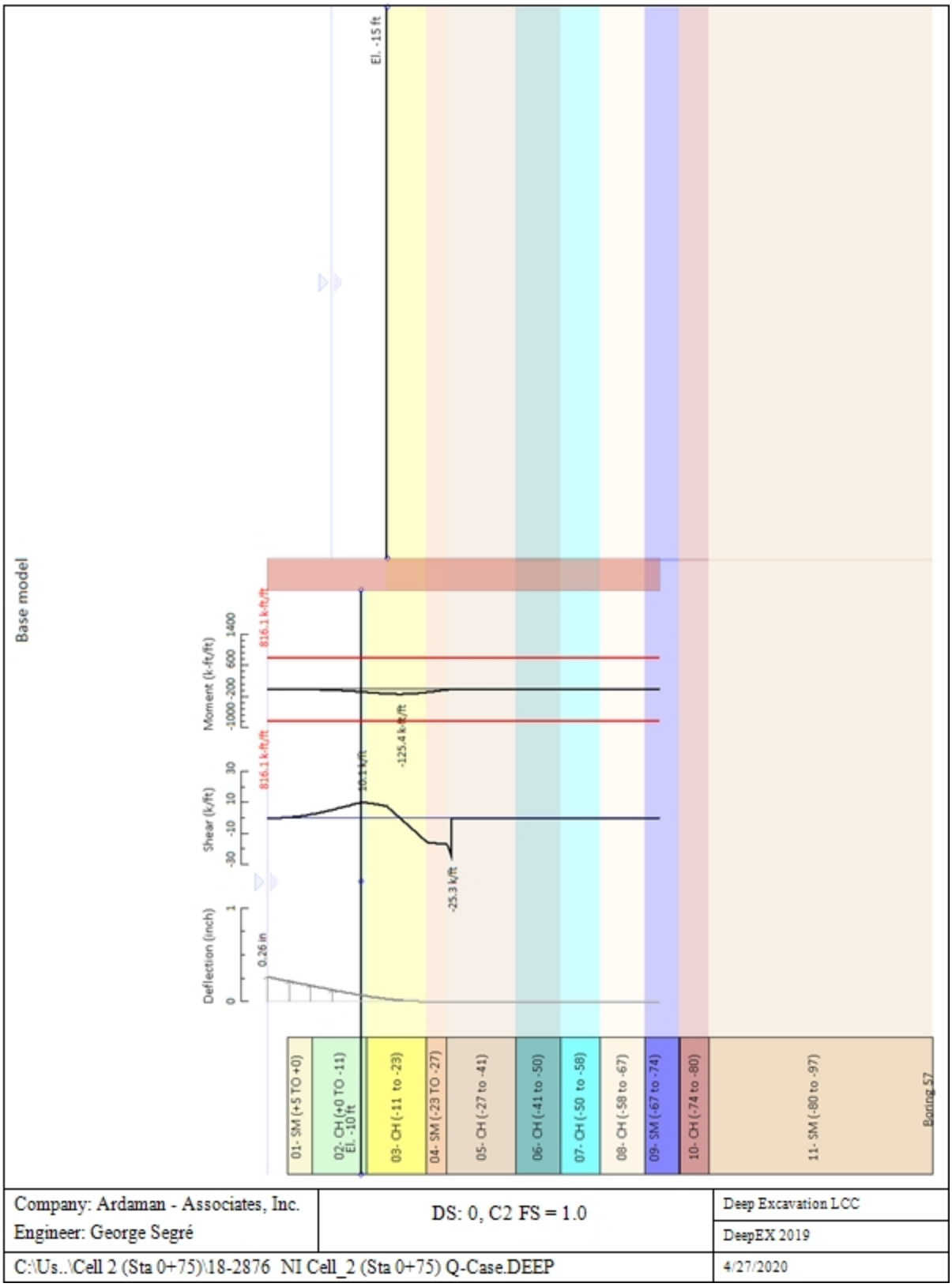

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP | | 4/27/2020 |



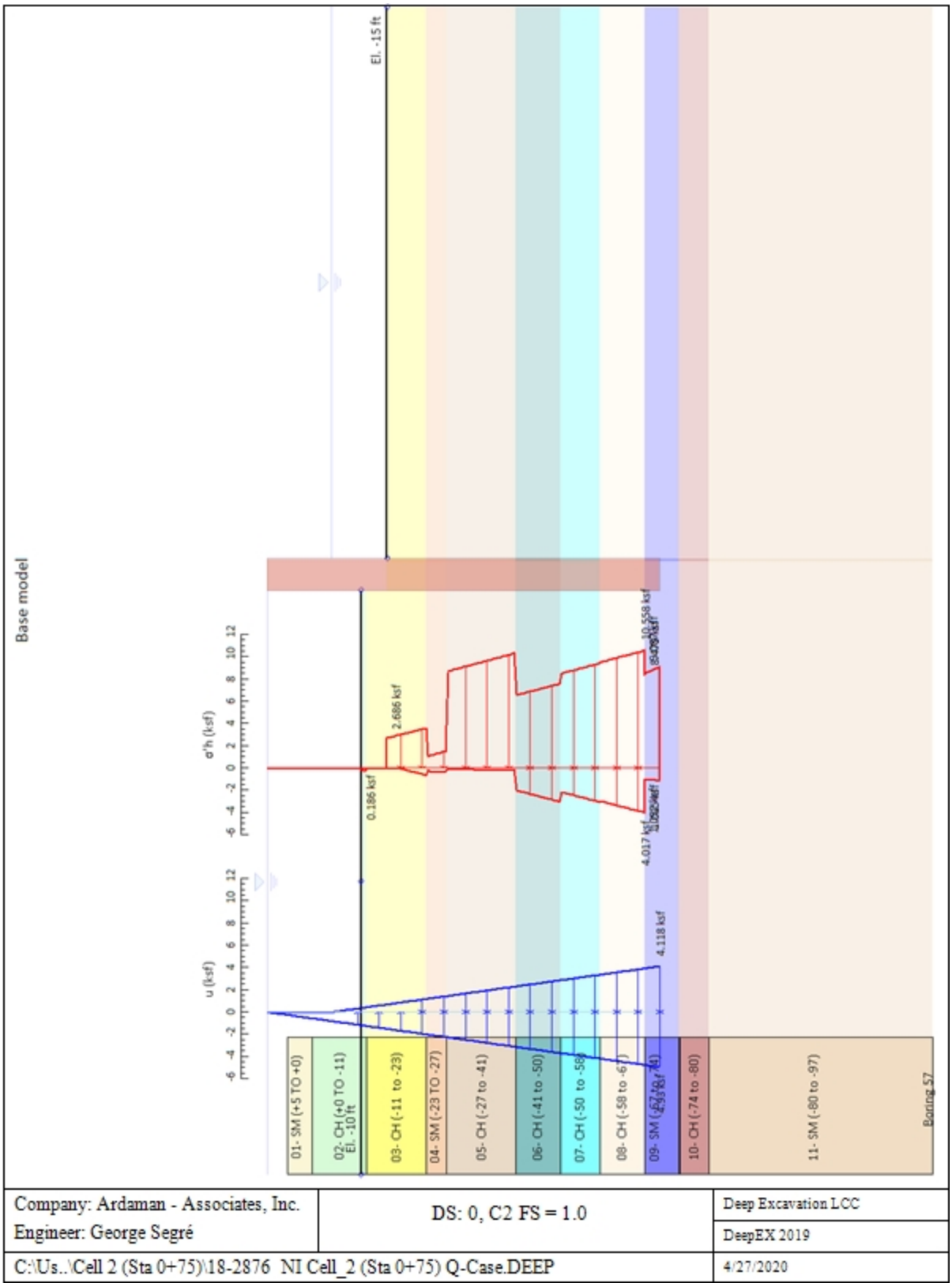

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP | | 4/27/2020 |

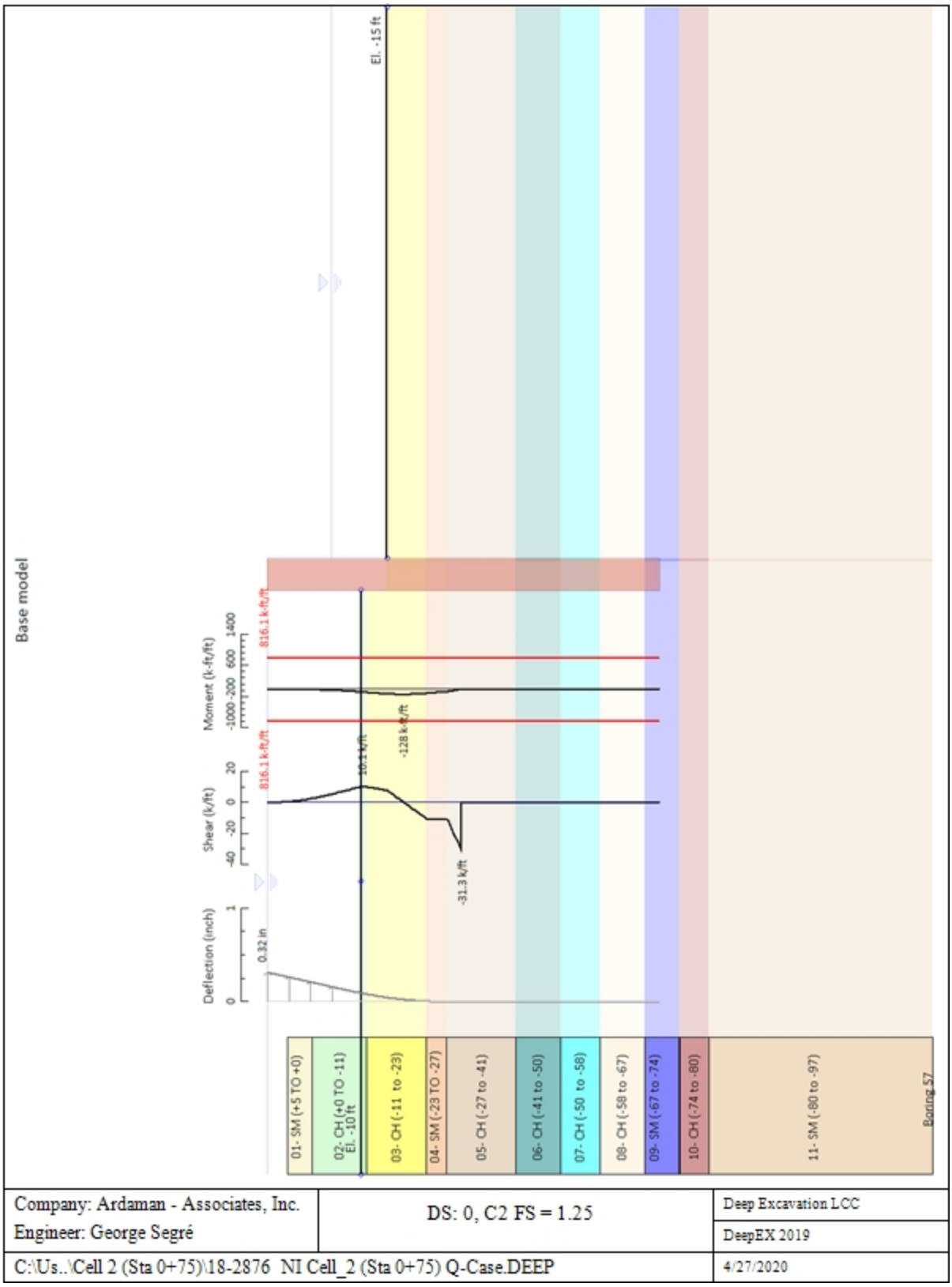

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-349.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
11.2 k/ft
-42.5 k/ft
Deflection (inch)
0 1
0.43 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
0.186 ksf
1.949 ksf
4.017 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020

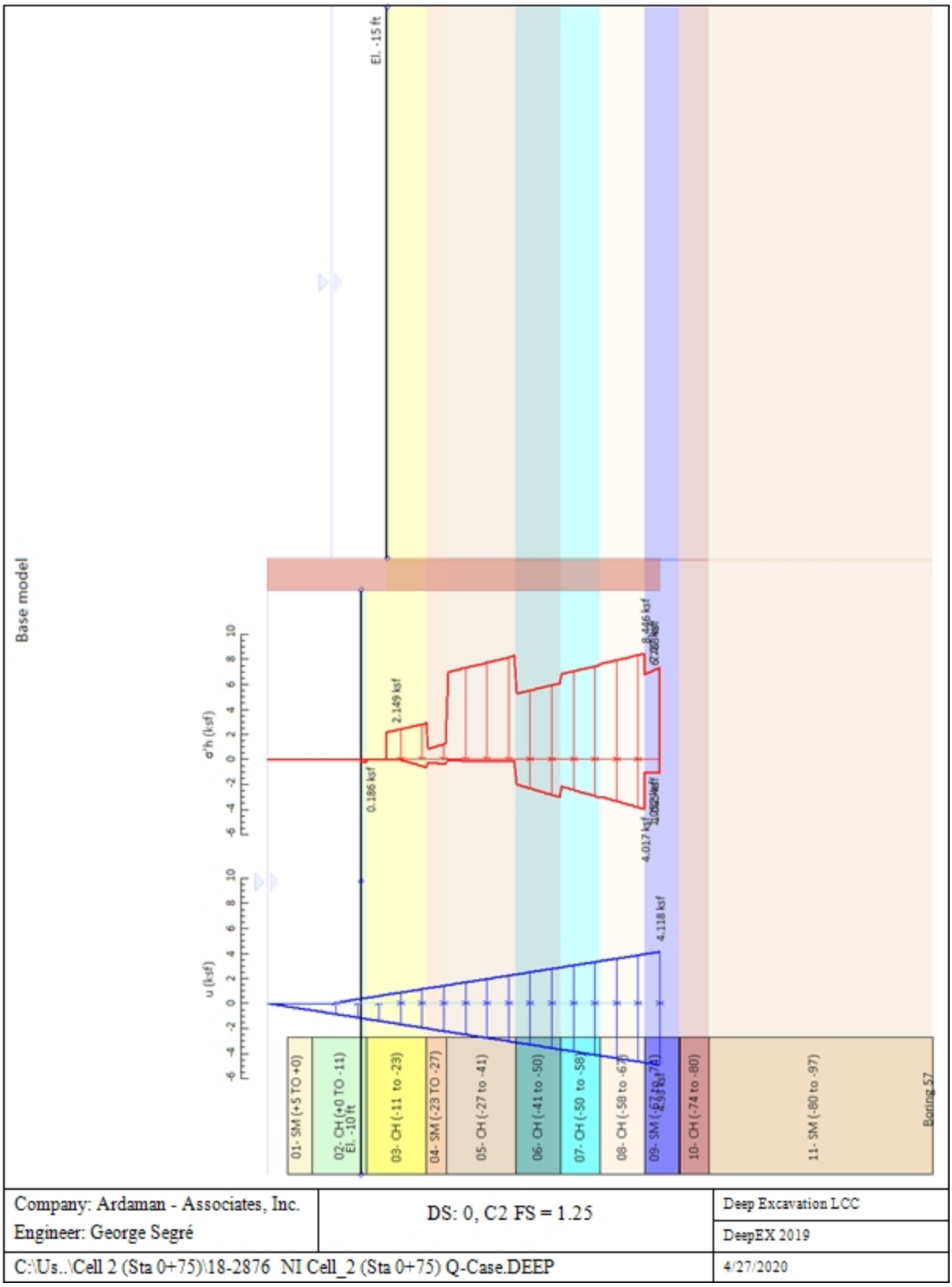


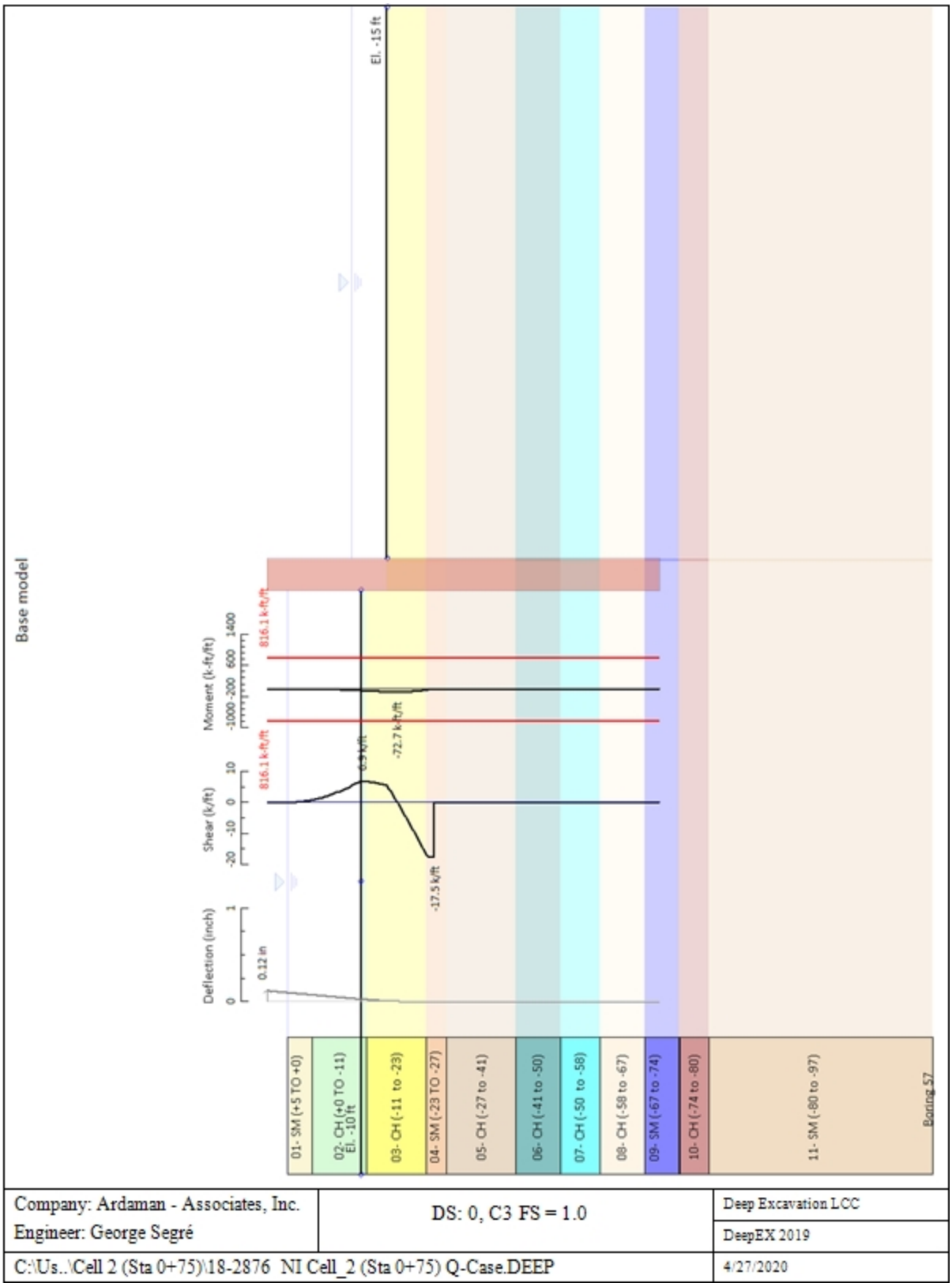

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
0.186 ksf
2.686 ksf
10.558 ksf
4.017 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020

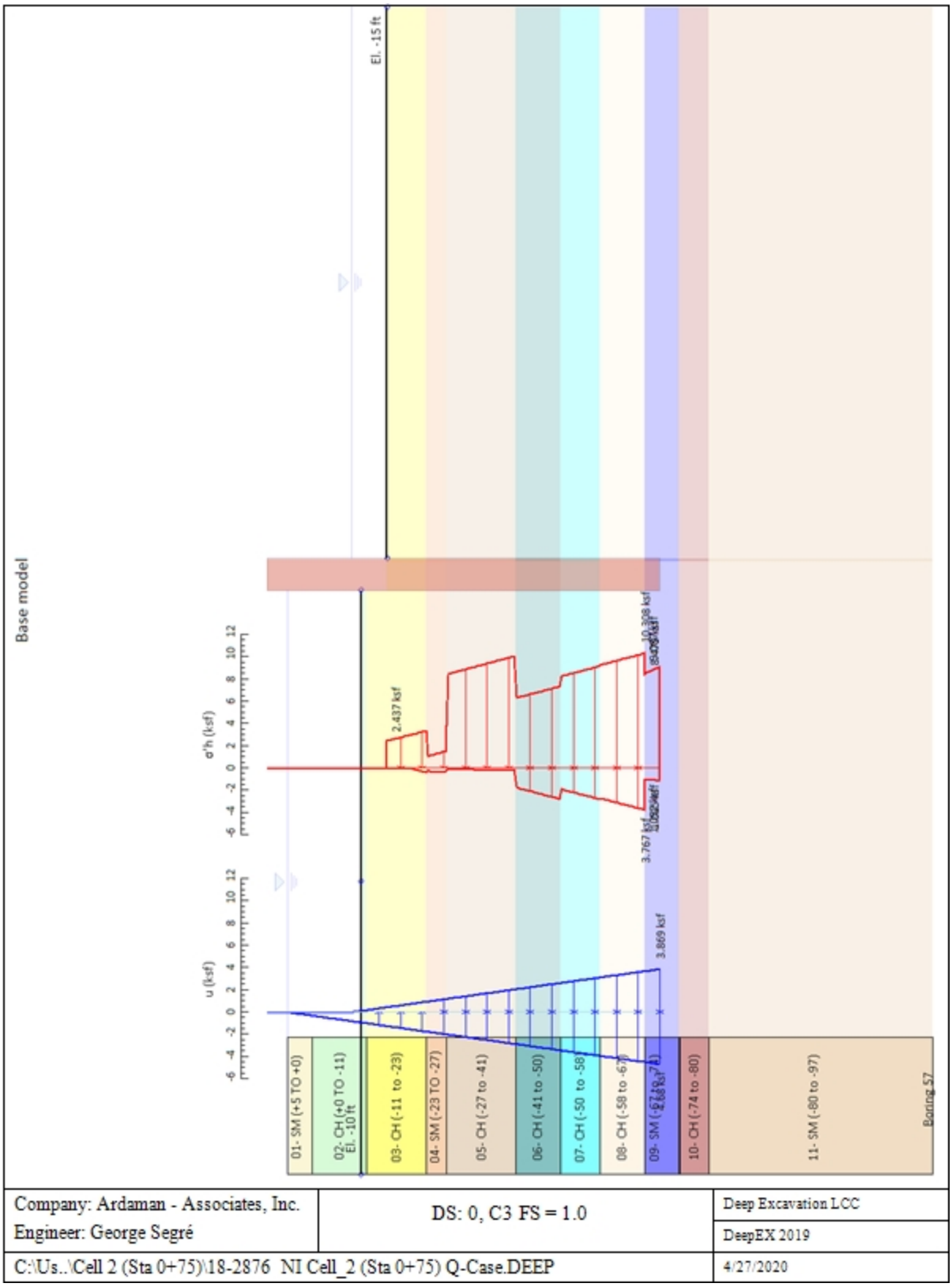



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP | | 4/27/2020 |

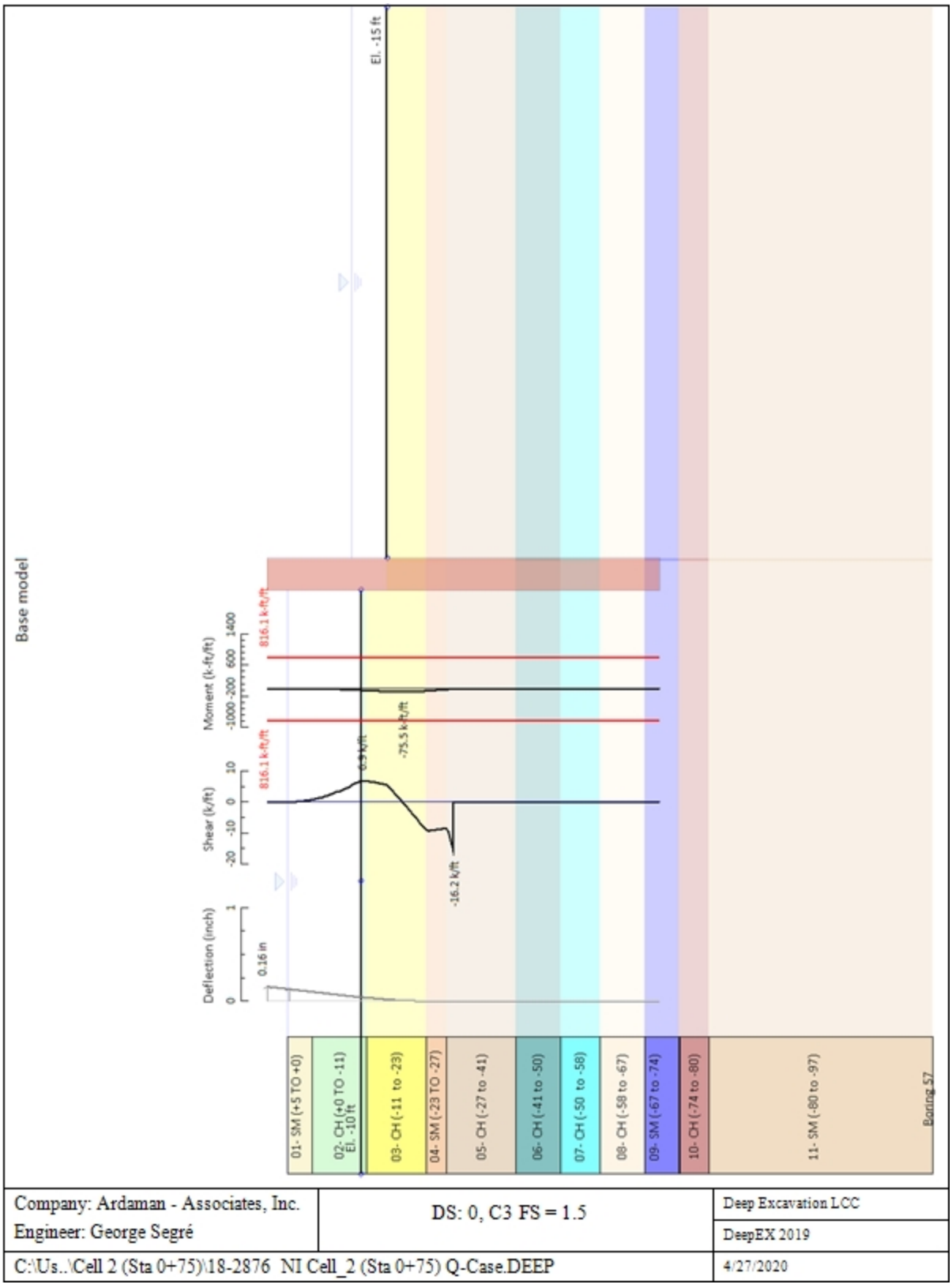

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10
0.186 ksf
2.149 ksf
8.446 ksf
4.017 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020



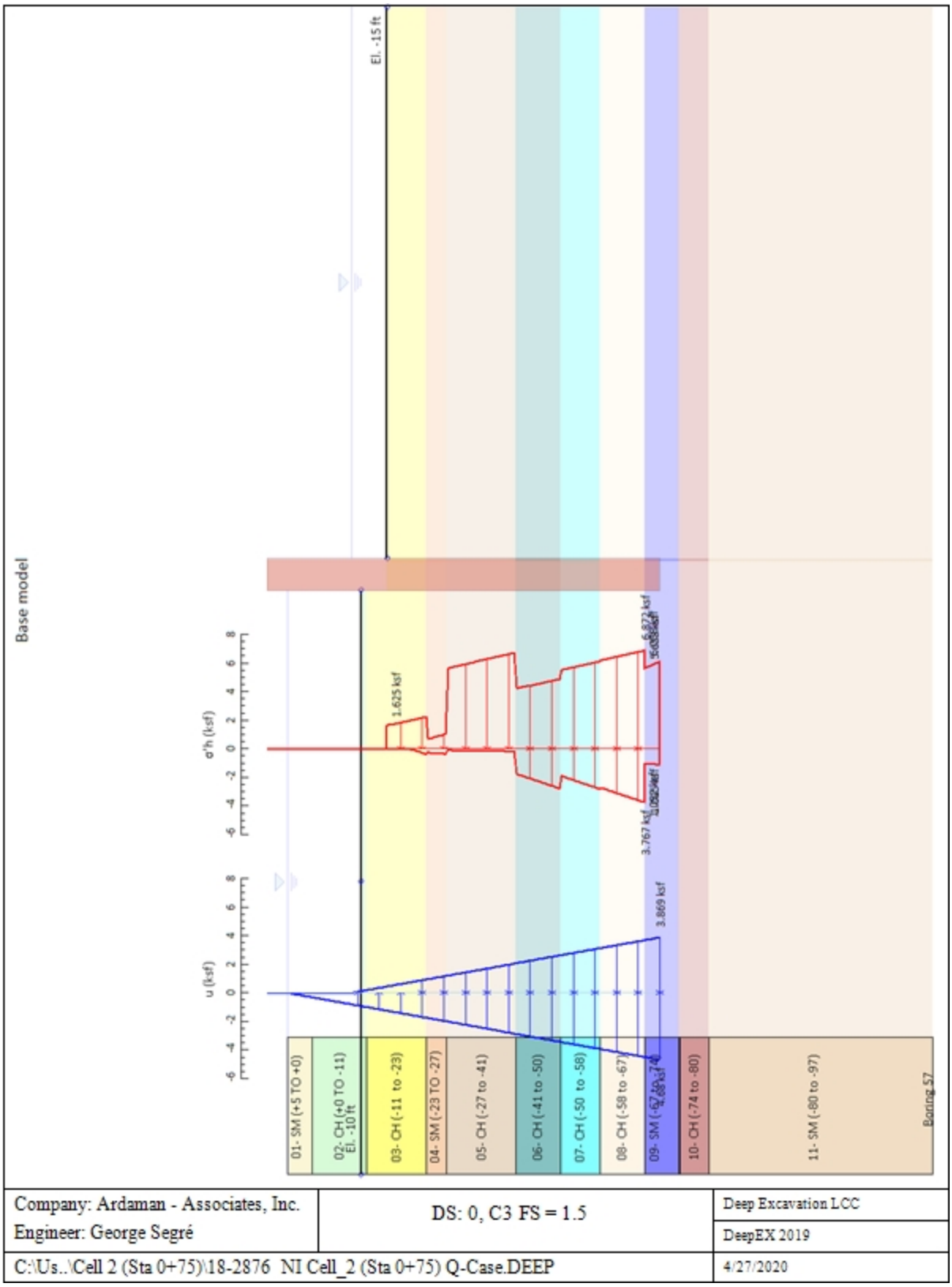

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP | | 4/27/2020 |



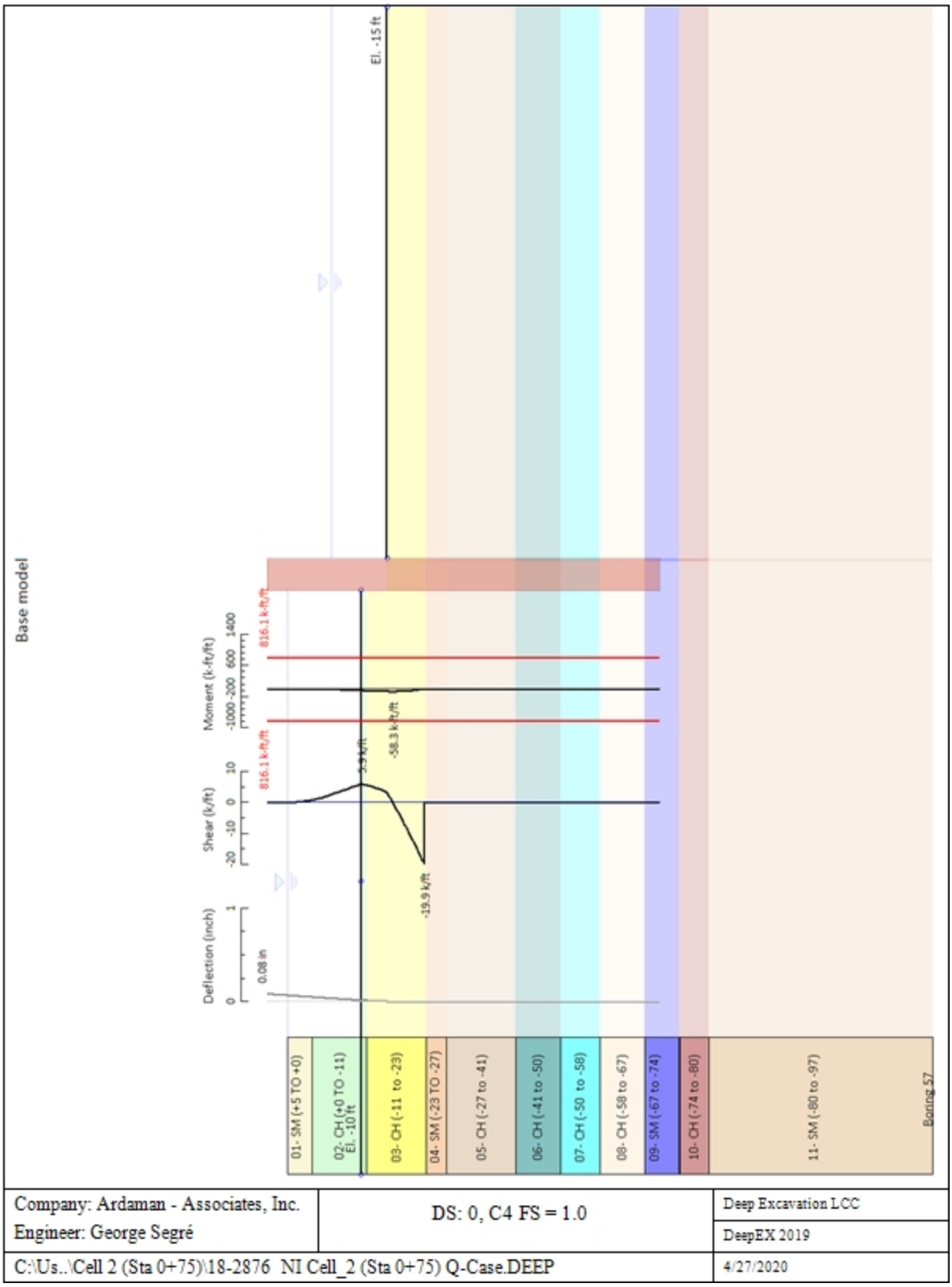

Attachment Figure C.2-71



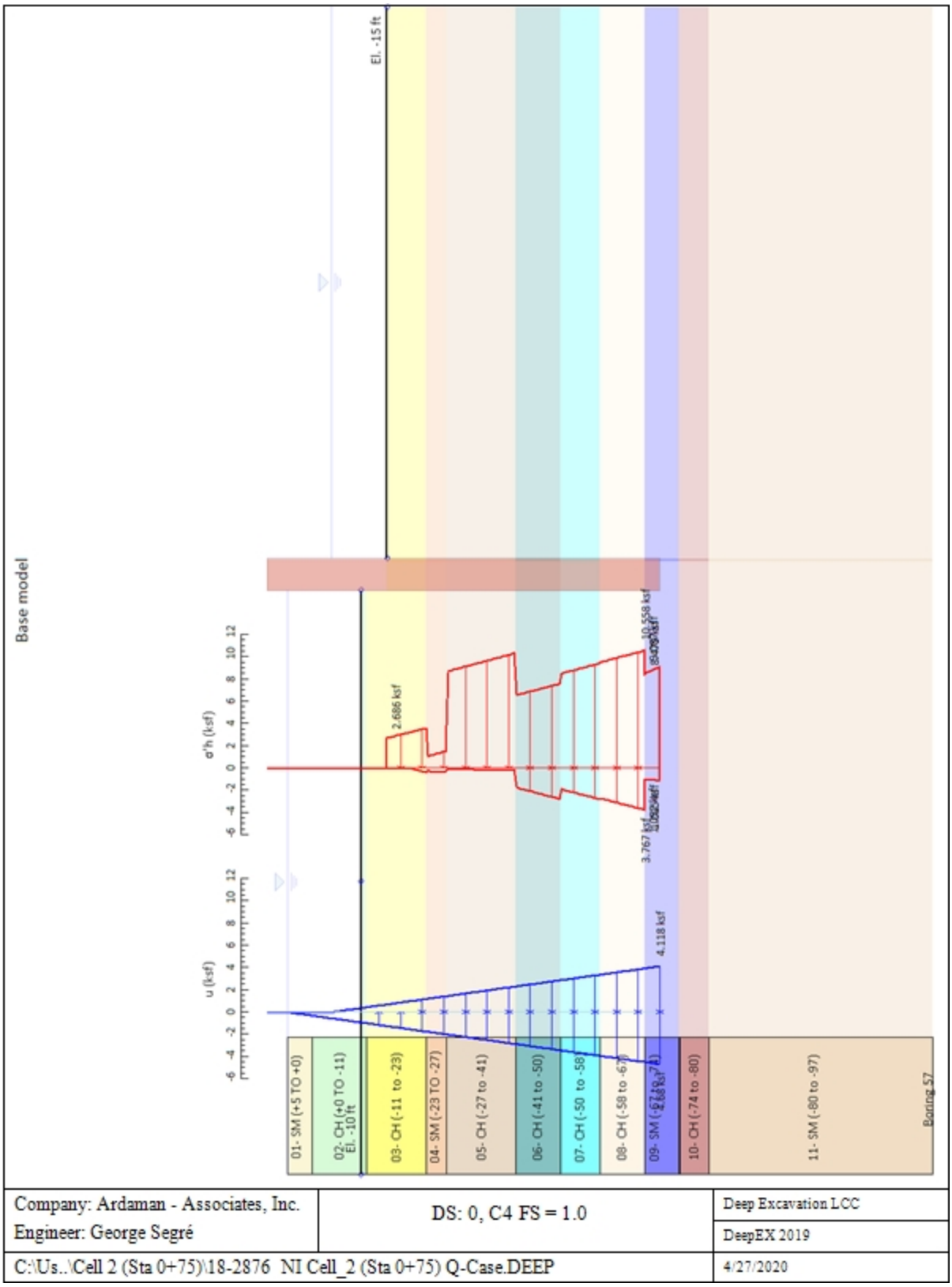

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP | | 4/27/2020 |

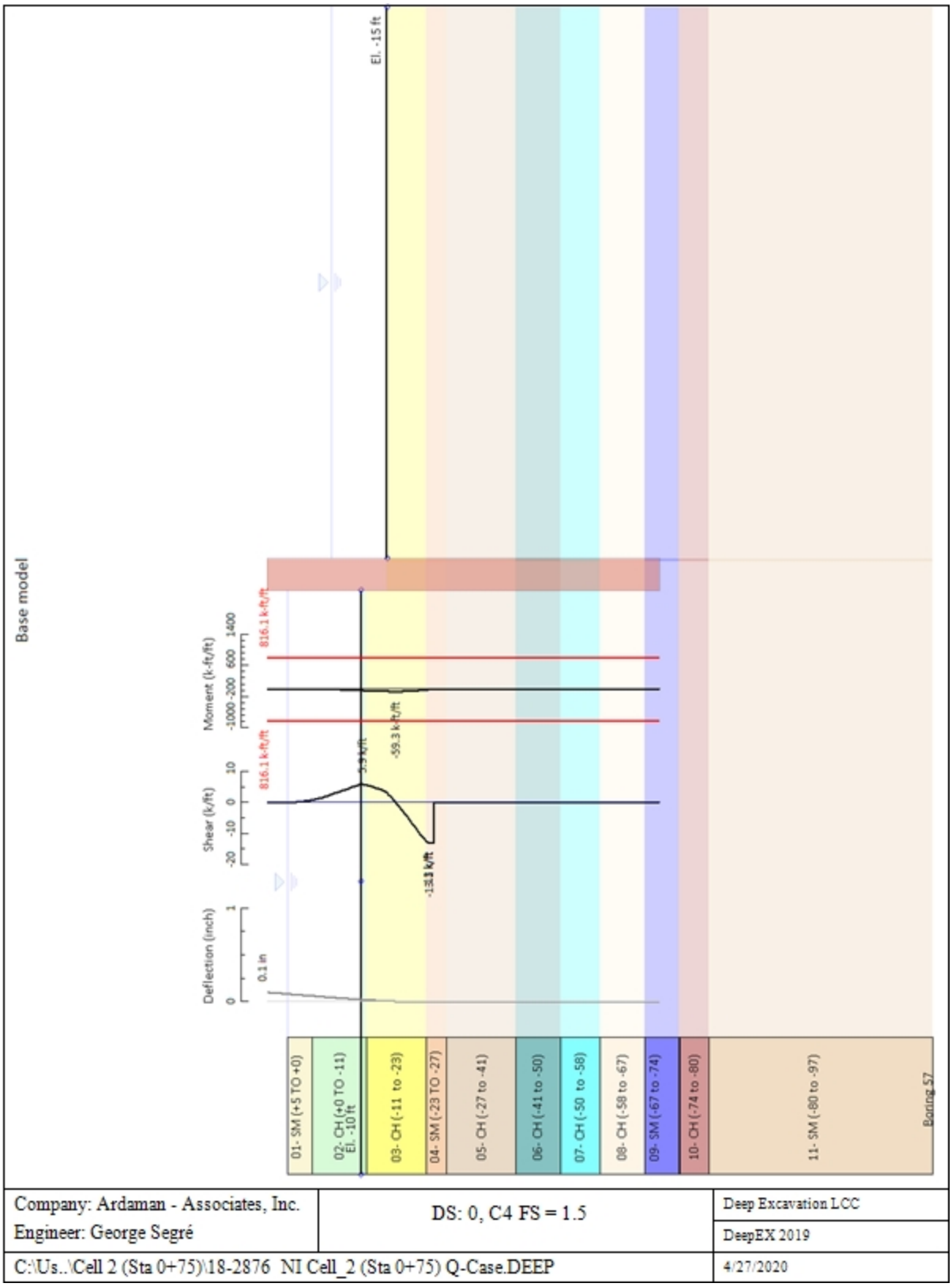


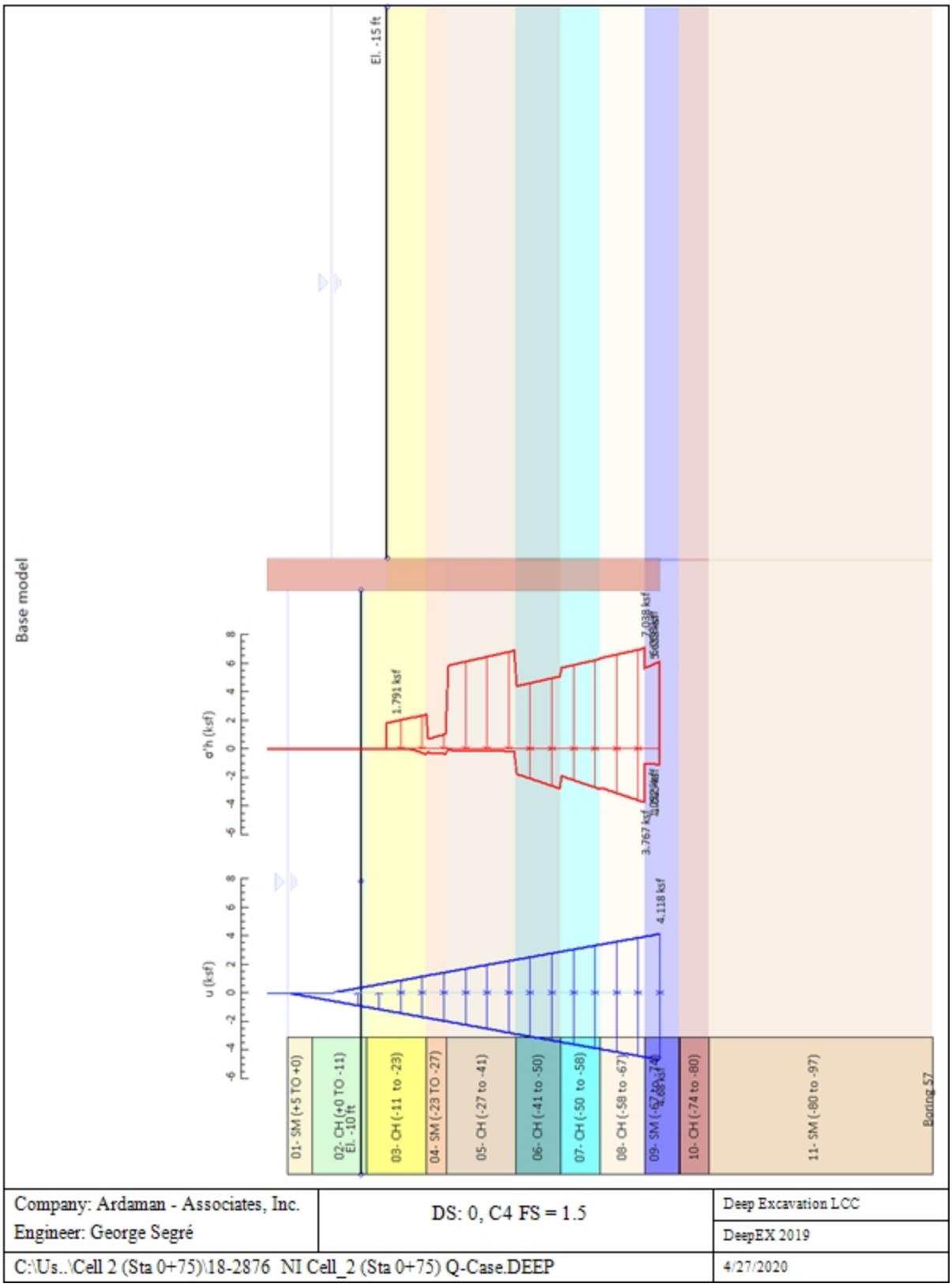

Attachment Figure C.2-73




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
3.767 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
Deflection (inch)
0
1
0.1 in
Shear (k/ft)
-20 -10 0 10
-13.1 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-59.3 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
1.791 ksf
7.038 ksf
3.767 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 TO -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:00:26 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 150 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | - | - | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | - | - | 0.609 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

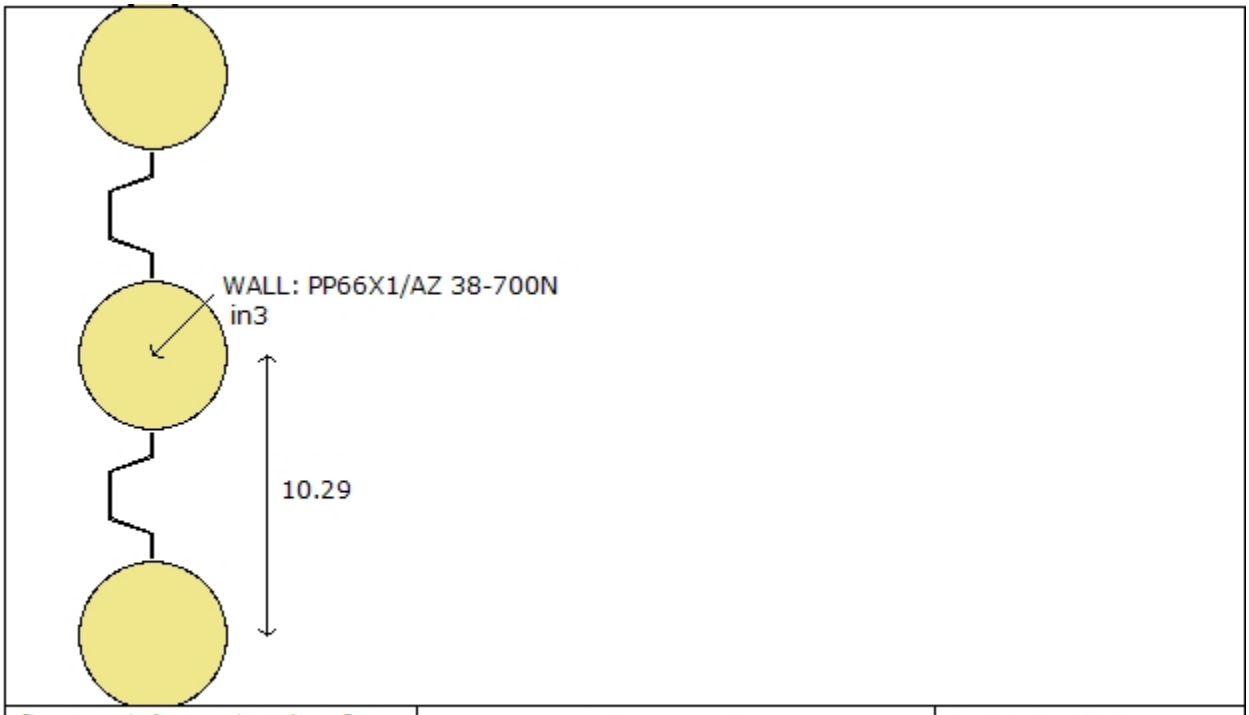
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 0.61 |
| -11 | 03- CH (-11 to | 1 | 0.61 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 0.61 |
| -41 | 06- CH (-41 to | 1 | 0.61 |
| -50 | 07- CH (-50 to | 1 | 0.61 |
| -58 | 08- CH (-58 to | 1 | 0.56 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 0.56 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.274 | 1.274 | 1.688 |
| Stage 1 | Simple span | N/A | 1.6 | 1.115 | 1.115 | 1.463 |
| Stage 2 | Simple span | N/A | 1.6 | 1.348 | 1.348 | 1.744 |
| Stage 3 | Simple span | N/A | 1.6 | 1.189 | 1.189 | 1.519 |
| Stage 4 | Simple span | N/A | 1.6 | 1.413 | 1.413 | 1.805 |
| Stage 5 | Simple span | N/A | 1.6 | 1.119 | 1.119 | 1.405 |
| Stage 6 | Simple span | N/A | 1.6 | 1.494 | 1.494 | 1.866 |
| Stage 7 | Simple span | N/A | 1.6 | 1.2 | 1.2 | 1.465 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

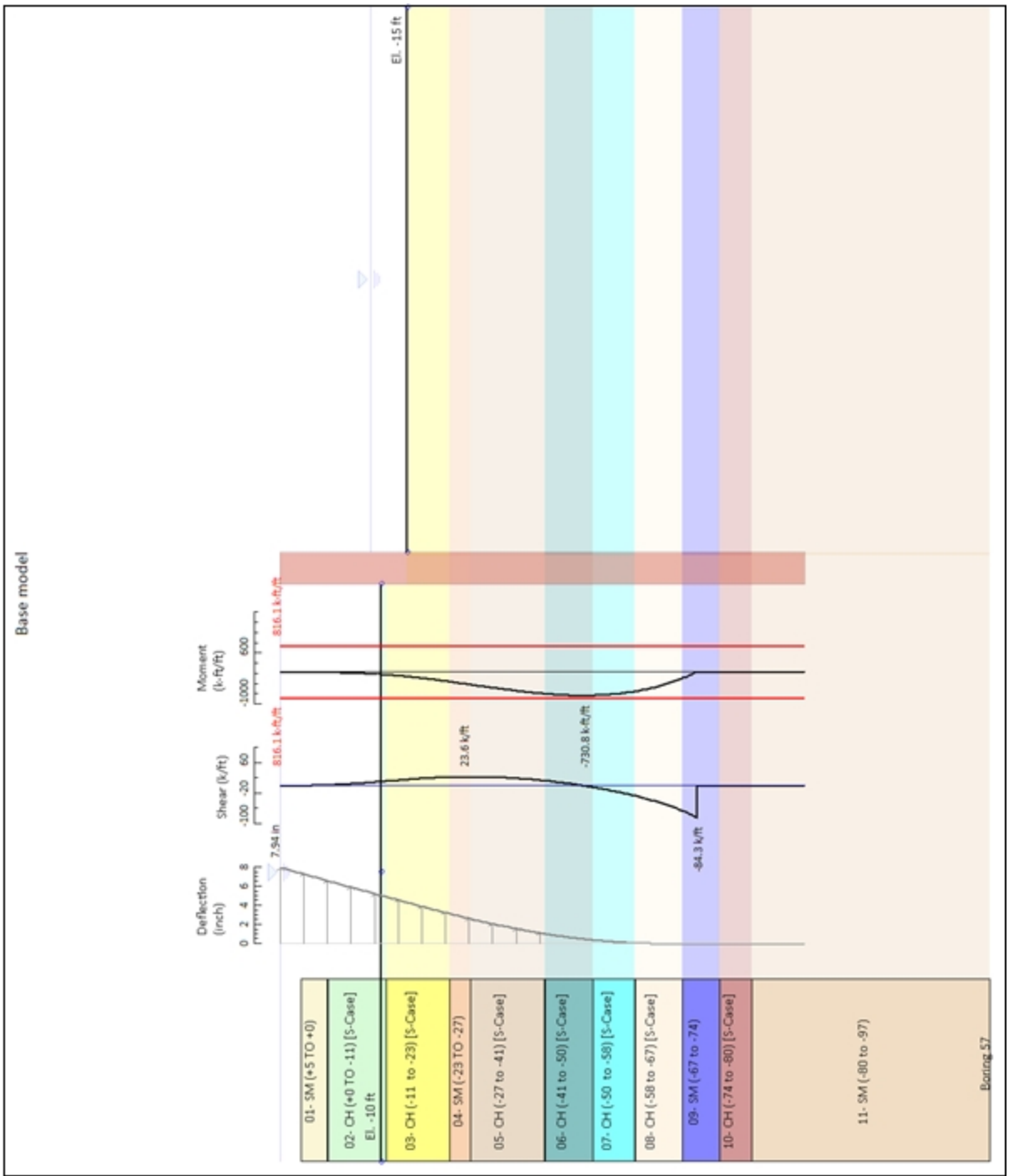
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

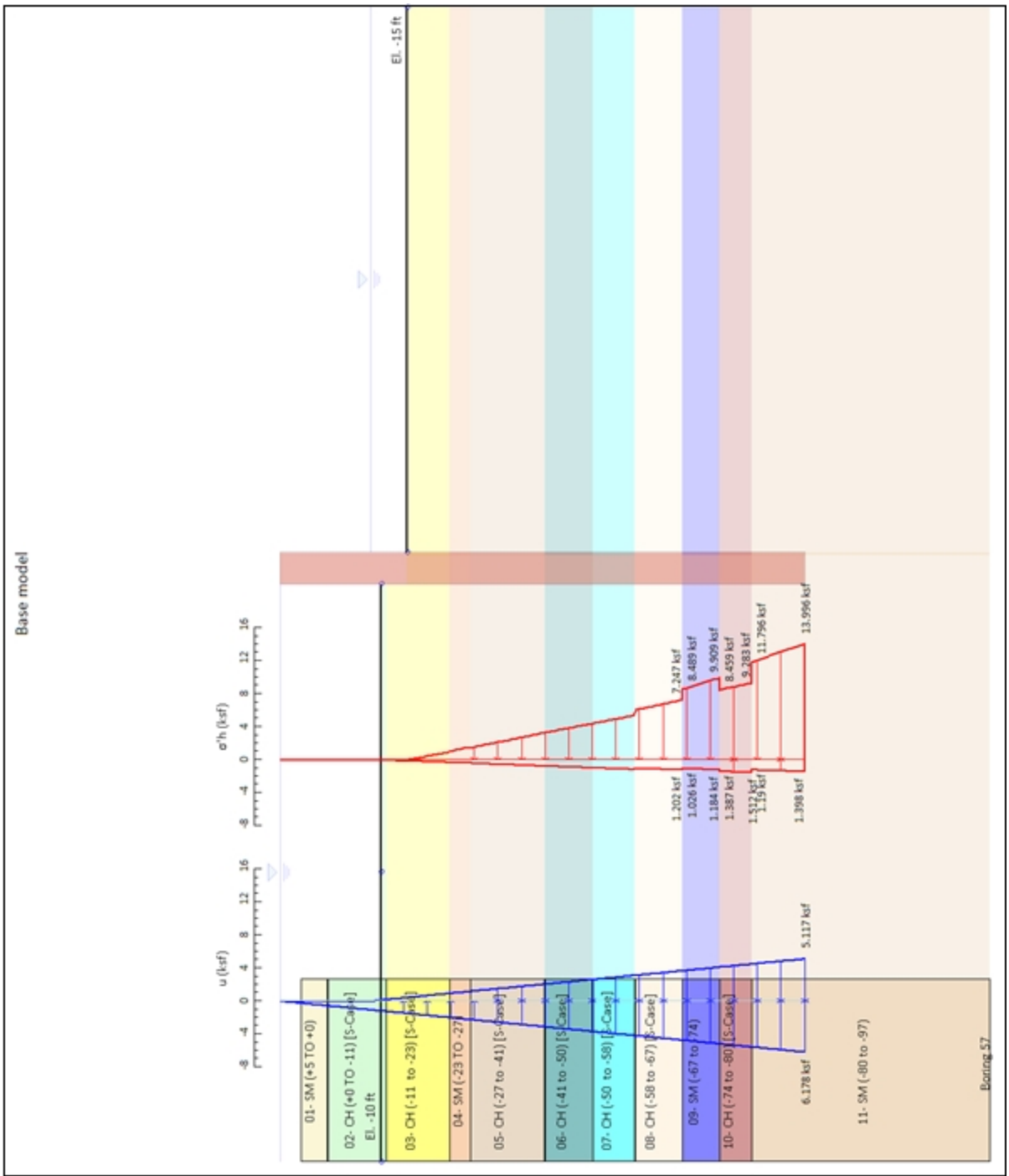
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

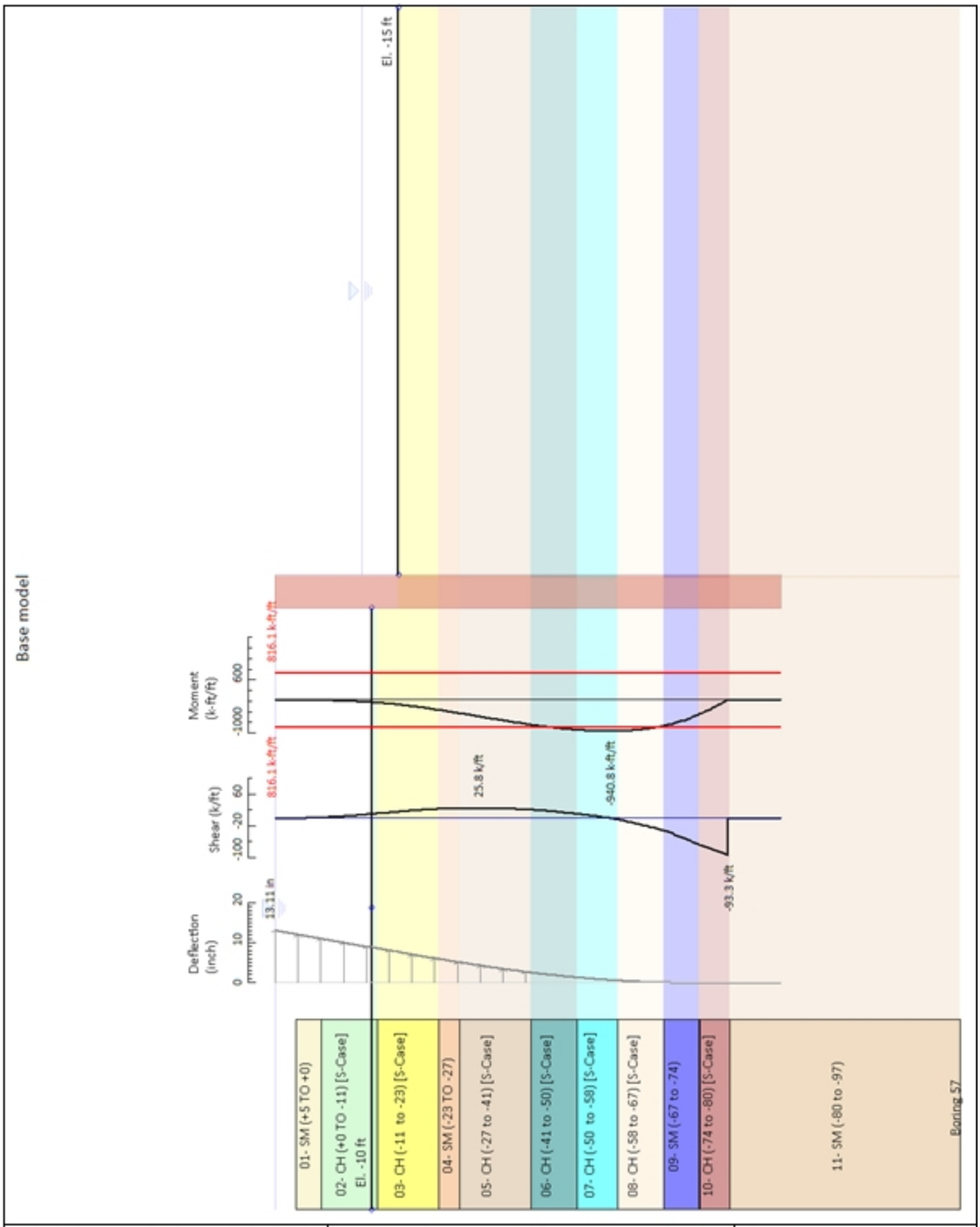
A sequence of figures for each excavation stage is reported



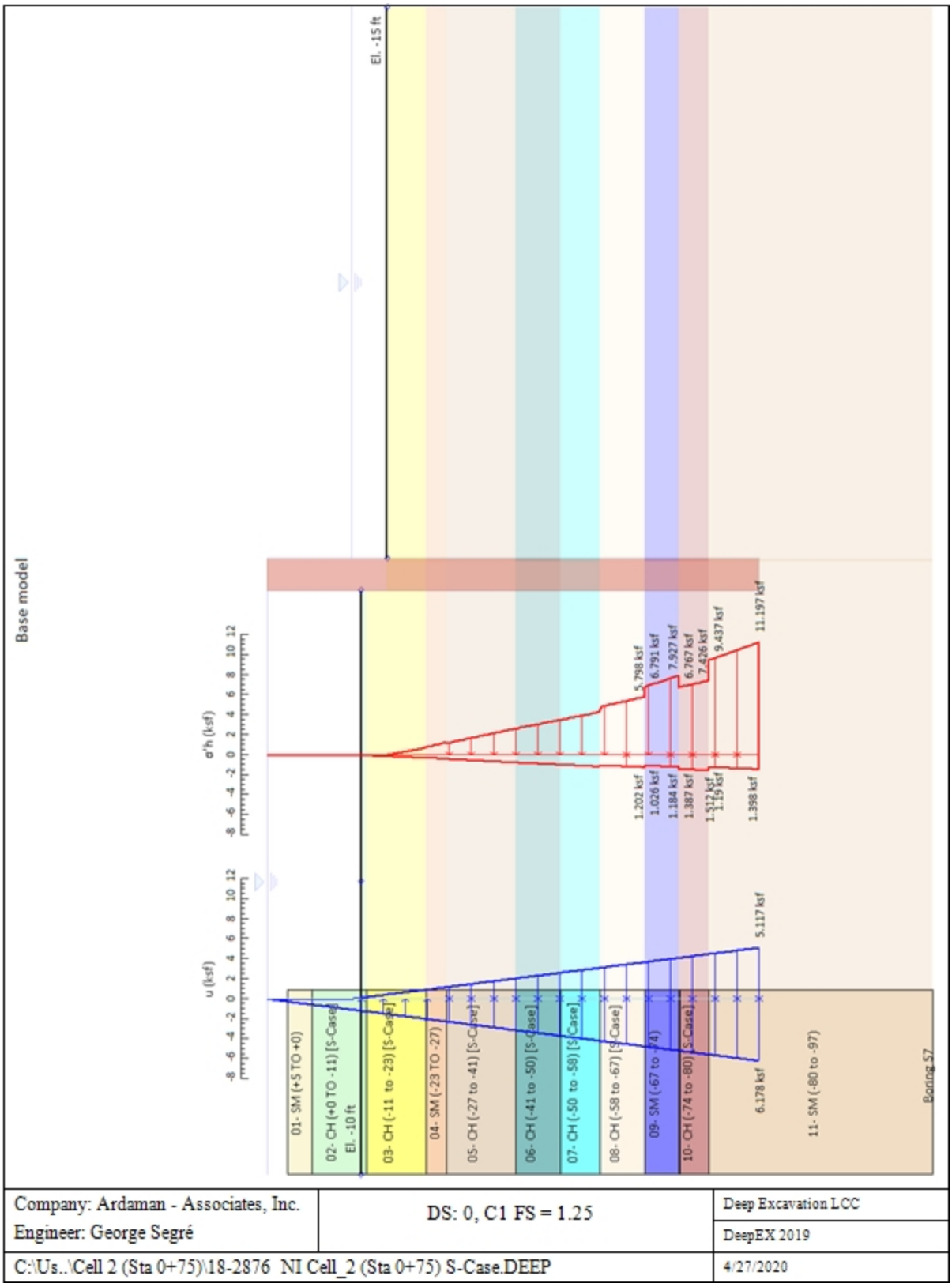

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |



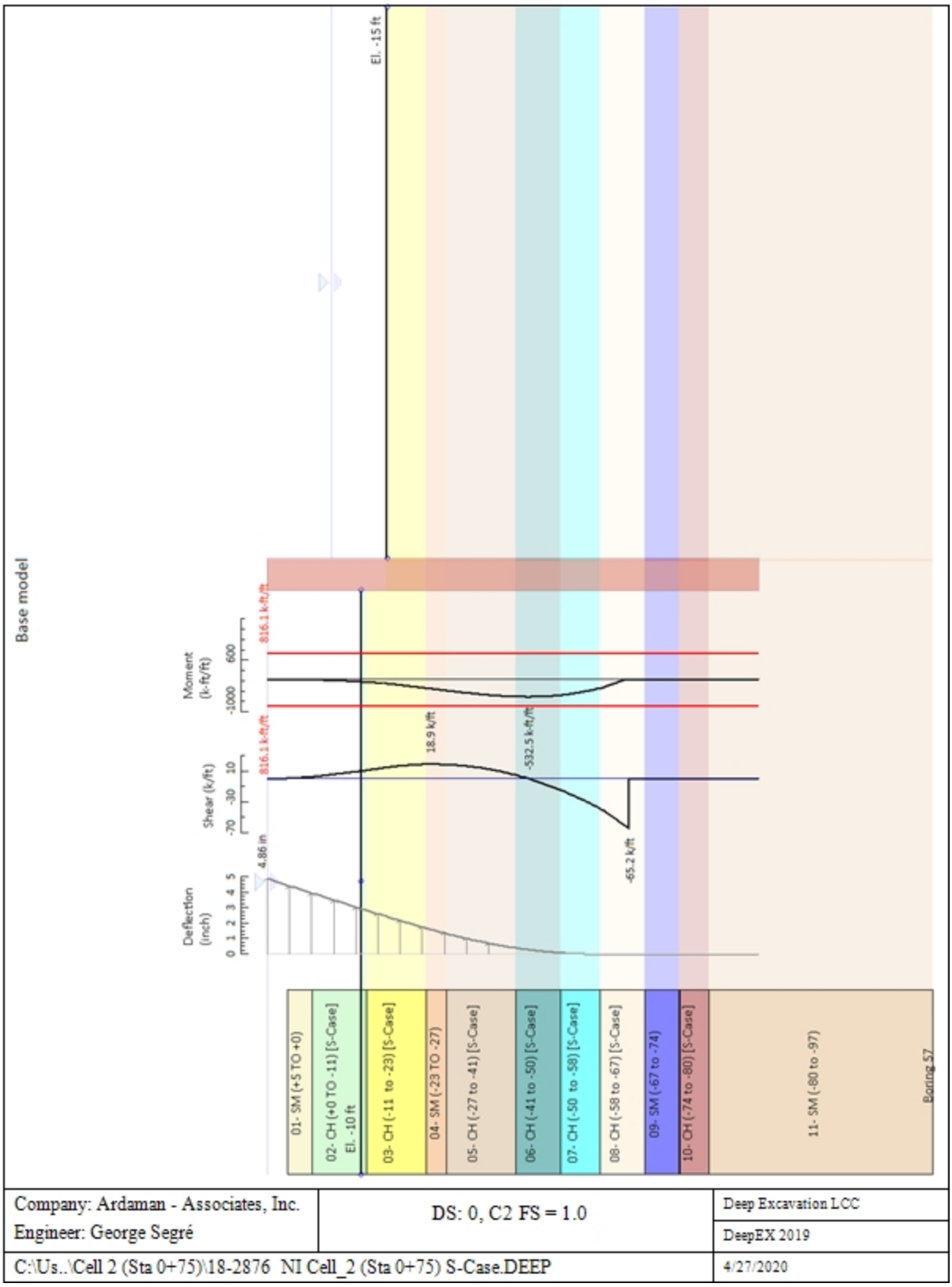

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |



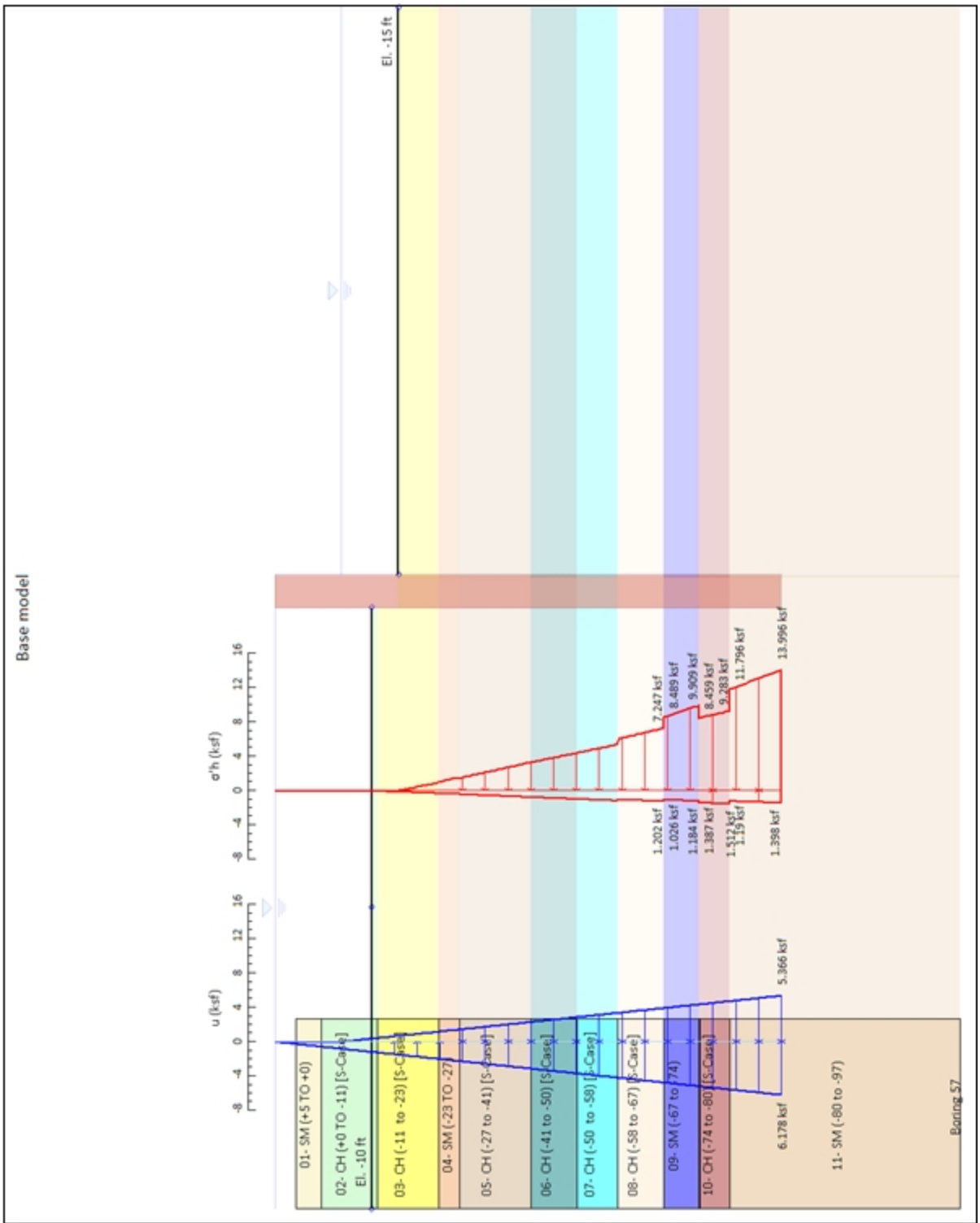

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |



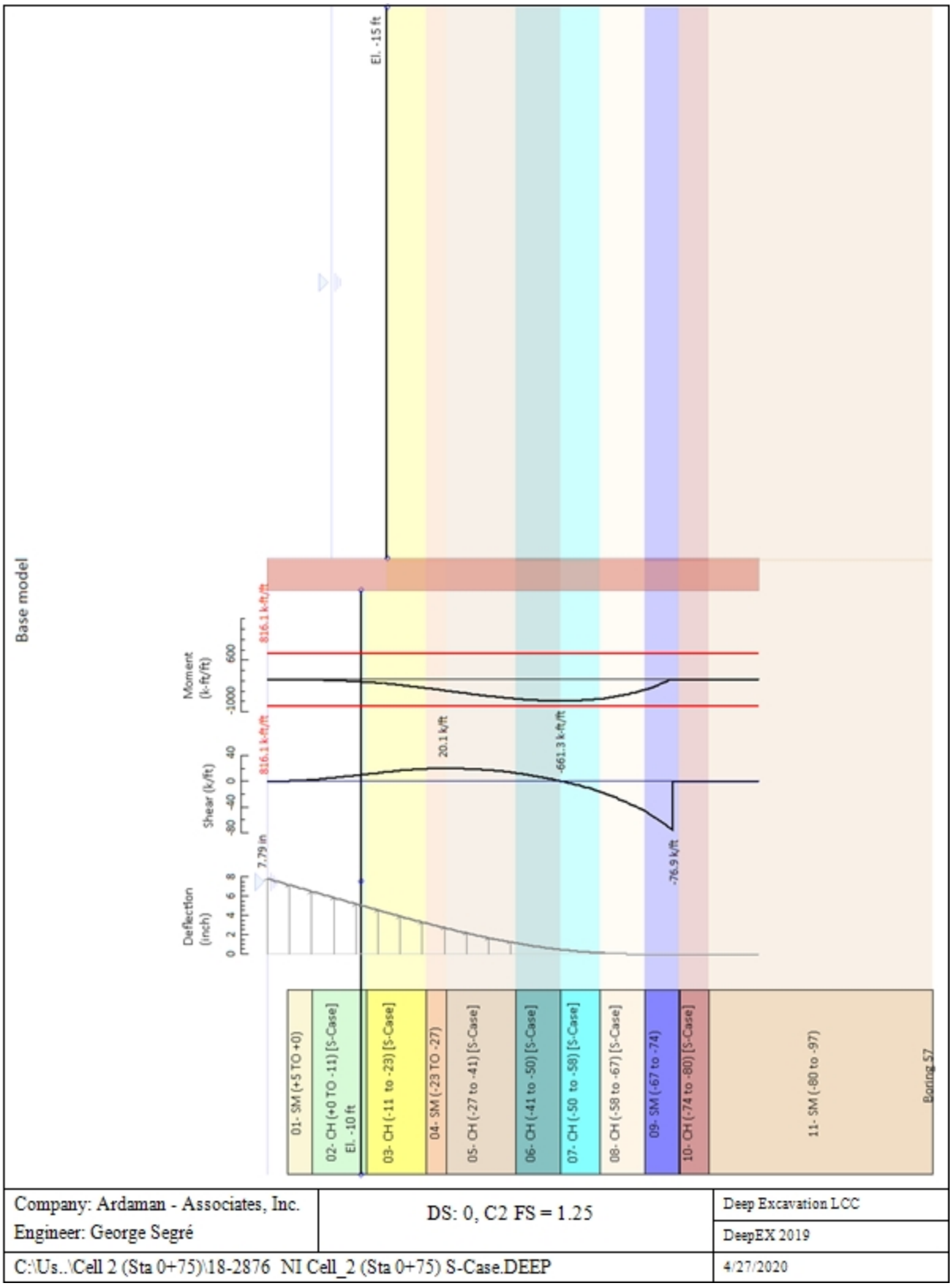

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |



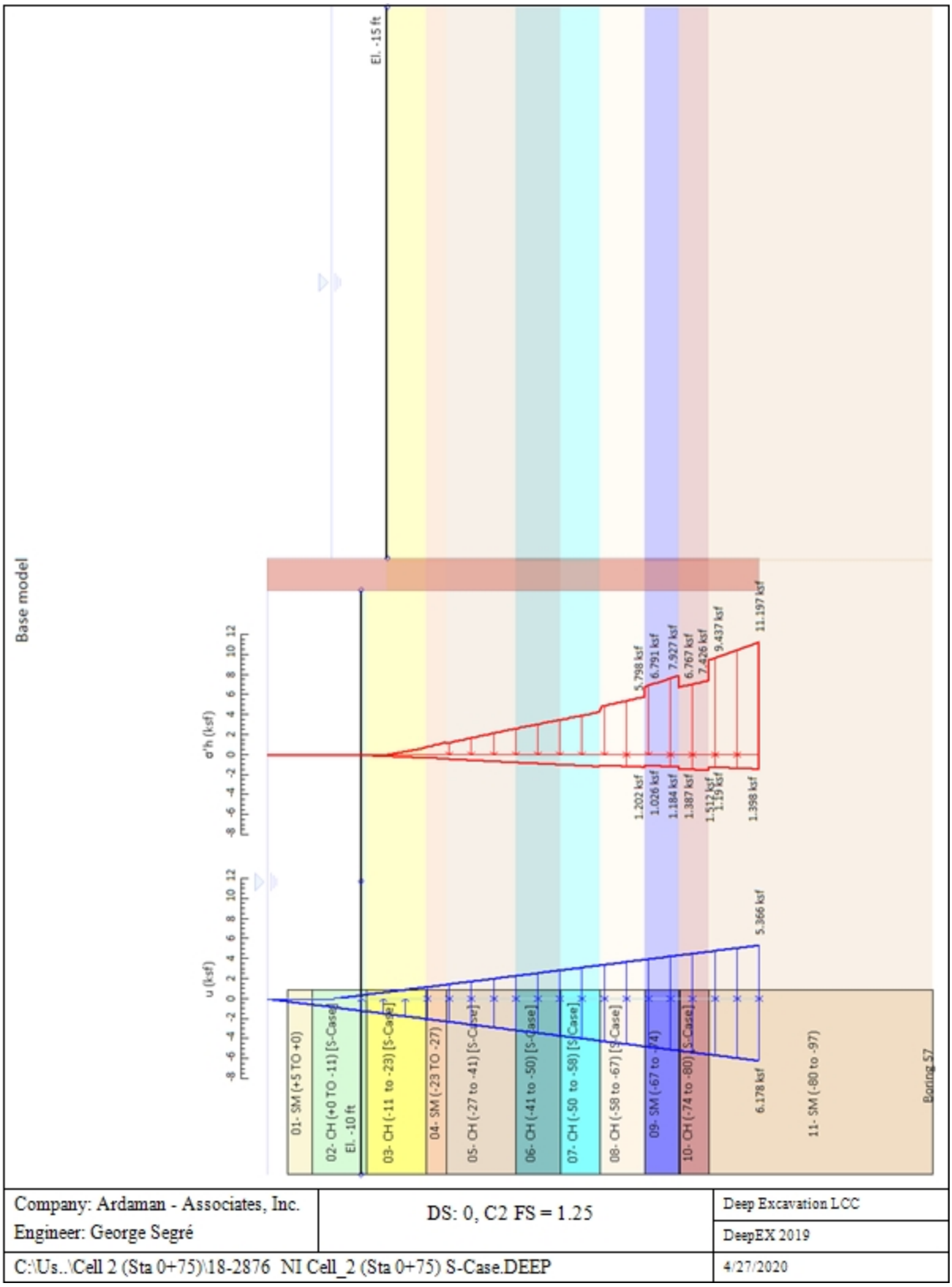

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |



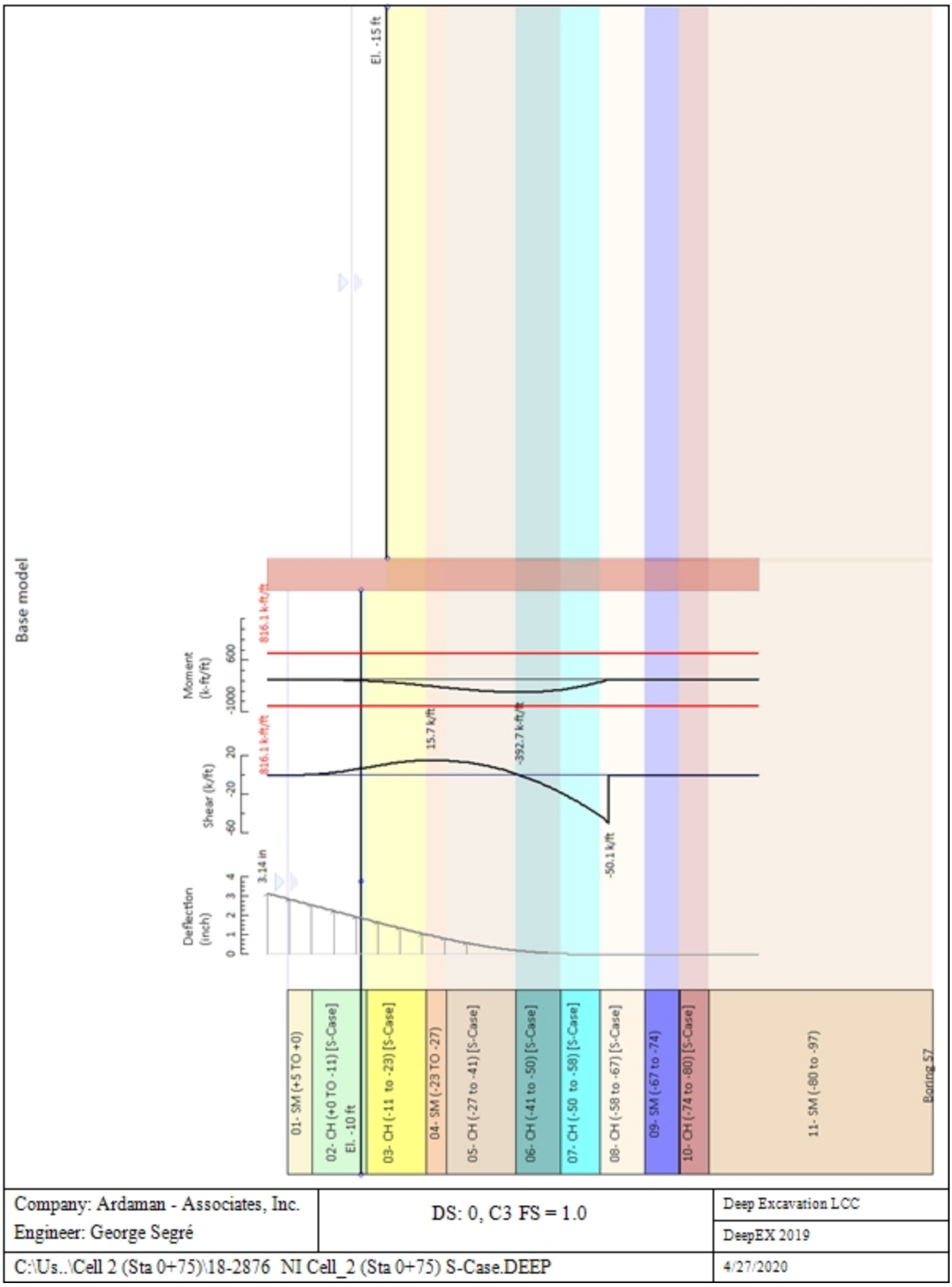

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |

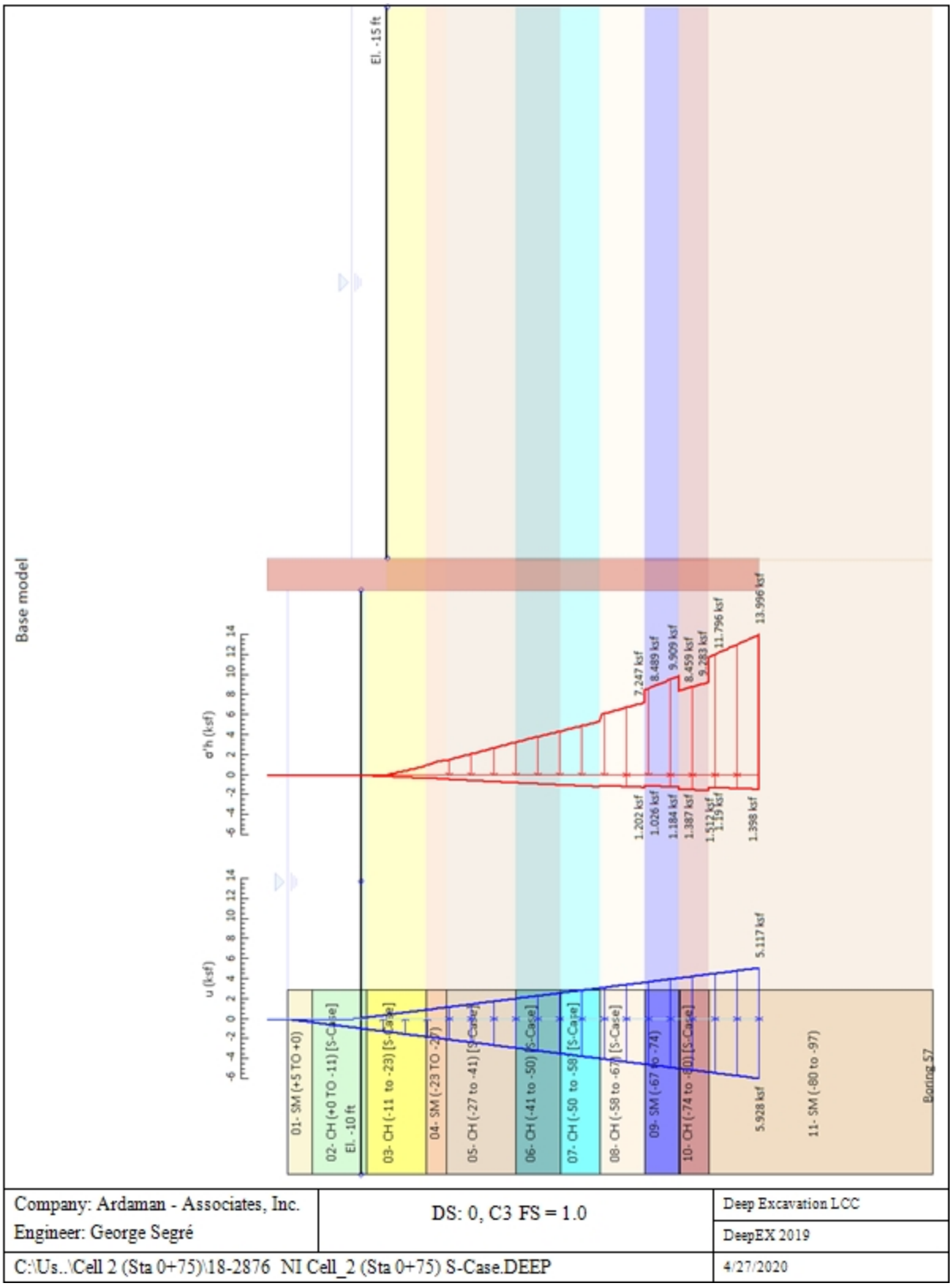



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |

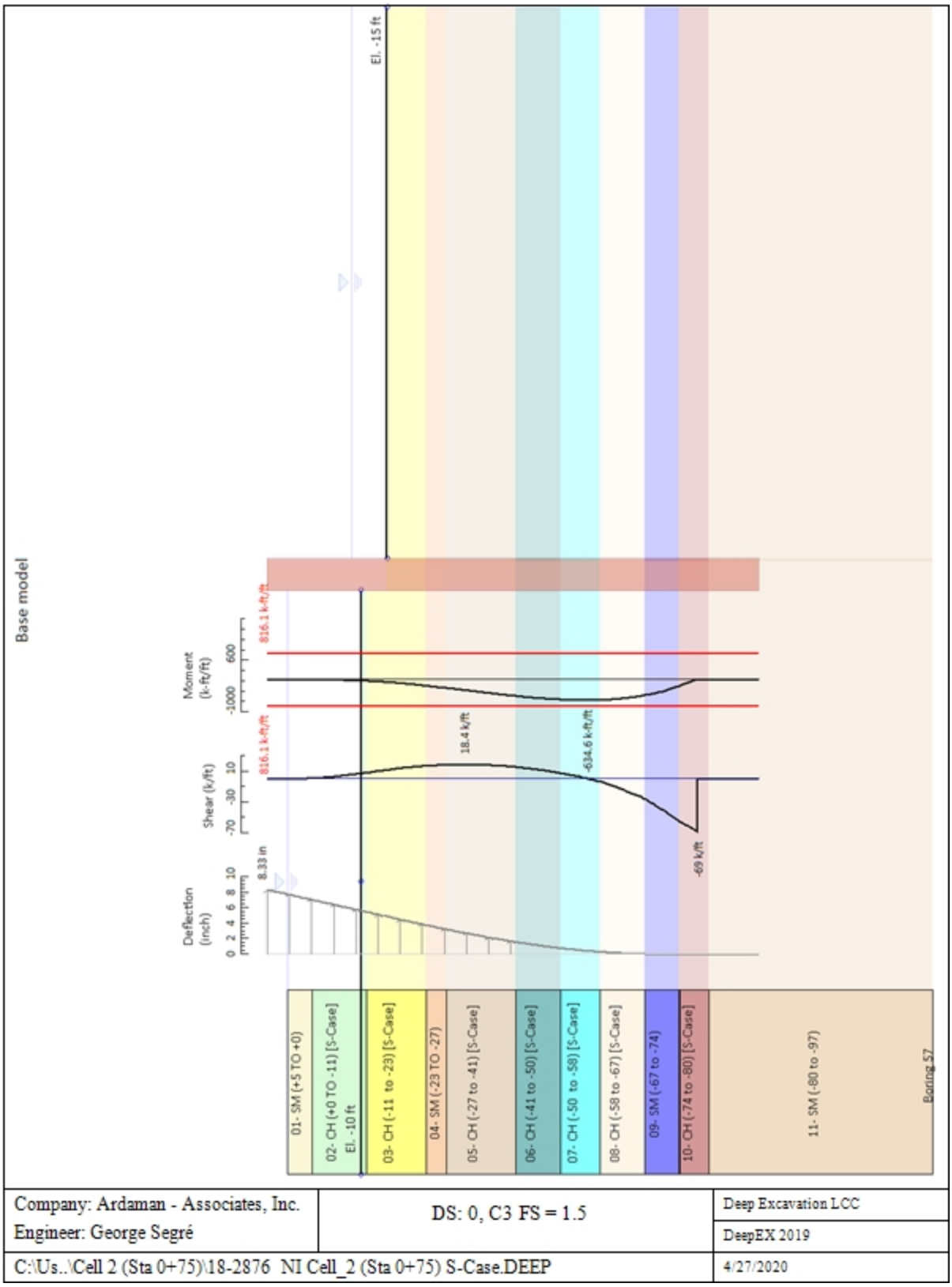



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |

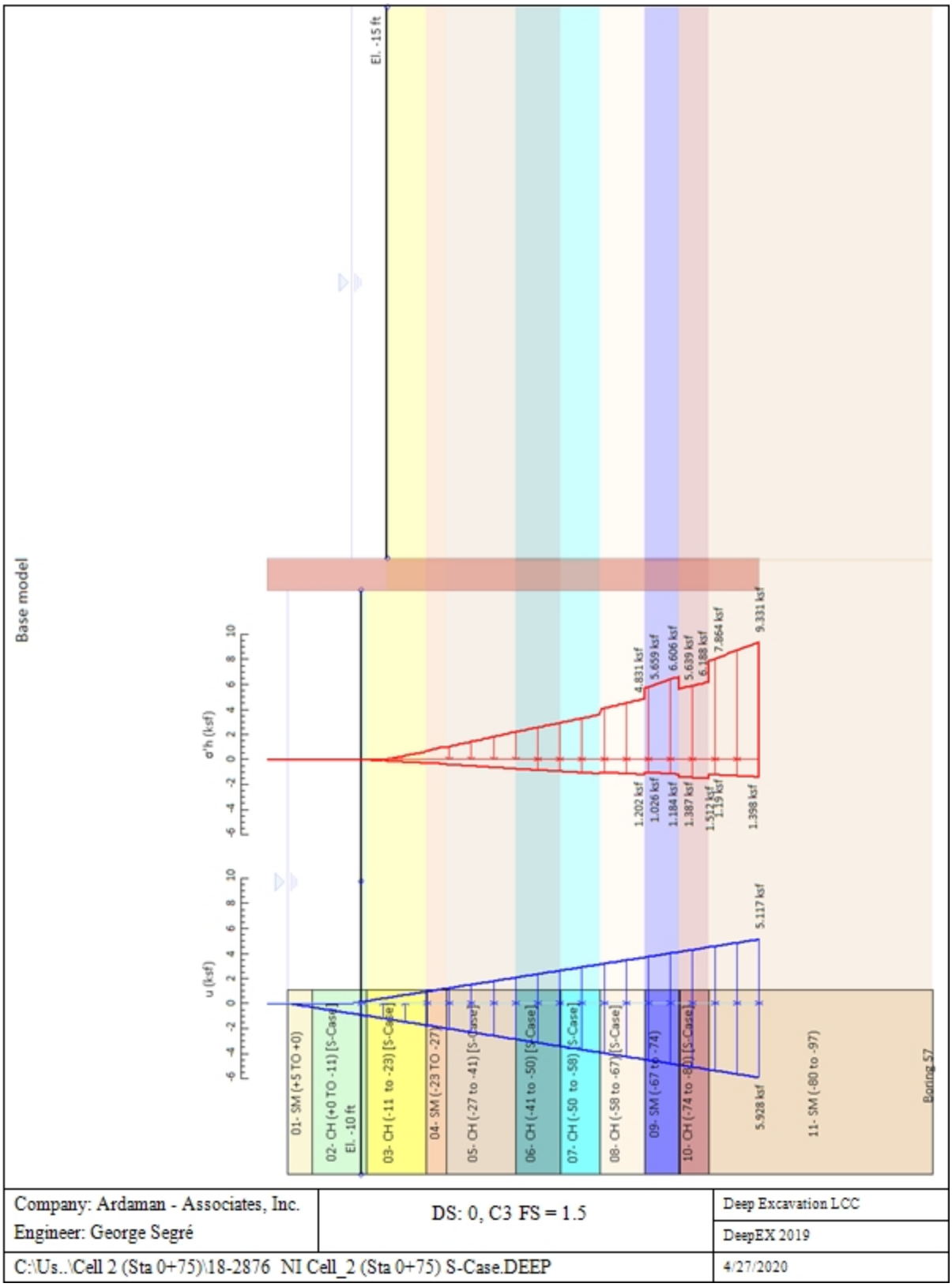

Base model
El. -15 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
-20
-60
15.7 k/ft
-392.7 k-ft/ft
-50.1 k/ft
Deflection (inch)
0 1 2 3 4
3.14 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -10 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP
4/27/2020



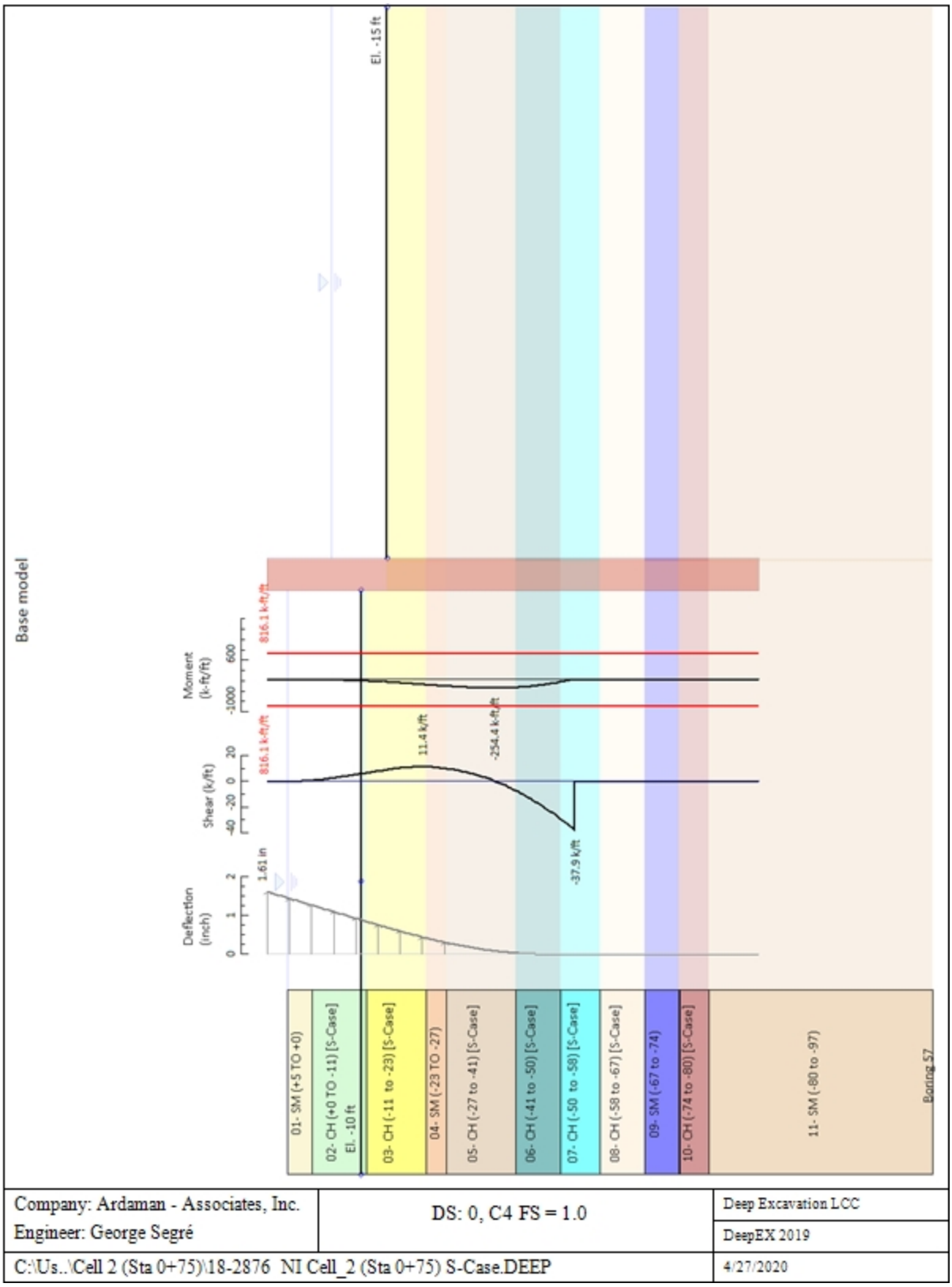

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |

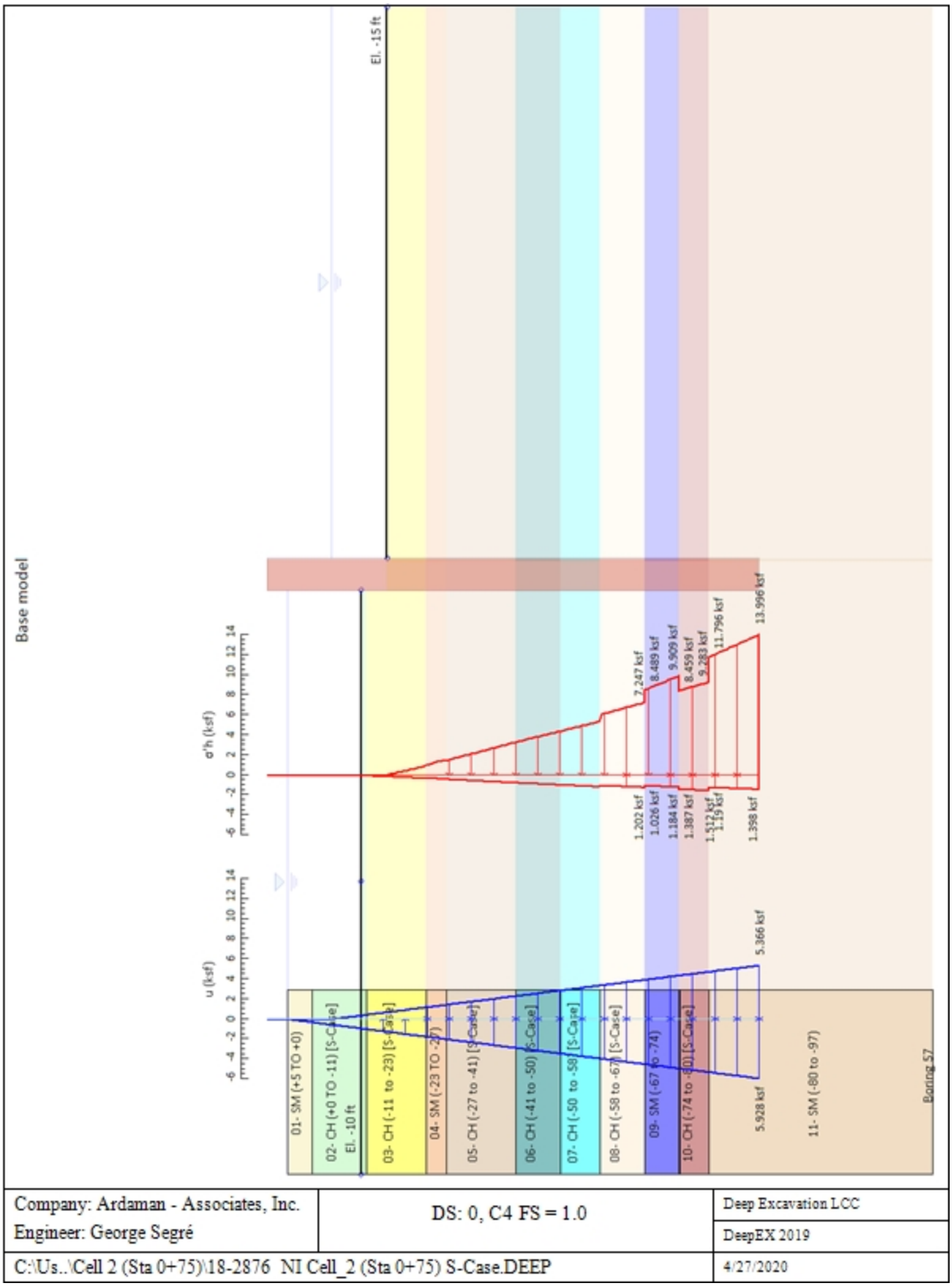



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |

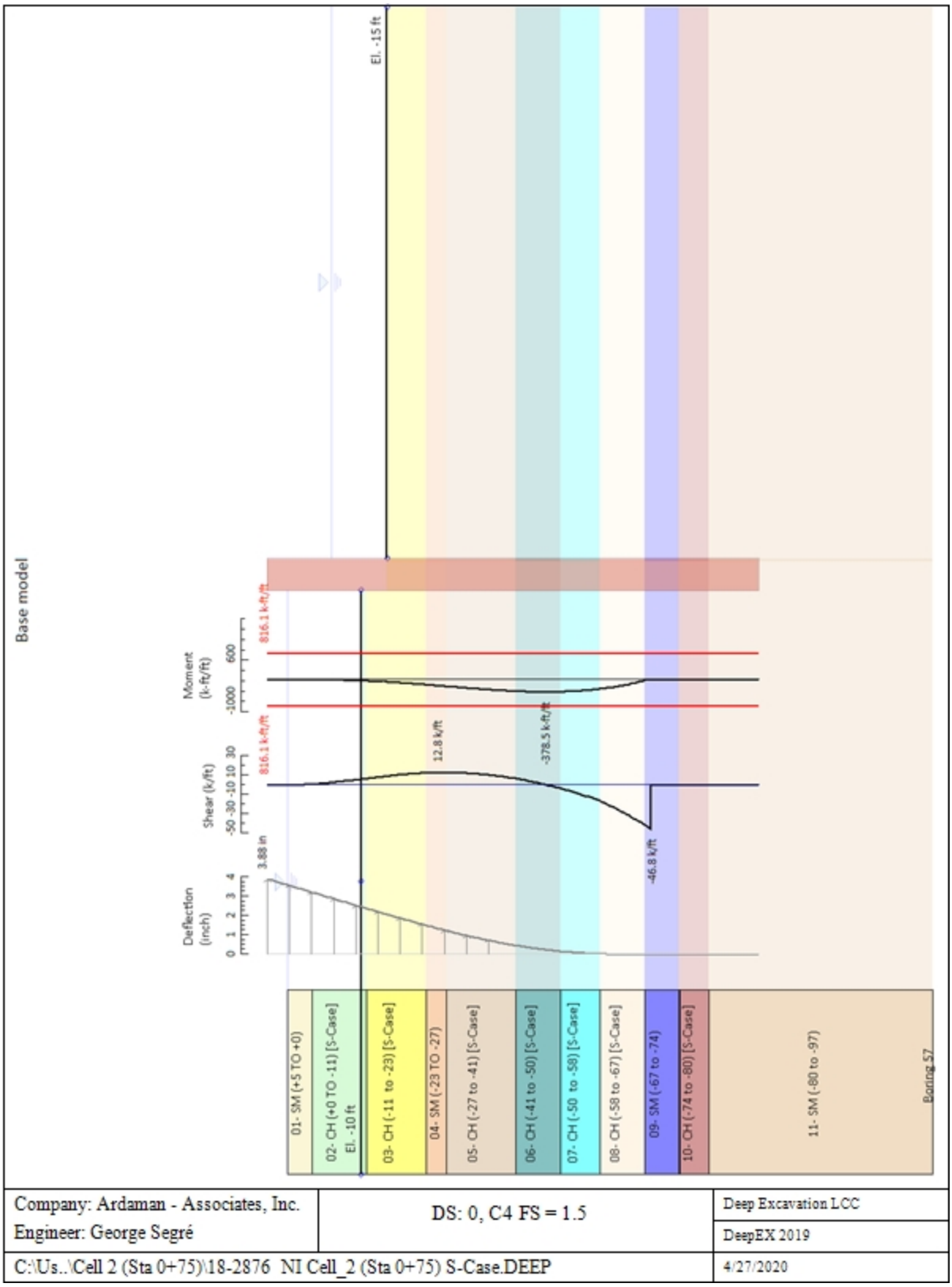


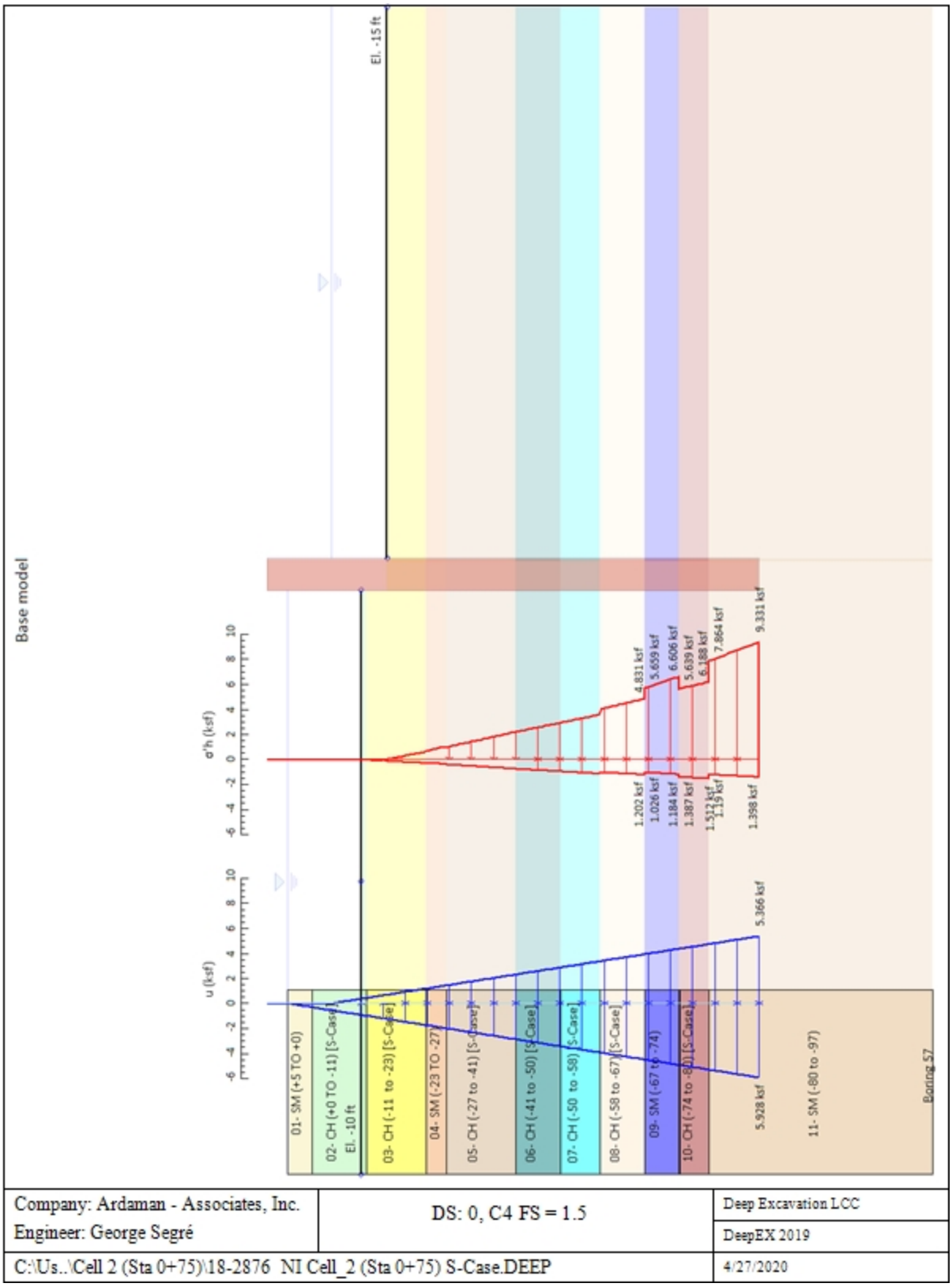

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
11.4 k/ft
-254.4 k-ft/ft
-37.9 k/ft
Deflection (inch)
0
1
2
1.61 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -10 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
12.8 k/ft
-378.5 k-ft/ft
-46.8 k/ft
Deflection (inch)
0 1 2 3 4
3.88 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -10 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 1+25 Left Wall)

| | | | | |
|---|---|---|---|---|
| Top of Wall = | 9.0 | ft., NAVD88 | Design Tip Elev. = | -102.0 ft., NAVD88 |
| Governing Tip Elev. = | -101.36 | ft., NAVD88 | Design Length of Sheeting = | 111.0 ft. |
| Length of Sheetting = | 110.36 | ft. | | |
| Use = | 111.0 | ft. | | |

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | $FS_{Active}$ | $FS_{Passive}$ | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -35.63 | 214.27 | 61.60 | 0.71 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -36.82 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -34.06 | 154.04 | 54.84 | 0.51 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -34.84 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -32.87 | 99.17 | 42.93 | 0.30 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -34.06 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -30.50 | 63.20 | 29.26 | 0.17 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -30.90 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -91.44 | 1,700.82 | 168.83 | 29.21 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -101.36 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -85.24 | 1,275.34 | 130.60 | 19.46 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -94.54 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -83.38 | 1,073.77 | 117.46 | 15.33 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -101.36 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -76.56 | 725.91 | 89.05 | 8.90 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -92.68 | -- | -- | -- |
| | | | | | | Governing Value: | -101.36 | 1,700.82 | 168.83 | 29.21 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:06:50 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 0 | 0 | 500 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 0 | 0 | 1000 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 0 | 0 | 3300 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 0 | 0 | 1400 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 0 | 0 | 1850 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 0 | 0 | 1900 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 0 | 0 | 2000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | 0 | 0 | 0.95 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

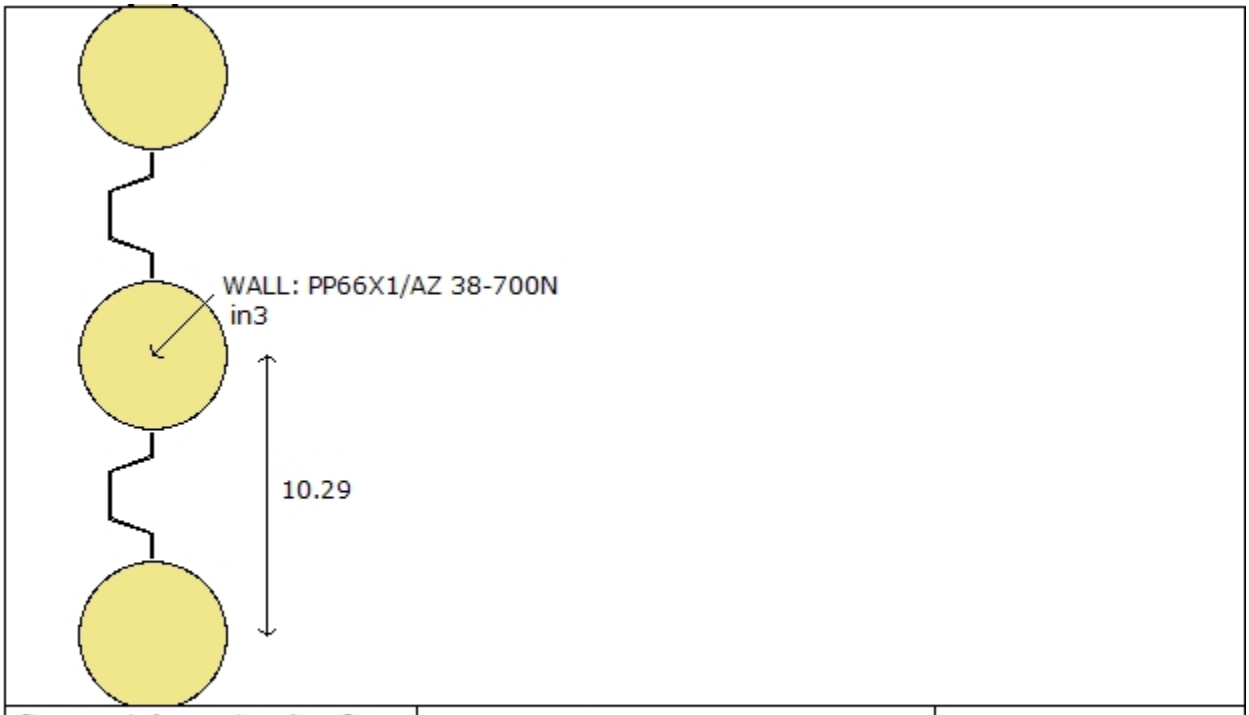
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 1 |
| -11 | 03- CH (-11 to | 1 | 0.95 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 1 |
| -41 | 06- CH (-41 to | 1 | 1 |
| -50 | 07- CH (-50 to | 1 | 1 |
| -58 | 08- CH (-58 to | 1 | 1 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 1 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 4.231 | 6.335 | 8.947 |
| Stage 1 | Simple span | N/A | 1.6 | 3.807 | 5.16 | 7.27 |
| Stage 2 | Simple span | N/A | 1.6 | 4.967 | 6.74 | 9.333 |
| Stage 3 | Simple span | N/A | 1.6 | 4.571 | 5.529 | 7.609 |
| Stage 4 | Simple span | N/A | 1.6 | 5.718 | 8.635 | 10.466 |
| Stage 5 | Simple span | N/A | 1.6 | 4.967 | 5.965 | 7.198 |
| Stage 6 | Simple span | N/A | 1.6 | 8.182 | 9.187 | 10.918 |
| Stage 7 | Simple span | N/A | 1.6 | 6.435 | 6.435 | 7.556 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

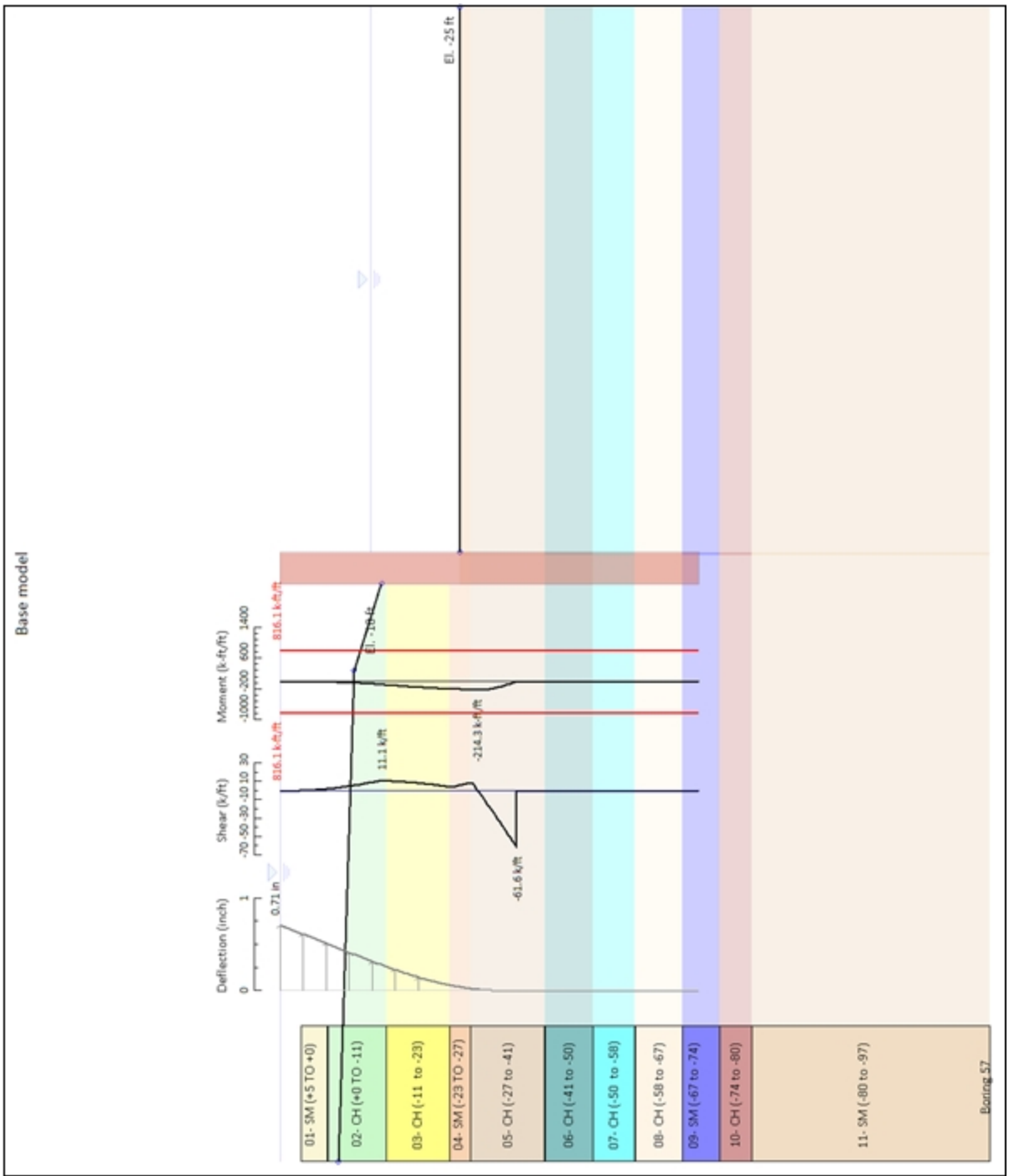
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

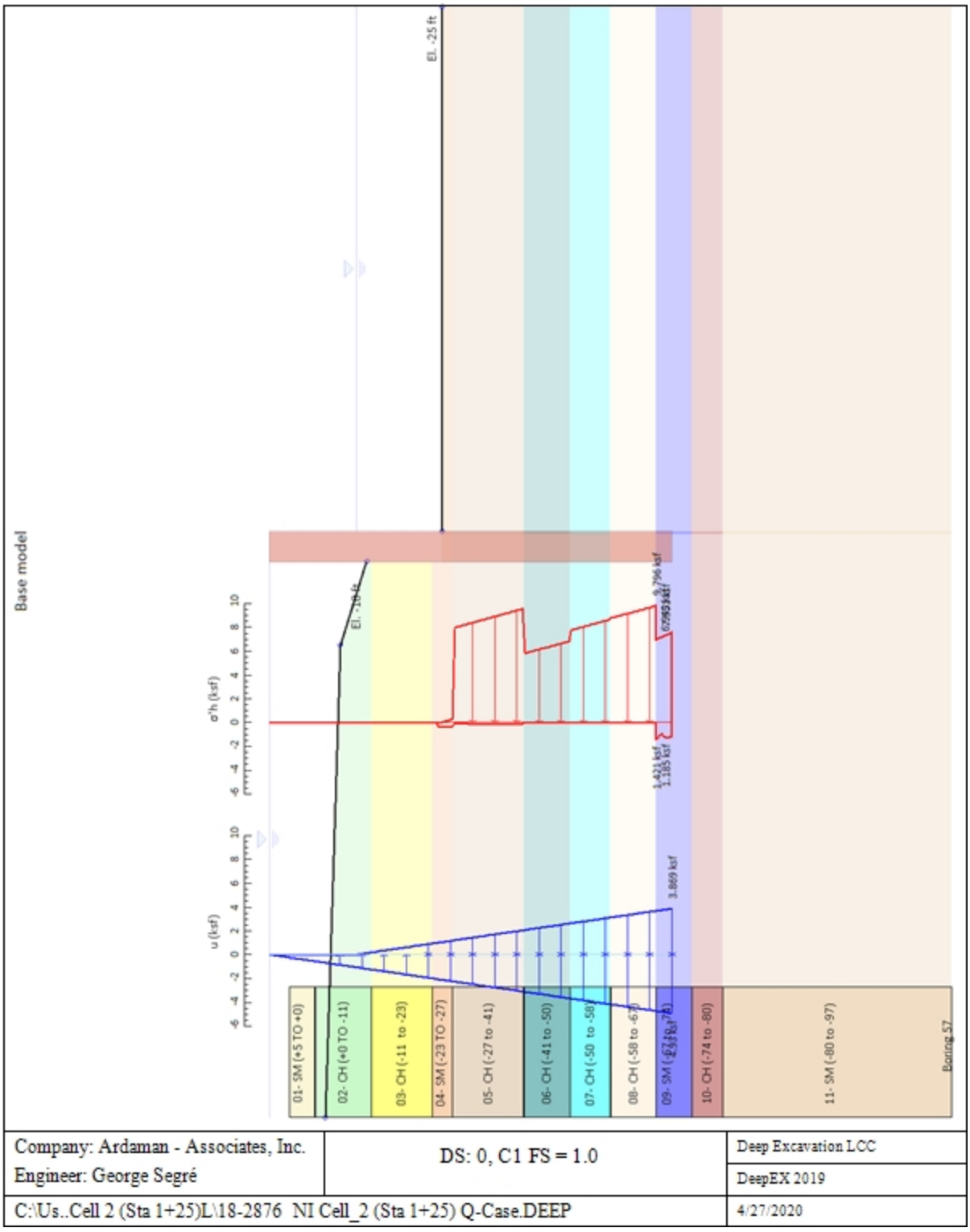
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

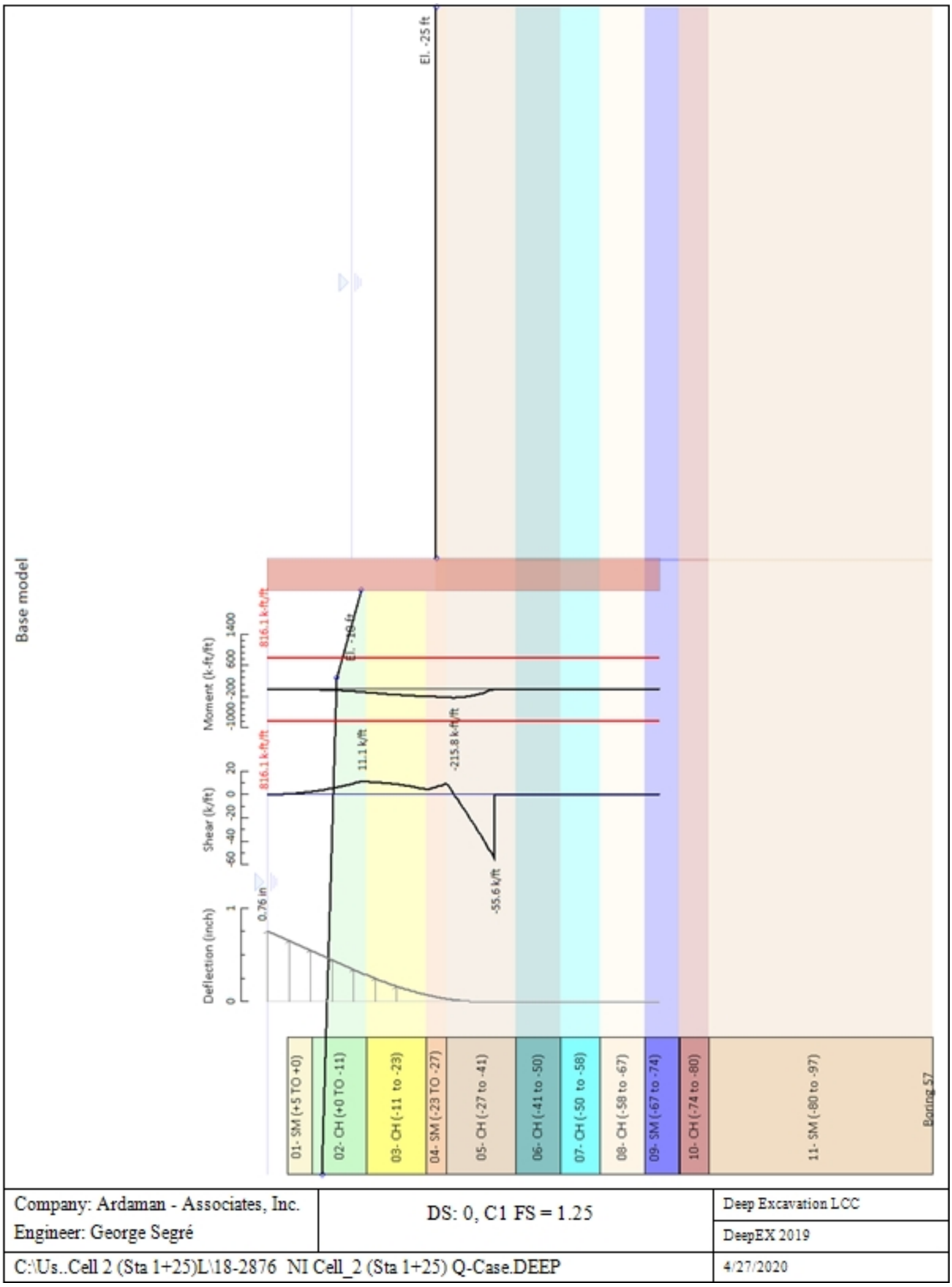
A sequence of figures for each excavation stage is reported



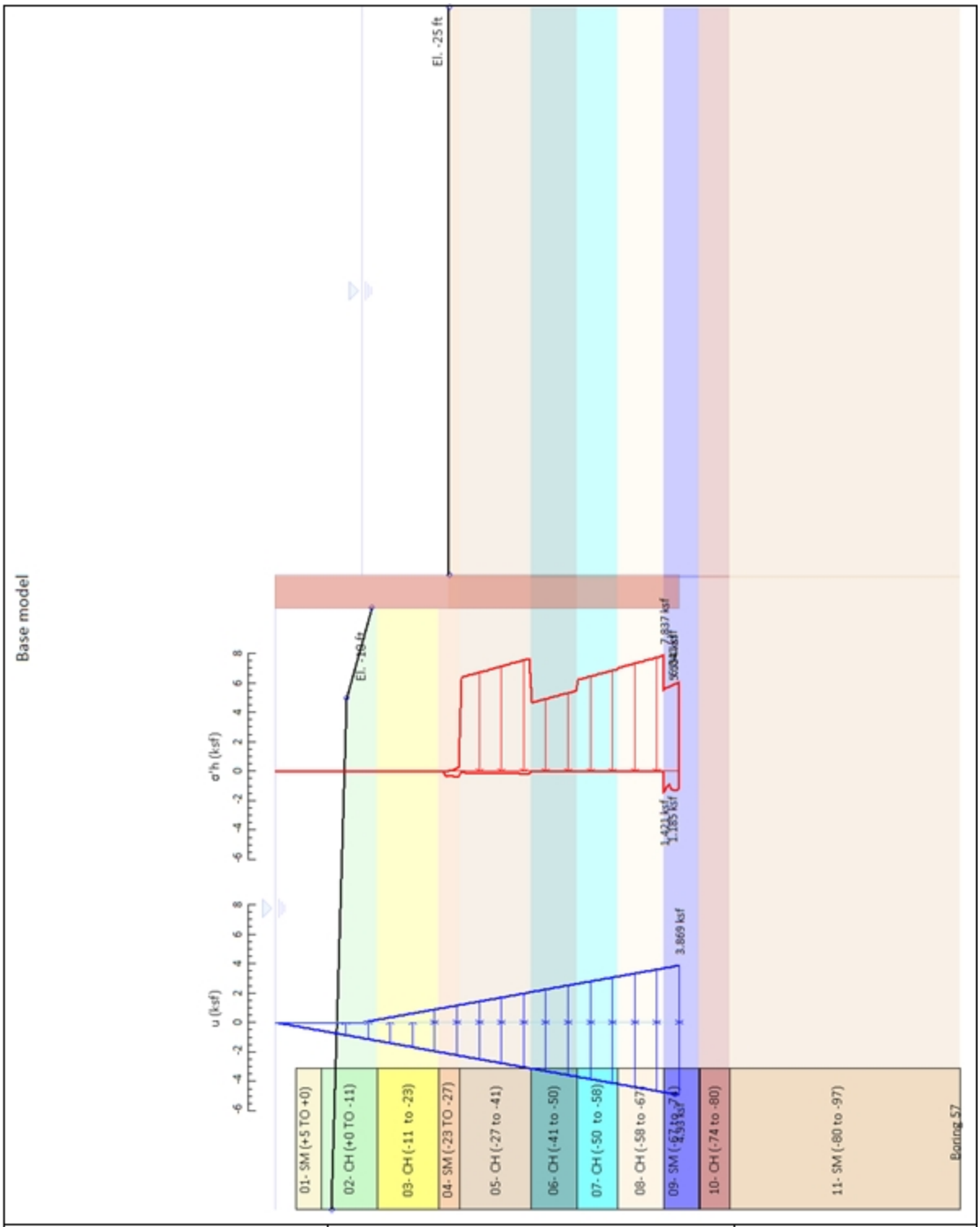

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |



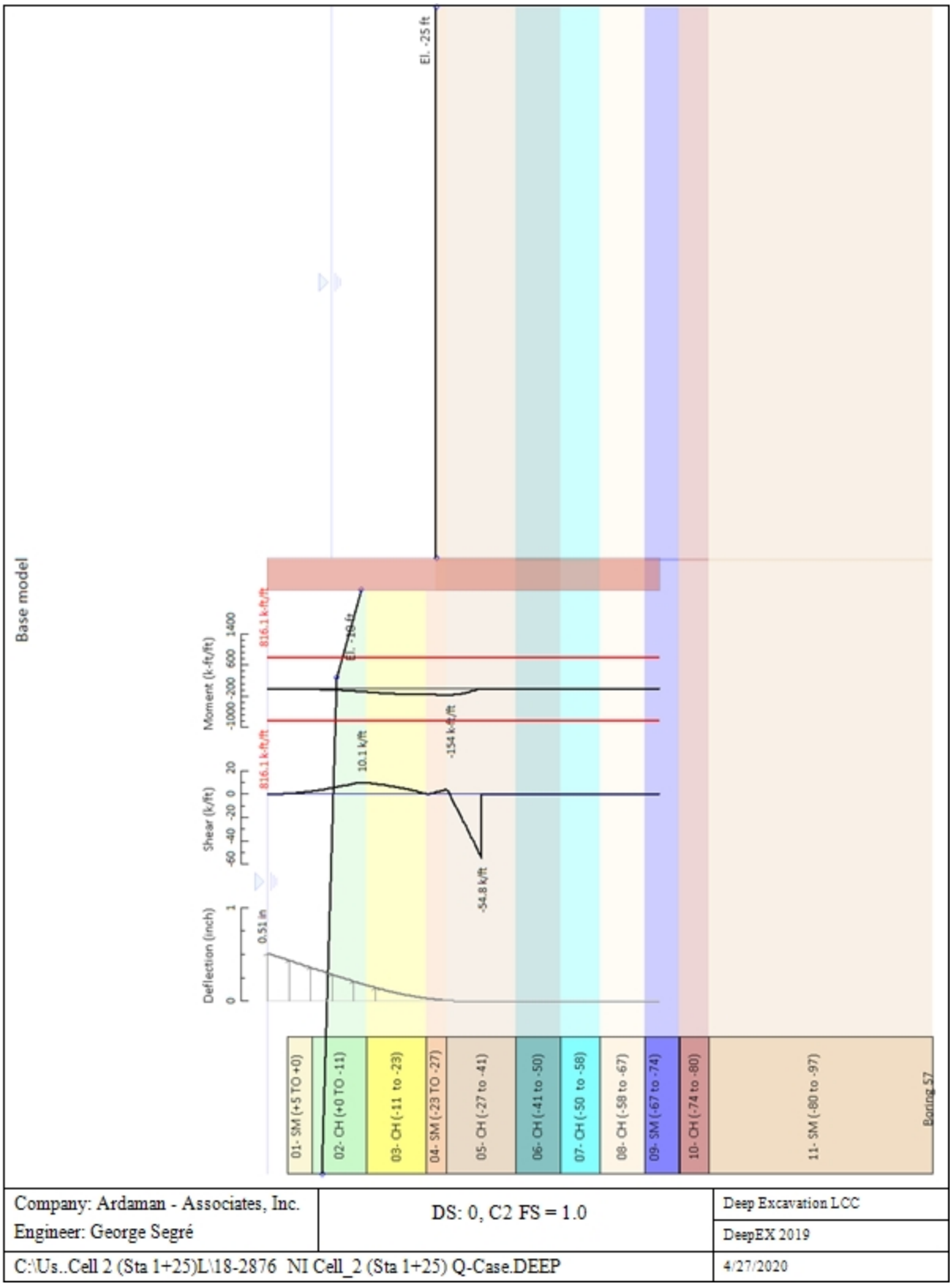

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |



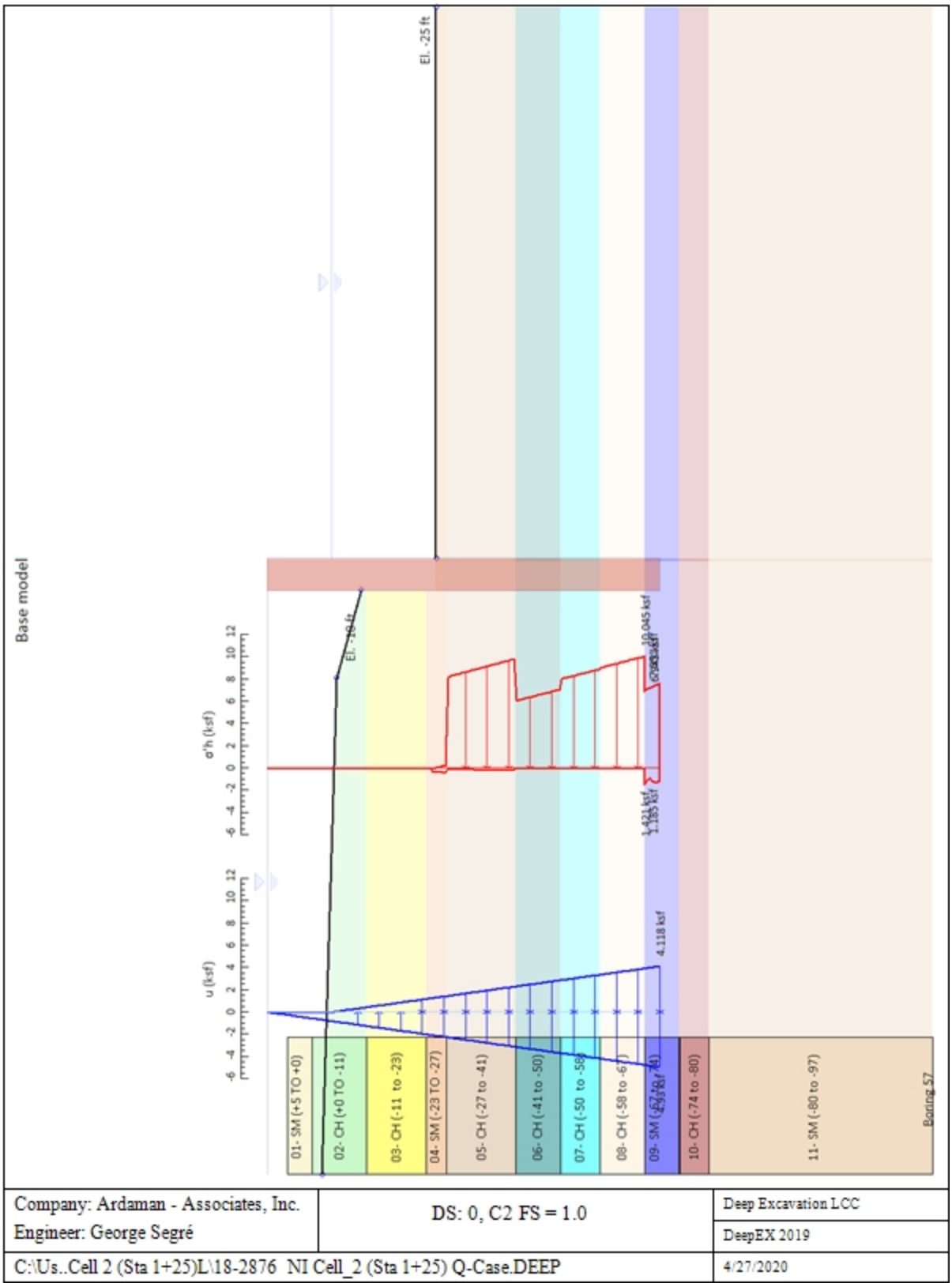

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |

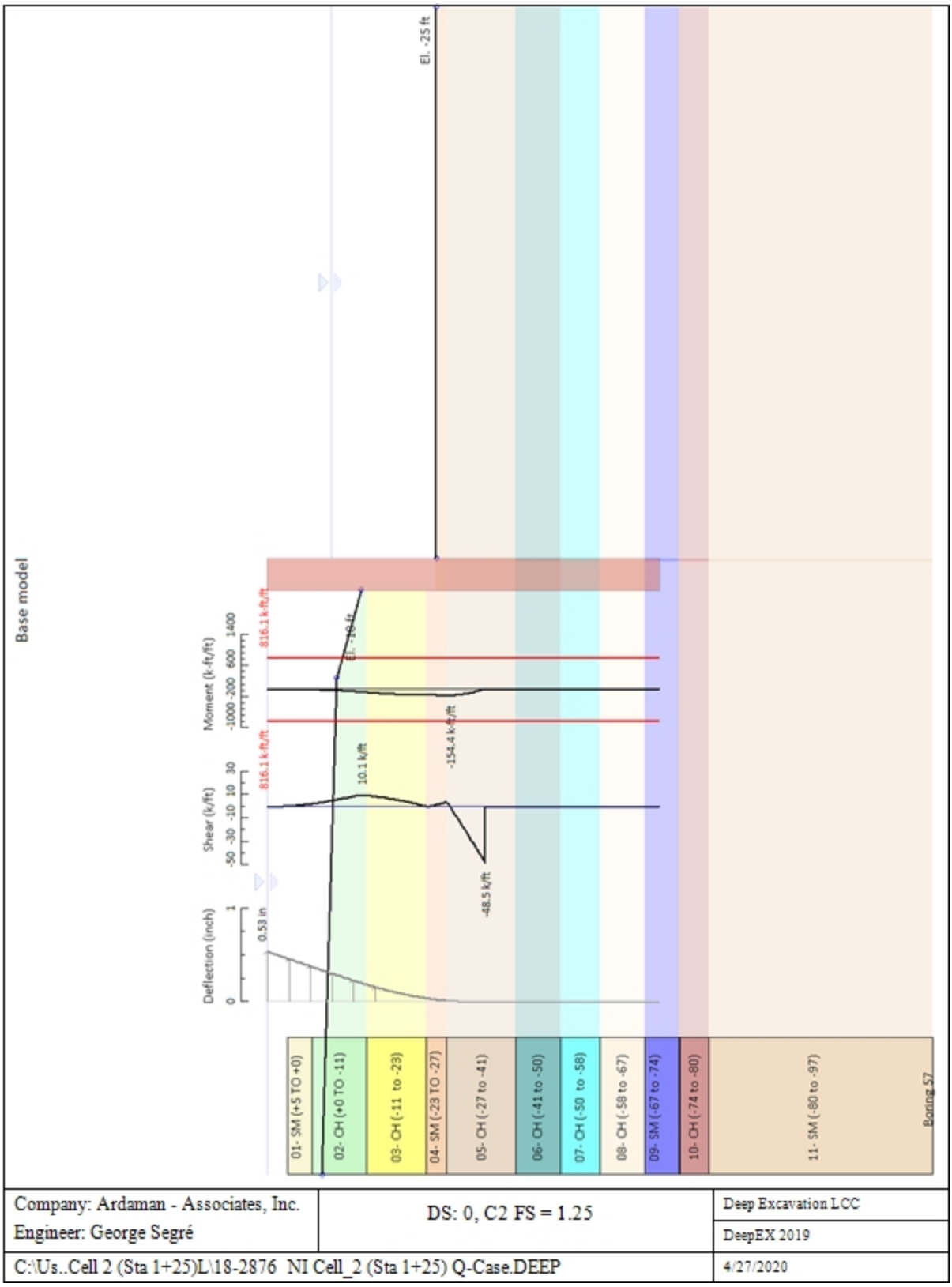



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |

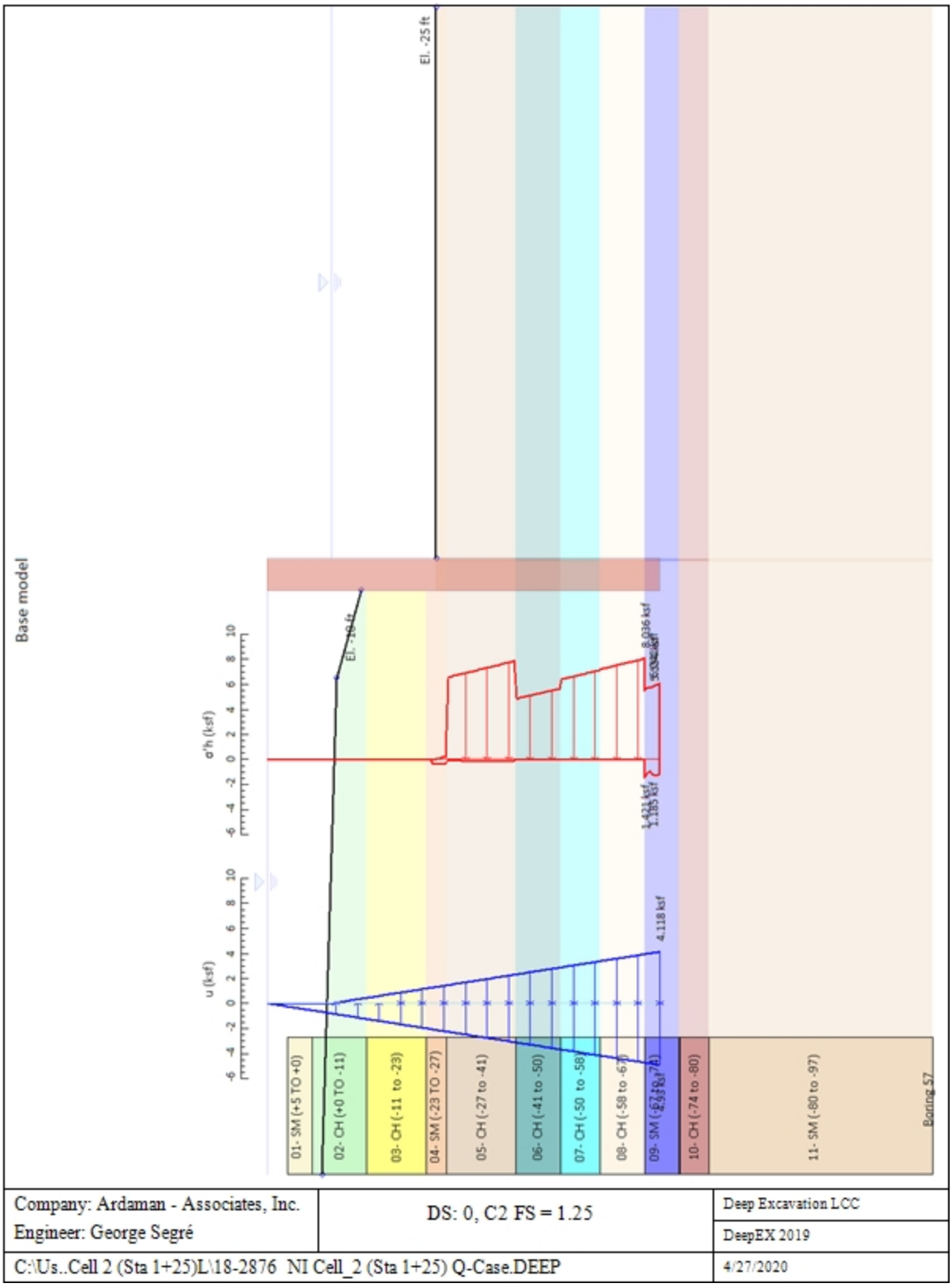



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |

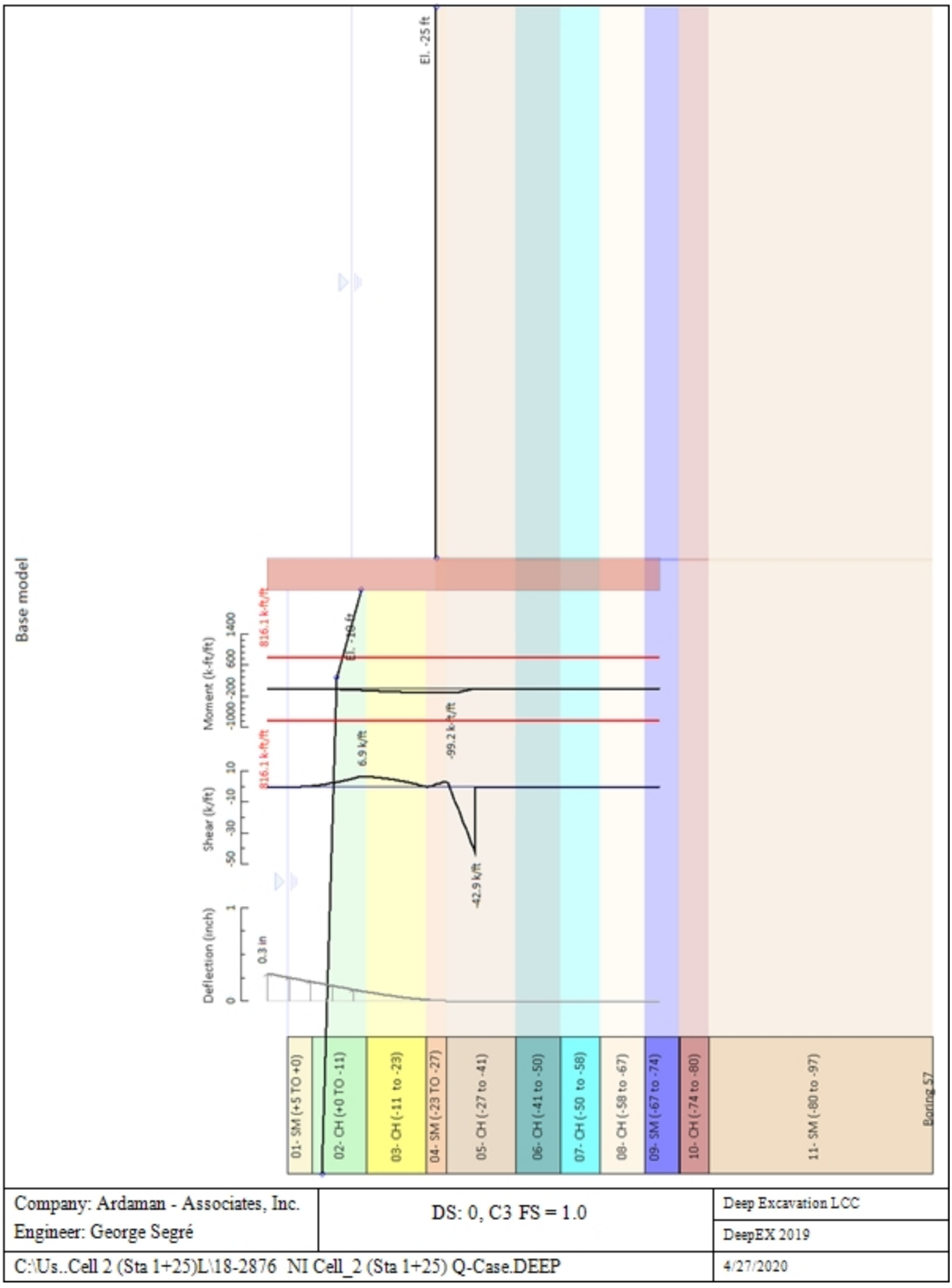

Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
10.045 ksf
1.421 ksf
1.185 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020

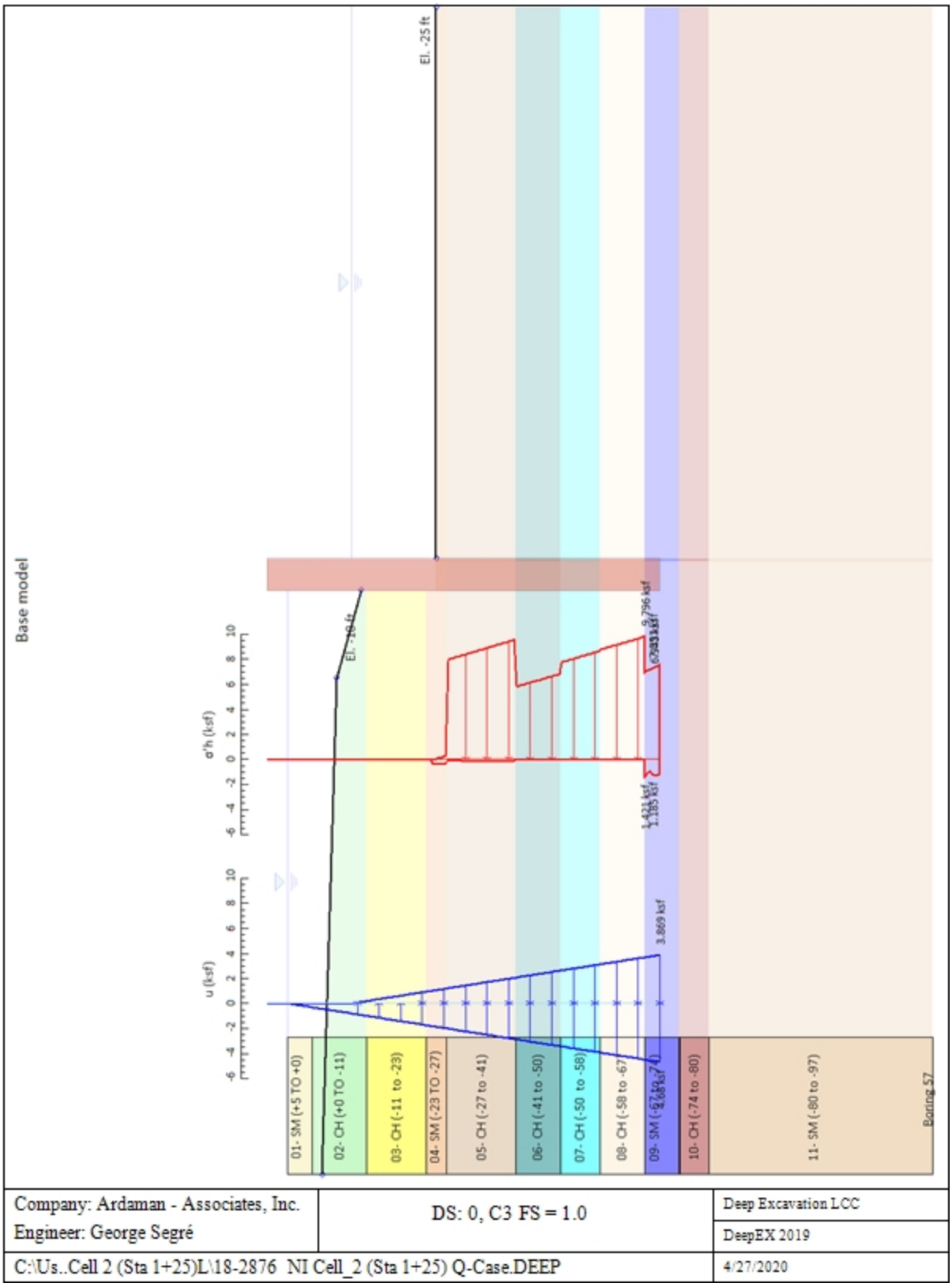


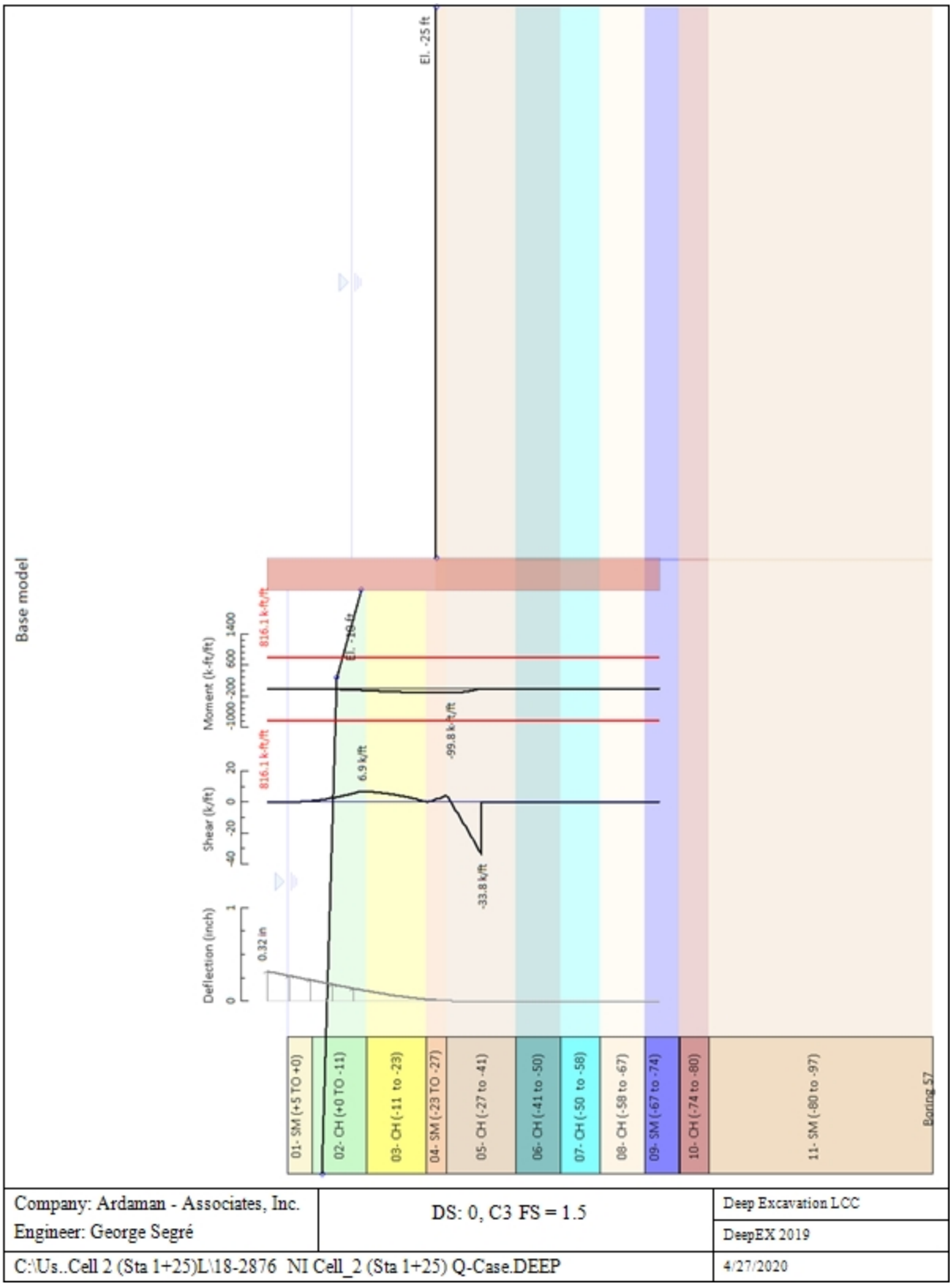

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |



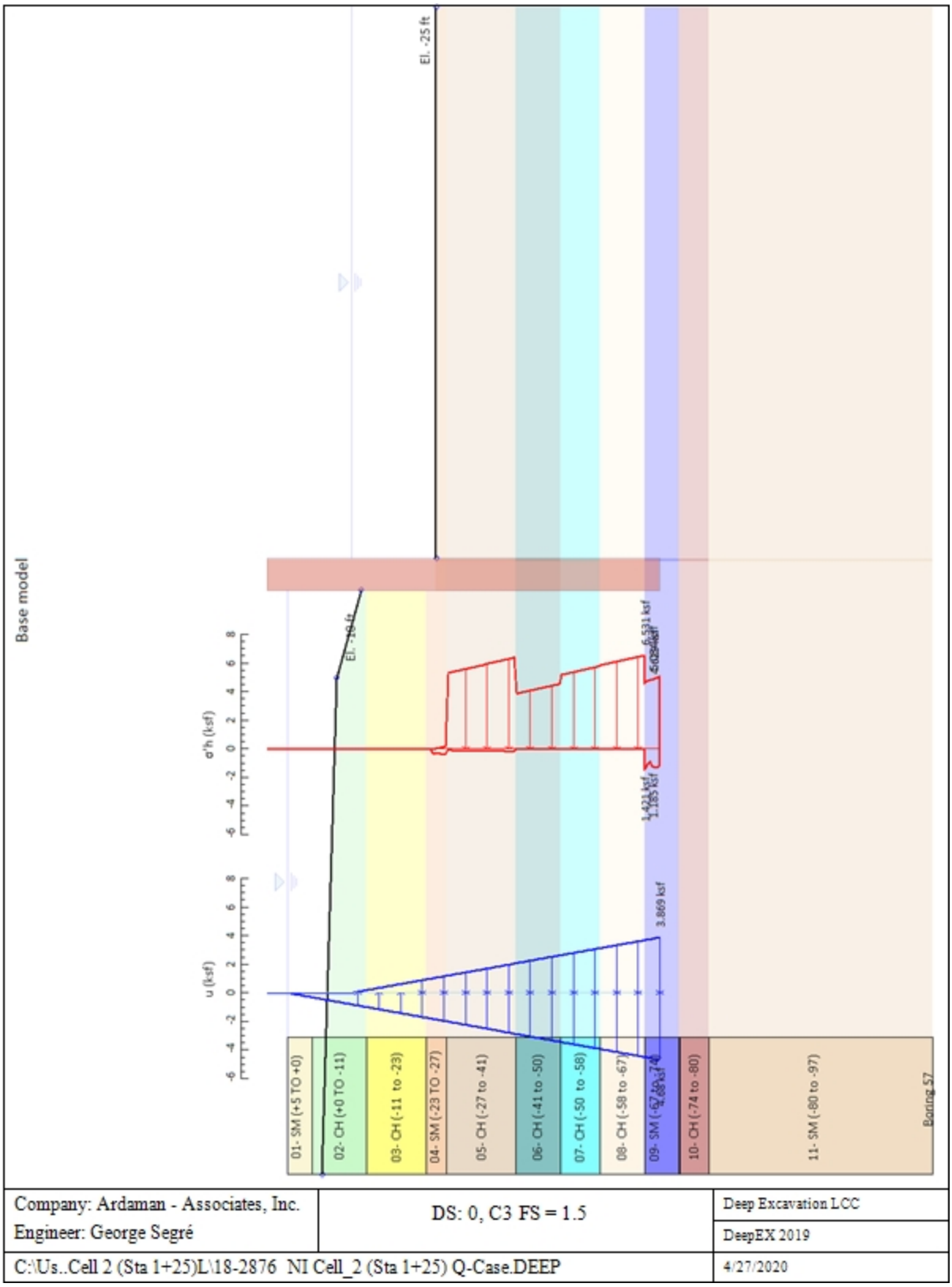

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |

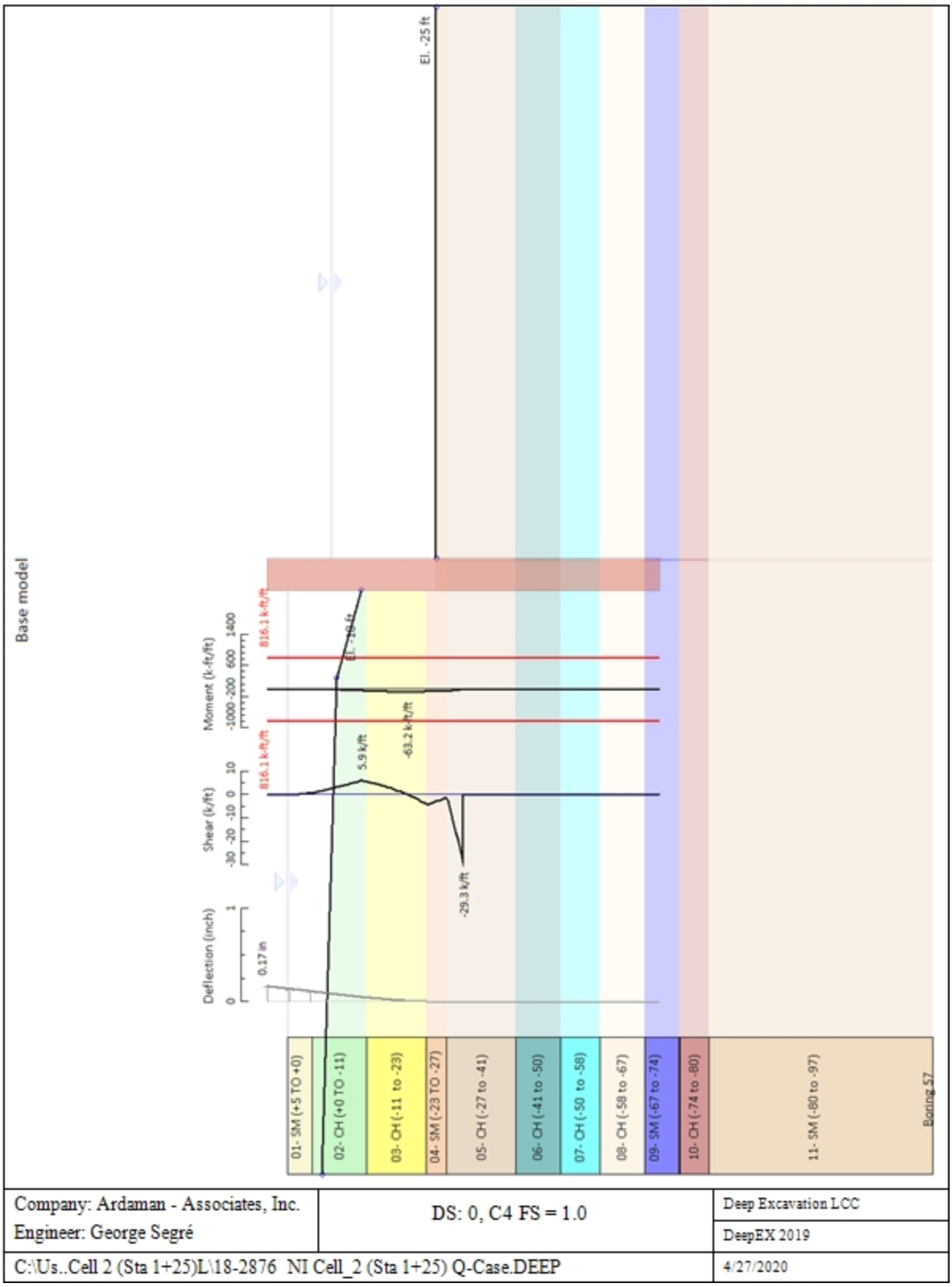

Base model
El. -25 ft
El. -16 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-50 -30 -10 10
6.9 k/ft
-99.2 k-ft/ft
-42.9 k/ft
Deflection (inch)
0 1
0.3 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020

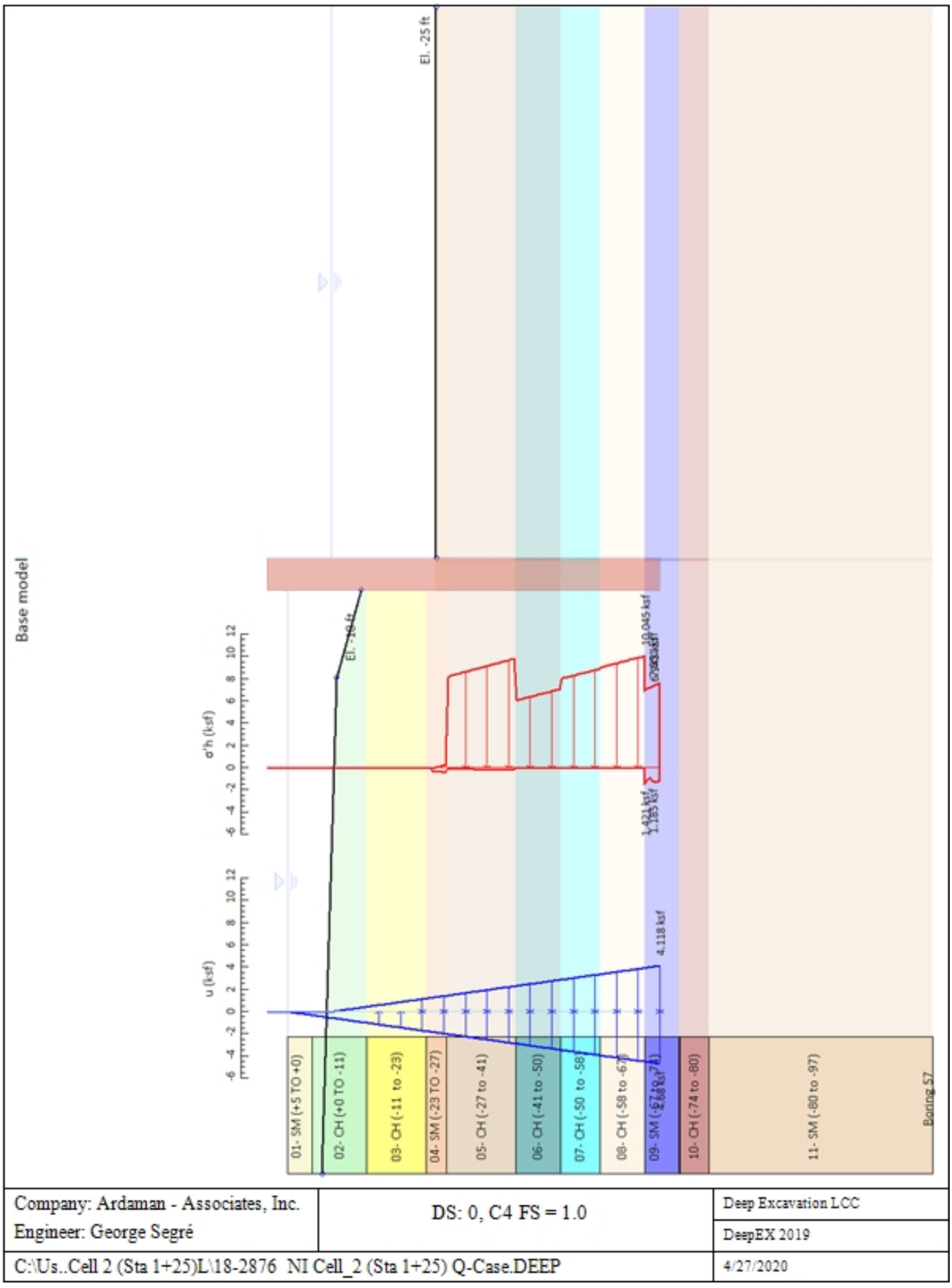

Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
9.796 ksf
1.421 ksf
1.185 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020

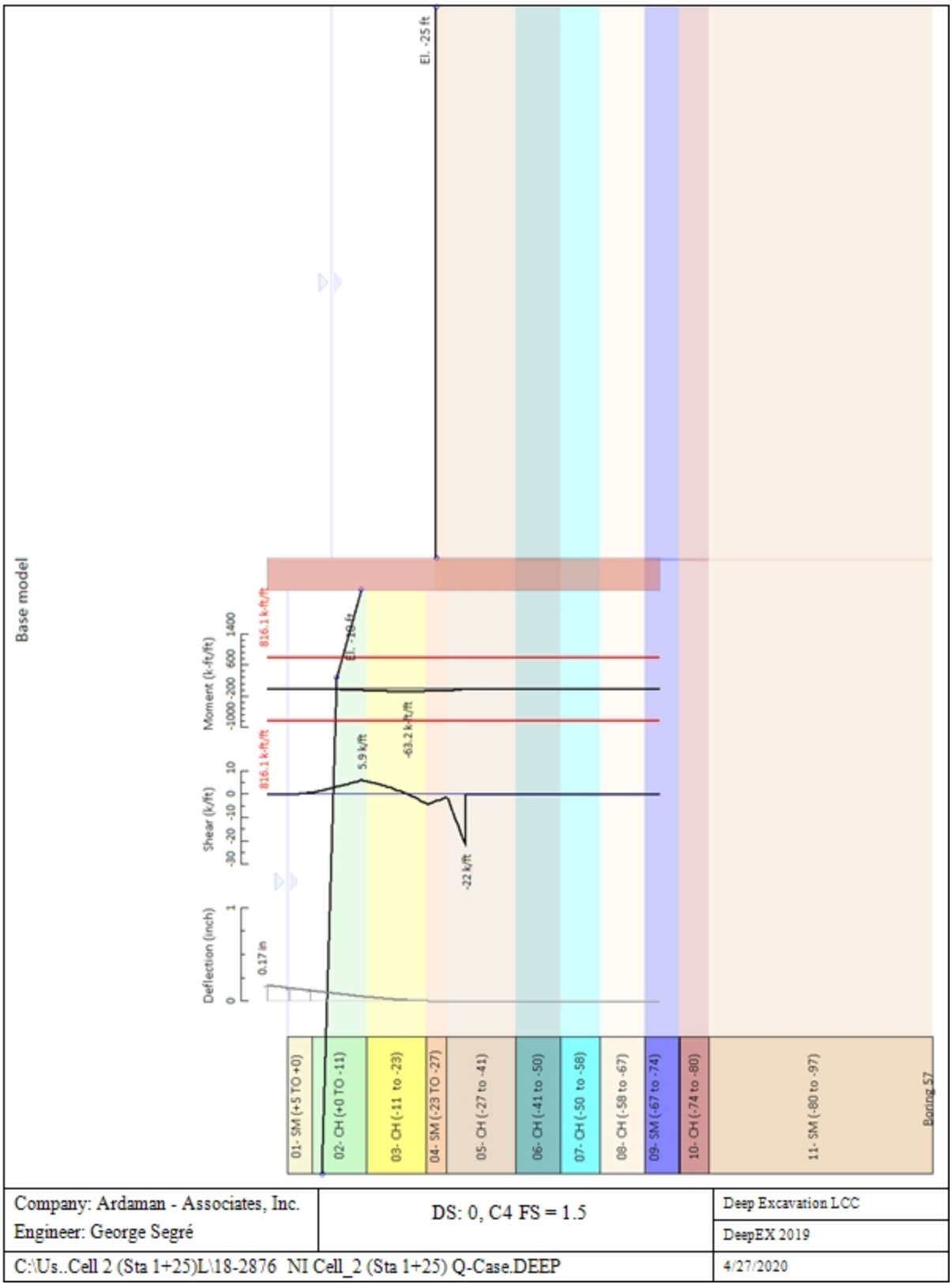


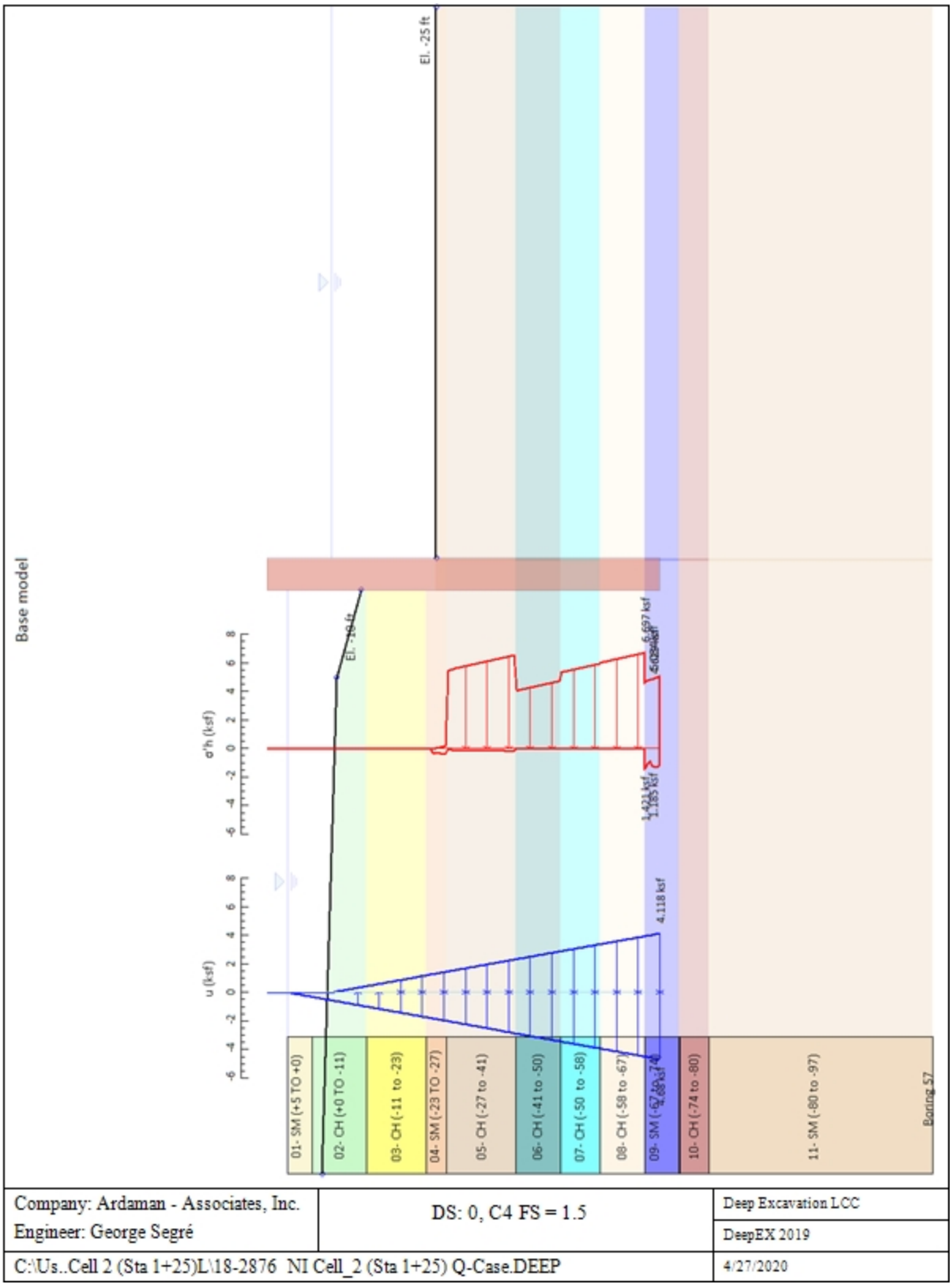

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
6.531 ksf
1.421 ksf
1.185 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 TO -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020


Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. -16 ft
-63.2 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
816.1 k-ft/ft
5.9 k/ft
-29.3 k/ft
Deflection (inch)
0 1
0.17 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020


Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
10.045 ksf
1.421 ksf
1.185 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020


Base model
El. -25 ft
El. -16 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
-63.2 k-ft/ft
5.9 k/ft
-22 k/ft
Shear (k/ft)
-30 -20 -10 0 10
Deflection (inch)
0 1
0.17 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP | | 4/27/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:13:45 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 150 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | - | - | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | - | - | 0.609 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

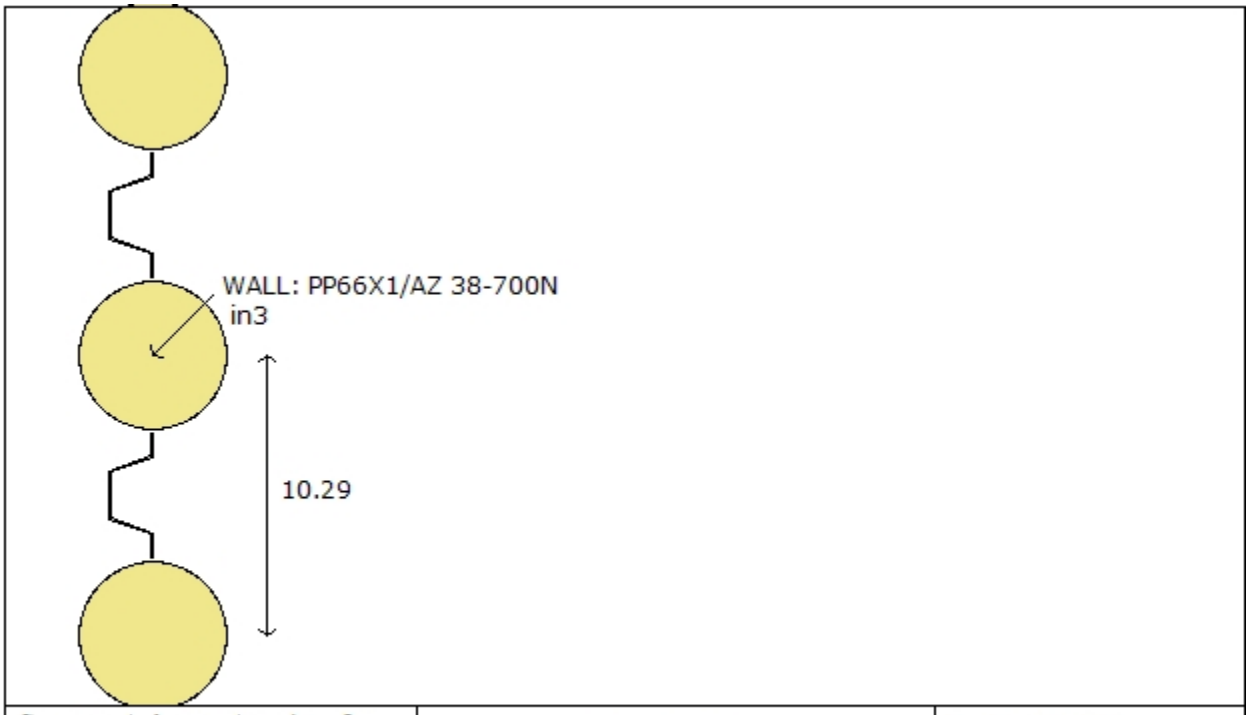
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 0.61 |
| -11 | 03- CH (-11 to | 1 | 0.61 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 0.61 |
| -41 | 06- CH (-41 to | 1 | 0.61 |
| -50 | 07- CH (-50 to | 1 | 0.61 |
| -58 | 08- CH (-58 to | 1 | 0.56 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 0.56 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -115 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.295 | 1.295 | 1.751 |
| Stage 1 | Simple span | N/A | 1.6 | 1.139 | 1.139 | 1.519 |
| Stage 2 | Simple span | N/A | 1.6 | 1.355 | 1.355 | 1.796 |
| Stage 3 | Simple span | N/A | 1.6 | 1.2 | 1.2 | 1.564 |
| Stage 4 | Simple span | N/A | 1.6 | 1.4 | 1.4 | 1.844 |
| Stage 5 | Simple span | N/A | 1.6 | 1.12 | 1.12 | 1.437 |
| Stage 6 | Simple span | N/A | 1.6 | 1.466 | 1.466 | 1.891 |
| Stage 7 | Simple span | N/A | 1.6 | 1.185 | 1.185 | 1.484 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

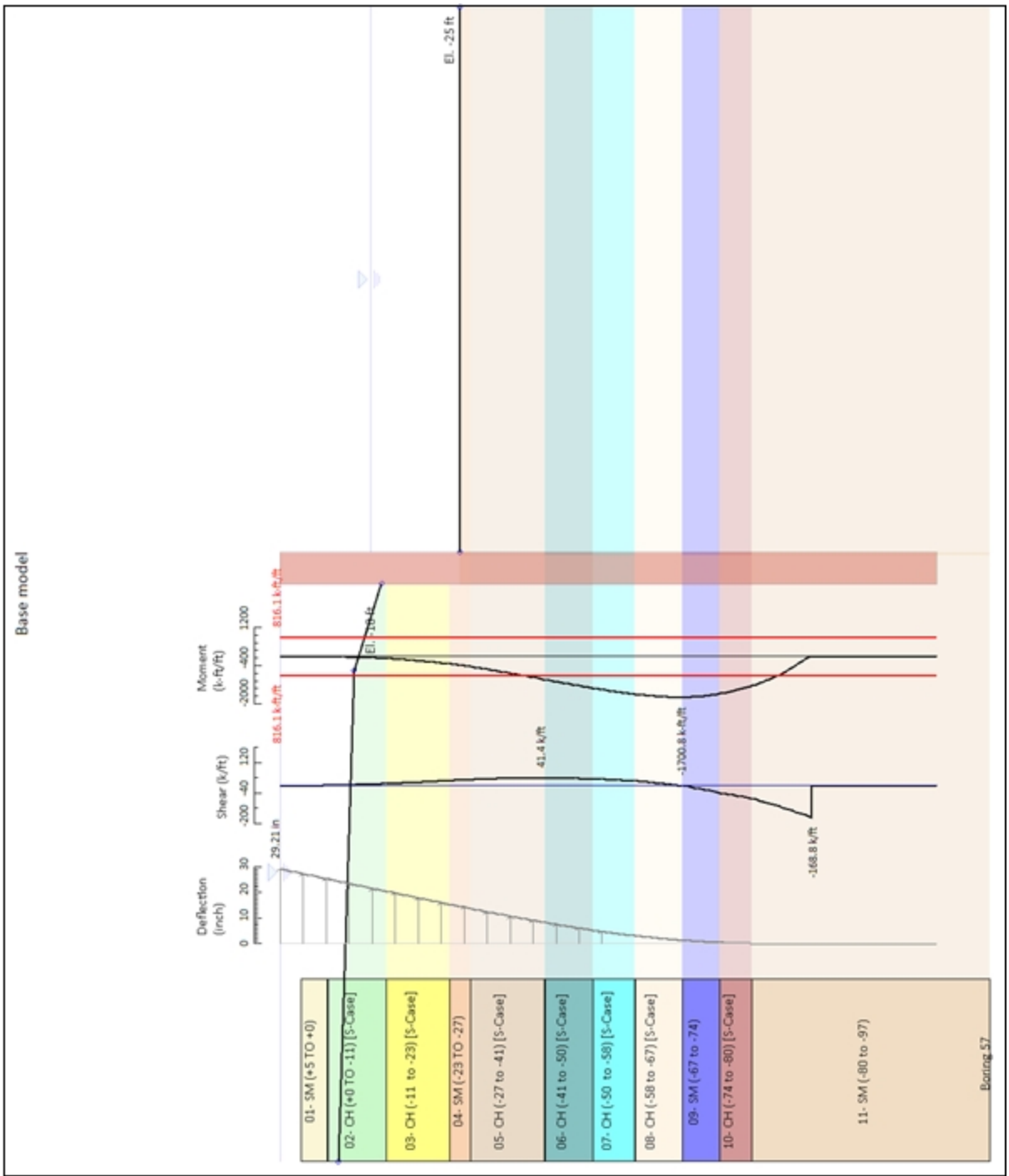
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

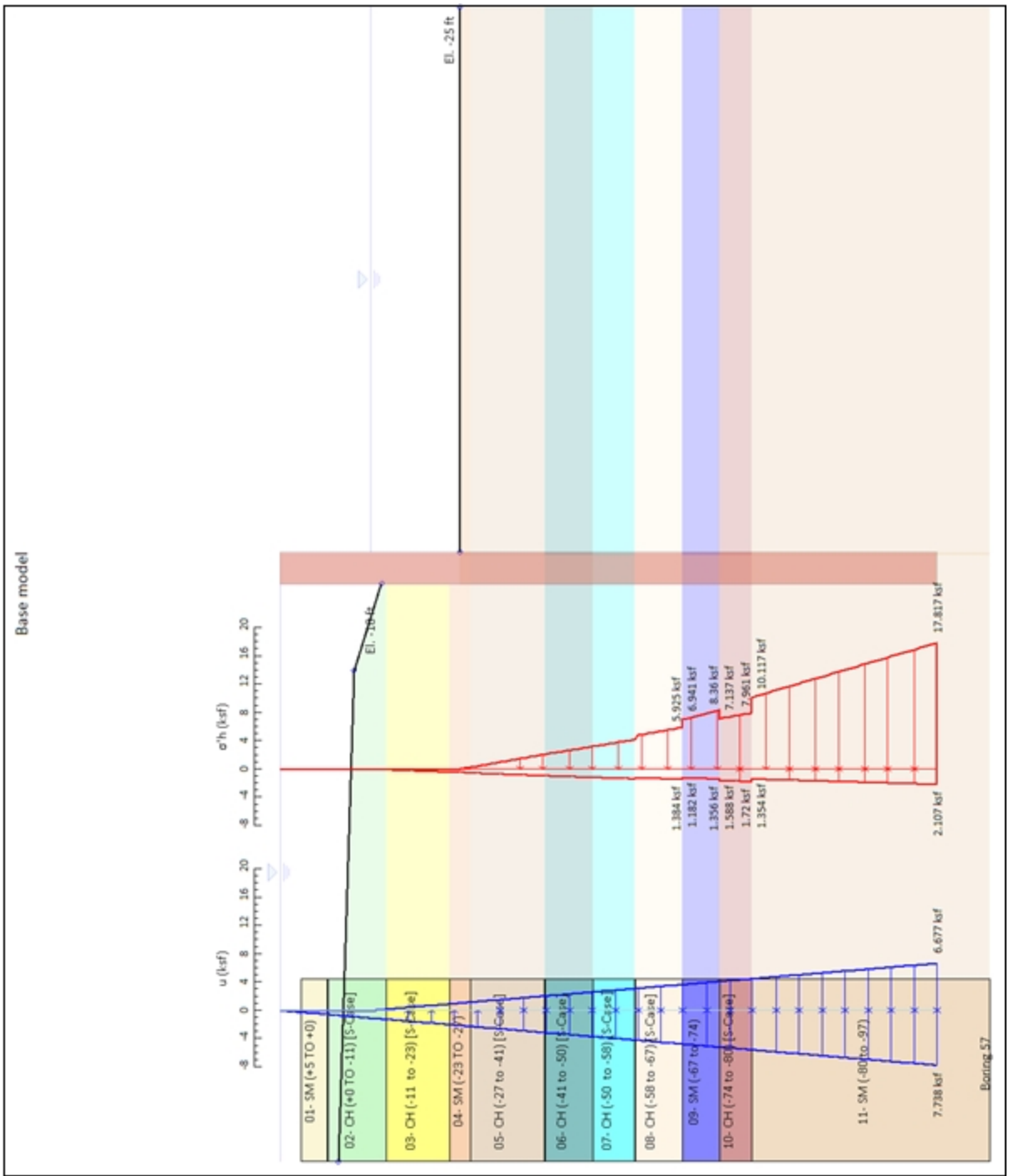
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

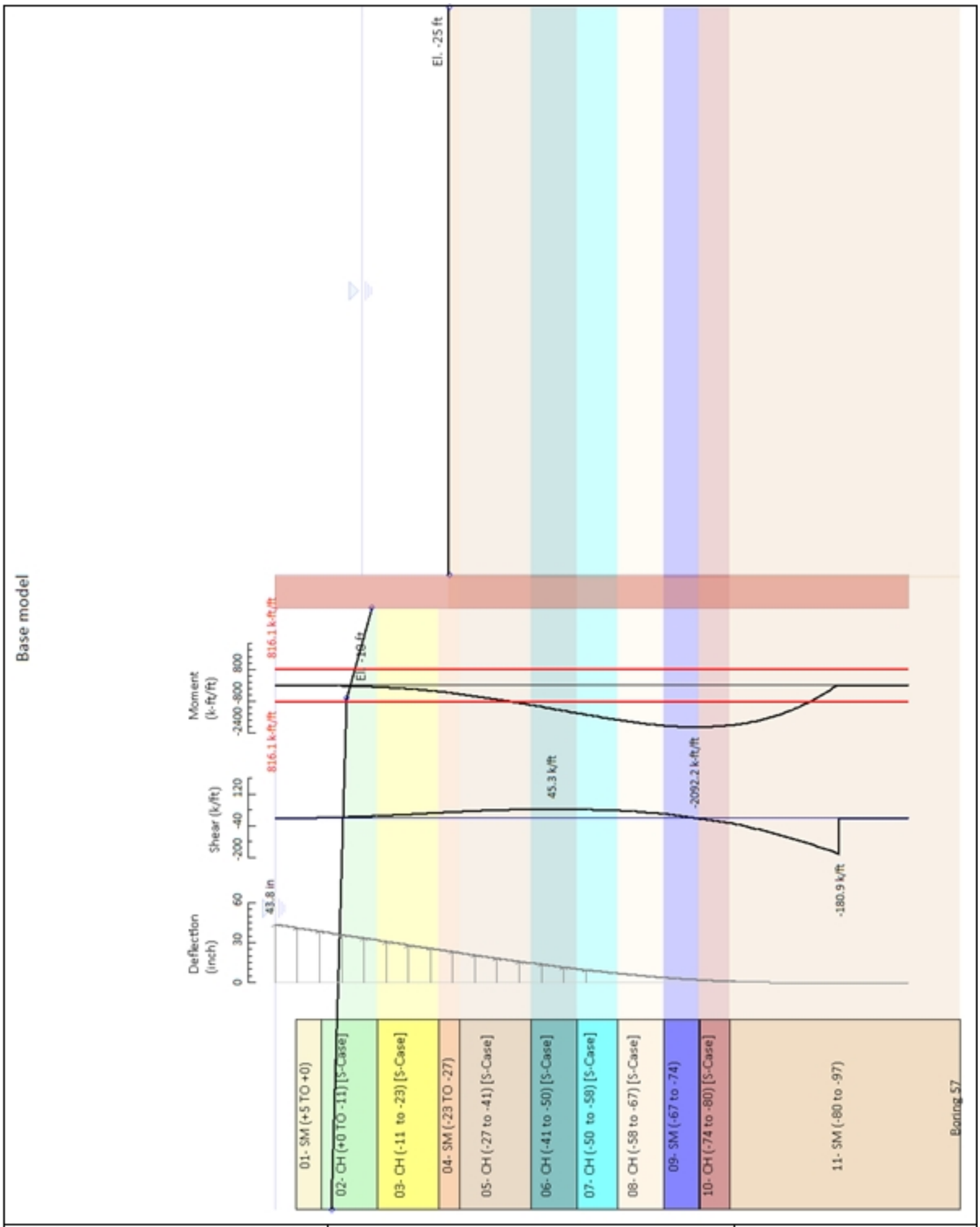
A sequence of figures for each excavation stage is reported



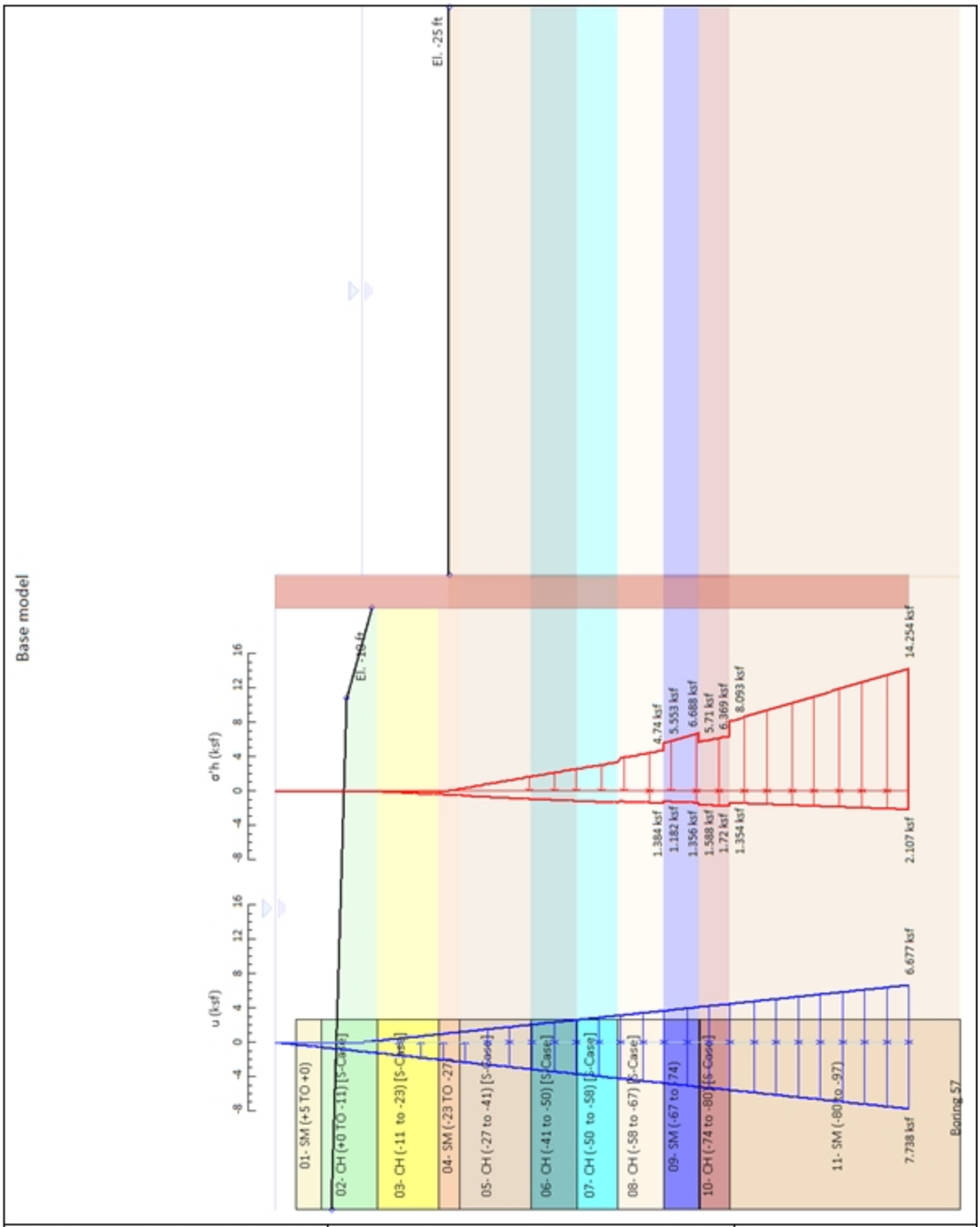

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



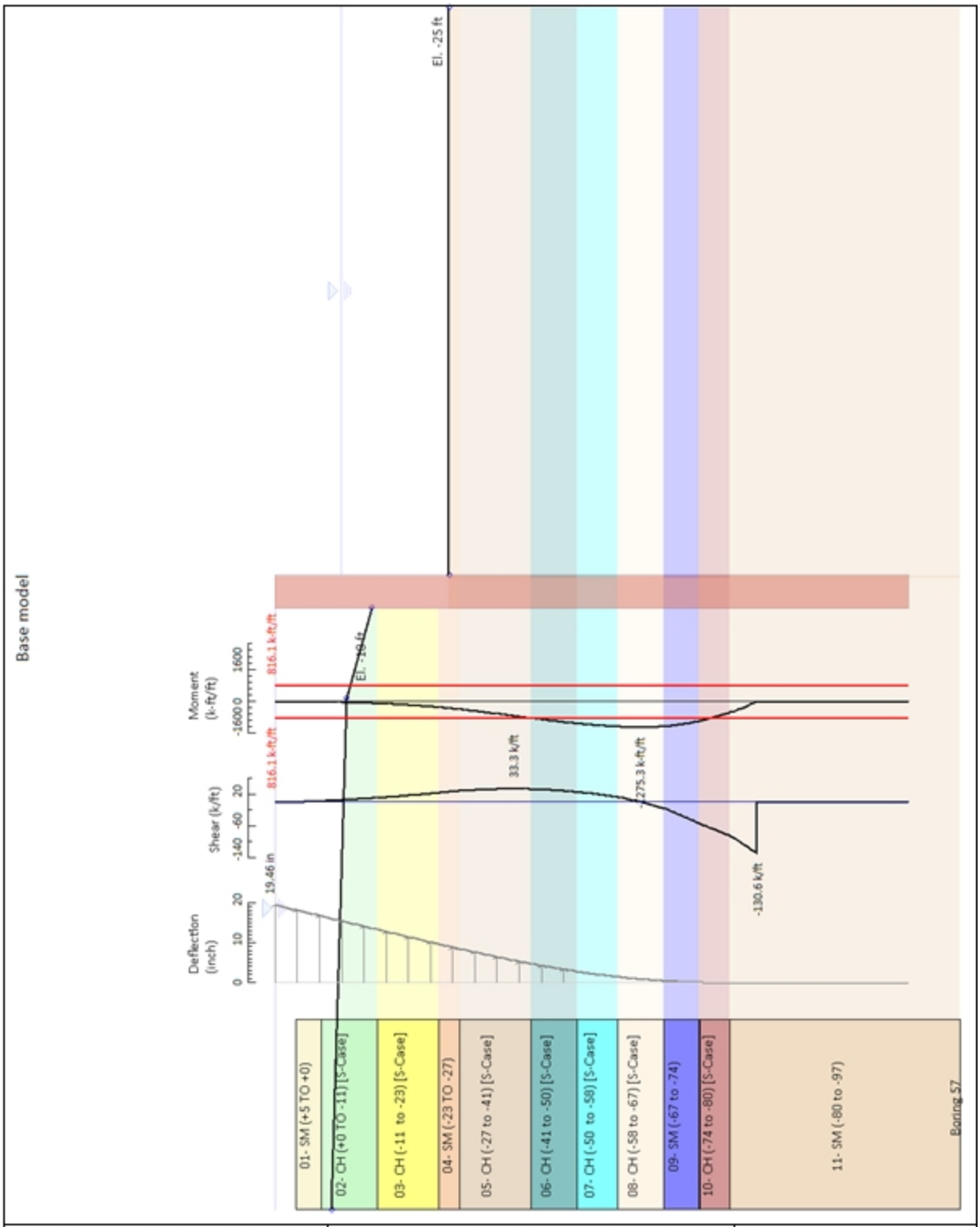

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



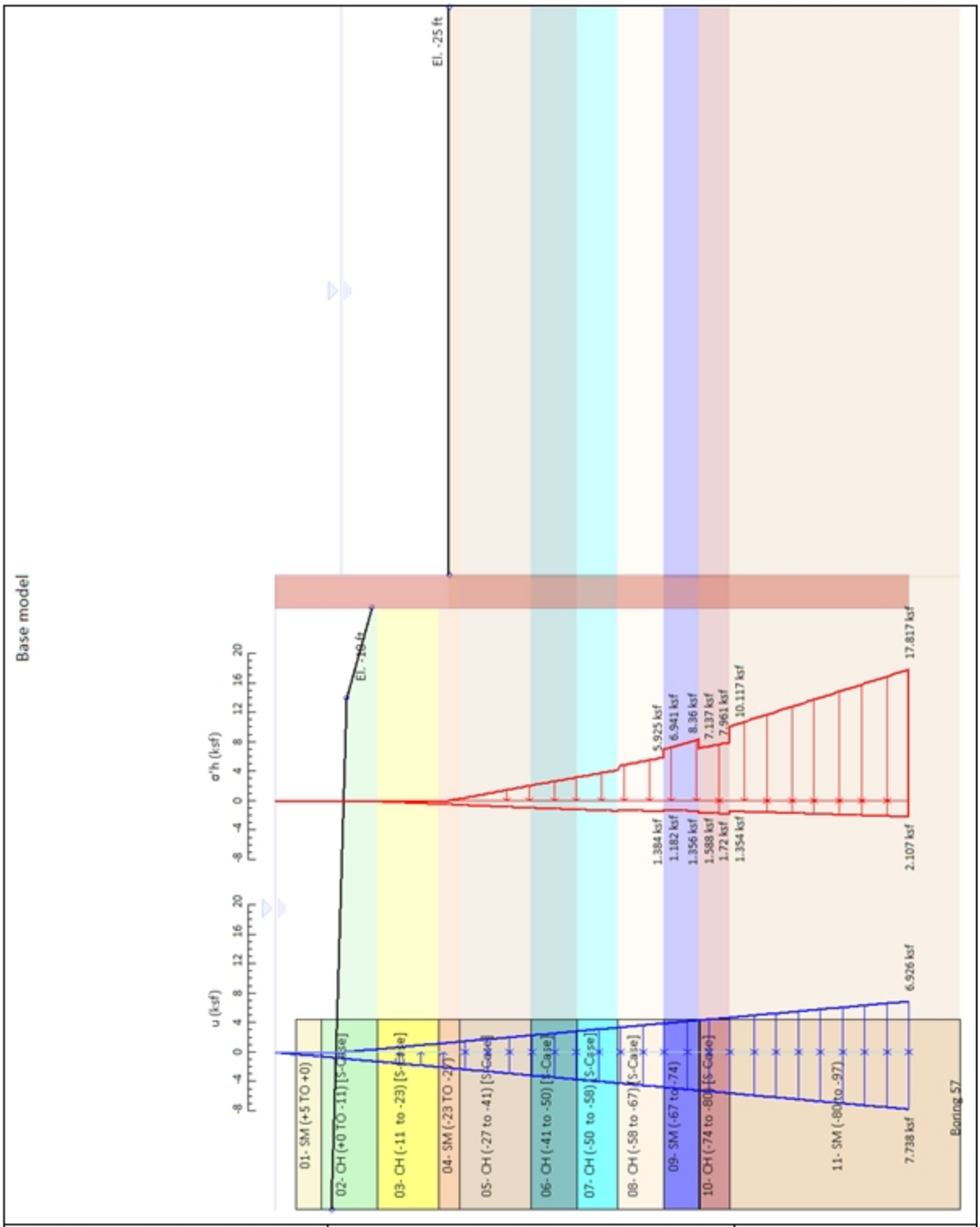

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



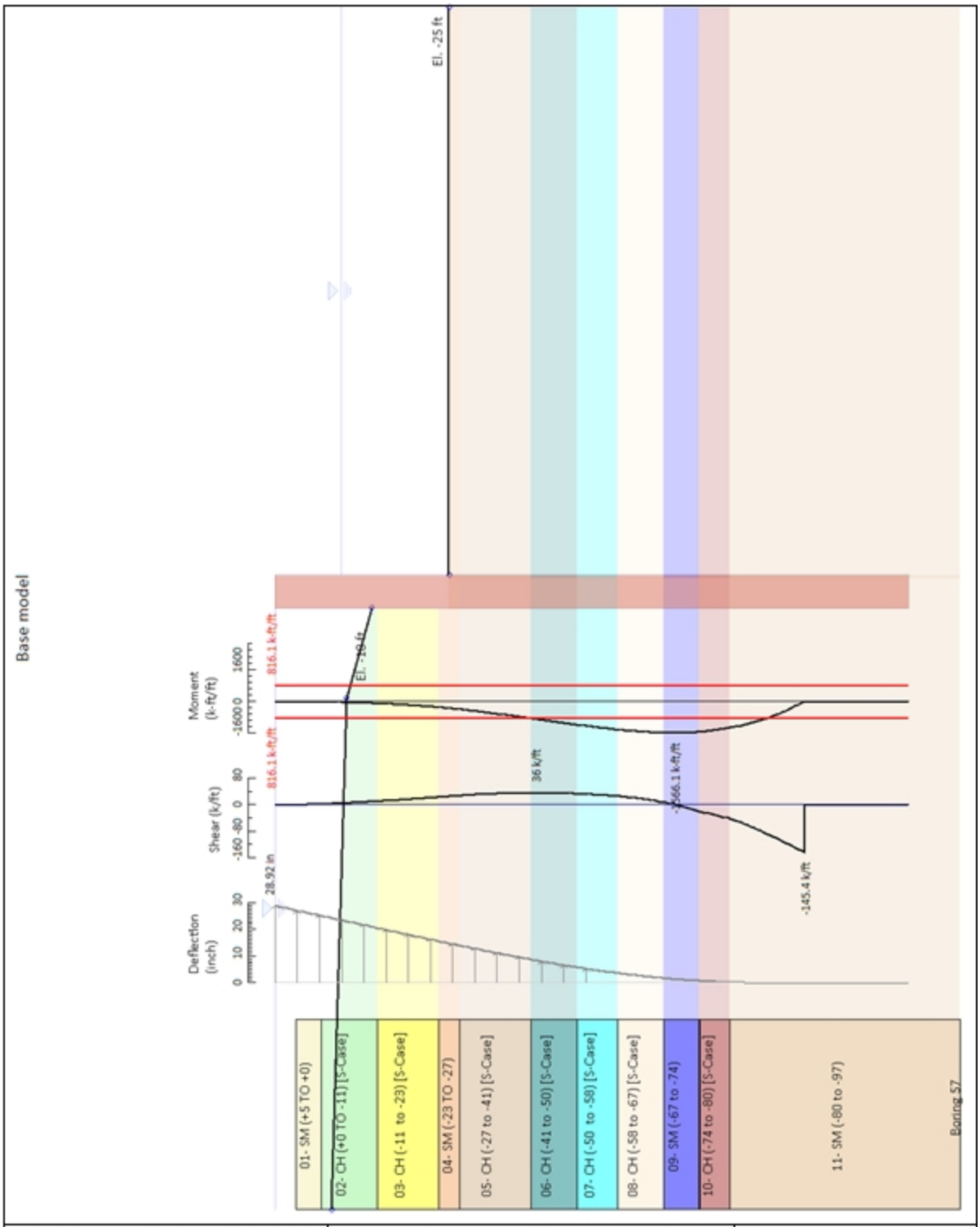

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



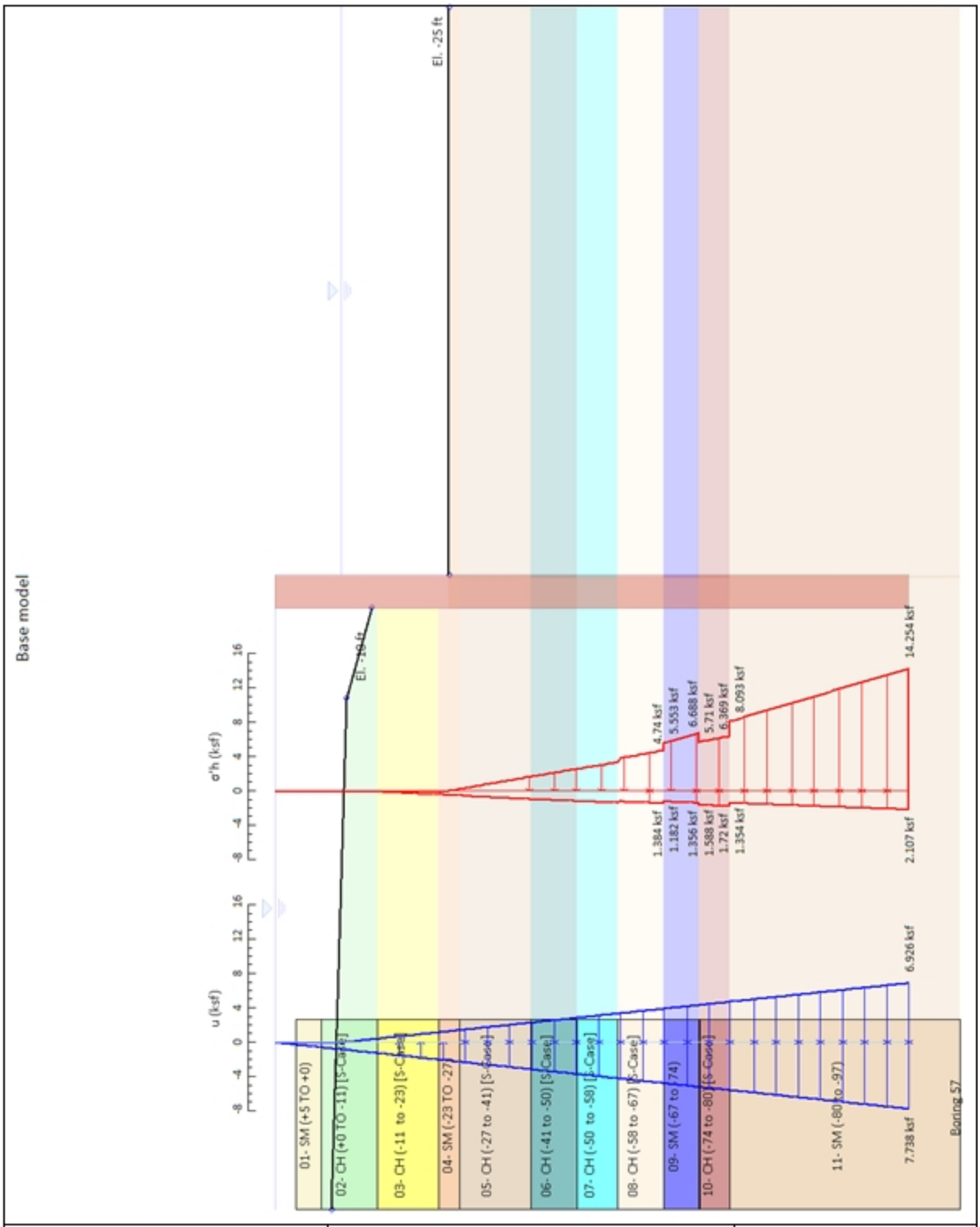

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



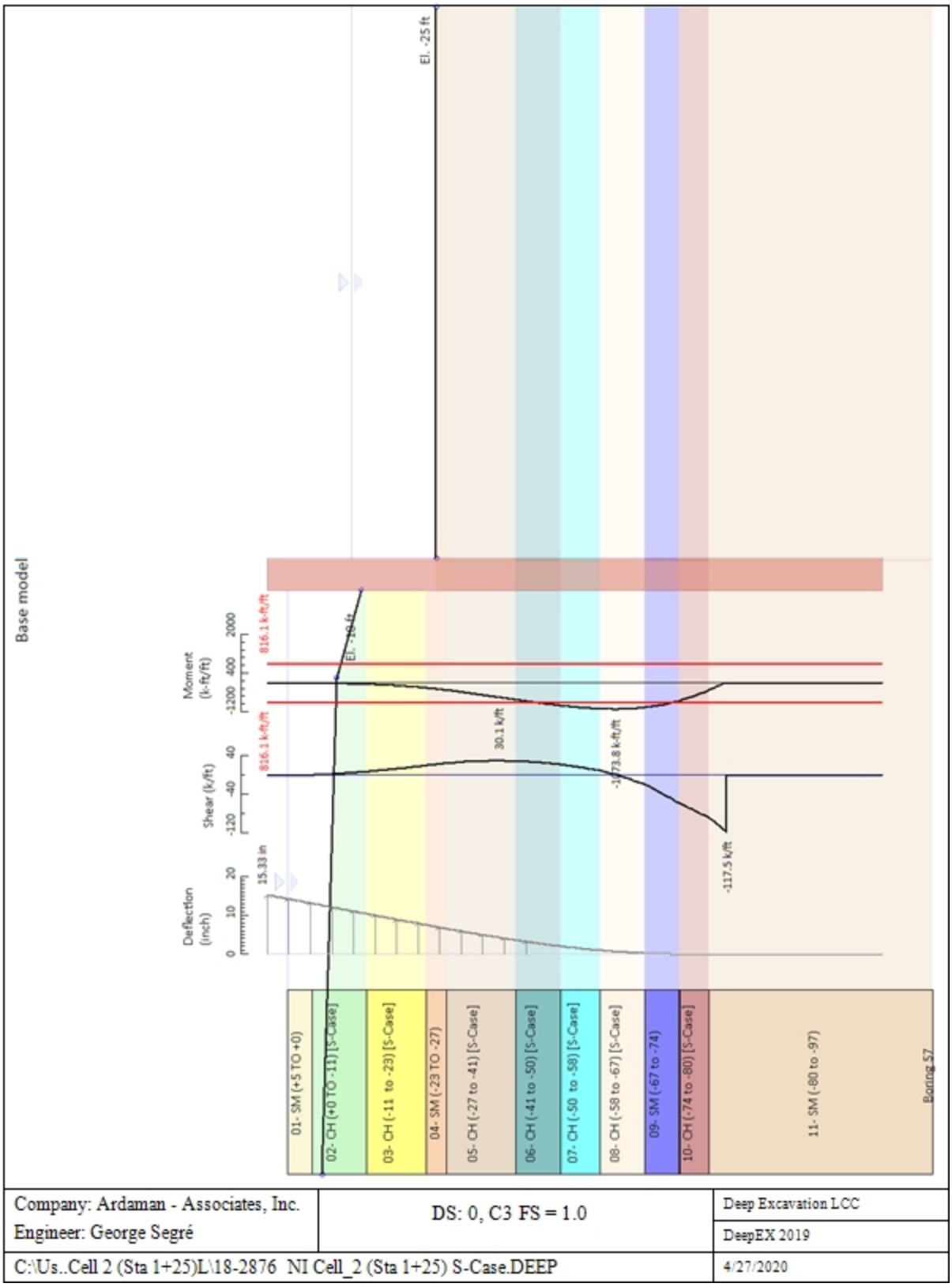

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



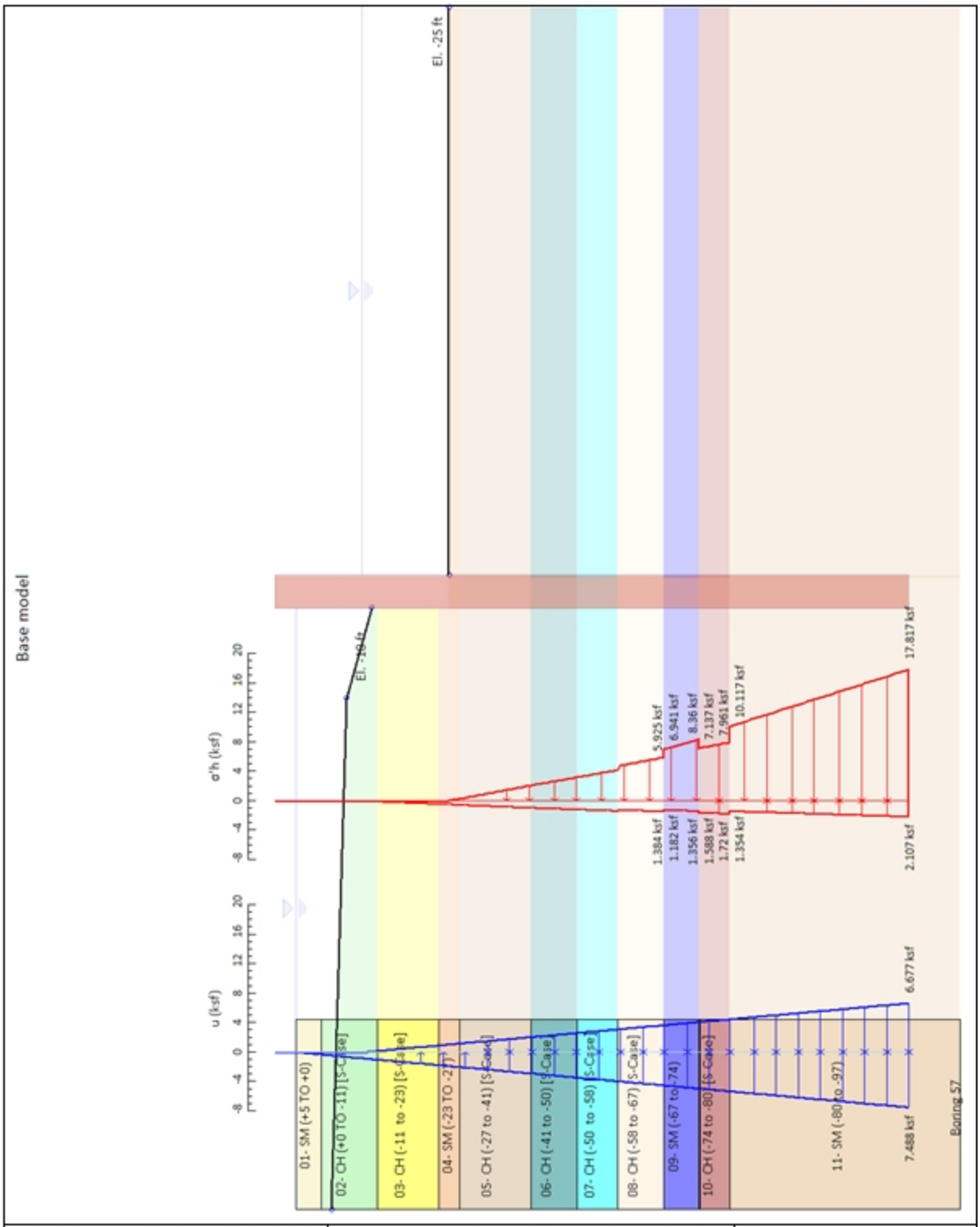

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



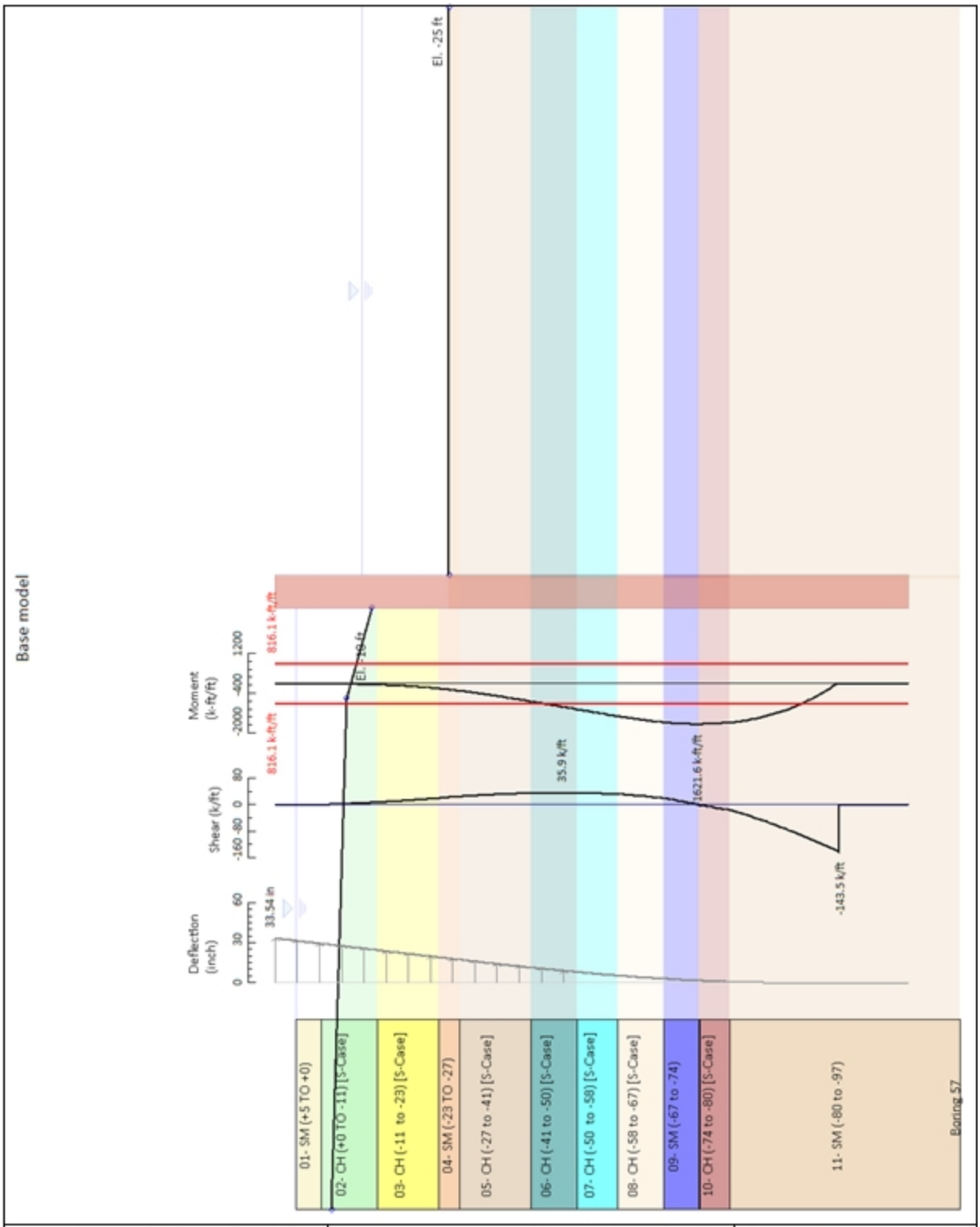

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



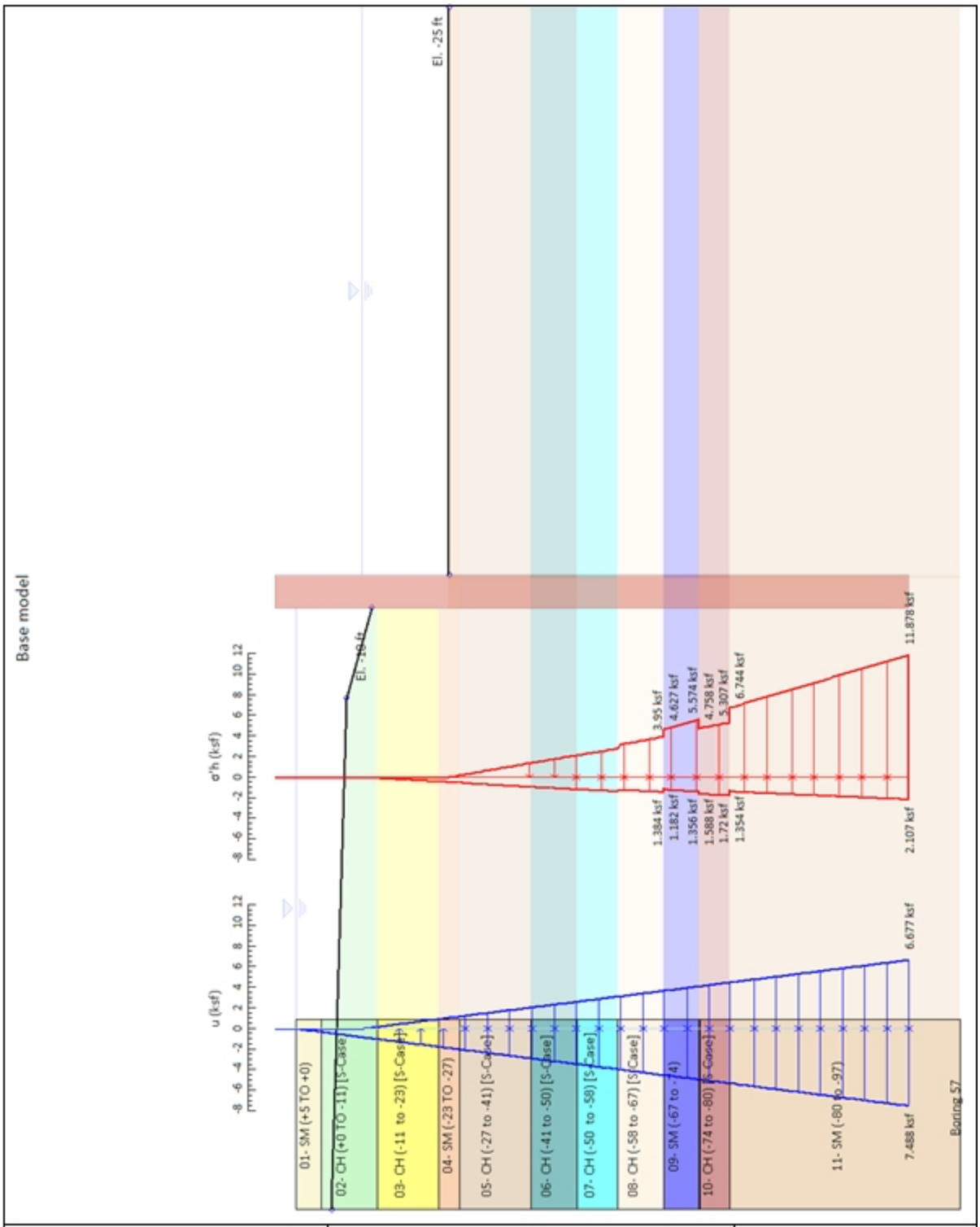

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



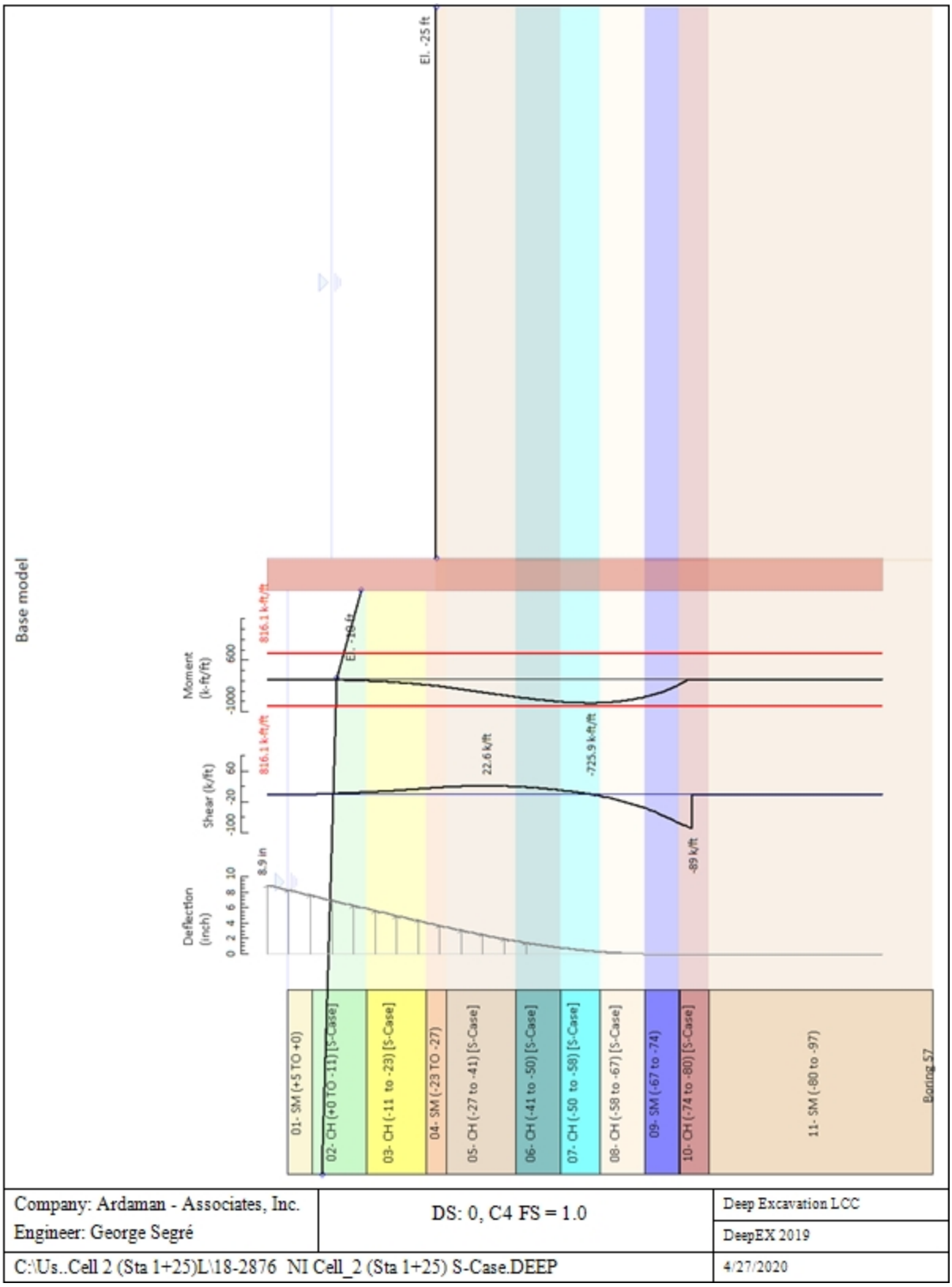

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



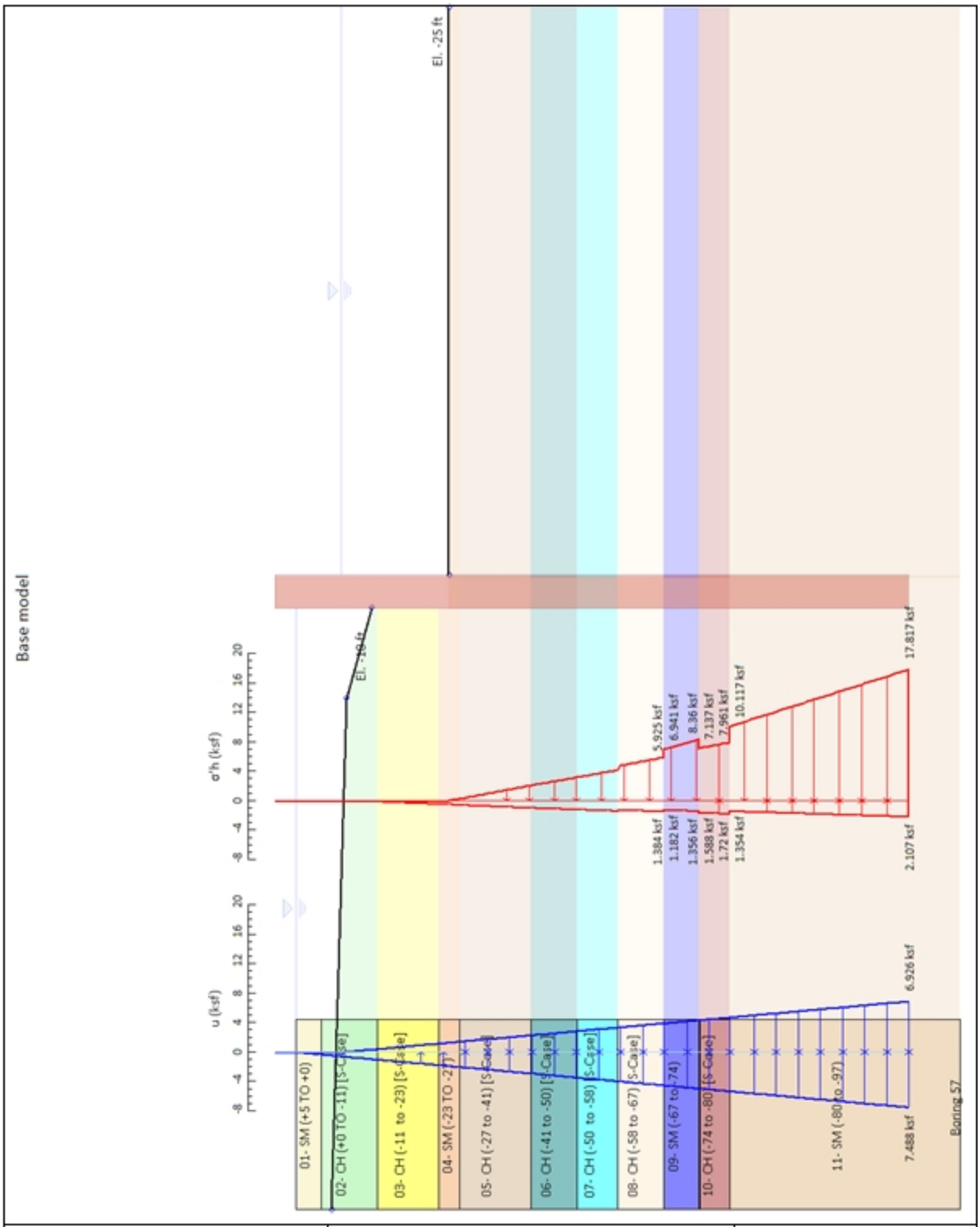

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



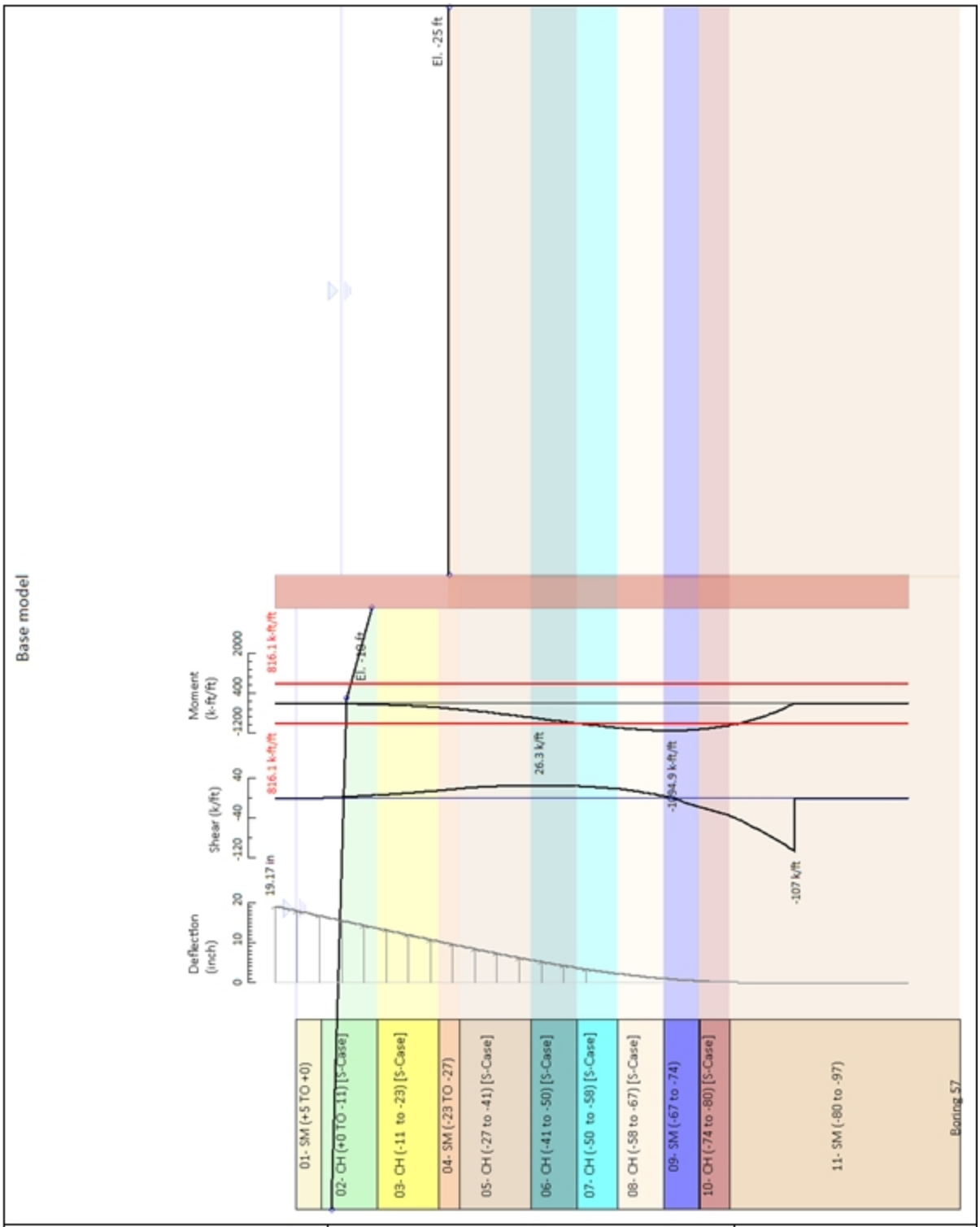

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |



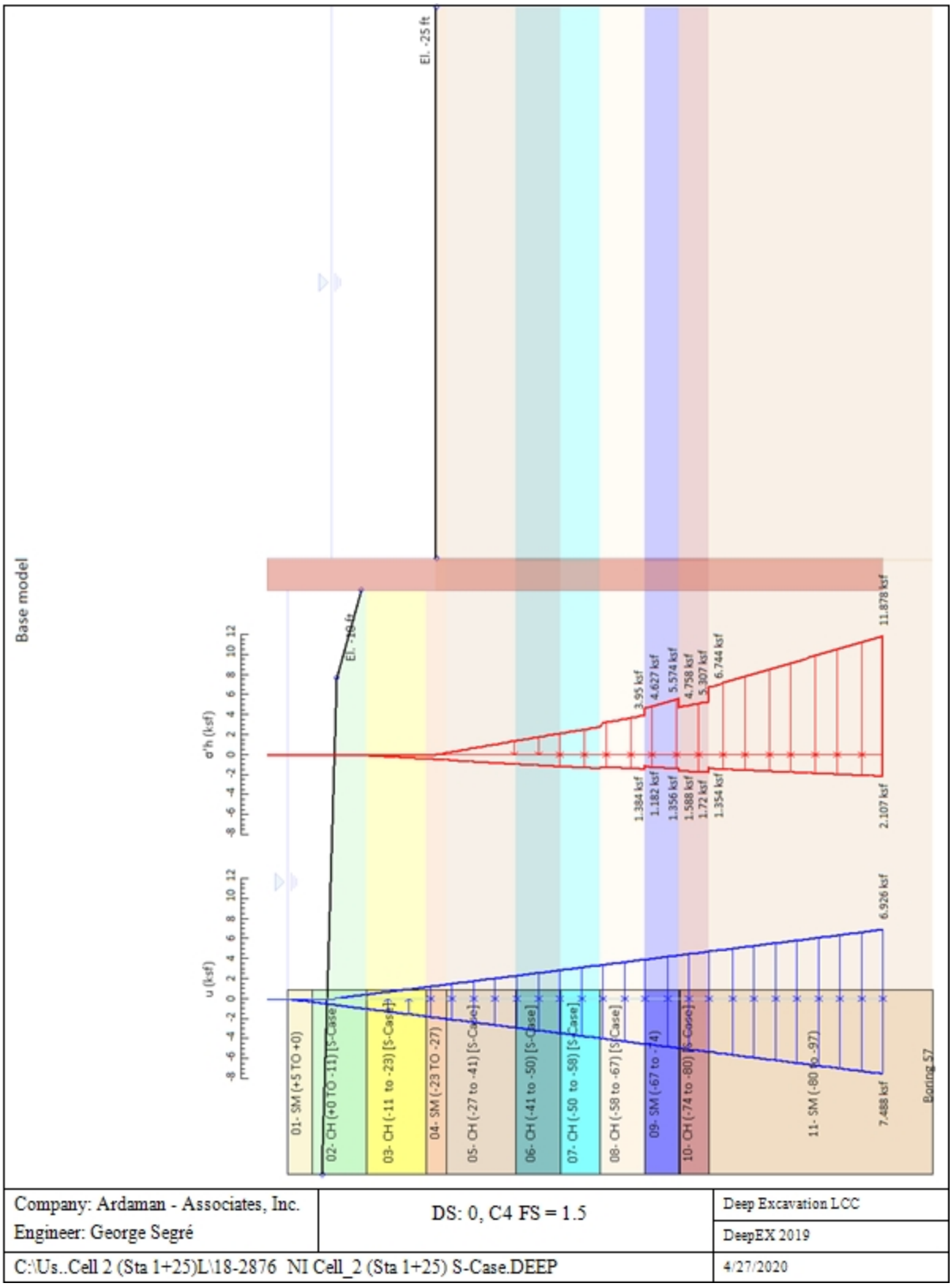

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 1+25 Right Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -85.86 ft., NAVD88

Length of Sheetting = 94.86 ft.

Use = 95.0 ft.

Design Tip Elev. = -86.0 ft., NAVD88

Design Length of Sheeting = 95.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -24.97 | 64.06 | 13.82 | 0.11 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -28.13 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -22.20 | 50.70 | 15.79 | 0.08 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -23.78 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -19.44 | 17.82 | 7.39 | 0.02 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -20.23 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -17.07 | 9.56 | 7.18 | 0.01 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -17.46 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -75.32 | 951.97 | 108.78 | 11.83 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -85.86 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -69.12 | 709.50 | 82.32 | 7.58 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -79.04 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -66.02 | 555.89 | 66.53 | 5.35 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -85.86 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -59.20 | 379.06 | 48.93 | 2.96 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -76.56 | -- | -- | -- |
| | | | | | | Governing Value: | -85.86 | 951.97 | 108.78 | 11.83 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:18:49 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 0 | 0 | 500 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 0 | 0 | 1000 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 0 | 0 | 3300 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 0 | 0 | 1400 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 0 | 0 | 1850 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 0 | 0 | 1900 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 0 | 0 | 2000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | 0 | 0 | 0.95 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

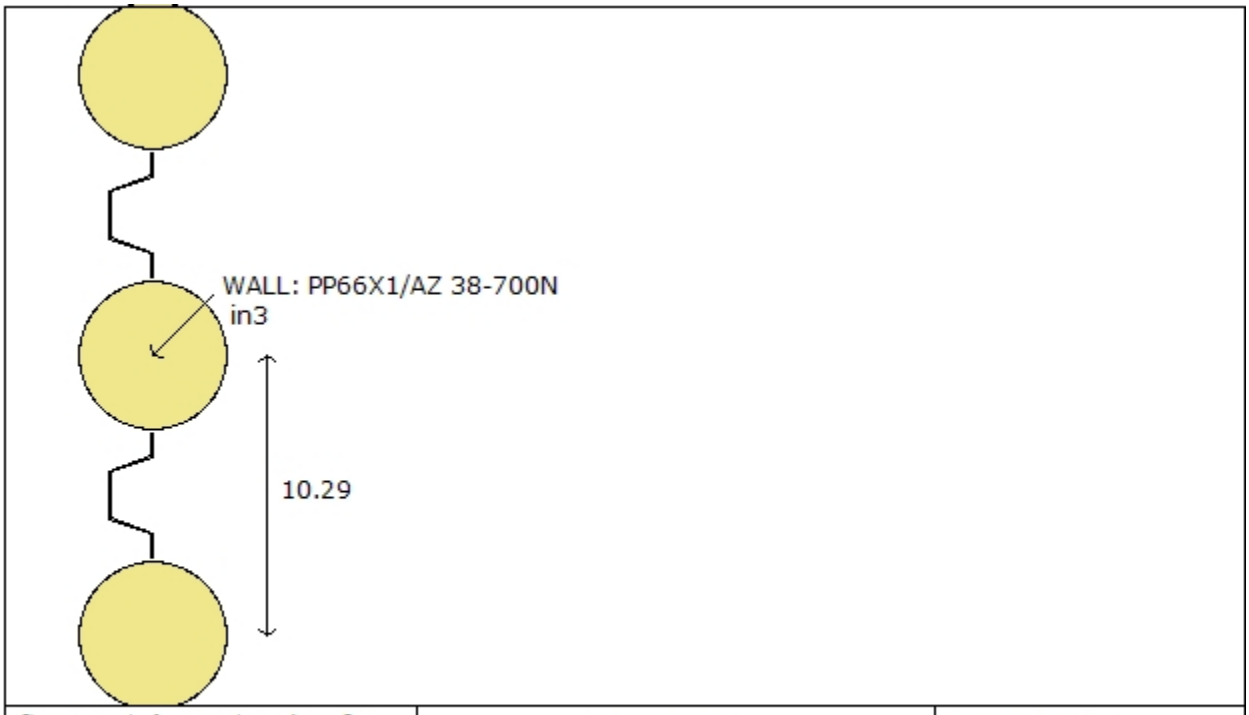
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 1 |
| -11 | 03- CH (-11 to | 1 | 0.95 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 1 |
| -41 | 06- CH (-41 to | 1 | 1 |
| -50 | 07- CH (-50 to | 1 | 1 |
| -58 | 08- CH (-58 to | 1 | 1 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 1 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 3.201 | 3.754 | 3.201 |
| Stage 1 | Simple span | N/A | 1.6 | 2.588 | 3.026 | 2.588 |
| Stage 2 | Simple span | N/A | 1.6 | 3.323 | 3.953 | 3.323 |
| Stage 3 | Simple span | N/A | 1.6 | 2.692 | 3.2 | 2.692 |
| Stage 4 | Simple span | N/A | 1.6 | 3.577 | 4.631 | 3.577 |
| Stage 5 | Simple span | N/A | 1.6 | 2.435 | 3.134 | 2.435 |
| Stage 6 | Simple span | N/A | 1.6 | 3.714 | 4.877 | 3.714 |
| Stage 7 | Simple span | N/A | 1.6 | 2.538 | 3.328 | 2.538 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

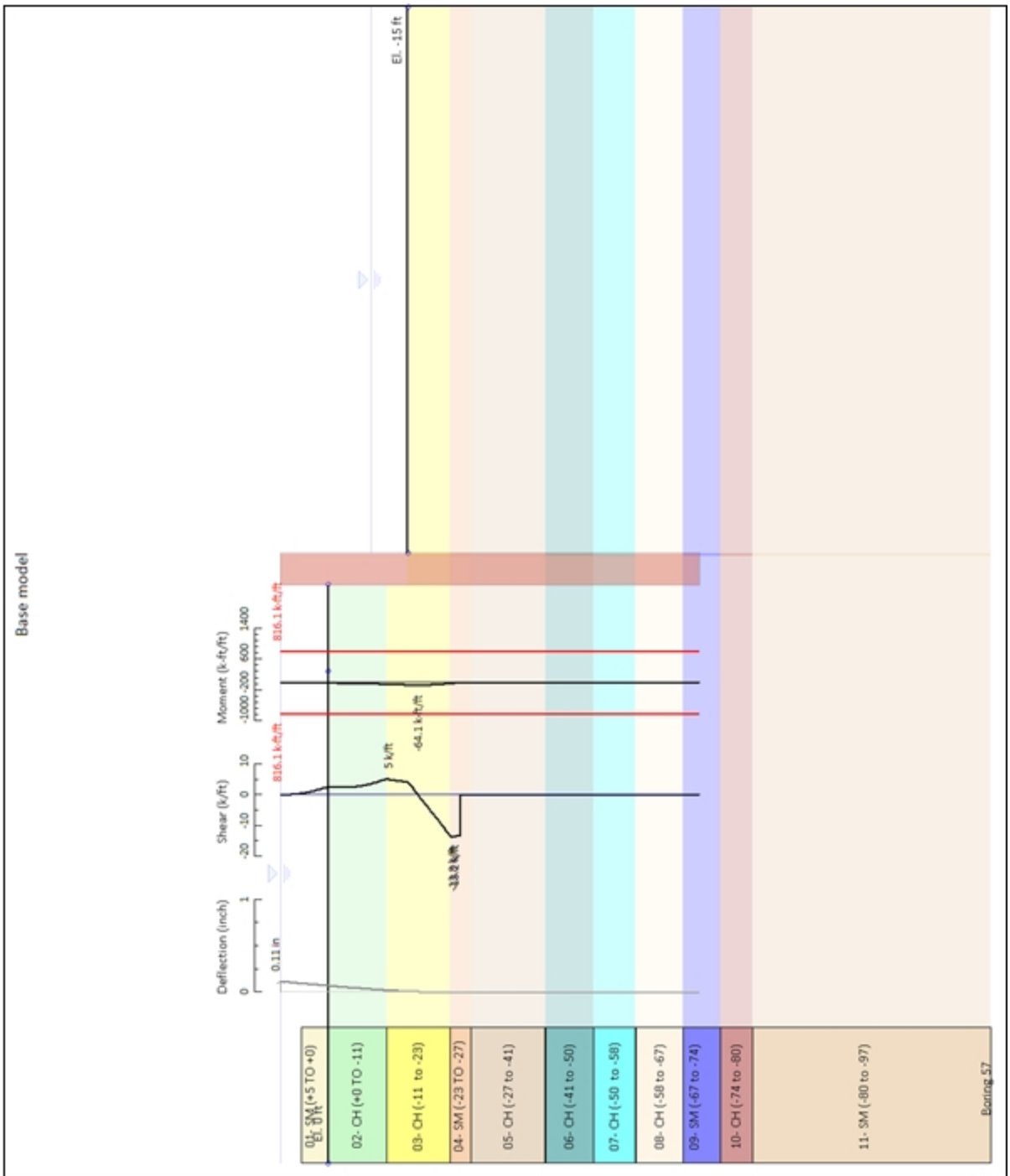
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

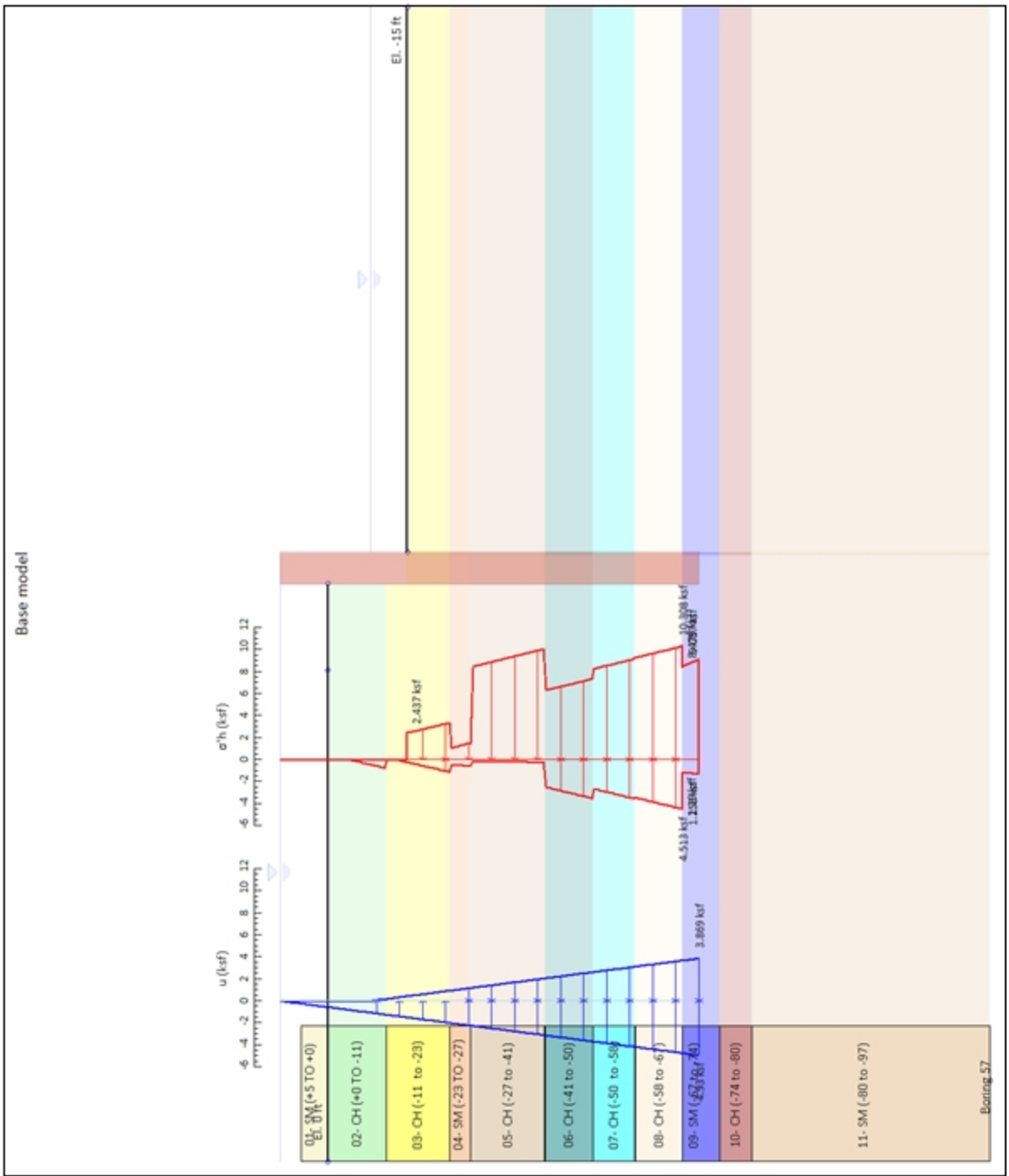
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

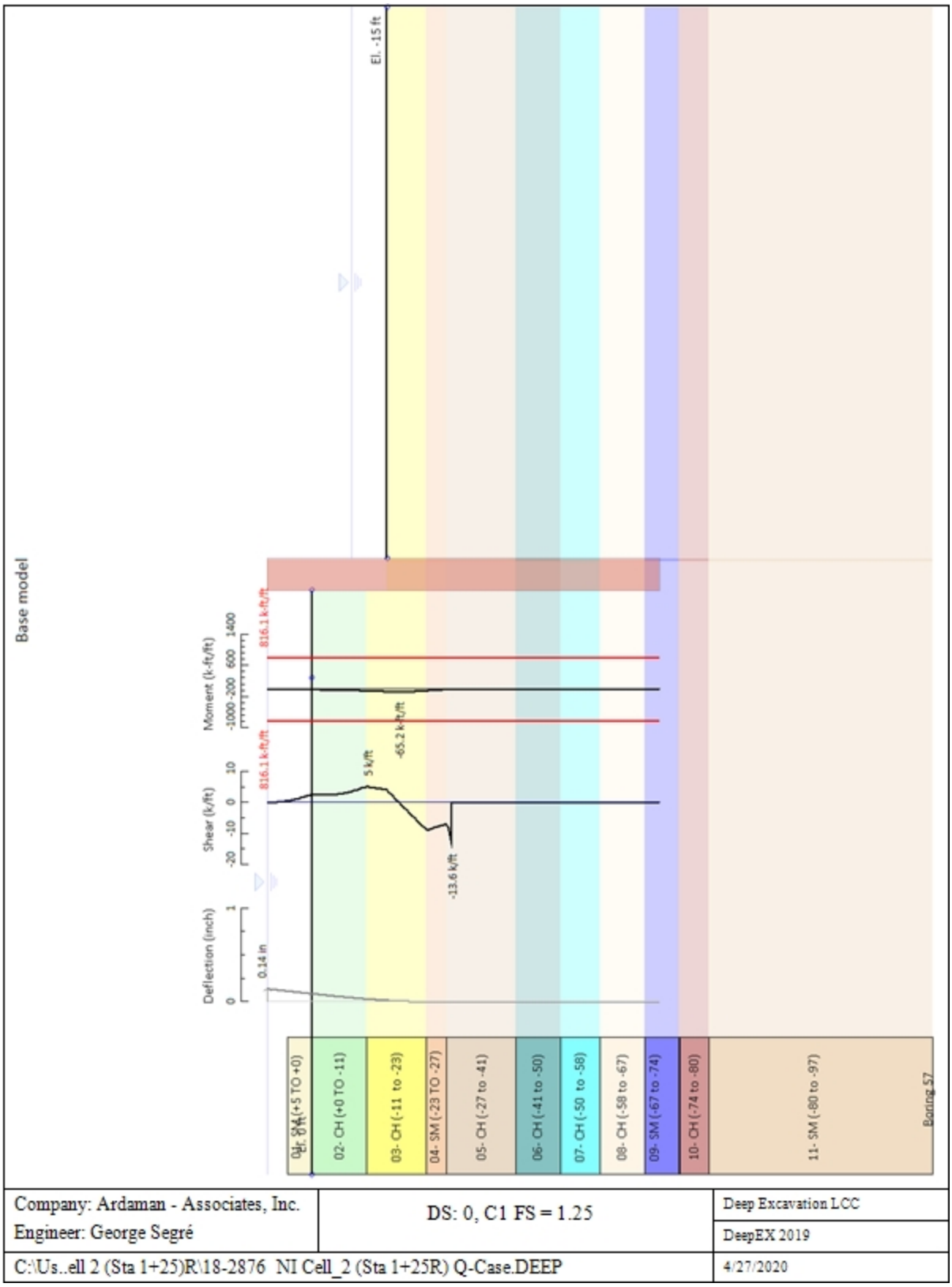
A sequence of figures for each excavation stage is reported



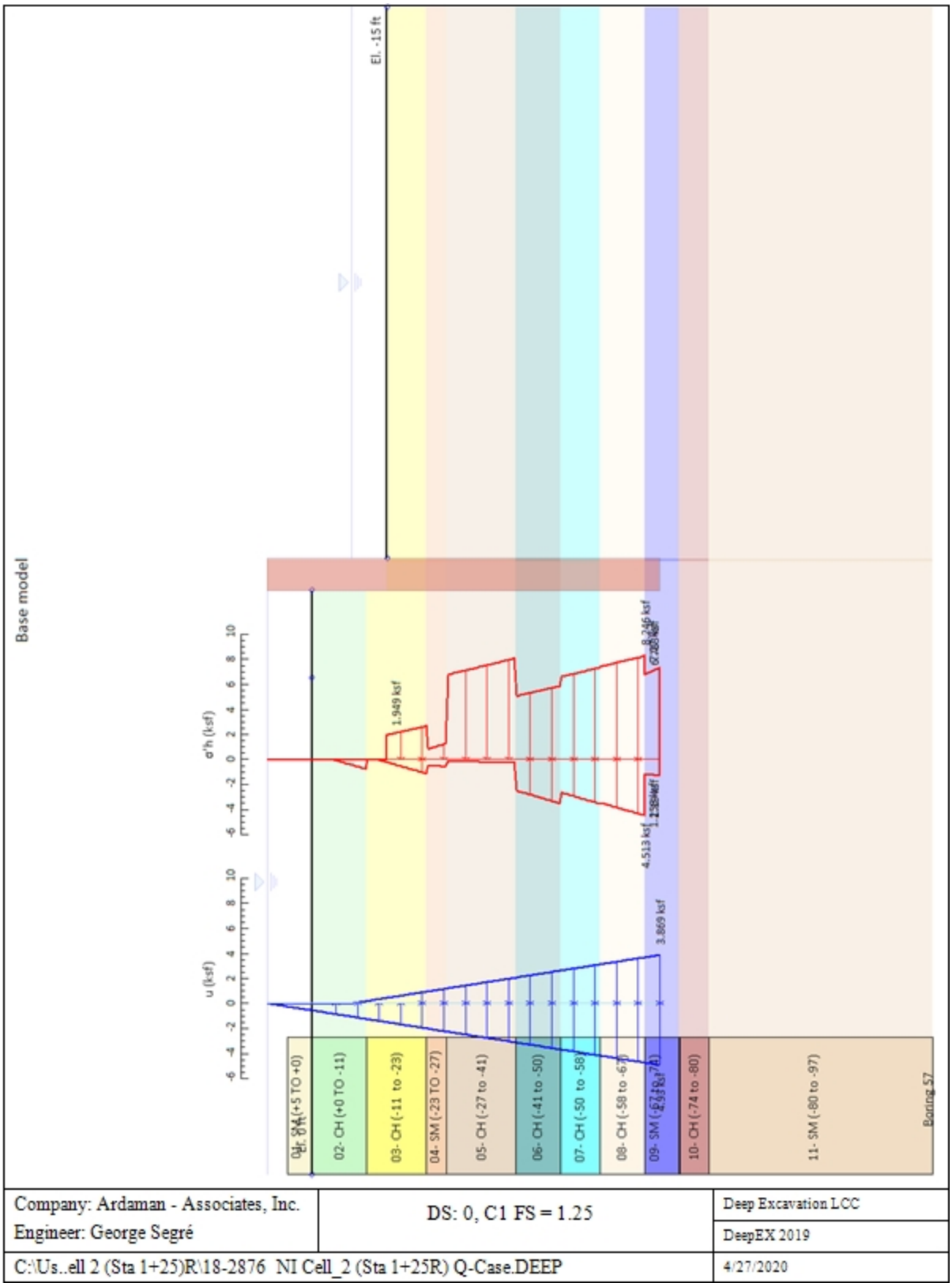

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP | | 4/27/2020 |



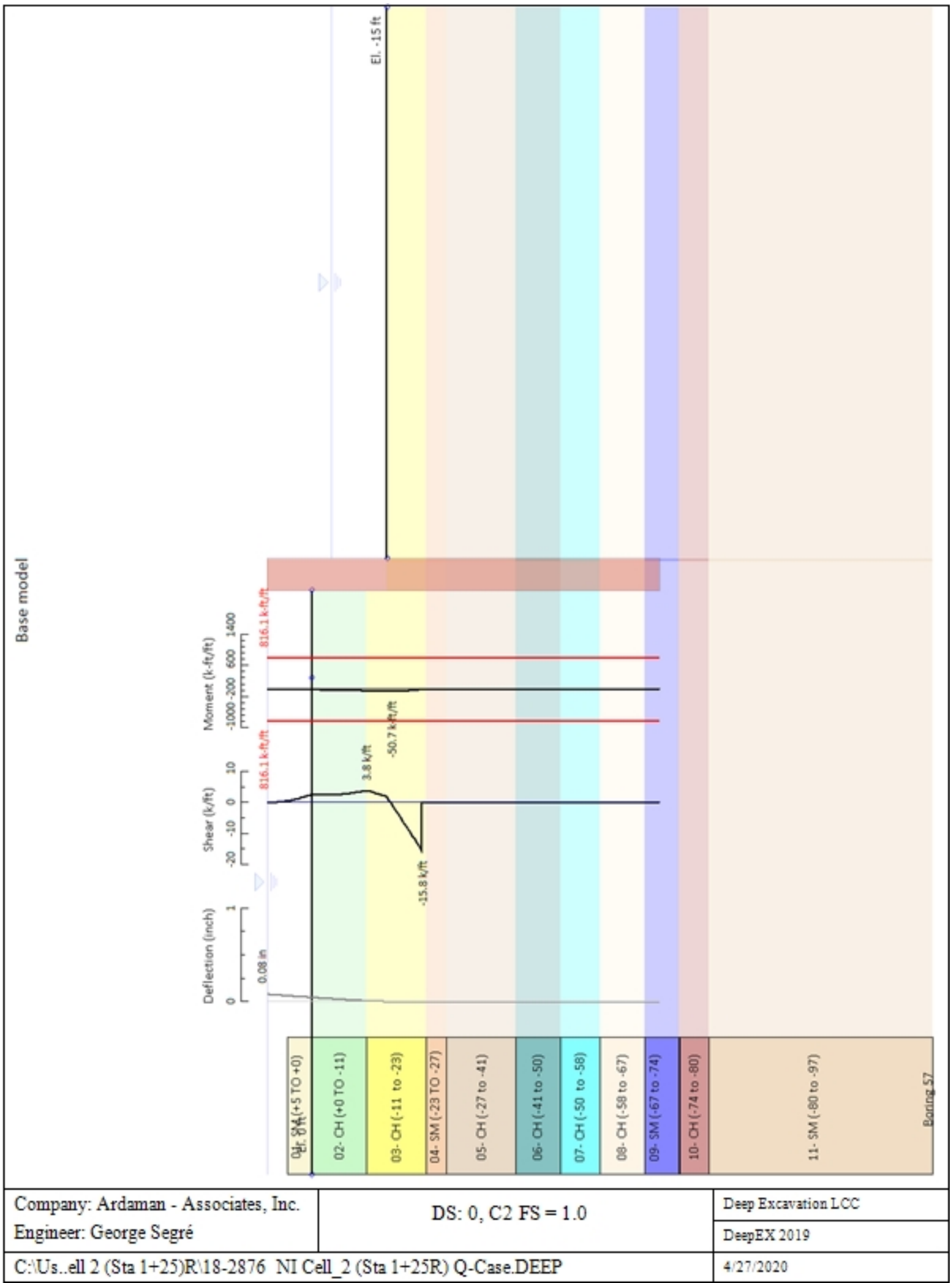

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP | | 4/27/2020 |

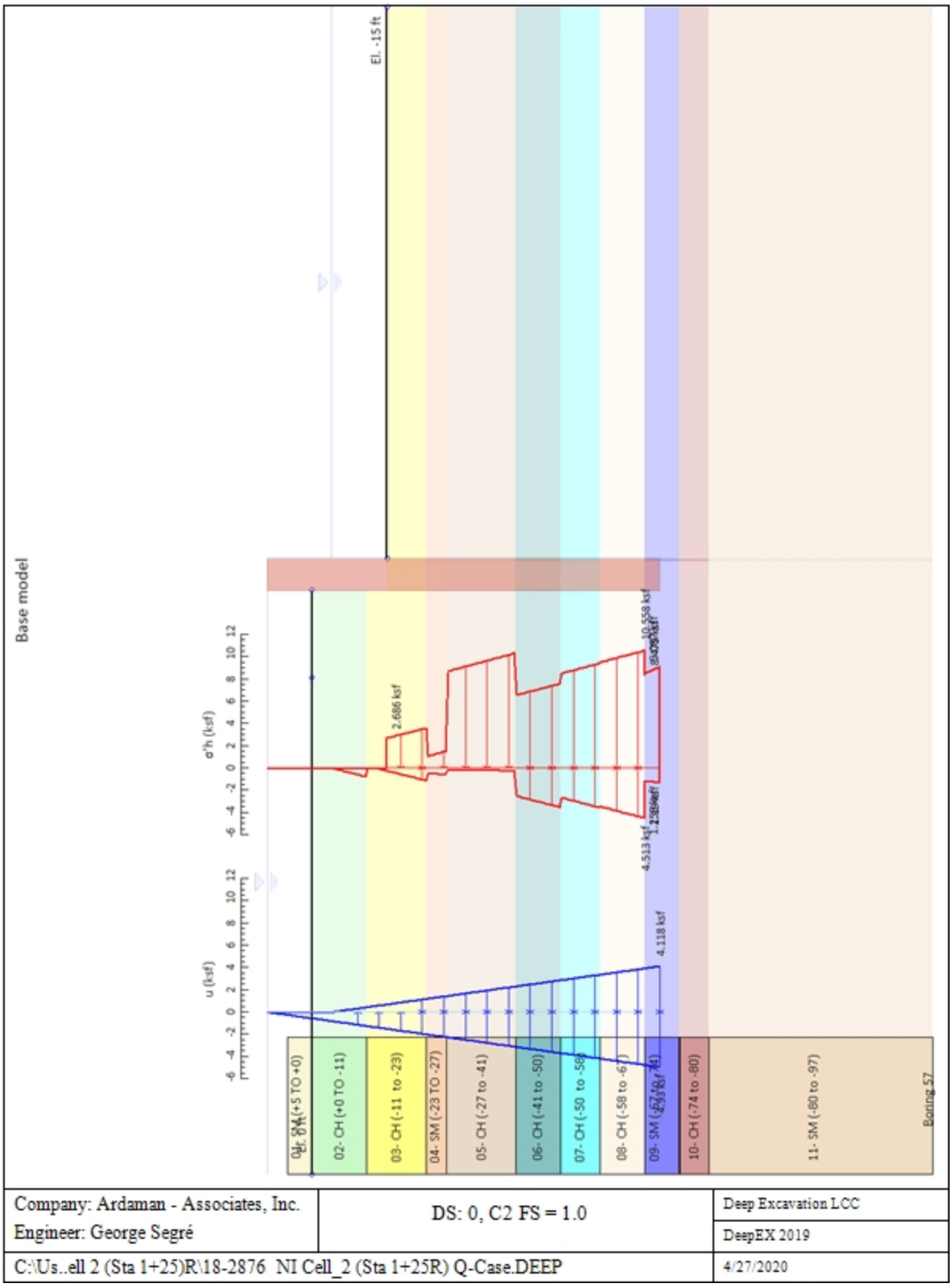


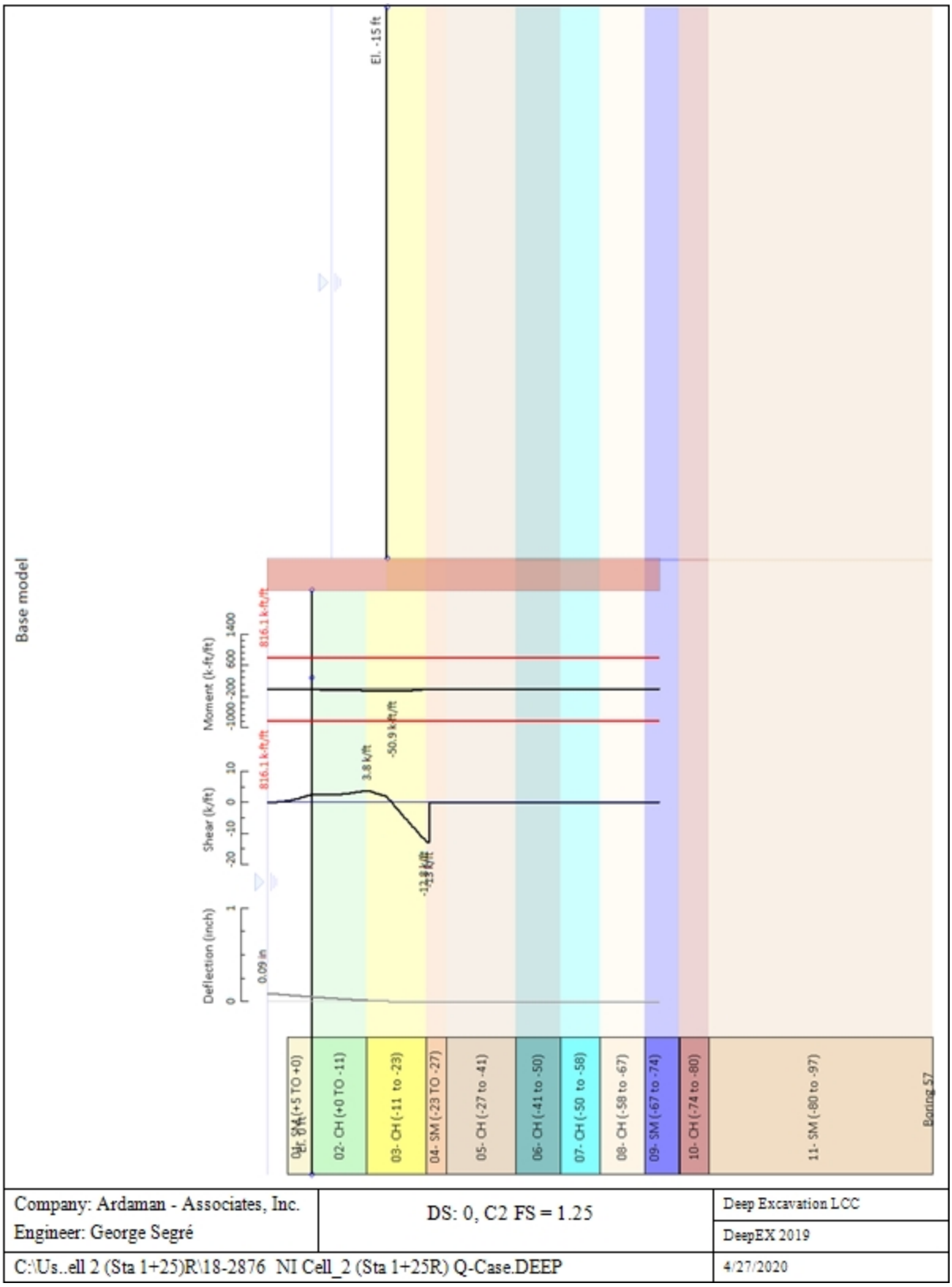

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP | | 4/27/2020 |

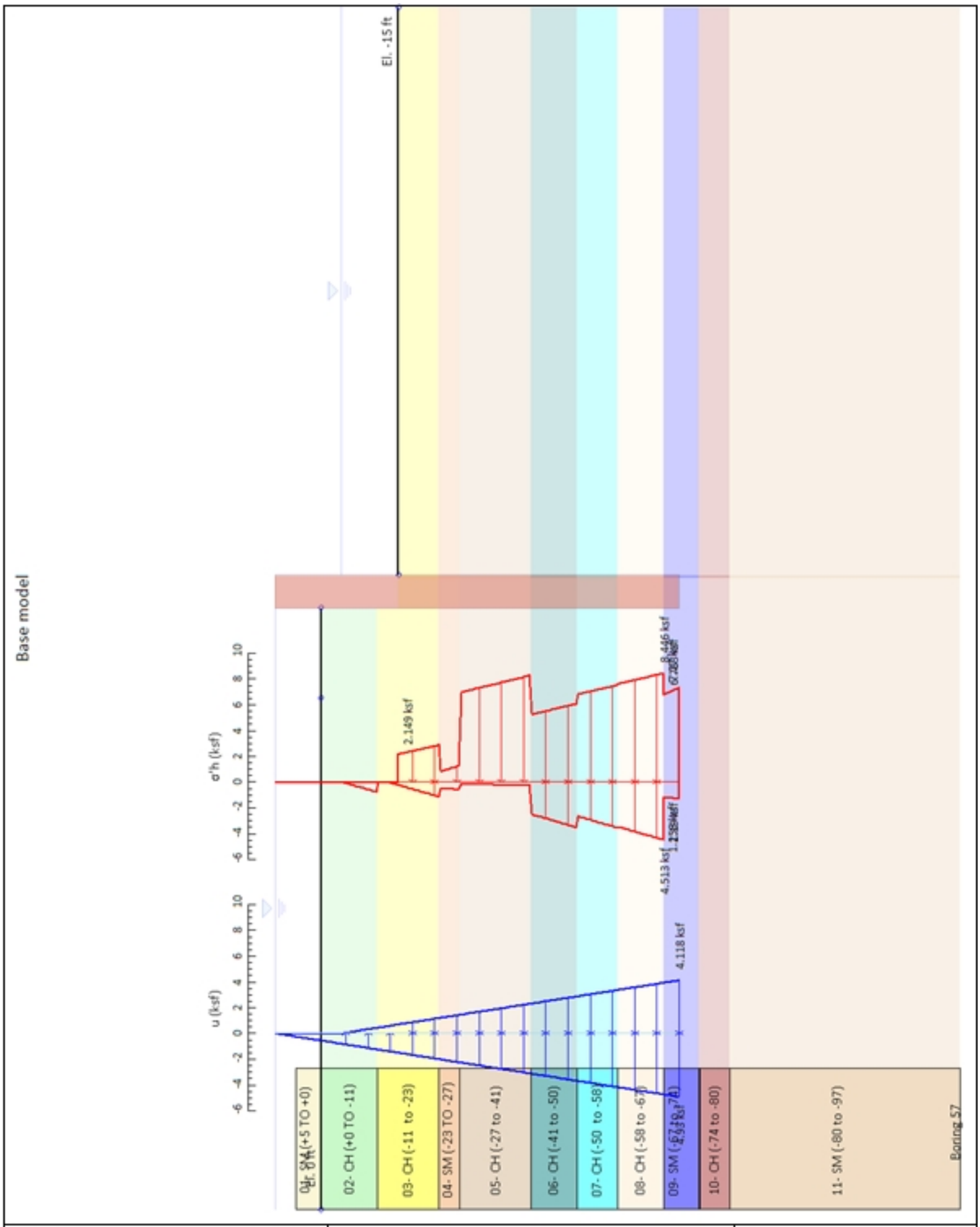


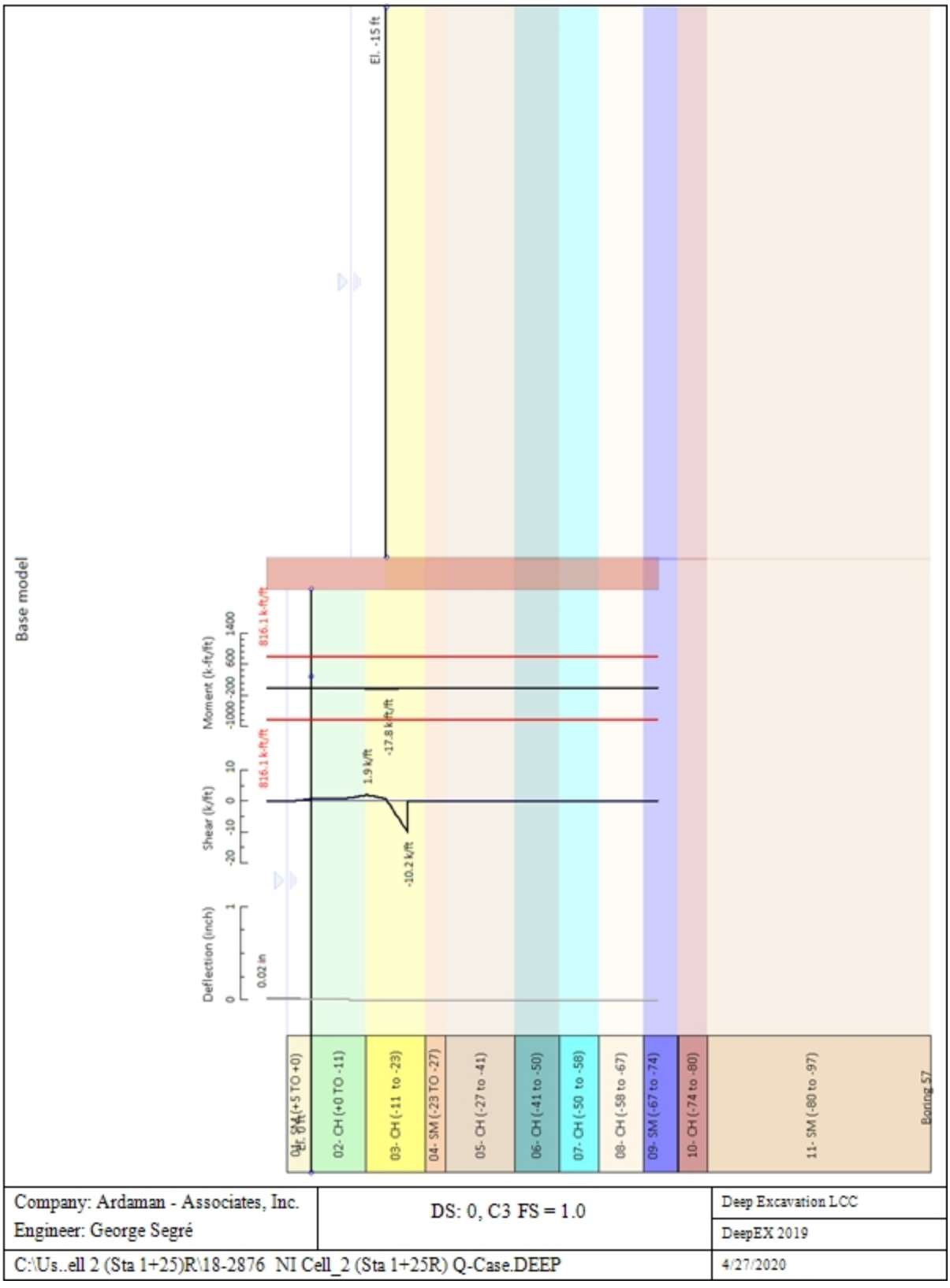

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP | | 4/27/2020 |

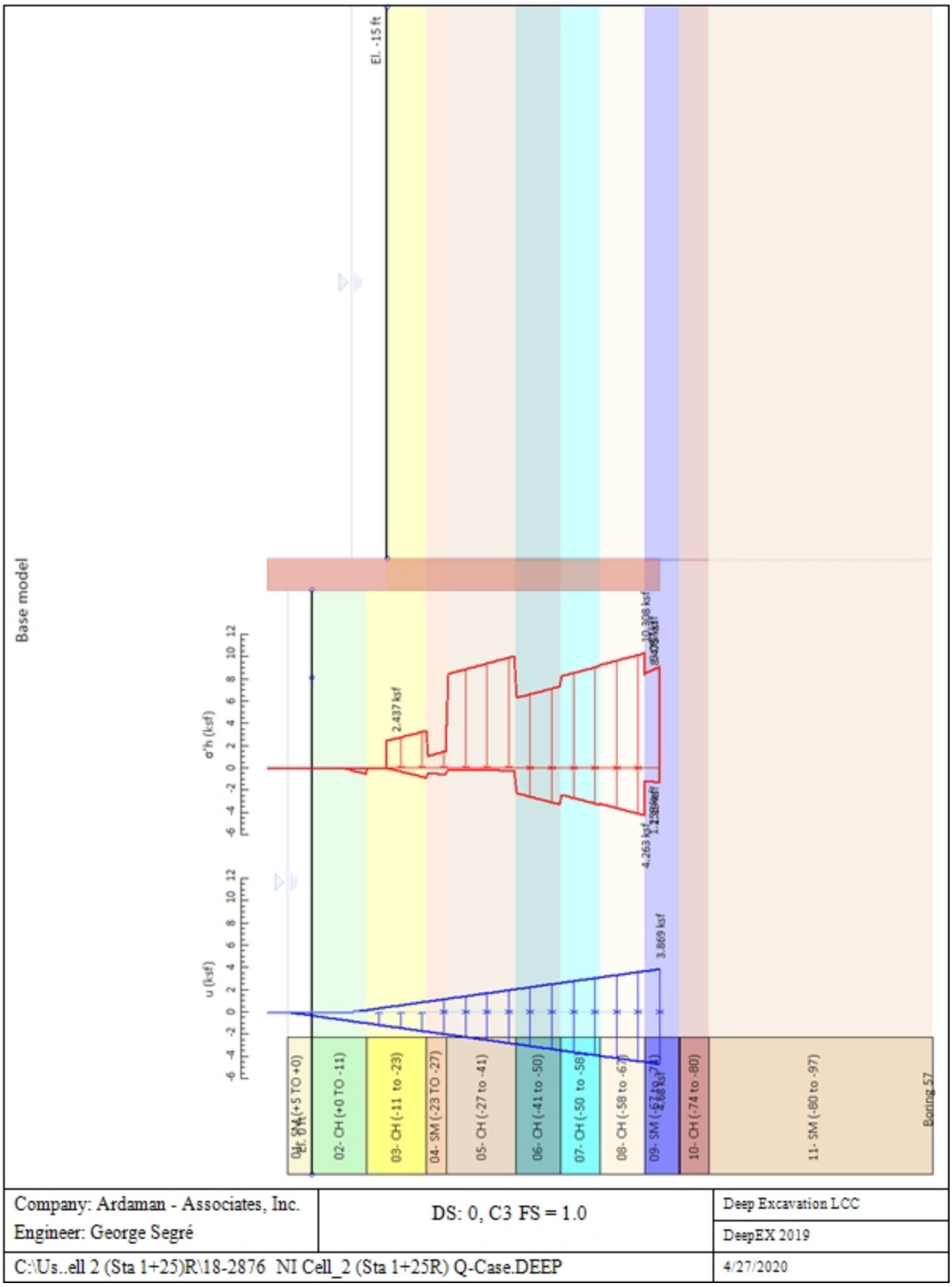

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-50.7 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.8 k/ft
-15.8 k/ft
Deflection (inch)
0 1
0.08 in
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

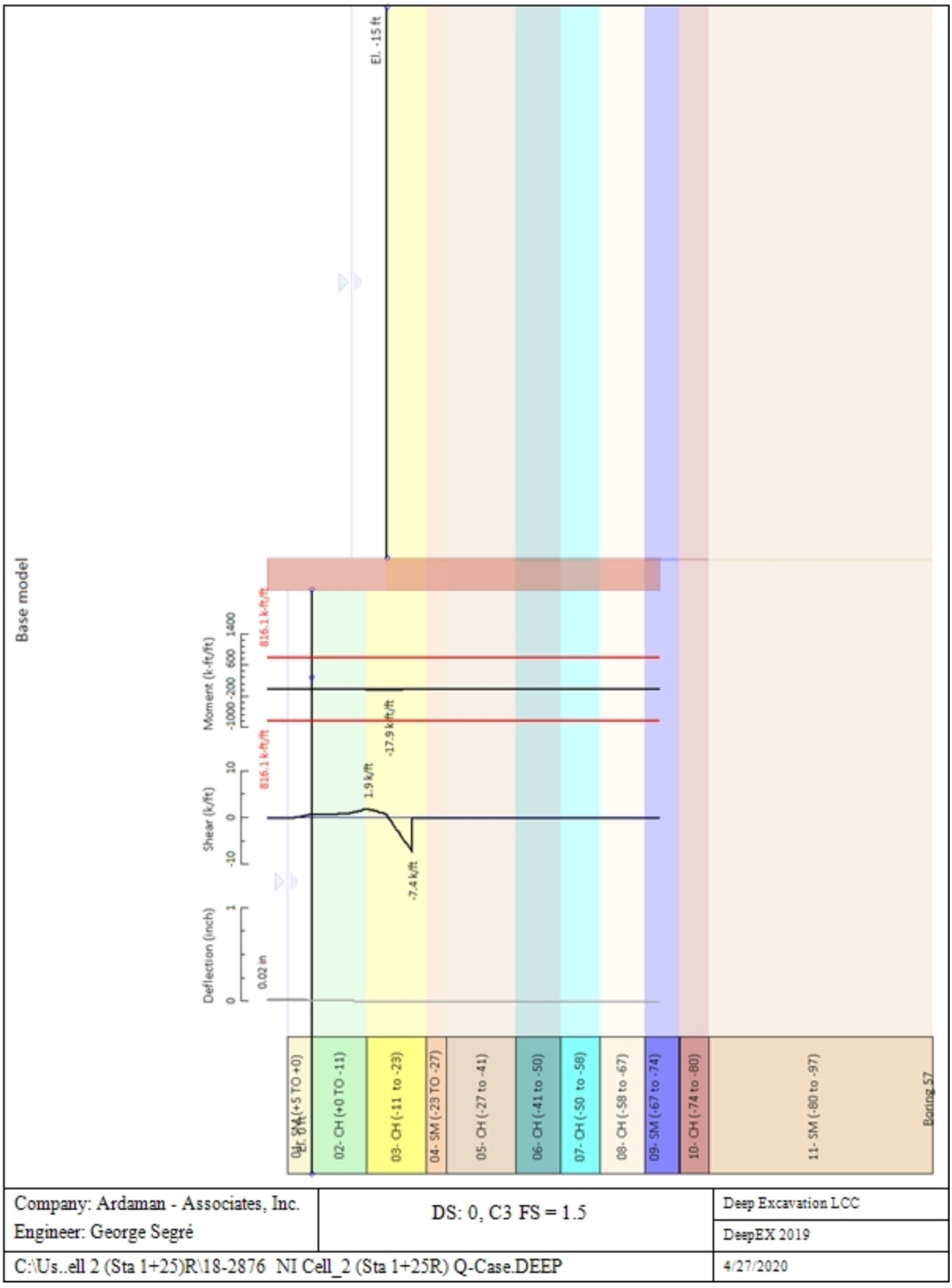

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.513 ksf
4.118 ksf
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

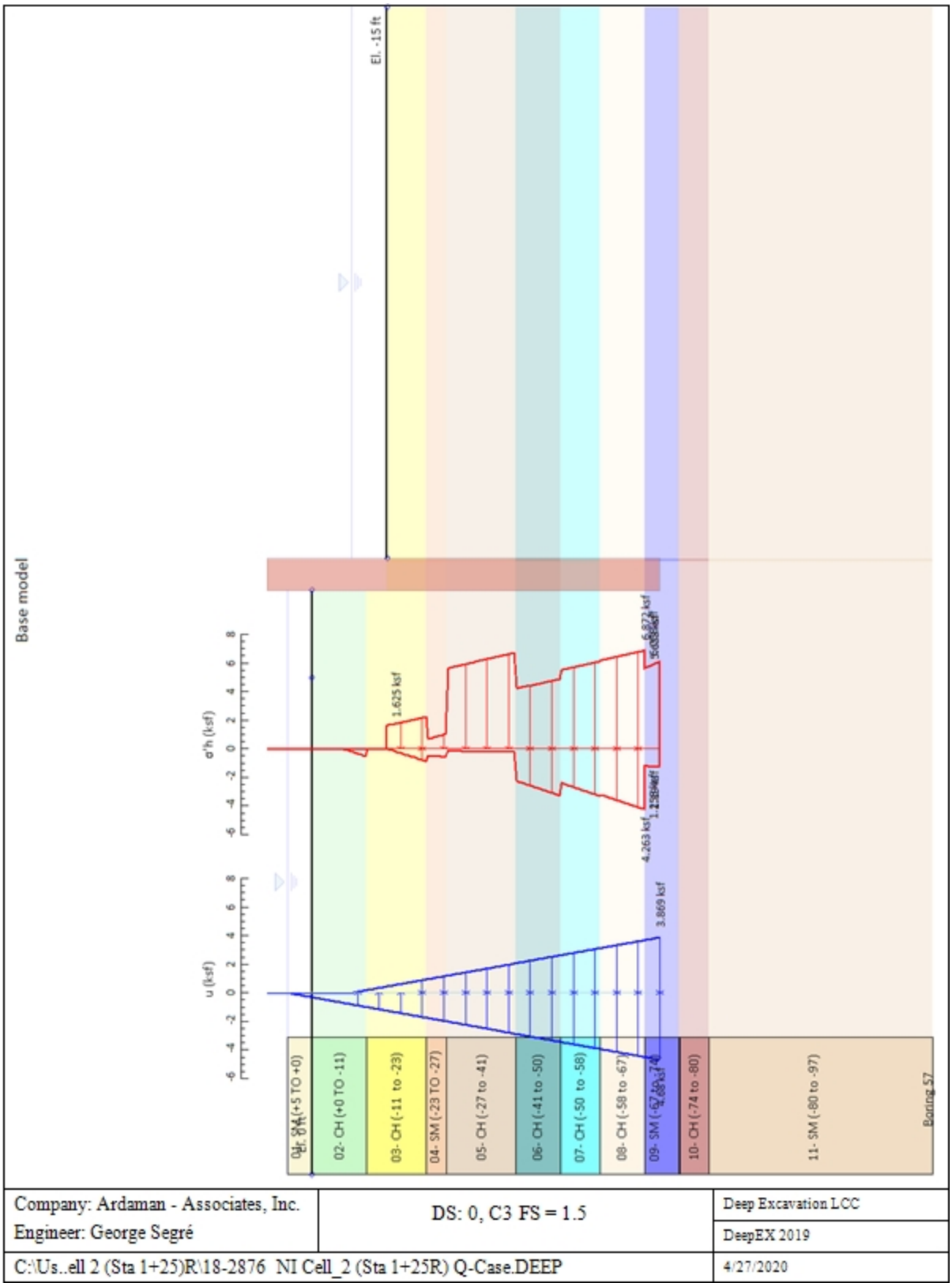

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-50.9 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.8 k/ft
Deflection (inch)
0 1
0.09 in
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

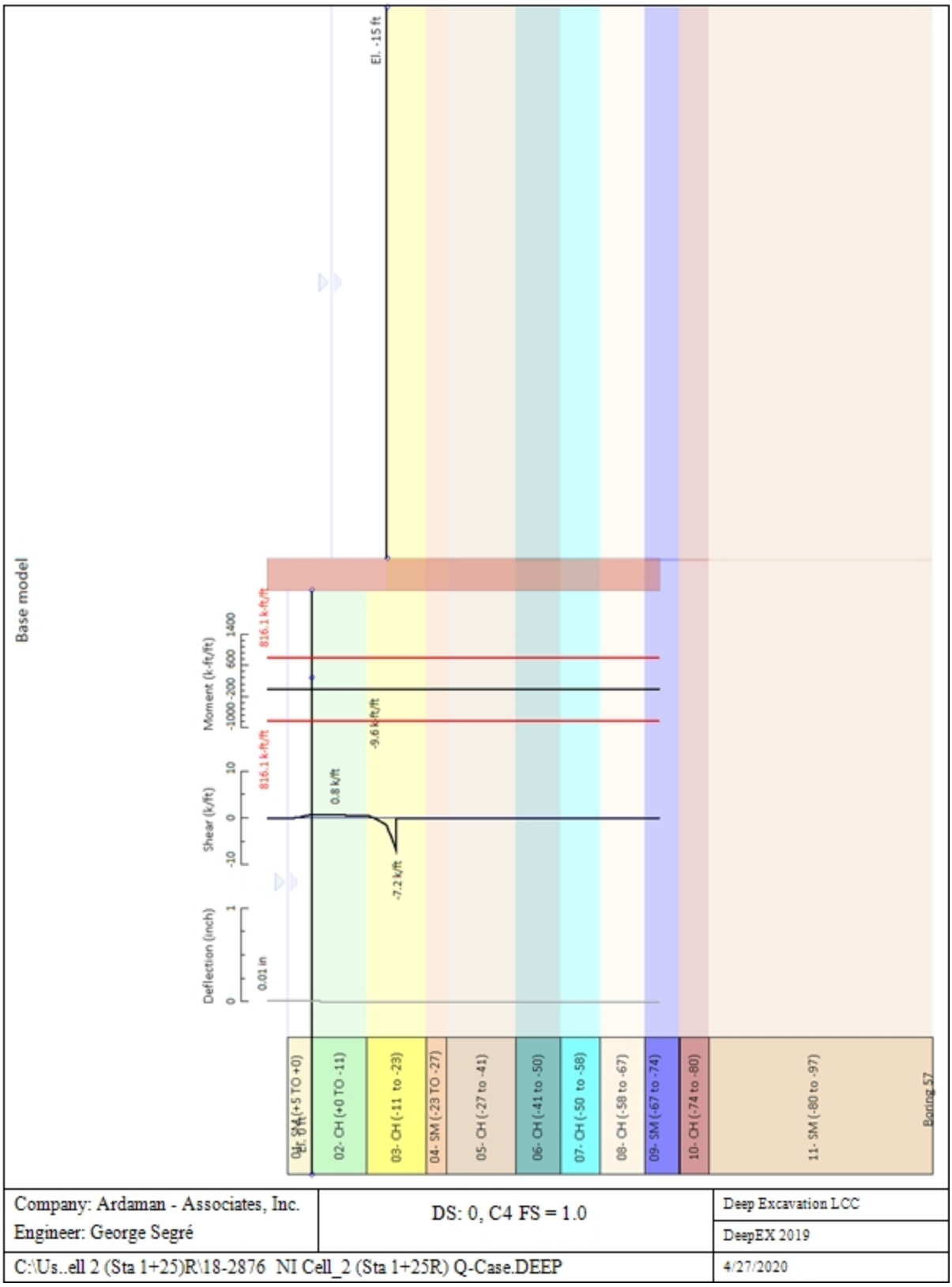

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.149 ksf
4.513 ksf
4.118 ksf
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
Deflection (inch)
0
1
0.02 in
Shear (k/ft)
-20
-10
0
10
1.9 k/ft
-10.2 k/ft
Moment (k-ft/ft)
-1000
-200
600
1400
816.1 k-ft/ft
816.1 k-ft/ft
-17.8 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

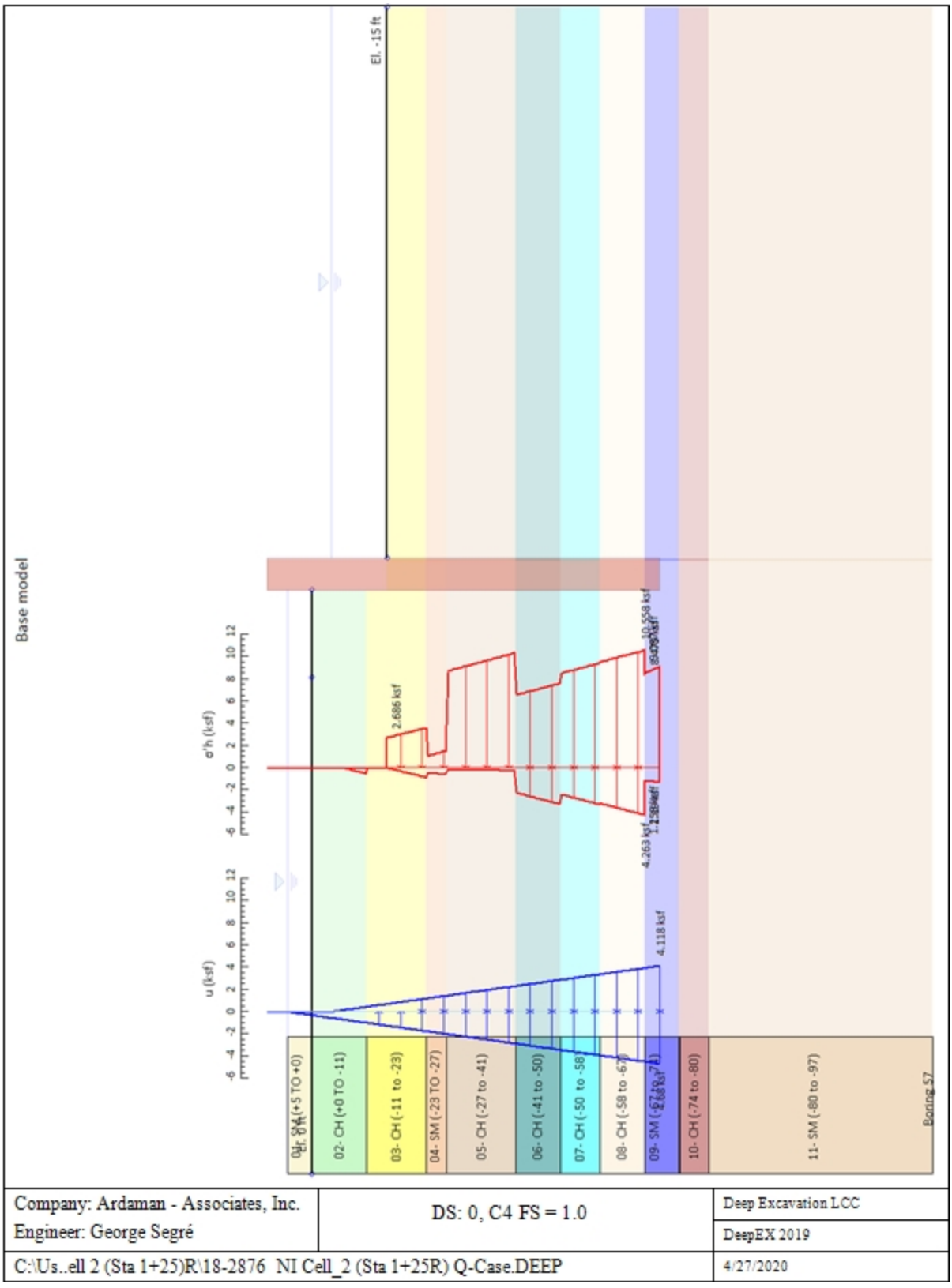

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.437 ksf
4.263 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

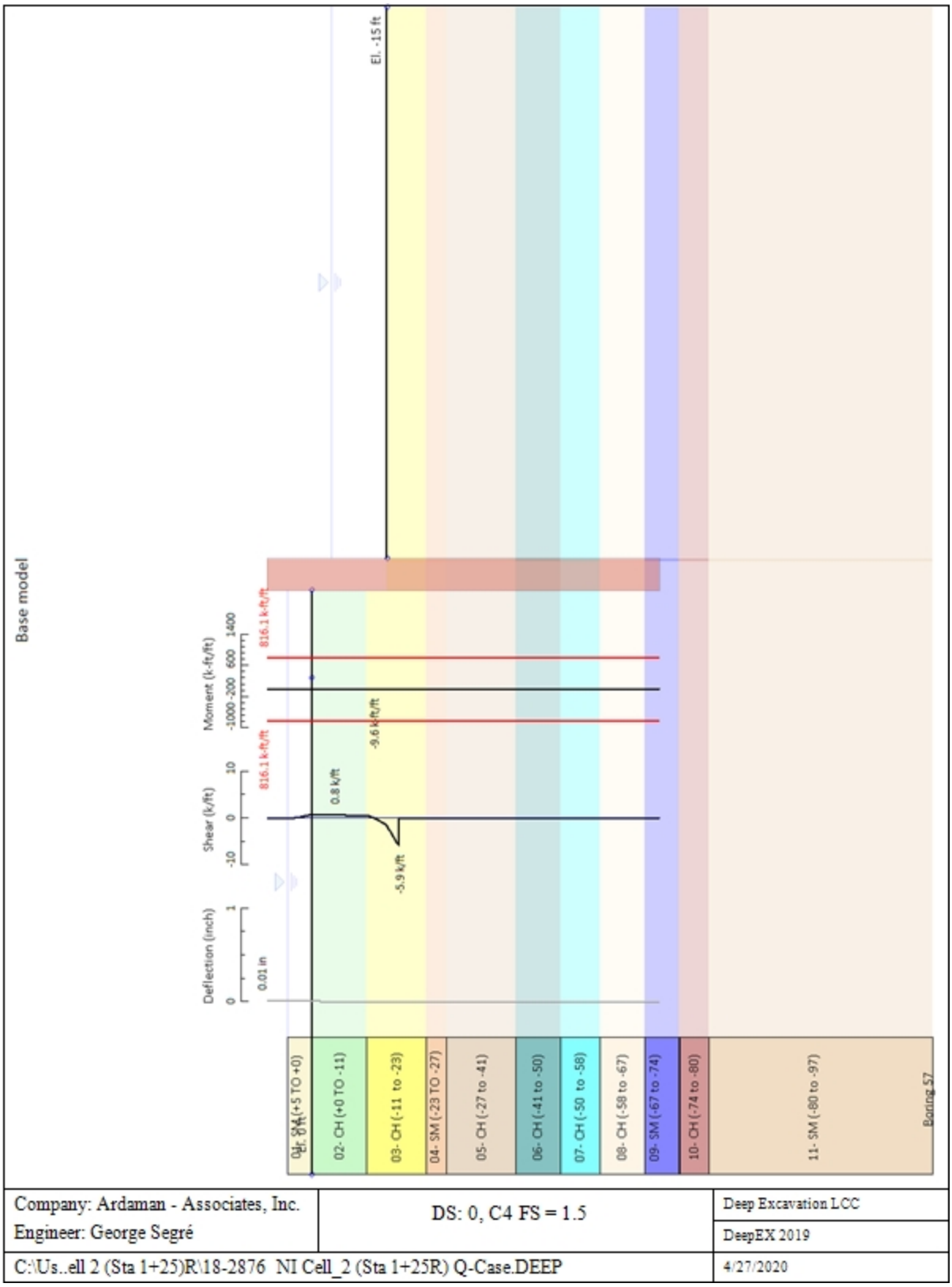

Base model
El. -15 ft
Deflection (inch)
0
1
0.02 in
Shear (k/ft)
-10
0
10
1.9 k/ft
-7.4 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-17.9 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

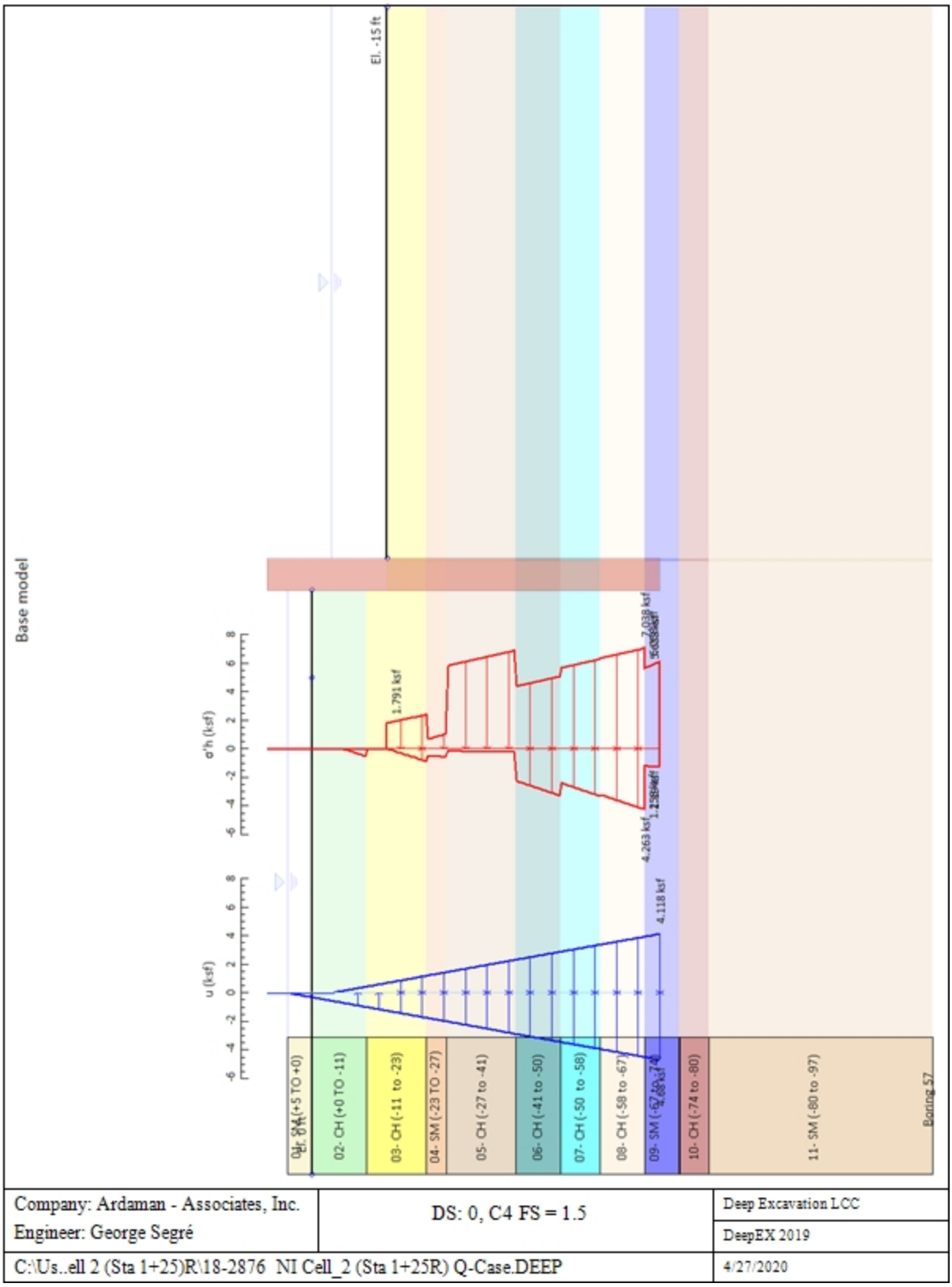

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
1.625 ksf
4.263 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.263 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
Deflection (inch)
0
1
0.01 in
Shear (k/ft)
-10
0
10
0.8 k/ft
-5.9 k/ft
Moment (k-ft/ft)
-1000
-200
600
1400
816.1 k-ft/ft
-9.6 k-ft/ft
816.1 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
1.791 ksf
7.038 ksf
4.263 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:22:53 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 150 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | - | - | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | - | - | 0.609 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

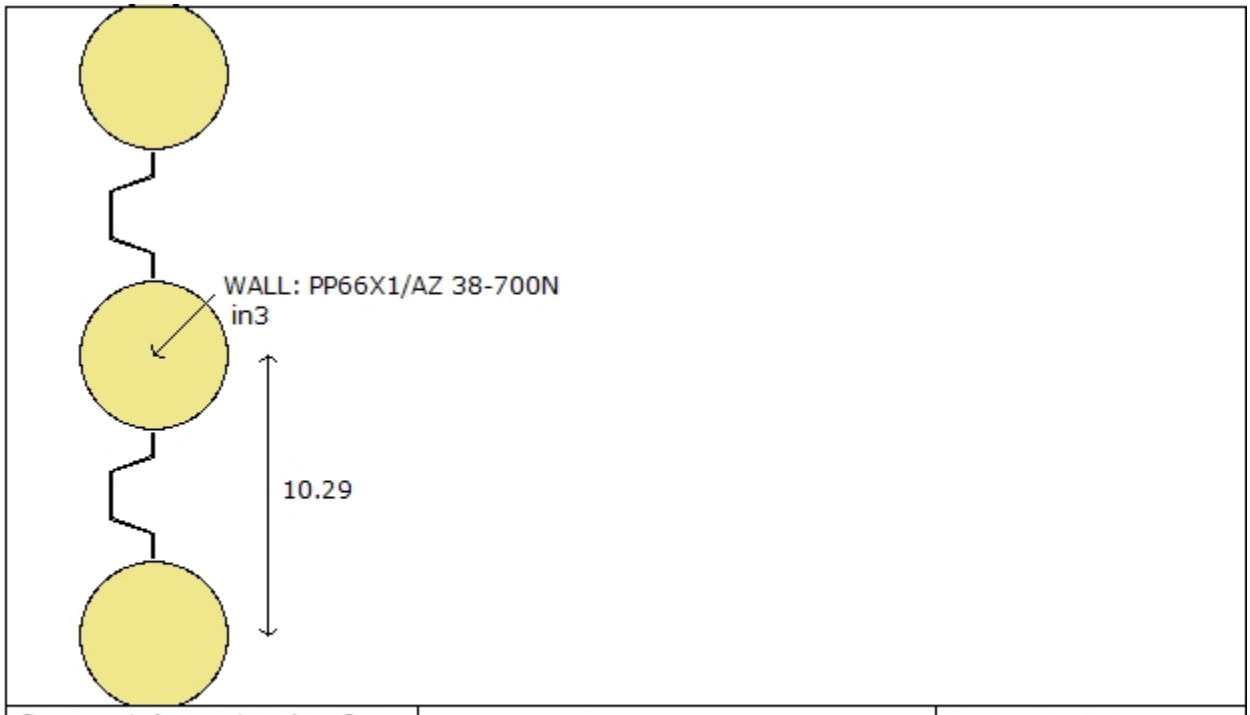
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 0.61 |
| -11 | 03- CH (-11 to | 1 | 0.61 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 0.61 |
| -41 | 06- CH (-41 to | 1 | 0.61 |
| -50 | 07- CH (-50 to | 1 | 0.61 |
| -58 | 08- CH (-58 to | 1 | 0.56 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 0.56 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -115 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.504 | 1.504 | 1.958 |
| Stage 1 | Simple span | N/A | 1.6 | 1.304 | 1.304 | 1.684 |
| Stage 2 | Simple span | N/A | 1.6 | 1.563 | 1.563 | 2.003 |
| Stage 3 | Simple span | N/A | 1.6 | 1.364 | 1.364 | 1.729 |
| Stage 4 | Simple span | N/A | 1.6 | 1.624 | 1.624 | 2.061 |
| Stage 5 | Simple span | N/A | 1.6 | 1.265 | 1.265 | 1.581 |
| Stage 6 | Simple span | N/A | 1.6 | 1.688 | 1.688 | 2.108 |
| Stage 7 | Simple span | N/A | 1.6 | 1.329 | 1.329 | 1.628 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

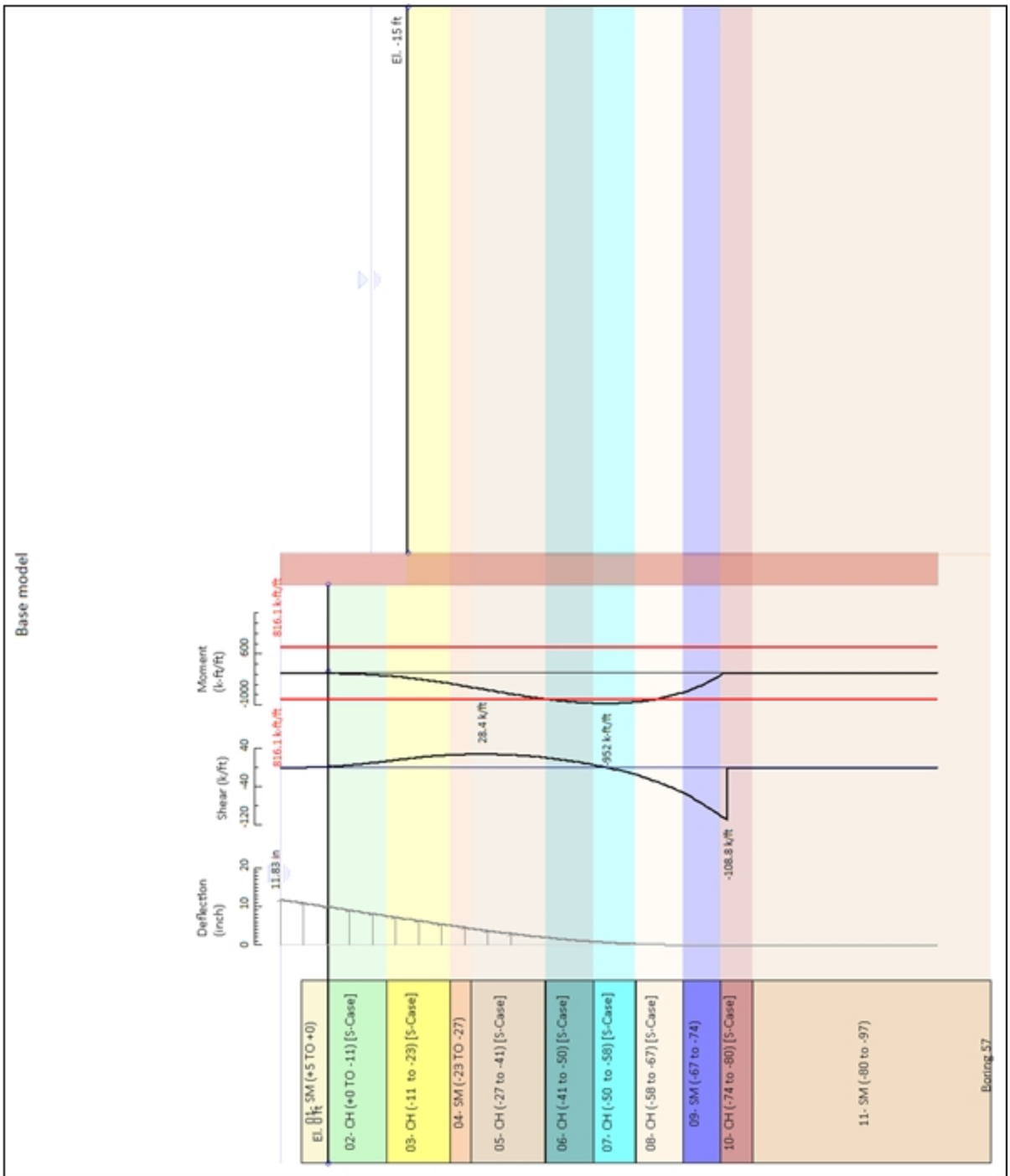
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

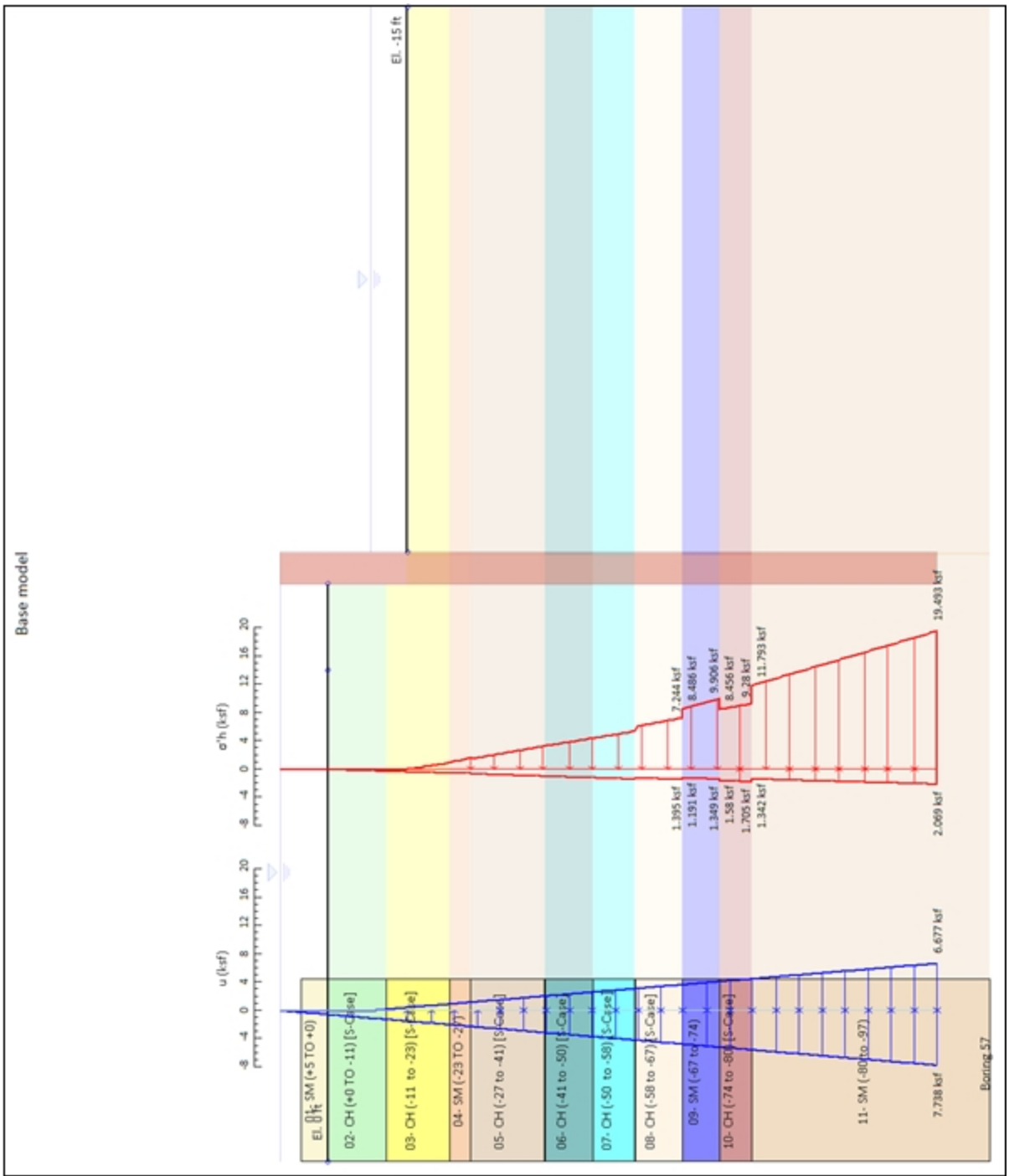
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

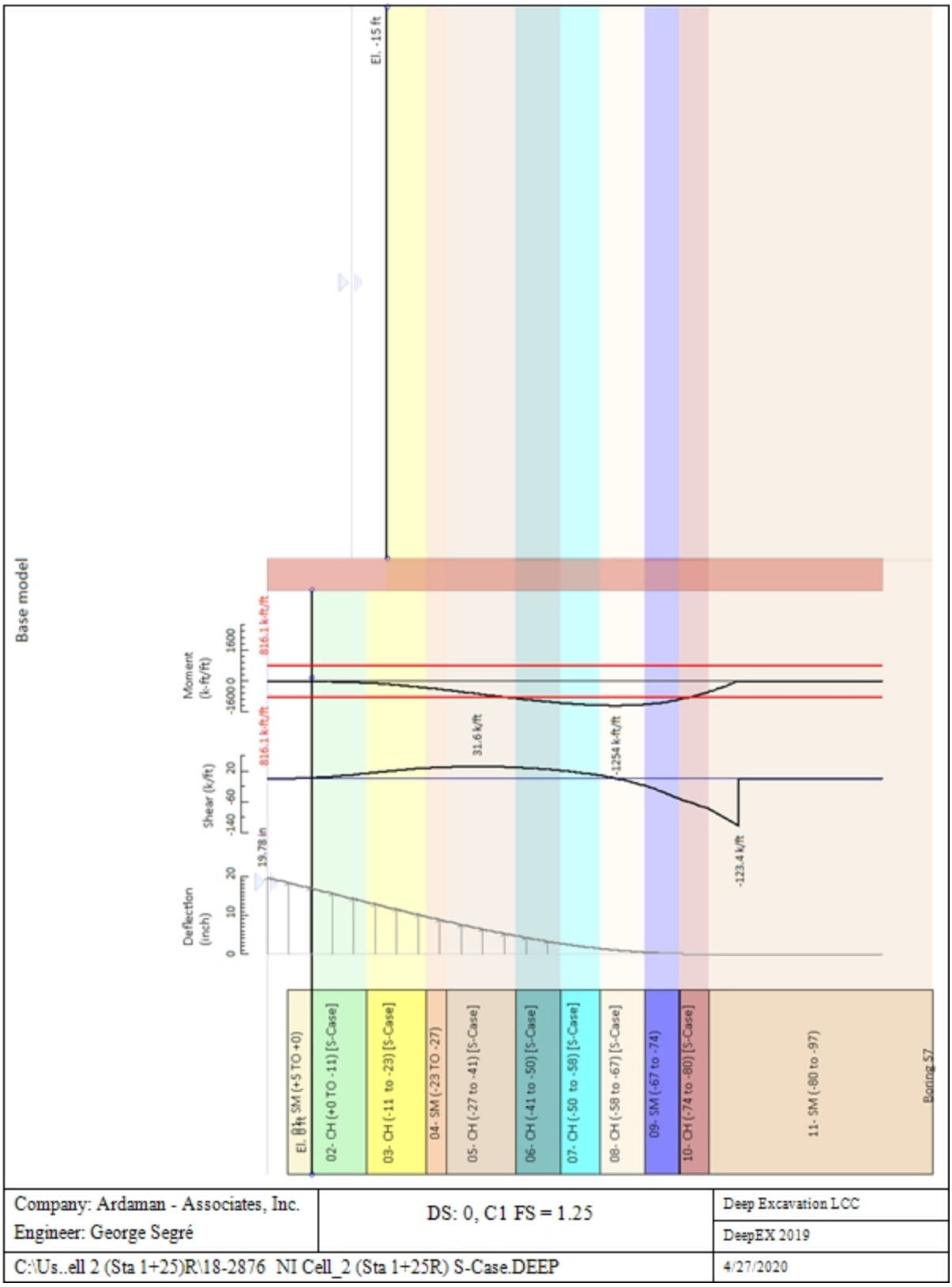
A sequence of figures for each excavation stage is reported



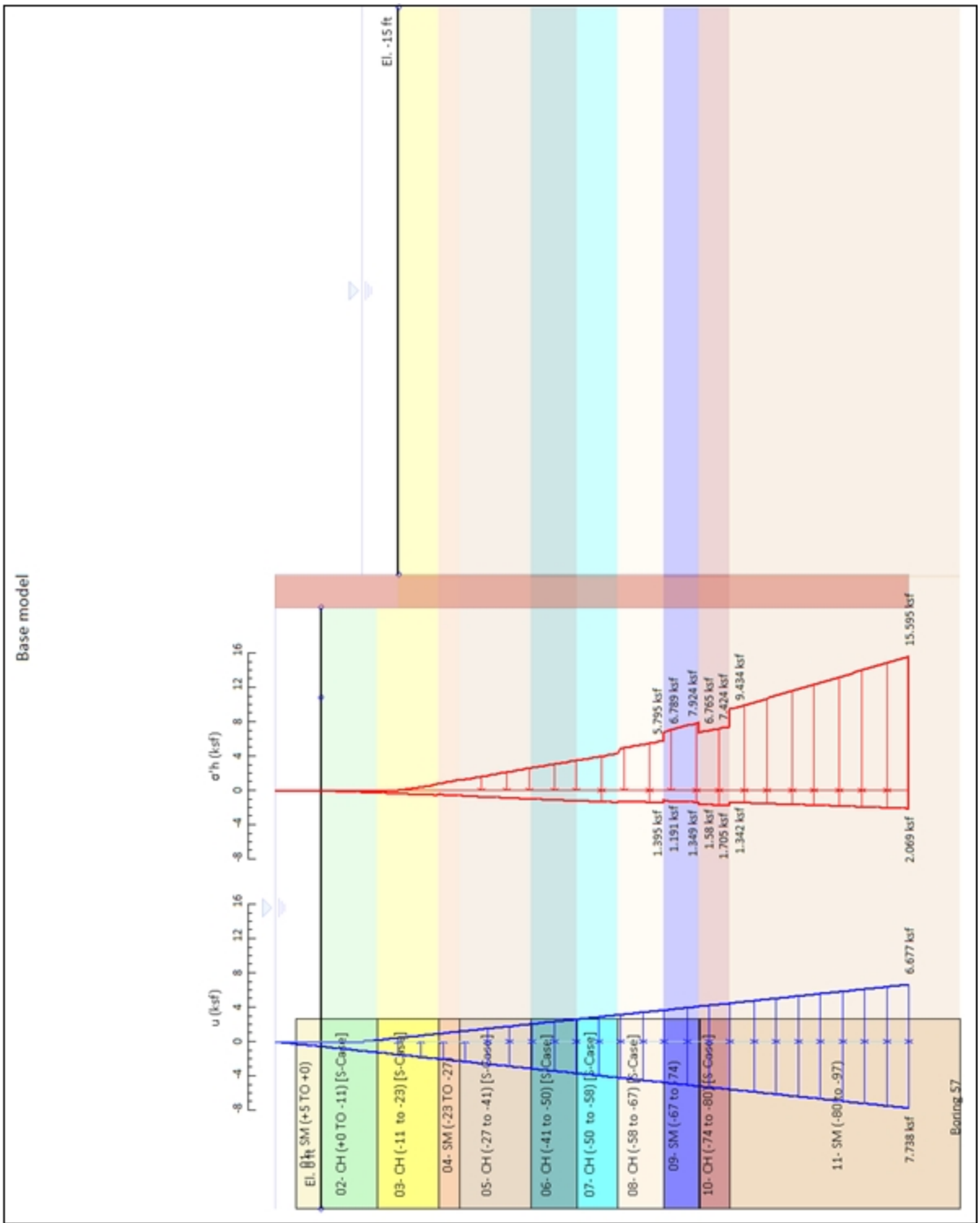

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



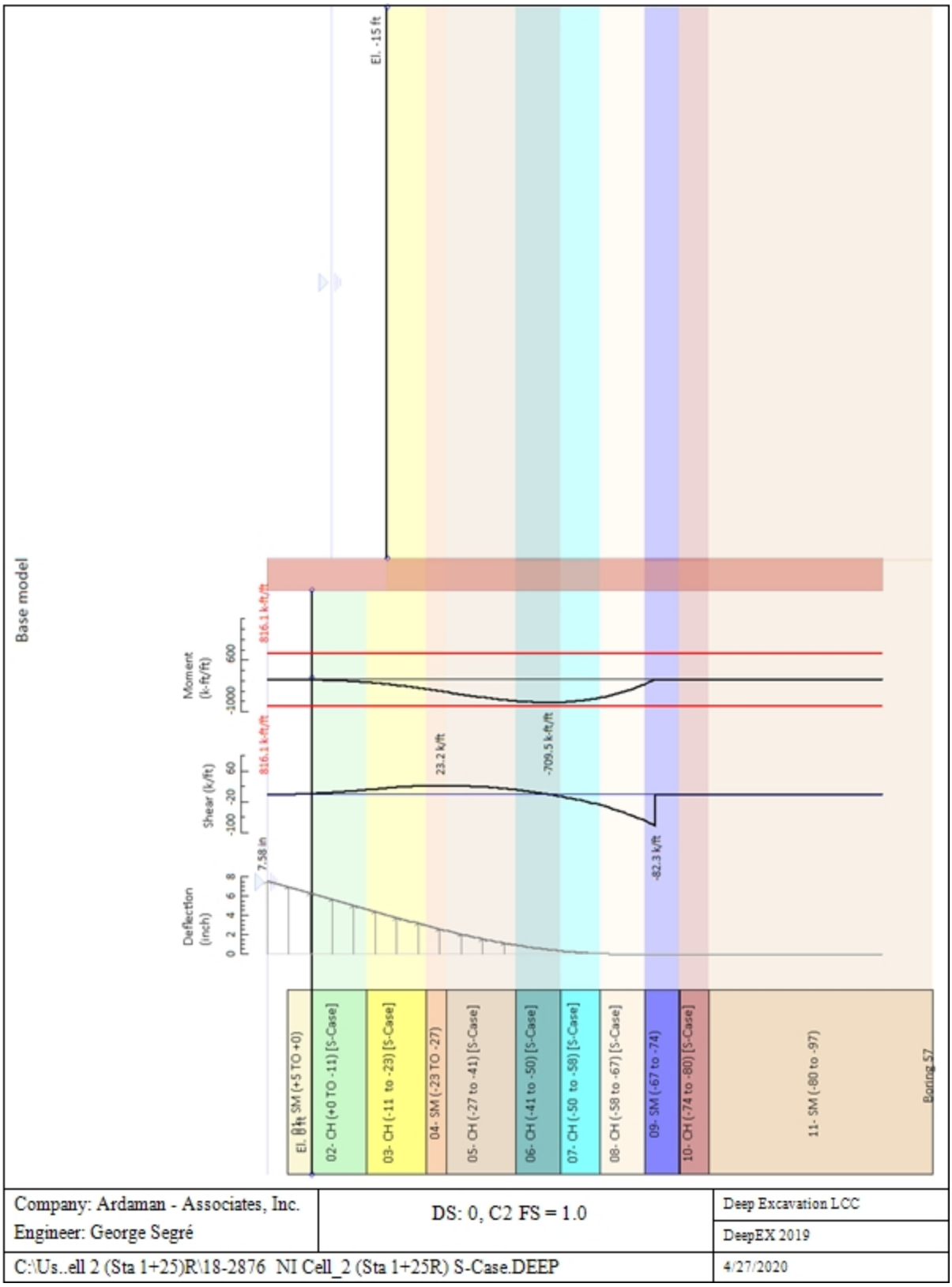

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



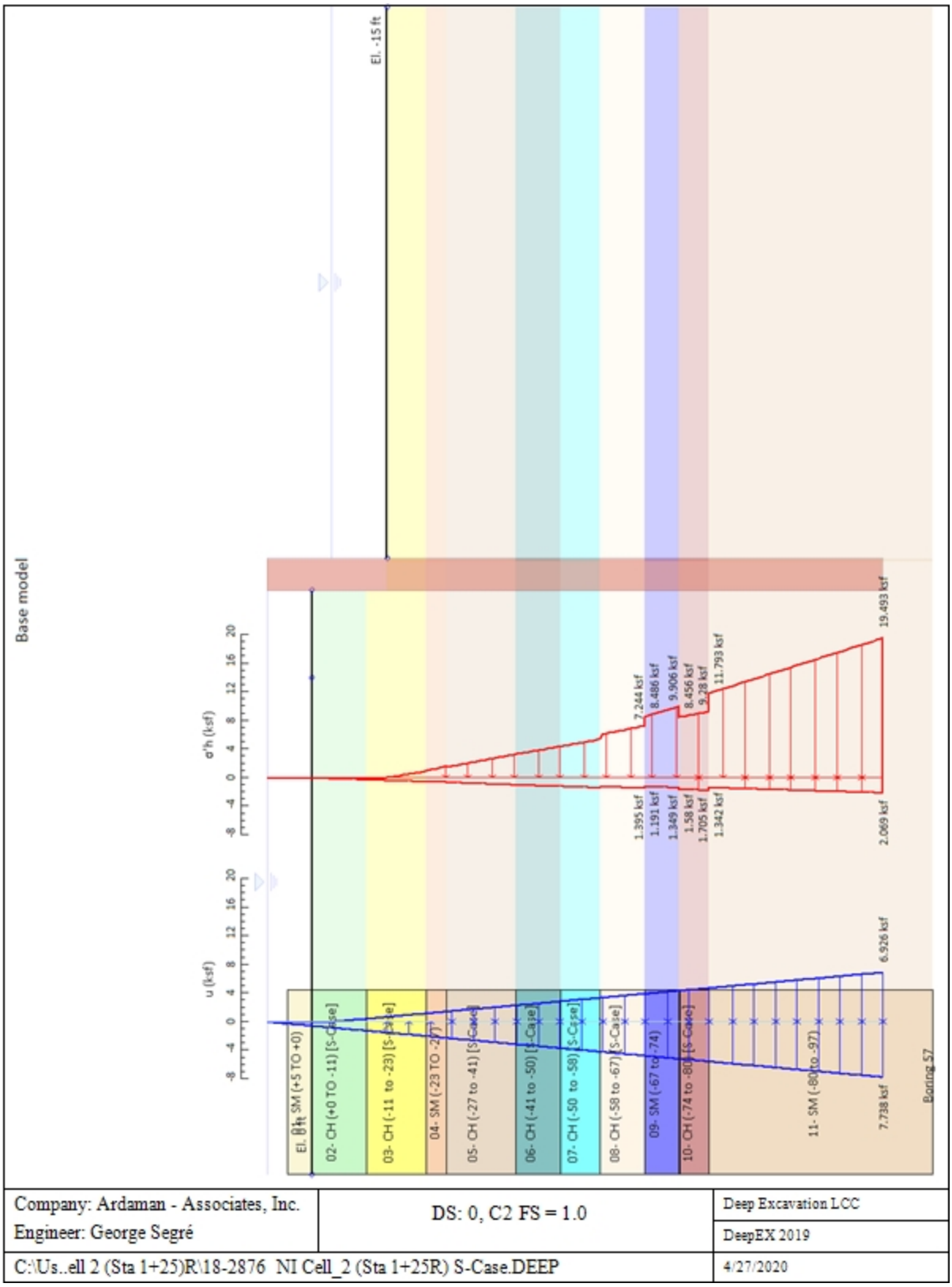

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



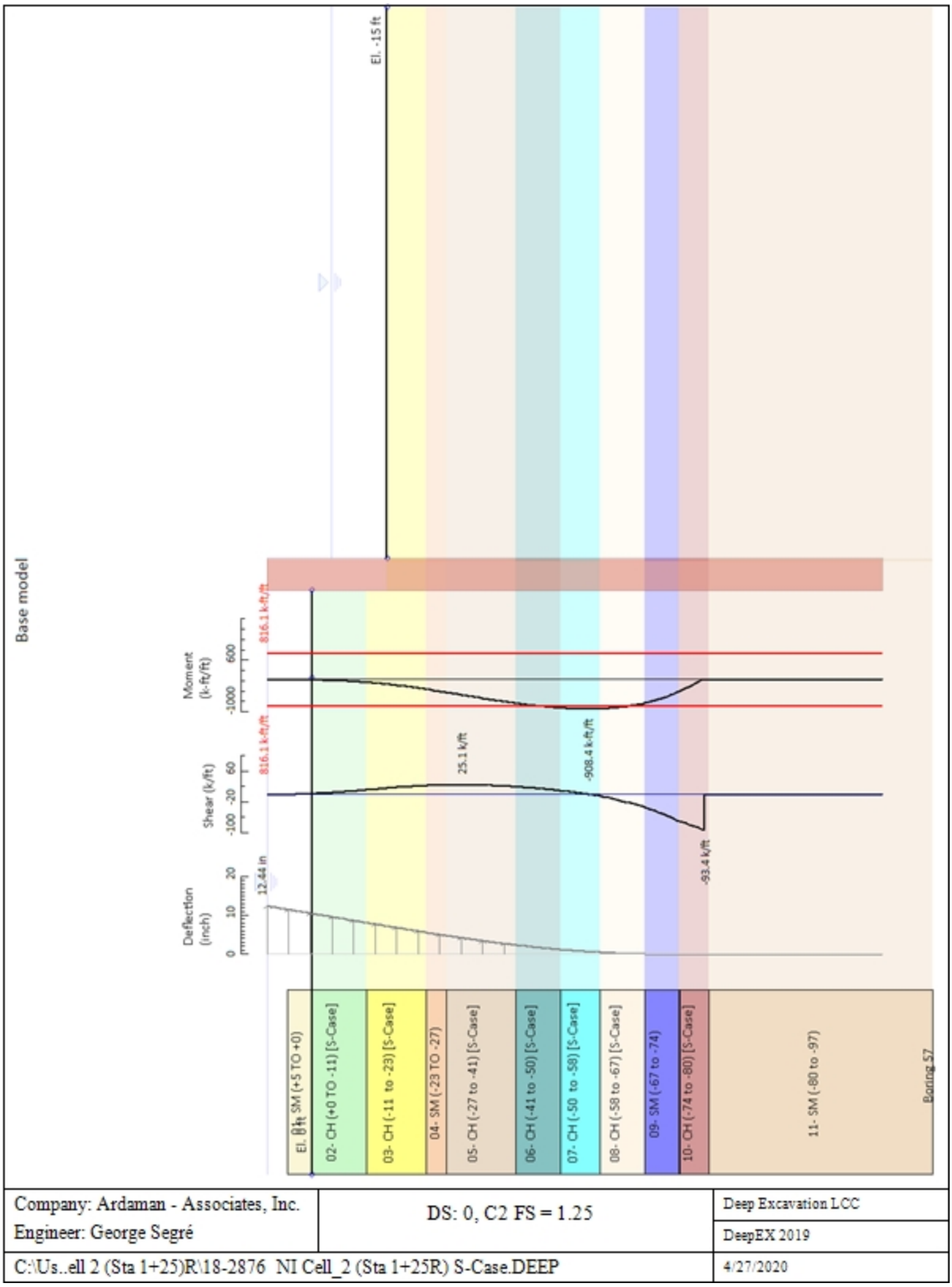

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



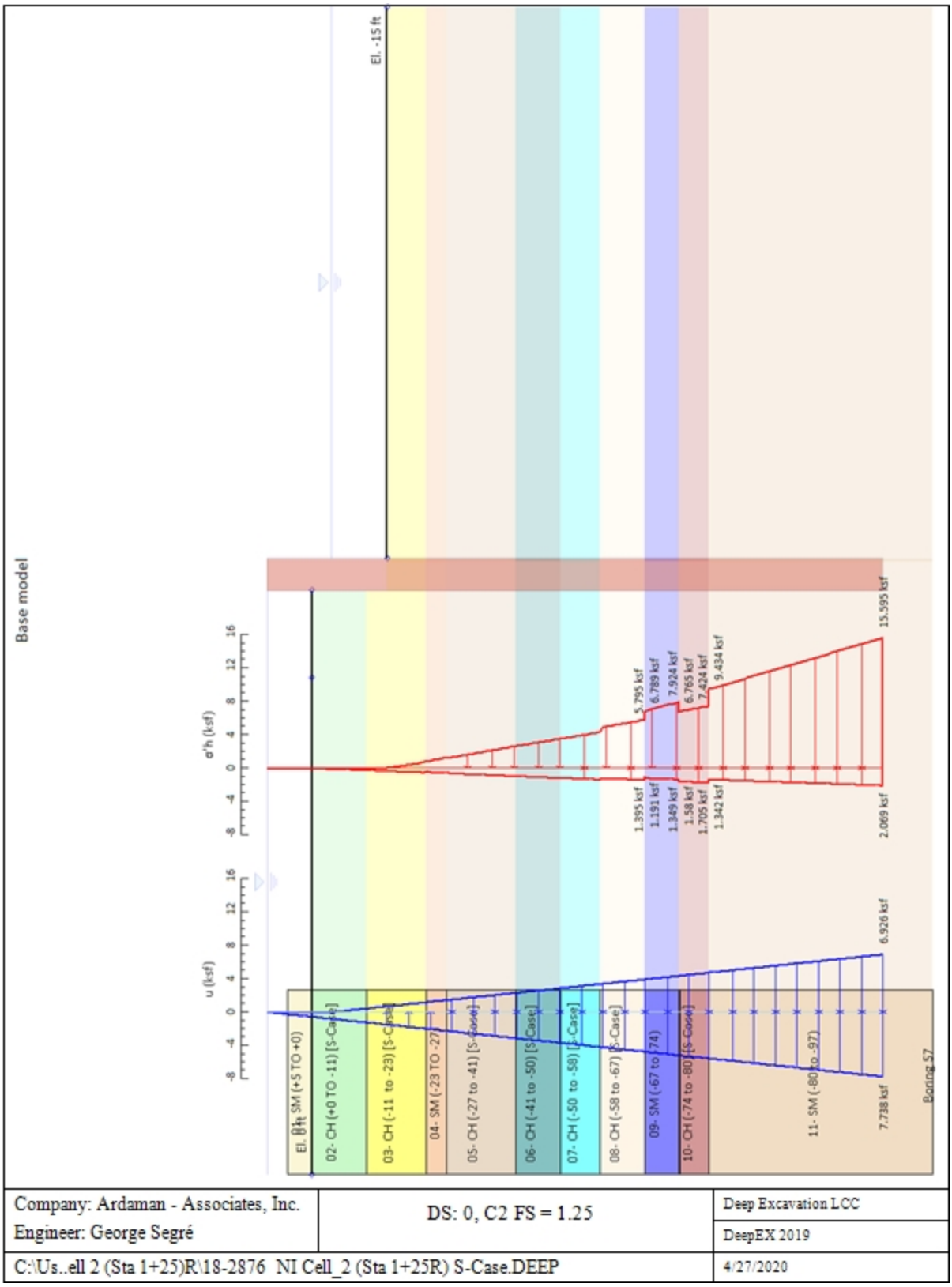

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



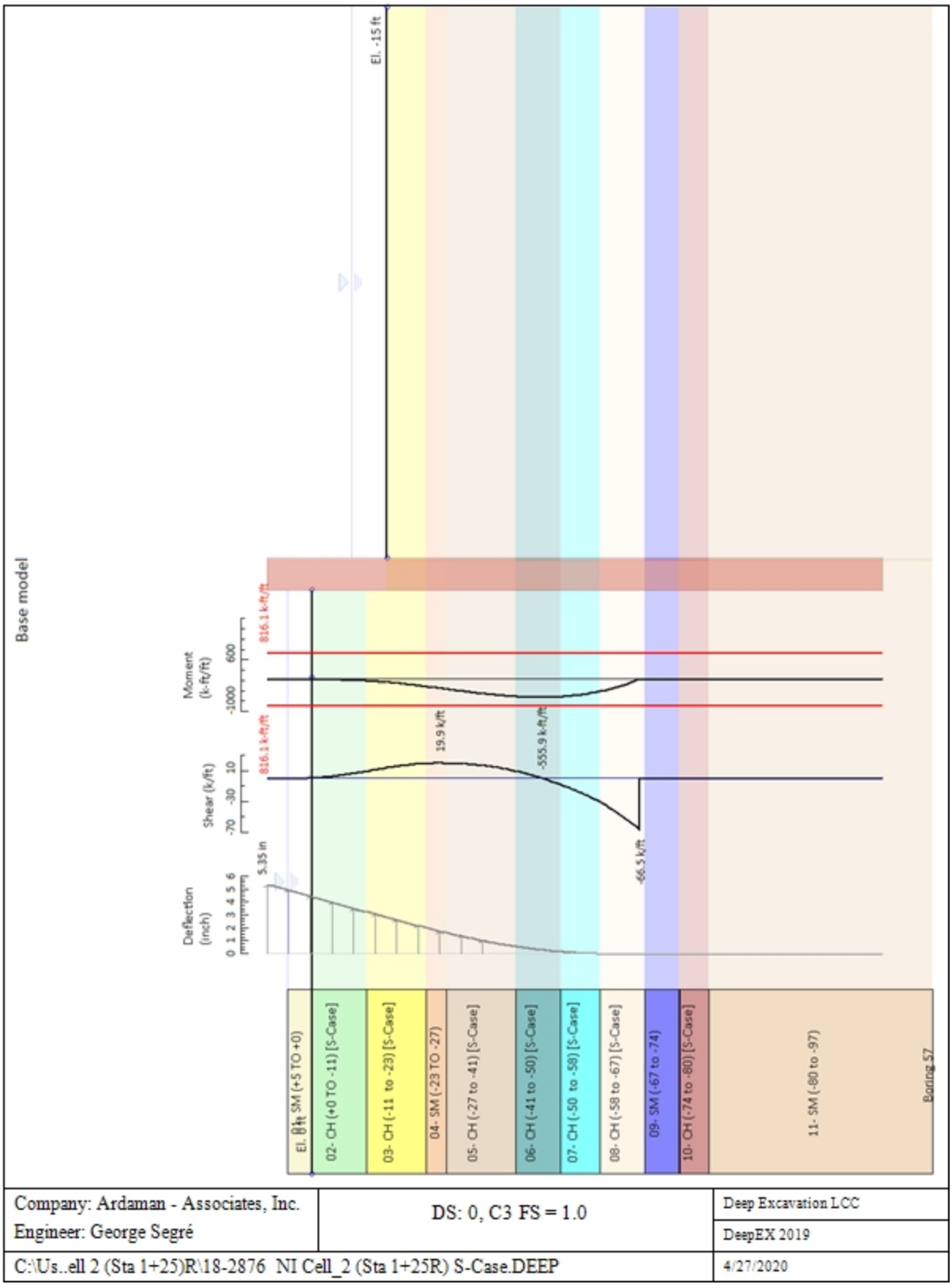

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



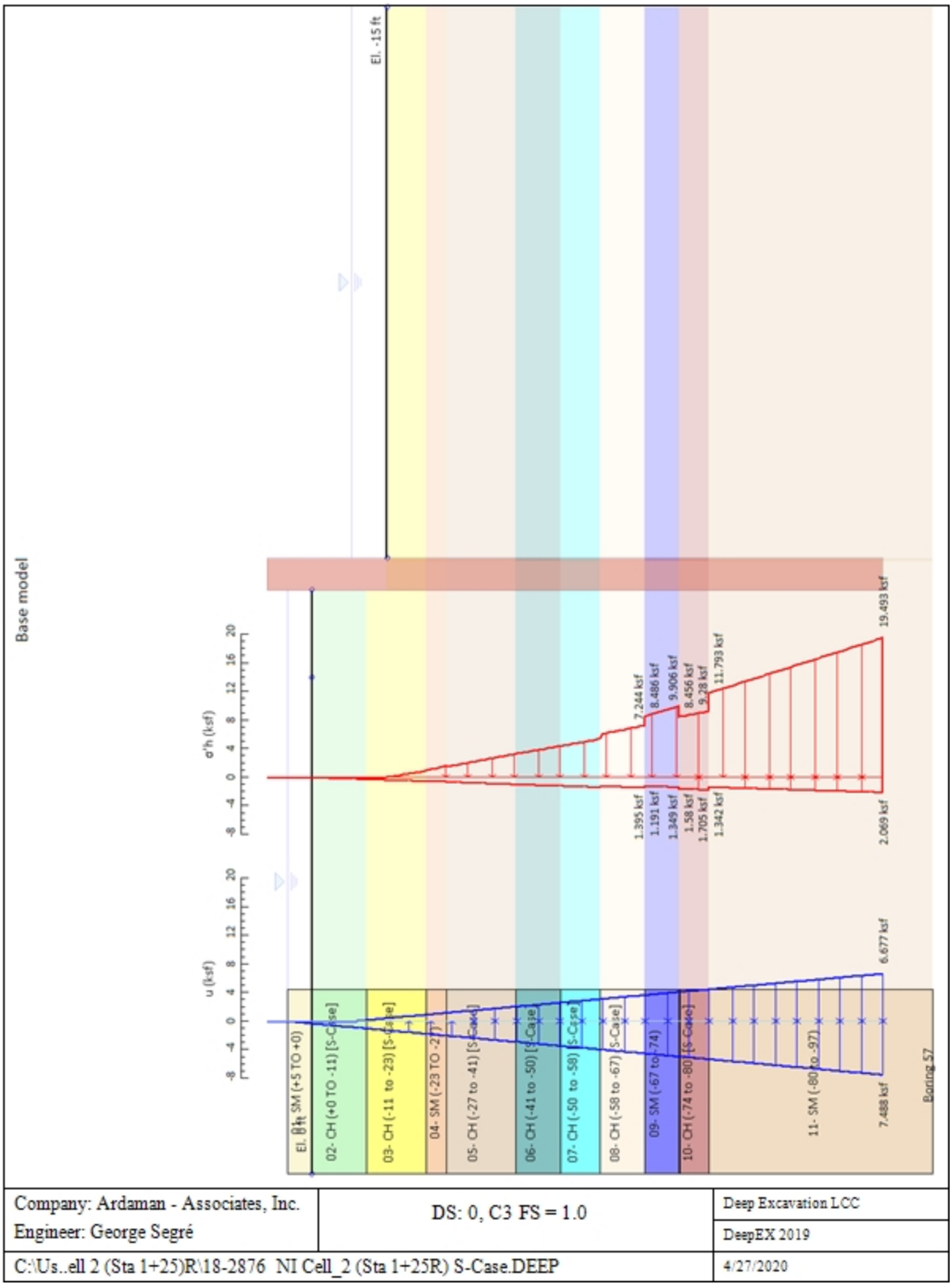

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



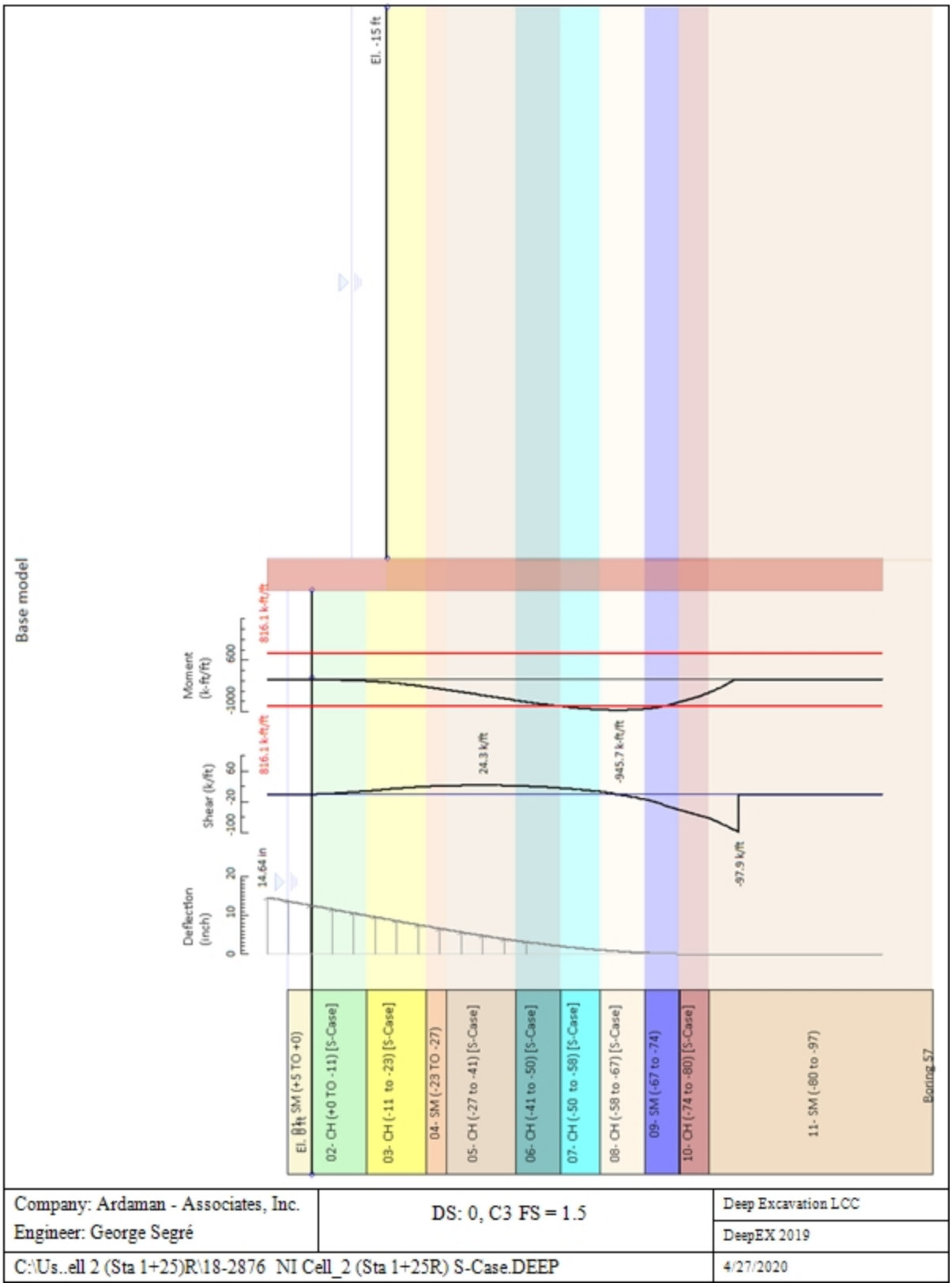

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



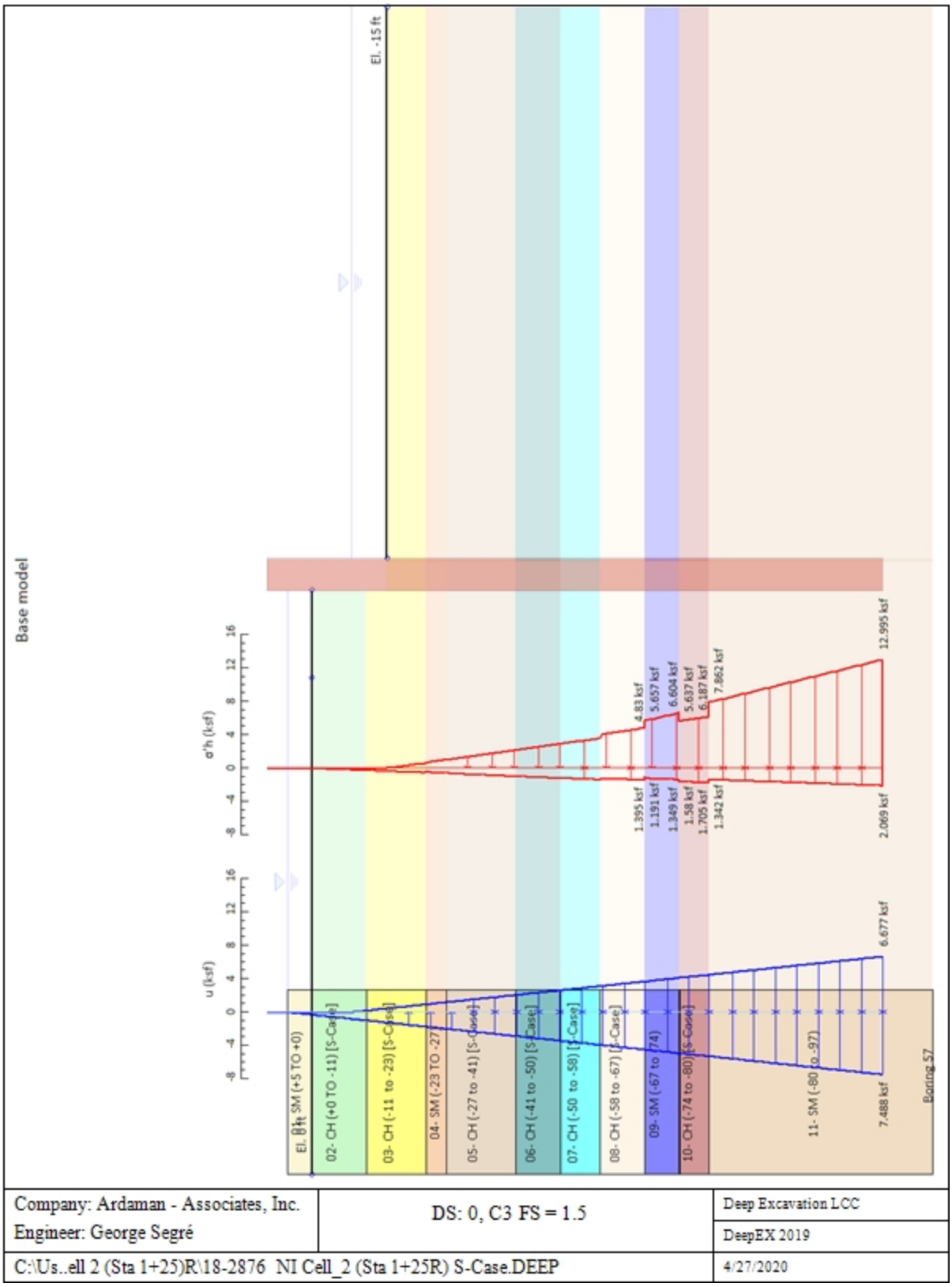

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |



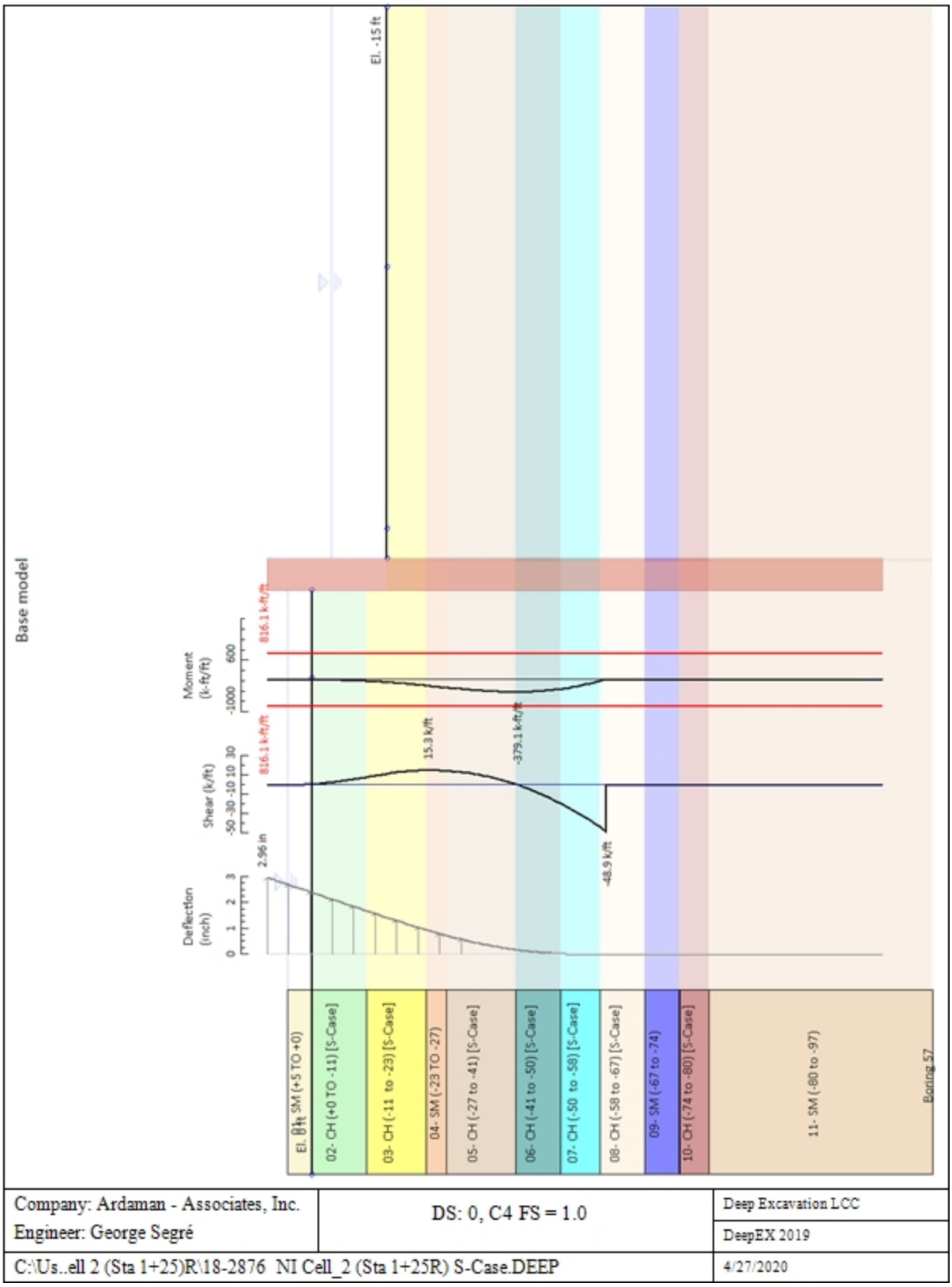

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |

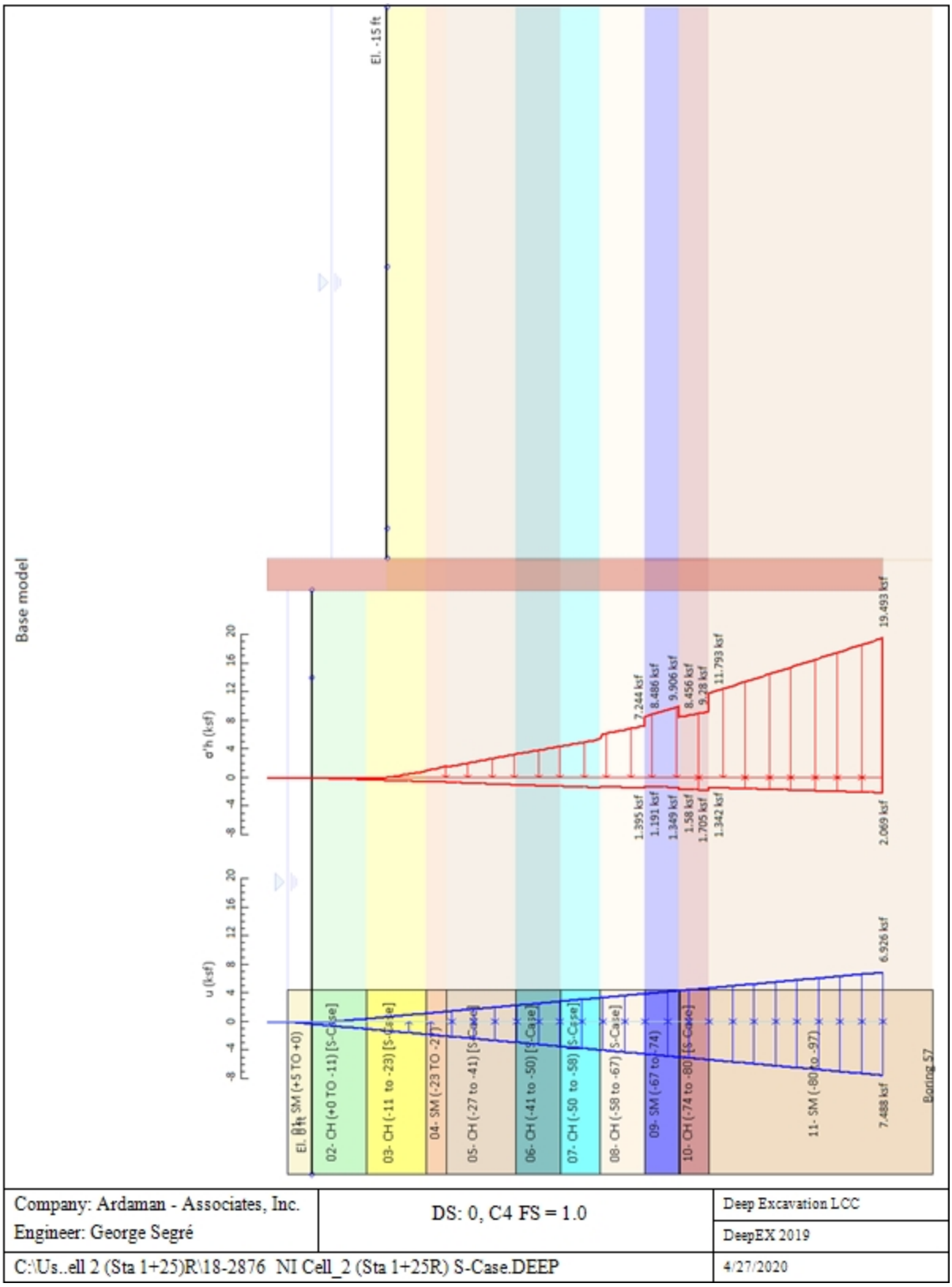



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |

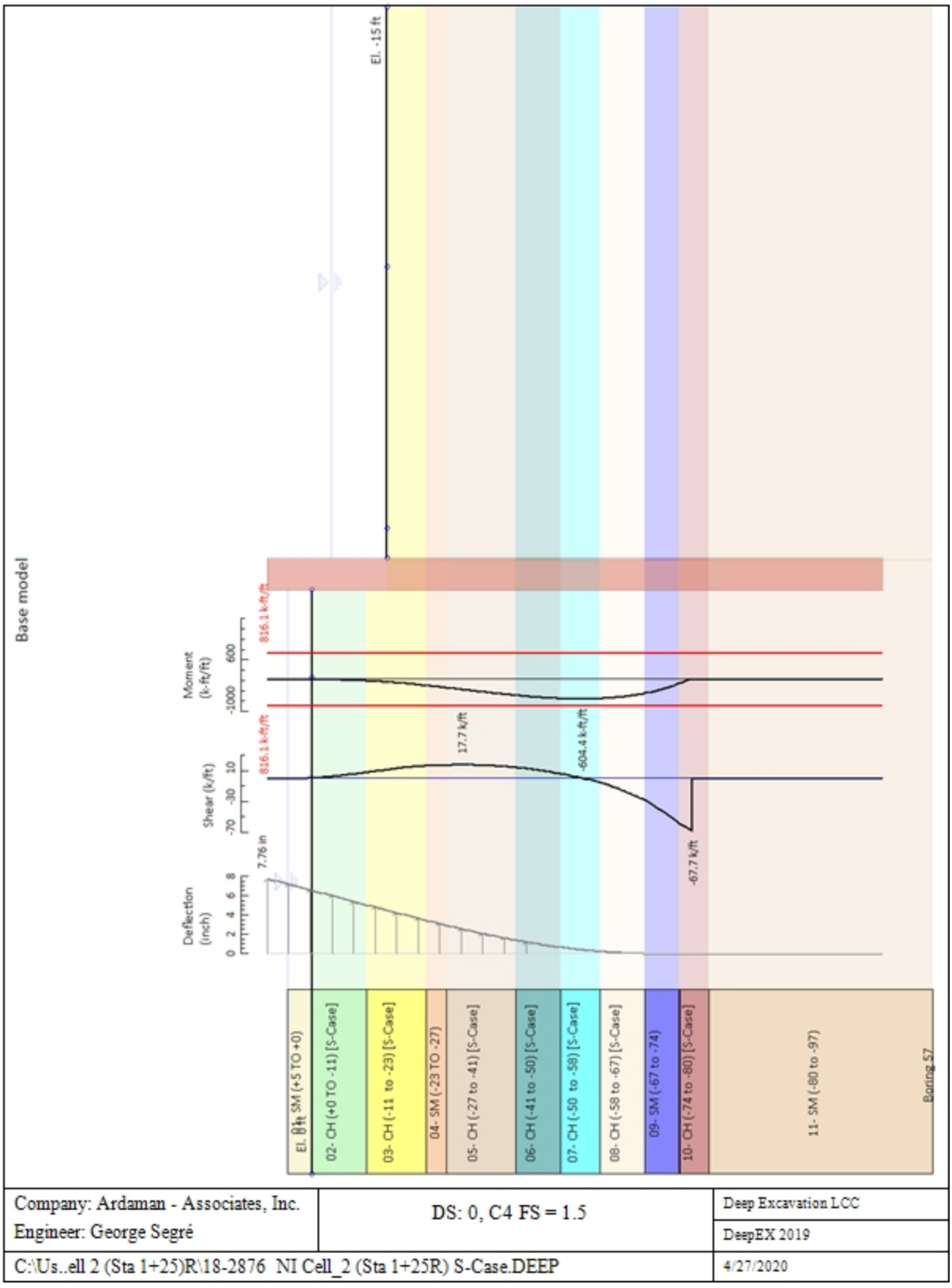



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |

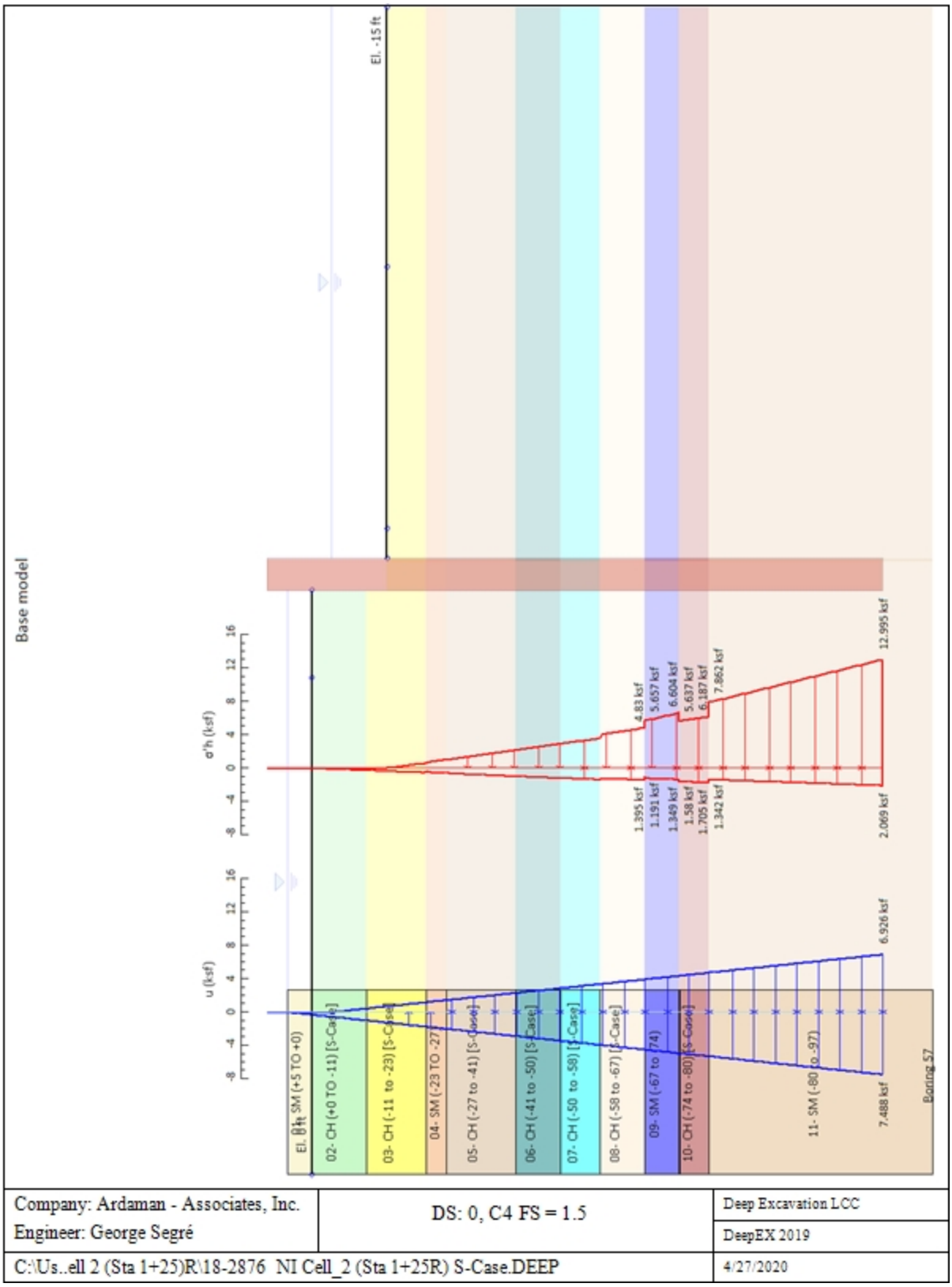

Base model
El. -15 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
30
10
-10
-30
-50
15.3 k/ft
-379.1 k-ft/ft
-48.9 k/ft
Deflection (inch)
0
1
2
3
2.96 in
El. 0 ft
SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 1+75)

| | | | | |
|---|---|---|---|---|
| Top of Wall = | 9.0 | ft., NAVD88 | Design Tip Elev. = | -101.0 ft., NAVD88 |
| Governing Tip Elev. = | -99.29 | ft., NAVD88 | Design Length of Sheeting = | 110.0 ft. |
| Length of Sheetting = | 108.29 | ft. | | |
| Use = | 110.0 | ft. | | |

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -35.63 | 203.81 | 60.20 | 0.66 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -36.82 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -33.66 | 142.66 | 49.96 | 0.47 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -34.84 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -32.08 | 76.38 | 36.39 | 0.23 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -33.26 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -29.31 | 48.11 | 19.46 | 0.11 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -29.71 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -89.77 | 1,595.96 | 161.53 | 26.51 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -99.29 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -83.82 | 1,193.32 | 126.25 | 17.56 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -92.74 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -81.44 | 996.98 | 108.99 | 13.67 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -98.69 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -74.30 | 671.11 | 84.14 | 7.87 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -90.36 | -- | -- | -- |
| | | | | | | Governing Value: | -99.29 | 1,595.96 | 161.53 | 26.51 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:29:20 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 0 | 0 | 500 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 0 | 0 | 1000 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 0 | 0 | 3300 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 0 | 0 | 1400 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 0 | 0 | 1850 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 0 | 0 | 1900 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 0 | 0 | 2000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | 0 | 0 | 0.95 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

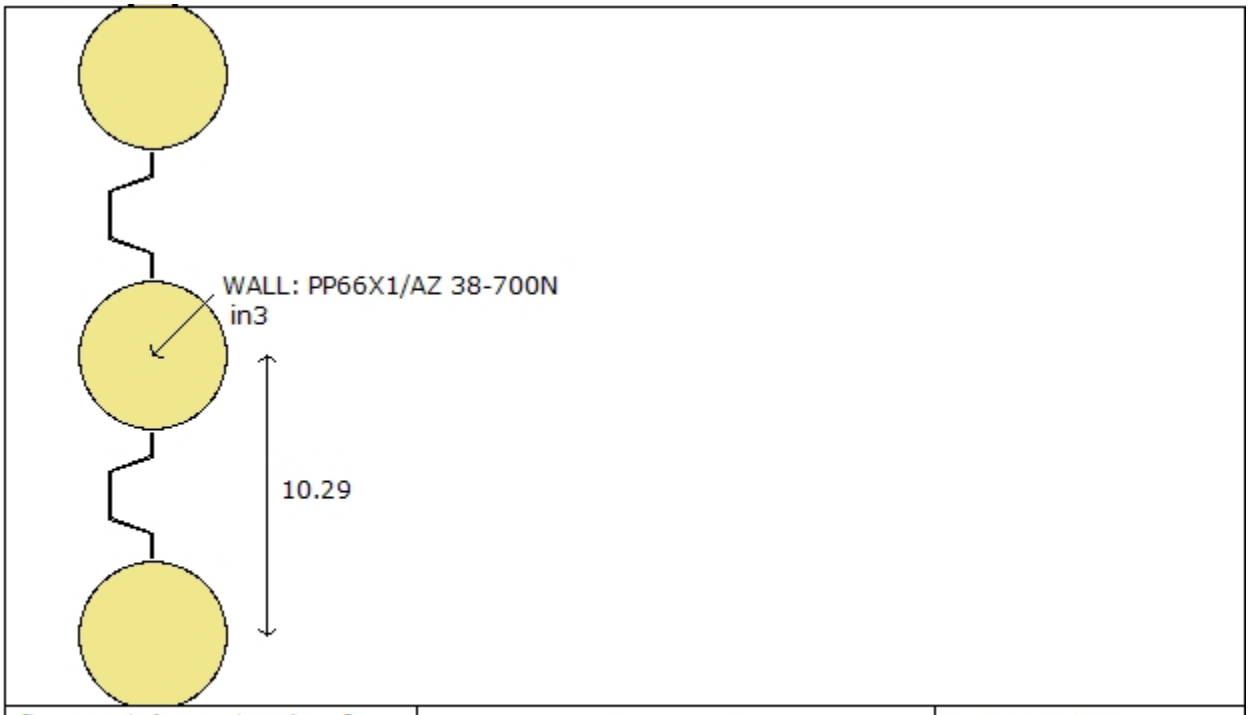
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 1 |
| -11 | 03- CH (-11 to | 1 | 0.95 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 1 |
| -41 | 06- CH (-41 to | 1 | 1 |
| -50 | 07- CH (-50 to | 1 | 1 |
| -58 | 08- CH (-58 to | 1 | 1 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 1 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 3.097 | 3.248 | 3.097 |
| Stage 1 | Simple span | N/A | 1.6 | 2.517 | 2.645 | 2.517 |
| Stage 2 | Simple span | N/A | 1.6 | 3.231 | 3.455 | 3.231 |
| Stage 3 | Simple span | N/A | 1.6 | 2.634 | 2.834 | 2.634 |
| Stage 4 | Simple span | N/A | 1.6 | 3.507 | 4.106 | 3.507 |
| Stage 5 | Simple span | N/A | 1.6 | 2.412 | 2.836 | 2.412 |
| Stage 6 | Simple span | N/A | 1.6 | 3.658 | 4.368 | 3.658 |
| Stage 7 | Simple span | N/A | 1.6 | 2.532 | 3.06 | 2.532 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

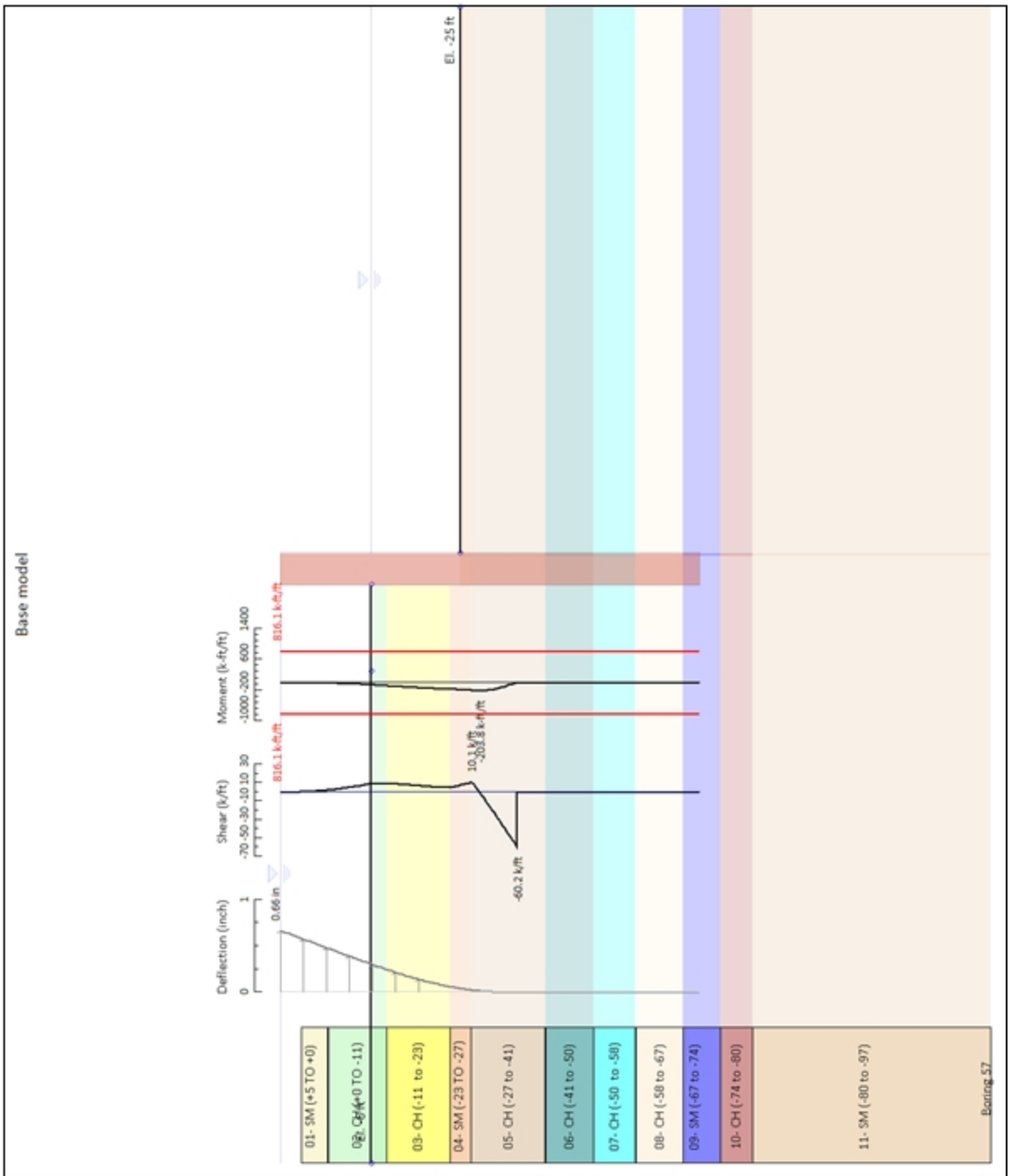
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

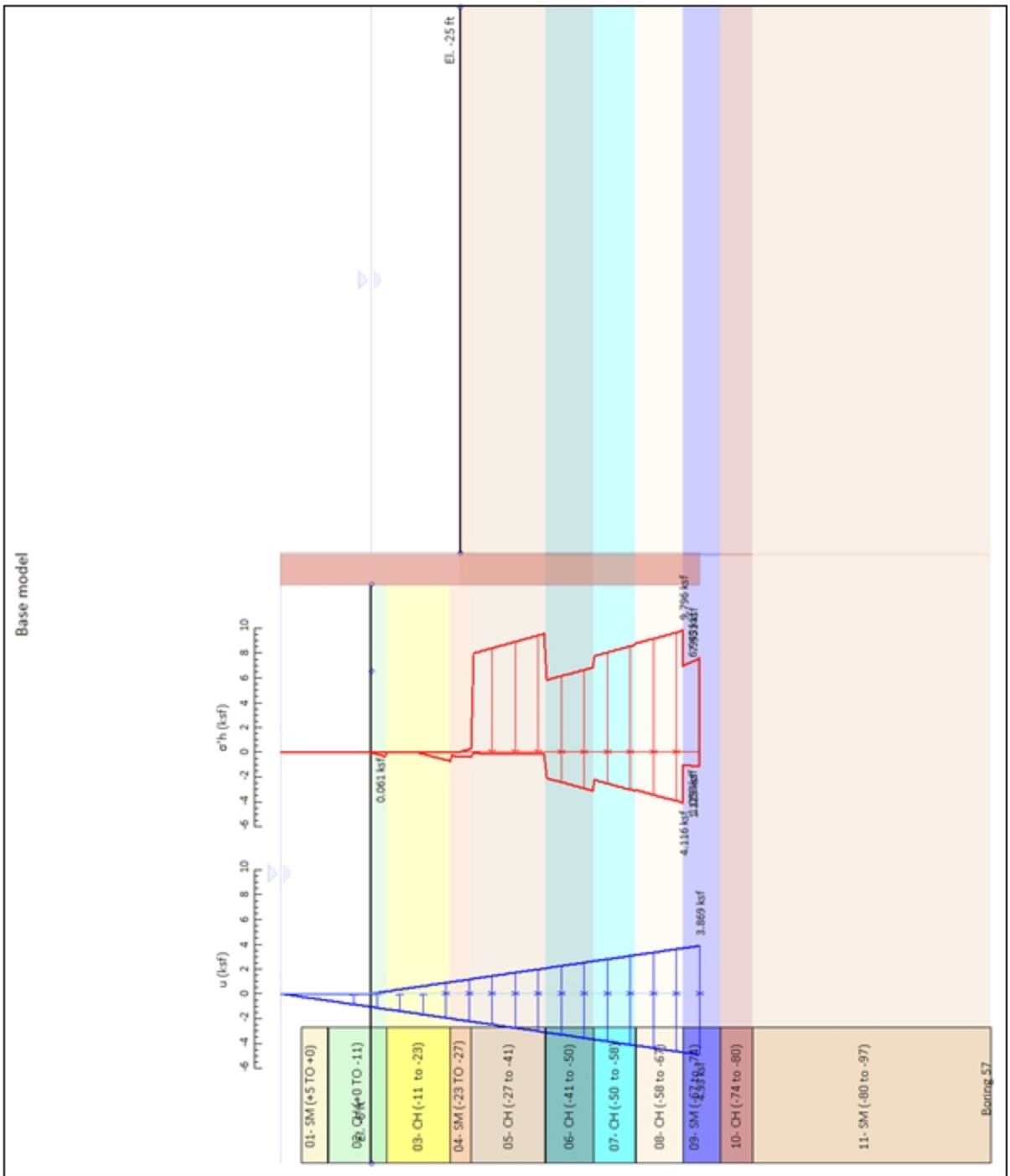
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

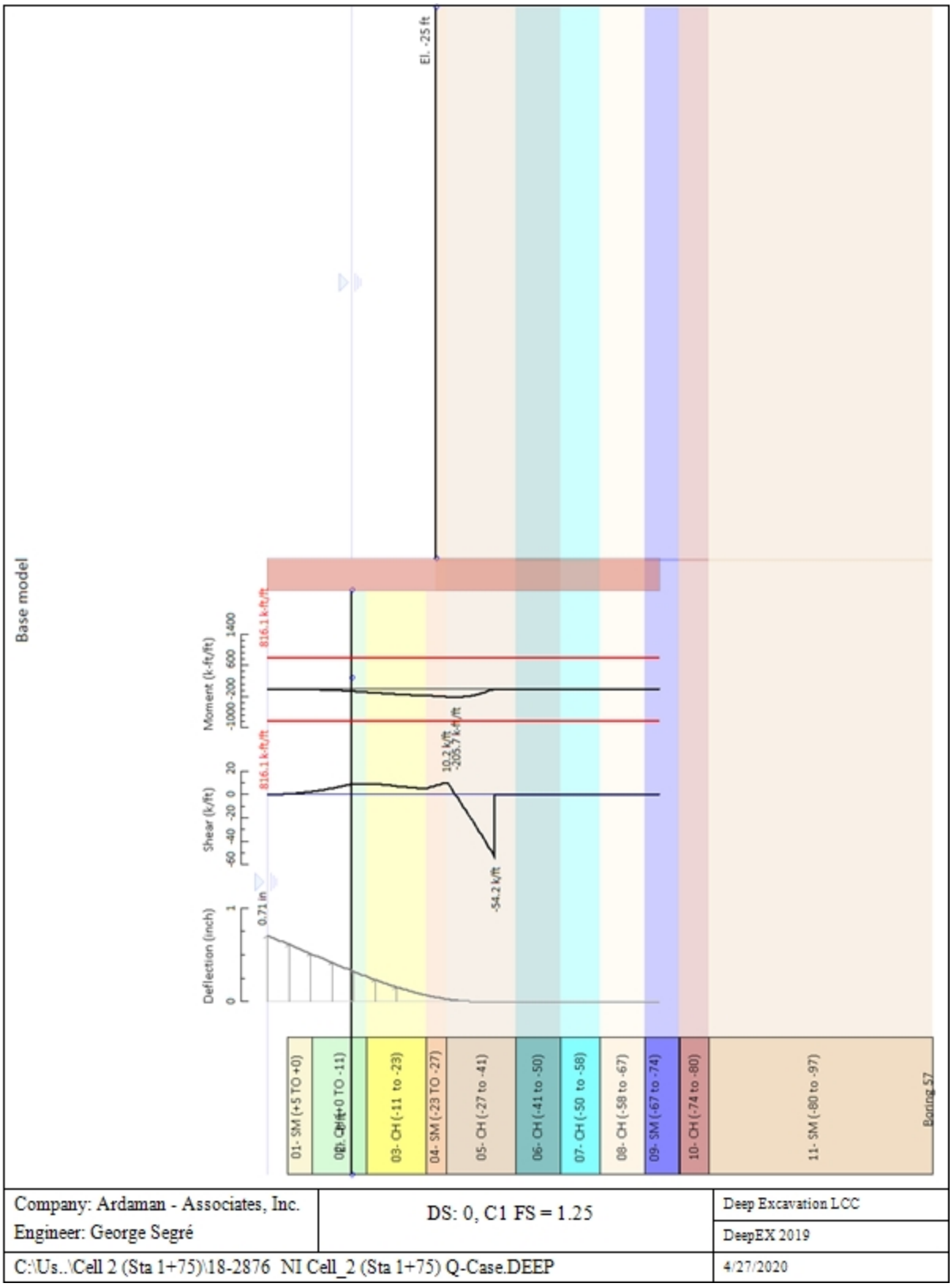
## EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported

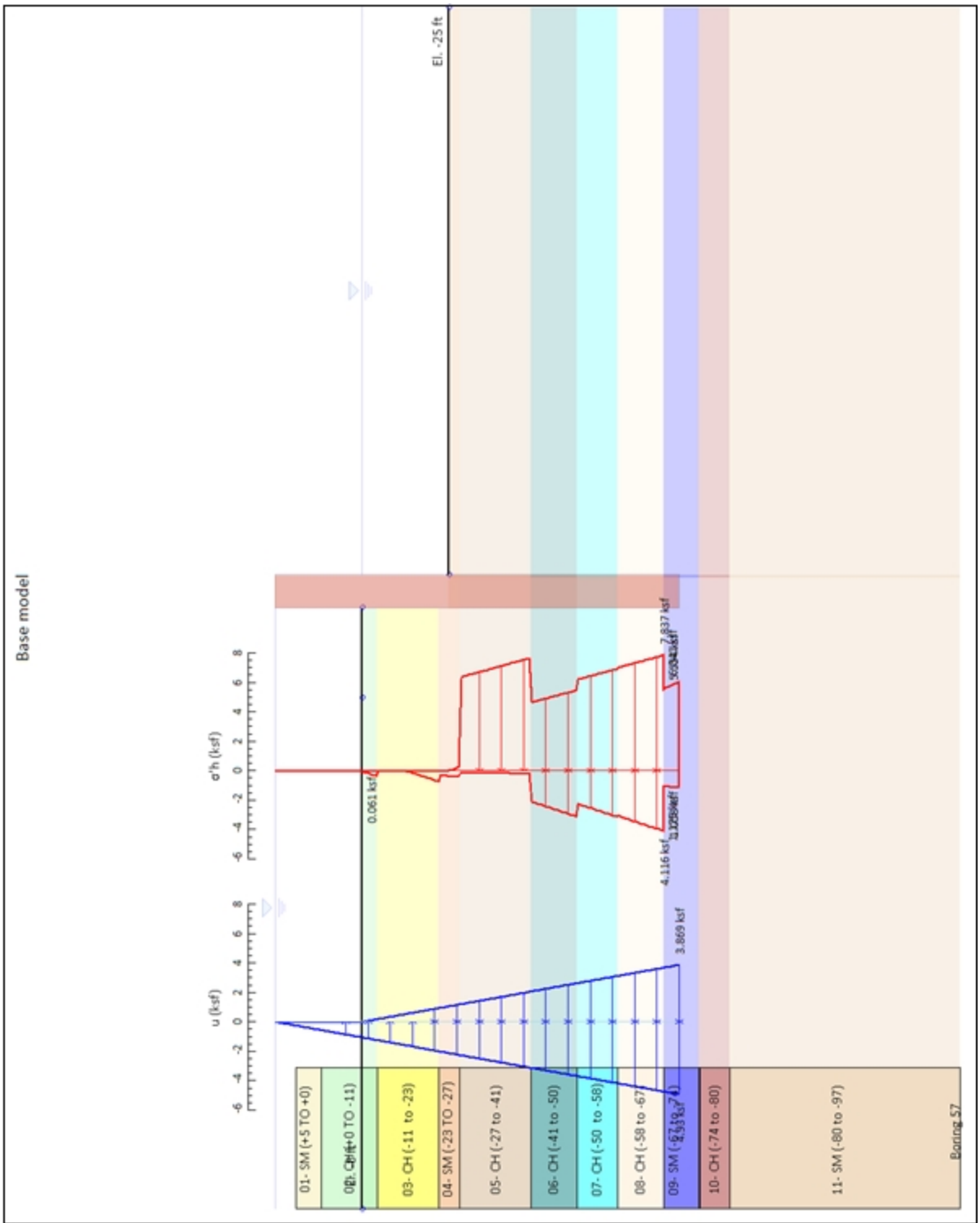



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |

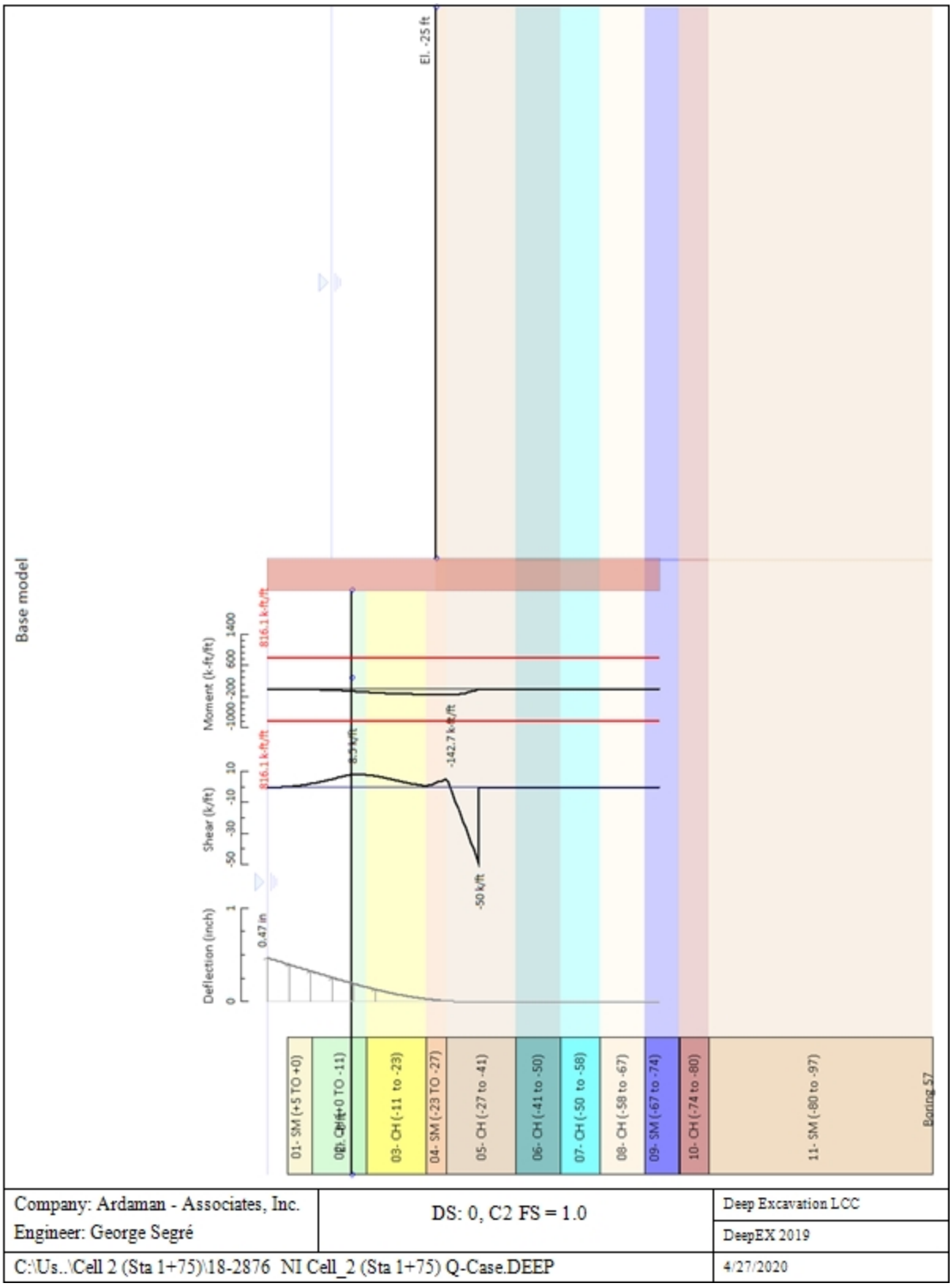

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
0.061 ksf
9.796 ksf
4.116 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020

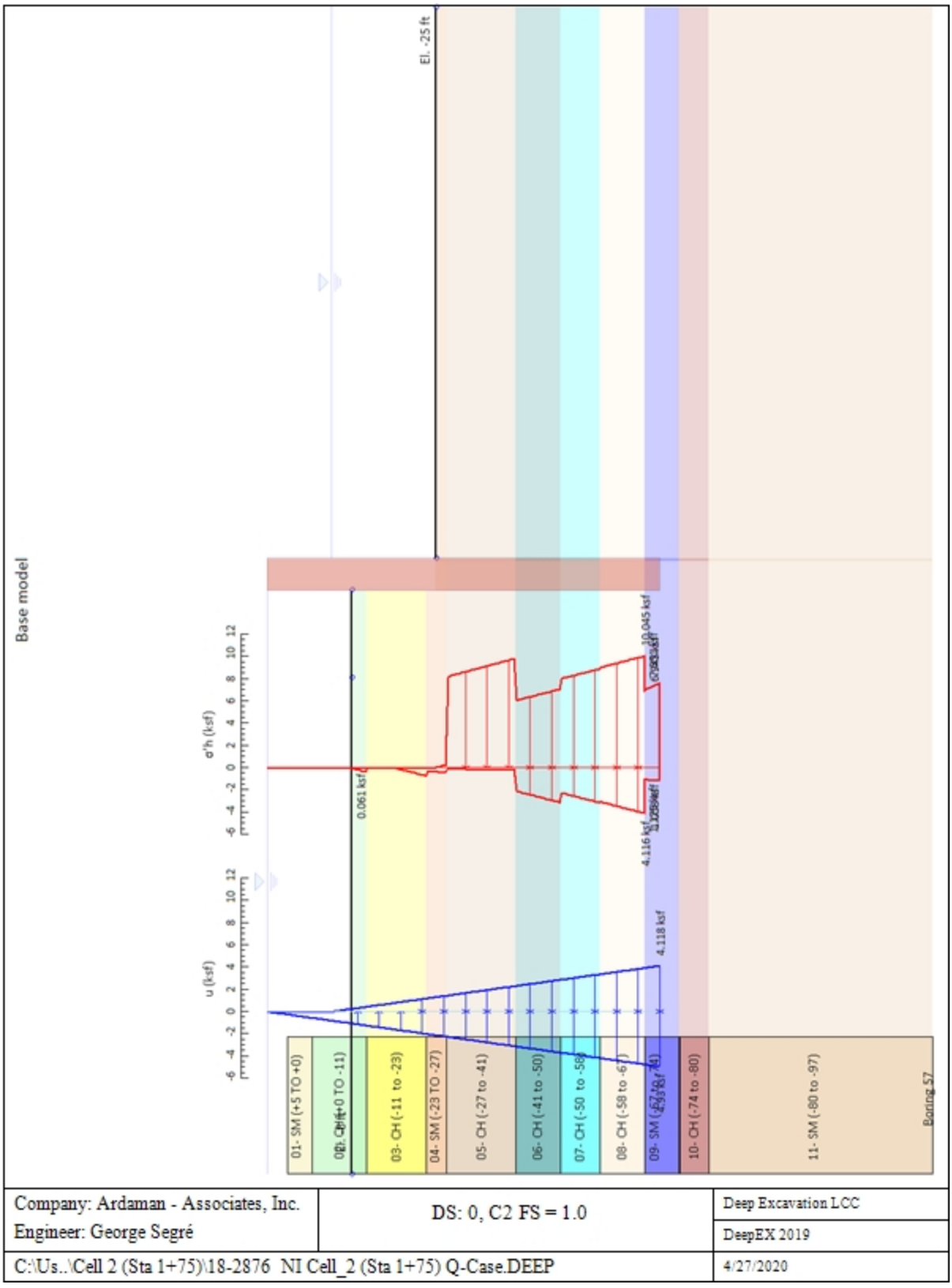



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |

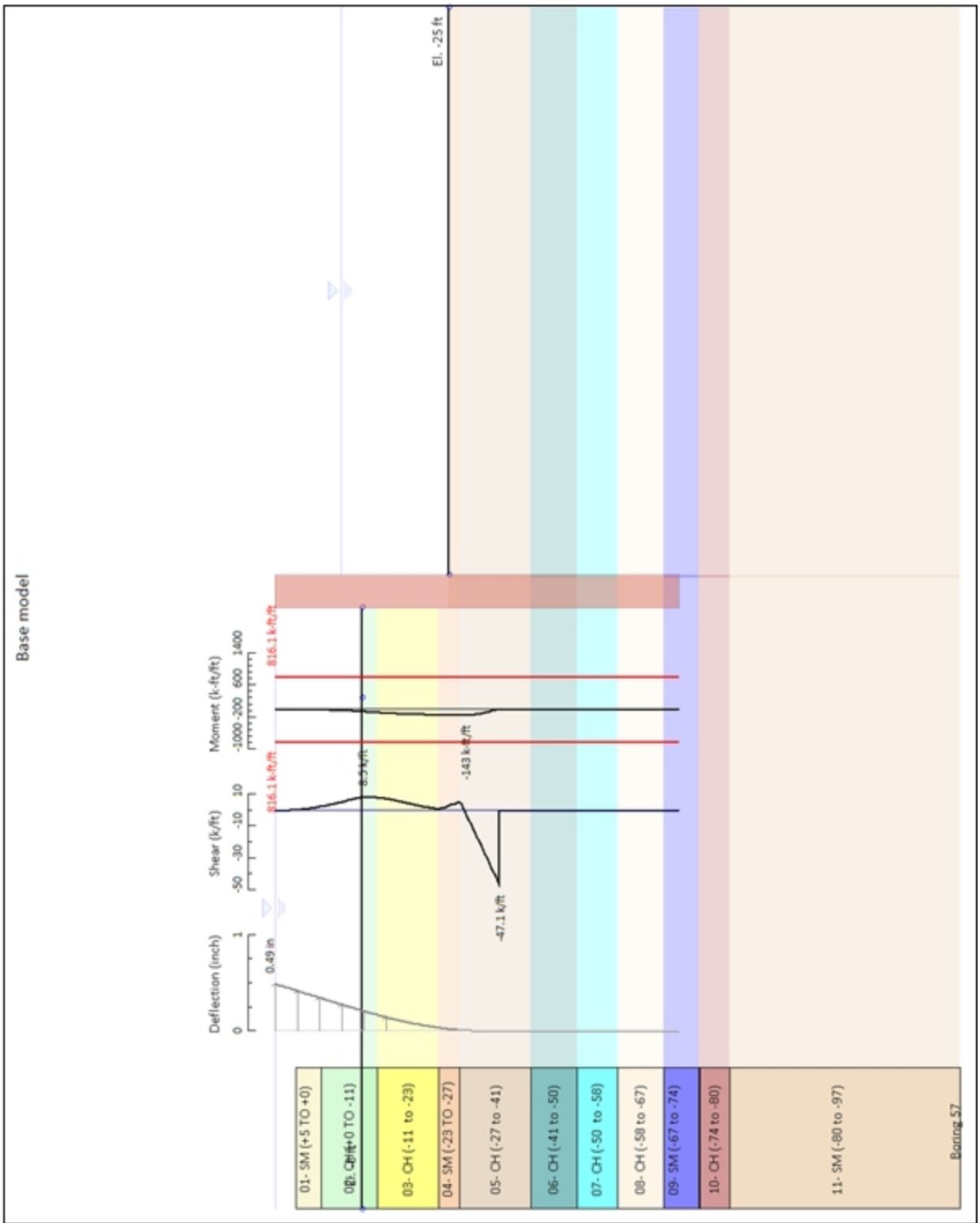



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |

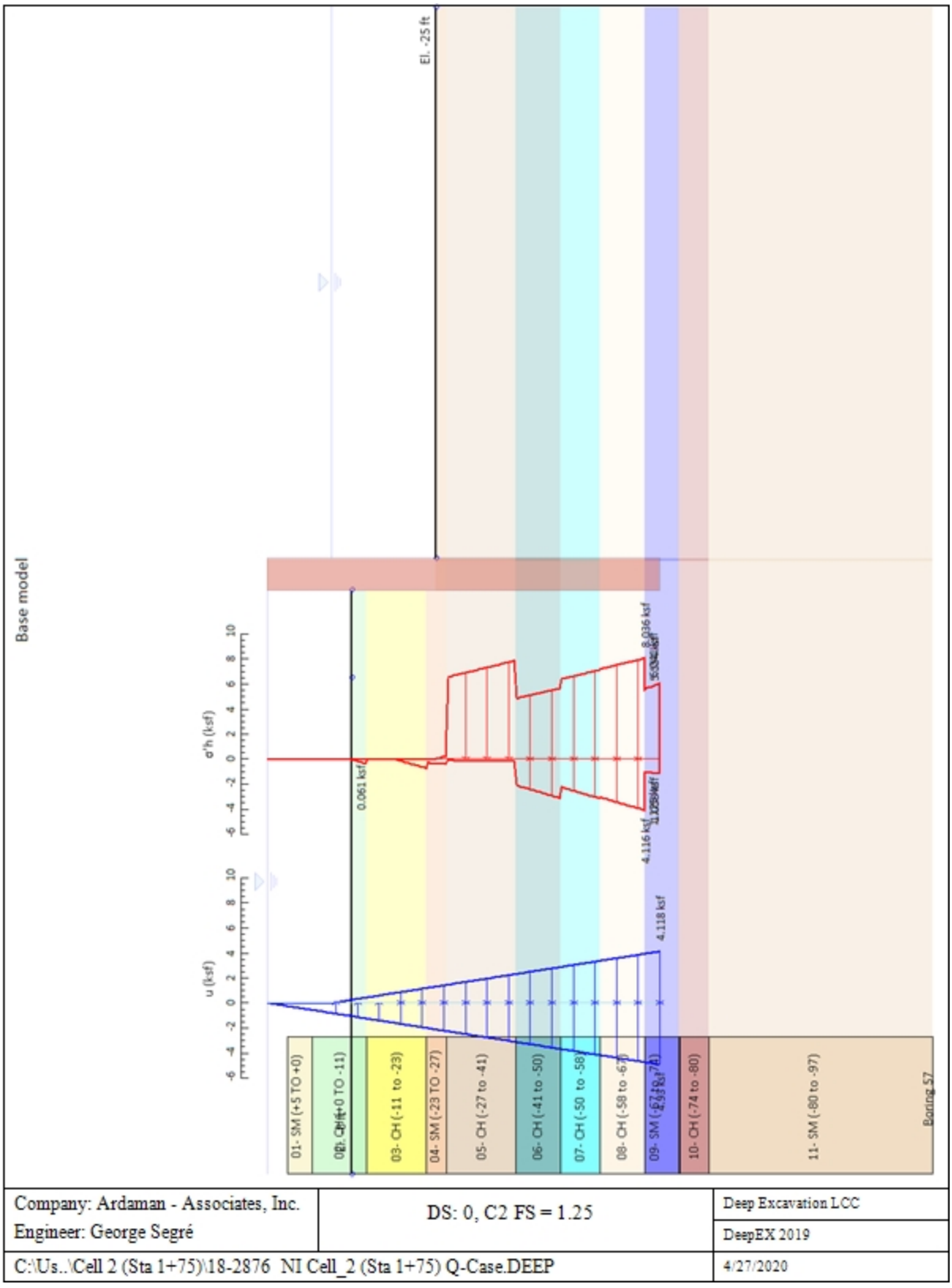

Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-142.7 k-ft/ft
Shear (k/ft)
-50 -30 -10 10
8.3 k/ft
-50 k/ft
Deflection (inch)
0 1
0.47 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020



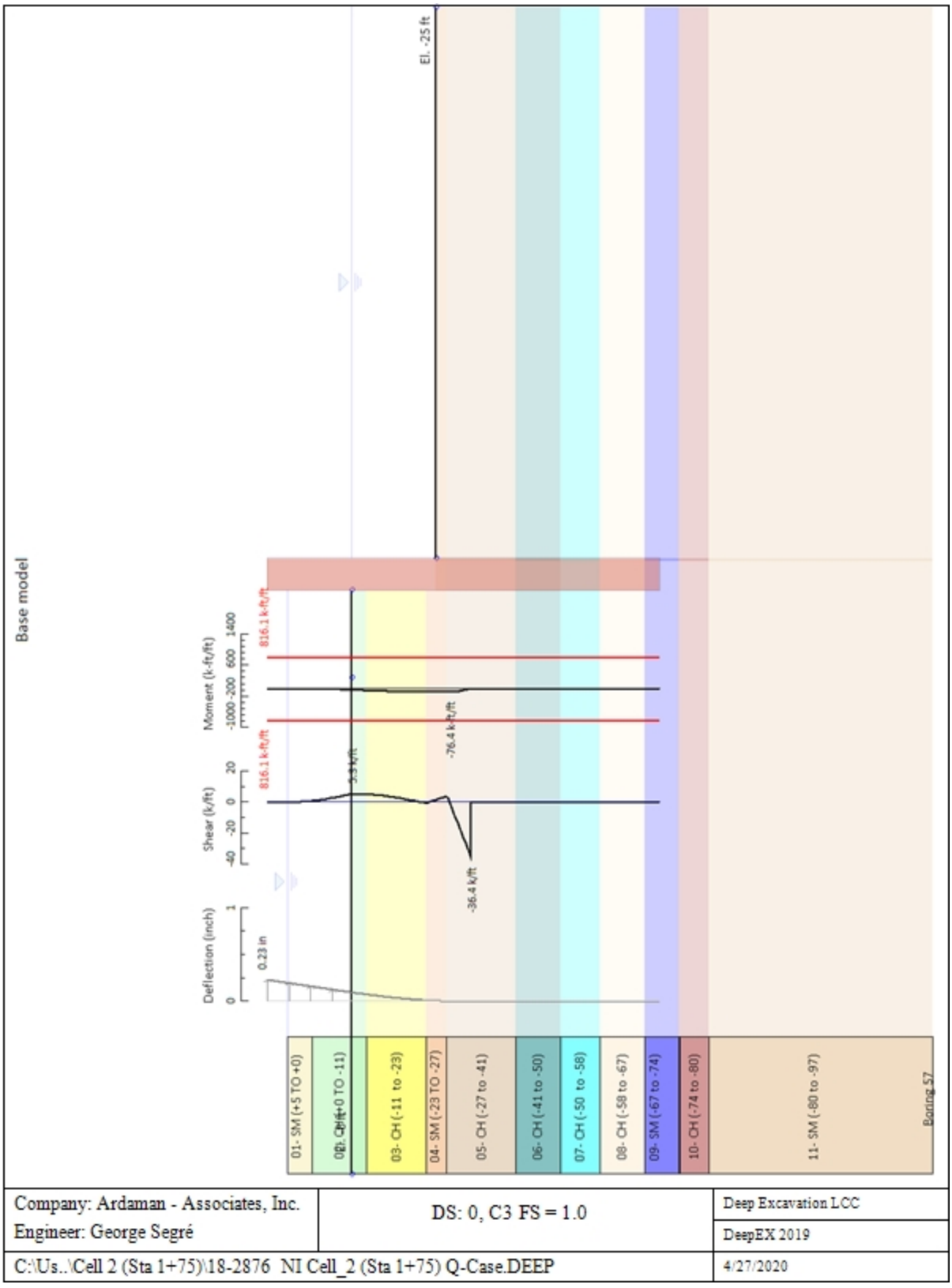

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |



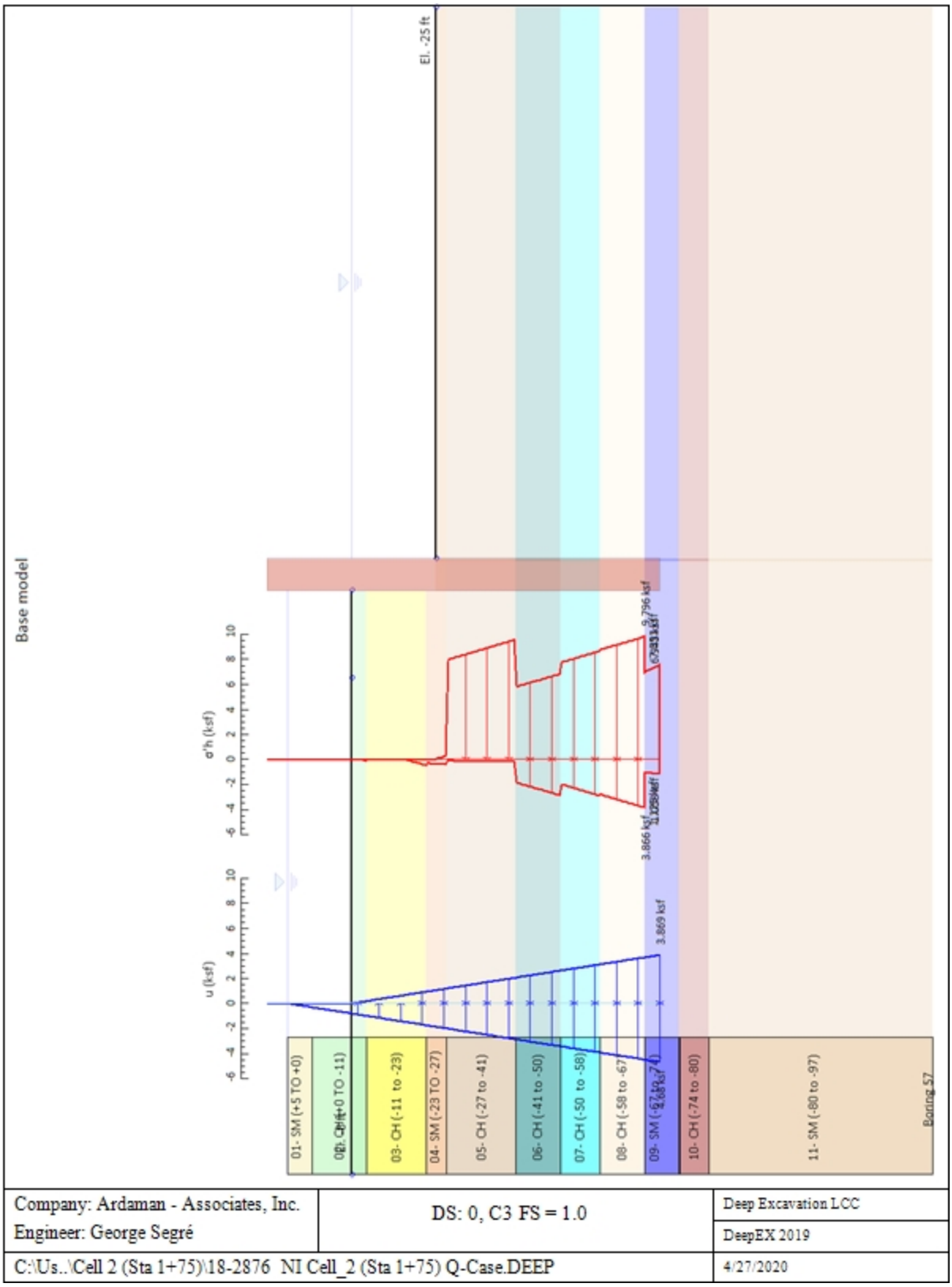

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |

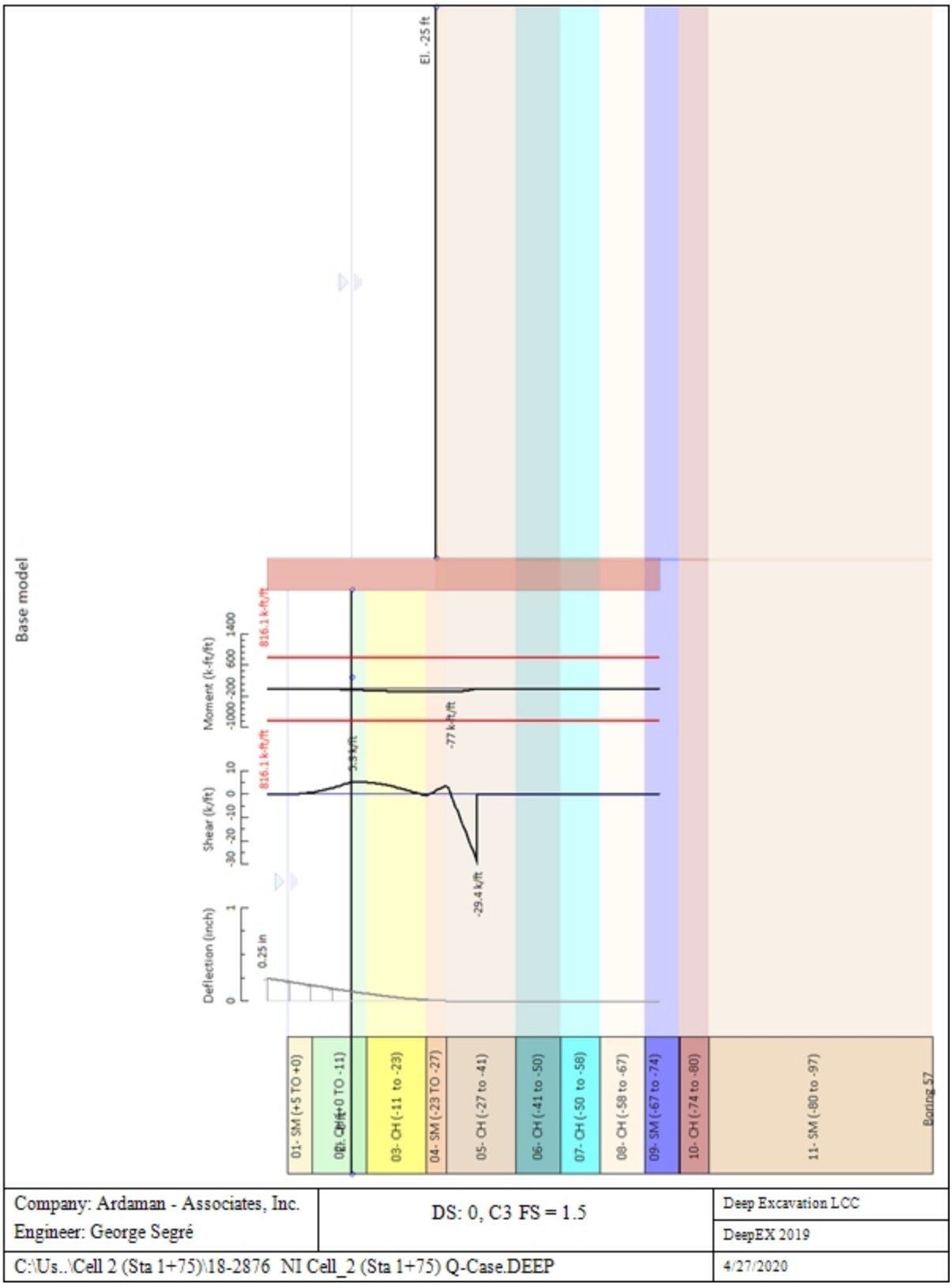


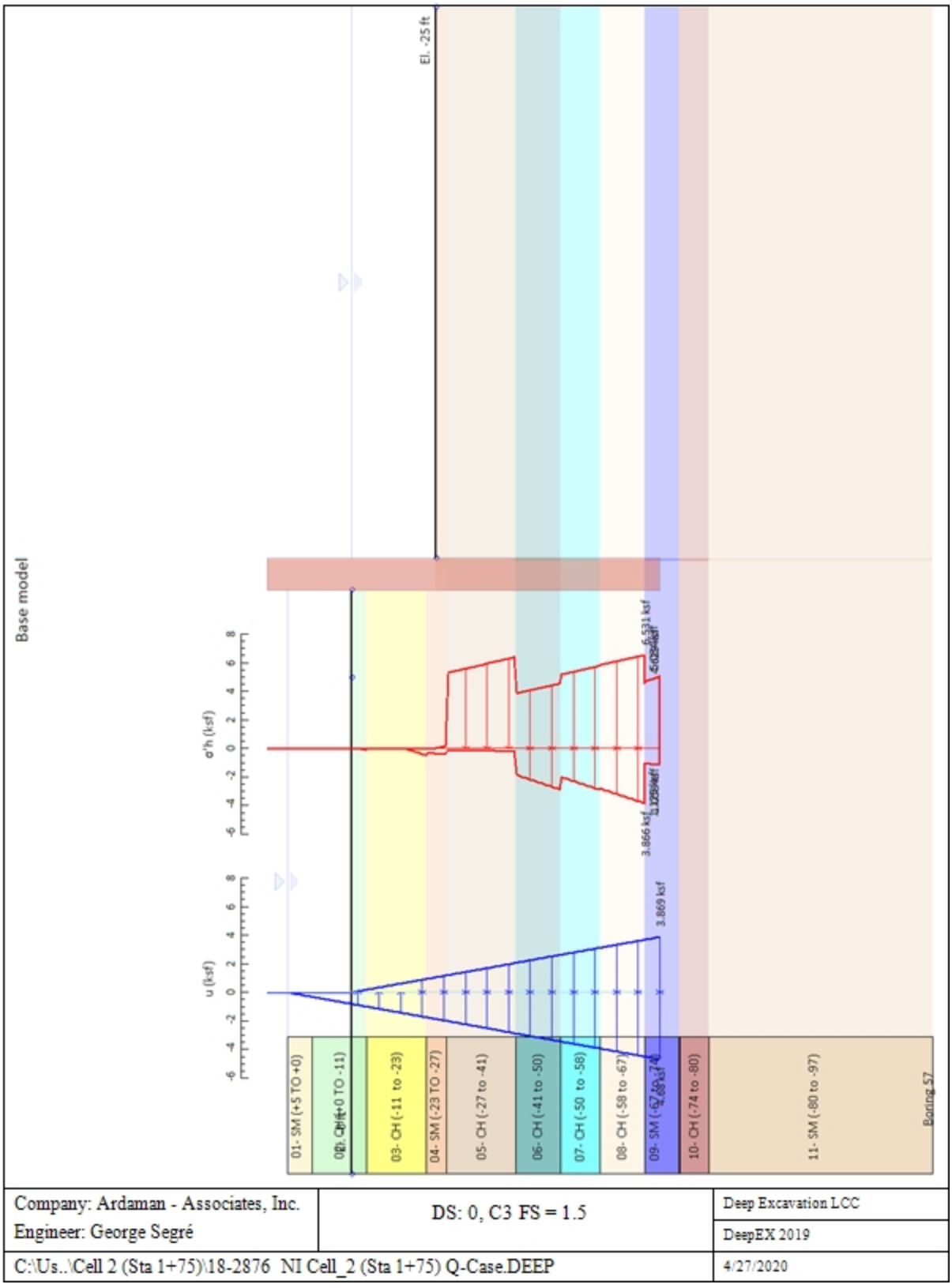

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |

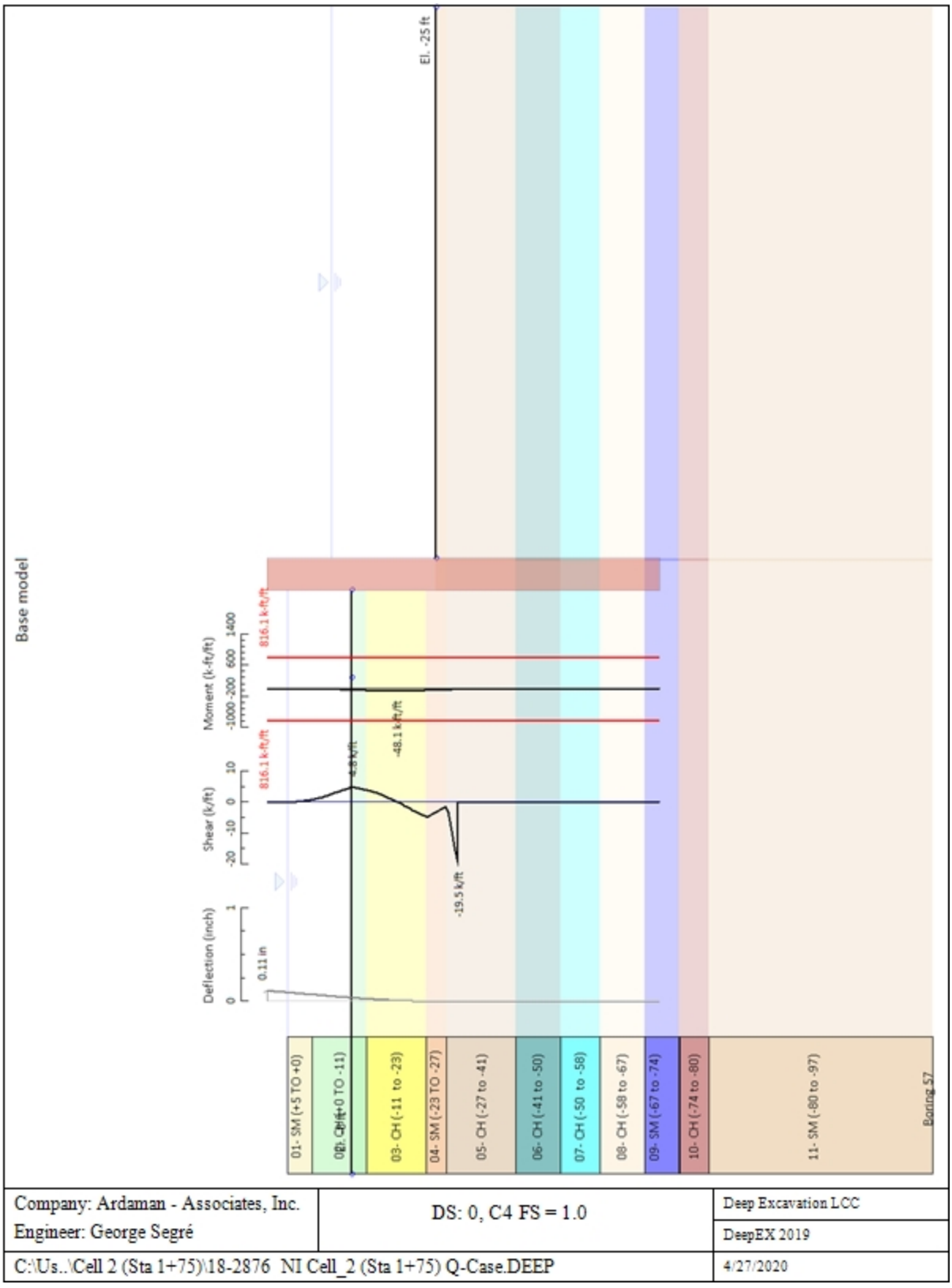



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |

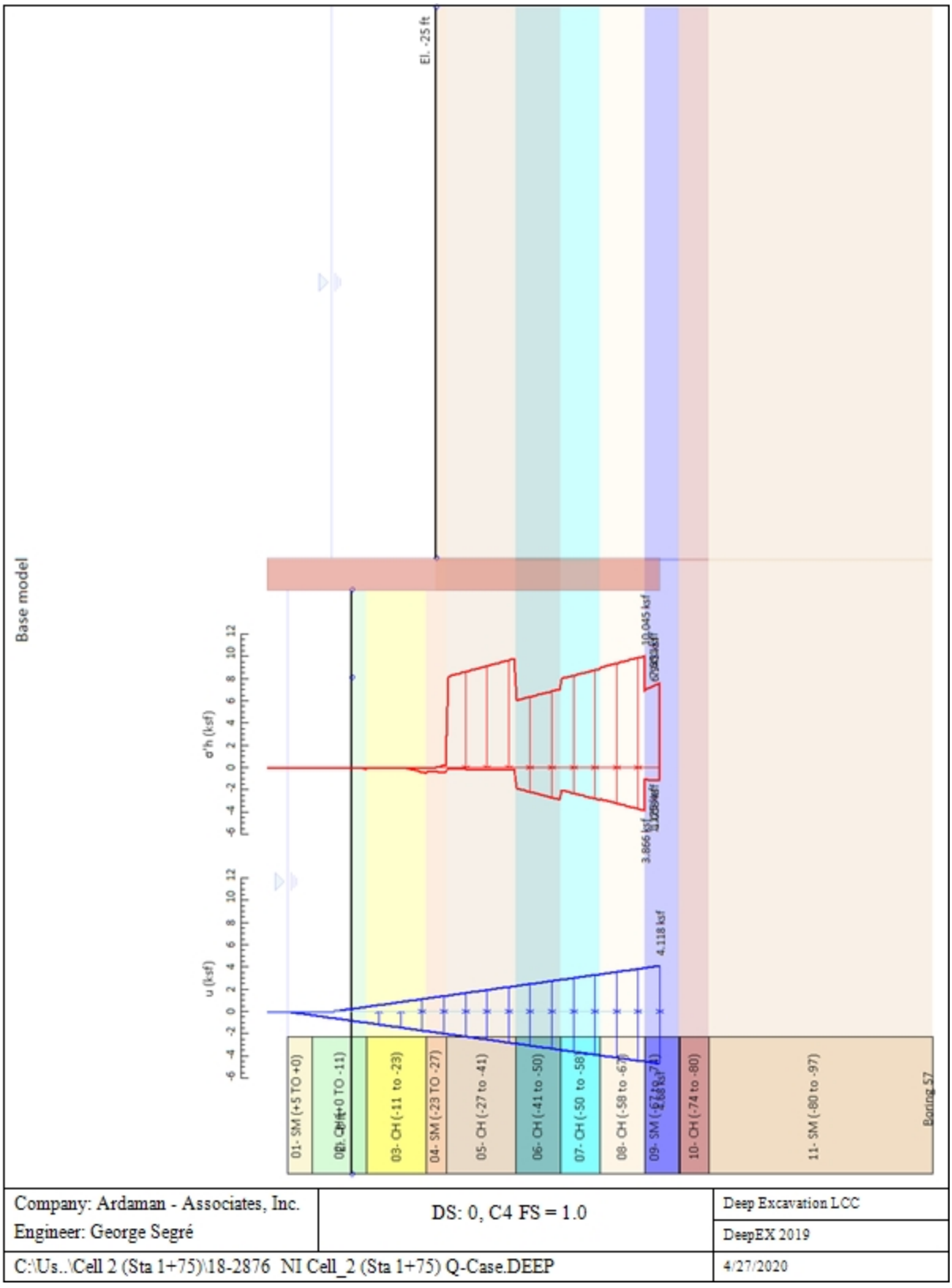

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10
9.796 ksf
3.866 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020


Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-77 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
3.3 k/ft
-29.4 k/ft
Deflection (inch)
0 1
0.25 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020

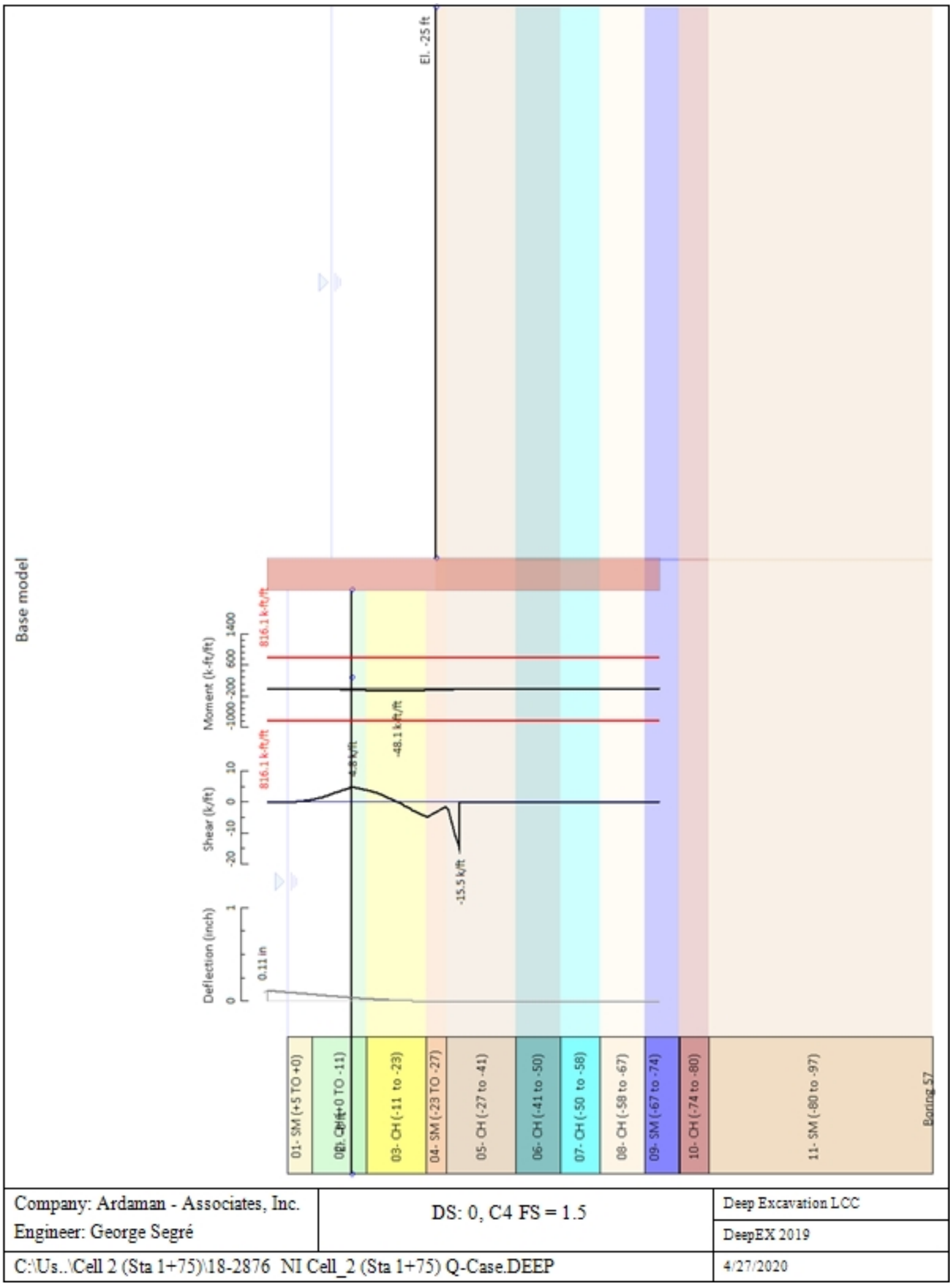

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
6.531 ksf
3.866 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020



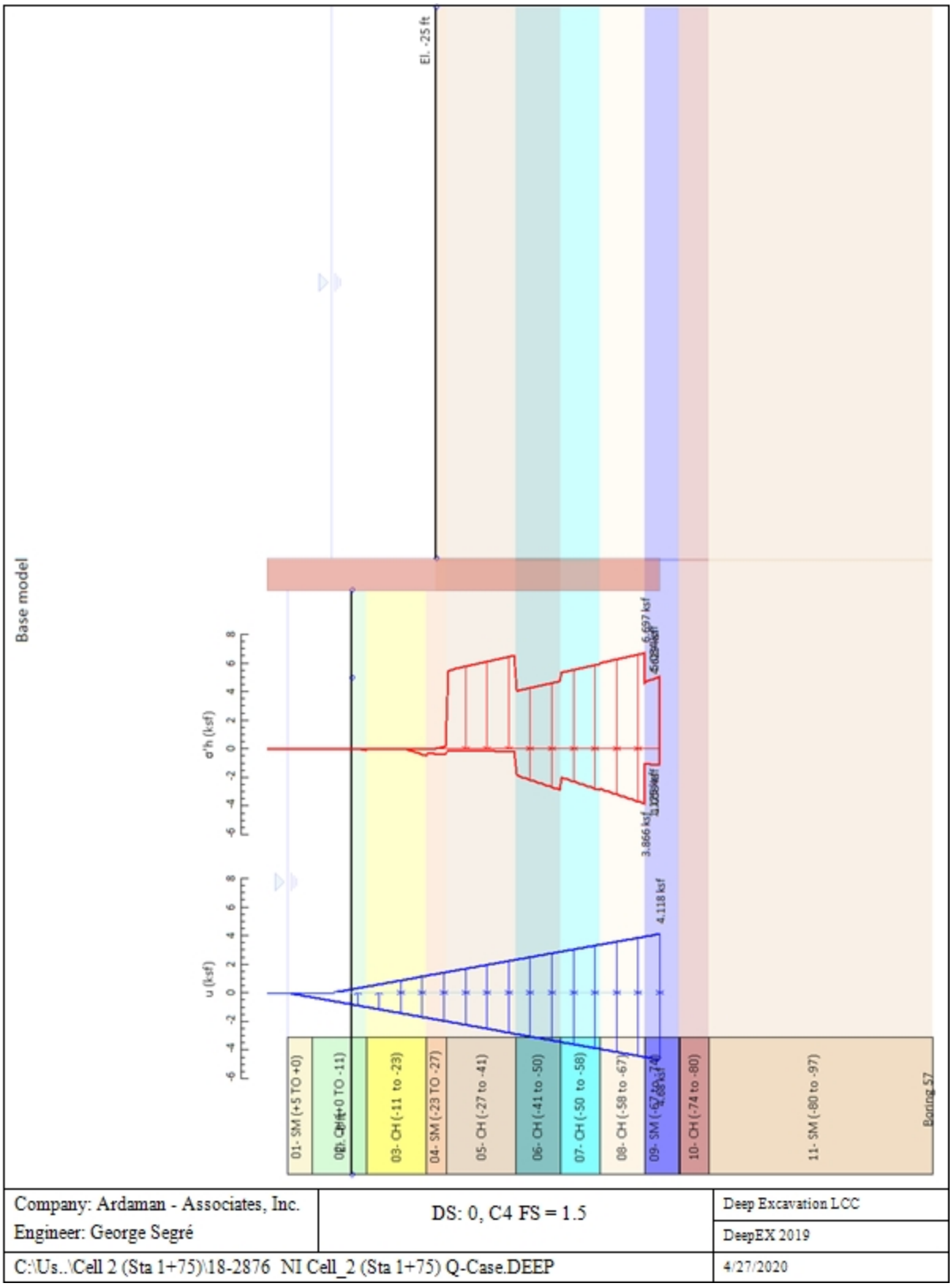

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -25 ft
σ'h (ksf)
u (ksf)
6.697 ksf
3.866 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:57:12 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 150 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | - | - | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | - | - | 0.609 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

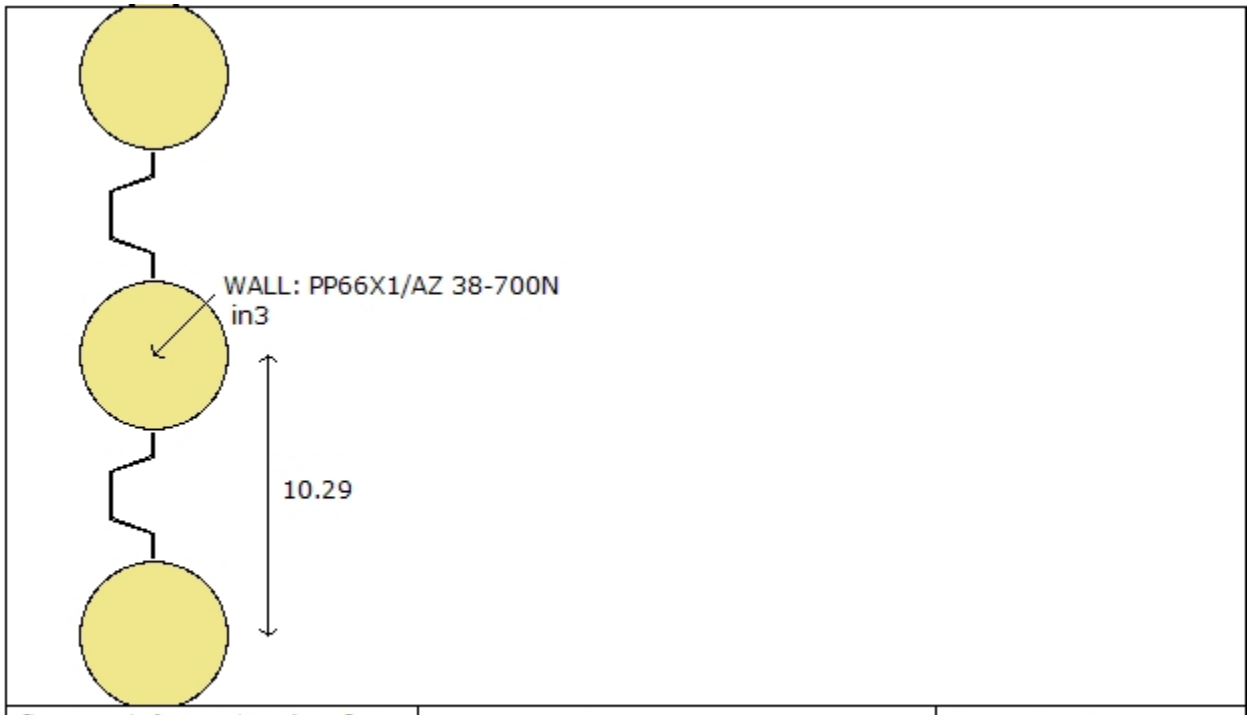
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 0.61 |
| -11 | 03- CH (-11 to | 1 | 0.61 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 0.61 |
| -41 | 06- CH (-41 to | 1 | 0.61 |
| -50 | 07- CH (-50 to | 1 | 0.61 |
| -58 | 08- CH (-58 to | 1 | 0.56 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 0.56 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -110 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.265 | 1.265 | 1.726 |
| Stage 1 | Simple span | N/A | 1.6 | 1.116 | 1.116 | 1.5 |
| Stage 2 | Simple span | N/A | 1.6 | 1.329 | 1.329 | 1.774 |
| Stage 3 | Simple span | N/A | 1.6 | 1.18 | 1.18 | 1.548 |
| Stage 4 | Simple span | N/A | 1.6 | 1.376 | 1.376 | 1.824 |
| Stage 5 | Simple span | N/A | 1.6 | 1.106 | 1.106 | 1.426 |
| Stage 6 | Simple span | N/A | 1.6 | 1.445 | 1.445 | 1.874 |
| Stage 7 | Simple span | N/A | 1.6 | 1.175 | 1.175 | 1.477 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

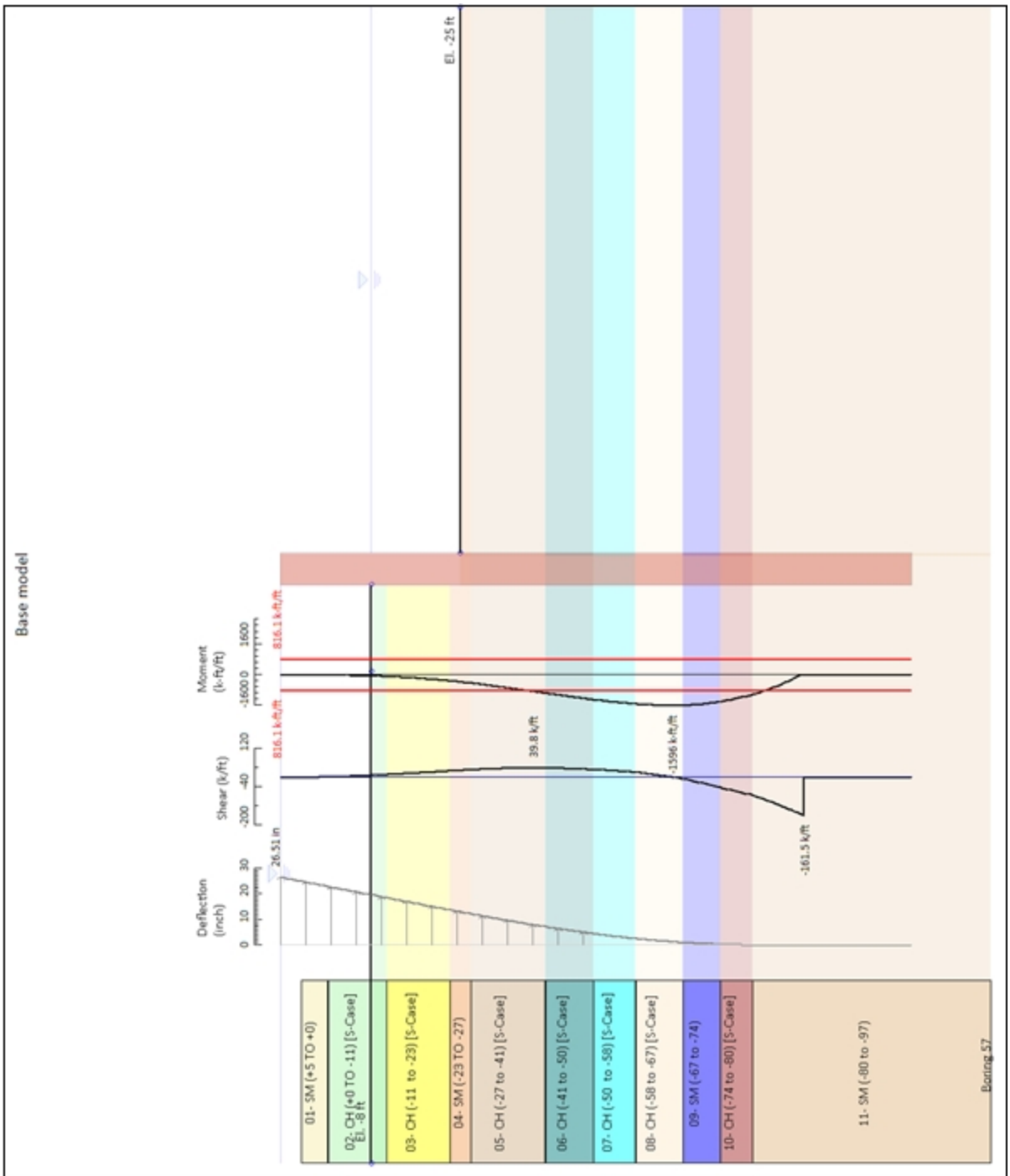
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

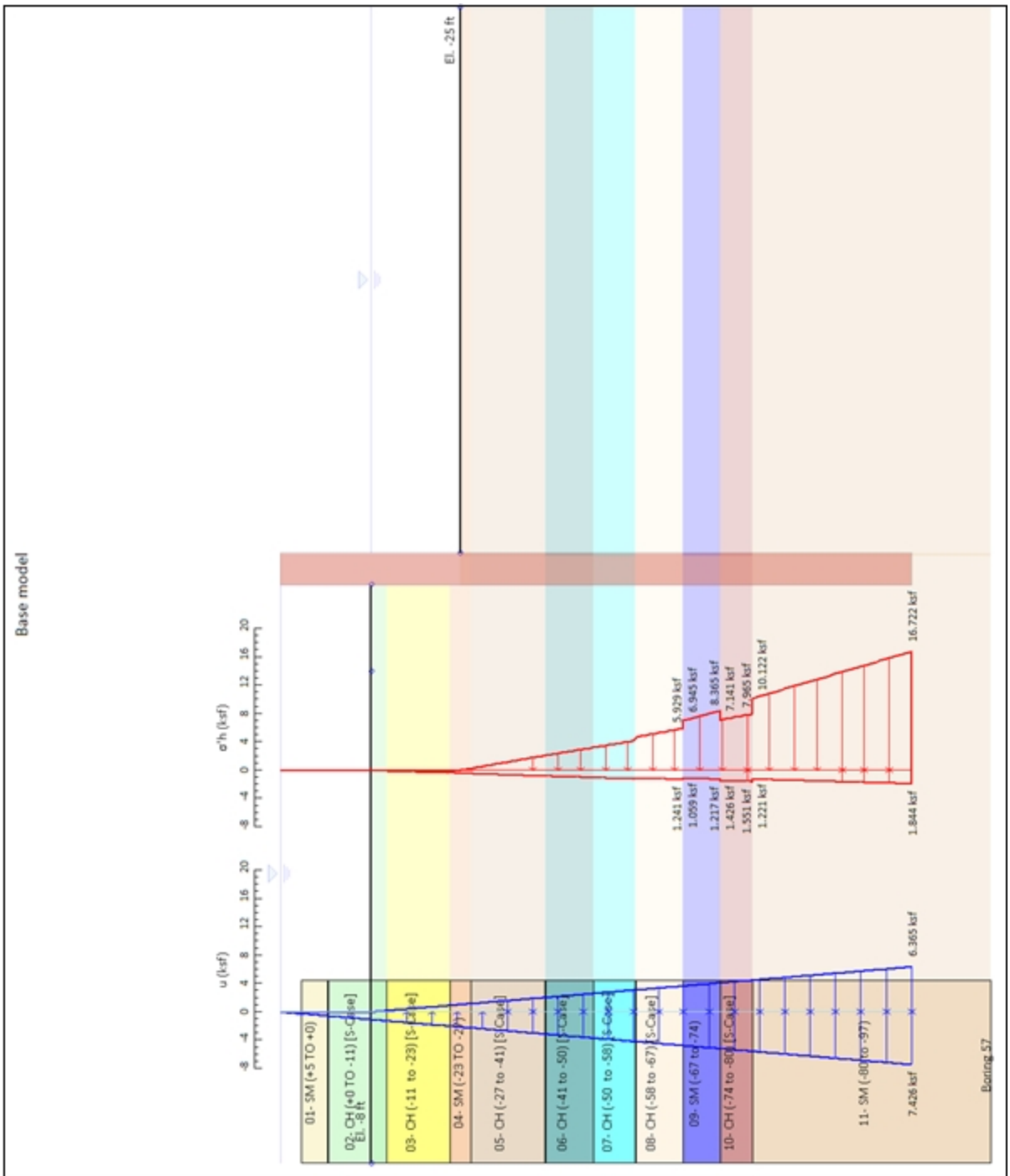
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

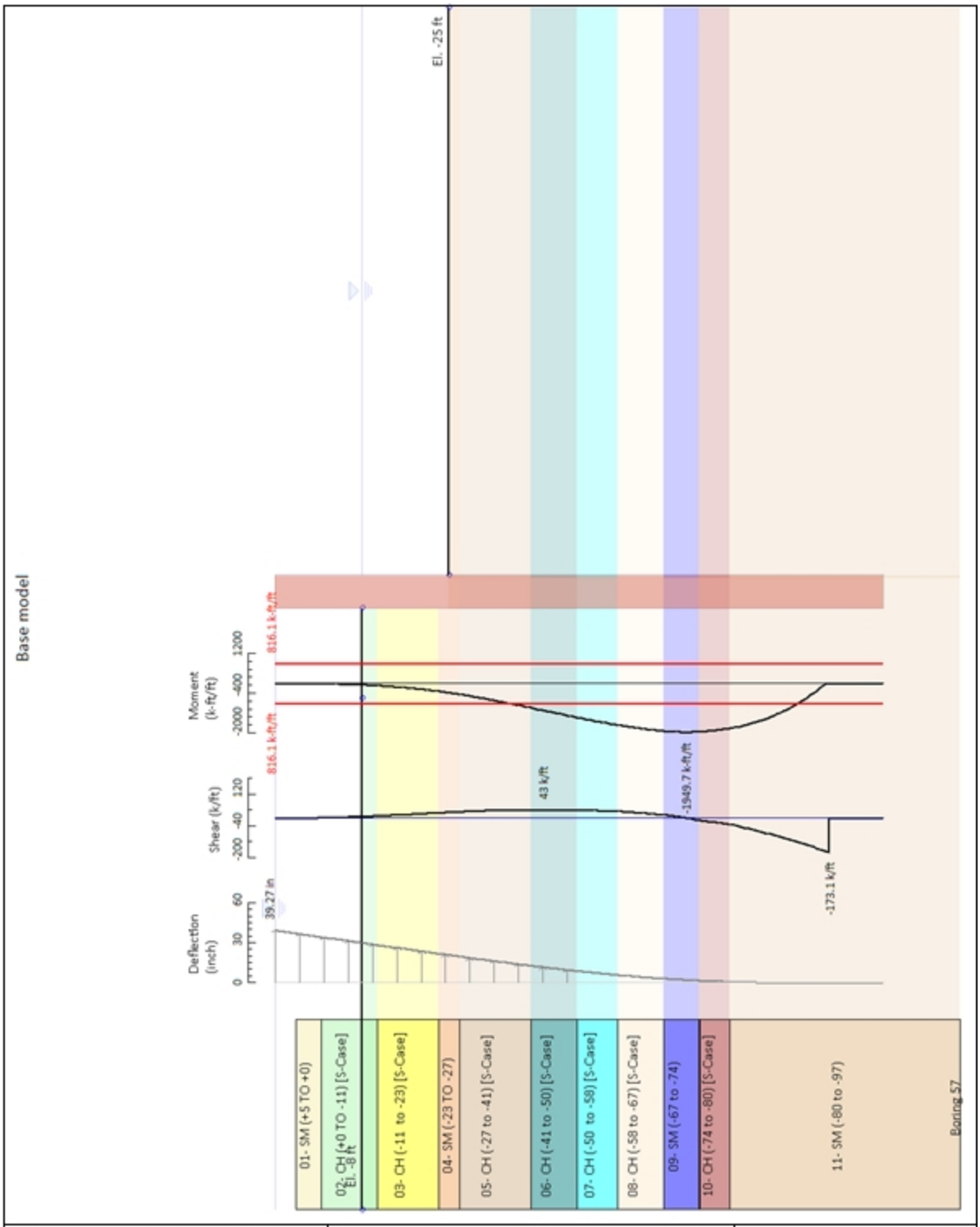
A sequence of figures for each excavation stage is reported



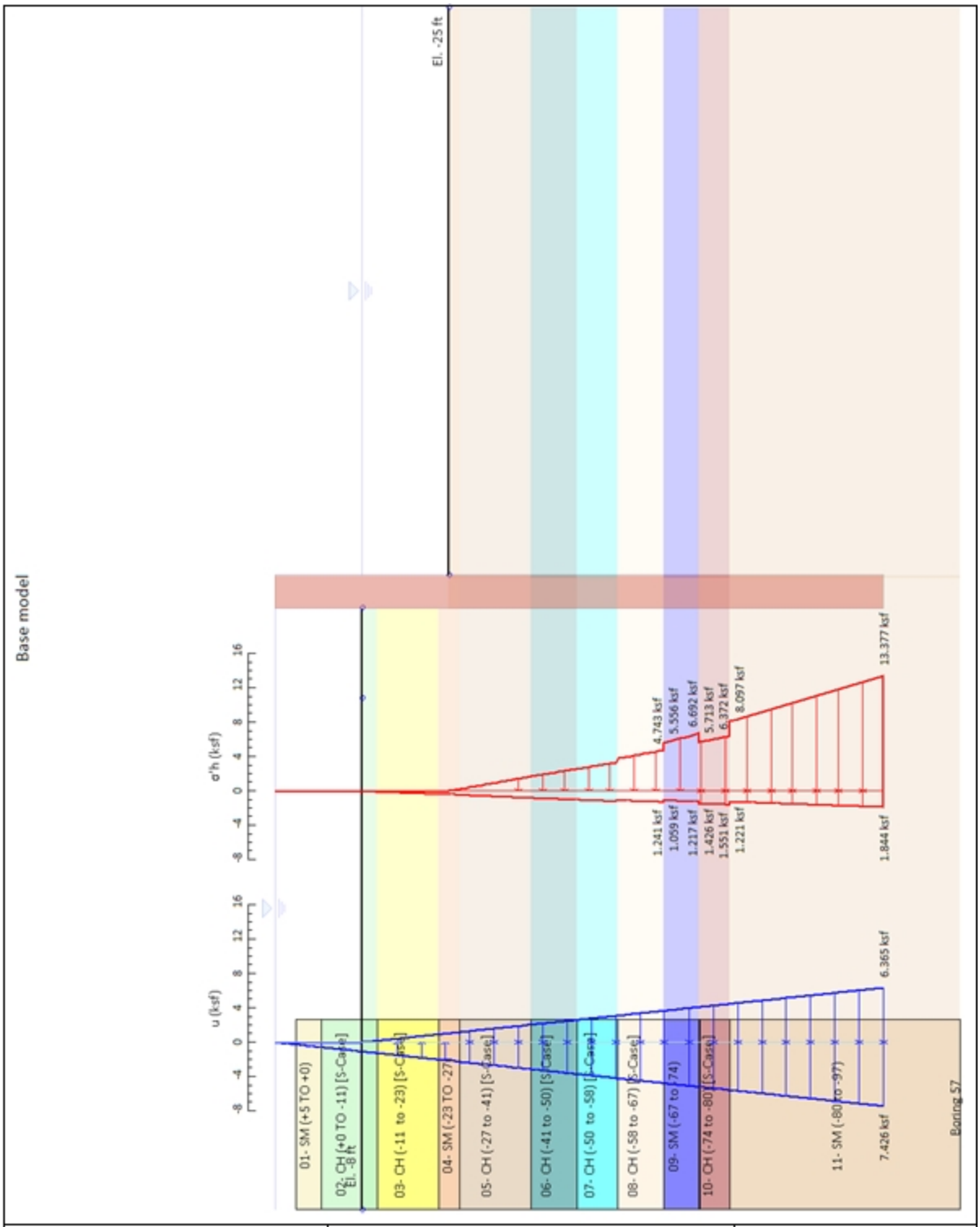

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



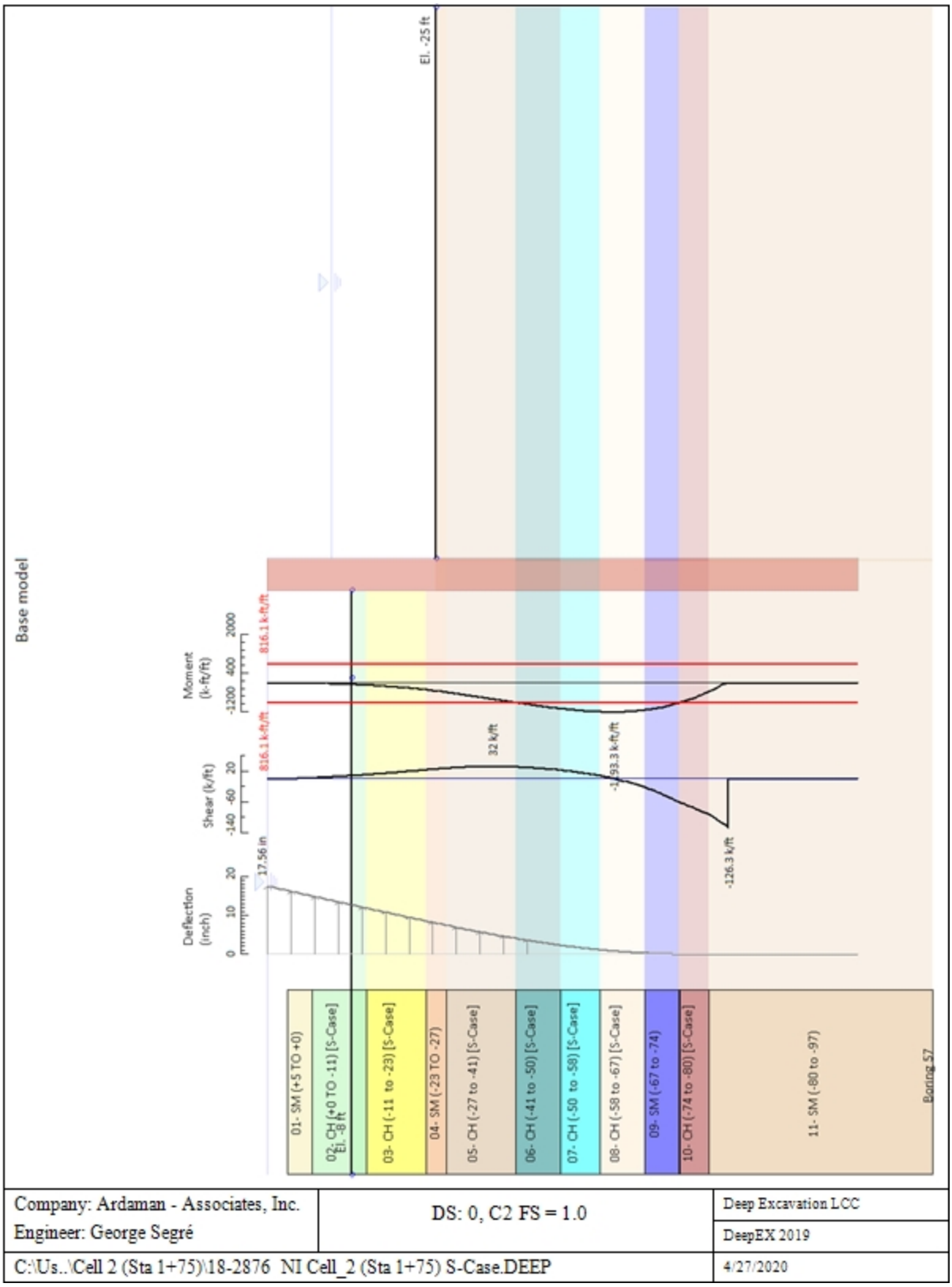

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |

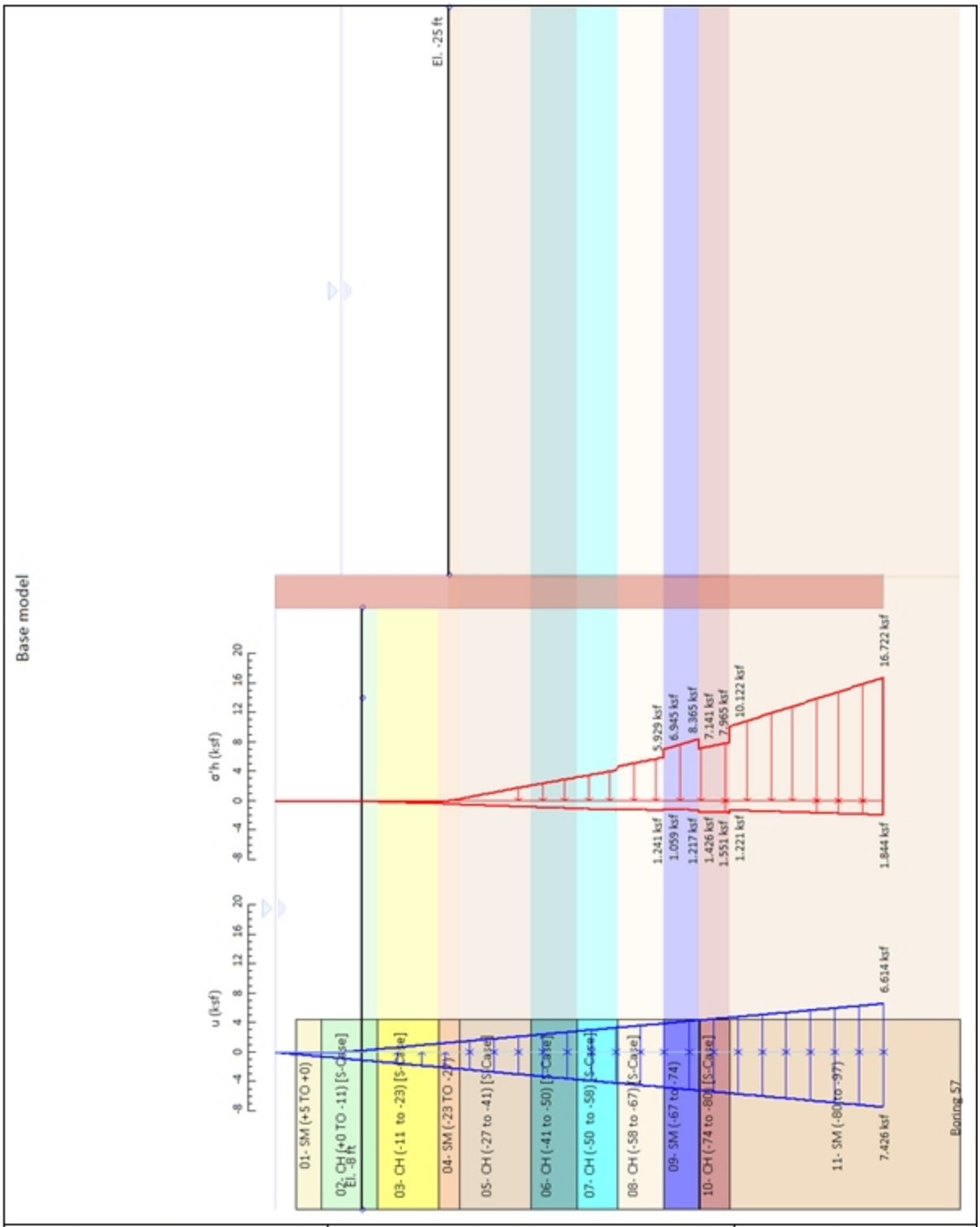



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |

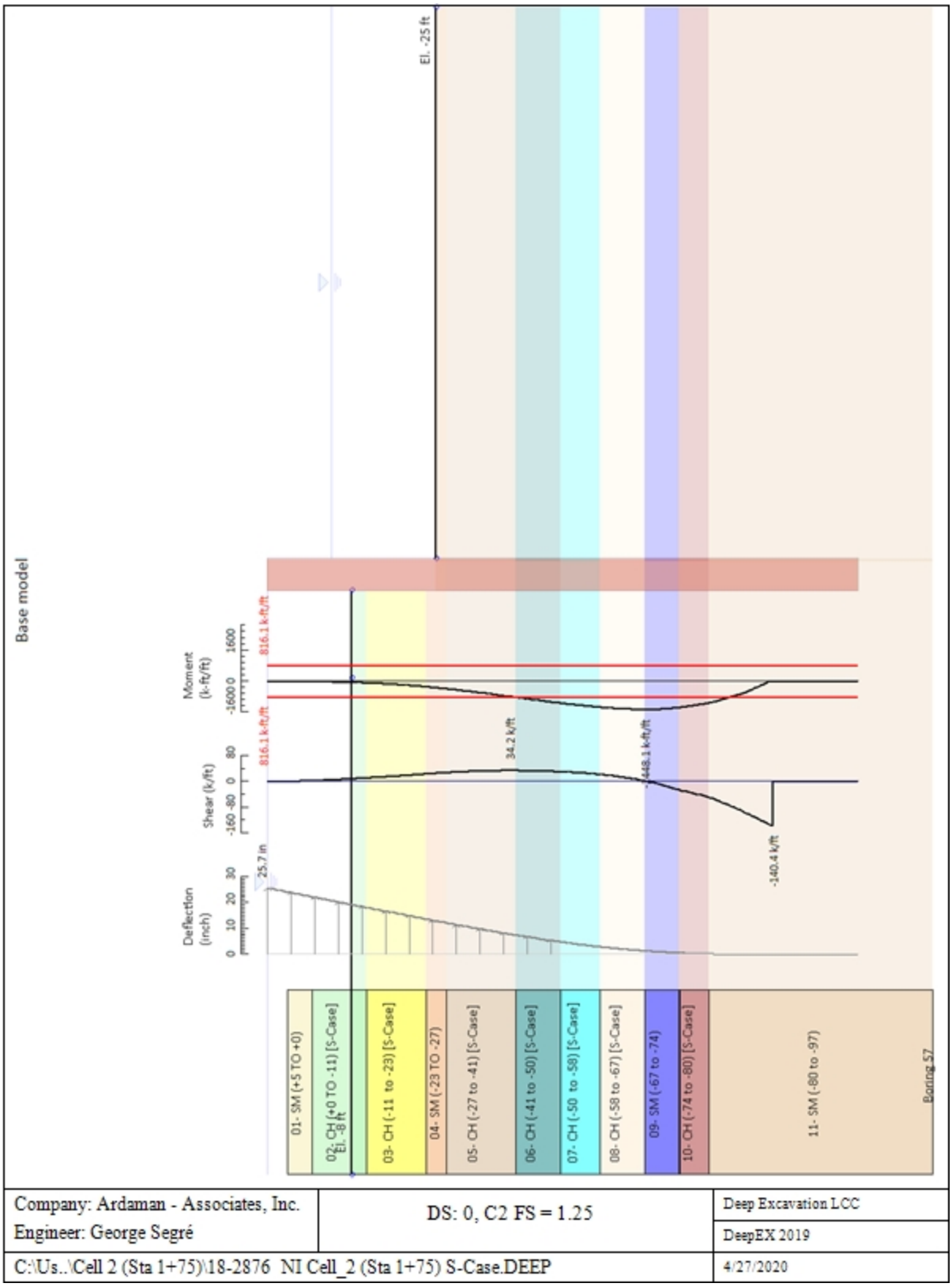



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |

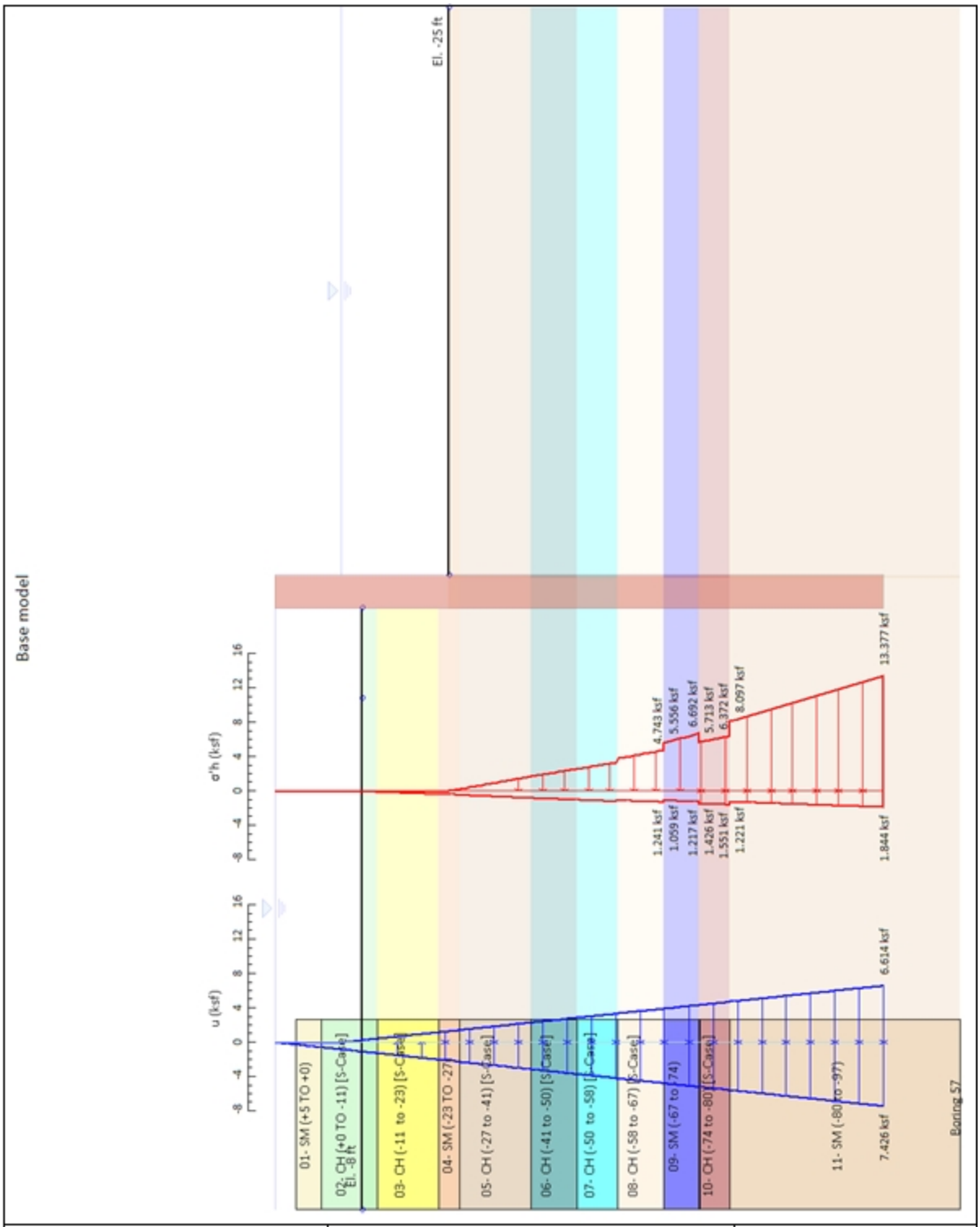

Base model
El. -25 ft
Moment (k-ft/ft)
-3200 400 2000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-140 -60 20
32 k/ft
-193.3 k-ft/ft
-126.3 k/ft
Deflection (inch)
0 10 20
17.56 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP
4/27/2020



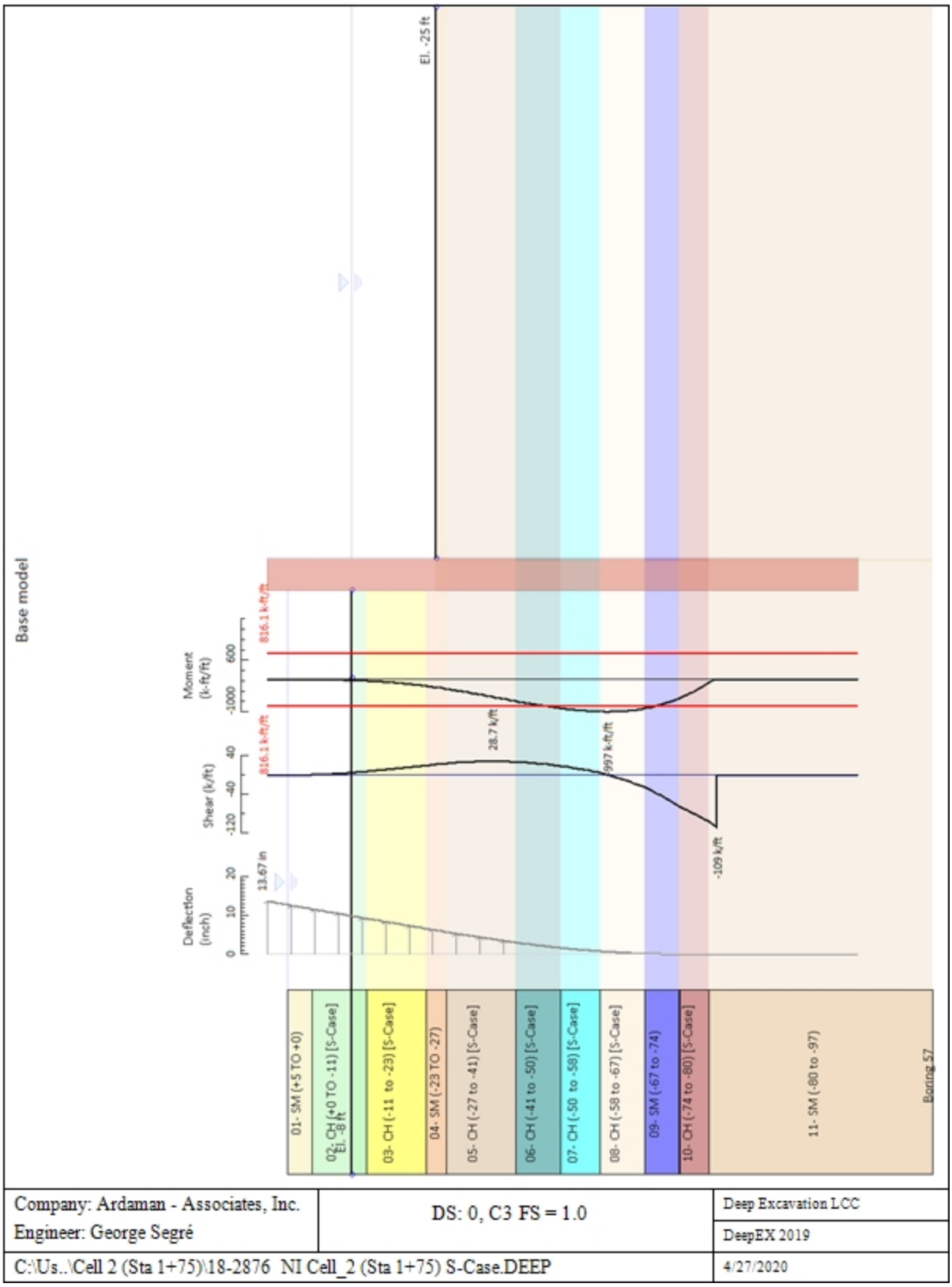

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



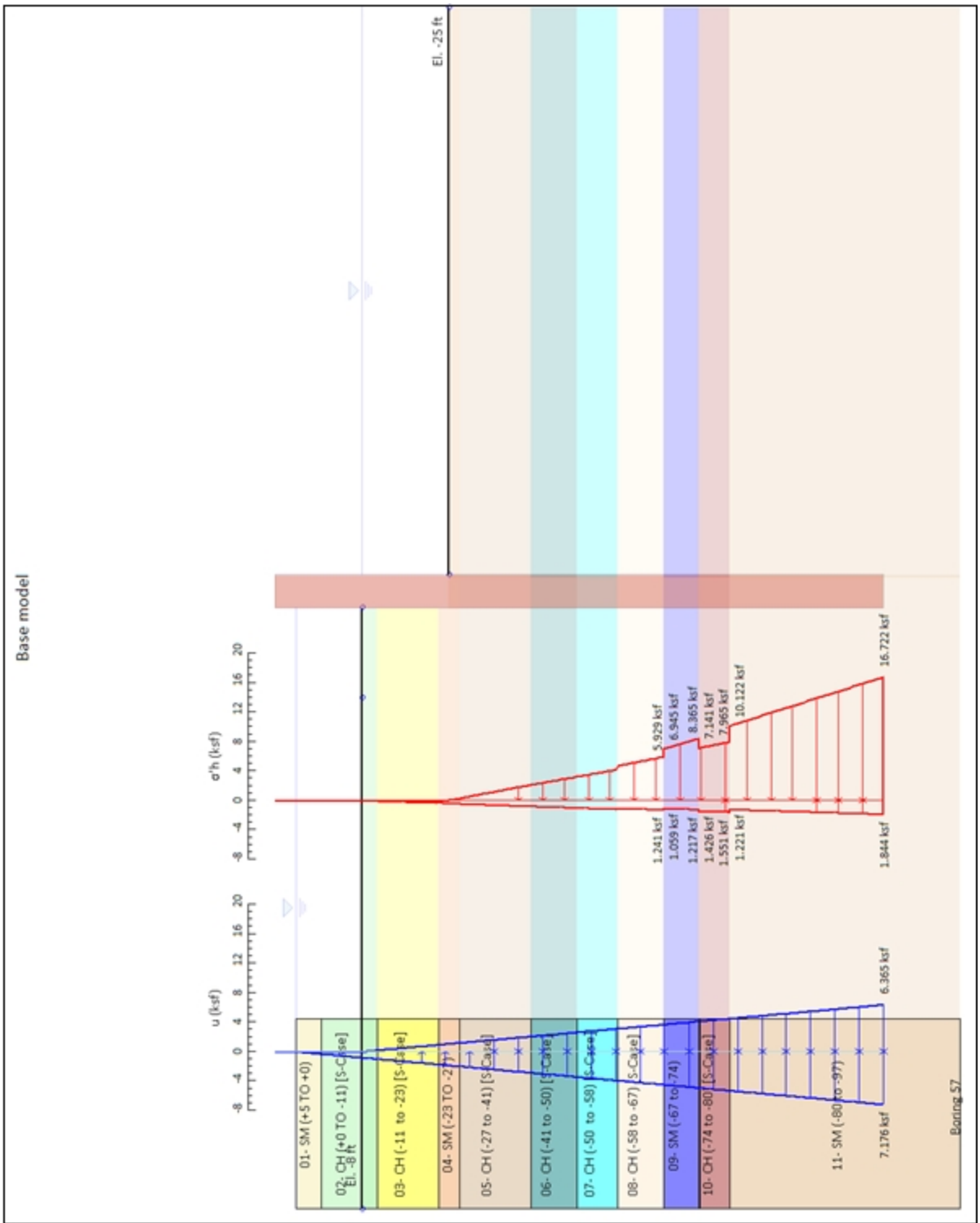

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



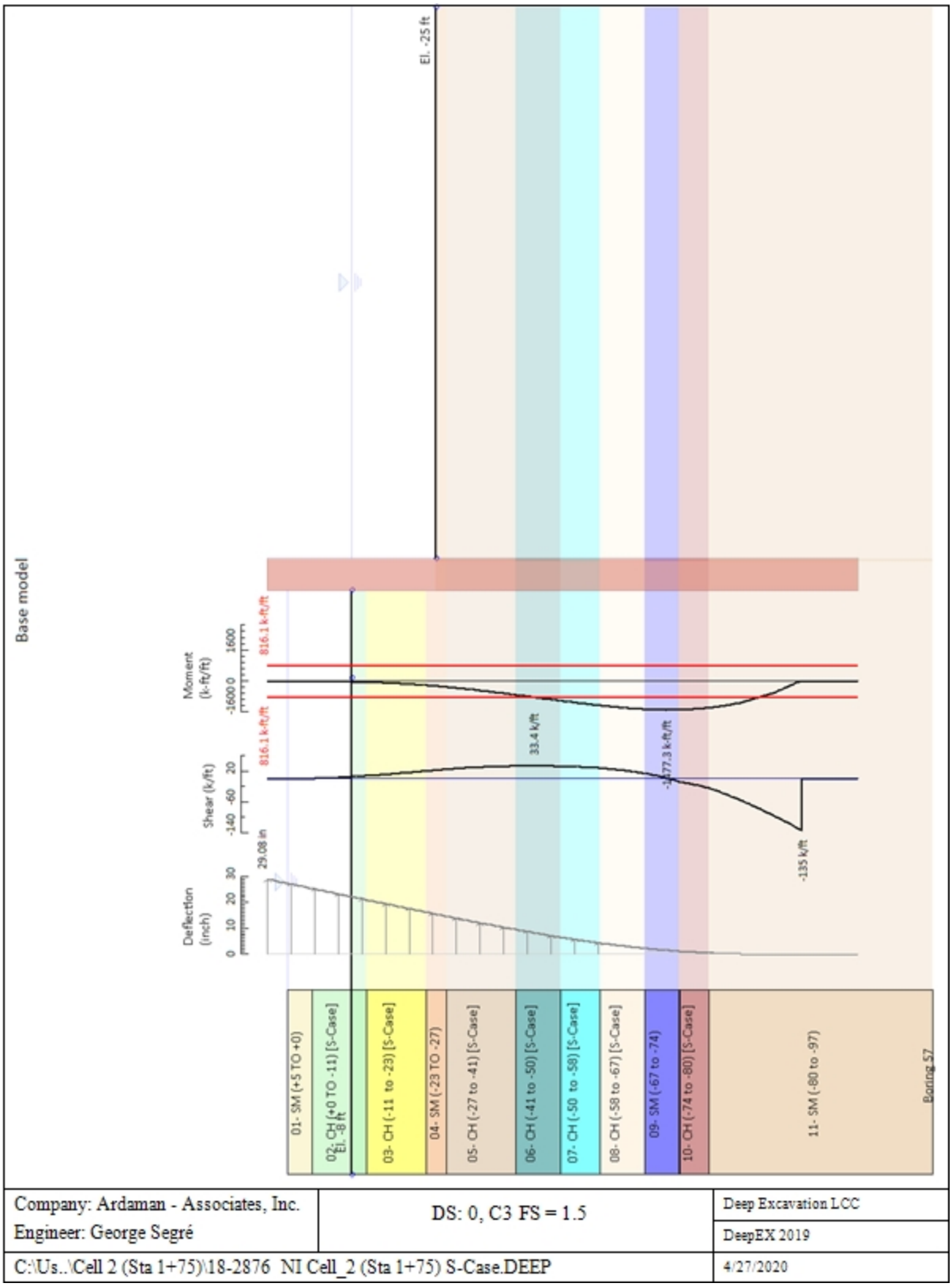

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



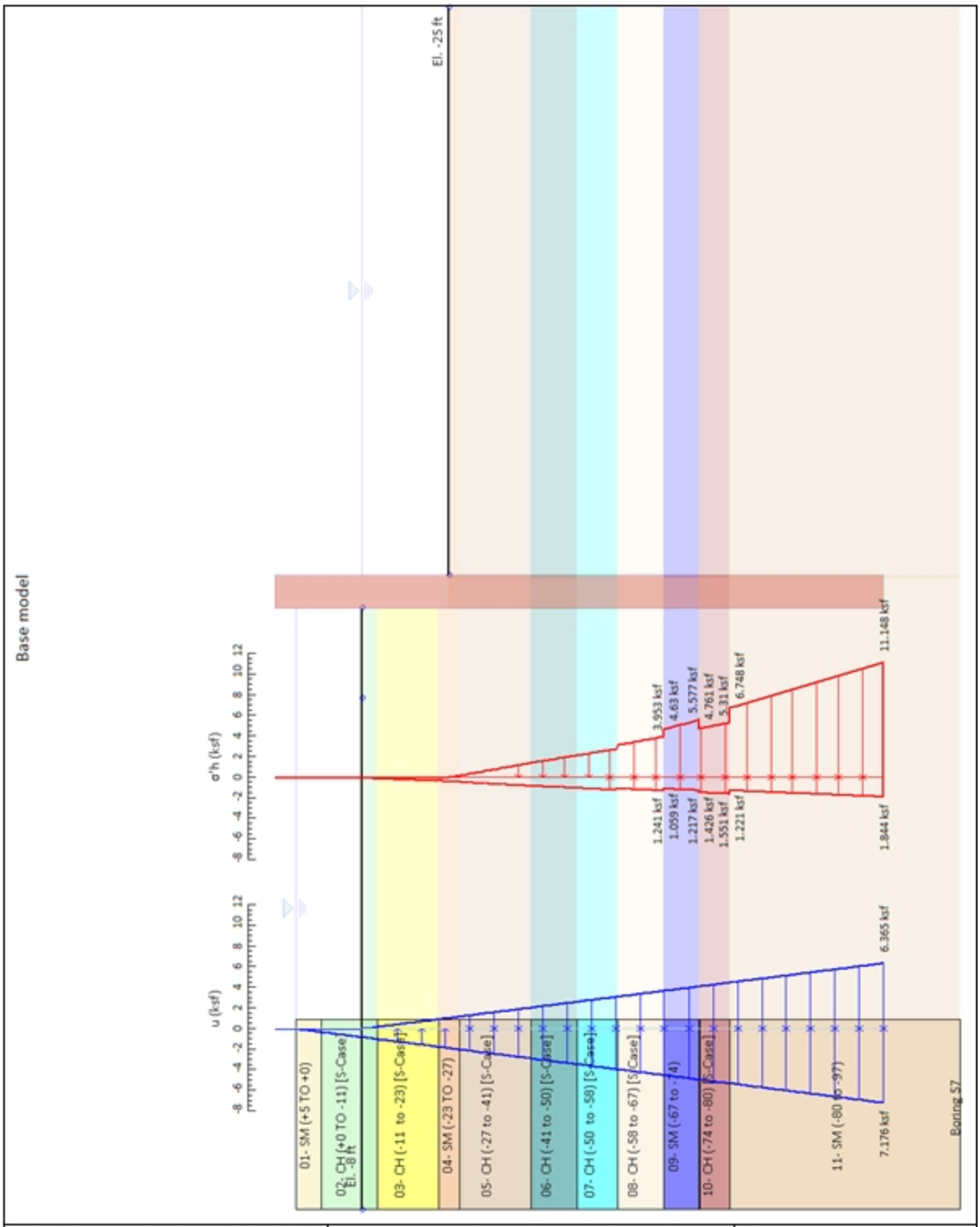

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



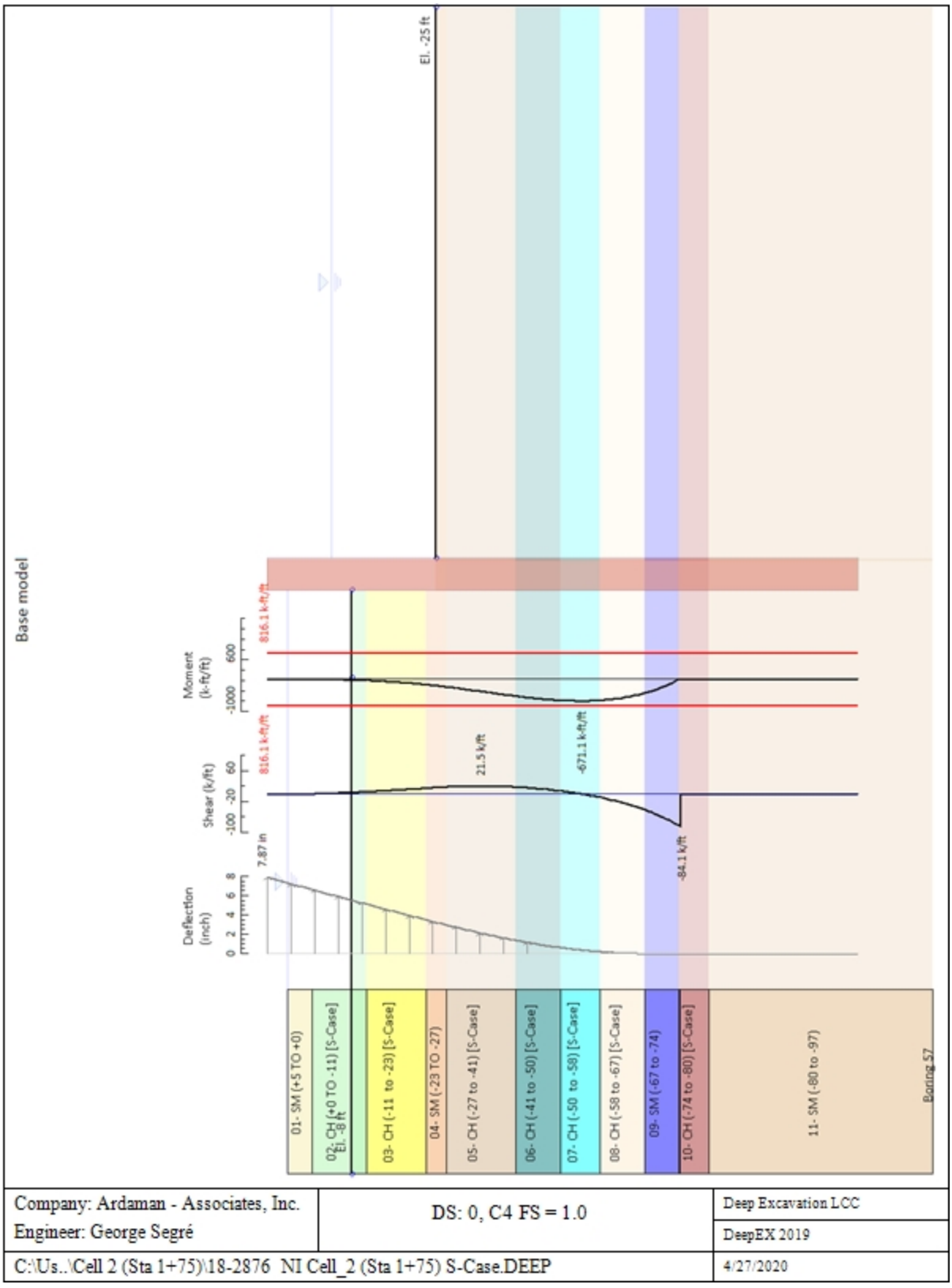

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



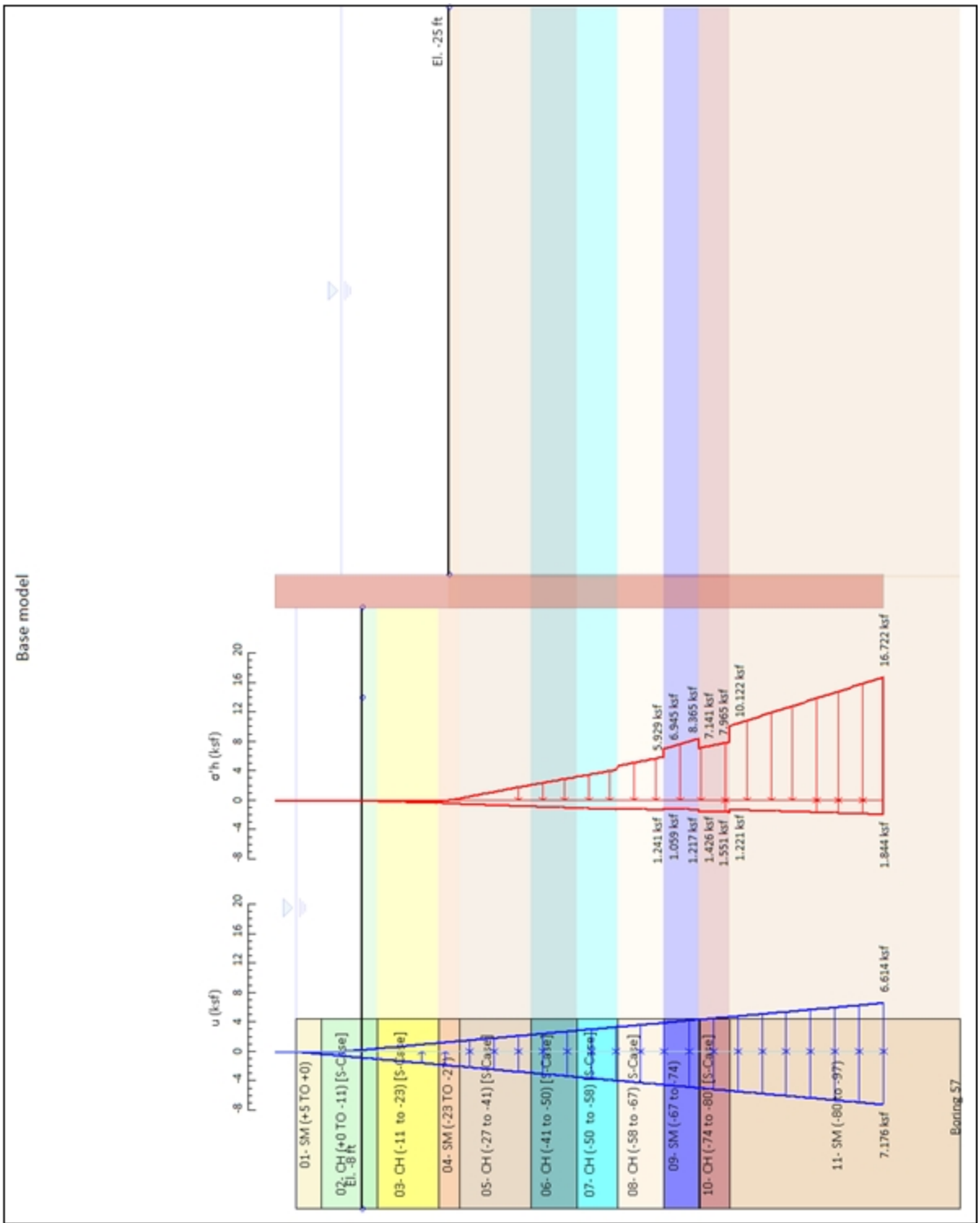

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



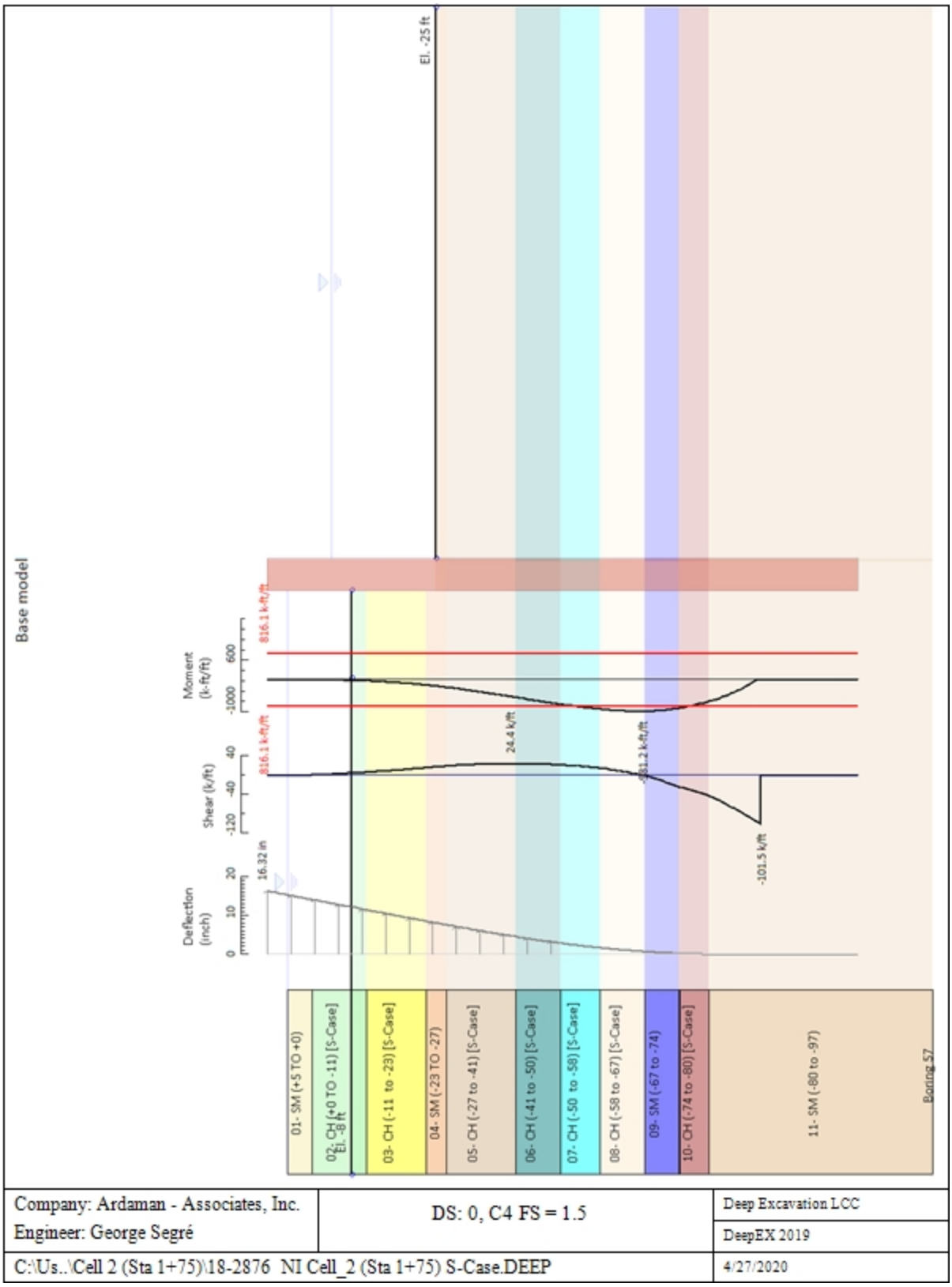

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |



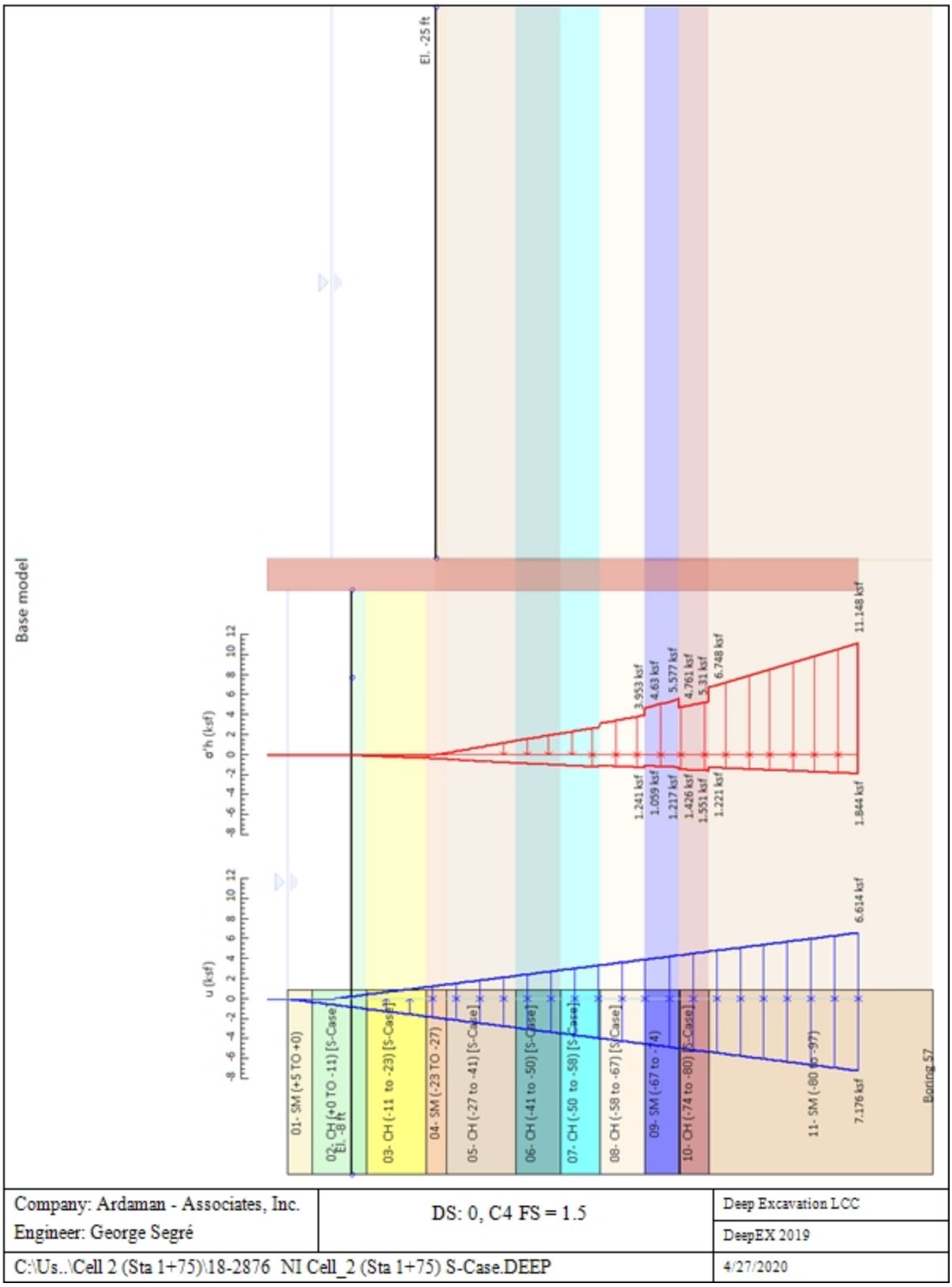

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP | | 4/27/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 2+00 Right Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -92.92 ft., NAVD88

Length of Sheetting = 101.92 ft.

Use = 105.0 ft.

Design Tip Elev. = -96.0 ft., NAVD88

Design Length of Sheeting = 105.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -19.44 | 46.54 | 16.91 | 0.06 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -20.23 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -18.25 | 40.41 | 16.40 | 0.05 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -19.05 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -16.68 | 19.53 | 10.44 | 0.02 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -17.86 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -15.49 | 14.56 | 9.60 | 0.01 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -16.28 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -75.47 | 1,024.22 | 113.53 | 12.93 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -87.46 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -70.03 | 781.26 | 91.33 | 8.57 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -80.92 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -71.11 | 764.69 | 92.64 | 8.51 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -92.92 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -64.58 | 556.22 | 66.77 | 5.21 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -85.28 | -- | -- | -- |
| | | | | | | Governing Value: | -92.92 | 1,024.22 | 113.53 | 12.93 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:05:00 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 0 | 0 | 500 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 0 | 0 | 1000 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 0 | 0 | 3300 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 0 | 0 | 1400 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 0 | 0 | 1850 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 0 | 0 | 1900 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 0 | 0 | 2000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | 0 | 0 | 0.95 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

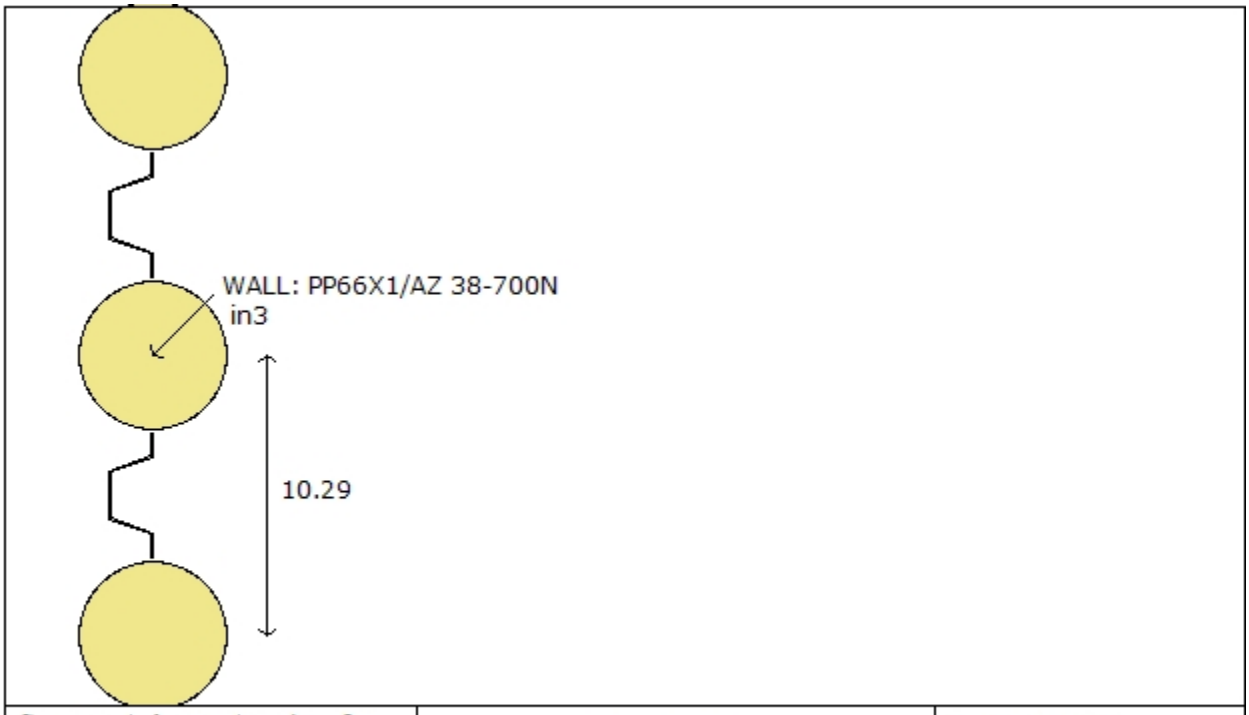
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 1 |
| -11 | 03- CH (-11 to | 1 | 0.95 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 1 |
| -41 | 06- CH (-41 to | 1 | 1 |
| -50 | 07- CH (-50 to | 1 | 1 |
| -58 | 08- CH (-58 to | 1 | 1 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 1 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 7.796 | 10.927 | 11.052 |
| Stage 1 | Simple span | N/A | 1.6 | 7.047 | 8.792 | 8.926 |
| Stage 2 | Simple span | N/A | 1.6 | 9.273 | 11.474 | 11.459 |
| Stage 3 | Simple span | N/A | 1.6 | 8.227 | 9.259 | 9.268 |
| Stage 4 | Simple span | N/A | 1.6 | 10.618 | 11.421 | 10.618 |
| Stage 5 | Simple span | N/A | 1.6 | 7.214 | 7.702 | 7.214 |
| Stage 6 | Simple span | N/A | 1.6 | 11.009 | 11.993 | 11.009 |
| Stage 7 | Simple span | N/A | 1.6 | 7.501 | 8.134 | 7.501 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

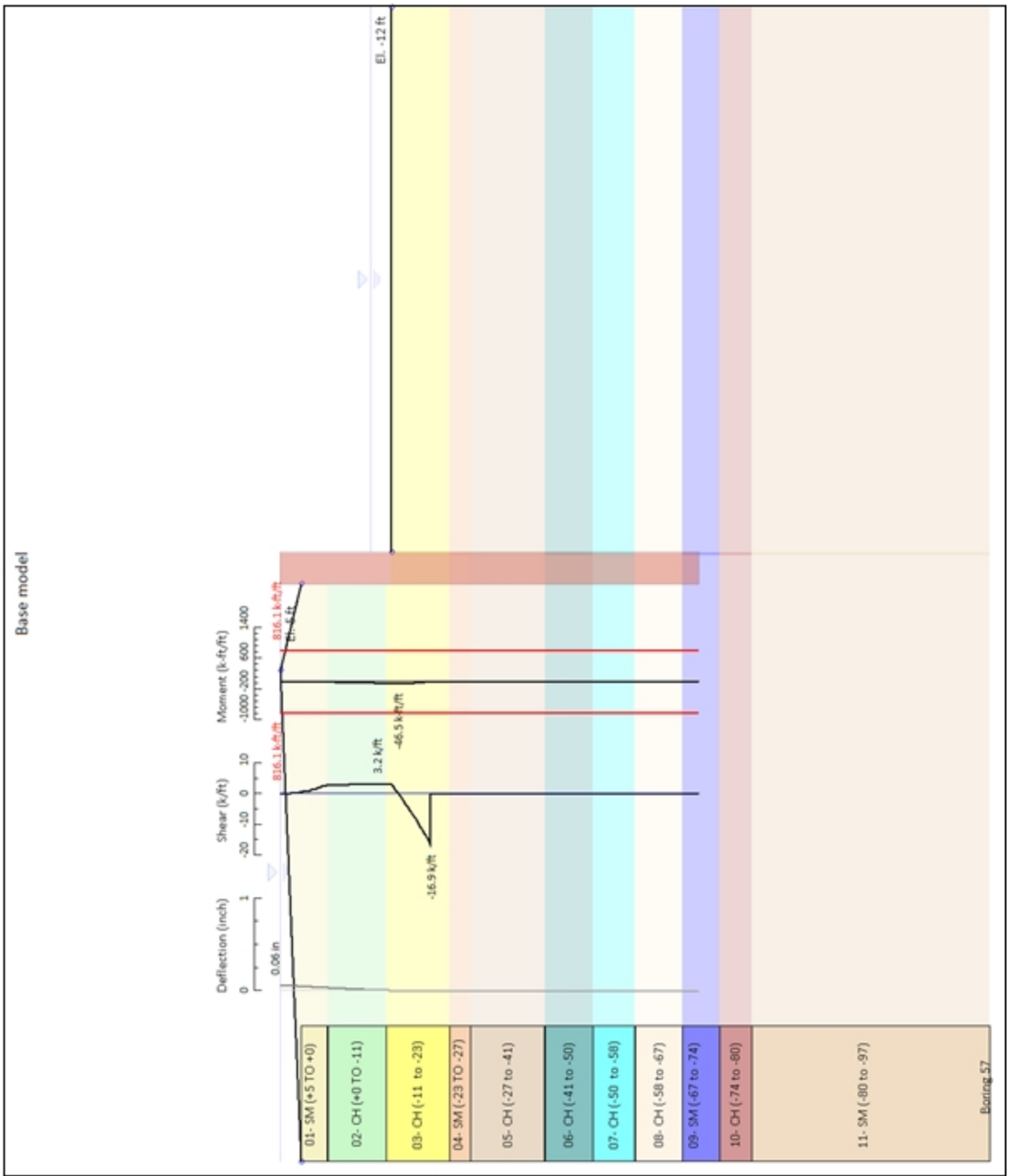
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

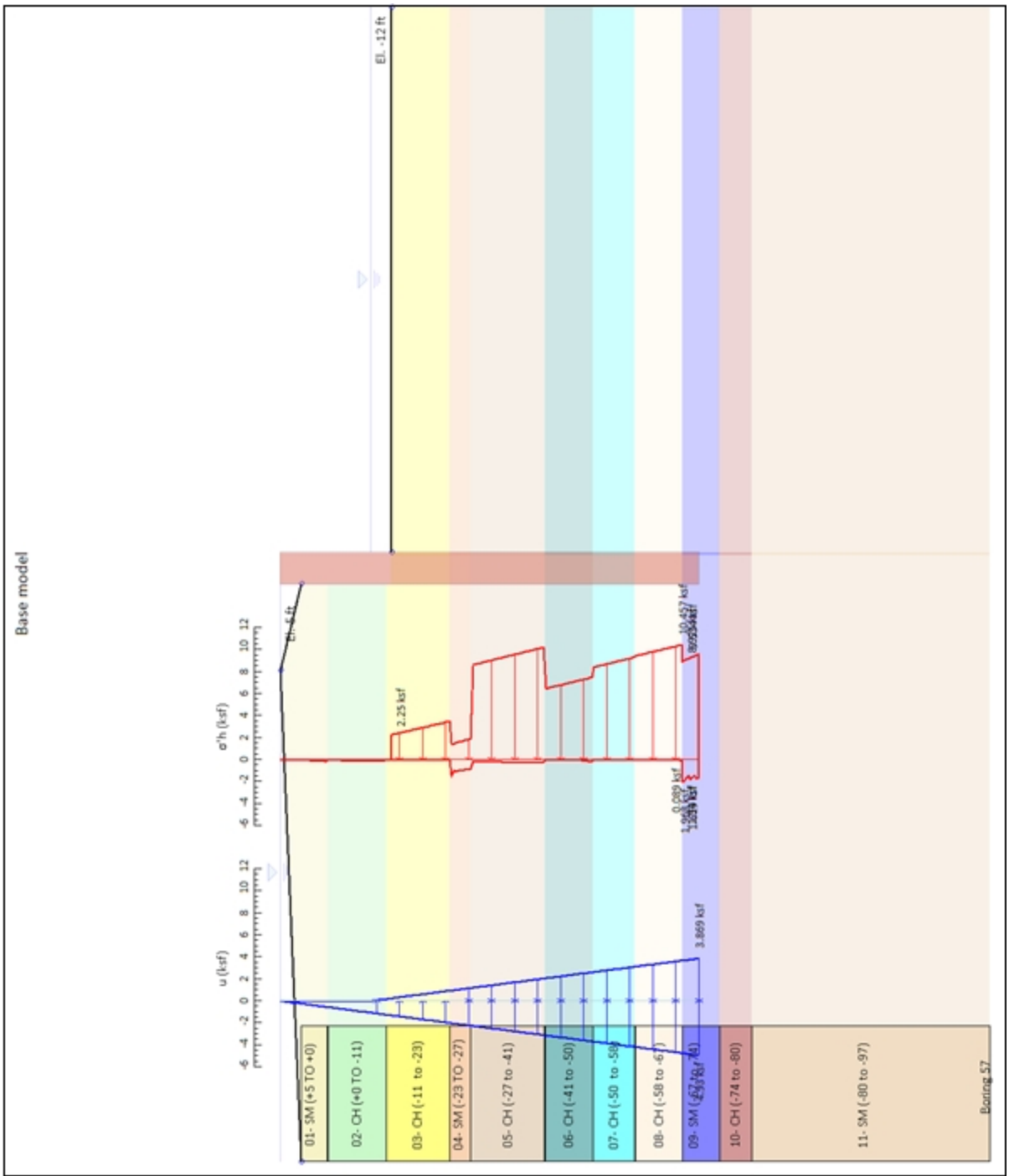
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

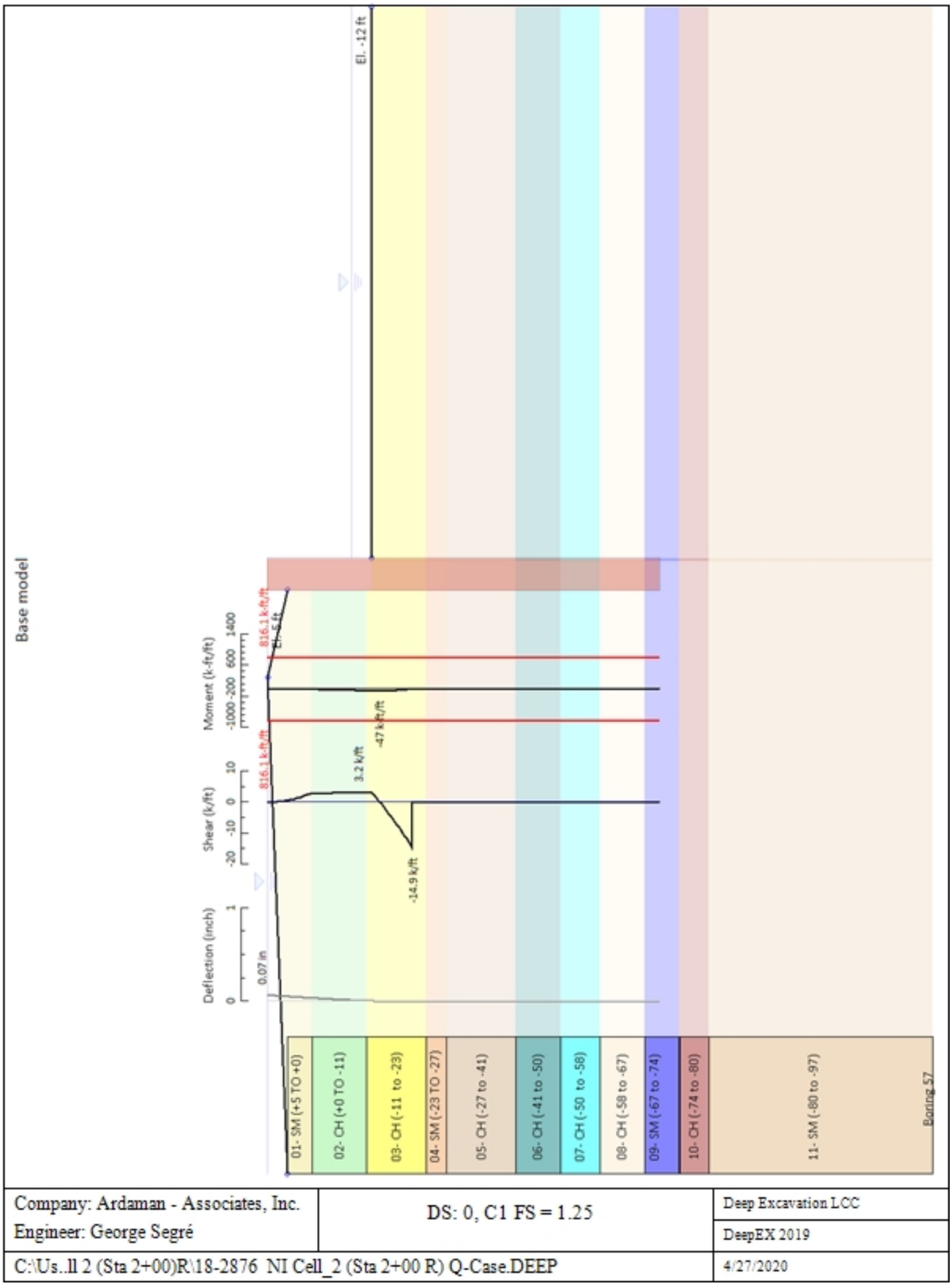
A sequence of figures for each excavation stage is reported



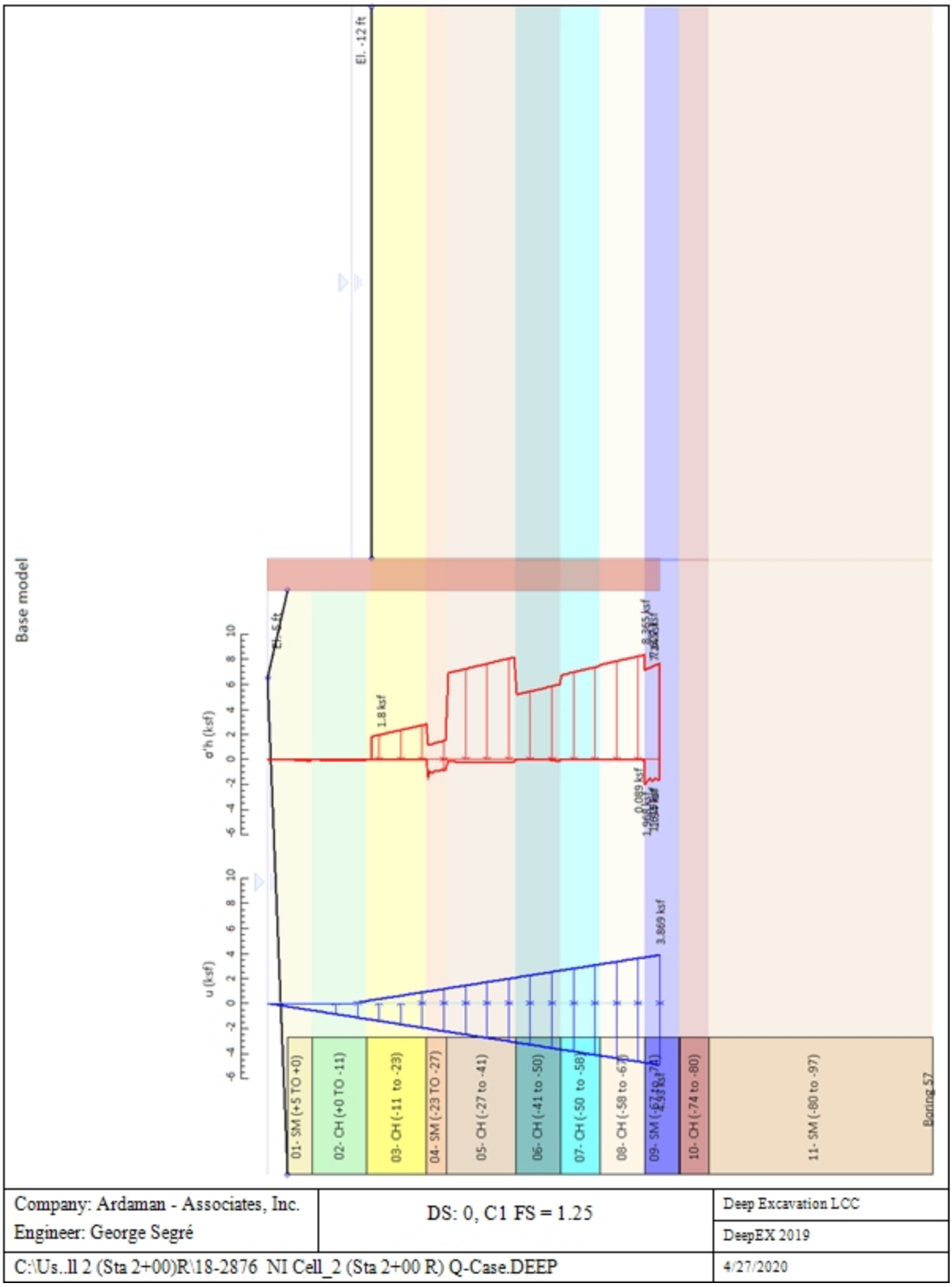

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |



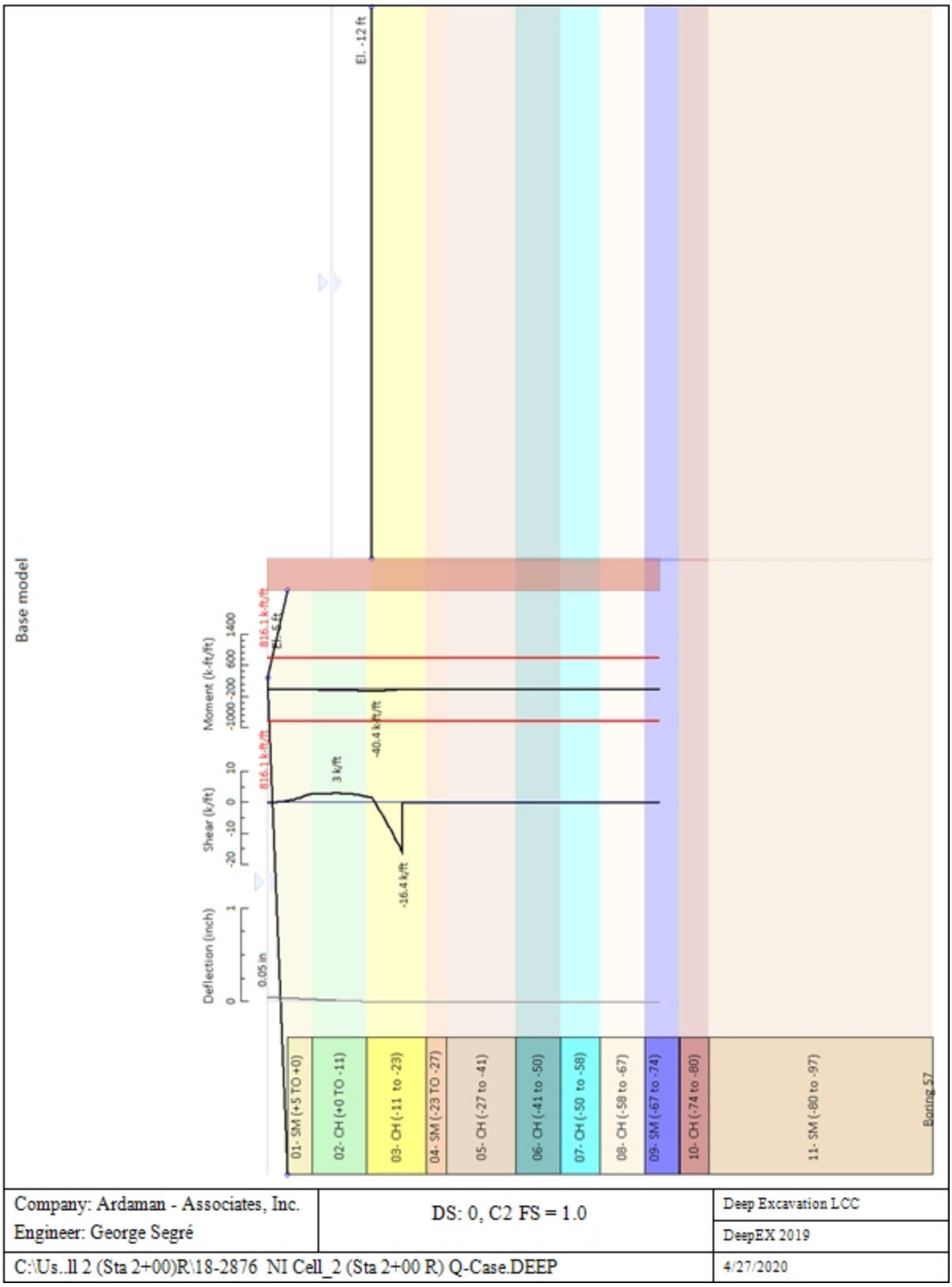

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |



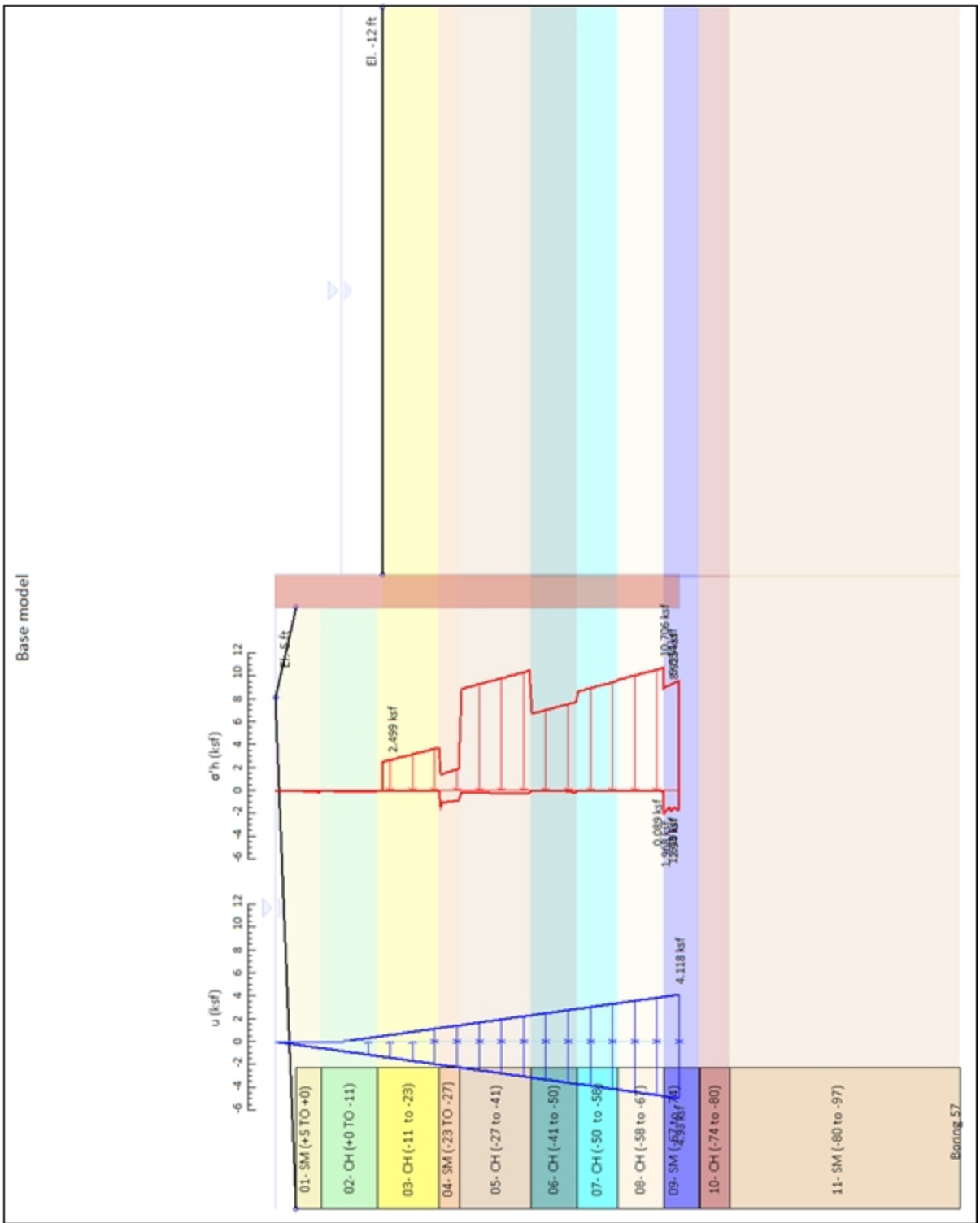

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |



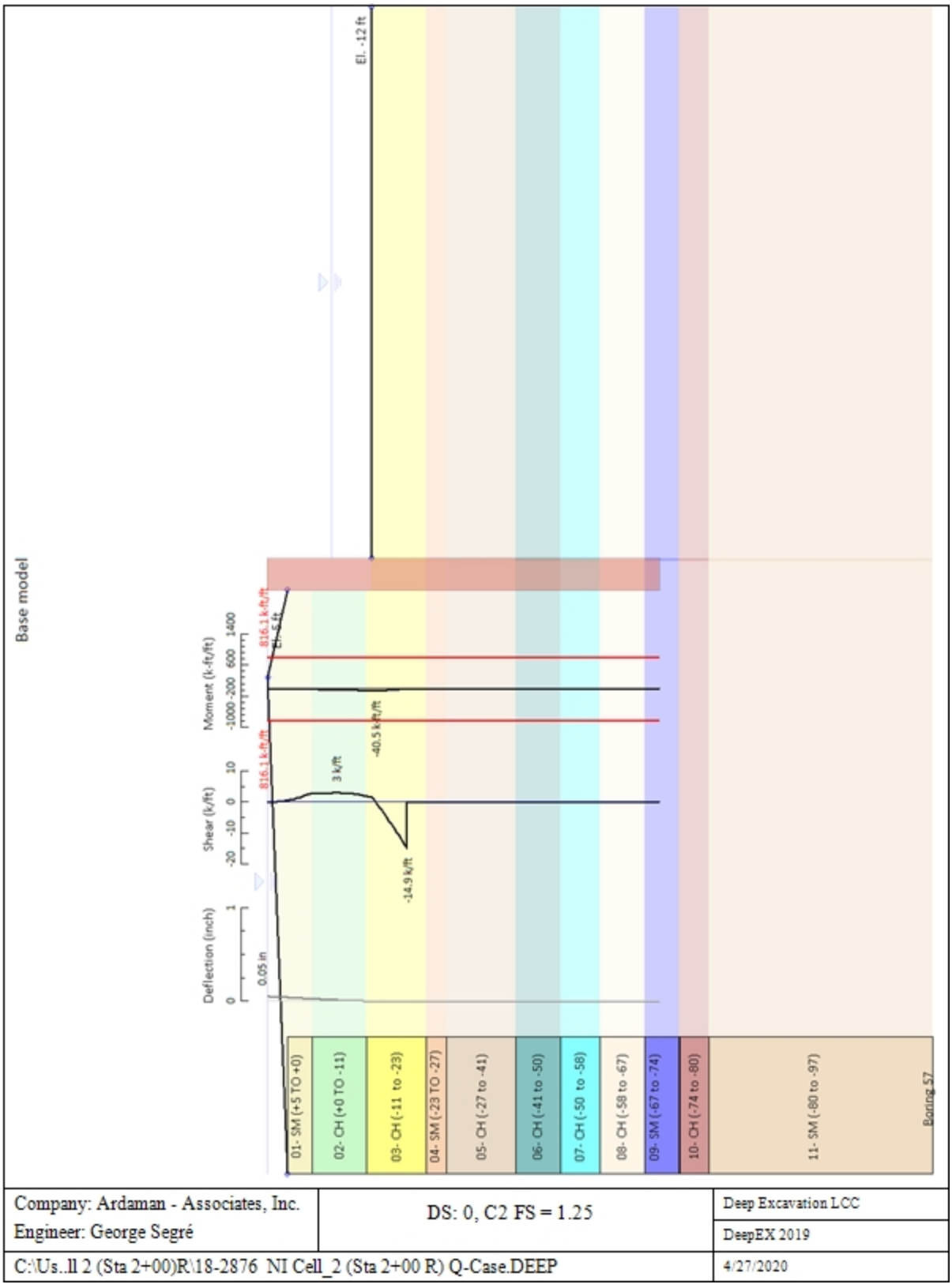

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |



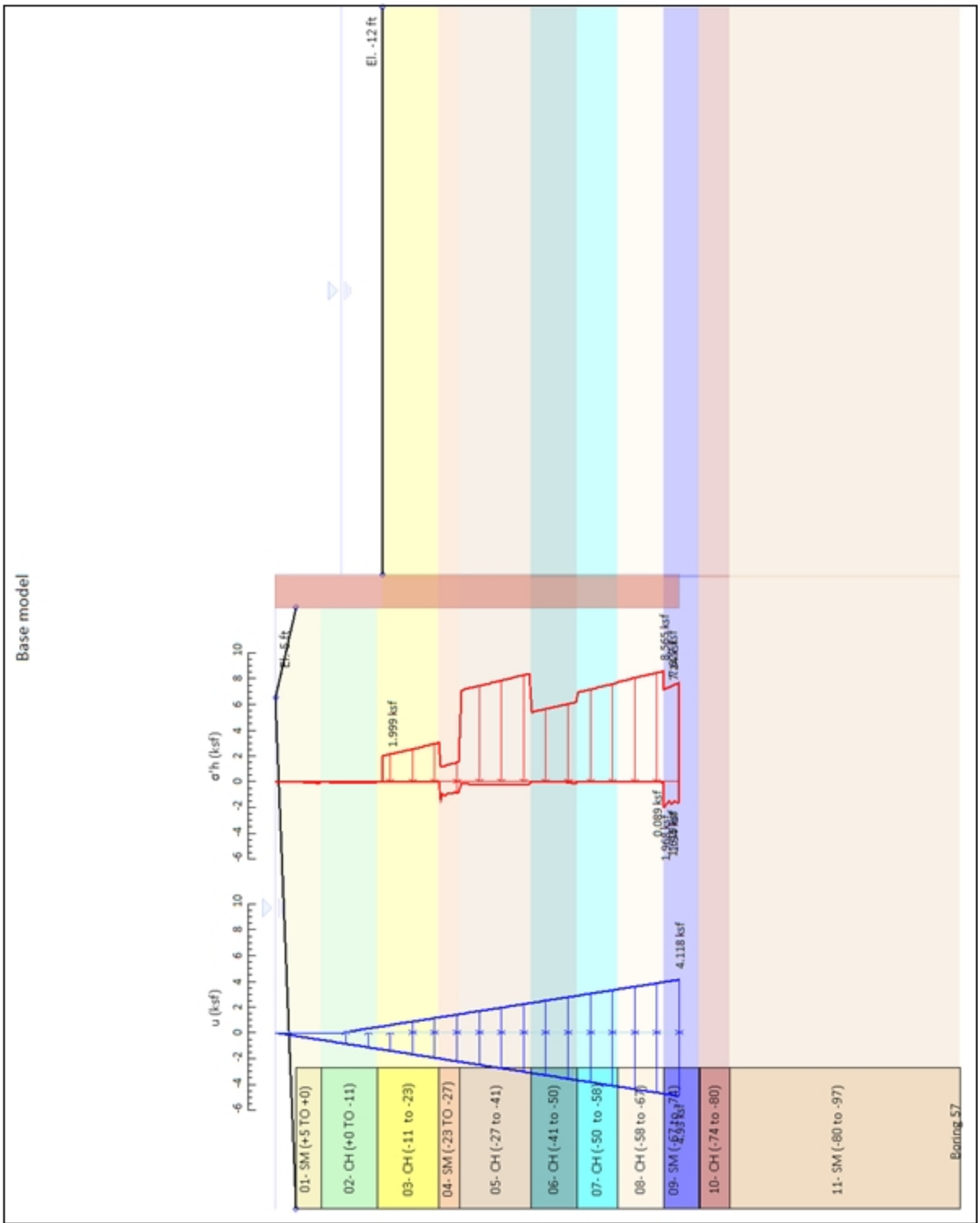

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |

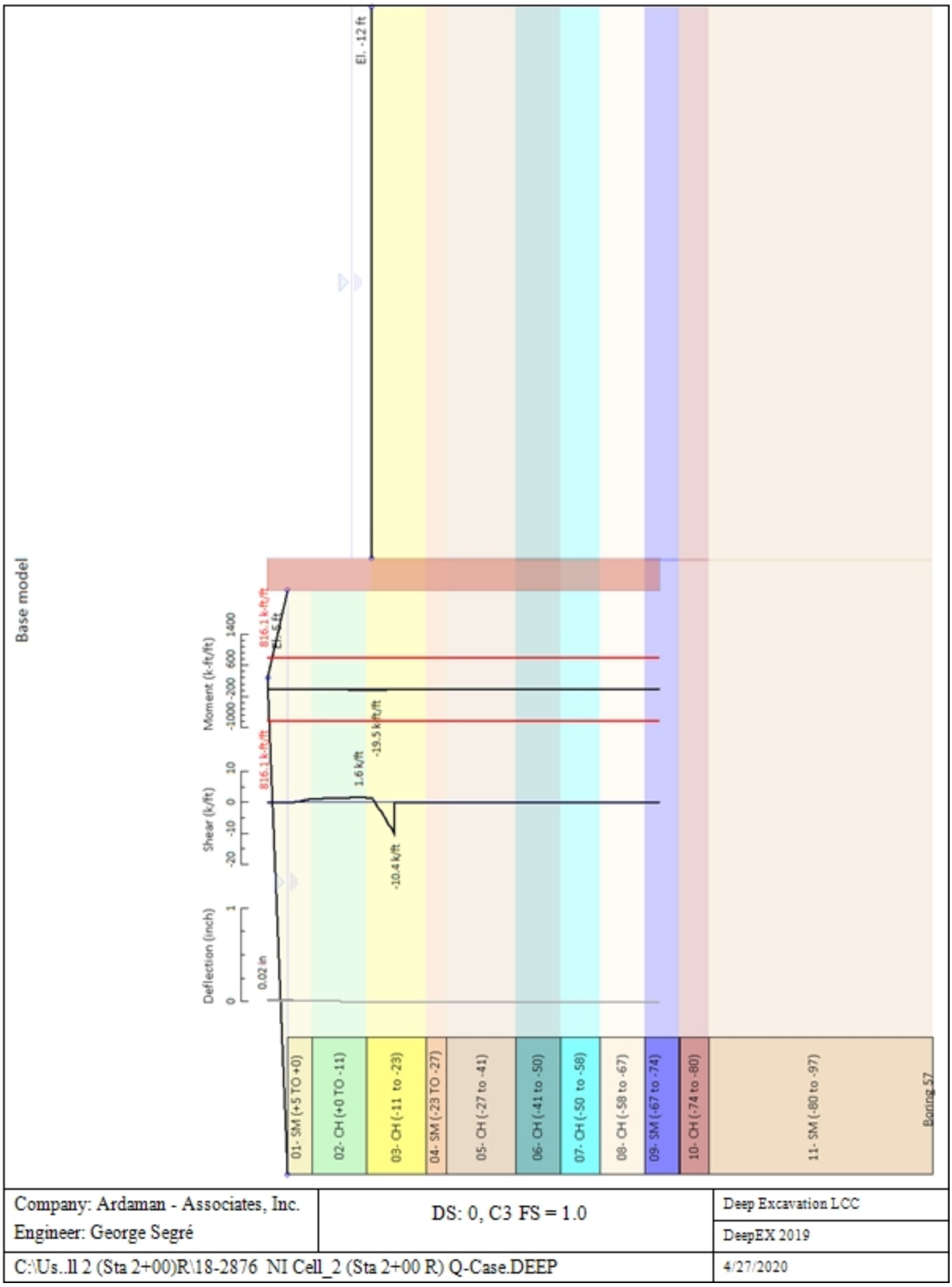



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |

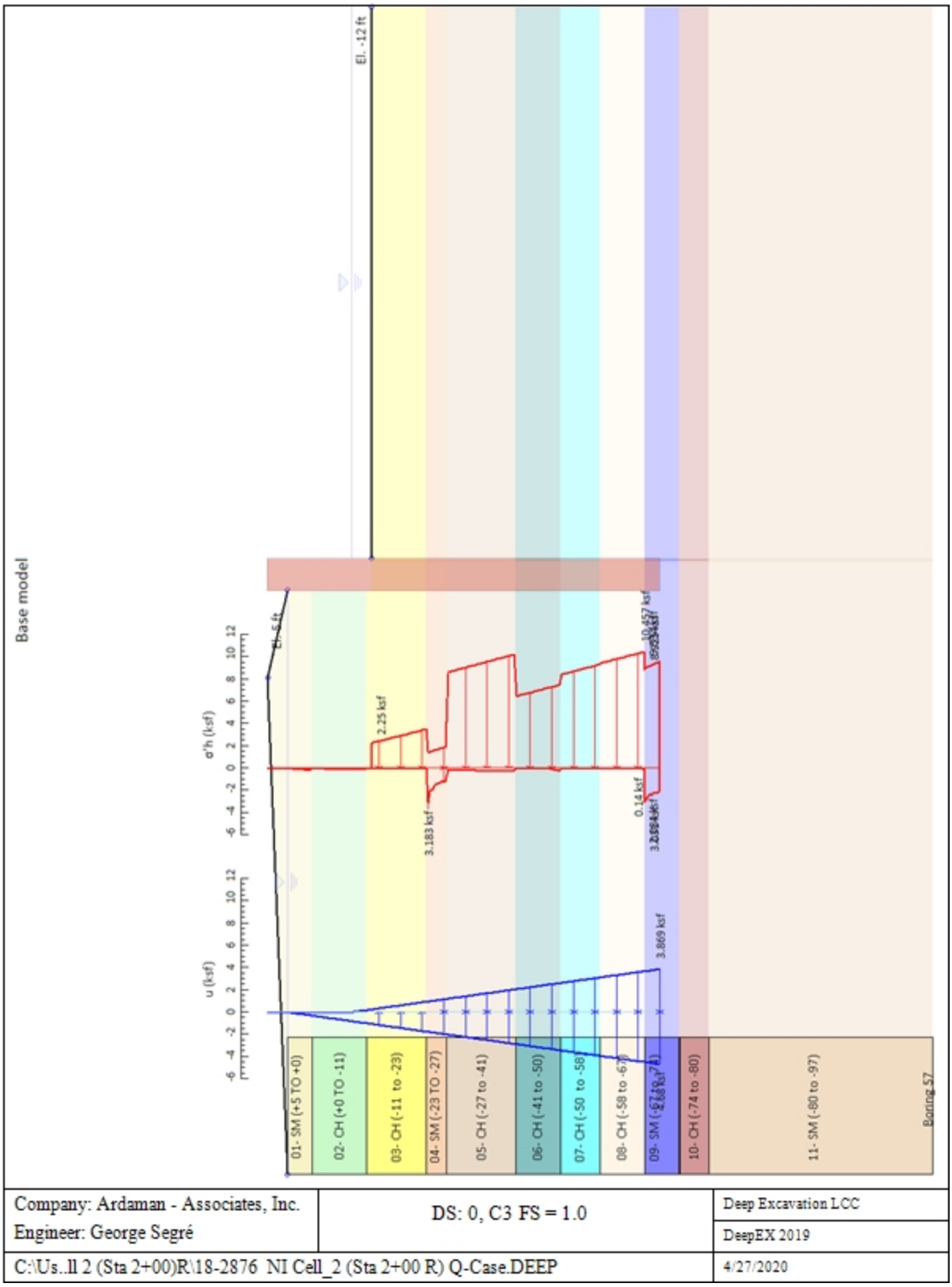


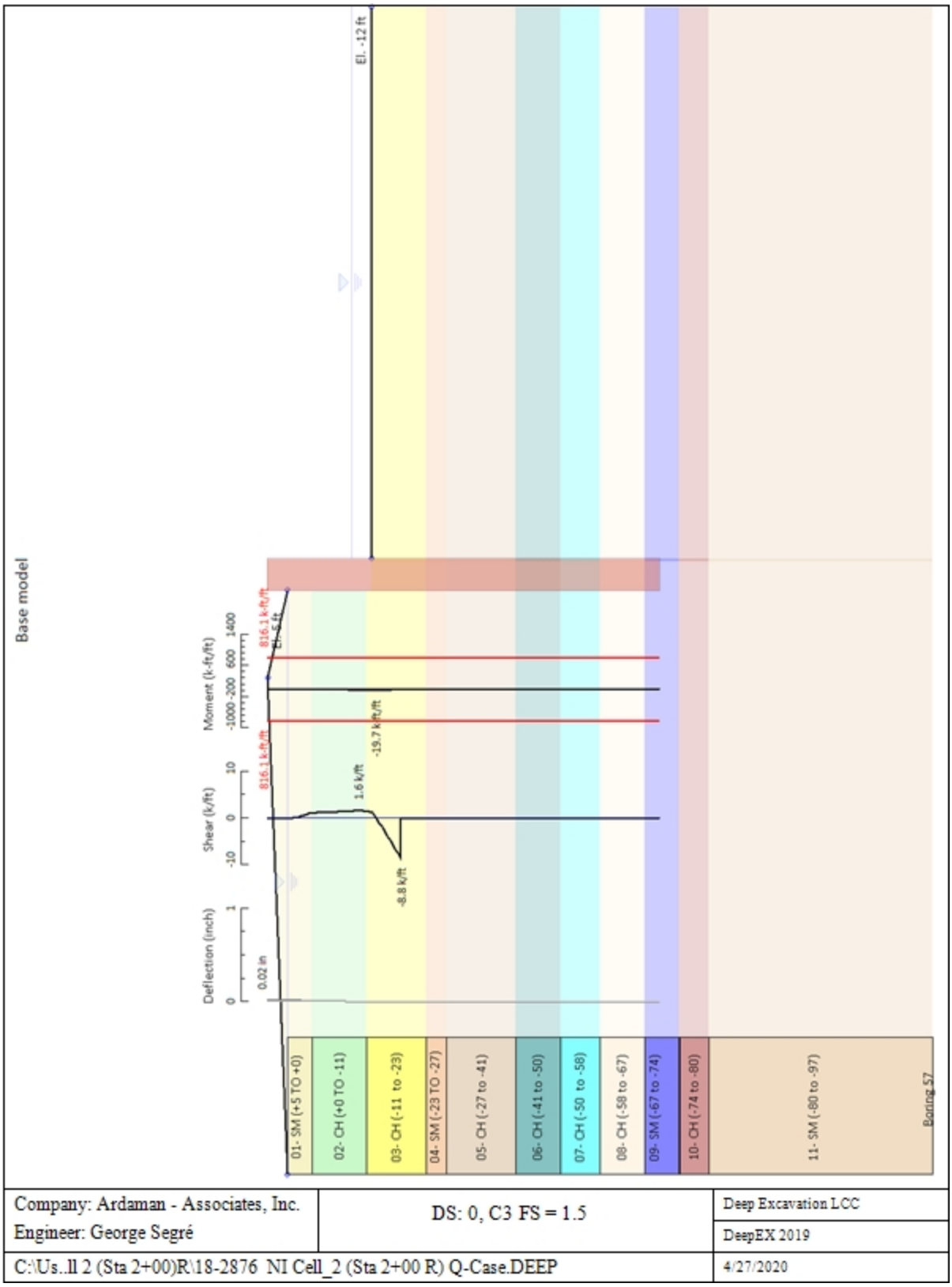

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |

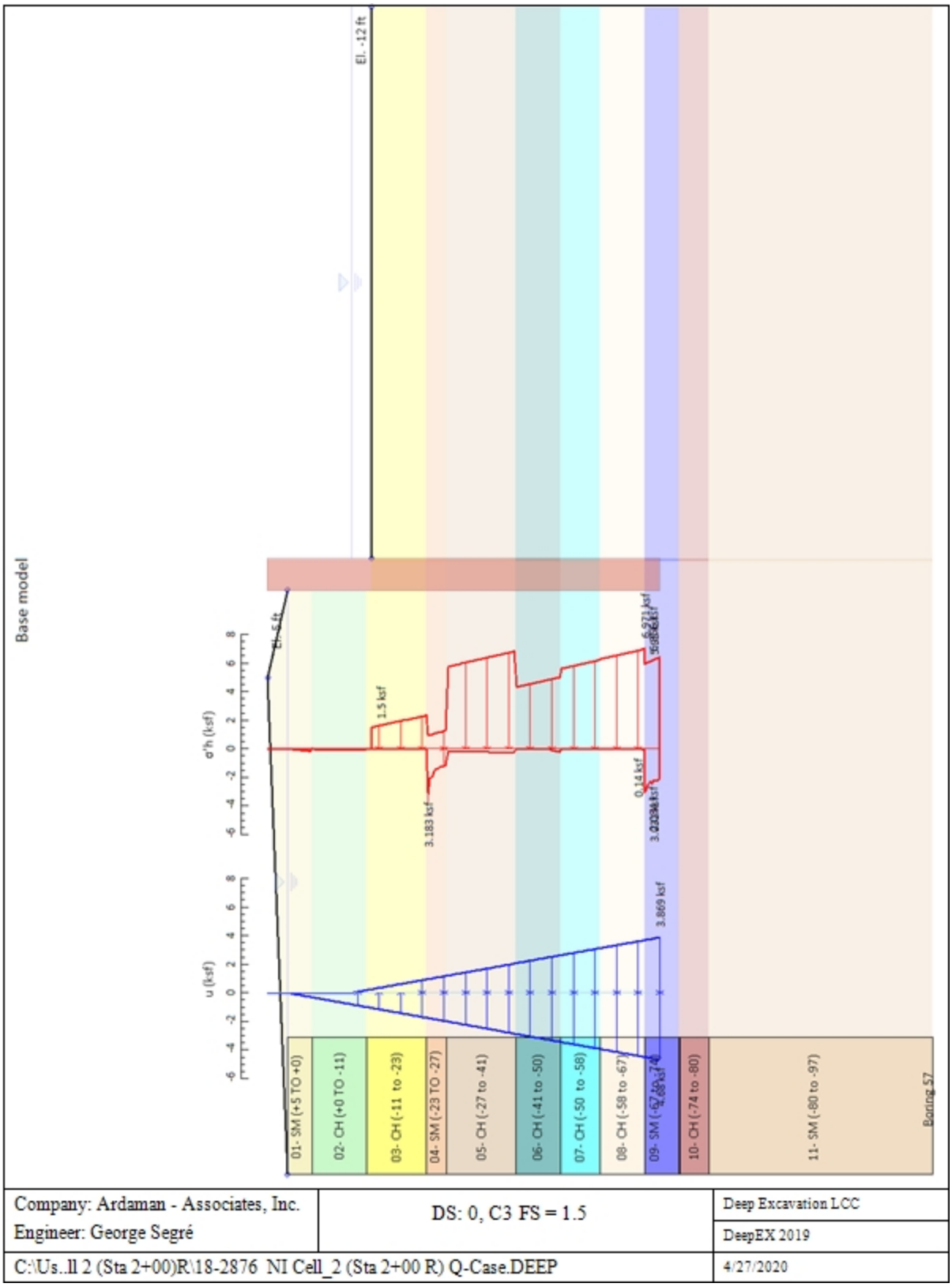

Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
1.999 ksf
8.565 ksf
0.039 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020

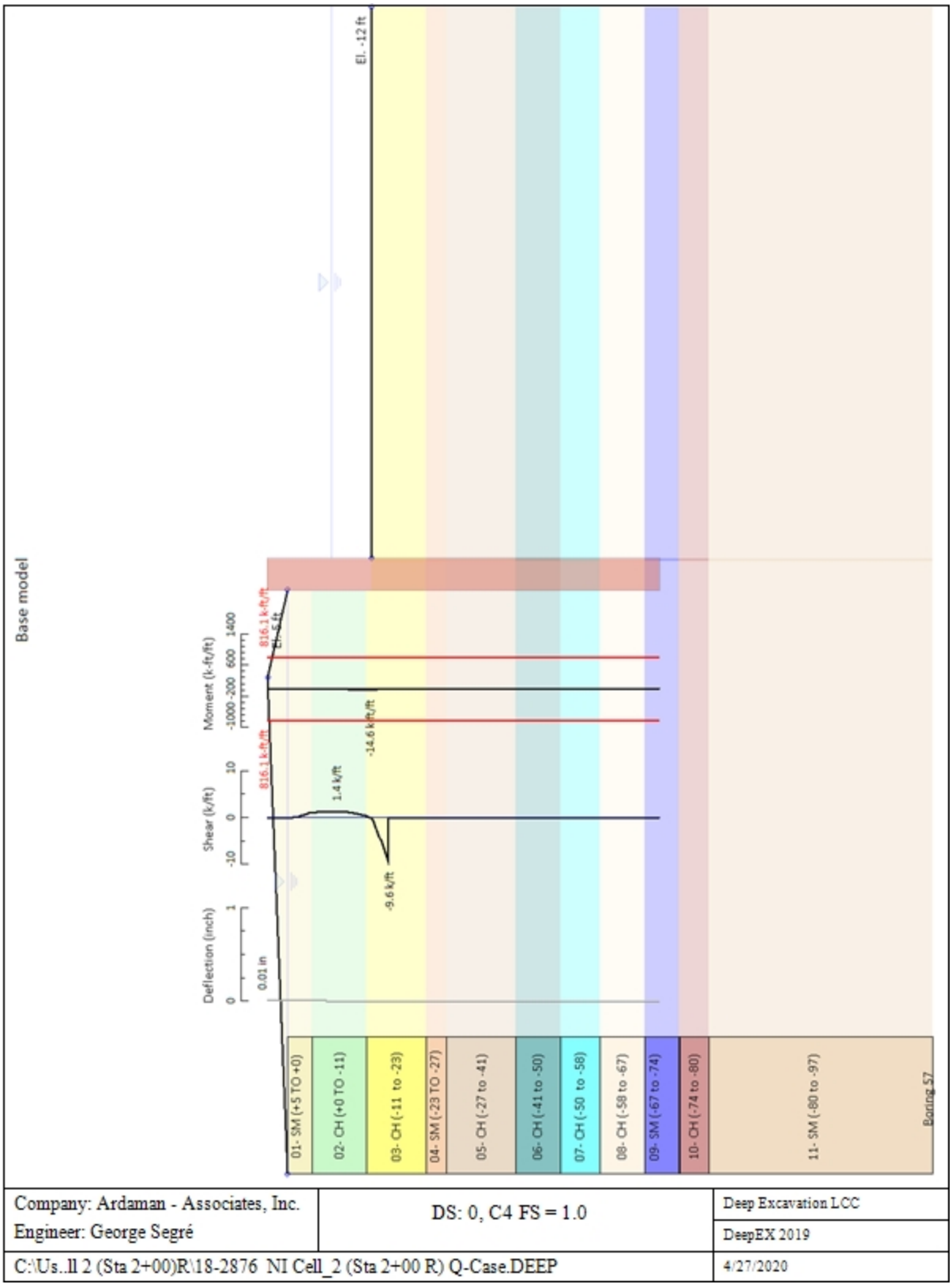



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |

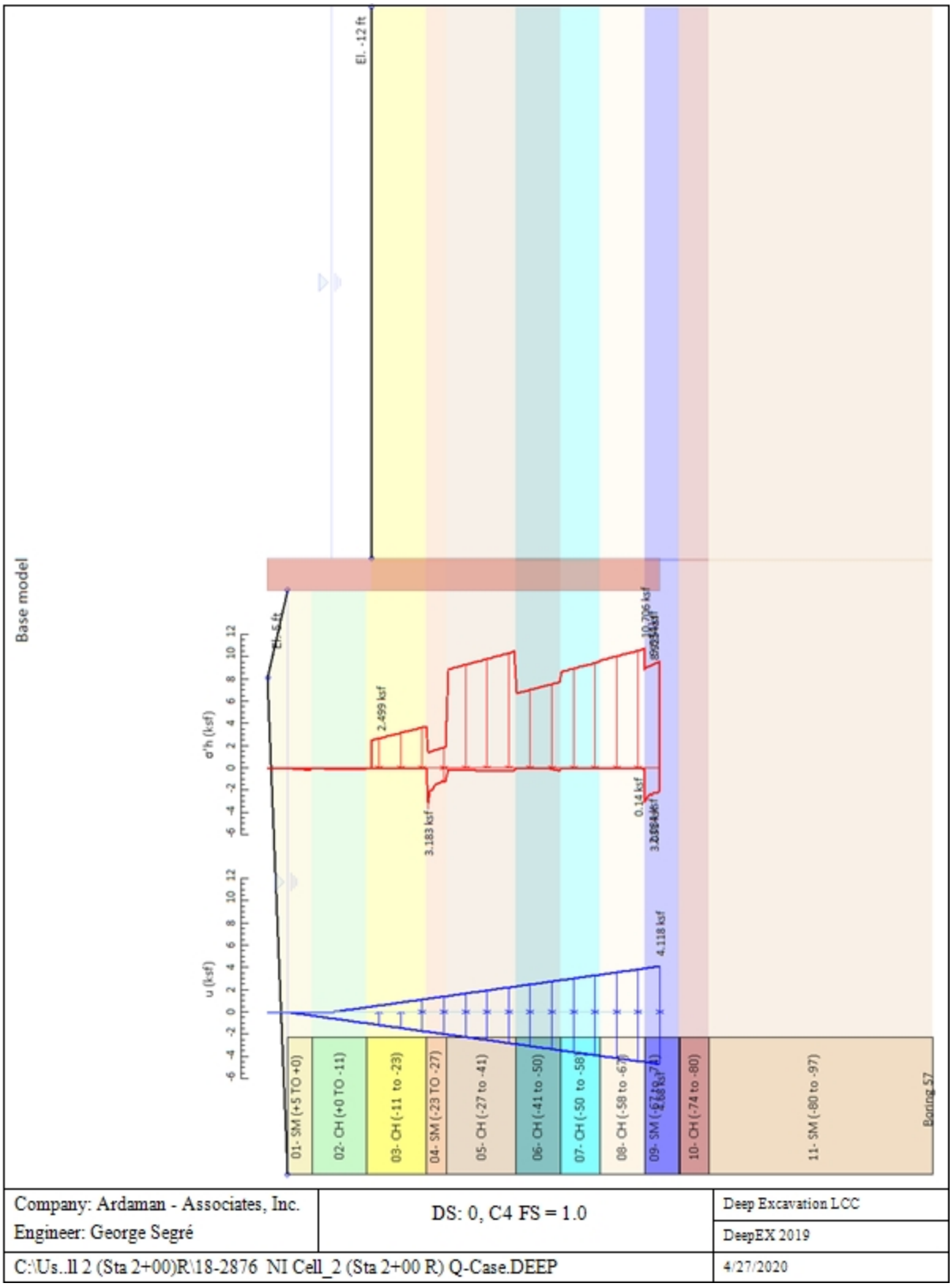

Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
2.25 ksf
3.183 ksf
0.14 ksf
10.457 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020


Base model
El. -12 ft
El. 6 ft
816.1 k-ft/ft
816.1 k-ft/ft
-19.7 k-ft/ft
1.6 k/ft
-8.8 k/ft
0.02 in
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-10 0 10
Deflection (inch)
0 1
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020

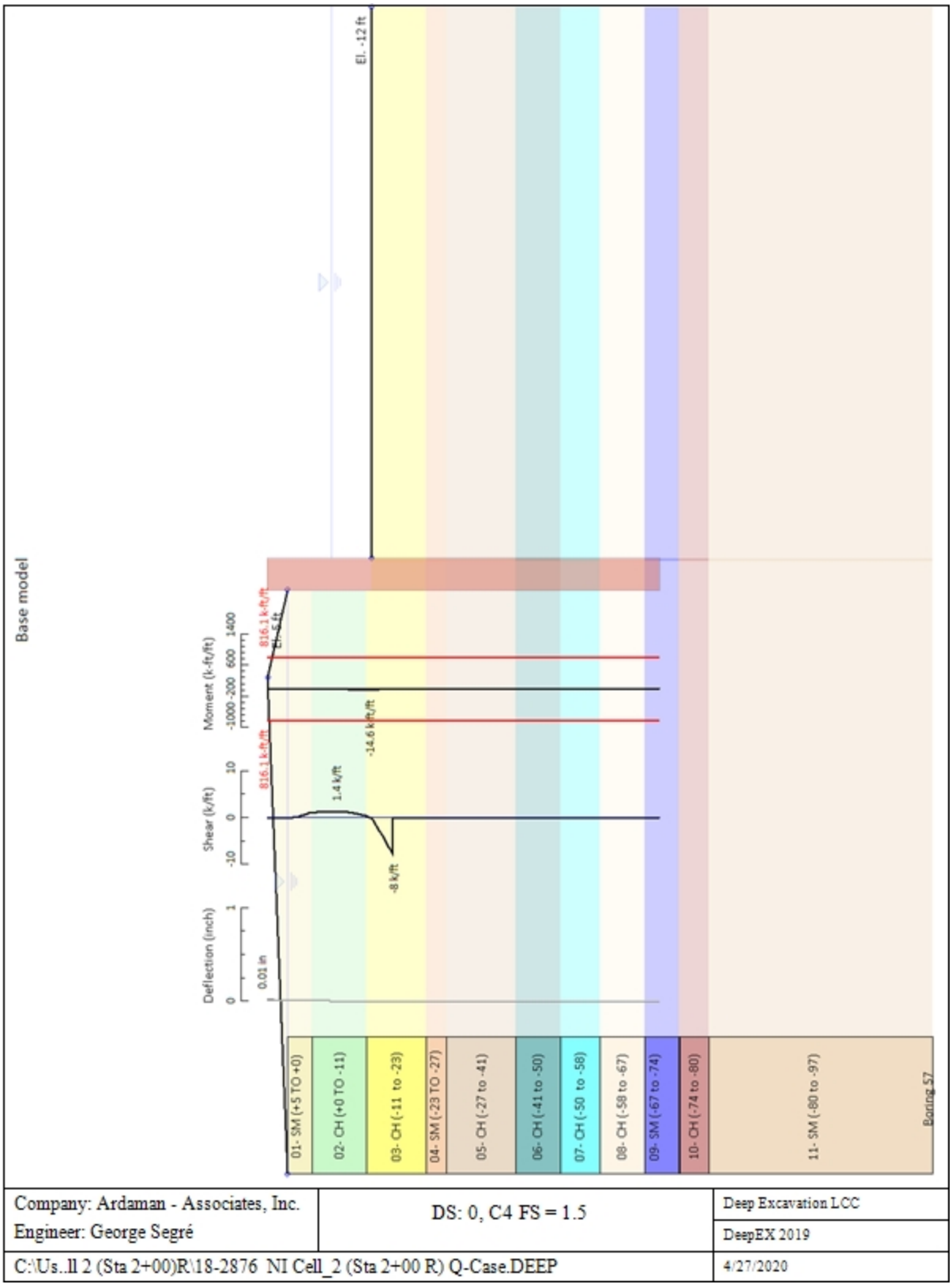

Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
1.5 ksf
3.183 ksf
0.14 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020

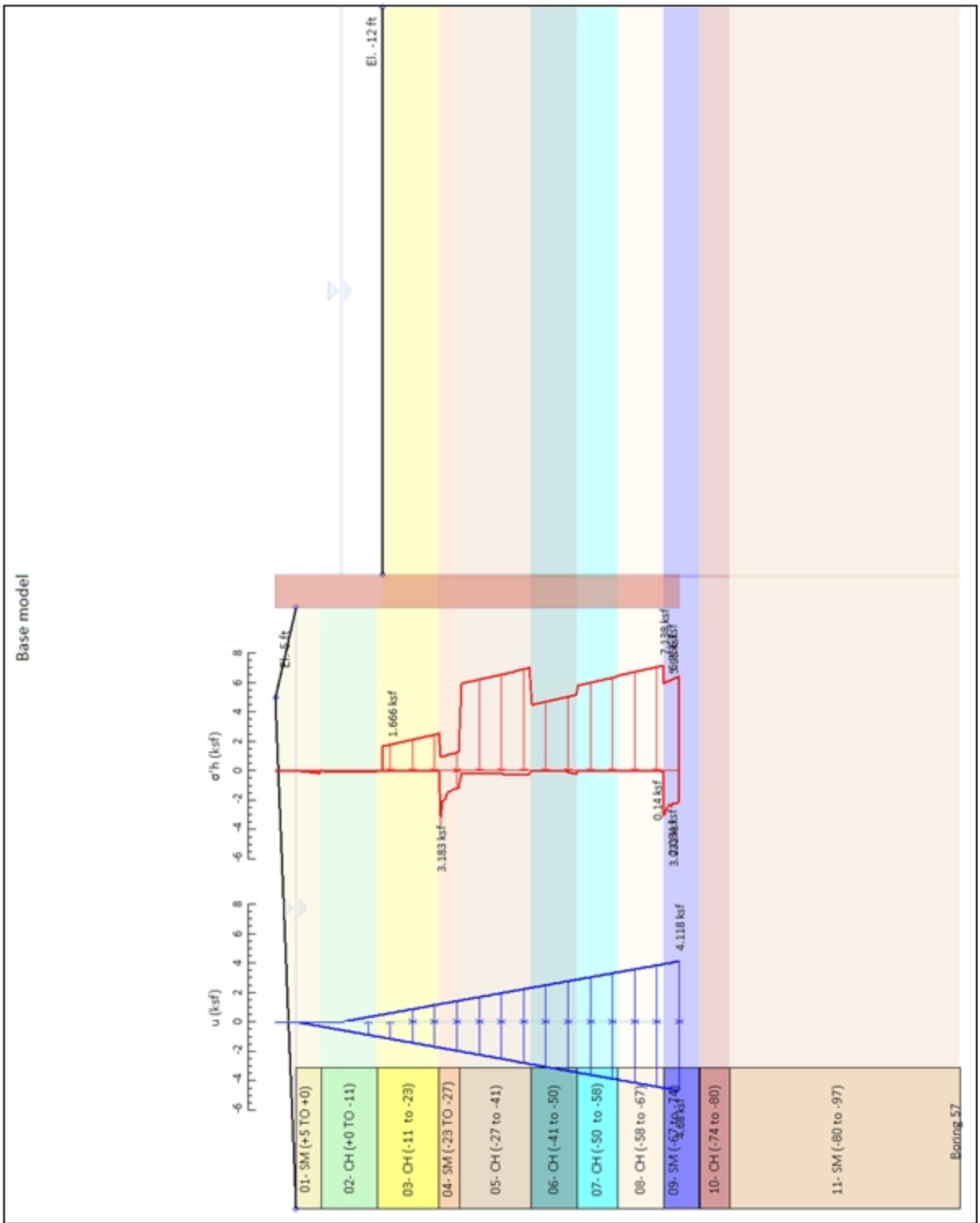



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |


Base model
El. -12 ft
El. 6 ft
816.1 k-ft/ft
-14.6 k-ft/ft
816.1 k-ft/ft
1.4 k/ft
-8 k/ft
0.01 in
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-10 0 10
Deflection (inch)
0 1
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP | | 4/27/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:12:01 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 150 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | - | - | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | - | - | 0.609 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

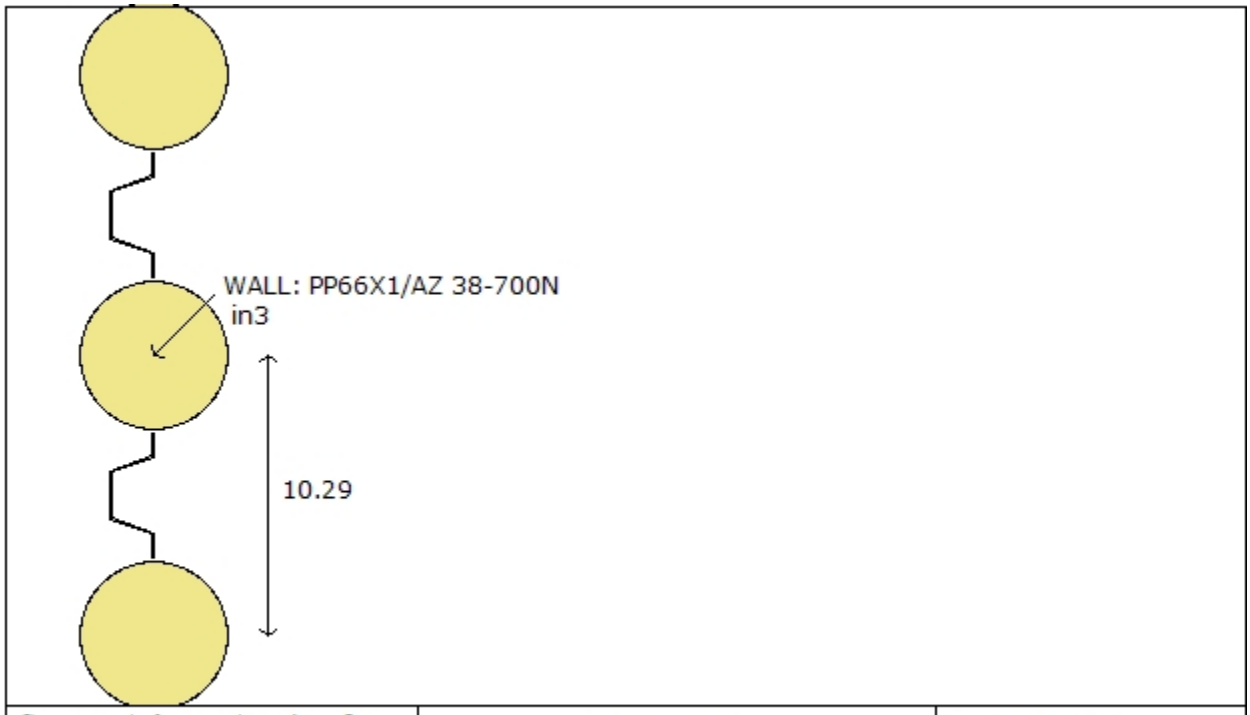
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 0.61 |
| -11 | 03- CH (-11 to | 1 | 0.61 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 0.61 |
| -41 | 06- CH (-41 to | 1 | 0.61 |
| -50 | 07- CH (-50 to | 1 | 0.61 |
| -58 | 08- CH (-58 to | 1 | 0.56 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 0.56 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.31 | 1.31 | 1.754 |
| Stage 1 | Simple span | N/A | 1.6 | 1.137 | 1.137 | 1.51 |
| Stage 2 | Simple span | N/A | 1.6 | 1.371 | 1.371 | 1.801 |
| Stage 3 | Simple span | N/A | 1.6 | 1.197 | 1.197 | 1.558 |
| Stage 4 | Simple span | N/A | 1.6 | 1.367 | 1.367 | 1.802 |
| Stage 5 | Simple span | N/A | 1.6 | 1.066 | 1.066 | 1.384 |
| Stage 6 | Simple span | N/A | 1.6 | 1.43 | 1.43 | 1.851 |
| Stage 7 | Simple span | N/A | 1.6 | 1.129 | 1.129 | 1.433 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

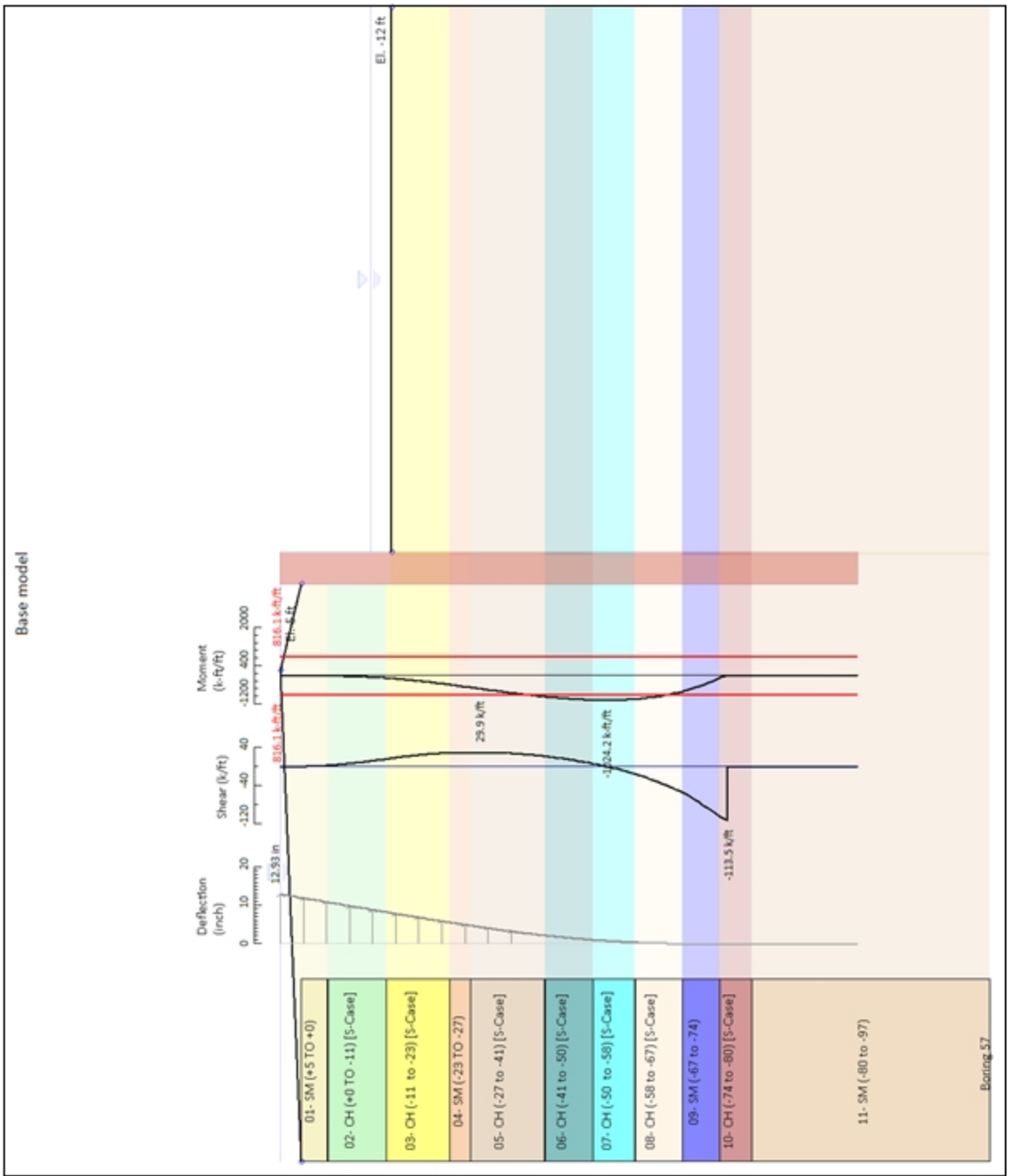
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

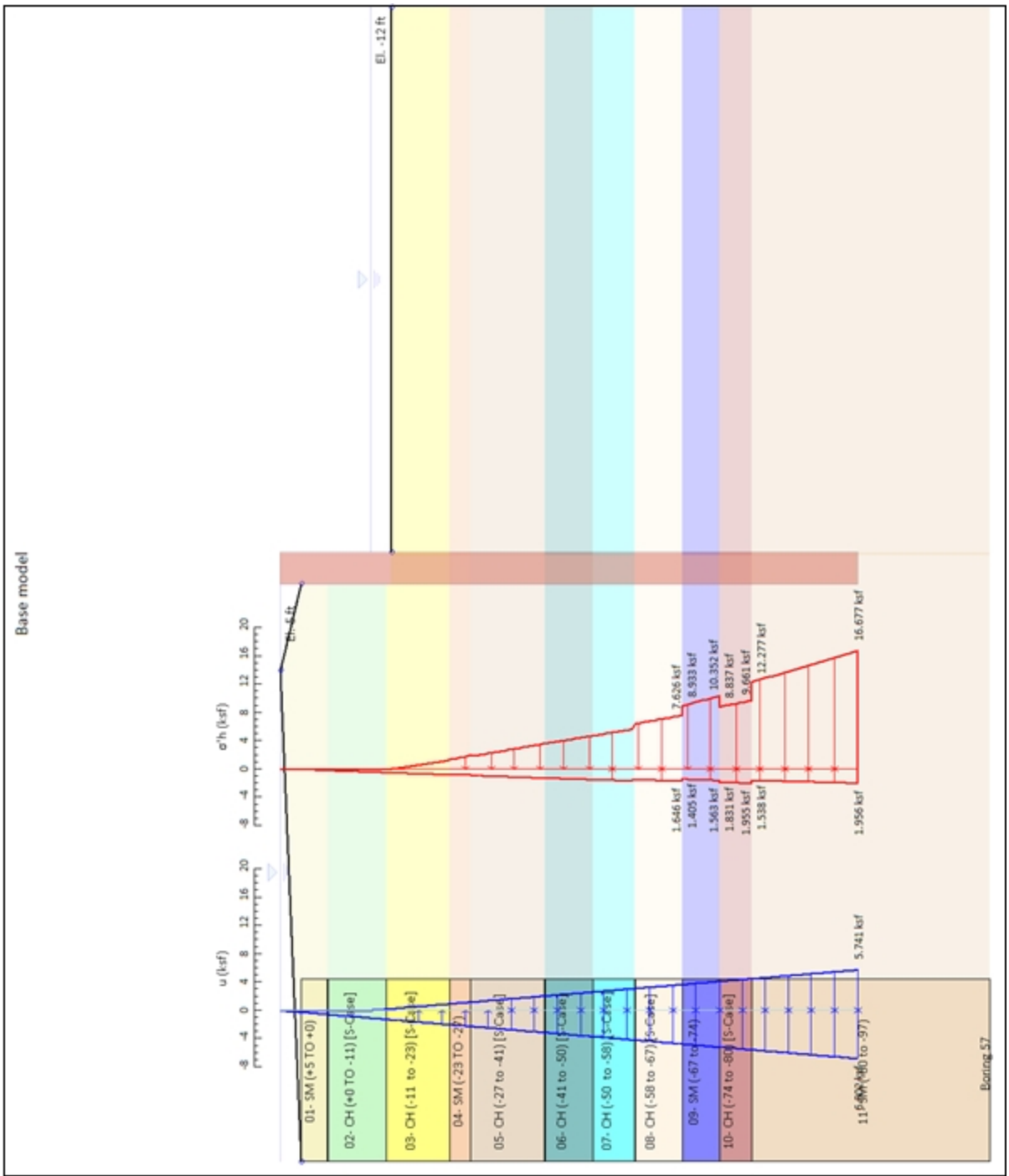
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

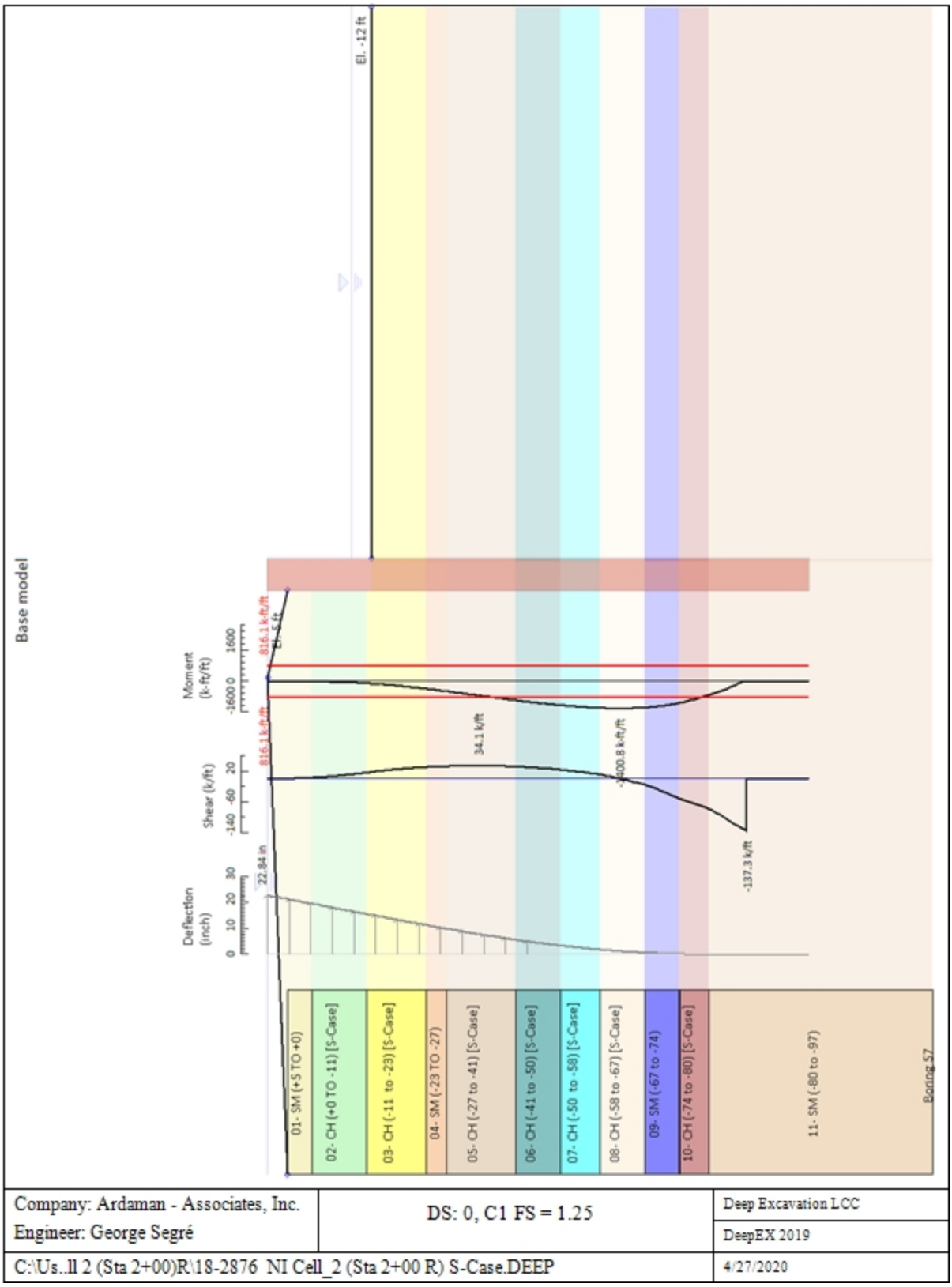
A sequence of figures for each excavation stage is reported



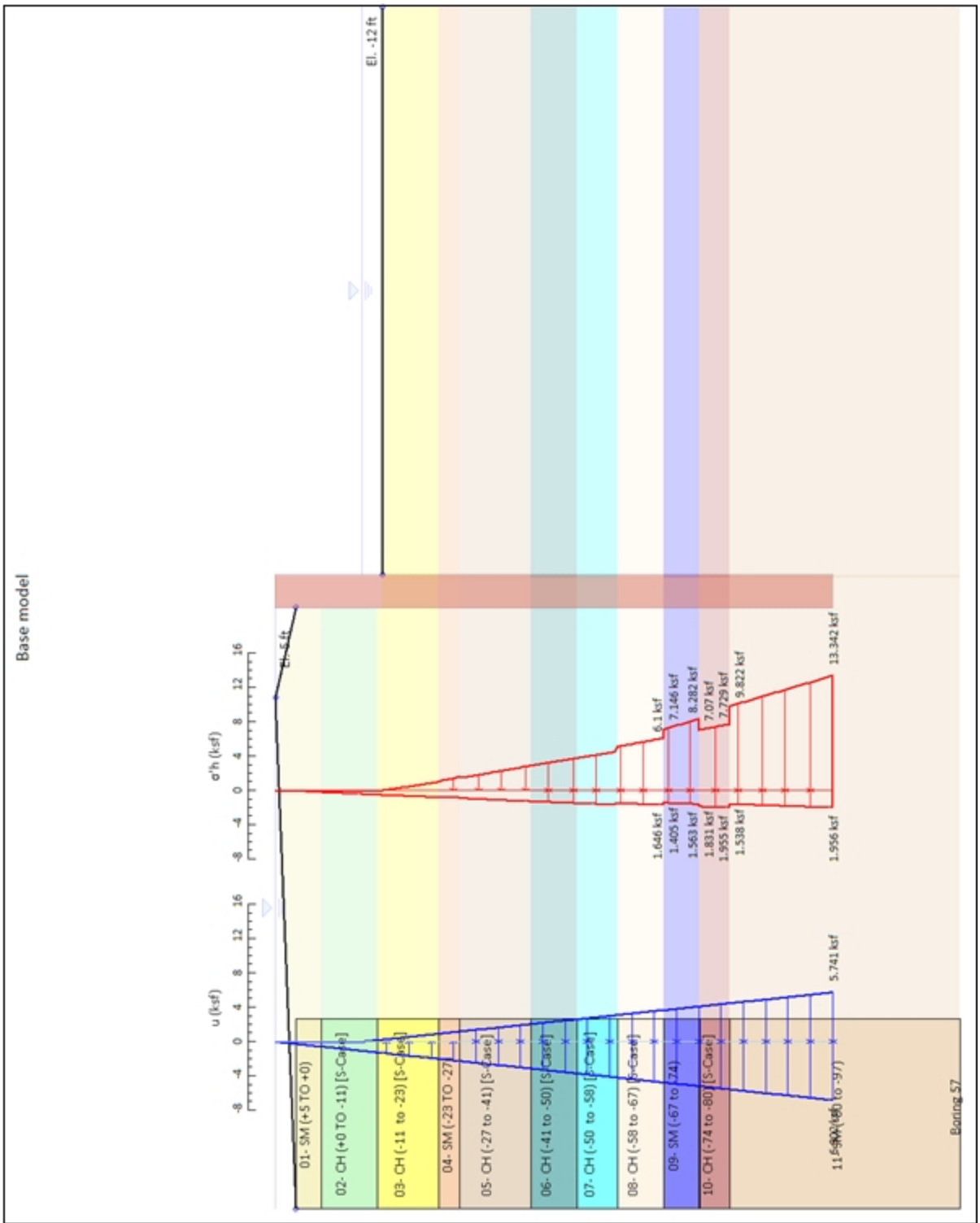

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



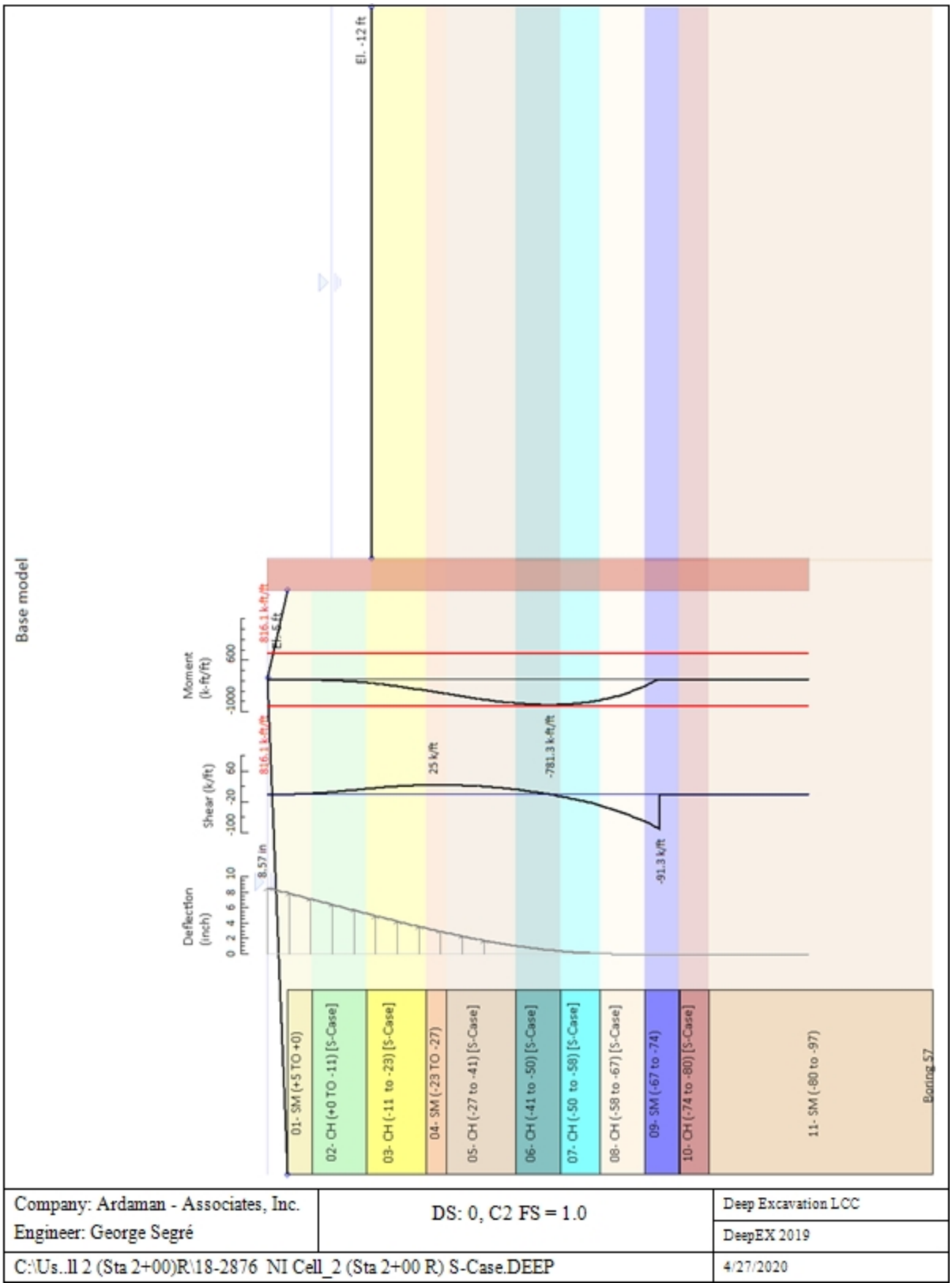

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



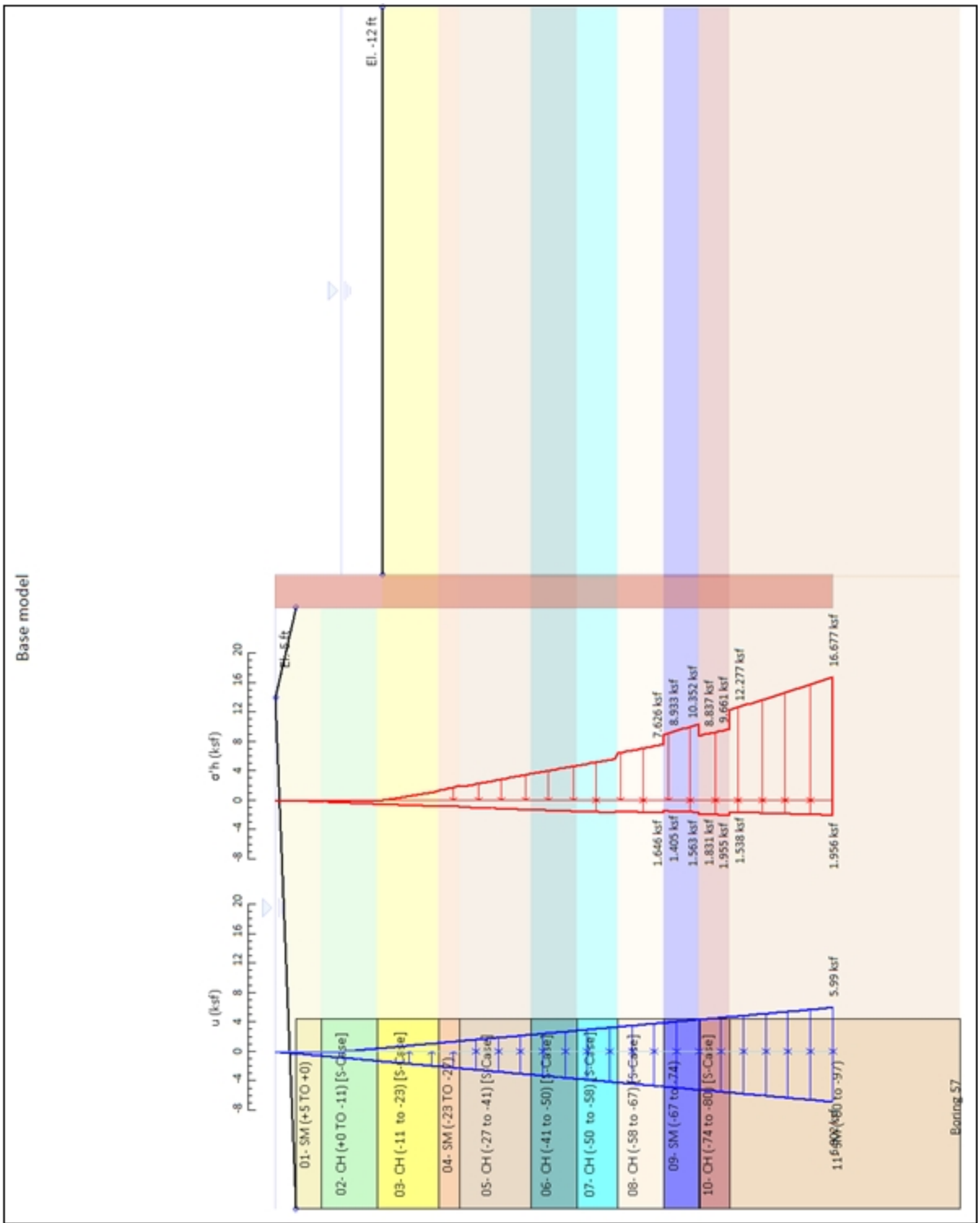

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



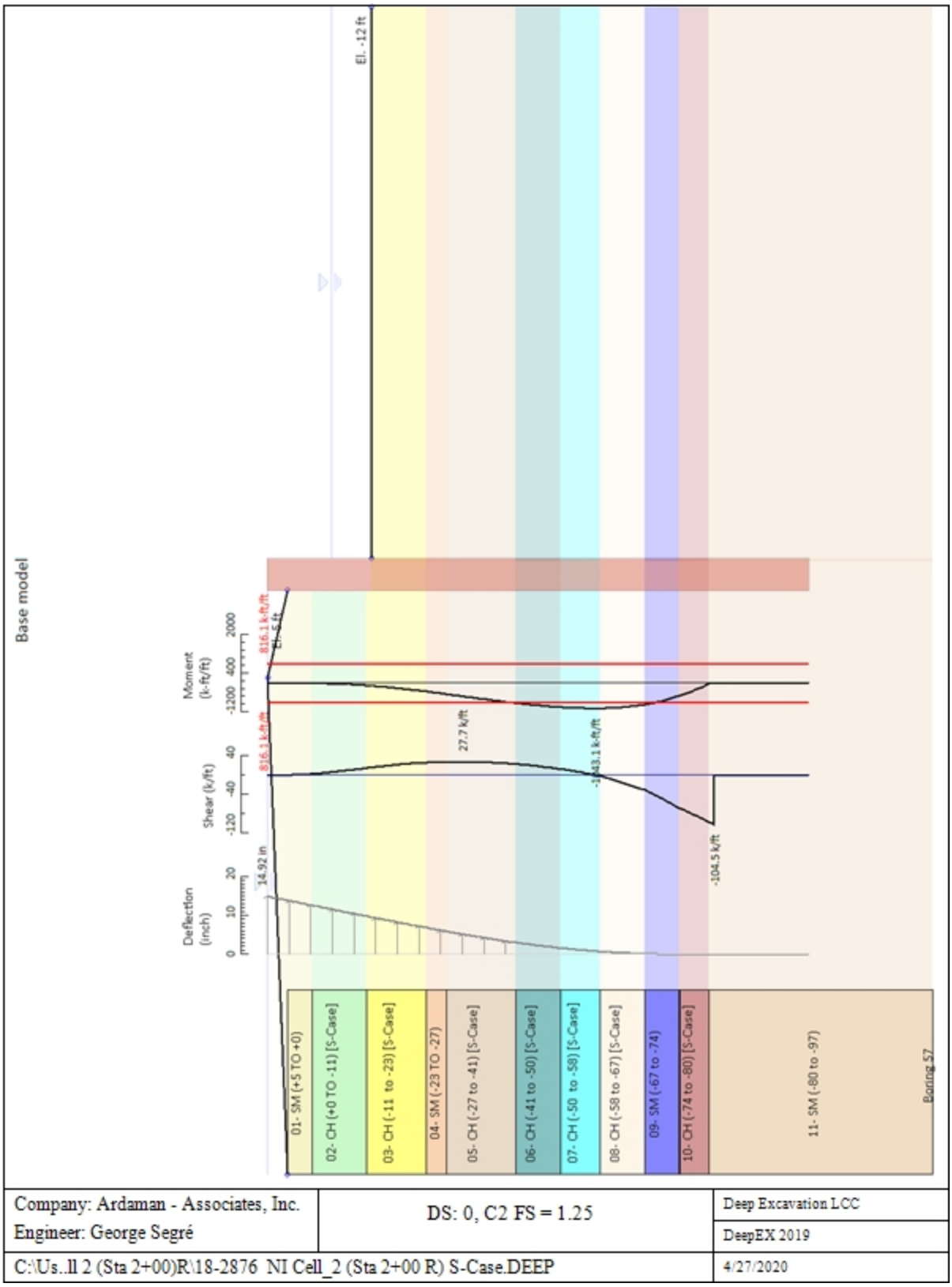

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



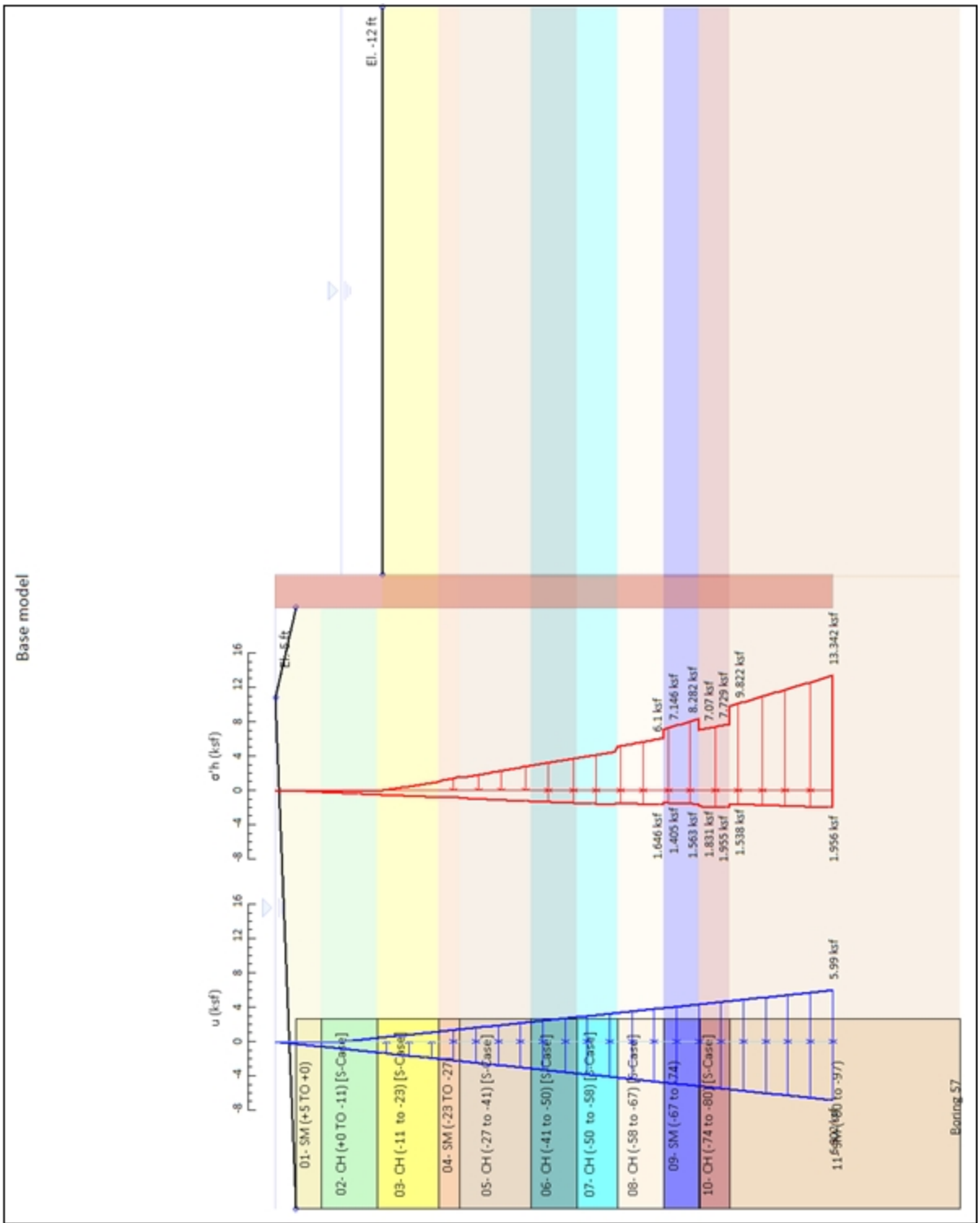

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



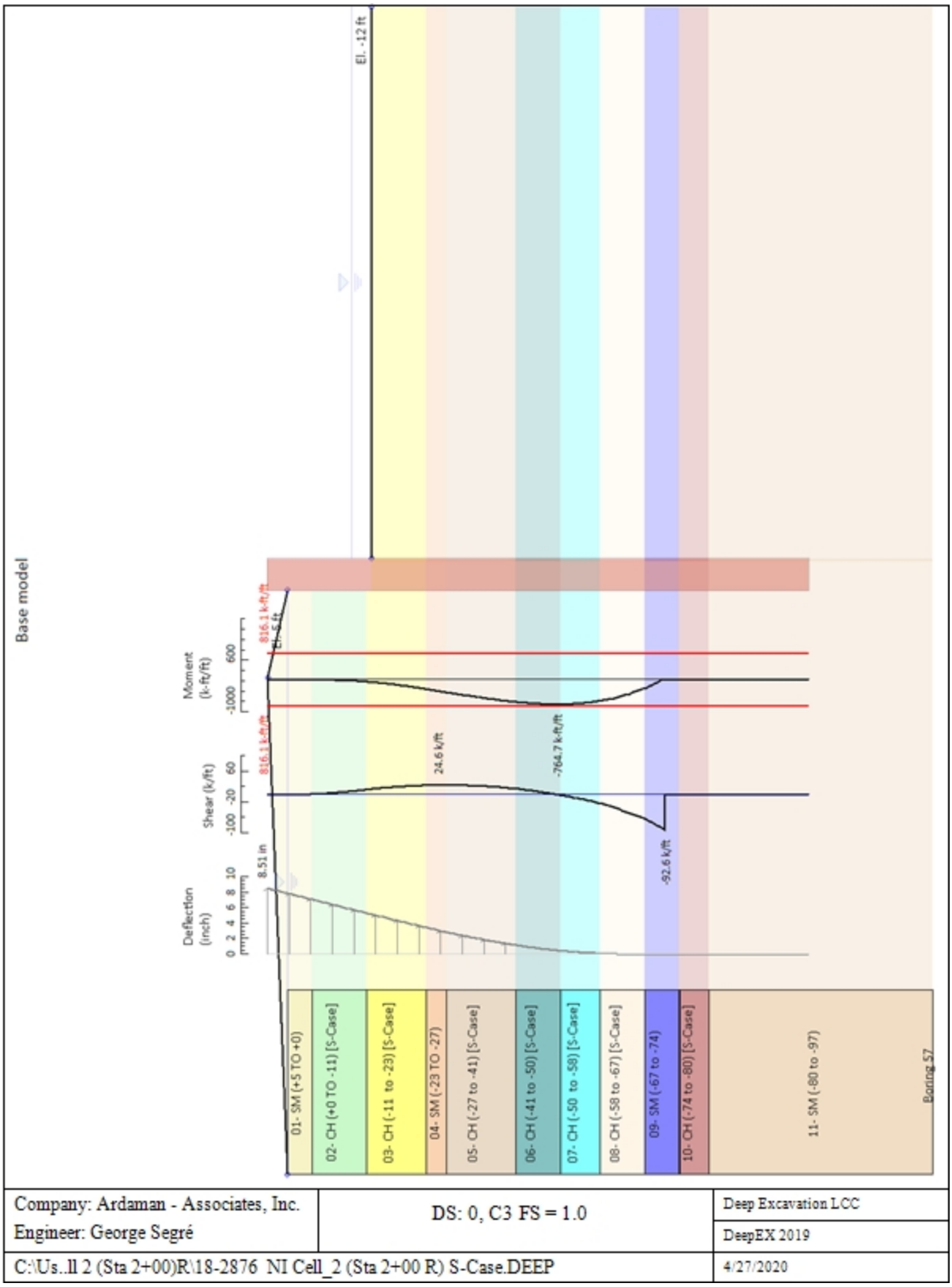

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |

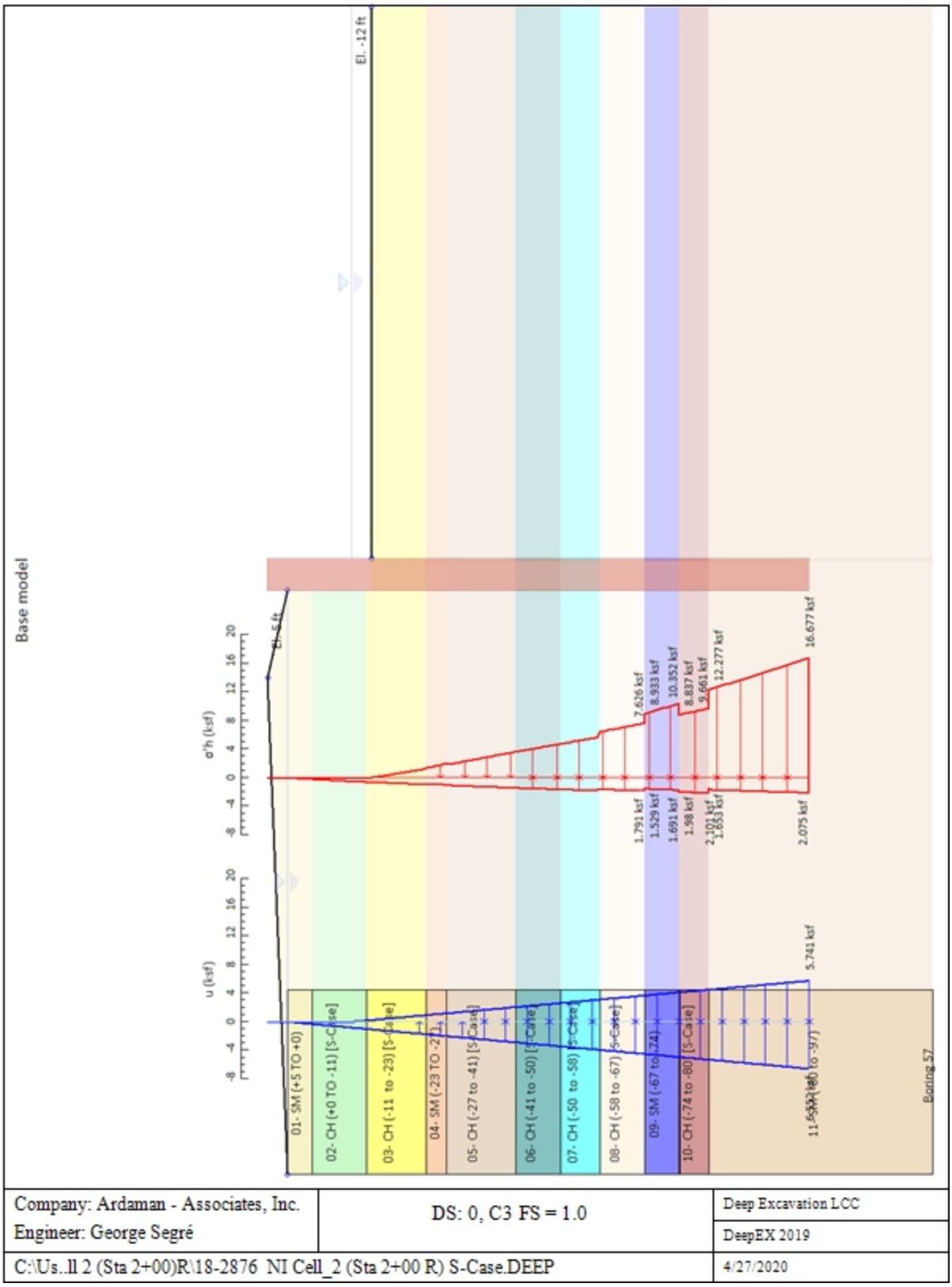



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |

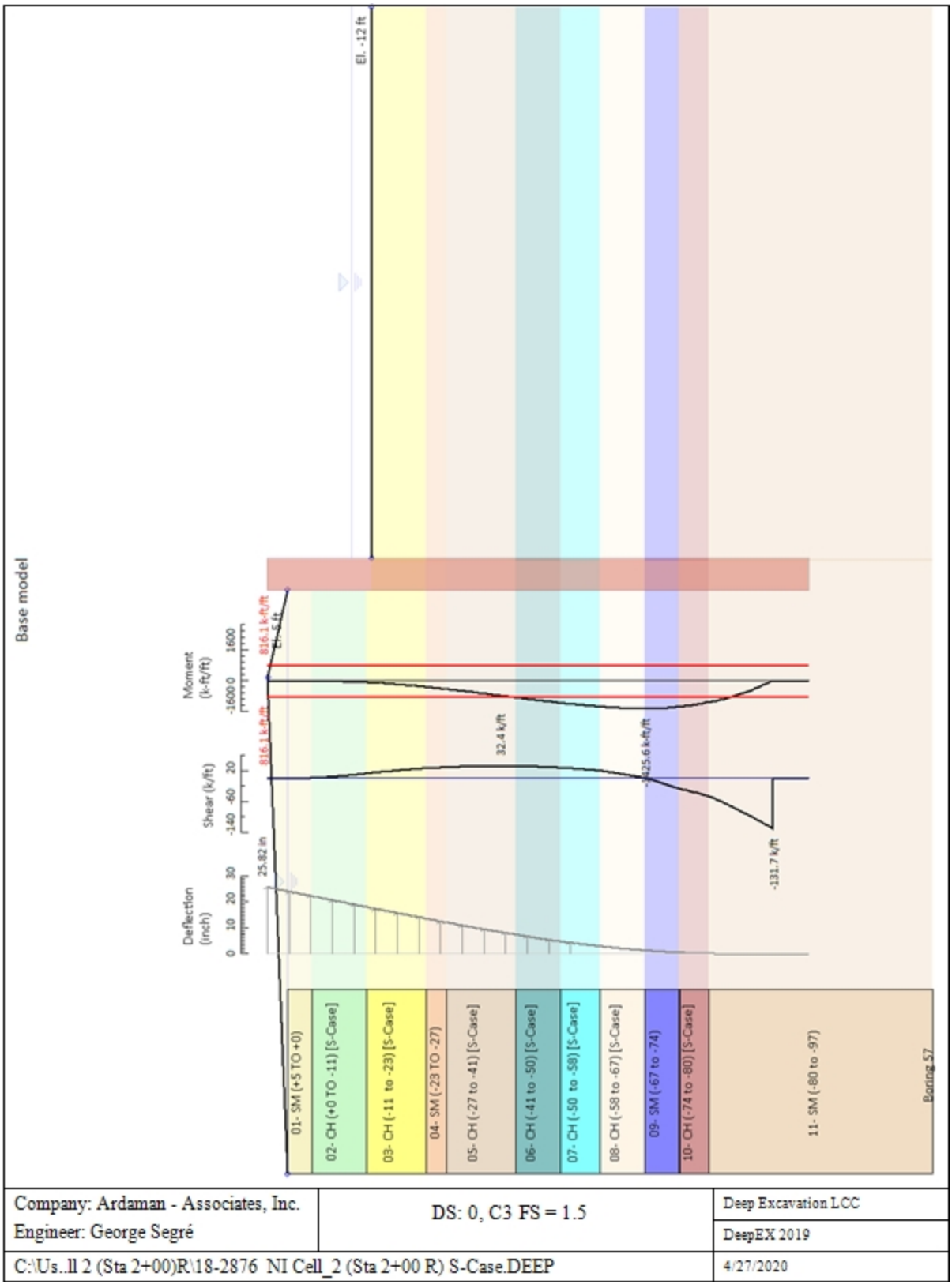



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |

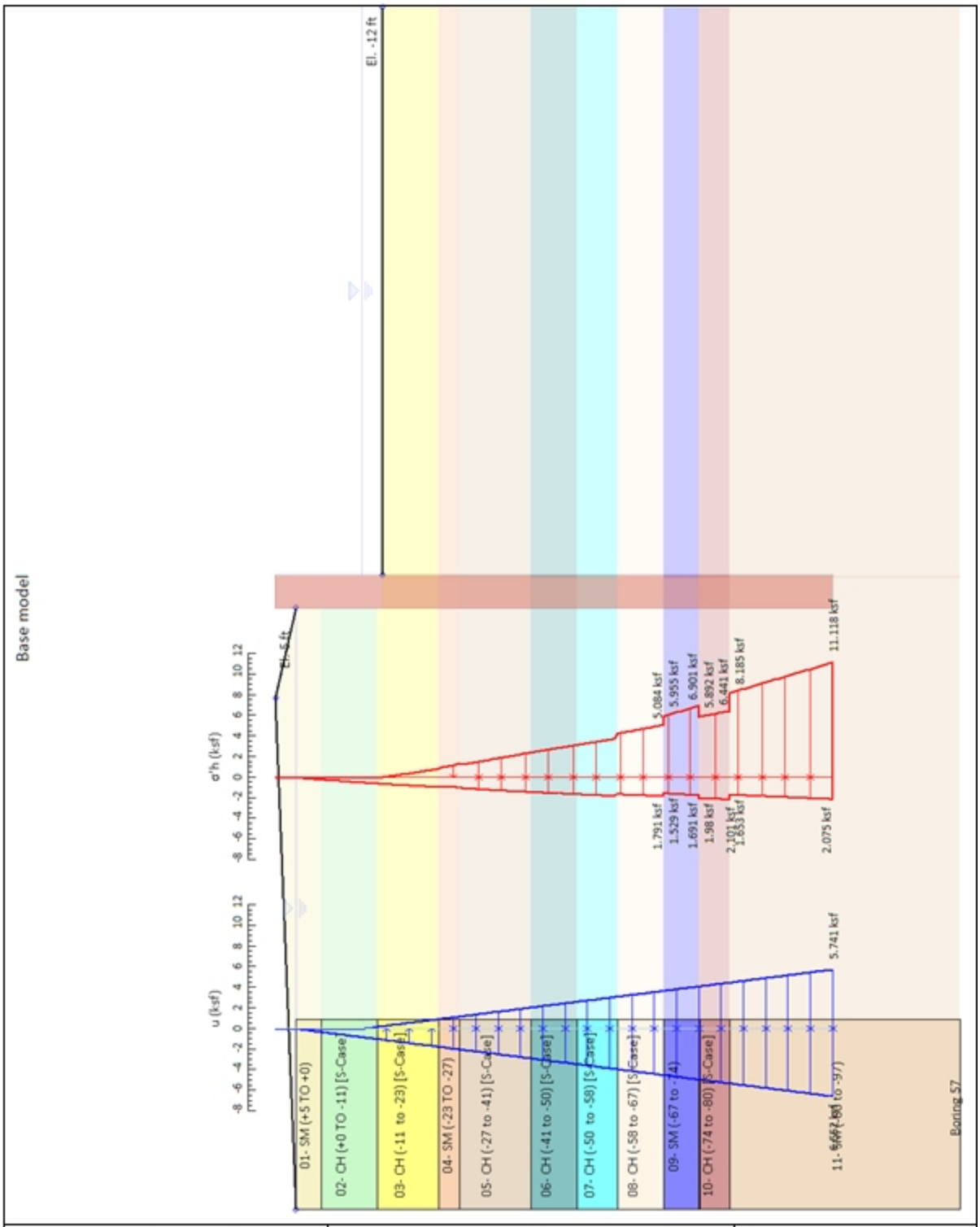

Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
El. -6 ft
Shear (k/ft)
-100
-20
60
816.1 k-ft/ft
24.6 k/ft
-764.7 k-ft/ft
-92.6 k/ft
Deflection (inch)
0 2 4 6 8 10
8.51 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP
4/27/2020



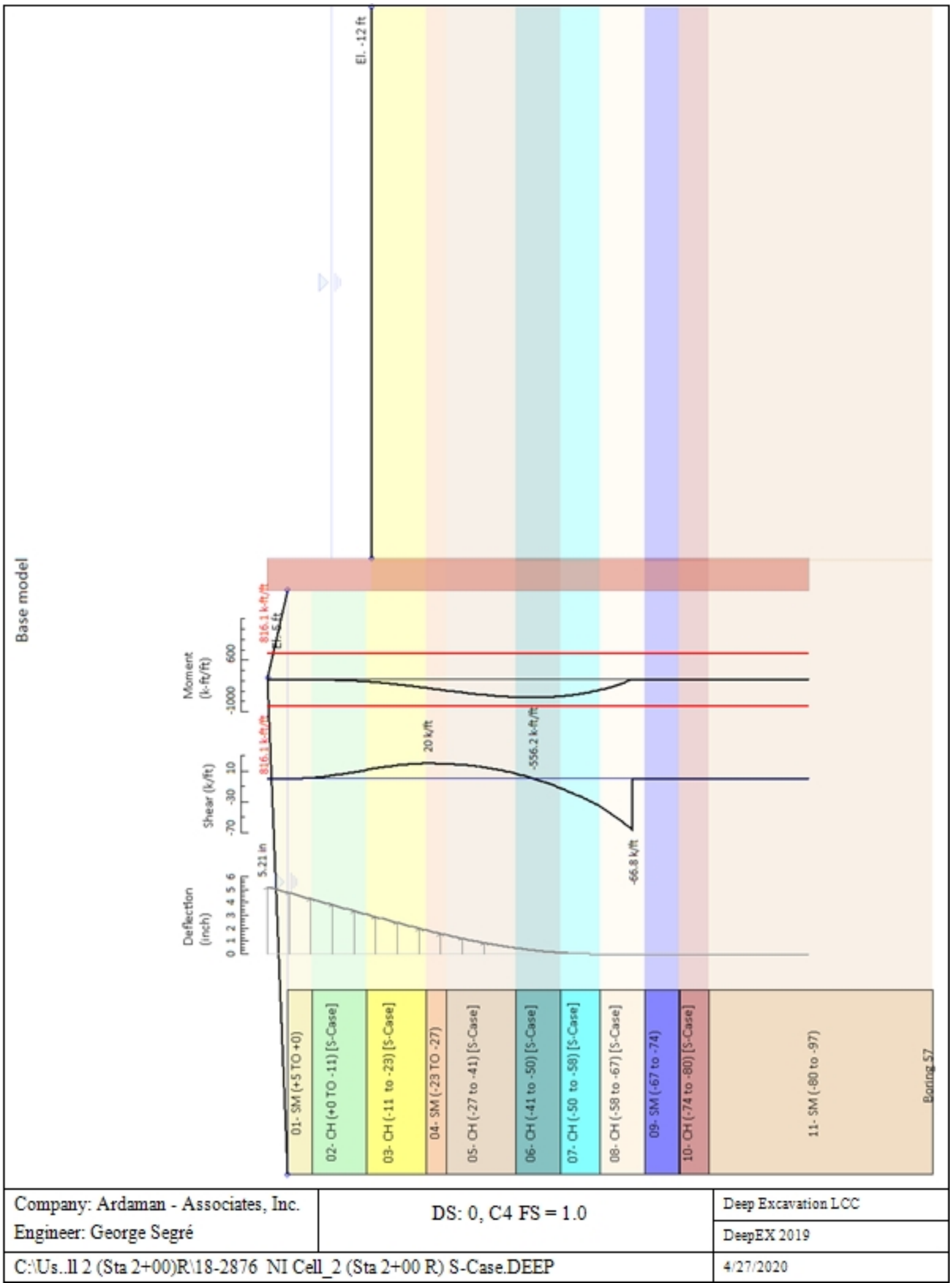

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



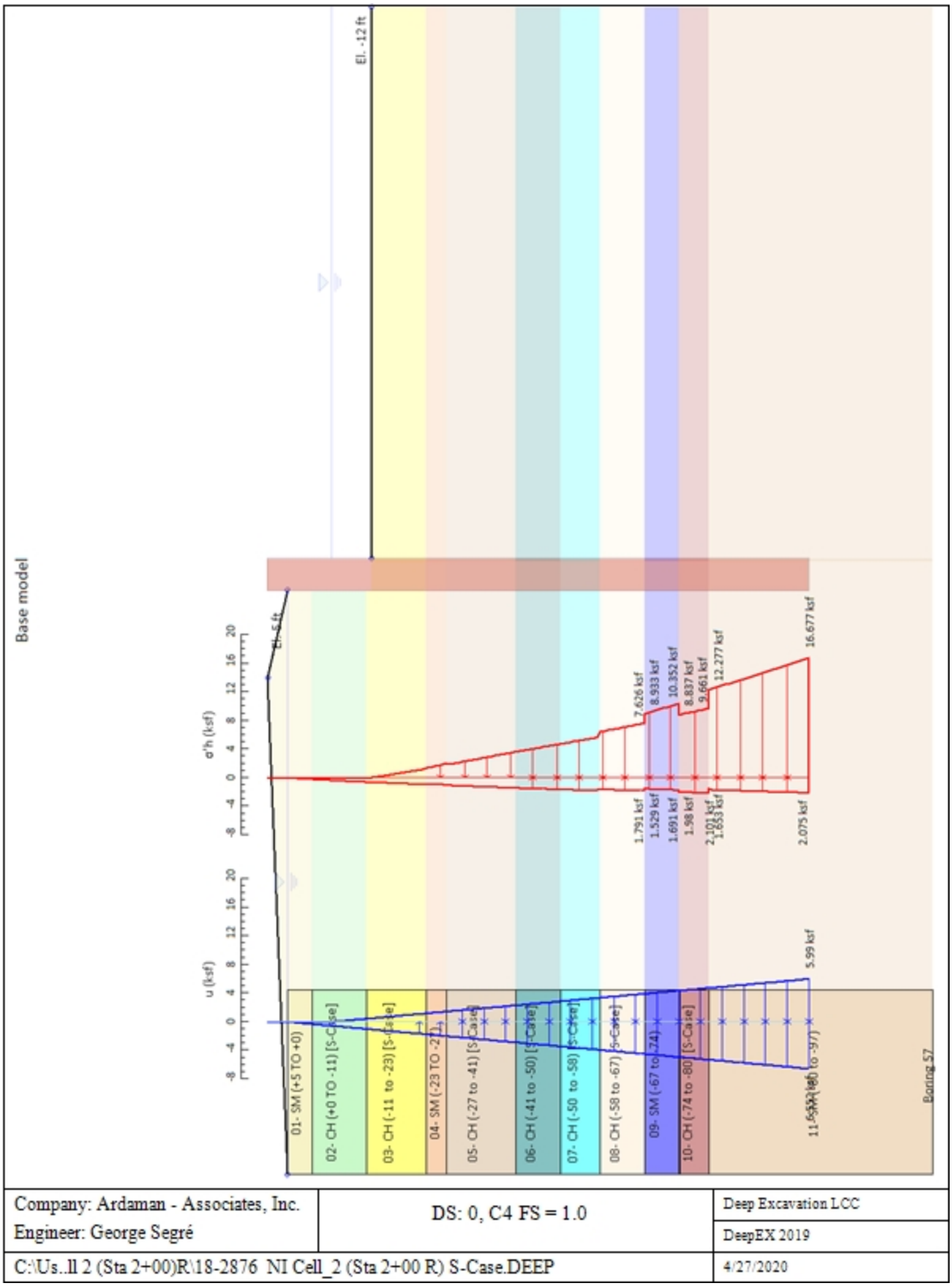

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



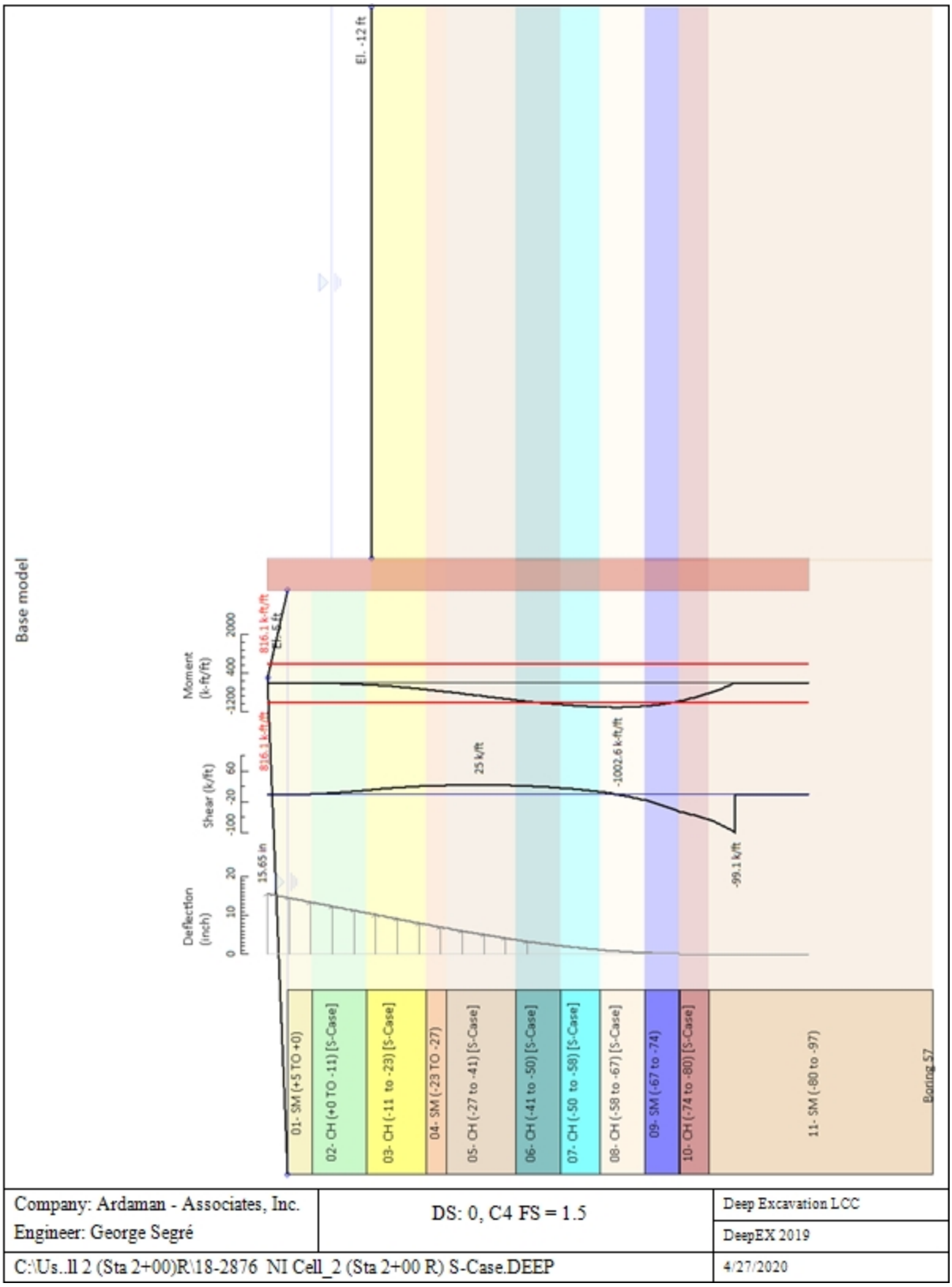

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |



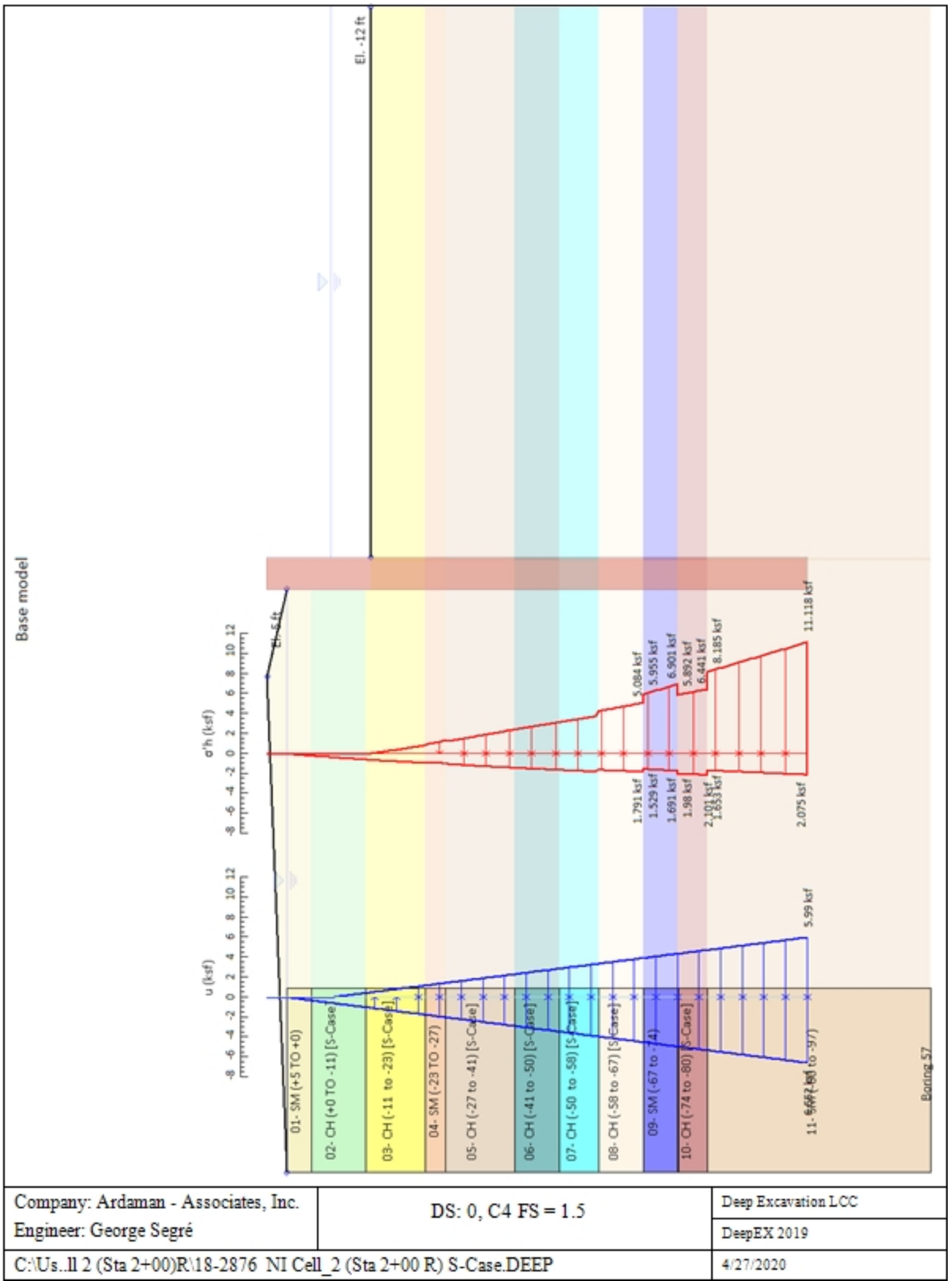

Attachment Figure C.2-303




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP | | 4/27/2020 |


Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
5.084 ksf
5.955 ksf
6.901 ksf
5.892 ksf
6.441 ksf
8.185 ksf
11.118 ksf
1.791 ksf
1.529 ksf
1.691 ksf
1.98 ksf
2.101 ksf
1.853 ksf
2.075 ksf
5.99 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP
4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 3+50 Interior Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -58.58 ft., NAVD88

Length of Sheetting = 67.58 ft.

Use = 110.0 ft.

Design Tip Elev. = -101.0 ft., NAVD88

Design Length of Sheeting = 110.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -29.71 | 111.14 | 28.86 | 0.28 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -33.66 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -26.94 | 95.56 | 17.00 | 0.20 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -30.90 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -- | -- | -- | -- |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -29.71 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -- | -- | -- | -- |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -24.97 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -49.86 | 309.70 | 43.21 | 1.84 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -58.58 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -44.41 | 231.28 | 35.70 | 1.13 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -51.49 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -39.51 | 139.05 | 24.84 | 0.54 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -53.13 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -34.06 | 93.37 | 19.12 | 0.28 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -43.86 | -- | -- | -- |
| | | | | | | Governing Value: | -58.58 | 309.70 | 43.21 | 1.84 |

*Note: For Q-Case 3/4 (FS = 1.0), the program could not converge on a solution

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:26:03 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 0 | 0 | 500 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 0 | 0 | 1000 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 0 | 0 | 3300 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 0 | 0 | 1400 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 0 | 0 | 1850 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 0 | 0 | 1900 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 0 | 0 | 2000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | 0 | 0 | 0.95 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

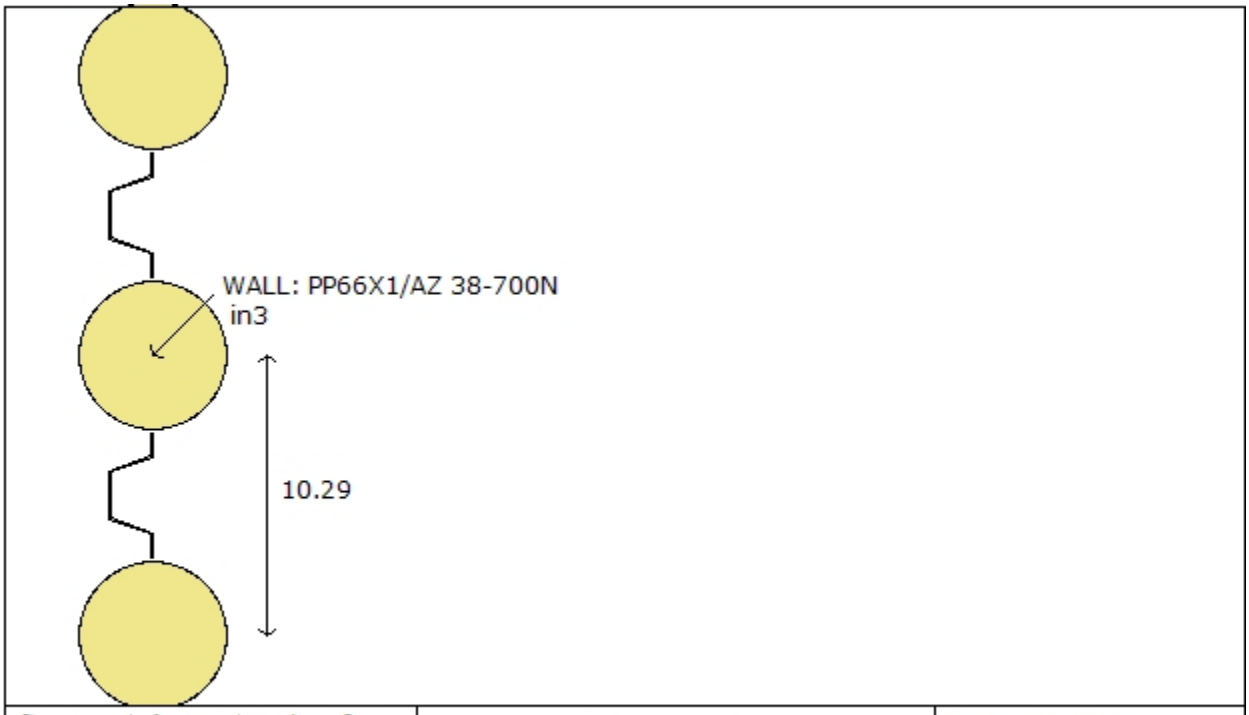
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 1 |
| -11 | 03- CH (-11 to | 1 | 0.95 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 1 |
| -41 | 06- CH (-41 to | 1 | 1 |
| -50 | 07- CH (-50 to | 1 | 1 |
| -58 | 08- CH (-58 to | 1 | 1 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 1 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1.05 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.111 | 2.111 | 2.284 |
| Stage 1 | Simple span | N/A | 1.6 | 1.785 | 1.785 | 1.948 |
| Stage 2 | Simple span | N/A | 1.6 | 2.21 | 2.21 | 2.364 |
| Stage 3 | Simple span | N/A | 1.6 | 1.883 | 1.883 | 2.028 |
| Stage 4 | Simple span | N/A | 1.6 | 2.373 | 2.373 | 2.44 |
| Stage 5 | Simple span | N/A | 1.6 | 1.828 | 1.828 | 1.909 |
| Stage 6 | Simple span | N/A | 1.6 | 2.198 | 2.198 | 2.246 |
| Stage 7 | Simple span | N/A | 1.6 | 1.944 | 1.944 | 1.998 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

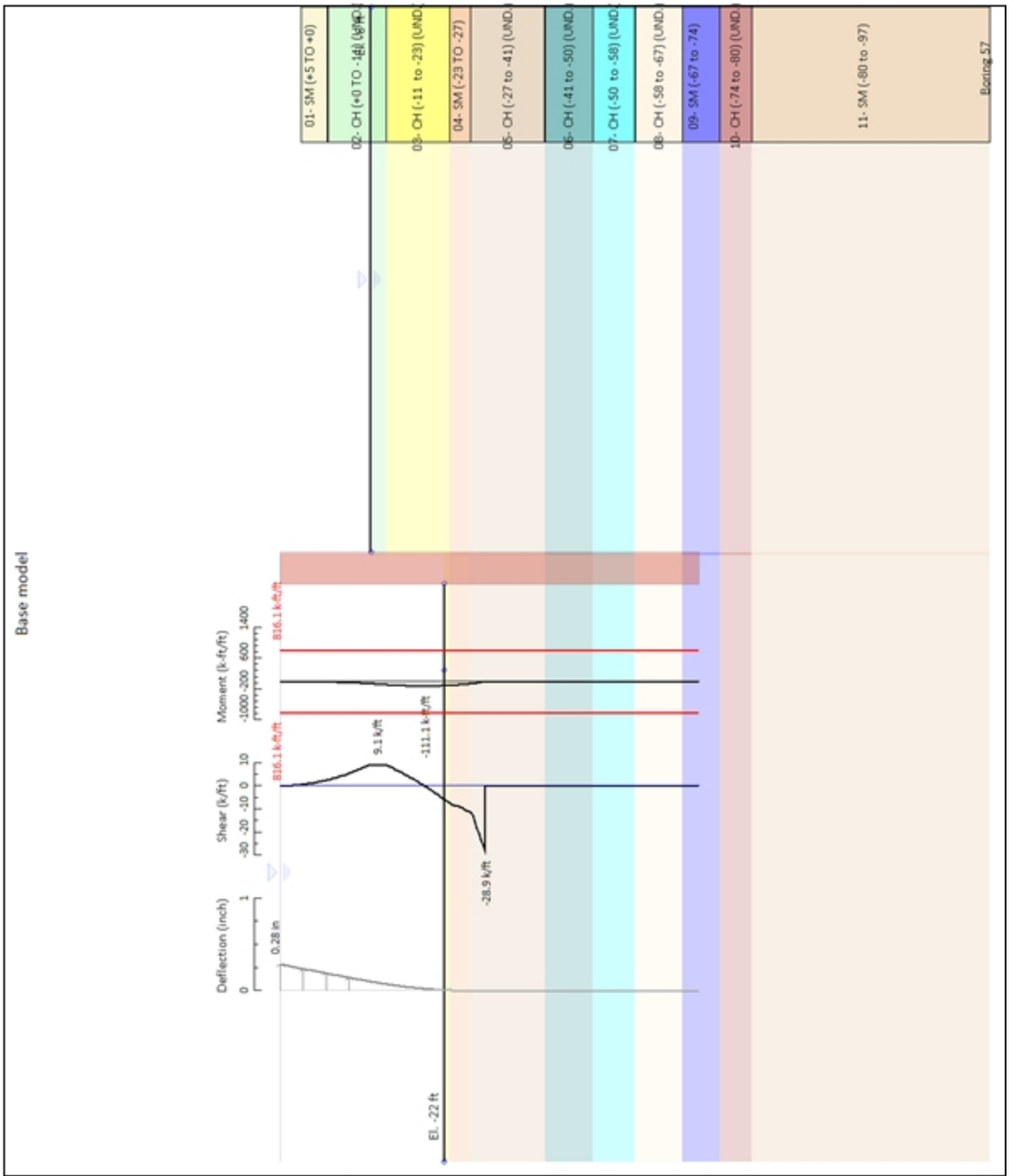
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

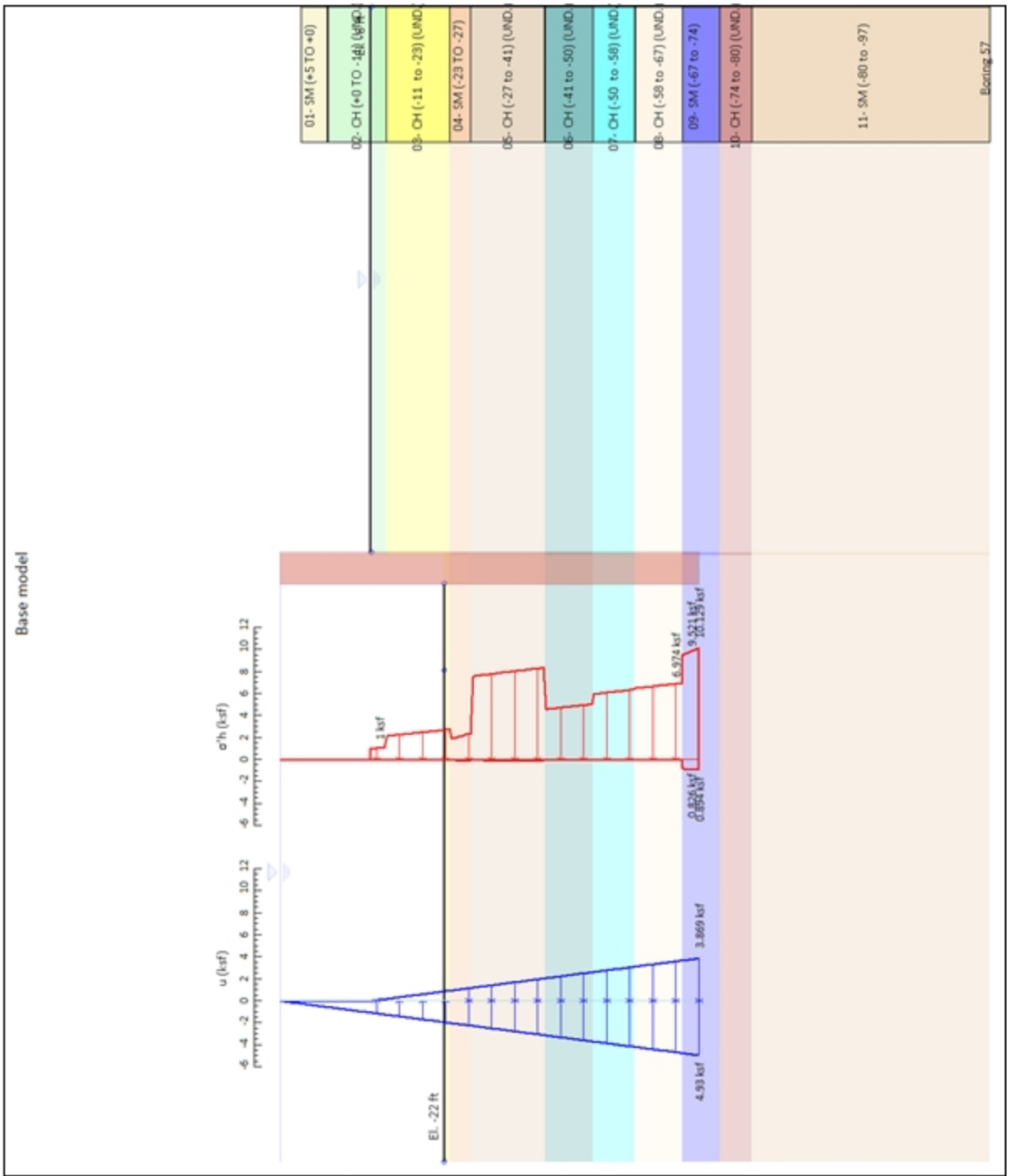
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

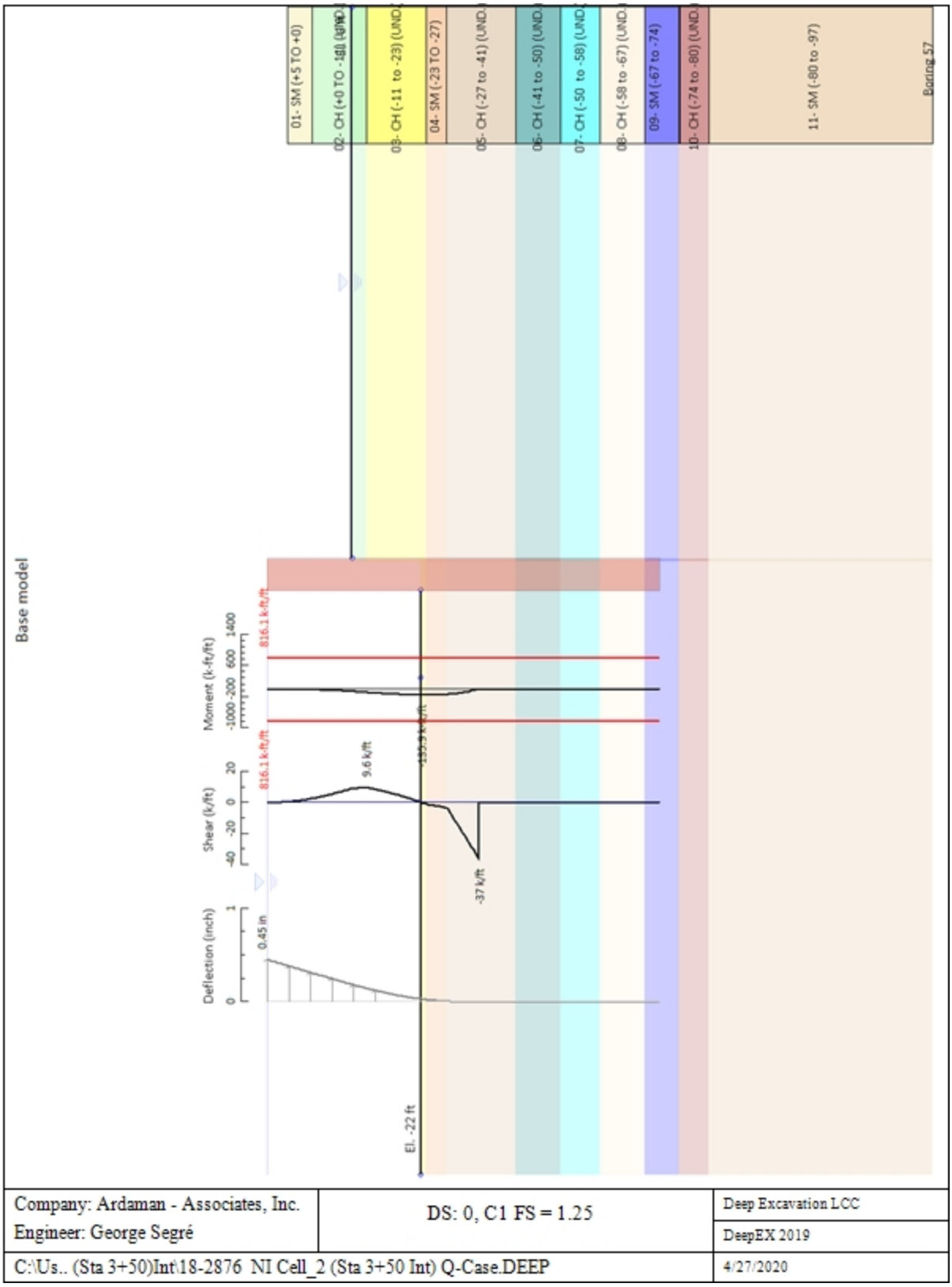
## EXCAVATION STAGES SKETCHES

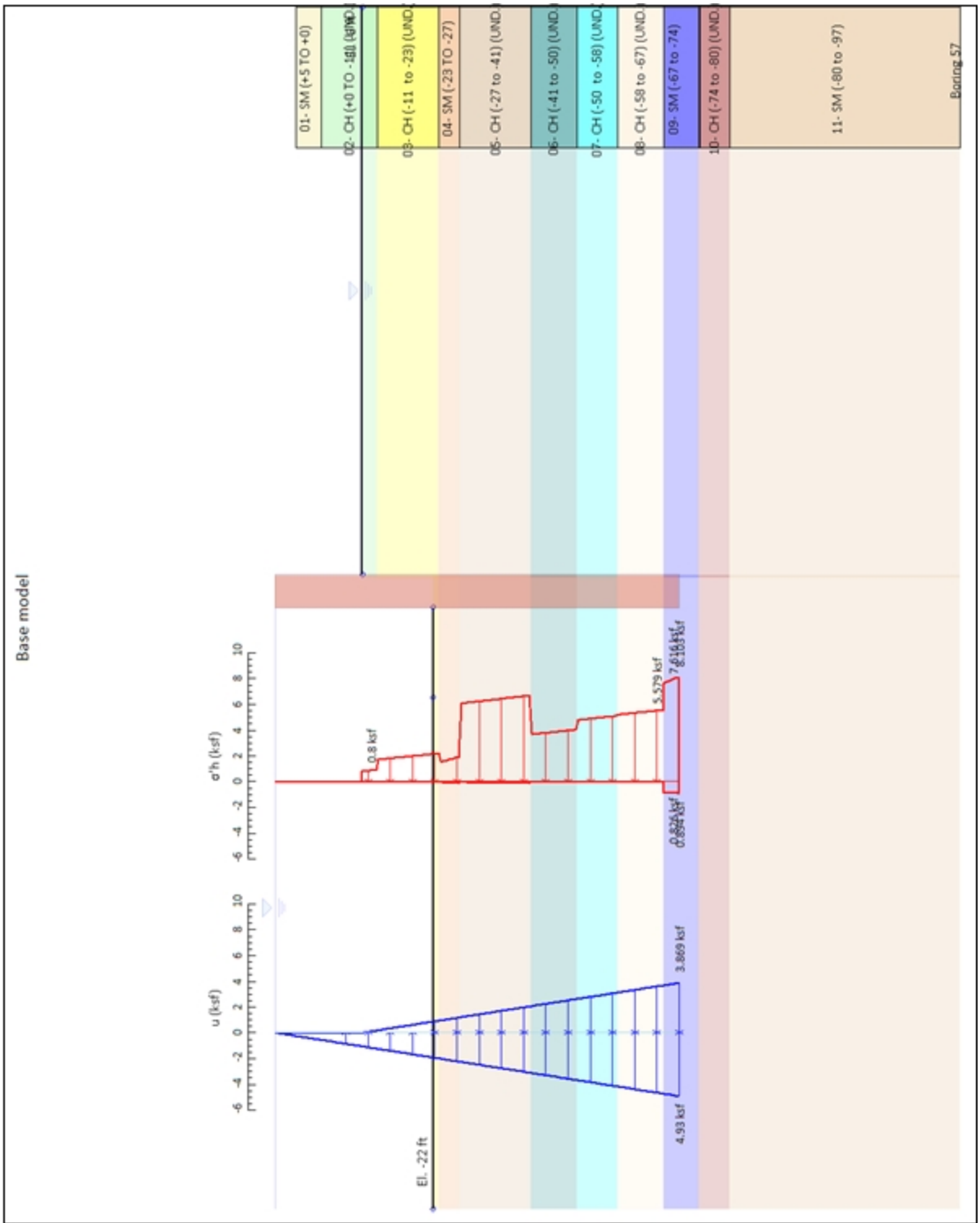
A sequence of figures for each excavation stage is reported

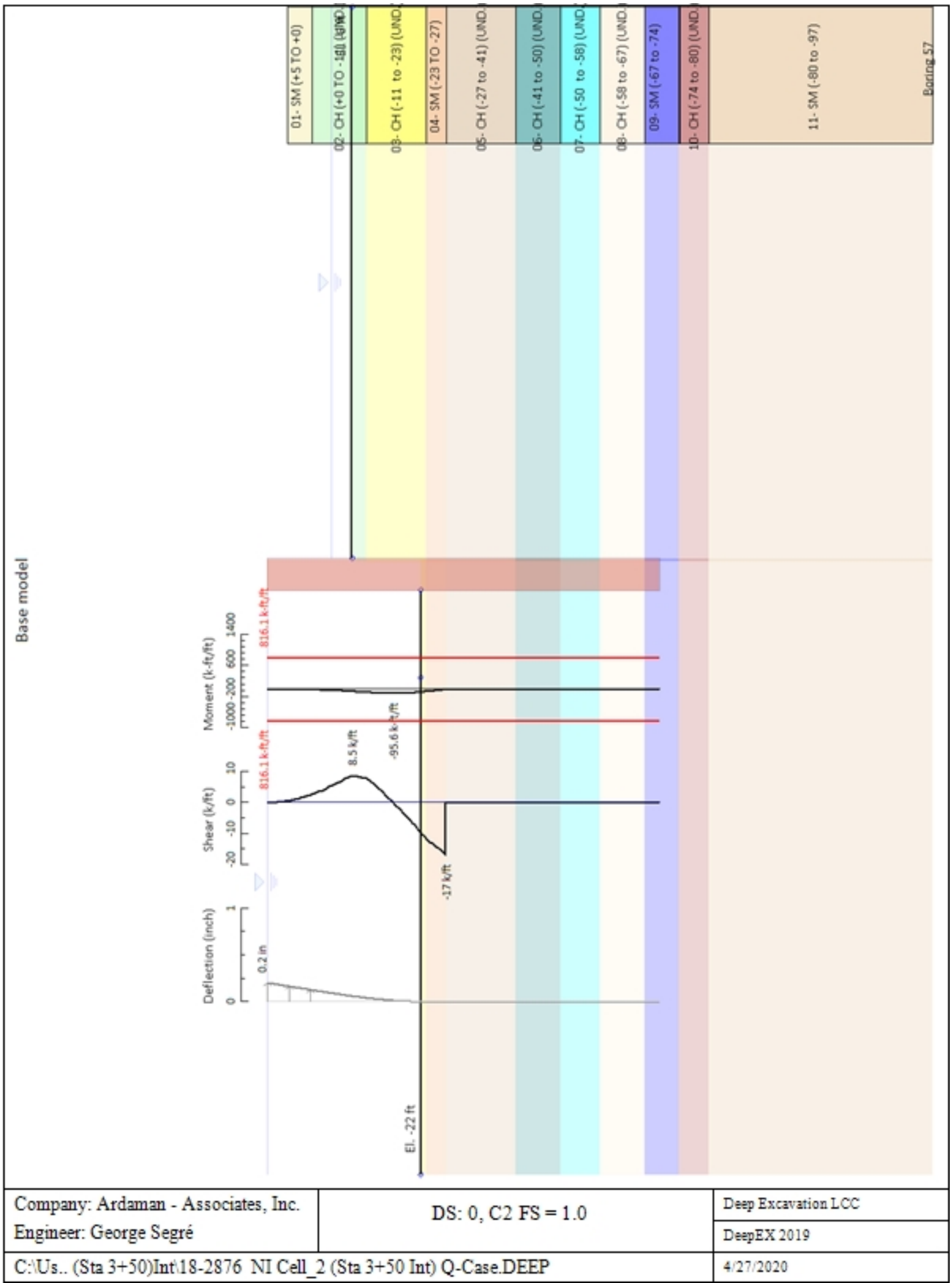


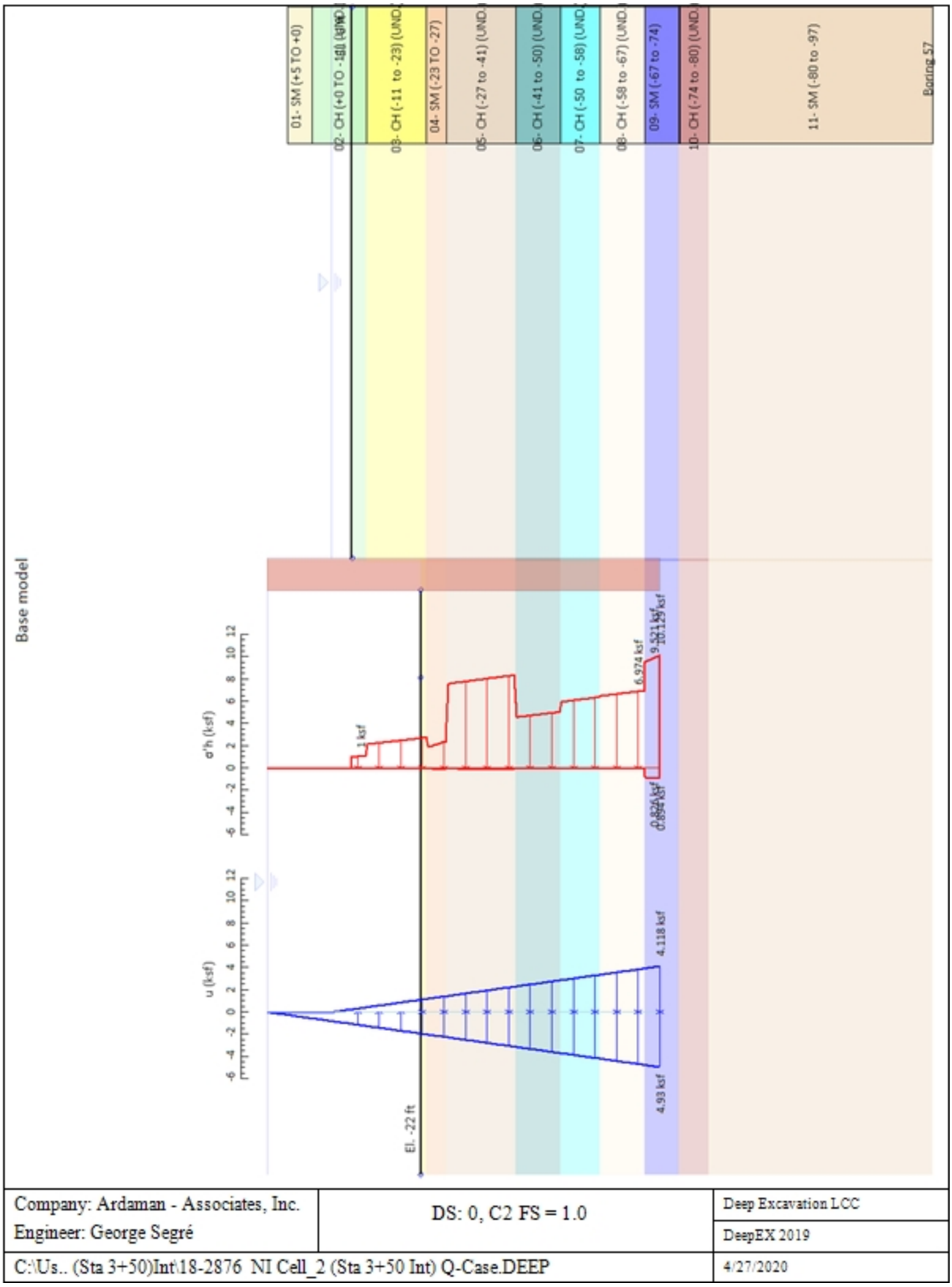

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP | | 4/27/2020 |

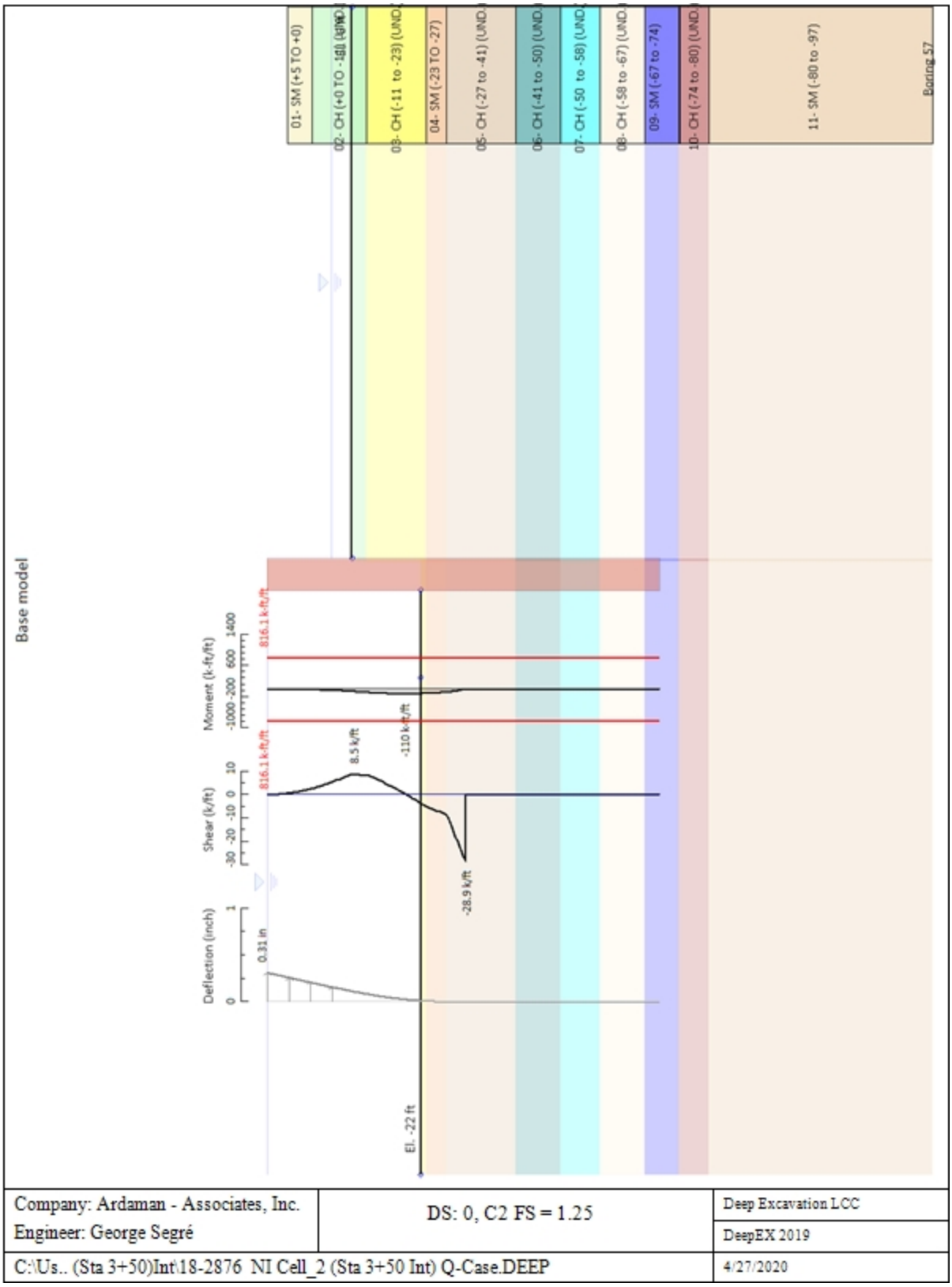

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
1 ksf
6.974 ksf
3.869 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

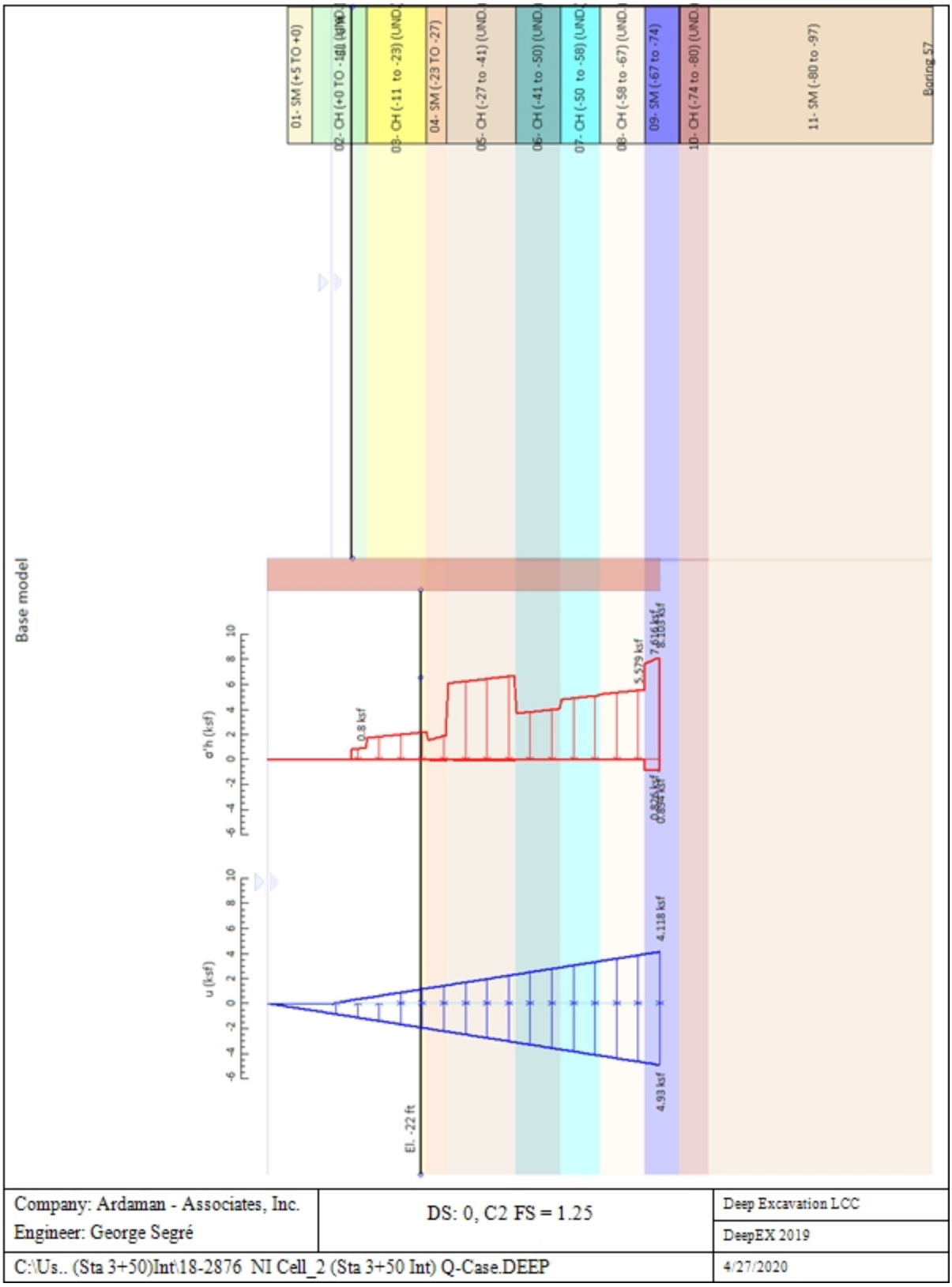

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-135.9 k-ft/ft
Shear (k/ft)
-40 -20 0 20
9.6 k/ft
-37 k/ft
Deflection (inch)
0 1
0.45 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

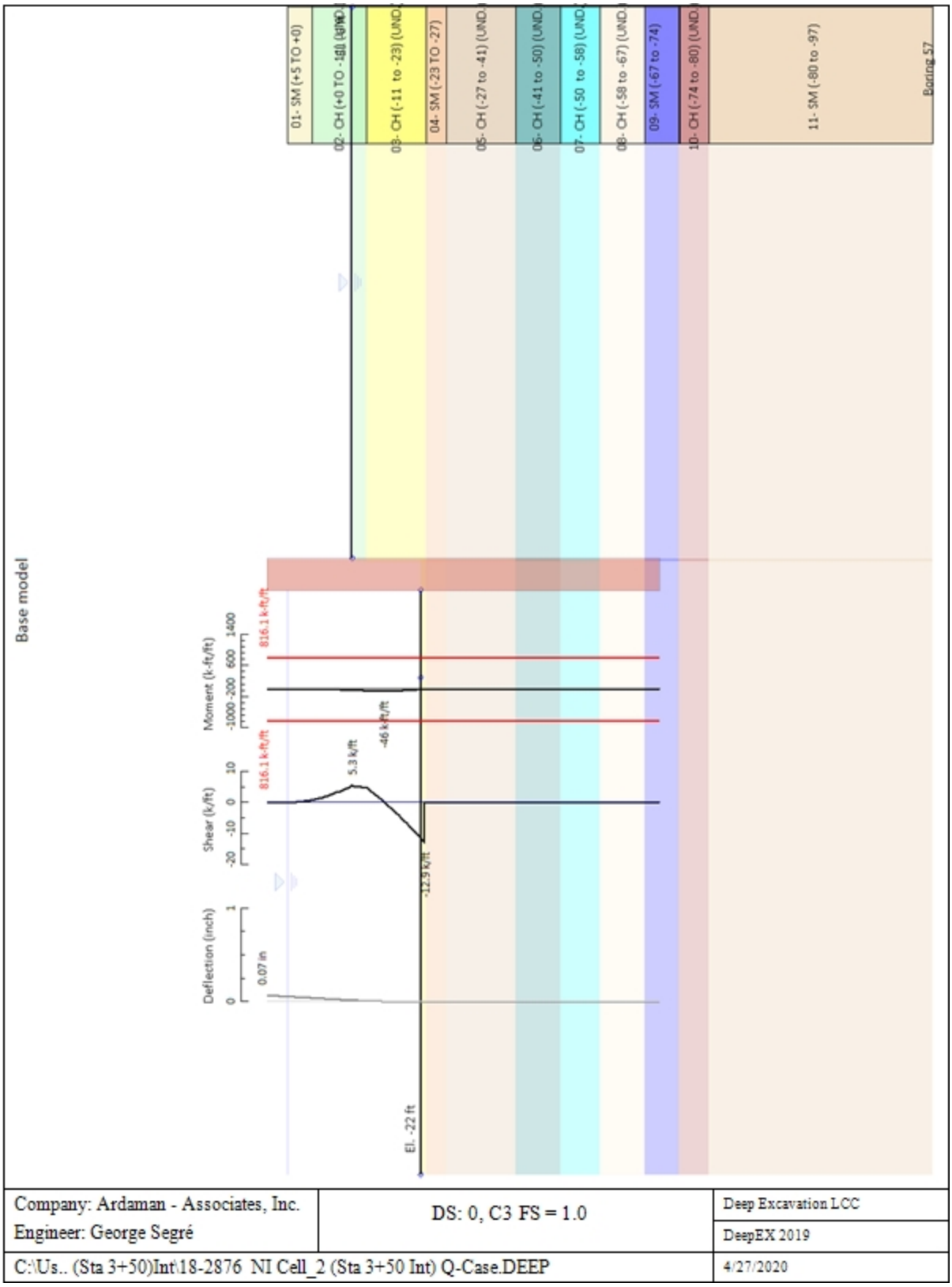

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -18) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.8 ksf
5.579 ksf
7.616 ksf
3.869 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

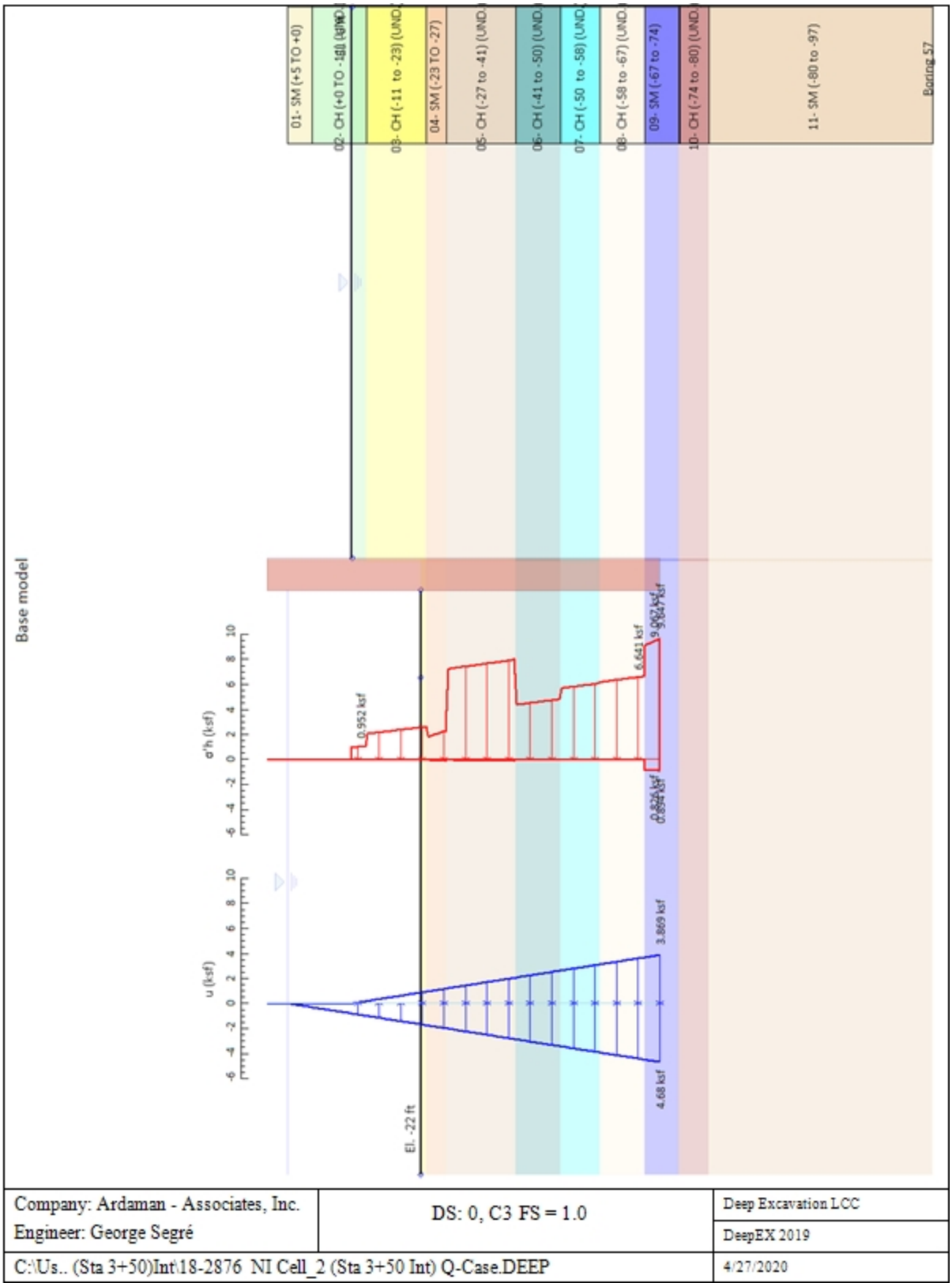

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-95.6 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
8.5 k/ft
-17 k/ft
Deflection (inch)
0 1
0.2 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
1 ksf
6.974 ksf
4.118 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

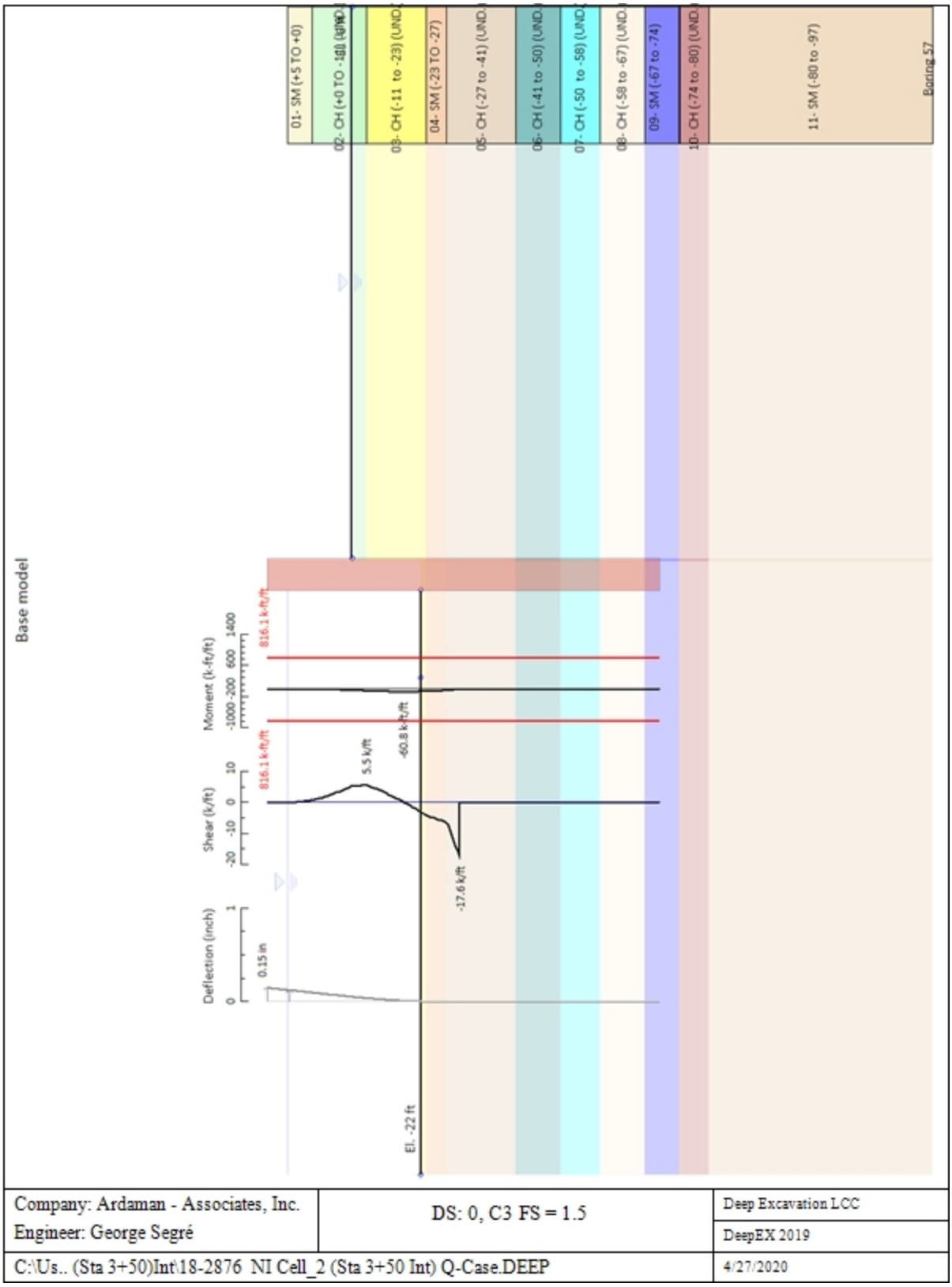

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-110 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
816.1 k-ft/ft
8.5 k/ft
-28.9 k/ft
Deflection (inch)
0 1
0.31 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

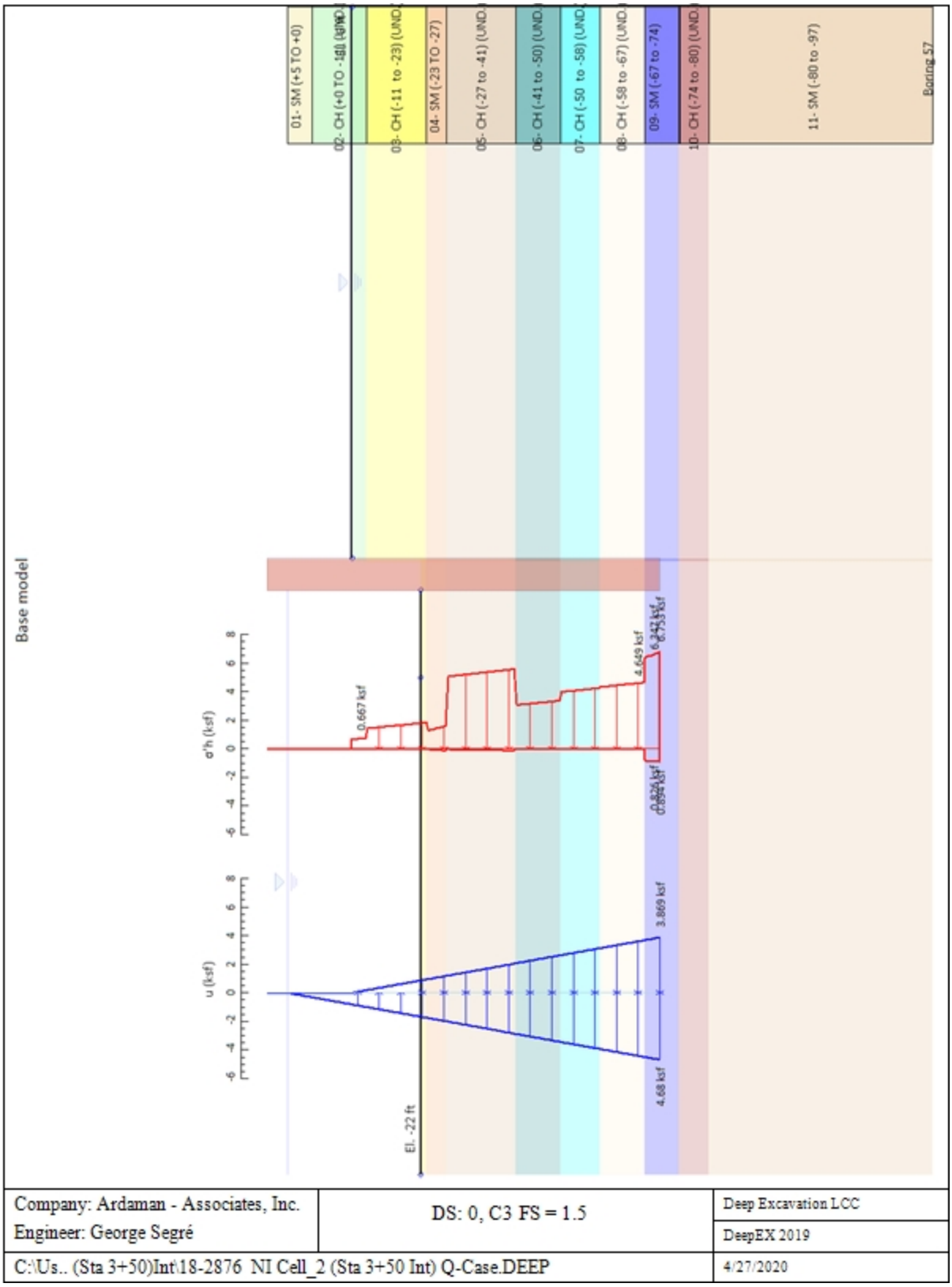

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.8 ksf
5.579 ksf
4.118 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

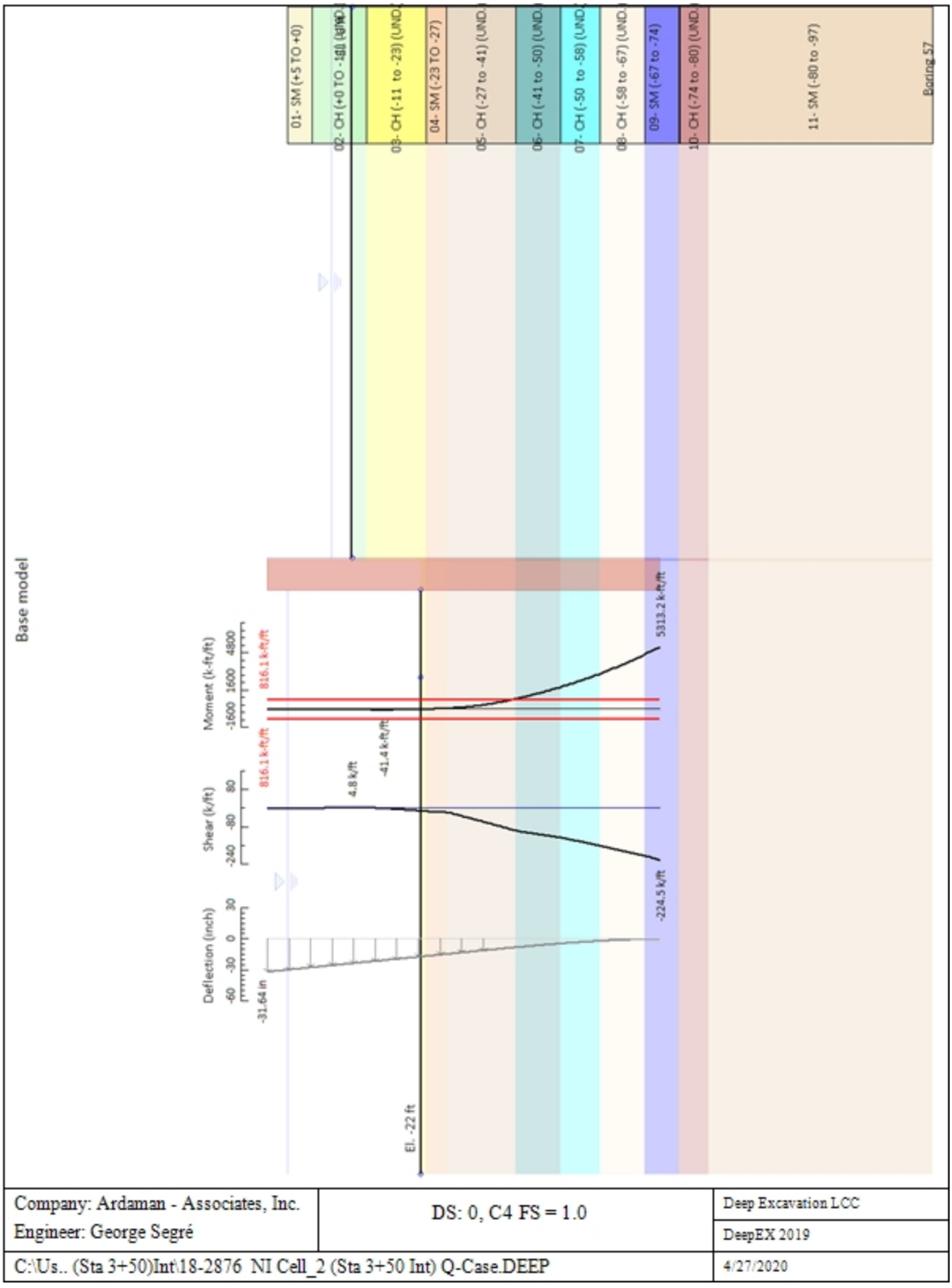

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-46 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
5.3 k/ft
-12.9 k/ft
Deflection (inch)
0 1
0.07 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

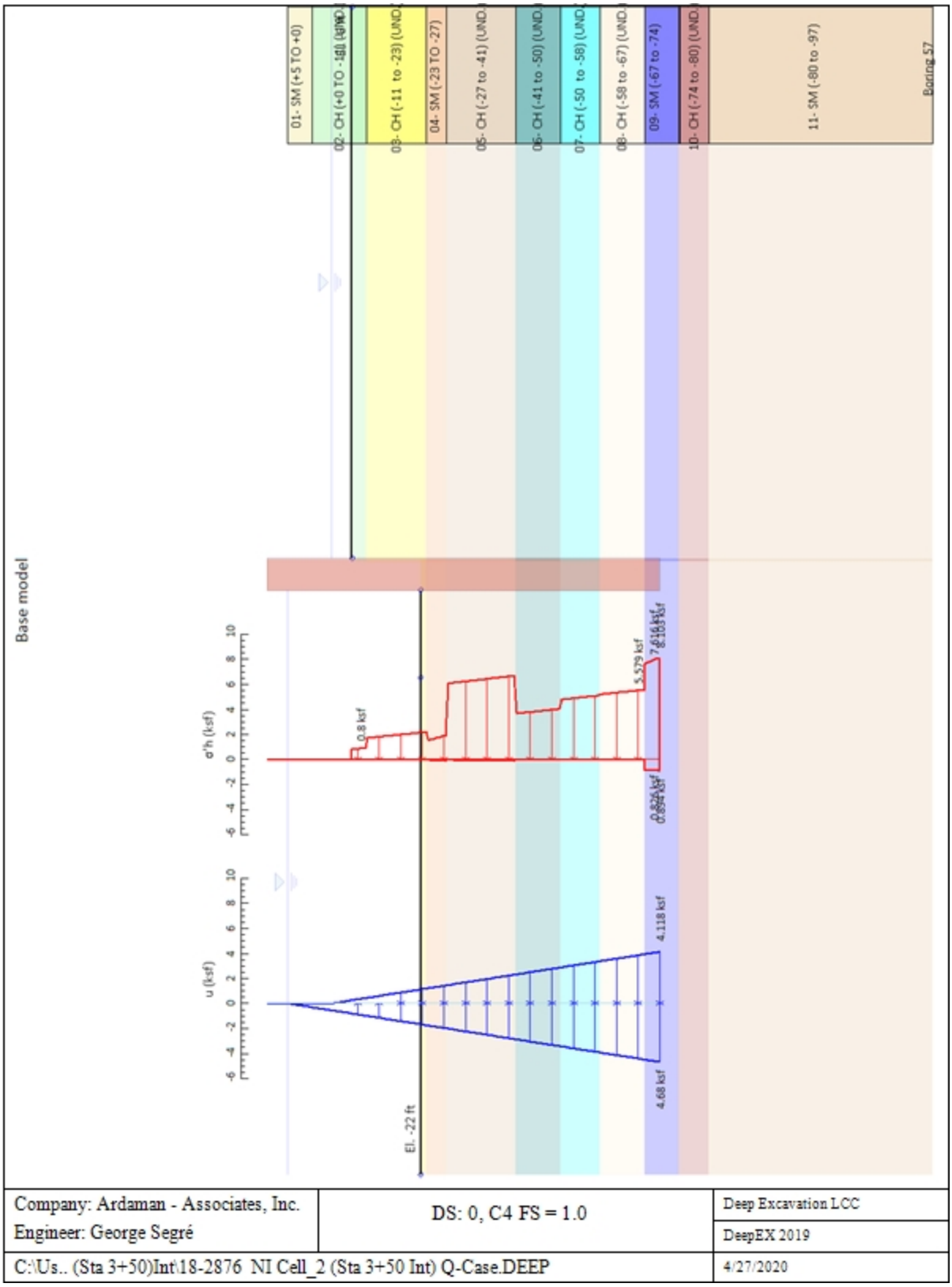


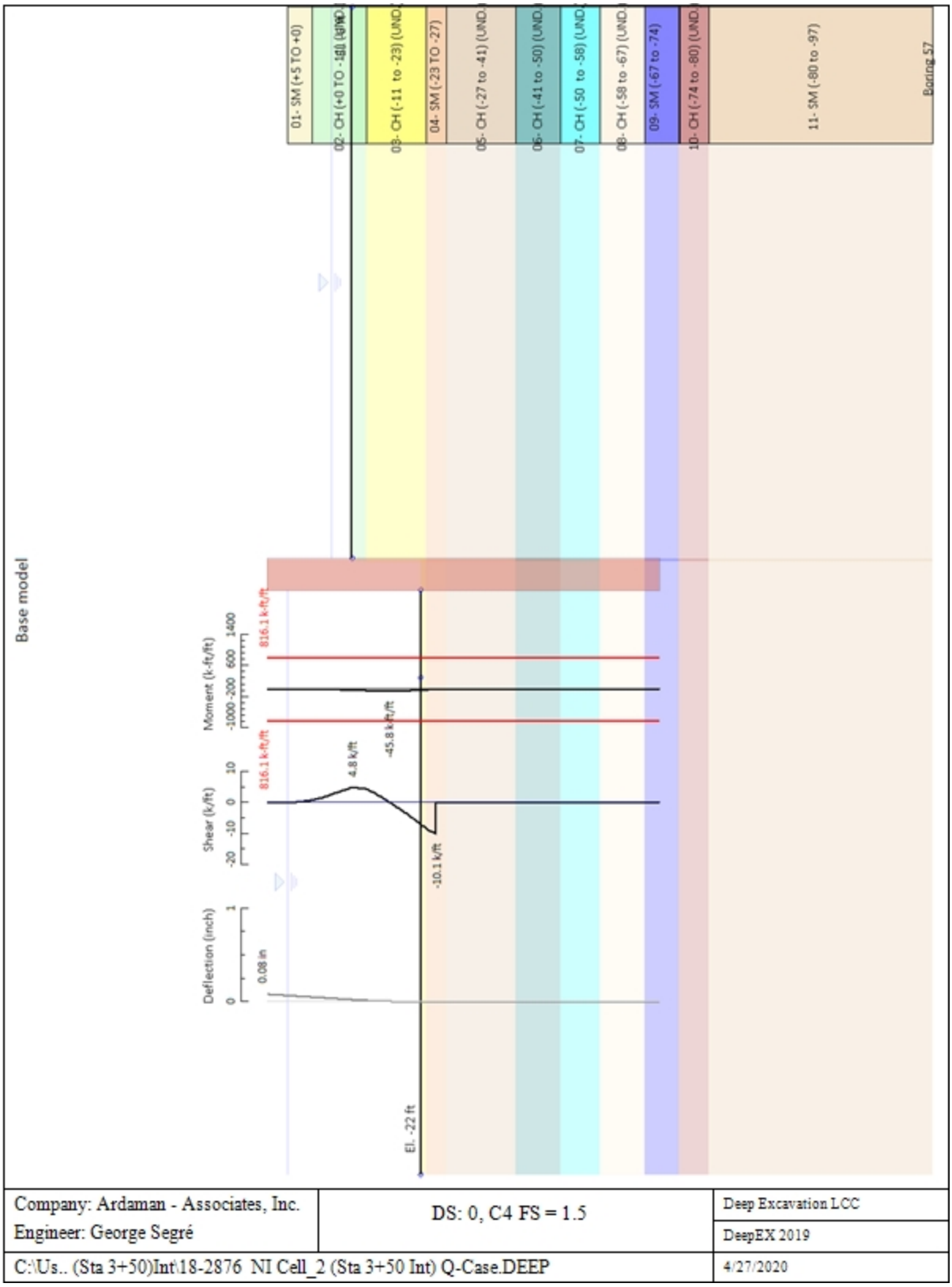

Attachment Figure C.2-326

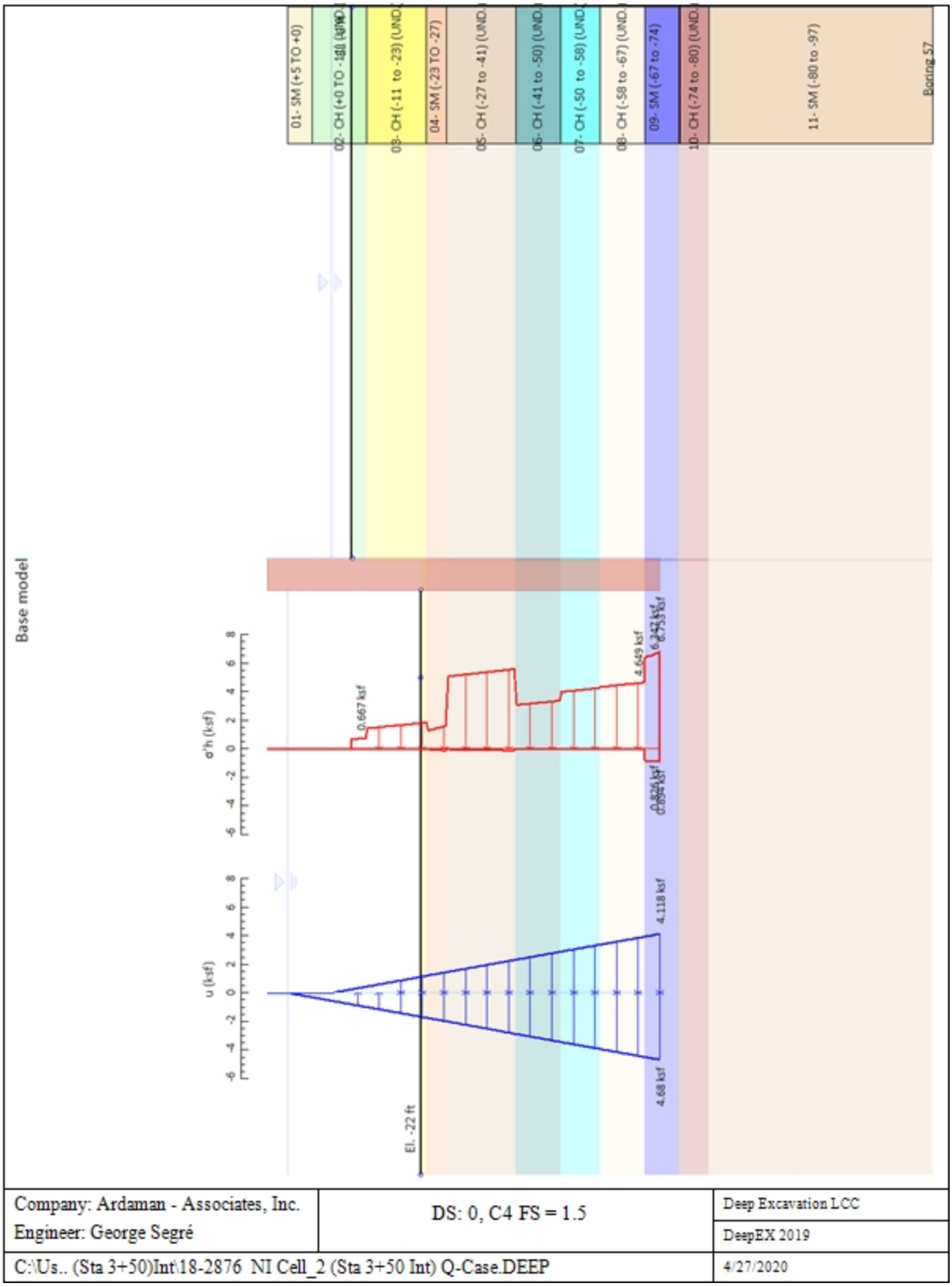

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-60.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
5.5 k/ft
-17.6 k/ft
Deflection (inch)
0 1
0.15 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -18) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.667 ksf
4.649 ksf
3.869 ksf
4.68 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1600 1600 4800
816.1 k-ft/ft
816.1 k-ft/ft
-41.4 k-ft/ft
5313.2 k-ft/ft
Shear (k/ft)
-240 -80 80
4.8 k/ft
-224.5 k/ft
Deflection (inch)
-60 -30 0 30
-31.64 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.8 ksf
5.579 ksf
4.118 ksf
4.68 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-45.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
4.8 k/ft
-10.1 k/ft
Deflection (inch)
0 1
0.08 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.667 ksf
4.649 ksf
4.118 ksf
4.68 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:29:47 PM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- SM (+5 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 300 | 3 | 0.41 | 2.46 | N/A | N/A | True | EXP | |
| 02- CH (+0 TO | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- CH (-11 t | 112 | 112 | 23 | 0 | N/A | N/A | N/A | 150 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 04- SM (-23 T | 120 | 120 | 25 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.41 | 2.46 | N/A | N/A | True | Linear | |
| 05- CH (-27 to | 120 | 120 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- CH (-41 to | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 07- CH (-50 t | 116 | 116 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 08- CH (-58 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 09- SM (-67 t | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- CH (-74 to | 116 | 116 | 26 | 0 | N/A | N/A | N/A | 300 | 3 | 0.39 | 2.56 | N/A | N/A | True | Linear | |
| 11- SM (-80 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- SM (+5 T | 0.4 | - | - | 0.577 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+0 TO | 0.4 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-11 t | 0.4 | - | - | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- SM (-23 T | 0.4 | - | - | 0.577 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-27 to | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-41 to | 0.35 | - | - | 0.609 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-50 t | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-58 to | 0.3 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SM (-67 t | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-74 to | 0.35 | - | - | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SM (-80 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

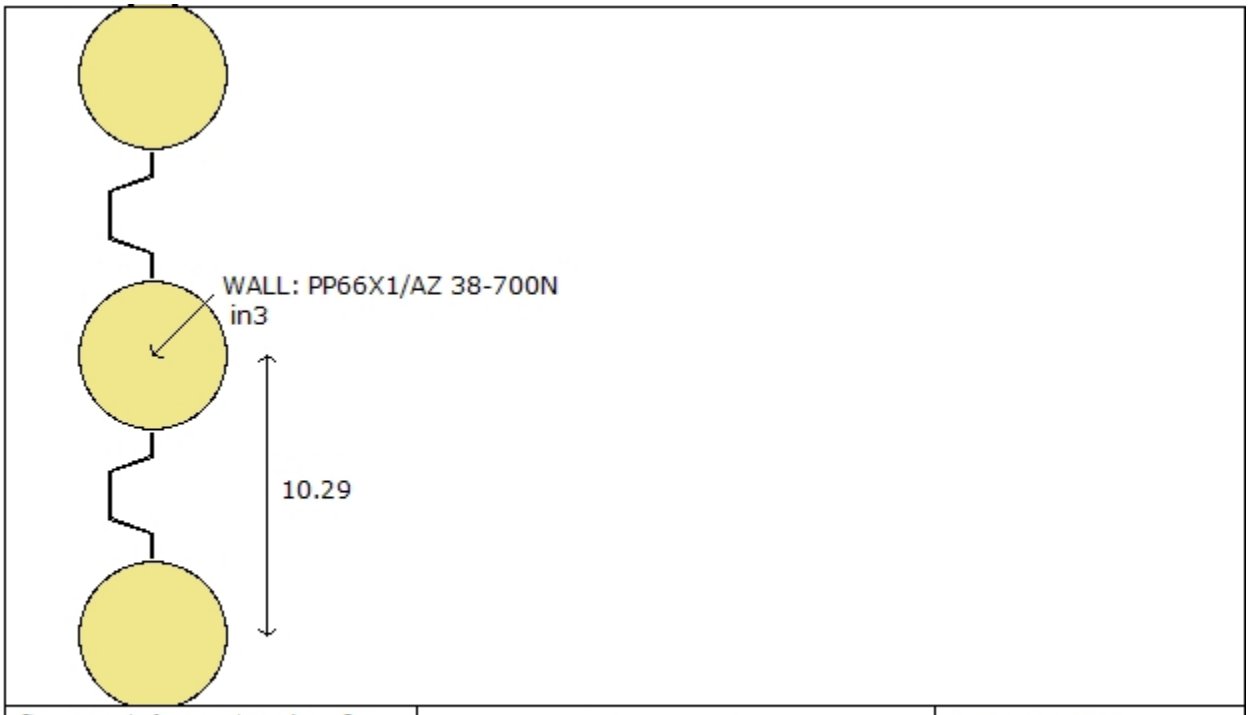
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- SM (+5 TO | 1 | 0.58 |
| 0 | 02- CH (+0 TO | 1 | 0.61 |
| -11 | 03- CH (-11 to | 1 | 0.61 |
| -23 | 04- SM (-23 T | 1 | 0.58 |
| -27 | 05- CH (-27 to | 1 | 0.61 |
| -41 | 06- CH (-41 to | 1 | 0.61 |
| -50 | 07- CH (-50 to | 1 | 0.61 |
| -58 | 08- CH (-58 to | 1 | 0.56 |
| -67 | 09- SM (-67 to | 1 | 0.5 |
| -74 | 10- CH (-74 to | 1 | 0.56 |
| -80 | 11- SM (-80 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.701 | 1.701 | 2.113 |
| Stage 1 | Simple span | N/A | 1.6 | 1.467 | 1.467 | 1.812 |
| Stage 2 | Simple span | N/A | 1.6 | 1.773 | 1.773 | 2.167 |
| Stage 3 | Simple span | N/A | 1.6 | 1.54 | 1.54 | 1.867 |
| Stage 4 | Simple span | N/A | 1.6 | 1.877 | 1.877 | 2.252 |
| Stage 5 | Simple span | N/A | 1.6 | 1.447 | 1.447 | 1.718 |
| Stage 6 | Simple span | N/A | 1.6 | 1.957 | 1.957 | 2.31 |
| Stage 7 | Simple span | N/A | 1.6 | 1.527 | 1.527 | 1.776 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

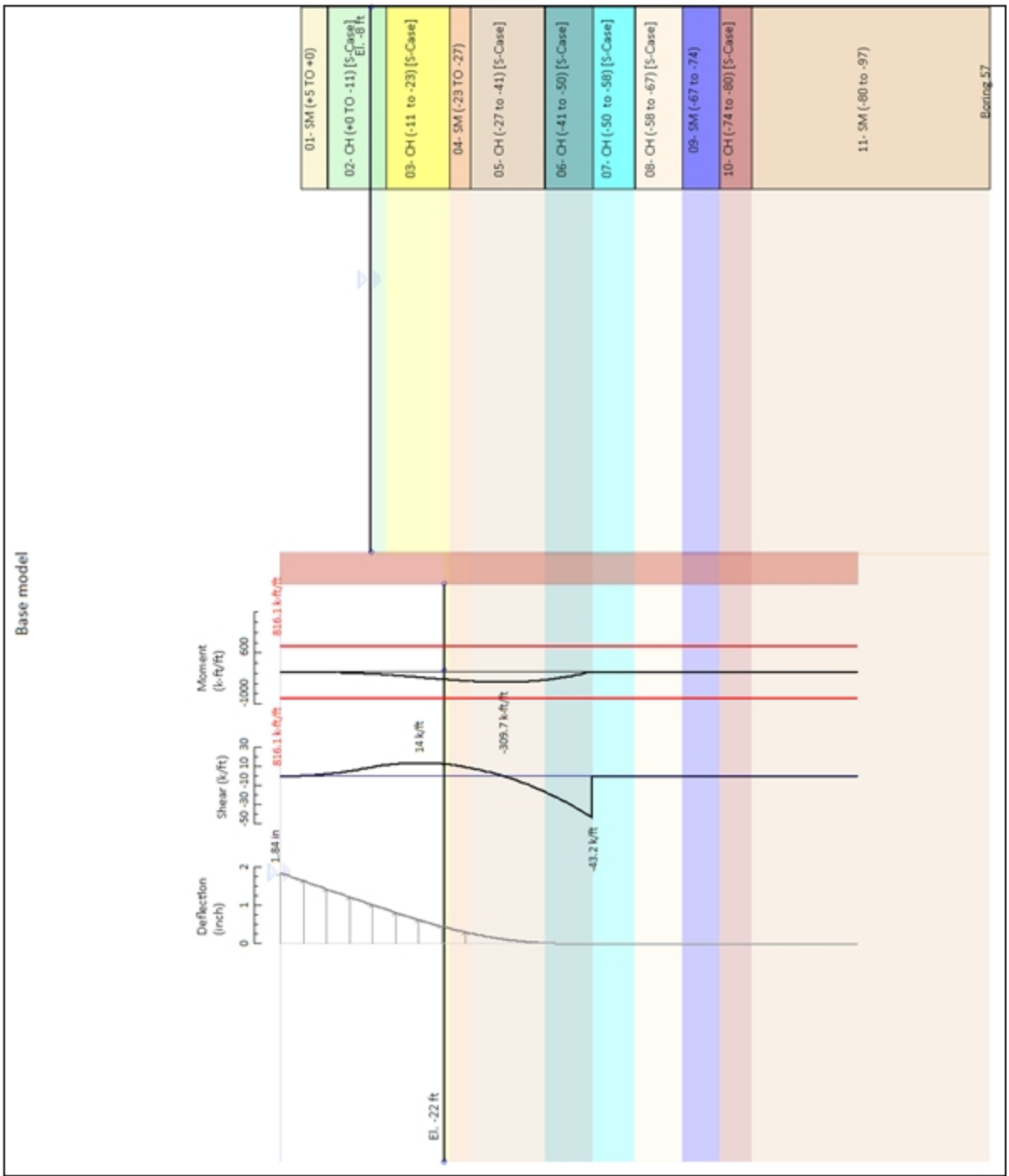
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

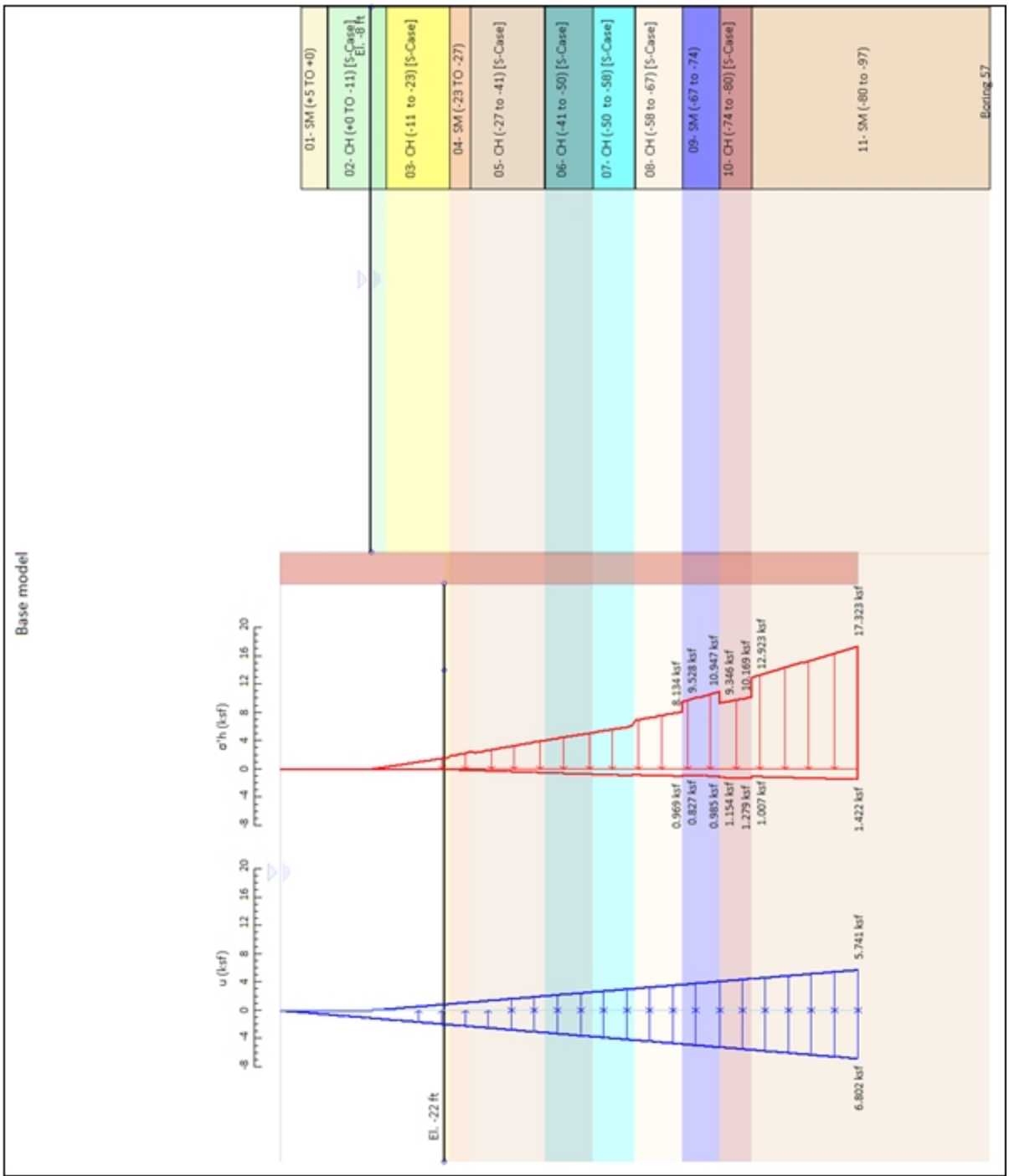
Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

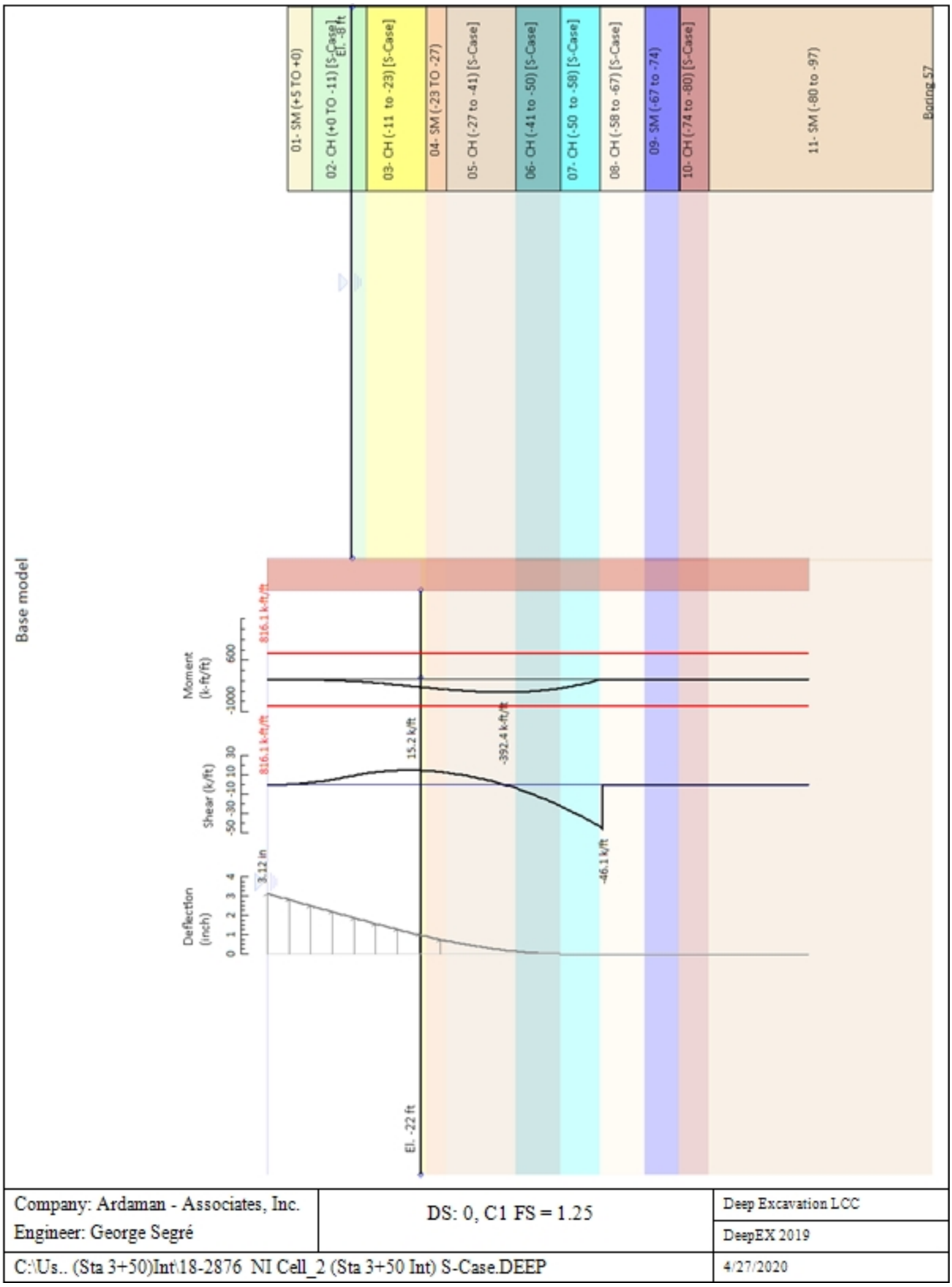
## EXCAVATION STAGES SKETCHES

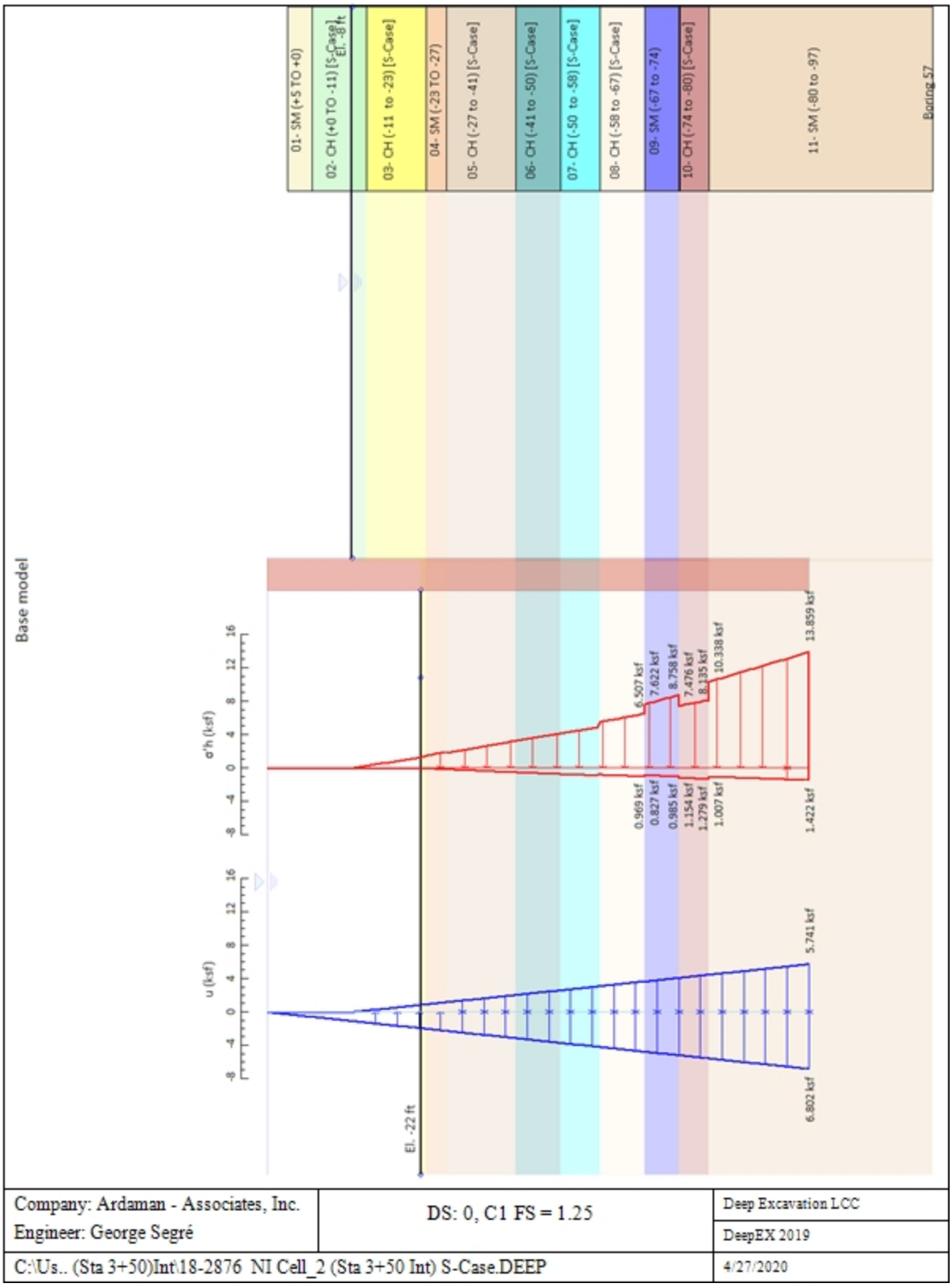
A sequence of figures for each excavation stage is reported

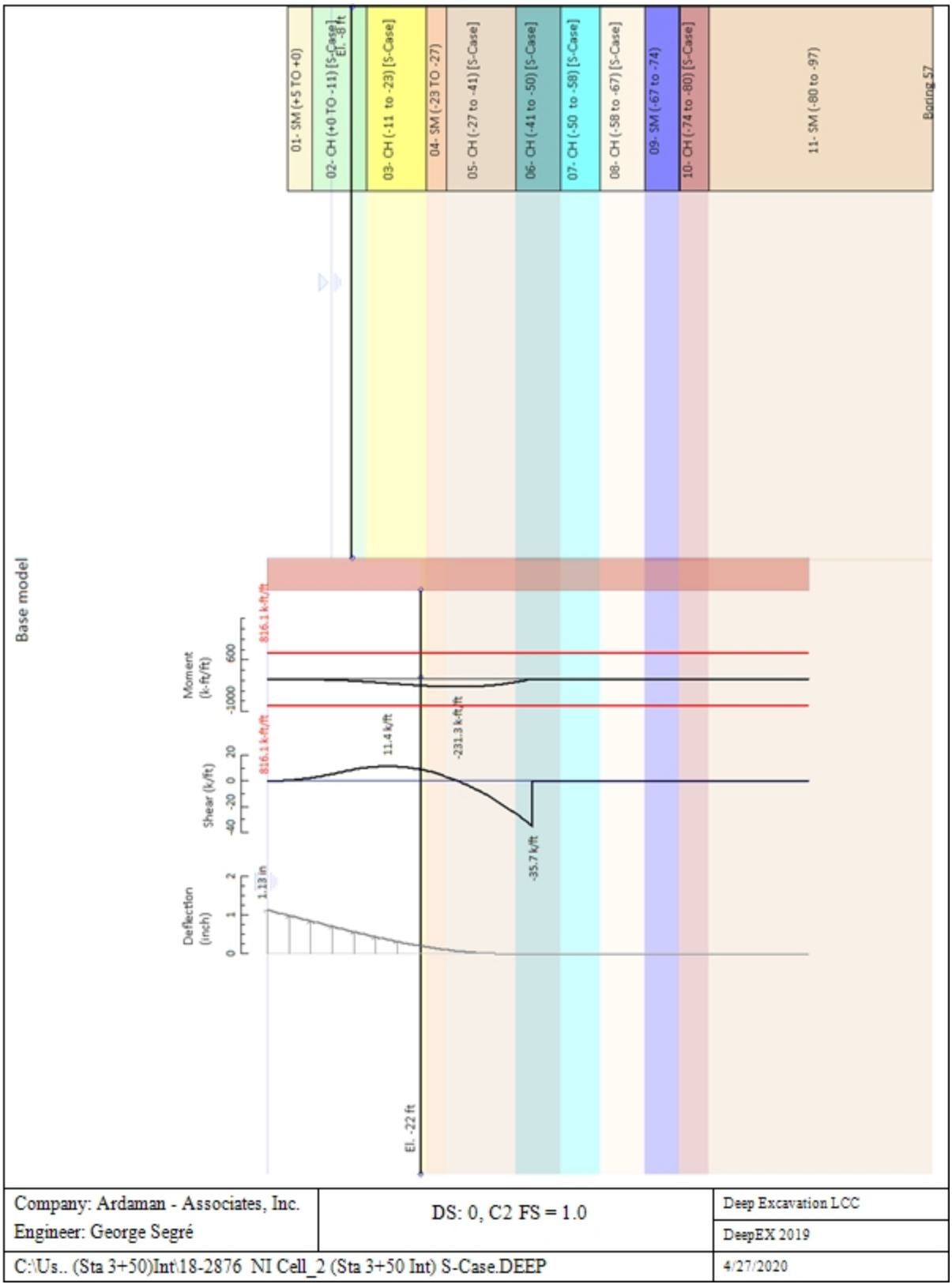

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case] El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
-309.7 k-ft/ft
Shear (k/ft)
30
10
-10
-30
-50
14 k/ft
-43.2 k/ft
Deflection (inch)
0
1
2
1.84 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

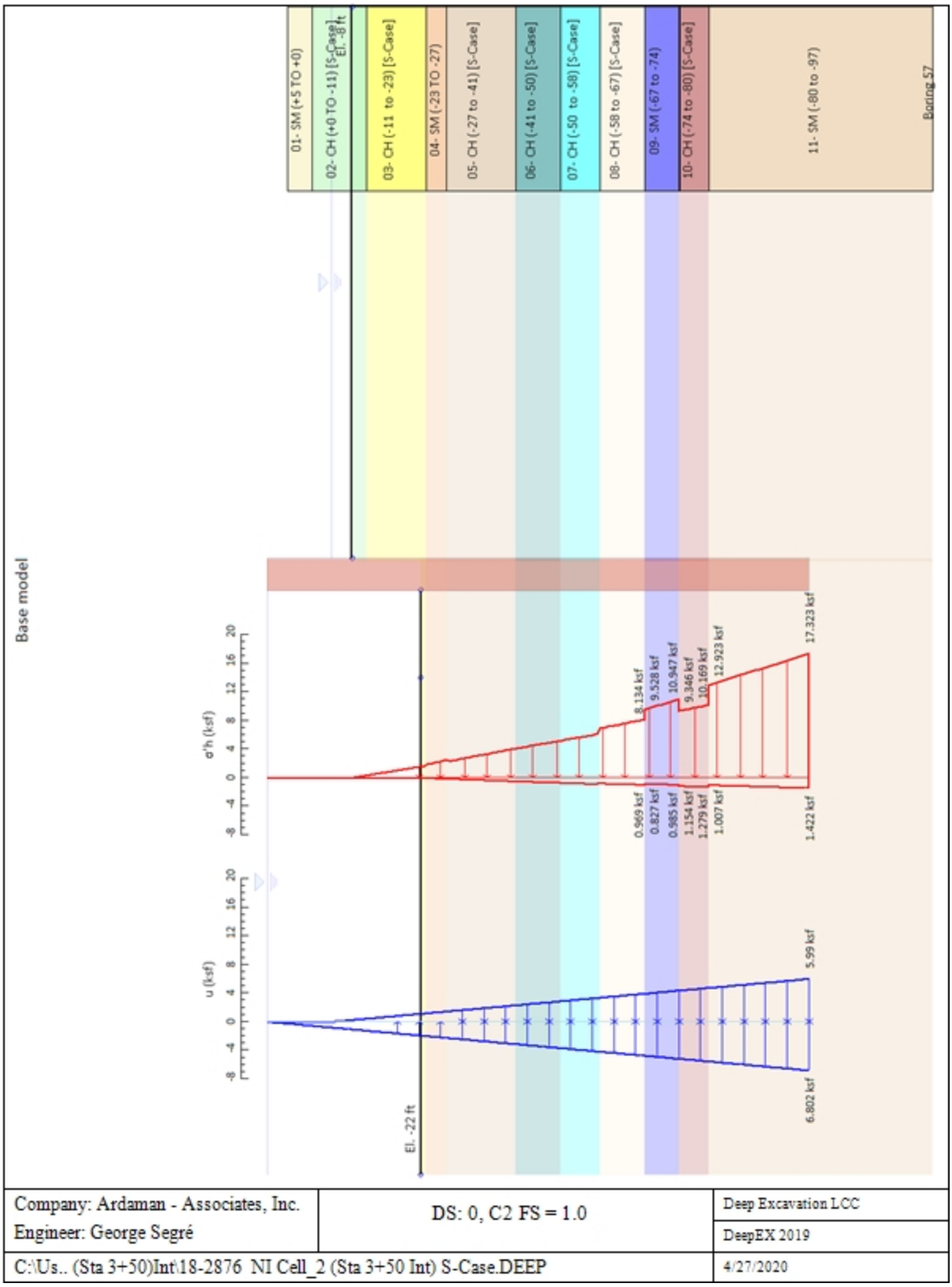


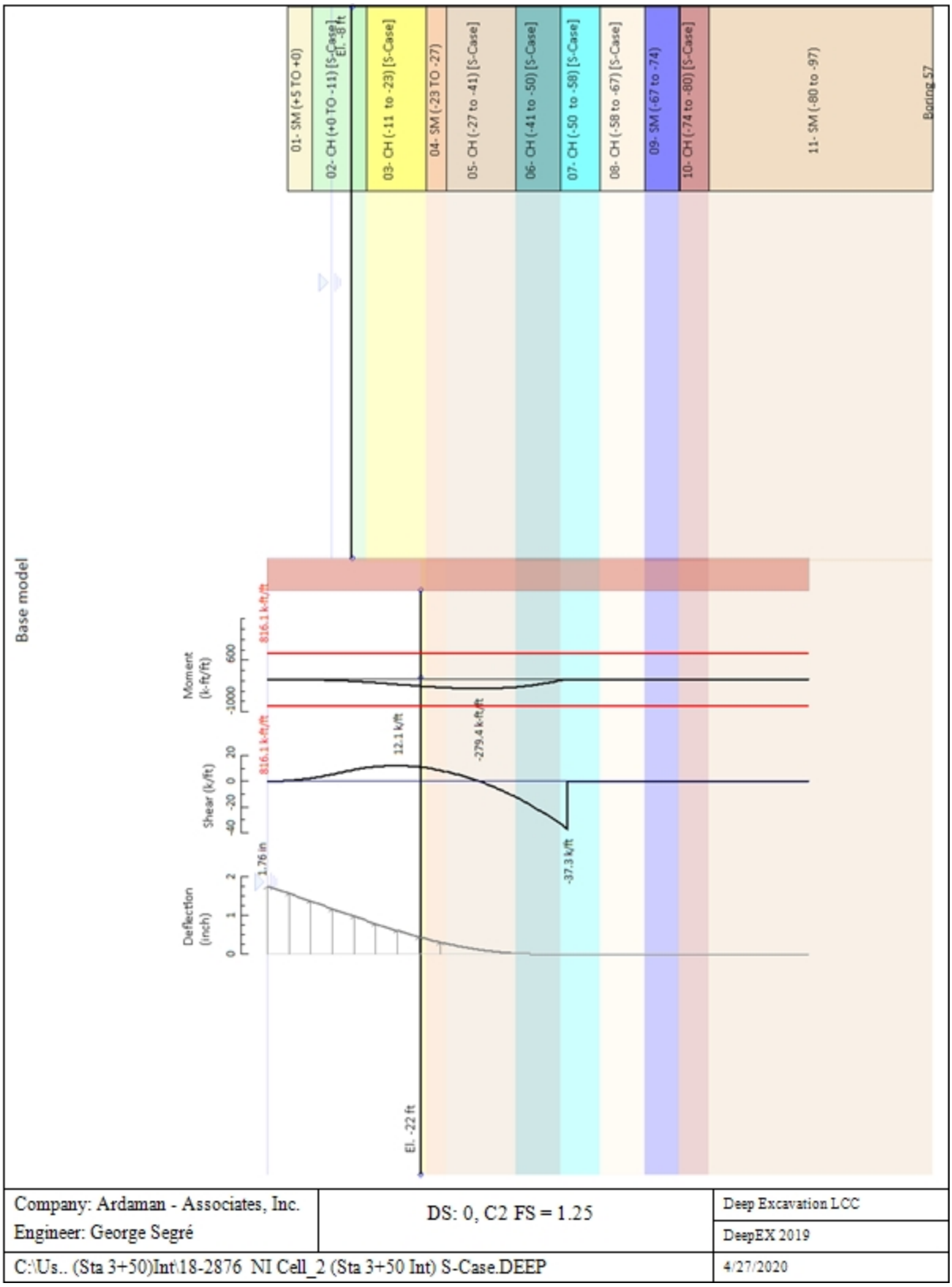

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP | | 4/27/2020 |

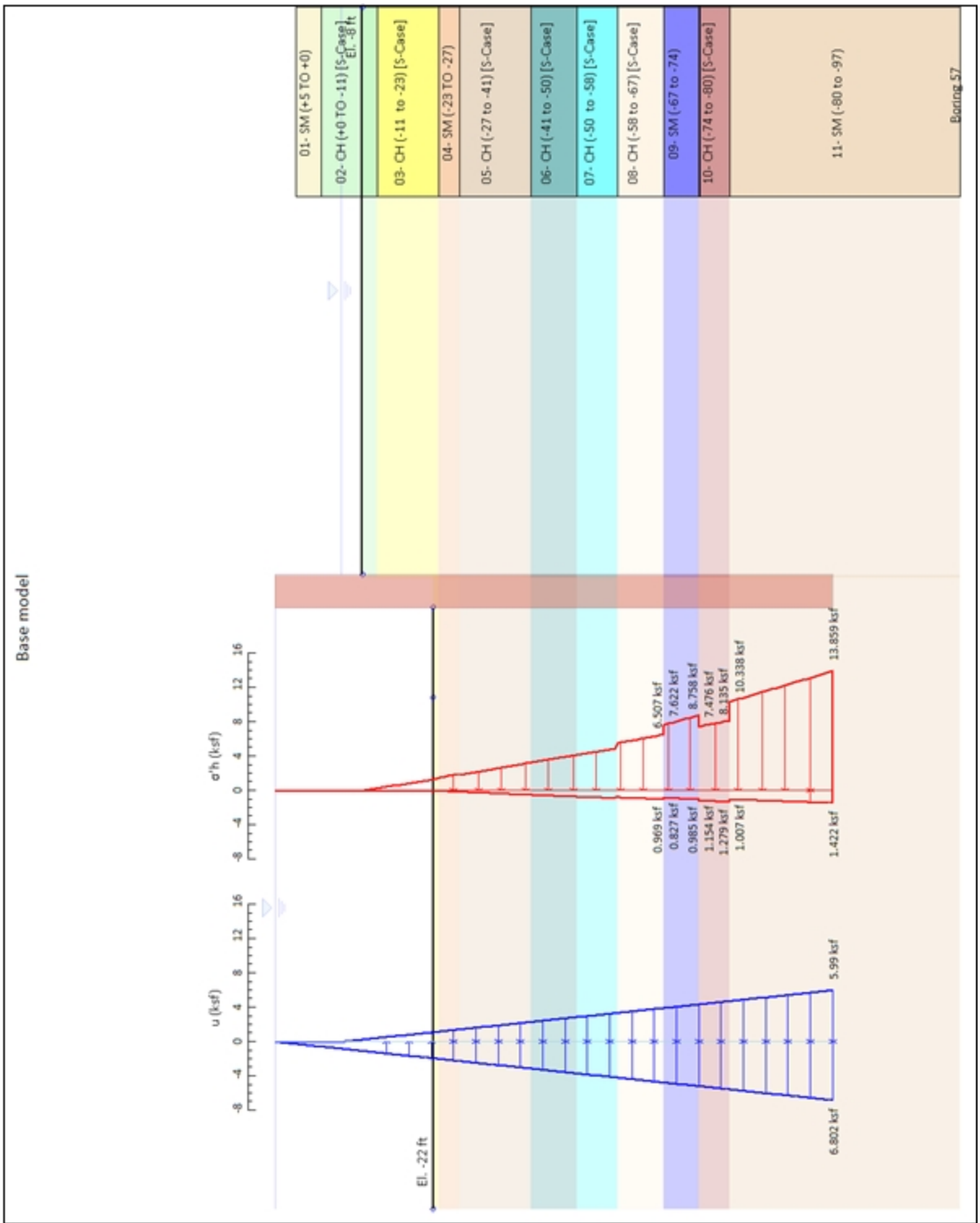

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
15.2 k/ft
-392.4 k-ft/ft
-46.1 k/ft
Deflection (inch)
0 1 2 3 4
3.12 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
6.507 ksf
7.622 ksf
8.758 ksf
7.476 ksf
8.135 ksf
10.338 ksf
13.859 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.741 ksf
6.802 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

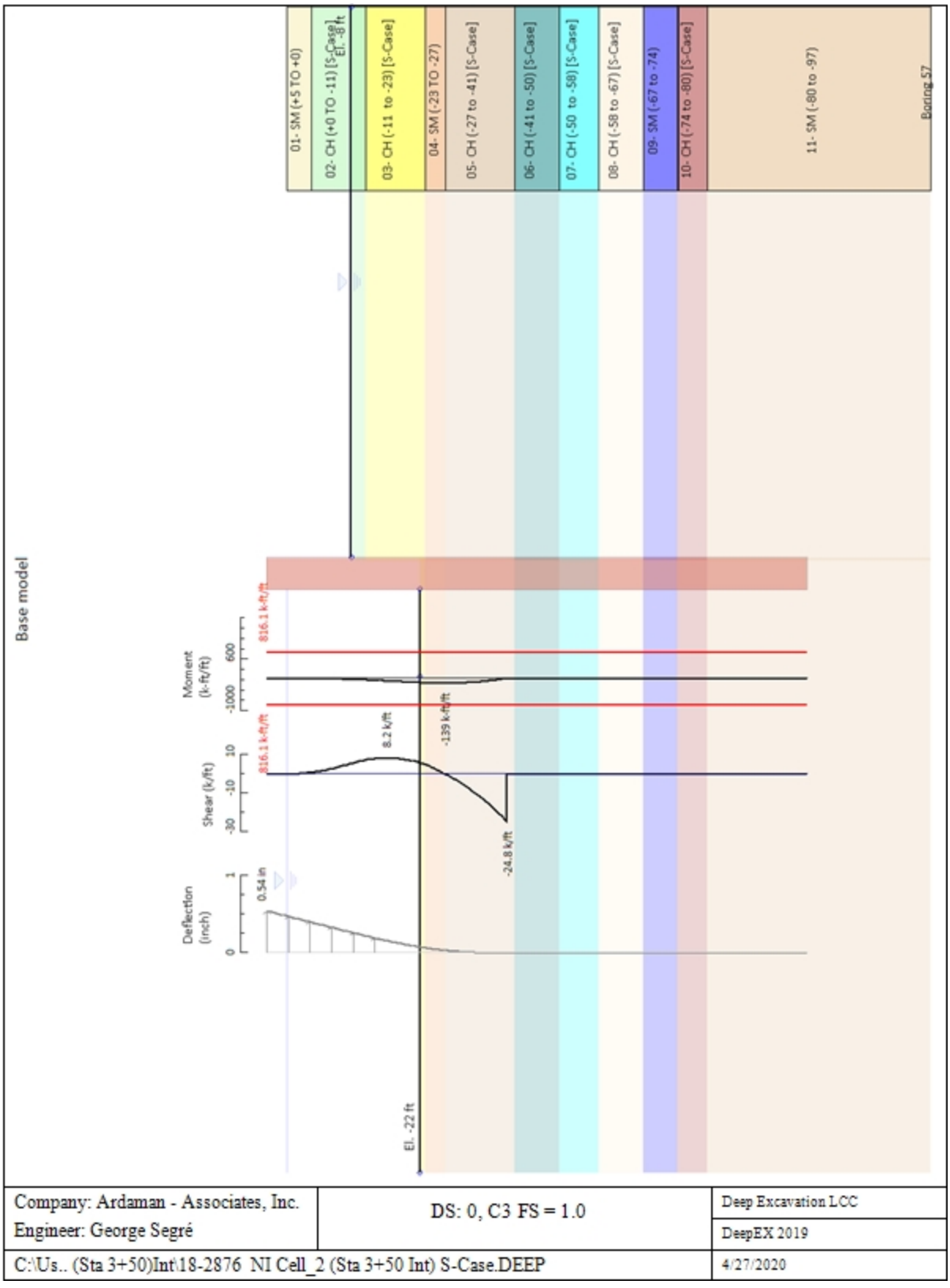

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-231.3 k-ft/ft
Shear (k/ft)
11.4 k/ft
-35.7 k/ft
Deflection (inch)
1.13 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

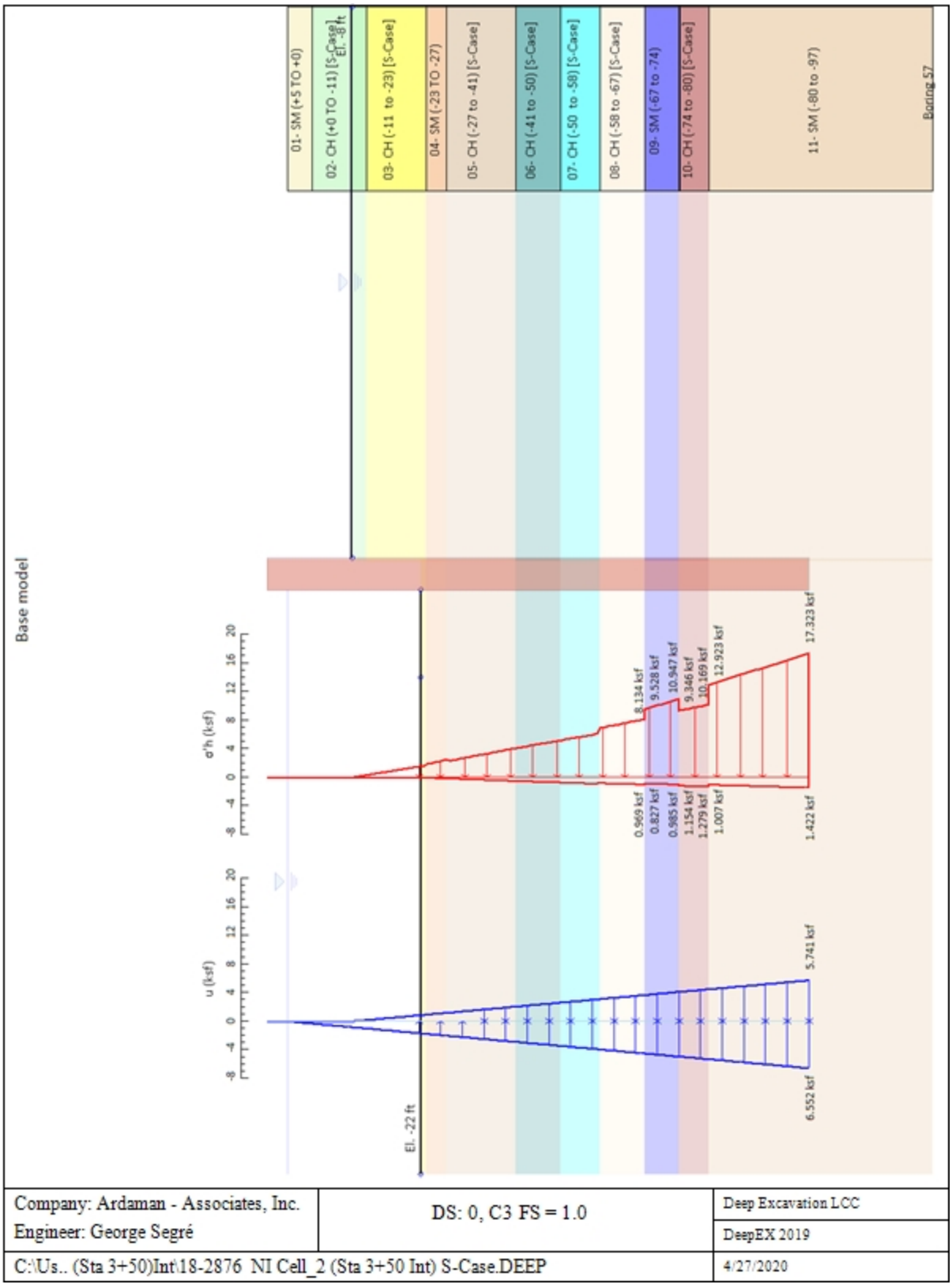

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
8.134 ksf
9.528 ksf
10.947 ksf
9.346 ksf
10.169 ksf
12.923 ksf
17.323 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.99 ksf
6.802 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

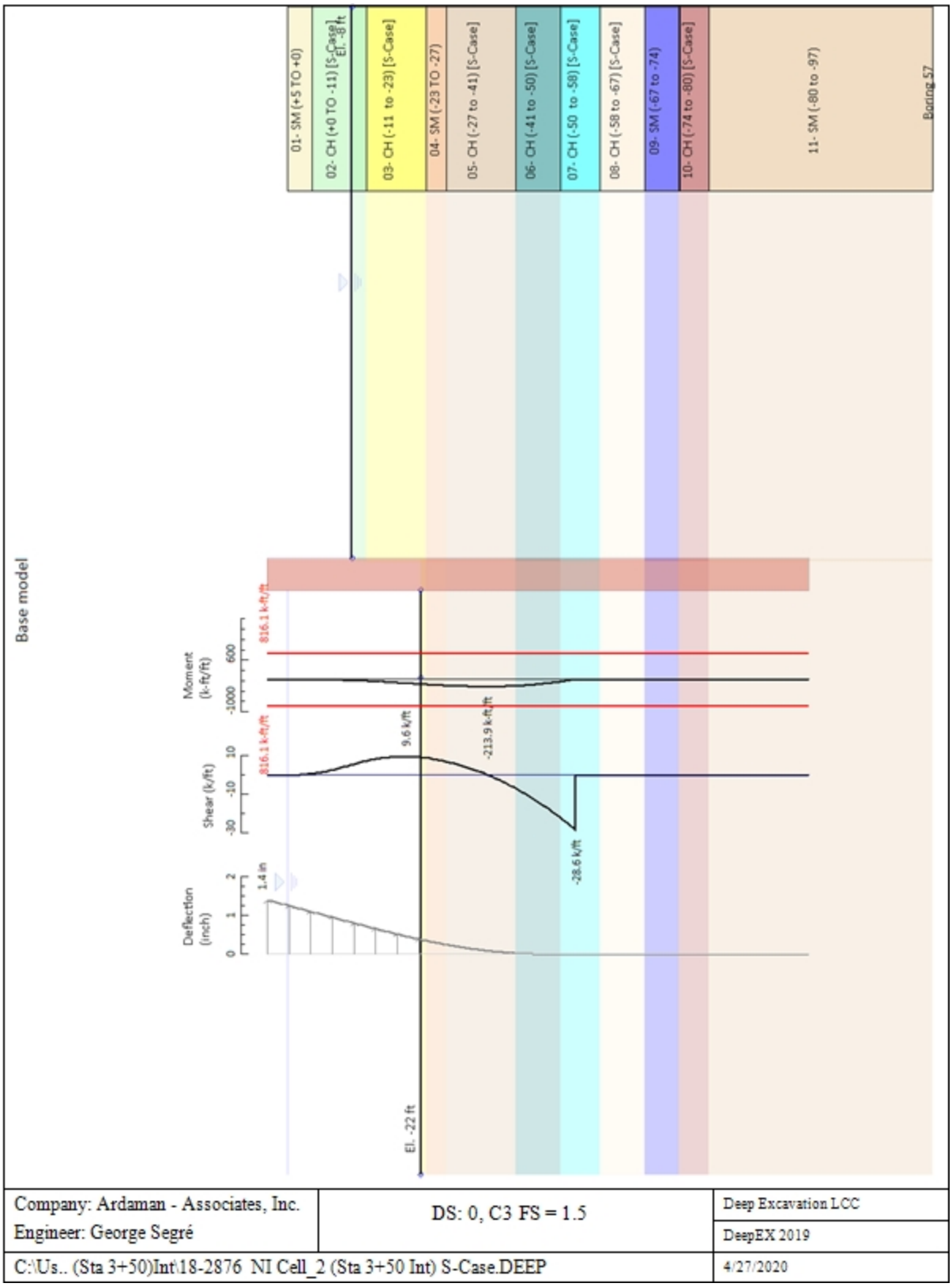

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-279.4 k-ft/ft
Shear (k/ft)
12.1 k/ft
-37.3 k/ft
Deflection (inch)
1.76 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

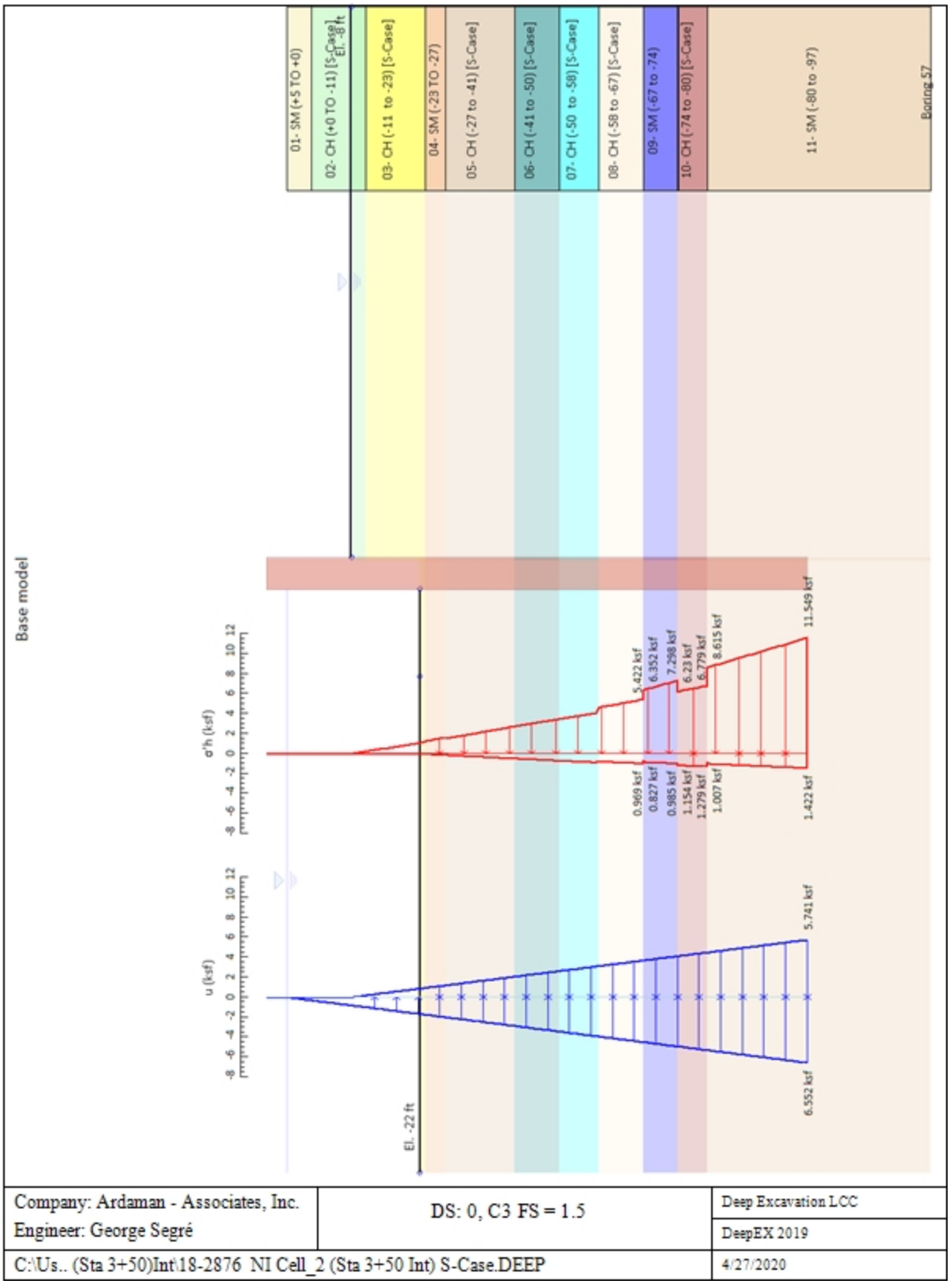



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP | | 4/27/2020 |

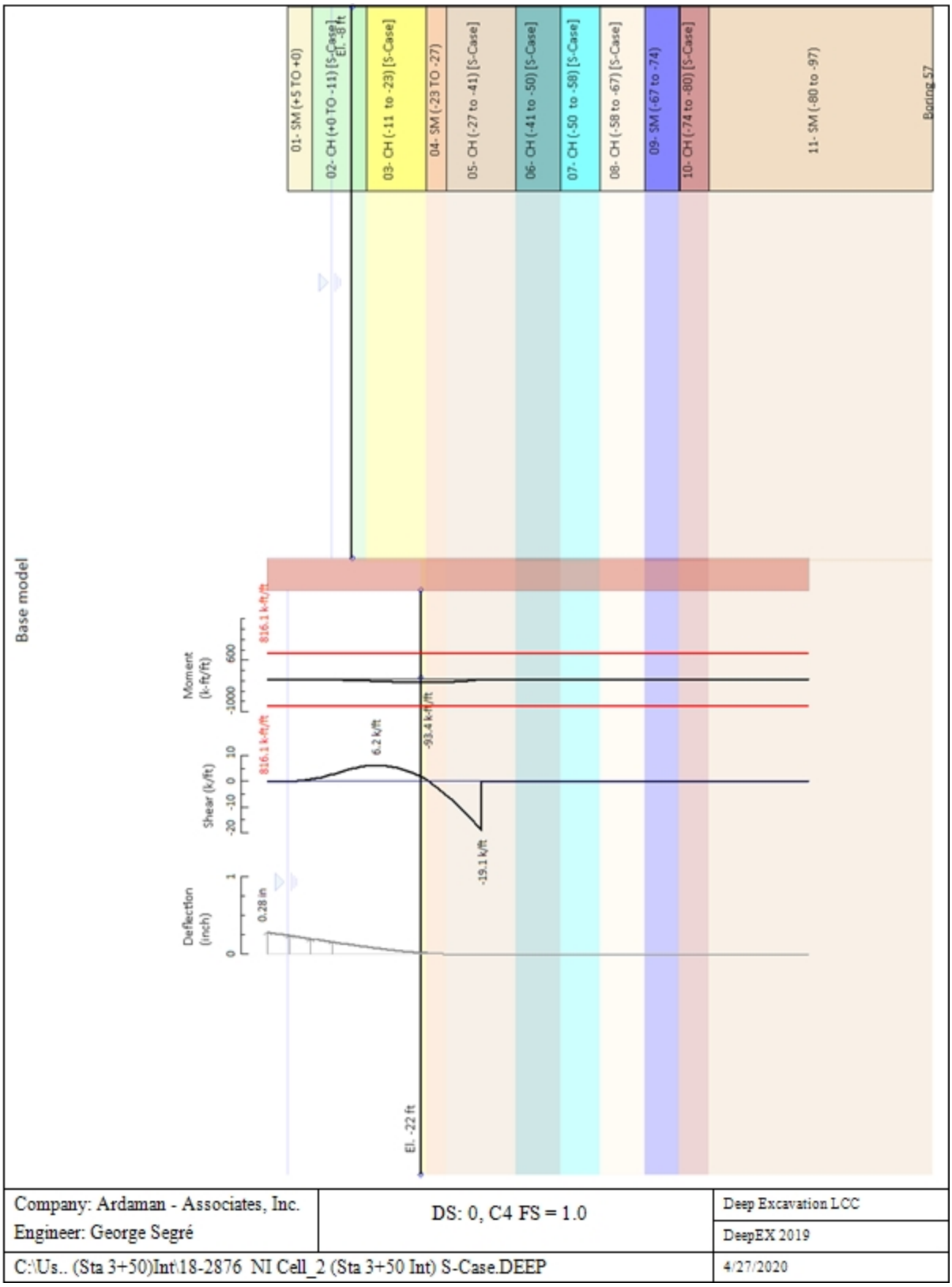

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
El. -8 ft
El. -22 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
-139 k-ft/ft
Shear (k/ft)
10
-10
-30
8.2 k/ft
-24.8 k/ft
Deflection (inch)
1
0
0.54 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

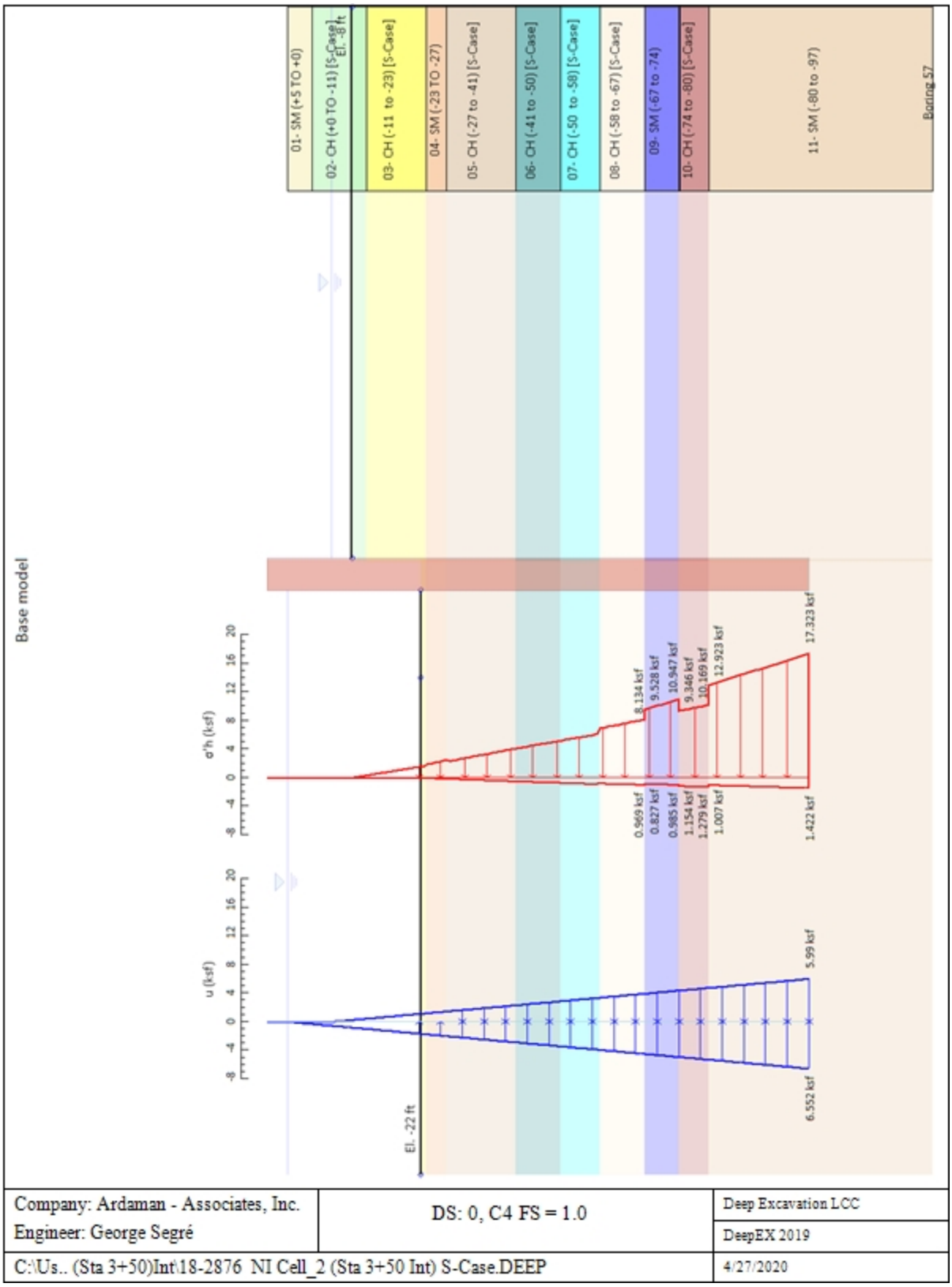

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
8.134 ksf
9.528 ksf
10.947 ksf
9.346 ksf
10.169 ksf
12.923 ksf
17.323 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.741 ksf
6.552 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

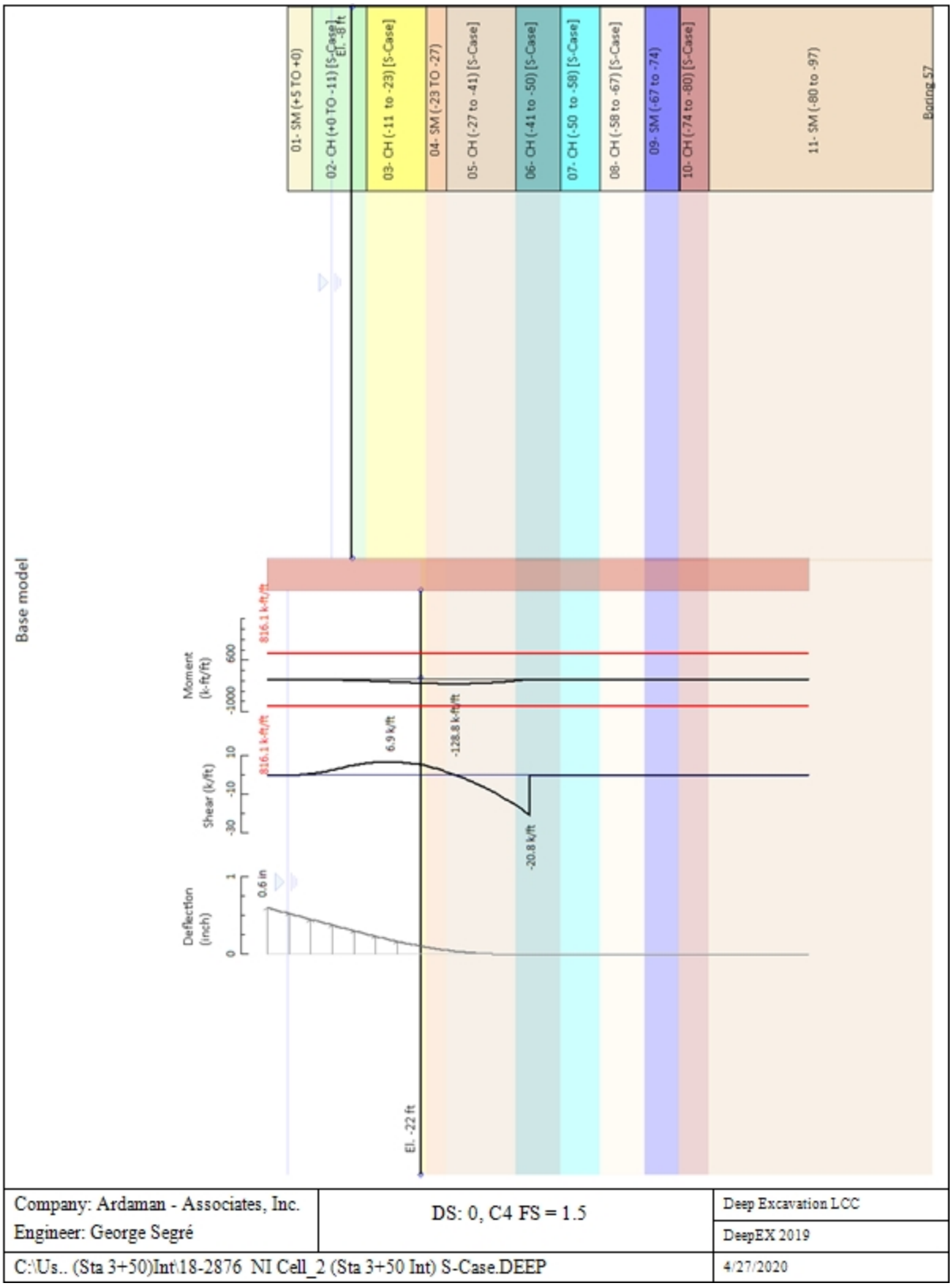

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-213.9 k-ft/ft
Shear (k/ft)
9.6 k/ft
-28.6 k/ft
Deflection (inch)
1.4 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

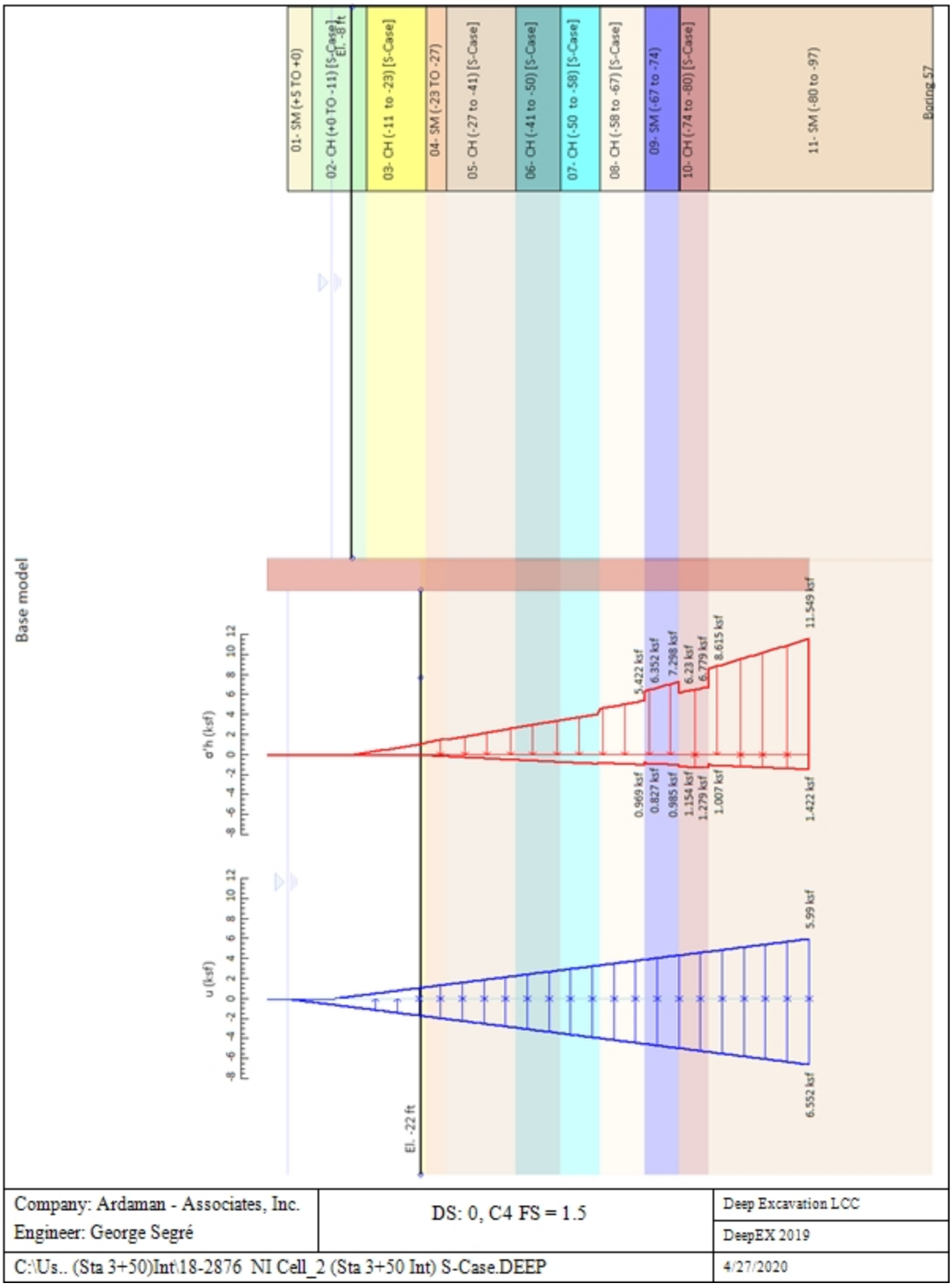



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP | | 4/27/2020 |


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-93.4 k-ft/ft
Shear (k/ft)
6.2 k/ft
-19.1 k/ft
Deflection (inch)
0.28 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
8.134 ksf
9.528 ksf
10.947 ksf
9.346 ksf
10.169 ksf
12.923 ksf
17.323 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.99 ksf
6.552 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
-128.8 k-ft/ft
Shear (k/ft)
-30
-10
10
816.1 k-ft/ft
6.9 k/ft
-20.8 k/ft
Deflection (inch)
0
1
0.6 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
5.422 ksf
6.352 ksf
7.298 ksf
6.23 ksf
6.779 ksf
8.615 ksf
11.549 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.99 ksf
6.552 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 4+00)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -94.84 ft., NAVD88

Length of Sheetting = 103.84 ft.

Use = 105.0 ft.

Design Tip Elev. = -96.0 ft., NAVD88

Design Length of Sheeting = 105.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -50.25 | 436.33 | 86.88 | 2.63 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -54.20 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -47.48 | 339.67 | 68.63 | 1.78 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -51.44 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -44.72 | 240.69 | 44.26 | 1.06 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -51.83 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -40.38 | 167.17 | 30.45 | 0.59 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -47.88 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -84.53 | 1,494.78 | 138.00 | 22.09 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -94.84 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -78.72 | 1,154.66 | 115.96 | 15.06 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -87.75 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -76.78 | 971.76 | 106.79 | 11.79 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -94.20 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -70.33 | 690.68 | 84.55 | 7.23 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -85.17 | -- | -- | -- |
| | | | | | | Governing Value: | -94.84 | 1,494.78 | 138.00 | 22.09 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:11:52 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 0 | 0 | 500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 0 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 0 | 0 | 350 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 0 | 0 | 1250 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 0 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 0 | 0 | 1730 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 0 | 0 | 3300 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

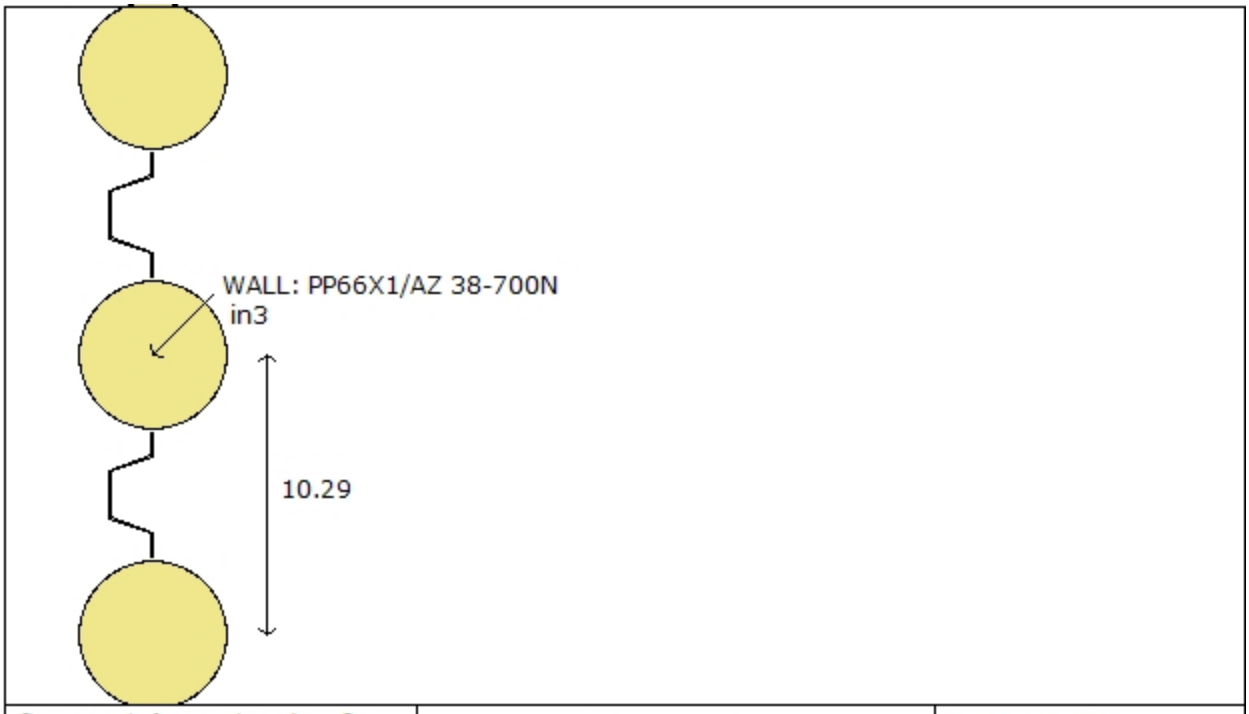
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 1 |
| -6 | 02- CH (-6 TO - | 1 | 1 |
| -15 | 03- CH (-15 to | 1 | 1 |
| -26 | 04- CH (-26 TO | 1 | 1 |
| -32 | 05- CH (-32 to | 1 | 1 |
| -40 | 06- CH (-40 to | 1 | 1 |
| -45 | 07- CH (-45 to | 1 | 1 |
| -54 | 08- ML (-54 to | 1 | 0.74 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.74 |
| -68 | 11- SP (-68 to - | 1 | 1 |
| -71 | 12- ML (-71 to | 1 | 0.74 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 1 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.66 | 1.66 | 2.455 |
| Stage 1 | Simple span | N/A | 1.6 | 1.328 | 1.328 | 1.964 |
| Stage 2 | Simple span | N/A | 1.6 | 1.741 | 1.741 | 2.615 |
| Stage 3 | Simple span | N/A | 1.6 | 1.393 | 1.393 | 2.092 |
| Stage 4 | Simple span | N/A | 1.6 | 2.066 | 2.066 | 2.891 |
| Stage 5 | Simple span | N/A | 1.6 | 1.378 | 1.378 | 1.927 |
| Stage 6 | Simple span | N/A | 1.6 | 2.172 | 2.172 | 3.1 |
| Stage 7 | Simple span | N/A | 1.6 | 1.448 | 1.448 | 2.066 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

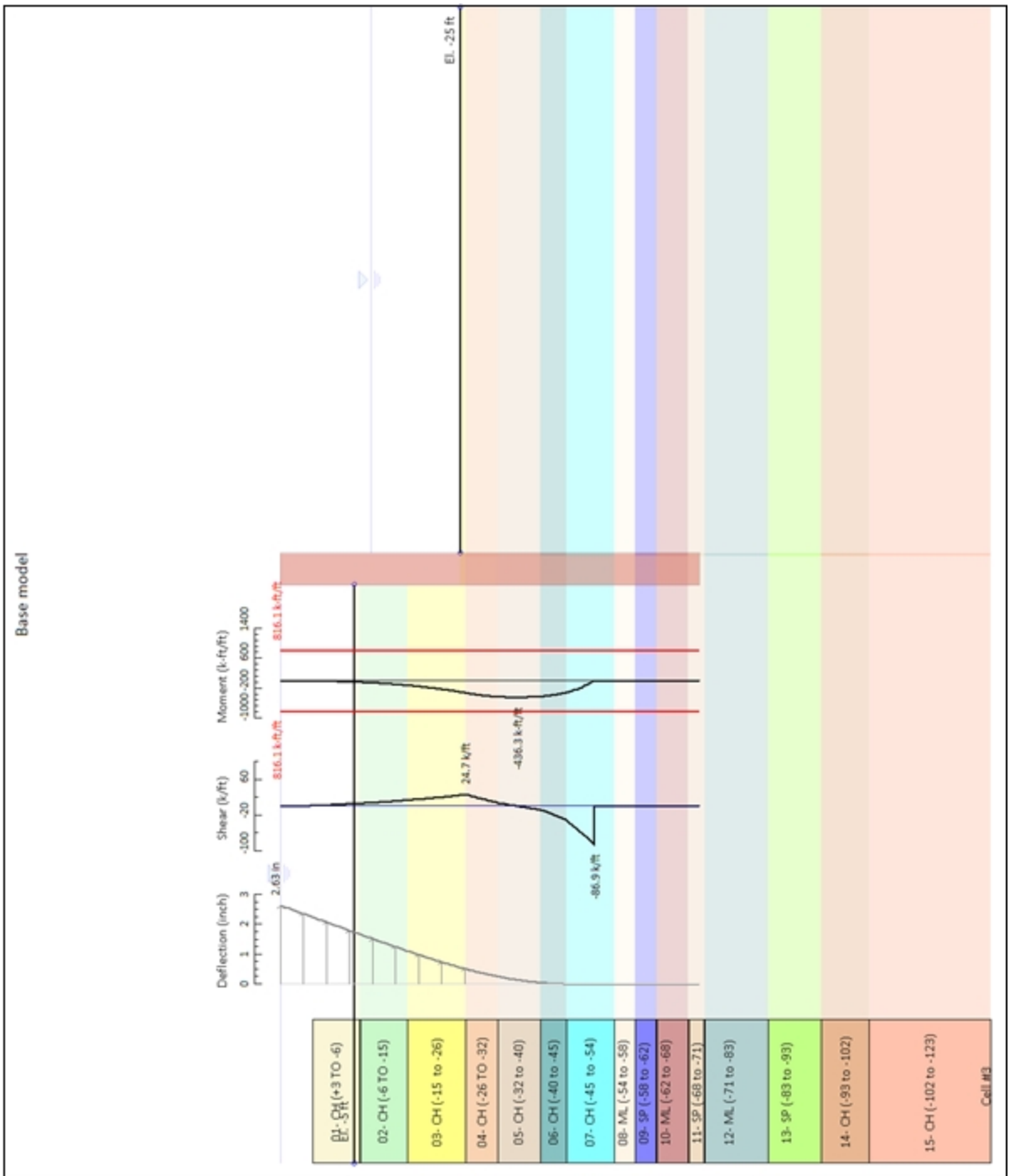
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

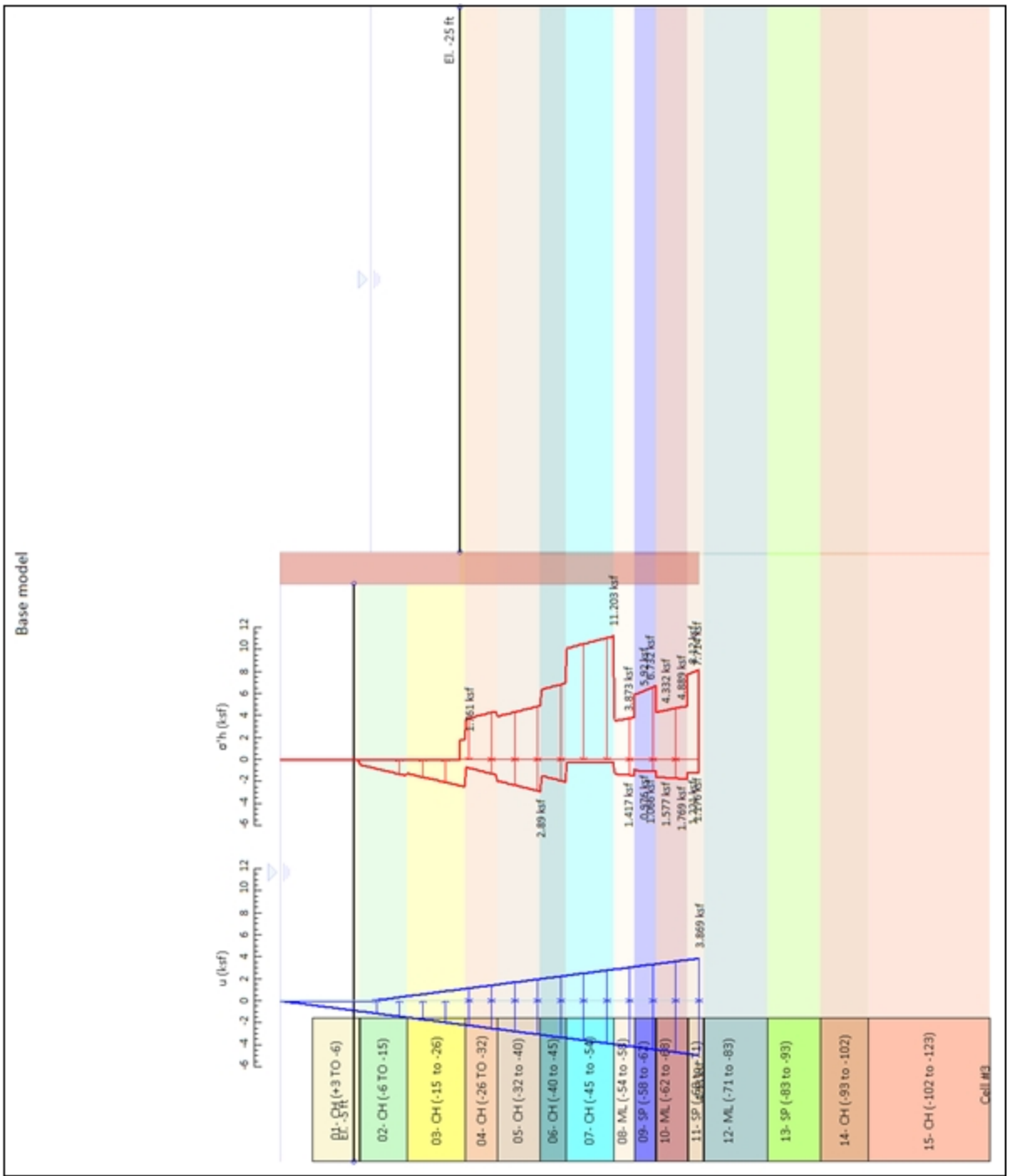
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

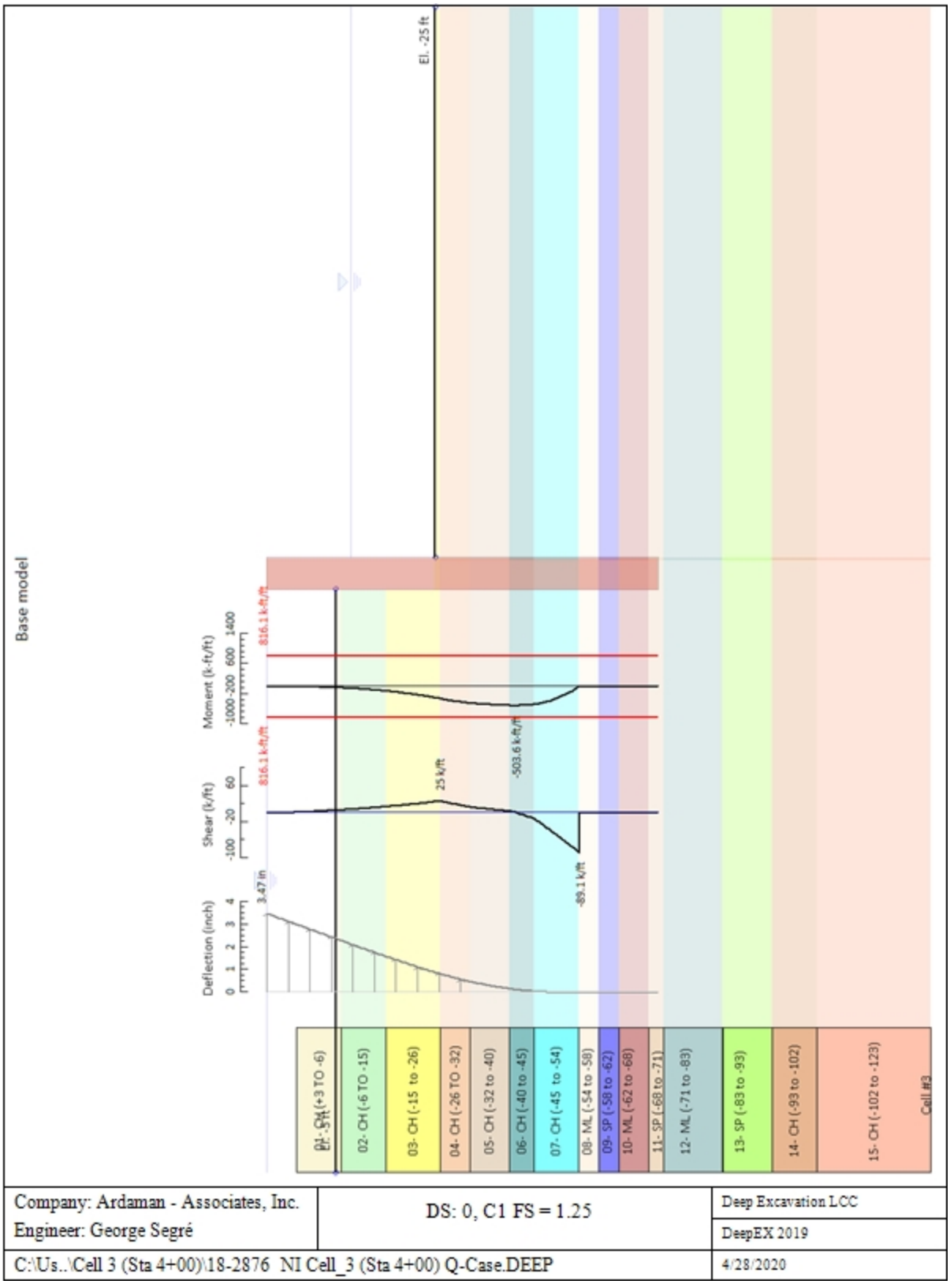
A sequence of figures for each excavation stage is reported

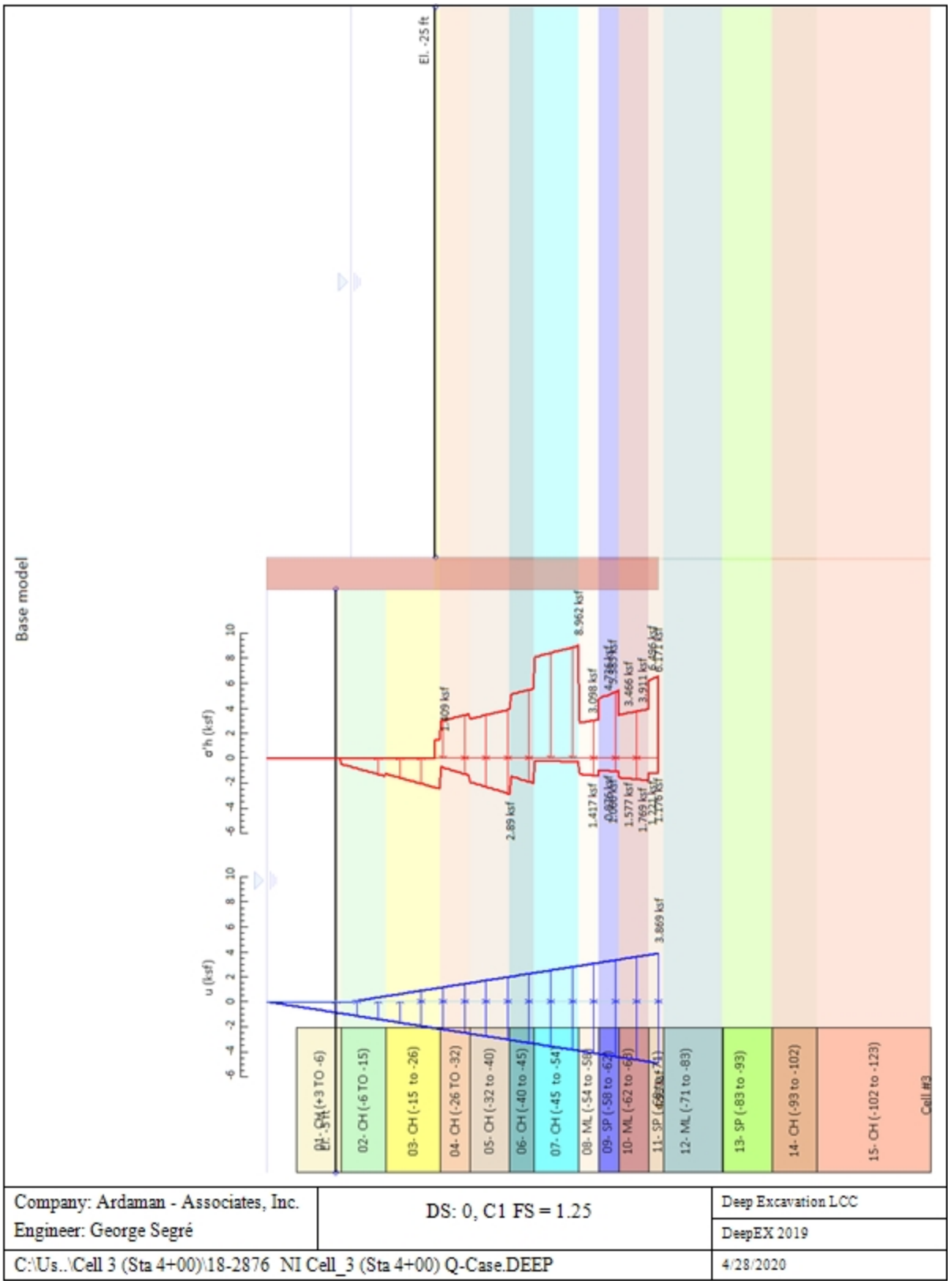


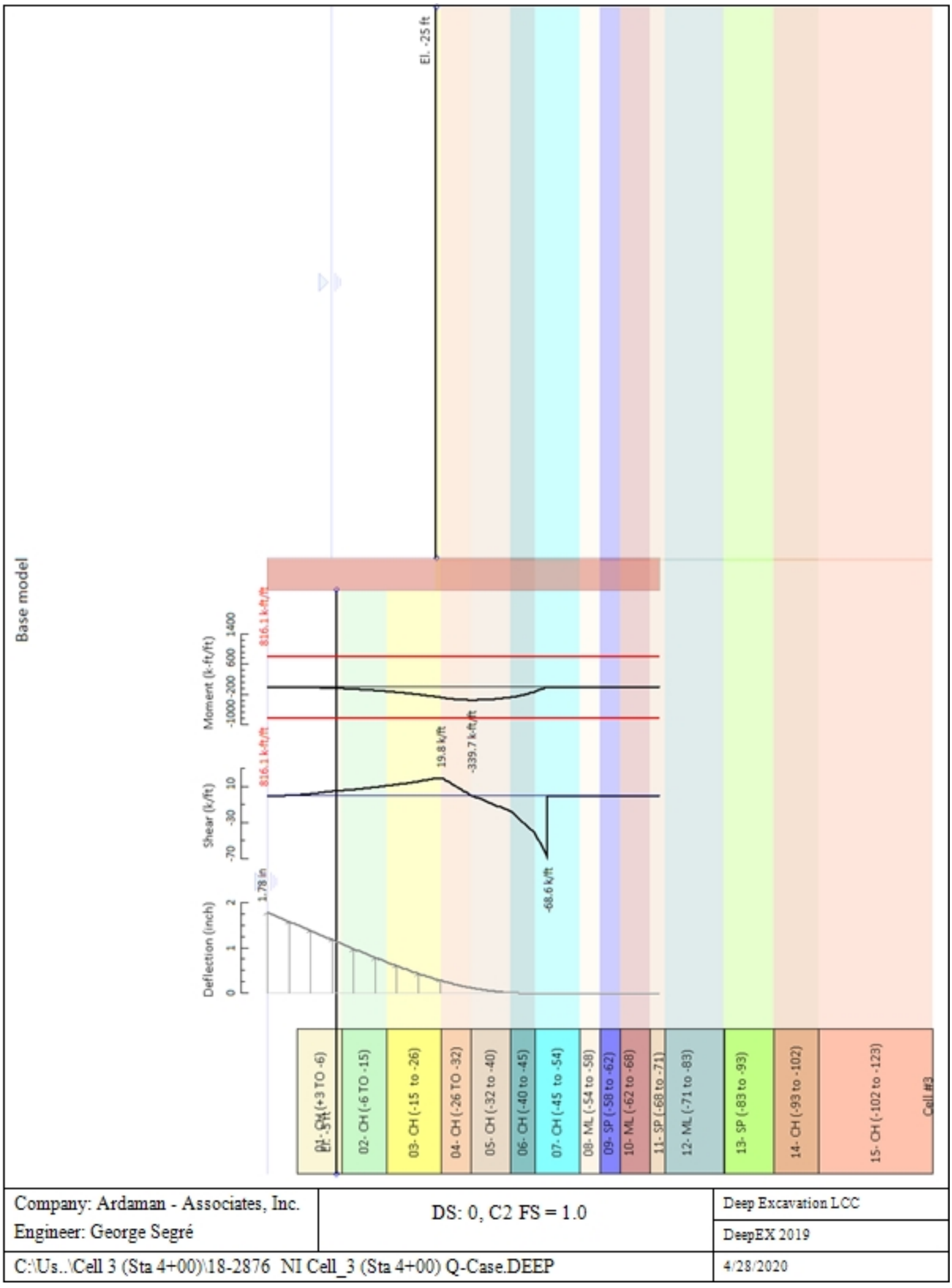

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |



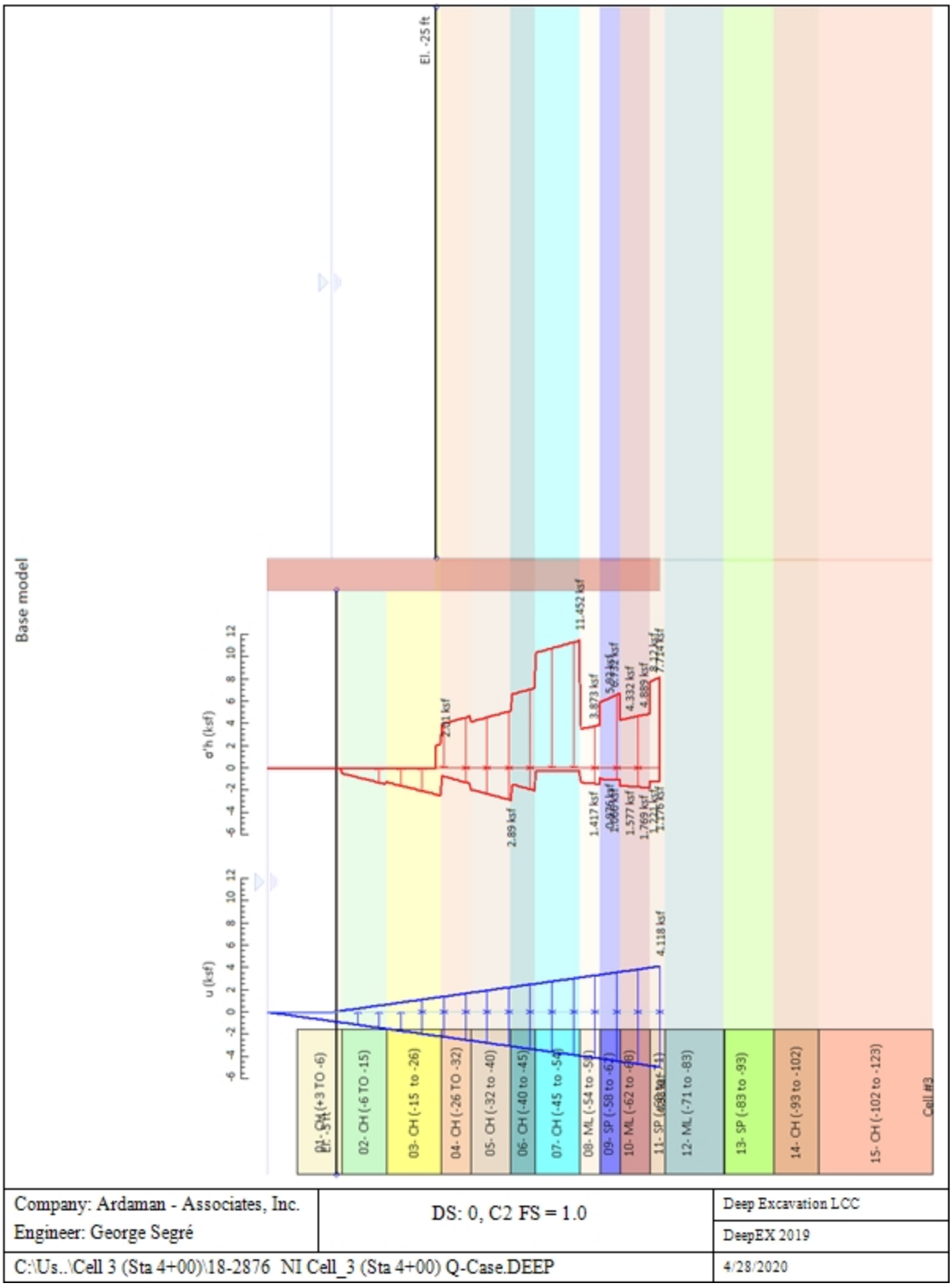

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |

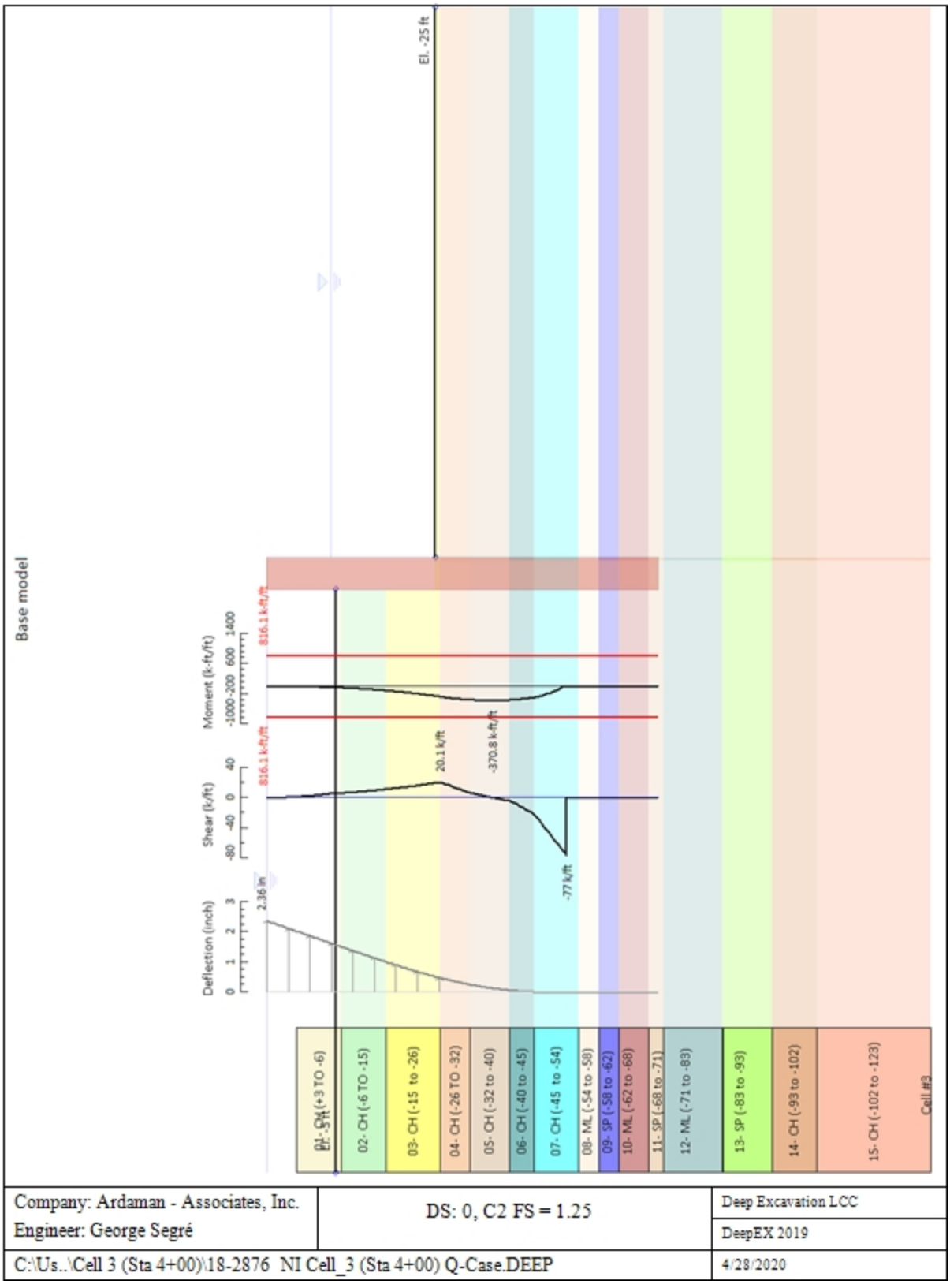

Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-503.6 k-ft/ft
Shear (k/ft)
-100 -20 60
25 k/ft
-89.1 k/ft
Deflection (inch)
0 1 2 3 4
3.47 in
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020

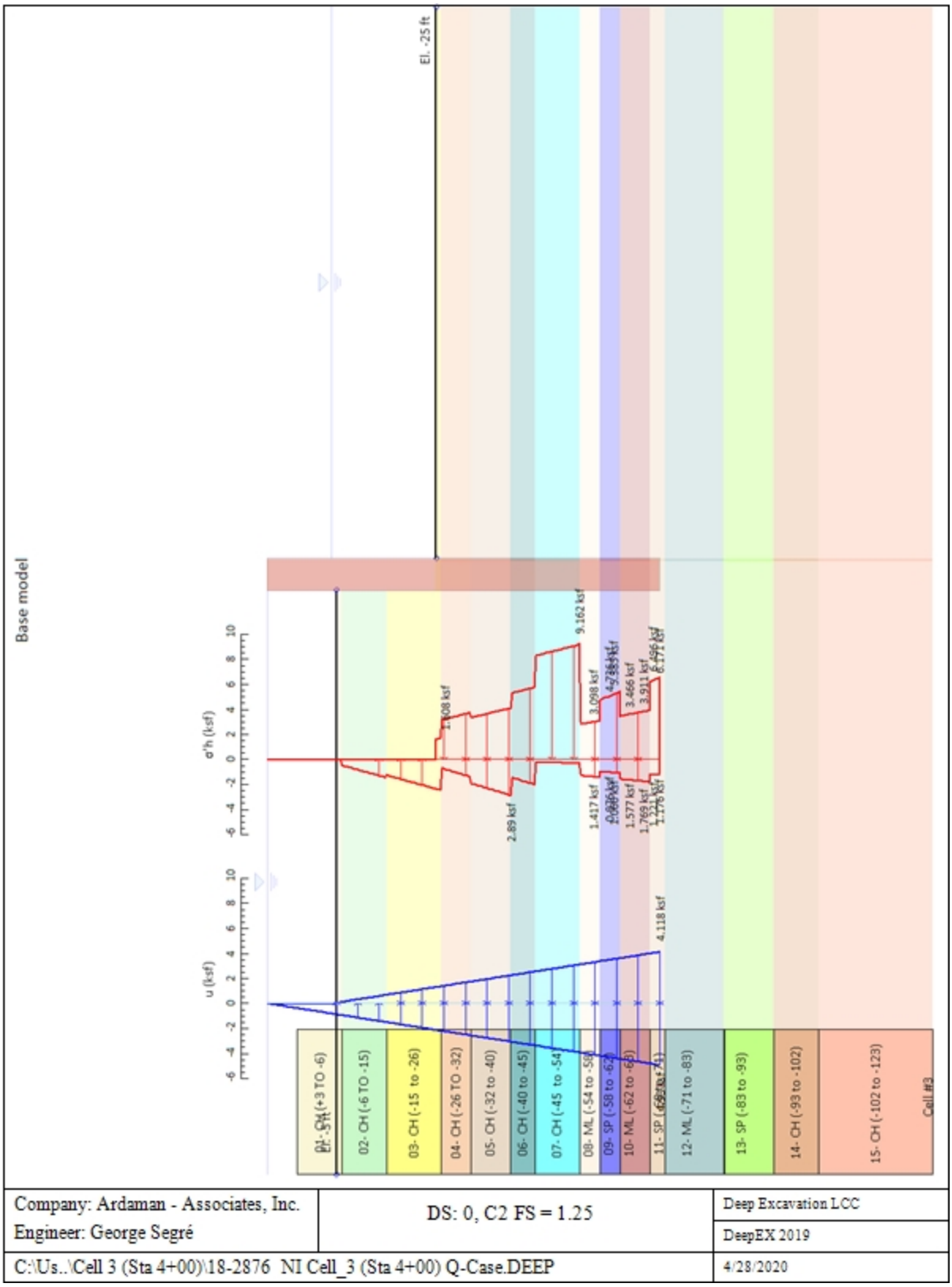

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
8.962 ksf
3.098 ksf
3.466 ksf
3.911 ksf
2.89 ksf
1.417 ksf
1.577 ksf
1.769 ksf
3.869 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54
08- ML (-54 to -58
09- SP (-58 to -62
10- ML (-62 to -68
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020

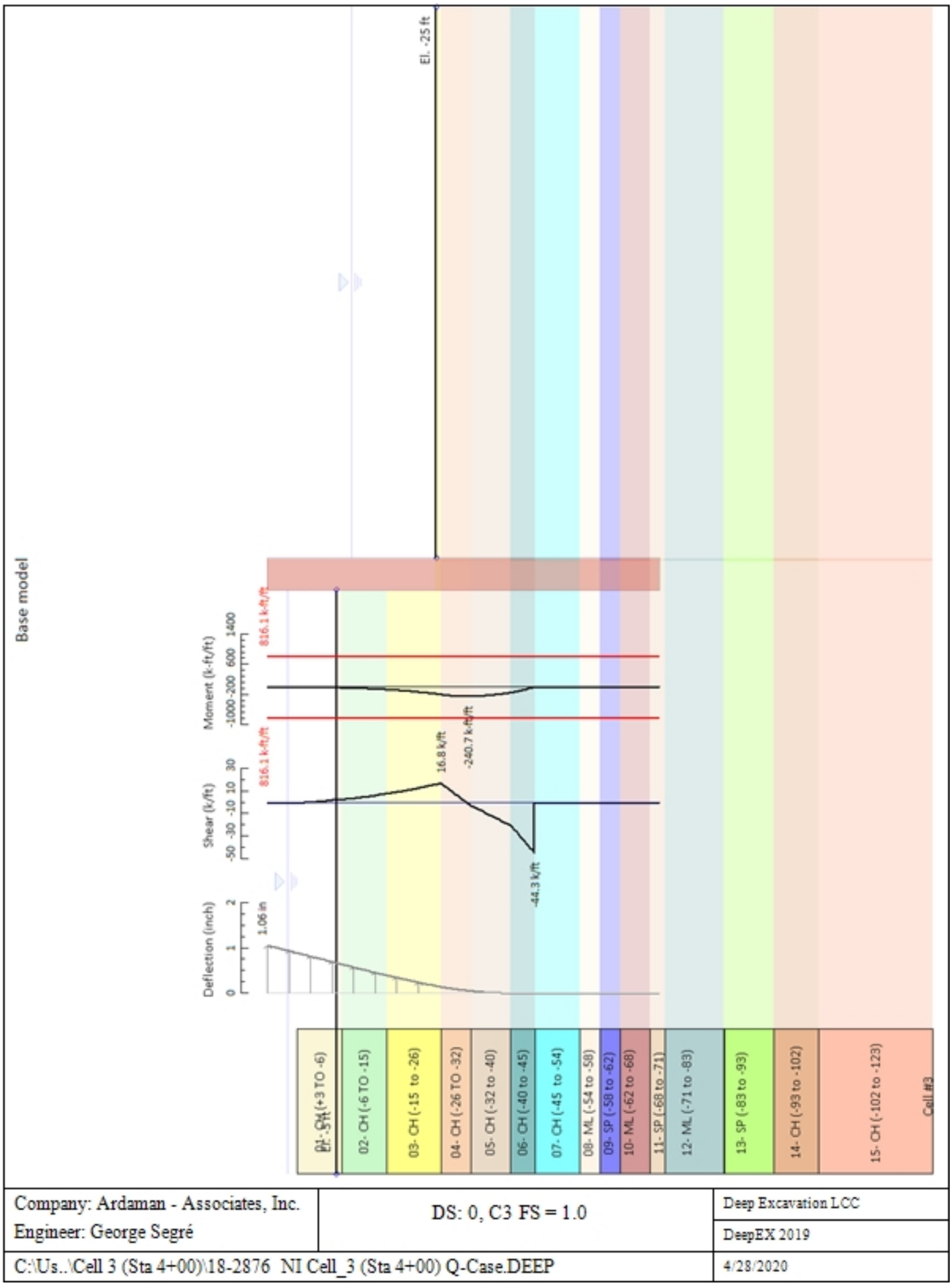



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |

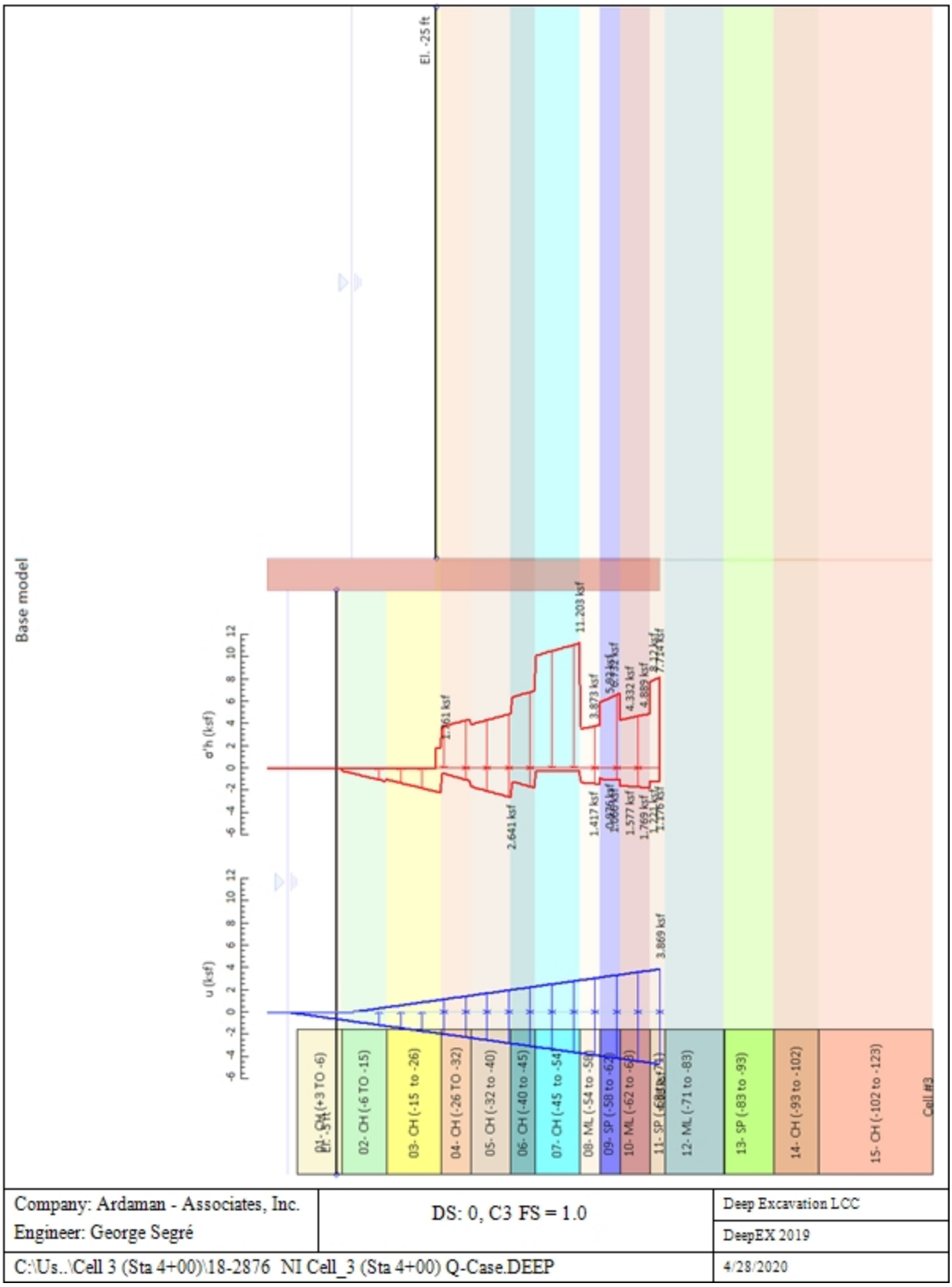

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
2.89 ksf
2.01 ksf
11.452 ksf
3.873 ksf
4.332 ksf
4.889 ksf
1.417 ksf
1.577 ksf
1.769 ksf
4.118 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020


Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-370.8 k-ft/ft
Shear (k/ft)
-80 -40 0 40
816.1 k-ft/ft
20.1 k/ft
-77 k/ft
Deflection (inch)
0 1 2 3
2.36 in
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020

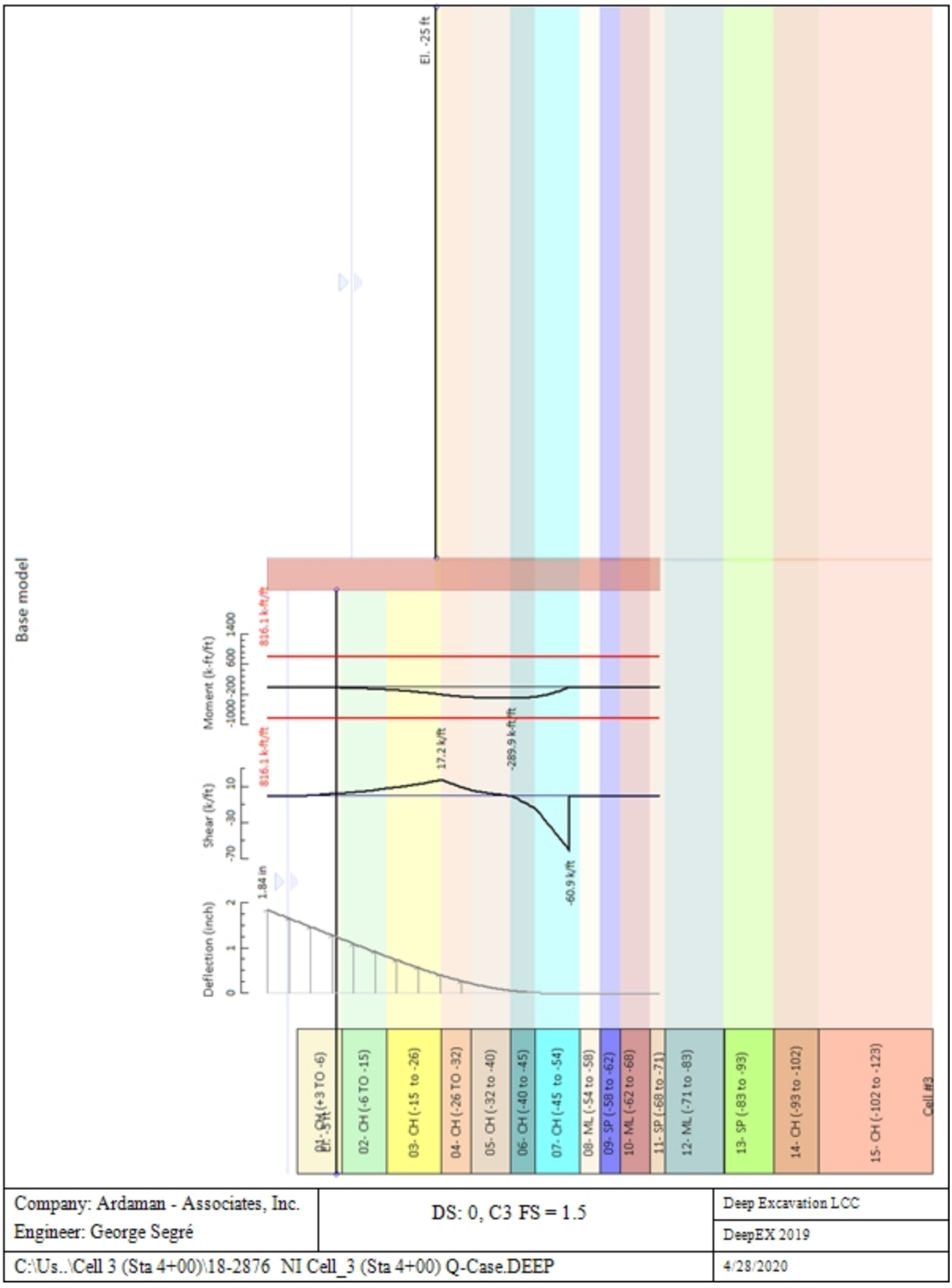

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
9.162 ksf
3.098 ksf
3.466 ksf
3.911 ksf
1.608 ksf
2.89 ksf
1.417 ksf
1.577 ksf
1.769 ksf
4.118 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54
08- ML (-54 to -58
09- SP (-58 to -62
10- ML (-62 to -68
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020



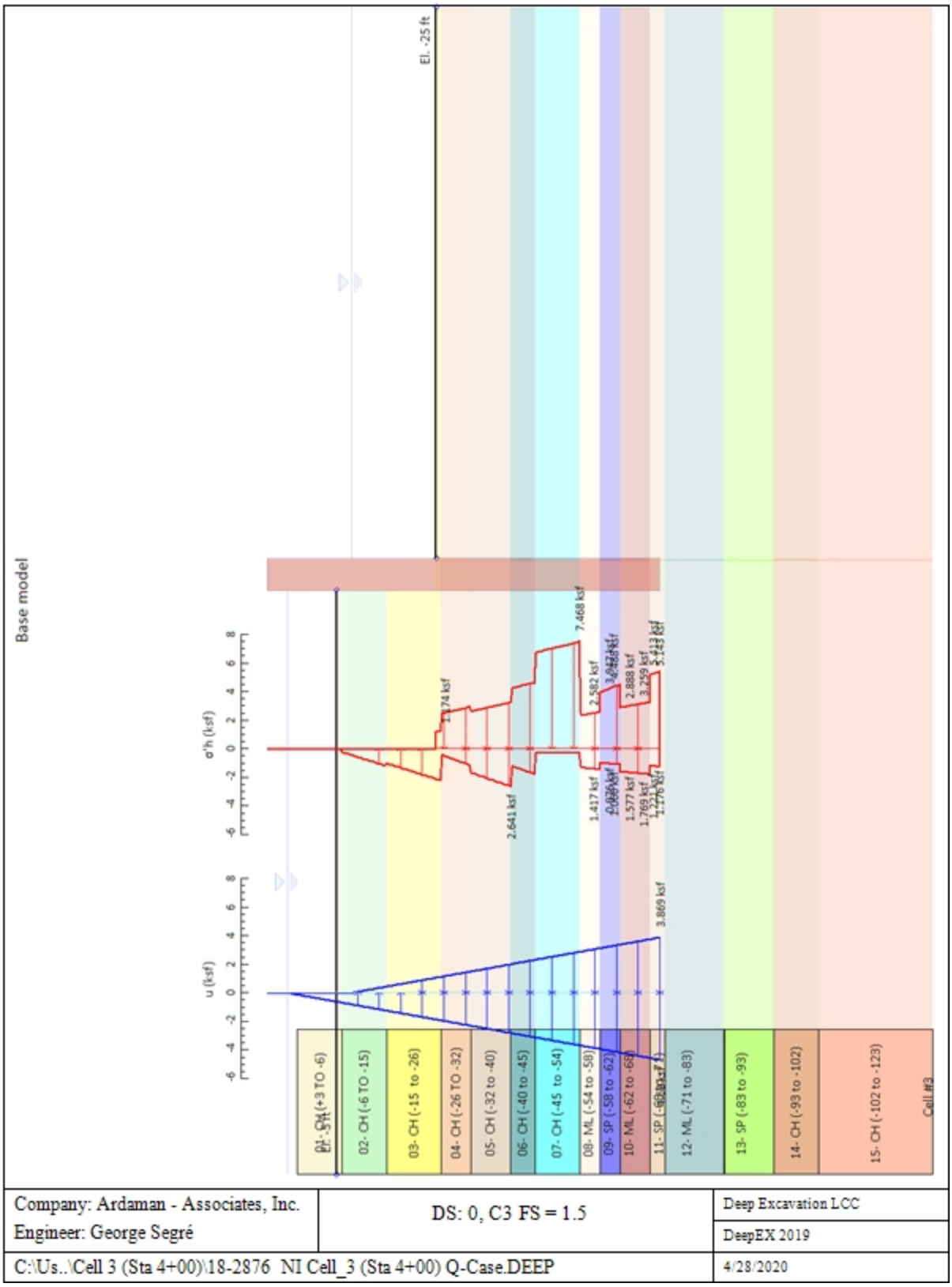

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |

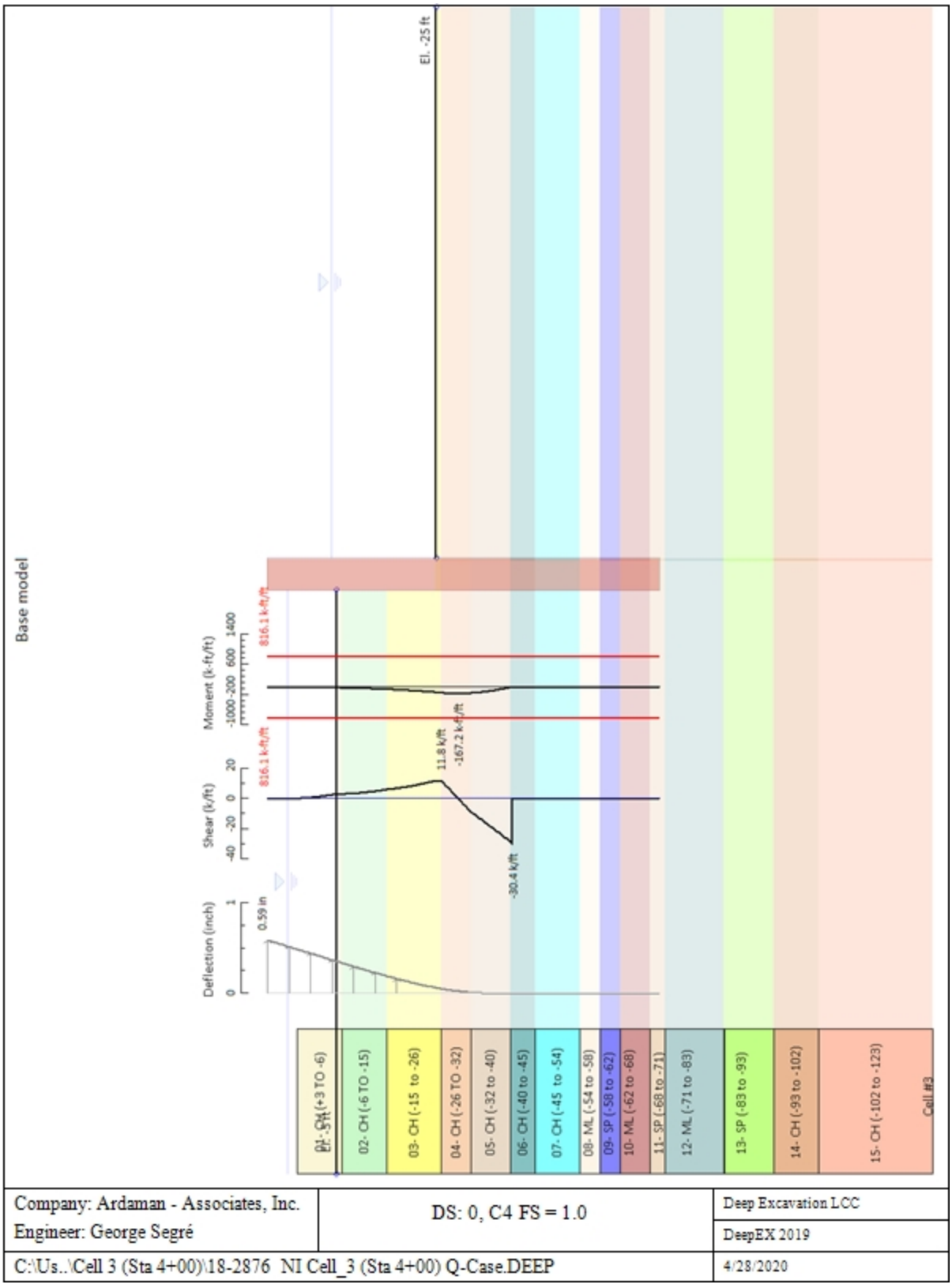



Attachment Figure C.3-21

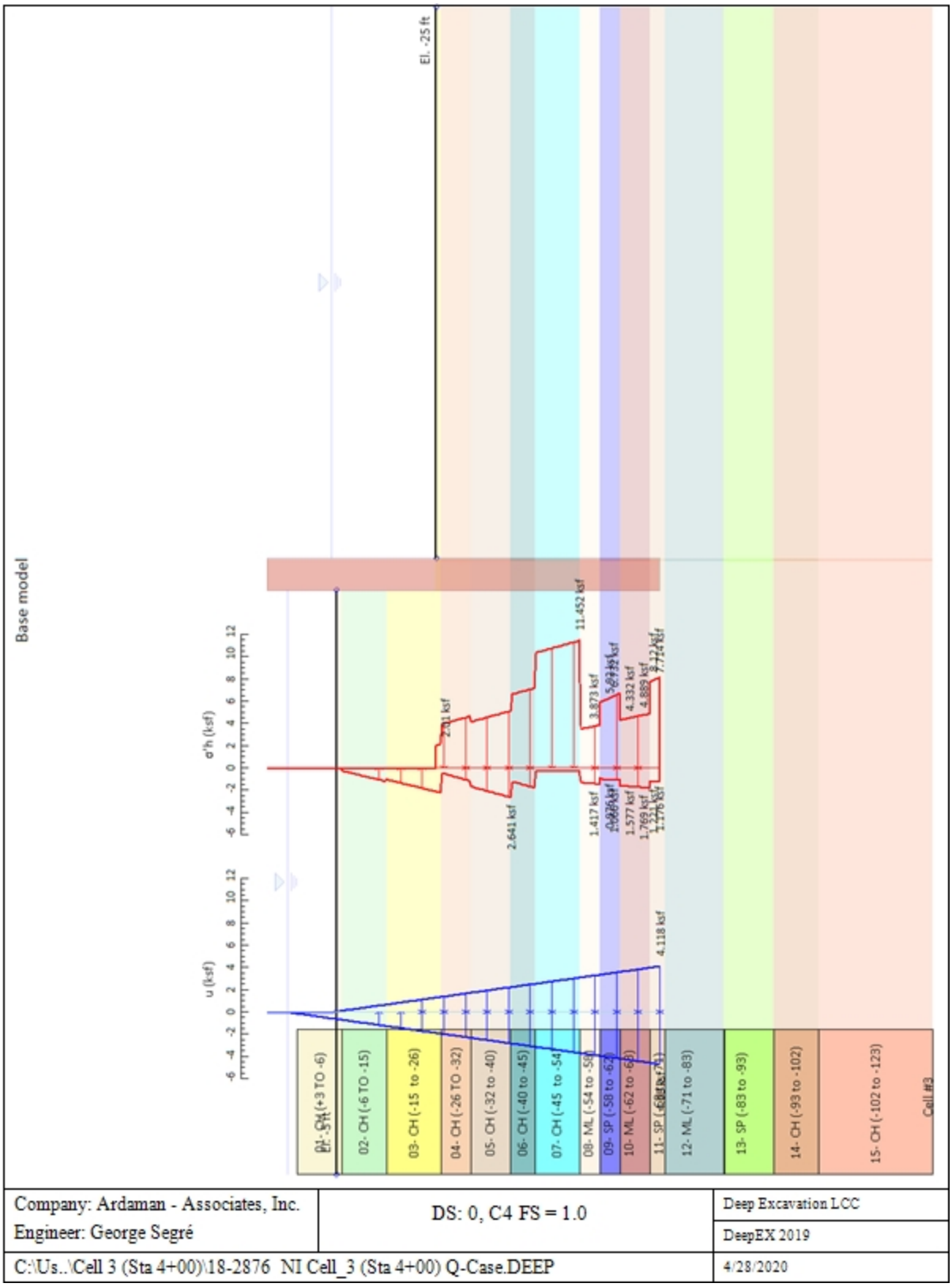



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |

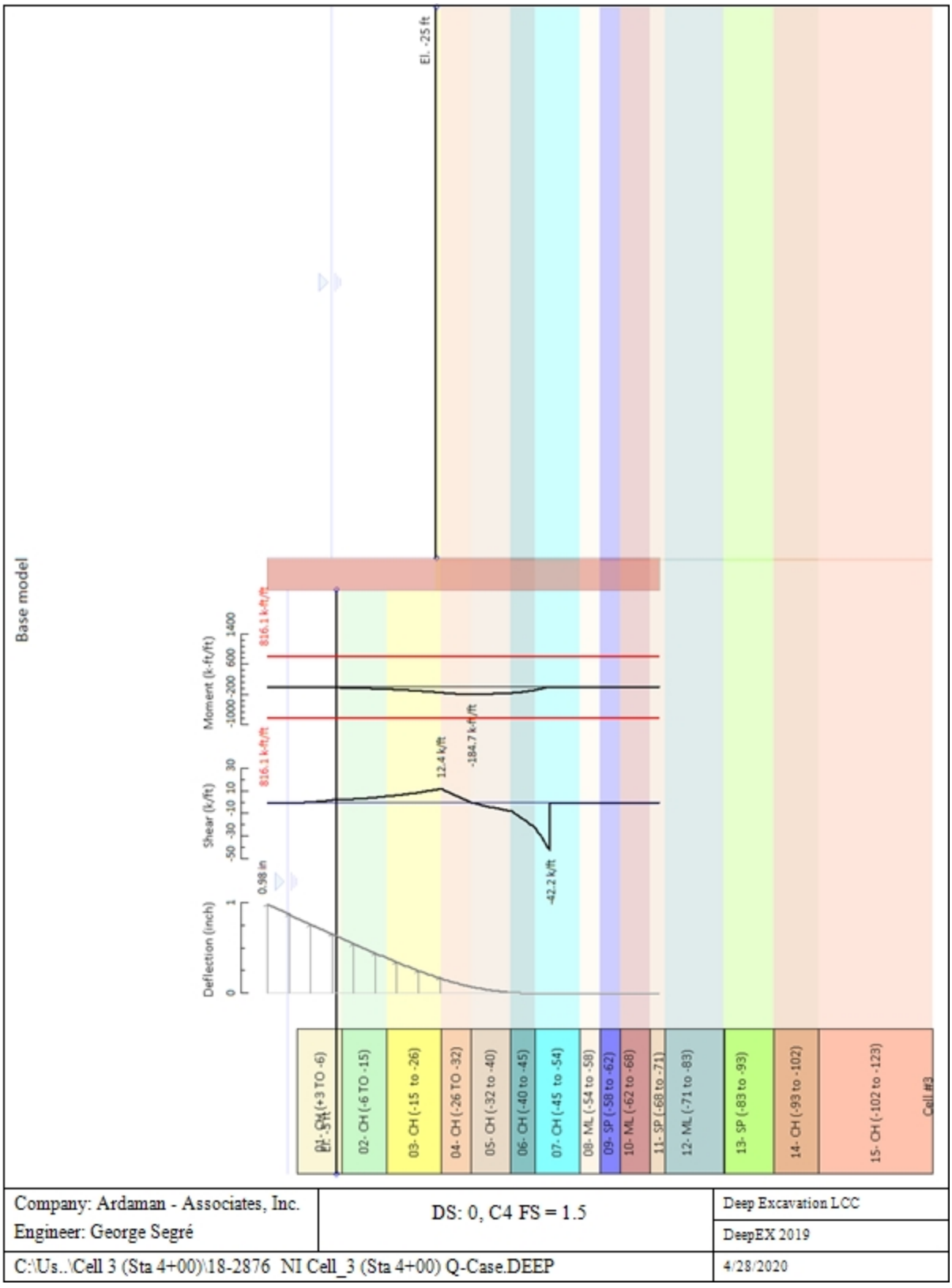

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
7.468 ksf
2.582 ksf
2.888 ksf
3.259 ksf
1.774 ksf
2.641 ksf
1.417 ksf
1.577 ksf
1.769 ksf
3.869 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020



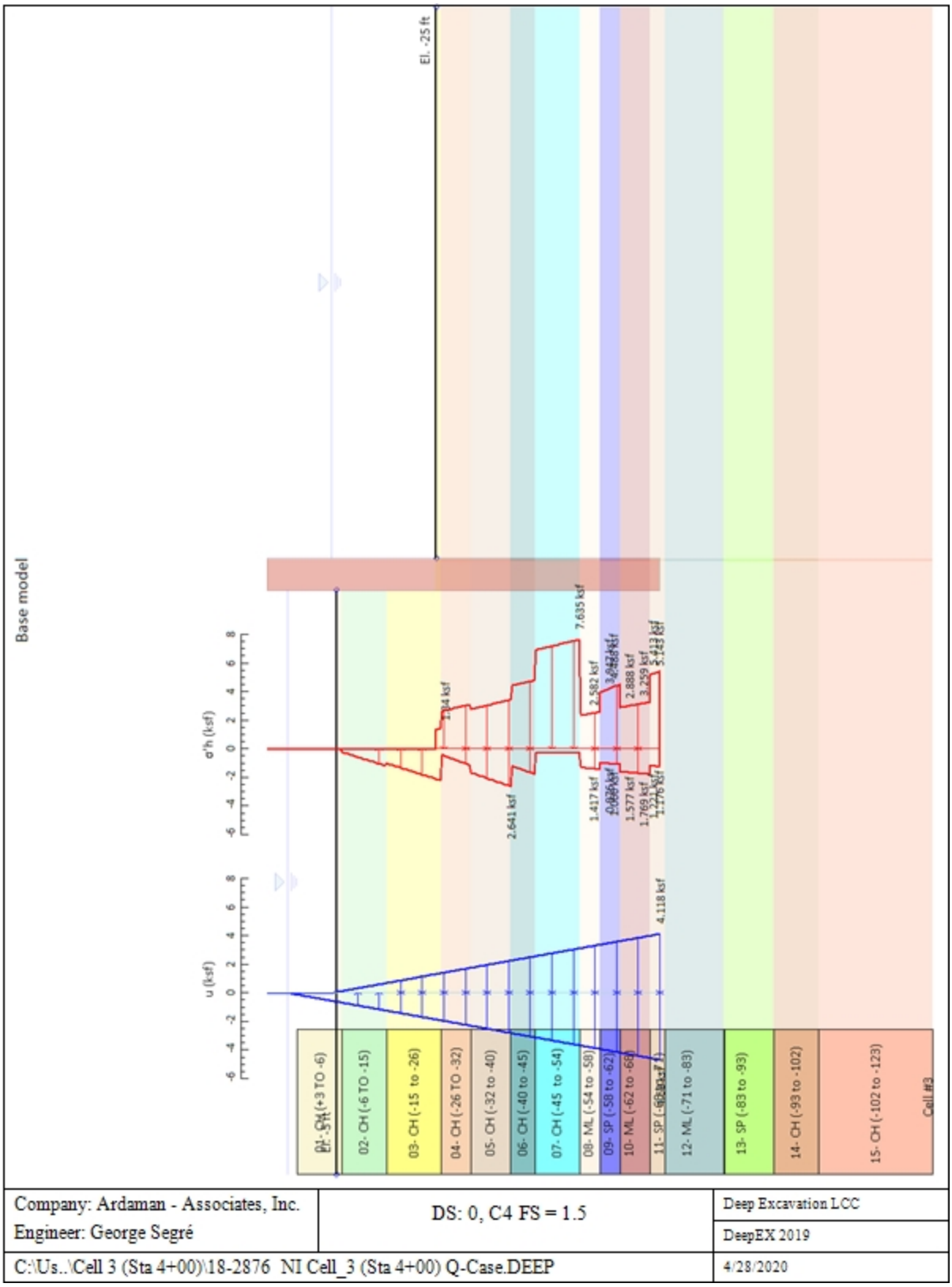

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:15:52 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 23 | 0 | 500 | 23 | 23 | 300 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 0 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 23 | 0 | 350 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 26 | 0 | 1250 | 26 | 26 | 521.92 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 26 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 26 | 0 | 1730 | 26 | 26 | 626.3 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 26 | 0 | 3300 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 26 | 0 | 4000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 0.609 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

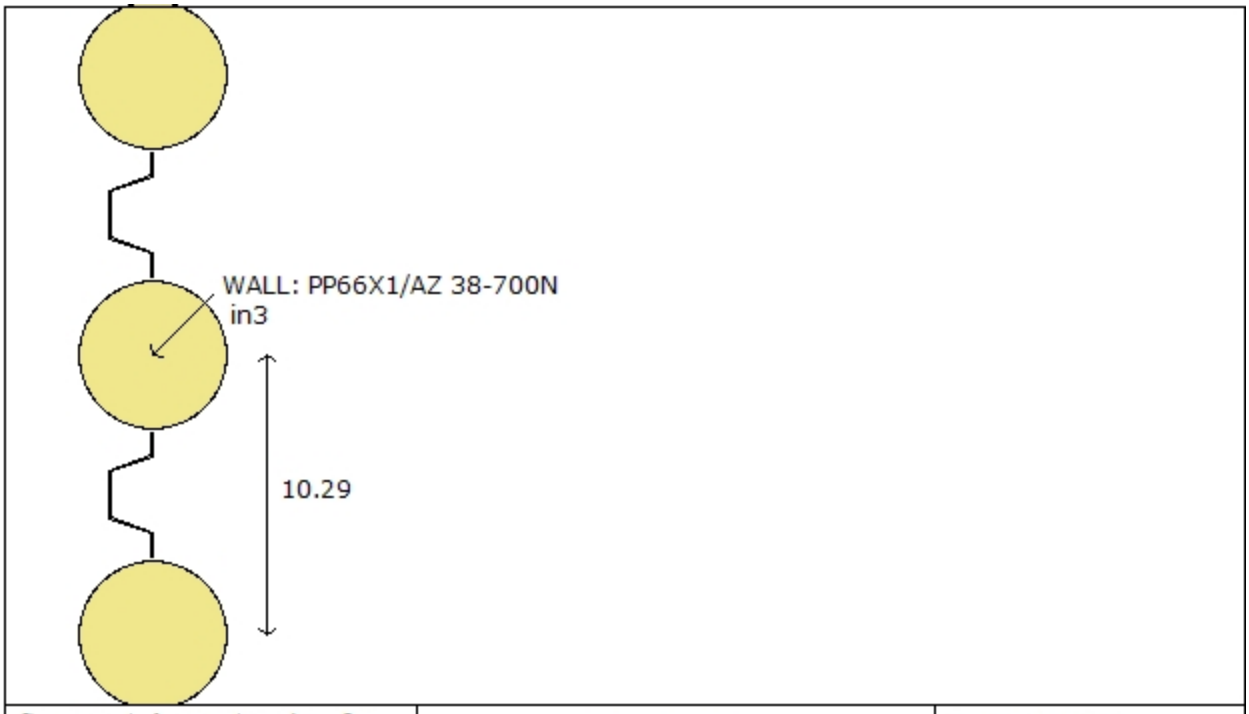
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 0.61 |
| -6 | 02- CH (-6 TO - | 1 | 1 |
| -15 | 03- CH (-15 to | 1 | 0.61 |
| -26 | 04- CH (-26 TO | 1 | 0.56 |
| -32 | 05- CH (-32 to | 1 | 0 |
| -40 | 06- CH (-40 to | 1 | 0.56 |
| -45 | 07- CH (-45 to | 1 | 0.56 |
| -54 | 08- ML (-54 to | 1 | 0.53 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.53 |
| -68 | 11- SP (-68 to - | 1 | 0.5 |
| -71 | 12- ML (-71 to | 1 | 0.53 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 0.56 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.596 | 1.799 | 2.714 |
| Stage 1 | Simple span | N/A | 1.6 | 1.36 | 1.439 | 2.171 |
| Stage 2 | Simple span | N/A | 1.6 | 1.768 | 2.054 | 3.036 |
| Stage 3 | Simple span | N/A | 1.6 | 1.514 | 1.643 | 2.429 |
| Stage 4 | Simple span | N/A | 1.6 | 1.835 | 2.127 | 3.077 |
| Stage 5 | Simple span | N/A | 1.6 | 1.373 | 1.418 | 2.052 |
| Stage 6 | Simple span | N/A | 1.6 | 2.096 | 2.493 | 3.498 |
| Stage 7 | Simple span | N/A | 1.6 | 1.579 | 1.662 | 2.332 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

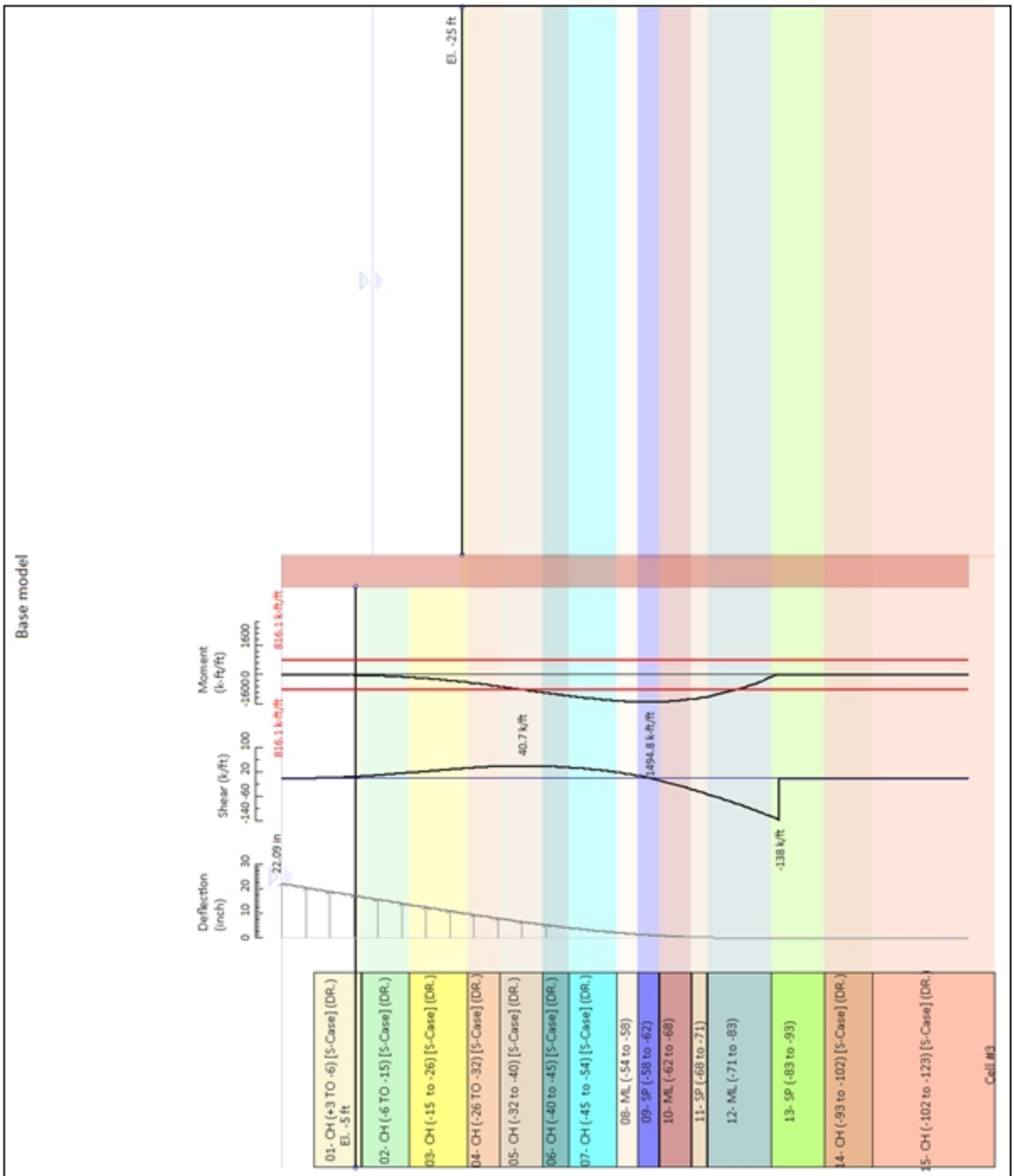
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

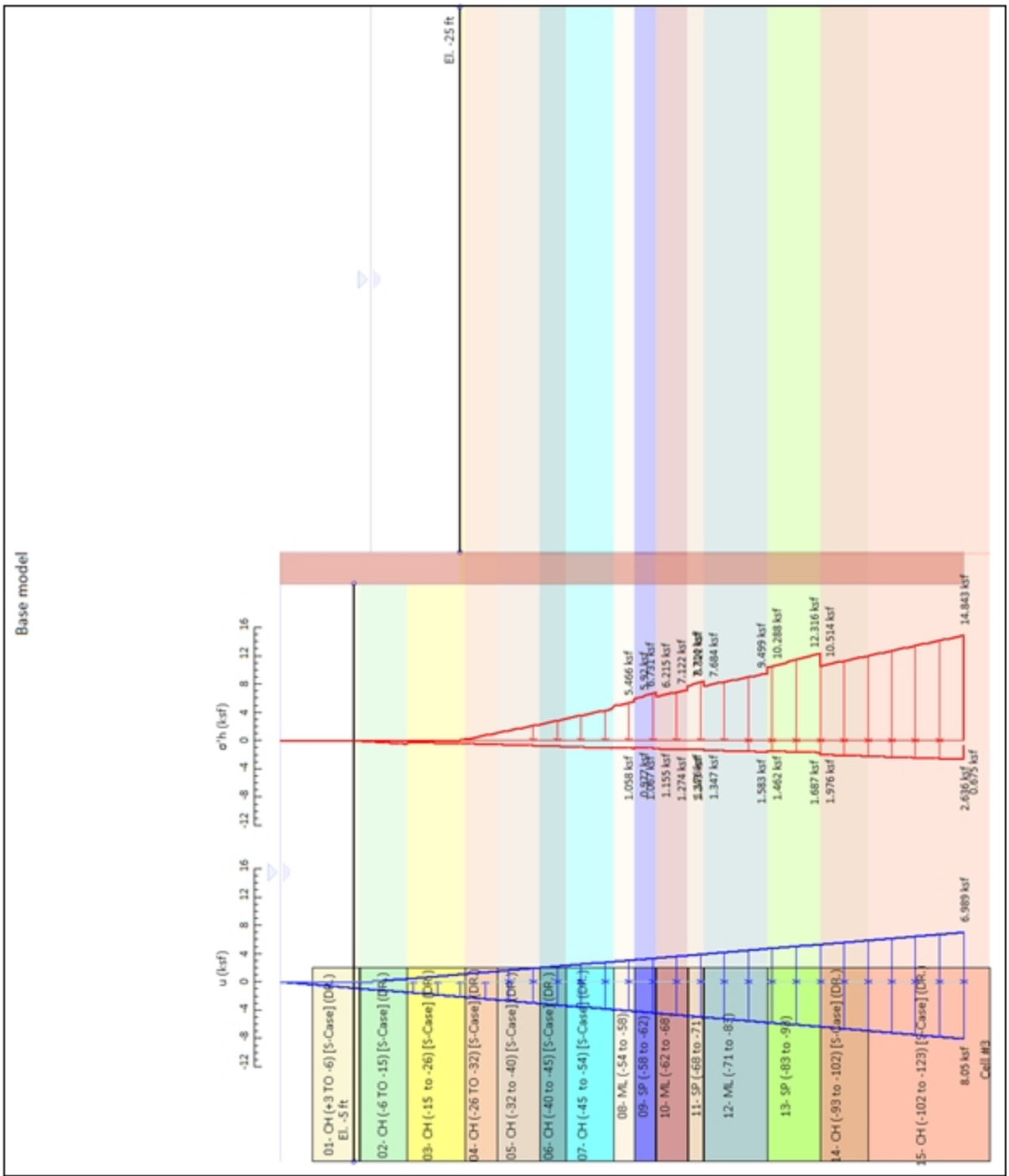
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

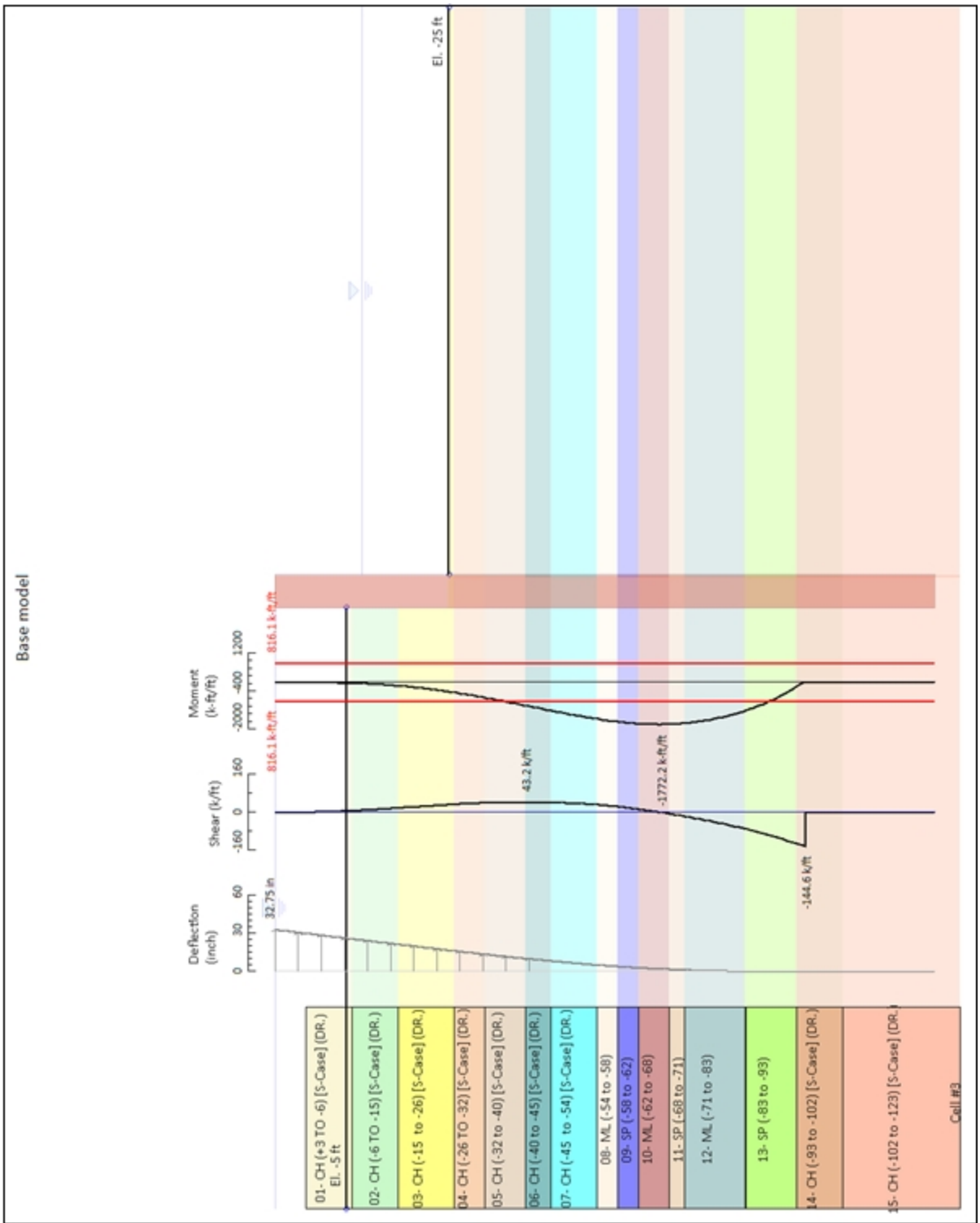
A sequence of figures for each excavation stage is reported



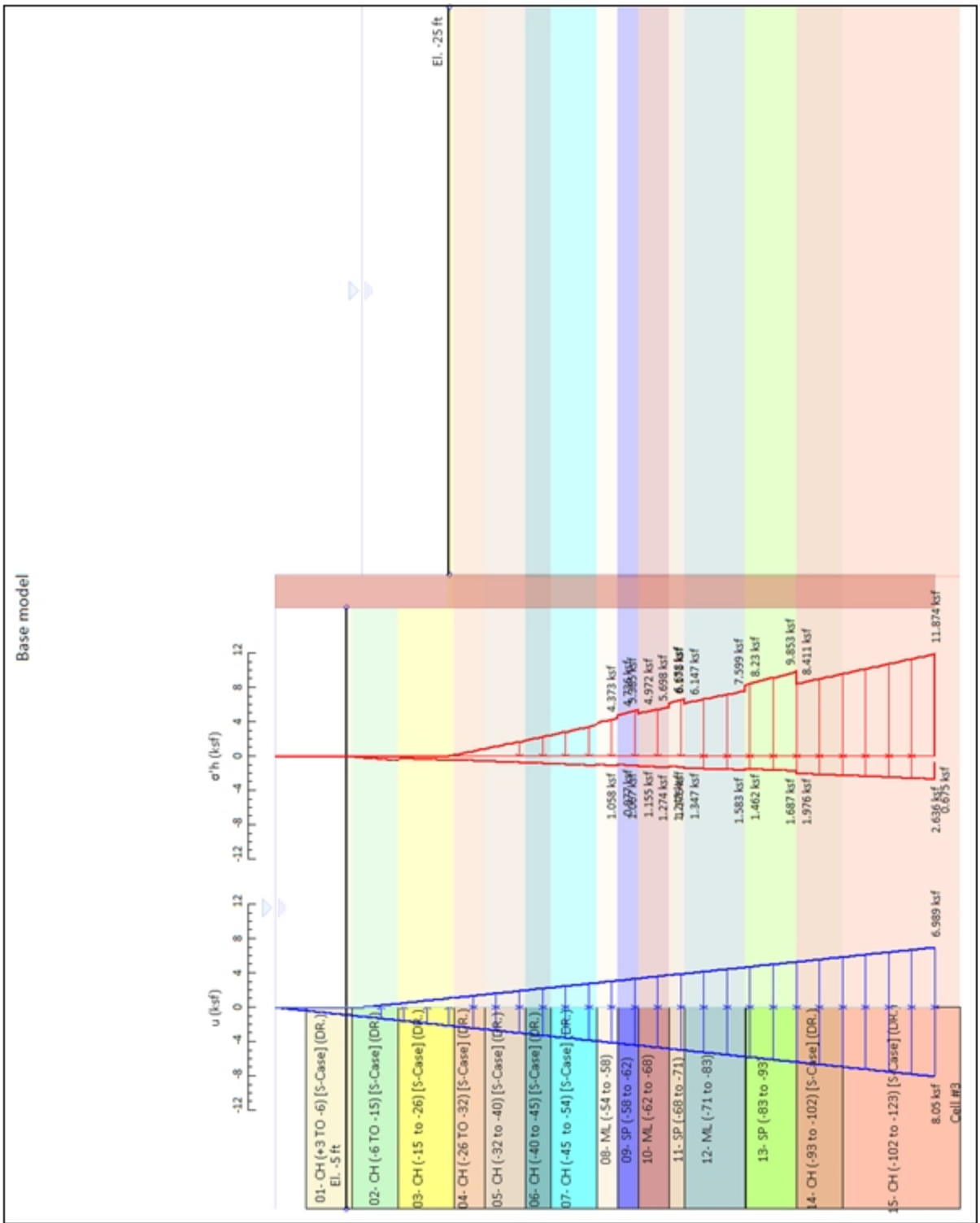

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



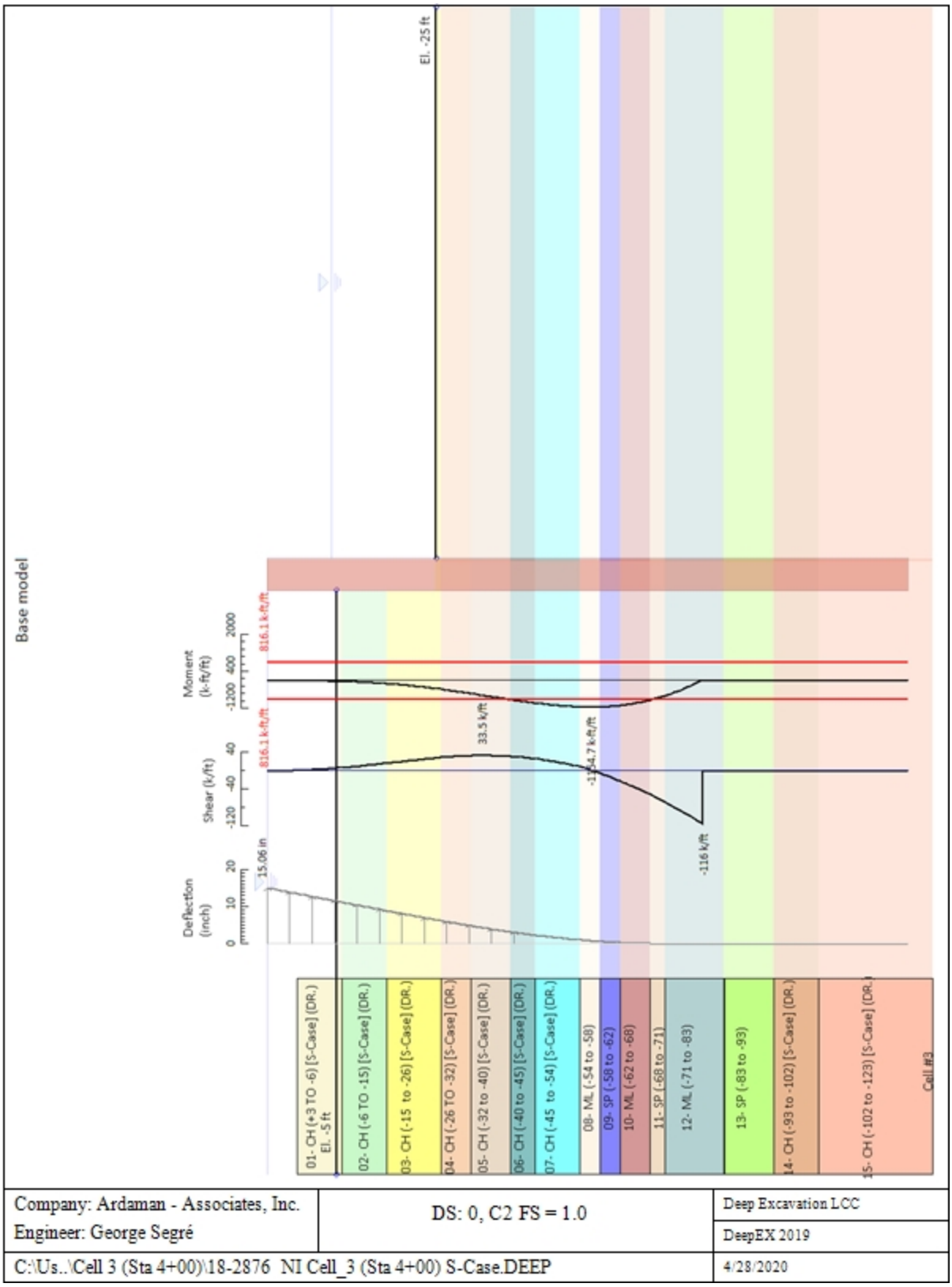

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



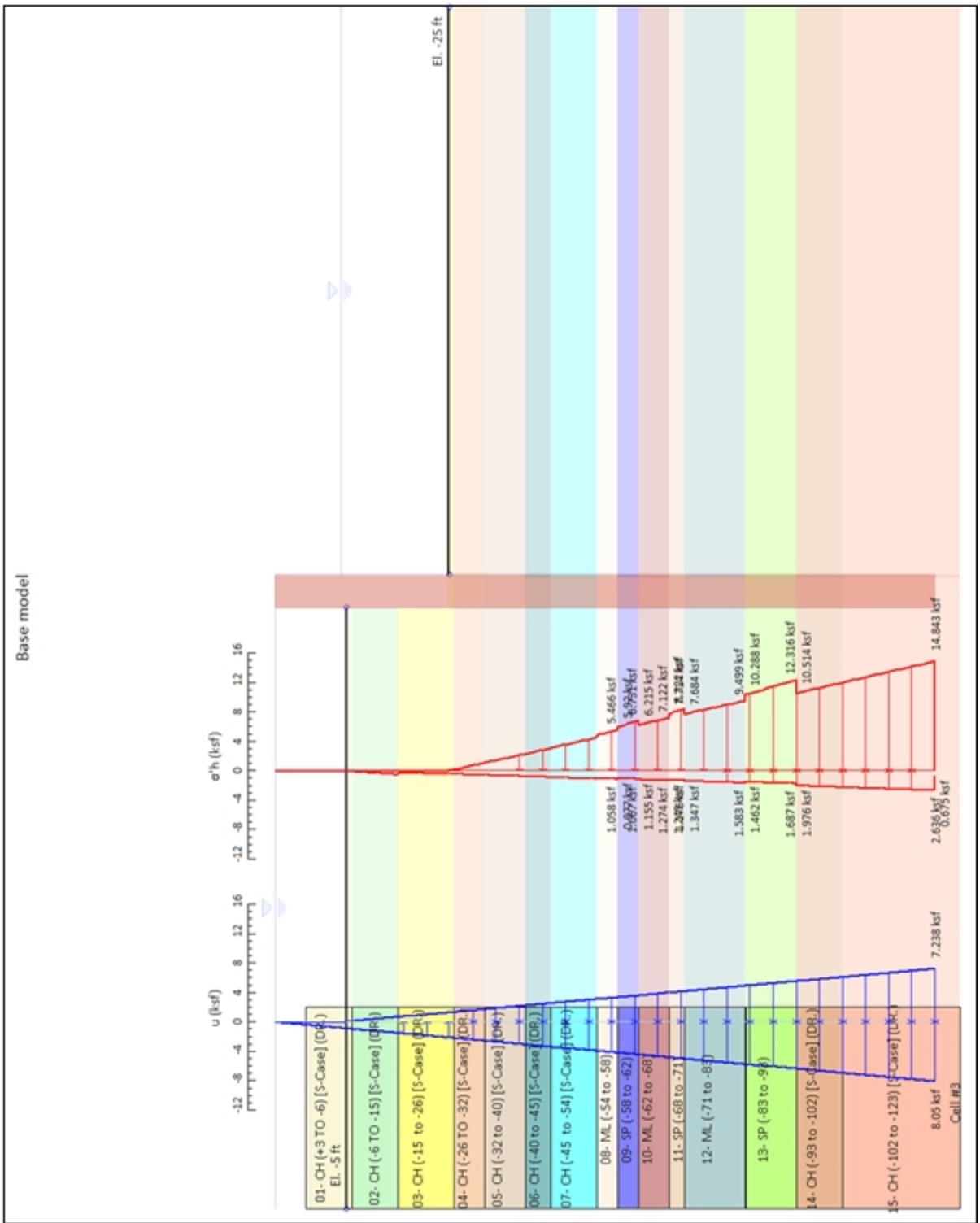

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



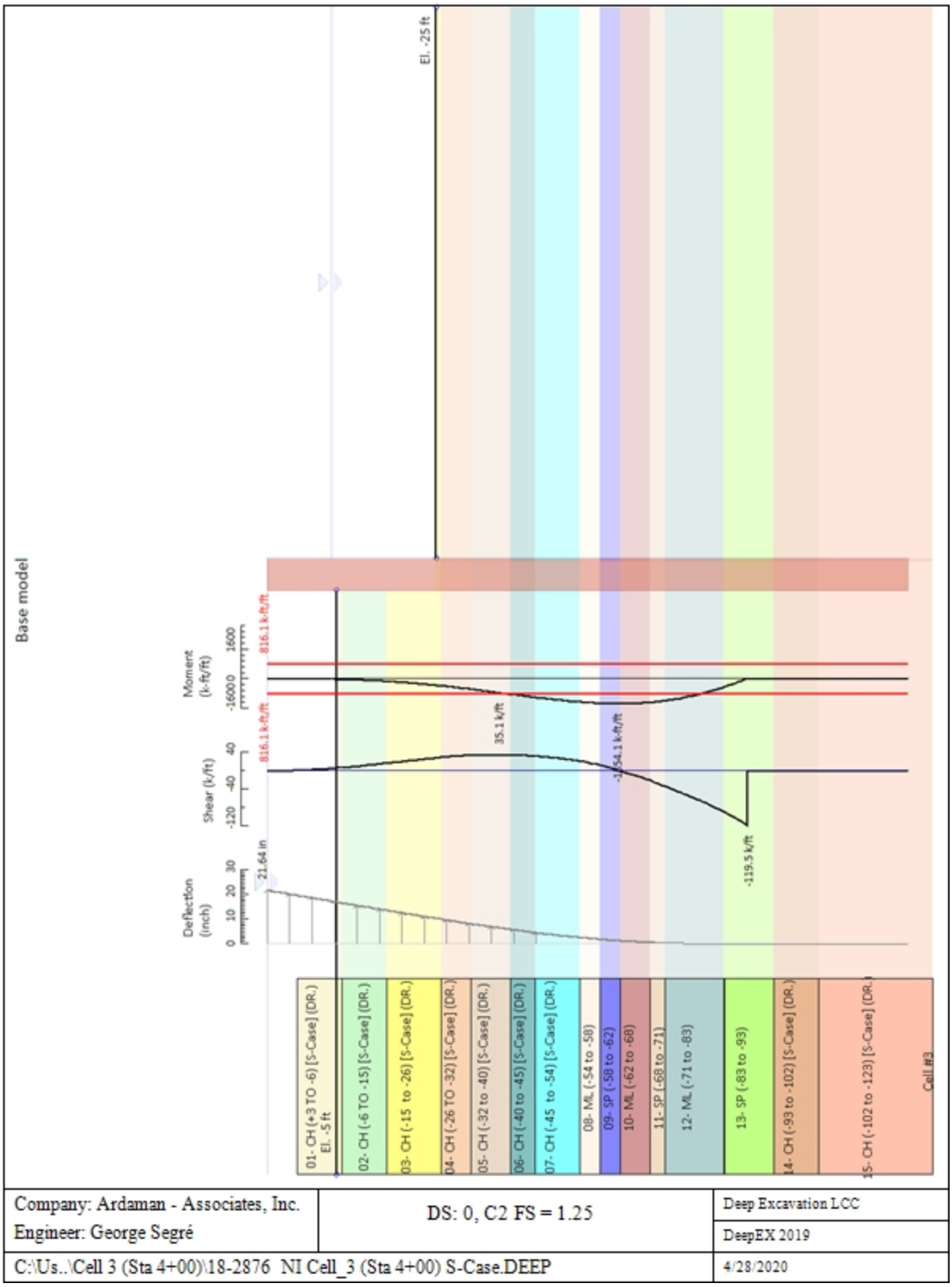

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



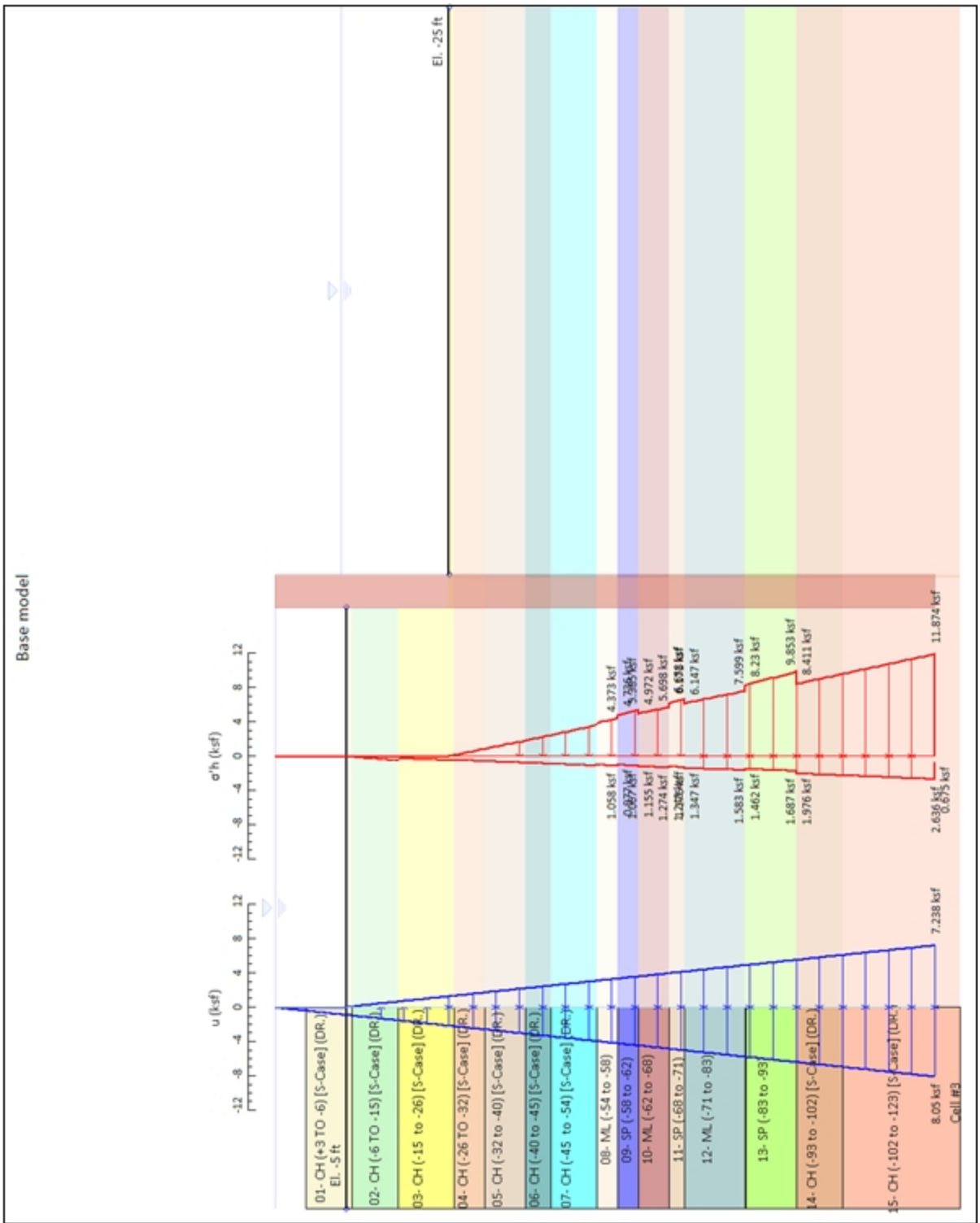

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



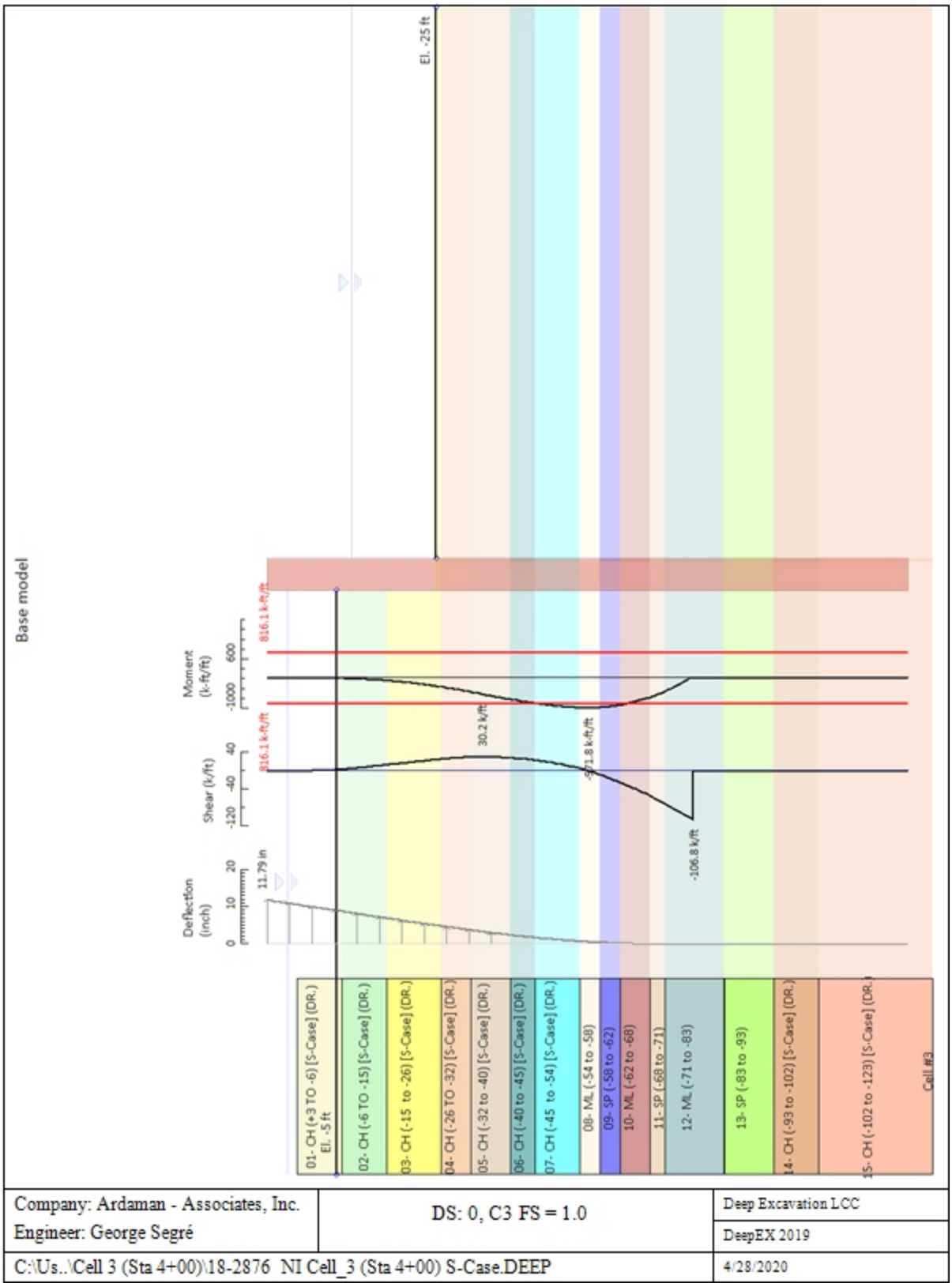

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



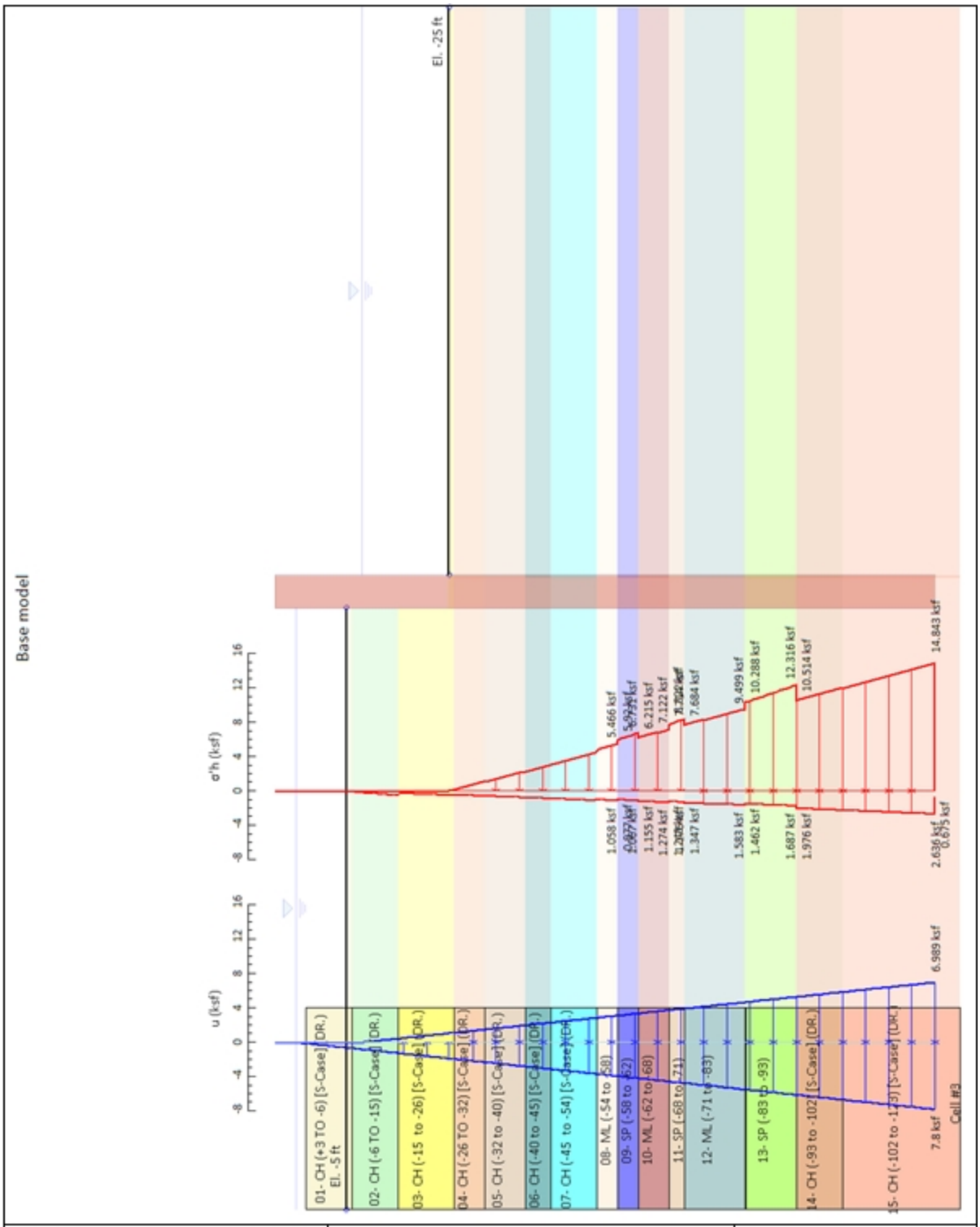

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



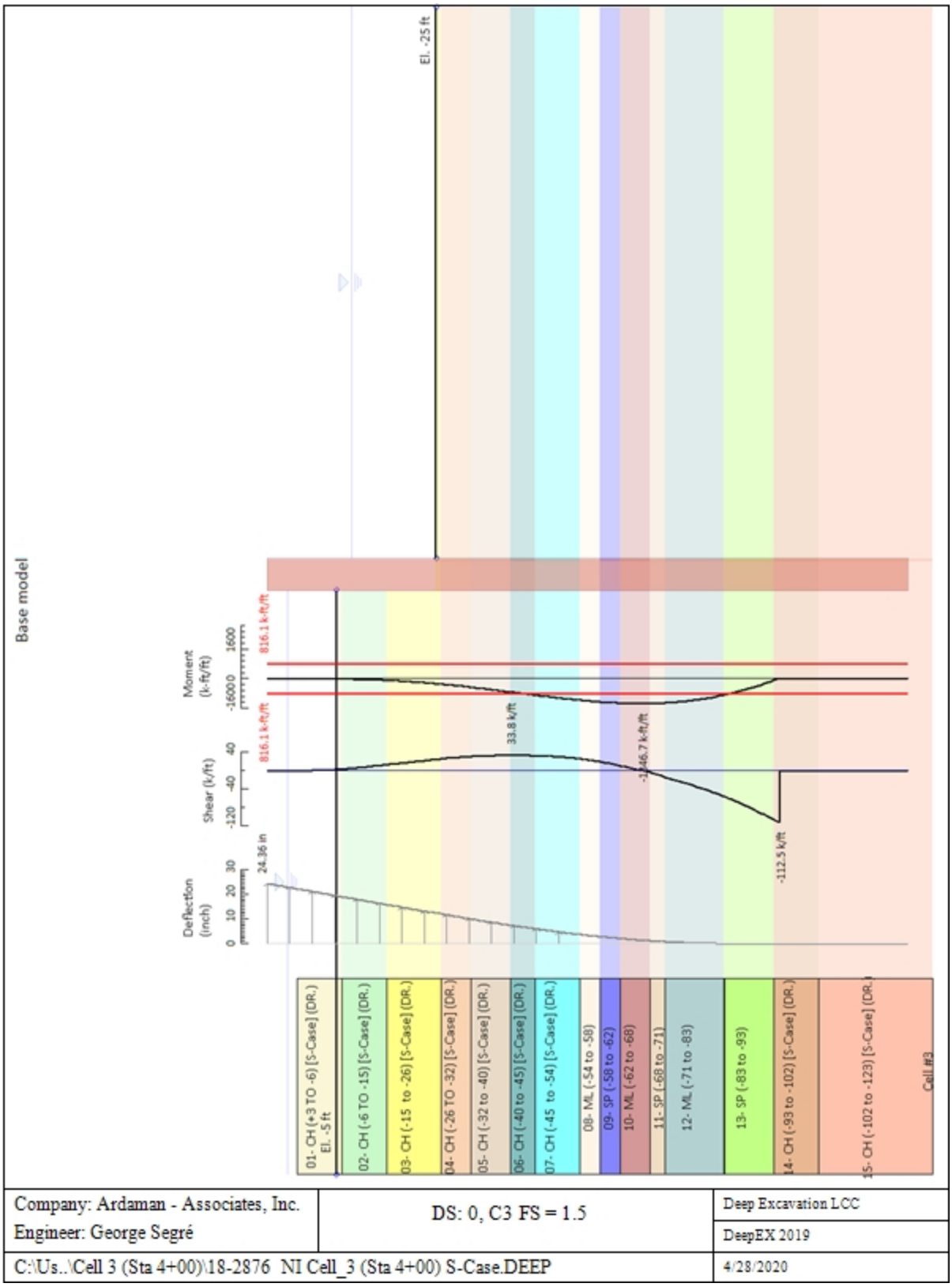

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



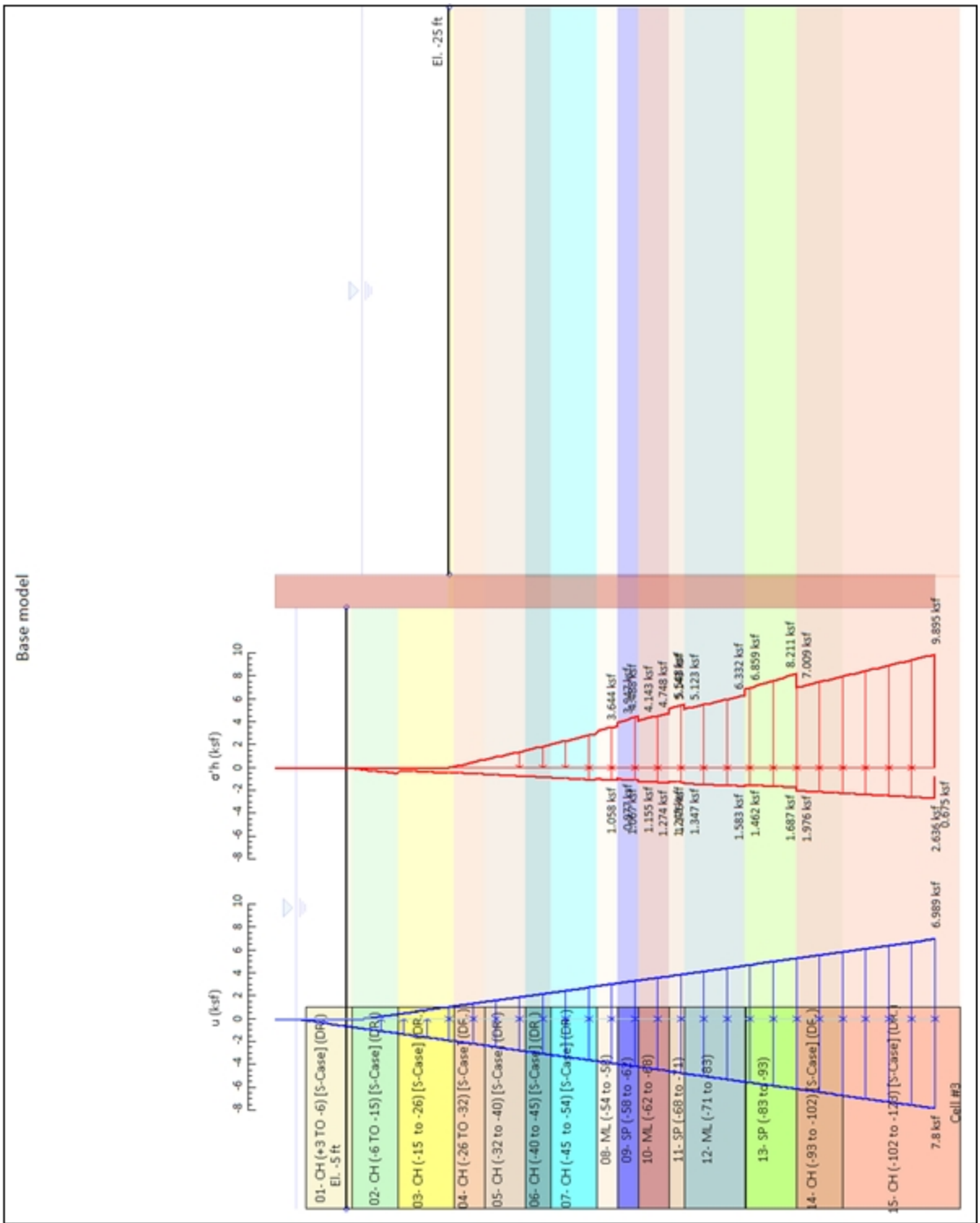

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



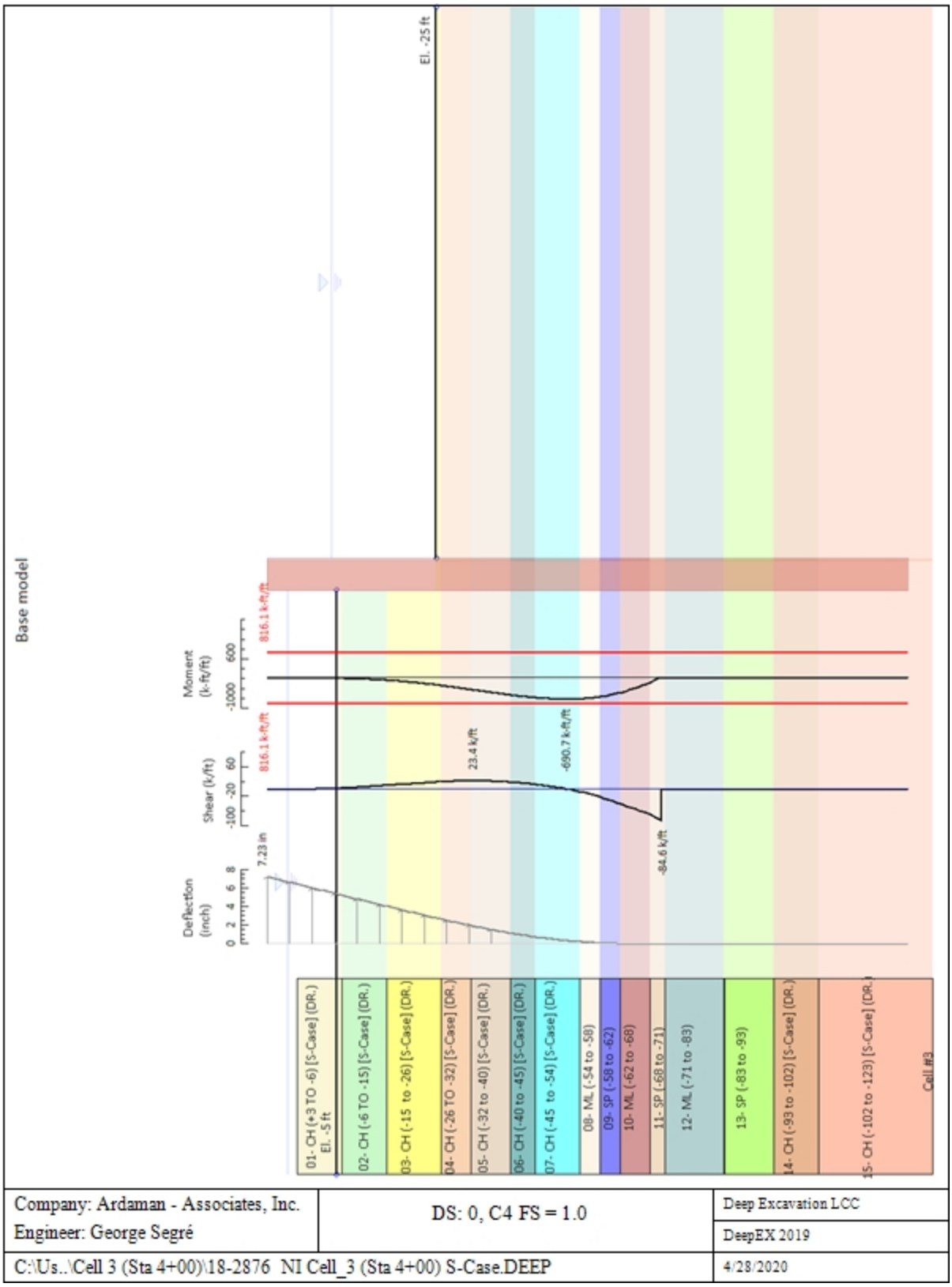

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



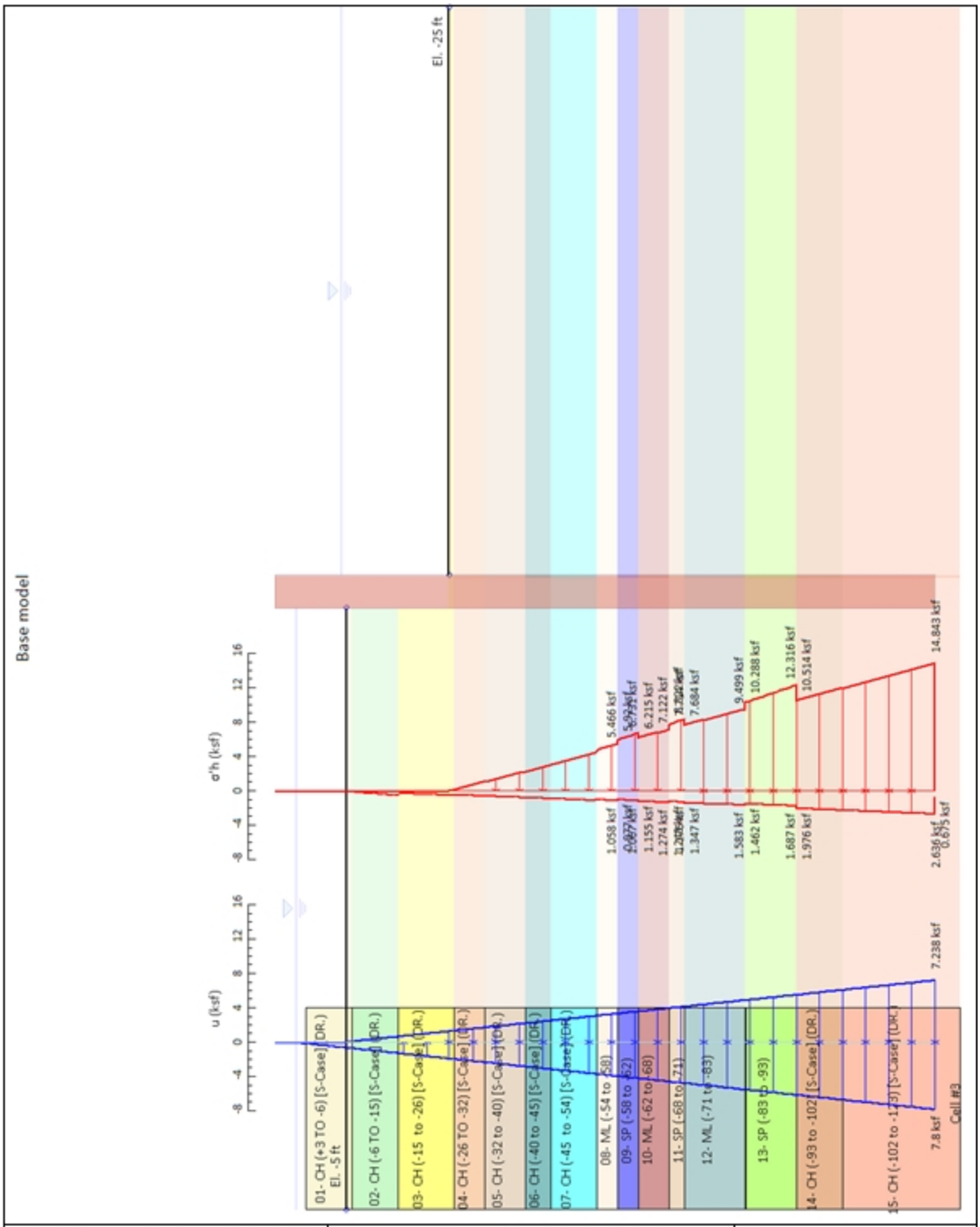

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



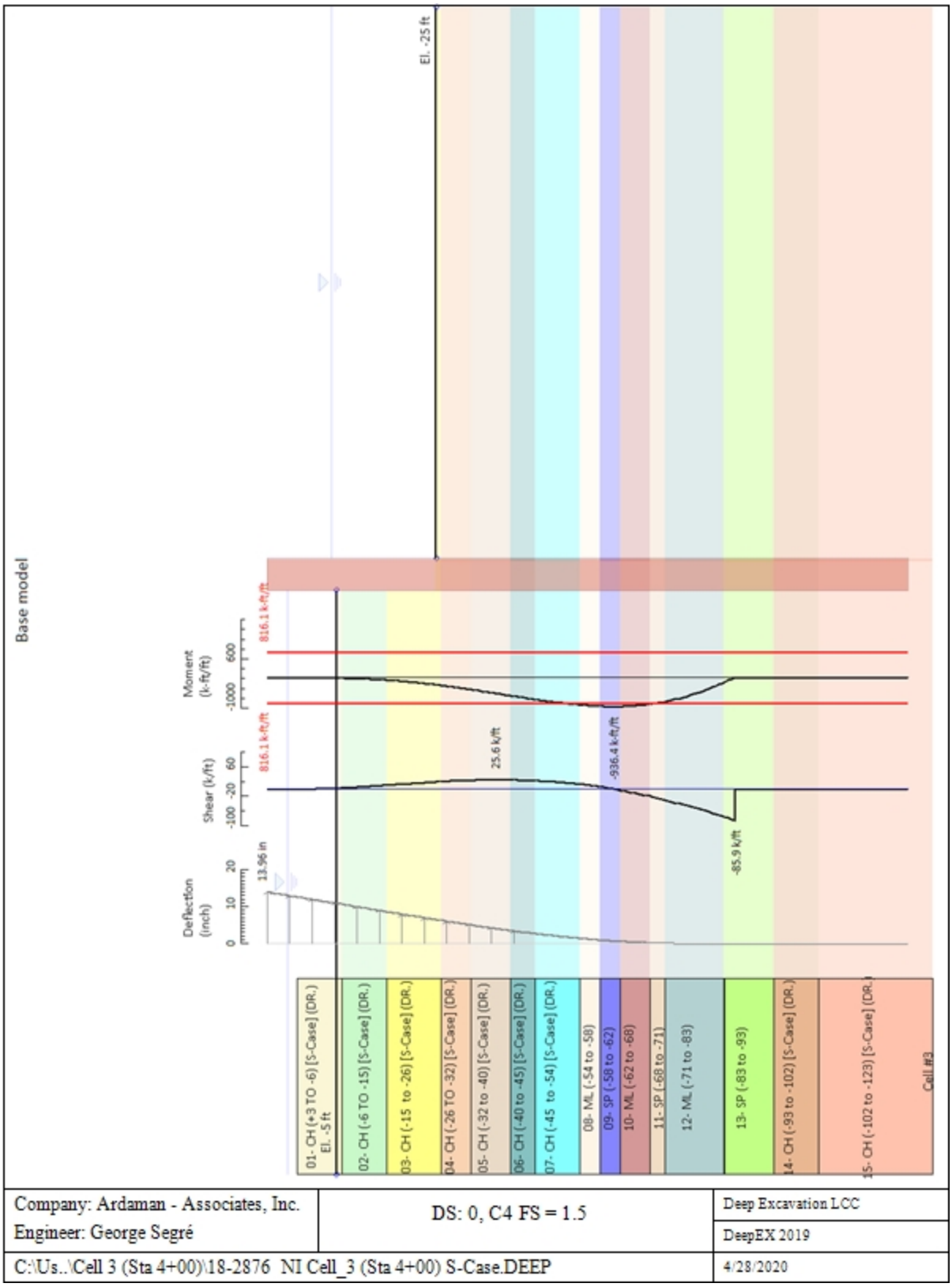

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |



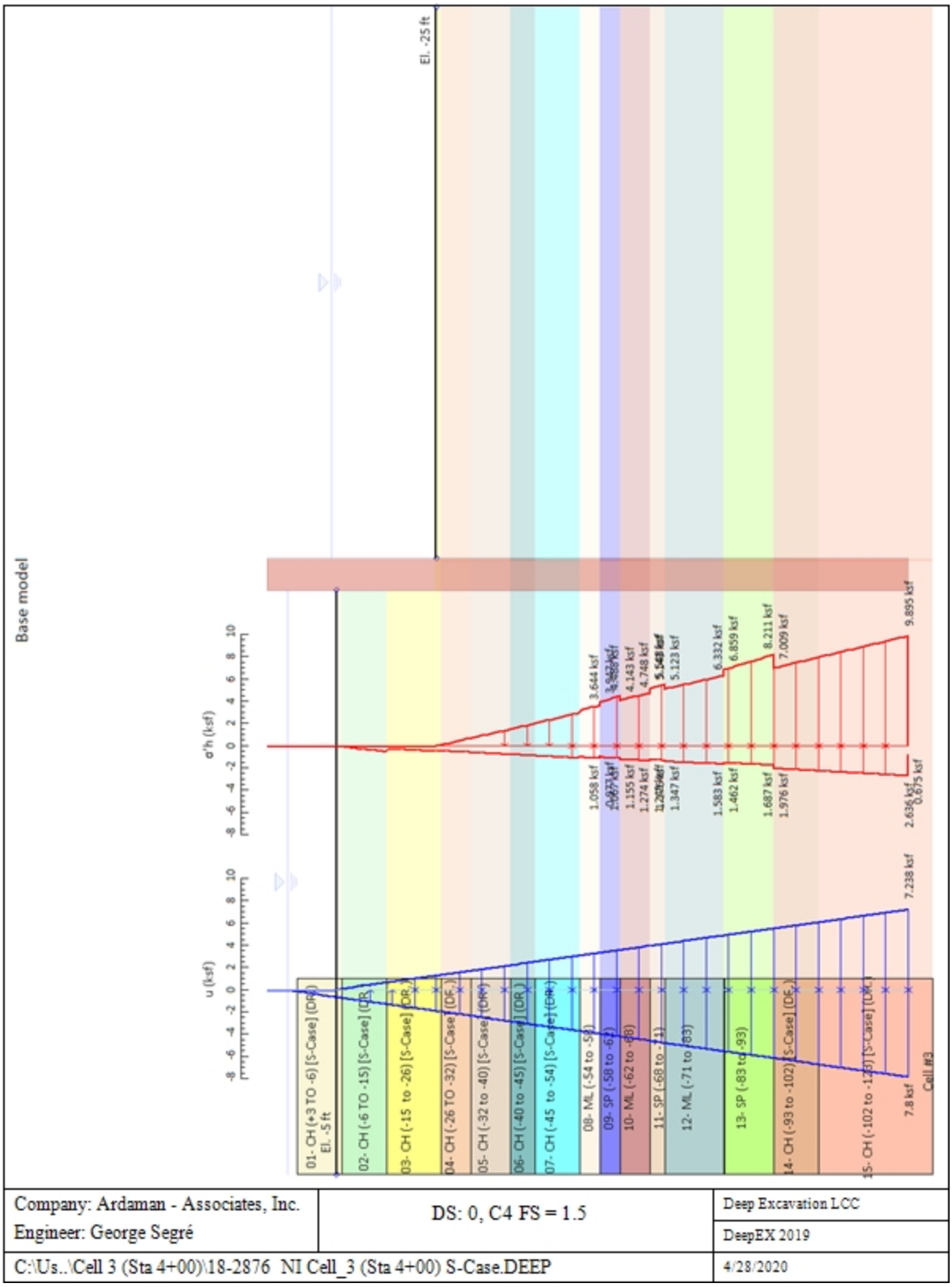

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 5+00)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -96.14 ft., NAVD88

Length of Sheetting = 105.14 ft.

Use = 106.0 ft.

Design Tip Elev. = -97.0 ft., NAVD88

Design Length of Sheeting = 106.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -51.04 | 435.35 | 91.21 | 2.65 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -54.99 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -47.88 | 330.78 | 68.80 | 1.76 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -51.83 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -45.90 | 249.50 | 50.46 | 1.15 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -53.41 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -41.56 | 171.51 | 32.76 | 0.62 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -49.46 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -85.17 | 1,533.84 | 139.59 | 23.04 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -96.14 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -79.36 | 1,186.64 | 116.90 | 15.72 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -89.04 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -77.43 | 1,001.73 | 107.68 | 12.36 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -95.49 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -71.00 | 712.90 | 86.02 | 7.59 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -86.46 | -- | -- | -- |
| | | | | | | Governing Value: | -96.14 | 1,533.84 | 139.59 | 23.04 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:35:30 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 0 | 0 | 500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 0 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 0 | 0 | 350 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 0 | 0 | 1250 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 0 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 0 | 0 | 1730 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 0 | 0 | 3300 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

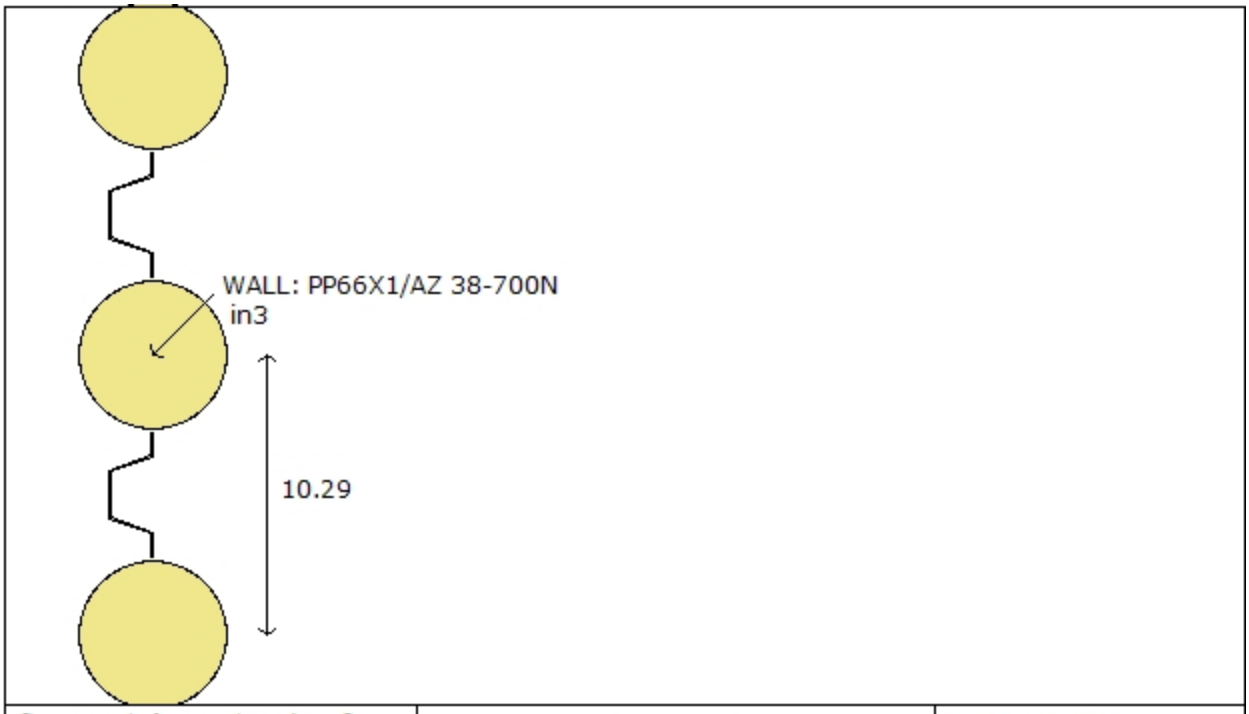
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 1 |
| -6 | 02- CH (-6 TO - | 1 | 1 |
| -15 | 03- CH (-15 to | 1 | 1 |
| -26 | 04- CH (-26 TO | 1 | 1 |
| -32 | 05- CH (-32 to | 1 | 1 |
| -40 | 06- CH (-40 to | 1 | 1 |
| -45 | 07- CH (-45 to | 1 | 1 |
| -54 | 08- ML (-54 to | 1 | 0.74 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.74 |
| -68 | 11- SP (-68 to - | 1 | 1 |
| -71 | 12- ML (-71 to | 1 | 0.74 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 1 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.596 | 1.596 | 2.34 |
| Stage 1 | Simple span | N/A | 1.6 | 1.277 | 1.277 | 1.872 |
| Stage 2 | Simple span | N/A | 1.6 | 1.672 | 1.672 | 2.487 |
| Stage 3 | Simple span | N/A | 1.6 | 1.338 | 1.338 | 1.99 |
| Stage 4 | Simple span | N/A | 1.6 | 1.937 | 1.937 | 2.714 |
| Stage 5 | Simple span | N/A | 1.6 | 1.291 | 1.291 | 1.809 |
| Stage 6 | Simple span | N/A | 1.6 | 2.034 | 2.034 | 2.902 |
| Stage 7 | Simple span | N/A | 1.6 | 1.356 | 1.356 | 1.935 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

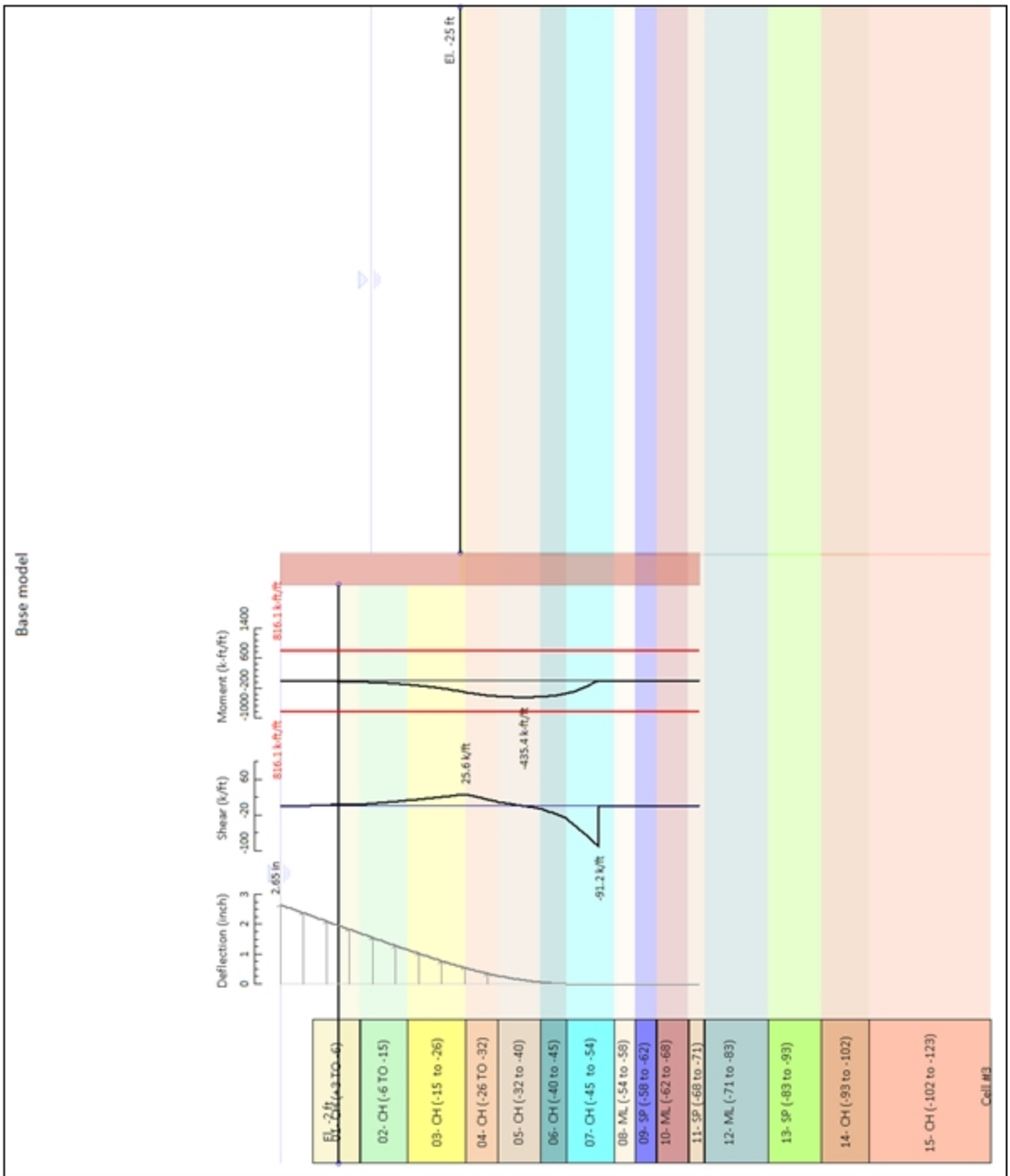
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

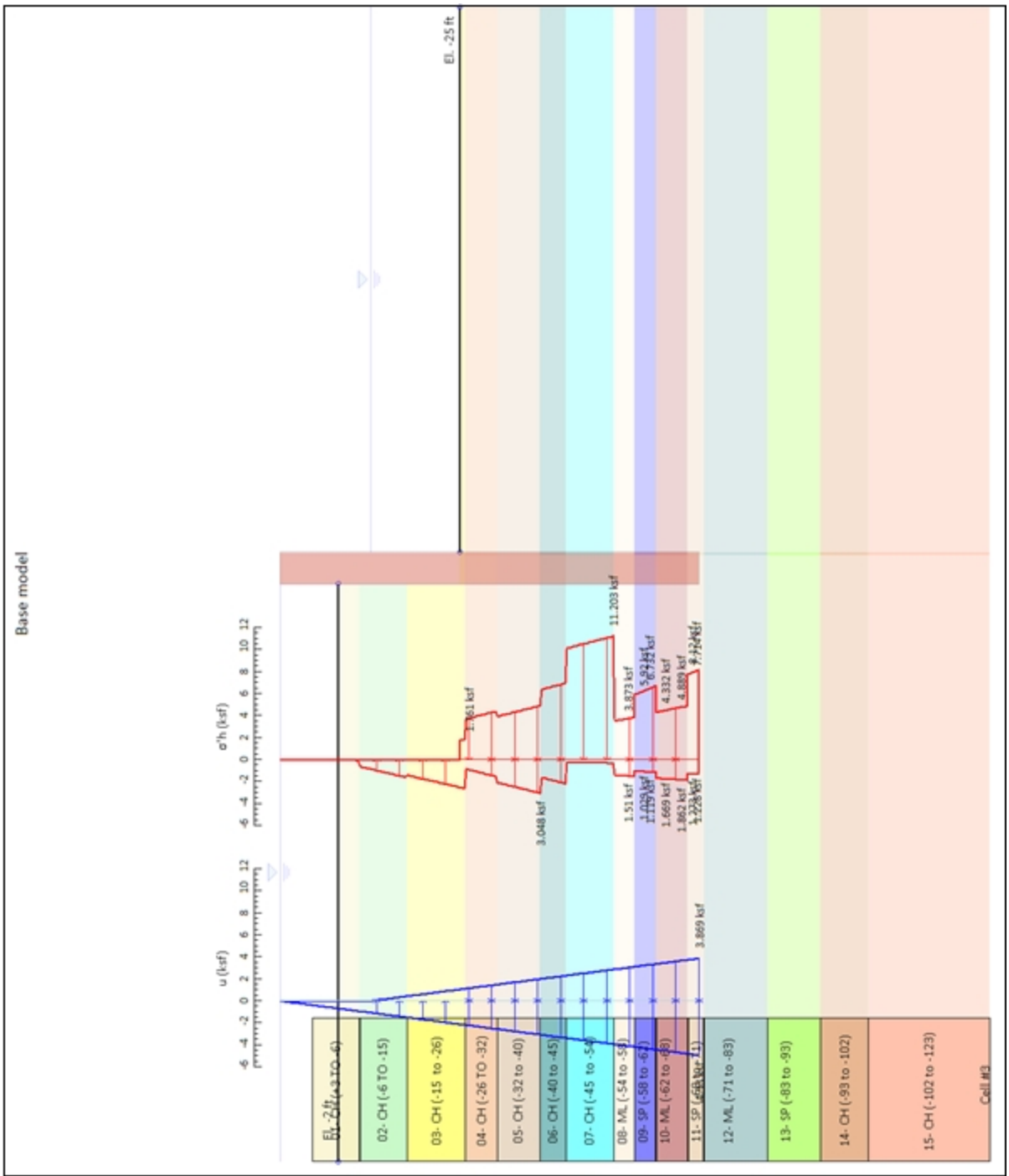
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

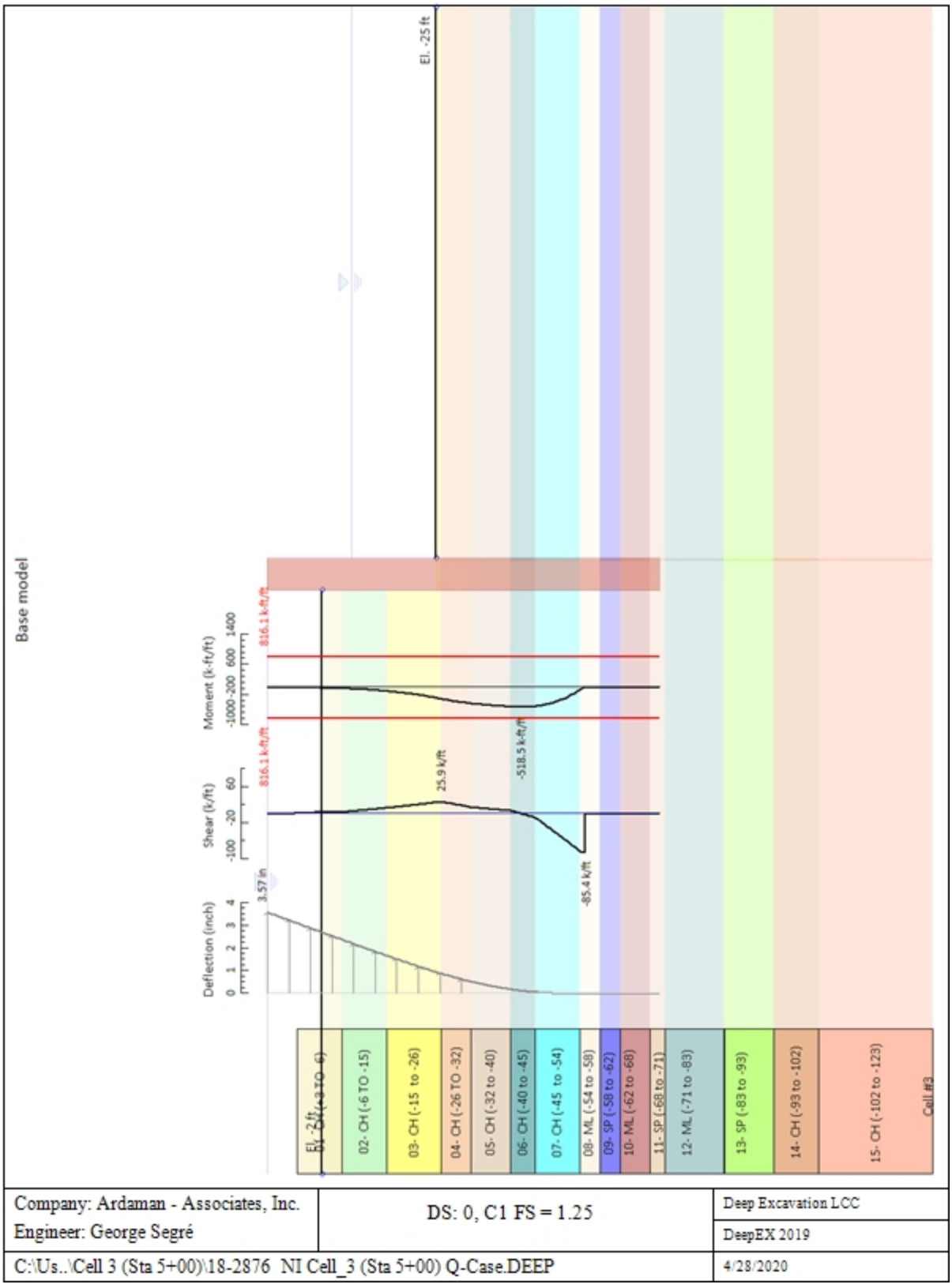
## EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported

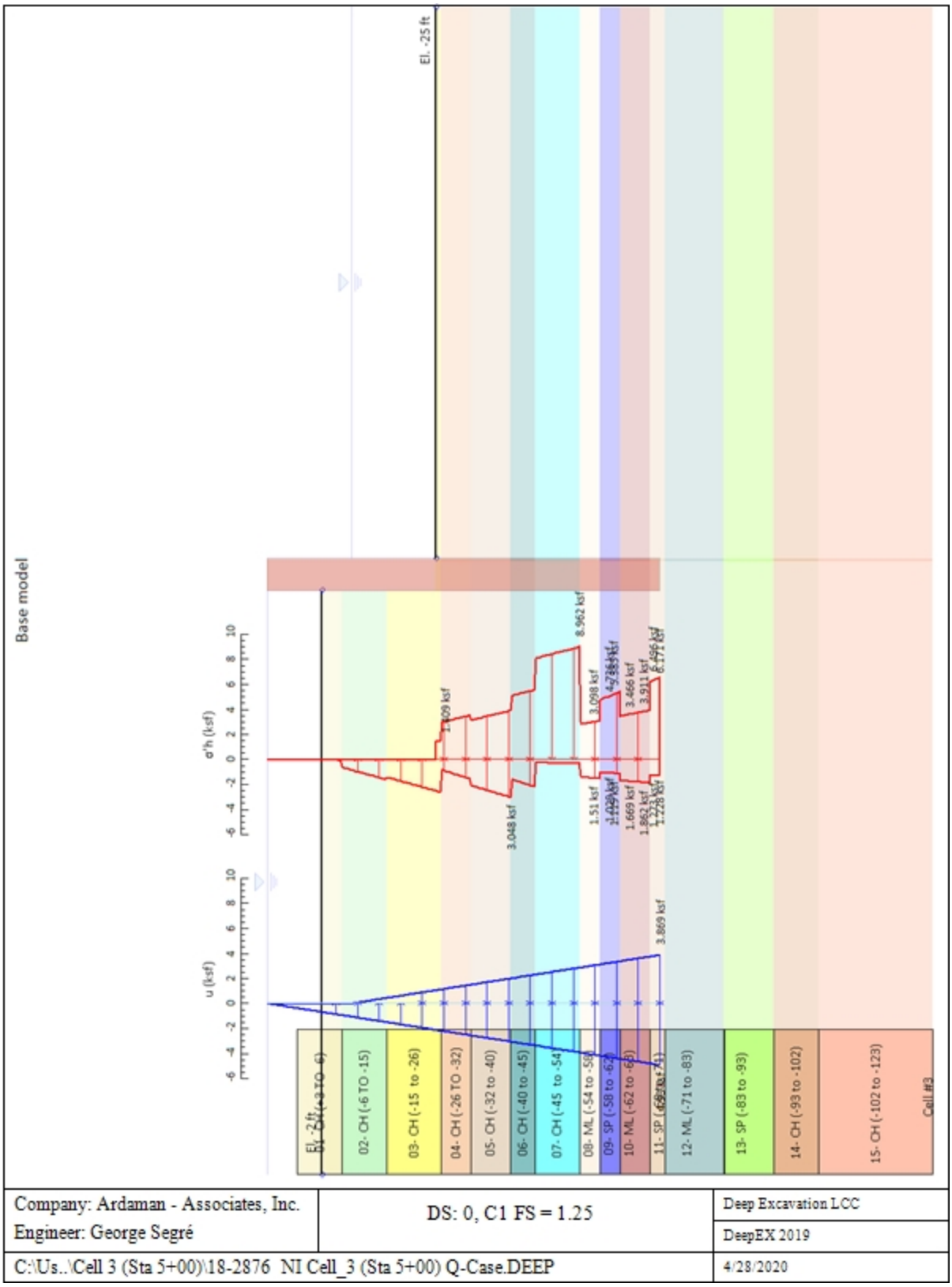


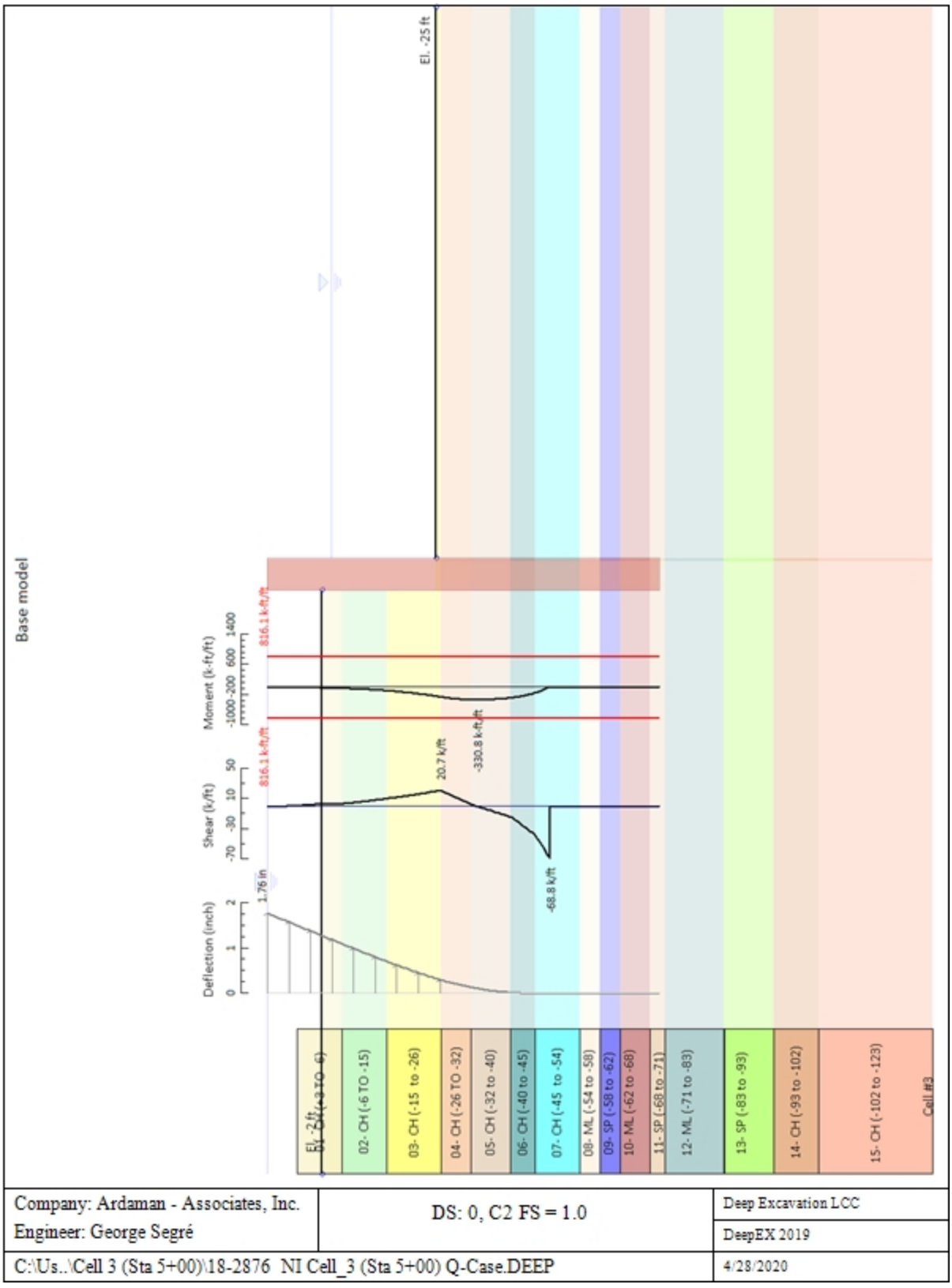

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -25 ft
σ'h (ksf)
u (ksf)
11.203 ksf
3.873 ksf
4.332 ksf
4.889 ksf
3.048 ksf
1.51 ksf
1.669 ksf
1.862 ksf
3.869 ksf
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP
4/28/2020

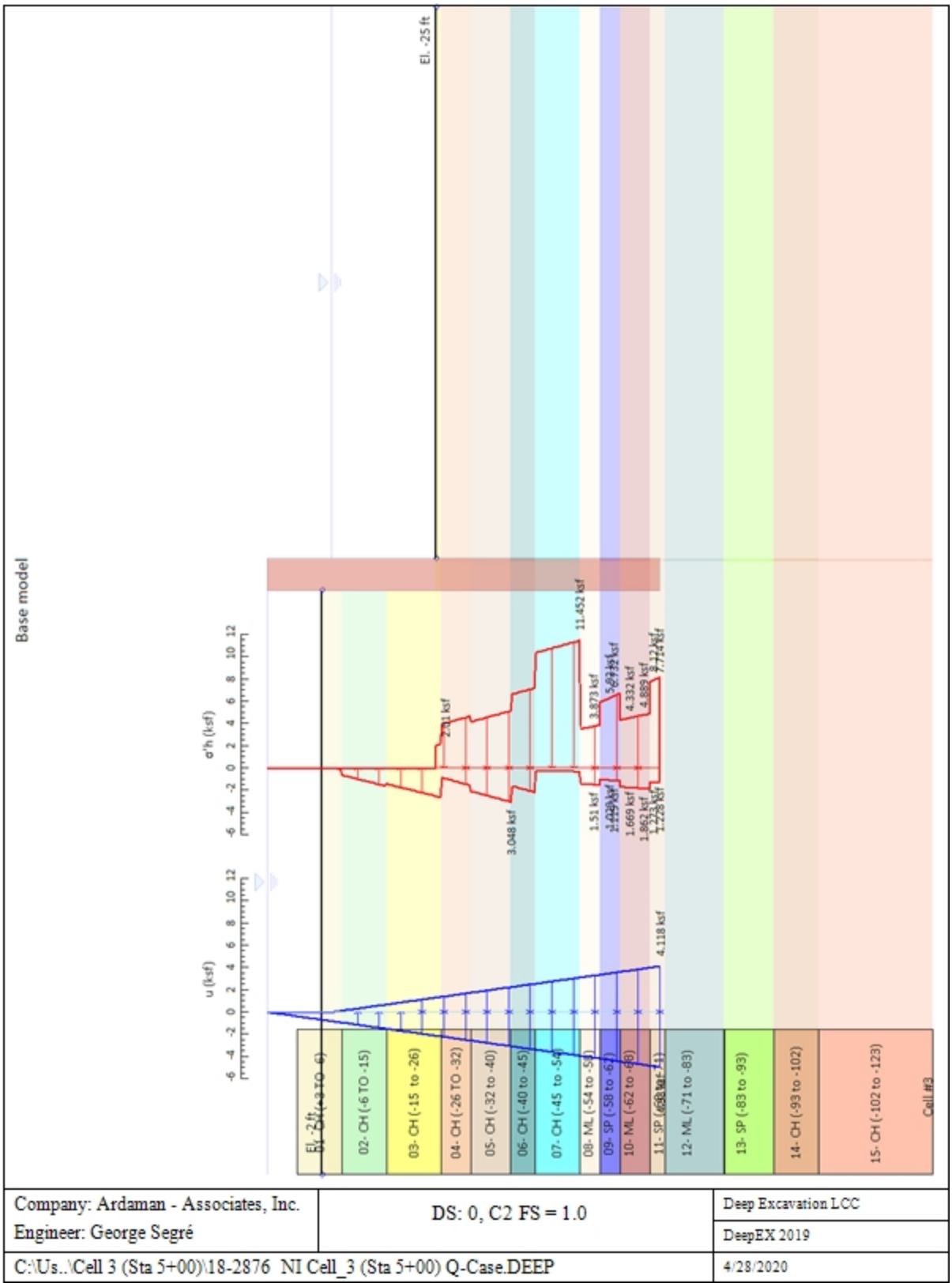



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |

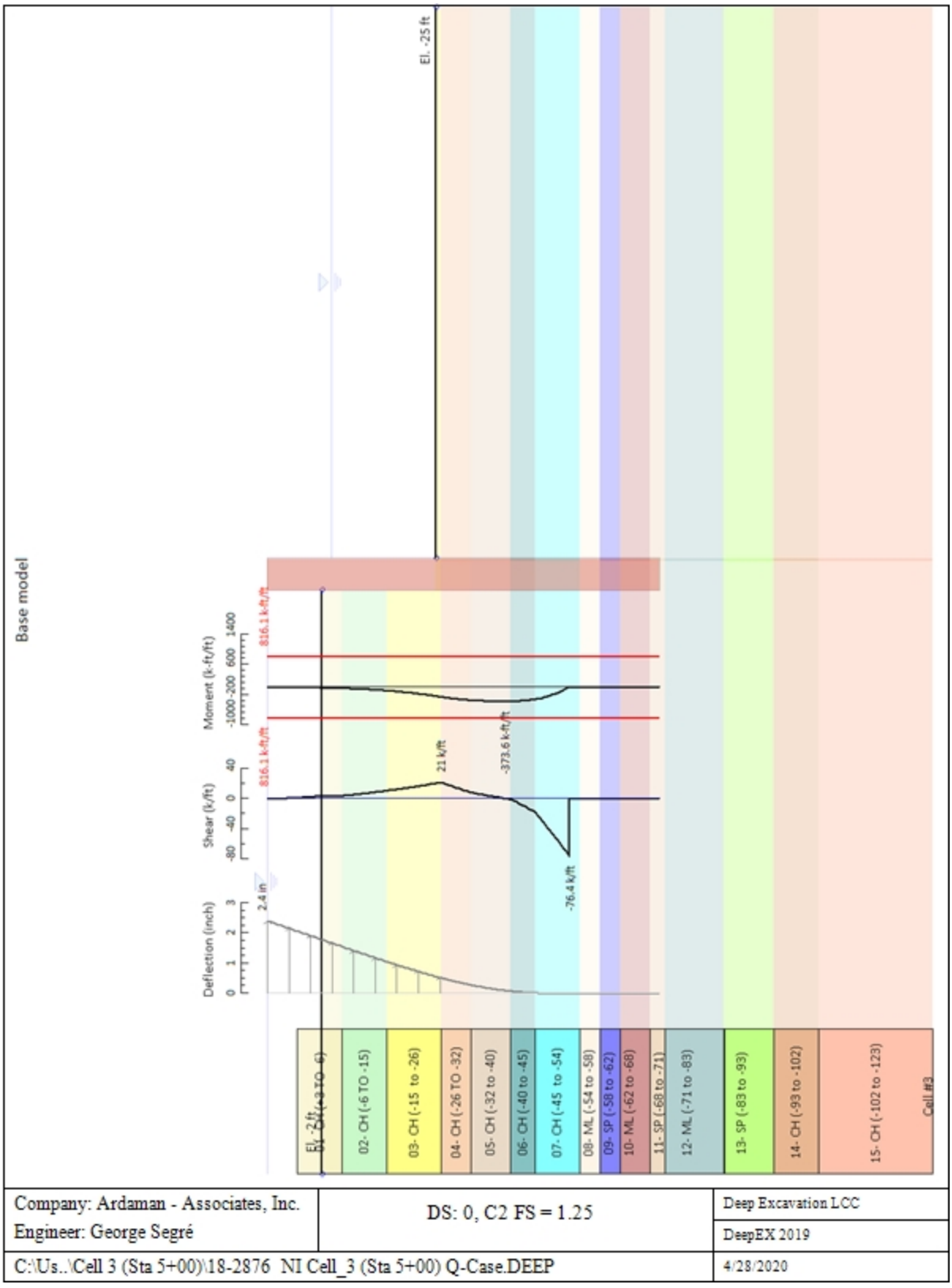

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
8.962 ksf
3.098 ksf
3.466 ksf
3.911 ksf
3.048 ksf
1.51 ksf
1.669 ksf
1.862 ksf
3.869 ksf
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54
08- ML (-54 to -58
09- SP (-58 to -62
10- ML (-62 to -68
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP
4/28/2020



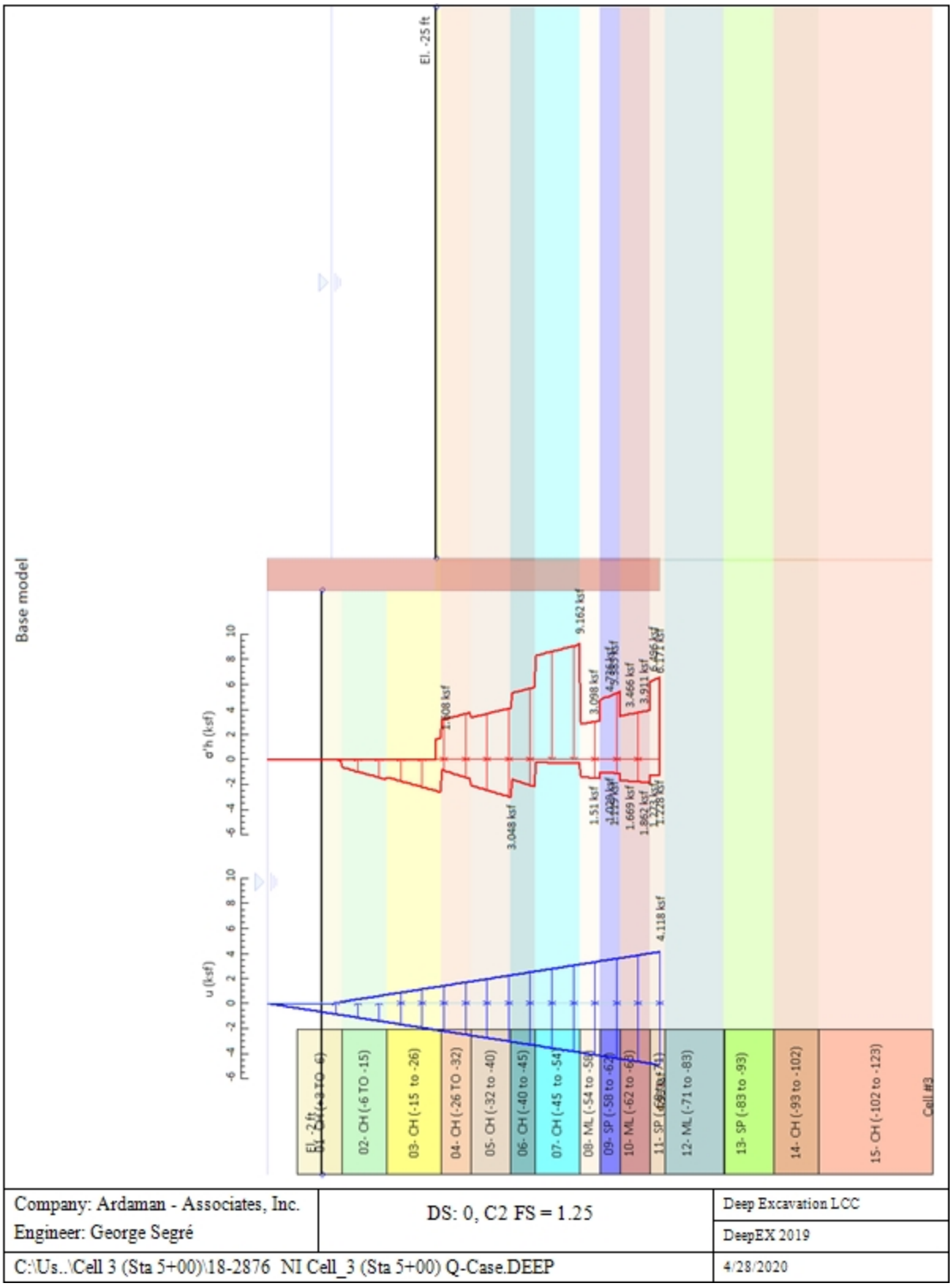

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



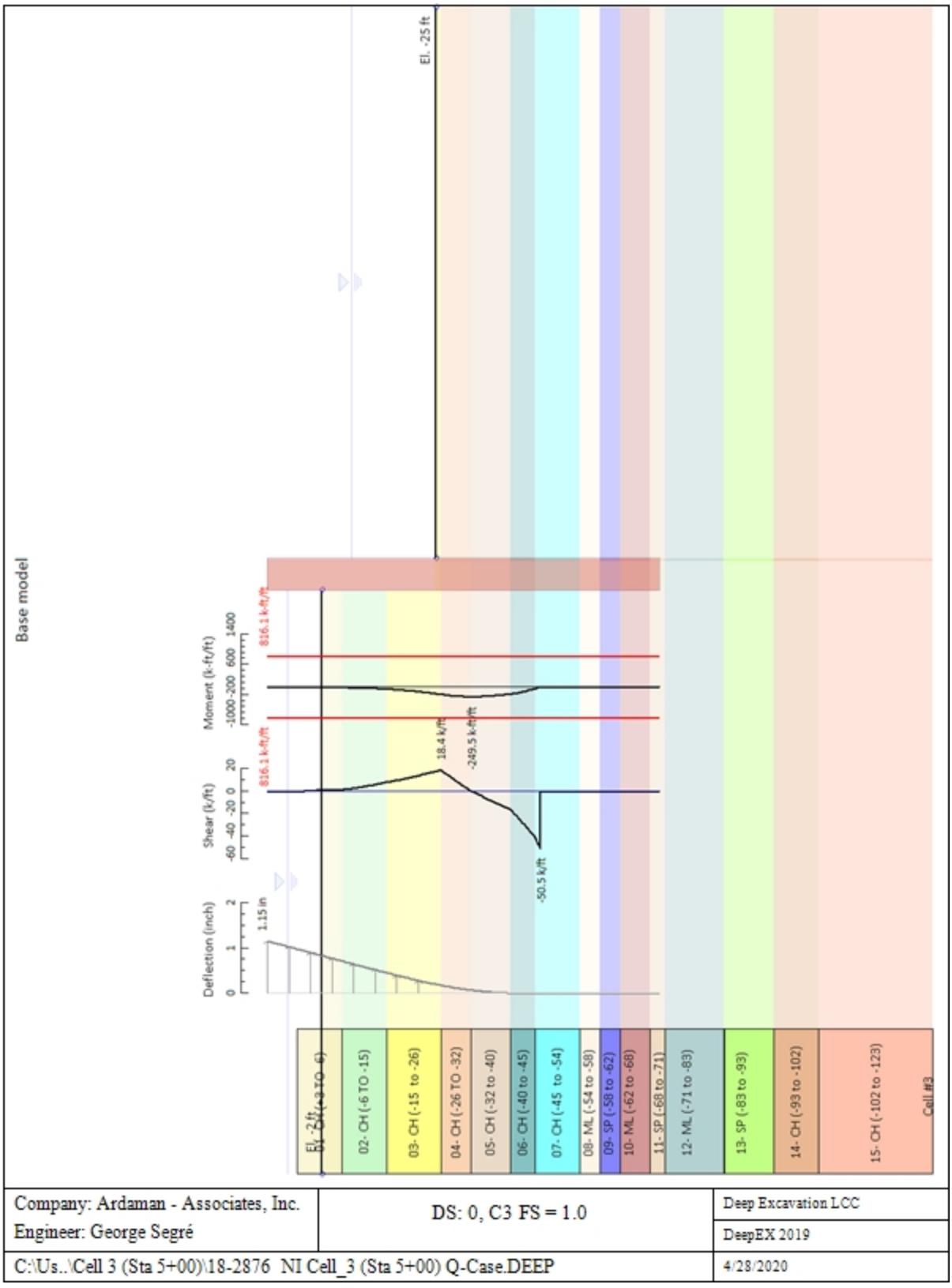

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



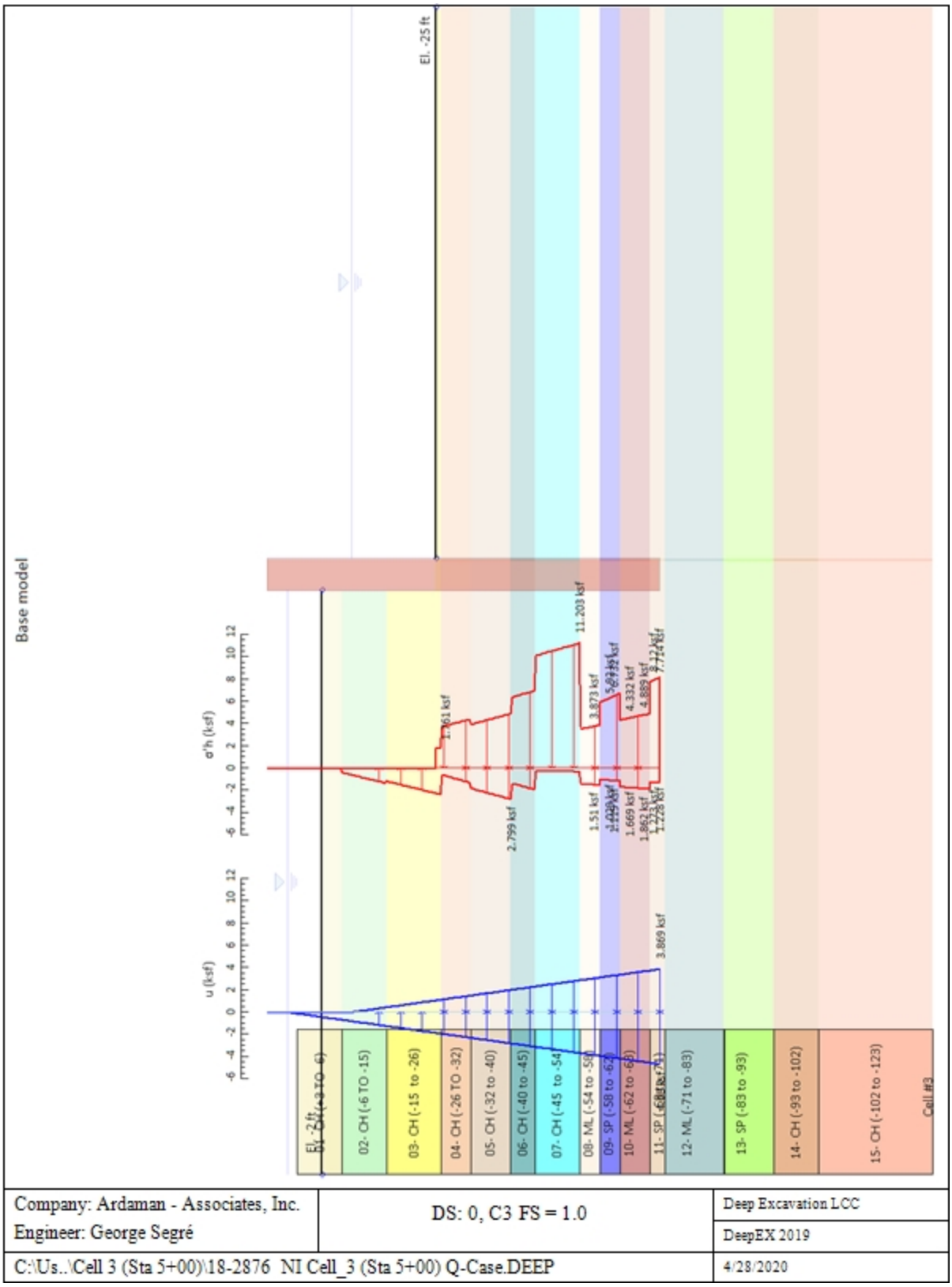

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



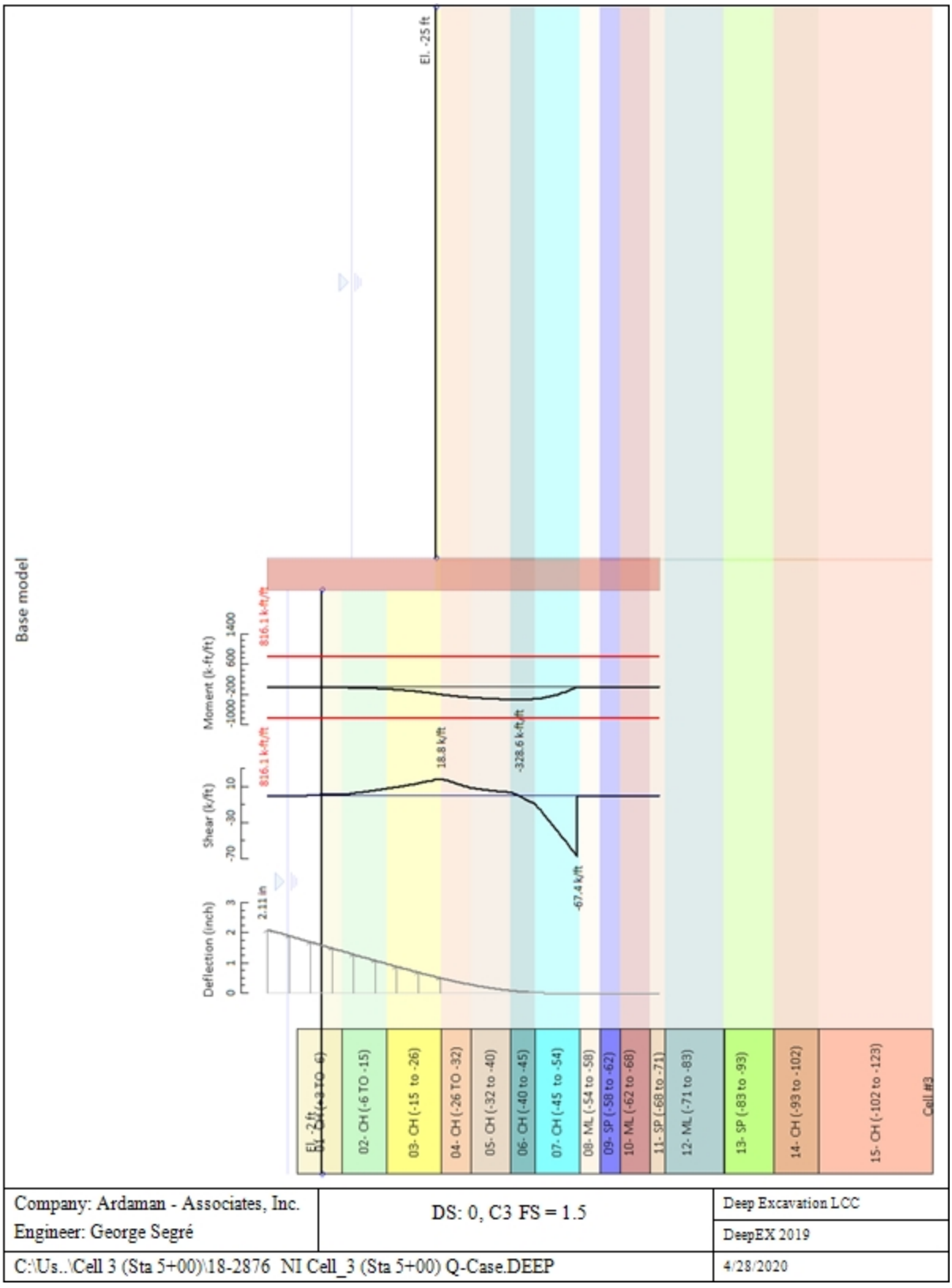

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



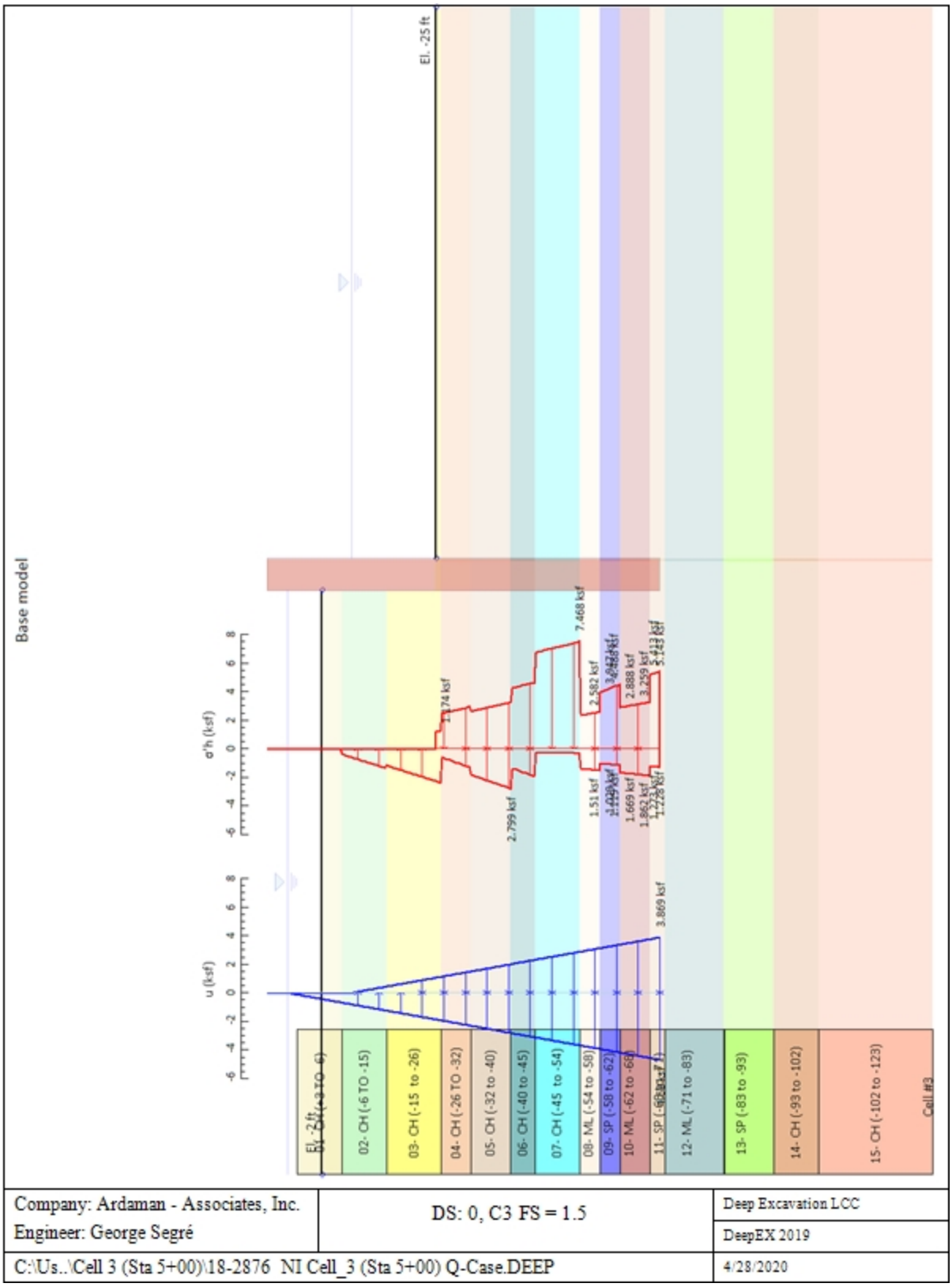

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



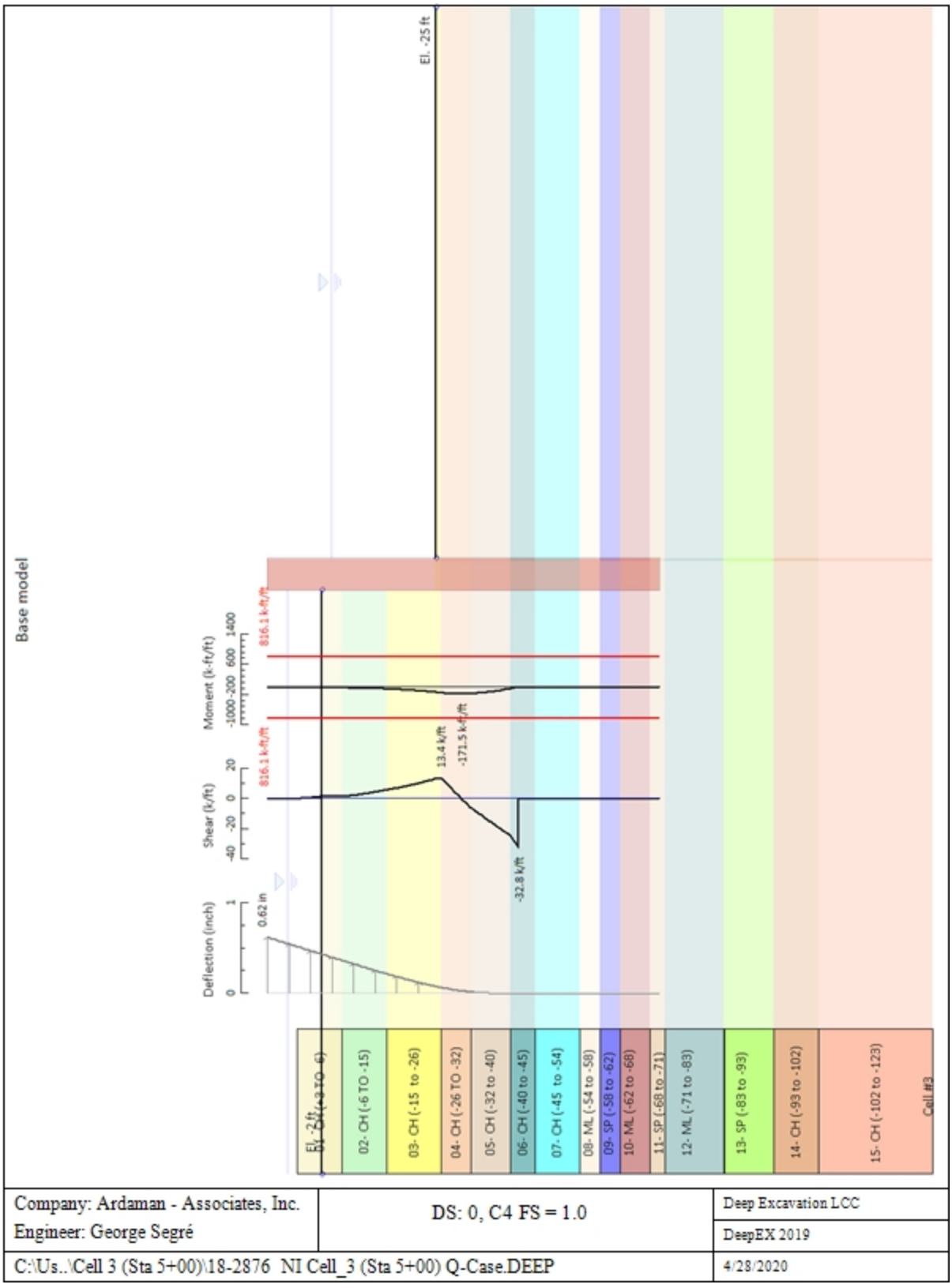

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



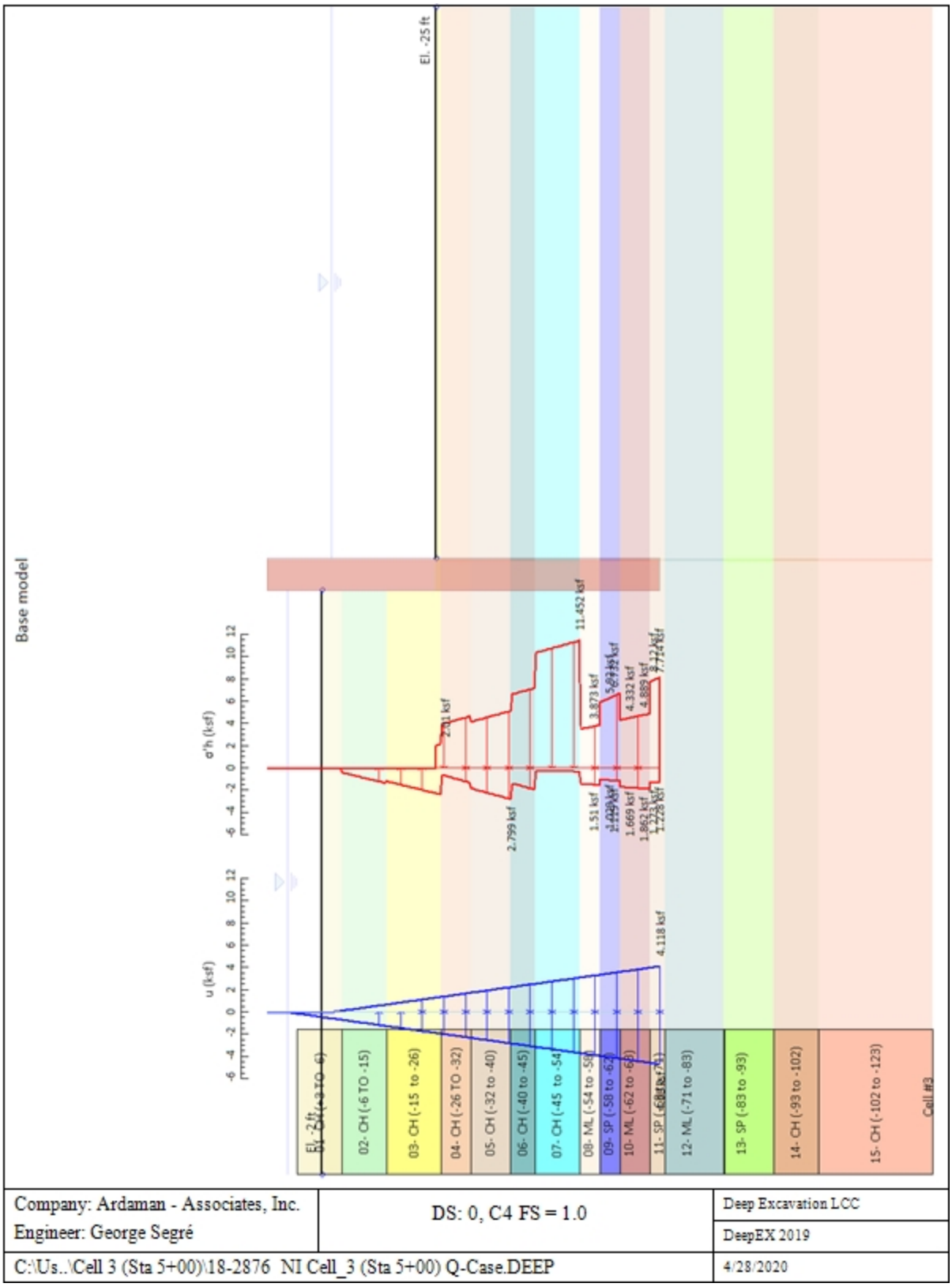

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



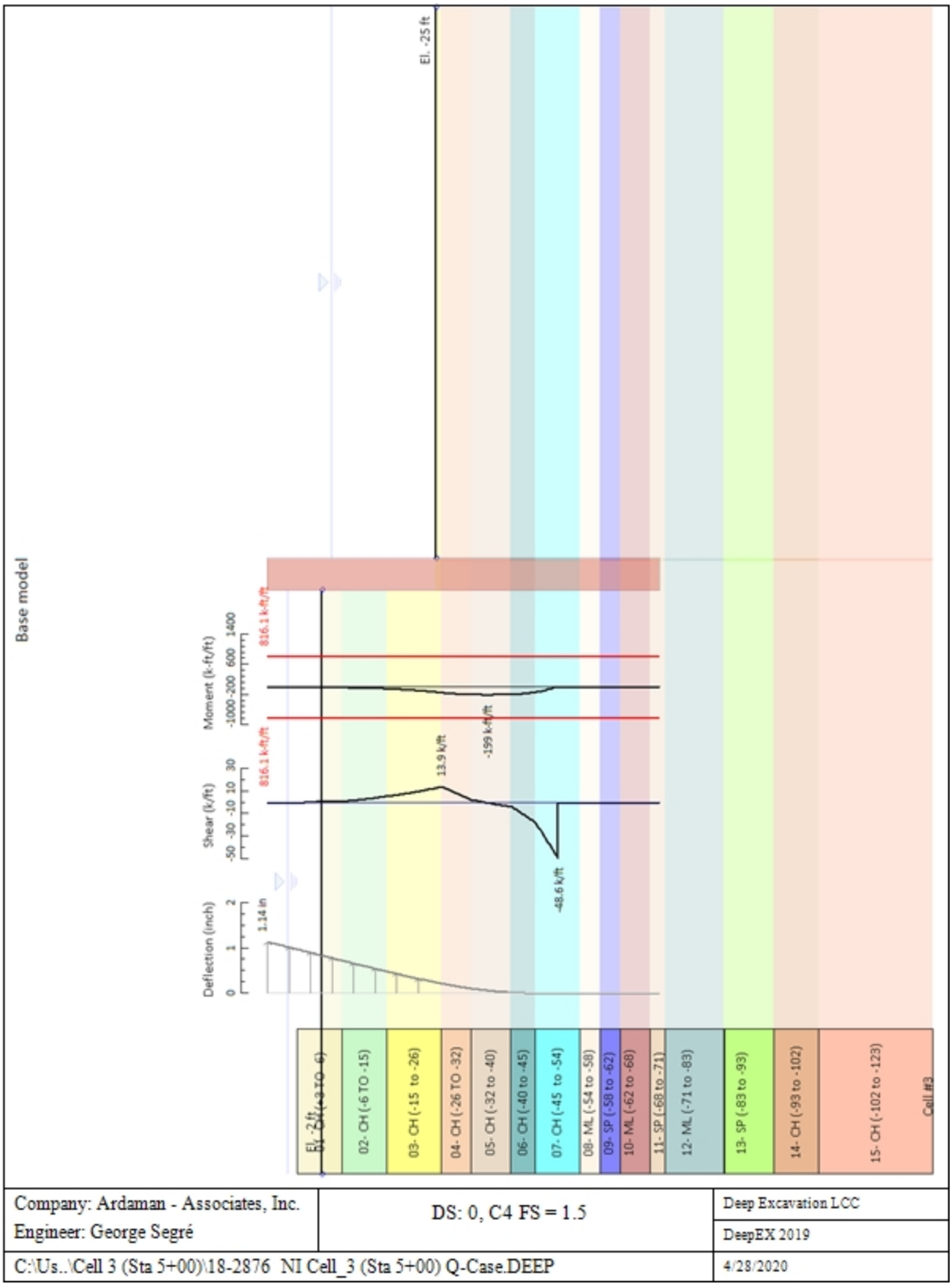

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



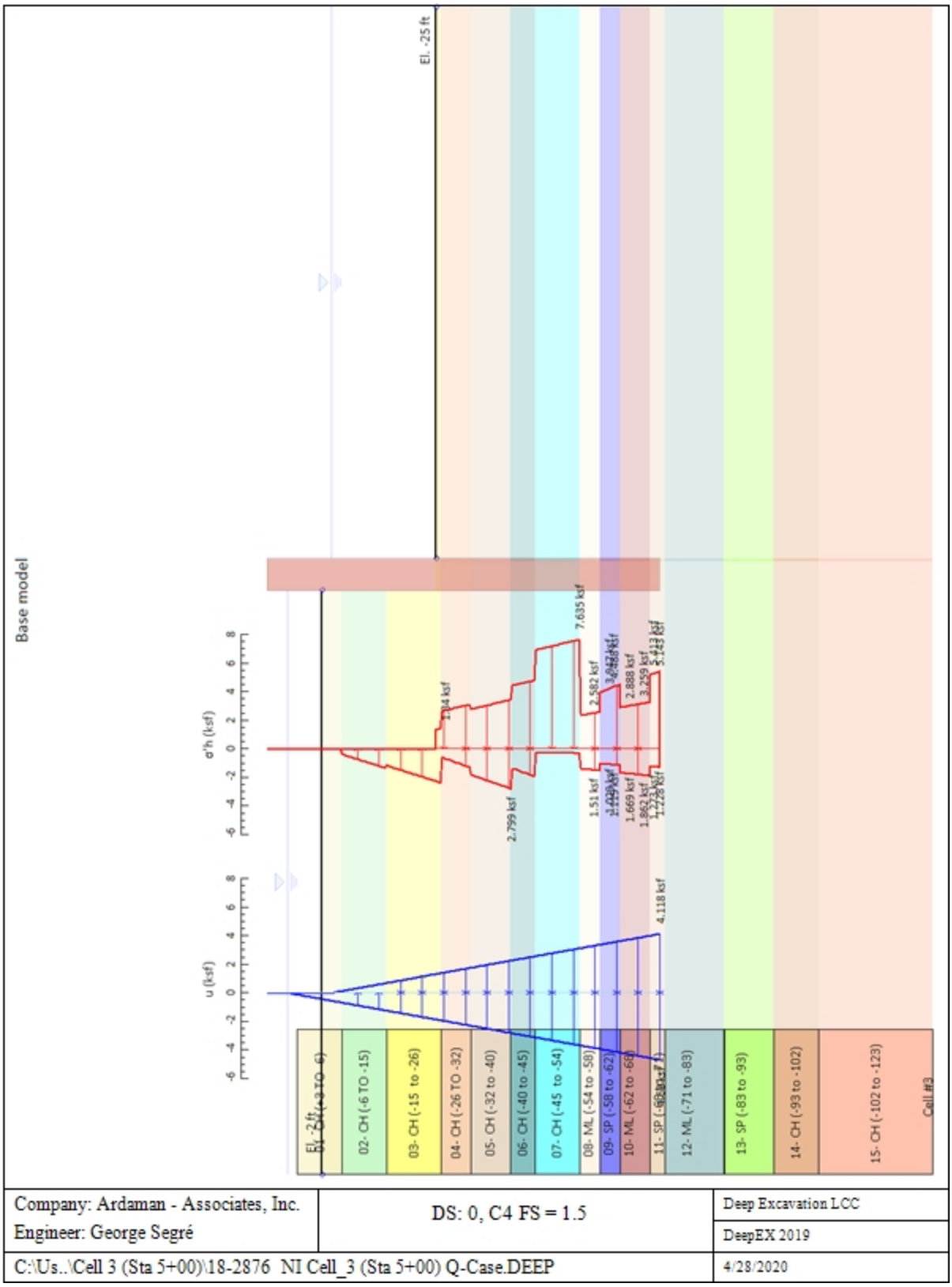

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:39:24 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 23 | 0 | 500 | 23 | 23 | 300 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 23 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 23 | 0 | 350 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 26 | 0 | 1250 | 26 | 26 | 521.92 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 26 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 26 | 0 | 1730 | 26 | 26 | 626.3 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 26 | 0 | 3300 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 26 | 0 | 4000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 0.609 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

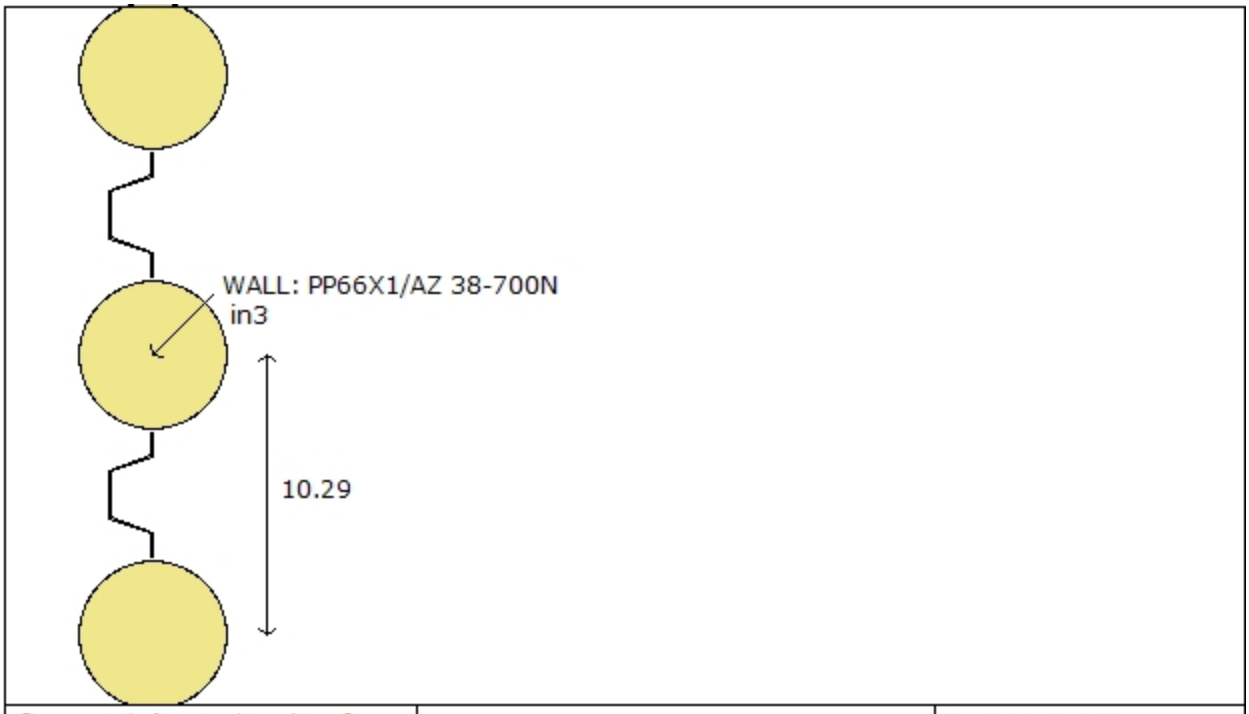
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 0.61 |
| -6 | 02- CH (-6 TO - | 1 | 0 |
| -15 | 03- CH (-15 to | 1 | 0.61 |
| -26 | 04- CH (-26 TO | 1 | 0.56 |
| -32 | 05- CH (-32 to | 1 | 0 |
| -40 | 06- CH (-40 to | 1 | 0.56 |
| -45 | 07- CH (-45 to | 1 | 0.56 |
| -54 | 08- ML (-54 to | 1 | 0.53 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.53 |
| -68 | 11- SP (-68 to - | 1 | 0.5 |
| -71 | 12- ML (-71 to | 1 | 0.53 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 0.56 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.579 | 1.762 | 2.657 |
| Stage 1 | Simple span | N/A | 1.6 | 1.335 | 1.409 | 2.126 |
| Stage 2 | Simple span | N/A | 1.6 | 1.747 | 2.006 | 2.965 |
| Stage 3 | Simple span | N/A | 1.6 | 1.483 | 1.605 | 2.372 |
| Stage 4 | Simple span | N/A | 1.6 | 1.812 | 2.075 | 3.005 |
| Stage 5 | Simple span | N/A | 1.6 | 1.348 | 1.383 | 2.003 |
| Stage 6 | Simple span | N/A | 1.6 | 2.065 | 2.422 | 3.405 |
| Stage 7 | Simple span | N/A | 1.6 | 1.546 | 1.615 | 2.27 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

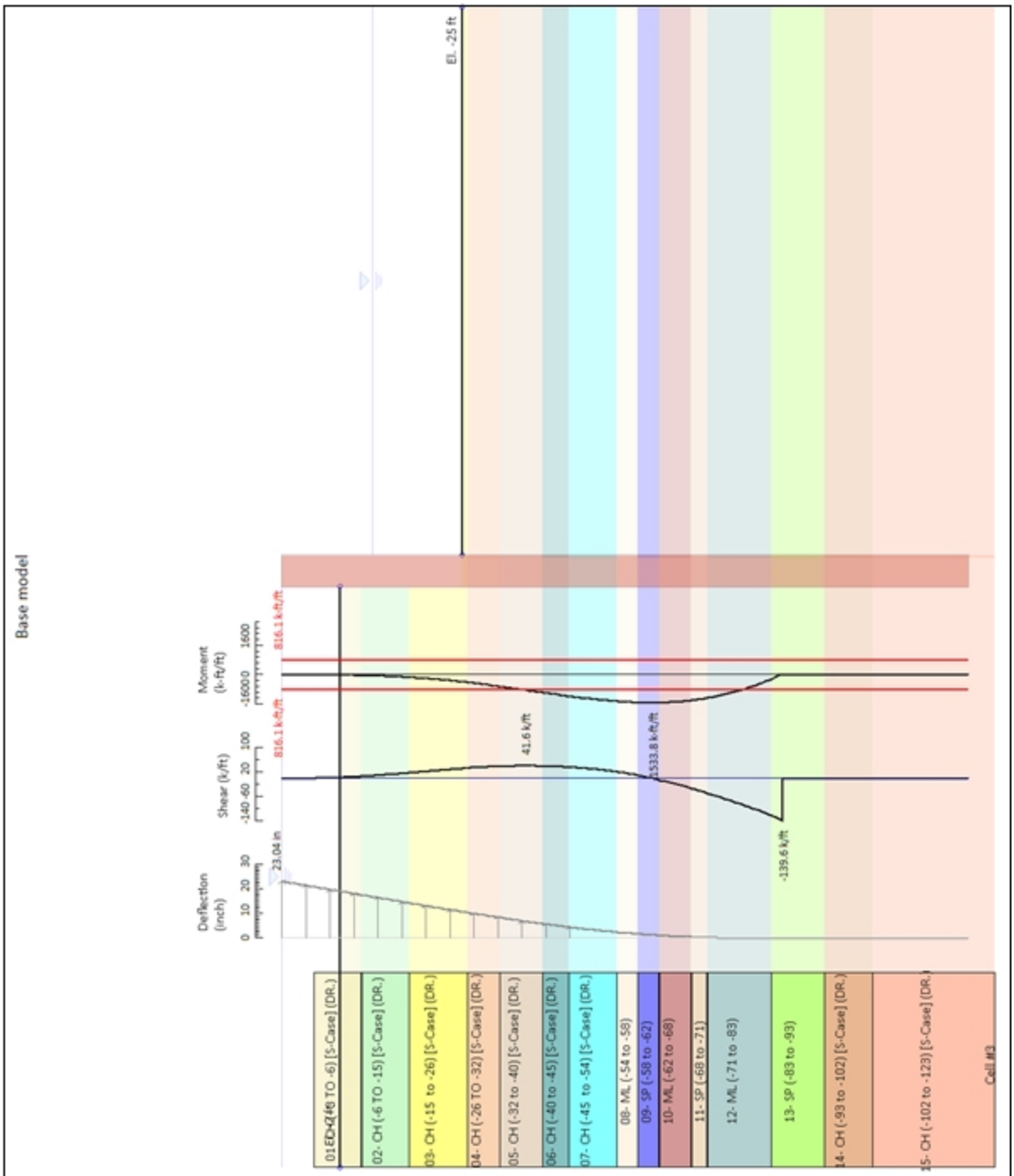
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

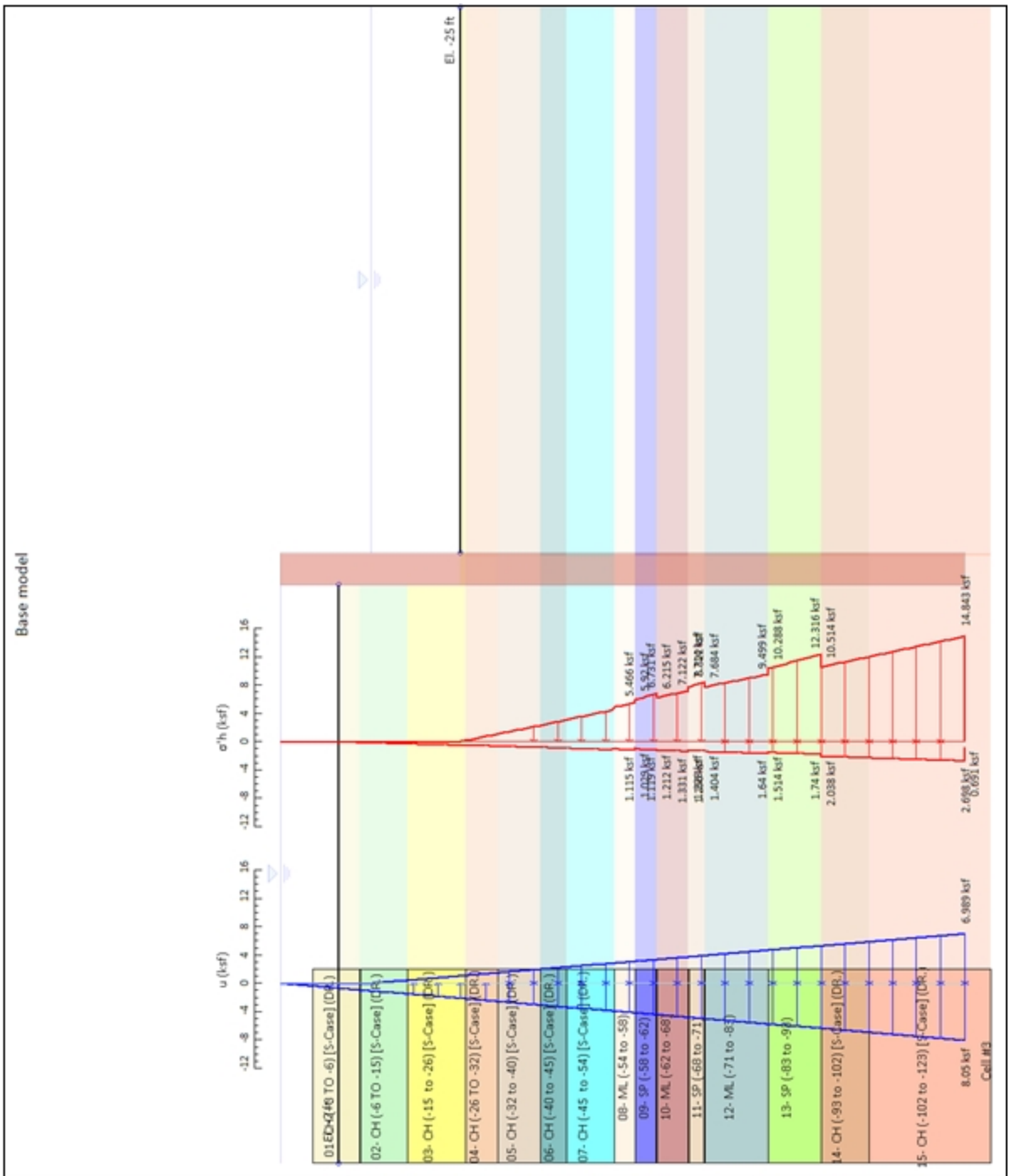
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

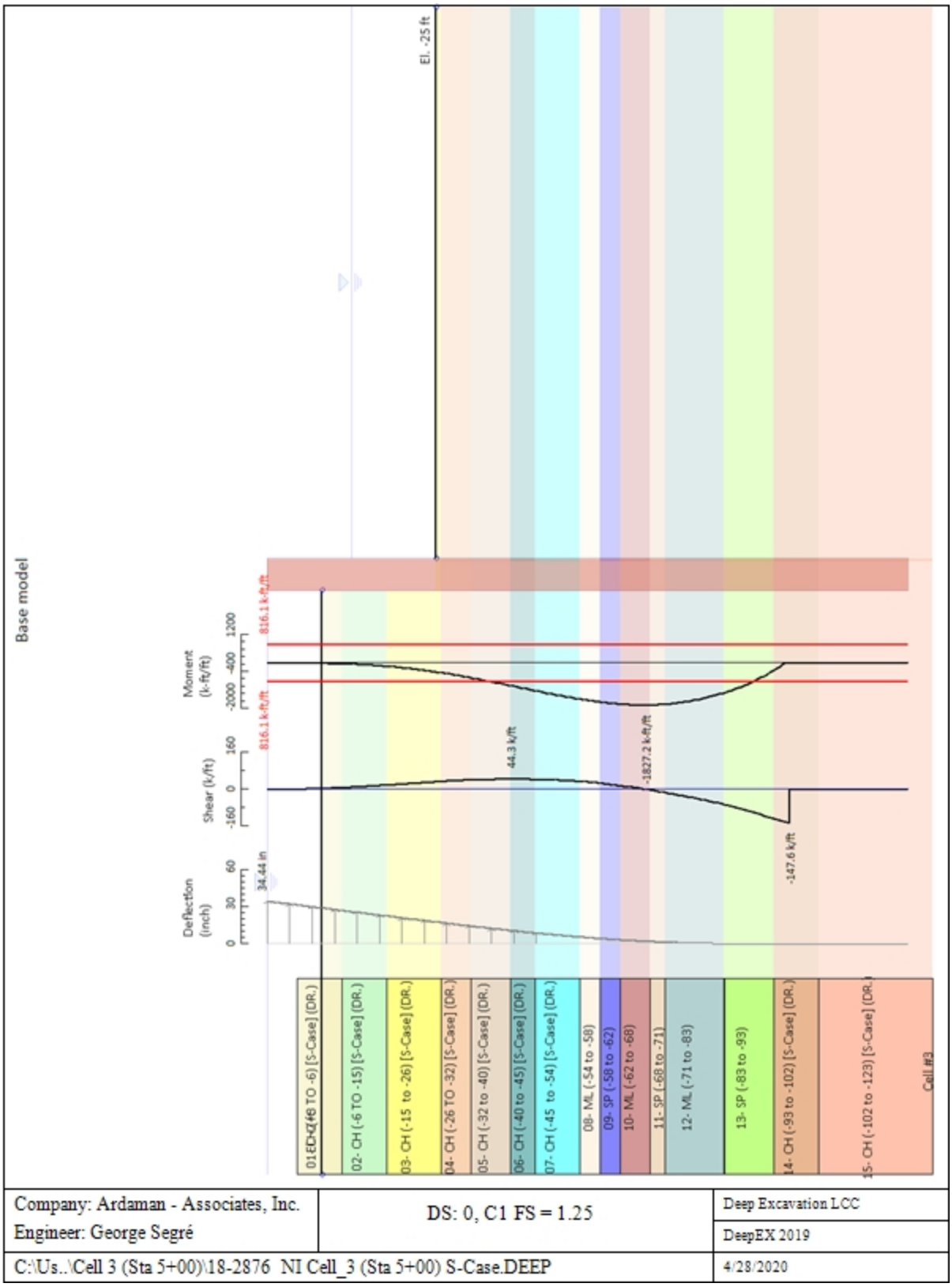
A sequence of figures for each excavation stage is reported



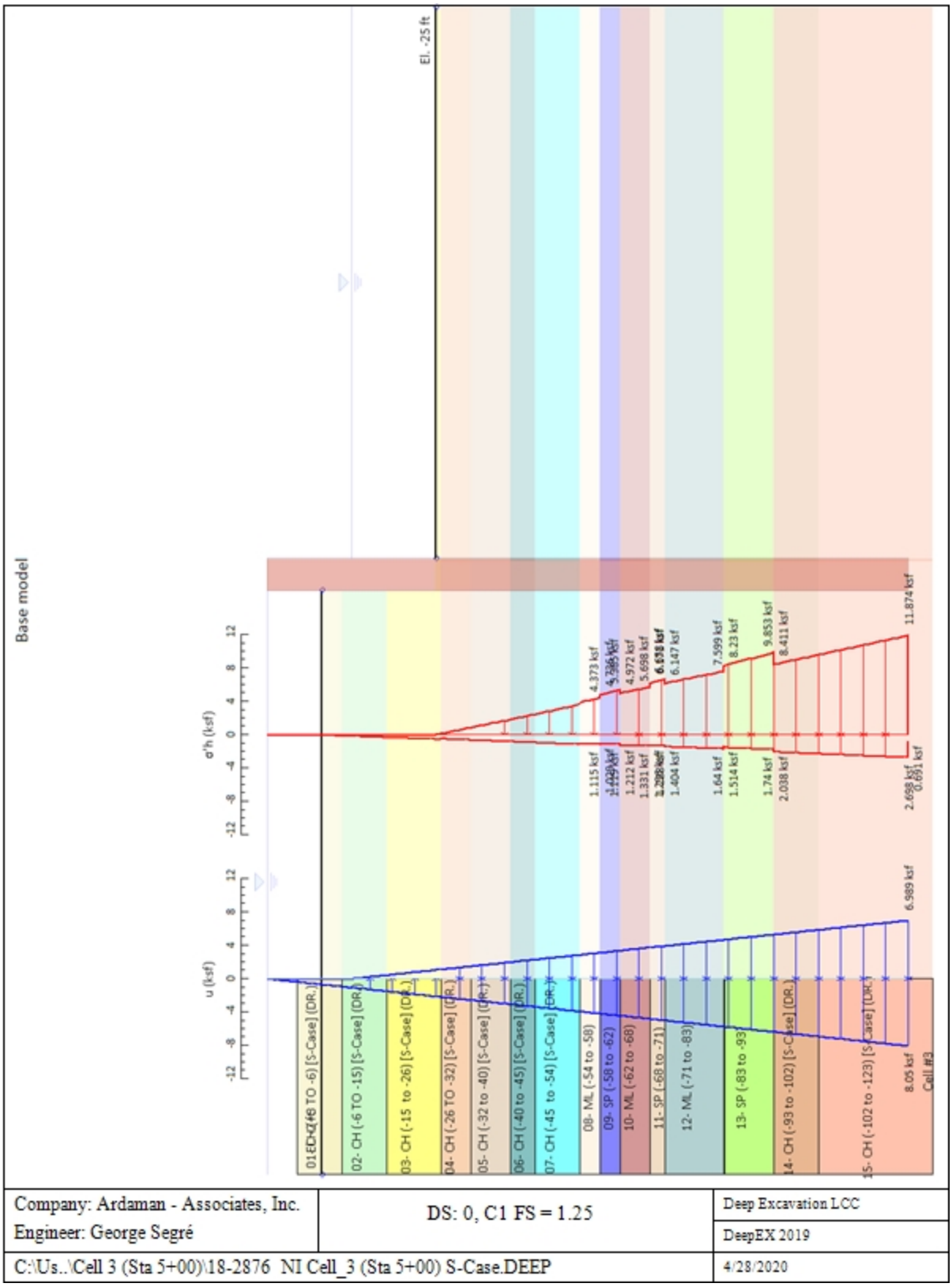

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



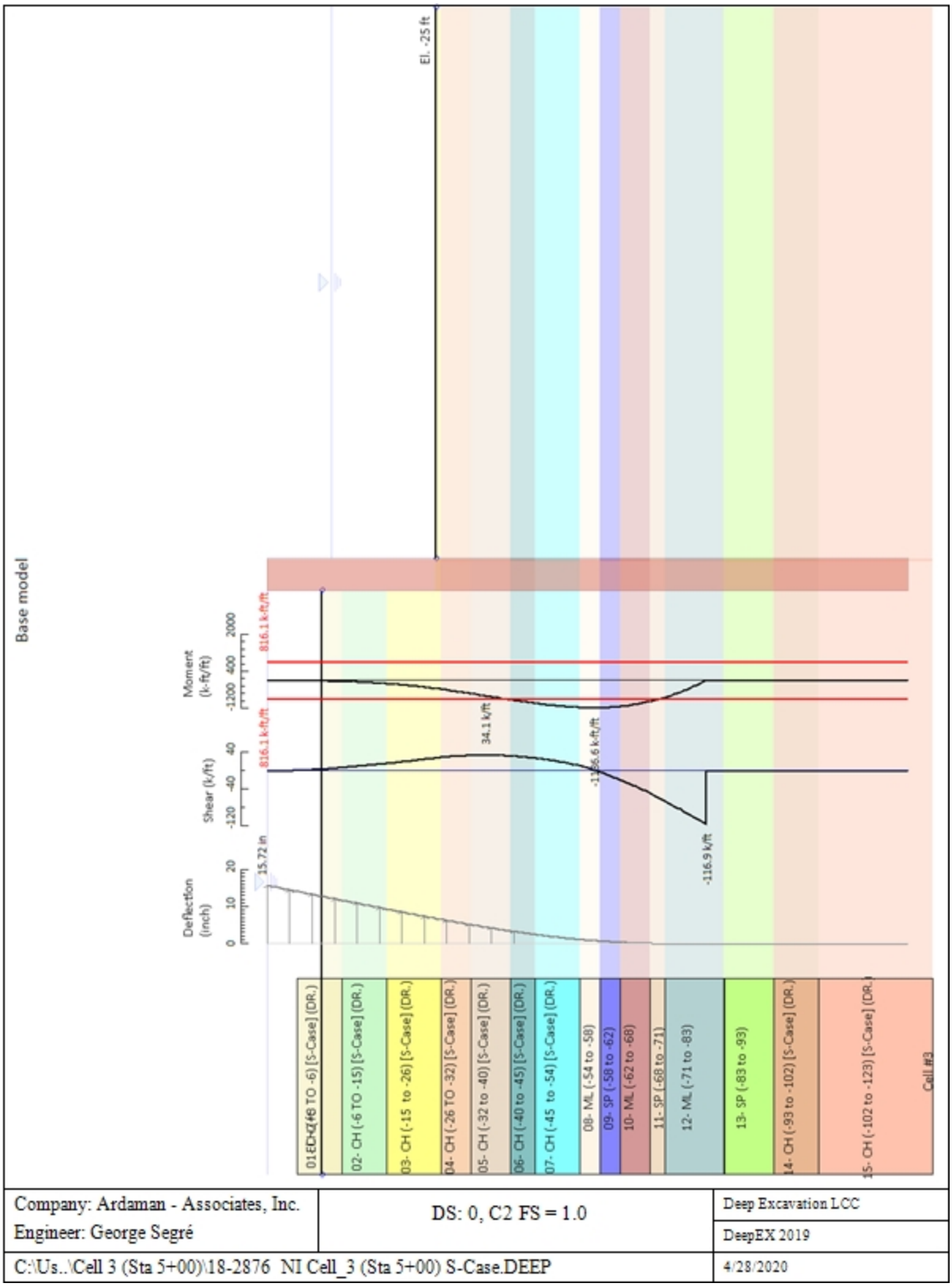

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



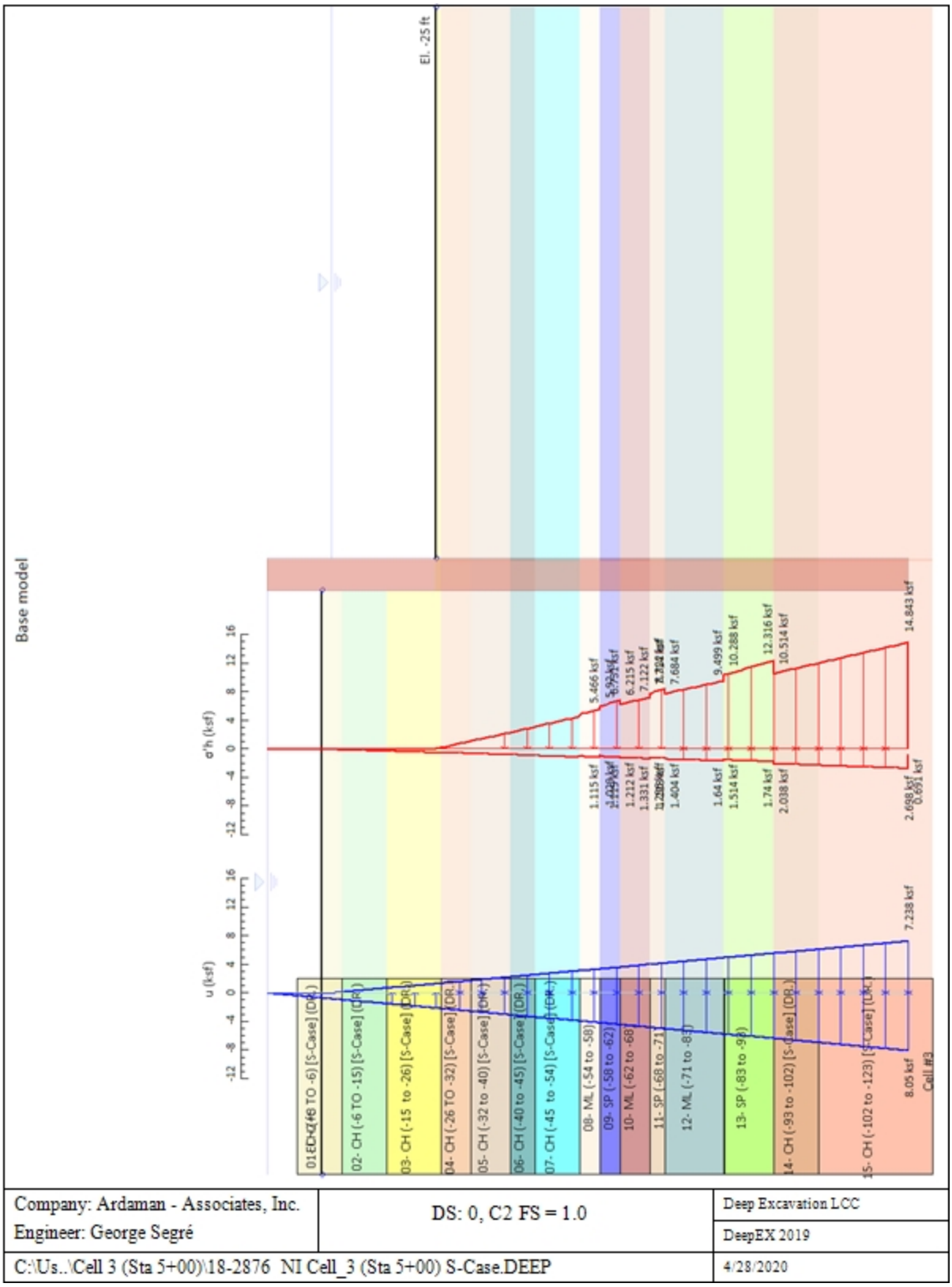

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



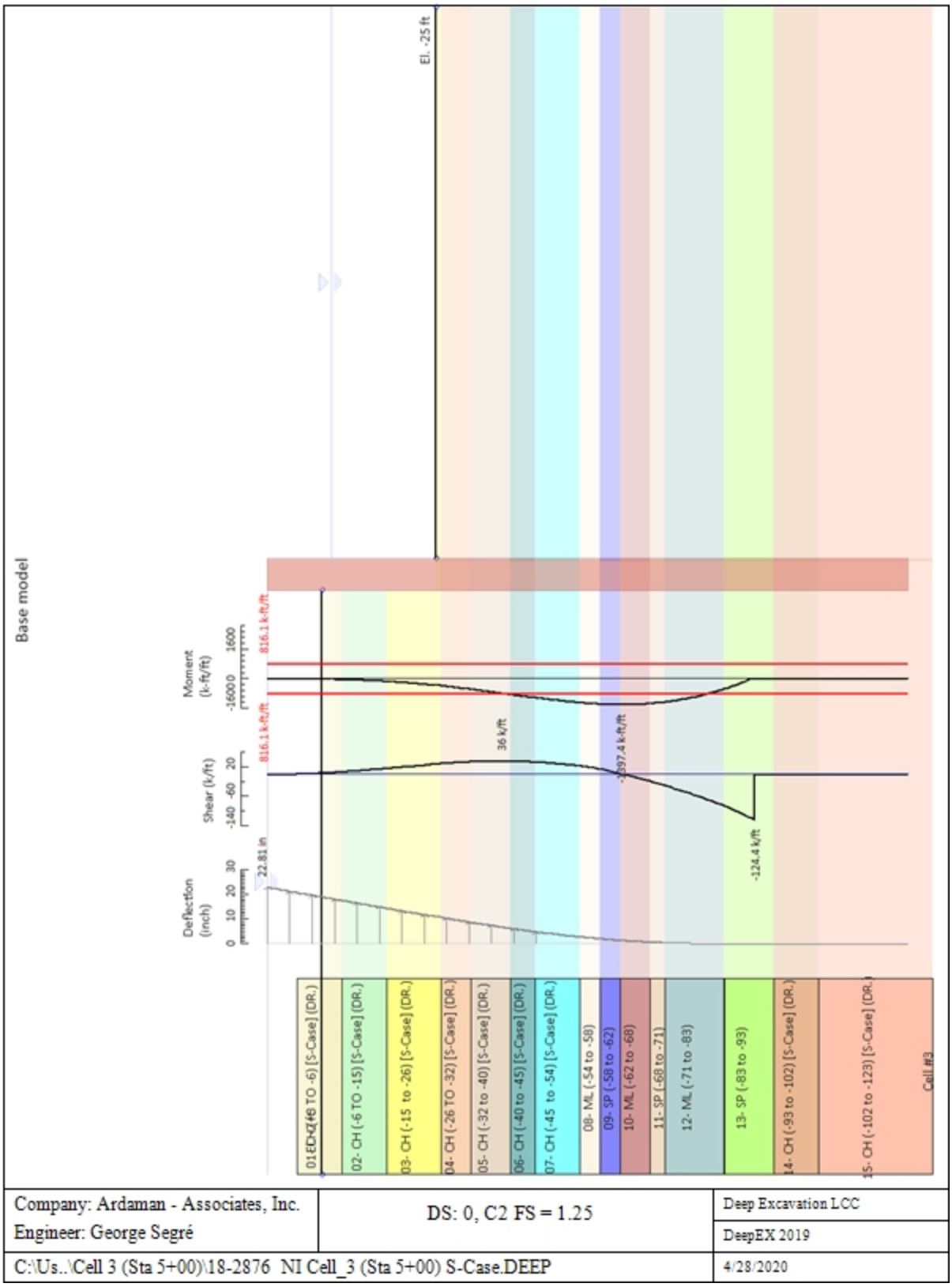

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



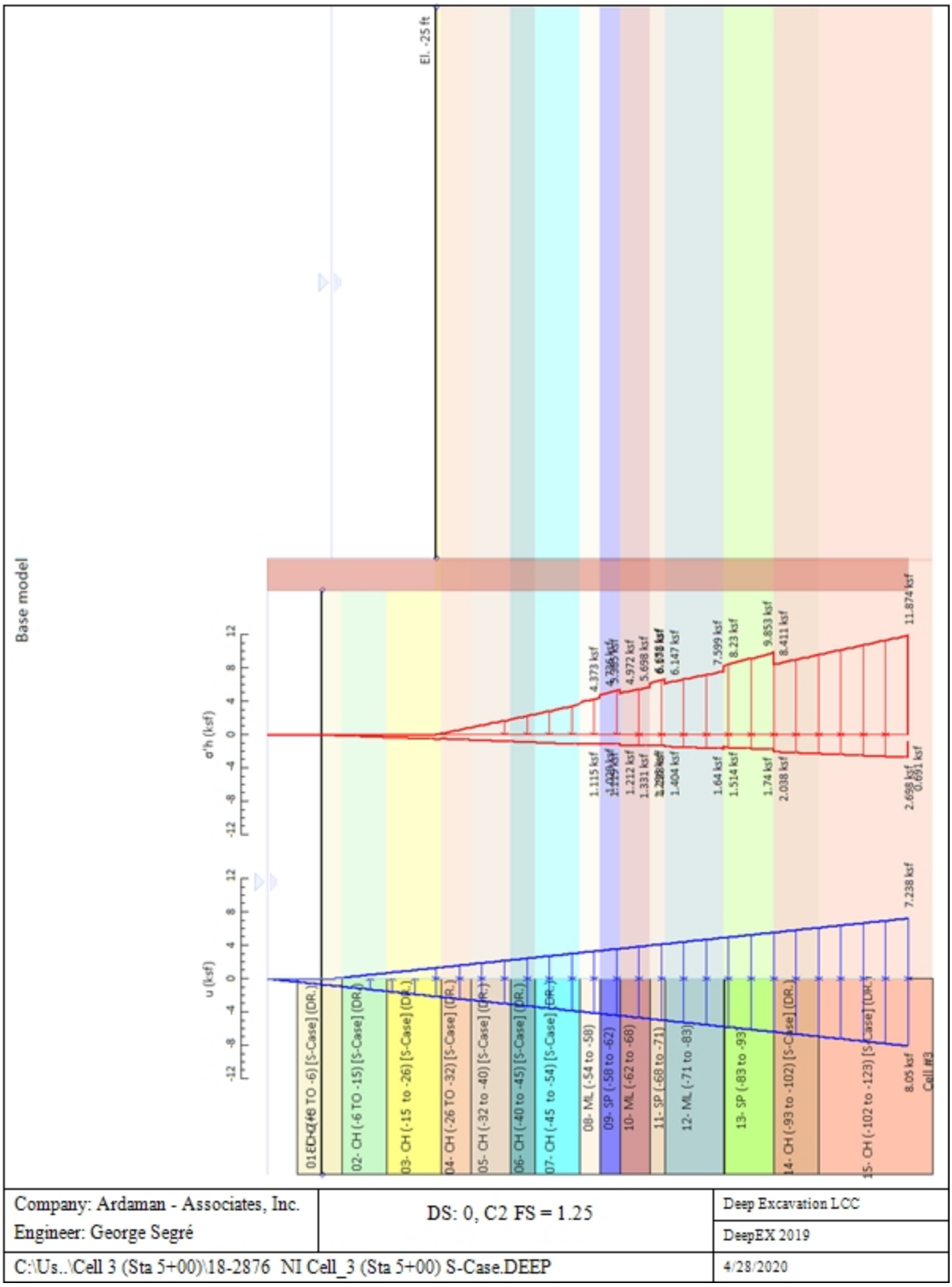

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



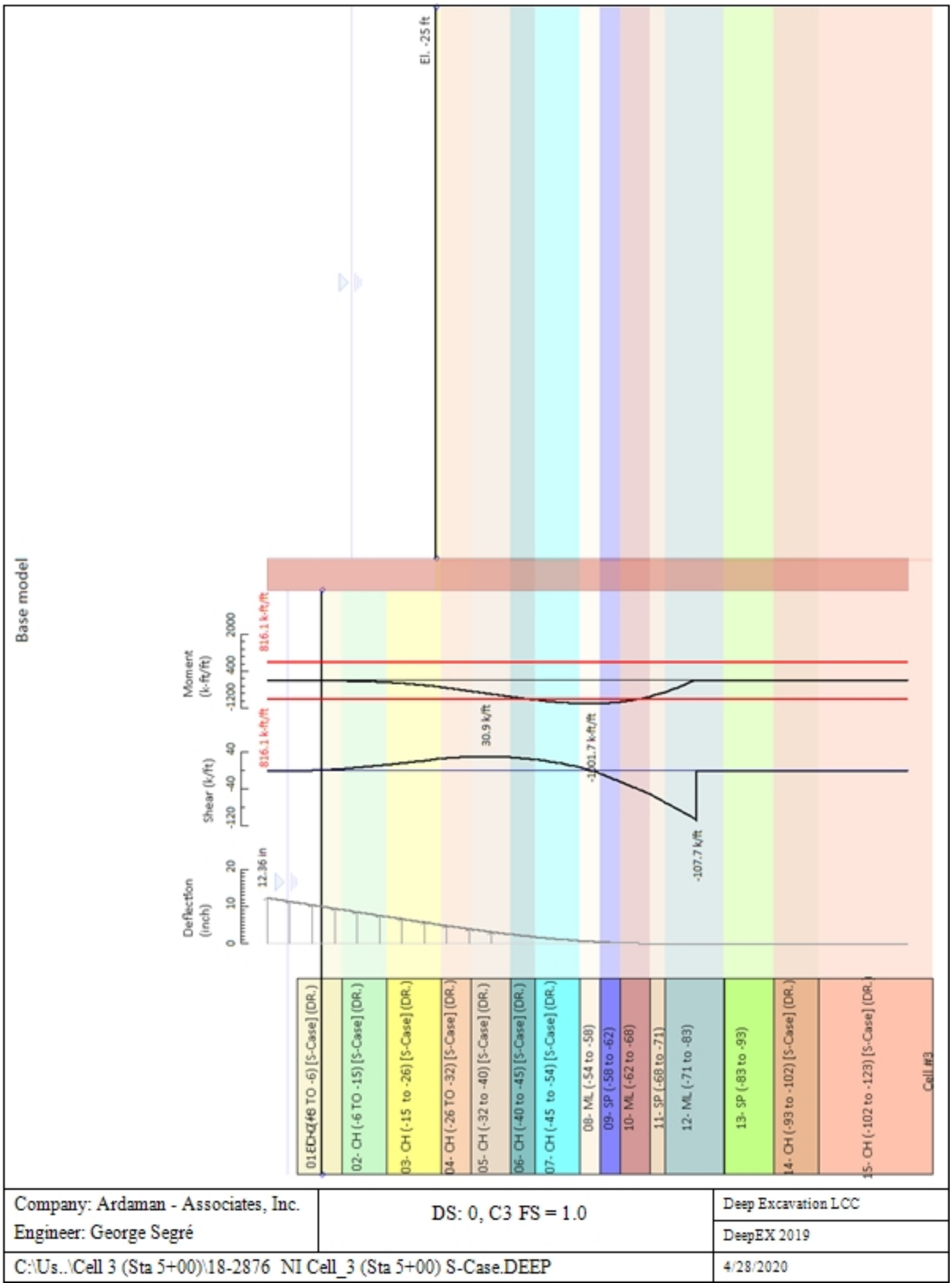

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



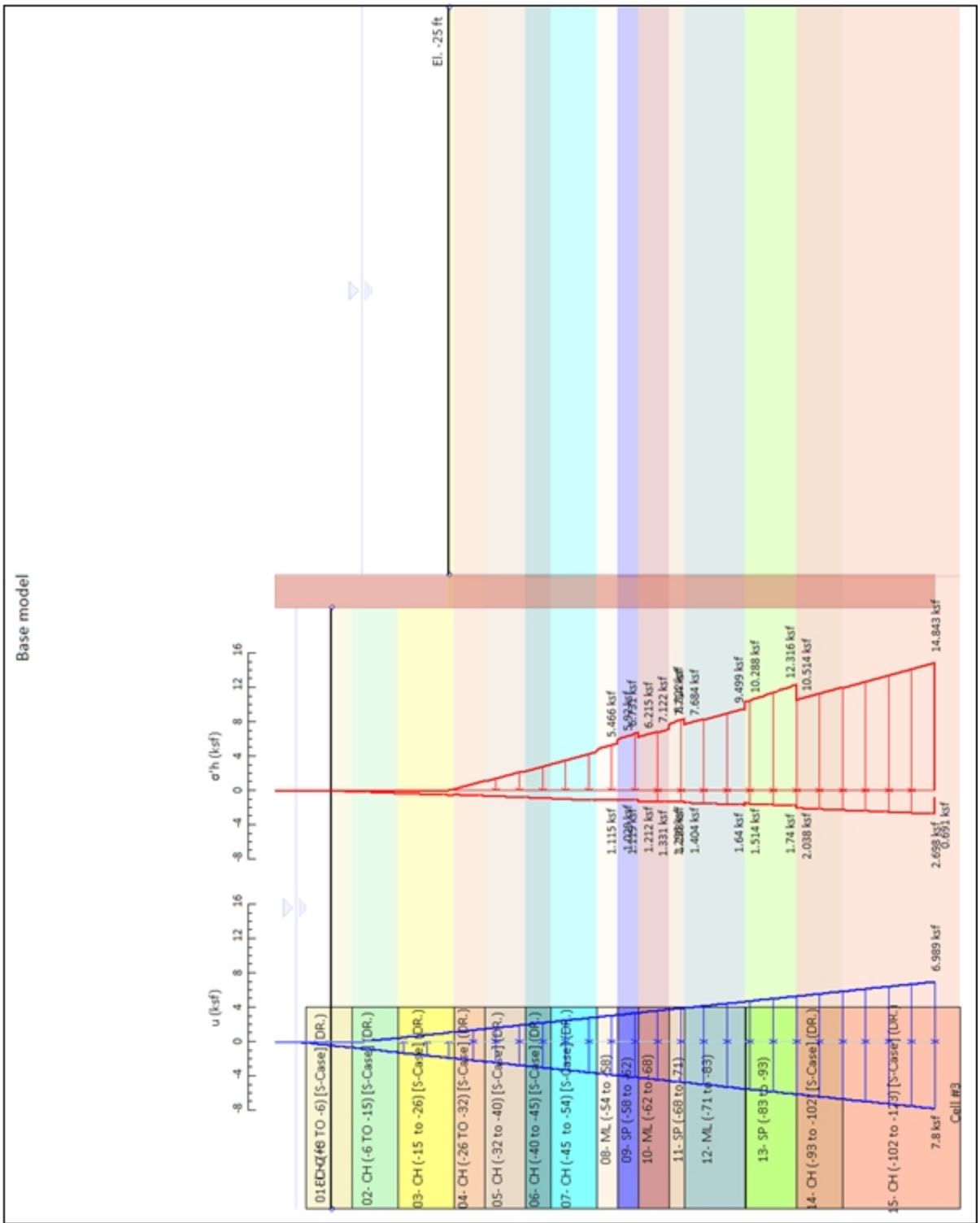

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



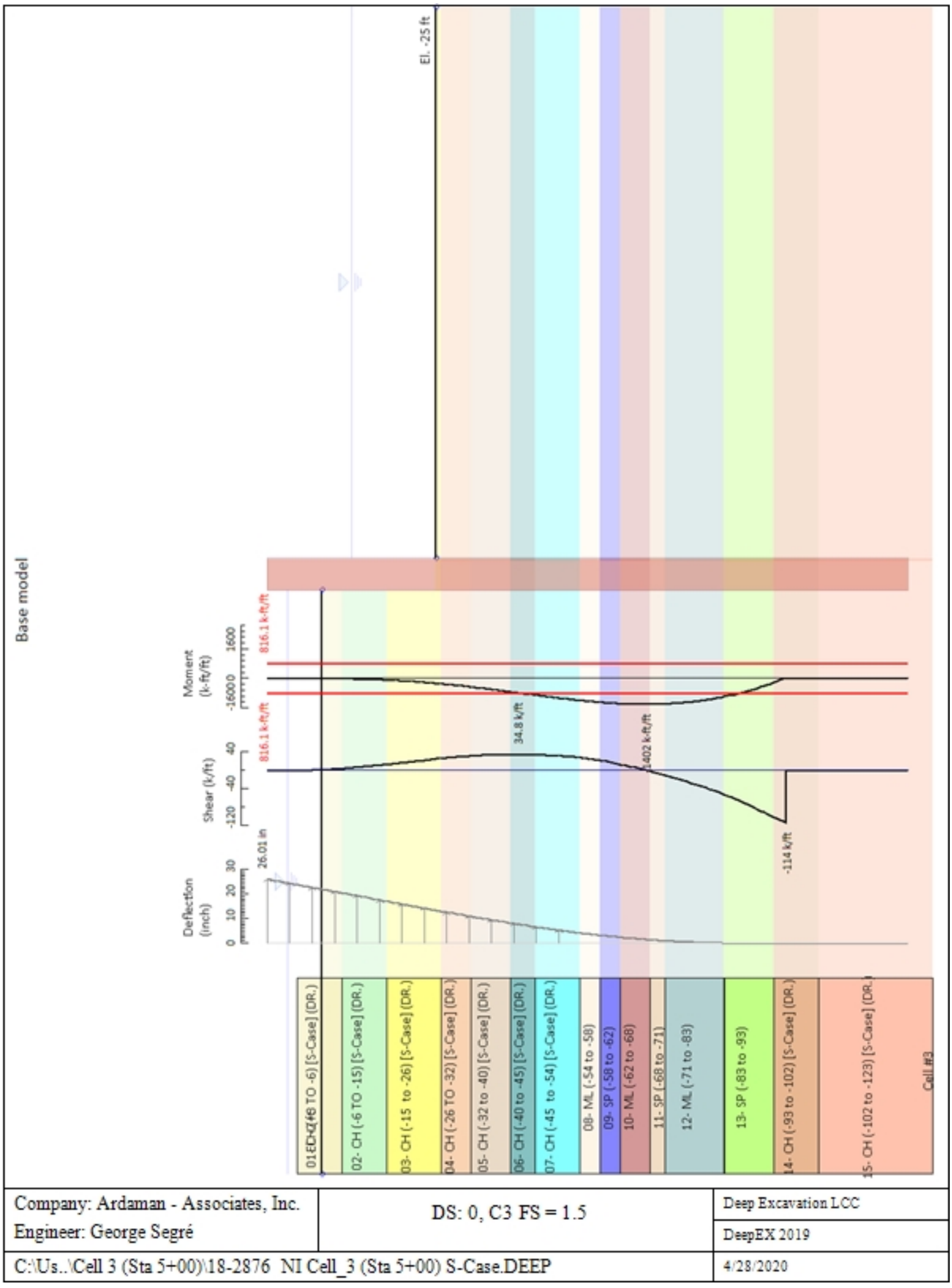

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



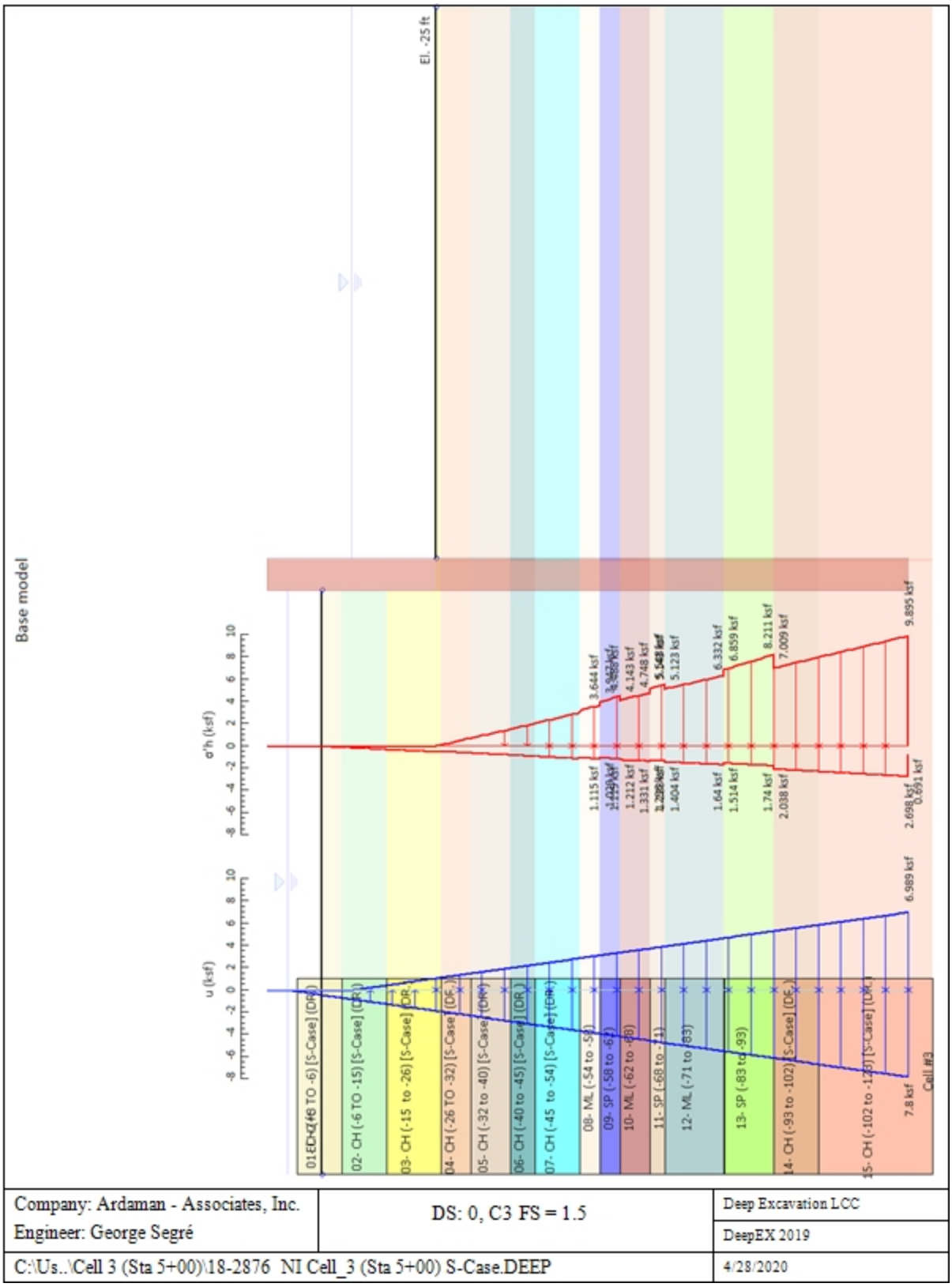

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



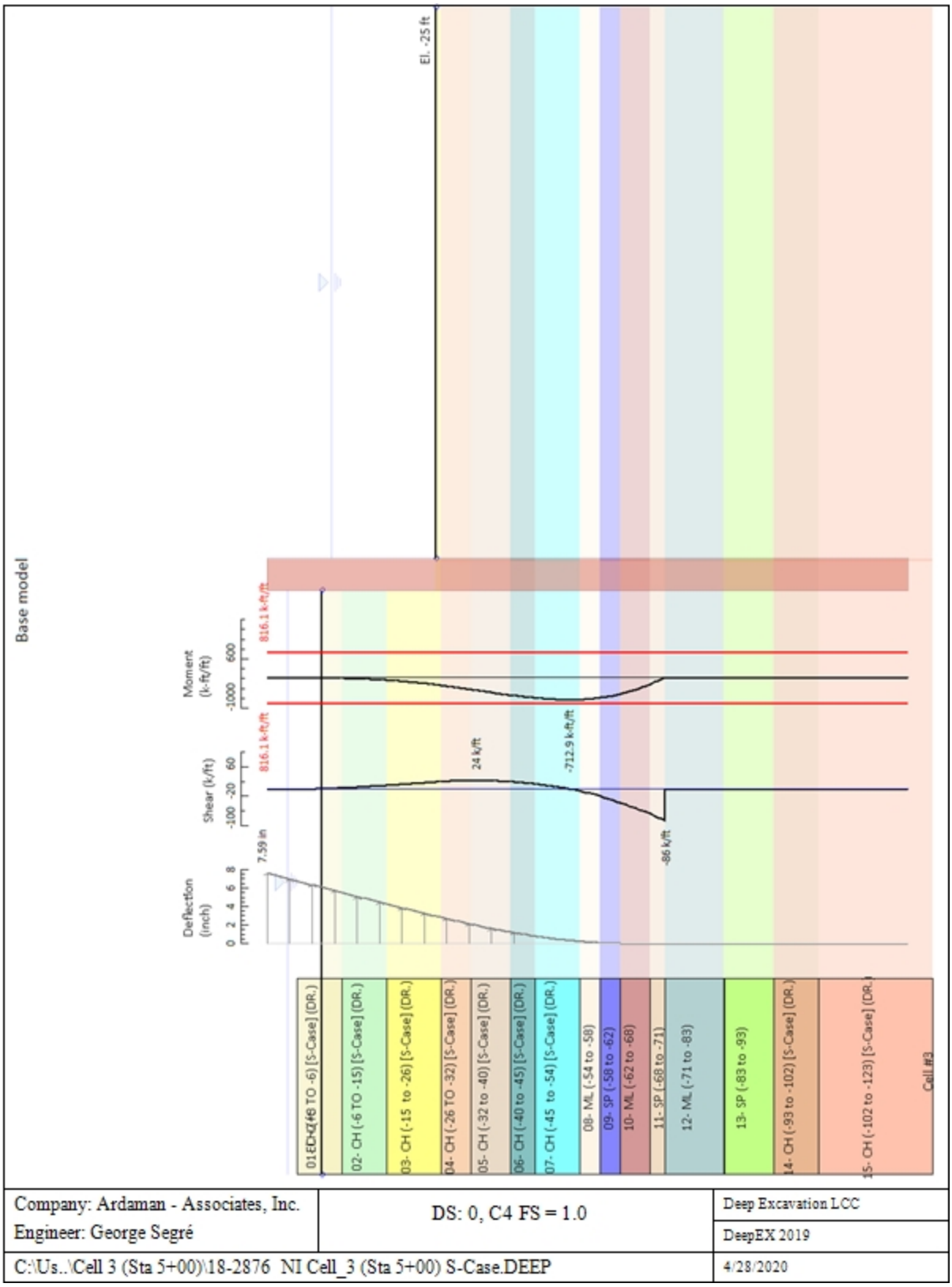

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



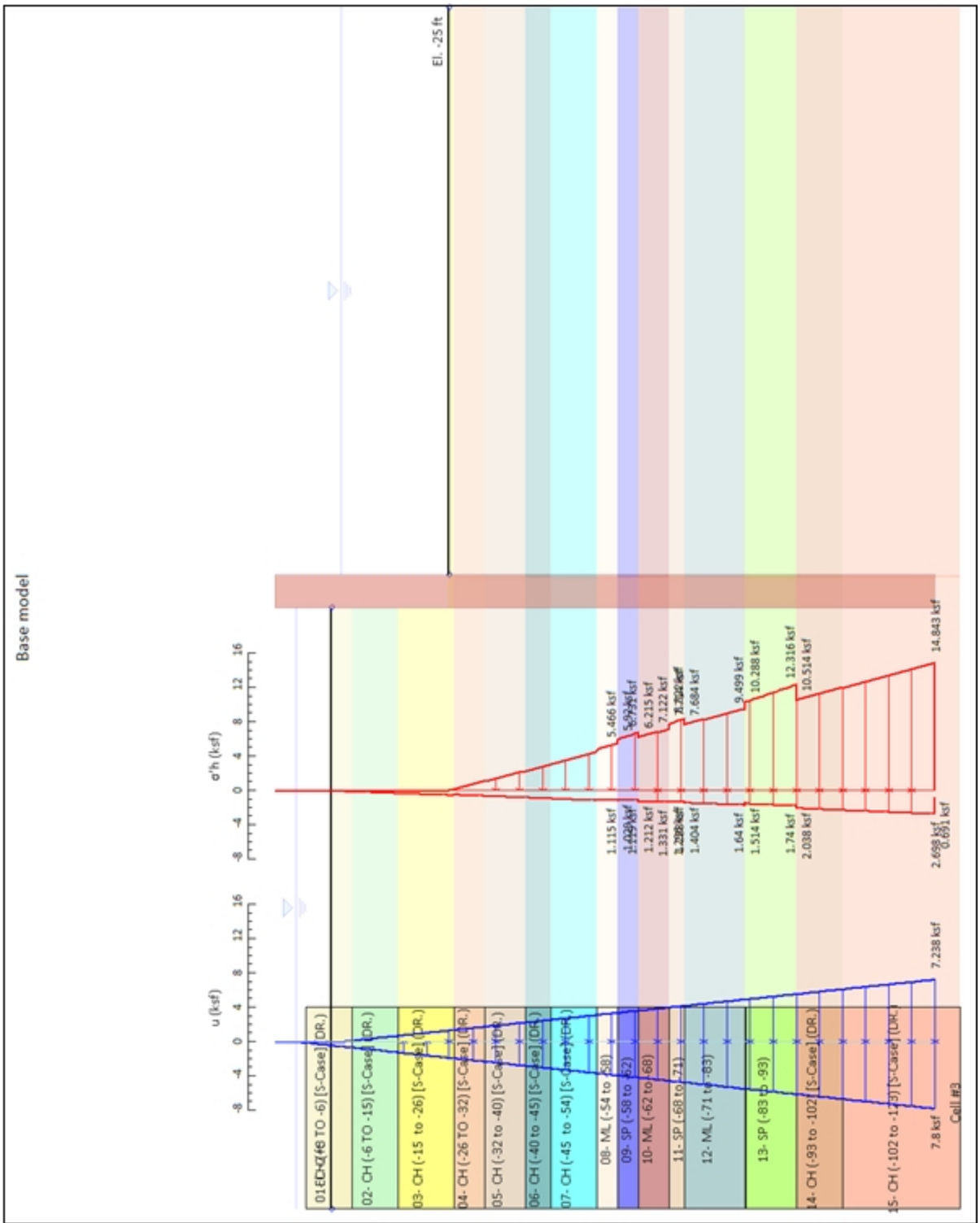

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



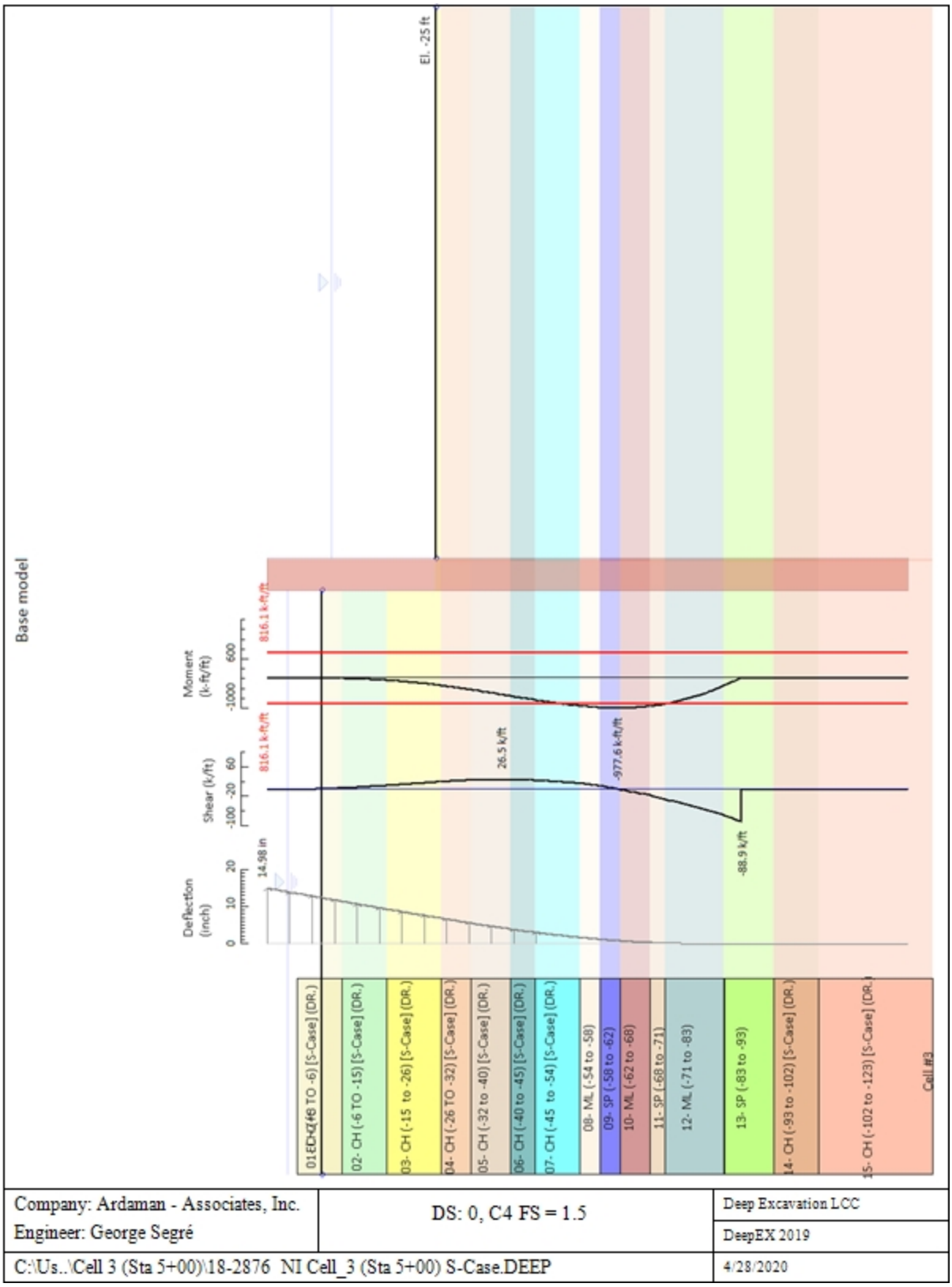

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



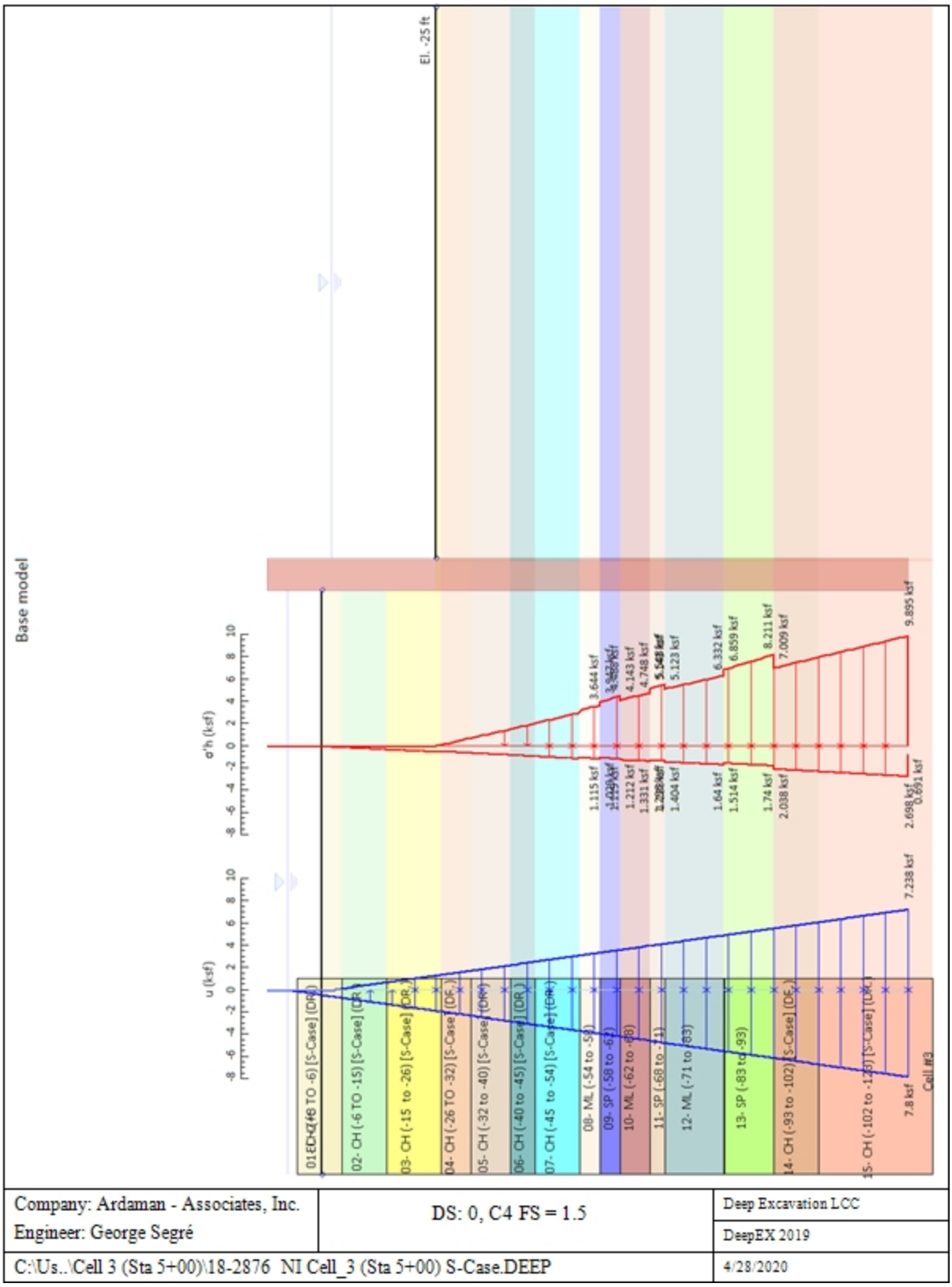

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 5+75 Left Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -116.3 ft., NAVD88

Length of Sheetting = 125.3 ft.

Use = 126.0 ft.

Design Tip Elev. = -117.0 ft., NAVD88

Design Length of Sheeting = 126.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -22 | 1.00 | 1.00 | -71.00 | 1,035.89 | 78.47 | 10.44 |
| | | Open excavation - degraded | 9 | -22 | 1.00 | 1.25 | -91.28 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -57.49 | 635.14 | 77.60 | 4.72 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -64.58 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -22 | 1.00 | 1.00 | -62.00 | 678.65 | 73.02 | 5.34 |
| | | Open excavation - degraded | 5 | -22 | 1.00 | 1.50 | -95.10 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -51.49 | 365.06 | 69.85 | 2.21 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -60.76 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -22 | 1.00 | 1.00 | -95.30 | 2,289.37 | 183.23 | 42.58 |
| | | Open excavation - degraded | 9 | -22 | 1.00 | 1.25 | -110.70 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -80.60 | 1,312.19 | 127.89 | 17.80 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -90.40 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -22 | 1.00 | 1.00 | -88.30 | 1,642.87 | 150.16 | 25.85 |
| | | Open excavation - degraded | 5 | -22 | 1.00 | 1.50 | -116.30 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -72.90 | 833.35 | 98.81 | 9.25 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -90.40 | -- | -- | -- |
| | | | | | | Governing Value: | -116.30 | 2,289.37 | 183.23 | 42.58 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:57:44 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 0 | 0 | 500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 0 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 0 | 0 | 350 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 0 | 0 | 1250 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 0 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 0 | 0 | 1730 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 0 | 0 | 3300 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

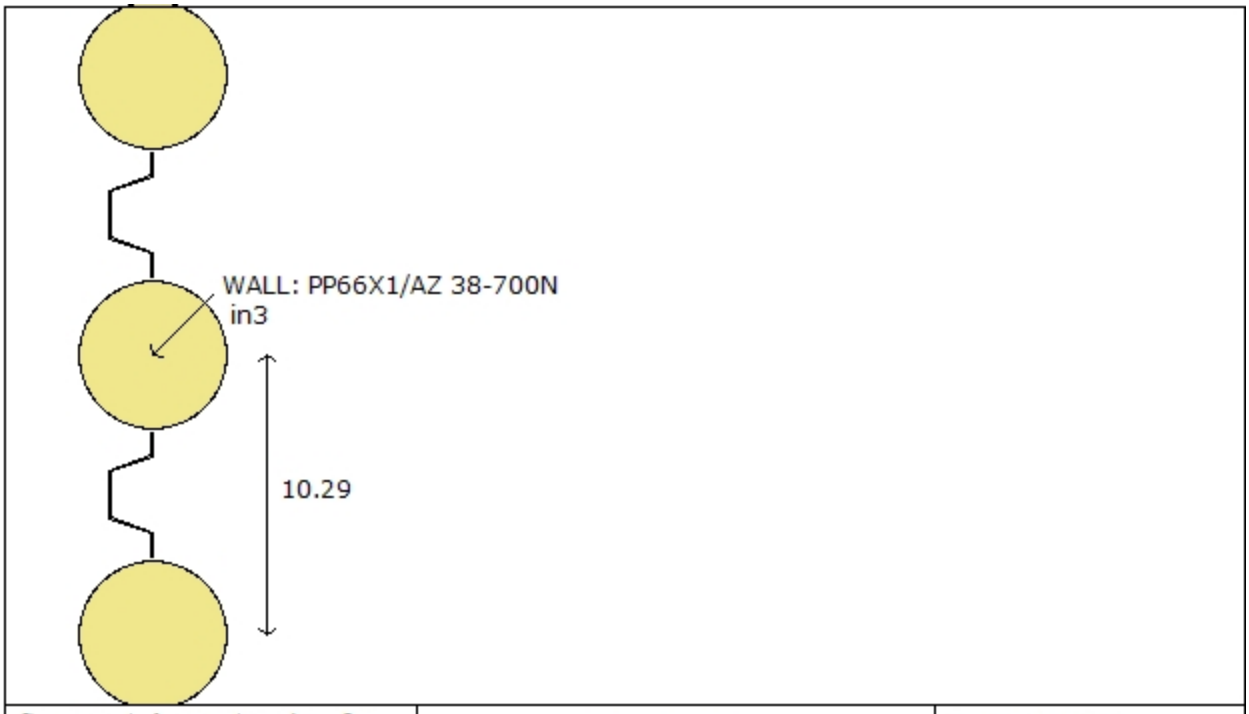
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 1 |
| -6 | 02- CH (-6 TO - | 1 | 1 |
| -15 | 03- CH (-15 to | 1 | 1 |
| -26 | 04- CH (-26 TO | 1 | 1 |
| -32 | 05- CH (-32 to | 1 | 1 |
| -40 | 06- CH (-40 to | 1 | 1 |
| -45 | 07- CH (-45 to | 1 | 1 |
| -54 | 08- ML (-54 to | 1 | 0.74 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.74 |
| -68 | 11- SP (-68 to - | 1 | 1 |
| -71 | 12- ML (-71 to | 1 | 0.74 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 1 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.369 | 1.369 | 1.934 |
| Stage 1 | Simple span | N/A | 1.6 | 1.095 | 1.095 | 1.547 |
| Stage 2 | Simple span | N/A | 1.6 | 1.935 | 1.935 | 2.707 |
| Stage 3 | Simple span | N/A | 1.6 | 1.548 | 1.548 | 2.166 |
| Stage 4 | Simple span | N/A | 1.6 | 1.577 | 1.577 | 2.155 |
| Stage 5 | Simple span | N/A | 1.6 | 1.051 | 1.051 | 1.437 |
| Stage 6 | Simple span | N/A | 1.6 | 2.379 | 2.379 | 3.161 |
| Stage 7 | Simple span | N/A | 1.6 | 1.586 | 1.586 | 2.108 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

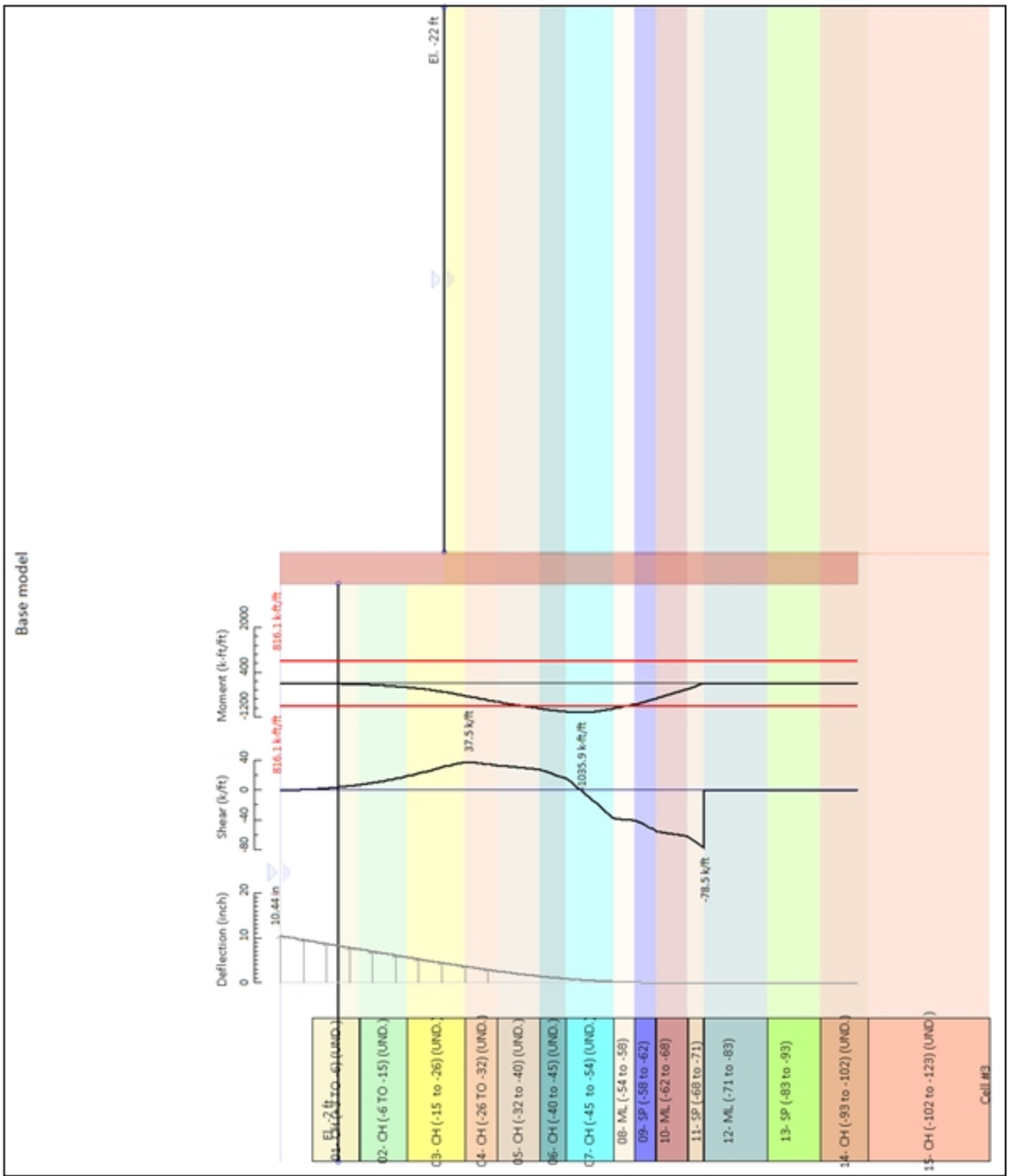
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

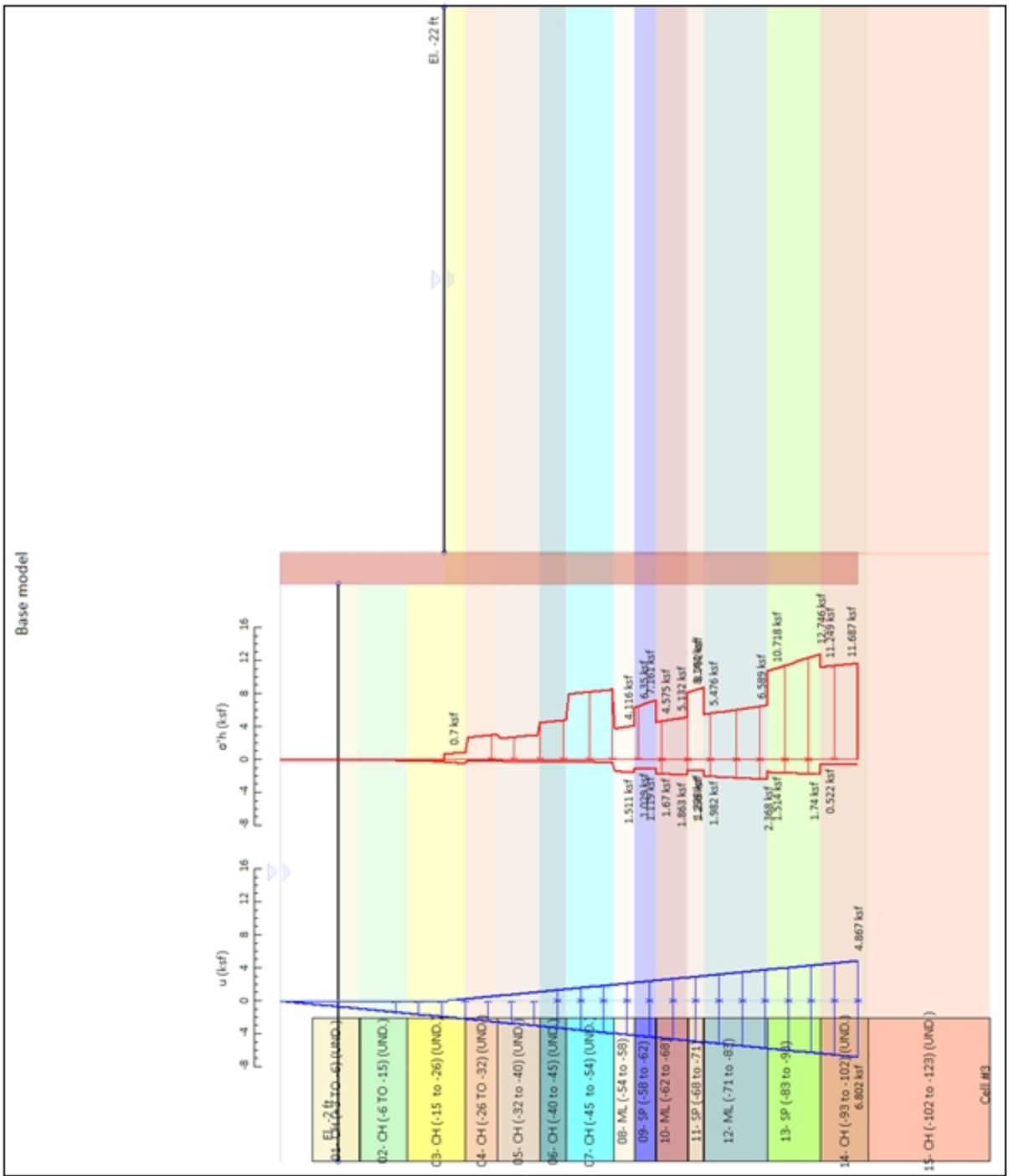
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

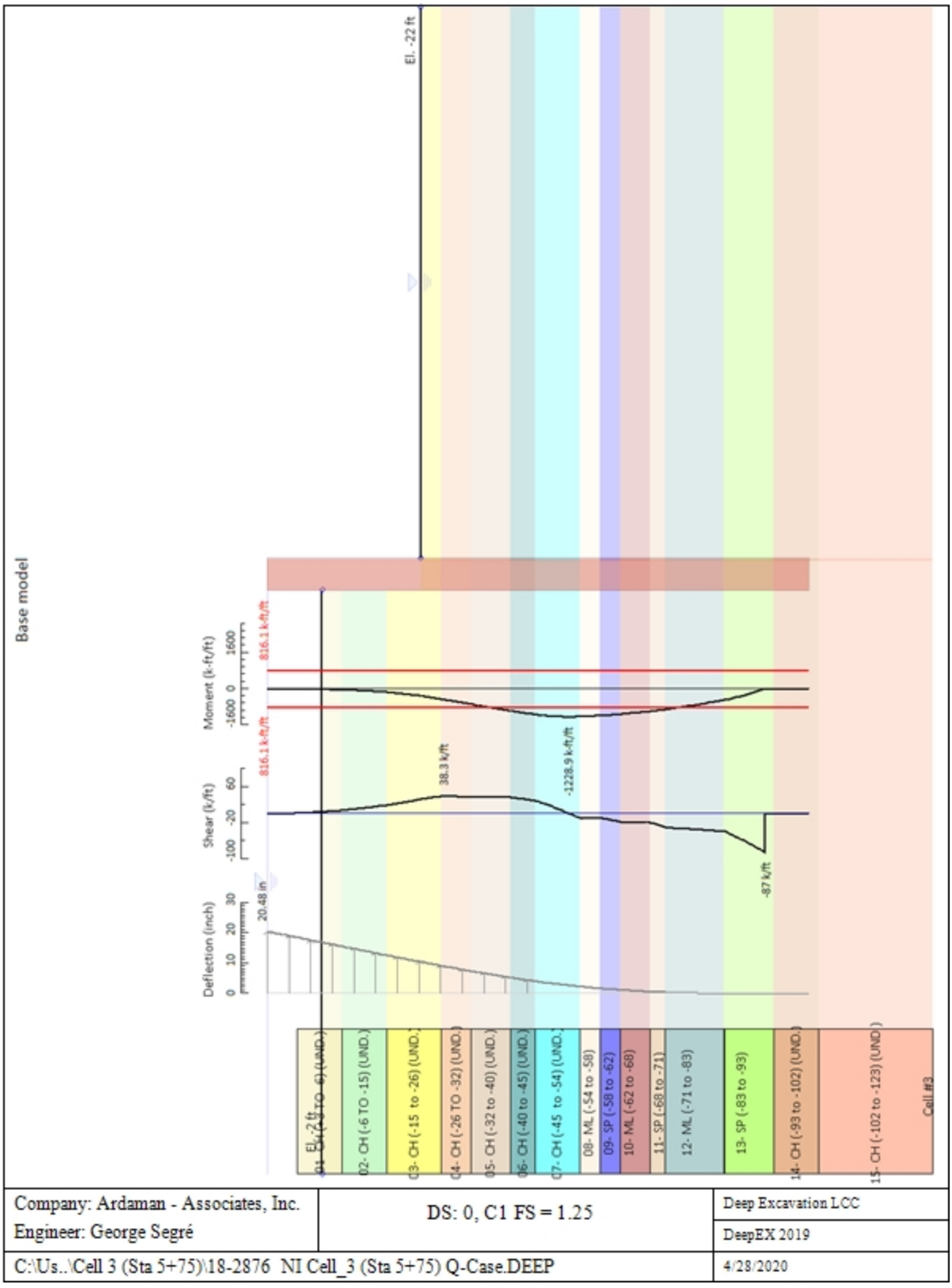
A sequence of figures for each excavation stage is reported

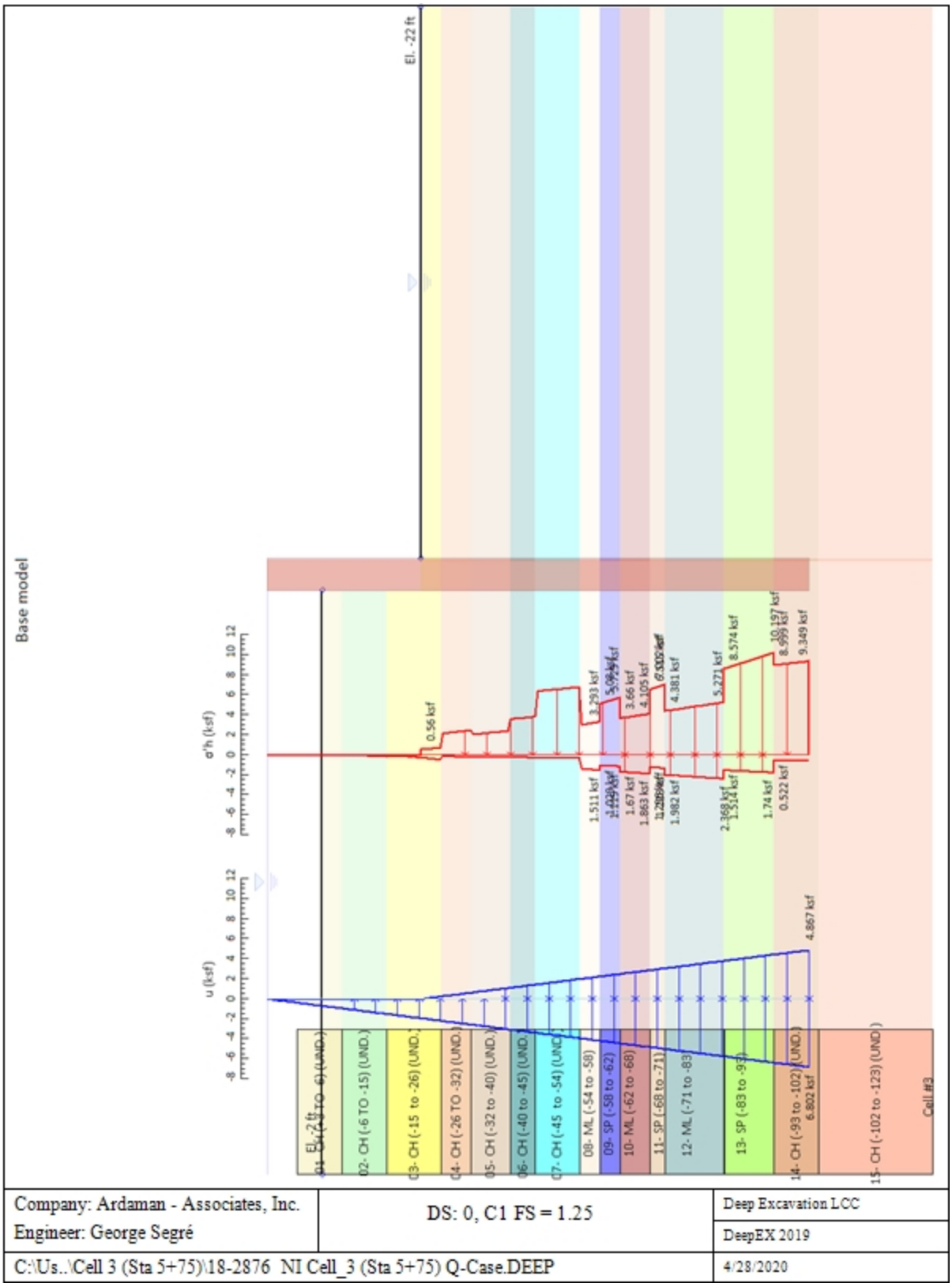



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |

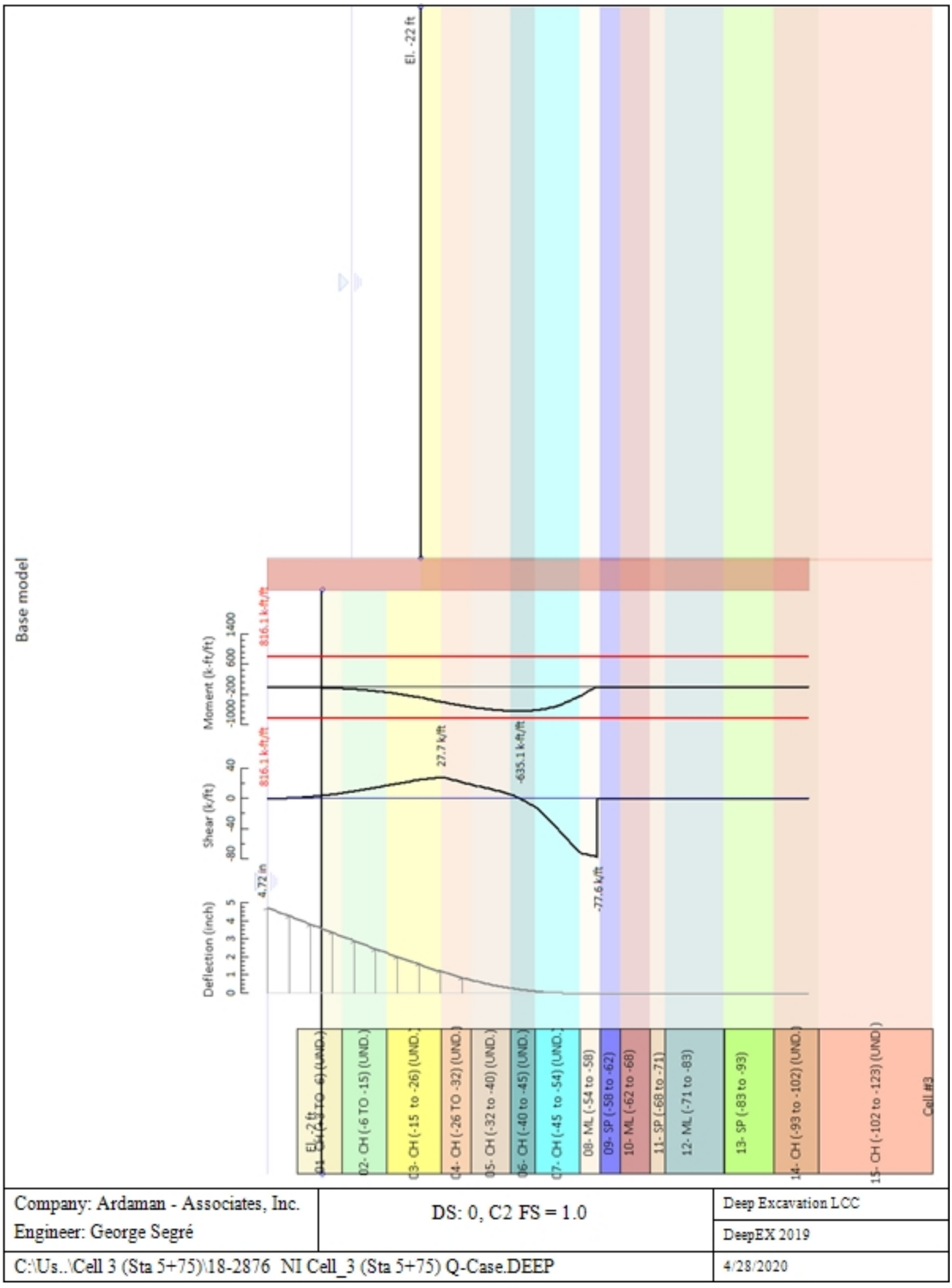



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |

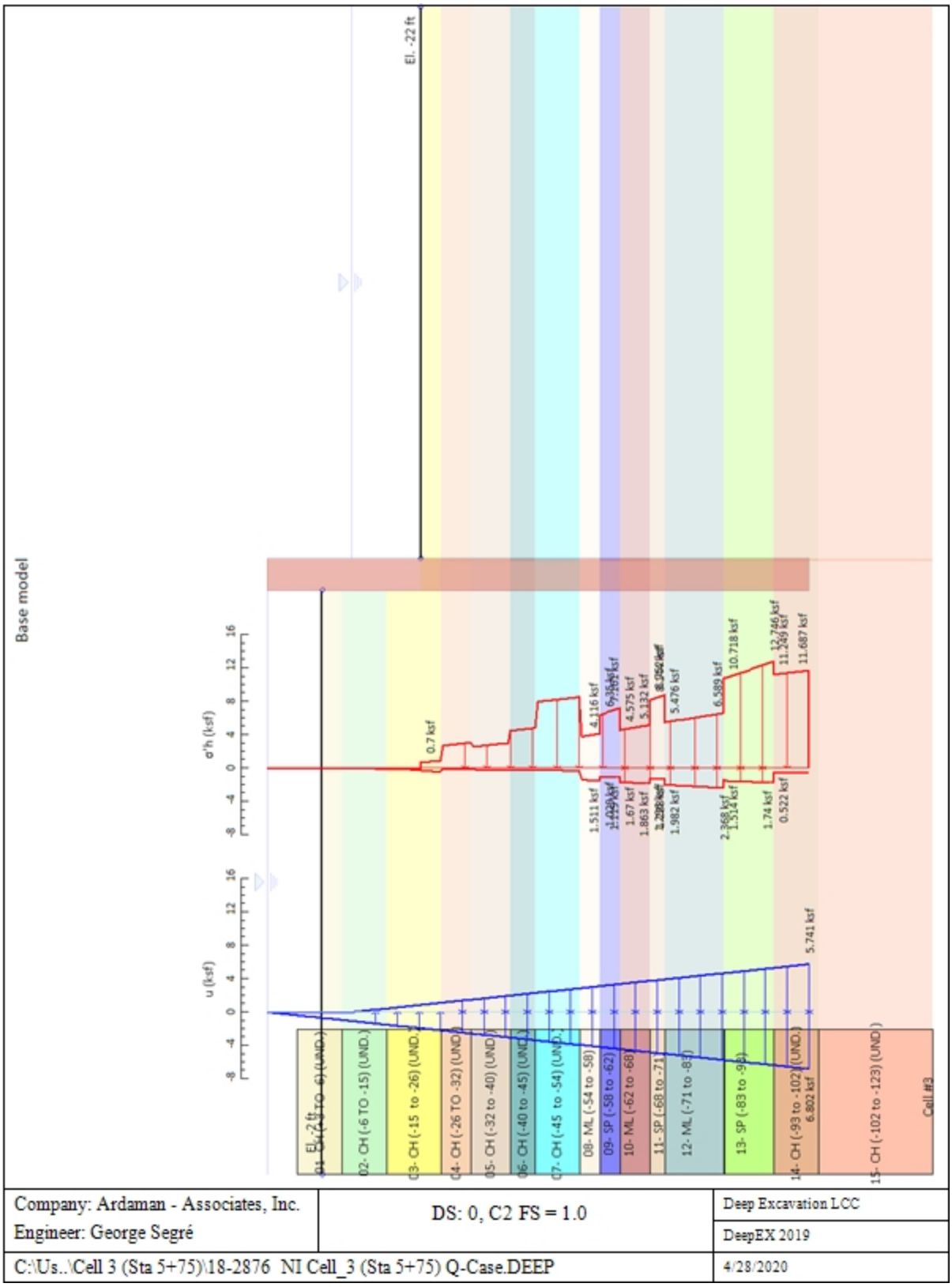

Base model
El. -22 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-100 -20 60
38.3 k/ft
-1228.9 k-ft/ft
-87 k/ft
Deflection (inch)
0 10 20 30
20.48 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP
4/28/2020



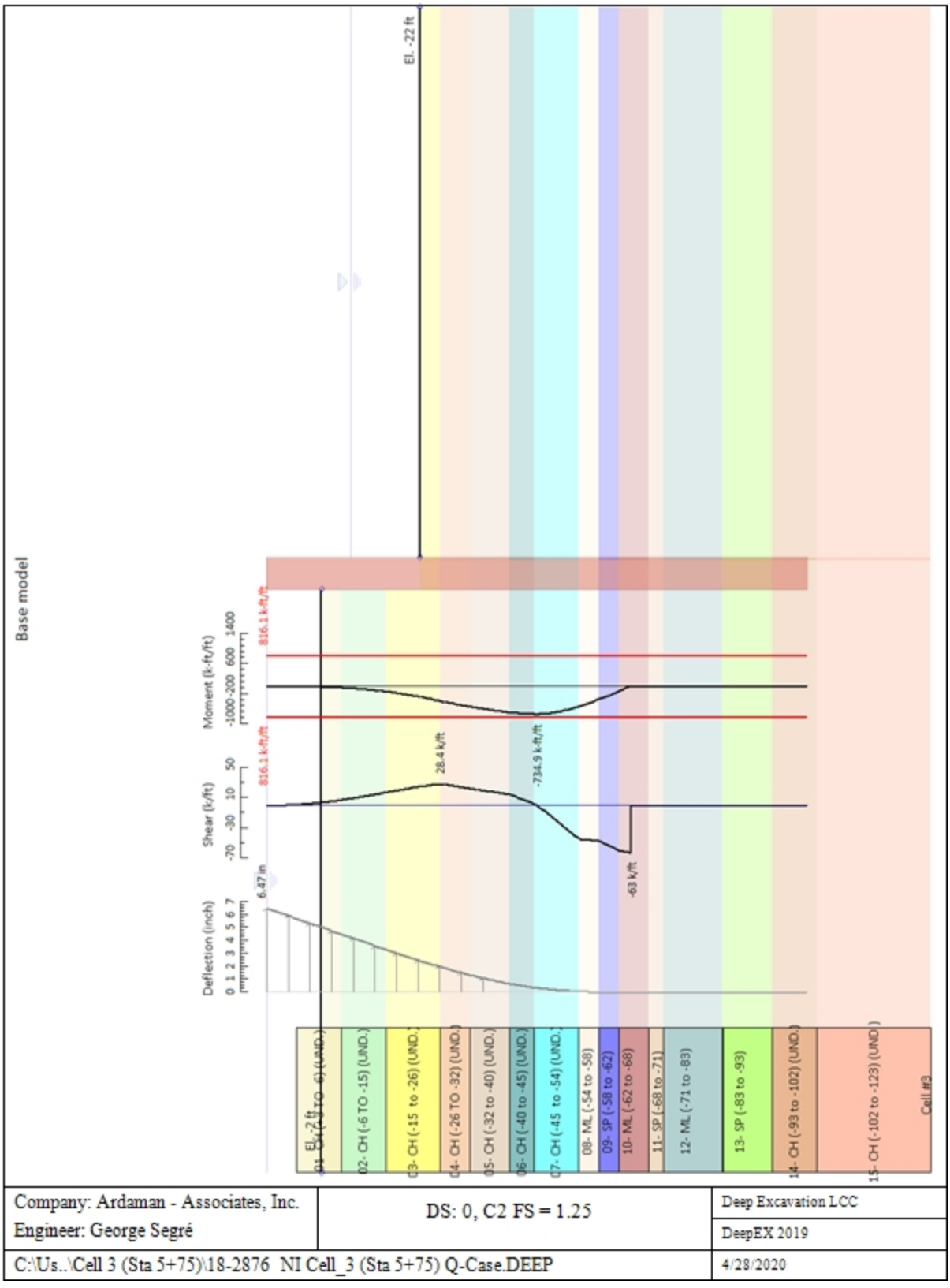

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |



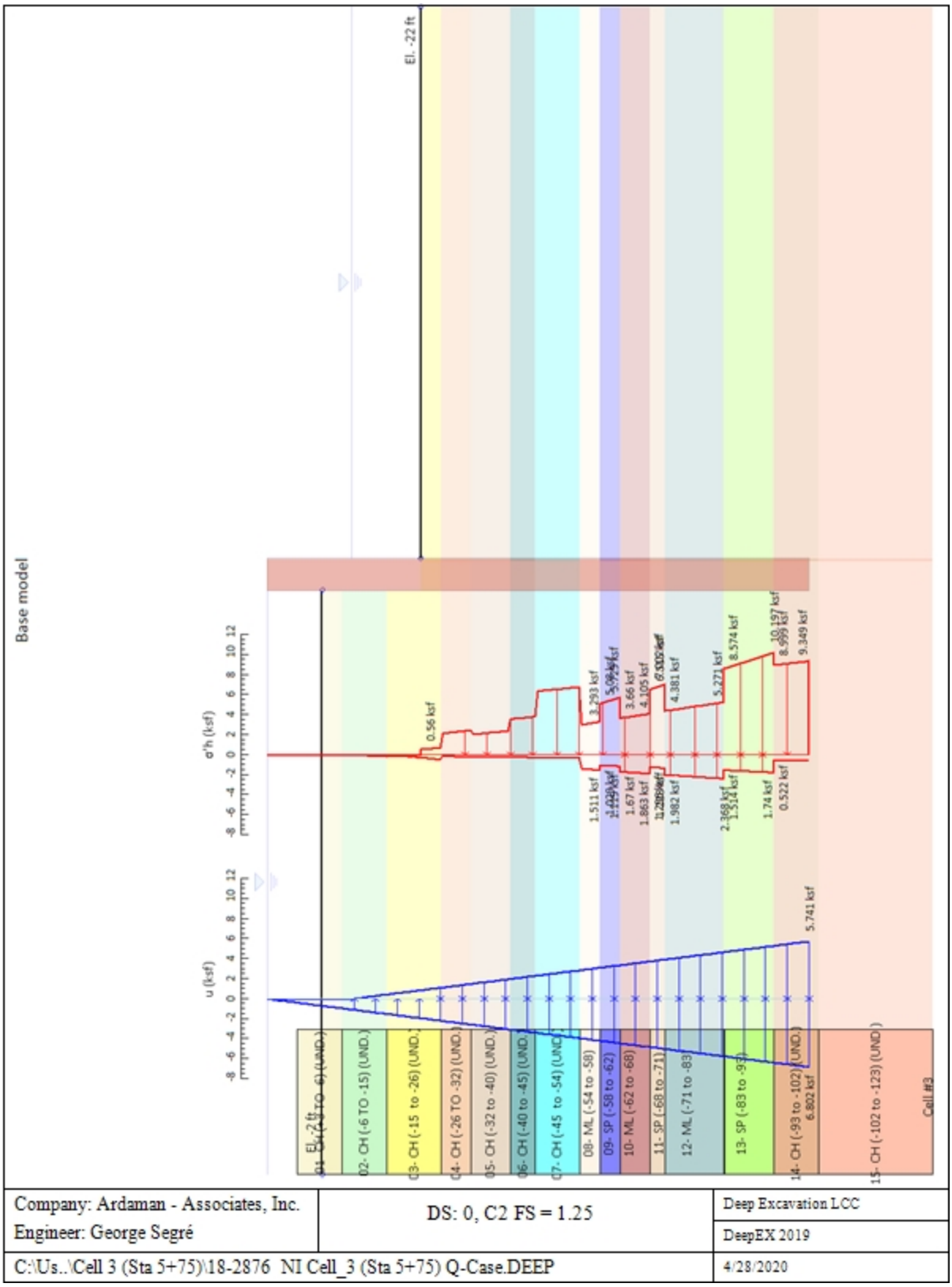

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |



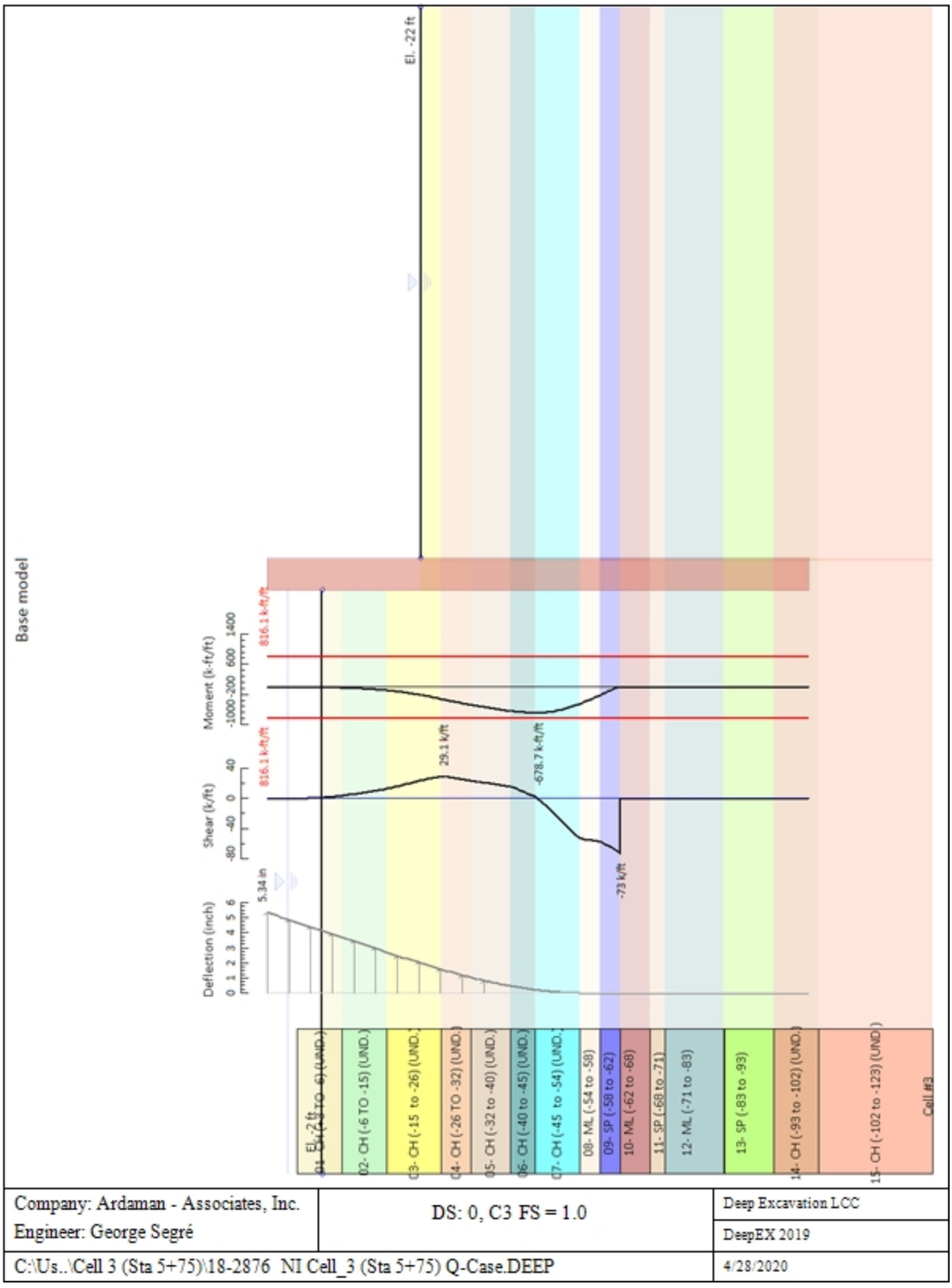

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |



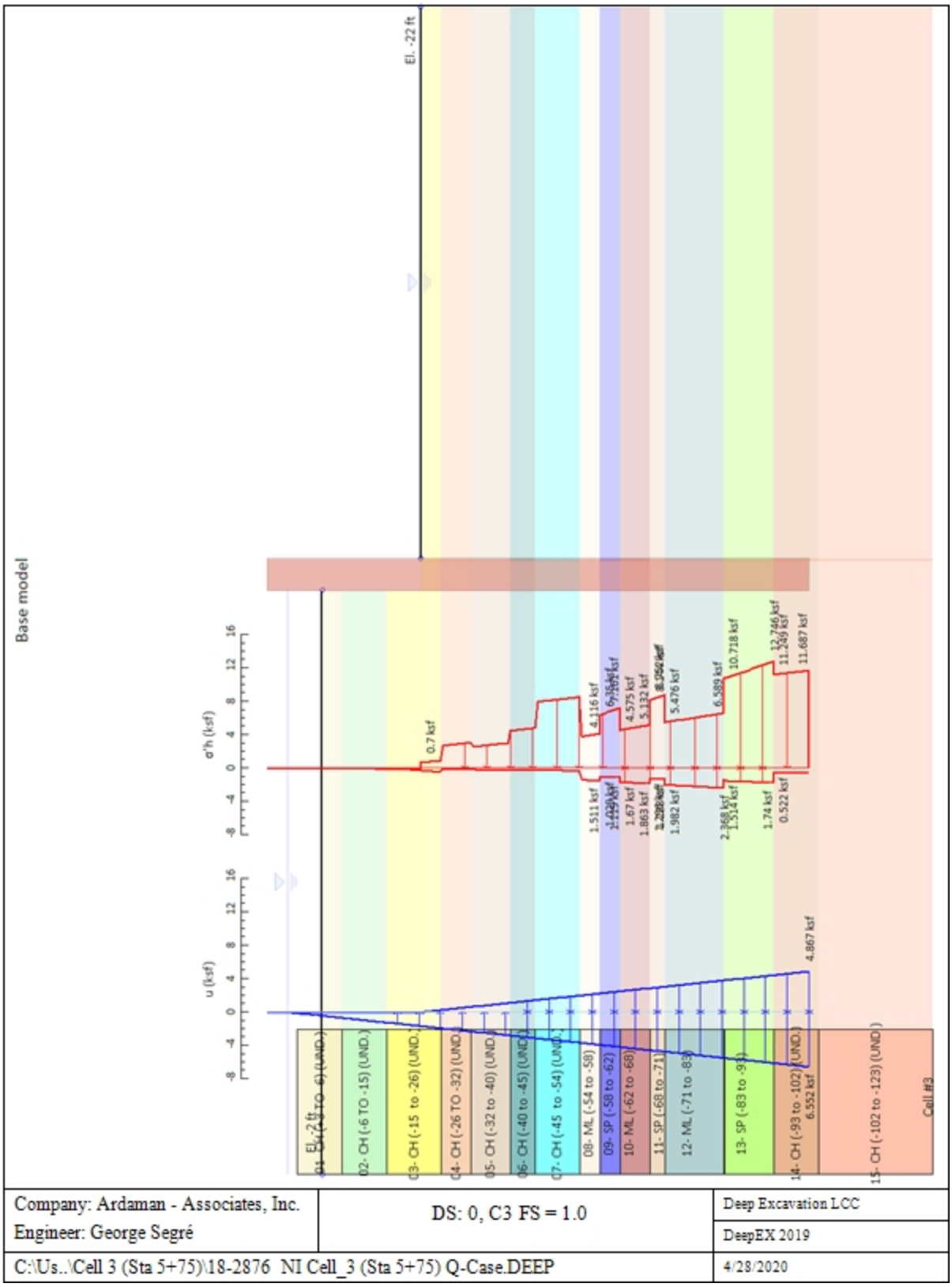

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |



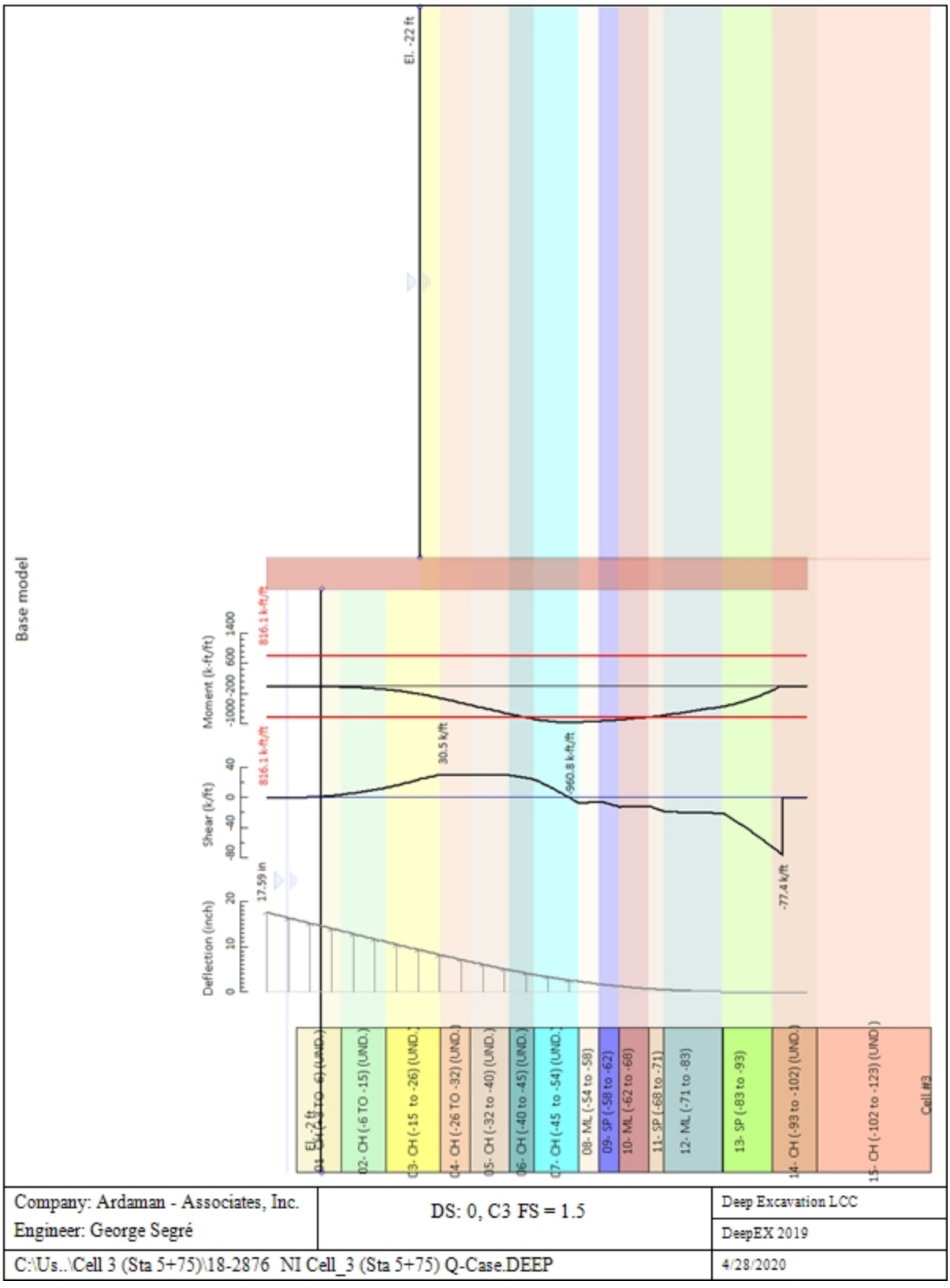

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |



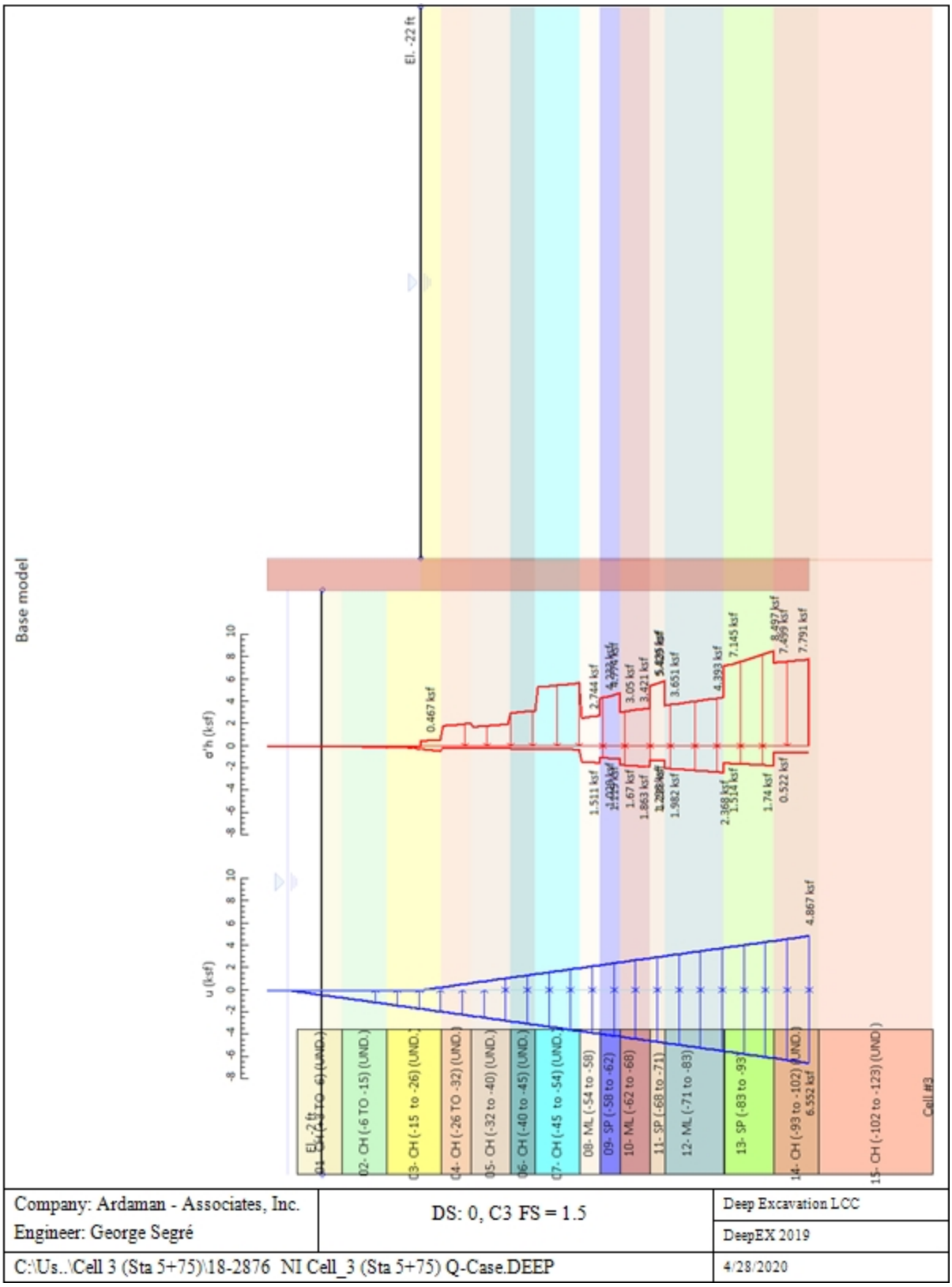

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |



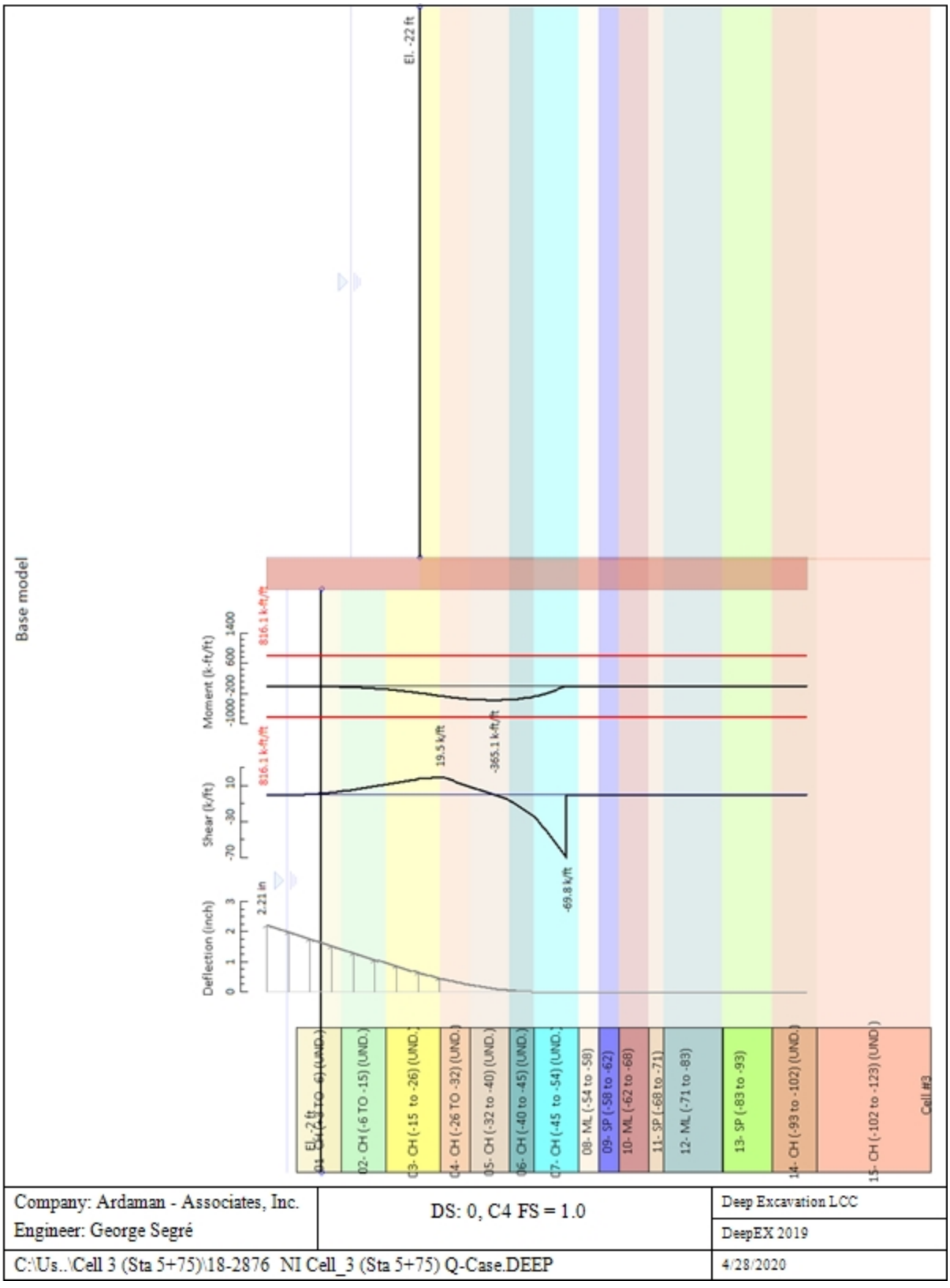

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |

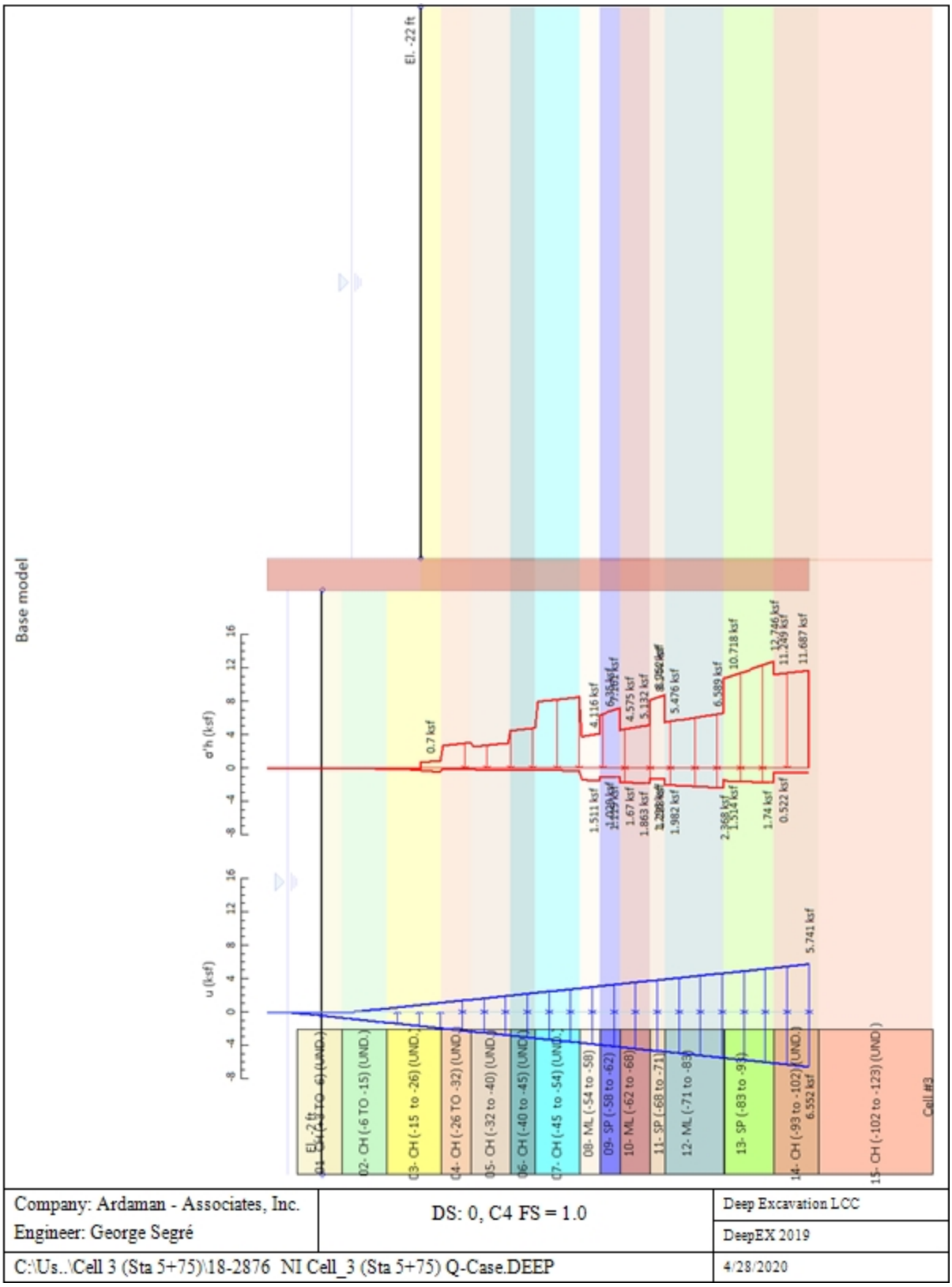



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |

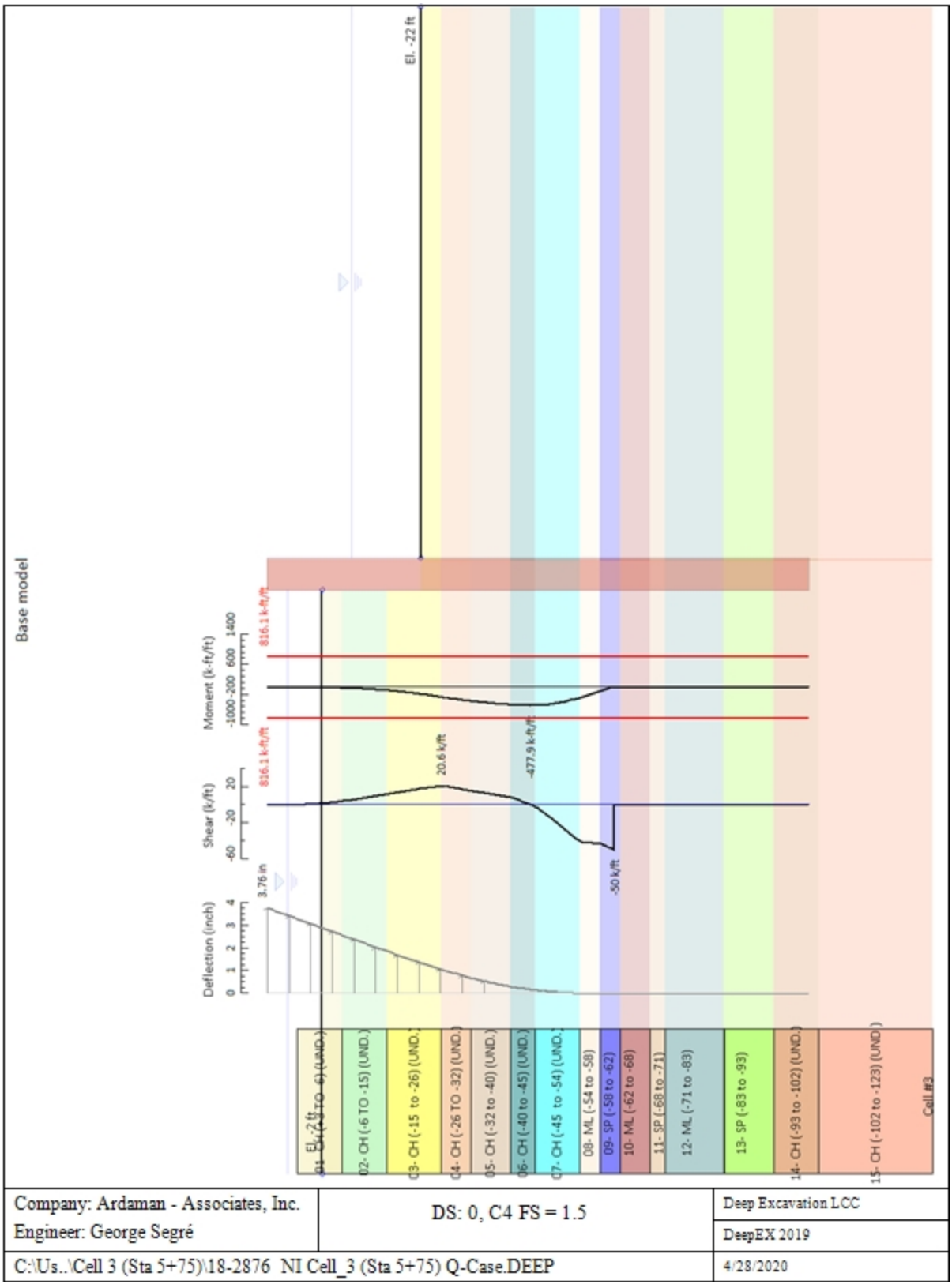



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |

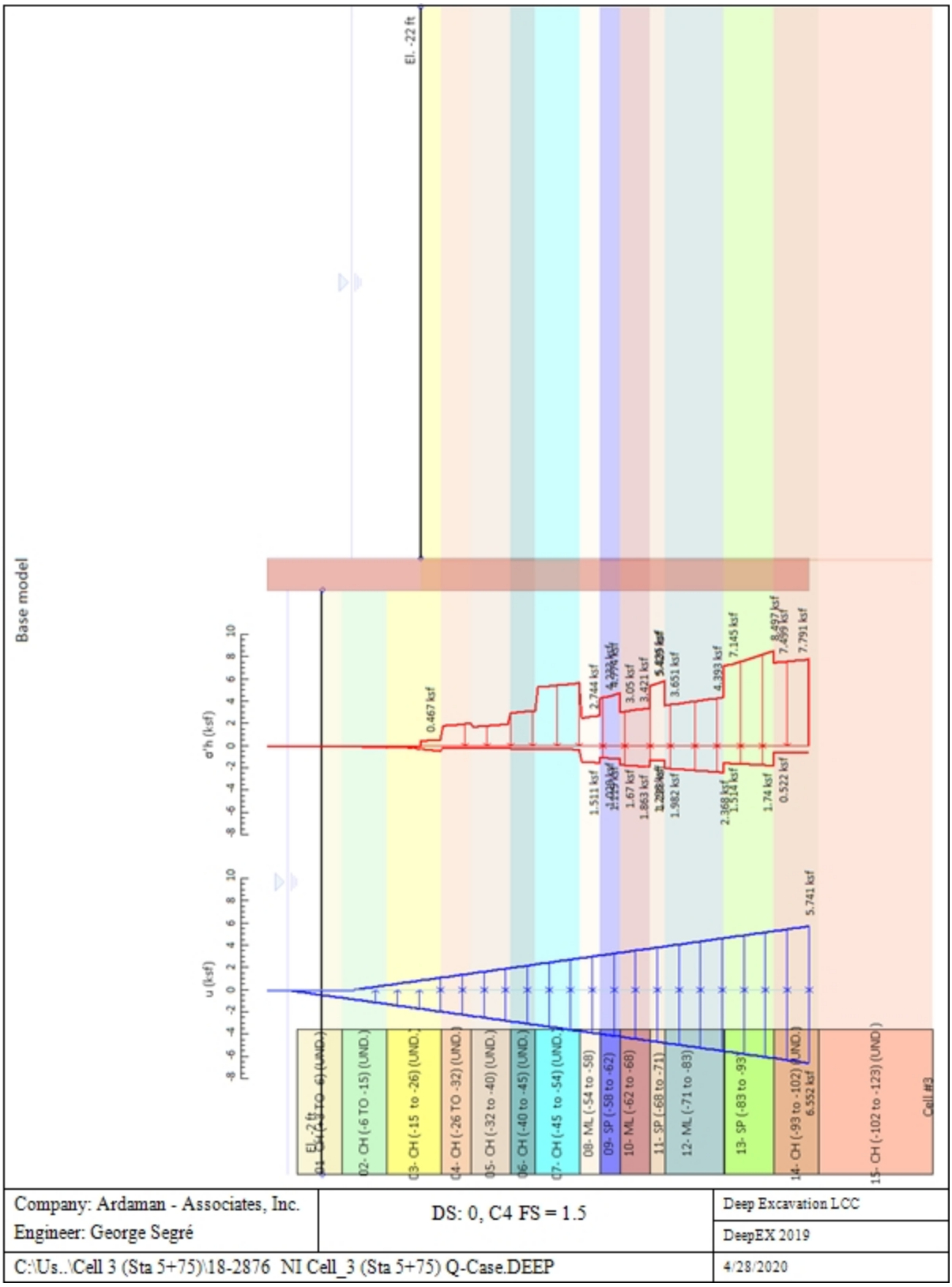

Base model
El. -22 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-70 -30 10
19.5 k/ft
-365.1 k-ft/ft
-69.8 k/ft
Deflection (inch)
0 1 2 3
2.21 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP
4/28/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:51:50 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 23 | 0 | 500 | 23 | 23 | 300 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 23 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 23 | 0 | 350 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 26 | 0 | 1250 | 26 | 26 | 521.92 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 26 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 26 | 0 | 1730 | 26 | 26 | 626.3 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 26 | 0 | 3300 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 26 | 0 | 4000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 0.609 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

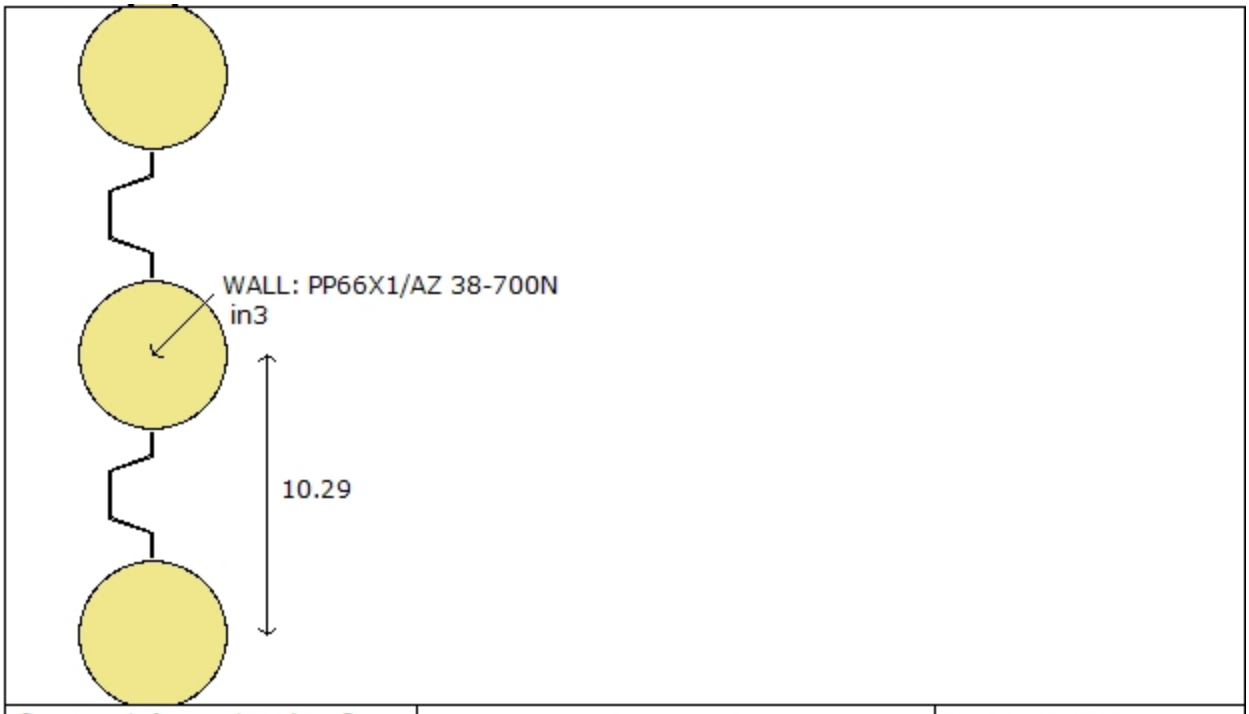
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 0.61 |
| -6 | 02- CH (-6 TO - | 1 | 0 |
| -15 | 03- CH (-15 to | 1 | 0.61 |
| -26 | 04- CH (-26 TO | 1 | 0.56 |
| -32 | 05- CH (-32 to | 1 | 0 |
| -40 | 06- CH (-40 to | 1 | 0.56 |
| -45 | 07- CH (-45 to | 1 | 0.56 |
| -54 | 08- ML (-54 to | 1 | 0.53 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.53 |
| -68 | 11- SP (-68 to - | 1 | 0.5 |
| -71 | 12- ML (-71 to | 1 | 0.53 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 0.56 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -131 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.487 | 1.542 | 2.251 |
| Stage 1 | Simple span | N/A | 1.6 | 1.229 | 1.234 | 1.801 |
| Stage 2 | Simple span | N/A | 1.6 | 1.86 | 2.09 | 2.972 |
| Stage 3 | Simple span | N/A | 1.6 | 1.594 | 1.672 | 2.378 |
| Stage 4 | Simple span | N/A | 1.6 | 1.644 | 1.724 | 2.453 |
| Stage 5 | Simple span | N/A | 1.6 | 1.15 | 1.15 | 1.635 |
| Stage 6 | Simple span | N/A | 1.6 | 2.141 | 2.439 | 3.335 |
| Stage 7 | Simple span | N/A | 1.6 | 1.594 | 1.626 | 2.223 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

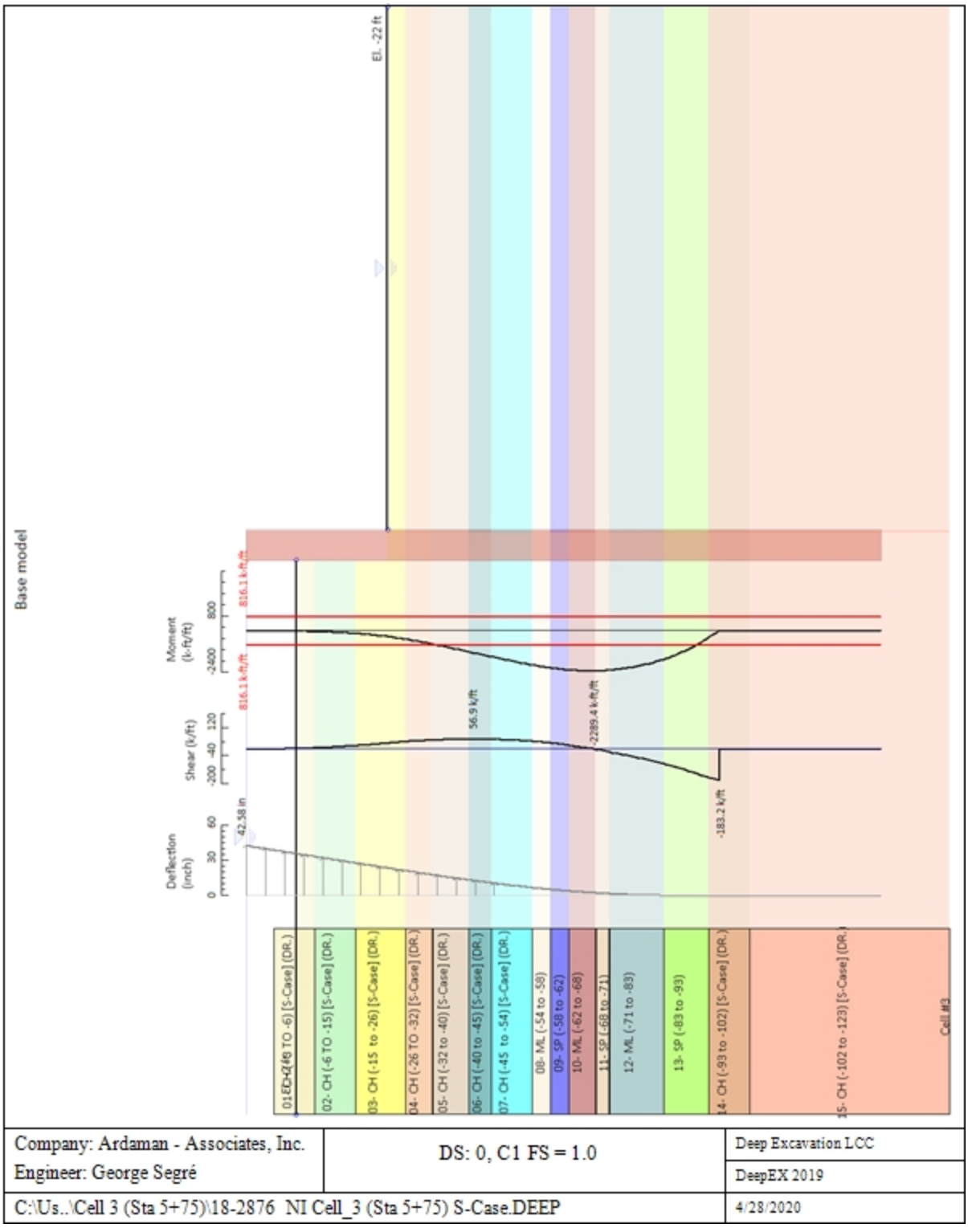
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

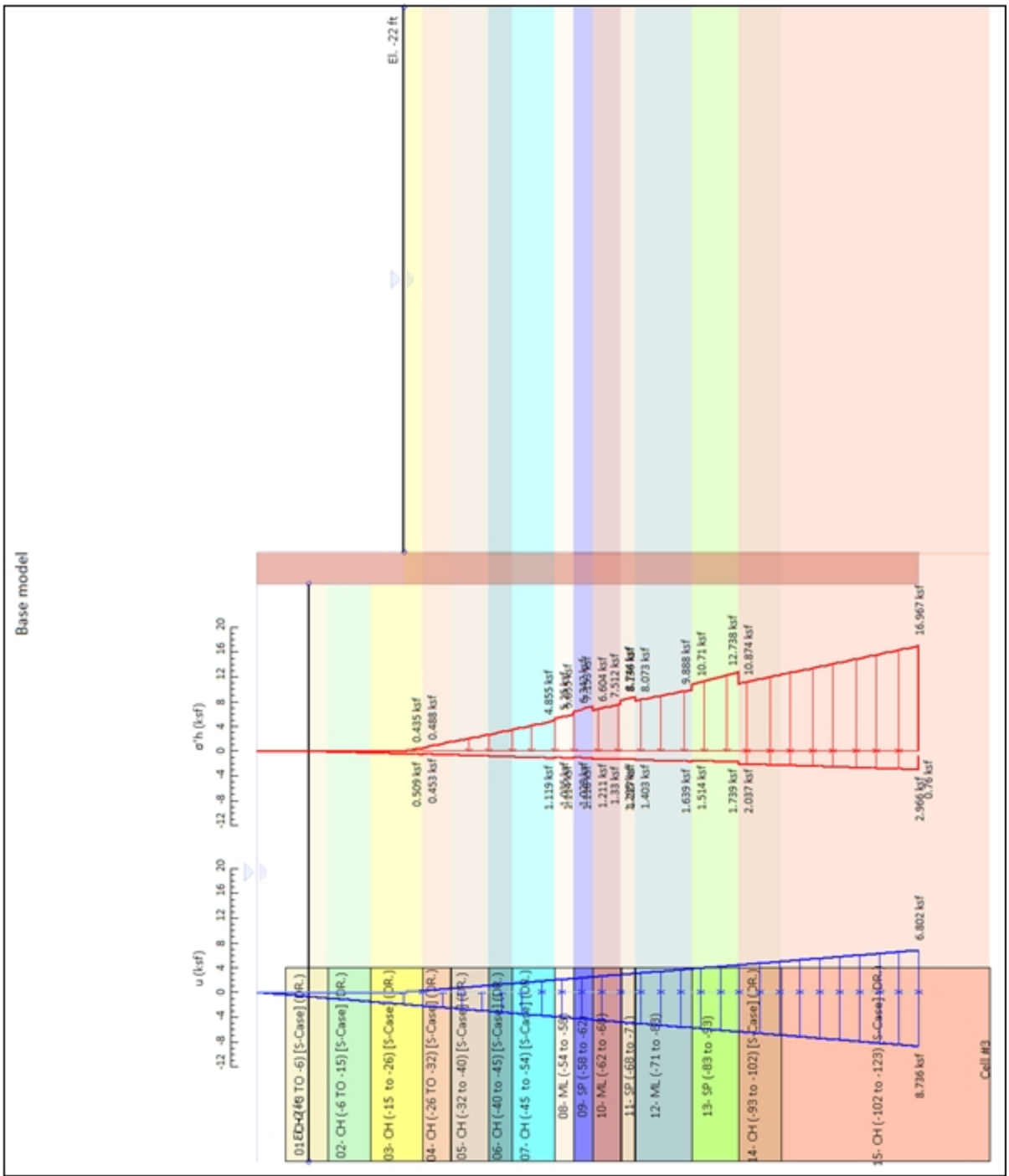
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

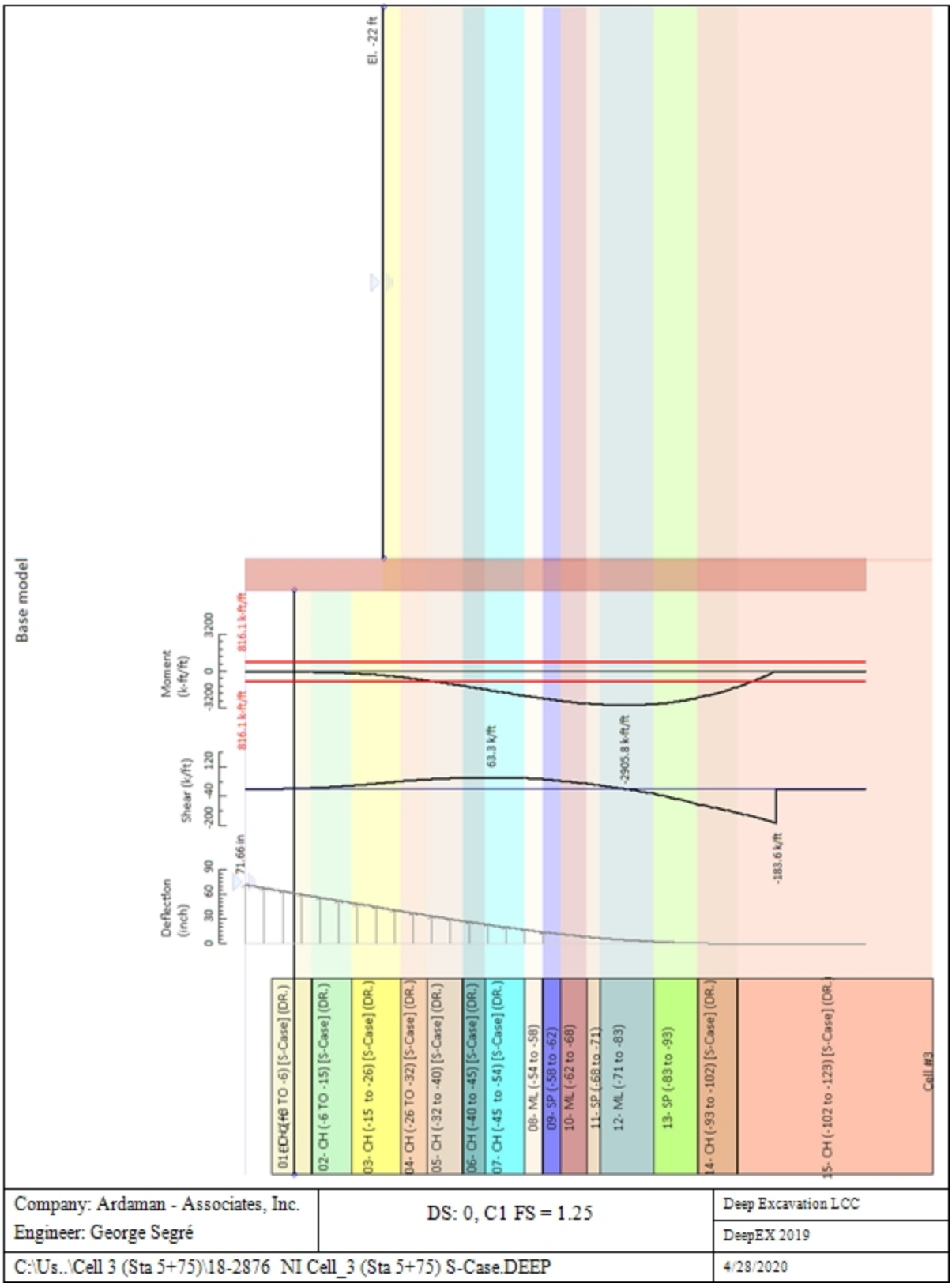
A sequence of figures for each excavation stage is reported



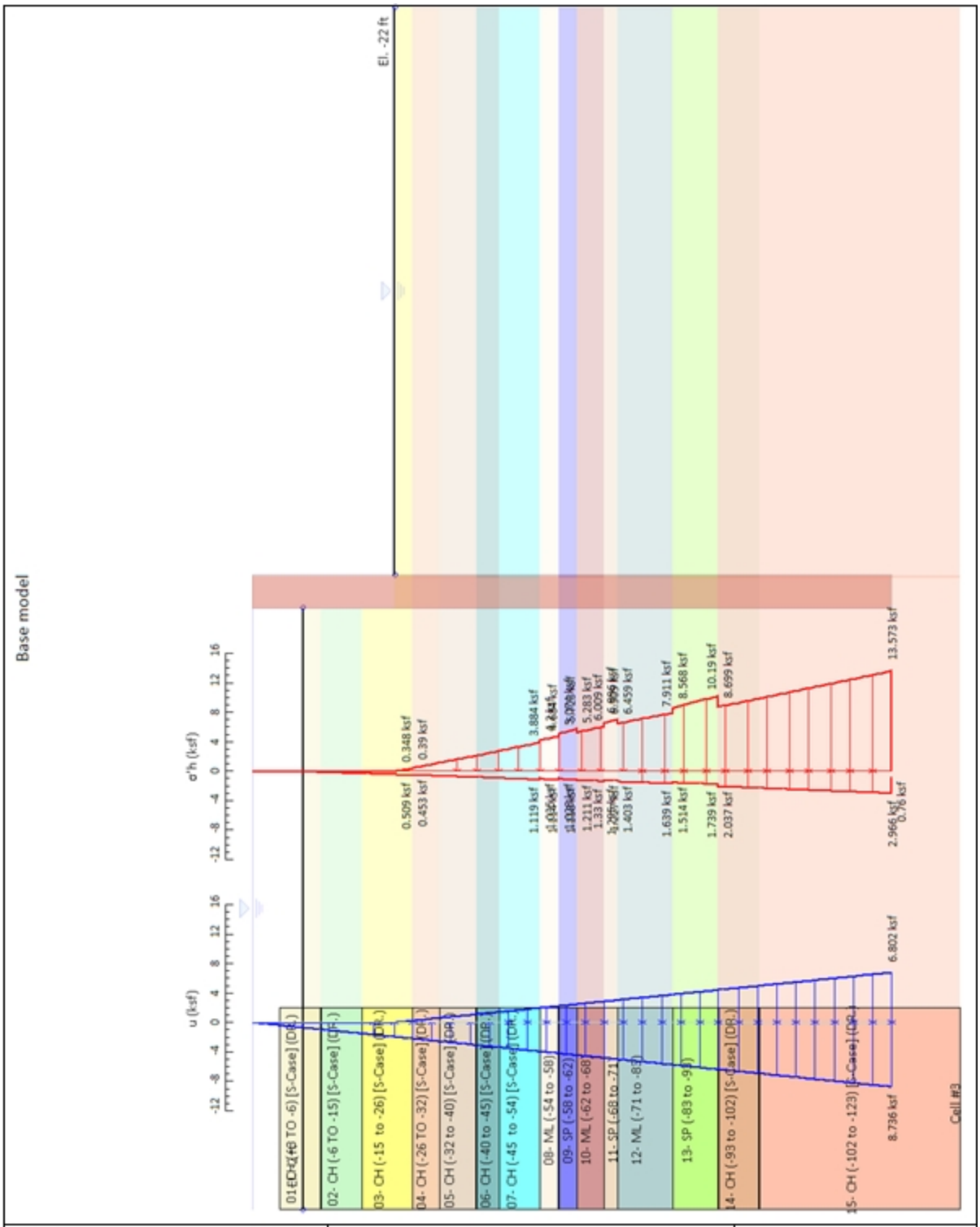

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



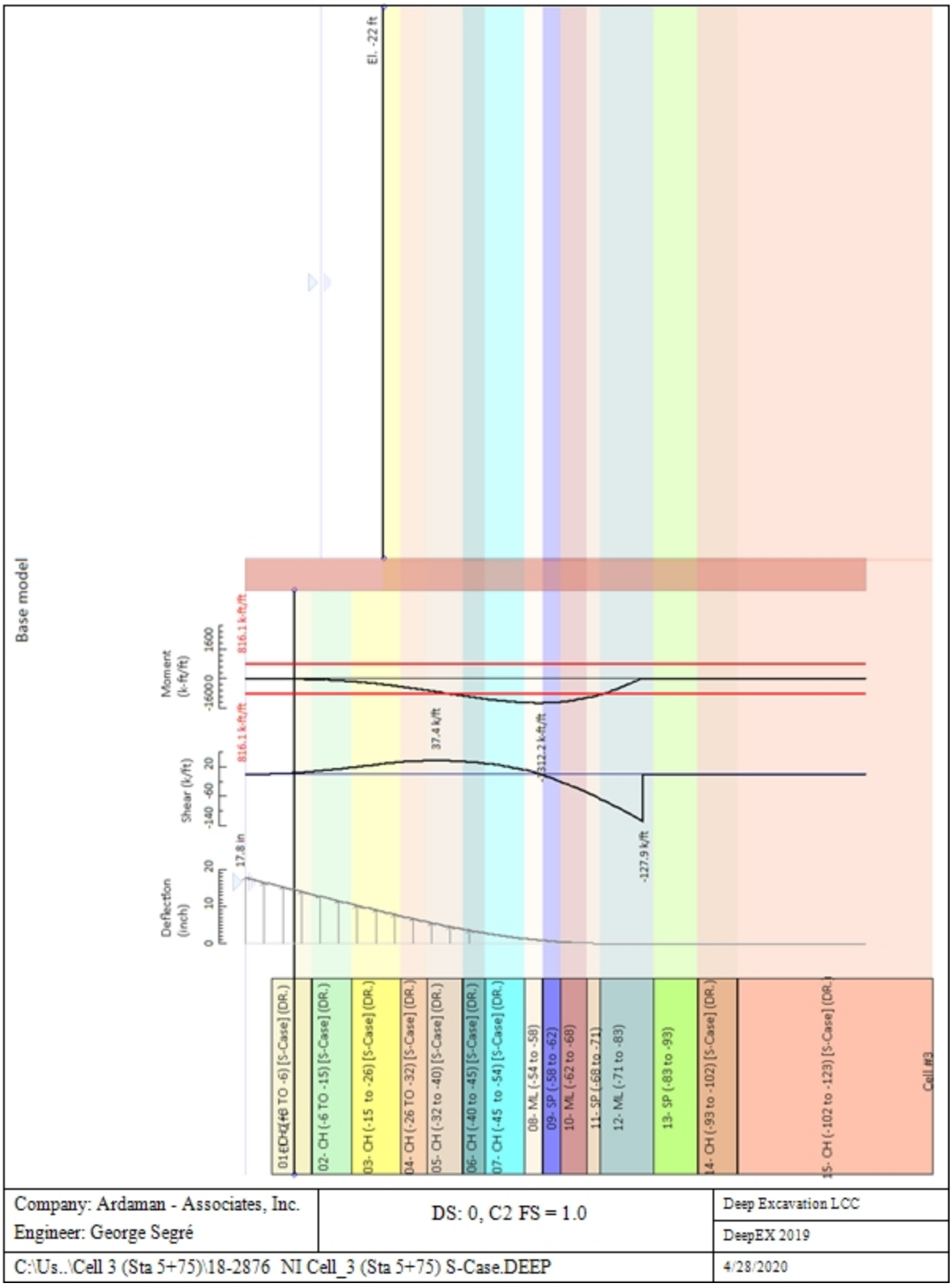

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



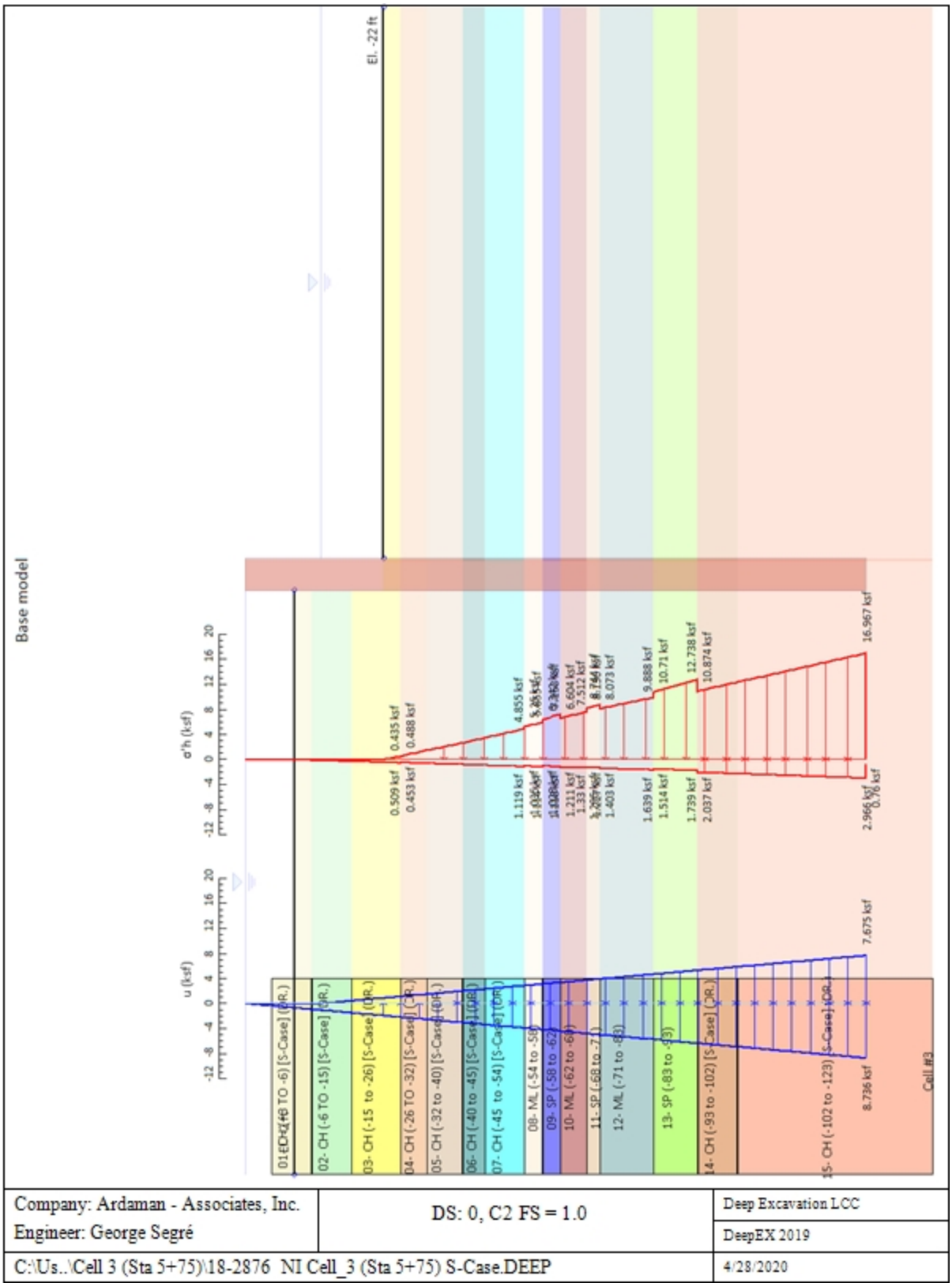

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



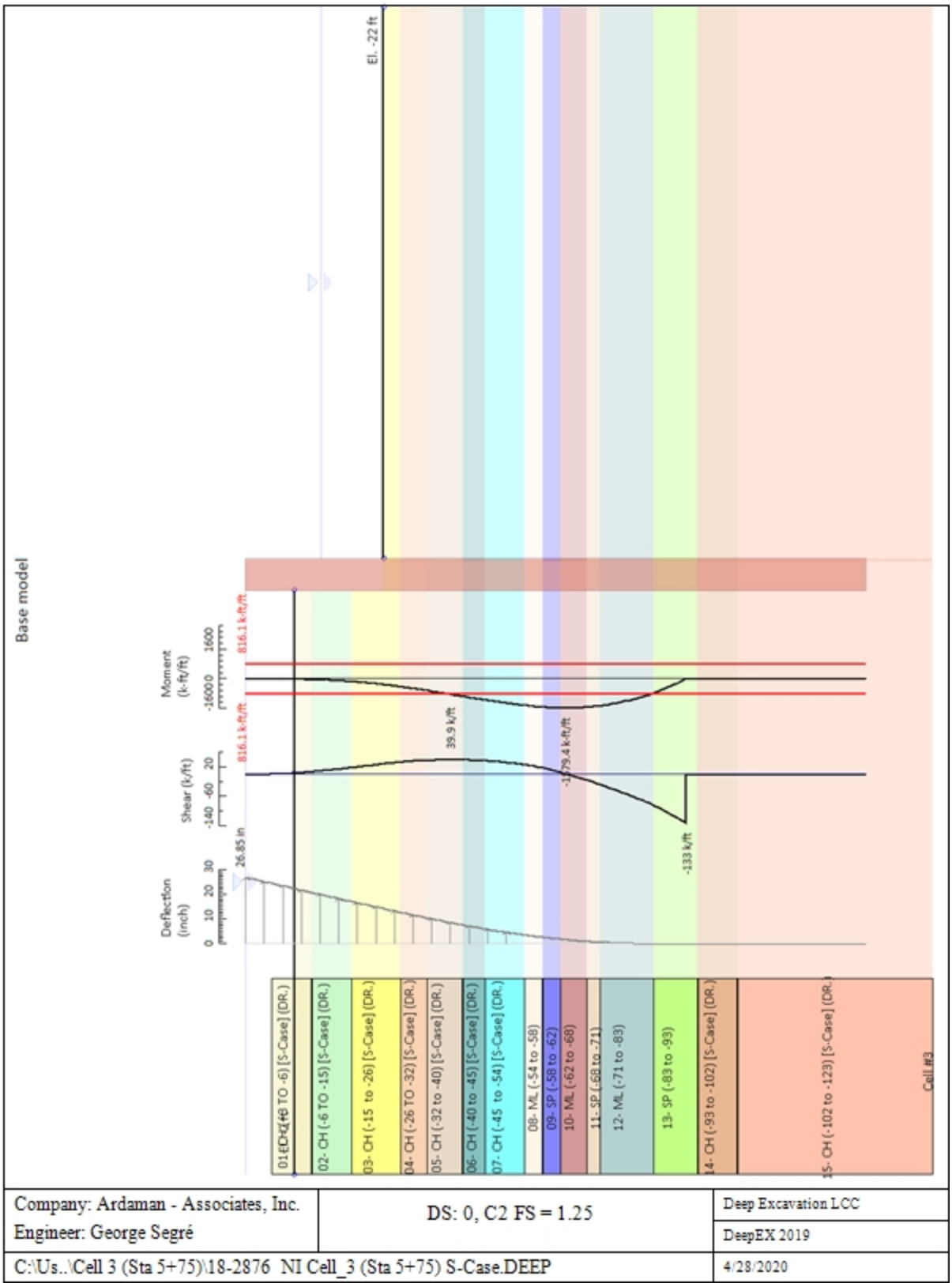

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



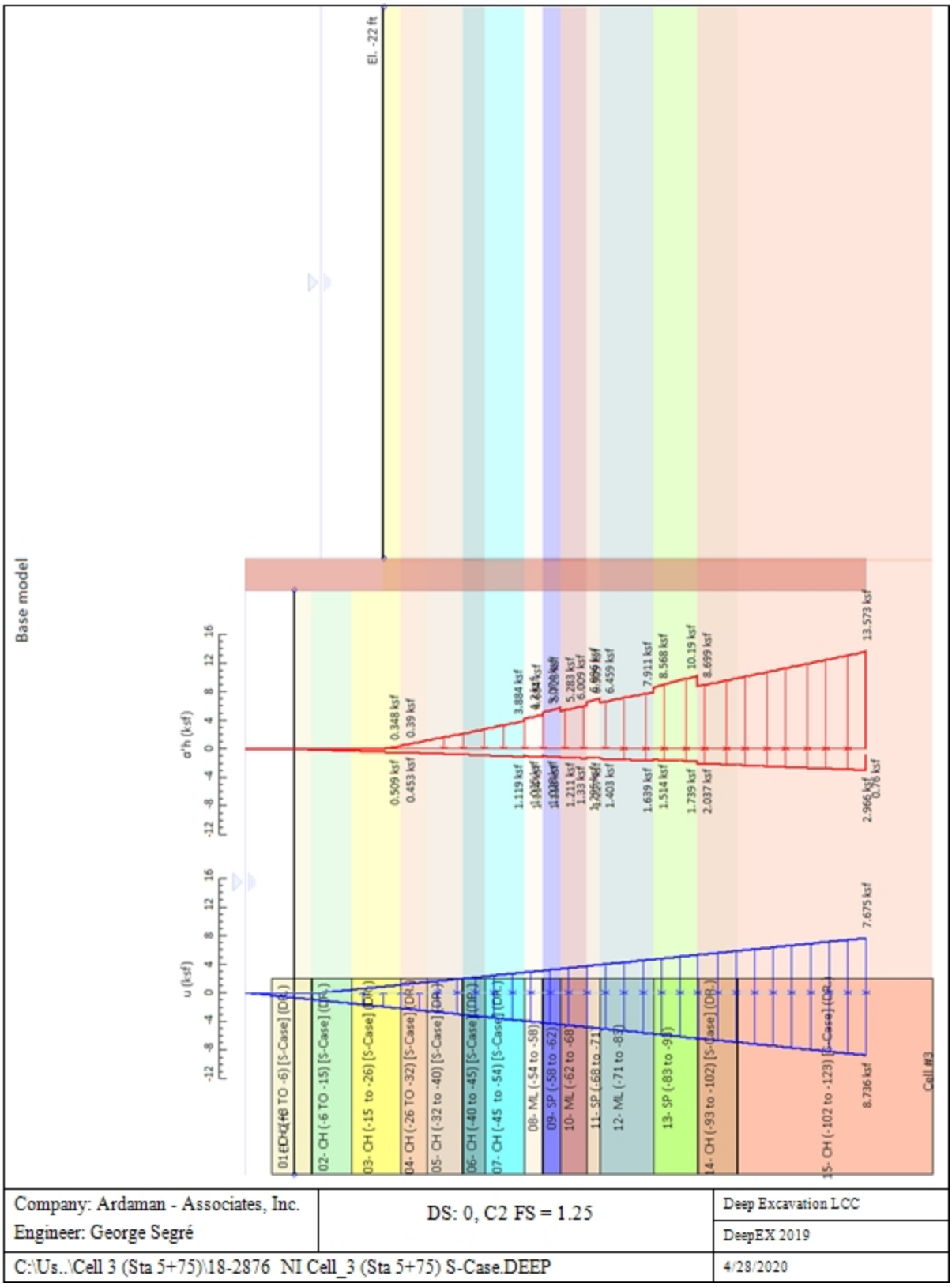

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



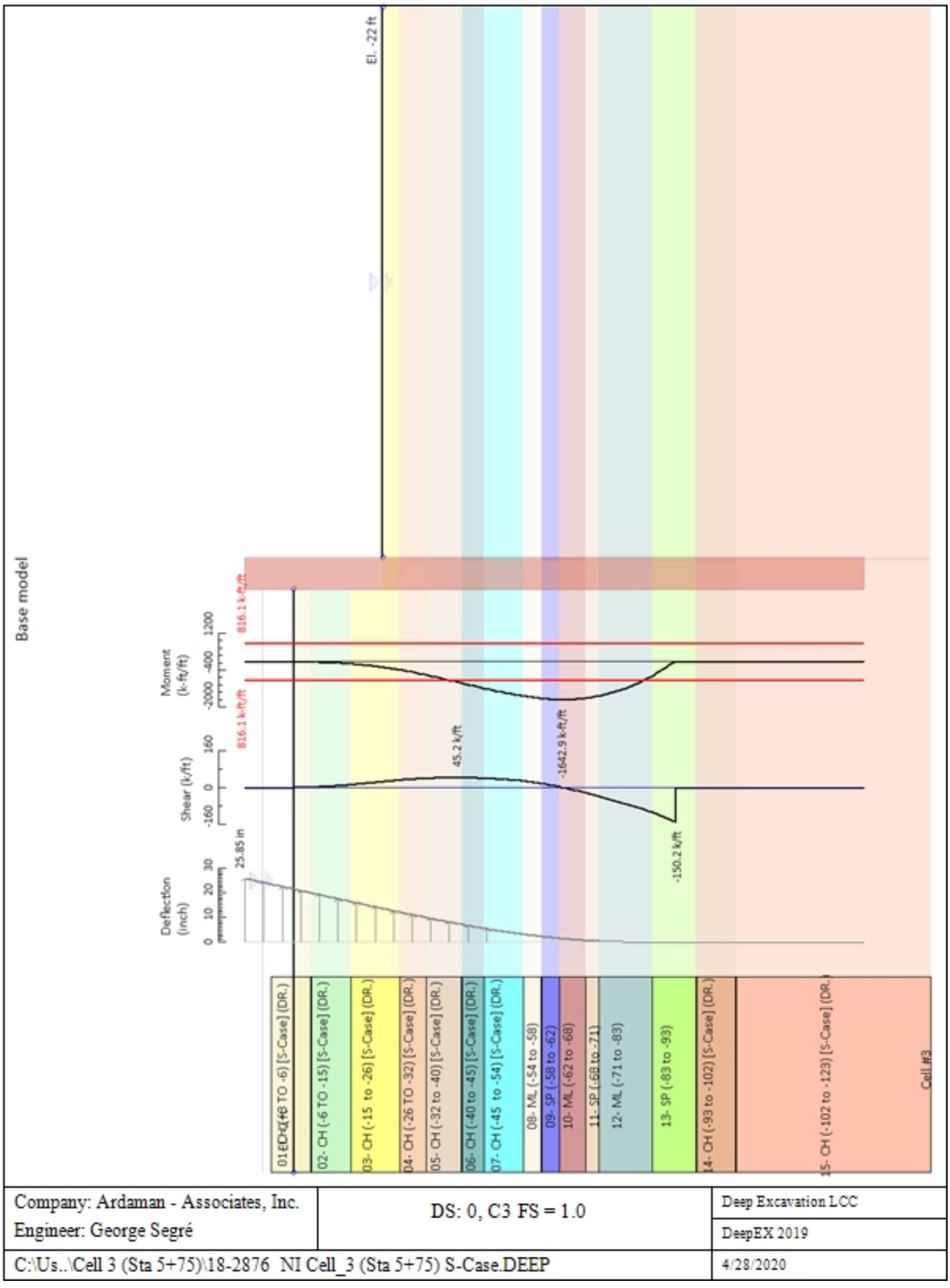

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



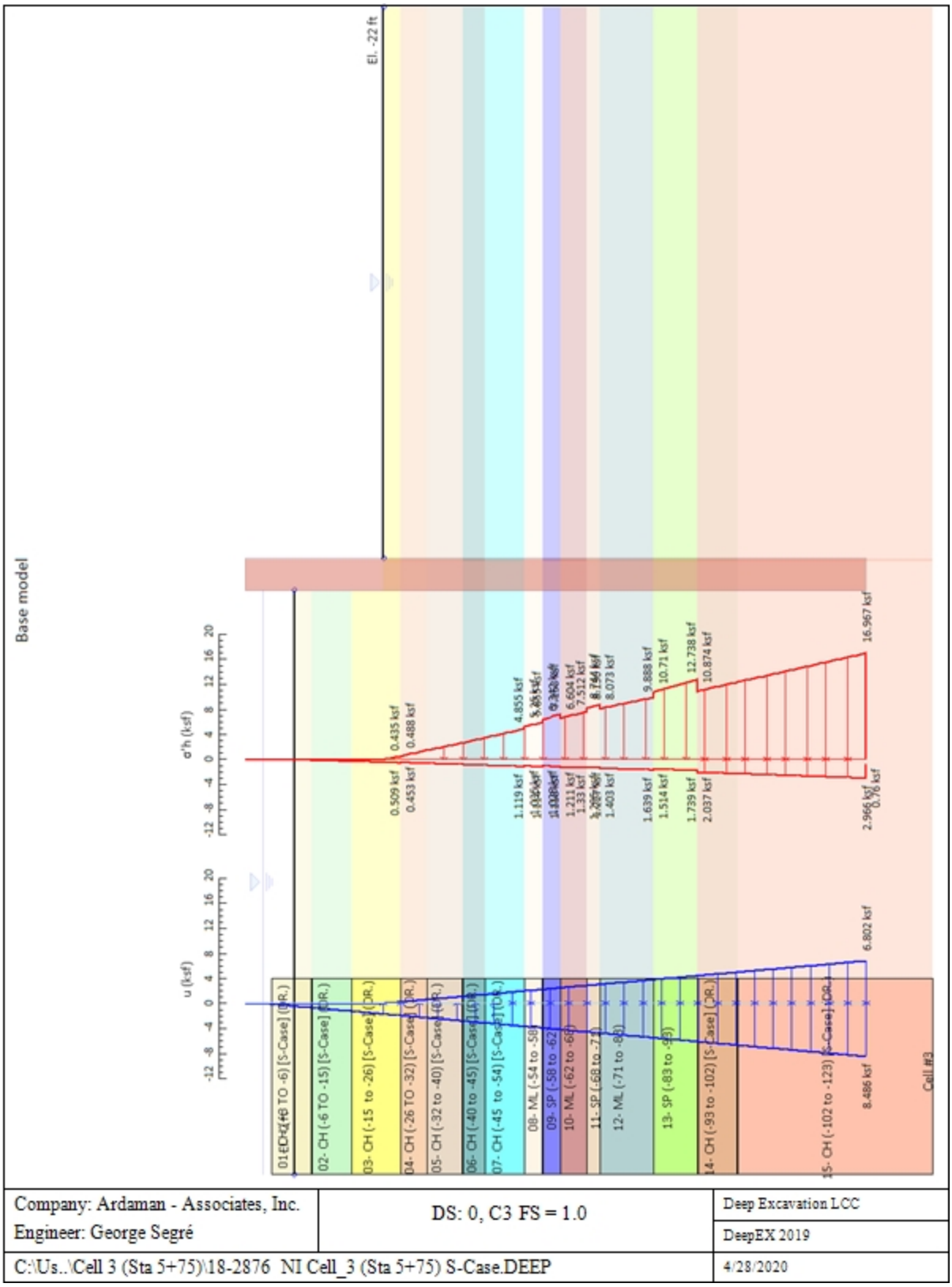

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



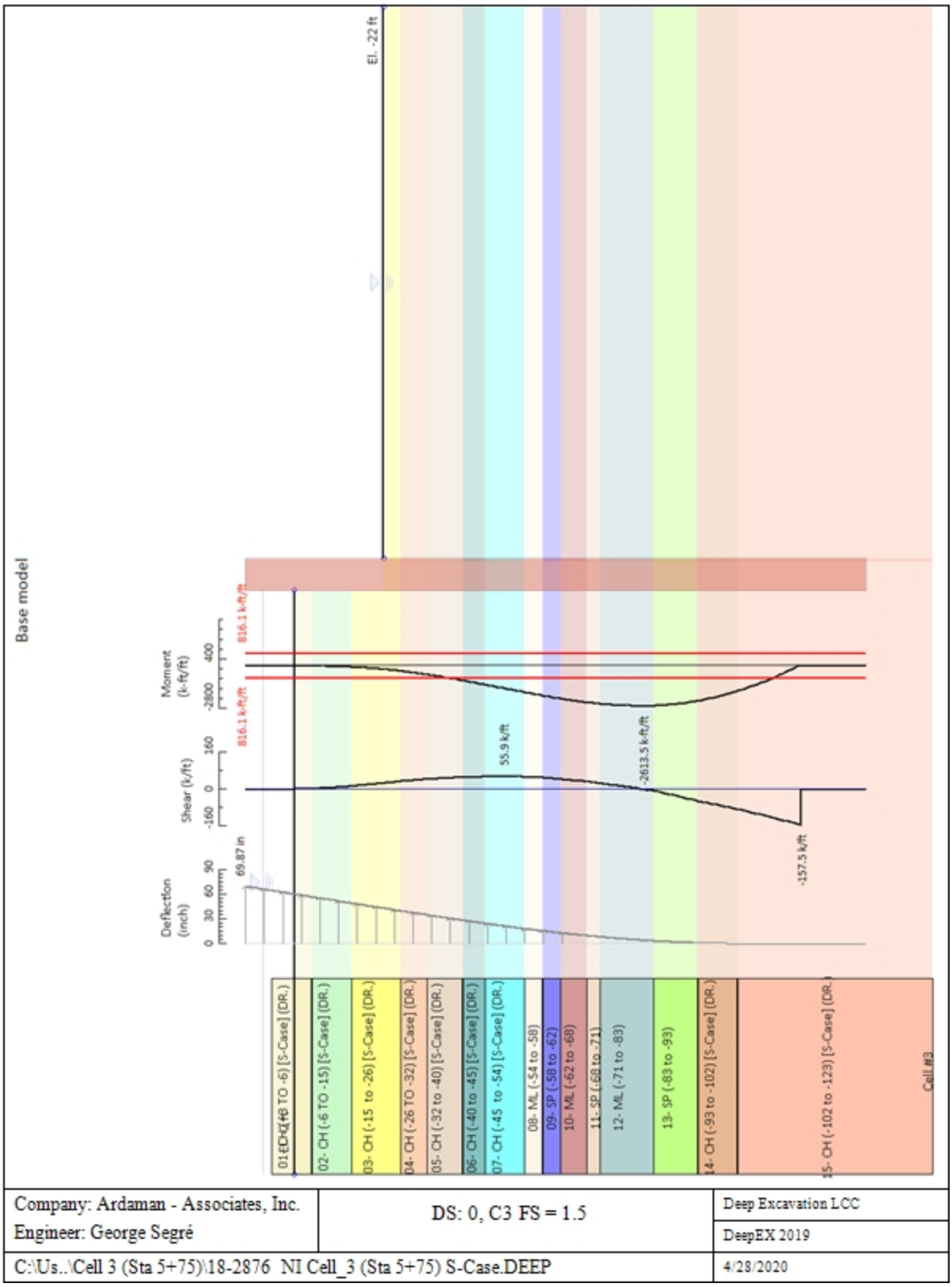

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



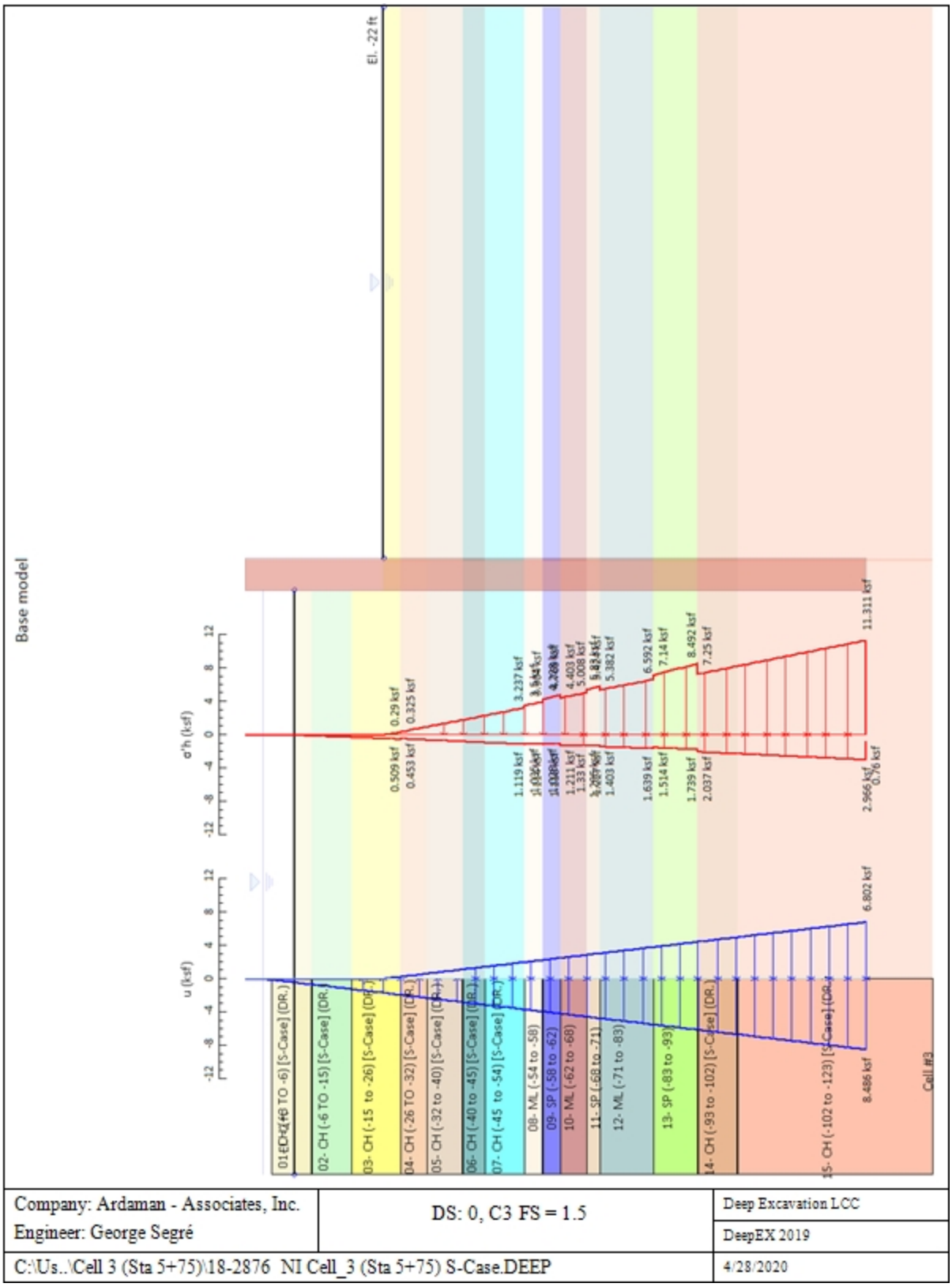

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



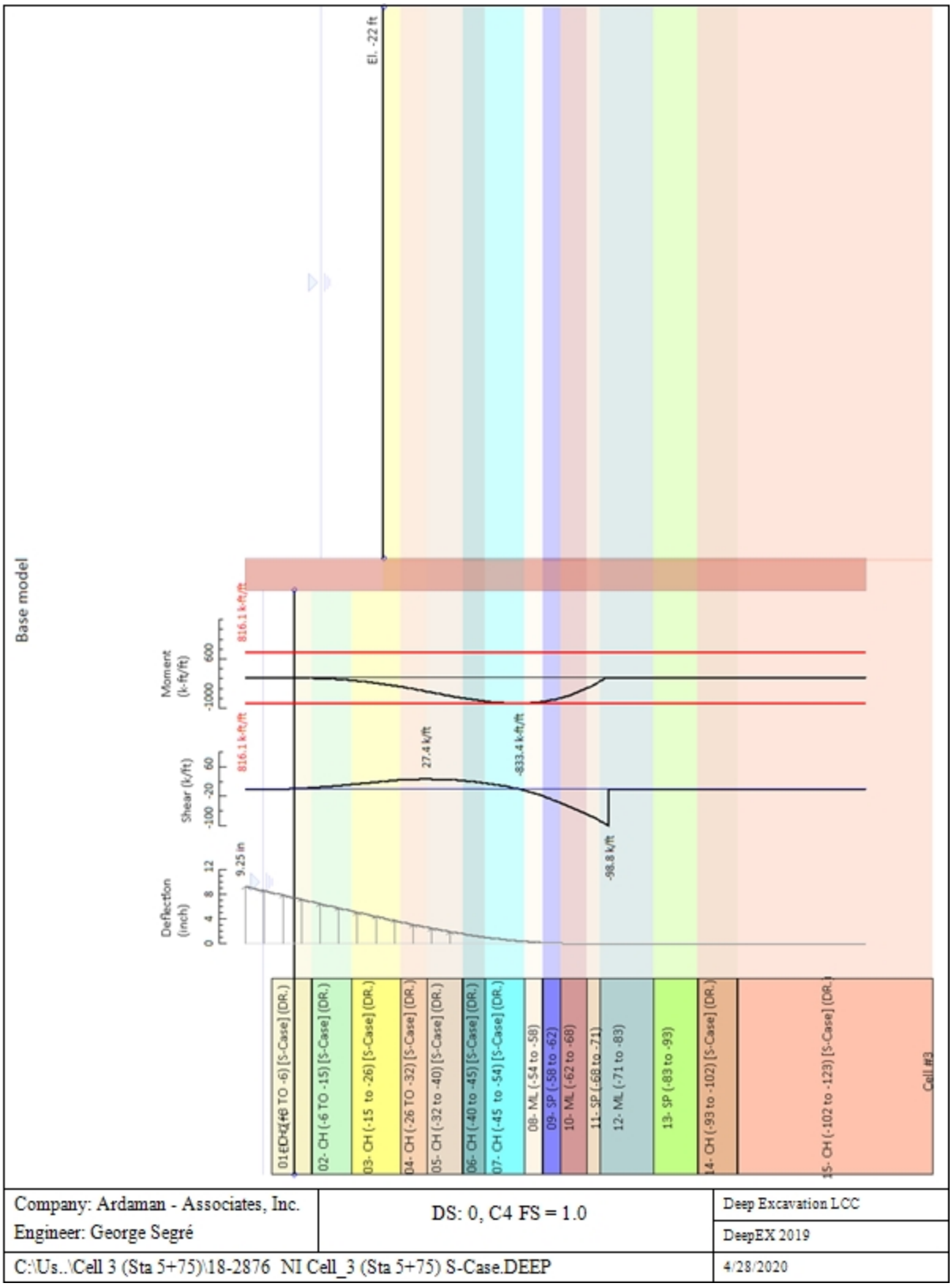

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



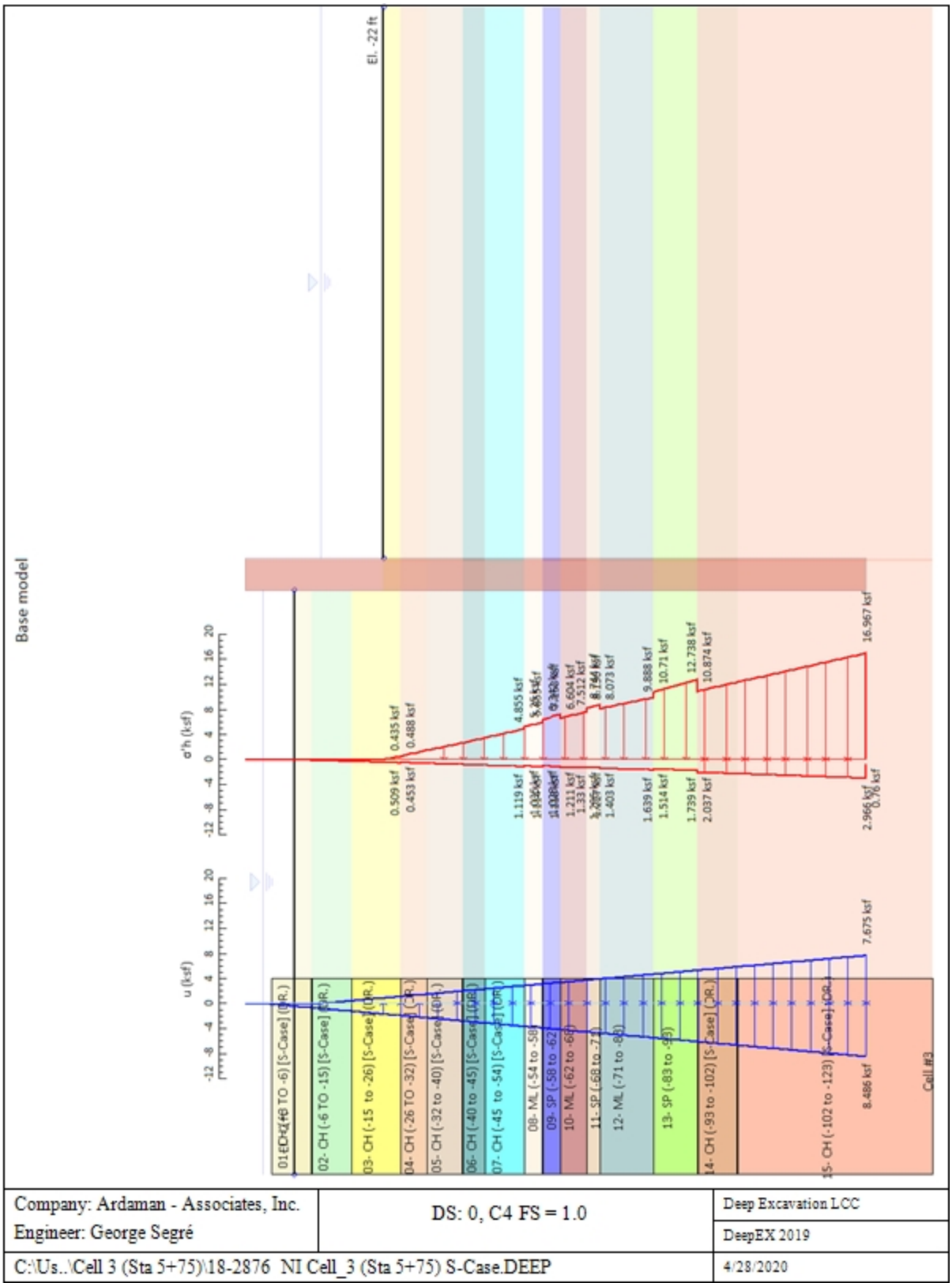

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



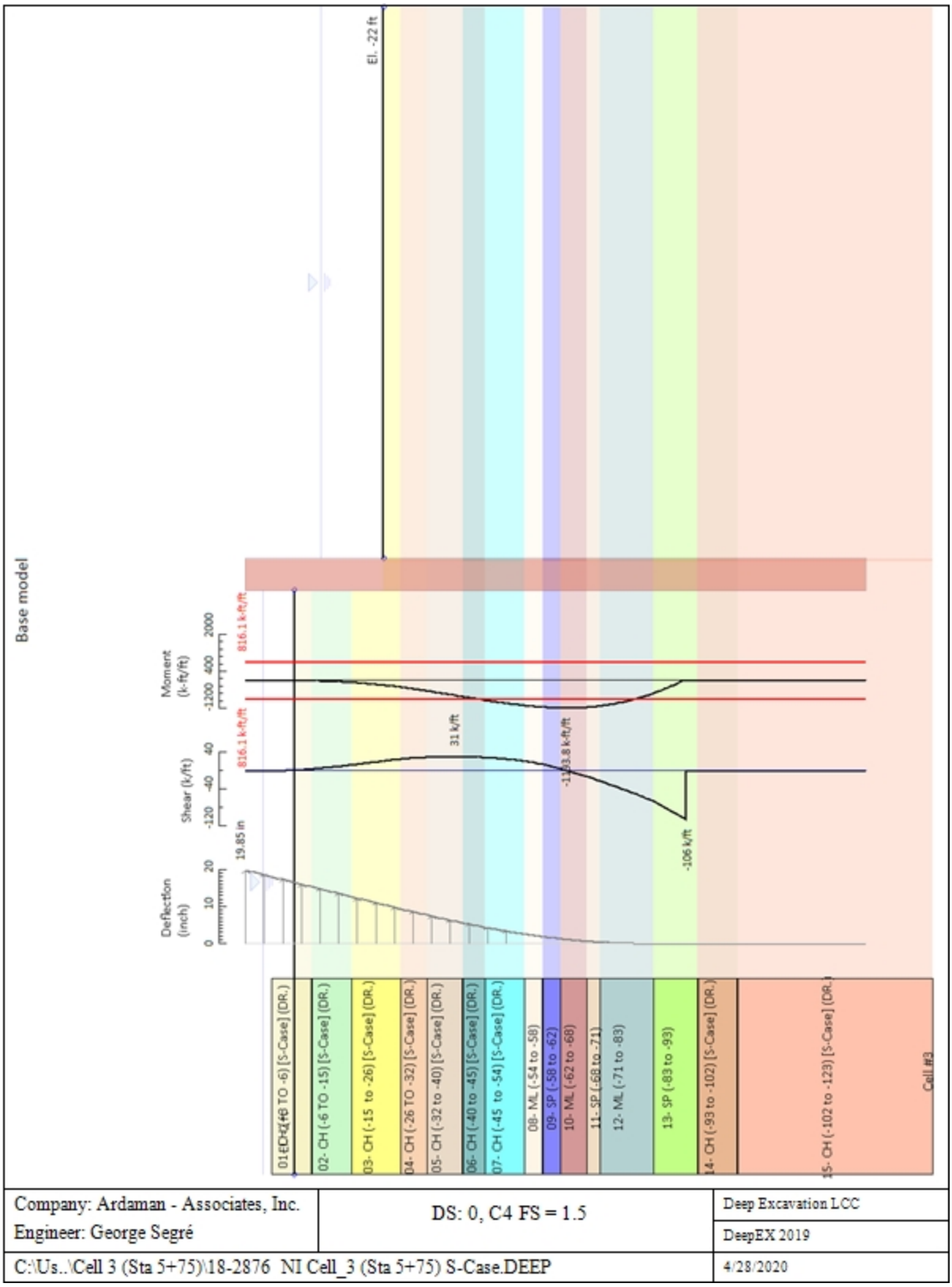

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |



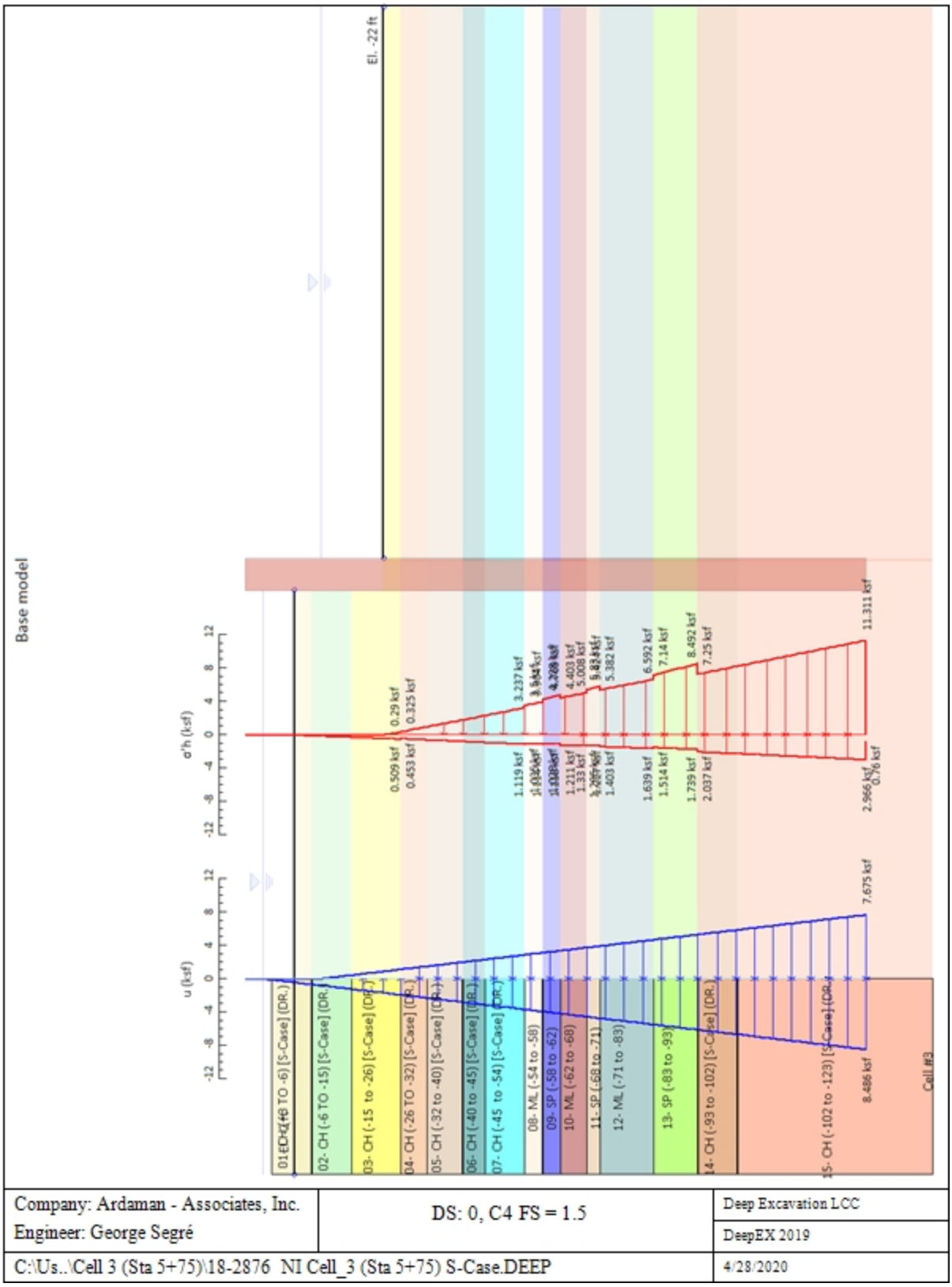

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 6+75 Left Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -89.04 ft., NAVD88

Length of Sheetting = 98.04 ft.

Use = 100.0 ft.

Design Tip Elev. = -91.0 ft., NAVD88

Design Length of Sheeting = 100.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -15 | 1.00 | 1.00 | -57.36 | 626.23 | 77.02 | 4.69 |
| | | Open excavation - degraded | 9 | -15 | 1.00 | 1.25 | -66.44 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -52.22 | 454.03 | 77.22 | 2.98 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -57.76 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -15 | 1.00 | 1.00 | -51.44 | 355.14 | 68.54 | 2.17 |
| | | Open excavation - degraded | 5 | -15 | 1.00 | 1.50 | -64.47 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -45.90 | 245.19 | 44.88 | 1.19 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -54.60 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -15 | 1.00 | 1.00 | -76.14 | 1,170.99 | 121.26 | 14.46 |
| | | Open excavation - degraded | 9 | -15 | 1.00 | 1.25 | -87.75 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -68.40 | 830.36 | 95.54 | 8.58 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -78.08 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -15 | 1.00 | 1.00 | -68.40 | 745.56 | 89.50 | 7.51 |
| | | Open excavation - degraded | 5 | -15 | 1.00 | 1.50 | -89.04 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -60.66 | 487.92 | 67.89 | 3.94 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -76.78 | -- | -- | -- |
| | | | | | | Governing Value: | -89.04 | 1,170.99 | 121.26 | 14.46 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:18:45 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 0 | 0 | 500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 0 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 0 | 0 | 350 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 0 | 0 | 1250 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 0 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 0 | 0 | 1730 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 0 | 0 | 3300 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

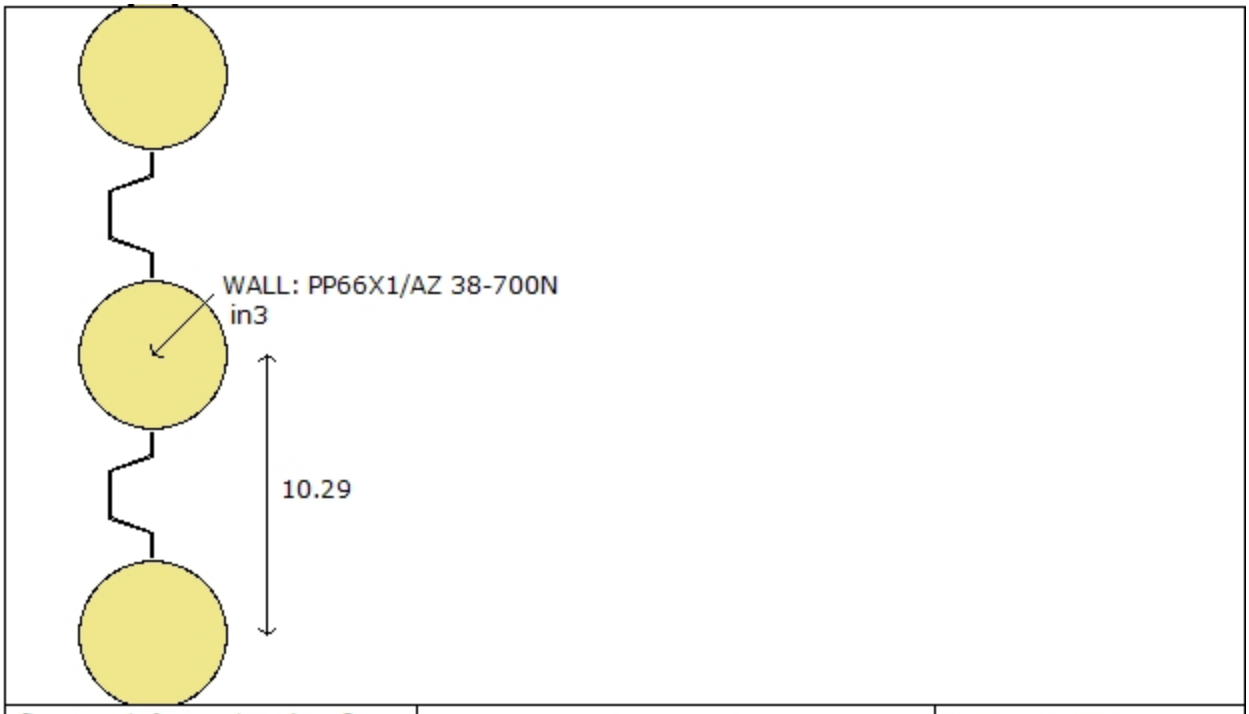
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 1 |
| -6 | 02- CH (-6 TO - | 1 | 1 |
| -15 | 03- CH (-15 to | 1 | 1 |
| -26 | 04- CH (-26 TO | 1 | 1 |
| -32 | 05- CH (-32 to | 1 | 1 |
| -40 | 06- CH (-40 to | 1 | 1 |
| -45 | 07- CH (-45 to | 1 | 1 |
| -54 | 08- ML (-54 to | 1 | 0.74 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.74 |
| -68 | 11- SP (-68 to - | 1 | 1 |
| -71 | 12- ML (-71 to | 1 | 0.74 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 1 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.298 | 1.33 | 1.933 |
| Stage 1 | Simple span | N/A | 1.6 | 1.064 | 1.064 | 1.547 |
| Stage 2 | Simple span | N/A | 1.6 | 1.478 | 1.648 | 2.399 |
| Stage 3 | Simple span | N/A | 1.6 | 1.286 | 1.318 | 1.919 |
| Stage 4 | Simple span | N/A | 1.6 | 1.509 | 1.644 | 2.264 |
| Stage 5 | Simple span | N/A | 1.6 | 1.096 | 1.096 | 1.509 |
| Stage 6 | Simple span | N/A | 1.6 | 1.78 | 2.159 | 2.929 |
| Stage 7 | Simple span | N/A | 1.6 | 1.389 | 1.439 | 1.952 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

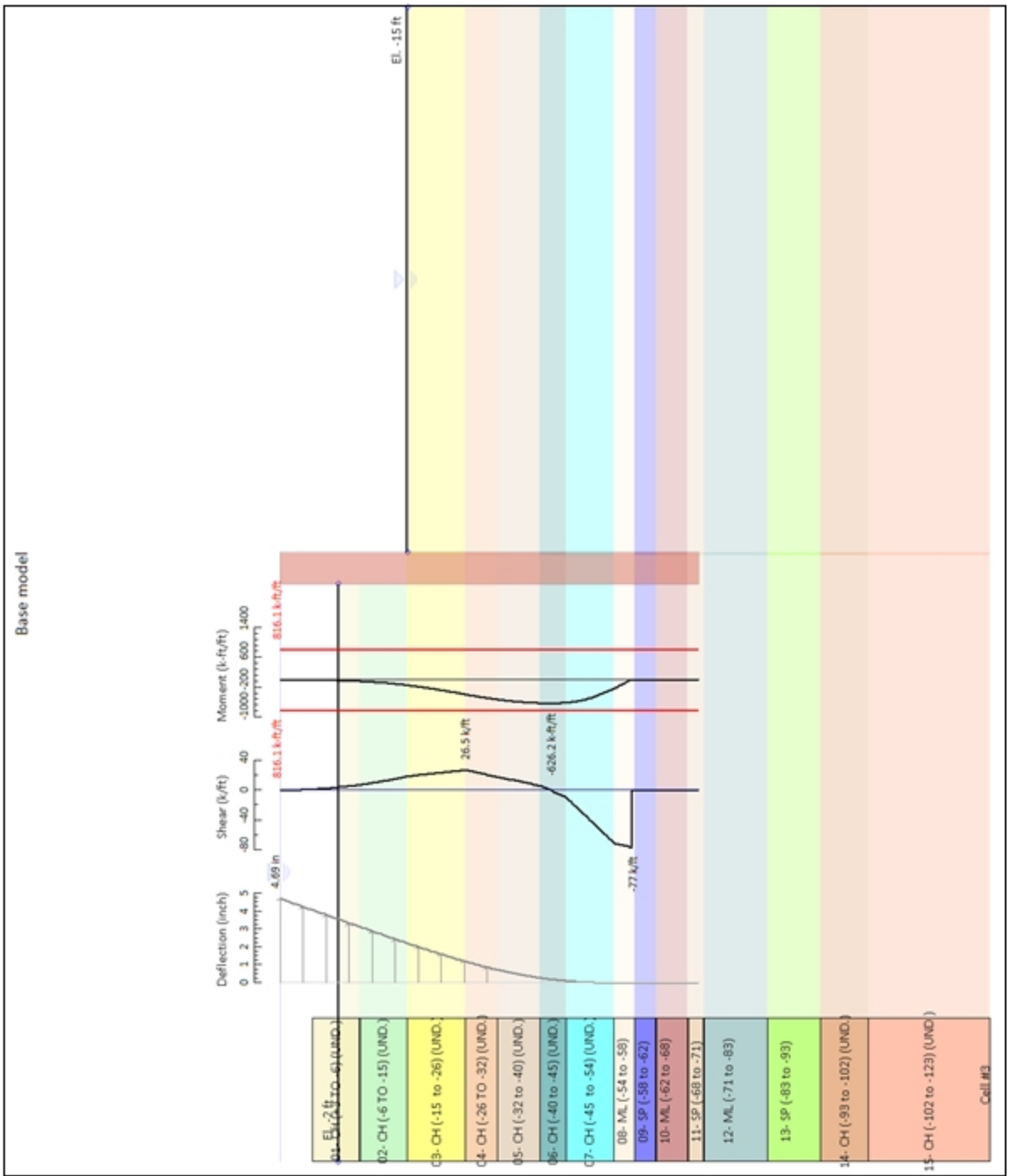
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

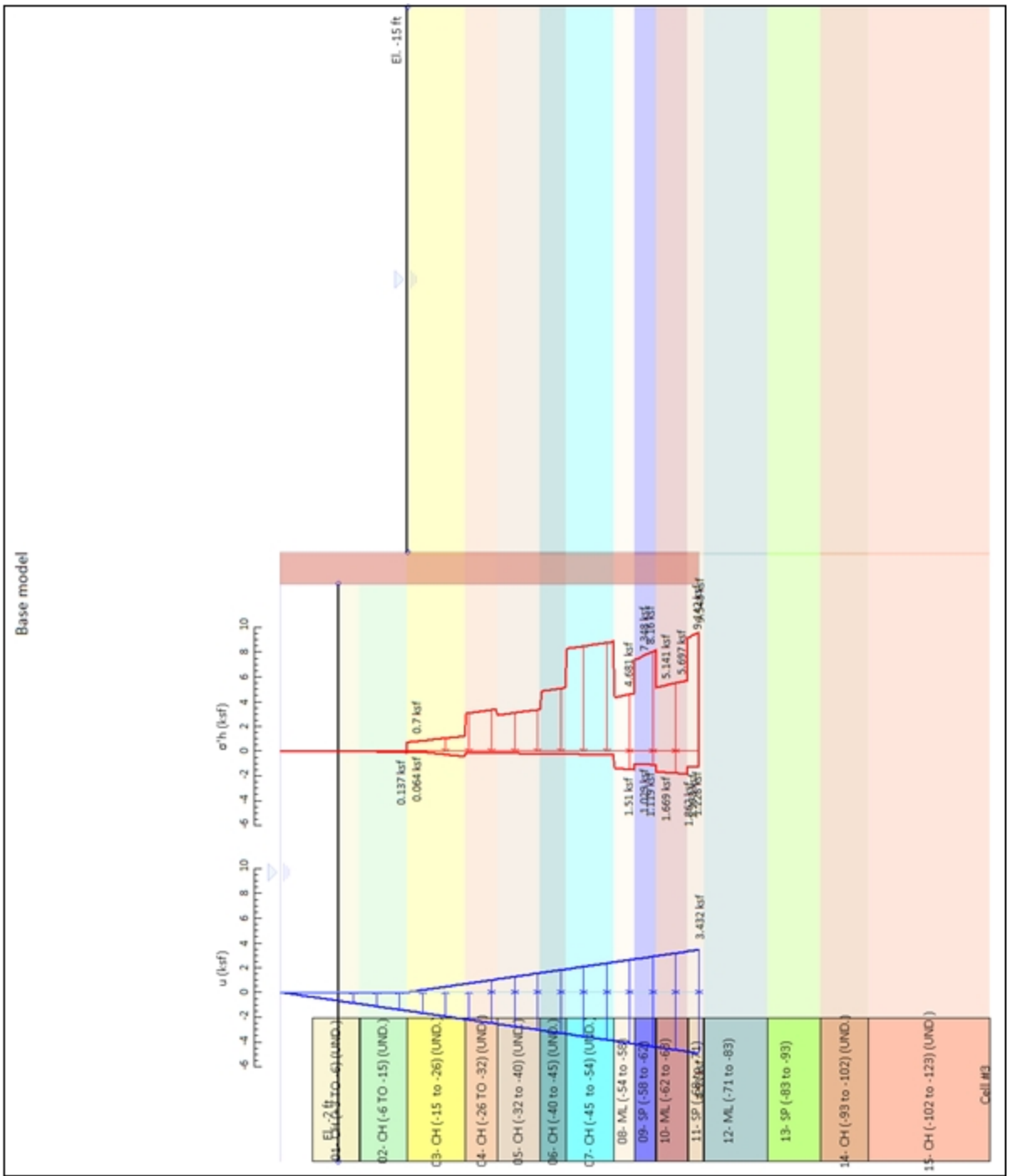
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

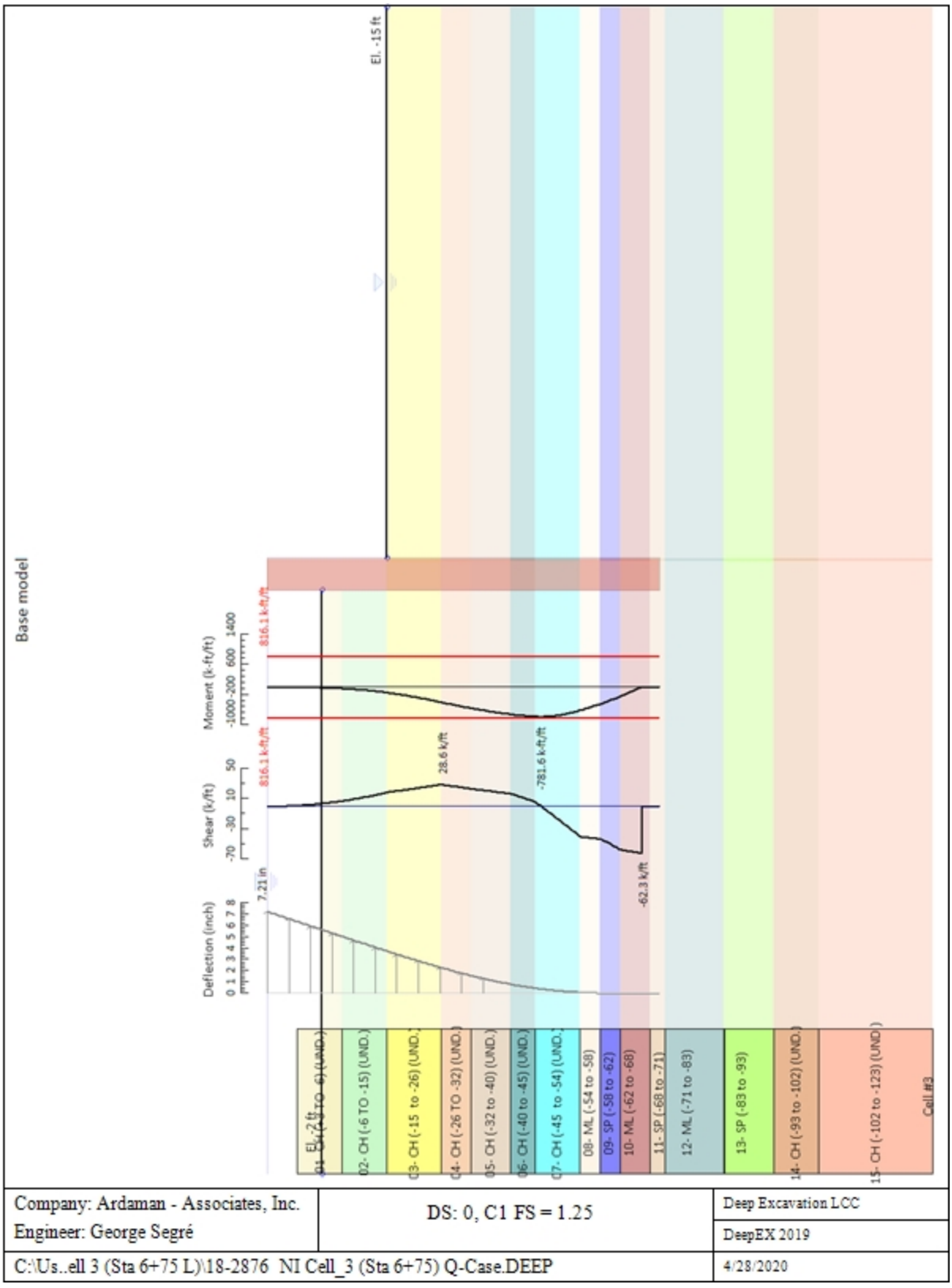
A sequence of figures for each excavation stage is reported

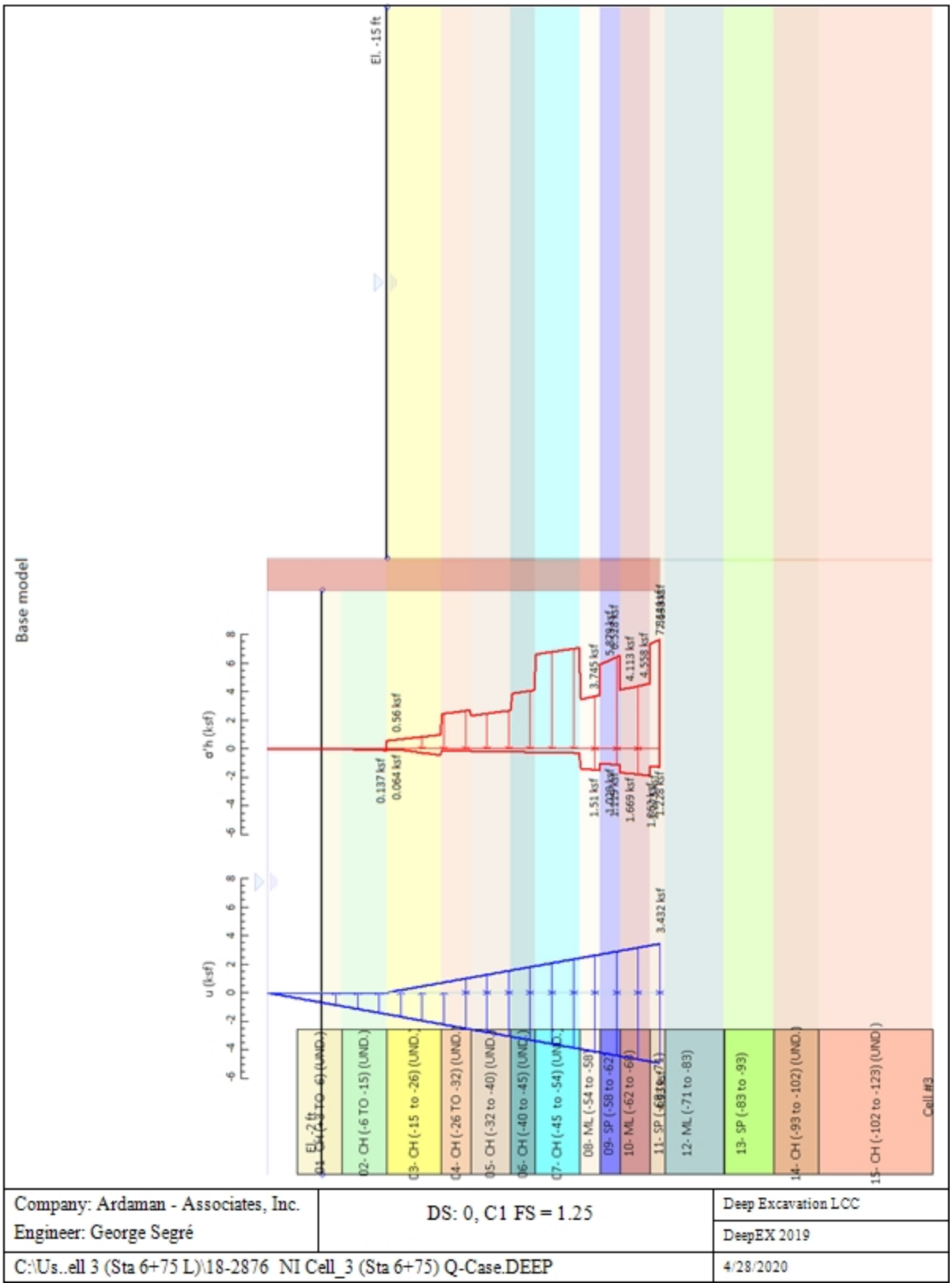


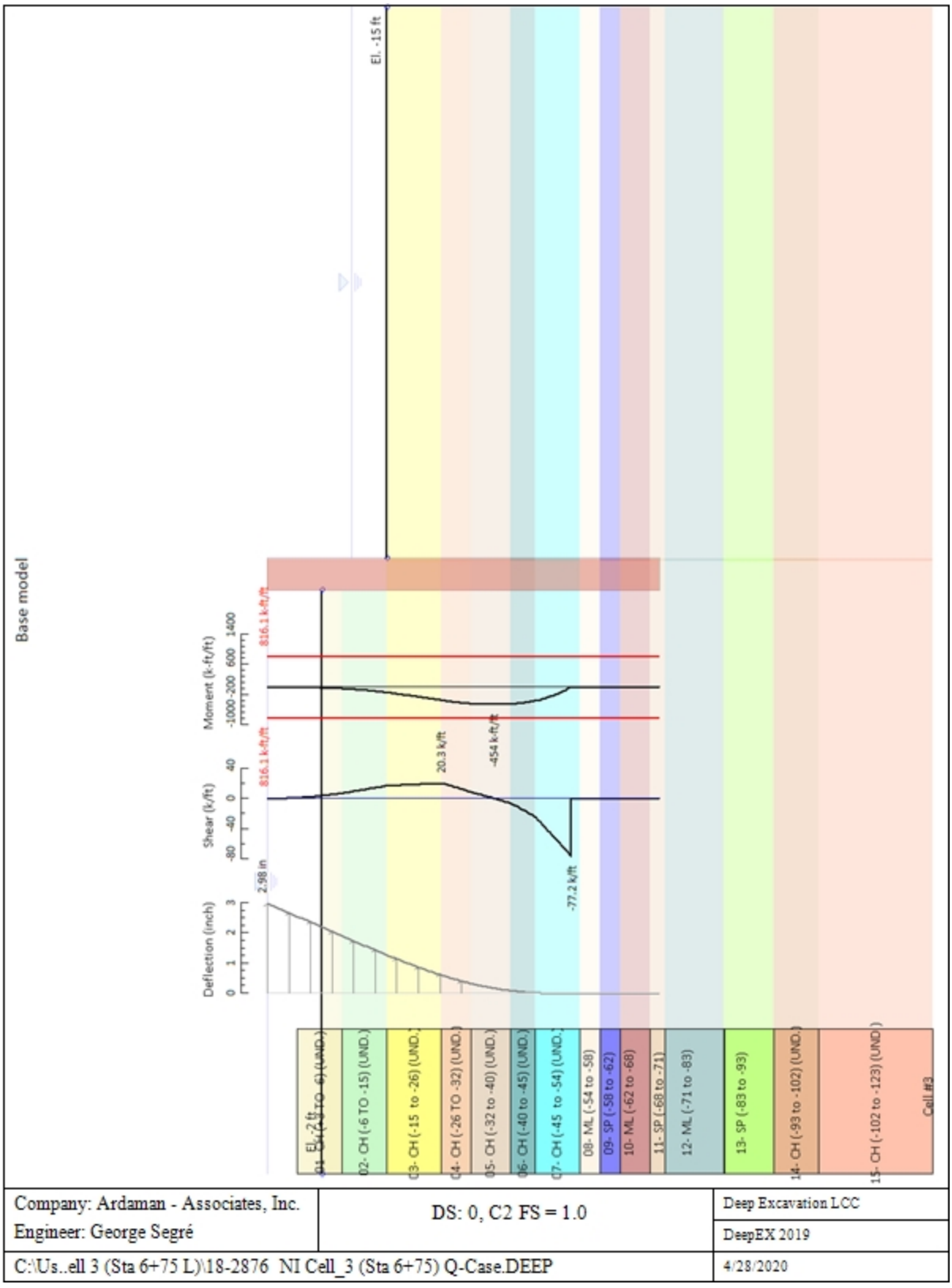

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP | | 4/28/2020 |

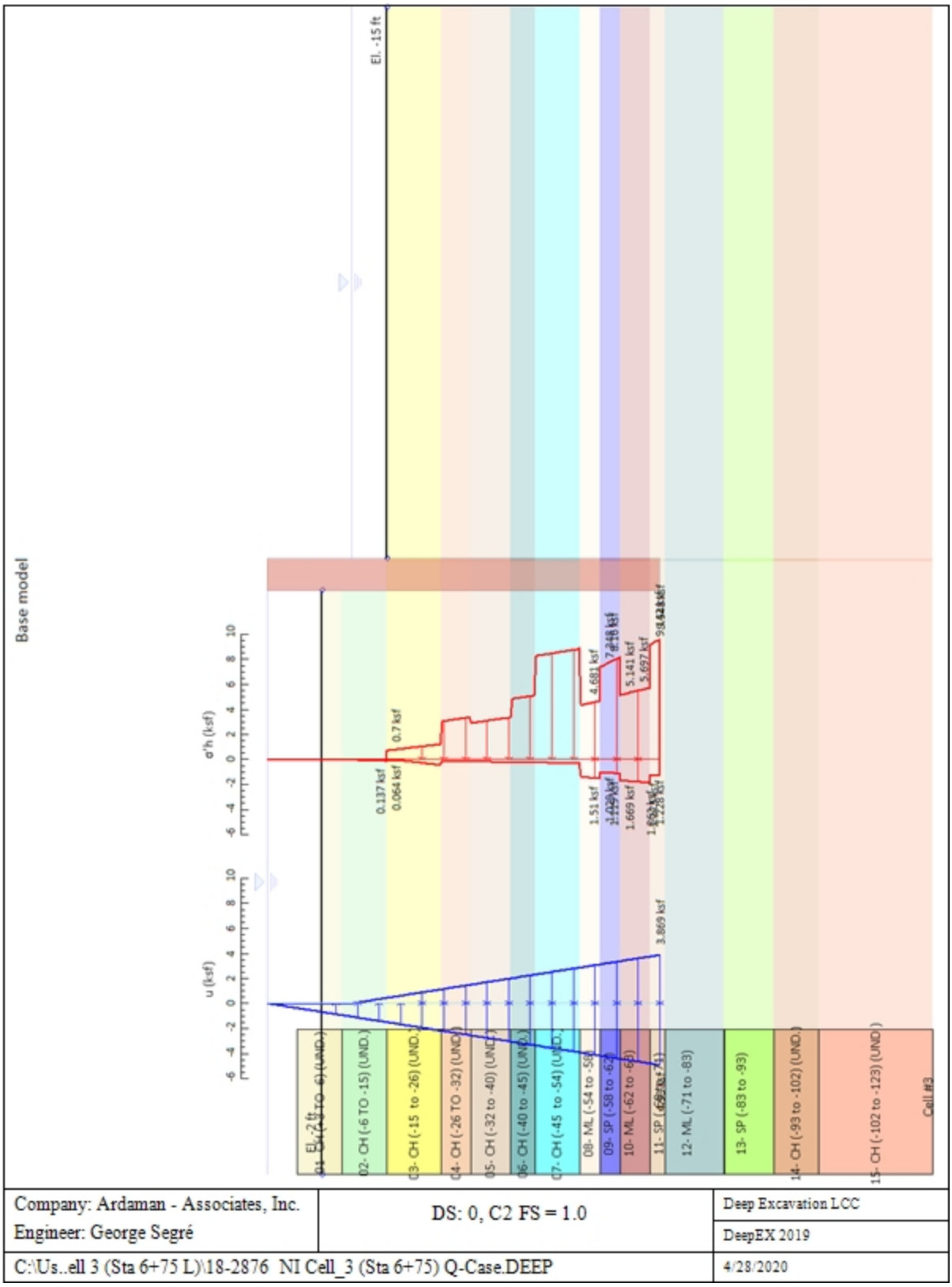


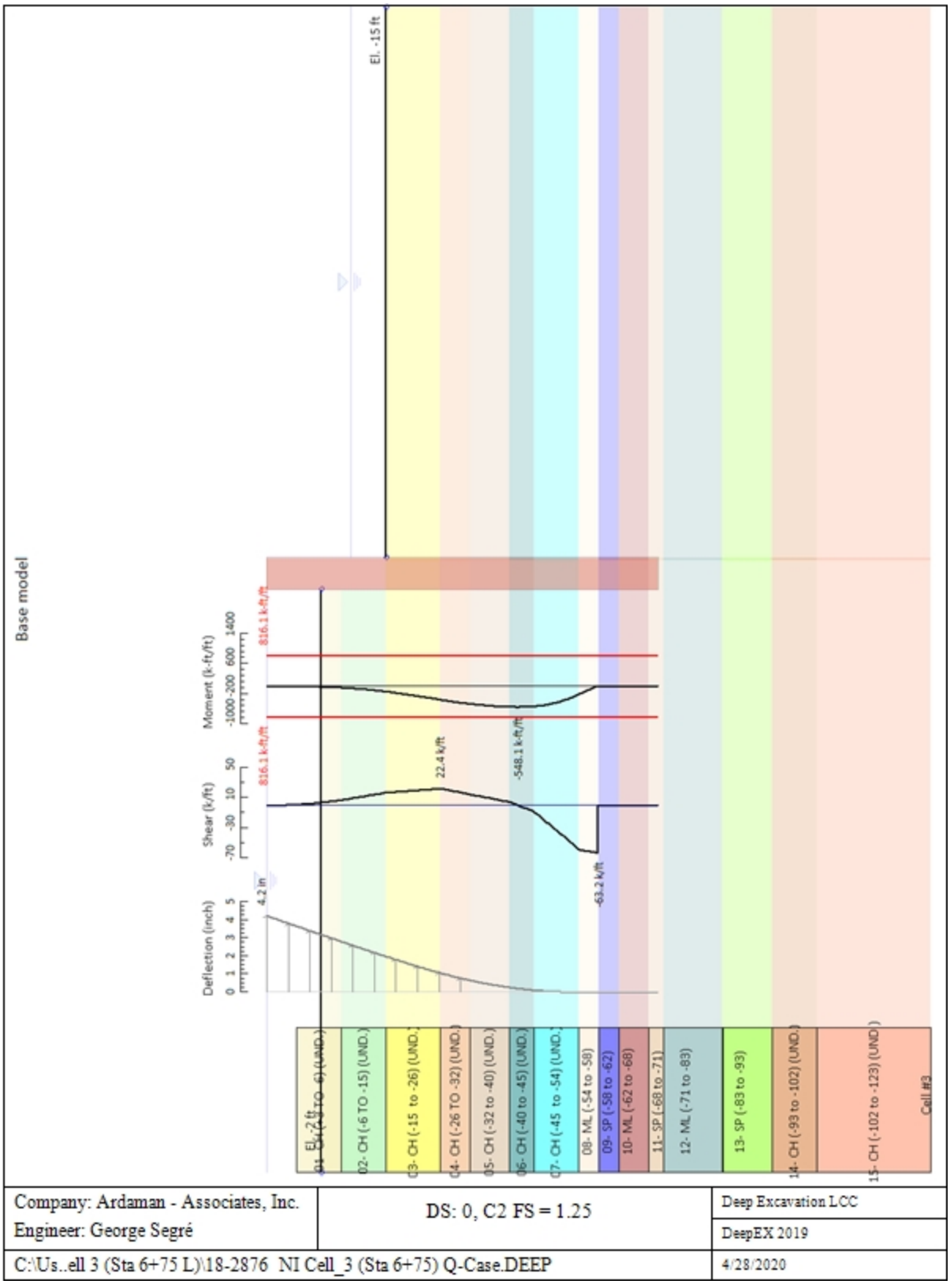

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP | | 4/28/2020 |

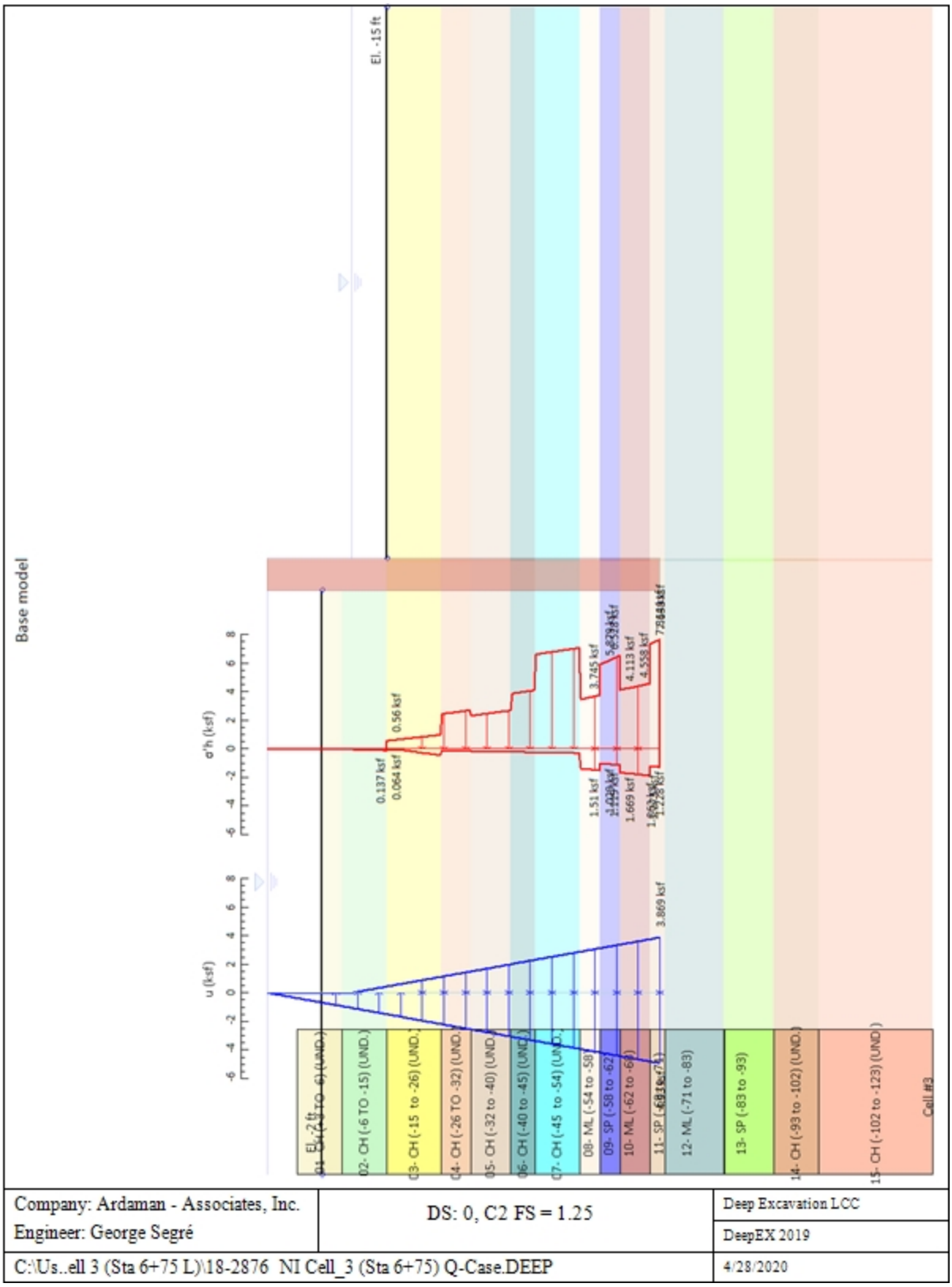

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-70 -30 10 50
28.6 k/ft
-781.6 k-ft/ft
-62.3 k/ft
Deflection (inch)
0 1 2 3 4 5 6 7 8
7.21 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

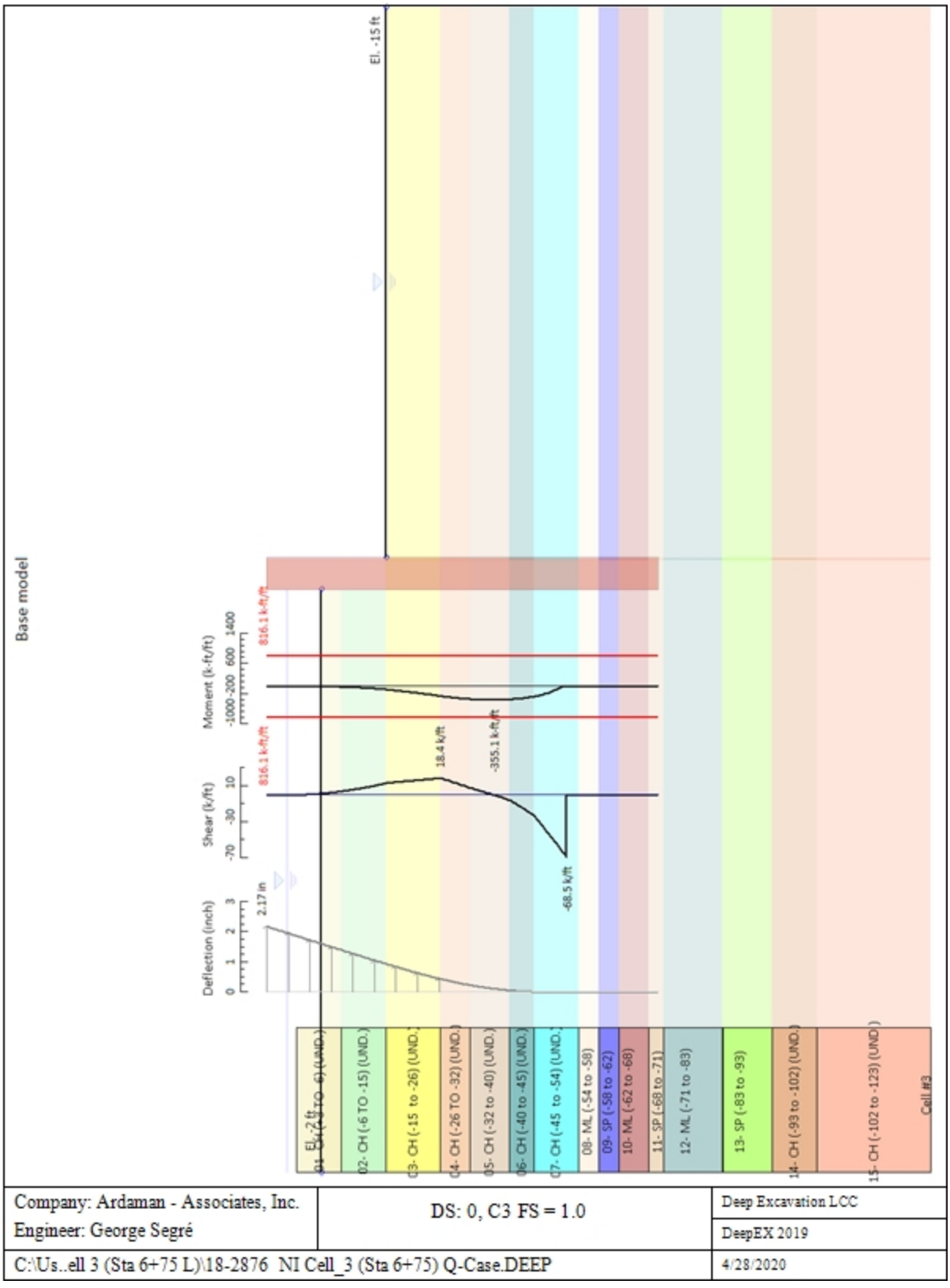

Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.56 ksf
1.51 ksf
1.669 ksf
3.745 ksf
4.113 ksf
4.558 ksf
3.432 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020


Base model
El. -15 ft
El. -2 ft
Deflection (inch)
0 1 2 3
2.98 in
Shear (k/ft)
-80 -40 0 40
816.1 k-ft/ft
20.3 k/ft
-77.2 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-454 k-ft/ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

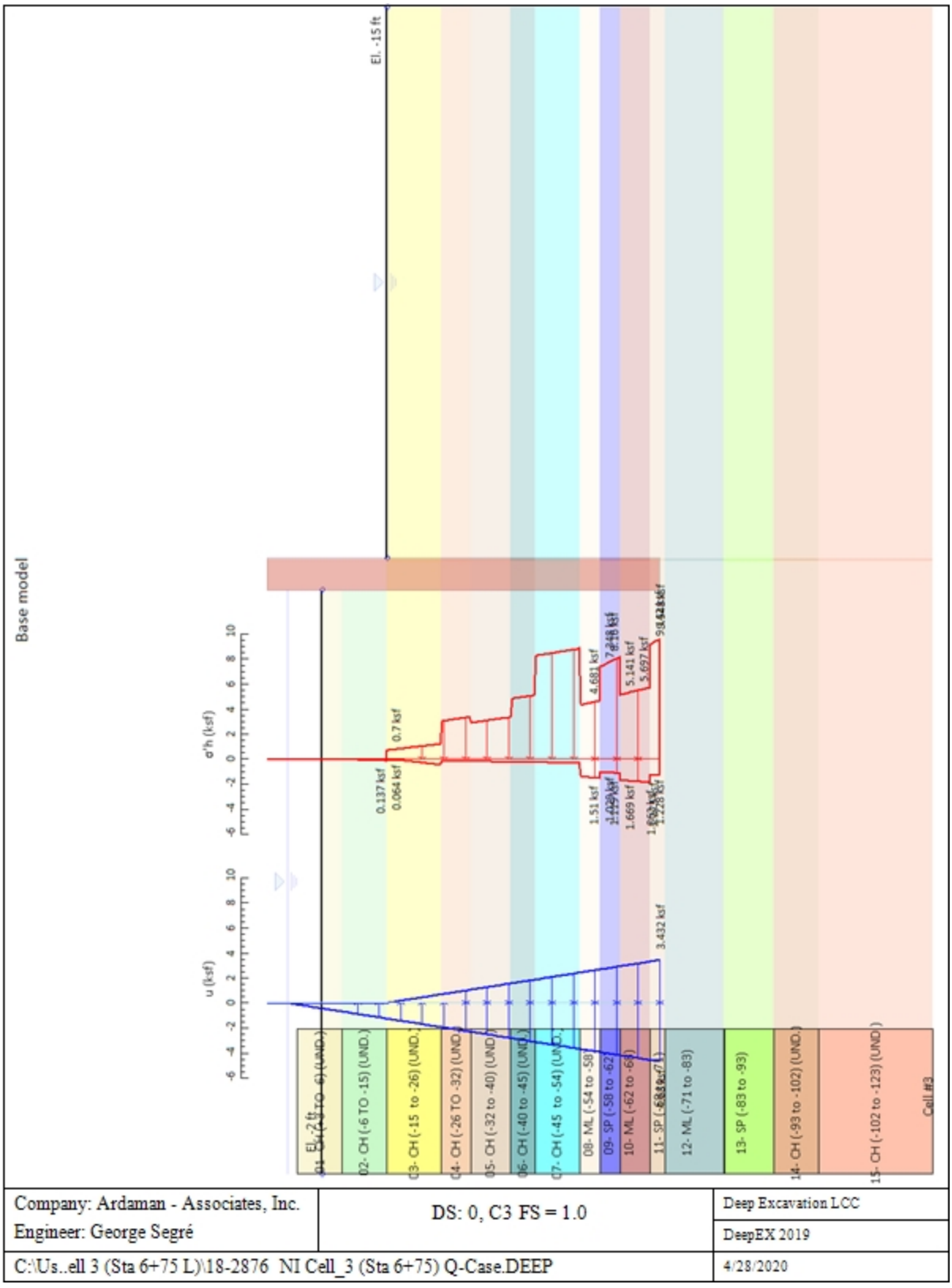

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.7 ksf
1.51 ksf
1.669 ksf
4.681 ksf
5.141 ksf
5.697 ksf
3.869 ksf
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

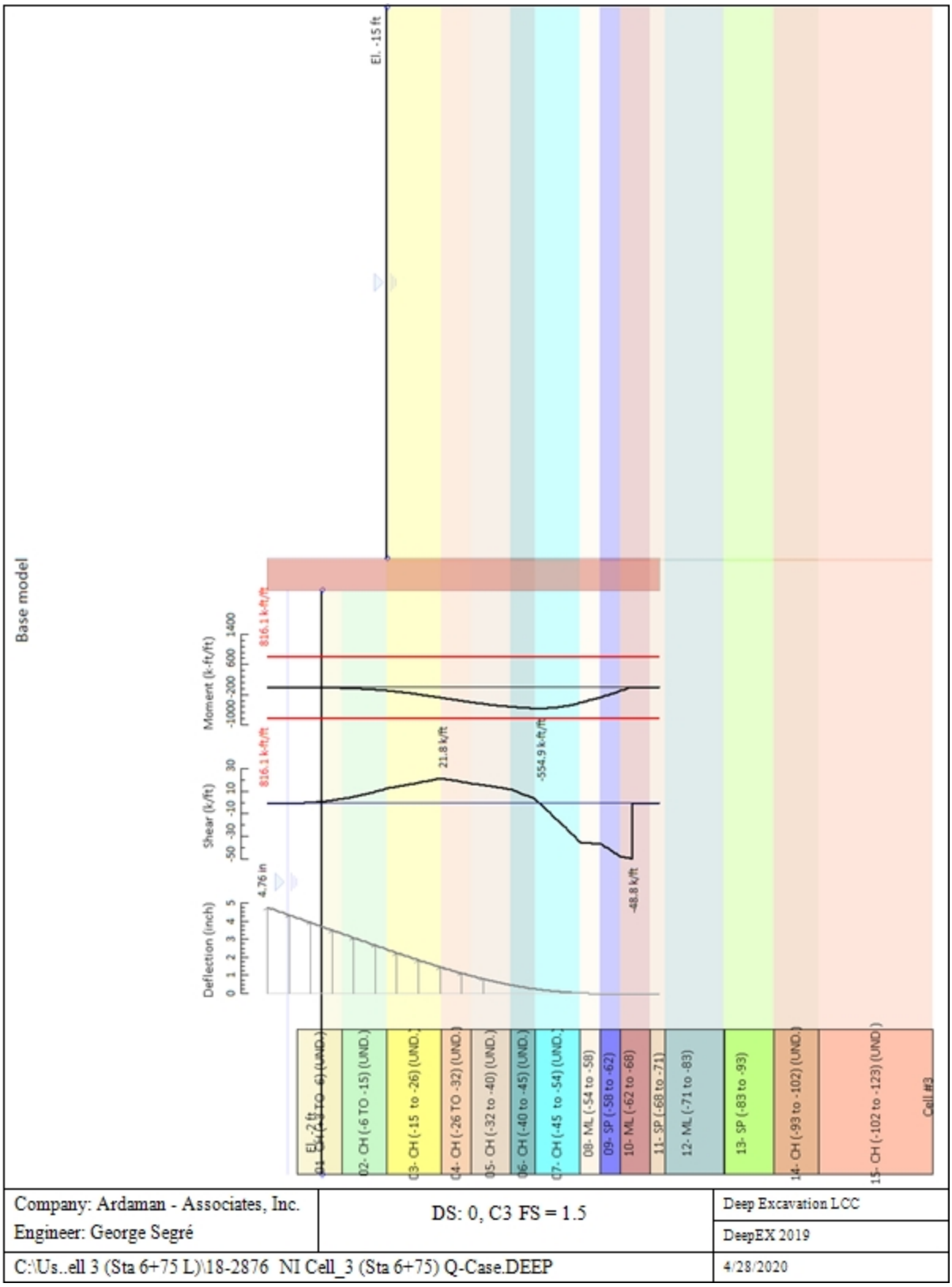

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-548.1 k-ft/ft
Shear (k/ft)
-70 -30 10 50
22.4 k/ft
-63.2 k/ft
Deflection (inch)
0 1 2 3 4 5
4.2 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.56 ksf
1.51 ksf
1.669 ksf
3.745 ksf
4.113 ksf
4.558 ksf
3.869 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

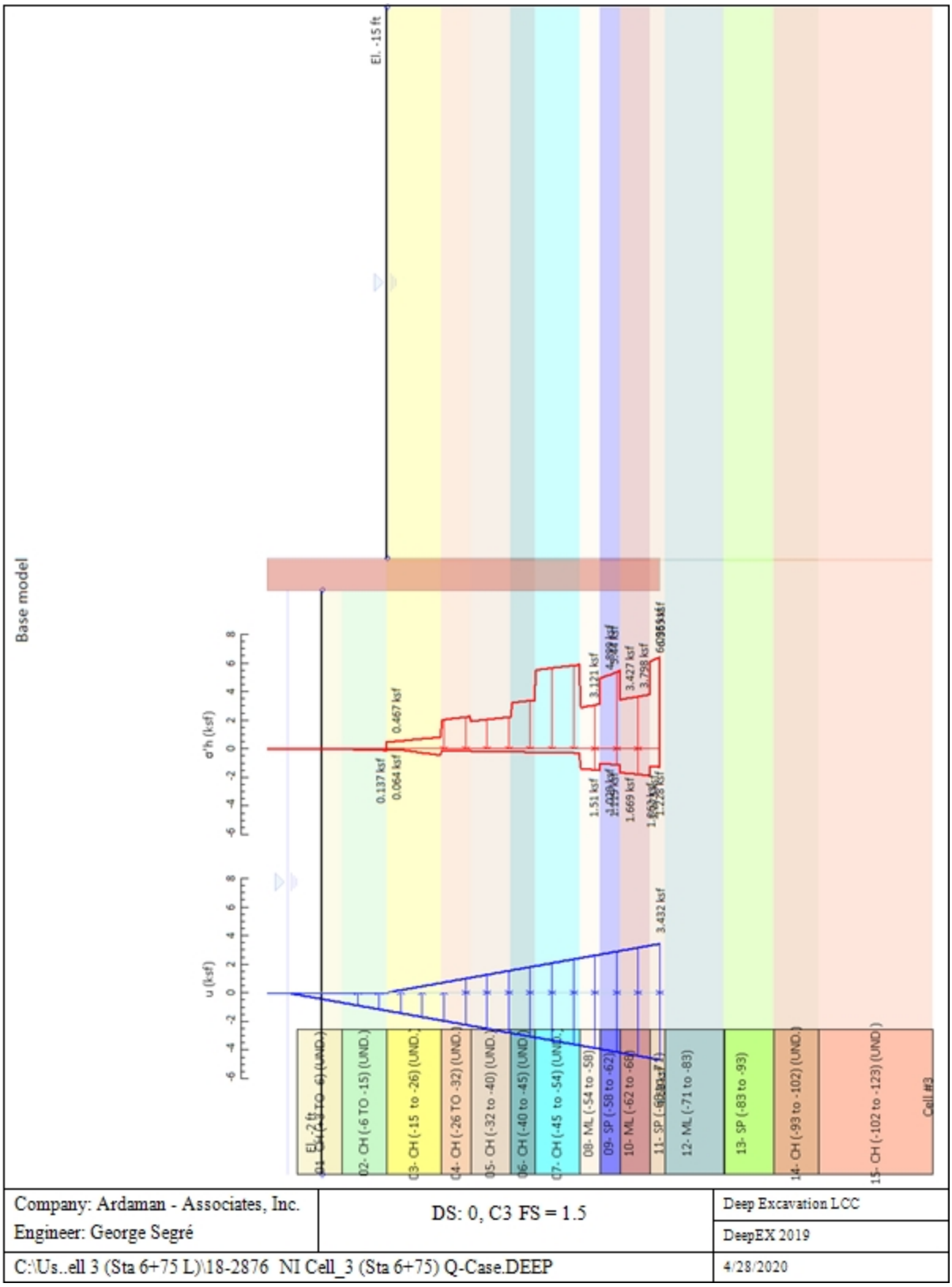


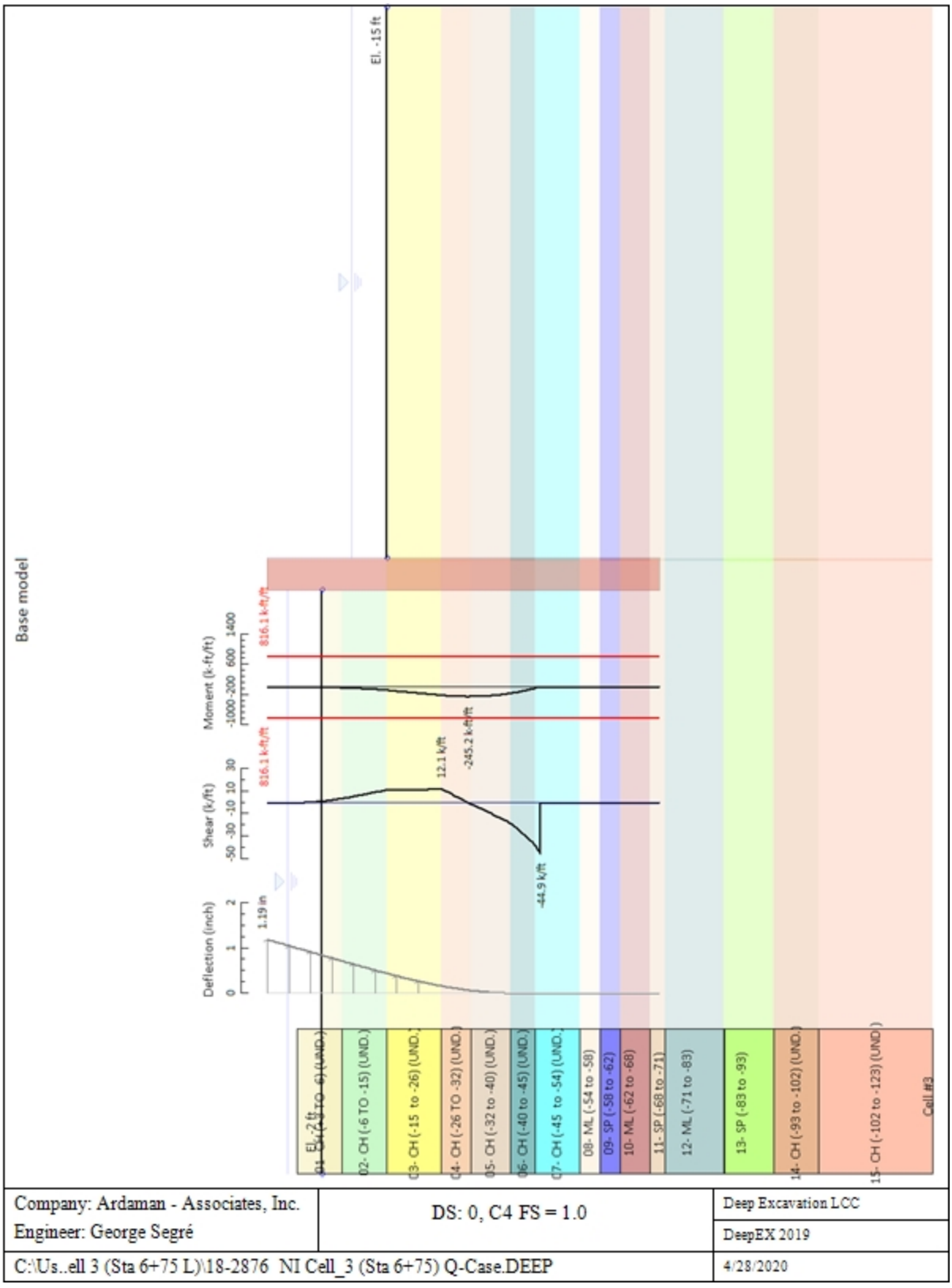

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.7 ksf
1.51 ksf
1.669 ksf
4.681 ksf
5.141 ksf
5.697 ksf
3.432 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

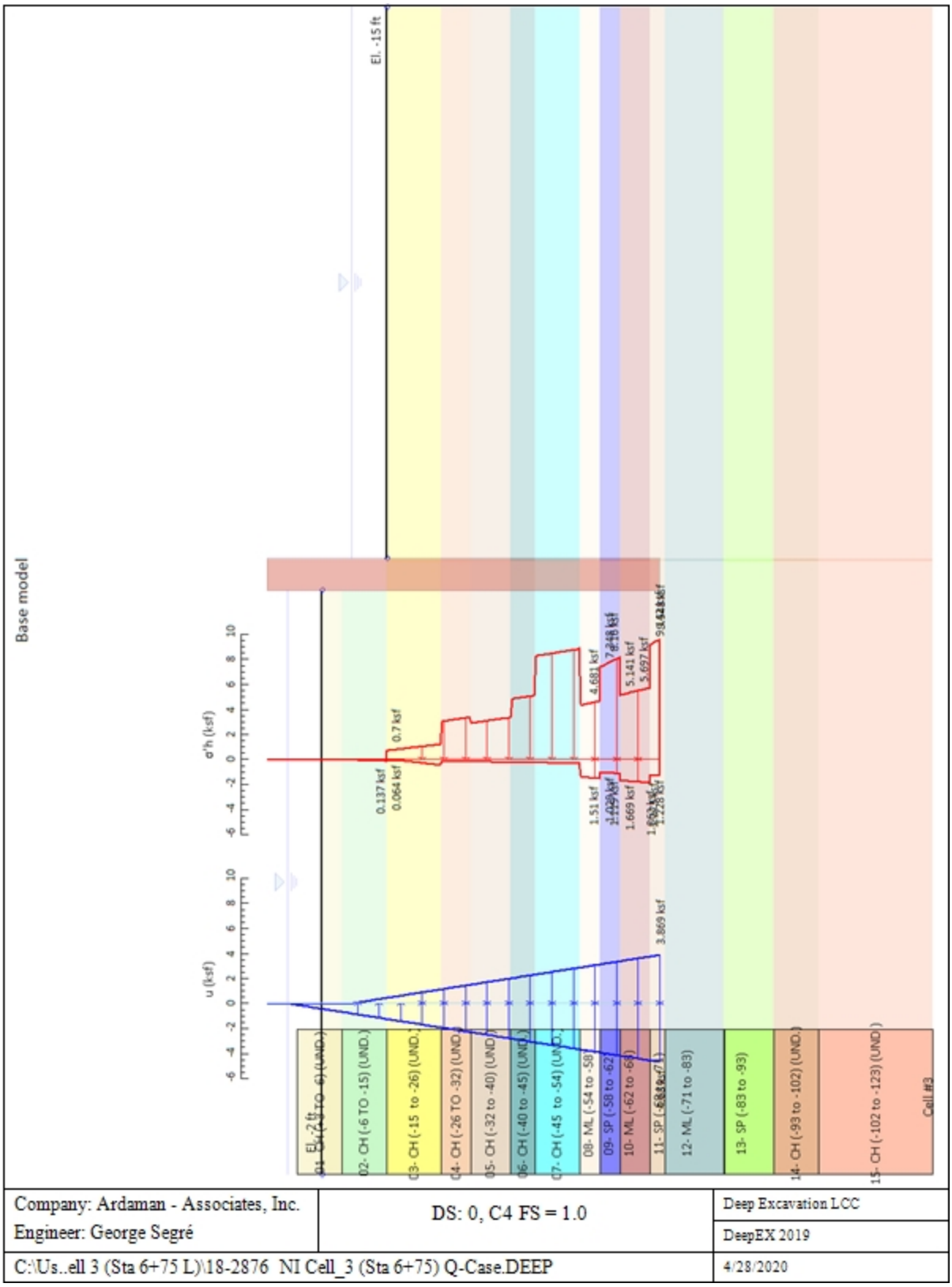


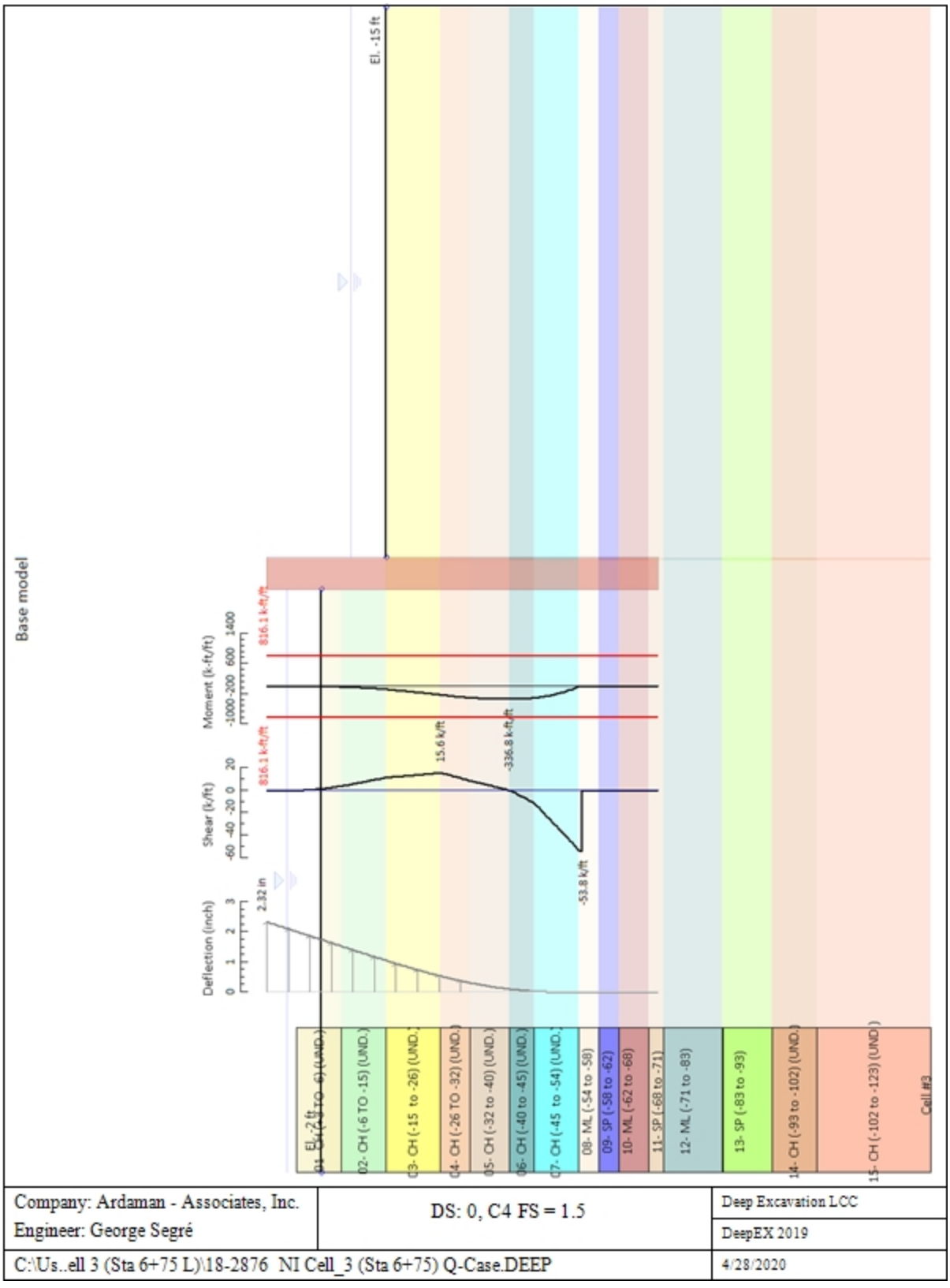

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.467 ksf
1.51 ksf
1.669 ksf
3.121 ksf
3.427 ksf
3.798 ksf
3.432 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

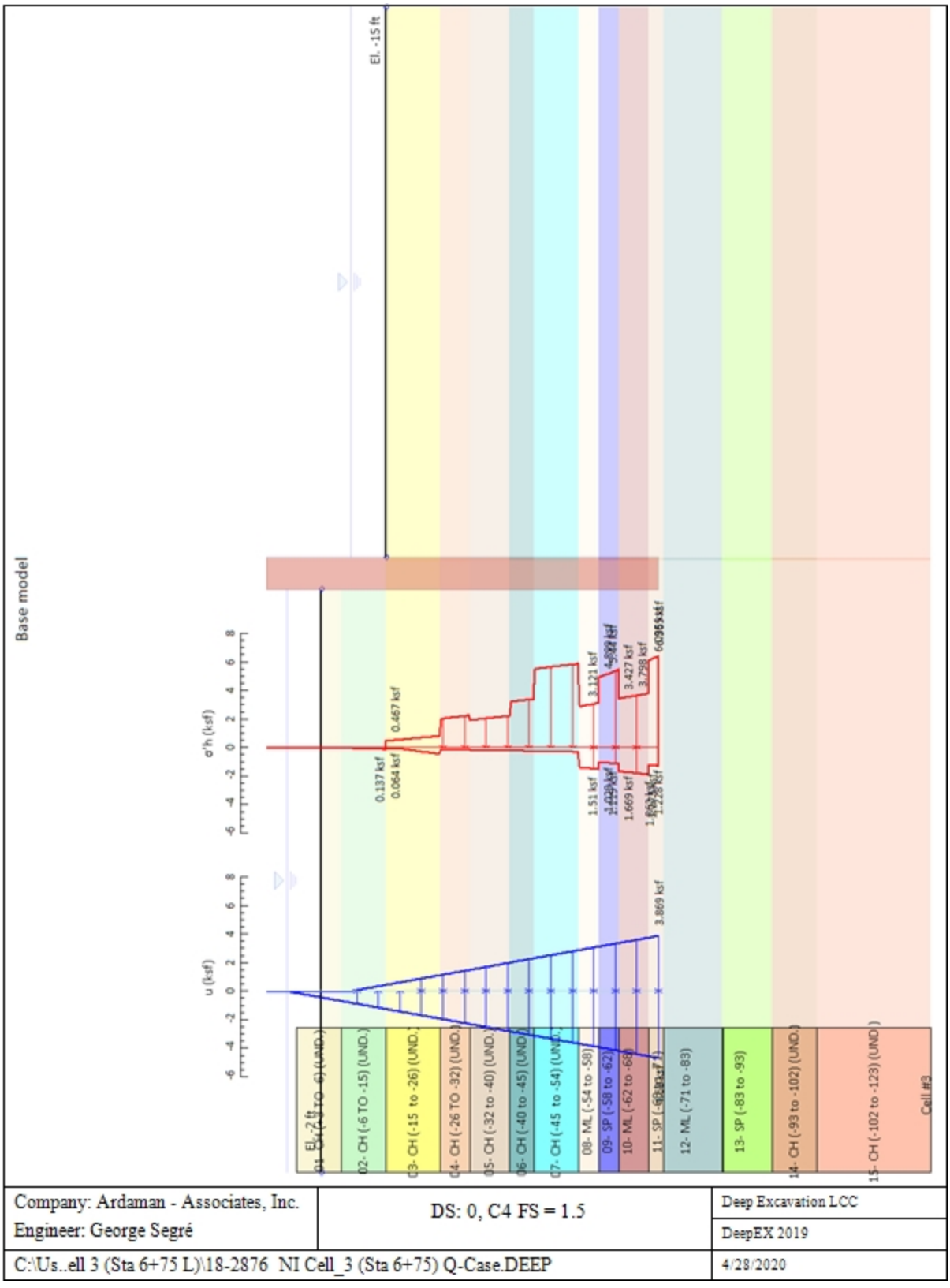



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.7 ksf
1.51 ksf
1.669 ksf
4.681 ksf
5.141 ksf
5.697 ksf
3.869 ksf
01- CL (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.467 ksf
1.51 ksf
1.669 ksf
3.121 ksf
3.427 ksf
3.798 ksf
3.869 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:25:40 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 23 | 0 | 500 | 23 | 23 | 300 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 23 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 23 | 0 | 350 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 26 | 0 | 1250 | 26 | 26 | 521.92 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 26 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 26 | 0 | 1730 | 26 | 26 | 626.3 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 26 | 0 | 3300 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 26 | 0 | 4000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 0.609 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

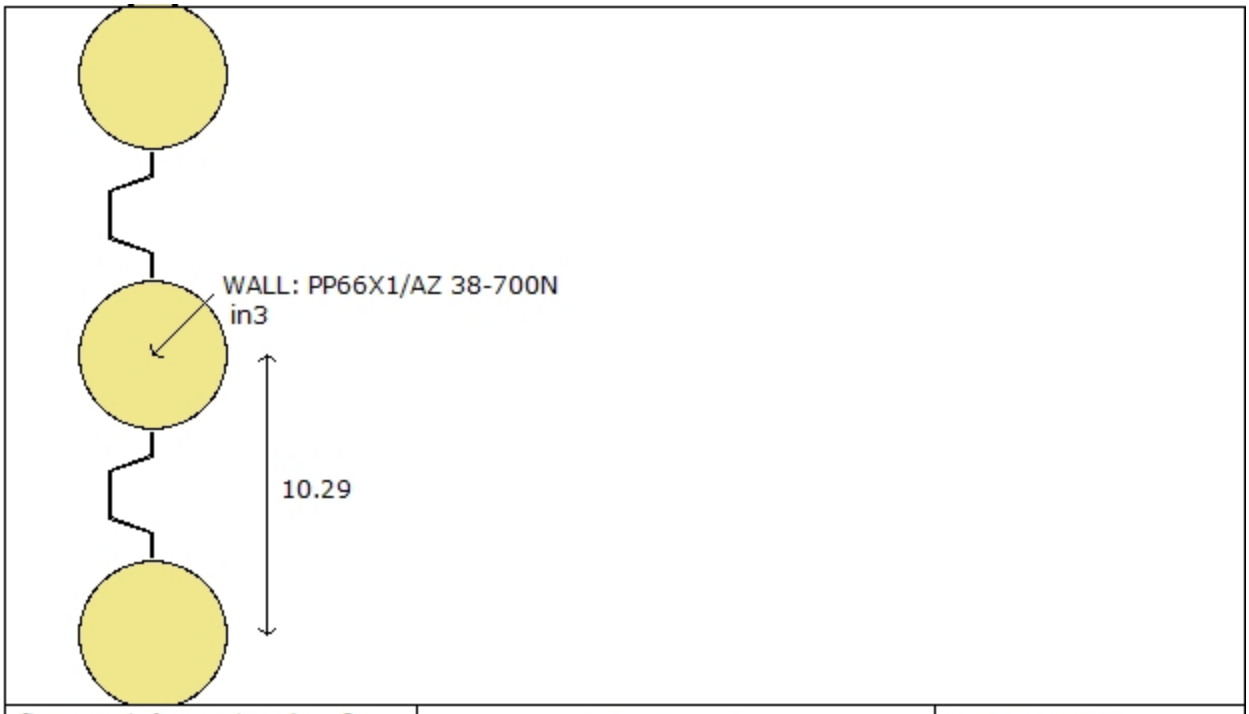
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 0.61 |
| -6 | 02- CH (-6 TO - | 1 | 0 |
| -15 | 03- CH (-15 to | 1 | 0.61 |
| -26 | 04- CH (-26 TO | 1 | 0.56 |
| -32 | 05- CH (-32 to | 1 | 0 |
| -40 | 06- CH (-40 to | 1 | 0.56 |
| -45 | 07- CH (-45 to | 1 | 0.56 |
| -54 | 08- ML (-54 to | 1 | 0.53 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.53 |
| -68 | 11- SP (-68 to - | 1 | 0.5 |
| -71 | 12- ML (-71 to | 1 | 0.53 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 0.56 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.717 | 1.872 | 2.659 |
| Stage 1 | Simple span | N/A | 1.6 | 1.443 | 1.497 | 2.127 |
| Stage 2 | Simple span | N/A | 1.6 | 1.966 | 2.233 | 3.119 |
| Stage 3 | Simple span | N/A | 1.6 | 1.665 | 1.786 | 2.495 |
| Stage 4 | Simple span | N/A | 1.6 | 1.966 | 2.143 | 2.95 |
| Stage 5 | Simple span | N/A | 1.6 | 1.418 | 1.429 | 1.966 |
| Stage 6 | Simple span | N/A | 1.6 | 2.3 | 2.63 | 3.527 |
| Stage 7 | Simple span | N/A | 1.6 | 1.699 | 1.753 | 2.351 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

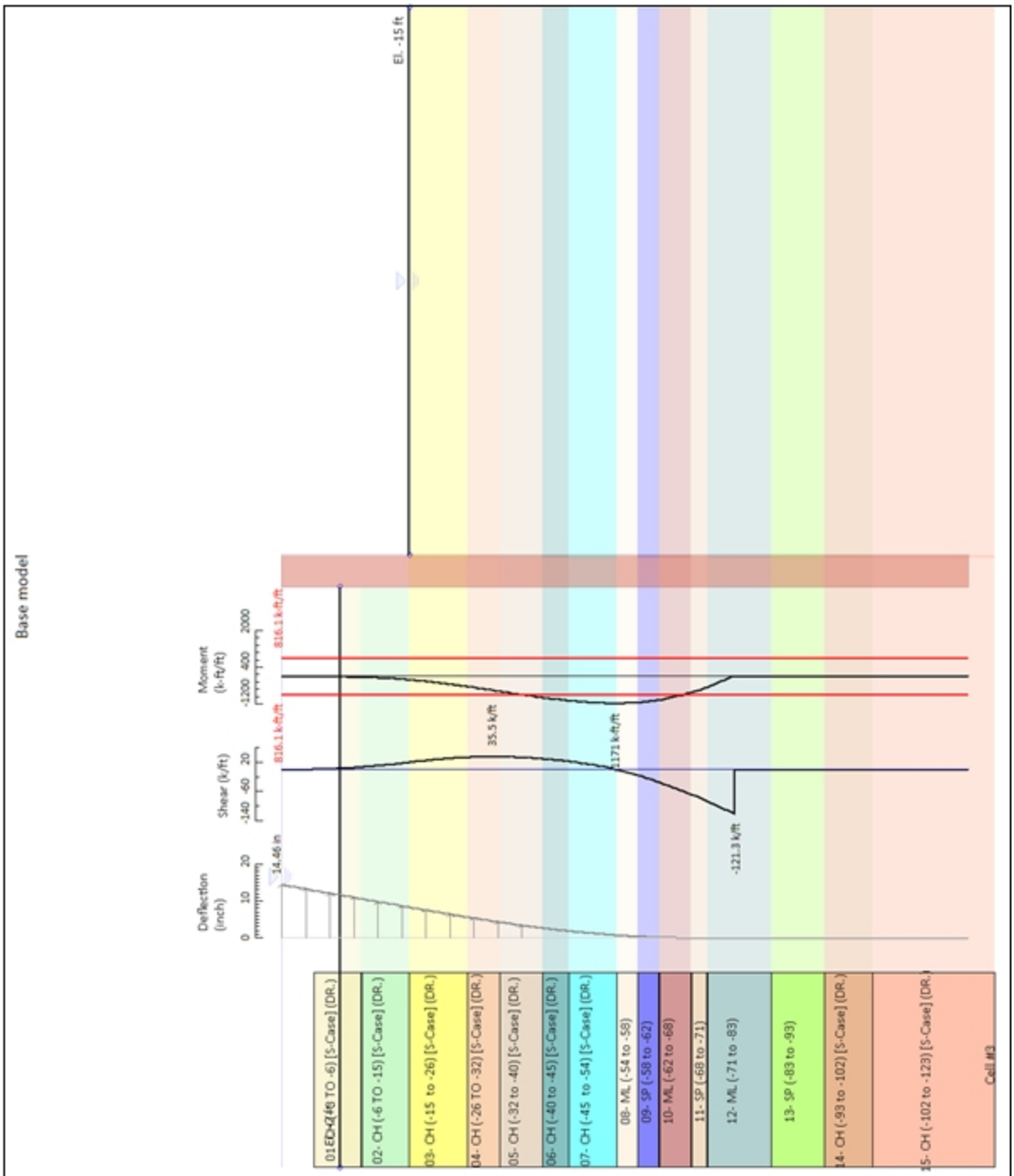
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

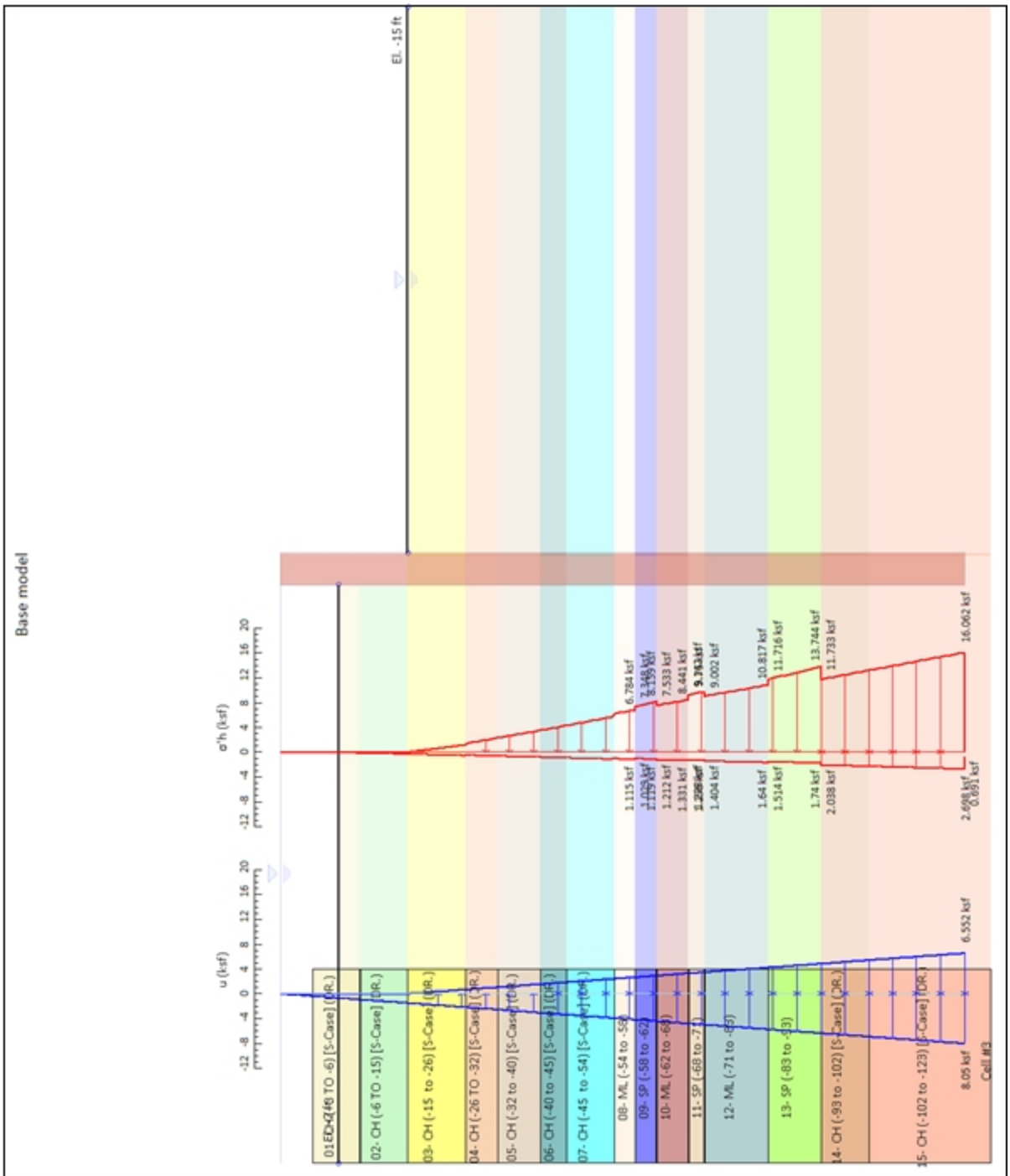
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

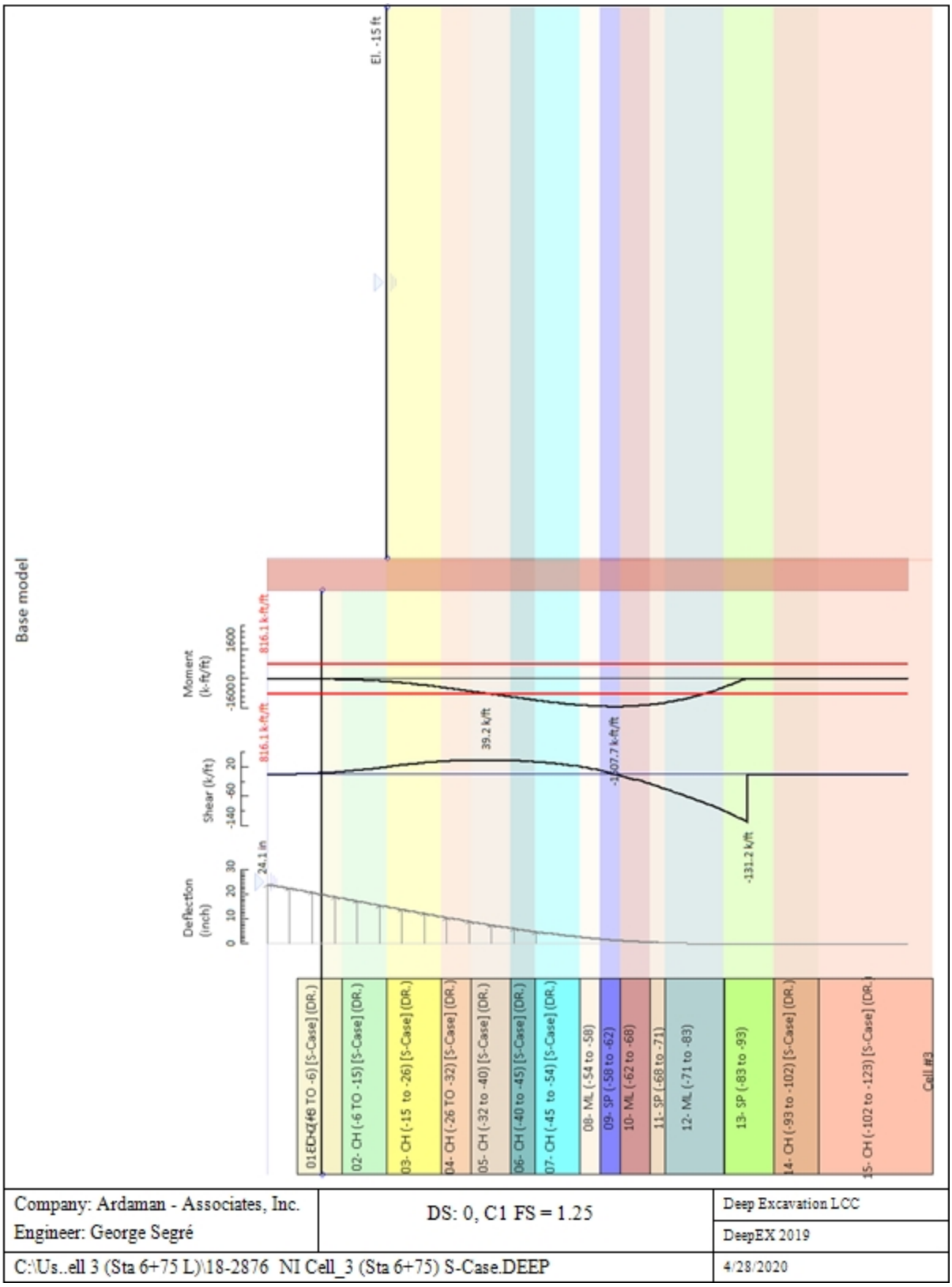
A sequence of figures for each excavation stage is reported



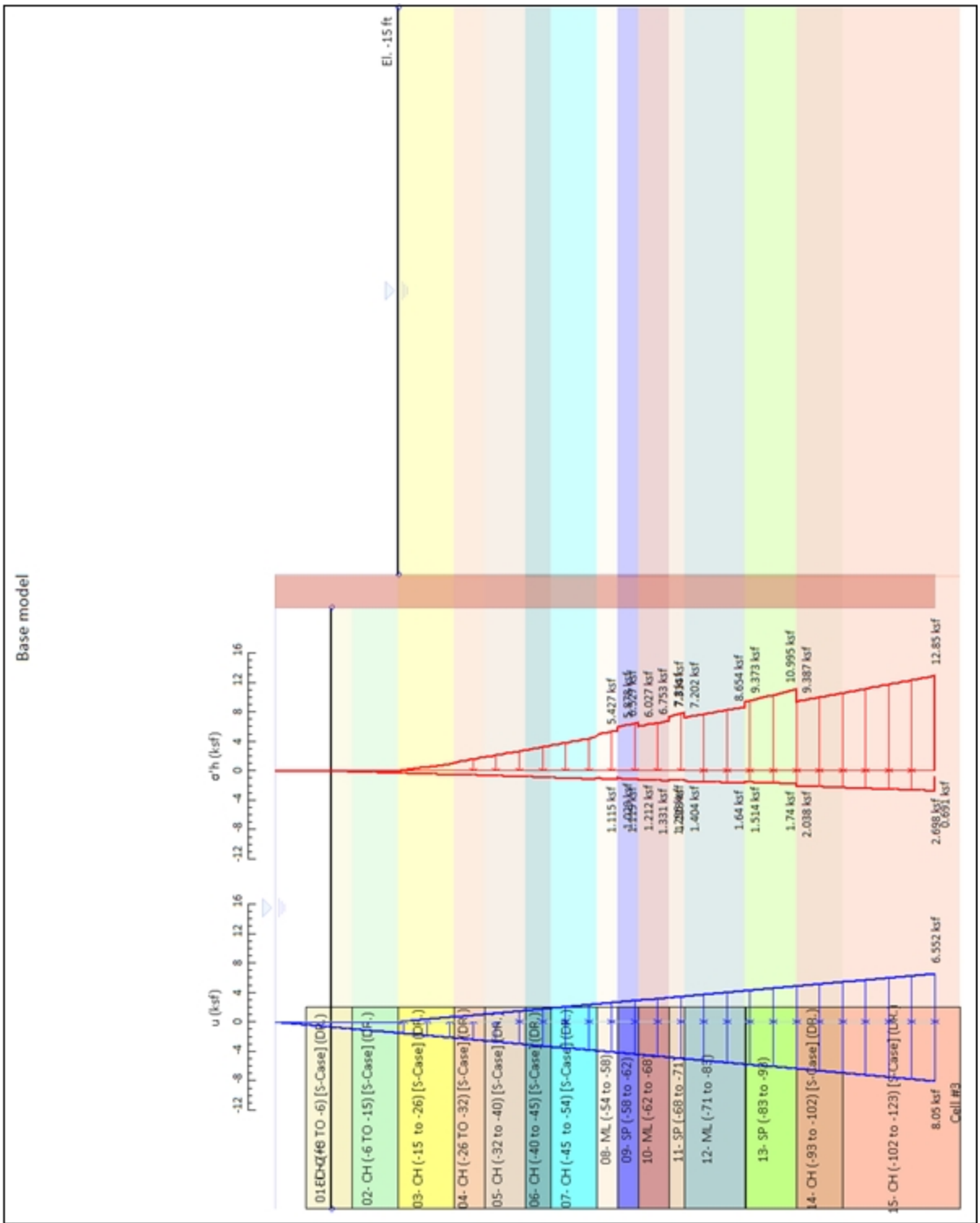

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



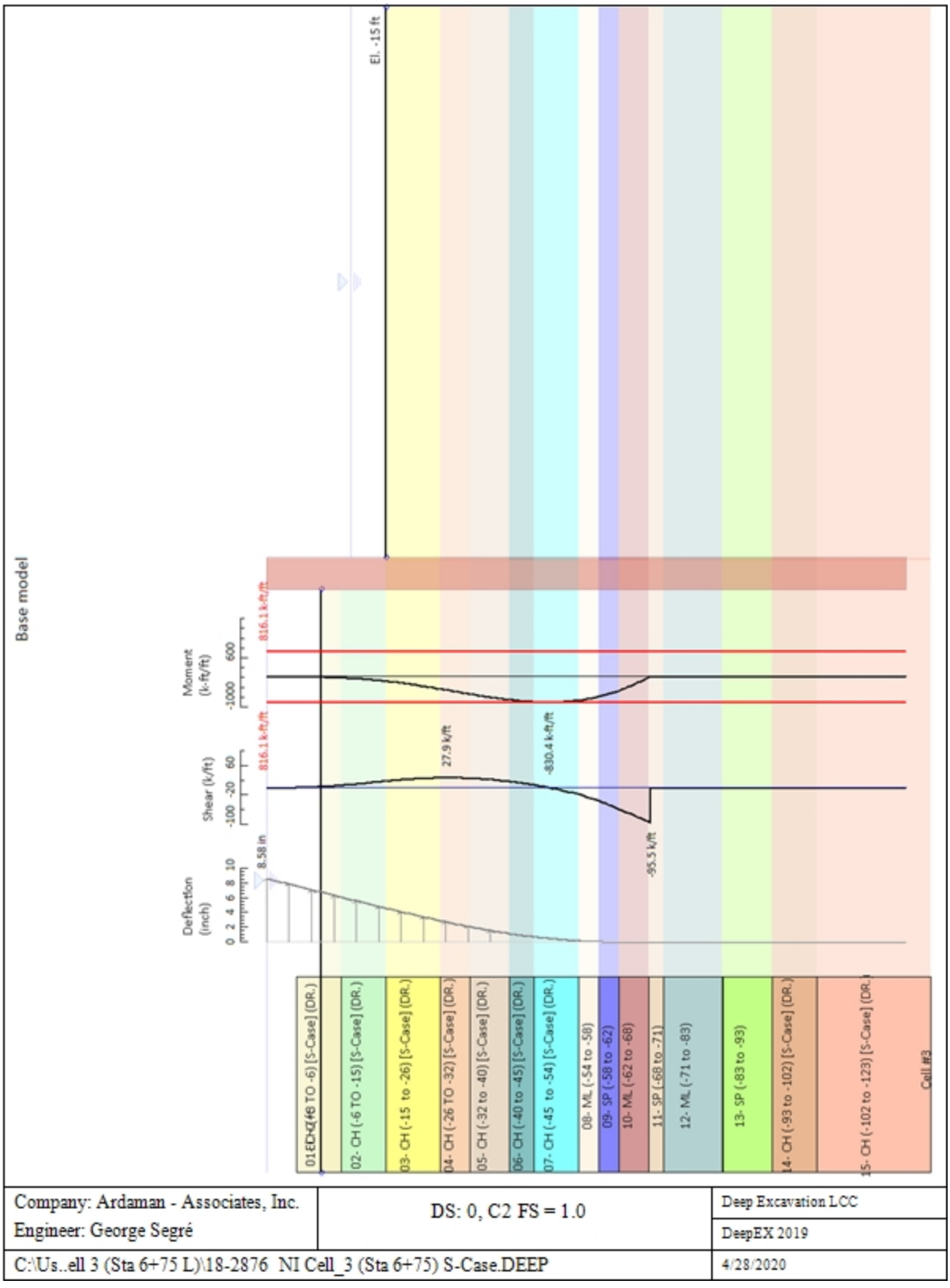

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



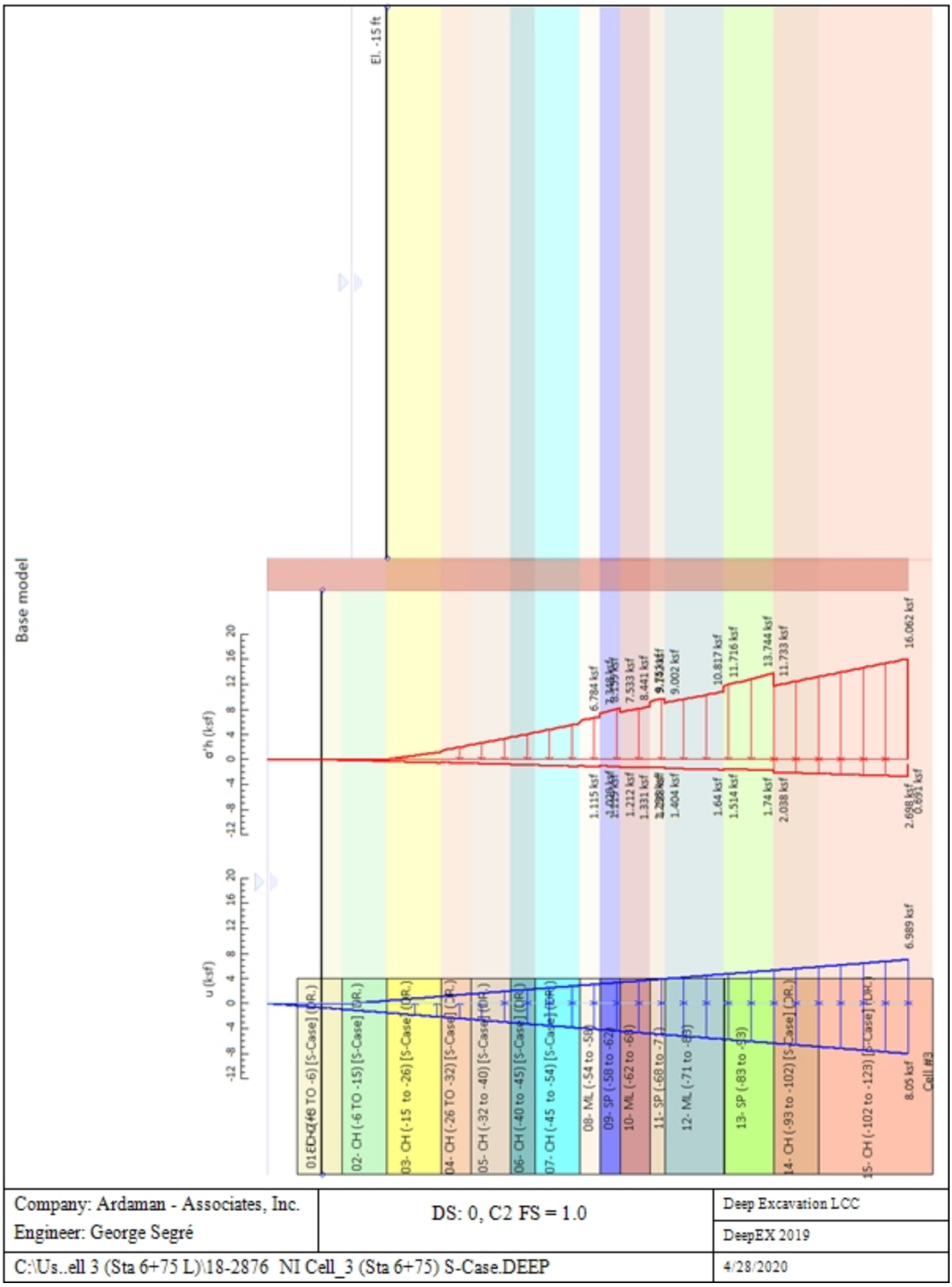

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



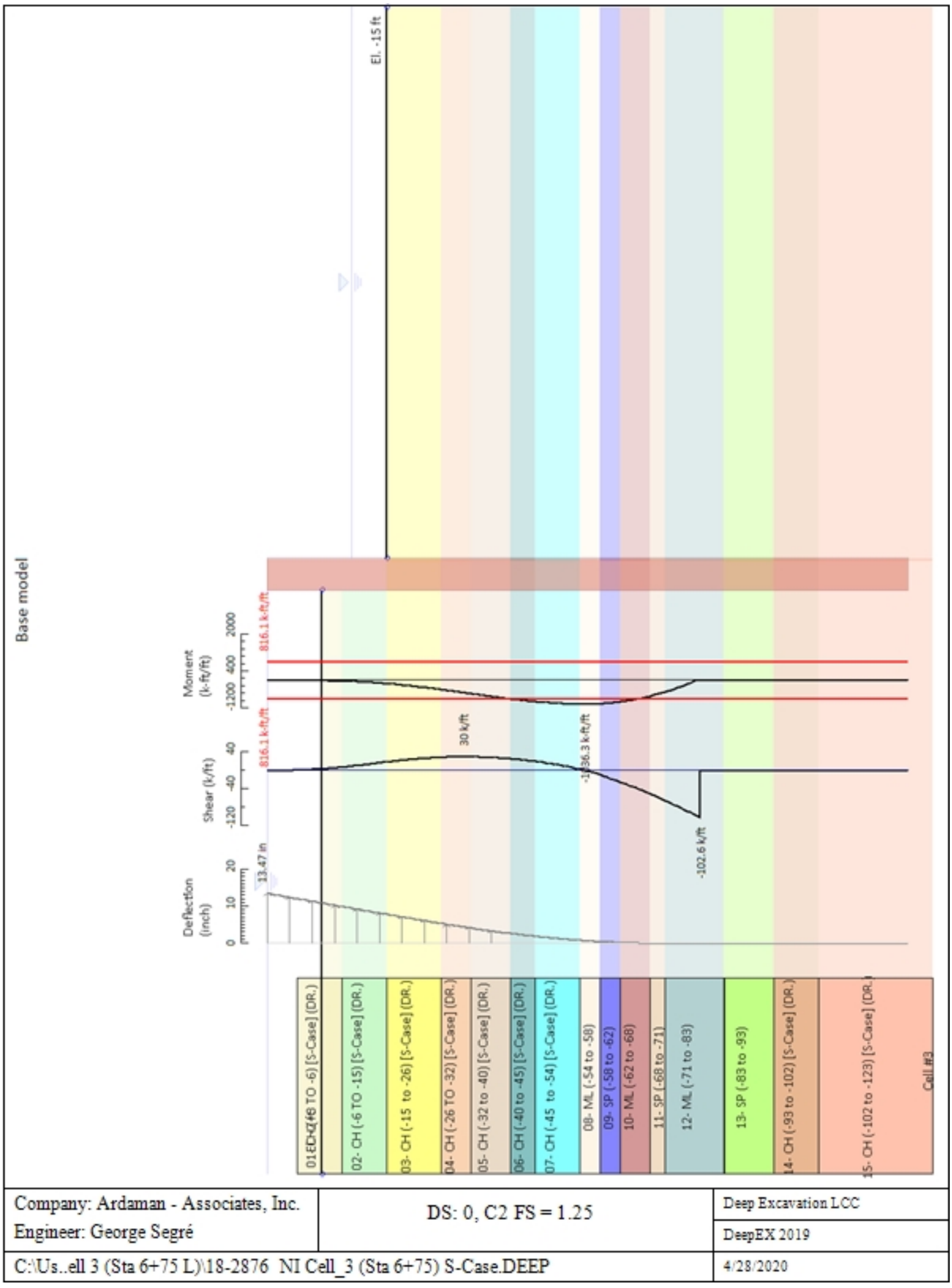

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



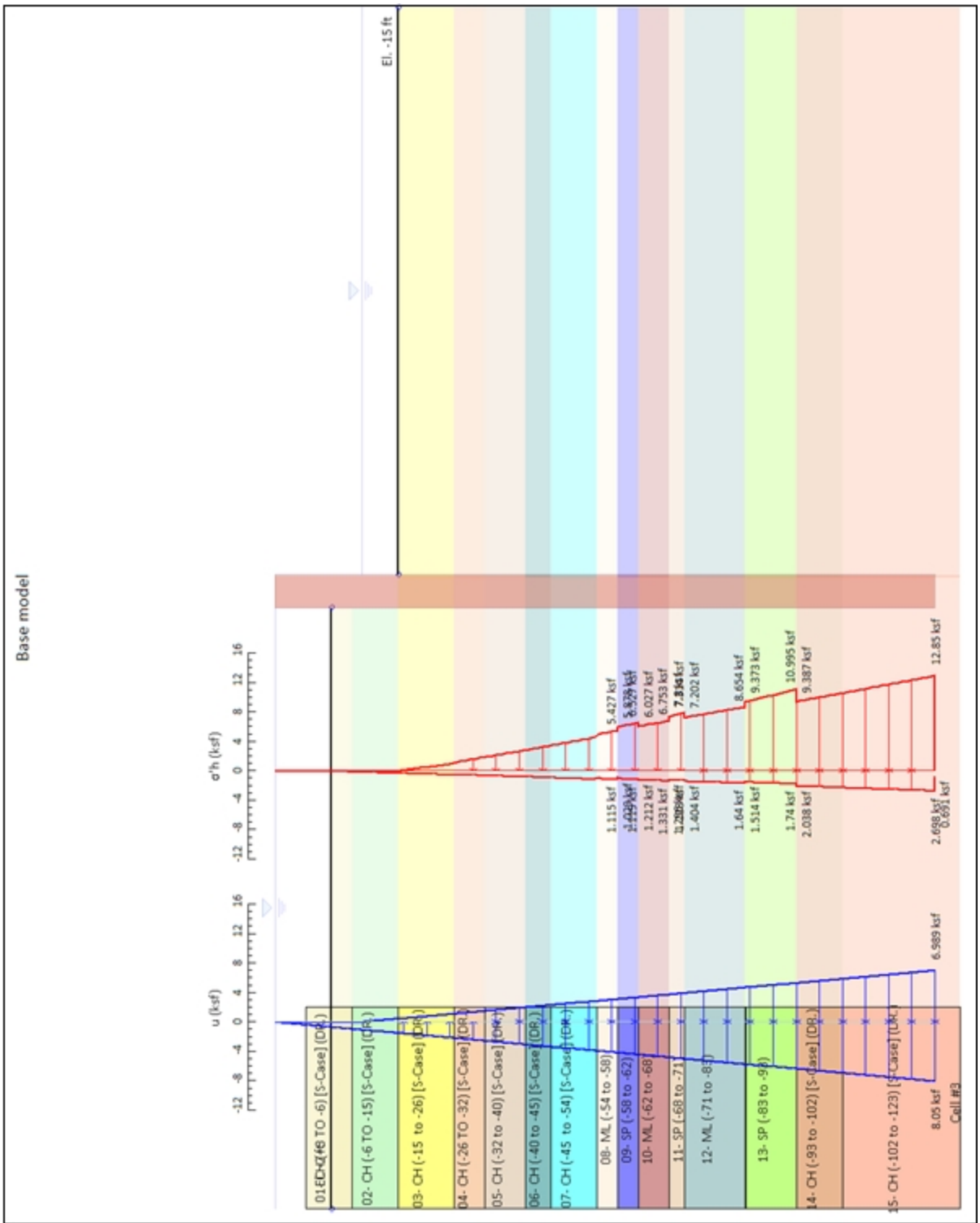

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



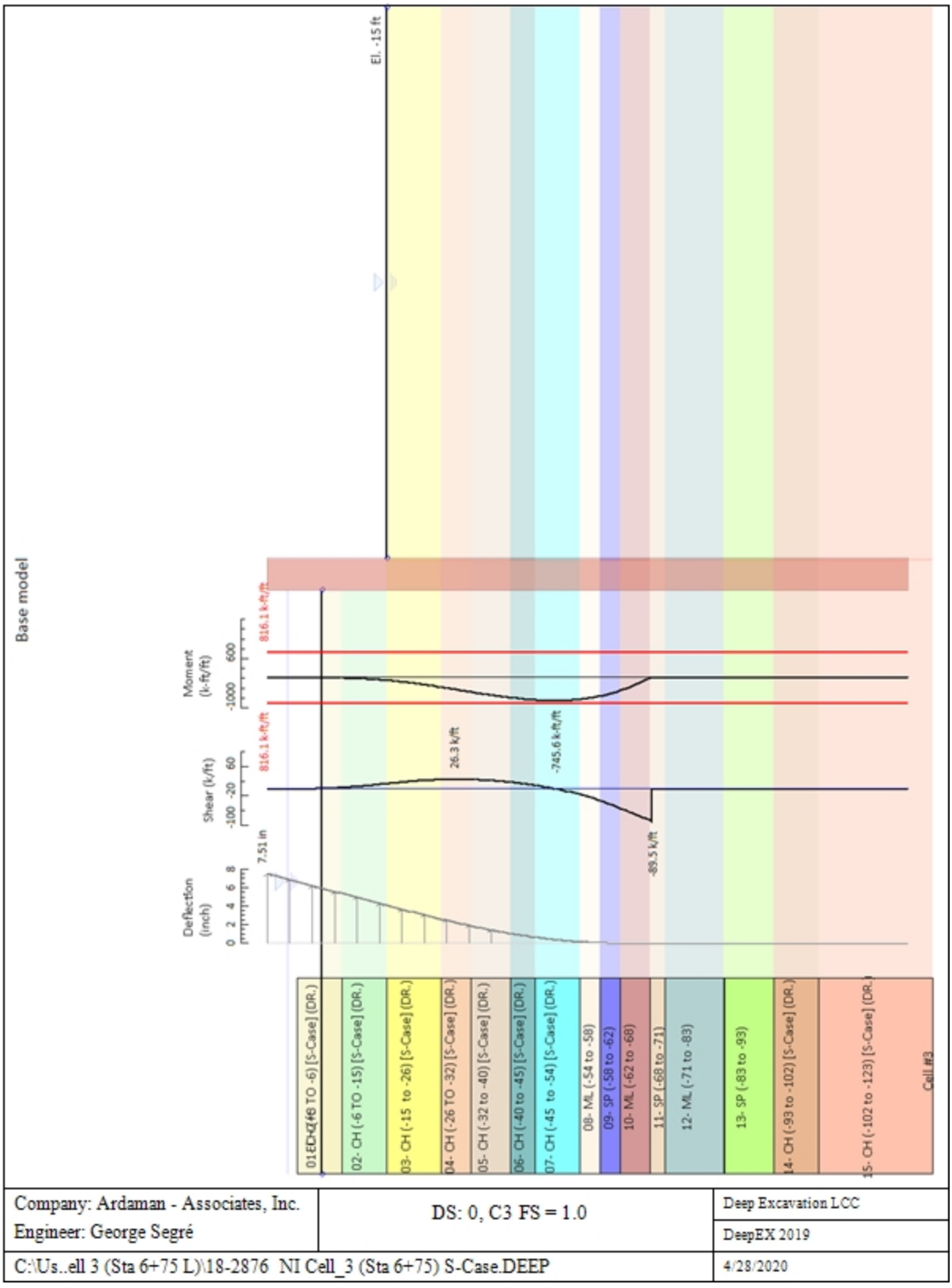

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



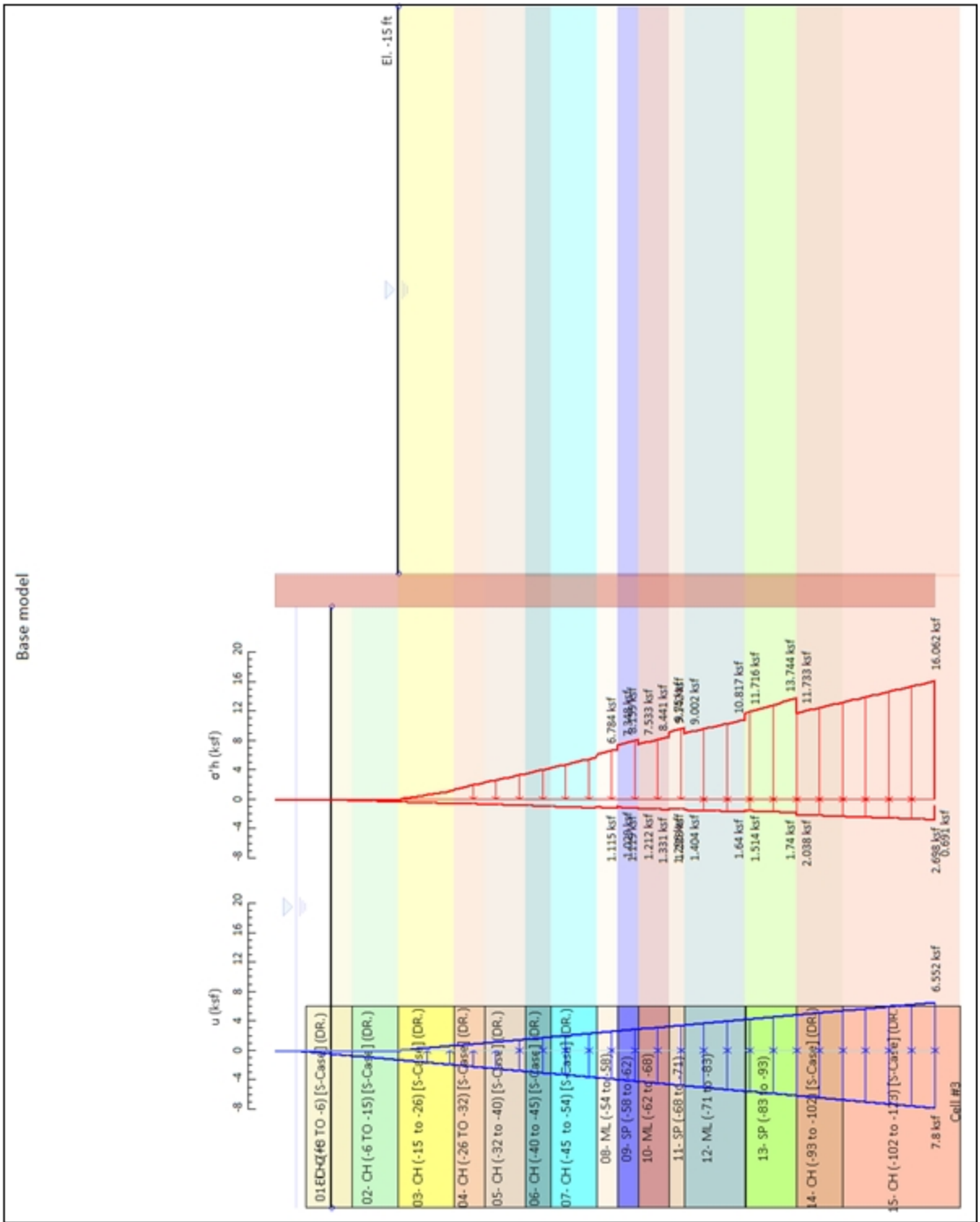

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



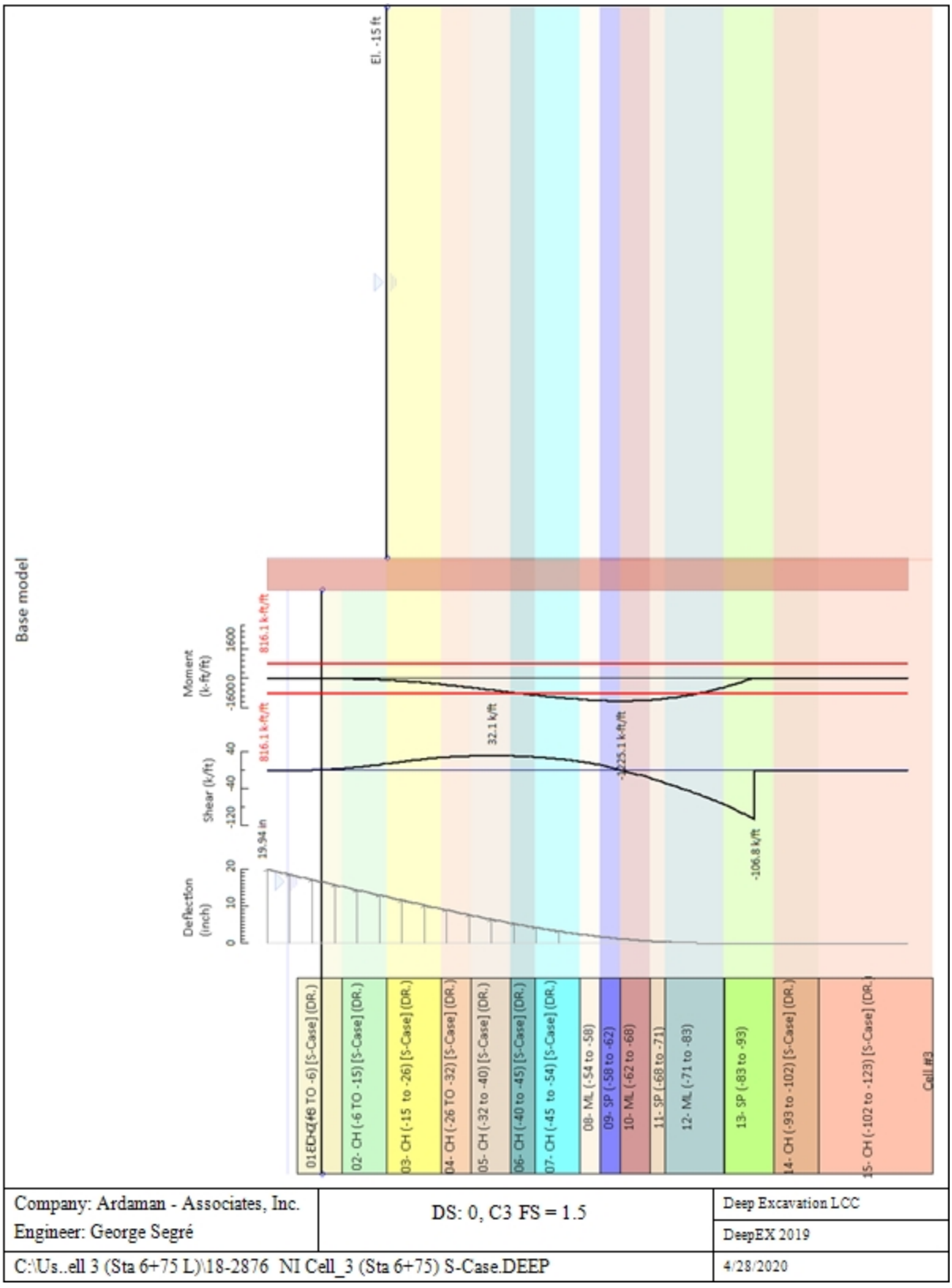

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



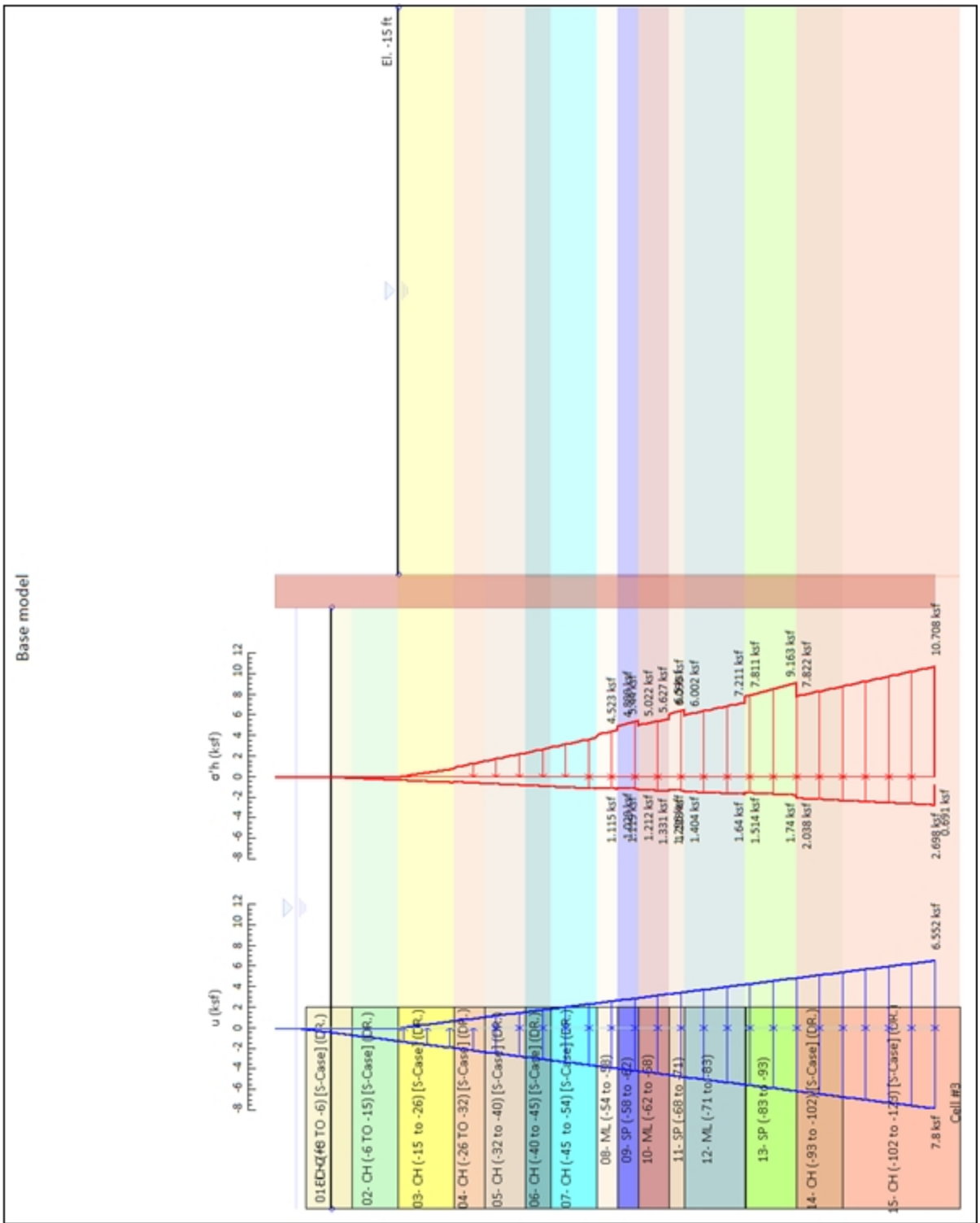

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



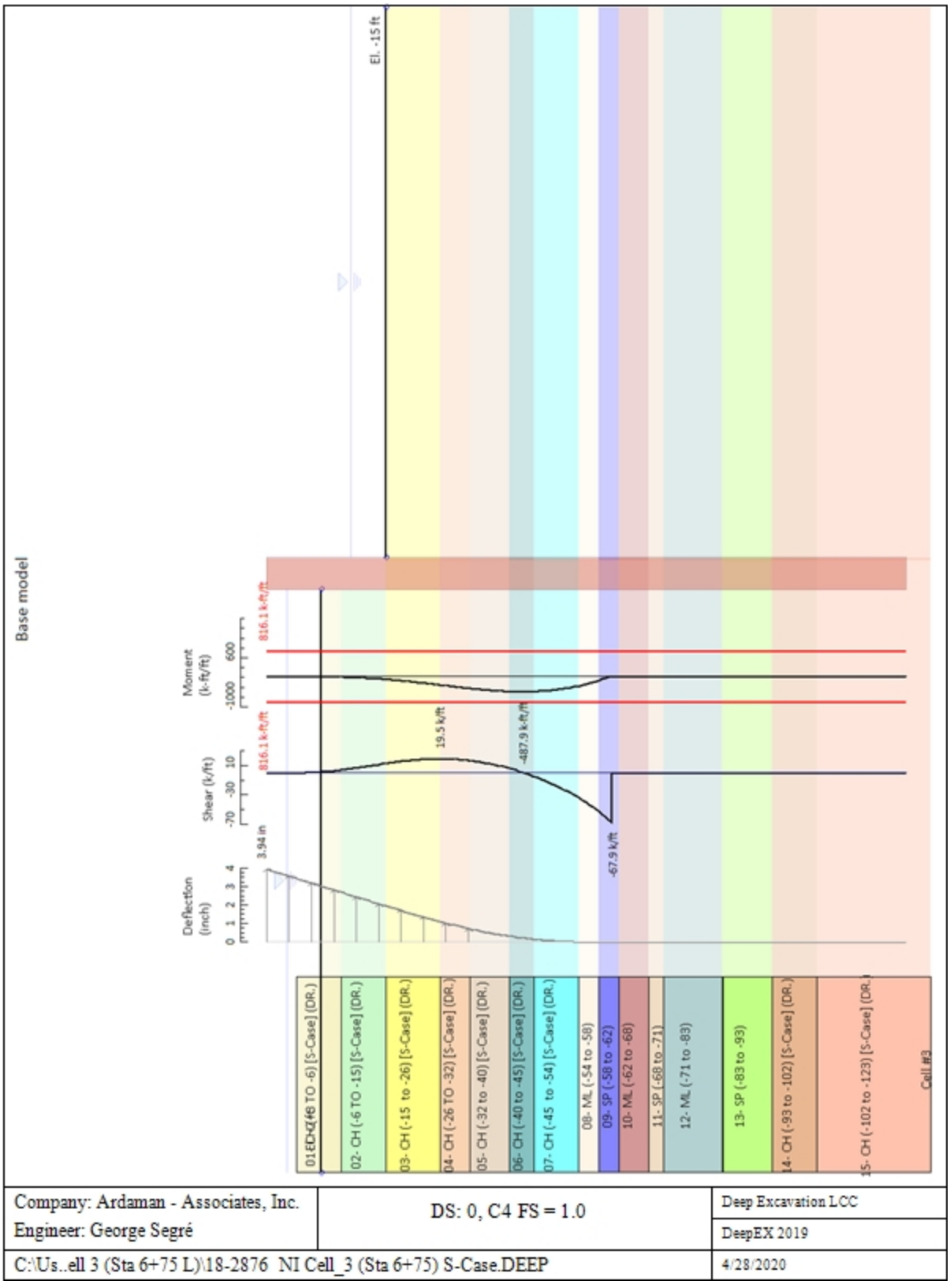

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



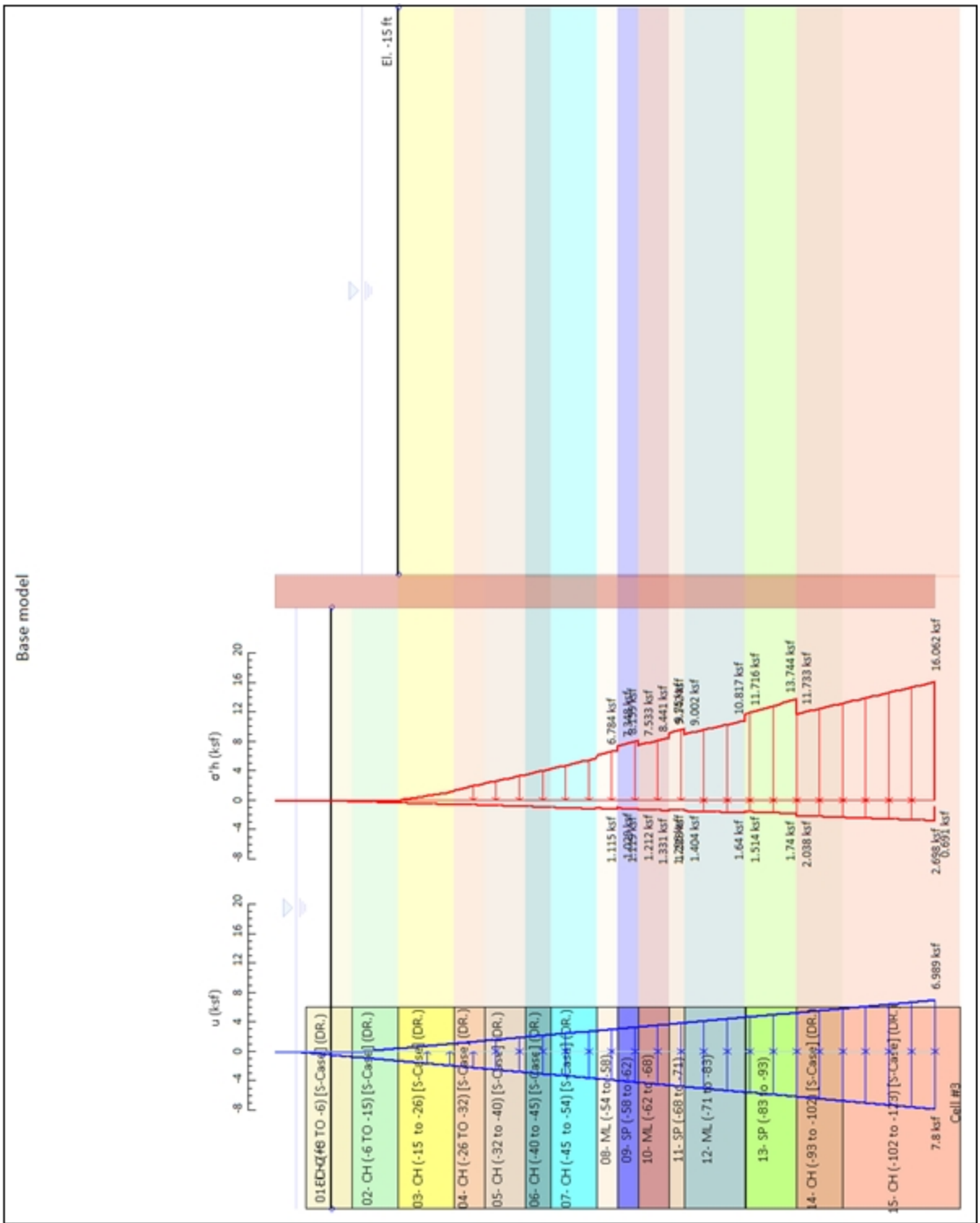

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



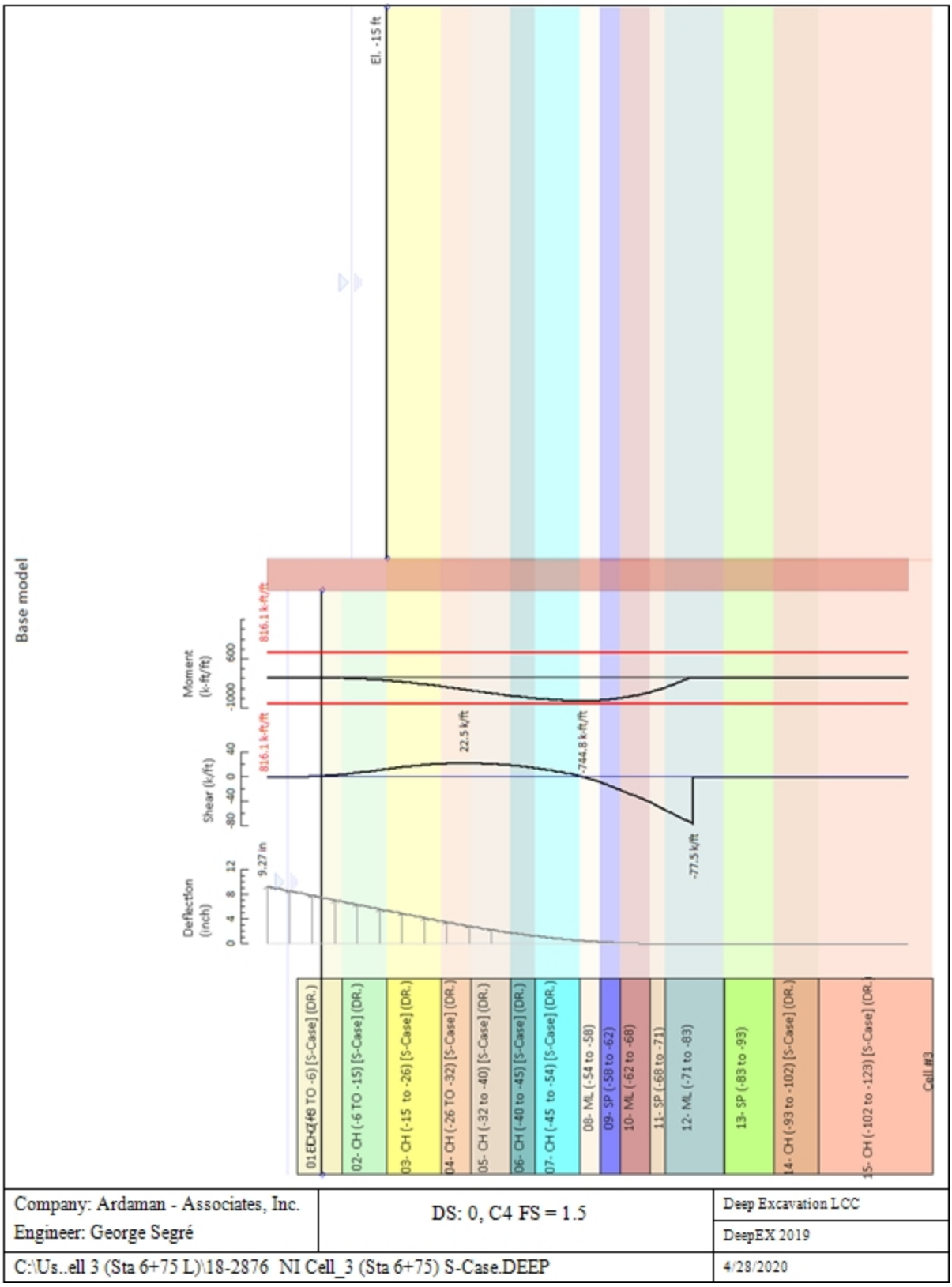

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |



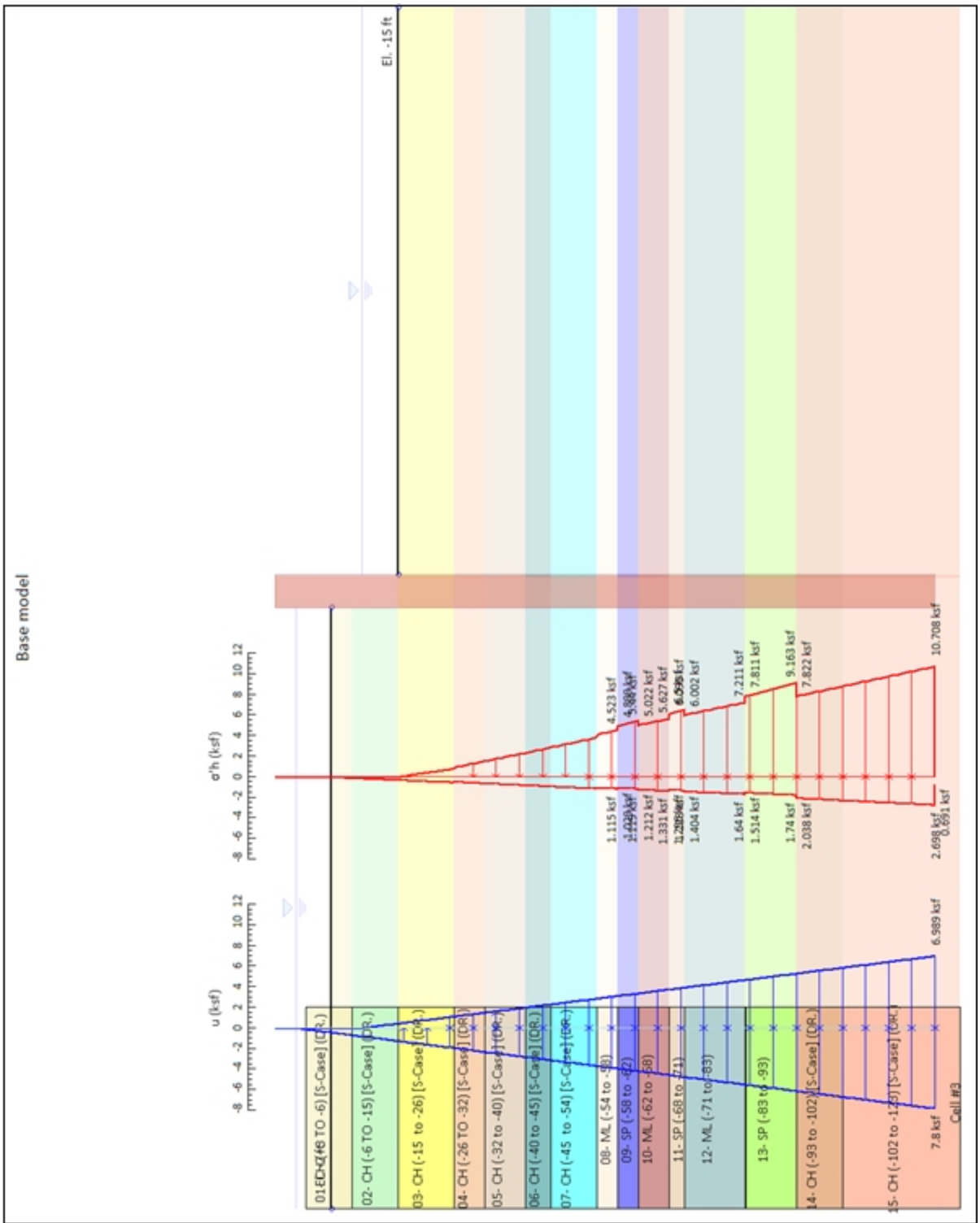

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Date: 4/29/2020

Project No.: 18-2876

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 6+75 Right Wall)

| | | | | |
|---|---|---|---|---|
| Top of Wall = | 9.0 | ft., NAVD88 | Design Tip Elev. = | -123.0 ft., NAVD88 |
| Governing Tip Elev. = | -122.12 | ft., NAVD88 | Design Length of Sheeting = | 132.0 ft. |
| Length of Sheetting = | 131.12 | ft. | | |
| Use = | 132.0 | ft. | | |

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -22 | 1.00 | 1.00 | -77.11 | 1,247.27 | 77.21 | 14.48 |
| | | Open excavation - degraded | 9 | -22 | 1.00 | 1.25 | -98.36 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -61.31 | 806.13 | 84.60 | 6.51 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -70.57 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -22 | 1.00 | 1.00 | -66.76 | 873.53 | 69.56 | 7.72 |
| | | Open excavation - degraded | 5 | -22 | 1.00 | 1.50 | -102.86 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -54.66 | 507.29 | 81.38 | 3.39 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -67.16 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -22 | 1.00 | 1.00 | -99.03 | 2,638.82 | 198.78 | 52.65 |
| | | Open excavation - degraded | 9 | -22 | 1.00 | 1.25 | -115.42 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -84.12 | 1,576.36 | 143.32 | 23.24 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -95.30 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -22 | 1.00 | 1.00 | -92.32 | 1,953.10 | 174.18 | 33.44 |
| | | Open excavation - degraded | 5 | -22 | 1.00 | 1.50 | -122.12 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -76.68 | 1,062.20 | 112.88 | 13.04 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -96.04 | -- | -- | -- |
| | | | | | | Governing Value: | -122.12 | 2,638.82 | 198.78 | 52.65 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:38:25 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 0 | 0 | 500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 0 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 0 | 0 | 350 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 0 | 0 | 1250 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 0 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 0 | 0 | 1730 | 0 | 0 | 626.3 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 0 | 0 | 3300 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 15 | 200 | N/A | N/A | N/A | 300 | 3 | 0.59 | 1.7 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 0 | 0 | 4000 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.741 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

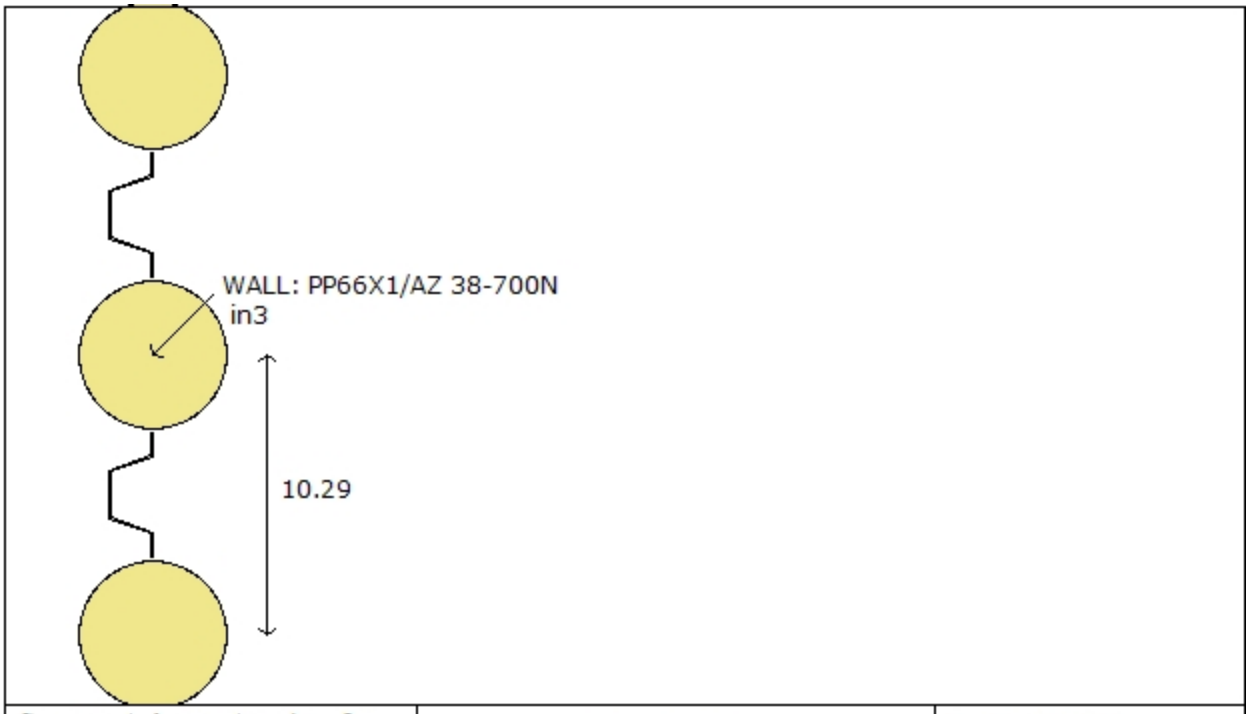
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 1 |
| -6 | 02- CH (-6 TO - | 1 | 1 |
| -15 | 03- CH (-15 to | 1 | 1 |
| -26 | 04- CH (-26 TO | 1 | 1 |
| -32 | 05- CH (-32 to | 1 | 1 |
| -40 | 06- CH (-40 to | 1 | 1 |
| -45 | 07- CH (-45 to | 1 | 1 |
| -54 | 08- ML (-54 to | 1 | 0.74 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.74 |
| -68 | 11- SP (-68 to - | 1 | 1 |
| -71 | 12- ML (-71 to | 1 | 0.74 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 1 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -110 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.418 | 1.418 | 2.089 |
| Stage 1 | Simple span | N/A | 1.6 | 1.135 | 1.135 | 1.671 |
| Stage 2 | Simple span | N/A | 1.6 | 1.951 | 1.951 | 2.885 |
| Stage 3 | Simple span | N/A | 1.6 | 1.56 | 1.56 | 2.308 |
| Stage 4 | Simple span | N/A | 1.6 | 1.608 | 1.608 | 2.313 |
| Stage 5 | Simple span | N/A | 1.6 | 1.072 | 1.072 | 1.542 |
| Stage 6 | Simple span | N/A | 1.6 | 2.329 | 2.329 | 3.332 |
| Stage 7 | Simple span | N/A | 1.6 | 1.552 | 1.552 | 2.221 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

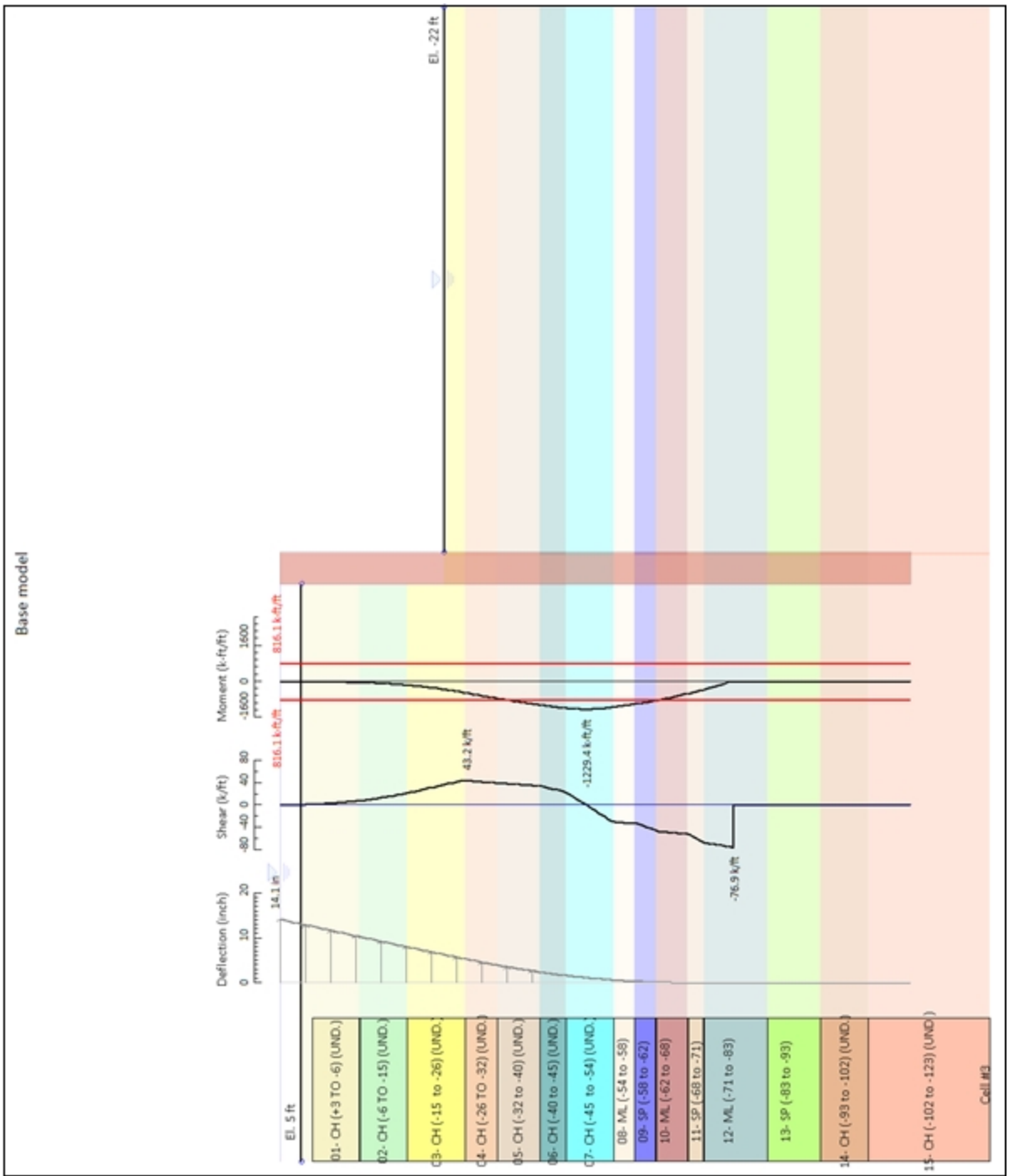
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

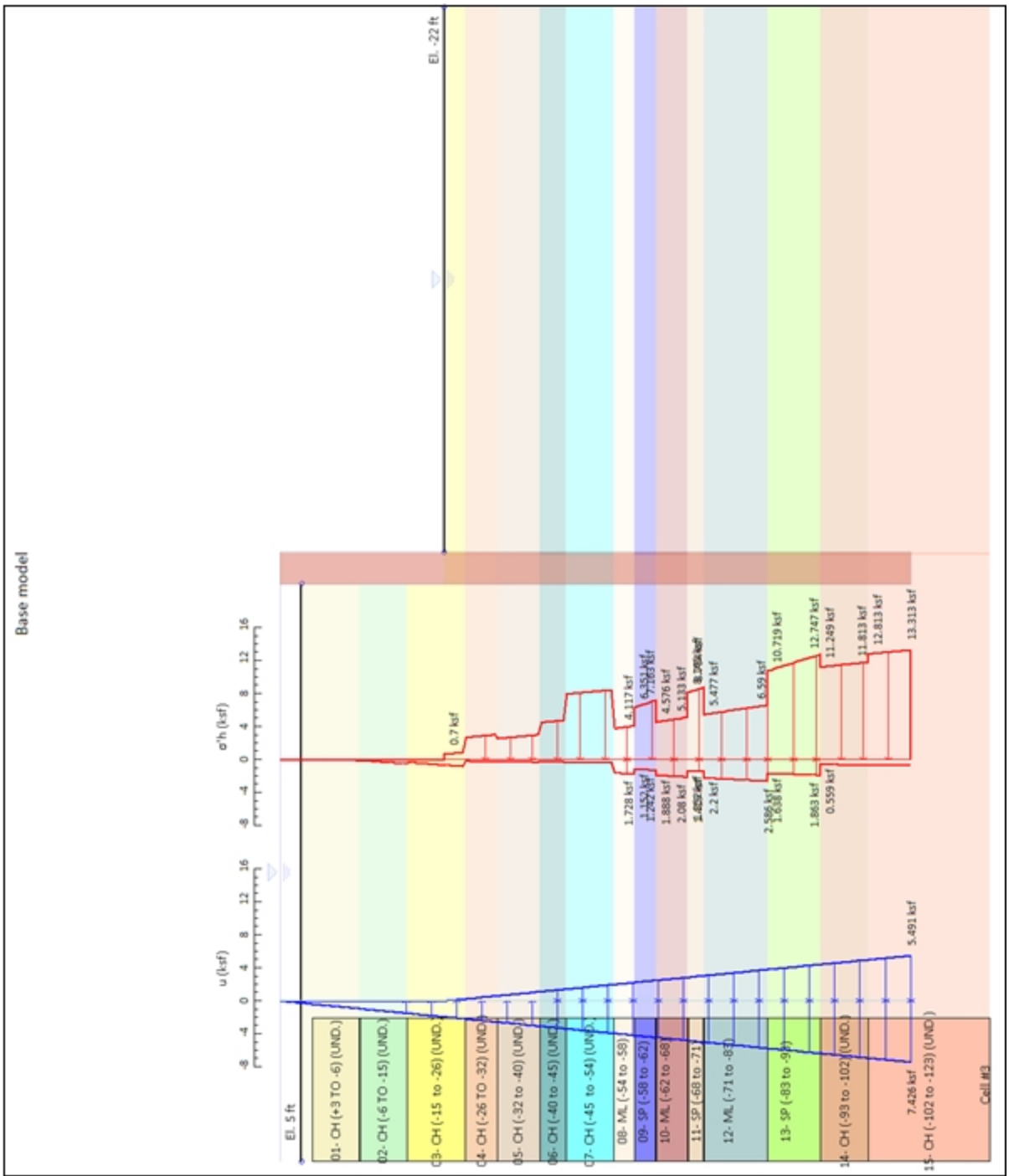
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

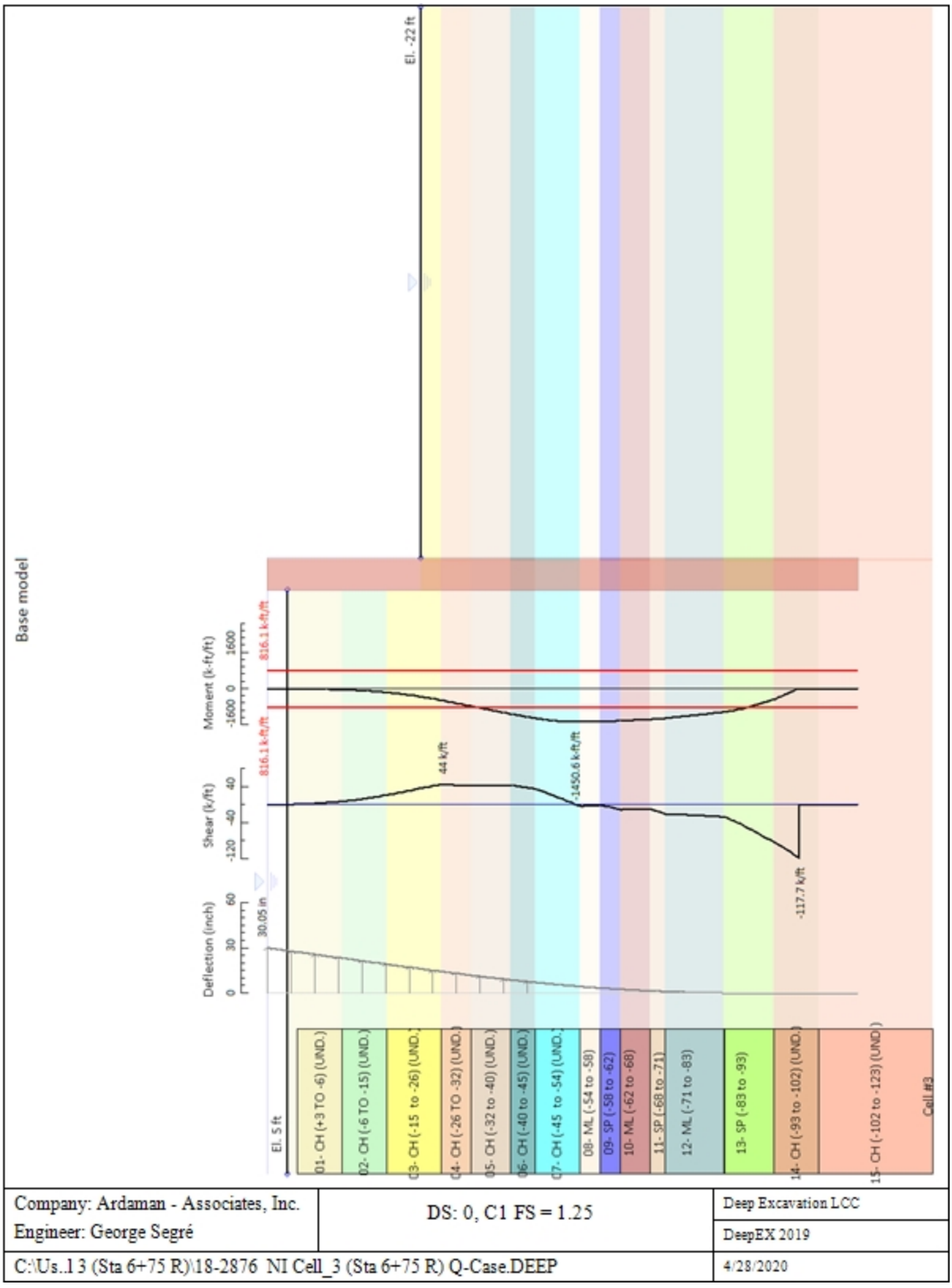
A sequence of figures for each excavation stage is reported

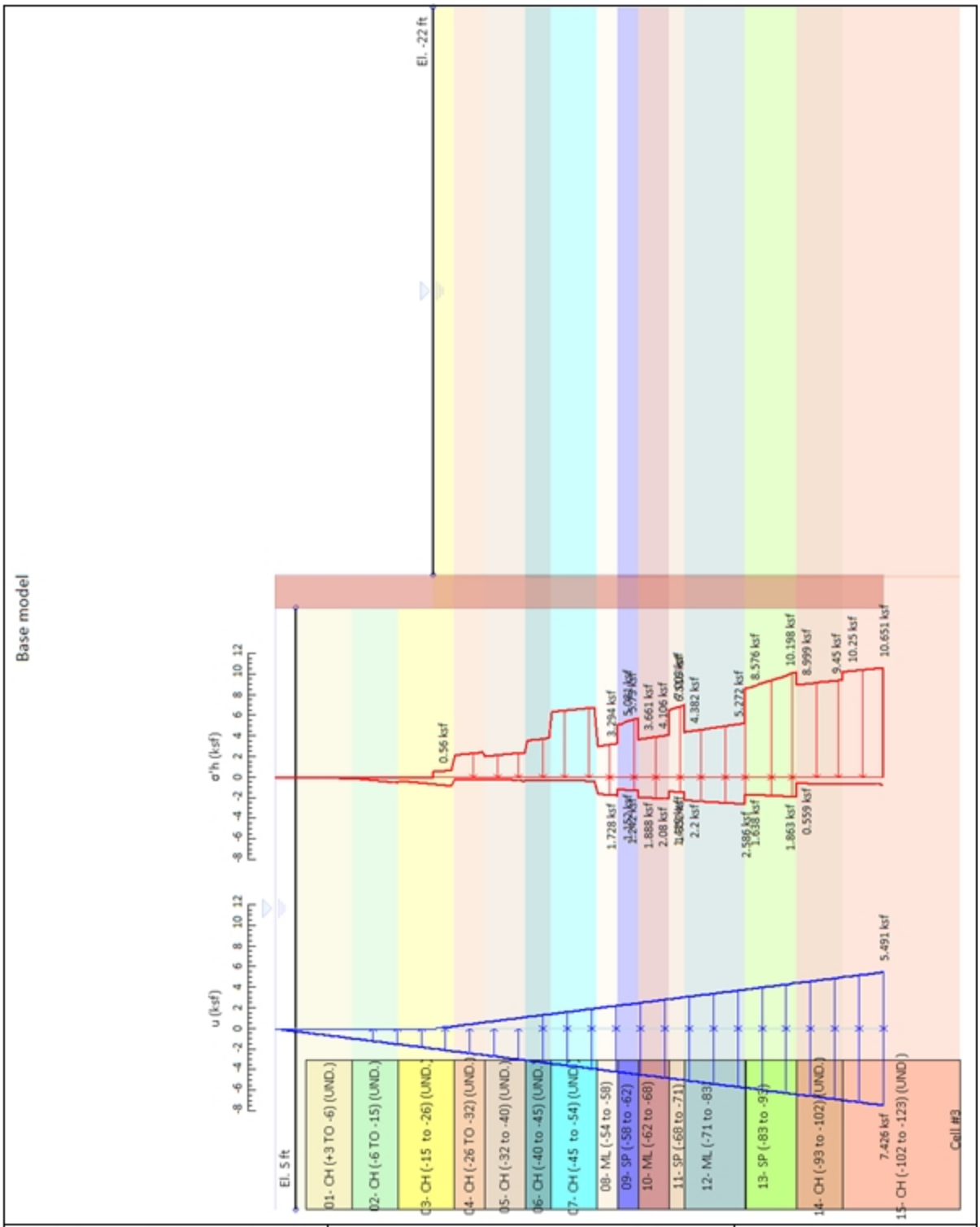



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |

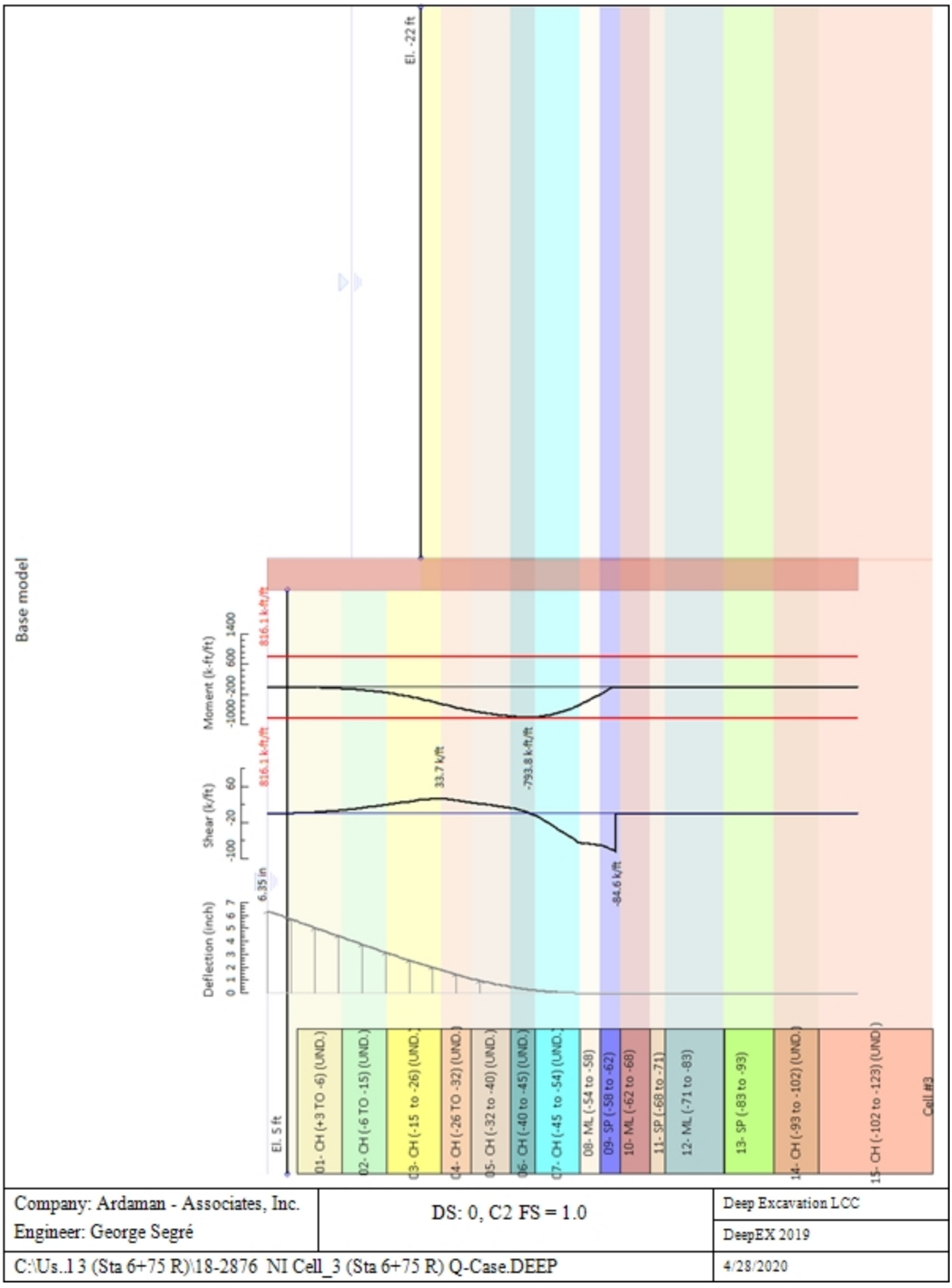



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |

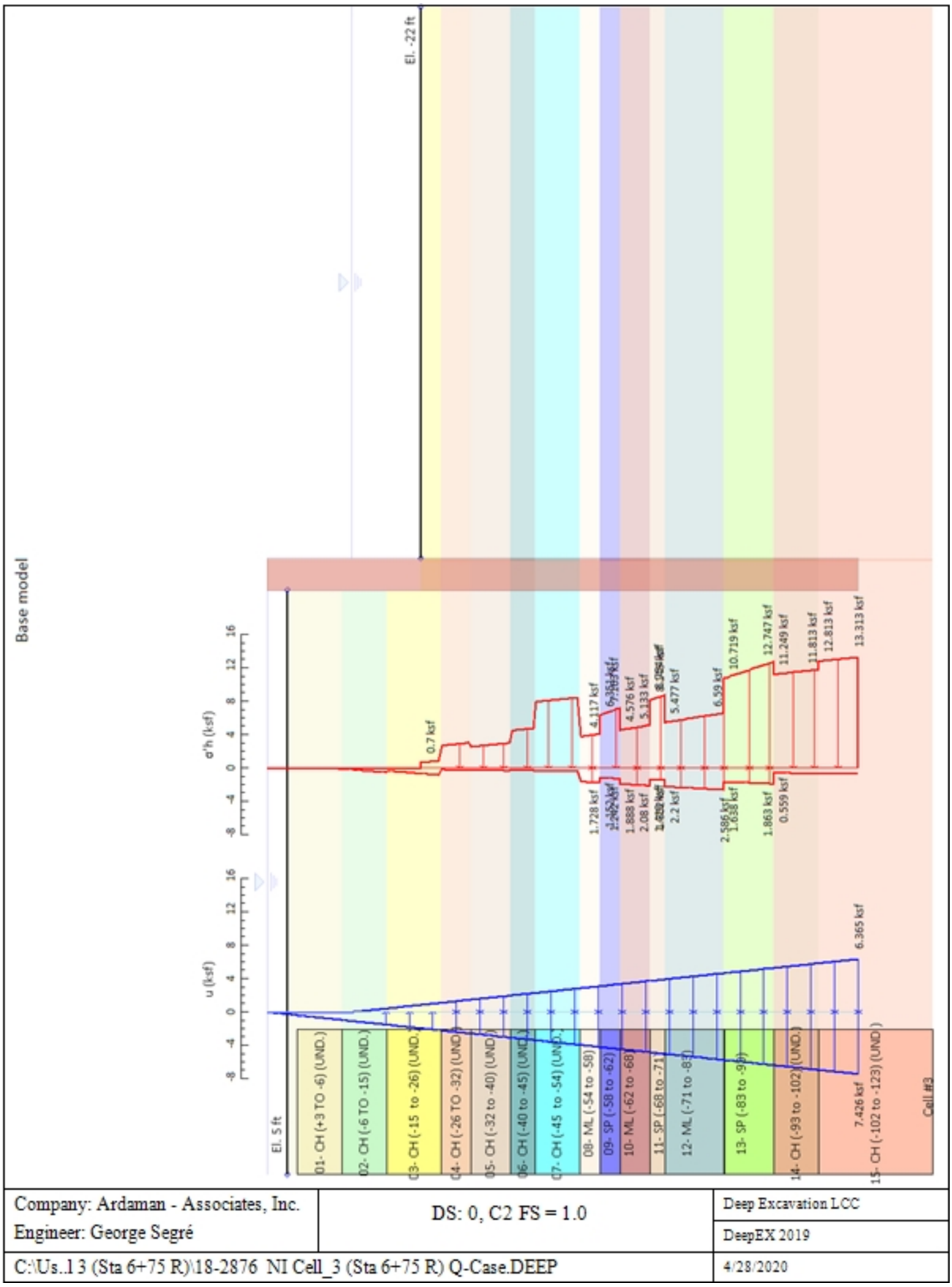

Base model
El. -22 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-120 -40 40
44 k/ft
-1450.6 k-ft/ft
-117.7 k/ft
Deflection (inch)
0 30 60
30.05 in
El. 5 ft
01- CH (+3 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP
4/28/2020



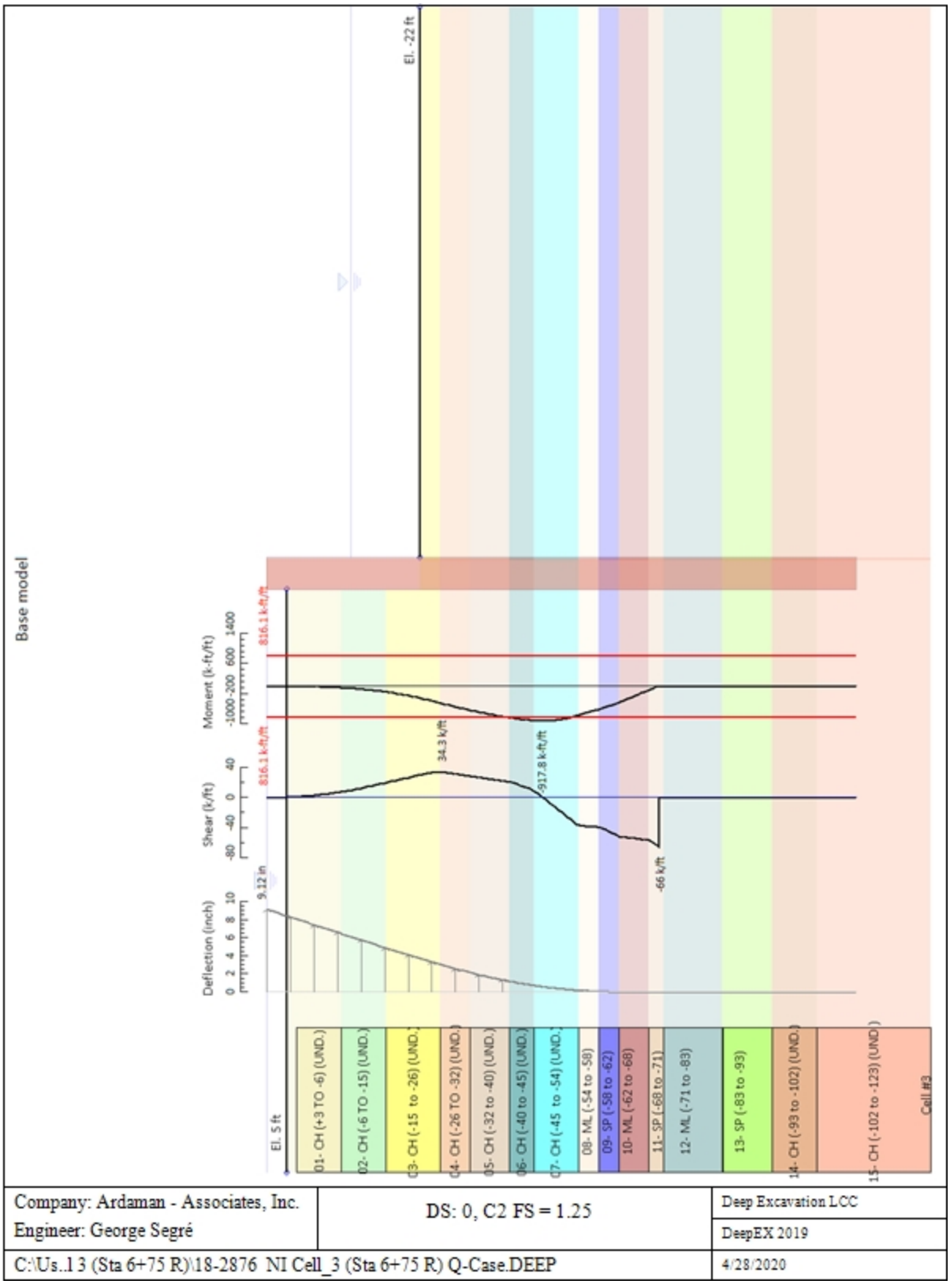

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



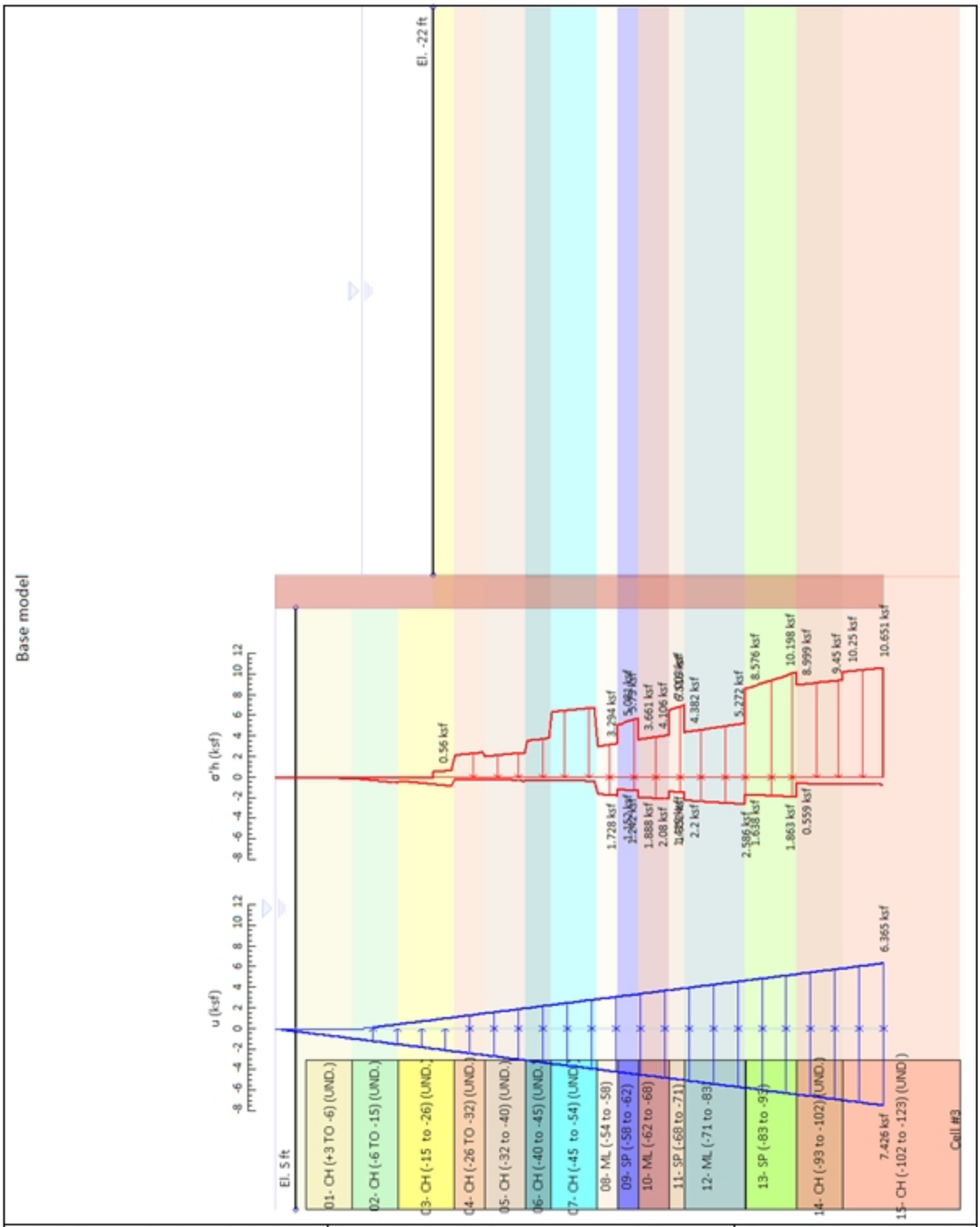

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



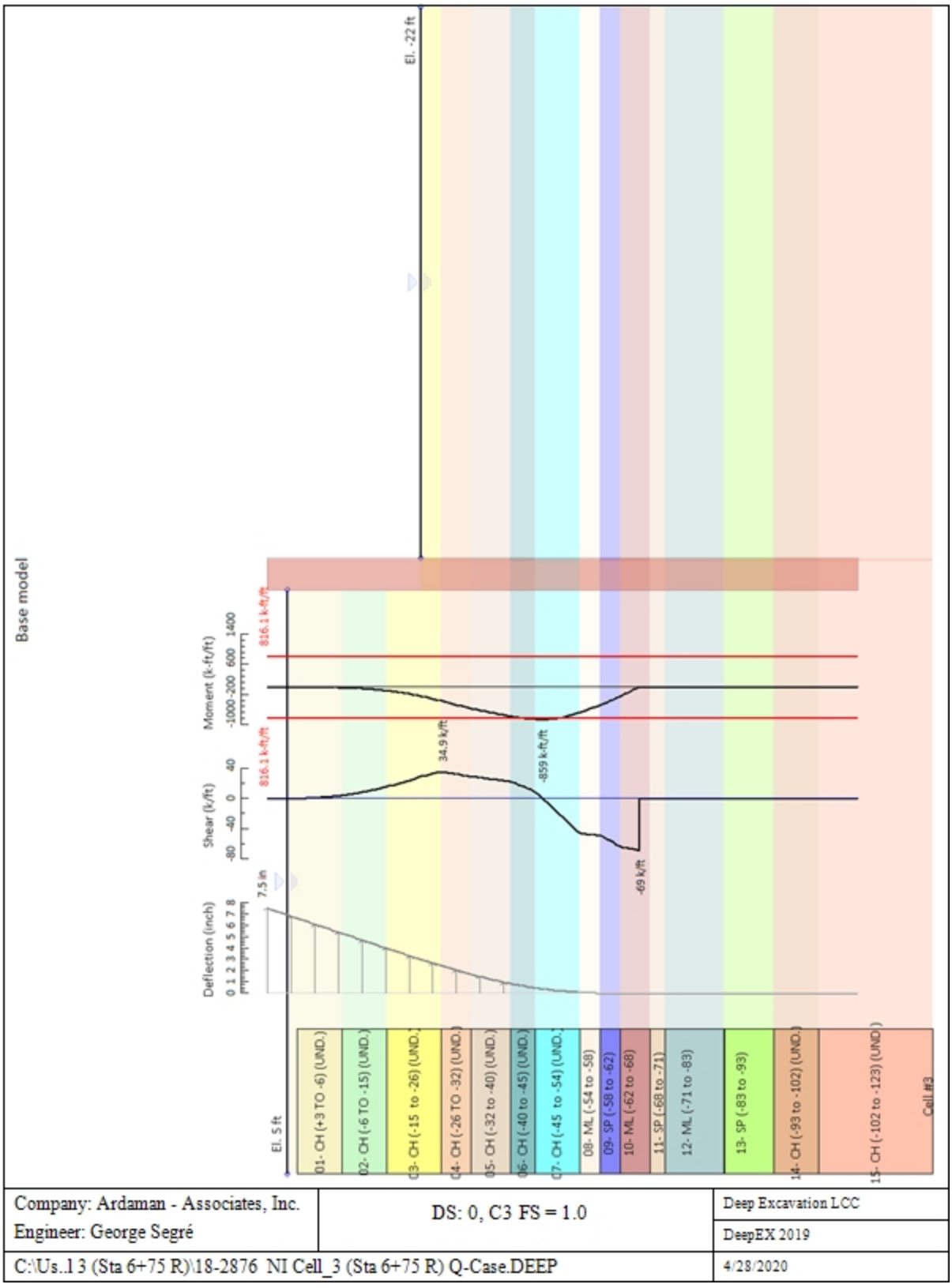

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



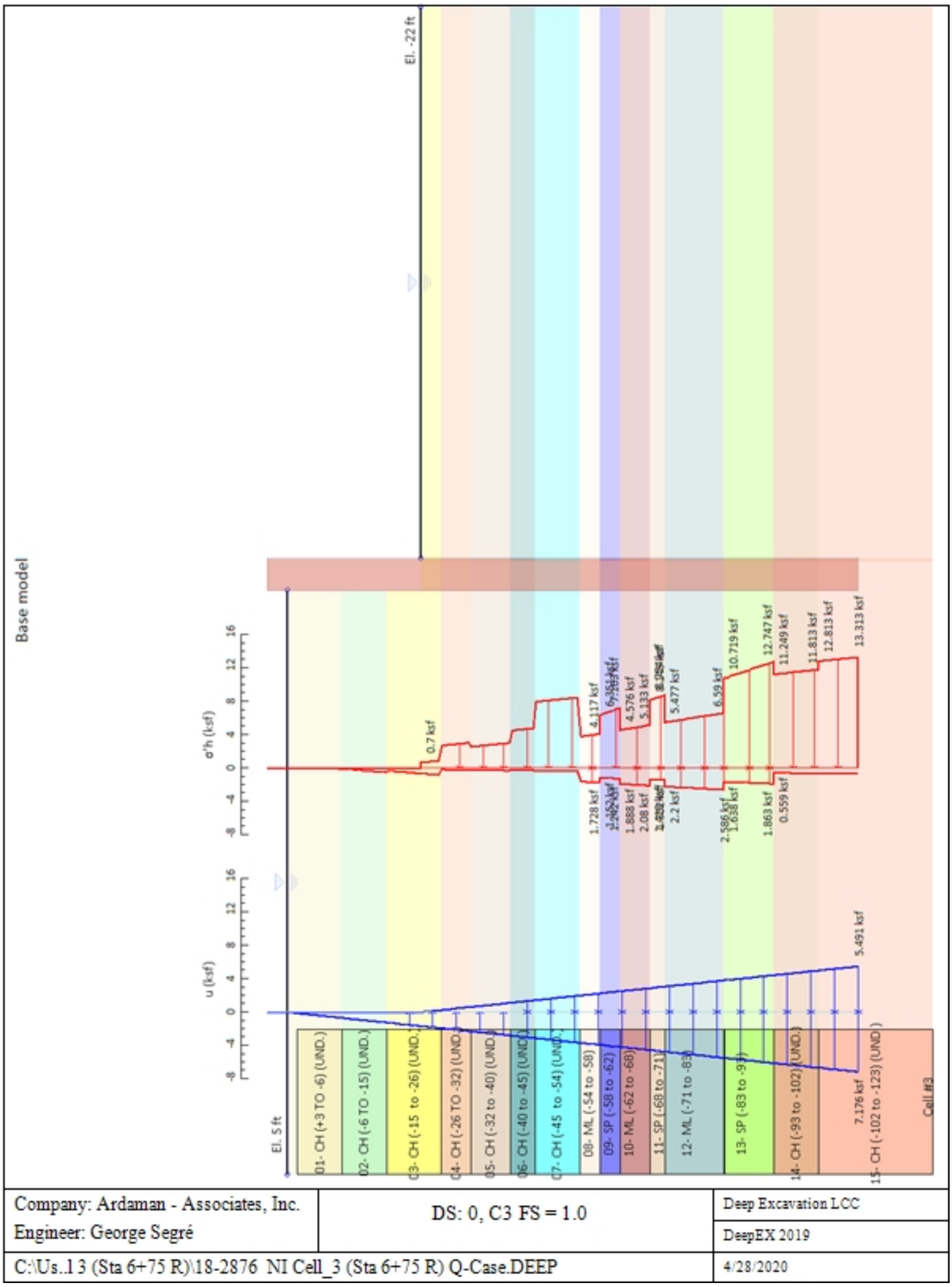

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



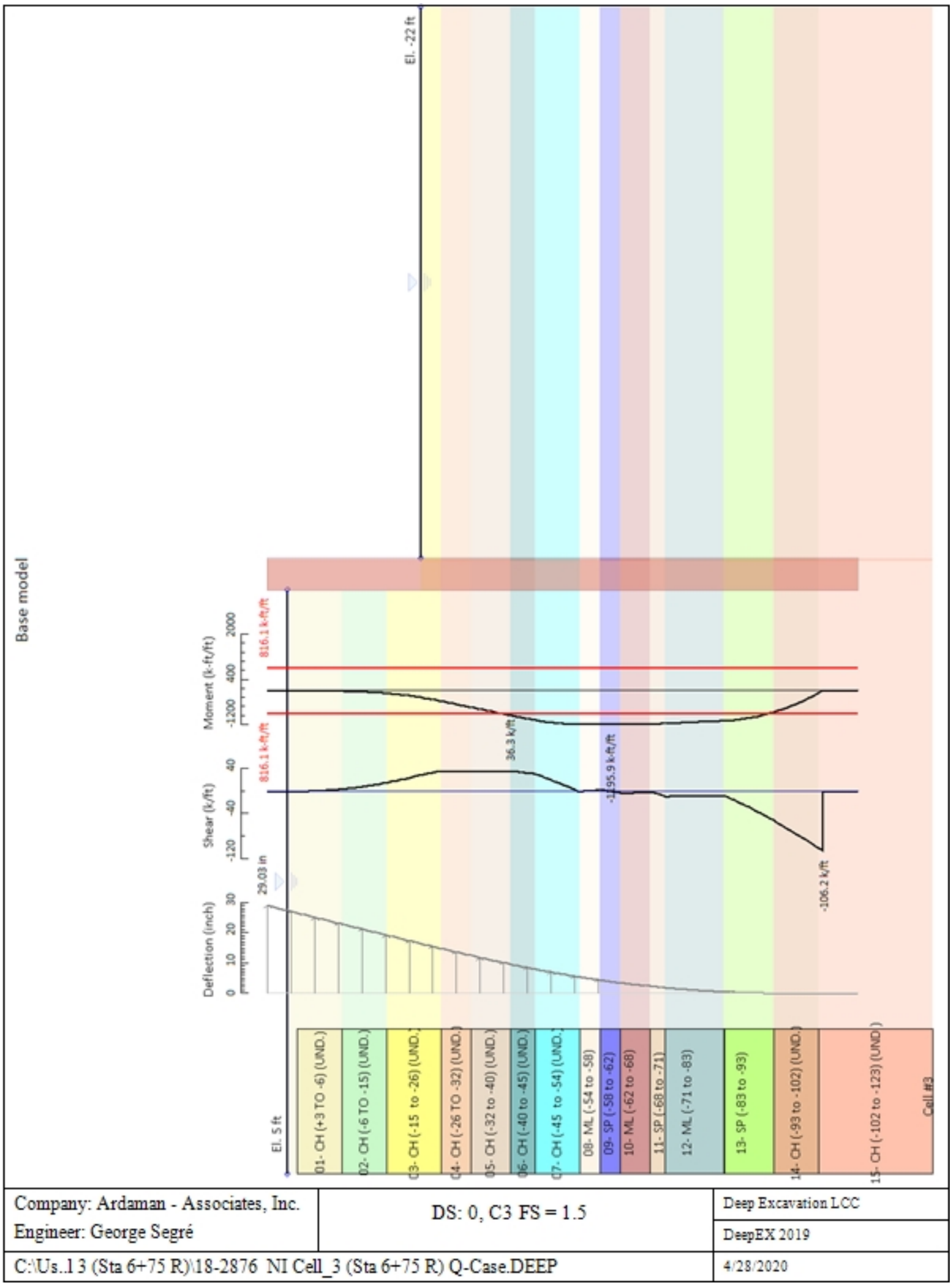

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



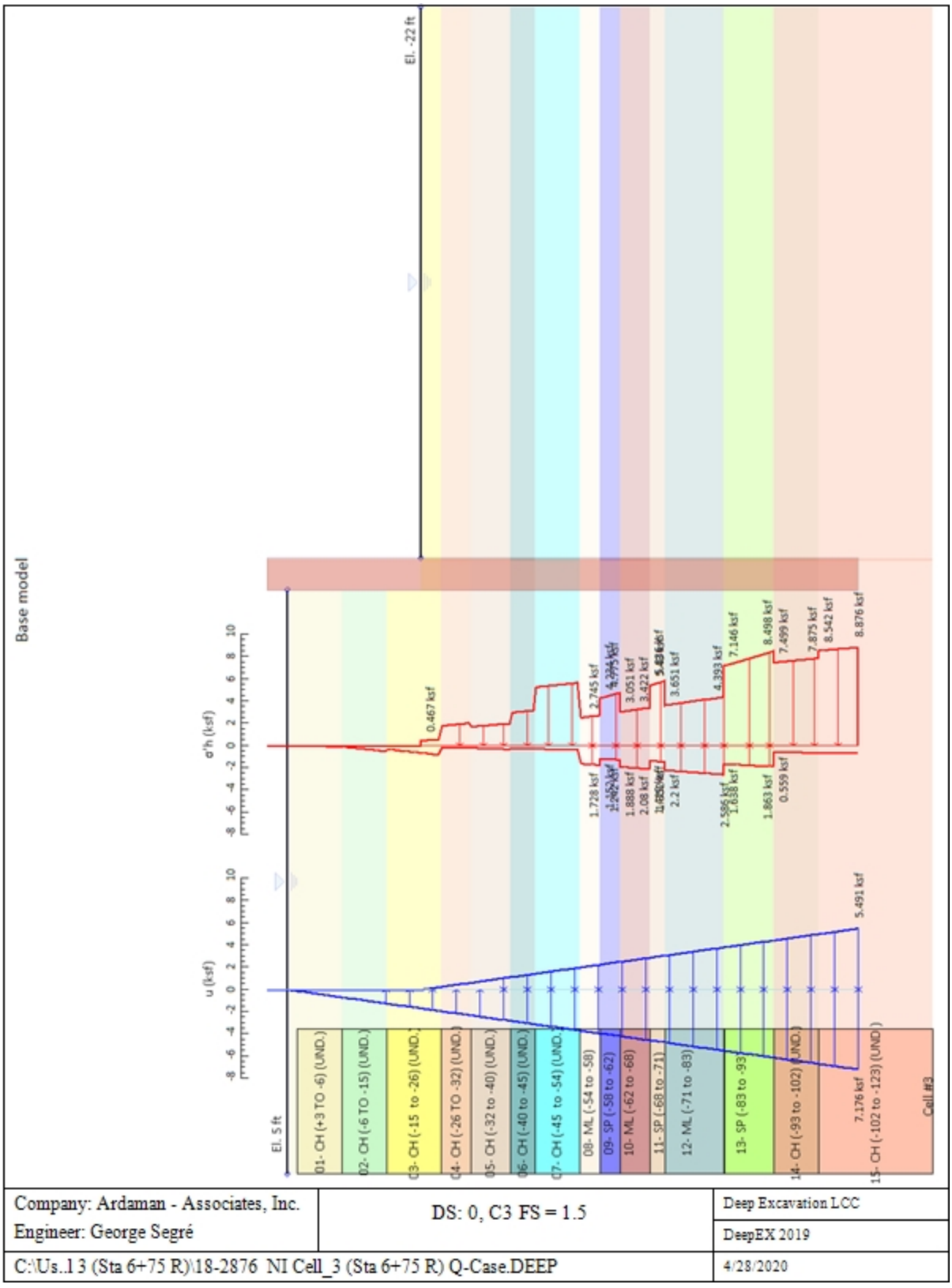

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



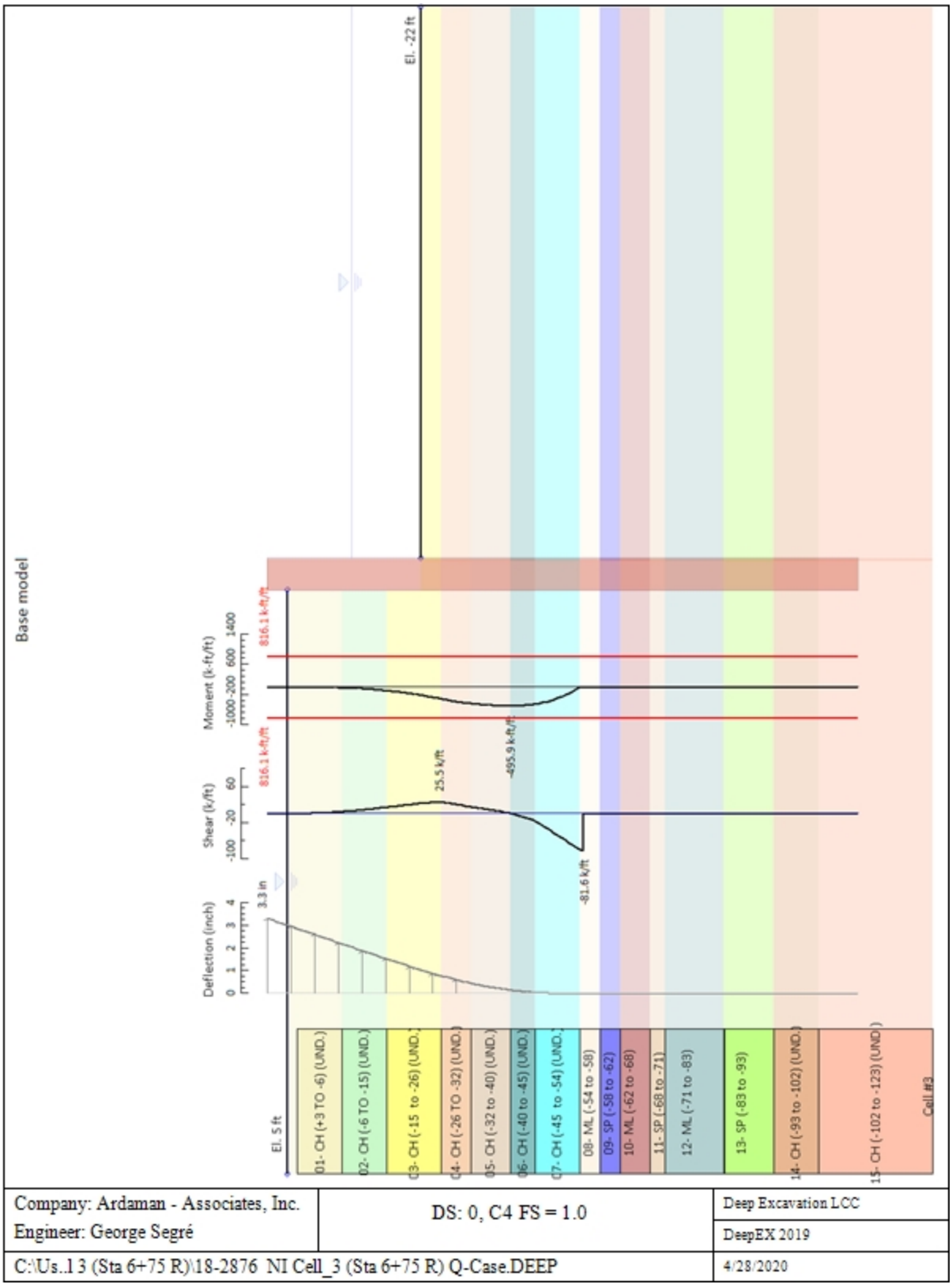

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



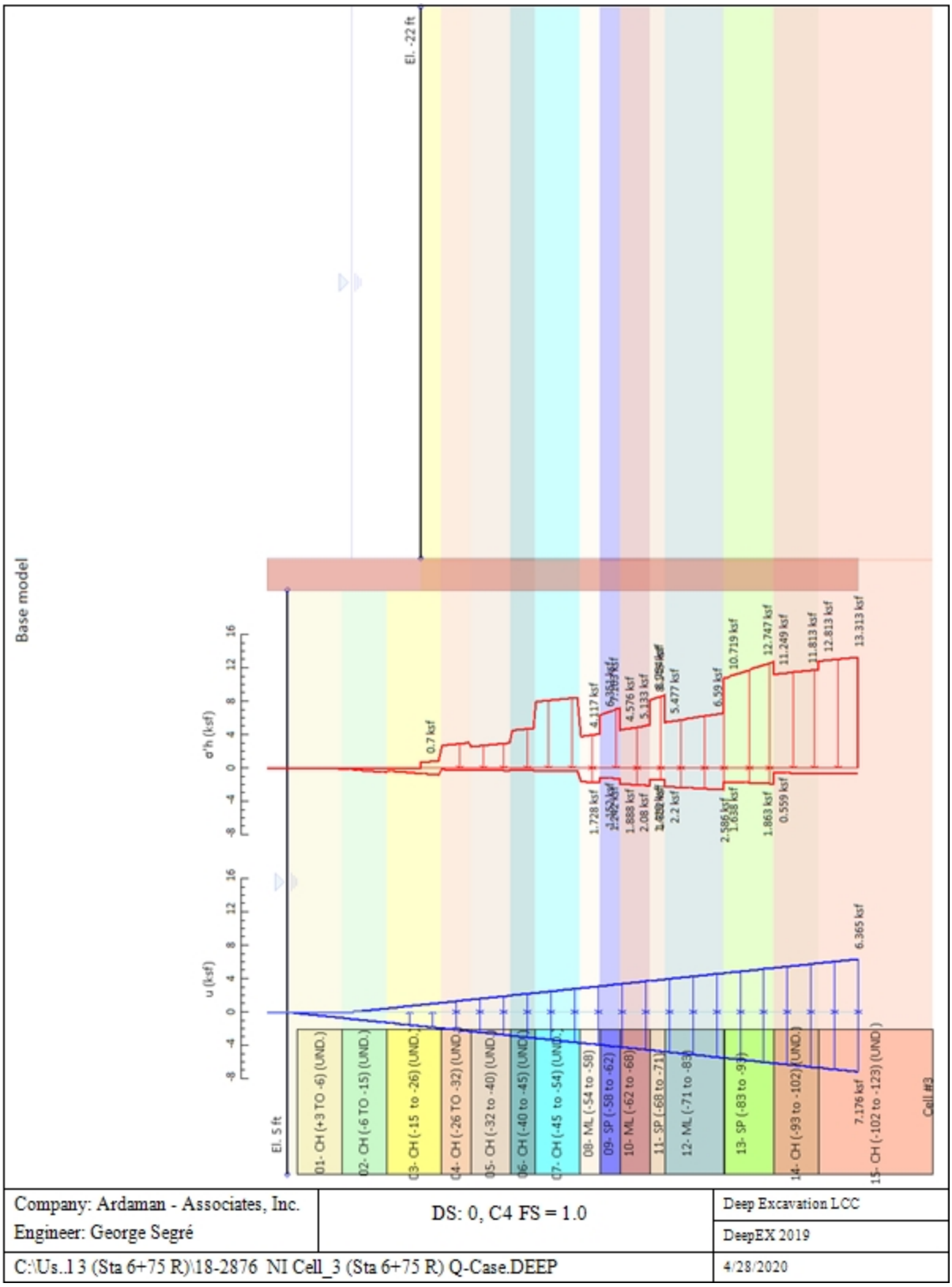

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



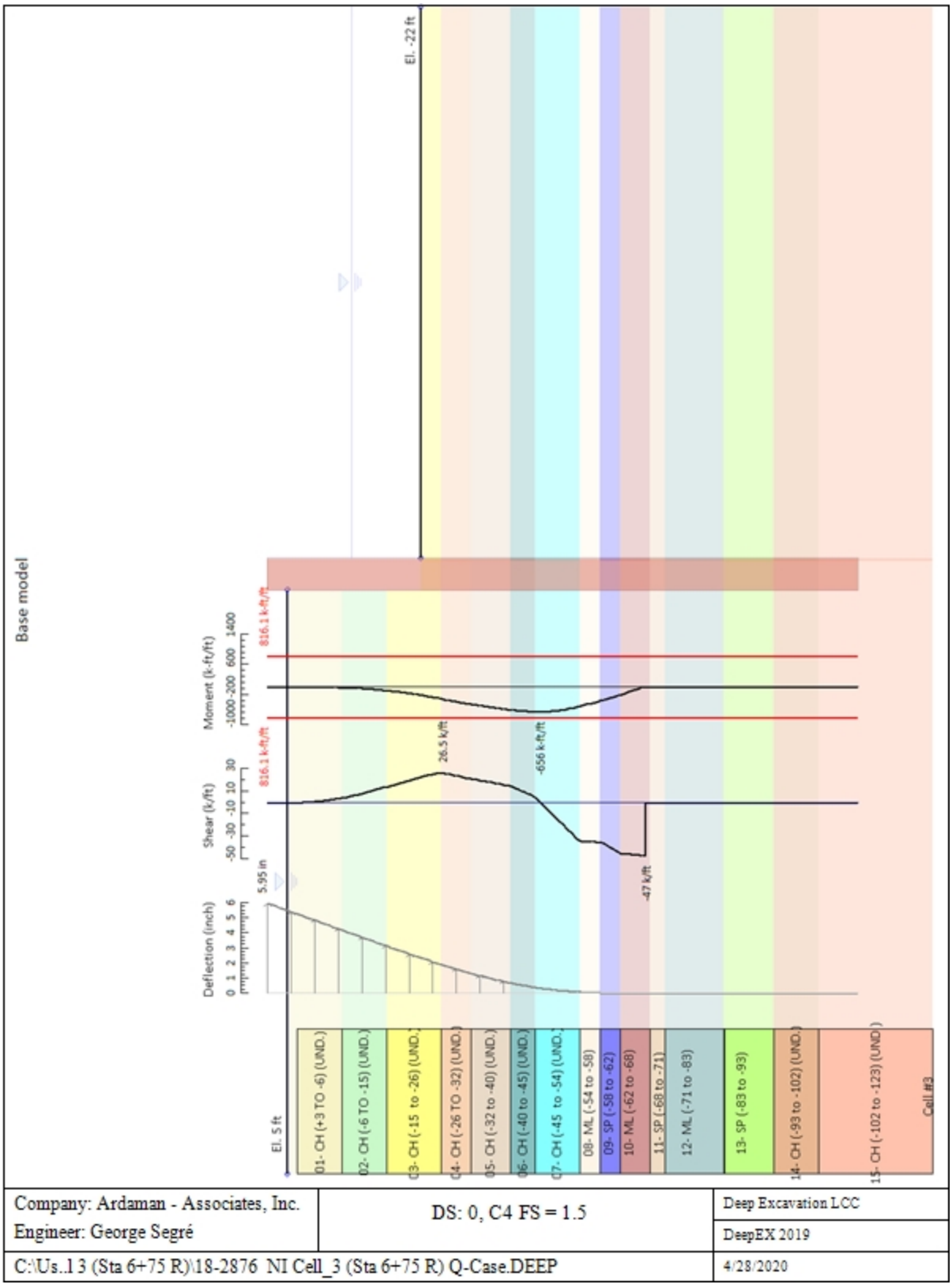

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |



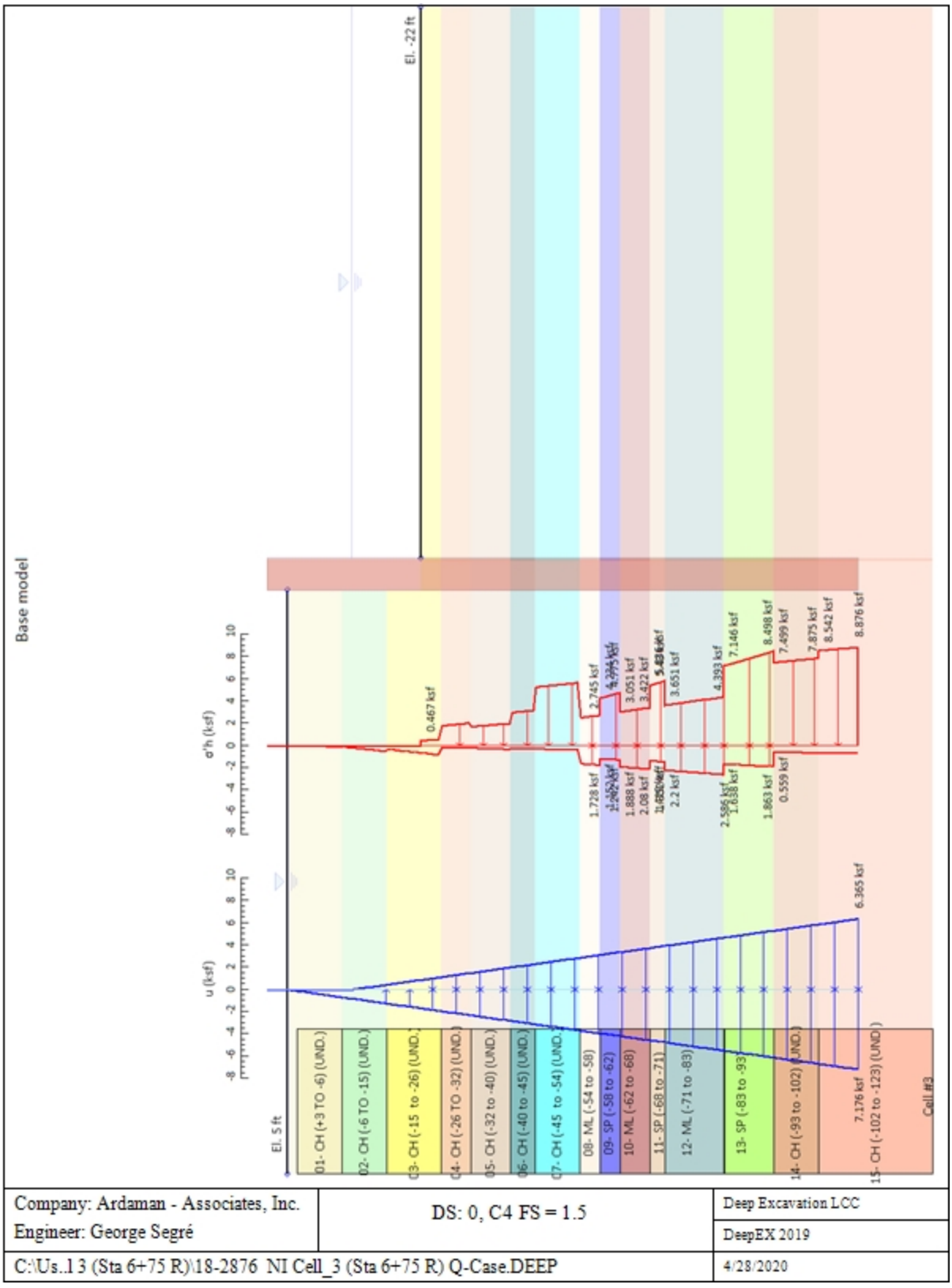

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:47:27 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+3 TO | 115 | 115 | 23 | 0 | 500 | 23 | 23 | 300 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | EXP | |
| 02- CH (-6 TO | 110 | 110 | 23 | 0 | 250 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-15 t | 110 | 110 | 23 | 0 | 350 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-26 T | 124 | 124 | 26 | 0 | 1250 | 26 | 26 | 521.92 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 05- CH (-32 to | 120 | 120 | 26 | 0 | 1000 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- CH (-40 to | 125 | 125 | 26 | 0 | 1730 | 26 | 26 | 626.3 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 07- CH (-45 t | 125 | 125 | 26 | 0 | 3300 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- ML (-54 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 09- SP (-58 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 10- ML (-62 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 11- SP (-68 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 12- ML (-71 t | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 13- SP (-83 to | 130 | 130 | 30 | 0 | N/A | N/A | N/A | 300 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 14- CH (-93 to | 125 | 125 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 15- CH (-102 t | 125 | 125 | 26 | 0 | 4000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+3 TO | 0.4 | 0.1 | 0 | 0.609 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-6 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-15 t | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-26 T | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-32 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- CH (-40 to | 0.35 | 0.1 | 0 | 0.562 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-45 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- ML (-54 t | 0.3 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- SP (-58 to | 0.25 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- ML (-62 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- SP (-68 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 12- ML (-71 t | 0.35 | - | - | 0.531 | 0.8 | - | - | 0 | 0 | 0 | - |
| 13- SP (-83 to | 0.35 | - | - | 0.5 | 0.8 | - | - | 0 | 0 | 0 | - |
| 14- CH (-93 to | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 15- CH (-102 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

## SOIL BORINGS

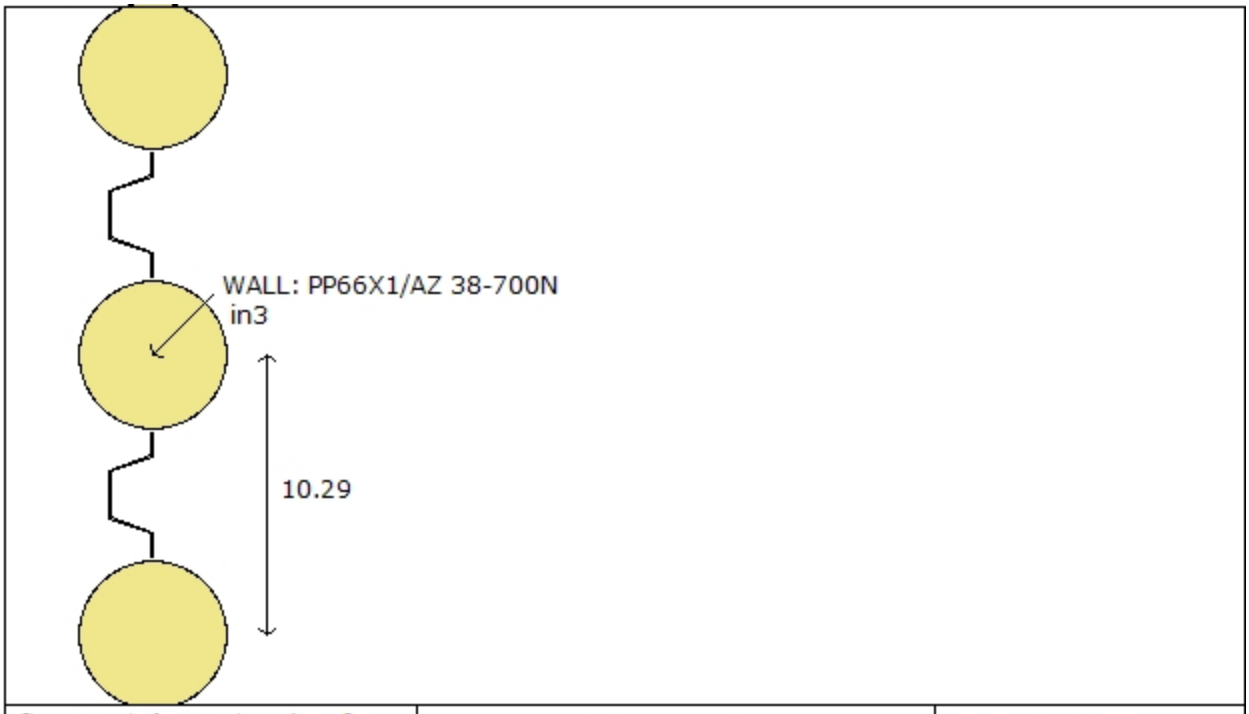
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 3 | 01- CH (+3 TO | 1 | 0.61 |
| -6 | 02- CH (-6 TO - | 1 | 0 |
| -15 | 03- CH (-15 to | 1 | 0.61 |
| -26 | 04- CH (-26 TO | 1 | 0.56 |
| -32 | 05- CH (-32 to | 1 | 0 |
| -40 | 06- CH (-40 to | 1 | 0.56 |
| -45 | 07- CH (-45 to | 1 | 0.56 |
| -54 | 08- ML (-54 to | 1 | 0.53 |
| -58 | 09- SP (-58 to - | 1 | 0.5 |
| -62 | 10- ML (-62 to | 1 | 0.53 |
| -68 | 11- SP (-68 to - | 1 | 0.5 |
| -71 | 12- ML (-71 to | 1 | 0.53 |
| -83 | 13- SP (-83 to - | 1 | 0.5 |
| -93 | 14- CH (-93 to | 1 | 0.56 |
| -102 | 15- CH (-102 t | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | Wall sketch | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |

Wall type: Combined sheet pile wall
Top wall El: 9 ft  Bottom wall El: -140 ft
Hor. wall spacing: 10.29 ft  Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft  Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi  Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.532 | 1.578 | 2.28 |
| Stage 1 | Simple span | N/A | 1.6 | 1.263 | 1.263 | 1.824 |
| Stage 2 | Simple span | N/A | 1.6 | 1.899 | 2.09 | 2.945 |
| Stage 3 | Simple span | N/A | 1.6 | 1.61 | 1.672 | 2.356 |
| Stage 4 | Simple span | N/A | 1.6 | 1.678 | 1.747 | 2.467 |
| Stage 5 | Simple span | N/A | 1.6 | 1.165 | 1.165 | 1.645 |
| Stage 6 | Simple span | N/A | 1.6 | 2.158 | 2.396 | 3.266 |
| Stage 7 | Simple span | N/A | 1.6 | 1.594 | 1.598 | 2.177 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

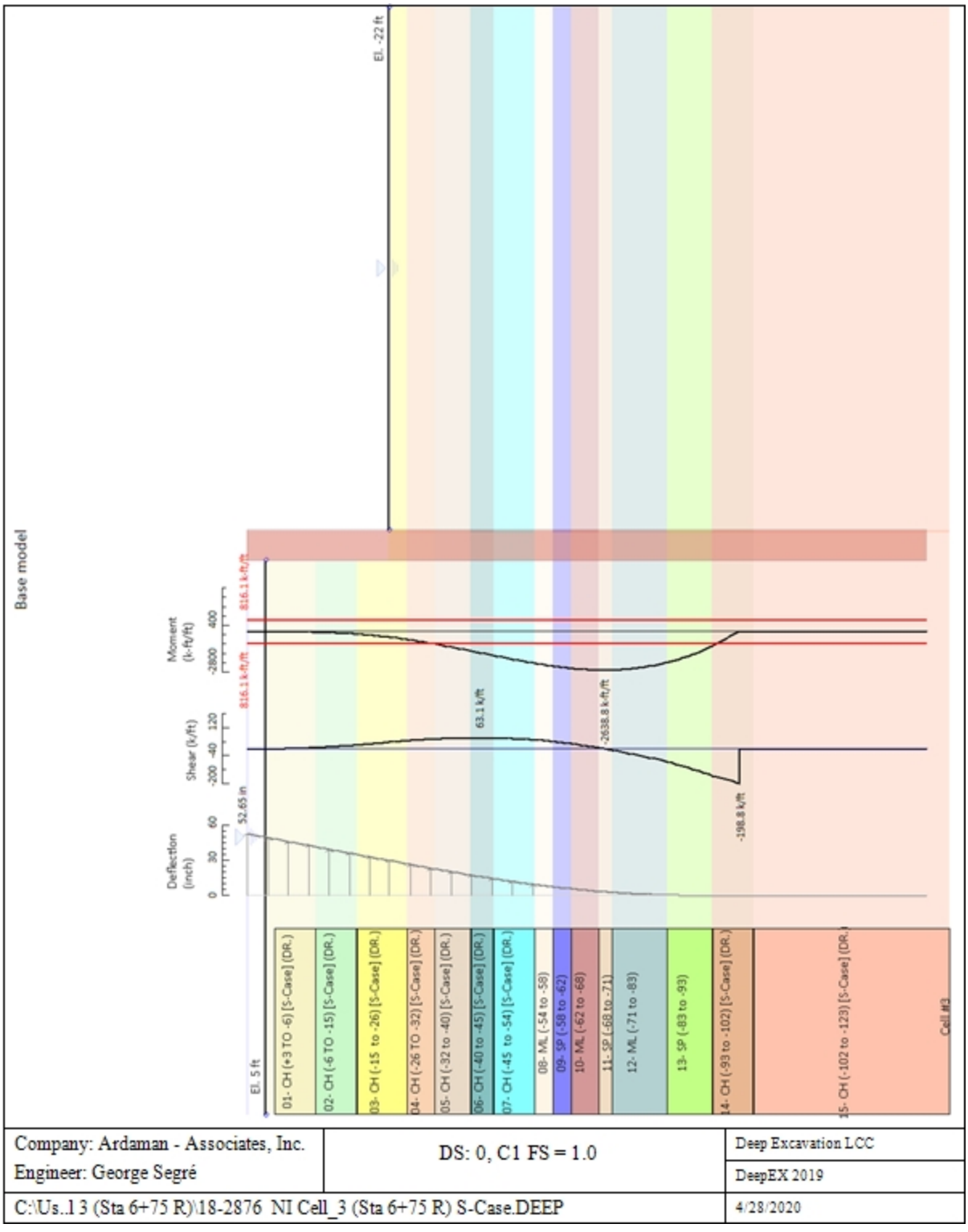
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

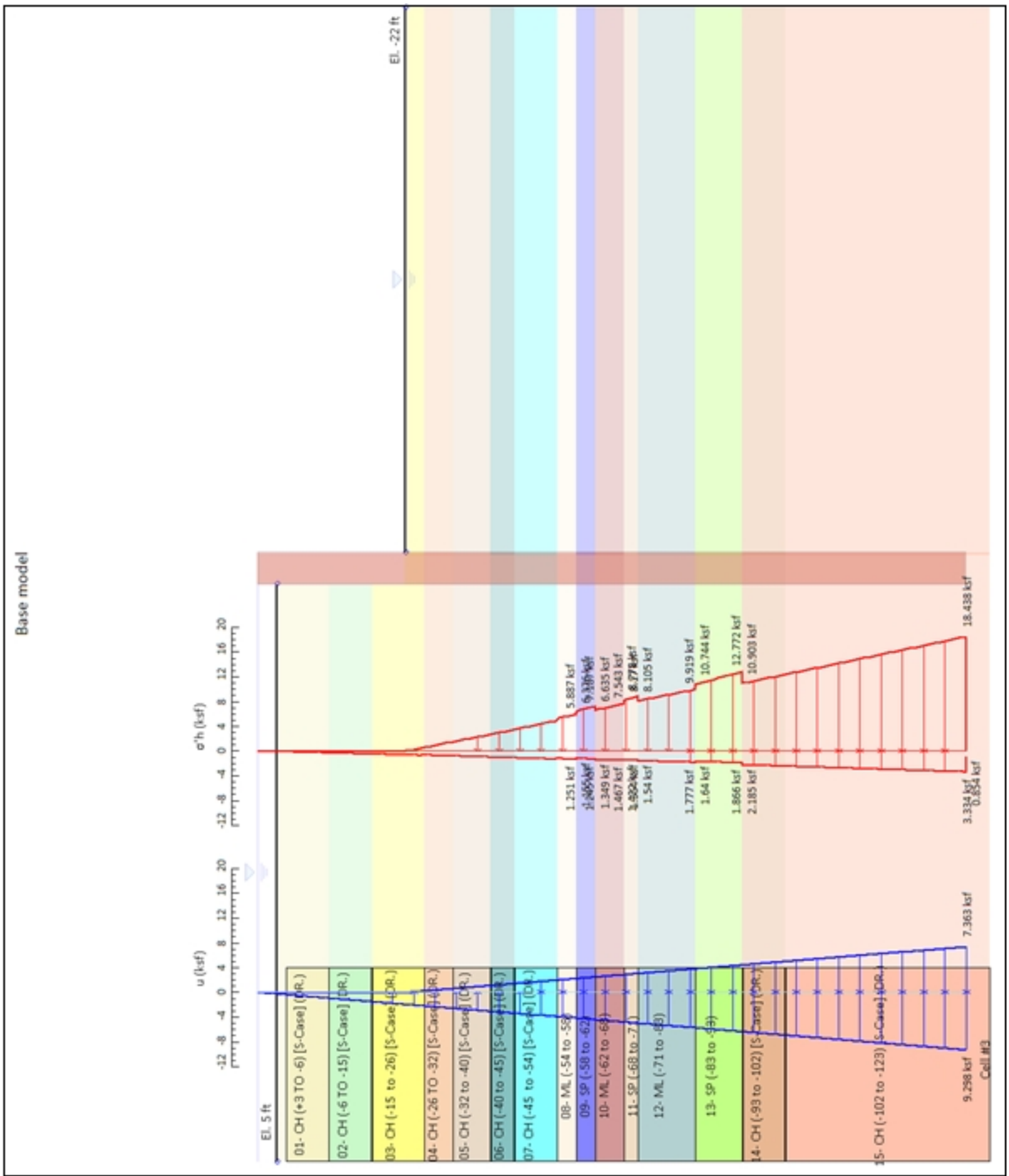
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

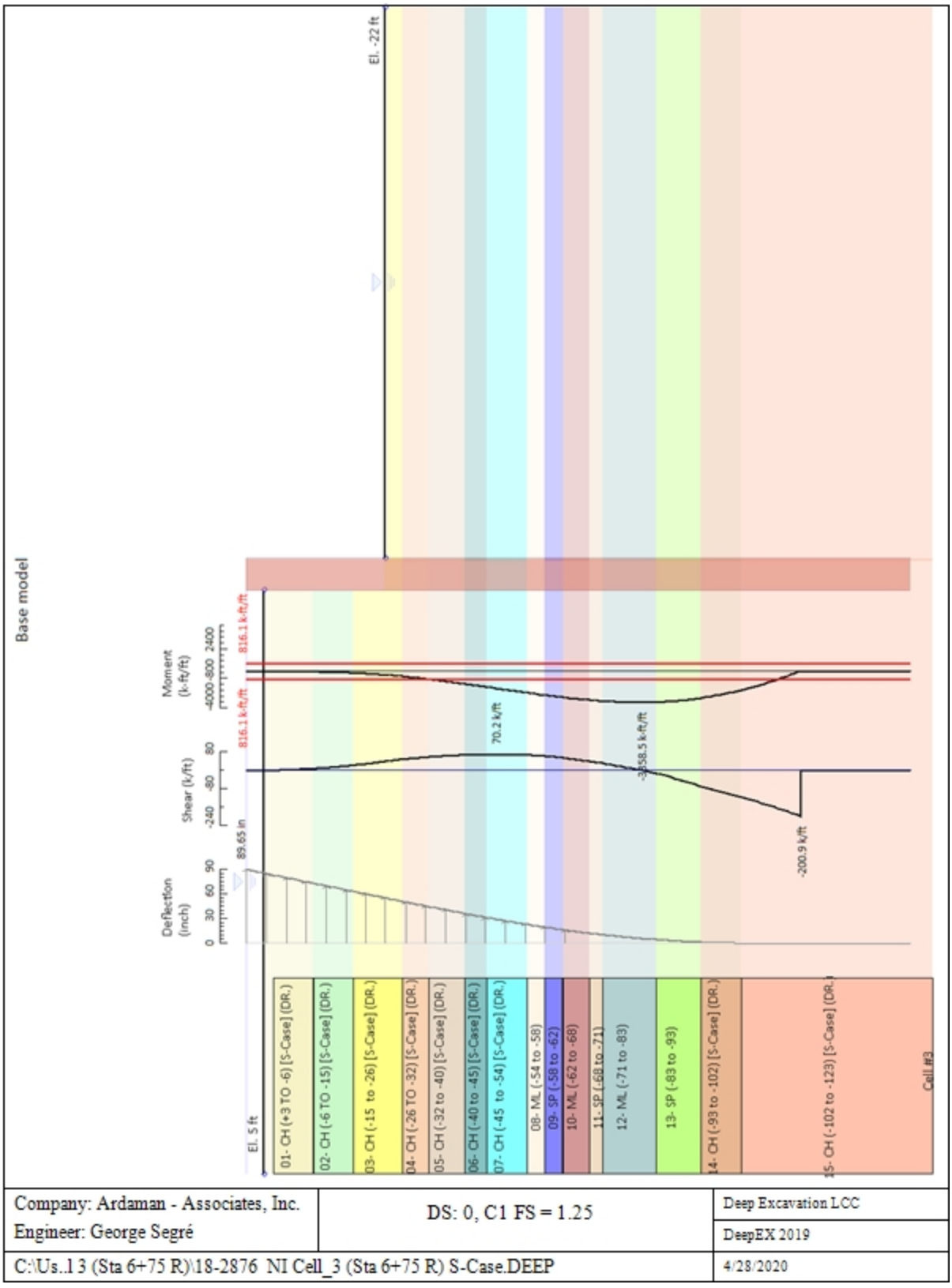
A sequence of figures for each excavation stage is reported



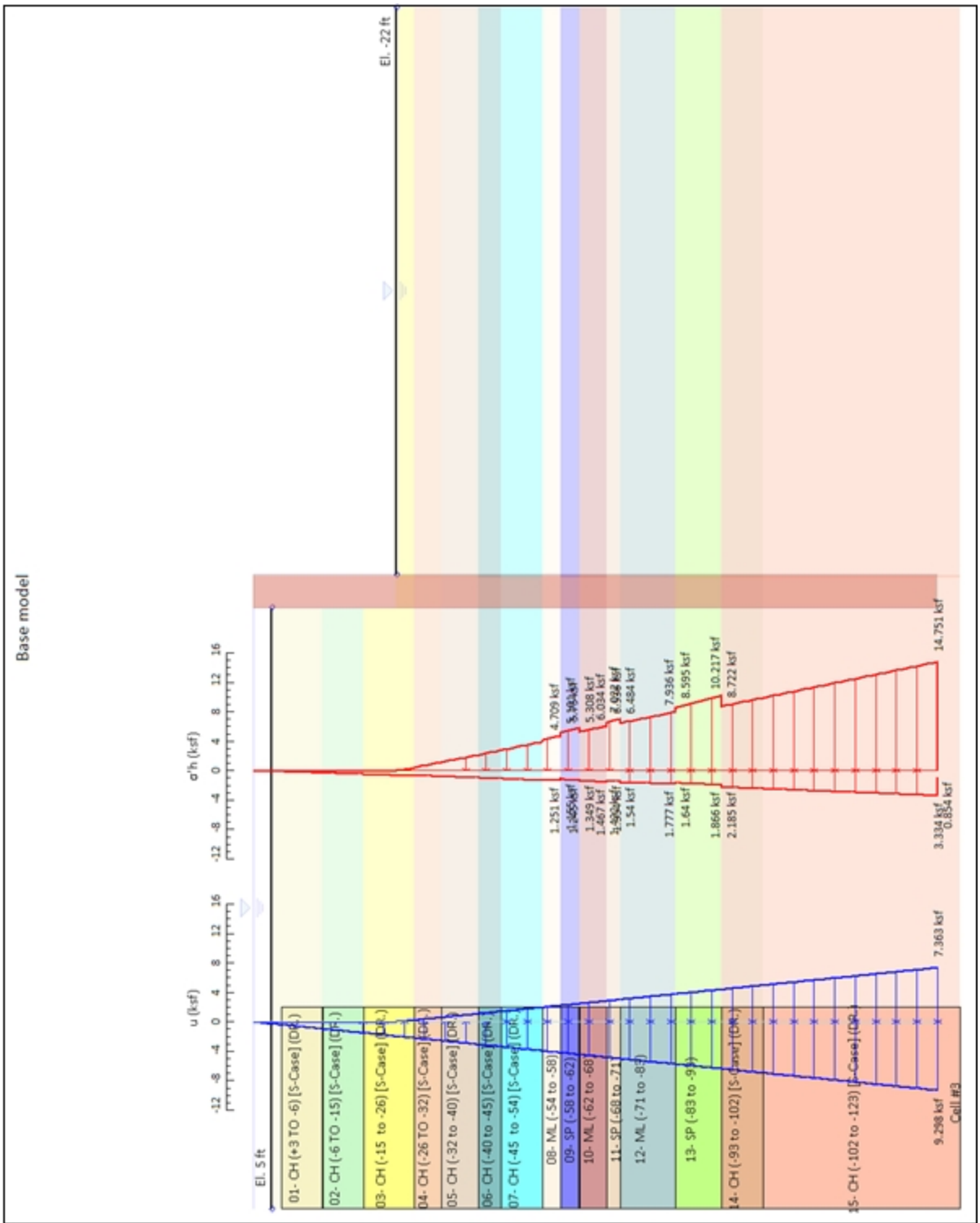

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



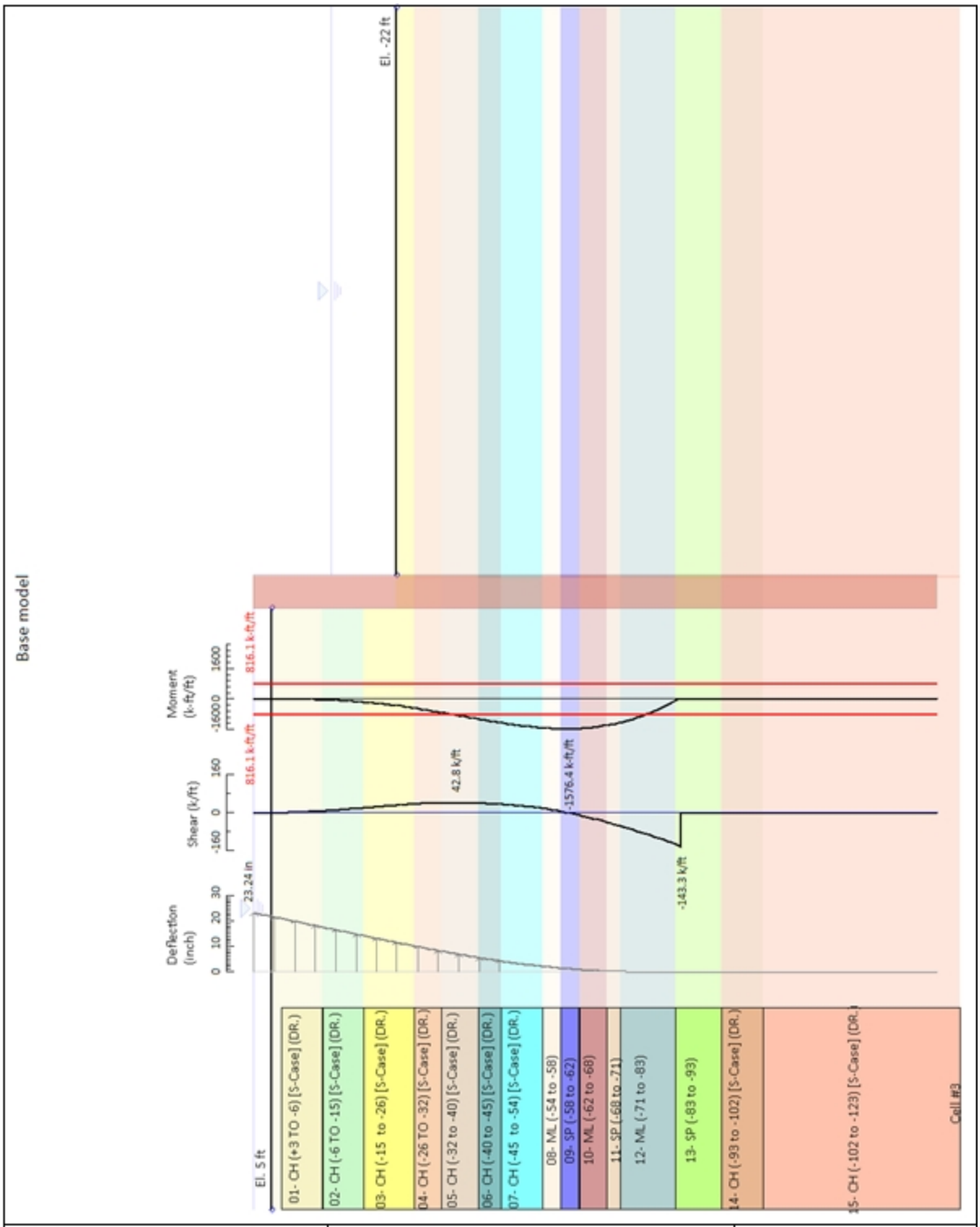

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



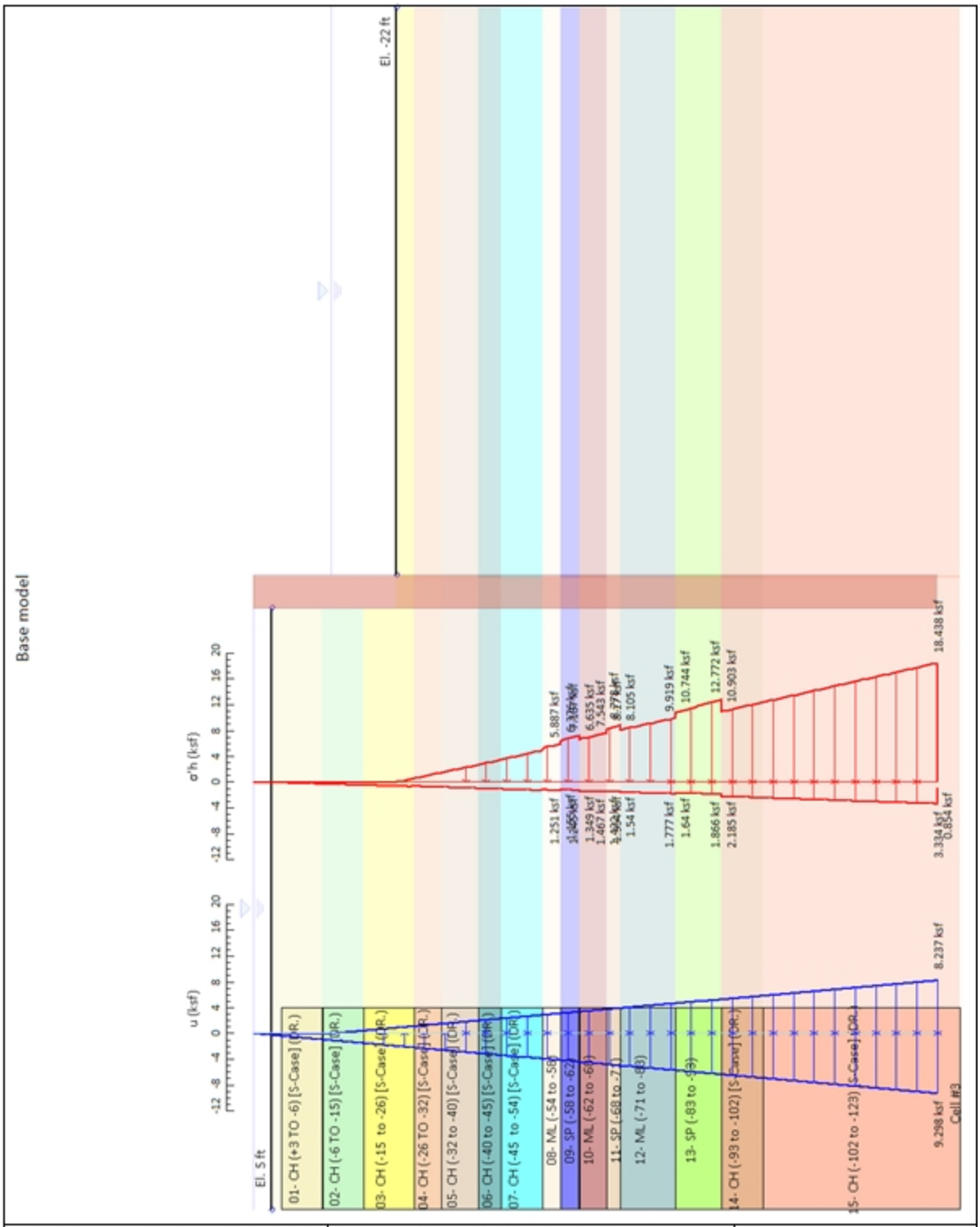

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



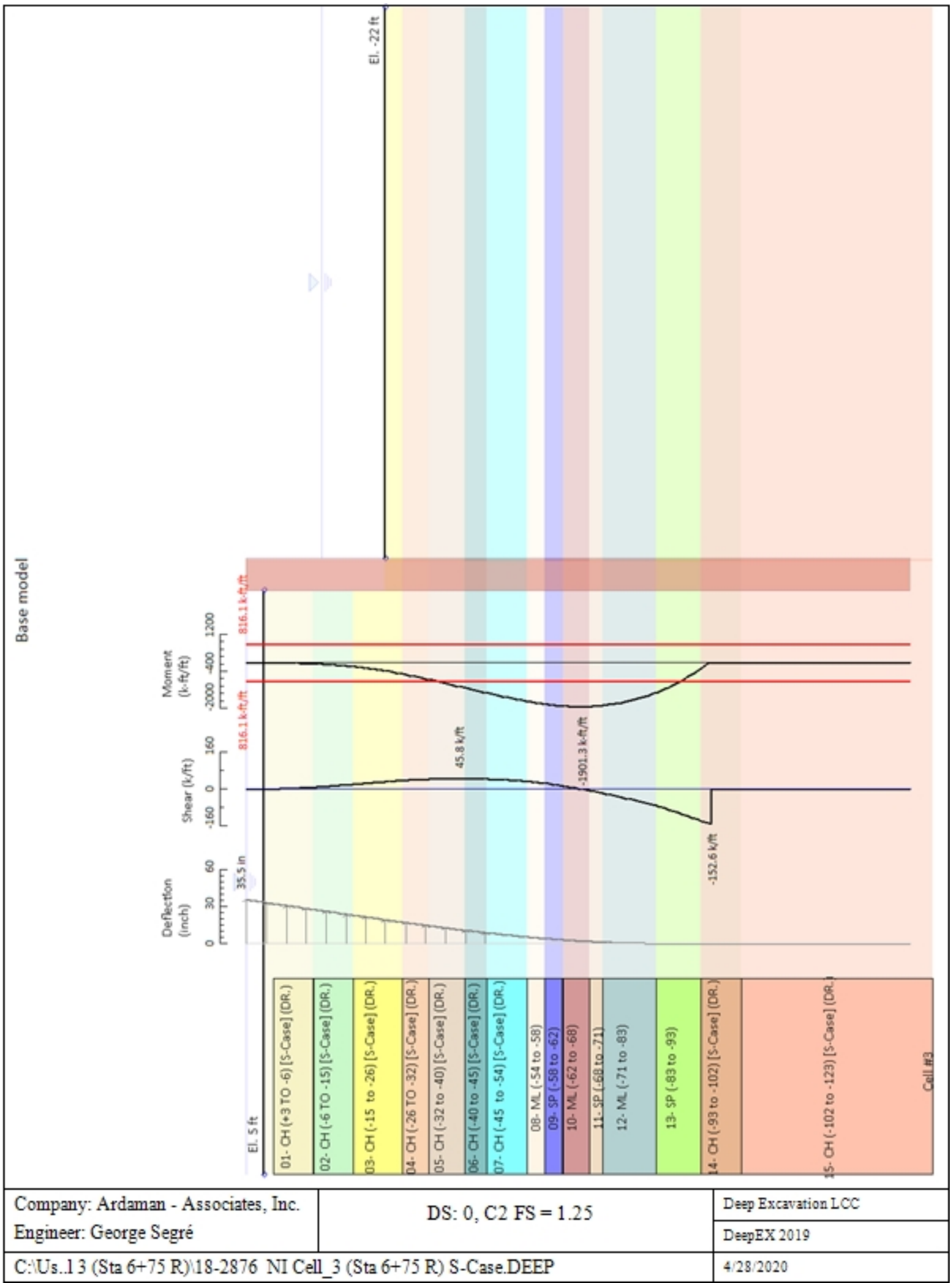

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



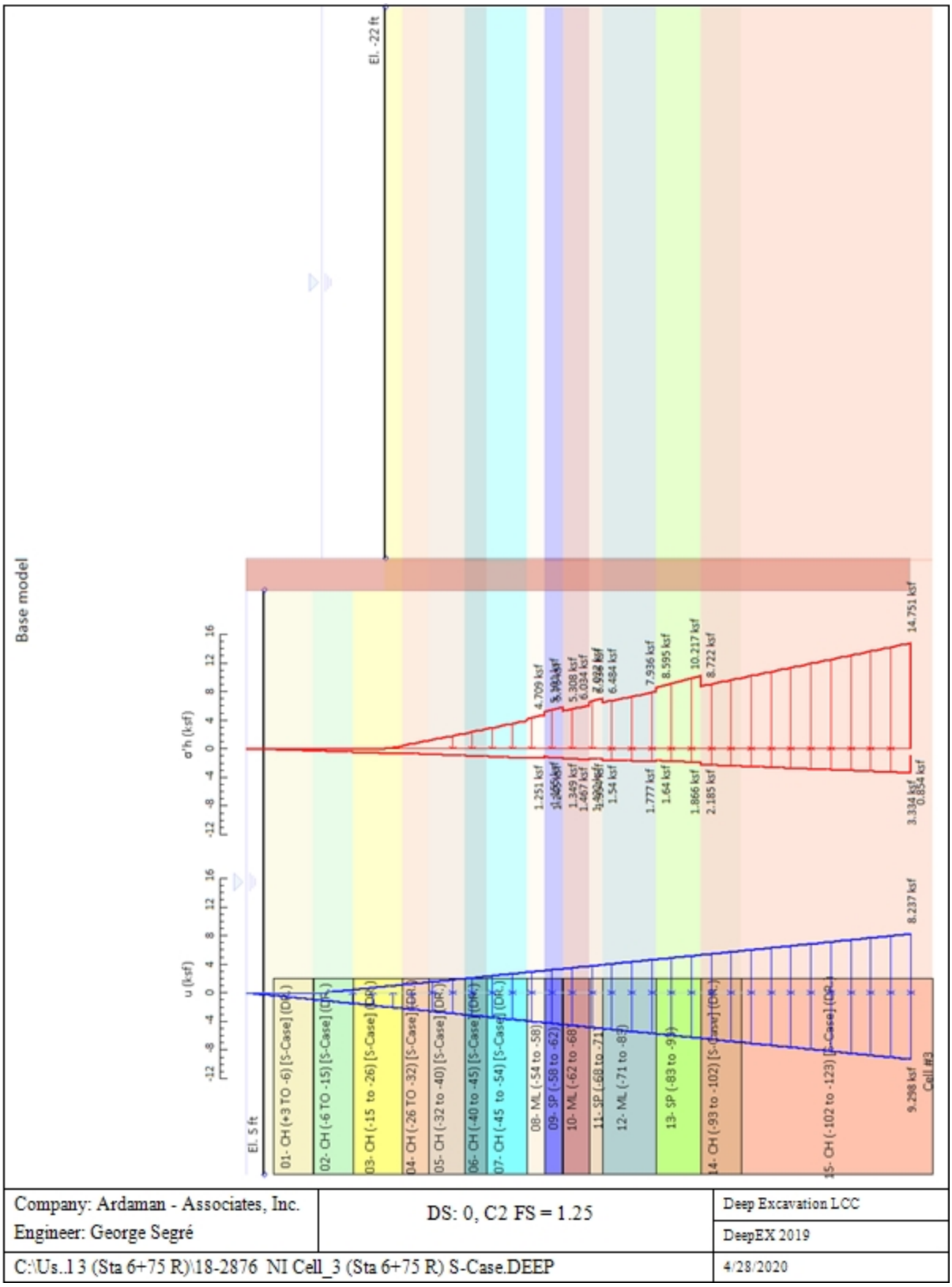

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



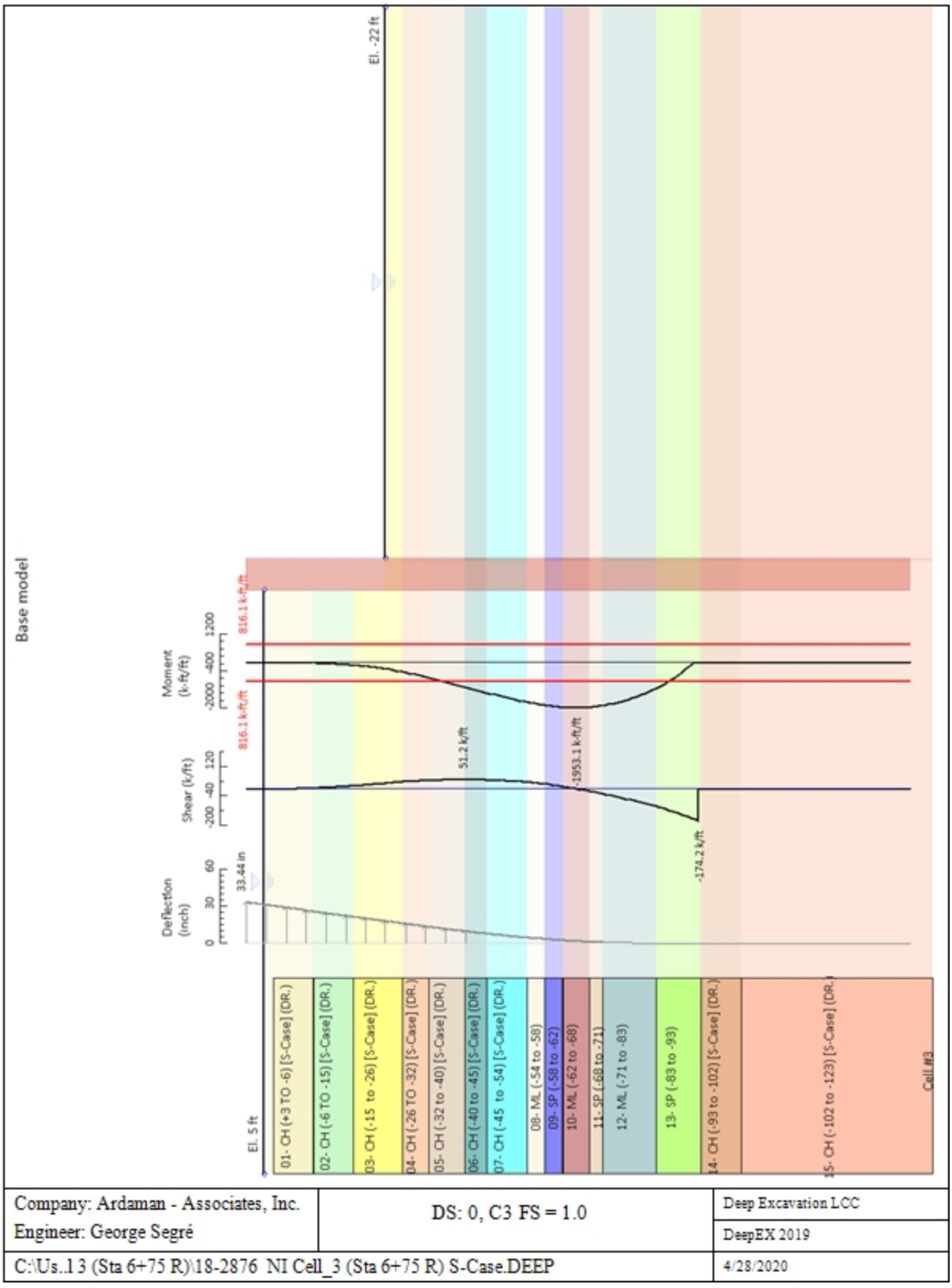

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



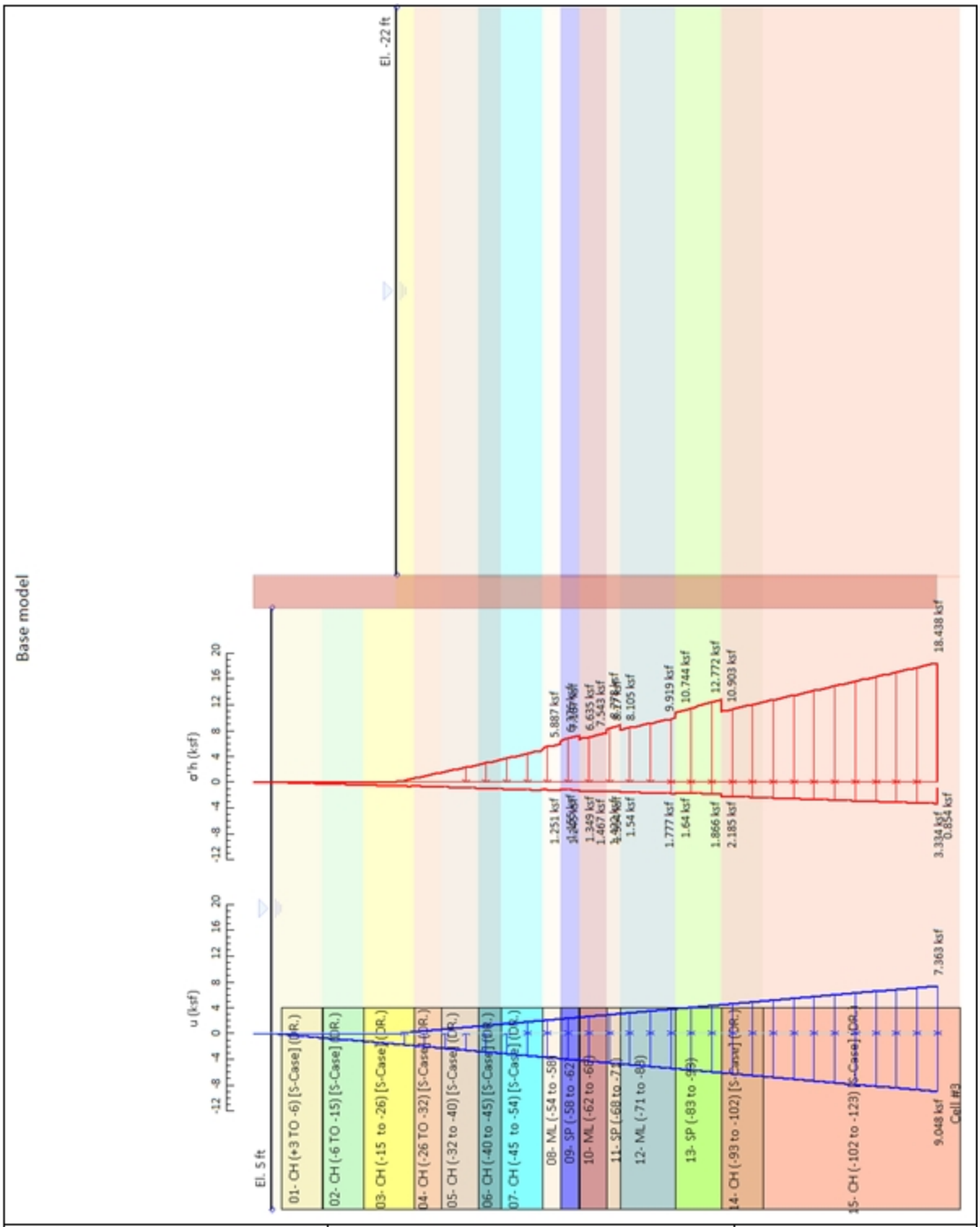

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



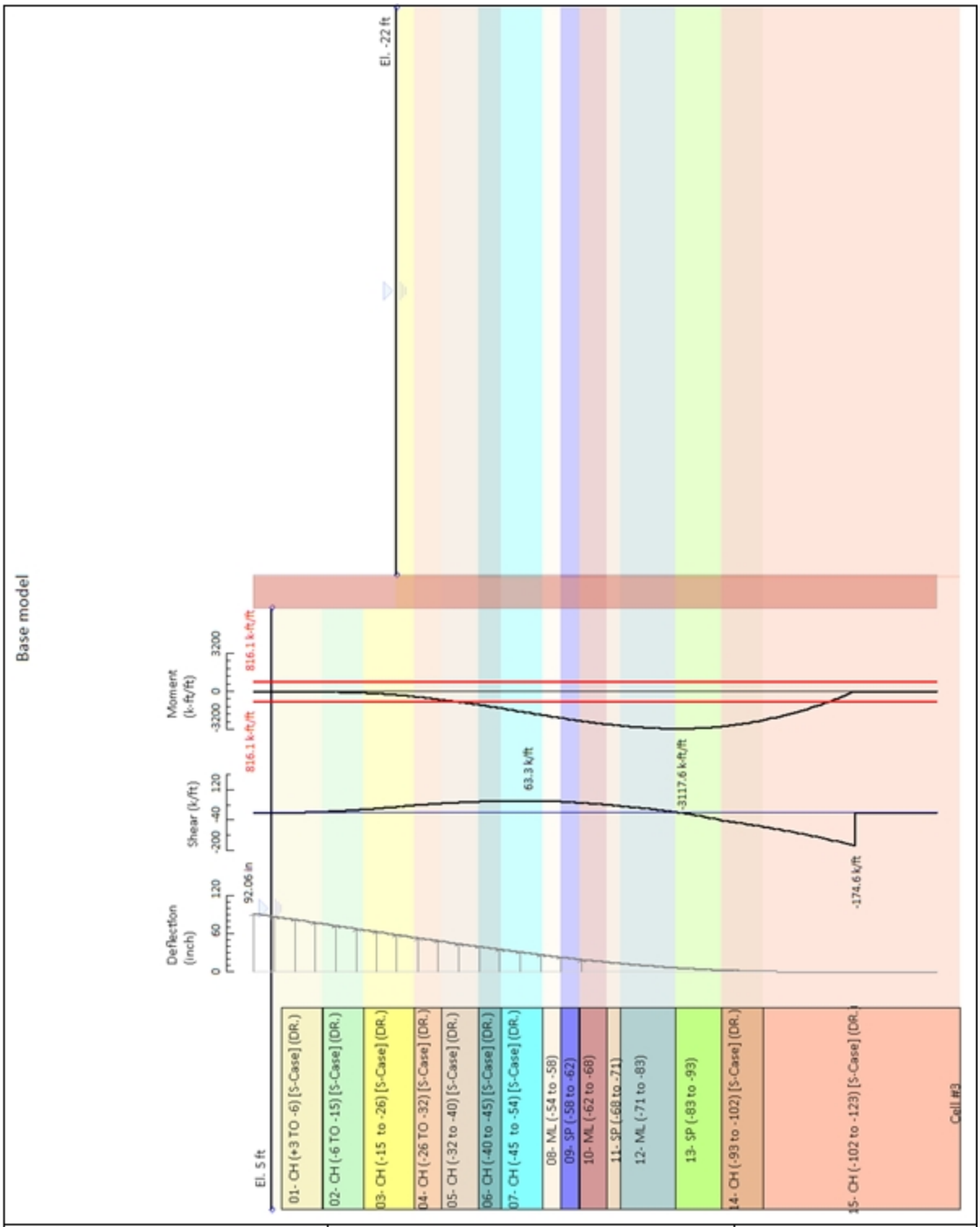

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



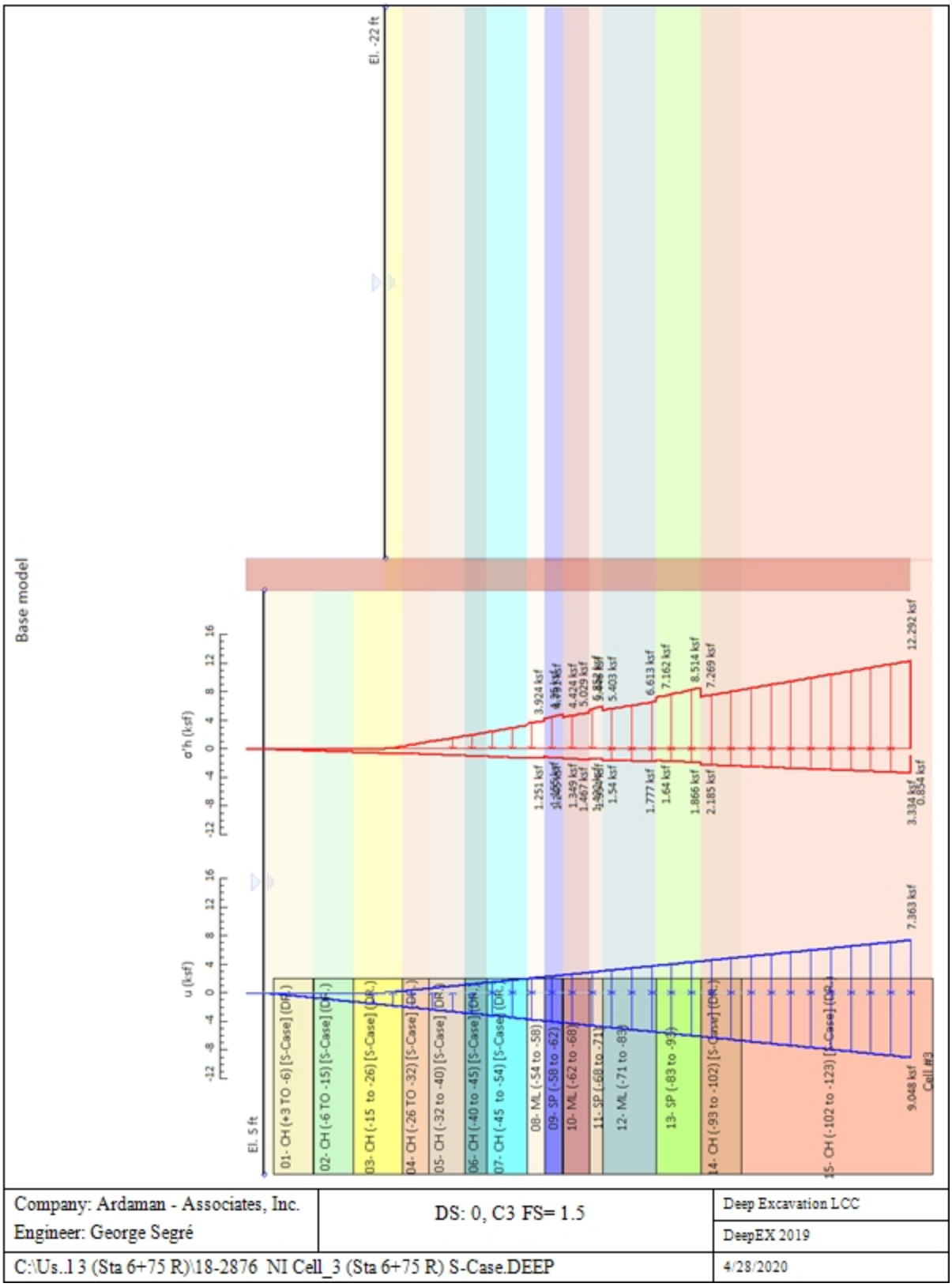

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



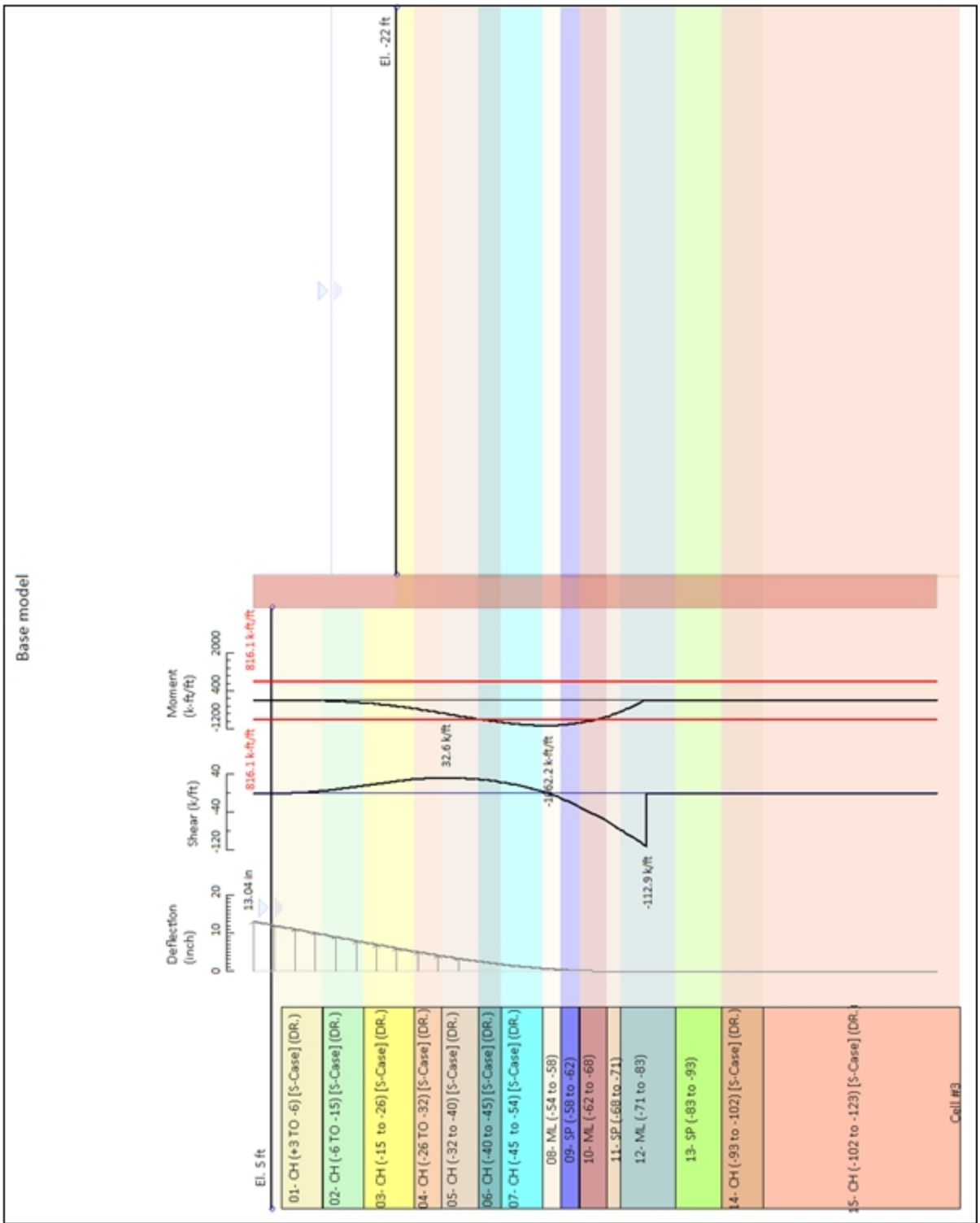

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



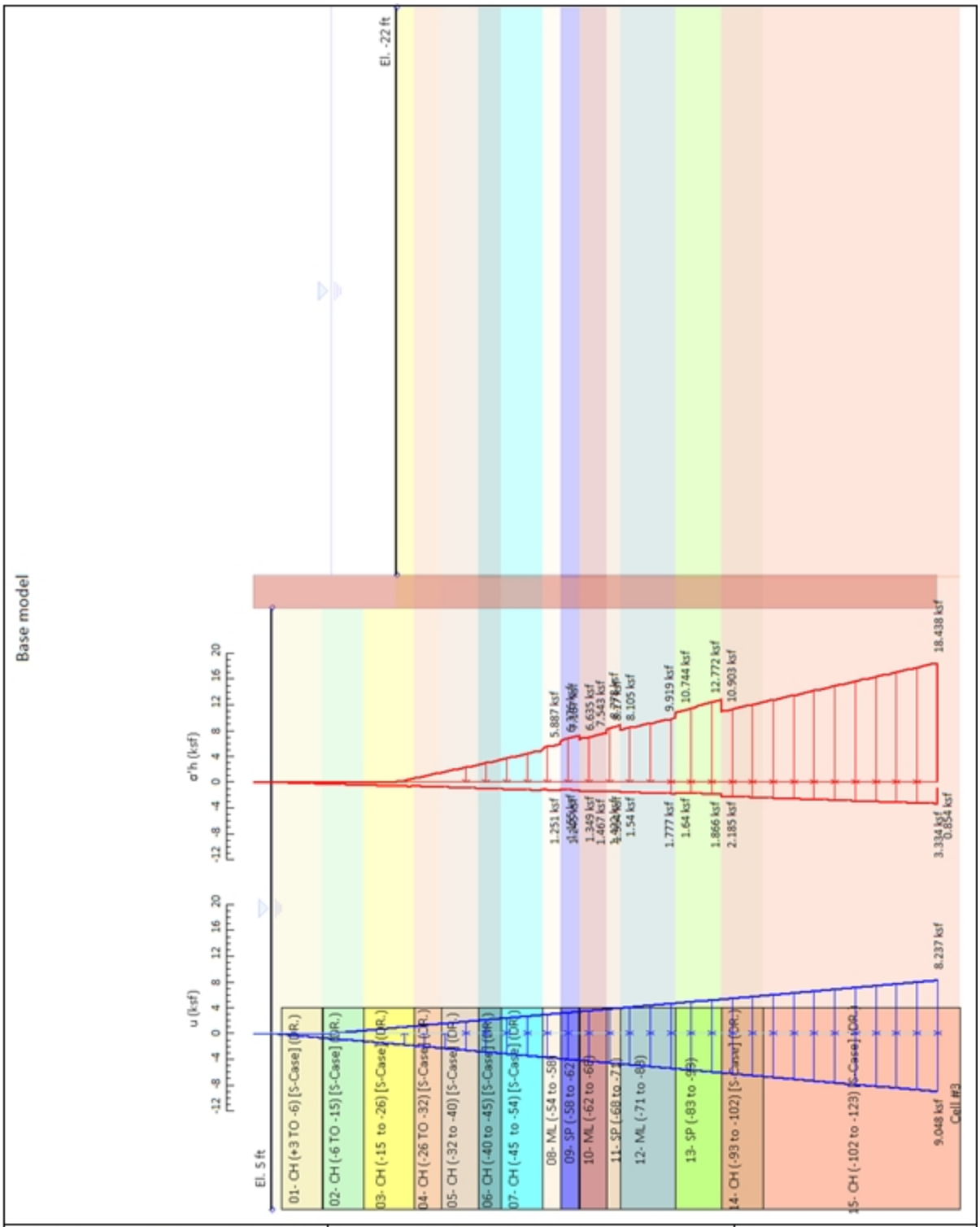

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



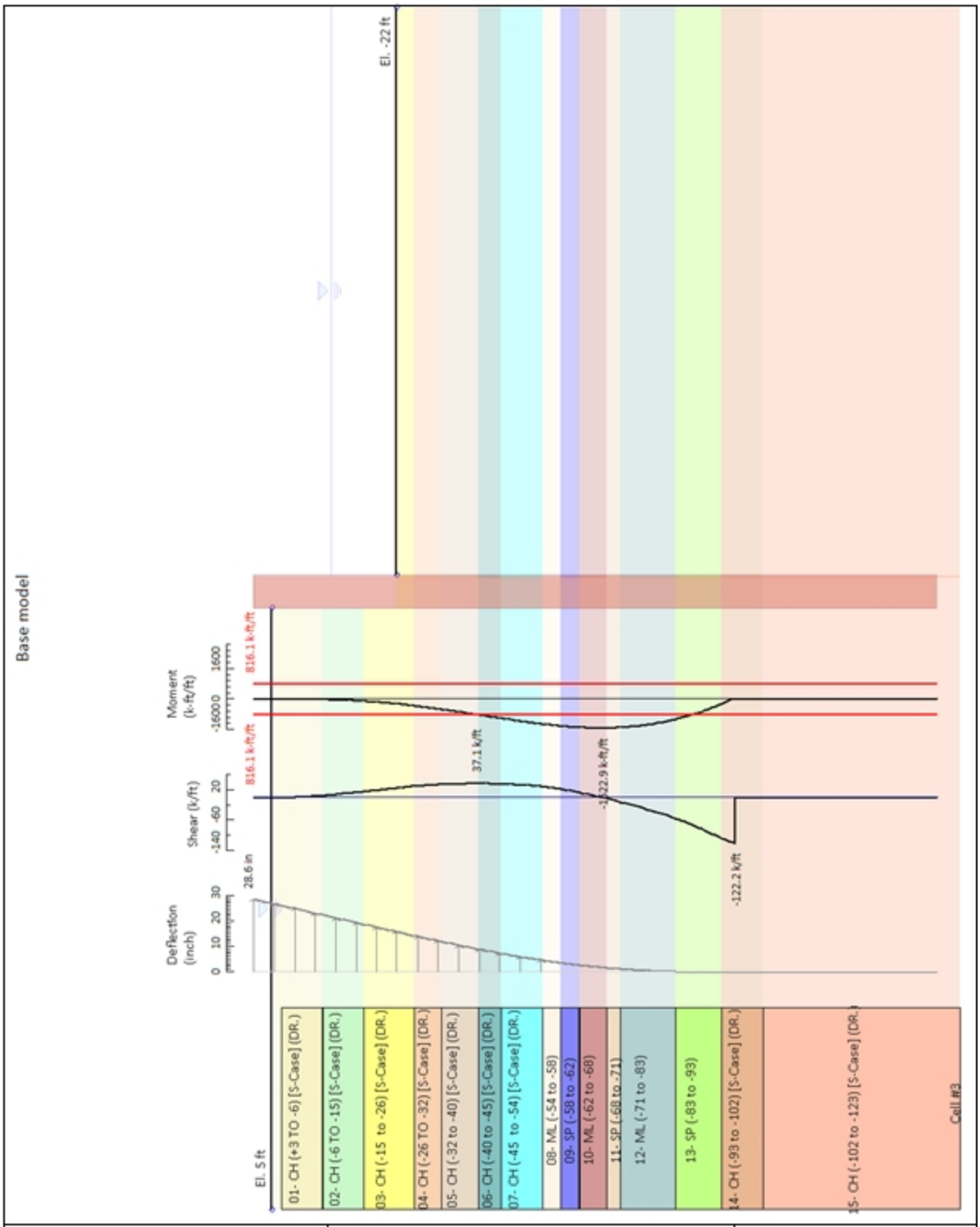

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |



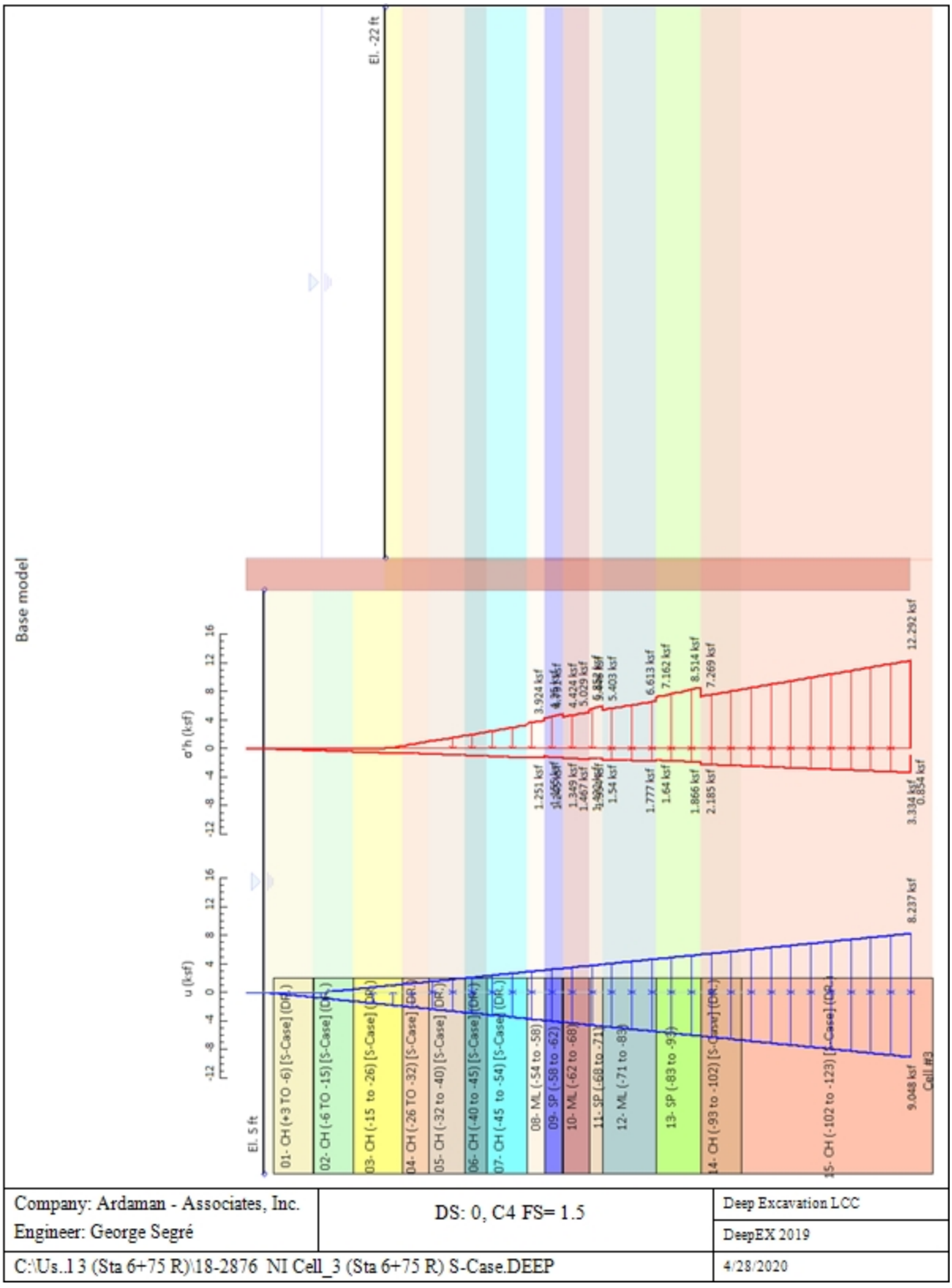

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS= 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS= 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #4 @ Sta. 5+00 Right Wall)

| | | | |
|---|---|---|---|
| Top of Wall = | 9.0 ft., NAVD88 | Design Tip Elev. = | -112.0 ft., NAVD88 |
| Governing Tip Elev. = | -111.62 ft., NAVD88 | Design Length of Sheeting = | 121.0 ft. |
| Length of Sheetting = | 120.62 ft. | | |
| Use = | 121.0 ft. | | |

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -20 | 1.00 | 1.00 | -68.39 | 1,157.34 | 106.26 | 10.83 |
| | | Open excavation - degraded | 9 | -20 | 1.00 | 1.25 | -79.29 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -59.12 | 793.11 | 99.42 | 5.85 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -65.67 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -20 | 1.00 | 1.00 | -61.31 | 808.06 | 89.20 | 6.15 |
| | | Open excavation - degraded | 5 | -20 | 1.00 | 1.50 | -81.47 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -53.67 | 496.49 | 85.26 | 3.02 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -62.94 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -20 | 1.00 | 1.00 | -93.56 | 2,238.97 | 198.79 | 39.90 |
| | | Open excavation - degraded | 9 | -20 | 1.00 | 1.25 | -106.46 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -81.30 | 1,350.54 | 141.51 | 18.96 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -90.97 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -20 | 1.00 | 1.00 | -87.10 | 1,618.84 | 158.36 | 25.11 |
| | | Open excavation - degraded | 5 | -20 | 1.00 | 1.50 | -111.62 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -74.20 | 863.52 | 104.78 | 10.30 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -92.26 | -- | -- | -- |
| | | | | | | Governing Value: | -111.62 | 2,238.97 | 198.79 | 39.90 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:54:41 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+5 TO | 118 | 118 | 0 | 0 | 1000 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-1 TO | 116 | 116 | 0 | 0 | 350 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-7 to | 116 | 116 | 0 | 0 | 500 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-14 T | 123 | 123 | 0 | 0 | 940 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-20 to | 115 | 115 | 0 | 0 | 350 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-26 to | 125 | 125 | 30 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 07- CH (-38 t | 100 | 100 | 0 | 0 | 2500 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-43 to | 100 | 10 | 0 | 0 | 3000 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 09- CH (-49 to | 100 | 100 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 10- SP (-56 to | 128 | 128 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+5 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-1 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-7 to | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-14 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-20 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-26 to | 0.35 | - | - | 0.5 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-38 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-43 to | 0.3 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-49 to | 0.25 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-56 to | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

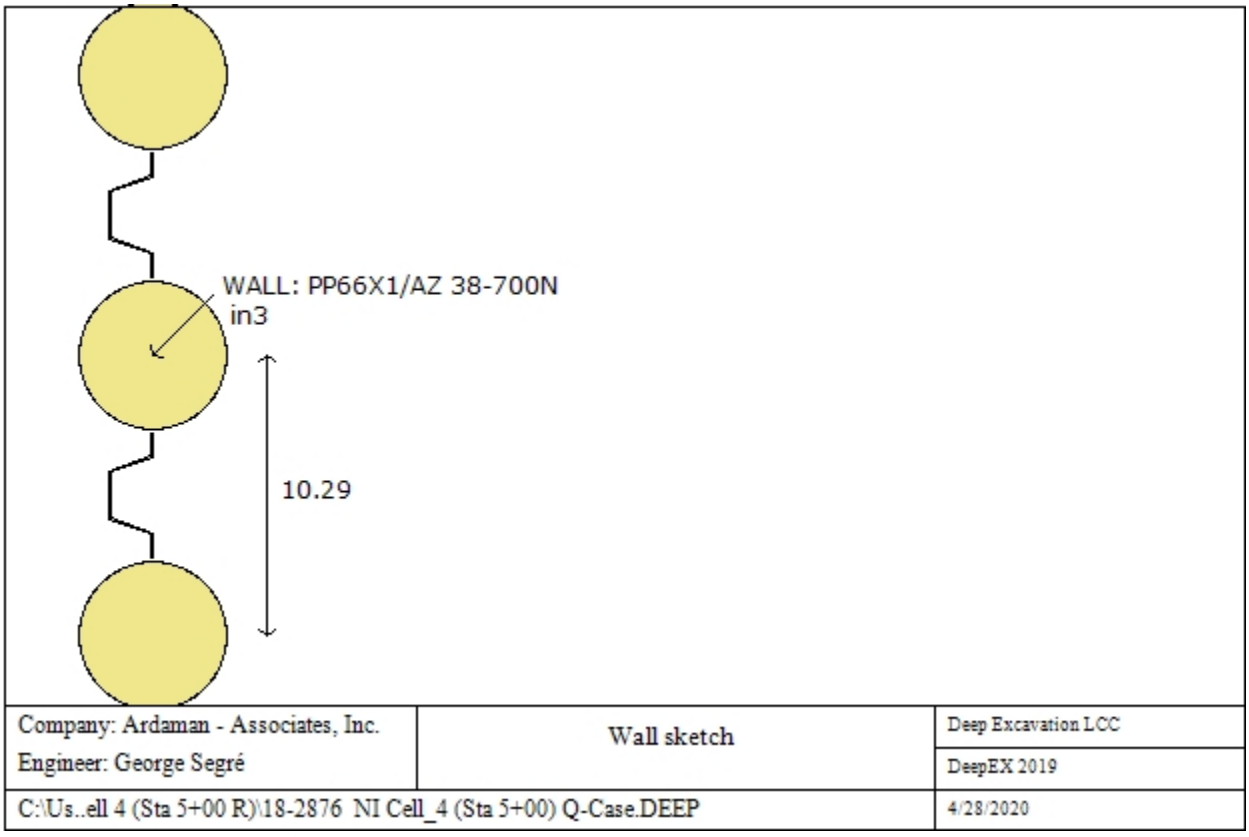
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 10 | 01- CH (+5 TO | 1 | 1 |
| -1 | 02- CH (-1 TO - | 1 | 1 |
| -7 | 03- CH (-7 to - | 1 | 1 |
| -14 | 04- CH (-14 TO | 1 | 1 |
| -20 | 05- CH (-20 to | 1 | 1 |
| -26 | 06- SP (-26 to - | 1 | 0.5 |
| -38 | 07- CH (-38 to | 1 | 1 |
| -43 | 08- CH (-43 to | 1 | 1 |
| -49 | 09- CH (-49 to | 1 | 1 |
| -56 | 10- SP (-56 to - | 1 | 0.47 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.653 | 1.666 | 2.445 |
| Stage 1 | Simple span | N/A | 1.6 | 1.333 | 1.333 | 1.956 |
| Stage 2 | Simple span | N/A | 1.6 | 2.045 | 2.258 | 3.283 |
| Stage 3 | Simple span | N/A | 1.6 | 1.752 | 1.806 | 2.627 |
| Stage 4 | Simple span | N/A | 1.6 | 1.884 | 1.884 | 2.634 |
| Stage 5 | Simple span | N/A | 1.6 | 1.256 | 1.256 | 1.756 |
| Stage 6 | Simple span | N/A | 1.6 | 2.376 | 2.677 | 3.633 |
| Stage 7 | Simple span | N/A | 1.6 | 1.785 | 1.785 | 2.422 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

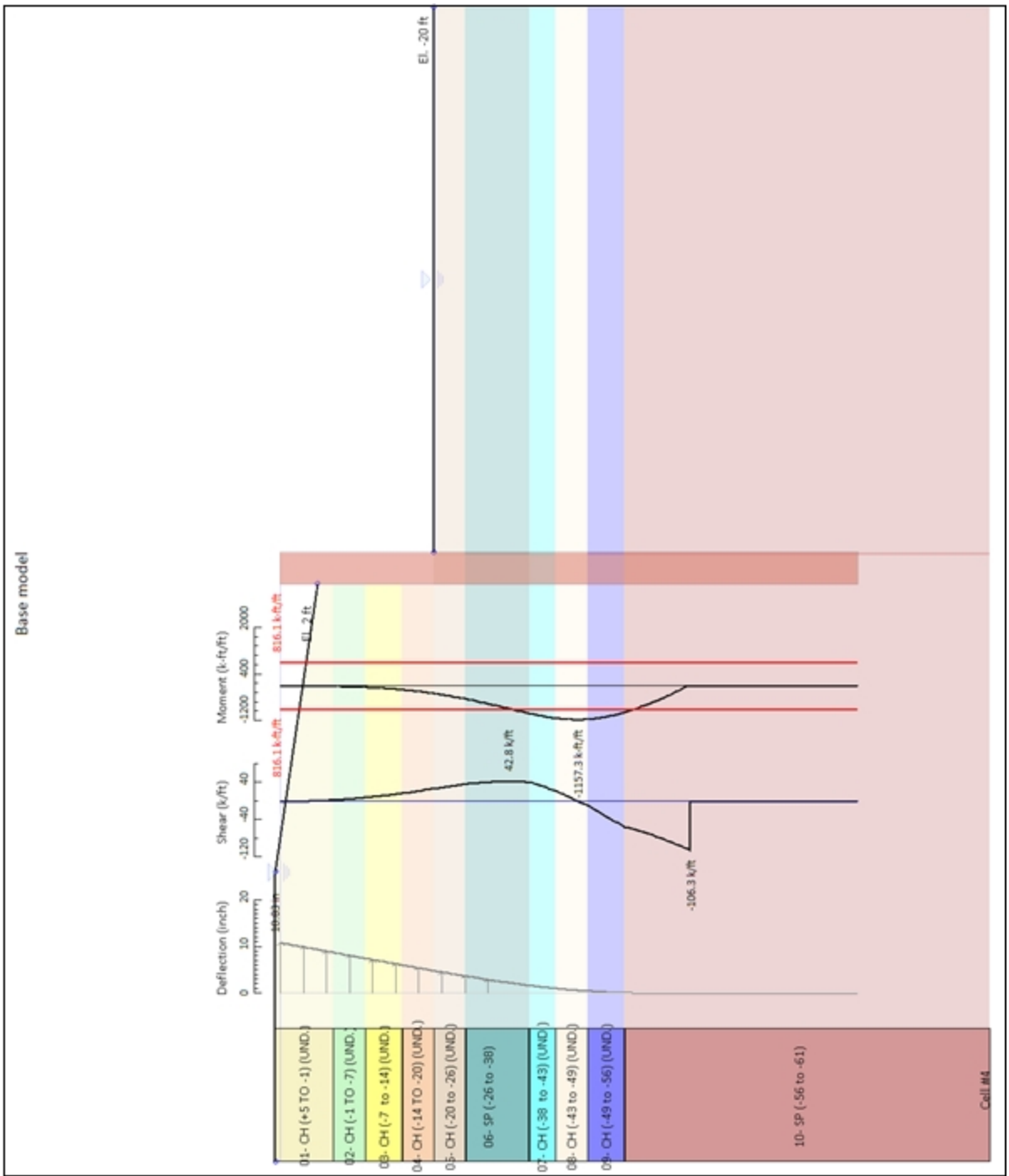
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

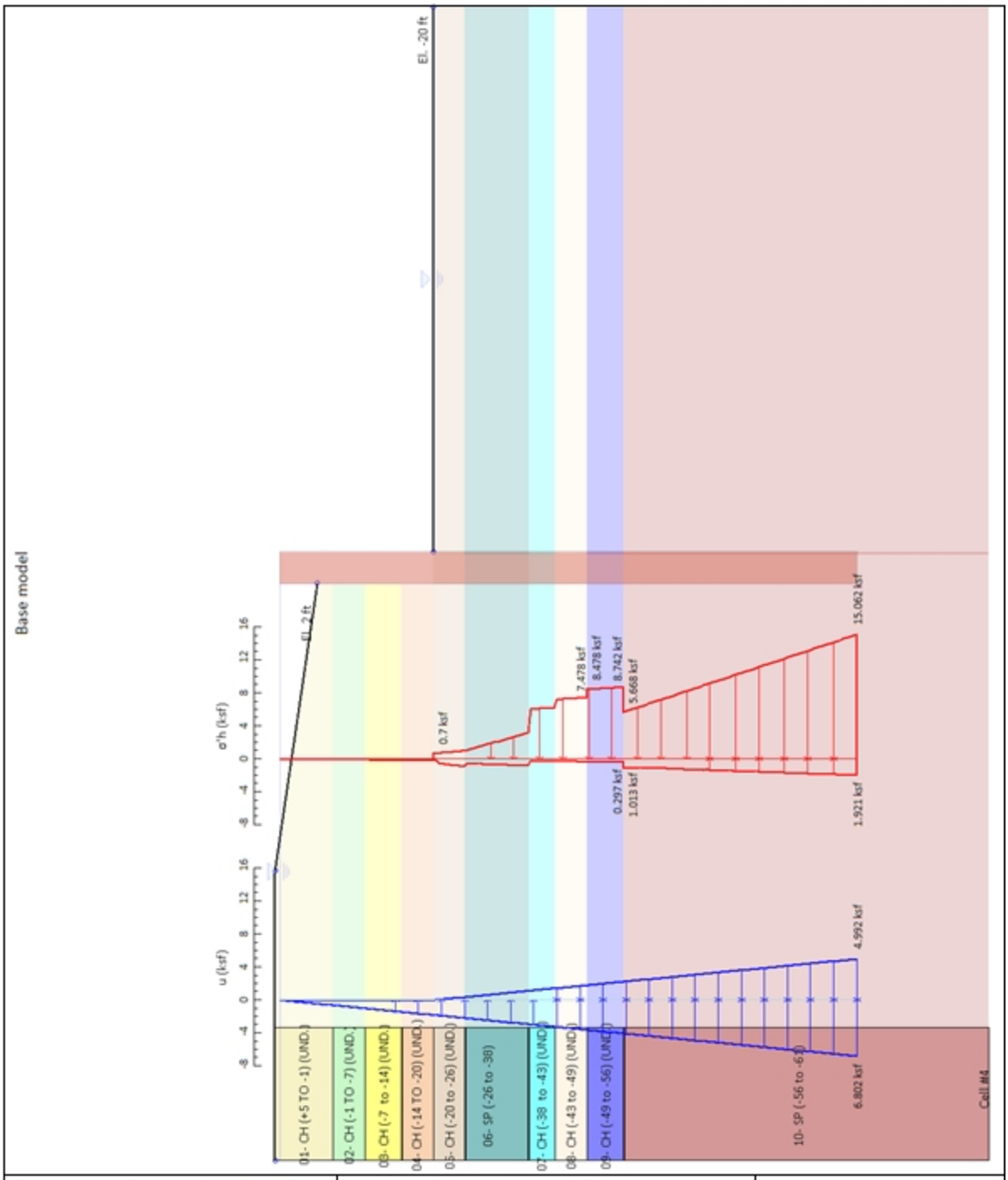
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

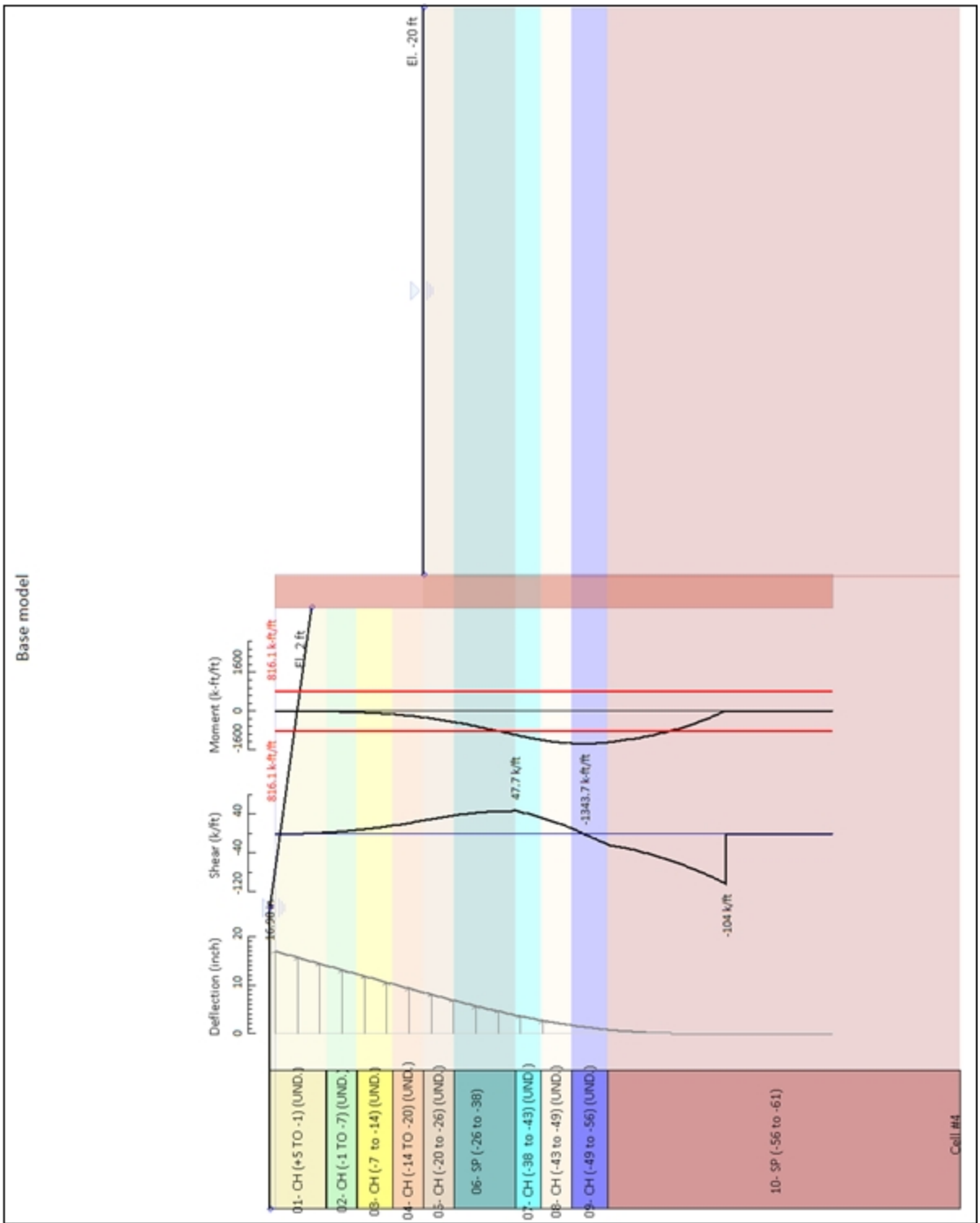
A sequence of figures for each excavation stage is reported



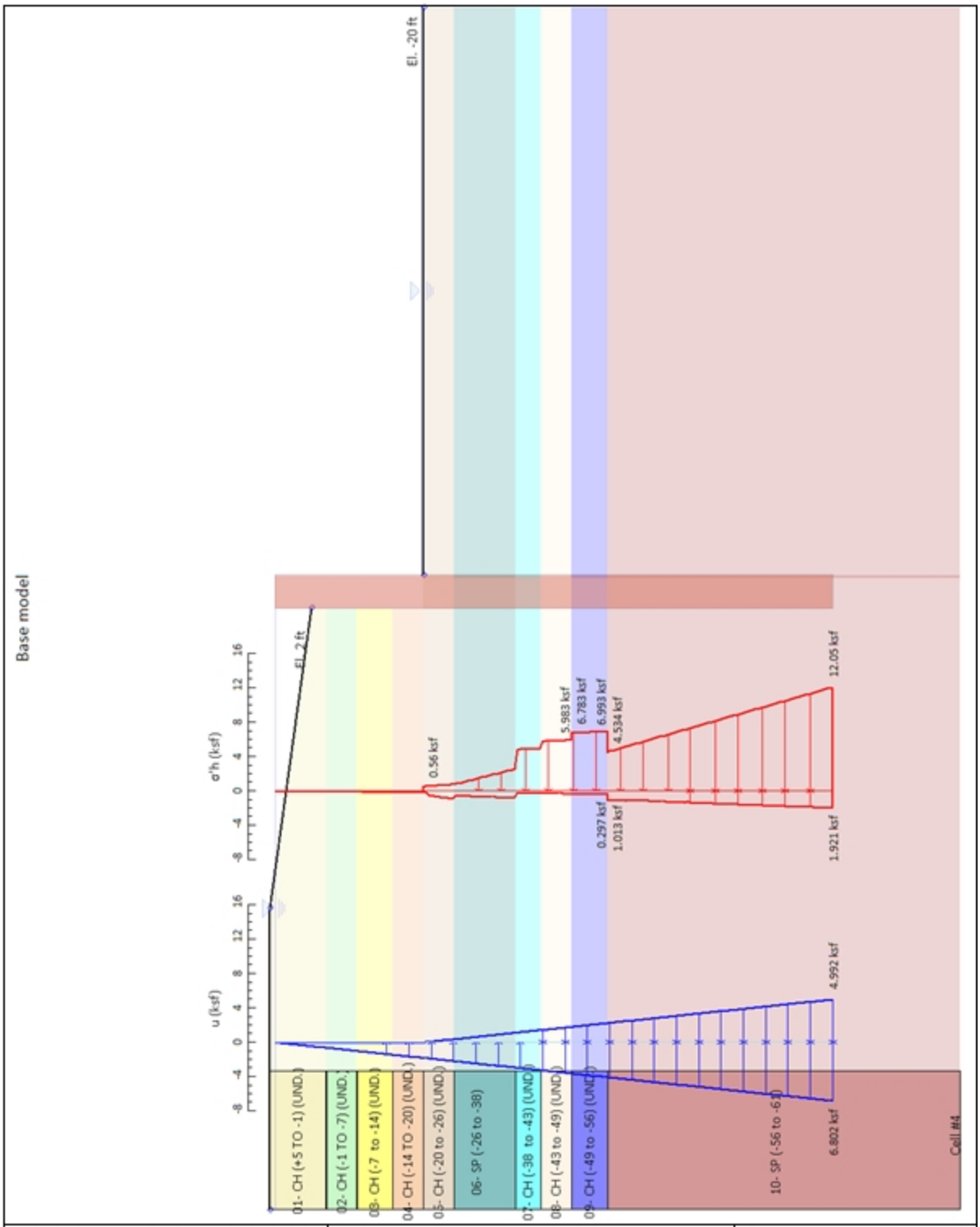

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



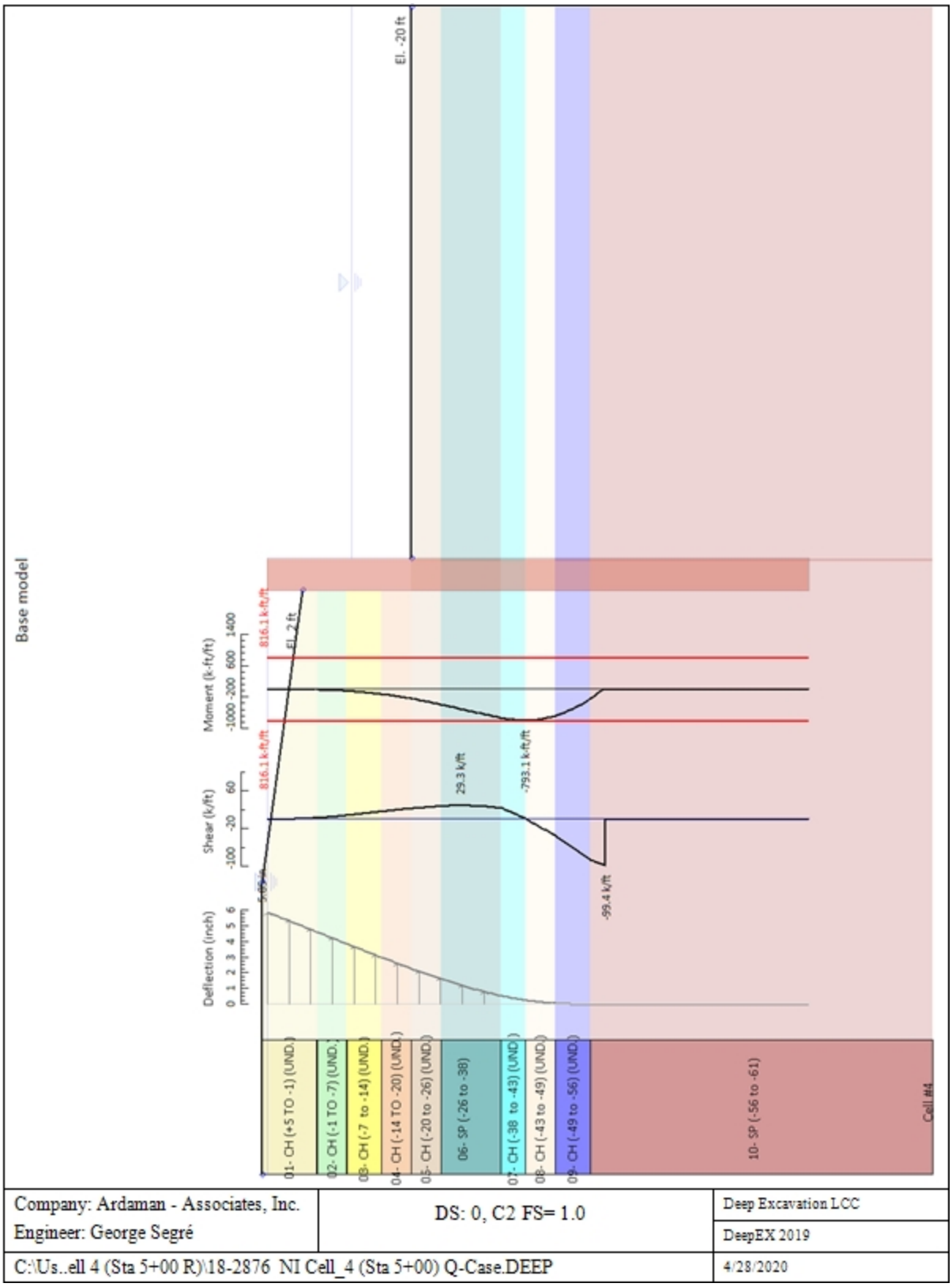

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



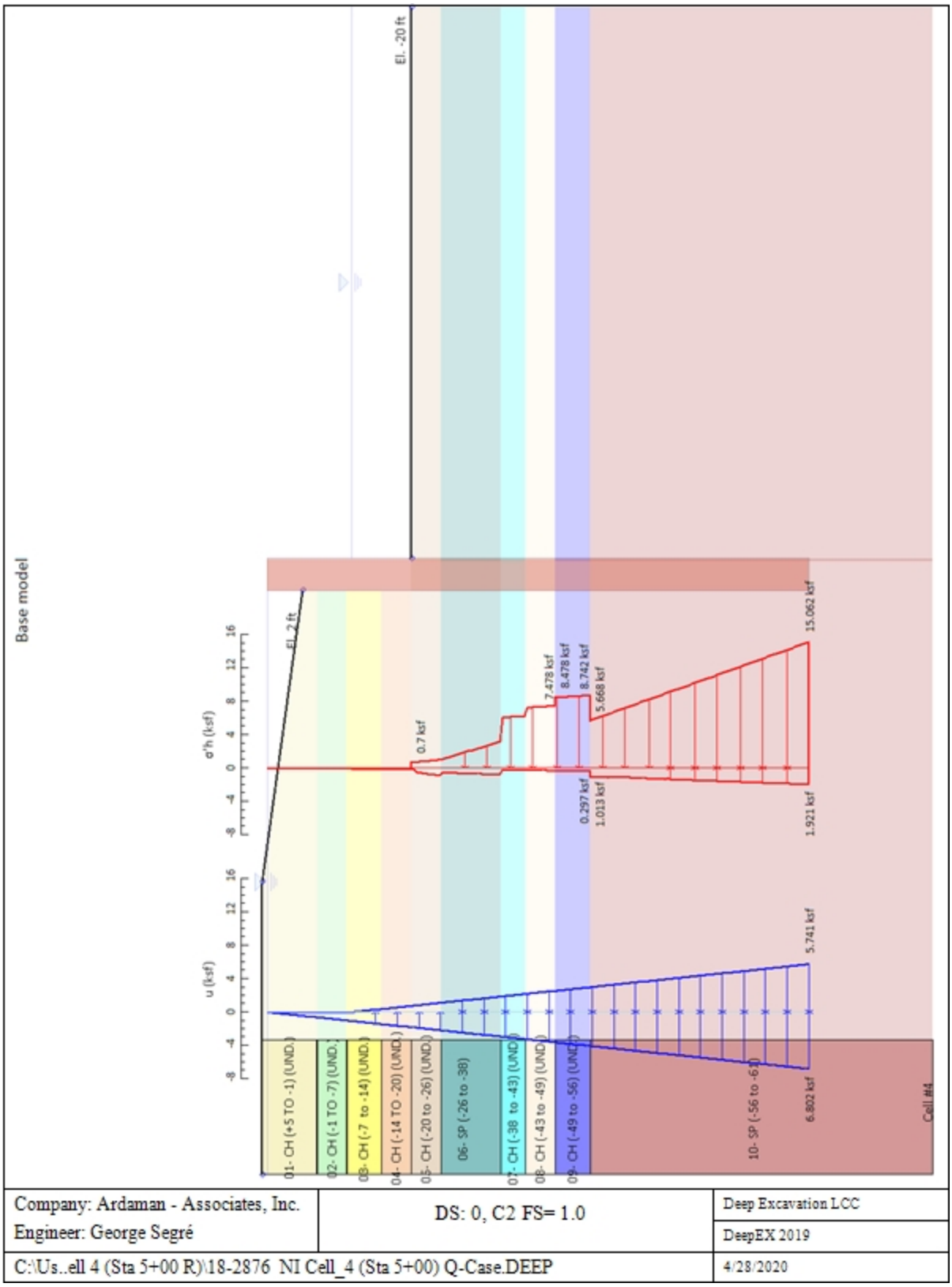

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS= 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



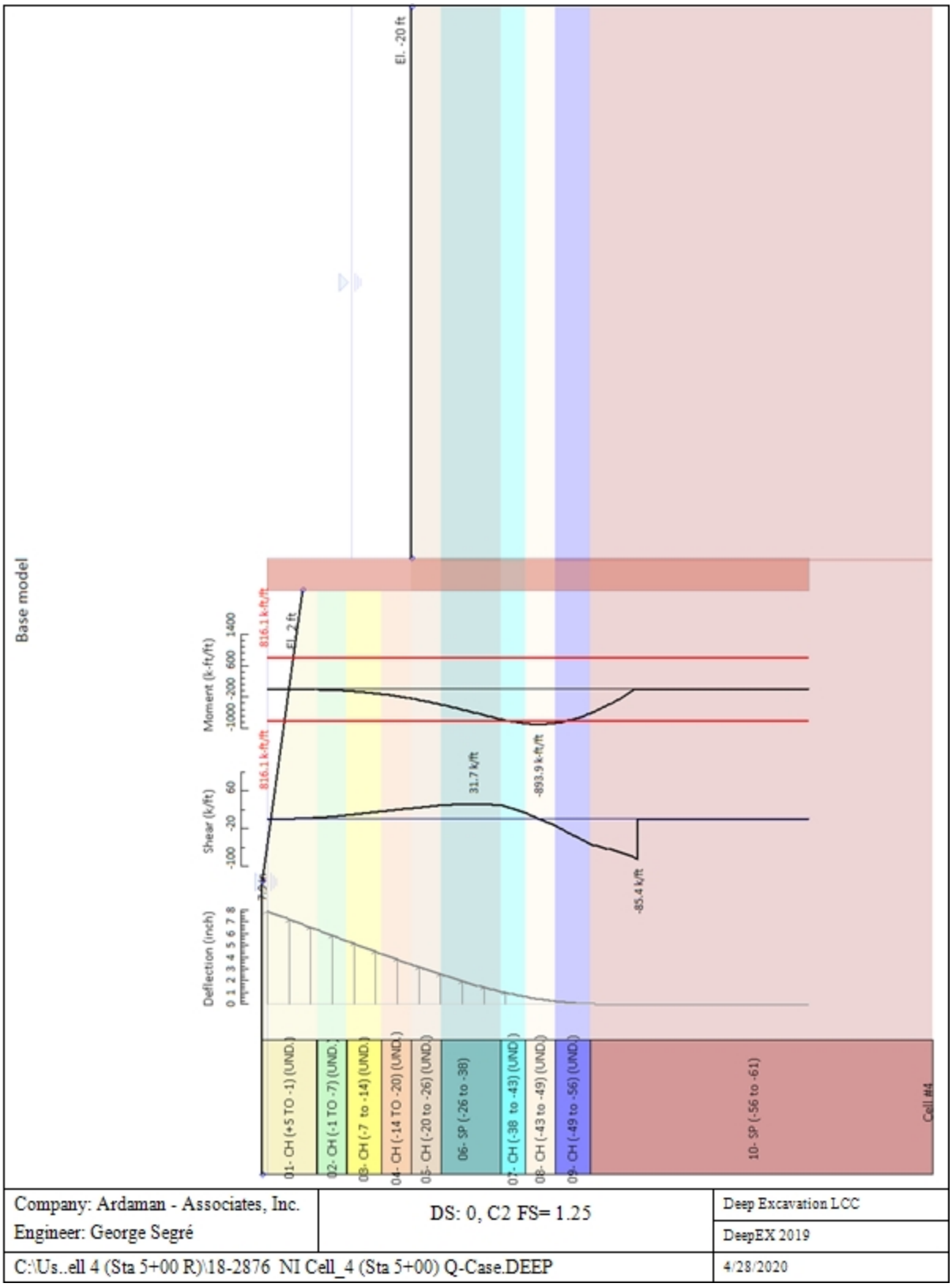

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS= 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



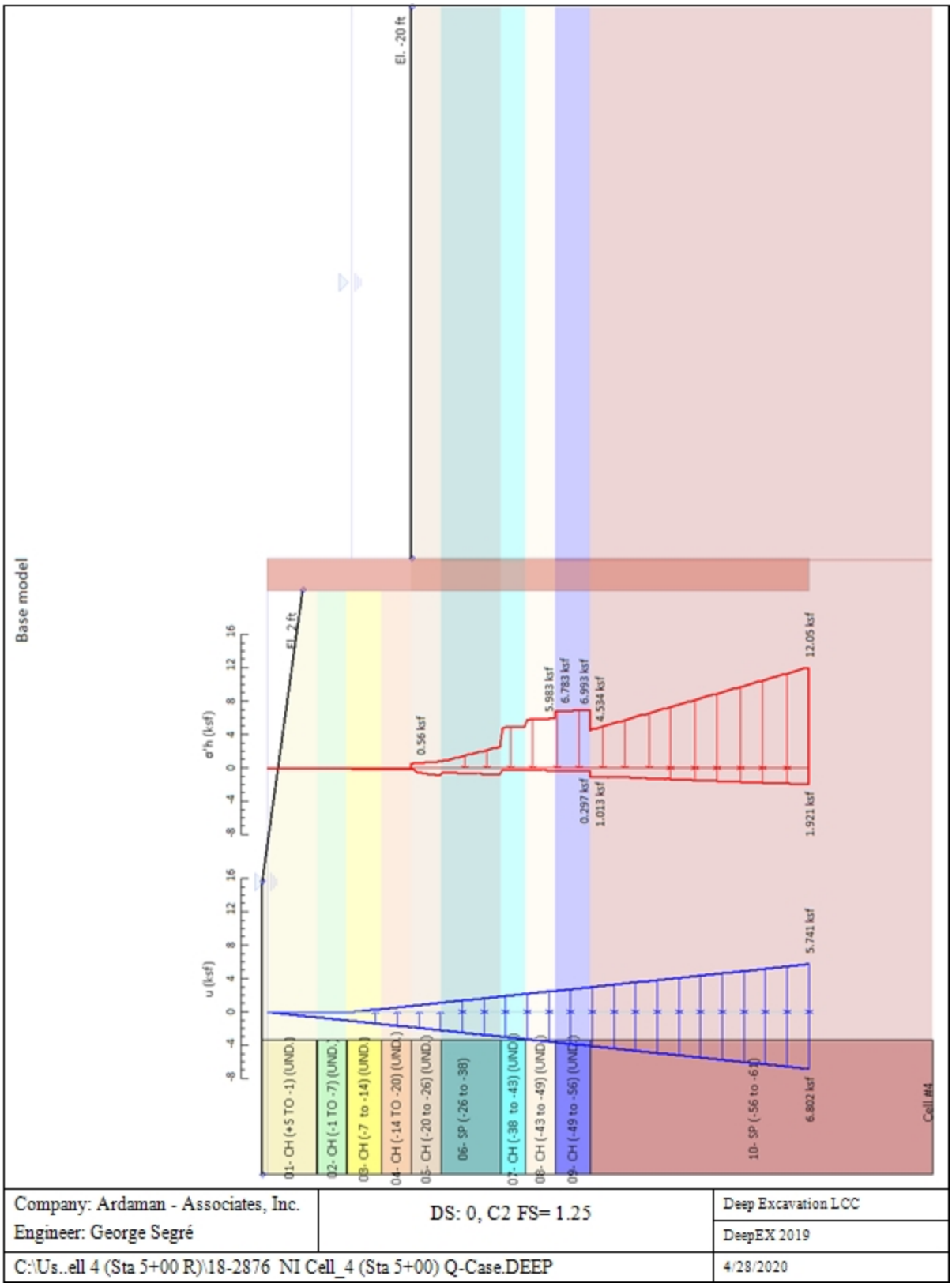

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS= 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |

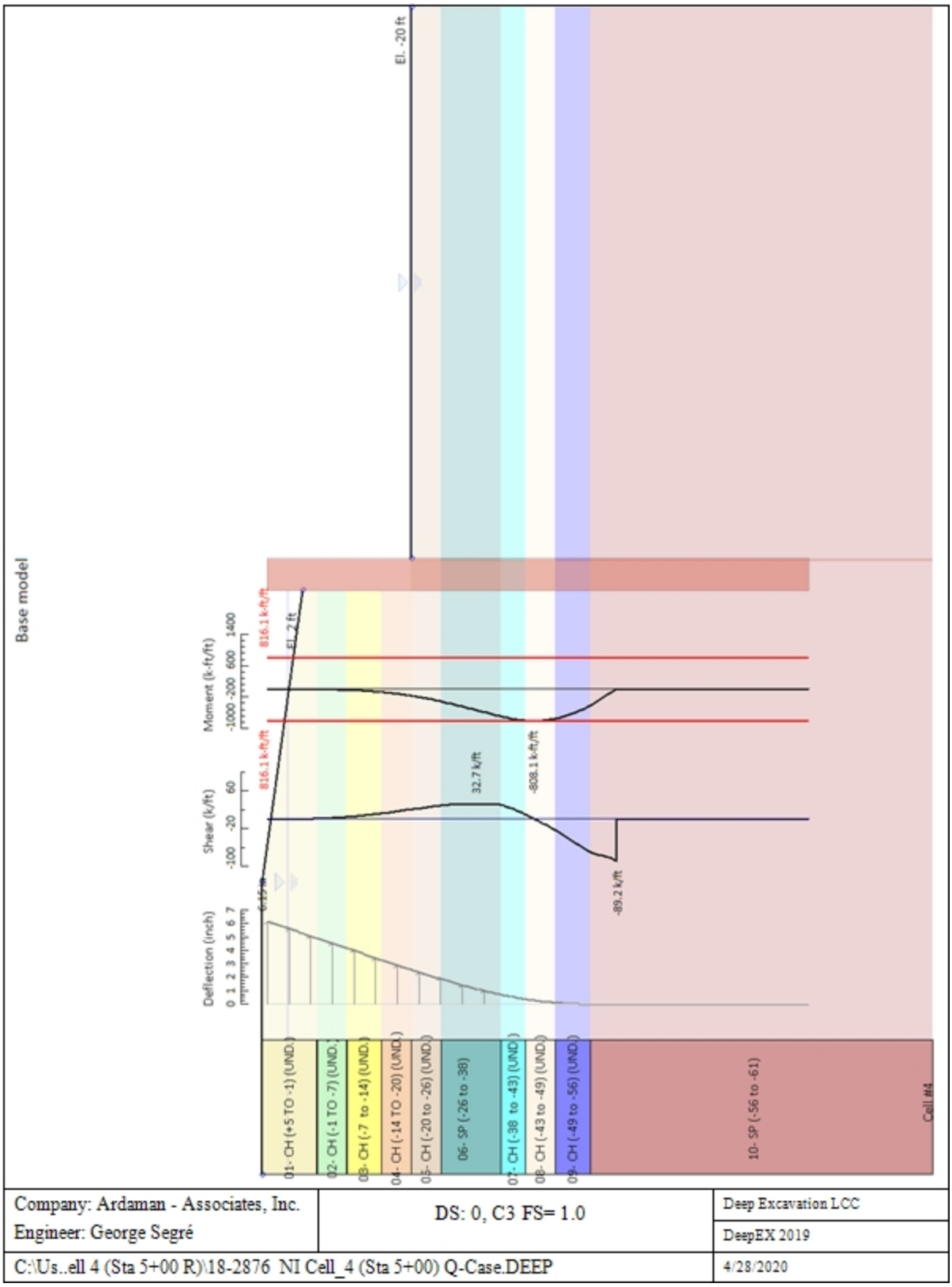



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS= 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |

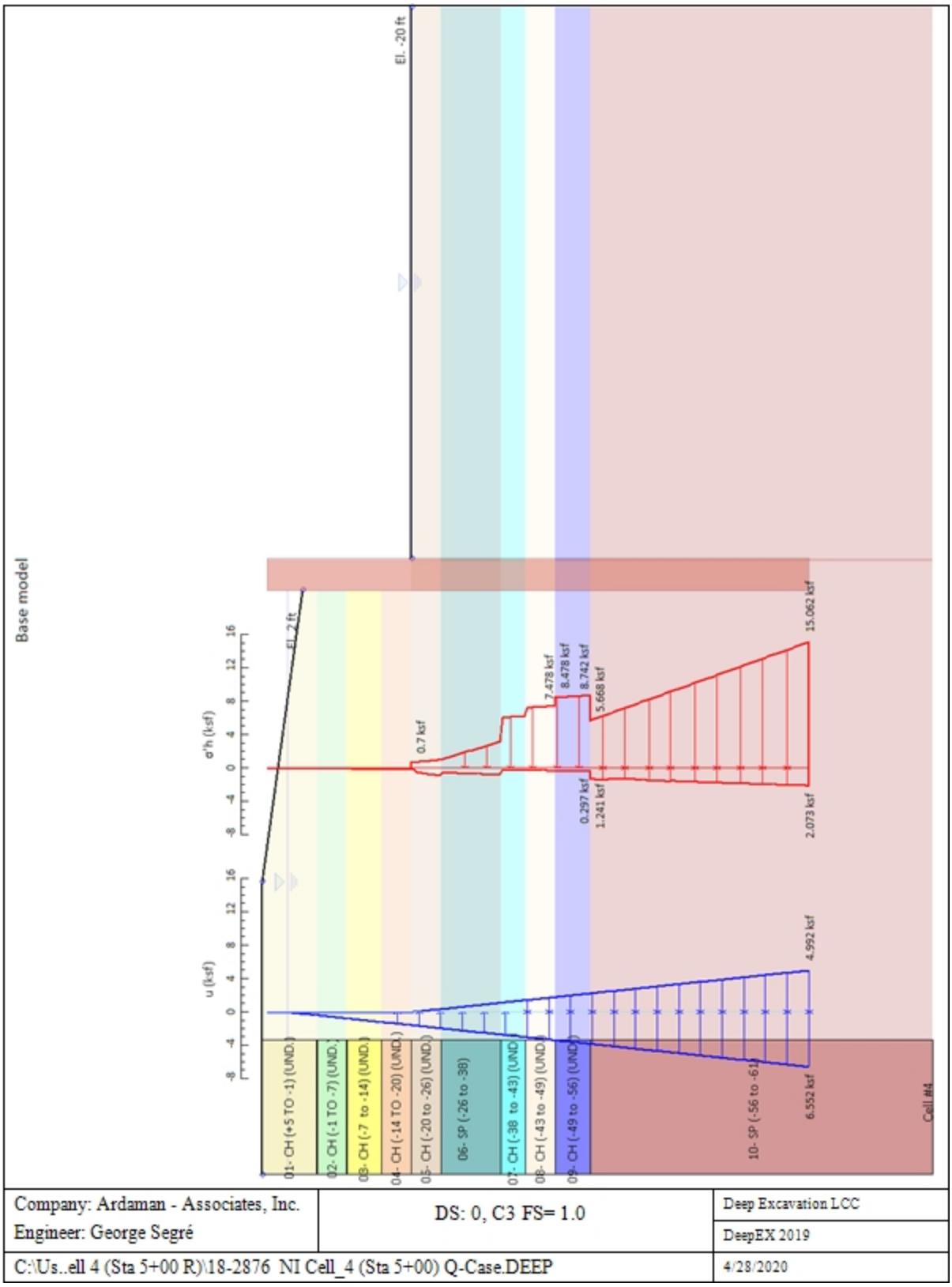


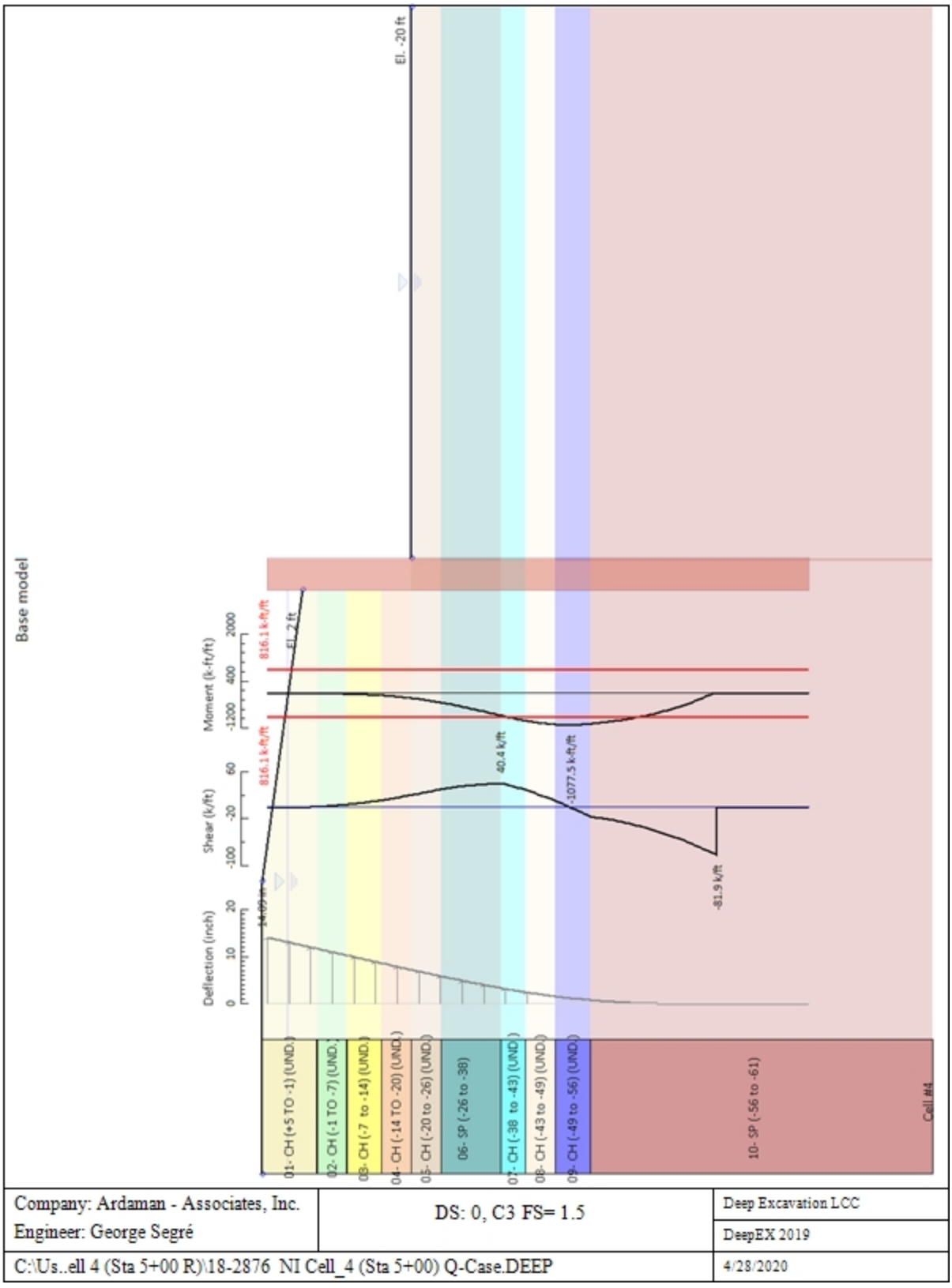

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS= 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -20 ft
El. 2 ft
σ'h (ksf)
u (ksf)
0.56 ksf
5.983 ksf
6.783 ksf
6.993 ksf
4.534 ksf
12.05 ksf
0.297 ksf
1.013 ksf
1.921 ksf
5.741 ksf
6.802 ksf
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -62)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS= 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP
4/28/2020

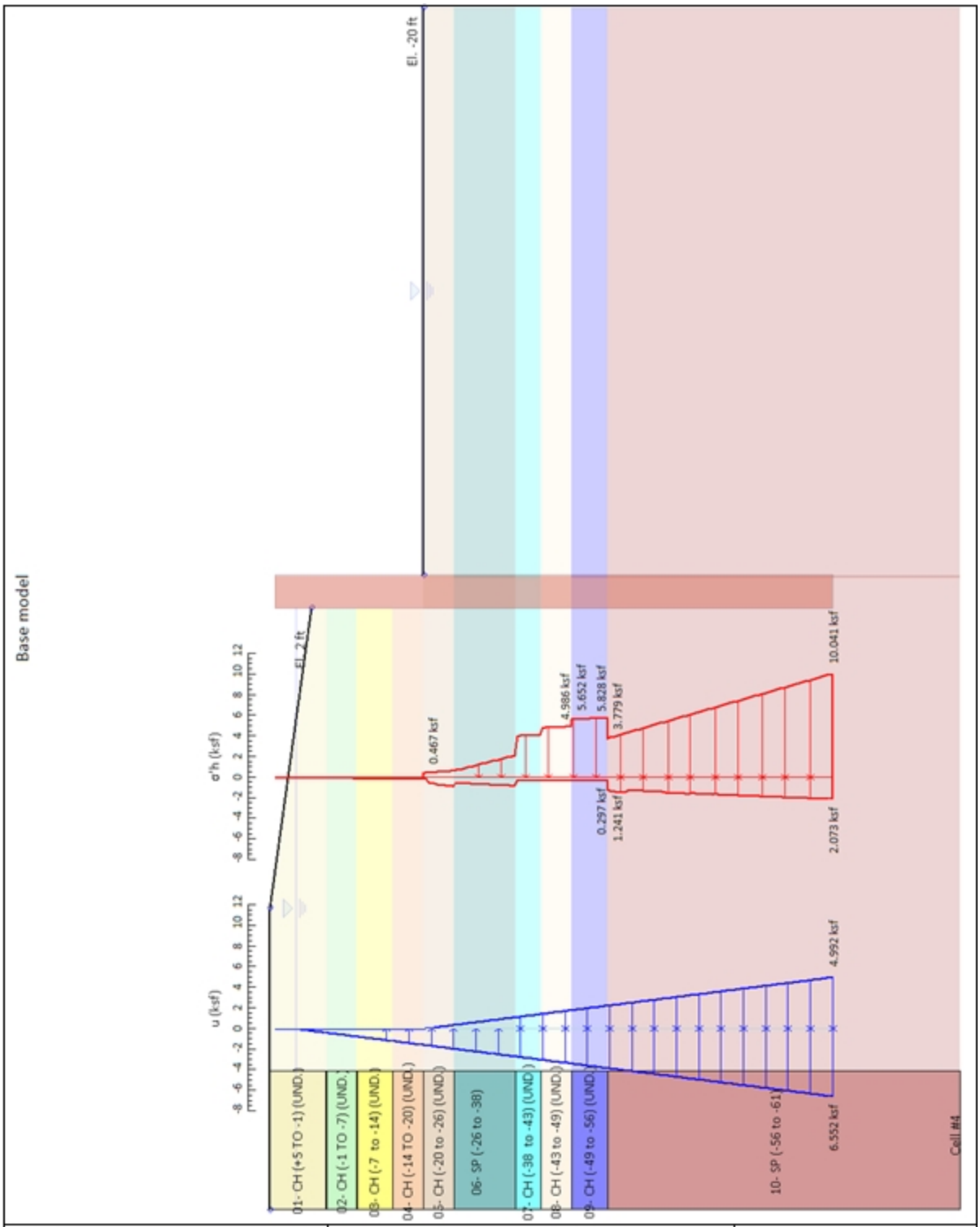



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS= 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |

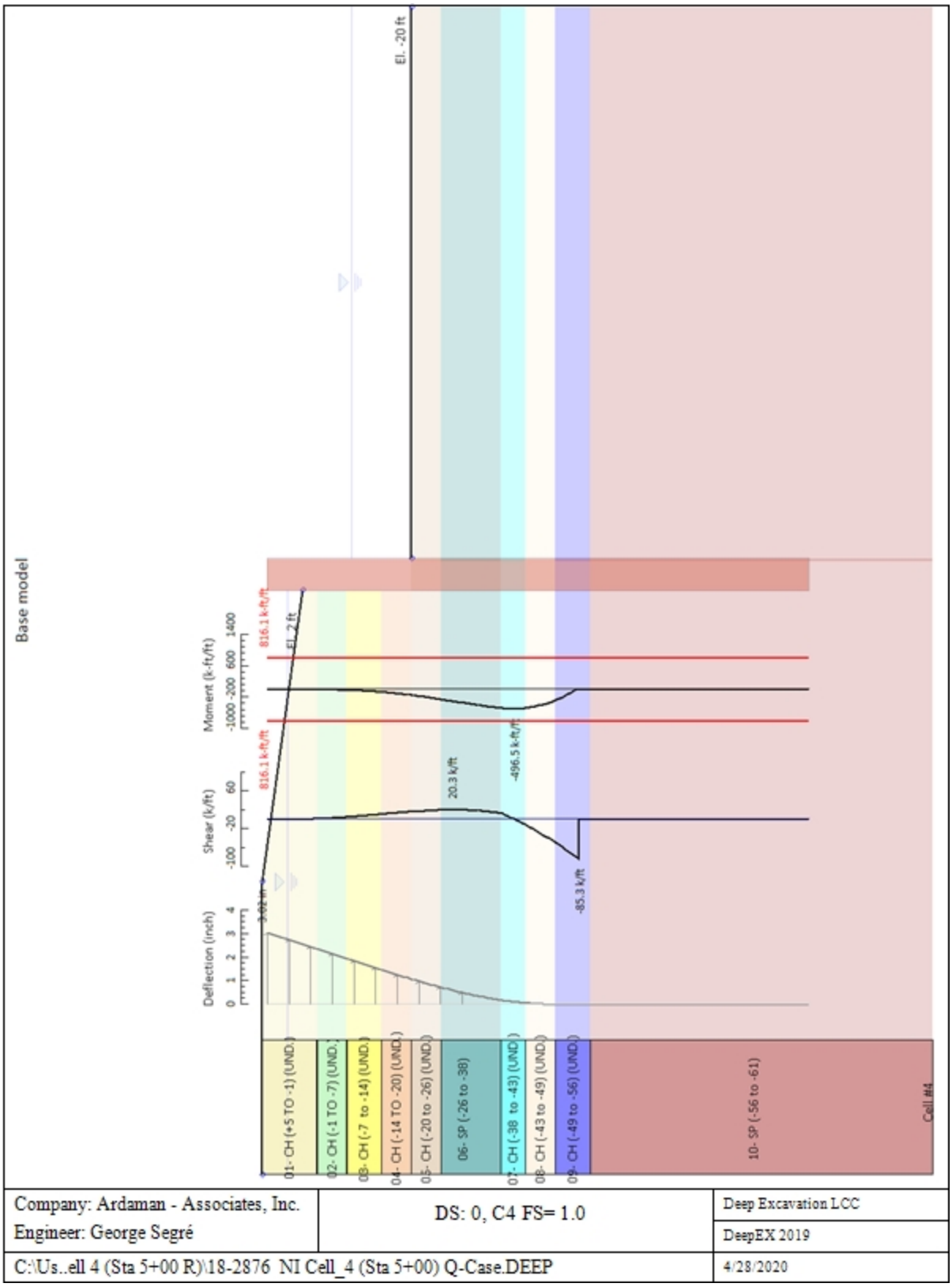

Base model
El. -20 ft
El. 2 ft
σ'h (ksf)
u (ksf)
0.7 ksf
7.478 ksf
8.478 ksf
8.742 ksf
5.668 ksf
15.062 ksf
0.297 ksf
1.241 ksf
2.073 ksf
4.992 ksf
6.552 ksf
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS= 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP
4/28/2020



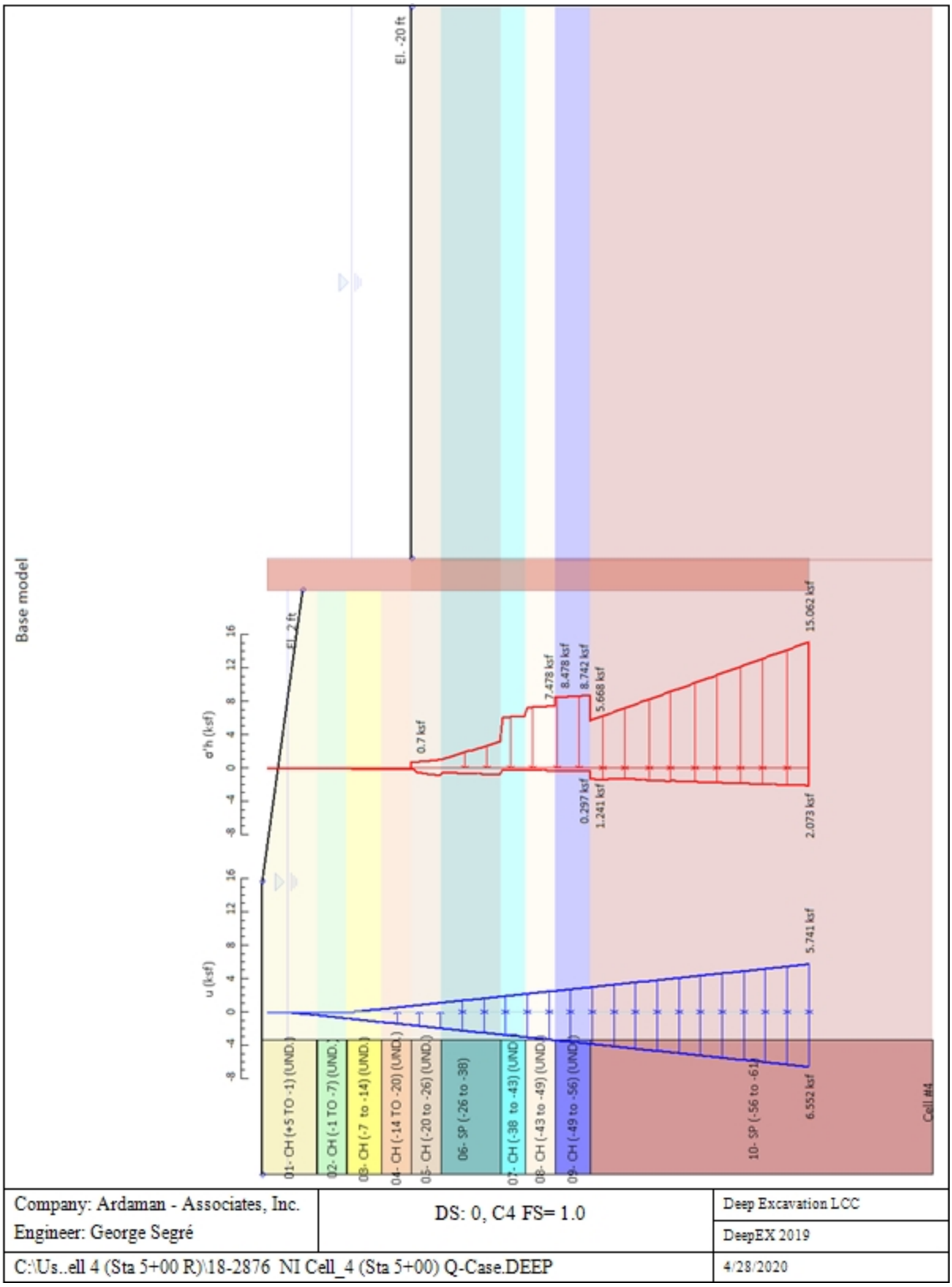

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



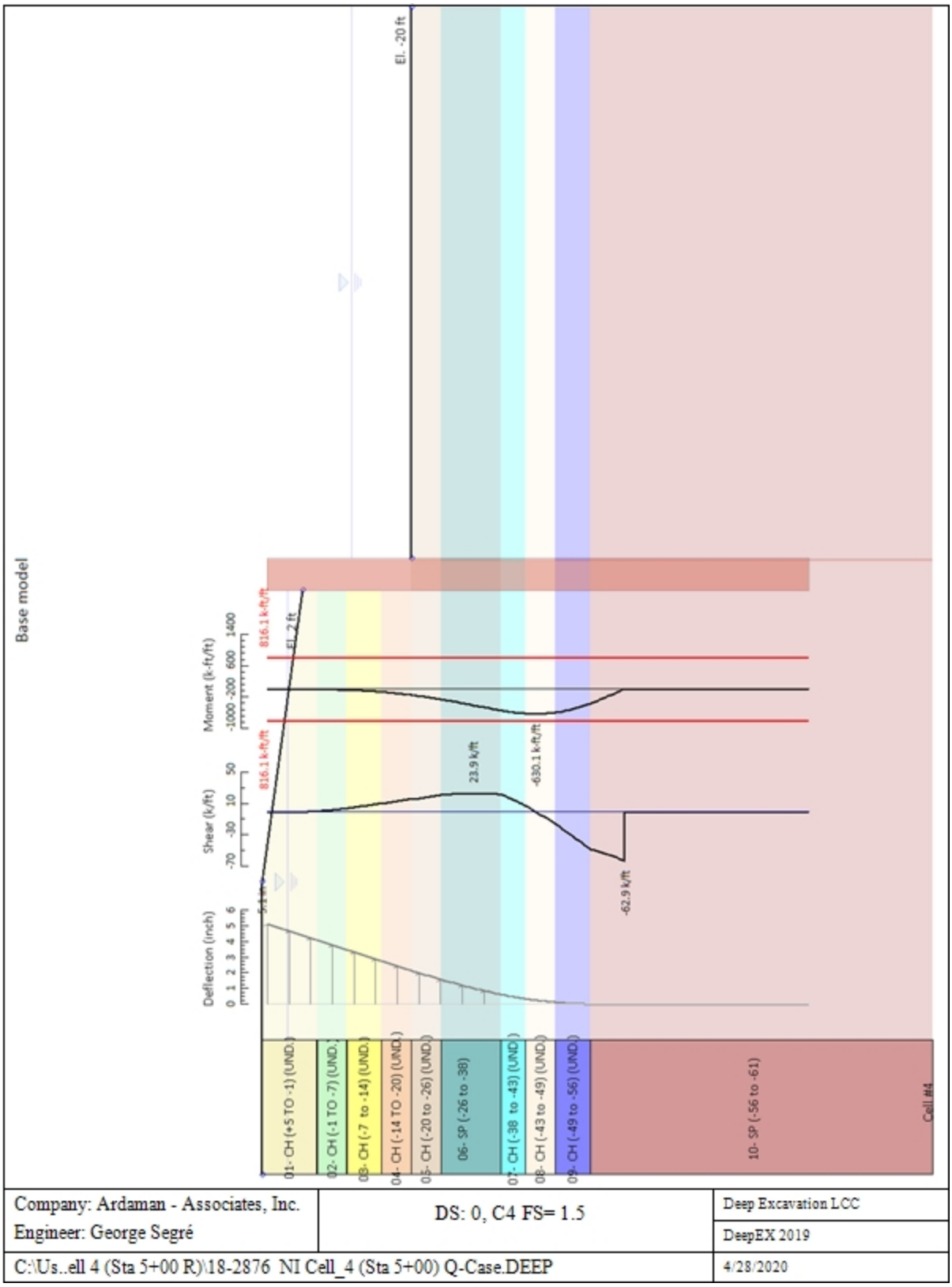

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |



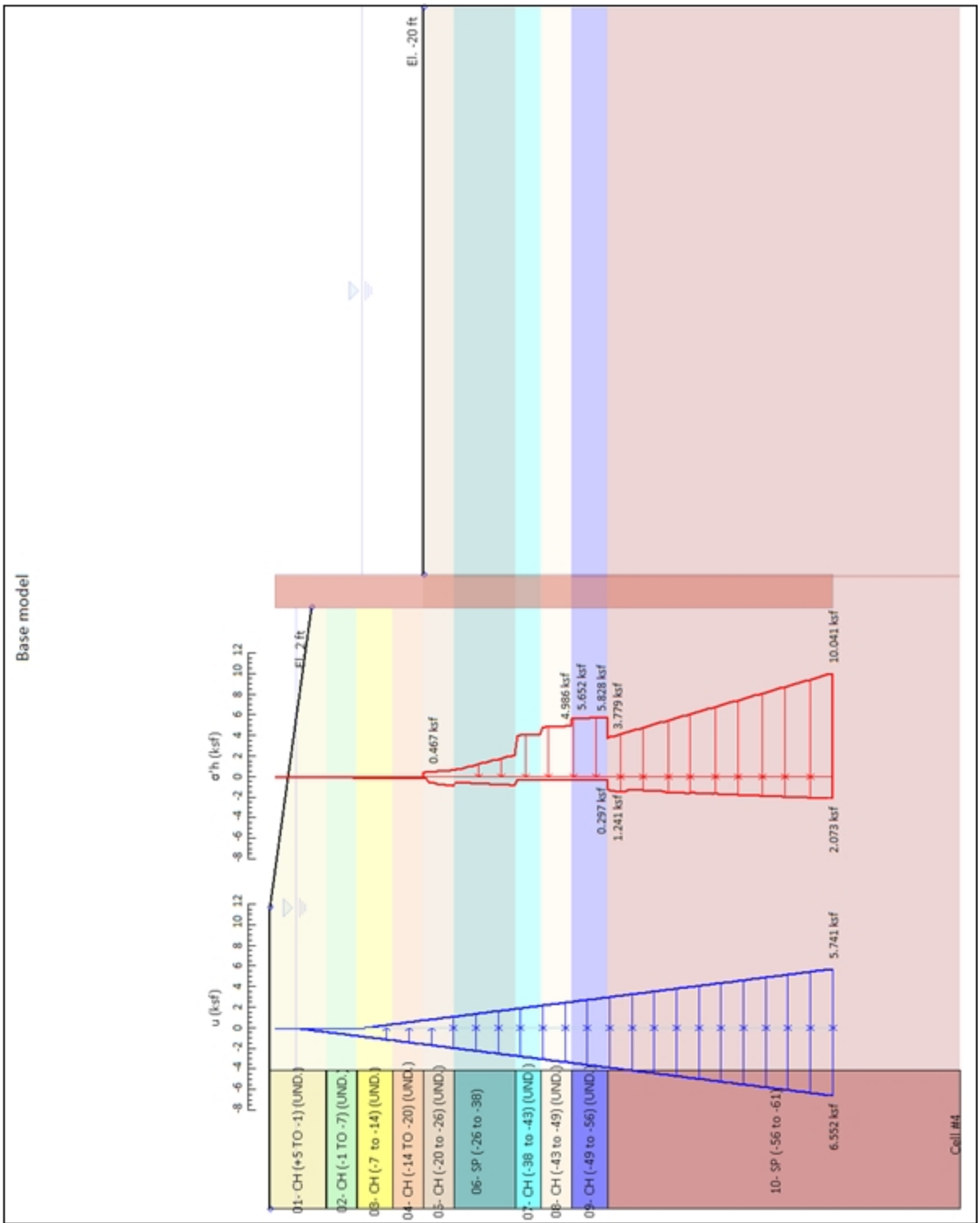

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS= 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |




Attachment Figure C.4-24




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS= 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:02:26 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+5 TO | 118 | 118 | 26 | 0 | 1000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | EXP | |
| 02- CH (-1 TO | 116 | 116 | 23 | 0 | 350 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-7 to | 116 | 116 | 23 | 0 | 500 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-14 T | 123 | 123 | 23 | 0 | 940 | 23 | 23 | 521.92 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 05- CH (-20 to | 115 | 115 | 23 | 0 | 350 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-26 to | 125 | 125 | 30 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 07- CH (-38 t | 100 | 100 | 26 | 0 | 2500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- CH (-43 to | 100 | 10 | 26 | 0 | 3000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 09- CH (-49 to | 100 | 100 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 10- SP (-56 to | 128 | 128 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+5 TO | 0.4 | 0.1 | 0 | 0.562 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-1 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-7 to | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-14 T | 0.35 | 0.1 | 0 | 0.609 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-20 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-26 to | 0.35 | - | - | 0.5 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-38 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-43 to | 0.3 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-49 to | 0.25 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-56 to | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

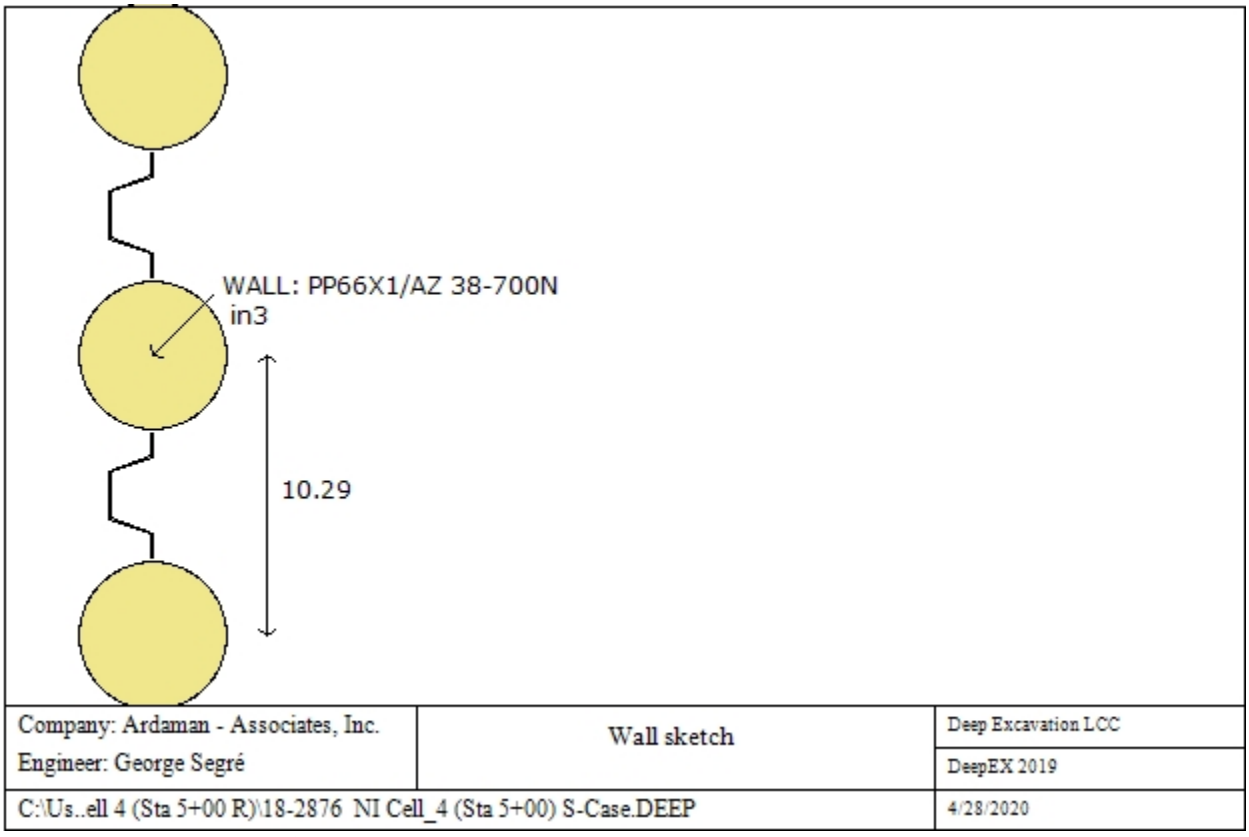
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- CH (+5 TO | 1 | 0.56 |
| -1 | 02- CH (-1 TO - | 1 | 0 |
| -7 | 03- CH (-7 to - | 1 | 0.61 |
| -14 | 04- CH (-14 TO | 1 | 0.61 |
| -20 | 05- CH (-20 to | 1 | 0 |
| -26 | 06- SP (-26 to - | 1 | 0.5 |
| -38 | 07- CH (-38 to | 1 | 0.56 |
| -43 | 08- CH (-43 to | 1 | 0.56 |
| -49 | 09- CH (-49 to | 1 | 0.56 |
| -56 | 10- SP (-56 to - | 1 | 0.47 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.359 | 1.514 | 2.459 |
| Stage 1 | Simple span | N/A | 1.6 | 1.157 | 1.211 | 1.967 |
| Stage 2 | Simple span | N/A | 1.6 | 1.631 | 1.962 | 3.157 |
| Stage 3 | Simple span | N/A | 1.6 | 1.409 | 1.57 | 2.526 |
| Stage 4 | Simple span | N/A | 1.6 | 1.49 | 1.673 | 2.639 |
| Stage 5 | Simple span | N/A | 1.6 | 1.091 | 1.115 | 1.759 |
| Stage 6 | Simple span | N/A | 1.6 | 1.845 | 2.239 | 3.46 |
| Stage 7 | Simple span | N/A | 1.6 | 1.384 | 1.492 | 2.307 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

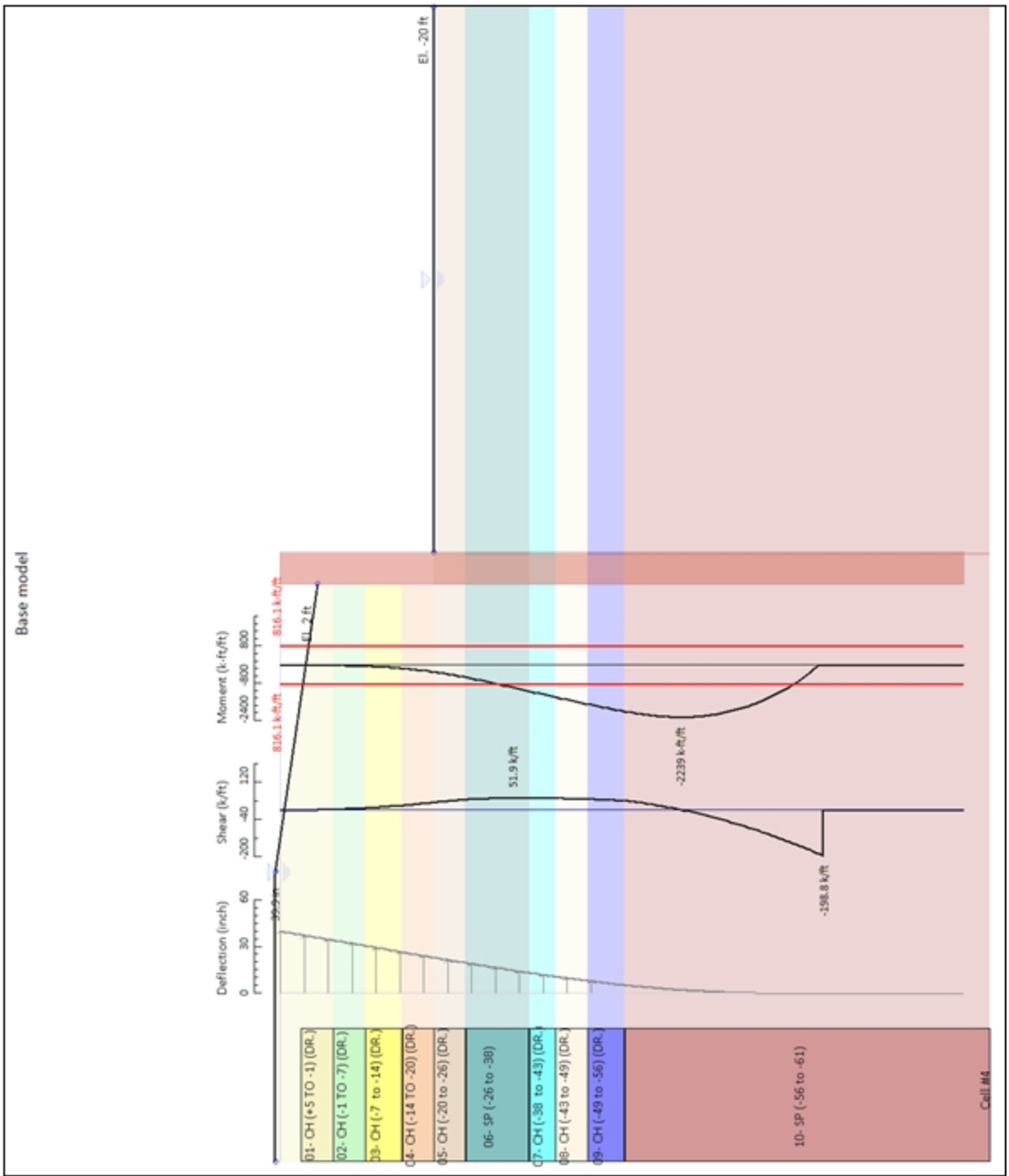
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

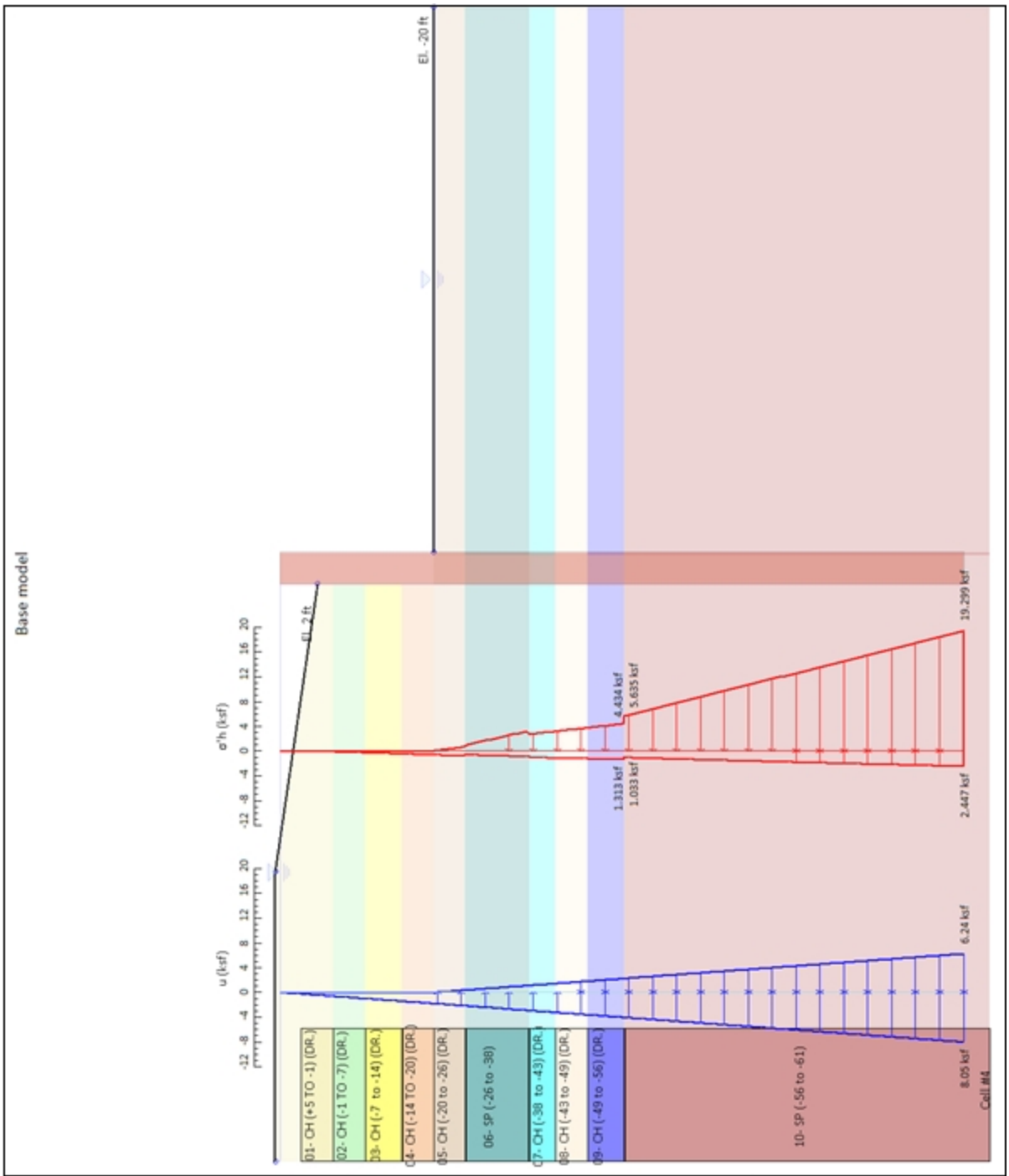
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

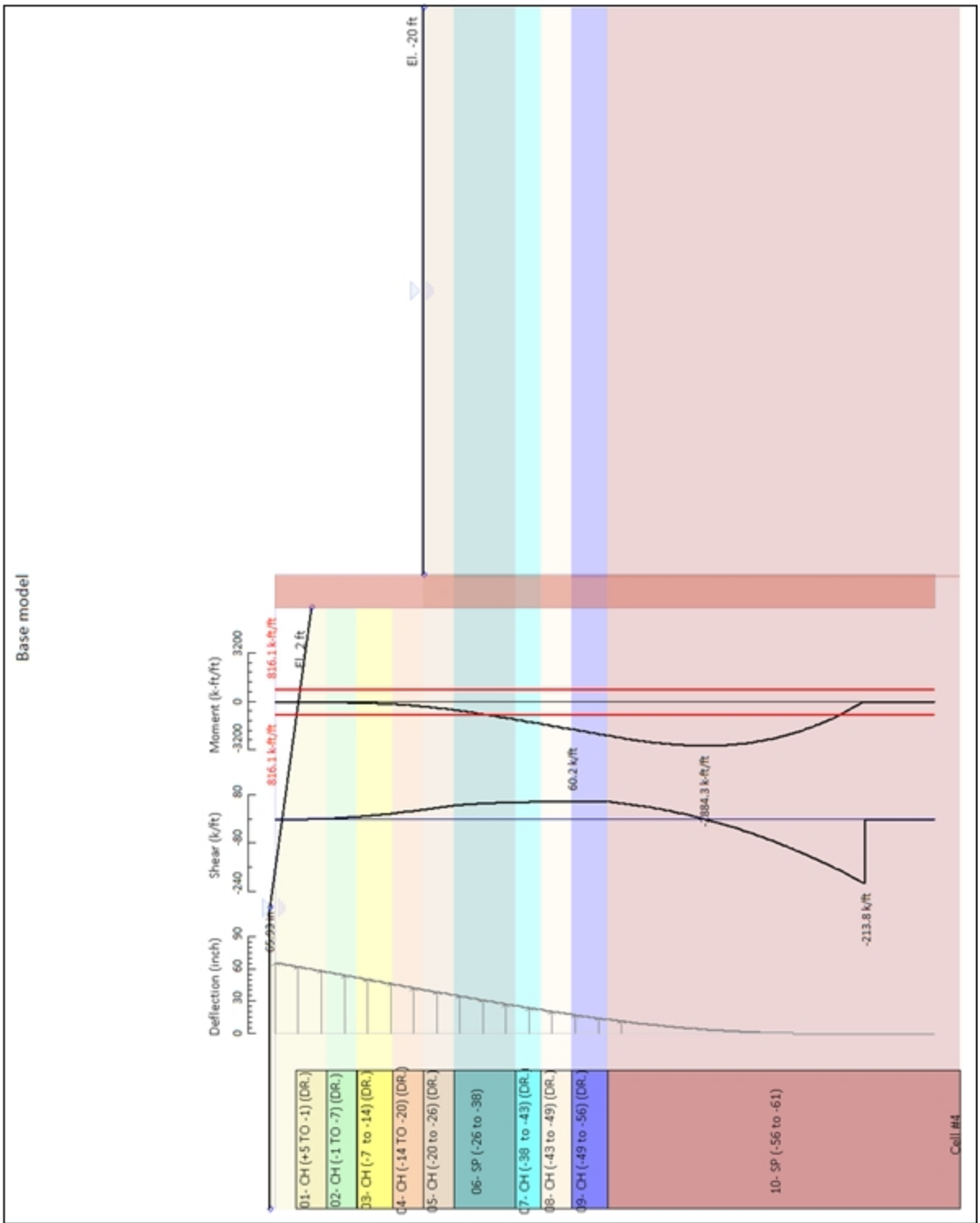
A sequence of figures for each excavation stage is reported



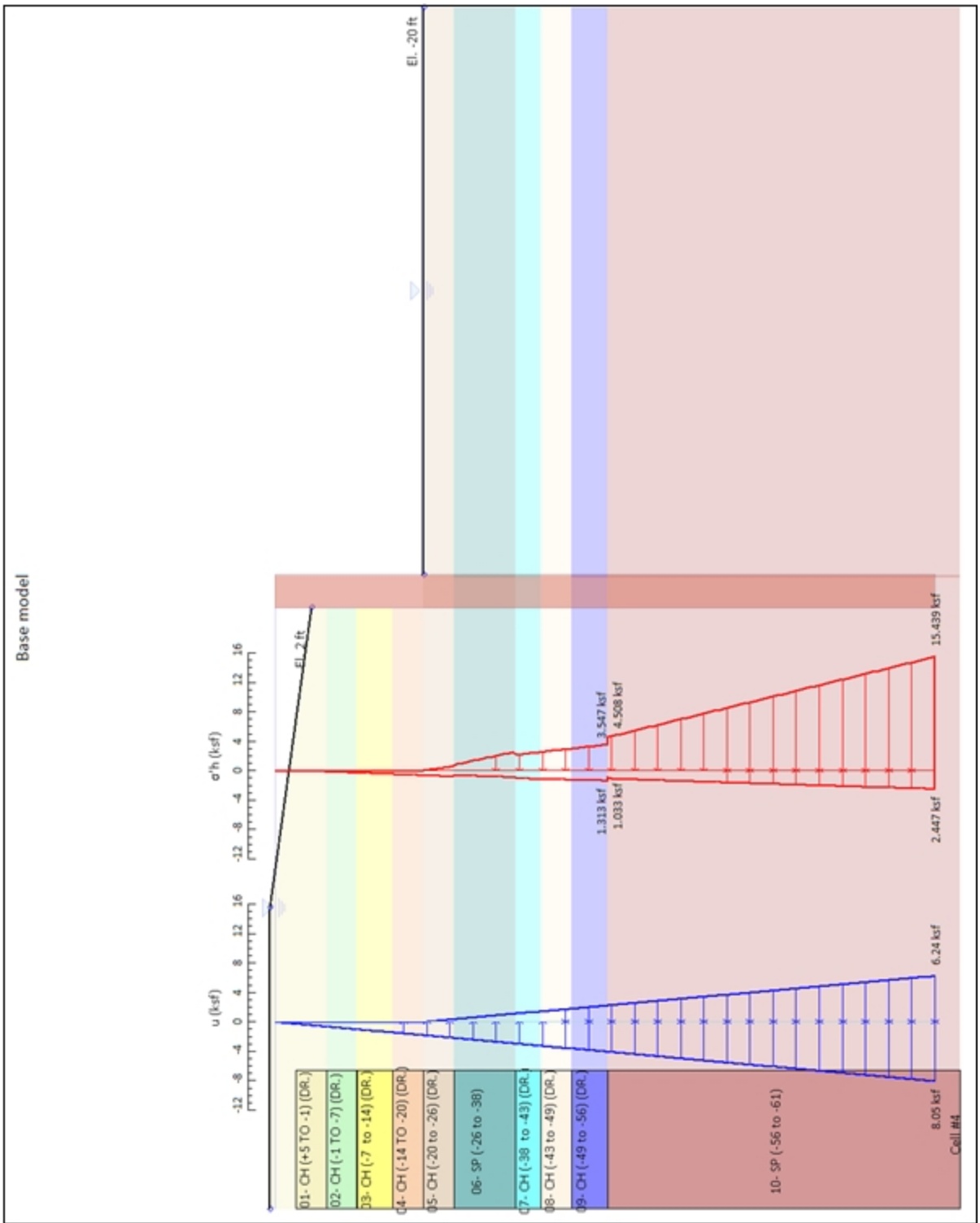

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



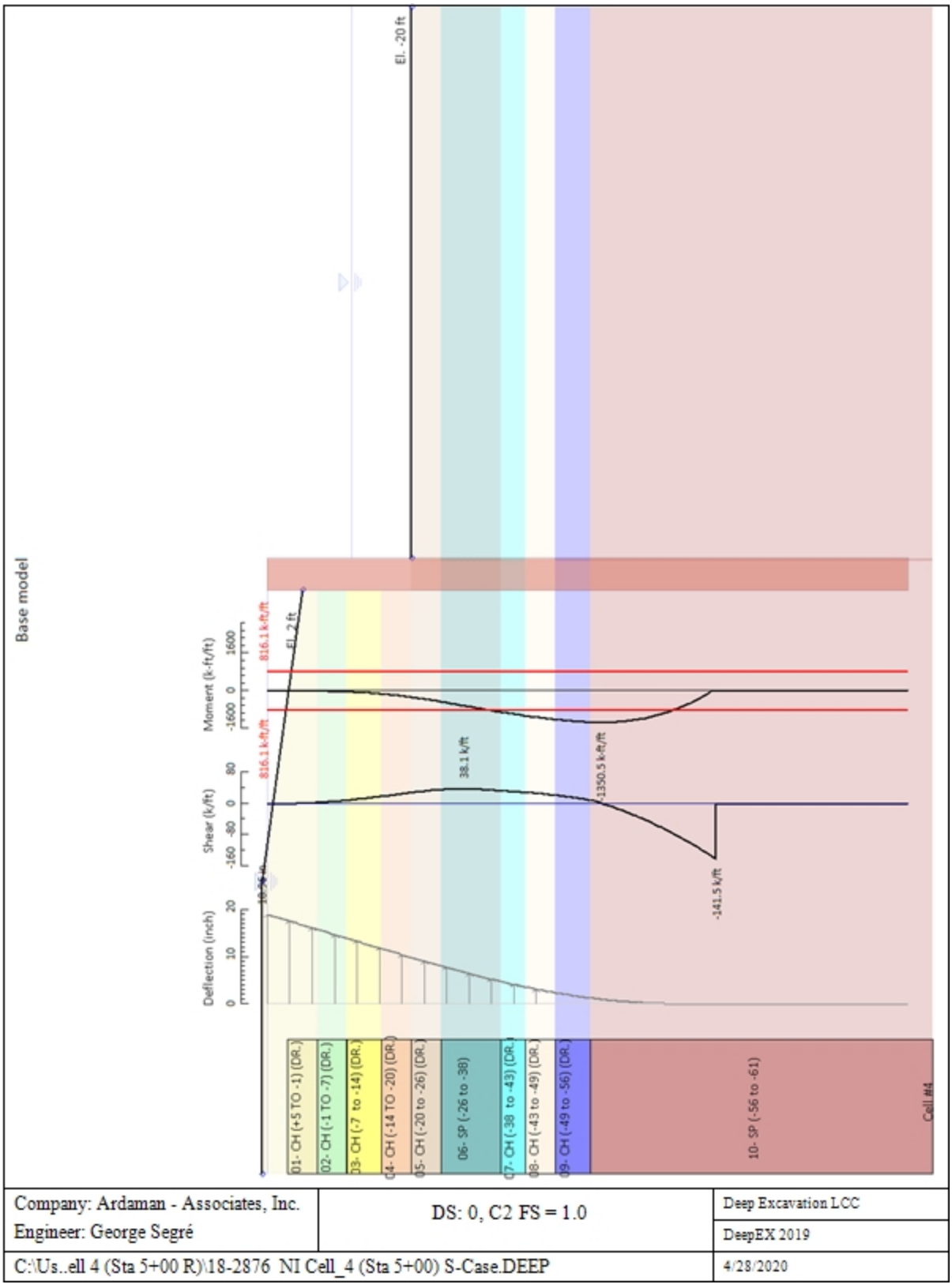

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



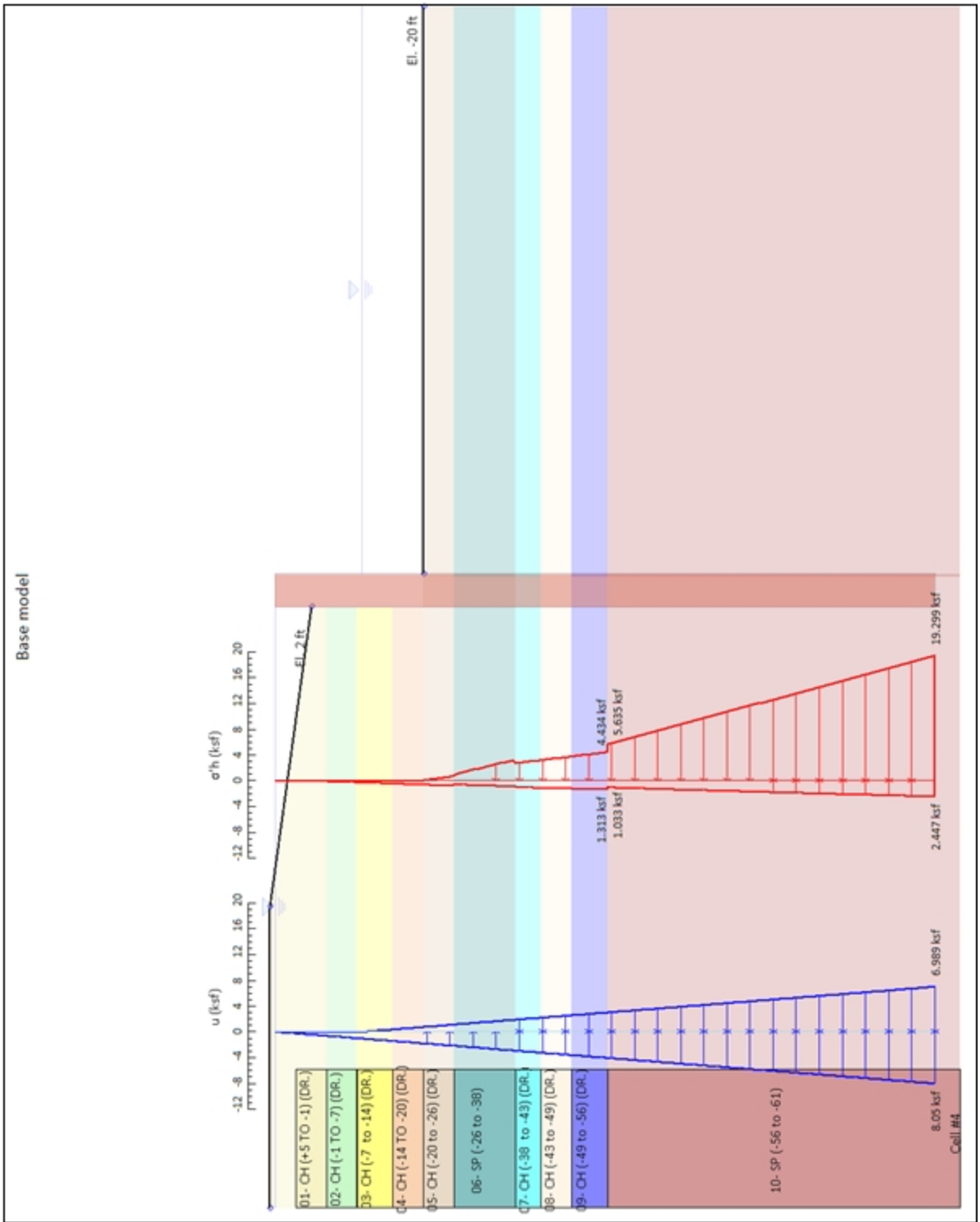

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



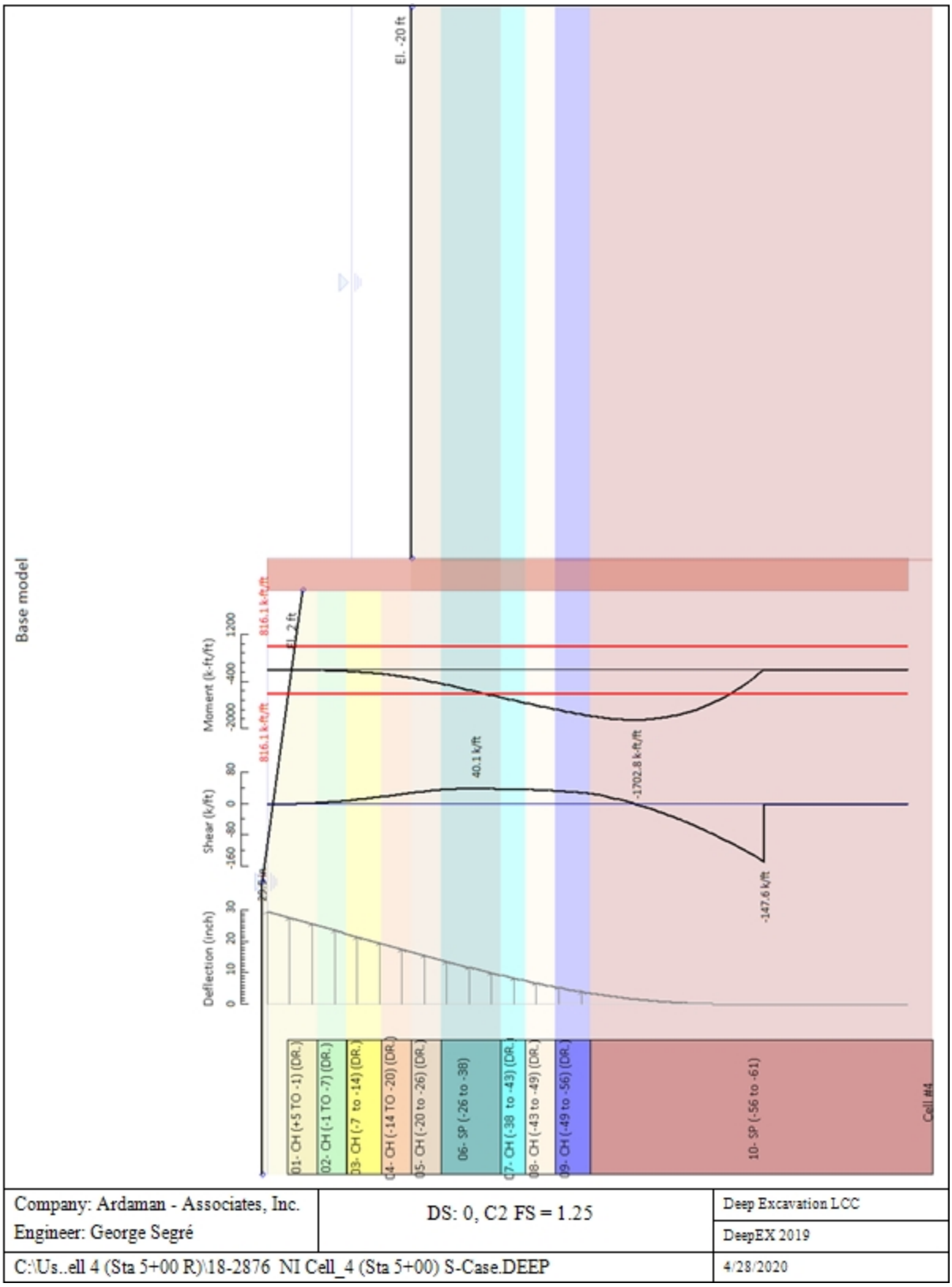

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



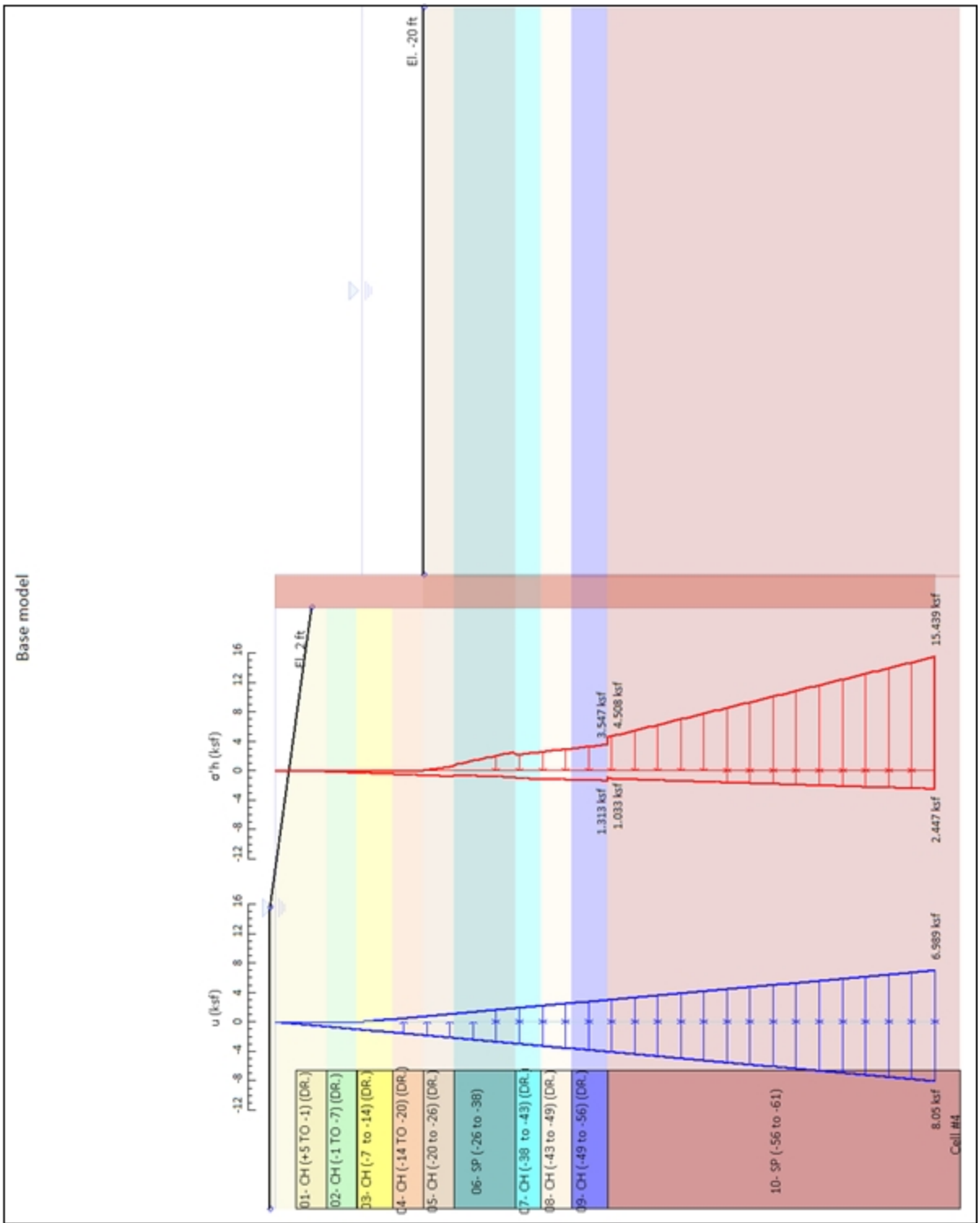

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



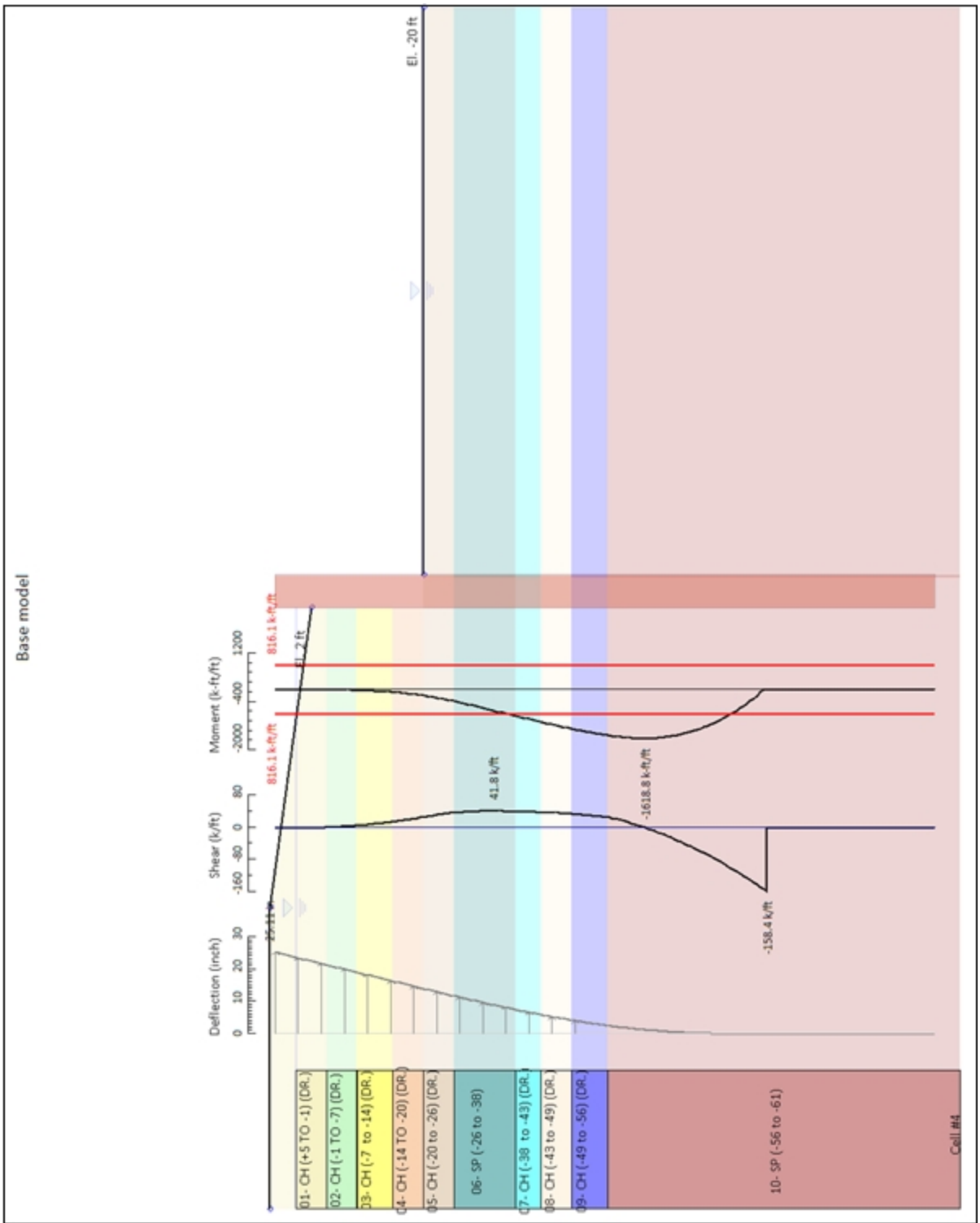

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



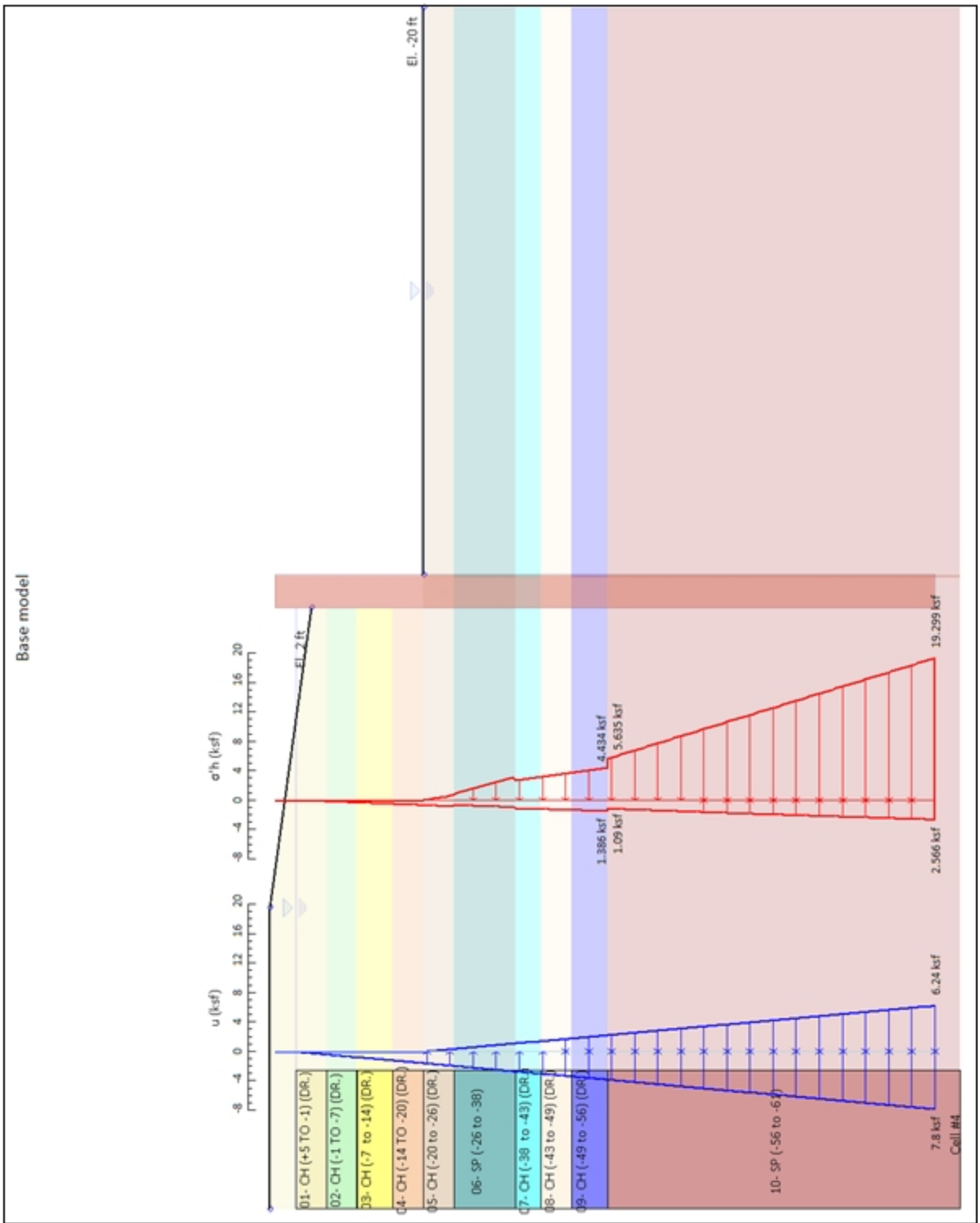

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



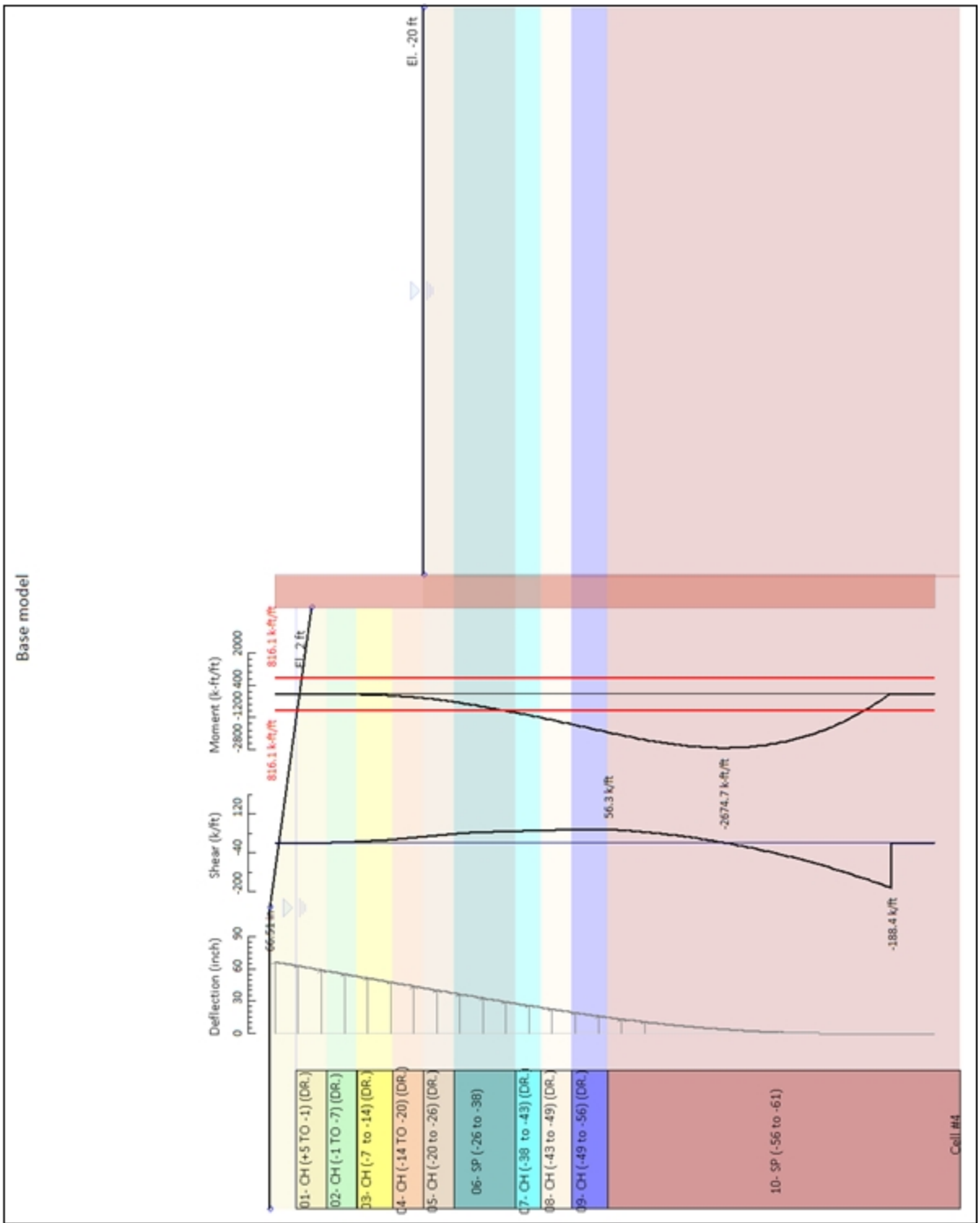

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



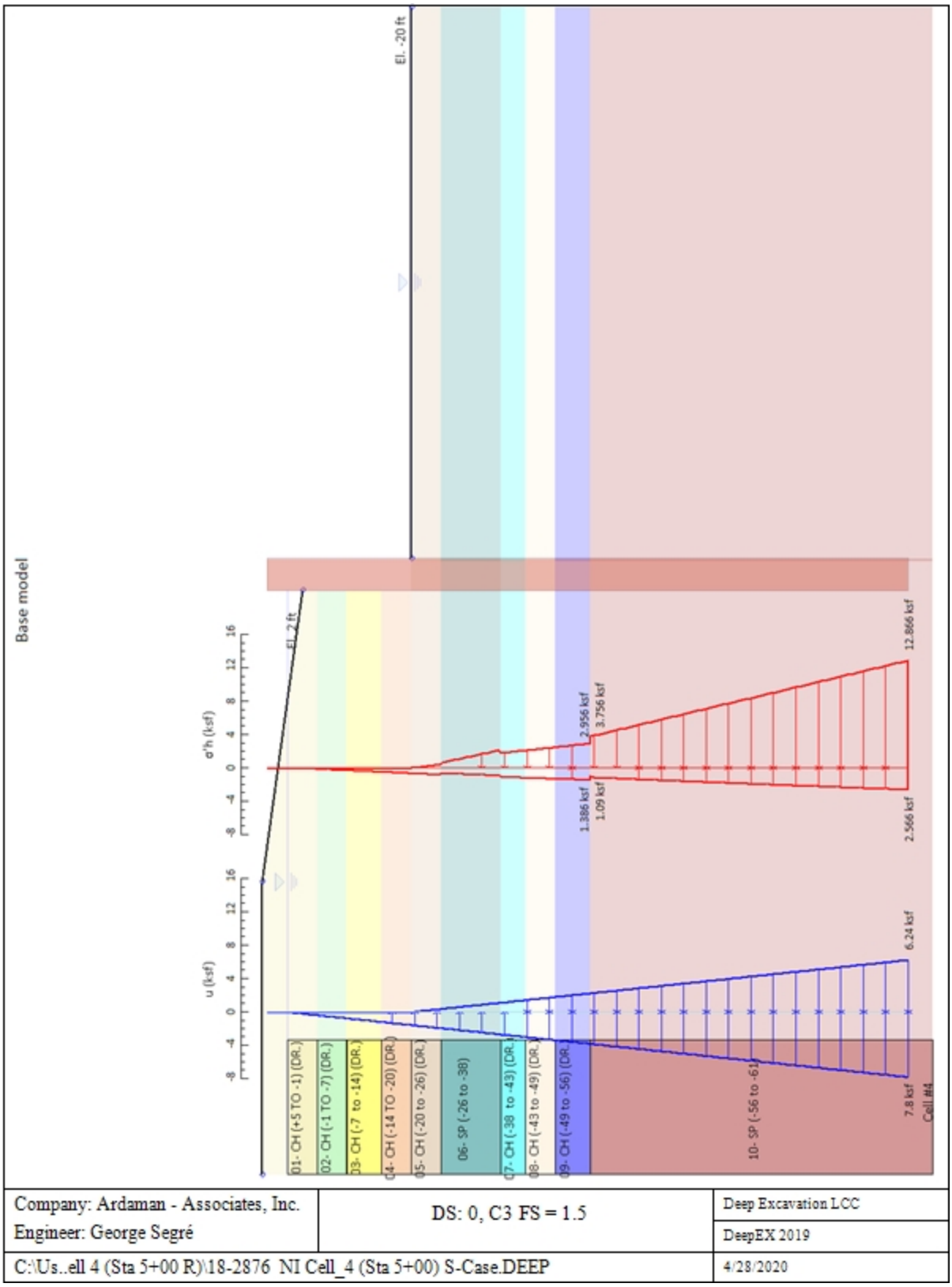

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



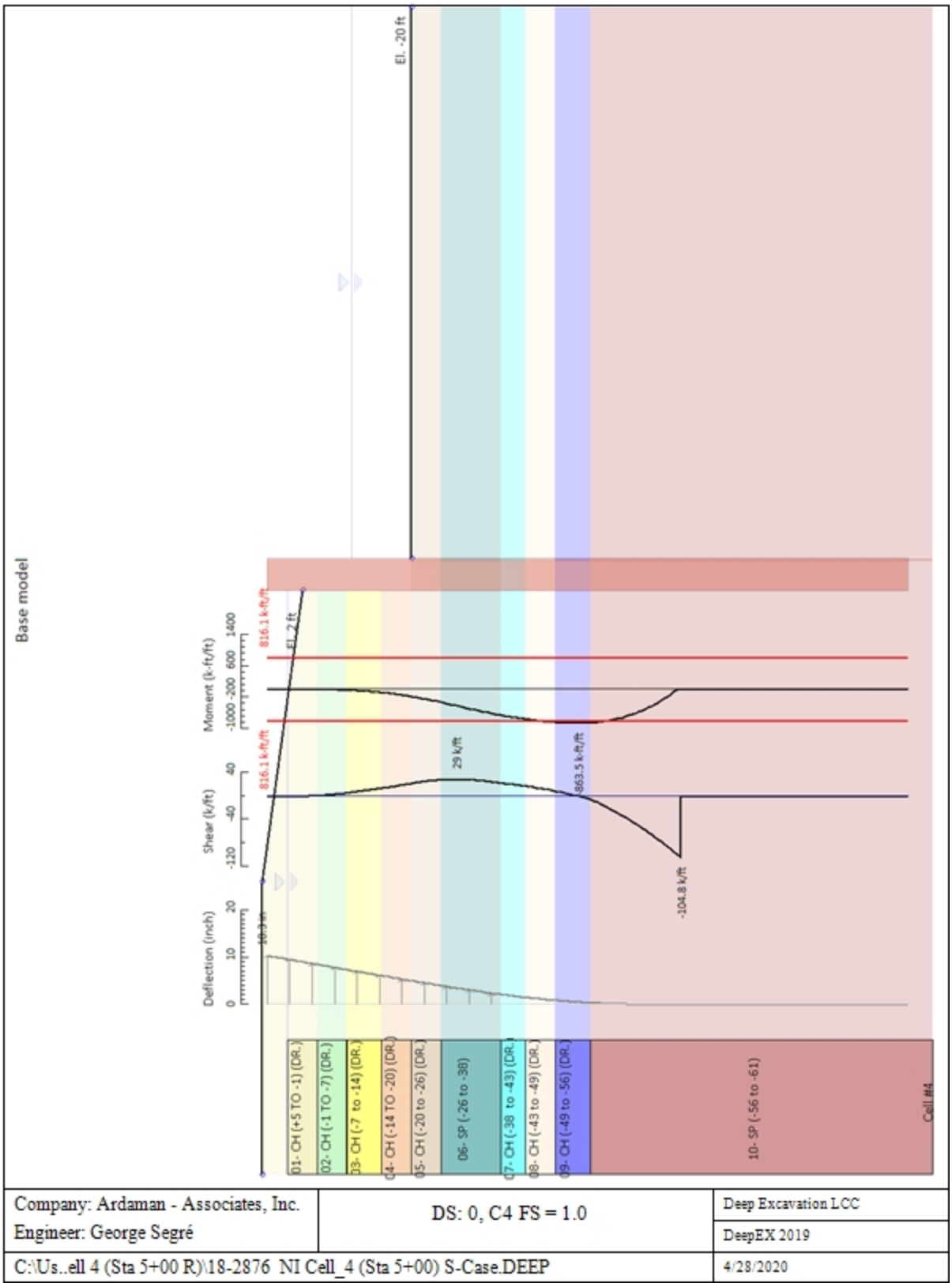

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



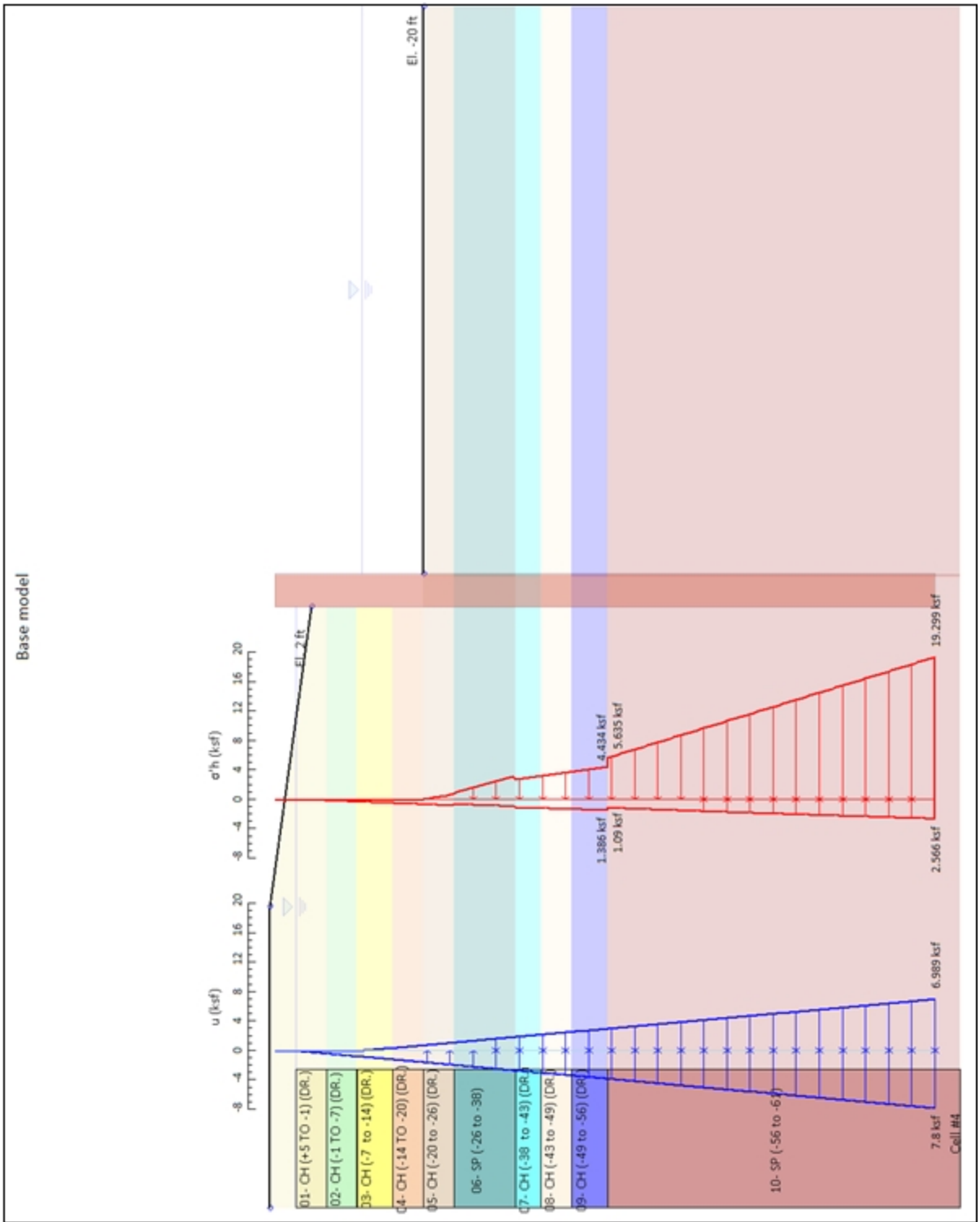

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



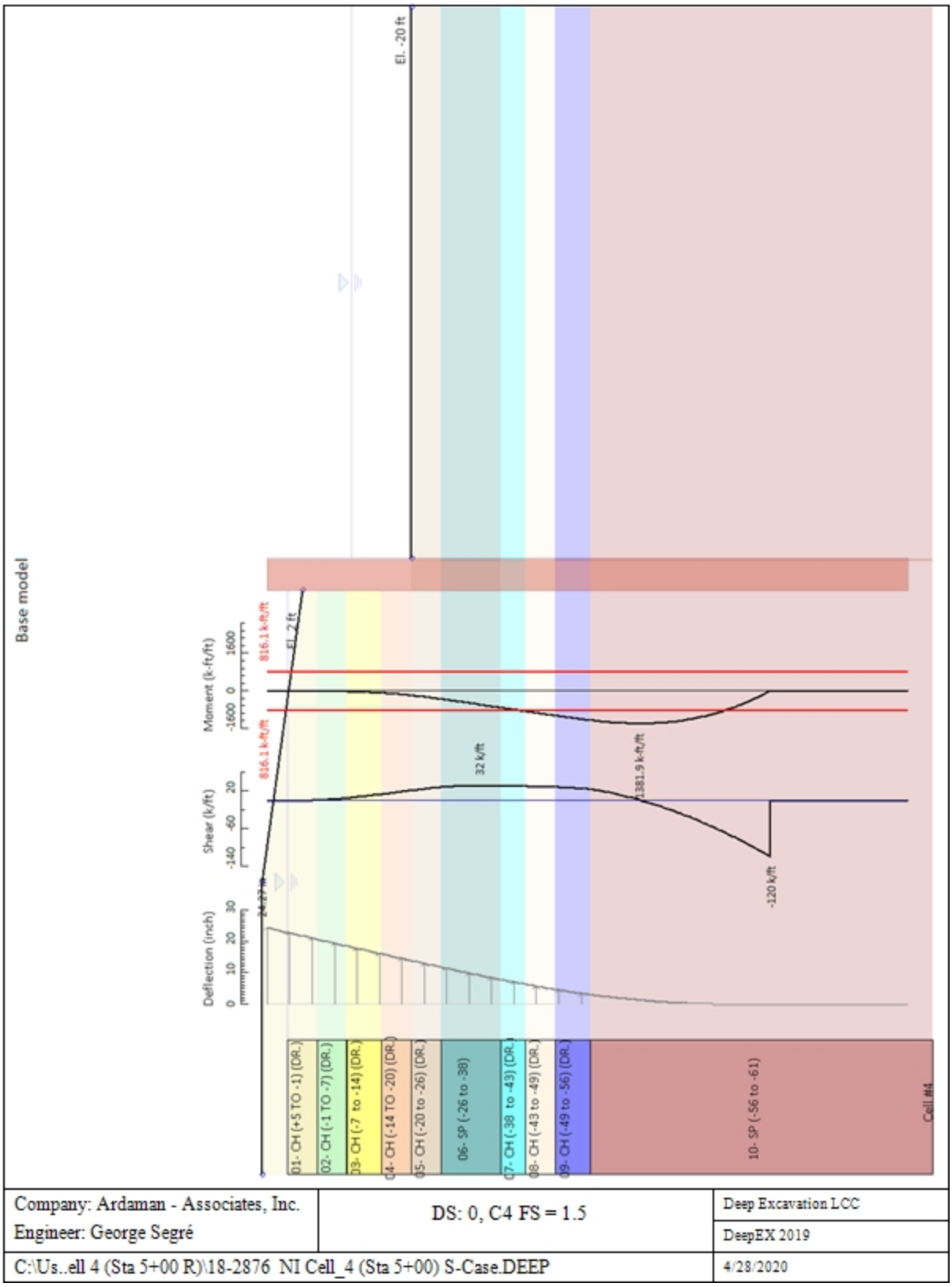

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |



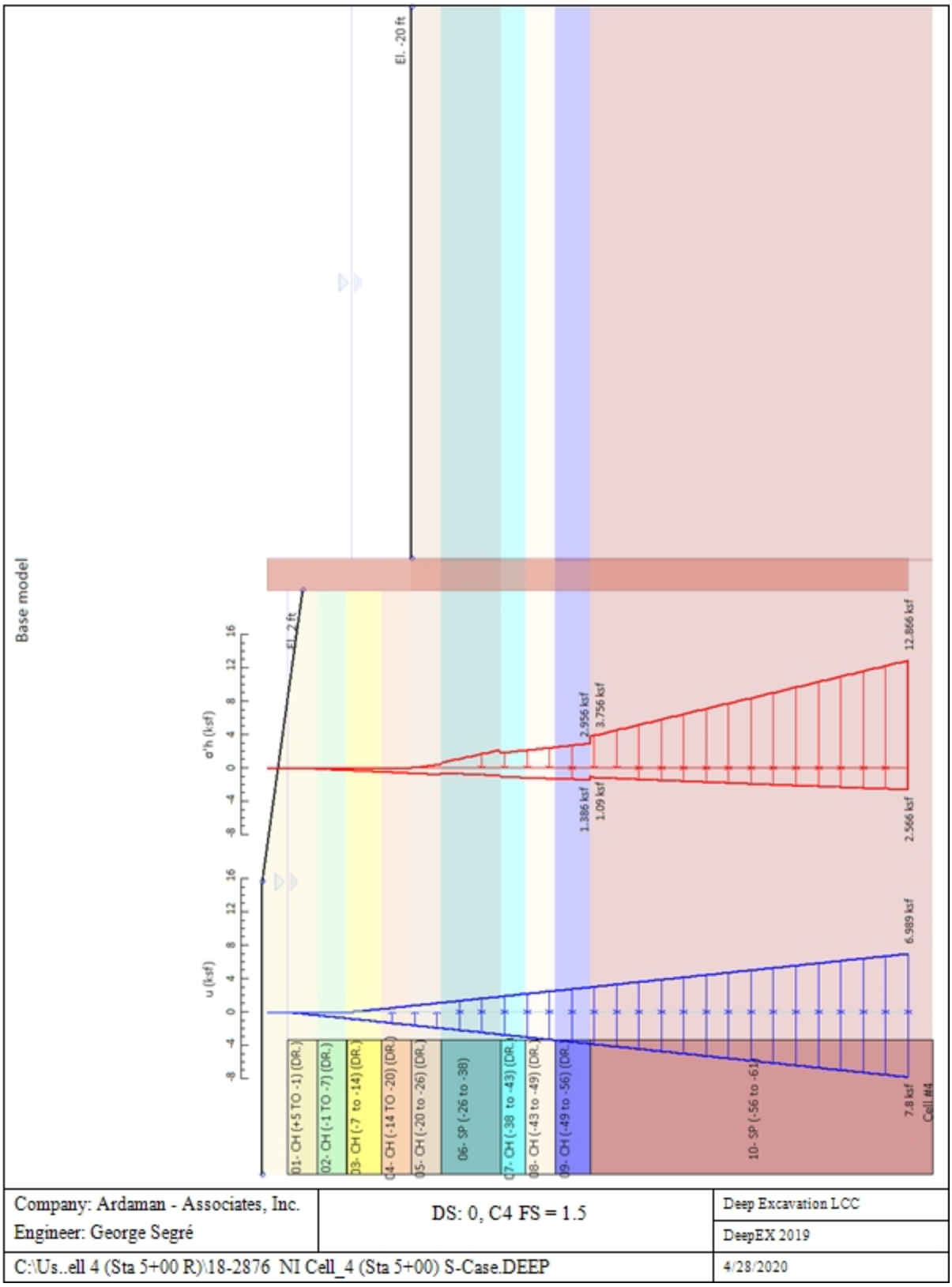

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #4 @ Sta. 8+00 Left Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -59.81 ft., NAVD88

Length of Sheetting = 68.81 ft.

Use = 70.0 ft.

Design Tip Elev. = -61.0 ft., NAVD88

Design Length of Sheeting = 70.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -38.50 | 1,541.09 | 317.96 | 0.56 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -45.50 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -34.50 | 1,192.00 | 247.53 | 0.49 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -41.00 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -28.00 | 582.76 | 105.81 | 0.41 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -41.50 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -23.00 | 456.76 | 104.83 | 0.36 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -34.00 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -49.90 | 394.98 | 50.09 | 2.27 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -59.81 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -45.45 | 309.29 | 45.07 | 1.52 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -53.37 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -41.98 | 209.56 | 37.00 | 0.87 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -57.33 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -37.53 | 147.06 | 31.54 | 0.52 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -49.00 | -- | -- | -- |
| | | | | | | Governing Value: | -59.81 | 1,541.09 | 317.96 | 2.27 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:09:01 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+5 TO | 118 | 118 | 0 | 0 | 1000 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-1 TO | 116 | 116 | 0 | 0 | 350 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-7 to | 116 | 116 | 0 | 0 | 500 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-14 T | 123 | 123 | 0 | 0 | 940 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-20 to | 115 | 115 | 0 | 0 | 350 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-26 to | 125 | 125 | 30 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 07- CH (-38 t | 100 | 100 | 0 | 0 | 2500 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-43 to | 100 | 10 | 0 | 0 | 3000 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 09- CH (-49 to | 100 | 100 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 10- SP (-56 to | 128 | 128 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+5 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-1 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-7 to | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-14 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-20 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-26 to | 0.35 | - | - | 0.5 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-38 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-43 to | 0.3 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-49 to | 0.25 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-56 to | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

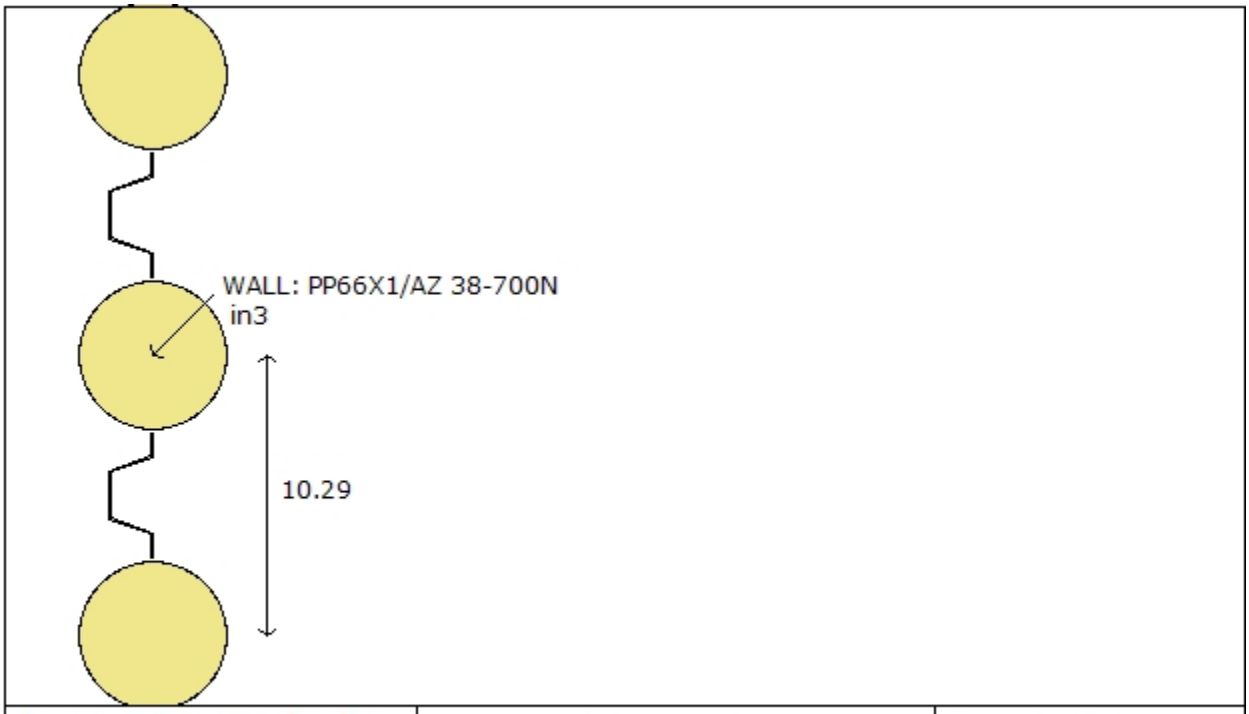
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 10 | 01- CH (+5 TO | 1 | 1 |
| -1 | 02- CH (-1 TO - | 1 | 1 |
| -7 | 03- CH (-7 to - | 1 | 1 |
| -14 | 04- CH (-14 TO | 1 | 1 |
| -20 | 05- CH (-20 to | 1 | 1 |
| -26 | 06- SP (-26 to - | 1 | 0.5 |
| -38 | 07- CH (-38 to | 1 | 1 |
| -43 | 08- CH (-43 to | 1 | 1 |
| -49 | 09- CH (-49 to | 1 | 1 |
| -56 | 10- SP (-56 to - | 1 | 0.47 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -91 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.721 | 2.99 | 4.118 |
| Stage 1 | Simple span | N/A | 1.6 | 2.213 | 2.392 | 3.294 |
| Stage 2 | Simple span | N/A | 1.6 | 3.132 | 3.52 | 4.779 |
| Stage 3 | Simple span | N/A | 1.6 | 2.515 | 2.816 | 3.823 |
| Stage 4 | Simple span | N/A | 1.6 | 3.739 | 3.739 | 4.899 |
| Stage 5 | Simple span | N/A | 1.6 | 2.478 | 2.492 | 3.266 |
| Stage 6 | Simple span | N/A | 1.6 | 4.605 | 4.605 | 5.865 |
| Stage 7 | Simple span | N/A | 1.6 | 3.07 | 3.07 | 3.91 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

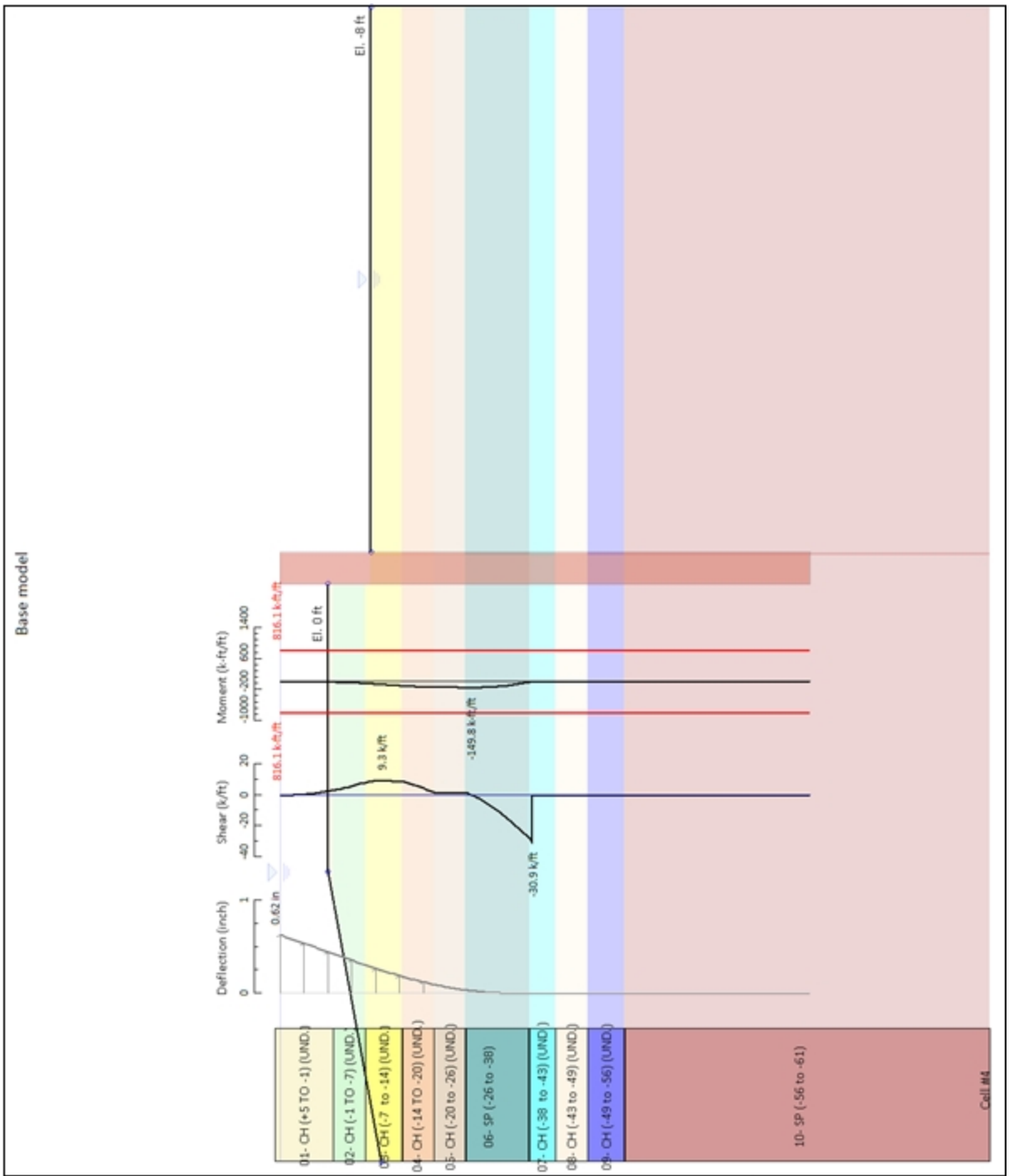
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

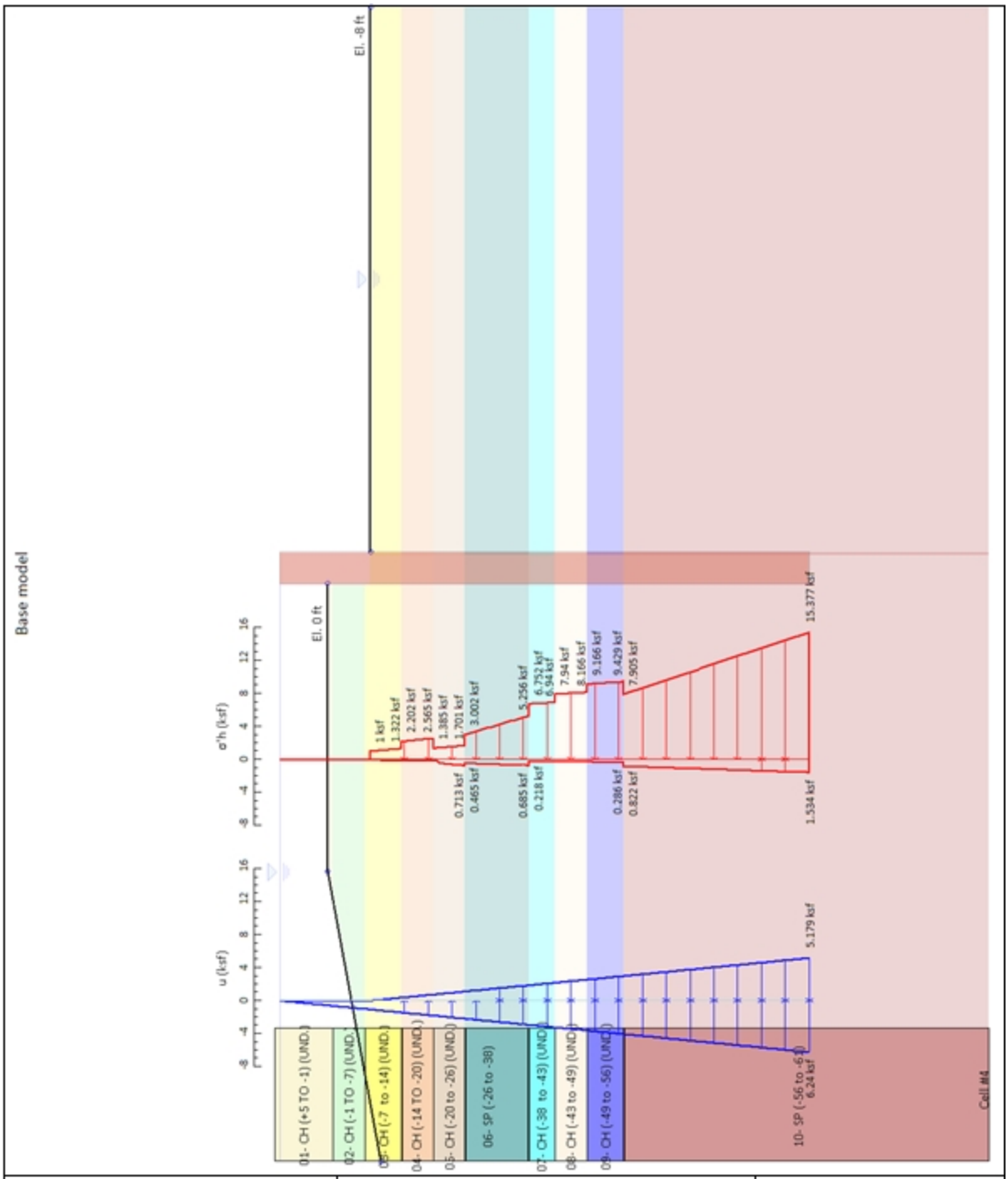
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

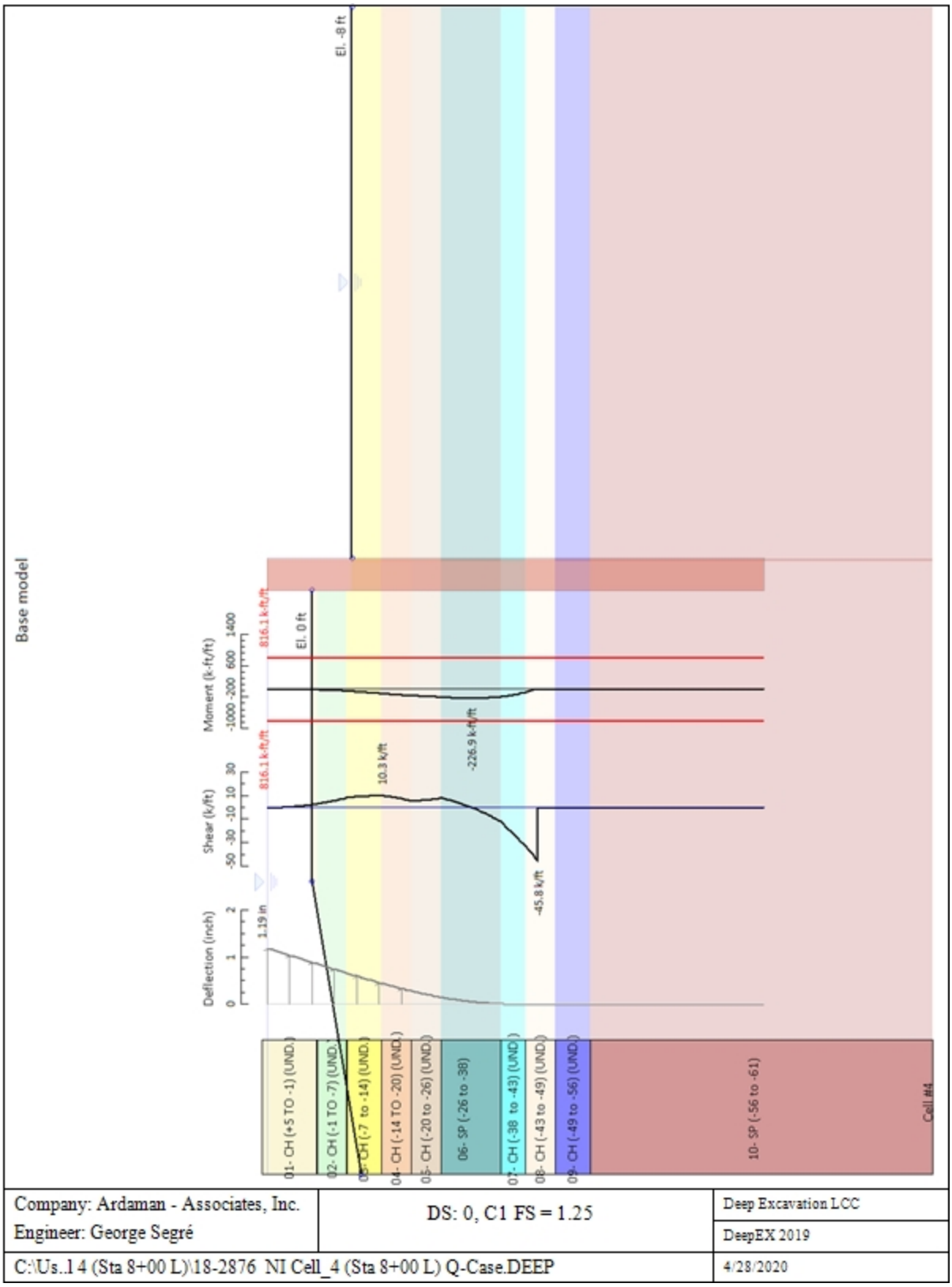
A sequence of figures for each excavation stage is reported



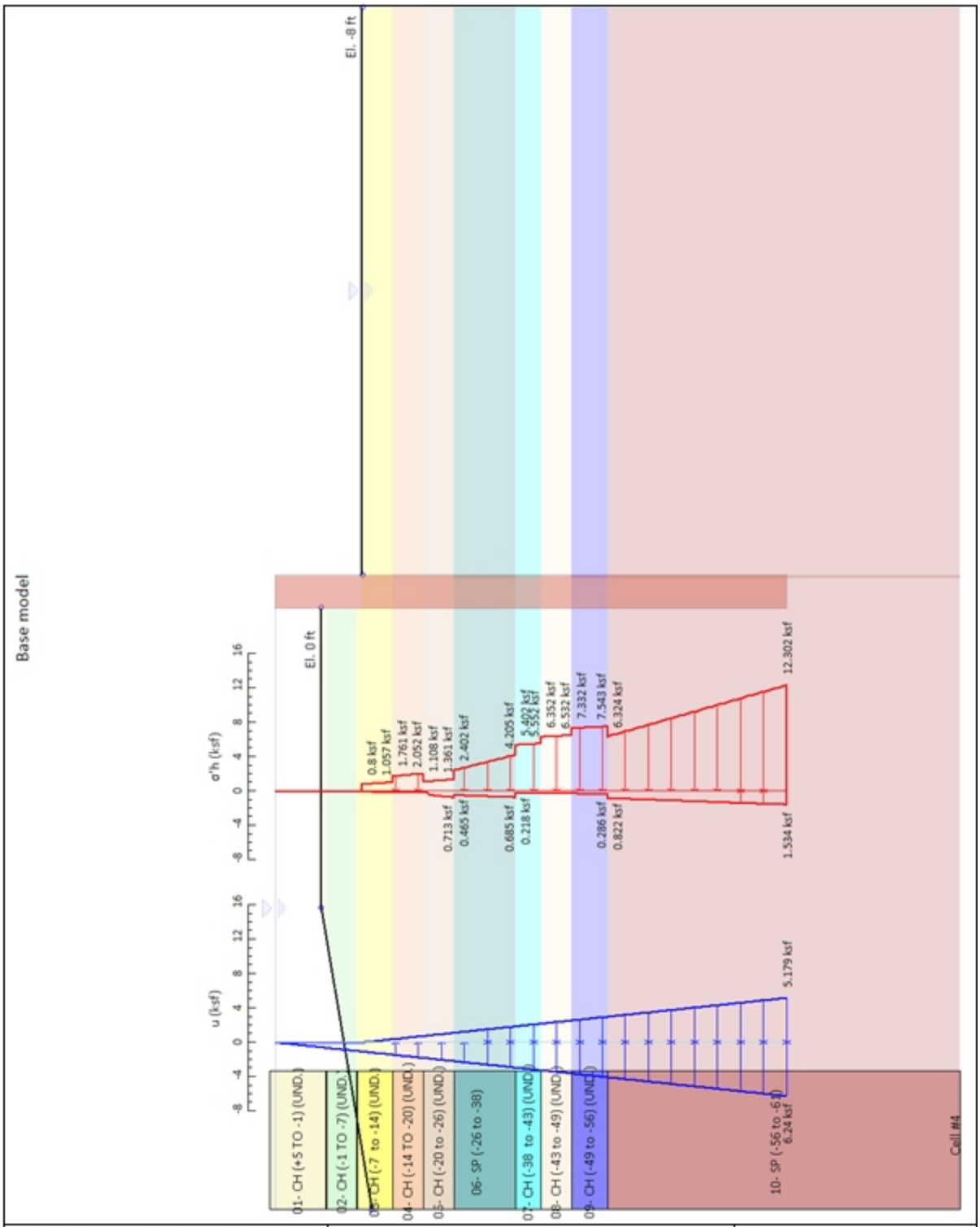

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |



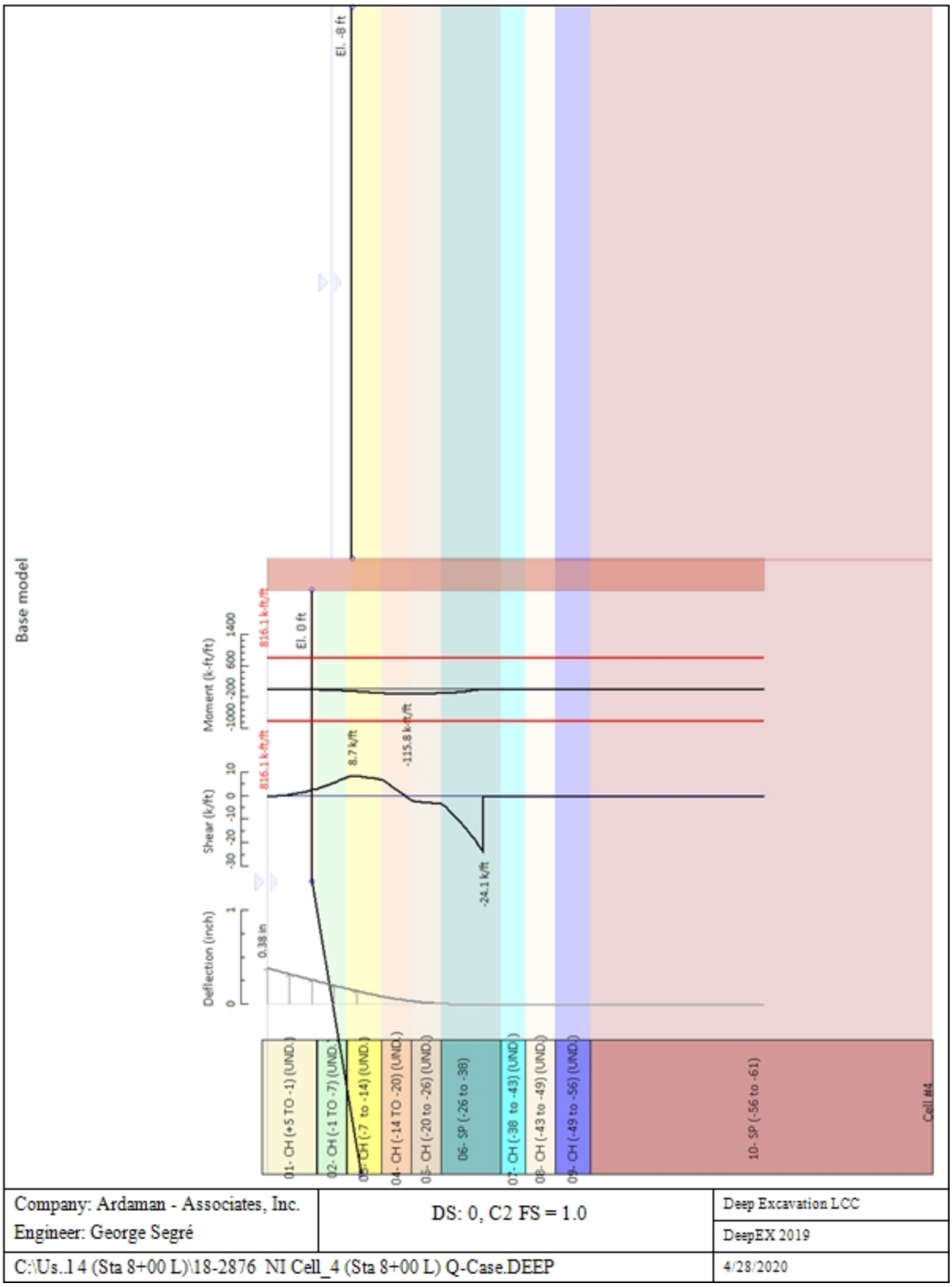

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |



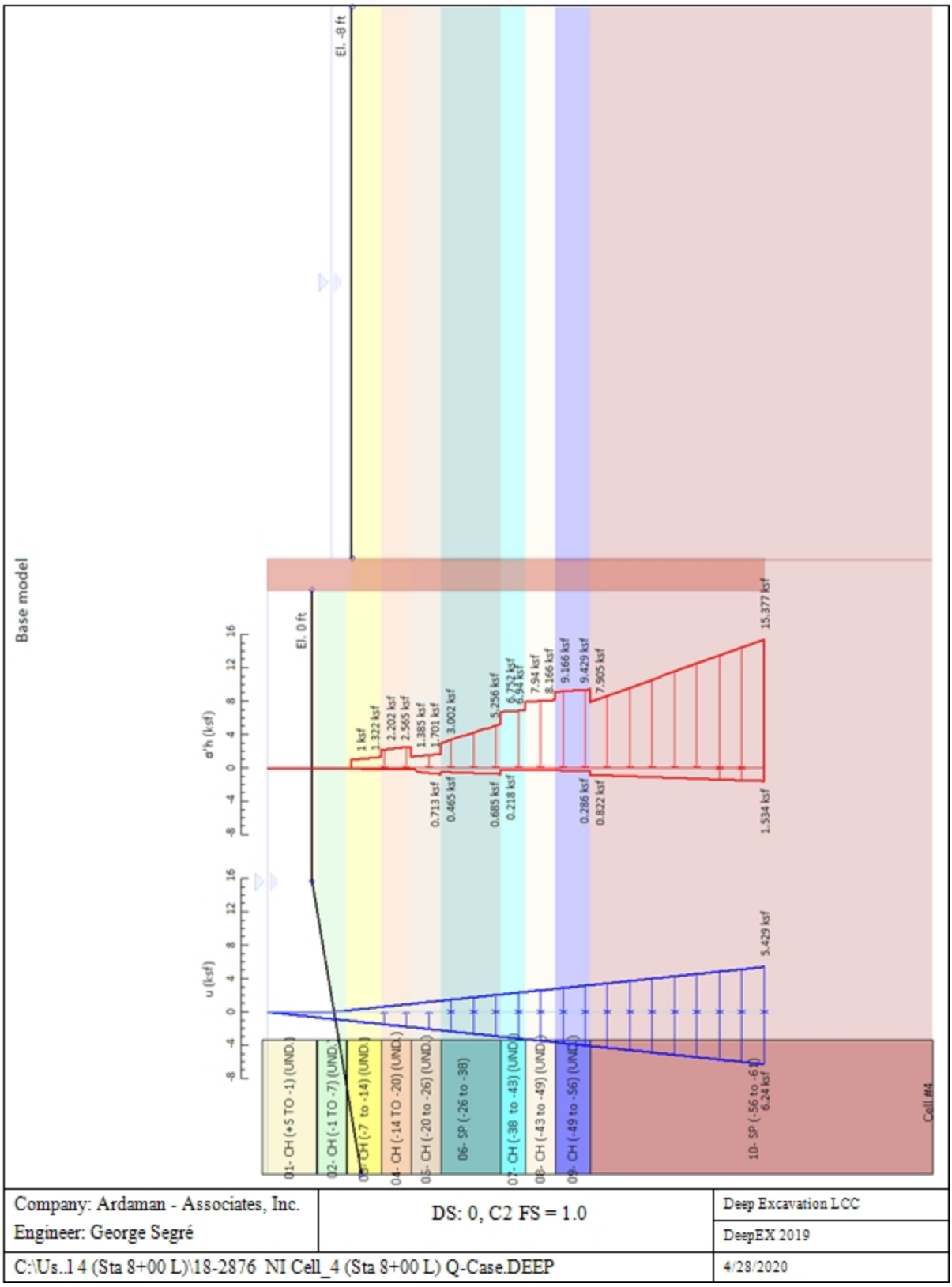

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |



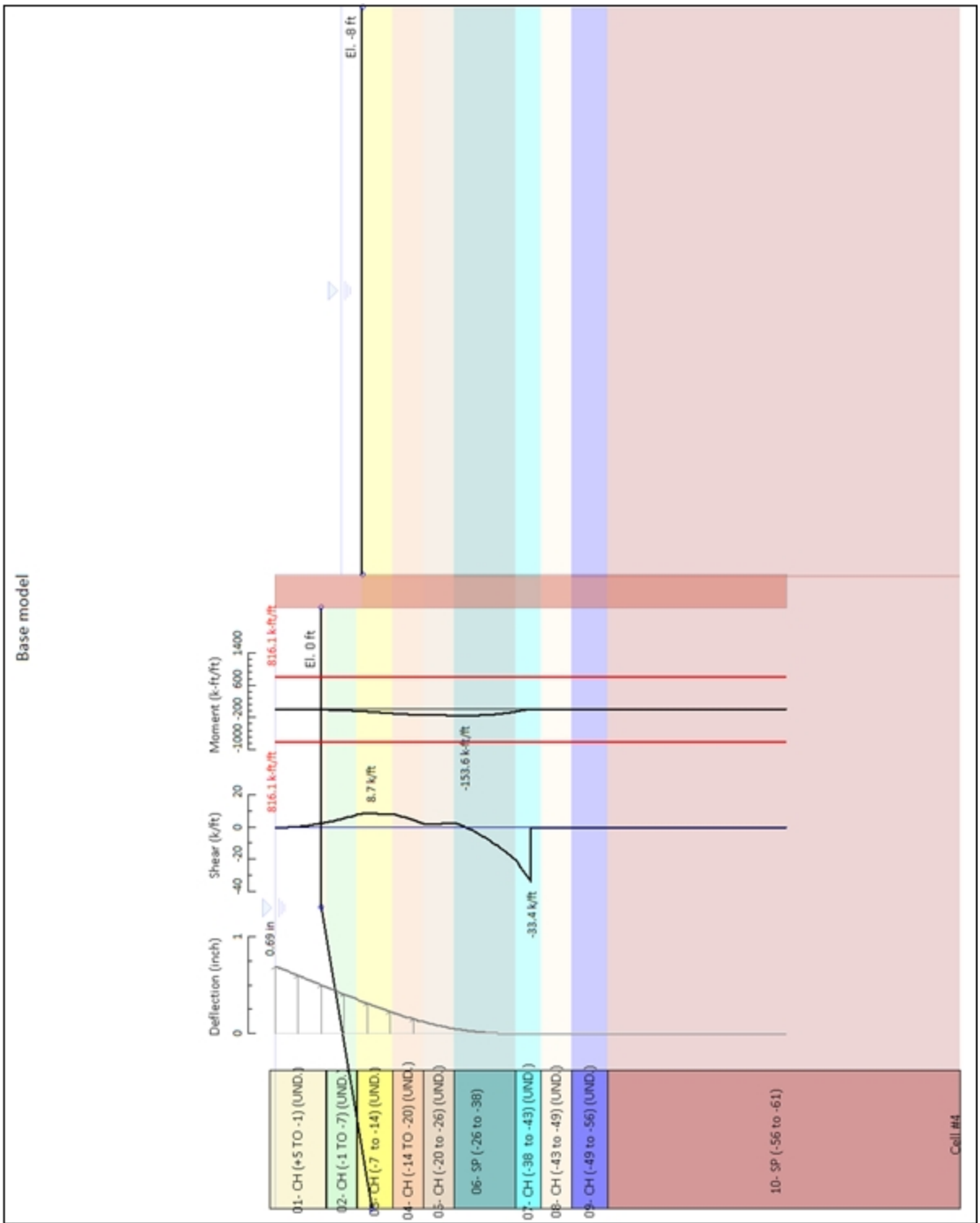

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |



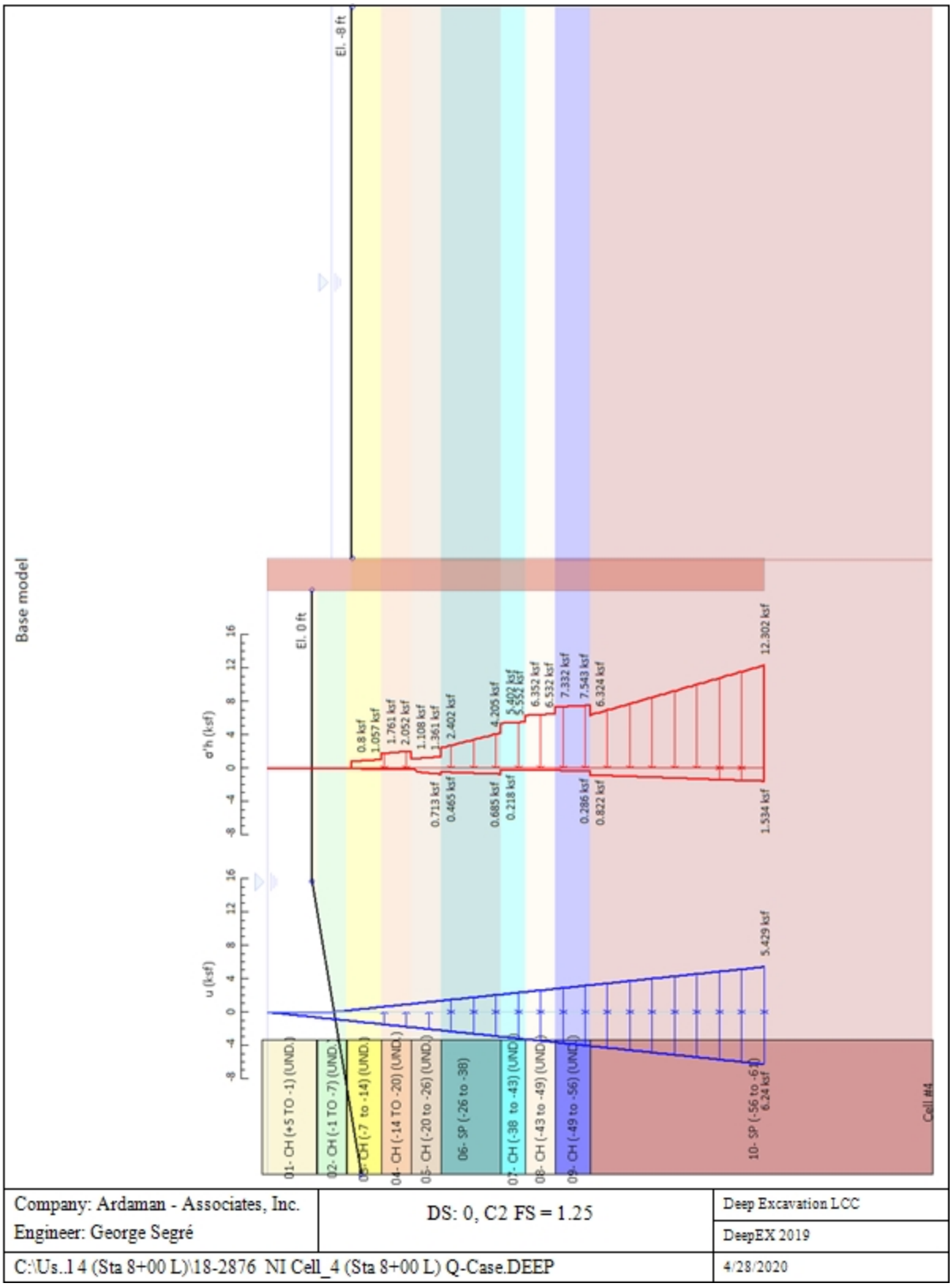

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |



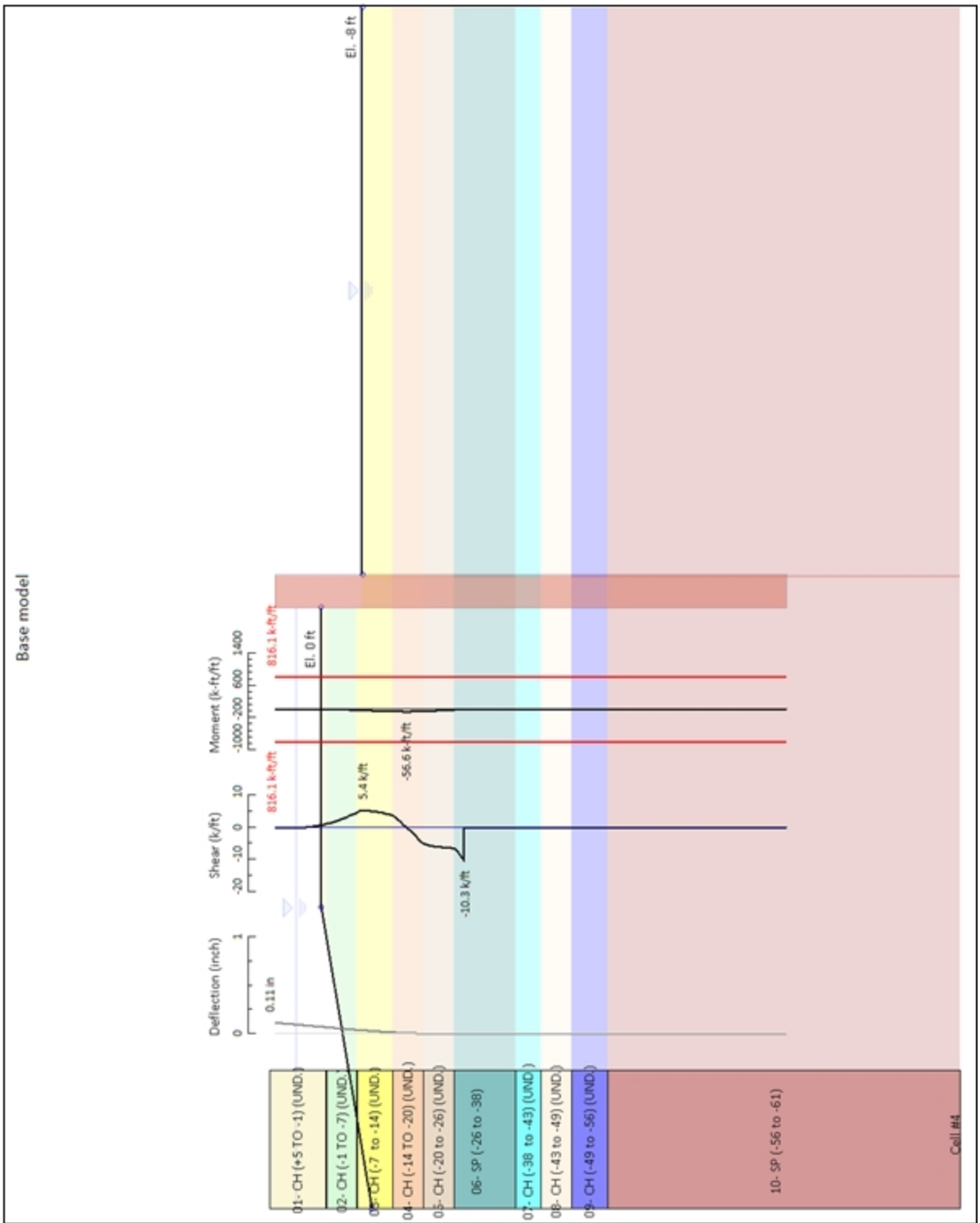

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |



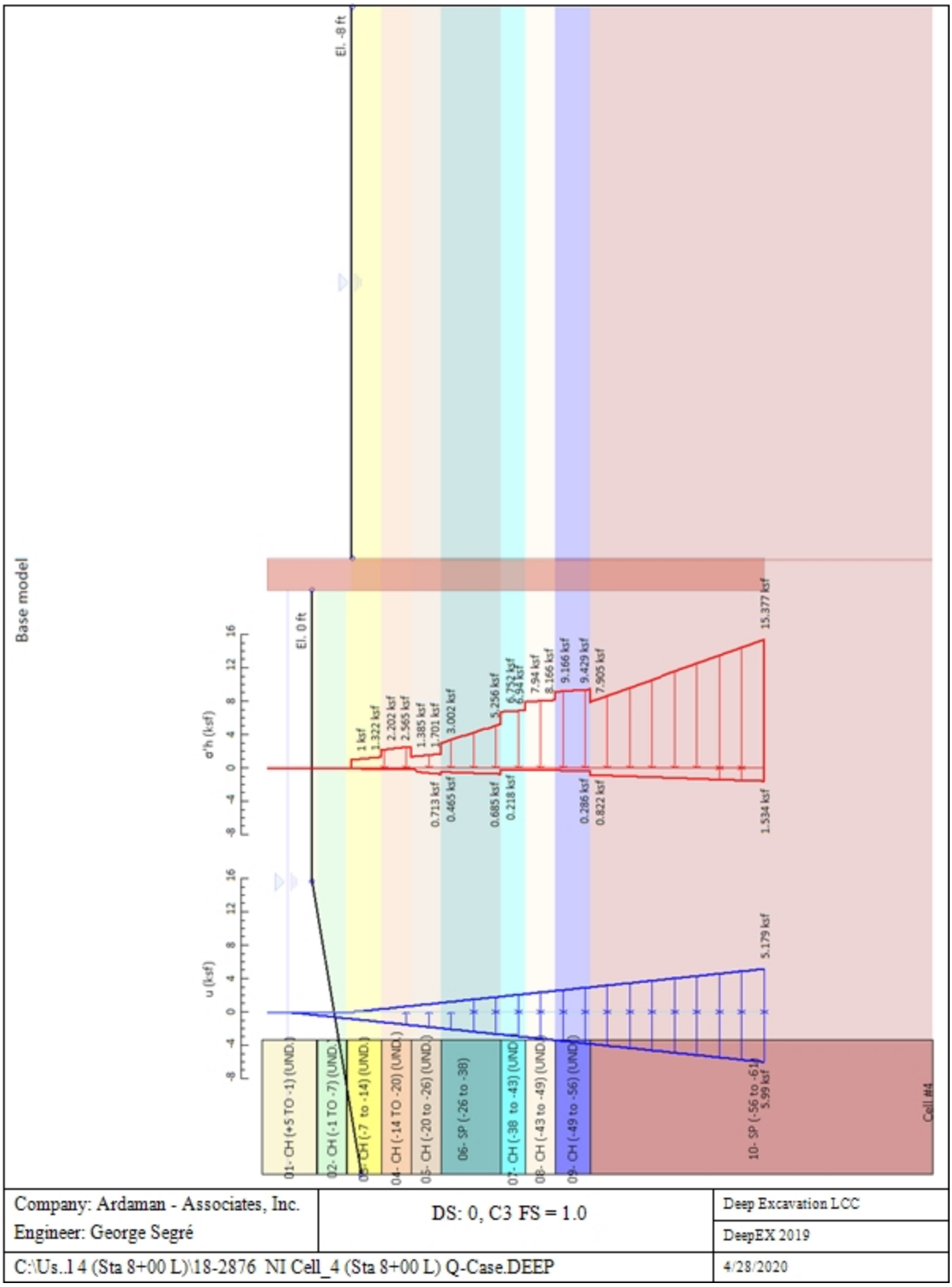

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |



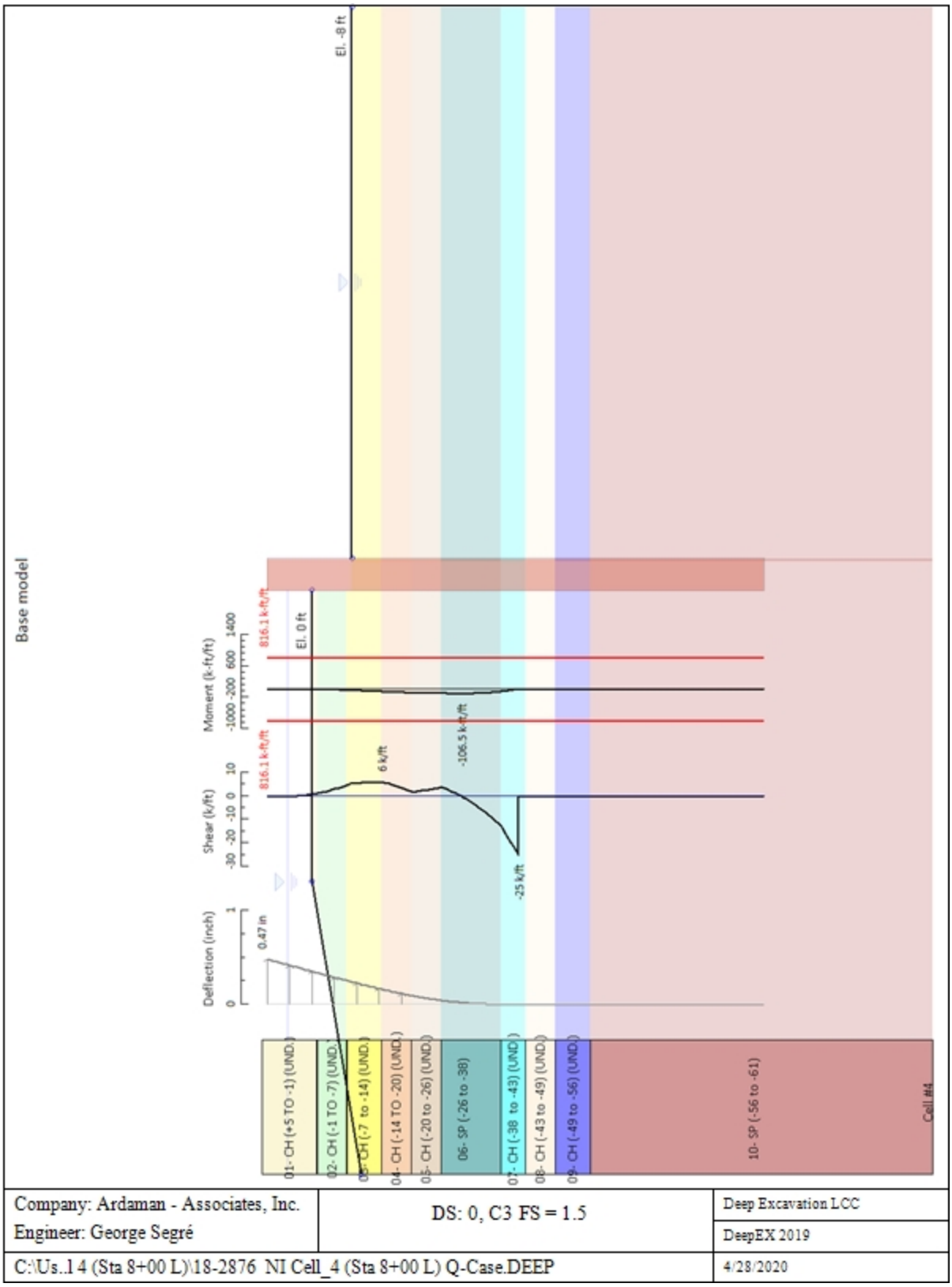

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |

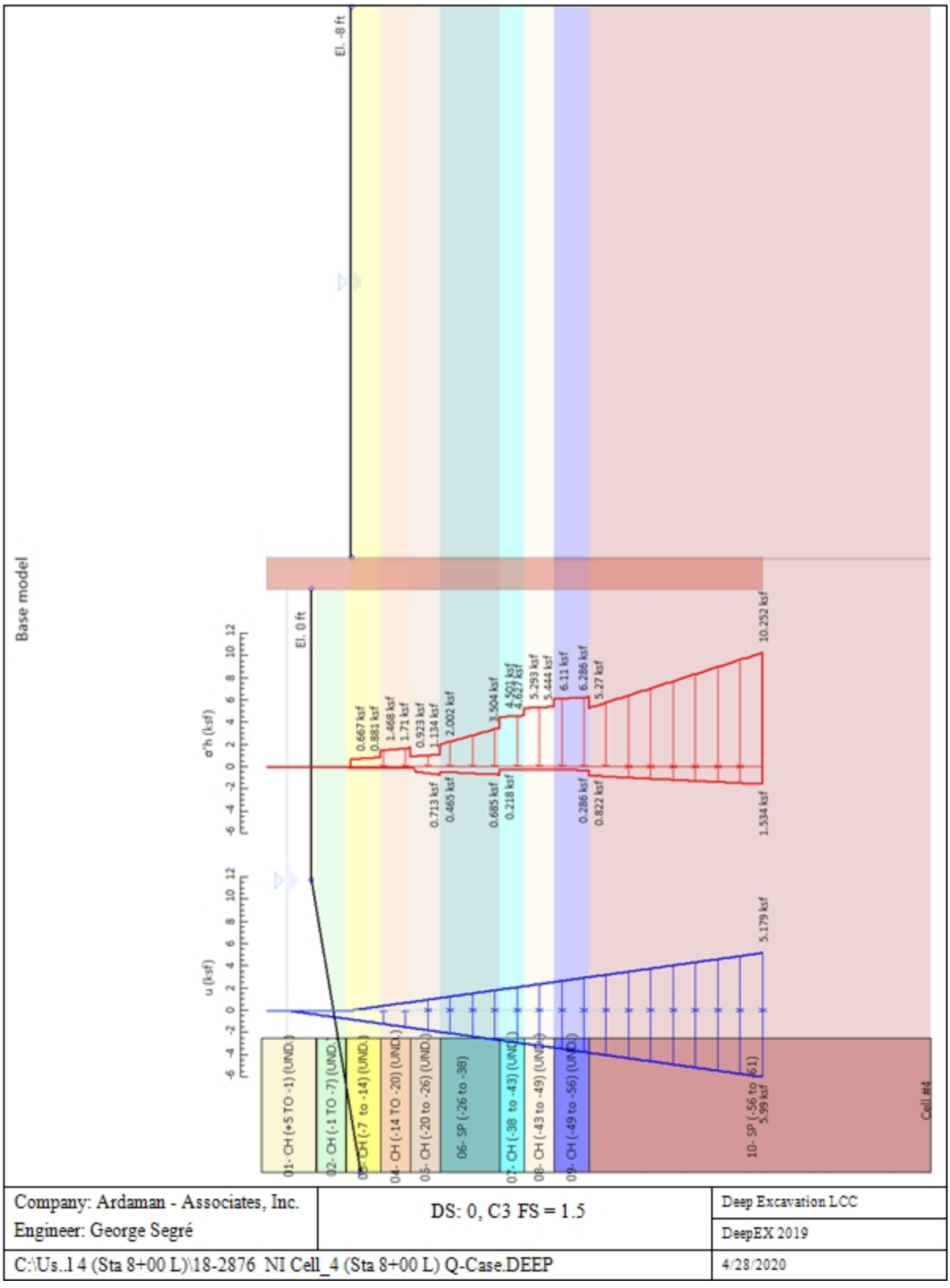



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |

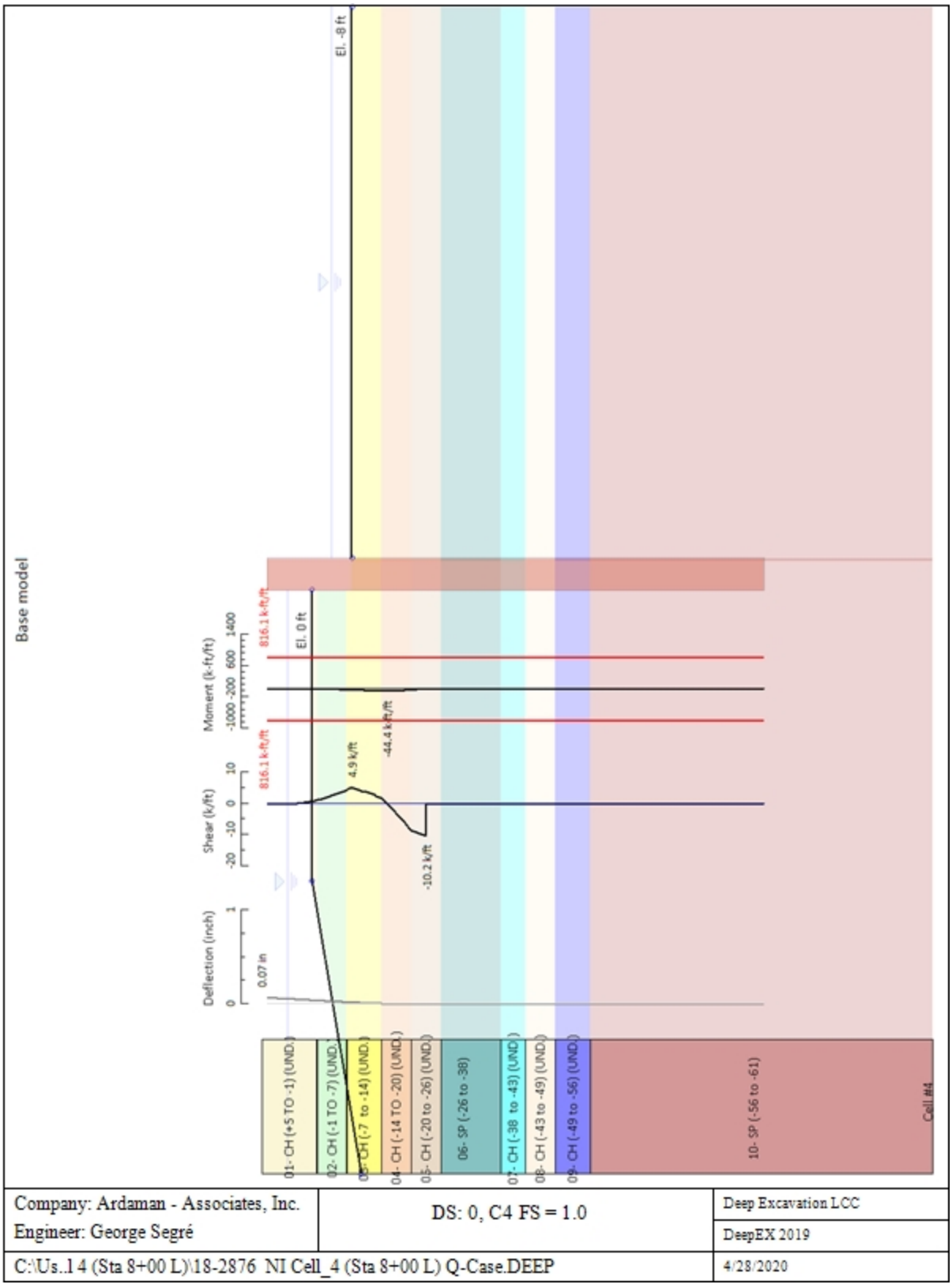


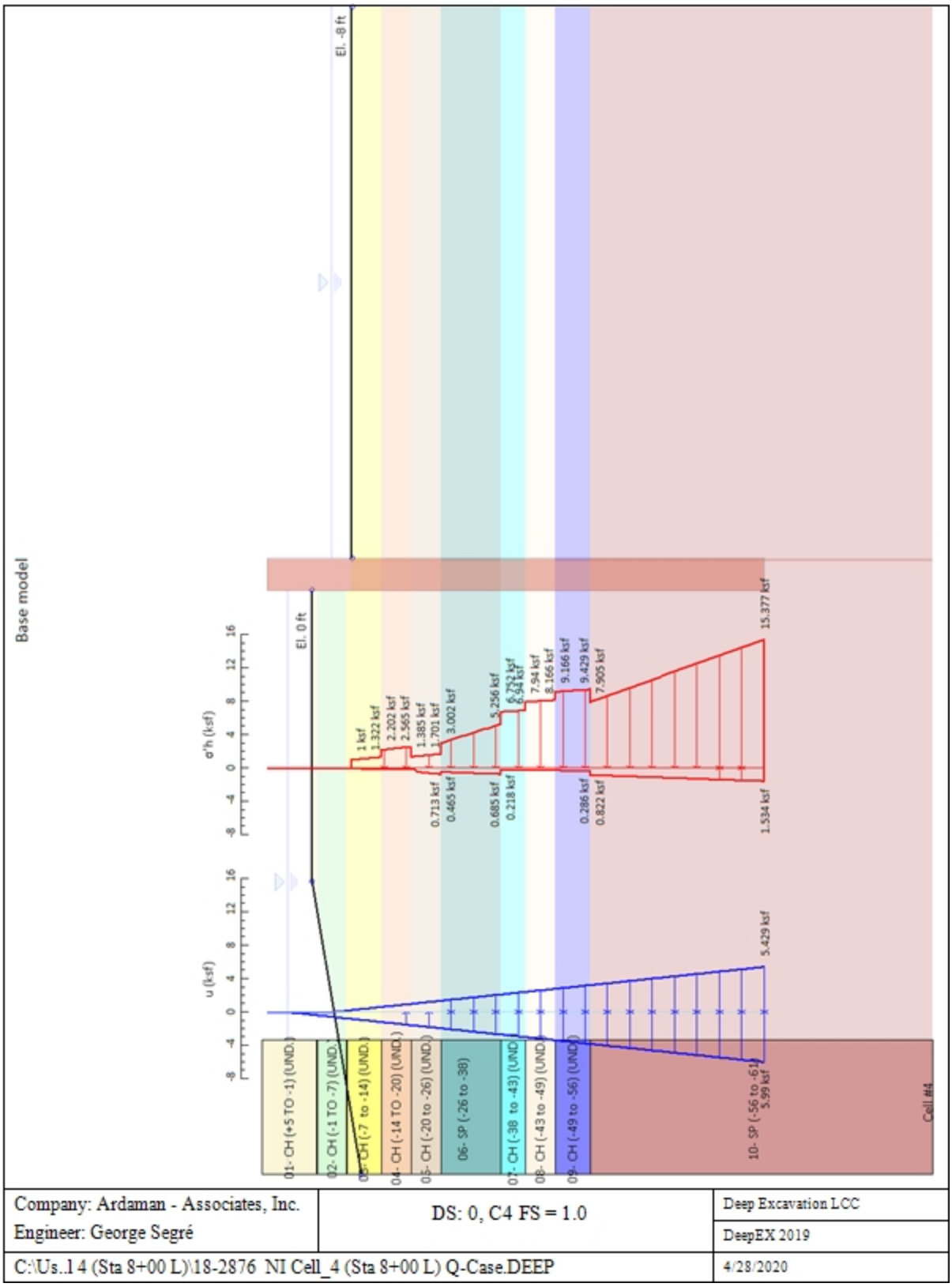

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -8 ft
El. 0 ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
6 k/ft
-106.5 k-ft/ft
-25 k/ft
Deflection (inch)
0 1
0.47 in
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP
4/28/2020

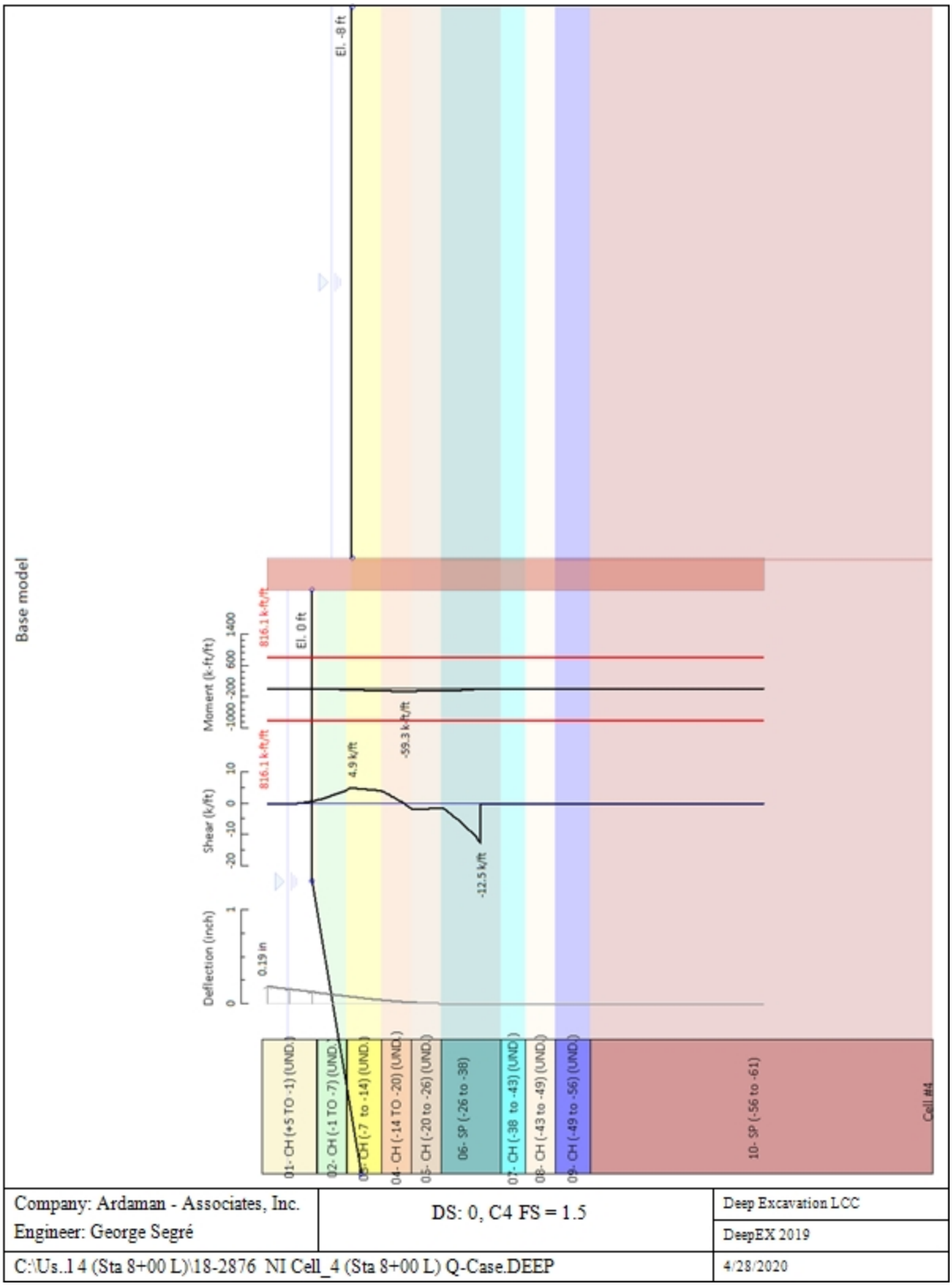



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |

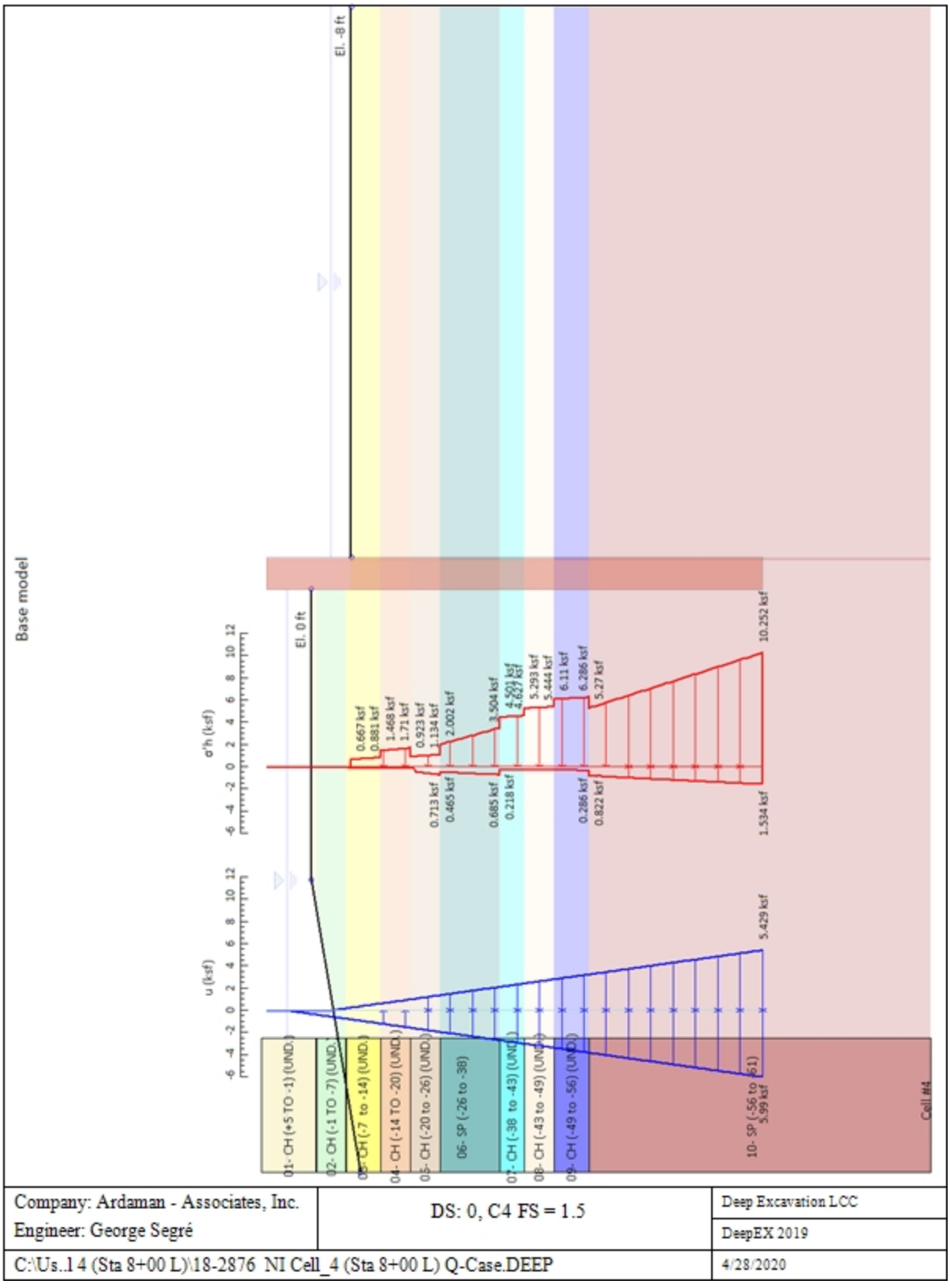

Base model
El. -8 ft
El. 0 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-44.4 k-ft/ft
Shear (k/ft)
-20 -10 0 10
4.9 k/ft
-10.2 k/ft
Deflection (inch)
0 1
0.07 in
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP
4/28/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:15:21 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+5 TO | 118 | 118 | 26 | 0 | 1000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | EXP | |
| 02- CH (-1 TO | 116 | 116 | 23 | 0 | 350 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-7 to | 116 | 116 | 23 | 0 | 500 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-14 T | 123 | 123 | 23 | 0 | 940 | 23 | 23 | 521.92 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 05- CH (-20 to | 115 | 115 | 23 | 0 | 350 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-26 to | 125 | 125 | 30 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 07- CH (-38 t | 100 | 100 | 26 | 0 | 2500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- CH (-43 to | 100 | 10 | 26 | 0 | 3000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 09- CH (-49 to | 100 | 100 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 10- SP (-56 to | 128 | 128 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+5 TO | 0.4 | 0.1 | 0 | 0.562 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-1 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-7 to | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-14 T | 0.35 | 0.1 | 0 | 0.609 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-20 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-26 to | 0.35 | - | - | 0.5 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-38 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-43 to | 0.3 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-49 to | 0.25 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-56 to | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

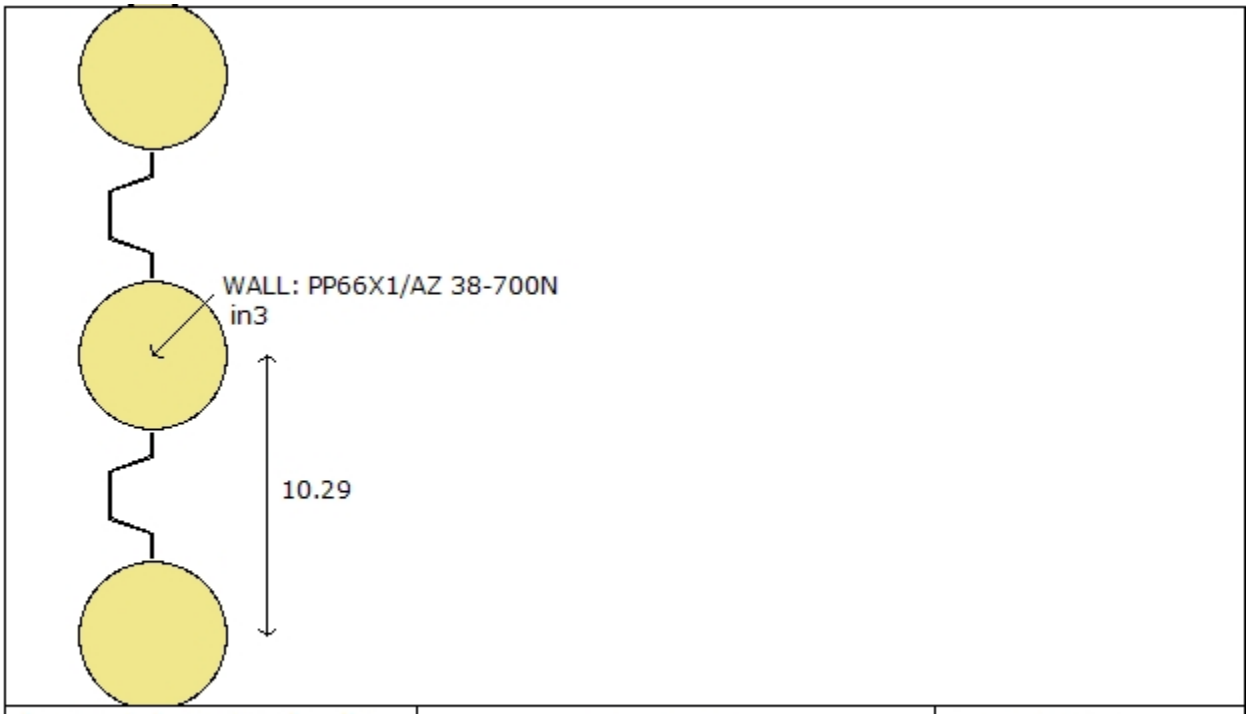
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- CH (+5 TO | 1 | 0.56 |
| -1 | 02- CH (-1 TO - | 1 | 0 |
| -7 | 03- CH (-7 to - | 1 | 0.61 |
| -14 | 04- CH (-14 TO | 1 | 0.61 |
| -20 | 05- CH (-20 to | 1 | 0 |
| -26 | 06- SP (-26 to - | 1 | 0.5 |
| -38 | 07- CH (-38 to | 1 | 0.56 |
| -43 | 08- CH (-43 to | 1 | 0.56 |
| -49 | 09- CH (-49 to | 1 | 0.56 |
| -56 | 10- SP (-56 to - | 1 | 0.47 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.957 | 2.118 | 3.252 |
| Stage 1 | Simple span | N/A | 1.6 | 1.583 | 1.694 | 2.602 |
| Stage 2 | Simple span | N/A | 1.6 | 2.19 | 2.435 | 3.709 |
| Stage 3 | Simple span | N/A | 1.6 | 1.807 | 1.948 | 2.967 |
| Stage 4 | Simple span | N/A | 1.6 | 2.413 | 2.563 | 3.791 |
| Stage 5 | Simple span | N/A | 1.6 | 1.662 | 1.709 | 2.527 |
| Stage 6 | Simple span | N/A | 1.6 | 2.777 | 3.043 | 4.427 |
| Stage 7 | Simple span | N/A | 1.6 | 2 | 2.029 | 2.951 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

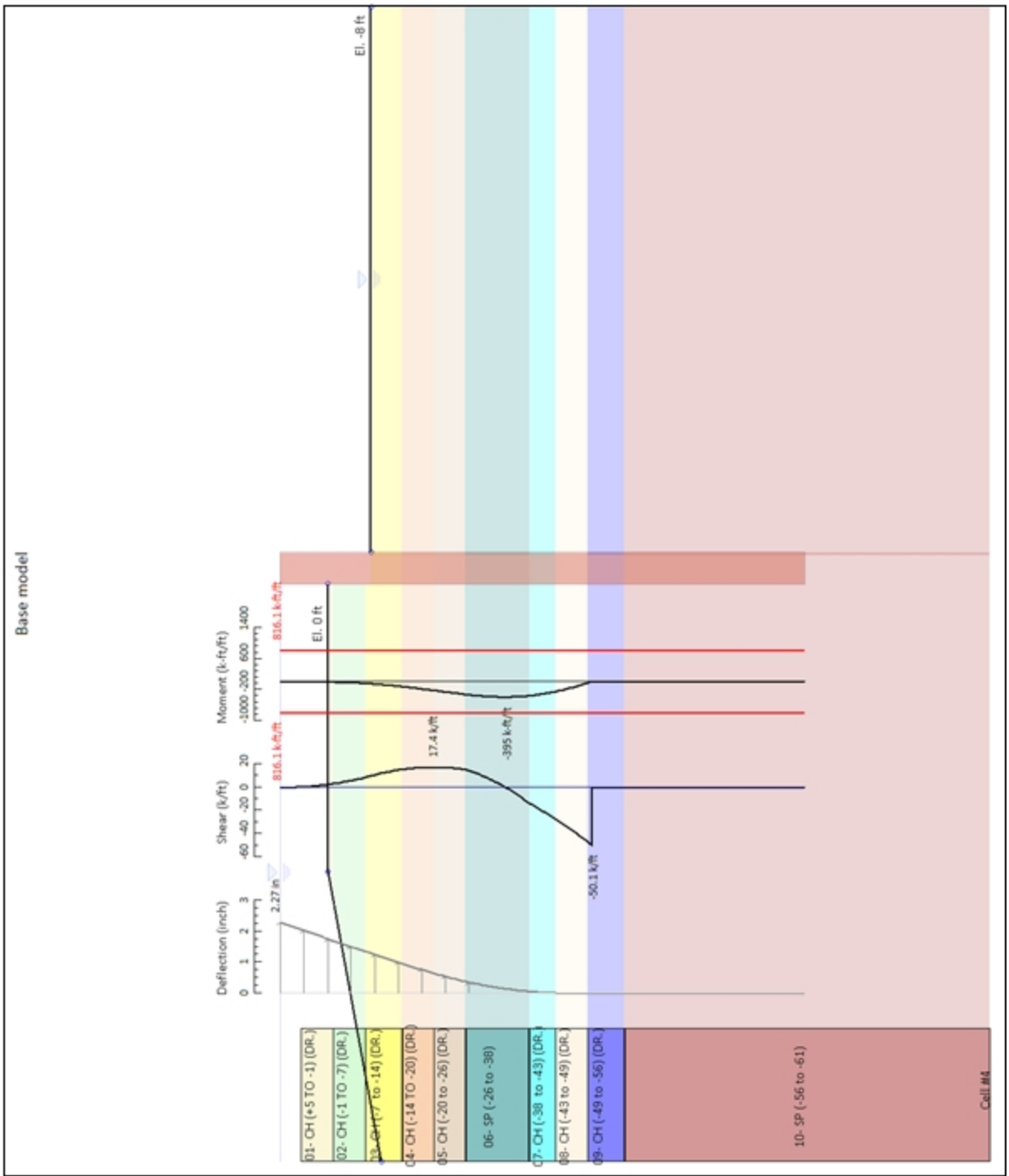
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

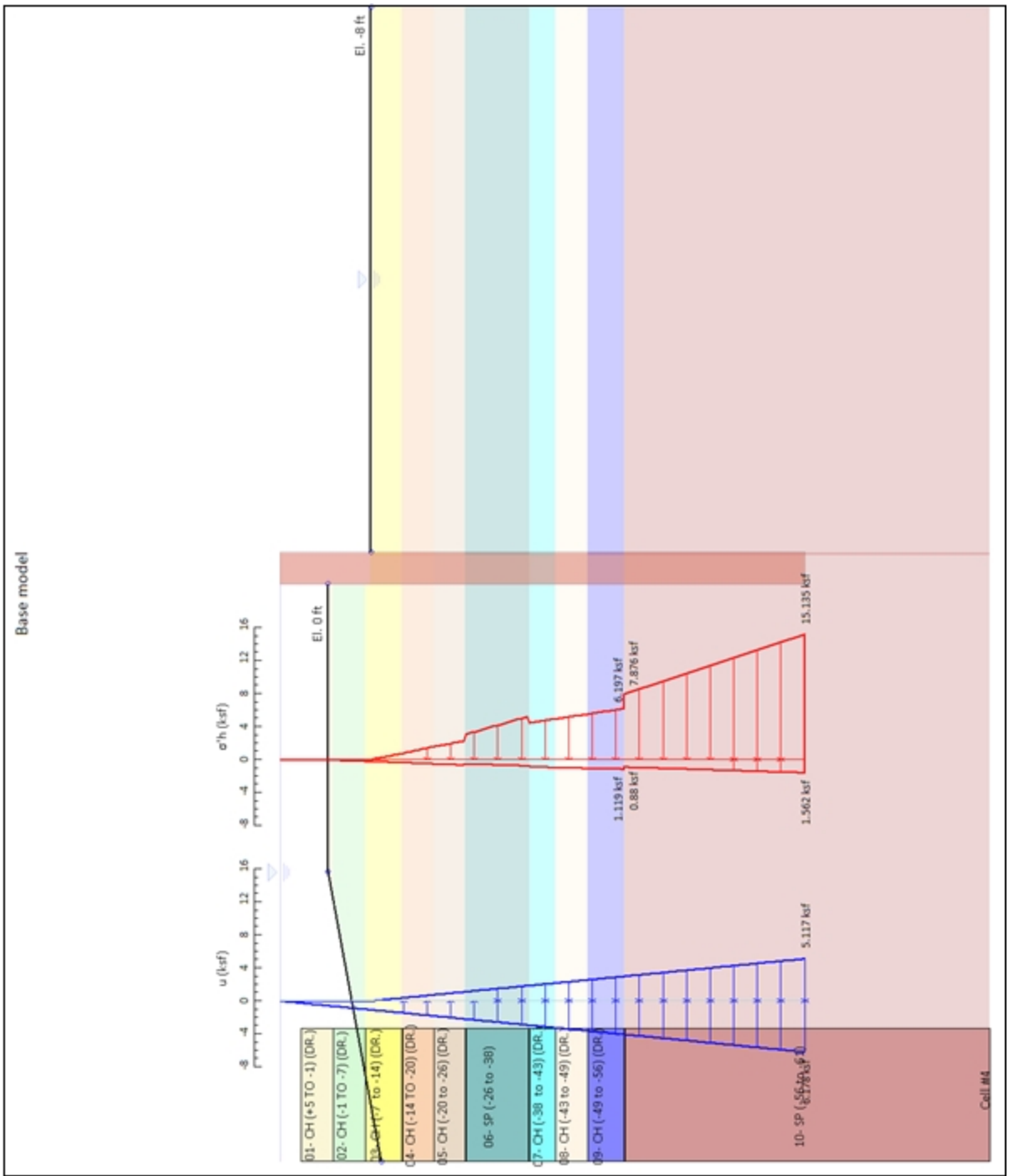
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

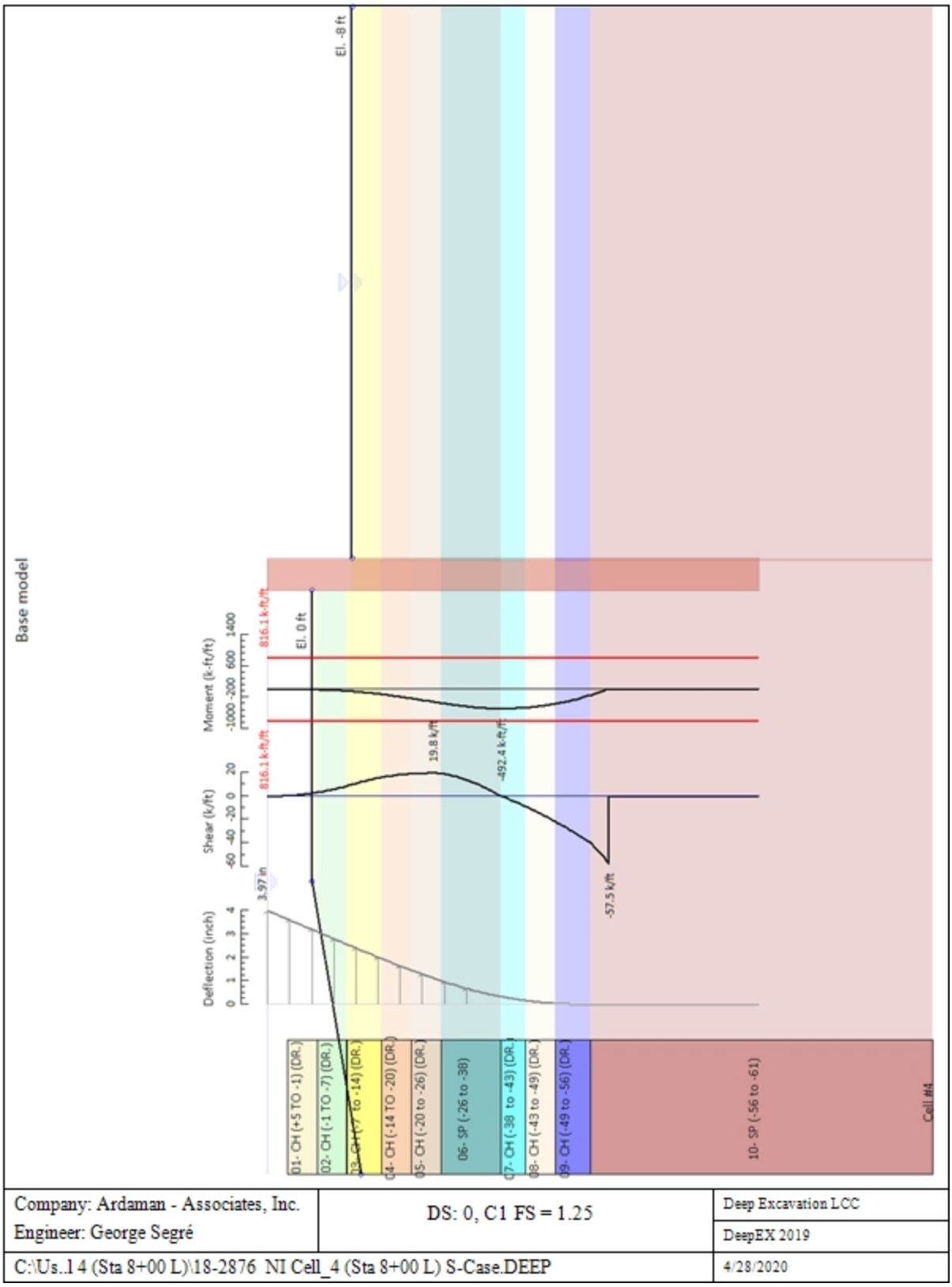
A sequence of figures for each excavation stage is reported



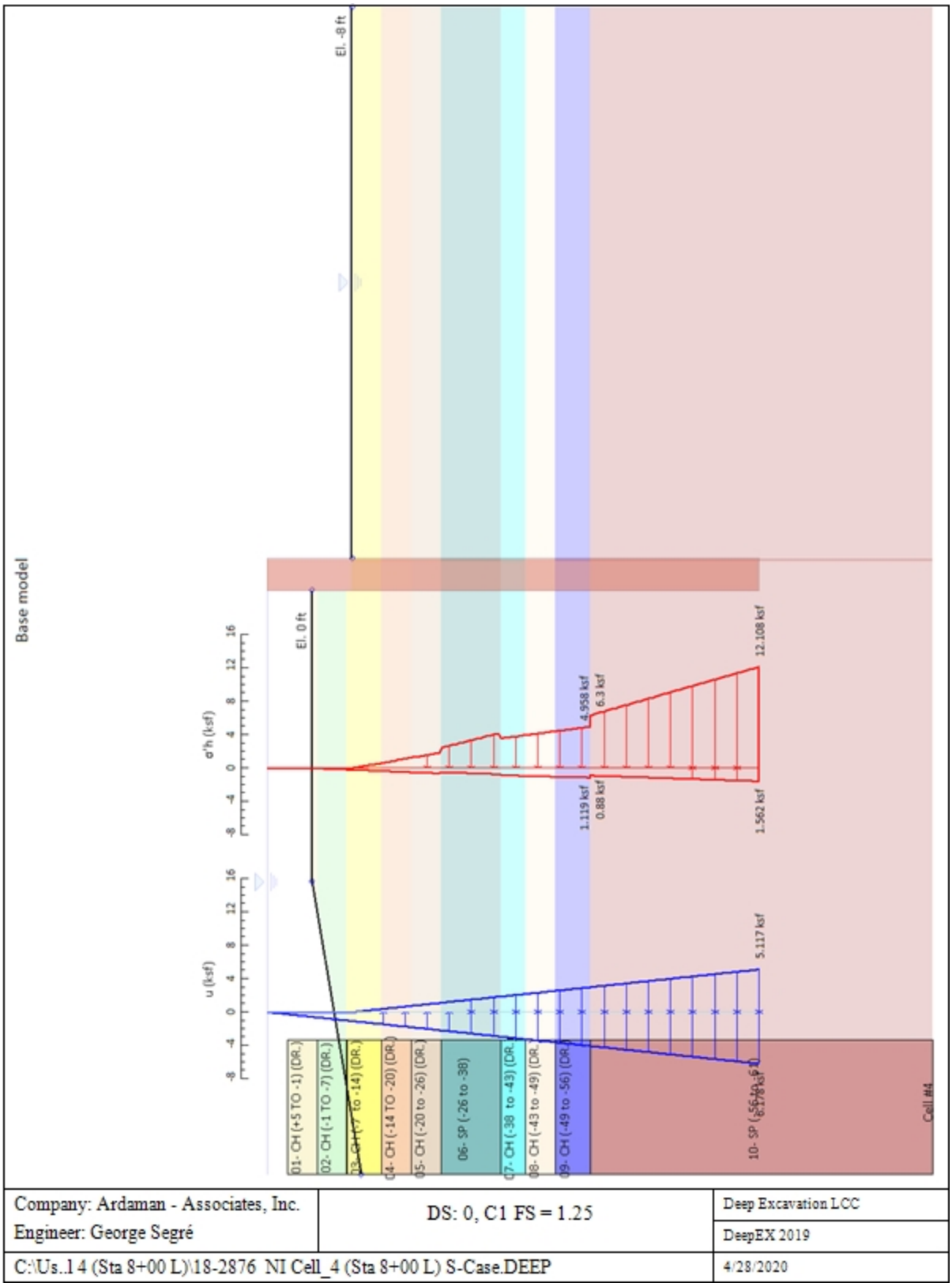

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



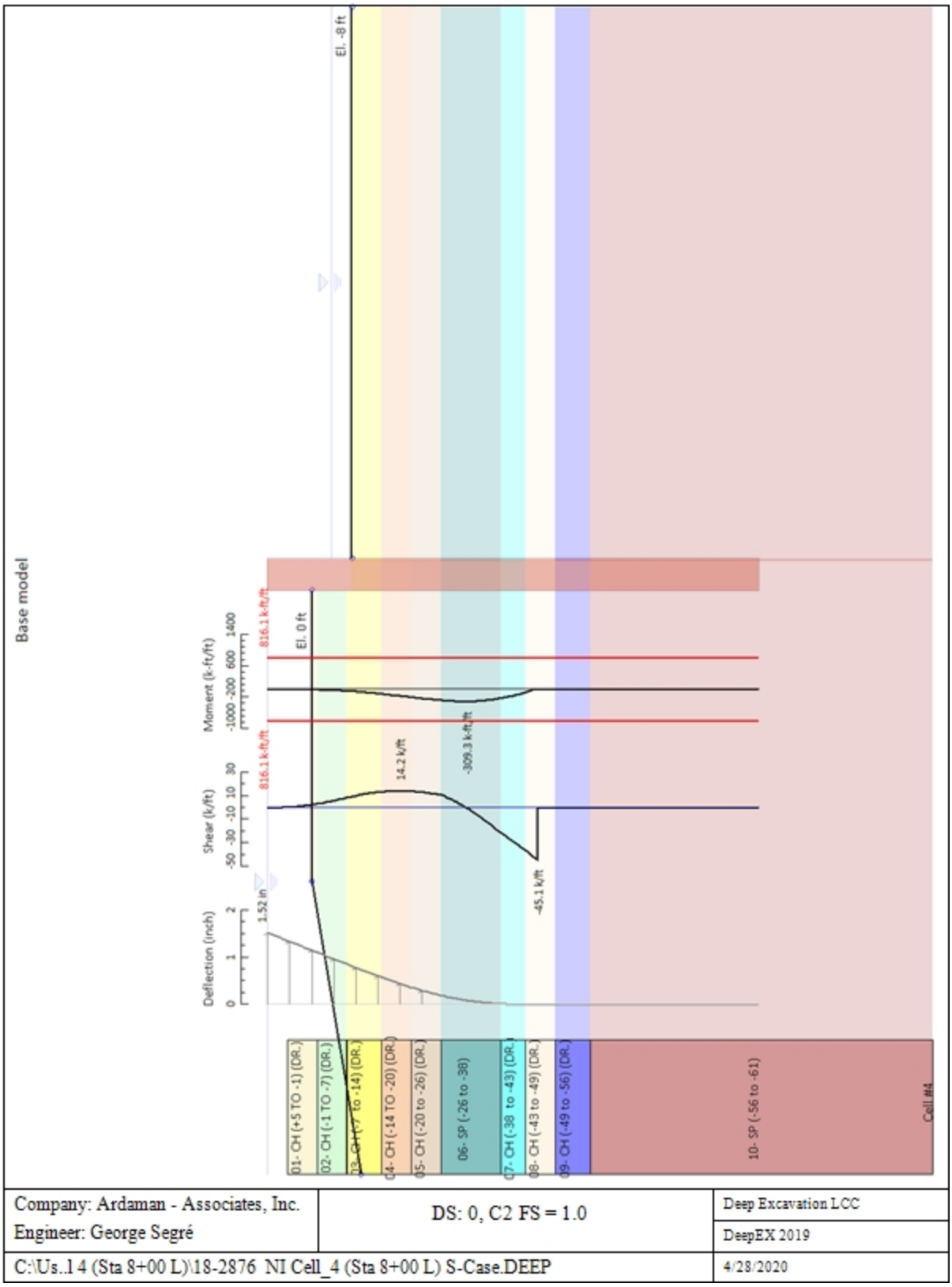

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



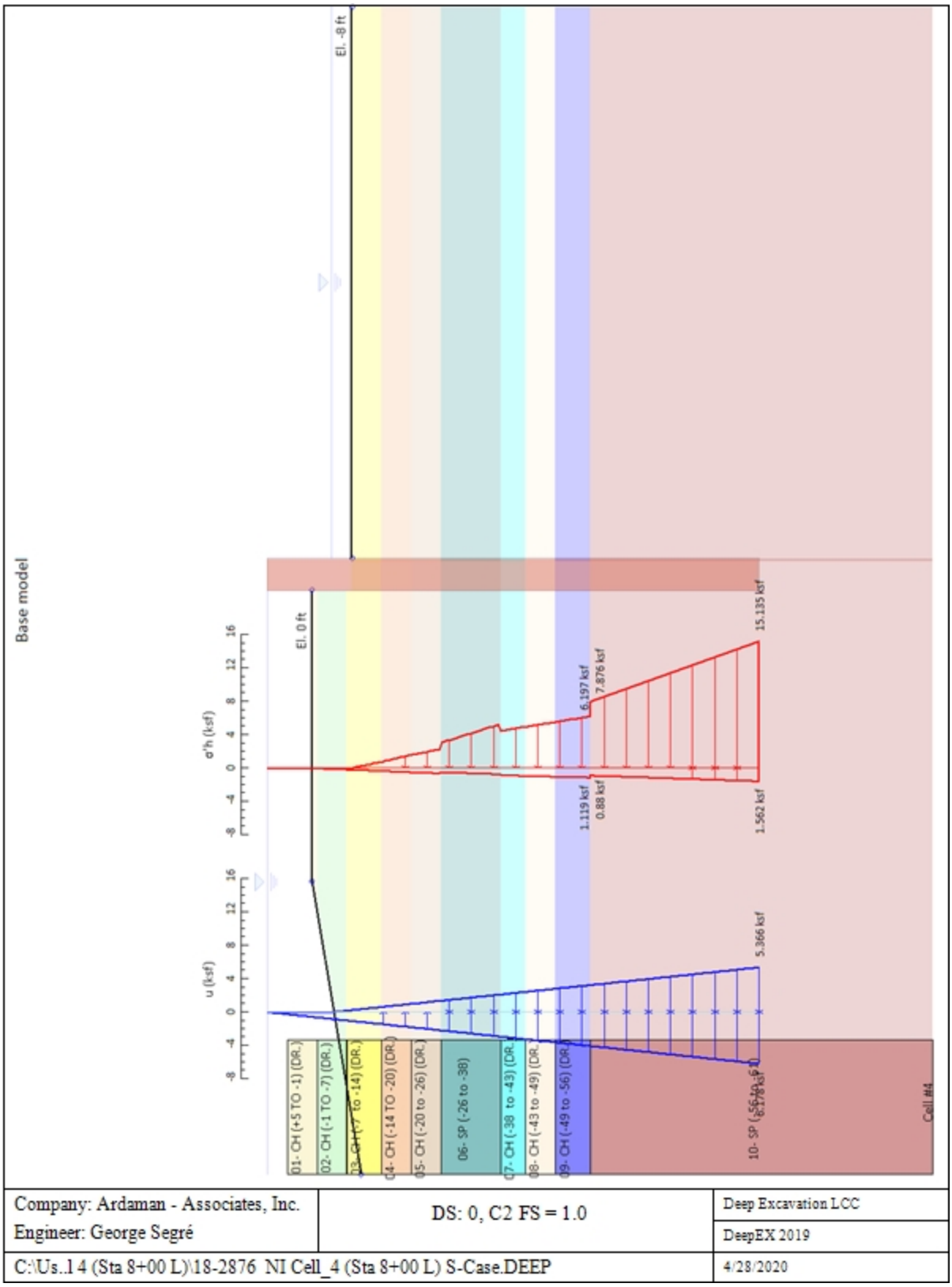

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



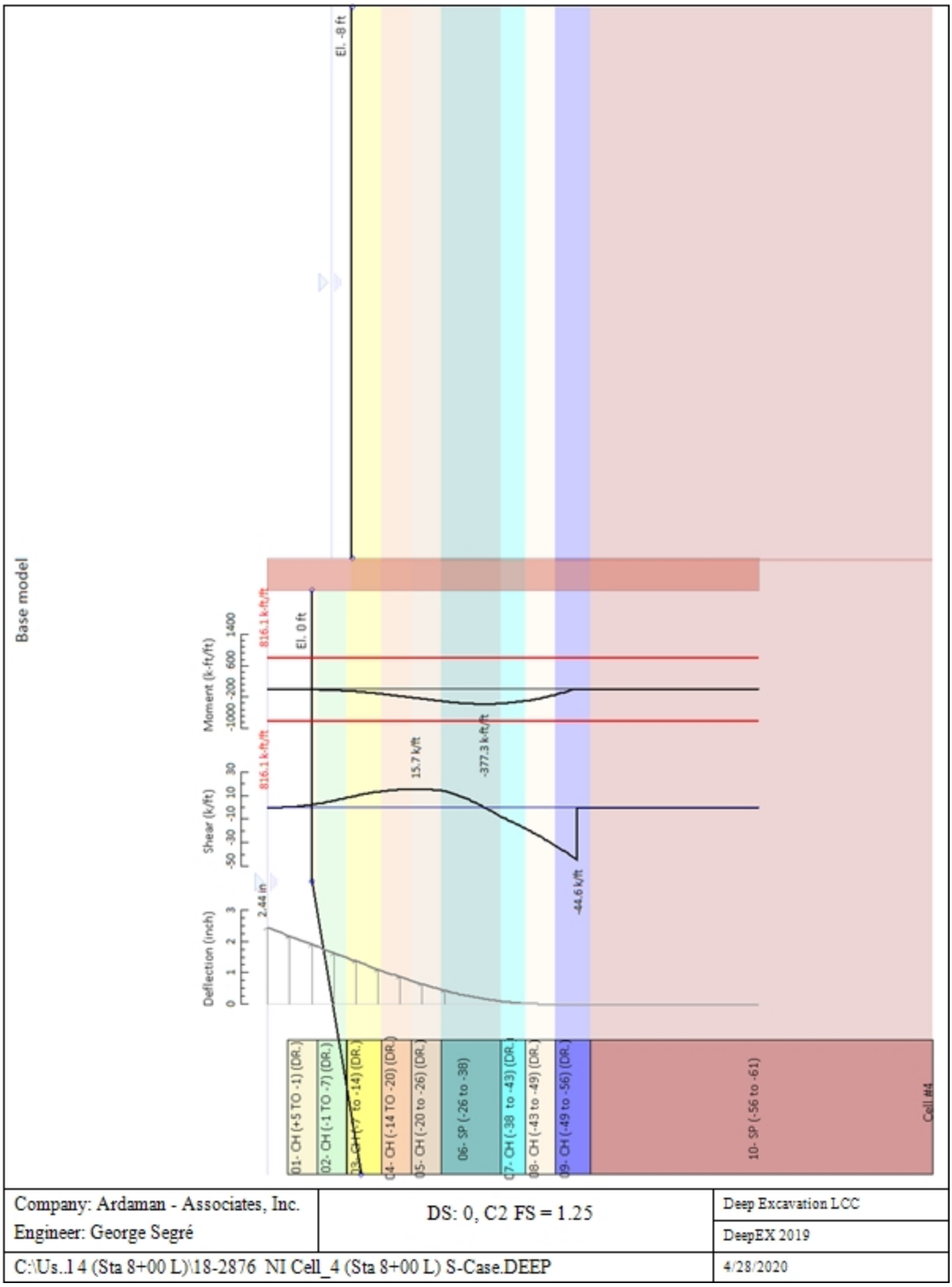

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



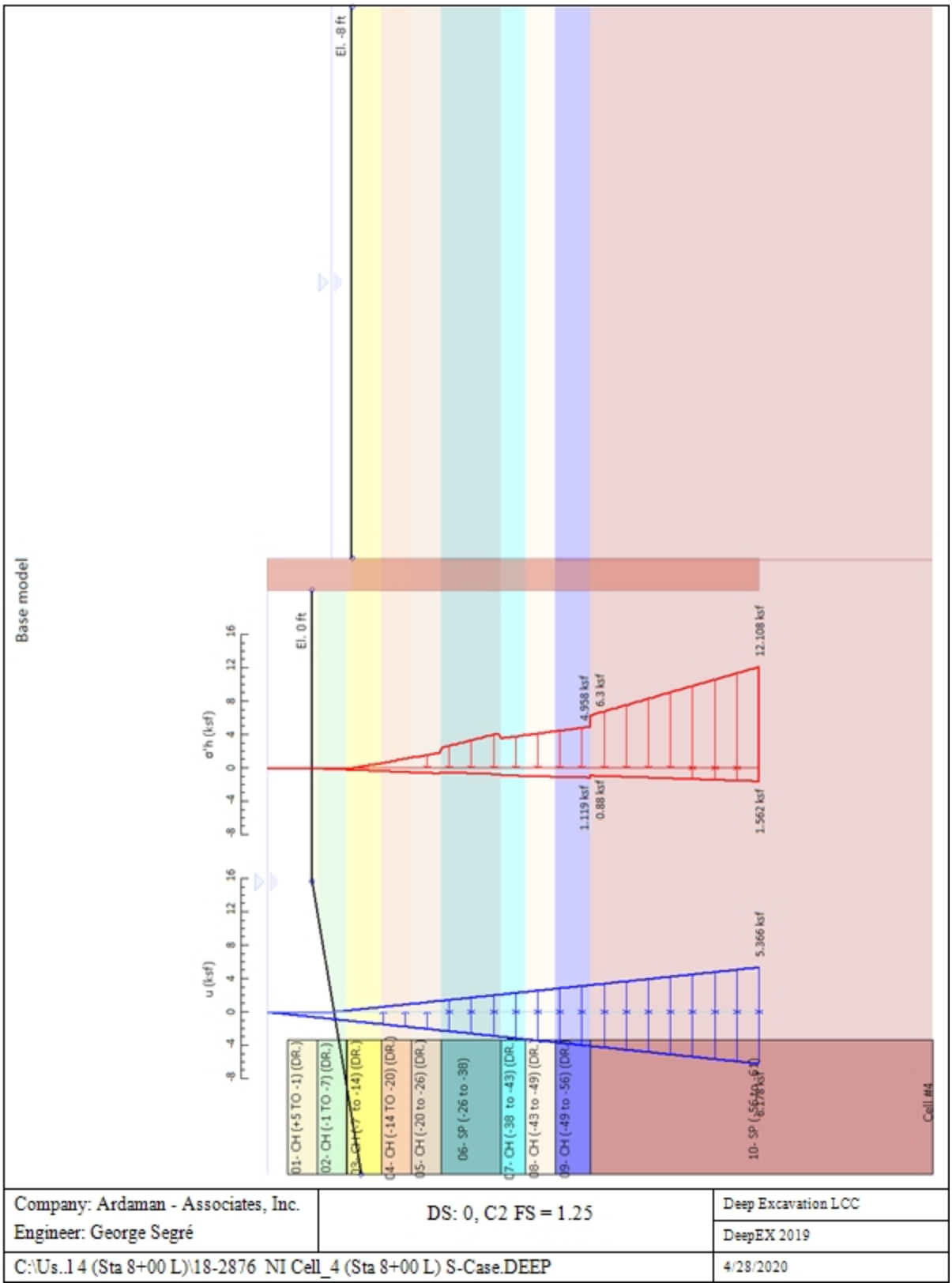

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



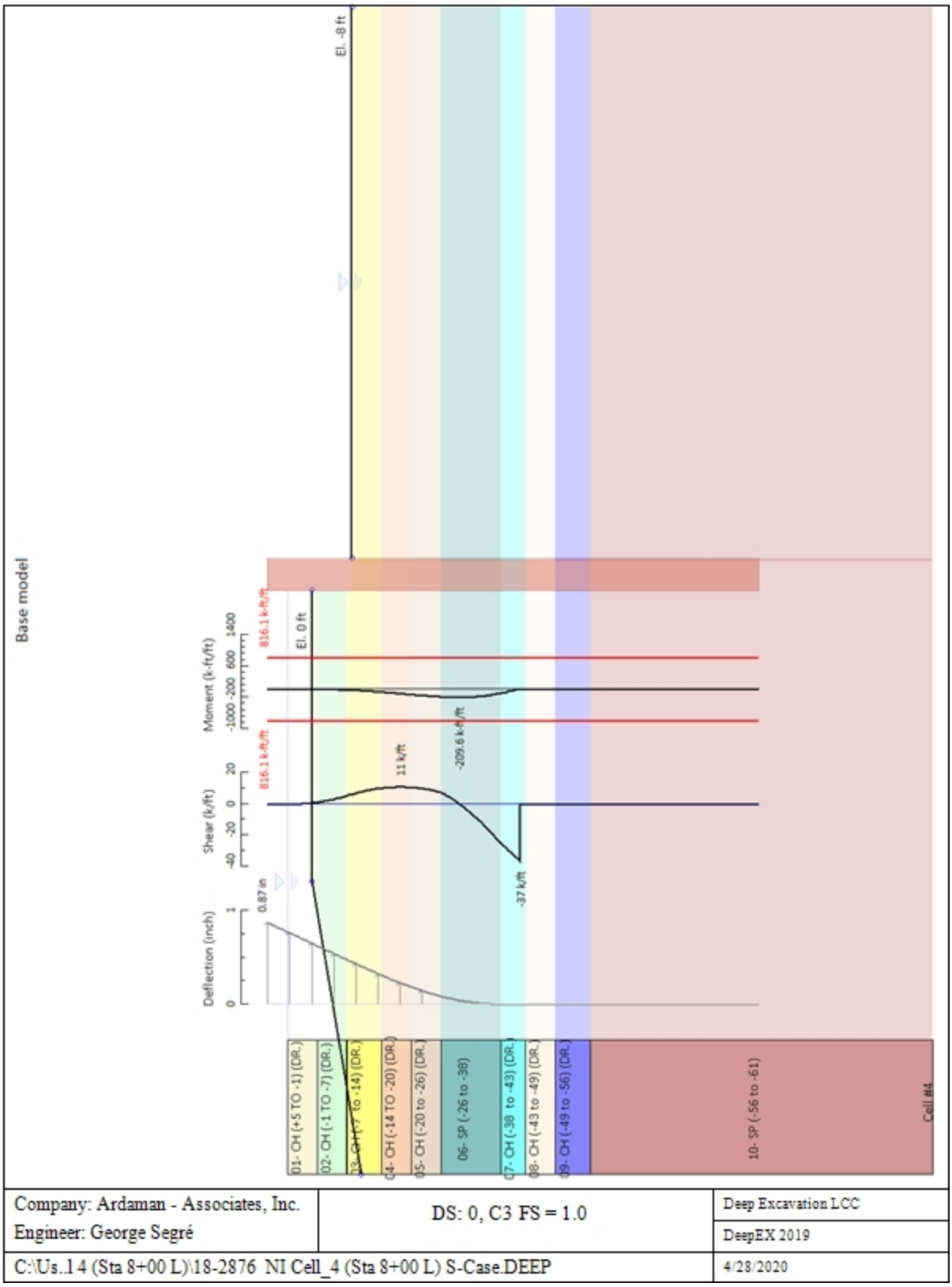

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



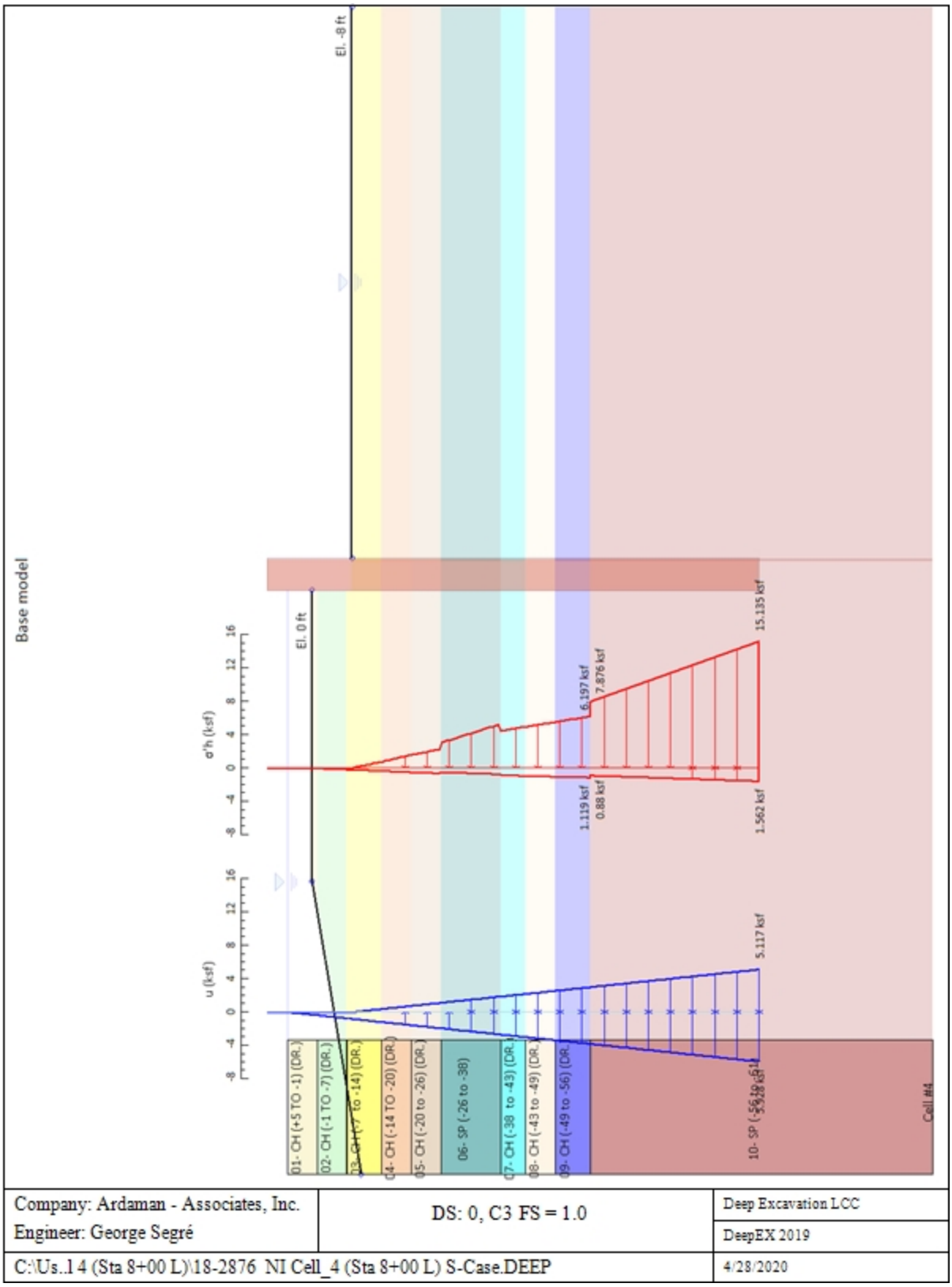

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |

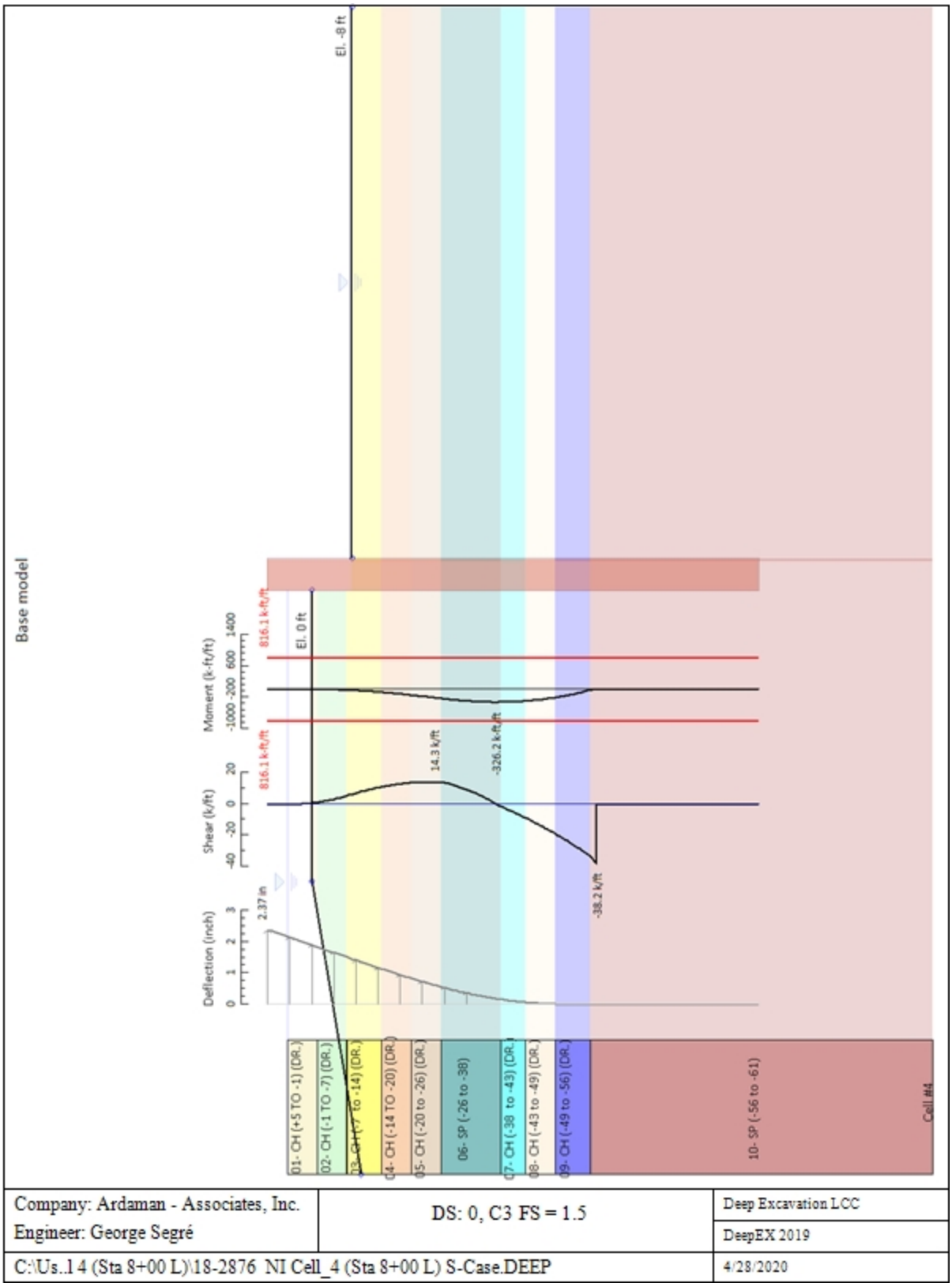



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |

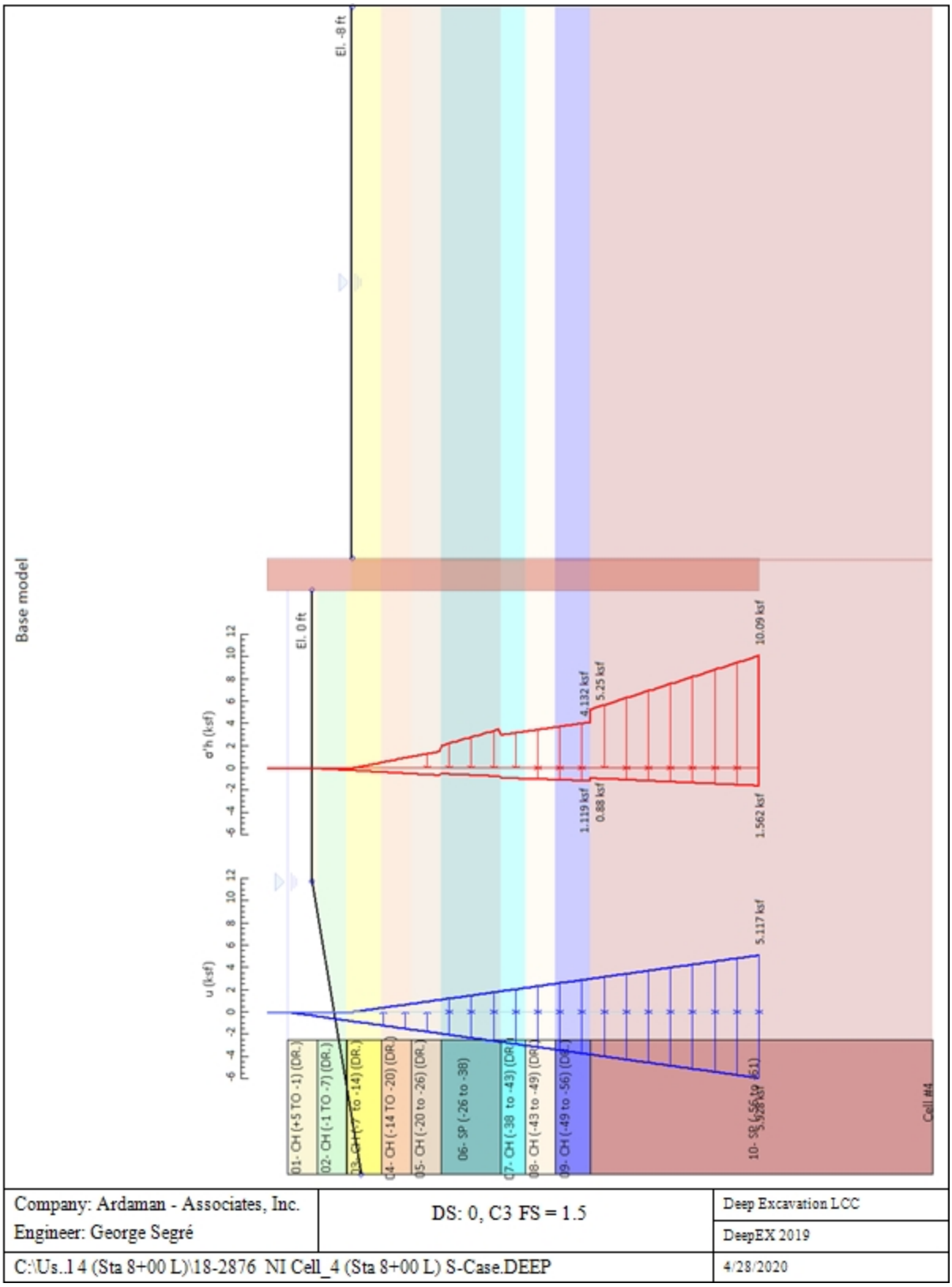



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |

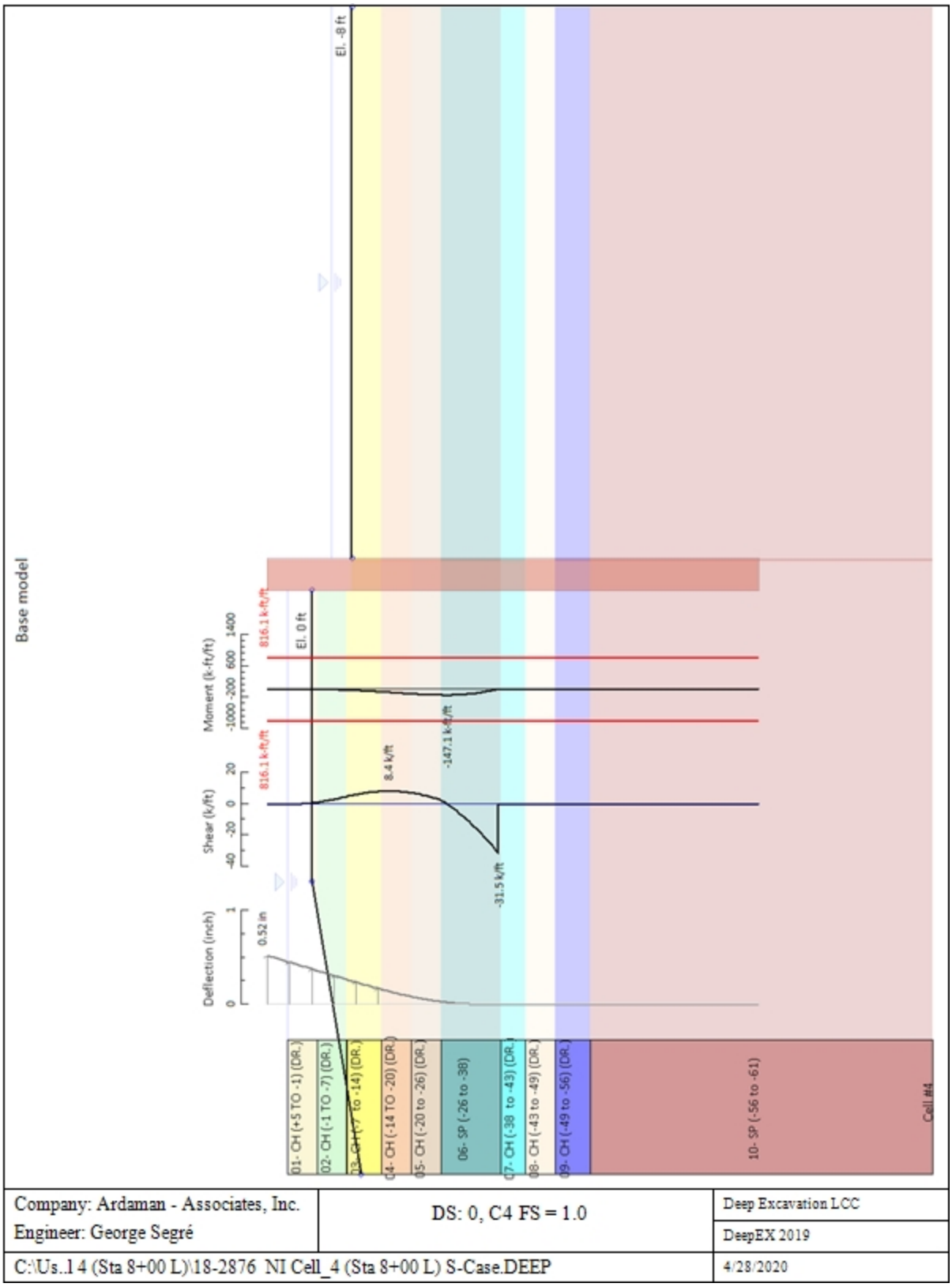

Base model
El. -8 ft
El. 0 ft
σ'h (ksf)
u (ksf)
15.135 ksf
7.876 ksf
6.197 ksf
1.119 ksf
0.88 ksf
1.562 ksf
5.117 ksf
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP
4/28/2020



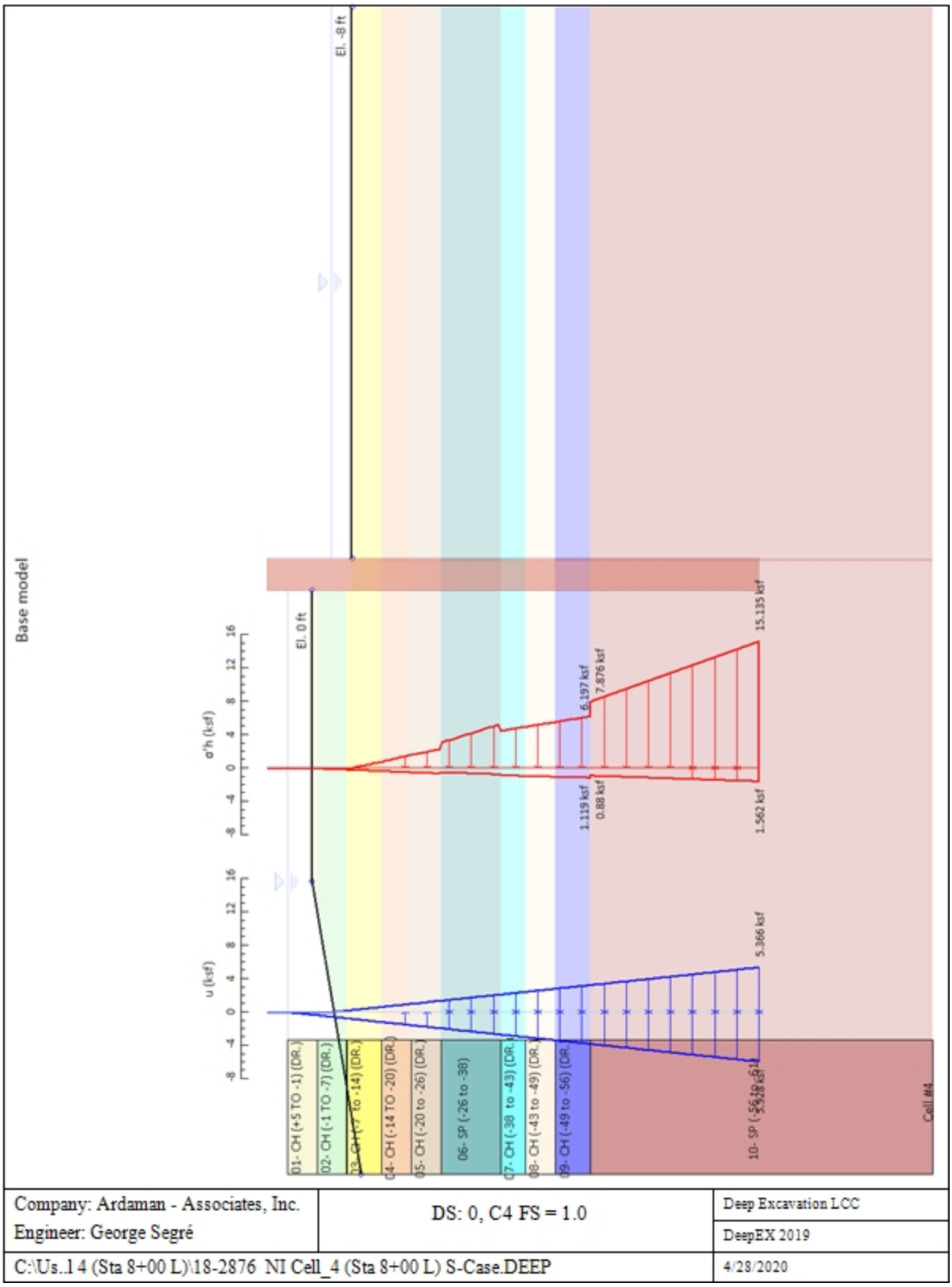

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



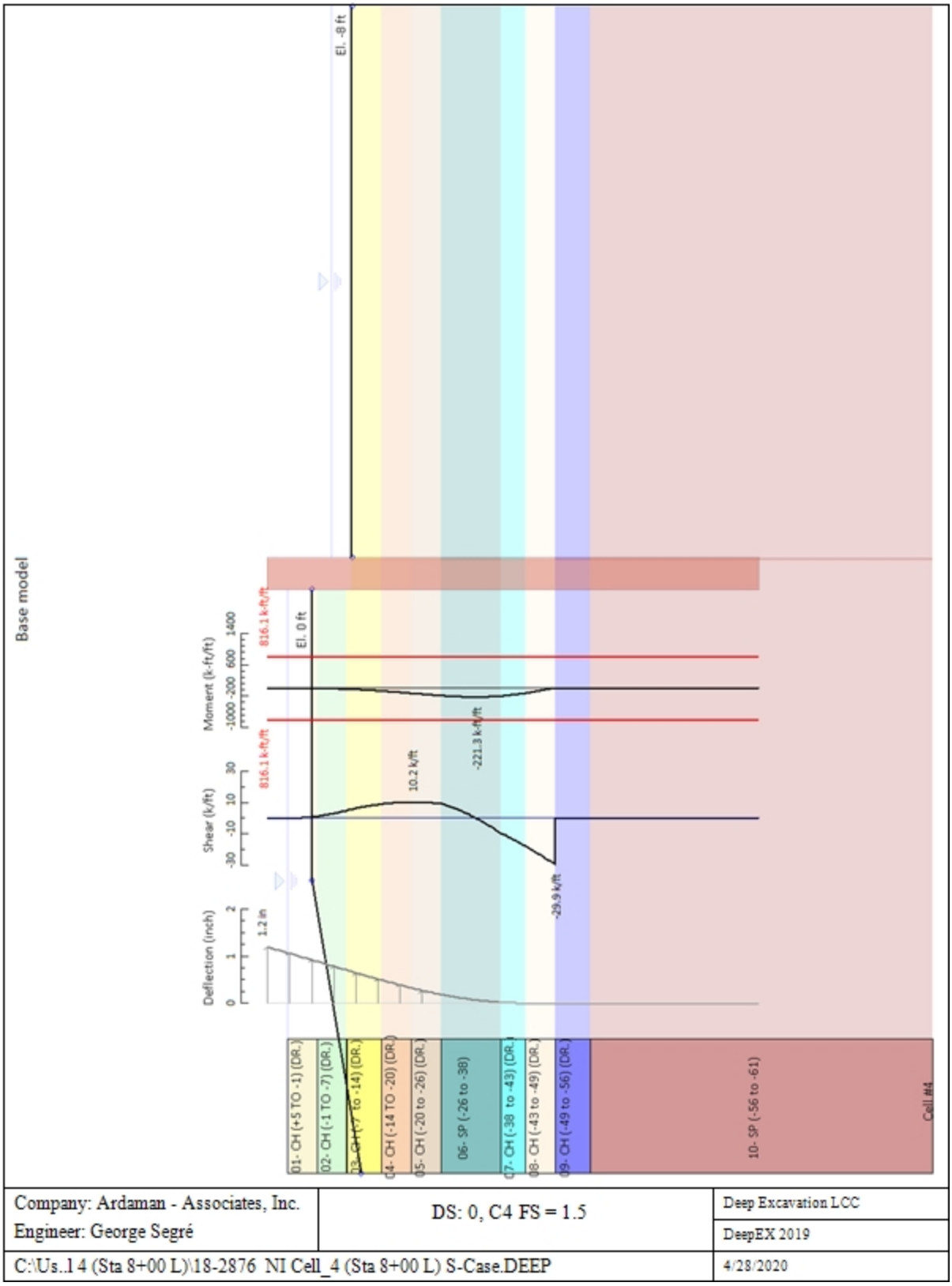

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |



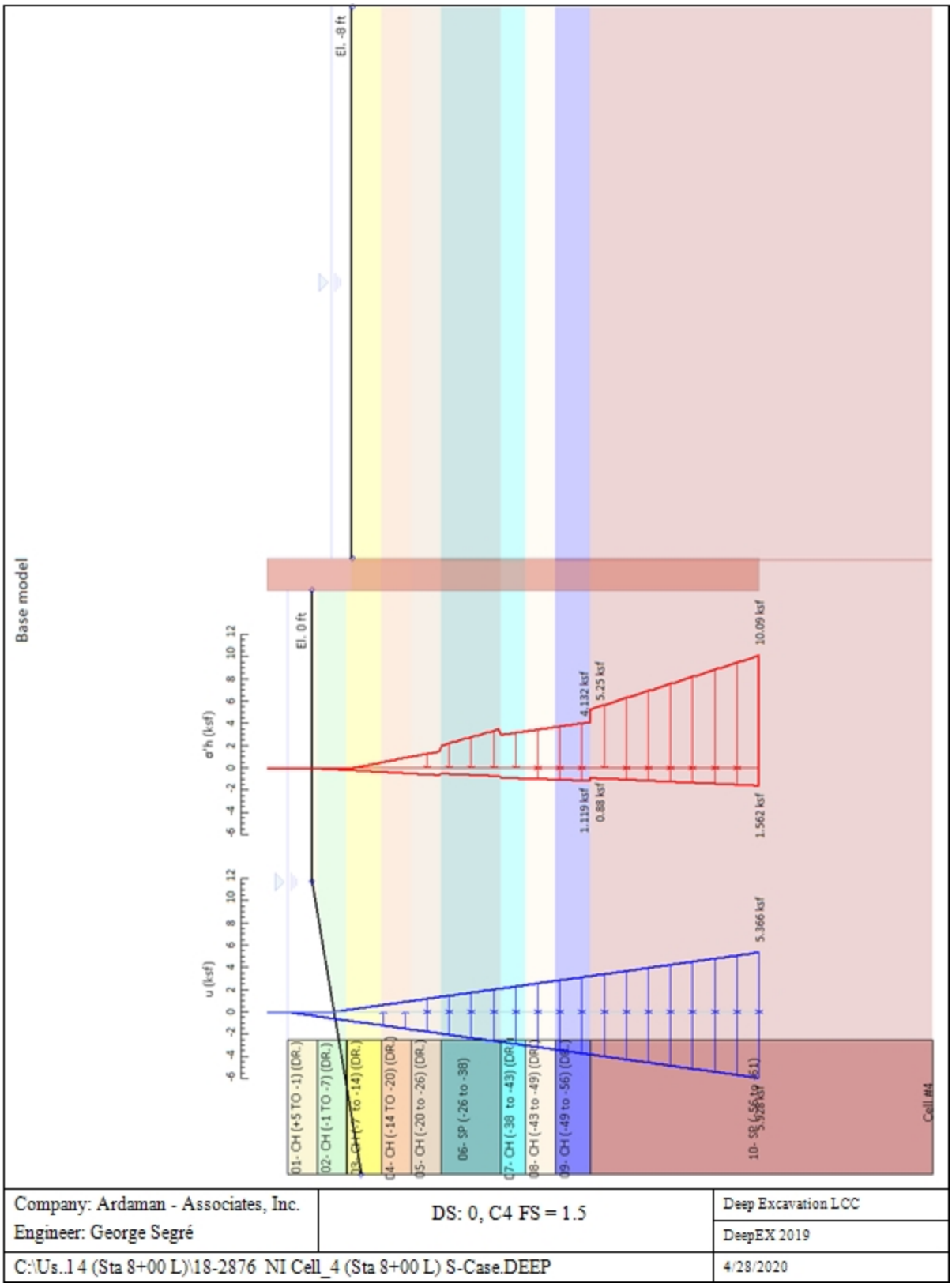

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Date: 4/29/2020

Project No.: 18-2876

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #4 @ Sta. 8+00 Right Wall)

| | | | | |
|---|---|---|---|---|
| Top of Wall = | 9.0 | ft., NAVD88 | Design Tip Elev. = | -21.0 ft., NAVD88 |
| Governing Tip Elev. = | -17.73 | ft., NAVD88 | Design Length of Sheeting = | 30.0 ft. |
| Length of Sheetting = | 26.73 | ft. | | |
| Use = | 30.0 | ft. | | |

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -2.00 | 4.82 | 3.23 | 0.10 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -3.50 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -2.00 | 4.82 | 3.23 | 0.10 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -3.50 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | 0.00 | 0.40 | 1.94 | 0.10 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | 0.00 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | 0.00 | 0.40 | 1.94 | 0.10 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | 0.00 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -11.79 | 17.12 | 7.28 | 0.10 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -16.24 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -4 | 1.00 | 1.00 | -12.78 | 17.25 | 6.76 | 0.10 |
| | | Open excavation - degraded | 9 | -4 | 1.00 | 1.25 | -17.73 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -4.36 | 1.76 | 1.64 | 0.10 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -9.32 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -4 | 1.00 | 1.00 | -4.36 | 1.76 | 1.64 | 0.10 |
| | | Open excavation - degraded | 5 | -4 | 1.00 | 1.50 | -9.81 | -- | -- | -- |
| | | | | | | Governing Value: | -17.73 | 17.25 | 7.28 | 0.10 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:32:36 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+5 TO | 118 | 118 | 0 | 0 | 1000 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | EXP | |
| 02- CH (-1 TO | 116 | 116 | 0 | 0 | 350 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-7 to | 116 | 116 | 0 | 0 | 500 | 0 | 0 | 150 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 04- CH (-14 T | 123 | 123 | 0 | 0 | 940 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-20 to | 115 | 115 | 0 | 0 | 350 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-26 to | 125 | 125 | 30 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 07- CH (-38 t | 100 | 100 | 0 | 0 | 2500 | 0 | 0 | 300 | 3 | 0.31 | 3.26 | 0.33 | 0.33 | True | Linear | |
| 08- CH (-43 to | 100 | 10 | 0 | 0 | 3000 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 09- CH (-49 to | 100 | 100 | 0 | 0 | 3500 | 0 | 0 | 300 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 10- SP (-56 to | 128 | 128 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+5 TO | 0.4 | 0.1 | 0 | 1 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-1 TO | 0.3 | 0.1 | 0 | 1 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-7 to | 0.4 | 0.1 | 0 | 1 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-14 T | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-20 to | 0.45 | 0.1 | 0 | 1 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-26 to | 0.35 | - | - | 0.5 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-38 t | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-43 to | 0.3 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-49 to | 0.25 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-56 to | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

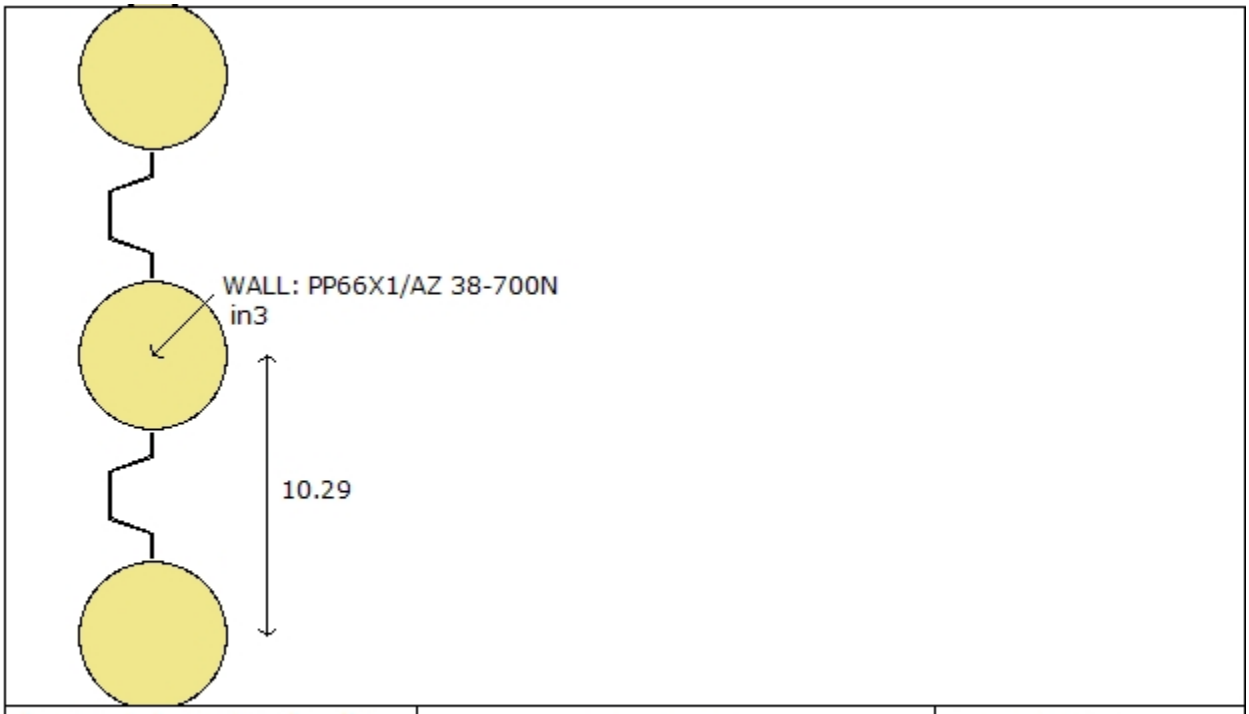
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 10 | 01- CH (+5 TO | 1 | 1 |
| -1 | 02- CH (-1 TO - | 1 | 1 |
| -7 | 03- CH (-7 to - | 1 | 1 |
| -14 | 04- CH (-14 TO | 1 | 1 |
| -20 | 05- CH (-20 to | 1 | 1 |
| -26 | 06- SP (-26 to - | 1 | 0.5 |
| -38 | 07- CH (-38 to | 1 | 1 |
| -43 | 08- CH (-43 to | 1 | 1 |
| -49 | 09- CH (-49 to | 1 | 1 |
| -56 | 10- SP (-56 to - | 1 | 0.47 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -91 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 3.851 | 3.851 | 4.79 |
| Stage 1 | Simple span | N/A | 1.6 | 3.081 | 3.081 | 3.832 |
| Stage 2 | Simple span | N/A | 1.6 | 4.253 | 4.253 | 5.29 |
| Stage 3 | Simple span | N/A | 1.6 | 3.402 | 3.402 | 4.232 |
| Stage 4 | Simple span | N/A | 1.6 | 4.742 | 4.742 | 5.636 |
| Stage 5 | Simple span | N/A | 1.6 | 3.161 | 3.161 | 3.758 |
| Stage 6 | Simple span | N/A | 1.6 | 5.444 | 5.444 | 6.394 |
| Stage 7 | Simple span | N/A | 1.6 | 3.629 | 3.629 | 4.262 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

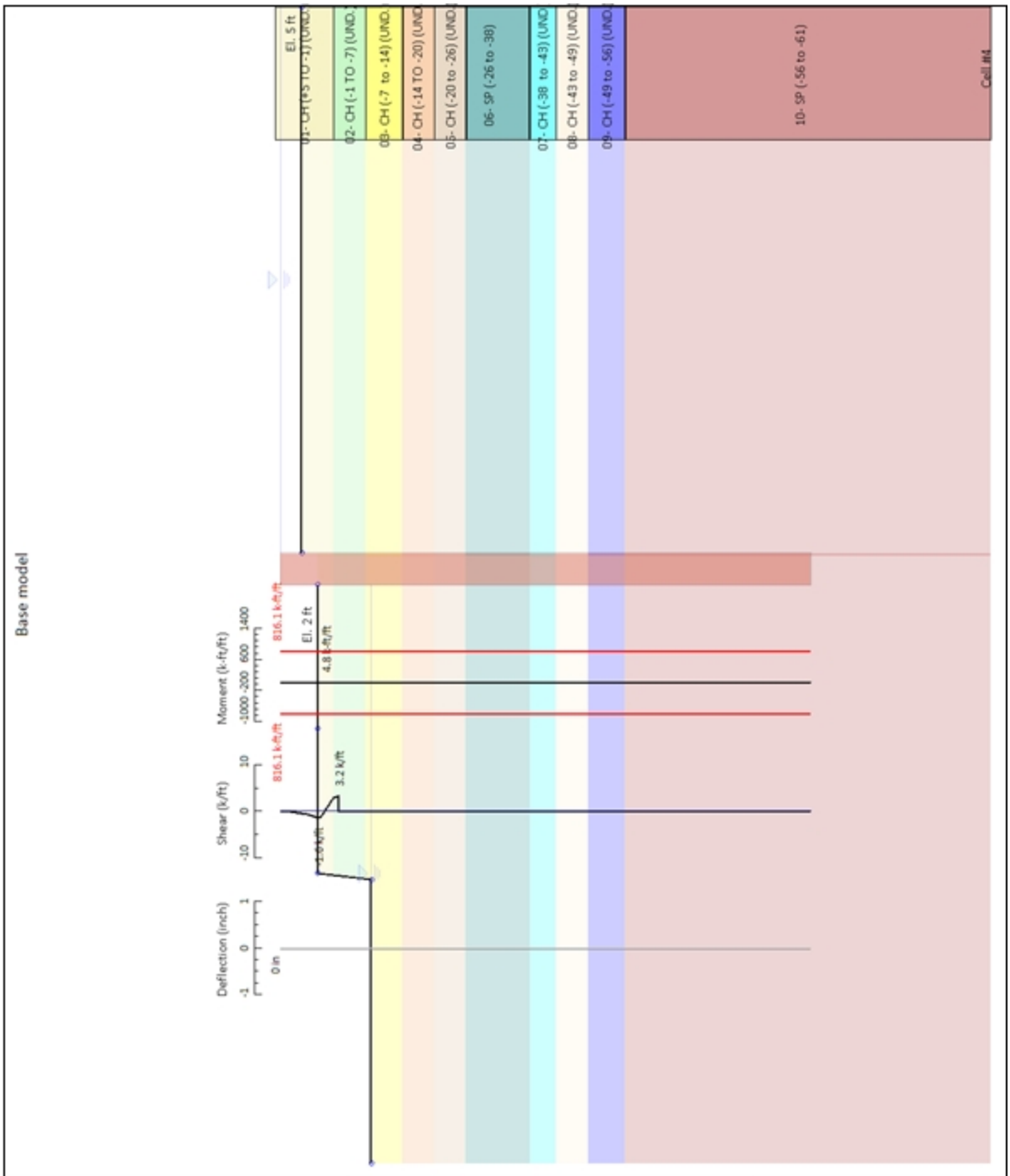
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

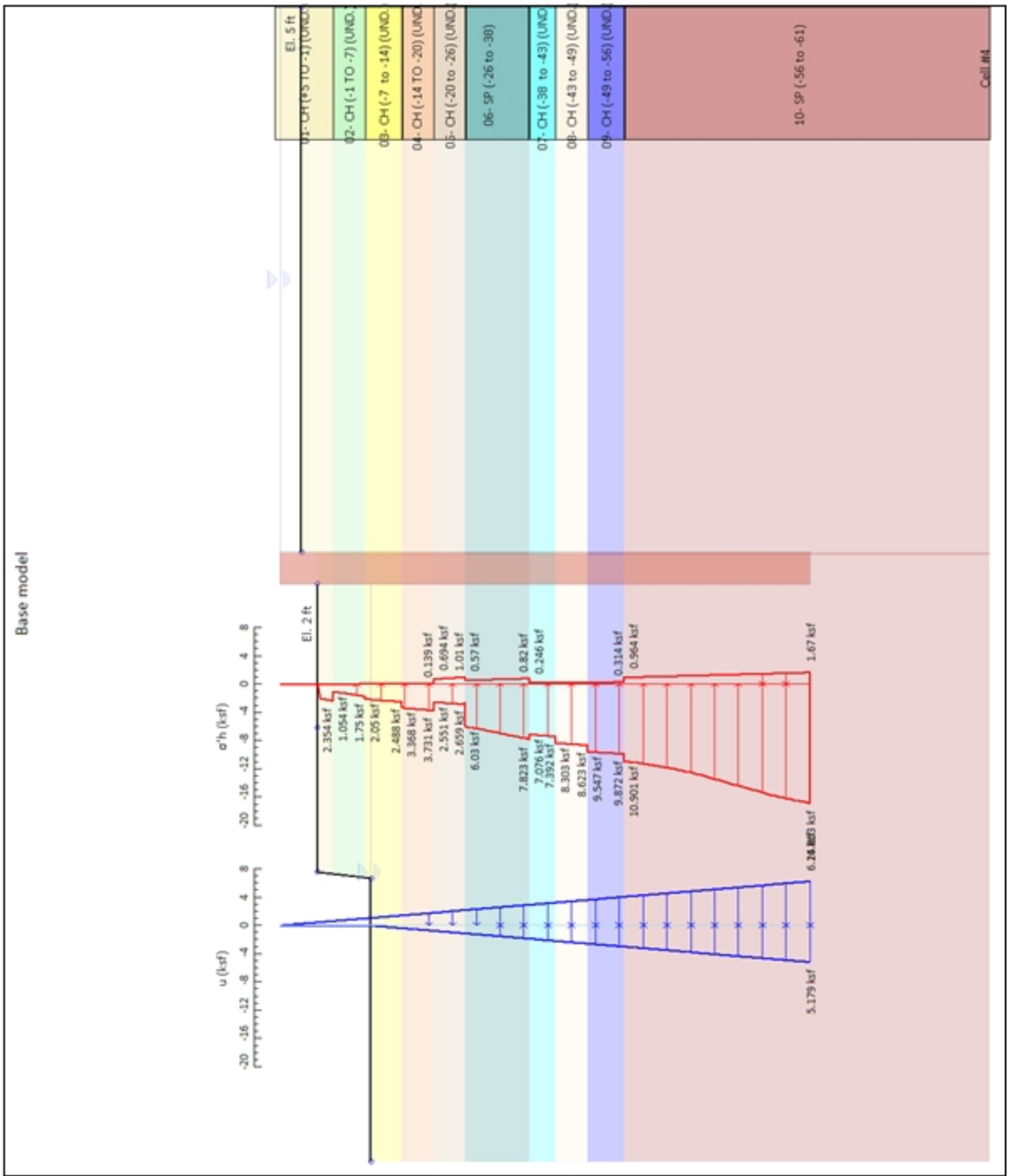
Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

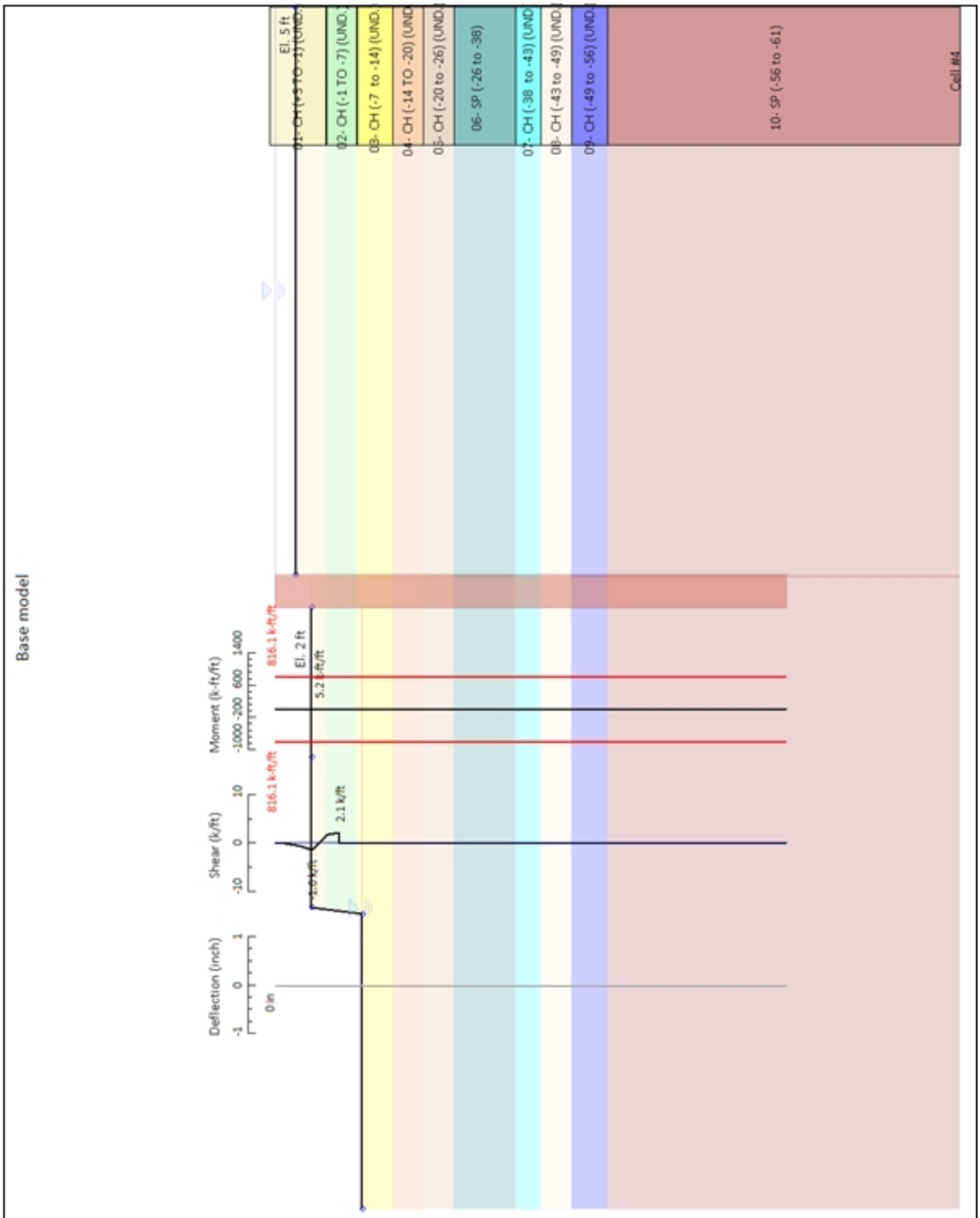
## EXCAVATION STAGES SKETCHES

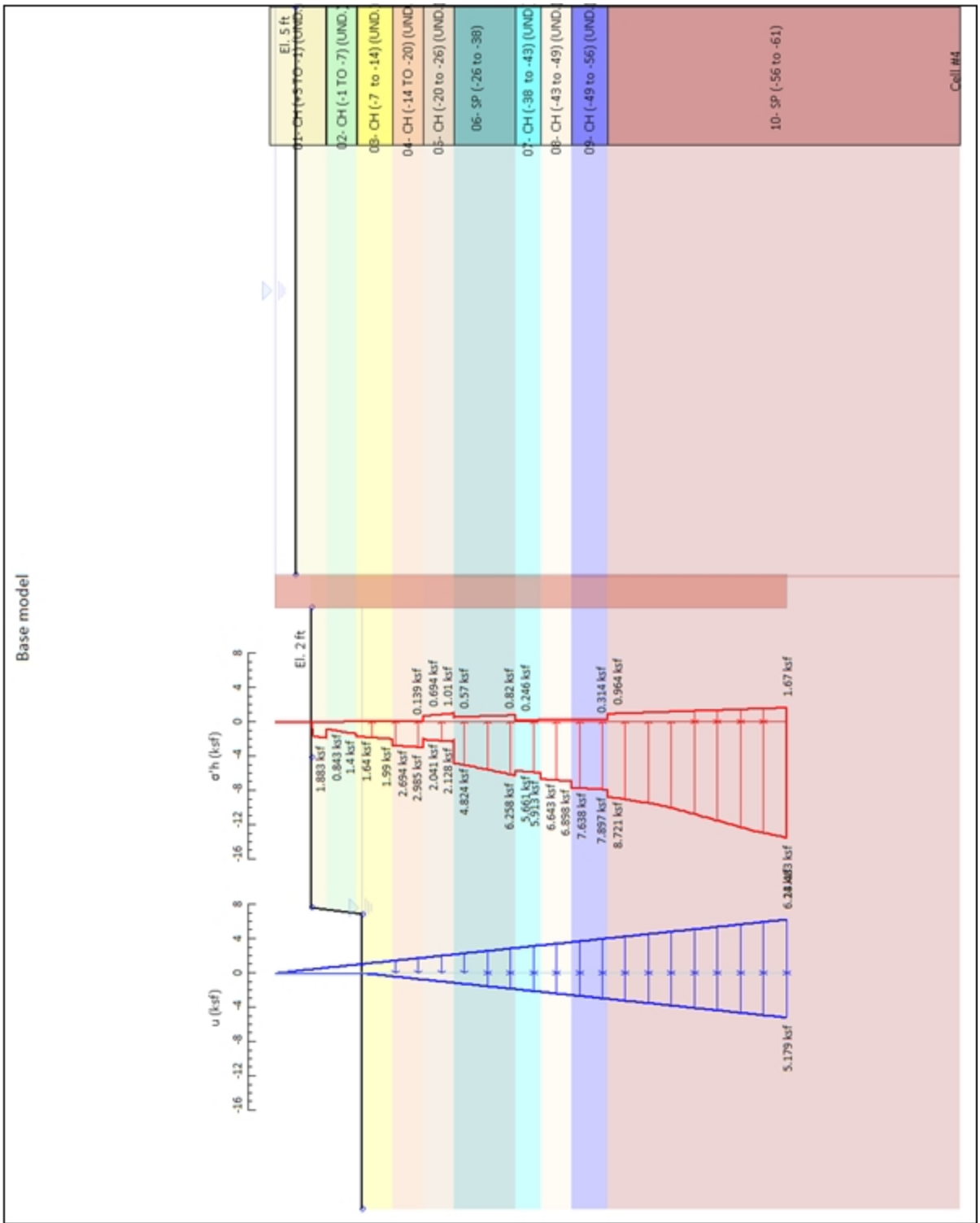
A sequence of figures for each excavation stage is reported


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
4.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
3.2 k/ft
-10.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

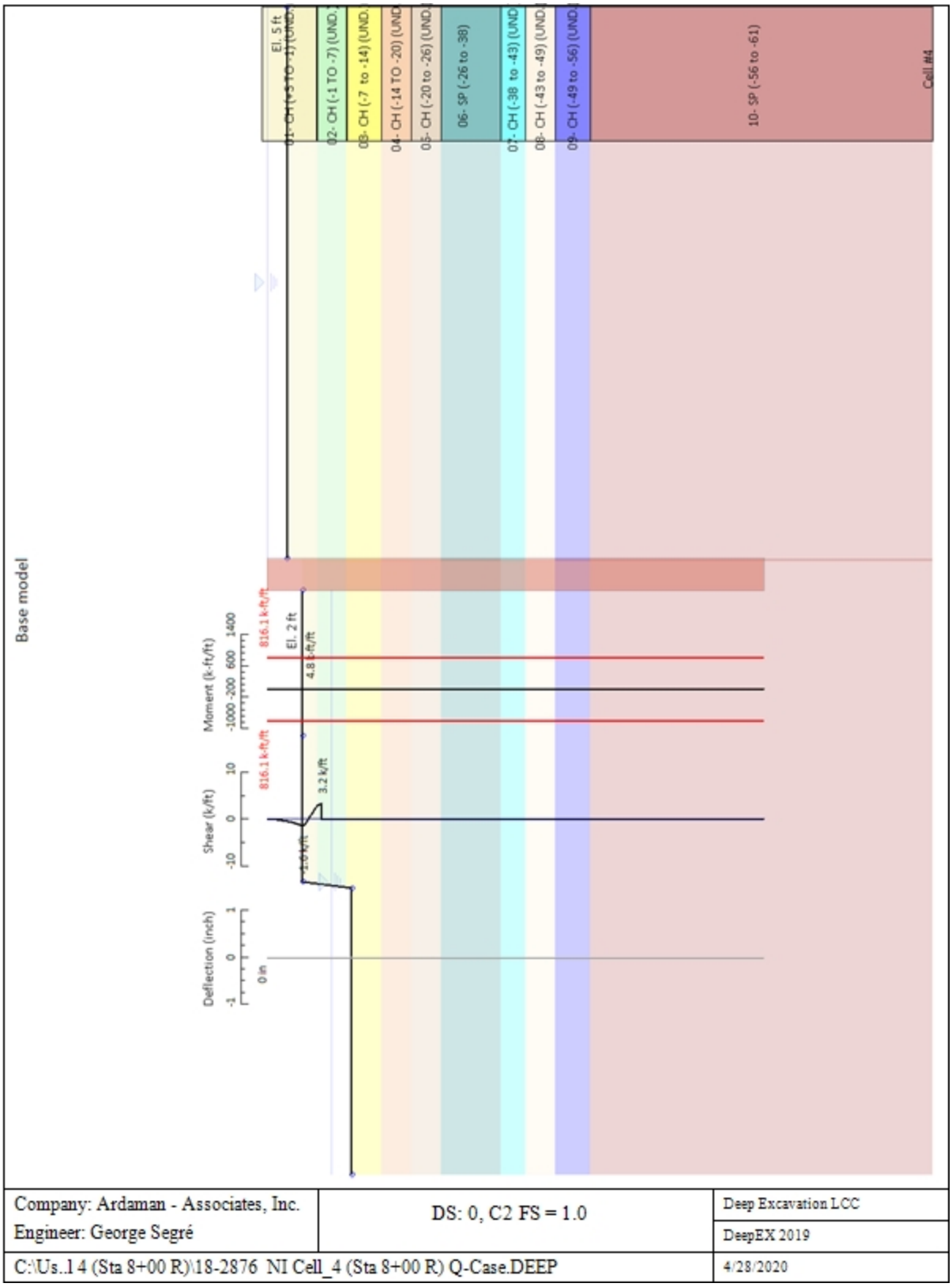


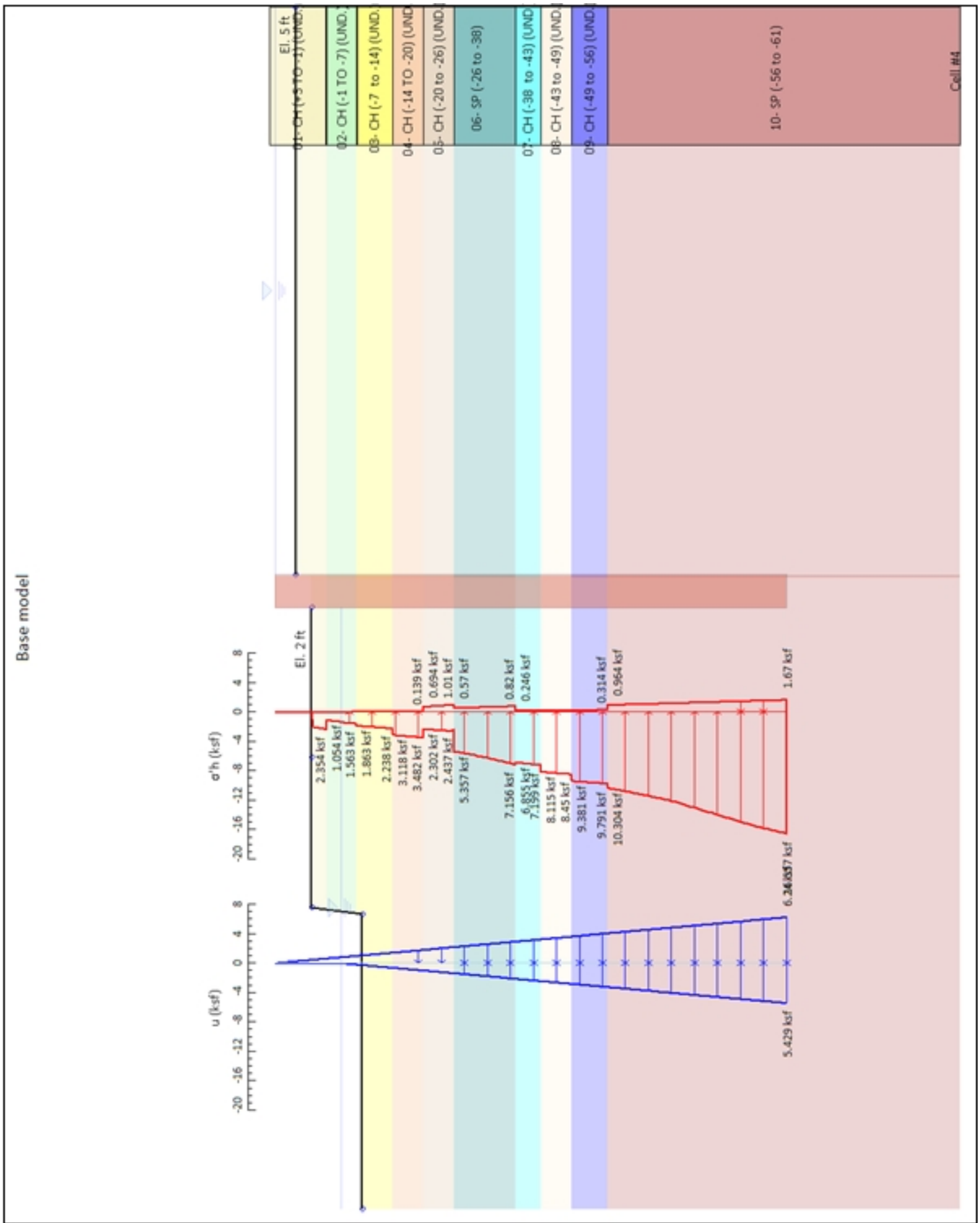

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
5.2 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.1 k/ft
-1.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

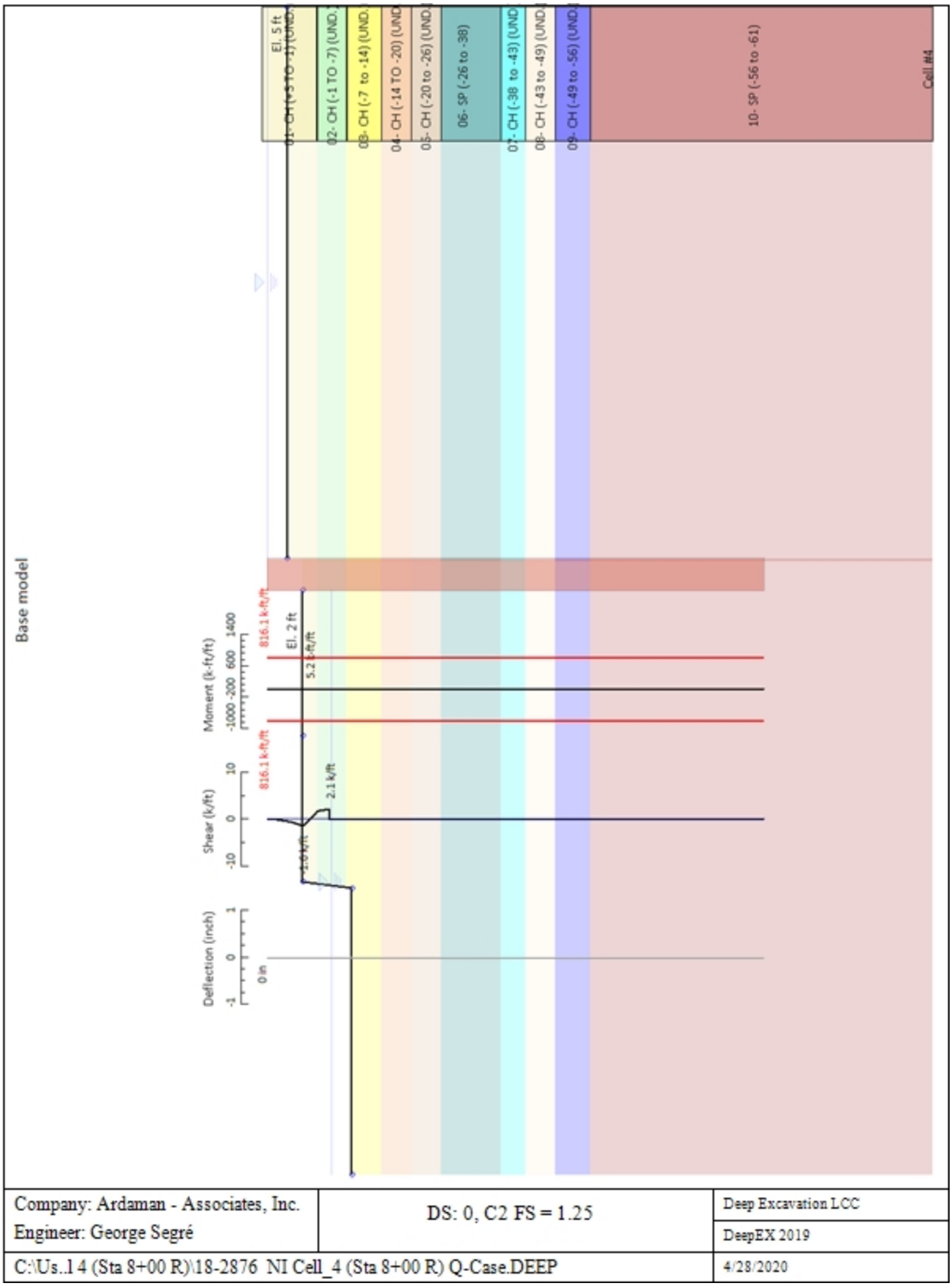


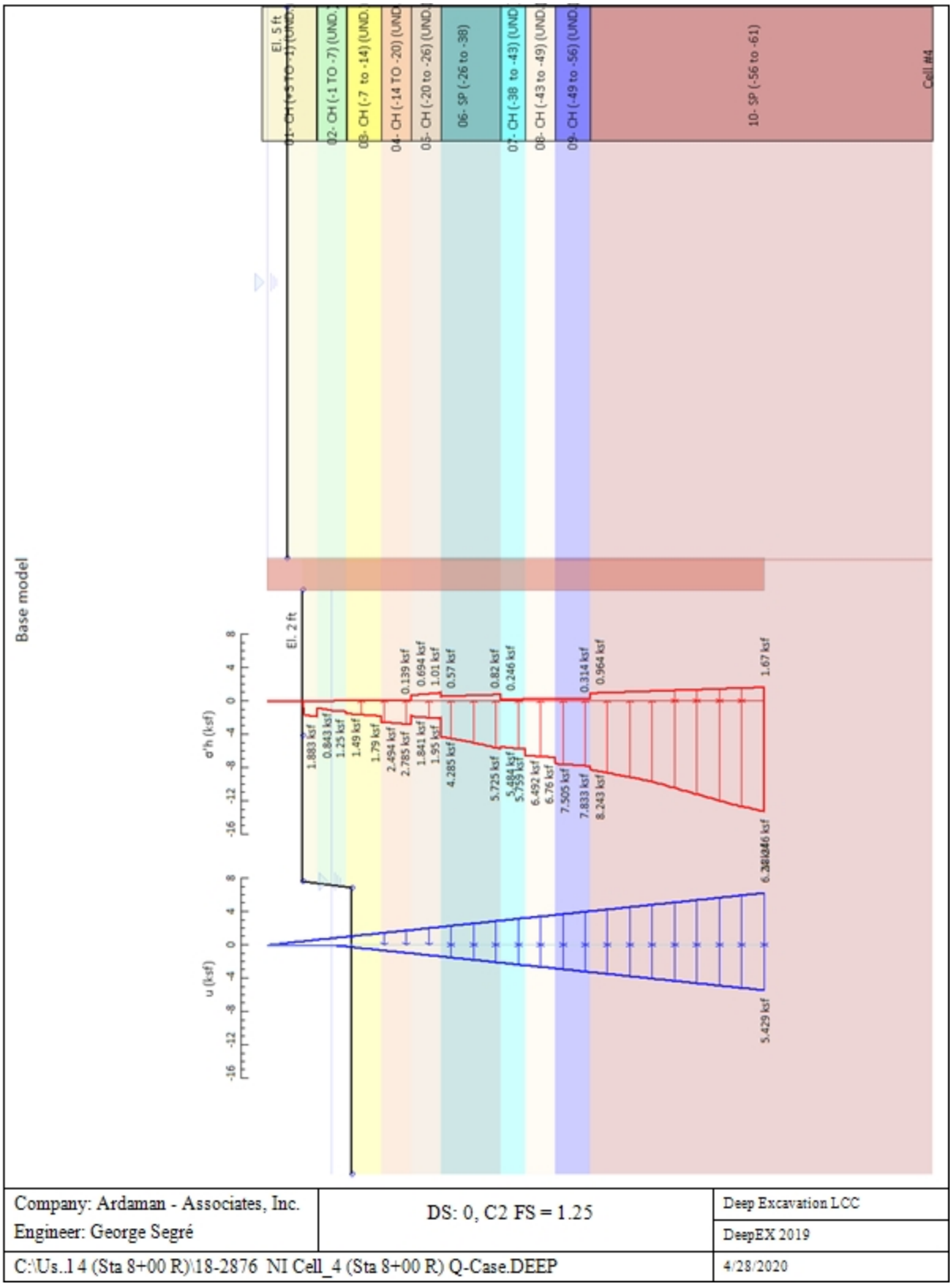

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
4.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
3.2 k/ft
-1.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

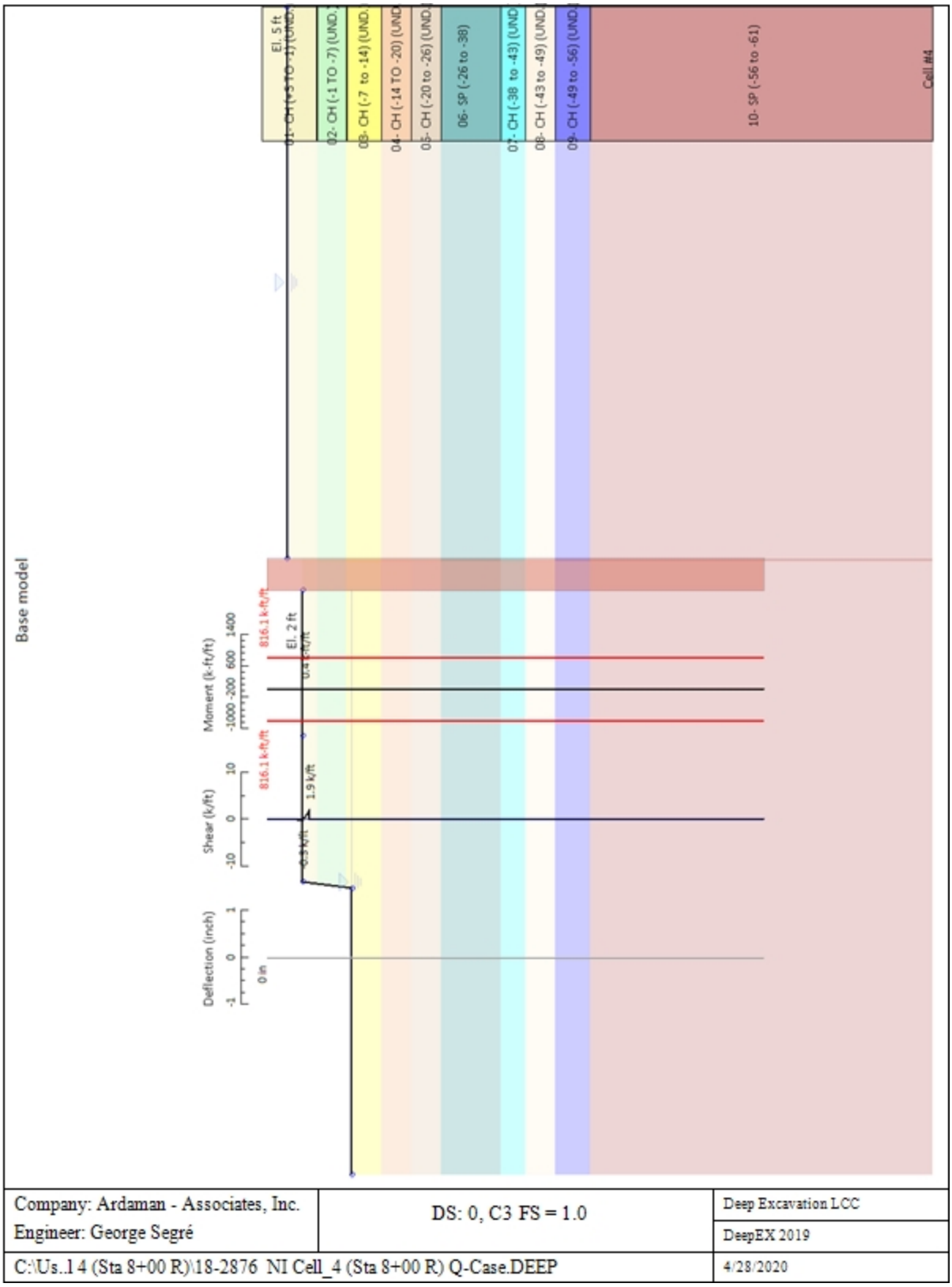


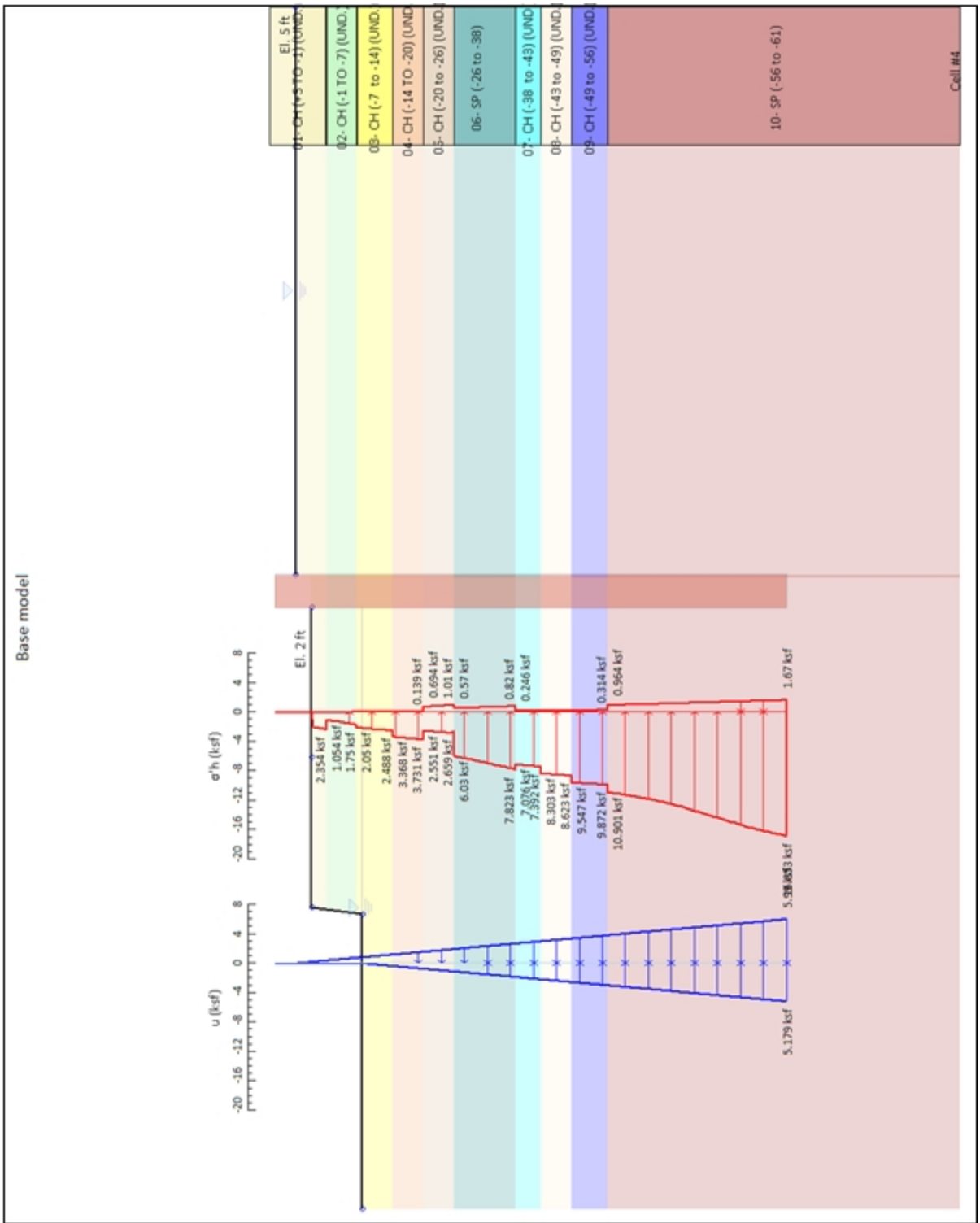

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
5.2 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.1 k/ft
-1.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

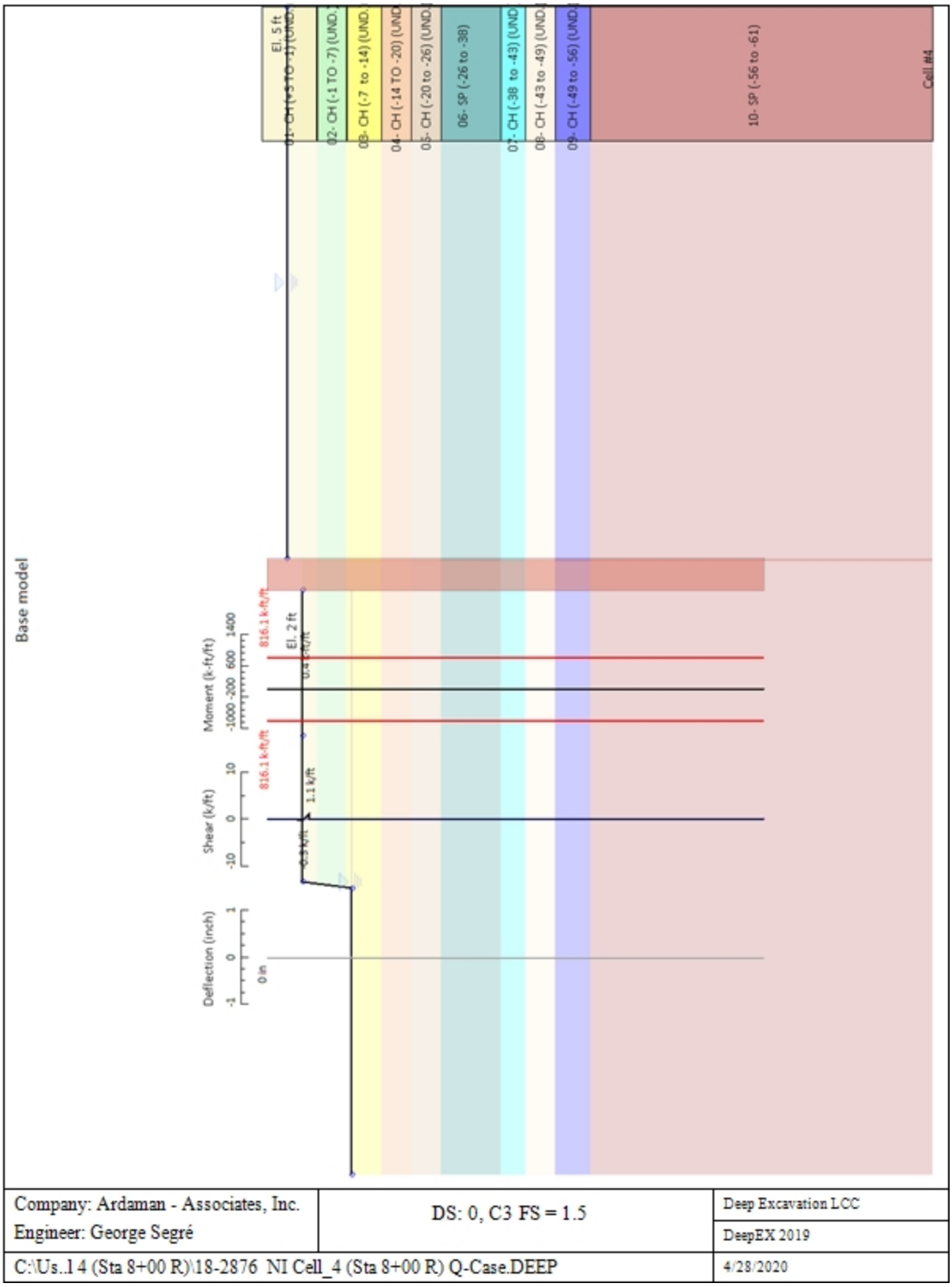


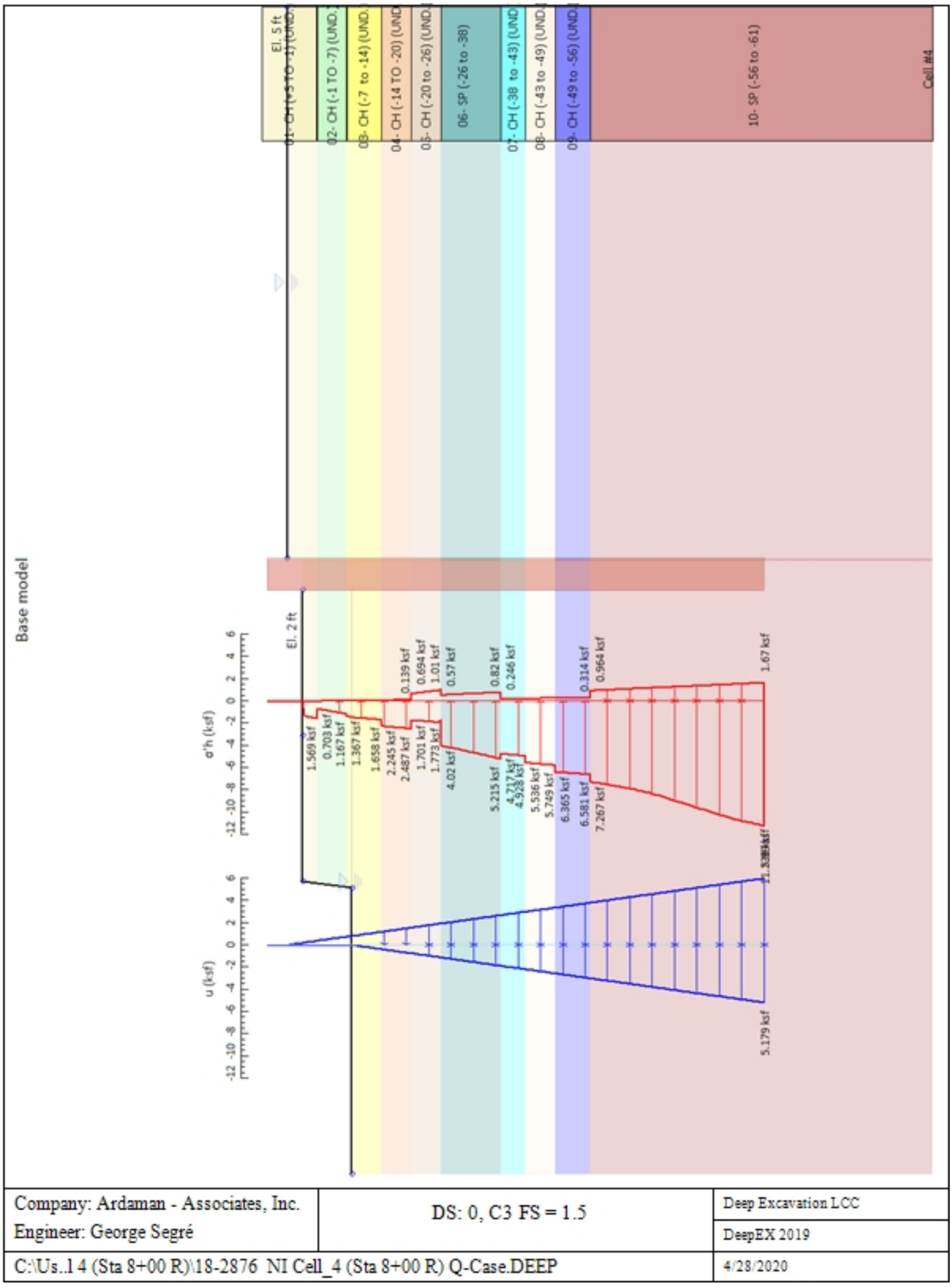

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.9 k/ft
-0.1 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

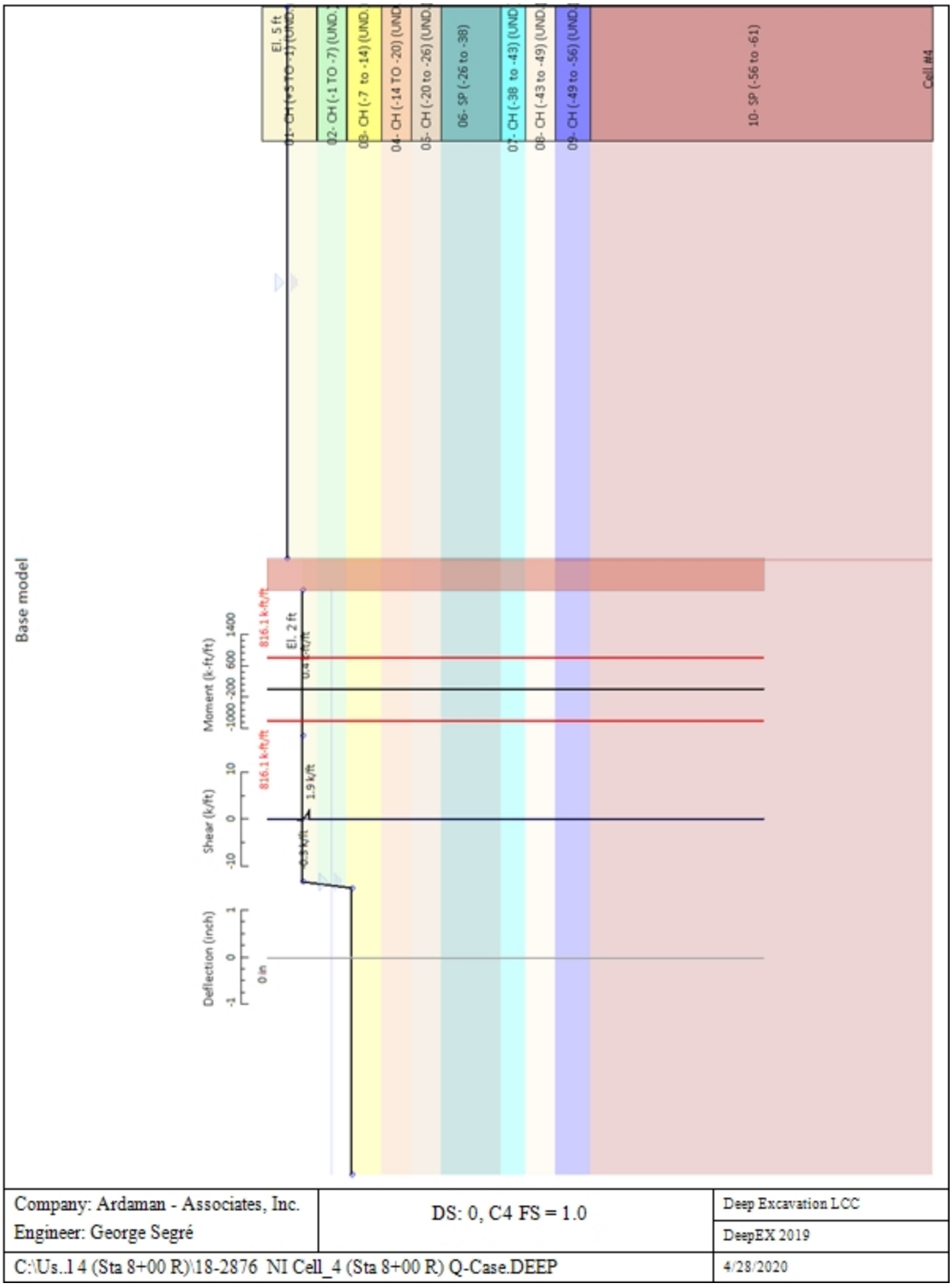


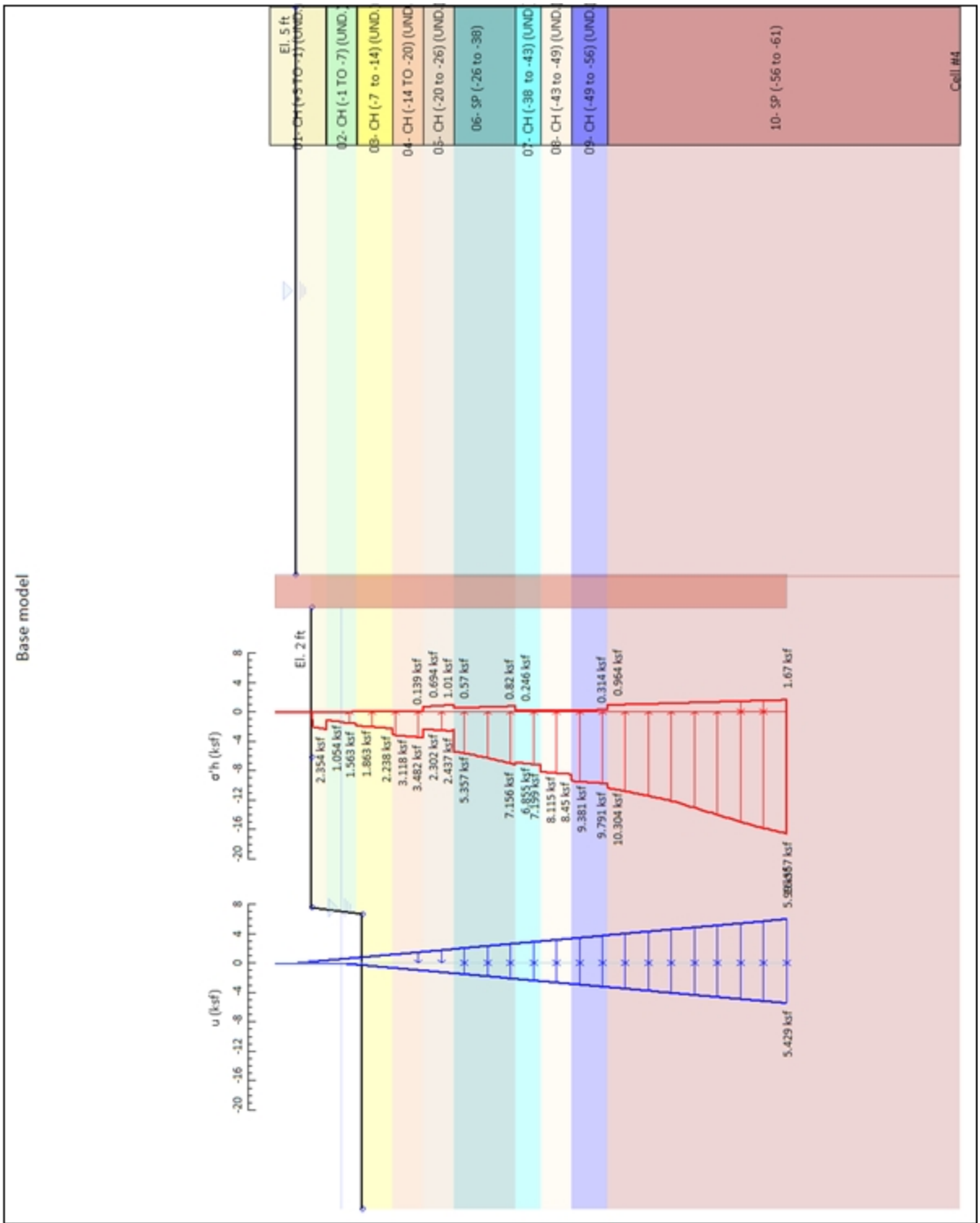

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.1 k/ft
0.3 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

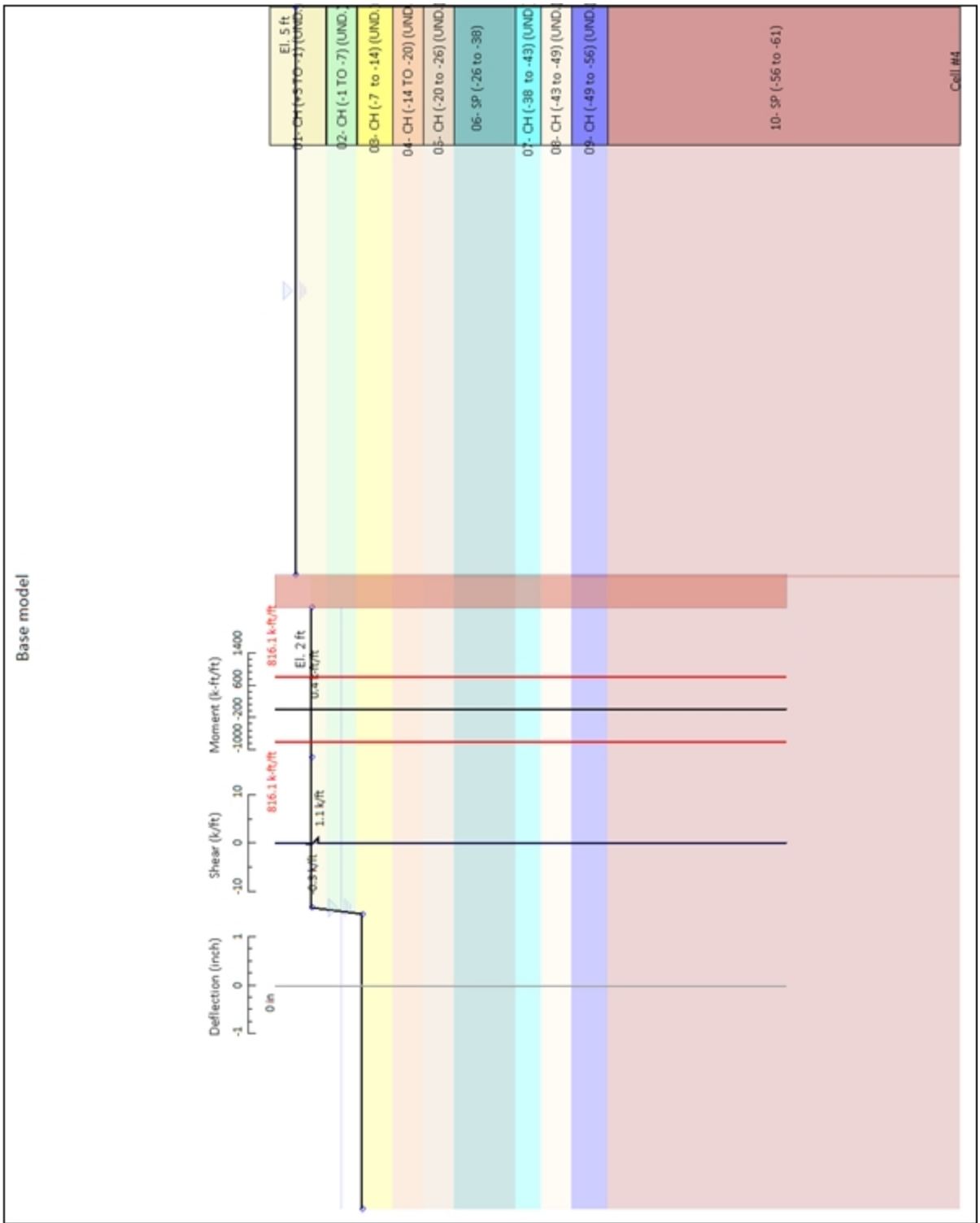


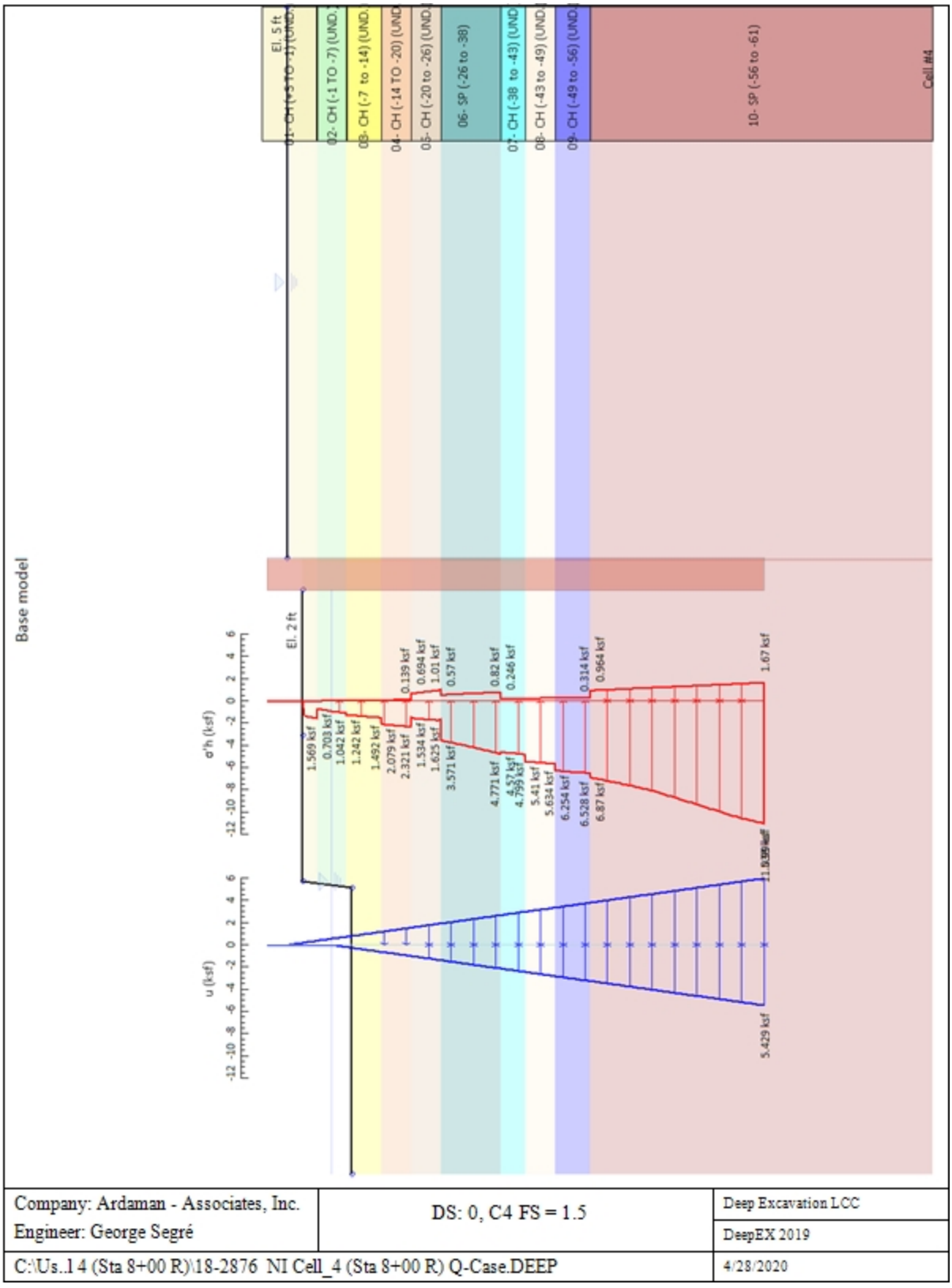

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |


Base model
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 5 ft
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.9 k/ft
-0.1 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
0.4 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.1 k/ft
-0.9 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:49:56 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- CH (+5 TO | 118 | 118 | 26 | 0 | 1000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | EXP | |
| 02- CH (-1 TO | 116 | 116 | 23 | 0 | 350 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- CH (-7 to | 116 | 116 | 23 | 0 | 500 | 23 | 23 | 150 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 04- CH (-14 T | 123 | 123 | 23 | 0 | 940 | 23 | 23 | 521.92 | 3 | 0.44 | 2.28 | 0.44 | 2.28 | True | Linear | |
| 05- CH (-20 to | 115 | 115 | 23 | 0 | 350 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-26 to | 125 | 125 | 30 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.33 | 3 | N/A | N/A | True | Linear | |
| 07- CH (-38 t | 100 | 100 | 26 | 0 | 2500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 08- CH (-43 to | 100 | 10 | 26 | 0 | 3000 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 09- CH (-49 to | 100 | 100 | 26 | 0 | 3500 | 26 | 26 | 300 | 3 | 0.39 | 2.56 | 0.39 | 2.56 | True | Linear | |
| 10- SP (-56 to | 128 | 128 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- CH (+5 TO | 0.4 | 0.1 | 0 | 0.562 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (-1 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- CH (-7 to | 0.4 | 0.1 | 0 | 0.609 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (-14 T | 0.35 | 0.1 | 0 | 0.609 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-20 to | 0.45 | 0.1 | 0 | 0 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-26 to | 0.35 | - | - | 0.5 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- CH (-38 t | 0.35 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-43 to | 0.3 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-49 to | 0.25 | 0.1 | 0 | 0.562 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- SP (-56 to | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

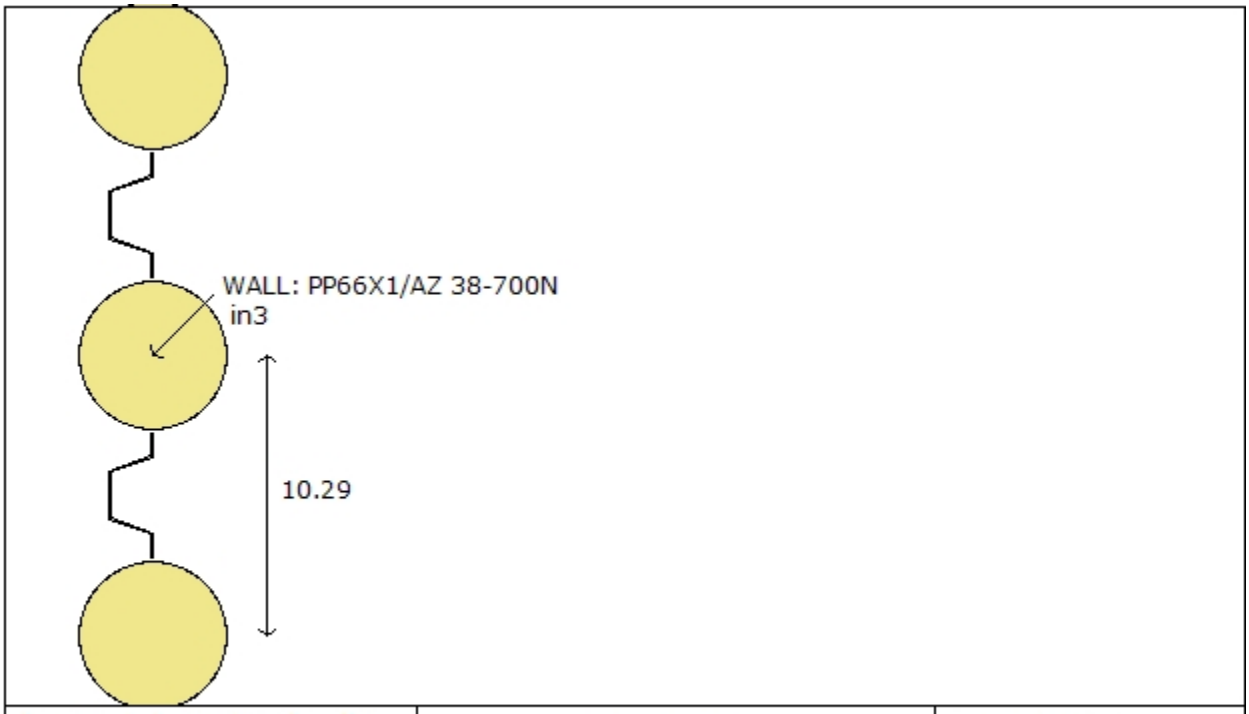
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- CH (+5 TO | 1 | 0.56 |
| -1 | 02- CH (-1 TO - | 1 | 0 |
| -7 | 03- CH (-7 to - | 1 | 0.61 |
| -14 | 04- CH (-14 TO | 1 | 0.61 |
| -20 | 05- CH (-20 to | 1 | 0 |
| -26 | 06- SP (-26 to - | 1 | 0.5 |
| -38 | 07- CH (-38 to | 1 | 0.56 |
| -43 | 08- CH (-43 to | 1 | 0.56 |
| -49 | 09- CH (-49 to | 1 | 0.56 |
| -56 | 10- SP (-56 to - | 1 | 0.47 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.936 | 2.936 | 3.682 |
| Stage 1 | Simple span | N/A | 1.6 | 2.349 | 2.349 | 2.945 |
| Stage 2 | Simple span | N/A | 1.6 | 3.095 | 3.095 | 3.987 |
| Stage 3 | Simple span | N/A | 1.6 | 2.476 | 2.476 | 3.19 |
| Stage 4 | Simple span | N/A | 1.6 | 3.506 | 3.506 | 4.256 |
| Stage 5 | Simple span | N/A | 1.6 | 2.338 | 2.338 | 2.837 |
| Stage 6 | Simple span | N/A | 1.6 | 3.799 | 3.799 | 4.706 |
| Stage 7 | Simple span | N/A | 1.6 | 2.533 | 2.533 | 3.138 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

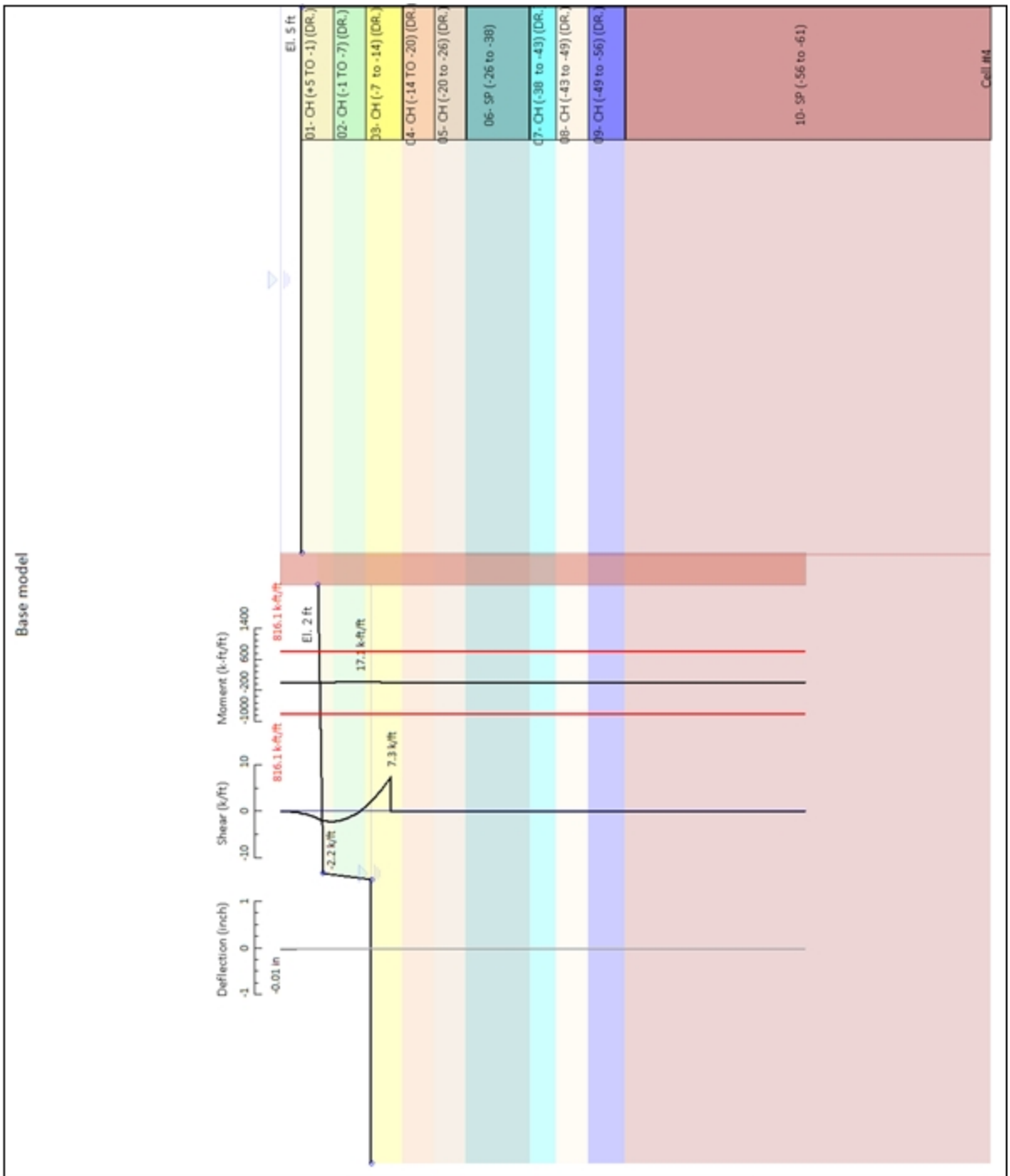
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

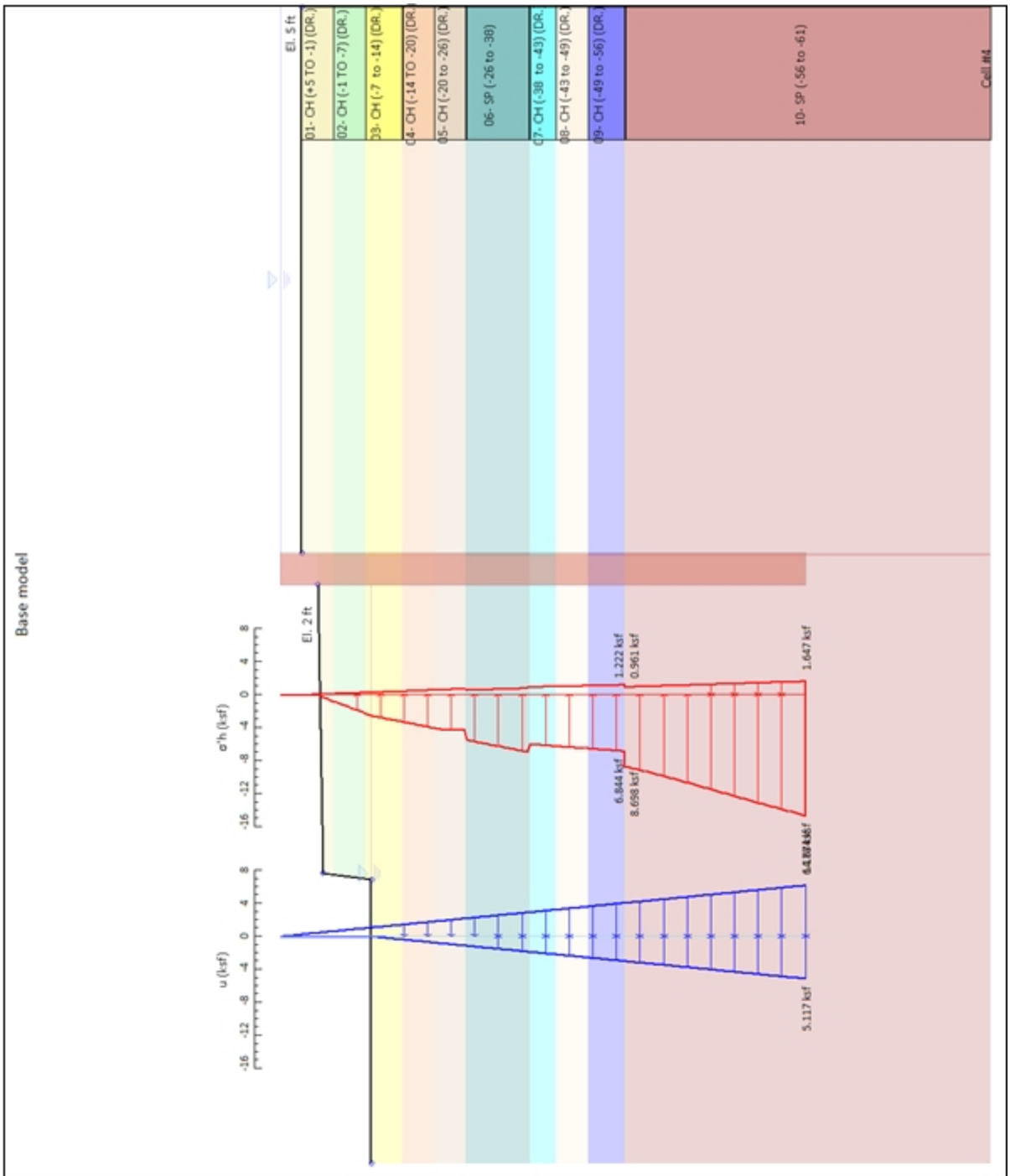
Axial Incl = Axial loads included for structural design

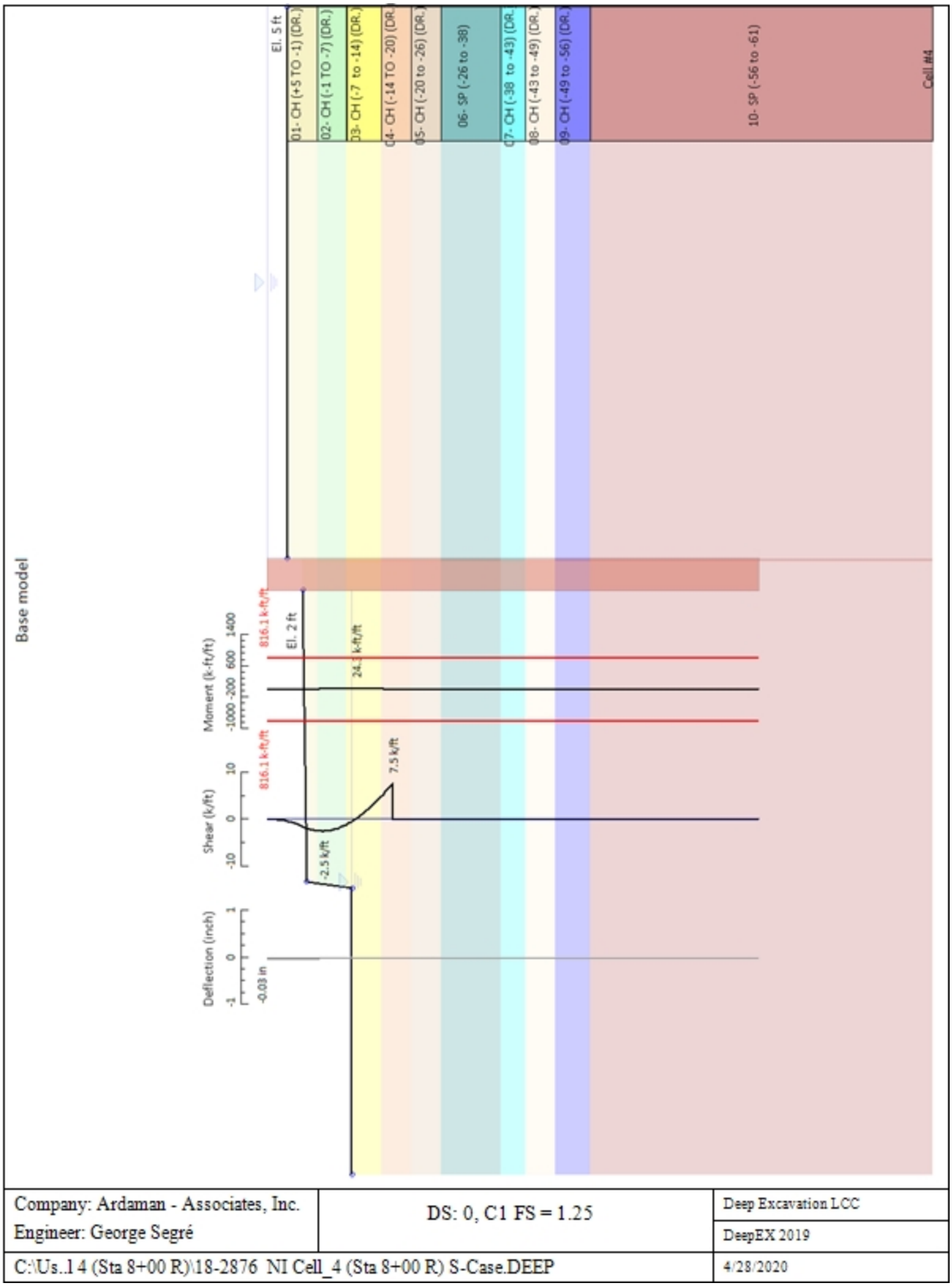
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

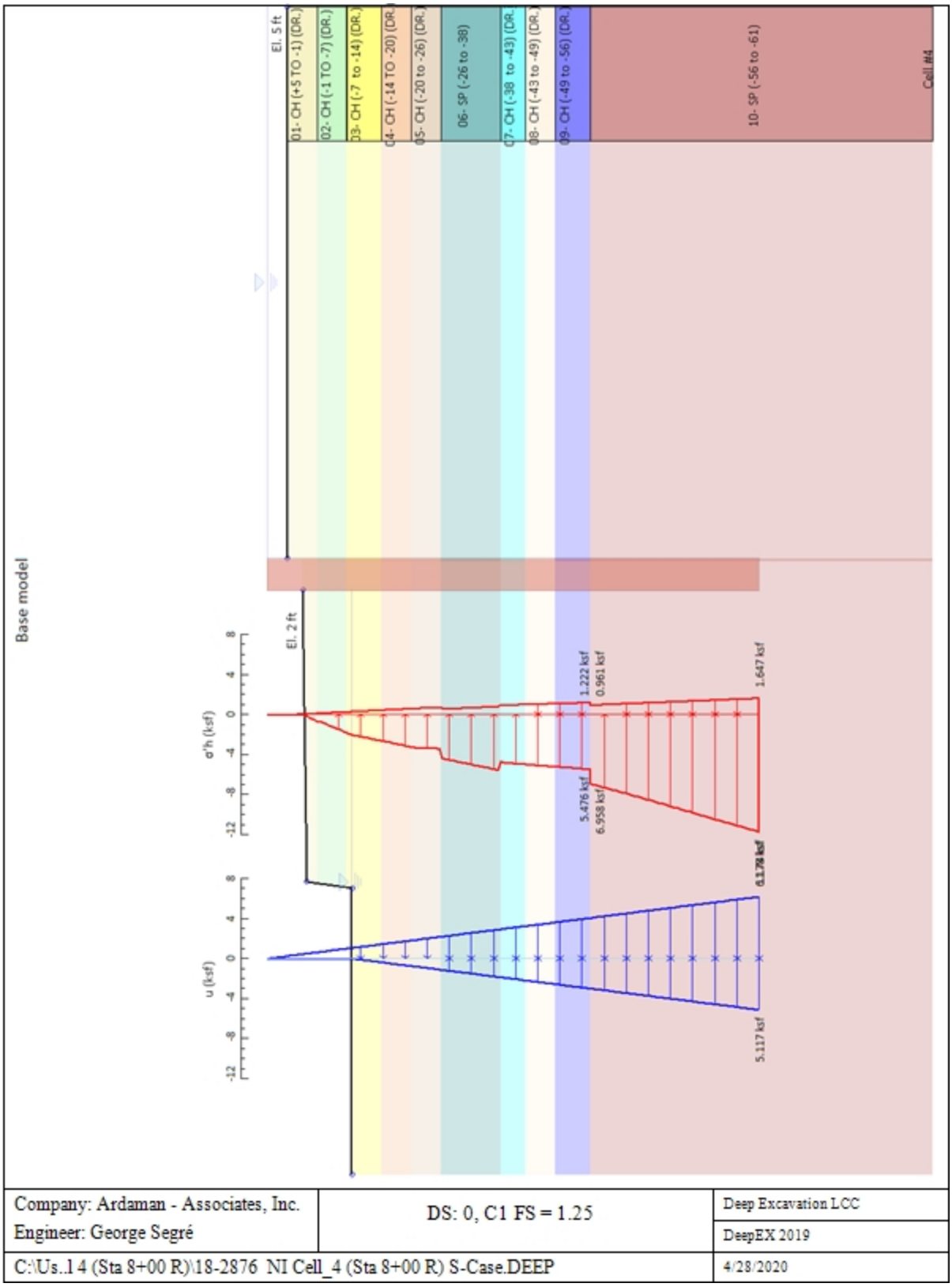
## EXCAVATION STAGES SKETCHES

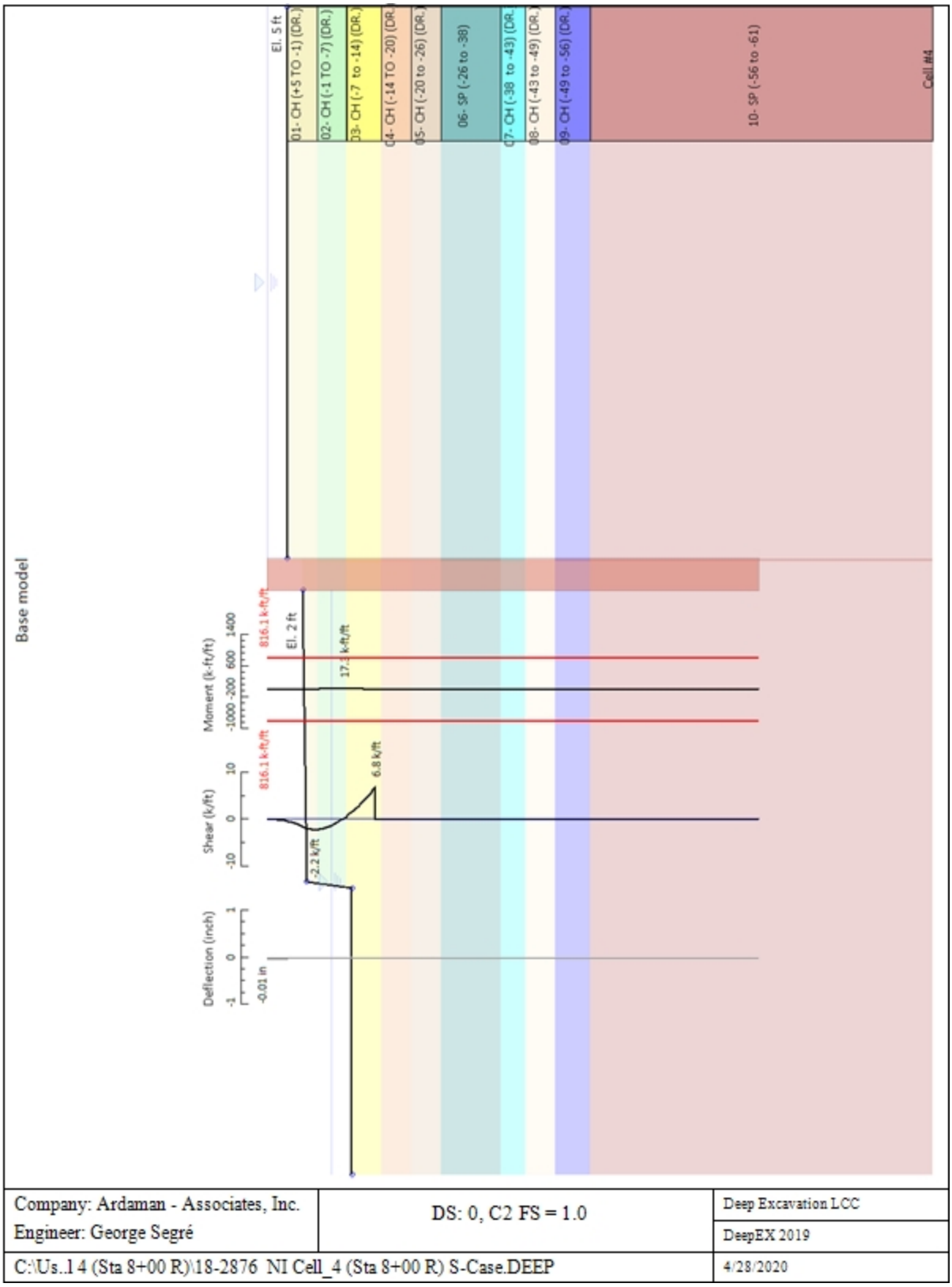
A sequence of figures for each excavation stage is reported

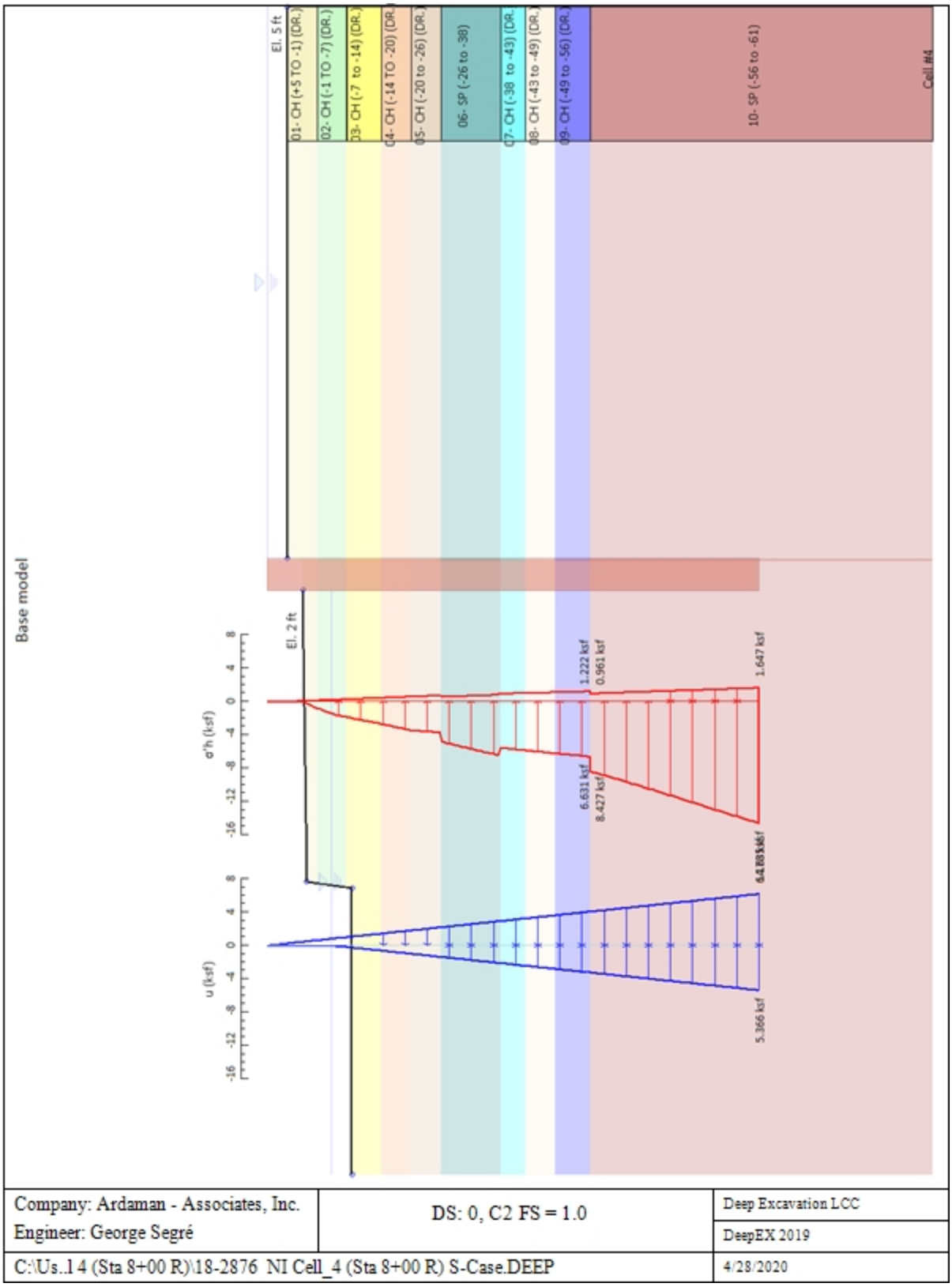

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
17.1 k-ft/ft
Shear (k/ft)
-10 0 10
816.1 k/ft
7.3 k/ft
-2.2 k/ft
Deflection (inch)
-1 0 1
-0.01 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

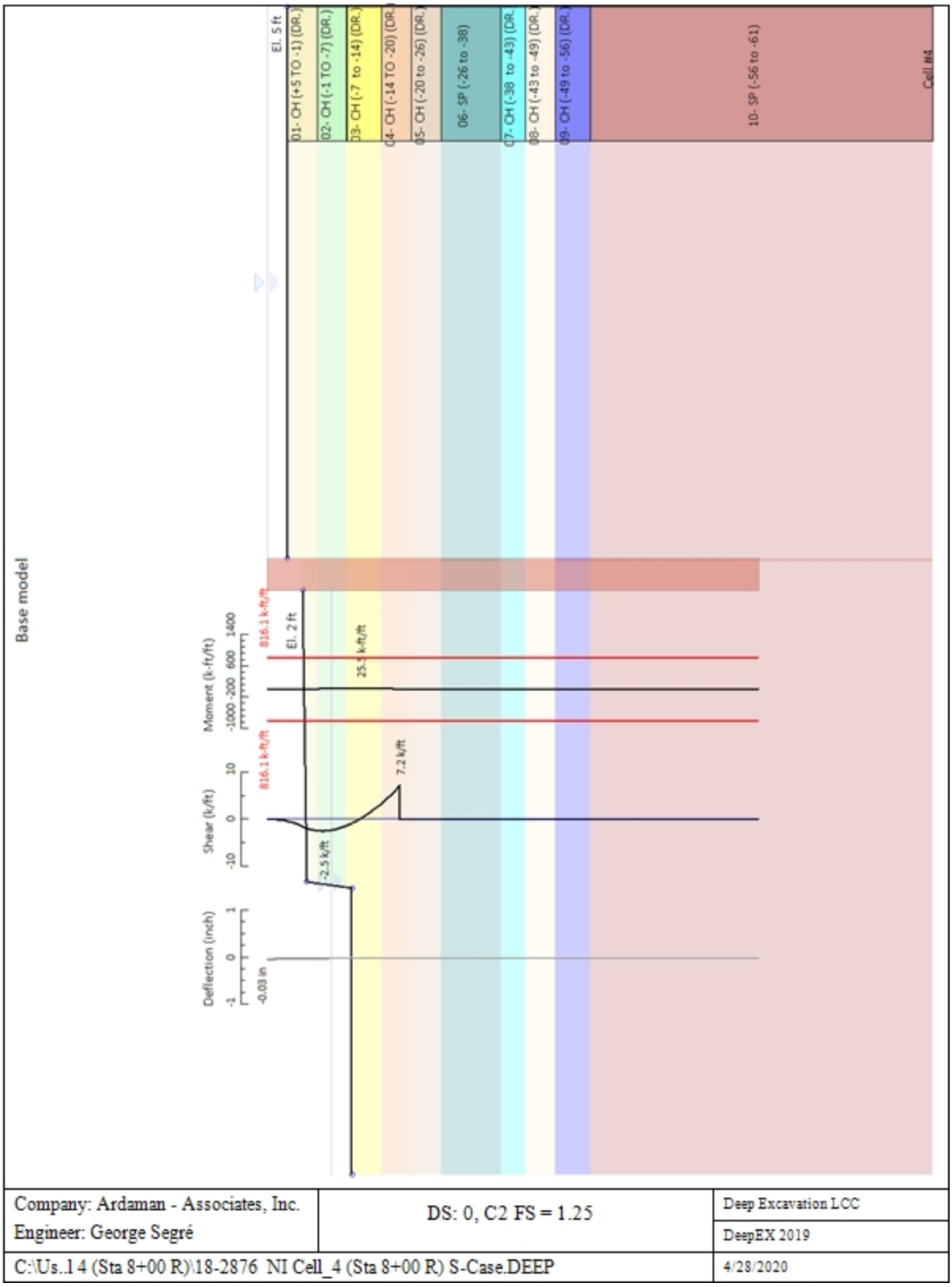

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.844 ksf
8.698 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

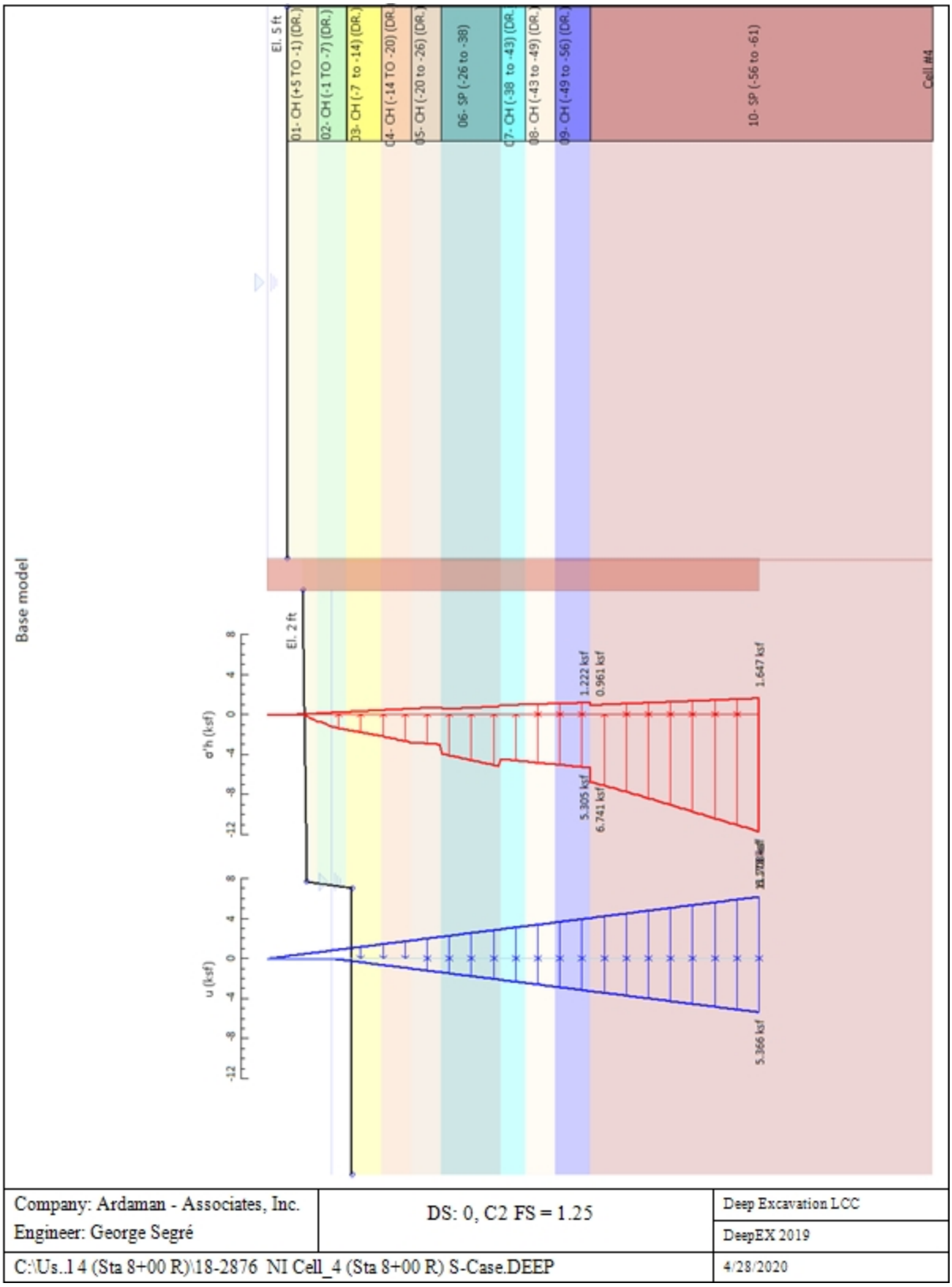

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
24.1 k-ft/ft
Shear (k/ft)
-10 0 10
7.5 k/ft
-2.5 k/ft
Deflection (inch)
-1 0 1
-0.03 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

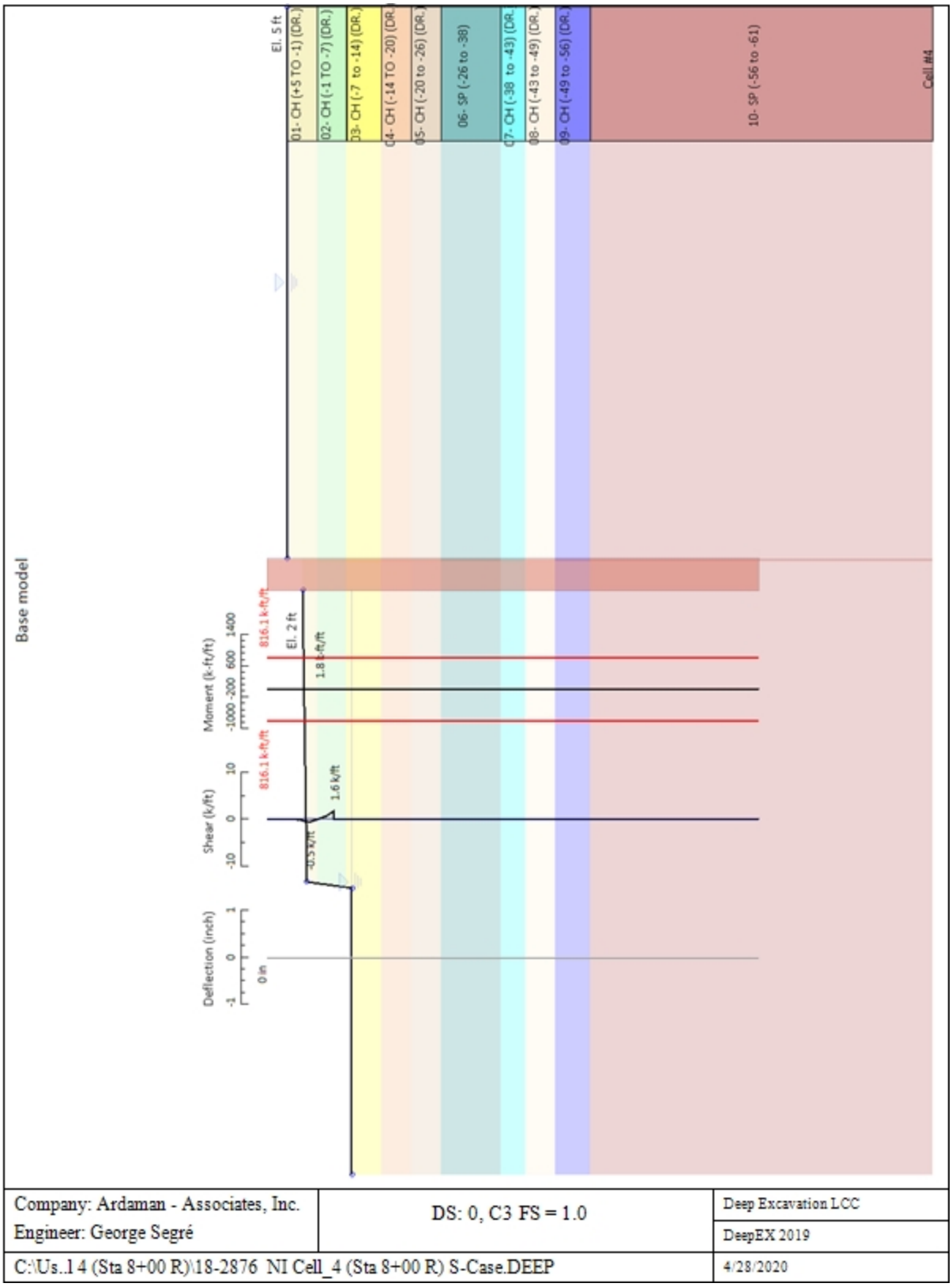

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
5.476 ksf
6.958 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

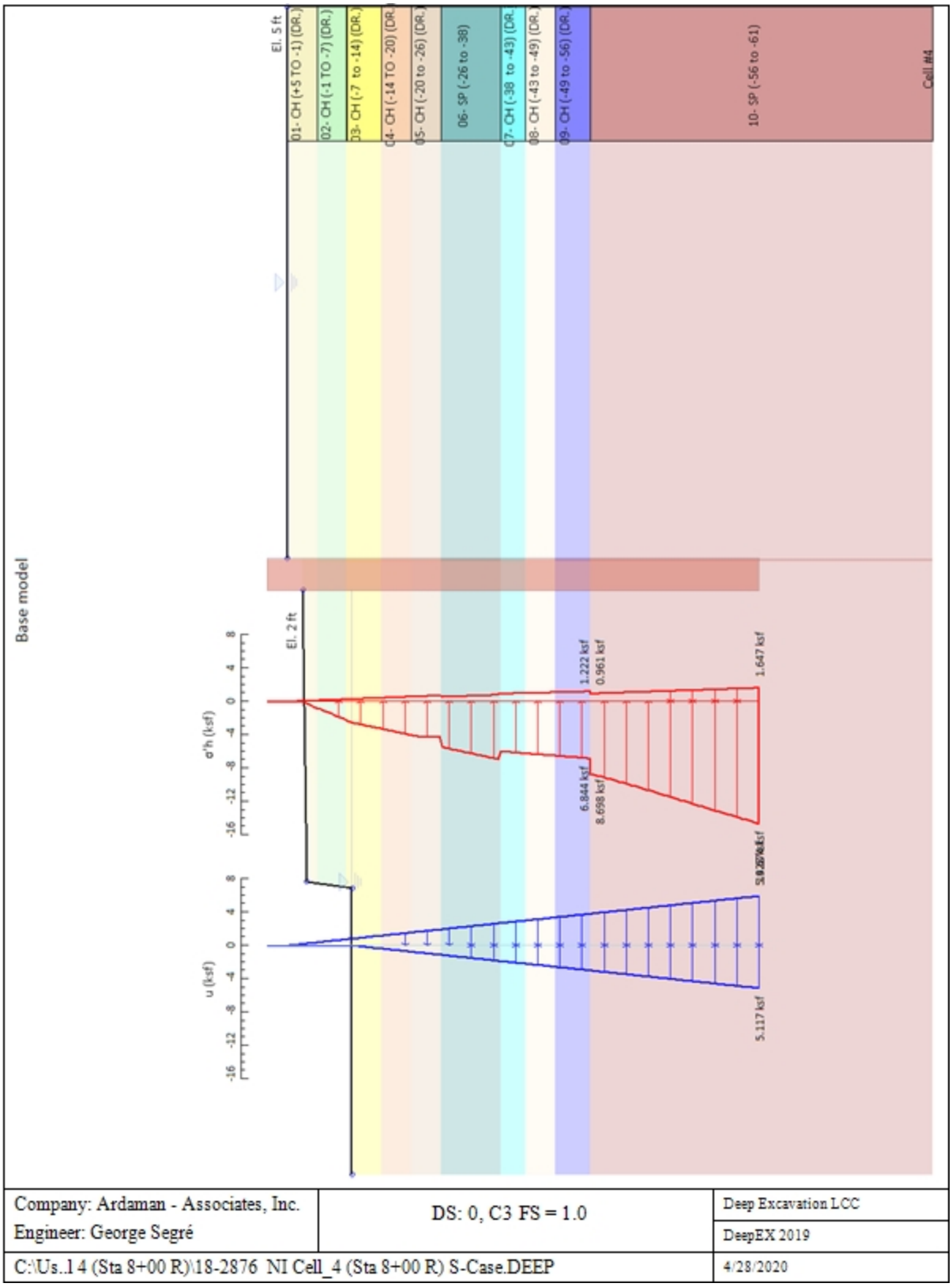

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
17.2 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
6.8 k/ft
-7.2 k/ft
Deflection (inch)
-1 0 1
-0.01 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

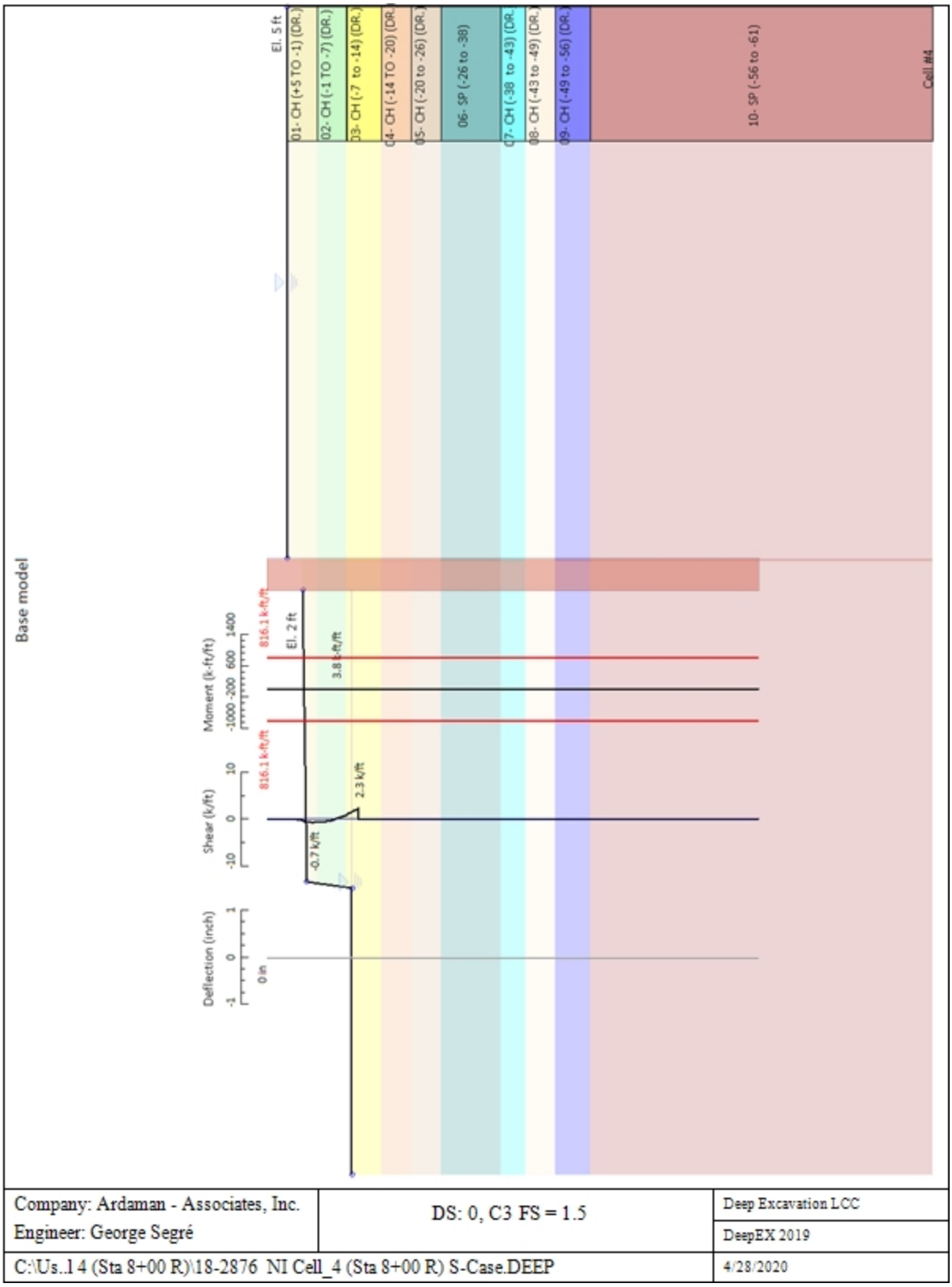

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.631 ksf
8.427 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

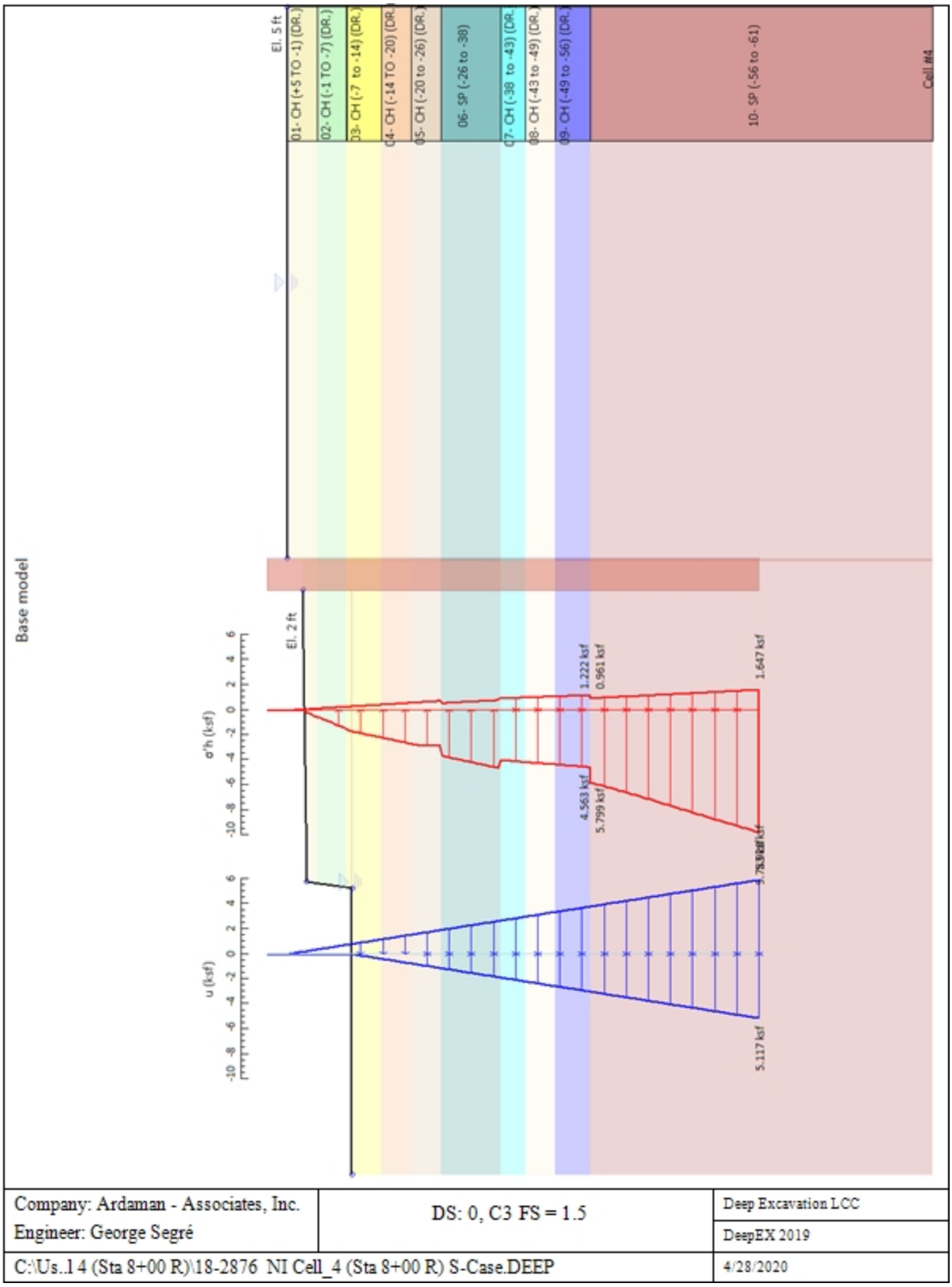

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
25.5 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
7.2 k/ft
-2.5 k/ft
Deflection (inch)
-1 0 1
-0.03 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

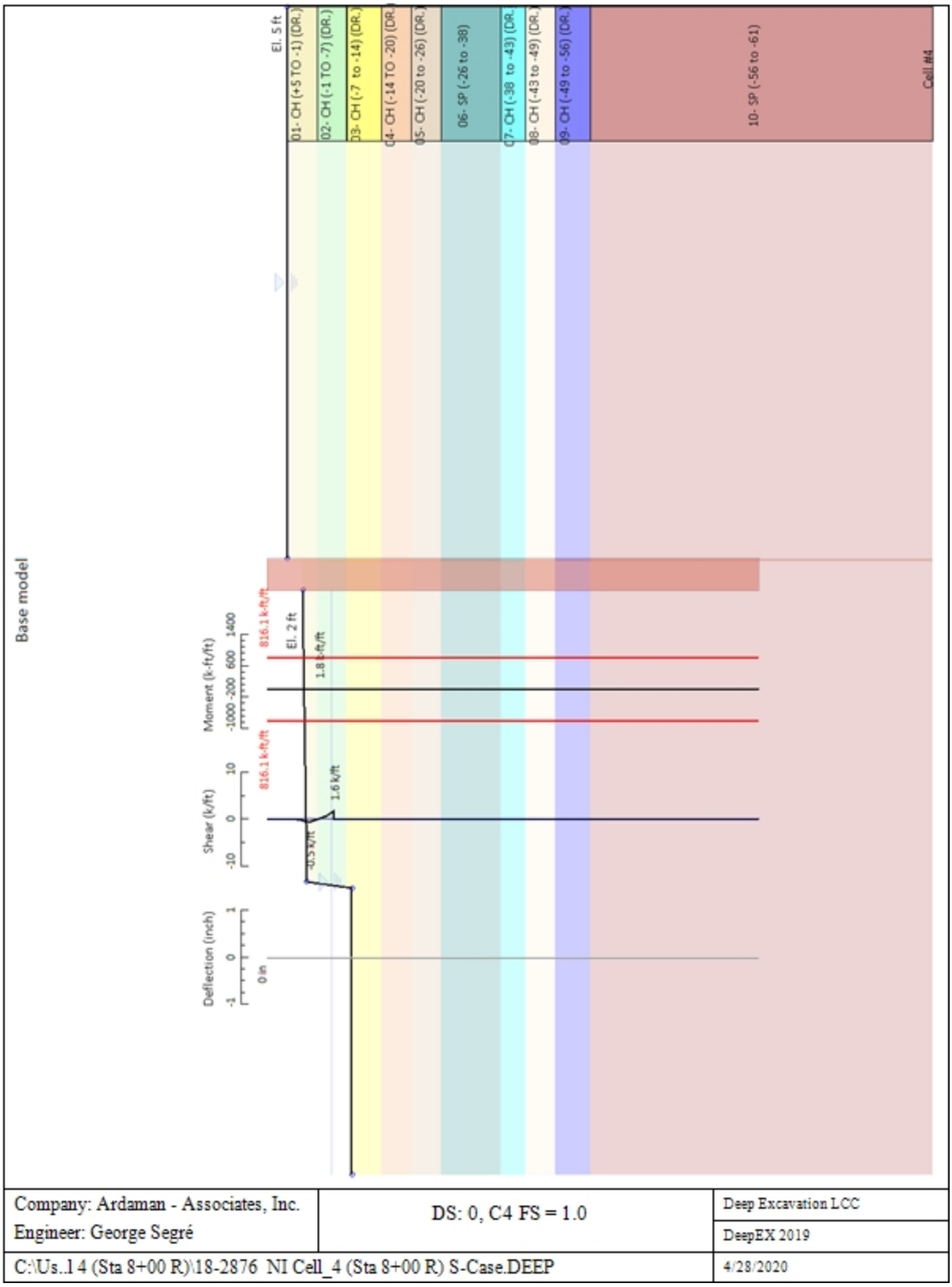

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
5.305 ksf
6.741 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

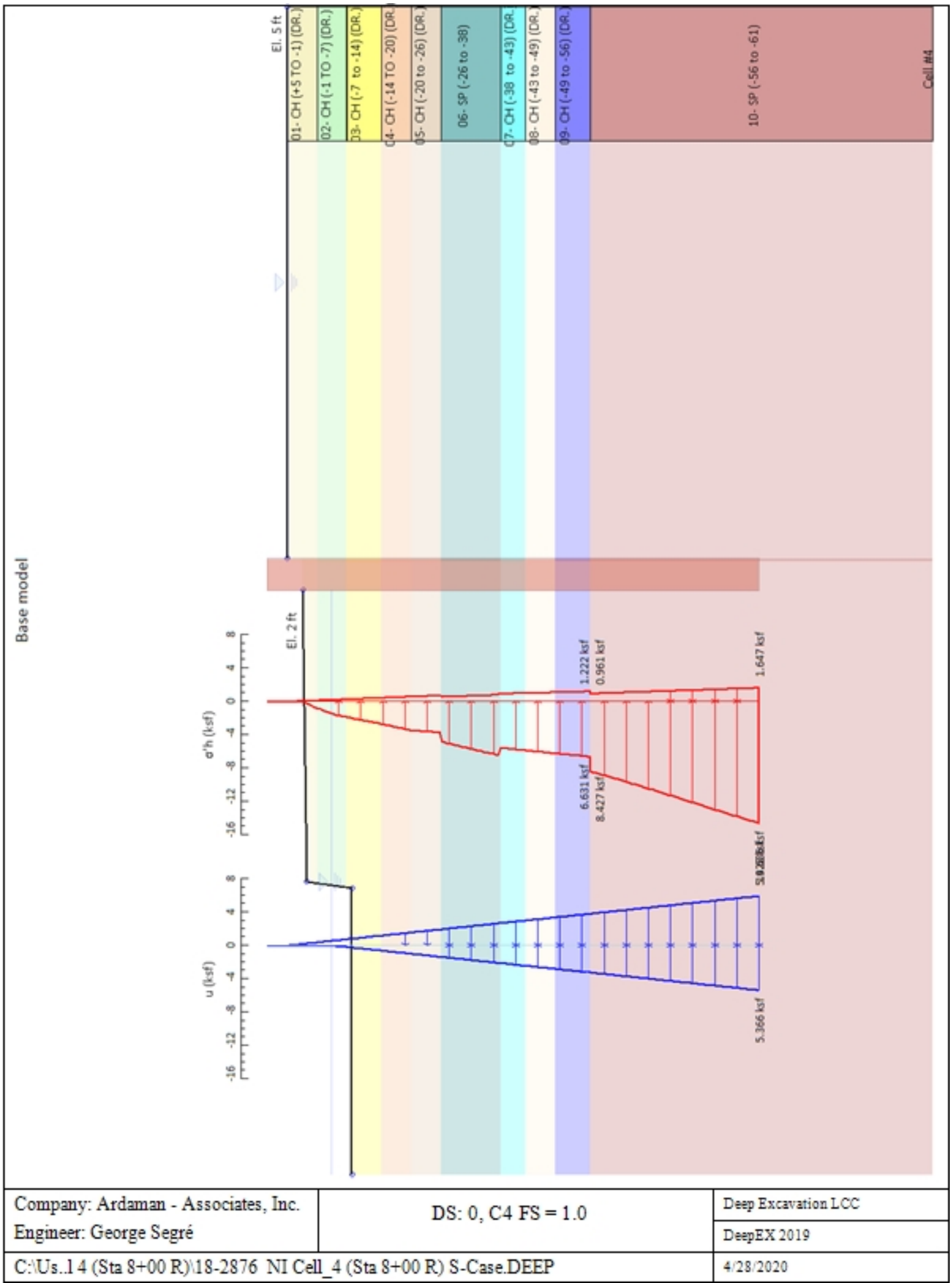

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
1.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.6 k/ft
-0.5 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

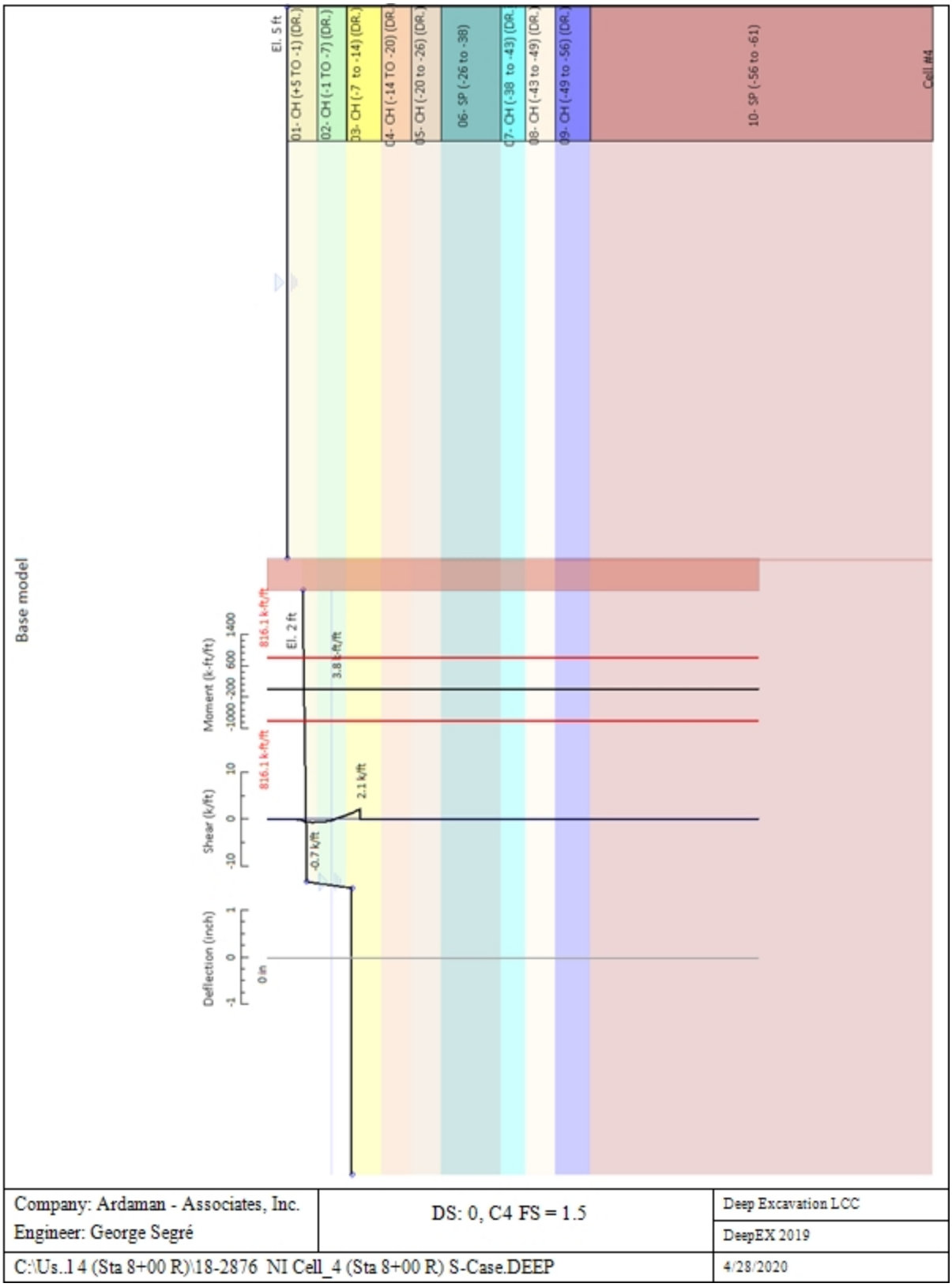

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.844 ksf
8.698 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

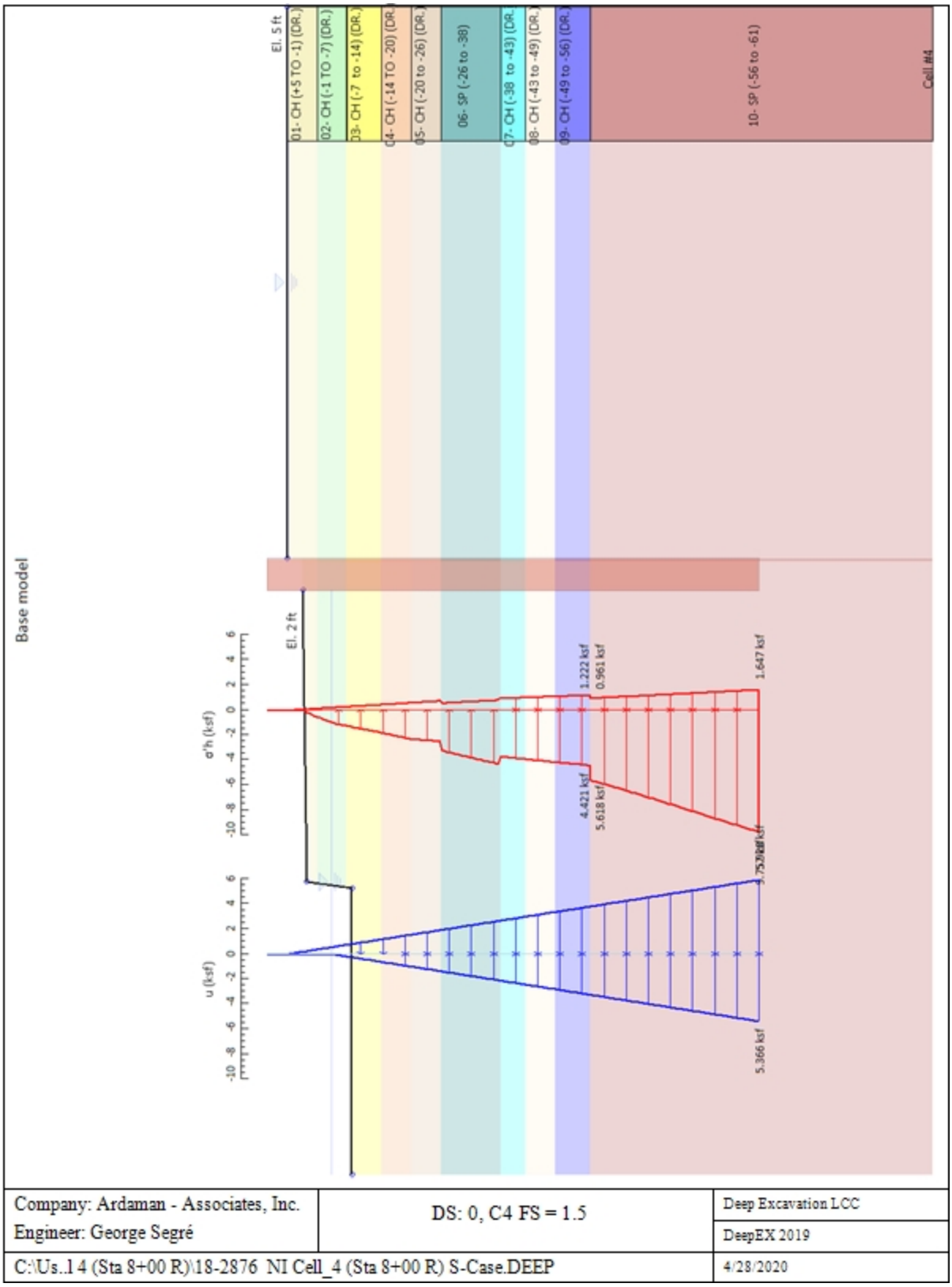

Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
3.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.3 k/ft
-0.7 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
4.563 ksf
5.799 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
1.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.6 k/ft
-0.5 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.631 ksf
8.427 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
3.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.1 k/ft
-0.7 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
-10 -8 -6 -4 -2 0 2 4 6
1.222 ksf
0.961 ksf
1.647 ksf
4.421 ksf
5.618 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #5 @ Sta. 5+50)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -78.74 ft., NAVD88

Length of Sheetting = 87.74 ft.

Use = 90.0 ft.

Design Tip Elev. = -81.0 ft., NAVD88

Design Length of Sheeting = 90.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -12 | 1.00 | 1.00 | -35.24 | 64.22 | 21.97 | 0.19 |
| | | Open excavation - degraded | 9 | -12 | 1.00 | 1.25 | -41.00 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -30.90 | 33.47 | 11.66 | 0.09 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -36.82 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -12 | 1.00 | 1.00 | -28.92 | 14.89 | 7.64 | 0.03 |
| | | Open excavation - degraded | 5 | -12 | 1.00 | 1.50 | -40.77 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -15.49 | 5.52 | 2.64 | 0.01 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -34.84 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -12 | 1.00 | 1.00 | -61.31 | 585.04 | 64.38 | 5.13 |
| | | Open excavation - degraded | 9 | -12 | 1.00 | 1.25 | -76.02 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -56.40 | 489.99 | 56.20 | 3.65 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -69.48 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -12 | 1.00 | 1.00 | -52.04 | 353.27 | 44.31 | 2.18 |
| | | Open excavation - degraded | 5 | -12 | 1.00 | 1.50 | -78.74 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -47.14 | 294.91 | 38.26 | 1.50 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -68.94 | -- | -- | -- |
| | | | | | | Governing Value: | -78.74 | 585.04 | 64.38 | 5.13 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:55:38 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

***Project: San Jacinto Waste Pits***
***Results for Design Section 0: Base model***

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- ML (+5 T | 117 | 117 | 15 | 0 | 200 | 15 | 15 | 300 | 3 | 0.59 | 1.7 | 0.59 | 1.7 | True | EXP | |
| 02- CH (+3 TO | 128 | 128 | 0 | 0 | 1000 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- ML (+2 to | 117 | 117 | 15 | 0 | 200 | 15 | 15 | 150 | 3 | 0.59 | 1.7 | 0.59 | 1.7 | True | Linear | |
| 04- CH (+0 TO | 127 | 127 | 0 | 0 | 750 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-5 to - | 130 | 130 | 0 | 0 | 1700 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-13 to | 130 | 130 | 31 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.32 | 3.12 | N/A | N/A | True | Linear | |
| 07- SP (-22 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |
| 08- CH (-33 to | 128 | 128 | 0 | 0 | 1800 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- CH (-41 to | 130 | 130 | 0 | 0 | 1950 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 10- CH (-46 to | 130 | 130 | 0 | 0 | 2200 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- CH (-56 to | 130 | 130 | 0 | 0 | 2500 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- ML (+5 T | 0.4 | 0.1 | 0 | 0.741 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+3 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- ML (+2 to | 0.4 | 0.1 | 0 | 0.741 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (+0 TO | 0.35 | 0.1 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-5 to - | 0.45 | 0.1 | 0 | 0.45 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-13 to | 0.35 | - | - | 0.485 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-22 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-33 to | 0.3 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-41 to | 0.25 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-46 to | 0.35 | 0.1 | 0 | 0 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-56 to | 0.35 | 0.1 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

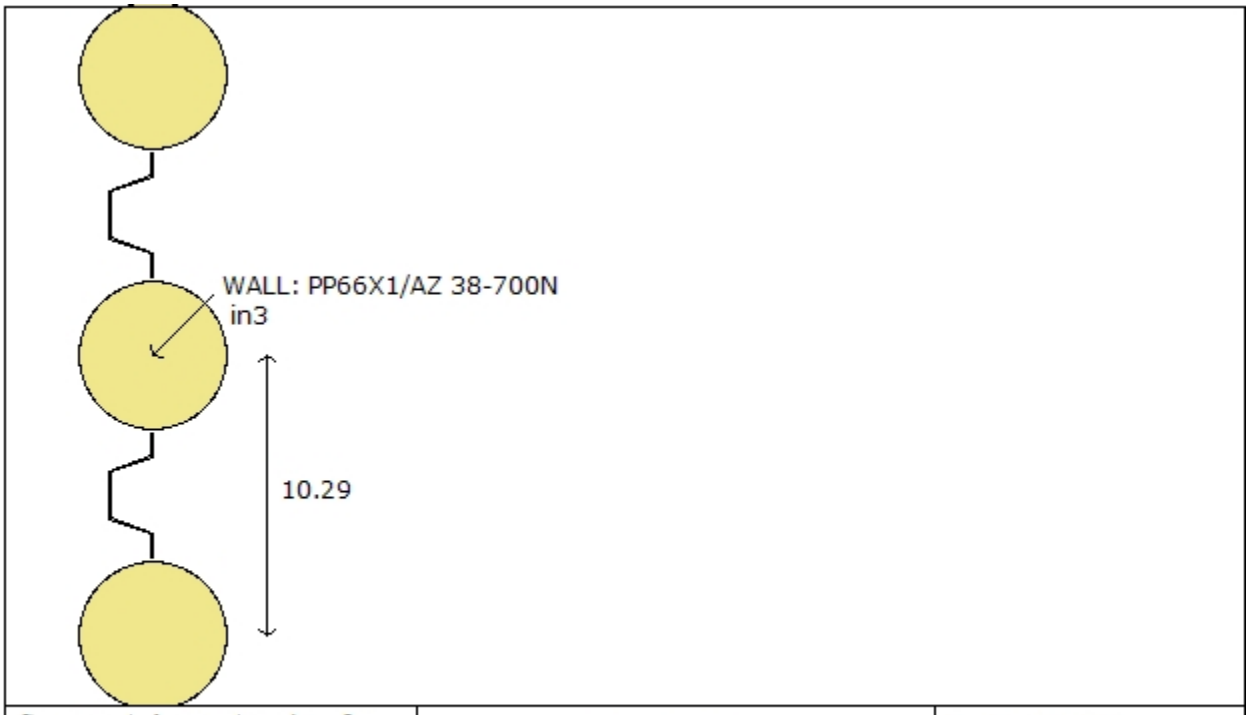
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- ML (+5 TO | 1 | 0.74 |
| 3 | 02- CH (+3 TO | 1 | 0 |
| 2 | 03- ML (+2 to | 1 | 0.74 |
| 0 | 04- CH (+0 TO | 1 | 1 |
| -5 | 05- CH (-5 to - | 1 | 0.45 |
| -13 | 06- SP (-13 to - | 1 | 0.48 |
| -22 | 07- SP (-22 to | 1 | 0.47 |
| -33 | 08- CH (-33 to | 1 | 1 |
| -41 | 09- CH (-41 to | 1 | 1 |
| -46 | 10- CH (-46 to | 1 | 0 |
| -56 | 11- CH (-56 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.003 | 2.003 | 2.458 |
| Stage 1 | Simple span | N/A | 1.6 | 1.631 | 1.631 | 1.983 |
| Stage 2 | Simple span | N/A | 1.6 | 2.107 | 2.107 | 2.546 |
| Stage 3 | Simple span | N/A | 1.6 | 1.726 | 1.726 | 2.06 |
| Stage 4 | Simple span | N/A | 1.6 | 2.254 | 2.254 | 2.701 |
| Stage 5 | Simple span | N/A | 1.6 | 1.556 | 1.556 | 1.831 |
| Stage 6 | Simple span | N/A | 1.6 | 2.372 | 2.372 | 2.798 |
| Stage 7 | Simple span | N/A | 1.6 | 1.657 | 1.657 | 1.908 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

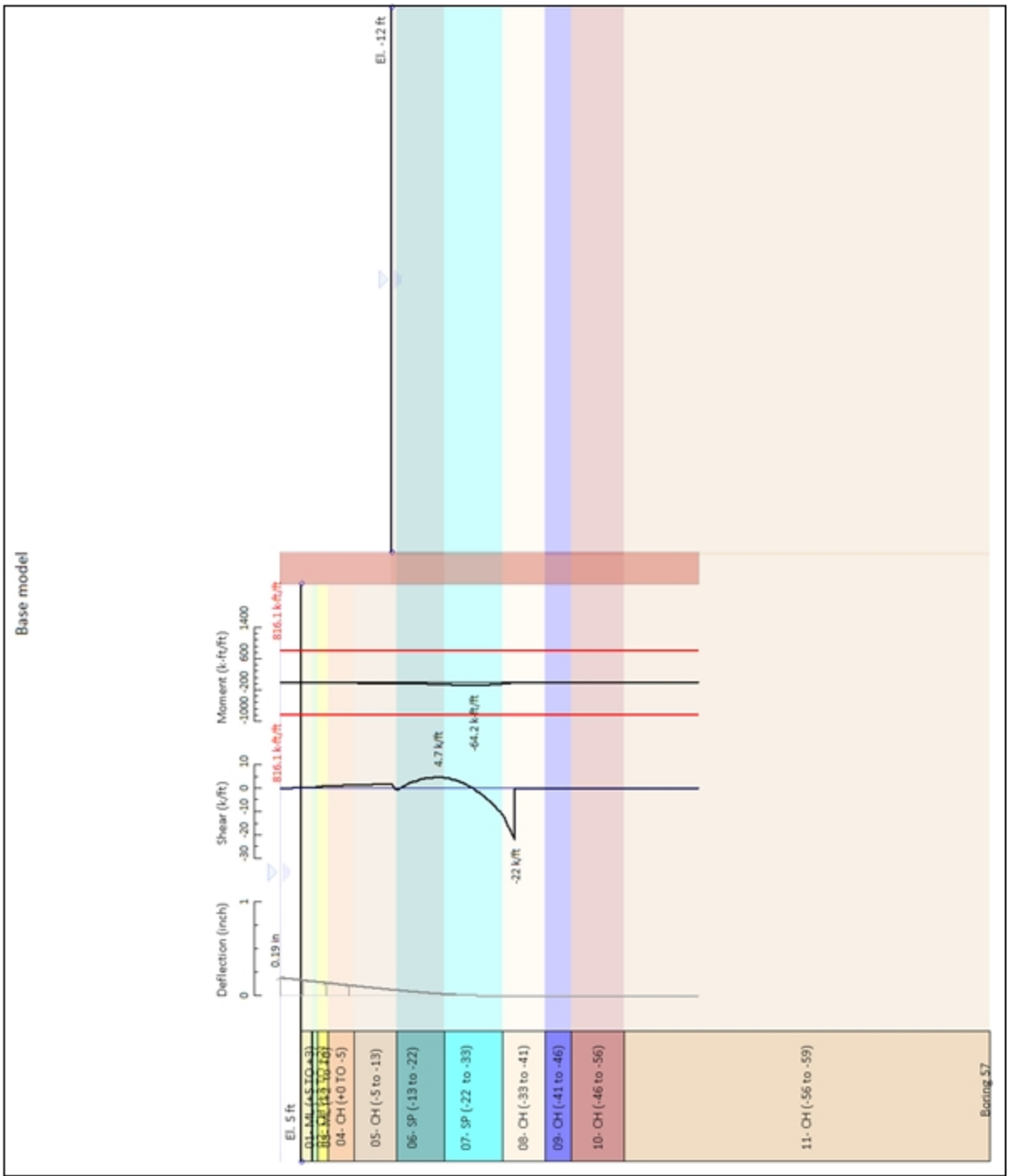
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

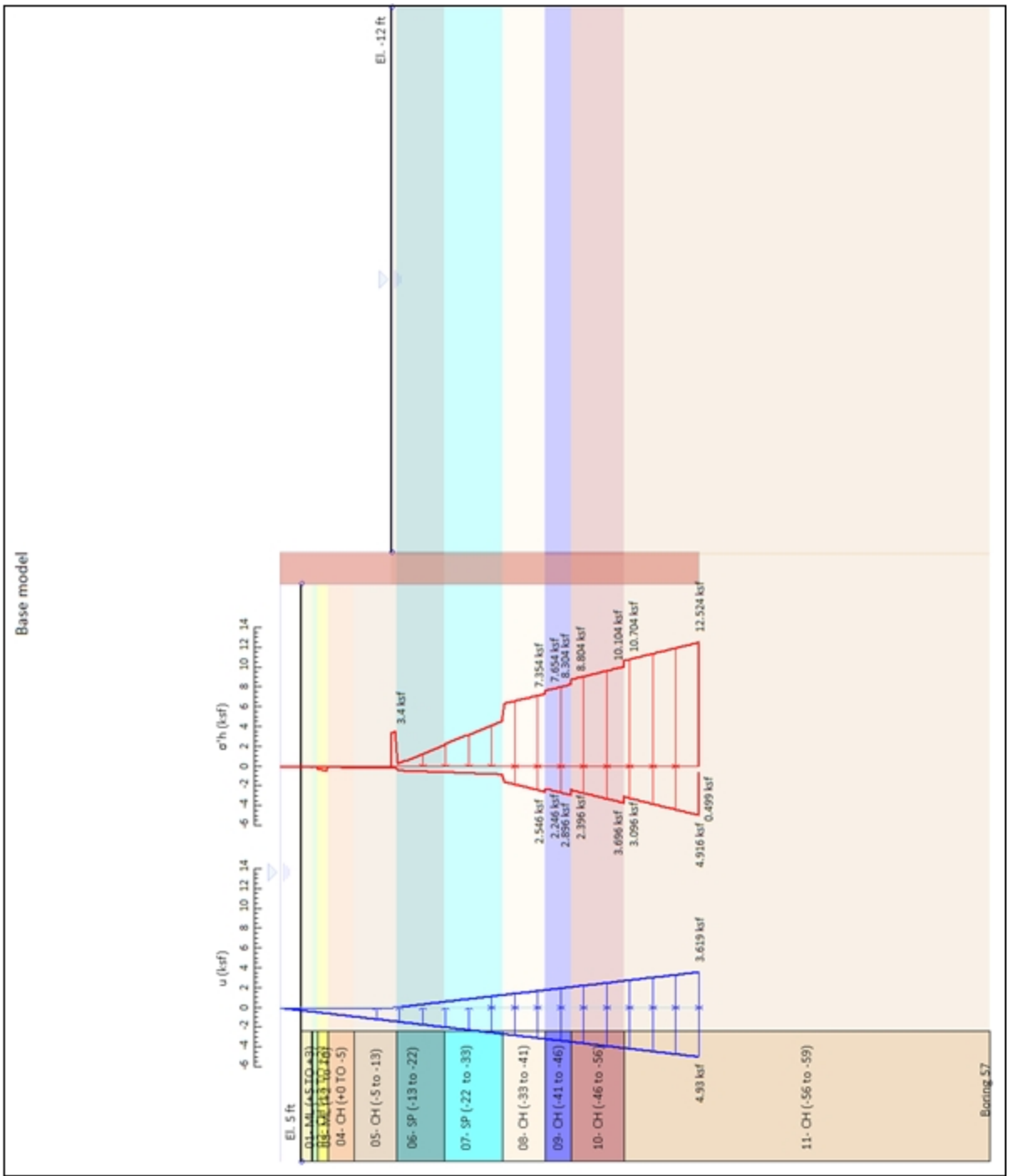
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

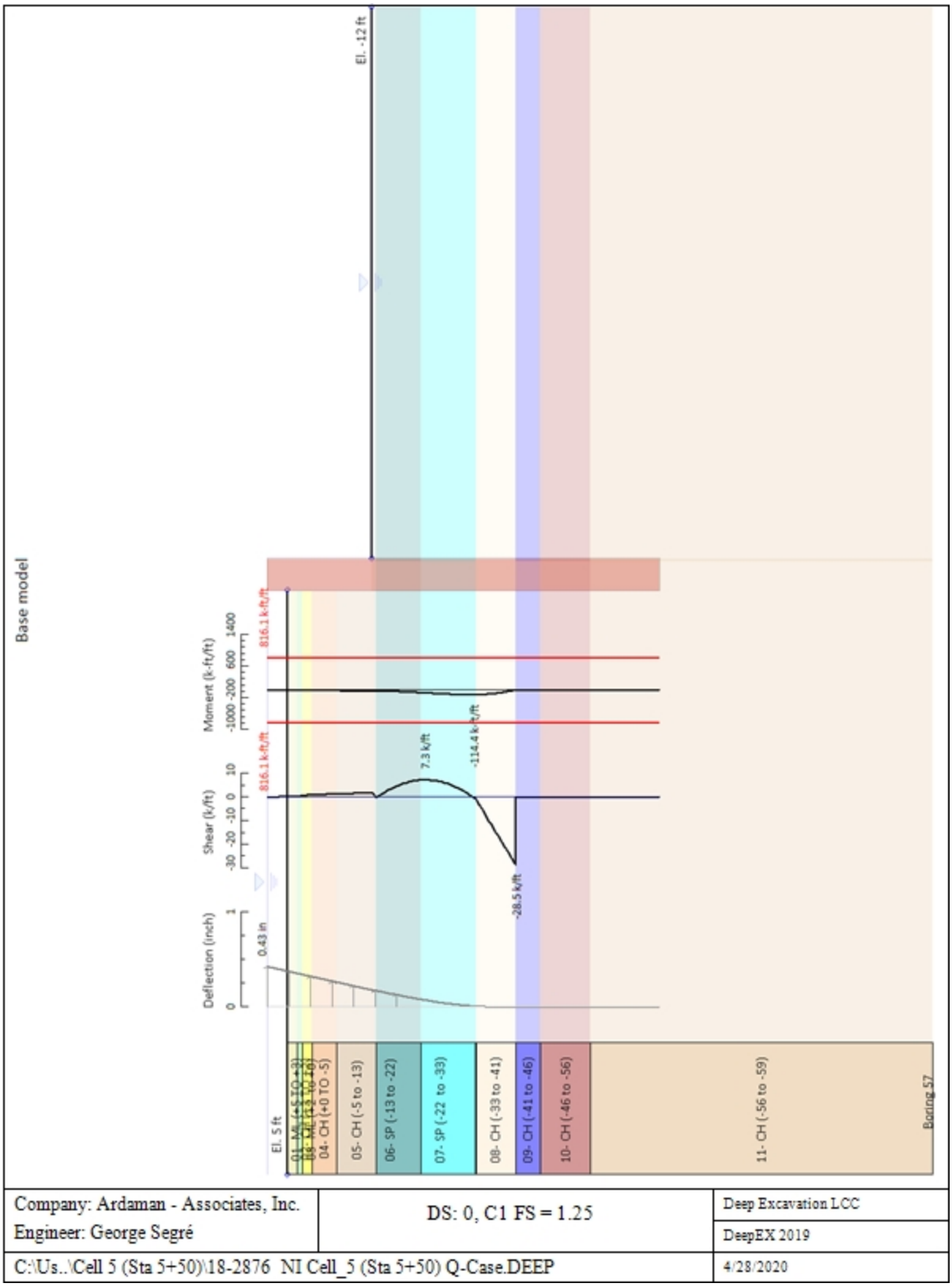
A sequence of figures for each excavation stage is reported



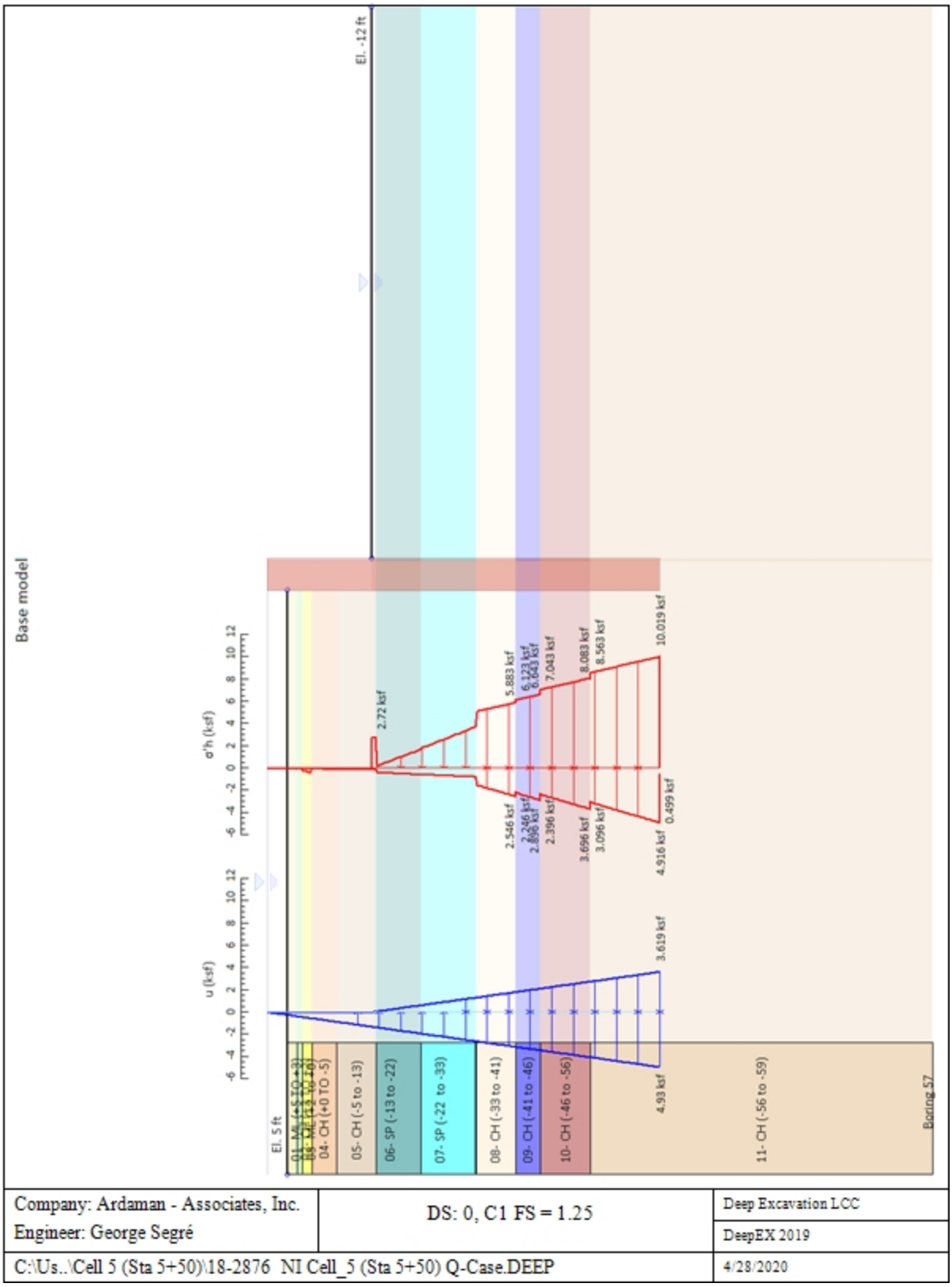

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



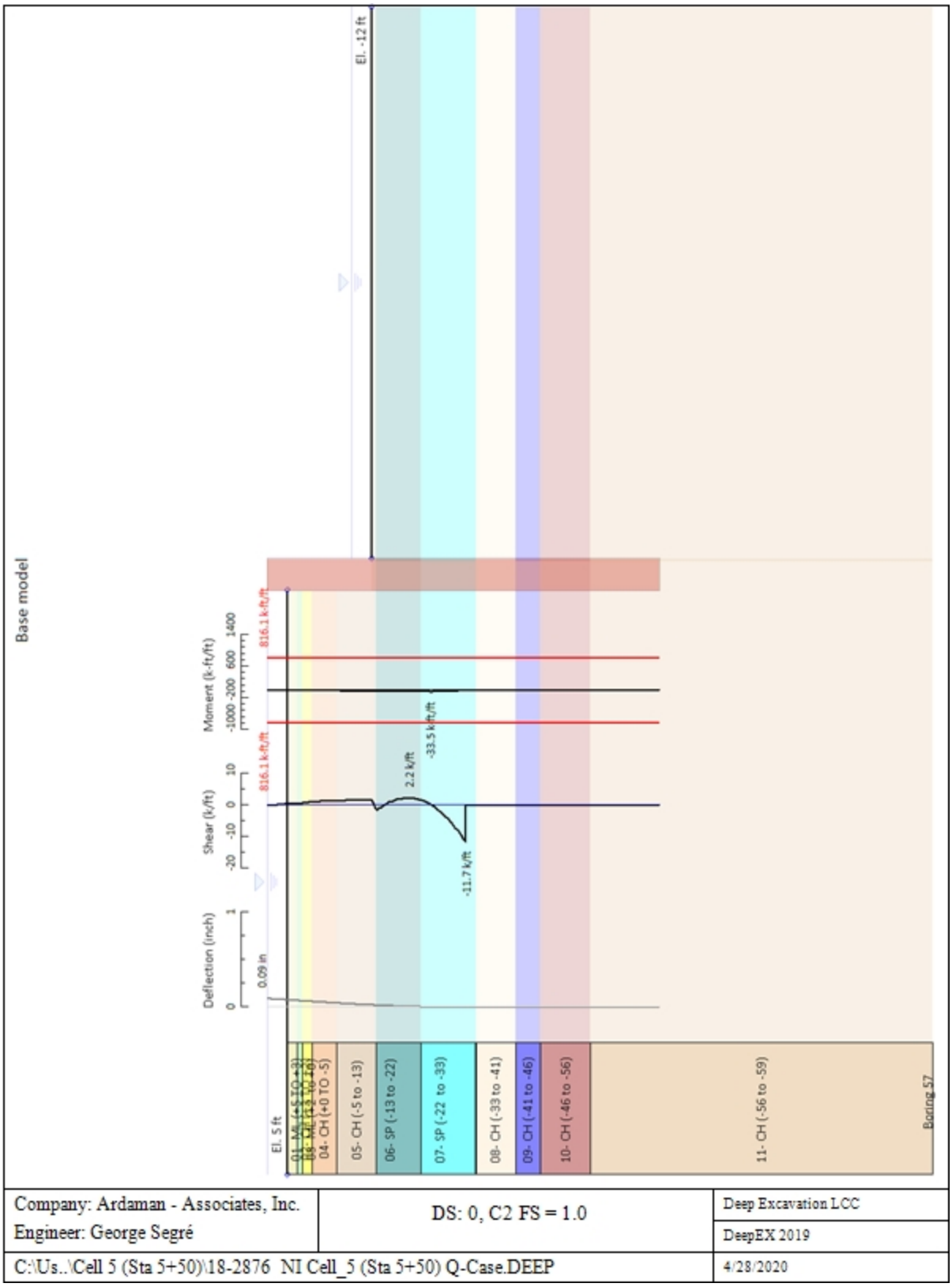

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



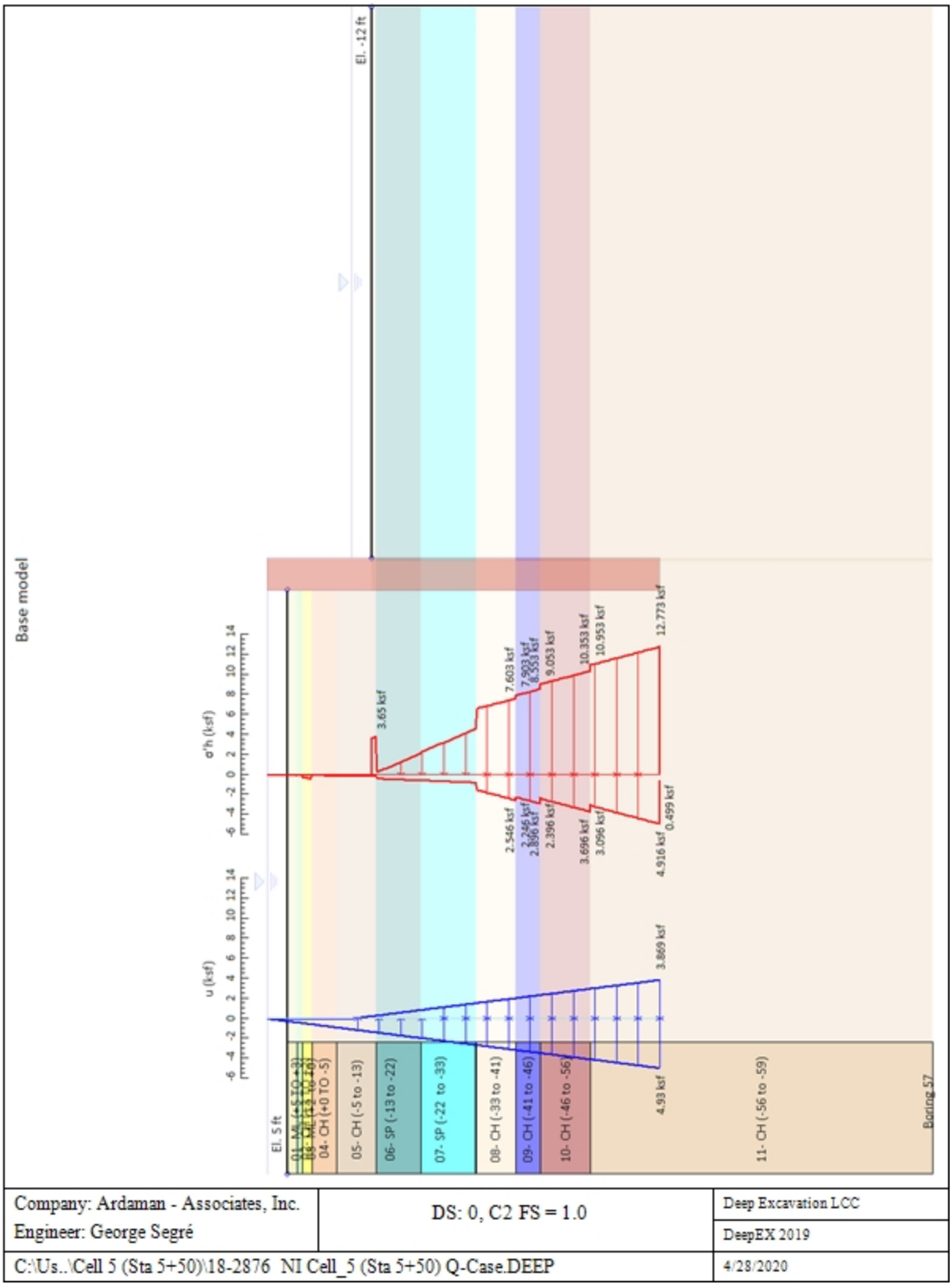

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



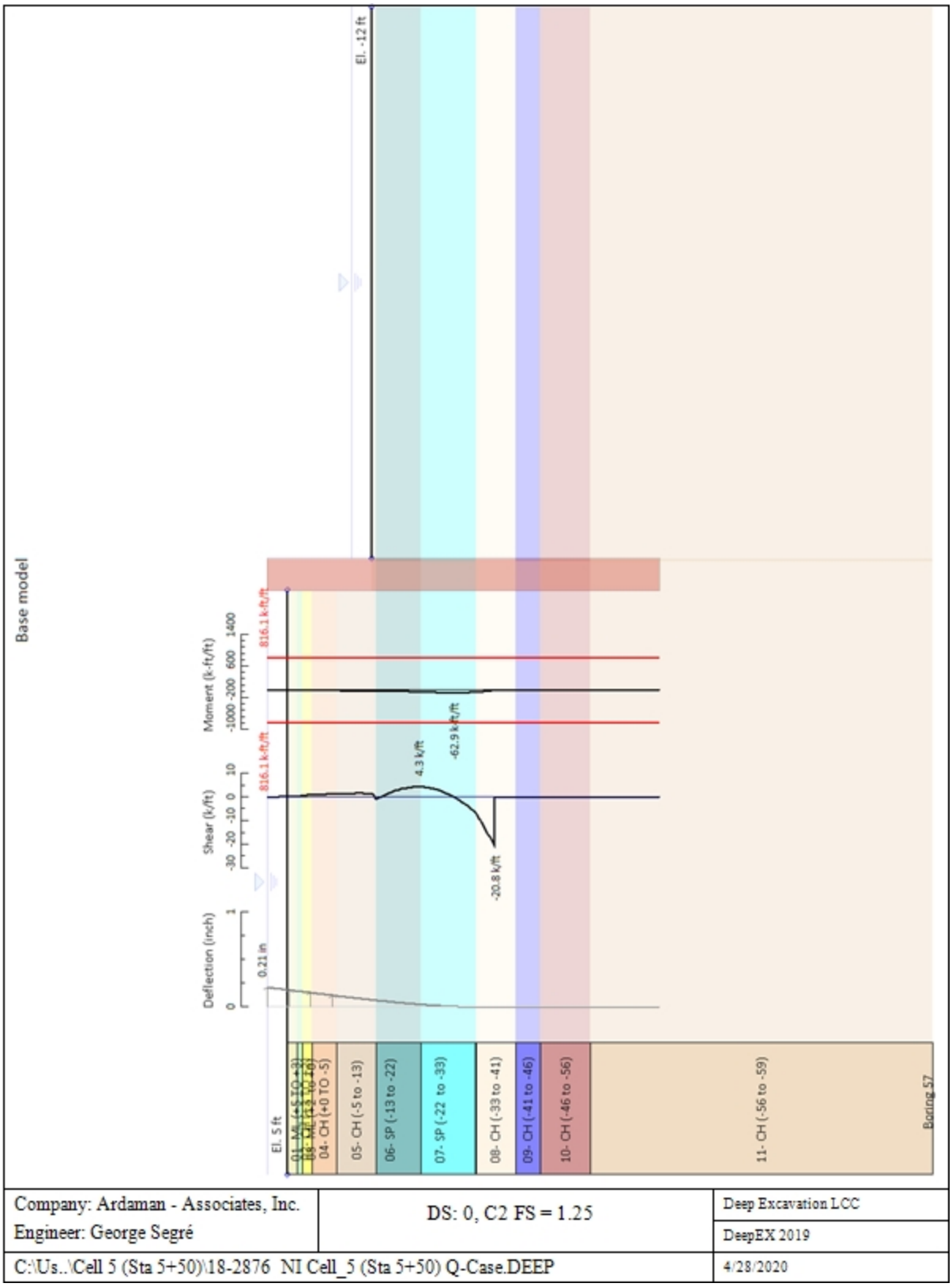

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



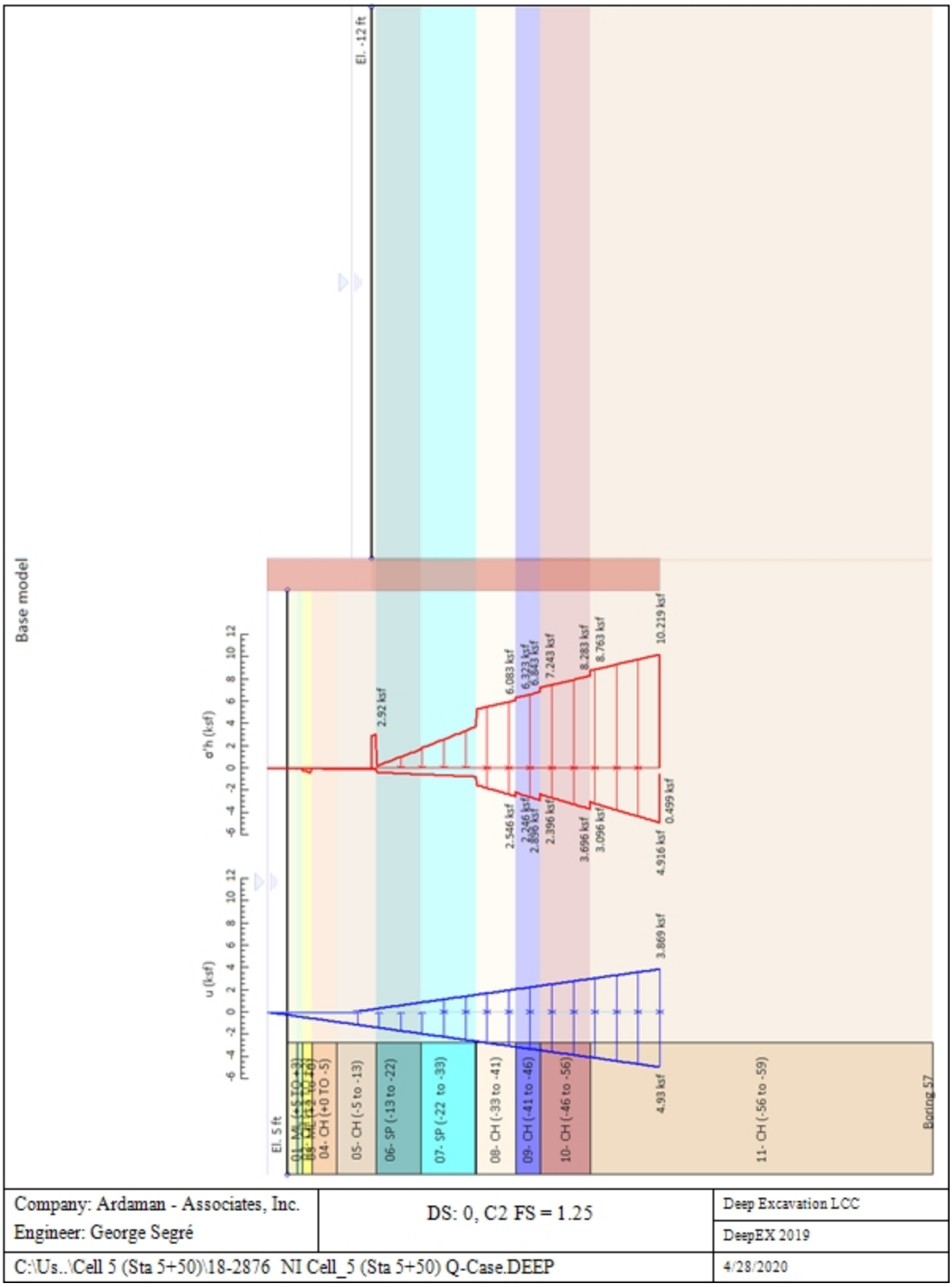

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



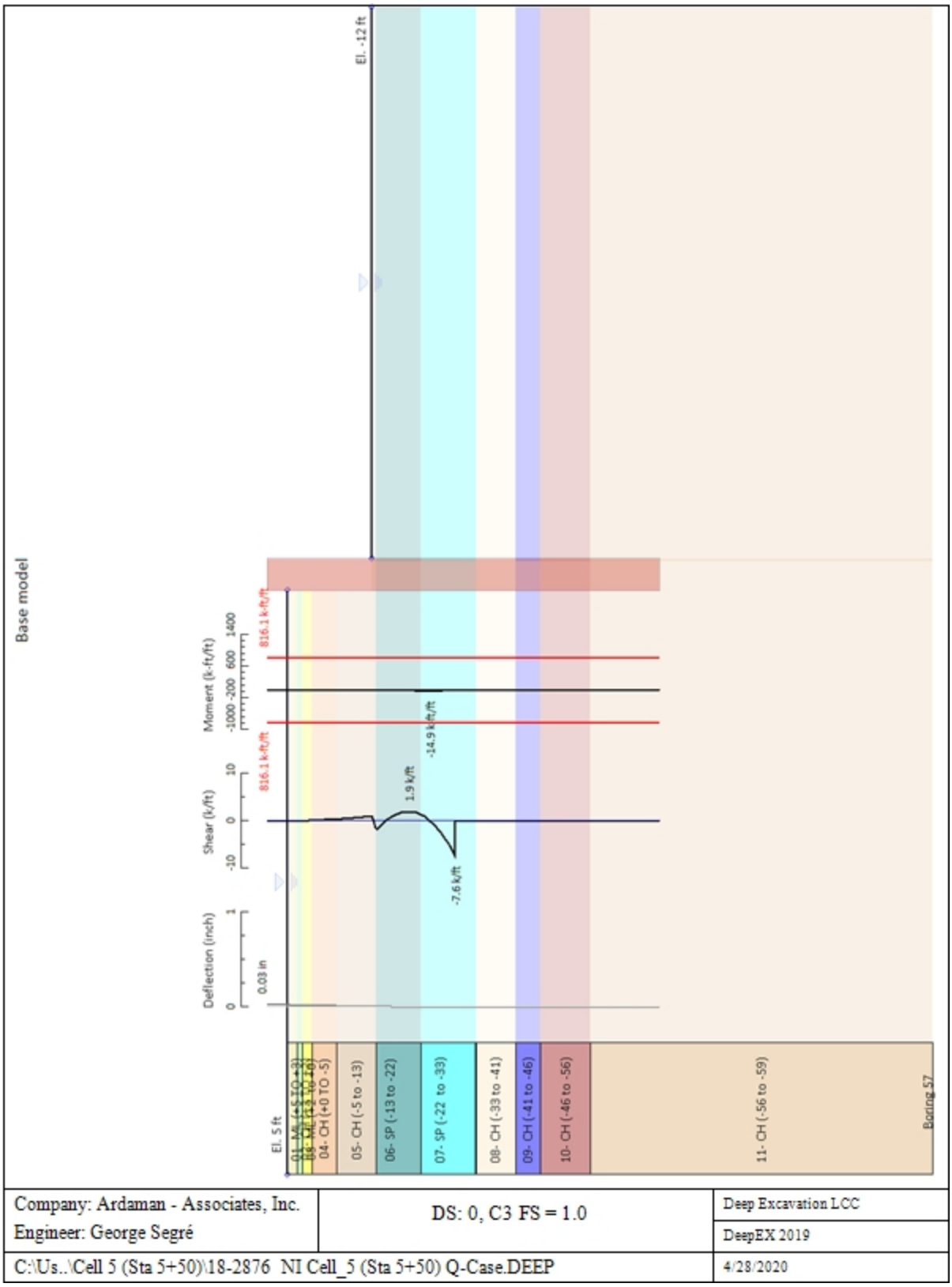

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



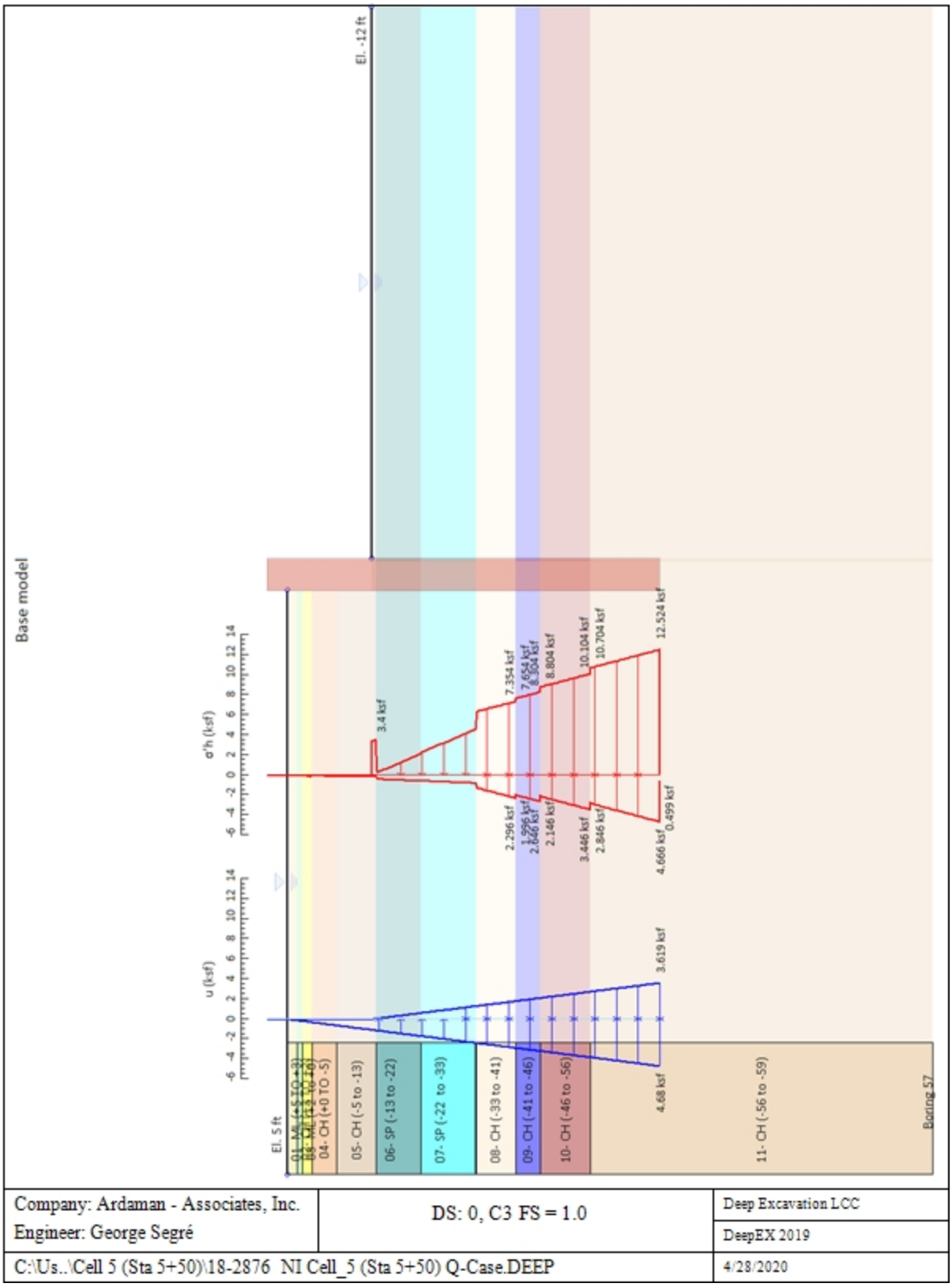

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



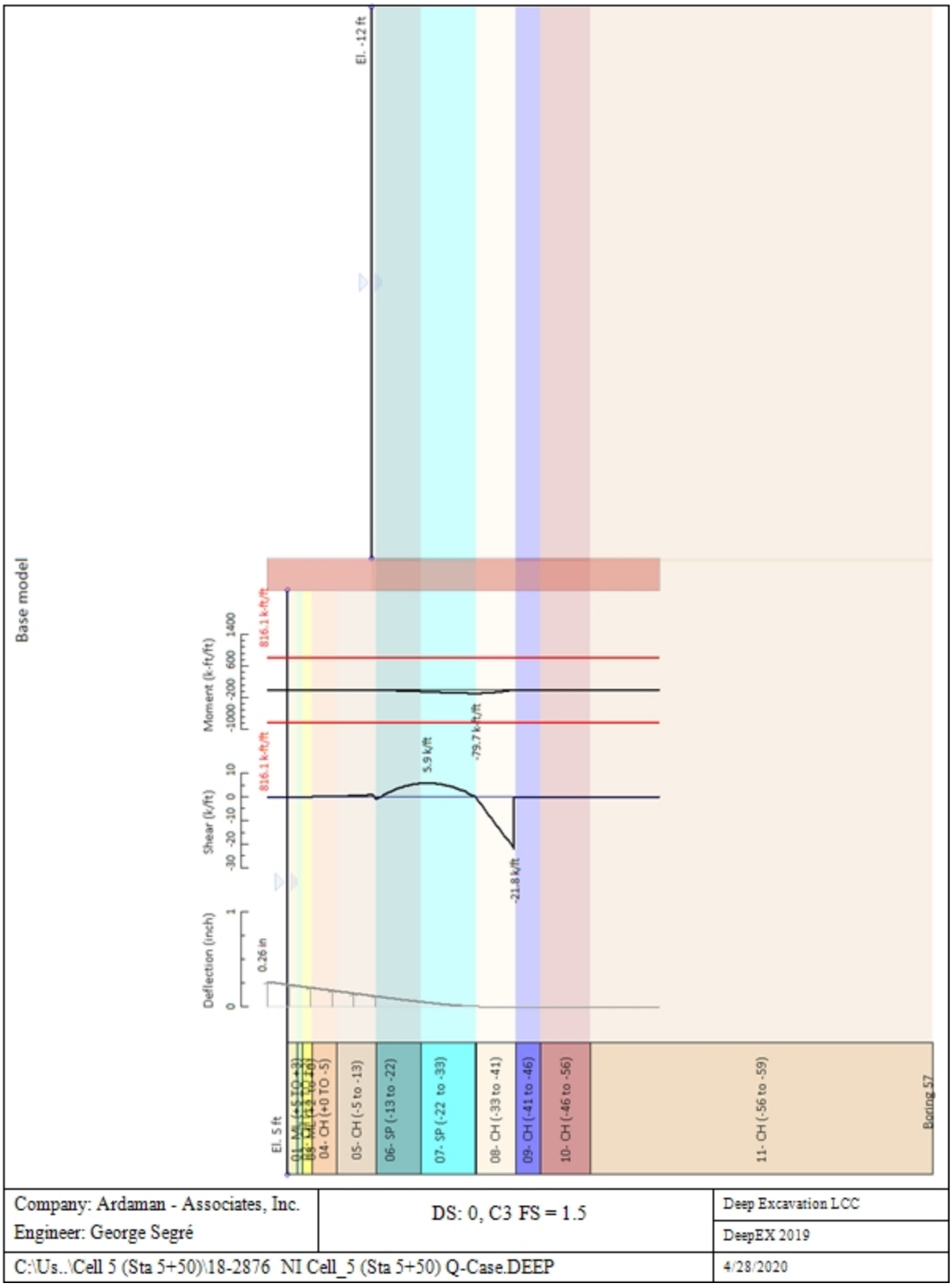

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |



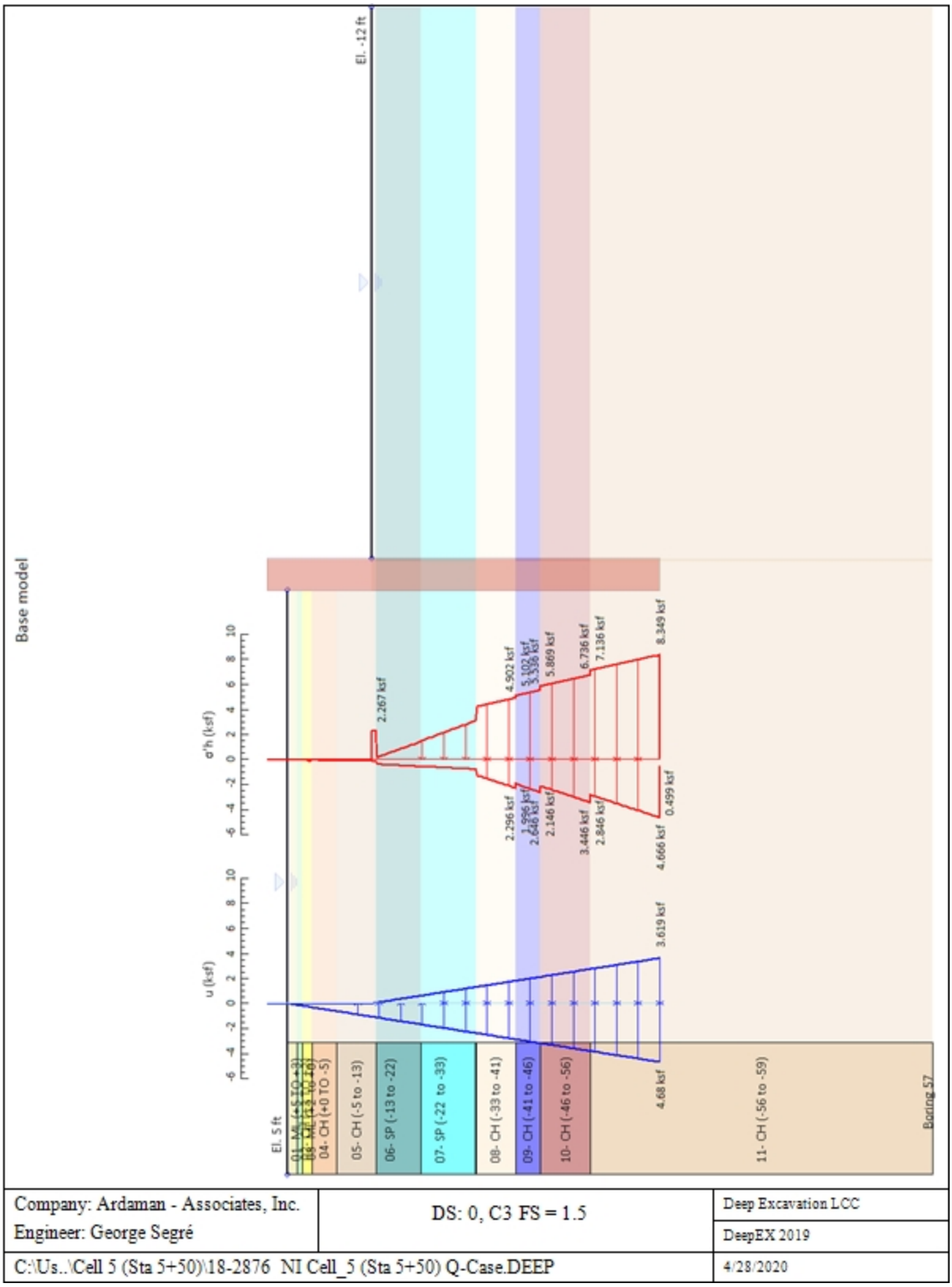

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |

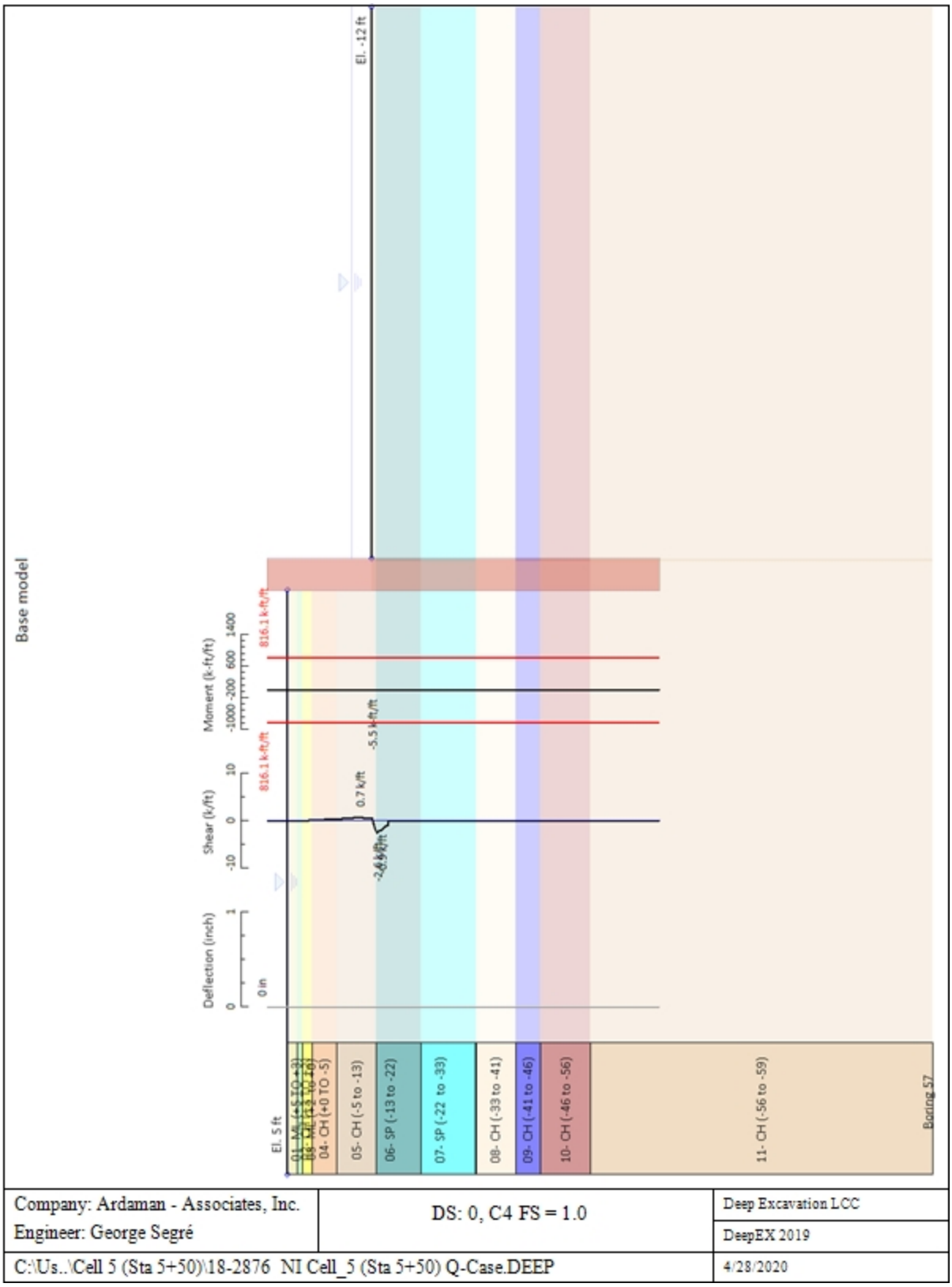



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |

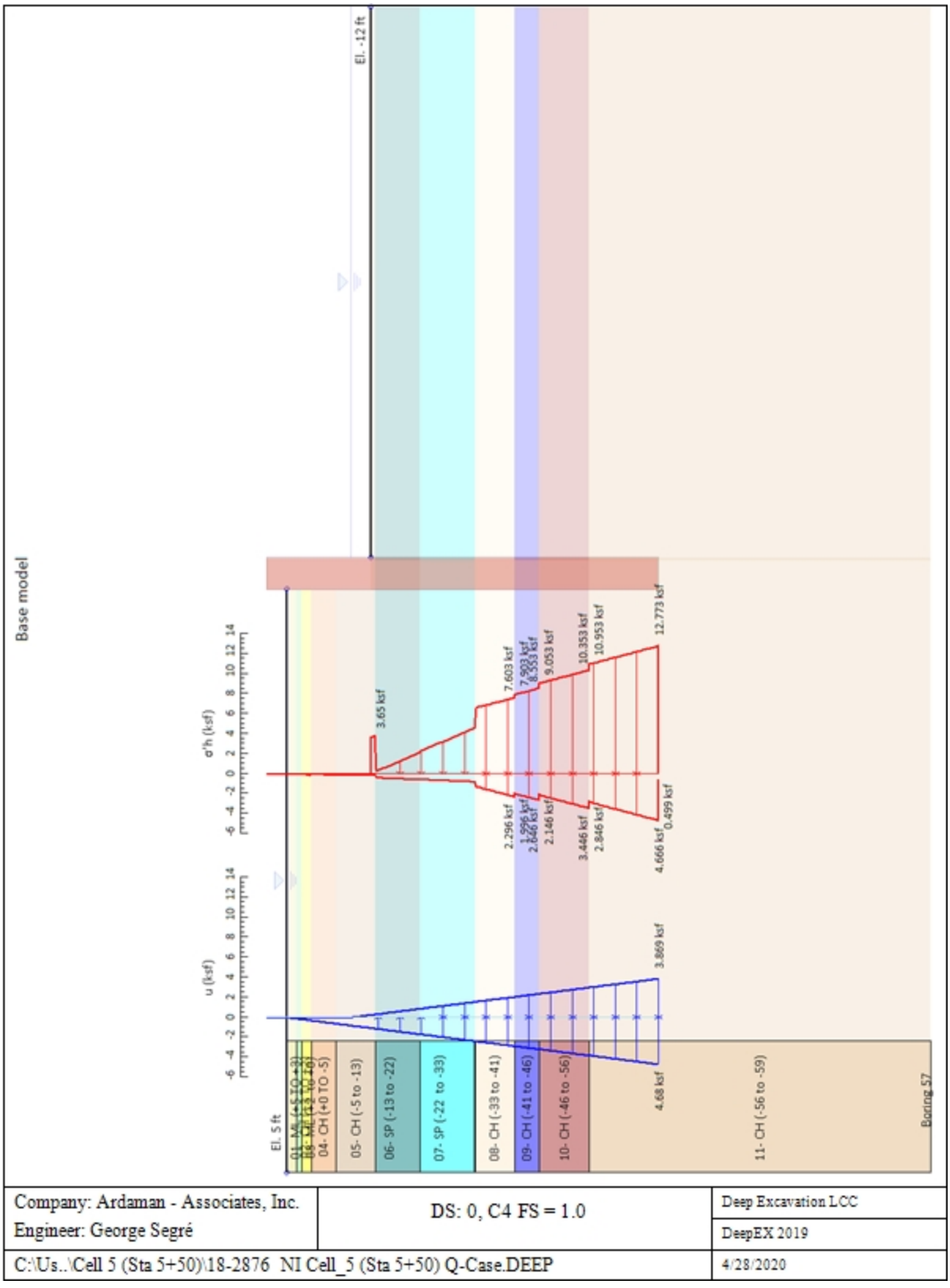



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |

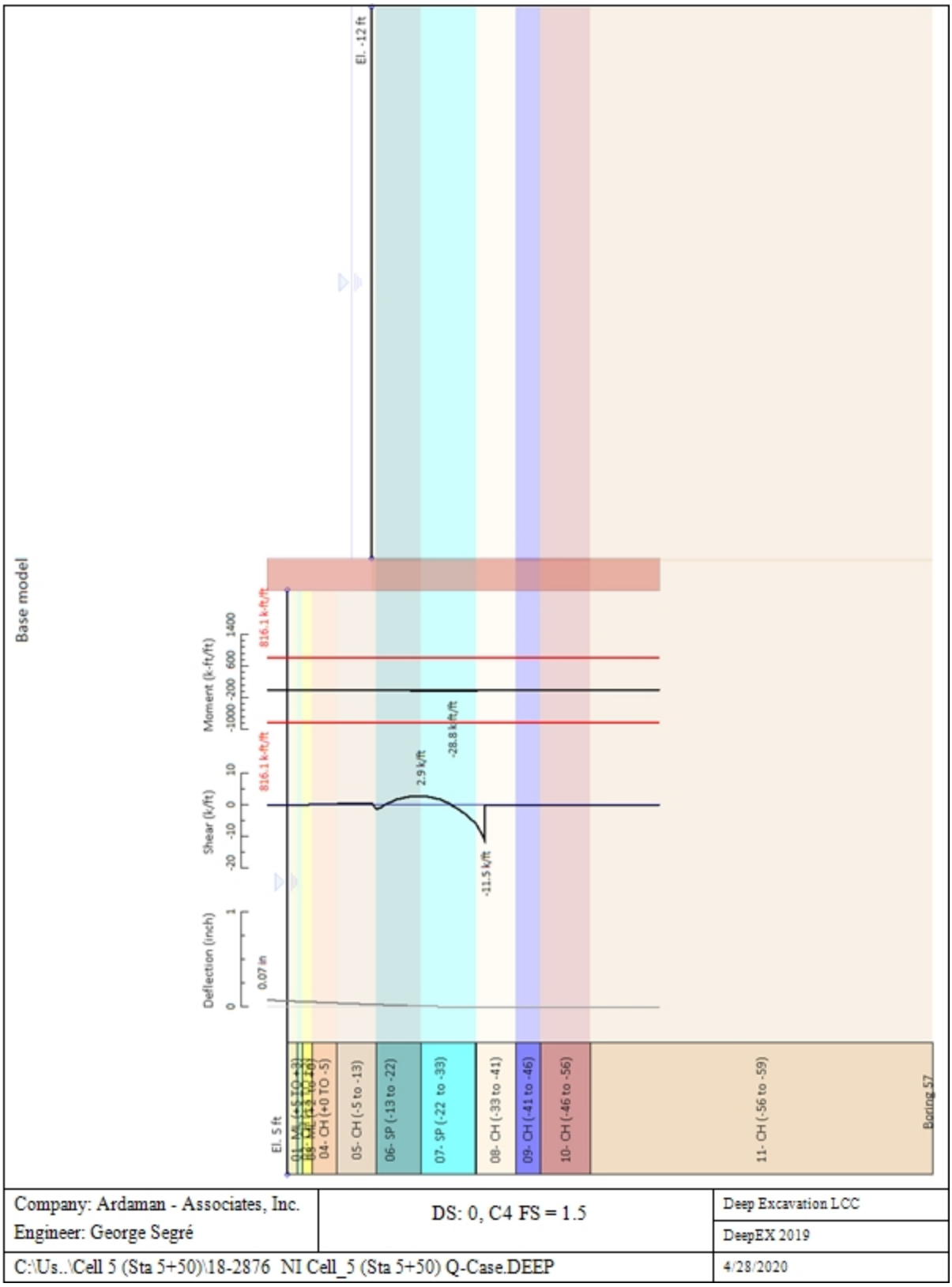

Base model
El. -12 ft
El. 5 ft
σ'h (ksf)
u (ksf)
2.267 ksf
4.902 ksf
5.102 ksf
5.336 ksf
5.869 ksf
6.736 ksf
7.136 ksf
8.349 ksf
2.296 ksf
1.996 ksf
2.646 ksf
2.146 ksf
3.446 ksf
2.846 ksf
4.666 ksf
0.499 ksf
3.619 ksf
4.68 ksf
01- MG (+5 TO -3)
03- CH (-3 TO -5)
04- CH (+0 TO -5)
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP
4/28/2020



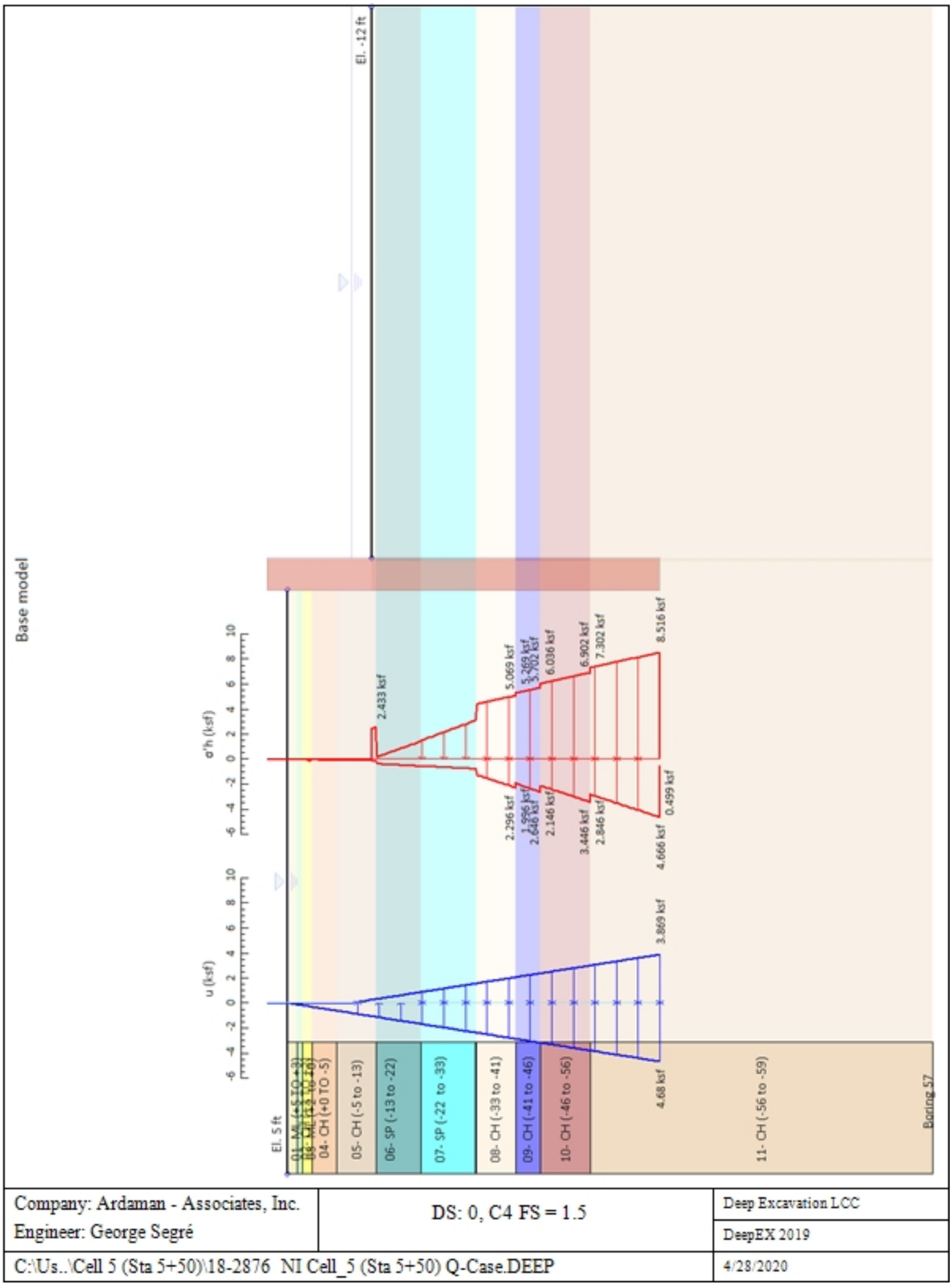

Attachment Figure C.5-23




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP | | 4/28/2020 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:59:37 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- ML (+5 T | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | EXP | |
| 02- CH (+3 TO | 128 | 128 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- ML (+2 to | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 150 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 04- CH (+0 TO | 127 | 127 | 23 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 05- CH (-5 to - | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- SP (-13 to | 130 | 130 | 31 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.32 | 3.12 | N/A | N/A | True | Linear | |
| 07- SP (-22 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |
| 08- CH (-33 to | 128 | 128 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 09- CH (-41 to | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 10- CH (-46 to | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 11- CH (-56 to | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- ML (+5 T | 0.4 | - | - | 0.531 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+3 TO | 0.3 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- ML (+2 to | 0.4 | - | - | 0.531 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (+0 TO | 0.35 | - | - | 0.609 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-5 to - | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-13 to | 0.35 | - | - | 0.485 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-22 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-33 to | 0.3 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-41 to | 0.25 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-46 to | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-56 to | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

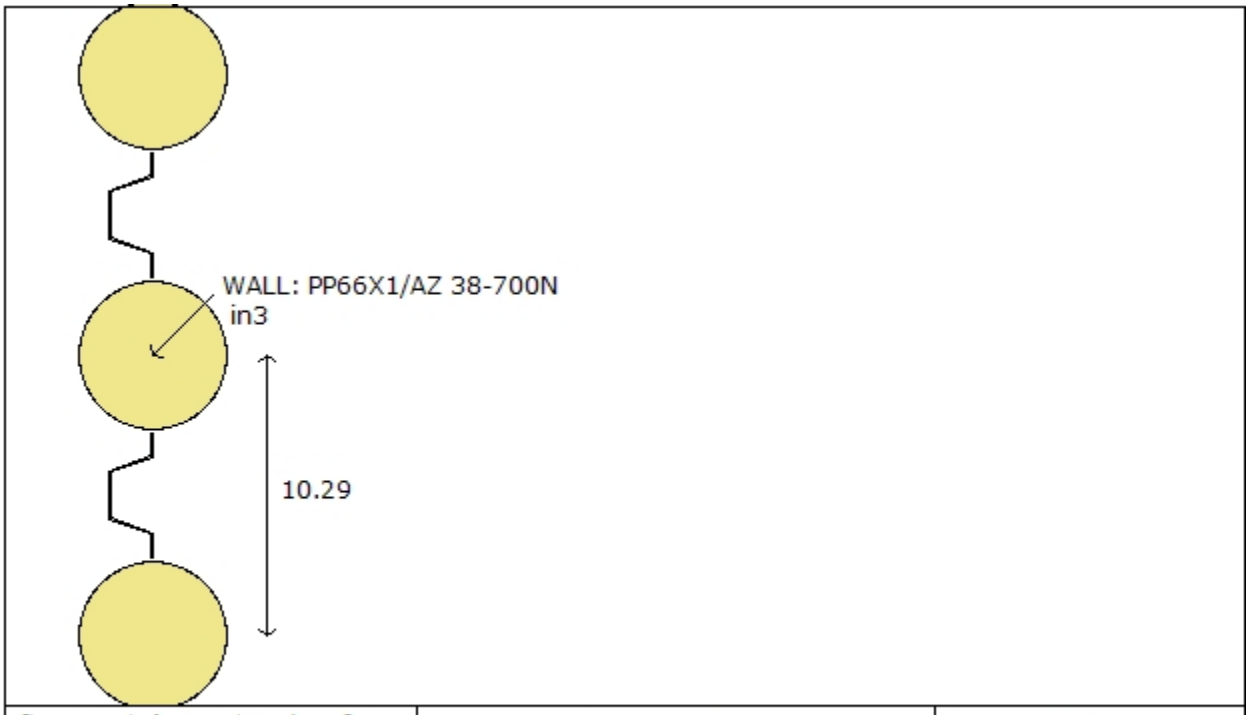
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- ML (+5 TO | 1 | 0.53 |
| 3 | 02- CH (+3 TO | 1 | 0.61 |
| 2 | 03- ML (+2 to | 1 | 0.53 |
| 0 | 04- CH (+0 TO | 1 | 0.61 |
| -5 | 05- CH (-5 to - | 1 | 0.61 |
| -13 | 06- SP (-13 to - | 1 | 0.48 |
| -22 | 07- SP (-22 to | 1 | 0.47 |
| -33 | 08- CH (-33 to | 1 | 0.61 |
| -41 | 09- CH (-41 to | 1 | 0.61 |
| -46 | 10- CH (-46 to | 1 | 0.61 |
| -56 | 11- CH (-56 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.372 | 1.372 | 1.615 |
| Stage 1 | Simple span | N/A | 1.6 | 1.174 | 1.174 | 1.384 |
| Stage 2 | Simple span | N/A | 1.6 | 1.427 | 1.427 | 1.658 |
| Stage 3 | Simple span | N/A | 1.6 | 1.228 | 1.228 | 1.427 |
| Stage 4 | Simple span | N/A | 1.6 | 1.486 | 1.486 | 1.701 |
| Stage 5 | Simple span | N/A | 1.6 | 1.128 | 1.128 | 1.296 |
| Stage 6 | Simple span | N/A | 1.6 | 1.545 | 1.545 | 1.746 |
| Stage 7 | Simple span | N/A | 1.6 | 1.187 | 1.187 | 1.341 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

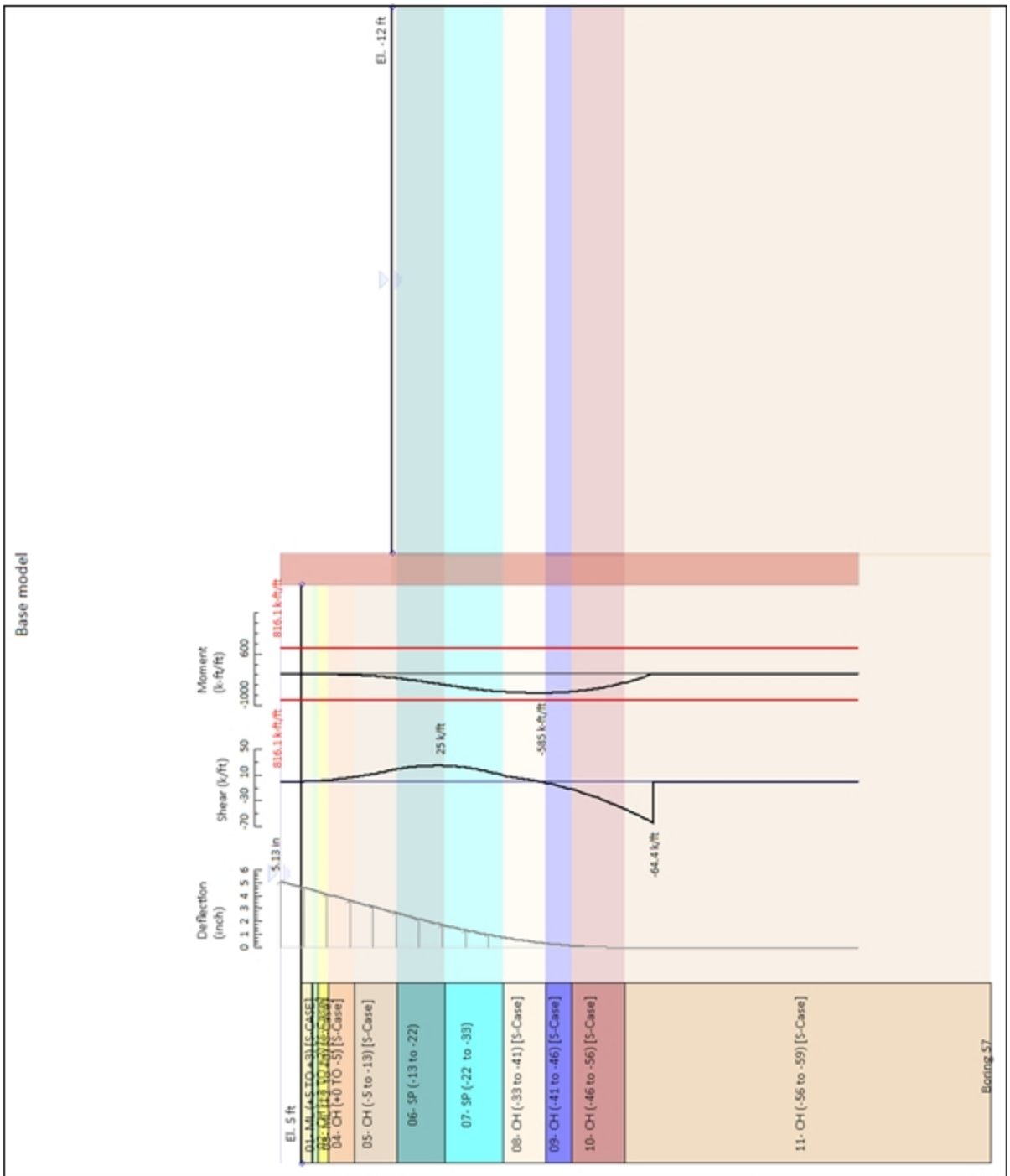
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

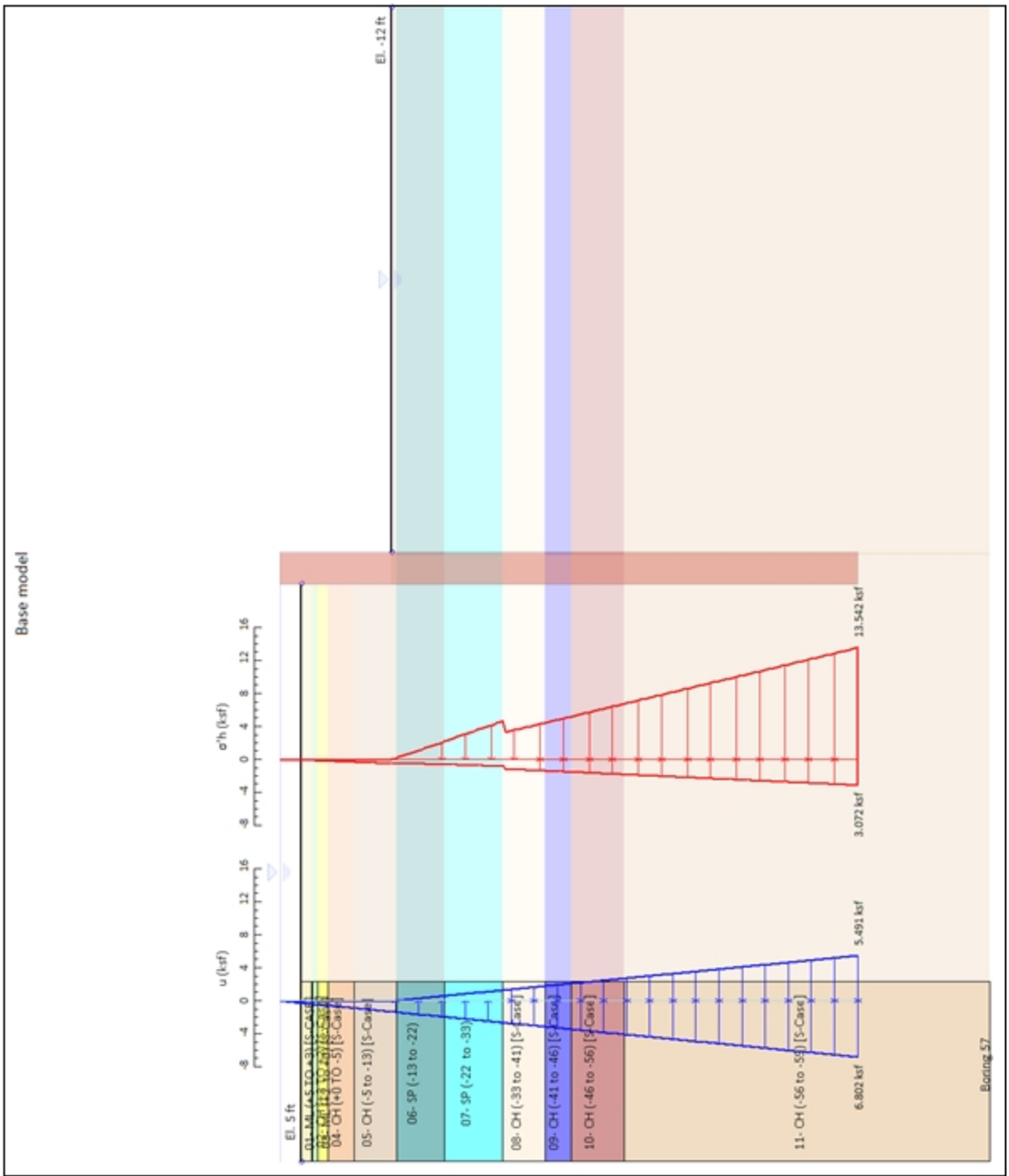
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

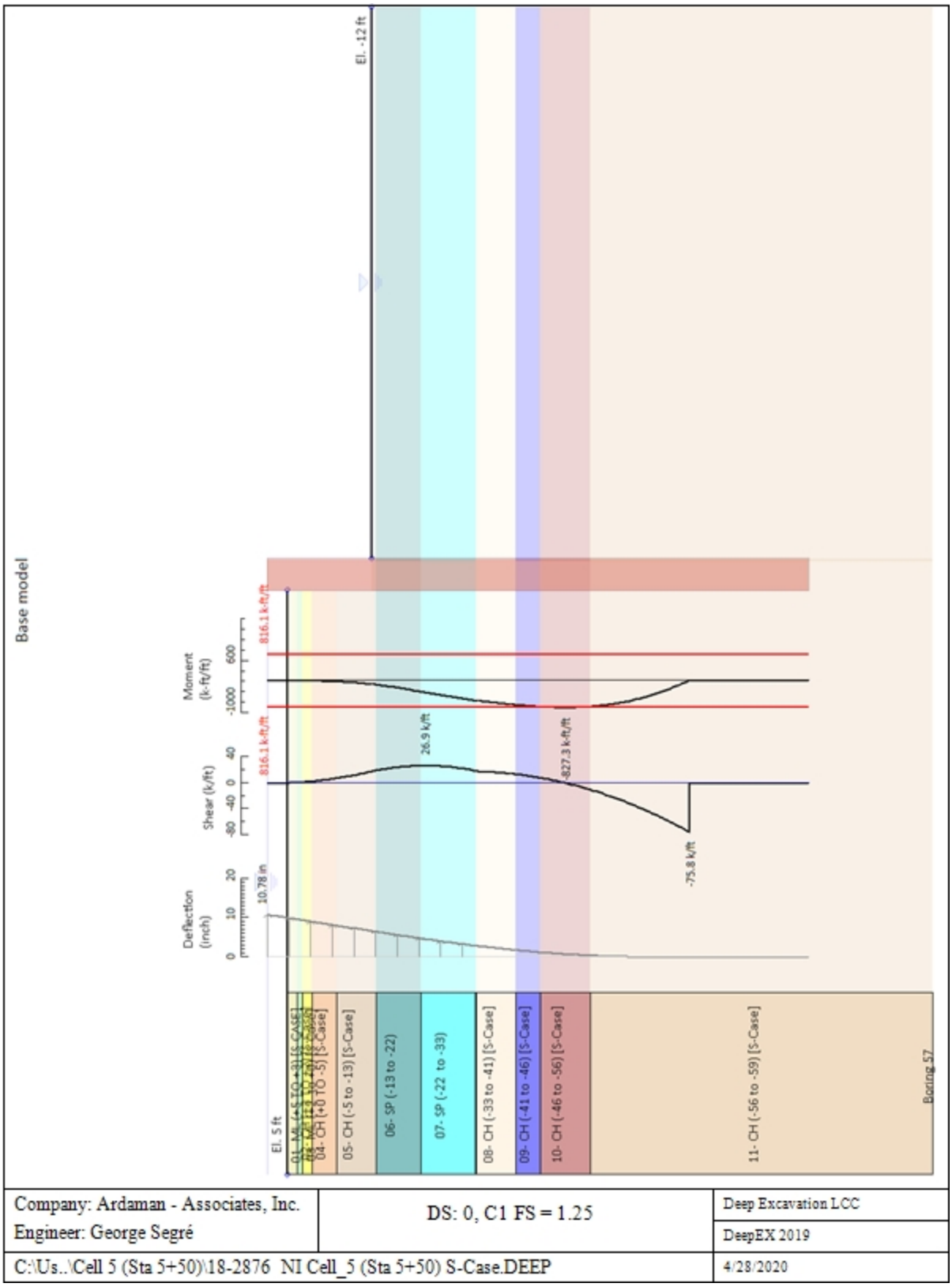
A sequence of figures for each excavation stage is reported

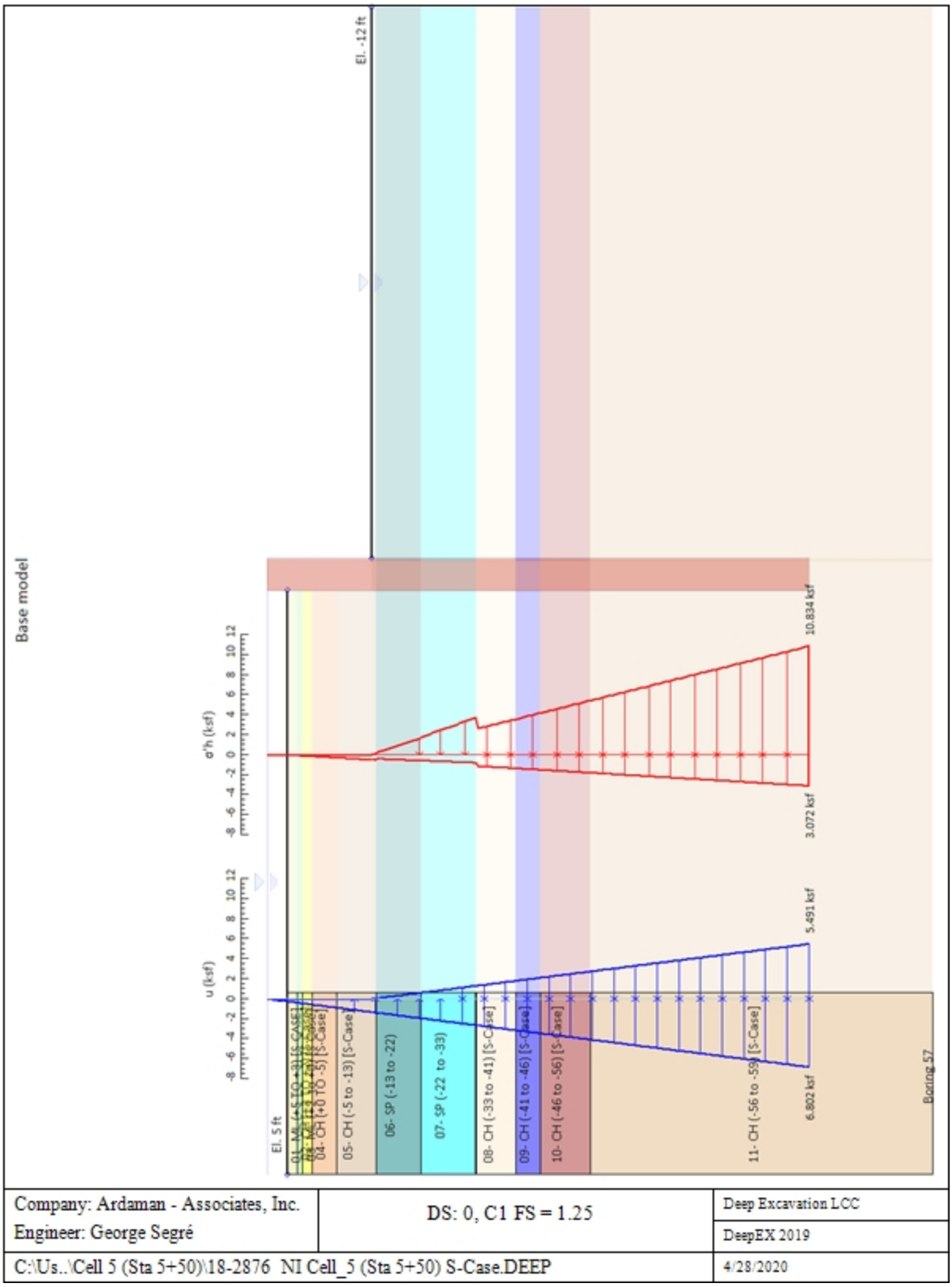



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |

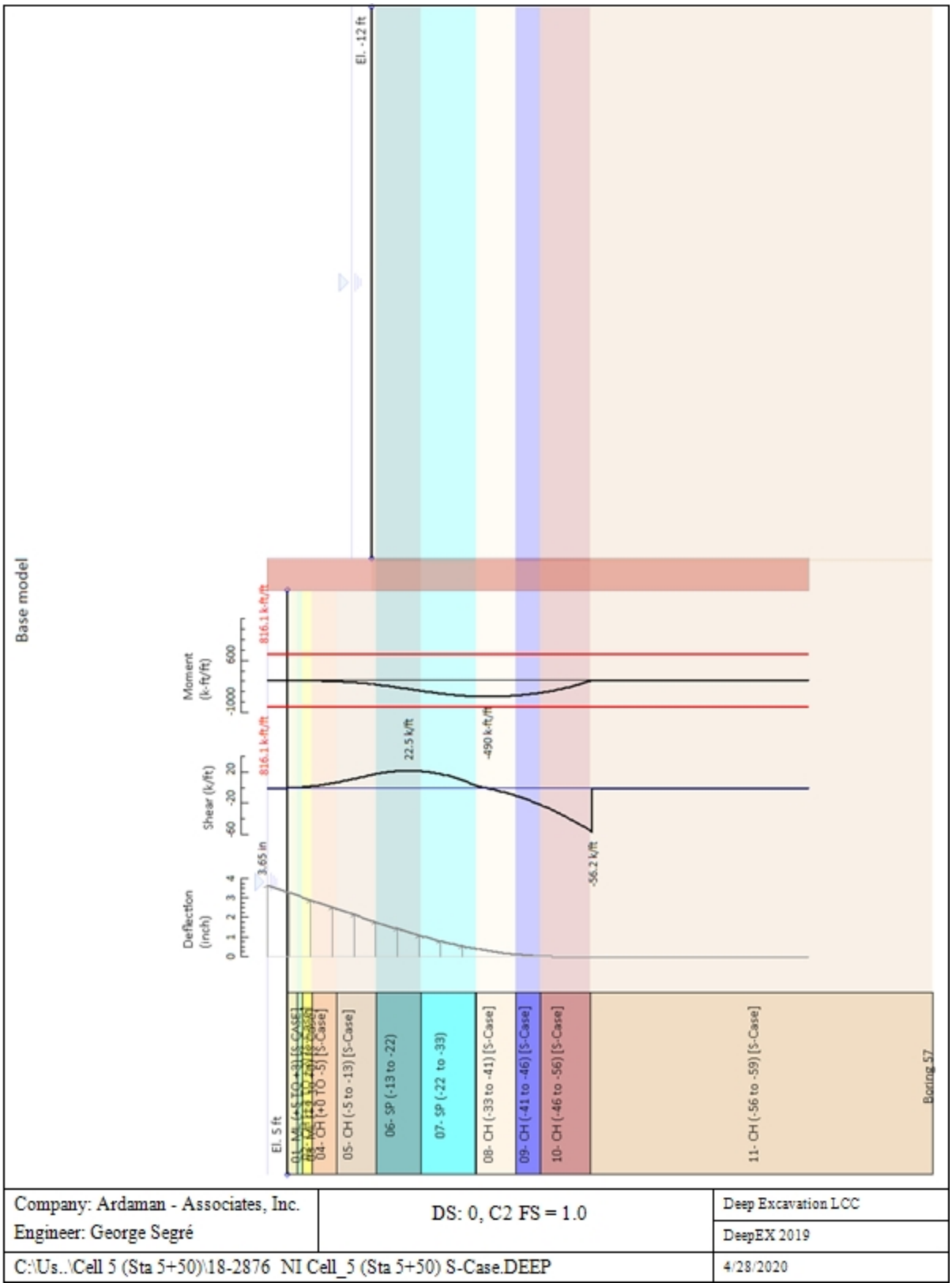


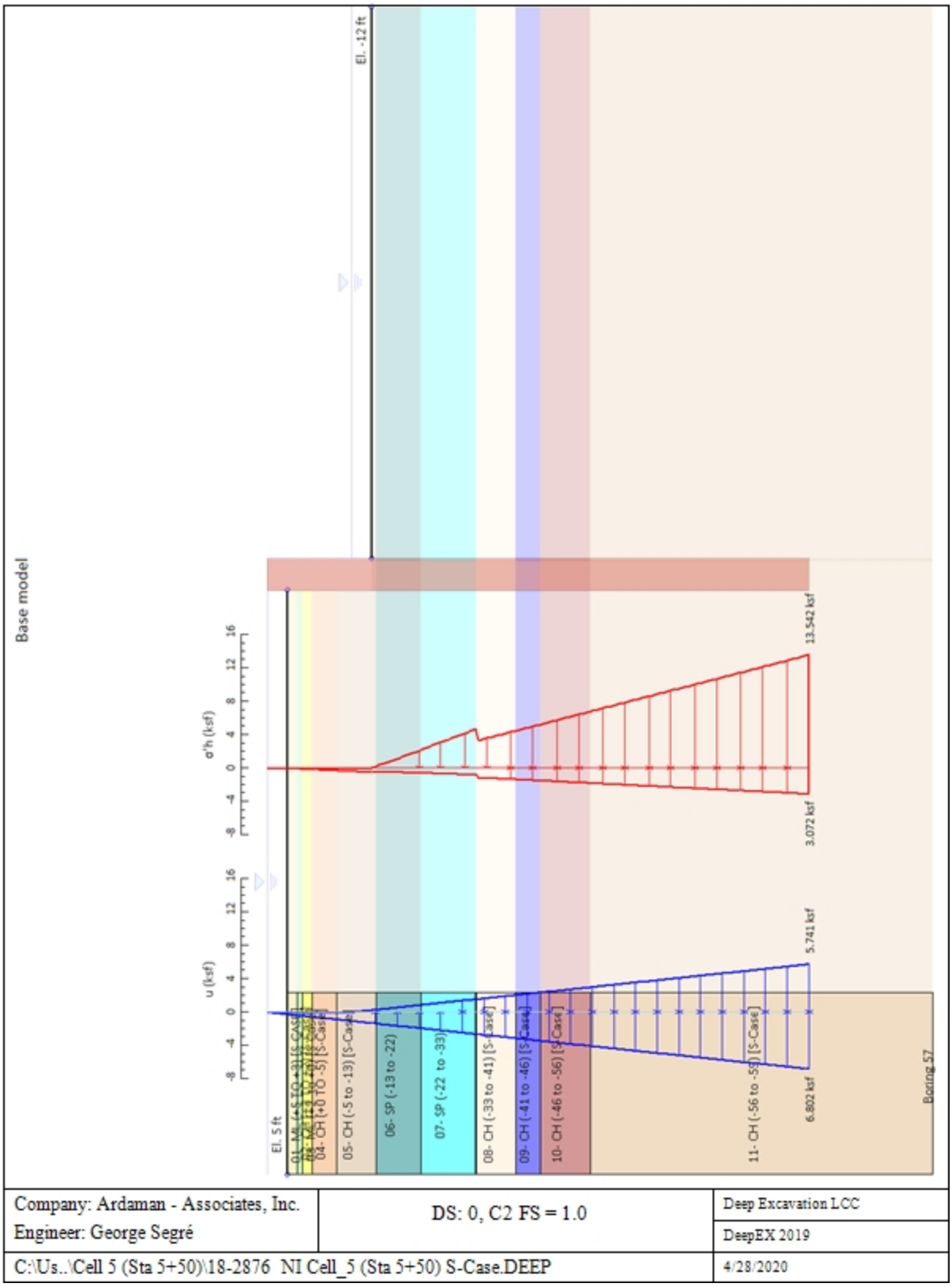

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
40
0
-40
-80
26.9 k/ft
-827.3 k-ft/ft
-75.8 k/ft
Deflection (inch)
0
10
20
10.78 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020

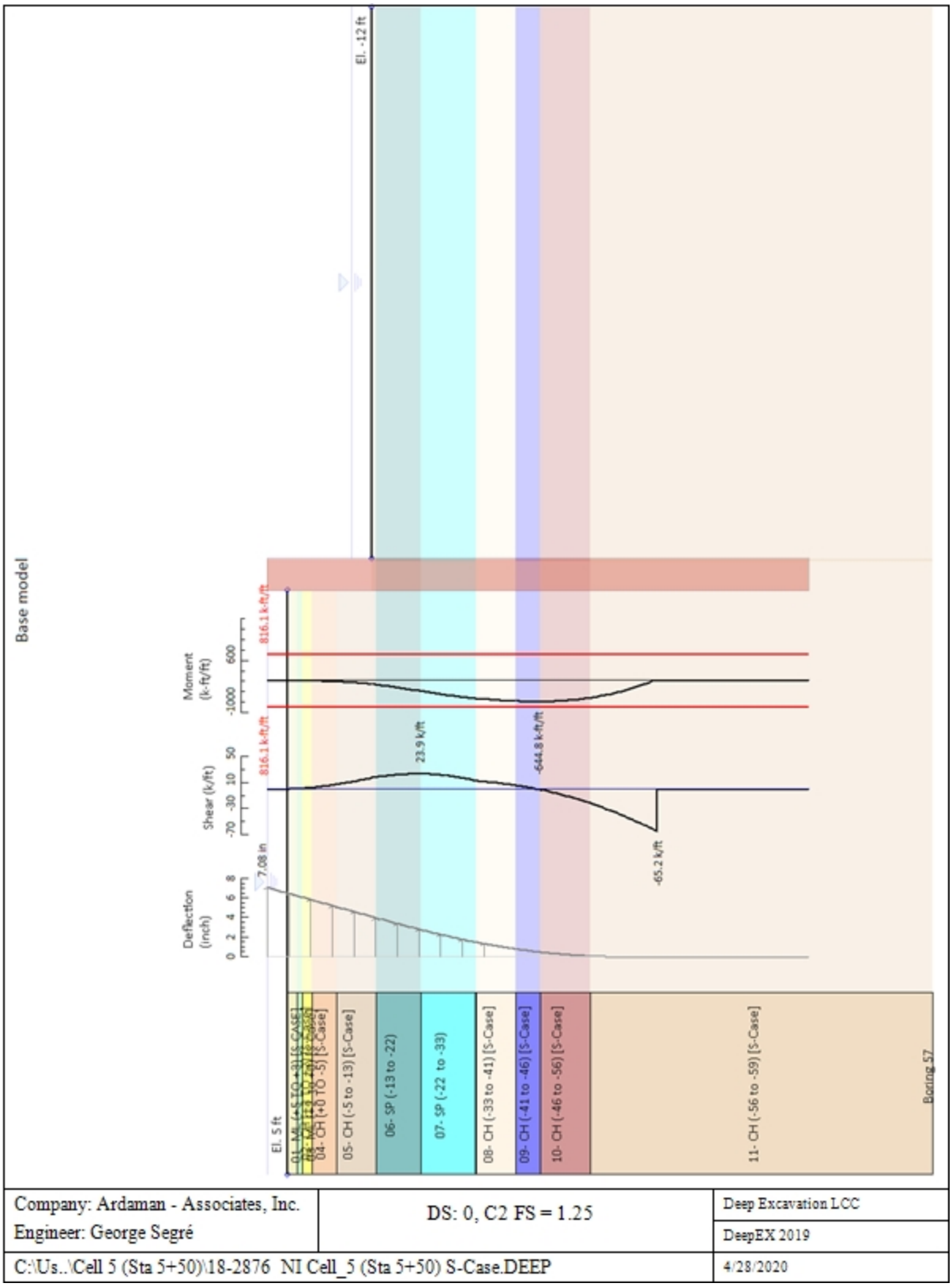


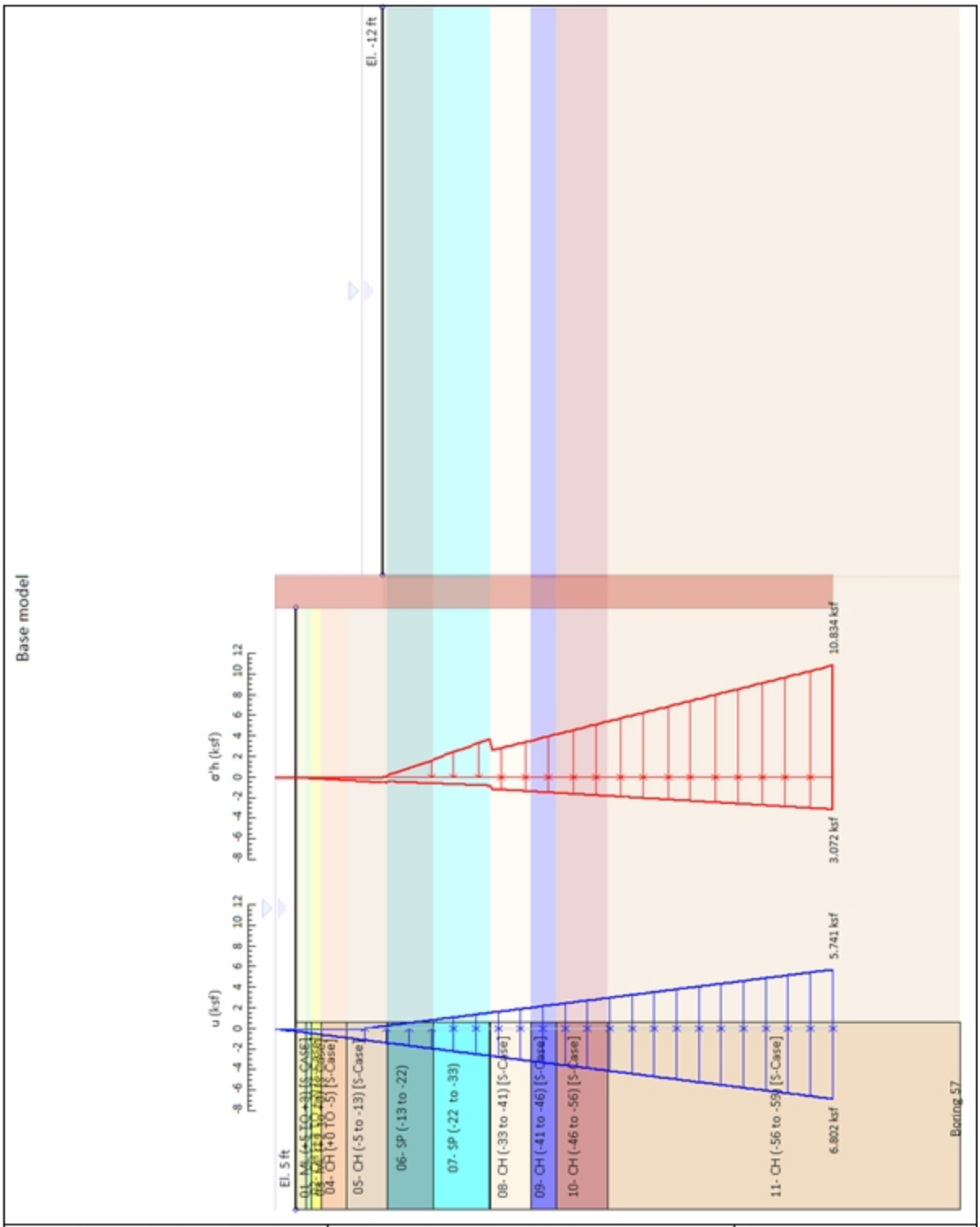

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
-20
-60
22.5 k/ft
-490 k-ft/ft
-56.2 k/ft
Deflection (inch)
0 1 2 3 4
3.65 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020

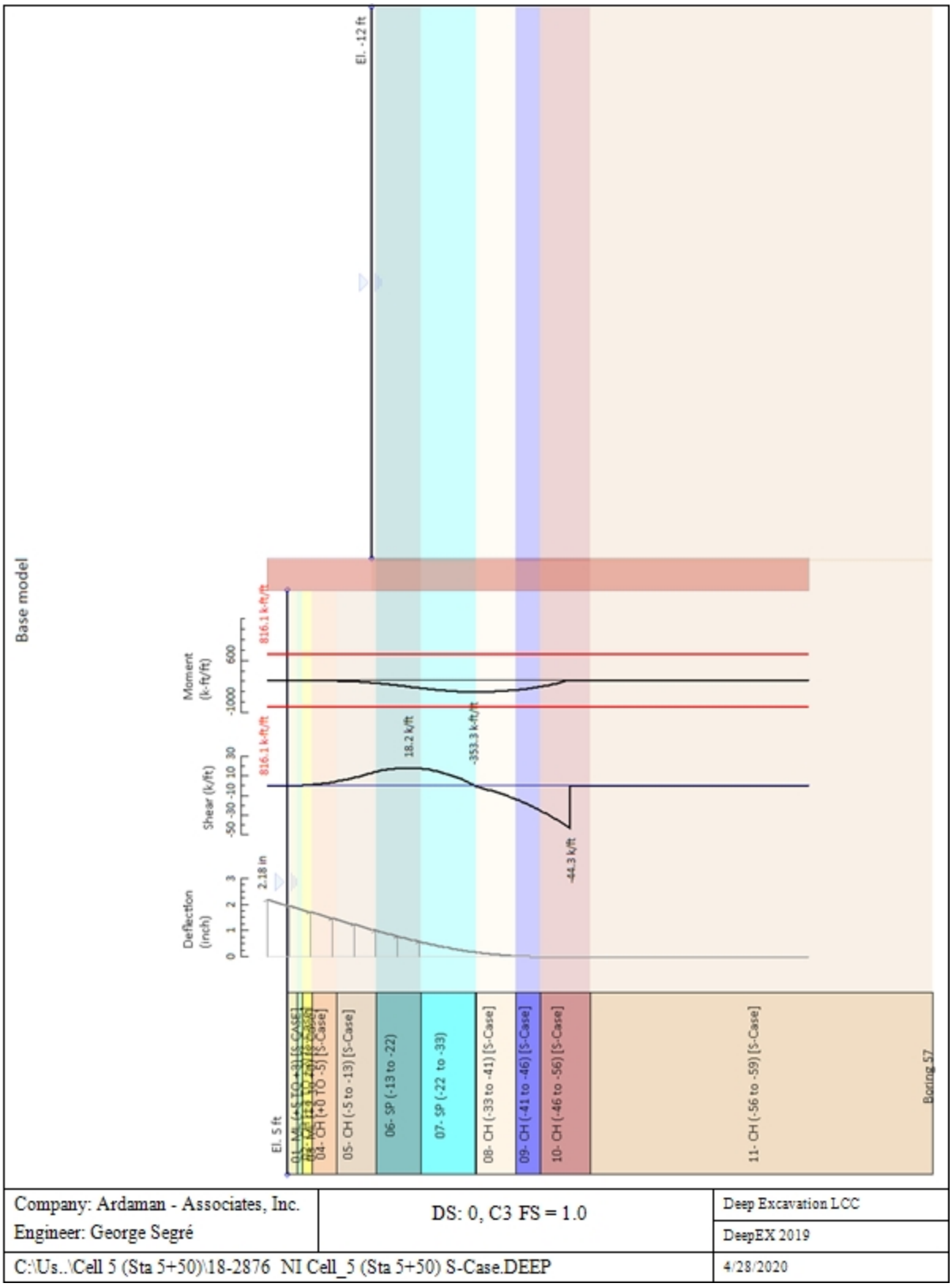


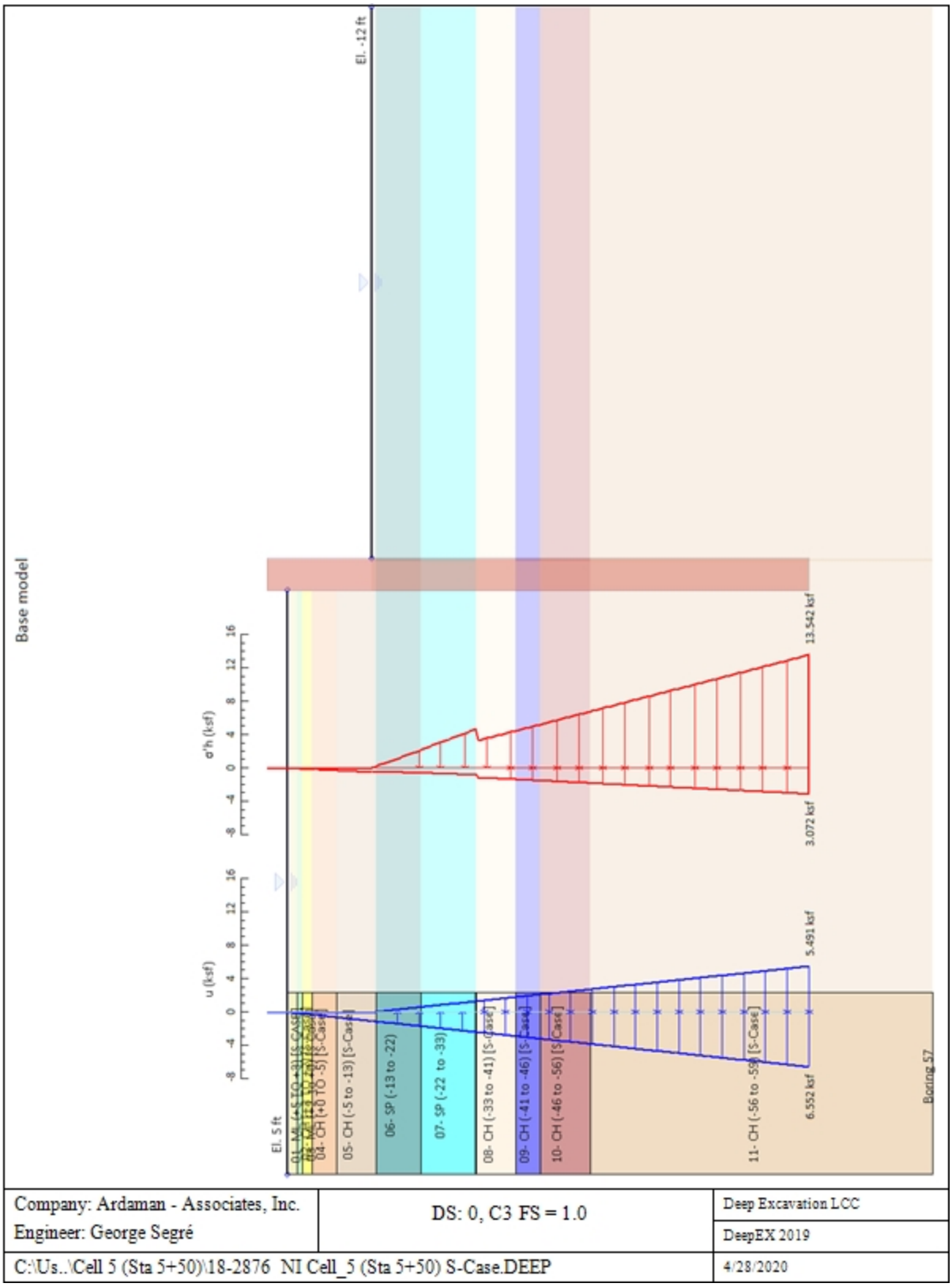

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
50
10
-30
-70
23.9 k/ft
-644.8 k-ft/ft
-65.2 k/ft
Deflection (inch)
0
2
4
6
8
7.08 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020

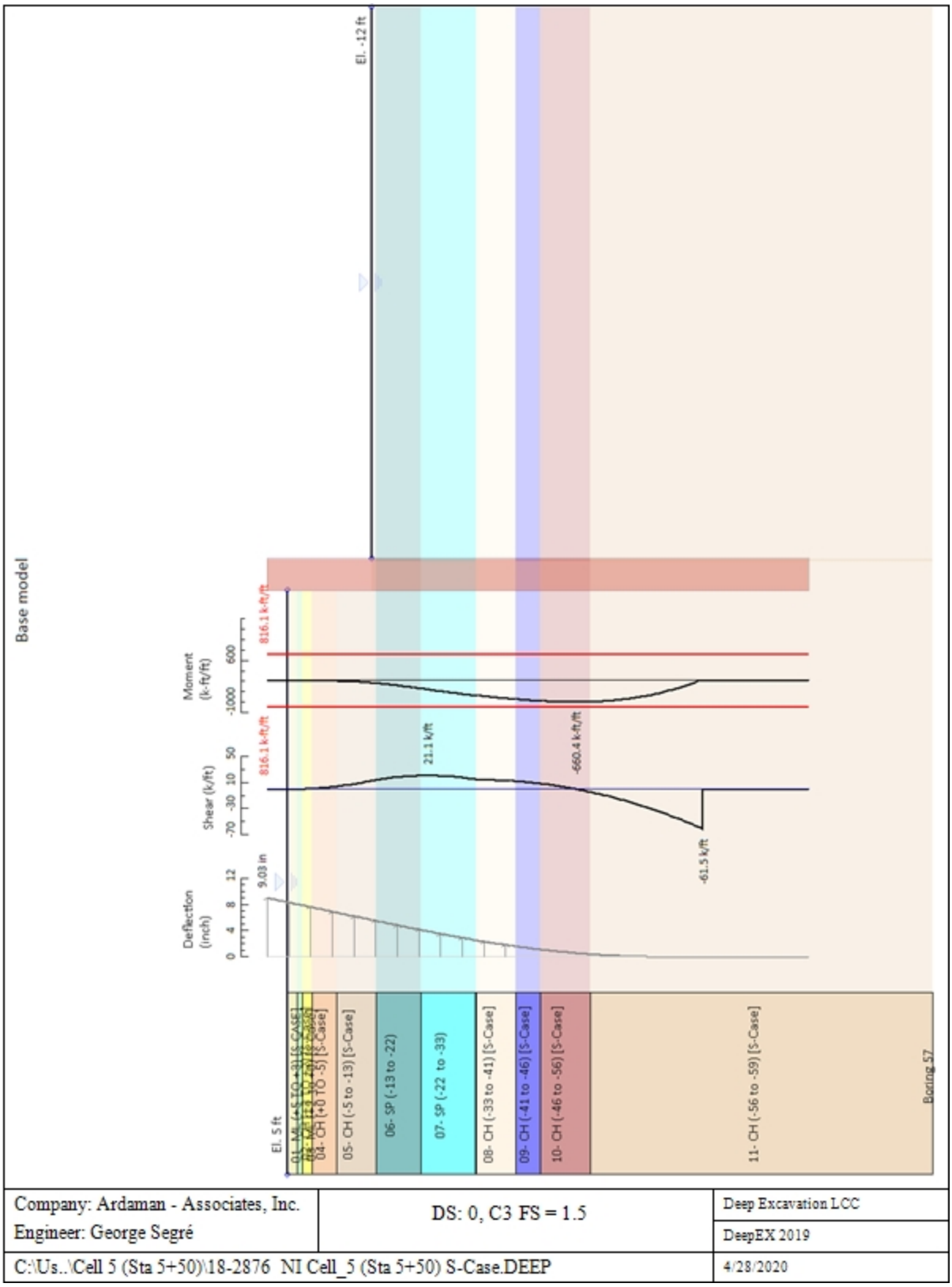


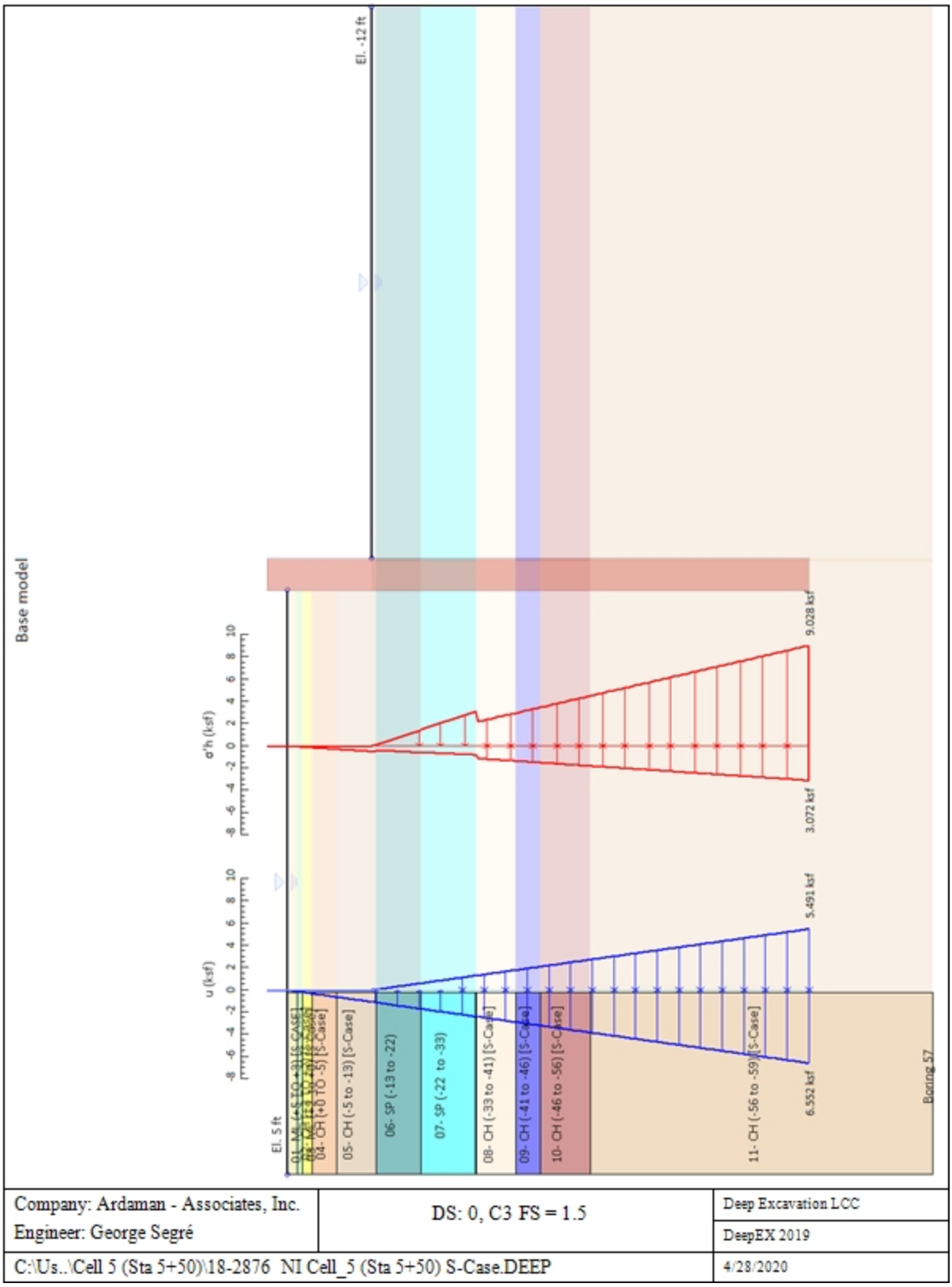

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
18.2 k/ft
-353.3 k-ft/ft
-44.3 k/ft
Deflection (inch)
0 1 2 3
2.18 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020

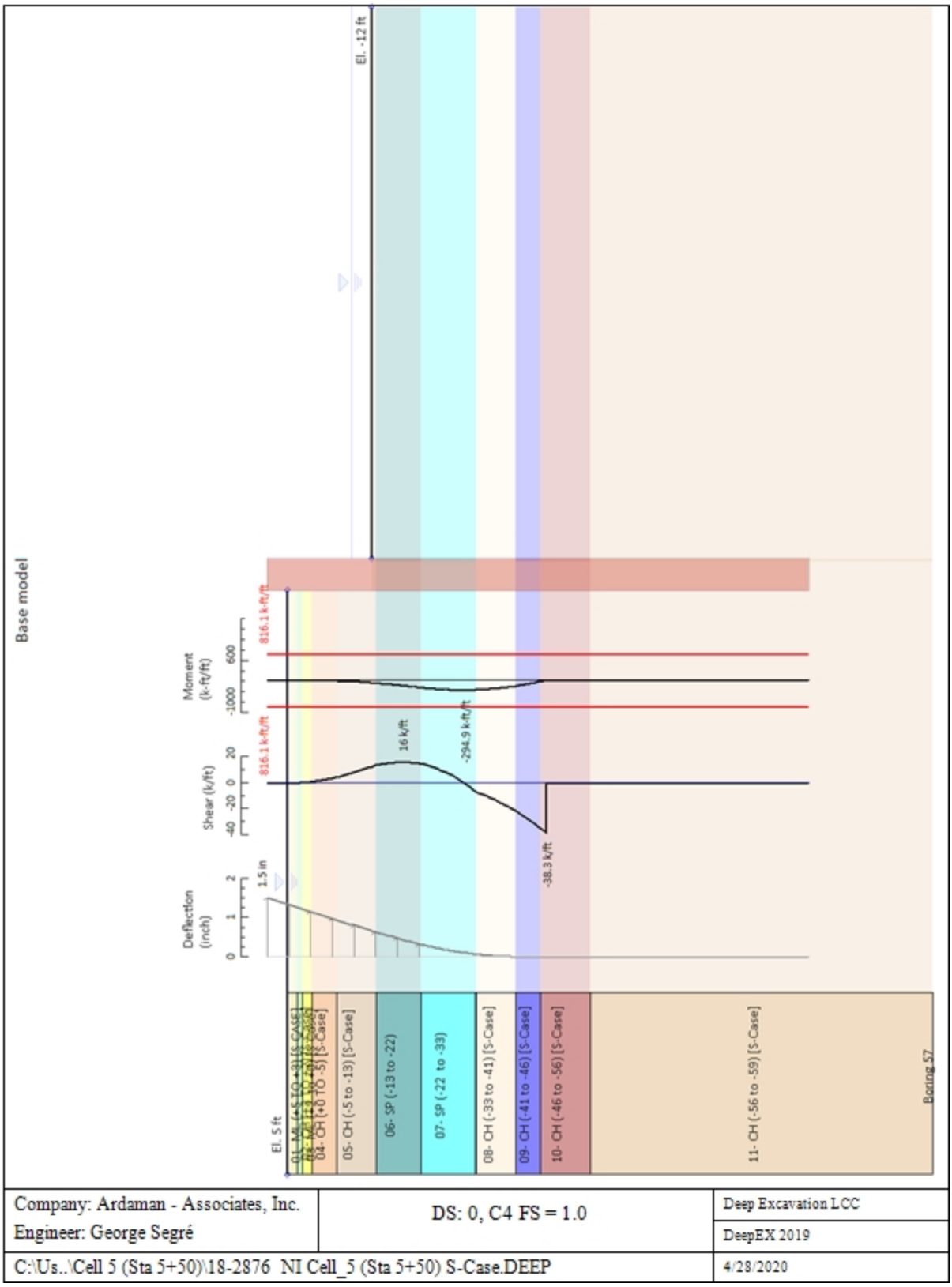


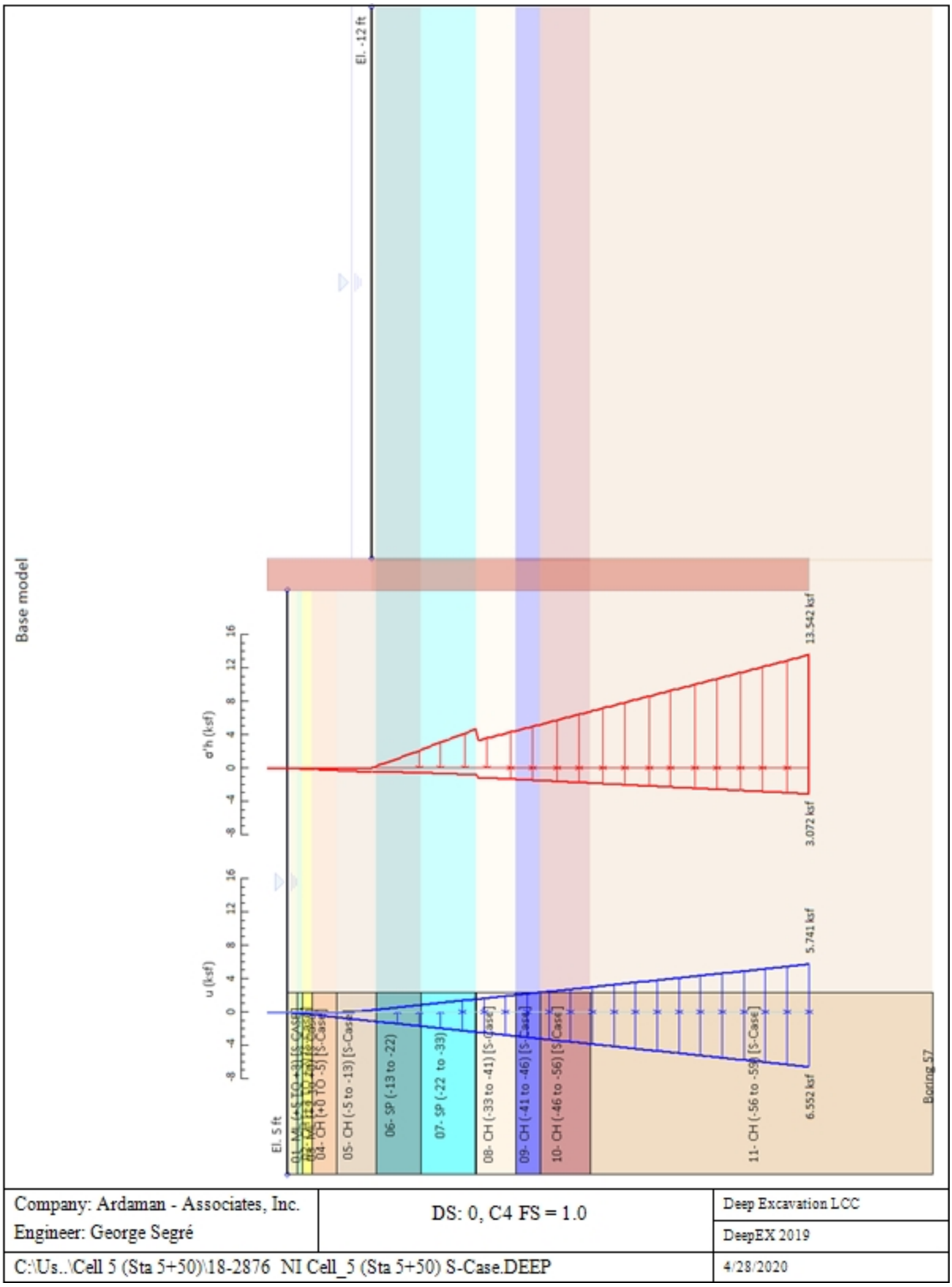

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
Moment (k-ft/ft)
816.1 k-ft/ft
-1000
600
Shear (k/ft)
816.1 k-ft/ft
-70 -30 10 50
21.1 k/ft
-660.4 k-ft/ft
-61.5 k/ft
Deflection (inch)
9.03 in
0 4 8 12
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020

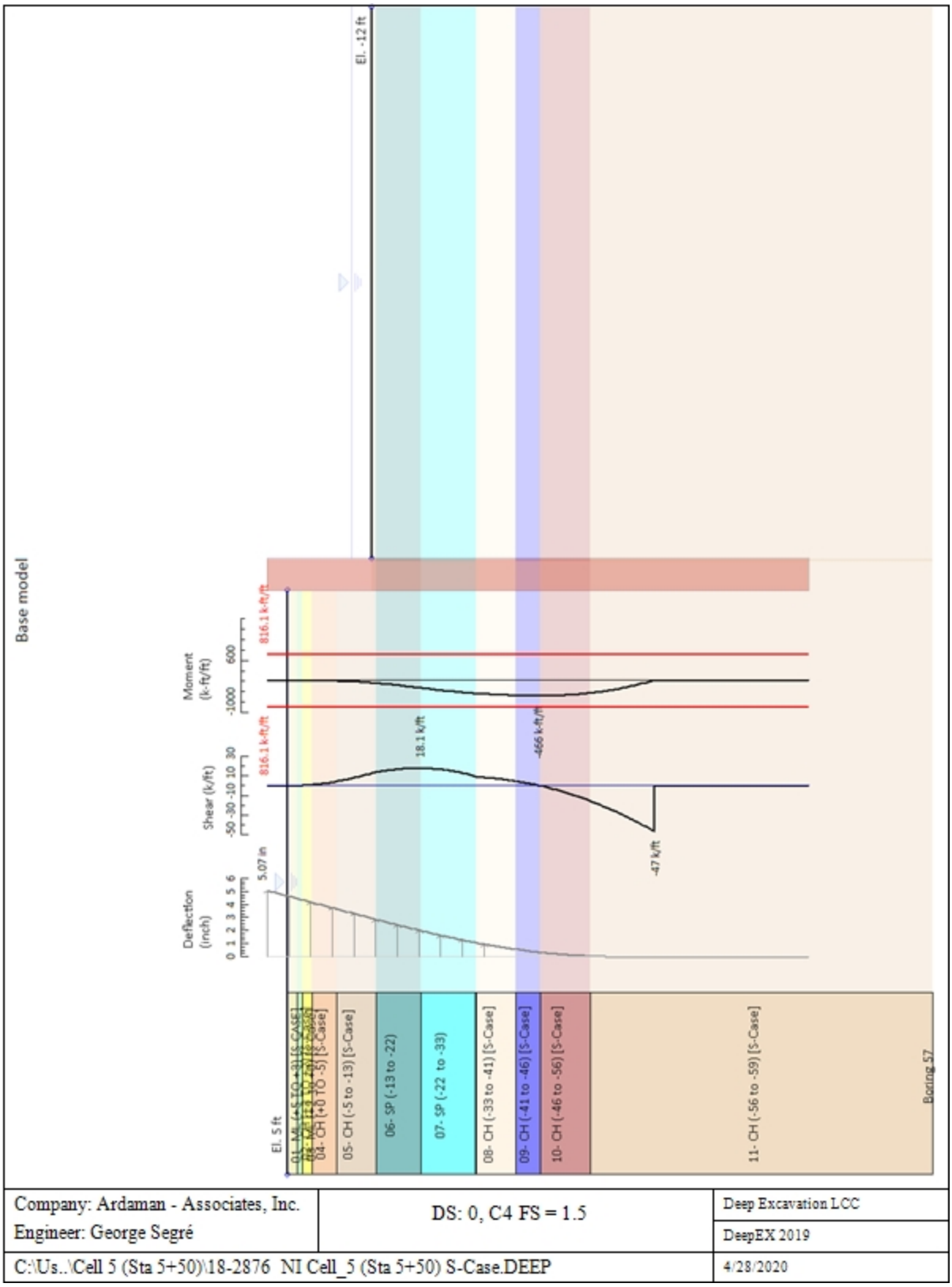



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |

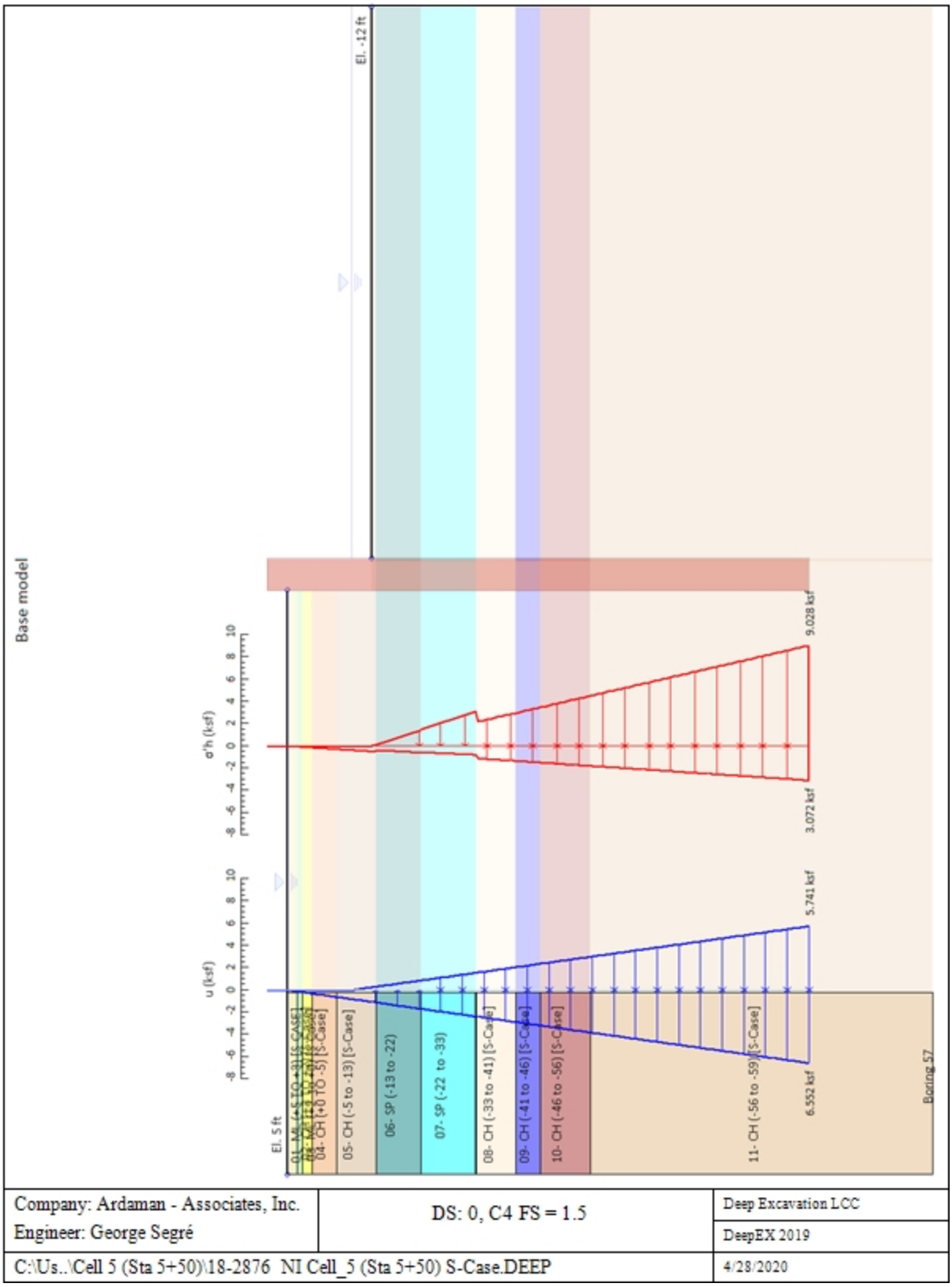

Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
16 k/ft
-294.9 k-ft/ft
-38.3 k/ft
Deflection (inch)
0
1
2
1.5 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP | | 4/28/2020 |

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #5 @ Sta. 6+25)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -67.72 ft., NAVD88

Length of Sheetting = 76.72 ft.

Use = 80.0 ft.

Design Tip Elev. = -71.0 ft., NAVD88

Design Length of Sheeting = 80.0 ft.

| Condition | Case | Description | Water (Driving) (ft., NAVD88) | Water (Passive) (ft., NAVD88) | FS Active | FS Passive | Tip Elev. (ft., NAVD88) | Max Moment (kip-ft/ft.) | Max Shear (kip/ft.) | Deflection (in) |
|---|---|---|---|---|---|---|---|---|---|---|
| Q-Case | 1 | Open excavation - degraded | 9 | -12 | 1.00 | 1.00 | -38.40 | 159.19 | 40.01 | 0.62 |
| | | Open excavation - degraded | 9 | -12 | 1.00 | 1.25 | -43.14 | -- | -- | -- |
| Q-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -36.03 | 123.61 | 33.67 | 0.44 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -40.38 | -- | -- | -- |
| Q-Case | 3 | Open excavation - degraded | 5 | -12 | 1.00 | 1.00 | -32.08 | 56.31 | 16.30 | 0.16 |
| | | Open excavation - degraded | 5 | -12 | 1.00 | 1.50 | -40.77 | -- | -- | -- |
| Q-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -28.52 | 37.42 | 12.25 | 0.09 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -36.82 | -- | -- | -- |
| S-Case | 1 | Open excavation - degraded | 9 | -12 | 1.00 | 1.00 | -54.86 | 427.14 | 51.24 | 3.01 |
| | | Open excavation - degraded | 9 | -12 | 1.00 | 1.25 | -67.72 | -- | -- | -- |
| S-Case | 2 | Open excavation - degraded | 9 | -8 | 1.00 | 1.00 | -50.40 | 361.87 | 45.66 | 2.12 |
| | | Open excavation - degraded | 9 | -8 | 1.00 | 1.25 | -60.80 | -- | -- | -- |
| S-Case | 3 | Open excavation - degraded | 5 | -12 | 1.00 | 1.00 | -44.96 | 237.67 | 32.75 | 1.10 |
| | | Open excavation - degraded | 5 | -12 | 1.00 | 1.50 | -66.74 | -- | -- | -- |
| S-Case | 4 | Open excavation - degraded | 5 | -8 | 1.00 | 1.00 | -41.00 | 192.93 | 30.35 | 0.75 |
| | | Open excavation - degraded | 5 | -8 | 1.00 | 1.50 | -57.33 | -- | -- | -- |
| | | | | | | Governing Value: | -67.72 | 427.14 | 51.24 | 3.01 |

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 11:04:19 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- ML (+5 T | 117 | 117 | 15 | 0 | 200 | 15 | 15 | 300 | 3 | 0.59 | 1.7 | 0.59 | 1.7 | True | EXP | |
| 02- CH (+3 TO | 128 | 128 | 0 | 0 | 1000 | 18 | 26 | 60 | 3 | 0.33 | 3 | 0.39 | 2.56 | True | Linear | |
| 03- ML (+2 to | 117 | 117 | 15 | 0 | 200 | 15 | 15 | 150 | 3 | 0.59 | 1.7 | 0.59 | 1.7 | True | Linear | |
| 04- CH (+0 TO | 127 | 127 | 0 | 0 | 750 | 0 | 0 | 521.92 | 3 | 1 | 1 | 1 | 1 | True | Linear | |
| 05- CH (-5 to - | 130 | 130 | 0 | 0 | 1700 | 21.1 | 30 | 417.54 | 3 | 0.47 | 2.12 | 0.33 | 3 | True | Linear | |
| 06- SP (-13 to | 130 | 130 | 31 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.32 | 3.12 | N/A | N/A | True | Linear | |
| 07- SP (-22 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |
| 08- CH (-33 to | 128 | 128 | 0 | 0 | 1800 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 09- CH (-41 to | 130 | 130 | 0 | 0 | 1950 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 10- CH (-46 to | 130 | 130 | 0 | 0 | 2200 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |
| 11- CH (-56 to | 130 | 130 | 0 | 0 | 2500 | 0 | 0 | 300 | 3 | 0.33 | 3 | 0.33 | 0.33 | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- ML (+5 T | 0.4 | 0 | 0 | 0.741 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+3 TO | 0.3 | 0.1 | 0 | 0 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- ML (+2 to | 0.4 | 0 | 0 | 0.741 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (+0 TO | 0.35 | 0 | 0 | 1 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-5 to - | 0.45 | 0.1 | 0 | 0.45 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-13 to | 0.35 | - | - | 0.485 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-22 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-33 to | 0.3 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-41 to | 0.25 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-46 to | 0.35 | 0 | 0 | 0 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-56 to | 0.35 | 0 | 0 | 1 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

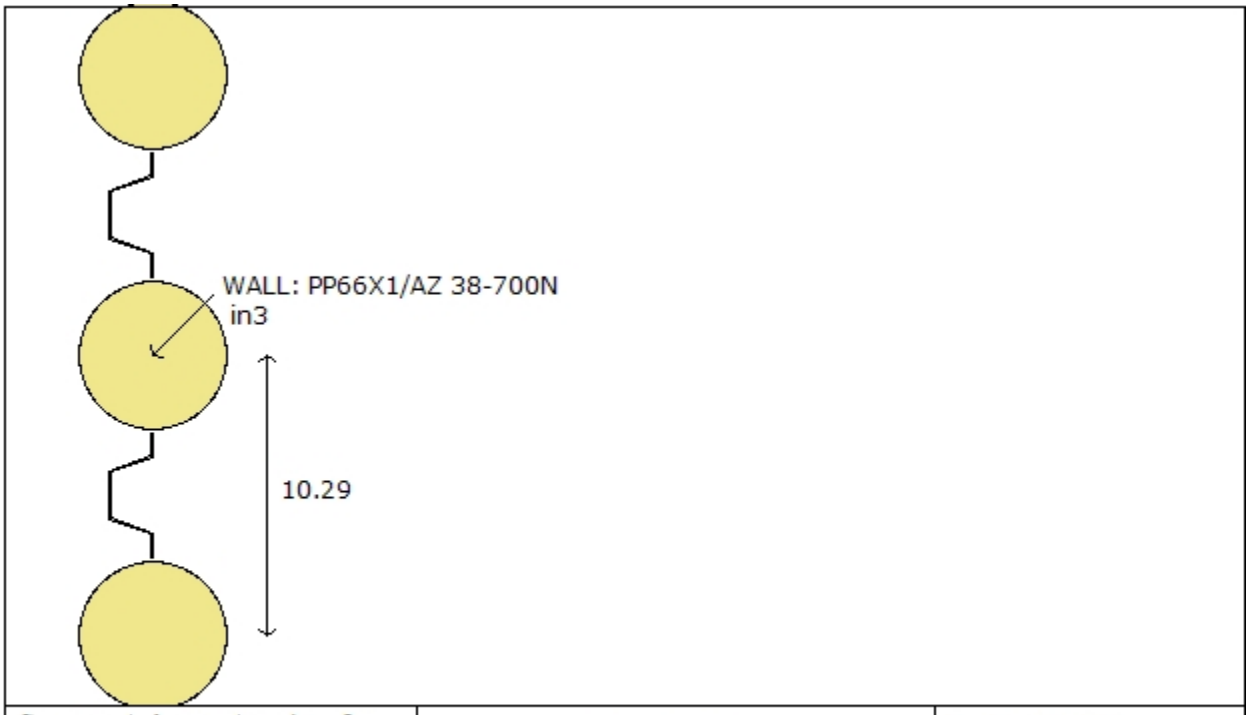
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- ML (+5 TO | 1 | 0.74 |
| 3 | 02- CH (+3 TO | 1 | 0 |
| 2 | 03- ML (+2 to | 1 | 0.74 |
| 0 | 04- CH (+0 TO | 1 | 1 |
| -5 | 05- CH (-5 to - | 1 | 0.45 |
| -13 | 06- SP (-13 to - | 1 | 0.48 |
| -22 | 07- SP (-22 to | 1 | 0.47 |
| -33 | 08- CH (-33 to | 1 | 1 |
| -41 | 09- CH (-41 to | 1 | 1 |
| -46 | 10- CH (-46 to | 1 | 0 |
| -56 | 11- CH (-56 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 2.153 | 2.153 | 2.83 |
| Stage 1 | Simple span | N/A | 1.6 | 1.753 | 1.753 | 2.283 |
| Stage 2 | Simple span | N/A | 1.6 | 2.265 | 2.265 | 2.932 |
| Stage 3 | Simple span | N/A | 1.6 | 1.856 | 1.856 | 2.372 |
| Stage 4 | Simple span | N/A | 1.6 | 2.546 | 2.546 | 3.206 |
| Stage 5 | Simple span | N/A | 1.6 | 1.757 | 1.757 | 2.173 |
| Stage 6 | Simple span | N/A | 1.6 | 2.678 | 2.678 | 3.321 |
| Stage 7 | Simple span | N/A | 1.6 | 1.871 | 1.871 | 2.264 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

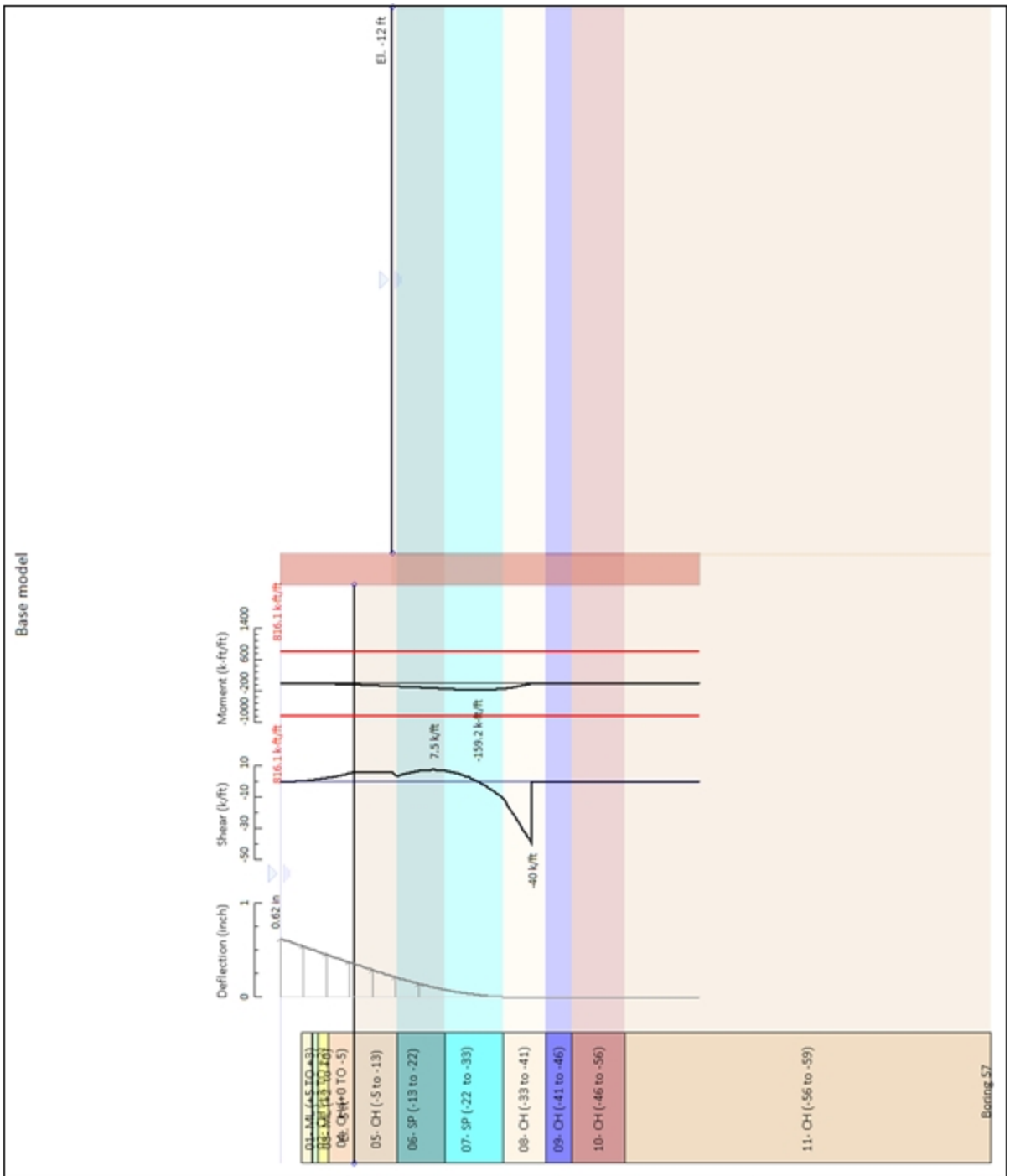
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

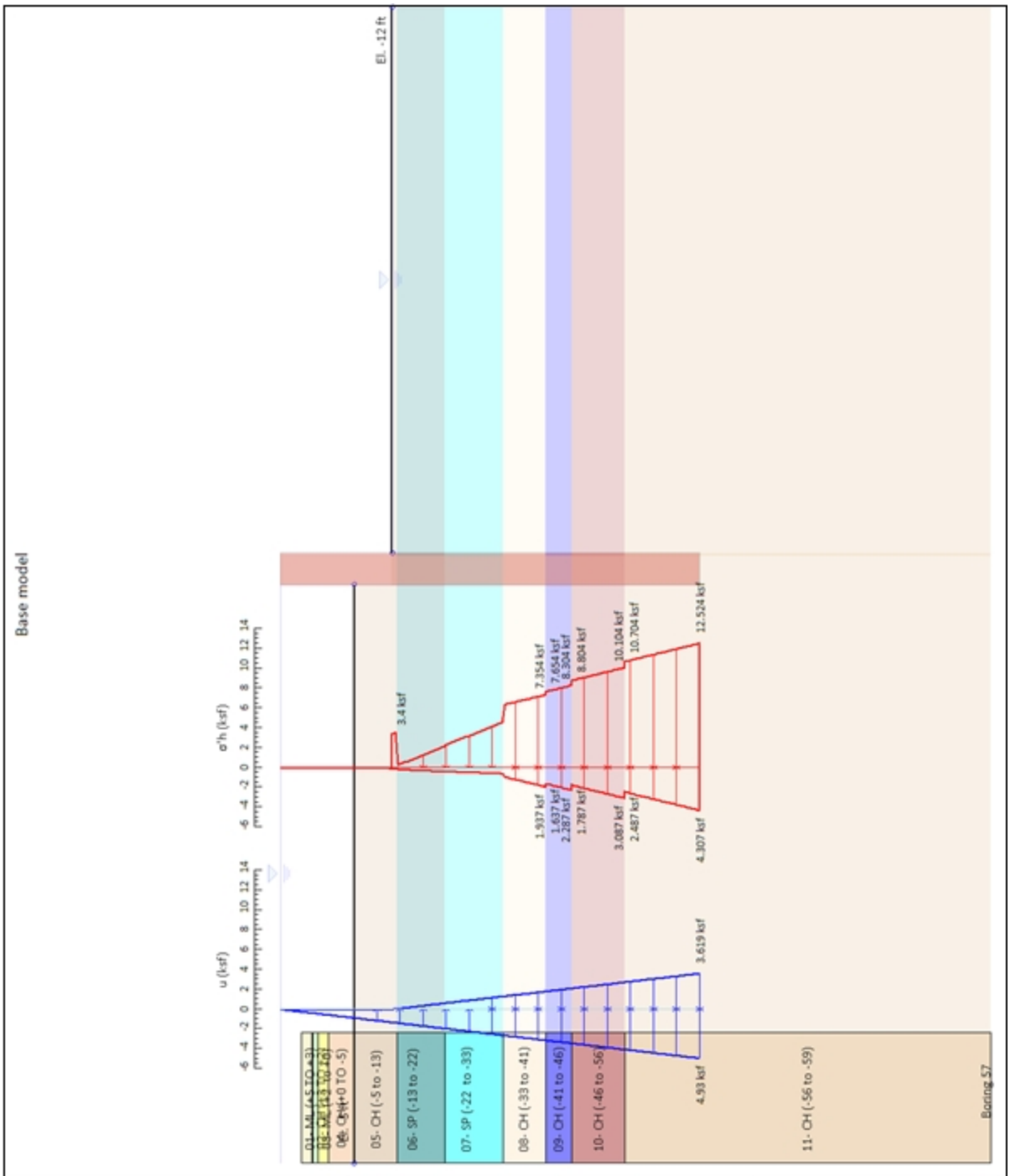
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

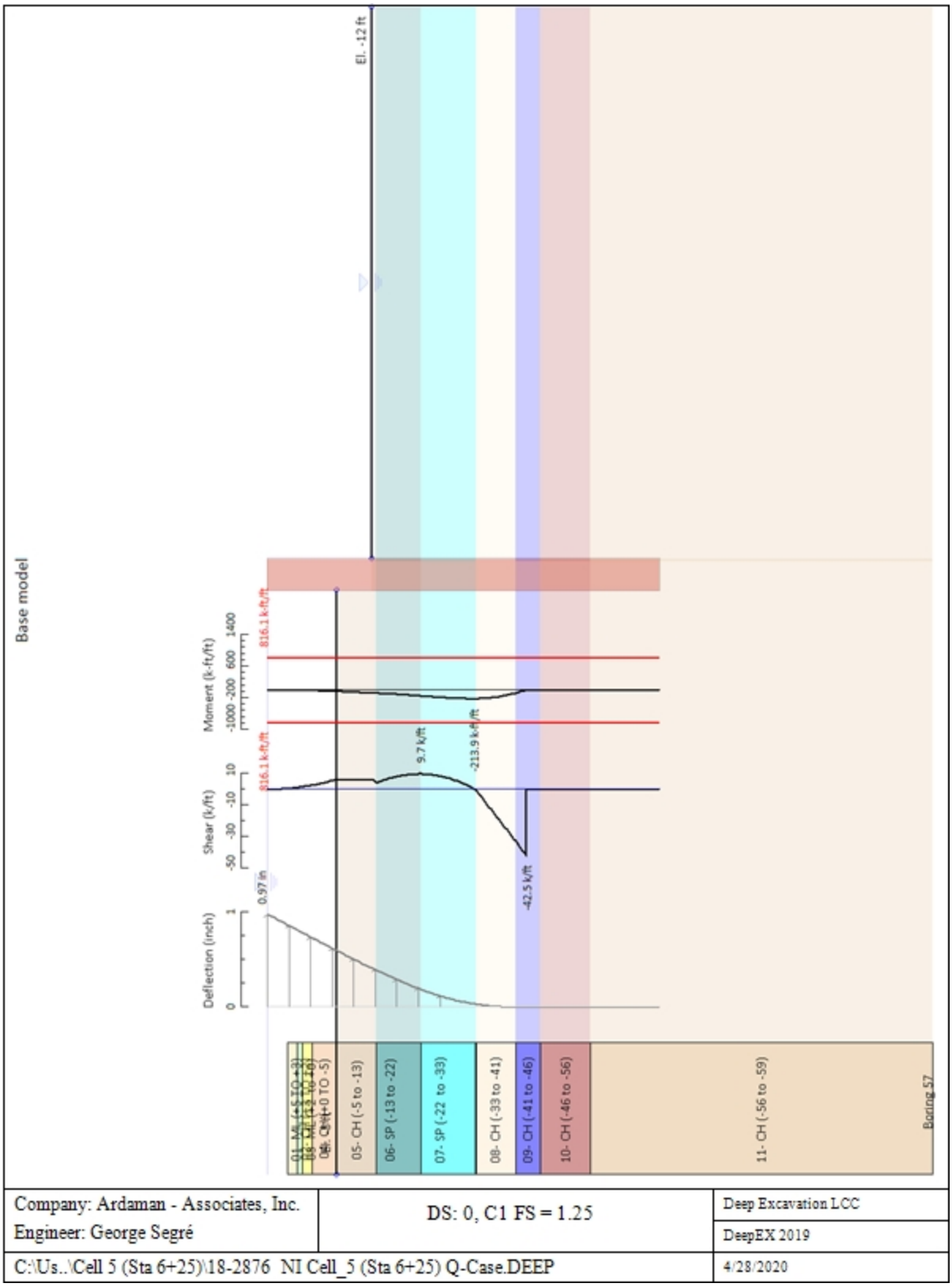
A sequence of figures for each excavation stage is reported

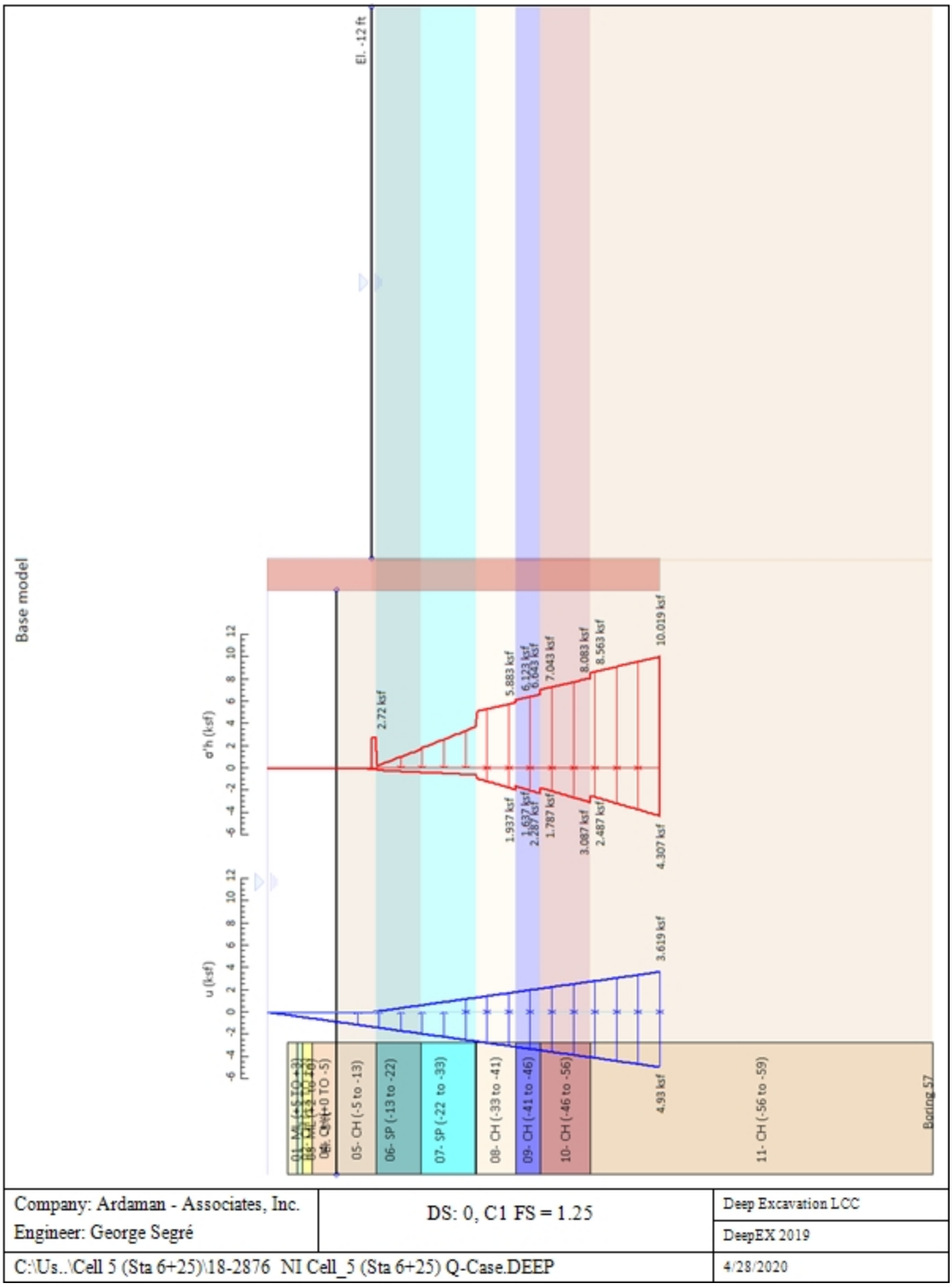



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP | | 4/28/2020 |

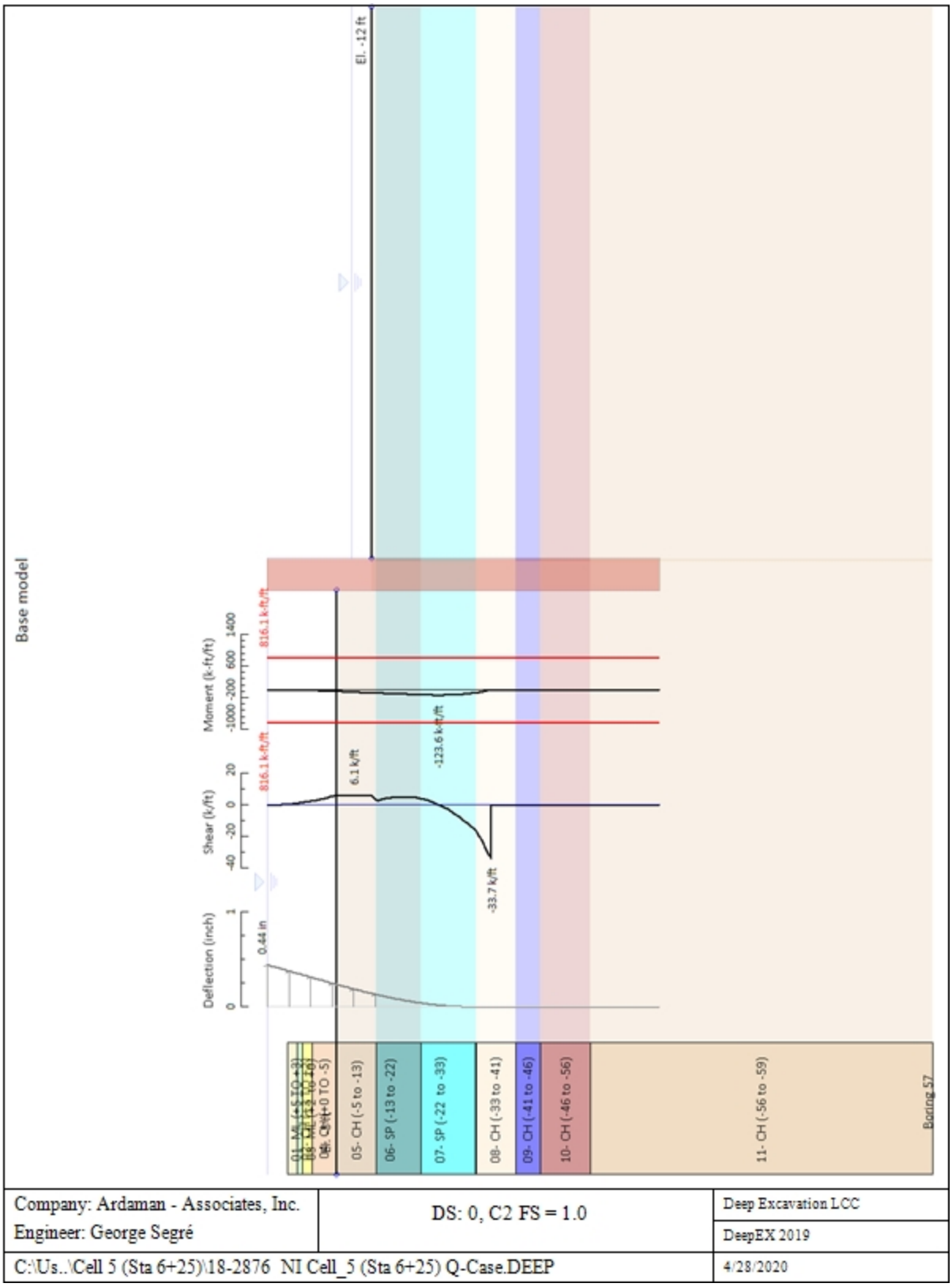


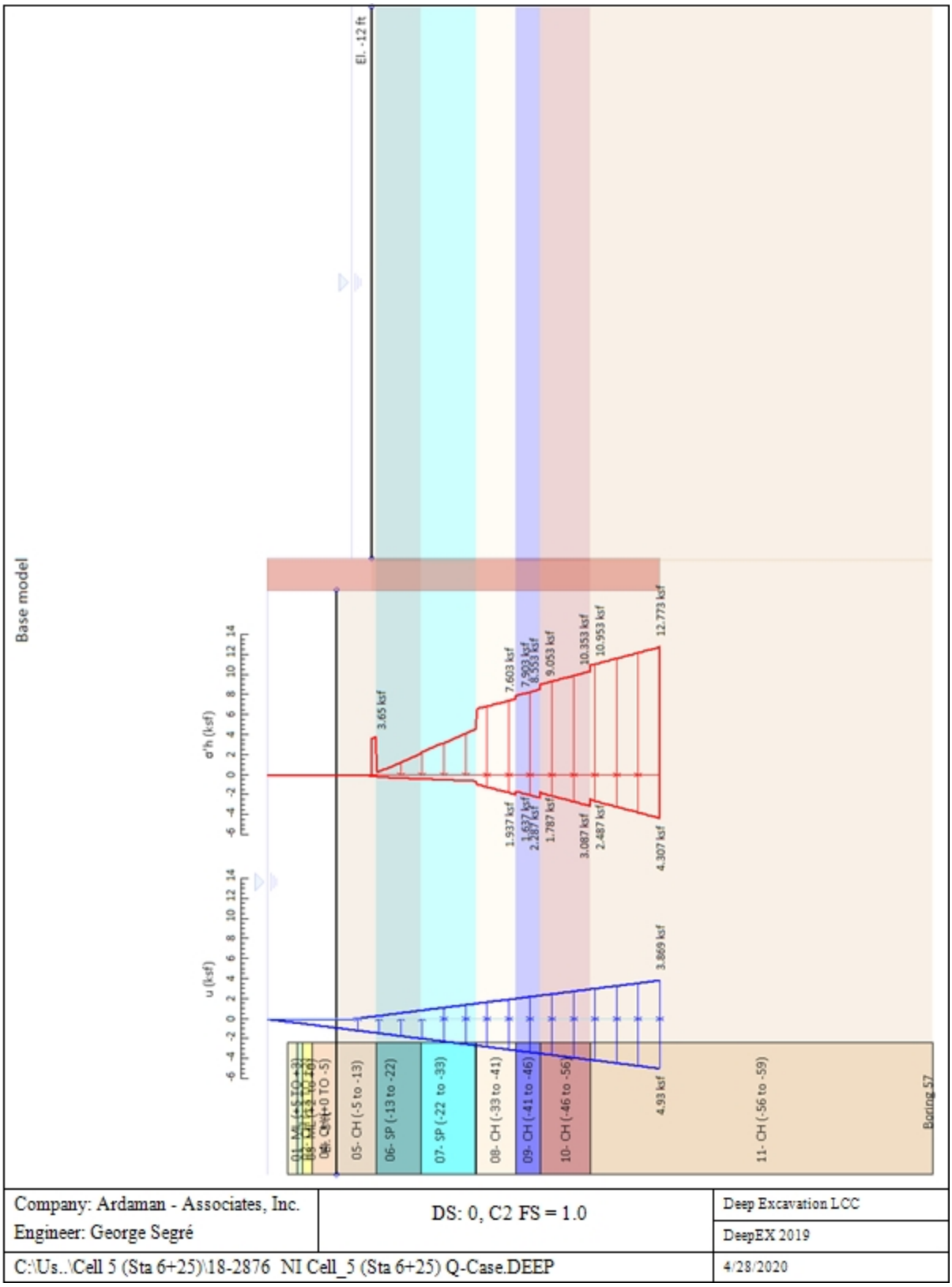

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP | | 4/28/2020 |

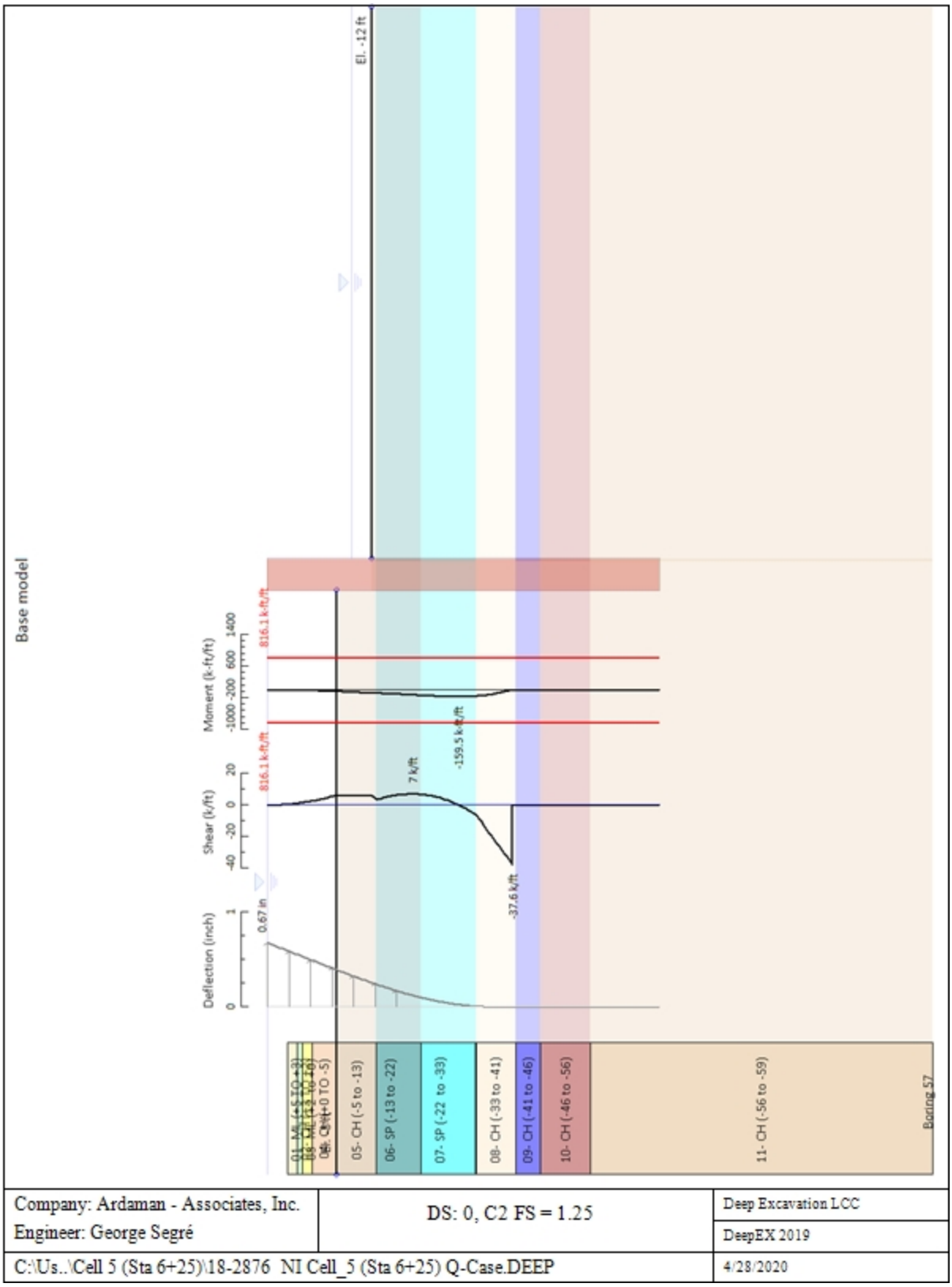

Base model
El. -12 ft
Deflection (inch)
0
1
0.97 in
Shear (k/ft)
-50 -30 -10 10
816.1 k-ft/ft
9.7 k/ft
-42.5 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-213.9 k-ft/ft
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020



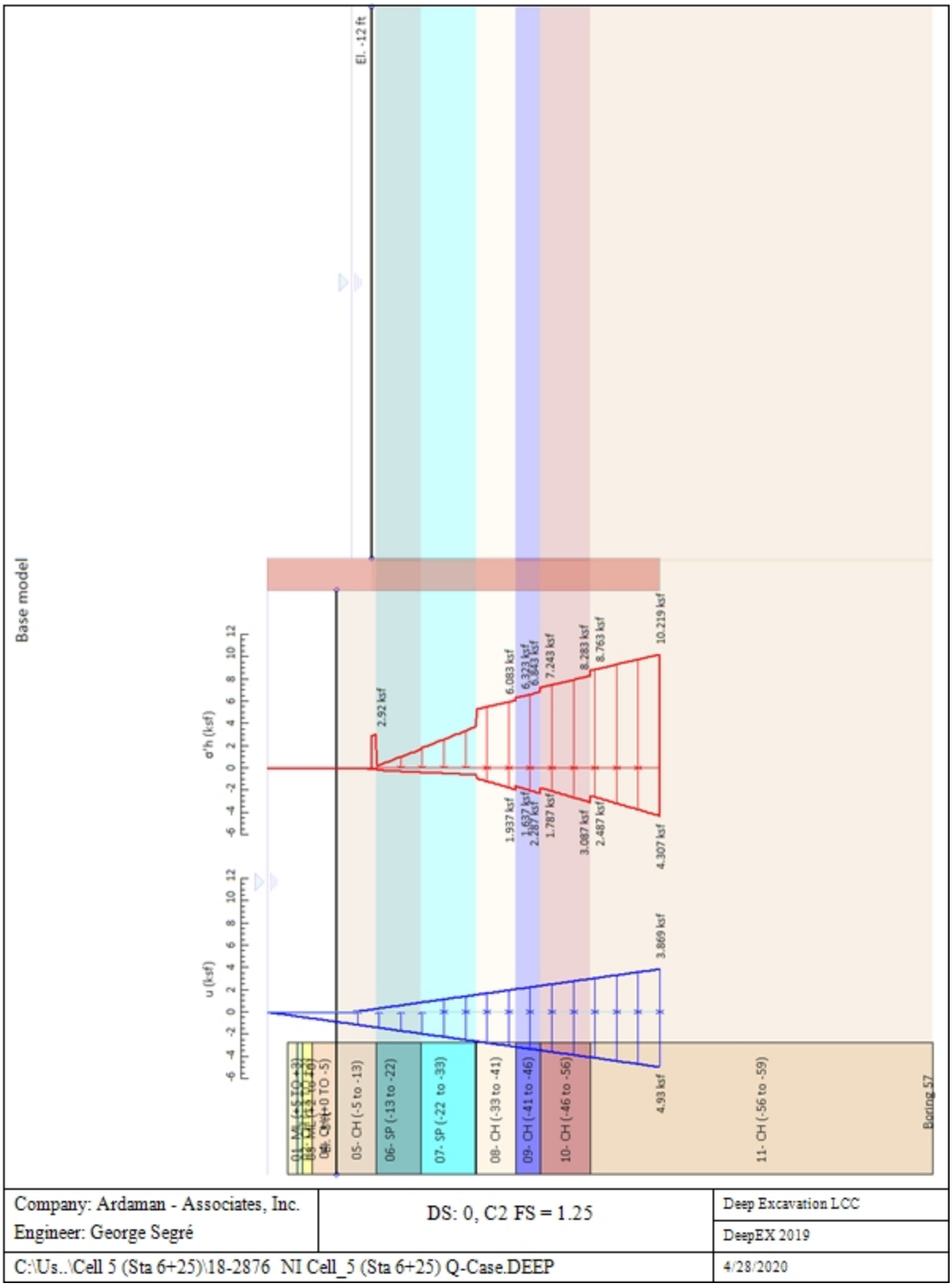

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP | | 4/28/2020 |

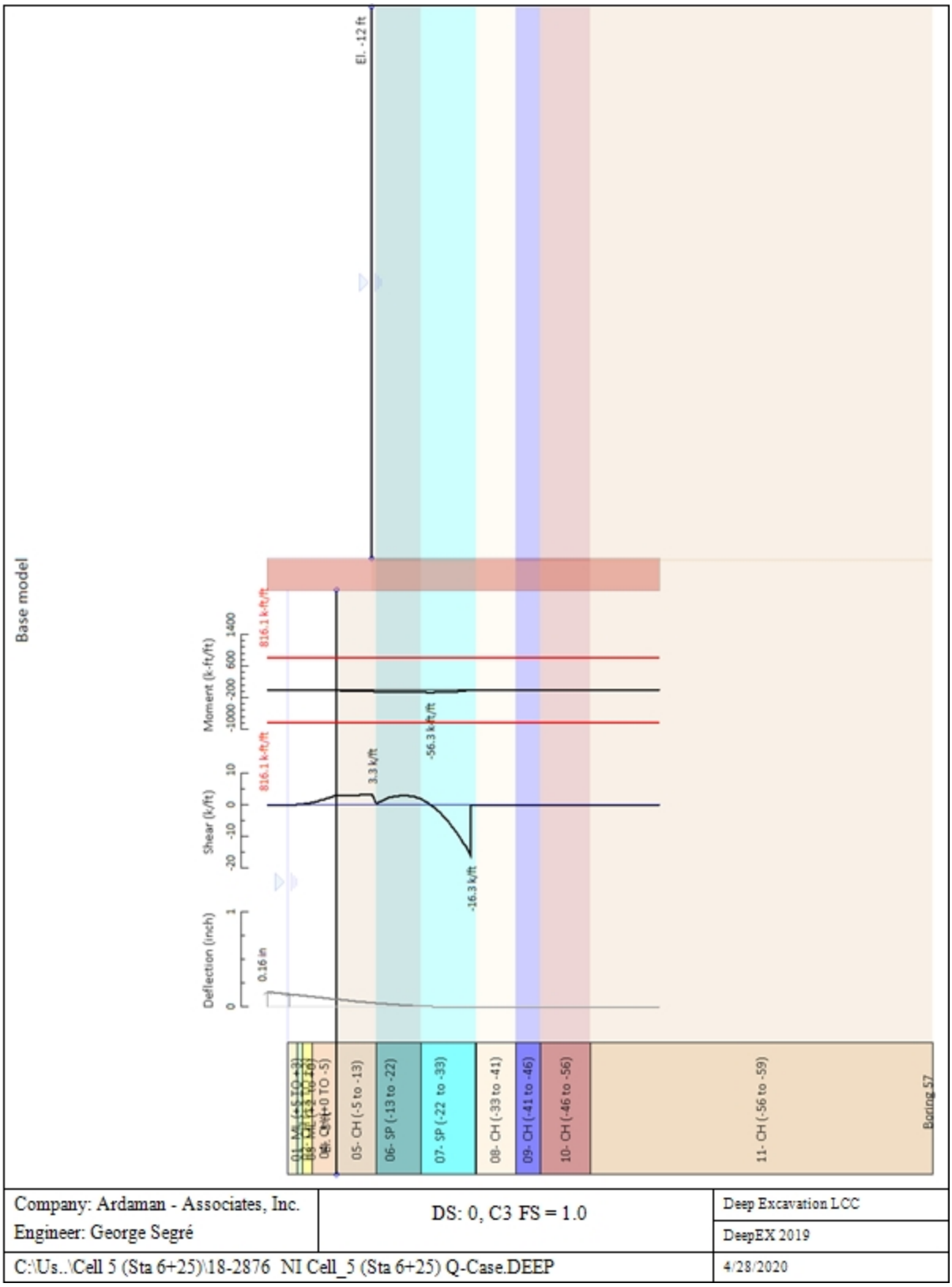

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-123.6 k-ft/ft
Shear (k/ft)
-40 -20 0 20
816.1 k-ft/ft
6.1 k/ft
-33.7 k/ft
Deflection (inch)
0 1
0.44 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

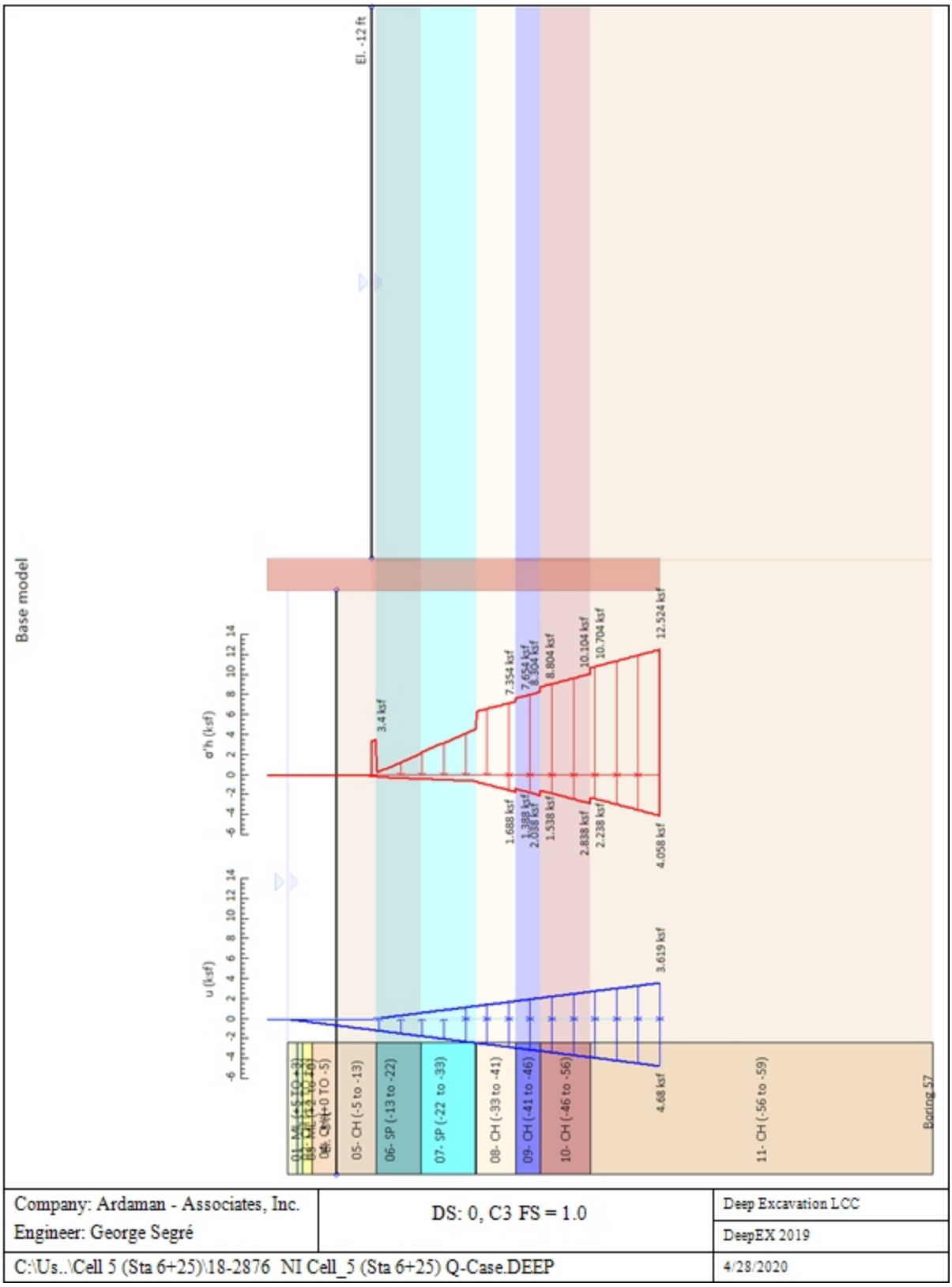

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
3.65 ksf
7.603 ksf
9.053 ksf
10.353 ksf
10.953 ksf
12.773 ksf
1.937 ksf
1.787 ksf
3.087 ksf
2.487 ksf
4.307 ksf
3.869 ksf
4.93 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

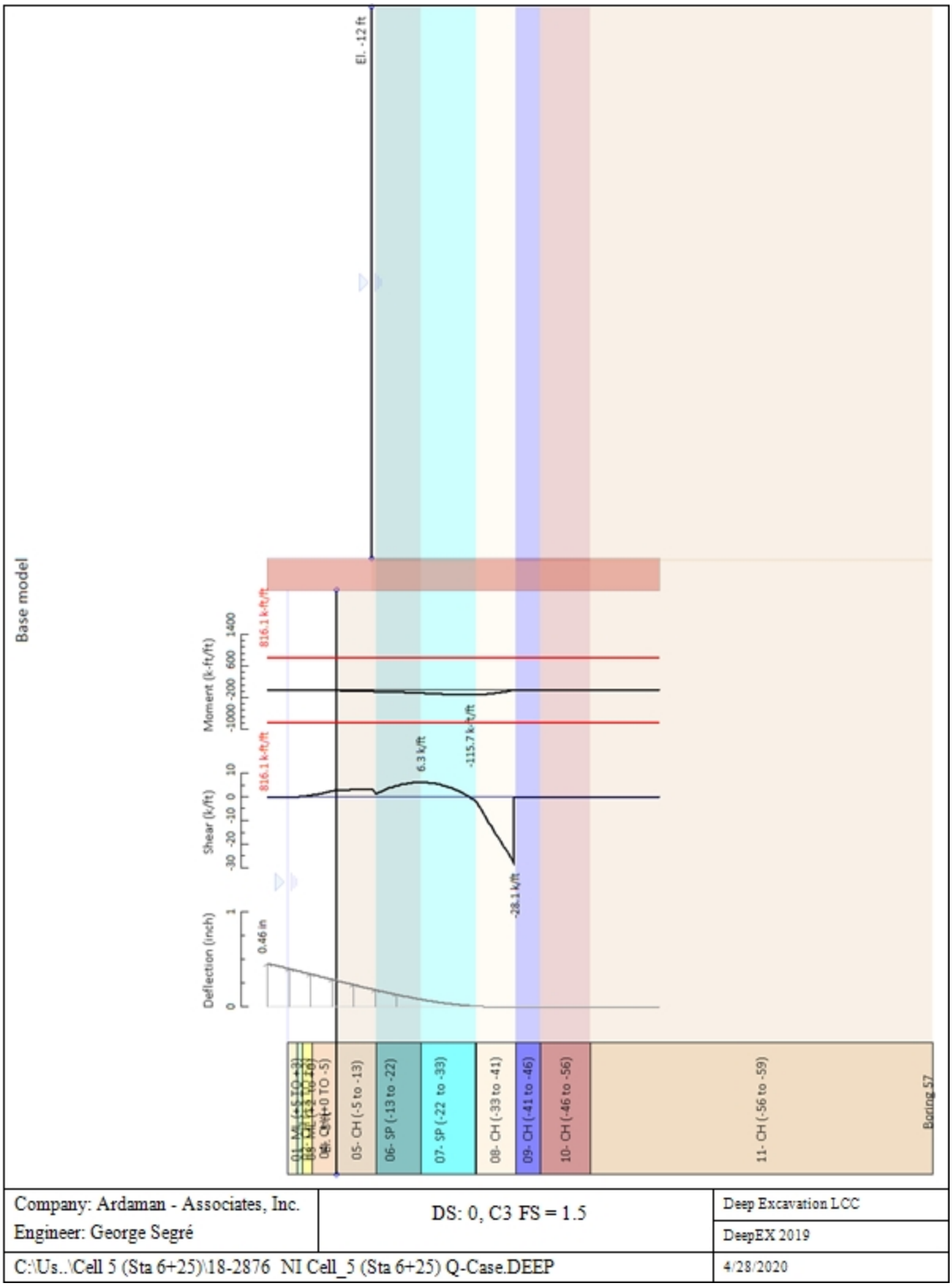


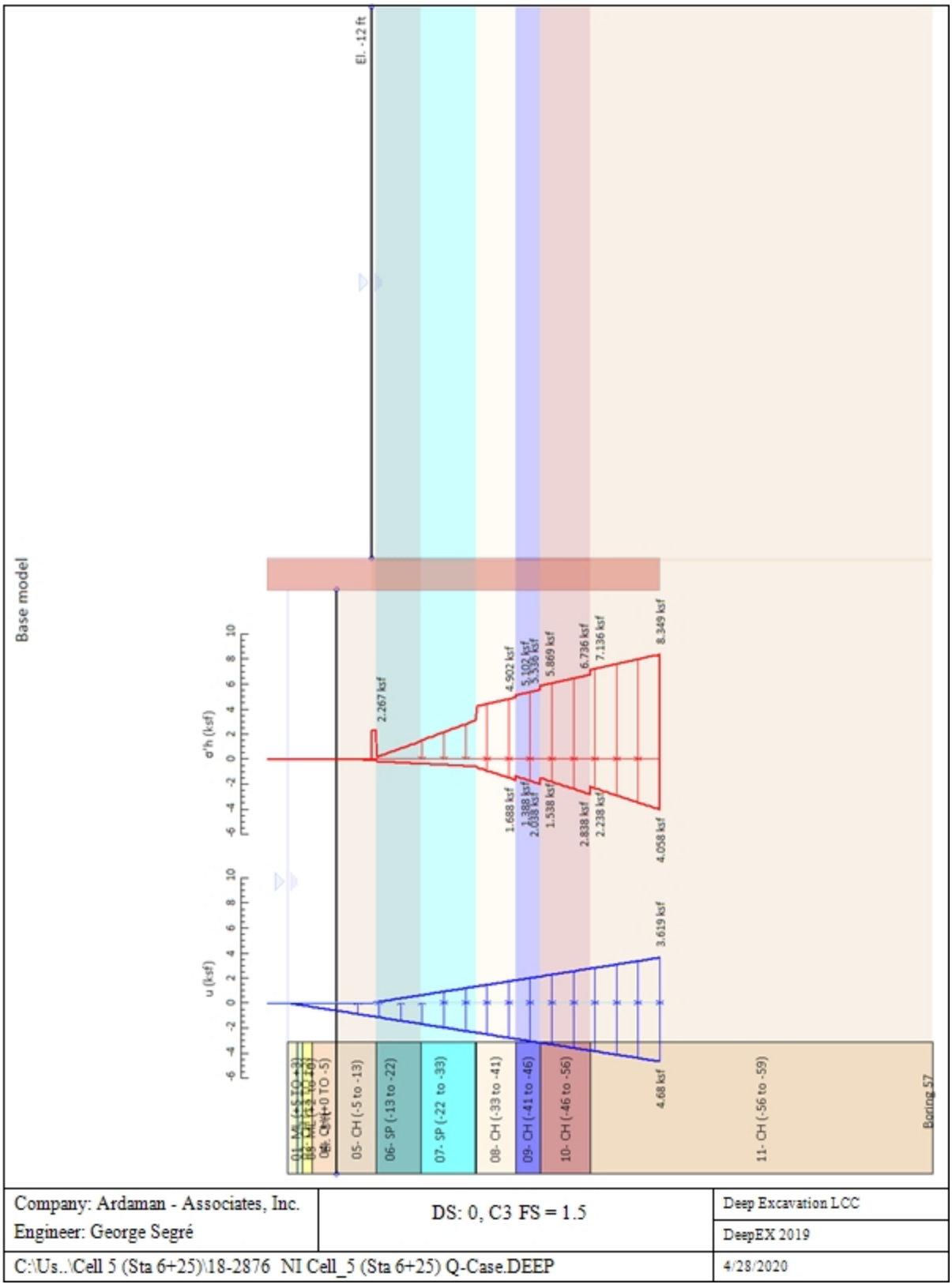

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP | | 4/28/2020 |

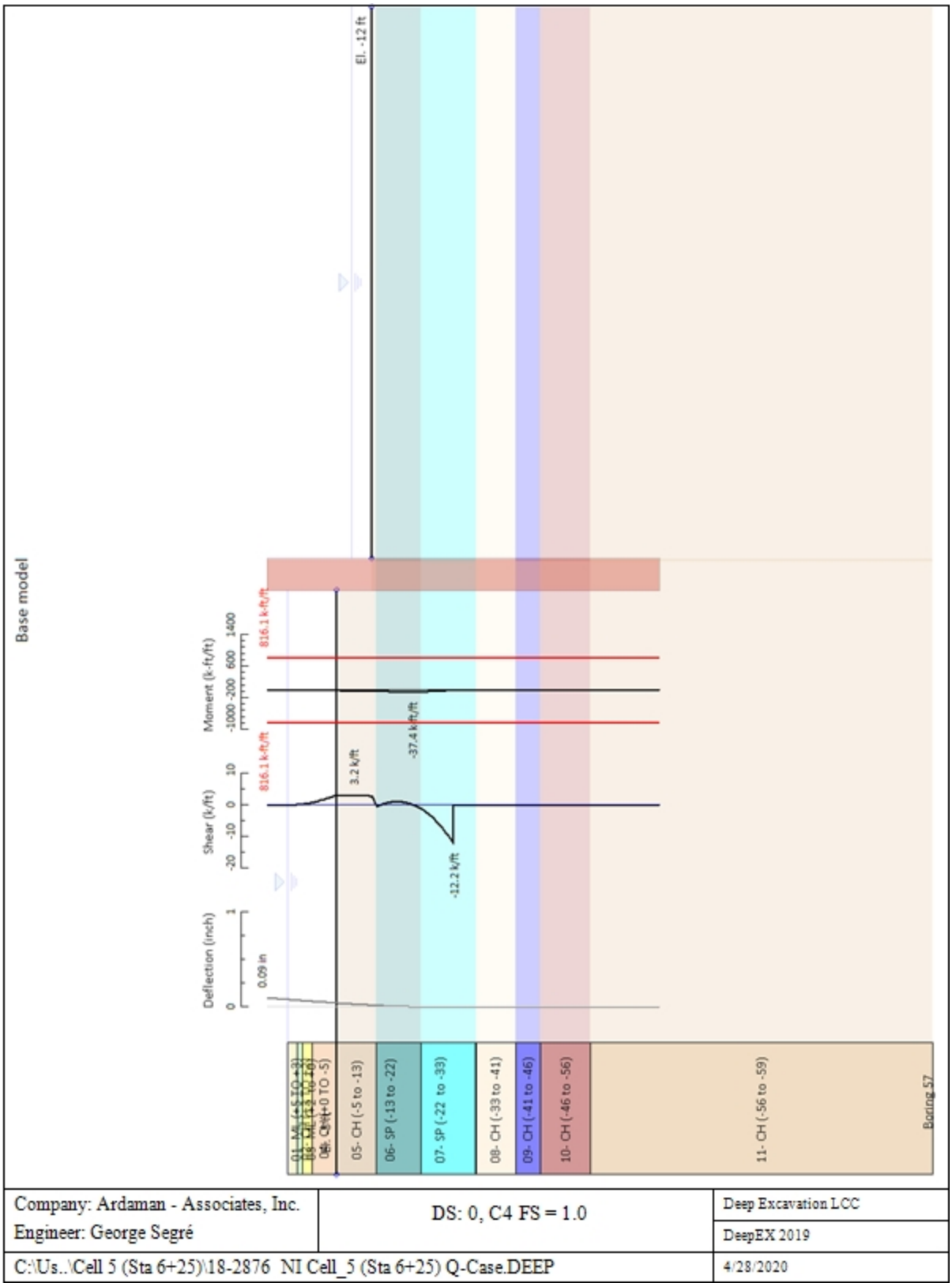

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
2.92 ksf
6.083 ksf
6.323 ksf
6.643 ksf
7.243 ksf
8.283 ksf
8.763 ksf
10.219 ksf
1.937 ksf
1.697 ksf
2.287 ksf
1.787 ksf
3.087 ksf
2.487 ksf
4.307 ksf
3.869 ksf
4.93 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

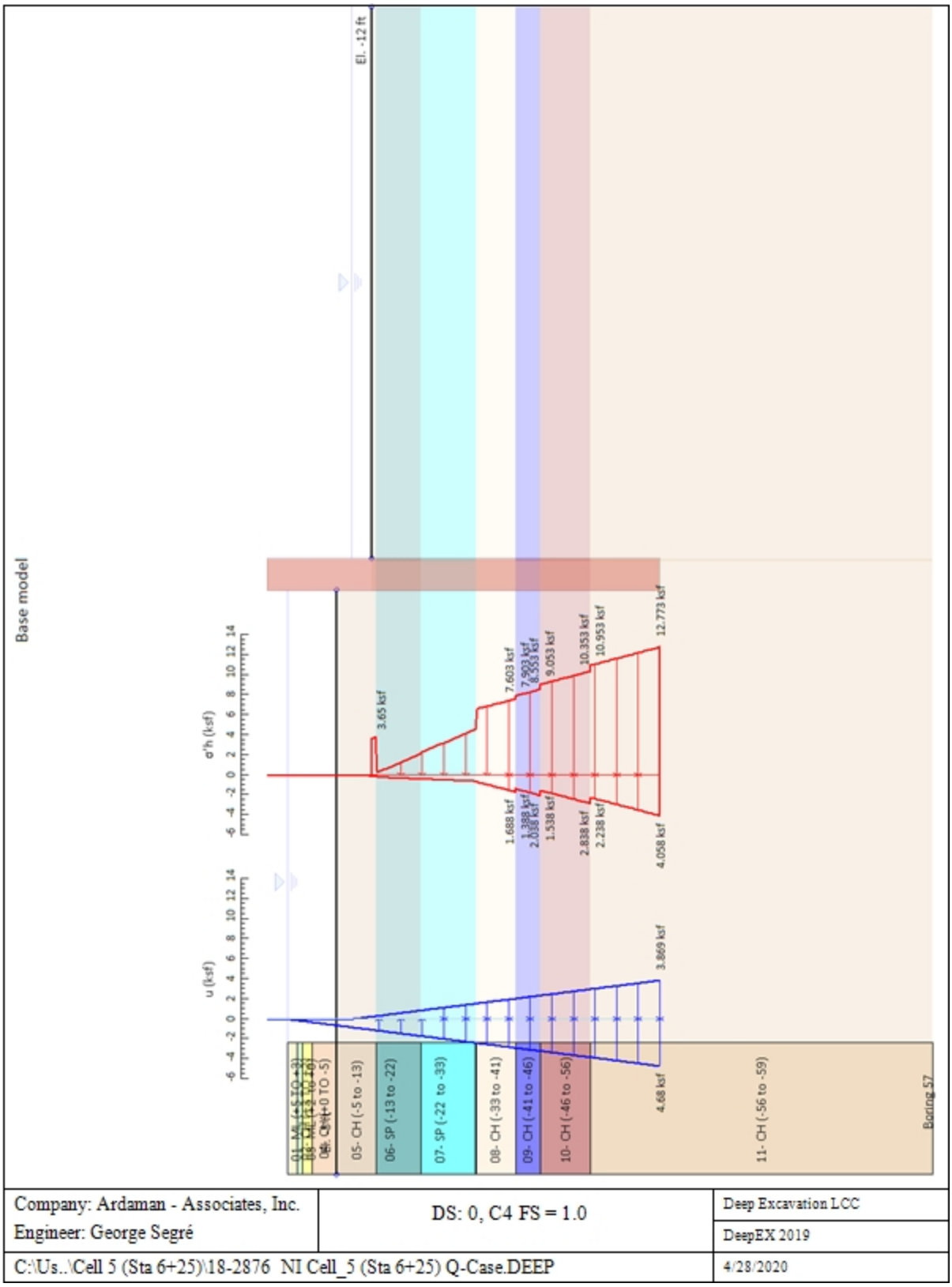

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-56.3 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.3 k/ft
-16.3 k/ft
Deflection (inch)
0 1
0.16 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
3.4 ksf
7.354 ksf
7.654 ksf
8.504 ksf
8.804 ksf
10.104 ksf
10.704 ksf
12.524 ksf
1.688 ksf
1.988 ksf
2.038 ksf
1.538 ksf
2.838 ksf
2.238 ksf
4.058 ksf
3.619 ksf
4.68 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

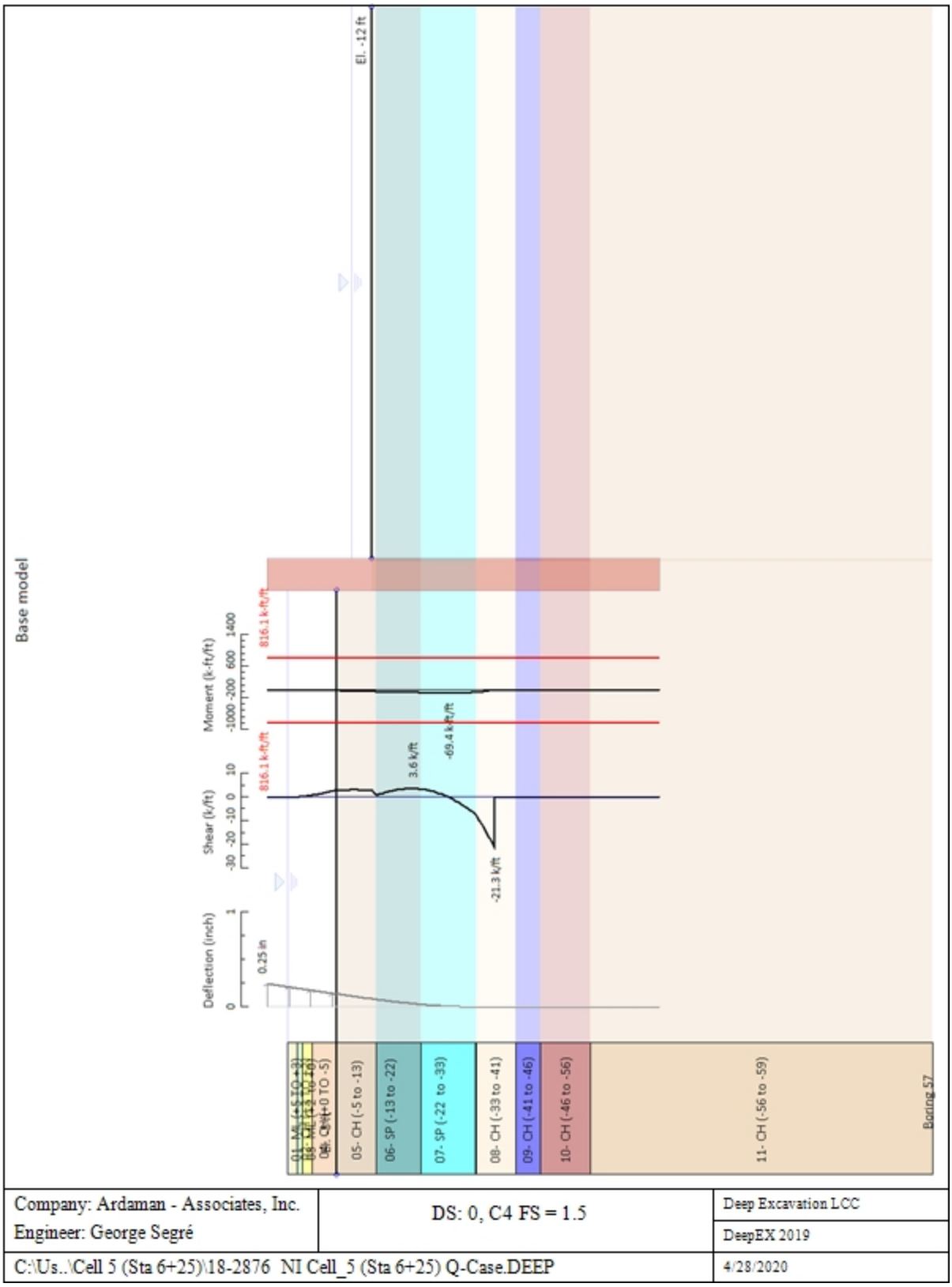

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-115.7 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
816.1 k-ft/ft
6.3 k/ft
-28.1 k/ft
Deflection (inch)
0 1
0.46 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
2.267 ksf
4.902 ksf
5.102 ksf
5.336 ksf
5.869 ksf
6.736 ksf
7.136 ksf
8.349 ksf
1.688 ksf
1.388 ksf
2.038 ksf
1.538 ksf
2.838 ksf
2.238 ksf
4.058 ksf
3.619 ksf
4.68 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

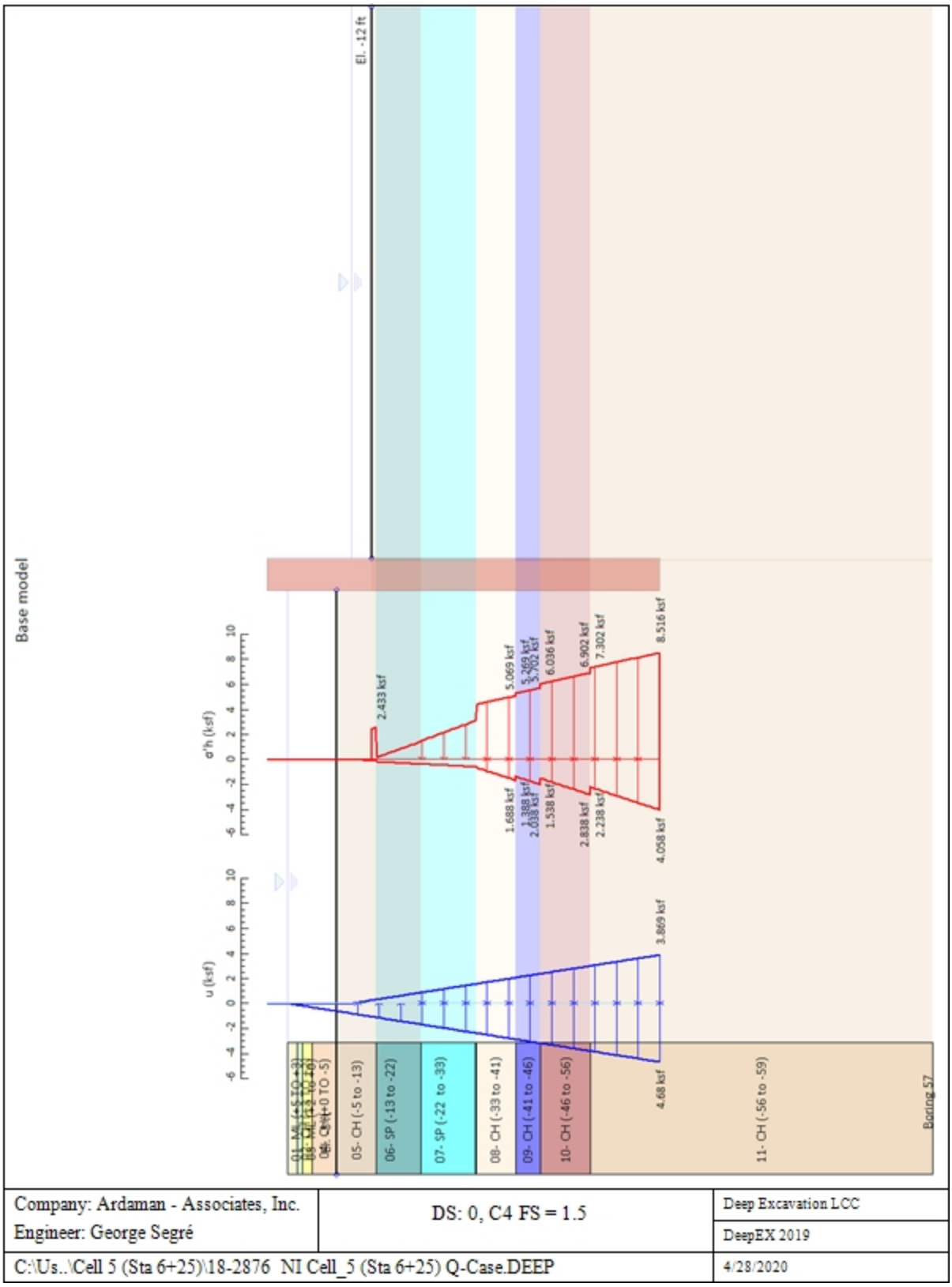

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-37.4 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.2 k/ft
-12.2 k/ft
Deflection (inch)
0 1
0.09 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP | | 4/28/2020 |




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
2.433 ksf
5.069 ksf
5.269 ksf
5.702 ksf
6.036 ksf
6.902 ksf
7.302 ksf
8.516 ksf
1.688 ksf
1.988 ksf
2.038 ksf
1.538 ksf
2.838 ksf
2.238 ksf
4.058 ksf
3.869 ksf
4.68 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

# *DeepEX 2019: Report Output*

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits

Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 11:10:00 AM

THIS PROGRAM IS PROTECTED BY U.S. COPYRIGHT LAWS AS DESCRIBED IN THE EULA. UNAUTHORIZED COPYING IS PROHIBITED. LICENSED TO: Deep Excavation LLC BY DEEP EXCAVATION LLC UNDER SPECIFIC LICENCE. This report has printed because the user has accepted responsibility as described in the disclaimer and EULA
File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S -Case.DEEP

# STRUCTURAL MATERIALS DATA

## Steel

| Name | Strength Fy | Fu | Elastic E | Density g |
|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) |
| A36 | 36 | 58 | 29000 | 0.49 |
| A50 | 50 | 72.5 | 29000 | 0.49 |

## Concrete

| Name | Strength Fc' | Elastic E | Density g | Tension Strength Ft |
|---|---|---|---|---|
| | (ksi) | (ksi) | (kcf) | (% of Fc') |
| Fc 3ksi | 3 | 3122 | 0.15 | 10 |
| Fc 4ksi | 4 | 3605 | 0.15 | 10 |
| Fc 5ksi | 5 | 4031 | 0.15 | 10 |
| Fc 6ksi | 6 | 4415 | 0.15 | 10 |

## Steel rebar

| Name | Strength Fy | Elastic E |
|---|---|---|
| | (ksi) | (ksi) |
| Grade 60 | 60 | 29000 |
| Grade 75 | 75 | 29000 |
| Grade 80 | 80 | 29000 |
| Grade 150 | 150 | 29000 |
| Strands 270 ksi | 270 | 29000 |
| S410 | 59.4 | 30434.8 |
| S500 | 72.5 | 30434.8 |
| B450C | 65.2 | 30434.8 |

## Wood

| Name | Ultimate Bending Srtength Fbu | Ultimate Tensile Strength Ftu | Ultimate Shear Strength Fvu | Density g | Elastic E |
|---|---|---|---|---|---|
| | (ksi) | (ksi) | (ksi) | (kcf) | (ksi) |
| Construction Timb | 1.6 | 1.4 | 0.8 | 0.05 | 1000 |
| Regular grade | 1 | 1 | 0.6 | 0.05 | 800 |

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

*Project: San Jacinto Waste Pits*
*Results for Design Section 0: Base model*

## SOIL DATA

| Name | g tot | g dry | Frict | C' | Su | FRp | FRcv | Eload | rEur | kAp | kPp | kAcv | kPcv | Vary | Spring | Color |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (pcf) | (pcf) | (deg) | (psf) | (psf) | (deg) | (deg) | (ksf) | (-) | NL | NL | NL | NL | | Model | |
| 01- ML (+5 T | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 300 | 3 | 0.36 | 2.77 | N/A | N/A | True | EXP | |
| 02- CH (+3 TO | 128 | 128 | 23 | 0 | N/A | N/A | N/A | 60 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 03- ML (+2 to | 117 | 117 | 28 | 0 | N/A | N/A | N/A | 150 | 3 | 0.36 | 2.77 | N/A | N/A | True | Linear | |
| 04- CH (+0 TO | 127 | 127 | 23 | 0 | N/A | N/A | N/A | 521.92 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 05- CH (-5 to - | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 417.54 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 06- SP (-13 to | 130 | 130 | 31 | 0 | N/A | N/A | N/A | 626.3 | 3 | 0.32 | 3.12 | N/A | N/A | True | Linear | |
| 07- SP (-22 t | 130 | 130 | 32 | 0 | N/A | N/A | N/A | 300 | 3 | 0.31 | 3.26 | N/A | N/A | True | Linear | |
| 08- CH (-33 to | 128 | 128 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 09- CH (-41 to | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 10- CH (-46 to | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |
| 11- CH (-56 to | 130 | 130 | 23 | 0 | N/A | N/A | N/A | 300 | 3 | 0.44 | 2.28 | N/A | N/A | True | Linear | |

| Name | Poisson | Min Ka | Min sh | ko.NC | nOCR | aH.EXP | aV.EXP | qSkin | qNails | kS.nails | PL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | v | (clays) | (clays) | - | - | (0 to 1) | (0 to 1) | (psi) | (psi) | (k/ft3) | (ksi) |
| 01- ML (+5 T | 0.4 | - | - | 0.531 | 0.5 | 1 | 0 | 7.2 | 4.8 | 20 | - |
| 02- CH (+3 TO | 0.3 | - | - | 0.609 | 0.5 | - | - | 5.1 | 3.4 | 20 | - |
| 03- ML (+2 to | 0.4 | - | - | 0.531 | 0.5 | - | - | 13 | 8.7 | 20 | - |
| 04- CH (+0 TO | 0.35 | - | - | 0.609 | 0.5 | - | - | 21.8 | 14.5 | 30 | - |
| 05- CH (-5 to - | 0.45 | - | - | 0.609 | 0.5 | - | - | 18.1 | 12.1 | 30 | - |
| 06- SP (-13 to | 0.35 | - | - | 0.485 | 0.5 | - | - | 29 | 19.3 | 70 | - |
| 07- SP (-22 t | 0.35 | - | - | 0.47 | 0.8 | - | - | 0 | 0 | 0 | - |
| 08- CH (-33 to | 0.3 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 09- CH (-41 to | 0.25 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 10- CH (-46 to | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |
| 11- CH (-56 to | 0.35 | - | - | 0.609 | 0.8 | - | - | 0 | 0 | 0 | - |

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

## SOIL BORINGS

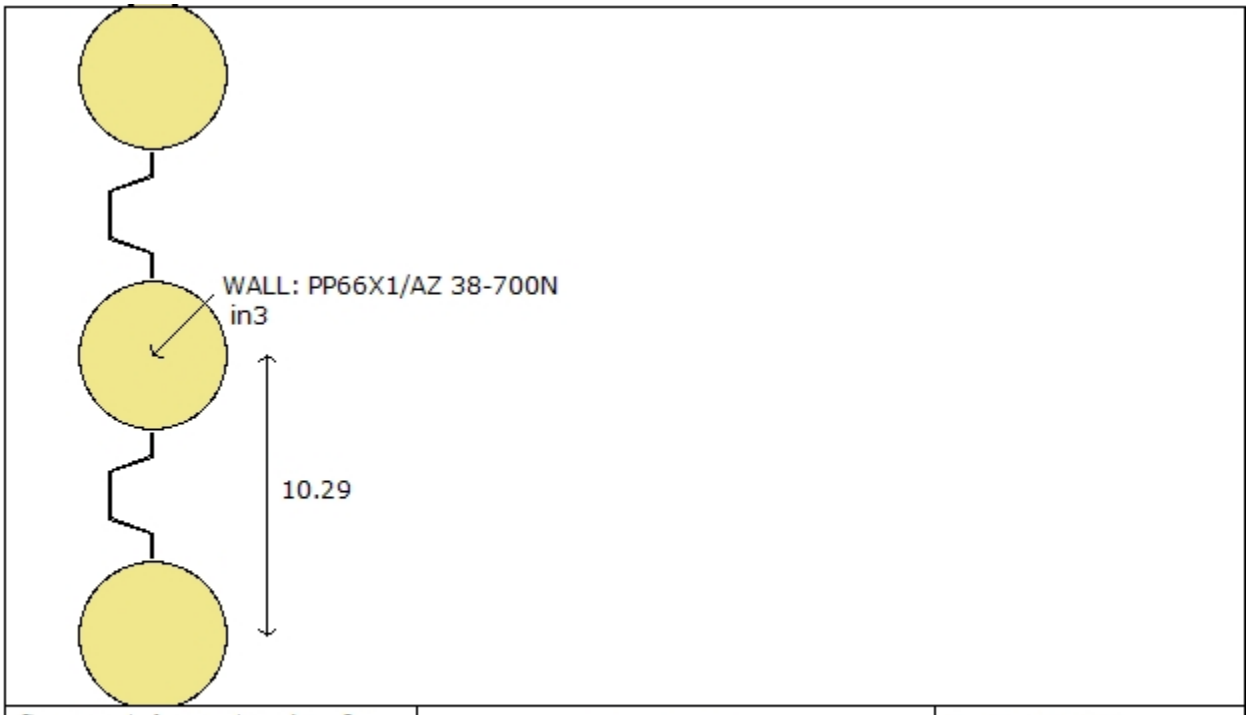
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

| Top elev. | Soil type | OCR | Ko |
|---|---|---|---|
| 5 | 01- ML (+5 TO | 1 | 0.53 |
| 3 | 02- CH (+3 TO | 1 | 0.61 |
| 2 | 03- ML (+2 to | 1 | 0.53 |
| 0 | 04- CH (+0 TO | 1 | 0.61 |
| -5 | 05- CH (-5 to - | 1 | 0.61 |
| -13 | 06- SP (-13 to - | 1 | 0.48 |
| -22 | 07- SP (-22 to | 1 | 0.47 |
| -33 | 08- CH (-33 to | 1 | 0.61 |
| -41 | 09- CH (-41 to | 1 | 0.61 |
| -46 | 10- CH (-46 to | 1 | 0.61 |
| -56 | 11- CH (-56 to | 1 | 1 |

## WALL DATA

Wall section 0: Wall 1




Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

| DES | Sheet | Piles | A | Ixx | Sxx | Pile A | Pile Ixx | Pile Sxx | Pile D | Pile bf | Pile tf | Pile tw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in2/ft) | (in4/ft) | (in3/ft) | (in^2) | (in4) | (in3) | (in) | (in) | (in) | (in) |
| PA 60/19-700 | AZ 38-700N | PP60X0.62 | 25.1 | 10793 | 327.1 | 204.2 | 107870.5 | 3268.8 | 66 | | 1 | |

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

## GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

| Name | Analysis | Drive | ka-Mult | Htr T/B | Resist | Res | Contle |
|---|---|---|---|---|---|---|---|
| | Method | Press | | (%) | Press | Mult | Method |
| Stage 0 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 1 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 2 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 3 | Conventional | Ka | N/A | N/A | Kp/M | 1.25 | Free Earth |
| Stage 4 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 5 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |
| Stage 6 | Conventional | Ka | N/A | N/A | Kp/M | 1 | Free Earth |
| Stage 7 | Conventional | Ka | N/A | N/A | Kp/M | 1.5 | Free Earth |

| Name | Support | Axial | Used | Min Toe | Toe | Toe |
|---|---|---|---|---|---|---|
| | Model | Incl | FSwall | FDtoe | FSrot | FSpas |
| Stage 0 | Simple span | N/A | 1.6 | 1.391 | 1.391 | 1.634 |
| Stage 1 | Simple span | N/A | 1.6 | 1.189 | 1.189 | 1.4 |
| Stage 2 | Simple span | N/A | 1.6 | 1.453 | 1.453 | 1.683 |
| Stage 3 | Simple span | N/A | 1.6 | 1.251 | 1.251 | 1.449 |
| Stage 4 | Simple span | N/A | 1.6 | 1.53 | 1.53 | 1.737 |
| Stage 5 | Simple span | N/A | 1.6 | 1.16 | 1.16 | 1.323 |
| Stage 6 | Simple span | N/A | 1.6 | 1.598 | 1.598 | 1.789 |
| Stage 7 | Simple span | N/A | 1.6 | 1.228 | 1.228 | 1.375 |

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

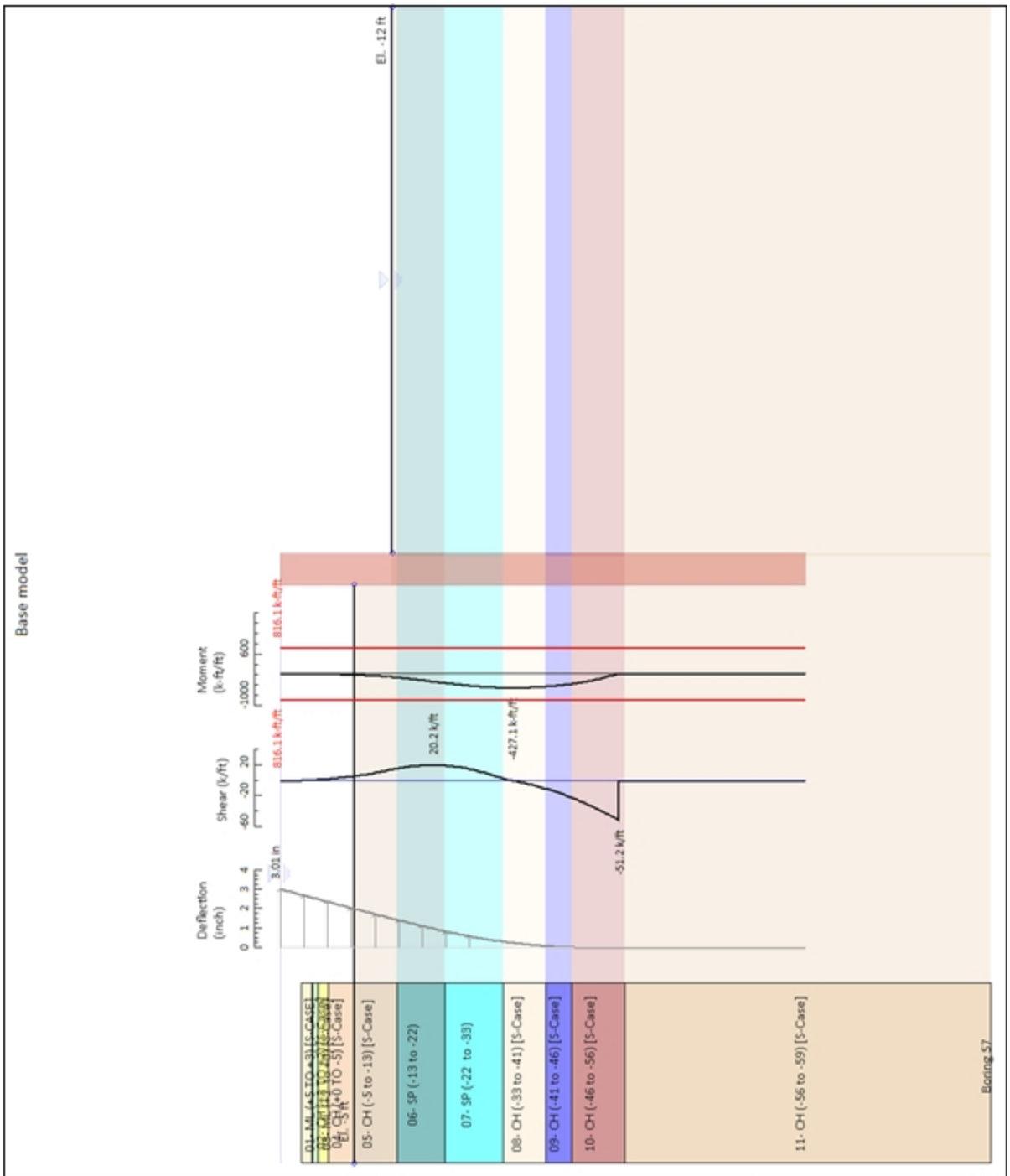
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

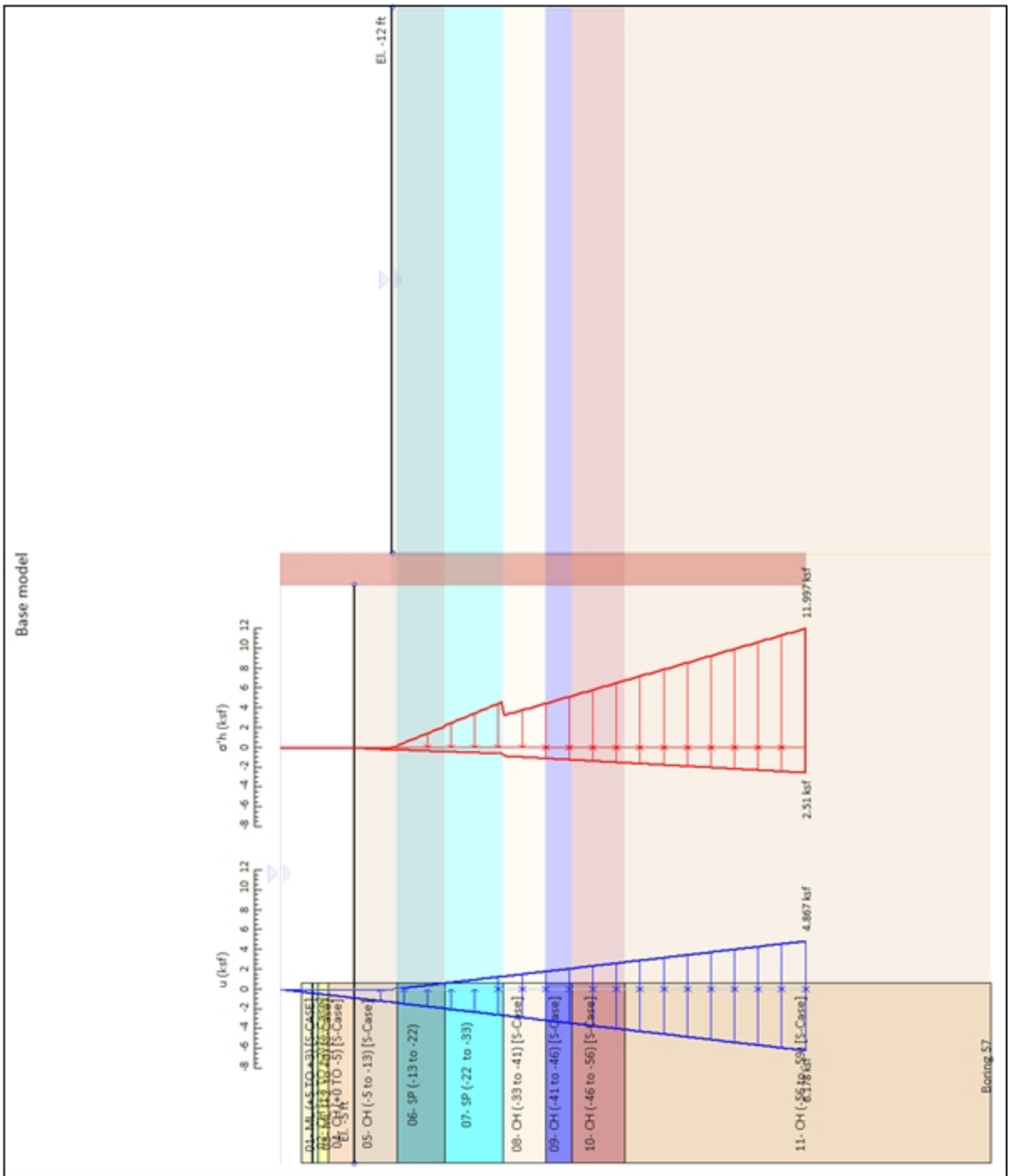
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

## EXCAVATION STAGES SKETCHES

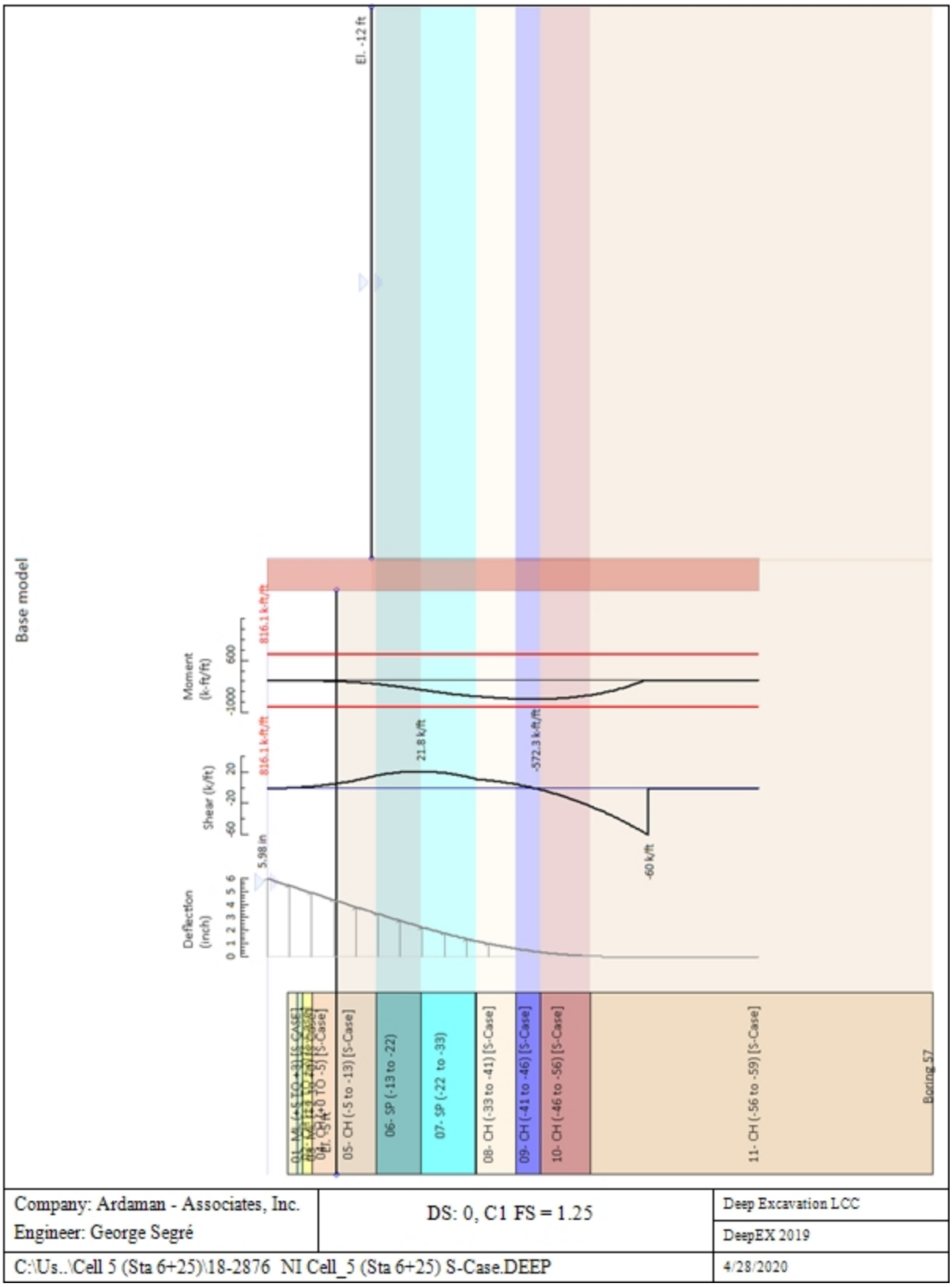
A sequence of figures for each excavation stage is reported

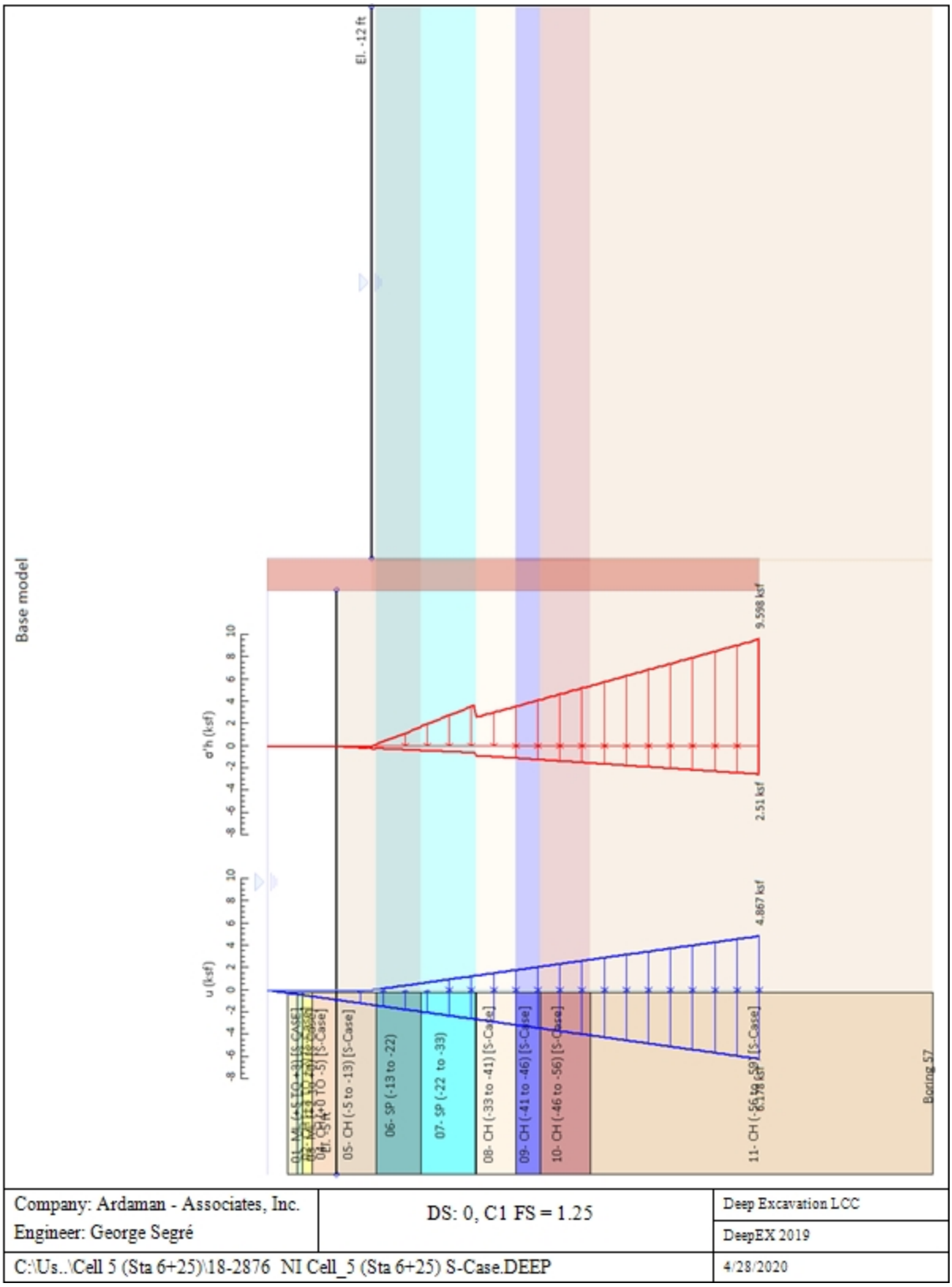


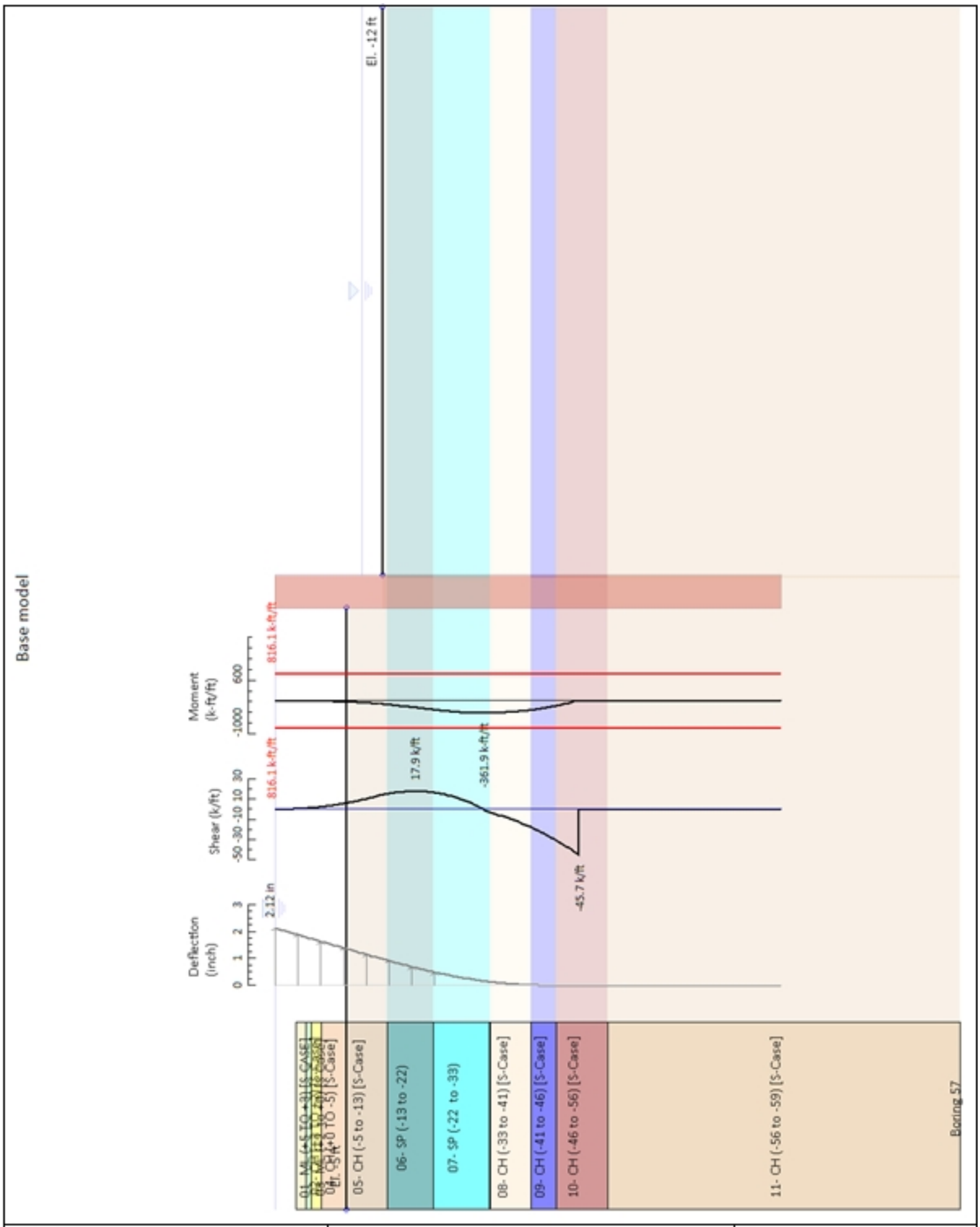

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP | | 4/28/2020 |

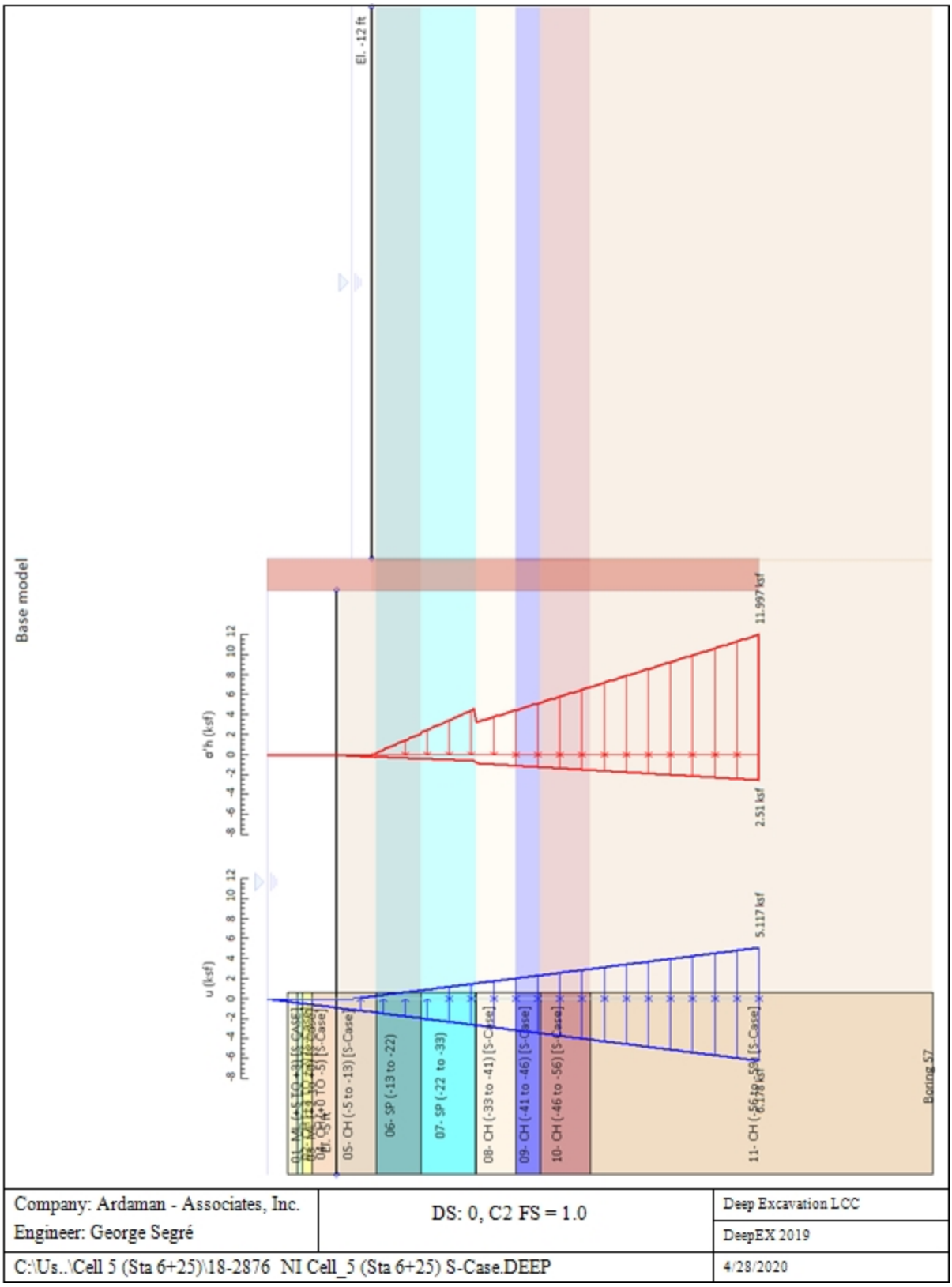



| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C1 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP | | 4/28/2020 |

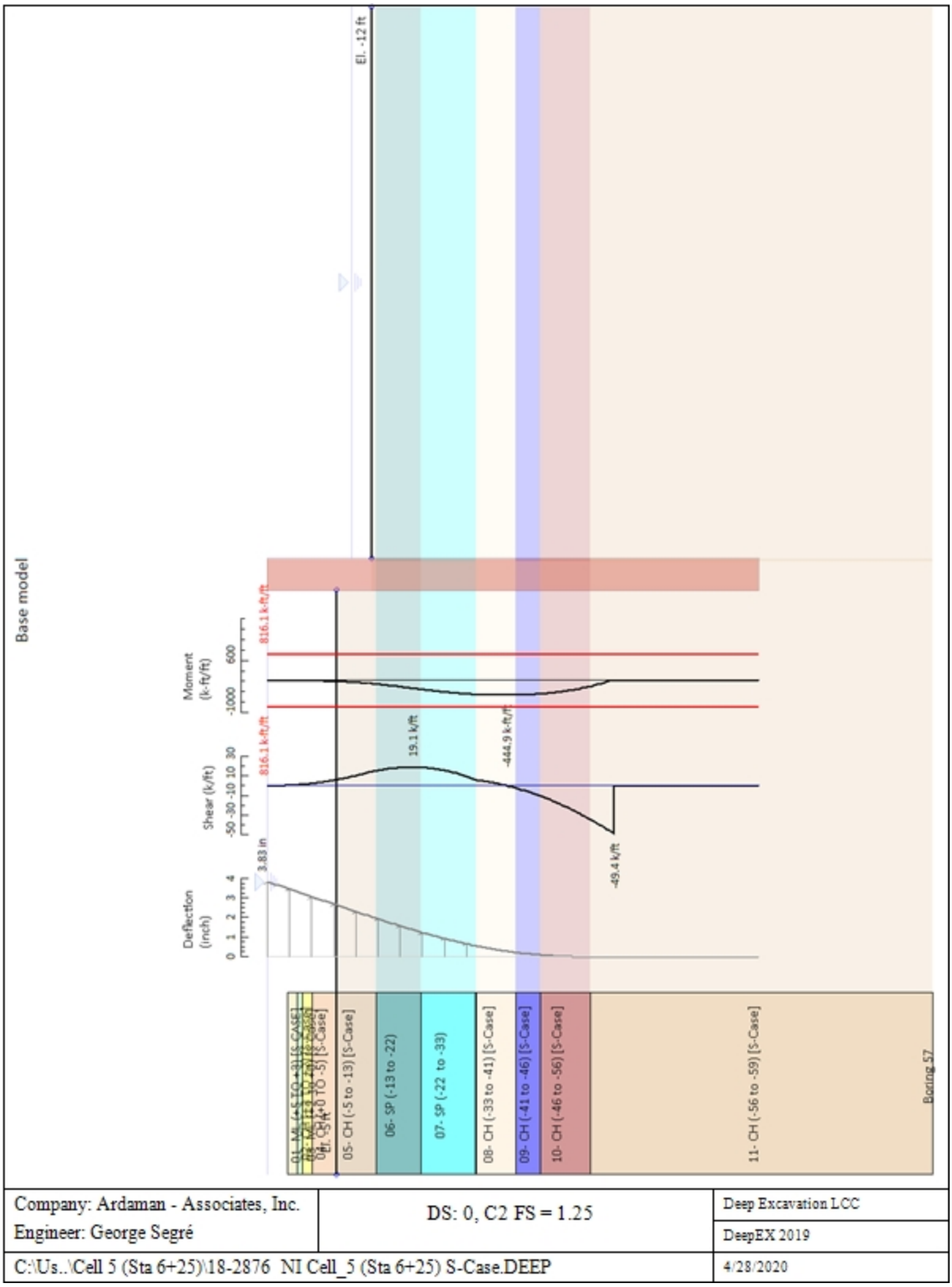

Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
Shear (k/ft)
-60
-20
20
816.1 k-ft/ft
21.8 k/ft
-572.3 k-ft/ft
-60 k/ft
Deflection (inch)
0 1 2 3 4 5 6
5.98 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

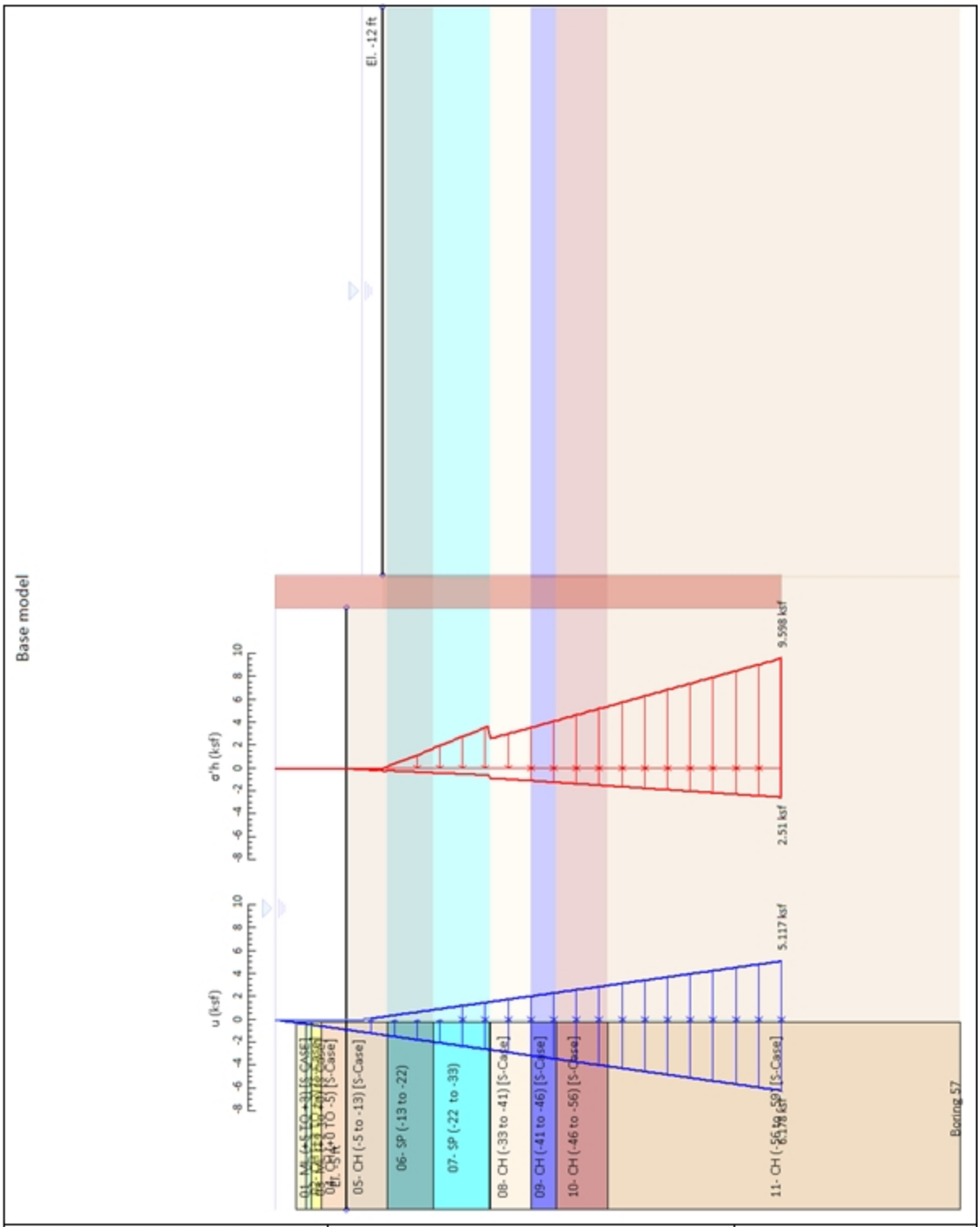

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
9.598 ksf
2.51 ksf
4.867 ksf
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -61) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020


Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
17.9 k/ft
-361.9 k-ft/ft
-45.7 k/ft
Deflection (inch)
0 1 2 3
2.12 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

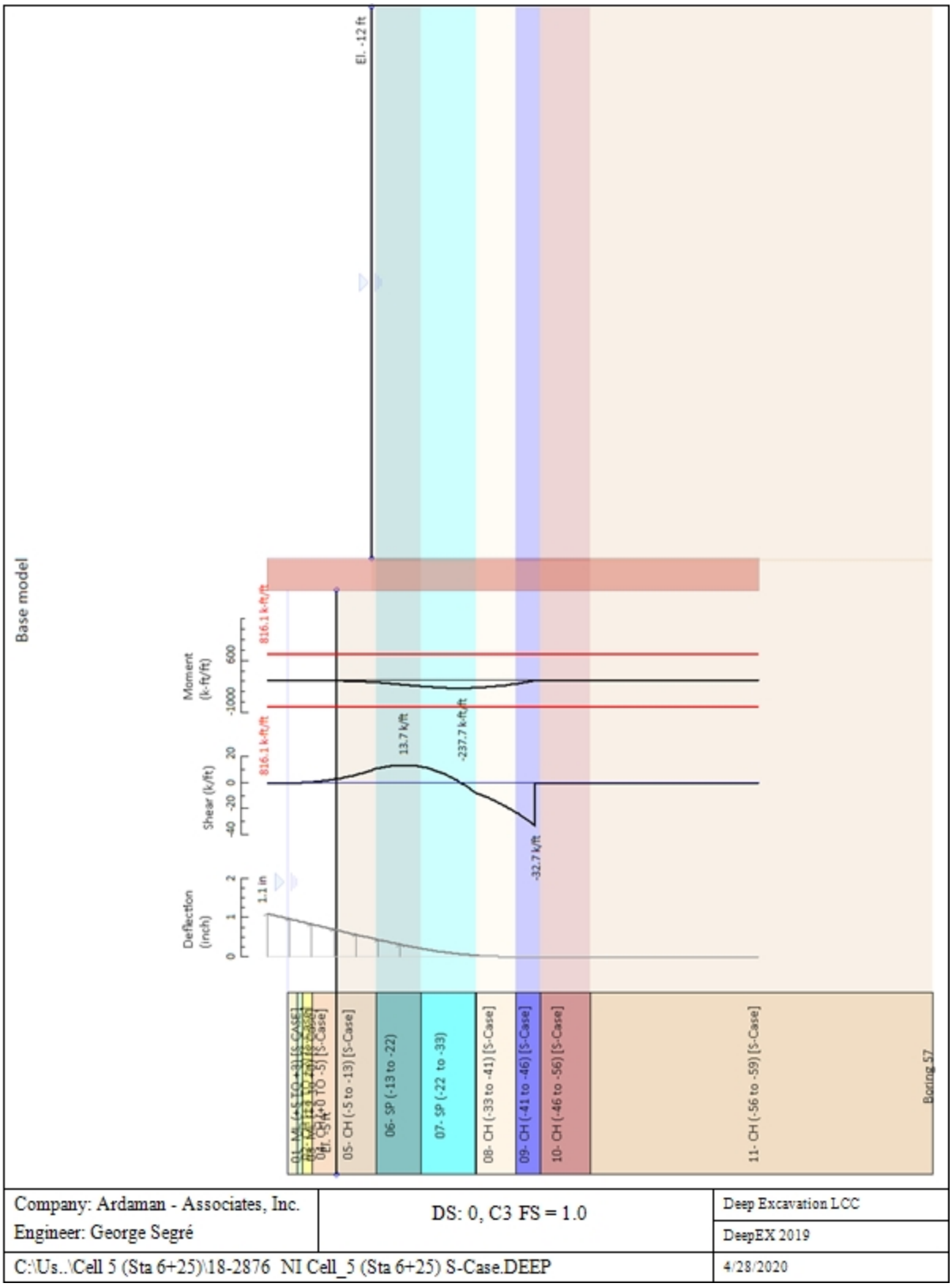


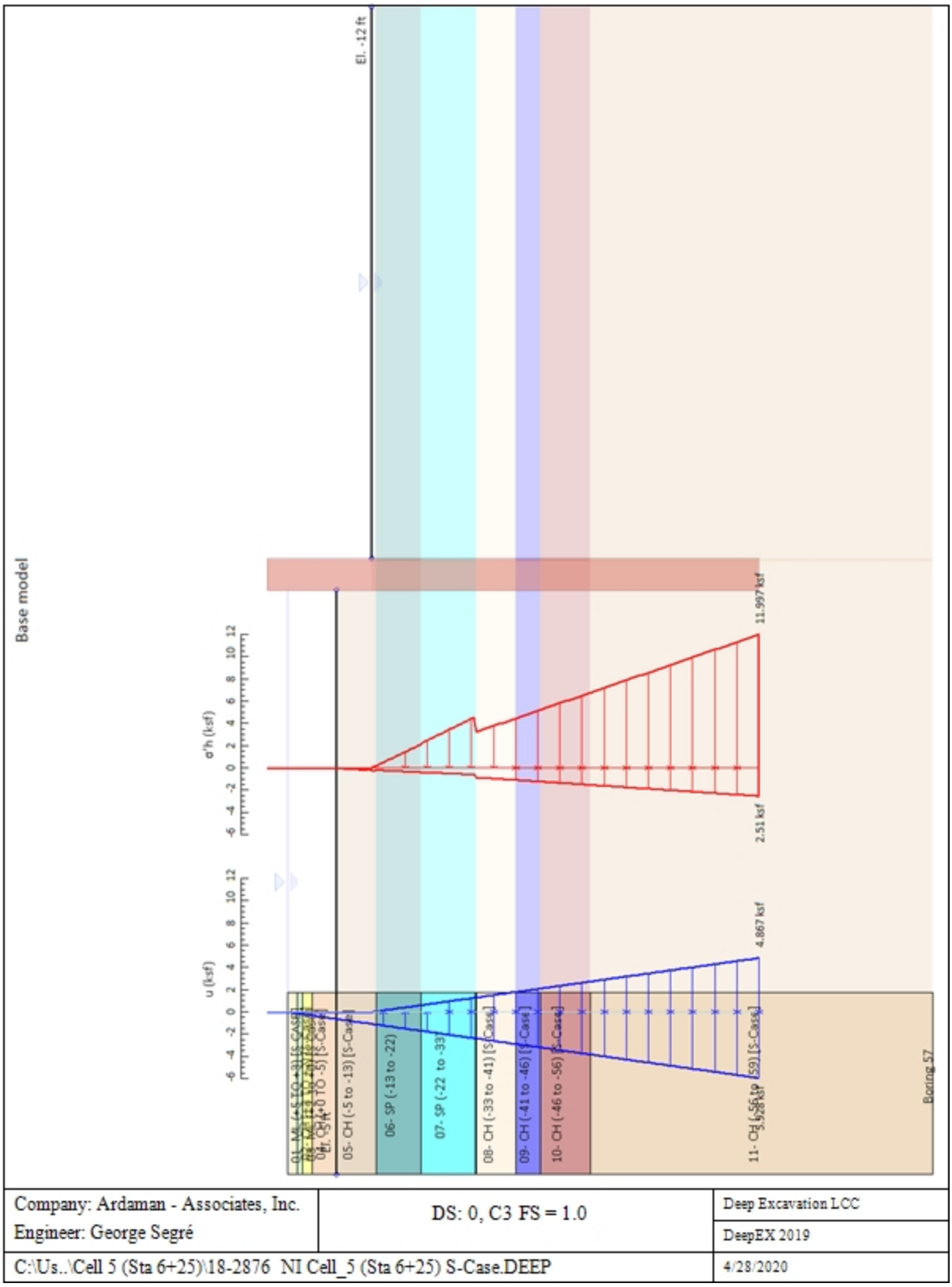

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
19.1 k/ft
-444.9 k-ft/ft
-49.4 k/ft
Deflection (inch)
0 1 2 3 4
3.83 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

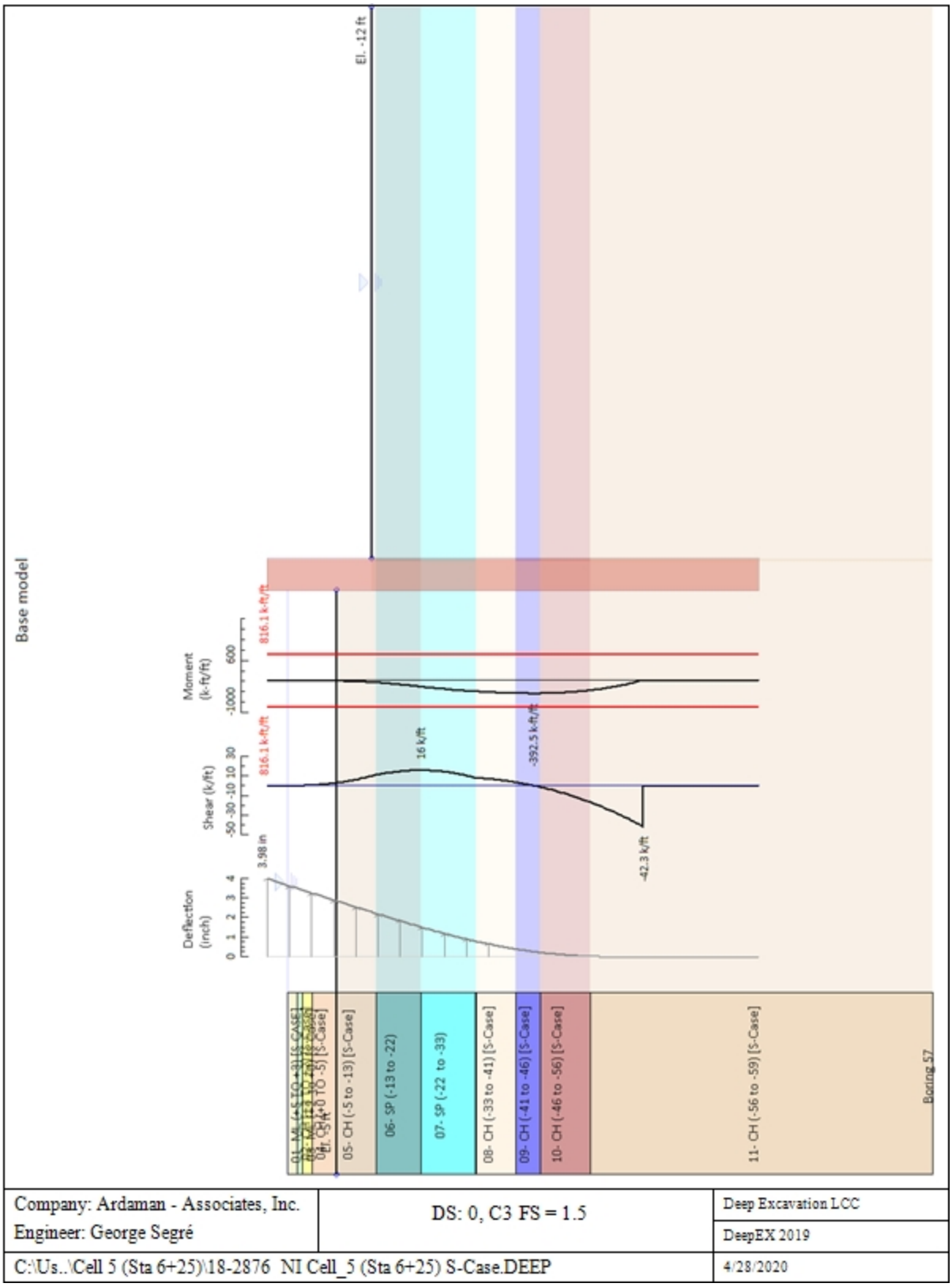


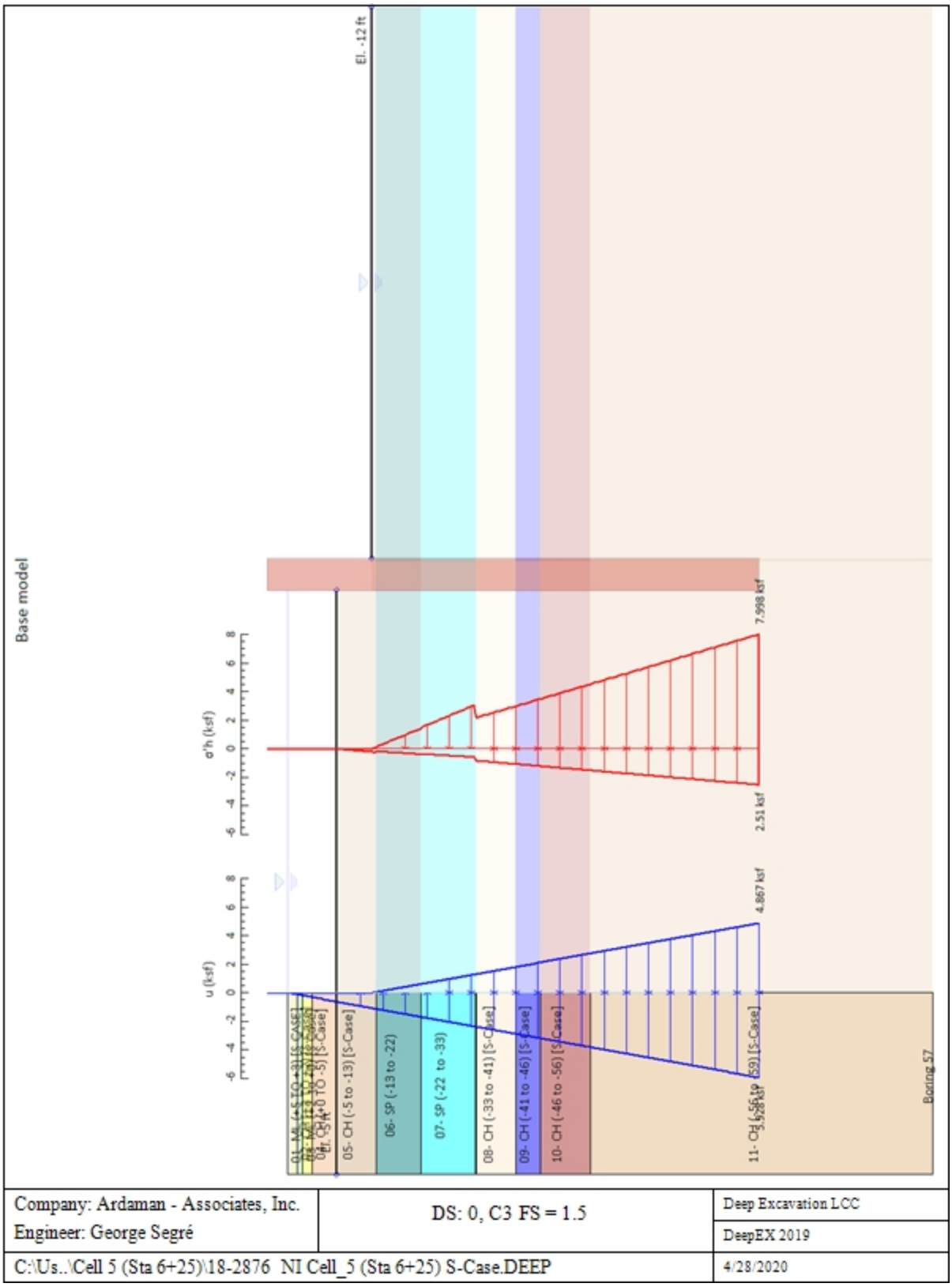

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C2 FS = 1.25 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP | | 4/28/2020 |

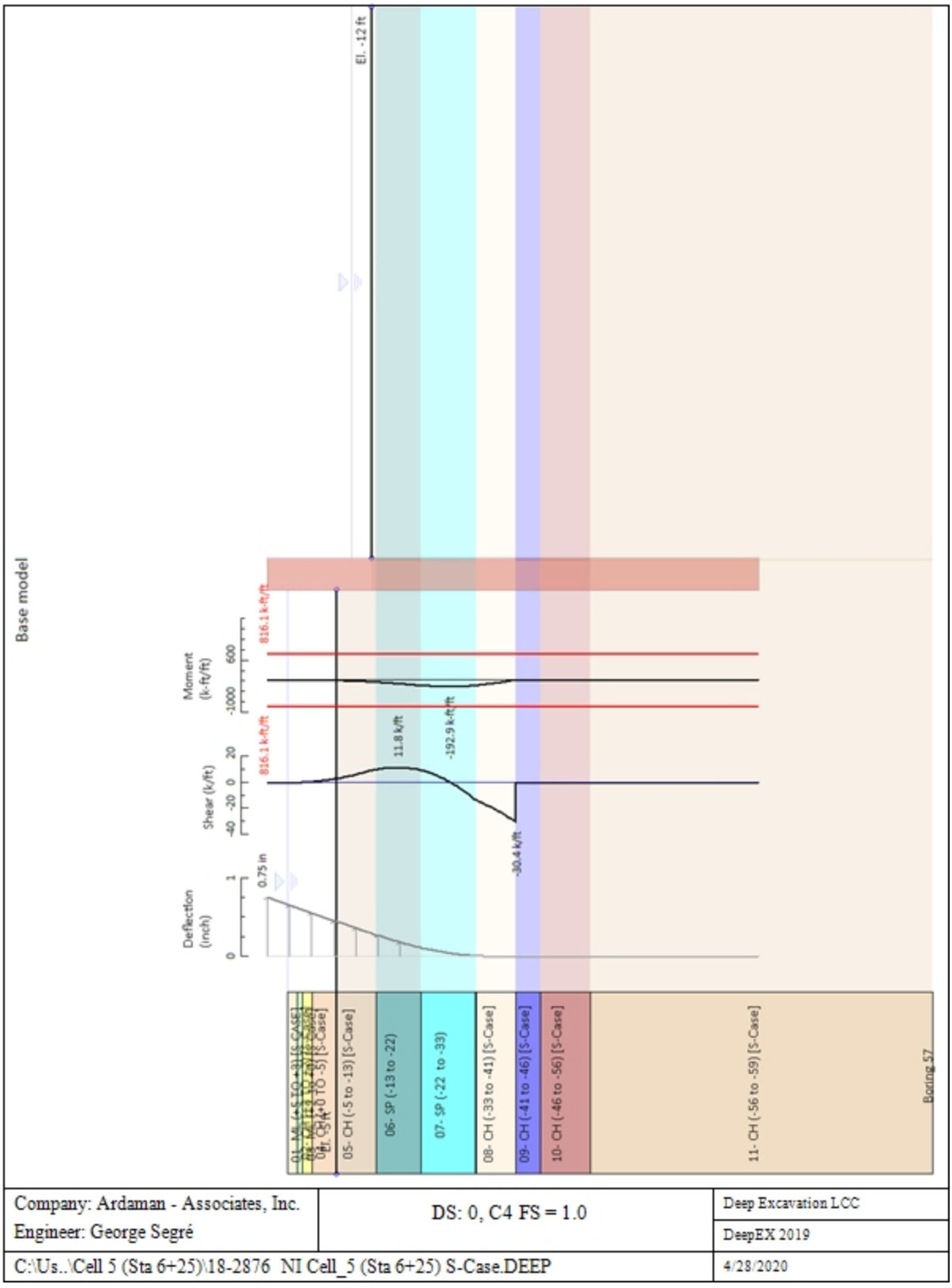

Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
13.7 k/ft
-237.7 k-ft/ft
-32.7 k/ft
Deflection (inch)
0
1
2
1.1 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

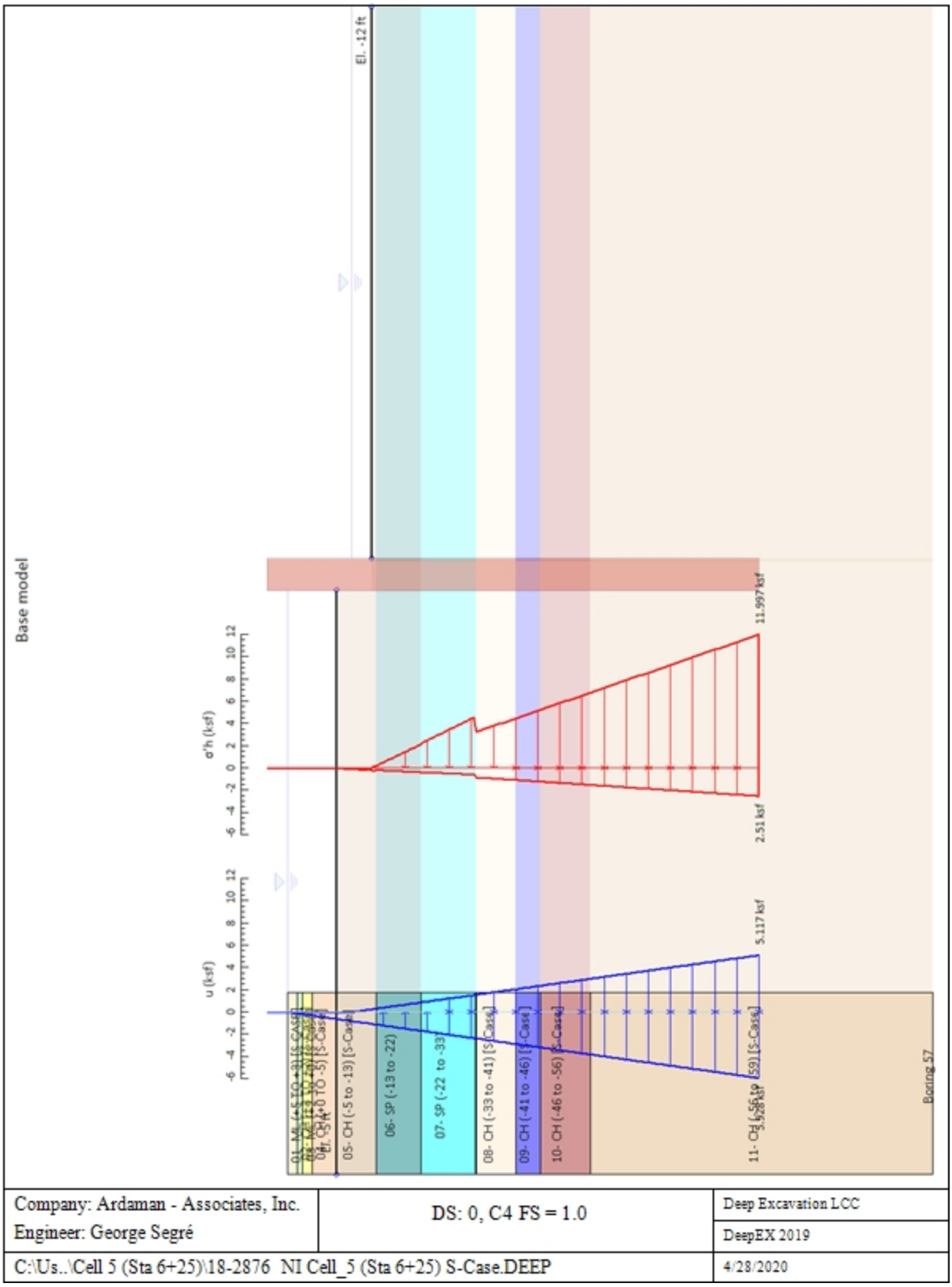


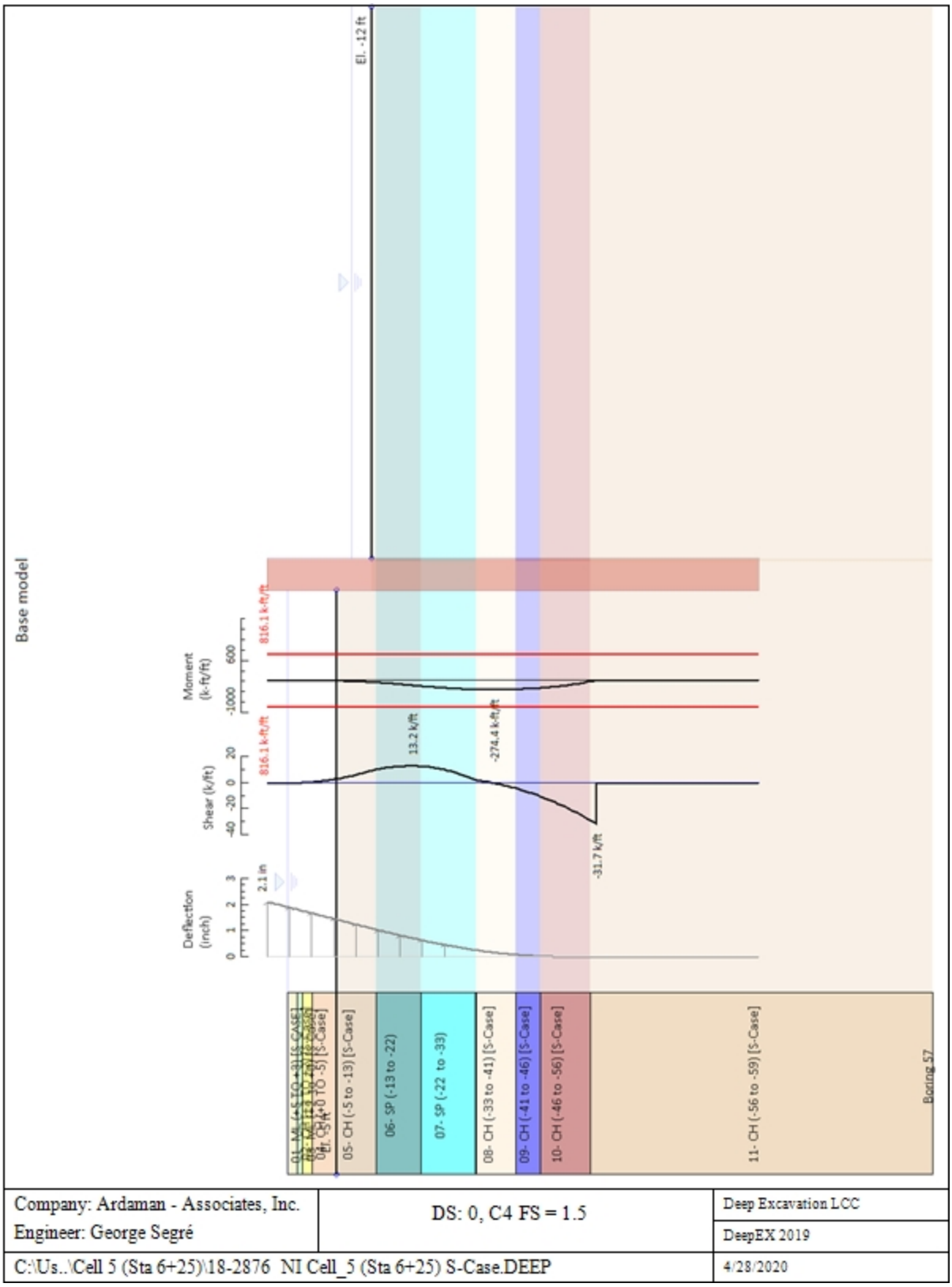

| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C3 FS = 1.0 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP | | 4/28/2020 |


Base model
El. -12 ft
Deflection (inch)
0 1 2 3 4
3.98 in
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
16 k/ft
-42.3 k/ft
Moment (k-ft/ft)
-1000 600
816.1 k-ft/ft
-392.5 k-ft/ft
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

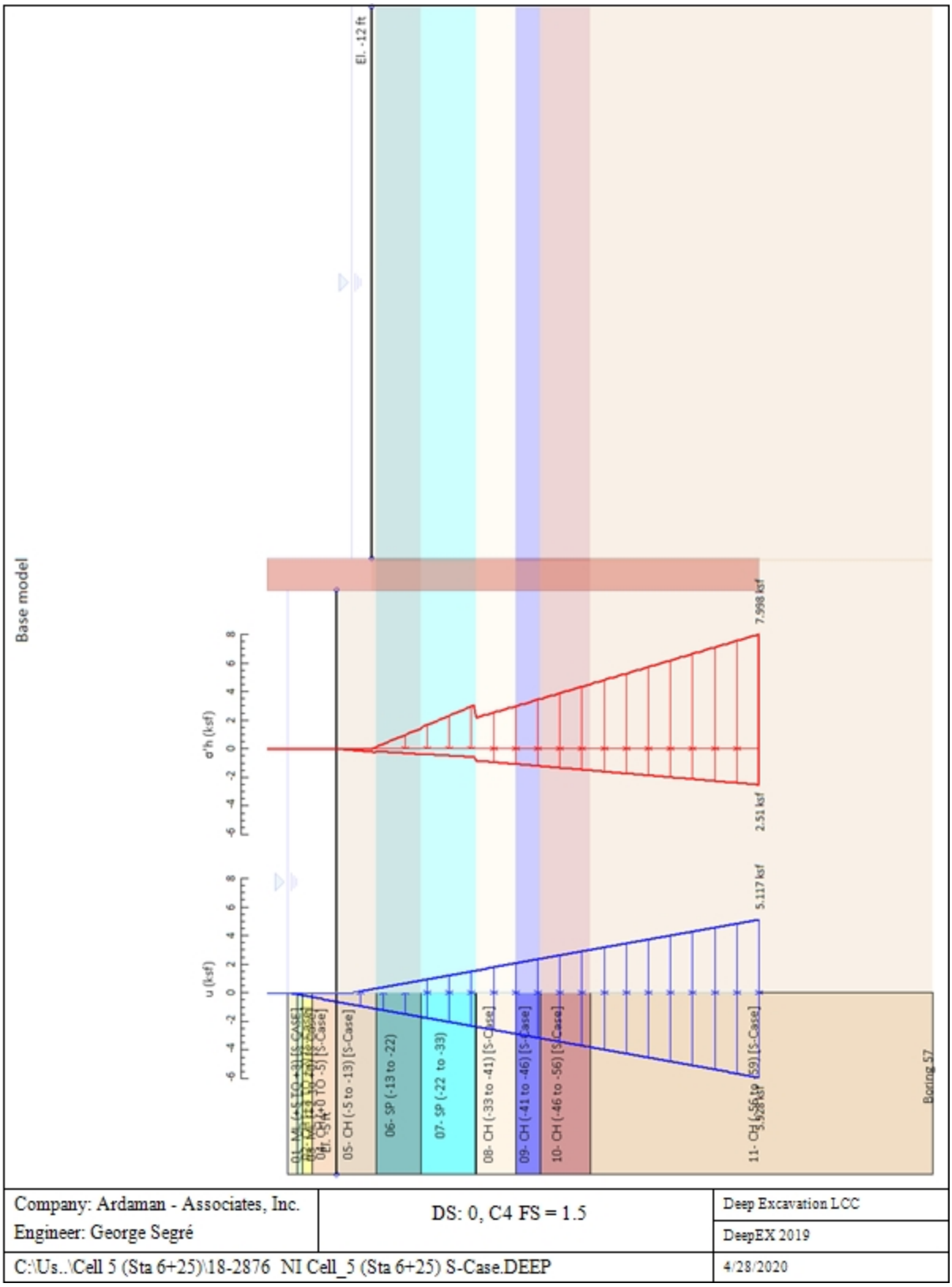

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
7.998 ksf
2.51 ksf
4.867 ksf
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020


Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
11.8 k/ft
-192.9 k-ft/ft
-30.4 k/ft
Deflection (inch)
1
0
0.75 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
11.997 ksf
2.51 ksf
5.117 ksf
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020




Attachment Figure C.5-101




| | | |
|---|---|---|
| Company: Ardaman - Associates, Inc.<br>Engineer: George Segré | DS: 0, C4 FS = 1.5 | Deep Excavation LCC<br>DeepEX 2019 |
| C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP | | 4/28/2020 |

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/30/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D80-42 (SJGB053)

| Depth ft | G-Ls G-Lt | Rult kips | Set inch | BlCt Bl/ft | TopFx kips | MxCS ksi | MxTS ksi | ENTHRU kip-ft | ActRes kips | Stroke ft |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 0.1 | 1.00/1.00 | 0 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 2.0 | 1.00/1.00 | 2 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 2.0 | 1.00/1.00 | 4 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 5.0 | 1.00/1.00 | 17 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 8.0 | 1.00/1.00 | 31 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 8.0 | 1.00/1.00 | 34 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 9.0 | 1.00/1.00 | 37 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 10.0 | 1.00/1.00 | 41 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 10.0 | 1.00/1.00 | 38 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 12.0 | 1.00/1.00 | 47 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 14.0 | 1.00/1.00 | 56 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 14.0 | 1.00/1.00 | 63 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| | Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | |
| 15.5 | 1.00/1.00 | 72 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| 17.0 | 1.00/1.00 | 81 | 7.40 | 1.6 | 3285.2 | 16.088 | 10.982 | 97.9 | 81 | 6.47 |
| 17.0 | 1.00/1.00 | 101 | 6.55 | 1.8 | 3372.8 | 16.517 | 11.011 | 99.9 | 101 | 6.58 |
| 24.5 | 1.00/1.00 | 201 | 3.08 | 3.9 | 3934.6 | 19.295 | 11.565 | 88.4 | 201 | 7.29 |
| 32.0 | 1.00/1.00 | 300 | 1.66 | 7.2 | 4137.3 | 20.324 | 10.888 | 82.4 | 300 | 7.67 |
| 32.0 | 1.00/1.00 | 284 | 1.81 | 6.6 | 4121.5 | 20.220 | 10.934 | 82.7 | 284 | 7.63 |
| 39.5 | 1.00/1.00 | 421 | 1.03 | 11.7 | 4319.1 | 21.221 | 9.820 | 78.6 | 421 | 8.04 |
| 47.0 | 1.00/1.00 | 558 | 0.69 | 17.3 | 4471.3 | 21.981 | 9.190 | 76.5 | 558 | 8.36 |
| 47.0 | 1.00/1.00 | 562 | 0.68 | 17.5 | 4482.8 | 22.014 | 9.174 | 76.5 | 562 | 8.37 |
| 52.0 | 1.00/1.00 | 662 | 0.55 | 21.9 | 4543.7 | 22.323 | 8.780 | 75.2 | 662 | 8.50 |
| 57.0 | 1.00/1.00 | 762 | 0.44 | 27.0 | 4637.2 | 22.768 | 8.442 | 74.7 | 762 | 8.69 |
| 57.0 | 1.00/1.00 | 772 | 0.43 | 27.7 | 4623.5 | 22.781 | 8.451 | 74.7 | 772 | 8.70 |
| 59.5 | 1.00/1.00 | 870 | 0.37 | 32.1 | 4679.5 | 23.040 | 8.633 | 74.2 | 867 | 8.81 |
| 62.0 | 1.00/1.00 | 974 | 0.33 | 36.4 | 4725.1 | 23.198 | 8.675 | 73.4 | 969 | 8.89 |
| 62.0 | 1.00/1.00 | 1003 | 0.31 | 38.8 | 4736.8 | 23.257 | 8.555 | 73.3 | 991 | 8.90 |
| 67.0 | 1.00/1.00 | 1273 | 0.24 | 50.6 | 4821.0 | 23.694 | 8.110 | 72.7 | 1254 | 9.12 |
| 72.0 | 1.00/1.00 | 1567 | 0.21 | 57.8 | 4865.7 | 24.004 | 7.459 | 73.5 | 1545 | 9.25 |
| 72.0 | 1.00/1.00 | 1651 | 0.18 | 66.4 | 4899.5 | 24.078 | 7.180 | 73.8 | 1594 | 9.27 |
| 80.0 | 1.00/1.00 | 2415 | 0.12 | 97.7 | 5010.6 | 24.612 | 4.523 | 75.6 | 2341 | 9.52 |
| 88.0 | 1.00/1.00 | 3267 | 0.08 | 152.3 | 5106.5 | 25.246 | 4.562 | 77.8 | 3181 | 9.81 |
| 88.0 | 1.00/1.00 | 3164 | 0.10 | 125.8 | 5112.3 | 25.167 | 4.852 | 77.6 | 3145 | 9.80 |
| 90.5 | 1.00/1.00 | 3202 | 0.10 | 125.6 | 5128.1 | 25.274 | 6.456 | 77.5 | 3184 | 9.82 |
| 93.0 | 1.00/1.00 | 3241 | 0.10 | 126.0 | 5137.5 | 25.270 | 7.963 | 77.4 | 3222 | 9.84 |
| 93.0 | 1.00/1.00 | 3244 | 0.10 | 126.2 | 5151.7 | 25.268 | 8.000 | 77.5 | 3224 | 9.84 |
| 94.0 | 1.00/1.00 | 3259 | 0.09 | 126.8 | 5125.5 | 25.316 | 8.527 | 77.2 | 3239 | 9.83 |
| 95.0 | 1.00/1.00 | 3275 | 0.09 | 127.5 | 5137.2 | 25.253 | 8.898 | 76.9 | 3254 | 9.83 |

Attachment Figure C.6-1

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/30/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D100-42 (SJGB053)

| Depth ft | G-Ls G-Lt | Rult kips | Set inch | BlCt Bl/ft | TopFx kips | MxCS ksi | MxTS ksi | ENTHRU kip-ft | ActRes kips | Stroke ft |
|---|---|---|---|---|---|---|---|---|---|---|
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 0.1 | 1.00/1.00 | 0 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 2.0 | 1.00/1.00 | 2 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 2.0 | 1.00/1.00 | 4 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 5.0 | 1.00/1.00 | 17 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 8.0 | 1.00/1.00 | 31 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 8.0 | 1.00/1.00 | 34 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 9.0 | 1.00/1.00 | 37 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 10.0 | 1.00/1.00 | 41 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 10.0 | 1.00/1.00 | 38 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 12.0 | 1.00/1.00 | 47 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 14.0 | 1.00/1.00 | 56 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 14.0 | 1.00/1.00 | 63 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 15.5 | 1.00/1.00 | 72 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| 17.0 | 1.00/1.00 | 81 | 10.59 | 1.1 | 3020.0 | 14.845 | 9.958 | 128.9 | 81 | 5.96 |
| 17.0 | 1.00/1.00 | 101 | 9.22 | 1.3 | 3202.1 | 15.762 | 10.444 | 132.3 | 101 | 6.18 |
| 24.5 | 1.00/1.00 | 201 | 3.97 | 3.0 | 3889.9 | 19.229 | 11.826 | 115.9 | 201 | 6.98 |
| 32.0 | 1.00/1.00 | 300 | 2.15 | 5.6 | 4151.5 | 20.582 | 11.409 | 107.0 | 300 | 7.48 |
| 32.0 | 1.00/1.00 | 284 | 2.32 | 5.2 | 4134.3 | 20.480 | 11.469 | 107.9 | 284 | 7.43 |
| 39.5 | 1.00/1.00 | 421 | 1.33 | 9.1 | 4345.4 | 21.593 | 10.378 | 101.2 | 421 | 7.88 |
| 47.0 | 1.00/1.00 | 558 | 0.89 | 13.5 | 4530.3 | 22.520 | 9.456 | 98.6 | 558 | 8.25 |
| 47.0 | 1.00/1.00 | 562 | 0.88 | 13.7 | 4538.2 | 22.526 | 9.449 | 98.6 | 562 | 8.26 |
| 52.0 | 1.00/1.00 | 662 | 0.70 | 17.1 | 4634.3 | 23.021 | 9.148 | 97.4 | 662 | 8.48 |
| 57.0 | 1.00/1.00 | 762 | 0.58 | 20.6 | 4675.5 | 23.351 | 8.918 | 95.6 | 762 | 8.59 |
| 57.0 | 1.00/1.00 | 772 | 0.57 | 21.1 | 4678.4 | 23.372 | 8.878 | 95.6 | 772 | 8.60 |
| 59.5 | 1.00/1.00 | 870 | 0.50 | 23.9 | 4731.2 | 23.604 | 9.038 | 95.2 | 870 | 8.71 |
| 62.0 | 1.00/1.00 | 974 | 0.44 | 27.4 | 4788.8 | 23.839 | 9.111 | 94.6 | 974 | 8.81 |
| 62.0 | 1.00/1.00 | 1003 | 0.41 | 29.1 | 4795.6 | 23.887 | 8.978 | 94.7 | 1001 | 8.83 |
| 67.0 | 1.00/1.00 | 1273 | 0.32 | 38.0 | 4909.4 | 24.408 | 8.624 | 93.8 | 1262 | 9.08 |
| 72.0 | 1.00/1.00 | 1567 | 0.27 | 45.3 | 4982.6 | 24.806 | 8.004 | 93.8 | 1550 | 9.25 |
| 72.0 | 1.00/1.00 | 1651 | 0.24 | 51.0 | 4997.3 | 24.885 | 7.657 | 94.2 | 1608 | 9.29 |
| 80.0 | 1.00/1.00 | 2415 | 0.18 | 68.5 | 5099.4 | 25.416 | 5.067 | 96.5 | 2354 | 9.52 |
| 88.0 | 1.00/1.00 | 3267 | 0.12 | 99.3 | 5167.5 | 25.722 | 3.542 | 98.0 | 3191 | 9.71 |
| 88.0 | 1.00/1.00 | 3164 | 0.14 | 86.5 | 5181.8 | 25.686 | 3.860 | 97.9 | 3148 | 9.70 |
| 90.5 | 1.00/1.00 | 3202 | 0.14 | 87.0 | 5190.5 | 25.709 | 5.181 | 97.9 | 3186 | 9.73 |
| 93.0 | 1.00/1.00 | 3241 | 0.14 | 87.8 | 5199.1 | 25.691 | 6.449 | 97.8 | 3225 | 9.75 |
| 93.0 | 1.00/1.00 | 3244 | 0.14 | 88.0 | 5203.8 | 25.658 | 6.486 | 97.9 | 3227 | 9.75 |
| 94.0 | 1.00/1.00 | 3259 | 0.14 | 88.3 | 5195.0 | 25.693 | 6.948 | 97.8 | 3241 | 9.75 |
| 95.0 | 1.00/1.00 | 3275 | 0.14 | 88.9 | 5208.1 | 25.674 | 7.454 | 97.5 | 3257 | 9.76 |

Attachment Figure C.6-2

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/20/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D80-42 (SJGB057)

| Depth ft | G-Ls G-Lt | Rult kips | Set inch | BlCt Bl/ft | TopFx kips | MxCS ksi | MxTS ksi | ENTHRU kip-ft | ActRes kips | Stroke ft |
|---|---|---|---|---|---|---|---|---|---|---|
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 5.0 | 1.00/1.00 | 6 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 10.0 | 1.00/1.00 | 20 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 10.0 | 1.00/1.00 | 25 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 11.0 | 1.00/1.00 | 30 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 12.0 | 1.00/1.00 | 36 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 12.0 | 1.00/1.00 | 47 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| 19.5 | 1.00/1.00 | 190 | 3.32 | 3.6 | 4030.2 | 19.736 | 11.481 | 89.9 | 190 | 7.24 |
| 27.0 | 1.00/1.00 | 333 | 1.46 | 8.2 | 4338.4 | 21.246 | 10.578 | 82.6 | 333 | 7.78 |
| 27.0 | 1.00/1.00 | 334 | 1.45 | 8.3 | 4315.8 | 21.209 | 10.576 | 82.5 | 334 | 7.78 |
| 33.5 | 1.00/1.00 | 457 | 0.93 | 12.8 | 4512.8 | 22.100 | 9.481 | 79.3 | 457 | 8.13 |
| 40.0 | 1.00/1.00 | 580 | 0.67 | 17.9 | 4675.1 | 22.895 | 8.513 | 77.5 | 580 | 8.42 |
| 40.0 | 1.00/1.00 | 594 | 0.65 | 18.5 | 4678.2 | 22.910 | 8.453 | 77.4 | 594 | 8.44 |
| 42.5 | 1.00/1.00 | 627 | 0.60 | 19.8 | 4679.4 | 22.916 | 8.344 | 76.3 | 627 | 8.42 |
| 45.0 | 1.00/1.00 | 660 | 0.57 | 21.2 | 4700.0 | 23.017 | 8.434 | 76.1 | 660 | 8.49 |
| 45.0 | 1.00/1.00 | 639 | 0.59 | 20.2 | 4693.9 | 22.987 | 8.531 | 76.0 | 639 | 8.47 |
| 54.5 | 1.00/1.00 | 813 | 0.42 | 28.7 | 4863.3 | 23.816 | 8.347 | 75.1 | 812 | 8.79 |
| 64.0 | 1.00/1.00 | 988 | 0.30 | 40.4 | 4985.9 | 24.417 | 8.357 | 74.2 | 984 | 9.04 |
| 64.0 | 1.00/1.00 | 1110 | 0.23 | 53.2 | 4979.3 | 24.469 | 7.890 | 74.4 | 1068 | 9.10 |
| 65.5 | 1.00/1.00 | 1228 | 0.22 | 55.7 | 5020.7 | 24.610 | 7.561 | 74.1 | 1182 | 9.18 |
| 67.0 | 1.00/1.00 | 1348 | 0.20 | 58.7 | 5058.8 | 24.788 | 7.176 | 74.7 | 1299 | 9.24 |
| 67.0 | 1.00/1.00 | 1351 | 0.20 | 58.7 | 5079.2 | 24.874 | 7.166 | 74.7 | 1302 | 9.25 |
| 70.0 | 1.00/1.00 | 1604 | 0.18 | 65.8 | 5142.4 | 25.183 | 6.406 | 75.9 | 1548 | 9.38 |
| 73.0 | 1.00/1.00 | 1869 | 0.16 | 75.1 | 5167.8 | 25.337 | 5.771 | 76.9 | 1805 | 9.50 |
| 73.0 | 1.00/1.00 | 1751 | 0.20 | 61.2 | 5168.3 | 25.317 | 6.120 | 76.8 | 1744 | 9.48 |
| 75.0 | 1.00/1.00 | 1834 | 0.19 | 63.4 | 5196.2 | 25.447 | 6.311 | 77.1 | 1827 | 9.53 |
| 77.0 | 1.00/1.00 | 1920 | 0.18 | 66.0 | 5233.5 | 25.629 | 6.975 | 77.4 | 1913 | 9.57 |
| 77.0 | 1.00/1.00 | 1945 | 0.17 | 68.8 | 5237.4 | 25.648 | 6.902 | 77.4 | 1926 | 9.57 |
| 82.0 | 1.00/1.00 | 2018 | 0.17 | 71.6 | 5277.7 | 25.846 | 8.646 | 77.7 | 1998 | 9.64 |
| 87.0 | 1.00/1.00 | 2091 | 0.16 | 75.2 | 5310.8 | 26.008 | 9.545 | 77.8 | 2072 | 9.70 |
| 87.0 | 1.00/1.00 | 2096 | 0.16 | 75.5 | 5308.9 | 25.999 | 9.498 | 77.8 | 2075 | 9.70 |
| 90.0 | 1.00/1.00 | 2297 | 0.14 | 86.2 | 5315.3 | 26.030 | 9.109 | 77.9 | 2274 | 9.77 |
| 93.0 | 1.00/1.00 | 2505 | 0.12 | 100.2 | 5335.1 | 26.163 | 8.488 | 78.2 | 2481 | 9.83 |
| 93.0 | 1.00/1.00 | 2481 | 0.13 | 95.7 | 5330.9 | 26.151 | 8.559 | 78.2 | 2472 | 9.83 |
| 94.0 | 1.00/1.00 | 2501 | 0.12 | 97.4 | 5364.3 | 26.270 | 8.548 | 78.2 | 2492 | 9.84 |
| 95.0 | 1.00/1.00 | 2521 | 0.12 | 99.3 | 5387.2 | 26.382 | 8.513 | 78.2 | 2512 | 9.86 |

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/20/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D100-42 (SJGB057)

| Depth ft | G-Ls G-Lt | Rult kips | Set inch | BlCt Bl/ft | TopFx kips | MxCS ksi | MxTS ksi | ENTHRU kip-ft | ActRes kips | Stroke ft |
|---|---|---|---|---|---|---|---|---|---|---|
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 5.0 | 1.00/1.00 | 6 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 10.0 | 1.00/1.00 | 20 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 10.0 | 1.00/1.00 | 25 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 11.0 | 1.00/1.00 | 30 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 12.0 | 1.00/1.00 | 36 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| Hammer+Pile Weight > Rult: Pile Runs | | | | | | | | | | |
| 12.0 | 1.00/1.00 | 47 | 39.60 | 0.3 | 0.0 | 0.000 | 0.000 | 0.0 | 0 | 11.25 |
| 19.5 | 1.00/1.00 | 190 | 4.30 | 2.8 | 3858.2 | 19.100 | 11.638 | 117.6 | 190 | 6.92 |
| 27.0 | 1.00/1.00 | 333 | 1.86 | 6.5 | 4212.5 | 20.866 | 10.852 | 106.0 | 333 | 7.59 |
| 27.0 | 1.00/1.00 | 334 | 1.85 | 6.5 | 4211.2 | 20.885 | 10.852 | 106.0 | 334 | 7.60 |
| 33.5 | 1.00/1.00 | 457 | 1.19 | 10.1 | 4392.0 | 21.959 | 9.971 | 101.2 | 457 | 7.97 |
| 40.0 | 1.00/1.00 | 580 | 0.84 | 14.2 | 4551.1 | 22.777 | 9.197 | 98.6 | 580 | 8.29 |
| 40.0 | 1.00/1.00 | 594 | 0.81 | 14.8 | 4553.7 | 22.836 | 9.153 | 98.5 | 594 | 8.32 |
| 42.5 | 1.00/1.00 | 627 | 0.76 | 15.9 | 4594.4 | 22.943 | 9.400 | 97.9 | 627 | 8.40 |
| 45.0 | 1.00/1.00 | 660 | 0.71 | 17.0 | 4625.1 | 23.258 | 9.644 | 98.0 | 660 | 8.48 |
| 45.0 | 1.00/1.00 | 639 | 0.74 | 16.2 | 4616.0 | 23.218 | 9.758 | 97.9 | 639 | 8.45 |
| 54.5 | 1.00/1.00 | 813 | 0.53 | 22.6 | 4731.6 | 23.896 | 9.522 | 95.4 | 813 | 8.70 |
| 64.0 | 1.00/1.00 | 988 | 0.38 | 31.4 | 4844.5 | 24.427 | 9.068 | 93.8 | 986 | 8.95 |
| 64.0 | 1.00/1.00 | 1110 | 0.29 | 41.5 | 4888.5 | 24.574 | 8.500 | 94.0 | 1084 | 9.04 |
| 65.5 | 1.00/1.00 | 1228 | 0.26 | 46.0 | 4919.8 | 24.654 | 8.175 | 93.6 | 1193 | 9.12 |
| 67.0 | 1.00/1.00 | 1348 | 0.25 | 48.2 | 4953.8 | 24.965 | 7.812 | 93.5 | 1310 | 9.20 |
| 67.0 | 1.00/1.00 | 1351 | 0.25 | 48.3 | 4951.7 | 24.951 | 7.805 | 93.4 | 1313 | 9.20 |
| 70.0 | 1.00/1.00 | 1604 | 0.22 | 53.7 | 5007.9 | 25.169 | 6.958 | 94.5 | 1558 | 9.32 |
| 73.0 | 1.00/1.00 | 1869 | 0.20 | 60.2 | 5053.0 | 25.387 | 6.048 | 95.3 | 1815 | 9.42 |
| 73.0 | 1.00/1.00 | 1751 | 0.24 | 51.0 | 5037.2 | 25.287 | 6.462 | 94.8 | 1745 | 9.39 |
| 75.0 | 1.00/1.00 | 1834 | 0.23 | 52.2 | 5057.2 | 25.278 | 6.593 | 95.0 | 1828 | 9.42 |
| 77.0 | 1.00/1.00 | 1920 | 0.22 | 53.4 | 5071.0 | 25.520 | 6.646 | 95.4 | 1914 | 9.46 |
| 77.0 | 1.00/1.00 | 1945 | 0.22 | 55.2 | 5064.5 | 25.531 | 6.566 | 95.4 | 1929 | 9.46 |
| 82.0 | 1.00/1.00 | 2018 | 0.21 | 56.5 | 5106.7 | 25.572 | 7.399 | 95.7 | 2002 | 9.54 |
| 87.0 | 1.00/1.00 | 2091 | 0.21 | 58.4 | 5138.8 | 25.774 | 9.308 | 95.7 | 2075 | 9.59 |
| 87.0 | 1.00/1.00 | 2096 | 0.20 | 58.7 | 5136.1 | 25.792 | 9.310 | 95.7 | 2078 | 9.59 |
| 90.0 | 1.00/1.00 | 2297 | 0.19 | 63.7 | 5159.0 | 25.822 | 9.533 | 95.9 | 2278 | 9.65 |
| 93.0 | 1.00/1.00 | 2505 | 0.17 | 69.7 | 5185.4 | 25.925 | 9.088 | 96.0 | 2485 | 9.69 |
| 93.0 | 1.00/1.00 | 2481 | 0.18 | 67.5 | 5183.2 | 25.895 | 9.137 | 96.0 | 2474 | 9.69 |
| 94.0 | 1.00/1.00 | 2501 | 0.18 | 68.3 | 5184.7 | 25.907 | 9.144 | 96.0 | 2493 | 9.69 |
| 95.0 | 1.00/1.00 | 2521 | 0.17 | 69.2 | 5175.0 | 25.822 | 9.104 | 95.7 | 2513 | 9.70 |

Attachment Figure C.7-2