INDIAN RIVER INLET BRIDGE

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# SITE CHARACTERIZATION AND PRELIMINARY GEOTECHNICAL STUDY

**REPLACEMENT OF 3-156, SR 1 OVER THE INDIAN RIVER INLET**

**DelDOT PROJECT NO. 1204**

**MACTEC PROJECT NO. 3530-03-1245**

**September 26, 2003**

**Prepared By**

MACTEC

**For**

Figg Engineering Group

**In Cooperation With**

DelDOT

# SITE CHARACTERIZATION AND PRELIMINARY GEOTECHNICAL STUDY

# INDIAN RIVER INLET BRIDGE

## SUSSEX COUNTY, DELAWARE

## DelDOT PROJECT NO. 1204

**Prepared for:**

**FIGG BRIDGE ENGINEERS, INC.**
**Tallahassee, Florida**

**MACTEC PROJECT NO. 3530-03-1245.01**
**September 26, 2003**

MACTEC

September 26, 2003

Mr. W. Denney Pate, P.E.
Figg Bridge Engineers, Inc.
424 North Calhoun Street
Tallahassee, Florida 32301

SUBJECT: **Report of Site Characterization and Preliminary Geotechnical Study**
**Indian River Inlet Bridge**
**Sussex County, Delaware**
**MACTEC Project No. 3530-03-1245.01**

Dear Mr. Pate:

MACTEC Engineering and Consulting, Inc. is pleased to present this report of *Site Characterization and Preliminary Geotechnical Study* for the Indian River Inlet Bridge project. This report presents a review of the project information provided to us, a discussion of the site and subsurface conditions, our geotechnical evaluation, and a presentation of ground improvement alternatives. The appendices contain site and boring location plans, estimated subsurface profiles, our laboratory test results, and previous field exploration and laboratory test data.

We have enjoyed working with you on this stage of the project and look forward to continuing to assist you on the remainder of the project. If you have any questions concerning this report, please feel free to call us.

Sincerely,

**MACTEC ENGINEERING AND CONSULTING, INC.**

Andy J. Abrams, E.I.T.
Staff Engineer

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## SUSSEX COUNTY, DELAWARE

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**Tallahassee, Florida**

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# 1.0 INTRODUCTION

## 1.1 GENERAL

The purpose of the Indian River Inlet Bridge project is to replace the existing State Route 1 (SR1) bridge over the Indian River Inlet located in Sussex County, Delaware. The purpose of this study was to collect subsurface information along the planned alignment for use in developing generalized subsurface profiles and performing preliminary engineering analyses. The preliminary evaluations and recommendations developed for this report are based on project information supplied by Rummel, Klepper, and Kahl, LLP (RK&K) and Figg Bridge Engineers, Inc. (FIGG). Additional information was obtained from the Delaware Department of Transportation (DelDOT), including various as-built plans and boring logs for the existing bridge over the inlet. This report contains the results of our subsurface exploration, site characterization, and engineering analyses. Once plans for roadways and bridges are finalized, MACTEC will submit separate comprehensive roadway and bridge structure reports based on the information provided during final design and additional borings and laboratory tests.

## 1.2 SCOPE OF SERVICES

The scope of services for this phase of the project are described in detail in MACTEC's proposal dated February 4, 2003. In summary, the purpose of this study was to supplement existing subsurface information, identify and delineate areas of common geotechnical characteristics, identify areas that may require ground improvement, and provide information for use in preliminary design including foundation alternatives. In order to provide the necessary information to perform these tasks, a total of twelve soil test borings were performed at selected locations along the proposed alignment. In general, these borings were located in areas of geotechnical interest identified from review of existing subsurface data, and in areas of anticipated embankment or pier construction. A laboratory-testing program was also established to characterize the physical and chemical parameters of the subsurface soils.

This report discusses our exploratory and testing procedures, presents our findings and evaluations, and includes the following:

- An overview of the project information provided to us, including a summary of the historical development of the existing bridge over the Inlet.
- A general review of surface topographical features and site conditions.
- A general review of area site and geologic conditions.
- A review of engineering parameters for typical subsurface strata.
- A review of the field exploration and testing procedures.
- A review of the subsurface soil stratigraphy with pertinent available physical parameters, including final logs of our soil test borings.
- The results of laboratory strength, consolidation, index/classification and physiochemical testing on the soil samples obtained.
- A summary review of existing subsurface data in the vicinity of the project.
- A delineation and description of areas of common geotechnical characteristics.
- Generalized estimated subsurface profiles to illustrate subsurface conditions encountered along planned alignment.
- A preliminary evaluation of consolidation settlements and slope stability associated with embankment construction on each side of the inlet.
- Preliminary geotechnical recommendations for bridge pier, abutment, and retaining wall foundations.
- Recommended areas for consideration of ground improvement, including an evaluation of feasible ground improvement methods.

## 1.3 AUTHORIZATION

Our services were provided in general accordance with our Proposal No. 20499-2-6099 dated February 4, 2003 and the Agreement for Subconsulting Services between MACTEC and FIGG dated June 18, 2003. The scope of services developed by MACTEC for the Site Characterization and Preliminary Geotechnical Study phase of this project was authorized by FIGG on June 18, 2003.

# 2.0 PROJECT INFORMATION

## 2.1 PROJECT OVERVIEW

The Indian River Inlet Bridge project consists of replacing the existing SR1 bridge over the Indian River Inlet, and constructing approximately 3,500 feet of new roadway to tie the new bridge into the existing alignment of SR1. The new bridge will be located to the west of the existing bridge, near a prior bridge alignment. The proposed bridge will be a segmental precast concrete, cable-stayed arch bridge with a main span of approximately 1000 feet and two backspans of approximately 150 feet. The new bridge will have two 12 foot travel lanes with 10 foot shoulders in each direction, a 10-foot wide protected sidewalk on the east side, and an 18 foot wide median. The total width of the new bridge will be about 108 feet. Both piers will be located on land, allowing the inlet to potentially be widened to 800 feet in the future. The vertical clearance under the new bridge will be increased to a minimum of 45 feet.

Embankments in excess of 40 feet above existing grade will be required to bring the proposed alignment to final grade. Retaining walls are planned on each side to support the approach embankments and minimize their footprint, reducing the impact to the existing wetlands and park facilities at the site. The proposed walls will have a total length of approximately 3,800 feet, and total a area of approximately 6,700 square yards, distributed on both the north and south sides of the inlet. Also, substantial bridge pier and abutment foundations will be constructed to support the bridge superstructure. The construction sequence for the proposed bridge will be designed to minimize traffic disruptions.

## 2.2 BACKGROUND INFORMATION

We have been provided with portions of the as-built drawings for some of the previous bridge structures which crossed the Indian River Inlet. The sections below describe our understanding of the previous bridges.

### 2.2.1 Previous Structures

1938 Bridge

In 1938, a swing-span bridge was constructed to the east of the bridge existing at that time. This new bridge was supported by twenty-seven piers, both on land and in the Inlet. The piers were founded on timber pile groups, with spacings ranging from 3 feet to 3.5 feet and lengths of approximately 30 feet below the pile caps. This corresponded to an approximate minimum tip elevation of -60 feet. The design load per pile specified on the plans was 18.8 tons. No significant grade changes were made along this alignment of the bridge. The longest span of this bridge was approximately 90 feet, which was the distance from the pivot pier to the rest pier for the swing span. The maximum clearance below this bridge was about 18 feet at low tide.

1963 Bridge

The northbound lanes of the existing Indian River Inlet Bridge were constructed in 1963 as a replacement for the 1938 bridge. This bridge is located to the west of the 1938 bridge. It was supported on four piers, two on land and two in the inlet. The abutments are supported on 12BP63 steel piles and the piers are supported on 14BP89 piles. Battered piles at 4(V):1(H) were installed at the abutments and piers to carry lateral loads. Information regarding design capacities or pile tip elevations was not available. Spans and clearance were not specified in these plans, but are assumed to be similar to that of the 1975 bridge below.

Embankments with maximum heights of approximately 30 feet were constructed to achieve the proposed grade for this bridge. The embankments were constructed to accommodate a future widening on the west side. The plans provided indicate that significant settlements due to the approach fills were anticipated; however, detailed information from the settlement monitoring program was not available.

1975 Bridge

The southbound lanes of the bridge existing today were constructed several years after the northbound lanes, in 1975. It appears that the land based piers of the 1963 bridge were modified or replaced to support the additional lanes. These new piers were founded on groups of 16-inch diameter, cast-in-place (CIP) concrete piles, with spacings ranging from 4 feet to 5 feet, and maximum tip elevations of about -90 feet. The pile groups were capped with a 4 foot thick reinforced concrete slab. Piles on the

perimeter of the groups were installed with a 4(V):1(H) batter. The design load per pile was specified on the plans as 65 tons. No additional grade changes were required for this construction. The longest span of this bridge is approximately 250 feet, along with two spans of about 186 feet, and two spans of about 126 feet. The maximum clearance under the bridge is about 35 feet at low tide.

### 2.2.2 Existing Subsurface Information

Plans for the 1938 bridge include a subsurface profile of eight soil test borings located along the proposed alignment of this bridge. This profile indicates that the subsurface conditions at that location consist of layers of fine to coarse sand from elevations of about +10 feet to -18 feet. One of these borings encountered clay and fine sand beginning at elevation -18 feet and was terminated at elevation -25 feet in that material.

The 1963 plans include a table summarizing information from five soil test borings located in the inlet, west of the bridge. This table indicates a layer of fine sand, approximately 20 feet to 30 feet thick, overlying "organic" clay. No elevation information was included in the table.

The 1975 plans for the existing bridge include boring logs summarizing the information from eighteen soil test borings located along the alignment of the existing bridge. This diagram indicates that the subsurface conditions along this alignment consist of approximately 30 to 40 feet of loose to very dense, fine to coarse sands overlying 25 to 60 feet of very soft to medium stiff "organic" clays and peat, which decrease in thickness to the north. These borings were terminated in dense to very dense, fine to coarse sands and gravels beneath the organic clay layer. The upper boundary between the sand and clay was located from about elevation -28 to -40 feet, while the lower boundary was located from about elevation-65 to -96 feet.

# 3.0 SITE AND SUBSURFACE CONDITIONS

## 3.1 SITE CONDITIONS

Site reconnaissances were performed by MACTEC personnel at various times from February through July 2003 to observe and document site conditions. The site exists on a barrier island bounded by the Atlantic Ocean on the east and Rehoboth and Indian River Bays on the west. This barrier island is part of the 2,825 acre Delaware Seashore State Park. SR1 travels down the barrier island, connecting the towns of Rehoboth Beach to the north, and Bethany Beach to the south. Dunes and beaches dominate the landscape to the east of SR1, while tidal marshes and wetlands are located to the west. Maximum elevations of the natural ground surface across the site likely do not exceed +10 to +15 feet, with typical elevations ranging from about +3 to +8 feet. Several park facilities such as marinas, bathhouses, campgrounds and parking lots, are located around the inlet on both the north and south sides. Paved roadways parallel existing SR1 at about natural grades and provide access to these facilities.

### 3.1.1 North Approach

Existing SR1 on the north side is fairly level and appears to follow natural grades until it encounters the approach embankment north of the existing bridge. This embankment begins at approximately Station 316+00, and rises to approximately 35 feet at its highest point around Station 305+00. West of SR1, an access road runs approximately from Stations 317+00 to 311+00, connecting SR1 with a large paved parking lot. This parking lot extends approximately from Stations 310+00 to 305+00 and provides parking for beachgoers, campers, and the park office. Adjacent to this parking lot to the west is a flat campground. The land between the access road and SR1 is flat, dry, and sandy with short juniper brush and dune grass. Adjacent to the access road and SR1 to the west are wetlands and tidal marshes with tall cattails, grass, and standing water, extending north past the project boundary. East of SR1, the landscape rises with grass-covered dunes that slope down to the east, giving way to beach and ocean.

### 3.1.2 South Approach

Existing SR1 on the south side is also quite level following natural grades until it encounters the approach embankment south of the existing bridge. This embankment begins at approximately Station 285+00 and rises to approximately 35 feet at its highest point around Station 295+00. An access road (Route 50A) runs around the base of the embankment, connecting SR1 with the park facilities on either side of SR1. West of SR1, a dense sand parking lot for the campground runs from approximately Stations 297+00 to 293+00. South of the campground, Route 50A runs through a flat, narrow grassy area approximately from Stations 293+00 to 284+00. Adjacent to Route 50A and SR1 to the west are wetlands and tidal marshes with tall cattails, grass, and standing water, extending south past the project boundary. East of SR1, Route 50A separates SR1 from a paved bathhouse parking lot, located from about Stations 295+00 to 287+00. South of this parking lot, the landscape rises with grass covered dunes that slope down to the east, giving way to beach and ocean.

## 3.2 GEOLOGIC CONDITIONS

### 3.2.1 Regional Geology

The project site is located in the Coastal Plain Physiographic Province. The Coastal Plain consists mainly of marine sediments which were deposited during successive periods of fluctuating sea level and moving shoreline. The formations dip slightly seaward and several are exposed at the surface in bands paralleling the coast. Many beds exist only as fragmental erosional remnants sandwiched between more continuous strata above and below.

The soils in this province are typical of those laid down in a shallow sloping sea bottom; sands, silts, and clays with irregular deposits of shells. Some of the existing formations contain predominantly plastic clays interbedded with strata of sands and poorly consolidated limestone. Others contain predominantly sands and chalky or porous limestone with local lenticular deposits of highly plastic clays.

### 3.2.2 Site Geology

General subsurface information was obtained from a geologic cross section entitled, *Cross Section of Pliocene and Holocene Deposits Along the Atlantic Coast of Delaware*, by Kelvin W. Ramsey in 1999. Based on this cross section, there are three major formations at the site: Holocene alluvial sand deposits, which are underlain by the Omar Formation, which is in turn underlain by the Beaverdam Formation.

The Holocene alluvial deposits at the site consist of fine to coarse sands, silty sands, and thin layers of organic rich silts with abundant plant fragments. The Omar formation consists of lagoonal, tidal, mash, and spit deposits, in which the dominant lithology is gray clayey sand with scattered shell and organic deposits. The Beaverdam Formation was deposited in fluvial to estuarine environments, and primarily consists of fine to coarse sand interbedded with silty sands, and clayey silts.

## 3.3 FIELD EXPLORATION PROGRAM

The field exploration program for Stage I of this project was developed with the intention of characterizing the geotechnical parameters of the subsurface soils at the site such that preliminary foundation alternatives and other potential geotechnical issues could be evaluated. Borings were located along the proposed bridge alignment with two goals in mind: to develop a general stratigraphy of the site; and to gain information about the subsurface conditions at specific locations, such as those for proposed bridge piers and approach embankments. When these locations had been selected, MACTEC reviewed the boring logs for the existing bridge to select appropriate depths for these borings.

### 3.3.1 Soil Test Borings

The field exploration program for this stage of the project consisted of twelve soil test borings, drilled by MACTEC, under the field supervision of a geotechnical engineer from our office. An all-terrain vehicle (ATV) mounted drill rig was used in this program. The drilling operations were performed in general accordance with ASTM standards, as well as those presented in Appendix B. The borings ranged in depth from 70 to 175 feet below existing ground surface. Table 3.3.1.1 presents coordinates and elevations of the as-drilled boring locations.

**Table 3.3.1.1 As-Drilled Boring Coordinates and Elevations**

| Boring ID | Coordinates | | Ground Surface Elevation (feet) | Boring Depth (feet) |
|---|---|---|---|---|
| | Northing | Easting | | |
| BI-1 | 219760.5 | 757236.7 | 2.60 | 105 |
| BI-2 | 219998.6 | 757226.1 | 2.60 | 125 |
| BI-3 | 220224.8 | 757218.9 | 2.46 | 110 |
| BI-4 | 220554.4 | 757158.4 | 2.53 | 115 |
| BI-5 | 220813.1 | 757163.4 | 2.64 | 147 |
| BI-6 | 221218.7 | 757050.7 | 5.57 | 175 |
| BI-7 | 222178.4 | 756953.6 | 5.79 | 175 |
| BI-8 | 222500.1 | 756900.4 | 5.13 | 100 |
| BI-9 | 222755.1 | 756859.4 | 4.55 | 90 |
| BI-10 | 223030.3 | 756807.2 | 3.95 | 70 |
| BI-11 | 223228.3 | 756786.5 | 2.75 | 100 |
| BI-12 | 223554.0 | 756715.4 | 3.46 | 85 |

Standard penetration tests (SPT) were conducted at regular intervals in the borings in general accordance with ASTM D-1586. Continuous sampling was done in certain locations at the requests of John Milner & Associates in order to identify items of potential archeological/historical interest. Fourteen undisturbed samples were taken at various depths, ranging from 30 to 147 feet below existing ground surface.

Visual classification of soil samples was performed in accordance with the Unified Soil Classification System (ASTM D 2488) and AASHTO Classification System (AASHTO M 145). Field classifications were verified by review of the samples brought to our laboratory and by laboratory classification tests.

The subsurface conditions encountered at the boring locations are shown on the soil test boring records in Appendix B and the estimated subsurface profile (Figures 3) in Appendix A. These test boring records and estimated subsurface profiles represent our interpretation of the subsurface conditions based on visual examination of field samples by a geotechnical engineer and laboratory tests of the field samples. The lines designating the interfaces between various strata on the test boring records and profiles represent the approximate interface locations. However, the actual transitions between strata may be gradual. Water levels shown on the soil test borings and the profiles represent the conditions only at the time of our exploration unless otherwise stated.

### 3.3.2 Pressuremeter Testing

Pressuremeter testing was performed by MACTEC at selected locations within the underlying clay layer. Six pressuremeter tests were performed at various depths in the soft clays on both the north and south sides of the inlet, ranging in depth from 33 to 73 feet below existing ground surface. Five of these tests were performed in boring BI-3, and one test in boring BI-10. The procedures used to perform these tests, along with summaries of the test results are presented in Appendix B. The data from these tests will be used in the more detailed settlement and foundation analyses for the final design phase of the project.

### 3.3.3 Ground-Water Monitoring

Monitoring wells consisting of 1.5 inch diameter slotted PVC pipe were installed at four locations across the site: two on the north side of the Inlet, and two on the south side. These wells were installed in or near borings BI-2, BI-6, BI-7, and BI-11. Ground-water measurements were taken in each of these wells after a period of time sufficient for stabilization of the ground-water level. These measurements are given below in Table 3.3.1.2.

**Table 3.3.3.1 Ground-Water Level Measurements**

| Well ID | Date of Reading | Water Level Elevation (feet) | Water Level Depth (feet) |
|---|---|---|---|
| BI-2 | August 2003 | +0.6 | 2.0 |
| | September 2003 | +0.0 | 1.4 |
| BI-6 | August 2003 | +0.1 | 5.5 |
| | September 2003 | +3.1 | 2.5 |
| BI-7 | August 2003 | No Reading | No Reading |
| | September 2003 | +4.7 | 1.1 |
| BI-11 | August 2003 | +1.2 | 1.6 |
| | September 2003 | +0.2 | 2.6 |

## 3.4 LABORATORY TESTING PROGRAM

The laboratory testing performed by MACTEC for this phase of the project consisted of the following tests on samples obtained during our drilling operations.

- Classification and index property tests
- Consolidation testing
- Shear strength testing
- Physiochemical testing

The following paragraphs discuss the four types of laboratory testing performed. The results of the laboratory tests are presented in Appendix C. Brief descriptions of the laboratory test procedures used are also presented in Appendix C.

### 3.4.1 Classification and Index Property Testing

The classification and index property tests were performed on representative soil samples obtained from the test borings in order to aid in classifying the soils according to the Unified Soil Classification System and AASHTO Classification System and to quantify and correlate engineering parameters. Table 3.4.1.1 summarizes the classification and index property tests performed for this phase of the project.

**Table 3.4.1.1 – Summary of Classification and Index Testing**

| Test Description | Number of Tests Performed |
|---|---|
| Water Content | 39 |
| Atterberg Limits (Liquid and Plastic Limits) | 30 |
| Sieve Analysis | 30 |
| Organic Content | 4 |

### 3.4.2 Consolidation Testing

One-dimensional consolidation tests were performed on undisturbed soil samples obtained in borings BI-3 and BI-9. The consolidation tests were performed to evaluate the compression characteristics of the soft clay soils encountered during the exploration under applied vertical stress. The consolidation test data may be used to provide information pertaining to magnitude of settlement, time-rate effects, and past stress history of the soil.

### 3.4.3 Shear Strength Testing

Consolidated-undrained (CU) triaxial shear tests were performed on undisturbed soil samples obtained in borings BI-3, and BI-6. The CU triaxial shear tests were performed to evaluate the stress-strain characteristics and strength values of the soft clay soils encountered during the exploration.

### 3.4.4 Physiochemical Testing

Physiochemical testing was performed on three soil samples obtained from the test borings. The chemical property testing consisted of electrical resistivity and pH tests for use in evaluating the potential corrosivity of the clay soils.

# 4.0 SOIL STRATIGRAPHY

## 4.1 GENERAL

The soil test borings encountered four distinct geologic soil strata within each respective termination depth. The soils encountered on the site consisted of both fine-grained and granular soils of widely varying stiffness and relative density. The following section describes the type and general nature of each stratum.

## 4.2 STRATIFICATION

A review of the general subsurface conditions is presented in the following subsections. This review describes the general characteristics encountered in the borings for the major soil strata.

### 4.2.1 Upper Sands (Stratum 1)

The soils of Stratum 1 are alluvial sand deposits consisting mainly of medium dense to dense fine to coarse sands (SP), and silty sands (SM). These soils were encountered directly beneath the ground surface or a thin layer of topsoil in each boring. Thin, organic-rich silt beds were encountered in various borings. Fine to coarse gravel and shell fragments in varying amounts were common constituents. SPT N-values ranged from 4 blows per foot (bpf) to 97 bpf, and averaged about 30 bpf. Stratum 1 ranged in thickness from about 23 feet to about 46 feet, generally thickening slightly to the north.

Laboratory classification tests were performed on samples obtained from this stratum. These tests indicate that the percent fines ranged approximately from 5 percent to 23 percent, with an average of approximately 12 percent. Natural moisture contents in this stratum ranged approximately from 17 percent to 24 percent, and averaged about 20 percent. Samples tested from this stratum were non-plastic.

### 4.2.2 Soft Clays (Stratum 2)

The soils of Stratum 2 were encountered in each boring beneath Stratum I. These soils are lagoonal, tidal, and/or marsh deposits consisting of dark gray highly plastic clay (CH), lean clay (CL), and elastic silt (MH). Fine to coarse sand, shell fragments, and plant fragments in varying amounts were common constituents. Occasional relatively thin layers of peat were encountered near the bottom of this stratum. SPT N-values ranged from weight of hammer (WOH) to 12 bpf. Typical values ranged from WOH to 4 bpf, except at the far northern portion of the site where higher blow counts were encountered. Stratum 2 ranged in thickness from about 5 feet to about 30 feet on the north side of the inlet tapering out to the north. On the south side of the inlet, the thickness of Stratum 2 was fairly consistent, ranging approximately from 50 feet to 63 feet thick.

Laboratory classification tests were performed on selected samples obtained from this stratum. These tests indicate that the percent fines ranged approximately from 78 percent to 100 percent, with an average of approximately 94 percent. Natural moisture contents in this stratum ranged approximately from 26 percent to 68 percent, and averaged about 54 percent. Liquid limits (LL) in Stratum 2 ranged approximately from 39 to 93, and averaged about 62. Plasticity indices (PI) ranged approximately from 18 to 64, and averaged about 38. Organic content tests performed on samples from Stratum 2 show organic contents ranging approximately from 7 percent to 9 percent, averaging about 8 percent. The organic content of a peat layer encountered near the bottom of Stratum 2 on the north side of the inlet was about 42 percent.

### 4.2.3 Lower Sands (Stratum 3)

The soils of Stratum 3 were encountered in each boring beneath Stratum 2. These soils are fluvial to estuarine deposits consisting mainly of medium dense to very dense fine to coarse silty sands (SM). Thin, beds of sandy silt and clay were encountered in various borings. Fine to coarse gravel and shell fragments in varying amounts were common constituents. SPT N-values ranged from 4 bpf to more than 100 bpf, and averaged about 50 bpf. Each of the borings except BI-5, BI-6, and BI-7 were terminated in Stratum 3.

Laboratory classification tests were performed on selected samples obtained from this stratum. These tests indicate that the percent fines ranged approximately from 6 percent to 23 percent,

with an average of approximately 13 percent. Natural moisture contents in this stratum ranged approximately from 16 percent to 21 percent, and averaged about 18 percent. The samples tested from this stratum were non-plastic.

#### 4.2.4 Sandy/Silty Clays (Stratum 4)

The soils of Stratum 4 were encountered beneath Stratum III in the deeper borings (BI-5 through BI-7). These soils consist mainly of loose to medium-dense clayey sands (SC) and sandy clays (CL). SPT N-values ranged from 1 bpf to 23 bpf, and averaged about 12 bpf. Borings BI-5, and BI-7 were terminated in Stratum 4.

Laboratory classification tests were performed on samples obtained from this stratum. These tests indicate that the percent fines ranged approximately from 32 percent to 72 percent, with an average of approximately 55 percent. Natural moisture contents in this stratum ranged approximately from 16 percent to 27 percent, and averaged about 21 percent. LL values ranged approximately from 23 percent to 33, averaging about 27 percent. PI values ranged approximately from 8 percent to 18, averaging about 13 percent.

# 5.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

## 5.1 FOUNDATIONS

It is anticipated that the proposed bridge piers and abutments will require deep foundations to support the substructure loads due to the compressible clay layer underlying the site. We expect that either drilled shafts or large-diameter driven piles bearing in the dense sands beneath the clay layer will likely be required. Shallow foundations bearing in the upper medium-dense sands of Stratum 1 may be feasible for relatively lightly loaded structures and very low retaining walls. A discussion on various foundation types evaluated as part of this study along with our preliminary geotechnical recommendations is provided in the following subsections.

### 5.1.1 Shallow Foundations

Shallow foundations may be feasible for lightly loaded structures such as those associated with the planned park improvements. Allowable bearing pressures of 2 to 4 kips per square foot (ksf) are feasible for maximum column loads of about 50 to 75 kips. Point loads of this magnitude should be dissipated within the Stratum 1 sands such that no significant increase in stress is incurred within the soft clays of Stratum 2. Footings should bear a minimum of 30 inches below finished grade to minimize the susceptibility to frost action.

It should be noted that grading activities resulting in even relatively minor amounts of fill placement over an extended area could result in significant settlements of the underlying clay layer. These settlements could result in intolerable deflections for structures on shallow foundations, particularly if the thickness of the fill varies across the structure footprint. Similar issues should be considered for retaining walls supported on shallow foundations.

### 5.1.2 Deep Foundations

Drilled shafts and/or driven piles will likely be required for support of the bridge piers and abutments and other heavily loaded structures. In addition, we understand that lateral deflections of up to 6 inches are anticipated at the bridge pier substructures due to shrinkage, creep, and temperature effects and will need to be considered in the final foundation selection for these locations. An evaluation of several different types of deep foundations is provided below.

5.1.2.1 Drilled Shafts

Constant diameter drilled shafts bearing in the dense sands of Stratum 3 are feasible for support of the planned bridge. Allowable drilled shaft capacities were analyzed using the FHWA's 1999 *Drilled Shafts: Construction Procedures and Design Methods* (FHWA-IF-99-025). The computer program SHAFT version 5.0, developed by Ensoft, Inc., was used to evaluate the capacities versus depth for drilled shafts ranging from 4 feet to 8 feet in diameter at each bridge pier location. The results of these analyses are shown graphically on Figures 4 and 5 in Appendix A.

We anticipate that drilled shafts will be constructed using a "wet" or slurry method due to the high ground water and sandy soils at the site. The wet method of drilled shaft construction utilizes a bentonite or polymer slurry to stabilize the shaft excavation prior to concrete placement. Temporary or permanent casing may be installed within the upper zone of the shaft as needed for constructability or other project requirements.

Drilled shaft capacities are greatly affected by construction methodology. Most design procedures, including the FHWA methods, are based on empirical data from load tests of shafts installed with conventional construction methods. Inexperienced contractors and/or poor construction techniques can result in significantly reduced capacities from those calculated by current design procedures. Prequalification and/or minimal experience requirements for drilled shaft contractors should be considered given the complexities and limited drilled shaft experience in this area. Axial load tests should be performed to verify that the contractor's construction methods can produce the required minimum shaft capacities and confirm the design assumptions.

Direct inspection of the shaft excavation is not possible when using the wet method; however, it is possible to use various remote inspection methods to ensure quality construction. We recommend that consideration be given to using a system such as the Shaft Inspection Device (SID) or Mini-SID developed by the Florida Department of Transportation. As with drilled shaft contractors, experienced drilled shaft inspectors are critical to the success of most drilled shaft projects. Procedures for inspecting drilled shaft construction will vary by project depending on construction methodology, the contractor's crew's experience, subsurface conditions, load test results, etc. Therefore, it is important that the drilled shaft inspector be well experienced in various construction methodologies so that the best inspection procedures for this project can be developed to ensure the successful installation of the drilled shafts.

5.1.2.2 Driven Piles

Various driven pile foundation types are also feasible for support of the planned bridge. We have analyzed several different driven pile types for support of the planned piers and abutments. Pile types analyzed include 18 inch and 24 inch square prestressed concrete (PSC) piles, 36 inch to 60 inch diameter concrete-filled steel pipe piles, and 54 inch and 66 inch PSC cylinder piles. These piles were analyzed using the FHWA's 1996 *Design and Construction of Driven Pile Foundations* (FHWA-HI-97-013). The computer program DRIVEN version 1.2, developed by FHWA, was used to analyze the capacity of the piles at various depths within the soil profile.

Plots of capacity versus depth for the various pile types analyzed are provided in Figures 6 and 7 in Appendix A. The capacity plots were "truncated" at the allowable structural capacities of the piles as determined by AASHTO. Note also that these analyses were performed subsurface profiles from the bridge abutments (which are similar to those at the piers) and do not include skin friction above the bottom of the clay layer due to potential downdrag. Some additional capacity from these layers may be available at the pier locations if downdrag forces can be mitigated prior to pile installation.

5.1.2.3 Lateral Loading Considerations

As mentioned above, the pier foundations will be subjected to lateral deflections of several inches due to shrinkage, creep, and temperature changes. The concrete shrinkage, creep and thermal expansion/contraction of the bridge superstructure are expected to induce lateral deflections of up to 6 inches. Shrinkage and creep are expected to contribute to about ½ of the total deflection and will be "set" within a relatively short time after construction. Thermal expansion/contraction, however, will result in cyclical deflections of about 3 inches that will vary with season during the life of the structure.

Lateral deflections of this magnitude will produce large shear forces and bending moments in the pier foundations due to the reaction against the medium-dense sands above the organic clay layer. As such, it may be necessary to design the pier foundations as "flexible" foundations within Stratum 1 to reduce the lateral loads imposed by these conditions.

LPILE Plus 4.0, developed by Ensoft, Inc., was used to estimate the maximum bending moments and shear forces in the shafts due to the anticipated lateral deflections. Soil parameters used for these analyses are presented in Table 5.1.2.3.1.

**Table 5.1.2.3.1 – Preliminary Soil Parameters for Lateral Load Analyses**

| | | Elevations (ft) | | Eff. Unit Wt. (pcf) | Eff. Friction Angle (deg.) | Subgrade Modulus $k_H$ (pci) | Cohesion (psf) | Soil Strain $\varepsilon_{50}$ |
|---|---|---|---|---|---|---|---|---|
| **Soil Layer** | **Side** | **Top** | **Base** | | | | | |
| **Med. Dense Sand (Unsat.)** | NS | +5 | 0 | 125 | 34 | 90 | N/A | N/A |
| | SS | +5 | 0 | | | | | |
| **Med. Dense Sand (Sat.)** | NS | 0 | -15 | 65 | 34 | 60 | N/A | N/A |
| | SS | 0 | -15 | | | | | |
| **Dense Sand** | NS | -15 | -21 | 70 | 38 | 125 | N/A | N/A |
| | SS | -15 | -28 | | | | | |
| **Soft Clay** | NS | -21 | -45 | 40 | N/A | N/A | 250 | 0.02 |
| | SS | -28 | -84 | | | | | |
| **Med. Dense Sand** | NS | -45 | -58 | 60 | 34 | 60 | N/A | N/A |
| | SS | N/A | N/A | | | | | |
| **Dense Sand** | NS | -58 | -125 | 70 | 38 | 125 | N/A | N/A |
| | SS | -84 | -125 | | | | | |

Our preliminary lateral analyses focused on drilled shaft foundations for these piers as these foundation elements lend themselves to creating a "flexible" foundation system as discussed later in this section. A similar approach could be used with concrete-filled pipe piles and the analyses modified appropriately. Shafts of several different diameters were analyzed assuming fixed head conditions and a set deflection of 6 inches. The results of this preliminary analysis for both the north and south piers are given in Table 5.1.2.3.2.

**Table 5.1.2.3.2 – Results of Preliminary Lateral Analysis (Stratum 1)**

| | **Shaft Diameter (ft)** | **Deflection (in)** | **Bending Moment (kip-ft)** | **Shear Force (kips)** |
|---|---|---|---|---|
| **North Pier** | 4 | 6 | 27,900 | 2,650 |
| | 5 | | 39,375 | 3,150 |
| | 6 | | 57,000 | 3,875 |
| | 8 | | 114,250 | 5,900 |
| | **Shaft Diameter (ft)** | **Deflection (in)** | **Bending Moment (kip-ft)** | **Shear Force (kips)** |
| **South Pier** | 4 | 6 | 31,925 | 2,875 |
| | 5 | | 55,000 | 4,225 |
| | 6 | | 75,575 | 5,275 |
| | 8 | | 83,325 | 6,625 |

As discussed previously, it will be necessary to provide some flexibility in the foundation system in order to accommodate the anticipated deflections. One possible solution to the high bending moments and shear forces experienced by these shafts is to drill holes with larger diameters than the shafts in the upper dense sands and fill the resulting space with a low-strength bentonite slurry or similar "weak" material. It is even feasible that this annulus space around the upper portion of the shaft be left open to provide no resistance to lateral deflections within the Stratum 1 sands. This would allow the shaft to deflect without the strong horizontal reaction of the upper dense sands. A schematic of one possible system incorporating this concept is shown in Figure 10 in Appendix A.

Preliminary analyses were performed using LPILE to model this type of configuration. A slurry mixture was assumed to be placed within the annulus space and have a unit weight of approximately 85 pcf with an undrained shear strength of 150 psf. The results of this analysis for both the north and south piers are given in Table 5.1.2.3.3.

**Table 5.2.1.3.3 – Results of Preliminary Lateral Analyses (with Slurry)**

| | **Shaft Diameter (ft)** | **Deflection (in)** | **Bending Moment (kip-ft)** | **Shear Force (kips)** |
|---|---|---|---|---|
| **North Pier** | 4 | 6 | 8,550 | 425 |
| | 5 | | 18,025 | 750 |
| | 6 | | 32,850 | 1,200 |
| | 8 | | 82,725 | 2,675 |
| | **Shaft Diameter (ft)** | **Deflection (in)** | **Bending Moment (kip-ft)** | **Shear Force (kips)** |
| **South Pier** | 4 | 6 | 5,250 | 225 |
| | 5 | | 9,650 | 350 |
| | 6 | | 16,800 | 600 |
| | 8 | | 43,325 | 1,425 |

Copies of the deflection, bending moment, and shear diagrams for these analyses are presented in Appendix D. It should be noted that the results of these lateral analyses provided above are based on analyzing a single shaft and do not include group effects (which will likely increase flexibility) or cap resistance (which may increase stiffness). These items are dependent on the actual group configuration and cap dimensions and can be elevated further once final the final foundation system and configuration are determined.

5.1.2.4 Downdrag Considerations

Settlement due to the approach fills will likely induce downdrag loads on the abutment foundations as the clays compress under the embankment loads. This settlement will also result in relative downward movement of the Stratum 1 sands which could induce significant downdrag loads on the piles. In some cases, downdrag loads may approach the allowable structural capacity of the pile for smaller pile sizes that might be considered.

Several things can be done to reduce or eliminate the effects of downdrag. These might include improving the clay soils in place such that settlements are minimal, allowing the settlements to occur prior to installing the piles, or applying a friction reducer to the piles within the potential downdrag zone. Each of these methods has various pros and cons such as cost, constructability issues, schedule impacts, etc. and will need to be evaluated during final design.

## 5.2 EMBANKMENTS

Placement of large embankments will be required to achieve proposed grades for the approaches on both the north and south sides of the Inlet. These embankments will extend along the centerline of the proposed roadway approximately from Stations 280+00 to 293+60 on the south side of the Inlet, and Stations 306+40 to 320+00 on the north side of the Inlet. The embankments will be approximately 40 feet high near the abutments, and will decrease in height with distance away from the Inlet. The width of the footprint of the embankments will likely be in excess of 100 feet (perpendicular to the proposed centreline) along their entire length.

### 5.2.1 Embankment Settlements

These large embankments are expected to induce significant consolidation settlements in the soft clays below. Laboratory tests were completed to estimate the compressibility and consolidation characteristics of the clays. Preliminary settlement analyses were completed using the results of this data. Copies of our analyses are presented in Appendix D. Assuming that regular weight fill material is used in the embankments, our preliminary analyses indicate that maximum consolidation settlements of approximately 30 inches and 55 inches may be possible on the north and south sides of the inlet, respectively.

These estimates represent locations near the abutments on each side of the Inlet, and reflect a combination of largest the embankment heights, and thickest clay sections anticipated. The magnitude of the estimated settlements decrease with distance away from the Inlet, as the embankments decrease in height, and/or the thickness of the clay layer decreases. Table 5.2.1.1 summarizes the results of these analyses. Plots showing the variation of the estimated settlements with Station and embankment height, on both the north and south sides of the inlet, are given in Figures 8 and 9, respectively.

**Table 5.2.1.1 – Summary of Settlement vs. Station**

| Location | Station | Nearest Boring | Embankment Fill Height (ft) | Estimated Consolidation Settlement (in) |
|---|---|---|---|---|
| South Approach | 281+04 | BI-1 | 3 | 7 |
| | 283+42 | BI-2 | 5 | 12 |
| | 285+67 | BI-3 | 12 | 24 |
| | 289+02 | BI-4 | 25 | 43 |
| | 291+58 | BI-5 | 35 | 55 |
| | 293+00 | BI-5/BI-6 | 38 | 54 |
| | 293+60 (South Abutment) | BI-5/BI-6 | 40 | 34 |
| North Approach | 306+40 (North Abutment) | BI-7/BI-8 | 40 | 18 |
| | 307+00 | BI-7/BI-8 | 40 | 29 |
| | 308+64 | BI-8 | 35 | 31 |
| | 311+23 | BI-9 | 25 | 13 |
| | 314+02 | BI-10 | 12 | 4 |
| | 316+02 | BI-11 | 5 | 1 |
| | 319+35 | BI-12 | 3 | <1 |

### 5.2.2 Time Rate of Consolidation

Due to the highly plastic nature of these clays, the full magnitude of the anticipated settlements may take years to occur unless some form of ground improvement is employed. Our preliminary analyses indicate that if regular weight fill material is used in the embankments, and no form of ground improvement is employed, it may take as much as 30 years and 40 years for 90 percent of the estimated settlements to occur, still leaving several inches of settlement beneath the highest portions of the embankments.

Cohesive soils are known to exhibit creep, or secondary compression, which is a continuous compression under sustained load following the dissipation of excess pore pressures. The mechanisms of secondary compression are not fully understood, but are believed to be at least partially associated with reorientation of clay particles over time. The rate of secondary compression is generally non-linear and decreases over time; however, this phenomenon can result in significant post-consolidation settlements of soft and/or organic cohesive soils. Consolidation test results indicate that secondary compression could account for as much as 3 inches of additional settlement over a 20 year period following the end of primary consolidation.

In these preliminary analyses, the assumption was made that the consolidating layers are homogeneous and isotropic. The presence of thin sand layers, which can sometimes be missed by standard penetration testing, can greatly increase the rate of consolidation. In addition, sedimentary soil deposits often exhibit increased hydraulic conductivity in the horizontal direction as compared to the vertical direction due to layering effects. These anisotropic properties can also result in settlements that occur faster in the field than anticipated from one-dimensional laboratory consolidation tests.

### 5.2.3 Slope Stability

MACTEC has not been provided with cross sections at this time and as such has not performed detailed slope stability analyses. However, we anticipate that the embankment fills will consist of sandy soils from nearby borrow sites that are similar in nature to the sands of Stratum 1. These soils should be stable at slopes no steeper than 2(H):1(V). Given the sandy nature of these soils, they will likely be highly susceptible to erosion and some localized sloughing may occur until adequate vegetation is established. If space allows, it may be more desirable to construct slopes at 3(H):1(V) or flatter to facilitate vegetation growth and ease of maintenance.

## 5.3 RETAINING WALLS

Retaining walls will be used to provide support for approach embankments and to minimize encroachment into the wetlands on the west side and park areas on the east side of the proposed alignment. The heights of the retaining walls, like the embankments which they support, are expected to be approximately 40 feet tall at their highest point. On the west side of the proposed alignment, the walls will be located approximately from Stations 284+50 to 293+50 south of the inlet, and Stations 306+50 to 315+50, north of the inlet. Locations of the retaining walls on the east side of the proposed alignment are not definite at this time, but are expected to be similar in length and height.

### 5.3.1 Cast-In-Place Walls

Due to the magnitude of the anticipated settlements, CIPC walls at this site will likely require pile support in order to accommodate the anticipated total and differential settlements. Preliminary analyses were performed for both 14-inch square pre-stressed concrete (PSC) piles and 14-inch diameter concrete-filled steel Monotube piles. A safety factor of 2.25 was used to estimate the allowable pile capacities, which assumes that dynamic load testing will be performed to verify design capacities. An elevation of +5 feet above mean sea level was assumed for the existing ground surface at the site. The results of the preliminary foundation analyses are summarized in Table 5.3.1.1 below.

**Table 5.3.1.1 – CIPC Wall Foundations Analyses**

| | North Walls | | South Walls | |
|---|---|---|---|---|
| | **PSCP** | **Monotube** | **PSCP** | **Monotube** |
| **Estimated Tip Elevation (feet)** | -85 | -70 | -95 | -90 |
| **Allowable Working Capacity (tons)** | 90 | 90 | 90 | 90 |

The allowable capacities and estimated tip elevations shown in Table 5.3.1.1 include estimated downdrag loads. Measures can be taken to reduce these downdrag forces, such as sheathing the piles with larger diameter pipe piles in the dense upper sands, or coating the piles with a material to reduce friction on the soil-pile interface.

If CIPC walls are used in the support of the embankments, they will need to be constructed prior the placement of the embankments. In this case, the full magnitude of the anticipated settlements will occur after the piles are driven. This will also likely result in the mobilization of the large downdrag loads expected.

### 5.3.2 MSE Walls and Reinforced Soil Slopes

It appears that mechanically stabilized earth (MSE) walls will likely be a more economical and desirable alternative to CIPC walls at this site. MSE walls are relatively flexible systems that can withstand significant total settlements and differential settlements as compared to other structures. Walls can normally withstand differential settlements of 2 inches in 100 feet without any special measures. Differential settlements of 2 to 6 inches per 100 feet are often accommodated using slip joints at regular intervals along the wall. When differential settlements exceed 6 inches per 100 feet, a two-stage construction sequence is often employed. In this two stage construction program, the embankments are typically constructed with a temporary wire wrap facing to provide a flexible facing system during consolidation of the soft clay layer. A permanent wall facing is then installed after settlements occur thus limiting the potential for damage to the facing.

MSE walls can be constructed on the existing Stratum 1 soils and will not require deep foundations for support. Also, wick drains, or other ground improvement methods may be employed to accelerate the consolidation process. Depending on the settlement profile, a two-stage construction program may be preferable, particularly on the north side where the compressible clay layer tapers out as the embankment fill height decreases.

Steepened reinforced soil slopes (RSS) may also be feasible for the approach embankments where sufficient right of way or clearance is available. RSS can be constructed as steep as 70 degrees; however, typical slopes are 0.7(H):1(V) to 1.5(H):1(V). Since RSS have flexible facings, these structures can withstand significant total and differential settlements. Additionally, installed unit costs are typically significantly less than CIPC and MSE walls. As such, RSS slopes may be viable options where sufficient space is available for steepened slopes but not for conventional embankments.

## 5.4 EVALUATION OF GROUND IMPROVEMENT ALTERNATIVES

As discussed, significant settlements are anticipated along the planned roadway alignment due to embankment loadings. The magnitude and duration of these settlements will likely require some form of in-situ ground improvement in order to minimize the potential impacts on the project. Several methods of ground improvement are feasible for the site and are discussed briefly in the following subsections.

### 5.4.1 Prefabricated Vertical Drains/Surcharging

Prefabricated vertical (PV) drains, or wick drains, are thin rectangular plastic strips surrounded by a geotextile filter fabric. These strips are inserted vertically into and through compressible cohesive soil deposits to provide significantly shortened drainage paths that can greatly accelerate consolidation settlements. PV drains are typically about 4 inches wide by ½ inch thick. The plastic core contains channels or ridges that allow water to flow freely from the clay layer to more permeable layers above and/or below. The drains are typically installed in triangular or rectangular patterns beneath embankment fills. Drain spacing ranges from about 3 to 12 feet; however, spacings of 4 to 6 feet are most common. The PV drains do not directly provide additional strength to the soft compressible layer; however, they do significantly speed up consolidation time and the resulting increase in strength of the layer following the dissipation of excess pore water pressures.

Surcharging is the process of loading the compressible soils above the final service loads, usually by temporarily increasing the height of the embankment fill. It is often used in conjunction with PV drains to provide additional speed to the consolidation of the compressible layer. Surcharging has the added benefit of allowing the compressible soils to be overconsolidated (if desired) so that settlements upon reloading will generally be less than virgin compression. Surcharging also reduces long-term secondary compression since the sustained embankment loads are somewhat less than the new preconsolidation pressure of the compressible layer.

PV drains and surcharging are typically a very economical ground improvement method. PV drains can typically be installed for $0.50 to $0.75 per foot, although predrilling through the upper sands at this site may increase the unit costs slightly. Since most surcharging is performed

using soil or aggregate, the unit costs are typically similar to regular embankment fill or select backfill material. At times it might be desirable to reinforce the surcharge soils with geosynthetics or wire mesh in order to construct steep (or near vertical) slopes to maximize load and/or minimize footprints.

### 5.4.2 Lightweight Fill

Lightweight fill materials are sometimes used to reduce embankment loads and thus reduce ultimate settlements. Three types of lightweight fill are typically used in roadway construction. Expanded polystyrene (EPS), or Geofoam, consists of synthetic blocks of material with typical dimensions of approximately 3 feet wide by 6 feet long by 1 ½ feet thick, although blocks can be fabricated or cut to any size required. Typical unit weights are on the order of 2 pounds per cubic foot (pcf), thus making the material buoyant when submerged in water. Given the high ground water level, close proximity to the ocean, and potential for tidal surges, we do not recommend using this material within the planned roadway embankments.

Foamed concrete (e.g., Elastizell) consists of low-density cellular concrete produced by adding foam to the cement mixing water. Placement of this material requires the use of forms until the concrete has gained sufficient strength to stand alone. Typical unit weights range from about 20 to 30 pcf, and typical prices range from about $50 to $75 per cubic yard. This material may lose some of its lightweight benefits if the voids in the concrete become saturated with water over time.

Lightweight aggregate, or expanded shale and clay, is often used as a lightweight fill material. It is created by exposing shale or clay particles to extremely high temperatures in a rotary kiln. This process results in the dehydration of the clay particles and the creation of a lightweight aggregate that will not rehydrate under normal conditions. Typical unit weights for these materials range from about 50 to 65 pcf, and typical costs range from about $40 to $50 per cubic yard.

### 5.4.3 Stone Columns

Stone columns, or vibro-replacement, have been successfully used on numerous projects to improve and stabilize subsurface soils for new embankments. The columns are installed a using down-hole vibrating probe that is inserted into the ground with the help of high-pressure water

jets. Typically a uniformly graded aggregate is introduced into the hole from the surface as the probe is slowly retracted and reinserted into the recently placed aggregate. Stone columns have the combined benefit of providing immediate strengthening of the compressible soil layer as well as accelerated dissipation of excess pore pressures due to embankment loading. The jetting process does create some spoils and can potentially impact nearby structures if not adequately controlled. Unit prices for stone columns can run $15 to $20 per linear foot or more depending on availability of suitable backfill material. In addition, specialized equipment is needed to install the columns and may result in very high mobilization charges on top of the unit prices.

### 5.4.4 Jet Grouting

Jet grouting is another method of improving soft soils. The process involves using high-pressure water jets to break down the existing soil structure and replace the material with a soil-cement grout. The method has the advantage of relatively quick strength increase and settlement reduction within the compressible clay layer. Costs are relatively high at around $50 to $100 per cubic yard of material treated. Also, like stone columns, jet grouting requires specialized equipment which could result in very high mobilization costs.

### 5.4.5 Other Ground Improvement Methods

Several other less-common ground improvement methods that may be technically feasible at this site are described briefly below. These methods typically have very high costs per area of treatment and are generally less economical than the methods presented above.

- Deep Soil Mixing (DSM) – Deep soil mixing is a process of mixing lime or cement with in-situ cohesive soils to create columns of strengthened material within the compressible layer matrix. The methods were developed in Europe and Japan and have been slowly introduced in the United States over the past decade. High mobilization costs and limited experience often make this method not practical for many sites.

- Vacuum Consolidation – Vacuum consolidation is a method of applying an effective surcharge to a compressible soil layer through the use of vacuum pressure. The method is similar to surcharging with PV drains; however, an impermeable membrane is placed over the ground surface prior to placement of embankment fill. The purpose of the membrane is to allow a vacuum to be established beneath the membrane to create a negative air pressure and thus increase the effective stress on the compressible soil layer. PV drains within the compressible layer provide shortened drainage paths and thus speed up the consolidation process. Slurry

trenches can be used in conjunction with the membrane to create a zone that can maintain the required vacuum sandy soils overlie the compressible layer. The method has the benefit of being able to apply significant surcharge loads to induce settlements and/or preconsolidate the compressible layer without the need to construct embankments higher than required for final design.

- Electro-osmosis – Electro-osmosis involves inducing a direct current between two probes in the soil in order to attract the mobile cations in the pore water of the compressible layer toward the cathode. This water removal results in an increase in effective stress within the clay layer. Use of this system could be limited due to high cation concentrations in the ground water caused by infiltration from the ocean.

### 5.4.6 Preliminary Ground Improvement Recommendations

Based on our experience and understanding of the project requirements, we anticipate that the most effective and economical ground improvement systems will include PV drains and surcharging. For preliminary evaluation purposes, we have analyzed the impacts of using wick drains at 5-foot spacing. Surcharge loads of 8 feet at the highest points of the embankment and tapering to about 2 feet near the lowest points were considered. Both regular and lightweight aggregate fill were evaluated for use as embankment fill materials. The results of these analyses are presented in Appendix D and graphically in Figures 8 and 9 in Appendix A. As can be seen in Figures 8 and 9, embankment settlements for lightweight aggregate fill are still substantial and thus the additional costs of using this material are likely not justified.

Our preliminary analyses also included an evaluation of the potential improvements in the time rate of consolidation by use of PV drains and surcharging. These analyses were completed for locations near each of the abutments where settlements are expected to be the largest. The results of these analyses are shown graphically in Appendix D and summarized in Table 5.4.6.1 below.

**Table 5.4.6.1 – Summary of Time Rate of Consolidation Analyses**

| Condition | Estimated Time for Consolidation to Reach 1 inch or Less Remaining Settlement (months) | |
|---|---|---|
| | Station 308+64 | Station 291+58 |
| Regular Fill | 200 | 930 |
| Lightweight Fill | 170 | 800 |
| Regular Fill + Surcharging | 100 | 430 |
| Lightweight Fill + Surcharging | 70 | 280 |
| Regular Fill + Surcharging + PV Drains | 9 | 10 |
| Lightweight Fill + Surcharging + PV Drains | 6 | 6.5 |

As shown, the use of PV drains and surcharging can greatly reduce the time necessary for the compressible clay layer to consolidate under planned embankment loads. Based on our review of the subsurface profile along the approach embankments, it appears that PV drains and surcharging should be performed beneath the entire south approach fill and from the north abutment to about Station 314+00on the north side approach. The time required to complete primary consolidation will vary depending on the height of the fill, surcharge load, and thickness of the underlying clay layer. Details of the PV drain and surcharging program will be determined in conjunction with RK&K as the roadway design progresses.

Assuming that this method of ground improvement is chosen, a detailed instrumentation and monitoring program will need to be developed so that adequate data can be obtained to assess the degree and rate of consolidation during construction. Detailed recommendations for the instrumentation and monitoring of the ground improvement program will be provided in our final geotechnical report for the planned roadway sections.

# 6.0 RECOMMENDED ADDITIONAL STUDIES

## 6.1 GENERAL

The purpose of this study was to provide general subsurface information for evaluation and consideration of various foundation and ground improvement alternatives and to provide preliminary geotechnical recommendations for design. This study was performed prior to final decisions being made regarding roadway alignment, profile, bridge foundations, retaining wall and drainage structures, etc. in order to assist the design team and owner in better evaluating the feasibility of several alternatives. A final geotechnical exploration will be performed to detailed design recommendations for the roadway and bridge that will address actual design configurations. We anticipate that this final report will include additional studies as described below.

## 6.2 ADDITIONAL FIELD EXPLORATIONS

The final geotechnical exploration should include additional soil test borings and in-situ tests to further characterize the subsurface conditions for use in final design of the bridge, roadway, and associated structures. We anticipate that the field testing program will include the following:

- Soil test borings – used to evaluate in-place densities/consistencies of soils, obtain samples for laboratory testing, and provide empirical data for use in design.
- Cone penetration test soundings – used to obtain continuous profiles and in-situ pore-pressure dissipation data from the compressible clay layer and provide data for design of bridge foundations.
- Field vane shear testing – used to provide in-situ shear strength data for clay layers underlying site for use in foundation and global stability analyses.

Additional field and laboratory testing should be performed at regular intervals at bridge substructure elements, along the planned roadway alignment, at planned embankment fill location, for retaining walls and drainage structures,

## 6.3 CONSOLIDATION CHARACTERISTICS OF COMPRESSIBLE LAYER

Additional evaluations of the compressible clay layer should be performed to better determine the compressibility and time-rate characteristics. The preliminary analyses assumed that this material is a homogeneous, isotropic material. However, experience generally indicates that alluvial clay deposits such as these often have thin lenses of silt or sand that can greatly decrease estimated

settlement times. In addition, properties such as hydraulic conductivity are not isotropic for sedimentary deposits as horizontal hydraulic conductivity values are often significantly higher than vertical values due to layering and other factors. The potential impacts of these and other items on the compressibility characteristics of the clay layer should be evaluated during the final geotechnical exploration. We anticipate that continuous profiling of the clay layer using cone penetration test soundings, continuous standard penetration tests, and/or undisturbed sampling may be utilized. Additional laboratory testing, including vertical and horizontal consolidation tests, may be utilized to identify the non-homogeneity and anisotropy of the deposits.

## 6.4 GROUND IMPROVEMENT PROGRAM

Detailed analyses and evaluations will be required for the chosen ground improvement program once final design configurations and structure locations are determined. This effort will likely involve developing plans and appropriate special provisions; evaluating impacts on existing and proposed utilities, facilities, and structures; and developing an instrumentation and monitoring program to verify that the appropriate improvements have occurred.

## 6.5 DESIGN-PHASE LOAD TEST PROGRAM

Depending on the bridge foundation system selected, it may be prudent to perform a design-phase load test to evaluate the feasibility and constructability issues associated with the selected system. A design-phase load test program may consist of static axial and/or lateral load tests and can provide valuable information regarding design parameters, especially where local experience is limited with the chosen foundation system. The data obtained from these tests can then be incorporated into the final design. The increased certainties in the design parameters and constructability issues often result in design savings that more than offset the costs of the load tests. However, adequate time to perform the tests has to be available in the project schedule to allow for the maximum value to be achieved.

## 6.6 POTENTIAL IMPACTS ON ADJACENT FACILITIES

Impacts of the new construction on existing facilities and adjacent structures will need to be evaluated as part of the final design. These impacts may include induced settlements of adjacent facilities due to new embankment construction, induced downdrag loads on existing bridge foundations, vibration impacts from pile driving, etc.

ADC Street Map of Sussex County, Delaware, 2nd Edition, 2001.

Scale: Not To Scale.

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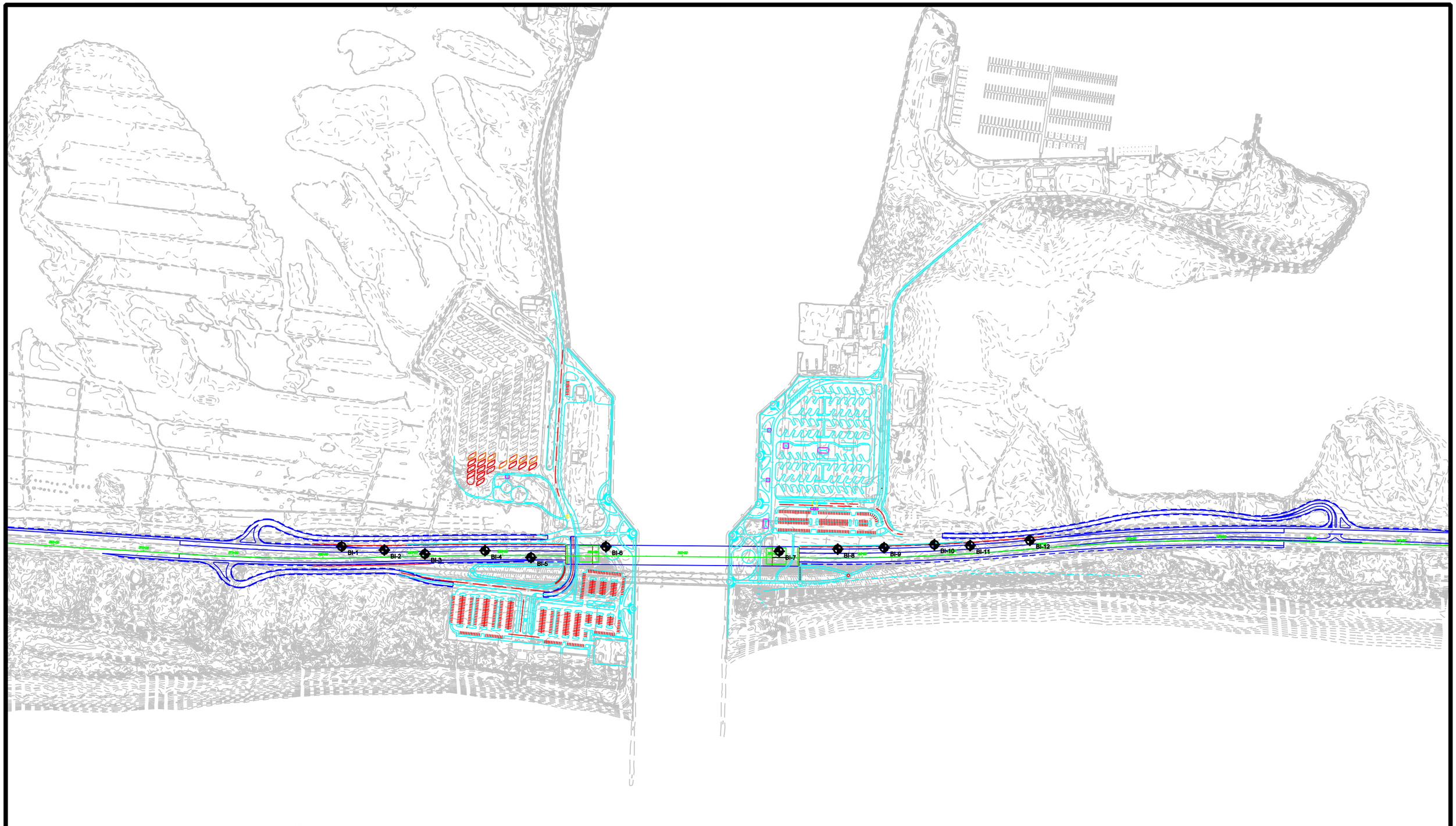
# FIGURE 1

SITE VICINITY MAP
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

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1606 Ownby Lane, Richmond, VA 23220

| | |
|---|---|
| Des. by | C.E.B. |
| Drn. by | A.J.A. |
| Rev. by | C.E.B. |

**FIGURE 2**
**BORING LOCATION PLAN**

| | | |
|---|---|---|
| 3530-03-1245.01 | September 26, 2003 | Not to Scale |

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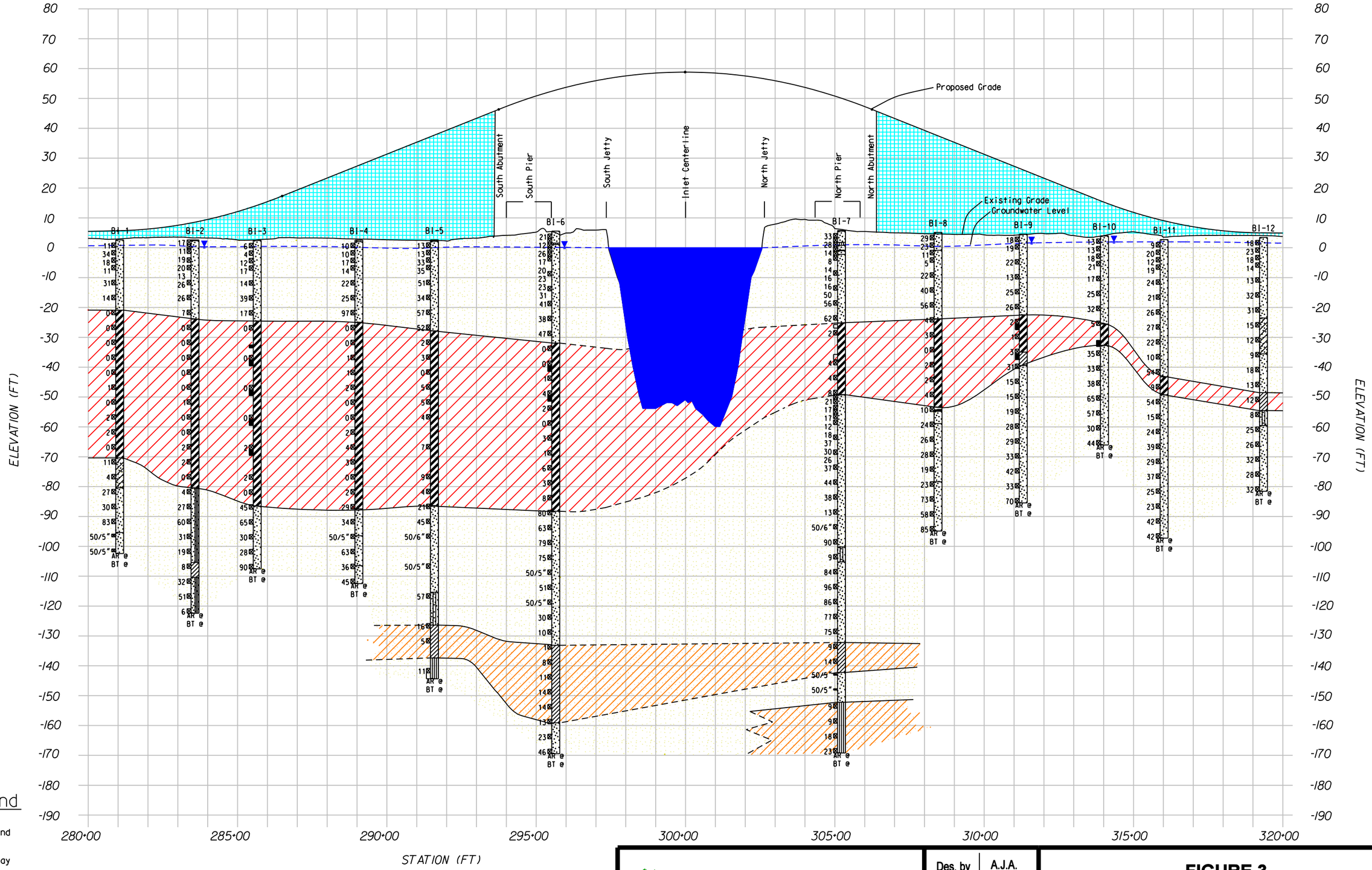


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1606 Ownby Lane, Richmond, VA 23220

| | |
|---|---|
| Des. by | A.J.A. |
| Drn. by | A.J.A. |
| Rev. by | C.E.B. |

**FIGURE 3**
**ESTIMATED SUBSURFACE PROFILE**

| 3530-03-1245.01 | 09/26/03 | Scale: |
|---|---|---|

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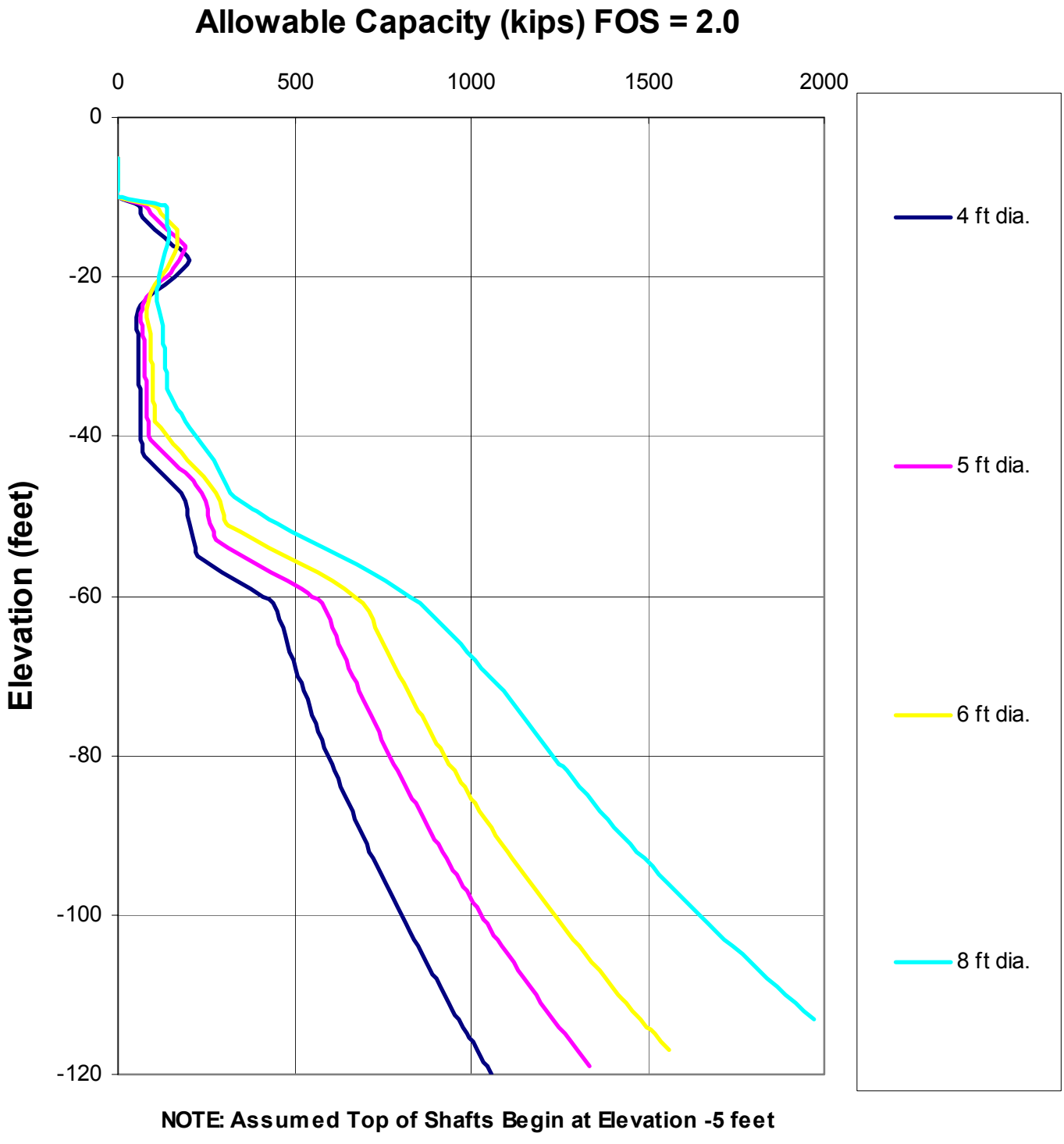
# North Pier Foundation Analysis - Drilled Shafts




**NOTE: Assumed Top of Shafts Begin at Elevation -5 feet**

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**FIGURE 4**

NORTH PIER – DRILLED SHAFTS
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

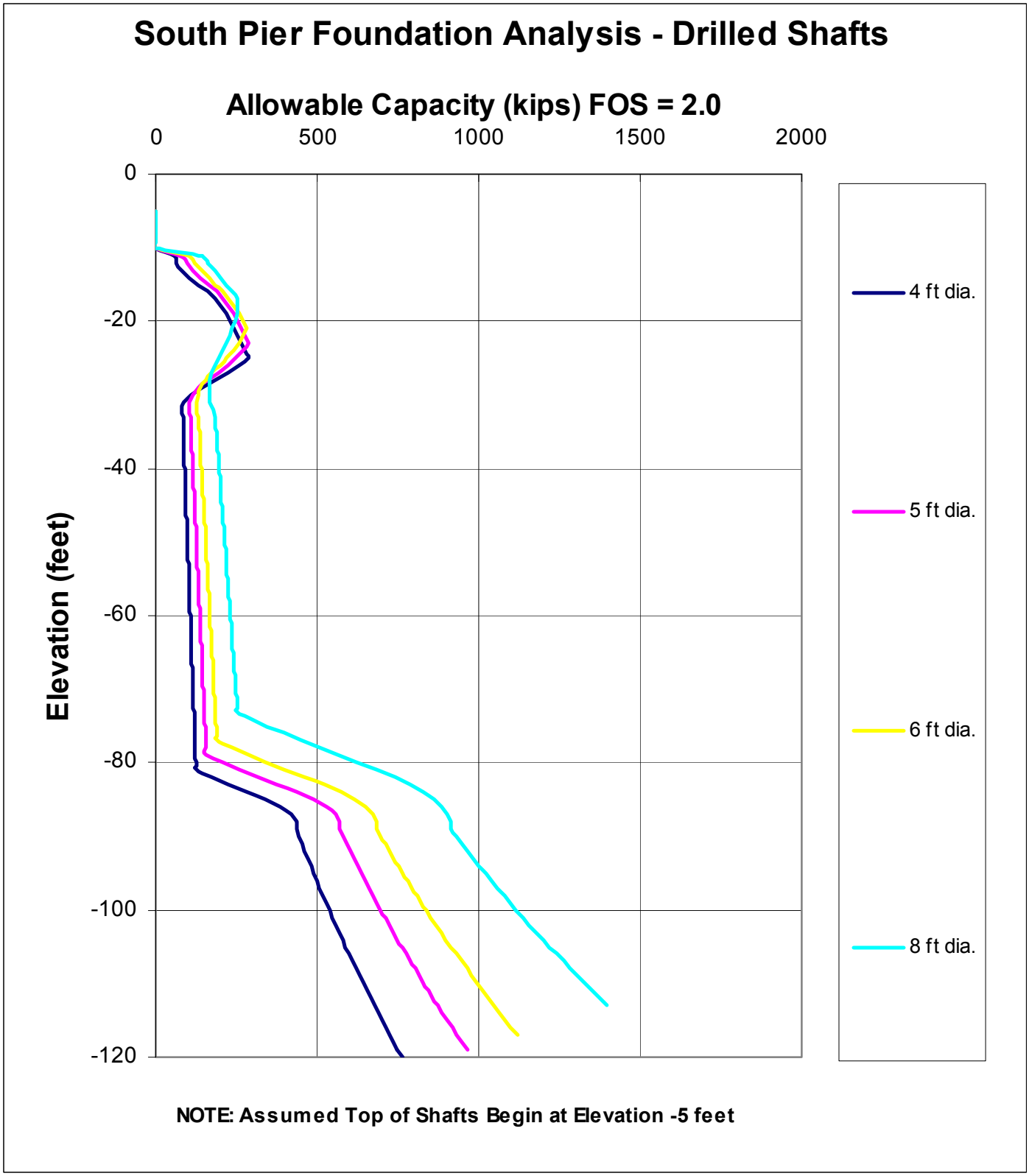


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**FIGURE 5**

SOUTH PIER – DRILLED SHAFTS
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

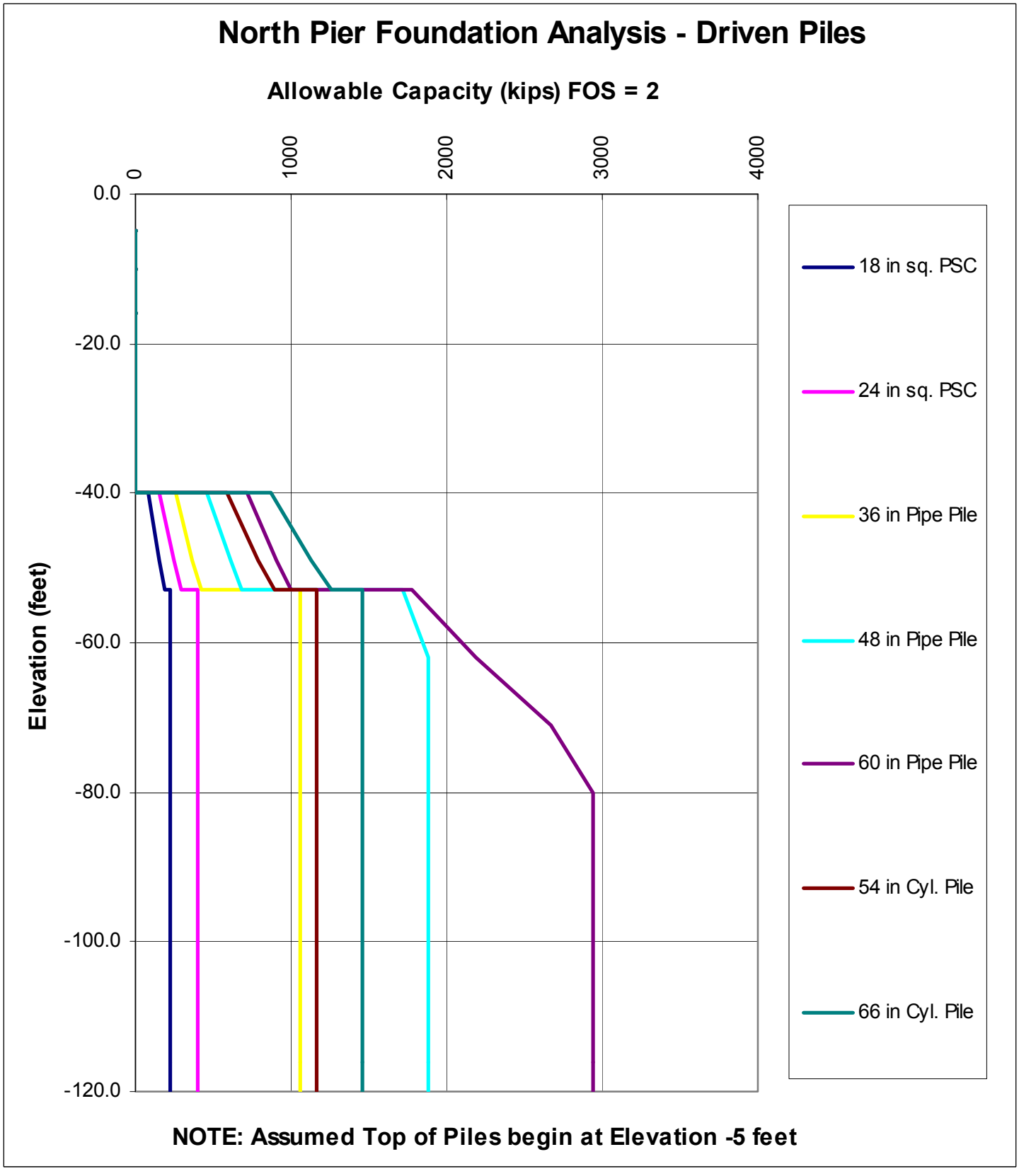


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**FIGURE 6**

NORTH PIER - DRIVEN PILES
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

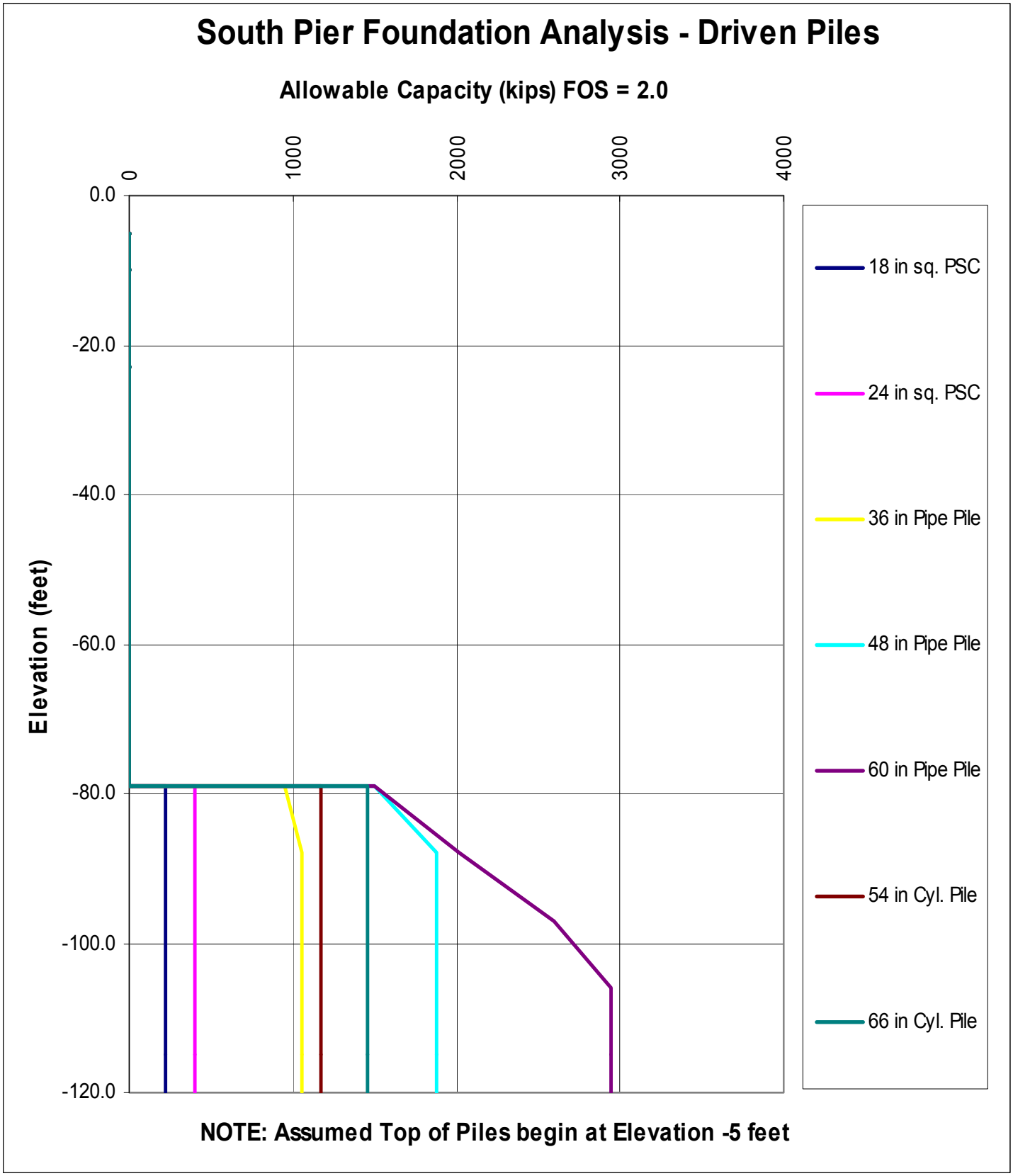


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**FIGURE 7**

SOUTH PIER - DRIVEN PILES
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

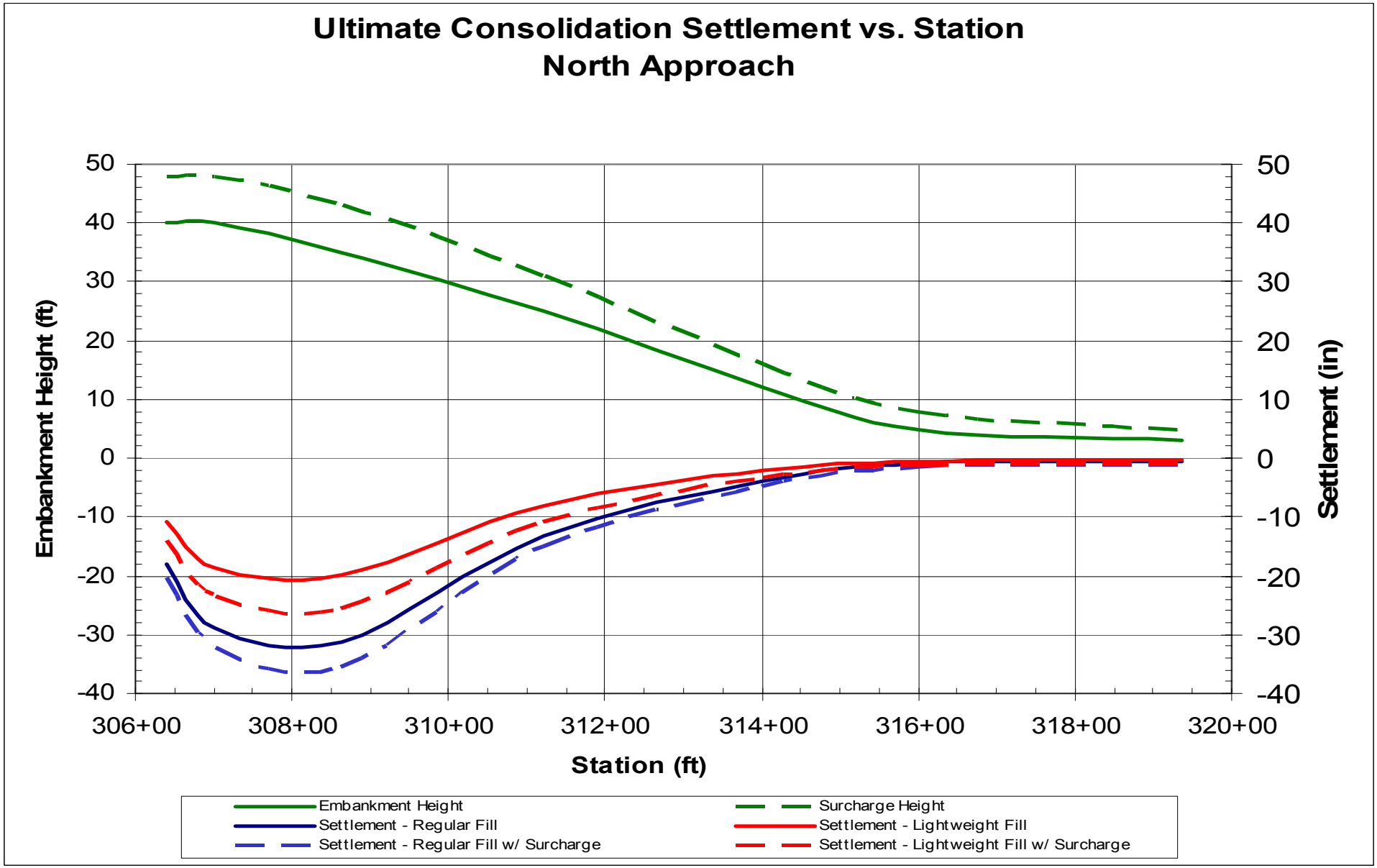


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**FIGURE 8**

NORTH APPROACH – SETTLEMENT VS. STATION
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

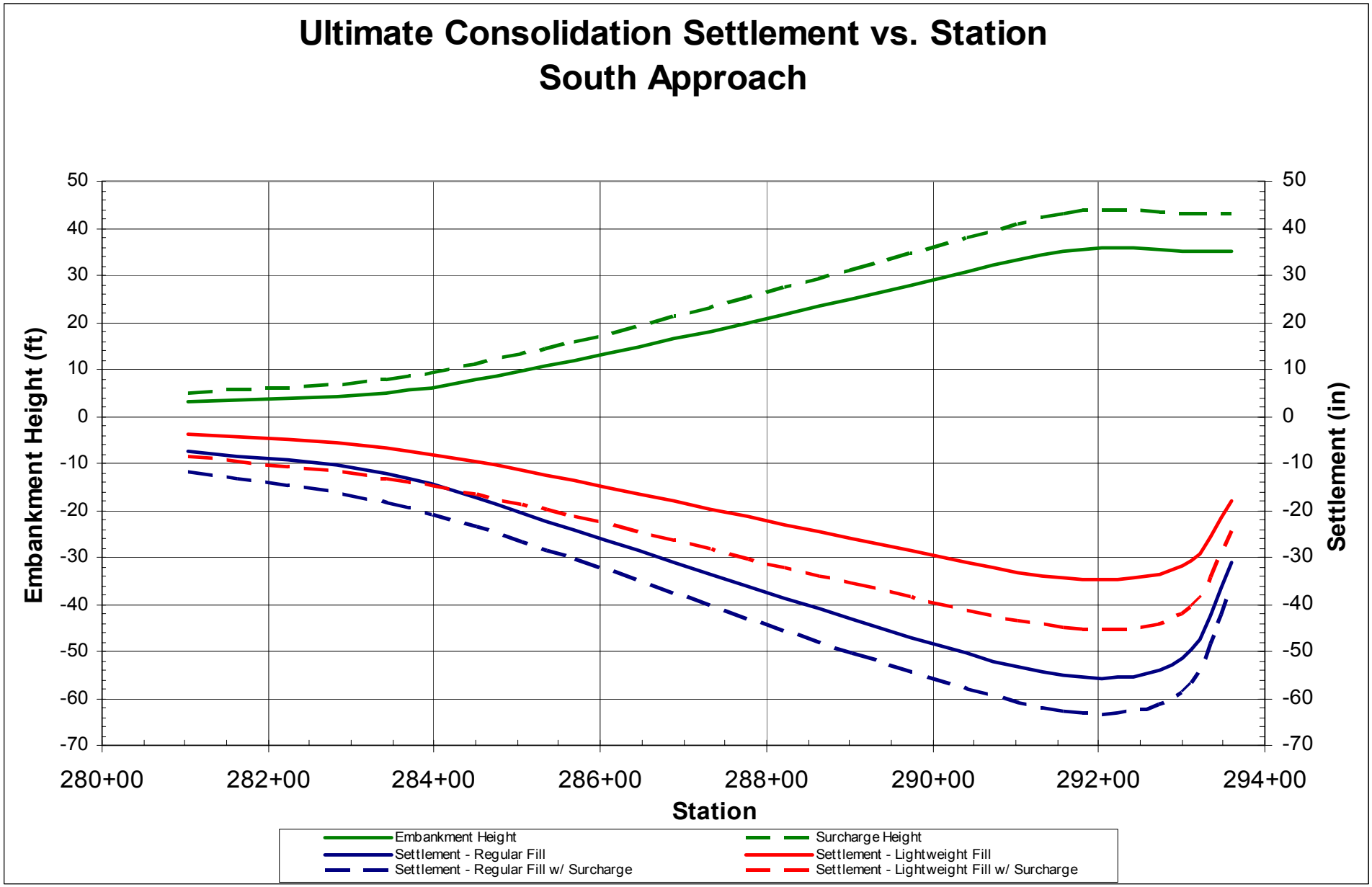


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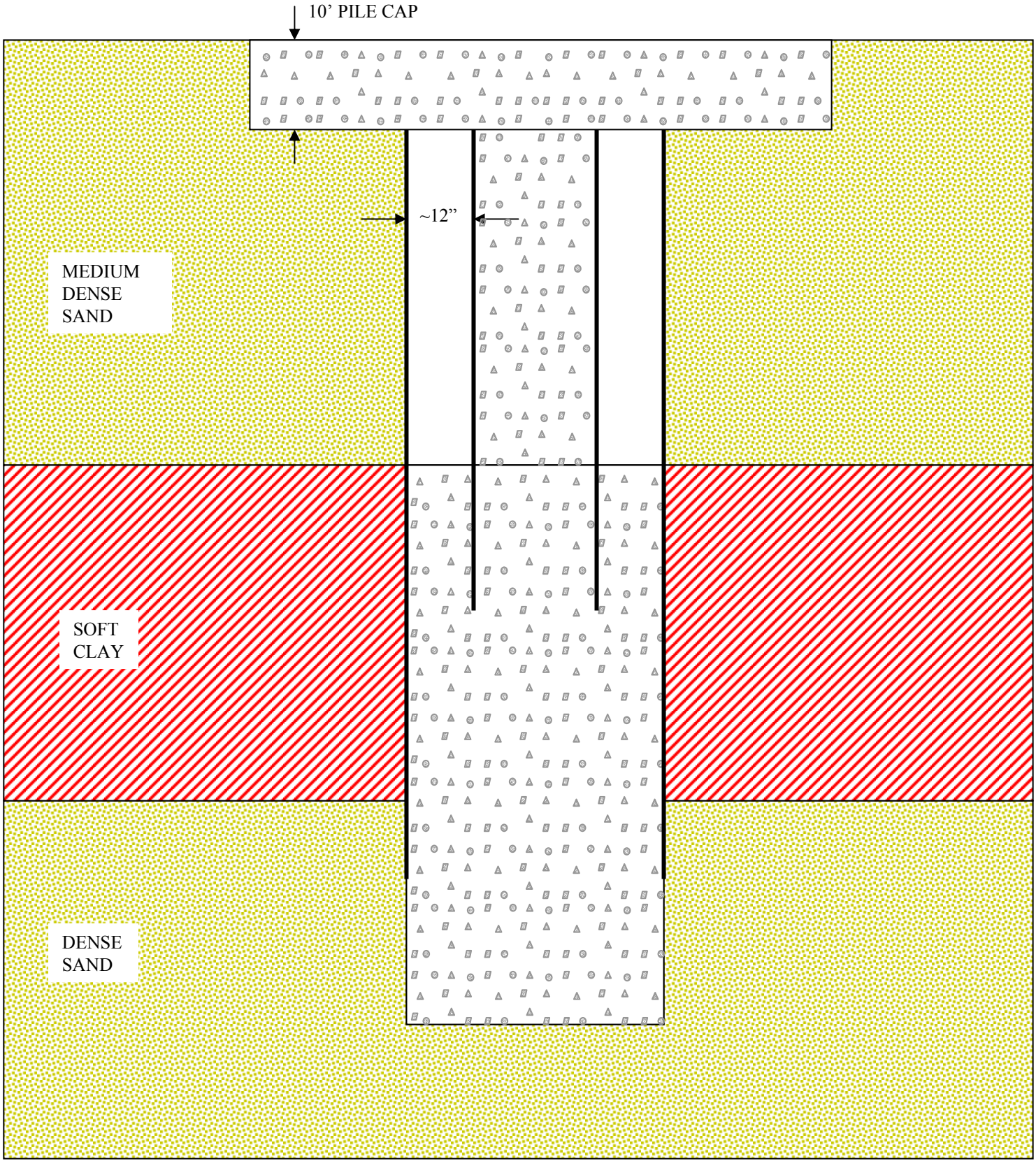
**FIGURE 9**

SOUTH APPROACH – SETTLEMENT VS. STATION
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003




Scale: Not To Scale.

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# FIGURE 10

"FLEXIBLE" DRILLED SHAFT OPTION
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

## FIELD OPERATIONS

The general field procedures employed by MACTEC are summarized in ASTM D 420 entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground-water conditions. These methods include geophysical and in-situ methods as well as borings.

Borings are drilled to depths to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

(a) Continuous 3¼ or 4¼-inch I.D. hollow stem augers;
(b) Wash borings using roller cone or drag bits (mud or water);
(c) Continuous flight augers (ASTM D 1452).
(d) Continuous sampling using a Tripod-mounted drill rig.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observation of ground water. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer or geologist. The engineer or geologist classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records which are the basis for further evaluations and recommendations.

The final test boring records represent our interpretation of the contents of the field records based on the results of the engineering examination and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground-water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The actual transition between materials may be gradual. The final Soil Test Boring Records are included in this appendix.

## SOIL SAMPLING PROCEDURES

Penetration Test and Split-barrel Sampling

The borings were drilled using wash boring techniques. Penetration testing and split-barrel sampling were conducted in the borings at regular intervals as indicated on the Soil Test Boring Records.

The standard penetration test (SPT) provides an indication of the soil strength and compressibility. The SPT resistances and split-barrel sampling are conducted simultaneously according to ASTM Specification D 1586. At regular intervals, soil samples are obtained with a standard split-tube sampler. The sampler is first seated six inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the 12-inch increment is recorded and is designated the "penetration resistance."

Representative portions of the soil samples obtained from each split-barrel sample are placed in glass jars, sealed, and transported to our laboratory. Descriptions of the split-tube samples and the penetration resistances are shown on the attached Test Boring Records.

Water Level Measurements

Water level readings and caved depths were measured in completed borings as noted on the Soil Test Boring Records. These water level readings indicate the approximate location of the ambient ground-water table at the time of our field investigation. In some instances, the caved depths may possibly indicate ground-water activity.

Temporary piezometers were installed at selected boring locations by inserting pipe to the desired depth in the borings. A slotted well screen was attached to the bottom of the pipe to allow subsurface water to enter the piezometer. Clean sand or pea gravel was backfilled around the bottom of the well screen. The remainder of the hole was backfilled with an impervious material, using a bentonite or cement grout cap to seal out surface water. The top of the pipe has a removable cover to seal out rainwater.

The time of drilling water level reported on the Soil Test Boring Records is determined by field crews as the drilling tools are advanced. Additional water table readings are generally obtained approximately one day after the borings are completed. The time lag is used to permit stabilization of the ground-water table that has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Undisturbed Sampling

For quantitative testing, relatively undisturbed samples are obtained by pushing sections of thin-walled steel or brass tubing (Shelby tube) into the soil at the desired sampling levels. This procedure is described by ASTM Specification D 1587. Each tube is carefully removed from the ground, sealed, and transported to the laboratory for specialized testing. Locations and depths of undisturbed samples are shown on the Test Boring Records.

| MAJOR DIVISIONS | | | GROUP SYMBOLS | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size) | GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size) | CLEAN GRAVELS (Little or no fines) | GW | Well graded gravels, gravel - sand mixtures, little or no fines. |
| | | | GP | Poorly graded gravels or gravel - sand mixtures, little or no fines. |
| | | GRAVELS WITH FINES (Appreciable amount of fines) | GM | Silty gravels, gravel - sand - silt mixtures. |
| | | | GC | Clayey gravels, gravel - sand - clay mixtures. |
| | SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size) | CLEAN SANDS (Little or no fines) | SW | Well graded sands, gravelly sands, little or no fines. |
| | | | SP | Poorly graded sands or gravelly sands, little or no fines. |
| | | SANDS WITH FINES (Appreciable amount of fines) | SM | Silty sands, sand - silt mixtures |
| | | | SC | Clayey sands, sand - clay mixtures. |
| FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size) | SILTS AND CLAYS (Liquid limit LESS than 50) | | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts and with slight plasticity. |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. |
| | | | OL | Organic silts and organic silty clays of low plasticity. |
| | SILTS AND CLAYS (Liquid limit GREATER than 50) | | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts. |
| | | | CH | Inorganic clays of high plasticity, fat clays |
| | | | OH | Organic clays of medium to high plasticity, organic silts. |
| DECOMPOSED ROCK | | | DR | Residual material that retains the relict structure of the parent bedrock & exhibits SPT resistances consistently over 60 bpf. |

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

| SILT OR CLAY | SAND | | | GRAVEL | | Cobbles | Boulders |
|---|---|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse | | |

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

| | |
|---|---|
| Undisturbed Sample | Auger Cuttings |
| Split Spoon Sample | Bulk Sample |
| Rock Core | Grab Sample |
| Dilatometer | Pressure Meter |
| Packer | No Recovery |
| Water Table at time of drilling | Water Table after 24 hours |

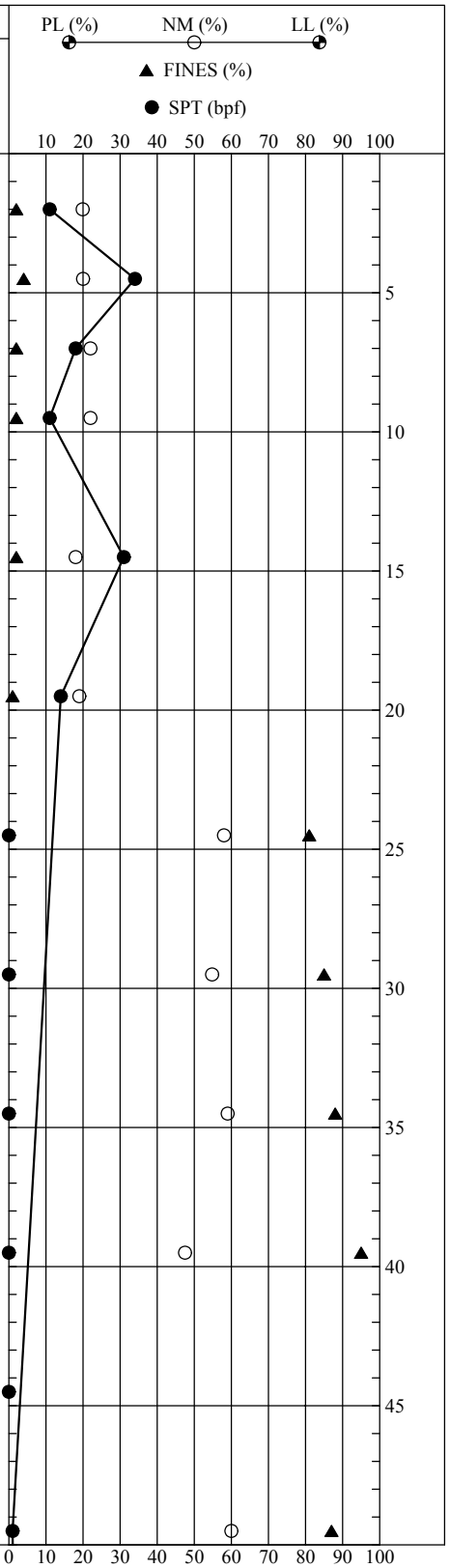
Correlation of Penetration Resistance with Relative Density and Consistency

| SAND & GRAVEL | | SILT & CLAY | |
|---|---|---|---|
| No. of Blows | Relative Density | No. of Blows | Consistency |
| 0 - 4 | Very Loose | 0 - 1 | Very Soft |
| 5 - 10 | Loose | 2 - 4 | Soft |
| 11 - 20 | Firm | 5 - 8 | Firm |
| 21 - 30 | Very Firm | 9 - 15 | Stiff |
| 31 - 50 | Dense | 16 - 30 | Very Stiff |
| Over 50 | Very Dense | Over 31 | Hard |

# KEY TO SYMBOLS AND DESCRIPTIONS

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 0 | Medium dense light gray fine to medium sand (SP), (A-3). Moist to wet | | 3 | SPT-1 | | 4-5-6 (N = 11) |
| 5 | | | -2 | SPT-2 | | 10-17-17 (N = 34) |
| | | | | SPT-3 | | 7-9-9 (N = 18) |
| 10 | | | -7 | SPT-4 | | 6-5-6 (N = 11) |
| | Trace shell fragments at 13.5 feet bgs. | | | | | |
| 15 | | | -12 | SPT-5 | | 9-13-18 (N = 31) |
| 20 | | | -17 | SPT-6 | | 8-7-7 (N = 14) |
| 25 | Very soft dark gray clay (CH), (A-7-6) with. Trace shell fragments, strong to weak organic odor. | | -22 | SPT-7 | | WOH |
| 30 | | | -27 | SPT-8 | | WOH |
| 35 | | | -32 | SPT-9 | | WOH |
| 40 | | | -37 | SPT-10 | | WOH |
| 45 | No sample 11 (zero recovery). | | -42 | SPT-11 | | WOH |
| 50 | | | -47 | SPT-12 | | 0-0-1 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

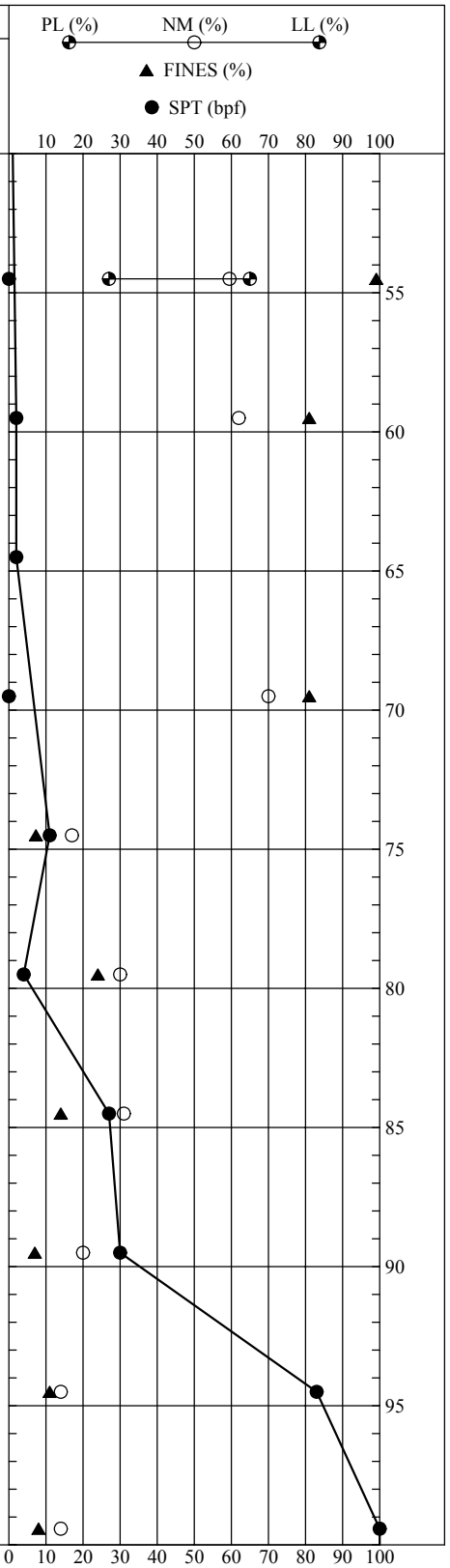
## SOIL TEST BORING RECORD

**BORING NO.:** BI-1
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 219760.5,757236.7
**DRILLED:** August 5, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | ELEV (ft) | SAMPLE IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|
| 50 | Very soft dark gray clay (CH), (A-7-6) with. Trace shell fragments, strong to weak organic odor. | -47 | | | (N = 1) |
| 55 | | -52 | SPT-13 | | WOH |
| 60 | | -57 | SPT-14 | | 0-1-1 (N = 2) |
| 65 | No sample 15 (zero recovery). | -62 | SPT-15 | | 0-0-2 (N = 2) |
| 70 | | -67 | SPT-16 | | WOH |
| 75 | Loose to medium dense black poorly graded fine to medium sand (SP-SM), (A-2-4) with silt. | -72 | SPT-17 | | 4-5-6 (N = 11) |
| 80 | | -77 | SPT-18 | | 1-2-2 (N = 4) |
| 85 | Medium to very dense, light to dark gray, fine to medium sand (SP), (A-2-4).<br>Little silt from 83 to 85 feet bgs. | -82 | SPT-19 | | 7-11-16 (N = 27) |
| 90 | | -87 | SPT-20 | | 7-14-16 (N = 30) |
| 95 | | -92 | SPT-21 | | 27-40-43 (N = 83) |
| 100 | Very dense orangish brown fine to medium sand (SP), (A-1-b).<br>Lens of medium to coarse gravel from 98.5 to 98.7 feet bgs. | -97 | SPT-22 | | 41-50/5" |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

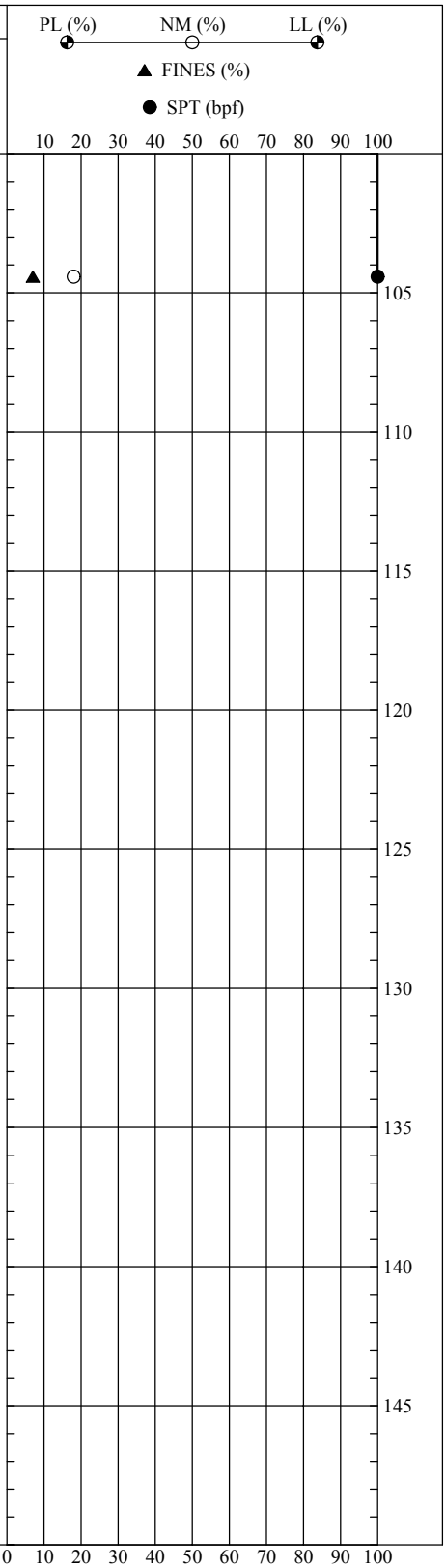
## SOIL TEST BORING RECORD

**BORING NO.:** BI-1
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 219760.5,757236.7
**DRILLED:** August 5, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" | PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) |
|---|---|---|---|---|---|---|---|
| 100 | Very dense orangish brown fine to medium sand (SP), (A-1-b). | | -97 | | | | |
| | | | | SPT-23 | ☒ | 46-50/5" | |
| 105 | Boring terminated at 105 feet bgs. | | -102 | | | | |
| 110 | | | -107 | | | | |
| 115 | | | -112 | | | | |
| 120 | | | -117 | | | | |
| 125 | | | -122 | | | | |
| 130 | | | -127 | | | | |
| 135 | | | -132 | | | | |
| 140 | | | -137 | | | | |
| 145 | | | -142 | | | | |
| 150 | | | -147 | | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

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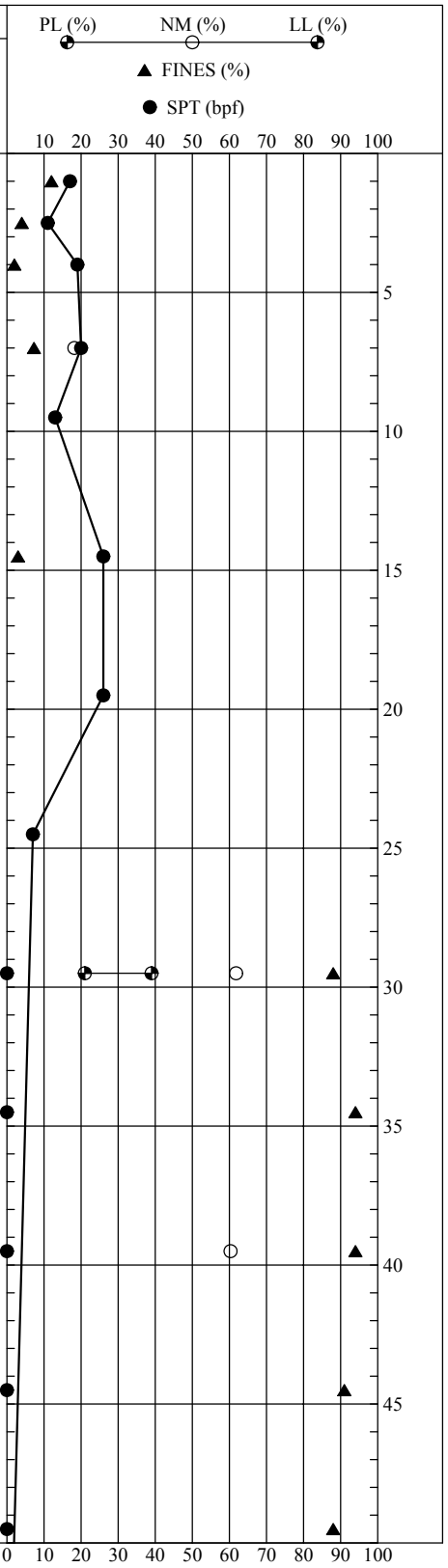
## SOIL TEST BORING RECORD

**BORING NO.:** BI-1
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 219760.5,757236.7
**DRILLED:** August 5, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) | SAMPLE IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|
| 0 | Medium dense, light dark tan, poorly graded fine to medium SAND (SP-SM), (A-1-b) with silt, dry to wet. Some medium gravel at 1.5 to 3.0 feet bgs. | 3 | SPT-1 | | 5-6-11 (N = 17) |
| | | | SPT-2 | | 3-5-6 (N = 11) |
| | | | SPT-3 | | 6-9-10 (N = 19) |
| 5 | | -2 | SPT-4 | | 7-7-13 (N = 20) |
| | | | SPT-5 | | 4-3-10 (N = 13) |
| 10 | | -7 | | | |
| 15 | Little medium gravel at 14.0 to 14.5 feet bgs. | -12 | SPT-6 | | 9-12-14 (N = 26) |
| 20 | | -17 | SPT-7 | | 11-11-15 (N = 26) |
| 25 | | -22 | SPT-8 | | 6-3-4 (N = 7) |
| | Very soft, dark gray, CLAY (CL), (A-6), trace shell fragments. | | | | |
| 30 | | -27 | SPT-9 | | WOH |
| 35 | | -32 | SPT-10 | | WOH |
| 40 | | -37 | SPT-11 | | WOH |
| 45 | | -42 | SPT-12 | | WOH |
| 50 | | -47 | SPT-13 | | WOH |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Piezometer installed ~ 5 feet south of boring immediately |
| REMARKS: | after completion. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

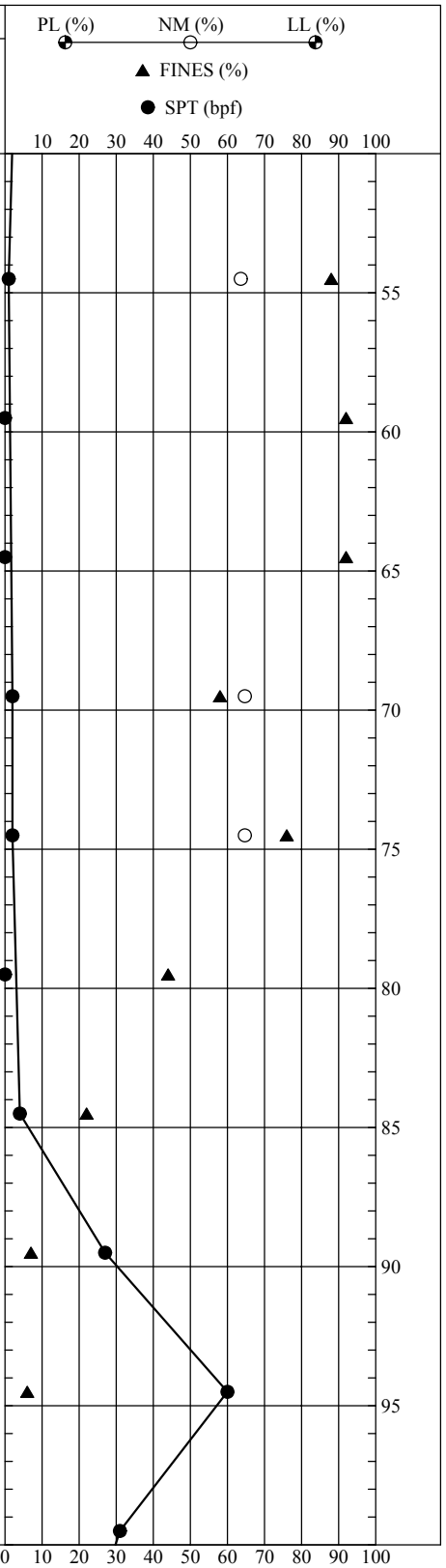
## SOIL TEST BORING RECORD

**BORING NO.:** BI-2
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 219998.6,757226.1
**DRILLED:** July 21, 2002
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Very soft, dark gray, CLAY (CL), (A-6), trace shell fragments. | | -47 | | | |
| 55 | | | -52 | SPT-14 | | 0-0-1 (N = 1) |
| 60 | | | -57 | SPT-15 | | WOH |
| 65 | | | -62 | SPT-16 | | WOH |
| 70 | | | -67 | SPT-17 | | 0-1-1 (N = 2) |
| 75 | | | -72 | SPT-18 | | 0-0-2 (N = 2) |
| 80 | | | -77 | SPT-19 | | WOH |
| 85 | Loose to dense, light and dark gray to tan, fine to medium SAND (SP-SM), (A-1-b) and silt, moist to wet. | | -82 | SPT-20 | | 0-1-3 (N = 4) |
| 90 | | | -87 | SPT-21 | | 11-14-13 (N = 27) |
| 95 | Some medium to coarese gravel at 93.5 to 95.0 feet bgs. | | -92 | SPT-22 | | 18-30-30 (N = 60) |
| 100 | | | -97 | SPT-23 | | 18-17-14 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Piezometer installed ~ 5 feet south of boring immediately |
| REMARKS: | after completion. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

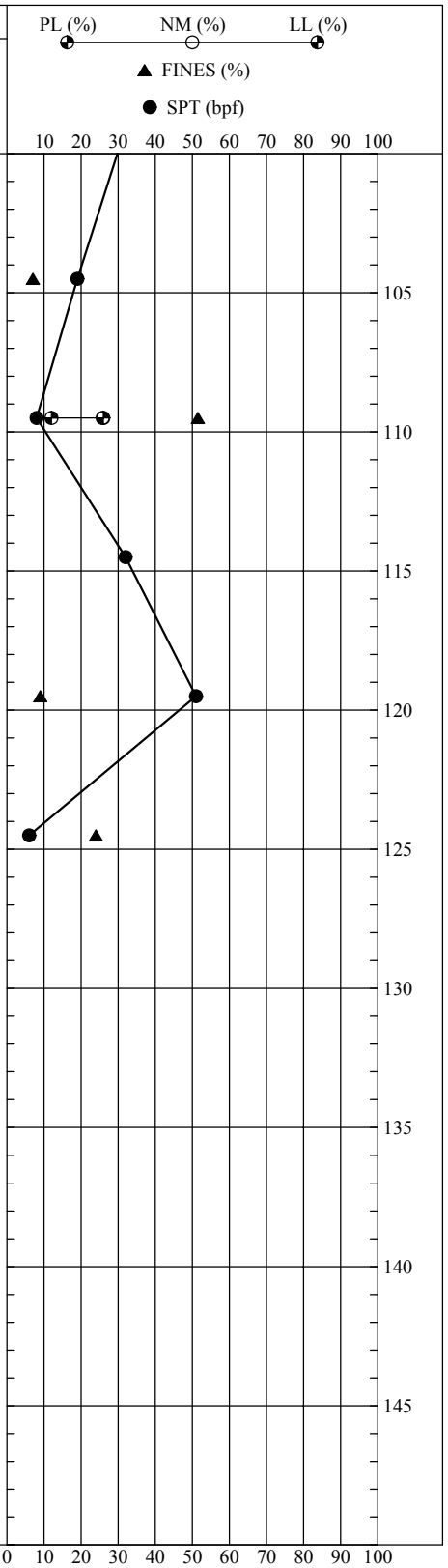
## SOIL TEST BORING RECORD

**BORING NO.:** BI-2
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 219998.6,757226.1
**DRILLED:** July 21, 2002
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 100 | Loose to dense, light and dark gray to tan, fine to medium SAND (SP-SM), (A-1-b) and silt, moist to wet. | | -97 | | | (N = 31) |
| | Little medium gravel at 103.5 to 105.0 feet bgs. | | | SPT-24 | | 14-11-8 (N = 19) |
| 105 | | | -102 | | | |
| | Medium stiff, dark gray, sandy CLAY (CL), (A-6) little fine sand. | | | SPT-25 | | 2-4-4 (N = 8) |
| 110 | | | -107 | | | |
| | Loose to dense, light to dark gray and orange, fine to medium SAND (SP-SM), (A-2-4) some silt, wet. | | | SPT-26 | | 18-18-14 (N = 32) |
| 115 | | | -112 | | | |
| | | | | SPT-27 | | 17-25-26 (N = 51) |
| 120 | | | -117 | | | |
| | | | | SPT-28 | | 5-3-3 (N = 6) |
| 125 | Boring terminated at 125 | | -122 | | | |
| 130 | | | -127 | | | |
| 135 | | | -132 | | | |
| 140 | | | -137 | | | |
| 145 | | | -142 | | | |
| 150 | | | -147 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Piezometer installed ~ 5 feet south of boring immediately |
| REMARKS: | after completion. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

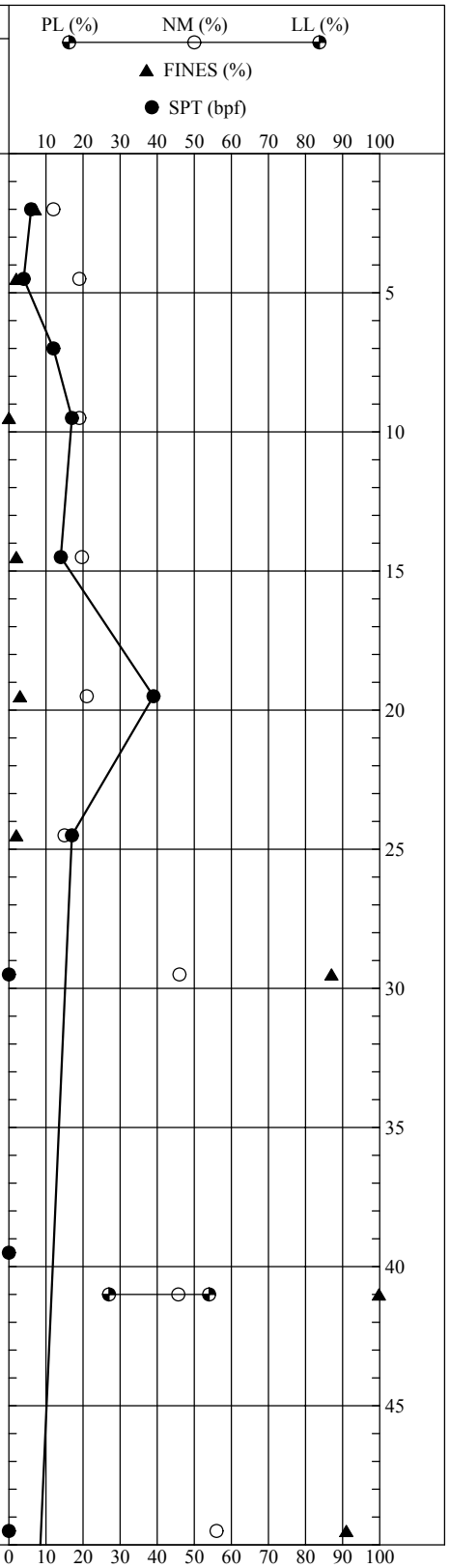
## SOIL TEST BORING RECORD

**BORING NO.:** BI-2
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 219998.6,757226.1
**DRILLED:** July 21, 2002
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW.) | ELEV (ft) | IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|
| 0 | Loose to medium dense, light tan, fine to medium SAND (SP), (A-1-b) moist to wet. | 2 | SPT-1 | | 4-3-3 (N = 6) |
| 5 | Lens of clean stone fill from 4.2 to 4.5 feet bgs. | -3 | SPT-2 | | 3-2-2 (N = 4) |
| | | | SPT-3 | | 4-4-8 (N = 12) |
| 10 | | -8 | SPT-4 | | 8-9-8 (N = 17) |
| 15 | | -13 | SPT-5 | | 7-7-7 (N = 14) |
| 20 | | -18 | SPT-6 | | 11-19-20 (N = 39) |
| 25 | | -23 | SPT-7 | | 6-9-8 (N = 17) |
| 30 | Very soft, dark gray, organic CLAY (CH), (A-7-6) little shell fragments, moist. | -28 | SPT-8 | | WOH |
| 35 | Pressure meter test 1 (PMT-1) at 33.0 feet bgs. | -33 | UD-7 | | |
| 40 | | -38 | SPT-9 | | WOH |
| | | | UD-8 | | |
| 45 | PMT-2 at 43.0 feet bgs. | -43 | | | |
| 50 | | -48 | SPT-10 | | WOH |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Offset ~ 35 feet south after sewer line strike at 13.5 feet in |
| REMARKS: | original boring. Advance to 13.5 feet bgs and begin resampling. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

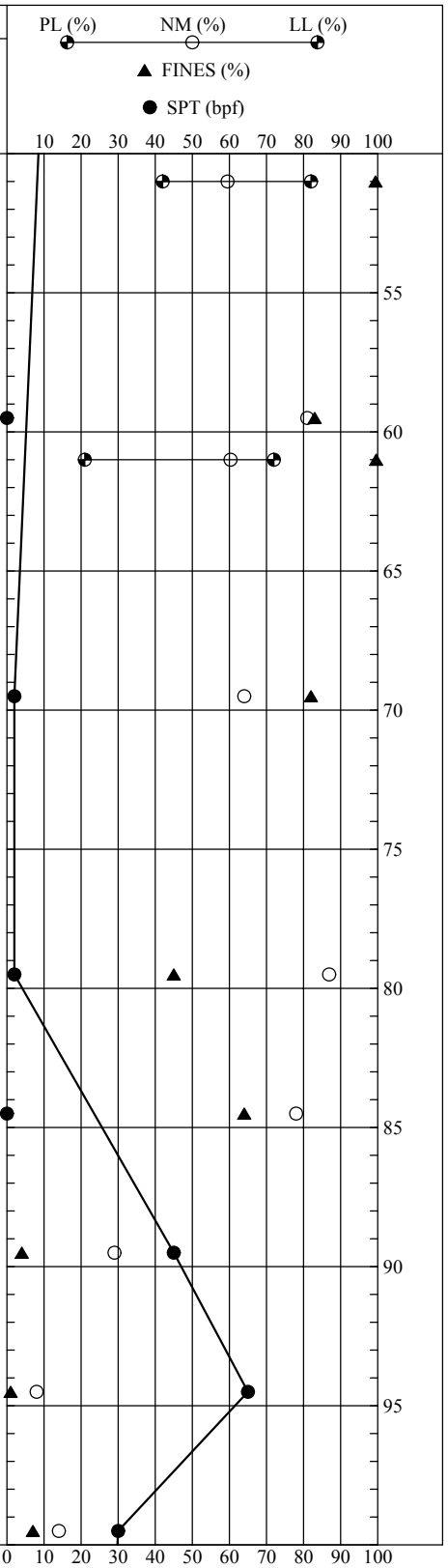
## SOIL TEST BORING RECORD

**BORING NO.:** BI-3
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220224.8,757218.9
**DRILLED:** July 22, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Very soft, dark gray, organic CLAY (CH), (A-7-6) little shell fragments, moist. | | -48 | UD-9 | | |
| | PMT-3 at 53.0 feet bgs. | | | | | |
| 55 | | | -53 | | | |
| 60 | | | -58 | SPT-11 | | WOH |
| | | | | UD-10 | | |
| | PMT-4 at 63.0 feet bgs. | | | | | |
| 65 | | | -63 | | | |
| 70 | | | -68 | SPT-12 | | 0-0-2 (N = 2) |
| | | | | UD-11 | | |
| | PMT-5 at 73.0 feet bgs. | | | | | |
| 75 | | | -73 | | | |
| 80 | | | -78 | SPT-13 | | 0-0-2 (N = 2) |
| 85 | | | -83 | SPT-14 | | WOH |
| 90 | Dense, light gray to orange yellow, fine to medium SAND (SP), (A-1-a) occasional coarse gravel, moist to wet. | | -88 | SPT-15 | | 3-25-20 (N = 45) |
| 95 | | | -93 | SPT-16 | | 20-29-36 (N = 65) |
| 100 | | | -98 | SPT-17 | | 14-14-16 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Offset ~ 35 feet south after sewer line strike at 13.5 feet in original boring. Advance to 13.5 feet bgs and begin resampling. |
| REMARKS: | |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

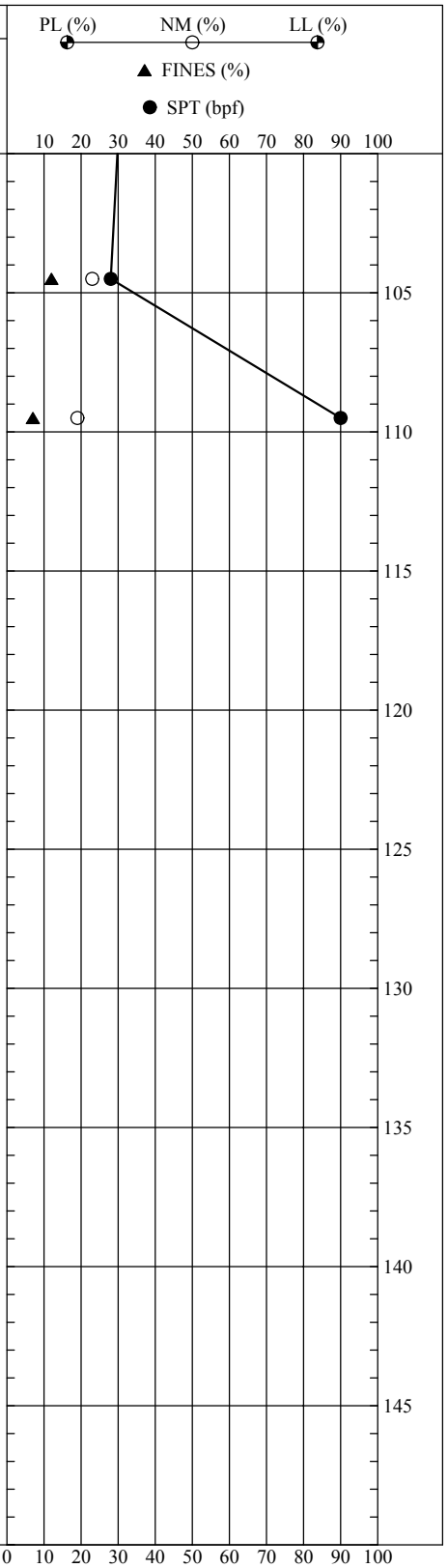
## SOIL TEST BORING RECORD

**BORING NO.:** BI-3
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220224.8,757218.9
**DRILLED:** July 22, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 100 | Dense, light gray to orange yellow, fine to medium SAND (SP), (A-1-a) occasional coarse gravel, moist to wet. | | -98 | | | (N = 30) |
| 105 | | | -103 | SS-18 | | 6-10-18 (N = 28) |
| 110 | | | -108 | SPT-19 | | 31-40-50 (N = 90) |
| | Boring terminated at 110 feet bgs. | | | | | |
| 115 | | | -113 | | | |
| 120 | | | -118 | | | |
| 125 | | | -123 | | | |
| 130 | | | -128 | | | |
| 135 | | | -133 | | | |
| 140 | | | -138 | | | |
| 145 | | | -143 | | | |
| 150 | | | -148 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Offset ~ 35 feet south after sewer line strike at 13.5 feet in |
| REMARKS: | original boring. Advance to 13.5 feet bgs and begin resampling. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

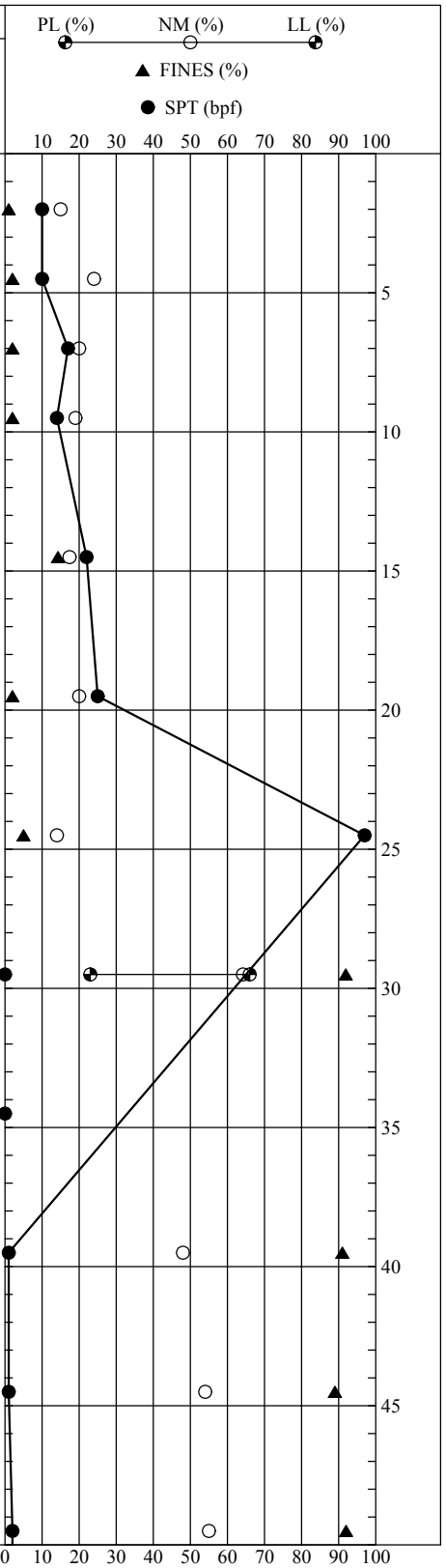
## SOIL TEST BORING RECORD

**BORING NO.:** BI-3
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220224.8,757218.9
**DRILLED:** July 22, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW.) | ELEV (ft) | SAMPLE IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|
| 0 | Brown silty sand topsoil with some root fragments. | 3 | | | |
| | Medium dense to very dense, light gray to dark yellowish brown, silty fine to medium sand (SM), (A-1-b). Moist to wet | | SPT-1 | | 2-3-7 (N = 10) |
| | | | SPT-2 | | 2-3-7 (N = 10) |
| 5 | Soft dark gray clay seam (approx. 1 inch thick) with some root fragments and strong organic odor at 4.5 feet bgs. | -2 | SPT-3 | | 5-8-9 (N = 17) |
| | Trace coarse sand at 8.5 feet bgs. | | SPT-4 | | 6-6-8 (N = 14) |
| 10 | | -7 | | | |
| | Trace medium gravel at 13.5 feet bgs. | | SPT-5 | | 9-12-10 (N = 22) |
| 15 | | -12 | | | |
| | | | SPT-6 | | 9-11-14 (N = 25) |
| 20 | | -17 | | | |
| | | | SPT-7 | | 27-48-49 (N = 97) |
| 25 | | -22 | | | |
| | Very soft to soft dark greenish gray clay (CH), (A-7-6). Strong to weak organic odor, trace shell fragments. | | SPT-8 | | WOH |
| 30 | | -27 | | | |
| | No sample 9 (zero recovery). | | SPT-9 | | WOH |
| 35 | | -32 | | | |
| | | | SPT-10 | | 0-0-1 (N = 1) |
| 40 | | -37 | | | |
| | | | SPT-11 | | 0-0-1 (N = 1) |
| 45 | | -42 | | | |
| | | | SPT-12 | | 0-0-2 |
| 50 | | -47 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | |
| REMARKS: | |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

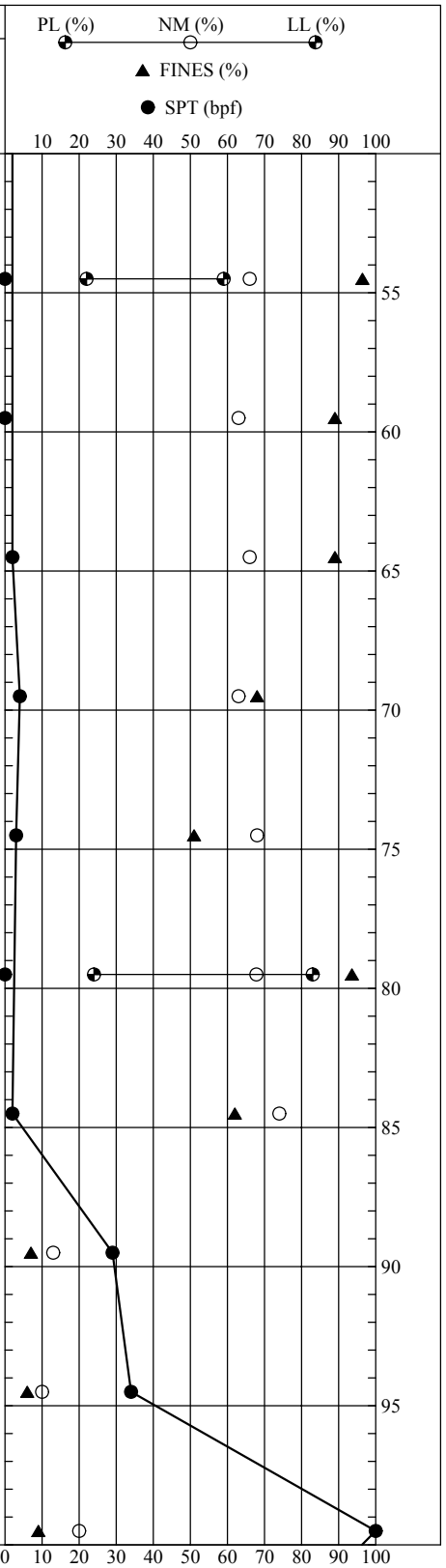
## SOIL TEST BORING RECORD

**BORING NO.:** BI-4
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220554.4,757158.4
**DRILLED:** July 28, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Very soft to soft dark greenish gray clay (CH), (A-7-6). Strong to weak organic odor, trace shell fragments. | | -47 | | | (N = 2) |
| 55 | | | -52 | SPT-13 | | WOH |
| 60 | | | -57 | SPT-14 | | WOH |
| 65 | | | -62 | SPT-15 | | 0-0-2 (N = 2) |
| 70 | | | -67 | SPT-16 | | 0-2-2 (N = 4) |
| 75 | | | -72 | SPT-17 | | 0-0-3 (N = 3) |
| 80 | | | -77 | SPT-18 | | WOH |
| 85 | | | -82 | SPT-19 | | 0-0-2 (N = 2) |
| 90 | Medium dark gray fine to coarse sand (SP), (A-1-b) with little medium to coarse gravel. Wet. | | -87 | SPT-20 | | 4-11-18 (N = 29) |
| 95 | | | -92 | SPT-21 | | 17-17-17 (N = 34) |
| 100 | Very dense light gray fine to medium sand (SP), (A-3). Wet. | | -97 | SPT-22 | | 20-42-50/5" |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

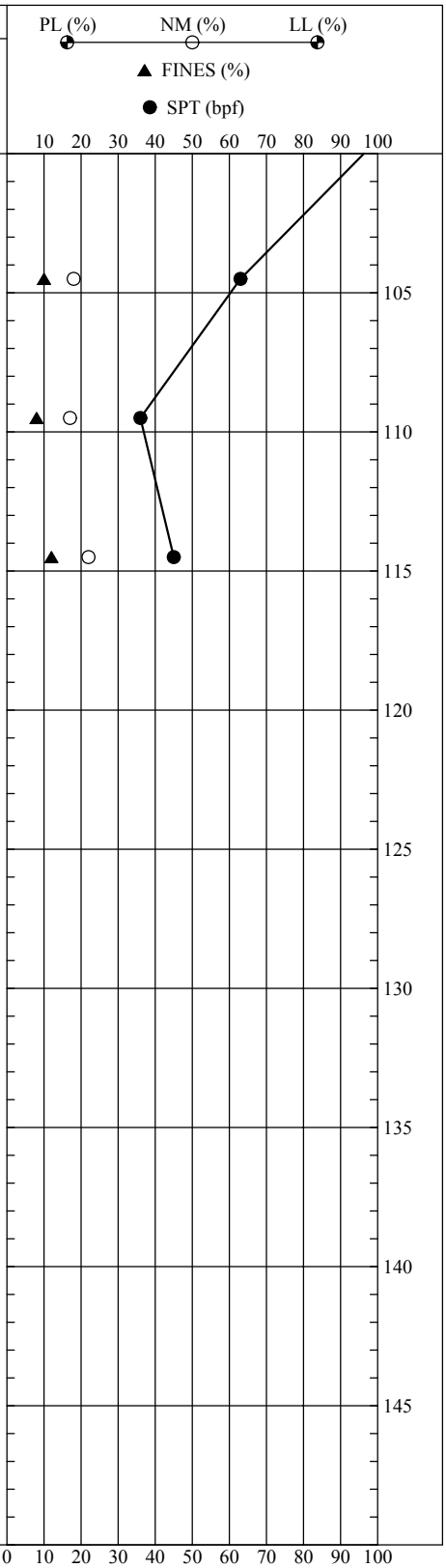
## SOIL TEST BORING RECORD

**BORING NO.:** BI-4
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220554.4,757158.4
**DRILLED:** July 28, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 100 | Very dense light gray fine to medium sand (SP), (A-3). Wet. | | -97 | | | |
| 105 | | | -102 | SPT-23 | | 25-27-36 (N = 63) |
| 110 | Dense yellowish orange fine to coarse sand (SP), (A-2-4) with trace medium gravel and little fines. Wet. | | -107 | SPT-24 | | 15-17-19 (N = 36) |
| 115 | | | -112 | SPT-25 | | 20-20-25 (N = 45) |
| | Boring terminated at 115 feet bgs. | | | | | |
| 120 | | | -117 | | | |
| 125 | | | -122 | | | |
| 130 | | | -127 | | | |
| 135 | | | -132 | | | |
| 140 | | | -137 | | | |
| 145 | | | -142 | | | |
| 150 | | | -147 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

## SOIL TEST BORING RECORD

**BORING NO.:** BI-4
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220554.4,757158.4
**DRILLED:** July 28, 2003
**PROJECT NO.:** 3530-03-1245.01

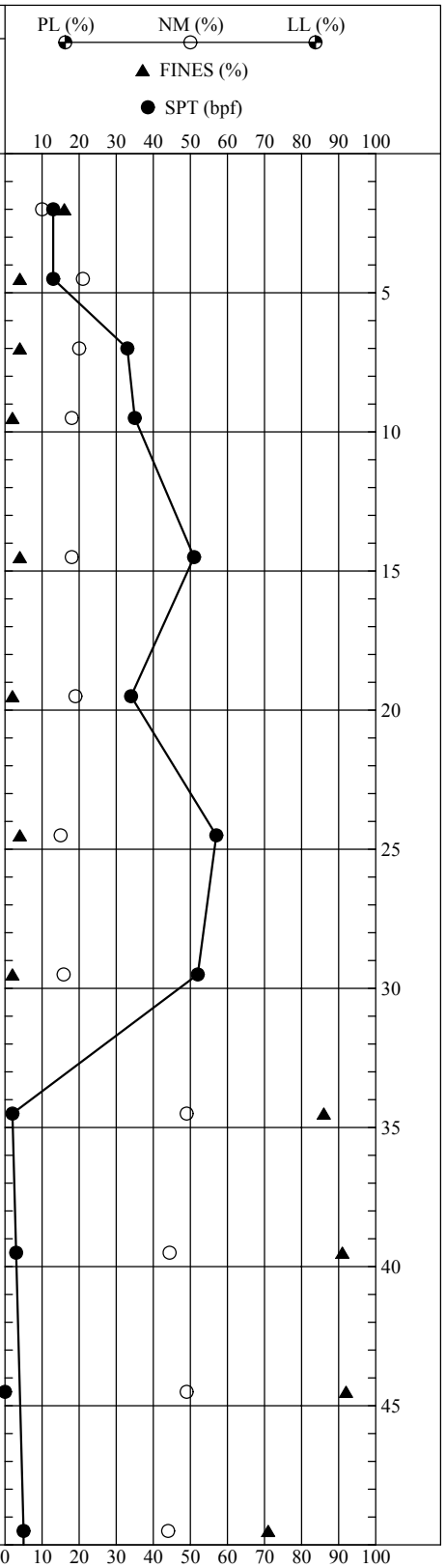


MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) |
|---|---|---|---|
| 0 | Loose silty sand topsoil with little root fragments. | | 3 |
| | Medium dense to very dense light gray fine to medium sand (SP), (A-1-b). Moist to wet.<br>Layer of oily asphaltic sand (approx. 2 inches thick) at 2 feet bgs.<br>Some root fragments at 3.5 feet bgs. | | |
| 5 | | | -2 |
| 10 | | | -7 |
| | Trace coarse sand at 13.5 feet bgs. | | |
| 15 | | | -12 |
| 20 | | | -17 |
| | Little shell fragments at 23.5 feet bgs. | | |
| 25 | | | -22 |
| 30 | | | -27 |
| | Very soft to medium stiff dark greenish gray clay (CH), (A-7-6). Strong to weak organic odor. | | |
| 35 | | | -32 |
| 40 | | | -37 |
| 45 | | | -42 |
| 50 | | | -47 |

SAMPLES

| IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|
| SPT-1 | X | 6-7-6 (N = 13) |
| SPT-2 | X | 6-6-7 (N = 13) |
| SPT-3 | X | 9-15-18 (N = 33) |
| SPT-4 | X | 8-16-19 (N = 35) |
| SPT-5 | X | 16-24-27 (N = 51) |
| SPT-6 | X | 7-14-20 (N = 34) |
| SPT-7 | X | 25-21-36 (N = 57) |
| SPT-8 | X | 21-30-22 (N = 52) |
| SPT-9 | X | 0-0-2 (N = 2) |
| SPT-10 | X | 0-1-2 (N = 3) |
| SPT-11 | X | WOH |
| SPT-12 | X | 1-2-3 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring offset ~ 60 feet east due to traffic and utility |
| REMARKS: | issues. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

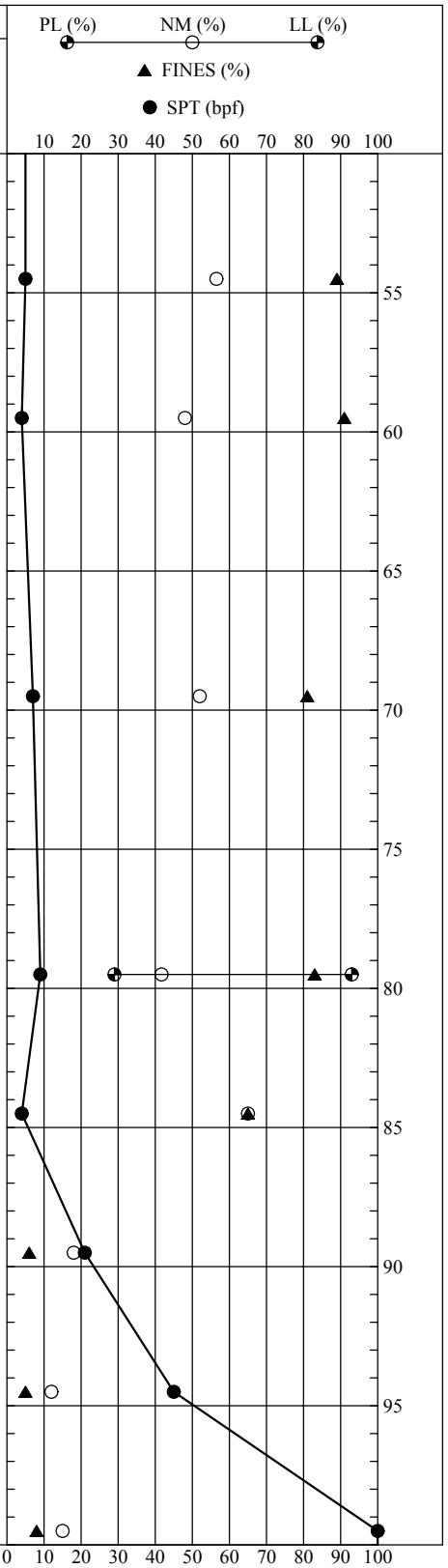
## SOIL TEST BORING RECORD

**BORING NO.:** BI-5
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220813.1,757163.4
**DRILLED:** July 31, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Very soft to medium stiff dark greenish gray clay (CH), (A-7-6). Strong to weak organic odor. | | -47 | | | (N = 5) |
| 55 | | | -52 | SPT-13 | | 0-2-3 (N = 5) |
| 60 | | | -57 | SPT-14 | | 0-2-2 (N = 4) |
| 65 | | | -62 | | | |
| 70 | | | -67 | SPT-15 | | 1-3-4 (N = 7) |
| 75 | | | -72 | | | |
| 80 | | | -77 | SPT-16 | | 0-3-6 (N = 9) |
| 85 | | | -82 | SPT-17 | | 0-0-4 (N = 4) |
| 90 | Medium to very dense, dark to light gray, fine to coarse sand (SP), (A--1-b) with little medium to coarse gravel. Wet. | | -87 | SPT-18 | | 4-5-16 (N = 21) |
| 95 | | | -92 | SPT-19 | | 20-25-20 (N = 45) |
| 100 | | | -97 | SPT-20 | | 38-50/6" |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring offset ~ 60 feet east due to traffic and utility |
| REMARKS: | issues. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

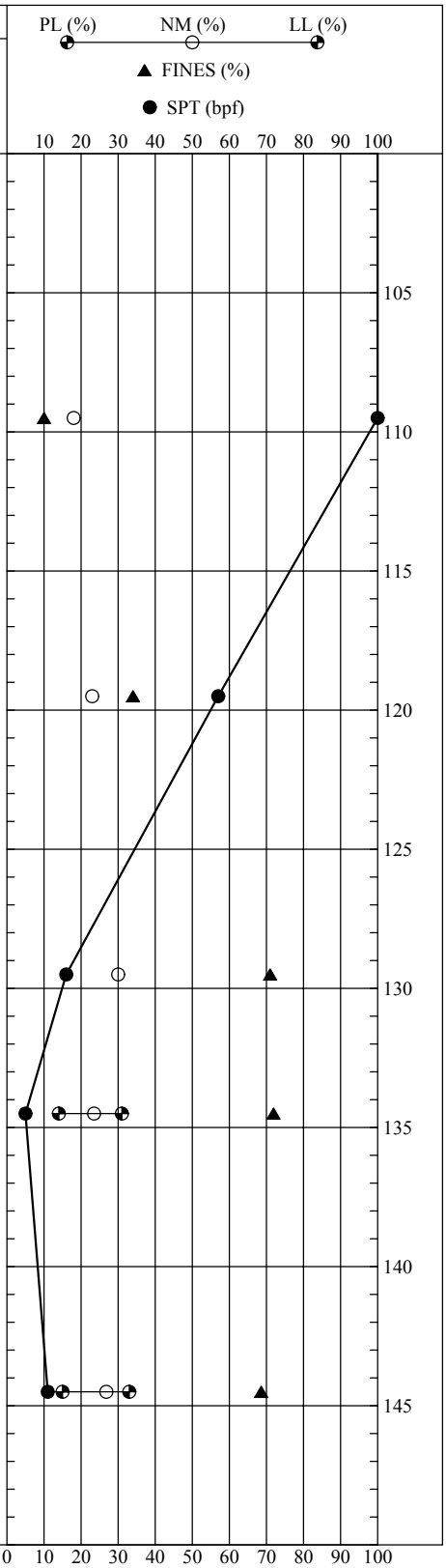
## SOIL TEST BORING RECORD

**BORING NO.:** BI-5
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220813.1,757163.4
**DRILLED:** July 31, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 100 | Medium to very dense, dark to light gray, fine to coarse sand (SP), (A--1-b) with little medium to coarse gravel. Wet. | | -97 | | | |
| 105 | | | -102 | | | |
| 110 | | | -107 | SPT-21 | | 40-50/5" |
| 115 | | | -112 | | | |
| 120 | Very dense tan silty silty fine sand (SM), (A-2-4) with trace organic material. | | -117 | SPT-22 | | 8-17-40 (N = 57) |
| 125 | | | -122 | | | |
| 130 | Medium stiff to stiff brown to dark gray silty clay (CL), (A-6) with little fine sand. | | -127 | SPT-23 | | 4-8-8 (N = 16) |
| 135 | | | -132 | SPT-24 | | 0-0-5 (N = 5) |
| 140 | Medium stiff light brown to dark greenish gray clay (CL), (A-6). | | -137 | | | |
| 145 | | | -142 | SPT-25 | | 4-5-6 (N = 11) |
| | | | | UNDIST-14 | | |
| 150 | Boring terminated at 147 feet bgs. | | -147 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring offset ~ 60 feet east due to traffic and utility |
| REMARKS: | issues. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

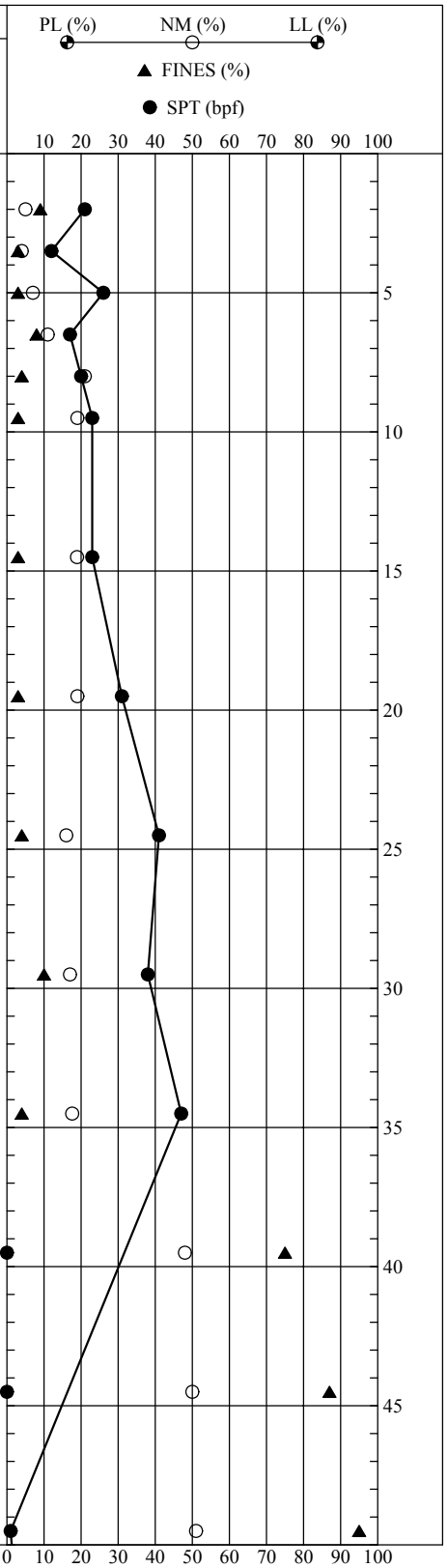
## SOIL TEST BORING RECORD

**BORING NO.:** BI-5
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 220813.1,757163.4
**DRILLED:** July 31, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 0 | Medium dense, light tan, fine to medium SAND (SP), (A-3) moist. | | 6 | SPT-1 | | 6-10-11 (N = 21) |
| | | | | SPT-2 | | 8-6-6 (N = 12) |
| | Stiff, light gray, SILT (ML) moist to wet. | | | | | |
| 5 | Medium dense to dense, light gray, fine to medium SAND (SP), (A-1-b) trace medium gravel, moist. | | 1 | SPT-3 | | 9-11-15 (N = 26) |
| | | | | SPT-4 | | 14-11-6 (N = 17) |
| | Lens of organic black SILT, little root fragment, from 7.2 to 7.5 feet bgs. | | | SPT-5 | | 5-8-12 (N = 20) |
| | | | | SPT-6 | | 8-11-12 (N = 23) |
| 10 | | | -4 | | | |
| 15 | | | -9 | SPT-7 | | 6-11-12 (N = 23) |
| 20 | | | -14 | SPT-8 | | 12-14-17 (N = 31) |
| 25 | | | -19 | SPT-9 | | 14-19-22 (N = 41) |
| 30 | | | -24 | SPT-10 | | 14-19-19 (N = 38) |
| 35 | | | -29 | SPT-11 | | 14-21-26 (N = 47) |
| | Very soft to medium stiff, dark gray to black, CLAY (CH), (A-7-6) trace shell fragments, weak to strong organic odor. | | | | | |
| 40 | | | -34 | SPT-12 | | WOH |
| 45 | | | -39 | SPT-13 | | WOH |
| | | | | UD-5 | | |
| 50 | | | -44 | SPT-14 | | 0-0-1 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring offset ~ 30 feet NW due to traffic and utility |
| REMARKS: | issues. Piezometer installed ~ 45 feet east of boring immediately after completion. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

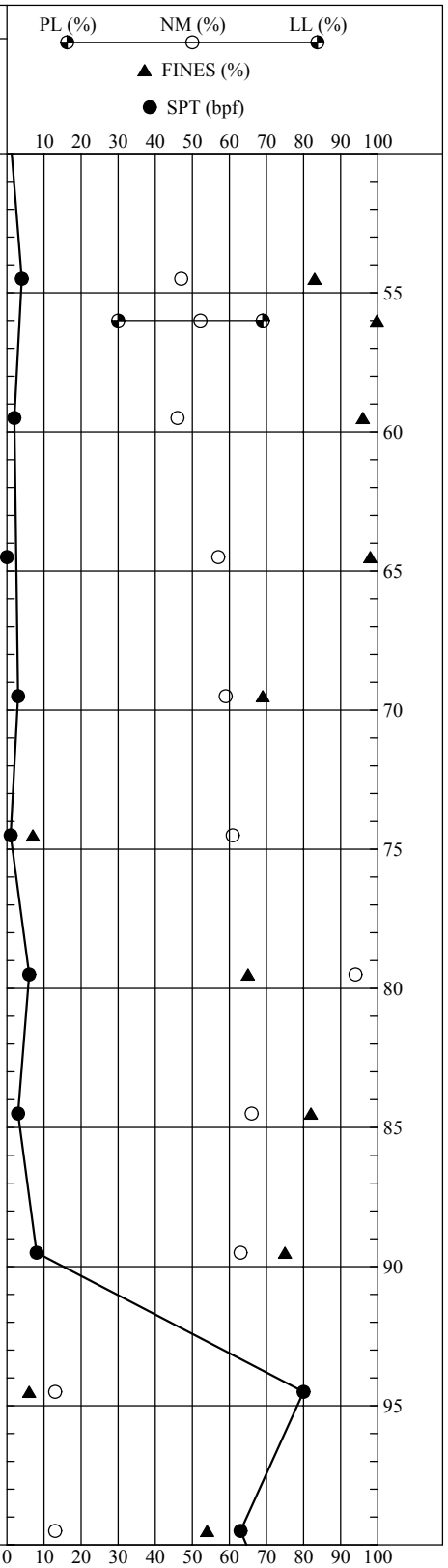
## SOIL TEST BORING RECORD

**BORING NO.:** BI-6
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 221218.7,757050.7
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW.) | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Very soft to medium stiff, dark gray to black, CLAY (CH), (A-7-6) trace shell fragments, weak to strong organic odor. | | -44 | | | (N = 1) |
| 55 | | | -49 | SPT-15 | | 0-2-2 (N = 4) |
| | | | | UD-6 | | |
| 60 | | | -54 | SPT-16 | | 0-0-2 (N = 2) |
| 65 | | | -59 | SPT-17 | | WOH |
| 70 | | | -64 | SPT-18 | | 0-1-2 (N = 3) |
| 75 | | | -69 | SPT-19 | | 0-0-1 (N = 1) |
| 80 | | | -74 | SPT-20 | | 2-2-4 (N = 6) |
| 85 | | | -79 | SPT-21 | | 0-1-2 (N = 3) |
| 90 | | | -84 | SPT-22 | | 1-4-4 (N = 8) |
| 95 | Very dense, light and dark gray to dark yellowish brown, fine to medium silty SAND (SM), (A-1-b) with some medium gravel, wet. | | -89 | SPT-23 | | 17-46-34 (N = 80) |
| 100 | | | -94 | SPT-24 | | 16-19-44 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring offset ~ 30 feet NW due to traffic and utility |
| REMARKS: | issues. Piezometer installed ~ 45 feet east of boring immediately after completion. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

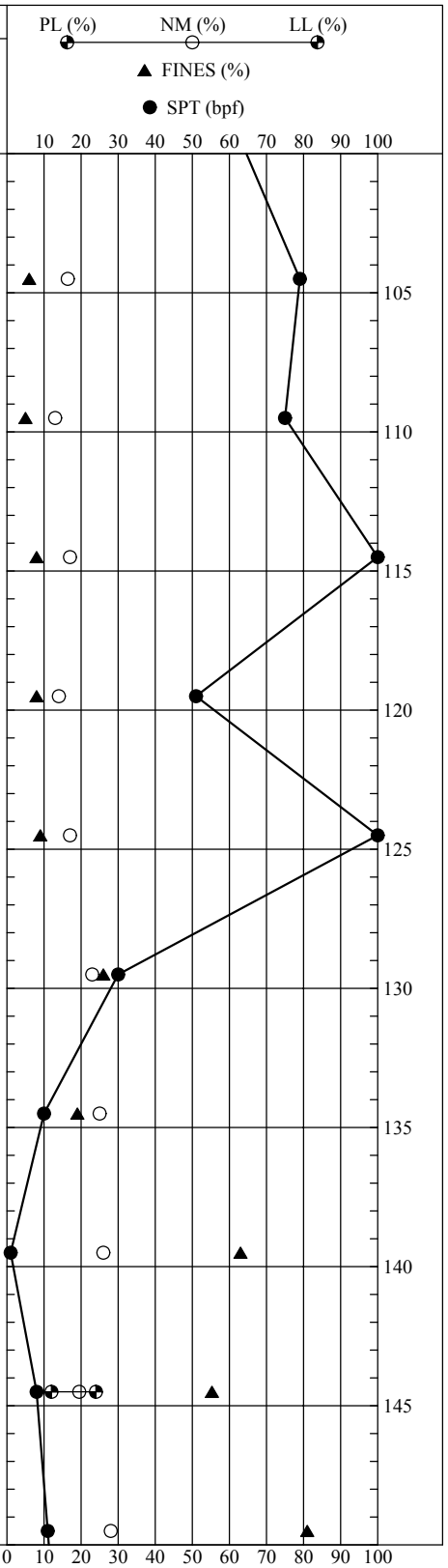
## SOIL TEST BORING RECORD

**BORING NO.:** BI-6
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 221218.7,757050.7
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 100 | Very dense, light and dark gray to dark yellowish brown, fine to medium silty SAND (SM), (A-1-b) with some medium gravel, wet. | | -94 | | | (N = 63) |
| 105 | | | -99 | SPT-25 | | 25-33-46 (N = 79) |
| 110 | | | -104 | SPT-26 | | 30-35-40 (N = 75) |
| 115 | | | -109 | SPT-27 | | 26-46-50/5" |
| 120 | | | -114 | SPT-28 | | 17-25-26 (N = 51) |
| 125 | | | -119 | SPT-29 | | 22-40-50/5" |
| 130 | Lens of dark gray, sandy silt from 127 to 129 feet bgs. | | -124 | SPT-30 | | 3-9-21 (N = 30) |
| 135 | | | -129 | SPT-31 | | 8-6-4 (N = 10) |
| 140 | Very soft to stiff, brown to dark greenish gray, sandy CLAY (CL), (A-6) trace to little fine sand, wet. | | -134 | SPT-32 | | 2-0-1 (N = 1) |
| 145 | | | -139 | SPT-33 | | 0-2-6 (N = 8) |
| 150 | | | -144 | SPT-34 | | 4-4-7 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring offset ~ 30 feet NW due to traffic and utility |
| REMARKS: | issues. Piezometer installed ~ 45 feet east of boring immediately after completion. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

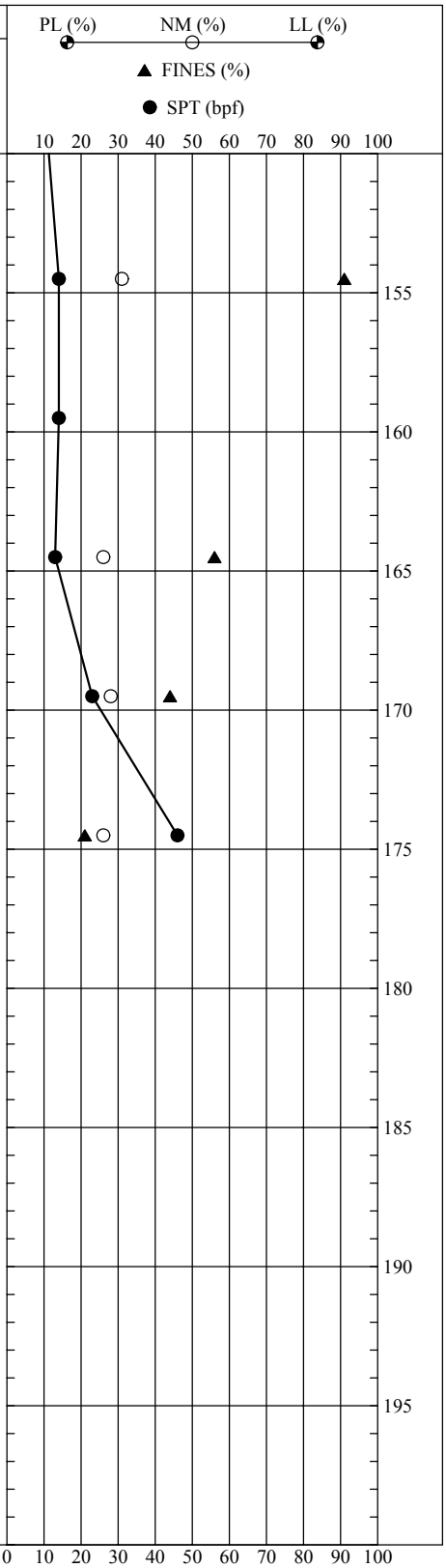
## SOIL TEST BORING RECORD

**BORING NO.:** BI-6
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 221218.7,757050.7
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 150 | Very soft to stiff, brown to dark greenish gray, sandy CLAY (CL), (A-6) trace to little fine sand, wet. | | -144 | | | (N = 11) |
| 155 | | | -149 | SPT-35 | | 4-6-8 (N = 14) |
| 160 | | | -154 | SPT-36 | | 6-7-7 (N = 14) |
| 165 | Medium dense, brown, fine SAND (SP), (A-3) and silt, trace coarse sand, wet. | | -159 | SPT-37 | | 5-5-8 (N = 13) |
| 170 | | | -164 | SPT-38 | | 6-8-15 (N = 23) |
| 175 | Boring Terminated at 175 feet bgs. | | -169 | SPT-39 | | 14-24-22 (N = 46) |
| 180 | | | -174 | | | |
| 185 | | | -179 | | | |
| 190 | | | -184 | | | |
| 195 | | | -189 | | | |
| 200 | | | -194 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring offset ~ 30 feet NW due to traffic and utility |
| REMARKS: | issues. Piezometer installed ~ 45 feet east of boring immediately after completion. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

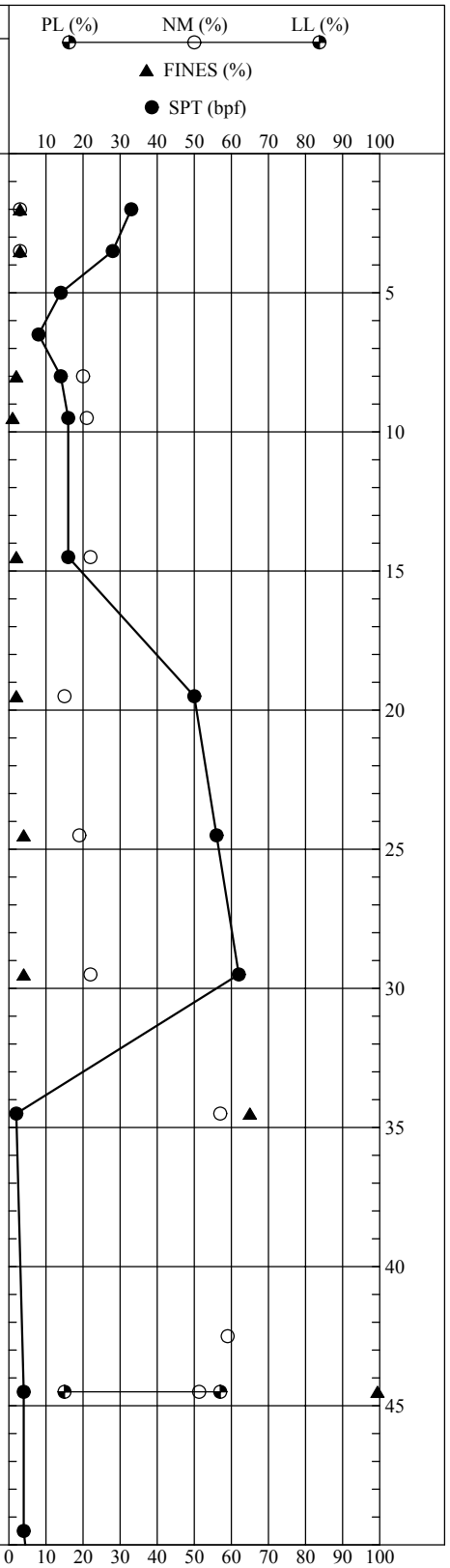
## SOIL TEST BORING RECORD

**BORING NO.:** BI-6
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 221218.7,757050.7
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW.) | ELEV (ft) | SAMPLE IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|
| 0 | Asphalt | 6 | | | |
| | Dense, light yellow, fine to medium SAND (SP), (A-1-b) dry. | | SPT-1 | X | 11-15-18 (N = 33) |
| | | | SPT-2 | X | 15-14-14 (N = 28) |
| | Stiff, light gray, SILT (ML). | | | | |
| 5 | Medium dense, light yellow, fine to medium SAND (SP). | 1 | SPT-3 | X | 9-7-7 (N = 14) |
| | | | SPT-4 | X | 2-3-5 (N = 8) |
| | Dark brown Peat (PT). | | | | |
| | Loose, brown, fine to medium SAND (SP), some root fragments. | | SPT-5 | X | 4-6-8 (N = 14) |
| | Medium dense to very dense, light tan to light gray, fine to medium SAND (SP), (A-3) wet. | | SPT-6 | X | 7-7-9 (N = 16) |
| 10 | | -4 | | | |
| | | | SPT-7 | X | 7-8-8 (N = 16) |
| 15 | | -9 | | | |
| | | | SPT-8 | X | 15-20-30 (N = 50) |
| 20 | Lens of little medium to coarse gravel and trace shell fragments from 19.2 to 19.5 feet bgs. | -14 | | | |
| | | | SPT-9 | X | 17-25-31 (N = 56) |
| 25 | | -19 | | | |
| | | | SPT-10 | X | 17-26-36 (N = 62) |
| 30 | | -24 | | | |
| | Soft, dark greenish gray, CLAY (CH), (A-7-6) weak to strong organic odor, little to some shell fragments. | | UNDIST-3 | | |
| | | | SPT-11 | X | 0-0-2 (N = 2) |
| 35 | | -29 | | | |
| 40 | | -34 | | | |
| | | | UNDIST-4 | | |
| | | | SPT-12 | X | 0-0-4 (N = 4) |
| 45 | | -39 | | | |
| | Lens of sand, weaker organic odor, little shell fragments from 48.5 to 48.6 feet bgs. | | SPT-13 | X | 0-0-4 |
| 50 | | -44 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Attempted to push UD-4 from 38.5 to 40.5 ft, but no |
| REMARKS: | recovery. Also no SPT sample from that interval. Peizometer installed ~ 5 feet north of boring immediately after completion. Boring offset ~35 feet East. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

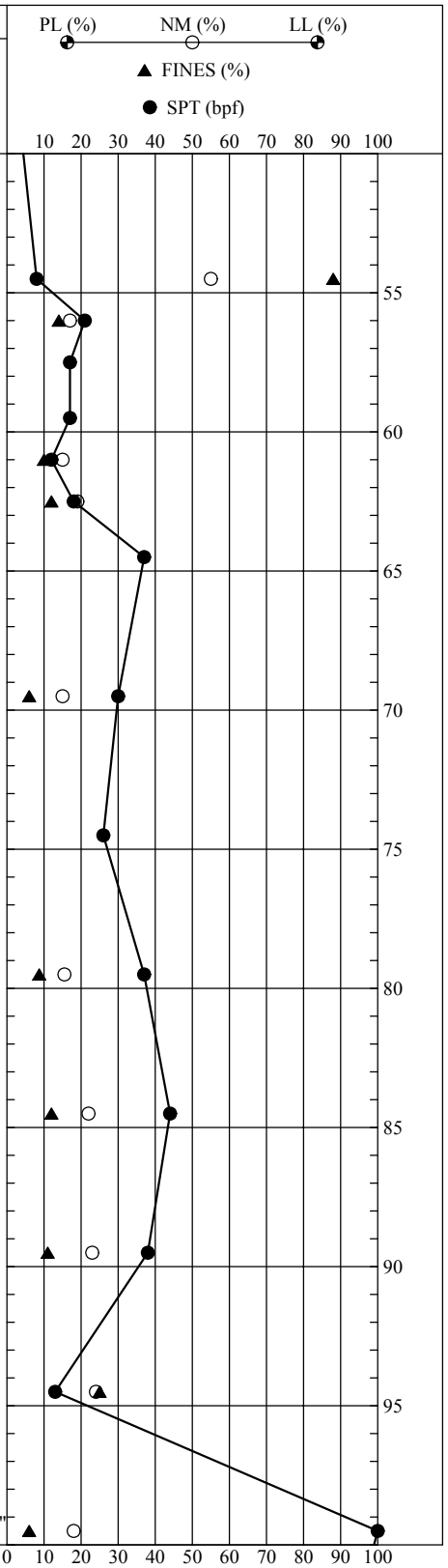
## SOIL TEST BORING RECORD

**BORING NO.:** BI-7
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222178.4,756953.6
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Soft, dark greenish gray, CLAY (CH), (A-7-6) weak to strong organic odor, little to some shell fragments. | | -44 | | | (N = 4) |
| | | | | SPT-14 | | 0-3-5 (N = 8) |
| 55 | Lens of dark brown, SILT (ML) and sand, with organics from 54.8 to 55 feet bgs. | | -49 | SPT-15 | | 9-10-11 (N = 21) |
| | Firm to dense, light to dark gray, poorly graded fine to coarse SAND (SP-SM), (A-2) with silt, little medium to coarse gravel, trace shell fragments. | | | SPT-16 | | 7-7-10 (N = 17) |
| | | | | SPT-17 | | 7-9-8 (N = 17) |
| 60 | | | -54 | SPT-18 | | 5-7-5 (N = 12) |
| | | | | SPT-19 | | 5-7-11 (N = 18) |
| | | | | SPT-20 | | 13-18-19 (N = 37) |
| 65 | | | -59 | | | |
| | | | | SPT-21 | | 14-14-16 (N = 30) |
| 70 | | | -64 | | | |
| | | | | SPT-22 | | 11-12-14 (N = 26) |
| 75 | | | -69 | | | |
| | | | | SPT-23 | | 14-19-18 (N = 37) |
| 80 | | | -74 | | | |
| | Dense, light gray, fine SAND (SP), wet.<br>Lens of light tan CLAY (CL) from 83.7 to 83.9 feet bgs. | | | SPT-24 | | 17-23-21 (N = 44) |
| 85 | | | -79 | | | |
| | Lens of light tan CLAY (CL) from 89 to 89.5 feet bgs. | | | SPT-25 | | 14-9-29 (N = 38) |
| 90 | | | -84 | | | |
| | Lenses of light tan CLAY (CL) from 93.8 to 94.3 feet bgs. | | | SPT-26 | | 4-6-7 (N = 13) |
| 95 | | | -89 | | | |
| | Very dense, light gray, fine to medium SAND (SP), trace medium gravel, wet. | | | SPT-27 | | 23-50/6"-50/6" |
| 100 | | | -94 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | |
| REMARKS: | Attempted to push UD-4 from 38.5 to 40.5 ft, but no recovery. Also no SPT sample from that interval. Peizometer installed ~ 5 feet north of boring immediately after completion. Boring offset ~35 feet East. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

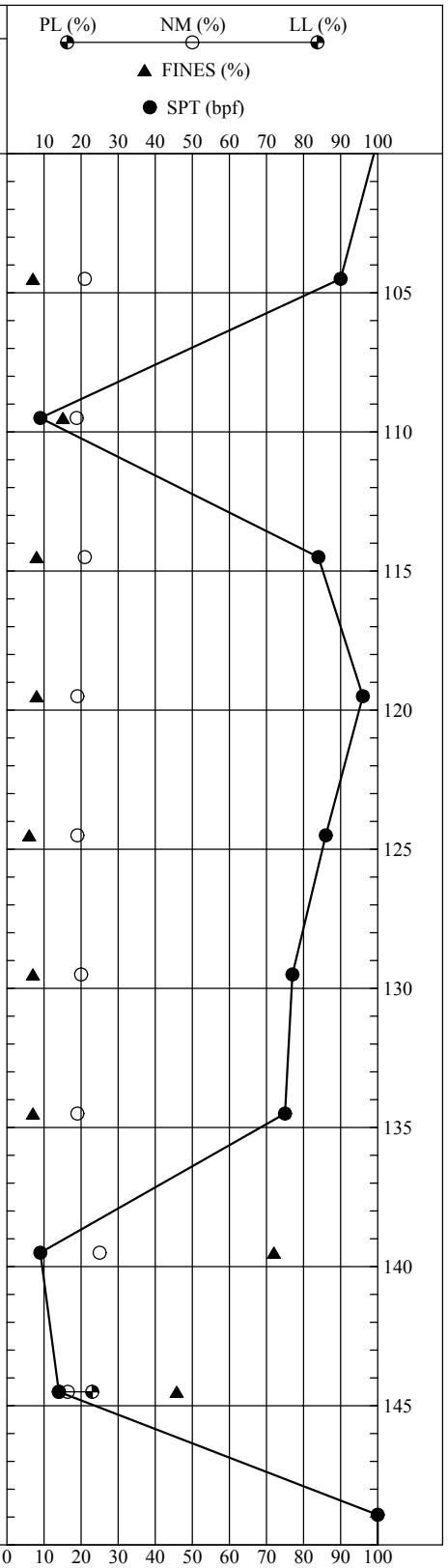
## SOIL TEST BORING RECORD

**BORING NO.:** BI-7
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222178.4,756953.6
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 100 | Firm to dense, light to dark gray, poorly graded fine to coarse SAND (SP-SM), (A-2) with silt, little medium to coarse gravel, trace shell fragments. | | -94 | | | |
| 105 | | | -99 | SPT-28 | | 34-44-46 (N = 90) |
| | Loose, light gray to yellowish brown, silty fine to medium SAND (SM), (A-3) trace medium gravel. | | | | | |
| 110 | | | -104 | SPT-29 | | 2-3-6 (N = 9) |
| | Very dense, light gray fine to medium SAND (SP), (A-3) trace medium gravel, trace silt and clay, occasional iron staining. | | | | | |
| 115 | | | -109 | SPT-30 | | 24-34-50 (N = 84) |
| 120 | | | -114 | SPT-31 | | 31-45-51 (N = 96) |
| 125 | | | -119 | SPT-32 | | 31-41-45 (N = 86) |
| 130 | | | -124 | SPT-33 | | 26-31-46 (N = 77) |
| 135 | | | -129 | SPT-34 | | 25-33-42 (N = 75) |
| | Stiff dark gray to yellowish brown, clayey sand (SC), (A-4) little fine to medium sand. | | | | | |
| 140 | | | -134 | SPT-35 | | 4-5-4 (N = 9) |
| 145 | | | -139 | SPT-36 | | 4-4-10 (N = 14) |
| | Very dense, dark gray, fine to medium SAND (SP), (A-2). | | | | | |
| 150 | | | -144 | SPT-37 | | 50/5" |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | |
| REMARKS: | Attempted to push UD-4 from 38.5 to 40.5 ft, but no recovery. Also no SPT sample from that interval. Peizometer installed ~ 5 feet north of boring immediately after completion. Boring offset ~35 feet East. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

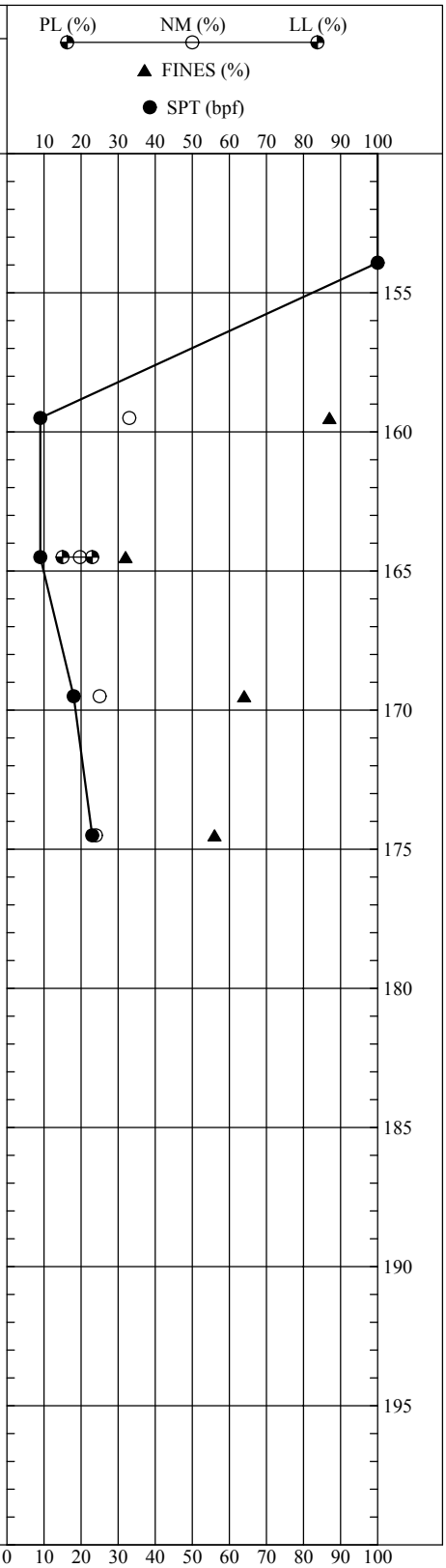
## SOIL TEST BORING RECORD

**BORING NO.:** BI-7
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222178.4,756953.6
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 150 | Very dense, dark gray, fine to medium SAND (SP), (A-2). | | -144 | | | |
| | | | | SPT-38 | | 50/5" |
| 155 | | | -149 | | | |
| | Stiff, dark grayish brown, clayey sand (SC), (A-2-4). | | | | | |
| | | | | SPT-39 | | 3-4-5 (N = 9) |
| 160 | | | -154 | | | |
| | | | | SPT-40 | | 4-4-5 (N = 9) |
| 165 | | | -159 | | | |
| | | | | SPT-41 | | 8-8-10 (N = 18) |
| 170 | | | -164 | | | |
| | | | | SPT-42 | | 8-10-13 (N = 23) |
| 175 | | | -169 | | | |
| | Boring terminated at 175 feet bgs. | | | | | |
| 180 | | | -174 | | | |
| 185 | | | -179 | | | |
| 190 | | | -184 | | | |
| 195 | | | -189 | | | |
| 200 | | | -194 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | |
| REMARKS: | Attempted to push UD-4 from 38.5 to 40.5 ft, but no recovery. Also no SPT sample from that interval. Peizometer installed ~ 5 feet north of boring immediately after completion. Boring offset ~35 feet East. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

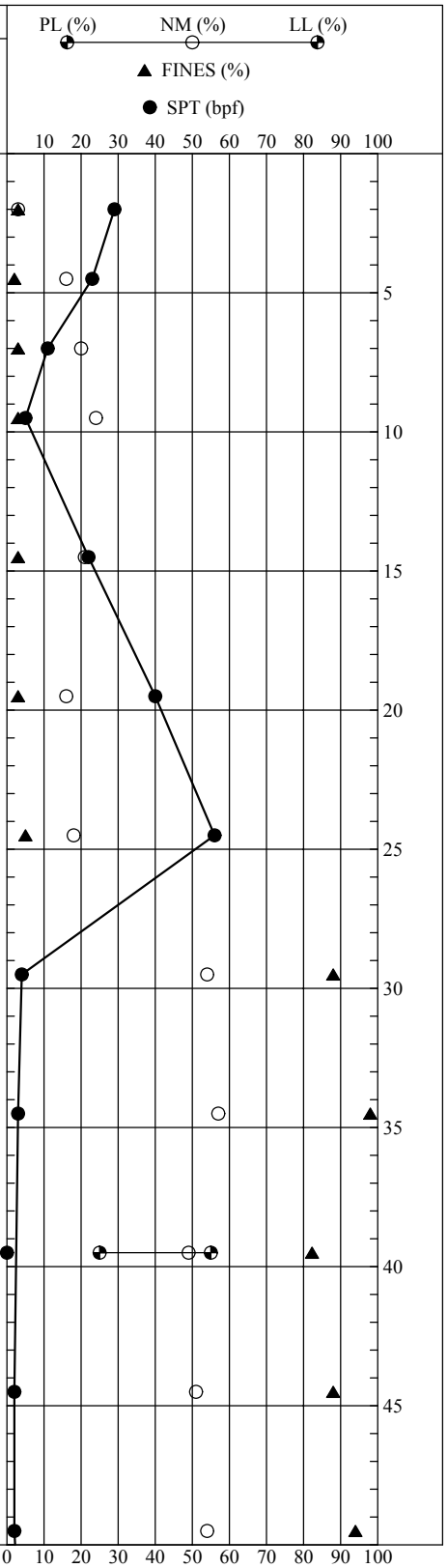
## SOIL TEST BORING RECORD

**BORING NO.:** BI-7
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222178.4,756953.6
**DRILLED:** July 16, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 0 | Medium dense tan fine to medium SAND (SP), (A-3) moist. | | 5 | SPT-1 | X | 8-12-17 (N = 29) |
| | | | | SPT-2 | X | 10-12-11 (N = 23) |
| 5 | Loose to very dense dark gray fine to medium SAND (SP), (A-3) trace silt, wet. | | 0 | SPT-3 | X | 6-5-6 (N = 11) |
| | | | | SPT-4 | X | 2-2-3 (N = 5) |
| 10 | | | -5 | | | |
| | | | | SPT-5 | X | 10-11-11 (N = 22) |
| 15 | | | -10 | | | |
| | Little coarse sand at 18.5 feet bgs. | | | SPT-6 | X | 13-16-24 (N = 40) |
| 20 | | | -15 | | | |
| | | | | SPT-7 | X | 12-26-30 (N = 56) |
| 25 | | | -20 | | | |
| | Very soft to soft dark grayish brown clay (CH), (A-7-5) with sand, organic odor, trace shell fragments. | | | SPT-8 | X | 9-2-2 (N = 4) |
| 30 | | | -25 | | | |
| | | | | SPT-9 | X | 2-1-2 (N = 3) |
| 35 | | | -30 | | | |
| | | | | SPT-10 | X | WOH |
| 40 | | | -35 | | | |
| | | | | SPT-11 | X | 0-0-2 (N = 2) |
| 45 | | | -40 | | | |
| | | | | SPT-12 | X | 0-0-2 |
| 50 | | | -45 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

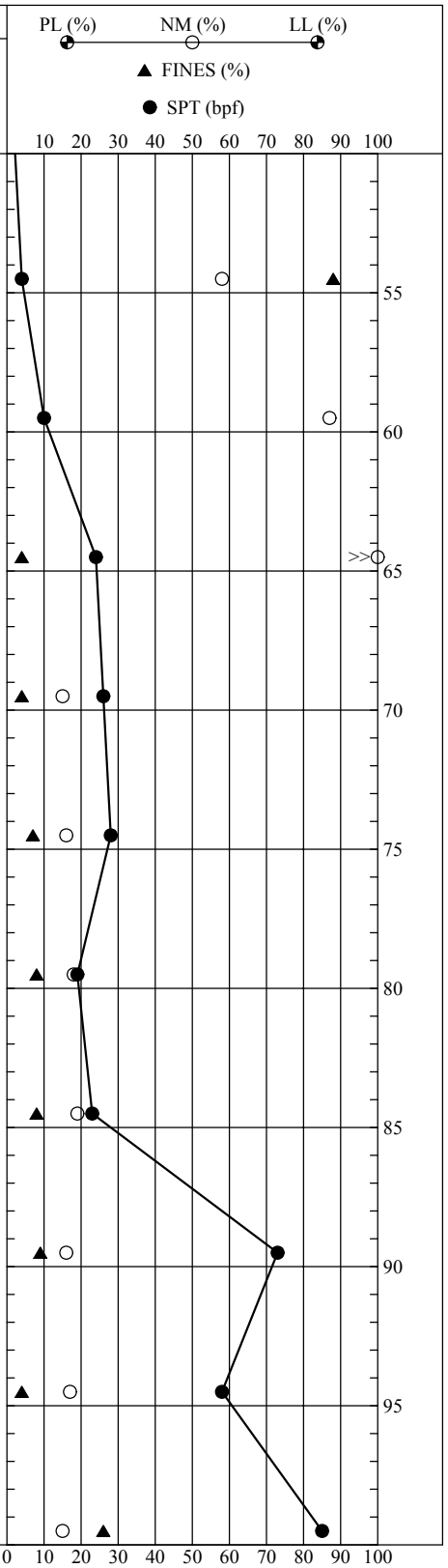
## SOIL TEST BORING RECORD

**BORING NO.:** BI-8
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222500.1,756900.4
**DRILLED:** July 2, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | ELEV (ft) | IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|
| 50 | Very soft to soft dark grayish brown clay (CH), (A-7-5) with sand, organic odor, trace shell fragments. | -45 | | | (N = 2) |
| 55 | | -50 | SPT-13 | X | 1-2-2 (N = 4) |
| | Lens of stiff dark brown to black organic silt (OL), very strong organic odor. | | | | |
| 60 | Interbedded sand, and organic silt and clay from 59.4 to 59.9 feet bgs.<br>Medium dense dark gray fine to medium SAND (SP), (A-1-b) wet. | -55 | SPT-14 | X | 3-5-5 (N = 10) |
| 65 | Medium dense light gray fine to medium SAND (SP), (A-1-b) with little gravel, wet. | -60 | SPT-15 | X | 8-12-12 (N = 24) |
| 70 | | -65 | SPT-16 | X | 7-11-15 (N = 26) |
| 75 | | -70 | SPT-17 | X | 14-12-16 (N = 28) |
| 80 | | -75 | SPT-18 | X | 10-9-10 (N = 19) |
| 85 | Medium dense to very dense light tan fine to medium SAND (SP), (A-1-b) wet. | -80 | SPT-19 | X | 12-10-13 (N = 23) |
| 90 | | -85 | SPT-20 | X | 20-33-40 (N = 73) |
| 95 | Trace coarse sand at 93.5 feet bgs. | -90 | SPT-21 | X | 22-28-30 (N = 58) |
| 100 | Boring terminated at 100.0 feet bgs. | -95 | SPT-22 | X | 32-38-47 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

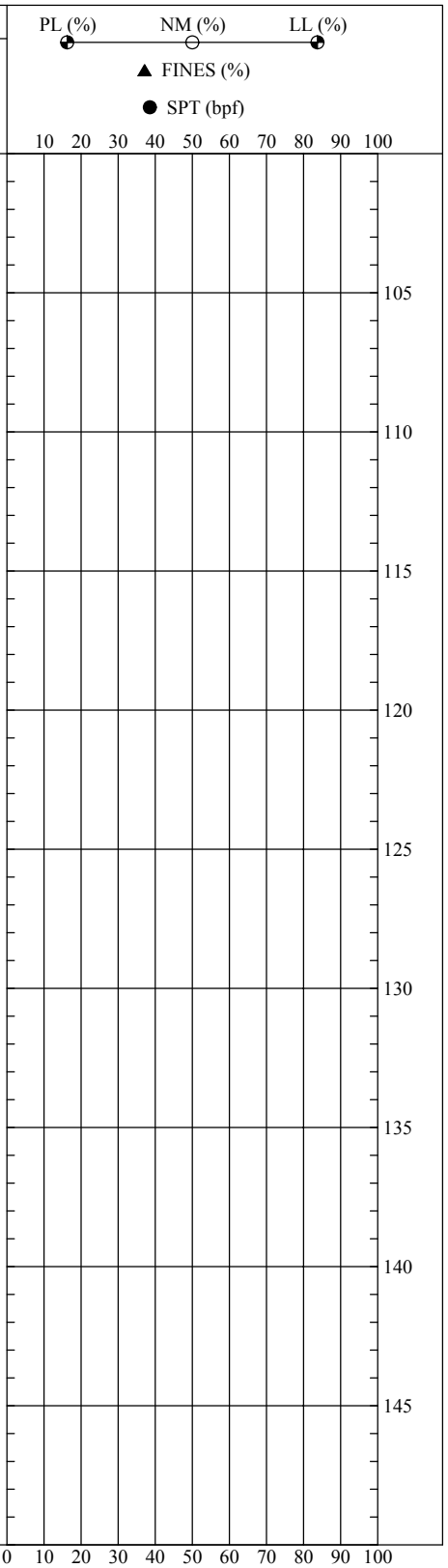
## SOIL TEST BORING RECORD

**BORING NO.:** BI-8
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222500.1,756900.4
**DRILLED:** July 2, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES: IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 100 | | | -95 | | | (N = 85) |
| 105 | | | -100 | | | |
| 110 | | | -105 | | | |
| 115 | | | -110 | | | |
| 120 | | | -115 | | | |
| 125 | | | -120 | | | |
| 130 | | | -125 | | | |
| 135 | | | -130 | | | |
| 140 | | | -135 | | | |
| 145 | | | -140 | | | |
| 150 | | | -145 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

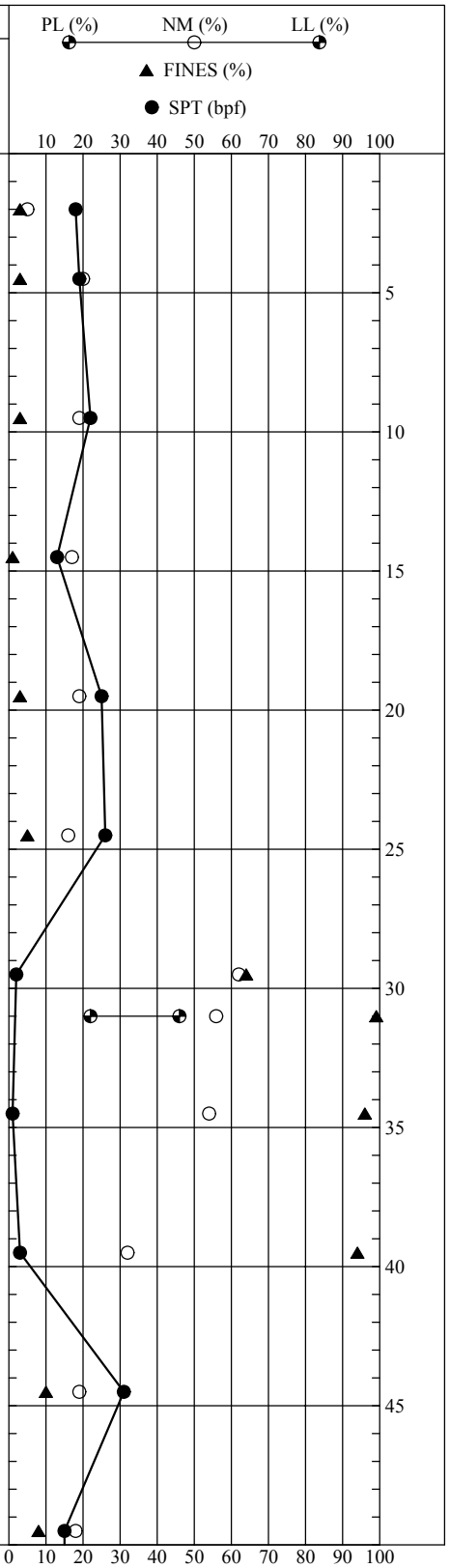
## SOIL TEST BORING RECORD

**BORING NO.:** BI-8
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222500.1,756900.4
**DRILLED:** July 2, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 0 | Medium dense, tan, fine to medium SAND (SP), (A-3) trace coarse sand, moist. | | 5 | SPT-1 | | 5-8-10 (N = 18) |
| | Indicated water level from 24 hour reading. Trace root fragments and wet at 3.5 feet below ground surface (bgs). | | | SPT-2 | | 5-8-11 (N = 19) |
| 5 | | | 0 | | | |
| | Sand changes to gray in color at 8.5 feet bgs. | | | SPT-3 | | 7-11-11 (N = 22) |
| 10 | | | -5 | | | |
| | | | | SPT-4 | | 4-6-7 (N = 13) |
| 15 | | | -10 | | | |
| | | | | SPT-5 | | 9-11-14 (N = 25) |
| 20 | | | -15 | | | |
| | Trace gravel and shell fragments at 23.5 feet bgs. | | | SPT-6 | | 13-13-13 (N = 26) |
| 25 | | | -20 | | | |
| | Soft to very soft, dark gray, CLAY (CH), (A-7-5) trace shell fragments, wet. | | | SPT-7 | | 1-1-1 (N = 2) |
| 30 | | | -25 | UD-1 | | |
| | | | | SPT-8 | | 0-0-1 (N = 1) |
| 35 | | | -30 | | | |
| | | | | SPT-9 | | 2-1-2 (N = 3) |
| 40 | Soft, dark gray, CLAY (CL), (A-7-5) some sand, wet. | | -35 | SH-2 | | |
| | Medium dense to very dense, light gray, fine to medium SAND (SP), (A-1-b) wet. | | | SPT-10 | | 7-14-17 (N = 31) |
| 45 | | | -40 | | | |
| | Tan color from 47 to 57 feet bgs. | | | SPT-11 | | 9-8-7 |
| 50 | | | -45 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

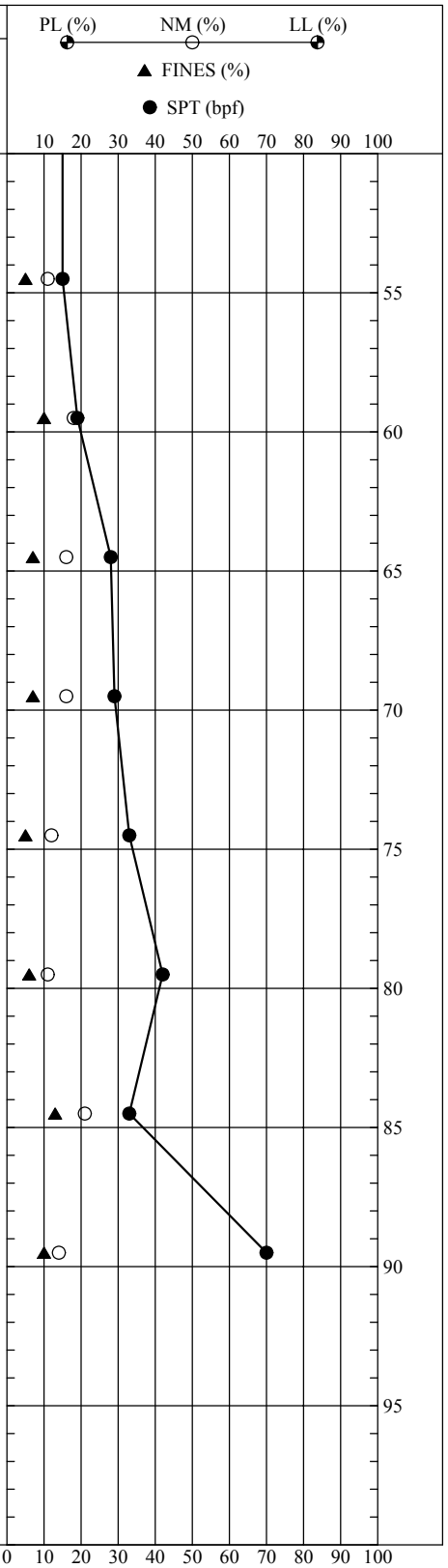
## SOIL TEST BORING RECORD

**BORING NO.:** BI-9
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222755.1,756859.4
**DRILLED:** June 30, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Medium dense to very dense, light gray, fine to medium SAND (SP), (A-1-b) wet. | | -45 | | | (N = 15) |
| 55 | | | -50 | SPT-12 | | 7-5-10 (N = 15) |
| | Light green color from 57 to 72 feet bgs. | | | | | |
| 60 | | | -55 | SPT-13 | | 12-10-9 (N = 19) |
| | Trace gravel and little coarse sand at 63.5 feet bgs. | | | | | |
| 65 | | | -60 | SPT-14 | | 17-14-14 (N = 28) |
| 70 | | | -65 | SPT-15 | | 12-14-15 (N = 29) |
| | Some coarse sand at 72 feet bgs. | | | | | |
| 75 | | | -70 | SPT-16 | | 17-16-17 (N = 33) |
| 80 | | | -75 | SPT-17 | | 19-18-24 (N = 42) |
| 85 | | | -80 | SPT-18 | | 23-17-16 (N = 33) |
| 90 | Boring Terminated at 90.0 feet bgs. | | -85 | SPT-19 | | 18-30-40 (N = 70) |
| 95 | | | -90 | | | |
| 100 | | | -95 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

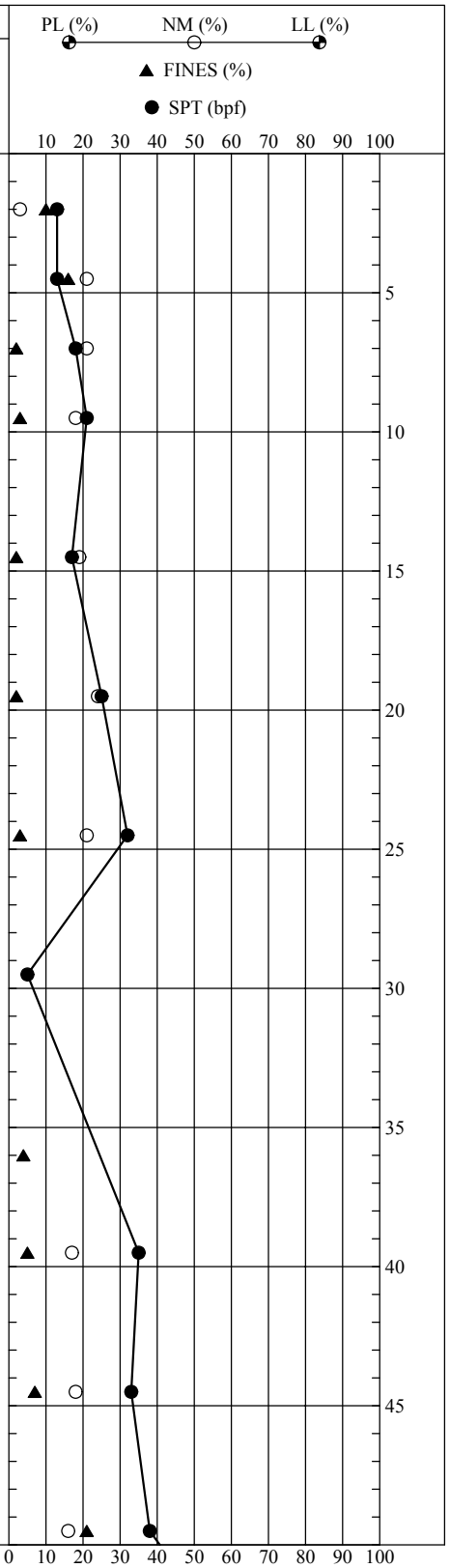
## SOIL TEST BORING RECORD

**BORING NO.:** BI-9
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 222755.1,756859.4
**DRILLED:** June 30, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 0 | Medium dense light tan to light to dark gray, fine to medium SAND (SP), (A-3) moist to wet. | | 4 | SPT-1 | X | 3-5-8 (N = 13) |
| | Lens of dark gray, clay, trace organics at 3.5 to 4.0 feet bgs. | | | SPT-2 | X | 2-5-8 (N = 13) |
| 5 | | | -1 | SPT-3 | X | 7-7-11 (N = 18) |
| | Trace medium gravel at 7.5 to 15 feet bgs. | | | SPT-4 | X | 9-9-12 (N = 21) |
| 10 | | | -6 | | | |
| | | | | SPT-5 | X | 7-8-9 (N = 17) |
| 15 | | | -11 | | | |
| | | | | SPT-6 | X | 8-10-15 (N = 25) |
| 20 | | | -16 | | | |
| | | | | SPT-7 | X | 11-14-18 (N = 32) |
| 25 | | | -21 | | | |
| | Sandy clay lens at 29-29.5 feet. | | | SPT-8 | X | 7-2-3 (N = 5) |
| 30 | Medium stiff, dark gray CLAY (CH). | | -26 | | | |
| | PMT-6 at 34 feet bgs | | | | | |
| 35 | | | -31 | UD-12 | | |
| | Dense, light gray to tan, fine to medium SAND (SP), (A-3) and silt, wet. | | | | | |
| | | | | SPT-9 | X | 7-14-21 (N = 35) |
| 40 | | | -36 | | | |
| | | | | SPT-10 | X | 9-16-17 (N = 33) |
| 45 | | | -41 | | | |
| | | | | SPT-11 | X | 8-17-21 |
| 50 | | | -46 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

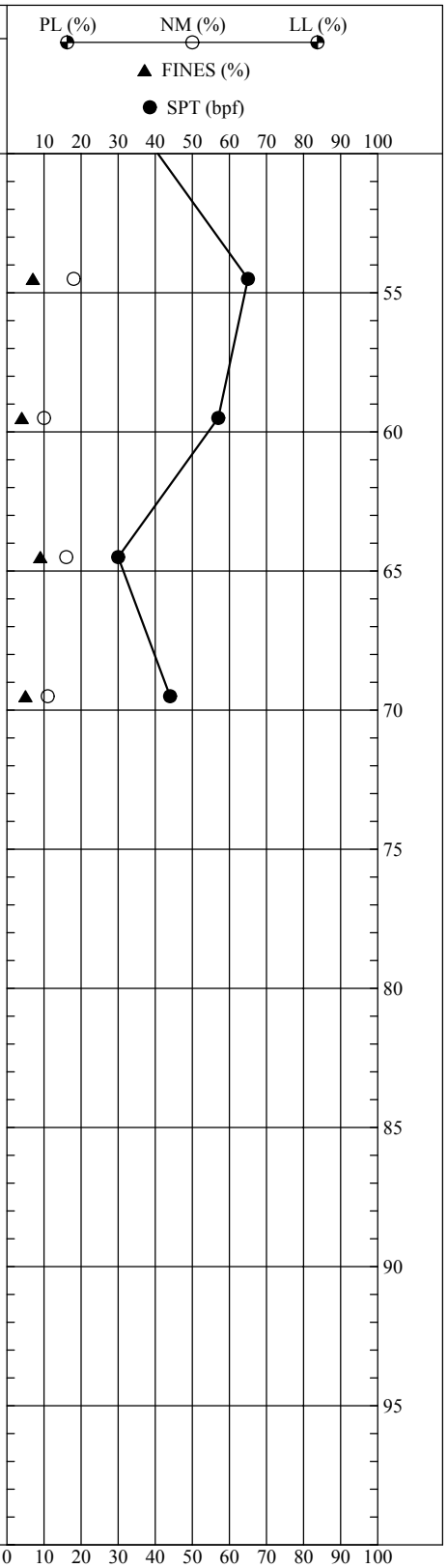
## SOIL TEST BORING RECORD

**BORING NO.:** BI-10
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 223030.3,756807.2
**DRILLED:** July 20, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Dense, light gray to tan, fine to medium SAND (SP), (A-3) and silt, wet. | | -46 | | | (N = 38) |
| 55 | | | -51 | SPT-12 | | 15-27-38 (N = 65) |
| 60 | Dense, light gray to tan, fine to coarse SAND (SP), (A-1-a) and silt, little medium to coarse gravel, wet. | | -56 | SPT-13 | | 27-37-20 (N = 57) |
| 65 | Trace medium gravel at 63.5 to 65.0 feet bgs. | | -61 | SPT-14 | | 13-13-17 (N = 30) |
| 70 | | | -66 | SPT-15 | | 17-20-24 (N = 44) |
| 75 | Boring terminated at 70 feet bgs. | | -71 | | | |
| 80 | | | -76 | | | |
| 85 | | | -81 | | | |
| 90 | | | -86 | | | |
| 95 | | | -91 | | | |
| 100 | | | -96 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

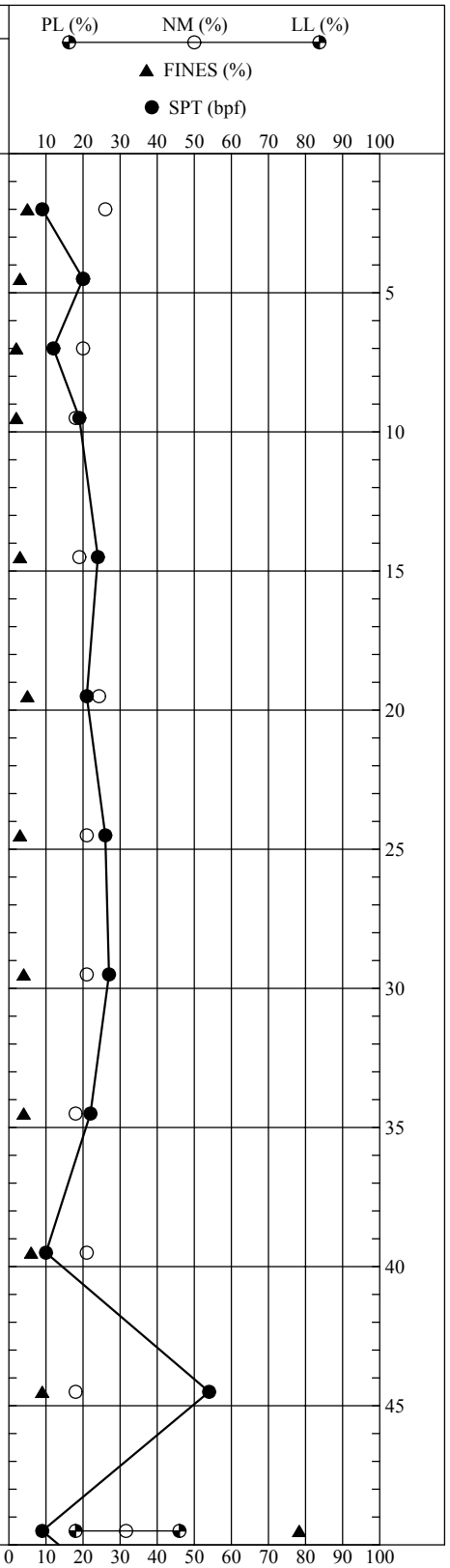
## SOIL TEST BORING RECORD

**BORING NO.:** BI-10
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 223030.3,756807.2
**DRILLED:** July 20, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW.) | ELEV (ft) | SAMPLE IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|
| 0 | Loose to medium dense light gray poorly graded fine to medium sand (SP), (A-3) wet | 3 | SPT-1 | X | 4-5-4 (N = 9) |
| 5 | | -2 | SPT-2 | X | 5-9-11 (N = 20) |
| | | | SPT-3 | X | 8-5-7 (N = 12) |
| 10 | Trace coarse sand and shell fragments at 8.5 feet bgs. | -7 | SPT-4 | X | 7-9-10 (N = 19) |
| 15 | | -12 | SPT-5 | X | 7-12-12 (N = 24) |
| 20 | Trace wood fragments at 18.5 feet bgs. | -17 | SPT-6 | X | 9-11-10 (N = 21) |
| 25 | | -22 | SPT-7 | X | 11-12-14 (N = 26) |
| 30 | | -27 | SPT-8 | X | 10-12-15 (N = 27) |
| 35 | Trace medium gravel at 33.5 feet bgs. | -32 | SPT-9 | X | 9-10-12 (N = 22) |
| 40 | Trace shell fragments at 38.5 feet bgs. Artesian pressures noticed approximately between 40 and 45 feet bgs. | -37 | SPT-10 | X | 5-4-6 (N = 10) |
| 45 | | -42 | SPT-11 | X | 13-27-27 (N = 54) |
| 50 | Stiff reddish gray clay (CL), (A-7-5) with sand. | -47 | SPT-12 | X | 5-4-5 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring was offset ~ 40 feet south as original location is in |
| REMARKS: | roadway. Piezometer installed in hole after drilling completed. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

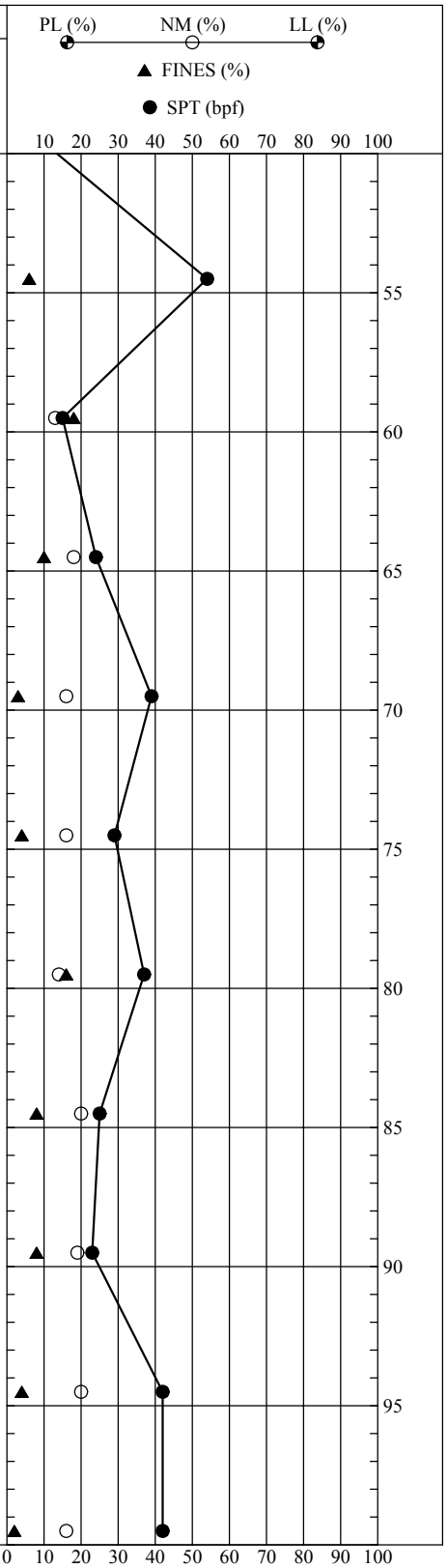
## SOIL TEST BORING RECORD

**BORING NO.:** BI-11
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 223228.3,756786.5
**DRILLED:** July 8, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Iron staining in clay at 49.5 feet bgs.<br>Stiff reddish gray clay (CL), (A-7-5) with sand. | | -47 | | | (N = 9) |
| | Medium dense to very dense light gray fine to medium sand (SP), (A-1-b) wet | | | | | |
| 55 | Some coarse gravel at 54.8 feet bgs. | | -52 | SPT-13 | | 4-17-37 (N = 54) |
| 60 | Little silt at 58.5 feet bgs | | -57 | SPT-14 | | 7-5-10 (N = 15) |
| 65 | Little coarse sand and medium to coarse gravel at 63.5 feet bgs. | | -62 | SPT-15 | | 3-8-16 (N = 24) |
| 70 | Medium to coarse sand (SP) from 68.5 to 83.5 feet bgs. | | -67 | SPT-16 | | 15-18-21 (N = 39) |
| 75 | Little medium gravel at 73.5. | | -72 | SPT-17 | | 13-13-16 (N = 29) |
| 80 | | | -77 | SPT-18 | | 9-14-23 (N = 37) |
| 85 | | | -82 | SPT-19 | | 9-11-14 (N = 25) |
| 90 | Trace medium gravel at 88.5 feet bgs. | | -87 | SPT-20 | | 6-10-13 (N = 23) |
| 95 | | | -92 | SPT-21 | | 11-21-21 (N = 42) |
| 100 | | | -97 | SPT-22 | | 13-20-22 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring was offset ~ 40 feet south as original location is in |
| REMARKS: | roadway. Piezometer installed in hole after drilling completed. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

## SOIL TEST BORING RECORD

**BORING NO.:** BI-11
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 223228.3,756786.5
**DRILLED:** July 8, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES: IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" | PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|
| 100 | Yellowish orange coloring at 99.75 feet bgs. | | -97 | | | (N = 42) | |
| | Boring terminated at 100.0 feet bgs. | | | | | | |
| 105 | | | -102 | | | | 105 |
| 110 | | | -107 | | | | 110 |
| 115 | | | -112 | | | | 115 |
| 120 | | | -117 | | | | 120 |
| 125 | | | -122 | | | | 125 |
| 130 | | | -127 | | | | 130 |
| 135 | | | -132 | | | | 135 |
| 140 | | | -137 | | | | 140 |
| 145 | | | -142 | | | | 145 |
| 150 | | | -147 | | | | 0 10 20 30 40 50 60 70 80 90 100 |

SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

| | |
|---|---|
| DRILLER: | MACTEC-Raleigh |
| EQUIPMENT: | Diedrich D-50 |
| METHOD: | Mud Rotary |
| HOLE DIA.: | 3" |
| LOGGED BY: | AJA |
| CHECKED BY: | Boring was offset ~ 40 feet south as original location is in |
| REMARKS: | roadway. Piezometer installed in hole after drilling completed. |

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

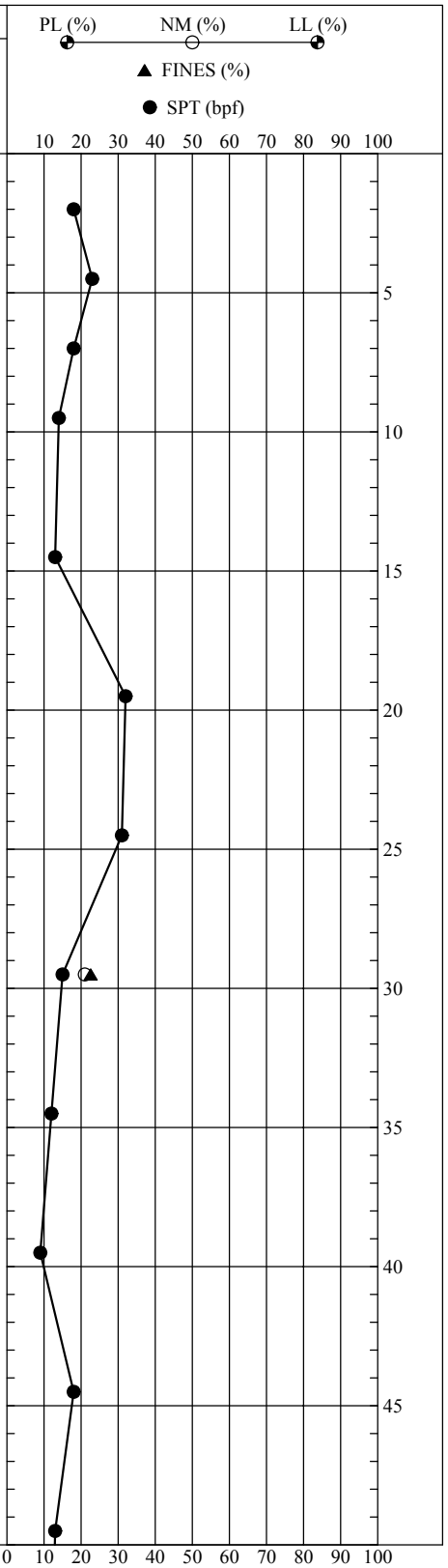
## SOIL TEST BORING RECORD

**BORING NO.:** BI-11
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 223228.3,756786.5
**DRILLED:** July 8, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 0 | Medium dense, tan to light gray, fine to medium SAND (SP), (A-2) trace medium to coarse gravel, moist to wet. | | 3 | | | |
| | | | | SPT-1 | | 7-8-10 (N = 18) |
| 5 | | | -2 | SPT-2 | | 9-10-13 (N = 23) |
| | | | | SPT-3 | | 4-7-11 (N = 18) |
| 10 | | | -7 | SPT-4 | | 5-6-8 (N = 14) |
| 15 | | | -12 | SPT-5 | | 5-6-7 (N = 13) |
| 20 | | | -17 | SPT-6 | | 11-15-17 (N = 32) |
| 25 | | | -22 | SPT-7 | | 10-14-17 (N = 31) |
| 30 | Medium dense, grayish brown, silty fine to coarse SAND (SM), (A-2) trace medium to fine gravel. | | -27 | SPT-8 | | 4-5-10 (N = 15) |
| 35 | | | -32 | SPT-9 | | 4-4-8 (N = 12) |
| 40 | Lens of black peat at 38.9 to 39.0 feet bgs.<br>Loose to medium dense, orange-brown to dark gray, fine to medium SAND (SP), (A-2) wet. | | -37 | SPT-10 | | 0-3-6 (N = 9) |
| 45 | | | -42 | SPT-11 | | 5-9-9 (N = 18) |
| 50 | | | -47 | SPT-12 | | 11-9-4 |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

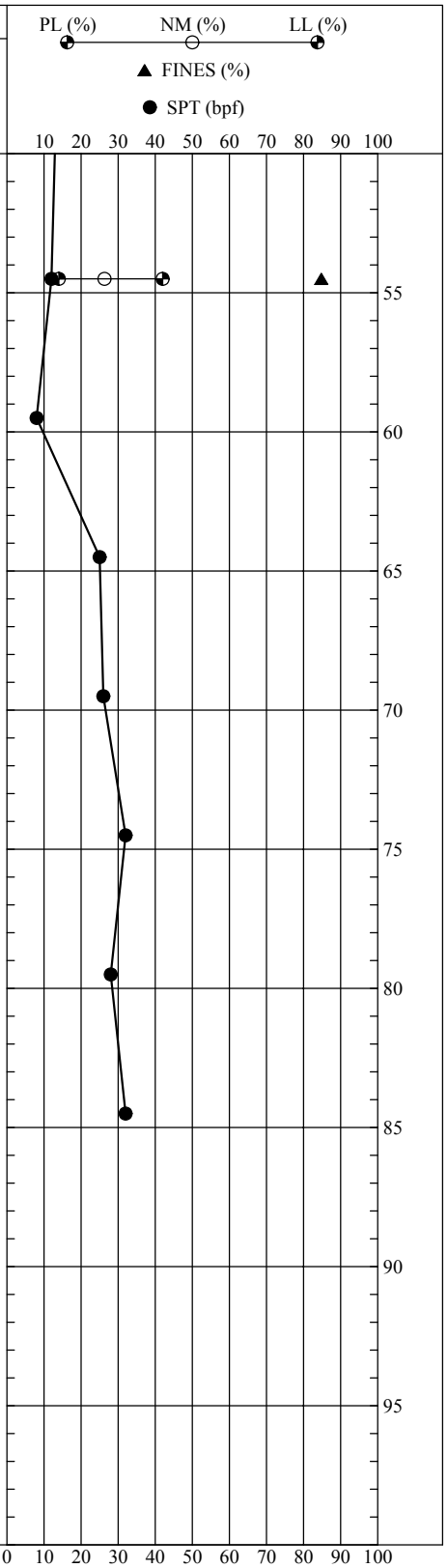
## SOIL TEST BORING RECORD

**BORING NO.:** BI-12
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 223554,756715.4
**DRILLED:** July 25, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 50 | Loose to medium dense, orange-brown to dark gray, fine to medium SAND (SP), (A-2) wet. | | -47 | | | (N = 13) |
| | Stiff, dark grayish brown, CLAY (CL), (A-7-5) with sand. | | | SPT-13 | | 4-5-7 (N = 12) |
| 55 | | | -52 | | | |
| | Medium stiff, dark gray to brown SILT (ML), (A-4) and sand, wet. | | | SPT-14 | | 4-4-4 (N = 8) |
| 60 | | | -57 | | | |
| | Medium dense, light gray, fine to medium SAND (SP), (A-2) trace silt and clay, wet. | | | SPT-15 | | 16-13-12 (N = 25) |
| 65 | | | -62 | | | |
| | | | | SPT-16 | | 11-13-13 (N = 26) |
| 70 | | | -67 | | | |
| | | | | SPT-17 | | 12-13-19 (N = 32) |
| 75 | | | -72 | | | |
| | | | | SPT-18 | | 13-13-15 (N = 28) |
| 80 | | | -77 | | | |
| | | | | SPT-19 | | 15-15-17 (N = 32) |
| 85 | Boring terminated at 85 feet bgs. | | -82 | | | |
| 90 | | | -87 | | | |
| 95 | | | -92 | | | |
| 100 | | | -97 | | | |




SOIL TEST BORING INDIAN RIVER.GPJ LAW_GIBB.GDT 9/29/03

DRILLER: MACTEC-Raleigh
EQUIPMENT: Diedrich D-50
METHOD: Mud Rotary
HOLE DIA.: 3"
LOGGED BY: AJA
CHECKED BY:
REMARKS:

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## SOIL TEST BORING RECORD

**BORING NO.:** BI-12
**PROJECT:** Indian River Inlet Bridge
**NORTHING/EASTING:** 223554,756715.4
**DRILLED:** July 25, 2003
**PROJECT NO.:** 3530-03-1245.01



MACTEC

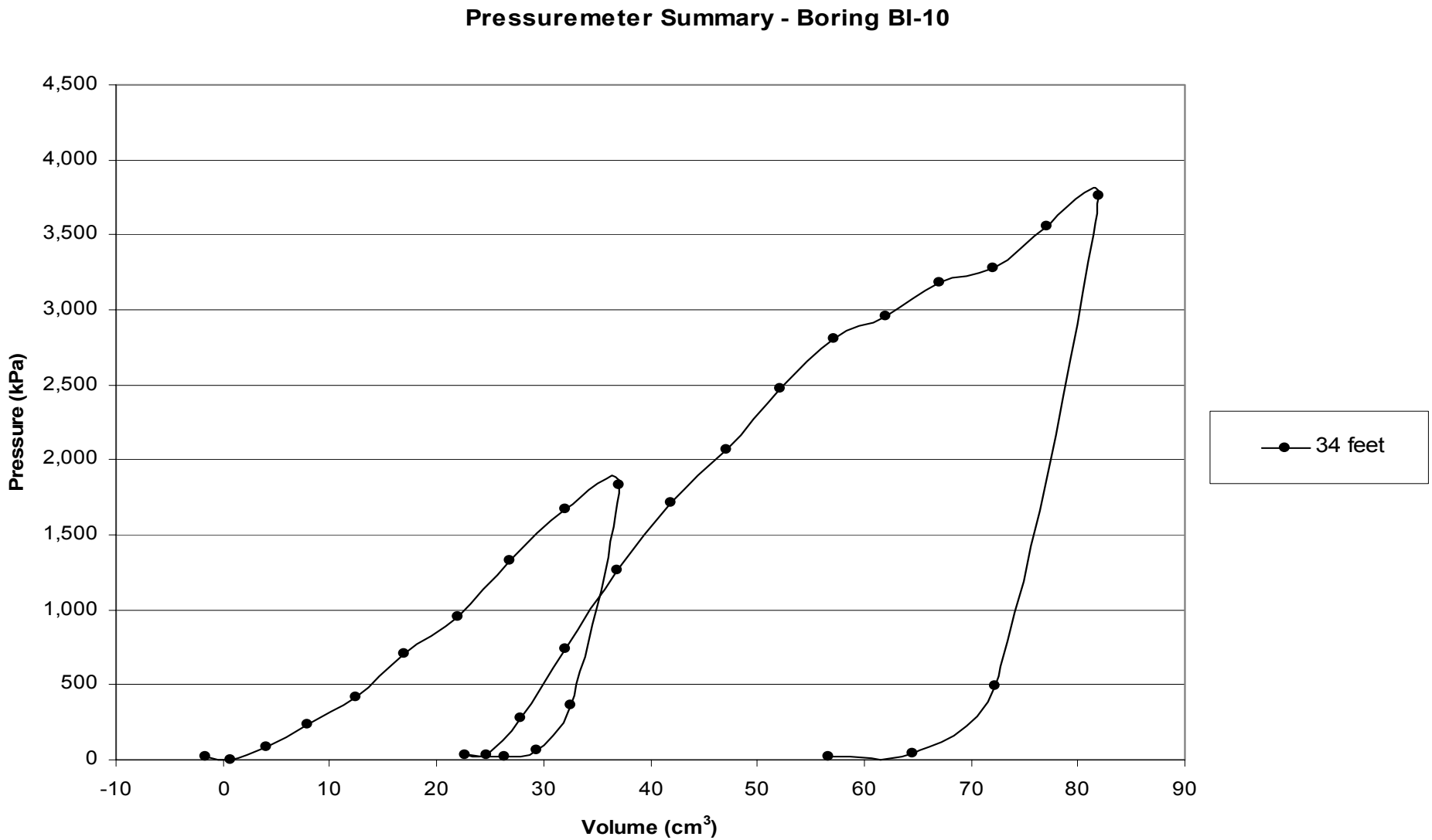
## PRESSUREMETER TEST

Pressuremeter tests were performed in general accordance with ASTM D 4719. The pressuremeter test (PMT) is an instrument used for the determination of in-situ soil strength and deformation characteristics. The essential features of the instrument provide for radial expansion of the borehole as a function of increasing radial pressure applied to the borehole wall. Soil properties are calculated utilizing elastic-plastic theory or empirical relationships. Typical data derived from PMT are the pressuremeter modulus and limit pressure which are measures of compressibility and soil strength, respectively.

The principal components of the pressuremeter system are the control unit, the probe and the coaxial tubing. The control unit registers and displays changes in pressures and volumes. The probe is a borehole expansion device consisting of two rubber membranes. One membrane forms an upper and lower guard cell and the second membrane forms an inner measuring cell. Water is supplied under pressure through the inner coaxial tubing to the measuring cell and the resulting volume change of the cell is considered equivalent to the volume change of the borehole. Pressurized gas in the outer coaxial tubing simultaneously expands the upper and lower guard cells to help minimize end effects of the measuring cell.

Tests are conducted concurrently with the drilling of an NX-size hole (3-inch diameter) in soil or rock. After each test, the pressuremeter apparatus is removed from the hole, the hole is advanced to the next sampling level and the procedures repeated until testing of each level has been completed.

Testing is performed by applying incremental pressure and recording the resulting deformations at set time intervals. The direct variables utilized from the test are the pressure applied to the measuring cell and the volume of cell expansion due to each incremental pressure increase. These values are used to determine radial expansion of the borehole diameter under each increment of pressure.

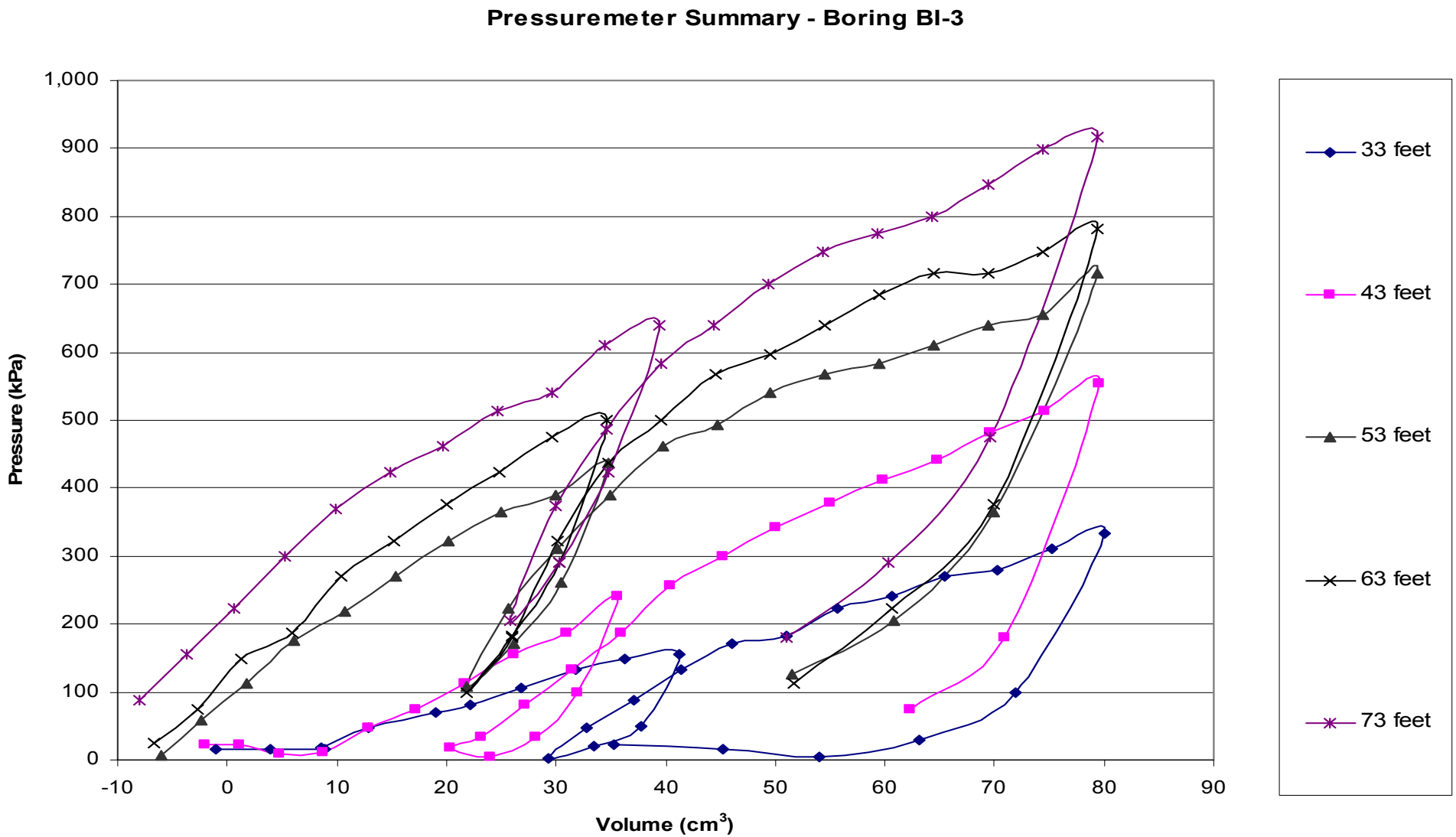



MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
1606 Ownby Lane Richmond, VA 23220

NORTH APPROACH – PRESSUREMETER DATA
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003




MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
1606 Ownby Lane Richmond, VA 23220

SOUTH APPROACH – PRESSUREMETER DATA
INDIAN RIVER INLET BRIDGE
SUSSEX COUNTY, DELAWARE

Project# 3530-03-1245.01 September 26, 2003

## LABORATORY TESTS

### SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types. Representative samples obtained during drilling operations are examined in our laboratory by an engineer. Soils are visually classified according to ASTM D 2488 based on color, texture, and consistency (determined from the number of blows per foot in standard penetration tests).

The classification system discussed above is primarily qualitative. For detailed soil classification, two laboratory tests are required: grain size analysis and index tests. Using these test results, soil can be classified according to the AASHTO, FAA, or UNIFIED Classification Systems (ASTM D 2487). Soil classifications, along with in-place physical soil properties, provide an index for estimating the behavior of a soil.

### GRAIN SIZE ANALYSIS

Grain size analysis (ASTM D 422) are performed to determine the distribution of particle sizes in soil. Samples are prepared for testing according to ASTM D 2217. Particles passing the No. 200 sieve (0.074 mm opening) are labeled as fines (silts and clays). Particles retained on the No. 200 sieve are labeled the coarse fraction of the sample (sands and gravels). Further differentiation is possible by passing the sample through a standard set of nested sieves and/or by performing hydrometer tests, in which particles are suspended in water and the particle size distribution is calculated from the measured settlement rate.

### INDEX TESTS

Index tests (ASTM D 4318) are performed to determine the moisture content boundaries between the liquid, plastic, and solid states of soils. These boundaries are called the Liquid Limit (LL) and Plastic Limit (PL). From these we derive the Plasticity Index (PI). Together, the LL, PL, and PI are referred to as the Atterberg Limits.

### MOISTURE CONTENT

The natural moisture content is determined in accordance with ASTM D 854 by oven-drying and weighing the sample.

**Mactec Engineering and Consulting, Inc.**
22455 Davis Drive, Suite 100
Sterling, Virginia 20164
(703) 404-7000

## Summary of Soil Classification Test Data

PROJECT NAME: Indian River Inlet Bridge
PROJECT NUMBER: **3530-03-1245 Phase 01**
DATE: **09/06/03**

| SAMPLE ID | DEPTH (ft.) | TYPE | SOIL DESCRIPTION | SOIL CLASS. | % RETAINED NO. 4 SIEVE | % FINER NO. 200 SIEVE | NAT. MOIST. (%) | ATTERBERG LIMITS L.L. | P.L. | P.I. | ORGANIC CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BI-1 | 53.5 - 55 | Jar | Very dark gray fat CLAY | CH | 0.0 | 99.1 | 59.4 | 65 | 27 | 38 | |
| BI-1 | 73.5 - 75 | Jar | Black poorly graded sand with silt | SP-SM | 0.0 | 7.3 | 17.0 | NLL | NP | --- | |
| BI-2 | 6 - 7.5 | Jar | Dark poorly graded SAND with silt | SP-SM | 0.0 | 7.3 | 18.2 | NLL | NP | --- | |
| BI-2 | 28.5 - 30 | Jar | Dark gray lean CLAY | CL | 0.8 | 88.0 | 61.8 | 39 | 21 | 18 | |
| BI-2 | 108.5 - 110 | Jar | Very dark gray sandy lean CLAY | CL | 0.0 | 51.5 | 25.8 | 26 | 12 | 14 | |
| BI-3 | 40 - 42 | UD | Dark gray fat CLAY | CH | 0.0 | 99.8 | 45.7 | 54 | 27 | 27 | |
| BI-3 | 50 - 52 | UD | Dark greenish gray elastic SILT | MH | 0.0 | 99.4 | 59.5 | 82 | 42 | 40 | |
| BI-3 | 60 - 62 | UD | Very dark greenish gray fat CLAY | CH | 0.0 | 99.6 | 60.3 | 72 | 21 | 51 | |
| BI-4 | 13.5 - 15 | Jar | Dark yellowish brown silty SAND | SM | 0.0 | 14.3 | 17.4 | NLL | NP | --- | |
| BI-4 | 28.5 - 30 | Jar | Very dark gray fat CLAY | CH | 0.0 | 91.9 | 64.2 | 66 | 23 | 43 | 8.0 |
| BI-4 | 53.5 - 55 | Jar | Dark greenish gray fat CLAY | CH | 0.0 | 96.4 | 66.0 | 59 | 22 | 37 | 6.7 |
| BI-4 | 78.5 - 80 | Jar | Very dark greenish gray fat CLAY | CH | 0.0 | 93.6 | 67.8 | 83 | 24 | 59 | 8.6 |
| BI-5 | 78.5 - 80 | Jar | Very dark greenish gray fat CLAY | CH | 0.0 | 99.7 | 62.6 | 93 | 29 | 64 | |
| BI-5 | 133.5 - 135 | Jar | Dark gray lean CLAY with sand | CL | 0.0 | 71.9 | 23.5 | 31 | 14 | 17 | |
| BI-5 | 143.5 - 145 | Jar | Dark greenish gray sandy lean CLAY | CL | 0.0 | 68.6 | 26.8 | 33 | 15 | 18 | |

NOTES:
1. Soil classification and testing in accordance with USCS, ASTM D2487, D421, D422 & D4318
2. L.L.= Liquid Limit N.P.= Non-Plastic
   P.L.= Plastic Limit N.L.L.=No Liquid Limit
   P.I. = Plasticity Index
3. Soil color determined from Munsell Soil Chart

9/10/03
Reviewed
Chan Tin
Manager, Laboratory Services

**Mactec Engineering and Consulting, Inc.**
22455 Davis Drive, Suite 100
Sterling, Virginia 20164
(703) 404-7000

## Summary of Soil Classification Test Data

PROJECT NAME: Indian River Inlet Bridge
PROJECT NUMBER: 3530-03-1245 Phase 01
DATE: 9/6/2003

| SAMPLE ID | SAMPLE DEPTH (ft.) | SAMPLE TYPE | SOIL DESCRIPTION | SOIL CLASS. | % RETAINED NO. 4 SIEVE | % FINER NO. 200 SIEVE | NAT. MOIST. (%) | ATTERBERG LIMITS L.L. | ATTERBERG LIMITS P.L. | ATTERBERG LIMITS P.I. | ORGANIC CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BI-6 | 55 - 57 | UD | Dark greenish gray fat CLAY | CH | 0.0 | 99.8 | 52.2 | 69 | 30 | 39 | |
| BI-6 | 103.5 - 105 | Jar | Dark yellowish brown silty SAND | SM | 0.0 | 6.0 | 16.4 | NLL | NP | --- | |
| BI-6 | 143.5 - 145 | Jar | Dark greenish gray sandy lean CLAY | CL | 0.0 | 55.3 | 19.5 | 24 | 12 | 12 | |
| BI-7 | 43.5 - 45 | Jar | Dark greenish gray fat CLAY | CH | 0.0 | 99.4 | 51.3 | 57 | 15 | 42 | |
| BI-7 | 78.5 - 80 | Jar | Gray poorly graded SAND with silt | SP-SM | 9.3 | 8.7 | 15.5 | NLL | NP | --- | |
| BI-7 | 108.5 - 110 | Jar | Yellowish brown silty SAND | SM | 2.7 | 15.1 | 18.8 | NLL | NP | --- | |
| BI-7 | 143.5 - 145 | Jar | Yellowish brown clayey SAND | SC | 0.0 | 45.8 | 16.4 | 23 | 14 | 9 | |
| BI-7 | 163.5 - 165 | Jar | Dark grayish brown clayey SAND | SC | 0.6 | 32.0 | 19.7 | 23 | 15 | 8 | |
| BI-8 | 38.5 - 40 | Jar | Dark grayish brown fat CLAY with sand | CH | 0.0 | 82.3 | 48.6 | 55 | 25 | 30 | |
| BI-9 | 30 - 32 | UD | Grayish brown lean CLAY | CL | 0.0 | 99.1 | 55.9 | 46 | 22 | 24 | |
| BI-10 | 35 - 37 | UD | Yellowish brown poorly graded SAND | SP | 0.0 | 3.9 | | NLL | NP | --- | |
| BI-11 | 18.5 - 20 | Jar | Gray poorly graded SAND | SP | 0.0 | 4.5 | 24.3 | NLL | NP | --- | |
| BI-11 | 48.5 - 50 | Jar | Reddish gray lean CLAY with sand | CL | 0.0 | 78.3 | 31.6 | 46 | 18 | 28 | |
| BI-12 | 28.5 - 30 | Jar | Grayish brown silty SAND | SM | 1.0 | 22.6 | 21.0 | NLL | NP | --- | |
| BI-12 | 53.5 - 55 | Jar | Dark grayish brown lean CLAY with sand | CL | 0.0 | 84.8 | 26.3 | 42 | 14 | 28 | |

NOTES:
1. Soil Classification in accordance with USCS or AASHTO standards
2. L.L.= Liquid Limit
   P.L.= Plastic Limit
   P.I. = Plasticity Index
3. Soil color determined from Munsell Soil Chart

Reviewed
Chan Tin
Manager, Laboratory Services

USCS Summary IRIB.xls

**Mactec Engineering and Consulting, Inc.**
22455 Davis Drive, Suite 100
Sterling, Virginia 20164
(703) 404-7000

## Summary of Soil Classification Test Data

PROJECT NAME: Indian River Inlet Bridge
PROJECT NUMBER: 3530-03-'245 Phase 01
DATE: 9/6/2003

| SAMPLE | | | | | | | | ATTERBERG LIMITS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | DEPTH (ft.) | TYPE | SOIL DESCRIPTION | SOIL CLASS. | % RETAINED NO. 4 SIEVE | % FINER NO. 200 SIEVE | NAT. MOIST. (%) | L.L. | P.L. | P.I. | ORGANIC CONTENT (%) |
| BI-8 | 58.5 - 59 | Jar | | | | | | | | | 41.8 |
| | | | | | | | | | | | |
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NOTES:
1. Soil Classification in accordance with USCS or AASHTO standards
2. L.L.= Liquid Limit
   P.L.= Plastic Limit
   P.I. = Plasticity Index
3. Soil color determined from Munsell Soil Chart

9/11/03
Reviewed
Chan Tin
Manager, Laboratory Services

MACTEC ENGINEERING AND CONSULTING, INC
22455 Davis Drive, Suite 100
Sterling, Virginia 20164

# Moisture Content Worksheet

ASTM D2216

Project Name: Indian River Inlet Bridge
Project Number: 3530-3-1245.01LAB
Date: 09/29/03

Reviewed by:

| Sample ID | BI-1 | BI-1 | BI-1 | BI-1 | BI-1 | BI-2 | BI-2 | BI-2 |
|---|---|---|---|---|---|---|---|---|
| Depth (ft) | 1 - 2.5 | 28.5 - 30 | 38.5 - 40 | 53.5 - 55 | 73.5 - 75 | 6 - 7.5 | 28.5 - 30 | 38.5 - 40 |
| Sample Type | Jar | Jar | Jar | Jar | Jar | Jar | Jar | Jar |
| Moisture Content (%) | **19.9** | **54.8** | **47.5** | **59.5** | **17.0** | **18.2** | **61.9** | **60.3** |

| Sample ID | BI-2 | BI-2 | BI-2 | BI-3 | BI-3 | BI-4 | BI-4 | BI-4 |
|---|---|---|---|---|---|---|---|---|
| Depth (ft) | 53.5 - 55 | 68.5 - 70 | 108.5 - 110 | 13.5 - 15 | 78.5 - 80 | 13.5 - 15 | 28.5 - 30 | 53.5 - 55 |
| Sample Type | Jar | Jar | Jar | Jar | Jar | Jar | Jar | Jar |
| Moisture Content (%) | **63.6** | **64.7** | **25.8** | **19.7** | **86.9** | **17.4** | **64.2** | **66.0** |

| Sample ID | BI-4 | BI-5 | BI-5 | BI-5 | BI-5 | BI-5 | BI-5 | BI-6 |
|---|---|---|---|---|---|---|---|---|
| Depth (ft) | 78.5 - 80 | 28.5 - 30 | 38.5 - 40 | 53.5 - 55 | 78.5 - 80 | 133.5 - 135 | 143.5 - 145 | 13.5 - 15 |
| Sample Type | Jar | Jar | Jar | Jar | Jar | Jar | Jar | Jar |
| Moisture Content (%) | **67.8** | **15.8** | **44.4** | **56.5** | **41.7** | **23.5** | **26.8** | **18.9** |

| Sample ID | BI-6 | BI-6 | BI-6 | BI-6 | BI-6 | BI-7 | BI-7 | BI-7 |
|---|---|---|---|---|---|---|---|---|
| Depth (ft) | 33.5 - 35 | 73.5 - 75 | 88.5 - 90 | 103.5 - 105 | 143.5 - 145 | 43.5 - 45 | 78.5 - 80 | 108.5 - 110 |
| Sample Type | Jar | Jar | Jar | Jar | Jar | Jar | Jar | Jar |
| Moisture Content (%) | **17.6** | **60.9** | **63.0** | **16.4** | **19.5** | **51.3** | **15.5** | **18.8** |

| Sample ID | BI-7 | BI-7 | BI-8 | BI-11 | BI-11 | BI-12 | BI-12 | |
|---|---|---|---|---|---|---|---|---|
| Depth (ft) | 143.5 - 145 | 163.5 - 165 | 38.5 - 40 | 18.5 - 20 | 48.5 - 49.5 | 28.5 - 30 | 53.5 - 55.0 | |
| Sample Type | Jar | Jar | Jar | Jar | Jar | Jar | Jar | |
| Moisture Content (%) | **16.4** | **19.7** | **44.8** | **24.3** | **31.6** | **21.0** | **26.3** | |

| Sample ID | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Depth (ft) | | | | | | | | |
| Sample Type | | | | | | | | |
| Moisture Content (%) | | | | | | | | |

## METHOD OF TEST FOR pH OF SOILS

The pH level measures the degree of alkalinity or acidity of a soil. The pH gives an indication of corrosion potential to buried structures. A scale of 1 (very acidic) to 14 (very alkaline), is used where a pH of 7 indicates neutral conditions.

The electrometric measurement of the pH of soils in suspension in distilled water is made with a potentiometer using a glass calomel electrode system. Standard pH buffer solutions are used to calibrate the meter prior to each test. Approximately 50 grams of soil are mixed with 50 ml of distilled water in a 100-ml beaker, the solution is stirred occasionally for five minutes, and the pH read in the meter. This method is California Division of Highways Method 643-C.

Standard pH buffer solutions are used to calibrate the meter prior to each test.

## METHOD OF LABORATORY MEASUREMENT OF SOIL RESISTIVITY

The resistivity of soil is a measure of its electrical conductivity and corrosion potential. The method used by MACTEC Engineering and Consulting, Inc., is the California Division of Highways Test Method No. 643-C, 1972.

The test apparatus consists of a Plexiglas box 6.5 inches long by 4.5 inches wide by 2 inches deep. Two stainless steel electrodes line opposite sides of the test box. A representative soil sample passing the No. 8 sieve is thoroughly mixed with a small amount of distilled water and lightly compacted in the test box. The resistance of the soil is then measured with an ohmmeter. Based on the geometry of the test box the resistance is then converted to resistivity. A small amount of distilled water is again added to the soil and the test repeated. This procedure is repeated until a curve of moisture content versus resistivity is established. The reported resistivity value is the minimum value of soil resistivity at any moisture content.

## *MACTEC ENGINEERING AND CONSULTING, INC*

### *CHEMICAL TEST RESULTS*

PROJECT NAME: Indian River Inlet Bridges

PROJECT NUMBER: 3530-03-1245 Task 01

DATE: 9/22/03

| SAMPLE | | | RESISTIVITY | MC | |
|---|---|---|---|---|---|
| ID | DEPTH (ft.) | TYPE | (ohm cm) | (%) | pH |
| BI-6 | 33.5-35 | Jar | 3,100 | 1.2 | 8.2 |
| | | | 1,200 | 3.3 | |
| | | | 800 | 5.3 | |
| | | | 600 | 8.1 | |
| | | | 310 | 12.0 | |
| | | | 250 | 16.0 | |
| | | | 230 | 20.5 | |
| | | | | | |
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*NOTES:* *ND = Not Detected*

Reviewed by: 9/23/03

BI-6 Chem.xls

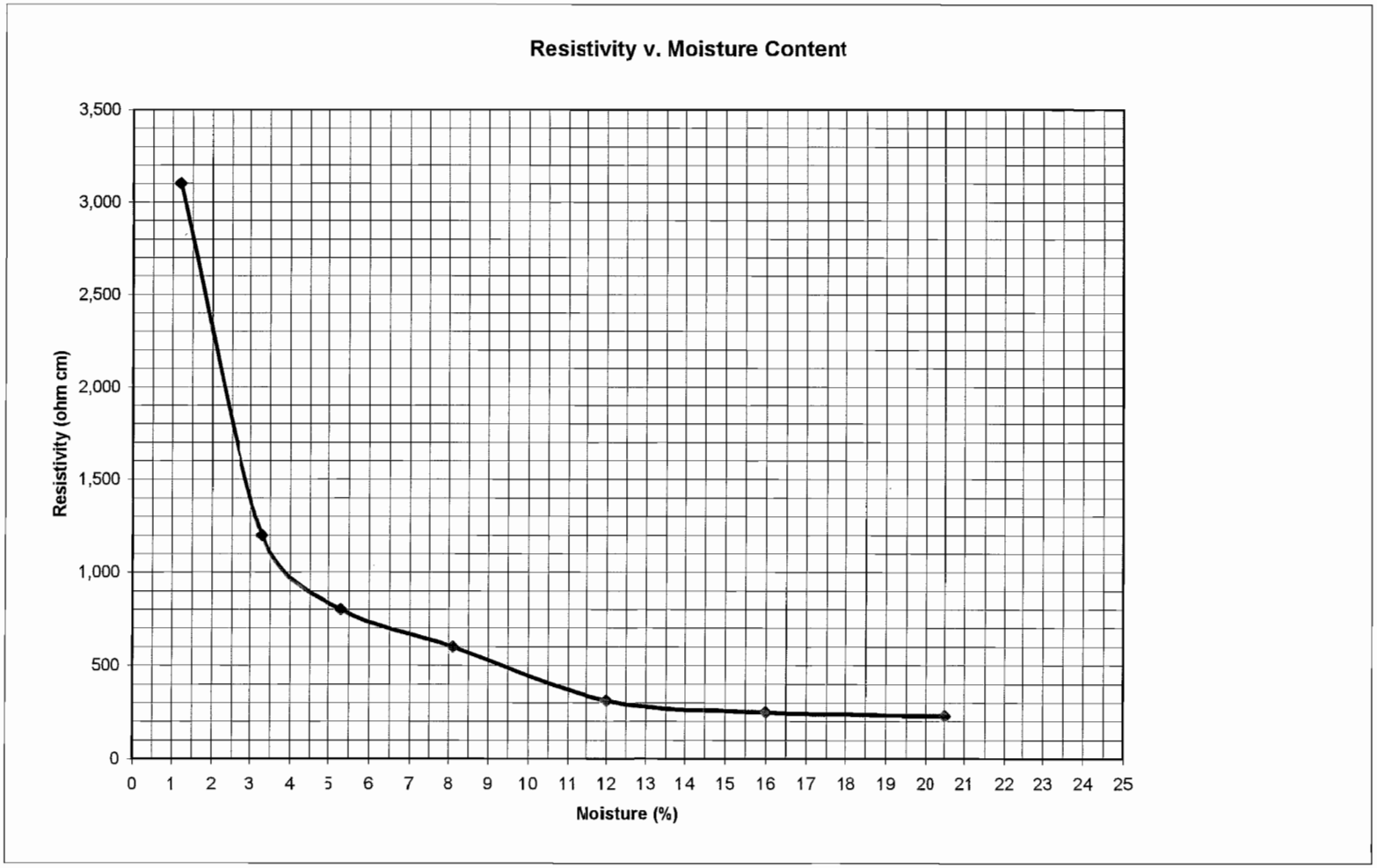
## *MACTEC ENGINEERING AND CONSULTING, INC.*

### *CHEMICAL TEST RESULTS*

PROJECT NAME: Indian River Inlet Bridges

PROJECT NUMBER: 3530-03-1245 Task 01

DATE: 9/22/2003



## *MACTEC ENGINEERING AND CONSULTING, INC*

### *CHEMICAL TEST RESULTS*

PROJECT NAME: Indian River Inlet Bridges

PROJECT NUMBER: 3530-03-1245 Task 01

DATE: 9/23/03

| SAMPLE | | | RESISTIVITY | MC | |
|---|---|---|---|---|---|
| ID | DEPTH (ft.) | TYPE | (ohm cm) | (%) | pH |
| BI-7 | 48.5 | 50 | 3,400 | 14.1 | 6.1 |
| | | | 1,600 | 20.5 | |
| | | | 410 | 27.3 | |
| | | | 170 | 33.9 | |
| | | | 150 | 40.7 | |
| | | | 150 | 47.4 | |
| | | | 170 | 54.1 | |
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*NOTES:* *ND = Not Detected*

Reviewed by: 9/25/03

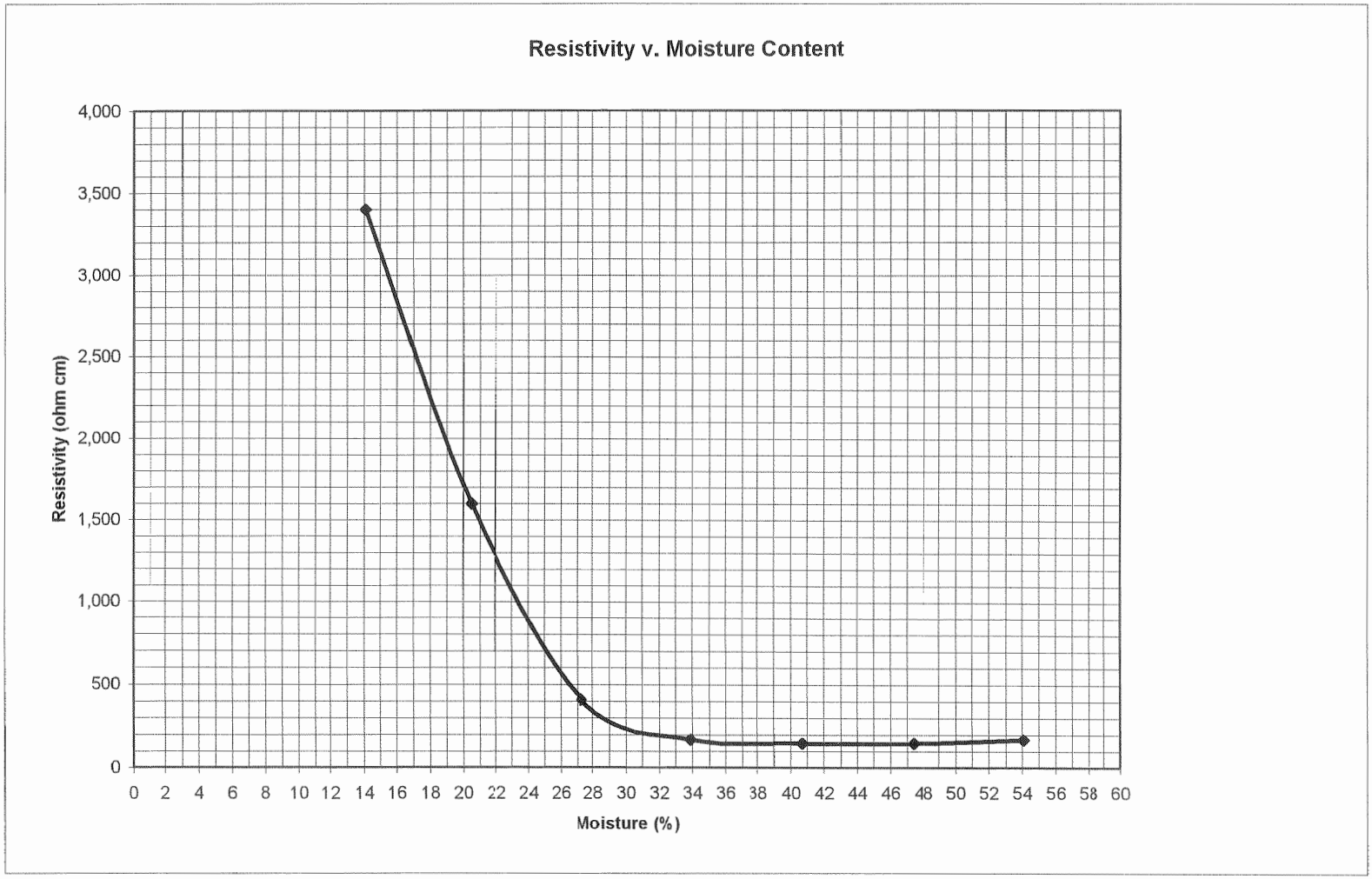
## *MACTEC ENGINEERING AND CONSULTING, INC.*

### *CHEMICAL TEST RESULTS*

PROJECT NAME: Indian River Inlet Bridges

PROJECT NUMBER: 3530-03-1245 Task 01

DATE: 9/23/2003



## TRIAXIAL SHEAR TESTS

Triaxial shear tests are used to measure the stress-strain characteristics and strength of soils under various loading conditions expected in the field. Tests may be undrained, semi-drained or fully-drained to simulate field behavior. Triaxial shear tests are performed in accordance with ASTM D 4767.

Triaxial shear tests are conducted either on relatively undisturbed samples or on remolded/compacted specimens of soil. Diameters of specimens range between 1.4 and 6.0 inches and a minimum length/diameter ratio of 2 is standard. Either stress-controlled or strain-controlled tests are performed. Loads are measured using proving rings or electronic load cells, deformations are monitored using electronic LVDT's or dial indicators, and pore water pressure is measured with transducers. Normally, samples are saturated, consolidated and sheared to failure under compression loading, although extension loading is also possible.

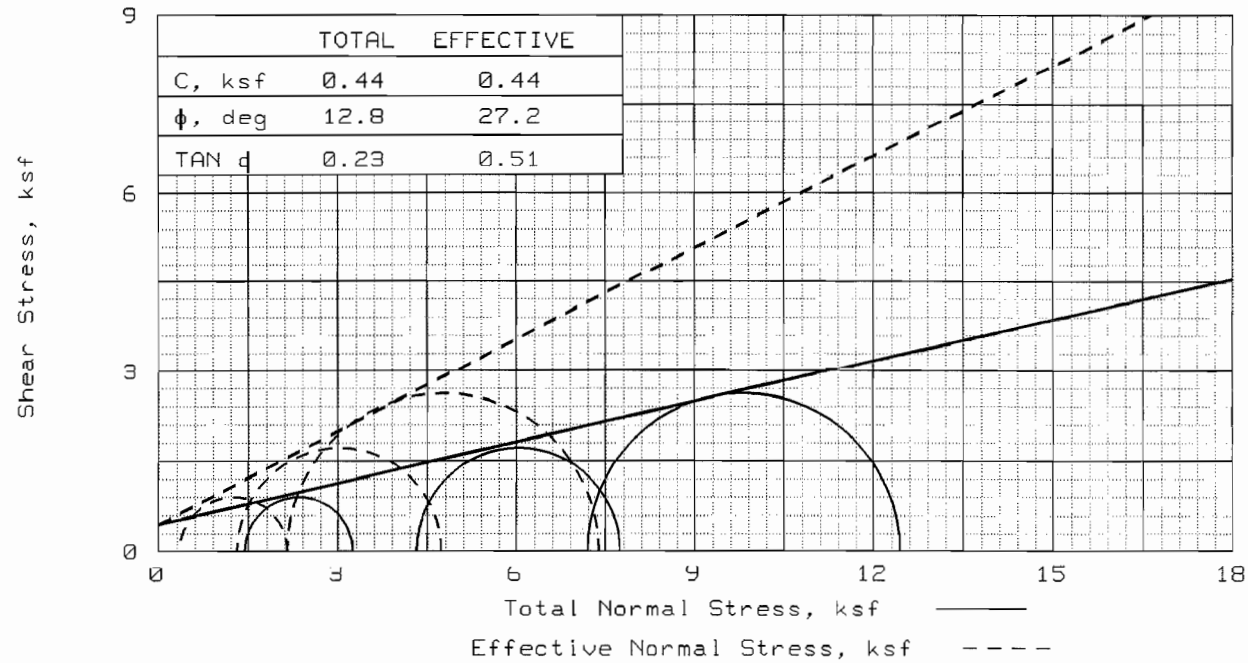
Various consolidation conditions may be implemented in the triaxial apparatus. Stress and deformation occur in three dimensions under triaxial conditions. The three most common types of triaxial compression tests in routine use include:

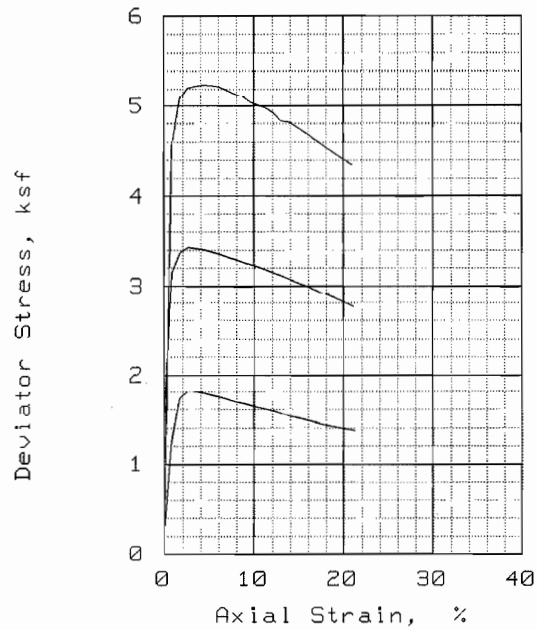
CU = isotropically-consolidated undrained (i.e., CIU)

CD = isotropically-consolidated drained (i.e., CID)

UU = unconsolidated-undrained shear tests

The results of the tests are presented in terms of stress-strain curves and stress paths to failure. Alternatively, the strength may be represented by Mohr-Coulomb circles at failure. Short-term undrained strengths may be represented by total stress parameters ($\phi$ and C) or by undrained shear strengths (Su). The long-term drained strengths (condition of zero excess pore pressure response) are described by the effective stress parameters ($\phi$ and C').




| SAMPLE NO.: | | 1 | 2 | 3 |
|---|---|---|---|---|
| INITIAL | WATER CONTENT, % | 49.2 | 51.7 | 53.7 |
| | DRY DENSITY, pcf | 71.3 | 69.9 | 68.9 |
| | SATURATION, % | 96.8 | 98.9 | 100.0 |
| | VOID RATIO | 1.383 | 1.411 | 1.448 |
| | DIAMETER, in | 2.85 | 2.84 | 2.85 |
| | HEIGHT, in | 5.50 | 5.50 | 5.58 |
| AT TEST | WATER CONTENT, % | 46.8 | 42.7 | 38.1 |
| | DRY DENSITY, pcf | 73.8 | 78.2 | 81.9 |
| | SATURATION, % | 97.8 | 99.7 | 97.1 |
| | VOID RATIO | 1.302 | 1.156 | 1.059 |
| | DIAMETER, in | 2.80 | 2.68 | 2.61 |
| | HEIGHT, in | 5.50 | 5.50 | 5.58 |
| Strain rate, in/min | | 0.0016 | 0.0016 | 0.0016 |
| BACK PRESSURE, ksf | | 5.62 | 5.62 | 5.62 |
| CELL PRESSURE, ksf | | 7.06 | 9.94 | 12.82 |
| FAILURE STRESS, ksf | | 1.81 | 3.43 | 5.25 |
| TOTAL PORE PR., ksf | | 6.71 | 8.63 | 10.67 |
| ULTIMATE STRESS, ksf | | 1.37 | 2.76 | 4.35 |
| TOTAL PORE PR., ksf | | 6.81 | 9.03 | 11.13 |
| $\bar{\sigma}_1$ FAILURE, ksf | | 2.16 | 4.74 | 7.39 |
| $\bar{\sigma}_3$ FAILURE, ksf | | 0.35 | 1.31 | 2.15 |

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Dark gray fat CLAY (CH)
LL= 54 PL= 27 PI= 27
SPECIFIC GRAVITY= 2.72
REMARKS:

9/10/03

Fig. No.: 1

CLIENT:

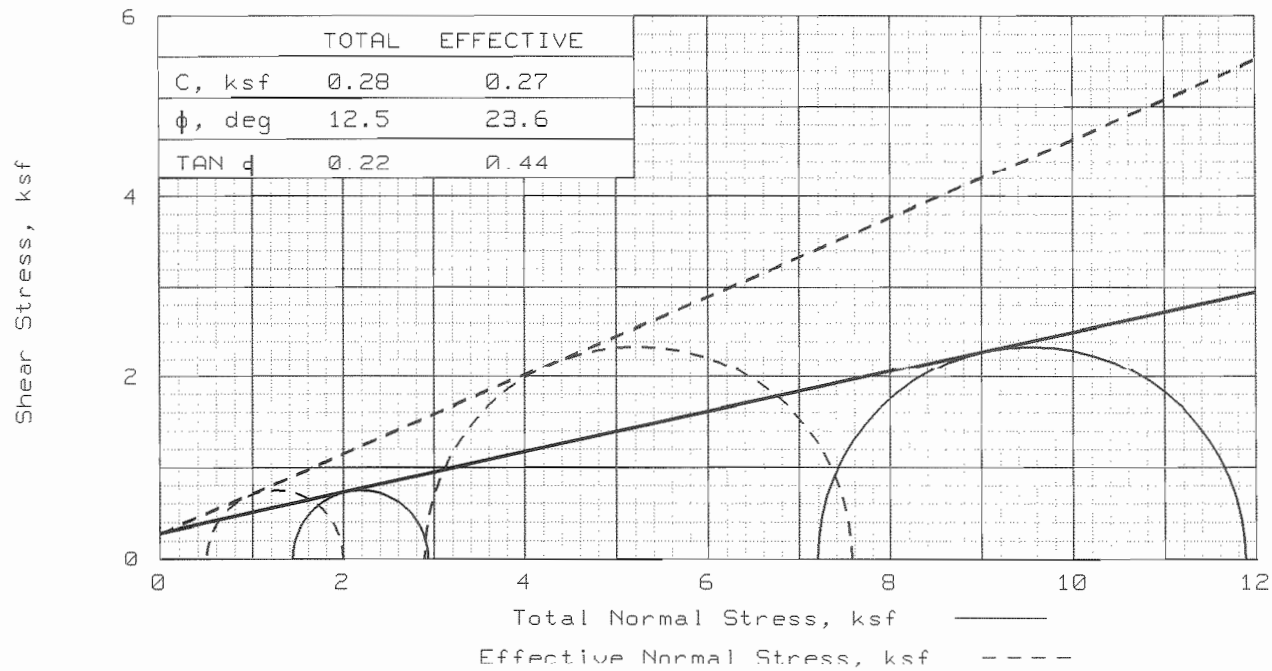
PROJECT: Indian River Inlet Bridges

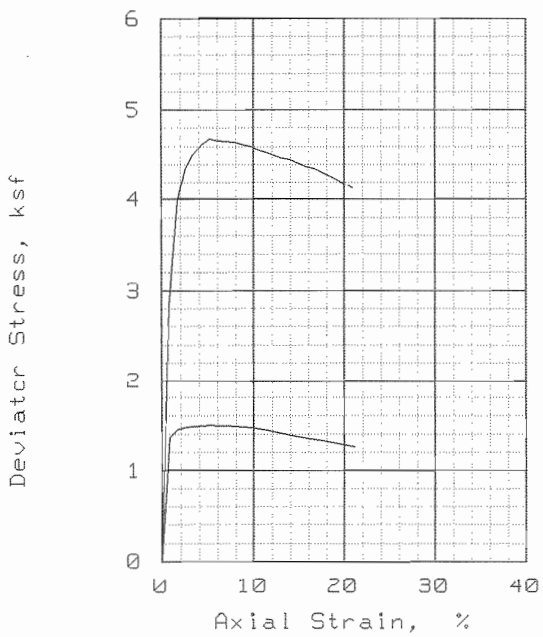
SAMPLE LOCATION: BI-3 UD-8 @ 40' - 42'

PROJ. NO.: 3530-03-1245 Phase 01 DATE: 9/3/03

TRIAXIAL SHEAR TEST REPORT

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**




| SAMPLE NO.: | | 1 | 2 |
|---|---|---|---|
| INITIAL | WATER CONTENT, % | 59.5 | 58.9 |
| | DRY DENSITY, pcf | 62.1 | 62.9 |
| | SATURATION, % | 93.7 | 94.6 |
| | VOID RATIO | 1.714 | 1.680 |
| | DIAMETER, in | 2.84 | 2.85 |
| | HEIGHT, in | 5.50 | 5.55 |
| AT TEST | WATER CONTENT, % | 59.8 | 42.8 |
| | DRY DENSITY, pcf | 62.7 | 76.5 |
| | SATURATION, % | 95.8 | 96.0 |
| | VOID RATIO | 1.686 | 1.202 |
| | DIAMETER, in | 2.83 | 2.58 |
| | HEIGHT, in | 5.50 | 5.55 |
| Strain rate, in/min | | 0.0016 | 0.0016 |
| BACK PRESSURE, ksf | | 5.62 | 4.18 |
| CELL PRESSURE, ksf | | 7.06 | 11.38 |
| FAILURE STRESS, ksf | | 1.49 | 4.68 |
| TOTAL PORE PR., ksf | | 6.55 | 8.48 |
| ULTIMATE STRESS, ksf | | 1.26 | 4.12 |
| TOTAL PORE PR., ksf | | 6.47 | 8.77 |
| $\bar{\sigma}_1$ FAILURE, ksf | | 2.00 | 7.58 |
| $\bar{\sigma}_3$ FAILURE, ksf | | 0.50 | 2.80 |

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Dark greenish gray elastic SILT (MH)
LL= 82 PL= 42 PI= 40
SPECIFIC GRAVITY- 2.7
REMARKS: 9/24/03

CLIENT:

PROJECT: Indian River Inlet Bridges

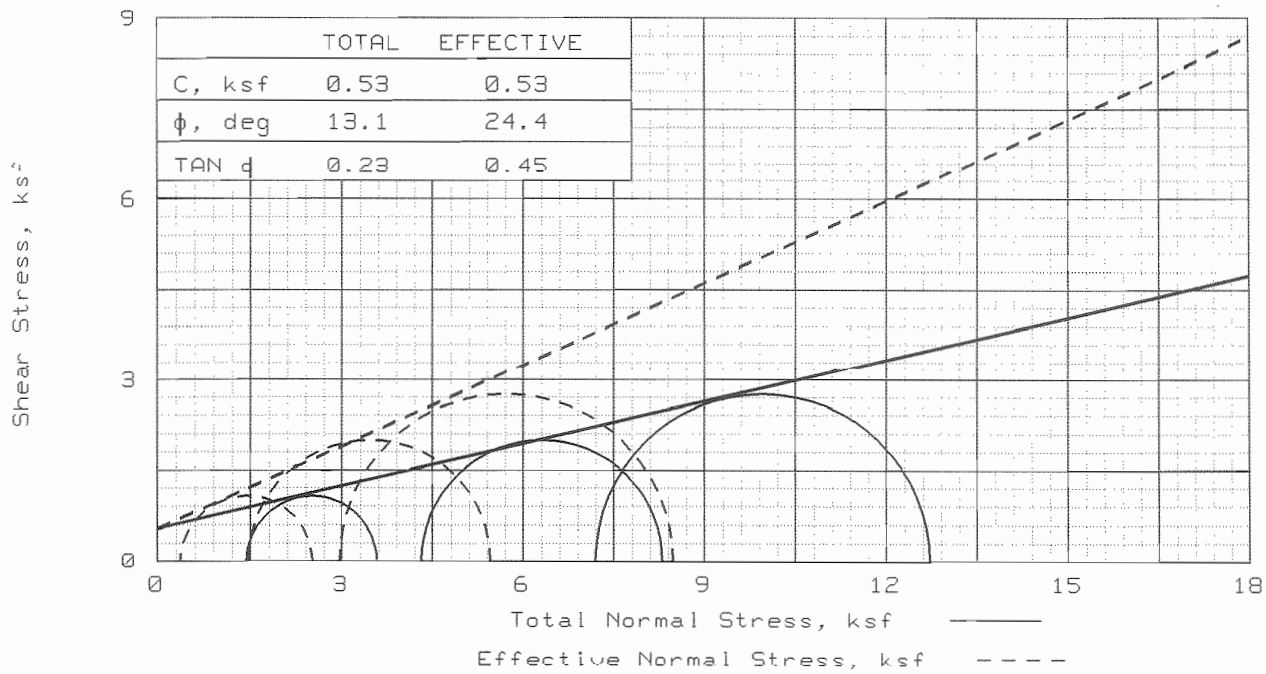
SAMPLE LOCATION: Boring BI-3 @ 50' - 52'

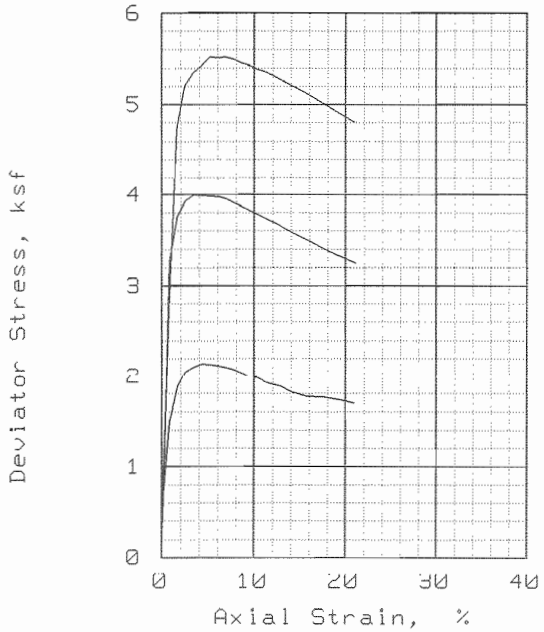
PROJ. NO.: 3530-03-1245 Task 01 DATE: 9/18/03

TRIAXIAL SHEAR TEST REPORT

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: 1




| SAMPLE NO.: | | 1 | 2 | 3 |
|---|---|---|---|---|
| INITIAL | WATER CONTENT, % | 52.2 | 48.1 | 52.0 |
| | DRY DENSITY, pcf | 68.6 | 73.2 | 68.9 |
| | SATURATION, % | 96.7 | 99.6 | 97.1 |
| | VOID RATIO | 1.457 | 1.304 | 1.447 |
| | DIAMETER, in | 2.86 | 2.84 | 2.83 |
| | HEIGHT, in | 5.56 | 5.53 | 5.57 |
| AT TEST | WATER CONTENT, % | 48.5 | 39.1 | 40.2 |
| | DRY DENSITY, pcf | 72.6 | 81.9 | 80.7 |
| | SATURATION, % | 99.1 | 99.8 | 99.6 |
| | VOID RATIO | 1.321 | 1.059 | 1.090 |
| | DIAMETER, in | 2.78 | 2.69 | 2.61 |
| | HEIGHT, in | 5.56 | 5.53 | 5.57 |
| Strain rate, in/min | | 0.0016 | 0.0016 | 0.0016 |
| BACK PRESSURE, ksf | | 4.18 | 5.62 | 5.62 |
| CELL PRESSURE, ksf | | 5.62 | 9.94 | 12.82 |
| FAILURE STRESS, ksf | | 2.14 | 3.99 | 5.52 |
| TOTAL PORE PR., ksf | | 5.24 | 8.47 | 9.85 |
| ULTIMATE STRESS, ksf | | 1.70 | 3.24 | 4.81 |
| TOTAL PORE PR., ksf | | 5.37 | 8.83 | 10.32 |
| $\bar{\sigma}_1$ FAILURE, ksf | | 2.51 | 5.46 | 8.49 |
| $\bar{\sigma}_3$ FAILURE, ksf | | 0.37 | 1.47 | 2.97 |

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Undisturbed
DESCRIPTION: Dark gray fat CLAY (CH)

SPECIFIC GRAVITY= 2.7
REMARKS:

9/23/03

CLIENT:

PROJECT: Indian River Inlet Bridges

SAMPLE LOCATION: Boring DI G @ 55' - 57'

PROJ. NO.: 3530-03-1245 Phase 01 DATE: 9/22/03

TRIAXIAL SHEAR TEST REPORT

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: 1

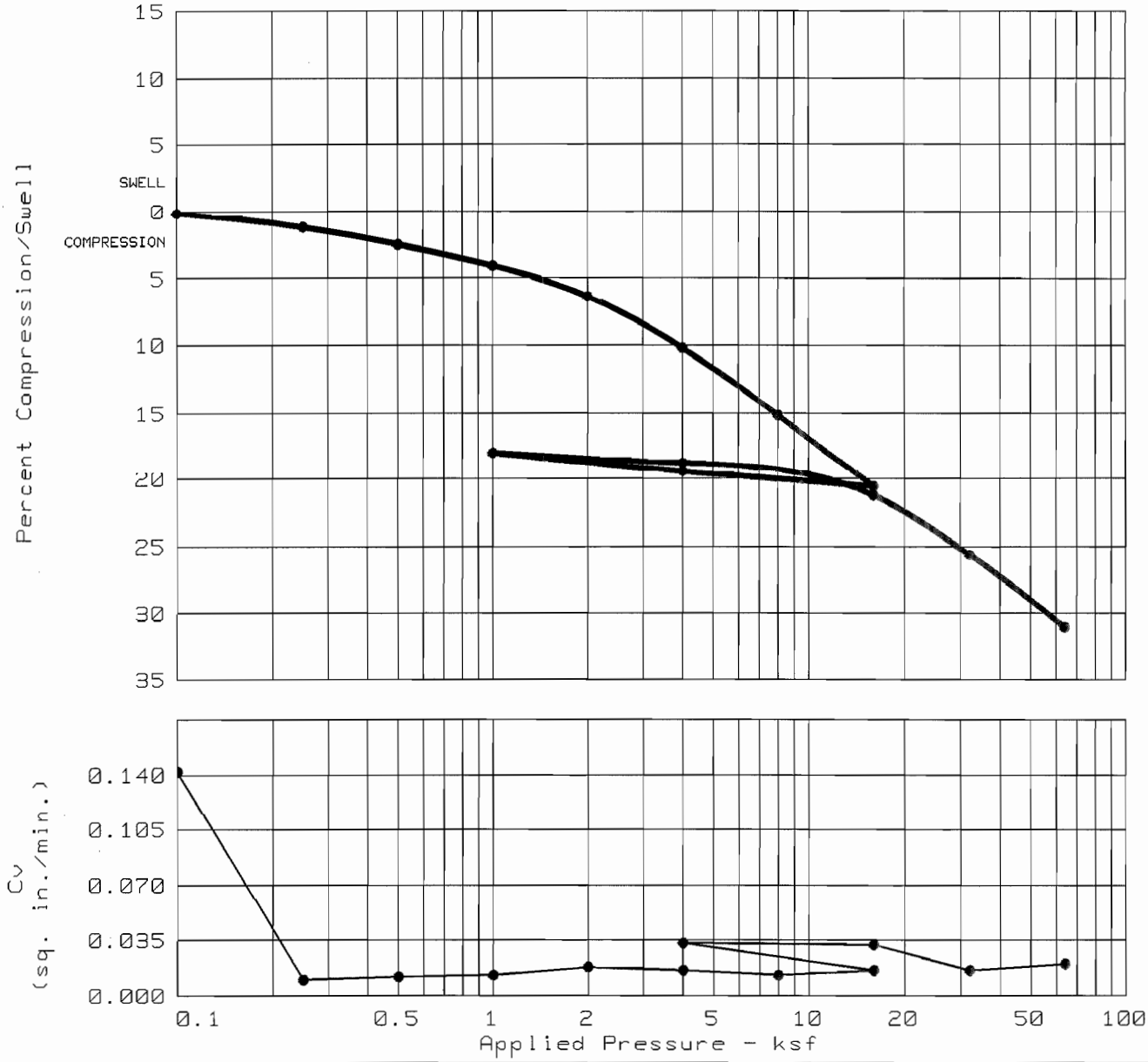
## CONSOLIDATION TESTS

One-dimensional consolidation tests are conducted to determine the compression characteristics of soils under applied vertical stresses. Test results may provide information including the magnitude of settlement, the time-rate effects, and the past stress history of the soil.

Tests are conducted in general accordance with ASTM D 2435. A soil sample 2.5 inches in diameter and 1.0 inch thick is fitted into a stainless steel ring, with porous stones above and below the soil. The sample is then placed in a loading device and subjected to a series of increasing vertical stresses under conditions of no lateral strain. Time-deformation readings are recorded for each applied stress, and the resultant strain or void ratio is calculated.

Typically, test results include a plot of void ratio or percent strain versus the log of the applied stress. The virgin compression index ($C_c$), the rebound or swelling index ($C_s$), the coefficient of consolidation ($C_V$), the constrained modulus ($M=1/m_v$), and the preconsolidation stress ($P'_c$) are all important parameters obtained from this test.

# CONSOLIDATION TEST REPORT



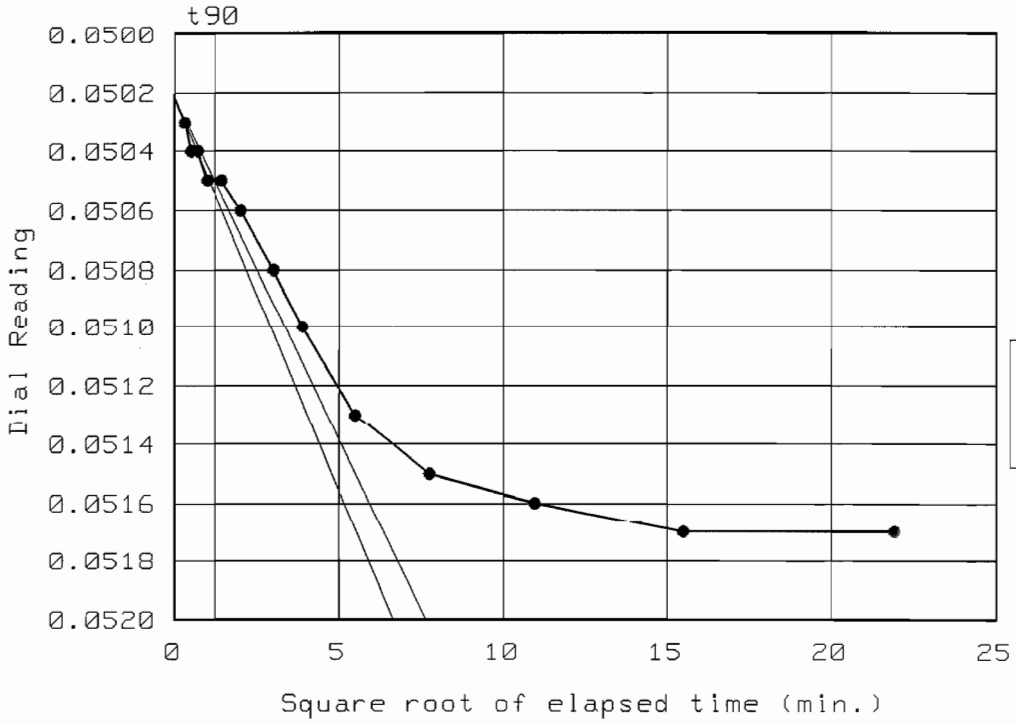

| Natural Saturation | Natural Moisture | Dry Dens. (pcf) | LL | PI | Sp.Gr. | Initial void ratio |
|---|---|---|---|---|---|---|
| 87.8 % | 45.7 % | 72.9 | 54 | 27 | 2.700 | 1.4060 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| | Dark gray fat CLAY (CH) |
| Project No.: 3530-03-1245 Phase 01<br>Project: Indian River Inlet Bridges<br>Location: Boring BI-3 @ 40' - 42'<br><br>Date: 9/3/03 | Class: Fat CLAY (CH)<br>Remarks:<br>9/23/03 |
| CONSOLIDATION TEST REPORT<br><br>**LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.** | Fig. No. 1 1 |

# Dial Reading vs. Time

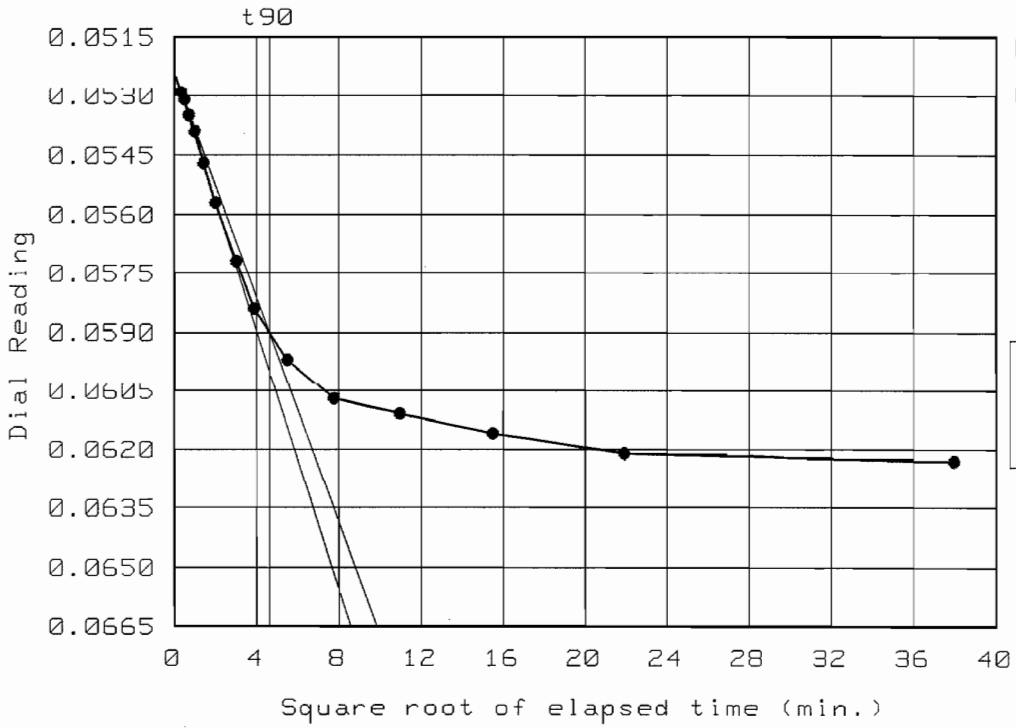
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

Date: 9/3/03




Load No.= 1
Load= 0.10 ksf
$D_0$ = 0.0502
$D_{90}$ = 0.0505
$D_{100}$= 0.0505
$T_{90}$= 1.50 min.

$C_v$ @ $T_{90}$ =
.142 in.$^2$/min.




Load No.= 2
Load= 0.25 ksf
$D_0$ = 0.0524
$D_{90}$ = 0.0590
$D_{100}$= 0.0597
$T_{90}$= 21.33 min.

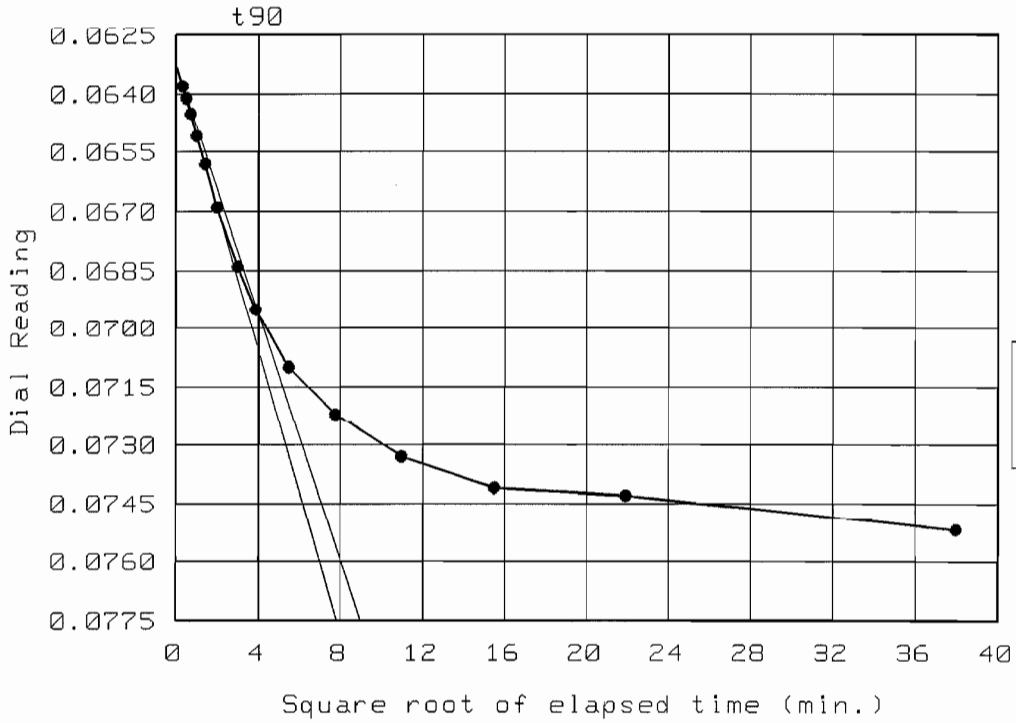
$C_v$ @ $T_{90}$ =
.010 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

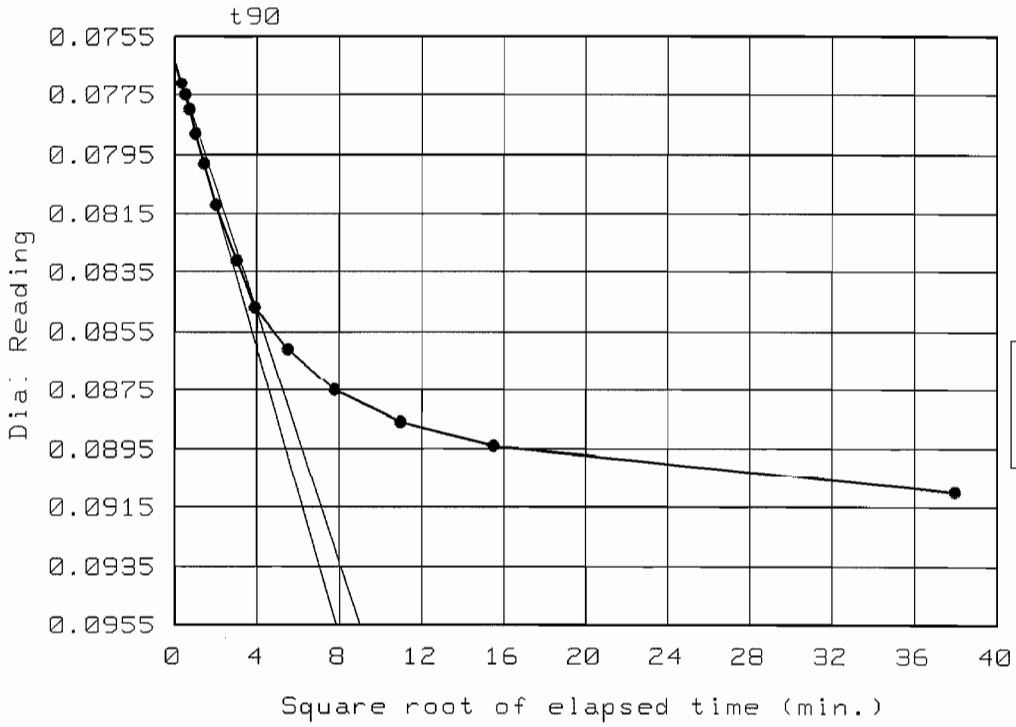
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

Date: 9/3/03




Load No.= 3
Load= 0.50 ksf
$D_0$ = 0.0632
$D_{90}$ = 0.0697
$D_{100}$= 0.0704
$T_{90}$= 16.39 min.

$C_v$ @ $T_{90}$ =
.012 in.$^2$/min.




Load No.= 4
Load= 1.00 ksf
$D_0$ = 0.0763
$D_{90}$ = 0.0848
$D_{100}$= 0.0857
$T_{90}$= 15.80 min.

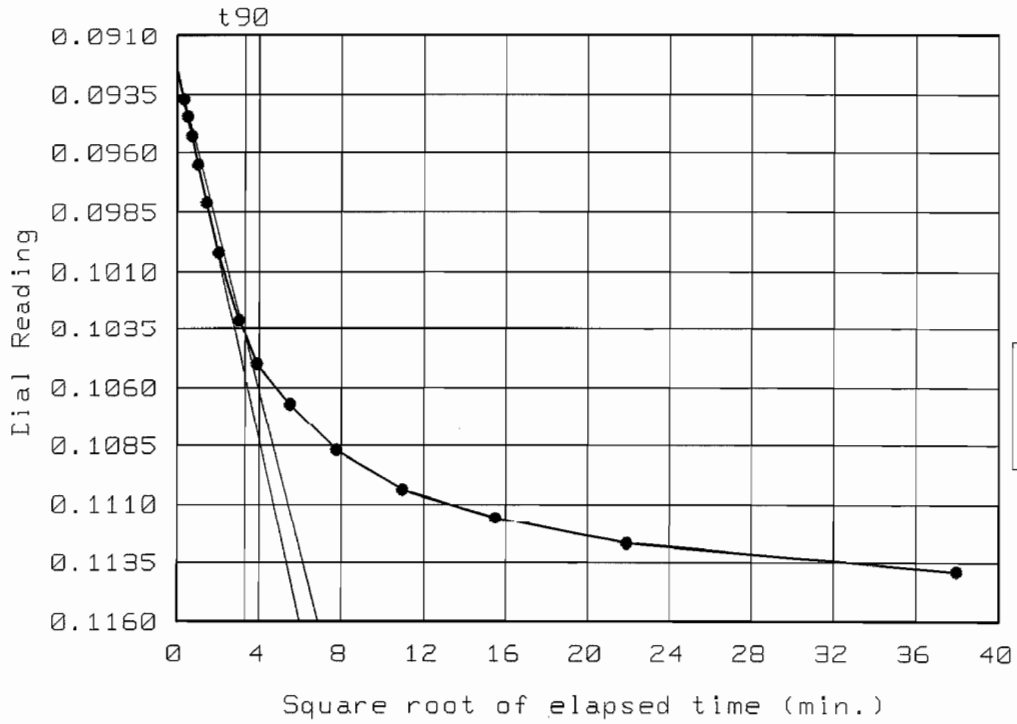
$C_v$ @ $T_{90}$ =
.013 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

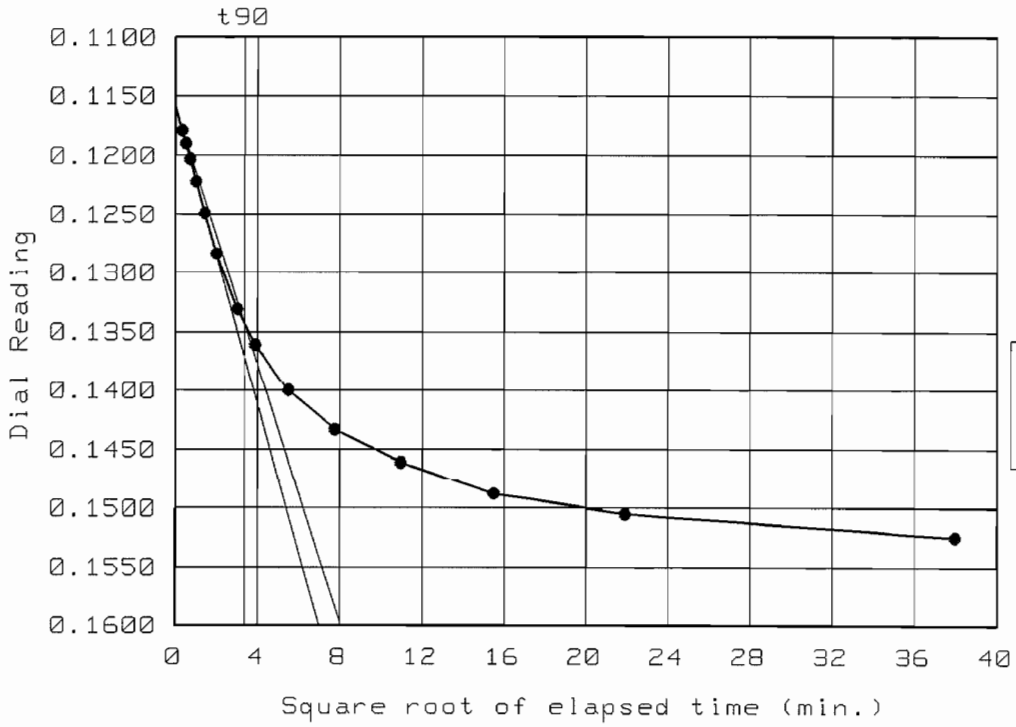
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

Date: 9/3/03




Load No.= 5
Load= 2.00 ksf
$D_0$ = 0.0925
$D_{90}$ = 0.1037
$D_{100}$= 0.1050
$T_{90}$= 10.82 min.

$C_v$ @ $T_{90}$ =
.018 in.$^2$/min.




Load No.= 6
Load= 4.00 ksf
$D_0$ = 0.1159
$D_{90}$ = 0.1343
$D_{100}$= 0.1364
$T_{90}$= 11.25 min.

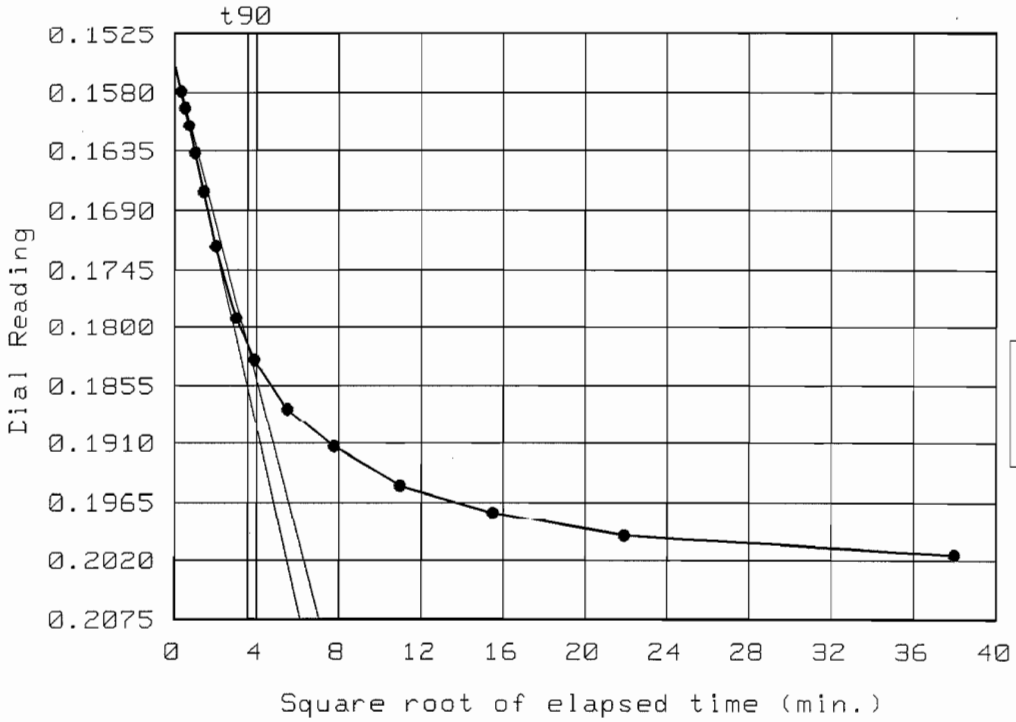
$C_v$ @ $T_{90}$ =
.016 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

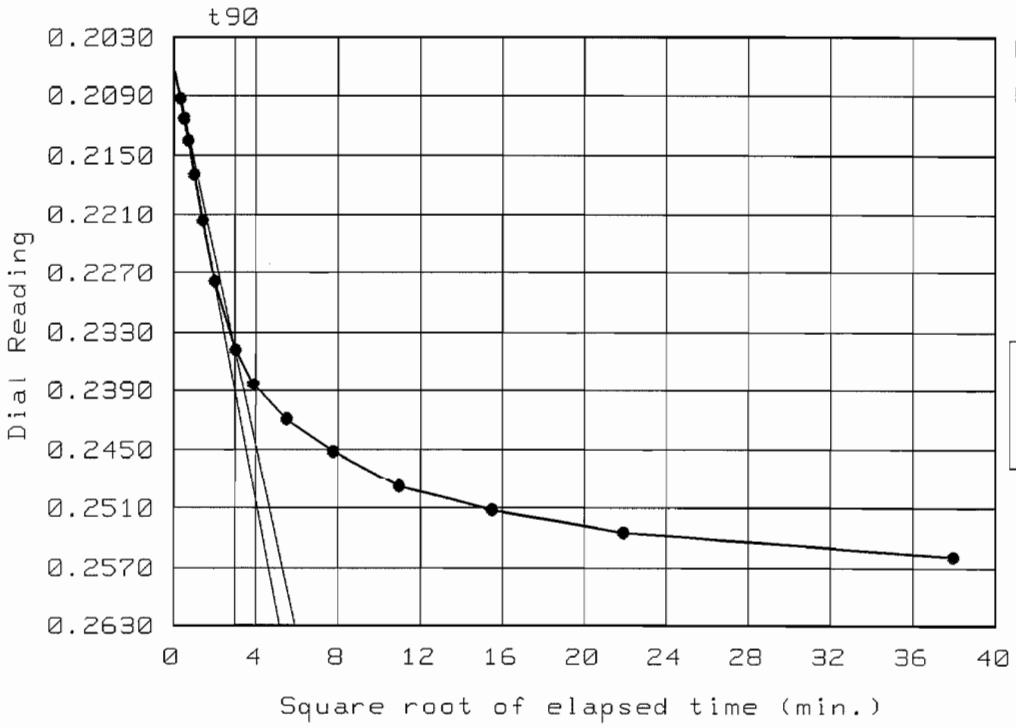
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

Date: 9/3/03




Load No.= 7
Load= 8.00 ksf
$D_0$ = 0.1552
$D_{90}$ = 0.1816
$D_{100}$= 0.1846
$T_{90}$= 12.63 min.

$C_v$ @ $T_{90}$ =
.013 in.$^2$/min.




Load No.= 8
Load= 16.00 ksf
$D_0$ = 0.2058
$D_{90}$ = 0.2347
$D_{100}$= 0.2380
$T_{90}$= 8.95 min.

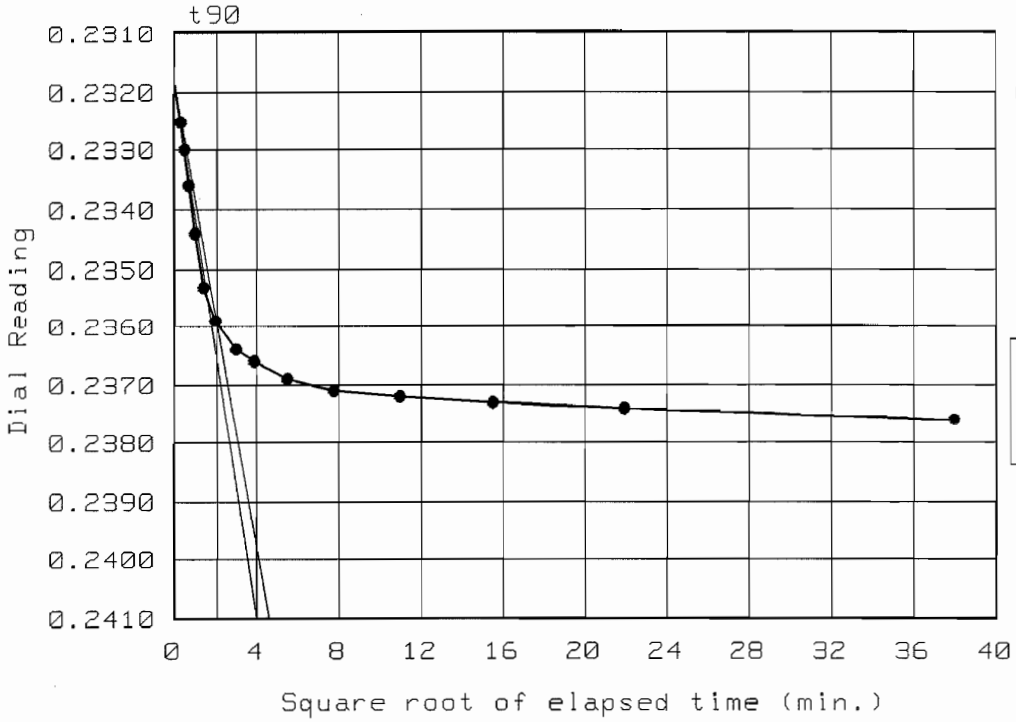
$C_v$ @ $T_{90}$ =
.016 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

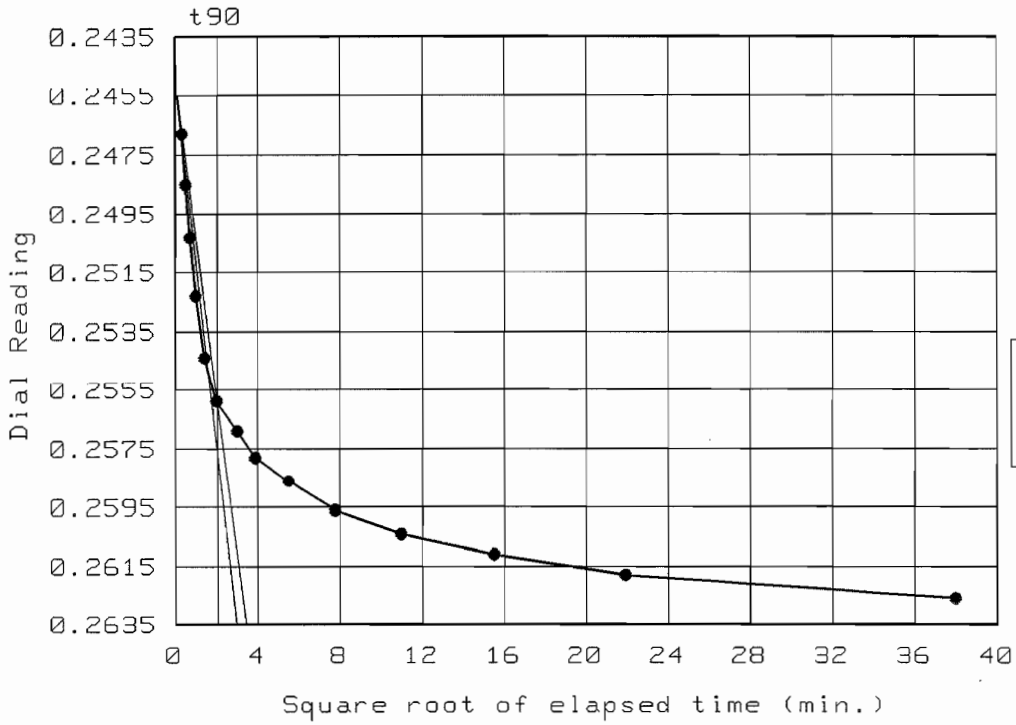
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

Date: 9/3/03




Load No.= 11
Load= 4.00 ksf
$D_0$ = 0.2318
$D_{90}$ = 0.2359
$D_{100}$= 0.2364
$T_{90}$= 4.28 min.

$C_v$ @ $T_{90}$ =
.033 in.$^2$/min.




Load No.= 12
Load= 16.00 ksf
$D_0$ = 0.2448
$D_{90}$ = 0.2559
$D_{100}$= 0.2572
$T_{90}$= 4.19 min.

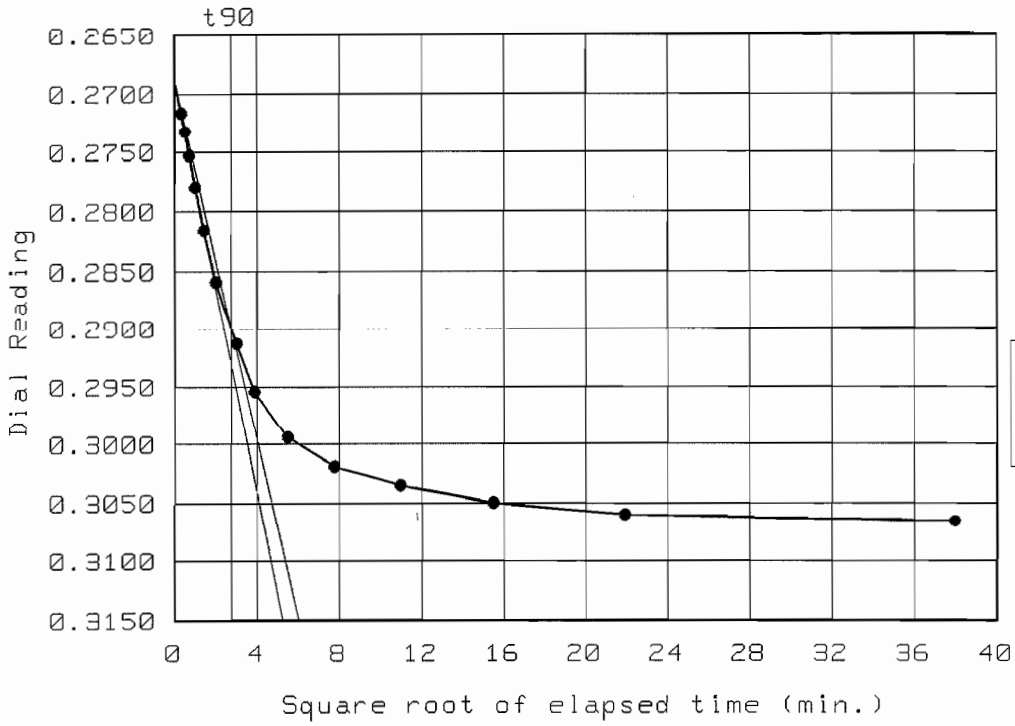
$C_v$ @ $T_{90}$ =
.032 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

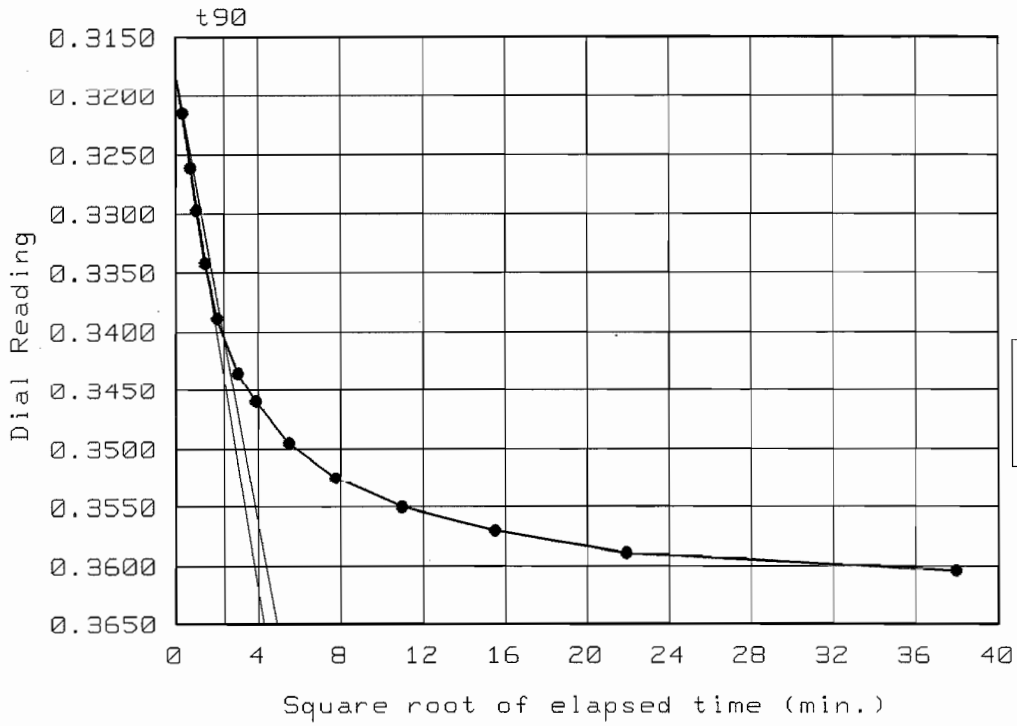
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

Date: 9/3/03




Load No.= 13
Load= 32.00 ksf
$D_0$ = 0.2688
$D_{90}$ = 0.2900
$D_{100}$= 0.2923
$T_{90}$= 7.60 min.

$C_v$ @ $T_{90}$ =
.016 in.$^2$/min.




Load No.= 14
Load= 64.00 ksf
$D_0$ = 0.3180
$D_{90}$ = 0.3405
$D_{100}$= 0.3430
$T_{90}$= 5.50 min.

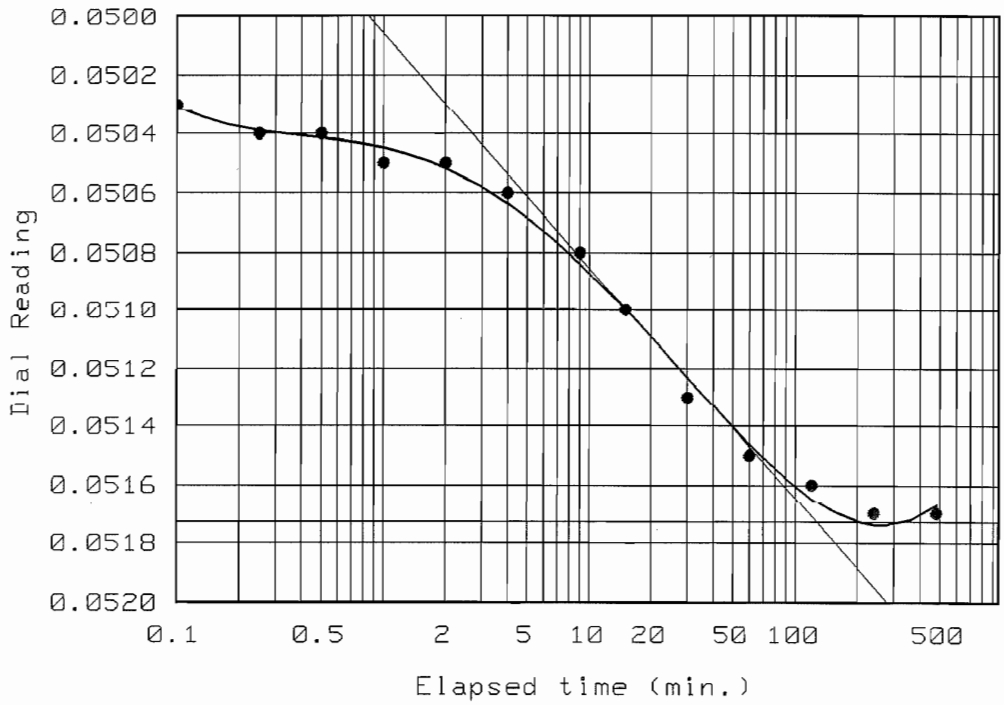
$C_v$ @ $T_{90}$ =
.020 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

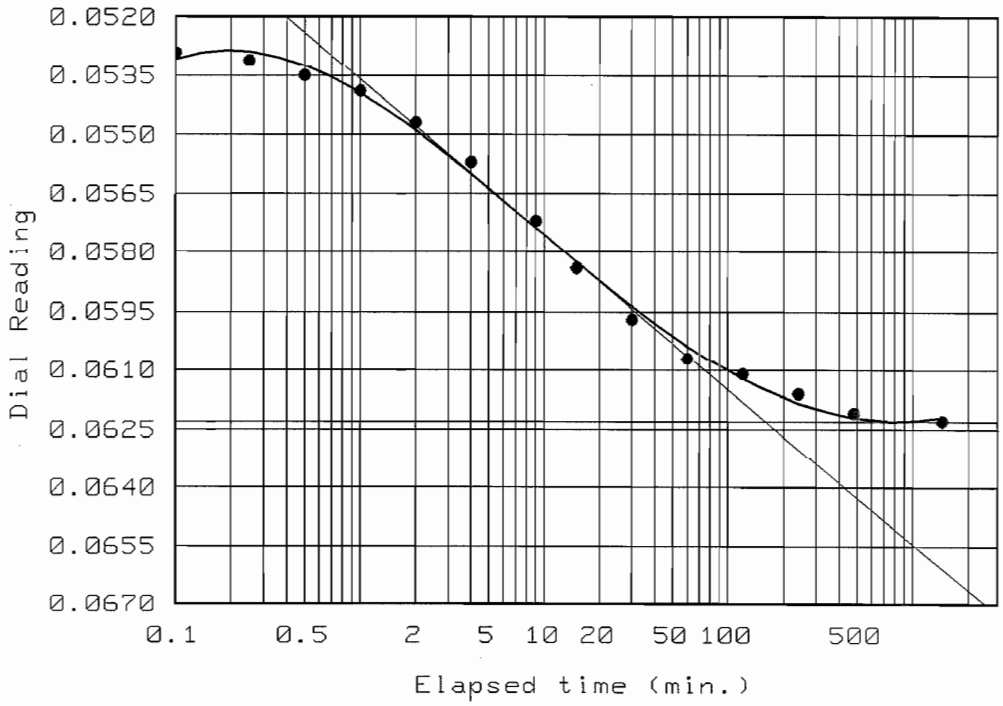
Date: 9/3/03




Load No.= 1
Load= 0.10 ksf
$D_0$ = 0.0502
$D_{50}$ = 0.0510
$D_{100}$= 0.0517
$T_{50}$= 13.77 min.

$C_v$ @ $T_{50}$ = .004 in.$^2$/min.

$C_\alpha$= 0.000




Load No.= 2
Load= 0.25 ksf
$D_0$ = 0.0530
$D_{50}$ = 0.0577
$D_{100}$= 0.0623
$T_{50}$= 10.66 min.

$C_v$ @ $T_{50}$ = .005 in.$^2$/min.

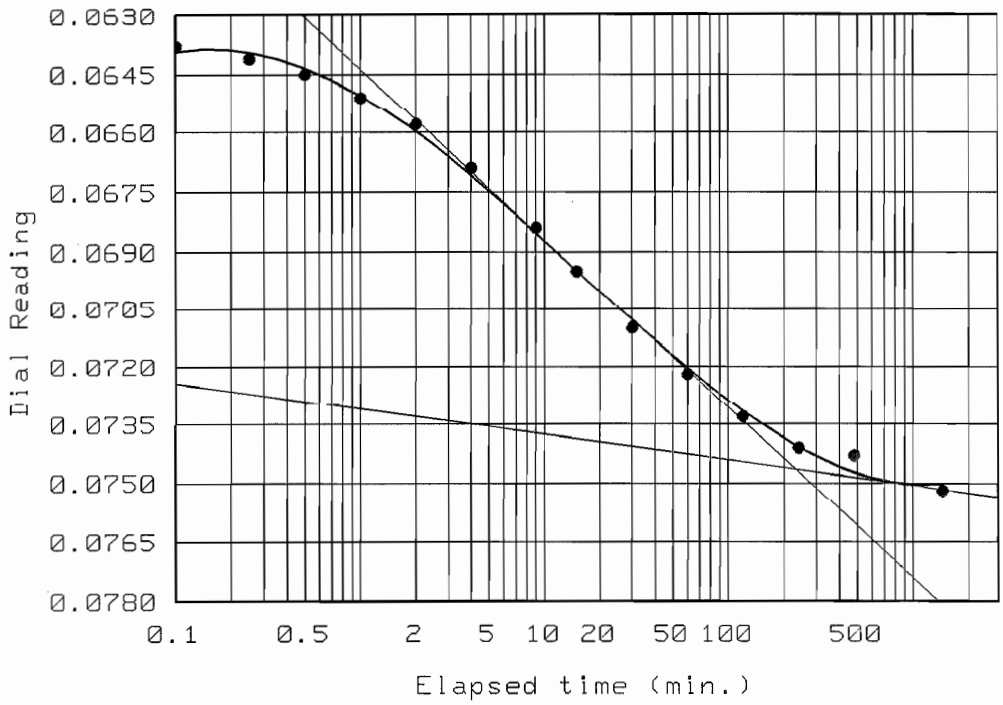
$C_\alpha$= 0.000

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

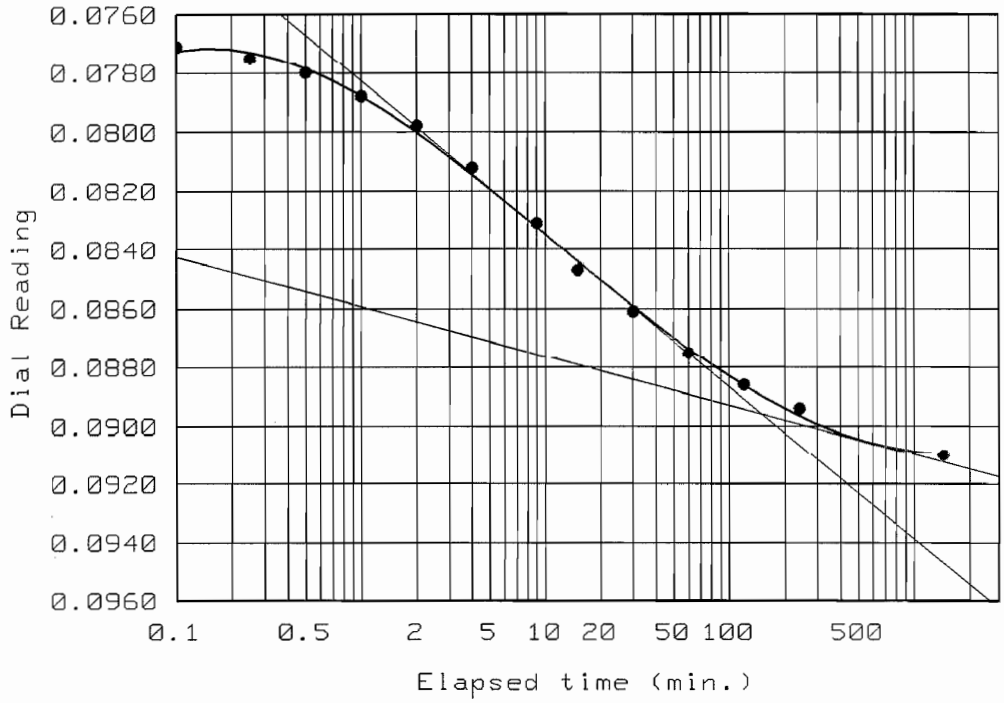
Date: 9/3/03




Load No.= 3
Load= 0.50 ksf
$D_0$ = 0.0637
$D_{50}$ = 0.0692
$D_{100}$= 0.0746
$T_{50}$= 12.50 min.

$C_v$ @ $T_{50}$ =
.004 in.$^2$/min.

$C_\alpha$= 0.001




Load No.= 4
Load= 1.00 ksf
$D_0$ = 0.0769
$D_{50}$ = 0.0832
$D_{100}$= 0.0896
$T_{50}$= 8.92 min.

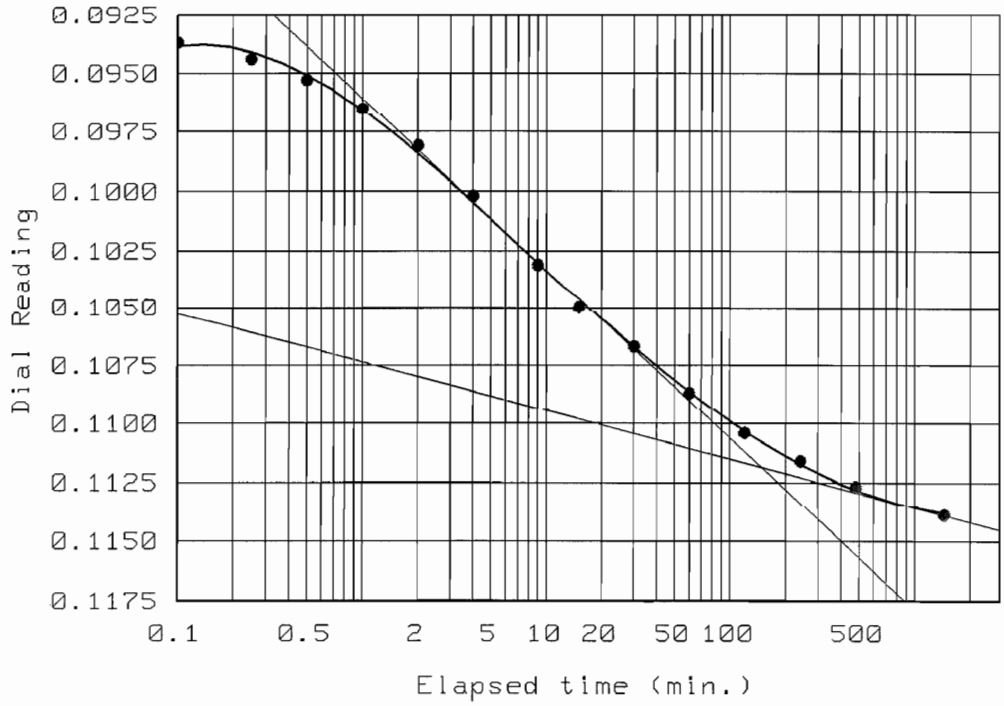
$C_v$ @ $T_{50}$ =
.005 in.$^2$/min.

$C_\alpha$= 0.002

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

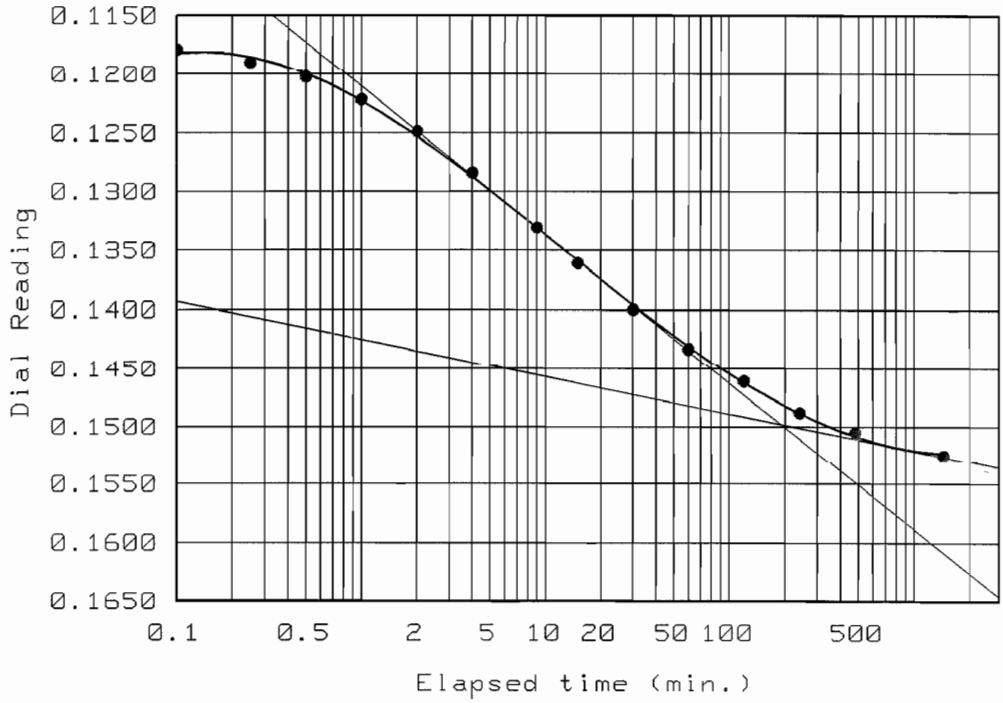
Date: 9/3/03




Load No.= 5
Load= 2.00 ksf
$D_0$ = 0.0930
$D_{50}$ = 0.1025
$D_{100}$= 0.1119
$T_{50}$= 7.50 min.

$C_v$ @ $T_{50}$ = .006 in.$^2$/min.

$C_\alpha$= 0.002




Load No.= 6
Load= 4.00 ksf
$D_0$ = 0.1169
$D_{50}$ = 0.1334
$D_{100}$= 0.1498
$T_{50}$= 9.48 min.

$C_v$ @ $T_{50}$ = .004 in.$^2$/min.

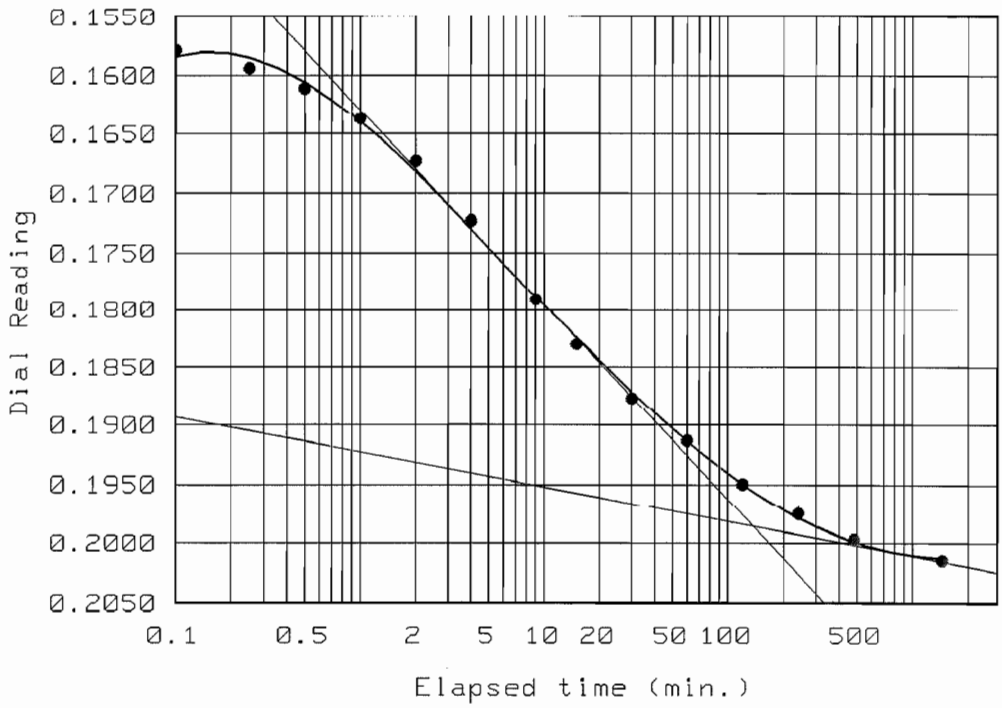
$C_\alpha$= 0.003

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

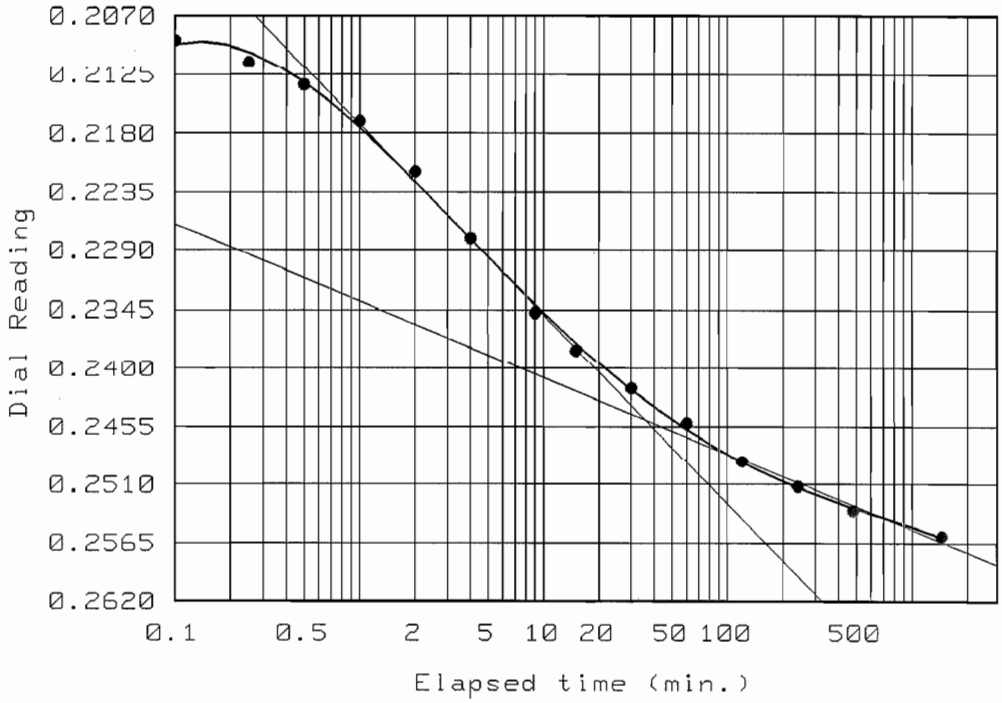
Date: 9/3/03




Load No.= 7
Load= 8.00 ksf
$D_0$ = 0.1570
$D_{50}$ = 0.1778
$D_{100}$= 0.1986
$T_{50}$= 7.81 min.

$C_v$ @ $T_{50}$ =
.005 in.$^2$/min.

$C_\alpha$= 0.003




Load No.= 8
Load= 16.00 ksf
$D_0$ = 0.2072
$D_{50}$ = 0.2261
$D_{100}$= 0.2449
$T_{50}$= 3.17 min.

$C_v$ @ $T_{50}$ =
.010 in.$^2$/min.

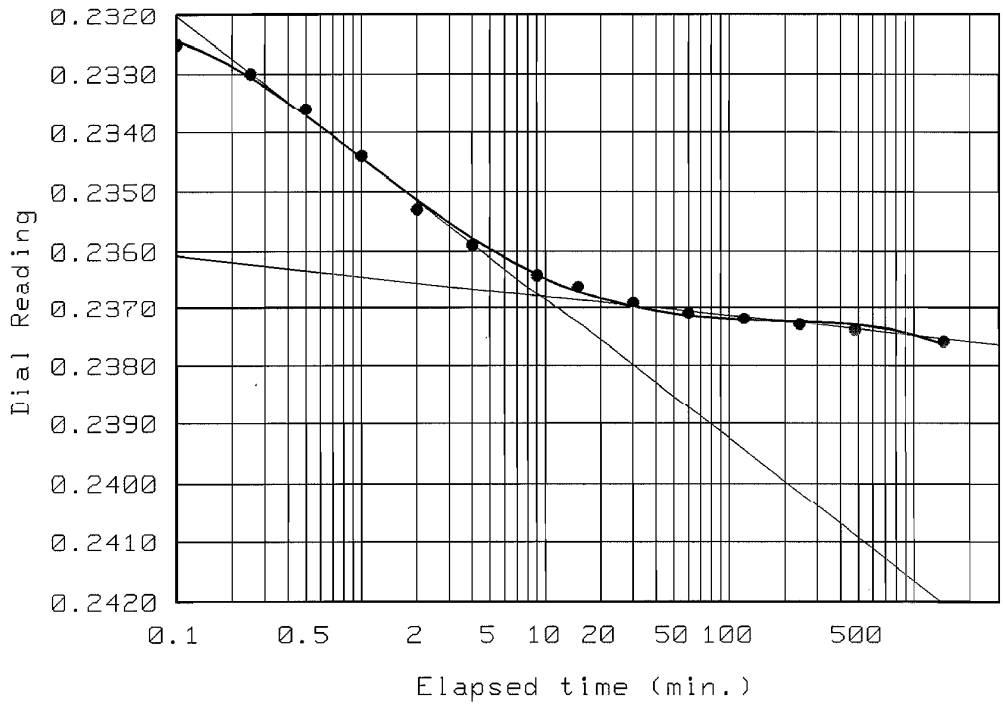
$C_\alpha$= 0.008

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

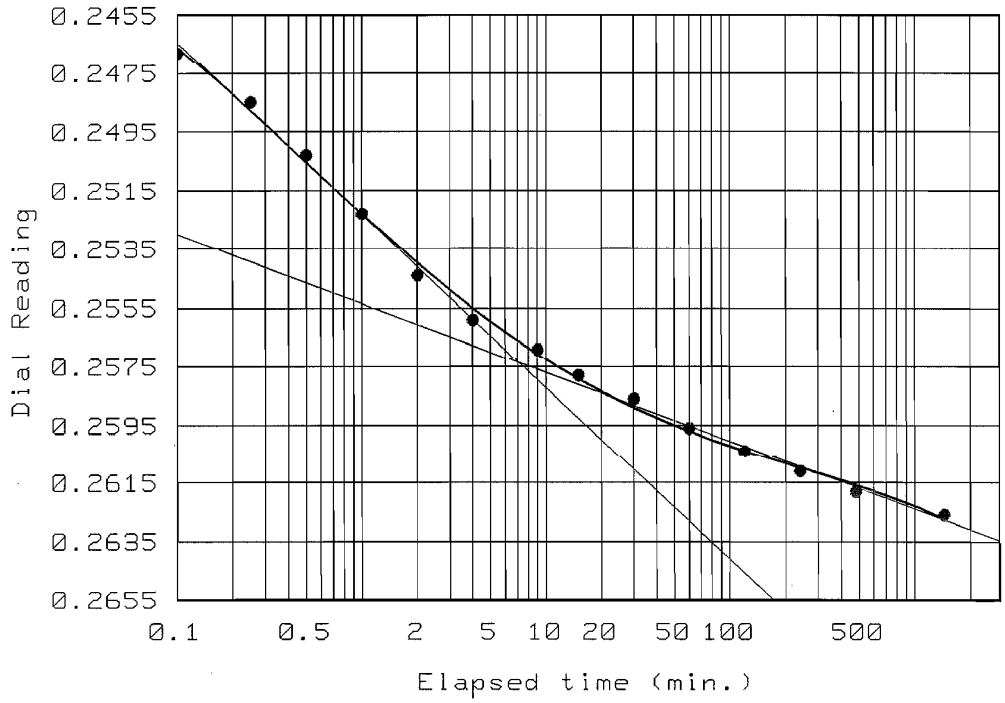
Date: 9/3/03




Load No.= 11
Load= 4.00 ksf
$D_0$ = 0.2314
$D_{50}$ = 0.2341
$D_{100}$= 0.2368
$T_{50}$= 0.72 min.

$C_v$ @ $T_{50}$ =
.046 in.$^2$/min.

$C_\alpha$= 0.000




Load No.= 12
Load= 16.00 ksf
$D_0$ = 0.2432
$D_{50}$ = 0.2503
$D_{100}$= 0.2574
$T_{50}$= 0.45 min.

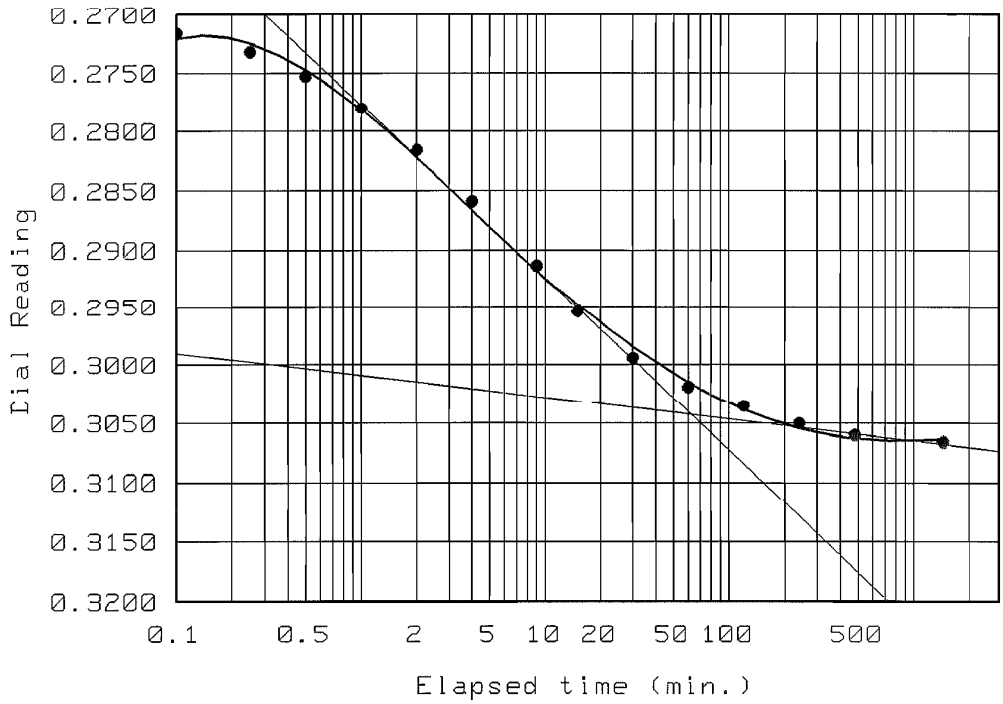
$C_v$ @ $T_{50}$ =
.070 in.$^2$/min.

$C_\alpha$= 0.003

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 40' - 42'

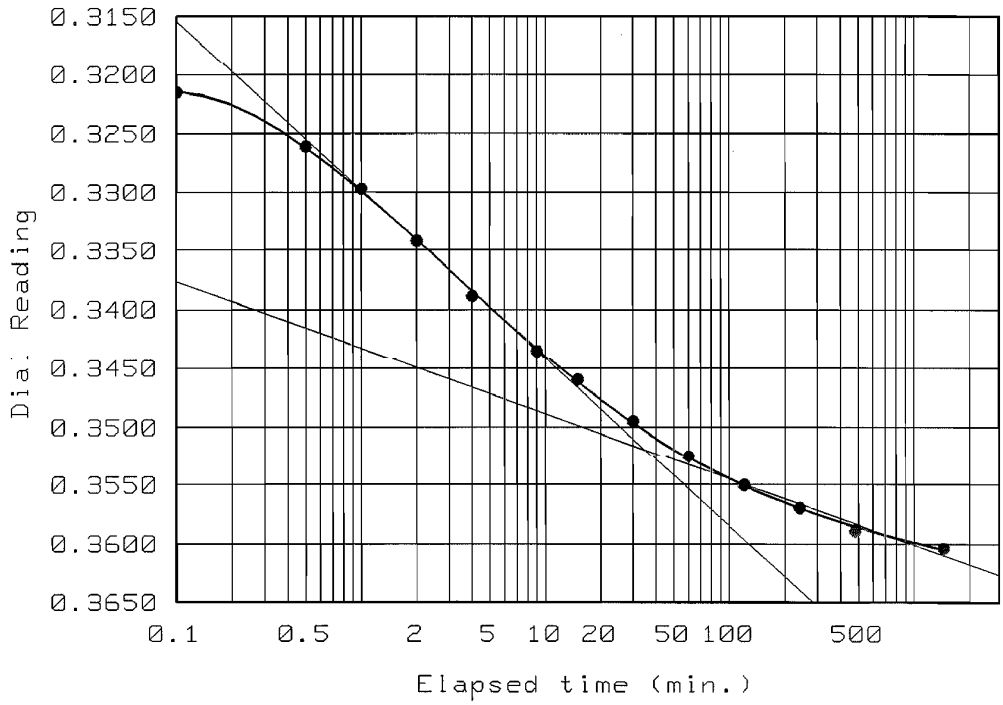
Date: 9/3/03




Load No.= 13
Load= 32.00 ksf
$D_0$ = 0.2703
$D_{50}$ = 0.2873
$D_{100}$= 0.3043
$T_{50}$= 4.41 min.

$C_v$ @ $T_{50}$ =
.007 in.$^2$/min.

$C_\alpha$= 0.002



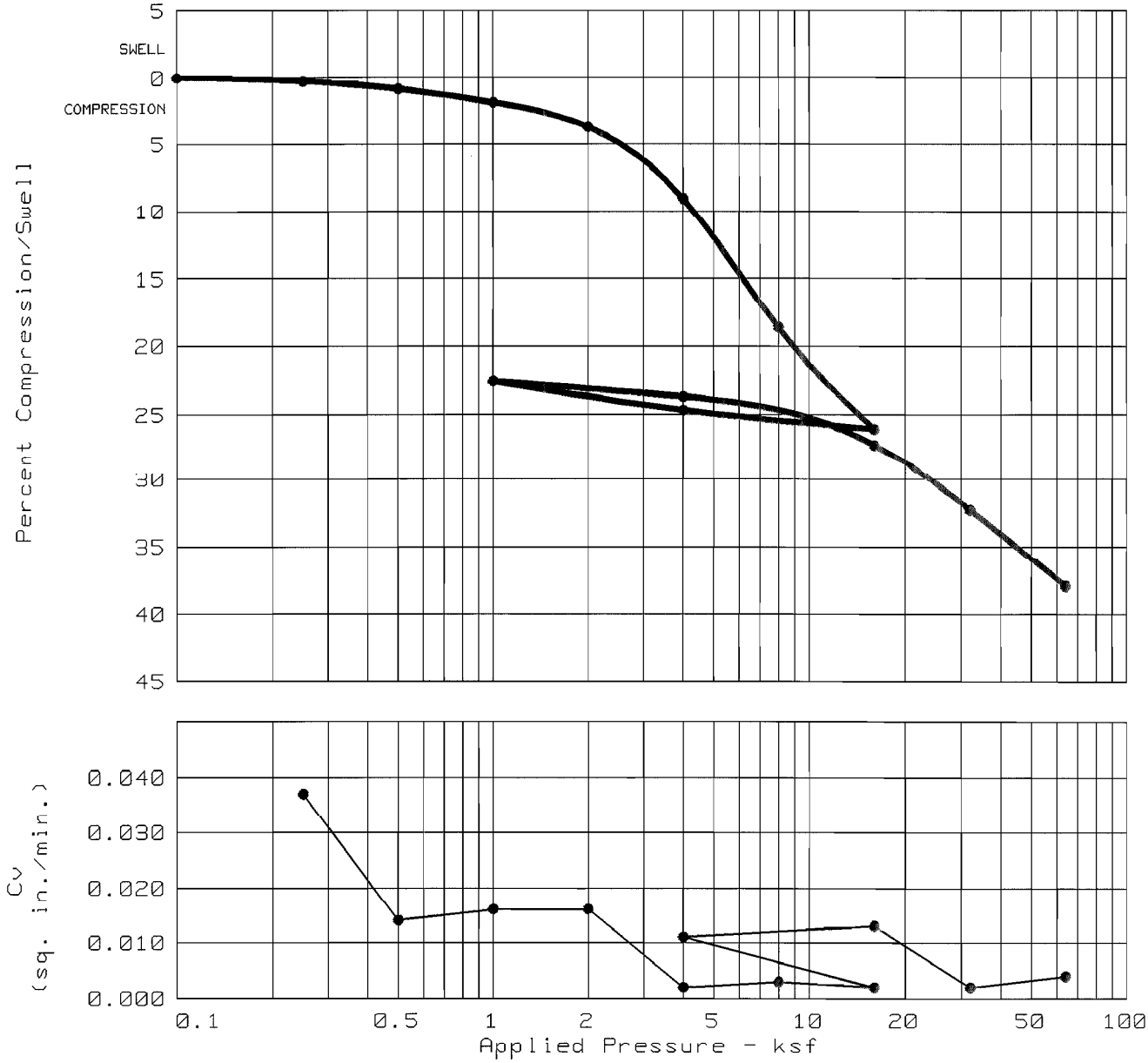

Load No.= 14
Load= 64.00 ksf
$D_0$ = 0.3177
$D_{50}$ = 0.3348
$D_{100}$= 0.3519
$T_{50}$= 2.23 min.

$C_v$ @ $T_{50}$ =
.011 in.$^2$/min.

$C_\alpha$= 0.008

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# CONSOLIDATION TEST REPORT



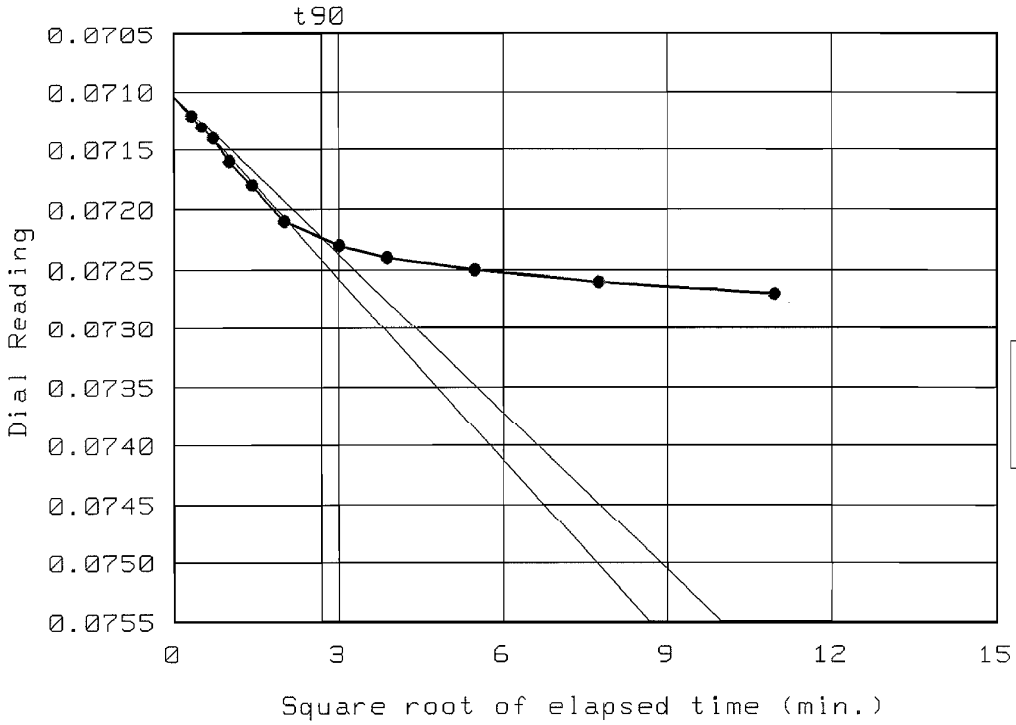

| Natural Saturation | Natural Moisture | Dry Dens. (pcf) | LL | PI | Sp.Gr. | Initial void ratio |
|---|---|---|---|---|---|---|
| 88.6 % | 60.3 % | 61.2 | 72 | 51 | 2.700 | 1.8379 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| | Very dark greenish gray fat CLAY<br>Class: (CH) |
| Project No.: 3530-03-1245 Phase 01<br>Project: Indian River Inlet Bridges<br>Location: Boring BI-3 @ 60' - 62'<br><br>Date: 9/3/03 | Remarks:<br>9/23/03 |
| CONSOLIDATION TEST REPORT<br><br>**LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.** | Fig. No. 1 1 |

# Dial Reading vs. Time

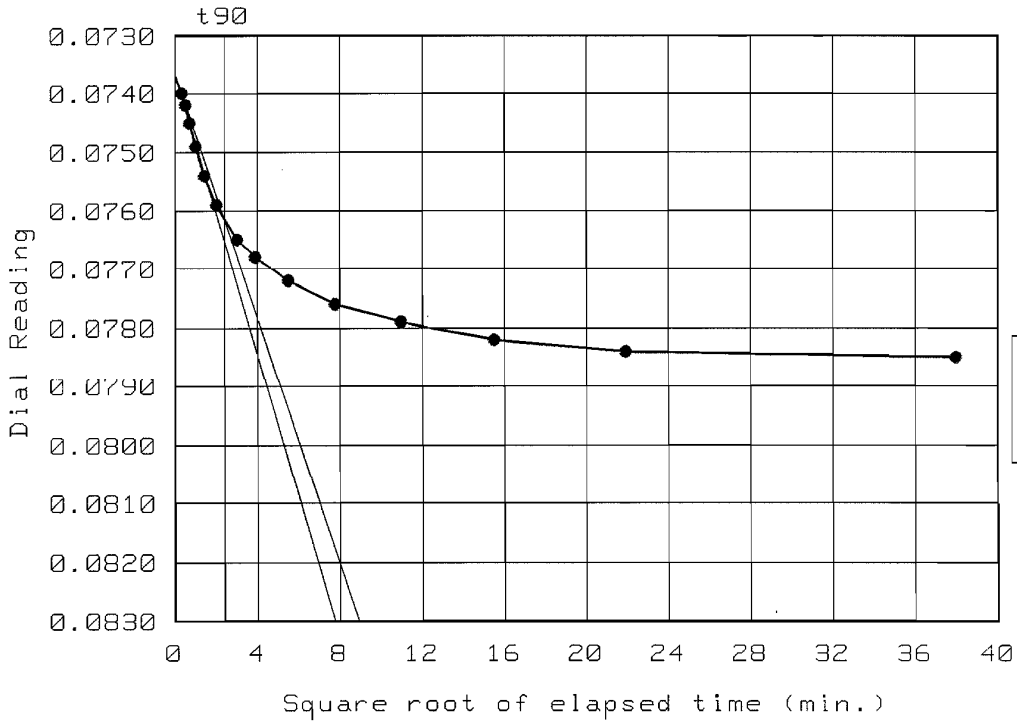
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

Date: 9/3/03




Load No. = 2
Load = 0.25 ksf
$D_0$ = 0.0710
$D_{90}$ = 0.0722
$D_{100}$ = 0.0724
$T_{90}$ = 7.21 min.

$C_v$ @ $T_{90}$ =
.029 in.$^2$/min.




Load No. = 3
Load = 0.50 ksf
$D_0$ = 0.0736
$D_{90}$ = 0.0761
$D_{100}$ = 0.0764
$T_{90}$ = 5.72 min.

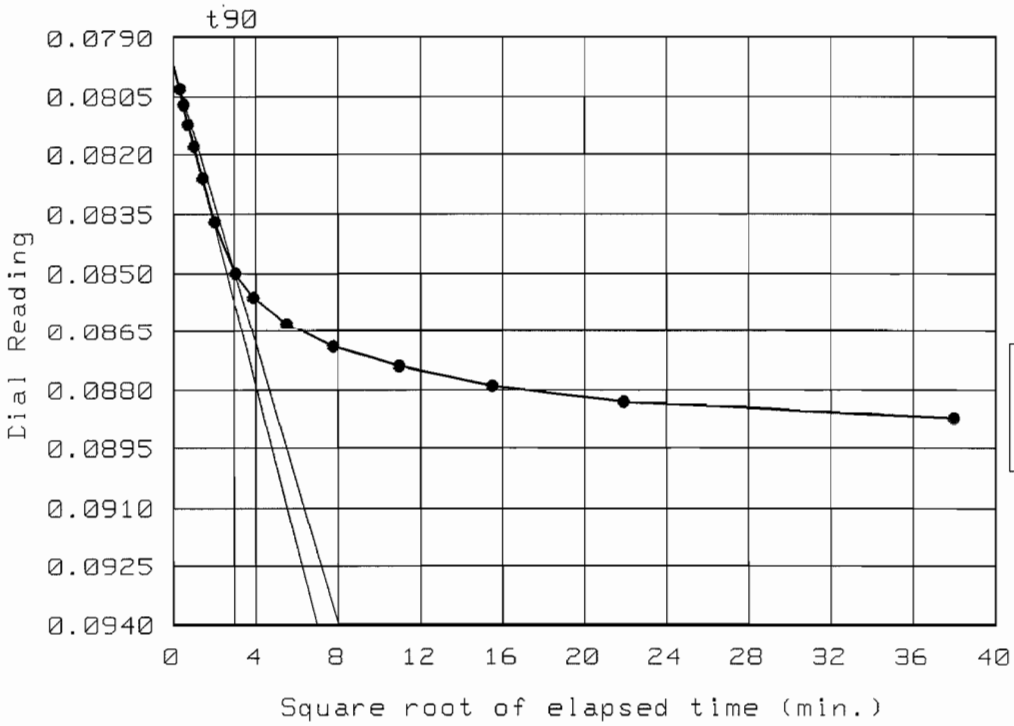
$C_v$ @ $T_{90}$ =
.037 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

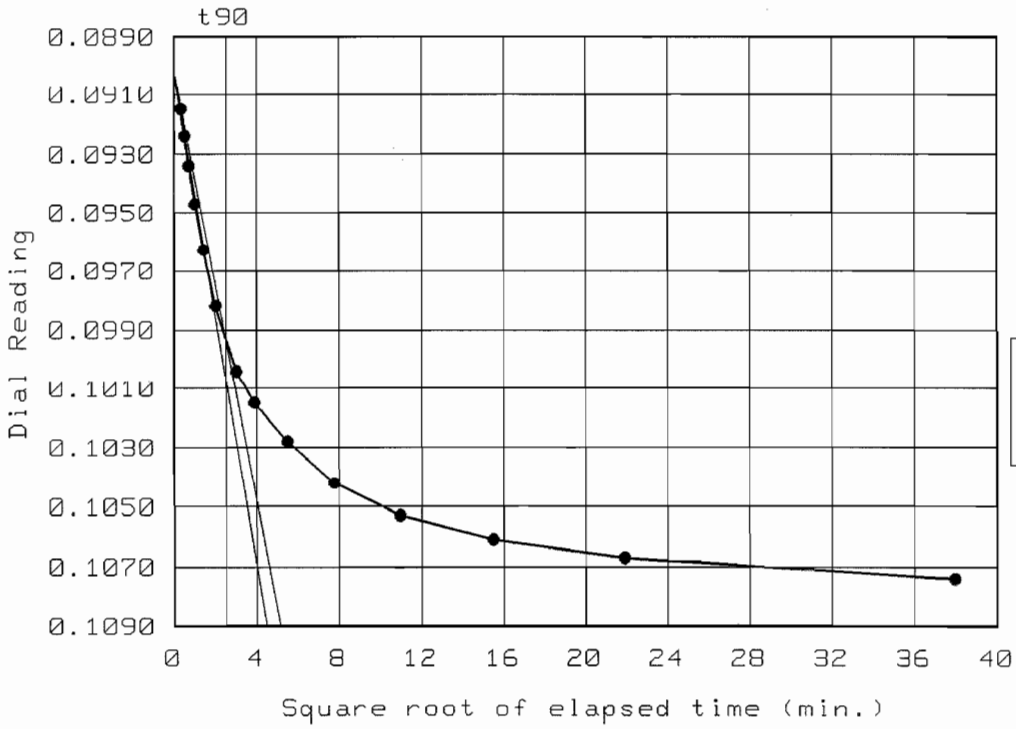
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

Date: 9/3/03




Load No. = 4
Load= 1.00 ksf
$D_0$ = 0.0796
$D_{90}$ = 0.0849
$D_{100}$= 0.0855
$T_{90}$= 8.69 min.

$C_v$ @ $T_{90}$ =
.024 in.$^2$/min.




Load No. = 5
Load= 2.00 ksf
$D_0$ = 0.0902
$D_{90}$ = 0.0993
$D_{100}$= 0.1003
$T_{90}$= 6.25 min.

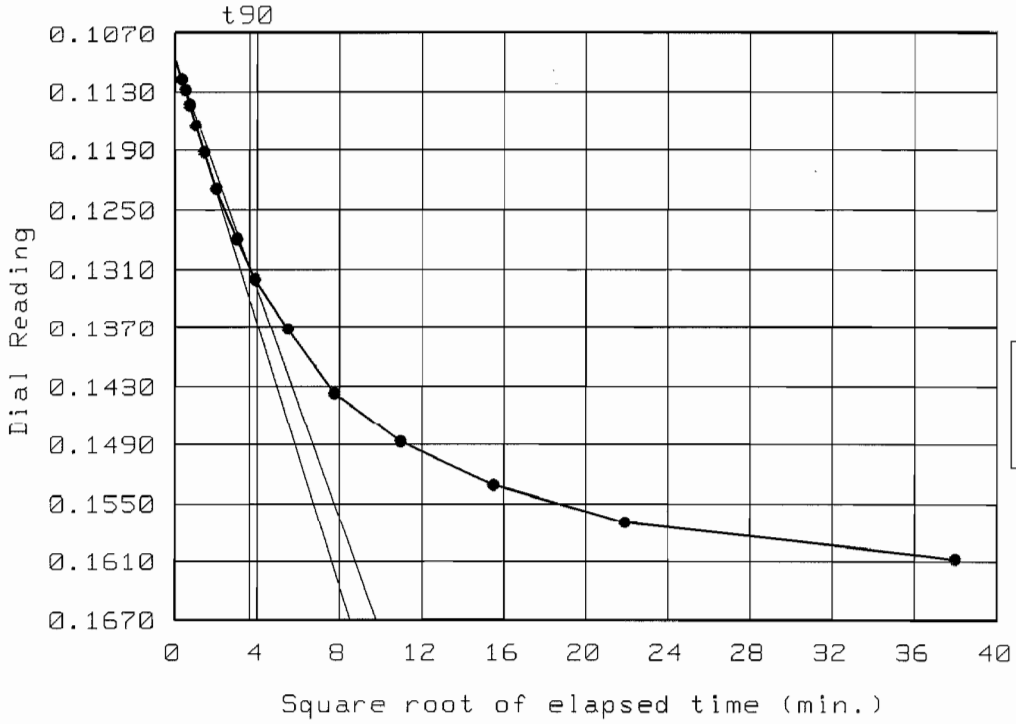
$C_v$ @ $T_{90}$ =
.032 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

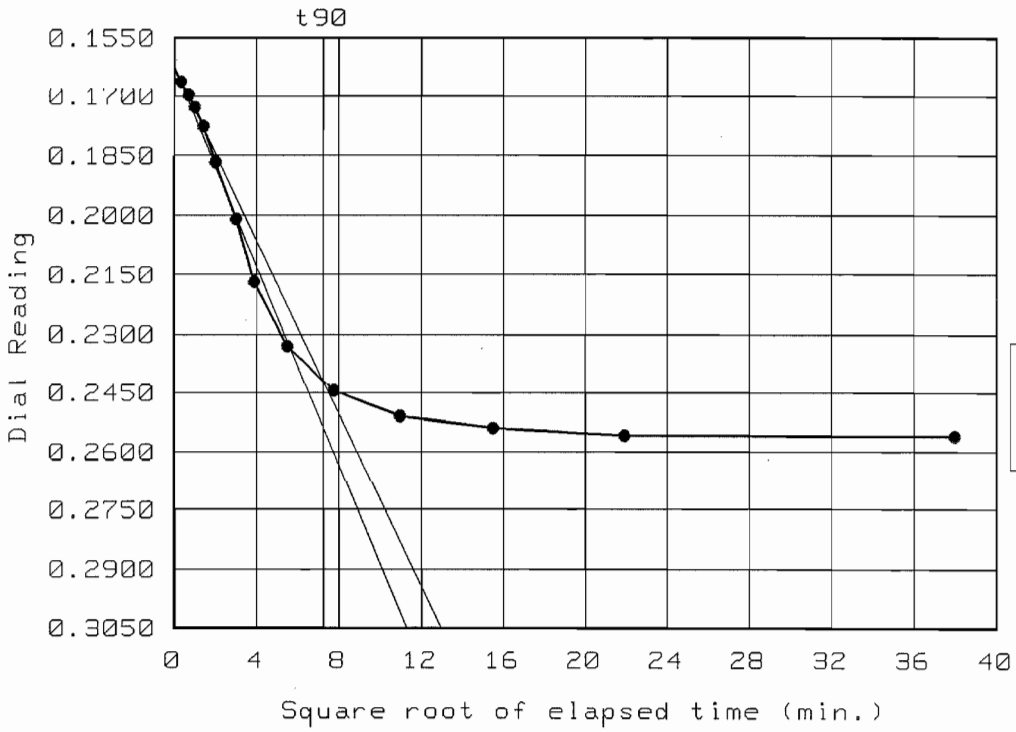
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

Date: 9/3/03




Load No.= 6
Load= 4.00 ksf
$D_0$ = 0.1096
$D_{90}$ = 0.1308
$D_{100}$= 0.1331
$T_{90}$= 13.06 min.

$C_v$ @ $T_{90}$ =
.014 in.$^2$/min.




Load No.= 7
Load= 8.00 ksf
$D_0$ = 0.1624
$D_{90}$ = 0.2419
$D_{100}$= 0.2507
$T_{90}$= 52.24 min.

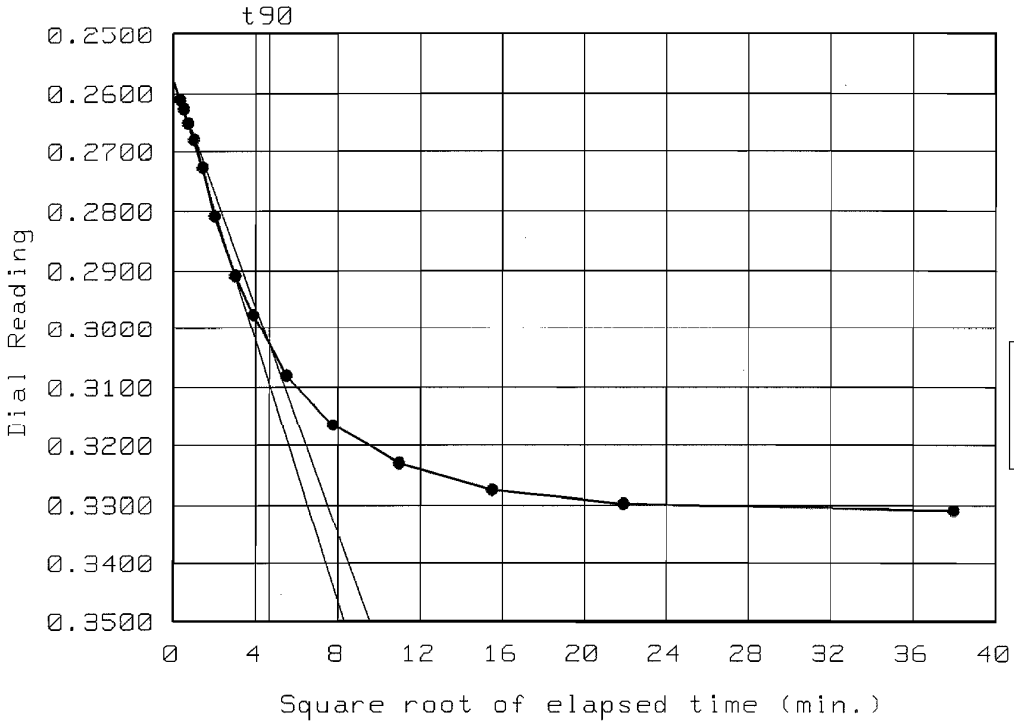
$C_v$ @ $T_{90}$ =
.003 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

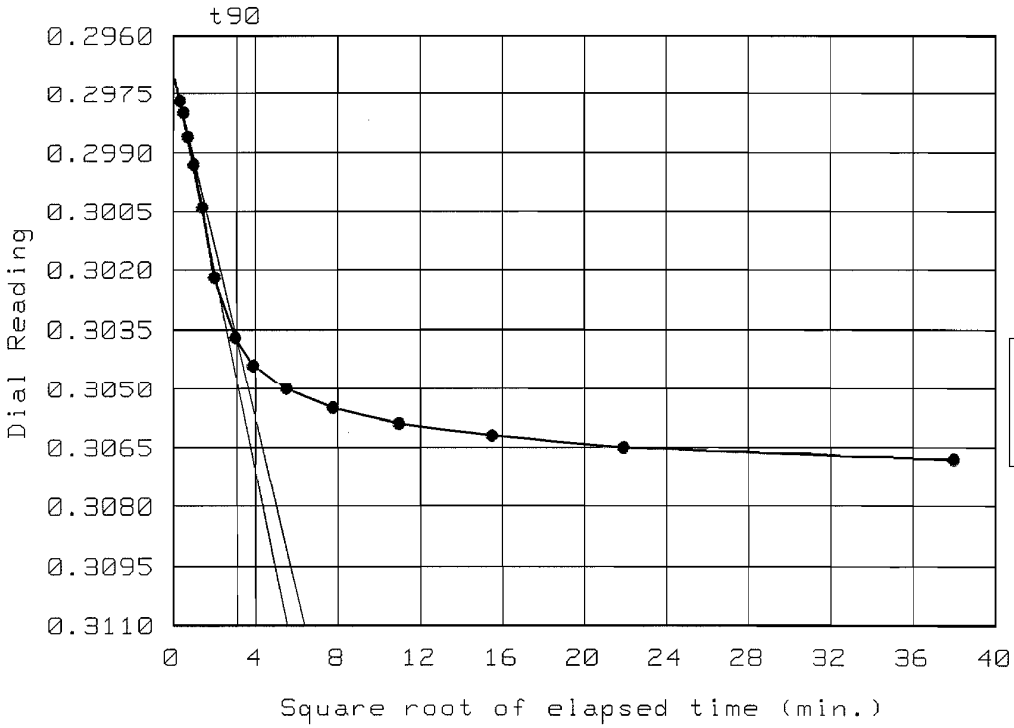
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

Date: 9/3/03




Load No.= 8
Load= 16.00 ksf
$D_0$ = 0.2575
$D_{90}$ = 0.3027
$D_{100}$= 0.3077
$T_{90}$= 21.77 min.

$C_v$ @ $T_{90}$ =
.006 in.$^2$/min.




Load No.= 11
Load= 4.00 ksf
$D_0$ = 0.2969
$D_{90}$ = 0.3038
$D_{100}$= 0.3045
$T_{90}$= 9.63 min.

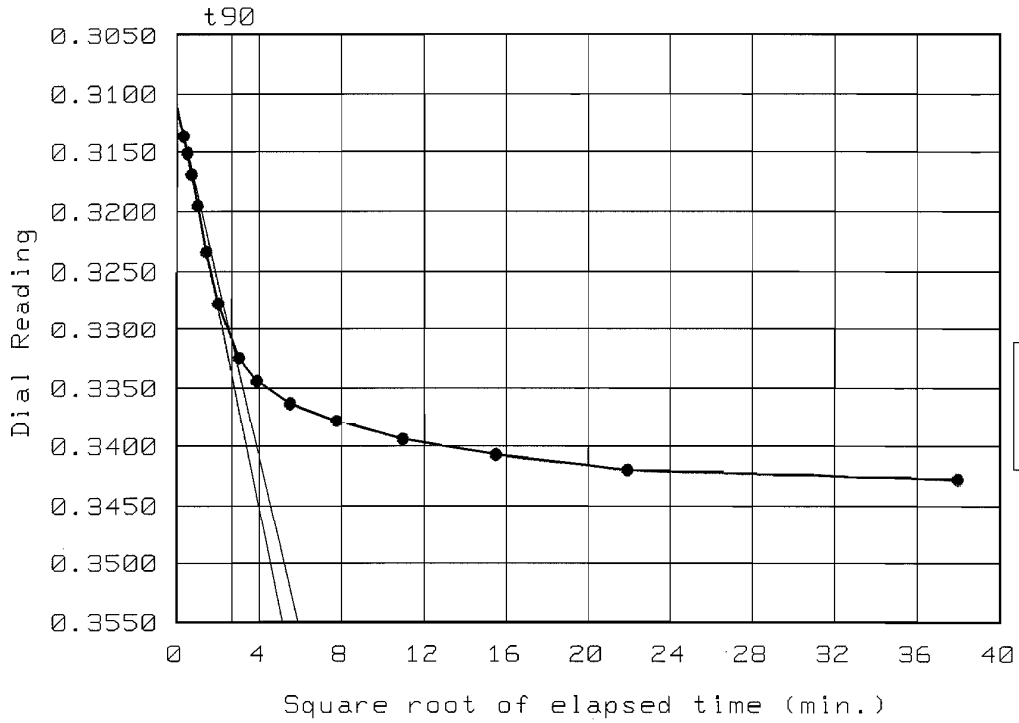
$C_v$ @ $T_{90}$ =
.013 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

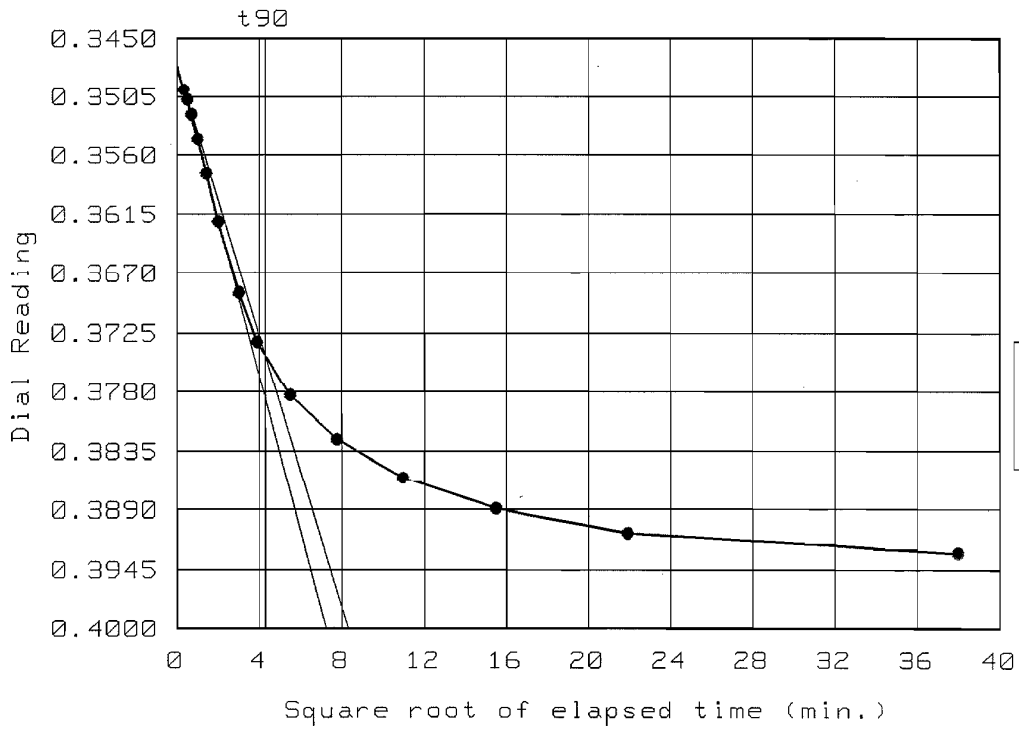
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

Date: 9/3/03




Load No.= 12
Load= 16.00 ksf
$D_0$ = 0.3110
$D_{90}$ = 0.3308
$D_{100}$= 0.3331
$T_{90}$= 7.05 min.

$C_v$ @ $T_{90}$ =
.017 in.$^2$/min.




Load No.= 13
Load= 32.00 ksf
$D_0$ = 0.3475
$D_{90}$ = 0.3746
$D_{100}$= 0.3776
$T_{90}$= 18.35 min.

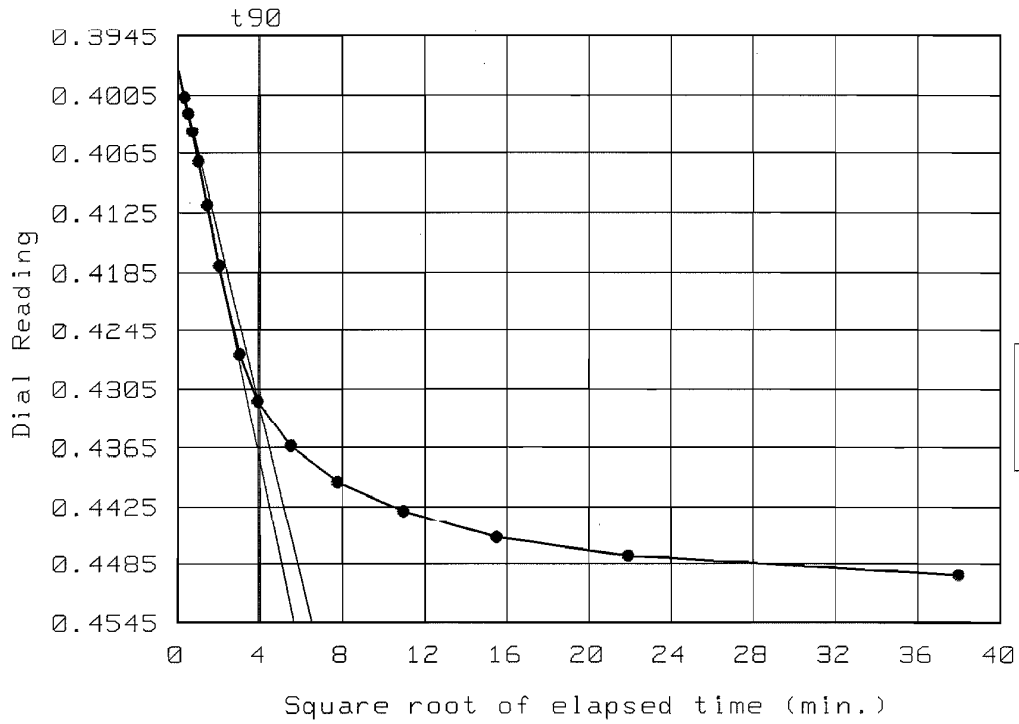
$C_v$ @ $T_{90}$ =
.006 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

Date: 9/3/03




Load No.= 14

Load= 64.00 ksf

$D_0$ = 0.3975

$D_{90}$ = 0.4318

$D_{100}$= 0.4356

$T_{90}$= 15.32 min.

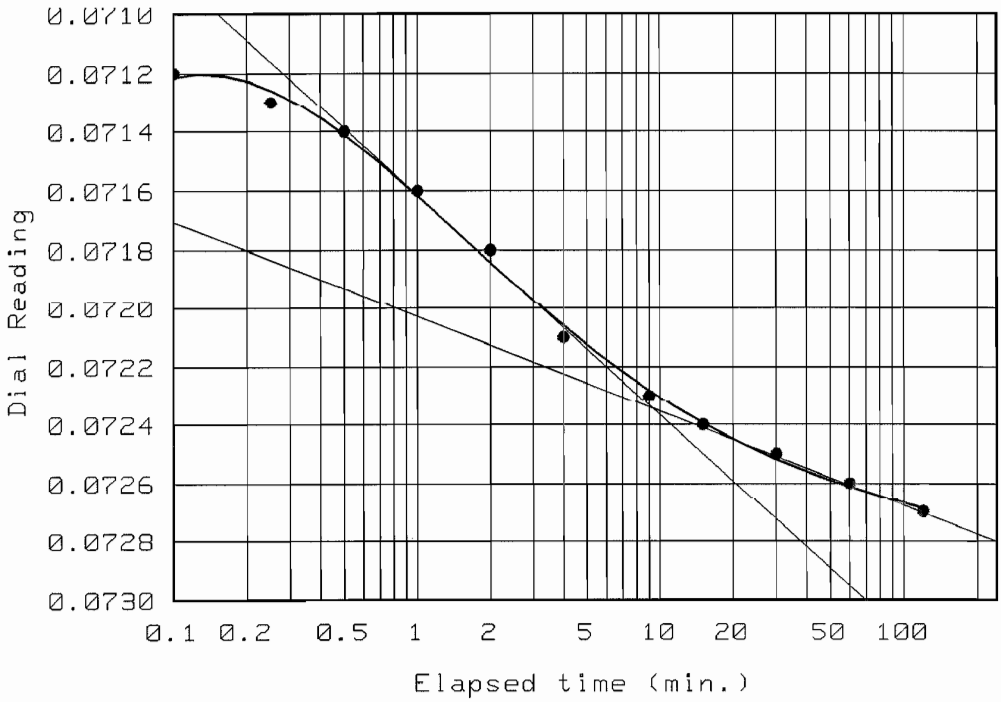
$C_v$ @ $T_{90}$ =

.006 in.²/min.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

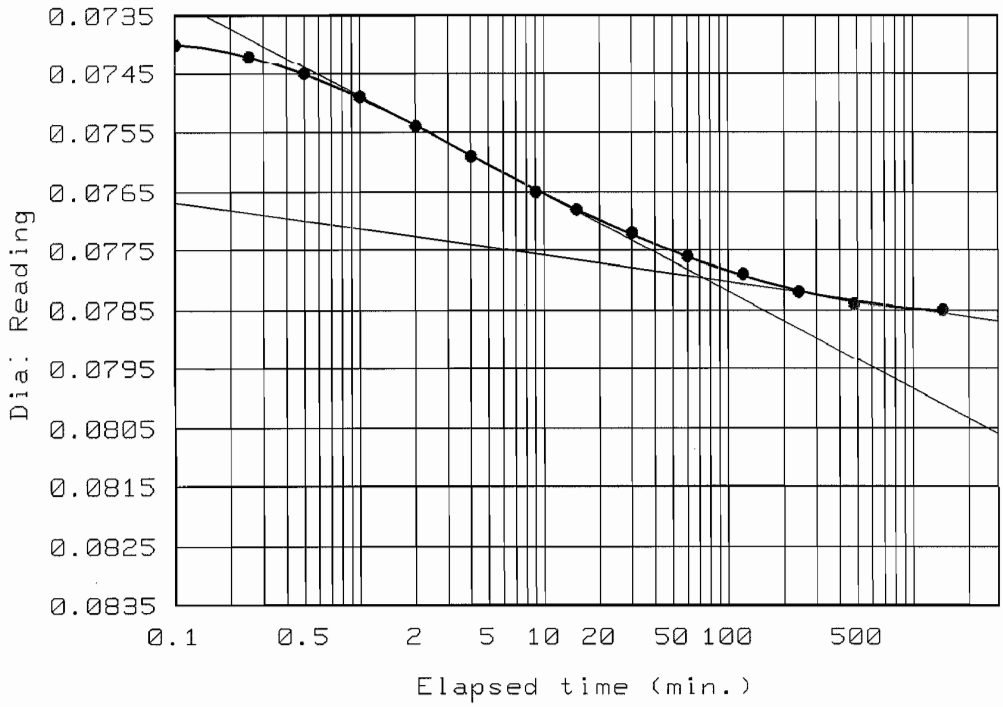
Date: 9/3/03




Load No.= 2
Load= 0.25 ksf
$D_0$ = 0.0711
$D_{50}$ = 0.0717
$D_{100}$= 0.0723
$T_{50}$= 1.32 min.

$C_v$ @ $T_{50}$ =
.037 in.$^2$/min.

$C_\alpha$= 0.000




Load No.= 3
Load= 0.50 ksf
$D_0$ = 0.0736
$D_{50}$ = 0.0758
$D_{100}$= 0.0780
$T_{50}$= 3.46 min.

$C_v$ @ $T_{50}$ =
.014 in.$^2$/min.

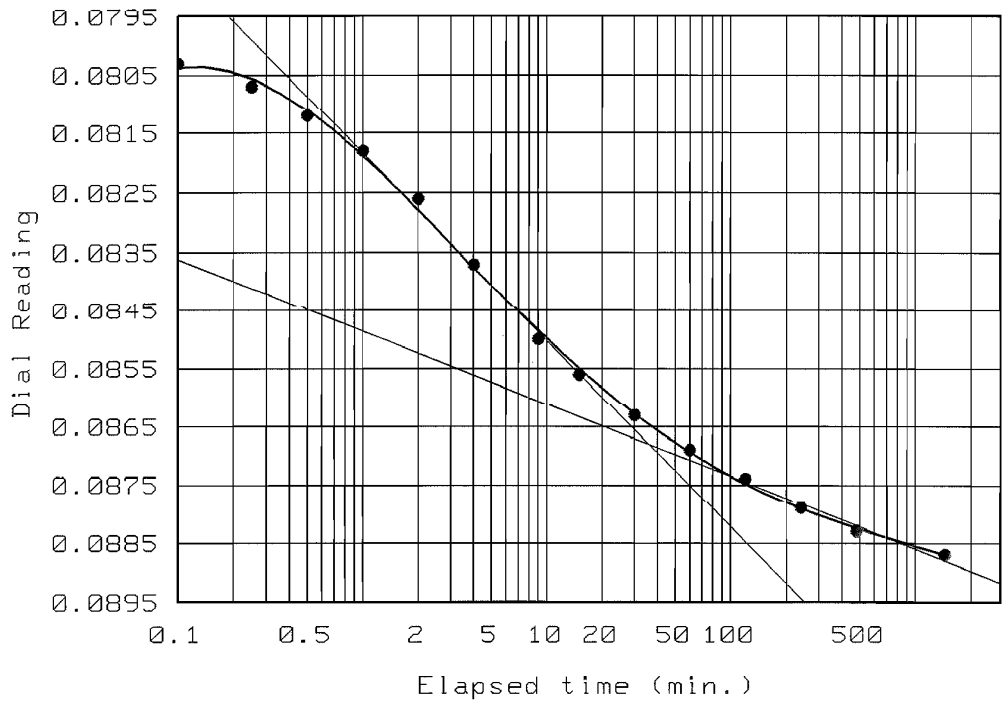
$C_\alpha$= 0.000

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

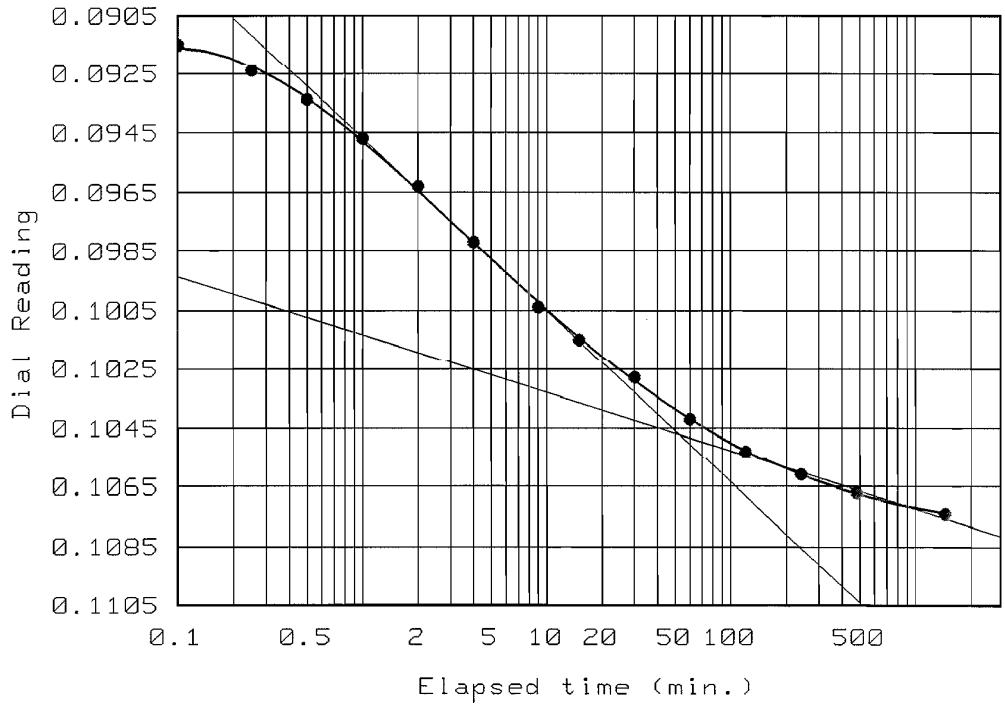
Date: 9/3/03




Load No.= 4
Load= 1.00 ksf
$D_0$ = 0.0798
$D_{50}$ = 0.0833
$D_{100}$= 0.0868
$T_{50}$= 2.93 min.

$C_v$ @ $T_{50}$ =
.016 in.$^2$/min.

$C_\alpha$= 0.001




Load No.= 5
Load= 2.00 ksf
$D_0$ = 0.0902
$D_{50}$ = 0.0975
$D_{100}$= 0.1047
$T_{50}$= 2.97 min.

$C_v$ @ $T_{50}$ =
.016 in.$^2$/min.

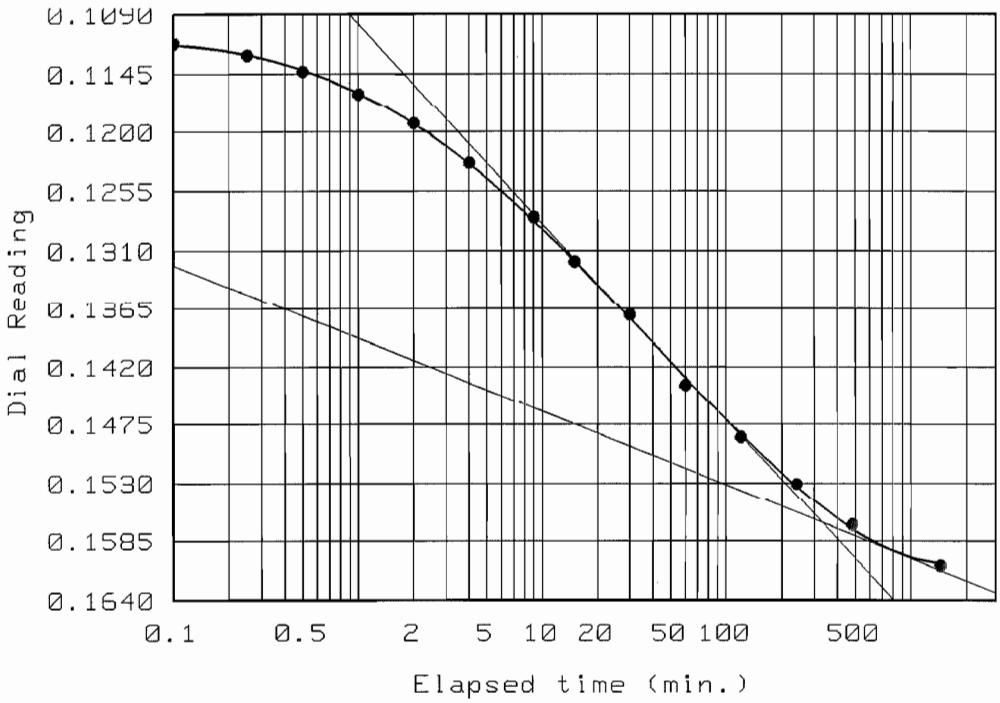
$C_\alpha$= 0.002

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

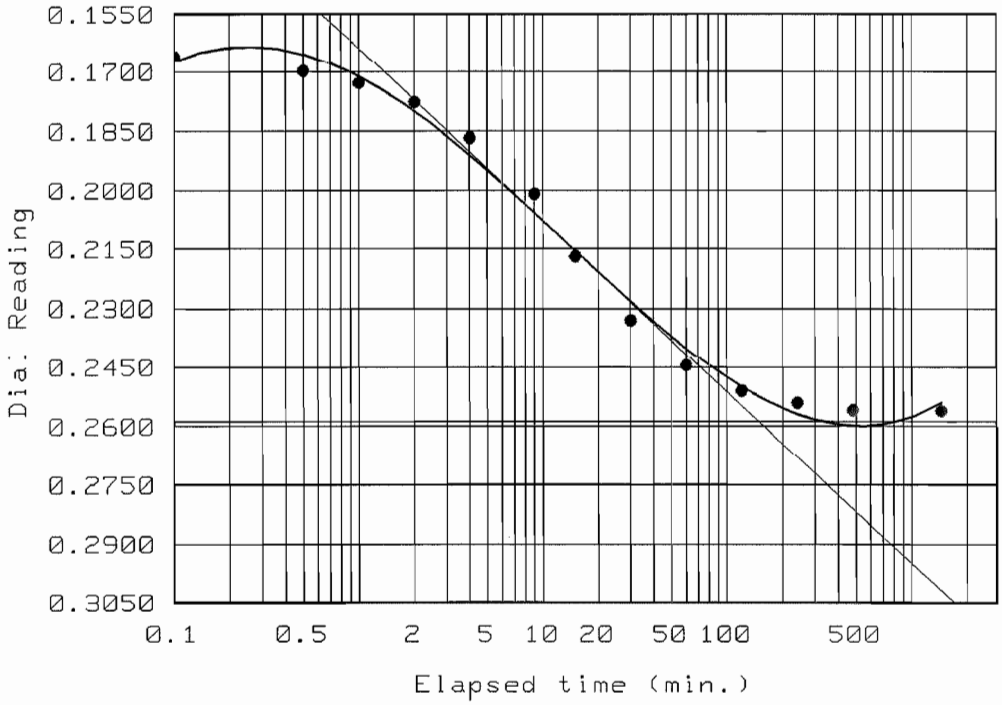
Date: 9/3/03




Load No.= 6
Load= 4.00 ksf
$D_0$ = 0.1099
$D_{50}$ = 0.1334
$D_{100}$= 0.1568
$T_{50}$= 18.05 min.

$C_v$ @ $T_{50}$ =
.002 in.$^2$/min.

$C_\alpha$= 0.007




Load No.= 7
Load= 8.00 ksf
$D_0$ = 0.1704
$D_{50}$ = 0.2146
$D_{100}$= 0.2587
$T_{50}$= 14.37 min.

$C_v$ @ $T_{50}$ =
.003 in.$^2$/min.

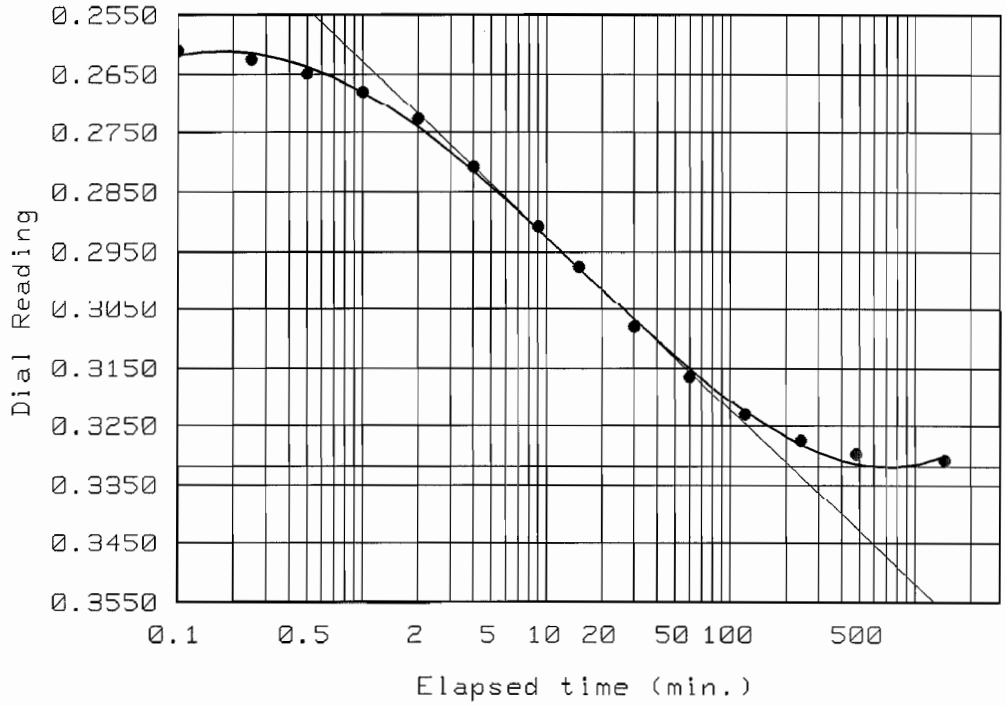
$C_\alpha$= 0.000

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

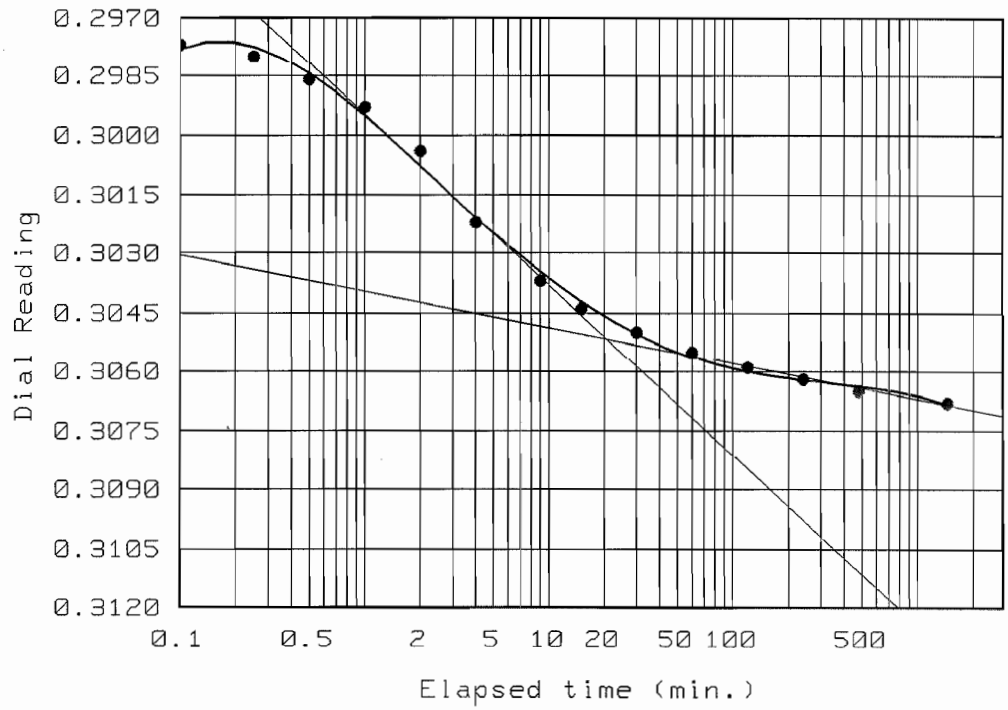
Date: 9/3/03




Load No.= 8
Load= 16.00 ksf
$D_0$ = 0.2608
$D_{50}$ = 0.2964
$D_{100}$= 0.3319
$T_{50}$= 13.42 min.

$C_v$ @ $T_{50}$ =
.002 in.$^2$/min.

$C_\alpha$= 0.000




Load No.= 11
Load= 4.00 ksf
$D_0$ = 0.2975
$D_{50}$ = 0.3013
$D_{100}$= 0.3052
$T_{50}$= 2.64 min.

$C_v$ @ $T_{50}$ =
.011 in.$^2$/min.

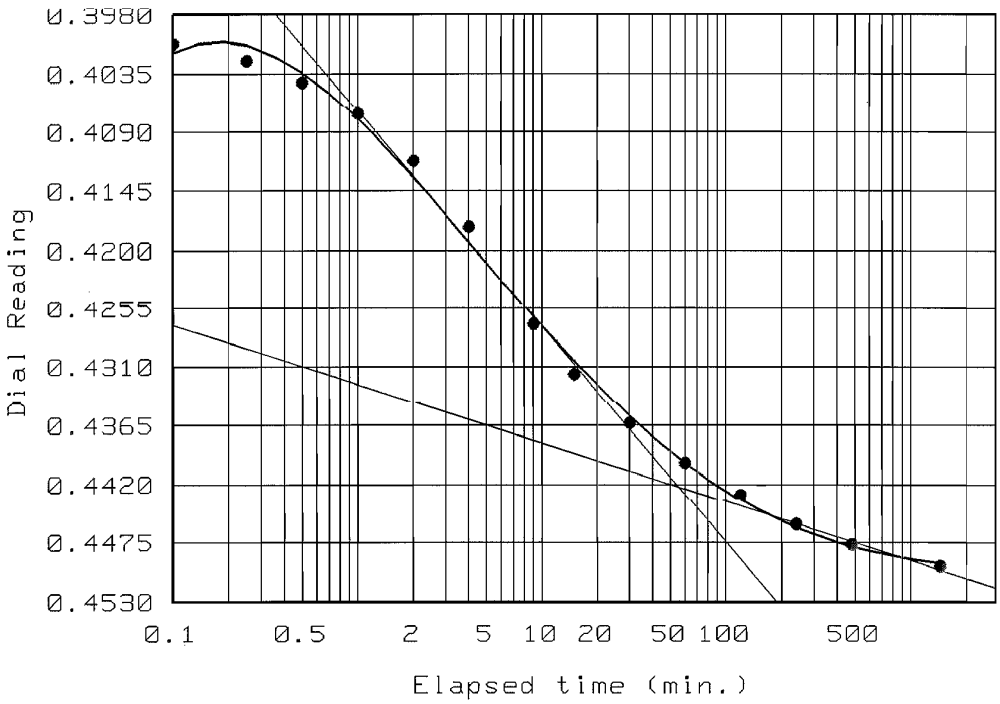
$C_\alpha$= 0.001

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-3 @ 60' - 62'

Date: 9/3/03




Load No.= 14

Load= 64.00 ksf

$D_0$ = 0.4006

$D_{50}$ = 0.4215

$D_{100}$= 0.4423

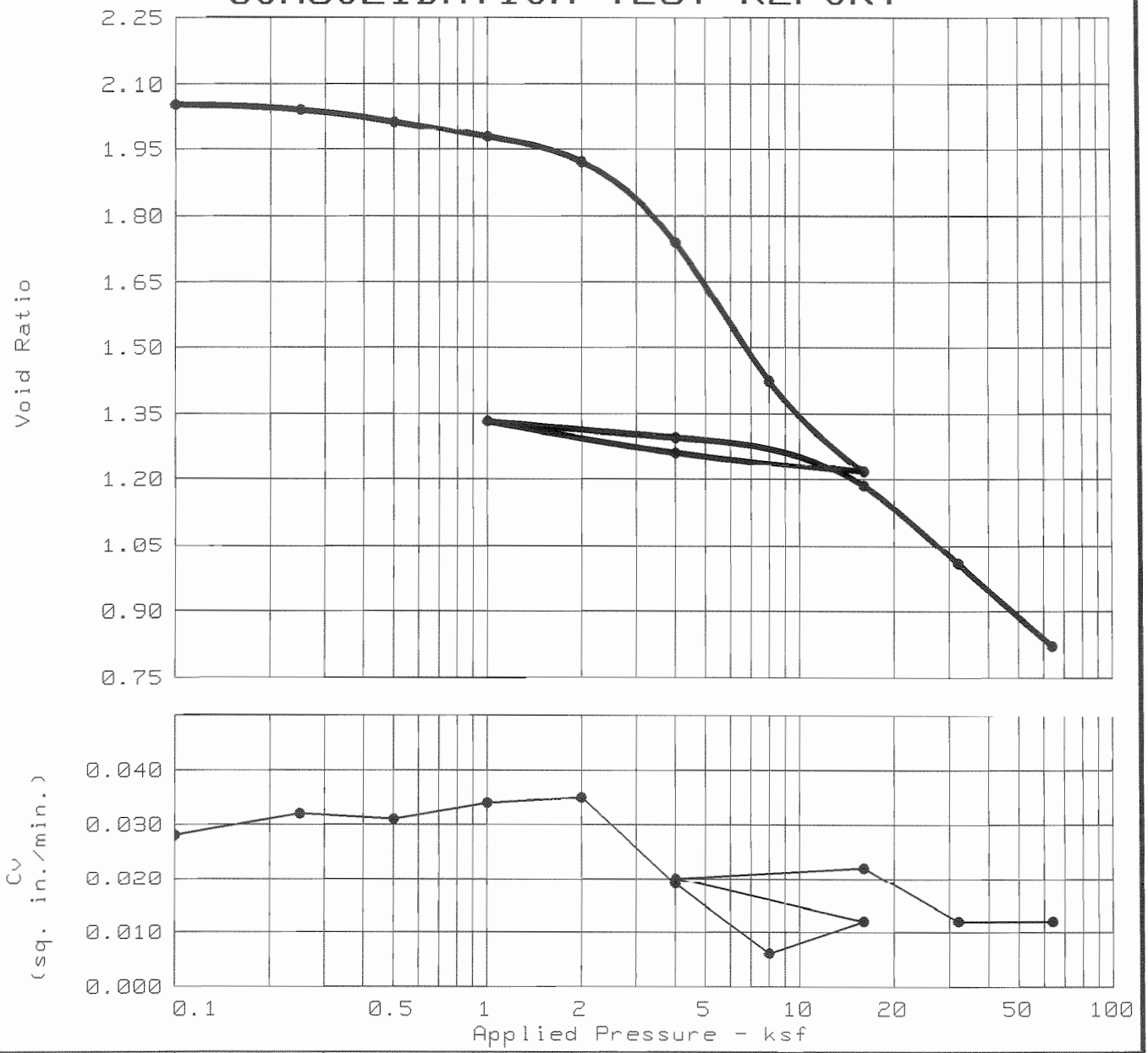
$T_{50}$= 5.18 min.

$C_v$ @ $T_{50}$ =

.004 in.$^2$/min.

$C_\alpha$= 0.008

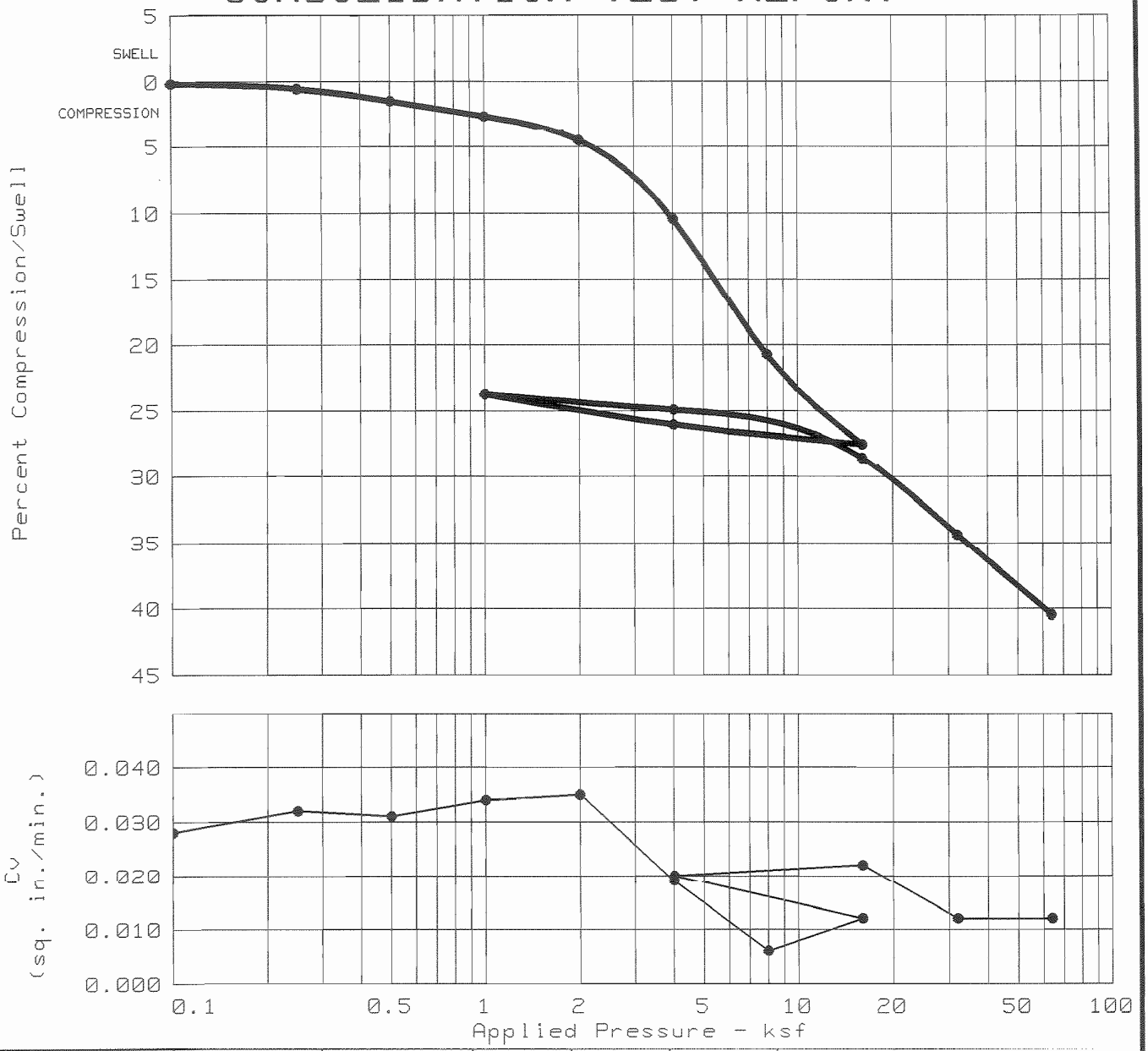
# CONSOLIDATION TEST REPORT




| Natural Saturation | Natural Moisture | Dry Dens. (pcf) | LL | PI | Sp.Gr. | Initial void ratio |
|---|---|---|---|---|---|---|
| 73.4 % | 55.9 % | 61.2 | 46 | 24 | 2.700 | 2.0590 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| | Grayish brown lean CLAY |
| | Class: (CL) |
| Project No.: 3530-03-1245 Phase 01<br>Project: Indian River Inlet Bridges<br>Location: Boring BI-9 @ 30' - 32'<br><br>Date: 9/29/03 | Remarks:<br><br>9/29/03 |
| CONSOLIDATION TEST REPORT<br><br>LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC. | Fig. No. 1 1 |

# CONSOLIDATION TEST REPORT



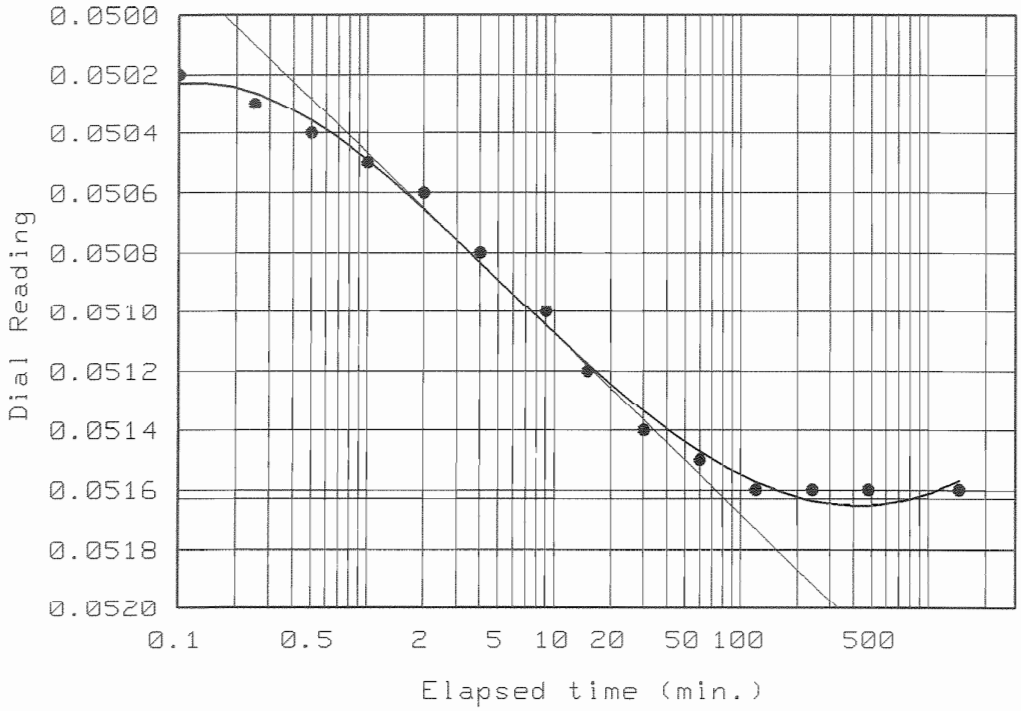

| Natural Saturation | Natural Moisture | Dry Dens. (pcf) | LL | PI | Sp.Gr. | Initial void ratio |
|---|---|---|---|---|---|---|
| 73.4 % | 55.9 % | 61.2 | 46 | 24 | 2.700 | 2.0590 |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| | Grayish brown lean CLAY |
| Project No.: 3530-03-1245 Phase 01<br>Project: Indian River Inlet Bridges<br>Location: Boring BI-9 @ 30' - 32'<br><br>Date: 9/29/03 | Class: (CL)<br>Remarks:<br><br>9/29/03 |
| CONSOLIDATION TEST REPORT<br><br>LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC. | Fig. No. 1 1 |

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

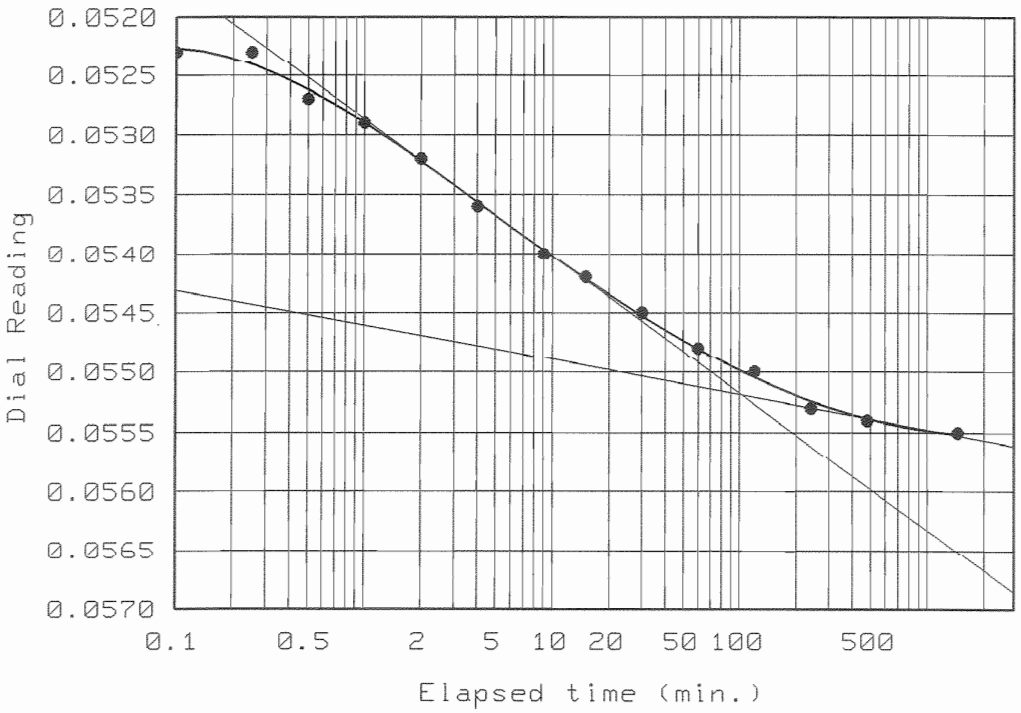
Date: 9/29/03




Load No.= 1
Load= 0.10 ksf
$D_0$ = 0.0501
$D_{50}$ = 0.0509
$D_{100}$= 0.0516
$T_{50}$= 4.81 min.

$C_v$ @ $T_{50}$ = .022 in.$^2$/min.

$C_\alpha$= 0.000




Load No.= 2
Load= 0.25 ksf
$D_0$ = 0.0520
$D_{50}$ = 0.0536
$D_{100}$= 0.0552
$T_{50}$= 4.19 min.

$C_v$ @ $T_{50}$ = .025 in.$^2$/min.

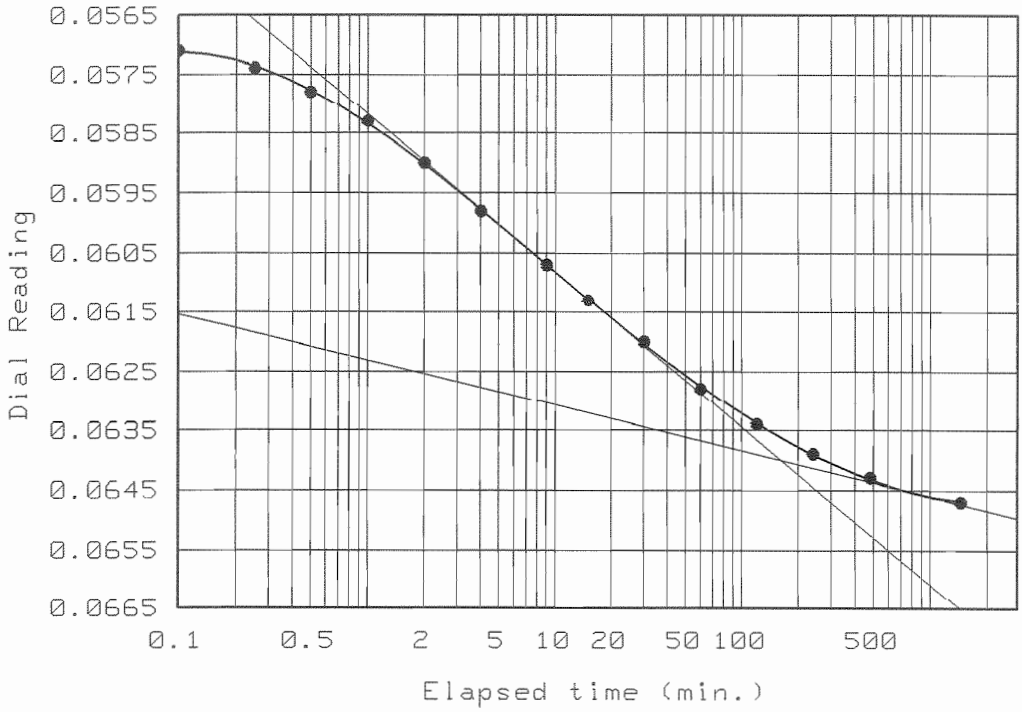
$C_\alpha$= 0.000

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

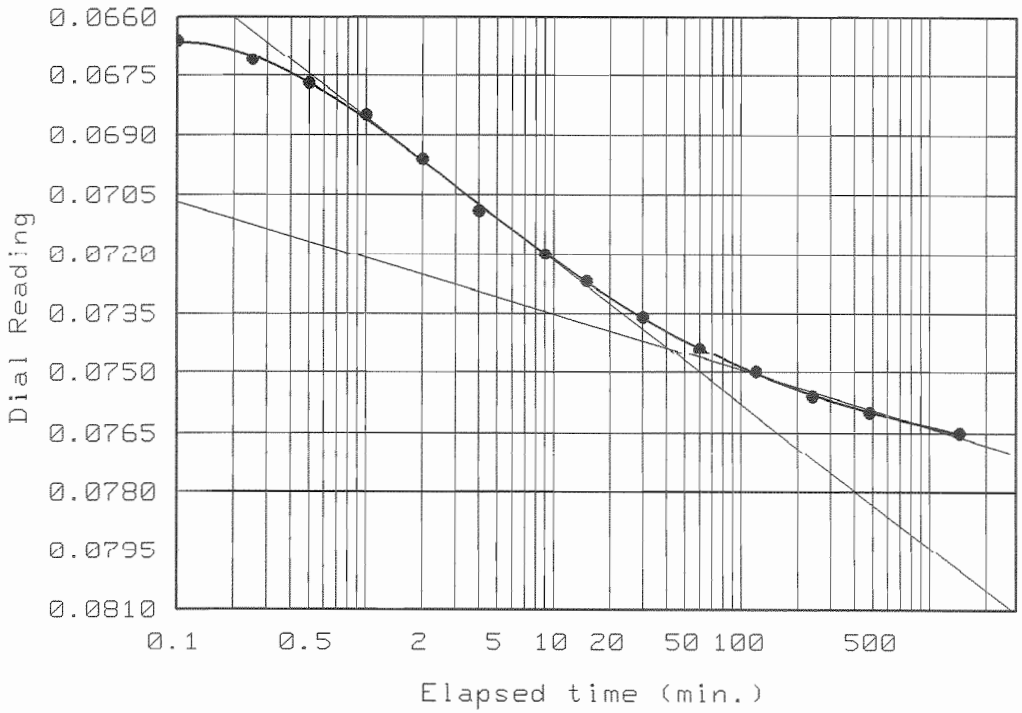
Date: 9/29/03




Load No.= 3
Load= 0.50 ksf
$D_0$ = 0.0566
$D_{50}$ = 0.0603
$D_{100}$= 0.0640
$T_{50}$= 6.41 min.

$C_v$ @ $T_{50}$ = .016 in.$^2$/min.

$C_\alpha$= 0.001




Load No.= 4
Load= 1.00 ksf
$D_0$ = 0.0658
$D_{50}$ = 0.0701
$D_{100}$= 0.0744
$T_{50}$= 2.66 min.

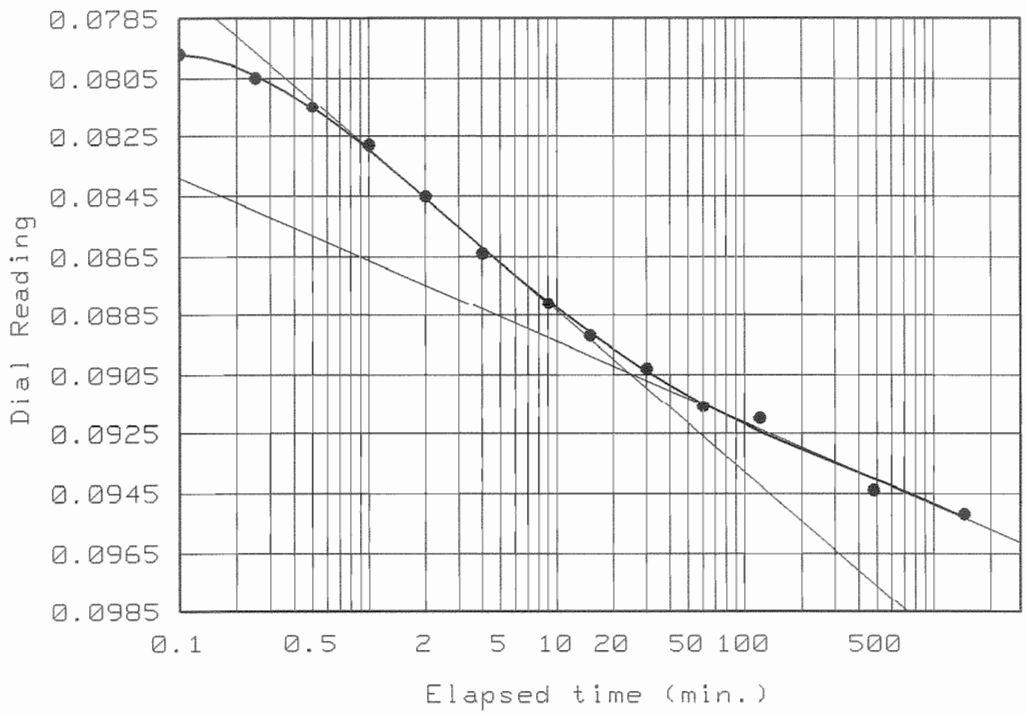
$C_v$ @ $T_{50}$ = .038 in.$^2$/min.

$C_\alpha$= 0.001

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

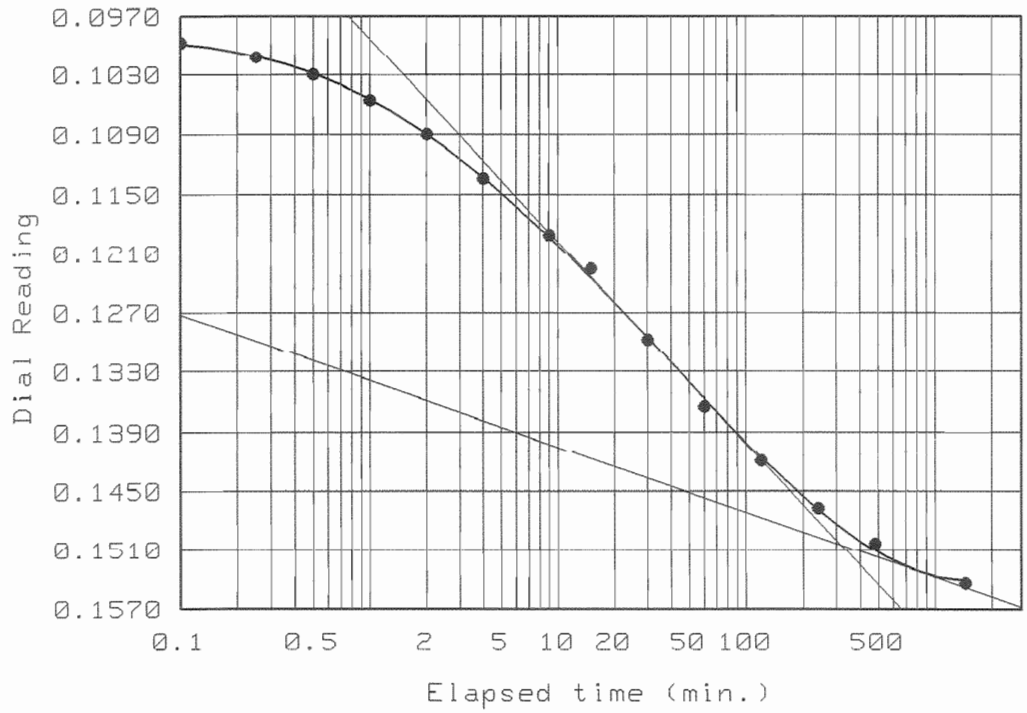
Date: 9/29/03




Load No.= 5
Load= 2.00 ksf
$D_0$ = 0.0783
$D_{50}$ = 0.0844
$D_{100}$= 0.0904
$T_{50}$= 1.83 min.

$C_v$ @ $T_{50}$ = .054 in.$^2$/min.

$C_\alpha$= 0.002




Load No.= 6
Load= 4.00 ksf
$D_0$ = 0.0974
$D_{50}$ = 0.1239
$D_{100}$= 0.1505
$T_{50}$= 15.76 min.

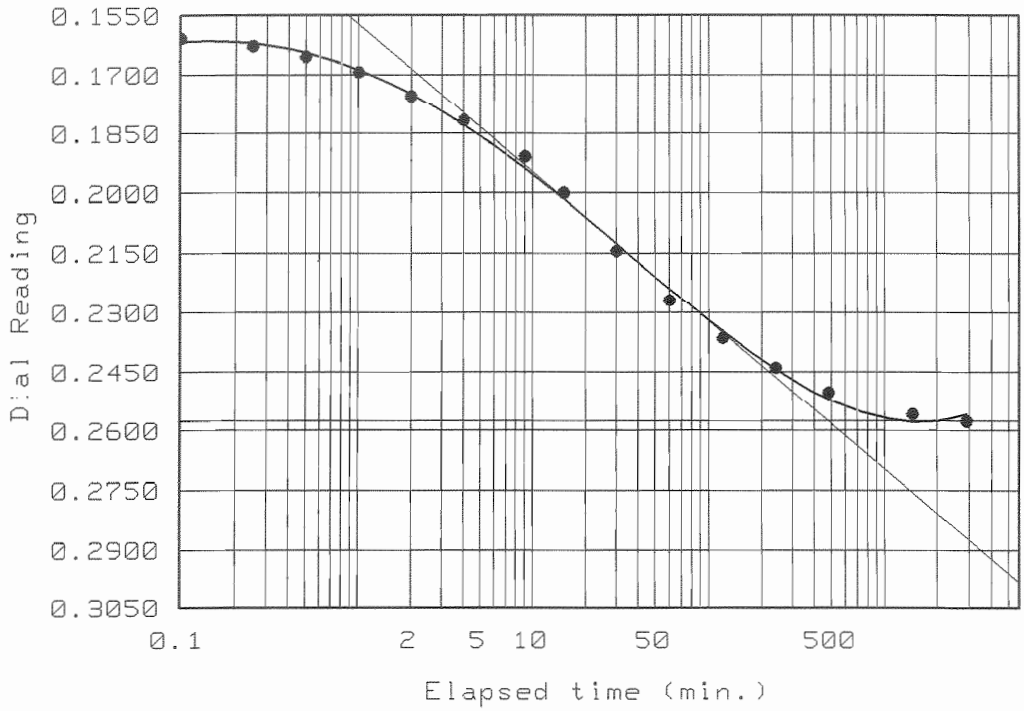
$C_v$ @ $T_{50}$ = .006 in.$^2$/min.

$C_\alpha$= 0.005

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

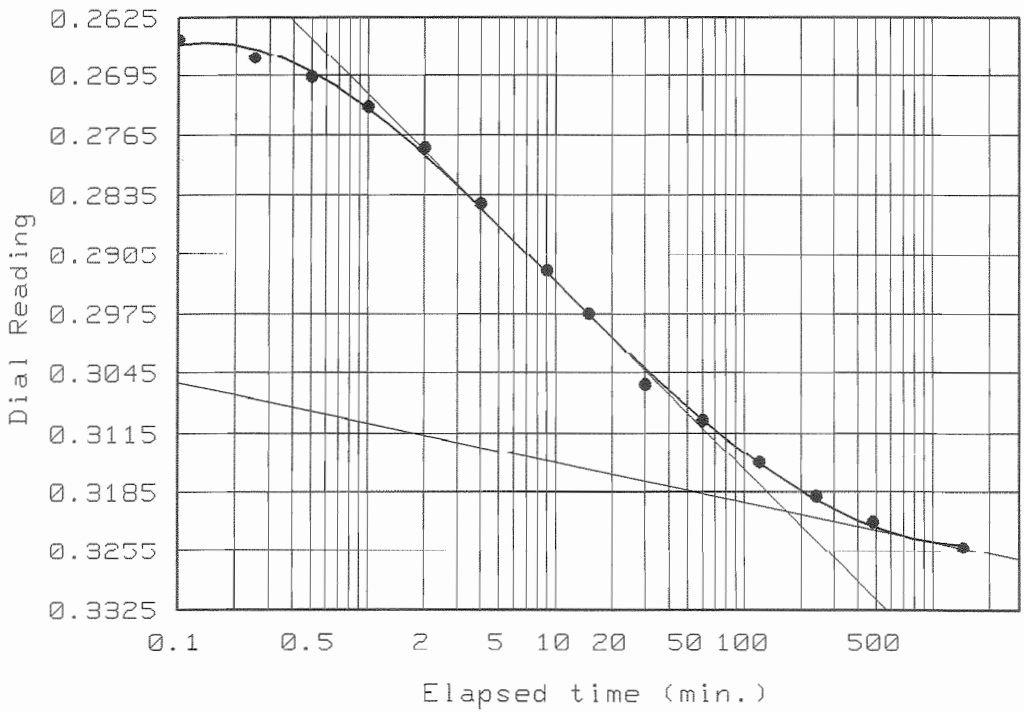
Date: 9/29/03




Load No. = 7
Load = 8.00 ksf
$D_0$ = 0.1598
$D_{50}$ = 0.2087
$D_{100}$ = 0.2576
$T_{50}$ = 23.43 min.

$C_v$ @ $T_{50}$ = .004 in.$^2$/min.

$C_\alpha$ = 0.000




Load No. = 8
Load = 16.00 ksf
$D_0$ = 0.2634
$D_{50}$ = 0.2921
$D_{100}$ = 0.3208
$T_{50}$ = 8.40 min.

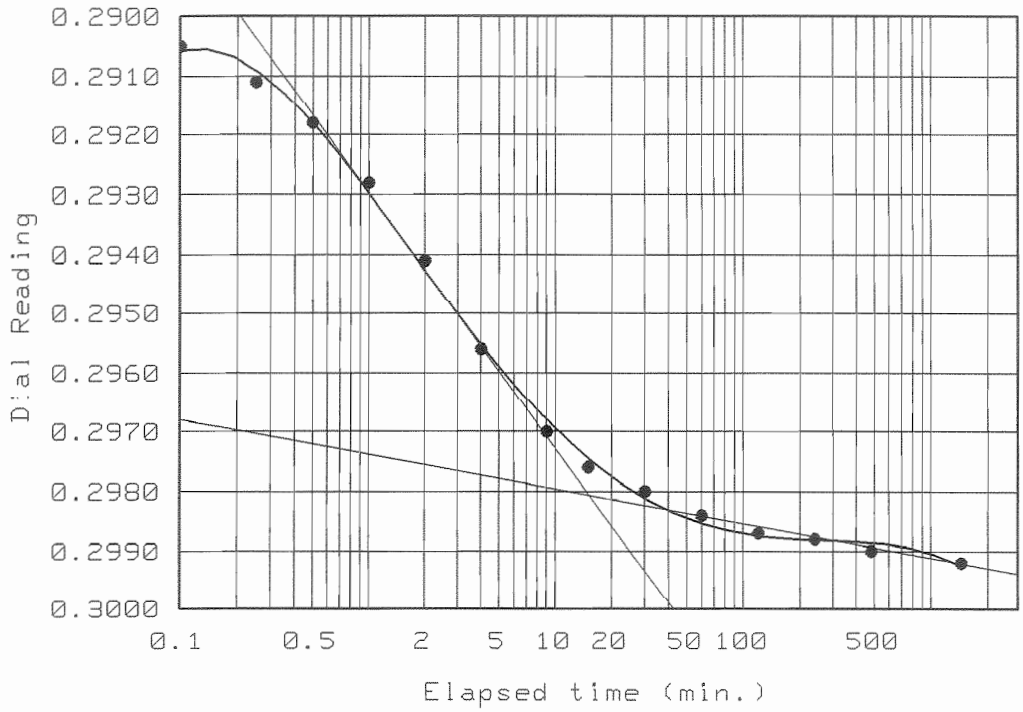
$C_v$ @ $T_{50}$ = .009 in.$^2$/min.

$C_\alpha$ = 0.004

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

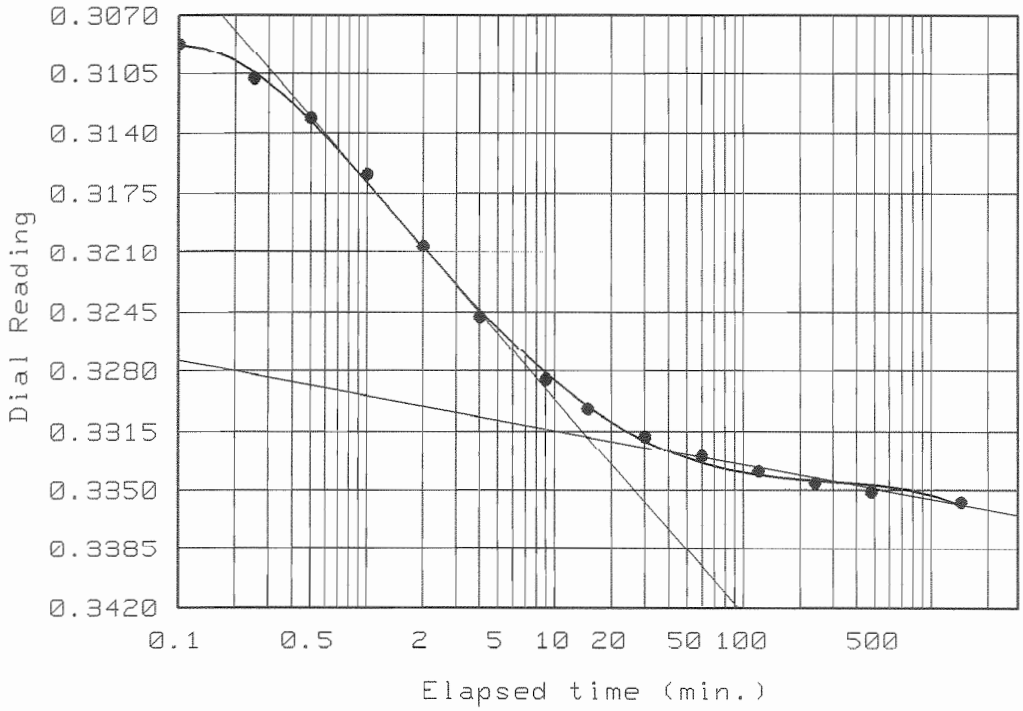
Date: 9/29/03




Load No.= 11
Load= 4.00 ksf
$D_0$ = 0.2897
$D_{50}$ = 0.2939
$D_{100}$= 0.2981
$T_{50}$= 1.62 min.

$C_v$ @ $T_{50}$ = .044 in.$^2$/min.

$C_\alpha$= 0.000




Load No.= 12
Load= 16.00 ksf
$D_0$ = 0.3053
$D_{50}$ = 0.3185
$D_{100}$= 0.3318
$T_{50}$= 1.35 min.

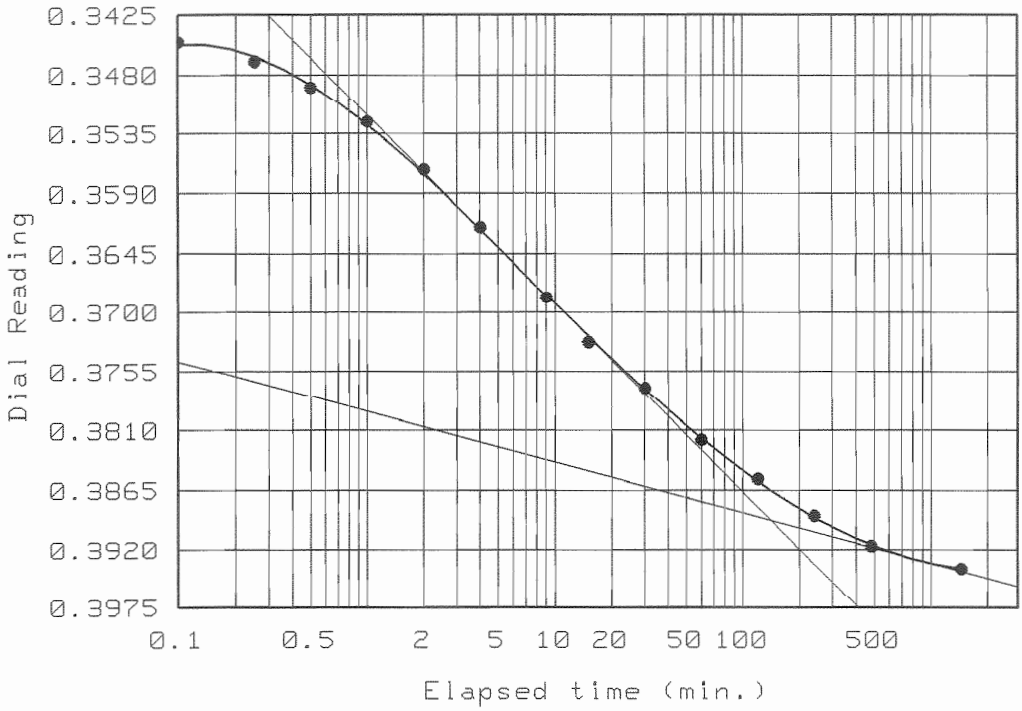
$C_v$ @ $T_{50}$ = .051 in.$^2$/min.

$C_\alpha$= 0.002

# Dial Reading vs. Time

Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

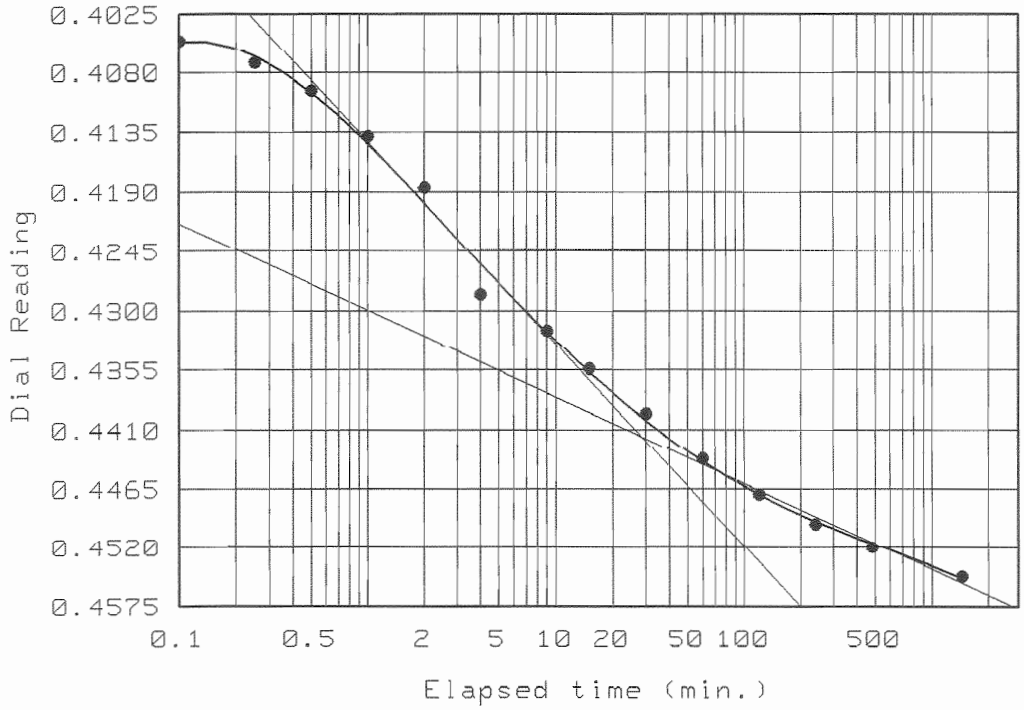
Date: 9/20/03




Load No.= 13
Load= 32.00 ksf
$D_0$ = 0.3425
$D_{50}$ = 0.3659
$D_{100}$= 0.3894
$T_{50}$= 6.49 min.

$C_v$ @ $T_{50}$ =
.010 in.$^2$/min.

$C_\alpha$= 0.004




Load No.= 14
Load= 64.00 ksf
$D_0$ = 0.4016
$D_{50}$ = 0.4216
$D_{100}$= 0.4417
$T_{50}$= 2.44 min.

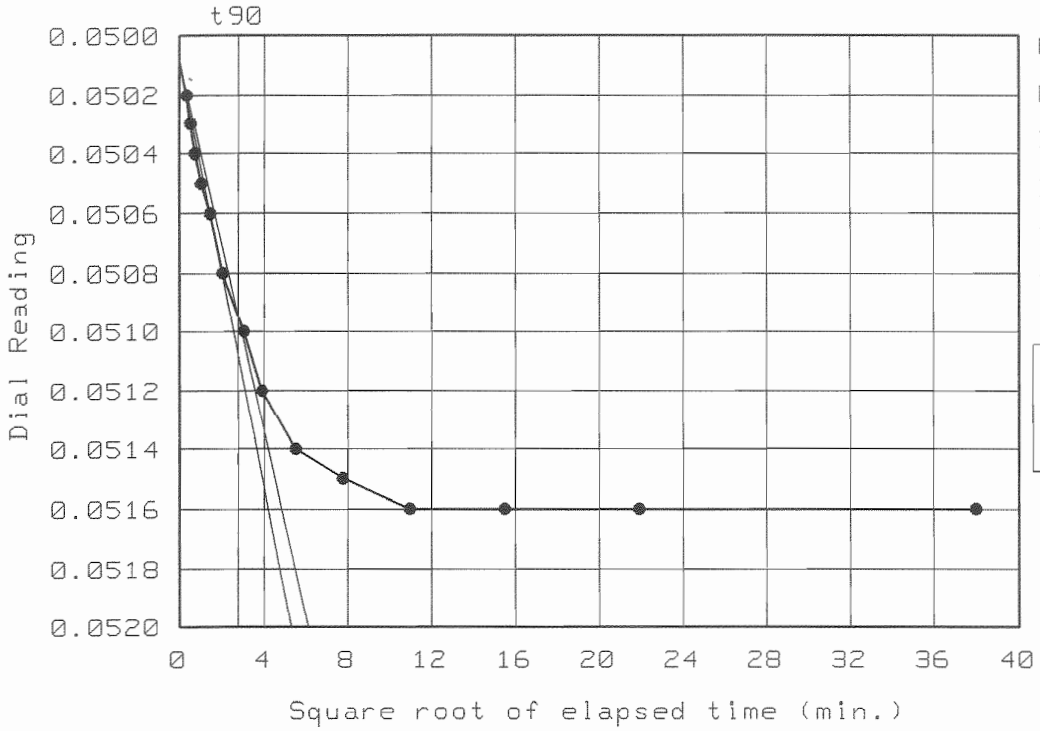
$C_v$ @ $T_{50}$ =
.023 in.$^2$/min.

$C_\alpha$= 0.007

# Dial Reading vs. Time

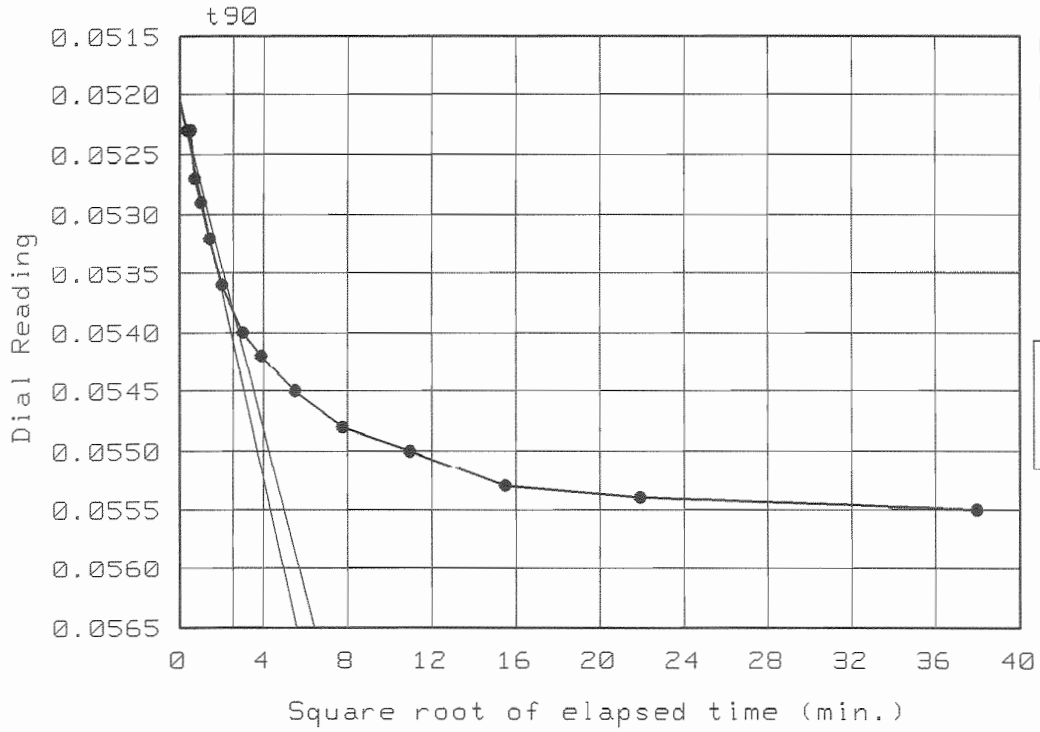
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

Date: 9/29/03




Load No.= 1
Load= 0.10 ksf
$D_0$ = 0.0501
$D_{90}$ = 0.0510
$D_{100}$= 0.0510
$T_{90}$= 7.62 min.

$C_v$ @ $T_{90}$ =
.028 in.$^2$/min.




Load No.= 2
Load= 0.25 ksf
$D_0$ = 0.0520
$D_{90}$ = 0.0538
$D_{100}$= 0.0540
$T_{90}$= 6.54 min.

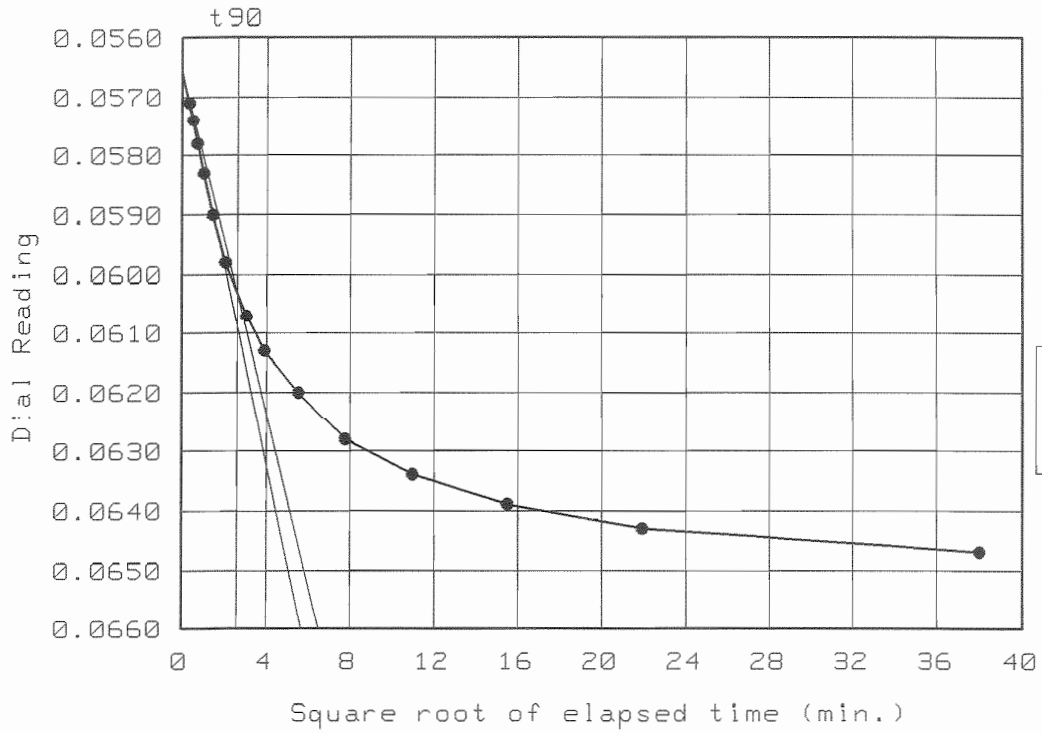
$C_v$ @ $T_{90}$ -
.032 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

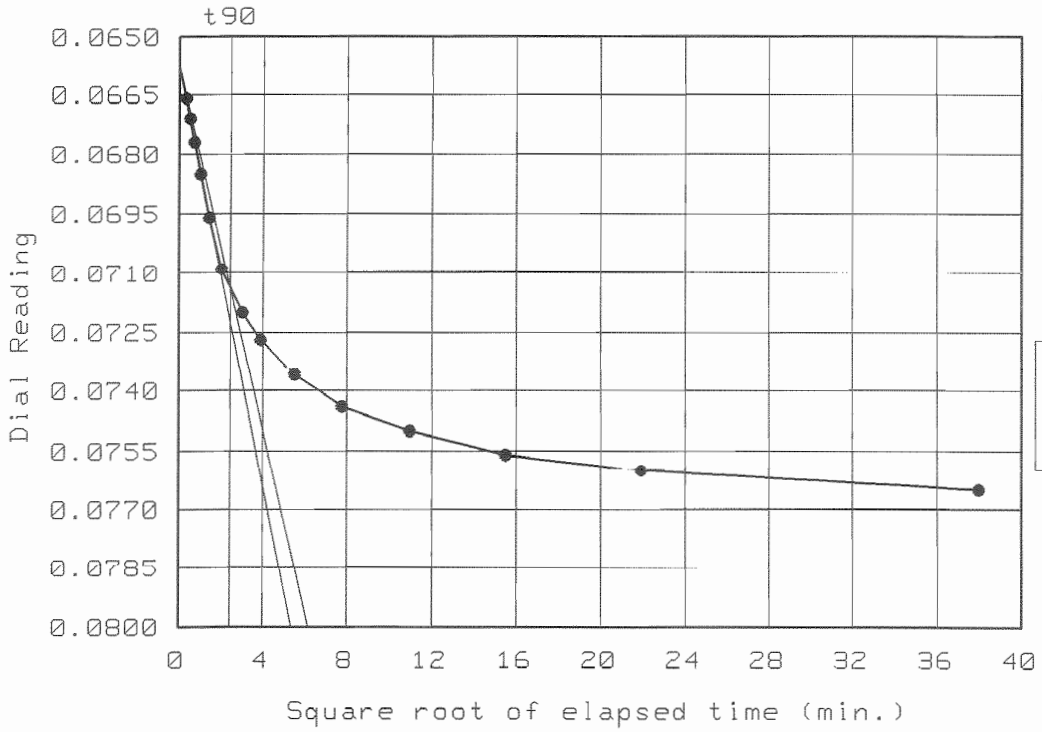
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

Date: 9/29/03




Load No.= 3
Load= 0.50 ksf
$D_0$ = 0.0566
$D_{90}$ = 0.0603
$D_{100}$= 0.0607
$T_{90}$= 6.61 min.

$C_v$ @ $T_{90}$ =
.031 in.$^2$/min.




Load No.= 4
Load= 1.00 ksf
$D_0$ = 0.0658
$D_{90}$ = 0.0714
$D_{100}$= 0.0720
$T_{90}$= 5.92 min.

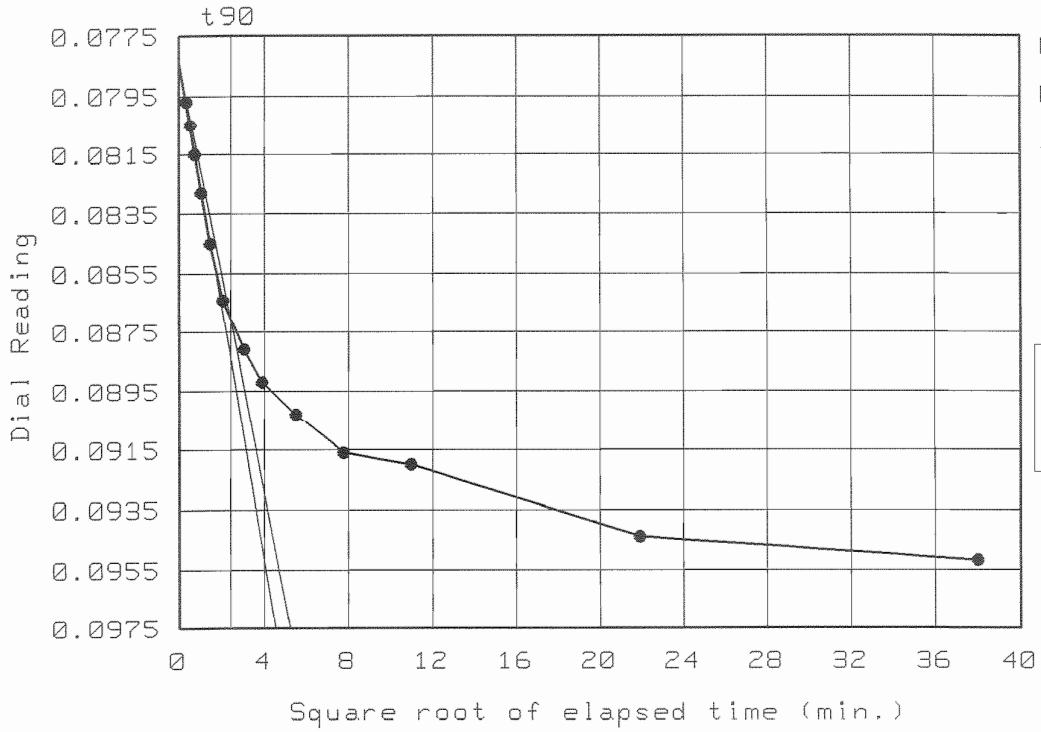
$C_v$ @ $T_{90}$ -
.034 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

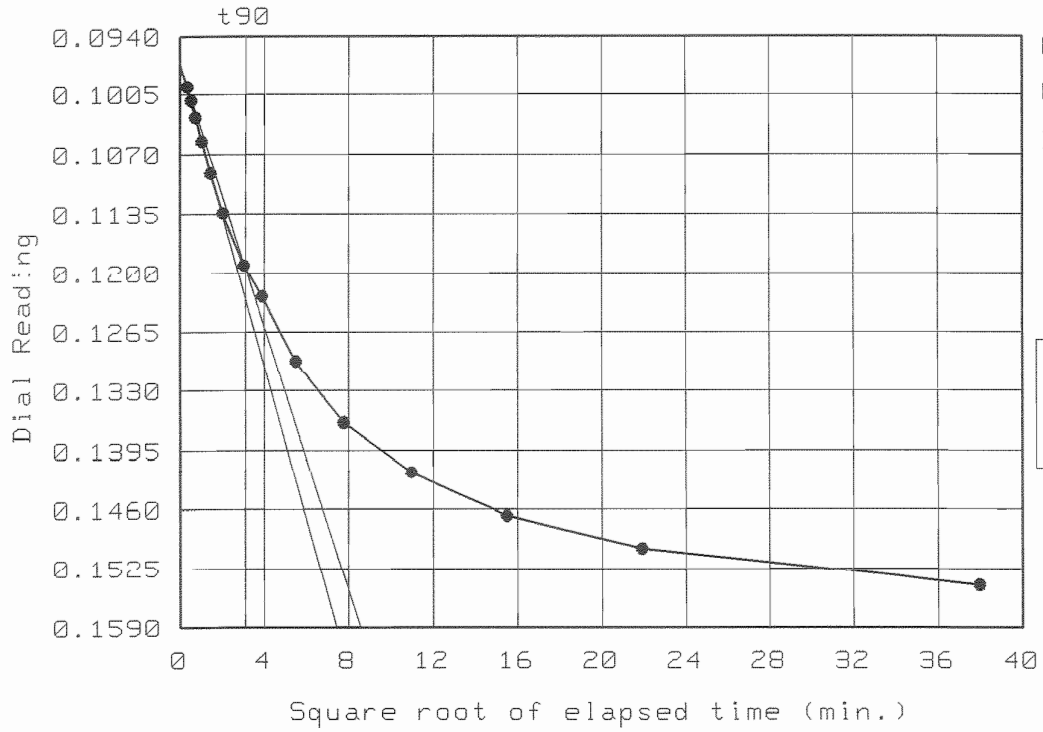
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

Date: 9/29/03




Load No. = 5
Load = 2.00 ksf
$D_0$ = 0.0784
$D_{90}$ = 0.0870
$D_{100}$ = 0.0880
$T_{90}$ = 5.63 min.

$C_v$ @ $T_{90}$ = .035 in.$^2$/min.




Load No. = 6
Load = 4.00 ksf
$D_0$ = 0.0971
$D_{90}$ = 0.1195
$D_{100}$ = 0.1220
$T_{90}$ = 9.61 min.

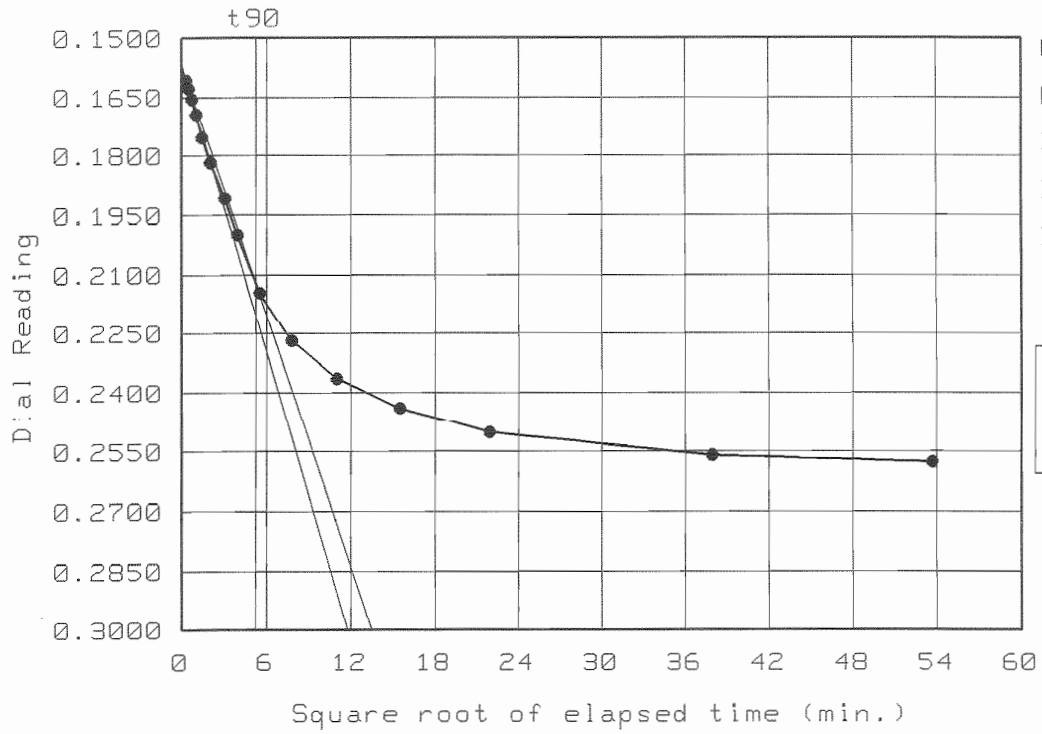
$C_v$ @ $T_{90}$ = .019 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

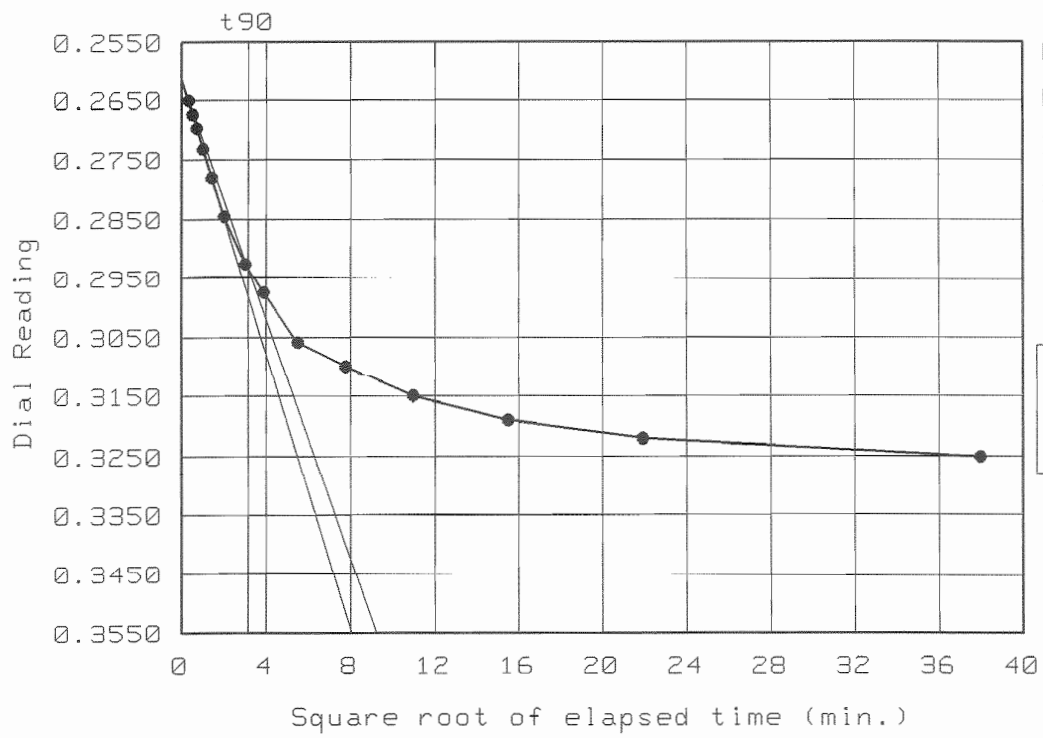
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

Date: 9/29/03




Load No.= 7
Load= 8.00 ksf
$D_0$ = 0.1569
$D_{90}$ = 0.2119
$D_{100}$= 0.2180
$T_{90}$= 26.91 min.

$C_v$ @ $T_{90}$ =
.006 in.$^2$/min.




Load No.= 8
Load= 16.00 ksf
$D_0$ = 0.2614
$D_{90}$ = 0.2934
$D_{100}$= 0.2970
$T_{90}$= 9.97 min.

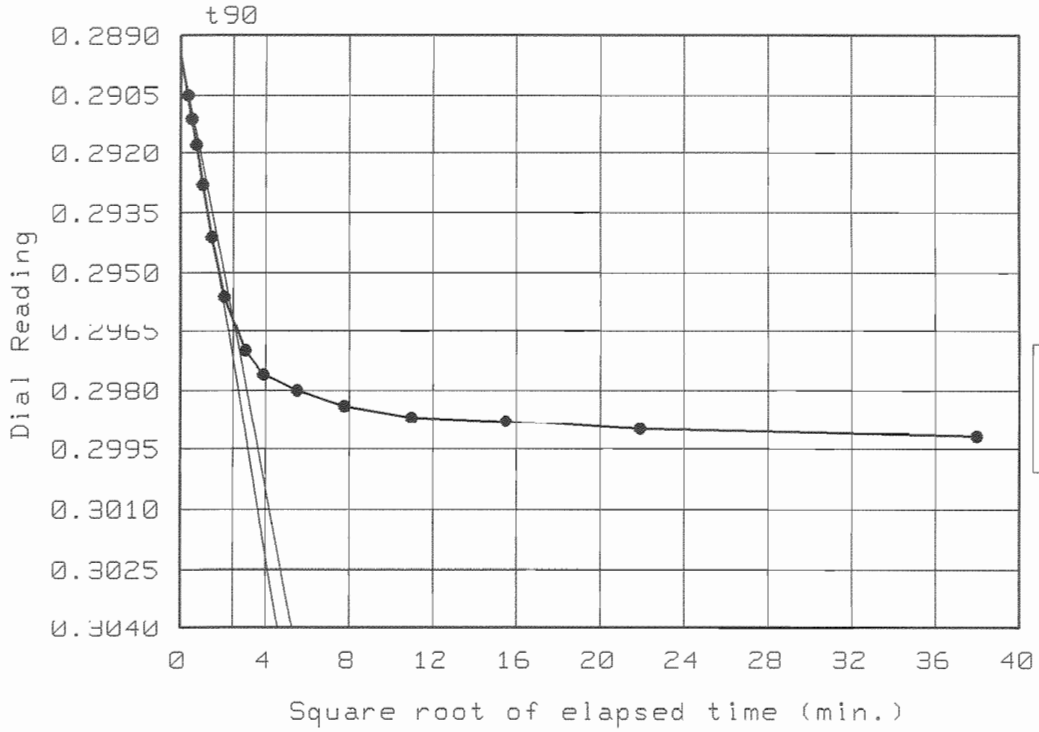
$C_v$ @ $T_{90}$ =
.012 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

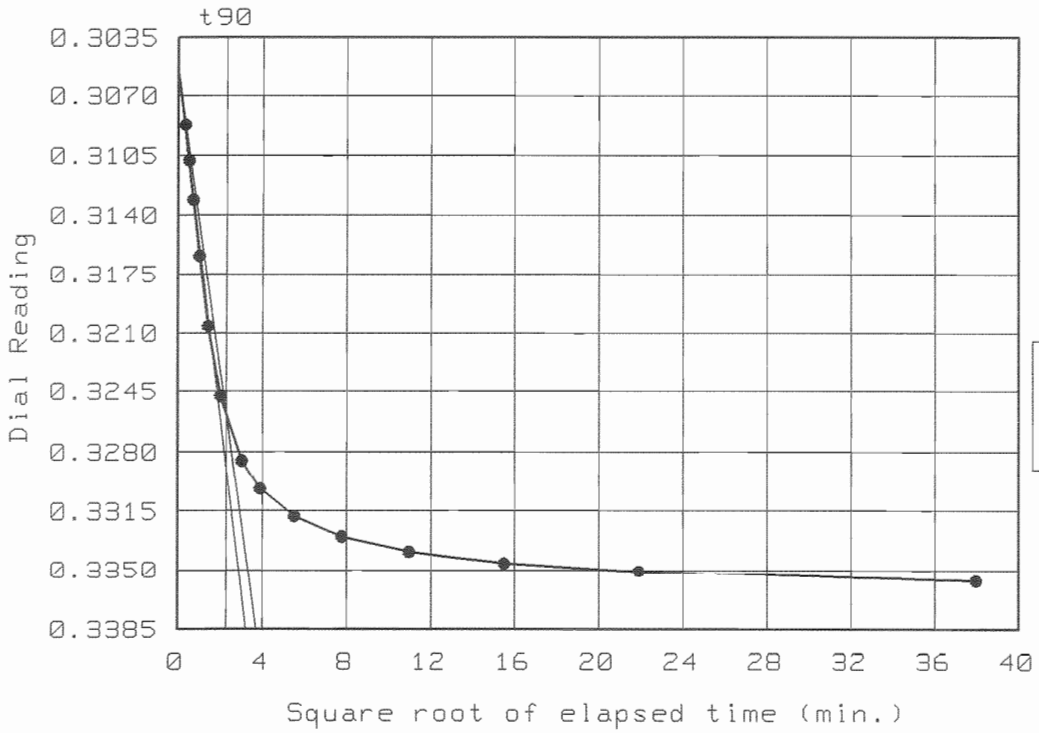
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

Date: 9/29/03




Load No.= 11
Load= 4.00 ksf
$D_0$ = 0.2895
$D_{90}$ = 0.2962
$D_{100}$= 0.2970
$T_{90}$= 5.94 min.

$C_v$ @ $T_{90}$ =
.020 in.$^2$/min.




Load No.= 12
Load= 16.00 ksf
$D_0$ = 0.3055
$D_{90}$ = 0.3258
$D_{100}$= 0.3281
$T_{90}$= 5.21 min.

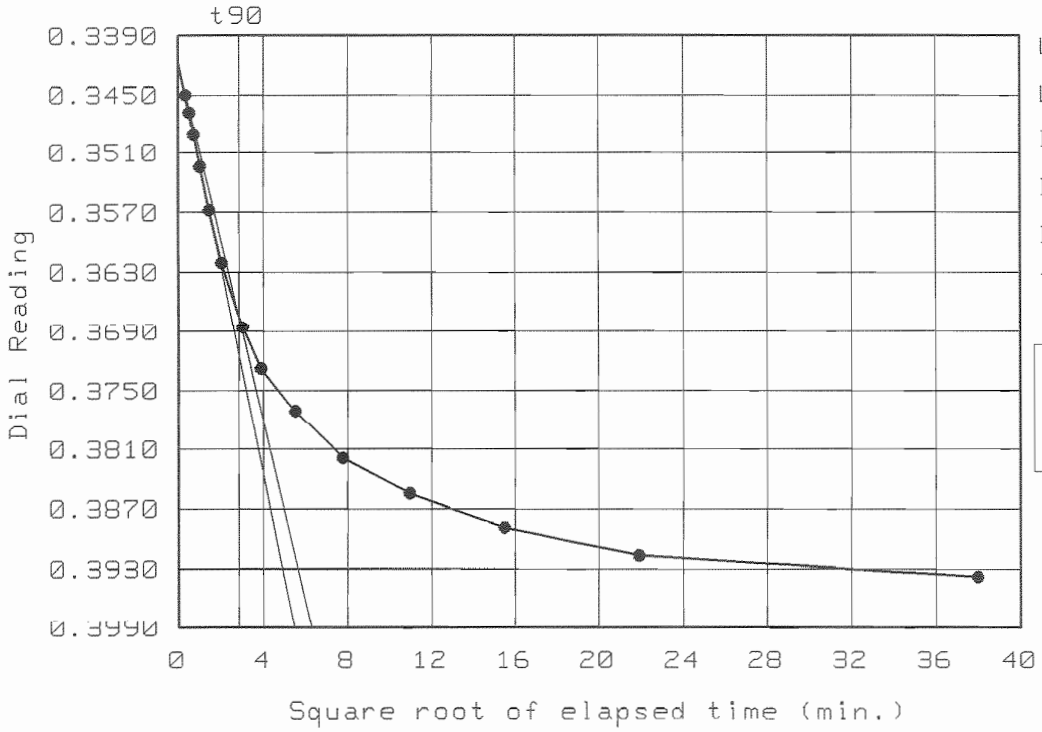
$C_v$ @ $T_{90}$ =
.022 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

# Dial Reading vs. Time

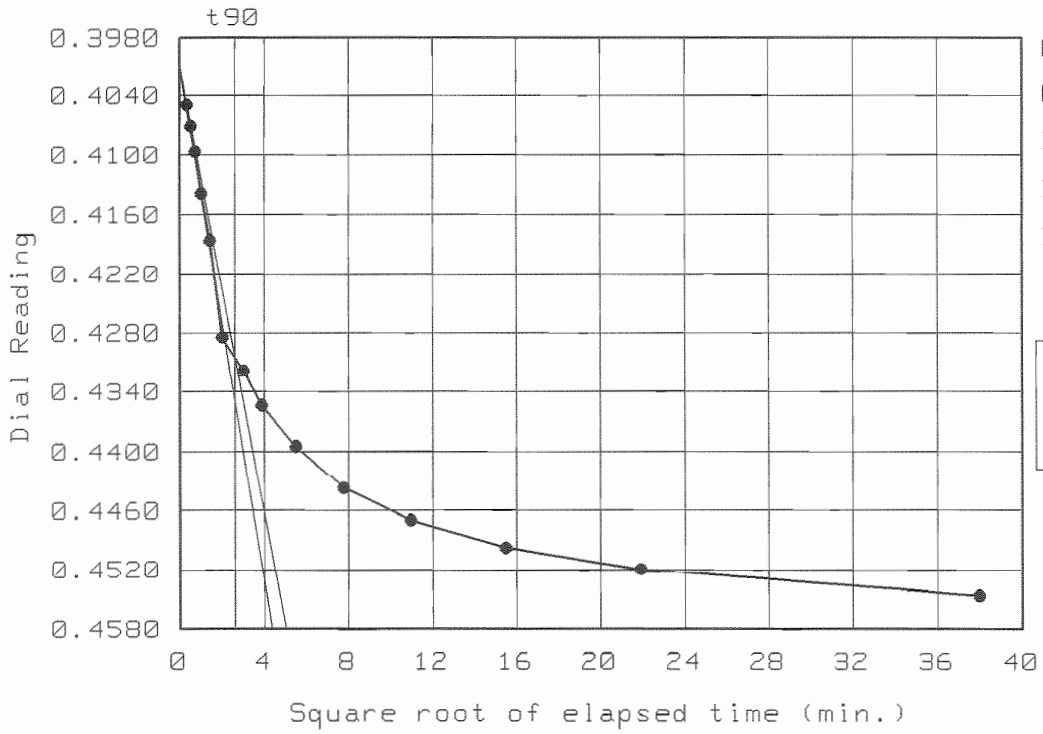
Project No.: 3530-03-1245 Phase 01
Project: Indian River Inlet Bridges
Location: Boring BI-9 @ 30' - 32'

Date: 9/29/03




Load No.= 13
Load= 32.00 ksf
$D_0$ = 0.3417
$D_{90}$ = 0.3675
$D_{100}$= 0.3704
$T_{90}$= 8.03 min.

$C_v$ @ $T_{90}$ =
.012 in.$^2$/min.




Load No.= 14
Load= 64.00 ksf
$D_0$ = 0.4009
$D_{90}$ = 0.4306
$D_{100}$= 0.4339
$T_{90}$= 6.83 min.

$C_v$ @ $T_{90}$ =
.012 in.$^2$/min.

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 20, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-1 | S#1 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 100 | 71 | 2 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#2 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 100 | 76 | 4 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#3 6.0- 7.5 | 100 | 100 | 100 | 100 | 100 | 100 | 87 | 2 | -- | -- | 22 | -- | NP | A-3 | 0 |
| | S#4 8.5-10.0 | 100 | 100 | 100 | 100 | 100 | 99 | 82 | 2 | -- | -- | 22 | -- | NP | A-3 | 0 |
| | S#5 13.5-15.0 | 100 | 100 | 100 | 98 | 96 | 92 | 60 | 2 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#6 18.5-20.0 | 100 | 100 | 100 | 100 | 99 | 95 | 37 | 1 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#7 23.5-25.0 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 81 | 34 | 21 | 58 | 5 | 13 | A-6 | 10 |
| | S#8 28.5-30.0 | 100 | 100 | 100 | 99 | 99 | 98 | 95 | 85 | 33 | 19 | 57 | 4 | 14 | A-6 | 11 |
| | S#9 33.5-35.0 | 100 | 100 | 100 | 100 | 100 | 100 | 92 | 88 | 36 | 21 | 59 | 4 | 15 | A-6 | 13 |
| | S#10 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 100 | 97 | 95 | 33 | 20 | 54 | 4 | 13 | A-6 | 12 |
| | S#11 43.5-45.0 | NO SAMPLE RECOVERY | | | | | | | | | | | | | | |
| | S#12 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 97 | 92 | 87 | 42 | 23 | 60 | 4 | 19 | A-7-6 | 17 |
| | S#13 53.5-55.0 | 100 | 100 | 100 | 100 | 100 | 100 | 91 | 89 | 37 | 20 | 57 | 4 | 17 | A-6 | 15 |
| | S#14 58.5-60.0 | 100 | 100 | 100 | 100 | 100 | 99 | 85 | 81 | 44 | 24 | 62 | 4 | 20 | A-7-6 | 17 |
| | S#15 63.5-65.0 | NO SAMPLE RECOVERY | | | | | | | | | | | | | | |
| | S#16 68.5-70.0 | 100 | 100 | 100 | 100 | 100 | 100 | 83 | 81 | 51 | 28 | 70 | 5 | 23 | A-7-6 | 20 |
| | S#17 73.5-75.0 | 100 | 100 | 100 | 100 | 100 | 99 | 43 | 11 | -- | -- | 20 | -- | NP | A-1-b | 0 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 2
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 20, 2003

| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
| | S#18 | | | | | | | | | | | | | | | |
| | 78.5-80.0 | 100 | 100 | 100 | 100 | 100 | 100 | 76 | 24 | -- | -- | 30 | 1 | NP | A-2-4 | 0 |
| | S#19 | | | | | | | | | | | | | | | |
| | 83.5-85.0 | 100 | 100 | 100 | 100 | 100 | 99 | 95 | 14 | -- | -- | 31 | 3 | NP | A-2-4 | 0 |
| | S#20 | | | | | | | | | | | | | | | |
| | 88.5-90.0 | 100 | 100 | 100 | 100 | 99 | 99 | 43 | 7 | -- | -- | 20 | -- | NP | A-1-b | 0 |
| | S#21 | | | | | | | | | | | | | | | |
| | 93.5-95.0 | 100 | 100 | 100 | 87 | 84 | 79 | 59 | 11 | -- | -- | 14 | -- | NP | A-2-4 | 0 |
| | S#22 | | | | | | | | | | | | | | | |
| | 98.5-100.0 | 100 | 100 | 100 | 100 | 96 | 86 | 38 | 8 | -- | -- | 14 | -- | NP | A-1-b | 0 |
| | S#23 | | | | | | | | | | | | | | | |
| | 103.5-105.0 | 100 | 100 | 100 | 100 | 98 | 96 | 29 | 7 | -- | -- | 18 | -- | NP | A-1-b | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 16, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-2 | S#1 0.0- 1.5 | 100 | 100 | 100 | 95 | 95 | 93 | 66 | 12 | -- | -- | -- | -- | NP | A-2-4 | 0 |
| | S#2 1.5- 3.0 | 100 | 100 | 100 | 90 | 78 | 64 | 22 | 4 | -- | -- | -- | -- | NP | A-1-b | 0 |
| | S#3 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 97 | 55 | 2 | -- | -- | -- | -- | NP | A-3 | 0 |
| | S#4 6.0- 7.5 | 100 | 100 | 100 | 98 | 97 | 95 | 79 | 8 | -- | -- | -- | -- | NP | A-3 | 0 |
| | S#5 8.5-10.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#6 13.5-15.0 | 100 | 100 | 100 | 99 | 97 | 93 | 43 | 3 | -- | -- | -- | -- | NP | A-1-b | 0 |
| | S#7 18.5-20.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#8 23.5-25.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#9 28.5-30.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 88 | 32 | 19 | -- | 4 | 13 | A-6 | 11 |
| | S#10 33.5-35.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 94 | 35 | 20 | -- | 4 | 15 | A-6 | 14 |
| | S#11 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 94 | 37 | 21 | -- | 4 | 16 | A-6 | 16 |
| | S#12 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 91 | 36 | 21 | -- | 4 | 15 | A-6 | 14 |
| | S#13 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 99 | 93 | 88 | 41 | 22 | -- | 4 | 19 | A-7-6 | 17 |
| | S#14 53.5-55.0 | 100 | 100 | 100 | 100 | 100 | 100 | 91 | 88 | 41 | 21 | -- | 4 | 20 | A-7-6 | 18 |
| | S#15 58.5-60.0 | 100 | 100 | 100 | 100 | 100 | 100 | 94 | 92 | 45 | 24 | -- | 4 | 21 | A-7-6 | 21 |
| | S#16 63.5-65.0 | 100 | 100 | 100 | 100 | 100 | 100 | 94 | 92 | 48 | 26 | -- | 4 | 22 | A-7-6 | 23 |
| | S#17 68.5-70.0 | 100 | 100 | 100 | 100 | 100 | 100 | 68 | 58 | 48 | 27 | -- | 5 | 21 | A-7-6 | 10 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 2
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 16, 2003

| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
| | S#18 73.5-75.0 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 76 | 46 | 31 | -- | 6 | 15 | A-7-5 | 12 |
| | S#19 78.5-80.0 | 100 | 100 | 100 | 100 | 100 | 100 | 72 | 44 | 44 | 27 | -- | 6 | 17 | A-7-6 | 4 |
| | S#20 83.5-85.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 22 | -- | -- | -- | 3 | NP | A-2-4 | 0 |
| | S#21 88.5-90.0 | 100 | 100 | 100 | 100 | 100 | 100 | 83 | 7 | -- | -- | -- | -- | NP | A-3 | 0 |
| | S#22 93.5-95.0 | 100 | 100 | 100 | 100 | 99 | 96 | 38 | 6 | -- | -- | -- | -- | NP | A-1-b | 0 |
| | S#23 98.5-100.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#24 103.5-105.0 | 100 | 100 | 100 | 100 | 98 | 91 | 49 | 7 | -- | -- | -- | 1 | NP | A-1-b | 0 |
| | S#25 108.5-110.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 61 | 23 | -- | -- | 2 | NP | A-4 | 0 |
| | S#26 113.5-115.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#27 118.5-120.0 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 9 | -- | -- | -- | -- | NP | A-3 | 0 |
| | S#28 123.5-125.0 | 100 | 100 | 100 | 100 | 100 | 100 | 97 | 24 | -- | -- | -- | 1 | NP | A-2-4 | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 16, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-3 | S#1 | | | | | | | | | | | | | | | |
| | 1.0- 2.5 | 100 | 100 | 100 | 99 | 98 | 95 | 60 | 7 | -- | -- | 12 | -- | NP | A-3 | 0 |
| | S#2 | | | | | | | | | | | | | | | |
| | 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 99 | 26 | 2 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#3 | | | | | | | | | | | | | | | |
| | 6.0- 7.5 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#4 | | | | | | | | | | | | | | | |
| | 8.5-10.0 | 100 | 100 | 100 | 100 | 100 | 99 | 49 | 0 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#5 | | | | | | | | | | | | | | | |
| | 13.5-15.0 | 100 | 100 | 100 | 100 | 100 | 100 | 41 | 2 | -- | -- | 21 | -- | NP | A-1-b | 0 |
| | S#6 | | | | | | | | | | | | | | | |
| | 18.5-20.0 | 100 | 100 | 100 | 100 | 100 | 100 | 61 | 3 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#7 | | | | | | | | | | | | | | | |
| | 23.5-25.0 | 100 | 100 | 100 | 100 | 91 | 75 | 25 | 2 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | S#8 | | | | | | | | | | | | | | | |
| | 28.5-30.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 87 | 30 | 20 | 46 | 3 | 10 | A-4 | 8 |
| | UD-7 | | | | | | | | | | | | | | | |
| | 35.0-36.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#9 | | | | | | | | | | | | | | | |
| | 38.5-40.0 | NO SIEVE ANALYSIS - SMALL SAMPLE | | | | | | | | 30 | 22 | 49 | 3 | 8 | ----- | -- |
| | UD-8 | | | | | | | | | | | | | | | |
| | 40.0-42.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#10 | | | | | | | | | | | | | | | |
| | 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 97 | 96 | 91 | 39 | 22 | 56 | 3 | 17 | A-6 | 16 |
| | UD-9 | | | | | | | | | | | | | | | |
| | 50.0-52.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#11 | | | | | | | | | | | | | | | |
| | 58.5-60.0 | 100 | 100 | 100 | 100 | 100 | 100 | 88 | 83 | 53 | 27 | 81 | 4 | 26 | A-7-6 | 24 |
| | UD-10 | | | | | | | | | | | | | | | |
| | 60.0-62.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#12 | | | | | | | | | | | | | | | |
| | 68.5-70.0 | 100 | 100 | 100 | 100 | 100 | 100 | 91 | 82 | 49 | 27 | 64 | 5 | 22 | A-7-6 | 20 |
| | UD-11 | | | | | | | | | | | | | | | |
| | 70.0-72.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 16, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| | S#13 78.5-80.0 | 100 | 100 | 100 | 100 | 100 | 100 | 66 | 45 | 56 | 41 | 90 | 6 | 15 | A-7-5 | 4 |
| | S#14 83.5-85.0 | 100 | 100 | 100 | 100 | 100 | 100 | 83 | 64 | 56 | 38 | 78 | 6 | 18 | A-7-5 | 12 |
| | S#15A 89.0-89.5 | NO SIEVE ANALYSIS - SMALL SAMPLE | | | | | | | | 17 | -- | 29 | 1 | -- | ----- | -- |
| | S#15B 89.5-90.0 | 100 | 100 | 100 | 70 | 51 | 29 | 19 | 4 | -- | -- | 10 | -- | NP | A-1-a | 0 |
| | S#16 93.5-95.0 | 100 | 100 | 100 | 79 | 62 | 43 | 15 | 1 | -- | -- | 8 | -- | NP | A-1-a | 0 |
| | S#17 98.5-100.0 | 100 | 100 | 100 | 94 | 90 | 78 | 32 | 7 | -- | -- | 14 | -- | NP | A-1-b | 0 |
| | S#18 103.5-105.0 | 100 | 100 | 100 | 100 | 100 | 99 | 92 | 12 | -- | -- | 23 | -- | NP | A-2-4 | 0 |
| | S#19 108.5-110.0 | 100 | 100 | 100 | 100 | 100 | 100 | 74 | 7 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 1
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 19, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-4 | S#1 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 98 | 46 | 1 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | S#2 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 100 | 91 | 2 | -- | -- | 24 | -- | NP | A-3 | 0 |
| | S#3 6.0- 7.5 | 100 | 100 | 100 | 100 | 100 | 99 | 77 | 2 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#4 8.5-10.0 | 100 | 100 | 100 | 100 | 100 | 98 | 33 | 2 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#5 13.5-15.0 | 100 | 100 | 100 | 100 | 100 | 97 | 70 | 3 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#6 18.5-20.0 | 100 | 100 | 100 | 100 | 100 | 100 | 41 | 2 | -- | -- | 20 | -- | NP | A-1-b | 0 |
| | S#7 23.5-25.0 | 100 | 100 | 100 | 99 | 96 | 90 | 27 | 5 | -- | -- | 14 | -- | NP | A-1-b | 0 |
| | S#8 28.5-30.0 | 100 | 100 | 100 | 100 | 100 | 100 | 87 | 71 | 40 | 25 | 61 | 4 | 15 | A-6 | 10 |
| | S#9 33.5-35.0 | NO SAMPLE RECOVERY | | | | | | | | | | | | | | |
| | S#10 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 100 | 94 | 91 | 32 | 21 | 48 | 3 | 11 | A-6 | 10 |
| | S#11 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 100 | 92 | 89 | 38 | 22 | 54 | 3 | 16 | A-6 | 15 |
| | S#12 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 92 | 42 | 22 | 55 | 3 | 20 | A-7-6 | 20 |
| | S#13 53.5-55.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#14 58.5-60.0 | 100 | 100 | 100 | 100 | 100 | 100 | 92 | 89 | 43 | 23 | 63 | 3 | 20 | A-7-6 | 19 |
| | S#15 63.5-65.0 | 100 | 100 | 100 | 100 | 100 | 100 | 93 | 89 | 50 | 27 | 66 | 4 | 23 | A-7-6 | 23 |
| | S#16 68.5-70.0 | 100 | 100 | 100 | 100 | 100 | 100 | 81 | 68 | 50 | 28 | 63 | 5 | 22 | A-7-6 | 15 |
| | S#17 73.5-75.0 | 100 | 100 | 100 | 100 | 100 | 100 | 71 | 51 | 52 | 29 | 68 | 5 | 23 | A-7-6 | 9 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 19, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| | S#18 | | | | | | | | | | | | | | | |
| | 78.5-80.0 | 100 | 100 | 100 | 100 | 100 | 100 | 76 | 57 | 50 | 30 | 67 | 4 | 20 | A-7-5 | 10 |
| | UD-13 | | | | | | | | | | | | | | | |
| | 80.0-82.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#19 | | | | | | | | | | | | | | | |
| | 83.5-85.0 | 100 | 100 | 100 | 100 | 100 | 100 | 82 | 62 | 55 | 33 | 74 | 5 | 22 | A-7-5 | 13 |
| | S#20 | | | | | | | | | | | | | | | |
| | 88.5-90.0 | 100 | 100 | 100 | 88 | 81 | 69 | 27 | 7 | -- | -- | 13 | -- | NP | A-1-b | 0 |
| | S#21 | | | | | | | | | | | | | | | |
| | 93.5-95.0 | 100 | 100 | 100 | 86 | 76 | 58 | 23 | 6 | -- | -- | 10 | -- | NP | A-1-b | 0 |
| | S#22 | | | | | | | | | | | | | | | |
| | 98.5-100.0 | 100 | 100 | 100 | 100 | 100 | 98 | 87 | 9 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#23 | | | | | | | | | | | | | | | |
| | 103.5-105.0 | 100 | 100 | 100 | 100 | 100 | 98 | 79 | 10 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#24 | | | | | | | | | | | | | | | |
| | 108.5-100.0 | 100 | 100 | 100 | 100 | 100 | 94 | 45 | 8 | -- | -- | 17 | -- | NP | A-1-b | 0 |
| | S#25 | | | | | | | | | | | | | | | |
| | 113.5-115.0 | 100 | 100 | 100 | 100 | 100 | 100 | 97 | 12 | -- | -- | 22 | -- | NP | A-2-4 | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265

PAGE 1

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 21, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-5 | S#1 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 92 | 71 | 16 | -- | -- | 10 | -- | NP | A-2-4 | 0 |
| | S#2 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 99 | 41 | 4 | -- | -- | 21 | -- | NP | A-1-b | 0 |
| | S#3 6.0- 7.5 | 100 | 100 | 100 | 100 | 100 | 100 | 68 | 4 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#4 8.5-10.0 | 100 | 100 | 100 | 100 | 100 | 98 | 32 | 2 | -- | -- | 18 | -- | NP | A-1-b | 0 |
| | S#5 13.5-15.0 | 100 | 100 | 100 | 100 | 99 | 99 | 64 | 4 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#6 18.5-20.0 | 100 | 100 | 100 | 100 | 100 | 100 | 59 | 2 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#7 23.5-25.0 | 100 | 100 | 100 | 100 | 98 | 95 | 32 | 4 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | S#8 28.5-30.0 | 100 | 100 | 100 | 100 | 97 | 88 | 15 | 2 | -- | -- | 93 | -- | NP | A-1-b | 0 |
| | S#9 33.5-35.0 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 86 | 35 | 23 | 49 | 4 | 12 | A-6 | 10 |
| | S#10 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 91 | 31 | 22 | 44 | 3 | 9 | A-4 | 8 |
| | S#11 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 100 | 94 | 92 | 34 | 19 | 49 | 3 | 15 | A-6 | 14 |
| | S#12 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 99 | 76 | 71 | 38 | 21 | 44 | 3 | 17 | A-6 | 11 |
| | S#13 53.5-55.0 | 100 | 100 | 100 | 100 | 99 | 99 | 95 | 89 | 42 | 22 | 50 | 4 | 20 | A-7-6 | 19 |
| | S#14 58.5-60.0 | 100 | 100 | 100 | 100 | 100 | 100 | 95 | 91 | 40 | 22 | 48 | 3 | 18 | A-6 | 17 |
| | 63.5-65.0 | SKIPPED SAMPLE - NO SAMPLE TAKEN | | | | | | | | | | | | | | |
| | S#15 68.5-70.0 | 100 | 100 | 100 | 100 | 100 | 100 | 91 | 81 | 47 | 25 | 52 | 5 | 22 | A-7-6 | 19 |
| | S#16 78.5-80.0 | 100 | 100 | 100 | 100 | 100 | 100 | 94 | 83 | 54 | 29 | 61 | 4 | 25 | A-7-6 | 23 |
| | S#17 83.5-85.0 | 100 | 100 | 100 | 100 | 100 | 100 | 85 | 65 | 53 | 32 | 65 | 5 | 21 | A-7-5 | 13 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 2
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 21, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| | S#18 | | | | | | | | | | | | | | | |
| | 88.5-90.0 | 100 | 100 | 100 | 94 | 86 | 79 | 57 | 6 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#19 | | | | | | | | | | | | | | | |
| | 93.5-95.0 | 100 | 100 | 100 | 86 | 76 | 67 | 24 | 5 | -- | -- | 12 | -- | NP | A-1-b | 0 |
| | S#20 | | | | | | | | | | | | | | | |
| | 98.5-100.0 | 100 | 100 | 100 | 100 | 100 | 95 | 48 | 8 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | 103.5-105.0 | SKIPPED SAMPLE - NO SAMPLE TAKEN | | | | | | | | | | | | | | |
| | S#21 | | | | | | | | | | | | | | | |
| | 108.5-110.0 | 100 | 100 | 100 | 100 | 100 | 95 | 75 | 10 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | 113.5-115.0 | SKIPPED SAMPLE - NO SAMPLE TAKEN | | | | | | | | | | | | | | |
| | S#22 | | | | | | | | | | | | | | | |
| | 118.5-120.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 34 | 17 | -- | 23 | 1 | NP | A-2-4 | 0 |
| | 123.5-125.0 | SKIPPED SAMPLE - NO SAMPLE TAKEN | | | | | | | | | | | | | | |
| | S#23 | | | | | | | | | | | | | | | |
| | 128.5-130.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 71 | 26 | 17 | 30 | 5 | 9 | A-4 | 4 |
| | S#24 | | | | | | | | | | | | | | | |
| | 133.5-135.0 | 100 | 100 | 100 | 100 | 100 | 100 | 65 | 27 | 26 | 17 | 26 | 2 | 9 | A-2-4 | 0 |
| | 138.5-140.0 | SKIPPED SAMPLE - NO SAMPLE TAKEN | | | | | | | | | | | | | | |
| | S#25 | | | | | | | | | | | | | | | |
| | 143.5-145.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 67 | 23 | -- | 29 | 2 | NP | A-4 | 0 |
| | UD-14 | SHELBY TUBE | | | | | | | | | | | | | | |
| | 145.0-147.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 1
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 9, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-6 | S#1 | | | | | | | | | | | | | | | |
| | 1.0- 2.5 | 100 | 100 | 100 | 100 | 98 | 96 | 65 | 9 | -- | -- | 5 | -- | NP | A-3 | 0 |
| | S#2 | | | | | | | | | | | | | | | |
| | 2.5- 4.0 | 100 | 100 | 100 | 100 | 100 | 99 | 59 | 3 | -- | -- | 4 | -- | NP | A-3 | 0 |
| | S#3 | | | | | | | | | | | | | | | |
| | 4.0- 5.5 | 100 | 100 | 100 | 100 | 100 | 100 | 57 | 3 | -- | -- | 7 | -- | NP | A-3 | 0 |
| | S#4 | | | | | | | | | | | | | | | |
| | 5.5- 7.0 | 100 | 100 | 100 | 98 | 91 | 81 | 48 | 8 | -- | -- | 11 | -- | NP | A-1-b | 0 |
| | S#5 | | | | | | | | | | | | | | | |
| | 7.0- 8.5 | 100 | 100 | 100 | 100 | 96 | 94 | 68 | 4 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#6 | | | | | | | | | | | | | | | |
| | 8.5-10.0 | 100 | 100 | 100 | 100 | 100 | 98 | 52 | 3 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#7 | | | | | | | | | | | | | | | |
| | 13.5-15.0 | 100 | 100 | 100 | 100 | 100 | 95 | 62 | 3 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#8 | | | | | | | | | | | | | | | |
| | 18.5-20.0 | 100 | 100 | 100 | 100 | 100 | 96 | 44 | 3 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#9 | | | | | | | | | | | | | | | |
| | 23.5-25.0 | 100 | 100 | 100 | 99 | 97 | 93 | 32 | 4 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | S#10 | | | | | | | | | | | | | | | |
| | 28.5-30.0 | 100 | 100 | 100 | 100 | 98 | 96 | 39 | 10 | -- | -- | 17 | -- | NP | A-1-b | 0 |
| | S#11 | | | | | | | | | | | | | | | |
| | 33.5-35.0 | 100 | 100 | 100 | 100 | 100 | 98 | 39 | 4 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#12 | | | | | | | | | | | | | | | |
| | 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 75 | 29 | 18 | 48 | -- | 11 | A-6 | 6 |
| | S#13 | | | | | | | | | | | | | | | |
| | 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 87 | 33 | 19 | 50 | -- | 14 | A-6 | 11 |
| | UD-5 SHELBY TUBE | | | | | | | | | | | | | | | |
| | 45.0-47.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#14 | | | | | | | | | | | | | | | |
| | 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 95 | 35 | 20 | 51 | -- | 15 | A-6 | 15 |
| | S#15 | | | | | | | | | | | | | | | |
| | 53.5-55.0 | 100 | 100 | 100 | 100 | 100 | 100 | 90 | 83 | 36 | 20 | 47 | -- | 16 | A-6 | 13 |
| | UD-6 SHELBY TUBE | | | | | | | | | | | | | | | |
| | 55.0-57.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 2
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 9, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| | S#16 58.5-60.0 | 100 | 100 | 100 | 100 | 100 | 100 | 97 | 96 | 38 | 20 | 46 | -- | 18 | A-6 | 18 |
| | S#17 63.5-65.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 43 | 23 | 57 | -- | 20 | A-7-6 | 22 |
| | S#18 68.5-70.0 | 100 | 100 | 100 | 100 | 100 | 100 | 78 | 69 | 46 | 25 | 59 | 5 | 21 | A-7-6 | 14 |
| | S#19 73.5-75.0 | 100 | 100 | 100 | 100 | 100 | 100 | 17 | 7 | -- | -- | 61 | 5 | NP | A-1-b | 0 |
| | S#20 78.5-80.0 | 100 | 100 | 100 | 100 | 100 | 100 | 85 | 65 | 65 | 42 | 94 | 13 | 23 | A-7-5 | 16 |
| | S#21 83.5-85.0 | 100 | 100 | 100 | 100 | 100 | 100 | 87 | 82 | 54 | 30 | 66 | 5 | 24 | A-7-5 | 22 |
| | S#22 88.5-90.0 | 100 | 100 | 100 | 100 | 100 | 100 | 89 | 75 | 52 | 30 | 62 | 6 | 22 | A-7-5 | 18 |
| | S#23 93.5-95.0 | 100 | 100 | 100 | 95 | 87 | 75 | 56 | 6 | -- | -- | 13 | -- | NP | A-3 | 0 |
| | S#24 98.5-100.0 | 100 | 100 | 100 | 96 | 86 | 67 | 55 | 54 | -- | -- | 13 | -- | NP | A-4 | 0 |
| | S#25 103.5- 105.0 | 100 | 100 | 100 | 100 | 97 | 90 | 37 | 7 | -- | -- | 17 | -- | NP | A-1-b | 0 |
| | S#26 108.5- 110.0 | 100 | 100 | 100 | 98 | 94 | 83 | 18 | 5 | -- | -- | 13 | -- | NP | A-1-b | 0 |
| | S#27 113.5- 115.0 | 100 | 100 | 100 | 99 | 98 | 95 | 49 | 8 | -- | -- | 17 | -- | NP | A-1-b | 0 |
| | S#28 118.5-120.0 | 100 | 100 | 100 | 100 | 99 | 85 | 49 | 8 | -- | -- | 14 | -- | NP | A-1-b | 0 |
| | S#29 123.5- 125.0 | 100 | 100 | 100 | 97 | 94 | 90 | 71 | 9 | -- | -- | 17 | -- | NP | A-3 | 0 |
| | S#30 128.5- 130.0 | 100 | 100 | 100 | 100 | 100 | 100 | 91 | 26 | -- | -- | 23 | -- | NP | A-2-4 | 0 |
| | S#31 133.5- 135.0 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 19 | -- | -- | 25 | -- | NP | A-2-4 | 0 |
| | S#32 138.5- 140.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 63 | 25 | 18 | 26 | -- | 7 | A-4 | 2 |
| | S#33 143.5- 145.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 55 | 24 | 17 | 22 | -- | 7 | A-4 | 1 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 3
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 9, 2003

| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
| | S#34 | | | | | | | | | | | | | | | |
| 148.5- 150.0 | | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 81 | 31 | 17 | 28 | -- | 14 | A-6 | 10 |
| | S#35 | | | | | | | | | | | | | | | |
| 153.5- 155.0 | | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 91 | 34 | 20 | 31 | -- | 14 | A-6 | 13 |
| | S#37A | | | | | | | | | | | | | | | |
| 163.5- 165.0 | | 100 | 100 | 100 | 100 | 100 | 100 | 92 | 56 | 25 | 21 | 26 | -- | 4 | A-4 | 0 |
| | S#38 | | | | | | | | | | | | | | | |
| 168.5- 170.0 | | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 44 | 21 | -- | 28 | -- | NP | A-4 | 0 |
| | S#39 | | | | | | | | | | | | | | | |
| 173.5- 175.0 | | 100 | 100 | 100 | 100 | 100 | 99 | 98 | 21 | -- | -- | 26 | -- | NP | A-2-4 | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 1
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 11, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # EI-7 | S#1 | | | | | | | | | | | | | | | |
| | 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 97 | 47 | 3 | -- | -- | 3 | -- | NP | A-1-b | 0 |
| | S#2 | | | | | | | | | | | | | | | |
| | 2.5- 4.0 | 100 | 100 | 100 | 100 | 100 | 98 | 64 | 3 | -- | -- | 3 | -- | NP | A-3 | 0 |
| | S#3 | | | | | | | | | | | | | | | |
| | 4.0- 5.5 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#4 | | | | | | | | | | | | | | | |
| | 5.5- 7.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#5 | | | | | | | | | | | | | | | |
| | 7.0- 8.5 | 100 | 100 | 100 | 100 | 100 | 100 | 52 | 2 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#6 | | | | | | | | | | | | | | | |
| | 8.5-10.0 | 100 | 100 | 100 | 100 | 100 | 99 | 59 | 1 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#7 | | | | | | | | | | | | | | | |
| | 13.5-15.0 | 100 | 100 | 100 | 100 | 100 | 99 | 92 | 2 | -- | -- | 22 | -- | NP | A-3 | 0 |
| | S#8 | | | | | | | | | | | | | | | |
| | 18.5-20.0 | 100 | 100 | 100 | 95 | 90 | 84 | 49 | 2 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | S#9 | | | | | | | | | | | | | | | |
| | 23.5-25.0 | 100 | 100 | 100 | 100 | 100 | 98 | 58 | 4 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#10 | | | | | | | | | | | | | | | |
| | 28.5-30.0 | 100 | 100 | 100 | 100 | 97 | 94 | 76 | 4 | -- | -- | 22 | -- | NP | A-3 | 0 |
| | UD-3 SHELBY TUBE | | | | | | | | | | | | | | | |
| | 31.5-32.1 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#11 | | | | | | | | | | | | | | | |
| | 33.5-35.0 | 100 | 100 | 100 | 94 | 86 | 79 | 72 | 65 | 43 | 25 | 57 | 4 | 18 | A-7-6 | 10 |
| | UD-4 SHELBY TUBE | | | | | | | | | | | | | | | |
| | 41.5-43.3 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#12 | | | | | | | | | | | | | | | |
| | 40.5-42.0 | 100 | 100 | 100 | 99 | 98 | 97 | 96 | 90 | 40 | 24 | 59 | 4 | 16 | A-6 | 16 |
| | S#13 | | | | | | | | | | | | | | | |
| | 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 99 | 98 | 97 | 37 | 22 | 47 | 3 | 15 | A-6 | 16 |
| | UD-5 SHELBY TUBE | | | | | | | | | | | | | | | |
| | 50.0-52.0 | NO SAMPLE RECOVERY - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#14 | | | | | | | | | | | | | | | |
| | 53.5-54.8 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 88 | 45 | 28 | 55 | 4 | 17 | A-7-6 | 17 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 11, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| | S#15 55.0-56.5 | 100 | 100 | 100 | 99 | 97 | 90 | 55 | 14 | -- | -- | 17 | 1 | NP | A-2-4 | 0 |
| | S#16 56.5-58.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#17 58.5-60.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#18 60.0-61.5 | 100 | 100 | 100 | 89 | 80 | 71 | 31 | 10 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | S#19 61.5-63.0 | 100 | 100 | 100 | 95 | 93 | 90 | 43 | 12 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#20 63.5-65.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#21 68.5-70.0 | 100 | 100 | 100 | 90 | 89 | 77 | 18 | 6 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | S#22 73.5-75.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#23 78.5-80.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#24 83.5-85.0 | 100 | 100 | 100 | 98 | 97 | 94 | 88 | 12 | -- | -- | 22 | -- | NP | A-2-4 | 0 |
| | S#25 88.5-90.0 | 100 | 100 | 100 | 100 | 97 | 94 | 93 | 11 | -- | -- | 23 | -- | NP | A-2-4 | 0 |
| | S#26 93.5-93.8 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 25 | -- | -- | 24 | -- | NP | A-2-4 | 0 |
| | S#26A 93.8-94.3 | 100 | 100 | 100 | 100 | 100 | 98 | 97 | 59 | 22 | 17 | 26 | -- | 5 | A-4 | 0 |
| | S#27 98.5-100.0 | 100 | 100 | 100 | 100 | 98 | 96 | 53 | 6 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#28 103.5-105.0 | 100 | 100 | 100 | 99 | 97 | 93 | 63 | 7 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#29 108.5-110.0 | 100 | 100 | 100 | 100 | 98 | 78 | 60 | 17 | 20 | -- | 18 | -- | NP | A-2-4 | 0 |
| | S#30 113.5-115.0 | 100 | 100 | 100 | 100 | 99 | 97 | 72 | 8 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#31 118.5-120.0 | 100 | 100 | 100 | 100 | 100 | 99 | 60 | 8 | -- | -- | 19 | -- | NP | A-3 | 0 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 3
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 11, 2003

| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
| | S#32 | | | | | | | | | | | | | | | |
| | 123.5-125.0 | 100 | 100 | 100 | 100 | 99 | 96 | 71 | 6 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#33 | | | | | | | | | | | | | | | |
| | 128.5-130.0 | 100 | 100 | 100 | 99 | 96 | 94 | 71 | 7 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#34 | | | | | | | | | | | | | | | |
| | 133.5-135.0 | 100 | 100 | 100 | 100 | 100 | 98 | 55 | 7 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#35 | | | | | | | | | | | | | | | |
| | 138.5-140.0 | 100 | 100 | 100 | 100 | 100 | 100 | 97 | 72 | 27 | 20 | 25 | 2 | 7 | A-4 | 3 |
| | S#36 | | | | | | | | | | | | | | | |
| | 143.5-145.0 | 100 | 100 | 100 | 100 | 100 | 100 | 92 | 53 | 21 | 17 | 19 | 2 | 4 | A-4 | 0 |
| | S#37 | | | | | | | | | | | | | | | |
| | 148.5-150.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#38 | | | | | | | | | | | | | | | |
| | 153.5-155.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#39 | | | | | | | | | | | | | | | |
| | 158.5-160.0 | 100 | 100 | 100 | 100 | 99 | 98 | 96 | 87 | 26 | -- | 33 | 2 | NP | A-4 | 0 |
| | S#40 | | | | | | | | | | | | | | | |
| | 163.5-165.0 | 100 | 100 | 100 | 100 | 100 | 100 | 90 | 58 | 25 | 18 | 23 | 2 | 7 | A-4 | 2 |
| | S#41 | | | | | | | | | | | | | | | |
| | 168.5-170.0 | 100 | 100 | 100 | 99 | 99 | 98 | 95 | 64 | 23 | -- | 25 | 1 | NP | A-4 | 0 |
| | S#42 | | | | | | | | | | | | | | | |
| | 173.5-175.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 56 | 22 | 18 | 24 | 3 | 4 | A-4 | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 1
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 12, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-8 | S#1 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 98 | 61 | 3 | -- | -- | 3 | -- | NP | A-3 | 0 |
| | S#2 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 99 | 46 | 2 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | S#3 6.0- 7.5 | 100 | 100 | 100 | 100 | 100 | 99 | 64 | 3 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#4 8.5-10.0 | 100 | 100 | 100 | 100 | 100 | 100 | 70 | 3 | -- | -- | 24 | -- | NP | A-3 | 0 |
| | S#5 13.5-15.0 | 100 | 100 | 100 | 100 | 100 | 99 | 91 | 3 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#6 18.5-20.0 | 100 | 100 | 100 | 99 | 99 | 96 | 36 | 3 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | S#7 23.5-25.0 | 100 | 100 | 100 | 100 | 100 | 100 | 81 | 5 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#8 28.5-30.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 88 | 37 | 21 | 54 | 4 | 16 | A-6 | 14 |
| | S#9 33.5-35.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 38 | 23 | 57 | 4 | 15 | A-6 | 16 |
| | S#10 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 35 | 21 | 50 | 3 | 14 | A-6 | 14 |
| | S#11 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 95 | 93 | 88 | 38 | 22 | 51 | 4 | 16 | A-6 | 14 |
| | S#12 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 94 | 38 | 22 | 54 | 4 | 16 | A-6 | 16 |
| | S#13 53.5-55.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 88 | 44 | 24 | 58 | 4 | 20 | A-7-6 | 19 |
| | S#14A 58.5-59.0 | NO SIEVE ANALYSIS | | | | | | | | 47 | 34 | 87 | 16 | 13 | ----- | -- |
| | S#14B 59.0-60.0 | 100 | 100 | 100 | 100 | 100 | 99 | 80 | 25 | -- | -- | 25 | 1 | NP | A-2-4 | 0 |
| | S#15A 63.5-64.0 | NO SIEVE ANALYSIS | | | | | | | | -- | -- | 159 | 28 | -- | ----- | -- |
| | S#15B 64.0-65.0 | 100 | 100 | 100 | 97 | 91 | 71 | 11 | 4 | -- | -- | 13 | -- | NP | A-1-b | 0 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 12, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| | S#16 68.5-70.0 | 100 | 100 | 100 | 96 | 91 | 84 | 19 | 4 | -- | -- | 15 | -- | NP | A-1-b | 0 |
| | S#17 73.5-75.0 | 100 | 100 | 100 | 99 | 96 | 87 | 19 | 7 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | S#18 78.5-80.0 | 100 | 100 | 100 | 100 | 100 | 97 | 55 | 8 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#19 83.5-85.0 | 100 | 100 | 100 | 95 | 90 | 86 | 67 | 8 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#20 88.5-90.0 | 100 | 100 | 100 | 100 | 99 | 97 | 61 | 9 | -- | -- | 16 | -- | NP | A-3 | 0 |
| | S#21 93.5-95.0 | 100 | 100 | 100 | 100 | 98 | 93 | 42 | 4 | -- | -- | 17 | -- | NP | A-1-b | 0 |
| | S#22 98.5-100.0 | 100 | 100 | 100 | 100 | 99 | 91 | 55 | 26 | -- | -- | 15 | -- | NP | A-2-4 | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 11, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B # BI-9 | S#1 | | | | | | | | | | | | | | | |
| | 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 98 | 56 | 3 | -- | -- | 5 | -- | NP | A-3 | 0 |
| | S#2 | | | | | | | | | | | | | | | |
| | 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 100 | 73 | 3 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#3 | | | | | | | | | | | | | | | |
| | 8.5-10.0 | 100 | 100 | 100 | 100 | 99 | 99 | 64 | 3 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#4 | | | | | | | | | | | | | | | |
| | 13.5-15.0 | 100 | 100 | 100 | 99 | 97 | 90 | 40 | 1 | -- | -- | 17 | -- | NP | A-1-b | 0 |
| | S#5 | | | | | | | | | | | | | | | |
| | 18.5-20.0 | 100 | 100 | 100 | 100 | 100 | 99 | 82 | 3 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#6 | | | | | | | | | | | | | | | |
| | 23.5-25.0 | 100 | 100 | 100 | 99 | 97 | 89 | 56 | 5 | -- | -- | 16 | -- | NP | A-3 | 0 |
| | S#7 | | | | | | | | | | | | | | | |
| | 28.5-30.0 | 100 | 100 | 100 | 100 | 100 | 84 | 79 | 64 | 40 | 23 | 62 | -- | 17 | A-6 | 9 |
| | UD-1 SHELBY TUBE | | | | | | | | | | | | | | | |
| | 30.0-32.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#8 | | | | | | | | | | | | | | | |
| | 33.5-35.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 40 | 22 | 54 | -- | 18 | A-6 | 19 |
| | S#9 | | | | | | | | | | | | | | | |
| | 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 94 | 24 | -- | 32 | -- | NP | A-4 | 0 |
| | UD-2 SHELBY TUBE | | | | | | | | | | | | | | | |
| | 40.0-42.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#10 | | | | | | | | | | | | | | | |
| | 43.5-45.0 | 100 | 100 | 100 | 100 | 99 | 99 | 86 | 10 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#11 | | | | | | | | | | | | | | | |
| | 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 99 | 71 | 8 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#12 | | | | | | | | | | | | | | | |
| | 53.5-55.0 | 100 | 100 | 100 | 92 | 77 | 55 | 18 | 5 | -- | -- | 11 | -- | NP | A-1-b | 0 |
| | S#13 | | | | | | | | | | | | | | | |
| | 58.5-60.0 | 100 | 100 | 100 | 100 | 97 | 94 | 54 | 10 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#14 | | | | | | | | | | | | | | | |
| | 63.5-65.0 | 100 | 100 | 100 | 96 | 94 | 83 | 21 | 7 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | S#15 | | | | | | | | | | | | | | | |
| | 68.5-70.0 | 100 | 100 | 100 | 97 | 95 | 81 | 24 | 7 | -- | -- | 16 | -- | NP | A-1-b | 0 |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 2
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 11, 2003

| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
| | S#16 | | | | | | | | | | | | | | | |
| | 73.5-75.0 | 100 | 100 | 100 | 88 | 71 | 43 | 12 | 5 | -- | -- | 12 | -- | NP | A-1-a | 0 |
| | S#17 | | | | | | | | | | | | | | | |
| | 78.5-80.0 | 100 | 100 | 100 | 82 | 72 | 53 | 17 | 6 | -- | -- | 11 | -- | NP | A-1-b | 0 |
| | S#18 | | | | | | | | | | | | | | | |
| | 83.5-85.0 | 100 | 100 | 100 | 100 | 100 | 100 | 94 | 13 | -- | -- | 21 | -- | NP | A-2-4 | 0 |
| | S#19 | | | | | | | | | | | | | | | |
| | 88.5-90.0 | 100 | 100 | 100 | 100 | 100 | 99 | 65 | 10 | -- | -- | 14 | -- | NP | A-3 | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265

PAGE 1

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 19, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B# BI-10 | S#1 | | | | | | | | | | | | | | | |
| | 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 98 | 59 | 10 | -- | -- | 3 | -- | NP | A-3 | 0 |
| | S#2 | | | | | | | | | | | | | | | |
| | 3.5- 4.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#2A | | | | | | | | | | | | | | | |
| | 4.0- 4.5 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | S#2B | | | | | | | | | | | | | | | |
| | 4.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 99 | 48 | 16 | -- | -- | 21 | -- | NP | A-1-b | 0 |
| | S#3 | | | | | | | | | | | | | | | |
| | 6.0- 7.5 | 100 | 100 | 100 | 100 | 100 | 98 | 57 | 2 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#4 | | | | | | | | | | | | | | | |
| | 8.5-10.0 | 100 | 100 | 100 | 99 | 99 | 97 | 57 | 3 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#5 | | | | | | | | | | | | | | | |
| | 13.5-15.0 | 100 | 100 | 100 | 100 | 99 | 92 | 32 | 2 | -- | -- | 19 | -- | NP | A-1-b | 0 |
| | S#6 | | | | | | | | | | | | | | | |
| | 18.5-20.0 | 100 | 100 | 100 | 100 | 100 | 100 | 98 | 2 | -- | -- | 24 | -- | NP | A-3 | 0 |
| | S#7 | | | | | | | | | | | | | | | |
| | 23.5-25.0 | 100 | 100 | 100 | 100 | 100 | 100 | 55 | 3 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#8 | | | | | | | | | | | | | | | |
| | 28.5-30.0 | ENTIRE SAMPLE KEPT BY MACTEC | | | | | | | | | | | | | | |
| | UD-12 | | | | | | | | | | | | | | | |
| | 35.0-37.0 | NO SIEVE ANALYSIS - PRESS SAMPLE | | | | | | | | | | | | | | |
| | S#9 | | | | | | | | | | | | | | | |
| | 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 95 | 77 | 5 | -- | -- | 17 | -- | NP | A-3 | 0 |
| | S#10 | | | | | | | | | | | | | | | |
| | 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 96 | 78 | 7 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#11 | | | | | | | | | | | | | | | |
| | 48.5-50.0 | 100 | 100 | 100 | 100 | 100 | 99 | 82 | 21 | -- | -- | 16 | -- | NP | A-2-4 | 0 |
| | S#12 | | | | | | | | | | | | | | | |
| | 53.5-55.0 | 100 | 100 | 100 | 100 | 100 | 98 | 73 | 7 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#13 | | | | | | | | | | | | | | | |
| | 58.5-60.0 | 100 | 100 | 100 | 82 | 67 | 50 | 20 | 4 | -- | -- | 10 | -- | NP | A-1-a | 0 |
| | S#14 | | | | | | | | | | | | | | | |
| | 63.5-65.0 | 100 | 100 | 100 | 99 | 95 | 82 | 37 | 9 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | S#15 | | | | | | | | | | | | | | | |
| | 68.5-70.0 | 100 | 100 | 100 | 90 | 70 | 51 | 16 | 5 | -- | -- | 11 | -- | NP | A-1-b | 0 |
| | END | | | | | | | | | | | | | | | |

MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS
AASHTO TESTS:T-89,T-90, & T-265



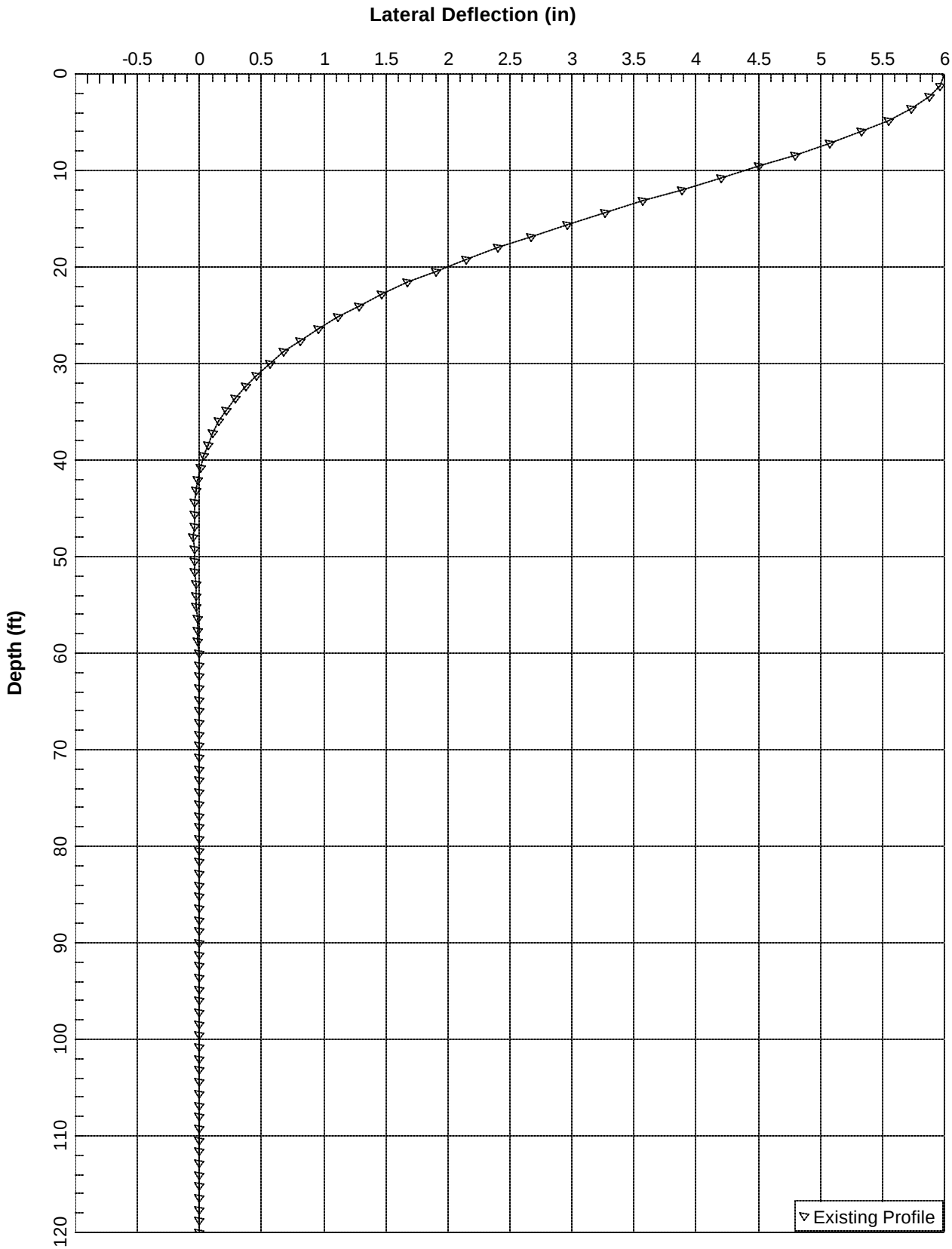
CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 12, 2003

| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| B# BI-11 | S#1 1.0- 2.5 | 100 | 100 | 100 | 100 | 100 | 100 | 75 | 5 | -- | -- | 26 | -- | NP | A-3 | 0 |
| | S#2 3.5- 5.0 | 100 | 100 | 100 | 100 | 100 | 100 | 57 | 3 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#3 6.0- 7.5 | 100 | 100 | 100 | 100 | 100 | 98 | 29 | 2 | -- | -- | 20 | -- | NP | A-1-b | 0 |
| | S#4 8.5-10.0 | 100 | 100 | 100 | 100 | 99 | 95 | 34 | 2 | -- | -- | 18 | -- | NP | A-1-b | 0 |
| | S#5 13.5-15.0 | 100 | 100 | 100 | 100 | 99 | 98 | 75 | 3 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#6 18.5-20.0 | 100 | 100 | 100 | 100 | 100 | 100 | 97 | 4 | -- | -- | 24 | -- | NP | A-3 | 0 |
| | S#7 23.5-25.0 | 100 | 100 | 100 | 100 | 100 | 97 | 83 | 3 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#8 28.5-30.0 | 100 | 100 | 100 | 100 | 100 | 100 | 77 | 4 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#9 33.5-35.0 | 100 | 100 | 100 | 98 | 97 | 95 | 58 | 4 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#10 38.5-40.0 | 100 | 100 | 100 | 100 | 100 | 99 | 73 | 6 | -- | -- | 21 | -- | NP | A-3 | 0 |
| | S#11 43.5-45.0 | 100 | 100 | 100 | 100 | 100 | 98 | 88 | 9 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#12A 48.5-49.5 | 100 | 100 | 100 | 100 | 100 | 100 | 96 | 89 | 32 | 18 | 26 | -- | 14 | A-6 | 12 |
| | S#12B 49.5-50.0 | 100 | 100 | 100 | 96 | 96 | 96 | 94 | 88 | 37 | 20 | 29 | -- | 17 | A-6 | 15 |
| | S#13 53.5-55.0 | 100 | 100 | 100 | 83 | 73 | 62 | 46 | 6 | -- | -- | 13 | -- | NP | A-1-b | 0 |
| | S#14 48.5-60.0 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 18 | -- | -- | 28 | -- | NP | A-2-4 | 0 |
| | S#15 63.5-65.0 | 100 | 100 | 100 | 96 | 94 | 91 | 51 | 10 | -- | -- | 18 | -- | NP | A-3 | 0 |
| | S#16 68.5-70.0 | 100 | 100 | 100 | 100 | 98 | 91 | 10 | 3 | -- | -- | 16 | -- | NP | A-1-b | 0 |

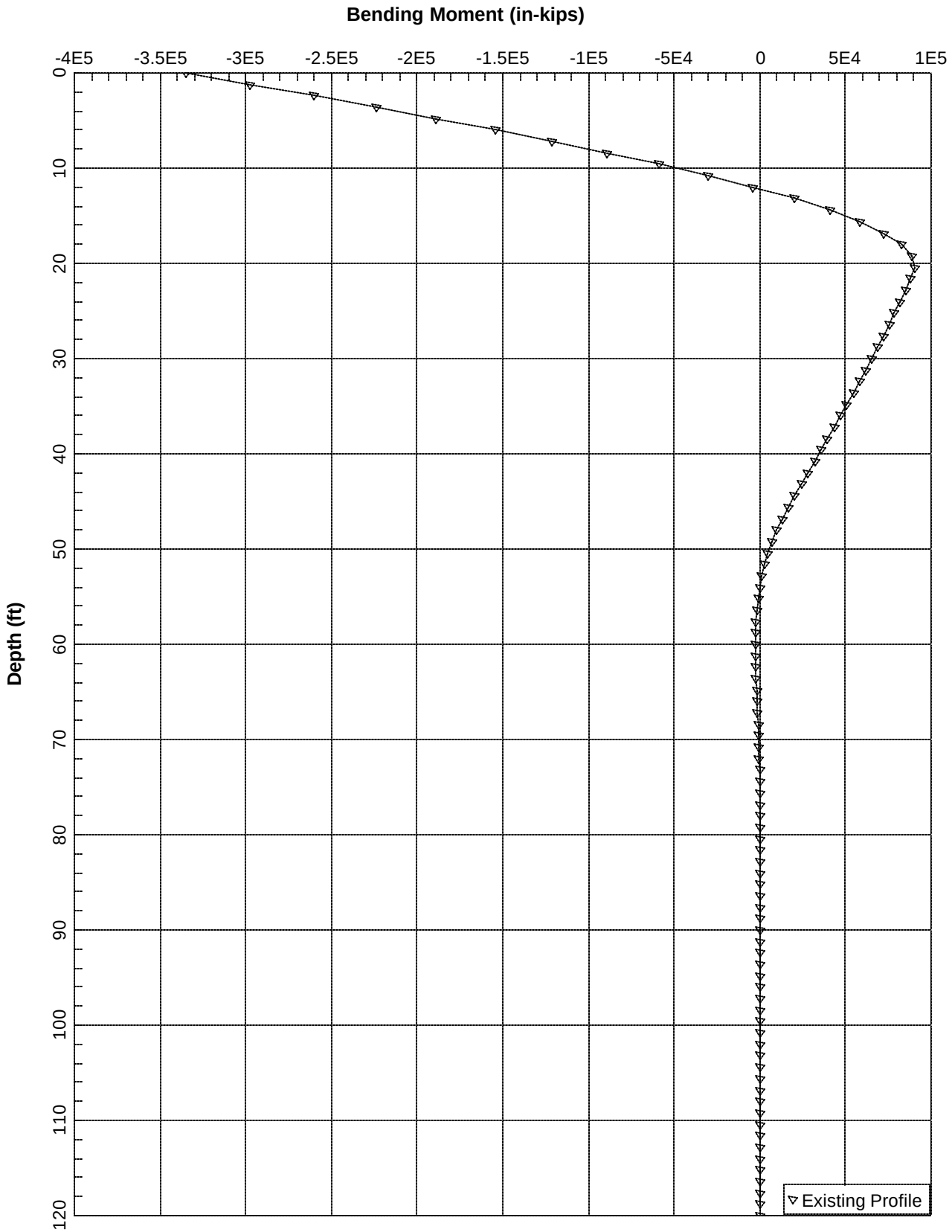
MATERIALS AND RESEARCH DIVISION
SUMMARY OF SOIL ANALYSIS TESTS PAGE 2
AASHTO TESTS:T-89,T-90, & T-265

CONTRACT- 23-073-03 NAME--- INDIAN RIVER INLET BRIDGE
DATE----- AUGUST 12, 2003

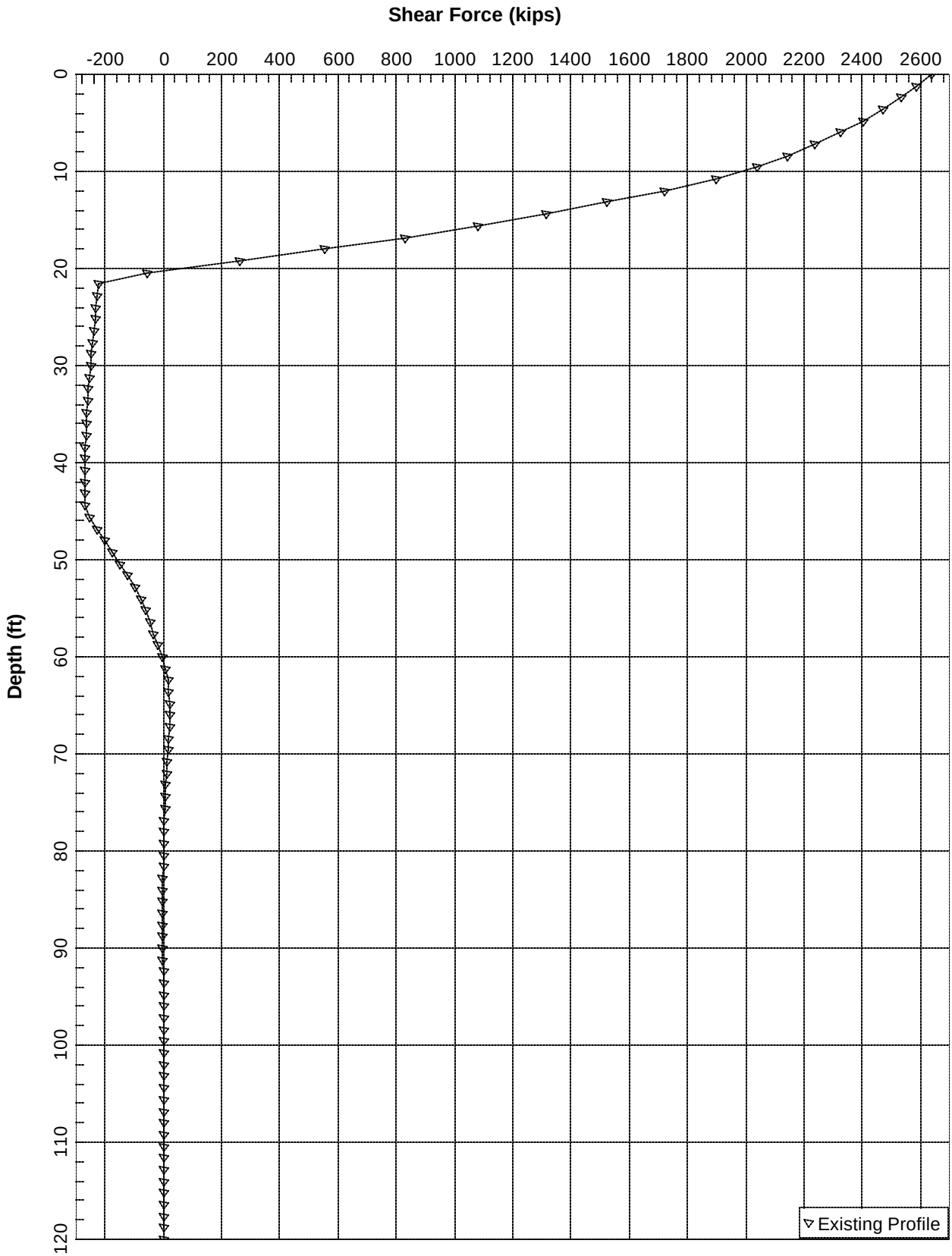
| LOCATION | DEPTH | 2.5 | 2 | 1 | 3/8 | 4 | 10 | 40 | 200 | LL | PL | MO | OR | PI | CLASS | GI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ********** PERCENT PASSING ********** | | | | | | | | | | | | | | |
| | S#17 | | | | | | | | | | | | | | | |
| | 73.5-75.0 | 100 | 100 | 100 | 98 | 92 | 78 | 12 | 4 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | S#18 | | | | | | | | | | | | | | | |
| | 78.5-80.0 | 100 | 100 | 100 | 97 | 93 | 84 | 65 | 16 | -- | -- | 14 | -- | NP | A-2-4 | 0 |
| | S#19 | | | | | | | | | | | | | | | |
| | 83.5-85.0 | 100 | 100 | 100 | 100 | 99 | 97 | 61 | 8 | -- | -- | 20 | -- | NP | A-3 | 0 |
| | S#20 | | | | | | | | | | | | | | | |
| | 88.5-90.0 | 100 | 100 | 100 | 96 | 91 | 86 | 61 | 8 | -- | -- | 19 | -- | NP | A-3 | 0 |
| | S#21 | | | | | | | | | | | | | | | |
| | 93.5-95.0 | 100 | 100 | 100 | 100 | 100 | 100 | 32 | 4 | -- | -- | 20 | -- | NP | A-1-b | 0 |
| | S#22 | | | | | | | | | | | | | | | |
| | 98.5-100.0 | 100 | 100 | 100 | 100 | 98 | 90 | 14 | 2 | -- | -- | 16 | -- | NP | A-1-b | 0 |
| | END | | | | | | | | | | | | | | | |



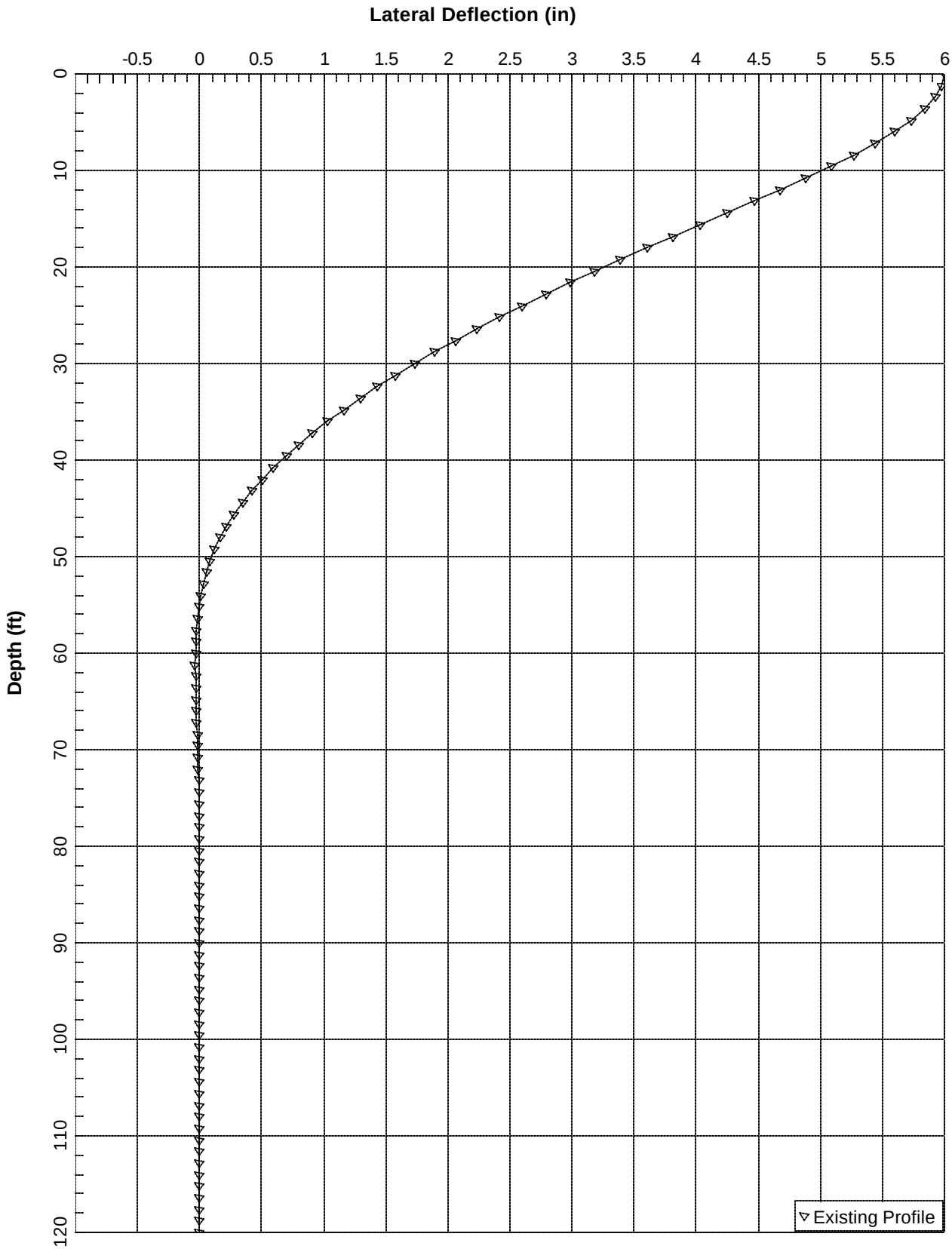

**North Pier Foundation - 6" Deflection/1000 kip Axial Load - 4' Dia. Shaft**



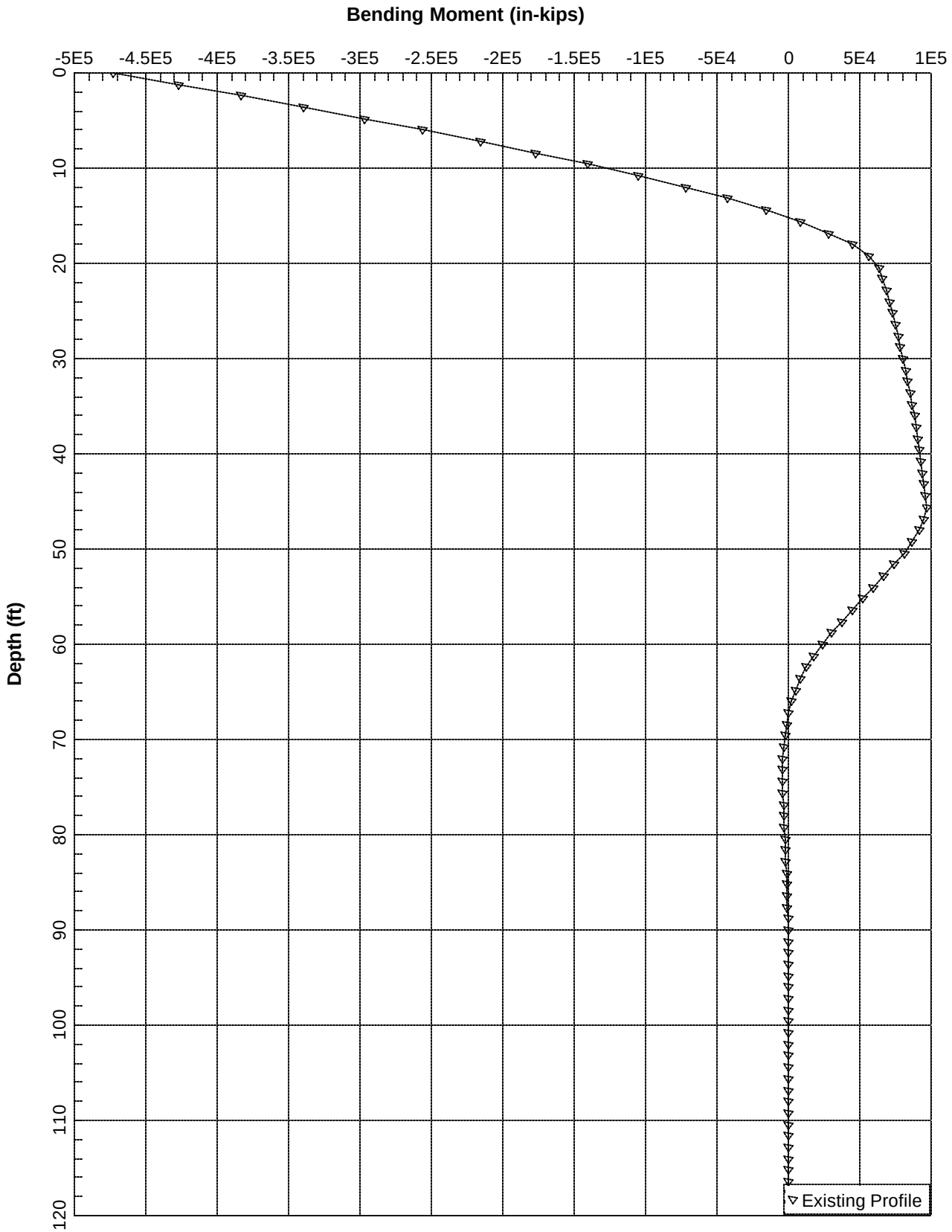

**North Pier Foundation - 6" Deflection/1000kip Axial Load - 4' Dia. Shaft**



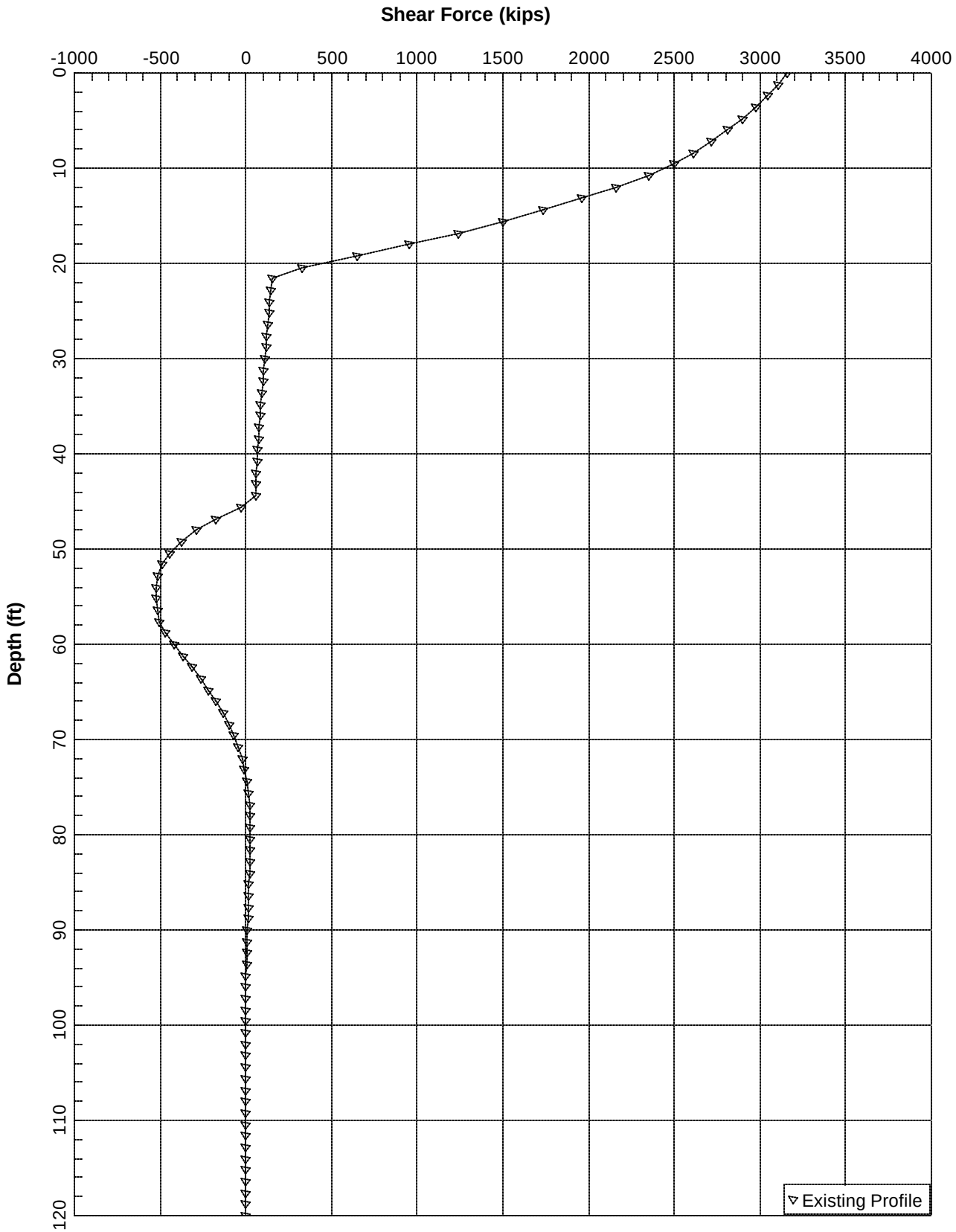

**North Pier Foundation - 6" Deflection/1000 kip Axial Load - 4' Dia. Shaft**



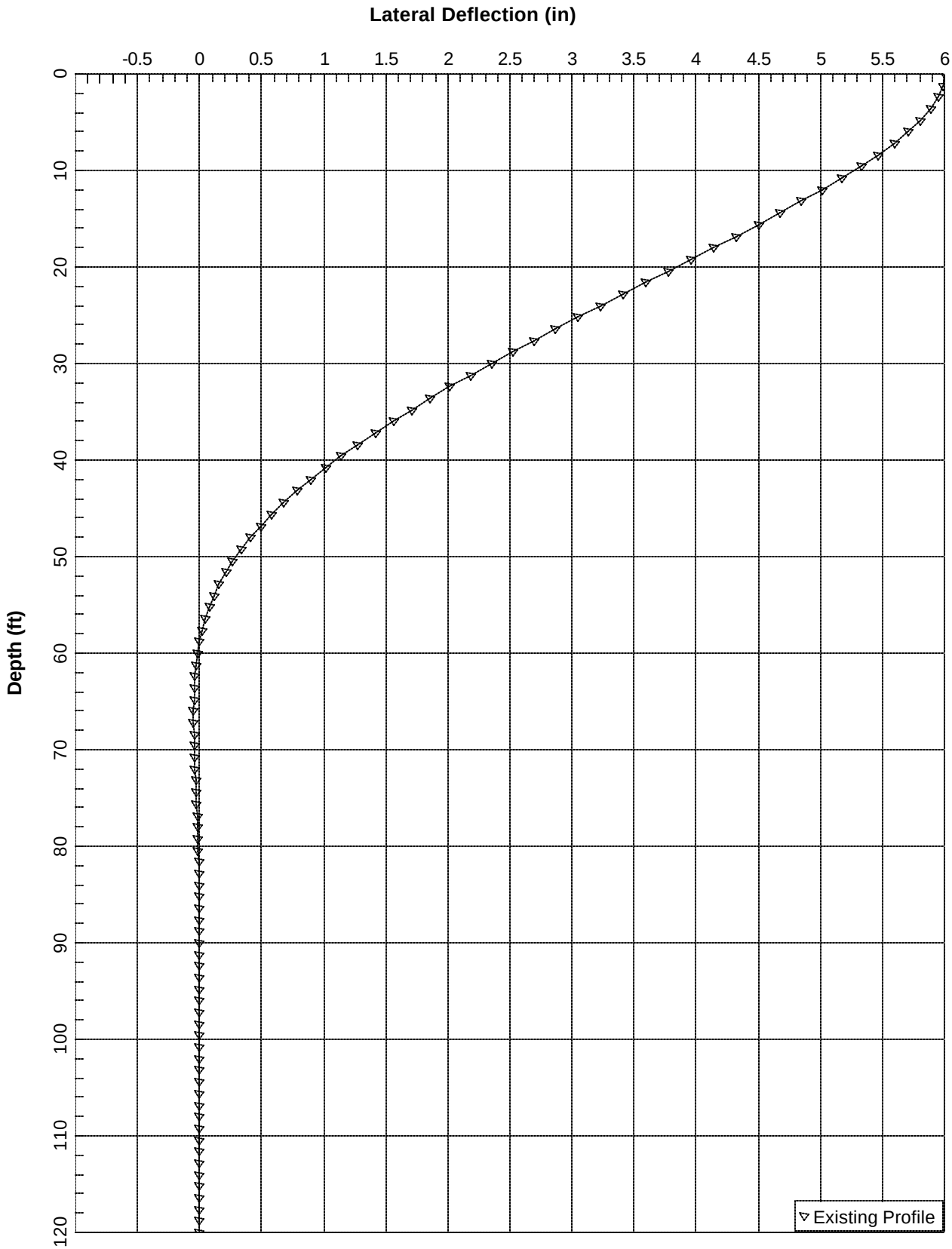

**IRIB North Pier - 6" Deflection/Fixed Head - 5' Dia. Shaft**



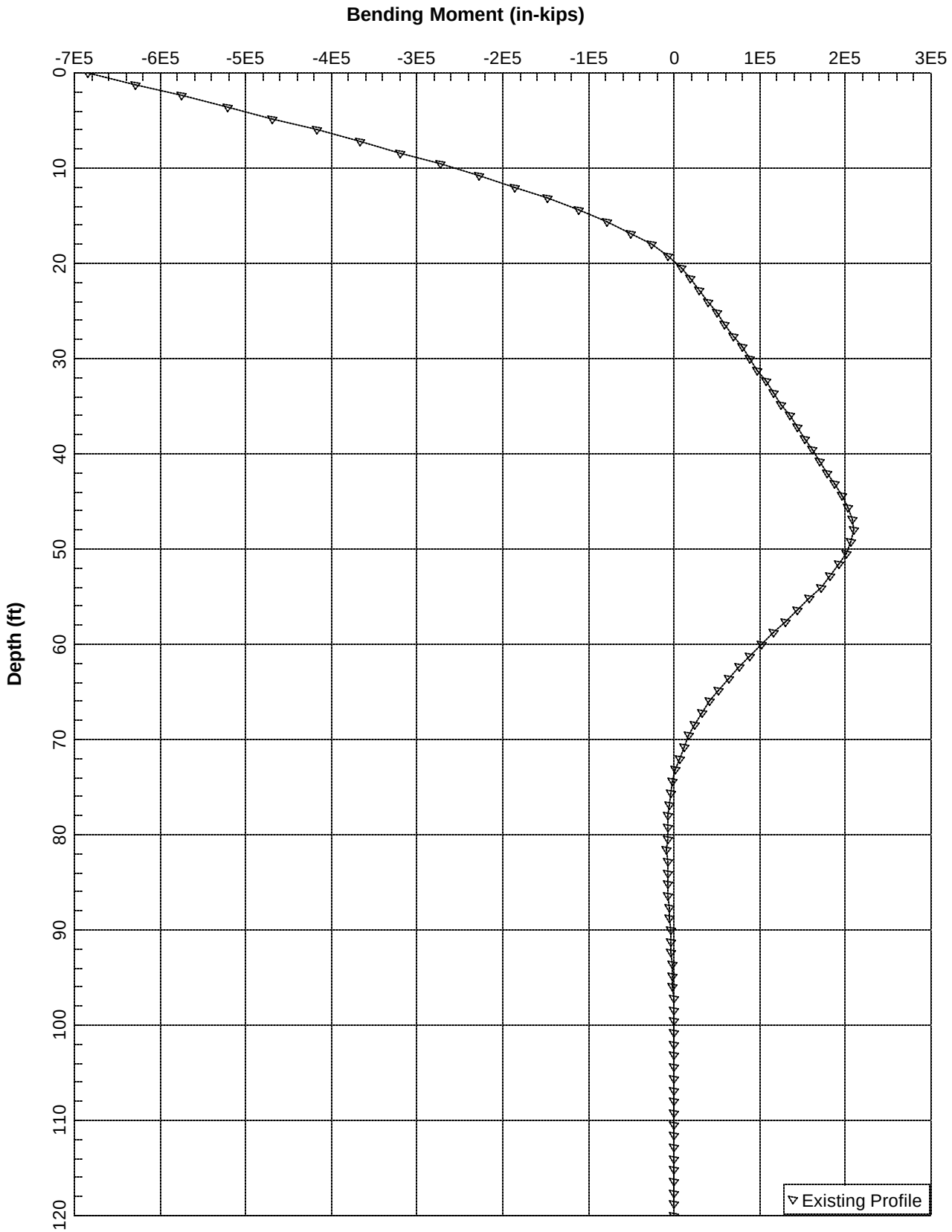

**IRIB North Pier - 6" Deflection/Fixed Head - 5' Dia. Shaft**



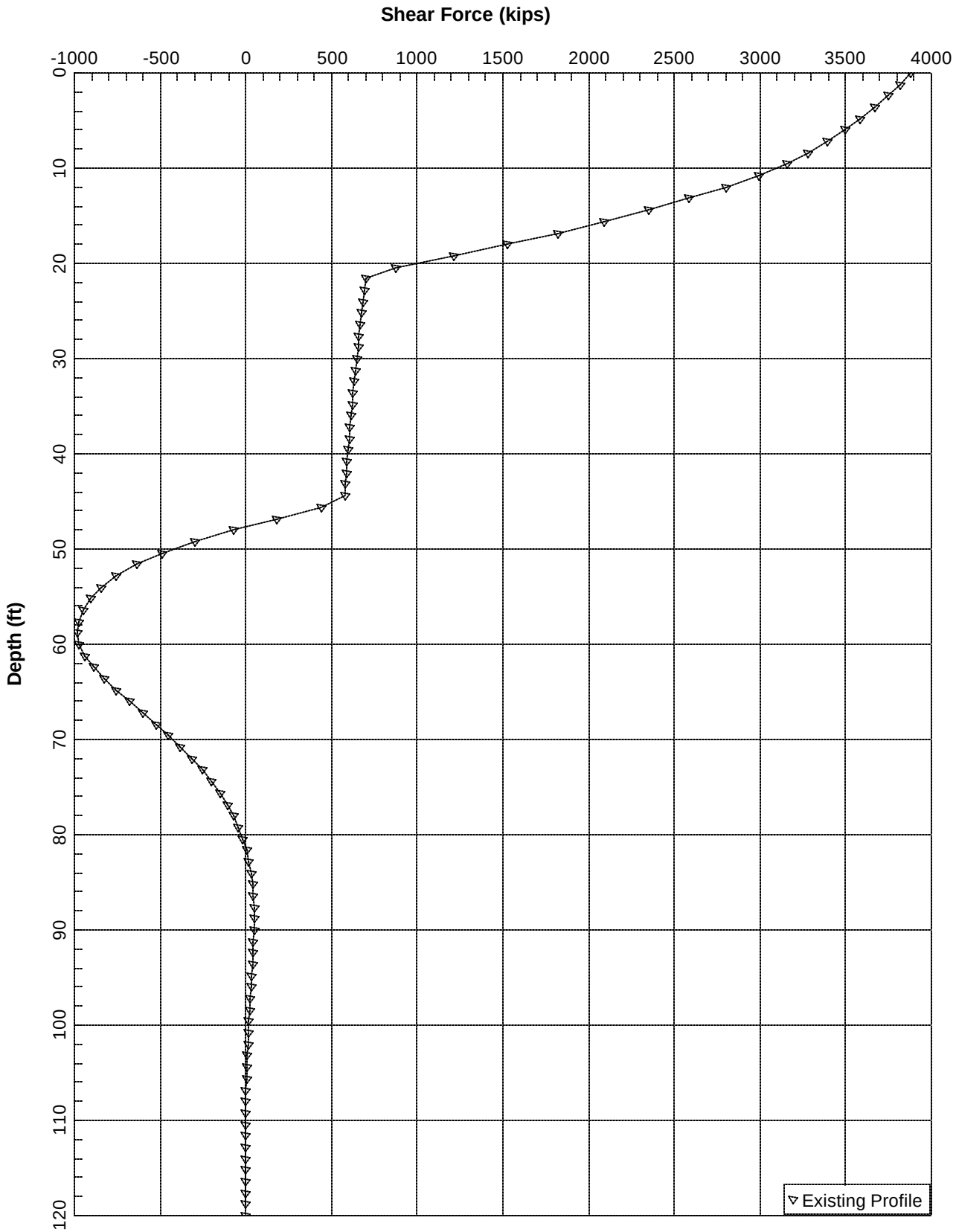

**IRIB North Pier - 6" Deflection/Fixed Head - 5' Dia. Shaft**



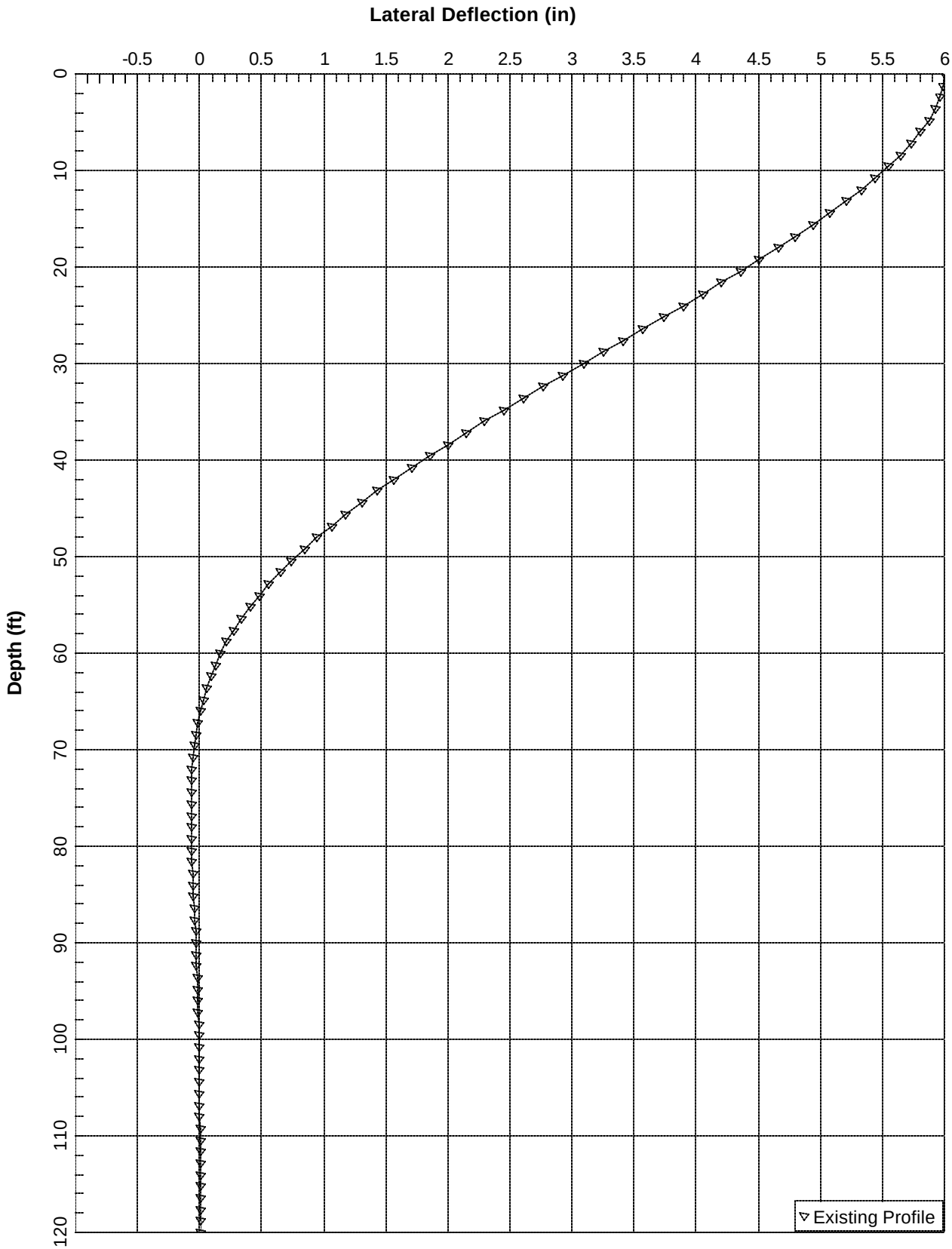

**IRIB North Pier - 6" Deflection/Fixed Head - 6' Dia. Shaft**



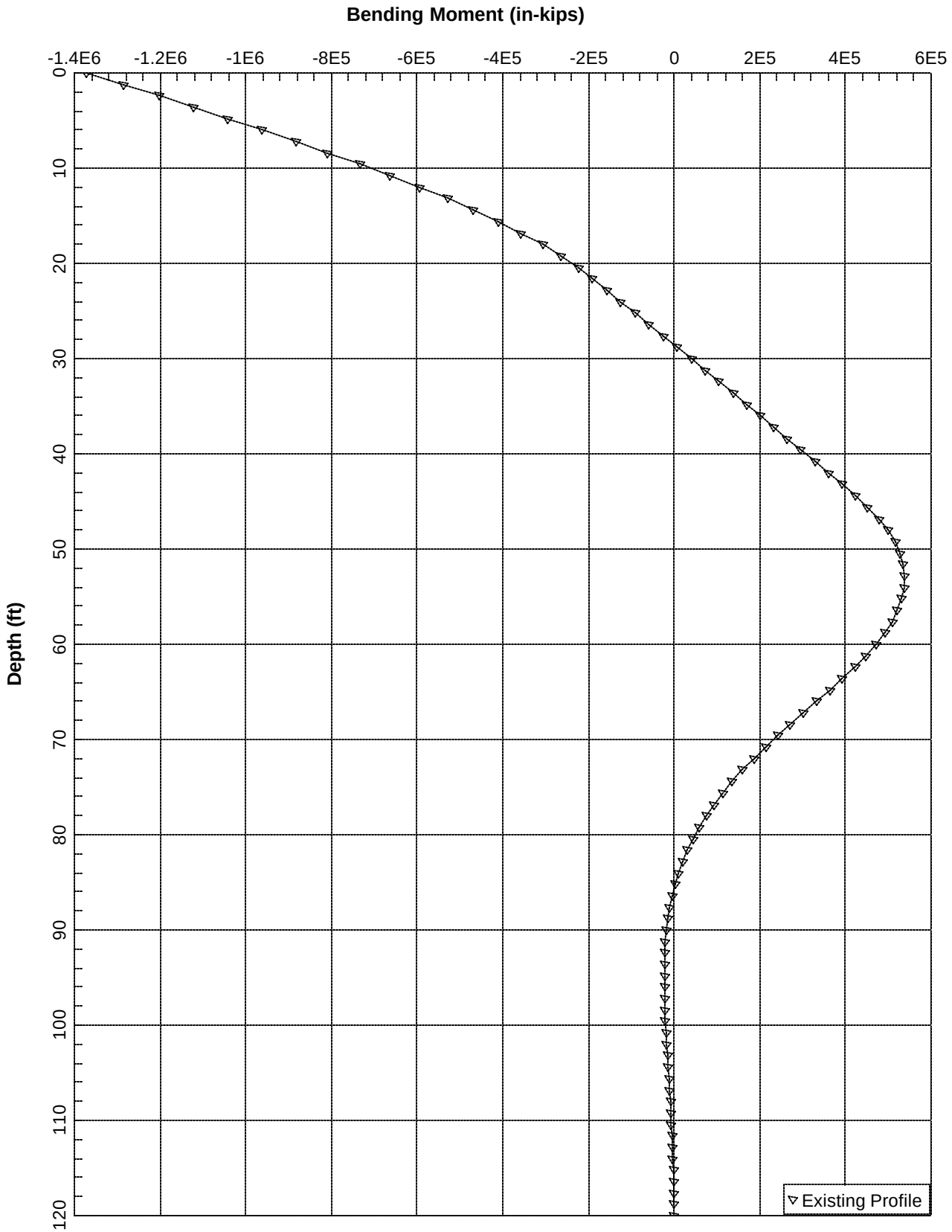

**IRIB North Pier - 6" Deflection/Fixed Head - 6' Dia. Shaft**



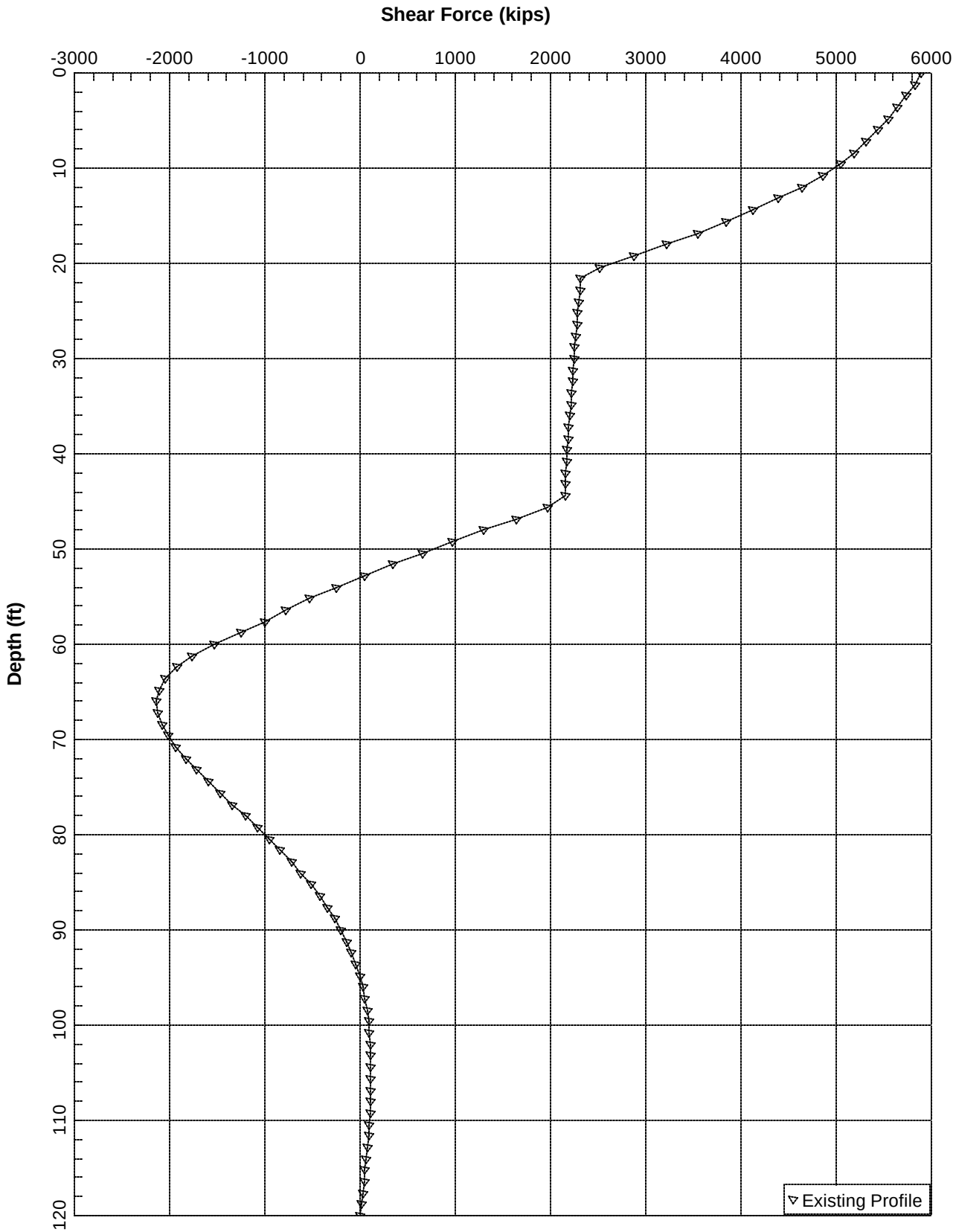

**IRIB North Pier - 6" Deflection/Fixed Head - 6' Dia. Shaft**



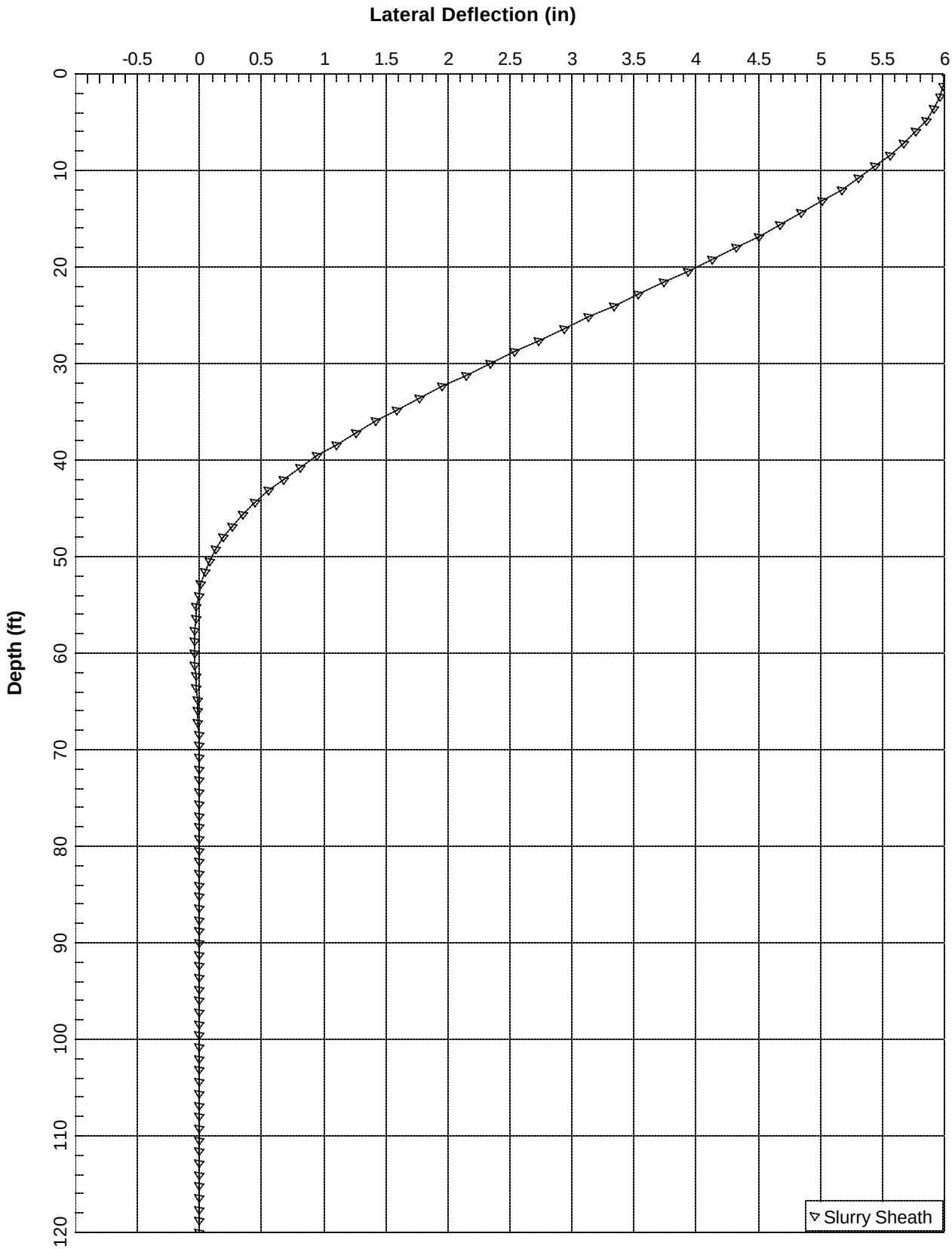

**IRIB North Pier - 6" Deflection/Fixed Head - 8' Dia. Shaft**



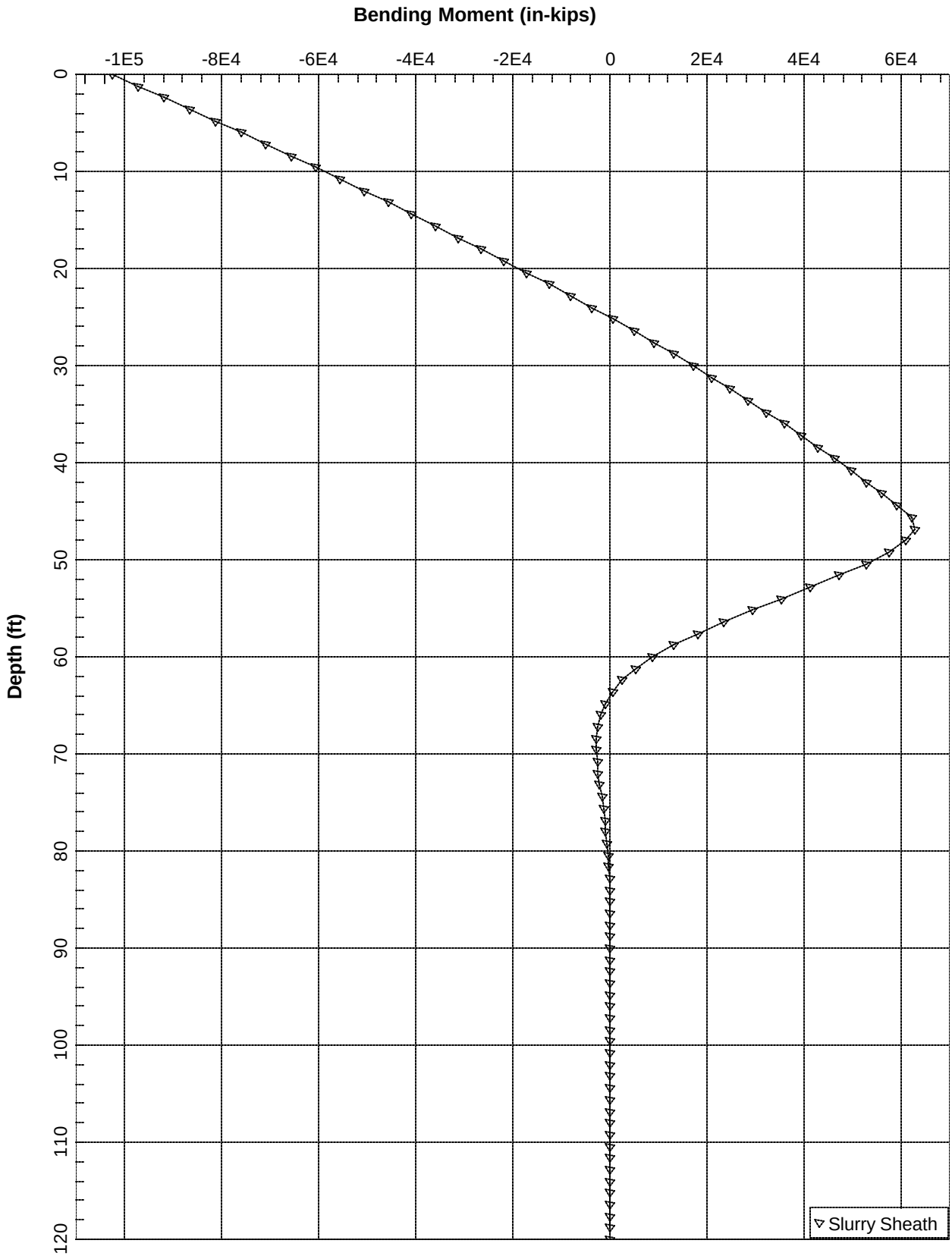

**IRIB North Pier - 6" Deflection/Fixed Head - 8' Dia. Shaft**



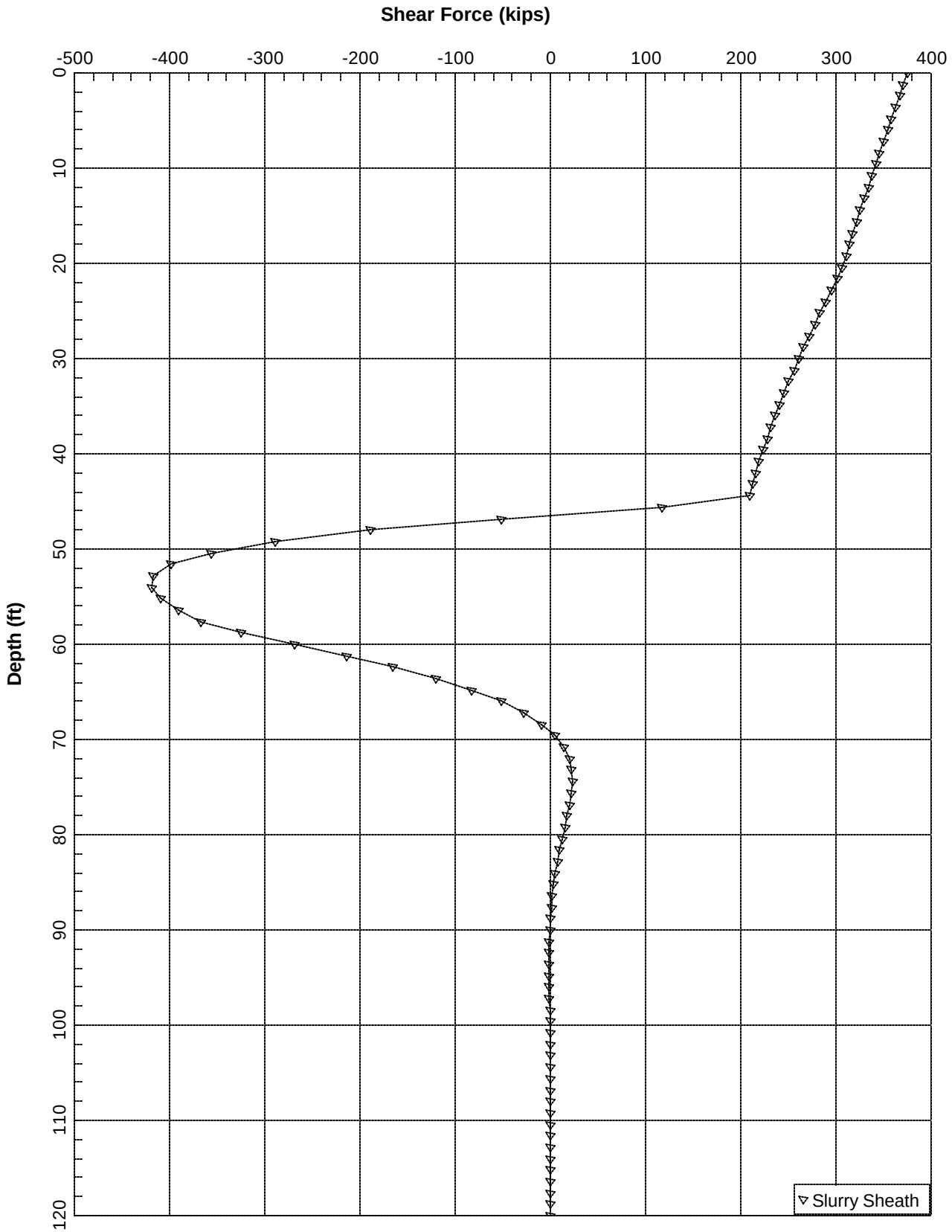

**IRIB North Pier - 6" Deflection/Fixed Head - 8' Dia. Shaft**



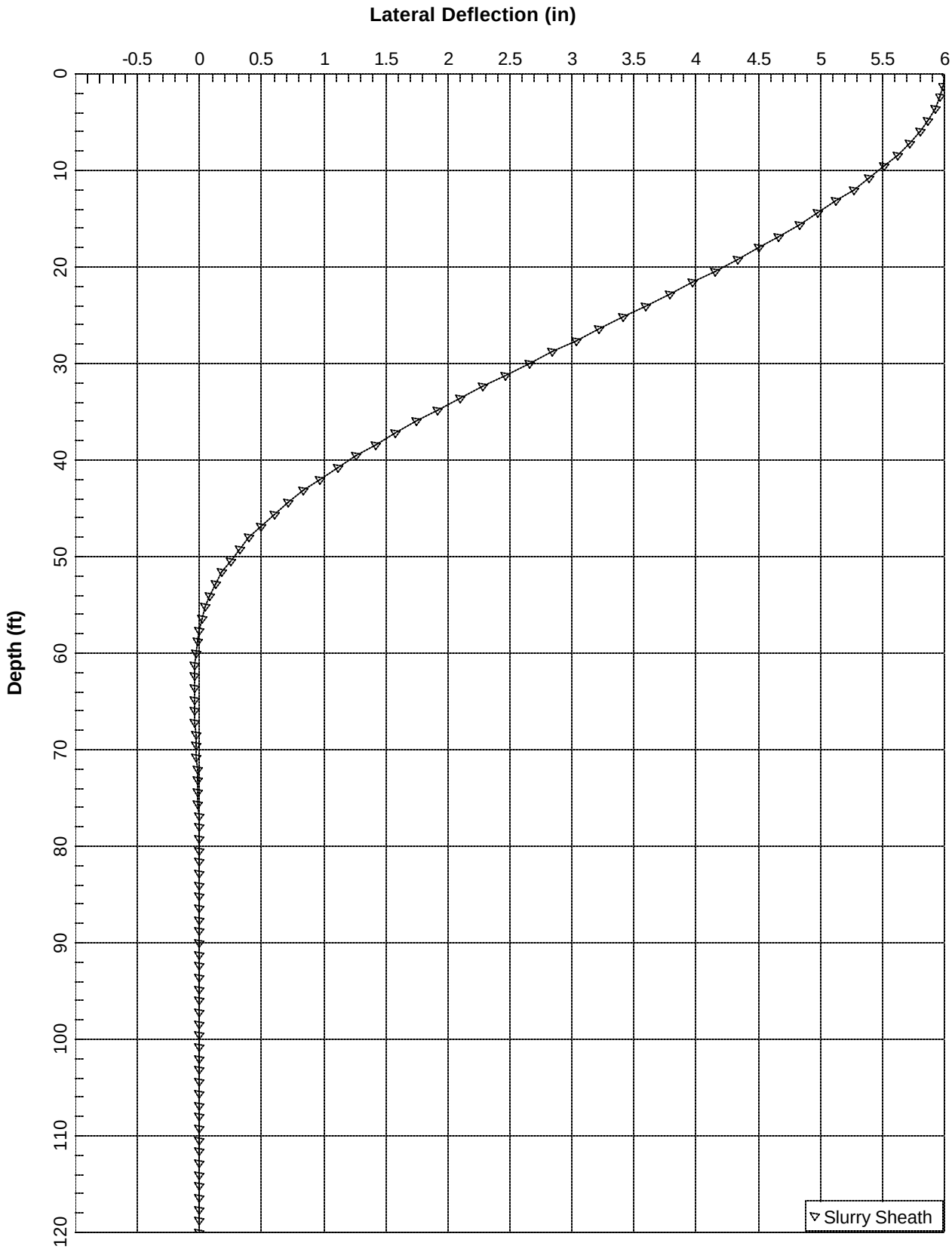

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 4' Dia. Shaft**



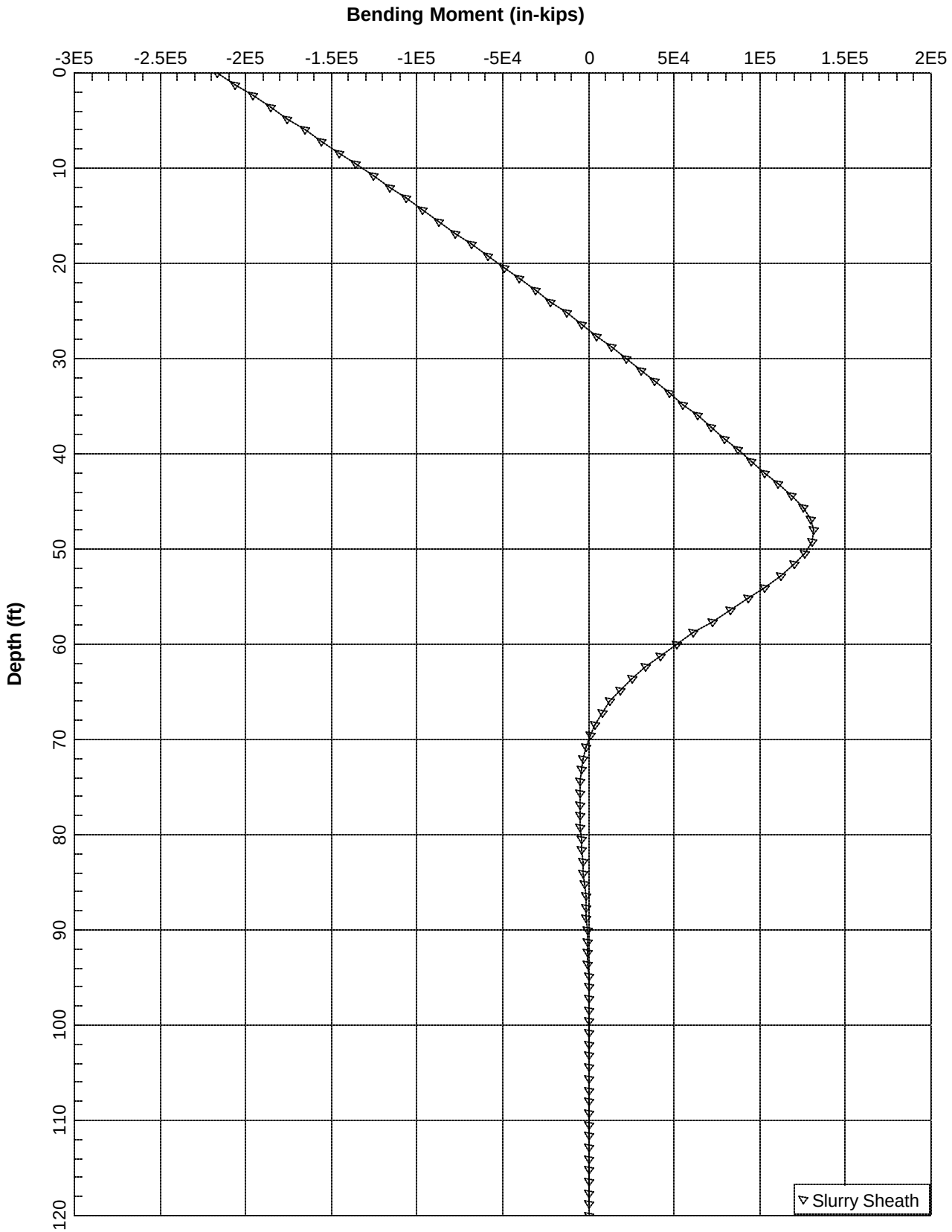

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 4' Dia. Shaft**



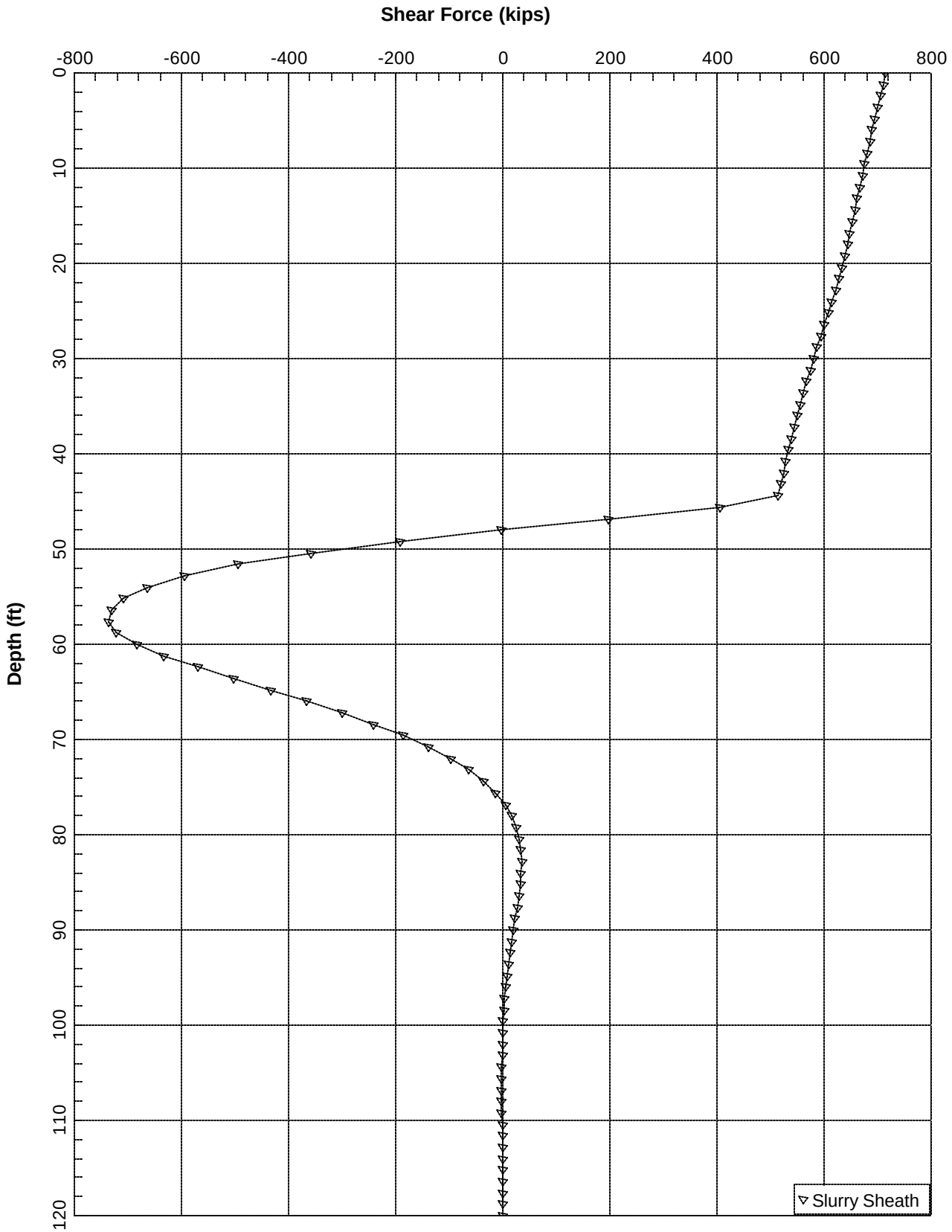

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 4' Dia. Shaft**



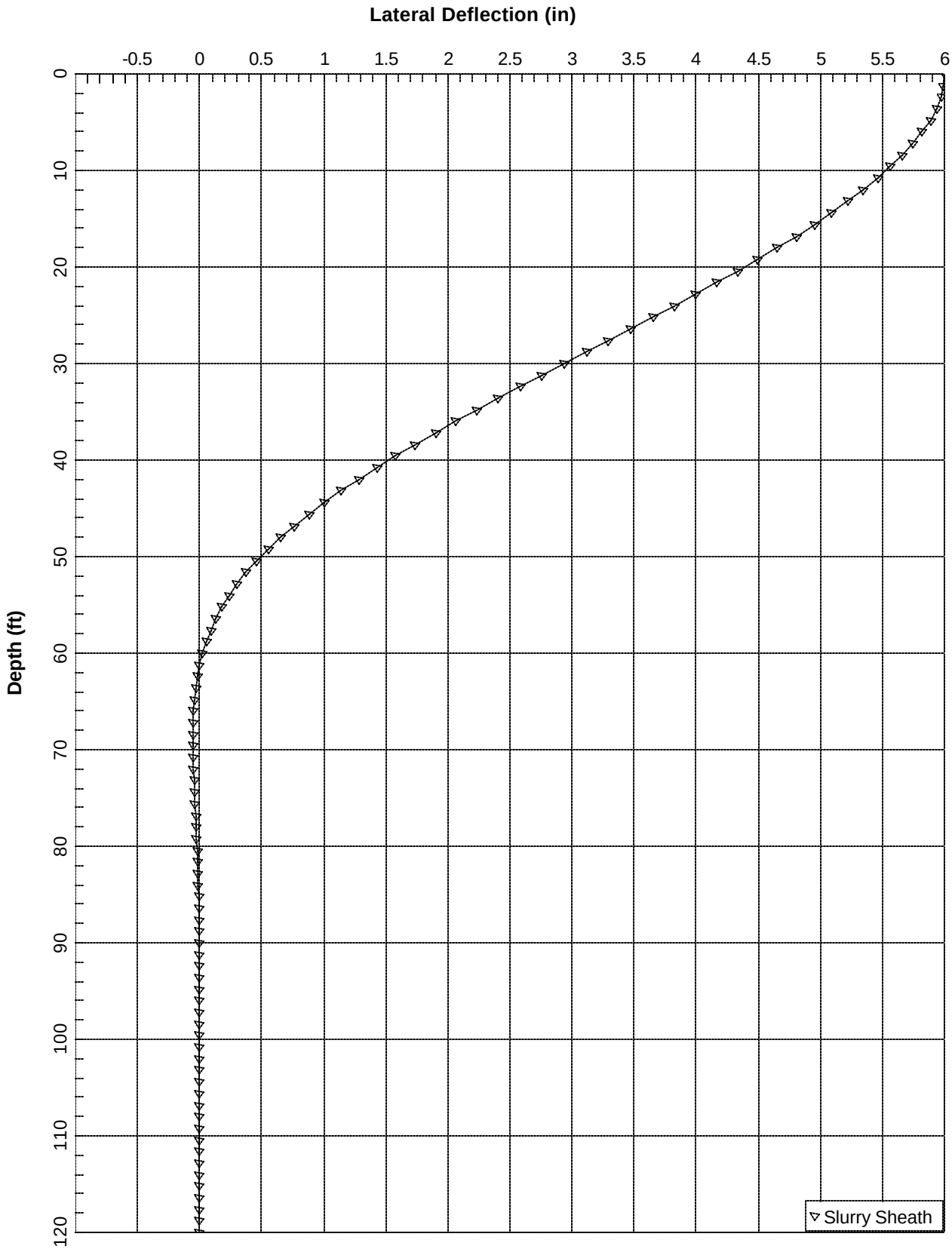

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 5' Dia. Shaft**



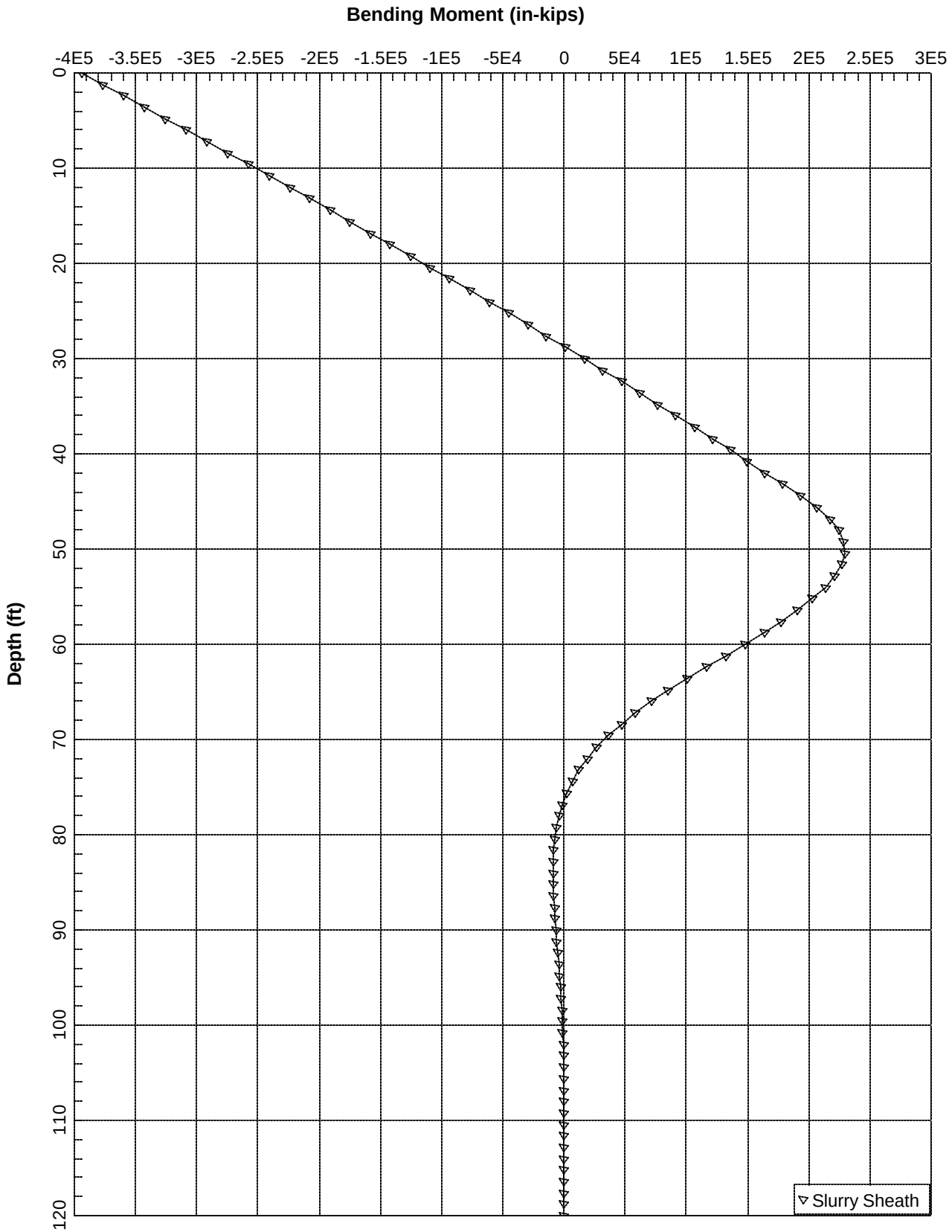

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 5' Dia. Shaft**



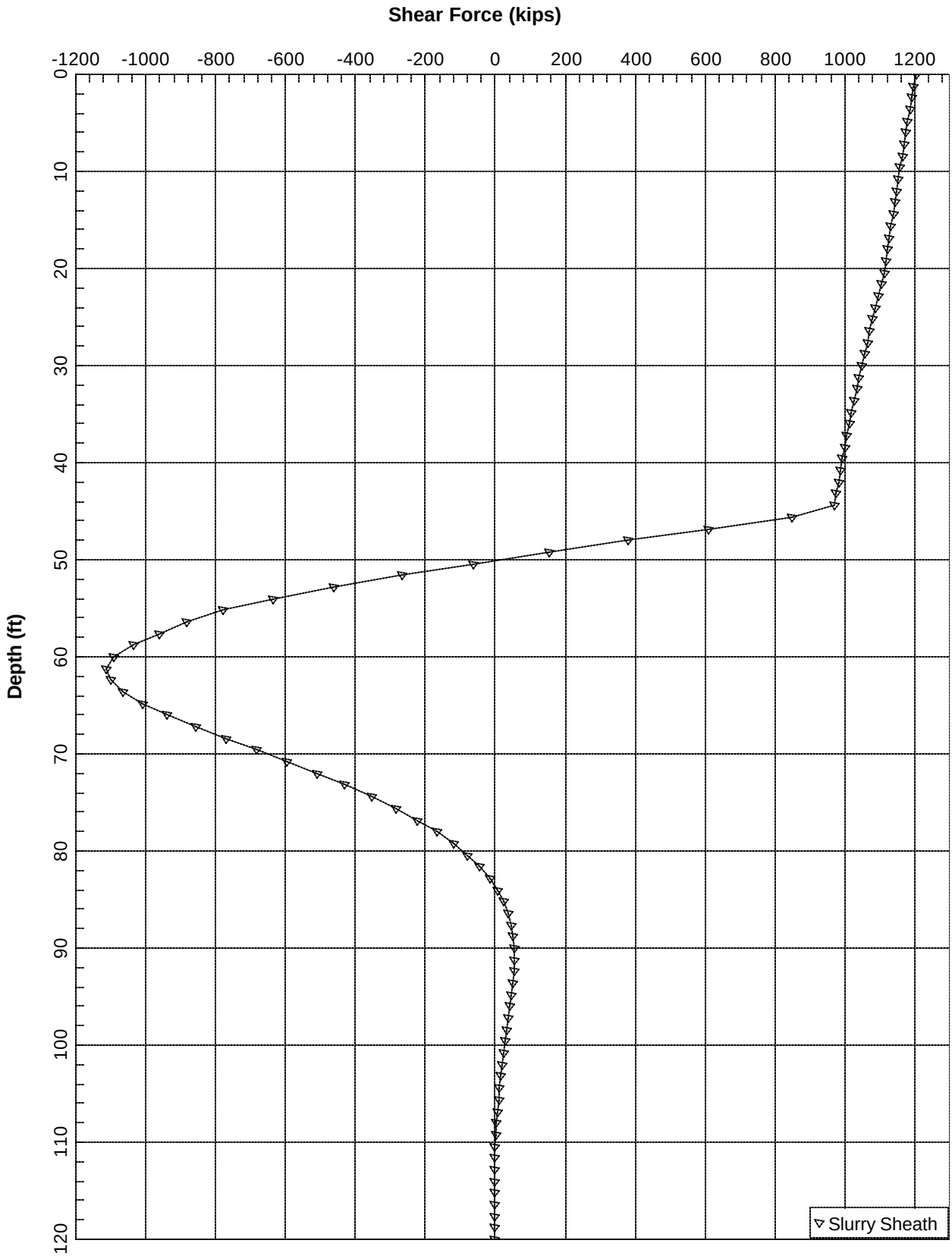

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 5' Dia. Shaft**



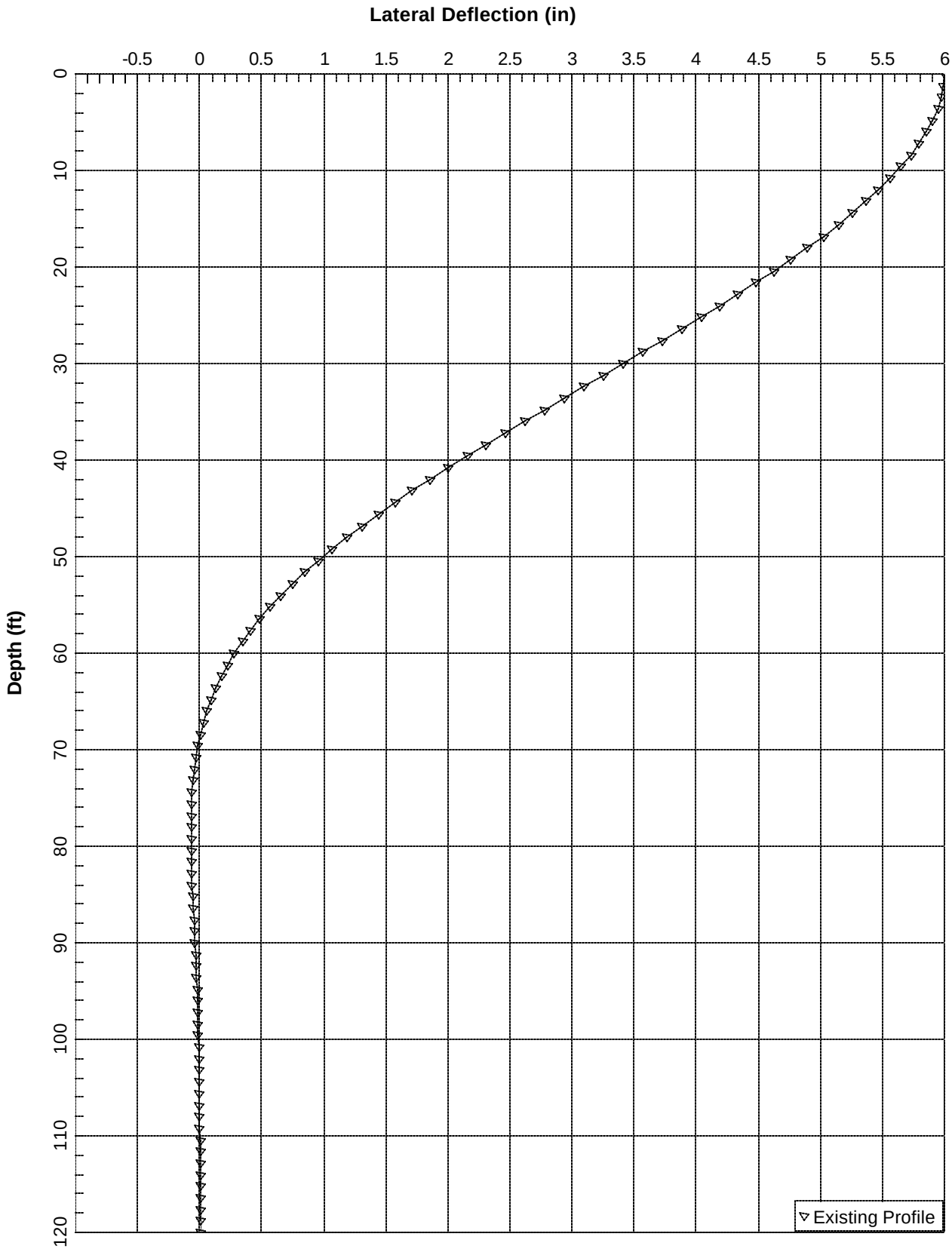

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 6' Dia. Shaft**



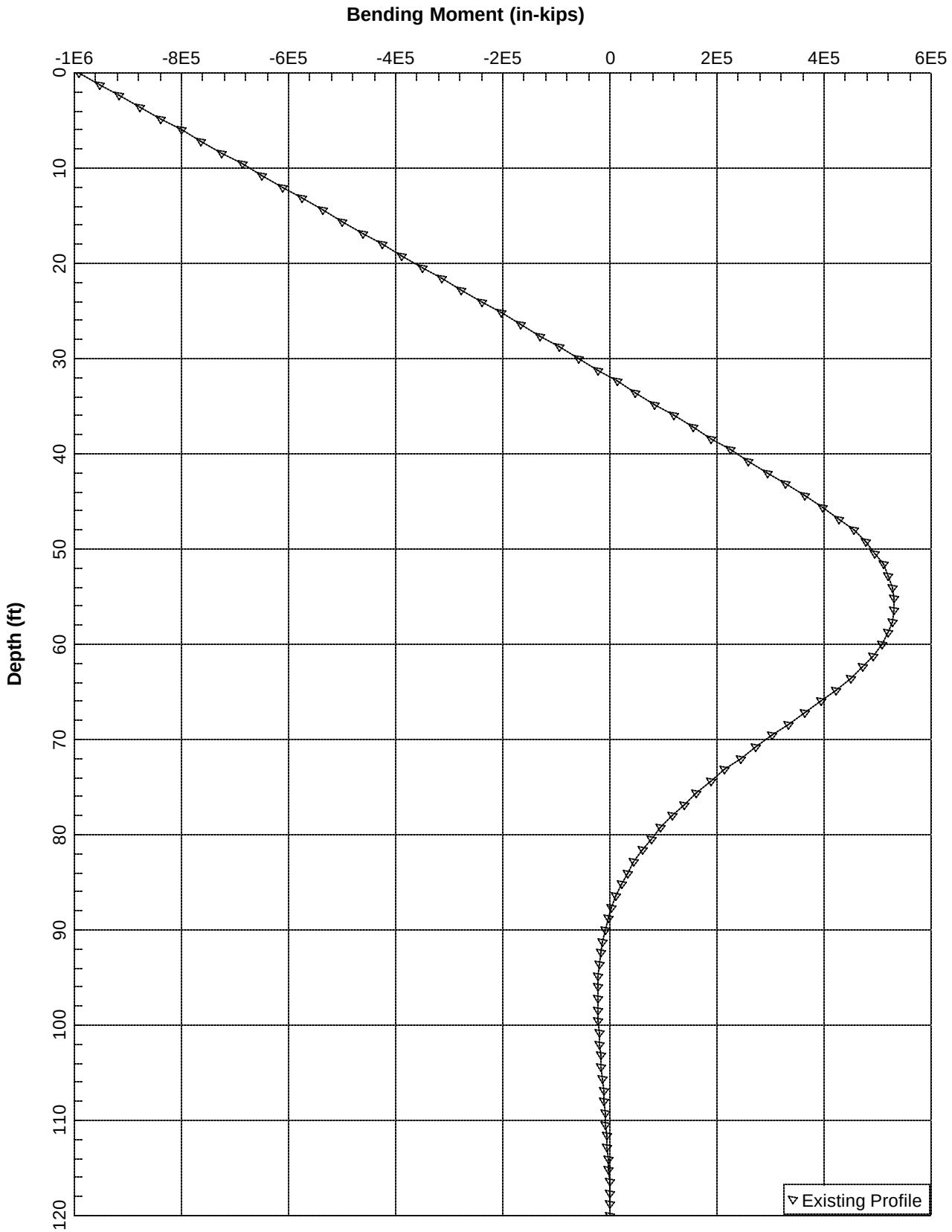

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 6' Dia. Shaft**



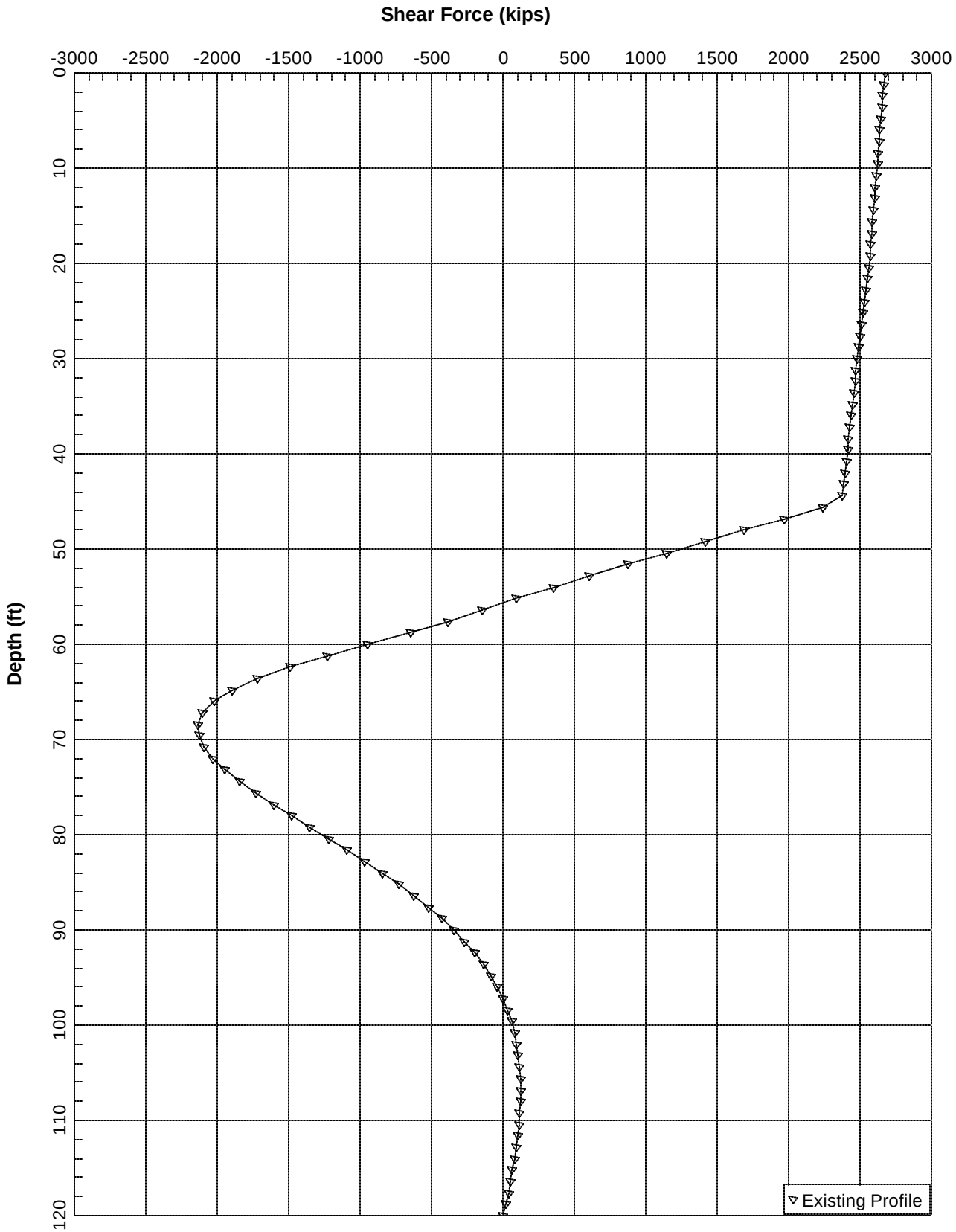

**IRIB North Pier - 6" Deflection/Fixed Head/Flexible Foundation - 6' Dia. Shaft**



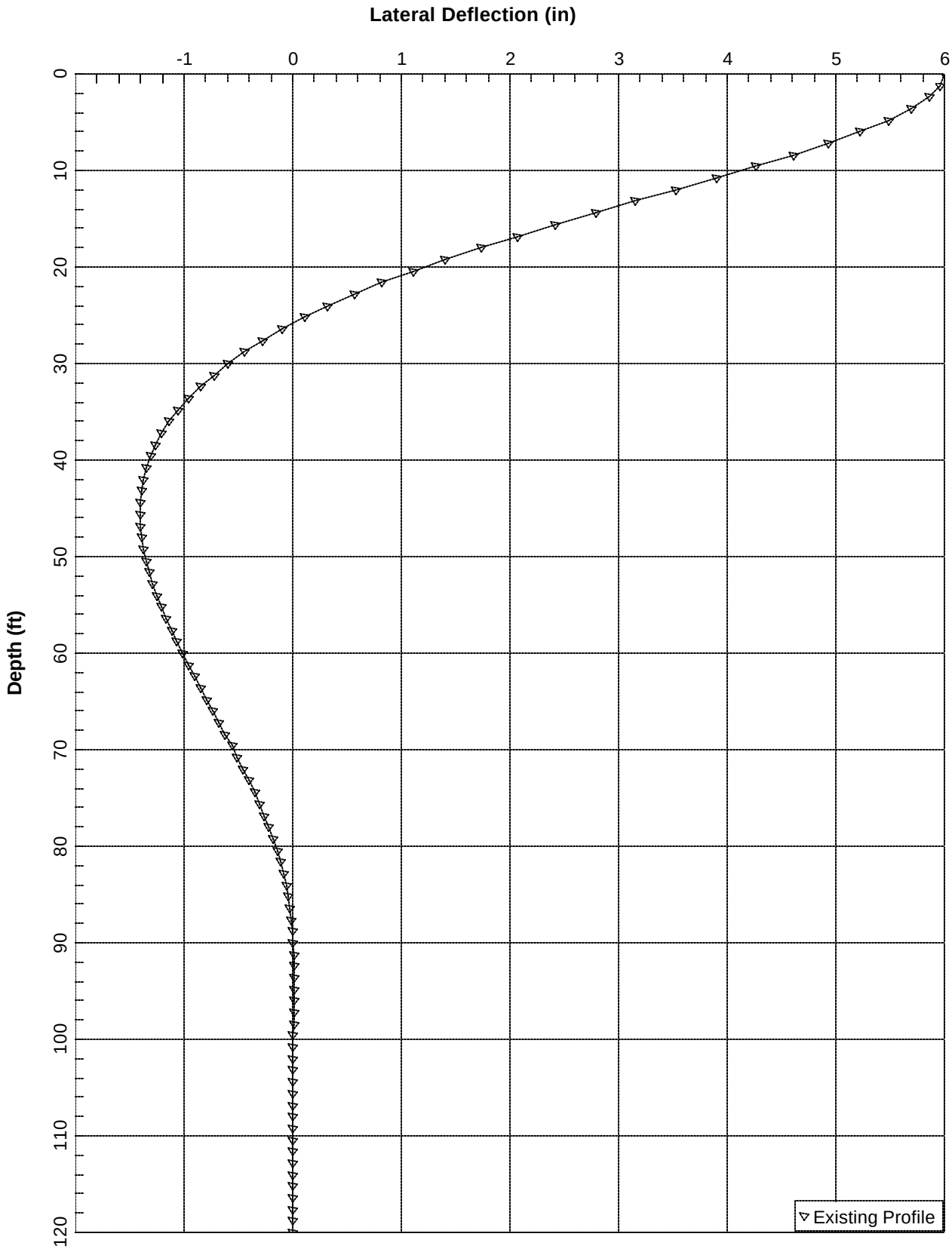

**IRIB North Pier - 6" Deflection/Fixed Head - 8' Dia. Shaft**



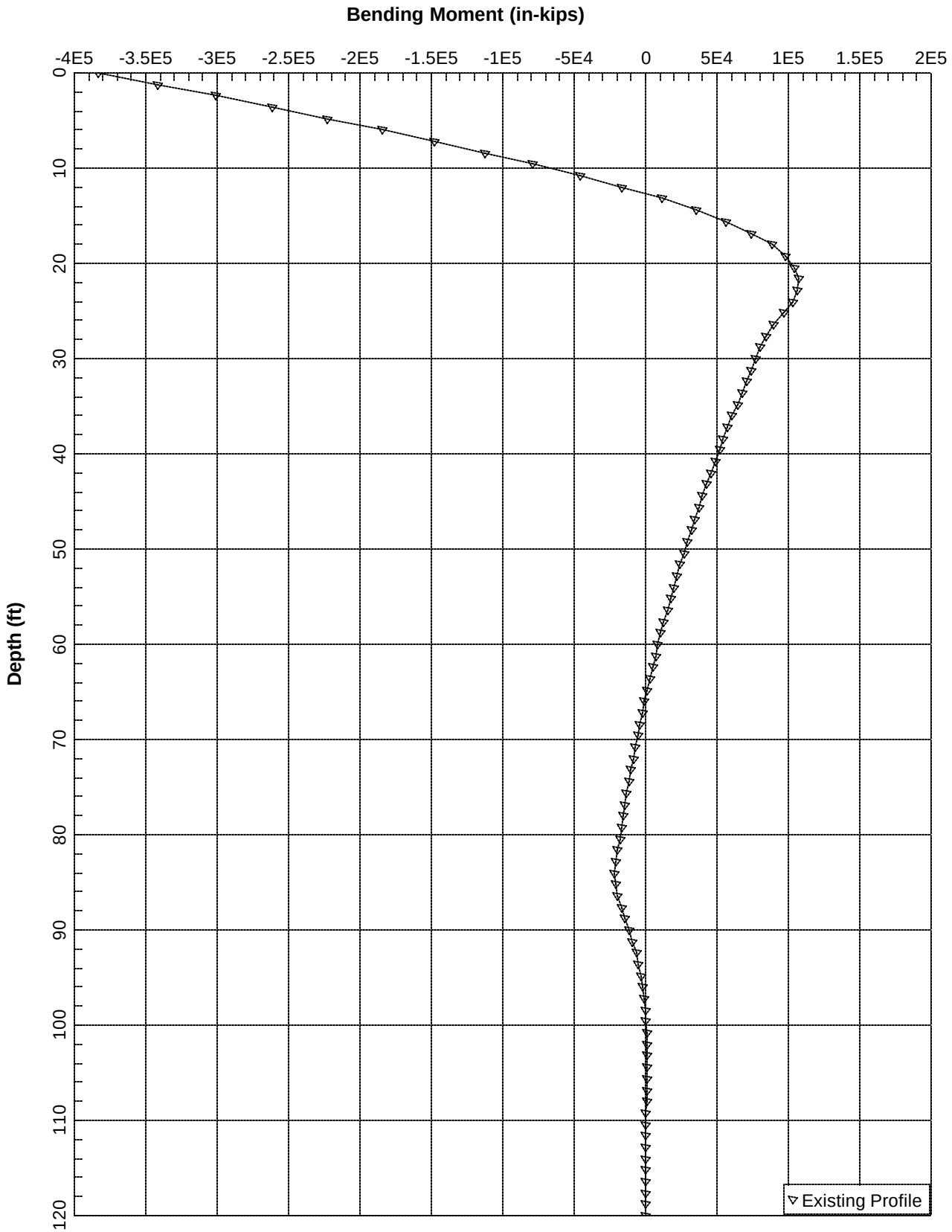

**IRIB North Pier - 6" Deflection/Fixed Head - 8' Dia. Shaft**



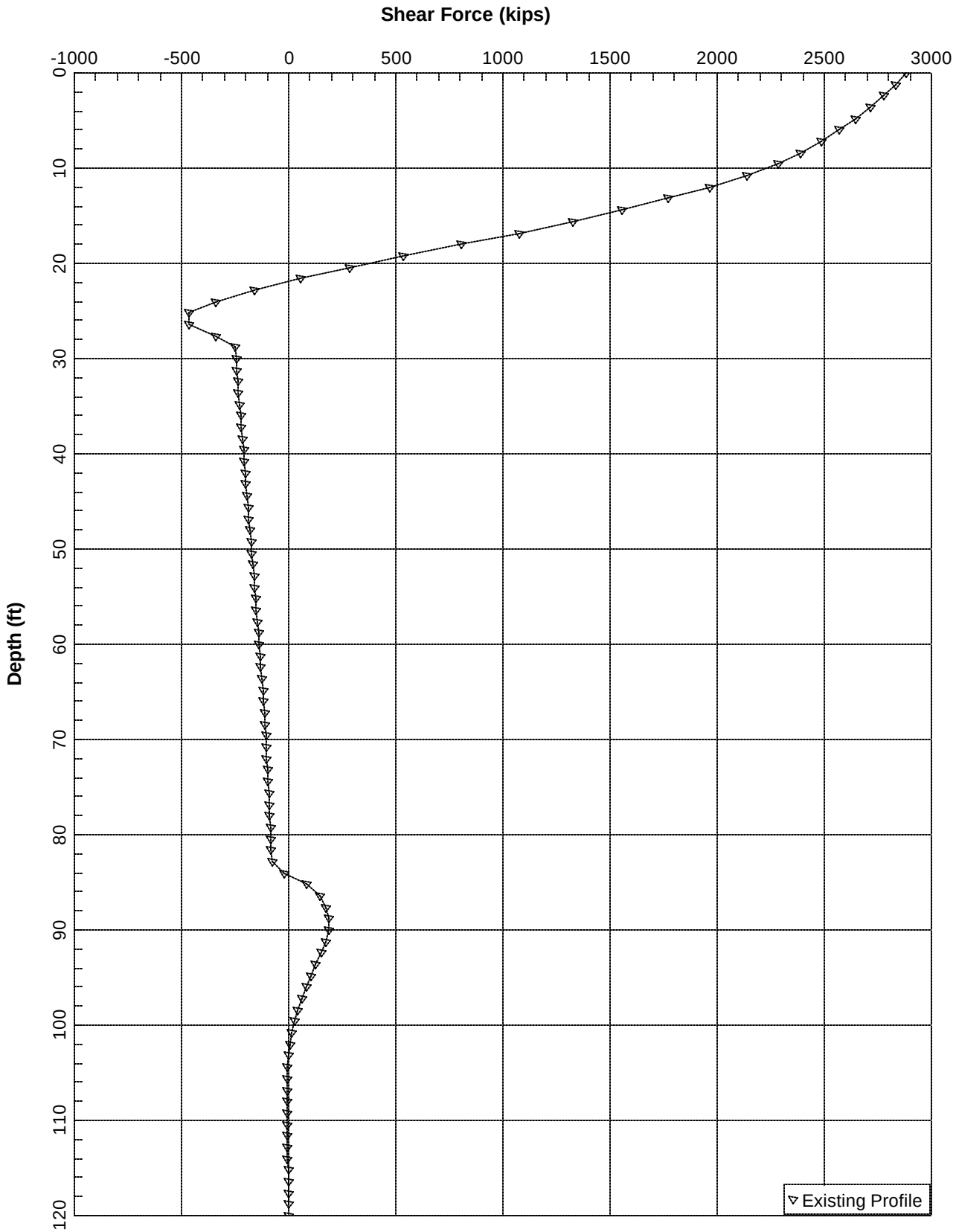

**IRIB North Pier - 6" Deflection/Fixed Head - 8' Dia. Shaft**



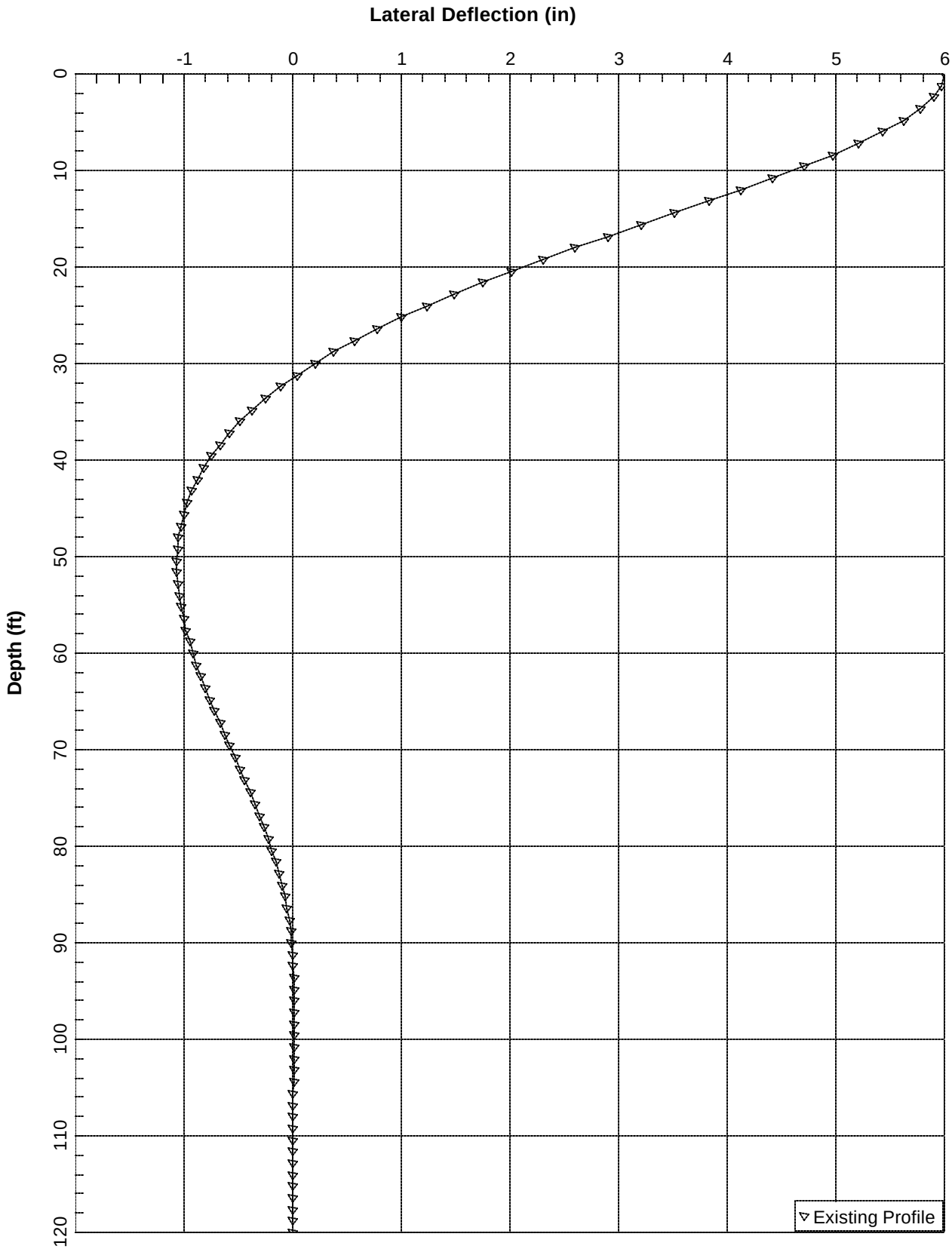

**South Pier Foundation - 6" Deflection/Fixed Head - 4' Dia. Shaft**



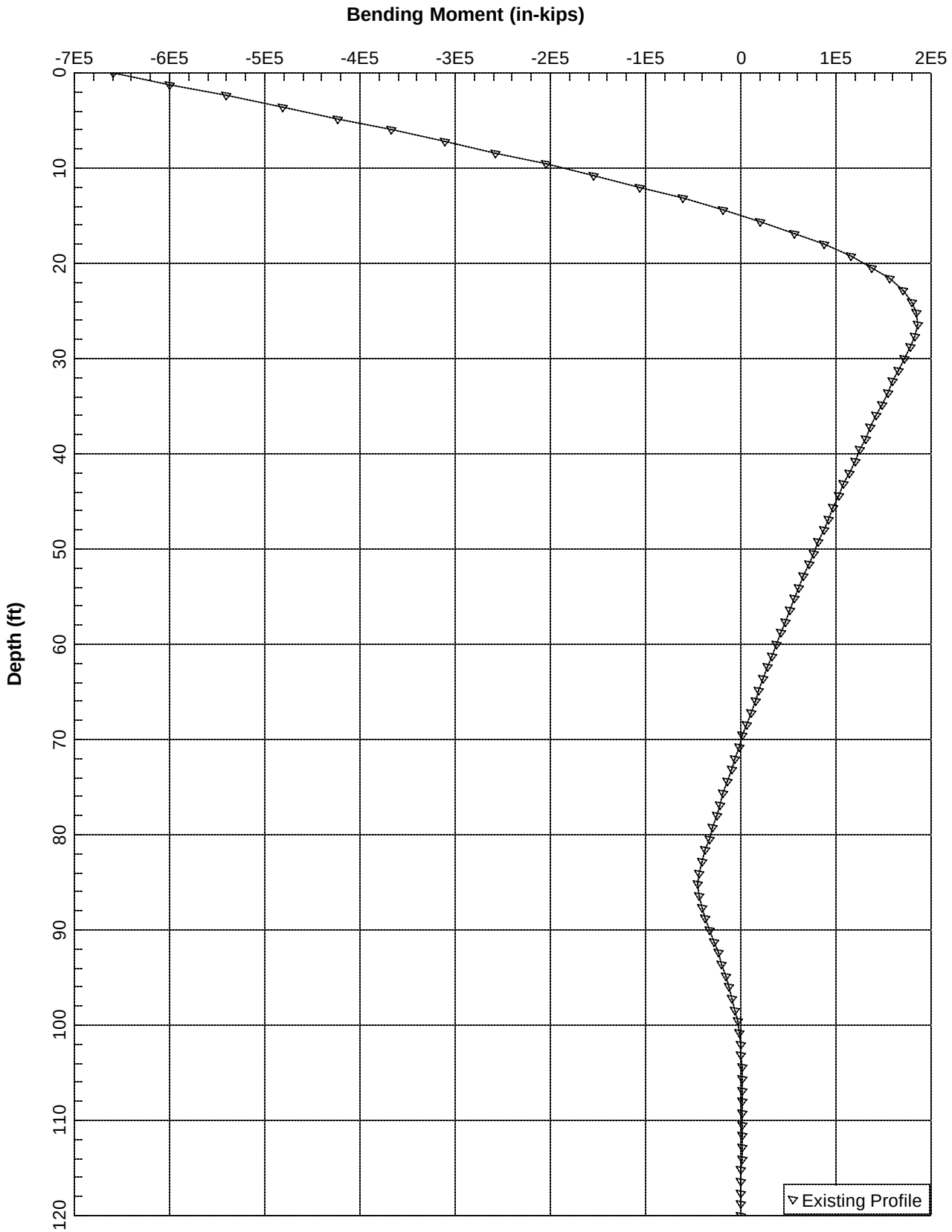

**South Pier Foundation - 6" Deflection/Fixed Head - 4' Dia. Shaft**



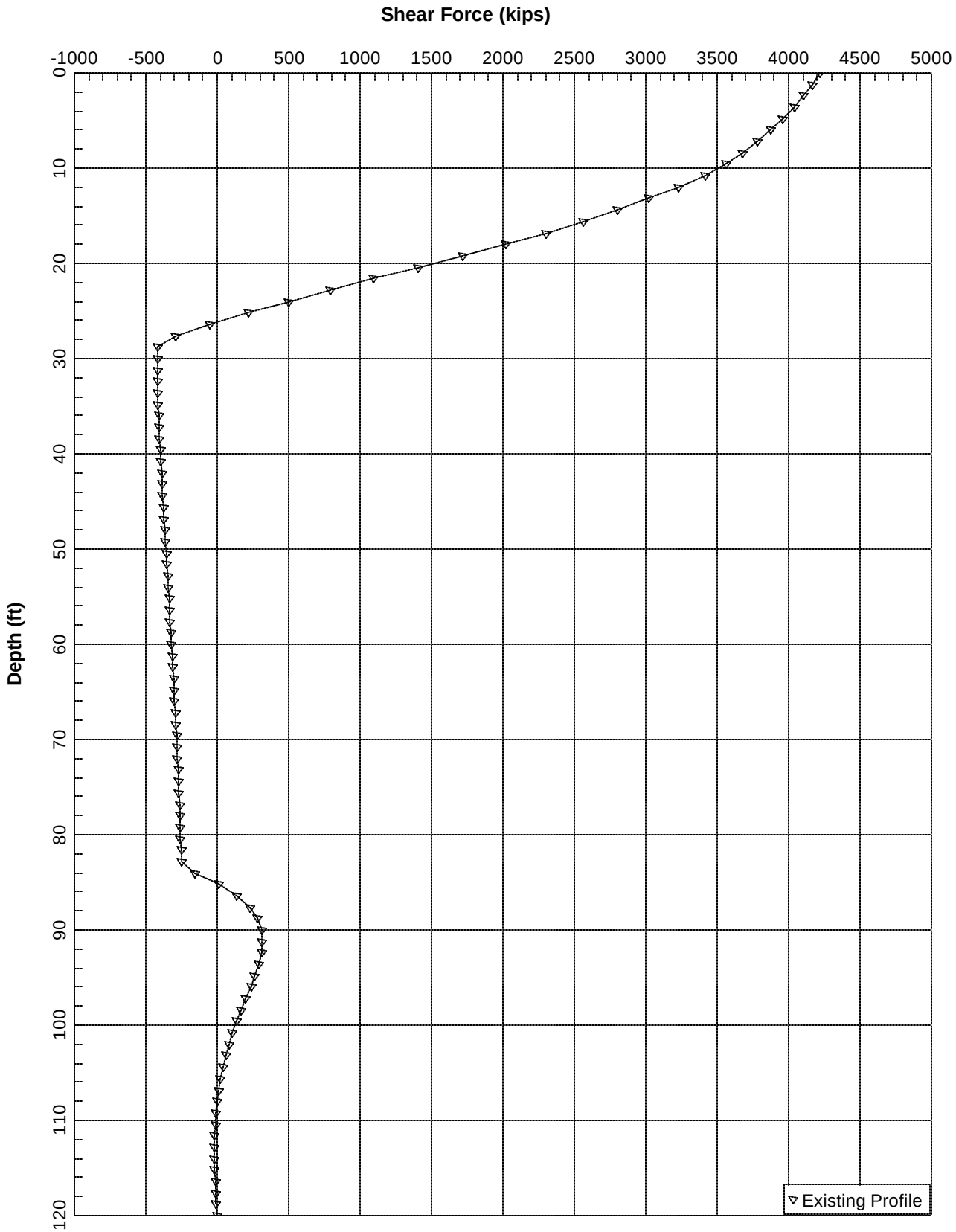

**South Pier Foundation - 6" Deflection/Fixed Head - 4' Dia. Shaft**



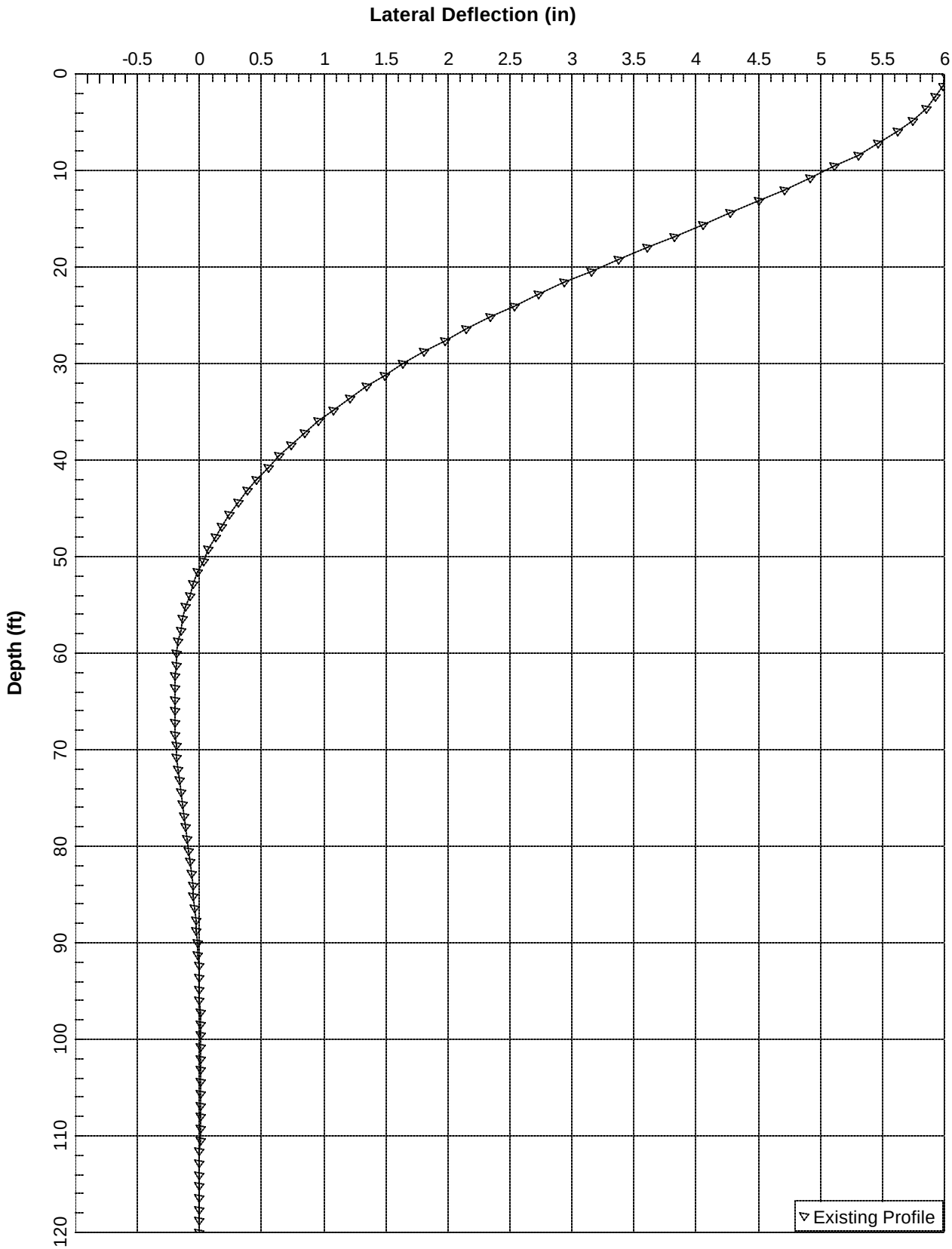

**South Pier Foundation - 6" Deflection/Fixed Head - 5' Dia. Shaft**



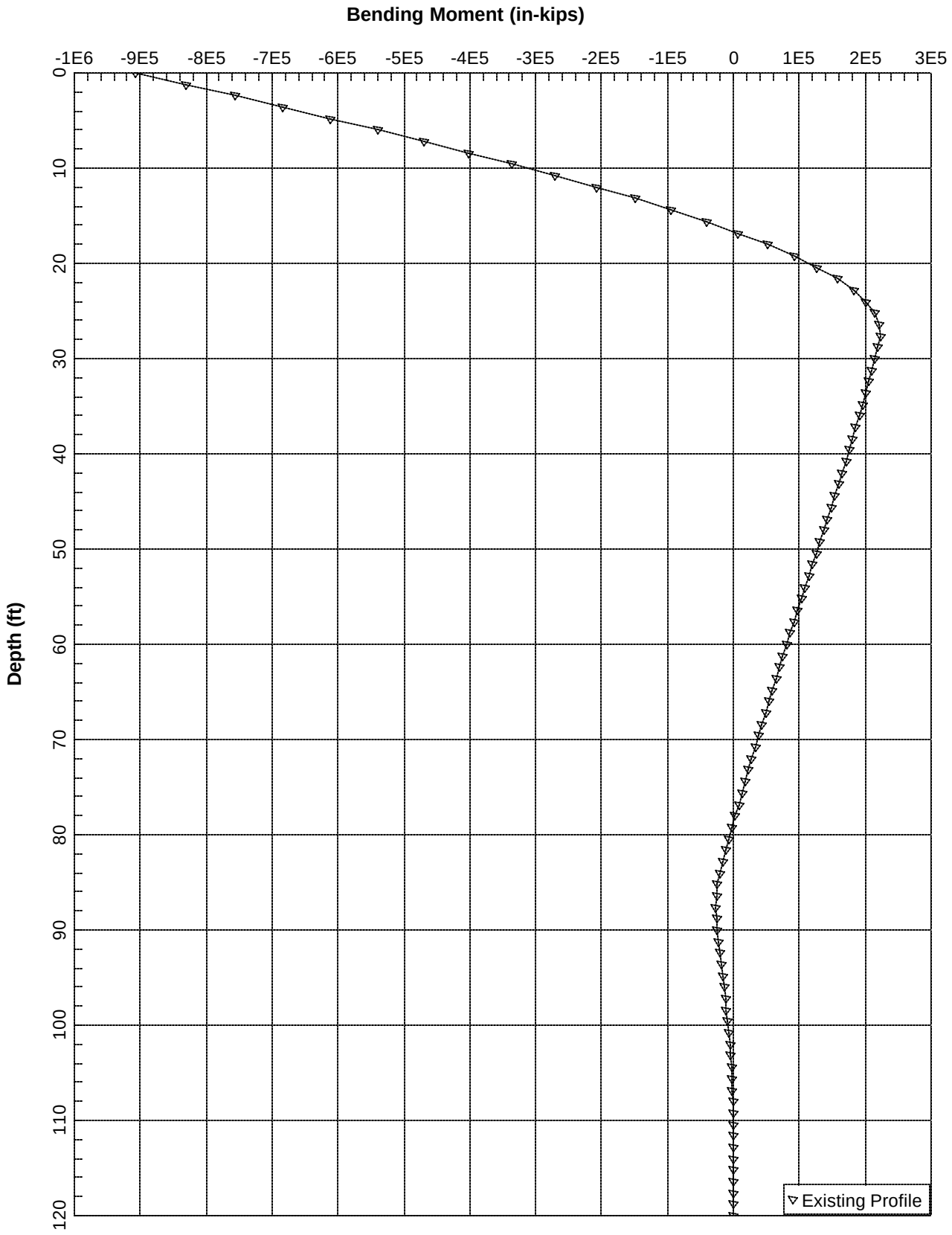

**South Pier Foundation - 6" Deflection/Fixed Head - 5' Dia. Shaft**



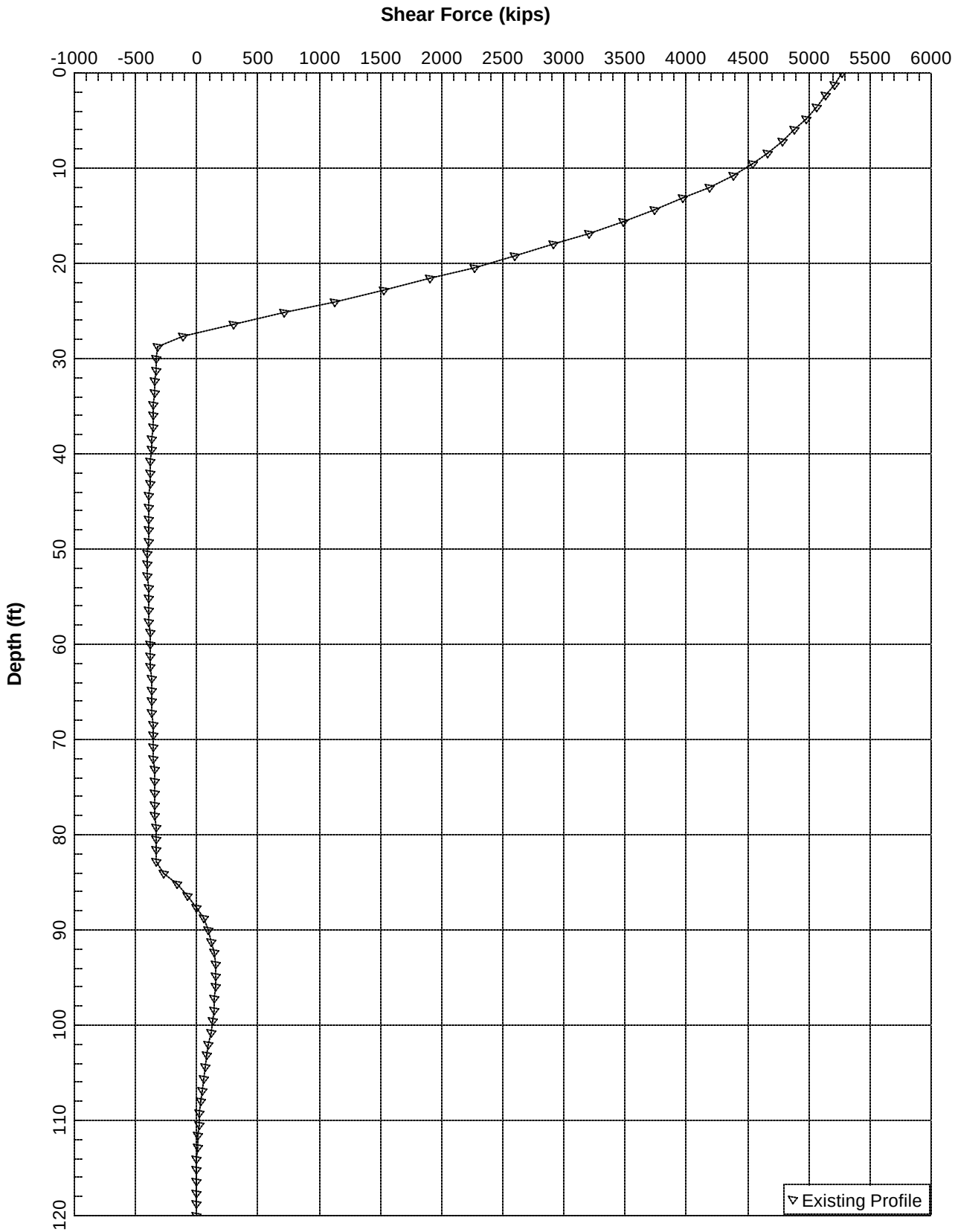

**South Pier Foundation - 6" Deflection/Fixed Head - 5' Dia. Shaft**



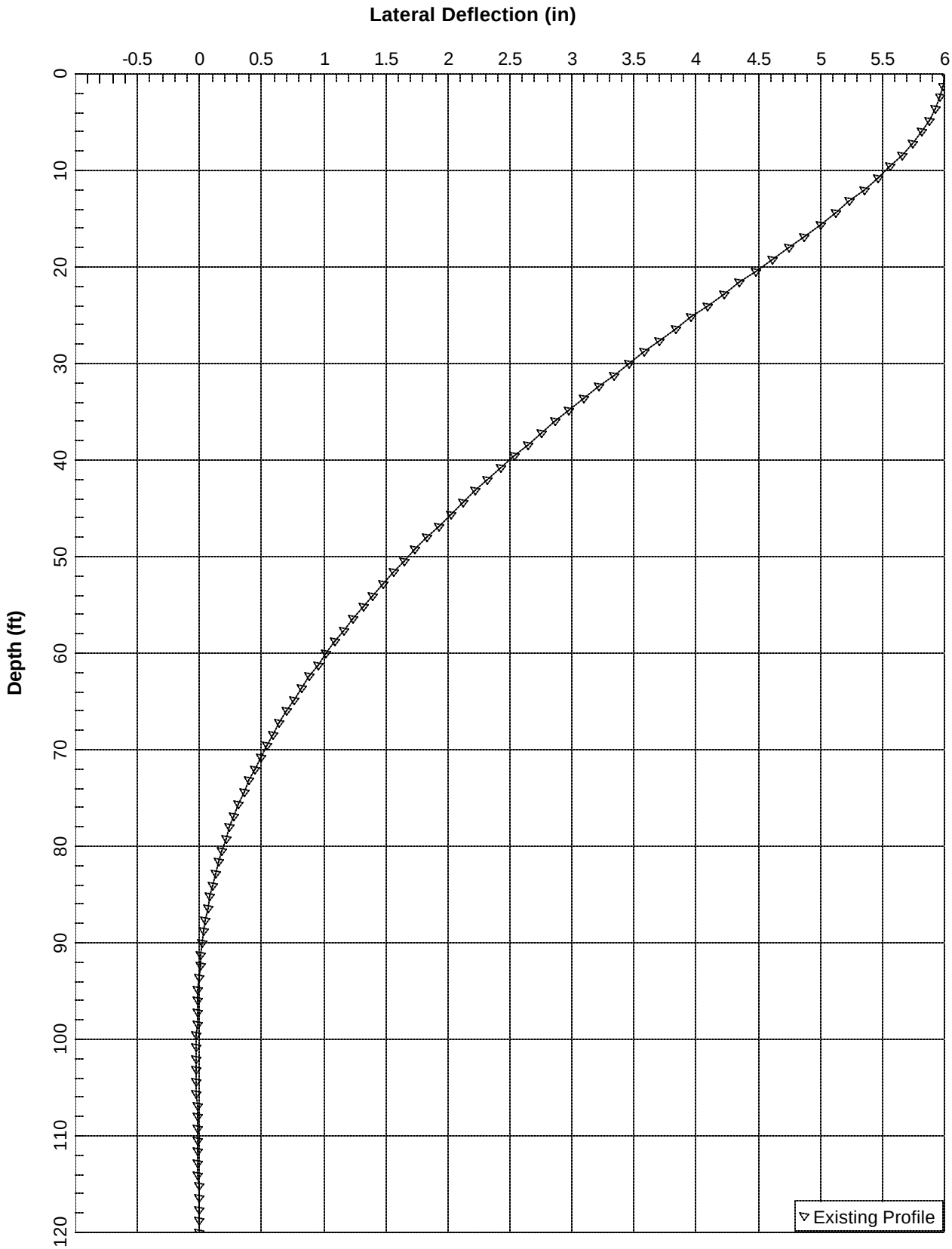

**South Pier Foundation - 6" Deflection/Fixed Head - 6' Dia. Shaft**



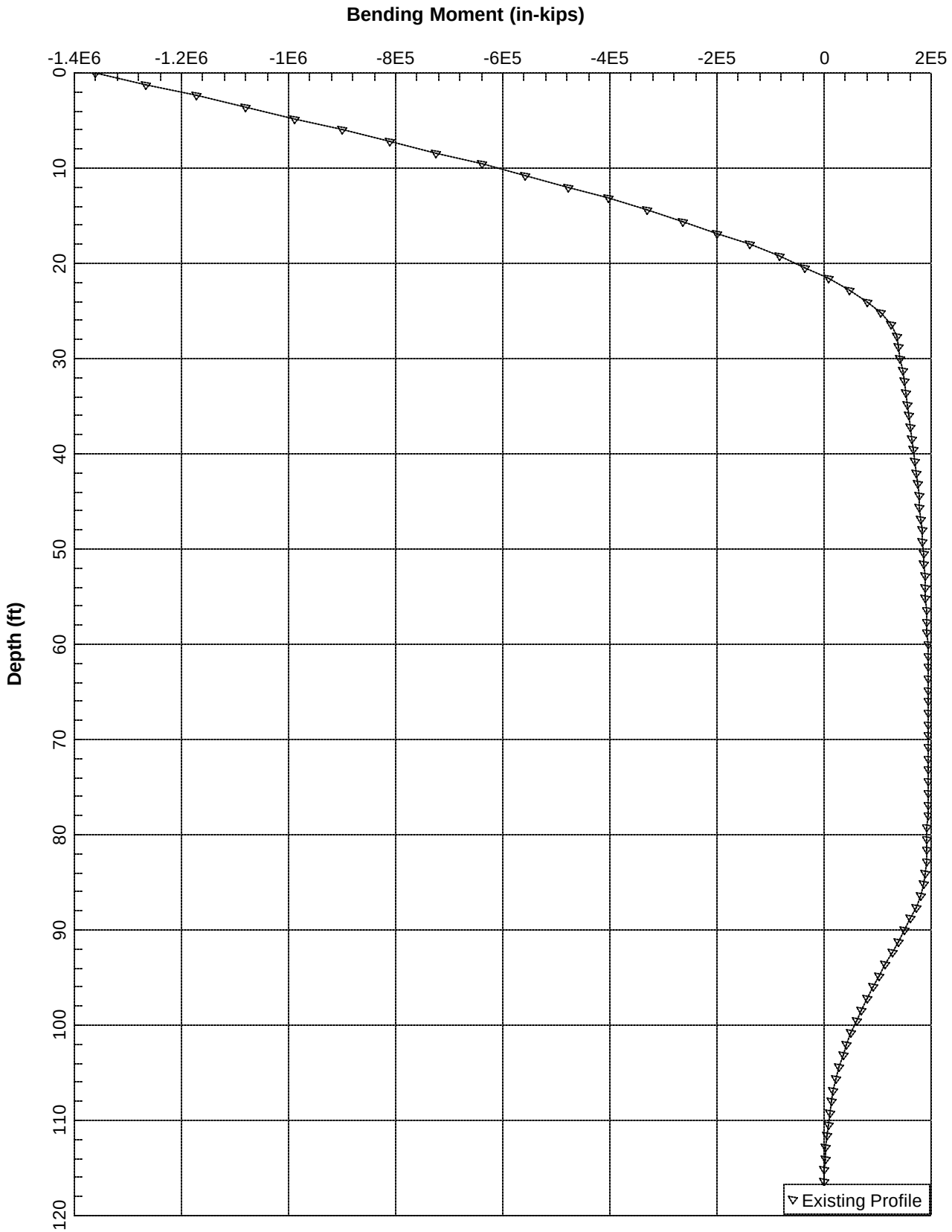

**South Pier Foundation - 6" Deflection/Fixed Head - 6' Dia. Shaft**



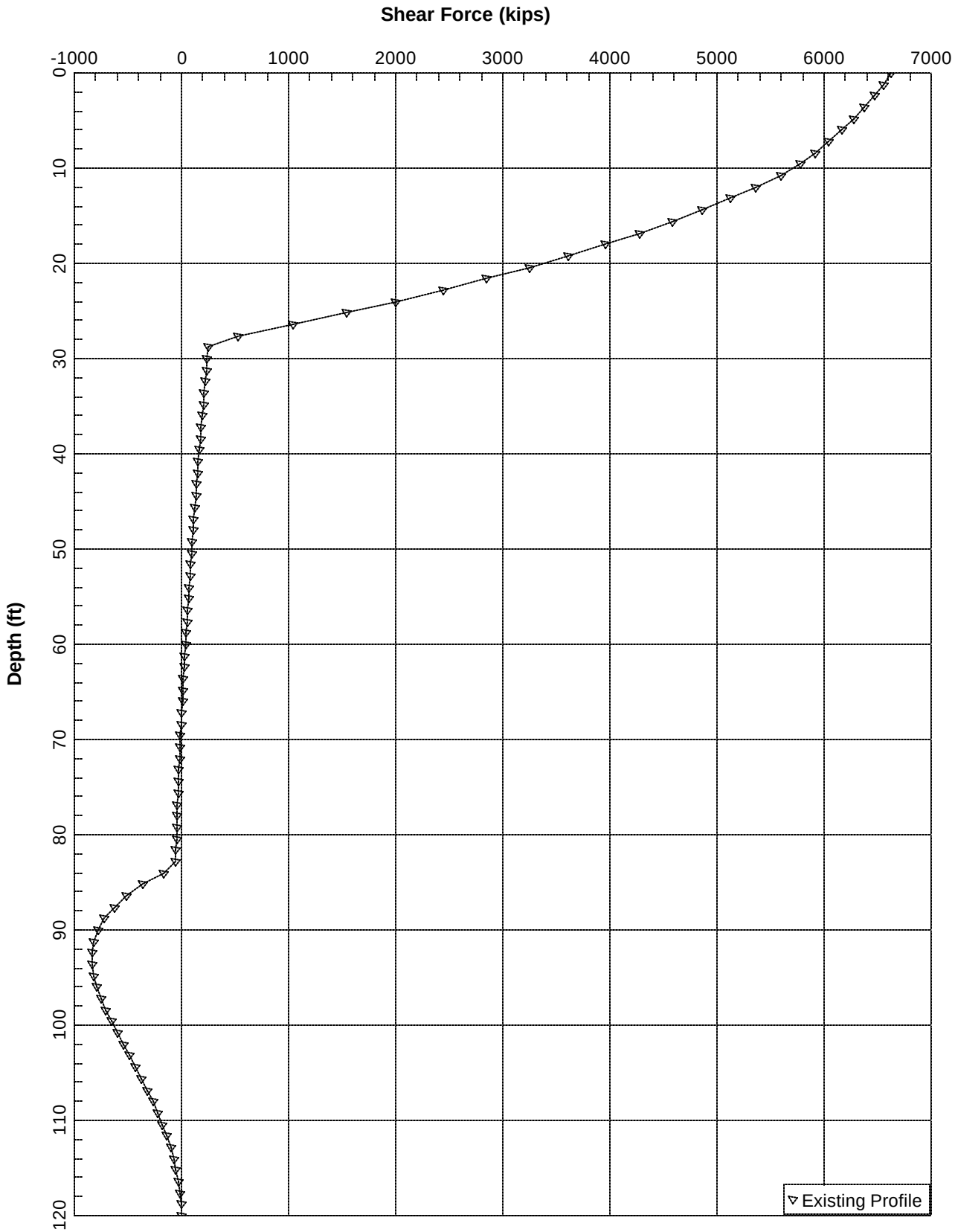

**South Pier Foundation - 6" Deflection/Fixed Head - 6' Dia. Shaft**



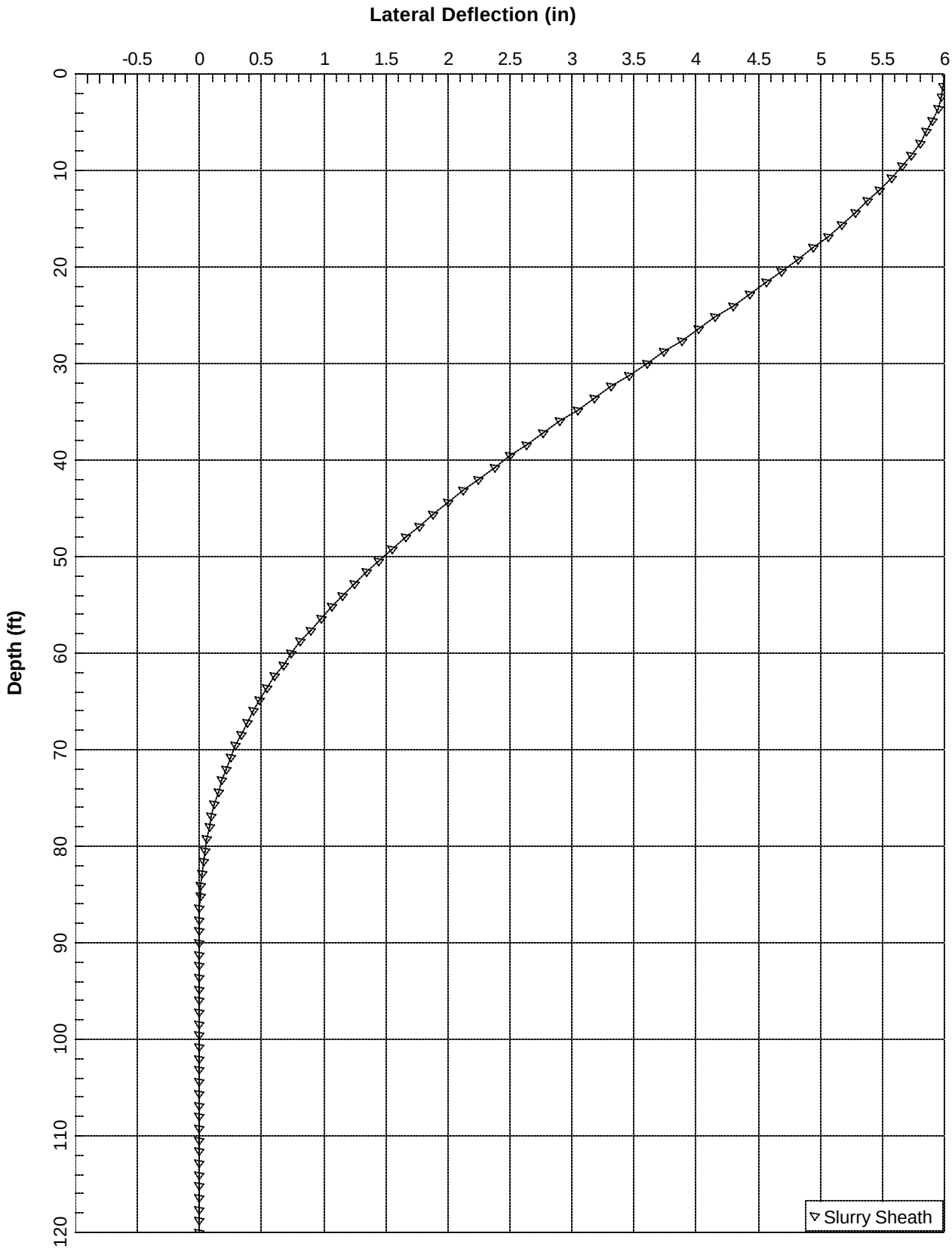

**South Pier Foundation - 6" Deflection/Fixed Head - 8' Dia. Shaft**



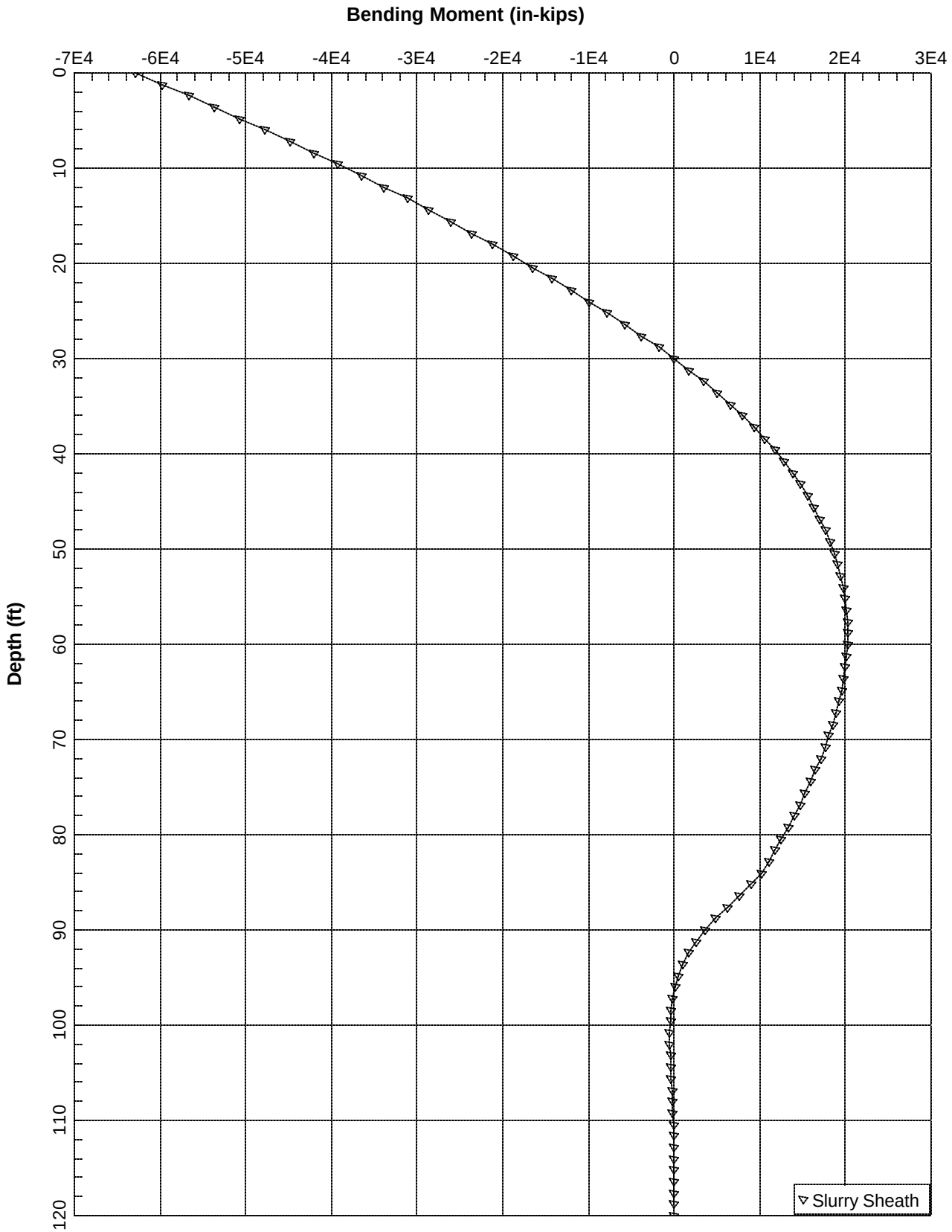

**South Pier Foundation - 6" Deflection/Fixed Head - 8' Dia. Shaft**



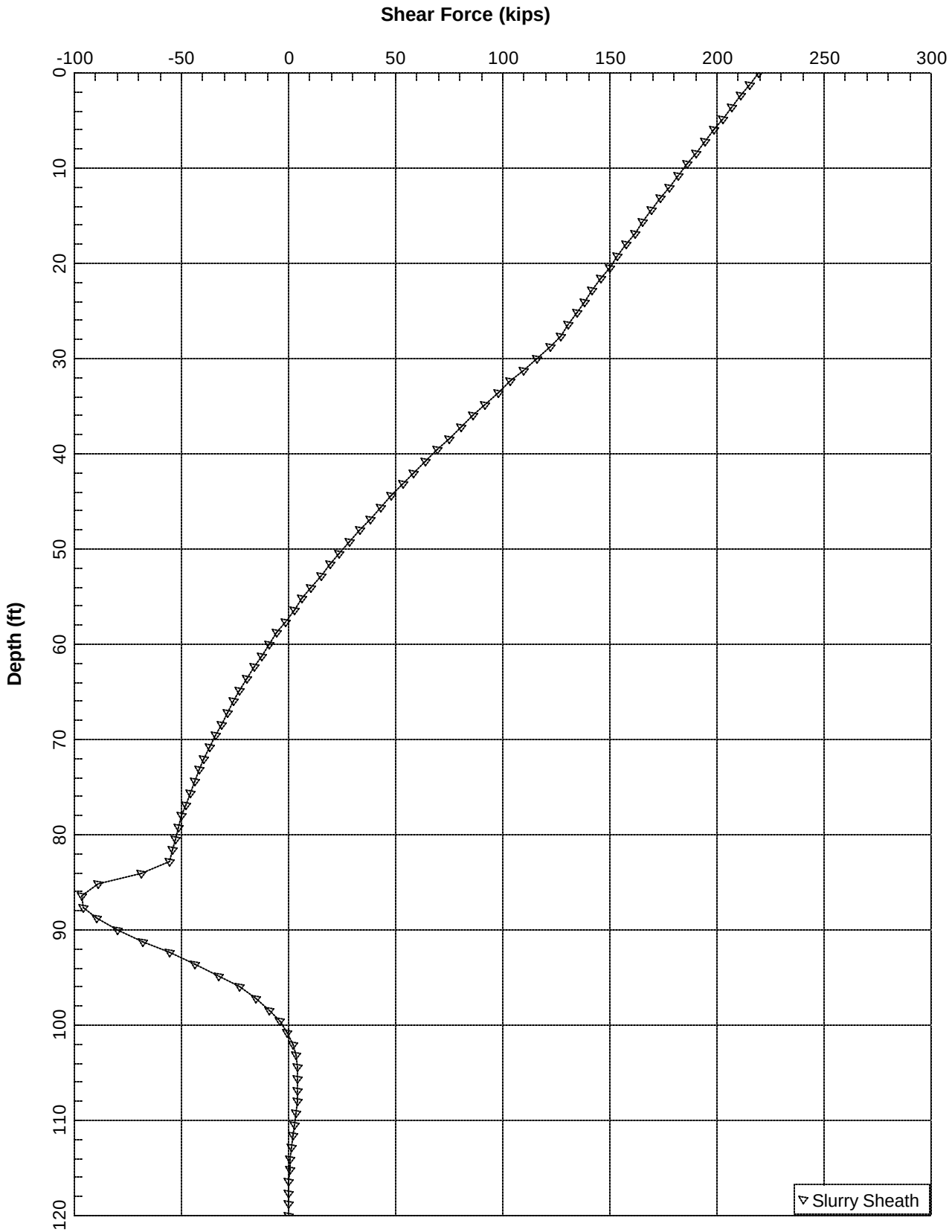

**South Pier Foundation - 6" Deflection/Fixed Head - 8' Dia. Shaft**



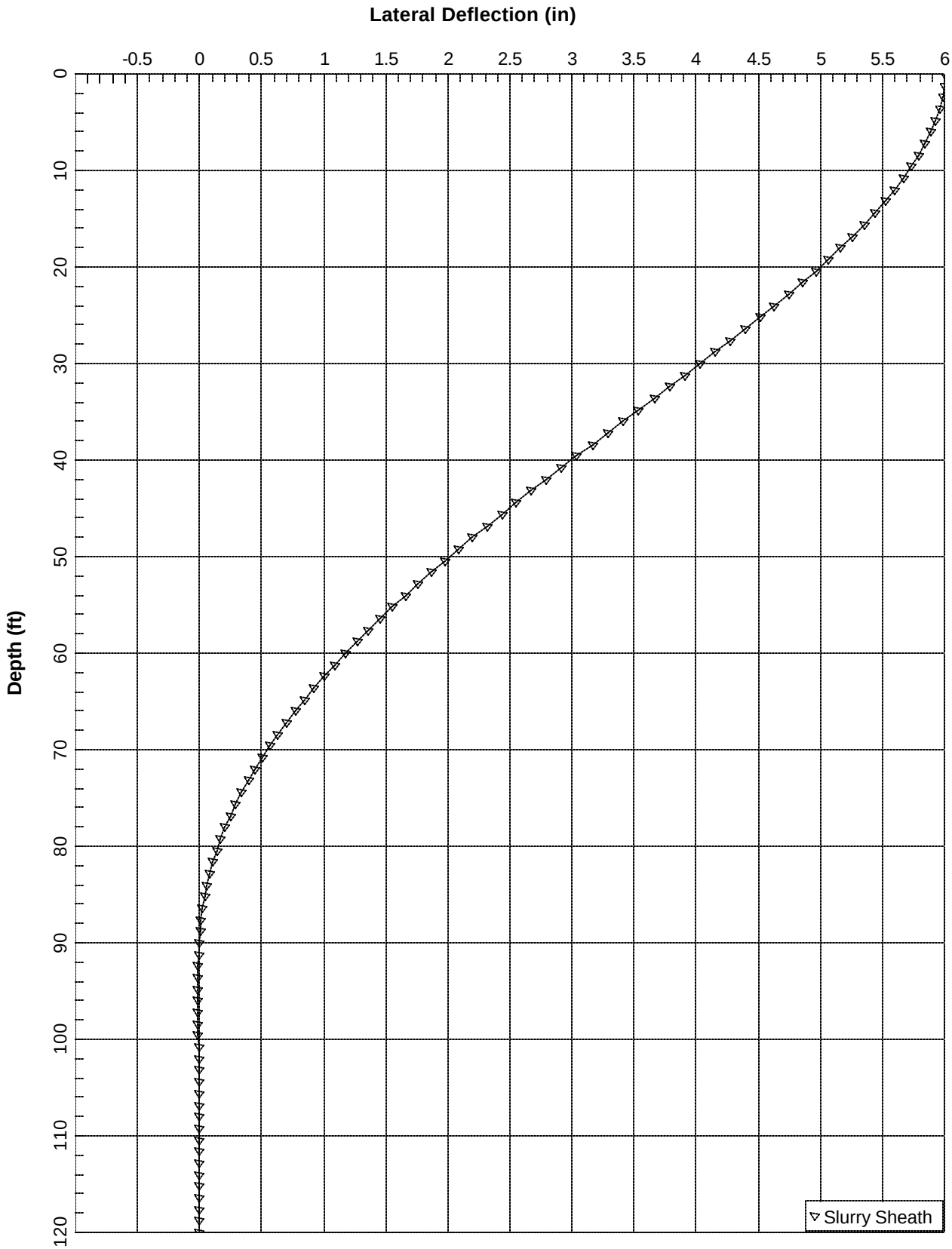

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 4' Dia. Shaft**



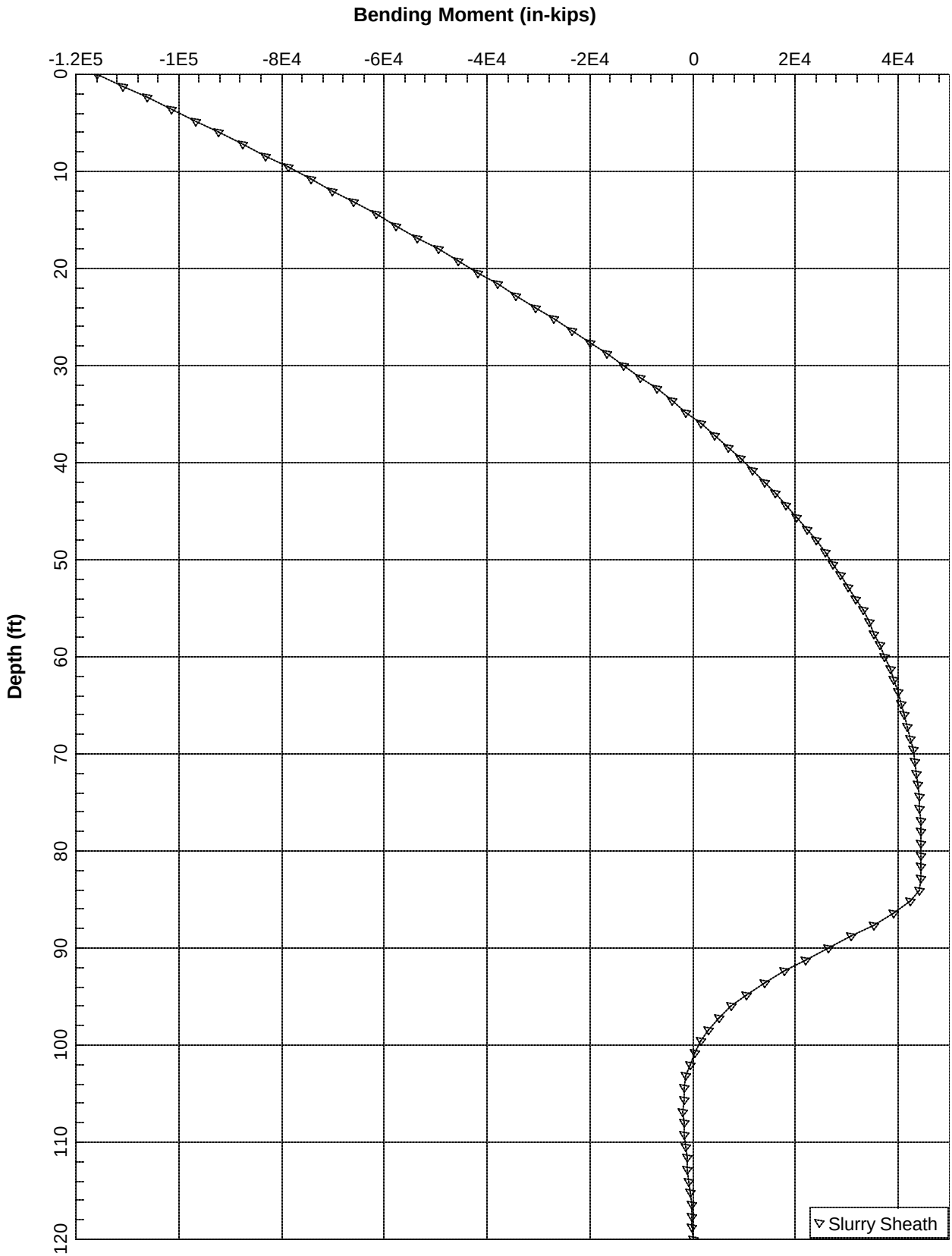

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 4' Dia. Shaft**



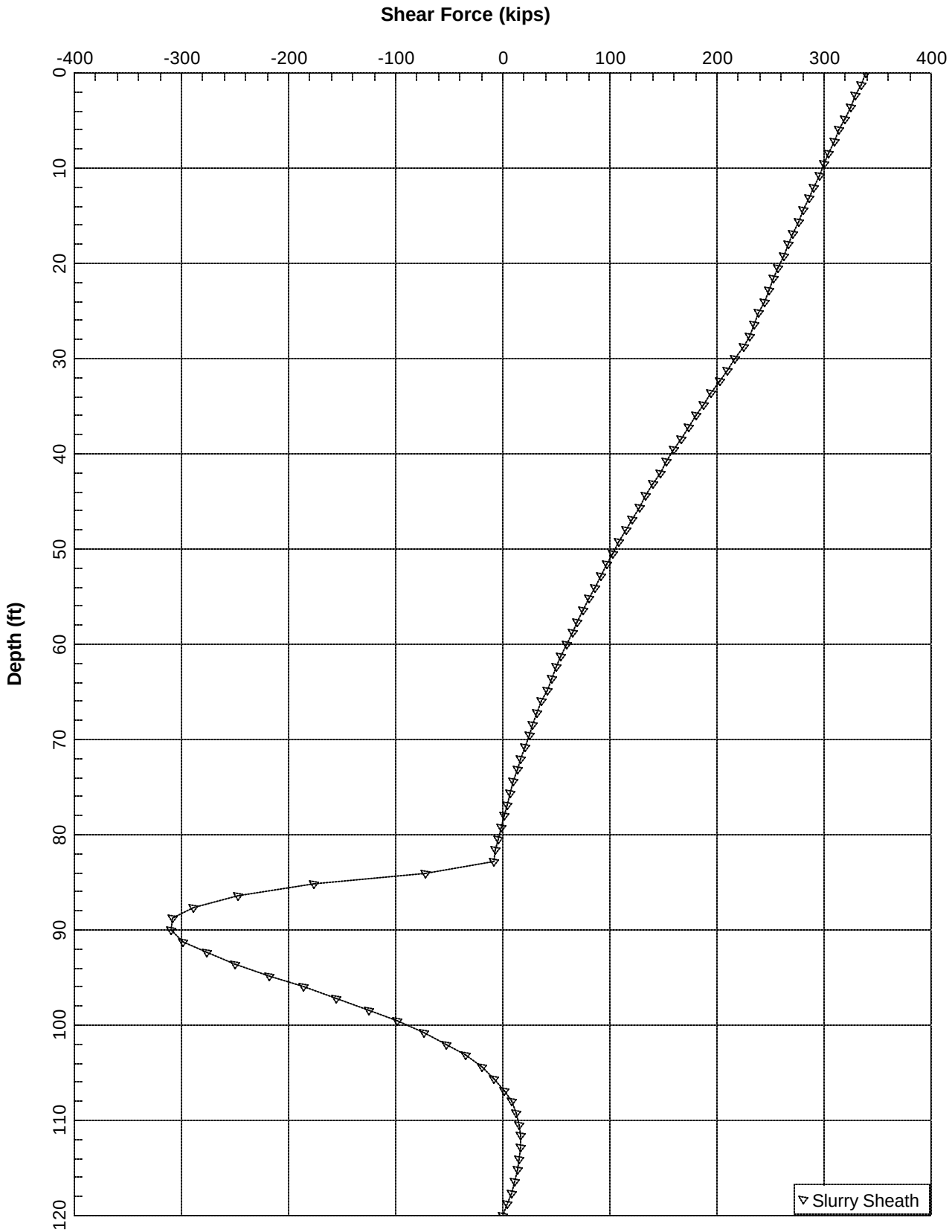

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 4' Dia. Shaft**



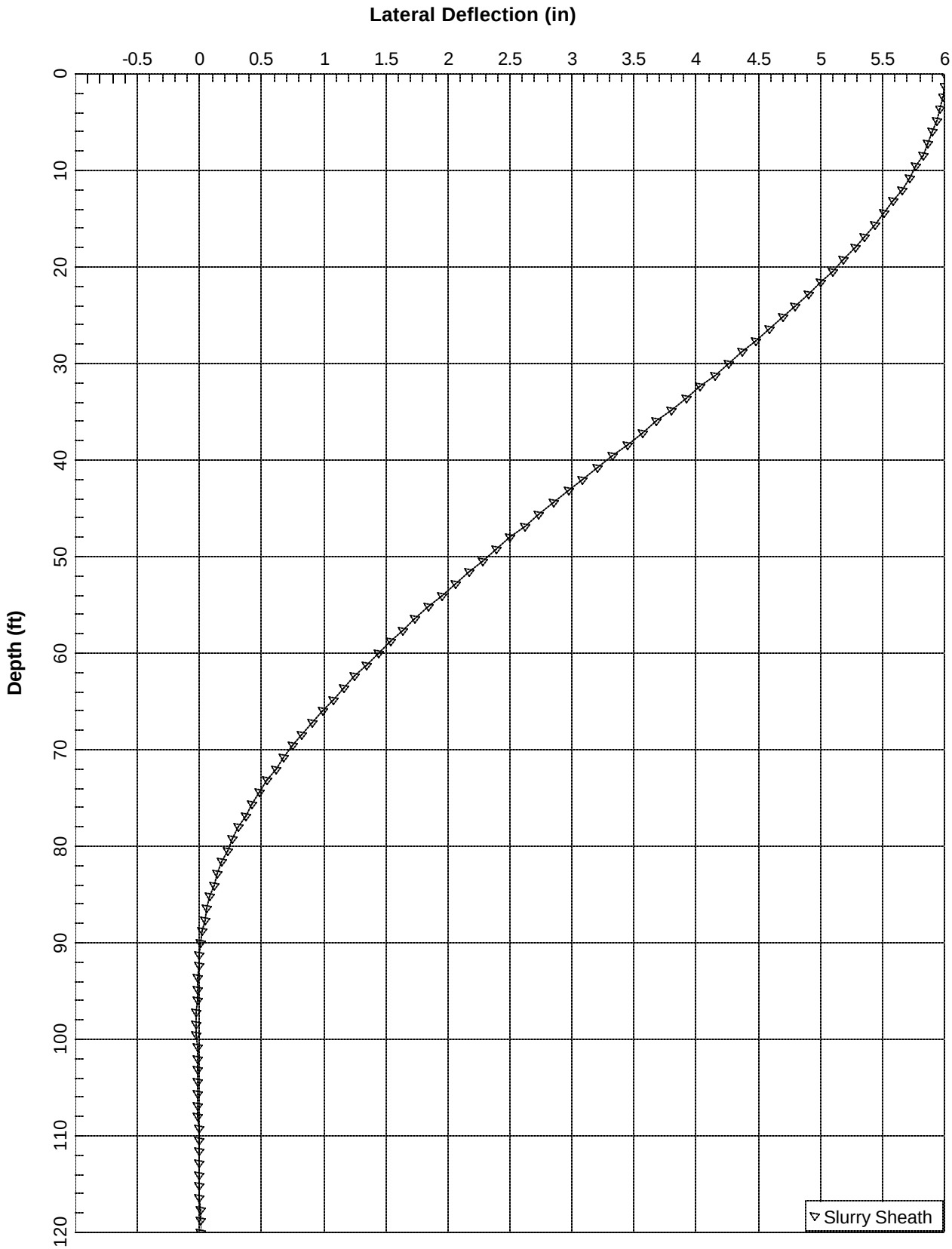

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 5' Dia. Shaft**



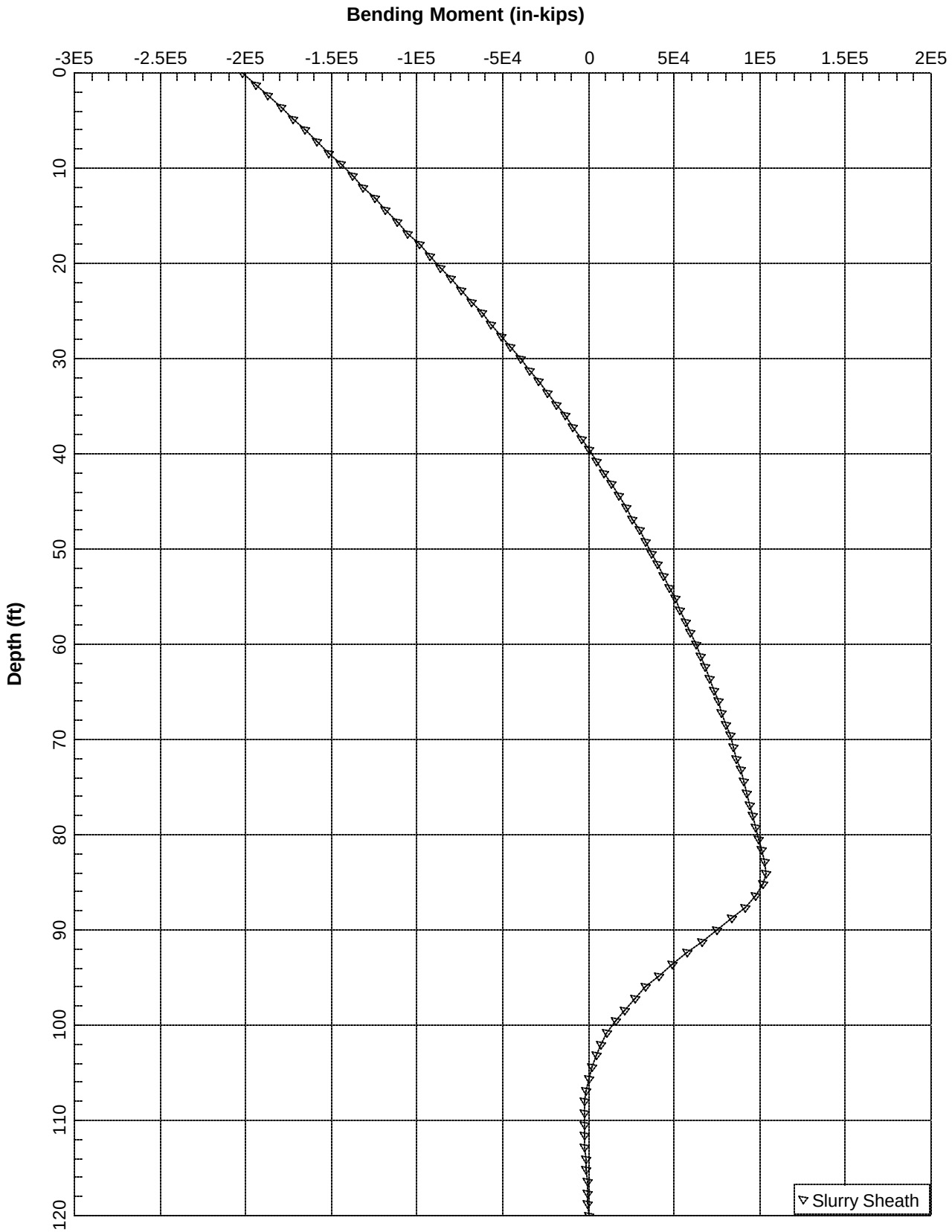

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 5' Dia. Shaft**



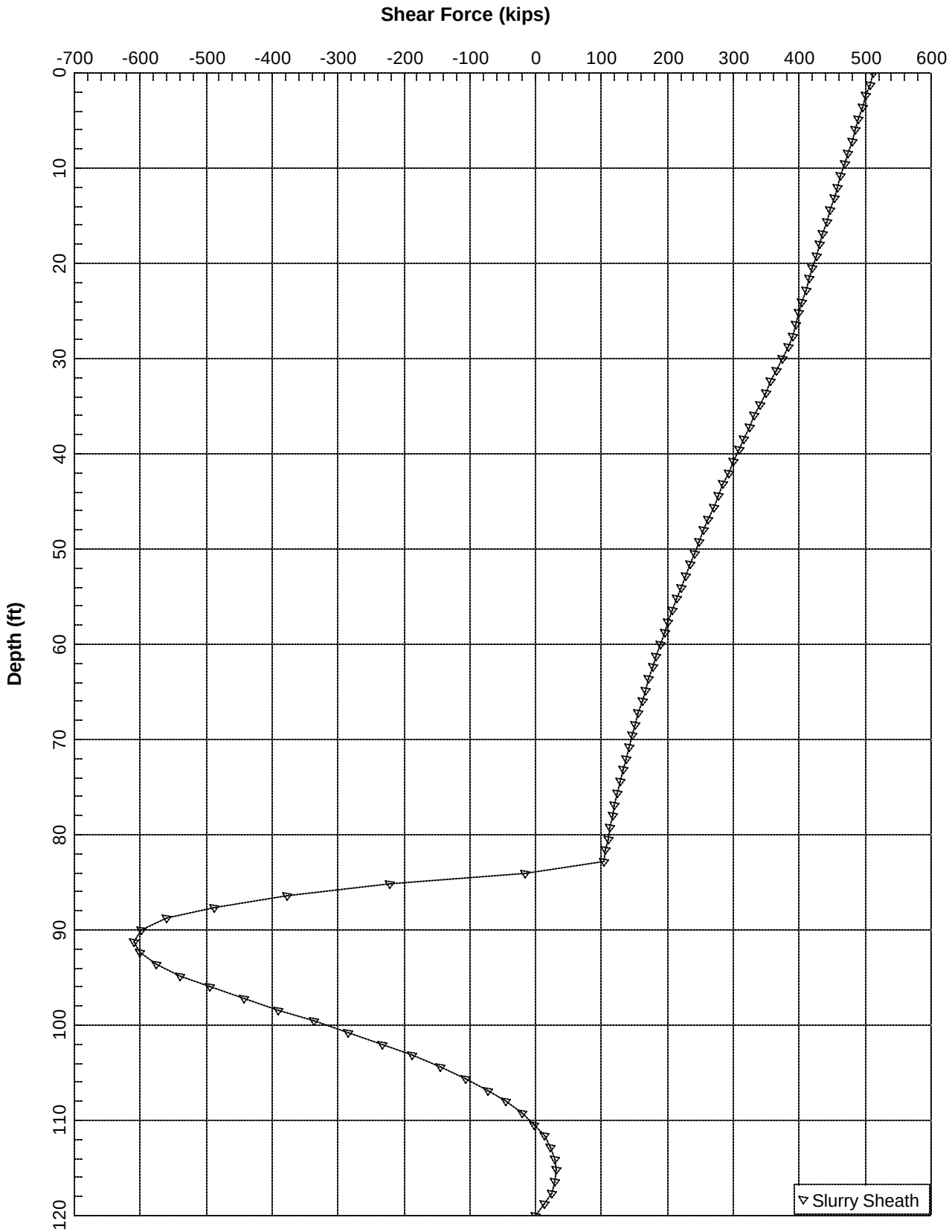

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 5' Dia. Shaft**



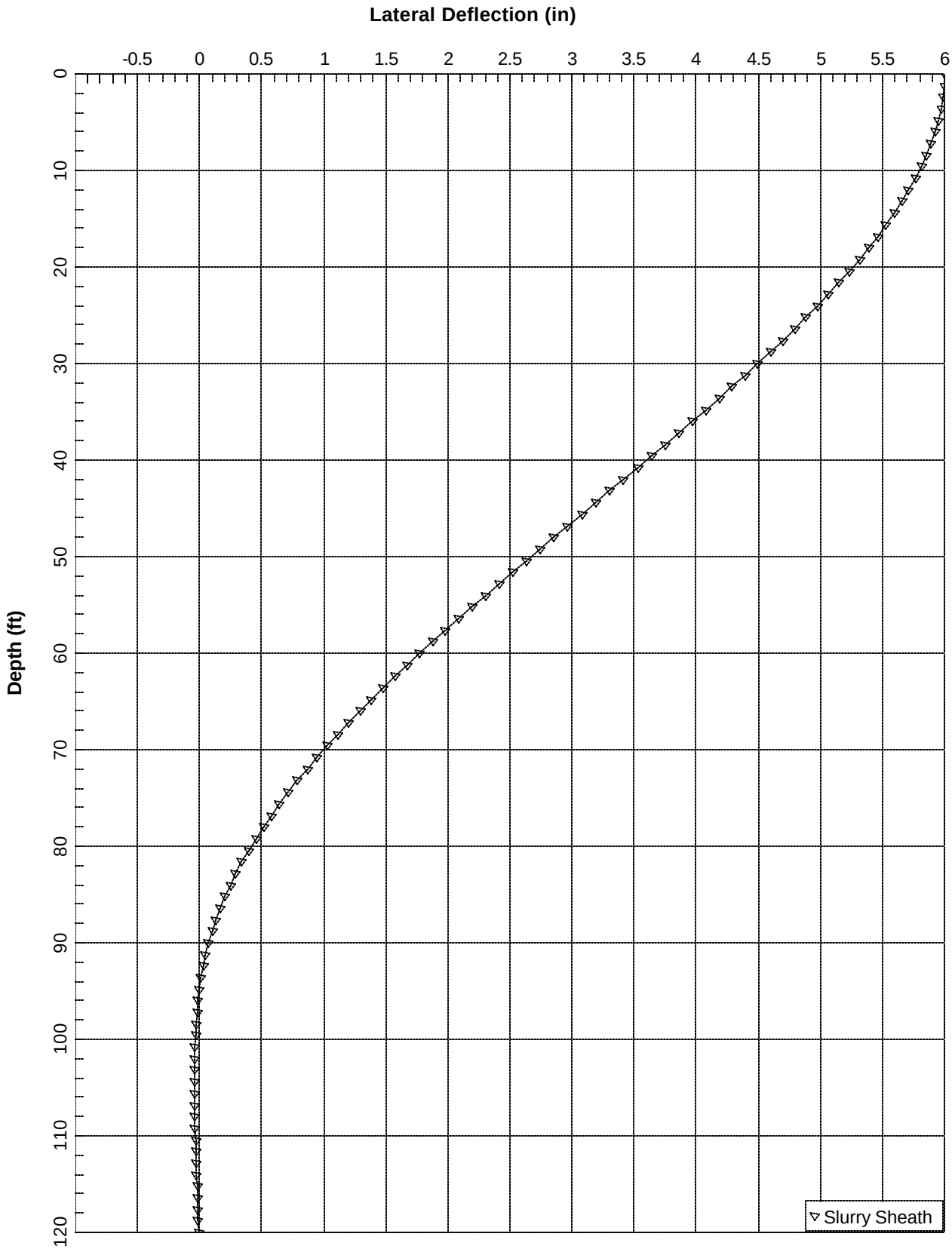

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 6' Dia. Shaft**



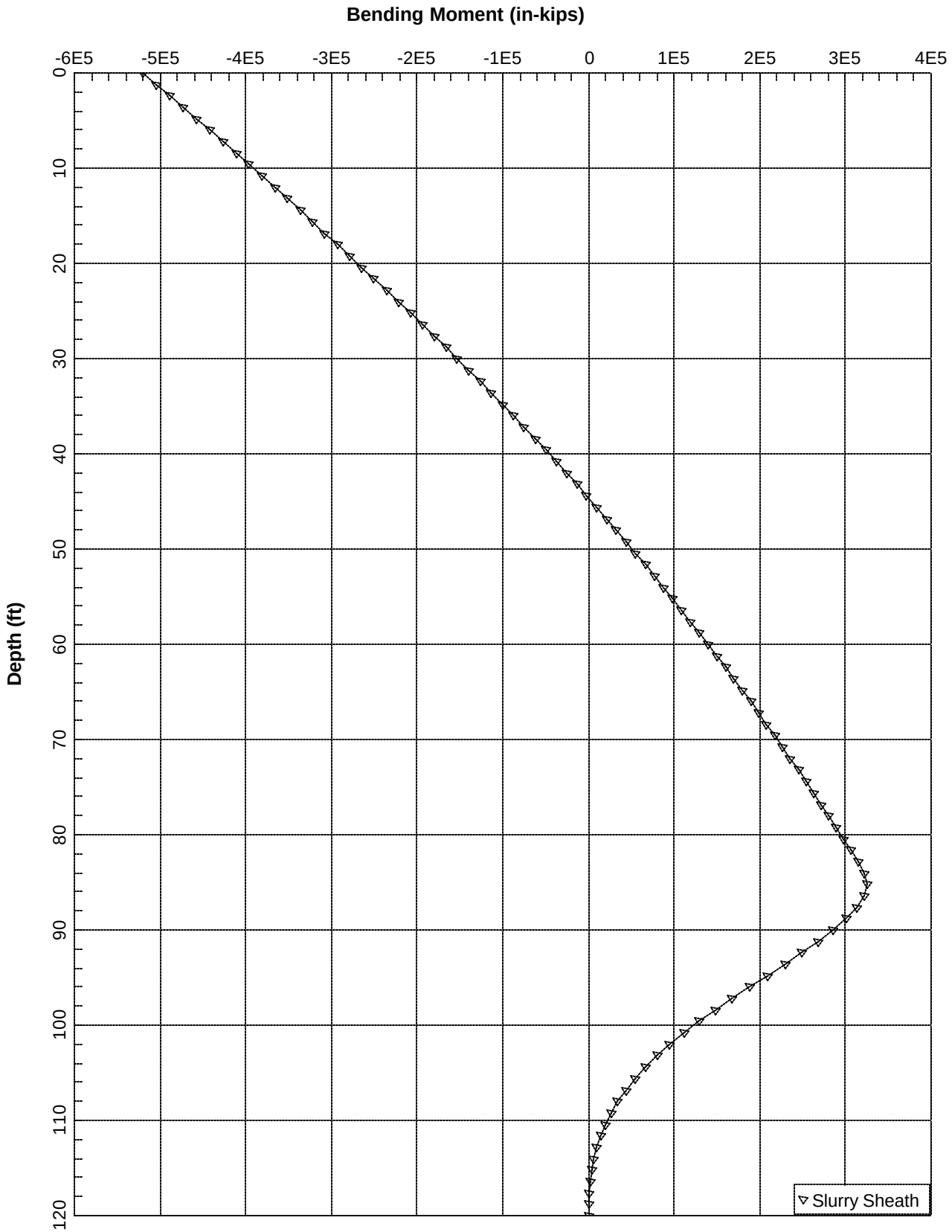

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 6' Dia. Shaft**



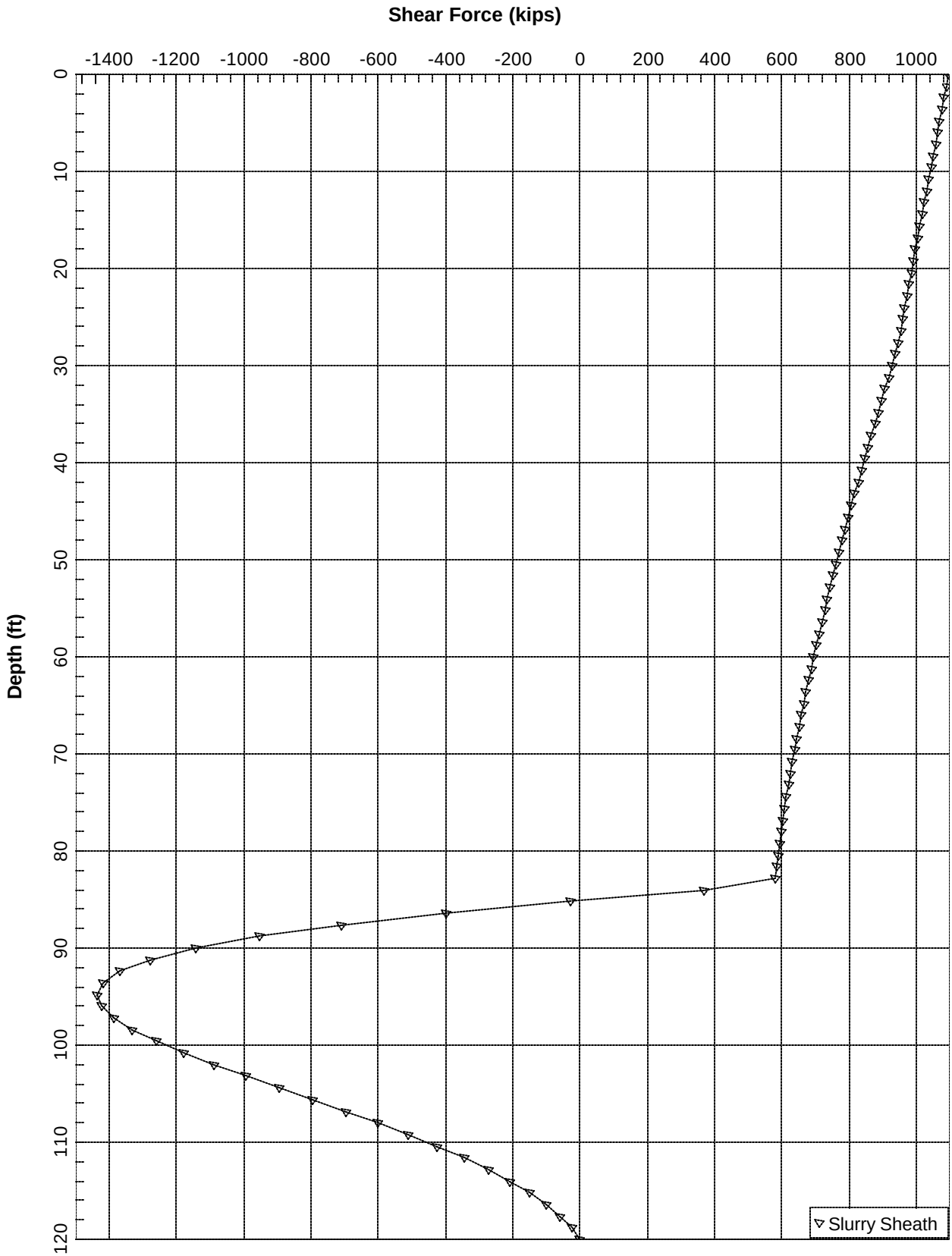

**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 6' Dia. Shaft**




**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 8' Dia. Shaft**




**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 8' Dia. Shaft**




**South Pier Foundation - 6" Deflection/Fixed Head/Flexible Foundation - 8' Dia. Shaft**

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**North Abutment**

**Station:** 306+40

Fill Unit Wt. 125 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5 For End of Emb.

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 2500.0 | 4784.00 | 0.022 | 0.208 | 0.067 | 4.01 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 2500.0 | 4972.00 | 0.022 | 0.208 | 0.063 | 3.79 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 2500.0 | 5160.00 | 0.022 | 0.208 | 0.060 | 3.59 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 2500.0 | 5348.00 | 0.022 | 0.208 | 0.057 | 3.42 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 2500.0 | 5536.00 | 0.022 | 0.208 | 0.054 | 3.26 |

**Total Consolidation Settlement (in):** **18.1**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Near North Abutment**
**Station:** 307+00

Fill Unit Wt. 125 pcf
Fill Ht. 40 ft

Surcharge Unit Wt. 125 pcf
Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 5000.0 | 7284.00 | 0.022 | 0.208 | 0.105 | 6.29 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 5000.0 | 7472.00 | 0.022 | 0.208 | 0.100 | 6.00 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 5000.0 | 7660.00 | 0.022 | 0.208 | 0.096 | 5.73 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 5000.0 | 7848.00 | 0.022 | 0.208 | 0.092 | 5.49 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 5000.0 | 8036.00 | 0.022 | 0.208 | 0.088 | 5.28 |

**Total Consolidation Settlement (in):** **28.8**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]307+00

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-8 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf
**Station:** 308+64 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 4375.0 | 6659.00 | 0.022 | 0.208 | 0.097 | 5.80 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 4375.0 | 6847.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 4375.0 | 7035.00 | 0.022 | 0.208 | 0.088 | 5.27 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 4375.0 | 7223.00 | 0.022 | 0.208 | 0.084 | 5.04 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 4375.0 | 7411.00 | 0.022 | 0.208 | 0.081 | 4.84 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 4375.0 | 7599.00 | 0.022 | 0.208 | 0.077 | 4.65 |

**Total Consolidation Settlement (in):** **31.1**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-8

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-9 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf
**Station:** 311+23 Fill Ht. 25 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 34 | 30.5 | 7 | 2133.8 | 2133.8 | 3125.0 | 5258.80 | 0.022 | 0.208 | 0.081 | 6.84 |
| 34 | 41 | 37.5 | 7 | 2397.0 | 2397.0 | 3125.0 | 5522.00 | 0.022 | 0.208 | 0.075 | 6.33 |

**Total Consolidation Settlement (in):** **13.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-9

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-10 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 314+02 Fill Ht. 12 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 37 | 33.5 | 7 | 2321.6 | 2321.6 | 1500.0 | 3821.60 | 0.022 | 0.208 | 0.045 | 3.78 |
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**Total Consolidation Settlement (in):** **3.8**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-11 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf
**Station:** 316+02 Fill Ht. 5 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 47 | 52 | 49.5 | 5 | 3348.2 | 3348.2 | 625.0 | 3973.20 | 0.022 | 0.208 | 0.015 | 0.93 |
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**Total Consolidation Settlement (in):** **0.9**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

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**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-12 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf
**Station:** 319+35 Fill Ht. 3 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 52 | 58 | 55 | 6 | 3680.0 | 3680.0 | 375.0 | 4055.00 | 0.022 | 0.208 | 0.009 | 0.63 |
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**Total Consolidation Settlement (in):** **0.6**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-12

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**North Abutment**

**Station:** 306+40

Fill Unit Wt. 65 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5 For End of Emb.

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 1300.0 | 3584.00 | 0.022 | 0.208 | 0.041 | 2.44 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 1300.0 | 3772.00 | 0.022 | 0.208 | 0.038 | 2.29 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 1300.0 | 3960.00 | 0.022 | 0.208 | 0.036 | 2.16 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 1300.0 | 4148.00 | 0.022 | 0.208 | 0.034 | 2.04 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 1300.0 | 4336.00 | 0.022 | 0.208 | 0.032 | 1.93 |

**Total Consolidation Settlement (in):** **10.9**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

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**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Near North Abutment**

**Station:** 307+00

Fill Unit Wt. 65 pcf

Fill Ht. 40 ft

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 2600.0 | 4884.00 | 0.022 | 0.208 | 0.069 | 4.12 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 2600.0 | 5072.00 | 0.022 | 0.208 | 0.065 | 3.90 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 2600.0 | 5260.00 | 0.022 | 0.208 | 0.062 | 3.70 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 2600.0 | 5448.00 | 0.022 | 0.208 | 0.059 | 3.52 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 2600.0 | 5636.00 | 0.022 | 0.208 | 0.056 | 3.35 |

**Total Consolidation Settlement (in):** **18.6**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]307+00 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-8 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 308+64 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 2275.0 | 4559.00 | 0.022 | 0.208 | 0.062 | 3.75 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 2275.0 | 4747.00 | 0.022 | 0.208 | 0.059 | 3.54 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 2275.0 | 4935.00 | 0.022 | 0.208 | 0.056 | 3.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 2275.0 | 5123.00 | 0.022 | 0.208 | 0.053 | 3.18 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 2275.0 | 5311.00 | 0.022 | 0.208 | 0.051 | 3.03 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 2275.0 | 5499.00 | 0.022 | 0.208 | 0.048 | 2.89 |

**Total Consolidation Settlement (in):** **19.7**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-8 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-9 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 311+23 Fill Ht. 25 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 34 | 30.5 | 7 | 2133.8 | 2133.8 | 1625.0 | 3758.80 | 0.022 | 0.208 | 0.051 | 4.30 |
| 34 | 41 | 37.5 | 7 | 2397.0 | 2397.0 | 1625.0 | 4022.00 | 0.022 | 0.208 | 0.047 | 3.93 |

**Total Consolidation Settlement (in):** **8.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-9 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-10 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 314+02 Fill Ht. 12 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 37 | 33.5 | 7 | 2321.6 | 2321.6 | 780.0 | 3101.60 | 0.022 | 0.208 | 0.026 | 2.20 |
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**Total Consolidation Settlement (in):** **2.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-10 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-11 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 316+02 Fill Ht. 5 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 47 | 52 | 49.5 | 5 | 3348.2 | 3348.2 | 325.0 | 3673.20 | 0.022 | 0.208 | 0.008 | 0.50 |
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**Total Consolidation Settlement (in):** **0.5**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-11 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-12 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 319+35 Fill Ht. 3 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 52 | 58 | 55 | 6 | 3680.0 | 3680.0 | 195.0 | 3875.00 | 0.022 | 0.208 | 0.005 | 0.34 |
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**Total Consolidation Settlement (in):** **0.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-12 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**North Abutment**

**Station:** 306+40

Fill Unit Wt. 125 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5 For End of Emb.

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 3000.0 | 5284.00 | 0.022 | 0.208 | 0.076 | 4.55 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 3000.0 | 5472.00 | 0.022 | 0.208 | 0.072 | 4.31 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 3000.0 | 5660.00 | 0.022 | 0.208 | 0.068 | 4.09 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 3000.0 | 5848.00 | 0.022 | 0.208 | 0.065 | 3.90 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 3000.0 | 6036.00 | 0.022 | 0.208 | 0.062 | 3.72 |

**Total Consolidation Settlement (in):** **20.6**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Near North Abutment**
**Station:** 307+00

Fill Unit Wt. 125 pcf
Fill Ht. 40 ft

Surcharge Unit Wt. 125 pcf
Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 6000.0 | 8284.00 | 0.022 | 0.208 | 0.116 | 6.98 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 6000.0 | 8472.00 | 0.022 | 0.208 | 0.111 | 6.68 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 6000.0 | 8660.00 | 0.022 | 0.208 | 0.107 | 6.40 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 6000.0 | 8848.00 | 0.022 | 0.208 | 0.102 | 6.14 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 6000.0 | 9036.00 | 0.022 | 0.208 | 0.099 | 5.91 |

**Total Consolidation Settlement (in):** **32.1**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]307+00 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-8 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 308+64 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 5375.0 | 7659.00 | 0.022 | 0.208 | 0.109 | 6.56 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 5375.0 | 7847.00 | 0.022 | 0.208 | 0.104 | 6.26 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 5375.0 | 8035.00 | 0.022 | 0.208 | 0.100 | 5.99 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 5375.0 | 8223.00 | 0.022 | 0.208 | 0.096 | 5.75 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 5375.0 | 8411.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 5375.0 | 8599.00 | 0.022 | 0.208 | 0.089 | 5.32 |

**Total Consolidation Settlement (in):** **35.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-8 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-9 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf
**Station:** 311+23 Fill Ht. 25 ft Surcharge Ht. 6 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 34 | 30.5 | 7 | 2133.8 | 2133.8 | 3875.0 | 6008.80 | 0.022 | 0.208 | 0.094 | 7.86 |
| 34 | 41 | 37.5 | 7 | 2397.0 | 2397.0 | 3875.0 | 6272.00 | 0.022 | 0.208 | 0.087 | 7.30 |

**Total Consolidation Settlement (in):** **15.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-9 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-10 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 314+02 Fill Ht. 12 ft Surcharge Ht. 4 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 37 | 33.5 | 7 | 2321.6 | 2321.6 | 2000.0 | 4321.60 | 0.022 | 0.208 | 0.056 | 4.71 |
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**Total Consolidation Settlement (in):** **4.7**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-10 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-11 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 316+02 Fill Ht. 5 ft Surcharge Ht. 3 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 47 | 52 | 49.5 | 5 | 3348.2 | 3348.2 | 1000.0 | 4348.20 | 0.022 | 0.208 | 0.024 | 1.42 |
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**Total Consolidation Settlement (in):** **1.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-11 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-12 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf
**Station:** 319+35 Fill Ht. 3 ft Surcharge Ht. 2 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 52 | 58 | 55 | 6 | 3680.0 | 3680.0 | 625.0 | 4305.00 | 0.022 | 0.208 | 0.014 | 1.02 |
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**Total Consolidation Settlement (in):** **1.0**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-12 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**North Abutment**

**Station:** 306+40

Fill Unit Wt. 65 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5 For End of Emb.

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 1800.0 | 4084.00 | 0.022 | 0.208 | 0.052 | 3.15 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 1800.0 | 4272.00 | 0.022 | 0.208 | 0.049 | 2.97 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 1800.0 | 4460.00 | 0.022 | 0.208 | 0.047 | 2.80 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 1800.0 | 4648.00 | 0.022 | 0.208 | 0.044 | 2.65 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 1800.0 | 4836.00 | 0.022 | 0.208 | 0.042 | 2.52 |

**Total Consolidation Settlement (in):** **14.1**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]N. ABUTMENT LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Near North Abutment**

**Station:** 307+00

Fill Unit Wt. 65 pcf

Fill Ht. 40 ft

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 3600.0 | 5884.00 | 0.022 | 0.208 | 0.085 | 5.13 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 3600.0 | 6072.00 | 0.022 | 0.208 | 0.081 | 4.87 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 3600.0 | 6260.00 | 0.022 | 0.208 | 0.077 | 4.64 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 3600.0 | 6448.00 | 0.022 | 0.208 | 0.074 | 4.43 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 3600.0 | 6636.00 | 0.022 | 0.208 | 0.071 | 4.24 |

**Total Consolidation Settlement (in):** **23.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]307+00 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-8 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 308+64 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 3275.0 | 5559.00 | 0.022 | 0.208 | 0.080 | 4.82 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 3275.0 | 5747.00 | 0.022 | 0.208 | 0.076 | 4.57 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 3275.0 | 5935.00 | 0.022 | 0.208 | 0.072 | 4.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 3275.0 | 6123.00 | 0.022 | 0.208 | 0.069 | 4.15 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 3275.0 | 6311.00 | 0.022 | 0.208 | 0.066 | 3.97 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 3275.0 | 6499.00 | 0.022 | 0.208 | 0.063 | 3.80 |

**Total Consolidation Settlement (in):** **25.7**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-8 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-9 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 311+23 Fill Ht. 25 ft Surcharge Ht. 6 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 34 | 30.5 | 7 | 2133.8 | 2133.8 | 2375.0 | 4508.80 | 0.022 | 0.208 | 0.068 | 5.68 |
| 34 | 41 | 37.5 | 7 | 2397.0 | 2397.0 | 2375.0 | 4772.00 | 0.022 | 0.208 | 0.062 | 5.22 |

**Total Consolidation Settlement (in):** **10.9**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-9 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-10 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 314+02 Fill Ht. 12 ft Surcharge Ht. 4 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 37 | 33.5 | 7 | 2321.6 | 2321.6 | 1280.0 | 3601.60 | 0.022 | 0.208 | 0.040 | 3.33 |
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**Total Consolidation Settlement (in):** **3.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-10 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge** - ***North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-11 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 316+02 Fill Ht. 5 ft Surcharge Ht. 3 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 47 | 52 | 49.5 | 5 | 3348.2 | 3348.2 | 700.0 | 4048.20 | 0.022 | 0.208 | 0.017 | 1.03 |
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**Total Consolidation Settlement (in):** **1.0**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-11 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-12 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 319+35 Fill Ht. 3 ft Surcharge Ht. 2 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 52 | 58 | 55 | 6 | 3680.0 | 3680.0 | 445.0 | 4125.00 | 0.022 | 0.208 | 0.010 | 0.74 |
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**Total Consolidation Settlement (in):** **0.7**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - North Approach - Sett. v. Station.XLS]BI-12 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-1 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 281+04 Fill Ht. 3 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 23 | 28 | 25.5 | 5 | 1845.8 | 1845.8 | 375.0 | 2220.80 | 0.022 | 0.208 | 0.017 | 1.00 |
| 28 | 33 | 30.5 | 5 | 2033.8 | 2033.8 | 375.0 | 2408.80 | 0.022 | 0.208 | 0.015 | 0.92 |
| 33 | 38 | 35.5 | 5 | 2221.8 | 2221.8 | 375.0 | 2596.80 | 0.022 | 0.208 | 0.014 | 0.85 |
| 38 | 43 | 40.5 | 5 | 2409.8 | 2409.8 | 375.0 | 2784.80 | 0.022 | 0.208 | 0.013 | 0.78 |
| 43 | 48 | 45.5 | 5 | 2597.8 | 2597.8 | 375.0 | 2972.80 | 0.022 | 0.208 | 0.012 | 0.73 |
| 48 | 53 | 50.5 | 5 | 2785.8 | 2785.8 | 375.0 | 3160.80 | 0.022 | 0.208 | 0.011 | 0.68 |
| 53 | 58 | 55.5 | 5 | 2973.8 | 2973.8 | 375.0 | 3348.80 | 0.022 | 0.208 | 0.011 | 0.64 |
| 58 | 63 | 60.5 | 5 | 3161.8 | 3161.8 | 375.0 | 3536.80 | 0.022 | 0.208 | 0.010 | 0.61 |
| 63 | 68 | 65.5 | 5 | 3349.8 | 3349.8 | 375.0 | 3724.80 | 0.022 | 0.208 | 0.010 | 0.58 |
| 68 | 73 | 70.5 | 5 | 3537.8 | 3537.8 | 375.0 | 3912.80 | 0.022 | 0.208 | 0.009 | 0.55 |
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**Total Consolidation Settlement (in):** **7.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-2 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 283+42 Fill Ht. 5 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 26 | 31 | 28.5 | 5 | 2033.6 | 2033.6 | 625.0 | 2658.60 | 0.022 | 0.208 | 0.024 | 1.45 |
| 31 | 36 | 33.5 | 5 | 2221.6 | 2221.6 | 625.0 | 2846.60 | 0.022 | 0.208 | 0.022 | 1.34 |
| 36 | 41 | 38.5 | 5 | 2409.6 | 2409.6 | 625.0 | 3034.60 | 0.022 | 0.208 | 0.021 | 1.25 |
| 41 | 46 | 43.5 | 5 | 2597.6 | 2597.6 | 625.0 | 3222.60 | 0.022 | 0.208 | 0.019 | 1.17 |
| 46 | 51 | 48.5 | 5 | 2785.6 | 2785.6 | 625.0 | 3410.60 | 0.022 | 0.208 | 0.018 | 1.10 |
| 51 | 56 | 53.5 | 5 | 2973.6 | 2973.6 | 625.0 | 3598.60 | 0.022 | 0.208 | 0.017 | 1.03 |
| 56 | 61 | 58.5 | 5 | 3161.6 | 3161.6 | 625.0 | 3786.60 | 0.022 | 0.208 | 0.016 | 0.98 |
| 61 | 66 | 63.5 | 5 | 3349.6 | 3349.6 | 625.0 | 3974.60 | 0.022 | 0.208 | 0.015 | 0.93 |
| 66 | 71 | 68.5 | 5 | 3537.6 | 3537.6 | 625.0 | 4162.60 | 0.022 | 0.208 | 0.015 | 0.88 |
| 71 | 76 | 73.5 | 5 | 3725.6 | 3725.6 | 625.0 | 4350.60 | 0.022 | 0.208 | 0.014 | 0.84 |
| 76 | 83 | 79.5 | 7 | 3951.2 | 3951.2 | 625.0 | 4576.20 | 0.022 | 0.208 | 0.013 | 1.11 |
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**Total Consolidation Settlement (in):** **12.1**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-2

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 285+67 Fill Ht. 12 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 1500.0 | 3596.20 | 0.022 | 0.208 | 0.049 | 2.93 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 1500.0 | 3972.20 | 0.022 | 0.208 | 0.043 | 2.57 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 1500.0 | 4160.20 | 0.022 | 0.208 | 0.040 | 2.42 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 1500.0 | 4348.20 | 0.022 | 0.208 | 0.038 | 2.29 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 1500.0 | 4536.20 | 0.022 | 0.208 | 0.036 | 2.18 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 1500.0 | 4724.20 | 0.022 | 0.208 | 0.035 | 2.07 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 1500.0 | 4912.20 | 0.022 | 0.208 | 0.033 | 1.97 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 1500.0 | 5100.20 | 0.022 | 0.208 | 0.031 | 1.89 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 1500.0 | 5288.20 | 0.022 | 0.208 | 0.030 | 1.81 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 1500.0 | 5476.20 | 0.022 | 0.208 | 0.029 | 1.73 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 1500.0 | 5664.20 | 0.022 | 0.208 | 0.028 | 1.67 |
| 87 | 89 | 88 | 2 | 4295.8 | 4295.8 | 1500.0 | 5795.80 | 0.022 | 0.208 | 0.027 | 0.65 |
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**Total Consolidation Settlement (in):** **24.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-3

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-4 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 289+02 Fill Ht. 25 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 3125.0 | 5221.20 | 0.022 | 0.208 | 0.082 | 4.95 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 3125.0 | 5597.20 | 0.022 | 0.208 | 0.074 | 4.43 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 3125.0 | 5785.20 | 0.022 | 0.208 | 0.070 | 4.21 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 3125.0 | 5973.20 | 0.022 | 0.208 | 0.067 | 4.01 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 3125.0 | 6161.20 | 0.022 | 0.208 | 0.064 | 3.84 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 3125.0 | 6349.20 | 0.022 | 0.208 | 0.061 | 3.67 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 3125.0 | 6537.20 | 0.022 | 0.208 | 0.059 | 3.52 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 3125.0 | 6725.20 | 0.022 | 0.208 | 0.056 | 3.39 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 3125.0 | 6913.20 | 0.022 | 0.208 | 0.054 | 3.26 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 3125.0 | 7101.20 | 0.022 | 0.208 | 0.052 | 3.14 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 3125.0 | 7289.20 | 0.022 | 0.208 | 0.051 | 3.03 |
| 87 | 90 | 88.5 | 3 | 4314.6 | 4314.6 | 3125.0 | 7439.60 | 0.022 | 0.208 | 0.049 | 1.77 |
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**Total Consolidation Settlement (in):** **43.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-5 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291+58 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 4375.0 | 6659.00 | 0.022 | 0.208 | 0.097 | 5.80 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 4375.0 | 6847.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 4375.0 | 7035.00 | 0.022 | 0.208 | 0.088 | 5.27 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 4375.0 | 7223.00 | 0.022 | 0.208 | 0.084 | 5.04 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 4375.0 | 7411.00 | 0.022 | 0.208 | 0.081 | 4.84 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 4375.0 | 7599.00 | 0.022 | 0.208 | 0.077 | 4.65 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 4375.0 | 7787.00 | 0.022 | 0.208 | 0.075 | 4.47 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 4375.0 | 7975.00 | 0.022 | 0.208 | 0.072 | 4.31 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 4375.0 | 8163.00 | 0.022 | 0.208 | 0.069 | 4.16 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 4375.0 | 8351.00 | 0.022 | 0.208 | 0.067 | 4.02 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 4375.0 | 8539.00 | 0.022 | 0.208 | 0.065 | 3.89 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 4375.0 | 8708.20 | 0.022 | 0.208 | 0.063 | 3.03 |
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**Total Consolidation Settlement (in):** **55.0**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-5

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Near South Abutment**
**Station:** 293+00

Fill Unit Wt. 125 pcf
Fill Ht. 38 ft

Surcharge Unit Wt. 125 pcf
Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 4750.0 | 7221.80 | 0.022 | 0.208 | 0.097 | 5.81 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 4750.0 | 7409.80 | 0.022 | 0.208 | 0.093 | 5.55 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 4750.0 | 7597.80 | 0.022 | 0.208 | 0.089 | 5.32 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 4750.0 | 7785.80 | 0.022 | 0.208 | 0.085 | 5.10 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 4750.0 | 7973.80 | 0.022 | 0.208 | 0.082 | 4.91 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 4750.0 | 8161.80 | 0.022 | 0.208 | 0.079 | 4.73 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 4750.0 | 8349.80 | 0.022 | 0.208 | 0.076 | 4.56 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 4750.0 | 8537.80 | 0.022 | 0.208 | 0.073 | 4.40 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 4750.0 | 8725.80 | 0.022 | 0.208 | 0.071 | 4.26 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 4750.0 | 8913.80 | 0.022 | 0.208 | 0.069 | 4.13 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 4750.0 | 9101.80 | 0.022 | 0.208 | 0.067 | 4.00 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 4750.0 | 9233.40 | 0.022 | 0.208 | 0.065 | 1.57 |
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**Total Consolidation Settlement (in):** **54.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]293+00

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**South Abutment**

**Station:** 293+60

Fill Unit Wt. 125 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 2500.0 | 4971.80 | 0.022 | 0.208 | 0.063 | 3.79 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 2500.0 | 5159.80 | 0.022 | 0.208 | 0.060 | 3.59 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 2500.0 | 5347.80 | 0.022 | 0.208 | 0.057 | 3.42 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 2500.0 | 5535.80 | 0.022 | 0.208 | 0.054 | 3.26 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 2500.0 | 5723.80 | 0.022 | 0.208 | 0.052 | 3.11 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 2500.0 | 5911.80 | 0.022 | 0.208 | 0.050 | 2.98 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 2500.0 | 6099.80 | 0.022 | 0.208 | 0.048 | 2.86 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 2500.0 | 6287.80 | 0.022 | 0.208 | 0.046 | 2.75 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 2500.0 | 6475.80 | 0.022 | 0.208 | 0.044 | 2.64 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 2500.0 | 6663.80 | 0.022 | 0.208 | 0.042 | 2.55 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 2500.0 | 6851.80 | 0.022 | 0.208 | 0.041 | 2.46 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 2500.0 | 6983.40 | 0.022 | 0.208 | 0.040 | 0.96 |
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**Total Consolidation Settlement (in):** **34.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

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**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-1 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 281+04 Fill Ht. 3 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 23 | 28 | 25.5 | 5 | 1845.8 | 1845.8 | 195.0 | 2040.80 | 0.022 | 0.208 | 0.009 | 0.54 |
| 28 | 33 | 30.5 | 5 | 2033.8 | 2033.8 | 195.0 | 2228.80 | 0.022 | 0.208 | 0.008 | 0.50 |
| 33 | 38 | 35.5 | 5 | 2221.8 | 2221.8 | 195.0 | 2416.80 | 0.022 | 0.208 | 0.008 | 0.46 |
| 38 | 43 | 40.5 | 5 | 2409.8 | 2409.8 | 195.0 | 2604.80 | 0.022 | 0.208 | 0.007 | 0.42 |
| 43 | 48 | 45.5 | 5 | 2597.8 | 2597.8 | 195.0 | 2792.80 | 0.022 | 0.208 | 0.007 | 0.39 |
| 48 | 53 | 50.5 | 5 | 2785.8 | 2785.8 | 195.0 | 2980.80 | 0.022 | 0.208 | 0.006 | 0.37 |
| 53 | 58 | 55.5 | 5 | 2973.8 | 2973.8 | 195.0 | 3168.80 | 0.022 | 0.208 | 0.006 | 0.34 |
| 58 | 63 | 60.5 | 5 | 3161.8 | 3161.8 | 195.0 | 3356.80 | 0.022 | 0.208 | 0.005 | 0.32 |
| 63 | 68 | 65.5 | 5 | 3349.8 | 3349.8 | 195.0 | 3544.80 | 0.022 | 0.208 | 0.005 | 0.31 |
| 68 | 73 | 70.5 | 5 | 3537.8 | 3537.8 | 195.0 | 3732.80 | 0.022 | 0.208 | 0.005 | 0.29 |
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**Total Consolidation Settlement (in):** **3.9**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-2 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 283+42 Fill Ht. 5 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 26 | 31 | 28.5 | 5 | 2033.6 | 2033.6 | 325.0 | 2358.60 | 0.022 | 0.208 | 0.013 | 0.80 |
| 31 | 36 | 33.5 | 5 | 2221.6 | 2221.6 | 325.0 | 2546.60 | 0.022 | 0.208 | 0.012 | 0.74 |
| 36 | 41 | 38.5 | 5 | 2409.6 | 2409.6 | 325.0 | 2734.60 | 0.022 | 0.208 | 0.011 | 0.69 |
| 41 | 46 | 43.5 | 5 | 2597.6 | 2597.6 | 325.0 | 2922.60 | 0.022 | 0.208 | 0.011 | 0.64 |
| 46 | 51 | 48.5 | 5 | 2785.6 | 2785.6 | 325.0 | 3110.60 | 0.022 | 0.208 | 0.010 | 0.60 |
| 51 | 56 | 53.5 | 5 | 2973.6 | 2973.6 | 325.0 | 3298.60 | 0.022 | 0.208 | 0.009 | 0.56 |
| 56 | 61 | 58.5 | 5 | 3161.6 | 3161.6 | 325.0 | 3486.60 | 0.022 | 0.208 | 0.009 | 0.53 |
| 61 | 66 | 63.5 | 5 | 3349.6 | 3349.6 | 325.0 | 3674.60 | 0.022 | 0.208 | 0.008 | 0.50 |
| 66 | 71 | 68.5 | 5 | 3537.6 | 3537.6 | 325.0 | 3862.60 | 0.022 | 0.208 | 0.008 | 0.48 |
| 71 | 76 | 73.5 | 5 | 3725.6 | 3725.6 | 325.0 | 4050.60 | 0.022 | 0.208 | 0.008 | 0.45 |
| 76 | 83 | 79.5 | 7 | 3951.2 | 3951.2 | 325.0 | 4276.20 | 0.022 | 0.208 | 0.007 | 0.60 |
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**Total Consolidation Settlement (in):** **6.6**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-2 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 285+67 Fill Ht. 12 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 780.0 | 2876.20 | 0.022 | 0.208 | 0.029 | 1.71 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 780.0 | 3252.20 | 0.022 | 0.208 | 0.025 | 1.49 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 780.0 | 3440.20 | 0.022 | 0.208 | 0.023 | 1.39 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 780.0 | 3628.20 | 0.022 | 0.208 | 0.022 | 1.31 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 780.0 | 3816.20 | 0.022 | 0.208 | 0.021 | 1.24 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 780.0 | 4004.20 | 0.022 | 0.208 | 0.020 | 1.17 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 780.0 | 4192.20 | 0.022 | 0.208 | 0.019 | 1.12 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 780.0 | 4380.20 | 0.022 | 0.208 | 0.018 | 1.06 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 780.0 | 4568.20 | 0.022 | 0.208 | 0.017 | 1.01 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 780.0 | 4756.20 | 0.022 | 0.208 | 0.016 | 0.97 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 780.0 | 4944.20 | 0.022 | 0.208 | 0.016 | 0.93 |
| 87 | 89 | 88 | 2 | 4295.8 | 4295.8 | 780.0 | 5075.80 | 0.022 | 0.208 | 0.015 | 0.36 |
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**Total Consolidation Settlement (in):** **13.8**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-3 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-4 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 289+02 Fill Ht. 25 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 1625.0 | 3721.20 | 0.022 | 0.208 | 0.052 | 3.11 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 1625.0 | 4097.20 | 0.022 | 0.208 | 0.046 | 2.74 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 1625.0 | 4285.20 | 0.022 | 0.208 | 0.043 | 2.58 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 1625.0 | 4473.20 | 0.022 | 0.208 | 0.041 | 2.45 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 1625.0 | 4661.20 | 0.022 | 0.208 | 0.039 | 2.32 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 1625.0 | 4849.20 | 0.022 | 0.208 | 0.037 | 2.21 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 1625.0 | 5037.20 | 0.022 | 0.208 | 0.035 | 2.11 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 1625.0 | 5225.20 | 0.022 | 0.208 | 0.034 | 2.02 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 1625.0 | 5413.20 | 0.022 | 0.208 | 0.032 | 1.93 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 1625.0 | 5601.20 | 0.022 | 0.208 | 0.031 | 1.86 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 1625.0 | 5789.20 | 0.022 | 0.208 | 0.030 | 1.79 |
| 87 | 90 | 88.5 | 3 | 4314.6 | 4314.6 | 1625.0 | 5939.60 | 0.022 | 0.208 | 0.029 | 1.04 |
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**Total Consolidation Settlement (in):** **26.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-4 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-5 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291+58 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 2275.0 | 4559.00 | 0.022 | 0.208 | 0.062 | 3.75 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 2275.0 | 4747.00 | 0.022 | 0.208 | 0.059 | 3.54 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 2275.0 | 4935.00 | 0.022 | 0.208 | 0.056 | 3.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 2275.0 | 5123.00 | 0.022 | 0.208 | 0.053 | 3.18 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 2275.0 | 5311.00 | 0.022 | 0.208 | 0.051 | 3.03 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 2275.0 | 5499.00 | 0.022 | 0.208 | 0.048 | 2.89 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 2275.0 | 5687.00 | 0.022 | 0.208 | 0.046 | 2.77 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 2275.0 | 5875.00 | 0.022 | 0.208 | 0.044 | 2.65 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 2275.0 | 6063.00 | 0.022 | 0.208 | 0.042 | 2.55 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 2275.0 | 6251.00 | 0.022 | 0.208 | 0.041 | 2.45 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 2275.0 | 6439.00 | 0.022 | 0.208 | 0.039 | 2.36 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 2275.0 | 6608.20 | 0.022 | 0.208 | 0.038 | 1.83 |
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**Total Consolidation Settlement (in):** **34.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Near South Abutment**

**Station:** 293+30

Fill Unit Wt. 65 pcf

Fill Ht. 38 ft

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 2470.0 | 4941.80 | 0.022 | 0.208 | 0.063 | 3.75 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 2470.0 | 5129.80 | 0.022 | 0.208 | 0.059 | 3.56 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 2470.0 | 5317.80 | 0.022 | 0.208 | 0.056 | 3.38 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 2470.0 | 5505.80 | 0.022 | 0.208 | 0.054 | 3.23 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 2470.0 | 5693.80 | 0.022 | 0.208 | 0.051 | 3.08 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 2470.0 | 5881.80 | 0.022 | 0.208 | 0.049 | 2.95 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 2470.0 | 6069.80 | 0.022 | 0.208 | 0.047 | 2.83 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 2470.0 | 6257.80 | 0.022 | 0.208 | 0.045 | 2.72 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 2470.0 | 6445.80 | 0.022 | 0.208 | 0.044 | 2.62 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 2470.0 | 6633.80 | 0.022 | 0.208 | 0.042 | 2.52 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 2470.0 | 6821.80 | 0.022 | 0.208 | 0.041 | 2.44 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 2470.0 | 6953.40 | 0.022 | 0.208 | 0.040 | 0.95 |
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**Total Consolidation Settlement (in):** **34.0**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]293+00 LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**South Abutment**

**Station:** 293+00

Fill Unit Wt. 65 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5 Due to end of Emb.

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 0 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 1300.0 | 3771.80 | 0.022 | 0.208 | 0.038 | 2.29 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 1300.0 | 3959.80 | 0.022 | 0.208 | 0.036 | 2.16 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 1300.0 | 4147.80 | 0.022 | 0.208 | 0.034 | 2.04 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 1300.0 | 4335.80 | 0.022 | 0.208 | 0.032 | 1.93 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 1300.0 | 4523.80 | 0.022 | 0.208 | 0.031 | 1.84 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 1300.0 | 4711.80 | 0.022 | 0.208 | 0.029 | 1.75 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 1300.0 | 4899.80 | 0.022 | 0.208 | 0.028 | 1.67 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 1300.0 | 5087.80 | 0.022 | 0.208 | 0.027 | 1.60 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 1300.0 | 5275.80 | 0.022 | 0.208 | 0.026 | 1.53 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 1300.0 | 5463.80 | 0.022 | 0.208 | 0.025 | 1.47 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 1300.0 | 5651.80 | 0.022 | 0.208 | 0.024 | 1.42 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 1300.0 | 5783.40 | 0.022 | 0.208 | 0.023 | 0.55 |
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**Total Consolidation Settlement (in):** **20.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]S. ABUTMENT LW

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-1 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 281+04 Fill Ht. 3 ft Surcharge Ht. 2 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 23 | 28 | 25.5 | 5 | 1845.8 | 1845.8 | 625.0 | 2470.80 | 0.022 | 0.208 | 0.026 | 1.58 |
| 28 | 33 | 30.5 | 5 | 2033.8 | 2033.8 | 625.0 | 2658.80 | 0.022 | 0.208 | 0.024 | 1.45 |
| 33 | 38 | 35.5 | 5 | 2221.8 | 2221.8 | 625.0 | 2846.80 | 0.022 | 0.208 | 0.022 | 1.34 |
| 38 | 43 | 40.5 | 5 | 2409.8 | 2409.8 | 625.0 | 3034.80 | 0.022 | 0.208 | 0.021 | 1.25 |
| 43 | 48 | 45.5 | 5 | 2597.8 | 2597.8 | 625.0 | 3222.80 | 0.022 | 0.208 | 0.019 | 1.17 |
| 48 | 53 | 50.5 | 5 | 2785.8 | 2785.8 | 625.0 | 3410.80 | 0.022 | 0.208 | 0.018 | 1.10 |
| 53 | 58 | 55.5 | 5 | 2973.8 | 2973.8 | 625.0 | 3598.80 | 0.022 | 0.208 | 0.017 | 1.03 |
| 58 | 63 | 60.5 | 5 | 3161.8 | 3161.8 | 625.0 | 3786.80 | 0.022 | 0.208 | 0.016 | 0.98 |
| 63 | 68 | 65.5 | 5 | 3349.8 | 3349.8 | 625.0 | 3974.80 | 0.022 | 0.208 | 0.015 | 0.93 |
| 68 | 73 | 70.5 | 5 | 3537.8 | 3537.8 | 625.0 | 4162.80 | 0.022 | 0.208 | 0.015 | 0.88 |
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**Total Consolidation Settlement (in):** **11.7**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-2 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 283+42 Fill Ht. 5 ft Surcharge Ht. 3 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 26 | 31 | 28.5 | 5 | 2033.6 | 2033.6 | 1000.0 | 3033.60 | 0.022 | 0.208 | 0.036 | 2.17 |
| 31 | 36 | 33.5 | 5 | 2221.6 | 2221.6 | 1000.0 | 3221.60 | 0.022 | 0.208 | 0.034 | 2.01 |
| 36 | 41 | 38.5 | 5 | 2409.6 | 2409.6 | 1000.0 | 3409.60 | 0.022 | 0.208 | 0.031 | 1.88 |
| 41 | 46 | 43.5 | 5 | 2597.6 | 2597.6 | 1000.0 | 3597.60 | 0.022 | 0.208 | 0.029 | 1.77 |
| 46 | 51 | 48.5 | 5 | 2785.6 | 2785.6 | 1000.0 | 3785.60 | 0.022 | 0.208 | 0.028 | 1.66 |
| 51 | 56 | 53.5 | 5 | 2973.6 | 2973.6 | 1000.0 | 3973.60 | 0.022 | 0.208 | 0.026 | 1.57 |
| 56 | 61 | 58.5 | 5 | 3161.6 | 3161.6 | 1000.0 | 4161.60 | 0.022 | 0.208 | 0.025 | 1.49 |
| 61 | 66 | 63.5 | 5 | 3349.6 | 3349.6 | 1000.0 | 4349.60 | 0.022 | 0.208 | 0.024 | 1.42 |
| 66 | 71 | 68.5 | 5 | 3537.6 | 3537.6 | 1000.0 | 4537.60 | 0.022 | 0.208 | 0.022 | 1.35 |
| 71 | 76 | 73.5 | 5 | 3725.6 | 3725.6 | 1000.0 | 4725.60 | 0.022 | 0.208 | 0.021 | 1.29 |
| 76 | 83 | 79.5 | 7 | 3951.2 | 3951.2 | 1000.0 | 4951.20 | 0.022 | 0.208 | 0.020 | 1.71 |
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**Total Consolidation Settlement (in):** **18.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-2 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 285+67 Fill Ht. 12 ft Surcharge Ht. 4 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 2000.0 | 4096.20 | 0.022 | 0.208 | 0.061 | 3.63 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 2000.0 | 4472.20 | 0.022 | 0.208 | 0.054 | 3.21 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 2000.0 | 4660.20 | 0.022 | 0.208 | 0.051 | 3.04 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 2000.0 | 4848.20 | 0.022 | 0.208 | 0.048 | 2.88 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 2000.0 | 5036.20 | 0.022 | 0.208 | 0.046 | 2.74 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 2000.0 | 5224.20 | 0.022 | 0.208 | 0.044 | 2.62 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 2000.0 | 5412.20 | 0.022 | 0.208 | 0.042 | 2.50 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 2000.0 | 5600.20 | 0.022 | 0.208 | 0.040 | 2.39 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 2000.0 | 5788.20 | 0.022 | 0.208 | 0.038 | 2.30 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 2000.0 | 5976.20 | 0.022 | 0.208 | 0.037 | 2.21 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 2000.0 | 6164.20 | 0.022 | 0.208 | 0.035 | 2.13 |
| 87 | 89 | 88 | 2 | 4295.8 | 4295.8 | 2000.0 | 6295.80 | 0.022 | 0.208 | 0.035 | 0.83 |
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**Total Consolidation Settlement (in):** **30.5**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-3 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-4 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 289+02 Fill Ht. 25 ft Surcharge Ht. 6 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 3875.0 | 5971.20 | 0.022 | 0.208 | 0.095 | 5.67 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 3875.0 | 6347.20 | 0.022 | 0.208 | 0.085 | 5.11 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 3875.0 | 6535.20 | 0.022 | 0.208 | 0.081 | 4.87 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 3875.0 | 6723.20 | 0.022 | 0.208 | 0.078 | 4.66 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 3875.0 | 6911.20 | 0.022 | 0.208 | 0.074 | 4.46 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 3875.0 | 7099.20 | 0.022 | 0.208 | 0.071 | 4.28 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 3875.0 | 7287.20 | 0.022 | 0.208 | 0.069 | 4.11 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 3875.0 | 7475.20 | 0.022 | 0.208 | 0.066 | 3.96 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 3875.0 | 7663.20 | 0.022 | 0.208 | 0.064 | 3.82 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 3875.0 | 7851.20 | 0.022 | 0.208 | 0.061 | 3.69 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 3875.0 | 8039.20 | 0.022 | 0.208 | 0.059 | 3.57 |
| 87 | 90 | 88.5 | 3 | 4314.6 | 4314.6 | 3875.0 | 8189.60 | 0.022 | 0.208 | 0.058 | 2.08 |
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**Total Consolidation Settlement (in):** **50.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-5 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291+58 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 5375.0 | 7659.00 | 0.022 | 0.208 | 0.109 | 6.56 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 5375.0 | 7847.00 | 0.022 | 0.208 | 0.104 | 6.26 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 5375.0 | 8035.00 | 0.022 | 0.208 | 0.100 | 5.99 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 5375.0 | 8223.00 | 0.022 | 0.208 | 0.096 | 5.75 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 5375.0 | 8411.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 5375.0 | 8599.00 | 0.022 | 0.208 | 0.089 | 5.32 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 5375.0 | 8787.00 | 0.022 | 0.208 | 0.085 | 5.13 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 5375.0 | 8975.00 | 0.022 | 0.208 | 0.083 | 4.95 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 5375.0 | 9163.00 | 0.022 | 0.208 | 0.080 | 4.79 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 5375.0 | 9351.00 | 0.022 | 0.208 | 0.077 | 4.64 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 5375.0 | 9539.00 | 0.022 | 0.208 | 0.075 | 4.49 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 5375.0 | 9708.20 | 0.022 | 0.208 | 0.073 | 3.50 |
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**Total Consolidation Settlement (in):** **62.9**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-5 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Near South Abutment**

**Station:** 293+00

Fill Unit Wt. 125 pcf

Fill Ht. 38 ft

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 5750.0 | 8221.80 | 0.022 | 0.208 | 0.109 | 6.51 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 5750.0 | 8409.80 | 0.022 | 0.208 | 0.104 | 6.24 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 5750.0 | 8597.80 | 0.022 | 0.208 | 0.100 | 5.99 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 5750.0 | 8785.80 | 0.022 | 0.208 | 0.096 | 5.76 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 5750.0 | 8973.80 | 0.022 | 0.208 | 0.092 | 5.55 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 5750.0 | 9161.80 | 0.022 | 0.208 | 0.089 | 5.35 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 5750.0 | 9349.80 | 0.022 | 0.208 | 0.086 | 5.17 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 5750.0 | 9537.80 | 0.022 | 0.208 | 0.083 | 5.01 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 5750.0 | 9725.80 | 0.022 | 0.208 | 0.081 | 4.85 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 5750.0 | 9913.80 | 0.022 | 0.208 | 0.078 | 4.70 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 5750.0 | 10101.80 | 0.022 | 0.208 | 0.076 | 4.56 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 5750.0 | 10233.40 | 0.022 | 0.208 | 0.075 | 1.79 |
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**Total Consolidation Settlement (in):** **61.5**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]293+00 Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**South Abutment**

**Station:** 293+60

Fill Unit Wt. 125 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 3000.0 | 5471.80 | 0.022 | 0.208 | 0.072 | 4.31 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 3000.0 | 5659.80 | 0.022 | 0.208 | 0.068 | 4.09 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 3000.0 | 5847.80 | 0.022 | 0.208 | 0.065 | 3.90 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 3000.0 | 6035.80 | 0.022 | 0.208 | 0.062 | 3.72 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 3000.0 | 6223.80 | 0.022 | 0.208 | 0.059 | 3.57 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 3000.0 | 6411.80 | 0.022 | 0.208 | 0.057 | 3.42 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 3000.0 | 6599.80 | 0.022 | 0.208 | 0.055 | 3.29 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 3000.0 | 6787.80 | 0.022 | 0.208 | 0.053 | 3.16 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 3000.0 | 6975.80 | 0.022 | 0.208 | 0.051 | 3.05 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 3000.0 | 7163.80 | 0.022 | 0.208 | 0.049 | 2.94 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 3000.0 | 7351.80 | 0.022 | 0.208 | 0.047 | 2.84 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 3000.0 | 7483.40 | 0.022 | 0.208 | 0.046 | 1.11 |
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**Total Consolidation Settlement (in):** **39.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]S. ABUTMENT Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA
**CHECKED BY:** CEB
**DATE:** 9/9/2003

**Boring:** BI-1 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf
**Station:** 281+04 Fill Ht. 3 ft Surcharge Ht. 2 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 23 | 28 | 25.5 | 5 | 1845.8 | 1845.8 | 445.0 | 2290.80 | 0.022 | 0.208 | 0.020 | 1.17 |
| 28 | 33 | 30.5 | 5 | 2033.8 | 2033.8 | 445.0 | 2478.80 | 0.022 | 0.208 | 0.018 | 1.07 |
| 33 | 38 | 35.5 | 5 | 2221.8 | 2221.8 | 445.0 | 2666.80 | 0.022 | 0.208 | 0.016 | 0.99 |
| 38 | 43 | 40.5 | 5 | 2409.8 | 2409.8 | 445.0 | 2854.80 | 0.022 | 0.208 | 0.015 | 0.92 |
| 43 | 48 | 45.5 | 5 | 2597.8 | 2597.8 | 445.0 | 3042.80 | 0.022 | 0.208 | 0.014 | 0.86 |
| 48 | 53 | 50.5 | 5 | 2785.8 | 2785.8 | 445.0 | 3230.80 | 0.022 | 0.208 | 0.013 | 0.80 |
| 53 | 58 | 55.5 | 5 | 2973.8 | 2973.8 | 445.0 | 3418.80 | 0.022 | 0.208 | 0.013 | 0.76 |
| 58 | 63 | 60.5 | 5 | 3161.8 | 3161.8 | 445.0 | 3606.80 | 0.022 | 0.208 | 0.012 | 0.71 |
| 63 | 68 | 65.5 | 5 | 3349.8 | 3349.8 | 445.0 | 3794.80 | 0.022 | 0.208 | 0.011 | 0.68 |
| 68 | 73 | 70.5 | 5 | 3537.8 | 3537.8 | 445.0 | 3982.80 | 0.022 | 0.208 | 0.011 | 0.64 |
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**Total Consolidation Settlement (in):** **8.6**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-1 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-2 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 283+42 Fill Ht. 5 ft Surcharge Ht. 3 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 26 | 31 | 28.5 | 5 | 2033.6 | 2033.6 | 700.0 | 2733.60 | 0.022 | 0.208 | 0.027 | 1.60 |
| 31 | 36 | 33.5 | 5 | 2221.6 | 2221.6 | 700.0 | 2921.60 | 0.022 | 0.208 | 0.025 | 1.48 |
| 36 | 41 | 38.5 | 5 | 2409.6 | 2409.6 | 700.0 | 3109.60 | 0.022 | 0.208 | 0.023 | 1.38 |
| 41 | 46 | 43.5 | 5 | 2597.6 | 2597.6 | 700.0 | 3297.60 | 0.022 | 0.208 | 0.022 | 1.29 |
| 46 | 51 | 48.5 | 5 | 2785.6 | 2785.6 | 700.0 | 3485.60 | 0.022 | 0.208 | 0.020 | 1.22 |
| 51 | 56 | 53.5 | 5 | 2973.6 | 2973.6 | 700.0 | 3673.60 | 0.022 | 0.208 | 0.019 | 1.15 |
| 56 | 61 | 58.5 | 5 | 3161.6 | 3161.6 | 700.0 | 3861.60 | 0.022 | 0.208 | 0.018 | 1.08 |
| 61 | 66 | 63.5 | 5 | 3349.6 | 3349.6 | 700.0 | 4049.60 | 0.022 | 0.208 | 0.017 | 1.03 |
| 66 | 71 | 68.5 | 5 | 3537.6 | 3537.6 | 700.0 | 4237.60 | 0.022 | 0.208 | 0.016 | 0.98 |
| 71 | 76 | 73.5 | 5 | 3725.6 | 3725.6 | 700.0 | 4425.60 | 0.022 | 0.208 | 0.016 | 0.93 |
| 76 | 83 | 79.5 | 7 | 3951.2 | 3951.2 | 700.0 | 4651.20 | 0.022 | 0.208 | 0.015 | 1.24 |
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**Total Consolidation Settlement (in):** **13.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-2 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 285+67 Fill Ht. 12 ft Surcharge Ht. 4 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 1280.0 | 3376.20 | 0.022 | 0.208 | 0.043 | 2.58 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 1280.0 | 3752.20 | 0.022 | 0.208 | 0.038 | 2.26 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 1280.0 | 3940.20 | 0.022 | 0.208 | 0.035 | 2.13 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 1280.0 | 4128.20 | 0.022 | 0.208 | 0.034 | 2.01 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 1280.0 | 4316.20 | 0.022 | 0.208 | 0.032 | 1.91 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 1280.0 | 4504.20 | 0.022 | 0.208 | 0.030 | 1.81 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 1280.0 | 4692.20 | 0.022 | 0.208 | 0.029 | 1.73 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 1280.0 | 4880.20 | 0.022 | 0.208 | 0.027 | 1.65 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 1280.0 | 5068.20 | 0.022 | 0.208 | 0.026 | 1.58 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 1280.0 | 5256.20 | 0.022 | 0.208 | 0.025 | 1.51 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 1280.0 | 5444.20 | 0.022 | 0.208 | 0.024 | 1.45 |
| 87 | 89 | 88 | 2 | 4295.8 | 4295.8 | 1280.0 | 5575.80 | 0.022 | 0.208 | 0.024 | 0.57 |
| | | | | | | | | | | | |
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**Total Consolidation Settlement (in):** **21.2**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-3 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-4 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 289+02 Fill Ht. 25 ft Surcharge Ht. 6 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 27 | 32 | 29.5 | 5 | 2096.2 | 2096.2 | 2375.0 | 4471.20 | 0.022 | 0.208 | 0.068 | 4.11 |
| 37 | 42 | 39.5 | 5 | 2472.2 | 2472.2 | 2375.0 | 4847.20 | 0.022 | 0.208 | 0.061 | 3.65 |
| 42 | 47 | 44.5 | 5 | 2660.2 | 2660.2 | 2375.0 | 5035.20 | 0.022 | 0.208 | 0.058 | 3.46 |
| 47 | 52 | 49.5 | 5 | 2848.2 | 2848.2 | 2375.0 | 5223.20 | 0.022 | 0.208 | 0.055 | 3.29 |
| 52 | 57 | 54.5 | 5 | 3036.2 | 3036.2 | 2375.0 | 5411.20 | 0.022 | 0.208 | 0.052 | 3.13 |
| 57 | 62 | 59.5 | 5 | 3224.2 | 3224.2 | 2375.0 | 5599.20 | 0.022 | 0.208 | 0.050 | 2.99 |
| 62 | 67 | 64.5 | 5 | 3412.2 | 3412.2 | 2375.0 | 5787.20 | 0.022 | 0.208 | 0.048 | 2.86 |
| 67 | 72 | 69.5 | 5 | 3600.2 | 3600.2 | 2375.0 | 5975.20 | 0.022 | 0.208 | 0.046 | 2.75 |
| 72 | 77 | 74.5 | 5 | 3788.2 | 3788.2 | 2375.0 | 6163.20 | 0.022 | 0.208 | 0.044 | 2.64 |
| 77 | 82 | 79.5 | 5 | 3976.2 | 3976.2 | 2375.0 | 6351.20 | 0.022 | 0.208 | 0.042 | 2.54 |
| 82 | 87 | 84.5 | 5 | 4164.2 | 4164.2 | 2375.0 | 6539.20 | 0.022 | 0.208 | 0.041 | 2.45 |
| 87 | 90 | 88.5 | 3 | 4314.6 | 4314.6 | 2375.0 | 6689.60 | 0.022 | 0.208 | 0.040 | 1.43 |
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**Total Consolidation Settlement (in):** **35.3**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-4 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-5 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291+58 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 3275.0 | 5559.00 | 0.022 | 0.208 | 0.080 | 4.82 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 3275.0 | 5747.00 | 0.022 | 0.208 | 0.076 | 4.57 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 3275.0 | 5935.00 | 0.022 | 0.208 | 0.072 | 4.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 3275.0 | 6123.00 | 0.022 | 0.208 | 0.069 | 4.15 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 3275.0 | 6311.00 | 0.022 | 0.208 | 0.066 | 3.97 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 3275.0 | 6499.00 | 0.022 | 0.208 | 0.063 | 3.80 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 3275.0 | 6687.00 | 0.022 | 0.208 | 0.061 | 3.65 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 3275.0 | 6875.00 | 0.022 | 0.208 | 0.058 | 3.51 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 3275.0 | 7063.00 | 0.022 | 0.208 | 0.056 | 3.38 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 3275.0 | 7251.00 | 0.022 | 0.208 | 0.054 | 3.26 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 3275.0 | 7439.00 | 0.022 | 0.208 | 0.052 | 3.15 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 3275.0 | 7608.20 | 0.022 | 0.208 | 0.051 | 2.44 |
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**Total Consolidation Settlement (in):** **45.0**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]BI-5 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Near South Abutment**
**Station:** 293+30

Fill Unit Wt. 65 pcf
Fill Ht. 38 ft

Surcharge Unit Wt. 125 pcf
Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 3470.0 | 5941.80 | 0.022 | 0.208 | 0.079 | 4.75 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 3470.0 | 6129.80 | 0.022 | 0.208 | 0.075 | 4.53 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 3470.0 | 6317.80 | 0.022 | 0.208 | 0.072 | 4.32 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 3470.0 | 6505.80 | 0.022 | 0.208 | 0.069 | 4.13 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 3470.0 | 6693.80 | 0.022 | 0.208 | 0.066 | 3.96 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 3470.0 | 6881.80 | 0.022 | 0.208 | 0.063 | 3.80 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 3470.0 | 7069.80 | 0.022 | 0.208 | 0.061 | 3.66 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 3470.0 | 7257.80 | 0.022 | 0.208 | 0.059 | 3.52 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 3470.0 | 7445.80 | 0.022 | 0.208 | 0.057 | 3.40 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 3470.0 | 7633.80 | 0.022 | 0.208 | 0.055 | 3.29 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 3470.0 | 7821.80 | 0.022 | 0.208 | 0.053 | 3.18 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 3470.0 | 7953.40 | 0.022 | 0.208 | 0.052 | 1.24 |
| | | | | | | | | | | | |
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**Total Consolidation Settlement (in):** **43.8**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]293+00 LW Sur

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**South Abutment**

**Station:** 293+00

Fill Unit Wt. 65 pcf

Fill Ht. 40 ft

Pressure Reduction: 0.5 Due to end of Emb.

Surcharge Unit Wt. 125 pcf

Surcharge Ht. 8 ft

**OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 33 | 38 | 35.5 | 5 | 2471.8 | 2471.8 | 1800.0 | 4271.80 | 0.022 | 0.208 | 0.049 | 2.97 |
| 38 | 43 | 40.5 | 5 | 2659.8 | 2659.8 | 1800.0 | 4459.80 | 0.022 | 0.208 | 0.047 | 2.80 |
| 43 | 48 | 45.5 | 5 | 2847.8 | 2847.8 | 1800.0 | 4647.80 | 0.022 | 0.208 | 0.044 | 2.65 |
| 48 | 53 | 50.5 | 5 | 3035.8 | 3035.8 | 1800.0 | 4835.80 | 0.022 | 0.208 | 0.042 | 2.52 |
| 53 | 58 | 55.5 | 5 | 3223.8 | 3223.8 | 1800.0 | 5023.80 | 0.022 | 0.208 | 0.040 | 2.40 |
| 58 | 63 | 60.5 | 5 | 3411.8 | 3411.8 | 1800.0 | 5211.80 | 0.022 | 0.208 | 0.038 | 2.30 |
| 63 | 68 | 65.5 | 5 | 3599.8 | 3599.8 | 1800.0 | 5399.80 | 0.022 | 0.208 | 0.037 | 2.20 |
| 68 | 73 | 70.5 | 5 | 3787.8 | 3787.8 | 1800.0 | 5587.80 | 0.022 | 0.208 | 0.035 | 2.11 |
| 73 | 78 | 75.5 | 5 | 3975.8 | 3975.8 | 1800.0 | 5775.80 | 0.022 | 0.208 | 0.034 | 2.02 |
| 78 | 83 | 80.5 | 5 | 4163.8 | 4163.8 | 1800.0 | 5963.80 | 0.022 | 0.208 | 0.032 | 1.95 |
| 83 | 88 | 85.5 | 5 | 4351.8 | 4351.8 | 1800.0 | 6151.80 | 0.022 | 0.208 | 0.031 | 1.88 |
| 88 | 90 | 89 | 2 | 4483.4 | 4483.4 | 1800.0 | 6283.40 | 0.022 | 0.208 | 0.030 | 0.73 |
| | | | | | | | | | | | |
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**Total Consolidation Settlement (in):** **26.5**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030909 - South Approach - Sett. v. Station.XLS]S. ABUTMENT LW Sur

# Data for Time Rate Settlement Plot - South Approach

**Sta** 291+58 **Boring** BI-3

**$C_{vv}$** 7.2 $in^2/d$
**$C_{vh}$** 7.2 $in^2/d$
**H** 720 in (Total Layer Thickness)

**Sreg** 55.01 in 1 inch Less: 54.01
**Slw** 34.36 in 1 inch Less: 33.36
**Sreg,su** 62.89 in
**Slw,sur** 45.03 in

| U (%) | T | t (d) | t (mos.) | t(y) | $S_{reg}$ | $S_{lw}$ | $S_{reg,sur}$ | $S_{lw,sur}$ |
|---|---|---|---|---|---|---|---|---|
| 0% | 0.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10% | 0.0079 | 141.37 | 4.71 | 0.39 | 5.50 | 3.44 | 6.29 | 4.50 |
| 20% | 0.0314 | 565.49 | 18.85 | 1.55 | 11.00 | 6.87 | 12.58 | 9.01 |
| 30% | 0.0707 | 1272.35 | 42.41 | 3.49 | 16.50 | 10.31 | 18.87 | 13.51 |
| 50% | 0.1958 | 3524.49 | 117.48 | 9.66 | 27.50 | 17.18 | 31.44 | 22.52 |
| 60% | 0.2862 | 5152.35 | 171.74 | 14.12 | 33.00 | 20.61 | 37.73 | 27.02 |
| 65% | 0.3404 | 6126.47 | 204.22 | 16.78 | 35.75 | 22.33 | 40.88 | 29.27 |
| 70% | 0.4028 | 7251.02 | 241.70 | 19.87 | 38.50 | 24.05 | 44.02 | 31.52 |
| 75% | 0.4767 | 8581.08 | 286.04 | 23.51 | 41.25 | 25.77 | 47.17 | 33.77 |
| 80% | 0.5672 | 10208.94 | 340.30 | 27.97 | 44.01 | 27.49 | 50.31 | 36.02 |
| 85% | 0.6838 | 12307.62 | 410.25 | 33.72 | 46.76 | 29.20 | 53.46 | 38.28 |
| 90% | 0.8481 | 15265.54 | 508.85 | 41.82 | 49.51 | 30.92 | 56.60 | 40.53 |
| 95% | 1.1290 | 20322.13 | 677.40 | 55.68 | 52.26 | 32.64 | 59.74 | 42.78 |
| 96% | 1.2194 | 21949.99 | 731.67 | 60.14 | 52.81 | 32.98 | 60.37 | 43.23 |
| 97% | 1.3360 | 24048.67 | 801.62 | 65.89 | 53.36 | 33.33 | 61.00 | 43.68 |
| 98% | 1.5004 | 27006.59 | 900.22 | 73.99 | 53.91 | 33.67 | 61.63 | 44.13 |
| 99% | 1.7813 | 32063.18 | 1068.77 | 87.84 | 54.46 | 34.01 | 62.26 | 44.58 |

Wick Drains - Radial & Vertical Drainage

| time (d) | t (mos.) | time (y) | $U_{vr}$ | $S_{reg,PV}$ | $S_{lw,PV}$ | $S_{reg+sur\ PV}$ | $S_{lw+sur\ PV}$ |
|---|---|---|---|---|---|---|---|
| 0 | 0.00 | 0 | 0.0% | 0 | 0 | 0 | 0 |
| 1 | 0.03 | 0.00274 | 1.4% | 0.78323 | 0.489208 | 0.89546781 | 0.641182 |
| 10 | 0.33 | 0.027397 | 8.2% | 4.528221 | 2.828341 | 5.1771189 | 3.706976 |
| 20 | 0.67 | 0.054795 | 14.5% | 7.956583 | 4.969707 | 9.09676792 | 6.513565 |
| 30 | 1.00 | 0.082192 | 20.1% | 11.03971 | 6.895435 | 12.6217048 | 9.037528 |
| 40 | 1.33 | 0.109589 | 25.2% | 13.86637 | 8.660978 | 15.8534313 | 11.35154 |
| 50 | 1.67 | 0.136986 | 30.0% | 16.47875 | 10.29268 | 18.8401693 | 13.49014 |
| 75 | 2.50 | 0.205479 | 40.4% | 22.23085 | 13.88546 | 25.4165487 | 18.19903 |
| 100 | 3.33 | 0.273973 | 49.2% | 27.06597 | 16.90549 | 30.9445458 | 22.15725 |
| 125 | 4.17 | 0.342466 | 56.6% | 31.15612 | 19.46021 | 35.6208134 | 25.5056 |
| 150 | 5.00 | 0.410959 | 63.0% | 34.62833 | 21.62896 | 39.5905936 | 28.34808 |
| 200 | 6.67 | 0.547945 | 75.7% | 41.6637 | 26.02328 | 47.6341462 | 34.10751 |
| 250 | 8.33 | 0.684932 | 82.1% | 45.13786 | 28.19325 | 51.6061509 | 36.95159 |
| 300 | 10.00 | 0.821918 | 86.7% | 47.70743 | 29.79821 | 54.5439398 | 39.05514 |
| 350 | 11.67 | 0.958904 | 90.2% | 49.60794 | 30.98528 | 56.7167983 | 40.61097 |
| 400 | 13.33 | 1.09589 | 92.7% | 51.01361 | 31.86326 | 58.3238959 | 41.7617 |
| 450 | 15.00 | 1.232877 | 94.6% | 52.05327 | 32.51263 | 59.5125435 | 42.61281 |
| 500 | 16.67 | 1.369863 | 96.0% | 52.82223 | 32.99293 | 60.3916954 | 43.24231 |
| 550 | 18.33 | 1.506849 | 97.1% | 53.39097 | 33.34817 | 61.0419371 | 43.7079 |
| 600 | 20.00 | 1.643836 | 97.8% | 53.81162 | 33.61091 | 61.5228713 | 44.05227 |
| 650 | 21.67 | 1.780822 | 98.4% | 54.12275 | 33.80524 | 61.8785816 | 44.30697 |
| 1000 | 33.33 | 2.739726 | 99.8% | 54.89952 | 34.29041 | 62.7666671 | 44.94286 |
| 5000 | 166.67 | 13.69863 | 100.0% | 55.00653 | 34.35725 | 62.8890108 | 45.03046 |
| 10000 | 333.33 | 27.39726 | 100.0% | 55.00653 | 34.35725 | 62.8890108 | 45.03046 |

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291.58 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 4375.0 | 6659.00 | 0.022 | 0.208 | 0.097 | 5.80 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 4375.0 | 6847.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 4375.0 | 7035.00 | 0.022 | 0.208 | 0.088 | 5.27 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 4375.0 | 7223.00 | 0.022 | 0.208 | 0.084 | 5.04 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 4375.0 | 7411.00 | 0.022 | 0.208 | 0.081 | 4.84 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 4375.0 | 7599.00 | 0.022 | 0.208 | 0.077 | 4.65 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 4375.0 | 7787.00 | 0.022 | 0.208 | 0.075 | 4.47 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 4375.0 | 7975.00 | 0.022 | 0.208 | 0.072 | 4.31 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 4375.0 | 8163.00 | 0.022 | 0.208 | 0.069 | 4.16 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 4375.0 | 8351.00 | 0.022 | 0.208 | 0.067 | 4.02 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 4375.0 | 8539.00 | 0.022 | 0.208 | 0.065 | 3.89 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 4375.0 | 8708.20 | 0.022 | 0.208 | 0.063 | 3.03 |
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**Total Consolidation Settlement (in):** **55.0**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291.58 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 5375.0 | 7659.00 | 0.022 | 0.208 | 0.109 | 6.56 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 5375.0 | 7847.00 | 0.022 | 0.208 | 0.104 | 6.26 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 5375.0 | 8035.00 | 0.022 | 0.208 | 0.100 | 5.99 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 5375.0 | 8223.00 | 0.022 | 0.208 | 0.096 | 5.75 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 5375.0 | 8411.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 5375.0 | 8599.00 | 0.022 | 0.208 | 0.089 | 5.32 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 5375.0 | 8787.00 | 0.022 | 0.208 | 0.085 | 5.13 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 5375.0 | 8975.00 | 0.022 | 0.208 | 0.083 | 4.95 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 5375.0 | 9163.00 | 0.022 | 0.208 | 0.080 | 4.79 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 5375.0 | 9351.00 | 0.022 | 0.208 | 0.077 | 4.64 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 5375.0 | 9539.00 | 0.022 | 0.208 | 0.075 | 4.49 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 5375.0 | 9708.20 | 0.022 | 0.208 | 0.073 | 3.50 |
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**Total Consolidation Settlement (in):** **62.9**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291.58 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 2275.0 | 4559.00 | 0.022 | 0.208 | 0.062 | 3.75 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 2275.0 | 4747.00 | 0.022 | 0.208 | 0.059 | 3.54 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 2275.0 | 4935.00 | 0.022 | 0.208 | 0.056 | 3.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 2275.0 | 5123.00 | 0.022 | 0.208 | 0.053 | 3.18 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 2275.0 | 5311.00 | 0.022 | 0.208 | 0.051 | 3.03 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 2275.0 | 5499.00 | 0.022 | 0.208 | 0.048 | 2.89 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 2275.0 | 5687.00 | 0.022 | 0.208 | 0.046 | 2.77 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 2275.0 | 5875.00 | 0.022 | 0.208 | 0.044 | 2.65 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 2275.0 | 6063.00 | 0.022 | 0.208 | 0.042 | 2.55 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 2275.0 | 6251.00 | 0.022 | 0.208 | 0.041 | 2.45 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 2275.0 | 6439.00 | 0.022 | 0.208 | 0.039 | 2.36 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 2275.0 | 6608.20 | 0.022 | 0.208 | 0.038 | 1.83 |
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**Total Consolidation Settlement (in):** **34.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291.58 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 3275.0 | 5559.00 | 0.022 | 0.208 | 0.080 | 4.82 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 3275.0 | 5747.00 | 0.022 | 0.208 | 0.076 | 4.57 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 3275.0 | 5935.00 | 0.022 | 0.208 | 0.072 | 4.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 3275.0 | 6123.00 | 0.022 | 0.208 | 0.069 | 4.15 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 3275.0 | 6311.00 | 0.022 | 0.208 | 0.066 | 3.97 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 3275.0 | 6499.00 | 0.022 | 0.208 | 0.063 | 3.80 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 3275.0 | 6687.00 | 0.022 | 0.208 | 0.061 | 3.65 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 3275.0 | 6875.00 | 0.022 | 0.208 | 0.058 | 3.51 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 3275.0 | 7063.00 | 0.022 | 0.208 | 0.056 | 3.38 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 3275.0 | 7251.00 | 0.022 | 0.208 | 0.054 | 3.26 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 3275.0 | 7439.00 | 0.022 | 0.208 | 0.052 | 3.15 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 3275.0 | 7608.20 | 0.022 | 0.208 | 0.051 | 2.44 |
| | | | | | | | | | | | |
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**Total Consolidation Settlement (in):** **45.0**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

# Data for Time Rate Settlement Plot - North Approach

**Sta** 308+64 **Boring** BI-9

**$C_{vv}$** 7.2 $in^2/d$
**$C_{vh}$** 7.2 $in^2/d$
**H** 360 in (Total Layer Thickness)

**Sreg** 31.12 in 1 inch Less: 30.12
**Slw** 19.74 in 1 inch Less: 18.74
**Sreg,su** 35.40 in
**Slw,sur** 25.66 in

| U (%) | T | t (d) | t (mos.) | t(y) | Sreg | Slw | Sreg,sur | Slw,sur |
|---|---|---|---|---|---|---|---|---|
| 0% | 0.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10% | 0.0079 | 35.34 | 1.18 | 0.10 | 3.11 | 1.97 | 3.54 | 2.57 |
| 20% | 0.0314 | 141.37 | 4.71 | 0.39 | 6.22 | 3.95 | 7.08 | 5.13 |
| 30% | 0.0707 | 318.09 | 10.60 | 0.87 | 9.34 | 5.92 | 10.62 | 7.70 |
| 50% | 0.1958 | 881.12 | 29.37 | 2.41 | 15.56 | 9.87 | 17.70 | 12.83 |
| 60% | 0.2862 | 1288.09 | 42.94 | 3.53 | 18.67 | 11.84 | 21.24 | 15.39 |
| 65% | 0.3404 | 1531.62 | 51.05 | 4.20 | 20.23 | 12.83 | 23.01 | 16.68 |
| 70% | 0.4028 | 1812.76 | 60.43 | 4.97 | 21.78 | 13.82 | 24.78 | 17.96 |
| 75% | 0.4767 | 2145.27 | 71.51 | 5.88 | 23.34 | 14.80 | 26.55 | 19.24 |
| 80% | 0.5672 | 2552.24 | 85.07 | 6.99 | 24.90 | 15.79 | 28.32 | 20.53 |
| 85% | 0.6838 | 3076.90 | 102.56 | 8.43 | 26.45 | 16.78 | 30.09 | 21.81 |
| 90% | 0.8481 | 3816.38 | 127.21 | 10.46 | 28.01 | 17.77 | 31.86 | 23.09 |
| 95% | 1.1290 | 5080.53 | 169.35 | 13.92 | 29.56 | 18.75 | 33.63 | 24.37 |
| 96% | 1.2194 | 5487.50 | 182.92 | 15.03 | 29.88 | 18.95 | 33.98 | 24.63 |
| 97% | 1.3360 | 6012.17 | 200.41 | 16.47 | 30.19 | 19.15 | 34.34 | 24.89 |
| 98% | 1.5004 | 6751.65 | 225.05 | 18.50 | 30.50 | 19.34 | 34.69 | 25.14 |
| 99% | 1.7813 | 8015.80 | 267.19 | 21.96 | 30.81 | 19.54 | 35.04 | 25.40 |

Wick Drains - Radial & Vertical Drainage

| time (d) | t (mos.) | time (y) | Uvr | Sreg+PV | Slw+PV | Sreg+sur+PV | Slw+sur+PV |
|---|---|---|---|---|---|---|---|
| 0 | 0.00 | 0 | 0.0% | 0 | 0 | 0 | 0 |
| 1 | 0.03 | 0.00274 | 2.3% | 0.703328 | 0.446112 | 0.79997491 | 0.57986 |
| 10 | 0.33 | 0.027397 | 10.7% | 3.342231 | 2.119934 | 3.80149962 | 2.75551 |
| 20 | 0.67 | 0.054795 | 17.8% | 5.541927 | 3.515173 | 6.303464 | 4.569054 |
| 30 | 1.00 | 0.082192 | 23.9% | 7.447128 | 4.723618 | 8.47046514 | 6.139801 |
| 40 | 1.33 | 0.109589 | 29.4% | 9.152785 | 5.805494 | 10.4105034 | 7.546034 |
| 50 | 1.67 | 0.136986 | 34.4% | 10.70144 | 6.787784 | 12.1719598 | 8.822823 |
| 75 | 2.50 | 0.205479 | 45.1% | 14.03423 | 8.901731 | 15.9627238 | 11.57055 |
| 100 | 3.33 | 0.273973 | 53.9% | 16.76464 | 10.63359 | 19.0683256 | 13.82164 |
| 125 | 4.17 | 0.342466 | 61.1% | 19.02765 | 12.06899 | 21.6423059 | 15.68739 |
| 150 | 5.00 | 0.410959 | 67.2% | 20.91555 | 13.26646 | 23.7896268 | 17.24387 |
| 200 | 6.67 | 0.547945 | 77.7% | 24.16799 | 15.32944 | 27.4889992 | 19.92535 |
| 250 | 8.33 | 0.684932 | 83.8% | 26.08302 | 16.54412 | 29.6671819 | 21.5042 |
| 300 | 10.00 | 0.821918 | 88.3% | 27.47059 | 17.42425 | 31.2454301 | 22.64819 |
| 350 | 11.67 | 0.958904 | 91.5% | 28.47599 | 18.06196 | 32.3889831 | 23.47709 |
| 400 | 13.33 | 1.09589 | 93.8% | 29.20447 | 18.52402 | 33.2175687 | 24.07769 |
| 450 | 15.00 | 1.232877 | 95.5% | 29.73231 | 18.85882 | 33.8179378 | 24.51287 |
| 500 | 16.67 | 1.369863 | 96.8% | 30.11477 | 19.10141 | 34.2529479 | 24.82819 |
| 550 | 18.33 | 1.506849 | 97.7% | 30.39188 | 19.27718 | 34.5681437 | 25.05666 |
| 600 | 20.00 | 1.643836 | 98.3% | 30.59267 | 19.40454 | 34.7965254 | 25.2222 |
| 650 | 21.67 | 1.780822 | 98.8% | 30.73816 | 19.49682 | 34.9620043 | 25.34214 |
| 1000 | 33.33 | 2.739726 | 99.9% | 31.08076 | 19.71413 | 35.3516859 | 25.6246 |
| 5000 | 166.67 | 13.69863 | 100.0% | 31.12089 | 19.73958 | 35.3973296 | 25.65769 |
| 10000 | 333.33 | 27.39726 | 100.0% | 31.12089 | 19.73958 | 35.3973296 | 25.65769 |

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *North Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-8 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 308.64 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 4375.0 | 6659.00 | 0.022 | 0.208 | 0.097 | 5.80 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 4375.0 | 6847.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 4375.0 | 7035.00 | 0.022 | 0.208 | 0.088 | 5.27 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 4375.0 | 7223.00 | 0.022 | 0.208 | 0.084 | 5.04 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 4375.0 | 7411.00 | 0.022 | 0.208 | 0.081 | 4.84 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 4375.0 | 7599.00 | 0.022 | 0.208 | 0.077 | 4.65 |

**Total Consolidation Settlement (in):** **31.1**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

P:\1200\1245 Indian River Inlet Bridge\Settlement - CEB\[030916 - North Approach - Sett. v. Time.XLS]Reg. Fill

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 125 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291.58 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 5375.0 | 7659.00 | 0.022 | 0.208 | 0.109 | 6.56 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 5375.0 | 7847.00 | 0.022 | 0.208 | 0.104 | 6.26 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 5375.0 | 8035.00 | 0.022 | 0.208 | 0.100 | 5.99 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 5375.0 | 8223.00 | 0.022 | 0.208 | 0.096 | 5.75 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 5375.0 | 8411.00 | 0.022 | 0.208 | 0.092 | 5.52 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 5375.0 | 8599.00 | 0.022 | 0.208 | 0.089 | 5.32 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 5375.0 | 8787.00 | 0.022 | 0.208 | 0.085 | 5.13 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 5375.0 | 8975.00 | 0.022 | 0.208 | 0.083 | 4.95 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 5375.0 | 9163.00 | 0.022 | 0.208 | 0.080 | 4.79 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 5375.0 | 9351.00 | 0.022 | 0.208 | 0.077 | 4.64 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 5375.0 | 9539.00 | 0.022 | 0.208 | 0.075 | 4.49 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 5375.0 | 9708.20 | 0.022 | 0.208 | 0.073 | 3.50 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Total Consolidation Settlement (in):** **62.9**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

**Station:** 291.58 Fill Ht. 35 ft Surcharge Ht. 0 ft **OCR =** 1.0

| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 2275.0 | 4559.00 | 0.022 | 0.208 | 0.062 | 3.75 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 2275.0 | 4747.00 | 0.022 | 0.208 | 0.059 | 3.54 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 2275.0 | 4935.00 | 0.022 | 0.208 | 0.056 | 3.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 2275.0 | 5123.00 | 0.022 | 0.208 | 0.053 | 3.18 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 2275.0 | 5311.00 | 0.022 | 0.208 | 0.051 | 3.03 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 2275.0 | 5499.00 | 0.022 | 0.208 | 0.048 | 2.89 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 2275.0 | 5687.00 | 0.022 | 0.208 | 0.046 | 2.77 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 2275.0 | 5875.00 | 0.022 | 0.208 | 0.044 | 2.65 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 2275.0 | 6063.00 | 0.022 | 0.208 | 0.042 | 2.55 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 2275.0 | 6251.00 | 0.022 | 0.208 | 0.041 | 2.45 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 2275.0 | 6439.00 | 0.022 | 0.208 | 0.039 | 2.36 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 2275.0 | 6608.20 | 0.022 | 0.208 | 0.038 | 1.83 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Total Consolidation Settlement (in):** **34.4**

Notes:

1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

**COMPUTATION SHEET FOR CONSOLIDATION SETTLEMENT ESTIMATES**

**PROJECT NAME:** **Indian River Inlet Bridge - *South Approach***

**PROJECT NUMBER:** 3530-03-1245.01

**CALCULATED BY:** AJA

**CHECKED BY:** CEB

**DATE:** 9/9/2003

**Boring:** BI-3 Fill Unit Wt. 65 pcf Surcharge Unit Wt. 125 pcf

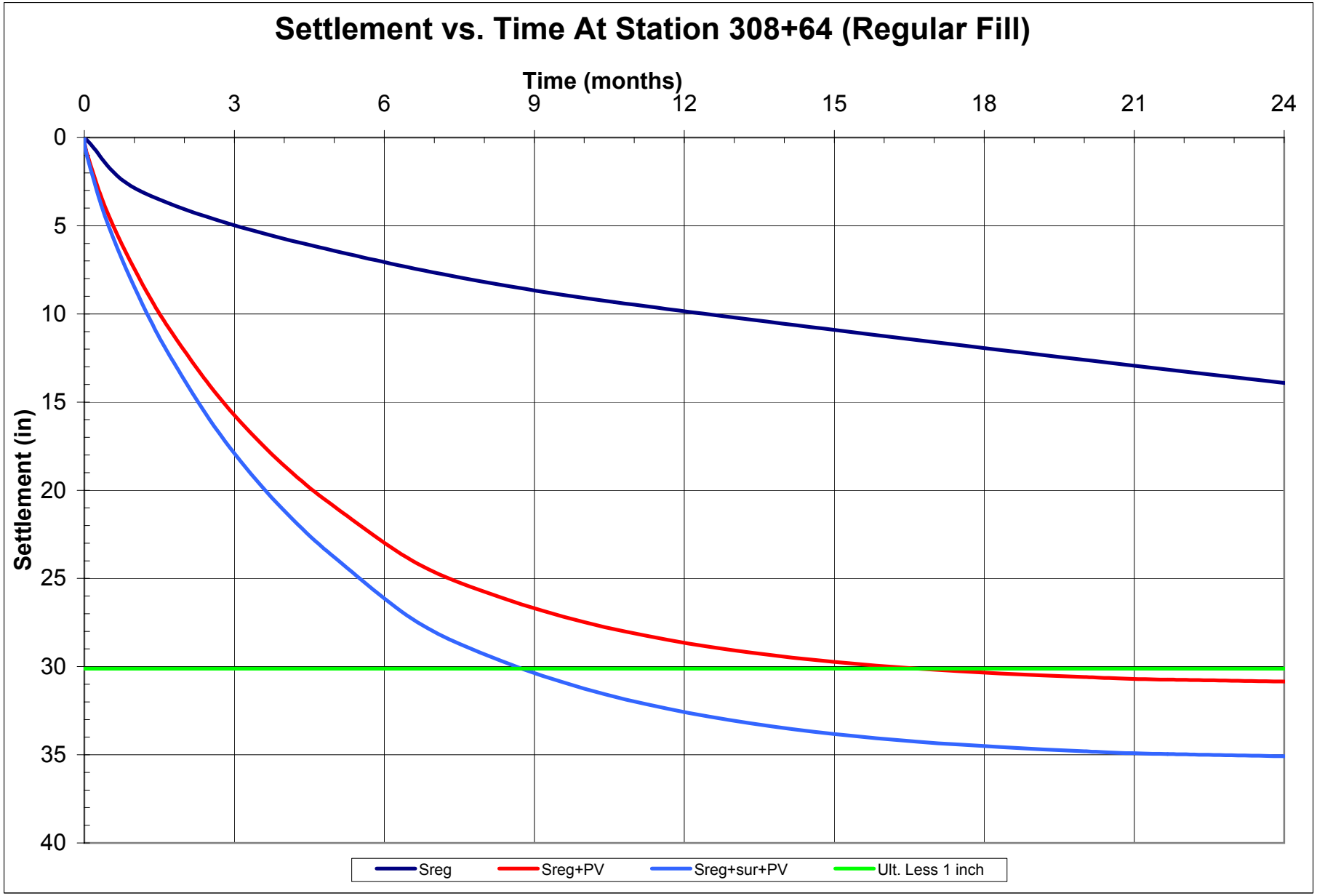
**Station:** 291.58 Fill Ht. 35 ft Surcharge Ht. 8 ft **OCR =** 1.0

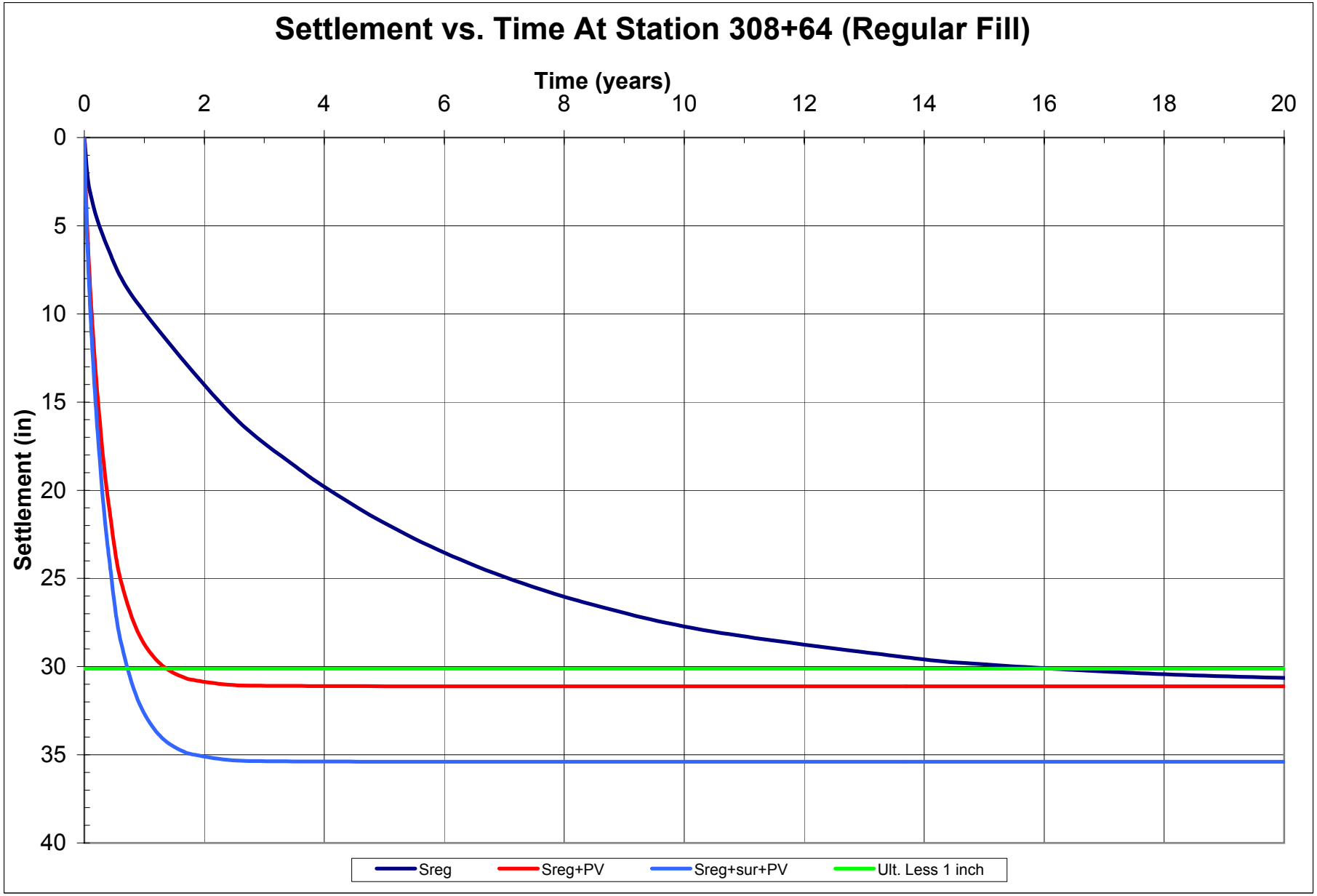
| Sublayer Depth | | | Sublayer Thickness | Effective Overburden Pressure | Preconsol. Pressure | Pressure Change | Final Pressure | Compression Ratio | | Vertical Strain | Settlement of Layer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Top (ft) | Bottom (ft) | Midpoint (ft) | $H_o$ (ft) | $p_o$ (psf) | $p_p$ (psf) | $\Delta p$ (psf) | $p_f$ (psf) | Rebound Curve $C_{\varepsilon r}$ | Virgin Curve $C_{\varepsilon c}$ | $\varepsilon_z$ | $\Delta H$ (in) |
| 30 | 35 | 32.5 | 5 | 2284.0 | 2284.0 | 3275.0 | 5559.00 | 0.022 | 0.208 | 0.080 | 4.82 |
| 35 | 40 | 37.5 | 5 | 2472.0 | 2472.0 | 3275.0 | 5747.00 | 0.022 | 0.208 | 0.076 | 4.57 |
| 40 | 45 | 42.5 | 5 | 2660.0 | 2660.0 | 3275.0 | 5935.00 | 0.022 | 0.208 | 0.072 | 4.35 |
| 45 | 50 | 47.5 | 5 | 2848.0 | 2848.0 | 3275.0 | 6123.00 | 0.022 | 0.208 | 0.069 | 4.15 |
| 50 | 55 | 52.5 | 5 | 3036.0 | 3036.0 | 3275.0 | 6311.00 | 0.022 | 0.208 | 0.066 | 3.97 |
| 55 | 60 | 57.5 | 5 | 3224.0 | 3224.0 | 3275.0 | 6499.00 | 0.022 | 0.208 | 0.063 | 3.80 |
| 60 | 65 | 62.5 | 5 | 3412.0 | 3412.0 | 3275.0 | 6687.00 | 0.022 | 0.208 | 0.061 | 3.65 |
| 65 | 70 | 67.5 | 5 | 3600.0 | 3600.0 | 3275.0 | 6875.00 | 0.022 | 0.208 | 0.058 | 3.51 |
| 70 | 75 | 72.5 | 5 | 3788.0 | 3788.0 | 3275.0 | 7063.00 | 0.022 | 0.208 | 0.056 | 3.38 |
| 75 | 80 | 77.5 | 5 | 3976.0 | 3976.0 | 3275.0 | 7251.00 | 0.022 | 0.208 | 0.054 | 3.26 |
| 80 | 85 | 82.5 | 5 | 4164.0 | 4164.0 | 3275.0 | 7439.00 | 0.022 | 0.208 | 0.052 | 3.15 |
| 85 | 89 | 87 | 4 | 4333.2 | 4333.2 | 3275.0 | 7608.20 | 0.022 | 0.208 | 0.051 | 2.44 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

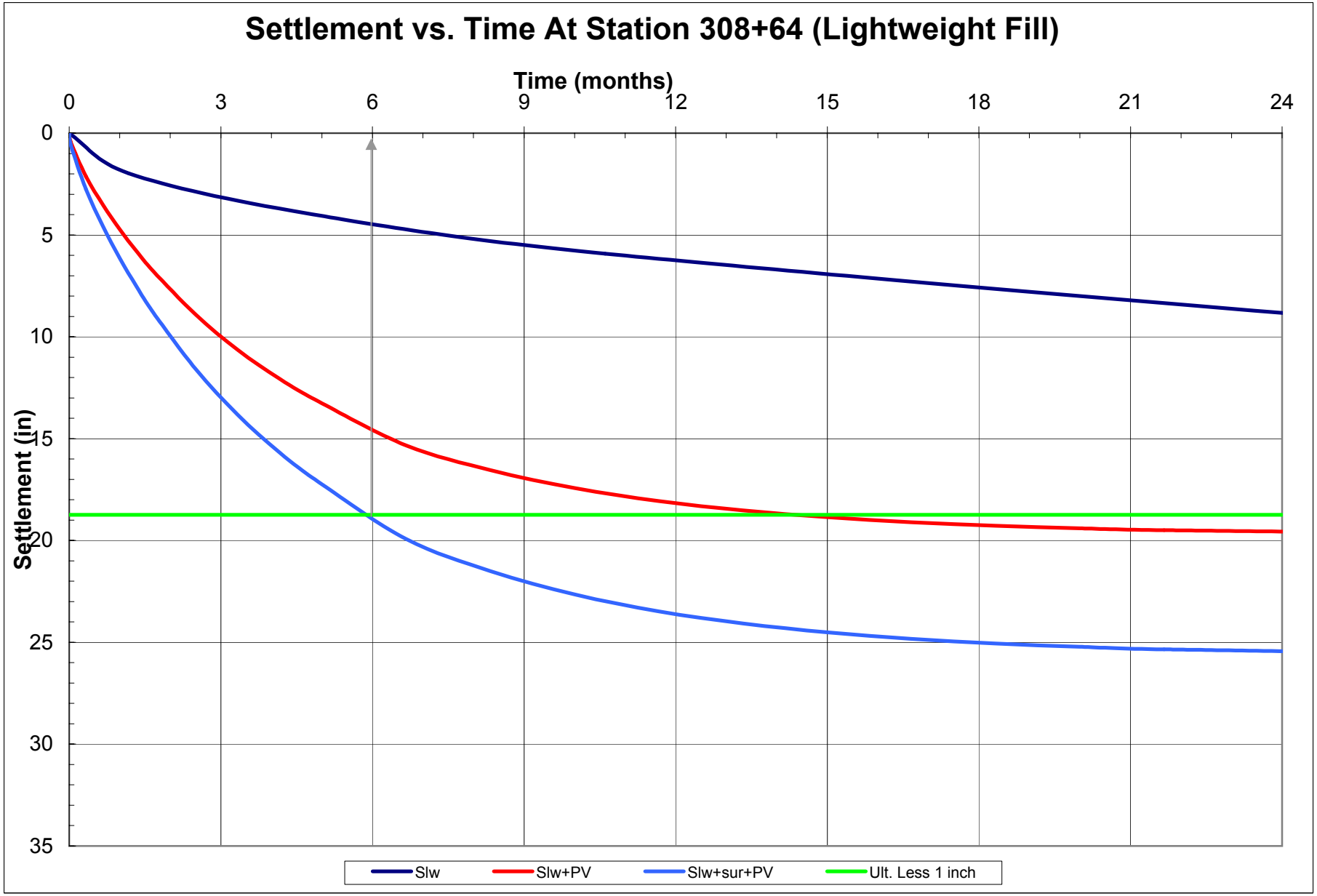
**Total Consolidation Settlement (in):** **45.0**

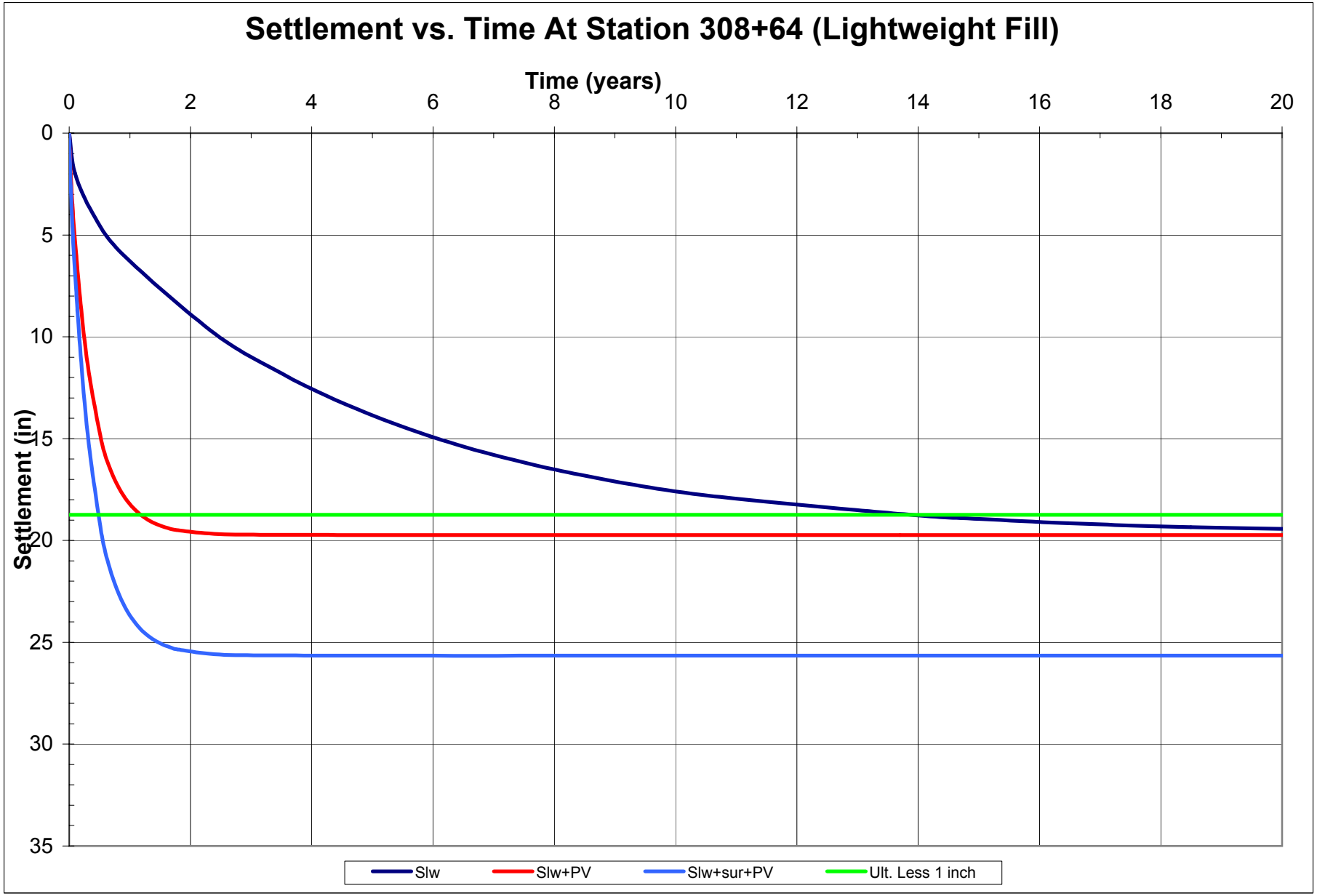
Notes:

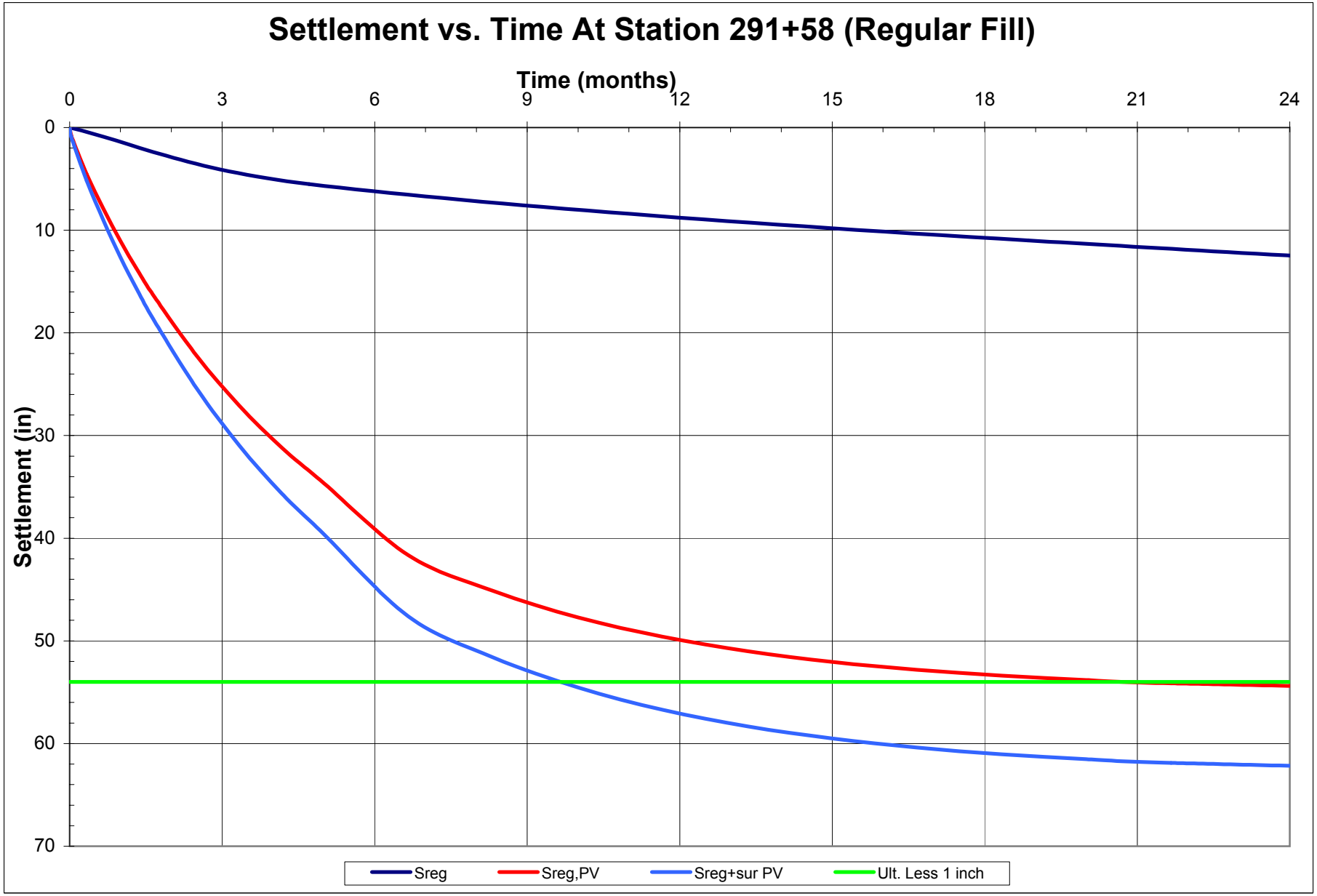
1. $C_{\varepsilon c} = C_c/(1+e_o)$
2. $C_{\varepsilon r} = C_r/(1+e_o)$
3. $\varepsilon_z = C_{\varepsilon c} \log (p_f/p_o)$ for normally consolidated soils ($p_o = p_p$)
   $\varepsilon_z = C_{\varepsilon r} \log (p_f/p_o)$ for overconsolidated soils where $p_f < p_p$
   $\varepsilon_z = C_{\varepsilon r} \log (p_p/p_o) + C_{\varepsilon c} \log (p_f/p_p)$ for overconsolidated soils where $p_f > p_p$
4. $\Delta H = \varepsilon_z \times H_o$

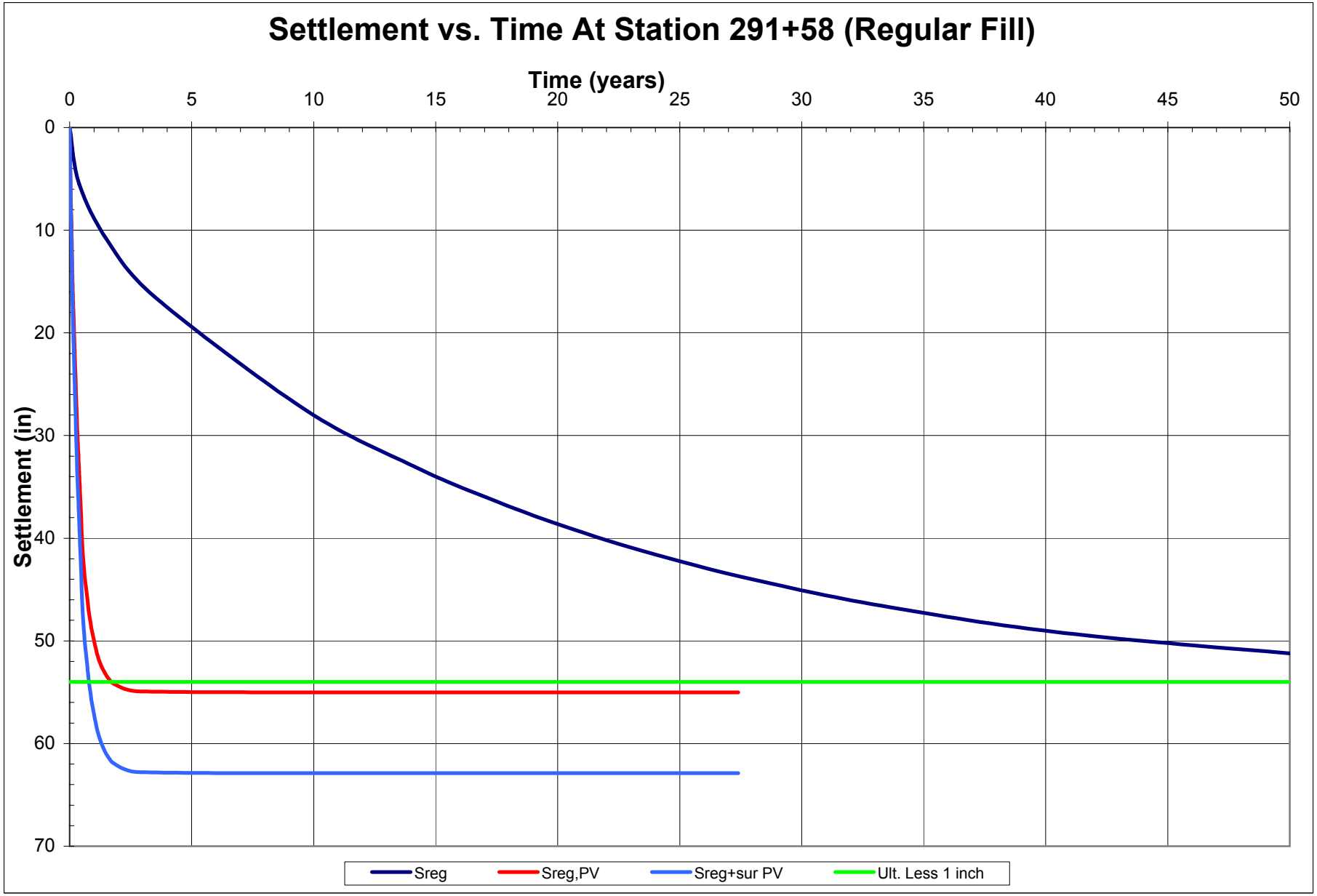

Settlement vs. Time At Station 308+64 (Regular Fill)
Time (months)
0
3
6
9
12
15
18
21
24
Settlement (in)
0
5
10
15
20
25
30
35
40
Sreg
Sreg+PV
Sreg+sur+PV
Ult. Less 1 inch

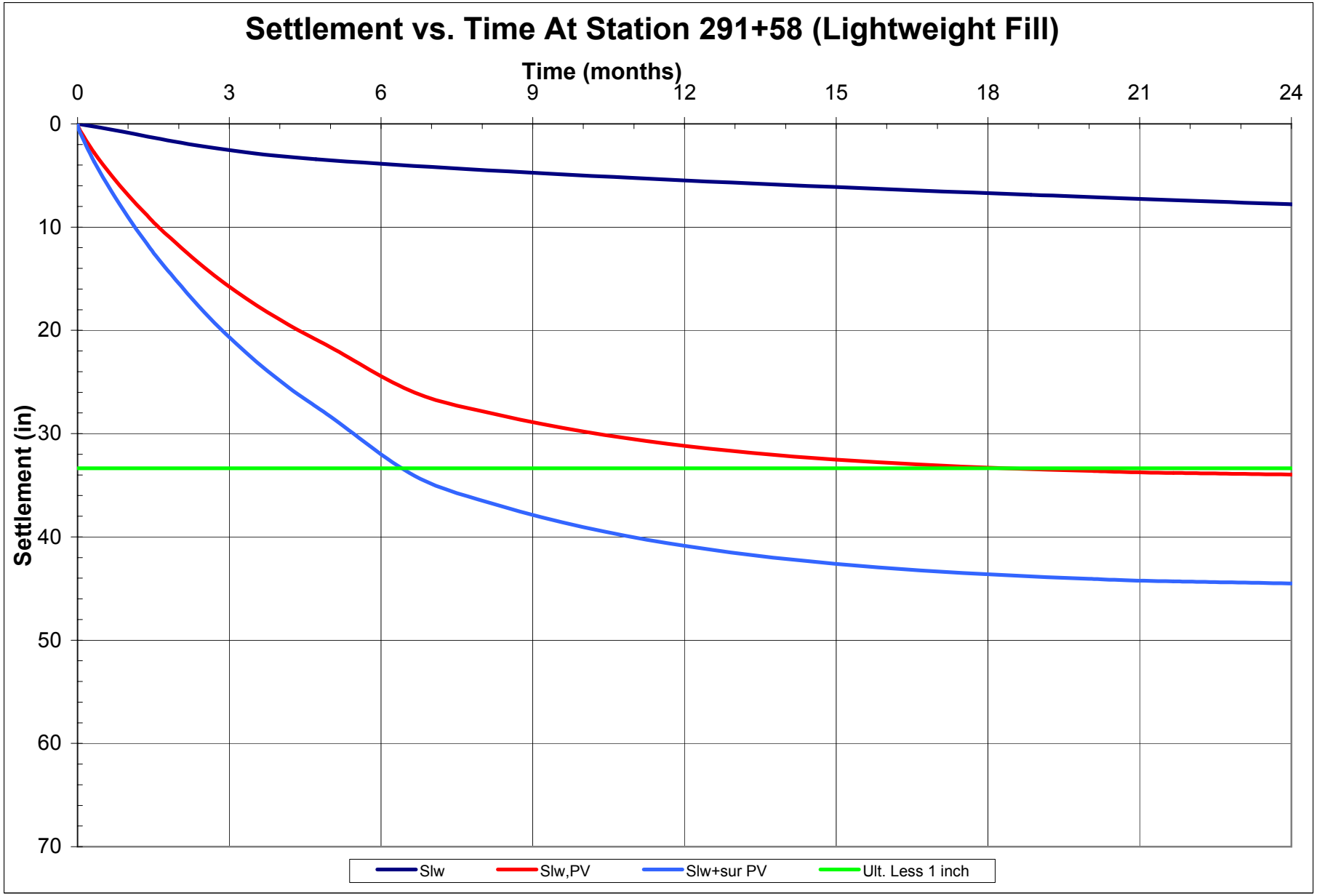

Settlement vs. Time At Station 308+64 (Regular Fill)
Time (years)
0
2
4
6
8
10
12
14
16
18
20
Settlement (in)
0
5
10
15
20
25
30
35
40
Sreg
Sreg+PV
Sreg+sur+PV
Ult. Less 1 inch

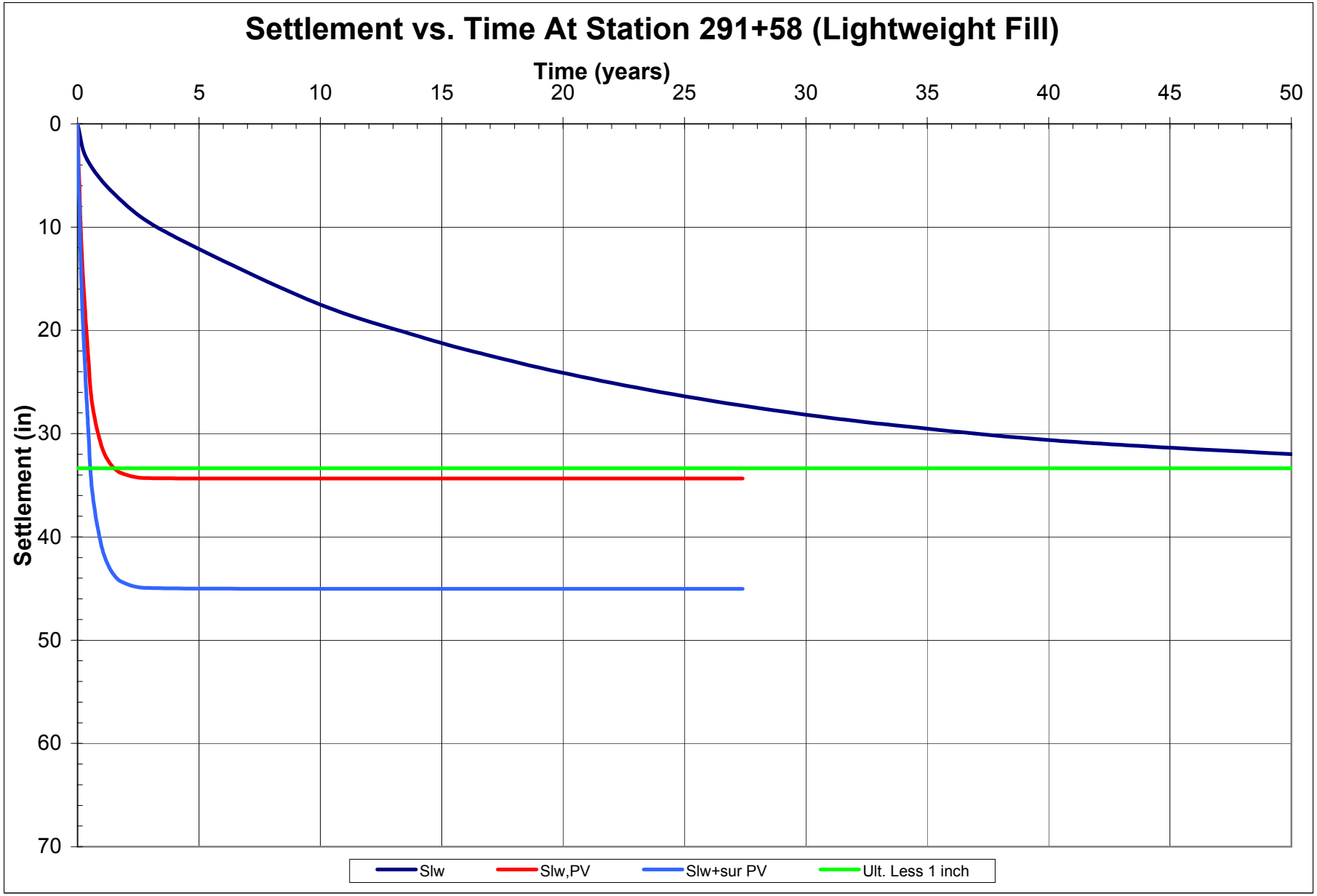

Settlement vs. Time At Station 308+64 (Lightweight Fill)
Time (months)
0
3
6
9
12
15
18
21
24
Settlement (in)
0
5
10
15
20
25
30
35
Slw
Slw+PV
Slw+sur+PV
Ult. Less 1 inch


Settlement vs. Time At Station 308+64 (Lightweight Fill)
Time (years)
0
2
4
6
8
10
12
14
16
18
20
Settlement (in)
0
5
10
15
20
25
30
35
Slw
Slw+PV
Slw+sur+PV
Ult. Less 1 inch


Settlement vs. Time At Station 291+58 (Regular Fill)
Time (months)
0
3
6
9
12
15
18
21
24
Settlement (in)
0
10
20
30
40
50
60
70
Sreg
Sreg,PV
Sreg+sur PV
Ult. Less 1 inch


Settlement vs. Time At Station 291+58 (Regular Fill)
Time (years)
0
5
10
15
20
25
30
35
40
45
50
Settlement (in)
0
10
20
30
40
50
60
70
Sreg
Sreg,PV
Sreg+sur PV
Ult. Less 1 inch


Settlement vs. Time At Station 291+58 (Lightweight Fill)
Time (months)
0
3
6
9
12
15
18
21
24
Settlement (in)
0
10
20
30
40
50
60
70
Slw
Slw,PV
Slw+sur PV
Ult. Less 1 inch


Settlement vs. Time At Station 291+58 (Lightweight Fill)
Time (years)
0
5
10
15
20
25
30
35
40
45
50
Settlement (in)
0
10
20
30
40
50
60
70
Slw
Slw,PV
Slw+sur PV
Ult. Less 1 inch