Final Geotechnical Engineering Report

Pine Point Crossing Bridge
Over B&M Railroad
Scarborough, Maine

Bridge No. 5260
MaineDOT WIN: 18229.00

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Nobis Project No. 85970.01

July 21, 2015

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1.0 INTRODUCTION

Nobis Engineering, Inc. (Nobis) has prepared this Geotechnical Engineering Report on behalf of CHA Consulting, Inc. (CHA) for the design and construction of the proposed replacement of MaineDOT Bridge No. 5260 located on Pine Point Road over the B&M railroad in Scarborough, Maine. Nobis' scope of work, including subsurface explorations, geotechnical analyses and this report, were prepared in accordance with our agreement dated June 6, 2012 as amended October 29, 2014. This report is subject to the limitations in Appendix A.

All elevations in this report are in feet and refer to the North American Vertical Datum of 1988 (NAVD 88).

2.0 PROPOSED BRIDGE STRUCTURE

The Maine Department of Transportation (MaineDOT) has determined that the existing bridge needs to be replaced.

Based on design drawings prepared by CHA dated June 12, 2015, we understand that the existing four-span bridge, located on Pine Point Road over the B&M railroad in Scarborough, Maine, will be replaced with a two-span bridge approximately 129 feet long. The proposed bridge will be approximately 39 feet wide, with two 12-foot lanes and two 6-foot shoulders. The proposed roadway surface of the bridge ranges from approximately El. 43 to El. 38 sloping down from west to east. The proposed grade will be raised on the order of 3 feet over existing grades in order to increase railroad vertical clearance to approximately 22.5 feet.

The proposed bridge substructure will consist of a west abutment, east abutment, and a pier. The B&M railroad will run between the west abutment and the pier, and Snow Canning Road will run between the pier and the east abutment.

Integral abutments are proposed for the bridge supported by a single row of seven HP 12x53 driven H-piles. Mechanically stabilized earth (MSE) breast walls will be constructed around the driven H-piles to support the approach embankments the abutments. The weak axis of the H-piles will be oriented in the longitudinal direction of the bridge. The bottom of the proposed west MSE wall is at El. 10 and the east MSE wall is at El. 7 stepping up to El. 12. The bottom of the wingwalls for the west MSE wall are at El. 10 stepping up to El. 15 on both the north and south side. The bottom of the wingwalls for the east MSE wall are at El. 7 on the south side, and El. 12 stepping up to El. 14.5 on the north side. Nobis understands the seven H-piles will extend through the reinforced wall fill, which will be placed following the installation of the H-Piles. The maximum height of the MSE-wall face is on the order of 27 feet for both the west and east abutments.

The pier will consist of a cap beam supported by a single row of six 24-inch diameter concrete-filled driven pipe piles. The height from the bottom of the cap beam (about El. 39) to the ground surface (about El. 15) is on the order of 24 feet.

A sheet pile retaining wall is proposed on the south side of the east approach embankment, between Pine Point Road and Snow Canning Road. The sheet pile retaining wall is approximately 180 feet long, and will extend from the MSE wall at the east abutment to an existing culvert that conveys Nonesuch River beneath Pine Point Road to the east. Nobis understands that the tip elevation of the wall will vary, from El. -4.0 at the highest exposed section, to El. 11.0 at the lowest exposed section.

A temporary bridge will be constructed to the north of the existing bridge to maintain traffic flow during construction of the proposed bridge. Nobis understands the temporary bridge will be designed by the contractor and therefore, recommendations for the temporary bridge are not covered in this report.

3.0 EXISTING SITE CONDITIONS

The existing bridge is located on a seasonally busy highway that connects Pine Point Road to Route 1. The bridge carries Pine Point Road over both the B&M railroad and Snow Canning Road, a gravel road that serves commercial properties and a residential property to the north. The bridge is a four span structure constructed around 1954 with dimensions of approximately 195 feet long and 35 feet wide. The superstructure consists of steel I-beam girders supporting a 6-inch concrete deck with a 2-inch asphalt wearing surface. The bridge abutments are monolithic cast-in-place structures founded in the embankment fill. The abutments were designed for a maximum toe pressure of 1.25 tons/ft^2. The bridge piers are founded on shallow spread footings at each column. The piers were designed for a maximum bearing pressure of 1.5 tons/ft^2. Information on the existing bridge is based on our review of the original construction drawings dated May 1953. See Appendix D for selected sheets of the 1953 Construction Drawings. Elevations on these original drawings are based on an unknown vertical datum.

The existing surface of the bridge ranges from approximately El. 40 to El. 35 sloping down from west to east. The grade at the B&M railroad below the bridge is at approximately El. 15. The bridge provides approximately 19 feet of vertical clearance at the controlling location over the western track.

An approximately 9-foot wide culvert conveys Nonesuch River under Pine Point Road and Snow Canning Road at STA 17+90 approximately 190 feet east of the existing bridge. Nonesuch River is tidally influenced.

There are several known utilities in the project area. Above-ground utility poles on the south side of the bridge run parallel to the east and west embankments. Above-ground utility lines also cross over Pine Point Road at approximately STA 15+90. Underground water utilities run parallel with Snow Canning Road on the south side of Pine Point Road. A separate underground water line runs northward along Snow Canning Road to a residential property on the north side of the bridge. Underground sewer utilities are located south of the east and west approach embankments running parallel to Pine Point Road. Privately owned communication lines run parallel with the B&M railroad alignment. Refer to Figure 1 – Boring Location Plan, for locations of known utilities in the project area.

4.0 SUBSURFACE EXPLORATIONS

The locations of the borings observed by Nobis are shown on Figure 1 and the boring logs for the explorations observed by Nobis are in Appendix B. The locations of the 1953 borings are shown on the original 1953 Construction Drawings and on Figure 1, and the 1953 boring logs are located in Appendix C.

4.1 Test Borings by Nobis

In 2012, borings BB-SMBR-101 through BB-SBMR-105 were performed to provide subsurface information to evaluate the re-use of the existing bridge foundations. A preliminary geotechnical report was prepared by Nobis dated October 25, 2012. Nobis understands the re-use of the

existing foundations has been abandoned in favor of replacing the bridge foundations as currently designed. As a result, borings BB-SMBR-201 through BB-SBMR-208 were performed to support the design of the new foundations.

Northern Test Boring, Inc. (Northern Test Boring) of Gorham, Maine drilled five test borings (designated BB-SBMR-101 through BB-SBMR-105) between August 10 and August 13, 2012, at the location of the existing abutments and piers. The test borings were a part of the preliminary engineering effort and were coordinated, observed, and logged by Nobis. BB-SBMR-104 was drilled using drive and wash, while the other four borings were drilled using a combination of hollow stem auger and drive and wash techniques. BB-SBMR-104 was drilled through the existing bridge deck to the ground surface approximately 22 feet below. Samples were taken with a 1-3/8-inch split spoon sampler advanced with an automatic hammer. Rock coring was performed in the five (5) borings using a NX core barrel.

Northern Test Boring drilled four additional test borings (designated BB-SBMR-204 through BB-SBMR-207) between December 22 and December 23, 2014, along the top and bottom of the east embankment. The test borings were coordinated, observed, and logged by Nobis. The four borings were drilled using drive and wash techniques. Samples were taken with a 1-3/8-inch split spoon sampler advanced with an automatic hammer.

Borings BB-SMBR-201 to BB-SBMR-203 and BB-SBMR-208 were planned in December of 2014, but could not be performed at that time due to restrictions involving the railroad right of way. Nobis was given clearance to proceed with the borings in the railroad right of way in February of 2015, but significant snowfall prevented accessing the boring locations. Borings could not be completed until the snow melted in April of 2015.

New Hampshire Boring, Inc. d.b.a. New England Boring Contractors (New Hampshire Boring) of Derry, New Hampshire drilled four test borings (designated BB-SMBR-201 to BB-SBMR-203 and BB-SBMR-208) between April 6 and April 10, 2015 at the location of the proposed abutments and pier. The test borings were coordinated, observed, and logged by Nobis. The four borings were drilled using drive and wash techniques. Samples were taken with a 1-3/8-inch split spoon sampler advanced with an automatic hammer. Rock coring was performed in borings BB-SBMR-202 and BB-SBMR-208 using a NX core barrel.

4.2 Previous Borings by Others

The original 1953 Construction Drawings show logs for a total of twelve (12) borings drilled in December 1953. Seven of the borings were drilled at the abutments and piers, and five were drilled at the approach embankment to the east. The location of these previous explorations and the accuracy of those logs have not been verified by Nobis.

4.3 Geotechnical Laboratory Testing

Select soil samples were submitted to GeoTesing Express of Acton, Massachusetts for laboratory testing. The laboratory test results are provided in Appendix E.

The laboratory testing included the following:

- 25 Grain Size Distribution Analyses (ASTM D 422).
- 11 Moisture Content (ASTM D 2216-05).
- 1 Organic Content (ASTM D2974)

- 13 Atterberg Limits (ASTM D 4318-05).
- 7 pH test (ASTM D 4972).
- 1 Compressive Strength of Rock Core (ASTM D 7012 Method C).
- 1 Compressive Strength and Elastic Moduli of Rock Core (ASTM D 7012 Method D).
- 6 Chloride Test (EPA Method 9251).
- 6 Sulfate Test (EPA Method 9038).

5.0 GENERALIZED SUBSURFACE CONDITIONS

Generally the borings indicate that the soil profile consists of a very loose to dense existing fill, overlying a loose to medium dense natural silty sand deposit, overlying medium dense to very dense glacial till, overlying bedrock. A trace amount of organic material was encountered in several borings at the interface between the fill and the silty sand. A layer with significant organic material was encountered in boring BB-SBMR-206. The soil layers show a downward sloping trend, from west to east, similar to the former ground and bedrock surface. Refer to Figure 2 – Generalized Subsurface Profile and the boring logs.

The 1953 Construction Drawings indicate that the grades east and west of the tracks were raised with granular borrow approximately 25 to 30 feet at the bridge and up to 35 feet along the east approach embankment. The drawings indicate that the soft organic deposits below the roadway and most of the east embankment were also excavated and replaced with granular borrow.

5.1 Soil Strata and Bedrock Descriptions

The following presents generalized soil descriptions of the materials encountered in the borings performed by Nobis.

Existing Fill

The existing fill was generally medium dense and consisted of fine to coarse sand, with varying amounts of gravel and silt. In borings that were not performed on the embankments, the fill stratum was less than 8 feet thick, and generally less than 4 feet thick. The thickness of the fill in borings performed on top of the embankments ranged from approximately 22 to 26 feet. The fill stratum terminated approximately between El. 14.9 and El. 5.6.

Sand with Organics

Trace amounts of organics were encountered in BB-SBMR-102, BB-SBMR-104, and BB-SBMR-105 at the interface of the Existing Fill and Silty Sand strata. BB-SBMR-206 contained a sand stratum with a significant amount (23.5%) of organics, approximately 5 feet thick, from El. 2.6 to El. -2.3. This boring is located at the south side of the east embankment, in the vicinity of the existing culvert.

Silty Sand

A layer of silty sand was encountered below the fill and generally consisted of loose to medium dense, fine to coarse sand, with varying amounts of silt and trace amounts of gravel and clay. The silty sand stratum terminated approximately between El. 8.0 and El. -16.25. The thickness of the silty sand layer ranged from approximately 4 to 24 feet.

Glacial Till

The glacial till generally consisted of medium dense to very dense fine to coarse sand, with varying amounts of gravel and silt and occasional trace amounts of clay. The glacial till stratum was encountered below the overlying silty sand layer and terminated approximately between El. -10.7 and El. -64.3. The glacial till layer ranged in thickness from approximately 3.3 to 63 feet.

Bedrock

Rock cores were taken approximately 10 feet into the bedrock in borings BB-SBMR-101 to BB-SBMR-105, BB-SMBR-202, and BB-SBMR-208. The bedrock generally consisted of gray/black, fine grained, hard, fresh to slightly weathered phyllite with moderately dipping, closely spaced, and tight to open joints. This rock appears to match the phyllite described in the Kittery Formation of which this area is mapped in the Bedrock Geology of the Portland 1:100,000 Quadrangle, 1998.

The Rock Quality Designations (RQD) for the bedrock ranged from 19% to 87%, but were generally around 50% or greater. The exception was the rock core performed at boring BB-SBMR-104 which consisted of moderately to highly weathered fractured rock with RQD values between 19% and 44%. At this location, approximately 600 gallons of water was lost during the coring, likely due to the open and weathered fractures in the rock.

Two uniaxial compressive tests were performed on selected rock cores, one from BB-SBMR-202 and one from BB-SBMR-208. The results show a uniaxial compressive strength of 10,299 psi and 13,282 psi, respectively, and are presented in Appendix E.

5.2 Groundwater Conditions

Groundwater at the site was encountered at elevations ranging between approximately El. 2.8 to El. 15.5. The hydraulic gradient appears to be sloping downward to the east which is consistent with the natural slope of the land. Tidal activity may potentially cause fluctuations in the groundwater. Groundwater will fluctuate with season, construction activities, and drilling activities and levels in the borings may not represent stabilized groundwater levels.

6.0 GEOTECHNICAL EVALUATIONS AND DESIGN RECOMMENDATIONS

These recommendations are based on the subsurface information obtained by Nobis and others as discussed in the Subsurface Explorations section of this report.

Nobis has conducted geotechnical engineering evaluations in general accordance with the following:

1. AASHTO. (2014). *AASHTO LRFD Bridge Design Specifications*, American Association of State Highway and Transportation Officials (AASHTO), 7th edition, Washington, DC.
2. MaineDOT Bridge Design Guide, 2003, with revisions through 2008.

6.1 Primary Geotechnical Issues Related to Design

Based on our review of the subsurface conditions at the site, we believe the primary geotechnical engineering issues related to the project are as follows:

Presence of Organics Beneath the East Embankment: the placement of fill soils over the organic materials, as encountered in boring BB-SBMR-206, is likely to induce settlement of the embankment and/or existing utilities retaining wall as discussed below.

Proximity of Existing Utilities: There are several utilities in close proximity of the work to be performed as discussed below.

Varying Bedrock Elevation: The elevation of the bedrock varies throughout the site, both parallel and perpendicular to the road alignment. This will make it difficult to predict pile lengths as discussed below. Bedrock elevations encountered in the borings varied, from El. -16.5 to El. -23.8 at the west abutment, from El. -24.9 to El. -46.2 at the pier, and from El. -30.6 to El. -64.3 at the east abutment.

6.2 Pier Foundation Evaluations

Based on discussions with the design team, CHA intends to use a single row of six (6) 24-inch diameter concrete filled close-ended pipe (CEP) piles to support the pier. The design indicates the 24-inch pipe piles will have a wall thickness of 0.625 inches and a conical tip for purposes of driving and achieving geotechnical axial tip resistance. The top 40 feet of the pile will contain 16 #8 steel reinforcement bars. Pile cap layout for the pier was developed by CHA.

We understand that pipe piles are: ASTM A252, Grade 3, with a minimum yield strength of 45 ksi., filled with Class A concrete (minimum compressive strength of 4,350 psi). The pipe pile tips will be protected with a prefabricated pointed cast steel pile tip in accordance with MaineDOT Standard Specification 501.10 to protect the piles during driving.

CHA provided maximum design pile loading applied at top of piles (bottom of pile cap) for the pier, dated June 4, 2015. Nobis evaluated the following load cases as directed by CHA: Strength I case 1 and case 2, Strength III case 1 through case 4, Strength IV case 3 and case 4, Extreme Event 1A case 1 and case 2, Extreme Event 1B case 1 and case 2, and Service I case 1 and case 2. The loads provided by CHA are included in Appendix F.

Note that the Structural Engineer should evaluate the Structural Resistance of the pile in accordance with AASHTO Section 10.7.3.2.3 and Section 6.5.4.2 for hard driving conditions.

We recommend the use of a structural resistance factor (Article 6.5.4.2) of 0.6 for pipe piles subject to damage due to severe driving conditions.

6.2.1 Axial Compression Pile Resistance and Driving Resistance

Nobis anticipates the piles will gain support through a combination of side resistance and tip resistance in glacial till, or a combination of side resistance in the glacial till and tip resistance on bedrock. Figure 3 shows a generalized subsurface profile for the pier. We understand that the piles will not be subject to uplift loads. Since piles will be supported by either dense glacial till or bedrock, there is no group reduction factor for group interaction in axial compression.

The maximum factored axial load per pile (the factored geotechnical resistance) of the pipe piles was calculated based on the lateral analyses performed on the pier. Based on the loading, the Strength I case 1 loading condition gave the highest maximum factored axial load per pile of 322 Kips. Considering the resistance factor of 0.65 for drivability, the required nominal pile resistance is 496 kips at the pier.

To estimate pile tip elevations, the nominal geotechnical resistance of the pipe piles was calculated using the factored axial load and a resistance factor, φ_{stat}, of 0.45 (Table 10.5.5.2.3-1). The computer program DRIVEN v1.2 (FHWA, 2001) was used to calculate the pile length in order to achieve that nominal geotechnical resistance. Based on the Driven analysis, the piles will achieve the nominal resistance on or near bedrock where bedrock is shallow (i.e. El -24.0), and where bedrock is deeper, the piles should be driven to a tip elevation of -18.0 in the glacial till. Calculations of the geotechnical resistance are included in Appendix G.

The piles will need to be driven and tested, as described in the Construction Considerations section below, to the required total nominal driving resistance using a resistance factor of 0.65 (Table 10.5.5.2.3-1) in order to support the factored loads. The piles should also be driven to a minimum tip elevation of El. -19 as described in 6.2.2 based on point of fixity, or deeper.

A preliminary WEAP analysis was performed to ensure that the nominal driving resistance can be achieved without overstressing the piles. In accordance with MaineDOT BDG, the piles cannot exceed 90% of the yield stress, and blows per inch should be between 3 and 15. Based on the preliminary analysis, the piles can feasibly be driven while meeting the requirements presented in the MaineDOT BDG. Calculations of the nominal driving resistance are included in Appendix G.

Critical Load Case	Strength 1, Case 1
Maximum Factored Axial Load (per pile)	322 Kips
Required Factored Geotechnical Resistance (per pile)	322 Kips
Driving Resistance Factor	0.65
Nominal Driving Resistance (per pile)	496 Kips

6.2.2 Lateral Pile Capacity

Nobis performed a lateral analysis of the bridge pier pile bent using Group v2014 developed by Ensoft, Inc. The lateral analysis was performed using the loads provided by CHA and assuming a fixed connection exists between the piles and the pile cap. Based on the lateral analysis, a maximum lateral deflection of 0.56-in was calculated for the Service Limit State loads. A maximum moment of 132 k*ft was calculated for the Strength III case 4. Additional details regarding lateral deflections, bending moments, and shear forces with depth were provided to CHA and are attached in Appendix G.

The depth of fixities, based on the second point of zero deflection in the Group output, are summarized in the following table. Only the strength load cases were analyzed per AASHTO Section 10.7.6.

Load Case	Load Case	Fixity		
		Depth Below Bottom of Pile Cap (ft)	Depth Below Proposed Ground Surface, El. 15 (ft)	Elevation (ft)
1	Strength I case I	55	31	-16
2	Strength I case 2	54	30	-15
3	Strength III case 1	55	31	-16
4	Strength III case 2	55	31	-16
5	Strength III case 3	55	31	-16
6	Strength III case 4	57	33	-18
7	Strength IV case 3	58	34	-19
8	Strength IV case 4	55	31	-16

Note that the Structural Engineer should evaluate the Structural Resistance of the pile in accordance with AASHTO.

6.2.3 Pile Settlement and Elastic Pile Compression

Pile tip settlement and elastic pile compression were evaluated based on the loads provided by CHA. Settlement due to elastic compression was estimated at less than ¼ inch for the 24 inches piles. The elastic pile compression will occur primarily during construction, as the superstructure loads are applied. It is assumed that pile tip settlement will be negligible.

6.2.4 Corrosion of Steel Piles

The steel piles may be subject to corrosion. Corrosion rates are typically a function of temperature, soil pH, access to oxygen, and chemistry of the environment surrounding the pile. Nobis recommends that corrosion protection measures be implemented, as the piles in the project site may be susceptible to corrosion. Nobis assumed no reduction in steel due to corrosion in our analyses. Nobis recommends that a corrosion engineer be consulted to confirm our assumptions and design corrosion protection measures if needed.

6.2.5 Pier Foundation Recommendations

- The proposed pier may be supported on 24-inch diameter concrete-filled pipe piles driven to the required nominal resistance.
- The piles should be driven to a nominal resistance calculated by dividing the maximum factored pile load of 322 kips by a resistance factor of 0.65, resulting in a required nominal pile resistance of 496 kips.
- For the purpose of estimating quantities, it should be assumed the piles will penetrate to a tip elevation of approximately El. -24.0 assuming the nominal pile resistance is achieved on or near bedrock.
- To limit driving damage, the steel piles should be fitted with protective conical driving tips.
- Pier piles should be filled with “Class A” concrete and reinforced in accordance with the requirements of CHA.
- Pile installation should be controlled based on dynamic pile testing with signal matching analysis. We recommend that one pile per

6.3 West and East Integral Abutment Foundation Evaluations

Based on discussions with the design team, CHA intends to use a single row of seven (7) HP 12x53 driven H-Piles to support the east and west integral abutments. The HP 12x53 H-Piles will be driven prior to the construction of the proposed MSE Wall. Pile cap layouts for the east and west abutments were developed by CHA. We understand that piles are ASTM A572, Grade 50, with a minimum yield strength of 50 ksi.

CHA provided maximum design pile loading applied at top of piles (bottom of pile cap) for the abutments, dated June 4, 2015. Nobis evaluated 14 of the load cases as directed by CHA including: Strength I case 1 and case 2, Strength III case 1 through case 4, Strength IV case 3 and case 4, Extreme Event 1A case 1 and case 2, Extreme Event 1B case 1 and case 2, and Service I case 1 and 2. The loads provided by CHA are included in Appendix F.

Note that the Structural Engineer should evaluate the Structural Resistance of the pile in accordance with AASHTO Section 10.7.3.2.3 and Section 6.5.4.2 for hard driving conditions.

We recommend the use of a structural resistance factor (Article 6.5.4.2) of 0.5 for H-piles subject to damage due to severe driving conditions.

6.3.1 Downdrag

Greater than 0.4 inches of settlement is anticipated to occur around the proposed abutment piles due to the construction of the MSE walls. Therefore, the piles should be designed to resist downdrag loading.

Side friction contributing to downdrag load was estimated using the Nordlund/Thurman method in accordance with AASHTO 10.7.3.8.6f. Side friction is anticipated to develop both below the bottom of the MSE wall in the silt and sand layer and within the MSE wall as the layers of the MSE wall are constructed. Sufficient settlement to cause downdrag loads is not anticipated in the glacial till stratum. The nominal downdrag load (DD) is estimated to be 83.4 kips. A load factor of 1.0 should be applied to the calculated downdrag load, which should be added to the maximum factored axial load provided by CHA.

6.3.2 Axial Compression Pile Resistance and Driving Resistance

Nobis anticipates the piles will gain support through a combination of side resistance and tip resistance in glacial till, or a combination of side resistance in the glacial till and tip resistance on bedrock. Figure 3 shows generalized subsurface profiles for the abutments. We understand that the piles will not be subject to uplift loads. Since piles will be supported by either dense glacial till or bedrock, there is no group reduction factor for group interaction in axial compression.

The maximum factored axial load per pile (the factored geotechnical resistance) of the H-pipe piles was calculated based on dividing the critical axial load by the number of piles per abutment (7). Based on the loading, the Strength I case 1 loading condition gave the critical axial load of 1154 Kips per abutment resulting in a maximum factored axial load per pile of 165 kips. Considering downdrag load, the total factored load is 248.4 kips. Considering the resistance factor of 0.65 for drivability, the required nominal pile resistance is 382.2 kips at the pier.

To estimate pile tip elevations, the nominal geotechnical resistance of the H-pile was calculated using the factored axial load and a resistance factor, φ_{stat}, of 0.45 (Table 10.5.5.2.3-1). The

computer program DRIVEN v1.2 (FHWA, 2001) was used to calculate the pile length in order to achieve that nominal geotechnical resistance. Based on the Driven analysis, the piles will achieve the nominal resistance on or near bedrock at the west abutment. At the east abutment, the piles will achieve the nominal driving resistance on or near bedrock where bedrock is shallow, and where bedrock is deeper, the piles should be driven to a tip elevation of -45.5 in the glacial till. Calculations of the geotechnical resistance are included in Appendix G.

The piles will need to be driven and tested, as described in the Construction Considerations section below, to the required total nominal driving resistance using a resistance factor of 0.65 (Table 10.5.5.2.3-1) in order to support the factored loads. The piles should also be driven to the point of fixity as described in 6.3.2 or deeper. It is unlikely that the depth of fixity will govern the pile length for the east and west abutments.

A preliminary WEAP analysis was performed to ensure that the nominal driving resistance can be achieved without overstressing the piles. In accordance with MaineDOT BDG, the piles cannot exceed 90% of the yield stress, and blows per inch should be between 3 and 15. Based on the preliminary analysis, the piles can feasibly be driven while meeting the requirements mentioned in the MaineDOT BDG. Calculations of the nominal driving resistance are included in Appendix G.

Critical Load Case	Strength 1, Case 1
Maximum Factored Axial Load (per pile)	165 Kips
Factored Downdrag Load	83.4 Kips
Required Factored Geotechnical Resistance (per pile)	248.4
Driving Resistance Factor	0.65
Nominal Driving Resistance (per pile)	382.2 Kips

6.3.3 Lateral Pile Capacity

A displacement based lateral pile analyses at the West and East Integral Abutments was performed using L-Pile v2015 developed by Ensoft, Inc., assuming the lateral deflection of the integral abutments is controlled by thermal expansion. Our LPile analysis assumed that a fixed connection exists for the abutments between the piles and the pile cap, meaning that the top of the piles could translate but not rotate. The pile reaction was evaluated by applying the anticipated horizontal displacement and the axial load, provided by CHA, to the bottom center of the pile cap. Lateral deflections, bending moments, and shear forces with depth were provided are attached in Appendix G.

The depth of fixities, based on the point of second zero deflection in the L-Pile output, are summarized in the following table.

Load Case	Assumed Lateral Deflection (in)	Fixity Below Bottom of Pile Cap (ft)
1	0.25	18
2	0.5	19
3	0.75	19
4	1.0	19
5	1.25	19
6	1.5	19
7	1.75	19
8	2.0	20

Note that the Structural Engineer should evaluate the Structural Resistance of the pile in accordance with AASHTO.

6.3.4 Pile Settlement and Elastic Pile Compression

Pile tip settlement and elastic pile compression were evaluated based on the loads provided by CHA, and the downdrag load. Settlement due to elastic compression was estimated at approximately 3/4 inch for the HP 12x53 piles. The elastic pile compression will occur primarily during construction, soon after the superstructure loads are applied. It is assumed that pile tip settlement will be negligible.

6.3.5 Corrosion of Steel Piles

The steel piles may be subject to corrosion. Corrosion rates are typically a function of temperature, soil pH, access to oxygen, and chemistry of the environment surrounding the pile. Nobis recommends that corrosion protection measures be implemented, as the piles in the project site may be susceptible to corrosion. Nobis assumed no reduction in steel due to corrosion in our analyses. Nobis recommends that a corrosion engineer be consulted to confirm our assumptions and design corrosion protection measures if needed.

6.3.6 Abutment Pile Foundation Recommendations

- The proposed integral abutments may be supported on HP 12x53 H-piles driven to the required nominal resistance.
- The abutment H-piles should be designed to resist downdrag loads. Therefore, the piles should be driven to a nominal resistance calculated by dividing the required factored geotechnical resistance per pile of 249 kips by a resistance factor of 0.65, resulting in a required nominal pile resistance of 383 kips.
- For the purpose of estimating quantities at the east abutment, it should be assumed the piles will penetrate to a tip elevation of approximately El. -45.5 assuming the nominal pile resistance is achieved in the glacial till. Actual tip elevations will vary and may be as shallow as El. -30.6 assuming end bearing on bedrock.
- For the purpose of estimating quantities at the west abutment, it should be assumed the piles will penetrate to a tip elevation of approximately El. -23.8 assuming the nominal pile resistance is achieved in the deep bedrock. Actual tip elevations will vary and may be as shallow as El. -16.5 assuming end bearing on shallow bedrock.
- To limit driving damage, the steel H-piles should be fitted with protective driving tips.
- Pile installation should be controlled based on dynamic pile testing with signal matching analysis.

6.4 MSE Wall Design Recommendations

The following paragraphs present recommendations regarding the external stability of the proposed west and east abutment MSE walls. The proposed retaining walls should be designed by an MSE wall supplier or wall design engineer. The design to be performed by others should include internal stability checks including checks for pullout and rupture of the reinforcements, design of wall system components, calculations that check sliding and overturning of the MSE gravity mass and determine the eccentricity and applied bearing pressure at the base of the structure, and other applicable design requirements as specified in AASHTO LRFD and MaineDOT Bridge Design Guide (BDG) specifications.

The MSE wall supplier or wall design engineer shall consider the effects of the laterally loaded piles in the MSE wall.

6.4.1 Bearing Resistance and Settlement

Based on the proposed elevations and the subsurface conditions encountered in the borings, Nobis anticipates the MSE wall will bear on the natural silty sand stratum. Embankment fill may be encountered in excavations for the footings. Nobis recommends that any embankment fill be over-excavated and replaced with compacted Granular Borrow and that 12 inches of compacted Gravel Borrow or Crushed Stone overlying non-woven geotextile filter fabric be placed on the silty sand stratum immediately below the concrete leveling pad for the facing panels.

Nobis estimated the bearing resistance and settlement of the MSE abutment walls and wingwalls using a footprint width of 0.7 times the MSE wall height, which varied per location. It was assumed that the effective width of the MSE footprint was 2/3 the footprint width. Using a resistance factor of 0.65, Nobis estimates a factored bearing resistance is 7.5 kips per square foot (ksf) at the Strength Limit State. We assumed that the concrete leveling pad MSE wall facing is supported by a minimum 12 inches of Gravel Borrow or Crushed Stone overlying non-woven geotextile filter fabric overlying natural silty sand subgrade and that the excavation for the Gravel Borrow MSE reinforcement zone extends horizontally across the entire footprint from the top of concrete leveling pad elevation. Refer to subgrade preparation in construction considerations.

Nobis estimates maximum total elastic settlement of 1, 2 and 3 inches at Service Limit State bearing pressures of 1.7 ksf, 3.4 ksf and 5.2 ksf, respectively. This settlement will occur during construction as the MSE wall fill is being placed.

6.4.2 Frost Protection

A depth of frost protection was determined using Table 5-1 and Figure 5-1 of the MaineDOT BDG. Using a coarse grained material and a water content of 10%, frost penetration was estimated at a depth of approximately 75.5 inches, or 6.3 feet.

6.4.3 MSE Wall Slope Stability

Nobis evaluated the global slope stability of the MSE Walls for the east and west abutments assuming the walls will be designed to be internally stable. The required resistance factor against global stability under static conditions is 0.65 (AASHTO Section 11.6.2) which corresponds to a factor of safety of 1.5. The results of our global stability evaluation for the MSE Walls indicate a factor of safety greater than 1.5. The results of our global stability evaluation for the MSE Walls indicate a factor of safety greater than 1.1.

6.4.4 Lateral Earth Pressures for MSE Wall

We recommend that the west and east MSE retaining wall be designed based on retained soil with the following soil parameters:

Active Earth pressure coefficient = 0.31 (Simplified Coulomb Method)
Friction angle, ϕ, = 32 deg. for granular borrow (MaineDOT BDG Table 3-3)
Soil density, γ = 125 pcf for granular borrow (MaineDOT BDG Table 3-3)

A live load surcharge should be applied as required by section 3.6.8 of the MaineDOT Bridge Design Guide.

6.4.5 Coefficient of Sliding Friction for MSE Wall

The coefficient of sliding friction at the base of the reinforced soil mass should be determined using the friction angle of the foundation soil. Assuming the foundation soil is natural silty sand stratum with $\phi' = 32°$, Nobis recommends using a friction factor (tan δ) of 0.62. We recommend using a resistance factor of $\phi_t = 1.0$ (AASHTO Table 10.5.5.2.2-1) for evaluation of sliding of the MSE wall.

6.5 Sheet Pile Retaining Wall Design Recommendations

The following paragraphs present recommendations regarding the global stability of the proposed sheet pile wall located on the south side of the east approach embankment. We understand that the proposed retaining wall will be designed by CHA. The design should include a structural evaluation of the sheet pile section to meet applied shear and moment, and an evaluation of overturning to determine embedment depth, and other applicable design requirements as specified in AASHTO LRFD and MaineDOT Bridge Design Guide specifications.

The steel sheet piles may be subject to potentially high corrosion. Corrosion rates are typically a function of temperature, soil pH, access to oxygen, and chemistry of the environment surrounding the pile. Laboratory tests show pH as low as 4.2 at the site. As such, corrosion and deterioration of the sheet piles is likely. Nobis recommends that a corrosion engineer be consulted.

6.5.1 Sheet Pile Wall Slope Stability

Nobis evaluated the global slope stability of the Sheet Pile Walls assuming the walls will be designed to be internally stable. The required resistance factor against global stability under static conditions is 0.65 (AASHTO Section 11.6.2) which corresponds to a factor of safety of 1.5. The results of our global stability evaluation for the Sheet Pile Walls indicate a factor of safety greater than 1.5. The results of our global stability evaluation for the Sheet Pile Walls indicate a factor of safety greater than 1.1.

6.5.2 Lateral Earth Pressures for Sheet Pile Wall

We recommend that the sheet pile retaining wall be designed using lateral earth pressures in accordance with MaineDOT Bridge Design Guide Section 3.6, and the following material properties:

For the existing fill, silty sand, and granular borrow (MaineDOT BDG Table 3-3):

Friction angle, ϕ = 32 deg.
Total Unit Weight, γ = 125 pcf
Cohesion, c = 0
Steel sheet pile, tan δ = 0.25 (NAVFAC DM 7.02)
Steel sheet pile, δ = 14 deg. (NAVFAC DM 7.02)

For the sand with organics:

Friction angle, ϕ = 27 deg.
Total Unit Weight, γ = 100 pcf
Cohesion, c = 0
Steel sheet pile, tan δ = 0.16 (NAVFAC DM 7.02)
Steel sheet pile, δ = 9 deg. (NAVFAC DM 7.02)

A live load surcharge should be applied as required by section 3.6.8 of the MaineDOT Bridge Design Guide.

6.6 Embankment Considerations

6.6.1 Settlement of East Embankment

Boring BB-SBMR-206 encountered an approximately 5 feet thick layer of sand with organics approximately 6 feet below existing grade on the south side of the east embankment, west of the existing culvert. The sand with organics layer is compressible, with approximately 24% organics and a moisture content of 165%. The sand with organics layer is located underneath two existing 10-inch diameter sewer pipes that run parallel and to the south of the east embankment. The proposed grade in the location of the sand with organics is 2 feet higher (Fill) than the existing grade.

The sand with organics layer is relatively thick, has compressible properties, and is located relatively close to the existing grade. We anticipate primary consolidation settlement on the order of 1½-inches will occur within 2 months of the load increase, due to the addition of soil at the bottom of the sheet pile wall. Additionally, we anticipate secondary consolidation settlement on the order of a 2-inches will occur over the life of the structure (assumed 50 years).

6.6.2 Slope Stability

Nobis evaluated the global slope stability for the east and west embankments. The required resistance factor against global stability is 0.75 (AASHTO Section 11.6.2) which corresponds to a factor of safety of 1.3. The results of our global stability evaluation for the embankments indicate a factor of safety greater than 1.3. The results of our global stability seismic evaluation for the embankments indicate a factor of safety greater than 1.0.

6.7 Seismic Evaluation

Seismic evaluations were performed in accordance with AASHTO LRFD Bridge Design Specifications, 2014.

Standard Penetration Test (SPT)-N values from the recently performed borings were used to determine the seismic site class using Method B (Table C3.10.3.1-1). Based on the SPT-N values, the abutments and piers are in a Site Class "D".

The seismic parameters developed for the bridge based on a 7% probability exceedance in 75 years (1,000 year event) are provided below:

Mapped Ground and Spectral Response Coefficients:

- Peak Horizontal Acceleration (PGA): 0.088g
- Horizontal Response Spectral Acceleration, 0.2 Sec (S_S): 0.175g
- Horizontal Response Spectral Acceleration, 1.0 Sec (S_1): 0.045g

Site Class: D

- Site Factors for Site Class "D" Zero-Period (F_{pga}) = 1.6, Short-Period, 0.2 Sec (F_a) = 1.6, and Long Period, 1.0 Sec (F_v) = 2.4.
- Design Spectral Response Parameters for Site Class "D"
  A_S = 0.141g, S_{DS} = 0.28g, S_{D1} = 0.107g.

Per AASHTO, the site is assigned Seismic Zone 1 based on a calculated S_{D1} of 0.107g. Per MaineDOT BDG, the site is assigned Seismic Performance Category "A".

Calculation for the seismic site classification are included in Appendix G.

7.0 CONSTRUCTION CONSIDERATIONS

This section provides comments related to foundation construction, earthwork, and other geotechnical aspects of the project. It will aid those responsible for preparation of contract plans and specifications and those involved with construction monitoring. Potential construction problems should be evaluated on the basis of the Contractor's knowledge and experience in the area and in similar localities, taking into account their own proposed equipment, construction methods, and procedures.

7.1 Dynamic Testing and Drivability

We recommend that piles be driven with an impact hammer utilizing fixed-lead pile installation equipment. Pile followers and pile jetting should not be allowed.

We recommend that dynamic pile testing using Pile Driving Analyzer (PDA) be performed to confirm that piles are driven to the nominal driving resistance. We recommend piles are driven to a nominal resistance equal to the maximum factored axial compressive pile load divided by a resistance factor equal to 0.65 (AASHTO Table 10.5.5.2.3-1). If desired, the Contractor could perform additional dynamic and/or static testing that meets the requirements of AASHTO Article 10.5.5.2.3 in order to use a resistance factor of 0.75 or 0.8.

Nobis performed preliminary drivability evaluations using the computer program GRLWEAP 2010 developed by GRL Engineers, Inc. (see Appendix G). A drivability analysis based on the actual hammer used to install the piles should be completed by the pile installer and pile testing subcontractor.

Due to the high variability of bedrock elevation, Nobis recommends that two (2) piles at opposing ends on each substructure (six piles total) be tested during initial driving with a PDA followed by a CAPWAP analysis. This test is used to determine the pile driving acceptance criteria including blows per inch (or pile set in inches per blow), the hammer and hammer stroke. We also recommend that a re-strike test with a CAPWAP analysis be completed on previously tested piles a minimum of 48 hours after installation to verify that piles have been driven to the required nominal driving resistance.

We recommend that the piles are monitored to ensure that pile driving stresses in the piles are within allowable limits. It is our understanding that the Contractor will retain an experienced pile consultant that will develop acceptance criteria for driving the piles including blows per inch (or pile set in inches per blow). Using the pile driving acceptance criteria established by the pile consultant, the remaining piles at the piers will be driven using the acceptance criteria (refusal criteria) established.

7.2 West and East Abutment MSE Wall Footing Preparation Procedures

We recommend the following subgrade preparation procedures for the proposed west and east abutment MSE walls and wingwalls:

- Proposed footings should bear on a minimum 12 inches of compacted Gravel Borrow within the zone of influence of the MSE wall.

- Gravel Borrow should consist of soil type 5 from Table 3-3 as defined by the MaineDOT Bridge Design Guide, Section 3.6.1.

- Subgrades for the footings should be dewatered, as needed, so that construction is performed in the dry.

- We recommend that a geotechnical engineer observe the subgrade conditions prior to backfilling to footing subgrade.

- Excavations for footing subgrades are anticipated to consist of silty soils that will be sensitive to disturbance when wet and excavation should be conducted in a manner that limits disturbance. Soil subgrades should be kept dry and proof-compacted or, as directed by the geotechnical engineer should be immediately covered with a minimum of 12-inches of Gravel Borrow to protect the subgrade from disturbance.

- The subgrades of the MSE walls should be proof-compacted using a minimum of 4 passes of a vibratory plate or drum compactor with a minimum of 12,000 pounds of centrifugal force. Unsuitable soils, if encountered, and loose or soft zones observed during compaction should be excavated to firm and stable ground and replaced with compacted granular borrow. We recommend that a geotechnical engineer observe the subgrade conditions and compaction of the existing fill soil prior to backfilling.

7.3 Compaction Efforts Behind Sheet Pile Walls

Compaction effort behind retaining walls should use only small hand-guided compactors on backfill material within 5 feet of wall backs to avoid increasing lateral pressures.

7.4 Temporary Dewatering

Groundwater will likely be encountered in the excavations in the area of the West and East Abutments. Temporary excavation dewatering should be performed so that the work conducted is completed in the dry. It is likely that dewatering may be accomplished by pumping from filtered sumps installed in low points of the excavation. Discharge water should be managed in accordance with local, state and federal government requirements.

7.5 Excavation and Temporary Lateral Support

Temporary lateral support may be required to excavate below existing grades in the location of the proposed footings and walls. A feasible option for support of excavation would include standard driven sheet piles. Groundwater will likely be near or above bottom of over-excavation for the footings and dewatering will likely be needed. Sheet piles should be removed prior to pouring footings or left in place and cut off below grade.

Excavation geometry should conform to OSHA excavation regulations contained in 29 CFR Part 1926, latest edition. In general, temporary soil slopes of 1V:1.5H (Soil Profile Type C), or flatter, appear appropriate but should be confirmed during construction based on conditions at the time of excavation.

Temporary earth support systems, if required, should be designed for additional lateral loads due to traffic surcharge, soil surcharge, sloping backfill and seismic loads as required by AASHTO LRFD and MaineDOT Bridge Design Guide. We also recommend a minimum live surcharge load of 350 psf be considered during construction for construction equipment and materials.

7.6 Protection of Adjacent Structures

Underground utilities or adjacent structures require protection during demolition of the existing bridge and the construction of the new bridge. Utilities should be protected or relocated during excavation. Overhead wires and their supporting poles may be in conflict with the proposed work and should be protected or relocated during construction. All underground utilities, if identified, should be relocated outside of the zone of influence of the footings.

7.7 Reuse of Excavated Soils

The majority of the soils to be excavated in this area will consist primarily of sand with varying amounts of silt and gravel. It is anticipated that this material can be reused as Granular Borrow (Table 3-3 from MaineDOT) so long as the material meets the specification. Unsuitable soils containing organics should not be reused.

Figures

NOTES:

1. THIS PLAN WAS DEVELOPED FROM DESIGN FILES OBTAINED FROM CLOUGH HARBOUR AND ASSOCIATES (CHA) ON JUNE 12, 2015.
2. LOCATIONS AND SITE FEATURES DEPICTED HEREON ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
3. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

LEGEND

B-4	APPROXIMATE LOCATION OF BORINGS PERFORMED BY OTHERS IN 1953
BB-SBMR-101	APPROXIMATE LOCATION OF BORINGS PERFORMED BY NOBIS IN SEPTEMBER 2012
BB-SBMR-205	APPROXIMATE LOCATION OF BORINGS PERFORMED BY NOBIS IN DECEMBER 2014 AND APRIL 2015

0 40' 80'

GRAPHIC SCALE

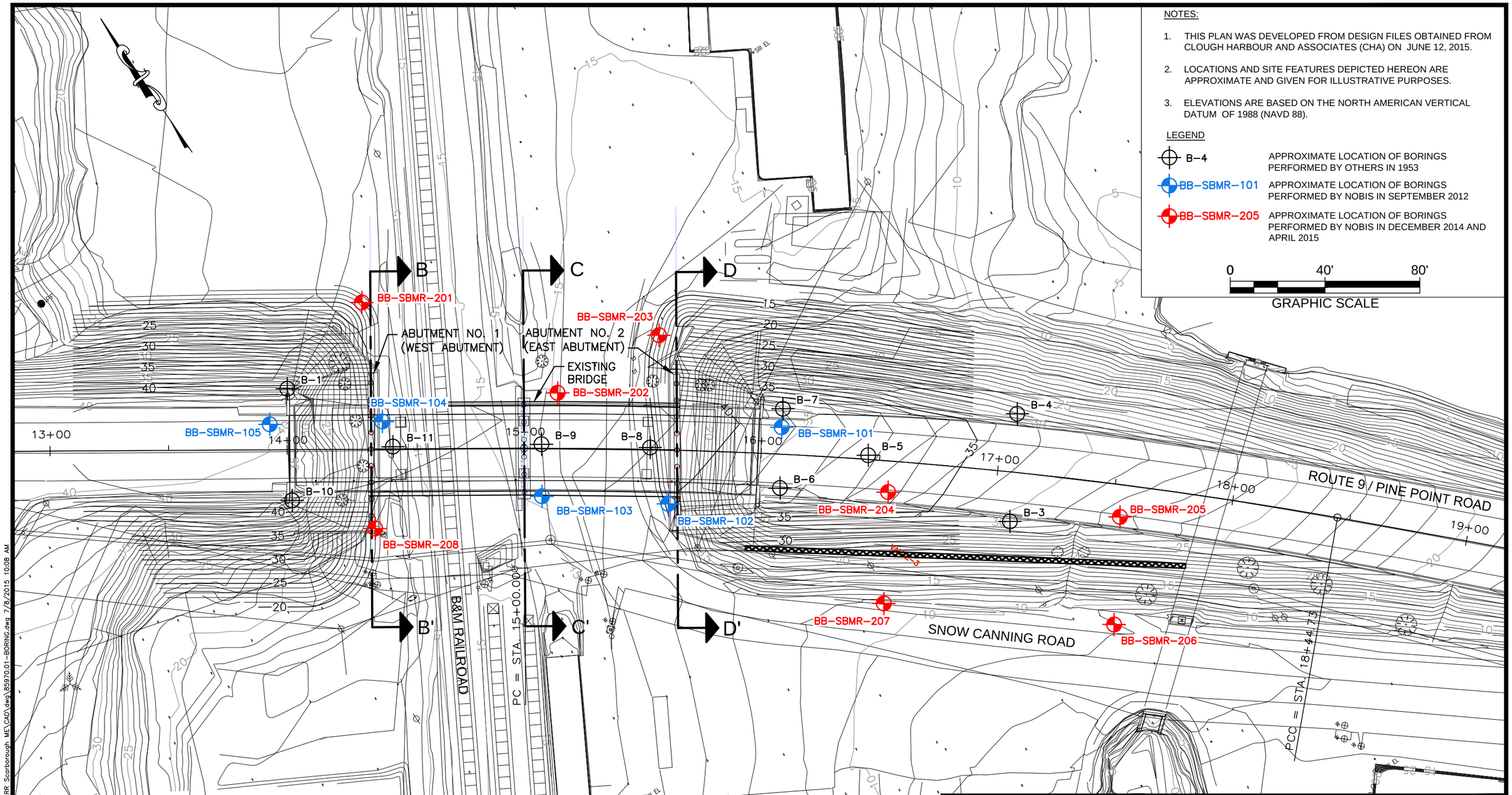

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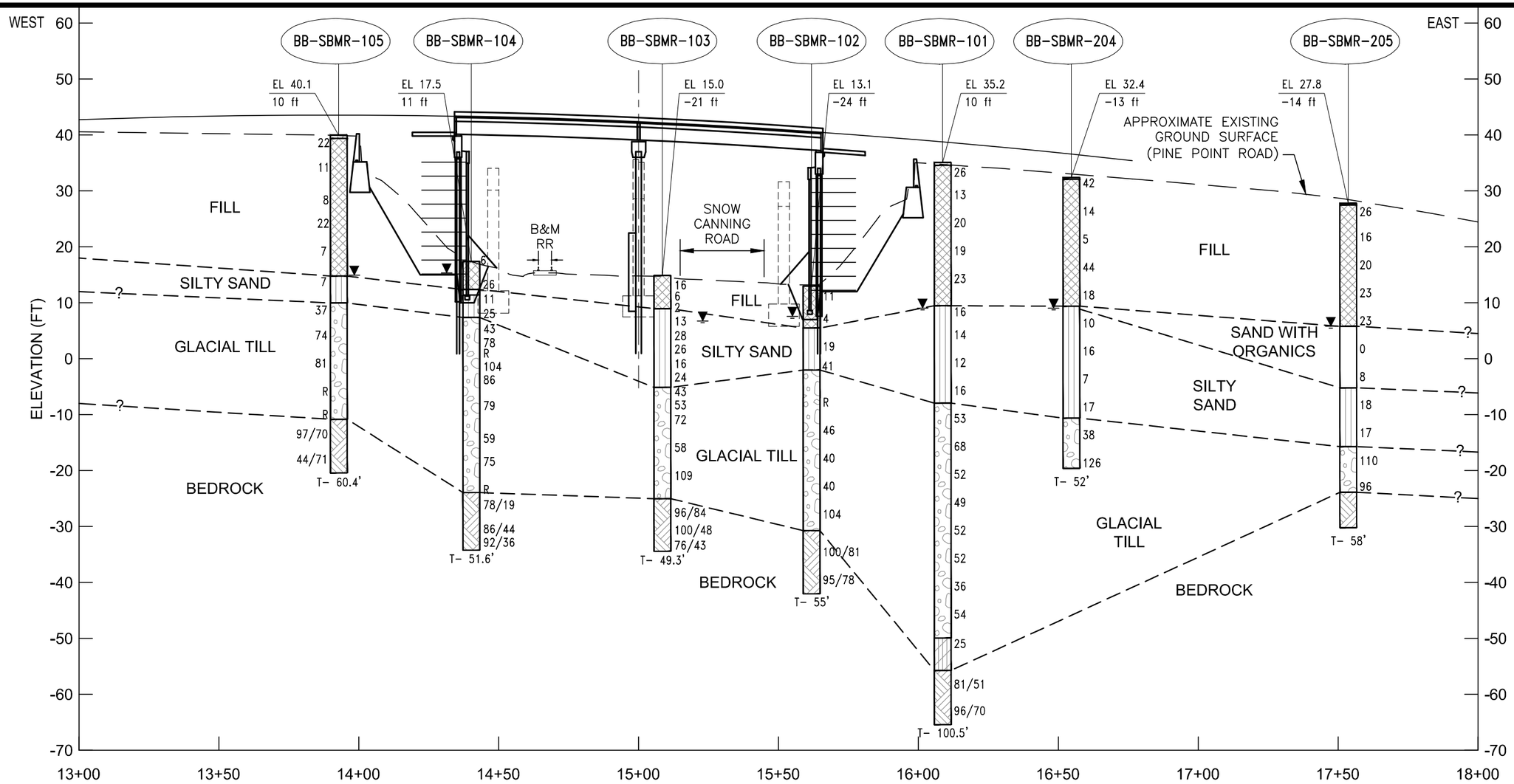
FIGURE 1

BORING LOCATION PLAN
PINE POINT CROSSING BRIDGE OVER B&M RAILROAD
SCARBOROUGH, MAINE

DRAWN BY:	AKP	APPROVED BY:	RAC
PROJECT NO.	85970.01	DATE:	JULY 2015

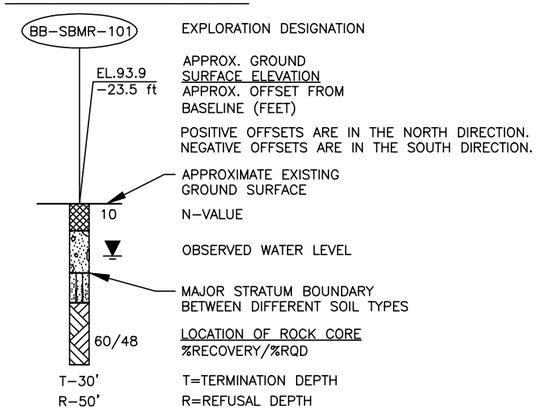
O:\Active\85970.01 - Pine Crossing over BM RR Scarborough ME\CAD\dwg\85970.01-BORING.dwg 7/8/2015 10:08 AM



NOTES:

1. REFER TO FIGURE 1 FOR LOCATIONS OF EXPLORATIONS.
2. THE BASELINE OF THIS PROFILE IS ALONG THE EXISTING ROADWAY CENTERLINE.
3. LINES REPRESENTING THE STRATA HAVE BEEN INTERPOLATED FROM A LIMITED NUMBER OF EXPLORATIONS AND ACTUAL CONDITIONS MAY VARY FROM CONDITIONS SHOWN.
4. APPROXIMATE TOP OF BEDROCK BASED ON ONE INTERPRETATION OF AVAILABLE SUBSURFACE DATA. THE TOP OF BEDROCK IS BASED ON WIDELY SPACED EXPLORATIONS AND ACTUAL CONDITIONS SHOULD BE EXPECTED TO VARY FROM THIS PROFILE.
5. SOIL DESCRIPTIONS ON THE PROFILES ARE GENERALIZED. REFER TO THE TEST BORING LOGS FOR DETAILED DESCRIPTIONS.
6. ELEVATIONS SHOWN ARE IN FEET AND REFER TO THE NORTH AMERICAN VERTICAL DATUM (NAVD 88) OF 1988.
7. N-VALUES SHOWN ON BB-SBMR-SERIES BORINGS ARE CORRECTED TO N60.

EXPLORATION LEGEND



HORIZONTAL SCALE IN FEET
0 40' 80'
0 20' 40'
VERTICAL SCALE IN FEET

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FIGURE 2

INTERPRETIVE SUBSURFACE PROFILE
PINE POINT CROSSING BRIDGE OVER B&M RAILROAD
SCARBOROUGH, MAINE

DRAWN BY:	AKP	APPROVED BY:	RAC
PROJECT NO.	85970.01	DATE:	MAY 2015

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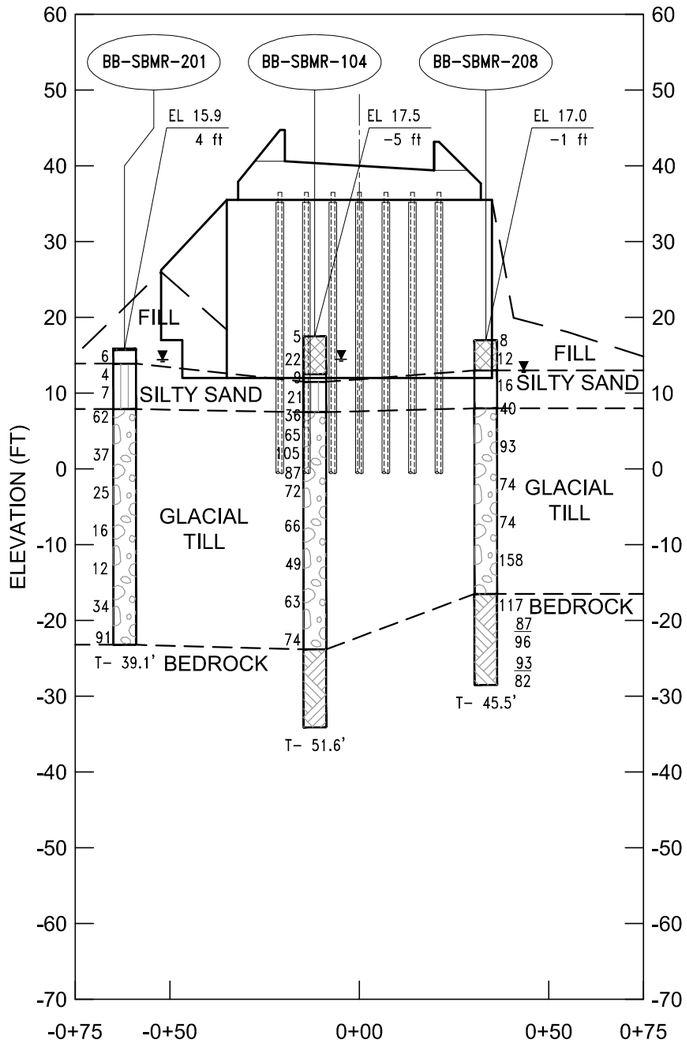
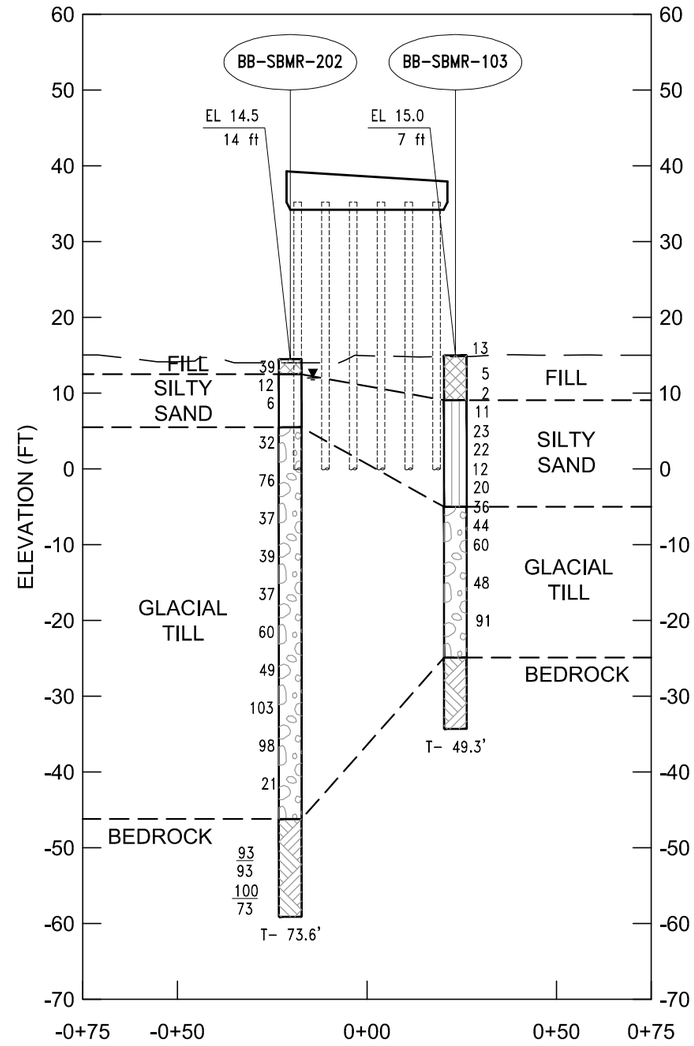
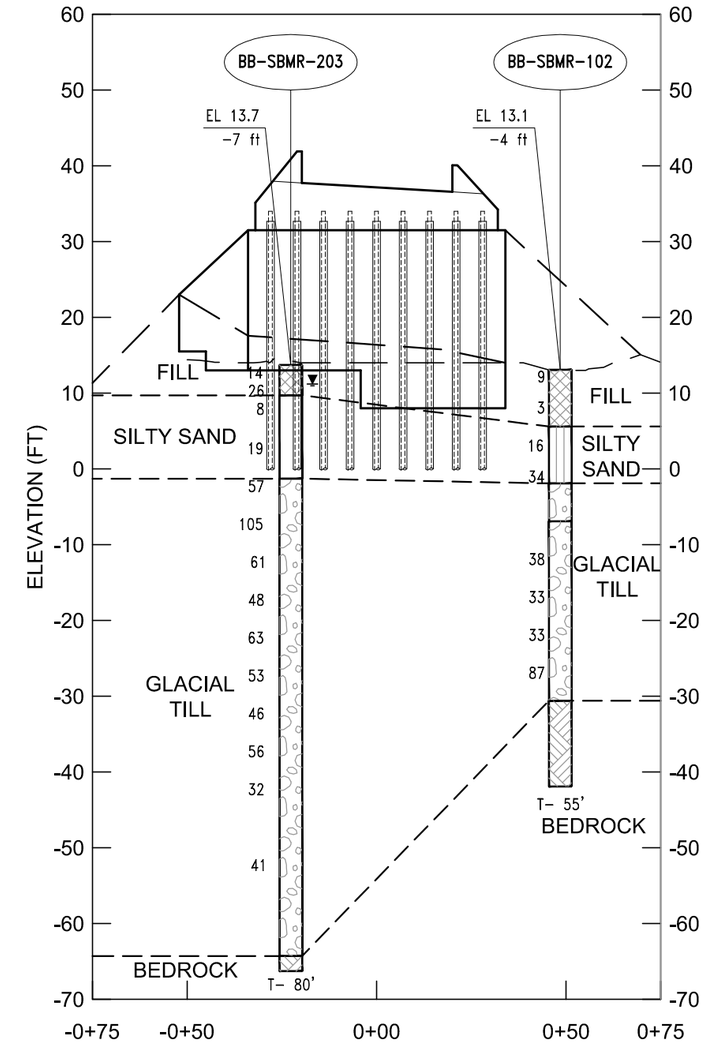


CROSS SECTION B-B' - WEST ABUTMENT



CROSS SECTION C-C' - PIER

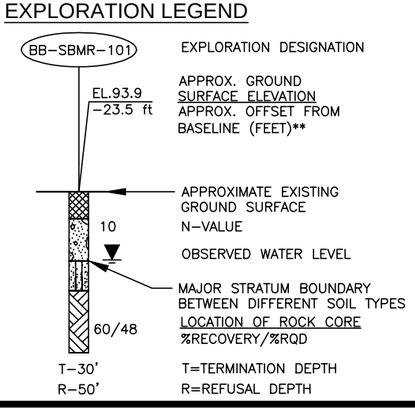


CROSS SECTION D-D' - EAST ABUTMENT

NOTES:

1. REFER TO FIGURE 1 FOR LOCATIONS OF EXPLORATIONS.
2. LINES REPRESENTING THE STRATA HAVE BEEN INTERPOLATED FROM A LIMITED NUMBER OF EXPLORATIONS AND ACTUAL CONDITIONS MAY VARY FROM CONDITIONS SHOWN.
3. APPROXIMATE TOP OF BEDROCK BASED ON ONE INTERPRETATION OF AVAILABLE SUBSURFACE DATA. THE TOP OF BEDROCK IS BASED ON WIDELY SPACED EXPLORATIONS AND ACTUAL CONDITIONS SHOULD BE EXPECTED TO VARY FROM THIS PROFILE.
4. SOIL DESCRIPTIONS ON THE PROFILES ARE GENERALIZED. REFER TO THE TEST BORING LOGS FOR DETAILED DESCRIPTIONS.
5. ELEVATIONS SHOWN ARE IN FEET AND REFER TO THE NORTH AMERICAN VERTICAL DATUM (NAVD 88) OF 1988.
6. N-VALUES SHOWN ON BB-SBMR-SERIES BORINGS ARE CORRECTED TO N60.
7. THE 1953 CONSTRUCTION DRAWINGS INDICATE THAT THE SOFT ORGANIC DEPOSITS ENCOUNTERED IN THIS LAYER WERE EXCAVATED AND REPLACED WITH GRANULAR BORROW BENEATH THE ROADWAY.

EXPLORATION LEGEND



**POSITIVE OFFSETS ARE IN THE EAST DIRECTION.
NEGATIVE OFFSETS ARE IN THE WEST DIRECTION.

HORIZONTAL SCALE IN FEET
0 40' 80'
0 20' 40'
VERTICAL SCALE IN FEET

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FIGURE 3

CROSS SECTION SUBSURFACE PROFILES
PINE POINT CROSSING BRIDGE OVER B&M RAILROAD
SCARBOROUGH, MAINE

DRAWN BY:	AKP	APPROVED BY:	RAC
PROJECT NO.	85970.01	DATE:	JULY 2015

G:\Active\85970.01 - Pine Crossing over BM RR Scarborough ME\CAD\dwg\85970.01-BORING-new to use.dwg 7/2/2015 8:20 AM

Appendix A – Limitations

LIMITATIONS

Subsurface Conditions

1) The generalized soil conditions described in the text are intended to convey trends in subsurface conditions and have been developed from several test borings. Actual soil conditions are likely to vary. Refer to the test boring logs for more specific information.

2) Water level readings have been made in the test borings at the time and under the conditions stated on the boring logs. Fluctuations in the level of groundwater will occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

Review

1) In the event that any changes in the nature, design, or location of the proposed project are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by Nobis Engineering, Inc. It is recommended that this firm be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

Use of Report

1) This report provides the details of the subsurface exploration program prepared for the Pine Point Crossing Bridge over B&M Railroad in Scarborough, Maine. This work has been completed in accordance with generally accepted geotechnical engineering practices and is for preliminary design purposes only. Contractors reviewing this report should do so with the understanding that its scope is limited to preliminary design considerations only. No other warranty, expressed or implied, is made.

Appendix B – Boring Logs by Nobis

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-101
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	35.2	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 10, 2012 / Sep 10, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	26.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/12	0.50 - 2.50	8/10/12/8	22	26		34.70	7" ASPHALT (0.50)	
									1D: Brown, moist, medium dense, gravelly SAND, trace Silt. (Fill).	
5	2D	24/17	5.00 - 7.00	5/5/6/6	11	13			2D: Brown, moist, medium dense, SAND, little Silt, little Gravel. (Fill).	WC=7.2% Fines Content:13%
10	3D	24/19	10.00 - 12.00	7/9/8/7	17	20			3D-A: (0-7") Brown, moist, medium dense, SAND, little fine Gravel, trace Silt. (Fill). 3D-B: (7-19") Gray/Brown, moist, medium dense, SAND, some Gravel, trace Silt, trace brick pieces. (Fill).	WC=6% Fines Content:9%
15	4D	24/14	15.00 - 17.00	5/6/10/10	16	19			4D: Gray, dry, medium dense, sandy GRAVEL, trace Silt. (Fractured Rock Fill).	
20	5D	24/14	20.00 - 22.00	12/10/9/7	19	23			5D: Gray/Brown, moist, medium dense, gravelly SAND, trace Silt. (Fractured Rock Fill).	
25	6D	24/17	25.00 - 27.00	12/9/4/3	13	16	104	9.53	6D-A: (0-8") Gray, moist, medium dense, gravelly SAND, trace Silt. (Fill). (25.67)	pH=5.6
							112		6D-B: (8-11") Orange, wet, medium dense, fine to medium SAND, some Silt, trace Clay. Rolled to 1/8". (Original Ground Surface).	
							161		6D-C: (11-17") Gray, wet, medium dense, fine SAND, some Silt, trace fine Gravel, trace Clay. (Silty Sand).	
							125			
30							120			

Remarks:

Augered top 25 feet to GW, then switched to Drive & Wash.
Drilled open hole starting at 30 feet below ground surface.
Approximately 15 gallons water lost during coring.
Borehole repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: BB-SBMR-101

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-101
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	35.2	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 10, 2012 / Sep 10, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	26.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	7D	24/14	30.00 - 32.00	5/6/6/5	12	14				7D: Gray, wet, medium dense, SAND, some Silt, little Gravel, little Clay. (Silty Sand).	
35	8D	24/13	35.00 - 37.00	6/6/4/7	10	12				8D: Gray, wet, medium dense, SAND, some Silt, little Gravel, trace Clay. Rolled to 1/8". (Silty Sand).	WC=10% Fines Content:36% LL=14 PL=11 PI=3
40	9D	24/14	40.00 - 42.00	5/5/8/8	13	16				9D: Gray, wet, medium dense, SAND, some Silt, little Clay, trace fine Gravel. Rolled to 1/16". (Silty Sand).	
								-7.80		43.00 Increased roller bit resistance at 43.0' bgs.	
45	10D	24/22	45.00 - 47.00	15/23/21/26	44	53				10D: Gray, wet, dense, SAND, some Silt, little Gravel, trace Clay. (Till).	WC=8.3% Fines Content:40%
50	11D	24/15	50.00 - 52.00	12/30/27/42	57	68				11D: Gray, wet, very dense, SAND, little Silt, little fine Gravel. (Till).	
55	12D	24/20	55.00 - 57.00	18/22/21/23	43	52				12D: Gray, wet, dense, SAND, little Silt, trace fine Gravel, trace Clay. (Glacial Till).	
60											

Remarks:

Augered top 25 feet to GW, then switched to Drive & Wash.
Drilled open hole starting at 30 feet below ground surface.
Approximately 15 gallons water lost during coring.
Borehole repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-101
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	35.2	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 10, 2012 / Sep 10, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	26.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
60	13D	24/16	60.00 - 62.00	14/20/21/23	41	49				13D: Gray, wet, dense, SAND, some Silt, little Gravel. (Till).	
65	14D	24/11	65.00 - 67.00	15/17/26/20	43	52				14D: Gray, wet, dense, SAND, some Silt, little Gravel, little Clay. (Till).	WC=10% Fines Content:53% Clay Content:22% LL=18 PL=10 PI=8
70	15D	24/21	70.00 - 72.00	14/19/24/32	43	52				15D: Gray, wet, dense, SAND, some Silt, little Clay, trace fine Gravel. (Till).	
75	16D	24/15	75.00 - 77.00	11/12/18/26	30	36				16D: Gray, wet, dense, SAND, some Silt, little Clay, trace fine Gravel. (Till).	
80	17D	20.5/4	80.00 - 81.71	16/19/26/50-2.5"	45	54				17D: Gray, wet, dense, SAND, some Silt, little Clay, with coarse Gravel stuck in spoon. (Till).	
85	18D	24/9	85.00 - 87.00	10/11/10/17	21	25		-49.80		85.00 18D: Gray, wet, very stiff, CLAY, some Silt, little fine to medium Sand.	
90										Increased drilling resistance at 89.5 feet.	

Remarks:

Augered top 25 feet to GW, then switched to Drive & Wash.
Drilled open hole starting at 30 feet below ground surface.
Approximately 15 gallons water lost during coring.
Borehole repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-101
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	35.2	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 10, 2012 / Sep 10, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	26.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
90	19D	9.5/9.5	90.00 - 90.79	9/50-3.5"				-55.60		19D: Gray, wet, dense, SILT, some Clay, some Sand, trace fine Gravel.	
	R1	54/44	91.00 - 95.50	RQD=51%						90.80	
										Split-Spoon and Roller Bit refusal at 90.8' bgs. Advanced roller bit to 91' bgs.	
										Bedrock: Black, fine grained, metamorphic, hard, fresh to slightly weathered, PHYLLITE, with moderately dipping, closely spaced, tight to healed joints.	
95	R2	60/57.5	95.50 - 100.50	RQD=70%						R1: Rock Mass Quality: Fair Core Times (min:sec) 91.0'-92.0' 4:40 92.0'-93.0' 4:30 93.0'-94.0' 8:20 94.0'-95.0' 4:40 95.0'-95.5' 4:30 81% Recovery R2: Rock Mass Quality: Fair Core Times (min:sec) 95.5'-96.0' 1:30 96.0'-97.0' 3:00 97.0'-98.0' 3:00 98.0'-99.0' 3:00 99.0'-100.0' 3:00 100.0'-100.5' 1:30 96% Recovery	
100								-65.30		100.50	
105										**Bottom of Exploration at 100.50 feet below ground surface.**	
110											
115											
120											

Remarks:

Augered top 25 feet to GW, then switched to Drive & Wash.
Drilled open hole starting at 30 feet below ground surface.
Approximately 15 gallons water lost during coring.
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Boring No.: BB-SBMR-101

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-102
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	13.1	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 11, 2012 / Sep 12, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	5.4' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
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V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/7	0.00 - 2.00	4/5/4/5	9	11				1D: Brown, moist, loose, SAND, some Silt, trace fine Gravel, trace Organics, with piece of plastic. (Topsoil Fill).	
5	2D	24/5	5.00 - 7.00	2/1/2/2	3	4				2D: Brown, wet, loose, SAND, some Silt, little fine Gravel, trace Organics (roots). (Fill).	
								5.60		7.50	
10	3D	24/19	10.00 - 12.00	3/6/10/9	16	19	25			3D: Gray/Black, wet, medium dense, SAND, some Silt, little fine Gravel, trace Clay . Rolled to 1/8". Slight unidentifiable odor and black staining, no sheen. (Silty Sand).	WC=10% Fines Content:37% LL=14 PL=11 PI=3 pH=5.6
							28				
							30				
							31				
							34				
15	4D	24/13	15.00 - 17.00	7/14/20/14	34	41		-1.90		15.00 4D: Gray, wet, dense, SAND, some Silt, little Gravel, little Clay. (Till).	
20	5D	7/6	20.00 - 20.58	12/50-1"						5D: Gray, wet, very dense, SAND, some Silt, trace fine Gravel, trace Clay. (Till). Possible rock at tip. Not retrieved. Possible cobble at 20.6 feet.	
25	6D	24/6	25.00 - 27.00	28/19/19/20	38	46				6D: Gray, wet, dense, SAND, little Silt, little fine Gravel. (Till).	
30											

Remarks:

Switched from HSA to casing at 10 feet. Cased to 15 feet then started open hole.
Approximately 15 gallons water lost during 10 feet of coring.
Borehole was filled with auger cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: BB-SBMR-102

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-102
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	13.1	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 11, 2012 / Sep 12, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	5.4' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
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SSA = Solid Stem Auger
HSA = Hollow Stem Auger
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WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
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q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
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WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	7D	24/18	30.00 - 32.00	15/17/16/16	33	40			7D: Gray, wet, dense, SAND, little Silt, trace fine Gravel. (Till).	
35	8D	24/16	35.00 - 37.00	11/14/19/22	33	40			8D: Gray, wet, dense, SAND, little Silt, little fine Gravel, trace Clay. (Till).	
40	9D	24/0	40.00 - 42.00	29/38/49/60	87	104			9D: No Recovery High blows possibly due to pushing stone.	
								-30.60	43.70	
45	R1	60/60	45.00 - 50.00	RQD=81%					Encountered possible bedrock at 43.7' bgs. Driller advanced auger to 45.0' bgs to verify. Bedrock: Black/Gray, fine grained, metamorphic, hard, fresh to very slightly weathered, PHYLLITE, with low to moderately dipping, closely to moderately closely spaced, tight joints. R1: Rock Mass Quality: Good Core Times (min:sec) 45'-46' 2:40 46'-47' 2:55 47'-48' 2:35 48'-49' 3:00 49'-50' 3:10 100% Recovery	
50	R2	60/57	50.00 - 55.00	RQD=78%					R2: Rock Mass Quality: Good Core Times (min:sec) 50'-51' 4:50 51'-52' 4:00 52'-53' 2:25 53'-54' 2:10 54'-55' 1:35 95% Recovery	
55								-41.90	55.00 **Bottom of Exploration at 55.00 feet below ground surface.**	
60										

Remarks:

Switched from HSA to casing at 10 feet. Cased to 15 feet then started open hole.
Approximately 15 gallons water lost during 10 feet of coring.
Borehole was filled with auger cuttings.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-103
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	15.0	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 13, 2012 / Sep 13, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	8.1' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/20	0.00 - 2.00	6/6/7/8	13	16			1D: Dark Brown, moist, medium dense, SAND, little Gravel, little Silt, trace coal ash. (Fill).	
	2D	24/13	2.00 - 4.00	5/3/2/2	5	6			2D: Brown, wet, loose, silty fine to medium SAND, trace fine Gravel. (Fill).	
5	3D	24/23	5.00 - 7.00	2/1/1/4	2	2		9.08	3D-A: (0-11") Gray/Brown, wet, very loose, silty SAND, trace fine Gravel. (Fill). 5.92	
	4D	24/24	7.00 - 9.00	5/6/5/6	11	13	36		3D-B: (11-23") Gray, wet, very loose, silty fine to medium SAND, trace fine Gravel. (Silty Sand) 4D: Gray, wet, loose, fine to medium SAND, some Silt, little Clay, trace fine Gravel. (Silty Sand).	Fines Content:42% Clay Content:14%
							41			
							45			
10	5D	24/17	10.00 - 12.00	5/12/11/9	23	28			5D: Gray, wet, medium dense, SAND, some Silt, trace fine Gravel, trace Clay. Rolled to 1/4". (Silty Sand).	
	6D	24/17	12.00 - 14.00	11/11/11/11	22	26			6D: Gray, wet, medium dense, SAND, some Silt, trace fine Gravel, trace Clay. Rolled to 1/8". (Silty Sand).	
15	7D	24/17	15.00 - 17.00	7/5/7/8	13	16			7D: Gray, wet, medium dense, SAND, some Silt, trace fine Gravel, trace Clay. Rolled to 1/4". (Silty Sand).	
	8D	24/20	17.00 - 19.00	13/9/11/14	20	24			8D: Gray, wet, medium dense, SAND, some Silt, little Clay, trace fine Gravel. Rolled to 1/16". (Silty Sand).	
20	9D	24/22	20.00 - 22.00	12/17/19/20	36	43		-5.00	20.00 9D: Gray, wet, dense, SAND, some silt, trace fine Gravel, trace Clay. (Till).	WC=8.4% Fines Content:39%
	10D	24/18	22.00 - 24.00	20/22/22/24	44	53			10D: Gray, wet, dense, SAND, some Silt, trace fine Gravel, trace Clay. (Till).	
25	11D	24/21	25.00 - 27.00	15/28/32/18	60	72			11D: Gray, wet, very dense, SAND, some Silt, trace fine Gravel, trace Clay. (Till).	
30										

Remarks:

Augered to 5' bgs, then switched to casing. Pushed casing to 6.5' bgs. Drove Casing to 10' bgs then drilled open hole.
Possible cobbles 19-20' bgs.
Rock core stuck in barrel during R2 core at 24". At 49.3' bgs the tooth matrix sheaved off the bit and could no longer advance. Approximately 10 gallons of water lost during coring.
Borehole repaired by filling up with cuttings and mounding in case of settlement.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-103
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	15.0	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 13, 2012 / Sep 13, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	8.1' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	12D	24/23	30.00 - 32.00	22/24/24/26	48	58			12D: Gray, wet, dense, SAND, some Silt, trace fine Gravel, with 3" layer of SAND, trace Silt at 30.5' bgs (sample taken). (Till).	
35	13D	23/21	35.00 - 36.92	25/40/51/50-5"	91	109			13D: Gray, wet, very dense, SAND, some Silt, little Clay, trace Gravel. (Till).	
40								-24.90	39.90	
	R1	65/62.5	40.00 - 45.42	RQD=84%					Encountered possible bedrock at 39.9' bgs. Advanced Roller Bit to 40.0' bgs. Bedrock: Black/Gray, fine grained, metamorphic, hard, fresh to moderately weathered, PHYLLITE, with moderately dipping, closely to moderately closely spaced, tight to open joints, gray sandy silt infill at top joint. R1: Rock Mass Quality: Good Core Times (min:sec) 40'-41' 2:25 41'-42' 2:10 42'-43' 3:05 43'-44' 2:35 44'-45' 2:30 45'-45.4' 1:00 96% Recovery	
45	R2	24/24	45.40 - 47.40	RQD=48%					R2: Rock Mass Quality: Poor Core Times (min:sec) 45.4'-46.4' 2:10 46.4'-47.4' 2:50 100% Recovery	
	R3	23/17.5	47.40 - 49.32	RQD=43%				-34.30	R3: Rock Mass Quality: Poor Core Times (min:sec) 47.4'-48.4' 4:00 48.4'-49.3' 3:00 76% Recovery	
50									49.30	
55									**Bottom of Exploration at 49.30 feet below ground surface.**	
60										

Remarks:

Augered to 5' bgs, then switched to casing. Pushed casing to 6.5' bgs. Drove Casing to 10' bgs then drilled open hole.
Possible cobbles 19-20' bgs.
Rock core stuck in barrel during R2 core at 24". At 49.3' bgs the tooth matrix sheaved off the bit and could no longer advance. Approximately 10 gallons of water lost during coring.
Borehole repaired by filling up with cuttings and mounding in case of settlement.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-104
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	17.5	**Auger ID/OD:**	N/A
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 12, 2012 / Sep 12, 2012	**Drilling Method:**	Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/11	0.00 - 2.00	5/2/3/4	5	6	16		1D: Brown, moist, loose, SAND, little Silt, little Gravel, trace Organics. (Fill).	
							31			
							31			
	2D	24/7	3.00 - 5.00	9/14/8/4	22	26	30		2D: Brown, moist, medium dense, SAND, some Gravel, little Silt. (Fill). Rock stuck in tip of spoon.	
							31			
5								12.50	5.00	
	3D	24/12	5.00 - 7.00	5/4/5/6	9	11	42	11.50	3D-A: (0-5") Brown, wet, loose, fine SAND, little Silt, trace Organics, with black organic seam at top.	
							71		6.00	pH=6.0
							83		3D-B (5-12") Gray, wet, loose, SAND, little Silt, trace fine Gravel. (Silty Sand).	
	4D	24/19	8.00 - 10.00	7/8/13/11	21	25			4D: Gray, wet, medium dense, fine SAND, some Silt, trace Clay, trace fine Gravel. Rolled to 1/4". (Silty Sand).	WC=10.1% Fines Content:37%
10								7.50	10.00	
	5D	24/18	10.00 - 12.00	14/18/18/21	36	43			5D: Gray, wet, dense, SAND, little Silt, little Gravel, trace Clay. (Till).	WC=8% LL=14 PL=10 PI=4
	6D	24/21	13.00 - 15.00	25/29/36/44	65	78			6D: Gray, wet, very dense, SAND, some Silt, little fine Gravel, trace Clay. (Till).	
15	7D	15/11	15.00 - 16.25	29/55/50-3"					7D: Gray, wet, very dense, SAND, some Silt, little Gravel, trace Clay. (Till). Refusal due to full spoon from wash spoils.	
	8D	24/21	18.00 - 20.00	30/42/45/60	87	104			8D: Gray, wet, very dense, fine SAND, some Silt, trace fine Gravel, trace Clay. (Till).	
20	9D	24/20	20.00 - 22.00	36/36/36/34	72	86			9D: Gray, wet, very dense, SAND, some Silt, little fine Gravel, trace Clay. (Till).	
25	10D	24/19	25.00 - 27.00	21/26/40/42	66	79			10D: Grat, wet, very dense, SAND, some Silt, little Gravel, trace Clay. (Till).	
30										

Remarks:

BB-SBMR-104 drilled through bridge deck to ground surface 22.0' below deck. Deck core obtained. 5" Asphalt, 6" Concrete Bridge Deck. Cased to 8.0' bgs then started drilling open hole. At approximately 35.0' bgs driller noted loss of drilling water. Lost approximaetly 100 gallons. During coring of R1 and R2 lost approximately 300 gallons of water. During coring of R3 lost approximately 300 gallons of water.
Borehole reparied by filling with large stones. Bridge deck reparied by filling with high strength quick set concrete. Concrete left to cure one hour before allowing traffic.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-104
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	17.5	**Auger ID/OD:**	N/A
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 12, 2012 / Sep 12, 2012	**Drilling Method:**	Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MD = Unsuccessful Split Spoon Sample attempt
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MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	11D	24/20	30.00 - 32.00	25/25/24/29	49	59			11D: Gray, wet, dense, SAND, some Silt, little Gravel, trace Clay. (Till).	
35	12D	24/21	35.00 - 37.00	17/29/34/64	63	75			12D: Gray, wet, very dense, SAND, some Silt, little fine Gravel, little Clay. (Till).	
									Possible cobble at 38.0' bgs.	
40	13D	15.5/14	40.00 - 41.29	18/24/50-3.5"					13D: Gray, wet, very dense, SAND, some Silt, little fine Gravel, trace Clay. (Till).	
								-23.80	41.30	
	R1	54/42	42.00 - 46.50	RQD=19%					Encountered bedrock at 41.3' bgs, advanced bit to 42.0' bgs to verify. Bedrock: Black/Gray, fine grained, metamorphic, hard to soft, moderately to highly weathered, PHYLLITE, with moderately to steeply dipping, very closely to closely spaced, open to healed joints. R1: Rock Mass Quality: Very Poor Core Times (min:sec) 42.0'-43.0' 2:50 43.0'-44.0' 1:50 44.0'-45.0' 1:30 45.0'-46.0' 1:30 46.0'-46.5' 1:00 78% Recovery Core sample from 2"-12" likely pulverized due to being stuck in core barrel.	
45	R2	36/31	46.50 - 49.50	RQD=44%					R2: Rock Mass Quality: Poor Core Times (min:sec) 46.5'-47.0' 1:10 47.0'-48.0' 1:05 48.0'-49.0' 2:30 49.0'-49.5' 0:35 86% Recovery Core sample stuck at 49.5' bgs.	
50	R3	25/23	49.50 - 51.58	RQD=36%				-34.10	R3: Rock Mass Quality: Poor Core Times (min:sec) 49.5'-50.0' 1:25 50.0'-51.0' 4:30 51.0'-51.6' 2:20 92% Recovery Core sample stuck at 51.6' bgs. Coring terminated.	
55									51.60	
60									**Bottom of Exploration at 51.60 feet below ground surface.**	

Remarks:

BB-SBMR-104 drilled through bridge deck to ground surface 22.0' below deck. Deck core obtained. 5" Asphalt, 6" Concrete Bridge Deck. Cased to 8.0' bgs then started drilling open hole. At approximately 35.0' bgs driller noted loss of drilling water. Lost approximaetly 100 gallons. During coring of R1 and R2 lost approximately 300 gallons of water. During coring of R3 lost approximately 300 gallons of water.
Borehole reparied by filling with large stones. Bridge deck reparied by filling with high strength quick set concrete. Concrete left to cure one hour before allowing traffic.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-105
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	40.1	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 11, 2012 / Sep 11, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	25.0' bgs wet sample
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/17	0.60 - 2.60	12/10/8/8	18	22		39.50	7.75" ASPHALT — 0.60 1D: Brown, moist, medium dense, SAND, some Gravel, trace Silt. (Fill).	
5	2D	24/16	5.00 - 7.00	5/5/4/3	9	11			2D: Brown, moist, loose, SAND, little fine Gravel, trace Silt. (Fill).	
10	3D	24/16	10.00 - 12.00	5/4/3/2	7	8			3D: Brown, moist, loose, SAND, little Gravel, trace Silt. (Fill).	WC=6.8% Fines Content:9%
15	4D	24/20	15.00 - 17.00	9/9/9/9	18	22			4D: Brown, moist, medium dense, SAND, little Gravel, little Silt. (Fill).	
20	5D	24/15	20.00 - 22.00	5/3/3/2	6	7			5D: Brown, moist, medium dense, SAND, little fine Gravel, little Silt. (Fill).	
							59			
							64			
							70			
							75			
25	6D	24/16	25.00 - 27.00	6/3/3/4	6	7	20	14.90	6D-A: (0-2") Brown, wet, loose, SAND, some fine Gravel, little Silt. (Fill). — 25.20 6D-B: (2-16") Gray, wet, loose, fine to medium SAND, some Silt, trace fine Gravel, trace Organics (roots) with 1" Peat layer at top of spoon. (Silty Sand).	pH=6.2
							40			
							46			
							66			
30							82			

Remarks:

Switched from HSA to Drive & Wash at 20.0' bgs.
Started drilling roller bit open hole at 30.0' bgs.
Approximately 15 gallons water lost during coring.
Borehole was repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-105
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	40.1	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 11, 2012 / Sep 11, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	25.0' bgs wet sample
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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SSA = Solid Stem Auger
HSA = Hollow Stem Auger
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WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
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N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
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WC = water content, percent
LL = Liquid Limit
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PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	7D	24/17	30.00 - 32.00	14/17/14/10	31	37		10.10		30.00 — 7D: Gray, wet, dense, SAND, some Silt, trace Gravel, trace Clay. (Till).	
35	8D	24/22	35.00 - 37.00	19/28/34/36	62	74				8D: Gray, wet, very dense, SAND, some Silt, little Gravel, little Clay. (Till).	WC=8.2% Fines Content:41%
40	9D	24/22	40.00 - 42.00	25/37/31/32	68	81				9D: Gray, wet, very dense, SAND, some Silt, little Gravel, little Clay. (Till).	
45	10D	16.5/15	45.00 - 46.38	32/54/50-4.5"						10D: Gray, wet, very dense, SAND, some Silt, trace fine Gravel. (Till).	
50	11D	1/0	50.00 - 50.08	50-1"						11D: No Recovery	
	R1	60/58	50.80 - 55.80	RQD=70%				-10.70		Advanced roller bit from 50.0' bgs to 50.8' bgs into rock. 50.80 — Bedrock: Black/Gray, fine grained, metamorphic, hard, fresh to very slightly weathered, PHYLLITE, with moderately dipping, closely spaced, tight joints. R1: Rock Mass Quality: Fair Core Times (min:sec) 50.8'-51.8' 4:30 51.8'-52.8' 4:30 52.8'-53.8' 5:00 53.8'-54.8' 5:00 54.8'-55.8' 5:00 97% Recovery	
55	R2	55/24	55.80 - 60.38	RQD=71%						R2: Rock Mass Quality: Poor Core Times (min:sec) 55.8'-56.8' 3:00 56.8'-57.8' 3:30 57.8'-58.8' 7:00	
60											

Remarks:

Switched from HSA to Drive & Wash at 20.0' bgs.
Started drilling roller bit open hole at 30.0' bgs.
Approximately 15 gallons water lost during coring.
Borehole was repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-105
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	40.1	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Adam Woodbrey	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Mailloux (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Sep 11, 2012 / Sep 11, 2012	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	NQ-2"
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	25.0' bgs wet sample
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
60								-20.30		59.8'-60.4' 3:00 44% Recovery RQD and Recovery likely inaccurate. Core bound in barrel at 2.0' and driller forced coring eqiupment for remaining 2.6' likely pulverizing sample. Coring time increased at 2.0' and driller used higher pressure on the equipment to advance. 60.40 **Bottom of Exploration at 60.40 feet below ground surface.**	
65											
70											
75											
80											
85											
90											

Remarks:

Switched from HSA to Drive & Wash at 20.0' bgs.
Started drilling roller bit open hole at 30.0' bgs.
Approximately 15 gallons water lost during coring.
Borehole was repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Boring No.: BB-SBMR-105

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-201
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	15.9	**Auger ID/OD:**	N/A
Operator:	Donny Palmer / Gary Pinheiro	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 6, 2015 / Apr 6, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	1.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/10	0.00 - 2.00	1/1/4/6	5	6		15.70	1D-A: (2") Brown, moist, loose, wood fragments and root fibers, little Sand. (Top Soil). 0.20	
	2D	24/16	2.00 - 4.00	5/2/1/1	3	4		13.90	1D-B: (8") Tan/Black, moist, loose, fine to medium SAND, some fine Gravel, little Silt. 2.00	pH = 4.2
	3D	24/24	4.00 - 6.00	2/2/4/5	6	7			2D: Gray, wet, very loose, fine SAND and Silt, little Clay, trace fine Gravel. 3D: Gray, wet, loose, fine SAND and Silt, little Clay, trace fine Gravel.	Gravel = 4.8% Sand = 58.0% Fines = 37.2% LL = 16 PL = 11 MC = 10%
5										
	4D	24/15	8.00 - 10.00	21/27/26/20	53	63		7.90	8.00 Increased roller bit resistance at 8.0' bgs. 4D: Gray, wet, very dense, SAND, little Silt, trace fine Gravel. (Till).	
10										
	5D	24/17	13.00 - 15.00	11/14/18/14	32	38			5D: Gray, wet, dense, SAND, some Silt, trace fine Gravel, trace Clay. (Till).	
15										
	6D	24/24	18.00 - 20.00	5/10/11/13	21	25			6D: Gray, wet, medium dense, SAND, some Silt, little Clay, trace fine Gravel. (Till).	Sample Non-Plastic MC = 9%
20										
	7D	24/24	23.00 - 25.00	8/6/8/7	14	17			7D: Gray, wet, medium dense, SAND, some Silt, little Clay, trace fine Gravel. (Till).	Gravel = 5.1% Sand = 60.5% Fines = 34.4% MC = 10.6%
25										
	8D	24/21	28.00 - 30.00	4/4/6/12	10	12			8D: Gray, wet, medium dense, SAND, some Silt, trace fine Gravel. (Till).	
30										

Remarks:

Borehole repaired by filling with cuttings.

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Boring No.: BB-SBMR-201

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-201
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	15.9	**Auger ID/OD:**	N/A
Operator:	Donny Palmer / Gary Pinheiro	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 6, 2015 / Apr 6, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	1.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
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S_u = Insitu Field Vane Shear Strength (psf)
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q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30											
	9D	24/16	33.00 - 35.00	8/13/16/15	29	34				9D: Gray, wet, medium dense, SAND, some Silt, trace fine Gravel. (Till).	
35											
	10D	13/6	38.00 - 39.08	12/18/50/1"	78	93		-23.20		10D: Gray, wet, very dense, SAND, some Silt, trace fine Gravel. Rock fragment in spoon tip, possible bedrock interface. (Till). 39.10	
40										**Bottom of Exploration at 39.10 feet below ground surface.**	
45											
50											
55											
60											

Remarks:

Borehole repaired by filling with cuttings.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-202
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	14.5	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Stewart (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 8, 2015 / Apr 9, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/16	0.00 - 2.00	7/12/21/10	33	39			1D: Dark brown, moist, dense, SAND, some Gravel, little Silt. (Fill).	
								12.50	2.00	
	2D	24/10	2.00 - 4.00	6/4/6/5	10	12			2D: Gray/tan, wet, medium dense, SAND, some Silt, trace fine Gravel.	pH = 8.0
	3D	24/16	4.00 - 6.00	5/3/2/4	5	6			3D: Gray, wet, loose, SAND and Silt, trace fine Gravel	Gravel = 6.2% Sand = 51.1% Fines = 42.7% LL = 16 PL = 11 MC = 11%
5										
								5.50	9.00	
10	4D	24/0	10.00 - 12.00	13/11/16/20	27	32			Increased roller bit resistance at 9.0' bgs. 4D: No recovery. Description from 3" spoon. Gray, wet, medium dense, fine SAND, some Silt, little Gravel. (Till).	
15	5D	24/19	15.00 - 17.00	13/30/35/35	65	77			5D: Gray, wet, very dense, SAND, some Silt, little Gravel. (Till).	
20	6D	24/21	20.00 - 22.00	12/14/18/16	32	38			6D: Gray, wet, dense, SAND, little Silt, little Gravel. (Till).	
25	7D	24/23	25.00 - 27.00	10/15/18/21	33	39			7D: Gray, wet, dense, SAND, some Silt, trace fine Gravel. (Till).	
30										

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-202
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	14.5	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Stewart (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 8, 2015 / Apr 9, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	8D	24/21	30.00 - 32.00	13/16/16/17	32	38				8D: Gray, wet, dense, SAND, some Silt, trace fine Gravel. (Till).	
35	9D	24/16	35.00 - 37.00	12/29/22/26	51	61				9D: Gray, wet, very dense, SAND, little Gravel, little Silt. (Till).	
40	10D	24/17	40.00 - 42.00	10/18/24/18	42	50				10D: Gray, wet, dense, SAND, little Gravel, little Silt. (Till).	
45	11D	24/5	45.00 - 47.00	19/41/47/54	88	104				11D: Gray, wet, very dense, SAND and Gravel, little Silt. Rock Fragment in spoon tip. (Till).	
50	12D	24/22	50.00 - 52.00	20/40/44/47	84	100				12D: Gray, wet, very dense, SAND, some Silt, trace fine Gravel. (Till).	
55	13D	24/24	55.00 - 57.00	5/8/10/11	18	21				13D: Gray, wet, medium dense, SAND, little Silt, little Clay, trace fine Gravel. (Till).	
60											

Remarks:

Borehole repaired by filling with cuttings.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-202
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	14.5	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Stewart (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 8, 2015 / Apr 9, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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WC = water content, percent
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Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
60	14D	8/7	60.00 - 60.67	13/75/2"	---			-46.20		14D: Gray, wet, very dense, SAND, some Silt, trace Clay, trace fine Gravel. (Till). 60.70	
										Encountered bedrock at 60.7' bgs, advanced bit to 64' bgs to verify.	
	R1	60/56	64.00 - 69.00	RQD=87%						Bedrock: Black/Gray, fine grained, metamorphic, hard, fresh to slightly weathered, PHYLLITE. Rock Mass Quality: Good Core Times (min:sec) 64'-65' 6:20 65'-66' 10:30 66'-67' 5:50 67'-68' 7:45 68'-69' 8:05 93% Recovery	Density=174 pci U.C.S.=10,299 psi E=11,260 ksi Depth=67-68
65											
	R2	56/56	69.00 - 73.67	RQD=73%						Bedrock: Black/Gray, fine grained, metamorphic, hard, fresh to slightly weathered, PHYLLITE. Rock Mass Quality: Fair Core Times (min:sec) 69'-70' 10:05 70'-71' 15:40 71'-72' 9:50 72'-73' 8:15 73'-73.6' 7:45 100% Recovery	
70								-59.10		73.60	
75										**Bottom of Exploration at 73.60 feet below ground surface.**	
80											
85											
90											

Remarks:

Borehole repaired by filling with cuttings.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-203
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	13.7	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Stewart (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 9, 2015 / Apr 10, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/20	0.00 - 2.00	5/9/3/5	12	14			1D: Dark brown, moist, medium dense, SAND, little Gravel, little Silt. (Fill).	
	2D	24/16	2.00 - 4.00	7/12/10/6	22	26			2D: Brown, wet, medium dense, SAND, little Gravel, trace Silt. (Fill) .	
	3D	24/14	4.00 - 6.00	4/2/5/5	7	8		9.70	4.00 3D: Gray, wet, loose, SAND and Silt, trace Gravel.	Gravel = 4.0% Sand = 53.2% Fines = 42.8% MC = 11.9%
5										
10	4D	24/16	10.00 - 12.00	5/6/10/11	16	19			4D: Gray, wet, medium dense, SAND, some Silt, trace Gravel.	
15	5D	24/20	15.00 - 17.00	15/25/24/19	49	58		-1.30	15.00 5D: Gray, wet, dense, SAND, little Silt, little Gravel. (Till).	
20	6D	24/17	20.00 - 22.00	37/38/52/46	90	107			6D: Gray, wet, very dense, SAND, little Silt, trace Gravel. (Till).	
25	7D	24/18	25.00 - 27.00	22/24/28/34	52	62			7D: Gray, wet, very dense, SAND, little Silt, trace Gravel. (Till).	
30										

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: BB-SBMR-203

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-203
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	13.7	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Stewart (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 9, 2015 / Apr 10, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	8D	24/20	30.00 - 32.00	14/19/20/21	39	46				8D: Gray, wet, dense, SAND, trace Silt, trace Gravel. (Till).	
35	9D	24/16	35.00 - 37.00	9/20/34/20	54	64				9D: Gray, wet, very dense, SAND, some Silt, trace Gravel. (Till).	
40	10D	24/20	40.00 - 42.00	8/15/30/29	45	53				10D: Gray, wet, dense, SAND and Silt, little Gravel. (Till).	
45	11D	24/24	45.00 - 47.00	14/19/20/24	39	46				11D: Gray, wet, dense, SAND, little Silt, trace Clay, trace Gravel. (Till).	Gravel = 7.2% Sand = 76.0% Fines = 16.8% LL = 20 PL = 12 MC = 10%
50	12D	24/0	50.00 - 52.00	16/20/28/35	48	57				12D: No recovery.	
55	13D	24/21	55.00 - 57.00	8/11/16/23	27	32				13D: Gray, wet, medium dense, SAND, some Silt, trace Clay, little Gravel. (Till).	
60											

Remarks:

Borehole repaired by filling with cuttings.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-203
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	13.7	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	J. Stewart (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 9, 2015 / Apr 10, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	2.5' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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SSA = Solid Stem Auger
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WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
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N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
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C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
60	14D	17/3	60.00 - 61.42	12/17/50/5"	---					14D: Gray, wet, very dense, SAND, some Silt, some Clay, little Gravel. (Till). Rock fragment in spoon tip, possible cobble.	
65	15D	24/24	65.00 - 67.00	12/15/20/24	35	42				15D: Gray, wet, dense, SAND, some Silt, some Clay, some Gravel. (Till).	
70											
75											
								-64.30		78.00	
										Encountered bedrock at 78' bgs, advanced bit to 80' bgs to verify.	
80								-66.30		80.00	
										Bottom of Exploration at 80.00 feet below ground surface.	
85											
90											

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-204
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	32.4	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 22, 2014 / Dec 22, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	22.9' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
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MU = Unsuccessful Thin Wall Tube Sample attempt
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MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/7	0.50 - 2.50	16/19/16/12	35	42		31.90	6" ASPHALT (0.50)	
									1D: Tan/brown, dry, dense, fine to coarse SAND, some Gravel, trace Silt. (Fill).	
5	2D	24/20	5.00 - 7.00	5/6/6/7	12	14			2D: Tan, dry, loose, fine to medium SAND, trace Gravel, trace Silt. (Fill).	
10	3D	24/15	10.00 - 12.00	2/2/2/2	4	5			3D: Tan, dry, very loose, fine to medium SAND, trace Gravel, trace Silt. (Fill).	
15	4D	24/16	15.00 - 17.00	7/24/17/12	41	49			4D-A: (7") Brown, dry, dense, fine to coarse SAND, little Gravel, trace Silt. (Fill). 4D-B: (7") Gray, dry, dense, GRAVEL, trace fine to coarse sand, trace Silt. (Fractured Rock Fill). 4D-C: (2") Brown, dry, dense, fine to coarse SAND, little Gravel, trace Silt, some asphalt fragments. (Fill).	
20	5D	24/20	20.00 - 22.00	7/7/8/6	15	18			5D: Tan, dry, medium dense, fine to medium SAND, little Silt, trace Gravel. (Fill).	Gravel = 6.8% Sand = 74.7% Fines = 18.5%
								9.40	(23.00) Driller noted decrease in drilling resistance and color change at 23'. Possible strata change.	
25	6D	24/19	25.00 - 27.00	4/4/4/4	8	10			6D: Olive/gray with orange spots, wet, loose, fine to coarse SAND, some Silt, little Clay, trace Gravel.	Gravel = 3.7% Sand = 56.3% Fines = 40.0% MC = 11% LL = 15 PL = 11
30										

Remarks:

Augered top 23 feet to GW, then switched to Drive & Wash
Borehole repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-204
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	32.4	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 22, 2014 / Dec 22, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	22.9' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	7D	24/11	30.00 - 32.00	9/8/5/6	13	16				7D: Olive/gray , wet, medium dense, fine to coarse SAND, some Silt, little Gravel, little Clay.	
35	8D	24/16	35.00 - 37.00	4/2/4/6	6	7				8D: Olive/gray, wet, loose, fine to coarse SAND, some Silt, little Gravel, trace Clay.	
										Increased roller bit resistance at 38.5' bgs.	
40	9D	24/14	40.00 - 42.00	6/6/8/8	14	17				9D: Olive/gray, wet, medium dense, fine to coarse SAND, some Silt, trace Gravel, trace Clay.	
								-10.60		43.00	
										Increased roller bit resistance at 43.0' bgs.	
45	10D	24/4	45.00 - 47.00	10/14/18/22	32	38				10D: Olive/gray, wet, dense, fine to coarse SAND, some Silt, little Gravel, trace Clay. (Till).	
50	11D	24/15	50.00 - 52.00	34/51/54/55	105	126				10D: Olive/gray, wet, very dense, fine to coarse SAND, some Silt, some Gravel, trace Clay. (Till).	
								-19.60		52.00	
										Bottom of Exploration at 52.00 feet below ground surface.	
55											
60											

Remarks:

Augered top 23 feet to GW, then switched to Drive & Wash
Borehole repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-205
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	27.8	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 22, 2014 / Dec 22, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	22.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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U = Thin Wall Tube Sample
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V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/14	0.50 - 2.50	10/11/11/10	22	26		27.30	6" ASPHALT (0.50) 1D: Tan, dry, medium dense, fine to coarse Gravely SAND, trace Silt. (Fill).	
5	2D	24/7	5.00 - 7.00	8/4/9/7	13	16			2D: Gray/brown with orange spots, fine to coarse Gravely SAND, trace Silt. (Fill).	
10	3D	24/5	10.00 - 12.00	14/10/7/7	17	20			3D: Black/brown, dry, medium dense, Asphalt fragments and fine to coarse sand, some Gravel, trace silt. Fractured rock fragments in spoon tip. (Fill).	
15	4D	24/14	15.00 - 17.00	9/9/10/10	19	23			4D: Brown, dry, medium dense, fine to coarse SAND, little Gravel, trace Silt. Few Asphalt fragments. (Fill).	
20	5D	24/18	20.00 - 22.00	7/10/9/8	19	23			5D: Tan, moist, medium dense, fine to medium sand, trace gravel, trace silt. (Fill).	
								5.80	(22.00)	
25	6D	24/17	25.00 - 27.00	WOH/WOH/WOH/6	0	0			6D: Tan, wet, very loose, fine to medium sand, little silt.	Gravel = 0.6% Sand = 83.2% Fines = 16.2%
30										

Remarks:

Augered top 22 feet to GW, then switched to Drive & Wash
Borehole repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

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Boring No.: BB-SBMR-205

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-205
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	27.8	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 22, 2014 / Dec 22, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	22.0' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

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Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	7D	24/11	30.00 - 32.00	4/3/4/7	7	8			Tan, wet, loose, fine to medium SAND, trace Silt, trace Gravel.	
									Change in cuttings color at 33.0' bgs.	
35	8D	24/18	35.00 - 37.00	7/7/8/14	15	18			8D: Olive/gray, wet, medium dense, fine to coarse SAND, some Silt, little Gravel, little Clay.	
									Increased roller bit resistance at 38.0' bgs.	
40	9D	24/0	40.00 - 42.00	3/5/7/5	14	17			No recovery. Cuttings consistent with materials found in sample 8D.	
								-15.70	43.50	
									Increased roller bit resistance at 43.5' bgs.	
45	10D	24/17	45.00 - 47.00	43/52/40/38	92	110			10D: Olive/gray, wet, very dense, fine to coarse SAND, some Silt, trace Gravel, trace Clay. (Till).	Gravel = 4.5% Sand = 58.2% Fines = 37.3%
50	11D	20/14	50.00 - 51.67	39/46/34/100/2"	80	96			11D: Olive/gray, wet, very dense, fine to coarse SAND, some Silt, little Gravel, trace Clay. (Till).	
								-23.86	51.66	
									Encountered possible bedrock at 51.7' bgs. Advanced Roller Bit to 58.0' bgs.	
								-30.20	58.00	
									Bottom of Exploration at 58.00 feet below ground surface.	
60										

Remarks:

Augered top 22 feet to GW, then switched to Drive & Wash
Borehole repaired by filling with auger cuttings, letting sit overnight to settle, then placing cold patch.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-206
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	8.75	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 23, 2014 / Dec 23, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	3.5' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/16	0.00 - 2.00	2/4/5/6	9	11		6.75	1D: Brown, moist, loose, fine to medium SAND, some Silt. Few root fibers. (Top Soil). — 2.00	
5	2D	24/18	5.00 - 7.00	11/7/4/2	11	13		2.59	2D-A: (14") Brown, wet, medium dense, fine to medium SAND, some Silt, trace Organics. (Sand with Organics). — 6.16	
									2D-B: (4") Black, wet, medium dense, fine to medium SAND, some Silt, some Organics. (Sand with Organics).	Ash = 76.5% Organics = 23.5% Sulfide = ND Chloride = 240 ppm pH = 5.1
10	3D	24/16	10.00 - 12.00	1/1/1/3	2	2		-2.33	3D-A: (13") Black, wet, very loose, fine to medium SAND, some Silt, some Oranics. (Sand with Organics). — 11.08	
									3D-B: (3") Brown, wet, very loose, fine to medium SAND, little Silt, trace Gravel.	
								-4.25	13.00	
									Change in cuttings color at 13.0' bgs.	
15	4D	24/18	15.00 - 17.00	7/8/8/12	16	19			4D: Olive/gray, wet, medium dense, fine to coarse SAND, some Silt, some Gravel, little Clay.	
20	5D	24/13	20.00 - 22.00	4/4/4/12	8	10			5D: Olive/gray, wet, loose, fine to medium SAND, some Silt, trace Clay, trace Gravel	Gravel = 9.5% Sand = 51.5% Fines = 39.0% MC = 9% Non-Plastic
25	6D	24/17	25.00 - 27.00	12/21/31/35	52	62		-16.25	25.00	
									6D: Olive/gray, wet, very dense, fine to coarse SAND, little Gravel, little Silt, trace Clay. (Till).	
								-19.55	28.30	
30									Encountered possible bedrock at 28.3' bgs. Advanced Roller Bit to 32.0' bgs.	

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-206
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	8.75	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 23, 2014 / Dec 23, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	3.5' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30											
								-23.25		32.00	
										Bottom of Exploration at 32.00 feet below ground surface.	
35											
40											
45											
50											
55											
60											

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-207
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	10.25	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 23, 2014 / Dec 23, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	7.5' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/16	0.00 - 2.00	5/10/6/7	16	19		9.75	1D-A: (6") Brown, moist, medium dense, fine to medium SAND, some Silt. Few root fibers. (Top Soil). 0.50	
	2D	24/18	2.00 - 4.00	10/17/2/1	19	23			1D-B: (10") Brown, moist, medium dense, fine to coarse SAND, little Gravel, trace Silt. 2D: Olive/gray/tan, moist, medium dense, fine to coarse SAND, some Silt, little Gravel, little Clay.	
5										
10	3D	24/18	10.00 - 12.00	3/5/7/6	12	14			3D: Olive/gray, wet, medium dense, fine to coarse SAND, some Silt, trace Gravel, trace Clay.	Gravel = 7.6% Sand = 58.1% Fines = 34.3%
15	4D	24/4	15.00 - 17.00	4/3/3/6	6	7			4D: Olive/gray, wet, loose, fine to coarse SAND, some Gravel, some Silt, trace Clay.	
20	5D	24/13	20.00 - 22.00	1/2/4/4	6	7			5D: Olive/gray, wet, loose, fine to medium SAND, some Silt, little Clay, trace Gravel.	
								-14.25	24.50	
25	6D	24/13	25.00 - 27.00	24/33/43/31	76	91			Increased roller bit resistance at 24.5' bgs. 6D: Olive/gray, wet, very dense, fine to coarse SAND and GRAVEL, some Silt, trace Clay. (Till).	Gravel = 36.6% Sand = 36.5% Fines = 26.9%
30										

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: BB-SBMR-207

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-207
PIN: 18229.00

Driller:	Northern Test Boring	**Elevation (ft.)**	10.25	**Auger ID/OD:**	2-1/4" / 5"
Operator:	Mike Nadeau / Ty Whitworth	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	ATV / Diedrich D50	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Dec 23, 2014 / Dec 23, 2014	**Drilling Method:**	HSA / Drive & Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	7.5' bgs
Hammer Efficiency Factor:	0.719	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30	7D	24/14	30.00 - 32.00	18/17/11/13	28	34				7D: Olive/gray, wet, medium dense, fine to coarse SAND, some Silt, little Gravel, trace Clay. (Till).	
								-23.75		34.00	
35										Encountered possible bedrock at 34.0' bgs. Advanced Roller Bit to 38.0' bgs.	
										Bottom of Exploration at 38.00 feet below ground surface.	
40											
45											
50											
55											
60											

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-208
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	17.0	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 7, 2015 / Apr 7, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	4.0' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/15	0.00 - 2.00	1/2/5/4	7	8			1D: Tan/brown, moist, loose, SAND, little Silt, little Gravel, very few root fibers. (Fill).	
	2D	24/15	2.00 - 4.00	4/4/6/7	10	12			2D: Tan/brown, moist, medium dense, SAND, little Silt, trace Gravel. (Fill).	
								13.00	4.00	
	3D	24/14	4.00 - 6.00	6/8/6/5	14	17			3D: Gray, wet, medium dense, SAND and Silt, trace Gravel.	Gravel = 3.4% Sand = 56.3% Fines = 40.3% MC = 11.5%
5										
								8.00	9.00	
	4D	24/15	9.00 - 11.00	18/19/15/18	34	40			Increased roller bit resistance at 9.0' bgs. 4D: Gray, wet, dense, SAND, some Silt, little Gravel. (Till).	
10										
	5D	24/19	14.00 - 16.00	18/31/49/39	80	95			5D: Gray, wet, very dense, SILT, some Sand, little Gravel. (Till).	Gravel = 16.7% Sand = 33.1% Fines = 50.2% MC = 9.3%
15										
	6D	24/18	19.00 - 21.00	16/30/33/30	63	75			6D: Gray, wet, very dense, SAND, some Silt, little Gravel. (Till).	LL = 20 PL = 14 MC = 14%
20										
	7D	24/18	24.00 - 26.00	25/30/33/42	63	75			7D: Gray, wet, very dense, SAND, some Silt, trace fine Gravel. (Till).	
25										
30	8D	22/16	29.00 - 30.83	29/60/75/100/4"	135	160			8D: Gray, wet, very dense, SAND, some Silt, trace fine Gravel. (Till).	

Remarks:

Borehole repaired by filling with cuttings.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Pine Point Road over B&M Railroad
Location: Scarborough, Maine

Boring No.: BB-SBMR-208
PIN: 18229.00

Driller:	New England Boring Contractors	**Elevation (ft.)**	17.0	**Auger ID/OD:**	N/A
Operator:	Bub Thompson / Donny Palmer	**Datum:**	NAVD 88	**Sampler:**	1-3/8" Split-Spoon
Logged By:	R. Clopper (Nobis Engineering)	**Rig Type:**	Rubber Tire / CME-550X	**Hammer Wt./Fall:**	140# / 30"
Date Start/Finish:	Apr 7, 2015 / Apr 7, 2015	**Drilling Method:**	Drive and Wash	**Core Barrel:**	n/a
Boring Location:	See Boring Location Plan	**Casing ID/OD:**	4" / 4.5"	**Water Level*:**	4.0' bgs
Hammer Efficiency Factor:	0.712	**Hammer Type:**	Automatic ☒ Hydraulic ☐ Rope & Cathead ☐		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
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SSA = Solid Stem Auger
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RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
30											
								-16.50		33.50	
	9D	0/0	34.00 - 34.00	100/0"	100	119				Encountered possible bedrock at 33.5' bgs. 9D: No recovery. Gray/black rock fragment in spoon tip. Advanced Roller Bit to 35.5' bgs.	
35	R1	60/52	35.50 - 40.50	RQD=83%						Bedrock: Black/Gray, fine grained, metamorphic, hard, fresh to moderately weathered, PHYLLITE. Rock Mass Quality: Good Core Times (min:sec) 35.5'-36.5' 3:30 36.5'-37.5' 3:10 37.5'-38.5' 2:30 38.5'-39.5' 3:15 39.5'-40.5' 7:00 87% Recovery	
40	R2	60/56	40.50 - 45.50	RQD=77%						Bedrock: Black/Gray, fine grained, metamorphic, hard, fresh to moderately weathered, PHYLLITE. Rock Mass Quality: Good Core Times (min:sec) 40.5'-41.5' 4:30 41.5'-42.5' 3:45 42.5'-43.5' 4:45 43.5'-44.5' 6:15 44.5'-45.5' 3:30 93% Recovery	Density=169 pcf U.C.S.=13,282 psi Depth=42.5-43.5
45								-28.50		45.50	
50											
55											
60											

Bottom of Exploration at 45.50 feet below ground surface.

Remarks:

Borehole repaired by filling with cuttings.

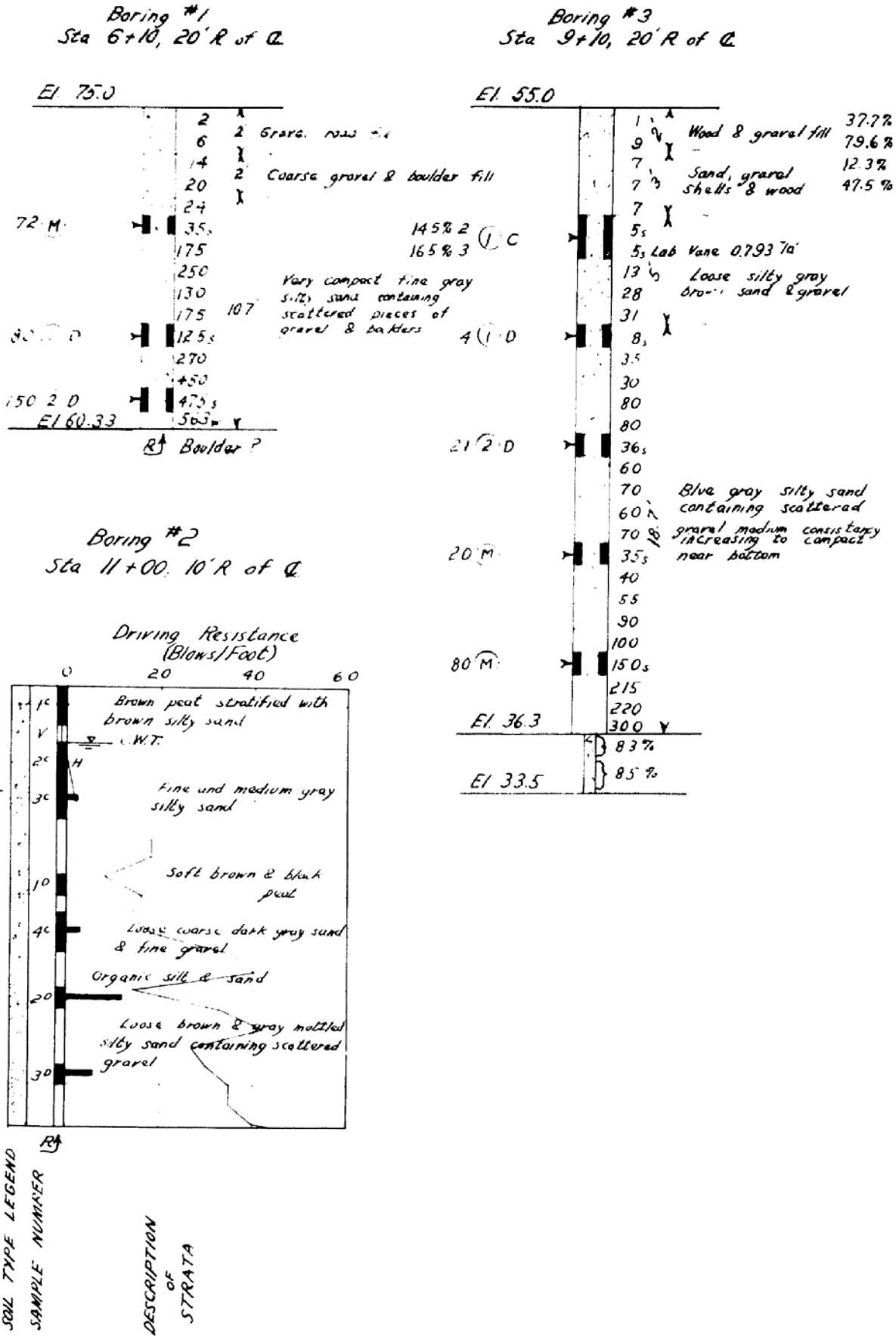
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

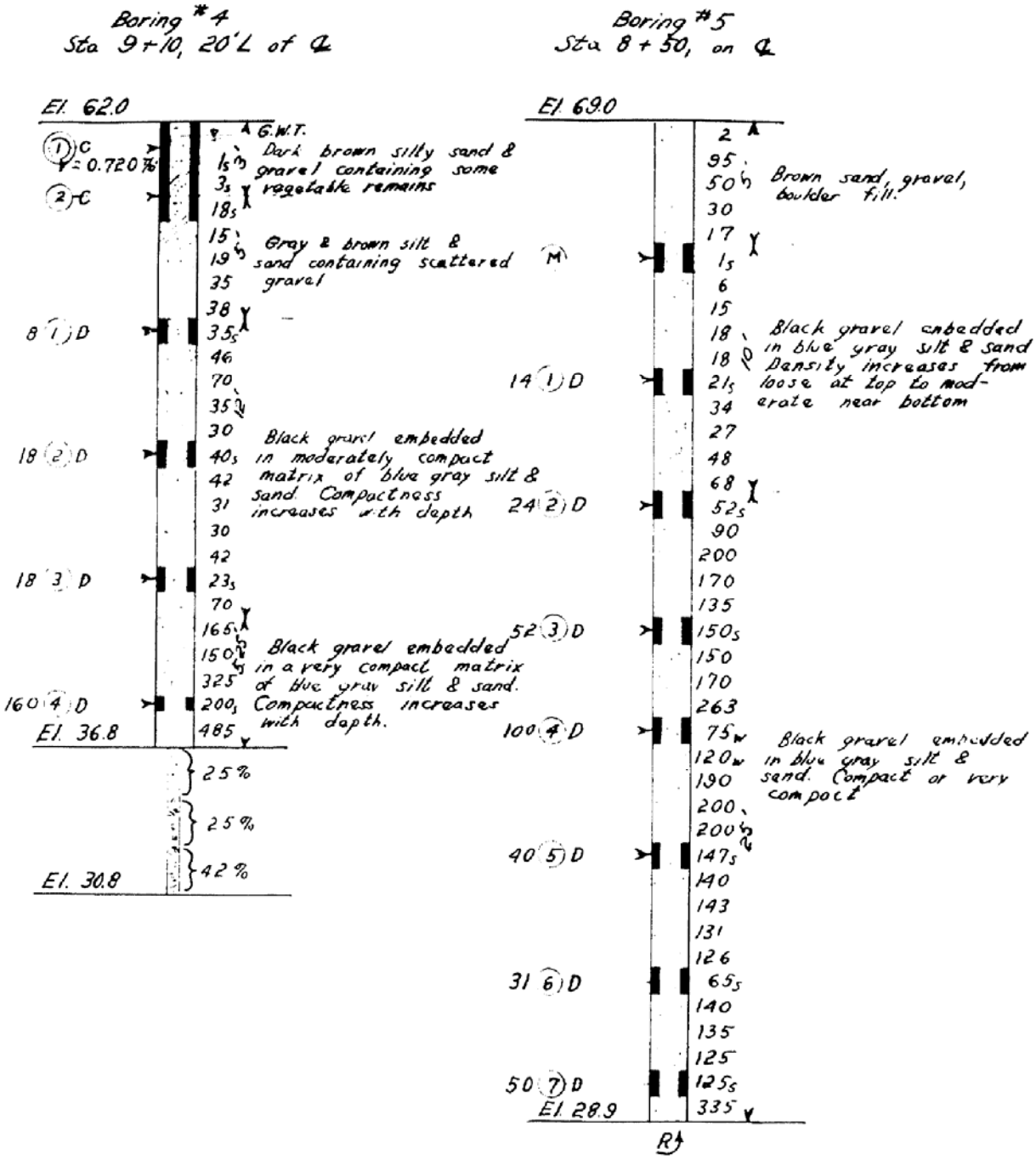
* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

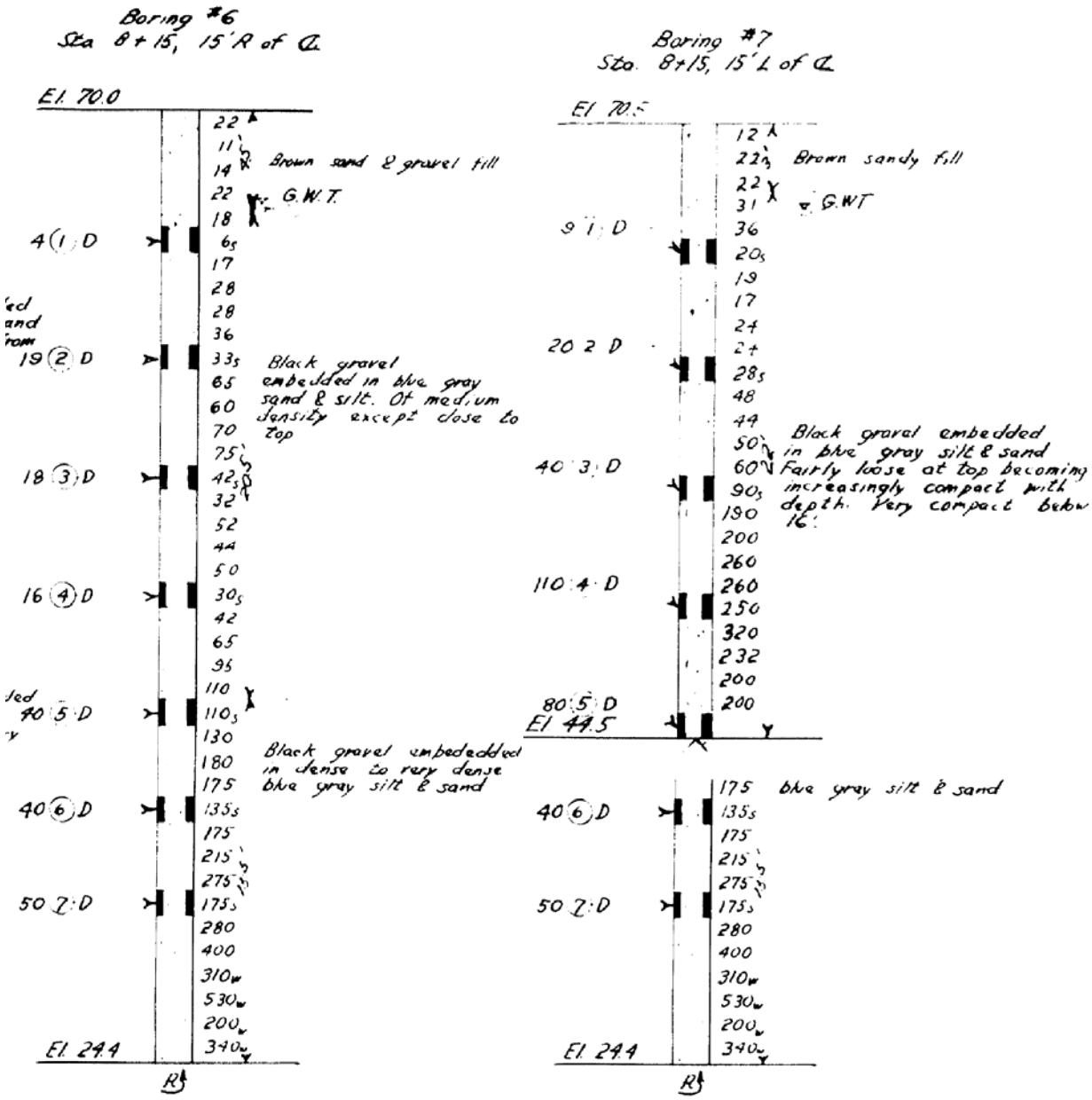
Appendix C – 1953 Boring Logs

Pine Point Crossing over Boston & Maine Railroad
Scarborough, Maine
December 1953 Borings

BORING NOTES	LOG SHEETS	DETAIL SHEETS
1. Scales as noted on drawings.		
2. Casing size as noted on drawings..		
3. Ground water table indicated thus:		
4. Number of blows of 275# hammer falling 18 inches required to drive extra heavy casing one foot indicated thus:	40	(graphical)
5. W, S, or V indicate respectively that the hole was washed, sampled, or ranud ahead of casing.		
6. Location and designation of "dry" samples taken in 5&H sampler #1290s indicated thus:	D	1D
7. Location and designation of "dry" samples taken in 2" O.D. 18 ga. seamless tubing indicated thus:	C	1C
8. Location and designation of "dry" samples taken in 3½" O.D., 16 ga. seamless tubing indicated thus:	U	1U
9. Location and designation of wash samples indicated thus:	W	1W
10. Unsuccessful attempts to secure dry sample indicated thus:	M	M
11. Number of blows of 275# hammer falling 15" required to drive sampling spoon or seamless tubing one foot indicated thus:	20	(graphical)
12. Sampling spoon or seamless tubing driven by static load not exceeding ½ ton indicated thus:	J	J
13. Sampling spoon or seamless tubing driven by static weight of drill rods and 275# hammer indicated thus:	H	H
14. Where no resistance is specified sampling spoon or seamless tubing was driven by the static weight of drill rods.		
15. Natural water contents, given as percent of dry weight, are indicated thus:	31% 20	graphical
16. Bottom of boring indicated thus:		
17. Refusal of drill rods or casing indicated thus:	R	R
18. Recovery of rock core by size "E" diamond bit indicated thus:	71%	71%


Boring #1
Sta 6+10, 20' R of ℄
El 75.0
2
6
14
20
24
35s
175
250
130
175
125s
270
450
475s
563
2 Grave. rock fill
2 Coarse gravel & boulder fill
72 M
145% 2
165% 3
1 C
Very compact fine gray silty sand containing scattered pieces of gravel & boulders
107
4 1 D
150 2 D
El 60.33
Rt Boulder ?
Boring #3
Sta 9+10, 20' R of ℄
El. 55.0
1
9
7
7
7
5s
5s Lab Vane 0.793 Ta
13
28
31
8s
3.5
30
80
80
36s
60
70
60
70
35s
40
55
90
100
150s
215
220
300
Wood & gravel fill
37.7%
79.6%
12.3%
47.5%
Sand, gravel shells & wood
Loose silty gray brown sand & gravel
4 1 D
21 2 D
Blue gray silty sand containing scattered gravel medium consistency increasing to compact near bottom
18
20 M
80 M
El. 36.3
83%
85%
El 33.5
Boring #2
Sta 11+00, 10' R of ℄
Driving Resistance (Blows/Foot)
0
20
40
60
60
55
50
45
40
1c
V
2c
3c
1D
4c
2D
3D
H
Brown peat stratified with brown silty sand
G.W.T.
Fine and medium gray silty sand
Soft brown & black peat
Loose coarse dark gray sand & fine gravel
Organic silt & sand
Loose brown & gray mottled silty sand containing scattered gravel
Rt
ELEVATION
SOIL TYPE LEGEND
SAMPLE NUMBER
DESCRIPTION OF STRATA


Boring #4
Sta 9+10, 20'L of ℄
El. 62.0
G.W.T.
(1) C
= 0.720%
(2) C
Dark brown silty sand & gravel containing some vegetable remains
Gray & brown silt & sand containing scattered gravel
8 (1) D
Black gravel embedded in moderately compact matrix of blue gray silt & sand. Compactness increases with depth
18 (2) D
18 (3) D
Black gravel embedded in a very compact matrix of blue gray silt & sand. Compactness increases with depth.
160 (4) D
El. 36.8
25%
25%
42%
El. 30.8
Boring #5
Sta 8+50, on ℄
El. 69.0
Brown sand, gravel, boulder fill.
(M)
Black gravel embedded in blue gray silt & sand. Density increases from loose at top to moderate near bottom
14 (1) D
24 (2) D
52 (3) D
Black gravel embedded in blue gray silt & sand. Compact or very compact
100 (4) D
40 (5) D
31 (6) D
50 (7) D
El. 28.9
R


Boring #6
Sta 8+15, 15' R of ℄
El. 70.0
22
11
14
Brown sand & gravel fill
22
G.W.T.
18
4 (1) D
6s
17
28
28
36
19 (2) D
33s
65
60
70
Black gravel embedded in blue gray sand & silt. Of medium density except close to top
75
18 (3) D
42s
32
52
44
50
16 (4) D
30s
42
65
95
110
40 (5) D
110s
130
180
175
Black gravel embedded in dense to very dense blue gray silt & sand
40 (6) D
135s
175
215
275
50 (7) D
175s
280
400
310w
530w
200w
340w
El. 24.4
R
Boring #7
Sta. 8+15, 15' L of ℄
El. 70.5
12
22
Brown sandy fill
22
31
G.W.T
9 (1) D
36
20s
19
17
24
20 (2) D
24
28s
48
44
50
60
Black gravel embedded in blue gray silt & sand Fairly loose at top becoming increasingly compact with depth. Very compact below 16'.
40 (3) D
90s
190
200
260
110 (4) D
260
250
320
232
200
80 (5) D
200
El. 44.5
175
blue gray silt & sand
40 (6) D
135s
175
215
275
50 (7) D
175s
280
400
310w
530w
200w
340w
El. 24.4
R

Boring #8
Sta 7+60, on ℄

El. 71.0

7
G.W.T
28
28 Loose brown sand & gravel fill
14
9 1 D 10s
18
19
20
24
21 2 D 48s
54
77
73
70
80 3 D 120s
170
150
150
180
60 4 D 130s
210 Blue gray silty sand containing scattered black gravel. Fairly loose consistency to 15' Very compact at greater depths
240
420
100 5 D 200s
160
300
280
325
17 6 D 70s
120
310
225
205
75 M 137s
162
205
110w
145
250
80 7 D 230s
350
100w
450w
160w
375

El. 25.3

Boring #9
Sta 7+15, on ℄

El. 71.4

12
16 Brown sand & gravel fill
10
12
16
G.W.T
10 1 D 8s
13
12
16
22
31 2 D 28s
70
85
85
90
40 3 D 65s
115
140 Blue gray silty sand containing scattered gravel loose at top, moderately dense to 25', very dense below 25'
140
115
30 4 D 37s
70
100
85
80
95 5 D 55s
110
130
120
110
80 6 D 136s
160
160
375

El. 46.9

R

Boring #10
Sta 6+10, 20' L of ℄

El. 73.0

Peaty sand & gravel

3
12
38
75
66 (1) D — 58s
102
138
403
110
80 (2) D — 110s
500w
195w
45w
135w
Blue gray silty sand containing scattered gravel. Very compact except in uppermost few feet.
50 (5) D — 100s
145
167
186
315
133 (4) D — 120w
105w
95w
125w
140 (5) D
El 47.0

R

Boring #11
Sta. 6+53, on ℄

El 73.0

2
Peaty brown silt & sand
12
15
16
30
13 (1) D — 15s
17
18
45
90
47 (2) D — 90s
160
113w
17w
19w
Blue gray silty sand containing scattered gravel. Moderately to highly compact except in uppermost 6'.
42 (3) D — 19w
8w
8w
21w
115w
80 (4) D — 14w
15w
23w
36w
48w
60 (5) D — 25w
205
240
350
60w
El 7.2

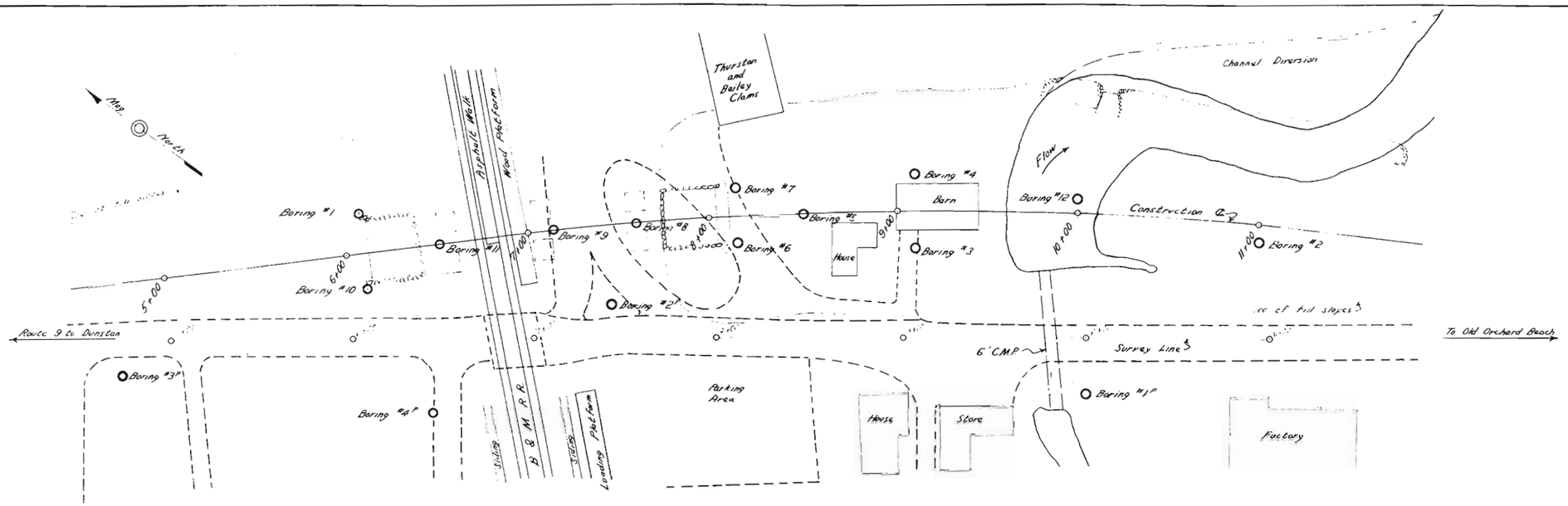
Boring #12
Sta. 10+00, 10' L of ℄

El 51.0

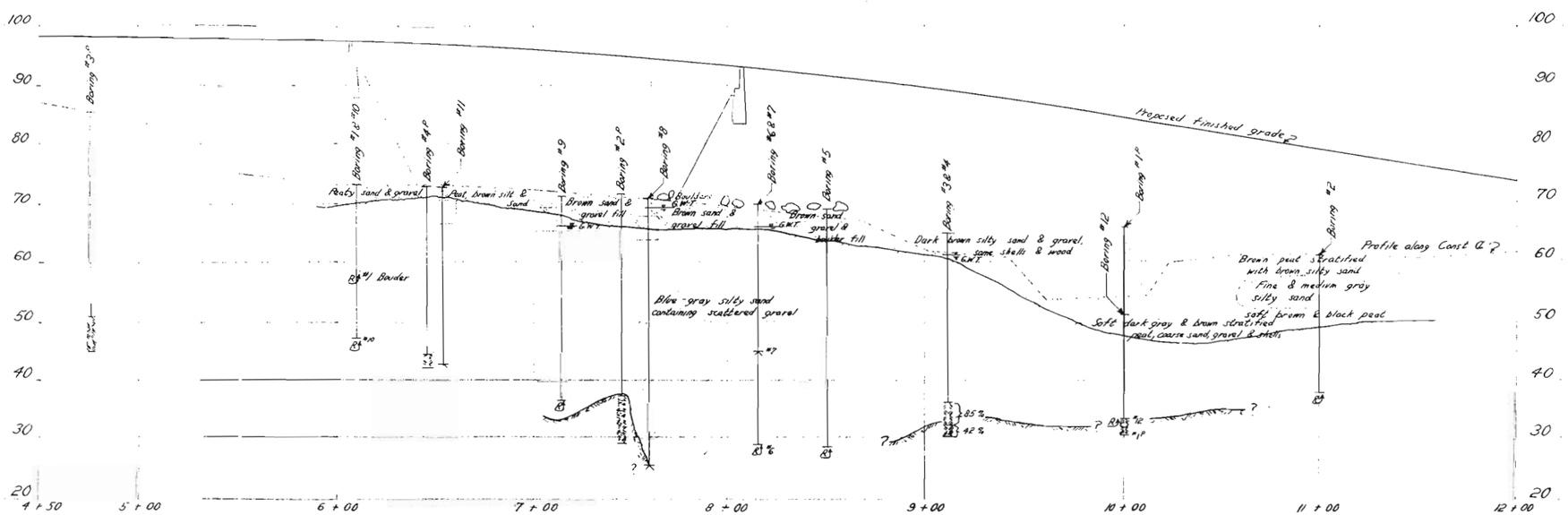
86%
16.2%
81.7%
121.0%
1 (U) — 3s
VC 180% — 2s
Vane Strength 0274 — 5v
Soft dark gray & brown stratified peat, course sand & gravel & shells
M. — 6s
7s
Vane Strength >120 — 45v
38 (1) D — 52s
90
110
47
57w
Moderately dense blue gray silty sand containing scattered gravel. Very compact in lowest 5'
21 (2) D — 55s
112
123
225
80 (3) D — 90w
El 53.7 — 175s

R

Appendix D – Existing 1953 Construction Drawings



PLAN
Scale 1" = 30'



PROFILE
Scales: Hor. 1" = 30'
Vert. 1" = 10'

SOILS ENGINEERING—GRAY
TRACE—FLYNT

BRIDGE—5260

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

PINE POINT CROSSING
OVER
BOSTON & MAINE RAILROAD
IN THE TOWN OF
SCARBORO
CUMBERLAND COUNTY
STRATIGRAPHIC PROFILE

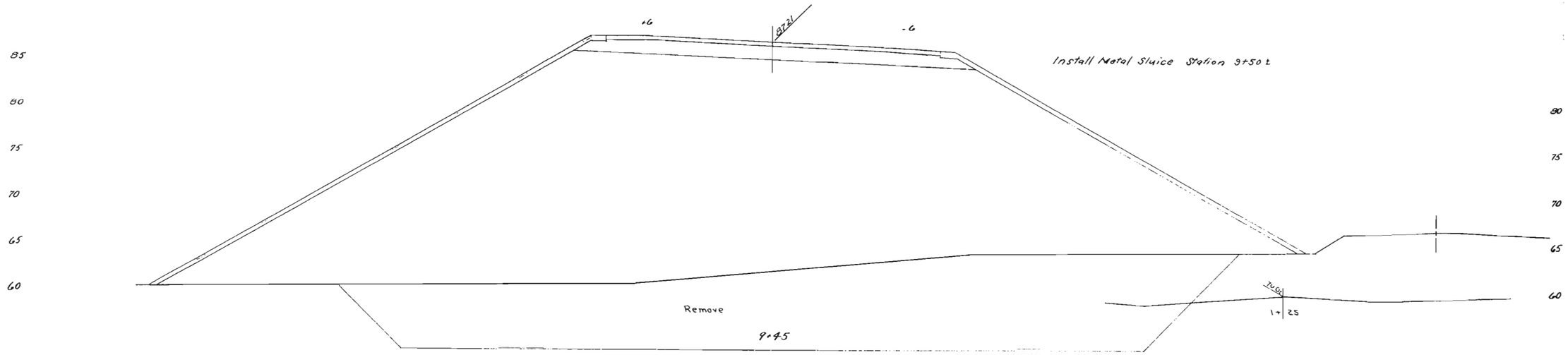
SHEET 7 OF 32 AUGUSTA, MAINE DEC., 1953

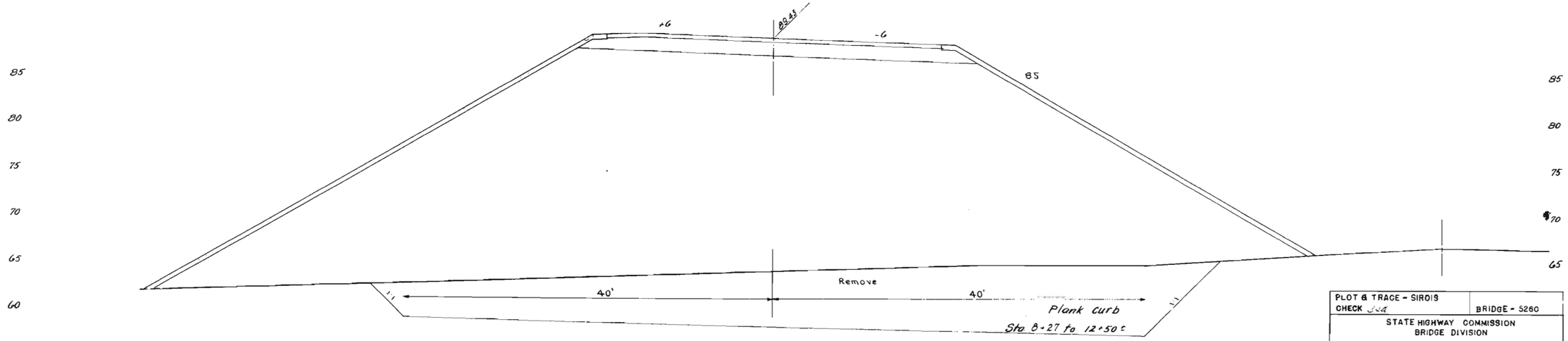
Revised & checked, May 21, 1954, H.D.H.

60-65

0 1 2 3 4 5 INCHES

SG-0112(1) 12 32





All material removed as herein indicated shall be paid for as "Muck Excavation."

9+00

Remove all overlaying soft organic material Sta. 8+73 to 10+30 within the limits shown on the cross sections.

Also remove, to a depth of 5 feet below the existing ground, all soft material within the limits shown on sheet 20 for the culvert at Sta. 10+00 downstream from the excavation shown in the cross sections.

Replace all material so removed with Granular Borrow.

PLOT & TRACE - SIR019 CHECK JCA	BRIDGE - 5260

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

PINE POINT CROSSING

OVER

BOSTON & MAINE RAILROAD

IN THE TOWN OF

SCARBORO
CUMBERLAND COUNTY

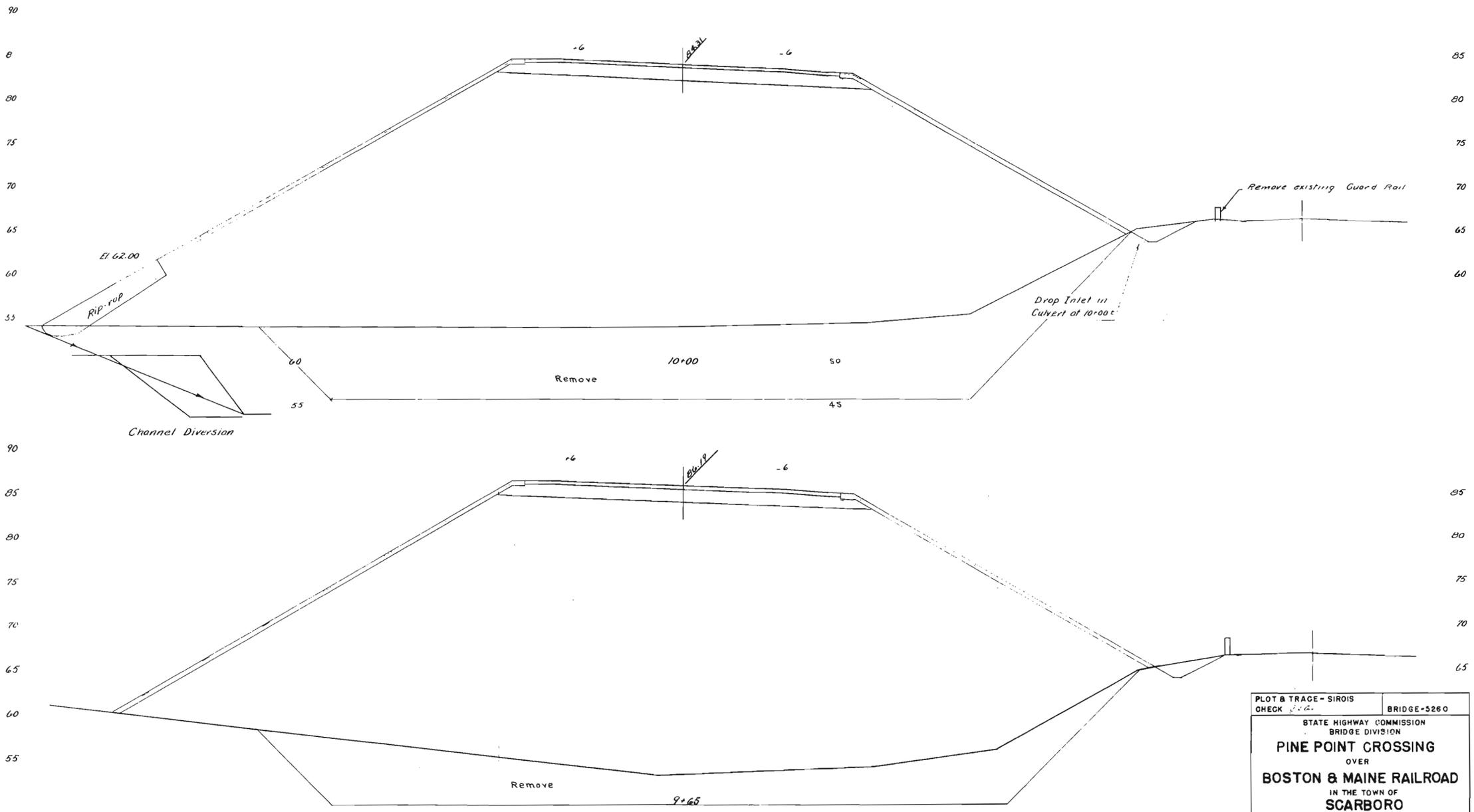
CROSS - SECTIONS

SHEET 12 OF 32 AUGUSTA, MAINE MAY 1953

& checked, May 21, 1954, H.D.H.

60-71

0 1 2 3 4 5 INCHES



PLOT & TRACE - SIROIS	
CHECK J.L.G.	BRIDGE-3260

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

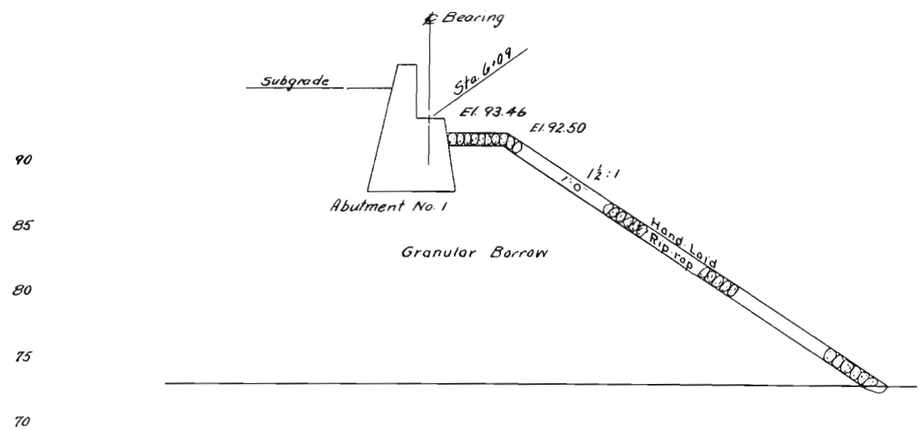
PINE POINT CROSSING
OVER
BOSTON & MAINE RAILROAD
IN THE TOWN OF
SCARBORO
CUMBERLAND COUNTY
CROSS - SECTIONS

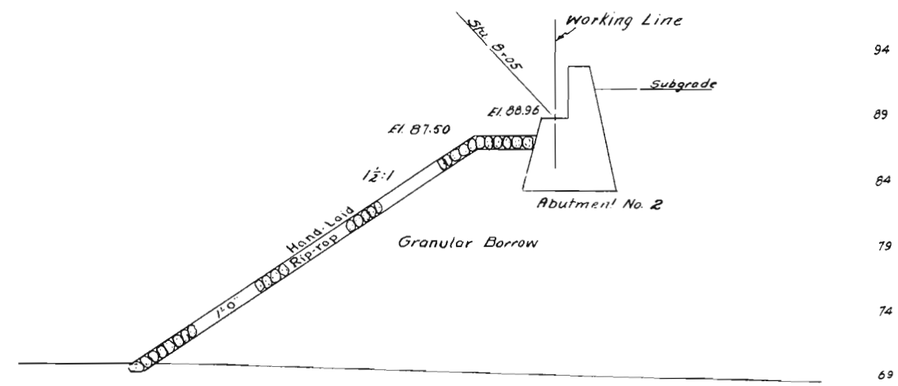
SHEET 13 OF 32 AUGUSTA, MAINE MAY 1953

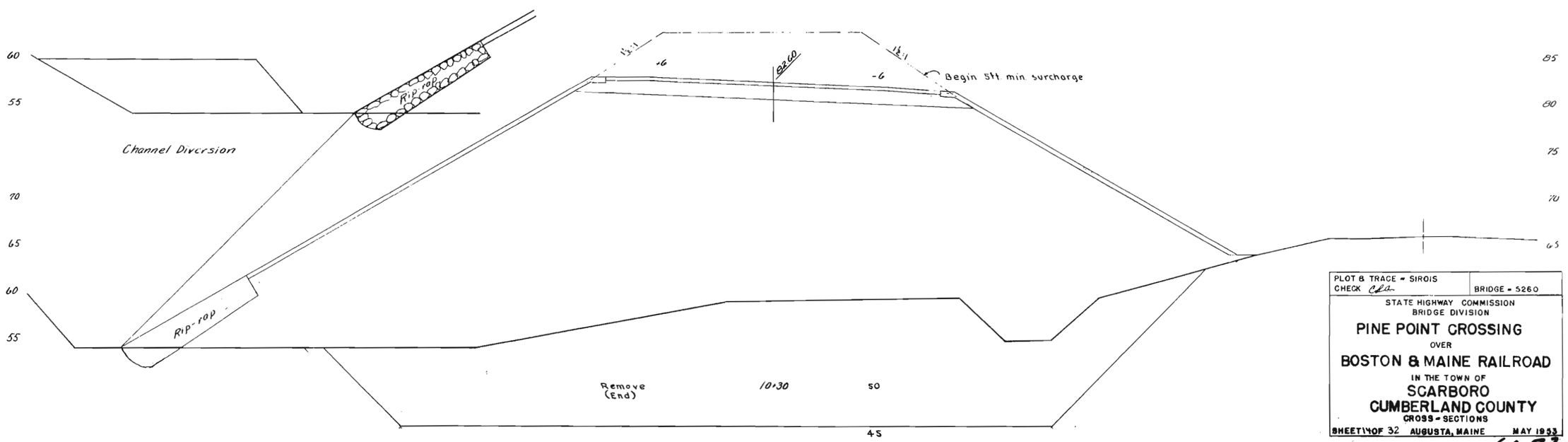
Revised & checked, May 21, 1954, H.D.H.

60-72

0 1 2 3 4 5 INCHES







PLOT & TRACE - SIROIS
CHECK Cfd
BRIDGE - 5260

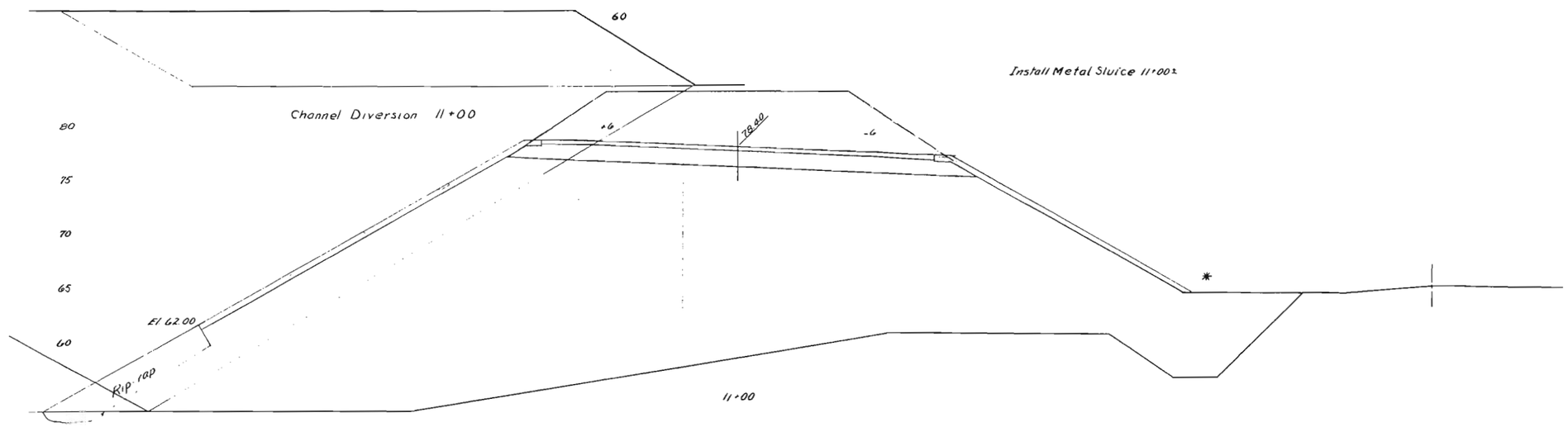
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

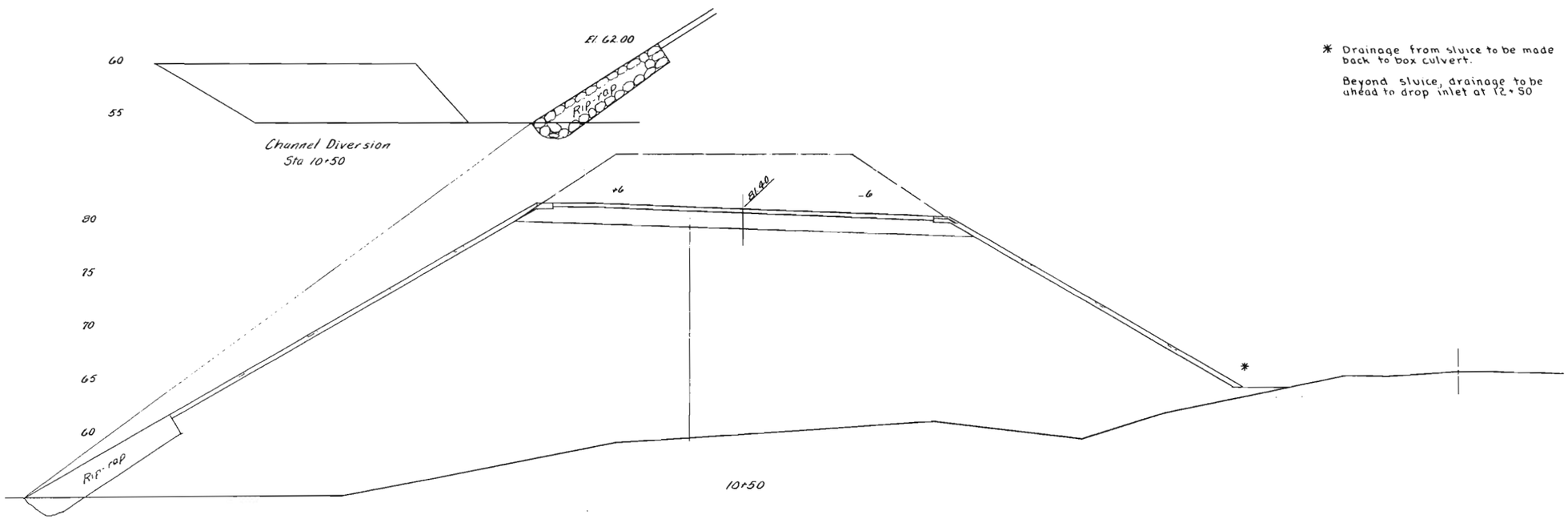
PINE POINT CROSSING
OVER
BOSTON & MAINE RAILROAD
IN THE TOWN OF
SCARBORO
CUMBERLAND COUNTY
CROSS - SECTIONS

SHEET 14 OF 32 AUGUSTA, MAINE MAY 1953

Revised & checked, May 21, 1954, H.D.H. 60-73

0 1 2 3 4 5 INCHES





✱ Drainage from sluice to be made back to box culvert.

Beyond sluice, drainage to be ahead to drop inlet at 12+50

PLOT & TRACE - SIROIS CHECK	BRIDGE-5260

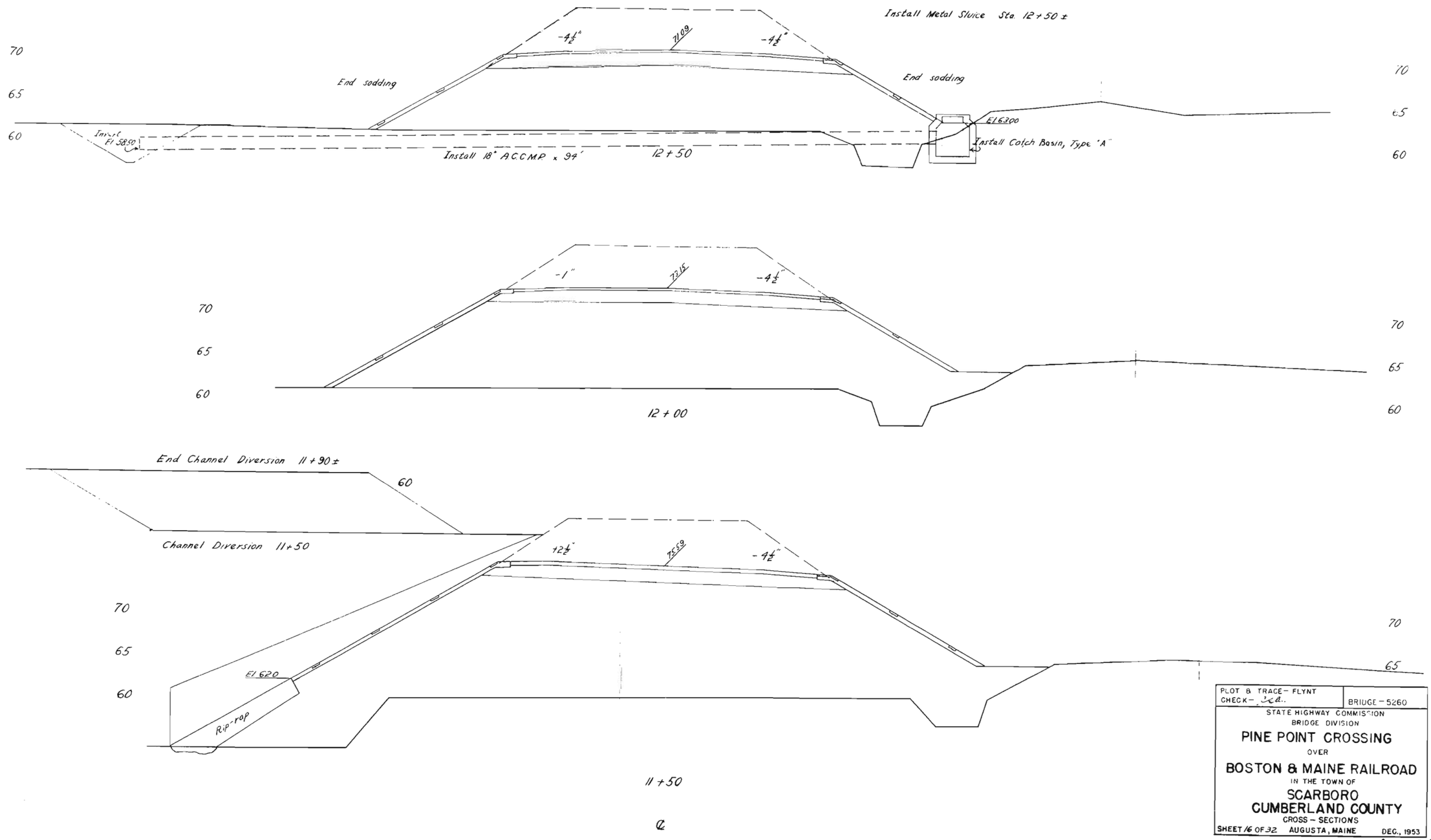
STATE HIGHWAY COMMISSION
BRIDGE DIVISION

PINE POINT CROSSING
OVER
BOSTON & MAINE RAILROAD
IN THE TOWN OF
SCARBORO
CUMBERLAND COUNTY
CROSS-SECTIONS

SHEET 15 OF 32 AUGUSTA, MAINE MAY 1953

60-74

0 1 2 3 4 5 INCHES



PLOT & TRACE – FLYNT
CHECK – J.C.A.

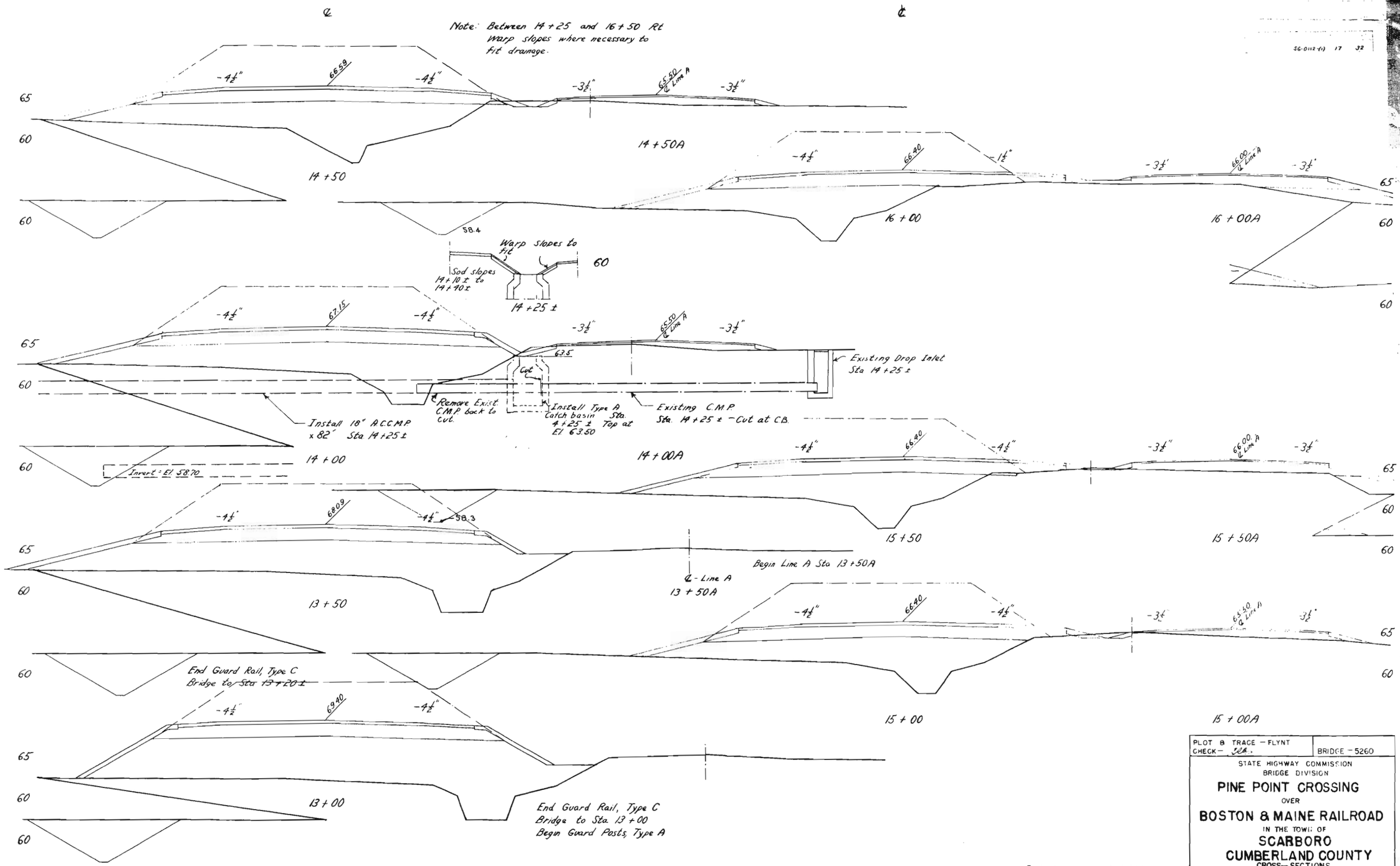
BRIDGE – 5260

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

PINE POINT CROSSING
OVER
BOSTON & MAINE RAILROAD
IN THE TOWN OF
SCARBORO
CUMBERLAND COUNTY
CROSS – SECTIONS

SHEET 16 OF 32 AUGUSTA, MAINE DEC., 1953

60-75



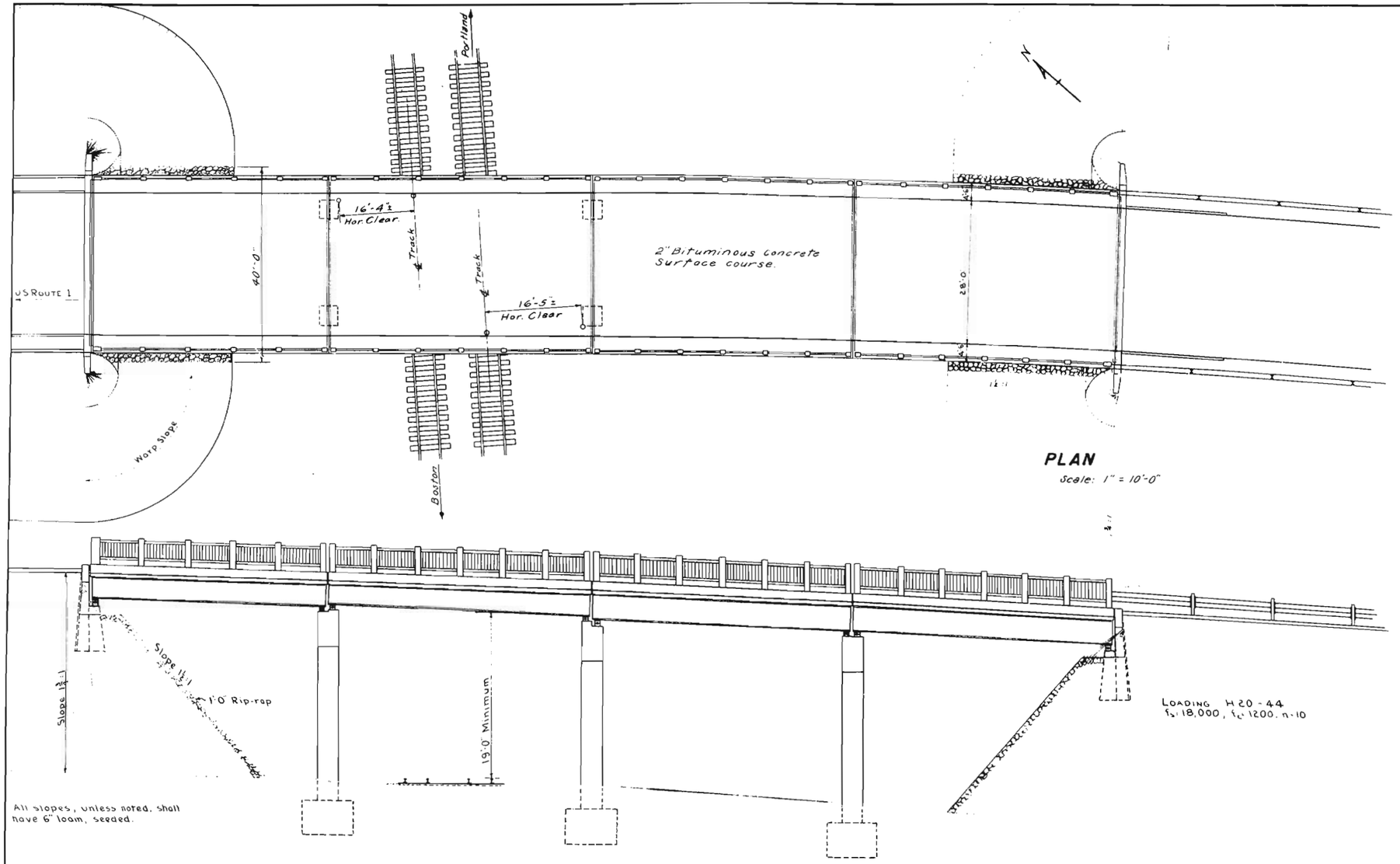
PLOT & TRACE — FLYNT CHECK —	BRIDGE — 5260

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

PINE POINT CROSSING
OVER
BOSTON & MAINE RAILROAD
IN THE TOWN OF
SCARBORO
CUMBERLAND COUNTY
CROSS—SECTIONS

SHEET 17 OF 32 AUGUSTA, MAINE DEC., 1953

60-76



PLAN

Scale: 1" = 10'-0"

ELEVATION

Scale: Horz. 1" = 10'-0", Vert. 1" = 6'-0"

CONCRETE CLASSIFICATION:
Class A - Roadway slab, sidewalks, approach curbs and [piers above footings.
Class B - Abutments, pier footings.
Class Y - Rail posts.

DETAIL - MCDOUGAL	BRIDGE - 5260
TRACE - MCDOUGAL	

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

PINE POINT CROSSING
OVER
BOSTON & MAINE RAILROAD
IN THE TOWN OF
SCARBORO
CUMBERLAND COUNTY

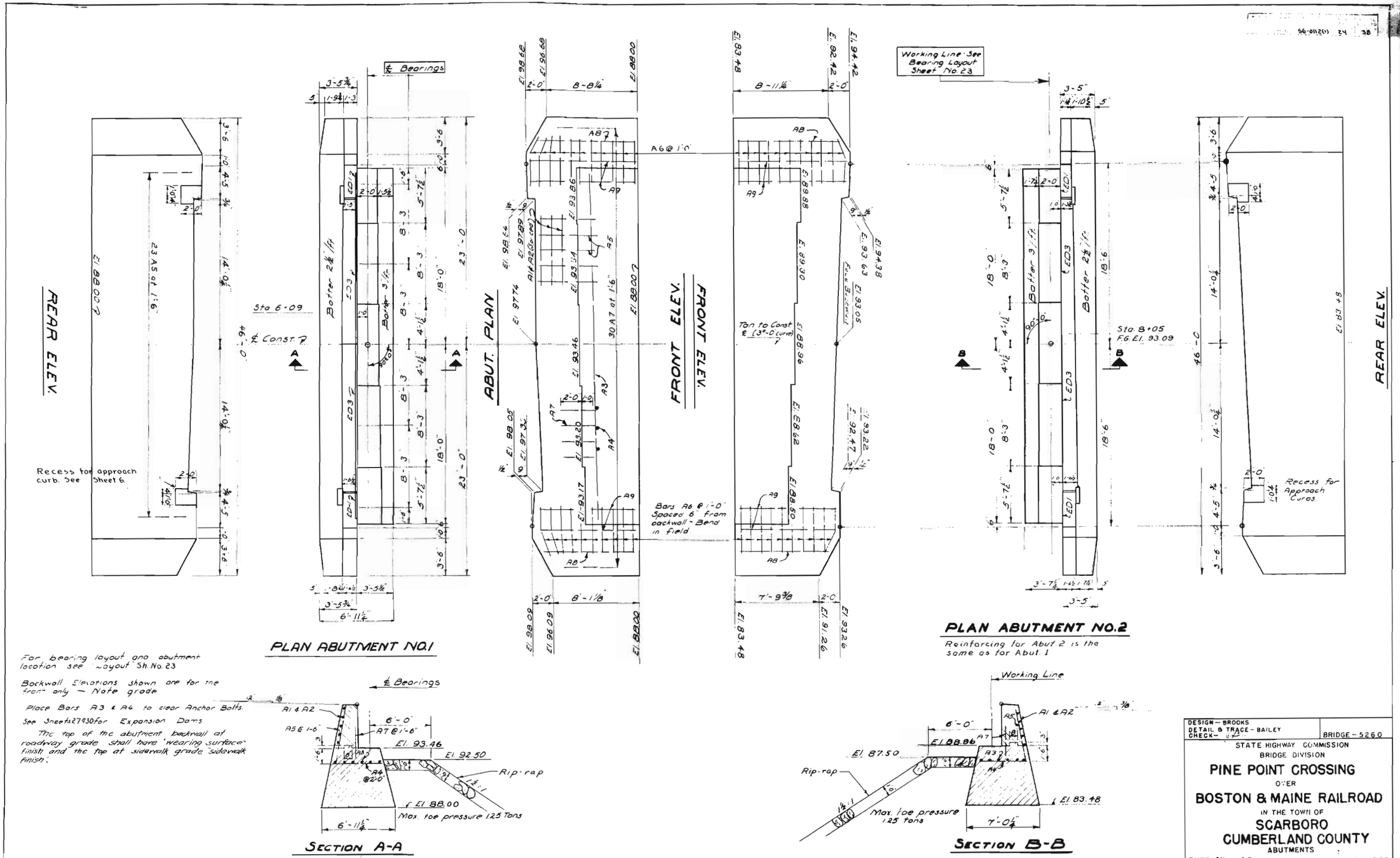
GENERAL PLAN

SHEET 22 OF 32 AUGUSTA, MAINE APRIL 1953

Revised + checked, May 21, 1954, H.D.H.

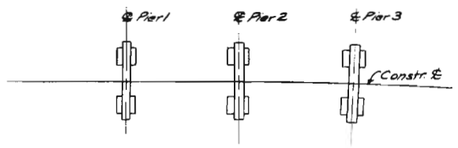
60-81

0 1 2 3 4 5 INCHES

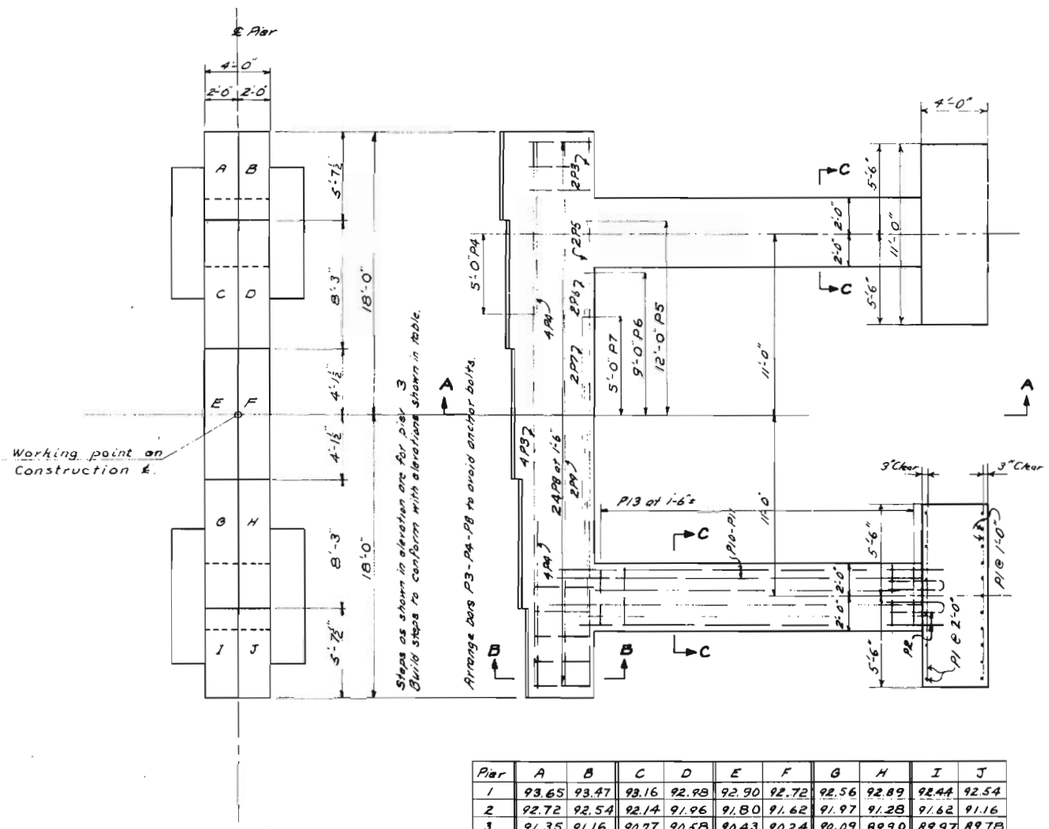


Revised & checked, May 21, 1954, K.D.H.

60-83

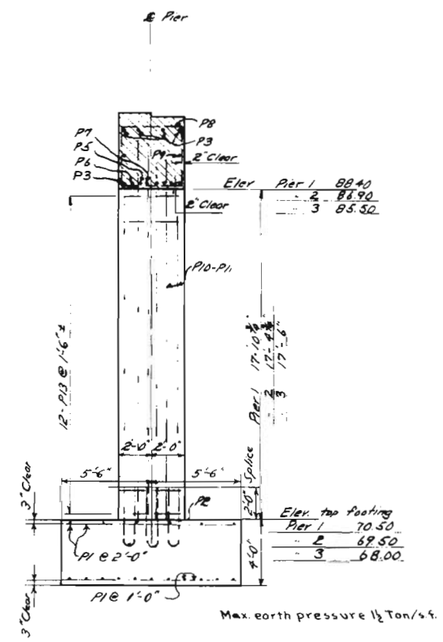


For detailed layout of piers and bearing areas see sheet no. 23

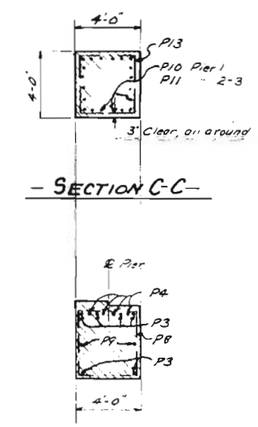


— PLAN PIER —

— ELEVATION —



— SECTION A-A —



— SECTION C-C —

— SECTION B-B —

Pier	A	B	C	D	E	F	G	H	I	J
1	93.65	93.47	93.16	92.98	92.90	92.72	92.56	92.89	92.44	92.54
2	92.72	92.54	92.14	91.96	91.80	91.62	91.97	91.28	91.62	91.16
3	91.35	91.16	90.77	90.58	90.43	90.24	90.09	89.90	89.97	89.78

— STEP ELEVATIONS —

Step elevations are the same as bearing elevations.

Added 1½T/s.f. March 1954 C.W.S.

Revised & checked, May 21, 1954, H.D.H.

DESIGN — BROOKS
TRACE — BACHELDER
CHECK — [illegible]

BRIDGE — 5260

STATE HIGHWAY COMMISSION
BRIDGE DIVISION

PINE POINT CROSSING

OVER

BOSTON & MAINE RAILROAD

IN THE TOWN OF

SCARBORO
CUMBERLAND COUNTY

PIERS

SHEET 25 OF 32 AUGUSTA, MAINE MAY 1953

60-84

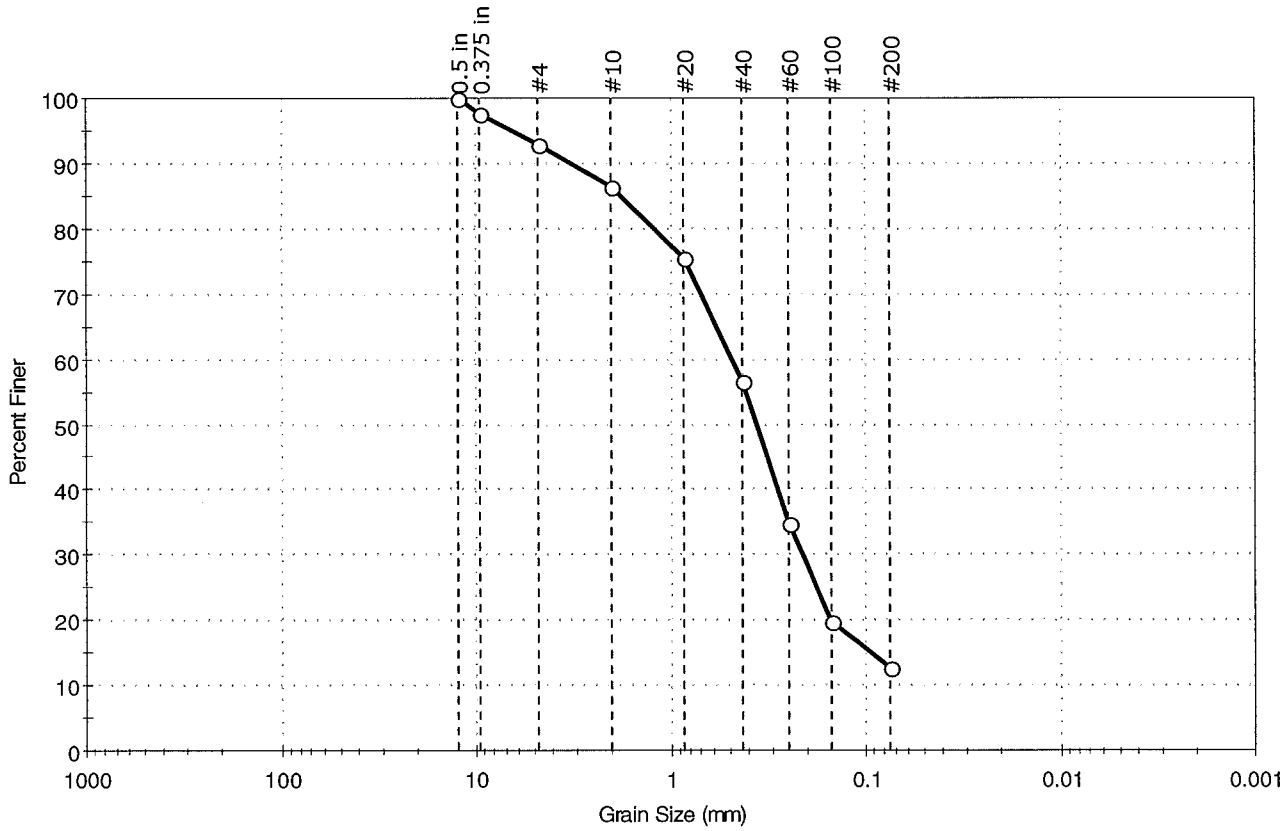
0 1 2 3 4 5 INCHES

Appendix E – Laboratory Test Results

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-101	Sample Type: jar	Tested By:	jbr
Sample ID:2D	Test Date: 10/11/12	Checked By:	jdt
Depth : ---	Test Id: 251767		
Test Comment:	---		
Sample Description:	Moist, brown silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	7.0	80.4	12.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	98		
#4	4.75	93		
#10	2.00	86		
#20	0.85	76		
#40	0.42	57		
#60	0.25	35		
#100	0.15	20		
#200	0.075	13		

Coefficients

D_{85} = 1.7968 mm D_{30} = 0.2124 mm

D_{60} = 0.4792 mm D_{15} = 0.0945 mm

D_{50} = 0.3611 mm D_{10} = 0.0584 mm

C_u = N/A C_c = N/A

Classification

ASTM N/A

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

Sample/Test Description

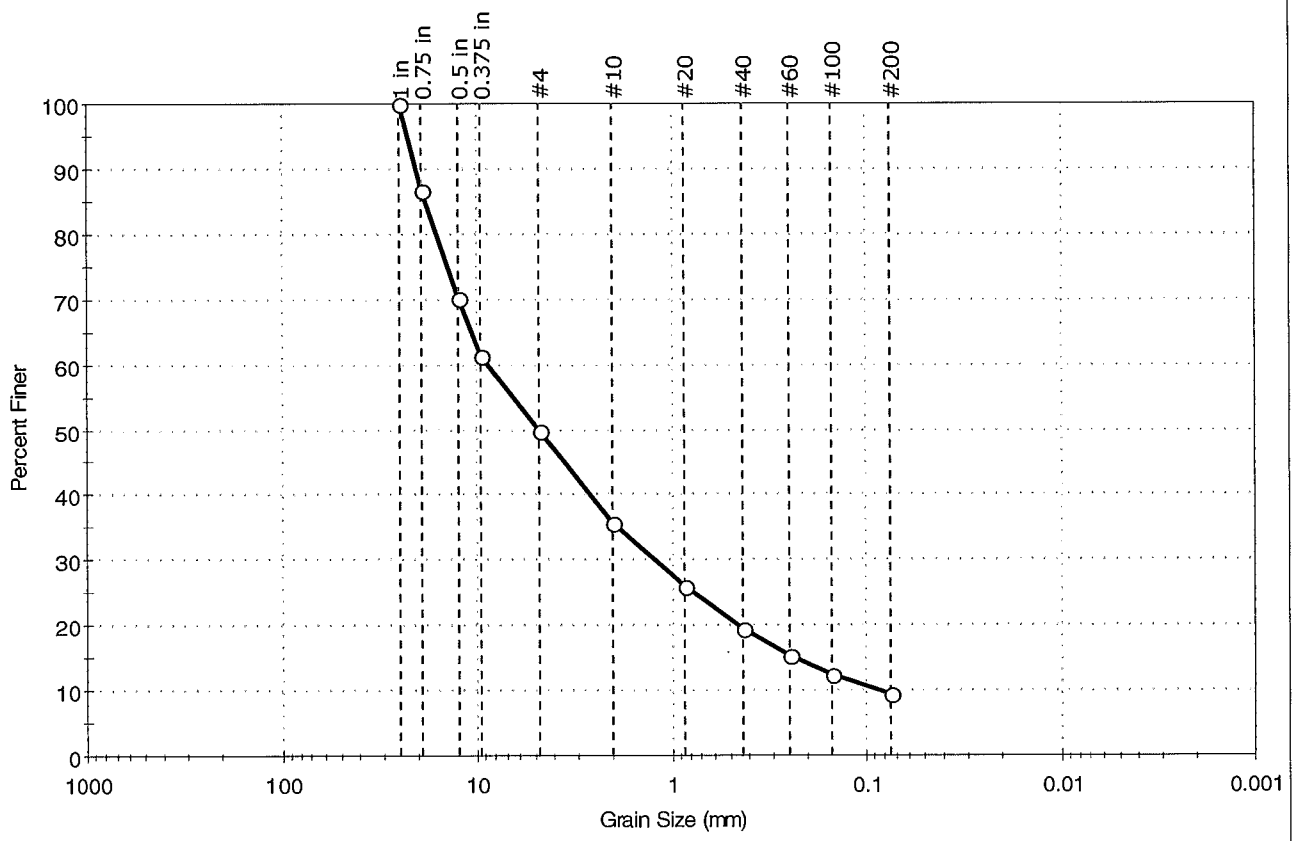
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-101	Sample Type: jar	Tested By:	jbr
Sample ID:3D-B	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251768		
Test Comment: ---			
Sample Description:	Moist, very dark brown gravel with silt and sand		
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	50.3	40.3	9.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	87		
0.5 in	12.50	70		
0.375 in	9.50	61		
#4	4.75	50		
#10	2.00	36		
#20	0.85	26		
#40	0.42	19		
#60	0.25	15		
#100	0.15	12		
#200	0.075	9		

Coefficients

D_{85} = 18.2255 mm D_{30} = 1.2179 mm
D_{60} = 8.7165 mm D_{15} = 0.2367 mm
D_{50} = 4.8201 mm D_{10} = 0.0864 mm
C_u = 100.885 C_c = 1.970

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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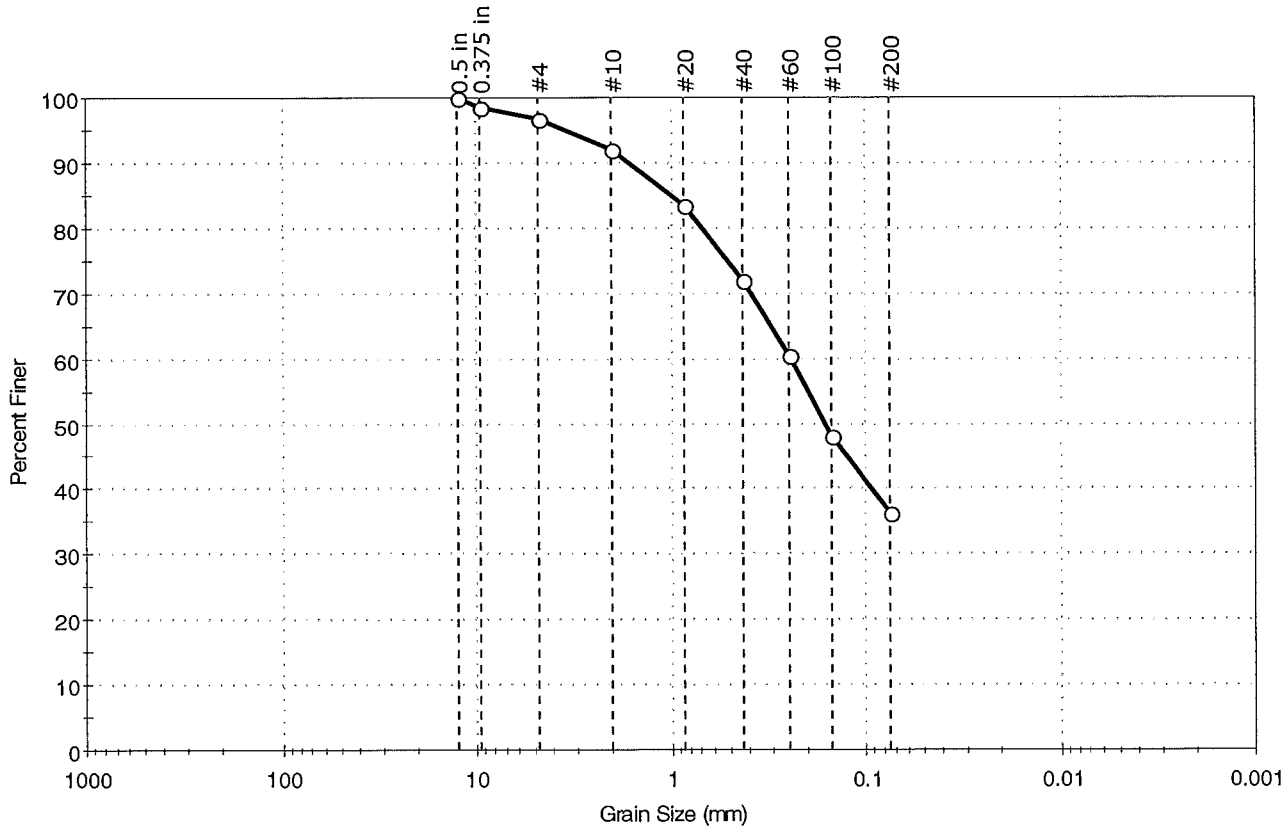
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-101	Sample Type: jar	Tested By:	jbr
Sample ID:8D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251769		
Test Comment:	---		
Sample Description:	Moist, dark gray silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	3.2	60.6	36.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	97		
#10	2.00	92		
#20	0.85	83		
#40	0.42	72		
#60	0.25	60		
#100	0.15	48		
#200	0.075	36		

Coefficients

D_{85} = 0.9922 mm D_{30} = N/A
D_{60} = 0.2452 mm D_{15} = N/A
D_{50} = 0.1626 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM Silty sand (SM)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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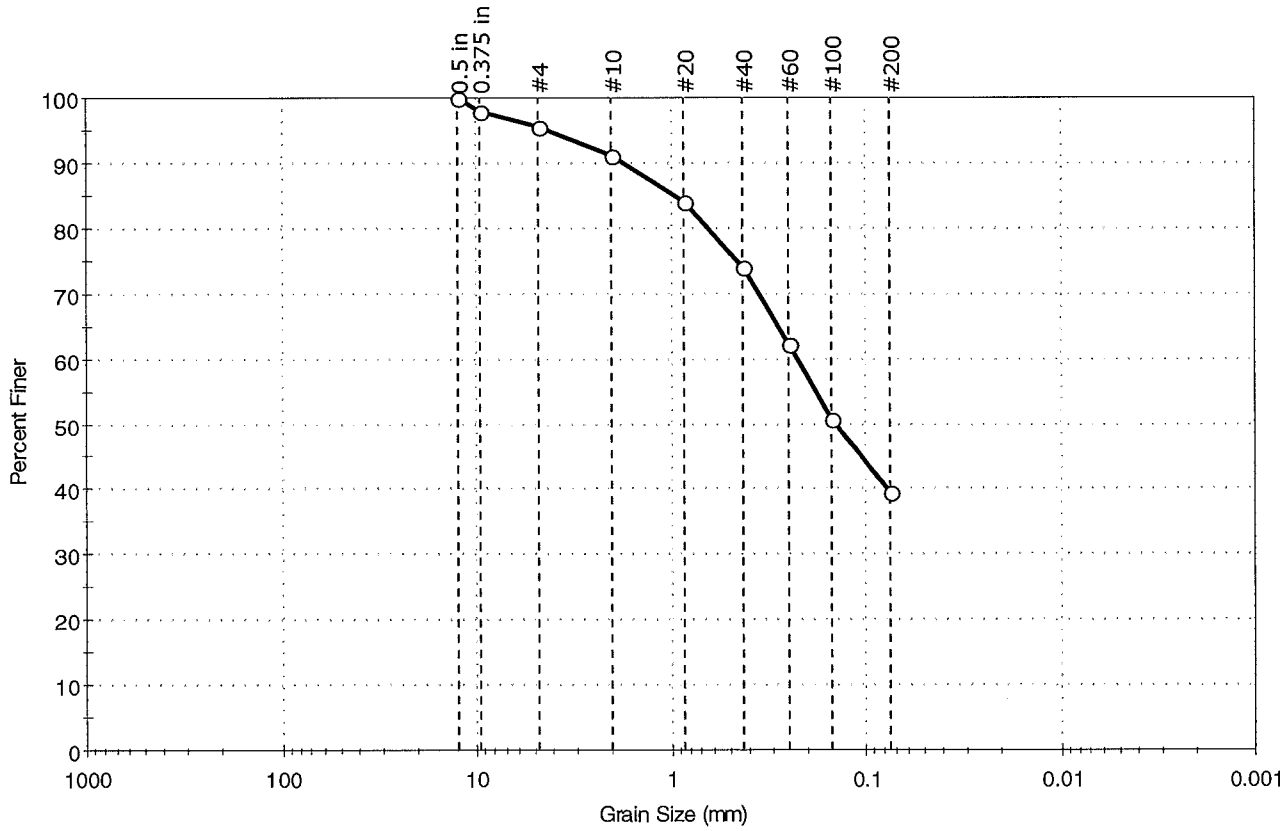
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-101	Sample Type: jar	Tested By:	jbr
Sample ID:10D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251770		
Test Comment:	---		
Sample Description:	Moist, gray silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	4.4	55.9	39.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	98		
#4	4.75	96		
#10	2.00	91		
#20	0.85	84		
#40	0.42	74		
#60	0.25	62		
#100	0.15	51		
#200	0.075	40		

Coefficients

D_{85} = 0.9558 mm D_{30} = N/A
D_{60} = 0.2272 mm D_{15} = N/A
D_{50} = 0.1443 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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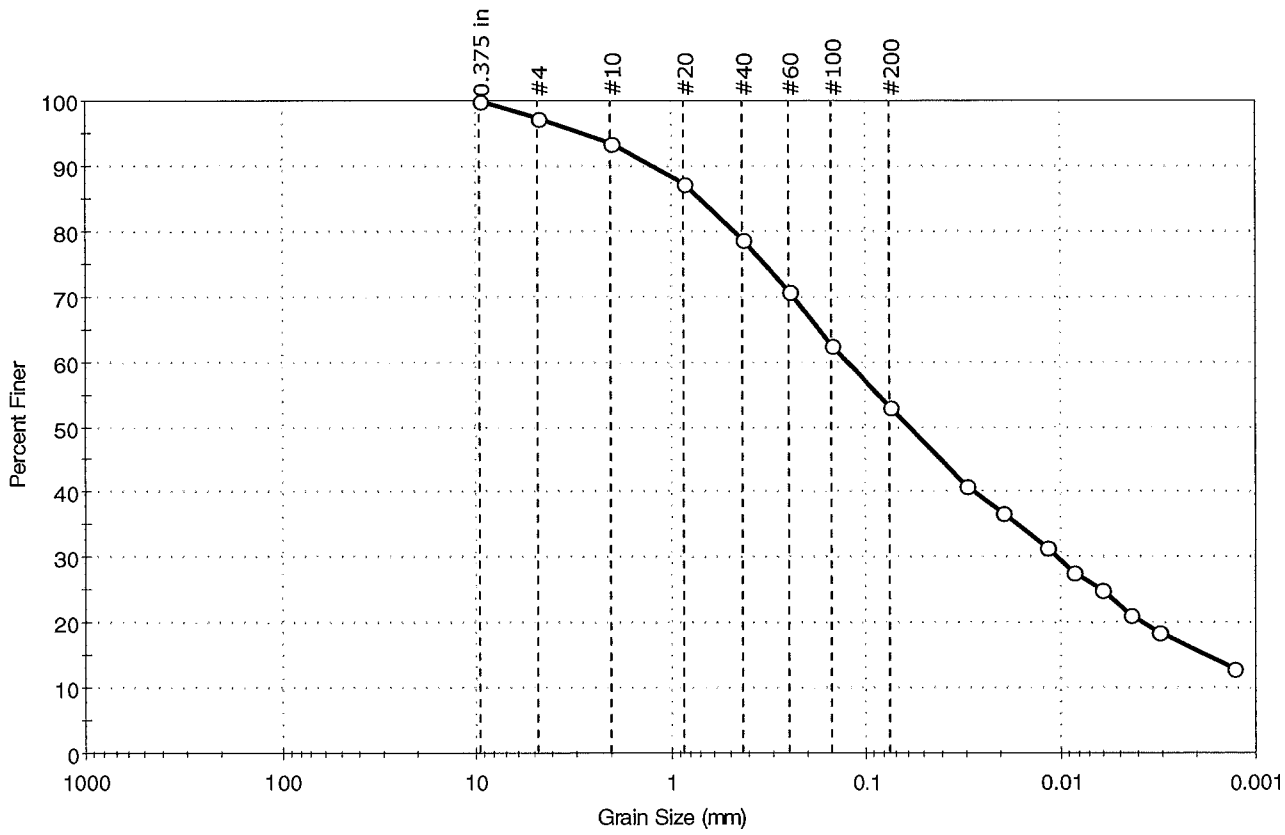
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-101	Sample Type: jar	Tested By:	jbr
Sample ID:14D	Test Date: 10/16/12	Checked By:	jdt
Depth : ---	Test Id: 252462		
Test Comment:	---		
Sample Description:	Moist, dark gray sandy clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	2.7	44.1	53.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	97		
#10	2.00	93		
#20	0.85	87		
#40	0.42	79		
#60	0.25	71		
#100	0.15	62		
#200	0.075	53		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0305	41		
---	0.0197	37		
---	0.0117	32		
---	0.0085	28		
---	0.0061	25		
---	0.0044	21		
---	0.0031	19		
---	0.0013	13		

Coefficients

D_{85} = 0.7099 mm D_{30} = 0.0102 mm

D_{60} = 0.1248 mm D_{15} = 0.0018 mm

D_{50} = 0.0593 mm D_{10} = 0.0008 mm

C_u = N/A C_c = N/A

Classification

ASTM Sandy lean clay (CL)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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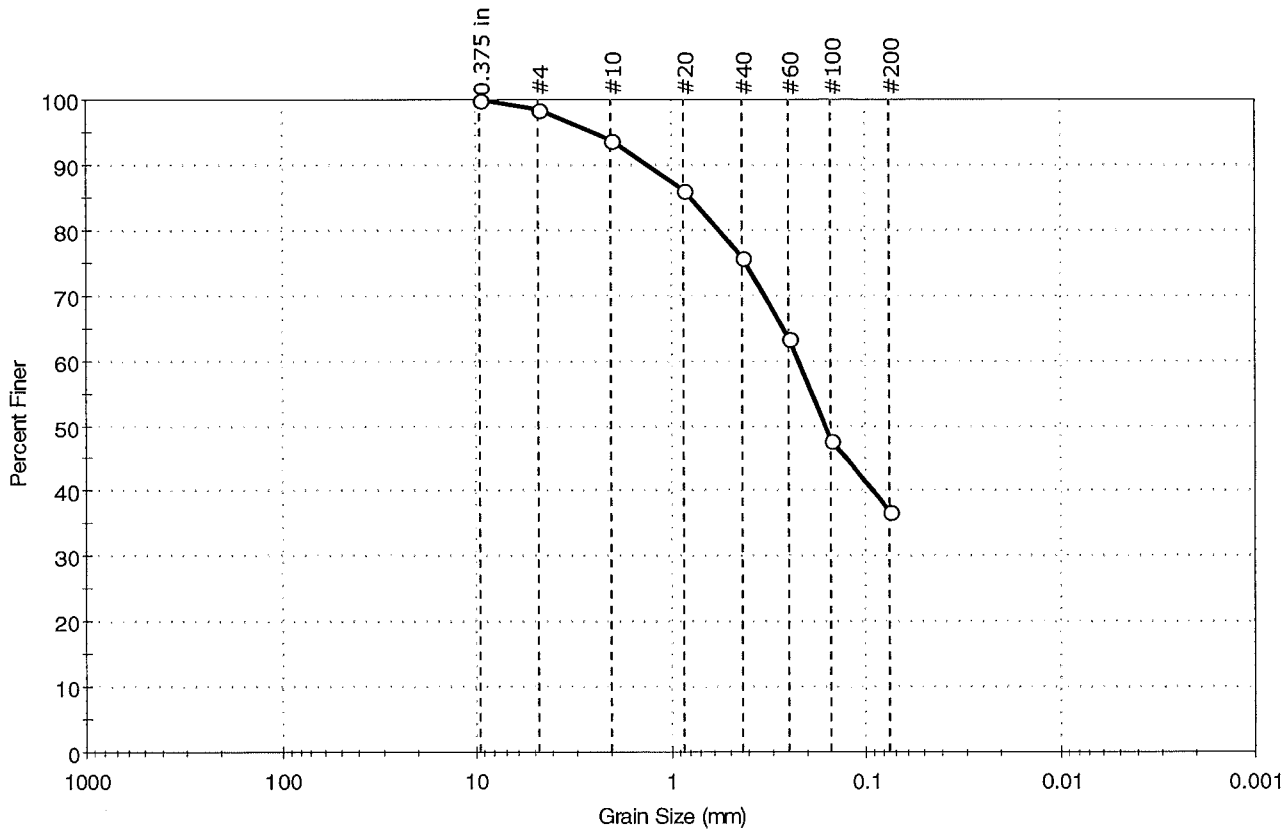
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-102	Sample Type: jar	Tested By:	jbr
Sample ID:3D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251772		
Test Comment:	---		
Sample Description:	Moist, dark gray silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.3	61.8	36.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	94		
#20	0.85	86		
#40	0.42	76		
#60	0.25	63		
#100	0.15	48		
#200	0.075	37		

Coefficients

D_{85} = 0.7826 mm	D_{30} = N/A
D_{60} = 0.2241 mm	D_{15} = N/A
D_{50} = 0.1610 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Silty sand (SM)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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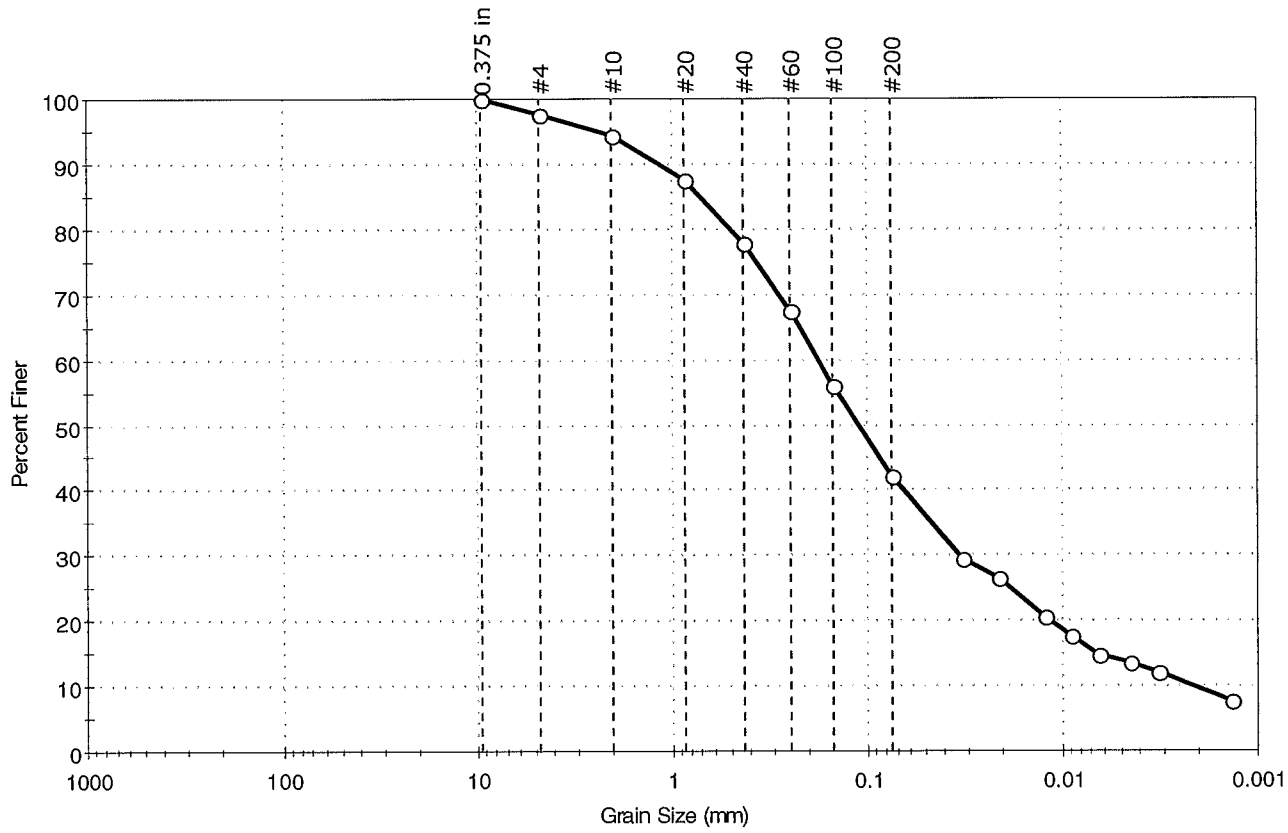
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-103	Sample Type: jar	Tested By:	jbr
Sample ID:4D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251778		
Test Comment:	---		
Sample Description:	Moist, dark gray silty sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	2.3	55.5	42.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	94		
#20	0.85	88		
#40	0.42	78		
#60	0.25	68		
#100	0.15	56		
#200	0.075	42		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0324	29		
---	0.0214	27		
---	0.0123	21		
---	0.0090	18		
---	0.0064	15		
---	0.0045	14		
---	0.0032	12		
---	0.0014	8		

Coefficients

D_{85} = 0.7072 mm D_{30} = 0.0336 mm
D_{60} = 0.1787 mm D_{15} = 0.0066 mm
D_{50} = 0.1107 mm D_{10} = 0.0021 mm
C_u = N/A C_c = N/A

Classification

ASTM Silty sand (SM)

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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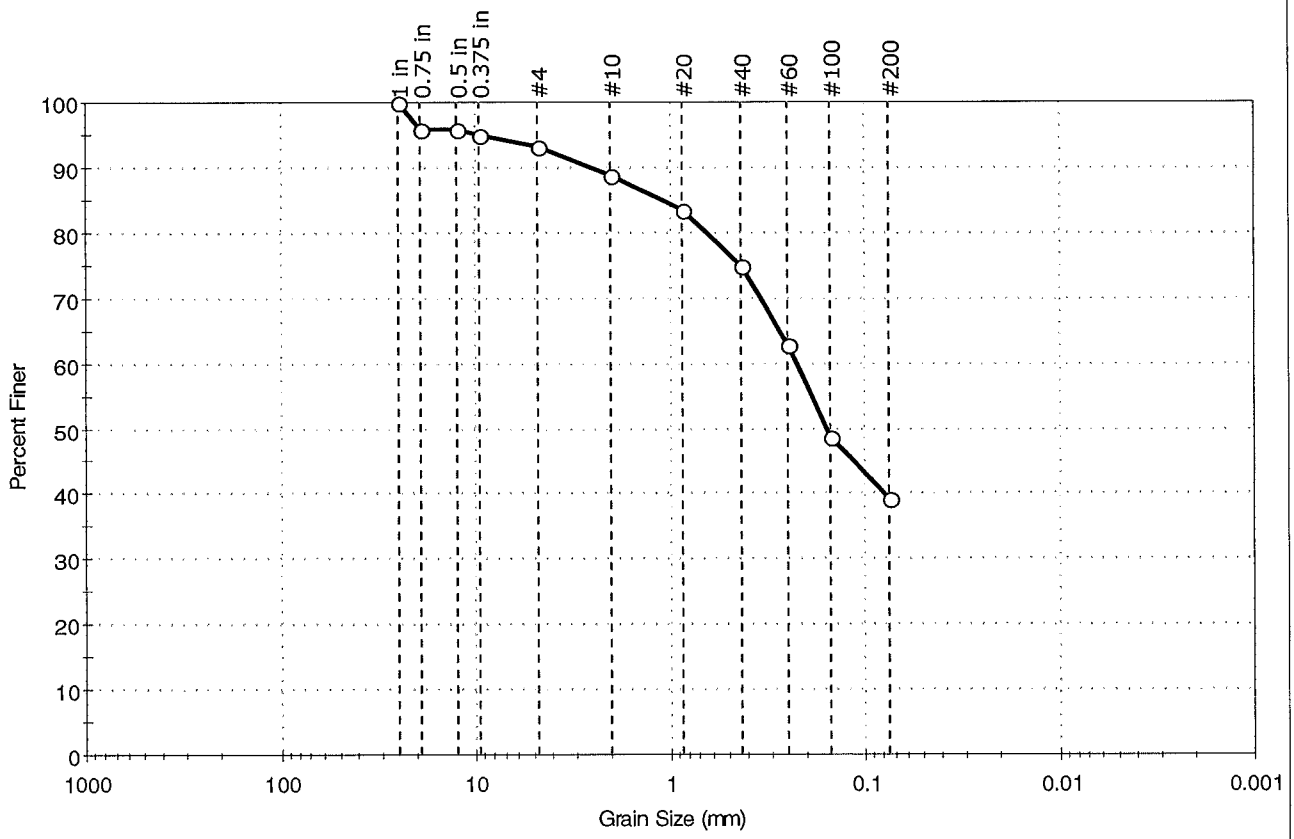
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-103	Sample Type: jar	Tested By:	jbr
Sample ID:9D	Test Date: 10/16/12	Checked By:	jdt
Depth : ---	Test Id: 251773		
Test Comment: ---			
Sample Description: Moist, dark gray silty sand			
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	6.7	54.2	39.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	96		
0.5 in	12.50	96		
0.375 in	9.50	95		
#4	4.75	93		
#10	2.00	89		
#20	0.85	84		
#40	0.42	75		
#60	0.25	63		
#100	0.15	49		
#200	0.075	39		

Coefficients

D_{85} = 1.0734 mm D_{30} = N/A
D_{60} = 0.2255 mm D_{15} = N/A
D_{50} = 0.1574 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

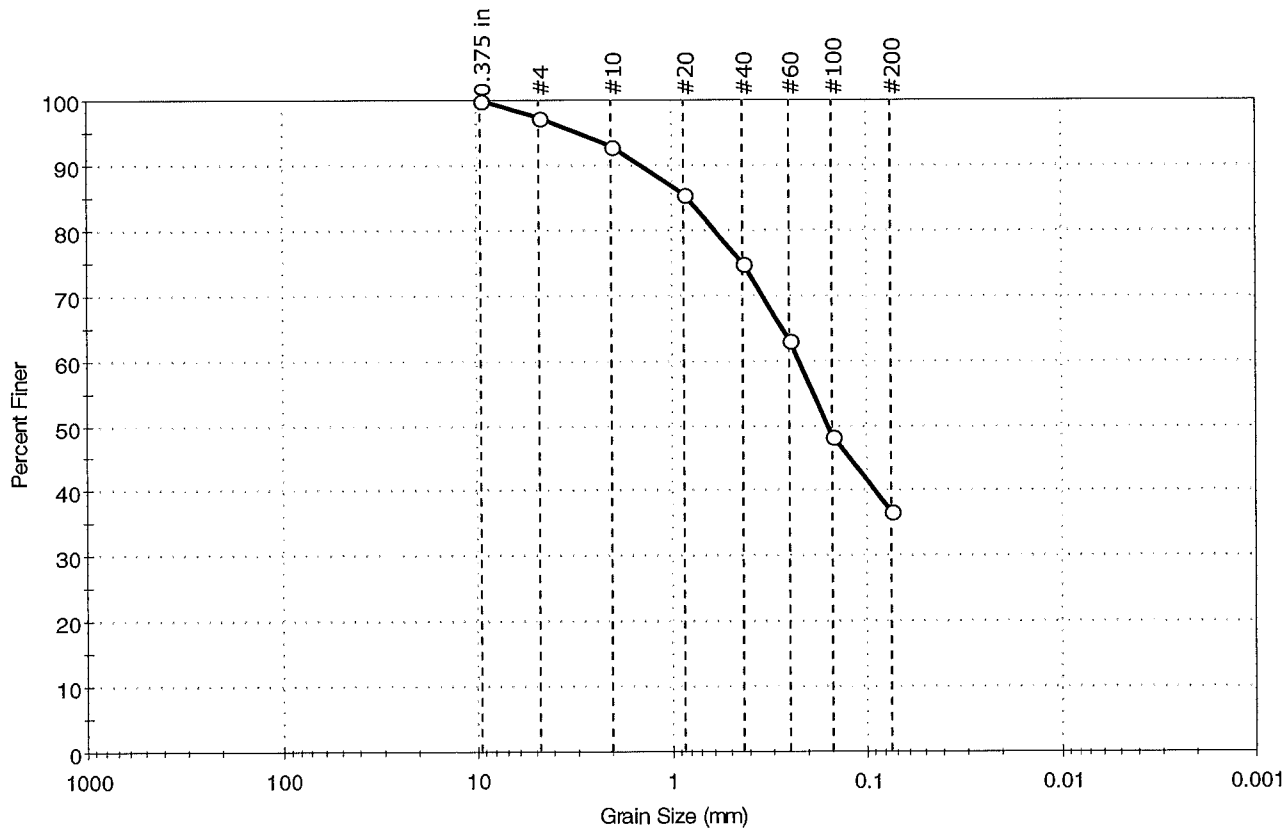
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-104	Sample Type: jar	Tested By:	jbr
Sample ID:4D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251774		
Test Comment: ---			
Sample Description:	Moist, light bluish gray silty sand		
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	2.6	60.6	36.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	97		
#10	2.00	93		
#20	0.85	86		
#40	0.42	75		
#60	0.25	63		
#100	0.15	48		
#200	0.075	37		

Coefficients

D_{85} = 0.8189 mm D_{30} = N/A
D_{60} = 0.2250 mm D_{15} = N/A
D_{50} = 0.1585 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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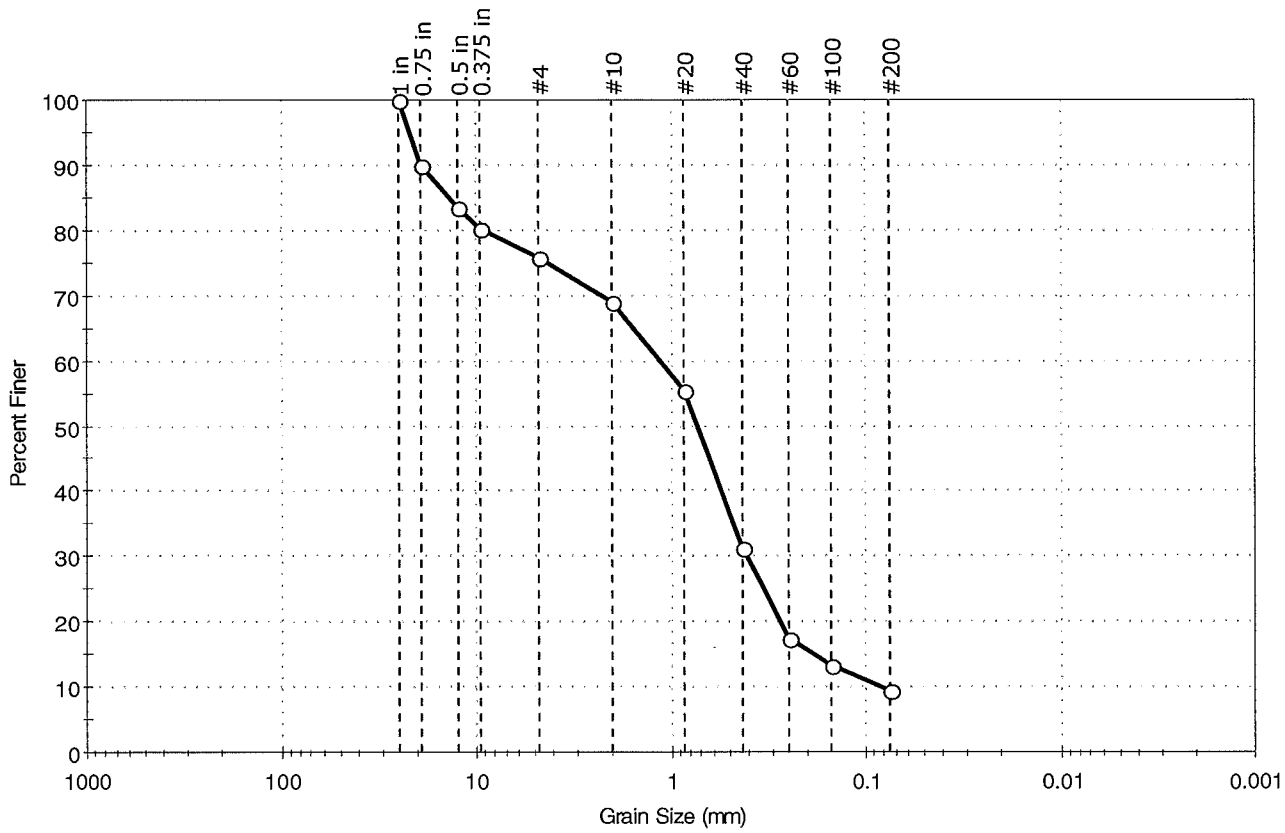
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-105	Sample Type: jar	Tested By:	jbr
Sample ID:3D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251775		
Test Comment: ---			
Sample Description:	Moist, reddish brown sand with silt and gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	24.2	66.4	9.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	90		
0.5 in	12.50	84		
0.375 in	9.50	80		
#4	4.75	76		
#10	2.00	69		
#20	0.85	55		
#40	0.42	31		
#60	0.25	18		
#100	0.15	13		
#200	0.075	9		

Coefficients

D_{85} = 13.7404 mm D_{30} = 0.4049 mm

D_{60} = 1.1361 mm D_{15} = 0.1849 mm

D_{50} = 0.7279 mm D_{10} = 0.0834 mm

C_u = 13.622 C_c = 1.730

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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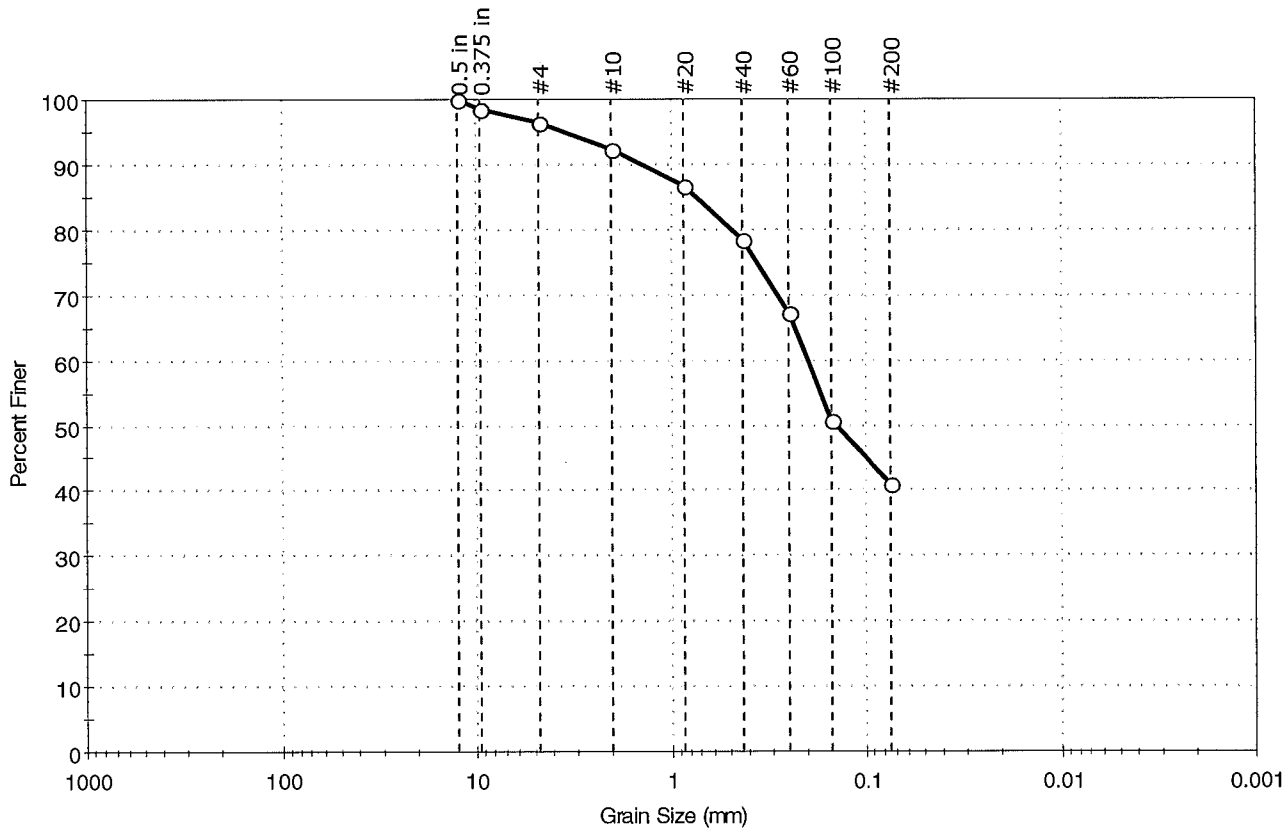
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-105	Sample Type: jar	Tested By:	jbr
Sample ID:8D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251776		
Test Comment: ---			
Sample Description:	Moist, dark gray silty sand		
Sample Comment: ---			

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	3.7	55.2	41.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	96		
#10	2.00	92		
#20	0.85	87		
#40	0.42	78		
#60	0.25	67		
#100	0.15	51		
#200	0.075	41		

Coefficients

D_{85} = 0.7397 mm D_{30} = N/A
D_{60} = 0.1997 mm D_{15} = N/A
D_{50} = 0.1427 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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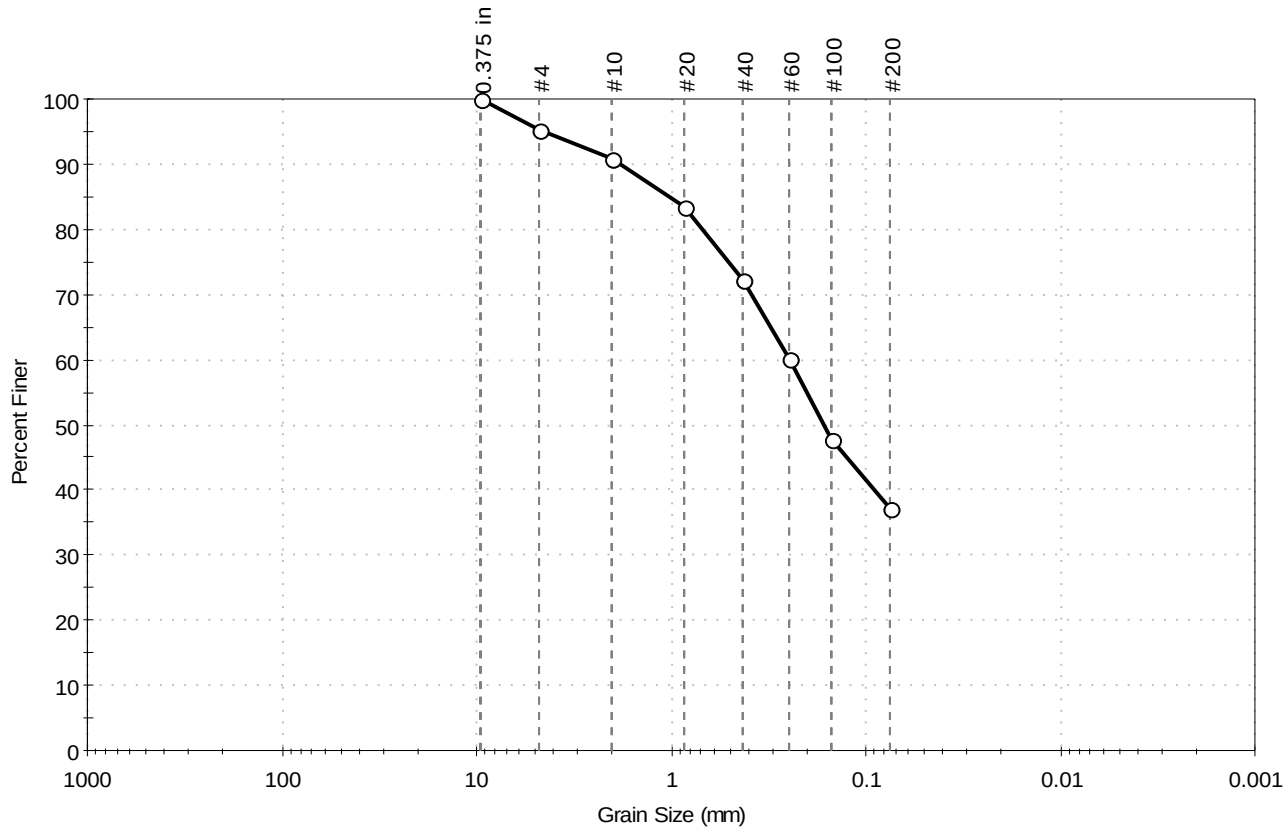
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-201	Sample Type:	jar	Tested By:	jbr
Sample ID:	3D	Test Date:	04/29/15	Checked By:	jdt
Depth :	4-6 ft	Test Id:	329140		
Test Comment:	---				
Sample Description:	Moist, olive gray silty clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	4.8	58.0	37.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	95		
#10	2.00	91		
#20	0.85	83		
#40	0.42	72		
#60	0.25	60		
#100	0.15	48		
#200	0.075	37		

Coefficients

D_{85} = 1.0145 mm D_{30} = N/A

D_{60} = 0.2478 mm D_{15} = N/A

D_{50} = 0.1640 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Silty, clayey sand (SC-SM)

AASHTO Silty Soils (A-4 (0))

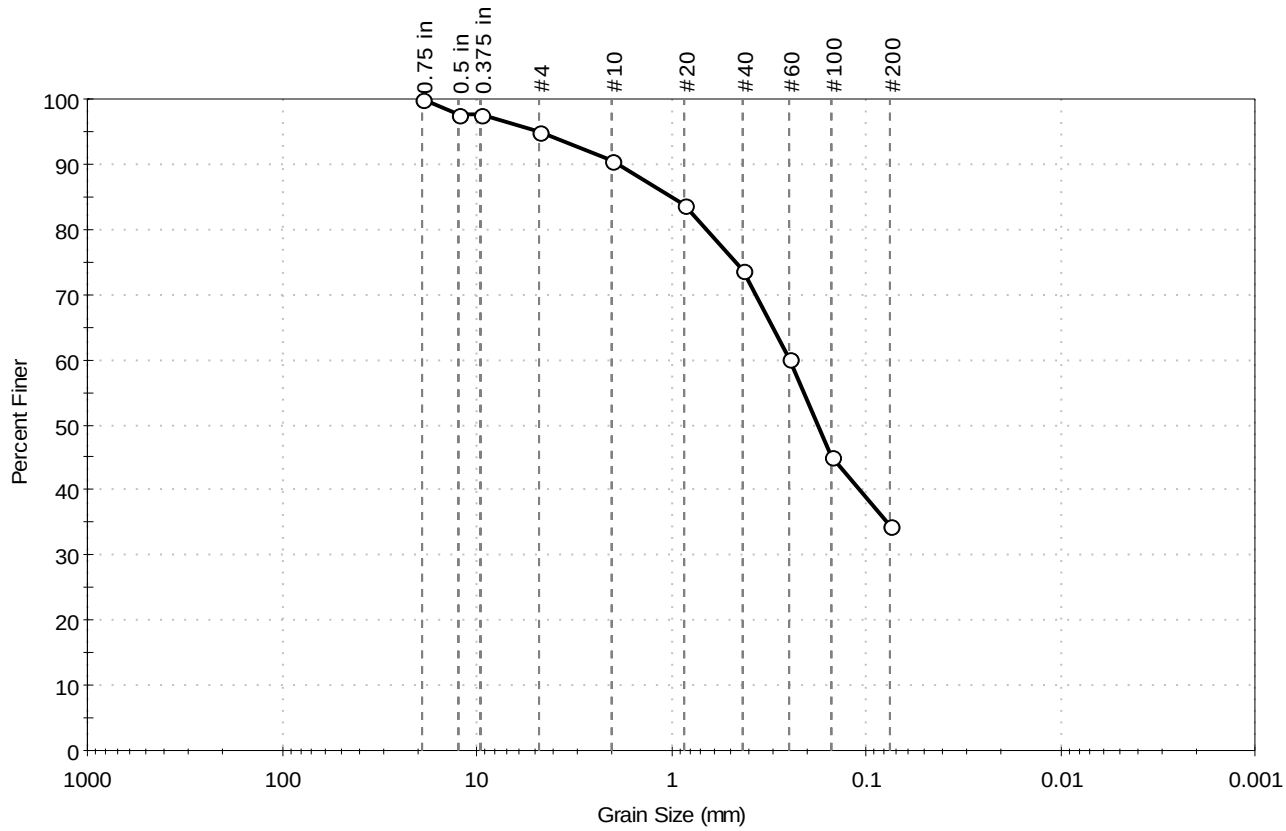
Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-201	Sample Type:	jar	Tested By:	jbr
Sample ID:	7D	Test Date:	04/29/15	Checked By:	jdt
Depth :	23-25 ft	Test Id:	329141		
Test Comment:	---				
Sample Description:	Moist, gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	5.1	60.5	34.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	98		
0.375 in	9.50	98		
#4	4.75	95		
#10	2.00	91		
#20	0.85	84		
#40	0.42	74		
#60	0.25	60		
#100	0.15	45		
#200	0.075	34		

Coefficients

D_{85} = 0.9955 mm D_{30} = N/A
D_{60} = 0.2489 mm D_{15} = N/A
D_{50} = 0.1765 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

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

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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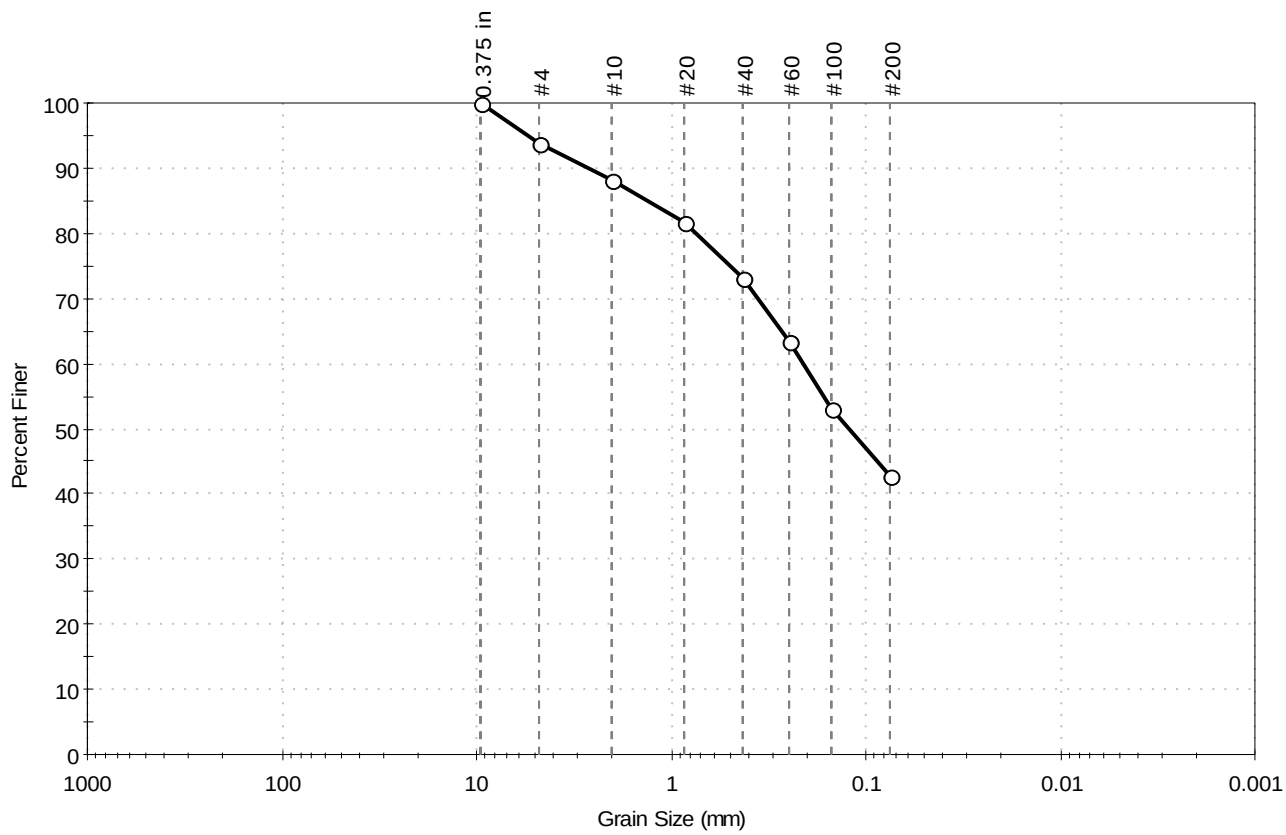
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-202	Sample Type:	jar	Tested By:	jbr
Sample ID:	3D	Test Date:	04/29/15	Checked By:	jdt
Depth :	4-6 ft	Test Id:	329142		
Test Comment:	---				
Sample Description:	Moist, dark gray silty clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	6.2	51.1	42.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	94		
#10	2.00	88		
#20	0.85	82		
#40	0.42	73		
#60	0.25	63		
#100	0.15	53		
#200	0.075	43		

Coefficients

D_{85} = 1.2888 mm D_{30} = N/A

D_{60} = 0.2118 mm D_{15} = N/A

D_{50} = 0.1227 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Silty, clayey sand (SC-SM)

AASHTO Silty Soils (A-4 (0))

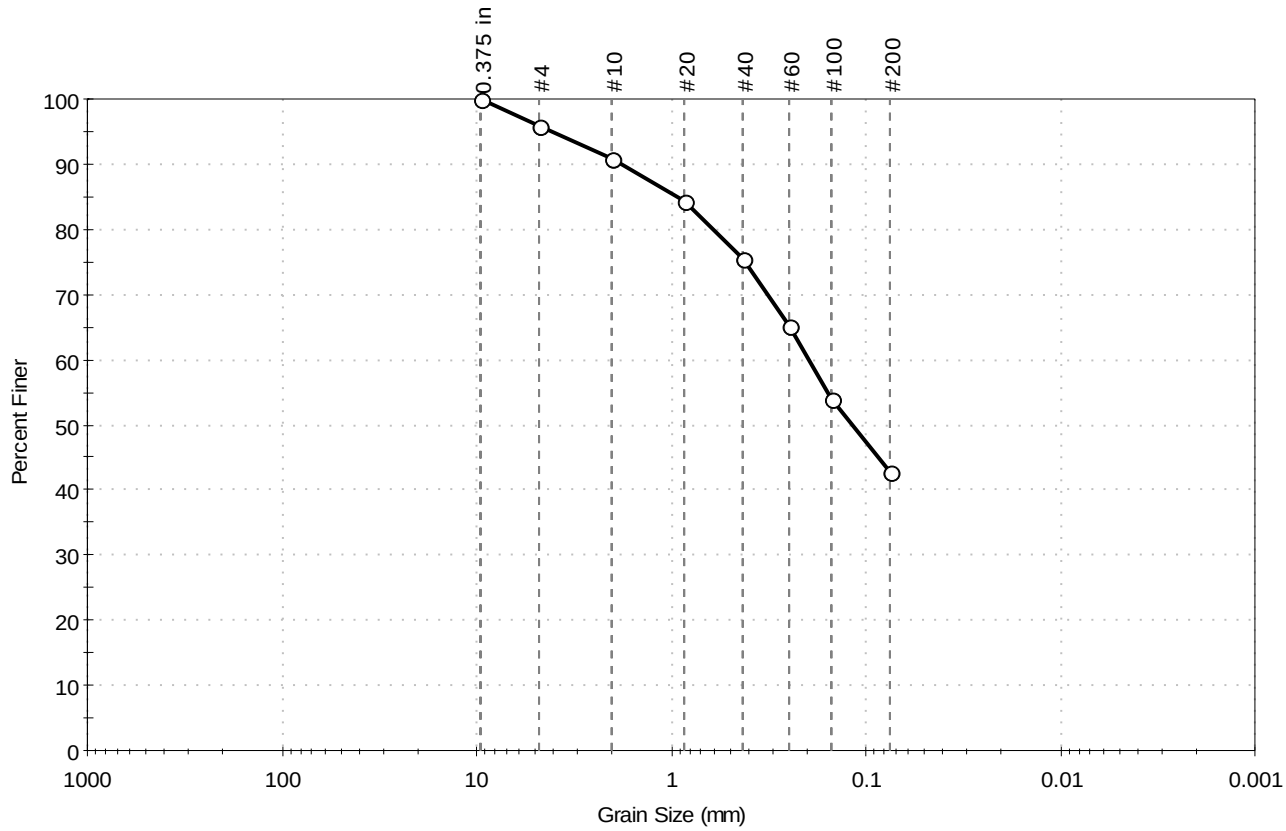
Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-203	Sample Type:	jar	Tested By:	jbr
Sample ID:	3D	Test Date:	04/29/15	Checked By:	jdt
Depth :	4-6 ft	Test Id:	329143		
Test Comment:	---				
Sample Description:	Moist, gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	4.0	53.2	42.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	96		
#10	2.00	91		
#20	0.85	84		
#40	0.42	76		
#60	0.25	65		
#100	0.15	54		
#200	0.075	43		

Coefficients

D_{85} = 0.9132 mm D_{30} = N/A

D_{60} = 0.1967 mm D_{15} = N/A

D_{50} = 0.1171 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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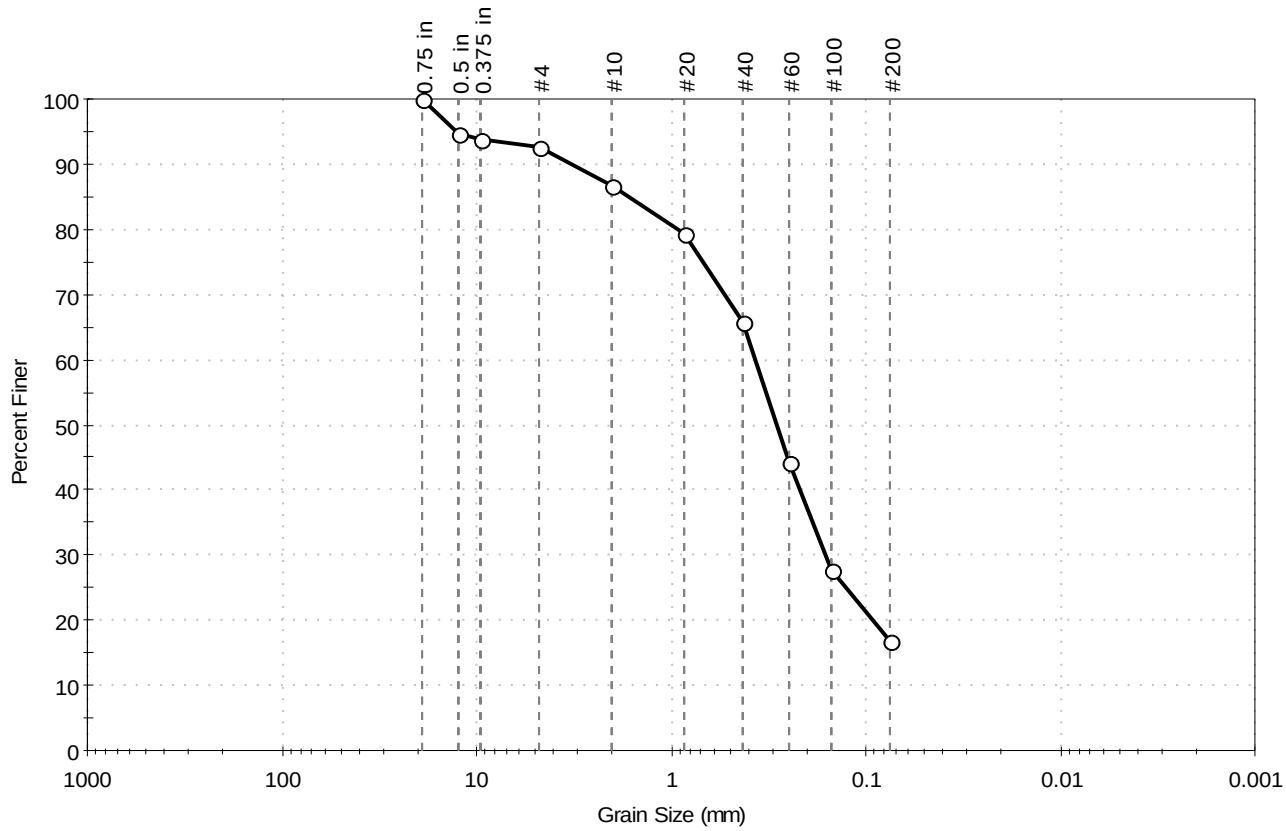
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-203	Sample Type:	jar	Tested By:	jbr
Sample ID:	11D	Test Date:	04/28/15	Checked By:	jdt
Depth :	45-47 ft	Test Id:	329144		
Test Comment:	---				
Sample Description:	Moist, very dark gray clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	7.2	76.0	16.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	95		
0.375 in	9.50	94		
#4	4.75	93		
#10	2.00	87		
#20	0.85	79		
#40	0.42	66		
#60	0.25	44		
#100	0.15	28		
#200	0.075	17		

Coefficients

D_{85} = 1.6590 mm D_{30} = 0.1611 mm
D_{60} = 0.3694 mm D_{15} = N/A
D_{50} = 0.2881 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM Clayey sand (SC)

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

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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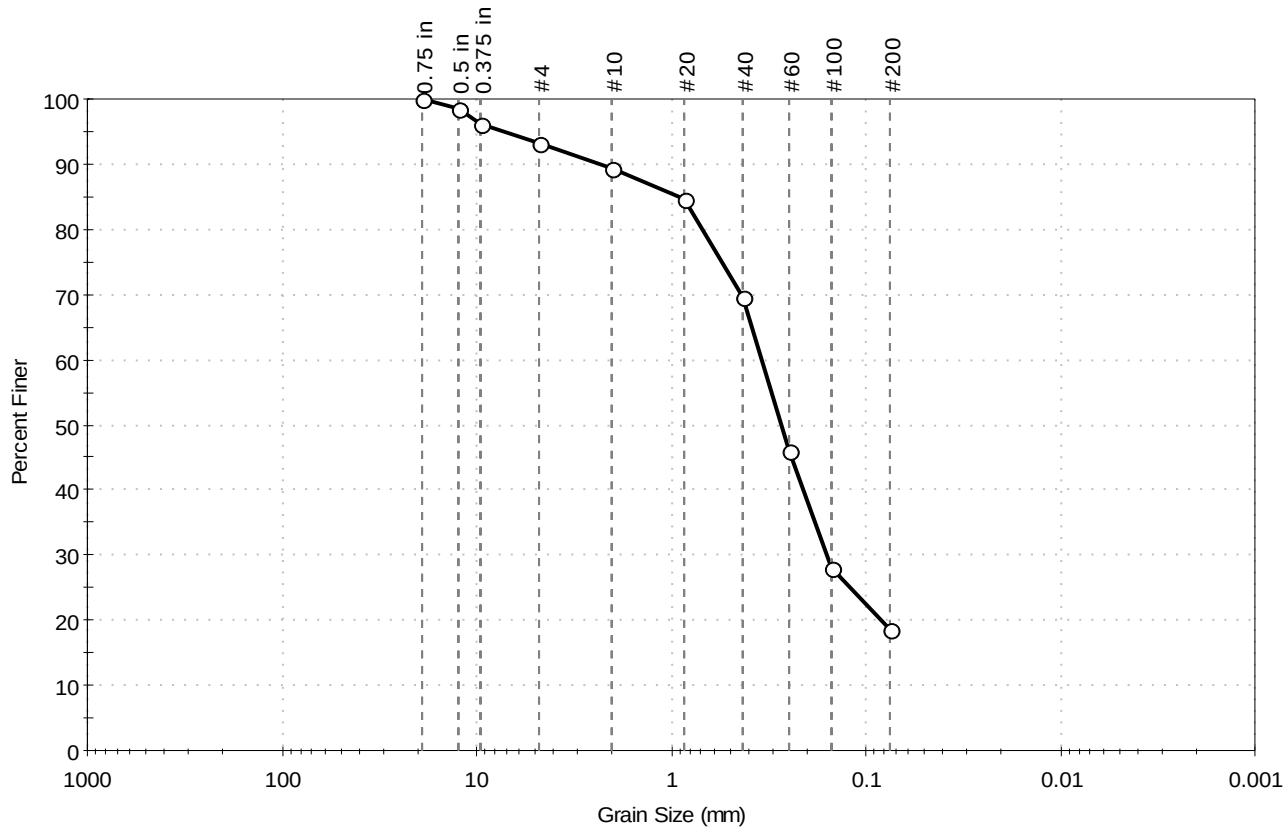
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-204	Sample Type:	jar	Tested By:	jbr
Sample ID:	5D	Test Date:	01/26/15	Checked By:	emm
Depth :	20-22 ft	Test Id:	320916		
Test Comment:	---				
Sample Description:	Moist, dark yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	6.8	74.7	18.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	99		
0.375 in	9.50	96		
#4	4.75	93		
#10	2.00	89		
#20	0.85	85		
#40	0.42	70		
#60	0.25	46		
#100	0.15	28		
#200	0.075	18		

Coefficients

D_{85} = 0.9111 mm D_{30} = 0.1585 mm
D_{60} = 0.3417 mm D_{15} = N/A
D_{50} = 0.2727 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

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

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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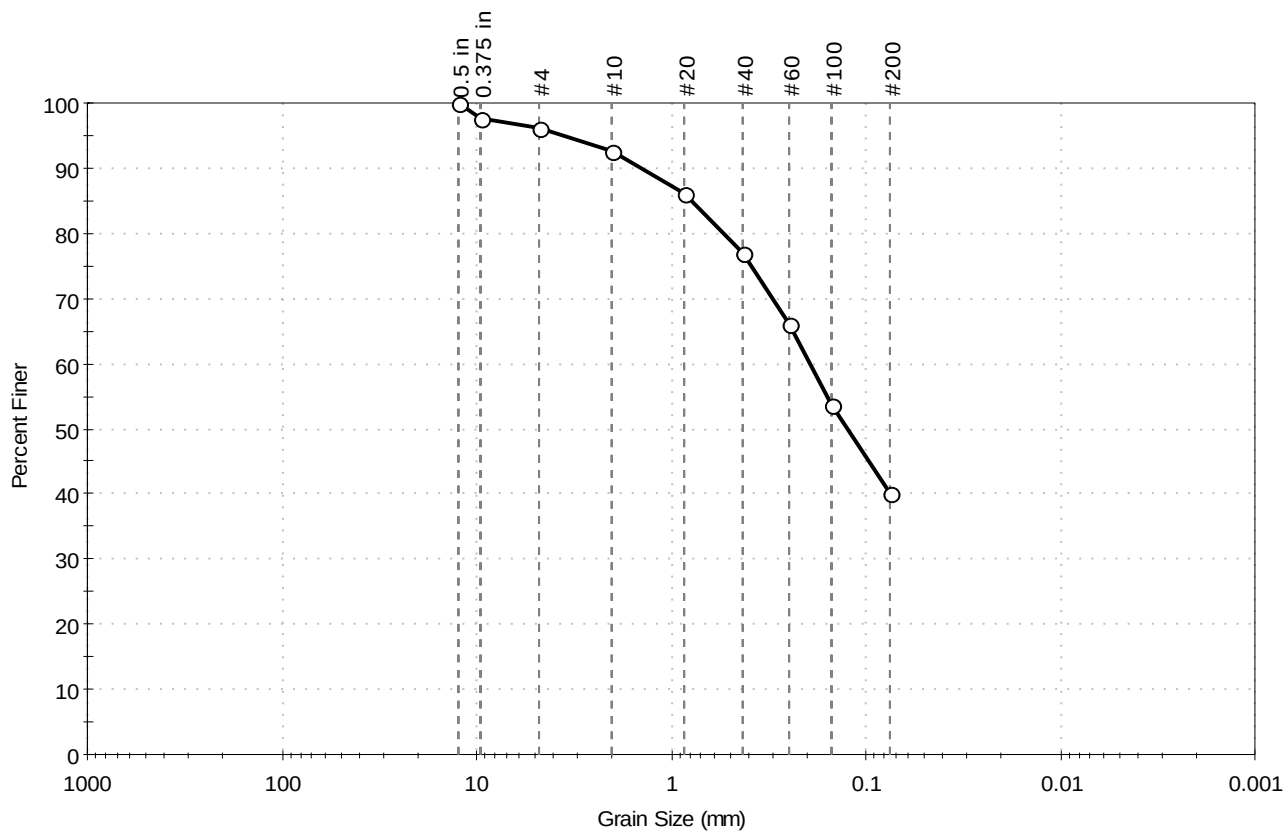
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-204	Sample Type:	jar	Tested By:	jbr
Sample ID:	6D	Test Date:	01/29/15	Checked By:	emm
Depth :	25-27 ft	Test Id:	320917		
Test Comment:	---				
Sample Description:	Moist, olive brown silty, clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	3.7	56.3	40.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	98		
#4	4.75	96		
#10	2.00	92		
#20	0.85	86		
#40	0.42	77		
#60	0.25	66		
#100	0.15	54		
#200	0.075	40		

Coefficients

D_{85} = 0.7762 mm D_{30} = N/A

D_{60} = 0.1946 mm D_{15} = N/A

D_{50} = 0.1245 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Silty, clayey sand (SC-SM)

AASHTO Silty Soils (A-4 (0))

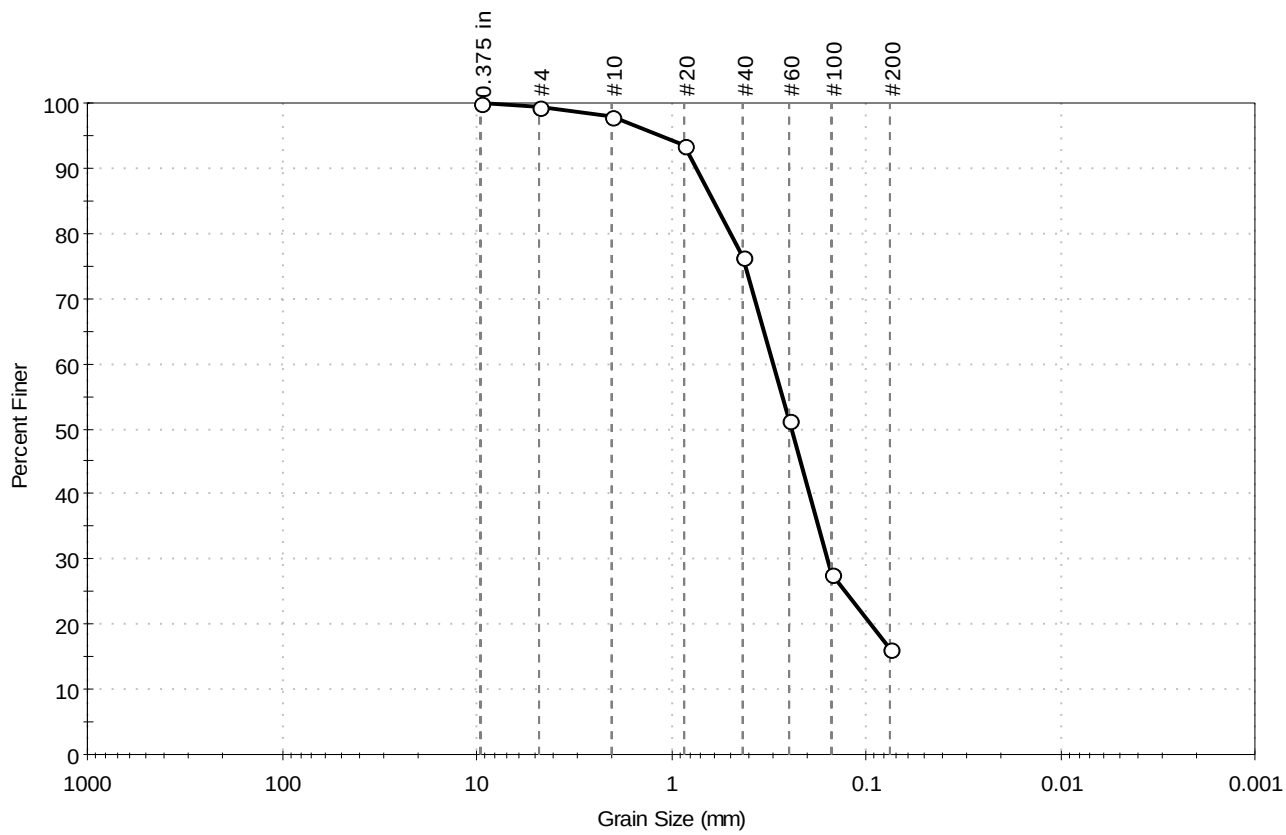
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-205	Sample Type:	jar	Tested By:	jbr
Sample ID:	6D	Test Date:	01/26/15	Checked By:	emm
Depth :	25-27 ft	Test Id:	320918		
Test Comment:	---				
Sample Description:	Moist, dark yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.6	83.2	16.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	98		
#20	0.85	94		
#40	0.42	76		
#60	0.25	51		
#100	0.15	28		
#200	0.075	16		

Coefficients

D_{85} = 0.6015 mm D_{30} = 0.1572 mm

D_{60} = 0.3002 mm D_{15} = N/A

D_{50} = 0.2427 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

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

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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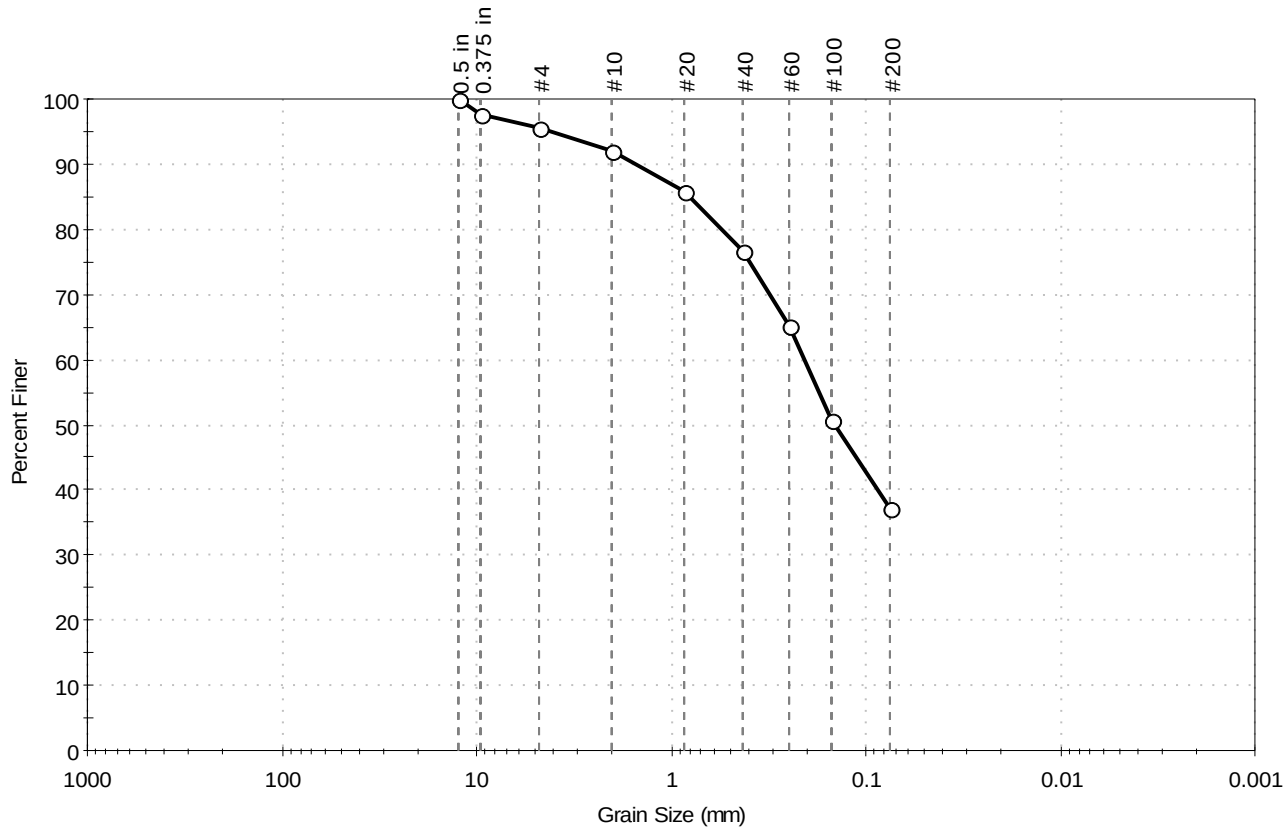
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-205	Sample Type:	jar	Tested By:	jbr
Sample ID:	10D	Test Date:	01/26/15	Checked By:	emm
Depth :	45-47 ft	Test Id:	320919		
Test Comment:	---				
Sample Description:	Moist, olive gray clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	4.5	58.2	37.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	98		
#4	4.75	95		
#10	2.00	92		
#20	0.85	86		
#40	0.42	77		
#60	0.25	65		
#100	0.15	51		
#200	0.075	37		

Coefficients

D_{85} = 0.7928 mm D_{30} = N/A

D_{60} = 0.2083 mm D_{15} = N/A

D_{50} = 0.1441 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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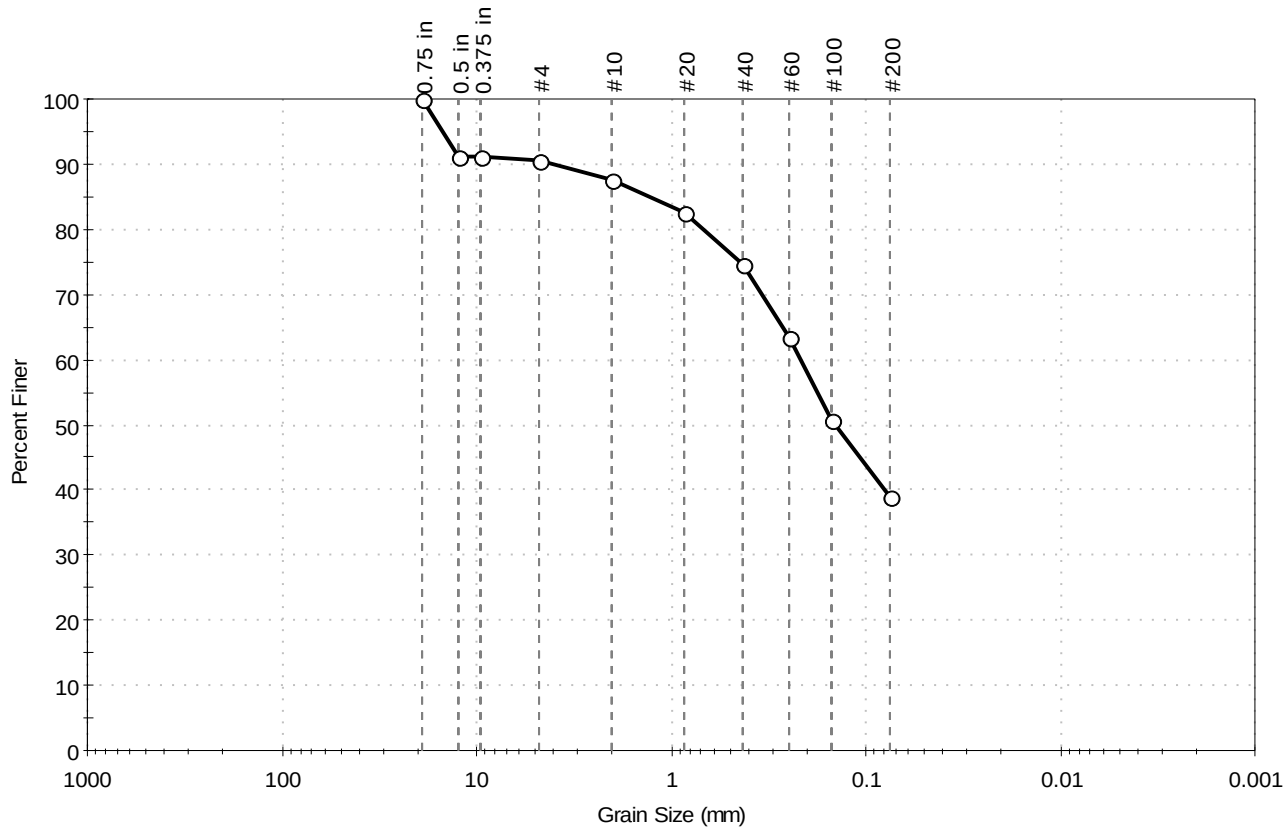
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-206	Sample Type:	jar	Tested By:	jbr
Sample ID:	5D	Test Date:	01/29/15	Checked By:	emm
Depth :	20-22 ft	Test Id:	320920		
Test Comment:	---				
Sample Description:	Moist, olive gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	9.5	51.5	39.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	91		
0.375 in	9.50	91		
#4	4.75	91		
#10	2.00	87		
#20	0.85	83		
#40	0.42	75		
#60	0.25	64		
#100	0.15	51		
#200	0.075	39		

Coefficients

D_{85} = 1.2941 mm D_{30} = N/A

D_{60} = 0.2169 mm D_{15} = N/A

D_{50} = 0.1428 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM Silty sand (SM)

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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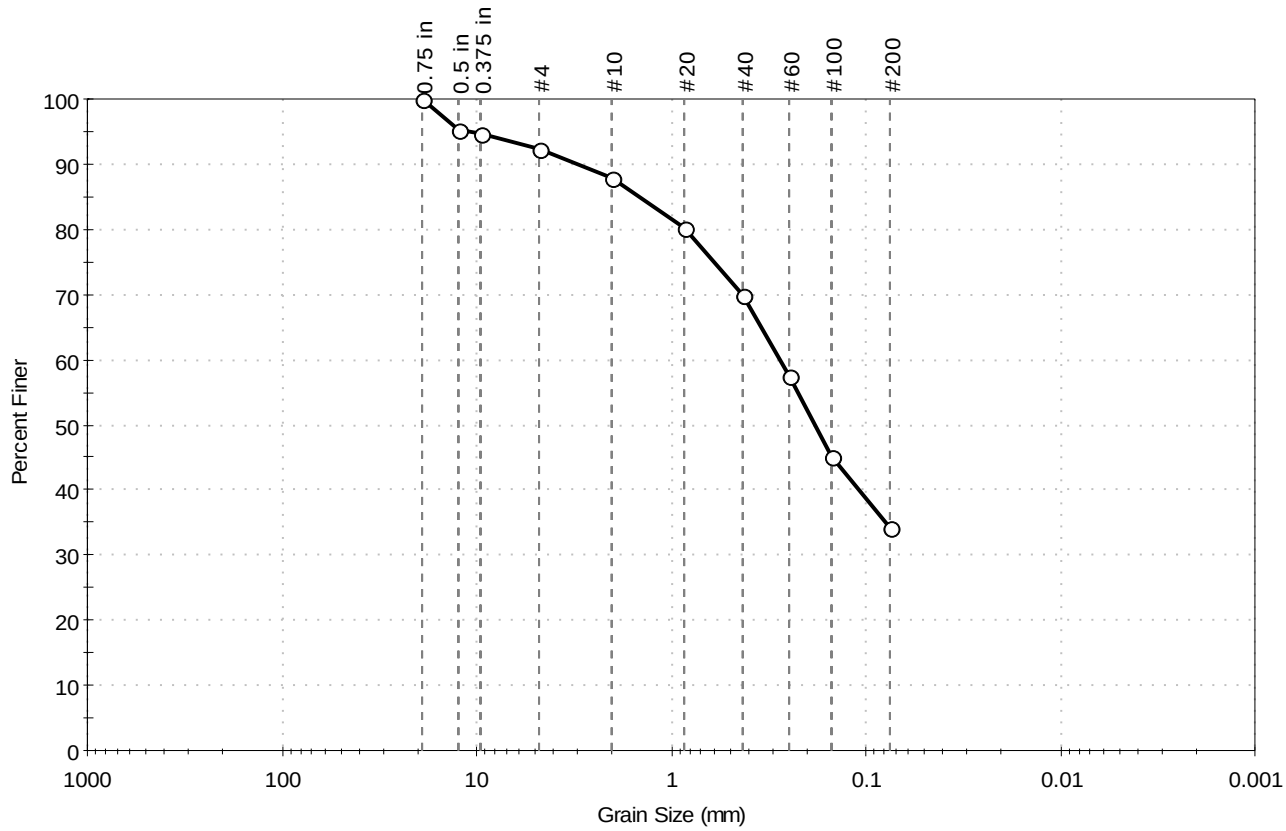
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-207	Sample Type:	jar	Tested By:	jbr
Sample ID:	3D	Test Date:	01/26/15	Checked By:	emm
Depth :	10-12 ft	Test Id:	320921		
Test Comment:	---				
Sample Description:	Moist, dark gray clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	7.6	58.1	34.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	95		
0.375 in	9.50	95		
#4	4.75	92		
#10	2.00	88		
#20	0.85	80		
#40	0.42	70		
#60	0.25	58		
#100	0.15	45		
#200	0.075	34		

Coefficients

D_{85} = 1.4323 mm D_{30} = N/A

D_{60} = 0.2774 mm D_{15} = N/A

D_{50} = 0.1826 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

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

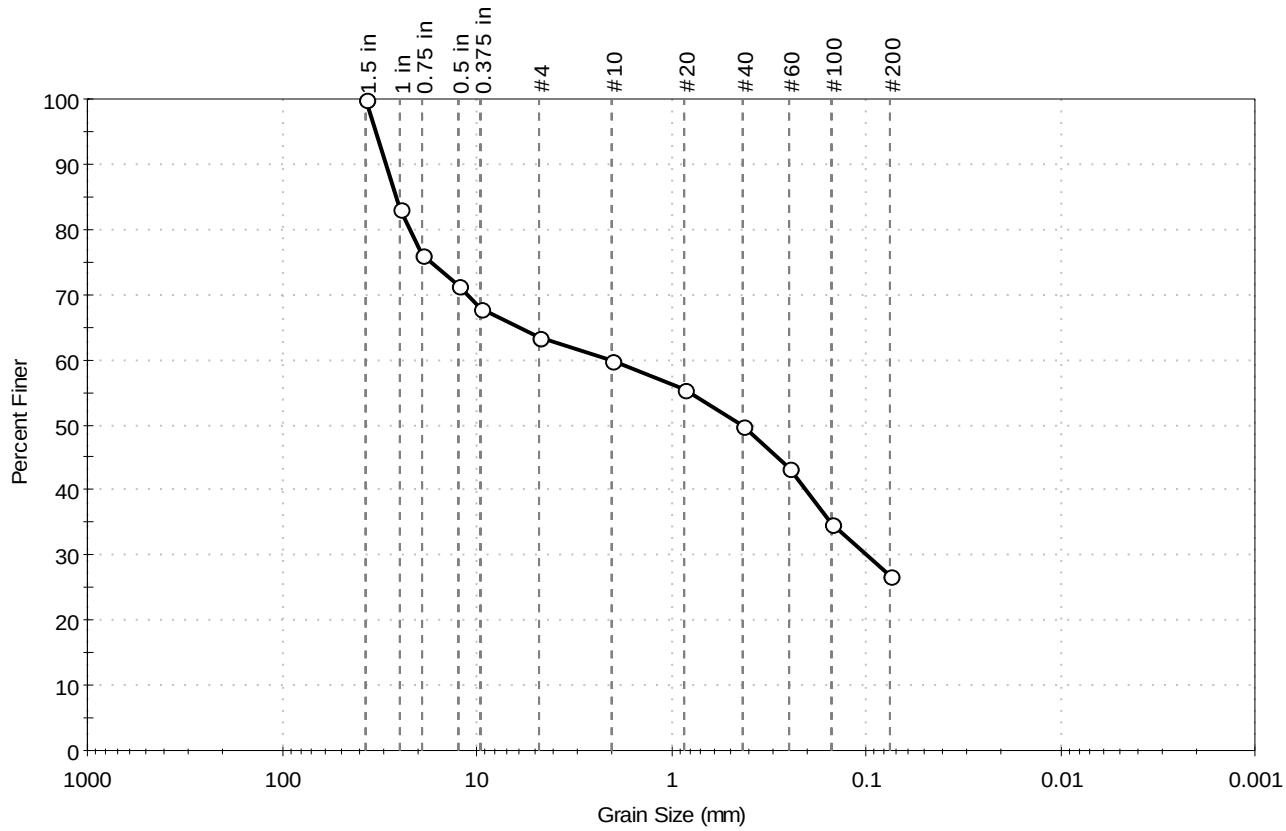
Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-207	Sample Type:	jar	Tested By:	jbr
Sample ID:	6D	Test Date:	01/29/15	Checked By:	emm
Depth :	25-27 ft	Test Id:	320922		
Test Comment:	---				
Sample Description:	Moist, olive gray clayey gravel with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	36.6	36.5	26.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	83		
0.75 in	19.00	76		
0.5 in	12.50	71		
0.375 in	9.50	68		
#4	4.75	63		
#10	2.00	60		
#20	0.85	56		
#40	0.42	50		
#60	0.25	43		
#100	0.15	35		
#200	0.075	27		

Coefficients

D_{85} = 26.0480 mm D_{30} = 0.0983 mm
D_{60} = 2.0448 mm D_{15} = N/A
D_{50} = 0.4318 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

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

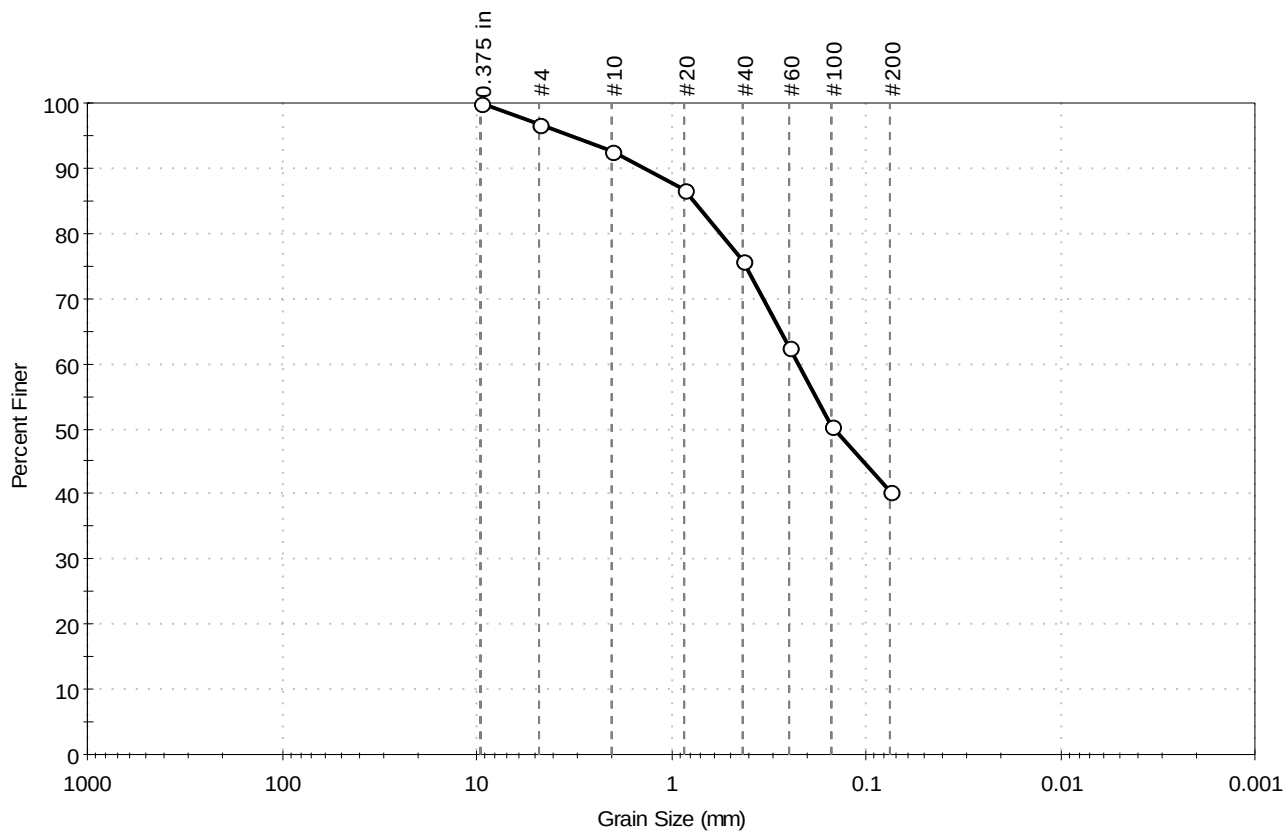
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-208	Sample Type:	jar	Tested By:	jbr
Sample ID:	3D	Test Date:	04/29/15	Checked By:	jdt
Depth :	4-6 ft	Test Id:	329145		
Test Comment:	---				
Sample Description:	Moist, brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	3.4	56.3	40.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	97		
#10	2.00	93		
#20	0.85	87		
#40	0.42	76		
#60	0.25	63		
#100	0.15	50		
#200	0.075	40		

Coefficients

D_{85} = 0.7679 mm D_{30} = N/A

D_{60} = 0.2240 mm D_{15} = N/A

D_{50} = 0.1451 mm D_{10} = N/A

C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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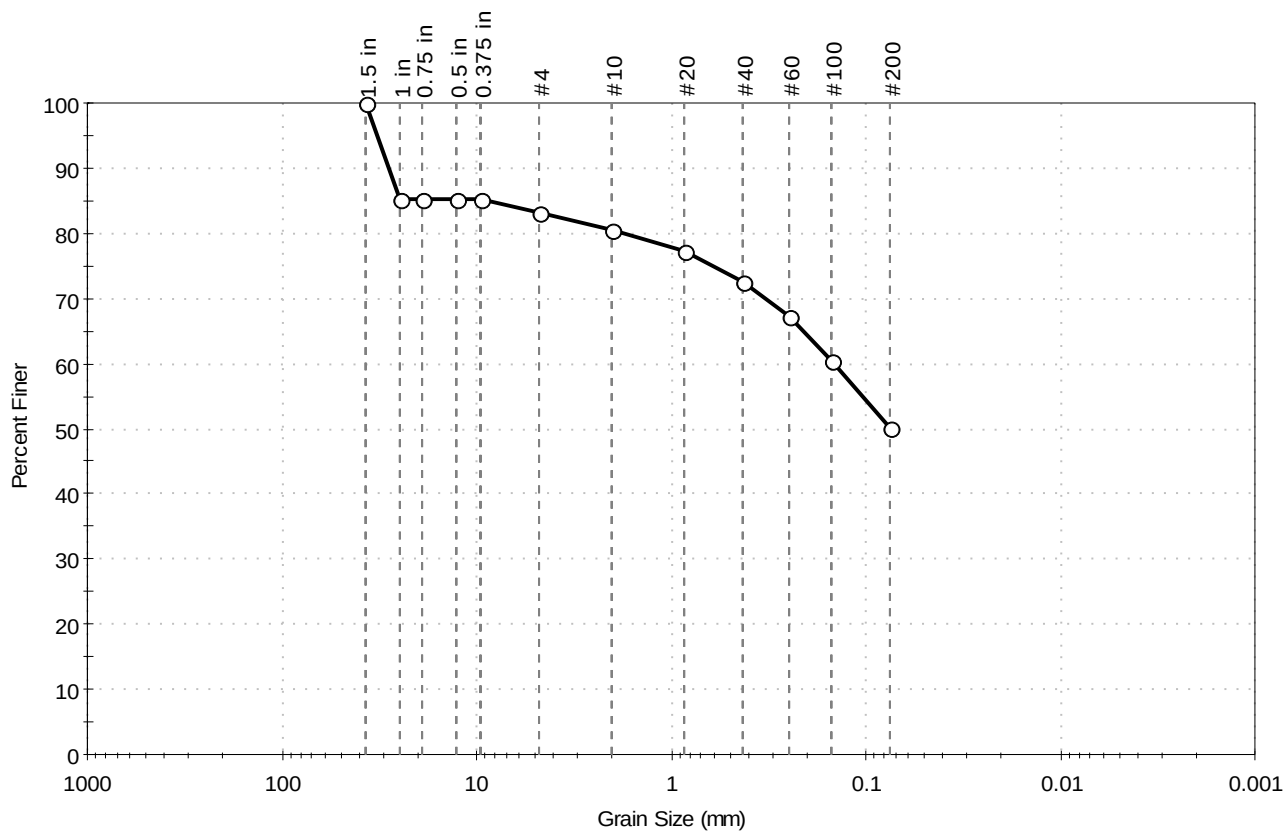
Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-208	Sample Type:	jar	Tested By:	jbr
Sample ID:	5D	Test Date:	04/29/15	Checked By:	jdt
Depth :	14-16 ft	Test Id:	329146		
Test Comment:	---				
Sample Description:	Moist, gray sand silt with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	16.7	33.1	50.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	85		
0.75 in	19.00	85		
0.5 in	12.70	85		
0.375 in	9.50	85		
#4	4.75	83		
#10	2.00	81		
#20	0.85	77		
#40	0.42	73		
#60	0.25	67		
#100	0.15	60		
#200	0.075	50		

Coefficients

D_{85} = 8.3569 mm	D_{30} = N/A
D_{60} = 0.1464 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Road over B&M Railroad				
Location:	Scarborough, ME			Project No:	GTX-12313
Boring ID: ---		Sample Type: ---		Tested By:	jek
Sample ID:---		Test Date:	10/16/12	Checked By:	jdt
Depth : ---		Sample Id: ---			

Moisture Content of Soil - ASTM D 2216-05

Boring ID	Sample ID	Depth	Description	Moisture Content,%
BB-SBMR-101	2D	---	Moist, brown silty sand	7.2
BB-SBMR-101	3D-B	---	Moist, very dark brown gravel with silt and sand	6
BB-SBMR-101	10D	---	Moist, gray silty sand	8.3
BB-SBMR-103	9D	---	Moist, dark gray silty sand	8.4
BB-SBMR-104	4D	---	Moist, light bluish gray silty sand	10.1
BB-SBMR-105	3D	---	Moist, reddish brown sand with silt and gravel	6.8
BB-SBMR-105	8D	---	Moist, dark gray silty sand	8.2

Notes: Temperature of Drying : 110° Celsius

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	04/27/15	Checked By:	jdt
Depth :	---	Test Id:	329155		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
BB-SBMR-201	7D	23-25 ft	Moist, gray silty sand	10.6
BB-SBMR-203	3D	4-6 ft	Moist, gray silty sand	11.9
BB-SBMR-208	3D	4-6 ft	Moist, brown silty sand	11.5
BB-SBMR-208	5D	14-16 ft	Moist, gray sand silt with gravel	9.3

Notes: Temperature of Drying : 110° Celsius

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-206	Sample Type:	jar	Tested By:	dln
Sample ID:	2D / 3D	Test Date:	01/29/15	Checked By:	emm
Depth :	10-12 ft	Test Id:	320926		
Test Comment:	---				
Sample Description:	Moist, very dark brown silt with organics				
Sample Comment:	---				

Moisture, Ash, and Organic Matter - ASTM D2974

Boring ID	Sample ID	Depth	Description	Moisture Content, %	Ash Content, %	Organic Matter, %
BB-SBMR-206	2D / 3D	10-12 ft	Moist, very dark brown silt with organics	165	76.5	23.5

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass; dried to a constant mass at temperature of 105º C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440º C

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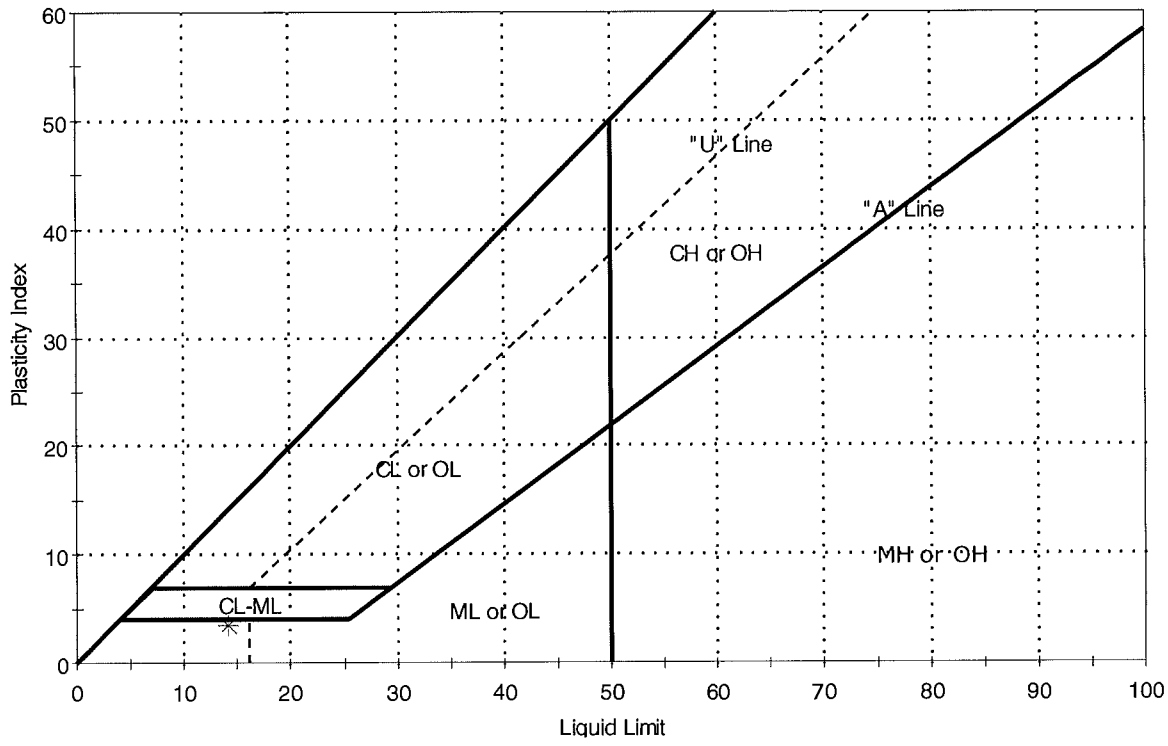
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-101	Sample Type: jar	Tested By:	cam
Sample ID:8D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251779		
Test Comment: ---			
Sample Description: Moist, dark gray silty sand			
Sample Comment: ---			

Atterberg Limits - ASTM D 4318-05

Plasticity Chart



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	8D	-SBMR-1	---	10	14	11	3	0	Silty sand (SM)

Sample Prepared using the WET method
28% Retained on #40 Sieve
Dry Strength: LOW
Dilentancy: SLOW
Toughness: LOW

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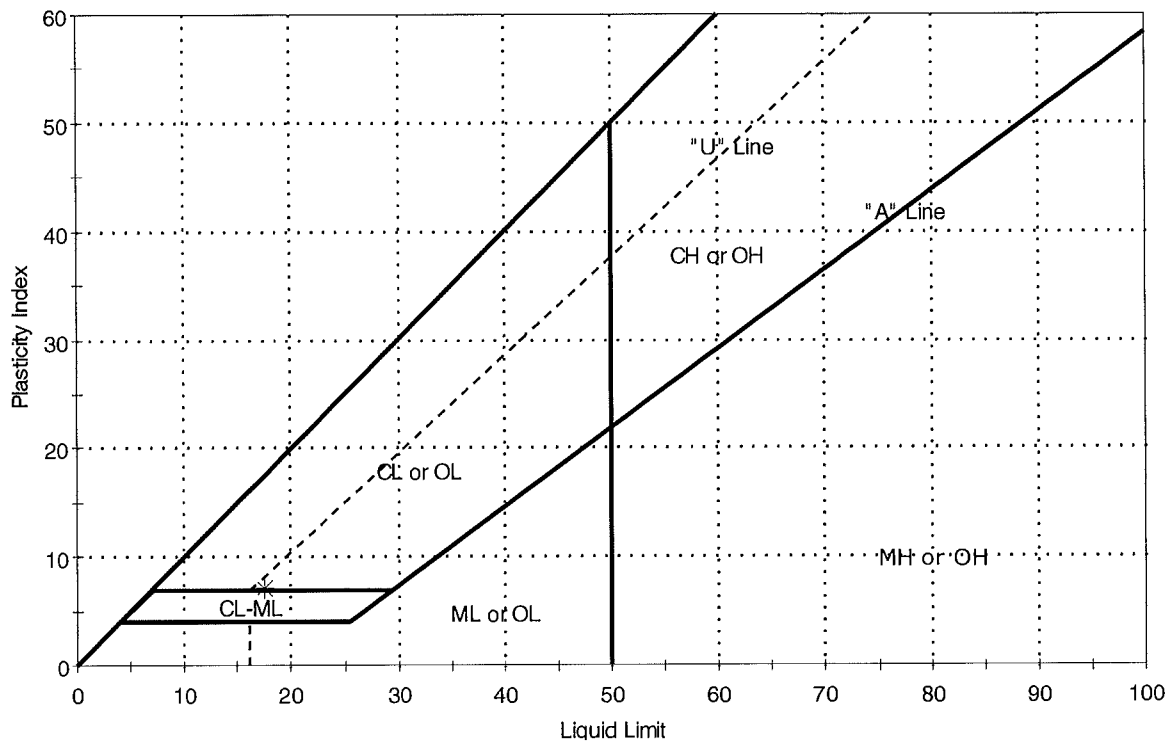
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-101	Sample Type: jar	Tested By:	cam
Sample ID:14D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251780		
Test Comment:	---		
Sample Description:	Moist, dark gray sandy clay		
Sample Comment:	---		

Atterberg Limits - ASTM D 4318-05



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	14D	-SBMR-1	---	10	18	10	8	0	Sandy lean clay (CL)

Sample Prepared using the WET method

21% Retained on #40 Sieve

Dry Strength: HIGH

Dilentancy: SLOW

Toughness: LOW

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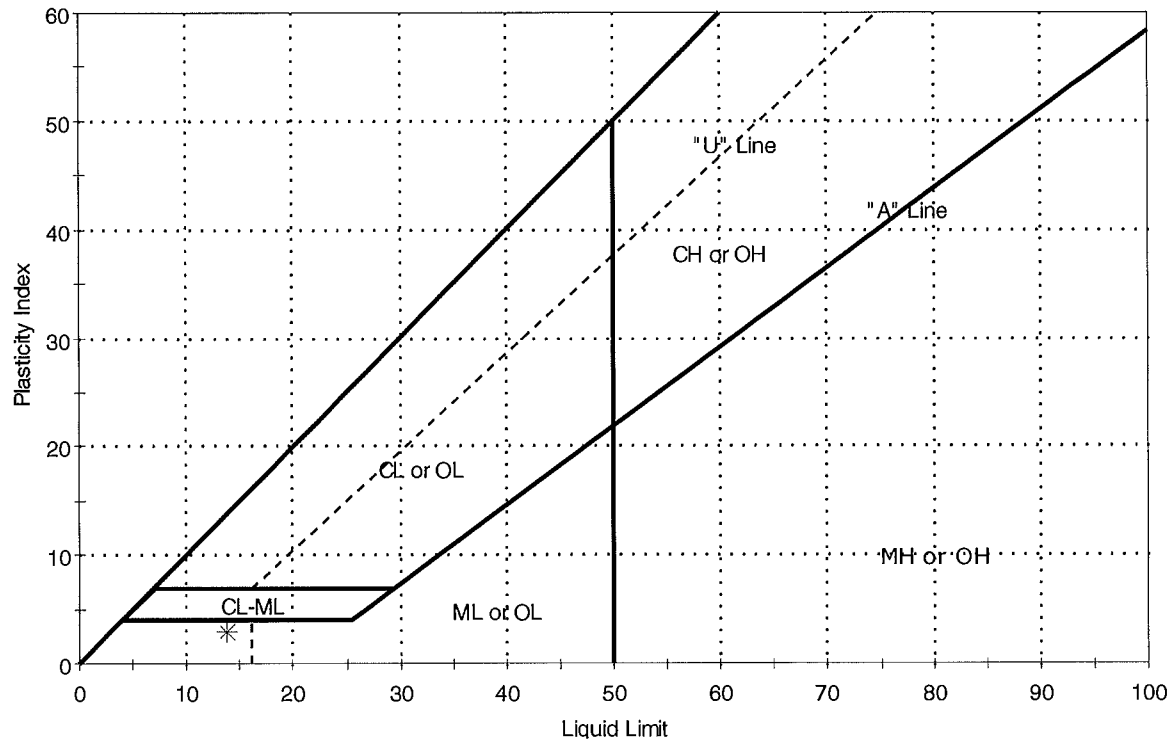
GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-102	Sample Type: jar	Tested By:	cam
Sample ID:3D	Test Date: 10/15/12	Checked By:	jdt
Depth : ---	Test Id: 251781		
Test Comment:	---		
Sample Description:	Moist, dark gray silty sand		
Sample Comment:	---		

Atterberg Limits - ASTM D 4318-05



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
*	3D	-SBMR-1	---	10	14	11	3	0	Silty sand (SM)

Sample Prepared using the WET method

24% Retained on #40 Sieve

Dry Strength: HIGH

Dilentancy: SLOW

Toughness: LOW

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Road over B&M Railroad				
Location:	Scarborough, ME			Project No:	GTX-12313
Boring ID:	BB-SBMR-103	Sample Type:	jar	Tested By:	cam
Sample ID:	4D	Test Date:	10/15/12	Checked By:	jdt
Depth :	---	Test Id:	251782		
Test Comment:	---				
Sample Description:	Moist, dark gray silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D 4318-05

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
*	4D	-SBMR-1	---	9	n/a	n/a	n/a	n/a	Silty sand (SM)

22% Retained on #40 Sieve

Dry Strength: HIGH

Dilentancy: RAPID

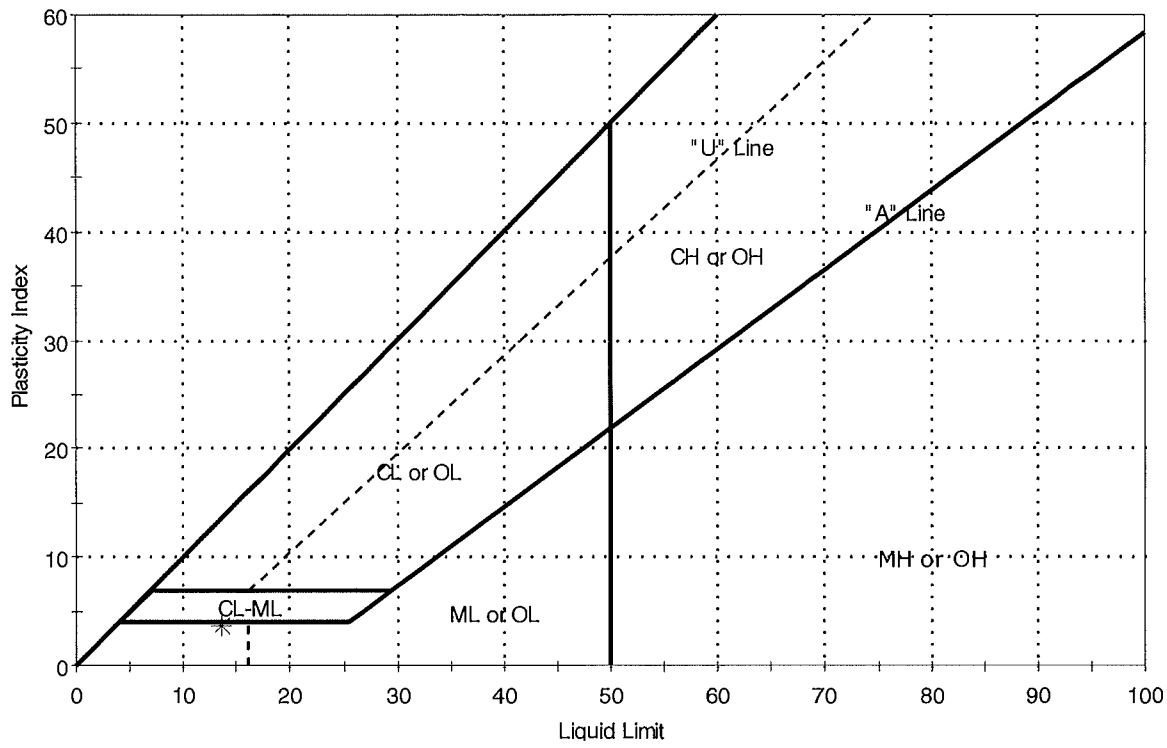
Toughness: n/a

The sample was determined to be Non-Plastic

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc.		
Project:	Pine Point Road over B&M Railroad		
Location:	Scarborough, ME	Project No:	GTX-12313
Boring ID: BB-SBMR-104	Sample Type: jar	Tested By:	cam
Sample ID:5D	Test Date: 10/11/12	Checked By:	jdt
Depth : ---	Test Id: 251783		
Test Comment:	---		
Sample Description:	Moist, olive gray clayey sand with gravel		
Sample Comment:	---		

Atterberg Limits - ASTM D 4318-05



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
*	5D	-SBMR-1	---	8	14	10	4	0	

Sample Prepared using the WET method

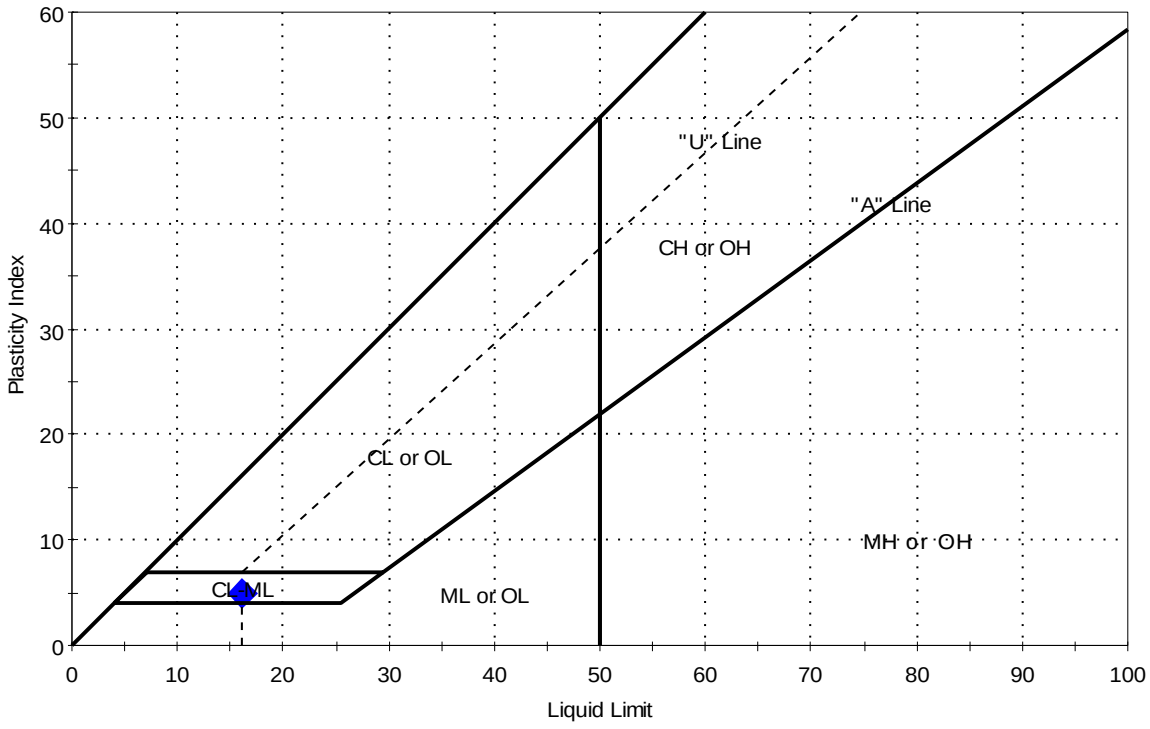
Dry Strength: VERY HIGH

Dilentancy: SLOW

Toughness: LOW

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-201	Sample Type:	jar	Tested By:	cam
Sample ID:	3D	Test Date:	04/24/15	Checked By:	jdt
Depth :	4-6 ft	Test Id:	329147		
Test Comment:	---				
Sample Description:	Moist, olive gray silty clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	3D	3-SBMR-2	4-6 ft	10	16	11	5	-0.3	Silty, clayey sand (SC-SM)

Sample Prepared using the WET method

28% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-201	Sample Type:	jar	Tested By:	cam
Sample ID:	6D	Test Date:	04/27/15	Checked By:	jdt
Depth :	18-20 ft	Test Id:	329148		
Test Comment:	---				
Sample Description:	Moist, dark gray sand with silt and gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	6D	B-SBMR-2	18-20 ft	9	n/a	n/a	n/a	n/a	

Dry Strength: HIGH

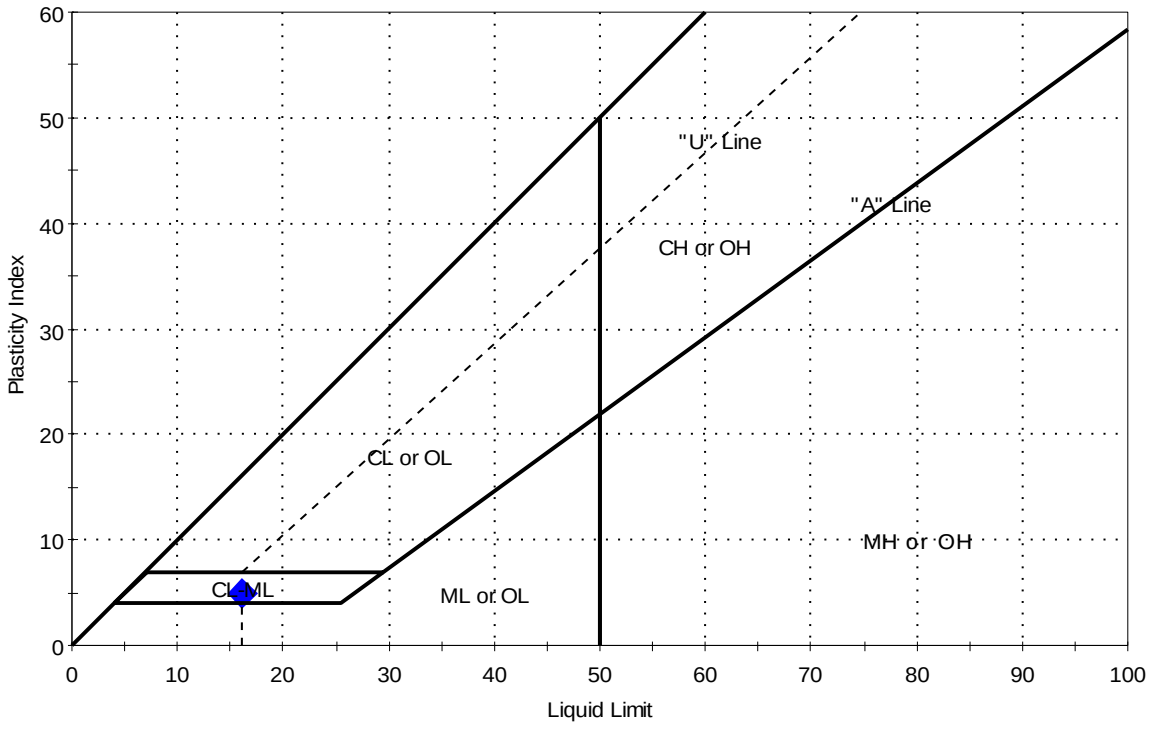
Dilatancy: RAPID

Toughness: n/a

The sample was determined to be Non-Plastic

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-202	Sample Type:	jar	Tested By:	cam
Sample ID:	3D	Test Date:	04/24/15	Checked By:	jdt
Depth :	4-6 ft	Test Id:	329149		
Test Comment:	---				
Sample Description:	Moist, dark gray silty clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	3D	3-SBMR-2	4-6 ft	11	16	11	5	0	Silty, clayey sand (SC-SM)

Sample Prepared using the WET method

27% Retained on #40 Sieve

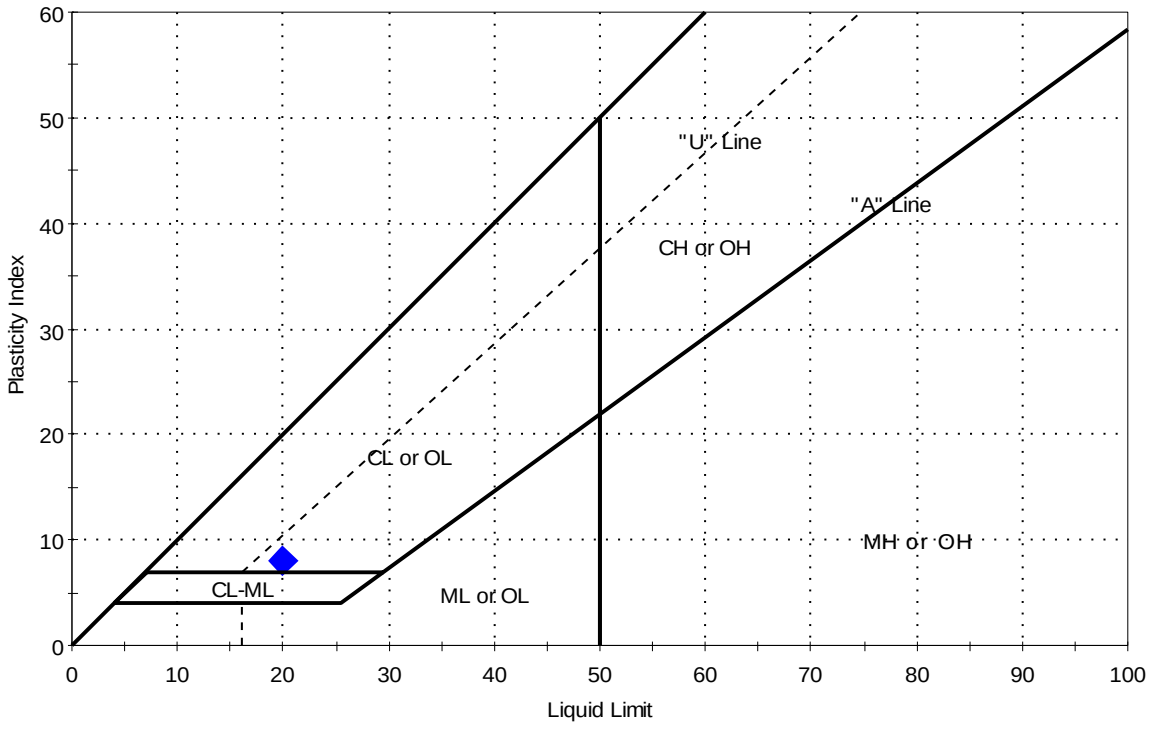
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-203	Sample Type:	jar	Tested By:	cam
Sample ID:	11D	Test Date:	04/27/15	Checked By:	jdt
Depth :	45-47 ft	Test Id:	329150		
Test Comment:	---				
Sample Description:	Moist, very dark gray clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	11D	-SBMR-2	45-47 ft	10	20	12	8	-0.3	Clayey sand (SC)

Sample Prepared using the WET method

34% Retained on #40 Sieve

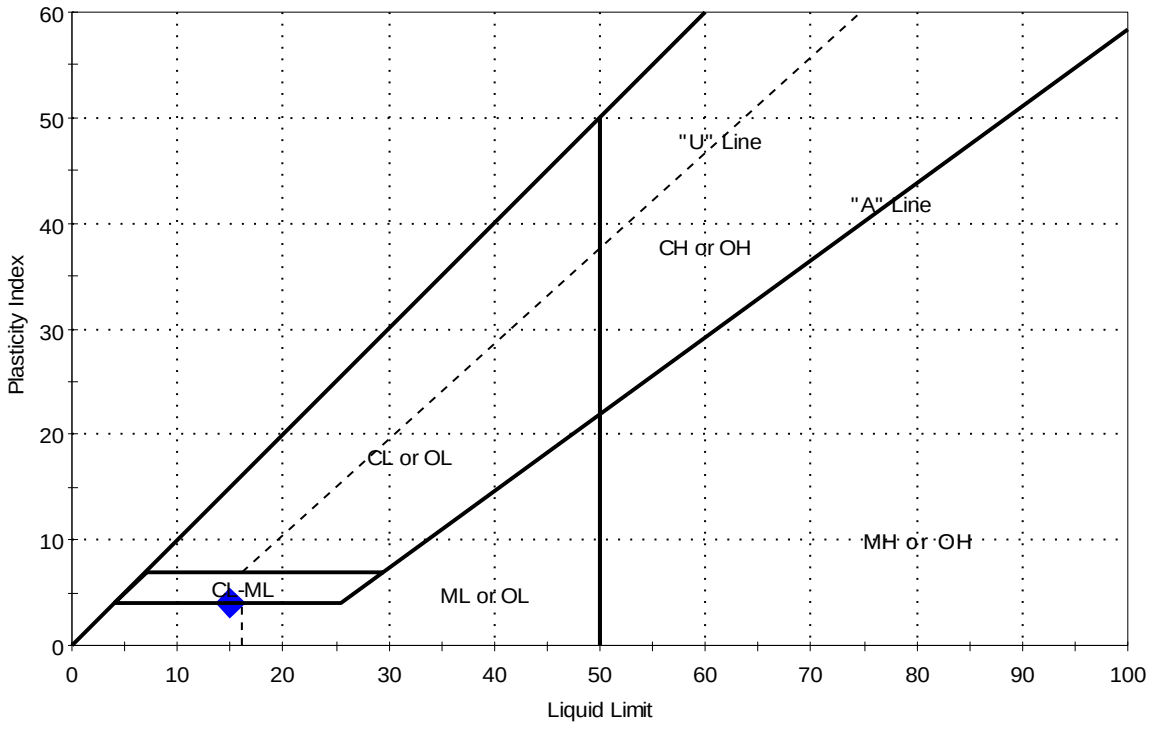
Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-204	Sample Type:	jar	Tested By:	cam
Sample ID:	6D	Test Date:	01/28/15	Checked By:	emm
Depth :	25-27 ft	Test Id:	320923		
Test Comment:	---				
Sample Description:	Moist, olive brown silty, clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	6D	-SBMR-2	25-27 ft	11	15	11	4	0	Silty, clayey sand (SC-SM)

Sample Prepared using the WET method

23% Retained on #40 Sieve

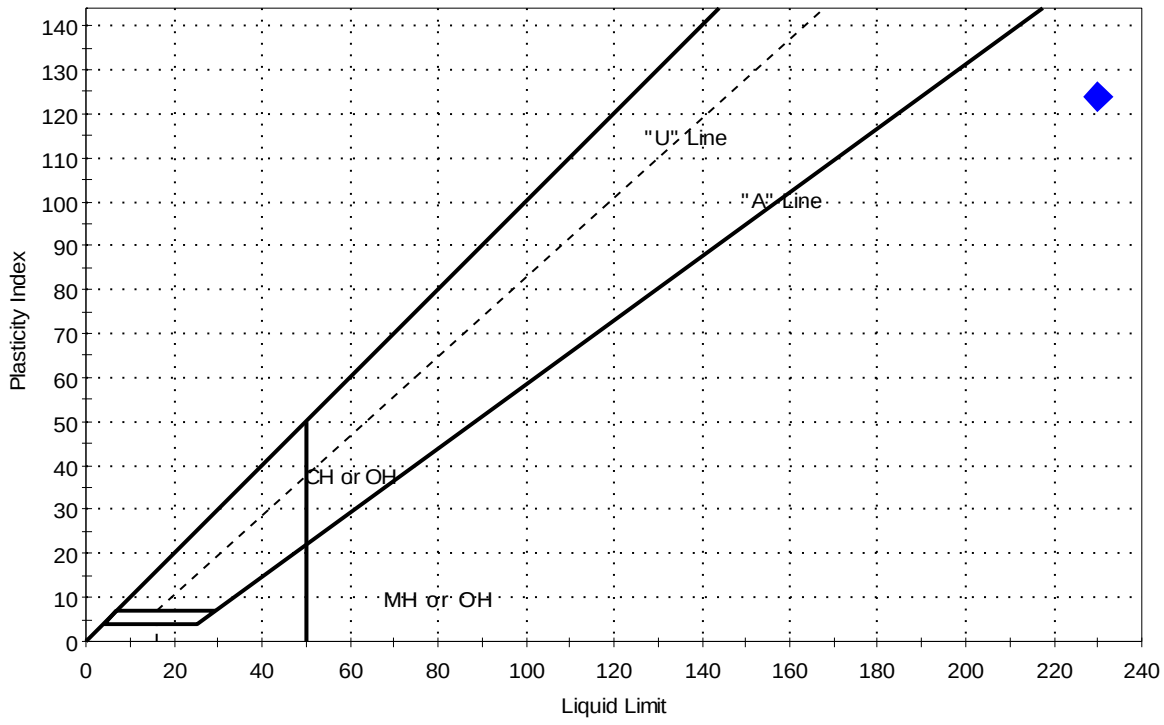
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-206	Sample Type:	jar	Tested By:	cam
Sample ID:	2D / 3D	Test Date:	01/29/15	Checked By:	emm
Depth :	10-12 ft	Test Id:	320924		
Test Comment:	---				
Sample Description:	Moist, very dark brown silt with organics				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	2D / 3D	-SBMR-2	10-12 ft	165	230	106	124	0.5	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-206	Sample Type:	jar	Tested By:	cam
Sample ID:	5D	Test Date:	01/28/15	Checked By:	emm
Depth :	20-22 ft	Test Id:	320925		
Test Comment:	---				
Sample Description:	Moist, olive gray silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	5D	B-SBMR-2	20-22 ft	9	n/a	n/a	n/a	n/a	Silty sand (SM)

25% Retained on #40 Sieve

Dry Strength: MEDIUM

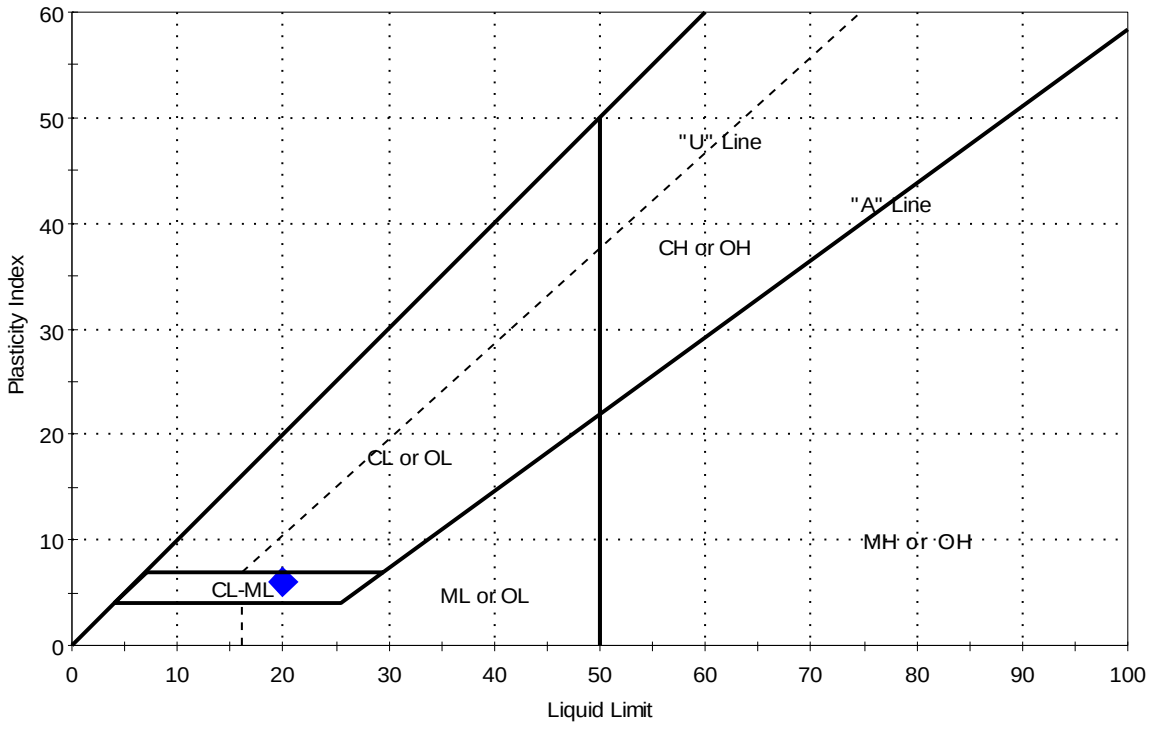
Dilatancy: RAPID

Toughness: n/a

The sample was determined to be Non-Plastic

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-208	Sample Type:	jar	Tested By:	cam
Sample ID:	6D	Test Date:	04/24/15	Checked By:	jdt
Depth :	19-21 ft	Test Id:	329151		
Test Comment:	---				
Sample Description:	Moist, dark gray clayey sand with gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	6D	-SBMR-2	19-21 ft	14	20	14	6	0	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

GeoTesting EXPRESS

Client:	Nobis Engineering, Inc
Project Name:	Pine Point Road Over B&M Railroad
Project Location:	Scarborough, ME
GTX #:	12313
Test Date:	10/16/12
Tested By:	jek
Checked By:	jdt

pH of Soil by ASTM D 4972

Boring ID	Sample ID	Depth, ft	Description	pH of Soil in	
				Distilled Water	Calcium Chloride
BB-SBMR-101	6D-BC	---	Moist, dark yellow silty sand	5.9	5.6
BB-SBMR-102	---	9-10	Moist, dark gray silty sand	5.6	5.6
BB-SBMR-104	3D-B	---	Moist, light gray silty sand	6.2	6.0
BB-SBMR-105	6D-3	---	Moist, dark gray silty sand	6.3	6.2

Notes: Method A, pH meter used
Sample preparation: screened through a #10 sieve

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	---	Sample Type:	---	Tested By:	jbr
Sample ID:	---	Test Date:	04/29/15	Checked By:	jdt
Depth :	---	Test Id:	329157		

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
BB-SBMR-201	2D	2-4 ft	Moist, olive silt	4.2	5.7
BB-SBMR-202	2D	2-4 ft	Moist, olive silty sand with gravel	8.0	7.2

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

Client:	Nobis Engineering, Inc.				
Project:	Pine Point Bridge				
Location:	Scarborough, ME			Project No:	GTX-302798
Boring ID:	BB-SBMR-206	Sample Type:	jar	Tested By:	dln
Sample ID:	2D / 3D	Test Date:	01/30/15	Checked By:	emm
Depth :	10-12 ft	Test Id:	320927		
Test Comment:	---				
Sample Description:	Moist, very dark brown silt with organics				
Sample Comment:	---				

pH of Soil by ASTM D4972

Boring ID	Sample ID	Depth	Visual Description	pH of Soil in Distilled Water	pH of Soil in Calcium Chloride
BB-SBMR-206	2D / 3D	10-12 ft	Moist, very dark brown silt with organics	5.1	5.0

Notes: Sample Preparation: screened through #10 sieve

Method A, pH meter used

Client:	Nobis Engineering, Inc.
Project Name:	Pine Point Bridge
Project Location:	Scarborough, ME
GTX #:	302798
Test Date:	4/17/2015
Tested By:	daa
Checked By:	mpd

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample ID	Depth, ft	Bulk Density, lb/ft^3	Compressive Strength, psi	Failure Type	In conformance with ASTM D4543
BB-SBMR-208	R2	42.5-43.5	169	13,282	1	YES

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.
All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure (See photographs)

After cutting and grinding

After break

Client:	Nobis Engineering, Inc.	Test Date:	4/16/2015
Project Name:	Pine Point Bridge	Tested By:	daa
Project Location:	Scarborough, ME	Checked By:	mpd
GTX #:	302798		
Boring ID:	BB-SBMR-208		
Sample ID:	R2		
Depth:	42.5-43.5 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.60	4.60	4.60
Specimen Diameter, in:	1.98	1.98	1.98
Specimen Mass, g:	627.87		
Bulk Density, lb/ft^3	169	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.3	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00020	-0.00020	-0.00020	-0.00020	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010

Difference between max and min readings, in:

0° = 0.00030 90° = 0.00020

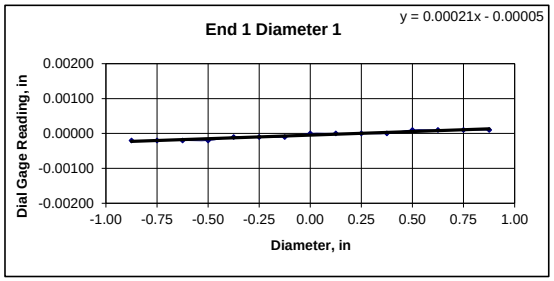
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010

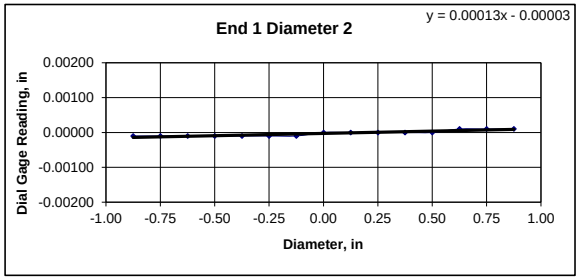
Difference between max and min readings, in:

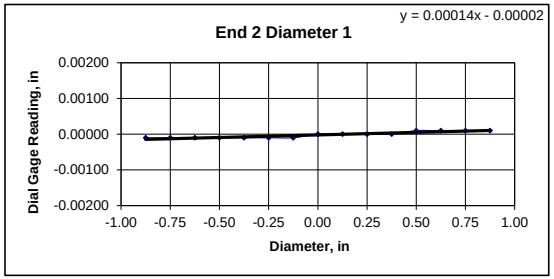
0° = 0.0002 90° = 0.0002

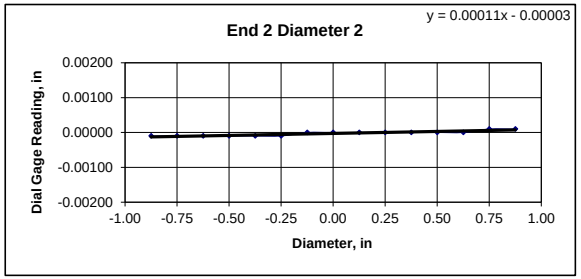
Maximum difference must be < 0.0020 in. Difference = ± 0.00015

Flatness Tolerance Met? YES









DIAMETER 1

End 1:

Slope of Best Fit Line 0.00021

Angle of Best Fit Line: 0.01203

End 2:

Slope of Best Fit Line 0.00014

Angle of Best Fit Line: 0.00802

Maximum Angular Difference: 0.00401

Parallelism Tolerance Met? YES

Spherically Seated

DIAMETER 2

End 1:

Slope of Best Fit Line 0.00013

Angle of Best Fit Line: 0.00745

End 2:

Slope of Best Fit Line 0.00011

Angle of Best Fit Line: 0.00630

Maximum Angular Difference: 0.00115

Parallelism Tolerance Met? YES

Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

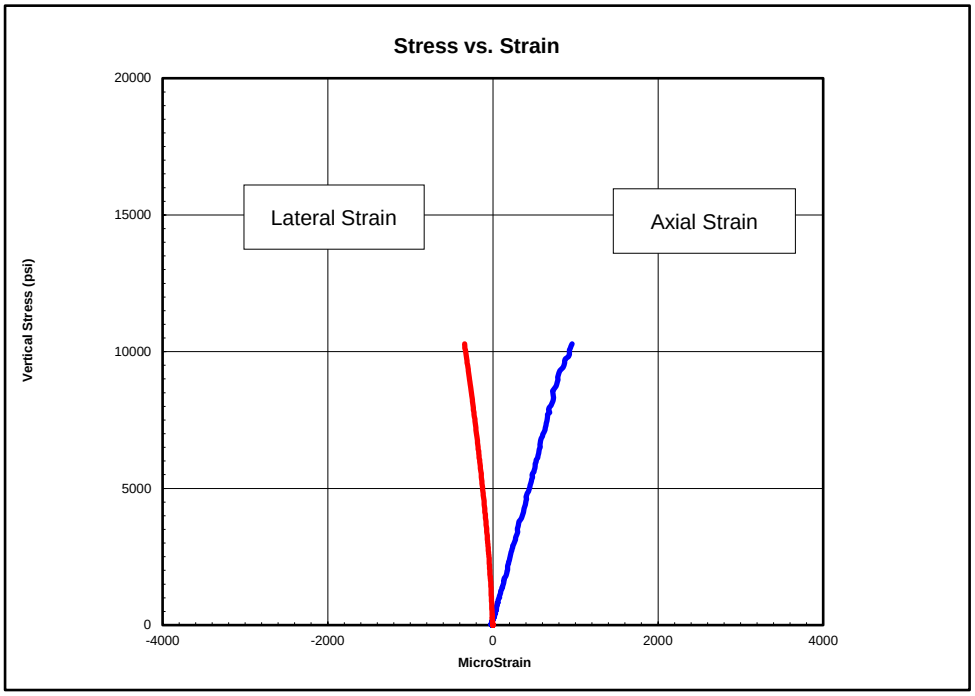
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00030	1.980	0.00015	0.009	YES
Diameter 2, in (rotated 90°)	0.00020	1.980	0.00010	0.006	YES
END 2					
Diameter 1, in	0.00020	1.980	0.00010	0.006	YES
Diameter 2, in (rotated 90°)	0.00020	1.980	0.00010	0.006	YES

Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

Client:	Nobis Engineering, Inc.
Project Name:	Pine Point Bridge
Project Location:	Scarborough, ME
GTX #:	302798
Test Date:	4/23/2015
Tested By:	daa
Checked By:	mpd
Boring ID:	BB-SBMR-202
Sample ID:	R1
Depth, ft:	67.0-68.0
Sample Type:	rock core
Sample Description:	See photographs Intact material failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 10,299 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1000-3800	11,300,000	0.27
3800-6500	11,550,000	0.41
6500-9300	11,260,000	0.48

Notes: The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	Nobis Engineering, Inc.	Test Date:	4/22/2015
Project Name:	Pine Point Bridge	Tested By:	daa
Project Location:	Scarborough, ME	Checked By:	mpd
GTX #:	302798		
Boring ID:	BB-SBMR-202		
Sample ID:	R1		
Depth:	67.0-68.0 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.34	4.34	4.34
Specimen Diameter, in:	1.98	1.98	1.98
Specimen Mass, g:	612.41		
Bulk Density, lb/ft^3	174	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010

Difference between max and min readings, in:

0° = 0.00000 90° = 0.00020

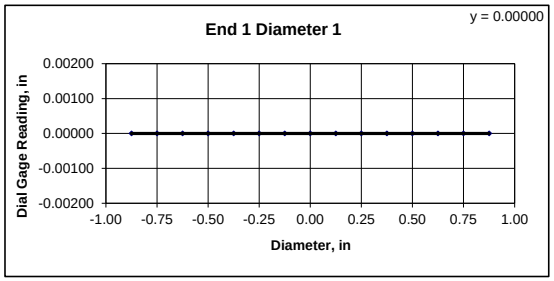
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010	0.00010	0.00020

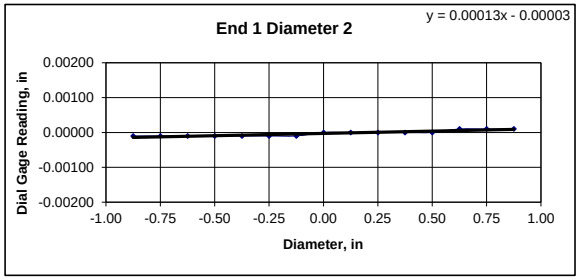
Difference between max and min readings, in:

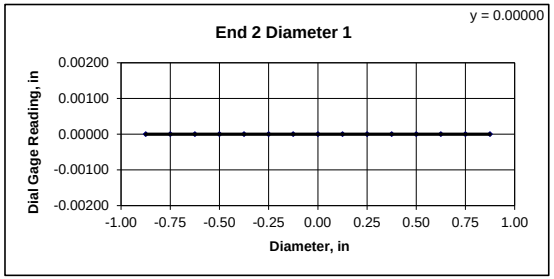
0° = 0 90° = 0.0003

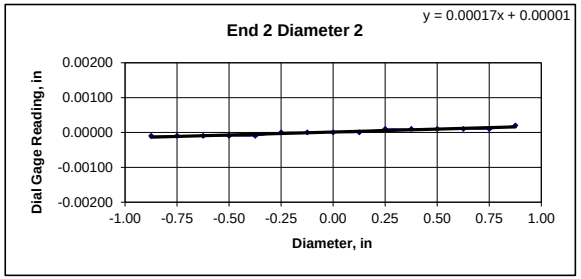
Maximum difference must be < 0.0020 in. Difference = ± 0.00015

Flatness Tolerance Met? YES









DIAMETER 1

End 1:

Slope of Best Fit Line	0.00000
Angle of Best Fit Line:	0.00000

End 2:

Slope of Best Fit Line	0.00000
Angle of Best Fit Line:	0.00000

Maximum Angular Difference: 0.00000

Parallelism Tolerance Met? YES

Spherically Seated

DIAMETER 2

End 1:

Slope of Best Fit Line	0.00013
Angle of Best Fit Line:	0.00745

End 2:

Slope of Best Fit Line	0.00017
Angle of Best Fit Line:	0.00974

Maximum Angular Difference: 0.00229

Parallelism Tolerance Met? YES

Spherically Seated

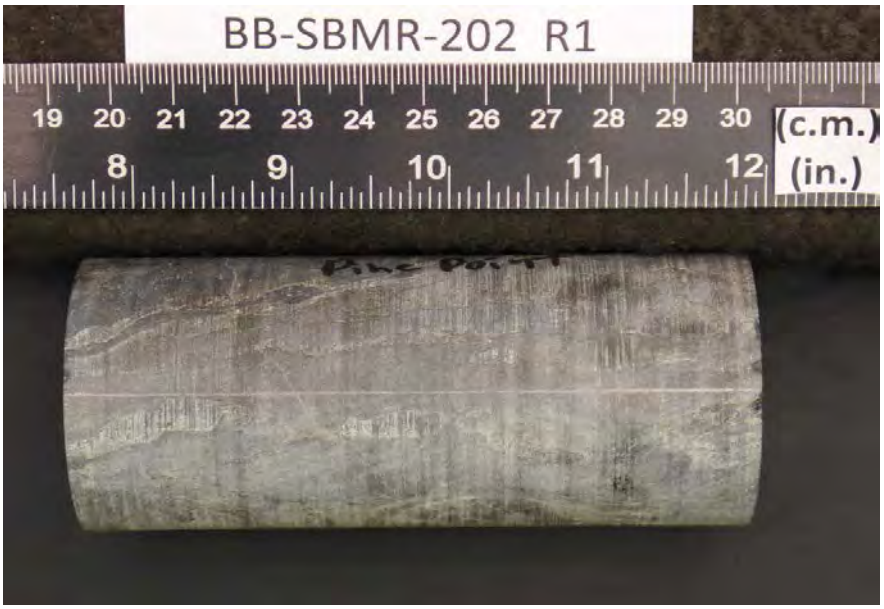
PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00000	1.980	0.00000	0.000	YES
Diameter 2, in (rotated 90°)	0.00020	1.980	0.00010	0.006	YES
END 2					
Diameter 1, in	0.00000	1.980	0.00000	0.000	YES
Diameter 2, in (rotated 90°)	0.00030	1.980	0.00015	0.009	YES

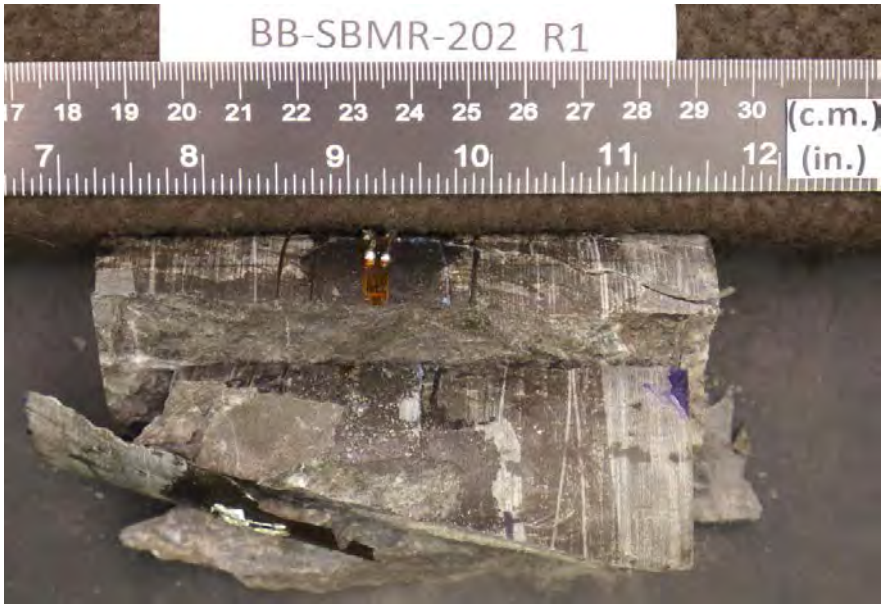
Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

Client:	Nobis Engineering, Inc.
Project Name:	Pine Point Bridge
Project Location:	Scarborough, ME
GTX #:	302798
Test Date:	4/23/2015
Tested By:	daa
Checked By:	mpd
Boring ID:	BB-SBMR-202
Sample ID:	R1
Depth, ft:	67.0-68.0



After cutting and grinding



After break

ALPHA ANALYTICAL

ANALYTICAL REPORT

Lab Number:	L1218419
Client:	Geo Testing Express 125 Nagog Park Acton, MA 01720
ATTN:	Joe Tomei
Phone:	(978) 893-1241
Project Name:	PINE POINT RD. OVER B&M RR
Project Number:	GTX : 12313
Report Date:	10/16/12

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name:	PINE POINT RD. OVER B&M RR	**Lab Number:**	L1218419
Project Number:	GTX : 12313	**Report Date:**	10/16/12

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1218419-01	BB-SBMR-104,3D-B	SCARBOROUGH, ME	10/12/12 00:00
L1218419-02	BB-SBMR-101,6D-BC	SCARBOROUGH, ME	10/12/12 00:00
L1218419-03	BB-SBMR-105,6D-B	SCARBOROUGH, ME	10/12/12 00:00
L1218419-04	BB-SBMR-102,9-10FT.	SCARBOROUGH, ME	10/12/12 00:00

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples free of charge for 30 days from the date the project is completed. After 30 days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples.

Please contact Client Services at 800-624-9220 with any questions.

Case Narrative (continued)

Sample Receipt

All analyses performed and the collection date/time were verified with the client.

Chloride

The WG566995-3 Laboratory Duplicate RPD (39%), performed on L1218419-03, is outside the acceptance criteria. The elevated RPD has been attributed to the non-homogeneous nature of the sample utilized for the Laboratory Duplicate.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth A. Simmons Elizabeth Simmons

Title: Technical Director/Representative Date: 10/16/12

INORGANICS
&
MISCELLANEOUS

Project Name: PINE POINT RD. OVER B&M RR

Project Number: GTX : 12313

Lab Number: L1218419

Report Date: 10/16/12

SAMPLE RESULTS

Lab ID: L1218419-01
Client ID: BB-SBMR-104,3D-B
Sample Location: SCARBOROUGH, ME
Matrix: Soil

Date Collected: 10/12/12 00:00
Date Received: 10/11/12
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	92		%	0.10	NA	1	-	10/13/12 11:00	30,2540G	TA
Chloride	43		mg/kg	10	--	1	-	10/15/12 12:06	1,9251	LA
Sulfate	ND		mg/kg	110	--	1	-	10/15/12 16:30	1,9038	MP

Project Name: PINE POINT RD. OVER B&M RR
Project Number: GTX : 12313

Lab Number: L1218419
Report Date: 10/16/12

SAMPLE RESULTS

Lab ID: L1218419-02
Client ID: BB-SBMR-101,6D-BC
Sample Location: SCARBOROUGH, ME
Matrix: Soil

Date Collected: 10/12/12 00:00
Date Received: 10/11/12
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	88		%	0.10	NA	1	-	10/13/12 11:00	30,2540G	TA
Chloride	48		mg/kg	10	--	1	-	10/15/12 12:06	1,9251	LA
Sulfate	ND		mg/kg	110	--	1	-	10/15/12 16:30	1,9038	MP

Project Name:	PINE POINT RD. OVER B&M RR	**Lab Number:**	L1218419
Project Number:	GTX : 12313	**Report Date:**	10/16/12

SAMPLE RESULTS

Lab ID:	L1218419-03	Date Collected:	10/12/12 00:00
Client ID:	BB-SBMR-105,6D-B	Date Received:	10/11/12
Sample Location:	SCARBOROUGH, ME	Field Prep:	Not Specified
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	80		%	0.10	NA	1	-	10/13/12 11:00	30,2540G	TA
Chloride	23		mg/kg	12	--	1	-	10/15/12 12:07	1,9251	LA
Sulfate	ND		mg/kg	120	--	1	-	10/15/12 16:30	1,9038	MP

Project Name: PINE POINT RD. OVER B&M RR
Project Number: GTX : 12313

Lab Number: L1218419
Report Date: 10/16/12

SAMPLE RESULTS

Lab ID: L1218419-04
Client ID: BB-SBMR-102,9-10FT.
Sample Location: SCARBOROUGH, ME
Matrix: Soil

Date Collected: 10/12/12 00:00
Date Received: 10/11/12
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	91		%	0.10	NA	1	-	10/13/12 11:00	30,2540G	TA
Chloride	170		mg/kg	11	--	1	-	10/15/12 12:11	1,9251	LA
Sulfate	220		mg/kg	110	--	1	-	10/15/12 16:30	1,9038	MP

Project Name: PINE POINT RD. OVER B&M RR **Lab Number:** L1218419

Project Number: GTX : 12313 **Report Date:** 10/16/12

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
ieneral Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG566995-1										
hloride	ND		mg/kg	10	--	1	-	10/15/12 11:30	1,9251	LA
ieneral Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG567053-1										
ulfate	ND		mg/kg	100	--	1	-	10/15/12 16:30	1,9038	MP

Lab Control Sample Analysis
Batch Quality Control

Project Name: PINE POINT RD. OVER B&M RR

Project Number: GTX : 12313

Lab Num

Report D

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	C
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG566995-2							
Chloride	91		-		89-109	-	
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG567053-2							
Sulfate	94		-		80-121	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: PINE POINT RD. OVER B&M RR

Project Number: GTX : 12313

Lab Num

Report D

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recove Limit
General Chemistry - Westborough Lab Associated sample(s): 01-04 105,6D-B				QC Batch ID: WG566995-4			QC Sample: L1218419-03		(
Chloride	23	482	420	85		-	-		62-129
General Chemistry - Westborough Lab Associated sample(s): 01-04				QC Batch ID: WG567053-4			QC Sample: L1218171-02		(
Sulfate	170	217	ND	83		-	-		22-183

Lab Duplicate Analysis
Batch Quality Control

Project Name: PINE POINT RD. OVER B&M RR

Project Number: GTX : 12313

Lab

Rep

Parameter	Native Sample	Duplicate Sample	Units	RPD
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG566903-1 QC Sample: L1217901-01 Cl				
Solids, Total	94	94	%	0
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG566995-3 QC Sample: L1218419-03 Cl 105,6D-B				
Chloride	23	34	mg/kg	**39**
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG567053-3 QC Sample: L1218419-01 Cl 104,3D-B				
Sulfate	ND	ND	mg/kg	NC

Project Name: PINE POINT RD. OVER B&M RR
Project Number: GTX : 12313

Lab Number: L1218419
Report Date: 10/16/12

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1218419-01A	Bag	A	N/A	5.1	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1218419-02A	Bag	A	N/A	5.1	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1218419-03A	Bag	A	N/A	5.1	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1218419-04A	Bag	A	N/A	5.1	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than five times (5x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The RPD between the results for the two columns exceeds the method-specified criteria; however, the lower value has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

Report Format: Data Usability Report

Data Qualifiers

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IIIA, 1997.

30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certificate/Approval Program Summary

Last revised August 16, 2012 - Westboro Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0574. ***NELAP Accredited Solid Waste/Soil.***

Drinking Water (Inorganic Parameters: Color, pH, Turbidity, Conductivity, Alkalinity, Chloride, Free Residual Chlorine, Fluoride, Calcium Hardness, Sulfate, Nitrate, Nitrite, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Selenium, Silver, Sodium, Thallium, Zinc, Total Dissolved Solids, Total Organic Carbon, Total Cyanide, Perchlorate. Organic Parameters: Volatile Organics 524.2, Total Trihalomethanes 524.2, 1,2-Dibromo-3-chloropropane (DBCP) 504.1, Ethylene Dibromide (EDB) 504.1, 1,4-Dioxane (Mod 8270). Microbiology Parameters: Total Coliform-MF mEndo (SM9222B), Total Coliform – Colilert (SM9223, Enumeration and P/A), E. Coli. – Colilert (SM9223, Enumeration and P/A), HPC – Pour Plate (SM9215B), Fecal Coliform – MF m-FC (SM9222D), Fecal Coliform-EC Medium (SM 9221E).

Wastewater/Non-Potable Water (Inorganic Parameters: Color, pH, Conductivity, Acidity, Alkalinity, Chloride, Total Residual Chlorine, Fluoride, Total Hardness, Silica, Sulfate, Sulfide, Ammonia, Kjeldahl Nitrogen, Nitrate, Nitrite, O-Phosphate, Total Phosphorus, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, Zinc, Total Residue (Solids), Total Dissolved Solids, Total Suspended Solids (non-filterable), BOD, CBOD, COD, TOC, Total Cyanide, Phenolics, Foaming Agents (MBAS), Bromide, Oil and Grease. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Acid Extractables (Phenols), Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, Polynuclear Aromatic Hydrocarbons, Haloethers, Chlorinated Hydrocarbons, Volatile Organics, TPH (HEM/SGT), CT-Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH. Microbiology Parameters: Total Coliform – MF mEndo (SM9222B), Total Coliform – MTF (SM9221B), E. Coli – Colilert (SM9223 Enumeration), HPC – Pour Plate (SM9215B), Fecal Coliform – MF m-FC (SM9222D), Fecal Coliform – A-1 Broth (SM9221E), Enterococcus - Enterolert.

Solid Waste/Soil (Inorganic Parameters: pH, Sulfide, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Tin, Vanadium, Zinc, Total Cyanide, Ignitability, Phenolics, Corrosivity, TCLP Leach (1311), SPLP Leach (1312 metals only), Reactivity. Organic Parameters: PCBs, PCBs in Oil, Organochlorine Pesticides, Technical Chlordane, Toxaphene, CT-Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH, Dicamba, 2,4-D, 2,4,5-T, 2,4,5-TP(Silvex), Dalapon, Volatile Organics (SW 8260), Acid Extractables (Phenols) (SW 8270), Benzidines (SW 8270), Phthalates (SW 8270), Nitrosamines (SW 8270), Nitroaromatics & Cyclic Ketones (SW 8270), PAHs (SW 8270), Haloethers (SW 8270), Chlorinated Hydrocarbons (SW 8270).)

Maine Department of Human Services Certificate/Lab ID: 2009024.
Drinking Water (Inorganic Parameters: SM9215B, 9222D, 9223B, EPA 180.1, 353.2, SM2130B, 2320B, 2540C, 4500Cl-D, 4500CN-C, 4500CN-E, 4500F-C, 4500H+B, 4500NO3-F, EPA 200.7, EPA 200.8, 245.1, EPA 300.0. Organic Parameters: 504.1, 524.2.)

Wastewater/Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664A, 350.1, 351.1, 353.2, 410.4, 420.1, SM2320B, 2510B, 2540C, 2540D, 426C, 4500Cl-D, 4500Cl-E, 4500CN-C, 4500CN-E, 4500F-B, 4500F-C, 4500H+B, 4500Norg-B, 4500Norg-C, 4500NH3-B, 4500NH3-G, 4500NO3-F, 4500P-B, 4500P-E, 5210B, 5220D, 5310C, 9010B, 9040B, 9030B, 7470A, 7196A, 2340B, EPA 200.7, 6010B, 200.8, 6020, 245.1, 1311, 1312, 3005A, Enterolert, 9223D, 9222D. Organic Parameters: 608, 624, 625, 8081A, 8082, 8330, 8151A, 8260B, 8270C, 3510C, 3630C, 5030B, ME-DRO, ME-GRO, MA-EPH, MA-VPH.)

Solid Waste/Soil (Inorganic Parameters: 9010B, 9012A, 9014A, 9030B, 9040B, 9045C, 6010B, 7471A, 7196A, 9050A, 1010, 1030, 9065, 1311, 1312, 3005A, 3050B. Organic Parameters: ME-DRO, ME-GRO, MA-EPH, MA-VPH, 8260B, 8270C, 8330, 8151A, 8081A, 8082, 3540C, 3546, 3580A, 3630C, 5030B, 5035.)

Massachusetts Department of Environmental Protection Certificate/Lab ID: M-MA086.
Drinking Water (Inorganic Parameters: (EPA 200.8 for: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl) (EPA 200.7 for: Ba,Be,Ca,Cd,Cr,Cu,Na,Ni) 245.1, (300.0 for: Nitrate-N, Fluoride, Sulfate); (EPA 353.2 for: Nitrate-N, Nitrite-N); (SM4500NO3-F for: Nitrate-N and Nitrite-N); 4500F-C, 4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, 2320B, SM2540C, SM4500H-B. Organic Parameters: (EPA 524.2 for: Trihalomethanes, Volatile Organics); (504.1 for: 1,2-Dibromoethane, 1,2-Dibromo-3-Chloropropane), EPA 332. Microbiology Parameters: SM9215B; ENZ. SUB. SM9223; ColilertQT SM9223B; MF-SM9222D.)

Non-Potable Water (Inorganic Parameters: (EPA 200.8 for: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn); (EPA 200.7

for: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn); 245.1, SM4500H,B, EPA 120.1, SM2510B, 2540C, 2340B, 2320B, 4500CL-E, 4500F-BC, 426C, SM4500NH3-BH, (EPA 350.1 for: Ammonia-N), LACHAT 10-107-06-1-B for Ammonia-N, SM4500NO3-F, 353.2 for Nitrate-N, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, 4500P-B,E, 5220D, EPA 410.4, SM 5210B, 5310C, 4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.
Organic Parameters: (EPA 624 for Volatile Halocarbons, Volatile Aromatics),(608 for: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT,Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs-Water), (EPA 625 for SVOC Acid Extractables and SVOC Base/Neutral Extractables), 600/4-81-045-PCB-Oil. Microbiology Parameters: (ColilertQT SM9223B; Enterolert-QT: SM9222D-MF.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 200307. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM 9222B, 9223B, 9215B, EPA 200.7, 200.8, 300.0, SM4500CN-E, 4500H+B, 4500NO3-F, 2320B, 2510B, 2540C, 4500F-C, 5310C, 2120B, EPA 332.0. Organic Parameters: 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: SM9222D, 9221B, 9222B, 9221E-EC, EPA 3005A, 200.7, 200.8, 245.1, SW-846 6010B, 6010C, 6020, 6020A, 7196A, 7470A, SM3500-CR-D, EPA 120.1, 300.0, 350.1, 350.2, 351.1, 353.2, 410.4, 420.1, 426C, 1664A, SW-846 9010B, 9030B, 9040B, SM2120B, 2310B, 2320B, 2540B, 2540D, 4500H+B, 4500CL-E, 4500CN-E, 4500NH3-H, 4500NO3-F, 4500NO2-B, 4500P-E, 4500-S2-D, 5210B, 5220D, 2510B, 2540C, 4500F-C, 5310C, 5540C, LACHAT 10-204-00-1-A, LACHAT 10-107-06-2-D, 3060A. Organic Parameters: SW-846 3510C, 3630C, 5030B, 8260B, 8270C, 8270D, 8330, EPA 624, 625, 608, SW-846 8082, 8082A, 8081A, 8081B, 8151A, 8330, 8270C-SIM, 8270D-SIM.)

Solid & Chemical Materials (Inorganic Parameters: SW-846 6010B, 6010C, 7196A, 7471A, 1010, 1030, 9010, 9012A, 9014, 9030B, 9040B, 9045C, 9050, 9065,1311, 1312, 3005A, 3050B, 3060A. Organic Parameters: SW-846 3540C, 3546, 3050B, 3580A, 3630C, 5030B, 5035, 8260B, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330, 8151A, 8015B, 8015C, 8082, 8082A, 8081A, 8081B.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA935. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM9222B, 9221E, 9223B, 9215B, 4500CN-CE, 4500NO3-F, 4500F-C, EPA 300.0, 200.7, 200.8, 245.1, 2540C, SM2120B, 2320B, 2510B, 5310C, SM4500H-B. Organic Parameters: EPA 332, 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: SM5210B, EPA 410.4, SM5220D, 4500Cl-E, EPA 300.0, SM2120B, 2340B, SM4500F-BC, EPA 200.7, 200.8, 351.1, LACHAT 10-107-06-2-D, EPA 353.2, SM4500NO3-F, 4500NO2-B, EPA 1664A, SM5310B, C or D, 4500-PE, EPA 420.1, SM510ABC, SM4500P-B5+E, 2540B, 2540C, 2540D, 2540G, EPA 120.1, SM2510B, SM2520B, SM15 426C, 9222D, 9221B, 9221C, 9221E, 9222B, 9215B, 2310B, 2320B, 4500NH3-H, 4500-S D, EPA 350.1, 350.2, SW-846 1312, 7470A, 5540C, SM4500H-B, 4500SO3-B, SM3500Cr-D, 4500CN-CE, EPA 245.1, SW-846 9040B, 3005A, 3015, EPA 6010B, 6010C, 6020, 6020A, 7196A, 3060A, SW-846 9010B, 9030B. Organic Parameters: SW-846 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 3510C, EPA 608, 624, 625, SW-846 3630C, 5030B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8330, 1,4-Dioxane by NJ Modified 8270, 8015B, NJ EPH.)

Solid & Chemical Materials (Inorganic Parameters: SW-846, 6010B, 6010C, 6020, 6020A, 7196A, 3060A, 9010B, 9030B, 1010, 1030, 1311, 1312, 3005A, 3050B, 7471A, 7471B, 9014, 9012A, 9040B, 9040C, 9045C, 9045D, 9050A, 9065, 9251. Organic Parameters: SW-846 8015B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8330, 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 3540C, 3546, 3580A, 3630C, 5030B, 5035L, 5035H, NJ OQA-QAM-025 Rev.7, NJ EPH.)

New York Department of Health Certificate/Lab ID: 11148. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM9223B, 9222B, 9215B, EPA 200.8, 200.7, 245.2, SM5310C, EPA 332.0, SM2320B, EPA 300.0, SM2120B, 4500CN-E, 4500F-C, 4500NO3-F, 2540C, SM 2510B. Organic Parameters: EPA 524.2, 504.1.)

Non-Potable Water (Inorganic Parameters: SM9221E, 9222D, 9221B, 9222B, 9215B, 5210B, 5310C, EPA 410.4, SM5220D, 2310B-4a, 2320B, EPA 200.7, 300.0, SM4500CL-E, 4500F-C, SM15 426C, EPA 350.1, SM4500NH3-BH, EPA 351.1, LACHAT 10-107-06-2, EPA 353.2, SM4500-NO3-F, 4500-NO2-B, 4500P-E, 2540C, 2540B, 2540D, EPA 200.8, EPA 6010B, 6010C, 6020, 6020A, EPA 7196A, SM3500Cr-D, EPA 245.1, 245.2, 7470A, SM2120B, LACHAT 10-204-00-1-A, 4500CN-CE, EPA 1664A, EPA 420.1, SM14 510C, EPA 120.1, SM2510B, SM4500S-D, SM5540C, EPA 3005A, 3015, 9010B, 9030B. Organic Parameters: EPA 624, 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 625, 608, 8081A, 8081B, 8151A, 8330, 8082, 8082A, EPA 3510C, 5030B.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1010, 1030, EPA 6010B, 6010C, 7196A, 7471A, 7471B, 9012A, 9014, 9065, 9050A, EPA 1311, 1312, 3005A, 3050B, 9010B, 9040C, 9045D. Organic Parameters: EPA 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8015B, 8015C, 8081A, 8081B, 8151A, 8330, 8082 8082A, 3540C, 3546, 3580, 3580A, 5030B, 5035A-H, 5035A-L.)

North Carolina Department of the Environment and Natural Resources Certificate/Lab ID : 666. (Inorganic Parameters: SM2310B, 2320B, 4500Cl-E, 4500Cn-E, 9014, Lachat 10-204-00-1-X, 1010A, 1030, 4500NO3-F, 353.2, 4500P-E, 4500SO4-E, 300.0, 4500S-D, 5310B, 5310C, 6010C, 6020A, 200.7, 200.8, 3500Cr-B, 7196A, 245.1, 7471A, 7471B, 1311,1312. Organic Parameters: 608, 8081B, 8082A, 624, 8260B, 625, 8270D, 8151A, 8015C, 504.1, MA-EPH, MA-VPH.)

Drinking Water Program Certificate/Lab ID: 25700. (Inorganic Parameters: Chloride EPA 300.0. Organic Parameters: 524.2)

Pennsylvania Department of Environmental Protection Certificate/Lab ID : 68-03671. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: 200.7, 200.8, 245.2, 300.0, 332.0, 2120B, 2320B, 2510B, 2540C, 4500-CN-CE, 4500F-C, 4500H+-B, 4500NO3-F, 5310C. Organic Parameters: EPA 524.2, 504.1)

Non-Potable Water (Inorganic Parameters: EPA 120.1, 1312, 3005A,3015, 3060A, 200.7, 200.8, 410.4, 1664A, SM2540D, 5210B, 5220D, 4500-P,BE, 245.1, 300.0, 3501., 350.2, 353.2, 420.1, 6010B, 6010C, 6020, 6020A, 7196A, 7470A, 9010B, 9030B, 9040B, Lachat 10-107-06-2-D, NJ-EPH, 2120B, 2310B, 2320B, 2340B, 2510C, 2540B, 2540C, 3500Cr-D, 436C, 4500CN-CE, 4500Cl-E, 4500F-B, 4500F-C, 4500H+-B, 4500NO2-B, 4500NO3-F, 4500S-D, 4500SO3-B, 5310BCD, 5540C. Organic Parameters: EPA 3510C, 3630C, 5030B, 625, 624, 608, 8081A, 8081B, 8082, 8082A, 8151A, 8260B, 8270C, 8270D, 8330, 8015B,)

Solid & Hazardous Waste (Inorganic Parameters: EPA 350.1, 1010, 1030, 1311, 1312, 3005A, 3050B, 3060A, 6010B, 6010C, 6020A, 7196A, 7471A, 7471B, 9010B, 9012A, 9014, 9040B, 9045C, 9050, 9065, SM 4500NH3-BH, 9030B, 9038, 9251. Organic Parameters: 3540C, 3546, 3580A, 3630C, 5035, 8015B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8260B, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330, NJ-EPH.)

Rhode Island Department of Health Certificate/Lab ID: LAO00065. ***NELAP Accredited via NJ-DEP.***
Refer to MA-DEP Certificate for Potable and Non-Potable Water.
Refer to NJ-DEP Certificate for Potable and Non-Potable Water.

Texas Commisson on Environmental Quality Certificate/Lab ID: T104704476-09-1. ***NELAP Accredited.***
Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664, 200.7, 200.8, 245.1, 245.2, 300.0, 350.1, 351.1, 353.2, 410.4, 420.1, 6010, 6020, 7196, 7470, 9040, SM 2120B, 2310B, 2320B, 2510B, 2540B, 2540C, 2540D, 426C, 4500CL-E, 4500CN-E, 4500F-C, 4500H+B, 4500NH3-H, 4500NO2B, 4500P-E, 4500 S2¯D, 510C, 5210B, 5220D, 5310C, 5540C. Organic Parameters: EPA 608, 624, 625, 8081, 8082, 8151, 8260, 8270, 8330.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 1312, 9012, 9014, 9040, 9045, 9050, 9065.)

Virginia Division of Consolidated Laboratory Services Certificate/Lab ID: 460195. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: EPA 200.7, 200.8, 300.0, 2510B, 2120B, 2540C, 4500CN-CE, 245.2, 2320B, 4500F-C, 4500F-C, 4500NO3-F, 5310C. Organic Parameters: EPA 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664A, 200.7, 2..08, 245.1, 300.0, 3005A, 3015, 1312, 6010B, 6010C, 3060A, 353.2, 420.1, 6020, 6020A, SM4500S-D, SM4500-CN-CE, Lachat 10-204-00-1-X, 7196A, 7470A, 9010B, 9040B, 2310B, 2320B, 2510B, 2540B, 2540C, 3500Cr-D, 426C, 4500Cl-E, 4500F-B, 4500F-C, 4500PE, 510AC, 5210B, 5310B 5310C, 5540C. Organic Parameters: EPA 3510C, 3630C, 5030B, 8260B, 608, 624, 625, 8081A, 8081B, 8082, 8082A, 8151A, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330,)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1010A, 1030, 3060A, 3050B, 1311, 1312, 6010B, 6010C, 6020, , 7196A, 7471A, 7471B, 6020A, 9030B, 9010B, 9012A, 9014 9040B, 9045C, 9050A, 9065. Organic Parameters: EPA 5035, 3540C, 3546, 3550, 3580, 3630C, 8260B, 8015B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330.)

Department of Defense, L-A-B Certificate/Lab ID: L2217.
Drinking Water (Inorganic Parameters: SM 4500H-B. Organic Parameters: EPA 524.2, 504.1.)

Non-Potable Water (Inorganic Parameters: EPA 200.7, 200.8, 6010B, 6010C, 6020, 6020A, 245.1, 245.2, 7470A, 9040B, 9010B, 180.1. 300.0, 332.0, 6860, 353.2, 410.4, 9060, 1664A, SM 4500CN-E, 4500H-B, 4500NO3-F, 4500CL-D, 5220D, 5310C, 2130B, 2320B, 2540C, 3005A, 3015, 9010B, 9056. Organic Parameters: EPA 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330A, 8082, 8082A, 8081A, 8081B, 3510C, 5030B, MassDEP EPH, MassDEP VPH.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 200.7, 6010B, 6010C, 7471A, 6860, 1311, 1312, 3050B, 7196A, 9010B, 9012A, 9040B, 9045C, 3500-CR-D, 4500CN-CE, 2540G, Organic Parameters: EPA 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330A/B-prep, 8082, 8082A, 8081A, 8081B, 3540C, 3546, 3580A, 5035A, MassDEP EPH, MassDEP VPH.)

The following analytes are not included in our current NELAP/TNI Scope of Accreditation:
EPA 8260B: Freon-113, 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene. **EPA 8330A:** PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT. **EPA 8270C:** Methyl naphthalene, Dimethyl naphthalene, Total Methylnapthalenes, Total Dimethylnaphthalenes, 1,4-Diphenylhydrazine (Azobenzene). **EPA 625:** 4-Chloroaniline, 4-Methylphenol. Total Phosphorus in a soil matrix, Chloride in a soil matrix, TKN in a soil matrix, NO2 in a soil matrix, NO3 in a soil matrix, SO4 in a soil matrix. **EPA 9071:** Total Petroleum Hydrocarbons, Oil & Grease.

ANALYTICAL REPORT

Lab Number:	L1507692
Client:	Geo Testing Express 125 Nagog Park Acton, MA 01720
ATTN:	Joe Tomei
Phone:	(978) 893-1241
Project Name:	PINE POINT BRIDGE
Project Number:	302798
Report Date:	04/23/15

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Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1507692
Report Date: 04/23/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1507692-01	2D, BB-SBMR-201,2-4 FT	SOIL	SCARBOROUGH, ME	04/16/15 00:00	04/16/15
L1507692-02	2D, BB-SBMR-202,2-4 FT	SOIL	SCARBOROUGH, ME	04/16/15 00:00	04/16/15

Project Name: PINE POINT BRIDGE
Project Number: 302798
Lab Number: L1507692
Report Date: 04/23/15

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	PINE POINT BRIDGE	**Lab Number:**	L1507692
Project Number:	302798	**Report Date:**	04/23/15

Case Narrative (continued)

Sulfate

L1507692-01 and -02 have elevated detection limits due to the dilutions required by the sample matrices.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kelly Stenstrom

Title: Technical Director/Representative

Date: 04/23/15

INORGANICS
&
MISCELLANEOUS

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1507692
Report Date: 04/23/15

SAMPLE RESULTS

Lab ID: L1507692-01
Client ID: 2D, BB-SBMR-201,2-4 FT
Sample Location: SCARBOROUGH, ME
Matrix: Soil

Date Collected: 04/16/15 00:00
Date Received: 04/16/15
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	90.2		%	0.100	NA	1	-	04/16/15 22:40	30,2540G	RT
Chloride	17		mg/kg	9.9	--	1	-	04/20/15 15:20	1,9251	LA
Sulfate	ND		mg/kg	550	--	5	-	04/21/15 16:00	1,9038	MP

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1507692
Report Date: 04/23/15

SAMPLE RESULTS

Lab ID: L1507692-02
Client ID: 2D, BB-SBMR-202,2-4 FT
Sample Location: SCARBOROUGH, ME
Matrix: Soil

Date Collected: 04/16/15 00:00
Date Received: 04/16/15
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	90.6		%	0.100	NA	1	-	04/16/15 22:40	30,2540G	RT
Chloride	24		mg/kg	10	--	1	-	04/20/15 15:21	1,9251	LA
Sulfate	ND		mg/kg	220	--	2	-	04/21/15 16:00	1,9038	MP

Project Name: PINE POINT BRIDGE **Lab Number:** L1507692

Project Number: 302798 **Report Date:** 04/23/15

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG777355-1										
Chloride	ND		mg/kg	10	--	1	-	04/20/15 14:14	1,9251	LA
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG777658-1										
Sulfate	ND		mg/kg	100	--	1	-	04/21/15 16:00	1,9038	MP

Lab Control Sample Analysis
Batch Quality Control

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1507692
Report Date: 04/23/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG777355-2								
Chloride	102		-		89-109	-		35
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG777658-2								
Sulfate	95		-		80-121	-		12

Matrix Spike Analysis
Batch Quality Control

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1507692
Report Date: 04/23/15

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG777355-4 QC Sample: L1507959-10 Client ID: MS Sample												
Chloride	ND	456	460	102		-	-		62-129	-		35
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG777658-4 QC Sample: L1507959-21 Client ID: MS Sample												
Sulfate	210	258	420	81		-	-		22-183	-		12

Lab Duplicate Analysis
Batch Quality Control

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1507692
Report Date: 04/23/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG776669-1 QC Sample: L1507676-01 Client ID: DUP Sample						
Solids, Total	87.7	87.7	%	0		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG777355-3 QC Sample: L1507959-10 Client ID: DUP Sample						
Chloride	ND	ND	mg/kg	NC		35
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG777658-3 QC Sample: L1507959-21 Client ID: DUP Sample						
Sulfate	210	180	mg/kg	**15**	Q	12

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1507692
Report Date: 04/23/15

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1507692-01A	Bag	A	N/A	2.7	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)
L1507692-02A	Bag	A	N/A	2.7	Y	Absent	CL-9251(28),SO4-9038(28),TS(7)

*Values in parentheses indicate holding time in days

Project Name:	PINE POINT BRIDGE	**Lab Number:**	L1507692
Project Number:	302798	**Report Date:**	04/23/15

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NI	- Not Ignitable.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A	- Spectra identified as "Aldol Condensation Product".
B	- The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
C	- Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
D	- Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
E	- Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

Report Format: Data Usability Report

Project Name:	PINE POINT BRIDGE	**Lab Number:**	L1507692
Project Number:	302798	**Report Date:**	04/23/15

Data Qualifiers

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

Project Name: PINE POINT BRIDGE **Lab Number:** L1507692
Project Number: 302798 **Report Date:** 04/23/15

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

Last revised December 16, 2014

The following analytes are not included in our NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.
EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.
EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 625: 4-Chloroaniline, 4-Methylphenol.
SM4500: Soil: Total Phosphorus, TKN, NO2, NO3.
EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility
EPA 8270D: Biphenyl.
EPA 2540D: TSS
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL — World Class Chemistry

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 4/16/15

ALPHA Job #: L1507692

Client Information

Client: GeoTesting Express
Address: 125 Nagog Park
Acton, MA
Phone: 978.635.0424
Fax: 978.635.0266
Email: emarro@geotesting.com

☐ These samples have been Previously analyzed by Alpha

Project Information

Project Name: Pine Point Bridge
Project Location: Scarborough, ME
Project #: 302798
Project Manager: Joe Tomei
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ Rush (ONLY IF PRE-APPROVED)

Due Date: 4/27/15 Time:

Report Information

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Data Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	EPA 375.2 SULFATES	EPA 325 CHLORIDES											Sample Specific Comments	TOTAL # BOTTLES
07692 -01	2D, BB-SBMR-201, 2-4 ft			soil		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		1
-02	2D, BB-SBMR-202, 2-4 ft			soil		☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		1
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
Container Type						B	B	-	-	-	-	-	-	-	-	-	-		
Preservative						-	-	-	-	-	-	-	-	-	-	-	-		

Relinquished By:	Date/Time	Received By:	Date/Time
Pat Walsh	4/16/15 11:45am	Pat Cyr AAL	4/16/15 11:45
Pat Walsh	4/16/15 1415	Lad Chuang	4/16/15 1415

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

FORM NO: 01-01(I-NJ) (rev. 5-JAN-12)

ANALYTICAL REPORT

Lab Number:	L1501562
Client:	Geo Testing Express 125 Nagog Park Acton, MA 01720
ATTN:	Joe Tomei
Phone:	(978) 893-1241
Project Name:	PINE POINT BRIDGE
Project Number:	302798
Report Date:	01/29/15

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: NY (11627), CT (PH-0141), NH (2206), NJ NELAP (MA015), RI (LAO00299), PA (68-02089), LA NELAP (03090), FL (E87814), TX (T104704419), WA (C954), DOD (L2217.01), USDA (Permit #P330-11-00109), US Army Corps of Engineers.

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1501562
Report Date: 01/29/15

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1501562-01	3D/BB-SBMR-206 10-12FT	SOIL	SCARBOROUGH, ME	01/22/15 00:00	01/23/15

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1501562
Report Date: 01/29/15

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative

Date: 01/29/15

INORGANICS
&
MISCELLANEOUS

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1501562
Report Date: 01/29/15

SAMPLE RESULTS

Lab ID: L1501562-01
Client ID: 3D/BB-SBMR-206 10-12FT
Sample Location: SCARBOROUGH, ME
Matrix: Soil

Date Collected: 01/22/15 00:00
Date Received: 01/23/15
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	38.1		%	0.100	NA	1	-	01/26/15 13:28	30,2540G	SG
Chloride	240		mg/kg	23	--	1	-	01/26/15 11:49	1,9251	LA
Sulfide	ND		mg/kg	1.3	--	1	01/26/15 14:45	01/26/15 15:56	1,9030B	MP

Project Name: PINE POINT BRIDGE **Lab Number:** L1501562

Project Number: 302798 **Report Date:** 01/29/15

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG758499-1										
Chloride	ND		mg/kg	10	--	1	-	01/26/15 10:50	1,9251	LA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG758666-1										
Sulfide	ND		mg/kg	0.50	--	1	01/26/15 14:45	01/26/15 15:54	1,9030B	MP

Lab Control Sample Analysis
Batch Quality Control

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1501562
Report Date: 01/29/15

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG758499-2								
Chloride	95		-		89-109	-		35
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG758666-2								
Sulfide	79		-		75-125	-		25

Matrix Spike Analysis
Batch Quality Control

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1501562
Report Date: 01/29/15

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG758499-4 QC Sample: L1501342-02 Client ID: MS Sample												
Chloride	1000	512	1700	**131**	Q	-	-		62-129	-		35
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG758666-4 QC Sample: L1501562-01 Client ID: 3D/BB-SBMR-206 10-12FT												
Sulfide	ND	35.6	25	70		-	-		70-130	-		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1501562
Report Date: 01/29/15

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG758499-3 QC Sample: L1501342-02 Client ID: DUP Sample						
Chloride	1000	900	mg/kg	11		35
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG758626-1 QC Sample: L1501554-01 Client ID: DUP Sample						
Solids, Total	68.3	68.3	%	0		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG758666-3 QC Sample: L1501562-01 Client ID: 3D/BB-SBMR-206 10-12FT						
Sulfide	ND	ND	mg/kg	NC		25

Project Name: PINE POINT BRIDGE
Project Number: 302798

Lab Number: L1501562
Report Date: 01/29/15

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1501562-01A	Bag	A	N/A	3.0	Y	Absent	SULFIDE-9030(7),CL-9251(28),TS(7)

*Values in parentheses indicate holding time in days

Project Name:	PINE POINT BRIDGE	**Lab Number:**	L1501562
Project Number:	302798	**Report Date:**	01/29/15

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NI	- Not Ignitable.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A	- Spectra identified as "Aldol Condensation Product".
B	- The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
C	- Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
D	- Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
E	- Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

Report Format: Data Usability Report

Project Name:	PINE POINT BRIDGE	**Lab Number:**	L1501562
Project Number:	302798	**Report Date:**	01/29/15

Data Qualifiers

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

Project Name: PINE POINT BRIDGE **Lab Number:** L1501562
Project Number: 302798 **Report Date:** 01/29/15

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

Last revised December 16, 2014

The following analytes are not included in our NELAP Scope of Accreditation:

Westborough Facility
EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether.
EPA 8260C: 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene, Iodomethane (methyl iodide), Methyl methacrylate, Azobenzene.
EPA 8270D: 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 625: 4-Chloroaniline, 4-Methylphenol.
SM4500: Soil: Total Phosphorus, TKN, NO2, NO3.
EPA 9071: Total Petroleum Hydrocarbons, Oil & Grease.

Mansfield Facility
EPA 8270D: Biphenyl.
EPA 2540D: TSS
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Appendix F – Loads and Orientation from CHA

Completed By: PAL
Checked By: NB
Project Name: Pine Point Crossing Over B&M Railroad
Project Location: Scarborough, ME
Date: 6/17/2015
Subject: Pile Loads, Rev 2

PIER PILE LOAD SUMMARY

Factored Loads at Bottom of Cap:

		Case 1 (Max Compression)		Case 2 (Min Load Tension Check)		Case 3 (Construction Case With Two Span 1 and Two Span 2 Girders Erected to Maximize Mz and Check Tension)		Case 4 (Construction Case With Four Span 2 Girders Erected to Maximize Mx and Check Tension)	
Load Combination Limit State	Load	TOTAL (K, K-FT)	TOTAL (LB, LB-IN)	TOTAL (K, K-FT)	TOTAL (LB, LB-IN)	TOTAL (K, K-FT)	TOTAL (LB, LB-IN)	TOTAL (K, K-FT)	TOTAL (LB, LB-IN)
Strength I	H_z	-15.75	-15750.00	-15.75	-15750.00	0.00	0.00	0.00	0.00
	H_x	-7.97	-7971.90	-3.75	-3751.48	0.00	0.00	0.00	0.00
	P_y	-1908.63	-1908634.05	-1110.19	-1110192.96	-473.70	-473695.00	-473.70	-473695.00
	M_x	-73.04	-876487.50	-73.04	-876487.50	0.00	0.00	-357.74	-4292925.00
	M_z	36.97	443636.28	4754.11	57049362.39	2861.95	34343400.00	0.00	0.00
Strength II	H_z	-9.72	-9720.00	-9.72	-9720.00	0.00	0.00	0.00	0.00
	H_x	-4.92	-4919.80	-2.32	-2315.20	0.00	0.00	0.00	0.00
	P_y	-1600.34	-1600341.50	-965.11	-965114.11	-341.06	-341060.40	-341.06	-341060.40
	M_x	-45.08	-540918.00	-45.08	-540918.00	0.00	0.00	-357.74	-4292925.00
	M_z	22.82	273786.96	2933.97	35207606.50	2861.95	34343400.00	0.00	0.00
Strength III	H_z	-17.47	-17473.12	-17.47	-17473.12	-13.07	-13065.31	-13.07	-13065.31
	H_x	-22.13	-22126.35	-22.13	-22126.35	-10.53	-10526.84	-10.53	-10526.84
	P_y	-1103.39	-1103392.32	-658.67	-658665.57	-473.70	-473695.00	-473.70	-473695.00
	M_x	-58.87	-706412.81	-58.87	-706412.81	-38.43	-461118.01	-396.17	-4754043.01
	M_z	813.34	9760107.09	813.34	9760107.09	2907.76	34893087.77	45.81	549687.77
Strength IV	H_z	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	H_x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	P_y	-1279.99	-1279986.98	-731.26	-731255.68	-341.06	-341060.40	-341.06	-341060.40
	M_x	0.00	0.00	0.00	0.00	0.00	0.00	-429.29	-5151510.00
	M_z	0.00	0.00	0.00	0.00	3434.34	41212080.00	0.00	0.00
Strength V	H_z	-16.47	-16470.10	-16.47	-16470.10	-3.73	-3732.94	-3.73	-3732.94
	H_x	-15.64	-15636.06	-13.03	-13031.46	-3.01	-3007.67	-3.01	-3007.67
	P_y	-1600.34	-1600341.50	-965.11	-965114.11	-473.70	-473695.00	-473.70	-473695.00
	M_x	-70.05	-840570.61	-70.05	-840570.61	-10.98	-131748.00	-368.72	-4424673.00
	M_z	275.58	3306939.95	3186.73	38240759.49	2875.04	34500453.65	13.09	157053.65
Extreme Event I (EQ Case A)	H_z	-208.90	-208904.55	-191.56	-191562.44				
	H_x	-1.82	-1822.15	-0.86	-857.48				
	P_y	-1287.45	-1287447.58	-817.87	-817869.91				
	M_x	-968.79	-11625538.06	-888.37	-10660450.02				
	M_z	8.45	101402.58	1086.65	13039854.26				
Extreme Event I (EQ Case B)	H_z	-3.60	-3600.00	-3.60	-3600.00				
	H_x	-207.13	-207126.70	-188.82	-188819.93				
	P_y	-1287.45	-1287447.58	-817.87	-817869.91				
	M_x	-16.70	-200340.00	-16.70	-200340.00				
	M_z	960.55	11526600.64	1958.33	23499964.28				
Service I	H_z	-12.70	-12702.02	-12.70	-12702.02				
	H_x	-12.78	-12780.10	-10.85	-10850.77				
	P_y	-1221.44	-1221435.15	-1026.55	-1026553.12				
	M_x	-54.16	-649874.56	-54.16	-649874.56				
	M_z	211.57	2538807.64	2367.98	28415711.00				
Service II	H_z	-9.36	-9360.00	-9.36	-9360.00				
	H_x	-4.74	-4737.59	-2.23	-2229.45				
	P_y	-1331.87	-1331868.30	-1078.52	-1078521.66				
	M_x	-43.41	-520884.00	-43.41	-520884.00				
	M_z	21.97	263646.71	2825.30	33903621.08				

Completed By: PAL
Checked By: NB
Project Name: Pine Point Crossing Over B&M Railroad
Project Location: Scarborough, ME
Date: 6/17/2015
Subject: Pile Loads, Rev 2

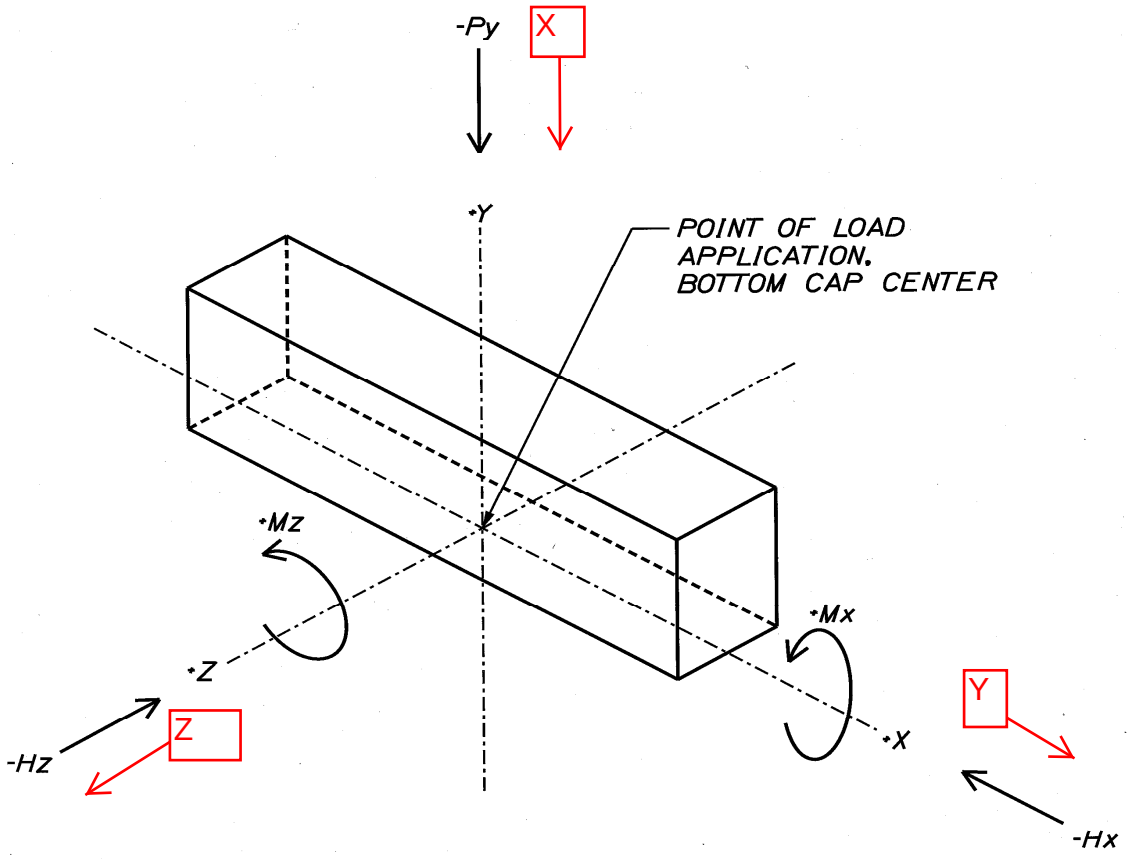
ABUTMENT PILE LOAD SUMMARY

Factored Loads at Bottom of Cap:

		Case 1 (Max Compression)		Case 2 (Min Load Tension Check)		Case 3 (Construction Case With Two Span 1 and Two Span 2 Girders Erected to Maximize Mz and Check Tension)	
Load Combination Limit State	Load	TOTAL (K, K-FT)	TOTAL (LB, LB-IN)	TOTAL (K, K-FT)	TOTAL (LB, LB-IN)	TOTAL (K, K-FT)	TOTAL (LB, LB-IN)
Strength I	H_z	-121.92	-121918.68	-121.92	-121918.68	-106.17	-106168.68
	H_x	-7.97	-7971.90	-3.75	-3751.48	0.00	0.00
	P_y	-1153.55	-1153554.19	-688.26	-688258.53	-320.17	-320171.16
	M_x	-308.67	-3704031.61	-308.67	-3704031.61	-244.09	-2929131.61
	M_z	32.68	392217.52	3205.39	38464662.88	1430.98	17171700.00
Strength II	H_z	-115.89	-115888.68	-115.89	-115888.68	-106.17	-106168.68
	H_x	-4.92	-4919.80	-2.32	-2315.20	0.00	0.00
	P_y	-945.93	-945930.27	-590.55	-590553.16	-242.44	-242435.11
	M_x	-283.95	-3407355.61	-283.95	-3407355.61	-244.09	-2929131.61
	M_z	20.17	242054.24	1978.18	23738191.95	1430.98	17171700.00
Strength III	H_z	-114.08	-114083.26	-114.08	-114083.26	-109.68	-109675.45
	H_x	-20.83	-20827.85	-20.83	-20827.85	-9.23	-9228.34
	P_y	-611.25	-611252.91	-396.76	-396762.88	-320.17	-320171.16
	M_x	-276.54	-3318529.02	-276.54	-3318529.02	-258.47	-3101664.61
	M_z	799.14	9589636.72	799.14	9589636.72	1468.81	17625734.23
Strength IV	H_z	-106.17	-106168.68	-106.17	-106168.68	-106.17	-106168.68
	H_x	0.00	0.00	0.00	0.00	0.00	0.00
	P_y	-711.77	-711769.87	-433.06	-433057.93	-242.44	-242435.11
	M_x	-244.09	-2929131.61	-244.09	-2929131.61	-244.09	-2929131.61
	M_z	0.00	0.00	0.00	0.00	1717.17	20606040.00
Strength V	H_z	-119.91	-119907.77	-119.91	-119907.77	-107.17	-107170.62
	H_x	-15.27	-15265.06	-12.66	-12660.46	-2.64	-2636.67
	P_y	-945.93	-945930.27	-590.55	-590553.16	-320.17	-320171.16
	M_x	-300.42	-3605094.72	-300.42	-3605094.72	-248.20	-2978426.75
	M_z	266.51	3198157.23	2224.52	26694294.93	1441.79	17301424.07
Extreme Event I (EQ Case A)	H_z	-230.05	-230048.75	-203.75	-203749.90		
	H_x	-1.82	-1822.15	-0.86	-857.48		
	P_y	-742.27	-742271.05	-491.39	-491389.50		
	M_x	-720.26	-8643083.86	-644.18	-7730127.73		
	M_z	7.47	89649.72	732.66	8791922.94		
Extreme Event I (EQ Case B)	H_z	-127.40	-127396.47	-109.77	-109768.68		
	H_x	-104.47	-104474.42	-94.84	-94838.70		
	P_y	-742.27	-742271.05	-491.39	-491389.50		
	M_x	-299.38	-3592591.99	-258.85	-3106251.61		
	M_z	428.35	5140141.58	1117.98	13415799.07		
Service I	H_z	-81.43	-81432.88	-81.43	-81432.88		
	H_x	-12.50	-12501.85	-10.57	-10572.52		
	P_y	-725.57	-725573.69	-594.33	-594327.67		
	M_x	-202.47	-2429650.07	-202.47	-2429650.07		
	M_z	204.20	2450428.37	1654.58	19854974.82		
Service II	H_z	-80.14	-80139.12	-80.14	-80139.12		
	H_x	-4.74	-4737.59	-2.23	-2229.45		
	P_y	-799.95	-799946.43	-629.33	-629326.61		
	M_x	-197.17	-2365997.06	-197.17	-2365997.06		
	M_z	19.42	233089.27	1904.92	22858999.65		

Completed By: PAL
Checked By: NB
Project Name: Pine Point Crossing Over B&M Railroad
Project Location: Scarborough, ME
Date: 6/17/2015
Subject: Pile Loads, Rev 2

LOAD AND AXIS ORIENTATION



Appendix G – Calculations

Purpose: Perform lateral, axial, and settlement calculations for the Pier of the Pine Point Crossing over B&M Railroad in Scarborough, ME.

References:
1) AASHTO LRFD Bridge Design Specifications, 7th Edition, 2014
2) Computer Program Driven, Version 2001, by FWHA
3) Computer Program L-Pile User's Manual, Version 2015, by Ensoft, INC.
4) Computer Program Group User's Manual, Version 2014, by Ensoft, INC.
5) Sketch Plans received via email on 6/16/2015
6) MaineDOT Bridge Design Manual, 2003, revised through 2008

Given:
1) Loads provided by CHA via email on 6/17/2015
2) Loads are applied at bottom of pile cap, see email from CHA dated 6/17/2015
3) Weight of pile cap was included in loads
4) Fixed head condition between piles and pile cap based on phone call with CHA
5) Only certain load cases were run, see load sheet provided by CHA
6) Bottom of the Pier pile cap ranges from El. 38.34 to El. 39.61 ft (NAVD 88) from Reference No. 5
7) Pile cap dimensions of 39.5' x 5' x 4.5' from Reference No. 5
8) 24" concrete filled pipe piles (Closed Ended) to be used, per discussion with CHA dated 4/8/2015
9) The proposed bridge is non-essential/non-critical
10) 40' of Pipe Pile contain 16#8 bars, per Reference No. 5

Assumptions:
1) Groundwater Table at ground surface
2) Geotechnical Axial Resistance Factor of 0.45 (Table 10.5.5.2.3-1 of Reference No. 1), Field Confirmation of Hammer Performance Required
3) No corrosion

Solution:

Step 1: Soil Properties and Profile

A subsurface profile for the pier location was developed using boring data collected by Nobis, see Borings BB-SBMR-103 and BB-SBMR-202. Elevations and depths for lateral analyses were based on Boring BB-SBMR-103. Depths listed below were taken from bottom of pile cap (Average Elevation 39 ft.). Soil unit weight (γ_{moist}) and soil friction angle (ϕ) were estimated based on SPT-N Values. The soil modulus parameter (k) was determined using Table 3.7 from Reference No. 4. Uniaxial Compressive Strength was taken from lab data.

Soil Layer	Elevation (ft)	Depth (ft)	γ_{moist} (pcf)	ϕ (°)	k (pci)	U.C.S. (ksi)	ε_{50} or k_rm (dims)
Fill	15 to 9	24 to 30	115	28	20	-	-
Silty Sand	9 to -5	30 to 44	125	32	60	-	-
Glacial Till	-5 to -25	44 to 64	135	37	125	-	-
Bedrock	<-25	>64	170	-	-	10300	-

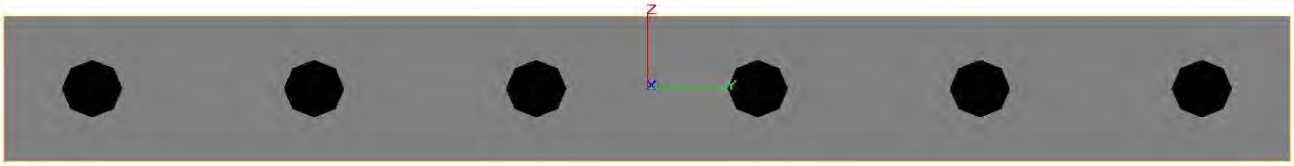
Relative Density	Loose	Medium	Dense
Submerged Sand	20 lb/in^3	60 lb/in^3	125 lb/in^3
	5,430 kN/m^3	16,300 kN/m^3	33,900 kN/m^3
Sand Above WT	25 lb/in^3	90 lb/in^3	225 lb/in^3
	6,790 kN/m^3	24,430 kN/m^3	61,000 kN/m^3

Table 3.7 Soil-Modulus Parameter k for Sands

Step 2: Pile and Pile Cap Properties

Pile:		
Section Diameter (outside):	24	in
Shell Thickness:	0.625	in
Yield Stress of Pipe Pile:	45	ksi
Elastic modulus of Pipe Pile:	29000	ksi
Concrete Compressive Strength:	4	ksi
Reinforcement:	16#8	bars (Only in first 40')

Pile Cap:	6 piles, 6 x 1. See graphic below	
Cap Length in Y-axis (Transverse):	39.5	ft
Cap Width in Z-axis (Longitudinal):	5	ft
Cap Thickness in X-axis (Vertical):	4.5	ft
Center to cap edge spacing Z-axis:	2.7	ft
Center-to-center spacing in Y-axis :	6.8	ft
Center to cap edge spacing Y-axis:	2.5	ft



Group Graphic of Pile Cap with Piles

Step 3: Lateral Analysis

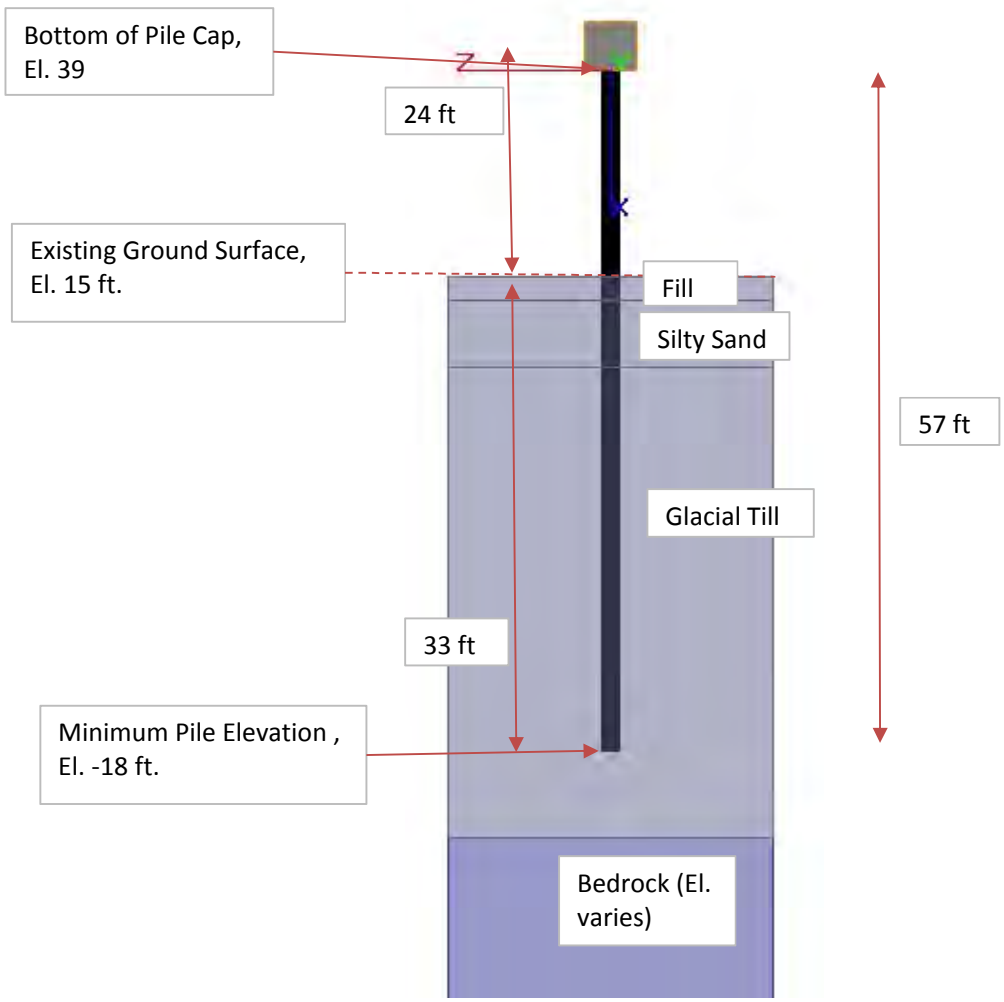
The Computer Program Group, version 2014 by Ensoft, INC. was used for the lateral analysis. Fixed-head condition from the piles to the pile cap was applied. A total of 14 load cases were analyzed: Strength I (case 1 and 2), Strength III (case 1 to 4), Strength IV (case 3 and 4), Service I (case 1 and 2), Extreme IA (case 1 and 2), and Extreme IB (case 1 and 2). For lateral deflection, only the service cases were considered, and for moment and shear, all load cases were considered. Non-linear EI was assumed and calculated using L-Pile, version 2015 by Ensoft, INC. Please see attached graphs for lateral deflection, moment, and shear. Structural enginner shall evaluate the adequacy of the piles.

Step 4: Axial and Settlement Analysis

The Computer Program Driven, version 2001 by FHWA was used for the axial analysis. Due to lateral loading and moments, the total axial load will not be distributed evenly to the piles. As such, some piles will experience higher axial load than others. Strength I (case 1) load condition was considered in the axial analysis as this gave the maximum axial load on an individual pile in the Lateral Analysis. See attached graph for Axial Resistance. The equation for elastic shortening was used to calculate settlement. Soil layers taken from BB-SBMR-202, as the bedrock was much deeper than in BB-SBMR-103. The piles will be bearing on glacial till or bedrock.

Maximum Axial Load on an Individual Pile = 330 Kips (Taken from Group Output)
Resistance Factor of 0.45 was assumed from Table 10.5.5.2.3-1 of Reference No. 1.

322 Kips / 0.45 ========> 716 Kips ===== From Driven Graph =========> 33 ft



N.T.S.

Settlement = $\frac{PL}{AE}$ ======> $\frac{(322 \text{ kips}) * (57 \text{ ft})}{(3.14 \text{ ft}^2) * (1282081 \text{ ksf})}$ =========> **0.0046 ft or 0.05 inches**

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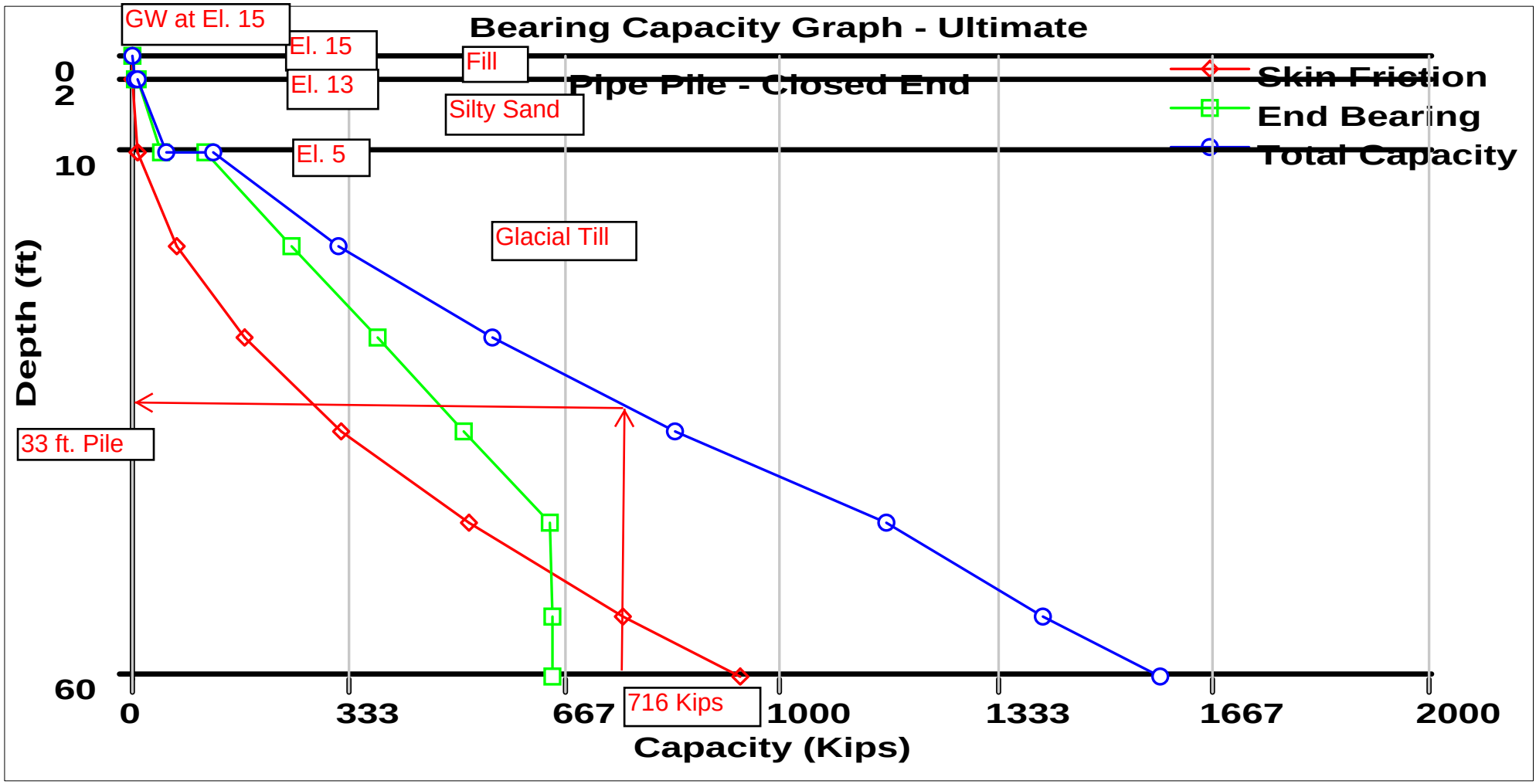


Based on Boring BB-SBMR-202 (Deepest Bedrock)

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: C:\DOCUME~1\XPMUSER\MYDOCU~1\SCMEPIE.DVN
Project Name: Pine Point Bridge, ME Project Date: 05/07/2015
Project Client: CHA
Computed By: Rob Clopper
Project Manager: Greg Mischel

PILE INFORMATION

Pile Type: Pipe Pile - Closed End
Top of Pile: 0.00 ft
Diameter of Pile: 24.00 in

ULTIMATE CONSIDERATIONS

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

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	2.50 ft	0.00%	115.00 pcf	28.0/28.0	Nordlund
2	Cohesionless	7.00 ft	0.00%	125.00 pcf	32.0/32.0	Nordlund
3	Cohesionless	51.00 ft	0.00%	135.00 pcf	37.0/37.0	Nordlund

RESTRIKE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.26 psf	22.34	N/A	0.00 Kips
2.49 ft	Cohesionless	65.49 psf	22.34	N/A	0.42 Kips
2.51 ft	Cohesionless	131.81 psf	25.54	N/A	0.43 Kips
9.49 ft	Cohesionless	350.29 psf	25.54	N/A	10.27 Kips
9.51 ft	Cohesionless	570.06 psf	29.53	N/A	10.34 Kips
18.51 ft	Cohesionless	896.76 psf	29.53	N/A	71.03 Kips
27.51 ft	Cohesionless	1223.46 psf	29.53	N/A	175.92 Kips
36.51 ft	Cohesionless	1550.16 psf	29.53	N/A	325.02 Kips
45.51 ft	Cohesionless	1876.86 psf	29.53	N/A	518.32 Kips
54.51 ft	Cohesionless	2203.56 psf	29.53	N/A	755.83 Kips
60.49 ft	Cohesionless	2420.64 psf	29.53	N/A	938.08 Kips

RESTRIKE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.53 psf	22.80	41.85 Kips	0.02 Kips
2.49 ft	Cohesionless	130.97 psf	22.80	41.85 Kips	5.03 Kips
2.51 ft	Cohesionless	132.13 psf	40.40	103.67 Kips	10.49 Kips
9.49 ft	Cohesionless	569.07 psf	40.40	103.67 Kips	45.19 Kips
9.51 ft	Cohesionless	570.43 psf	91.20	647.29 Kips	115.63 Kips
18.51 ft	Cohesionless	1223.83 psf	91.20	647.29 Kips	248.08 Kips
27.51 ft	Cohesionless	1877.23 psf	91.20	647.29 Kips	380.53 Kips
36.51 ft	Cohesionless	2530.63 psf	91.20	647.29 Kips	512.98 Kips
45.51 ft	Cohesionless	3184.03 psf	91.20	647.29 Kips	645.43 Kips
54.51 ft	Cohesionless	3837.43 psf	91.20	647.29 Kips	647.29 Kips
60.49 ft	Cohesionless	4271.57 psf	91.20	647.29 Kips	647.29 Kips

RESTRIKE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
2.49 ft	0.42 Kips	5.03 Kips	5.45 Kips
2.51 ft	0.43 Kips	10.49 Kips	10.92 Kips
9.49 ft	10.27 Kips	45.19 Kips	55.46 Kips
9.51 ft	10.34 Kips	115.63 Kips	125.97 Kips
18.51 ft	71.03 Kips	248.08 Kips	319.11 Kips
27.51 ft	175.92 Kips	380.53 Kips	556.45 Kips
36.51 ft	325.02 Kips	512.98 Kips	838.00 Kips
45.51 ft	518.32 Kips	645.43 Kips	1163.75 Kips
54.51 ft	755.83 Kips	647.29 Kips	1403.12 Kips
60.49 ft	938.08 Kips	647.29 Kips	1585.37 Kips

DRIVING - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.26 psf	22.34	N/A	0.00 Kips
2.49 ft	Cohesionless	65.49 psf	22.34	N/A	0.42 Kips
2.51 ft	Cohesionless	131.81 psf	25.54	N/A	0.43 Kips
9.49 ft	Cohesionless	350.29 psf	25.54	N/A	10.27 Kips
9.51 ft	Cohesionless	570.06 psf	29.53	N/A	10.34 Kips
18.51 ft	Cohesionless	896.76 psf	29.53	N/A	71.03 Kips
27.51 ft	Cohesionless	1223.46 psf	29.53	N/A	175.92 Kips
36.51 ft	Cohesionless	1550.16 psf	29.53	N/A	325.02 Kips
45.51 ft	Cohesionless	1876.86 psf	29.53	N/A	518.32 Kips
54.51 ft	Cohesionless	2203.56 psf	29.53	N/A	755.83 Kips
60.49 ft	Cohesionless	2420.64 psf	29.53	N/A	938.08 Kips

DRIVING - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.53 psf	22.80	41.85 Kips	0.02 Kips
2.49 ft	Cohesionless	130.97 psf	22.80	41.85 Kips	5.03 Kips
2.51 ft	Cohesionless	132.13 psf	40.40	103.67 Kips	10.49 Kips
9.49 ft	Cohesionless	569.07 psf	40.40	103.67 Kips	45.19 Kips
9.51 ft	Cohesionless	570.43 psf	91.20	647.29 Kips	115.63 Kips
18.51 ft	Cohesionless	1223.83 psf	91.20	647.29 Kips	248.08 Kips
27.51 ft	Cohesionless	1877.23 psf	91.20	647.29 Kips	380.53 Kips
36.51 ft	Cohesionless	2530.63 psf	91.20	647.29 Kips	512.98 Kips
45.51 ft	Cohesionless	3184.03 psf	91.20	647.29 Kips	645.43 Kips
54.51 ft	Cohesionless	3837.43 psf	91.20	647.29 Kips	647.29 Kips
60.49 ft	Cohesionless	4271.57 psf	91.20	647.29 Kips	647.29 Kips

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
2.49 ft	0.42 Kips	5.03 Kips	5.45 Kips
2.51 ft	0.43 Kips	10.49 Kips	10.92 Kips
9.49 ft	10.27 Kips	45.19 Kips	55.46 Kips
9.51 ft	10.34 Kips	115.63 Kips	125.97 Kips
18.51 ft	71.03 Kips	248.08 Kips	319.11 Kips
27.51 ft	175.92 Kips	380.53 Kips	556.45 Kips
36.51 ft	325.02 Kips	512.98 Kips	838.00 Kips
45.51 ft	518.32 Kips	645.43 Kips	1163.75 Kips
54.51 ft	755.83 Kips	647.29 Kips	1403.12 Kips
60.49 ft	938.08 Kips	647.29 Kips	1585.37 Kips

ULTIMATE - SKIN FRICTION

Depth	Soil Type	Effective Stress At Midpoint	Sliding Friction Angle	Adhesion	Skin Friction
0.01 ft	Cohesionless	0.26 psf	22.34	N/A	0.00 Kips
2.49 ft	Cohesionless	65.49 psf	22.34	N/A	0.42 Kips
2.51 ft	Cohesionless	131.81 psf	25.54	N/A	0.43 Kips
9.49 ft	Cohesionless	350.29 psf	25.54	N/A	10.27 Kips
9.51 ft	Cohesionless	570.06 psf	29.53	N/A	10.34 Kips
18.51 ft	Cohesionless	896.76 psf	29.53	N/A	71.03 Kips
27.51 ft	Cohesionless	1223.46 psf	29.53	N/A	175.92 Kips
36.51 ft	Cohesionless	1550.16 psf	29.53	N/A	325.02 Kips
45.51 ft	Cohesionless	1876.86 psf	29.53	N/A	518.32 Kips
54.51 ft	Cohesionless	2203.56 psf	29.53	N/A	755.83 Kips
60.49 ft	Cohesionless	2420.64 psf	29.53	N/A	938.08 Kips

ULTIMATE - END BEARING

Depth	Soil Type	Effective Stress At Tip	Bearing Cap. Factor	Limiting End Bearing	End Bearing
0.01 ft	Cohesionless	0.53 psf	22.80	41.85 Kips	0.02 Kips
2.49 ft	Cohesionless	130.97 psf	22.80	41.85 Kips	5.03 Kips
2.51 ft	Cohesionless	132.13 psf	40.40	103.67 Kips	10.49 Kips
9.49 ft	Cohesionless	569.07 psf	40.40	103.67 Kips	45.19 Kips
9.51 ft	Cohesionless	570.43 psf	91.20	647.29 Kips	115.63 Kips
18.51 ft	Cohesionless	1223.83 psf	91.20	647.29 Kips	248.08 Kips
27.51 ft	Cohesionless	1877.23 psf	91.20	647.29 Kips	380.53 Kips
36.51 ft	Cohesionless	2530.63 psf	91.20	647.29 Kips	512.98 Kips
45.51 ft	Cohesionless	3184.03 psf	91.20	647.29 Kips	645.43 Kips
54.51 ft	Cohesionless	3837.43 psf	91.20	647.29 Kips	647.29 Kips
60.49 ft	Cohesionless	4271.57 psf	91.20	647.29 Kips	647.29 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
2.49 ft	0.42 Kips	5.03 Kips	5.45 Kips
2.51 ft	0.43 Kips	10.49 Kips	10.92 Kips
9.49 ft	10.27 Kips	45.19 Kips	55.46 Kips
9.51 ft	10.34 Kips	115.63 Kips	125.97 Kips
18.51 ft	71.03 Kips	248.08 Kips	319.11 Kips
27.51 ft	175.92 Kips	380.53 Kips	556.45 Kips
36.51 ft	325.02 Kips	512.98 Kips	838.00 Kips
45.51 ft	518.32 Kips	645.43 Kips	1163.75 Kips
54.51 ft	755.83 Kips	647.29 Kips	1403.12 Kips
60.49 ft	938.08 Kips	647.29 Kips	1585.37 Kips

Section: Pipe Pile w/ 16#8 reinforcement

Inputs:

Diameter of Pile:	24	in
Logitudinal Steel:	3.11	% (rebar only, do not include casing)
Casing Thickness:	0.625	in
f_y (casing):	45000	psi
f'_c (concrete):	4000	psi
$EI_{composite}$:	1.55E+11	lb-in^2 (from EI vs BM graph from L-Pile)

Calculations: **Geometry:**

$A_{casing(STEEL)}$:	45.9	in^2
$A_{rebar(STEEL)}$:	12.6	in^2
A_{STEEL} :	58.5	in^2
$A_{concrete}$:	393.9	in^2
S_{STEEL} :	261.4	**in^3**
$S_{concrete}$:	n/a	
A_{total} :	**452.4**	**in^2**
$S_{composite}$:	**261.4**	**in^3**
I_{total} :	**16,286**	**in^4**
J_{total} :	**32,572**	**in^4**

Modulus of Elasticity/Rigidity:

E_{STEEL} :	29,000,000	psi
$E_{concrete}$:	3,604,997	psi
$E_{composite}$:	**9,517,367**	**psi (To be used in GROUP Analysis)**
G_{STEEL} :	11,500,000	psi
$G_{concrete}$:	1,540,597	psi
$G_{composite}$:	**2,829,331**	**psi (To be used in GROUP Analysis)**

Section: Pipe Pile w/o reinforcement

Inputs:

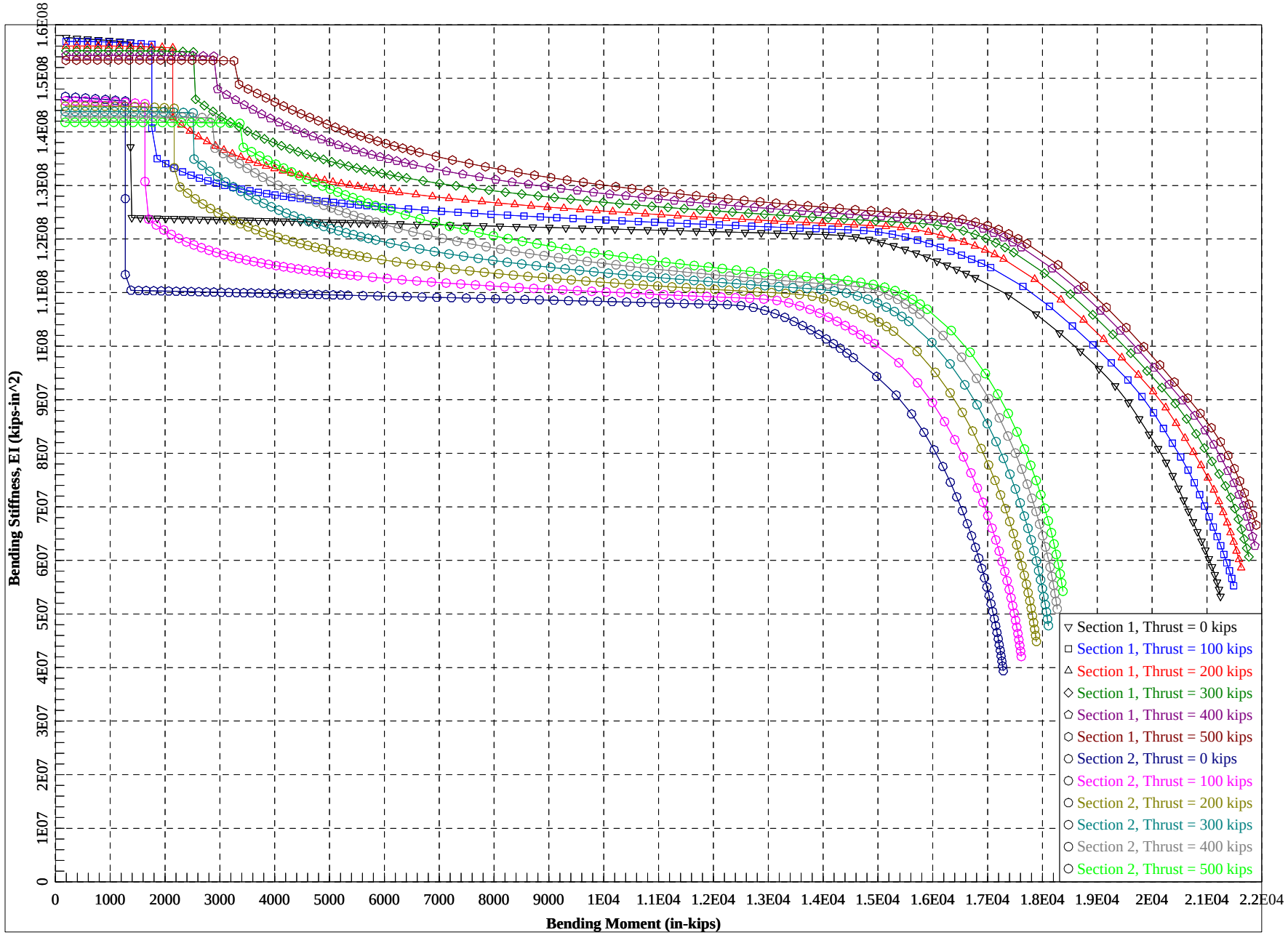
Diameter of Pile:	24	in
Logitudinal Steel:	0	% (rebar only, do not include casing)
Casing Thickness:	0.625	in
f_y (casing):	45000	psi
f'_c (concrete):	4000	psi
$EI_{composite}$:	1.45E+11	lb-in^2 (from EI vs BM graph from L-Pile)

Calculations: **Geometry:**

$A_{casing(STEEL)}$:	45.9	in^2
$A_{rebar(STEEL)}$:	0.0	in^2
A_{STEEL} :	45.9	in^2
$A_{concrete}$:	406.5	in^2
S_{STEEL} :	261.4	**in^3**
$S_{concrete}$:	n/a	
A_{total} :	**452.4**	**in^2**
$S_{composite}$:	**261.4**	**in^3**
I_{total} :	**16,286**	**in^4**
J_{total} :	**32,572**	**in^4**

Modulus of Elasticity/Rigidity:

E_{STEEL} :	29,000,000	psi
$E_{concrete}$:	3,604,997	psi
$E_{composite}$:	**8,903,344**	**psi (To be used in GROUP Analysis)**
G_{STEEL} :	11,500,000	psi
$G_{concrete}$:	1,540,597	psi
$G_{composite}$:	**2,551,018**	**psi (To be used in GROUP Analysis)**


Bending Stiffness, EI (kips-in^2)
0
1E07
2E07
3E07
4E07
5E07
6E07
7E07
8E07
9E07
1E08
1.1E08
1.2E08
1.3E08
1.4E08
1.5E08
1.6E08
Bending Moment (in-kips)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
1E04
1.1E04
1.2E04
1.3E04
1.4E04
1.5E04
1.6E04
1.7E04
1.8E04
1.9E04
2E04
2.1E04
2.2E04
Section 1, Thrust = 0 kips
Section 1, Thrust = 100 kips
Section 1, Thrust = 200 kips
Section 1, Thrust = 300 kips
Section 1, Thrust = 400 kips
Section 1, Thrust = 500 kips
Section 2, Thrust = 0 kips
Section 2, Thrust = 100 kips
Section 2, Thrust = 200 kips
Section 2, Thrust = 300 kips
Section 2, Thrust = 400 kips
Section 2, Thrust = 500 kips

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LPile Plus for Windows, Version 2013-07.007

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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Files Used for Analysis

Path to file locations: O:\Active\85970.01 - Pine Crossing over BM RR Scarborough ME\Geotechnical\Calculations\Pier\24 in Pipe with .625 casing, 16#8 (6 x 1)\Nonlinear EI\
Name of input data file: Non-Linear EI.lp7d
Name of output report file: Non-Linear EI.lp7o
Name of plot output file: Non-Linear EI.lp7p
Name of runtime messeage file: Non-Linear EI.lp7r

Date and Time of Analysis

Date: June 18, 2015 Time: 9:32:35

Problem Title

Project Name: 24" Pipe Pile W/ 0.625" Casing, 16#8 bars

Job Number: 85970.01 (Pine Point)

Client: CHA

Engineer: Rob Clopper

Description: Non-Linear EI Only

Program Options and Settings

Engineering Units of Input Data and Computations:
- Engineering units are US Customary Units (pounds, feet, inches)

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

Loading Type and Number of Cycles of Loading:
- Static loading specified

Computational Options:
- Use unfactored loads in computations (conventional analysis)
- Compute nonlinear bending properties of pile only
- Use of p-y modification factors for p-y curves not selected
- Loading by lateral soil movements acting on pile not selected

- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- No p-y curves to be computed and reported for user-specified depths
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total number of pile sections = 2

Total length of pile = 100.00 ft

Depth of ground surface below top of pile = 0.00 ft

Pile diameter values used for p-y curve computations are defined using 4 points.

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

Point	Depth X ft	Pile Diameter in
1	0.00000	24.0000000
2	50.000000	24.0000000
3	50.000000	24.0000000
4	100.000000	24.0000000

Input Structural Properties:

Pile Section No. 1:

Section Type = Drilled Shaft with Permanent Casing
Section Length = 50.00000 ft
Section Diameter = 24.00000 in

Pile Section No. 2:

Section Type = Drilled Shaft with Permanent Casing
Section Length = 50.00000 ft
Section Diameter = 24.00000 in

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Permanent Casing:

Length of Section = 50.00000 ft
Outer Diameter of Casing = 24.00000 in
Concrete Cover Thickness Inside Casing = 2.50000 in
Casing Wall Thickness = 0.62500 in
Moment of Inertia of Steel Casing = 3136.93223 in^4
Yield Stress of Casing = 45000. psi
Elastic Modulus of Casing = 29000000. psi
Number of Reinforcing Bars = 16 bars
Area of Single Reinforcing Bar = 0.79000 sq. in.
Edge-to-Edge Bar Spacing = 2.26776 in
Maximum Concrete Aggregate Size = 0.25000 in
Ratio of Bar Spacing to Aggregate Size = 9.07
Offset of Center of Rebar Cage from Center of Pile = 0.0000 in
Yield Stress of Reinforcing Bars = 60000. psi
Modulus of Elasticity of Reinforcing Bars = 29000000. psi
Gross Area of Pile = 452.38934 sq. in.
Area of Concrete = 393.85264 sq. in.
Cross-sectional Area of Steel Casing = 45.89671 sq. in.

Non-Linear EI

Area of All Steel (Casing and Bars) = 58.53671 sq. in.
Area Ratio of All Steel to Gross Area of Pile = 12.94 percent

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 4162.851 kips
Tensile Load for Cracking of Concrete = -359.656 kips
Nominal Axial Tensile Capacity = -2823.752 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.00000	0.79000	8.37500	0.00000
2	1.00000	0.79000	7.73749	3.20497
3	1.00000	0.79000	5.92202	5.92202
4	1.00000	0.79000	3.20497	7.73749
5	1.00000	0.79000	0.00000	8.37500
6	1.00000	0.79000	-3.20497	7.73749
7	1.00000	0.79000	-5.92202	5.92202
8	1.00000	0.79000	-7.73749	3.20497
9	1.00000	0.79000	-8.37500	0.00000
10	1.00000	0.79000	-7.73749	-3.20497
11	1.00000	0.79000	-5.92202	-5.92202
12	1.00000	0.79000	-3.20497	-7.73749
13	1.00000	0.79000	0.00000	-8.37500
14	1.00000	0.79000	3.20497	-7.73749
15	1.00000	0.79000	5.92202	-5.92202
16	1.00000	0.79000	7.73749	-3.20497

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

Minimum spacing between any two bars not equal to zero = 2.26776 inches between Bars 11 and 12

Concrete Properties:

Compressive Strength of Concrete = 4000.00000 psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34164 psi
Compression Strain at Peak Stress = 0.00189
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.0000 in

Input Axial Thrust Forces:

Number of Axial Thrust Force Values Determined from Input Data = 6

Number	Axial Thrust Force kips
1	0.000
2	100.000
3	200.000
4	300.000
5	400.000
6	500.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending	Bending	Bending	Depth to	Max Comp	Max Tens	Max Concrete	Max Steel

Max Curvature rad/in.	Run Moment in-kip	Stiffness kip-in2	N Axis in	Strain in/in	Strain in/in	Stress ksi	Stress ksi	Stress ksi	Msg
0.000001250	197.0042305	157603384.	12.0001363	0.0000150	-0.0000150	0.0627342	0.4306549	0.4306549	
0.000002500	393.6626538	157465062.	12.0001366	0.0000300	-0.0000300	0.1249726	0.8613099	0.8613099	
0.000003750	589.9752700	157326739.	12.0001369	0.0000450	-0.0000450	0.1867151	1.2919649	1.2919649	
0.000005000	785.9420790	157188416.	12.0001372	0.0000600	-0.0000600	0.2479618	1.7226199	1.7226199	
0.000006250	981.5630809	157050093.	12.0001375	0.0000750	-0.0000750	0.3087126	2.1532749	2.1532749	
0.000007500	1176.8382755	156911770.	12.0001378	0.0000900	-0.0000900	0.3689676	2.5839299	2.5839299	
0.000008750	1371.7676631	156773447.	12.0001381	0.0001050	-0.0001050	0.4287268	3.0145850	3.0145850	
0.0000100	1371.7676631	137176766.	10.3818080	0.0001038	-0.0001362	0.4233824	-3.9144756	-3.9144756	C
0.0000113	1394.7032929	123973626.	10.3840555	0.0001168	-0.0001532	0.4747410	-4.4030519	-4.4030519	C
0.0000125	1549.2287219	123938298.	10.3863065	0.0001298	-0.0001702	0.5257507	-4.8914639	-4.8914639	C
0.0000138	1703.6651687	123902921.	10.3885611	0.0001428	-0.0001872	0.5764108	-5.3797112	-5.3797112	C
0.0000150	1858.0124507	123867497.	10.3908192	0.0001559	-0.0002041	0.6267211	-5.8677936	-5.8677936	C
0.0000163	2012.2703846	123832024.	10.3930809	0.0001689	-0.0002211	0.6766810	-6.3557106	-6.3557106	C
0.0000175	2166.4387864	123796502.	10.3953462	0.0001819	-0.0002381	0.7262901	-6.8434618	-6.8434618	C
0.0000188	2320.5174714	123760932.	10.3976150	0.0001950	-0.0002550	0.7755480	-7.3310468	-7.3310468	C
0.0000200	2474.5062541	123725313.	10.3998875	0.0002080	-0.0002720	0.8244542	-7.8184652	-7.8184652	C
0.0000213	2628.4049483	123689645.	10.4021636	0.0002210	-0.0002890	0.8730082	-8.3057166	-8.3057166	C
0.0000225	2782.2133670	123653927.	10.4044433	0.0002341	-0.0003059	0.9212097	-8.7928007	-8.7928007	C
0.0000238	2935.9313225	123618161.	10.4067267	0.0002472	-0.0003228	0.9690581	-9.2797169	-9.2797169	C
0.0000250	3089.5586263	123582345.	10.4090137	0.0002602	-0.0003398	1.0165530	-9.7664650	-9.7664650	C
0.0000263	3243.0950892	123546480.	10.4113044	0.0002733	-0.0003567	1.0636940	-10.2530444	-10.2530444	C
0.0000275	3396.5405213	123510564.	10.4135988	0.0002864	-0.0003736	1.1104806	-10.7394549	-10.7394549	C
0.0000288	3549.8947317	123474599.	10.4158968	0.0002995	-0.0003905	1.1569124	-11.2256959	-11.2256959	C
0.0000300	3703.1575289	123438584.	10.4181986	0.0003125	-0.0004075	1.2029888	-11.7117672	-11.7117672	C
0.0000313	3856.3287207	123402519.	10.4205041	0.0003256	-0.0004244	1.2487095	-12.1976681	-12.1976681	C
0.0000325	4009.4081138	123366404.	10.4228132	0.0003387	-0.0004413	1.2940739	-12.6833984	-12.6833984	C
0.0000338	4162.3955146	123330237.	10.4251262	0.0003518	-0.0004582	1.3390816	-13.1689577	-13.1689577	C
0.0000350	4315.2907282	123294021.	10.4274428	0.0003650	-0.0004750	1.3837321	-13.6543454	-13.6543454	C
0.0000363	4468.0935593	123257753.	10.4297633	0.0003781	-0.0004919	1.4280250	-14.1395613	-14.1395613	C
0.0000375	4620.8038115	123221435.	10.4320875	0.0003912	-0.0005088	1.4719598	-14.6246048	-14.6246048	C
0.0000388	4773.4212878	123185065.	10.4344155	0.0004043	-0.0005257	1.5155360	-15.1094755	-15.1094755	C
0.0000400	4925.9457904	123148645.	10.4367473	0.0004175	-0.0005425	1.5587532	-15.5941731	-15.5941731	C
0.0000413	5078.3771205	123112173.	10.4390829	0.0004306	-0.0005594	1.6016109	-16.0786970	-16.0786970	C
0.0000425	5230.7151926	123075652.	10.4414084	0.0004438	-0.0005762	1.6441066	-16.5630641	-16.5630641	C
0.0000438	5382.9597857	123039081.	10.4437286	0.0004569	-0.0005931	1.6862404	-17.0472693	-17.0472693	C
0.0000450	5535.1106433	123002459.	10.4460525	0.0004701	-0.0006099	1.7280132	-17.5313013	-17.5313013	C
0.0000463	5687.1675628	122965785.	10.4483803	0.0004832	-0.0006268	1.7694244	-18.0151598	-18.0151598	C
0.0000475	5839.1303434	122929060.	10.4507119	0.0004964	-0.0006436	1.8104736	-18.4988443	-18.4988443	C
0.0000488	5990.9987837	122892283.	10.4530473	0.0005096	-0.0006604	1.8511602	-18.9823543	-18.9823543	C

0.0000513	6294.4518213	122818572.	10.4577295	0.0005360	-0.0006940	1.9314439	-19.9488495	-19.9488495 C
0.0000538	6597.5250683	122744652.	10.4624272	0.0005624	-0.0007276	2.0102717	-20.9146416	-20.9146416 C
0.0000563	6900.2168714	122670522.	10.4671404	0.0005888	-0.0007612	2.0876396	-21.8797272	-21.8797272 C
0.0000588	7202.5255740	122596180.	10.4718692	0.0006152	-0.0007948	2.1635438	-22.8441029	-22.8441029 C
0.0000613	7504.4495058	122521625.	10.4766137	0.0006417	-0.0008283	2.2379802	-23.8077650	-23.8077650 C
0.0000638	7805.9869820	122446855.	10.4813740	0.0006682	-0.0008618	2.3109448	-24.7707098	-24.7707098 C
0.0000663	8107.1363039	122371869.	10.4861503	0.0006947	-0.0008953	2.3824336	-25.7329338	-25.7329338 C
0.0000688	8407.8957580	122296666.	10.4909426	0.0007213	-0.0009287	2.4524426	-26.6944332	-26.6944332 C
0.0000713	8708.2636164	122221244.	10.4957511	0.0007478	-0.0009622	2.5209676	-27.6552044	-27.6552044 C
0.0000738	9008.2381363	122145602.	10.5005758	0.0007744	-0.0009956	2.5880046	-28.6152435	-28.6152435 C
0.0000763	9307.8175599	122069738.	10.5054169	0.0008010	-0.0010290	2.6535493	-29.5745469	-29.5745469 C
0.0000788	9607.0001141	121993652.	10.5102746	0.0008277	-0.0010623	2.7175977	-30.5331106	-30.5331106 C
0.0000813	9905.7840104	121917342.	10.5151488	0.0008544	-0.0010956	2.7801454	-31.4909309	-31.4909309 C
0.0000838	10204.	121840805.	10.5200397	0.0008811	-0.0011289	2.8411882	-32.4480037	-32.4480037 C
0.0000863	10502.	121764042.	10.5249475	0.0009078	-0.0011622	2.9007218	-33.4043253	-33.4043253 C
0.0000888	10800.	121687049.	10.5298722	0.0009345	-0.0011955	2.9587420	-34.3598916	-34.3598916 C
0.0000913	11097.	121609827.	10.5348140	0.0009613	-0.0012287	3.0152442	-35.3146986	-35.3146986 C
0.0000938	11394.	121532373.	10.5397730	0.0009881	-0.0012619	3.0702243	-36.2687423	-36.2687423 C
0.0000963	11690.	121454685.	10.5447494	0.0010149	-0.0012951	3.1236777	-37.2220186	-37.2220186 C
0.0000988	11986.	121376763.	10.5497432	0.0010418	-0.0013282	3.1755999	-38.1745233	-38.1745233 C
0.0001013	12281.	121298604.	10.5547545	0.0010687	-0.0013613	3.2259865	-39.1262524	-39.1262524 C
0.0001038	12577.	121220207.	10.5597836	0.0010956	-0.0013944	3.2748330	-40.0772016	-40.0772016 C
0.0001063	12871.	121141571.	10.5648304	0.0011225	-0.0014275	3.3221347	-41.0273666	-41.0273666 C
0.0001088	13166.	121062693.	10.5698953	0.0011495	-0.0014605	3.3678871	-41.9767432	-41.9767432 C
0.0001113	13459.	120983573.	10.5749782	0.0011765	-0.0014935	3.4120855	-42.9253271	-42.9253271 C
0.0001138	13753.	120904209.	10.5800793	0.0012035	-0.0015265	3.4547252	-43.8731138	-43.8731138 C
0.0001163	14046.	120824598.	10.5851988	0.0012305	-0.0015595	3.4958015	-44.8200991	-44.8200991 C
0.0001188	14331.	120679631.	10.5880813	0.0012573	-0.0015927	3.5349224	-45.7740449	-45.0000000 CY
0.0001213	14596.	120378185.	10.5854448	0.0012835	-0.0016265	3.5715554	-46.7469796	-45.0000000 CY
0.0001238	14839.	119909364.	10.5767352	0.0013089	-0.0016611	3.6056680	-47.7420944	-45.0000000 CY
0.0001263	15068.	119348019.	10.5645385	0.0013338	-0.0016962	3.6377487	-48.7512332	-45.0000000 CY
0.0001288	15286.	118723013.	10.5498413	0.0013583	-0.0017317	3.6680006	-49.7714799	-45.0000000 CY
0.0001313	15494.	118051465.	10.5332271	0.0013825	-0.0017675	3.6965541	-50.8011540	-45.0000000 CY
0.0001338	15695.	117345305.	10.5151053	0.0014064	-0.0018036	3.7235065	-51.8390849	-45.0000000 CY
0.0001363	15889.	116613460.	10.4957861	0.0014301	-0.0018399	3.7489361	-52.8843748	-45.0000000 CY
0.0001388	16076.	115862892.	10.4755155	0.0014535	-0.0018765	3.7729082	-53.9362940	-45.0000000 CY
0.0001413	16258.	115099177.	10.4544948	0.0014767	-0.0019133	3.7954790	-54.9942252	-45.0000000 CY
0.0001438	16434.	114326642.	10.4328052	0.0014997	-0.0019503	3.8166860	-56.0579931	-45.0000000 CY
0.0001463	16606.	113545407.	10.4103401	0.0015225	-0.0019875	3.8365424	-57.1281946	-45.0000000 CY
0.0001488	16773.	112759834.	10.3874278	0.0015451	-0.0020249	3.8551165	-58.2035828	-45.0000000 CY
0.0001588	17384.	109503310.	10.3028660	0.0016356	-0.0021744	3.9182014	-60.0000000	45.0000000 CY
0.0001688	17884.	105977270.	10.2429162	0.0017285	-0.0023215	3.9643686	-60.0000000	45.0000000 CY
0.0001788	18312.	102443799.	10.1985891	0.0018230	-0.0024670	3.9919303	-60.0000000	

45.0000000	CY							
0.0001888		18691.	99024937.	10.1632719	0.0019183	-0.0026117	3.9985508	-60.0000000
45.0000000	CY							
0.0001988		19032.	95756816.	10.1341980	0.0020142	-0.0027558	3.9982858	-60.0000000
45.0000000	CY							
0.0002088		19326.	92581925.	10.1059105	0.0021096	-0.0029004	3.9999950	60.0000000
45.0000000	CY							
0.0002188		19567.	89450631.	10.0720691	0.0022033	-0.0030467	3.9993386	60.0000000
45.0000000	CY							
0.0002288		19765.	86404321.	10.0346212	0.0022954	-0.0031946	3.9999924	60.0000000
45.0000000	CY							
0.0002388		19944.	83536076.	10.0009096	0.0023877	-0.0033423	3.9979306	60.0000000
45.0000000	CY							
0.0002488		20110.	80843241.	9.9707496	0.0024802	-0.0034898	3.9987834	60.0000000
45.0000000	CY							
0.0002588		20254.	78277814.	9.9397775	0.0025719	-0.0036381	3.9990866	60.0000000
45.0000000	CY							
0.0002688		20375.	75813197.	9.9058200	0.0026622	-0.0037878	3.9989657	60.0000000
45.0000000	CY							
0.0002788		20478.	73462608.	9.8705320	0.0027514	-0.0039386	3.9983758	60.0000000
45.0000000	CY							
0.0002888		20573.	71249196.	9.8372777	0.0028405	-0.0040895	3.9971208	60.0000000
45.0000000	CY							
0.0002988		20663.	69163180.	9.8069513	0.0029298	-0.0042402	3.9987754	60.0000000
45.0000000	CY							
0.0003088		20746.	67194689.	9.7784414	0.0030191	-0.0043909	3.9997219	60.0000000
45.0000000	CY							
0.0003188		20826.	65336044.	9.7519724	0.0031084	-0.0045416	3.9981941	60.0000000
45.0000000	CY							
0.0003288		20900.	63574949.	9.7284643	0.0031982	-0.0046918	3.9968297	60.0000000
45.0000000	CY							
0.0003388		20970.	61904794.	9.7070772	0.0032883	-0.0048417	3.9995160	60.0000000
45.0000000	CY							
0.0003488		21034.	60313516.	9.6871733	0.0033784	-0.0049916	3.9964341	60.0000000
45.0000000	CY							
0.0003588		21093.	58795671.	9.6690797	0.0034688	-0.0051412	3.9998798	60.0000000
45.0000000	CY							
0.0003688		21143.	57336385.	9.6518359	0.0035591	-0.0052909	3.9968532	60.0000000
45.0000000	CY							
0.0003788		21184.	55931437.	9.6344094	0.0036490	-0.0054410	3.9998923	60.0000000
45.0000000	CY							
0.0003888		21219.	54582123.	9.6181825	0.0037391	-0.0055909	3.9959727	60.0000000
45.0000000	CY							
0.0003988		21248.	53285673.	9.6022633	0.0038289	-0.0057411	3.9995848	60.0000000
45.0000000	CY							

Axial Thrust Force = 100.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	196.0986438	156878915.	35.8521743	0.0000448	0.0000148	0.1871901	1.2952913	1.2952913	
0.000002500	392.2095073	156883803.	23.9341717	0.0000598	-0.000000165	0.2485152	1.7265274	1.7265274	
0.000003750	588.2839463	156875719.	19.9648050	0.0000749	-0.0000151	0.3093937	2.1581226	2.1581226	
0.000005000	784.1521017	156830420.	17.9815079	0.0000899	-0.0000301	0.3698021	2.5899187	2.5899187	
0.000006250	979.7223798	156755581.	16.7920528	0.0001050	-0.0000450	0.4297251	3.0218096	3.0218096	
0.000007500	1174.9668928	156662252.	15.9993215	0.0001200	-0.0000600	0.4891565	3.4537525	3.4537525	
0.000008750	1369.8750966	156557154.	15.4332101	0.0001350	-0.0000750	0.5480935	3.8857271	3.8857271	
0.0000100	1564.4425366	156444254.	15.0087011	0.0001501	-0.0000899	0.6065345	4.3177233	4.3177233	
0.0000113	1758.6671927	156325973.	14.6785773	0.0001651	-0.0001049	0.6644787	4.7497359	4.7497359	
0.0000125	1758.6671927	140693375.	13.5807745	0.0001698	-0.0001302	0.6817901	4.8795307	4.8795307	C
0.0000138	1855.9968013	134981586.	13.3095235	0.0001830	-0.0001470	0.7321862	5.2593225	5.2593225	C
0.0000150	2010.6661563	134044410.	13.0817887	0.0001962	-0.0001638	0.7821001	5.6383781	5.6383781	C
0.0000163	2165.0604626	133234490.	12.8877324	0.0002094	-0.0001806	0.8315466	6.0167939	6.0167939	C
0.0000175	2319.2488164	132528504.	12.7206351	0.0002226	-0.0001974	0.8805602	6.3948224	6.3948224	C

0.0000188	2473.2801097	131908273.	12.5755208	0.0002358	-0.0002142	0.9291711	6.7726895	6.7726895 C
0.0000200	2627.1166850	131355834.	12.4478634	0.0002490	-0.0002310	0.9773499	7.1501608	7.1501608 C
0.0000213	2780.8385222	130862989.	12.3352747	0.0002621	-0.0002479	1.0251517	7.5276631	7.5276631 C
0.0000225	2934.3964039	130417618.	12.2347667	0.0002753	-0.0002647	1.0725374	7.9048854	7.9048854 C
0.0000238	3087.8605641	130015182.	12.1450751	0.0002884	-0.0002816	1.1195630	8.2822705	8.2822705 C
0.0000250	3241.1839263	129647357.	12.0641037	0.0003016	-0.0002984	1.1661855	8.6594753	8.6594753 C
0.0000263	3394.3934881	129310228.	11.9908653	0.0003148	-0.0003152	1.2124297	-9.0506037	-9.0506037 C
0.0000275	3547.5092584	129000337.	11.9244907	0.0003279	-0.0003321	1.2583133	-9.5345186	-9.5345186 C
0.0000288	3700.5179115	128713666.	11.8639475	0.0003411	-0.0003489	1.3038221	-10.0183837	-10.0183837 C
0.0000300	3853.3976117	128446587.	11.8082873	0.0003542	-0.0003658	1.3489332	-10.5023899	-10.5023899 C
0.0000313	4006.1833918	128197869.	11.7572628	0.0003674	-0.0003826	1.3936833	-10.9862305	-10.9862305 C
0.0000325	4158.8750595	127965386.	11.7103394	0.0003806	-0.0003994	1.4380719	-11.4699050	-11.4699050 C
0.0000338	4311.4724219	127747331.	11.6670618	0.0003938	-0.0004162	1.4820986	-11.9534131	-11.9534131 C
0.0000350	4463.9643969	127541840.	11.6269231	0.0004069	-0.0004331	1.5257493	-12.4368729	-12.4368729 C
0.0000363	4616.3400610	127347312.	11.5894857	0.0004201	-0.0004499	1.5690102	-12.9204031	-12.9204031 C
0.0000375	4768.6212271	127163233.	11.5546988	0.0004333	-0.0004667	1.6119087	-13.4037650	-13.4037650 C
0.0000388	4920.8076993	126988586.	11.5223063	0.0004465	-0.0004835	1.6544441	-13.8869582	-13.8869582 C
0.0000400	5072.8992811	126822482.	11.4920841	0.0004597	-0.0005003	1.6966161	-14.3699824	-14.3699824 C
0.0000413	5224.8957750	126664140.	11.4638351	0.0004729	-0.0005171	1.7384241	-14.8528371	-14.8528371 C
0.0000425	5376.7969830	126512870.	11.4373858	0.0004861	-0.0005339	1.7798678	-15.3355219	-15.3355219 C
0.0000438	5528.6027060	126368062.	11.4125819	0.0004993	-0.0005507	1.8209466	-15.8180365	-15.8180365 C
0.0000450	5680.3034845	126228966.	11.3891831	0.0005125	-0.0005675	1.8616455	-16.3005160	-16.3005160 C
0.0000463	5831.8980761	126095094.	11.3670621	0.0005257	-0.0005843	1.9019627	-16.7829779	-16.7829779 C
0.0000475	5983.3969094	125966251.	11.3462306	0.0005389	-0.0006011	1.9419142	-17.2652673	-17.2652673 C
0.0000488	6134.7997816	125842047.	11.3265897	0.0005522	-0.0006178	1.9814997	-17.7473837	-17.7473837 C
0.0000513	6437.3168287	125606182.	11.2905324	0.0005786	-0.0006514	2.0595704	-18.7110961	-18.7110961 C
0.0000538	6739.4475797	125385071.	11.2582763	0.0006051	-0.0006849	2.1361710	-19.6741116	-19.6741116 C
0.0000563	7041.1903840	125176718.	11.2293168	0.0006316	-0.0007184	2.2112975	-20.6364269	-20.6364269 C
0.0000588	7342.5435769	124979465.	11.2032349	0.0006582	-0.0007518	2.2849460	-21.5980384	-21.5980384 C
0.0000613	7643.5054806	124791926.	11.1796802	0.0006848	-0.0007852	2.3571125	-22.5589428	-22.5589428 C
0.0000638	7944.0731349	124612912.	11.1583412	0.0007113	-0.0008187	2.4277903	-23.5191666	-23.5191666 C
0.0000663	8244.2321196	124441240.	11.1388073	0.0007379	-0.0008521	2.4969478	-24.4790163	-24.4790163 C
0.0000688	8543.9955697	124276299.	11.1210569	0.0007646	-0.0008854	2.5646131	-25.4381425	-25.4381425 C
0.0000713	8843.3617403	124117358.	11.1049041	0.0007912	-0.0009188	2.6307824	-26.3965416	-26.3965416 C
0.0000738	9142.3288718	123963781.	11.0901882	0.0008179	-0.0009521	2.6954513	-27.3542098	-27.3542098 C
0.0000763	9440.8951894	123815019.	11.0767694	0.0008446	-0.0009854	2.7586157	-28.3111435	-28.3111435 C
0.0000788	9739.0589032	123670589.	11.0645259	0.0008713	-0.0010187	2.8202714	-29.2673387	-29.2673387 C
0.0000813	10037.	123530068.	11.0533509	0.0008981	-0.0010519	2.8804141	-30.2227937	-30.2227937 C
0.0000838	10334.	123393088.	11.0431503	0.0009249	-0.0010851	2.9390397	-31.1775004	-31.1775004 C
0.0000863	10631.	123259317.	11.0338408	0.0009517	-0.0011183	2.9961437	-32.1314571	-32.1314571 C
0.0000888	10928.	123128465.	11.0253487	0.0009785	-0.0011515	3.0517219	-33.0846599	-33.0846599 C
0.0000913	11224.	123000269.	11.0176084	0.0010054	-0.0011846	3.1057698	-34.0371048	-34.0371048 C
0.0000938	11519.	122874498.	11.0105611	0.0010322	-0.0012178	3.1582831	-34.9887878	

-34.9887878 C							
0.0000963	11815.	122750943.	11.0041543	0.0010591	-0.0012509	3.2092573	-35.9397049
-35.9397049 C							
0.0000988	12110.	122629416.	10.9983408	0.0010861	-0.0012839	3.2586878	-36.8898519
-36.8898519 C							
0.0001013	12404.	122509747.	10.9930781	0.0011130	-0.0013170	3.3065703	-37.8392248
-37.8392248 C							
0.0001038	12698.	122391785.	10.9883277	0.0011400	-0.0013500	3.3529001	-38.7878194
-38.7878194 C							
0.0001063	12992.	122275389.	10.9840548	0.0011671	-0.0013829	3.3976726	-39.7356314
-39.7356314 C							
0.0001088	13285.	122160433.	10.9802278	0.0011941	-0.0014159	3.4408832	-40.6826566
-40.6826566 C							
0.0001113	13578.	122046802.	10.9768181	0.0012212	-0.0014488	3.4825273	-41.6288907
-41.6288907 C							
0.0001138	13870.	121934391.	10.9737994	0.0012483	-0.0014817	3.5226001	-42.5743294
-42.5743294 C							
0.0001163	14162.	121823104.	10.9711477	0.0012754	-0.0015146	3.5610969	-43.5189682
-43.5189682 C							
0.0001188	14453.	121712853.	10.9688412	0.0013025	-0.0015475	3.5980129	-44.4628028
-44.4628028 C							
0.0001213	14740.	121569900.	10.9657030	0.0013296	-0.0015804	3.6331631	-45.4098967
-45.0000000 CY							
0.0001238	15012.	121311779.	10.9588184	0.0013562	-0.0016138	3.6661183	-46.3708921
-45.0000000 CY							
0.0001263	15264.	120900458.	10.9467093	0.0013820	-0.0016480	3.6967130	-47.3520102
-45.0000000 CY							
0.0001288	15498.	120373475.	10.9305806	0.0014073	-0.0016827	3.7251954	-48.3498942
-45.0000000 CY							
0.0001313	15720.	119774001.	10.9118084	0.0014322	-0.0017178	3.7518221	-49.3601787
-45.0000000 CY							
0.0001338	15933.	119122984.	10.8910441	0.0014567	-0.0017533	3.7767315	-50.3809124
-45.0000000 CY							
0.0001363	16137.	118434163.	10.8688587	0.0014809	-0.0017891	3.8000418	-51.4102716
-45.0000000 CY							
0.0001388	16333.	117717305.	10.8455803	0.0015048	-0.0018252	3.8218323	-52.4472460
-45.0000000 CY							
0.0001413	16523.	116979876.	10.8214616	0.0015285	-0.0018615	3.8421681	-53.4910374
-45.0000000 CY							
0.0001438	16708.	116227782.	10.7967056	0.0015520	-0.0018980	3.8611043	-54.5409830
-45.0000000 CY							
0.0001463	16886.	115457283.	10.7719660	0.0015754	-0.0019346	3.8787412	-55.5944487
45.0000000 CY							
0.0001488	17055.	114658266.	10.7482262	0.0015988	-0.0019712	3.8951982	-56.6471888
45.0000000 CY							
0.0001588	17643.	111134952.	10.6711036	0.0016940	-0.0021160	3.9498141	-60.0000000
45.0000000 CY							
0.0001688	18127.	107417719.	10.6135884	0.0017910	-0.0022590	3.9850084	-60.0000000
45.0000000 CY							
0.0001788	18546.	103753131.	10.5668605	0.0018888	-0.0024012	3.9995986	-60.0000000
45.0000000 CY							
0.0001888	18919.	100232228.	10.5284193	0.0019872	-0.0025428	3.9998304	-60.0000000
45.0000000 CY							
0.0001988	19255.	96880965.	10.4971405	0.0020863	-0.0026837	3.9997599	-60.0000000
45.0000000 CY							
0.0002088	19557.	93686427.	10.4696690	0.0021855	-0.0028245	3.9992178	60.0000000
45.0000000 CY							
0.0002188	19815.	90584211.	10.4408376	0.0022839	-0.0029661	3.9987734	60.0000000
45.0000000 CY							
0.0002288	20027.	87549977.	10.4062947	0.0023804	-0.0031096	3.9991571	60.0000000
45.0000000 CY							
0.0002388	20206.	84630990.	10.3695433	0.0024757	-0.0032543	3.9998329	60.0000000
45.0000000 CY							
0.0002488	20369.	81885845.	10.3359879	0.0025711	-0.0033989	3.9999966	60.0000000
45.0000000 CY							
0.0002588	20521.	79307642.	10.3056918	0.0026666	-0.0035434	3.9987218	60.0000000
45.0000000 CY							
0.0002688	20655.	76857010.	10.2751048	0.0027614	-0.0036886	3.9986163	60.0000000
45.0000000 CY							
0.0002788	20770.	74510648.	10.2420546	0.0028550	-0.0038350	3.9999980	60.0000000
45.0000000 CY							
0.0002888	20867.	72264976.	10.2077354	0.0029475	-0.0039825	3.9998118	60.0000000
45.0000000 CY							
0.0002988	20955.	70143907.	10.1740554	0.0030395	-0.0041305	3.9990002	60.0000000
45.0000000 CY							
0.0003088	21038.	68139346.	10.1433624	0.0031318	-0.0042782	3.9970463	60.0000000
45.0000000 CY							
0.0003188	21114.	66241207.	10.1161266	0.0032245	-0.0044255	3.9999997	60.0000000
45.0000000 CY							
0.0003288	21185.	64440791.	10.0912375	0.0033175	-0.0045725	3.9990916	60.0000000
45.0000000 CY							
0.0003388	21250.	62731148.	10.0693639	0.0034110	-0.0047190	3.9958682	60.0000000
45.0000000 CY							
0.0003488	21309.	61099769.	10.0521037	0.0035057	-0.0048643	3.9998173	60.0000000
45.0000000 CY							

0.0003588	21361.	59543605.	10.0373589	0.0036009	-0.0050091	3.9971422	60.0000000	45.0000000 CY
0.0003688	21409.	58059612.	10.0250850	0.0036968	-0.0051532	3.9999840	60.0000000	45.0000000 CY
0.0003788	21452.	56638320.	10.0154579	0.0037934	-0.0052966	3.9974884	60.0000000	45.0000000 CY
0.0003888	21487.	55273270.	10.0052208	0.0038895	-0.0054405	3.9999919	60.0000000	45.0000000 CY

Axial Thrust Force = 200.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	195.0117796	156009424.	59.8887965	0.0000749	0.0000449	0.3105871	2.1666189	2.1666189	
0.000002500	390.0495897	156019836.	35.9525479	0.0000899	0.0000299	0.3709083	2.5978597	2.5978597	
0.000003750	585.0844887	156022530.	27.9773896	0.0001049	0.0000149	0.4307864	3.0294911	3.0294911	
0.000005000	780.1150336	156023007.	23.9925039	0.0001200	-3.748043E-08	0.4902198	3.4615131	3.4615131	
0.000006250	975.1297017	156020752.	21.6036821	0.0001350	-0.0000150	0.5492061	3.8939174	3.8939174	
0.000007500	1170.0297276	156003964.	20.0125028	0.0001501	-0.0000299	0.6077327	4.3266194	4.3266194	
0.000008750	1364.7115268	155967032.	18.8767224	0.0001652	-0.0000448	0.6657850	4.7595183	4.7595183	
0.0000100	1559.1215004	155912150.	18.0253531	0.0001803	-0.0000597	0.7233541	5.1925524	5.1925524	
0.0000113	1753.2303450	155842697.	17.3634716	0.0001953	-0.0000747	0.7804346	5.6256826	5.6256826	
0.0000125	1947.0223008	155761784.	16.8341655	0.0002104	-0.0000896	0.8370228	6.0588850	6.0588850	
0.0000138	2140.4875791	155671824.	16.4012362	0.0002255	-0.0001045	0.8931165	6.4921430	6.4921430	
0.0000150	2140.4875791	142699172.	15.5503734	0.0002333	-0.0001267	0.9214166	6.7122124	6.7122124	C
0.0000163	2296.0117533	141293031.	15.1897176	0.0002468	-0.0001432	0.9711737	7.1016045	7.1016045	C
0.0000175	2452.5355828	140144890.	14.8776517	0.0002604	-0.0001596	1.0203376	7.4895083	7.4895083	C
0.0000188	2608.4445366	139117042.	14.6050709	0.0002738	-0.0001762	1.0689546	7.8762573	7.8762573	C
0.0000200	2763.8130006	138190650.	14.3647570	0.0002873	-0.0001927	1.1170417	8.2619591	8.2619591	C
0.0000213	2918.7267246	137351846.	14.1512858	0.0003007	-0.0002093	1.1646226	8.6467799	8.6467799	C
0.0000225	3073.2690293	136589735.	13.9604801	0.0003141	-0.0002259	1.2117236	9.0309134	9.0309134	C
0.0000238	3227.5137415	135895315.	13.7890573	0.0003275	-0.0002425	1.2583716	9.4145633	9.4145633	C
0.0000250	3381.4019531	135256078.	13.6337530	0.0003408	-0.0002592	1.3045370	9.7974710	9.7974710	C
0.0000263	3535.0750737	134669527.	13.4928750	0.0003542	-0.0002758	1.3502773	10.1801012	10.1801012	C
0.0000275	3688.5270537	134128256.	13.3644243	0.0003675	-0.0002925	1.3955905	10.5624284	10.5624284	C
0.0000288	3841.7519411	133626154.	13.2466955	0.0003808	-0.0003092	1.4404693	10.9443825	10.9443825	C
0.0000300	3994.8034473	133160115.	13.1386072	0.0003942	-0.0003258	1.4849408	11.3261884	11.3261884	C
0.0000313	4147.6849451	132725918.	13.0389839	0.0004075	-0.0003425	1.5290036	11.7078292	11.7078292	C
0.0000325	4300.3693388	132319057.	12.9467127	0.0004208	-0.0003592	1.5726436	12.0891768	12.0891768	C
0.0000338	4452.9555542	131939424.	12.8614493	0.0004341	-0.0003759	1.6159139	12.4706936	12.4706936	C
0.0000350	4605.3405861	131581160.	12.7819137	0.0004474	-0.0003926	1.6587538	12.8518425	12.8518425	C
0.0000363	4757.5907210	131243882.	12.7078410	0.0004607	-0.0004093	1.7012028	13.2329679	13.2329679	C
0.0000375	4909.7427444	130926473.	12.6388625	0.0004740	-0.0004260	1.7432821	13.6142631	13.6142631	C
0.0000388	5061.7514147	130625843.	12.5742484	0.0004873	-0.0004427	1.7849622	13.9954618	13.9954618	C
0.0000400	5213.5957161	130339893.	12.5134811	0.0005005	-0.0004595	1.8262298	14.3764382	14.3764382	C
0.0000413	5365.3419409	130068896.	12.4565393	0.0005138	-0.0004762	1.8671276	14.7575852		

14.7575852 C							
0.0000425	5516.9898827	129811527.	12.4030857	0.0005271	-0.0004929	1.9076551	15.1389033
15.1389033 C							
0.0000438	5668.5275051	129566343.	12.3527580	0.0005404	-0.0005096	1.9478034	15.5203119
15.5203119 C							
0.0000450	5819.8978814	129331064.	12.3049972	0.0005537	-0.0005263	1.9875317	15.9014215
15.9014215 C							
0.0000463	5971.1699268	129106377.	12.2599464	0.0005670	-0.0005430	2.0268893	16.2827033
16.2827033 C							
0.0000475	6122.3434332	128891441.	12.2173921	0.0005803	-0.0005597	2.0658759	16.6641577
16.6641577 C							
0.0000488	6273.4181921	128685501.	12.1771424	0.0005936	-0.0005764	2.1044909	17.0457852
17.0457852 C							
0.0000513	6575.2432344	128297429.	12.1027337	0.0006203	-0.0006097	2.1805821	17.8093381
17.8093381 C							
0.0000538	6876.5853114	127936471.	12.0352421	0.0006469	-0.0006431	2.2551139	18.5728838
18.5728838 C							
0.0000563	7177.5302048	127600537.	11.9741800	0.0006735	-0.0006765	2.3281533	-19.4213688
-19.4213688 C							
0.0000588	7478.0762096	127286404.	11.9187284	0.0007002	-0.0007098	2.3996965	-20.3790164
-20.3790164 C							
0.0000613	7778.2031493	126991072.	11.8680974	0.0007269	-0.0007431	2.4697224	-21.3361419
-21.3361419 C							
0.0000638	8077.8709589	126711701.	11.8215073	0.0007536	-0.0007764	2.5381932	-22.2931381
-22.2931381 C							
0.0000663	8377.1364411	126447343.	11.7788072	0.0007803	-0.0008097	2.6051589	-23.2494165
-23.2494165 C							
0.0000688	8675.9978379	126196332.	11.7395744	0.0008071	-0.0008429	2.6706155	-24.2049733
-24.2049733 C							
0.0000713	8974.4533764	125957240.	11.7034457	0.0008339	-0.0008761	2.7345586	-25.1598051
-25.1598051 C							
0.0000738	9272.5012694	125728831.	11.6701071	0.0008607	-0.0009093	2.7969843	-26.1139082
-26.1139082 C							
0.0000763	9570.1386377	125510015.	11.6392792	0.0008875	-0.0009425	2.8578871	-27.0672936
-27.0672936 C							
0.0000788	9867.3215140	125299321.	11.6104705	0.0009143	-0.0009757	2.9172187	-28.0205377
-28.0205377 C							
0.0000813	10164.	125096526.	11.5837504	0.0009412	-0.0010088	2.9750229	-28.9730379
-28.9730379 C							
0.0000838	10460.	124900902.	11.5589333	0.0009681	-0.0010419	3.0312954	-29.9247904
-29.9247904 C							
0.0000863	10756.	124711802.	11.5358554	0.0009950	-0.0010750	3.0860318	-30.8757914
-30.8757914 C							
0.0000888	11052.	124528654.	11.5143712	0.0010219	-0.0011081	3.1392277	-31.8260369
-31.8260369 C							
0.0000913	11347.	124350948.	11.4943512	0.0010489	-0.0011411	3.1908787	-32.7755230
-32.7755230 C							
0.0000938	11642.	124178229.	11.4756796	0.0010758	-0.0011742	3.2409804	-33.7242457
-33.7242457 C							
0.0000963	11936.	124010087.	11.4582530	0.0011029	-0.0012071	3.2895282	-34.6722010
-34.6722010 C							
0.0000988	12230.	123846156.	11.4419781	0.0011299	-0.0012401	3.3365176	-35.6193849
-35.6193849 C							
0.0001013	12523.	123686103.	11.4267711	0.0011570	-0.0012730	3.3819442	-36.5657932
-36.5657932 C							
0.0001038	12816.	123529630.	11.4125560	0.0011841	-0.0013059	3.4258031	-37.5114218
-37.5114218 C							
0.0001063	13109.	123376456.	11.3992568	0.0012112	-0.0013388	3.4680887	-38.4562896
-38.4562896 C							
0.0001088	13401.	123226196.	11.3866992	0.0012383	-0.0013717	3.5087782	-39.4007470
-39.4007470 C							
0.0001113	13693.	123078789.	11.3749536	0.0012655	-0.0014045	3.5478882	-40.3444056
-40.3444056 C							
0.0001138	13984.	122934029.	11.3639677	0.0012927	-0.0014373	3.5854137	-41.2872612
-41.2872612 C							
0.0001163	14275.	122791726.	11.3536939	0.0013199	-0.0014701	3.6213501	-42.2293091
-42.2293091 C							
0.0001188	14565.	122651705.	11.3440884	0.0013471	-0.0015029	3.6556923	-43.1705485
-43.1705485 C							
0.0001213	14855.	122513813.	11.3351113	0.0013744	-0.0015356	3.6884358	-44.1109676
-44.1109676 C							
0.0001238	15144.	122373807.	11.3265846	0.0014017	-0.0015683	3.7195557	-45.0510723
-45.0000000 CY							
0.0001263	15421.	122147999.	11.3155727	0.0014286	-0.0016014	3.7486600	-46.0015091
-45.0000000 CY							
0.0001288	15680.	121784761.	11.3001348	0.0014549	-0.0016351	3.7755427	-46.9700711
-45.0000000 CY							
0.0001313	15919.	121288399.	11.2802696	0.0014805	-0.0016695	3.8002820	-47.9577235
-45.0000000 CY							
0.0001338	16145.	120713643.	11.2578359	0.0015057	-0.0017043	3.8231825	-48.9582188
-45.0000000 CY							
0.0001363	16362.	120084839.	11.2336430	0.0015306	-0.0017394	3.8443947	-49.9689176
-45.0000000 CY							
0.0001388	16569.	119416614.	11.2081697	0.0015551	-0.0017749	3.8640186	-50.9882766
-45.0000000 CY							

0.0001413	16767.	118703004.	11.1826092	0.0015795	-0.0018105	3.8822187	-52.0116866	45.0000000 CY
0.0001438	16955.	117948606.	11.1574008	0.0016039	-0.0018461	3.8990597	-53.0373351	45.0000000 CY
0.0001463	17128.	117116543.	11.1345369	0.0016284	-0.0018816	3.9147364	-54.0566951	45.0000000 CY
0.0001488	17291.	116242841.	11.1131547	0.0016531	-0.0019169	3.9291508	-55.0729783	45.0000000 CY
0.0001588	17858.	112493966.	11.0420854	0.0017529	-0.0020571	3.9738926	-59.1025491	45.0000000 CY
0.0001688	18335.	108651314.	10.9839913	0.0018535	-0.0021965	3.9968454	-60.0000000	45.0000000 CY
0.0001788	18749.	104889472.	10.9354843	0.0019547	-0.0023353	3.9987155	-60.0000000	45.0000000 CY
0.0001888	19116.	101279073.	10.8941538	0.0020563	-0.0024737	3.9987119	-60.0000000	45.0000000 CY
0.0001988	19448.	97849118.	10.8588256	0.0021582	-0.0026118	3.9983656	60.0000000	45.0000000 CY
0.0002088	19749.	94605165.	10.8293885	0.0022606	-0.0027494	3.9999978	60.0000000	45.0000000 CY
0.0002188	20019.	91513256.	10.8019644	0.0023629	-0.0028871	3.9994514	60.0000000	45.0000000 CY
0.0002288	20248.	88516603.	10.7720371	0.0024641	-0.0030259	3.9995665	60.0000000	45.0000000 CY
0.0002388	20437.	85600008.	10.7371581	0.0025635	-0.0031665	3.9982879	60.0000000	45.0000000 CY
0.0002488	20601.	82816169.	10.7014197	0.0026620	-0.0033080	3.9989718	60.0000000	45.0000000 CY
0.0002588	20751.	80198682.	10.6682932	0.0027604	-0.0034496	3.9992224	60.0000000	45.0000000 CY
0.0002688	20892.	77737669.	10.6378807	0.0028589	-0.0035911	3.9991749	60.0000000	45.0000000 CY
0.0002788	21018.	75401820.	10.6074387	0.0029568	-0.0037332	3.9987536	60.0000000	45.0000000 CY
0.0002888	21126.	73163779.	10.5754533	0.0030537	-0.0038763	3.9976870	60.0000000	45.0000000 CY
0.0002988	21216.	71016266.	10.5429726	0.0031497	-0.0040203	3.9972748	60.0000000	45.0000000 CY
0.0003088	21295.	68971292.	10.5123592	0.0032457	-0.0041643	3.9998531	60.0000000	45.0000000 CY
0.0003188	21367.	67032743.	10.4849888	0.0033421	-0.0043079	3.9985486	60.0000000	45.0000000 CY
0.0003288	21430.	65186652.	10.4627490	0.0034396	-0.0044504	3.9953819	60.0000000	45.0000000 CY
0.0003388	21487.	63430042.	10.4440824	0.0035379	-0.0045921	3.9997475	60.0000000	45.0000000 CY
0.0003488	21537.	61755600.	10.4282427	0.0036368	-0.0047332	3.9973039	60.0000000	45.0000000 CY
0.0003588	21583.	60162973.	10.4152764	0.0037365	-0.0048735	3.9999990	60.0000000	45.0000000 CY
0.0003688	21624.	58642574.	10.4046096	0.0038367	-0.0050133	3.9981266	60.0000000	45.0000000 CY

Axial Thrust Force = 300.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	193.9160828	155132866.	84.1199142	0.0001051	0.0000751	0.4329281	3.0449969	3.0449969	
0.000002500	387.8721567	155148863.	48.0681734	0.0001202	0.0000602	0.4922373	3.4762426	3.4762426	
0.000003750	581.8252956	155153412.	36.0545470	0.0001352	0.0000452	0.5511028	3.9078820	3.9078820	
0.000005000	775.7740450	155154809.	30.0504493	0.0001503	0.0000303	0.6095231	4.3399152	4.3399152	
0.000006250	969.7169500	155154712.	26.4501631	0.0001653	0.0000153	0.6674970	4.7723421	4.7723421	
0.000007500	1163.6525557	155153674.	24.0517828	0.0001804	0.000000388	0.7250231	5.2051628	5.2051628	
0.000008750	1357.5762736	155151574.	22.3401960	0.0001955	-0.0000145	0.7820997	5.6383748	5.6383748	
0.0000100	1551.4317370	155143174.	21.0576955	0.0002106	-0.0000294	0.8387193	6.0719317	6.0719317	
0.0000113	1745.1285237	155122535.	20.0610018	0.0002257	-0.0000443	0.8948704	6.5057519	6.5057519	
0.0000125	1938.6051187	155088409.	19.2642007	0.0002408	-0.0000592	0.9505439	6.9397728	6.9397728	
0.0000138	2131.8235532	155041713.	18.6126675	0.0002559	-0.0000741	1.0057337	7.3739512		

7.3739512							
0.0000150	2324.7574388	154983829.	18.0700088	0.0002711	-0.0000889	1.0604351	7.8082539
7.8082539							
0.0000163	2517.3895876	154916282.	17.6110494	0.0002862	-0.0001038	1.1146447	8.2426571
8.2426571							
0.0000175	2556.5605180	146089172.	16.9061795	0.0002959	-0.0001241	1.1488655	8.5189861
8.5189861 C							
0.0000188	2716.9065418	144901682.	16.5188662	0.0003097	-0.0001403	1.1977829	8.9168835
8.9168835 C							
0.0000200	2876.0285763	143801429.	16.1767360	0.0003235	-0.0001565	1.2460495	9.3129069
9.3129069 C							
0.0000213	3034.0061003	142776758.	15.8718354	0.0003373	-0.0001727	1.2936729	9.7070686
9.7070686 C							
0.0000225	3191.1320770	141828092.	15.5986886	0.0003510	-0.0001890	1.3407157	10.0998444
10.0998444 C							
0.0000238	3347.5429332	140949176.	15.3525870	0.0003646	-0.0002054	1.3872071	10.4914444
10.4914444 C							
0.0000250	3503.3607860	140134431.	15.1297590	0.0003782	-0.0002218	1.4331749	10.8820753
10.8820753 C							
0.0000263	3658.6785107	139378229.	14.9270989	0.0003918	-0.0002382	1.4786417	11.2719041
11.2719041 C							
0.0000275	3813.5755488	138675475.	14.7420588	0.0004054	-0.0002546	1.5236284	11.6610919
11.6610919 C							
0.0000288	3967.9958047	138017245.	14.5720979	0.0004189	-0.0002711	1.5681140	12.0494367
12.0494367 C							
0.0000300	4122.0523848	137401746.	14.4156308	0.0004325	-0.0002875	1.6121306	12.4371989
12.4371989 C							
0.0000313	4275.8592694	136827497.	14.2714001	0.0004460	-0.0003040	1.6557167	12.8247064
12.8247064 C							
0.0000325	4429.2408545	136284334.	14.1373771	0.0004595	-0.0003205	1.6988086	13.2113780
13.2113780 C							
0.0000338	4582.4528733	135776381.	14.0132326	0.0004729	-0.0003371	1.7414954	13.5980015
13.5980015 C							
0.0000350	4735.3264078	135295040.	13.8973415	0.0004864	-0.0003536	1.7837148	13.9840017
13.9840017 C							
0.0000363	4888.0711587	134843342.	13.7895197	0.0004999	-0.0003701	1.8255446	14.3700827
14.3700827 C							
0.0000375	5040.4760612	134412695.	13.6882447	0.0005133	-0.0003867	1.8669013	14.7554662
14.7554662 C							
0.0000388	5192.7787311	134007193.	13.5936606	0.0005268	-0.0004032	1.9078797	15.1410263
15.1410263 C							
0.0000400	5344.8368300	133620921.	13.5046475	0.0005402	-0.0004198	1.9484192	15.5261912
15.5261912 C							
0.0000413	5496.7084564	133253538.	13.4208924	0.0005536	-0.0004364	1.9885451	15.9111926
15.9111926 C							
0.0000425	5648.4779216	132905363.	13.3422069	0.0005670	-0.0004530	2.0282929	16.2963702
16.2963702 C							
0.0000438	5800.0097790	132571652.	13.2676846	0.0005805	-0.0004695	2.0676010	16.6811249
16.6811249 C							
0.0000450	5951.3834549	132252966.	13.1972463	0.0005939	-0.0004861	2.1065060	17.0658065
17.0658065 C							
0.0000463	6102.6550501	131949298.	13.1307468	0.0006073	-0.0005027	2.1450329	17.4506643
17.4506643 C							
0.0000475	6253.7930384	131658801.	13.0677637	0.0006207	-0.0005193	2.1831660	17.8355446
17.8355446 C							
0.0000488	6404.7015069	131378492.	13.0076912	0.0006341	-0.0005359	2.2208591	18.2199736
18.2199736 C							
0.0000513	6706.2121934	130852921.	12.8966943	0.0006610	-0.0005690	2.2951105	18.9893620
18.9893620 C							
0.0000538	7007.1988549	130366490.	12.7960700	0.0006878	-0.0006022	2.3677862	19.7588243
19.7588243 C							
0.0000563	7307.6344617	129913502.	12.7043433	0.0007146	-0.0006354	2.4388720	20.5282102
20.5282102 C							
0.0000588	7607.6595344	129492077.	12.6208426	0.0007415	-0.0006685	2.5084391	21.2983108
21.2983108 C							
0.0000613	7907.1262953	129095940.	12.5440355	0.0007683	-0.0007017	2.5764015	22.0681932
22.0681932 C							
0.0000638	8206.1287622	128723588.	12.4734603	0.0007952	-0.0007348	2.6428120	22.8384599
22.8384599 C							
0.0000663	8504.7179831	128373102.	12.4085886	0.0008221	-0.0007679	2.7076965	23.6094511
23.6094511 C							
0.0000688	8802.8652075	128041676.	12.3486983	0.0008490	-0.0008010	2.7710344	24.3809673
24.3809673 C							
0.0000713	9100.4847101	127726101.	12.2929556	0.0008759	-0.0008341	2.8327718	25.1523697
25.1523697 C							
0.0000738	9397.6878041	127426275.	12.2413363	0.0009028	-0.0008672	2.8929750	25.9245082
25.9245082 C							
0.0000763	9694.4726318	127140625.	12.1934364	0.0009297	-0.0009003	2.9516397	26.6973865
26.6973865 C							
0.0000788	9990.8373203	126867775.	12.1489033	0.0009567	-0.0009333	3.0087614	27.4710082
27.4710082 C							
0.0000813	10287.	126606170.	12.1073147	0.0009837	-0.0009663	3.0643170	28.2451104
28.2451104 C							
0.0000838	10582.	126354375.	12.0682751	0.0010107	-0.0009993	3.1182816	29.0193734
29.0193734 C							

0.0000863	10877.	126112263.	12.0318014	0.0010377	-0.0010323	3.1706939	29.7943936	29.7943936 C
0.0000888	11172.	125878994.	11.9976782	0.0010648	-0.0010652	3.2215494	-30.5821254	-30.5821254 C
0.0000913	11466.	125653820.	11.9657139	0.0010919	-0.0010981	3.2708436	-31.5281794	-31.5281794 C
0.0000938	11760.	125436072.	11.9357371	0.0011190	-0.0011310	3.3185721	-32.4734646	-32.4734646 C
0.0000963	12053.	125225150.	11.9075944	0.0011461	-0.0011639	3.3647302	-33.4179769	-33.4179769 C
0.0000988	12346.	125020517.	11.8811479	0.0011733	-0.0011967	3.4093133	-34.3617123	-34.3617123 C
0.0001013	12638.	124821178.	11.8560549	0.0012004	-0.0012296	3.4522821	-35.3053085	-35.3053085 C
0.0001038	12930.	124627219.	11.8324234	0.0012276	-0.0012624	3.4936680	-36.2481459	-36.2481459 C
0.0001063	13222.	124438264.	11.8101614	0.0012548	-0.0012952	3.5334679	-37.1901900	-37.1901900 C
0.0001088	13513.	124253949.	11.7891758	0.0012821	-0.0013279	3.5716771	-38.1314365	-38.1314365 C
0.0001113	13803.	124073943.	11.7693820	0.0013093	-0.0013607	3.6082907	-39.0718811	-39.0718811 C
0.0001138	14093.	123897943.	11.7507026	0.0013366	-0.0013934	3.6433040	-40.0115193	-40.0115193 C
0.0001163	14383.	123725672.	11.7330672	0.0013640	-0.0014260	3.6767121	-40.9503469	-40.9503469 C
0.0001188	14672.	123556876.	11.7164110	0.0013913	-0.0014587	3.7085100	-41.8883593	-41.8883593 C
0.0001213	14961.	123391322.	11.7006748	0.0014187	-0.0014913	3.7386927	-42.8255520	-42.8255520 C
0.0001238	15250.	123228798.	11.6858040	0.0014461	-0.0015239	3.7672553	-43.7619205	-43.7619205 C
0.0001263	15537.	123069104.	11.6717486	0.0014736	-0.0015564	3.7941928	-44.6974601	-44.6974601 C
0.0001288	15819.	122863128.	11.6567795	0.0015008	-0.0015892	3.8193047	-45.6384493	-45.0000000 CY
0.0001313	16084.	122546451.	11.6385516	0.0015276	-0.0016224	3.8423605	-46.5940125	-45.0000000 CY
0.0001338	16330.	122094715.	11.6158721	0.0015536	-0.0016564	3.8633056	-47.5694855	-45.0000000 CY
0.0001363	16559.	121530644.	11.5911233	0.0015793	-0.0016907	3.8824711	-48.5564236	45.0000000 CY
0.0001388	16772.	120876405.	11.5660772	0.0016048	-0.0017252	3.9000791	-49.5481465	45.0000000 CY
0.0001413	16967.	120122843.	11.5428049	0.0016304	-0.0017596	3.9163358	-50.5362352	45.0000000 CY
0.0001438	17148.	119288462.	11.5215658	0.0016562	-0.0017938	3.9312480	-51.5192223	45.0000000 CY
0.0001463	17317.	118407275.	11.5013860	0.0016821	-0.0018279	3.9447220	-52.5007964	45.0000000 CY
0.0001488	17476.	117488265.	11.4824147	0.0017080	-0.0018620	3.9567627	-53.4800831	45.0000000 CY
0.0001588	18036.	113614309.	11.4142130	0.0018120	-0.0019980	3.9902107	-57.3893665	45.0000000 CY
0.0001688	18509.	109683337.	11.3548468	0.0019161	-0.0021339	3.9989272	-60.0000000	45.0000000 CY
0.0001788	18920.	105844818.	11.3030451	0.0020204	-0.0022696	3.9997121	-60.0000000	45.0000000 CY
0.0001888	19284.	102165904.	11.2582234	0.0021250	-0.0024050	3.9998777	60.0000000	45.0000000 CY
0.0001988	19611.	98669771.	11.2200893	0.0022300	-0.0025400	3.9997788	60.0000000	45.0000000 CY
0.0002088	19908.	95368717.	11.1874468	0.0023354	-0.0026746	3.9991900	60.0000000	45.0000000 CY
0.0002188	20180.	92249308.	11.1592239	0.0024411	-0.0028089	3.9988841	60.0000000	45.0000000 CY
0.0002288	20422.	89275433.	11.1314523	0.0025463	-0.0029437	3.9992282	60.0000000	45.0000000 CY
0.0002388	20629.	86404401.	11.1006407	0.0026503	-0.0030797	3.9998976	60.0000000	45.0000000 CY
0.0002488	20801.	83622478.	11.0652326	0.0027525	-0.0032175	3.9998258	60.0000000	45.0000000 CY
0.0002588	20952.	80972293.	11.0292485	0.0028538	-0.0033562	3.9984333	60.0000000	45.0000000 CY
0.0002688	21091.	78479692.	10.9961747	0.0029552	-0.0034948	3.9985261	60.0000000	45.0000000 CY
0.0002788	21221.	76129446.	10.9668993	0.0030570	-0.0036330	3.9999993	60.0000000	45.0000000 CY
0.0002888	21336.	73891274.	10.9405779	0.0031591	-0.0037709	3.9999042	60.0000000	45.0000000 CY
0.0002988	21433.	71741303.	10.9139382	0.0032605	-0.0039095	3.9993588	60.0000000	45.0000000 CY
0.0003088	21511.	69670773.	10.8879060	0.0033616	-0.0040484	3.9978551	60.0000000	45.0000000 CY
0.0003188	21574.	67683297.	10.8646304	0.0034631	-0.0041869	3.9973100	60.0000000	

45.0000000 CY
0.0003288 21629. 65792461. 10.8436885 0.0035649 -0.0043251 3.9996455 60.0000000
45.0000000 CY
0.0003388 21678. 63995327. 10.8267696 0.0036676 -0.0044624 3.9974149 60.0000000
45.0000000 CY
0.0003488 21724. 62290492. 10.8117772 0.0037706 -0.0045994 3.9996594 60.0000000
45.0000000 CY
0.0003588 21765. 60668613. 10.7985395 0.0038740 -0.0047360 3.9985716 60.0000000
45.0000000 CY

Axial Thrust Force = 400.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	192.8113356	154249068.	108.5503265	0.0001357	0.0001057	0.5541871	3.9305993	3.9305993	
0.000002500	385.6767759	154270710.	60.2834479	0.0001507	0.0000907	0.6124759	4.3618500	4.3618500	
0.000003750	578.5392570	154277135.	44.1981389	0.0001657	0.0000757	0.6703204	4.7934976	4.7934976	
0.000005000	771.3973122	154279462.	36.1582224	0.0001808	0.0000608	0.7277194	5.2255423	5.2255423	
0.000006250	964.2494745	154279916.	31.3364630	0.0001959	0.0000459	0.7846713	5.6579839	5.6579839	
0.000007500	1157.0942770	154279237.	28.1237822	0.0002109	0.0000309	0.8411749	6.0908226	6.0908226	
0.000008750	1349.9302526	154277743.	25.8305750	0.0002260	0.0000160	0.8972288	6.5240584	6.5240584	
0.0000100	1542.7559342	154275593.	24.1120389	0.0002411	0.000001120	0.9528315	6.9576913	6.9576913	
0.0000113	1735.5690431	154272804.	22.7766150	0.0002562	-0.0000138	1.0079817	7.3917207	7.3917207	
0.0000125	1928.3380397	154267043.	21.7093007	0.0002714	-0.0000286	1.0626747	7.8261215	7.8261215	
0.0000138	2120.9914119	154253921.	20.8368198	0.0002865	-0.0000435	1.1169017	8.2608319	8.2608319	
0.0000150	2313.4671921	154231146.	20.1103286	0.0003017	-0.0000583	1.1706543	8.6957930	8.6957930	
0.0000163	2505.7222862	154198295.	19.4960422	0.0003168	-0.0000732	1.2239262	9.1309599	9.1309599	
0.0000175	2697.7272401	154155842.	18.9698514	0.0003320	-0.0000880	1.2767126	9.5662996	9.5662996	
0.0000188	2889.4595045	154104507.	18.5140862	0.0003471	-0.0001029	1.3290097	10.0017844	10.0017844	
0.0000200	2958.7679100	147938396.	17.9056808	0.0003581	-0.0001219	1.3663926	10.3156949	10.3156949	C
0.0000213	3122.0697771	146920931.	17.5167300	0.0003722	-0.0001378	1.4142385	10.7207349	10.7207349	C
0.0000225	3283.9435412	145953046.	17.1681340	0.0003863	-0.0001537	1.4614283	11.1239075	11.1239075	C
0.0000238	3444.3272827	145024307.	16.8531746	0.0004003	-0.0001697	1.5079404	11.5249741	11.5249741	C
0.0000250	3603.5842747	144143371.	16.5674996	0.0004142	-0.0001858	1.5538391	11.9244373	11.9244373	C
0.0000263	3761.8579508	143308874.	16.3071478	0.0004281	-0.0002019	1.5991487	12.3224663	12.3224663	C
0.0000275	3919.2650164	142518728.	16.0688442	0.0004419	-0.0002181	1.6438897	12.7192034	12.7192034	C
0.0000288	4075.9170943	141771029.	15.8498969	0.0004557	-0.0002343	1.6880832	13.1148016	13.1148016	C
0.0000300	4231.9238366	141064128.	15.6480849	0.0004694	-0.0002506	1.7317520	13.5094340	13.5094340	C
0.0000313	4387.3916123	140396532.	15.4615638	0.0004832	-0.0002668	1.7749200	13.9032923	13.9032923	C
0.0000325	4542.2887727	139762731.	15.2884373	0.0004969	-0.0002831	1.8175763	14.2962523	14.2962523	C
0.0000338	4696.7518361	139163017.	15.1274979	0.0005106	-0.0002994	1.8597530	14.6885886	14.6885886	C
0.0000350	4850.9068848	138597340.	14.9777378	0.0005242	-0.0003158	1.9014841	15.0806039	15.0806039	C
0.0000363	5004.5949763	138057792.	14.8375779	0.0005379	-0.0003321	1.9427241	15.4718539	15.4718539	C
0.0000375	5158.0096077	137546923.	14.7065023	0.0005515	-0.0003485	1.9835255	15.8628214	15.8628214	C
0.0000388	5311.0820551	137060182.	14.5834570	0.0005651	-0.0003649	2.0238691	16.2533099	16.2533099	C
0.0000400	5463.8774484	136596936.	14.4678185	0.0005787	-0.0003813	2.0637715	16.6434696	16.6434696	C

0.0000413	5616.3640363	136154280.	14.3588312	0.0005923	-0.0003977	2.1032238	17.0332019	17.0332019 C
0.0000425	5768.6663870	135733327.	14.2561996	0.0006059	-0.0004141	2.1422634	17.4228661	17.4228661 C
0.0000438	5920.6097952	135328224.	14.1589297	0.0006195	-0.0004305	2.1808340	17.8118922	17.8118922 C
0.0000450	6072.4472594	134943272.	14.0672050	0.0006330	-0.0004470	2.2190180	18.2011026	18.2011026 C
0.0000463	6223.9777968	134572493.	13.9800490	0.0006466	-0.0004634	2.2567466	18.5897908	18.5897908 C
0.0000475	6375.3131996	134217120.	13.8973849	0.0006601	-0.0004799	2.2940587	18.9783478	18.9783478 C
0.0000488	6526.5426808	133877799.	13.8190899	0.0006737	-0.0004963	2.3309846	19.3670884	19.3670884 C
0.0000513	6828.2447694	133234044.	13.6731961	0.0007008	-0.0005292	2.4035196	20.1434378	20.1434378 C
0.0000538	7129.3963321	132639932.	13.5410164	0.0007278	-0.0005622	2.4744633	20.9200095	20.9200095 C
0.0000563	7429.7596804	132084617.	13.4200956	0.0007549	-0.0005951	2.5437242	21.6957812	21.6957812 C
0.0000588	7729.6646691	131568760.	13.3098031	0.0007820	-0.0006280	2.6114255	22.4721272	22.4721272 C
0.0000613	8028.8212412	131082796.	13.2080780	0.0008090	-0.0006610	2.6774503	23.2476988	23.2476988 C
0.0000638	8327.5530265	130628283.	13.1147299	0.0008361	-0.0006939	2.7419274	24.0240071	24.0240071 C
0.0000663	8625.6814181	130198965.	13.0283298	0.0008631	-0.0007269	2.8047784	24.8001288	24.8001288 C
0.0000688	8923.2685765	129792997.	12.9482826	0.0008902	-0.0007598	2.8660297	25.5763886	25.5763886 C
0.0000713	9220.4282739	129409520.	12.8742131	0.0009173	-0.0007927	2.9257264	26.3533930	26.3533930 C
0.0000738	9517.0406585	129044619.	12.8051850	0.0009444	-0.0008256	2.9838120	27.1304395	27.1304395 C
0.0000763	9813.1112172	128696541.	12.7407177	0.0009715	-0.0008585	3.0402889	27.9075622	27.9075622 C
0.0000788	10109.	128365098.	12.6806739	0.0009986	-0.0008914	3.0952036	28.6854393	28.6854393 C
0.0000813	10404.	128048731.	12.6246469	0.0010258	-0.0009242	3.1485518	29.4640746	29.4640746 C
0.0000838	10699.	127744951.	12.5720089	0.0010529	-0.0009571	3.2002860	30.2428169	30.2428169 C
0.0000863	10993.	127452818.	12.5225036	0.0010801	-0.0009899	3.2504118	31.0217624	31.0217624 C
0.0000888	11287.	127172235.	12.4760865	0.0011073	-0.0010227	3.2989626	31.8014779	31.8014779 C
0.0000913	11580.	126902233.	12.4325053	0.0011345	-0.0010555	3.3459337	32.5819675	32.5819675 C
0.0000938	11873.	126641942.	12.3915346	0.0011617	-0.0010883	3.3913206	33.3632349	33.3632349 C
0.0000963	12165.	126390361.	12.3529067	0.0011890	-0.0011210	3.4351085	34.1451012	34.1451012 C
0.0000988	12457.	126146090.	12.3162311	0.0012162	-0.0011538	3.4772616	34.9269572	34.9269572 C
0.0001013	12748.	125909503.	12.2816365	0.0012435	-0.0011865	3.5178205	35.7096054	35.7096054 C
0.0001038	13039.	125680024.	12.2489737	0.0012708	-0.0012192	3.5567805	36.4930499	36.4930499 C
0.0001063	13330.	125457131.	12.2181078	0.0012982	-0.0012518	3.5941369	37.2772950	37.2772950 C
0.0001088	13620.	125240352.	12.1889162	0.0013255	-0.0012845	3.6298847	38.0623449	38.0623449 C
0.0001113	13910.	125029253.	12.1612875	0.0013529	-0.0013171	3.6640191	38.8482040	38.8482040 C
0.0001138	14199.	124823442.	12.1351198	0.0013804	-0.0013496	3.6965352	39.6348767	39.6348767 C
0.0001163	14487.	124622324.	12.1102302	0.0014078	-0.0013822	3.7274164	40.4220638	40.4220638 C
0.0001188	14776.	124425475.	12.0864941	0.0014353	-0.0014147	3.7566540	41.2096143	41.2096143 C
0.0001213	15063.	124232962.	12.0639730	0.0014628	-0.0014472	3.7842616	41.9979955	41.9979955 C
0.0001238	15351.	124044501.	12.0425947	0.0014903	-0.0014797	3.8102341	42.7872120	42.7872120 C
0.0001263	15637.	123859835.	12.0222924	0.0015178	-0.0015122	3.8345664	43.5772686	43.5772686 C
0.0001288	15924.	123678725.	12.0030049	0.0015454	-0.0015446	3.8572532	44.3681698	44.3681698 C
0.0001313	16205.	123470036.	11.9843672	0.0015729	-0.0015771	3.8782593	-45.2777519	45.0000000 CY
0.0001338	16470.	123139320.	11.9653207	0.0016004	-0.0016096	3.8974942	-46.2140621	45.0000000 CY
0.0001363	16706.	122615561.	11.9463434	0.0016277	-0.0016423	3.9150230	-47.1528603	45.0000000 CY
0.0001388	16917.	121925454.	11.9271384	0.0016549	-0.0016751	3.9308389	-48.0953263	

45.0000000	CY							
0.0001413		17111.	121138686.	11.9081143	0.0016820	-0.0017080	3.9449926	-49.0398362
45.0000000	CY							
0.0001438		17291.	120288055.	11.8892819	0.0017091	-0.0017409	3.9574981	-49.9863058
45.0000000	CY							
0.0001463		17459.	119375116.	11.8709446	0.0017361	-0.0017739	3.9683850	-50.9334059
45.0000000	CY							
0.0001488		17617.	118432749.	11.8528478	0.0017631	-0.0018069	3.9776462	-51.8821274
45.0000000	CY							
0.0001588		18178.	114506325.	11.7847594	0.0018708	-0.0019392	3.9986626	-55.6834633
45.0000000	CY							
0.0001688		18651.	110521589.	11.7237585	0.0019784	-0.0020716	3.9999062	-59.4896065
45.0000000	CY							
0.0001788		19060.	106628965.	11.6697833	0.0020860	-0.0022040	3.9985229	-60.0000000
45.0000000	CY							
0.0001888		19421.	102892255.	11.6224532	0.0021937	-0.0023363	3.9988284	60.0000000
45.0000000	CY							
0.0001988		19744.	99343154.	11.5804839	0.0023016	-0.0024684	3.9983937	60.0000000
45.0000000	CY							
0.0002088		20038.	95989906.	11.5441366	0.0024098	-0.0026002	3.9999931	60.0000000
45.0000000	CY							
0.0002188		20308.	92836833.	11.5127104	0.0025184	-0.0027316	3.9993462	60.0000000
45.0000000	CY							
0.0002288		20555.	89858371.	11.4845097	0.0026271	-0.0028629	3.9999999	60.0000000
45.0000000	CY							
0.0002388		20775.	87016234.	11.4564853	0.0027352	-0.0029948	3.9982738	60.0000000
45.0000000	CY							
0.0002488		20965.	84279826.	11.4254375	0.0028421	-0.0031279	3.9990386	60.0000000
45.0000000	CY							
0.0002588		21123.	81635994.	11.3909372	0.0029474	-0.0032626	3.9992623	60.0000000
45.0000000	CY							
0.0002688		21259.	79103601.	11.3569541	0.0030522	-0.0033978	3.9991597	60.0000000
45.0000000	CY							
0.0002788		21382.	76706858.	11.3274374	0.0031575	-0.0035325	3.9987535	60.0000000
45.0000000	CY							
0.0002888		21492.	74431079.	11.3037745	0.0032640	-0.0036660	3.9979256	60.0000000
45.0000000	CY							
0.0002988		21587.	72258666.	11.2844737	0.0033712	-0.0037988	3.9964005	60.0000000
45.0000000	CY							
0.0003088		21666.	70174326.	11.2673501	0.0034788	-0.0039312	3.9999996	60.0000000
45.0000000	CY							
0.0003188		21731.	68176952.	11.2500718	0.0035860	-0.0040640	3.9994774	60.0000000
45.0000000	CY							
0.0003288		21785.	66266628.	11.2330339	0.0036929	-0.0041971	3.9974570	60.0000000
45.0000000	CY							
0.0003388		21832.	64448930.	11.2149499	0.0037991	-0.0043309	3.9992966	60.0000000
45.0000000	CY							
0.0003488		21875.	62724171.	11.1986506	0.0039055	-0.0044645	3.9988922	60.0000000
45.0000000	CY							

Axial Thrust Force = 500.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	191.6973108	153357849.	133.1850333	0.0001665	0.0001365	0.6743368	4.8236075	4.8236075	
0.000002500	383.4629973	153385199.	72.6008713	0.0001815	0.0001215	0.7315967	5.2548632	5.2548632	
0.000003750	575.2256995	153393520.	52.4098320	0.0001965	0.0001065	0.7884118	5.6865192	5.6865192	
0.000005000	766.9839385	153396788.	42.3170734	0.0002116	0.0000916	0.8447808	6.1185757	6.1185757	
0.000006250	958.7362349	153397798.	36.2636273	0.0002266	0.0000766	0.9007022	6.5510325	6.5510325	
0.000007500	1150.4811094	153397481.	32.2298374	0.0002417	0.0000617	0.9561747	6.9838896	6.9838896	
0.000008750	1342.2170826	153396238.	29.3501369	0.0002568	0.0000468	1.0111969	7.4171473	7.4171473	
0.0000100	1533.9426756	153394268.	27.1917423	0.0002719	0.0000319	1.0657674	7.8508052	7.8508052	
0.0000113	1725.6564069	153391681.	25.5142186	0.0002870	0.0000170	1.1198848	8.2848638	8.2848638	
0.0000125	1917.3567974	153388544.	24.1733045	0.0003022	0.000002166	1.1735477	8.7193229	8.7193229	
0.0000138	2109.0422402	153384890.	23.0771972	0.0003173	-0.0000127	1.2267548	9.1541824	9.1541824	
0.0000150	2300.6959824	153379732.	22.1646662	0.0003325	-0.0000275	1.2795031	9.5894298	9.5894298	

0.0000163	2492.2639982	153370092.	21.3932511	0.0003476	-0.0000424	1.3317858	10.0250196	10.0250196
0.0000175	2683.6898006	153353703.	20.7326117	0.0003628	-0.0000572	1.3835956	10.4609005	10.4609005
0.0000188	2874.9280092	153329494.	20.1605109	0.0003780	-0.0000720	1.4349264	10.8970279	10.8970279
0.0000200	3065.9453986	153297270.	19.6602877	0.0003932	-0.0000868	1.4857732	11.3333669	11.3333669
0.0000213	3256.7178492	153257311.	19.2192138	0.0004084	-0.0001016	1.5361321	11.7698905	11.7698905
0.0000225	3349.1115144	148849401.	18.6811609	0.0004203	-0.0001197	1.5751471	12.1111576	12.1111576 C
0.0000238	3514.8980372	147995707.	18.3007178	0.0004346	-0.0001354	1.6216997	12.5219695	12.5219695 C
0.0000250	3678.9292007	147157168.	17.9554225	0.0004489	-0.0001511	1.6675666	12.9306814	12.9306814 C
0.0000263	3841.6206630	146347454.	17.6409000	0.0004631	-0.0001669	1.7128091	13.3377852	13.3377852 C
0.0000275	4002.9127350	145560463.	17.3527052	0.0004772	-0.0001828	1.7574106	13.7430825	13.7430825 C
0.0000288	4163.0679807	144802365.	17.0877935	0.0004913	-0.0001987	1.8014123	14.1468979	14.1468979 C
0.0000300	4322.1961901	144073206.	16.8433807	0.0005053	-0.0002147	1.8448308	14.5493413	14.5493413 C
0.0000313	4480.4139132	143373245.	16.6171591	0.0005193	-0.0002307	1.8876851	14.9505505	14.9505505 C
0.0000325	4637.8332994	142702563.	16.4071879	0.0005332	-0.0002468	1.9299949	15.3506747	15.3506747 C
0.0000338	4794.5176793	142059783.	16.2117335	0.0005471	-0.0002629	1.9717710	15.7497842	15.7497842 C
0.0000350	4950.4411293	141441175.	16.0291254	0.0005610	-0.0002790	2.0130046	16.1477624	16.1477624 C
0.0000363	5105.8238184	140850312.	15.8584242	0.0005749	-0.0002951	2.0537411	16.5450185	16.5450185 C
0.0000375	5260.7602640	140286940.	15.6986122	0.0005887	-0.0003113	2.0940018	16.9417409	16.9417409 C
0.0000388	5415.0825056	139744065.	15.5482655	0.0006025	-0.0003275	2.1337468	17.3375135	17.3375135 C
0.0000400	5569.0313278	139225783.	15.4069399	0.0006163	-0.0003437	2.1730300	17.7328504	17.7328504 C
0.0000413	5722.6301044	138730427.	15.2738606	0.0006300	-0.0003600	2.2118581	18.1278059	18.1278059 C
0.0000425	5875.7866319	138253803.	15.1480796	0.0006438	-0.0003762	2.2502059	18.5221082	18.5221082 C
0.0000438	6028.7139832	137799177.	15.0293996	0.0006575	-0.0003925	2.2881276	18.9163008	18.9163008 C
0.0000450	6181.2246444	137360548.	14.9168224	0.0006713	-0.0004087	2.3255733	19.3098534	19.3098534 C
0.0000463	6333.5196263	136940965.	14.8102599	0.0006850	-0.0004250	2.3625960	19.7033112	19.7033112 C
0.0000475	6485.5065537	136536980.	14.7090281	0.0006987	-0.0004413	2.3991694	20.0963864	20.0963864 C
0.0000488	6637.1921260	136147531.	14.6127292	0.0007124	-0.0004576	2.4352963	20.4890961	20.4890961 C
0.0000513	6939.8798505	135412290.	14.4338679	0.0007397	-0.0004903	2.5062659	21.2739863	21.2739863 C
0.0000538	7241.7285458	134729833.	14.2713276	0.0007671	-0.0005229	2.5755454	22.0583820	22.0583820 C
0.0000563	7542.5386982	134089577.	14.1224637	0.0007944	-0.0005556	2.6430726	22.8415191	22.8415191 C
0.0000588	7842.6870899	133492546.	13.9862371	0.0008217	-0.0005883	2.7089556	23.6246016	23.6246016 C
0.0000613	8142.0668536	132931704.	13.8608786	0.0008490	-0.0006210	2.7731629	24.4072358	24.4072358 C
0.0000638	8440.7782630	132404365.	13.7452682	0.0008763	-0.0006537	2.8357203	25.1897148	25.1897148 C
0.0000663	8738.8042138	131906479.	13.6382653	0.0009035	-0.0006865	2.8966234	25.9719675	25.9719675 C
0.0000688	9036.3038583	131437147.	13.5392362	0.0009308	-0.0007192	2.9559191	26.7546024	26.7546024 C
0.0000713	9333.0477512	130990144.	13.4468516	0.0009581	-0.0007519	3.0135314	27.5366074	27.5366074 C
0.0000738	9629.3508917	130567470.	13.3610884	0.0009854	-0.0007846	3.0695628	28.3193780	28.3193780 C
0.0000763	9925.0475135	130164558.	13.2809311	0.0010127	-0.0008173	3.1239534	29.1021092	29.1021092 C
0.0000788	10220.	129779480.	13.2058378	0.0010400	-0.0008500	3.1767021	29.8847823	29.8847823 C
0.0000813	10515.	129412639.	13.1356938	0.0010673	-0.0008827	3.2278627	30.6682288	30.6682288 C
0.0000838	10809.	129061883.	13.0699620	0.0010946	-0.0009154	3.2774163	31.4522205	31.4522205 C
0.0000863	11102.	128723686.	13.0078501	0.0011219	-0.0009481	3.3252979	32.2357353	32.2357353 C
0.0000888	11395.	128399509.	12.9495417	0.0011493	-0.0009807	3.3715836	33.0200331	

33.0200331 C							
0.0000913	11688.	128088178.	12.8947256	0.0011766	-0.0010134	3.4162688	33.8051179
33.8051179 C							
0.0000938	11980.	127788642.	12.8431240	0.0012040	-0.0010460	3.4593487	34.5909936
34.5909936 C							
0.0000963	12272.	127497979.	12.7940416	0.0012314	-0.0010786	3.5007540	35.3764188
35.3764188 C							
0.0000988	12563.	127217325.	12.7476943	0.0012588	-0.0011112	3.5405456	36.1625599
36.1625599 C							
0.0001013	12853.	126946044.	12.7039093	0.0012863	-0.0011437	3.5787230	36.9495040
36.9495040 C							
0.0001038	13143.	126683438.	12.6625027	0.0013137	-0.0011763	3.6152814	37.7372553
37.7372553 C							
0.0001063	13433.	126428873.	12.6233080	0.0013412	-0.0012088	3.6502158	38.5258180
38.5258180 C							
0.0001088	13722.	126181263.	12.5860360	0.0013687	-0.0012413	3.6835033	39.3147614
39.3147614 C							
0.0001113	14011.	125939816.	12.5504724	0.0013962	-0.0012738	3.7151310	40.1038120
40.1038120 C							
0.0001138	14299.	125704916.	12.5167225	0.0014238	-0.0013062	3.7451246	40.8936887
40.8936887 C							
0.0001163	14587.	125476121.	12.4846706	0.0014513	-0.0013387	3.7734790	41.6843960
41.6843960 C							
0.0001188	14874.	125253027.	12.4542107	0.0014789	-0.0013711	3.8001892	42.4759384
42.4759384 C							
0.0001213	15161.	125035262.	12.4252457	0.0015066	-0.0014034	3.8252501	43.2683205
43.2683205 C							
0.0001238	15447.	124822484.	12.3976862	0.0015342	-0.0014358	3.8486563	44.0615468
44.0615468 C							
0.0001263	15733.	124614379.	12.3714502	0.0015619	-0.0014681	3.8704026	44.8556222
44.8556222 C							
0.0001288	16012.	124367492.	12.3480590	0.0015898	-0.0015002	3.8906281	45.6565158
45.0000000 CY							
0.0001313	16282.	124052640.	12.3287079	0.0016181	-0.0015319	3.9094027	46.4693948
45.0000000 CY							
0.0001338	16540.	123661344.	12.3138636	0.0016470	-0.0015630	3.9267015	47.2969487
45.0000000 CY							
0.0001363	16780.	123157461.	12.3008800	0.0016760	-0.0015940	3.9422607	48.1297025
45.0000000 CY							
0.0001388	17001.	122528591.	12.2871097	0.0017048	-0.0016252	3.9558884	48.9574079
45.0000000 CY							
0.0001413	17201.	121773521.	12.2718412	0.0017334	-0.0016566	3.9675775	49.7769799
45.0000000 CY							
0.0001438	17384.	120931478.	12.2555581	0.0017617	-0.0016883	3.9774000	50.5901081
45.0000000 CY							
0.0001463	17556.	120038998.	12.2386902	0.0017899	-0.0017201	3.9854120	51.3983954
45.0000000 CY							
0.0001488	17718.	119111635.	12.2216453	0.0018180	-0.0017520	3.9916560	52.2034729
45.0000000 CY							
0.0001588	18284.	115172726.	12.1551298	0.0019296	-0.0018804	3.9997861	55.4067294
45.0000000 CY							
0.0001688	18758.	111160569.	12.0926642	0.0020406	-0.0020094	3.9991259	58.5912259
45.0000000 CY							
0.0001788	19168.	107231505.	12.0358868	0.0021514	-0.0021386	3.9997888	60.0000000
45.0000000 CY							
0.0001888	19527.	103456801.	11.9851345	0.0022622	-0.0022678	3.9999064	60.0000000
45.0000000 CY							
0.0001988	19849.	99868719.	11.9404952	0.0023732	-0.0023968	3.9997813	60.0000000
45.0000000 CY							
0.0002088	20140.	96481061.	11.9010840	0.0024844	-0.0025256	3.9991079	60.0000000
45.0000000 CY							
0.0002188	20406.	93286135.	11.8661159	0.0025957	-0.0026543	3.9997831	60.0000000
45.0000000 CY							
0.0002288	20653.	90287203.	11.8353577	0.0027073	-0.0027827	3.9989961	60.0000000
45.0000000 CY							
0.0002388	20880.	87454052.	11.8067806	0.0028189	-0.0029111	3.9998143	60.0000000
45.0000000 CY							
0.0002488	21081.	84747413.	11.7787705	0.0029300	-0.0030400	3.9999988	60.0000000
45.0000000 CY							
0.0002588	21250.	82124784.	11.7499459	0.0030403	-0.0031697	3.9983767	60.0000000
45.0000000 CY							
0.0002688	21388.	79582010.	11.7207222	0.0031499	-0.0033001	3.9981429	60.0000000
45.0000000 CY							
0.0002788	21501.	77133870.	11.6945240	0.0032598	-0.0034302	3.9993329	60.0000000
45.0000000 CY							
0.0002888	21599.	74801334.	11.6739695	0.0033709	-0.0035591	3.9999677	60.0000000
45.0000000 CY							
0.0002988	21686.	72588710.	11.6581626	0.0034829	-0.0036871	3.9996885	60.0000000
45.0000000 CY							
0.0003088	21766.	70495752.	11.6452641	0.0035955	-0.0038145	3.9988383	60.0000000
45.0000000 CY							
0.0003188	21836.	68506659.	11.6324376	0.0037078	-0.0039422	3.9968799	60.0000000
45.0000000 CY							
0.0003288	21898.	66609162.	11.6176370	0.0038193	-0.0040707	4.0000000	60.0000000
45.0000000 CY							

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

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	0.000	20728.423	0.00300000
2	100.000	20917.296	0.00300000
3	200.000	21066.314	0.00300000
4	300.000	21148.452	0.00300000
5	400.000	21191.471	0.00300000
6	500.000	21188.107	0.00300000

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

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

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

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	20728.423	0.000	13473.474	120979772.655
2	0.65	20917.296	65.000	13596.242	122039674.687
3	0.65	21066.314	130.000	13693.103	123078497.152
4	0.65	21148.452	195.000	13746.493	124109084.236
5	0.65	21191.471	260.000	13774.456	125127688.686
6	0.65	21188.107	325.000	13772.269	126139383.090
1	0.70	20728.423	0.000	14509.896	120475911.116
2	0.70	20917.296	70.000	14642.107	121618842.997
3	0.70	21066.314	140.000	14746.419	122565363.095
4	0.70	21148.452	210.000	14803.916	123481477.706
5	0.70	21191.471	280.000	14834.030	124386330.285
6	0.70	21188.107	350.000	14831.675	125285747.252
1	0.75	20728.423	0.000	15546.317	117868265.768
2	0.75	20917.296	75.000	15687.972	119861300.337
3	0.75	21066.314	150.000	15799.735	121535978.056
4	0.75	21148.452	225.000	15861.339	122812202.076
5	0.75	21191.471	300.000	15893.603	123697720.903
6	0.75	21188.107	375.000	15891.081	124474484.350

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Permanent Casing:

Length of Section	=	50.00000	ft
Outer Diameter of Casing	=	24.00000	in
Casing Wall Thickness	=	0.62500	in
Moment of Inertia of Steel Casing	=	3136.93223	in^4
Yield Stress of Casing	=	45000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Area of Single Reinforcing Bar	=	0.0000	sq. in.
Offset of Center of Rebar Cage from Center of Pile	=	0.0000	in
Yield Stress of Reinforcing Bars	=	0.0000	psi
Modulus of Elasticity of Reinforcing Bars	=	0.0000	psi
Gross Area of Pile	=	452.38934	sq. in.
Area of Concrete	=	406.49264	sq. in.
Cross-sectional Area of Steel Casing	=	45.89671	sq. in.
Area of All Steel (Casing and Bars)	=	45.89671	sq. in.
Area Ratio of All Steel to Gross Area of Pile	=	10.15	percent

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3447.427 kips
Tensile Load for Cracking of Concrete = -322.623 kips
Nominal Axial Tensile Capacity = -2065.352 kips

Concrete Properties:

Compressive Strength of Concrete = 4000.00000 psi
Modulus of Elasticity of Concrete = 3604997. psi
Modulus of Rupture of Concrete = -474.34164 psi
Compression Strain at Peak Stress = 0.00189
Tensile Strain at Fracture of Concrete = -0.0001154
Maximum Coarse Aggregate Size = 0.0000 in

Input Axial Thrust Forces:

Number of Axial Thrust Force Values Determined from Input Data = 6

Number	Axial Thrust Force kips
1	0.000
2	100.000
3	200.000
4	300.000
5	400.000
6	500.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	183.2535485	146602839.	12.0000000	0.0000150	-0.0000150	0.0627335	0.000000	0.4306500	
0.000002500	366.1501682	146460067.	12.0000000	0.0000300	-0.0000300	0.1249712	0.000000	0.8613000	
0.000003750	548.6898591	146317296.	12.0000000	0.0000450	-0.0000450	0.1867130	0.000000	1.2919500	
0.000005000	730.8726212	146174524.	12.0000000	0.0000600	-0.0000600	0.2479590	0.000000	1.7226000	
0.000006250	912.6984545	146031753.	12.0000000	0.0000750	-0.0000750	0.3087091	0.000000	2.1532500	
0.000007500	1094.1673590	145888981.	12.0000000	0.0000900	-0.0000900	0.3689635	0.000000	2.5839000	
0.000008750	1275.2793347	145746210.	12.0000000	0.0001050	-0.0001050	0.4287220	0.000000	3.0145500	
0.0000100	1275.2793347	127527933.	10.0351691	0.0001004	-0.0001396	0.4094671	0.000000	-4.0150009	C
0.0000113	1275.2793347	113358163.	10.0375996	0.0001129	-0.0001571	0.4592054	0.000000	-4.5160831	C
0.0000125	1380.2172350	110417379.	10.0400344	0.0001255	-0.0001745	0.5086210	0.000000	-5.0169875	C
0.0000138	1517.8119672	110386325.	10.0424736	0.0001381	-0.0001919	0.5577136	0.000000	-5.5177136	C
0.0000150	1655.3283481	110355223.	10.0449171	0.0001507	-0.0002093	0.6064827	0.000000	-6.0182610	C
0.0000163	1792.7661958	110324074.	10.0473649	0.0001633	-0.0002267	0.6549278	0.000000		

-6.5186292 C							
0.0000175	1930.1253279	110292876.	10.0498172	0.0001759	-0.0002441	0.7030484	0.000000
-7.0188177 C							
0.0000188	2067.4055610	110261630.	10.0522738	0.0001885	-0.0002615	0.7508442	0.000000
-7.5188261 C							
0.0000200	2204.6067108	110230336.	10.0547348	0.0002011	-0.0002789	0.7983147	0.000000
-8.0186538 C							
0.0000213	2341.7285924	110198993.	10.0572002	0.0002137	-0.0002963	0.8454593	0.000000
-8.5183003 C							
0.0000225	2478.7710198	110167601.	10.0596701	0.0002263	-0.0003137	0.8922776	0.000000
-9.0177652 C							
0.0000238	2615.7338064	110136160.	10.0621444	0.0002390	-0.0003310	0.9387693	0.000000
-9.5170480 C							
0.0000250	2752.6167646	110104671.	10.0646232	0.0002516	-0.0003484	0.9849337	0.000000
-10.0161481 C							
0.0000263	2889.4197060	110073132.	10.0671065	0.0002643	-0.0003657	1.0307705	0.000000
-10.5150651 C							
0.0000275	3026.1424414	110041543.	10.0695942	0.0002769	-0.0003831	1.0762791	0.000000
-11.0137985 C							
0.0000288	3162.7847806	110009905.	10.0720865	0.0002896	-0.0004004	1.1214592	0.000000
-11.5123478 C							
0.0000300	3299.3465326	109978218.	10.0745833	0.0003022	-0.0004178	1.1663101	0.000000
-12.0107124 C							
0.0000313	3435.8275055	109946480.	10.0770847	0.0003149	-0.0004351	1.2108315	0.000000
-12.5088919 C							
0.0000325	3572.2275066	109914693.	10.0795907	0.0003276	-0.0004524	1.2550229	0.000000
-13.0068857 C							
0.0000338	3708.5463422	109882855.	10.0821012	0.0003403	-0.0004697	1.2988838	0.000000
-13.5046934 C							
0.0000350	3844.7838178	109850966.	10.0846163	0.0003530	-0.0004870	1.3424137	0.000000
-14.0023144 C							
0.0000363	3980.9397379	109819027.	10.0871361	0.0003657	-0.0005043	1.3856121	0.000000
-14.4997481 C							
0.0000375	4117.0139063	109787038.	10.0896604	0.0003784	-0.0005216	1.4284785	0.000000
-14.9969942 C							
0.0000388	4253.0061256	109754997.	10.0921895	0.0003911	-0.0005389	1.4710125	0.000000
-15.4940520 C							
0.0000400	4388.9161976	109722905.	10.0947232	0.0004038	-0.0005562	1.5132135	0.000000
-15.9909210 C							
0.0000413	4524.7439233	109690762.	10.0972616	0.0004165	-0.0005735	1.5550812	0.000000
-16.4876008 C							
0.0000425	4660.4891026	109658567.	10.0998047	0.0004292	-0.0005908	1.5966149	0.000000
-16.9840907 C							
0.0000438	4796.1515346	109626321.	10.1023525	0.0004420	-0.0006080	1.6378142	0.000000
-17.4803902 C							
0.0000450	4931.7310173	109594023.	10.1049050	0.0004547	-0.0006253	1.6786786	0.000000
-17.9764988 C							
0.0000463	5067.2273479	109561672.	10.1074624	0.0004675	-0.0006425	1.7192075	0.000000
-18.4724160 C							
0.0000475	5202.6403225	109529270.	10.1100245	0.0004802	-0.0006598	1.7594006	0.000000
-18.9681412 C							
0.0000488	5337.9697363	109496815.	10.1125914	0.0004930	-0.0006770	1.7992572	0.000000
-19.4636739 C							
0.0000513	5608.3770411	109431747.	10.1177396	0.0005185	-0.0007115	1.8779592	0.000000
-20.4541596 C							
0.0000538	5878.4476358	109366468.	10.1229072	0.0005441	-0.0007459	1.9553094	0.000000
-21.4438684 C							
0.0000563	6148.1798318	109300975.	10.1280944	0.0005697	-0.0007803	2.0313037	0.000000
-22.4327960 C							
0.0000588	6417.5719392	109235267.	10.1333013	0.0005953	-0.0008147	2.1059380	0.000000
-23.4209379 C							
0.0000613	6686.6222519	109169343.	10.1385281	0.0006210	-0.0008490	2.1792081	0.000000
-24.4082896 C							
0.0000638	6955.3290471	109103201.	10.1437748	0.0006467	-0.0008833	2.2511097	0.000000
-25.3948464 C							
0.0000663	7223.6905853	109036839.	10.1490417	0.0006724	-0.0009176	2.3216387	0.000000
-26.3806037 C							
0.0000688	7491.7051099	108970256.	10.1543290	0.0006981	-0.0009519	2.3907908	0.000000
-27.3655568 C							
0.0000713	7759.3708472	108903450.	10.1596367	0.0007239	-0.0009861	2.4585615	0.000000
-28.3497009 C							
0.0000738	8026.6860058	108836420.	10.1649650	0.0007497	-0.0010203	2.5249466	0.000000
-29.3330312 C							
0.0000763	8293.6487765	108769164.	10.1703142	0.0007755	-0.0010545	2.5899417	0.000000
-30.3155429 C							
0.0000788	8560.2573322	108701680.	10.1756843	0.0008013	-0.0010887	2.6535422	0.000000
-31.2972312 C							
0.0000813	8826.5098272	108633967.	10.1810756	0.0008272	-0.0011228	2.7157438	0.000000
-32.2780909 C							
0.0000838	9092.4043976	108566023.	10.1864882	0.0008531	-0.0011569	2.7765418	0.000000
-33.2581172 C							
0.0000863	9357.9391603	108497845.	10.1919222	0.0008791	-0.0011909	2.8359318	0.000000
-34.2373049 C							
0.0000888	9623.1122132	108429433.	10.1973779	0.0009050	-0.0012250	2.8939091	0.000000
-35.2156490 C							

0.0000913	9887.9229026	108360799.	10.2028210	0.0009310	-0.0012590	2.9504623	0.000000	-36.1932346 C
0.0000938	10152.	108291939.	10.2082541	0.0009570	-0.0012930	3.0055870	0.000000	-37.1700596 C
0.0000963	10416.	108222843.	10.2137089	0.0009831	-0.0013269	3.0592850	0.000000	-38.1460357 C
0.0000988	10680.	108153508.	10.2191854	0.0010091	-0.0013609	3.1115514	0.000000	-39.1211583 C
0.0001013	10943.	108083933.	10.2246840	0.0010352	-0.0013948	3.1623816	0.000000	-40.0954221 C
0.0001038	11206.	108014115.	10.2302048	0.0010614	-0.0014286	3.2117706	0.000000	-41.0688218 C
0.0001063	11469.	107944053.	10.2357480	0.0010875	-0.0014625	3.2597137	0.000000	-42.0413521 C
0.0001088	11731.	107873745.	10.2413138	0.0011137	-0.0014963	3.3062060	0.000000	-43.0130074 C
0.0001113	11993.	107803189.	10.2469023	0.0011400	-0.0015300	3.3512424	0.000000	-43.9837822 C
0.0001138	12255.	107732383.	10.2525138	0.0011662	-0.0015638	3.3948181	0.000000	-44.9536710 C
0.0001163	12504.	107558853.	10.2540067	0.0011920	-0.0015980	3.4361616	0.000000	-45.0000000 CY
0.0001188	12730.	107199318.	10.2478222	0.0012169	-0.0016331	3.4746534	0.000000	-45.0000000 CY
0.0001213	12934.	106675143.	10.2346446	0.0012410	-0.0016690	3.5104817	0.000000	-45.0000000 CY
0.0001238	13124.	106051848.	10.2170885	0.0012644	-0.0017056	3.5441749	0.000000	-45.0000000 CY
0.0001263	13302.	105358617.	10.1962579	0.0012873	-0.0017427	3.5759751	0.000000	-45.0000000 CY
0.0001288	13469.	104612824.	10.1726283	0.0013097	-0.0017803	3.6060075	0.000000	-45.0000000 CY
0.0001313	13627.	103827473.	10.1469413	0.0013318	-0.0018182	3.6344394	0.000000	-45.0000000 CY
0.0001338	13778.	103012122.	10.1195839	0.0013535	-0.0018565	3.6613726	0.000000	-45.0000000 CY
0.0001363	13921.	102174223.	10.0908618	0.0013749	-0.0018951	3.6868925	0.000000	-45.0000000 CY
0.0001388	14058.	101320030.	10.0610387	0.0013960	-0.0019340	3.7110750	0.000000	-45.0000000 CY
0.0001413	14189.	100454322.	10.0303181	0.0014168	-0.0019732	3.7339840	0.000000	-45.0000000 CY
0.0001438	14315.	99581299.	9.9988851	0.0014373	-0.0020127	3.7556787	0.000000	-45.0000000 CY
0.0001463	14436.	98704431.	9.9668969	0.0014577	-0.0020523	3.7762116	0.000000	-45.0000000 CY
0.0001488	14552.	97825499.	9.9340917	0.0014777	-0.0020923	3.7955737	0.000000	-45.0000000 CY
0.0001588	14977.	94340505.	9.8002414	0.0015558	-0.0022542	3.8626505	0.000000	-45.0000000 CY
0.0001688	15333.	90859687.	9.6738494	0.0016325	-0.0024175	3.9155617	0.000000	45.0000000 CY
0.0001788	15612.	87339956.	9.5696098	0.0017106	-0.0025794	3.9563022	0.000000	45.0000000 CY
0.0001888	15837.	83904776.	9.4831108	0.0017899	-0.0027401	3.9840842	0.000000	45.0000000 CY
0.0001988	16024.	80626260.	9.4057309	0.0018694	-0.0029006	3.9981348	0.000000	45.0000000 CY
0.0002088	16183.	77522582.	9.3370288	0.0019491	-0.0030609	3.9998295	0.000000	45.0000000 CY
0.0002188	16319.	74602260.	9.2751582	0.0020289	-0.0032211	3.9981028	0.000000	45.0000000 CY
0.0002288	16437.	71856884.	9.2188083	0.0021088	-0.0033812	3.9993242	0.000000	45.0000000 CY
0.0002388	16540.	69275680.	9.1668736	0.0021886	-0.0035414	3.9998149	0.000000	45.0000000 CY
0.0002488	16629.	66850159.	9.1196066	0.0022685	-0.0037015	3.9999619	0.000000	45.0000000 CY
0.0002588	16708.	64571579.	9.0766024	0.0023486	-0.0038614	3.9999866	0.000000	45.0000000 CY
0.0002688	16778.	62429171.	9.0371385	0.0024287	-0.0040213	3.9999623	0.000000	45.0000000 CY
0.0002788	16839.	60410467.	9.0013871	0.0025091	-0.0041809	3.9998191	0.000000	45.0000000 CY
0.0002888	16894.	58507018.	8.9676236	0.0025894	-0.0043406	3.9993241	0.000000	45.0000000 CY
0.0002988	16943.	56712934.	8.9359291	0.0026696	-0.0045004	3.9980906	0.000000	45.0000000 CY
0.0003088	16986.	55016869.	8.9073909	0.0027502	-0.0046598	3.9963205	0.000000	45.0000000 CY
0.0003188	17026.	53414810.	8.8808284	0.0028308	-0.0048192	3.9998446	0.000000	45.0000000 CY
0.0003288	17061.	51897768.	8.8565431	0.0029116	-0.0049784	3.9982163	0.000000	45.0000000 CY
0.0003388	17093.	50458940.	8.8334521	0.0029923	-0.0051377	3.9973316	0.000000	

45.0000000	CY							
0.0003488		17122.	49094444.	8.8126805	0.0030734	-0.0052966	3.9992106	0.000000
45.0000000	CY							
0.0003588		17148.	47799208.	8.7930283	0.0031545	-0.0054555	3.9950550	0.000000
45.0000000	CY							
0.0003688		17171.	46565463.	8.7751548	0.0032358	-0.0056142	3.9994468	0.000000
45.0000000	CY							
0.0003788		17193.	45393928.	8.7582775	0.0033172	-0.0057728	3.9946595	0.000000
45.0000000	CY							
0.0003888		17212.	44274211.	8.7420421	0.0033985	-0.0059315	3.9991651	0.000000
45.0000000	CY							
0.0003988		17229.	43208361.	8.7273843	0.0034800	-0.0060900	3.9953838	0.000000
45.0000000	CY							
0.0004088		17245.	42190104.	8.7124556	0.0035612	-0.0062488	3.9980353	0.000000
45.0000000	CY							
0.0004188		17259.	41216534.	8.7000657	0.0036432	-0.0064068	3.9999961	0.000000
45.0000000	CY							
0.0004288		17272.	40285292.	8.6880258	0.0037250	-0.0065650	3.9952604	0.000000
45.0000000	CY							
0.0004388		17284.	39394379.	8.6761033	0.0038066	-0.0067234	3.9991386	0.000000
45.0000000	CY							

Axial Thrust Force = 100.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	182.2158726	145772698.	38.3220968	0.0000479	0.0000179	0.1999635	0.000000	1.3848260	
0.000002500	364.4300517	145772021.	25.1702127	0.0000629	0.000002926	0.2611965	0.000000	1.8161404	
0.000003750	546.6276738	145767380.	20.7902138	0.0000780	-0.0000120	0.3219926	0.000000	2.2478857	
0.000005000	728.6637624	145732752.	18.6021969	0.0000930	-0.0000270	0.3823303	0.000000	2.6799186	
0.000006250	910.4140404	145666246.	17.2901635	0.0001081	-0.0000419	0.4421884	0.000000	3.1120922	
0.000007500	1091.8371302	145578284.	16.4158294	0.0001231	-0.0000569	0.5015577	0.000000	3.5443429	
0.000008750	1272.9176961	145476308.	15.7914935	0.0001382	-0.0000718	0.5604340	0.000000	3.9766415	
0.0000100	1453.6491135	145364911.	15.3233542	0.0001532	-0.0000868	0.6188150	0.000000	4.4089727	
0.0000113	1634.0281507	145246947.	14.9593198	0.0001683	-0.0001017	0.6766995	0.000000	4.8413281	
0.0000125	1634.0281507	130722252.	13.7513177	0.0001719	-0.0001281	0.6900198	0.000000	4.9413526	C
0.0000138	1700.8958177	123701514.	13.4422409	0.0001848	-0.0001452	0.7391779	0.000000	5.3122436	C
0.0000150	1839.1292548	122608617.	13.1821126	0.0001977	-0.0001623	0.7878221	0.000000	5.6820190	C
0.0000163	1977.0357244	121663737.	12.9601152	0.0002106	-0.0001794	0.8359849	0.000000	6.0509043	C
0.0000175	2114.6841551	120839095.	12.7685467	0.0002234	-0.0001966	0.8836997	0.000000	6.4191375	C
0.0000188	2252.1312698	120113668.	12.6017636	0.0002363	-0.0002137	0.9309993	0.000000	6.7869590	C
0.0000200	2389.3366192	119466831.	12.4546147	0.0002491	-0.0002309	0.9778477	0.000000	7.1540766	C
0.0000213	2526.4188716	118890300.	12.3246748	0.0002619	-0.0002481	1.0243278	0.000000	7.5211309	C
0.0000225	2663.3235666	118369936.	12.2085462	0.0002747	-0.0002653	1.0703965	0.000000	7.8877764	C
0.0000238	2800.1281120	117900131.	12.1047356	0.0002875	-0.0002825	1.1161138	0.000000	8.2544867	C
0.0000250	2936.7609898	117470440.	12.0106896	0.0003003	-0.0002997	1.1614166	0.000000	8.6207500	C
0.0000263	3073.3097739	117078468.	11.9258341	0.0003131	-0.0003169	1.2063825	0.000000	-9.1001087	C
0.0000275	3209.7413688	116717868.	11.8485754	0.0003258	-0.0003342	1.2509780	0.000000	-9.5950610	C
0.0000288	3346.0426819	116384093.	11.7777911	0.0003386	-0.0003514	1.2951902	0.000000	-10.0902166	C
0.0000300	3482.2599423	116075331.	11.7131116	0.0003514	-0.0003686	1.3390655	0.000000	-10.5851928	C
0.0000313	3618.3929557	115788575.	11.6538051	0.0003642	-0.0003858	1.3826032	0.000000	-11.0799891	C
0.0000325	3754.3980580	115519940.	11.5987985	0.0003770	-0.0004030	1.4257528	0.000000	-11.5750324	C

0.0000338	3890.3048771	115268293.	11.5479096	0.0003897	-0.0004203	1.4685488	0.000000	-12.0700333 C
0.0000350	4026.1274210	115032212.	11.5008348	0.0004025	-0.0004375	1.5110069	0.000000	-12.5648526 C
0.0000363	4161.8654933	114810083.	11.4571799	0.0004153	-0.0004547	1.5531269	0.000000	-13.0594895 C
0.0000375	4297.5188967	114600504.	11.4166033	0.0004281	-0.0004719	1.5949081	0.000000	-13.5539438 C
0.0000388	4433.0652946	114401685.	11.3785683	0.0004409	-0.0004891	1.6363199	0.000000	-14.0484837 C
0.0000400	4568.5102560	114212756.	11.3428941	0.0004537	-0.0005063	1.6773700	0.000000	-14.5430427 C
0.0000413	4703.8704327	114033223.	11.3095367	0.0004665	-0.0005235	1.7180809	0.000000	-15.0374167 C
0.0000425	4839.1456245	113862250.	11.2782919	0.0004793	-0.0005407	1.7584522	0.000000	-15.5316051 C
0.0000438	4974.3356299	113699100.	11.2489793	0.0004921	-0.0005579	1.7984833	0.000000	-16.0256074 C
0.0000450	5109.4402468	113543117.	11.2214380	0.0005050	-0.0005750	1.8381738	0.000000	-16.5194233 C
0.0000463	5244.4592719	113393714.	11.1955249	0.0005178	-0.0005922	1.8775232	0.000000	-17.0130521 C
0.0000475	5379.3925012	113250368.	11.1711118	0.0005306	-0.0006094	1.9165310	0.000000	-17.5064934 C
0.0000488	5514.2277271	113112364.	11.1479468	0.0005435	-0.0006265	1.9551764	0.000000	-17.9999401 C
0.0000513	5783.6185870	112851094.	11.1051540	0.0005691	-0.0006609	2.0314044	0.000000	-18.9866148 C
0.0000538	6052.6645127	112607712.	11.0668317	0.0005948	-0.0006952	2.1062612	0.000000	-19.9725259 C
0.0000563	6321.3638268	112379801.	11.0323865	0.0006206	-0.0007294	2.1797429	0.000000	-20.9576694 C
0.0000588	6589.7148366	112165359.	11.0013259	0.0006463	-0.0007637	2.2518452	0.000000	-21.9420408 C
0.0000613	6857.7158332	111962707.	10.9732380	0.0006721	-0.0007979	2.3225640	0.000000	-22.9256358 C
0.0000638	7125.3650919	111770433.	10.9477753	0.0006979	-0.0008321	2.3918951	0.000000	-23.9084501 C
0.0000663	7392.6608715	111587334.	10.9246431	0.0007238	-0.0008662	2.4598342	0.000000	-24.8904793 C
0.0000688	7659.5864403	111412166.	10.9033959	0.0007496	-0.0009004	2.5263430	0.000000	-25.8721042 C
0.0000713	7926.1519157	111244237.	10.8839769	0.0007755	-0.0009345	2.5914443	0.000000	-26.8530326 C
0.0000738	8192.3596543	111082843.	10.8662512	0.0008014	-0.0009686	2.6551434	0.000000	-27.8331551 C
0.0000763	8458.2078360	110927316.	10.8500544	0.0008273	-0.0010027	2.7174357	0.000000	-28.8124670 C
0.0000788	8723.6946230	110777075.	10.8352430	0.0008533	-0.0010367	2.7783168	0.000000	-29.7909635 C
0.0000813	8988.8181594	110631608.	10.8216913	0.0008793	-0.0010707	2.8377823	0.000000	-30.7686397 C
0.0000838	9253.5765709	110490467.	10.8092883	0.0009053	-0.0011047	2.8958276	0.000000	-31.7454909 C
0.0000863	9517.9679643	110353252.	10.7979362	0.0009313	-0.0011387	2.9524482	0.000000	-32.7215119 C
0.0000888	9781.9901646	110219607.	10.7875480	0.0009574	-0.0011726	3.0076393	0.000000	-33.6967005 C
0.0000913	10046.	110089225.	10.7780466	0.0009835	-0.0012065	3.0613965	0.000000	-34.6710462 C
0.0000938	10309.	109961820.	10.7693627	0.0010096	-0.0012404	3.1137151	0.000000	-35.6445468 C
0.0000963	10572.	109837139.	10.7614346	0.0010358	-0.0012742	3.1645903	0.000000	-36.6171971 C
0.0000988	10834.	109714956.	10.7542067	0.0010620	-0.0013080	3.2140172	0.000000	-37.5889918 C
0.0001013	11097.	109595066.	10.7476289	0.0010882	-0.0013418	3.2619911	0.000000	-38.5599258 C
0.0001038	11358.	109477282.	10.7416559	0.0011144	-0.0013756	3.3085072	0.000000	-39.5299937 C
0.0001063	11620.	109361438.	10.7362468	0.0011407	-0.0014093	3.3535604	0.000000	-40.4991901 C
0.0001088	11881.	109247381.	10.7313646	0.0011670	-0.0014430	3.3971459	0.000000	-41.4675095 C
0.0001113	12141.	109134970.	10.7269752	0.0011934	-0.0014766	3.4392587	0.000000	-42.4349465 C
0.0001138	12401.	109024080.	10.7230481	0.0012197	-0.0015103	3.4798936	0.000000	-43.4014955 C
0.0001163	12661.	108914593.	10.7195549	0.0012461	-0.0015439	3.5190456	0.000000	-44.3671507 C
0.0001188	12917.	108777597.	10.7153181	0.0012724	-0.0015776	3.5565164	0.000000	-45.0000000 CY
0.0001213	13158.	108516849.	10.7063946	0.0012982	-0.0016118	3.5916695	0.000000	-45.0000000 CY
0.0001238	13375.	108084106.	10.6906284	0.0013230	-0.0016470	3.6242133	0.000000	

-45.0000000 CY								
0.0001263	13574.	107519544.	10.6693744	0.0013470	-0.0016830	3.6544446	0.000000	
-45.0000000 CY								
0.0001288	13760.	106871677.	10.6444921	0.0013705	-0.0017195	3.6827237	0.000000	
-45.0000000 CY								
0.0001313	13934.	106164153.	10.6170366	0.0013935	-0.0017565	3.7092677	0.000000	
-45.0000000 CY								
0.0001338	14099.	105409679.	10.5874823	0.0014161	-0.0017939	3.7341954	0.000000	
-45.0000000 CY								
0.0001363	14255.	104623331.	10.5564441	0.0014383	-0.0018317	3.7576409	0.000000	
-45.0000000 CY								
0.0001388	14404.	103813010.	10.5242319	0.0014602	-0.0018698	3.7796876	0.000000	
-45.0000000 CY								
0.0001413	14547.	102985028.	10.4910965	0.0014819	-0.0019081	3.8004071	0.000000	
-45.0000000 CY								
0.0001438	14683.	102142394.	10.4571378	0.0015032	-0.0019468	3.8198480	0.000000	
-45.0000000 CY								
0.0001463	14814.	101289323.	10.4223010	0.0015243	-0.0019857	3.8380387	0.000000	
-45.0000000 CY								
0.0001488	14939.	100429983.	10.3867603	0.0015450	-0.0020250	3.8550363	0.000000	
-45.0000000 CY								
0.0001588	15382.	96896010.	10.2513365	0.0016274	-0.0021826	3.9131648	0.000000	
45.0000000 CY								
0.0001688	15723.	93170397.	10.1406116	0.0017112	-0.0023388	3.9571230	0.000000	
45.0000000 CY								
0.0001788	15992.	89466707.	10.0469556	0.0017959	-0.0024941	3.9859411	0.000000	
45.0000000 CY								
0.0001888	16215.	85904830.	9.9654218	0.0018810	-0.0026490	3.9991219	0.000000	
45.0000000 CY								
0.0001988	16401.	82520805.	9.8912184	0.0019659	-0.0028041	3.9982334	0.000000	
45.0000000 CY								
0.0002088	16559.	79325148.	9.8245603	0.0020509	-0.0029591	3.9998702	0.000000	
45.0000000 CY								
0.0002188	16695.	76320874.	9.7643875	0.0021360	-0.0031140	3.9982847	0.000000	
45.0000000 CY								
0.0002288	16813.	73497547.	9.7097367	0.0022211	-0.0032689	3.9994550	0.000000	
45.0000000 CY								
0.0002388	16914.	70845074.	9.6592197	0.0023061	-0.0034239	3.9998902	0.000000	
45.0000000 CY								
0.0002488	17003.	68352875.	9.6131313	0.0023913	-0.0035787	3.9999932	0.000000	
45.0000000 CY								
0.0002588	17081.	66012460.	9.5712365	0.0024766	-0.0037334	3.9998945	0.000000	
45.0000000 CY								
0.0002688	17150.	63812568.	9.5328428	0.0025620	-0.0038880	3.9999972	0.000000	
45.0000000 CY								
0.0002788	17210.	61741324.	9.4978404	0.0026475	-0.0040425	3.9999263	0.000000	
45.0000000 CY								
0.0002888	17264.	59788345.	9.4656291	0.0027332	-0.0041968	3.9995803	0.000000	
45.0000000 CY								
0.0002988	17312.	57947522.	9.4350076	0.0028187	-0.0043513	3.9985822	0.000000	
45.0000000 CY								
0.0003088	17354.	56208692.	9.4071790	0.0029045	-0.0045055	3.9964423	0.000000	
45.0000000 CY								
0.0003188	17393.	54565632.	9.3816819	0.0029904	-0.0046596	3.9999706	0.000000	
45.0000000 CY								
0.0003288	17427.	53009839.	9.3578194	0.0030764	-0.0048136	3.9987877	0.000000	
45.0000000 CY								
0.0003388	17457.	51534550.	9.3358666	0.0031625	-0.0049675	3.9952215	0.000000	
45.0000000 CY								
0.0003488	17485.	50136727.	9.3158000	0.0032489	-0.0051211	3.9996179	0.000000	
45.0000000 CY								
0.0003588	17510.	48807877.	9.2970184	0.0033353	-0.0052747	3.9962551	0.000000	
45.0000000 CY								
0.0003688	17532.	47544423.	9.2798671	0.0034220	-0.0054280	3.9998080	0.000000	
45.0000000 CY								
0.0003788	17553.	46343318.	9.2636066	0.0035086	-0.0055814	3.9960427	0.000000	
45.0000000 CY								
0.0003888	17570.	45196447.	9.2492155	0.0035956	-0.0057344	3.9996869	0.000000	
45.0000000 CY								
0.0003988	17587.	44104222.	9.2354046	0.0036826	-0.0058874	3.9945222	0.000000	
45.0000000 CY								
0.0004088	17601.	43061099.	9.2219226	0.0037695	-0.0060405	3.9990043	0.000000	
45.0000000 CY								
0.0004188	17614.	42063368.	9.2100399	0.0038567	-0.0061933	3.9966505	0.000000	
45.0000000 CY								

Axial Thrust Force = 200.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg

0.000001250	180.9878053	144790244.	64.9023422	0.0000811	0.0000511	0.3360693	0.000000	2.3483599	
0.000002500	361.9738999	144789560.	38.4604283	0.0000962	0.0000362	0.3961922	0.000000	2.7796811	
0.000003750	542.9565727	144788419.	29.6505715	0.0001112	0.0000212	0.4558793	0.000000	3.2114497	
0.000005000	723.9341129	144786823.	25.2487290	0.0001262	0.000006244	0.5151290	0.000000	3.6436657	
0.000006250	904.9042386	144784678.	22.6100896	0.0001413	-0.000008687	0.5739398	0.000000	4.0763288	
0.000007500	1085.8186538	144775821.	20.8528534	0.0001564	-0.0000236	0.6323043	0.000000	4.5093956	
0.000008750	1266.5628073	144750035.	19.5988258	0.0001715	-0.0000385	0.6902059	0.000000	4.9427521	
0.0000100	1447.0594831	144705948.	18.6589961	0.0001866	-0.0000534	0.7476319	0.000000	5.3763089	
0.0000113	1627.2660712	144645873.	17.9284569	0.0002017	-0.0000683	0.8045741	0.000000	5.8100091	
0.0000125	1807.1584544	144572676.	17.3443203	0.0002168	-0.0000832	0.8610272	0.000000	6.2438161	
0.0000138	1986.7223013	144488895.	16.8665970	0.0002319	-0.0000981	0.9169877	0.000000	6.6777056	
0.0000150	2165.9487546	144396584.	16.4686455	0.0002470	-0.0001130	0.9724534	0.000000	7.1116608	
0.0000163	2165.9487546	133289154.	15.5735352	0.0002531	-0.0001369	0.9941482	0.000000	7.2824783	C
0.0000175	2269.9650933	129712291.	15.2236706	0.0002664	-0.0001536	1.0424618	0.000000	7.6651129	C
0.0000188	2410.2777143	128548145.	14.9166838	0.0002797	-0.0001703	1.0901283	0.000000	8.0456969	C
0.0000200	2549.8978437	127494892.	14.6455266	0.0002929	-0.0001871	1.1372250	0.000000	8.4248055	C
0.0000213	2688.9280192	126537789.	14.4041845	0.0003061	-0.0002039	1.1837797	0.000000	8.8026288	C
0.0000225	2827.4633417	125665037.	14.1879994	0.0003192	-0.0002208	1.2298211	0.000000	9.1793697	C
0.0000238	2965.5907698	124866980.	13.9933117	0.0003323	-0.0002377	1.2753783	0.000000	9.5552435	C
0.0000250	3103.3556835	124134227.	13.8170402	0.0003454	-0.0002546	1.3204665	0.000000	9.9303542	C
0.0000263	3240.7423494	123456851.	13.6563781	0.0003585	-0.0002715	1.3650720	0.000000	10.3045679	C
0.0000275	3377.9070180	122832982.	13.5098983	0.0003715	-0.0002885	1.4092633	0.000000	10.6784440	C
0.0000288	3514.7987924	122253871.	13.3754859	0.0003845	-0.0003055	1.4530158	0.000000	11.0517615	C
0.0000300	3651.4638180	121715461.	13.2517927	0.0003976	-0.0003224	1.4963472	0.000000	11.4246597	C
0.0000313	3787.9315489	121213810.	13.1376742	0.0004106	-0.0003394	1.5392734	0.000000	11.7972673	C
0.0000325	3924.2130711	120745018.	13.0320350	0.0004235	-0.0003565	1.5817965	0.000000	12.1695931	C
0.0000338	4060.2927021	120304969.	12.9338522	0.0004365	-0.0003735	1.6239082	0.000000	12.5415579	C
0.0000350	4196.2826205	119893789.	12.8428667	0.0004495	-0.0003905	1.6656709	0.000000	12.9137098	C
0.0000363	4332.0134722	119503820.	12.7574643	0.0004625	-0.0004075	1.7069828	0.000000	13.2851345	C
0.0000375	4467.6492512	119137313.	12.6778989	0.0004754	-0.0004246	1.7479430	0.000000	13.6567152	C
0.0000388	4603.1954796	118792141.	12.6036334	0.0004884	-0.0004416	1.7885545	0.000000	14.0284832	C
0.0000400	4738.5154200	118462886.	12.5334599	0.0005013	-0.0004587	1.8287277	0.000000	14.3996136	C
0.0000413	4873.7388554	118151245.	12.4676593	0.0005143	-0.0004757	1.8685480	0.000000	14.7708876	C
0.0000425	5008.8728808	117855832.	12.4058819	0.0005272	-0.0004928	1.9080196	0.000000	15.1423496	C
0.0000438	5143.8924524	117574685.	12.3476494	0.0005402	-0.0005098	1.9471243	0.000000	15.5138303	C
0.0000450	5278.7321758	117305159.	12.2923224	0.0005532	-0.0005268	1.9858155	0.000000	15.8848809	C
0.0000463	5413.4825912	117048272.	12.2401271	0.0005661	-0.0005439	2.0241580	0.000000	16.2561206	C
0.0000475	5548.1434827	116803021.	12.1908166	0.0005791	-0.0005609	2.0621513	0.000000	16.6275500	C
0.0000488	5682.7146335	116568505.	12.1441693	0.0005920	-0.0005780	2.0997949	0.000000	16.9991694	C
0.0000513	5951.4578134	116126006.	12.0573958	0.0006179	-0.0006121	2.1739297	0.000000	17.7419547	C
0.0000538	6219.7940670	115717099.	11.9789425	0.0006439	-0.0006461	2.2466269	0.000000	-18.5507732	C
0.0000563	6487.7697863	115338130.	11.9079353	0.0006698	-0.0006802	2.3179206	0.000000		

-19.5294304 C							
0.0000588	6755.3085568	114983975.	11.8430115	0.0006958	-0.0007142	2.3877410	0.000000
-20.5080189 C							
0.0000613	7022.4308550	114651932.	11.7835374	0.0007217	-0.0007483	2.4561056	0.000000
-21.4863414 C							
0.0000638	7289.1898204	114340232.	11.7291527	0.0007477	-0.0007823	2.5230590	0.000000
-22.4638787 C							
0.0000663	7555.5836494	114046546.	11.6792835	0.0007738	-0.0008162	2.5885969	0.000000
-23.4406263 C							
0.0000688	7821.5976801	113768694.	11.6333637	0.0007998	-0.0008502	2.6527021	0.000000
-24.4167310 C							
0.0000713	8087.1704201	113504146.	11.5906342	0.0008258	-0.0008842	2.7153119	0.000000
-25.3929019 C							
0.0000738	8352.3747197	113252539.	11.5511787	0.0008519	-0.0009181	2.7764974	0.000000
-26.3682663 C							
0.0000763	8617.2087109	113012573.	11.5146774	0.0008780	-0.0009520	2.8362541	0.000000
-27.3428193 C							
0.0000788	8881.6705077	112783118.	11.4808509	0.0009041	-0.0009859	2.8945775	0.000000
-28.3165565 C							
0.0000813	9145.7582060	112563178.	11.4494543	0.0009303	-0.0010197	2.9514630	0.000000
-29.2894730 C							
0.0000838	9409.4698833	112351879.	11.4202720	0.0009564	-0.0010536	3.0069061	0.000000
-30.2615641 C							
0.0000863	9672.7909362	112148301.	11.3930319	0.0009826	-0.0010874	3.0608876	0.000000
-31.2330286 C							
0.0000888	9935.6972217	111951518.	11.3674277	0.0010089	-0.0011211	3.1133787	0.000000
-32.2042328 C							
0.0000913	10198.	111761352.	11.3435460	0.0010351	-0.0011549	3.1644169	0.000000
-33.1745911 C							
0.0000938	10460.	111577252.	11.3212511	0.0010614	-0.0011886	3.2139973	0.000000
-34.1440983 C							
0.0000963	10722.	111398725.	11.3004211	0.0010877	-0.0012223	3.2621153	0.000000
-35.1127493 C							
0.0000988	10984.	111225326.	11.2809466	0.0011140	-0.0012560	3.3087659	0.000000
-36.0805390 C							
0.0001013	11244.	111056656.	11.2627289	0.0011404	-0.0012896	3.3539442	0.000000
-37.0474620 C							
0.0001038	11505.	110892351.	11.2456790	0.0011667	-0.0013233	3.3976453	0.000000
-38.0135130 C							
0.0001063	11765.	110732085.	11.2297162	0.0011932	-0.0013568	3.4398641	0.000000
-38.9786866 C							
0.0001088	12025.	110575559.	11.2147673	0.0012196	-0.0013904	3.4805957	0.000000
-39.9429774 C							
0.0001113	12285.	110422502.	11.2007655	0.0012461	-0.0014239	3.5198349	0.000000
-40.9063799 C							
0.0001138	12544.	110272665.	11.1876502	0.0012726	-0.0014574	3.5575767	0.000000
-41.8688885 C							
0.0001163	12802.	110125823.	11.1753659	0.0012991	-0.0014909	3.5938157	0.000000
-42.8304975 C							
0.0001188	13060.	109981767.	11.1638616	0.0013257	-0.0015243	3.6285469	0.000000
-43.7912013 C							
0.0001213	13318.	109840224.	11.1530059	0.0013523	-0.0015577	3.6617521	0.000000
-44.7512928 C							
0.0001238	13568.	109642218.	11.1404264	0.0013786	-0.0015914	3.6930886	0.000000
-45.0000000 CY							
0.0001263	13800.	109308738.	11.1228273	0.0014043	-0.0016257	3.7221239	0.000000
-45.0000000 CY							
0.0001288	14009.	108808099.	11.0986829	0.0014290	-0.0016610	3.7487284	0.000000
-45.0000000 CY							
0.0001313	14202.	108204367.	11.0705054	0.0014530	-0.0016970	3.7733386	0.000000
-45.0000000 CY							
0.0001338	14383.	107535455.	11.0397922	0.0014766	-0.0017334	3.7962214	0.000000
-45.0000000 CY							
0.0001363	14554.	106818499.	11.0071959	0.0014997	-0.0017703	3.8175155	0.000000
-45.0000000 CY							
0.0001388	14717.	106065405.	10.9731663	0.0015225	-0.0018075	3.8373255	0.000000
-45.0000000 CY							
0.0001413	14872.	105285091.	10.9380403	0.0015450	-0.0018450	3.8557359	0.000000
-45.0000000 CY							
0.0001438	15020.	104483622.	10.9018192	0.0015671	-0.0018829	3.8727893	0.000000
-45.0000000 CY							
0.0001463	15157.	103640652.	10.8666485	0.0015892	-0.0019208	3.8887509	0.000000
45.0000000 CY							
0.0001488	15287.	102769193.	10.8320011	0.0016113	-0.0019587	3.9035784	0.000000
45.0000000 CY							
0.0001588	15715.	98994310.	10.7142304	0.0017009	-0.0021091	3.9530138	0.000000
45.0000000 CY							
0.0001688	16047.	95093104.	10.6151653	0.0017913	-0.0022587	3.9850774	0.000000
45.0000000 CY							
0.0001788	16315.	91273384.	10.5271059	0.0018817	-0.0024083	3.9992400	0.000000
45.0000000 CY							
0.0001888	16538.	87616743.	10.4489289	0.0019722	-0.0025578	3.9991630	0.000000
45.0000000 CY							
0.0001988	16725.	84148434.	10.3772424	0.0020625	-0.0027075	3.9983385	0.000000
45.0000000 CY							

0.0002088	16883.	80875272.	10.3125425	0.0021527	-0.0028573	3.9999074	0.000000	45.0000000 CY
0.0002188	17019.	77798983.	10.2541318	0.0022431	-0.0030069	3.9984668	0.000000	45.0000000 CY
0.0002288	17135.	74908580.	10.2011965	0.0023335	-0.0031565	3.9995770	0.000000	45.0000000 CY
0.0002388	17236.	72194732.	10.1521900	0.0024238	-0.0033062	3.9999482	0.000000	45.0000000 CY
0.0002488	17324.	69644657.	10.1073513	0.0025142	-0.0034558	3.9996605	0.000000	45.0000000 CY
0.0002588	17401.	67250362.	10.0666567	0.0026047	-0.0036053	3.9986435	0.000000	45.0000000 CY
0.0002688	17469.	65000330.	10.0294154	0.0026954	-0.0037546	3.9990956	0.000000	45.0000000 CY
0.0002788	17529.	62883285.	9.9952557	0.0027862	-0.0039038	3.9999882	0.000000	45.0000000 CY
0.0002888	17581.	60886861.	9.9645983	0.0028773	-0.0040527	3.9997846	0.000000	45.0000000 CY
0.0002988	17628.	59005123.	9.9353166	0.0029682	-0.0042018	3.9990253	0.000000	45.0000000 CY
0.0003088	17669.	57228821.	9.9083285	0.0030592	-0.0043508	3.9972203	0.000000	45.0000000 CY
0.0003188	17706.	55549689.	9.8840309	0.0031505	-0.0044995	3.9993686	0.000000	45.0000000 CY
0.0003288	17739.	53959729.	9.8606801	0.0032417	-0.0046483	3.9992791	0.000000	45.0000000 CY
0.0003388	17768.	52452298.	9.8400023	0.0033333	-0.0047967	3.9963448	0.000000	45.0000000 CY
0.0003488	17795.	51025240.	9.8207723	0.0034250	-0.0049450	3.9998936	0.000000	45.0000000 CY
0.0003588	17818.	49666506.	9.8029681	0.0035168	-0.0050932	3.9973658	0.000000	45.0000000 CY
0.0003688	17839.	48376972.	9.7866765	0.0036088	-0.0052412	3.9999886	0.000000	45.0000000 CY
0.0003788	17858.	47148844.	9.7714629	0.0037009	-0.0053891	3.9973250	0.000000	45.0000000 CY
0.0003888	17874.	45978586.	9.7579711	0.0037934	-0.0055366	3.9999659	0.000000	45.0000000 CY
0.0003988	17889.	44862907.	9.7448668	0.0038858	-0.0056842	3.9962109	0.000000	45.0000000 CY

Axial Thrust Force = 300.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	179.7471563	143797725.	91.7549062	0.0001147	0.0000847	0.4710492	0.000000	3.3217654	
0.000002500	359.4925841	143797034.	51.8868061	0.0001297	0.0000697	0.5300505	0.000000	3.7530935	
0.000003750	539.2345547	143795881.	38.6015965	0.0001448	0.0000548	0.5886155	0.000000	4.1848736	
0.000005000	718.9713396	143794268.	31.9621095	0.0001598	0.0000398	0.6467426	0.000000	4.6171059	
0.000006250	898.7012100	143792194.	27.9809118	0.0001749	0.0000249	0.7044302	0.000000	5.0497903	
0.000007500	1078.4224369	143789658.	25.3288588	0.0001900	0.000009966	0.7616768	0.000000	5.4829268	
0.000008750	1258.1332911	143786662.	23.4363172	0.0002051	-0.000004932	0.8184808	0.000000	5.9165155	
0.0000100	1437.8217219	143782172.	22.0184382	0.0002202	-0.0000198	0.8748394	0.000000	6.3505471	
0.0000113	1617.4177416	143770466.	20.9168022	0.0002353	-0.0000347	0.9307428	0.000000	6.7849567	
0.0000125	1796.8419089	143747353.	20.0363119	0.0002505	-0.0000495	0.9861793	0.000000	7.2196631	
0.0000138	1976.0382346	143711872.	19.3164947	0.0002656	-0.0000644	1.0411399	0.000000	7.6546023	
0.0000150	2154.9691661	143664611.	18.7170734	0.0002808	-0.0000792	1.0956179	0.000000	8.0897270	
0.0000163	2333.6094007	143606732.	18.2101901	0.0002959	-0.0000941	1.1496083	0.000000	8.5250021	
0.0000175	2511.9416180	143539521.	17.7759640	0.0003111	-0.0001089	1.2031073	0.000000	8.9604018	
0.0000188	2529.8020718	134922777.	17.0620300	0.0003199	-0.0001301	1.2338188	0.000000	9.2122288	C
0.0000200	2674.9525082	133747625.	16.6822589	0.0003336	-0.0001464	1.2815145	0.000000	9.6061102	C
0.0000213	2818.5725358	132638708.	16.3429245	0.0003473	-0.0001627	1.3284830	0.000000		

9.9973773	C							
	0.0000225	2961.1009275	131604486.	16.0384135	0.0003609	-0.0001791	1.3748195	0.000000
10.3867648	C							
	0.0000238	3102.6640165	130638485.	15.7634573	0.0003744	-0.0001956	1.4205485	0.000000
10.7744313	C							
	0.0000250	3243.3782860	129735131.	15.5138436	0.0003878	-0.0002122	1.4656941	0.000000
11.1605367	C							
	0.0000263	3383.3550237	128889715.	15.2861791	0.0004013	-0.0002287	1.5102809	0.000000
11.5452539	C							
	0.0000275	3522.6995294	128098165.	15.0777034	0.0004146	-0.0002454	1.5543344	0.000000
11.9287685	C							
	0.0000288	3661.5103504	127356882.	14.8861512	0.0004280	-0.0002620	1.5978809	0.000000
12.3112786	C							
	0.0000300	3799.8785431	126662618.	14.7096495	0.0004413	-0.0002787	1.6409471	0.000000
12.6929952	C							
	0.0000313	3937.8138673	126010044.	14.5463813	0.0004546	-0.0002954	1.6835343	0.000000
13.0739082	C							
	0.0000325	4075.2955080	125393708.	14.3946772	0.0004678	-0.0003122	1.7256302	0.000000
13.4538833	C							
	0.0000338	4212.5350037	124815852.	14.2539236	0.0004811	-0.0003289	1.7673093	0.000000
13.8335778	C							
	0.0000350	4349.3653364	124267581.	14.1223670	0.0004943	-0.0003457	1.8085089	0.000000
14.2124026	C							
	0.0000363	4485.9849794	123751310.	13.9996722	0.0005075	-0.0003625	1.8493011	0.000000
14.5910055	C							
	0.0000375	4622.2800383	123260801.	13.8845664	0.0005207	-0.0003793	1.8896418	0.000000
14.9689661	C							
	0.0000388	4758.4134164	122797766.	13.7768296	0.0005339	-0.0003961	1.9295938	0.000000
15.3468623	C							
	0.0000400	4894.2144565	122355361.	13.6751865	0.0005470	-0.0004130	1.9690866	0.000000
15.7240165	C							
	0.0000413	5029.9208241	121937475.	13.5798691	0.0005602	-0.0004298	2.0082196	0.000000
16.1013685	C							
	0.0000425	5165.3246854	121537051.	13.4895946	0.0005733	-0.0004467	2.0469009	0.000000
16.4780255	C							
	0.0000438	5300.5767748	121156041.	13.4044393	0.0005864	-0.0004636	2.0851978	0.000000
16.8546325	C							
	0.0000450	5435.7343422	120794096.	13.3241660	0.0005996	-0.0004804	2.1231352	0.000000
17.2314367	C							
	0.0000463	5570.5815889	120445007.	13.2476224	0.0006127	-0.0004973	2.1606121	0.000000
17.6074236	C							
	0.0000475	5705.3225123	120112053.	13.1752084	0.0006258	-0.0005142	2.1977246	0.000000
17.9835497	C							
	0.0000488	5839.9690816	119794238.	13.1066474	0.0006389	-0.0005311	2.2344781	0.000000
18.3598729	C							
	0.0000513	6108.6713503	119193587.	12.9788829	0.0006652	-0.0005648	2.3067535	0.000000
19.1115148	C							
	0.0000538	6376.9189336	118640352.	12.8632509	0.0006914	-0.0005986	2.3775545	0.000000
19.8635424	C							
	0.0000563	6644.5377349	118125115.	12.7574925	0.0007176	-0.0006324	2.4467832	0.000000
20.6149097	C							
	0.0000588	6911.7111274	117646147.	12.6609692	0.0007438	-0.0006662	2.5145382	0.000000
21.3666764	C							
	0.0000613	7178.4238035	117198756.	12.5724728	0.0007701	-0.0006999	2.5808051	0.000000
22.1187050	C							
	0.0000638	7444.5827130	116777768.	12.4907295	0.0007963	-0.0007337	2.6455304	0.000000
22.8703863	C							
	0.0000663	7710.3620771	116382824.	12.4155741	0.0008225	-0.0007675	2.7088119	0.000000
23.6228720	C							
	0.0000688	7975.7192696	116010462.	12.3461357	0.0008488	-0.0008012	2.7706202	0.000000
24.3758583	C							
	0.0000713	8240.5364409	115656652.	12.2813829	0.0008750	-0.0008350	2.8308820	0.000000
25.1284575	C							
	0.0000738	8504.9713625	115321646.	12.2214023	0.0009013	-0.0008687	2.8896925	0.000000
25.8818743	C							
	0.0000763	8769.0220709	115003568.	12.1657266	0.0009276	-0.0009024	2.9470470	0.000000
26.6361131	C							
	0.0000788	9032.6689495	114700558.	12.1138782	0.0009540	-0.0009360	3.0029295	0.000000
27.3910197	C							
	0.0000813	9295.8006955	114409855.	12.0650824	0.0009803	-0.0009697	3.0572652	0.000000
28.1456007	C							
	0.0000838	9558.5451018	114131882.	12.0195447	0.0010066	-0.0010034	3.1101364	0.000000
28.9010195	C							
	0.0000863	9820.9001445	113865509.	11.9769838	0.0010330	-0.0010370	3.1615383	0.000000
-29.7724190	C							
	0.0000888	10083.	113609733.	11.9371499	0.0010594	-0.0010706	3.2114662	0.000000
-30.7379101	C							
	0.0000913	10344.	113363660.	11.8998209	0.0010859	-0.0011041	3.2599152	0.000000
-31.7025487	C							
	0.0000938	10606.	113126033.	11.8646193	0.0011123	-0.0011377	3.3068509	0.000000
-32.6668161	C							
	0.0000963	10866.	112896073.	11.8313362	0.0011388	-0.0011712	3.3522639	0.000000
-33.6308326	C							
	0.0000988	11127.	112673733.	11.8000427	0.0011653	-0.0012047	3.3961879	0.000000
-34.5939775	C							

0.0001013	11386.	112458429.	11.7705932	0.0011918	-0.0012382	3.4386179	0.000000	-35.5562456 C
0.0001038	11646.	112249630.	11.7428561	0.0012183	-0.0012717	3.4795489	0.000000	-36.5176314 C
0.0001063	11905.	112046858.	11.7167124	0.0012449	-0.0013051	3.5189757	0.000000	-37.4781297 C
0.0001088	12164.	111849675.	11.6920538	0.0012715	-0.0013385	3.5568932	0.000000	-38.4377349 C
0.0001113	12422.	111657685.	11.6687820	0.0012982	-0.0013718	3.5932962	0.000000	-39.3964416 C
0.0001138	12680.	111470526.	11.6468073	0.0013248	-0.0014052	3.6281794	0.000000	-40.3542441 C
0.0001163	12937.	111287556.	11.6258784	0.0013515	-0.0014385	3.6615133	0.000000	-41.3117070 C
0.0001188	13194.	111108665.	11.6060197	0.0013782	-0.0014718	3.6933083	0.000000	-42.2685195 C
0.0001213	13451.	110933725.	11.5872437	0.0014050	-0.0015050	3.7235712	0.000000	-43.2244040 C
0.0001238	13707.	110762479.	11.5694866	0.0014317	-0.0015383	3.7522964	0.000000	-44.1793545 C
0.0001263	13961.	110583924.	11.5522573	0.0014585	-0.0015715	3.7794240	0.000000	-45.0000000 CY
0.0001288	14203.	110314872.	11.5321334	0.0014848	-0.0016052	3.8045489	0.000000	-45.0000000 CY
0.0001313	14425.	109904896.	11.5068816	0.0015103	-0.0016397	3.8274743	0.000000	-45.0000000 CY
0.0001338	14627.	109363116.	11.4766874	0.0015350	-0.0016750	3.8483205	0.000000	-45.0000000 CY
0.0001363	14816.	108742100.	11.4436135	0.0015592	-0.0017108	3.8674057	0.000000	-45.0000000 CY
0.0001388	14991.	108043715.	11.4099648	0.0015831	-0.0017469	3.8850320	0.000000	45.0000000 CY
0.0001413	15153.	107281189.	11.3760947	0.0016069	-0.0017831	3.9012688	0.000000	45.0000000 CY
0.0001438	15301.	106444005.	11.3442137	0.0016307	-0.0018193	3.9163416	0.000000	45.0000000 CY
0.0001463	15436.	105547567.	11.3145558	0.0016548	-0.0018552	3.9302596	0.000000	45.0000000 CY
0.0001488	15562.	104619158.	11.2859447	0.0016788	-0.0018912	3.9429159	0.000000	45.0000000 CY
0.0001588	15981.	100670148.	11.1833847	0.0017754	-0.0020346	3.9810128	0.000000	45.0000000 CY
0.0001688	16314.	96673138.	11.0912136	0.0018716	-0.0021784	3.9986324	0.000000	45.0000000 CY
0.0001788	16583.	92774023.	11.0073651	0.0019676	-0.0023224	3.9992427	0.000000	45.0000000 CY
0.0001888	16807.	89045998.	10.9320912	0.0020634	-0.0024666	3.9991992	0.000000	45.0000000 CY
0.0001988	16995.	85509328.	10.8629717	0.0021590	-0.0026110	3.9984354	0.000000	45.0000000 CY
0.0002088	17153.	82172040.	10.8003664	0.0022546	-0.0027554	3.9999377	0.000000	45.0000000 CY
0.0002188	17289.	79035838.	10.7438215	0.0023502	-0.0028998	3.9986377	0.000000	45.0000000 CY
0.0002288	17405.	76088849.	10.6924465	0.0024459	-0.0030441	3.9996818	0.000000	45.0000000 CY
0.0002388	17506.	73323571.	10.6453368	0.0025416	-0.0031884	3.9999850	0.000000	45.0000000 CY
0.0002488	17593.	70724249.	10.6018832	0.0026372	-0.0033328	3.9985272	0.000000	45.0000000 CY
0.0002588	17668.	68284041.	10.5625025	0.0027330	-0.0034770	3.9973581	0.000000	45.0000000 CY
0.0002688	17735.	65991070.	10.5265460	0.0028290	-0.0036210	3.9976522	0.000000	45.0000000 CY
0.0002788	17794.	63834495.	10.4934684	0.0029251	-0.0037649	3.9994252	0.000000	45.0000000 CY
0.0002888	17845.	61800843.	10.4639276	0.0030215	-0.0039085	3.9999233	0.000000	45.0000000 CY
0.0002988	17890.	59884146.	10.4366235	0.0031179	-0.0040521	3.9994012	0.000000	45.0000000 CY
0.0003088	17931.	58075632.	10.4106278	0.0032143	-0.0041957	3.9979368	0.000000	45.0000000 CY
0.0003188	17966.	56364444.	10.3874784	0.0033110	-0.0043390	3.9970253	0.000000	45.0000000 CY
0.0003288	17998.	54745542.	10.3650392	0.0034075	-0.0044825	3.9996630	0.000000	45.0000000 CY
0.0003388	18025.	53210460.	10.3457069	0.0035046	-0.0046254	3.9973759	0.000000	45.0000000 CY
0.0003488	18050.	51757471.	10.3271994	0.0036016	-0.0047684	3.9999997	0.000000	45.0000000 CY
0.0003588	18071.	50373317.	10.3107591	0.0036990	-0.0049110	3.9983392	0.000000	45.0000000 CY
0.0003688	18091.	49061187.	10.2955311	0.0037965	-0.0050535	3.9976623	0.000000	45.0000000 CY
0.0003788	18108.	47809442.	10.2814395	0.0038941	-0.0051959	3.9984253	0.000000	

45.0000000 CY

Axial Thrust Force = 400.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	178.4935307	142794825.	118.8883341	0.0001486	0.0001186	0.6048678	0.000000	4.3053521	
0.000002500	356.9853146	142794126.	65.4536190	0.0001636	0.0001036	0.6627358	0.000000	4.7366874	
0.000003750	535.4736049	142792961.	47.6462482	0.0001787	0.0000887	0.7201670	0.000000	5.1684795	
0.000005000	713.9566546	142791331.	38.7457137	0.0001937	0.0000737	0.7771596	0.000000	5.6007285	
0.000006250	892.4327167	142789235.	33.4079137	0.0002088	0.0000588	0.8337122	0.000000	6.0334344	
0.000007500	1070.9000439	142786673.	29.8514812	0.0002239	0.0000439	0.8898231	0.000000	6.4665972	
0.000008750	1249.3568887	142783644.	27.3129732	0.0002390	0.0000290	0.9454907	0.000000	6.9002170	
0.0000100	1427.8015047	142780150.	25.4106680	0.0002541	0.0000141	1.0007136	0.000000	7.3342936	
0.0000113	1606.2321414	142776190.	23.9324982	0.0002692	-0.000000759	1.0554900	0.000000	7.7688275	
0.0000125	1784.6459017	142771672.	22.7512206	0.0002844	-0.0000156	1.1098184	0.000000	8.2038175	
0.0000138	1963.0110736	142764442.	21.7857950	0.0002996	-0.0000304	1.1636936	0.000000	8.6392358	
0.0000150	2141.2623230	142750822.	20.9821149	0.0003147	-0.0000453	1.2171066	0.000000	9.0750200	
0.0000163	2319.3417180	142728721.	20.3027261	0.0003299	-0.0000601	1.2700487	0.000000	9.5111097	
0.0000175	2497.2052622	142697444.	19.7208966	0.0003451	-0.0000749	1.3225130	0.000000	9.9474551	
0.0000188	2674.8201830	142657076.	19.2170409	0.0003603	-0.0000897	1.3744938	0.000000	10.3840160	
0.0000200	2852.1623235	142608116.	18.7764842	0.0003755	-0.0001045	1.4259867	0.000000	10.8207609	
0.0000213	2910.4128861	136960606.	18.1753155	0.0003862	-0.0001238	1.4617406	0.000000	11.1265882	C
0.0000225	3059.2417946	135966302.	17.7899382	0.0004003	-0.0001397	1.5084784	0.000000	11.5296347	C
0.0000238	3206.3751106	135005268.	17.4416073	0.0004142	-0.0001558	1.5545046	0.000000	11.9302571	C
0.0000250	3351.9875589	134079502.	17.1249697	0.0004281	-0.0001719	1.5998439	0.000000	12.3286031	C
0.0000263	3496.2628108	133190964.	16.8357589	0.0004419	-0.0001881	1.6445258	0.000000	12.7248715	C
0.0000275	3639.4493328	132343612.	16.5706903	0.0004557	-0.0002043	1.6885973	0.000000	13.1194256	C
0.0000288	3781.6657844	131536201.	16.3267919	0.0004694	-0.0002206	1.7320801	0.000000	13.5124128	C
0.0000300	3923.0268669	130767562.	16.1016019	0.0004830	-0.0002370	1.7749966	0.000000	13.9039937	C
0.0000313	4063.6424642	130036559.	15.8930666	0.0004967	-0.0002533	1.8173699	0.000000	14.2943417	C
0.0000325	4203.6168191	129342056.	15.6994617	0.0005102	-0.0002698	1.8592238	0.000000	14.6836427	C
0.0000338	4342.9116908	128678865.	15.5189695	0.0005238	-0.0002862	1.9005452	0.000000	15.0717415	C
0.0000350	4481.6411844	128046891.	15.3503987	0.0005373	-0.0003027	1.9413605	0.000000	15.4588547	C
0.0000363	4619.9660032	127447338.	15.1928873	0.0005507	-0.0003193	1.9817133	0.000000	15.8453729	C
0.0000375	4757.8062743	126874834.	15.0451058	0.0005642	-0.0003358	2.0215805	0.000000	16.2310527	C
0.0000388	4895.2023278	126327802.	14.9061593	0.0005776	-0.0003524	2.0609700	0.000000	16.6159467	C
0.0000400	5032.3370245	125808426.	14.7756771	0.0005910	-0.0003690	2.0999377	0.000000	17.0005856	C
0.0000413	5168.9696867	125308356.	14.6522390	0.0006044	-0.0003856	2.1384067	0.000000	17.3841910	C
0.0000425	5305.4454715	124834011.	14.5360908	0.0006178	-0.0004022	2.1764859	0.000000	17.7678320	C
0.0000438	5441.4666545	124376381.	14.4258200	0.0006311	-0.0004189	2.2140774	0.000000	18.1505092	C
0.0000450	5577.3290132	123940645.	14.3216860	0.0006445	-0.0004355	2.2512787	0.000000	18.5332003	C

0.0000463	5712.8757277	123521637.	14.2227655	0.0006578	-0.0004522	2.2880351	0.000000	18.9153343 C
0.0000475	5848.1687311	123119342.	14.1288044	0.0006711	-0.0004689	2.3243690	0.000000	19.2971282 C
0.0000488	5983.3616987	122735625.	14.0398079	0.0006844	-0.0004856	2.3603324	0.000000	19.6791285 C
0.0000513	6252.7949048	122005754.	13.8735706	0.0007110	-0.0005190	2.4309163	0.000000	20.4412445 C
0.0000538	6521.5309431	121330808.	13.7225298	0.0007376	-0.0005524	2.4999101	0.000000	21.2029435 C
0.0000563	6789.5965898	120703939.	13.5847239	0.0007641	-0.0005859	2.5673254	0.000000	21.9643310 C
0.0000588	7056.8629980	120116817.	13.4580612	0.0007907	-0.0006193	2.6331056	0.000000	22.7247219 C
0.0000613	7323.6392895	119569621.	13.3419638	0.0008172	-0.0006528	2.6973735	0.000000	23.4855133 C
0.0000638	7589.6802618	119053808.	13.2345074	0.0008437	-0.0006863	2.7600239	0.000000	24.2454457 C
0.0000663	7855.2408022	118569672.	13.1353744	0.0008702	-0.0007198	2.8211630	0.000000	25.0057883 C
0.0000688	8120.2610083	118112887.	13.0434729	0.0008967	-0.0007533	2.8807597	0.000000	25.7661742 C
0.0000713	8384.6740892	117679636.	12.9578609	0.0009232	-0.0007868	2.9387859	0.000000	26.5262302 C
0.0000738	8648.6886284	117270354.	12.8784456	0.0009498	-0.0008202	2.9953291	0.000000	27.2871258 C
0.0000763	8912.1633484	116880831.	12.8042237	0.0009763	-0.0008537	3.0503221	0.000000	28.0479899 C
0.0000788	9175.0921337	116509106.	12.7346832	0.0010029	-0.0008871	3.1037626	0.000000	28.8087830 C
0.0000813	9437.6196719	116155319.	12.6697833	0.0010294	-0.0009206	3.1557127	0.000000	29.5704271 C
0.0000838	9699.7438238	115817837.	12.6091103	0.0010560	-0.0009540	3.2061677	0.000000	30.3329269 C
0.0000863	9961.2750696	115493044.	12.5517537	0.0010826	-0.0009874	3.2550365	0.000000	31.0949241 C
0.0000888	10222.	115181602.	12.4978665	0.0011092	-0.0010208	3.3023904	0.000000	31.8575342 C
0.0000913	10483.	114882771.	12.4472608	0.0011358	-0.0010542	3.3482408	0.000000	32.6210141 C
0.0000938	10743.	114595519.	12.3996758	0.0011625	-0.0010875	3.3925827	0.000000	33.3853687 C
0.0000963	11003.	114318720.	12.3548183	0.0011892	-0.0011208	3.4354017	0.000000	34.1504367 C
0.0000988	11262.	114050296.	12.3121043	0.0012158	-0.0011542	3.4766366	0.000000	34.9151391 C
0.0001013	11521.	113791058.	12.2718035	0.0012425	-0.0011875	3.5163533	0.000000	35.6807332 C
0.0001038	11780.	113540319.	12.2337430	0.0012693	-0.0012207	3.5545468	0.000000	36.4472245 C
0.0001063	12038.	113297459.	12.1977665	0.0012960	-0.0012540	3.5912118	0.000000	37.2146184 C
0.0001088	12295.	113061912.	12.1637321	0.0013228	-0.0012872	3.6263430	0.000000	37.9829205 C
0.0001113	12553.	112833165.	12.1315105	0.0013496	-0.0013204	3.6599349	0.000000	38.7521361 C
0.0001138	12809.	112610137.	12.1007565	0.0013765	-0.0013535	3.6919518	0.000000	39.5215207 C
0.0001163	13066.	112392705.	12.0714693	0.0014033	-0.0013867	3.7224048	0.000000	40.2913912 C
0.0001188	13321.	112180844.	12.0436867	0.0014302	-0.0014198	3.7513073	0.000000	41.0621965 C
0.0001213	13577.	111974191.	12.0173174	0.0014571	-0.0014529	3.7786537	0.000000	41.8339425 C
0.0001238	13832.	111772409.	11.9922772	0.0014840	-0.0014860	3.8044384	0.000000	-42.6620648 C
0.0001263	14086.	111575189.	11.9684890	0.0015110	-0.0015190	3.8286557	0.000000	-43.6110192 C
0.0001288	14340.	111382247.	11.9458815	0.0015380	-0.0015520	3.8512998	0.000000	-44.5590145 C
0.0001313	14589.	111154322.	11.9228233	0.0015649	-0.0015851	3.8722093	0.000000	-45.0000000 CY
0.0001338	14817.	110783807.	11.8986202	0.0015914	-0.0016186	3.8913477	0.000000	45.0000000 CY
0.0001363	15019.	110231393.	11.8726186	0.0016176	-0.0016524	3.9087001	0.000000	45.0000000 CY
0.0001388	15198.	109531998.	11.8456526	0.0016436	-0.0016864	3.9243899	0.000000	45.0000000 CY
0.0001413	15358.	108728710.	11.8194558	0.0016695	-0.0017205	3.9385879	0.000000	45.0000000 CY
0.0001438	15503.	107846080.	11.7946451	0.0016955	-0.0017545	3.9513427	0.000000	45.0000000 CY
0.0001463	15638.	106924330.	11.7698785	0.0017213	-0.0017887	3.9625662	0.000000	45.0000000 CY
0.0001488	15764.	105974335.	11.7453210	0.0017471	-0.0018229	3.9722875	0.000000	

45.0000000	CY							
0.0001588		16188.	101970026.	11.6527251	0.0018499	-0.0019601	3.9965433	0.000000
45.0000000	CY							
0.0001688		16525.	97923262.	11.5662856	0.0019518	-0.0020982	3.9985664	0.000000
45.0000000	CY							
0.0001788		16798.	93972818.	11.4863451	0.0020532	-0.0022368	3.9992320	0.000000
45.0000000	CY							
0.0001888		17024.	90191684.	11.4142101	0.0021544	-0.0023756	3.9992231	0.000000
45.0000000	CY							
0.0001988		17212.	86602148.	11.3478462	0.0022554	-0.0025146	3.9985156	0.000000
45.0000000	CY							
0.0002088		17371.	83214356.	11.2875184	0.0023563	-0.0026537	3.9999602	0.000000
45.0000000	CY							
0.0002188		17507.	80030244.	11.2330123	0.0024572	-0.0027928	3.9987906	0.000000
45.0000000	CY							
0.0002288		17622.	77037337.	11.1833622	0.0025582	-0.0029318	3.9997692	0.000000
45.0000000	CY							
0.0002388		17722.	74230182.	11.1383154	0.0026593	-0.0030707	3.9999997	0.000000
45.0000000	CY							
0.0002488		17808.	71590234.	11.0964127	0.0027602	-0.0032098	3.9973941	0.000000
45.0000000	CY							
0.0002588		17883.	69111968.	11.0585051	0.0028614	-0.0033486	3.9972417	0.000000
45.0000000	CY							
0.0002688		17948.	66783241.	11.0239890	0.0029627	-0.0034873	3.9969221	0.000000
45.0000000	CY							
0.0002788		18005.	64593046.	10.9923447	0.0030641	-0.0036259	3.9977755	0.000000
45.0000000	CY							
0.0002888		18055.	62528926.	10.9638848	0.0031658	-0.0037642	3.9999930	0.000000
45.0000000	CY							
0.0002988		18099.	60582565.	10.9381104	0.0032678	-0.0039022	3.9996880	0.000000
45.0000000	CY							
0.0003088		18138.	58747039.	10.9140488	0.0033697	-0.0040403	3.9985745	0.000000
45.0000000	CY							
0.0003188		18171.	57008568.	10.8919423	0.0034718	-0.0041782	3.9960581	0.000000
45.0000000	CY							
0.0003288		18201.	55364848.	10.8710337	0.0035739	-0.0043161	3.9999136	0.000000
45.0000000	CY							
0.0003388		18227.	53807228.	10.8528715	0.0036764	-0.0044536	3.9982803	0.000000
45.0000000	CY							
0.0003488		18250.	52330644.	10.8355802	0.0037789	-0.0045911	3.9970567	0.000000
45.0000000	CY							
0.0003588		18270.	50926456.	10.8203132	0.0038818	-0.0047282	3.9991291	0.000000
45.0000000	CY							

Axial Thrust Force = 500.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Concrete Stress ksi	Max Steel Stress ksi	Max Casing Stress ksi	Run Msg
0.000001250	177.2265127	141781210.	146.3116280	0.0001829	0.0001529	0.7374879	0.000000	5.2994465	
0.000002500	354.4512597	141780504.	79.1653680	0.0001979	0.0001379	0.7942105	0.000000	5.7307892	
0.000003750	531.6724753	141779327.	56.7875276	0.0002130	0.0001230	0.8504956	0.000000	6.1625936	
0.000005000	708.8883938	141777679.	45.6017923	0.0002280	0.0001080	0.9063417	0.000000	6.5948599	
0.000006250	886.0972492	141775560.	38.8928991	0.0002431	0.0000931	0.9617470	0.000000	7.0275880	
0.000007500	1063.2972754	141772970.	34.4224272	0.0002582	0.0000782	1.0167100	0.000000	7.4607779	
0.000008750	1240.4867060	141769909.	31.2310532	0.0002733	0.0000633	1.0712291	0.000000	7.8944298	
0.0000100	1417.6637746	141766377.	28.8391156	0.0002884	0.0000484	1.1253028	0.000000	8.3285436	
0.0000113	1594.8267178	141762375.	26.9801358	0.0003035	0.0000335	1.1789293	0.000000	8.7631190	
0.0000125	1771.9737607	141757901.	25.4942266	0.0003187	0.0000187	1.2321071	0.000000	9.1981569	
0.0000138	1949.1031396	141752956.	24.2796416	0.0003338	0.000003845	1.2848347	0.000000	9.6336569	
0.0000150	2126.2130681	141747538.	23.2685500	0.0003490	-0.0000110	1.3371103	0.000000	10.0696191	
0.0000163	2303.2935103	141741139.	22.4139757	0.0003642	-0.0000258	1.3889315	0.000000	10.5060361	
0.0000175	2480.3007387	141731471.	21.6823008	0.0003794	-0.0000406	1.4402920	0.000000	10.9428677	
0.0000188	2657.1818660	141716366.	21.0488497	0.0003947	-0.0000553	1.4911844	0.000000	11.3800621	

0.0000200	2833.8916919	141694585.	20.4951234	0.0004099	-0.0000701	1.5416019	0.000000	11.8175716
0.0000213	3010.3936852	141665585.	20.0069859	0.0004251	-0.0000849	1.5915388	0.000000	12.2553551
0.0000225	3186.6591077	141629294.	19.5734531	0.0004404	-0.0000996	1.6409901	0.000000	12.6933782
0.0000238	3362.6654726	141585915.	19.1858617	0.0004557	-0.0001143	1.6899519	0.000000	13.1316123
0.0000250	3427.0366508	137081466.	18.6690142	0.0004667	-0.0001333	1.7249852	0.000000	13.4480354 C
0.0000263	3577.2992121	136278065.	18.3222017	0.0004810	-0.0001490	1.7698051	0.000000	13.8564261 C
0.0000275	3725.7655008	135482382.	18.0038997	0.0004951	-0.0001649	1.8139189	0.000000	14.2624101 C
0.0000288	3872.7920247	134705810.	17.7109332	0.0005092	-0.0001808	1.8573830	0.000000	14.6664406 C
0.0000300	4018.5009978	133950033.	17.4402588	0.0005232	-0.0001968	1.9002150	0.000000	15.0686253 C
0.0000313	4163.0141032	133216451.	17.1893351	0.0005372	-0.0002128	1.9424337	0.000000	15.4690850 C
0.0000325	4306.4514286	132506198.	16.9560257	0.0005511	-0.0002289	1.9840585	0.000000	15.8679543 C
0.0000338	4448.9304653	131820162.	16.7385242	0.0005649	-0.0002451	2.0251097	0.000000	16.2653807 C
0.0000350	4590.5651612	131159005.	16.5352954	0.0005787	-0.0002613	2.0656082	0.000000	16.6615249 C
0.0000363	4731.4650228	130523173.	16.3450280	0.0005925	-0.0002775	2.1055755	0.000000	17.0565608 C
0.0000375	4871.7342586	129912914.	16.1665974	0.0006062	-0.0002938	2.1450339	0.000000	17.4506748 C
0.0000388	5011.3069990	129324052.	15.9986838	0.0006199	-0.0003101	2.1839669	0.000000	17.8436710 C
0.0000400	5150.2570752	128756427.	15.8403929	0.0006336	-0.0003264	2.2223883	0.000000	18.2356559 C
0.0000413	5288.8152616	128213703.	15.6912998	0.0006473	-0.0003427	2.2603533	0.000000	18.6271675 C
0.0000425	5426.7605117	127688483.	15.5501174	0.0006609	-0.0003591	2.2978074	0.000000	19.0176198 C
0.0000438	5564.3214512	127184490.	15.4165933	0.0006745	-0.0003755	2.3348050	0.000000	19.4075529 C
0.0000450	5701.4747649	126699439.	15.2900388	0.0006881	-0.0003919	2.3713414	0.000000	19.7969008 C
0.0000463	5838.2088898	126231544.	15.1698280	0.0007016	-0.0004084	2.4074111	0.000000	20.1855820 C
0.0000475	5974.6185998	125781444.	15.0556534	0.0007151	-0.0004249	2.4430403	0.000000	20.5738627 C
0.0000488	6110.6839534	125347363.	14.9469804	0.0007287	-0.0004413	2.4782213	0.000000	20.9616437 C
0.0000513	6381.9382872	124525625.	14.7448320	0.0007557	-0.0004743	2.5472849	0.000000	21.7361567 C
0.0000538	6651.9623557	123757439.	14.5603740	0.0007826	-0.0005074	2.6145952	0.000000	22.5089331 C
0.0000563	6920.9621292	123039327.	14.3915653	0.0008095	-0.0005405	2.6802065	0.000000	23.2804910 C
0.0000588	7189.1605878	122368691.	14.2368246	0.0008364	-0.0005736	2.7441846	0.000000	24.0515402 C
0.0000613	7456.4405172	121737804.	14.0941542	0.0008633	-0.0006067	2.8064936	0.000000	24.8215916 C
0.0000638	7722.9345633	121144072.	13.9623400	0.0008901	-0.0006399	2.8671692	0.000000	25.5910262 C
0.0000663	7988.7637264	120585113.	13.8404027	0.0009169	-0.0006731	2.9262516	0.000000	26.3603239 C
0.0000688	8253.8262634	120055655.	13.7270000	0.0009437	-0.0007063	2.9837027	0.000000	27.1289564 C
0.0000713	8518.2852284	119554880.	13.6215762	0.0009705	-0.0007395	3.0395774	0.000000	27.8976321 C
0.0000738	8782.1525145	119080034.	13.5233141	0.0009973	-0.0007727	3.0938746	0.000000	28.6663382 C
0.0000763	9045.3173540	118627113.	13.4312668	0.0010241	-0.0008059	3.1465577	0.000000	29.4345388 C
0.0000788	9308.0651420	118197653.	13.3454473	0.0010510	-0.0008390	3.1977205	0.000000	30.2036155 C
0.0000813	9570.1271468	117786180.	13.2646768	0.0010778	-0.0008722	3.2472673	0.000000	30.9721450 C
0.0000838	9831.6511344	117392849.	13.1888269	0.0011046	-0.0009054	3.2952496	0.000000	31.7409137 C
0.0000863	10093.	117017452.	13.1177281	0.0011314	-0.0009386	3.3417044	0.000000	32.5105678 C
0.0000888	10353.	116656872.	13.0506534	0.0011582	-0.0009718	3.3865783	0.000000	33.2802695 C
0.0000913	10613.	116309499.	12.9871903	0.0011851	-0.0010049	3.4298589	0.000000	34.0498026 C
0.0000938	10873.	115976142.	12.9274419	0.0012119	-0.0010381	3.4716039	0.000000	34.8202329 C
0.0000963	11132.	115655684.	12.8711206	0.0012388	-0.0010712	3.5118082	0.000000	

35.5915657 C							
0.0000988	11390.	115346060.	12.8177142	0.0012657	-0.0011043	3.5504307	0.000000
36.3630794 C							
0.0001013	11648.	115046084.	12.7669161	0.0012927	-0.0011373	3.5874578	0.000000
37.1345077 C							
0.0001038	11906.	114756433.	12.7188710	0.0013196	-0.0011704	3.6229351	0.000000
37.9068534 C							
0.0001063	12163.	114476358.	12.6733863	0.0013465	-0.0012035	3.6568571	0.000000
38.6801218 C							
0.0001088	12420.	114205173.	12.6302872	0.0013735	-0.0012365	3.6892184	0.000000
39.4543185 C							
0.0001113	12676.	113941817.	12.5892899	0.0014006	-0.0012694	3.7199977	0.000000
40.2290468 C							
0.0001138	12932.	113685000.	12.5500397	0.0014276	-0.0013024	3.7491657	0.000000
41.0035939 C							
0.0001163	13187.	113435468.	12.5127585	0.0014546	-0.0013354	3.7767626	0.000000
41.7790876 C							
0.0001188	13442.	113192738.	12.4773237	0.0014817	-0.0013683	3.8027825	0.000000
42.5555339 C							
0.0001213	13696.	112956370.	12.4436227	0.0015088	-0.0014012	3.8272197	0.000000
43.3329388 C							
0.0001238	13950.	112725957.	12.4115522	0.0015359	-0.0014341	3.8500685	0.000000
44.1113083 C							
0.0001263	14203.	112501124.	12.3810170	0.0015631	-0.0014669	3.8713230	0.000000
44.8906487 CY							
0.0001288	14451.	112237864.	12.3539430	0.0015906	-0.0014994	3.8911587	0.000000
45.0000000 CY							
0.0001313	14688.	111909386.	12.3314548	0.0016185	-0.0015315	3.9096327	0.000000
45.0000000 CY							
0.0001338	14914.	111508604.	12.3141867	0.0016470	-0.0015630	3.9267263	0.000000
45.0000000 CY							
0.0001363	15123.	110997361.	12.2989981	0.0016757	-0.0015943	3.9421300	0.000000
45.0000000 CY							
0.0001388	15312.	110360174.	12.2826707	0.0017042	-0.0016258	3.9556137	0.000000
45.0000000 CY							
0.0001413	15480.	109592896.	12.2643768	0.0017323	-0.0016577	3.9671736	0.000000
45.0000000 CY							
0.0001438	15631.	108739273.	12.2445959	0.0017602	-0.0016898	3.9768948	0.000000
45.0000000 CY							
0.0001463	15771.	107834811.	12.2239046	0.0017877	-0.0017223	3.9848529	0.000000
45.0000000 CY							
0.0001488	15900.	106892164.	12.2030245	0.0018152	-0.0017548	3.9911108	0.000000
45.0000000 CY							
0.0001588	16336.	102904532.	12.1196373	0.0019240	-0.0018860	3.9995756	0.000000
45.0000000 CY							
0.0001688	16680.	98845670.	12.0388860	0.0020316	-0.0020184	3.9988898	0.000000
45.0000000 CY							
0.0001788	16958.	94867597.	11.9633330	0.0021384	-0.0021516	3.9992000	0.000000
45.0000000 CY							
0.0001888	17186.	91051775.	11.8947258	0.0022451	-0.0022849	3.9992288	0.000000
45.0000000 CY							
0.0001988	17376.	87425300.	11.8313580	0.0023515	-0.0024185	3.9985721	0.000000
45.0000000 CY							
0.0002088	17535.	84000645.	11.7735668	0.0024577	-0.0025523	3.9999753	0.000000
45.0000000 CY							
0.0002188	17671.	80780604.	11.7213334	0.0025640	-0.0026860	3.9989211	0.000000
45.0000000 CY							
0.0002288	17786.	77752429.	11.6736246	0.0026703	-0.0028197	3.9998387	0.000000
45.0000000 CY							
0.0002388	17885.	74912043.	11.6307269	0.0027768	-0.0029532	3.9992428	0.000000
45.0000000 CY							
0.0002488	17970.	72240935.	11.5906835	0.0028832	-0.0030868	3.9974272	0.000000
45.0000000 CY							
0.0002588	18043.	69732442.	11.5544375	0.0029897	-0.0032203	3.9976818	0.000000
45.0000000 CY							
0.0002688	18107.	67375120.	11.5215428	0.0030964	-0.0033536	3.9974521	0.000000
45.0000000 CY							
0.0002788	18163.	65157882.	11.4915073	0.0032033	-0.0034867	3.9966653	0.000000
45.0000000 CY							
0.0002888	18211.	63069254.	11.4643326	0.0033103	-0.0036197	3.9989324	0.000000
45.0000000 CY							
0.0002988	18253.	61098874.	11.4401223	0.0034177	-0.0037523	3.9998857	0.000000
45.0000000 CY							
0.0003088	18290.	59240417.	11.4178572	0.0035253	-0.0038847	3.9991023	0.000000
45.0000000 CY							
0.0003188	18322.	57480610.	11.3974169	0.0036329	-0.0040171	3.9970651	0.000000
45.0000000 CY							
0.0003288	18350.	55816617.	11.3782176	0.0037406	-0.0041494	3.9999473	0.000000
45.0000000 CY							
0.0003388	18374.	54240720.	11.3614109	0.0038487	-0.0042813	3.9990254	0.000000
45.0000000 CY							

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 2

Non-Linear EI

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	0.000	17095.682	0.00300000
2	100.000	17396.608	0.00300000
3	200.000	17642.332	0.00300000
4	300.000	17833.613	0.00300000
5	400.000	17969.077	0.00300000
6	500.000	18049.421	0.00300000

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

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

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

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	17095.682	0.000	11112.193	108039144.331
2	0.65	17396.608	65.000	11307.795	109499992.776
3	0.65	17642.332	130.000	11467.515	110916036.540
4	0.65	17833.613	195.000	11591.848	112293123.872
5	0.65	17969.077	260.000	11679.900	113637241.314
6	0.65	18049.421	325.000	11732.123	114951948.473
1	0.70	17095.682	0.000	11966.977	107810229.382
2	0.70	17396.608	70.000	12177.626	109119476.050
3	0.70	17642.332	140.000	12349.632	110384825.442
4	0.70	17833.613	210.000	12483.529	111612965.985
5	0.70	17969.077	280.000	12578.354	112810867.896
6	0.70	18049.421	350.000	12634.594	113984404.858
1	0.75	17095.682	0.000	12821.762	106963840.755
2	0.75	17396.608	75.000	13047.456	108636424.678
3	0.75	17642.332	150.000	13231.749	109887650.906
4	0.75	17833.613	225.000	13375.210	110985209.209
5	0.75	17969.077	300.000	13476.808	112055156.459
6	0.75	18049.421	375.000	13537.066	113104046.977

The analysis ended normally.

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

                 GROUP for Windows, Version 2014.9.3

                  Serial Number : 160578423

                  Analysis of A Group of Piles
               Subjected to Axial and Lateral Loading

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


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Path to file locations      : O:\Active\85970.01 - Pine Crossing over BM RR Scarborough
ME\Geotechnical\Calculations\Pier\24 in Pipe with .625 casing, 16#8 (6 x 1)\
Name of input data file     : Pier.gp9r
Name of output echo file    : Pier.gp9e
Name of output results file : Pier.gp9o
Name of output summary file : Pier.gp9t
Name of plot output file    : Pier.gp9p
Name of runtime file        : Pier.gp9r


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

          Date:  June 25, 2015     Time:  11:45:25





           *****     INPUT INFORMATION     *****


Pine Point - Pier, Rob Clopper

ANALYSIS TYPE = 3D ANALYSIS

UNITS SYSTEM  = ENGL


* TABLE B *  PILE CAP OPTIONS

LENGTH,YY    ( FT ) =    39.50
WIDTH, ZZ    ( FT ) =    5.000
THICKNESS,XX ( FT ) =    4.500

* PILE CAP DIMENSIONS ARE NOT CONSIDERED
  FOR THE PILE GROUP ANALYSIS



* TABLE C *  LOAD AND CONTROL PARAMETERS


** LOAD CASES **


NUMBER OF LOAD CASES :   14


LOAD CASE    :     1
CASE NAME    : Strength I, Case 1
LOAD TYPE    : Dead, DL
SCALE FACTOR :       1.0000

* CONCENTRATED LOADS *

 NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
        LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   1.91E+06 -7.97E+03 -1.58E+04      0.00 -8.76E+05  4.44E+05      0.00      0.00      0.00
```

```
 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           1.90863E+06          -7970.00          -15750.0

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -8.76480E+05       4.43640E+05


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :     2
 CASE NAME    : Strength I, Case 2
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   1.11E+06 -3.75E+03 -1.58E+04      0.00 -8.76E+05  5.70E+07      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           1.11019E+06          -3750.00          -15750.0

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -8.76480E+05       5.70493E+07


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :     3
 CASE NAME    : Strength III, Case 1
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   1.10E+06 -2.21E+04 -1.75E+04      0.00 -7.06E+05  9.76E+06      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           1.10339E+06          -22130.0          -17470.0

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -7.06440E+05       9.76008E+06


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
```

```
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :     4
 CASE NAME    : Strength III, Case 2
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   6.59E+05 -2.21E+04 -1.75E+04      0.00 -7.06E+05  9.76E+06      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           6.58670E+05          -22130.0          -17470.0

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -7.06440E+05       9.76008E+06


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :     5
 CASE NAME    : Strength III, Case 3
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   4.74E+05 -1.05E+04 -1.31E+04      0.00 -4.61E+05  3.49E+07      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           4.73700E+05          -10530.0          -13070.0

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -4.61160E+05       3.48931E+07


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :     6
 CASE NAME    : Strength III, Case 4
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *
```

NL	VERT.LOAD LBS	HR.LOAD Y LBS	HR.LOAD Z LBS	MOMENT X LBS-IN	MOMENT Y LBS-IN	MOMENT Z LBS-IN	COORD X FT	COORD Y FT	COORD Z FT
1	4.74E+05	-1.05E+04	-1.31E+04	0.00	-4.75E+06	5.50E+05	0.00	0.00	0.00

* EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

VER.LOAD X,LBS	HOR.LOAD Y,LBS	HOR.LOAD Z,LBS
4.73700E+05	-10530.0	-13070.0

MOMENT X,LBS-IN	MOMENT Y,LBS-IN	MOMENT Z,LBS-IN
0.00000	-4.75404E+06	5.49720E+05

* THE LOADING IS STATIC *

* CONTROL PARAMETERS *
TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT = 1.00000E-04
TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS = 1.00000E-04 IN
MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS = 100
MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS = 100
FACTOR TO APPLY THE LOAD IN INCREMENTS = 1.00000
MINIMUM FACTOR FOR LOAD INCREMENTS = 1.00000
PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
PRINT RESULTS EVERY 1 NODE(S)

LOAD CASE : 7
CASE NAME : Strength IV, Case 3
LOAD TYPE : Dead, DL
SCALE FACTOR : 1.0000

* CONCENTRATED LOADS *

NL	VERT.LOAD LBS	HR.LOAD Y LBS	HR.LOAD Z LBS	MOMENT X LBS-IN	MOMENT Y LBS-IN	MOMENT Z LBS-IN	COORD X FT	COORD Y FT	COORD Z FT
1	3.41E+05	0.00	0.00	0.00	0.00	4.12E+07	0.00	0.00	0.00

* EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

VER.LOAD X,LBS	HOR.LOAD Y,LBS	HOR.LOAD Z,LBS
3.41060E+05	0.00000	0.00000

MOMENT X,LBS-IN	MOMENT Y,LBS-IN	MOMENT Z,LBS-IN
0.00000	0.00000	4.12121E+07

* THE LOADING IS STATIC *

* CONTROL PARAMETERS *
TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT = 1.00000E-04
TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS = 1.00000E-04 IN
MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS = 100
MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS = 100
FACTOR TO APPLY THE LOAD IN INCREMENTS = 1.00000
MINIMUM FACTOR FOR LOAD INCREMENTS = 1.00000
PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
PRINT RESULTS EVERY 1 NODE(S)

LOAD CASE : 8
CASE NAME : Strength IV, Case 4
LOAD TYPE : Dead, DL
SCALE FACTOR : 1.0000

* CONCENTRATED LOADS *

NL	VERT.LOAD LBS	HR.LOAD Y LBS	HR.LOAD Z LBS	MOMENT X LBS-IN	MOMENT Y LBS-IN	MOMENT Z LBS-IN	COORD X FT	COORD Y FT	COORD Z FT
1	3.41E+05	0.00	0.00	0.00	-5.15E+06	0.00	0.00	0.00	0.00

* EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

VER.LOAD X,LBS	HOR.LOAD Y,LBS	HOR.LOAD Z,LBS
3.41060E+05	0.00000	0.00000

MOMENT X,LBS-IN	MOMENT Y,LBS-IN	MOMENT Z,LBS-IN
0.00000	-5.15148E+06	0.00000

* THE LOADING IS STATIC *

```
 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :     9
 CASE NAME    : Extreme I, Case 1A
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   1.29E+06 -1.82E+03 -2.09E+05      0.00 -1.16E+07  1.01E+05      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           1.28745E+06          -1820.00      -2.08900E+05

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -1.16255E+07       1.01400E+05


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :    10
 CASE NAME    : Extreme I, Case 2A
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   8.18E+05 -8.60E+02 -1.92E+05      0.00 -1.07E+07  1.30E+07      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           8.17870E+05          -860.000      -1.91560E+05

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -1.06604E+07       1.30398E+07


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :    11
 CASE NAME    : Extreme I, Case 1B
```

```
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   1.29E+06 -2.07E+05 -3.60E+03      0.00 -2.00E+05  1.15E+07      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           1.28745E+06      -2.07130E+05          -3600.00

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -2.00400E+05       1.15266E+07


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :    12
 CASE NAME    : Extreme I, Case 2B
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   8.18E+05 -1.89E+05 -3.60E+03      0.00 -2.00E+05  2.35E+07      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           8.17870E+05      -1.88820E+05          -3600.00

        MOMENT X,LBS-IN    MOMENT Y,LBS-IN    MOMENT Z,LBS-IN
               0.00000      -2.00400E+05       2.35000E+07


 * THE LOADING IS STATIC *


 * CONTROL PARAMETERS *
     TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
     TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
     MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
     MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
     FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
     MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
     PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
     PRINT RESULTS EVERY     1 NODE(S)


 LOAD CASE    :    13
 CASE NAME    : Service I, Case 1
 LOAD TYPE    : Dead, DL
 SCALE FACTOR :       1.0000

 * CONCENTRATED LOADS *

NL  VERT.LOAD HR.LOAD Y HR.LOAD Z  MOMENT X  MOMENT Y  MOMENT Z   COORD X   COORD Y   COORD Z
       LBS       LBS       LBS      LBS-IN    LBS-IN    LBS-IN      FT        FT        FT
 1   1.22E+06 -1.28E+04 -1.27E+04      0.00 -6.50E+05  2.54E+06      0.00      0.00      0.00


 * EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

        VER.LOAD X,LBS     HOR.LOAD Y,LBS     HOR.LOAD Z,LBS
           1.22144E+06          -12780.0          -12700.0
```

MOMENT X,LBS-IN	MOMENT Y,LBS-IN	MOMENT Z,LBS-IN
0.00000	-6.49920E+05	2.53884E+06

* THE LOADING IS STATIC *

* CONTROL PARAMETERS *

```
TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
PRINT RESULTS EVERY     1 NODE(S)
```

LOAD CASE : 14
CASE NAME : Service I, Case 2
LOAD TYPE : Dead, DL
SCALE FACTOR : 1.0000

* CONCENTRATED LOADS *

NL	VERT.LOAD LBS	HR.LOAD Y LBS	HR.LOAD Z LBS	MOMENT X LBS-IN	MOMENT Y LBS-IN	MOMENT Z LBS-IN	COORD X FT	COORD Y FT	COORD Z FT
1	1.03E+06	-1.08E+04	-1.27E+04	0.00	-6.50E+05	2.84E+07	0.00	0.00	0.00

* EQUIVALENT CONCENTRATED LOAD AT ORIGIN *

VER.LOAD X,LBS	HOR.LOAD Y,LBS	HOR.LOAD Z,LBS
1.02655E+06	-10850.0	-12700.0

MOMENT X,LBS-IN	MOMENT Y,LBS-IN	MOMENT Z,LBS-IN
0.00000	-6.49920E+05	2.84158E+07

* THE LOADING IS STATIC *

* CONTROL PARAMETERS *

```
TOLERANCE ON CONVERGENCE OF PILE CAP MOVEMENT        =  1.00000E-04
TOLERANCE ON DETERMINATION OF PILE DEFLECTIONS       =  1.00000E-04 IN
MAX NO OF ITERATIONS ALLOWED FOR FOUNDATION ANALYSIS =      100
MAXIMUM NO OF ITERATIONS ALLOWED FOR PILE ANALYSIS   =      100
FACTOR TO APPLY THE LOAD IN INCREMENTS               =  1.00000
MINIMUM FACTOR FOR LOAD INCREMENTS                   =  1.00000
PRINT RESULTS AT PILE CAP, PILE HEADS AND ALONG PILES
PRINT RESULTS EVERY     1 NODE(S)
```

* TABLE D * ARRANGEMENT OF PILE GROUPS

GROUP	CONNECTY	CONNECTZ	PILE PROP	P-Y CURVE	L-S CURVE	T-R CURVE	R-F-L SET
1	FIX	FIX	1	0	0	0	0
2	FIX	FIX	1	0	0	0	0
3	FIX	FIX	1	0	0	0	0
4	FIX	FIX	1	0	0	0	0
5	FIX	FIX	1	0	0	0	0
6	FIX	FIX	1	0	0	0	0

GROUP	CorX,FT	CorY,FT	CorZ,FT	ALPHA,DEG	BETA,DEG	GROUND,FT	SPy,LBS-IN	SPz,LBS-IN
1	0.000	-17.08	0.000	0.000	90.00	24.00	0.000	0.000
2	0.000	-10.25	0.000	0.000	90.00	24.00	0.000	0.000
3	0.000	-3.420	0.000	0.000	90.00	24.00	0.000	0.000
4	0.000	3.420	0.000	0.000	90.00	24.00	0.000	0.000
5	0.000	10.25	0.000	0.000	90.00	24.00	0.000	0.000
6	0.000	17.08	0.000	0.000	90.00	24.00	0.000	0.000

* TABLE E * PILE GEOMETRY AND PROPERTIES
PILE TYPE = 1 - DRIVEN PILE
= 2 - DRILLED SHAFT

PROP	SECTS	INC	PILE TYPE	LENGTH, FT
1	2	100	1	64.000

* PILE SECTIONS *

PROP	SECT	FROM,FT	TO,FT	CROSS SECT	E,LBS/IN**2	SET NLEIy	SET NLEIz
1	1	0.00000	40.0000	1	9.51737E+06	1	1

```
    1       2        40.0000        64.0000       2          8.90334E+06           2           2

 * PILE CROSS SECTIONS *

  CROSS SECTION       :     1
  SECTION NAME        : 24"
  CROSS SECTION TYPE  : CIRCULAR PIPE
  EXTERNAL DIAMETER   :       24.0000 IN
  INTERNAL DIAMETER   :       0.00000 IN
  SHEAR MODULUS       :   2.82933E+06 LBS/IN**2

  CROSS SECTION       :     2
  SECTION NAME        : 24"
  CROSS SECTION TYPE  : CIRCULAR PIPE
  EXTERNAL DIAMETER   :       24.0000 IN
  INTERNAL DIAMETER   :       0.00000 IN
  SHEAR MODULUS       :   2.55102E+06 LBS/IN**2

 * PILE CROSS SECTIONS PROPERTIES *

SECT         DIAM,IN   AREA,IN**2   Iz,IN**4    Iy,IN**4   GJ,LBS-IN**2   Mn,LBS-IN    Vn,LBS
  1           24.000      452.39  1.6286E+04  1.6286E+04   9.2157E+10      0.0000      0.0000
  2           24.000      452.39  1.6286E+04  1.6286E+04   8.3092E+10      0.0000      0.0000


 * TABLE F *   SOIL DATA


 SOILS INFORMATION

     GROUND SURFACE          =      24.0000  FT

     4 LAYER(S) OF SOIL

     LAYER  1
     THE SOIL IS A SAND
                                                   TOP OF LAYER    BOTTOM OF LAYER
     X COORDINATE                          (FT)       24.0000           30.0000
     EFFECTIVE UNIT WEIGHT         (LBS/FT**3)        48.0000           48.0000
     FRICTION ANGLE                  (DEGREES)        28.0000           28.0000
     P-Y SUBGRADE MODULUS          (LBS/IN**3)        20.0000           20.0000
     ULTIMATE UNIT SIDE FRICTION   (LBS/FT**2)        1.35933 (P)       107.512 (P)
     ULTIMATE UNIT TIP RESISTANCE  (LBS/FT**2)        0.00000           0.00000

     LAYER  2
     THE SOIL IS A SAND
                                                   TOP OF LAYER    BOTTOM OF LAYER
     X COORDINATE                          (FT)       30.0000           44.0000
     EFFECTIVE UNIT WEIGHT         (LBS/FT**3)        58.0000           58.0000
     FRICTION ANGLE                  (DEGREES)        32.0000           32.0000
     P-Y SUBGRADE MODULUS          (LBS/IN**3)        60.0000           60.0000
     ULTIMATE UNIT SIDE FRICTION   (LBS/FT**2)        107.512 (P)       498.190 (P)
     ULTIMATE UNIT TIP RESISTANCE  (LBS/FT**2)        0.00000           0.00000

     LAYER  3
     THE SOIL IS A SAND
                                                   TOP OF LAYER    BOTTOM OF LAYER
     X COORDINATE                          (FT)       44.0000           64.0000
     EFFECTIVE UNIT WEIGHT         (LBS/FT**3)        73.0000           73.0000
     FRICTION ANGLE                  (DEGREES)        37.0000           37.0000
     P-Y SUBGRADE MODULUS          (LBS/IN**3)        125.000           125.000
     ULTIMATE UNIT SIDE FRICTION   (LBS/FT**2)        498.190 (P)       1280.49 (P)
     ULTIMATE UNIT TIP RESISTANCE  (LBS/FT**2)        41800.6 (R)   1.12641E+05 (R)

     LAYER  4
     THE LAYER IS A VUGGY LIMESTONE
                                                   TOP OF LAYER    BOTTOM OF LAYER
     X COORDINATE                          (FT)       64.0000           100.000
     EFFECTIVE UNIT WEIGHT         (LBS/FT**3)        88.0000           88.0000
     UNIAXIAL COMPRESSIVE STRENGTH (LBS/IN**2)        10300.0           10300.0
     ULTIMATE UNIT SIDE FRICTION   (LBS/FT**2)    1.48320E+05 (P)   1.48320E+05 (P)
     ULTIMATE UNIT TIP RESISTANCE  (LBS/FT**2)    1.33488E+07 (R)   1.33488E+07 (R)

   Notes :  Program estimated values for listed parameters
            if zero input values were entered:
            (P) ULTIMATE UNIT SIDE FRICTION for Driven Piles
            (R) ULTIMATE UNIT TIP RESISTANCE for Driven Piles


 * TABLE H *   AXIAL LOAD VS DISPLACEMENT

 AXIAL LOAD-DISPLACEMENT CURVES GENERATED INTERNALLY
```

NUM OF CURVES 1

CURVE 1 NUM OF POINTS 19

DISPLACEMENT, IN	AXIAL LOAD,LBS
-2.02001	-1.35999E+05
-1.01918	-1.30645E+05
-0.51877	-1.27968E+05
-0.11340	-92749.4
-0.0600253	-70209.1
-0.0134711	-25102.9
-6.75763E-03	-12765.5
-1.35153E-03	-2553.09
-1.35153E-04	-255.309
0.00000	0.00000
0.0243542	1.37075E+05
0.23502	1.29464E+06
1.14964	6.27616E+06
2.28759	1.24672E+07
5.60296	3.03621E+07
7.79523	4.20657E+07
8.19599	4.20701E+07
8.69632	4.20721E+07
9.69677	4.20748E+07

* TABLE I * TORS. MOM. VS ANGLE ROT.

TORQUE-ROTATION CURVES GENERATED INTERNALLY

NUM OF CURVES 1

CURVE 1 NUM OF POINTS 19

ROT. ANGLE,Rad.	TORS.MOMEN,LBS-IN
-0.17787	-1.61176E+06
-0.0940743	-1.54840E+06
-0.0521764	-1.51671E+06
-0.0159613	-1.12115E+06
-9.99067E-03	-8.69308E+05
-2.99967E-03	-3.39494E+05
-1.59291E-03	-1.88966E+05
-3.18995E-04	-37910.2
-3.18995E-05	-3791.02
0.00000	0.00000
3.18995E-05	3791.02
3.18995E-04	37910.2
1.59291E-03	1.88966E+05
2.99967E-03	3.39494E+05
9.99067E-03	8.69308E+05
0.0159613	1.12115E+06
0.0521764	1.51671E+06
0.0940743	1.54840E+06
0.17787	1.61176E+06

* TABLE J * MOMENT CURVATURE SETS

USER DEFINED MOMENT CURVATURE

NUM OF SETS : 2

CURVE SET 1 NUM OF CURVES 6

CURVE 1 AXIAL LOAD 0.000E+00 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.97004E+05	1.25000E-06
3	3.93663E+05	2.50000E-06
4	5.89975E+05	3.75000E-06
5	7.85942E+05	5.00000E-06
6	9.81563E+05	6.25000E-06
7	1.17684E+06	7.50000E-06
8	1.37177E+06	8.75000E-06
9	1.37177E+06	1.00000E-05
10	1.39470E+06	1.13000E-05
11	1.54923E+06	1.25000E-05
12	1.70367E+06	1.38000E-05

13	1.85801E+06	1.50000E-05
14	2.01227E+06	1.63000E-05
15	2.16644E+06	1.75000E-05
16	2.32052E+06	1.88000E-05
17	2.47451E+06	2.00000E-05
18	2.62840E+06	2.13000E-05
19	2.78221E+06	2.25000E-05
20	2.93593E+06	2.38000E-05
21	3.08956E+06	2.50000E-05
22	3.24310E+06	2.63000E-05
23	3.39654E+06	2.75000E-05
24	3.54989E+06	2.88000E-05
25	3.70316E+06	3.00000E-05
26	3.85633E+06	3.13000E-05
27	4.00941E+06	3.25000E-05
28	4.16240E+06	3.38000E-05
29	4.31529E+06	3.50000E-05
30	4.46809E+06	3.63000E-05
31	4.62080E+06	3.75000E-05
32	4.77342E+06	3.88000E-05
33	4.92595E+06	4.00000E-05
34	5.07838E+06	4.13000E-05
35	5.23072E+06	4.25000E-05
36	5.38296E+06	4.38000E-05
37	5.53511E+06	4.50000E-05
38	5.68717E+06	4.63000E-05
39	5.83913E+06	4.75000E-05
40	5.99100E+06	4.88000E-05
41	6.29445E+06	5.13000E-05
42	6.59753E+06	5.38000E-05
43	6.90022E+06	5.63000E-05
44	7.20253E+06	5.88000E-05
45	7.50445E+06	6.13000E-05
46	7.80599E+06	6.38000E-05
47	8.10714E+06	6.63000E-05
48	8.40790E+06	6.88000E-05
49	8.70826E+06	7.13000E-05
50	9.00824E+06	7.38000E-05
51	9.30782E+06	7.63000E-05
52	9.60700E+06	7.88000E-05
53	9.90578E+06	8.13000E-05
54	1.02040E+07	8.38000E-05
55	1.05020E+07	8.63000E-05
56	1.08000E+07	8.88000E-05
57	1.10970E+07	9.13000E-05
58	1.13940E+07	9.38000E-05
59	1.16900E+07	9.63000E-05
60	1.19860E+07	9.88000E-05
61	1.22810E+07	1.01300E-04
62	1.25770E+07	1.03800E-04
63	1.28710E+07	1.06300E-04
64	1.31660E+07	1.08800E-04
65	1.34590E+07	1.11300E-04
66	1.37530E+07	1.13800E-04
67	1.40460E+07	1.16300E-04
68	1.43310E+07	1.18800E-04
69	1.45960E+07	1.21300E-04
70	1.48390E+07	1.23800E-04
71	1.50680E+07	1.26300E-04
72	1.52860E+07	1.28800E-04
73	1.54940E+07	1.31300E-04
74	1.56950E+07	1.33800E-04
75	1.58890E+07	1.36300E-04
76	1.60760E+07	1.38800E-04
77	1.62580E+07	1.41300E-04
78	1.64340E+07	1.43800E-04
79	1.66060E+07	1.46300E-04
80	1.67730E+07	1.48800E-04
81	1.73840E+07	1.58800E-04
82	1.78840E+07	1.68800E-04
83	1.83120E+07	1.78800E-04
84	1.86910E+07	1.88800E-04
85	1.90320E+07	1.98800E-04
86	1.93260E+07	2.08800E-04
87	1.95670E+07	2.18800E-04
88	1.97650E+07	2.28800E-04
89	1.99440E+07	2.38800E-04
90	2.01100E+07	2.48800E-04
91	2.02540E+07	2.58800E-04
92	2.03750E+07	2.68800E-04
93	2.04780E+07	2.78800E-04
94	2.05730E+07	2.88800E-04
95	2.06630E+07	2.98800E-04
96	2.07460E+07	3.08800E-04
97	2.08260E+07	3.18800E-04

98	2.09000E+07	3.28800E-04
99	2.09700E+07	3.38800E-04
100	2.10340E+07	3.48800E-04
101	2.10930E+07	3.58800E-04
102	2.11430E+07	3.68800E-04
103	2.11840E+07	3.78800E-04
104	2.12190E+07	3.88800E-04
105	2.12480E+07	3.98800E-04

CURVE 2 AXIAL LOAD 0.100E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.96099E+05	1.25000E-06
3	3.92210E+05	2.50000E-06
4	5.88284E+05	3.75000E-06
5	7.84152E+05	5.00000E-06
6	9.79722E+05	6.25000E-06
7	1.17497E+06	7.50000E-06
8	1.36988E+06	8.75000E-06
9	1.56444E+06	1.00000E-05
10	1.75867E+06	1.13000E-05
11	1.75867E+06	1.25000E-05
12	1.85600E+06	1.38000E-05
13	2.01067E+06	1.50000E-05
14	2.16506E+06	1.63000E-05
15	2.31925E+06	1.75000E-05
16	2.47328E+06	1.88000E-05
17	2.62712E+06	2.00000E-05
18	2.78084E+06	2.13000E-05
19	2.93440E+06	2.25000E-05
20	3.08786E+06	2.38000E-05
21	3.24118E+06	2.50000E-05
22	3.39439E+06	2.63000E-05
23	3.54751E+06	2.75000E-05
24	3.70052E+06	2.88000E-05
25	3.85340E+06	3.00000E-05
26	4.00618E+06	3.13000E-05
27	4.15888E+06	3.25000E-05
28	4.31147E+06	3.38000E-05
29	4.46396E+06	3.50000E-05
30	4.61634E+06	3.63000E-05
31	4.76862E+06	3.75000E-05
32	4.92081E+06	3.88000E-05
33	5.07290E+06	4.00000E-05
34	5.22490E+06	4.13000E-05
35	5.37680E+06	4.25000E-05
36	5.52860E+06	4.38000E-05
37	5.68030E+06	4.50000E-05
38	5.83190E+06	4.63000E-05
39	5.98340E+06	4.75000E-05
40	6.13480E+06	4.88000E-05
41	6.43732E+06	5.13000E-05
42	6.73945E+06	5.38000E-05
43	7.04119E+06	5.63000E-05
44	7.34254E+06	5.88000E-05
45	7.64351E+06	6.13000E-05
46	7.94407E+06	6.38000E-05
47	8.24423E+06	6.63000E-05
48	8.54400E+06	6.88000E-05
49	8.84336E+06	7.13000E-05
50	9.14233E+06	7.38000E-05
51	9.44090E+06	7.63000E-05
52	9.73906E+06	7.88000E-05
53	1.00370E+07	8.13000E-05
54	1.03340E+07	8.38000E-05
55	1.06310E+07	8.63000E-05
56	1.09280E+07	8.88000E-05
57	1.12240E+07	9.13000E-05
58	1.15190E+07	9.38000E-05
59	1.18150E+07	9.63000E-05
60	1.21100E+07	9.88000E-05
61	1.24040E+07	1.01300E-04
62	1.26980E+07	1.03800E-04
63	1.29920E+07	1.06300E-04
64	1.32850E+07	1.08800E-04
65	1.35780E+07	1.11300E-04
66	1.38700E+07	1.13800E-04
67	1.41620E+07	1.16300E-04
68	1.44530E+07	1.18800E-04
69	1.47400E+07	1.21300E-04
70	1.50120E+07	1.23800E-04
71	1.52640E+07	1.26300E-04
72	1.54980E+07	1.28800E-04

73	1.57200E+07	1.31300E-04
74	1.59330E+07	1.33800E-04
75	1.61370E+07	1.36300E-04
76	1.63330E+07	1.38800E-04
77	1.65230E+07	1.41300E-04
78	1.67080E+07	1.43800E-04
79	1.68860E+07	1.46300E-04
80	1.70550E+07	1.48800E-04
81	1.76430E+07	1.58800E-04
82	1.81270E+07	1.68800E-04
83	1.85460E+07	1.78800E-04
84	1.89190E+07	1.88800E-04
85	1.92550E+07	1.98800E-04
86	1.95570E+07	2.08800E-04
87	1.98150E+07	2.18800E-04
88	2.00270E+07	2.28800E-04
89	2.02060E+07	2.38800E-04
90	2.03690E+07	2.48800E-04
91	2.05210E+07	2.58800E-04
92	2.06550E+07	2.68800E-04
93	2.07700E+07	2.78800E-04
94	2.08670E+07	2.88800E-04
95	2.09550E+07	2.98800E-04
96	2.10380E+07	3.08800E-04
97	2.11140E+07	3.18800E-04
98	2.11850E+07	3.28800E-04
99	2.12500E+07	3.38800E-04
100	2.13090E+07	3.48800E-04
101	2.13610E+07	3.58800E-04
102	2.14090E+07	3.68800E-04
103	2.14520E+07	3.78800E-04
104	2.14870E+07	3.88800E-04

CURVE 3 AXIAL LOAD 0.200E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.95012E+05	1.25000E-06
3	3.90050E+05	2.50000E-06
4	5.85084E+05	3.75000E-06
5	7.80115E+05	5.00000E-06
6	9.75130E+05	6.25000E-06
7	1.17003E+06	7.50000E-06
8	1.36471E+06	8.75000E-06
9	1.55912E+06	1.00000E-05
10	1.75323E+06	1.13000E-05
11	1.94702E+06	1.25000E-05
12	2.14049E+06	1.38000E-05
13	2.14049E+06	1.50000E-05
14	2.29601E+06	1.63000E-05
15	2.45254E+06	1.75000E-05
16	2.60844E+06	1.88000E-05
17	2.76381E+06	2.00000E-05
18	2.91873E+06	2.13000E-05
19	3.07327E+06	2.25000E-05
20	3.22751E+06	2.38000E-05
21	3.38140E+06	2.50000E-05
22	3.53508E+06	2.63000E-05
23	3.68853E+06	2.75000E-05
24	3.84175E+06	2.88000E-05
25	3.99480E+06	3.00000E-05
26	4.14768E+06	3.13000E-05
27	4.30037E+06	3.25000E-05
28	4.45296E+06	3.38000E-05
29	4.60534E+06	3.50000E-05
30	4.75759E+06	3.63000E-05
31	4.90974E+06	3.75000E-05
32	5.06175E+06	3.88000E-05
33	5.21360E+06	4.00000E-05
34	5.36534E+06	4.13000E-05
35	5.51699E+06	4.25000E-05
36	5.66853E+06	4.38000E-05
37	5.81990E+06	4.50000E-05
38	5.97117E+06	4.63000E-05
39	6.12234E+06	4.75000E-05
40	6.27342E+06	4.88000E-05
41	6.57524E+06	5.13000E-05
42	6.87659E+06	5.38000E-05
43	7.17753E+06	5.63000E-05
44	7.47808E+06	5.88000E-05
45	7.77820E+06	6.13000E-05
46	8.07787E+06	6.38000E-05
47	8.37714E+06	6.63000E-05
48	8.67600E+06	6.88000E-05

49	8.97445E+06	7.13000E-05
50	9.27250E+06	7.38000E-05
51	9.57014E+06	7.63000E-05
52	9.86732E+06	7.88000E-05
53	1.01640E+07	8.13000E-05
54	1.04600E+07	8.38000E-05
55	1.07560E+07	8.63000E-05
56	1.10520E+07	8.88000E-05
57	1.13470E+07	9.13000E-05
58	1.16420E+07	9.38000E-05
59	1.19360E+07	9.63000E-05
60	1.22300E+07	9.88000E-05
61	1.25230E+07	1.01300E-04
62	1.28160E+07	1.03800E-04
63	1.31090E+07	1.06300E-04
64	1.34010E+07	1.08800E-04
65	1.36930E+07	1.11300E-04
66	1.39840E+07	1.13800E-04
67	1.42750E+07	1.16300E-04
68	1.45650E+07	1.18800E-04
69	1.48550E+07	1.21300E-04
70	1.51440E+07	1.23800E-04
71	1.54210E+07	1.26300E-04
72	1.56800E+07	1.28800E-04
73	1.59190E+07	1.31300E-04
74	1.61450E+07	1.33800E-04
75	1.63620E+07	1.36300E-04
76	1.65690E+07	1.38800E-04
77	1.67670E+07	1.41300E-04
78	1.69550E+07	1.43800E-04
79	1.71280E+07	1.46300E-04
80	1.72910E+07	1.48800E-04
81	1.78580E+07	1.58800E-04
82	1.83350E+07	1.68800E-04
83	1.87490E+07	1.78800E-04
84	1.91160E+07	1.88800E-04
85	1.94480E+07	1.98800E-04
86	1.97490E+07	2.08800E-04
87	2.00190E+07	2.18800E-04
88	2.02480E+07	2.28800E-04
89	2.04370E+07	2.38800E-04
90	2.06010E+07	2.48800E-04
91	2.07510E+07	2.58800E-04
92	2.08920E+07	2.68800E-04
93	2.10180E+07	2.78800E-04
94	2.11260E+07	2.88800E-04
95	2.12160E+07	2.98800E-04
96	2.12950E+07	3.08800E-04
97	2.13670E+07	3.18800E-04
98	2.14300E+07	3.28800E-04
99	2.14870E+07	3.38800E-04
100	2.15370E+07	3.48800E-04
101	2.15830E+07	3.58800E-04
102	2.16240E+07	3.68800E-04

CURVE 4 AXIAL LOAD 0.300E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.93916E+05	1.25000E-06
3	3.87872E+05	2.50000E-06
4	5.81825E+05	3.75000E-06
5	7.75774E+05	5.00000E-06
6	9.69717E+05	6.25000E-06
7	1.16365E+06	7.50000E-06
8	1.35758E+06	8.75000E-06
9	1.55143E+06	1.00000E-05
10	1.74513E+06	1.13000E-05
11	1.93861E+06	1.25000E-05
12	2.13182E+06	1.38000E-05
13	2.32476E+06	1.50000E-05
14	2.51739E+06	1.63000E-05
15	2.55656E+06	1.75000E-05
16	2.71691E+06	1.88000E-05
17	2.87603E+06	2.00000E-05
18	3.03401E+06	2.13000E-05
19	3.19113E+06	2.25000E-05
20	3.34754E+06	2.38000E-05
21	3.50336E+06	2.50000E-05
22	3.65868E+06	2.63000E-05
23	3.81358E+06	2.75000E-05
24	3.96800E+06	2.88000E-05
25	4.12205E+06	3.00000E-05
26	4.27586E+06	3.13000E-05

27	4.42924E+06	3.25000E-05
28	4.58245E+06	3.38000E-05
29	4.73533E+06	3.50000E-05
30	4.88807E+06	3.63000E-05
31	5.04048E+06	3.75000E-05
32	5.19278E+06	3.88000E-05
33	5.34484E+06	4.00000E-05
34	5.49671E+06	4.13000E-05
35	5.64848E+06	4.25000E-05
36	5.80001E+06	4.38000E-05
37	5.95138E+06	4.50000E-05
38	6.10266E+06	4.63000E-05
39	6.25379E+06	4.75000E-05
40	6.40470E+06	4.88000E-05
41	6.70621E+06	5.13000E-05
42	7.00720E+06	5.38000E-05
43	7.30763E+06	5.63000E-05
44	7.60766E+06	5.88000E-05
45	7.90713E+06	6.13000E-05
46	8.20613E+06	6.38000E-05
47	8.50472E+06	6.63000E-05
48	8.80287E+06	6.88000E-05
49	9.10048E+06	7.13000E-05
50	9.39769E+06	7.38000E-05
51	9.69447E+06	7.63000E-05
52	9.99084E+06	7.88000E-05
53	1.02870E+07	8.13000E-05
54	1.05820E+07	8.38000E-05
55	1.08770E+07	8.63000E-05
56	1.11720E+07	8.88000E-05
57	1.14660E+07	9.13000E-05
58	1.17600E+07	9.38000E-05
59	1.20530E+07	9.63000E-05
60	1.23460E+07	9.88000E-05
61	1.26380E+07	1.01300E-04
62	1.29300E+07	1.03800E-04
63	1.32220E+07	1.06300E-04
64	1.35130E+07	1.08800E-04
65	1.38030E+07	1.11300E-04
66	1.40930E+07	1.13800E-04
67	1.43830E+07	1.16300E-04
68	1.46720E+07	1.18800E-04
69	1.49610E+07	1.21300E-04
70	1.52500E+07	1.23800E-04
71	1.55370E+07	1.26300E-04
72	1.58190E+07	1.28800E-04
73	1.60840E+07	1.31300E-04
74	1.63300E+07	1.33800E-04
75	1.65590E+07	1.36300E-04
76	1.67720E+07	1.38800E-04
77	1.69670E+07	1.41300E-04
78	1.71480E+07	1.43800E-04
79	1.73170E+07	1.46300E-04
80	1.74760E+07	1.48800E-04
81	1.80360E+07	1.58800E-04
82	1.85090E+07	1.68800E-04
83	1.89200E+07	1.78800E-04
84	1.92840E+07	1.88800E-04
85	1.96110E+07	1.98800E-04
86	1.99080E+07	2.08800E-04
87	2.01800E+07	2.18800E-04
88	2.04220E+07	2.28800E-04
89	2.06290E+07	2.38800E-04
90	2.08010E+07	2.48800E-04
91	2.09520E+07	2.58800E-04
92	2.10910E+07	2.68800E-04
93	2.12210E+07	2.78800E-04
94	2.13360E+07	2.88800E-04
95	2.14330E+07	2.98800E-04
96	2.15110E+07	3.08800E-04
97	2.15740E+07	3.18800E-04
98	2.16290E+07	3.28800E-04
99	2.16780E+07	3.38800E-04
100	2.17240E+07	3.48800E-04
101	2.17650E+07	3.58800E-04

CURVE 5 AXIAL LOAD 0.400E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.92811E+05	1.25000E-06
3	3.85677E+05	2.50000E-06
4	5.78539E+05	3.75000E-06
5	7.71397E+05	5.00000E-06

6	9.64249E+05	6.25000E-06
7	1.15709E+06	7.50000E-06
8	1.34993E+06	8.75000E-06
9	1.54276E+06	1.00000E-05
10	1.73557E+06	1.13000E-05
11	1.92834E+06	1.25000E-05
12	2.12099E+06	1.38000E-05
13	2.31347E+06	1.50000E-05
14	2.50572E+06	1.63000E-05
15	2.69773E+06	1.75000E-05
16	2.88946E+06	1.88000E-05
17	2.95877E+06	2.00000E-05
18	3.12207E+06	2.13000E-05
19	3.28394E+06	2.25000E-05
20	3.44433E+06	2.38000E-05
21	3.60358E+06	2.50000E-05
22	3.76186E+06	2.63000E-05
23	3.91926E+06	2.75000E-05
24	4.07592E+06	2.88000E-05
25	4.23192E+06	3.00000E-05
26	4.38739E+06	3.13000E-05
27	4.54229E+06	3.25000E-05
28	4.69675E+06	3.38000E-05
29	4.85091E+06	3.50000E-05
30	5.00460E+06	3.63000E-05
31	5.15801E+06	3.75000E-05
32	5.31108E+06	3.88000E-05
33	5.46388E+06	4.00000E-05
34	5.61636E+06	4.13000E-05
35	5.76867E+06	4.25000E-05
36	5.92061E+06	4.38000E-05
37	6.07245E+06	4.50000E-05
38	6.22398E+06	4.63000E-05
39	6.37531E+06	4.75000E-05
40	6.52654E+06	4.88000E-05
41	6.82824E+06	5.13000E-05
42	7.12940E+06	5.38000E-05
43	7.42976E+06	5.63000E-05
44	7.72966E+06	5.88000E-05
45	8.02882E+06	6.13000E-05
46	8.32755E+06	6.38000E-05
47	8.62568E+06	6.63000E-05
48	8.92327E+06	6.88000E-05
49	9.22043E+06	7.13000E-05
50	9.51704E+06	7.38000E-05
51	9.81311E+06	7.63000E-05
52	1.01090E+07	7.88000E-05
53	1.04040E+07	8.13000E-05
54	1.06990E+07	8.38000E-05
55	1.09930E+07	8.63000E-05
56	1.12870E+07	8.88000E-05
57	1.15800E+07	9.13000E-05
58	1.18730E+07	9.38000E-05
59	1.21650E+07	9.63000E-05
60	1.24570E+07	9.88000E-05
61	1.27480E+07	1.01300E-04
62	1.30390E+07	1.03800E-04
63	1.33300E+07	1.06300E-04
64	1.36200E+07	1.08800E-04
65	1.39100E+07	1.11300E-04
66	1.41990E+07	1.13800E-04
67	1.44870E+07	1.16300E-04
68	1.47760E+07	1.18800E-04
69	1.50630E+07	1.21300E-04
70	1.53510E+07	1.23800E-04
71	1.56370E+07	1.26300E-04
72	1.59240E+07	1.28800E-04
73	1.62050E+07	1.31300E-04
74	1.64700E+07	1.33800E-04
75	1.67060E+07	1.36300E-04
76	1.69170E+07	1.38800E-04
77	1.71110E+07	1.41300E-04
78	1.72910E+07	1.43800E-04
79	1.74590E+07	1.46300E-04
80	1.76170E+07	1.48800E-04
81	1.81780E+07	1.58800E-04
82	1.86510E+07	1.68800E-04
83	1.90600E+07	1.78800E-04
84	1.94210E+07	1.88800E-04
85	1.97440E+07	1.98800E-04
86	2.00380E+07	2.08800E-04
87	2.03080E+07	2.18800E-04
88	2.05550E+07	2.28800E-04
89	2.07750E+07	2.38800E-04
90	2.09650E+07	2.48800E-04

91	2.11230E+07	2.58800E-04
92	2.12590E+07	2.68800E-04
93	2.13820E+07	2.78800E-04
94	2.14920E+07	2.88800E-04
95	2.15870E+07	2.98800E-04
96	2.16660E+07	3.08800E-04
97	2.17310E+07	3.18800E-04
98	2.17850E+07	3.28800E-04
99	2.18320E+07	3.38800E-04
100	2.18750E+07	3.48800E-04

CURVE 6 AXIAL LOAD 0.500E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.91697E+05	1.25000E-06
3	3.83463E+05	2.50000E-06
4	5.75226E+05	3.75000E-06
5	7.66984E+05	5.00000E-06
6	9.58736E+05	6.25000E-06
7	1.15048E+06	7.50000E-06
8	1.34222E+06	8.75000E-06
9	1.53394E+06	1.00000E-05
10	1.72566E+06	1.13000E-05
11	1.91736E+06	1.25000E-05
12	2.10904E+06	1.38000E-05
13	2.30070E+06	1.50000E-05
14	2.49226E+06	1.63000E-05
15	2.68369E+06	1.75000E-05
16	2.87493E+06	1.88000E-05
17	3.06595E+06	2.00000E-05
18	3.25672E+06	2.13000E-05
19	3.34911E+06	2.25000E-05
20	3.51490E+06	2.38000E-05
21	3.67893E+06	2.50000E-05
22	3.84162E+06	2.63000E-05
23	4.00291E+06	2.75000E-05
24	4.16307E+06	2.88000E-05
25	4.32220E+06	3.00000E-05
26	4.48041E+06	3.13000E-05
27	4.63783E+06	3.25000E-05
28	4.79452E+06	3.38000E-05
29	4.95044E+06	3.50000E-05
30	5.10582E+06	3.63000E-05
31	5.26076E+06	3.75000E-05
32	5.41508E+06	3.88000E-05
33	5.56903E+06	4.00000E-05
34	5.72263E+06	4.13000E-05
35	5.87579E+06	4.25000E-05
36	6.02871E+06	4.38000E-05
37	6.18122E+06	4.50000E-05
38	6.33352E+06	4.63000E-05
39	6.48551E+06	4.75000E-05
40	6.63719E+06	4.88000E-05
41	6.93988E+06	5.13000E-05
42	7.24173E+06	5.38000E-05
43	7.54254E+06	5.63000E-05
44	7.84269E+06	5.88000E-05
45	8.14207E+06	6.13000E-05
46	8.44078E+06	6.38000E-05
47	8.73880E+06	6.63000E-05
48	9.03630E+06	6.88000E-05
49	9.33305E+06	7.13000E-05
50	9.62935E+06	7.38000E-05
51	9.92505E+06	7.63000E-05
52	1.02200E+07	7.88000E-05
53	1.05150E+07	8.13000E-05
54	1.08090E+07	8.38000E-05
55	1.11020E+07	8.63000E-05
56	1.13950E+07	8.88000E-05
57	1.16880E+07	9.13000E-05
58	1.19800E+07	9.38000E-05
59	1.22720E+07	9.63000E-05
60	1.25630E+07	9.88000E-05
61	1.28530E+07	1.01300E-04
62	1.31430E+07	1.03800E-04
63	1.34330E+07	1.06300E-04
64	1.37220E+07	1.08800E-04
65	1.40110E+07	1.11300E-04
66	1.42990E+07	1.13800E-04
67	1.45870E+07	1.16300E-04
68	1.48740E+07	1.18800E-04
69	1.51610E+07	1.21300E-04
70	1.54470E+07	1.23800E-04

71	1.57330E+07	1.26300E-04
72	1.60120E+07	1.28800E-04
73	1.62820E+07	1.31300E-04
74	1.65400E+07	1.33800E-04
75	1.67800E+07	1.36300E-04
76	1.70010E+07	1.38800E-04
77	1.72010E+07	1.41300E-04
78	1.73840E+07	1.43800E-04
79	1.75560E+07	1.46300E-04
80	1.77180E+07	1.48800E-04
81	1.82840E+07	1.58800E-04
82	1.87580E+07	1.68800E-04
83	1.91680E+07	1.78800E-04
84	1.95270E+07	1.88800E-04
85	1.98490E+07	1.98800E-04
86	2.01400E+07	2.08800E-04
87	2.04060E+07	2.18800E-04
88	2.06530E+07	2.28800E-04
89	2.08800E+07	2.38800E-04
90	2.10810E+07	2.48800E-04
91	2.12500E+07	2.58800E-04
92	2.13880E+07	2.68800E-04
93	2.15010E+07	2.78800E-04
94	2.15990E+07	2.88800E-04
95	2.16860E+07	2.98800E-04
96	2.17660E+07	3.08800E-04
97	2.18360E+07	3.18800E-04
98	2.18980E+07	3.28800E-04

CURVE SET 2 NUM OF CURVES 6

CURVE 1 AXIAL LOAD 0.000E+00 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.83254E+05	1.25000E-06
3	3.66150E+05	2.50000E-06
4	5.48690E+05	3.75000E-06
5	7.30873E+05	5.00000E-06
6	9.12698E+05	6.25000E-06
7	1.09417E+06	7.50000E-06
8	1.27528E+06	8.75000E-06
9	1.27528E+06	1.00000E-05
10	1.27528E+06	1.13000E-05
11	1.38022E+06	1.25000E-05
12	1.51781E+06	1.38000E-05
13	1.65533E+06	1.50000E-05
14	1.79277E+06	1.63000E-05
15	1.93013E+06	1.75000E-05
16	2.06741E+06	1.88000E-05
17	2.20461E+06	2.00000E-05
18	2.34173E+06	2.13000E-05
19	2.47877E+06	2.25000E-05
20	2.61573E+06	2.38000E-05
21	2.75262E+06	2.50000E-05
22	2.88942E+06	2.63000E-05
23	3.02614E+06	2.75000E-05
24	3.16278E+06	2.88000E-05
25	3.29935E+06	3.00000E-05
26	3.43583E+06	3.13000E-05
27	3.57223E+06	3.25000E-05
28	3.70855E+06	3.38000E-05
29	3.84478E+06	3.50000E-05
30	3.98094E+06	3.63000E-05
31	4.11701E+06	3.75000E-05
32	4.25301E+06	3.88000E-05
33	4.38892E+06	4.00000E-05
34	4.52474E+06	4.13000E-05
35	4.66049E+06	4.25000E-05
36	4.79615E+06	4.38000E-05
37	4.93173E+06	4.50000E-05
38	5.06723E+06	4.63000E-05
39	5.20264E+06	4.75000E-05
40	5.33797E+06	4.88000E-05
41	5.60838E+06	5.13000E-05
42	5.87845E+06	5.38000E-05
43	6.14818E+06	5.63000E-05
44	6.41757E+06	5.88000E-05
45	6.68662E+06	6.13000E-05
46	6.95533E+06	6.38000E-05
47	7.22369E+06	6.63000E-05
48	7.49171E+06	6.88000E-05

49	7.75937E+06	7.13000E-05
50	8.02669E+06	7.38000E-05
51	8.29365E+06	7.63000E-05
52	8.56026E+06	7.88000E-05
53	8.82651E+06	8.13000E-05
54	9.09240E+06	8.38000E-05
55	9.35794E+06	8.63000E-05
56	9.62311E+06	8.88000E-05
57	9.88792E+06	9.13000E-05
58	1.01520E+07	9.38000E-05
59	1.04160E+07	9.63000E-05
60	1.06800E+07	9.88000E-05
61	1.09430E+07	1.01300E-04
62	1.12060E+07	1.03800E-04
63	1.14690E+07	1.06300E-04
64	1.17310E+07	1.08800E-04
65	1.19930E+07	1.11300E-04
66	1.22550E+07	1.13800E-04
67	1.25040E+07	1.16300E-04
68	1.27300E+07	1.18800E-04
69	1.29340E+07	1.21300E-04
70	1.31240E+07	1.23800E-04
71	1.33020E+07	1.26300E-04
72	1.34690E+07	1.28800E-04
73	1.36270E+07	1.31300E-04
74	1.37780E+07	1.33800E-04
75	1.39210E+07	1.36300E-04
76	1.40580E+07	1.38800E-04
77	1.41890E+07	1.41300E-04
78	1.43150E+07	1.43800E-04
79	1.44360E+07	1.46300E-04
80	1.45520E+07	1.48800E-04
81	1.49770E+07	1.58800E-04
82	1.53330E+07	1.68800E-04
83	1.56120E+07	1.78800E-04
84	1.58370E+07	1.88800E-04
85	1.60240E+07	1.98800E-04
86	1.61830E+07	2.08800E-04
87	1.63190E+07	2.18800E-04
88	1.64370E+07	2.28800E-04
89	1.65400E+07	2.38800E-04
90	1.66290E+07	2.48800E-04
91	1.67080E+07	2.58800E-04
92	1.67780E+07	2.68800E-04
93	1.68390E+07	2.78800E-04
94	1.68940E+07	2.88800E-04
95	1.69430E+07	2.98800E-04
96	1.69860E+07	3.08800E-04
97	1.70260E+07	3.18800E-04
98	1.70610E+07	3.28800E-04
99	1.70930E+07	3.38800E-04
100	1.71220E+07	3.48800E-04
101	1.71480E+07	3.58800E-04
102	1.71710E+07	3.68800E-04
103	1.71930E+07	3.78800E-04
104	1.72120E+07	3.88800E-04
105	1.72290E+07	3.98800E-04
106	1.72450E+07	4.08800E-04
107	1.72590E+07	4.18800E-04
108	1.72720E+07	4.28800E-04
109	1.72840E+07	4.38800E-04

CURVE 2 AXIAL LOAD 0.100E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.82216E+05	1.25000E-06
3	3.64430E+05	2.50000E-06
4	5.46628E+05	3.75000E-06
5	7.28664E+05	5.00000E-06
6	9.10414E+05	6.25000E-06
7	1.09184E+06	7.50000E-06
8	1.27292E+06	8.75000E-06
9	1.45365E+06	1.00000E-05
10	1.63403E+06	1.13000E-05
11	1.63403E+06	1.25000E-05
12	1.70090E+06	1.38000E-05
13	1.83913E+06	1.50000E-05
14	1.97704E+06	1.63000E-05
15	2.11468E+06	1.75000E-05
16	2.25213E+06	1.88000E-05
17	2.38934E+06	2.00000E-05
18	2.52642E+06	2.13000E-05
19	2.66332E+06	2.25000E-05

20	2.80013E+06	2.38000E-05
21	2.93676E+06	2.50000E-05
22	3.07331E+06	2.63000E-05
23	3.20974E+06	2.75000E-05
24	3.34604E+06	2.88000E-05
25	3.48226E+06	3.00000E-05
26	3.61839E+06	3.13000E-05
27	3.75440E+06	3.25000E-05
28	3.89030E+06	3.38000E-05
29	4.02613E+06	3.50000E-05
30	4.16187E+06	3.63000E-05
31	4.29752E+06	3.75000E-05
32	4.43307E+06	3.88000E-05
33	4.56851E+06	4.00000E-05
34	4.70387E+06	4.13000E-05
35	4.83915E+06	4.25000E-05
36	4.97434E+06	4.38000E-05
37	5.10944E+06	4.50000E-05
38	5.24446E+06	4.63000E-05
39	5.37939E+06	4.75000E-05
40	5.51423E+06	4.88000E-05
41	5.78362E+06	5.13000E-05
42	6.05266E+06	5.38000E-05
43	6.32136E+06	5.63000E-05
44	6.58971E+06	5.88000E-05
45	6.85772E+06	6.13000E-05
46	7.12537E+06	6.38000E-05
47	7.39266E+06	6.63000E-05
48	7.65959E+06	6.88000E-05
49	7.92615E+06	7.13000E-05
50	8.19236E+06	7.38000E-05
51	8.45821E+06	7.63000E-05
52	8.72369E+06	7.88000E-05
53	8.98882E+06	8.13000E-05
54	9.25358E+06	8.38000E-05
55	9.51797E+06	8.63000E-05
56	9.78199E+06	8.88000E-05
57	1.00460E+07	9.13000E-05
58	1.03090E+07	9.38000E-05
59	1.05720E+07	9.63000E-05
60	1.08340E+07	9.88000E-05
61	1.10970E+07	1.01300E-04
62	1.13580E+07	1.03800E-04
63	1.16200E+07	1.06300E-04
64	1.18810E+07	1.08800E-04
65	1.21410E+07	1.11300E-04
66	1.24010E+07	1.13800E-04
67	1.26610E+07	1.16300E-04
68	1.29170E+07	1.18800E-04
69	1.31580E+07	1.21300E-04
70	1.33750E+07	1.23800E-04
71	1.35740E+07	1.26300E-04
72	1.37600E+07	1.28800E-04
73	1.39340E+07	1.31300E-04
74	1.40990E+07	1.33800E-04
75	1.42550E+07	1.36300E-04
76	1.44040E+07	1.38800E-04
77	1.45470E+07	1.41300E-04
78	1.46830E+07	1.43800E-04
79	1.48140E+07	1.46300E-04
80	1.49390E+07	1.48800E-04
81	1.53820E+07	1.58800E-04
82	1.57230E+07	1.68800E-04
83	1.59920E+07	1.78800E-04
84	1.62150E+07	1.88800E-04
85	1.64010E+07	1.98800E-04
86	1.65590E+07	2.08800E-04
87	1.66950E+07	2.18800E-04
88	1.68130E+07	2.28800E-04
89	1.69140E+07	2.38800E-04
90	1.70030E+07	2.48800E-04
91	1.70810E+07	2.58800E-04
92	1.71500E+07	2.68800E-04
93	1.72100E+07	2.78800E-04
94	1.72640E+07	2.88800E-04
95	1.73120E+07	2.98800E-04
96	1.73540E+07	3.08800E-04
97	1.73930E+07	3.18800E-04
98	1.74270E+07	3.28800E-04
99	1.74570E+07	3.38800E-04
100	1.74850E+07	3.48800E-04
101	1.75100E+07	3.58800E-04
102	1.75320E+07	3.68800E-04
103	1.75530E+07	3.78800E-04
104	1.75700E+07	3.88800E-04

105	1.75870E+07	3.98800E-04
106	1.76010E+07	4.08800E-04
107	1.76140E+07	4.18800E-04

CURVE 3 AXIAL LOAD 0.200E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.80988E+05	1.25000E-06
3	3.61974E+05	2.50000E-06
4	5.42957E+05	3.75000E-06
5	7.23934E+05	5.00000E-06
6	9.04904E+05	6.25000E-06
7	1.08582E+06	7.50000E-06
8	1.26656E+06	8.75000E-06
9	1.44706E+06	1.00000E-05
10	1.62727E+06	1.13000E-05
11	1.80716E+06	1.25000E-05
12	1.98672E+06	1.38000E-05
13	2.16595E+06	1.50000E-05
14	2.16595E+06	1.63000E-05
15	2.26997E+06	1.75000E-05
16	2.41028E+06	1.88000E-05
17	2.54990E+06	2.00000E-05
18	2.68893E+06	2.13000E-05
19	2.82746E+06	2.25000E-05
20	2.96559E+06	2.38000E-05
21	3.10336E+06	2.50000E-05
22	3.24074E+06	2.63000E-05
23	3.37791E+06	2.75000E-05
24	3.51480E+06	2.88000E-05
25	3.65146E+06	3.00000E-05
26	3.78793E+06	3.13000E-05
27	3.92421E+06	3.25000E-05
28	4.06029E+06	3.38000E-05
29	4.19628E+06	3.50000E-05
30	4.33201E+06	3.63000E-05
31	4.46765E+06	3.75000E-05
32	4.60320E+06	3.88000E-05
33	4.73852E+06	4.00000E-05
34	4.87374E+06	4.13000E-05
35	5.00887E+06	4.25000E-05
36	5.14389E+06	4.38000E-05
37	5.27873E+06	4.50000E-05
38	5.41348E+06	4.63000E-05
39	5.54814E+06	4.75000E-05
40	5.68271E+06	4.88000E-05
41	5.95146E+06	5.13000E-05
42	6.21979E+06	5.38000E-05
43	6.48777E+06	5.63000E-05
44	6.75531E+06	5.88000E-05
45	7.02243E+06	6.13000E-05
46	7.28919E+06	6.38000E-05
47	7.55558E+06	6.63000E-05
48	7.82160E+06	6.88000E-05
49	8.08717E+06	7.13000E-05
50	8.35237E+06	7.38000E-05
51	8.61721E+06	7.63000E-05
52	8.88167E+06	7.88000E-05
53	9.14576E+06	8.13000E-05
54	9.40947E+06	8.38000E-05
55	9.67279E+06	8.63000E-05
56	9.93570E+06	8.88000E-05
57	1.01980E+07	9.13000E-05
58	1.04600E+07	9.38000E-05
59	1.07220E+07	9.63000E-05
60	1.09840E+07	9.88000E-05
61	1.12440E+07	1.01300E-04
62	1.15050E+07	1.03800E-04
63	1.17650E+07	1.06300E-04
64	1.20250E+07	1.08800E-04
65	1.22850E+07	1.11300E-04
66	1.25440E+07	1.13800E-04
67	1.28020E+07	1.16300E-04
68	1.30600E+07	1.18800E-04
69	1.33180E+07	1.21300E-04
70	1.35680E+07	1.23800E-04
71	1.38000E+07	1.26300E-04
72	1.40090E+07	1.28800E-04
73	1.42020E+07	1.31300E-04
74	1.43830E+07	1.33800E-04
75	1.45540E+07	1.36300E-04
76	1.47170E+07	1.38800E-04
77	1.48720E+07	1.41300E-04

78	1.50200E+07	1.43800E-04
79	1.51570E+07	1.46300E-04
80	1.52870E+07	1.48800E-04
81	1.57150E+07	1.58800E-04
82	1.60470E+07	1.68800E-04
83	1.63150E+07	1.78800E-04
84	1.65380E+07	1.88800E-04
85	1.67250E+07	1.98800E-04
86	1.68830E+07	2.08800E-04
87	1.70190E+07	2.18800E-04
88	1.71350E+07	2.28800E-04
89	1.72360E+07	2.38800E-04
90	1.73240E+07	2.48800E-04
91	1.74010E+07	2.58800E-04
92	1.74690E+07	2.68800E-04
93	1.75290E+07	2.78800E-04
94	1.75810E+07	2.88800E-04
95	1.76280E+07	2.98800E-04
96	1.76690E+07	3.08800E-04
97	1.77060E+07	3.18800E-04
98	1.77390E+07	3.28800E-04
99	1.77680E+07	3.38800E-04
100	1.77950E+07	3.48800E-04
101	1.78180E+07	3.58800E-04
102	1.78390E+07	3.68800E-04
103	1.78580E+07	3.78800E-04
104	1.78740E+07	3.88800E-04
105	1.78890E+07	3.98800E-04

CURVE 4 AXIAL LOAD 0.300E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.79747E+05	1.25000E-06
3	3.59493E+05	2.50000E-06
4	5.39235E+05	3.75000E-06
5	7.18971E+05	5.00000E-06
6	8.98701E+05	6.25000E-06
7	1.07842E+06	7.50000E-06
8	1.25813E+06	8.75000E-06
9	1.43782E+06	1.00000E-05
10	1.61742E+06	1.13000E-05
11	1.79684E+06	1.25000E-05
12	1.97604E+06	1.38000E-05
13	2.15497E+06	1.50000E-05
14	2.33361E+06	1.63000E-05
15	2.51194E+06	1.75000E-05
16	2.52980E+06	1.88000E-05
17	2.67495E+06	2.00000E-05
18	2.81857E+06	2.13000E-05
19	2.96110E+06	2.25000E-05
20	3.10266E+06	2.38000E-05
21	3.24338E+06	2.50000E-05
22	3.38336E+06	2.63000E-05
23	3.52270E+06	2.75000E-05
24	3.66151E+06	2.88000E-05
25	3.79988E+06	3.00000E-05
26	3.93781E+06	3.13000E-05
27	4.07530E+06	3.25000E-05
28	4.21254E+06	3.38000E-05
29	4.34937E+06	3.50000E-05
30	4.48598E+06	3.63000E-05
31	4.62228E+06	3.75000E-05
32	4.75841E+06	3.88000E-05
33	4.89421E+06	4.00000E-05
34	5.02992E+06	4.13000E-05
35	5.16532E+06	4.25000E-05
36	5.30058E+06	4.38000E-05
37	5.43573E+06	4.50000E-05
38	5.57058E+06	4.63000E-05
39	5.70532E+06	4.75000E-05
40	5.83997E+06	4.88000E-05
41	6.10867E+06	5.13000E-05
42	6.37692E+06	5.38000E-05
43	6.64454E+06	5.63000E-05
44	6.91171E+06	5.88000E-05
45	7.17842E+06	6.13000E-05
46	7.44458E+06	6.38000E-05
47	7.71036E+06	6.63000E-05
48	7.97572E+06	6.88000E-05
49	8.24054E+06	7.13000E-05
50	8.50497E+06	7.38000E-05
51	8.76902E+06	7.63000E-05
52	9.03267E+06	7.88000E-05

53	9.29580E+06	8.13000E-05
54	9.55855E+06	8.38000E-05
55	9.82090E+06	8.63000E-05
56	1.00830E+07	8.88000E-05
57	1.03440E+07	9.13000E-05
58	1.06060E+07	9.38000E-05
59	1.08660E+07	9.63000E-05
60	1.11270E+07	9.88000E-05
61	1.13860E+07	1.01300E-04
62	1.16460E+07	1.03800E-04
63	1.19050E+07	1.06300E-04
64	1.21640E+07	1.08800E-04
65	1.24220E+07	1.11300E-04
66	1.26800E+07	1.13800E-04
67	1.29370E+07	1.16300E-04
68	1.31940E+07	1.18800E-04
69	1.34510E+07	1.21300E-04
70	1.37070E+07	1.23800E-04
71	1.39610E+07	1.26300E-04
72	1.42030E+07	1.28800E-04
73	1.44250E+07	1.31300E-04
74	1.46270E+07	1.33800E-04
75	1.48160E+07	1.36300E-04
76	1.49910E+07	1.38800E-04
77	1.51530E+07	1.41300E-04
78	1.53010E+07	1.43800E-04
79	1.54360E+07	1.46300E-04
80	1.55620E+07	1.48800E-04
81	1.59810E+07	1.58800E-04
82	1.63140E+07	1.68800E-04
83	1.65830E+07	1.78800E-04
84	1.68070E+07	1.88800E-04
85	1.69950E+07	1.98800E-04
86	1.71530E+07	2.08800E-04
87	1.72890E+07	2.18800E-04
88	1.74050E+07	2.28800E-04
89	1.75060E+07	2.38800E-04
90	1.75930E+07	2.48800E-04
91	1.76680E+07	2.58800E-04
92	1.77350E+07	2.68800E-04
93	1.77940E+07	2.78800E-04
94	1.78450E+07	2.88800E-04
95	1.78900E+07	2.98800E-04
96	1.79310E+07	3.08800E-04
97	1.79660E+07	3.18800E-04
98	1.79980E+07	3.28800E-04
99	1.80250E+07	3.38800E-04
100	1.80500E+07	3.48800E-04
101	1.80710E+07	3.58800E-04
102	1.80910E+07	3.68800E-04
103	1.81080E+07	3.78800E-04

CURVE 5 AXIAL LOAD 0.400E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.78494E+05	1.25000E-06
3	3.56985E+05	2.50000E-06
4	5.35474E+05	3.75000E-06
5	7.13957E+05	5.00000E-06
6	8.92433E+05	6.25000E-06
7	1.07090E+06	7.50000E-06
8	1.24936E+06	8.75000E-06
9	1.42780E+06	1.00000E-05
10	1.60623E+06	1.13000E-05
11	1.78465E+06	1.25000E-05
12	1.96301E+06	1.38000E-05
13	2.14126E+06	1.50000E-05
14	2.31934E+06	1.63000E-05
15	2.49721E+06	1.75000E-05
16	2.67482E+06	1.88000E-05
17	2.85216E+06	2.00000E-05
18	2.91041E+06	2.13000E-05
19	3.05924E+06	2.25000E-05
20	3.20638E+06	2.38000E-05
21	3.35199E+06	2.50000E-05
22	3.49626E+06	2.63000E-05
23	3.63945E+06	2.75000E-05
24	3.78167E+06	2.88000E-05
25	3.92303E+06	3.00000E-05
26	4.06364E+06	3.13000E-05
27	4.20362E+06	3.25000E-05
28	4.34291E+06	3.38000E-05
29	4.48164E+06	3.50000E-05

30	4.61997E+06	3.63000E-05
31	4.75781E+06	3.75000E-05
32	4.89520E+06	3.88000E-05
33	5.03234E+06	4.00000E-05
34	5.16897E+06	4.13000E-05
35	5.30545E+06	4.25000E-05
36	5.44147E+06	4.38000E-05
37	5.57733E+06	4.50000E-05
38	5.71288E+06	4.63000E-05
39	5.84817E+06	4.75000E-05
40	5.98336E+06	4.88000E-05
41	6.25279E+06	5.13000E-05
42	6.52153E+06	5.38000E-05
43	6.78960E+06	5.63000E-05
44	7.05686E+06	5.88000E-05
45	7.32364E+06	6.13000E-05
46	7.58968E+06	6.38000E-05
47	7.85524E+06	6.63000E-05
48	8.12026E+06	6.88000E-05
49	8.38467E+06	7.13000E-05
50	8.64869E+06	7.38000E-05
51	8.91216E+06	7.63000E-05
52	9.17509E+06	7.88000E-05
53	9.43762E+06	8.13000E-05
54	9.69974E+06	8.38000E-05
55	9.96128E+06	8.63000E-05
56	1.02220E+07	8.88000E-05
57	1.04830E+07	9.13000E-05
58	1.07430E+07	9.38000E-05
59	1.10030E+07	9.63000E-05
60	1.12620E+07	9.88000E-05
61	1.15210E+07	1.01300E-04
62	1.17800E+07	1.03800E-04
63	1.20380E+07	1.06300E-04
64	1.22950E+07	1.08800E-04
65	1.25530E+07	1.11300E-04
66	1.28090E+07	1.13800E-04
67	1.30660E+07	1.16300E-04
68	1.33210E+07	1.18800E-04
69	1.35770E+07	1.21300E-04
70	1.38320E+07	1.23800E-04
71	1.40860E+07	1.26300E-04
72	1.43400E+07	1.28800E-04
73	1.45890E+07	1.31300E-04
74	1.48170E+07	1.33800E-04
75	1.50190E+07	1.36300E-04
76	1.51980E+07	1.38800E-04
77	1.53580E+07	1.41300E-04
78	1.55030E+07	1.43800E-04
79	1.56380E+07	1.46300E-04
80	1.57640E+07	1.48800E-04
81	1.61880E+07	1.58800E-04
82	1.65250E+07	1.68800E-04
83	1.67980E+07	1.78800E-04
84	1.70240E+07	1.88800E-04
85	1.72120E+07	1.98800E-04
86	1.73710E+07	2.08800E-04
87	1.75070E+07	2.18800E-04
88	1.76220E+07	2.28800E-04
89	1.77220E+07	2.38800E-04
90	1.78080E+07	2.48800E-04
91	1.78830E+07	2.58800E-04
92	1.79480E+07	2.68800E-04
93	1.80050E+07	2.78800E-04
94	1.80550E+07	2.88800E-04
95	1.80990E+07	2.98800E-04
96	1.81380E+07	3.08800E-04
97	1.81710E+07	3.18800E-04
98	1.82010E+07	3.28800E-04
99	1.82270E+07	3.38800E-04
100	1.82500E+07	3.48800E-04
101	1.82700E+07	3.58800E-04

CURVE 6 AXIAL LOAD 0.500E+06 LBS

POINT	MOMENT LBS-IN	CURVATURE RADIAN/IN
1	0.00000	0.00000
2	1.77227E+05	1.25000E-06
3	3.54451E+05	2.50000E-06
4	5.31672E+05	3.75000E-06
5	7.08888E+05	5.00000E-06
6	8.86097E+05	6.25000E-06
7	1.06330E+06	7.50000E-06
8	1.24049E+06	8.75000E-06

9	1.41766E+06	1.00000E-05
10	1.59483E+06	1.13000E-05
11	1.77197E+06	1.25000E-05
12	1.94910E+06	1.38000E-05
13	2.12621E+06	1.50000E-05
14	2.30329E+06	1.63000E-05
15	2.48030E+06	1.75000E-05
16	2.65718E+06	1.88000E-05
17	2.83389E+06	2.00000E-05
18	3.01039E+06	2.13000E-05
19	3.18666E+06	2.25000E-05
20	3.36267E+06	2.38000E-05
21	3.42704E+06	2.50000E-05
22	3.57730E+06	2.63000E-05
23	3.72577E+06	2.75000E-05
24	3.87279E+06	2.88000E-05
25	4.01850E+06	3.00000E-05
26	4.16301E+06	3.13000E-05
27	4.30645E+06	3.25000E-05
28	4.44893E+06	3.38000E-05
29	4.59057E+06	3.50000E-05
30	4.73146E+06	3.63000E-05
31	4.87173E+06	3.75000E-05
32	5.01131E+06	3.88000E-05
33	5.15026E+06	4.00000E-05
34	5.28882E+06	4.13000E-05
35	5.42676E+06	4.25000E-05
36	5.56432E+06	4.38000E-05
37	5.70147E+06	4.50000E-05
38	5.83821E+06	4.63000E-05
39	5.97462E+06	4.75000E-05
40	6.11068E+06	4.88000E-05
41	6.38194E+06	5.13000E-05
42	6.65196E+06	5.38000E-05
43	6.92096E+06	5.63000E-05
44	7.18916E+06	5.88000E-05
45	7.45644E+06	6.13000E-05
46	7.72293E+06	6.38000E-05
47	7.98876E+06	6.63000E-05
48	8.25383E+06	6.88000E-05
49	8.51829E+06	7.13000E-05
50	8.78215E+06	7.38000E-05
51	9.04532E+06	7.63000E-05
52	9.30807E+06	7.88000E-05
53	9.57013E+06	8.13000E-05
54	9.83165E+06	8.38000E-05
55	1.00930E+07	8.63000E-05
56	1.03530E+07	8.88000E-05
57	1.06130E+07	9.13000E-05
58	1.08730E+07	9.38000E-05
59	1.11320E+07	9.63000E-05
60	1.13900E+07	9.88000E-05
61	1.16480E+07	1.01300E-04
62	1.19060E+07	1.03800E-04
63	1.21630E+07	1.06300E-04
64	1.24200E+07	1.08800E-04
65	1.26760E+07	1.11300E-04
66	1.29320E+07	1.13800E-04
67	1.31870E+07	1.16300E-04
68	1.34420E+07	1.18800E-04
69	1.36960E+07	1.21300E-04
70	1.39500E+07	1.23800E-04
71	1.42030E+07	1.26300E-04
72	1.44510E+07	1.28800E-04
73	1.46880E+07	1.31300E-04
74	1.49140E+07	1.33800E-04
75	1.51230E+07	1.36300E-04
76	1.53120E+07	1.38800E-04
77	1.54800E+07	1.41300E-04
78	1.56310E+07	1.43800E-04
79	1.57710E+07	1.46300E-04
80	1.59000E+07	1.48800E-04
81	1.63360E+07	1.58800E-04
82	1.66800E+07	1.68800E-04
83	1.69580E+07	1.78800E-04
84	1.71860E+07	1.88800E-04
85	1.73760E+07	1.98800E-04
86	1.75350E+07	2.08800E-04
87	1.76710E+07	2.18800E-04
88	1.77860E+07	2.28800E-04
89	1.78850E+07	2.38800E-04
90	1.79700E+07	2.48800E-04
91	1.80430E+07	2.58800E-04
92	1.81070E+07	2.68800E-04
93	1.81630E+07	2.78800E-04

94	1.82110E+07	2.88800E-04
95	1.82530E+07	2.98800E-04
96	1.82900E+07	3.08800E-04
97	1.83220E+07	3.18800E-04
98	1.83500E+07	3.28800E-04
99	1.83740E+07	3.38800E-04

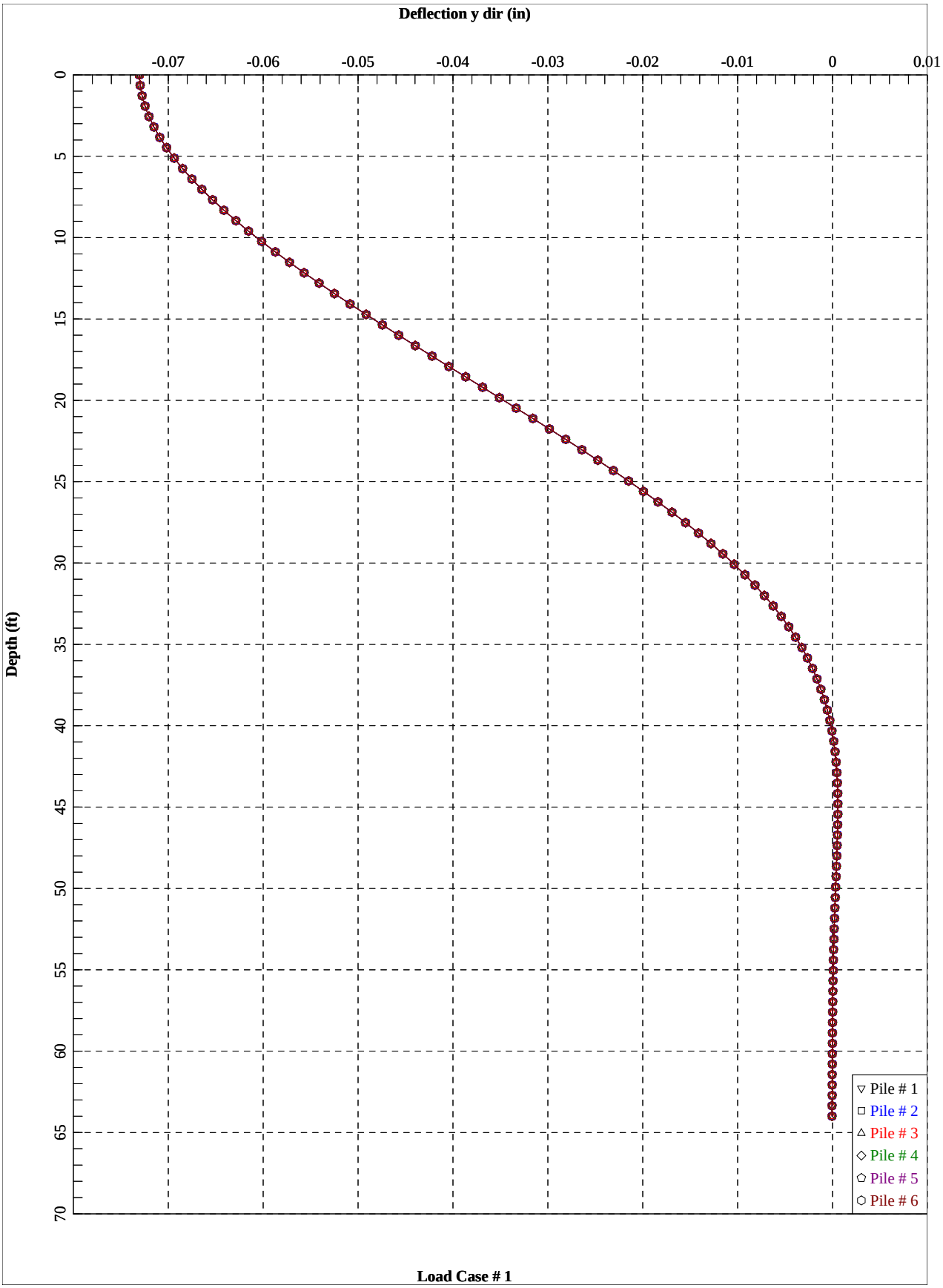
* TABLE K * REDUCTION FACTORS

REDUCTION FACTORS FOR CLOSELY-SPACED PILE GROUPS ALONG Y-DIRECTION

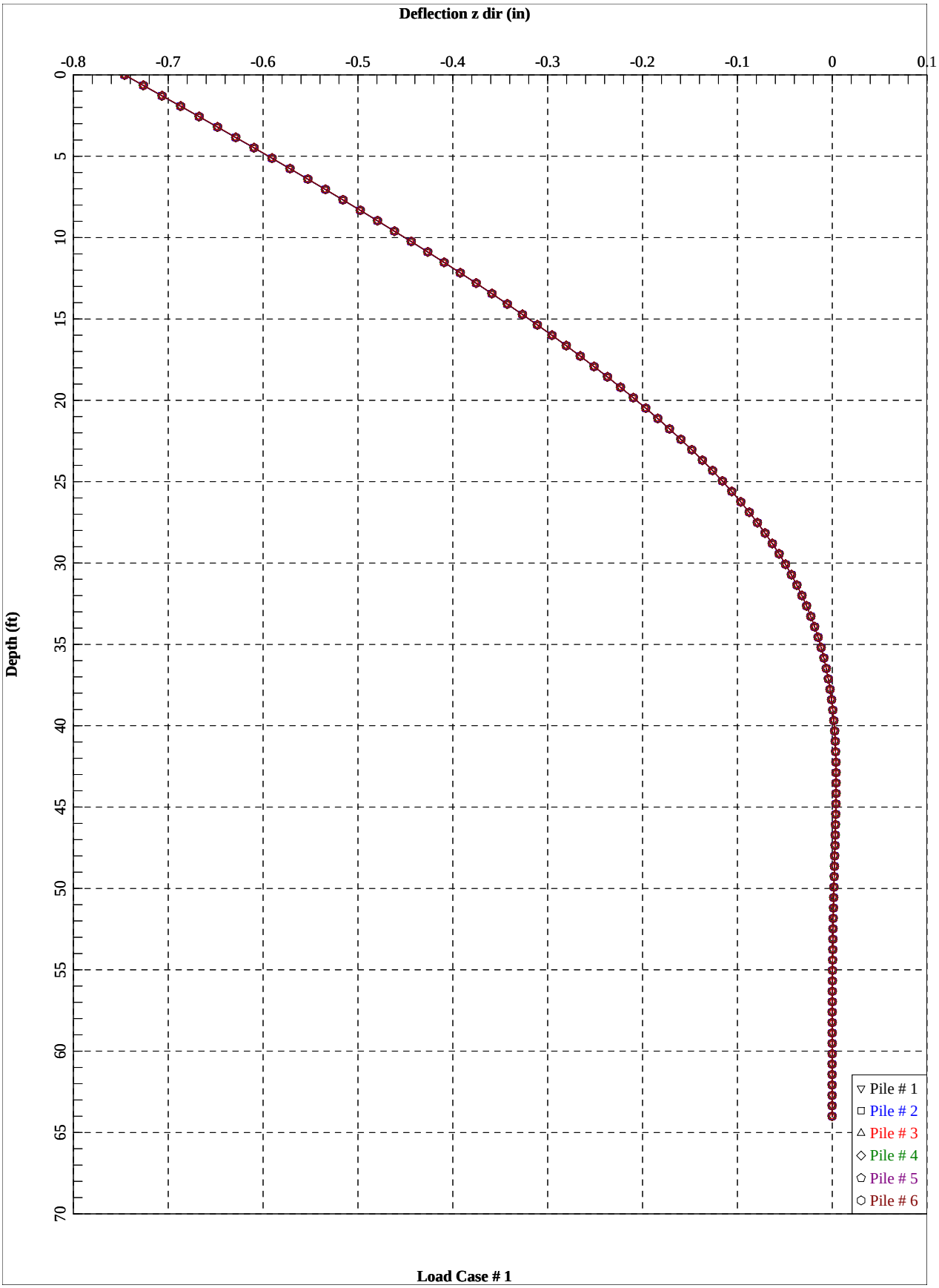
GROUP NO	P-FACTOR	Y-FACTOR
1	0.4000	1.0000
2	0.4000	1.0000
3	0.4000	1.0000
4	0.4000	1.0000
5	0.5000	1.0000
6	0.8500	1.0000

REDUCTION FACTORS FOR CLOSELY-SPACED PILE GROUPS ALONG Z-DIRECTION

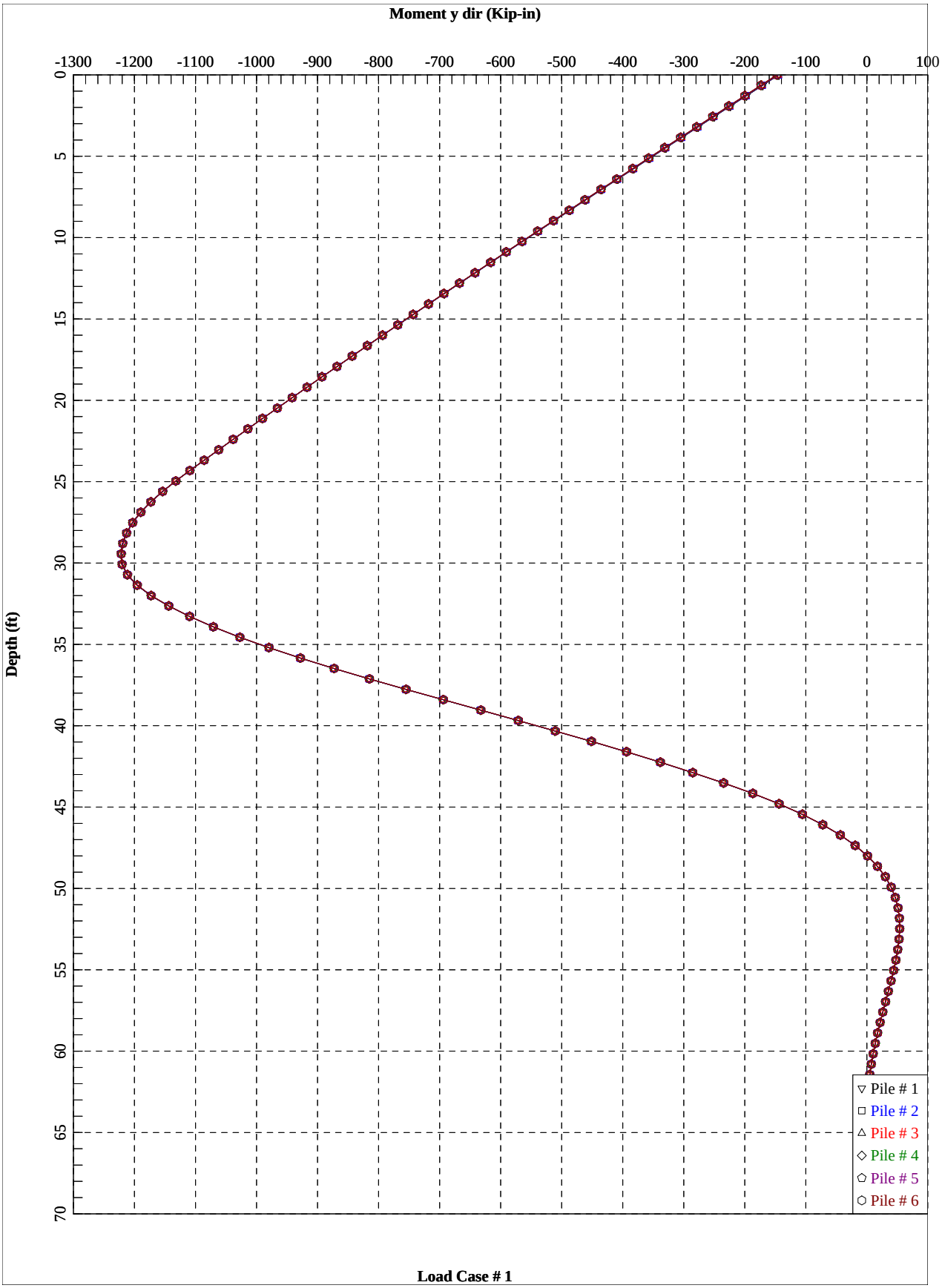
GROUP NO	P-FACTOR	Y-FACTOR
1	0.8500	1.0000
2	0.8500	1.0000
3	0.8500	1.0000
4	0.8500	1.0000
5	0.8500	1.0000
6	0.8500	1.0000



Strength I case 1



Strength I case 1



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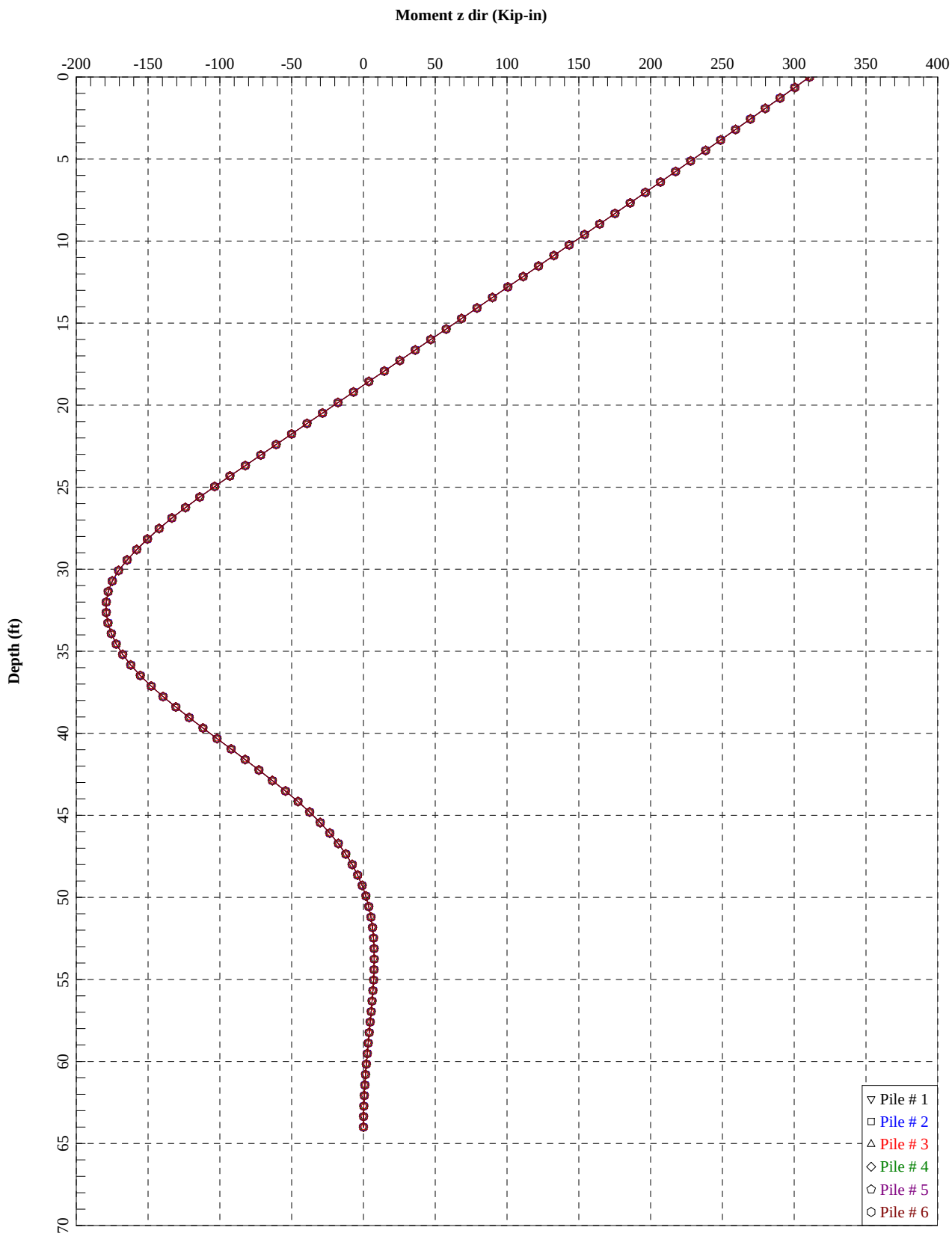
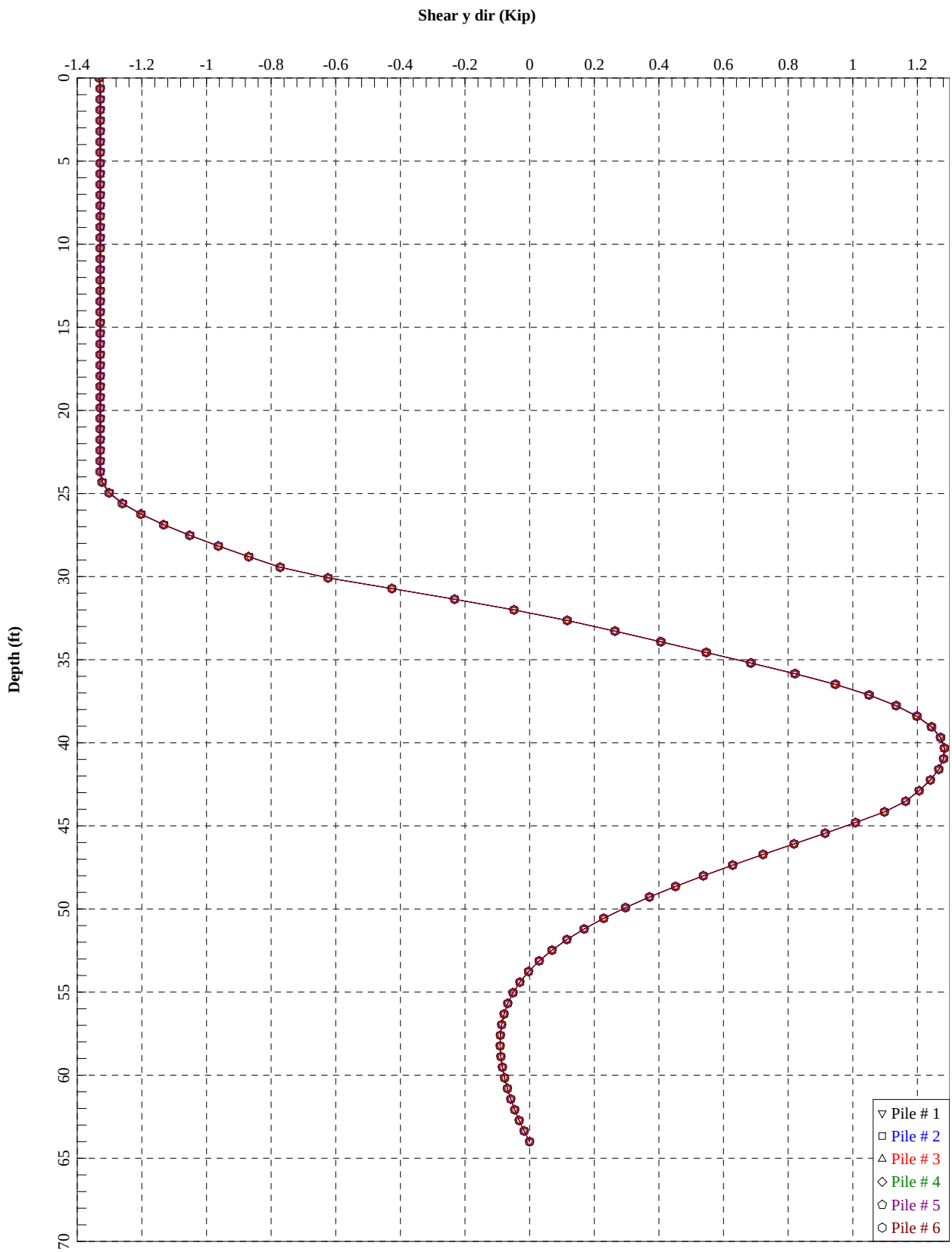


Load Case # 1

Strength I case 1



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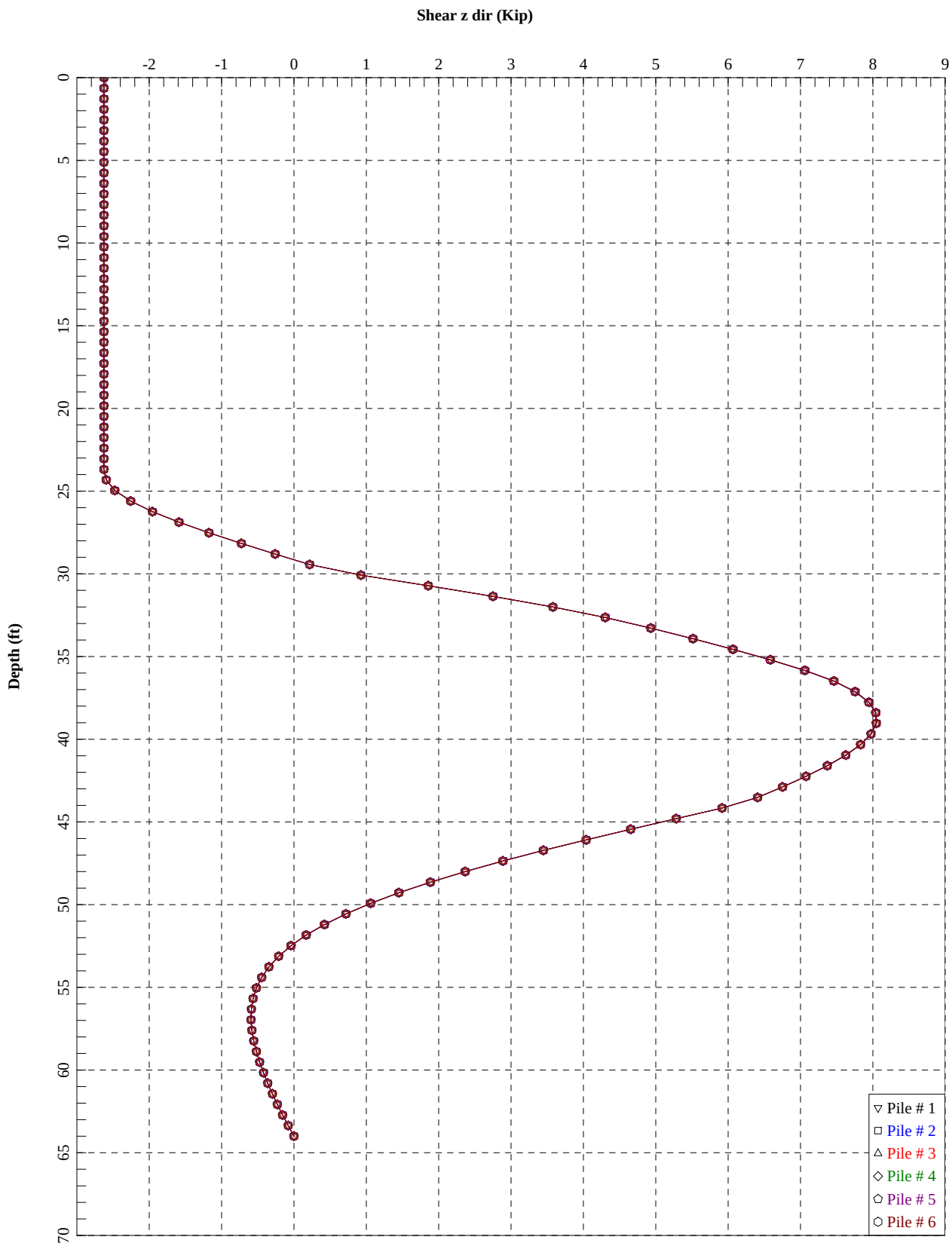
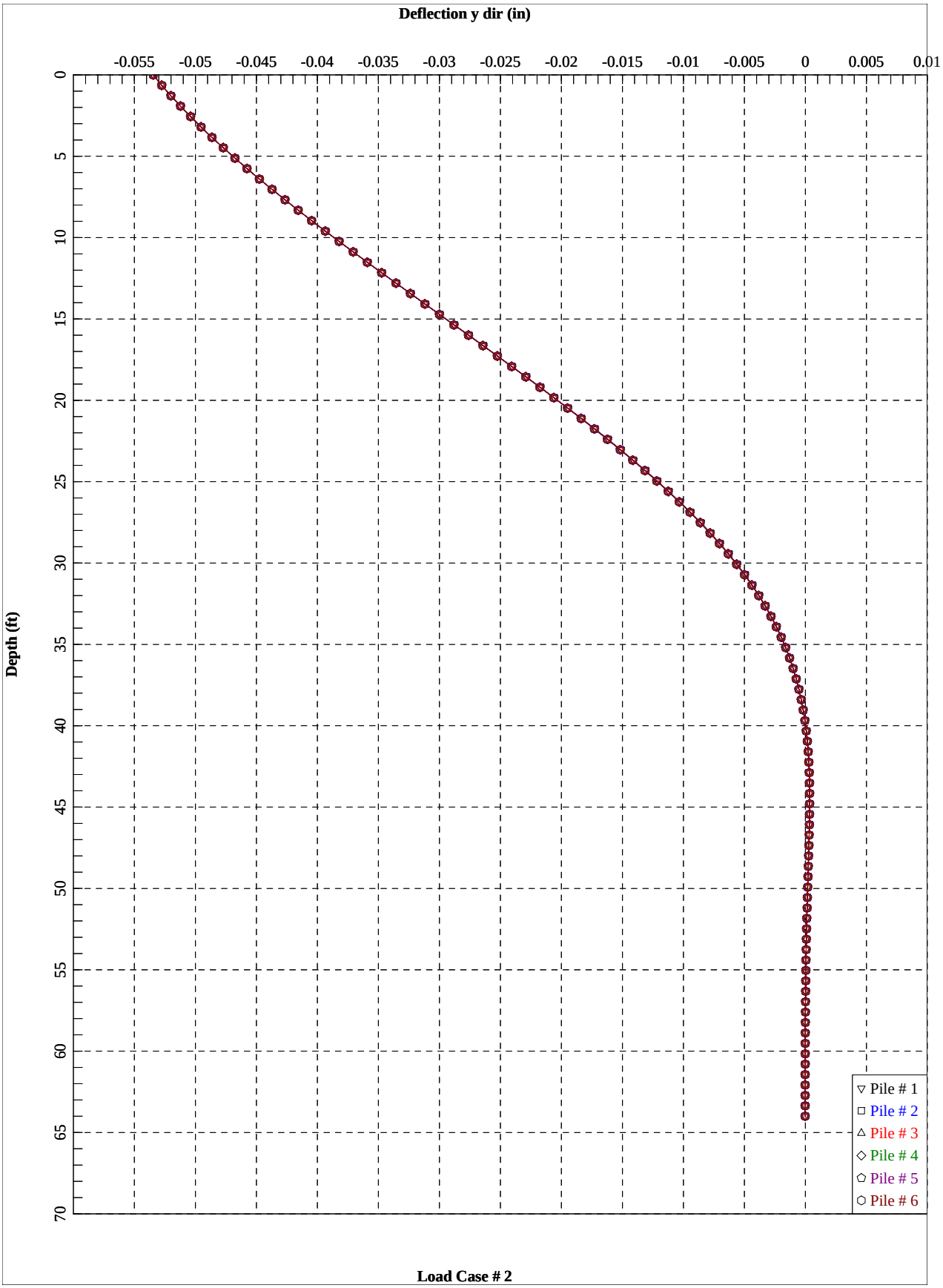


Load Case # 1

Strength I case 1



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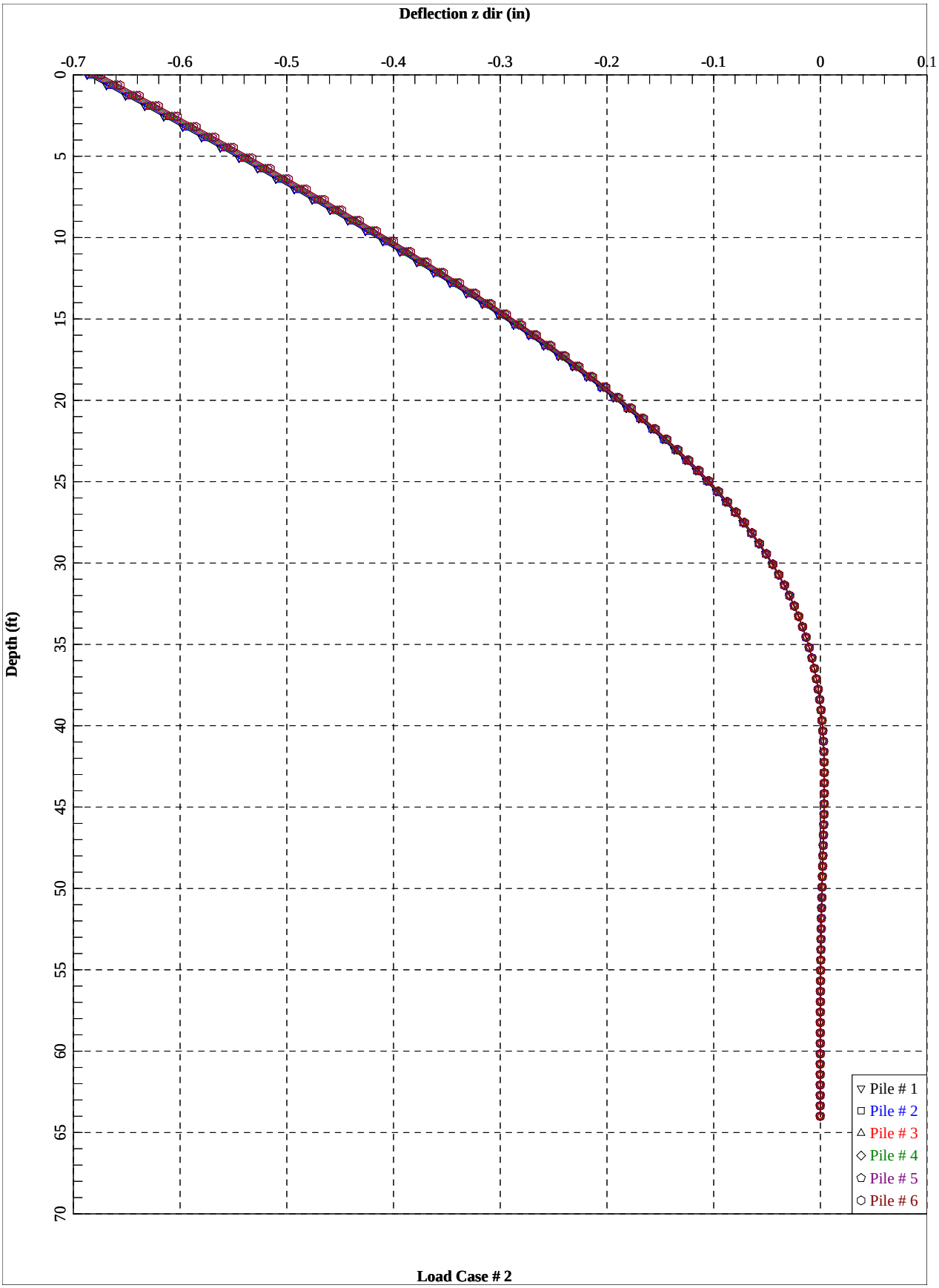

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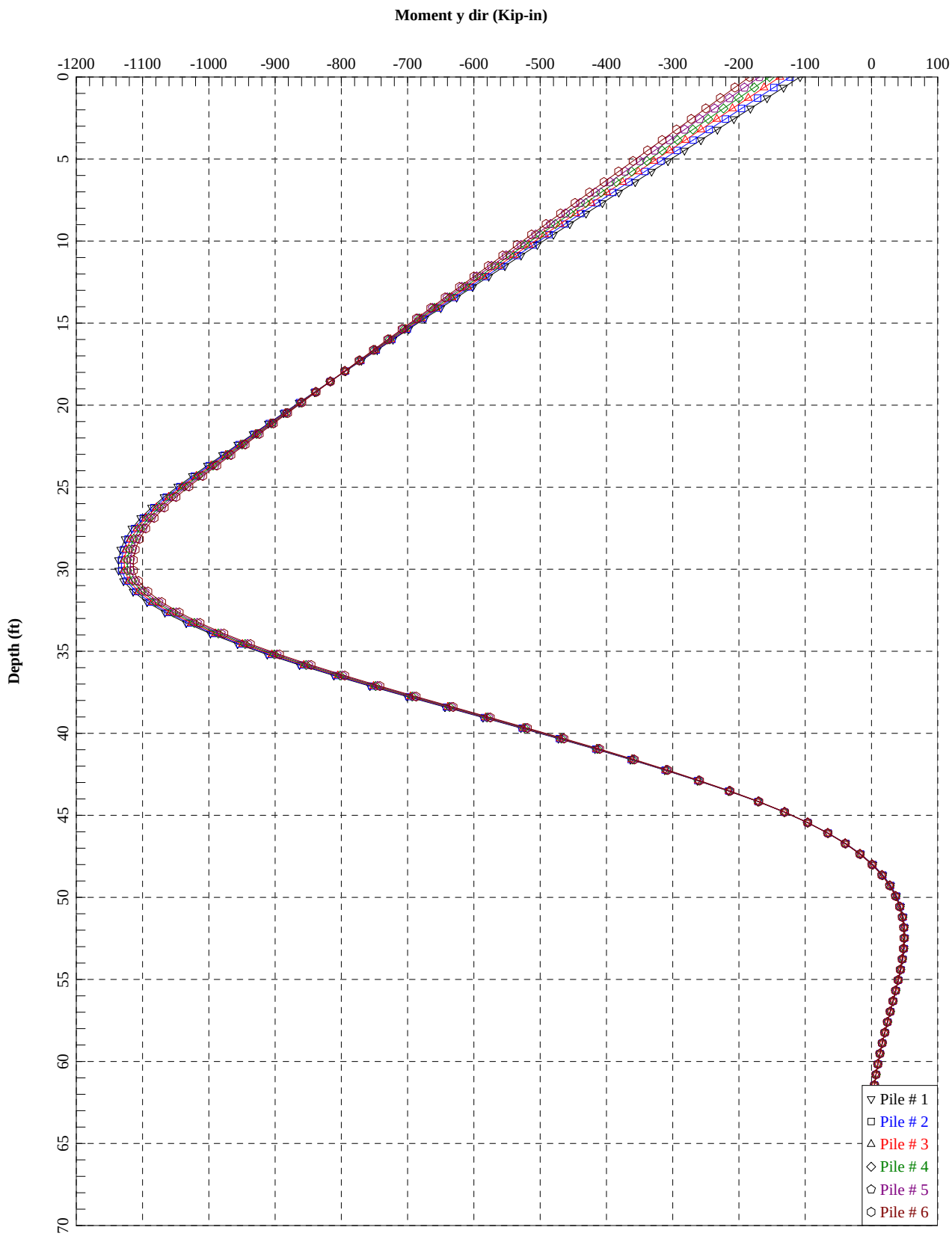
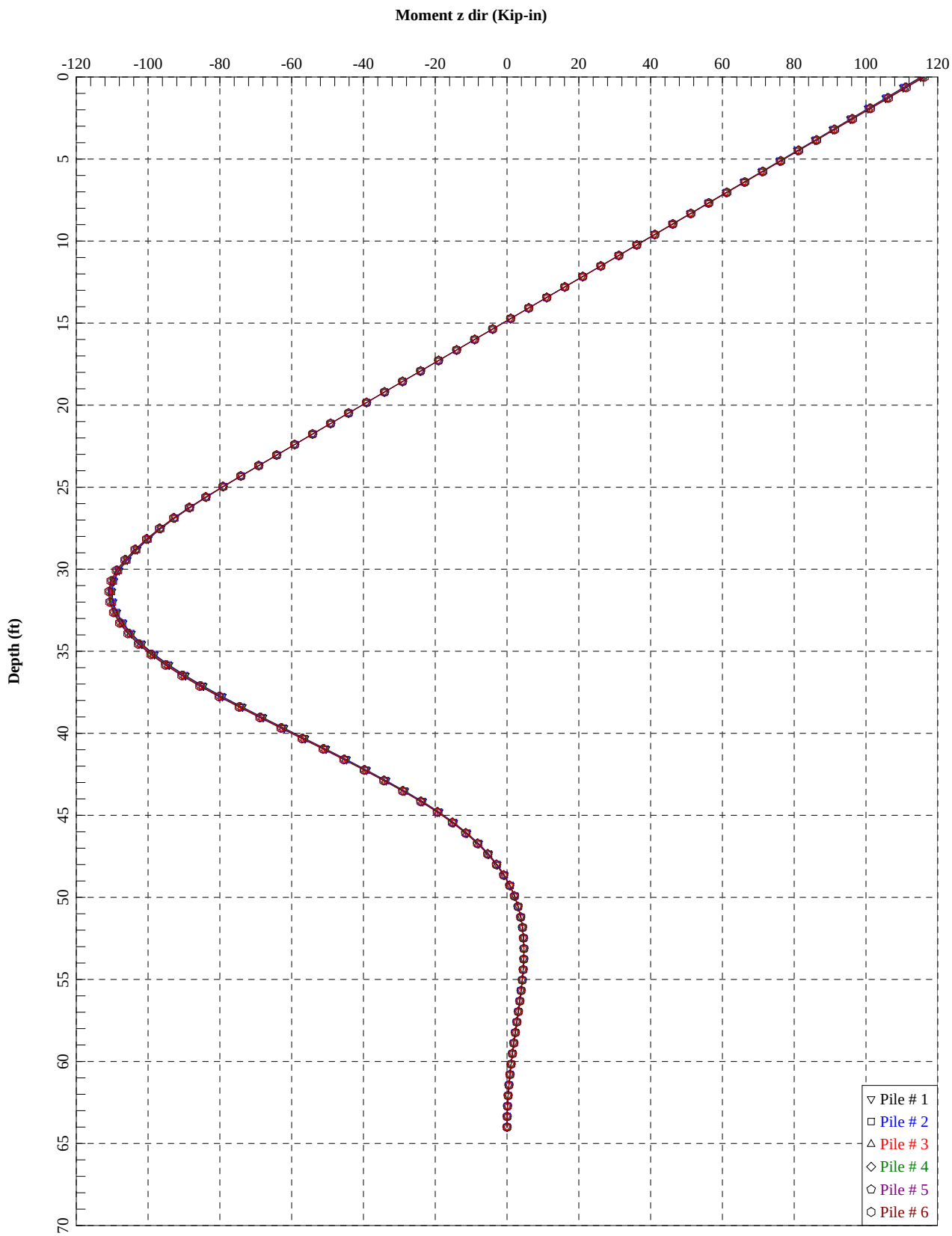


Load Case # 2

Strength I case 2



Load Case # 2

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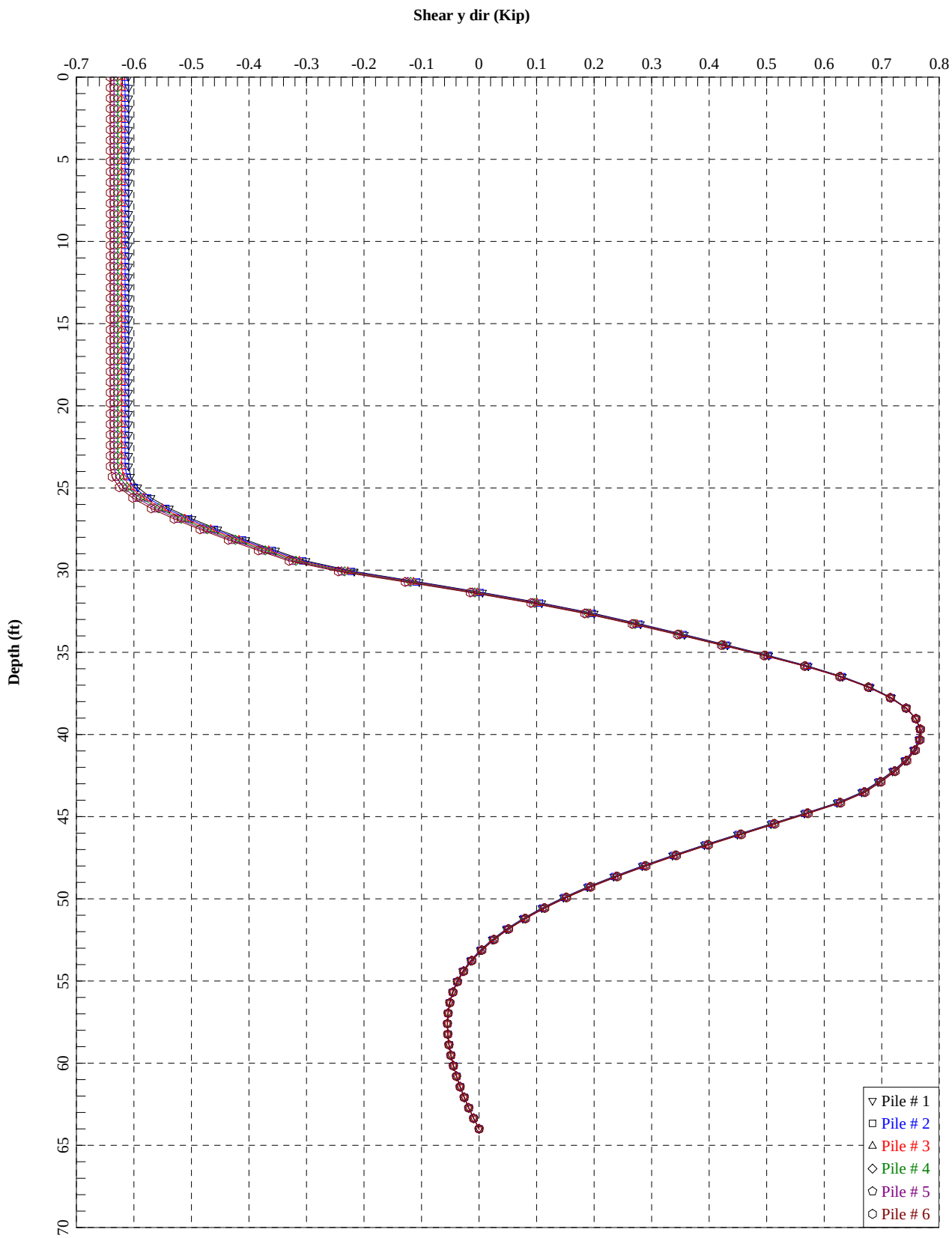
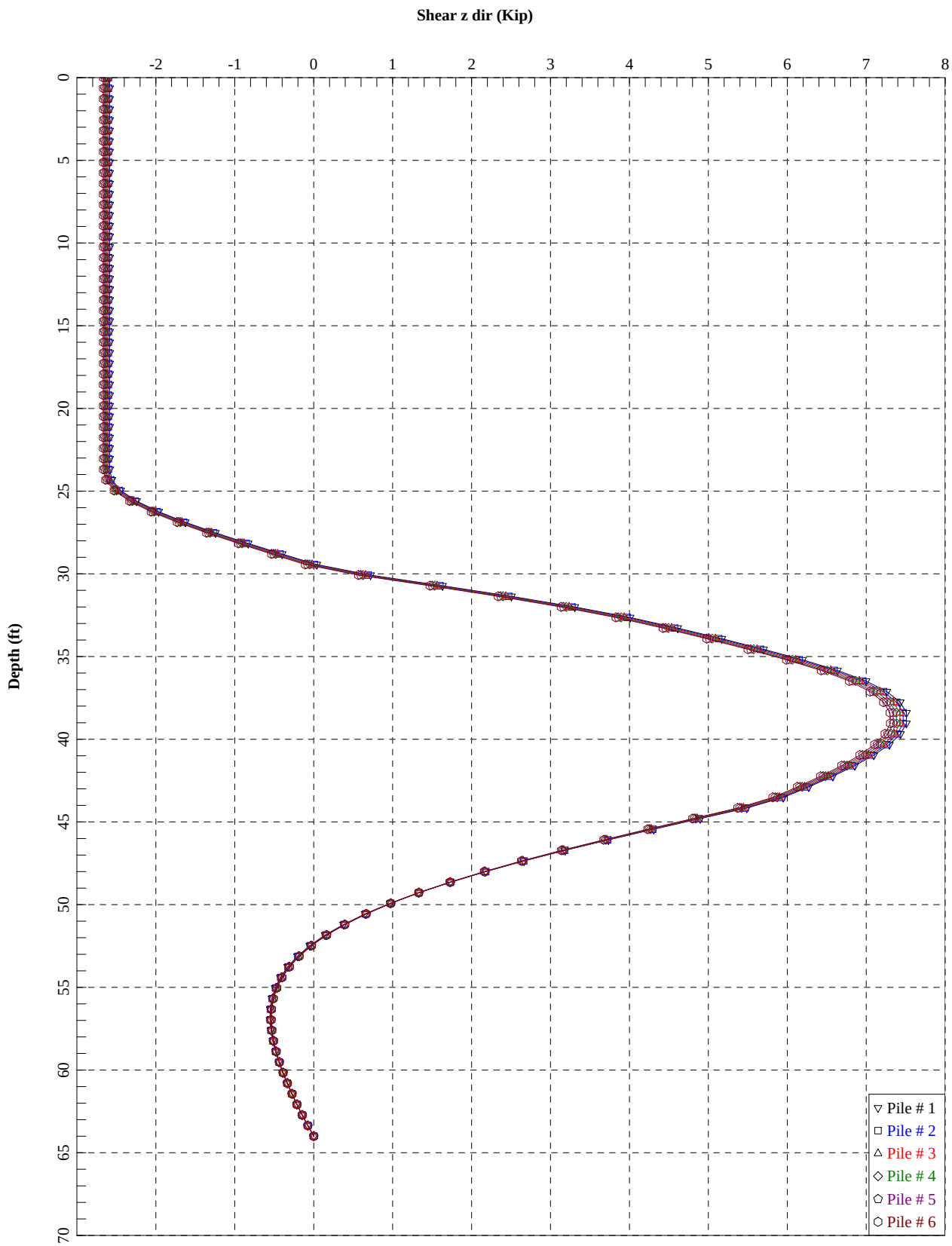
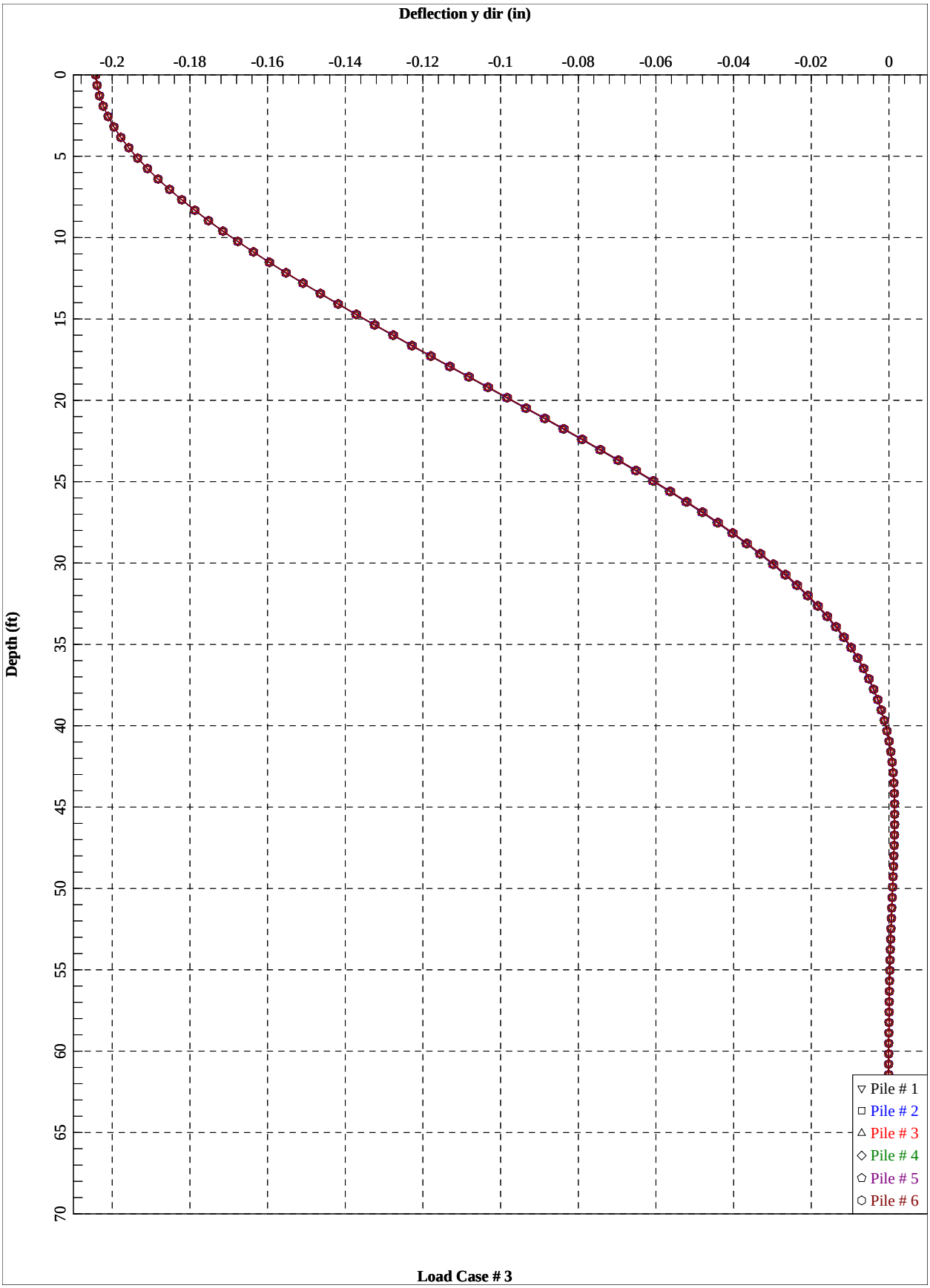


Load Case # 2

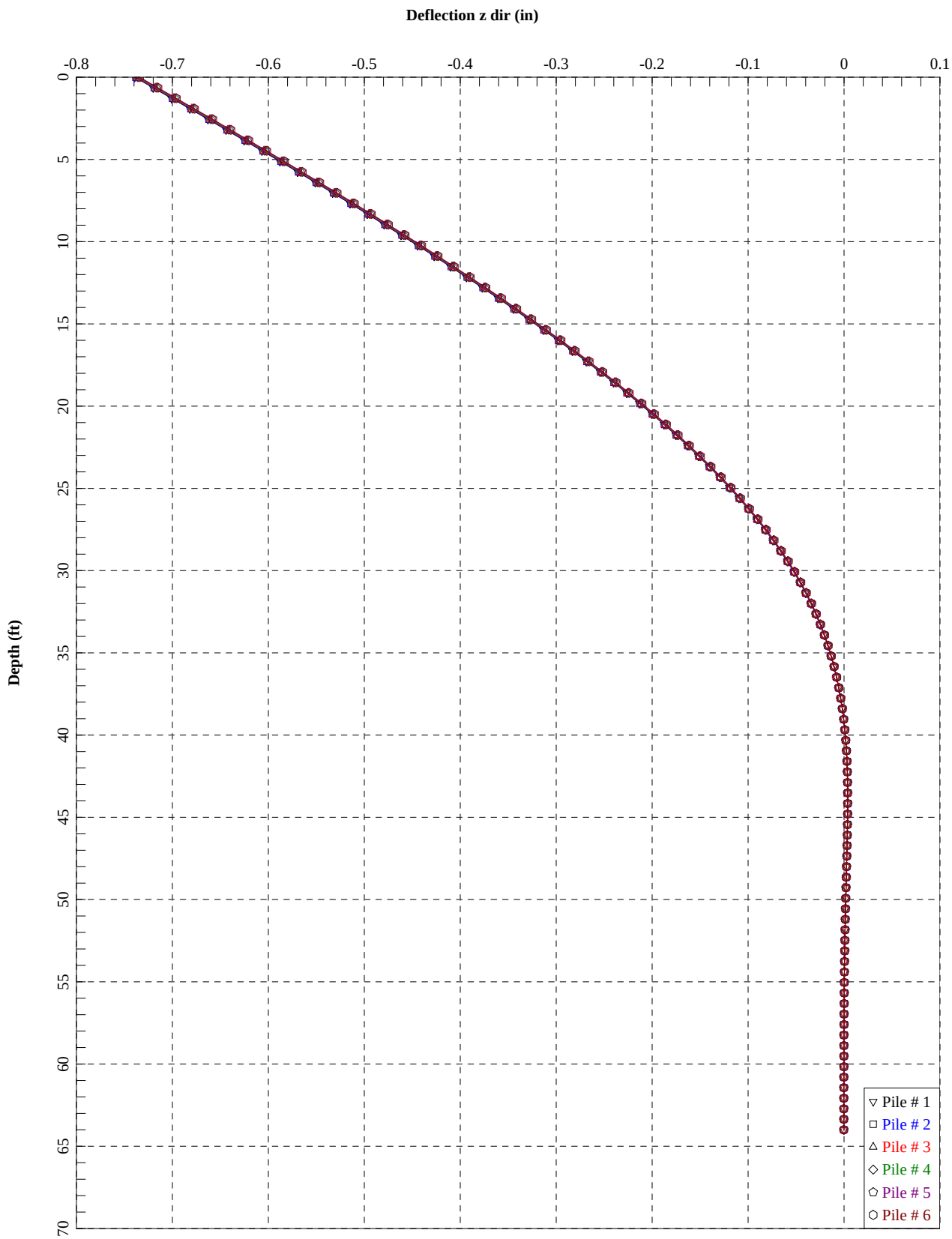
Strength I case 2



Strength I case 2

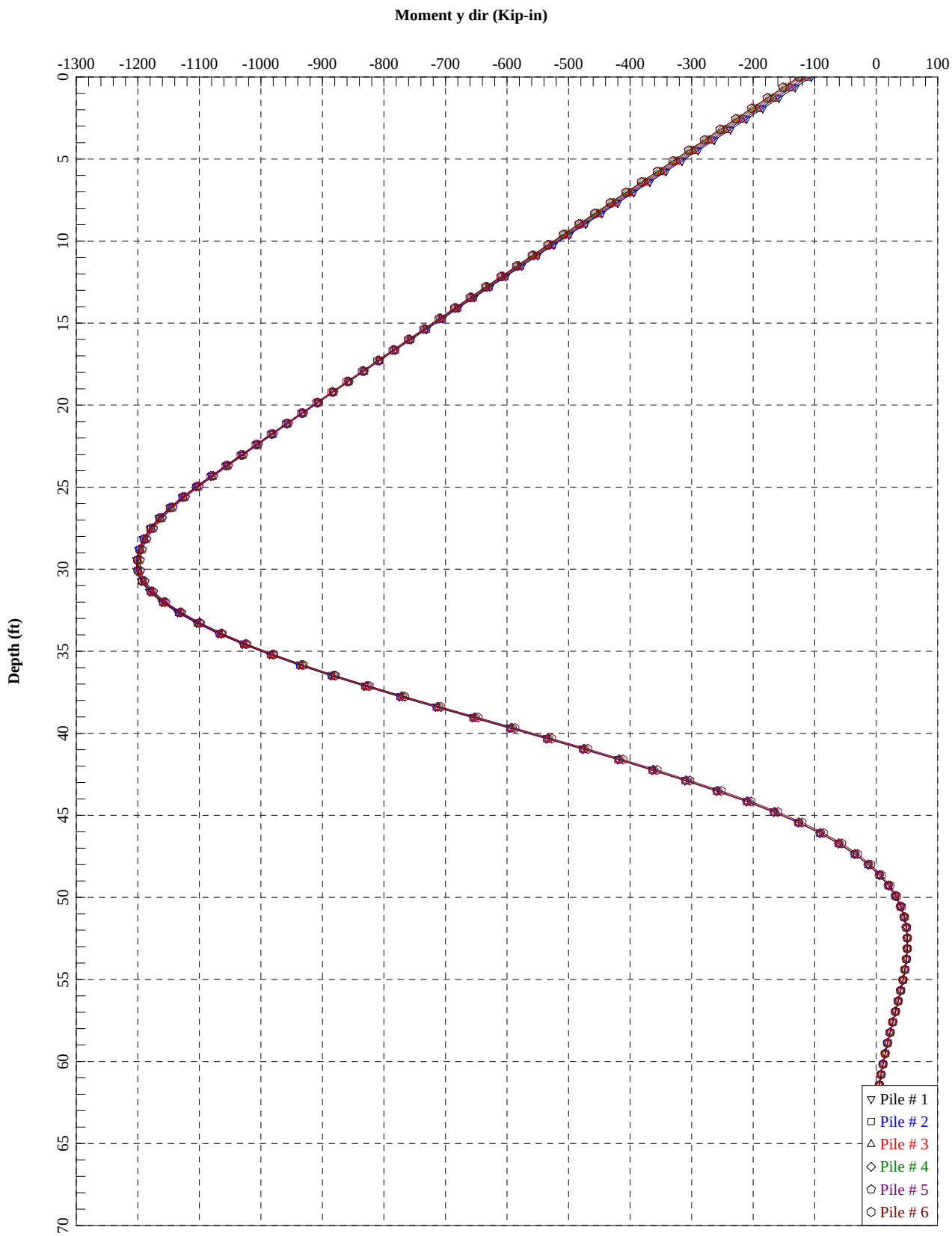


Strength III case 1



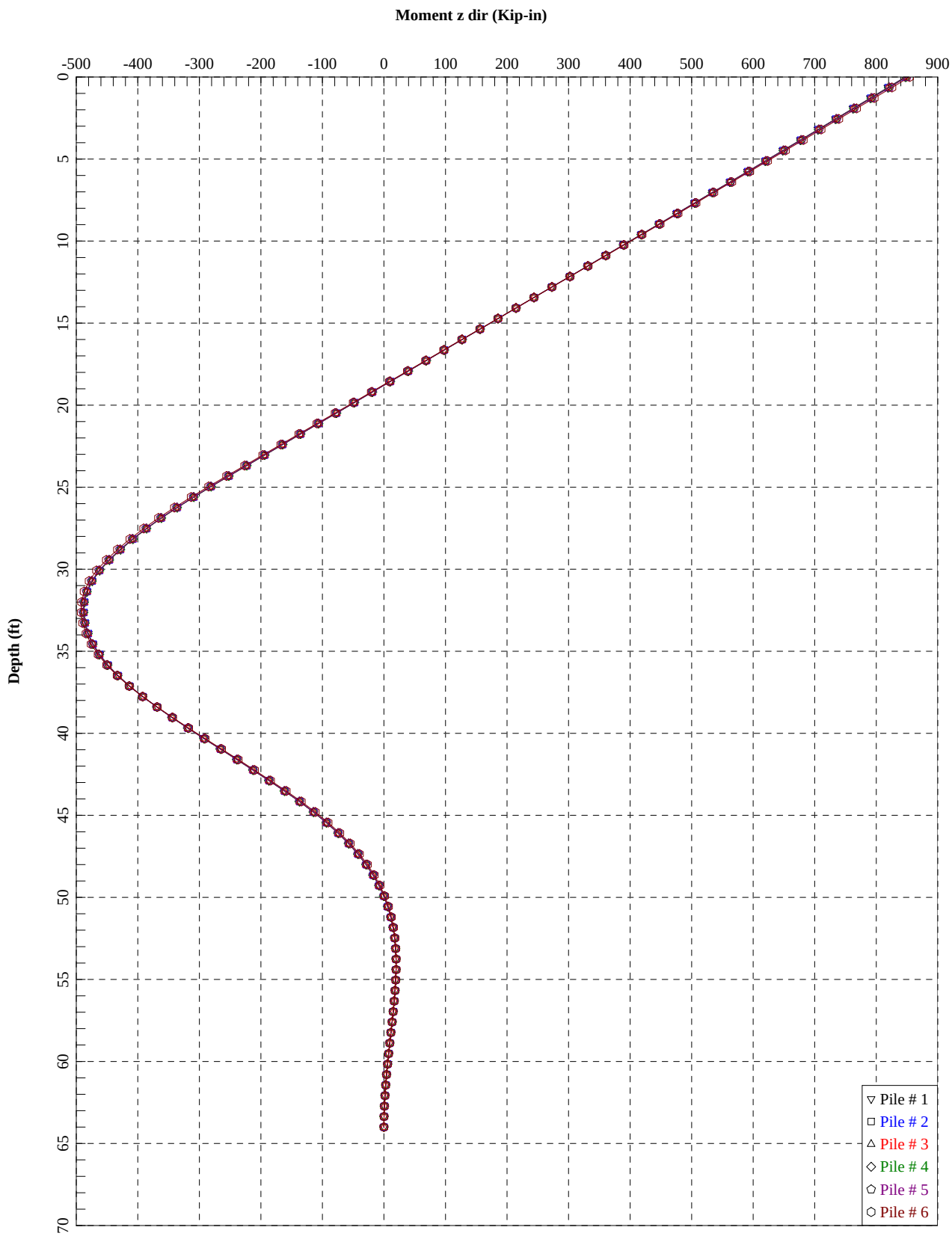
Load Case # 3

Strength III case 1



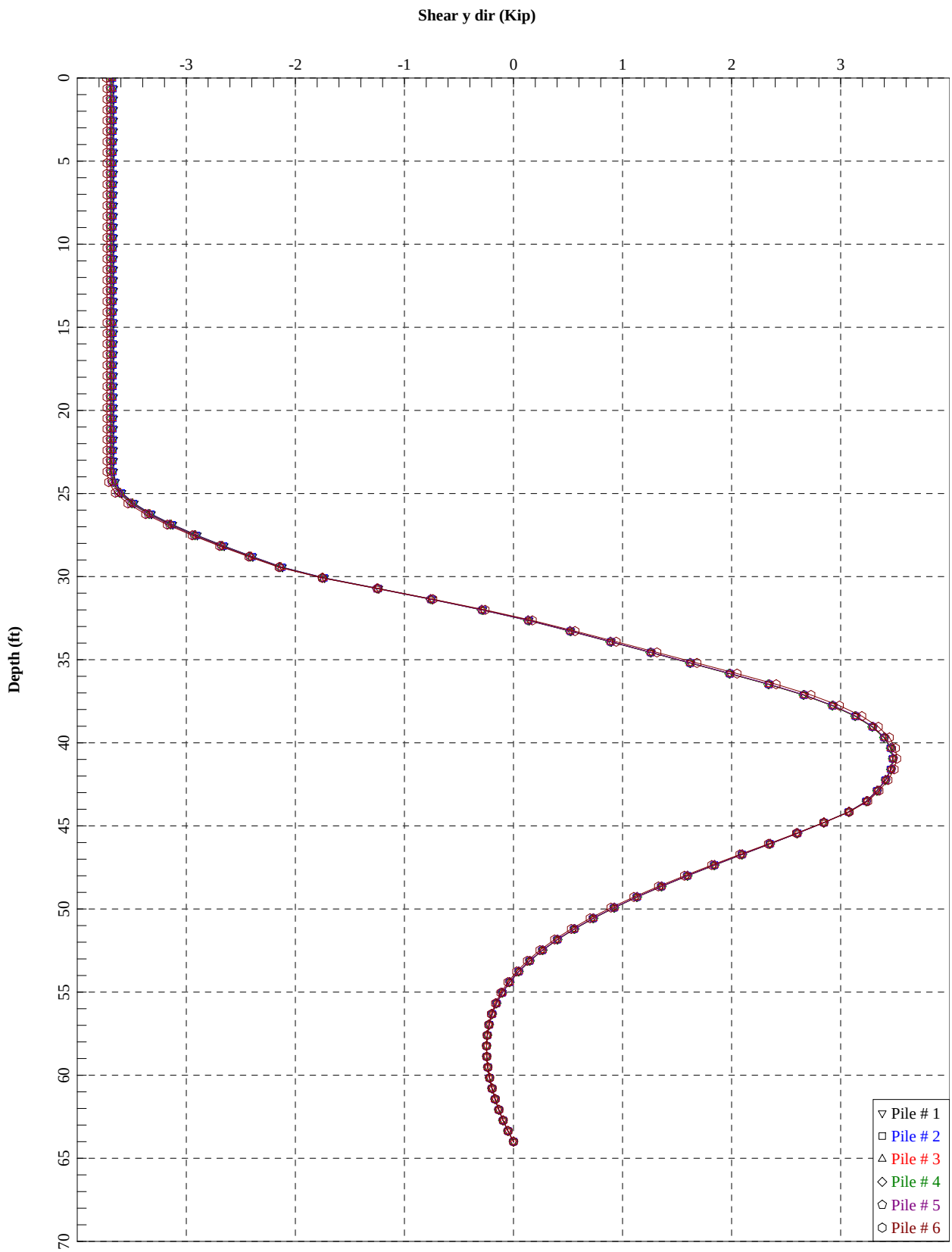
Load Case # 3

Strength III case 1



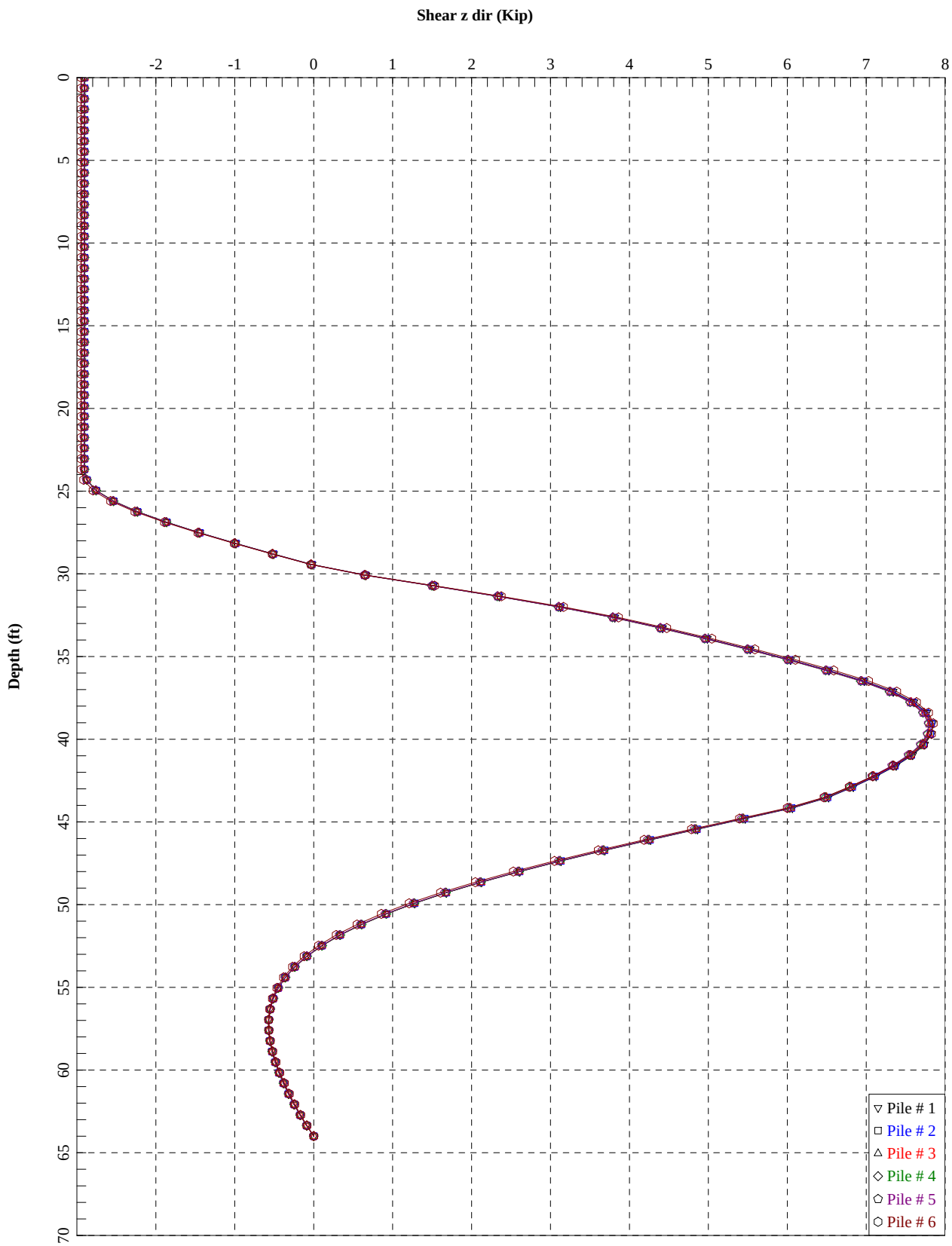
Load Case # 3

Strength III case 1



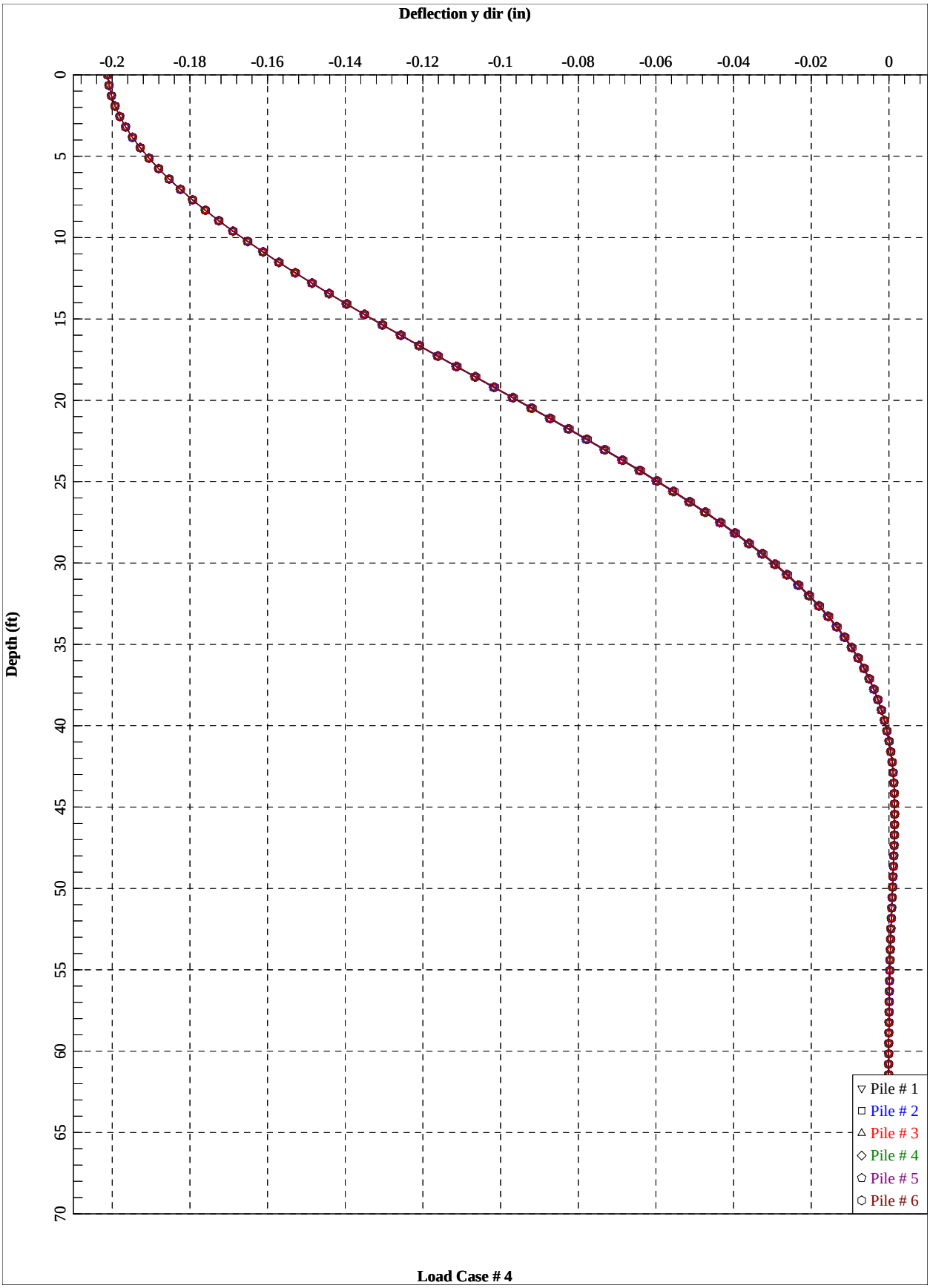
Load Case # 3

Strength III case 1

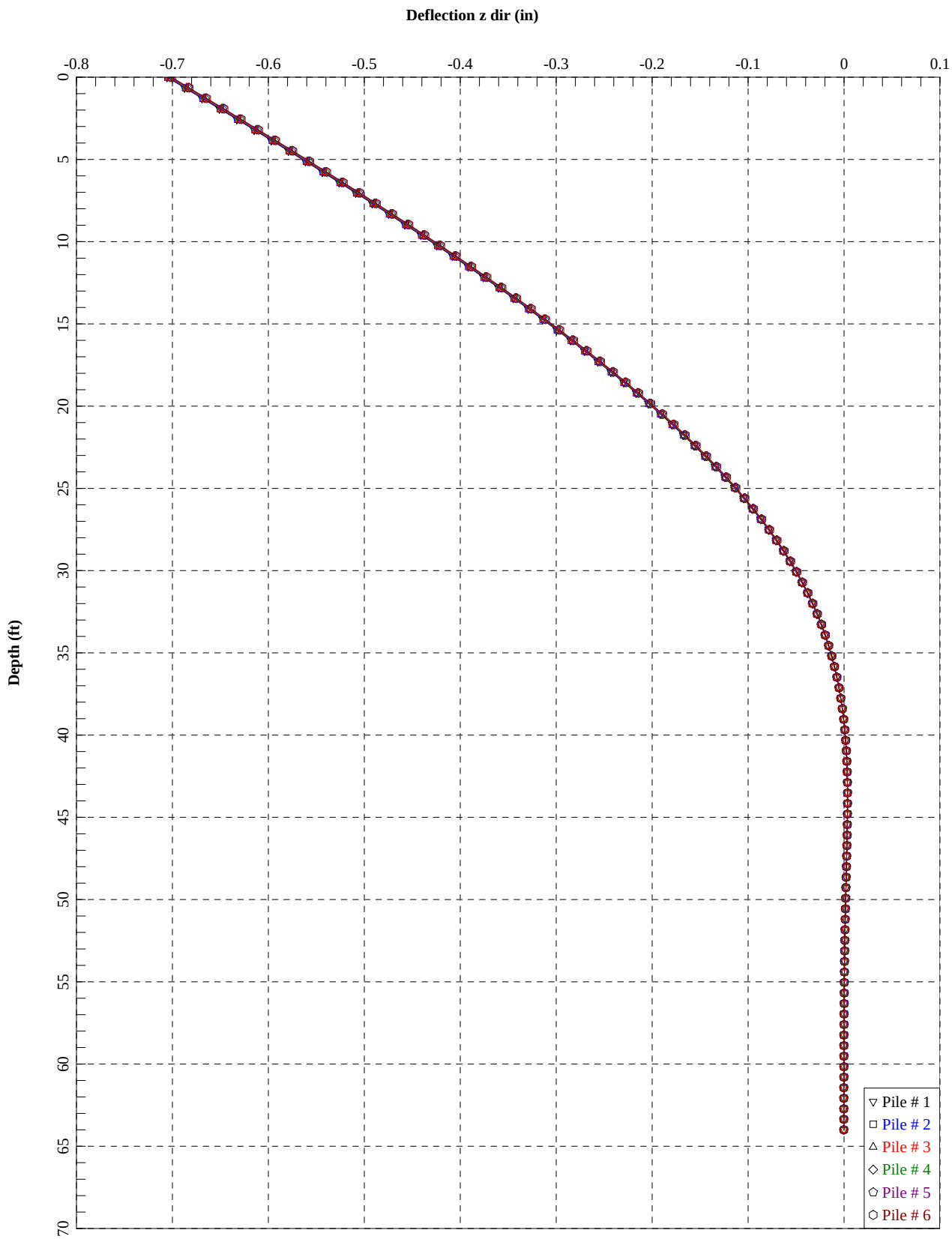


Load Case # 3

Strength III case 1



Strength III case 2



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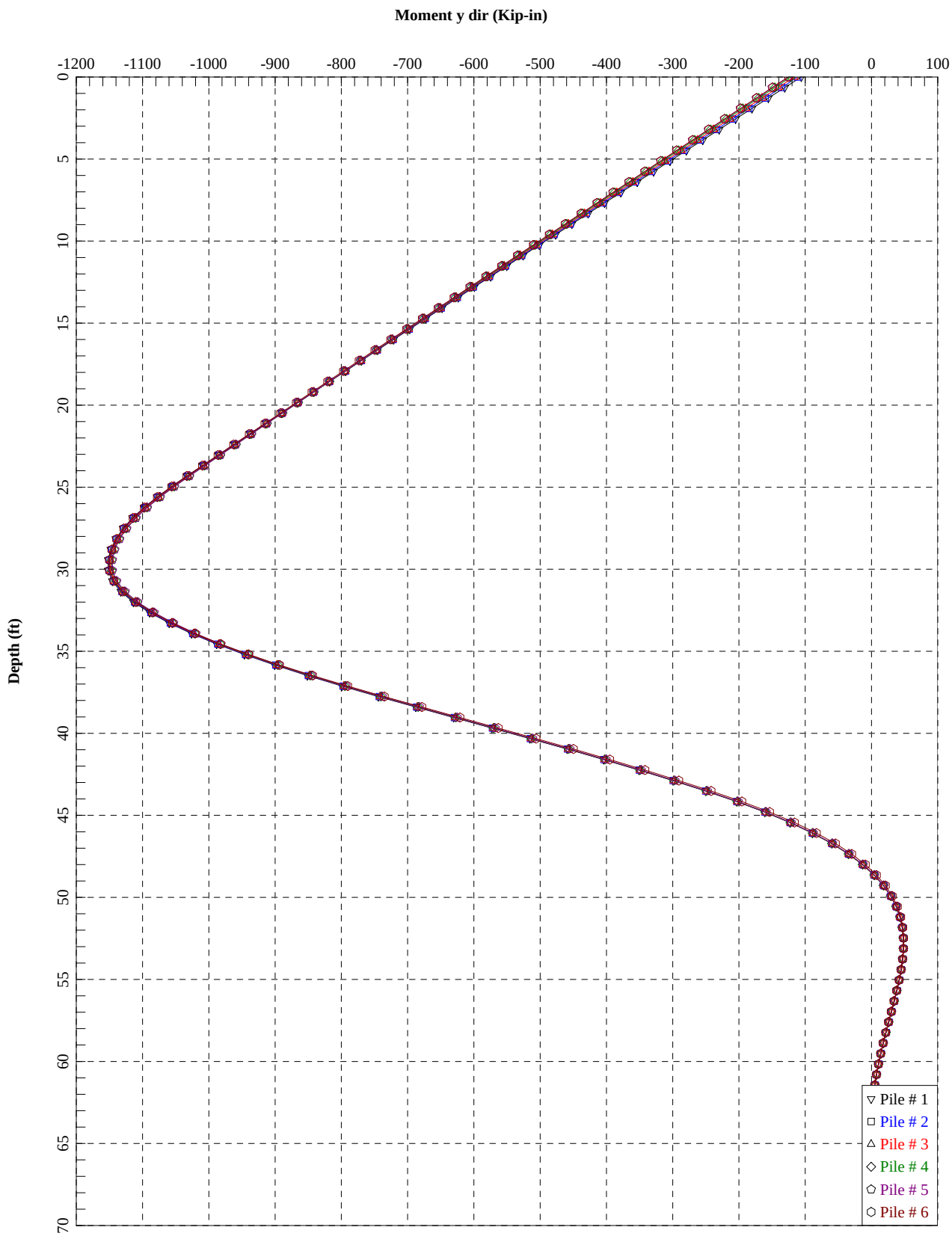

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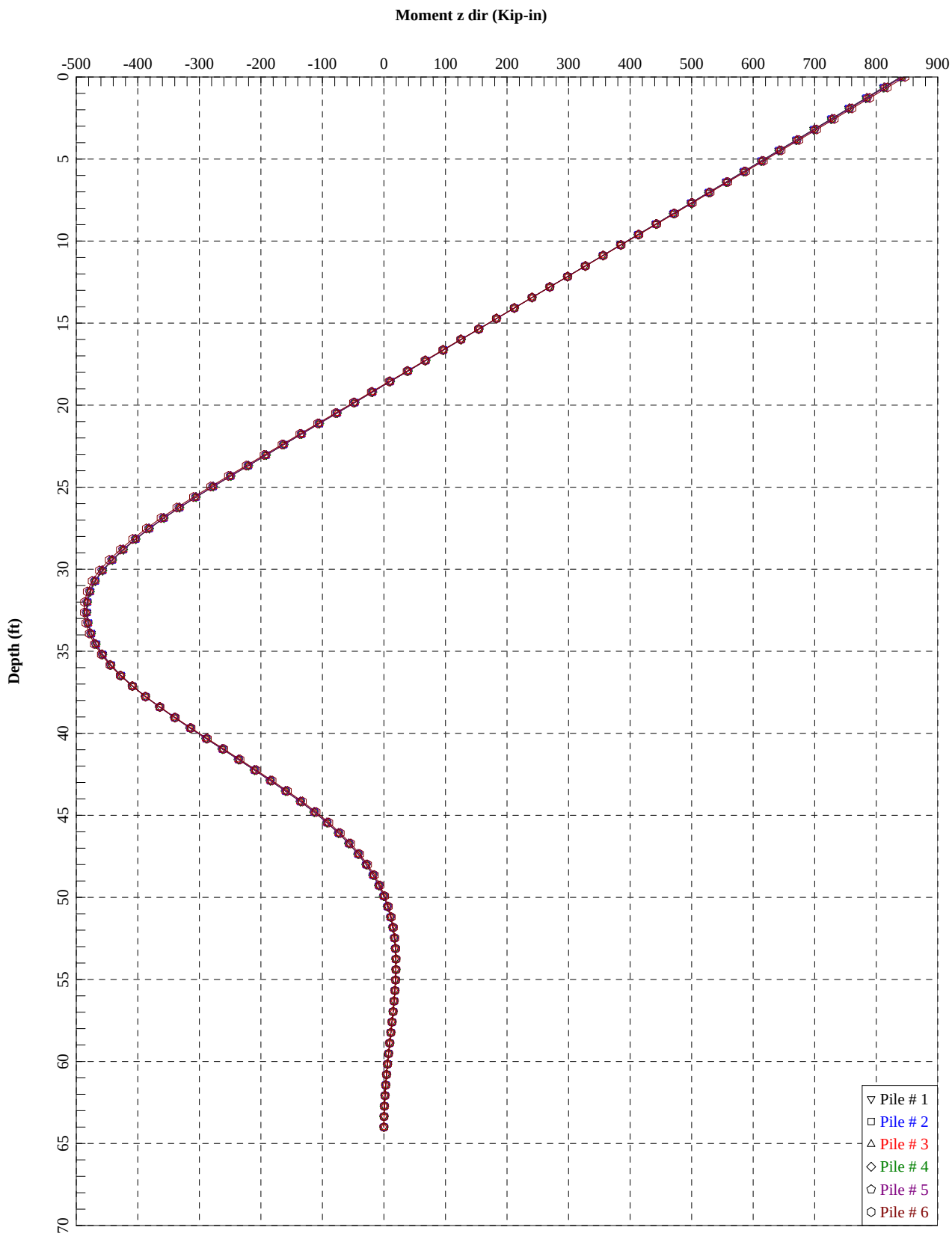

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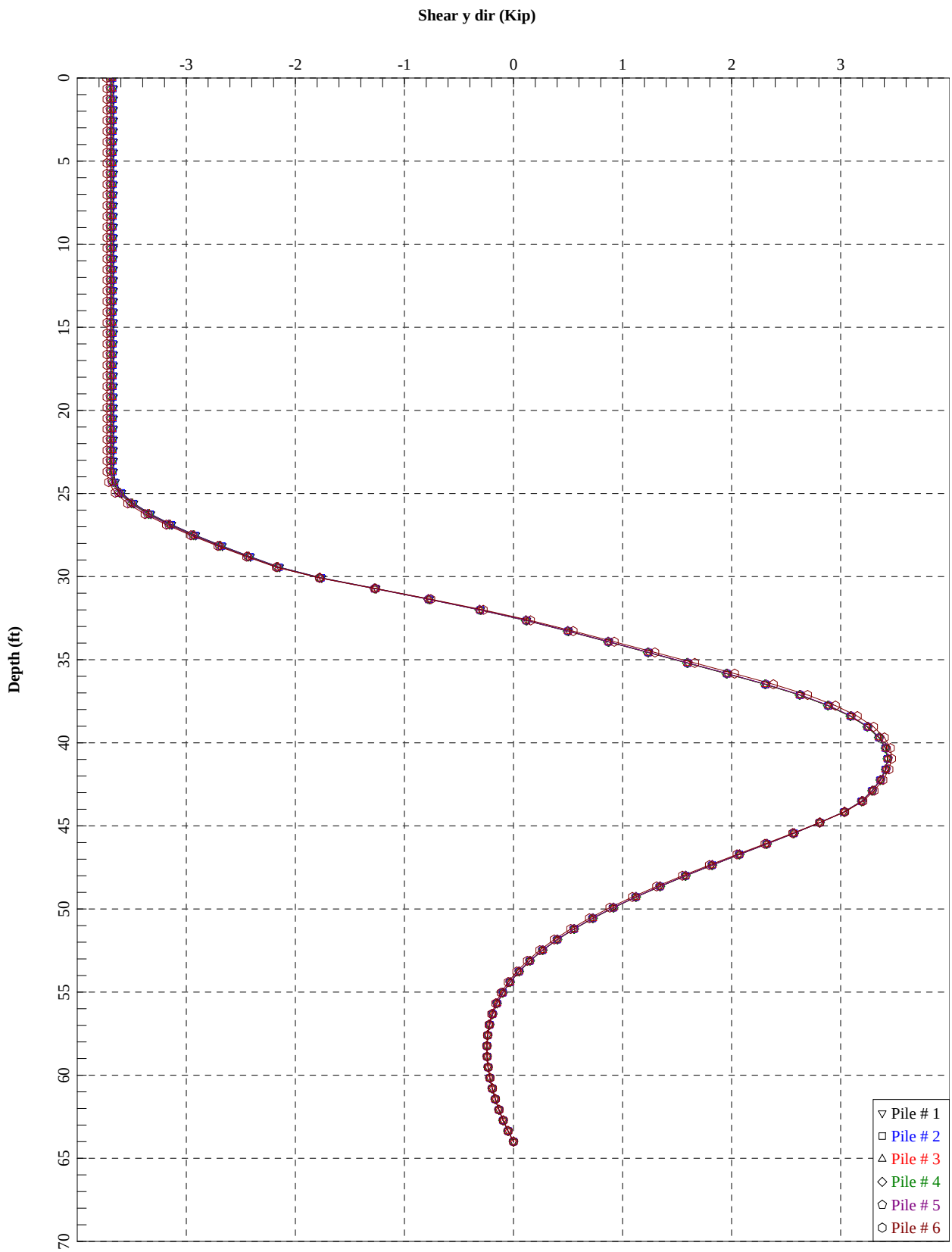

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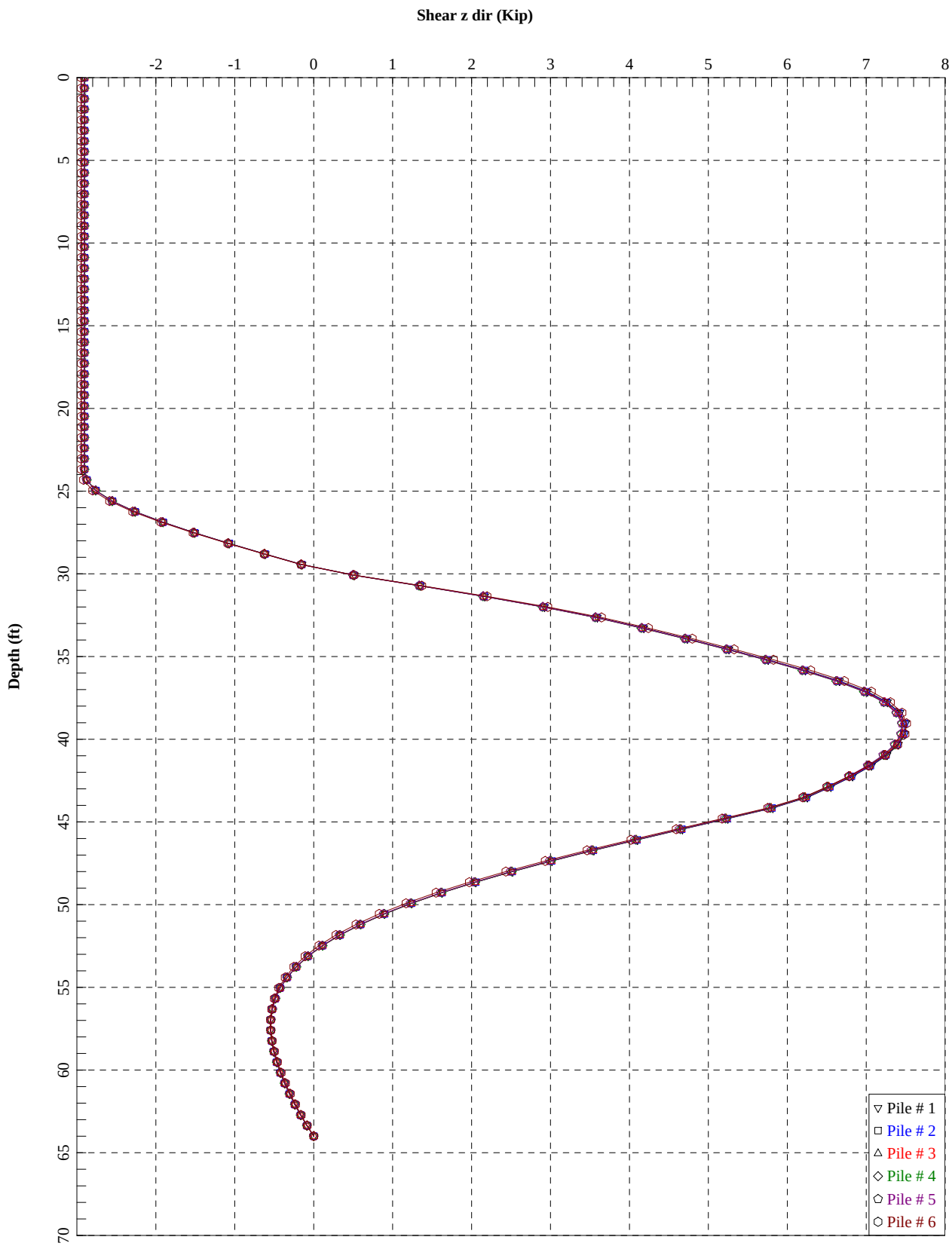

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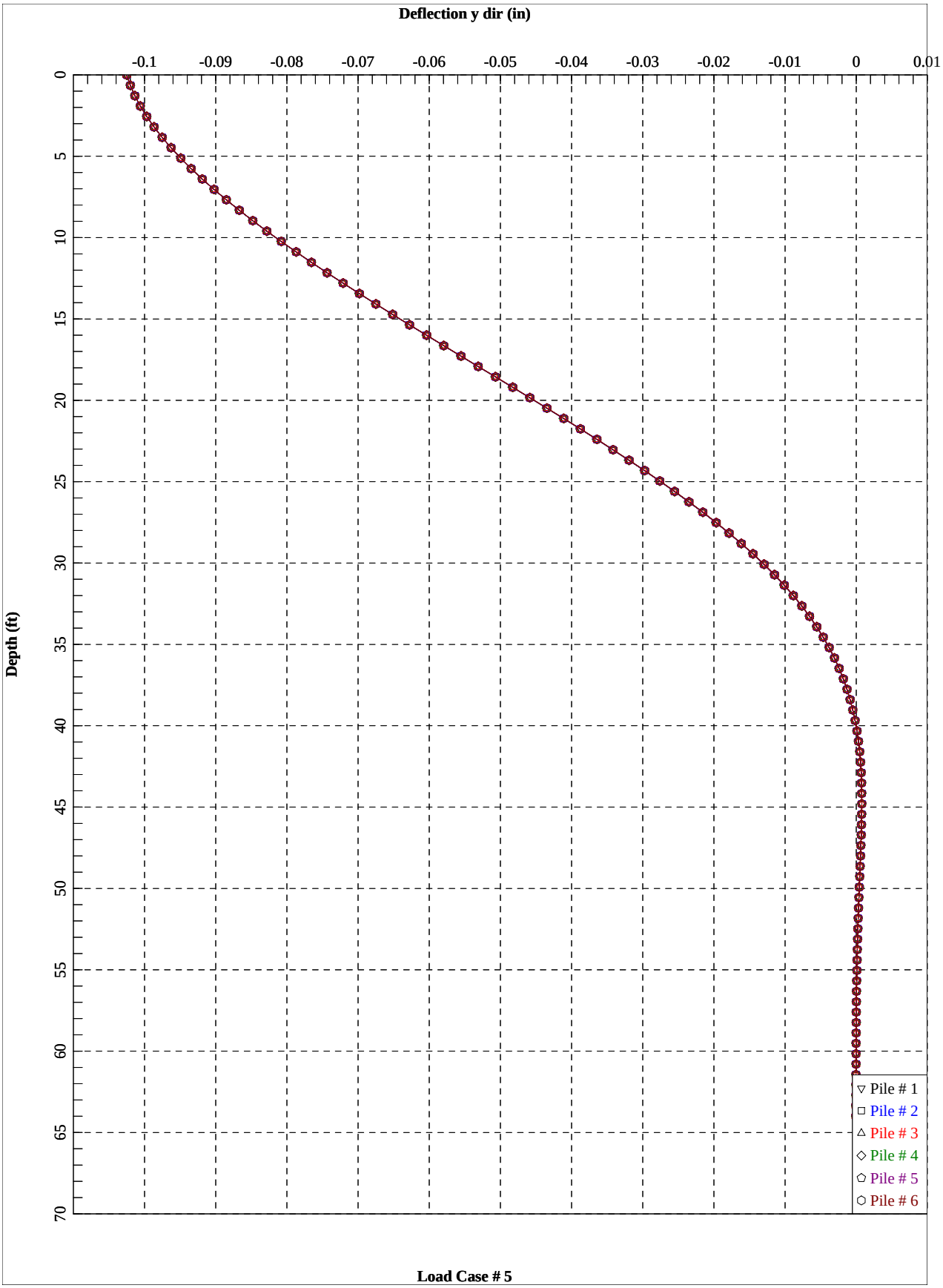
Strength III case 2



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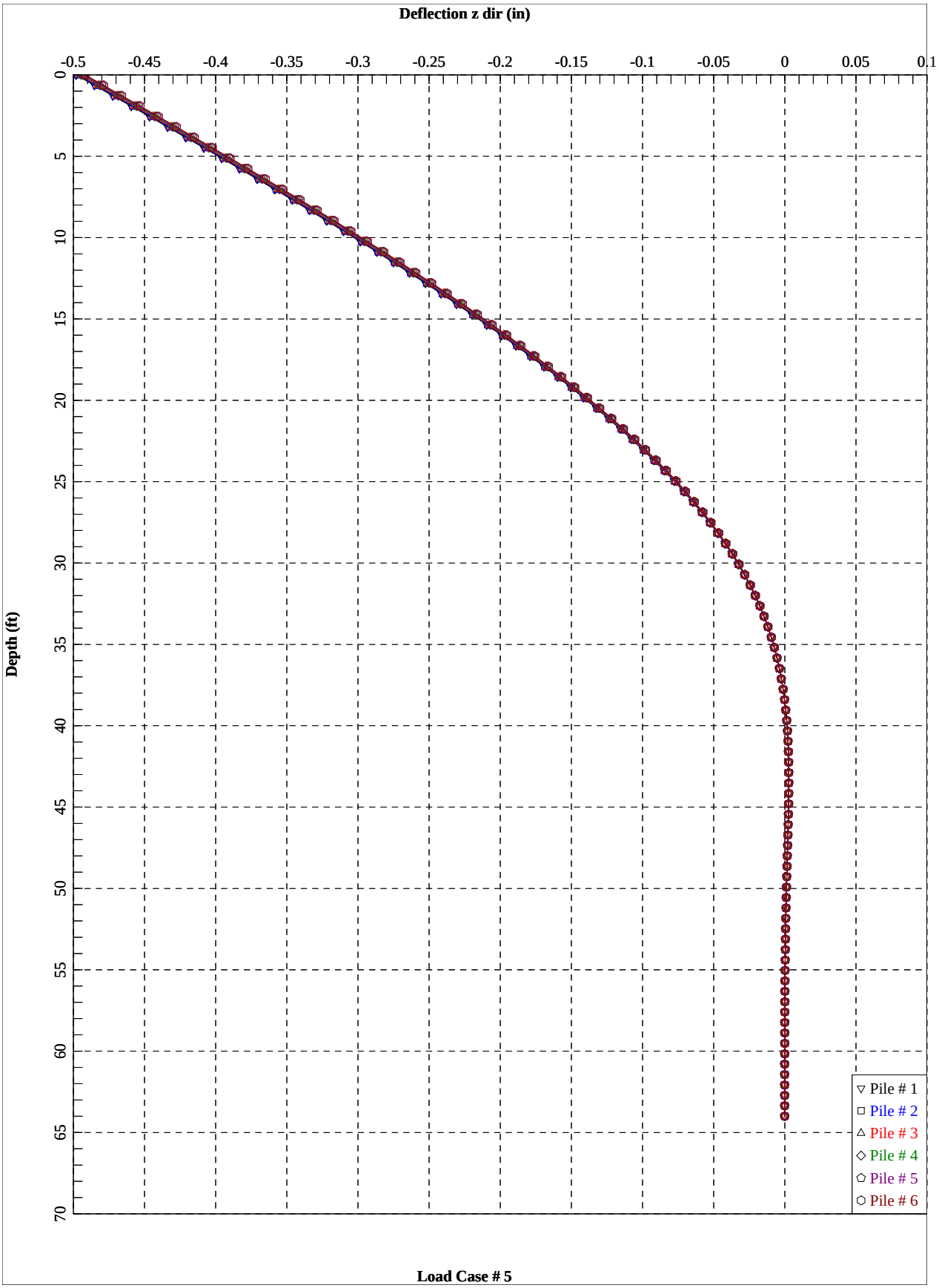

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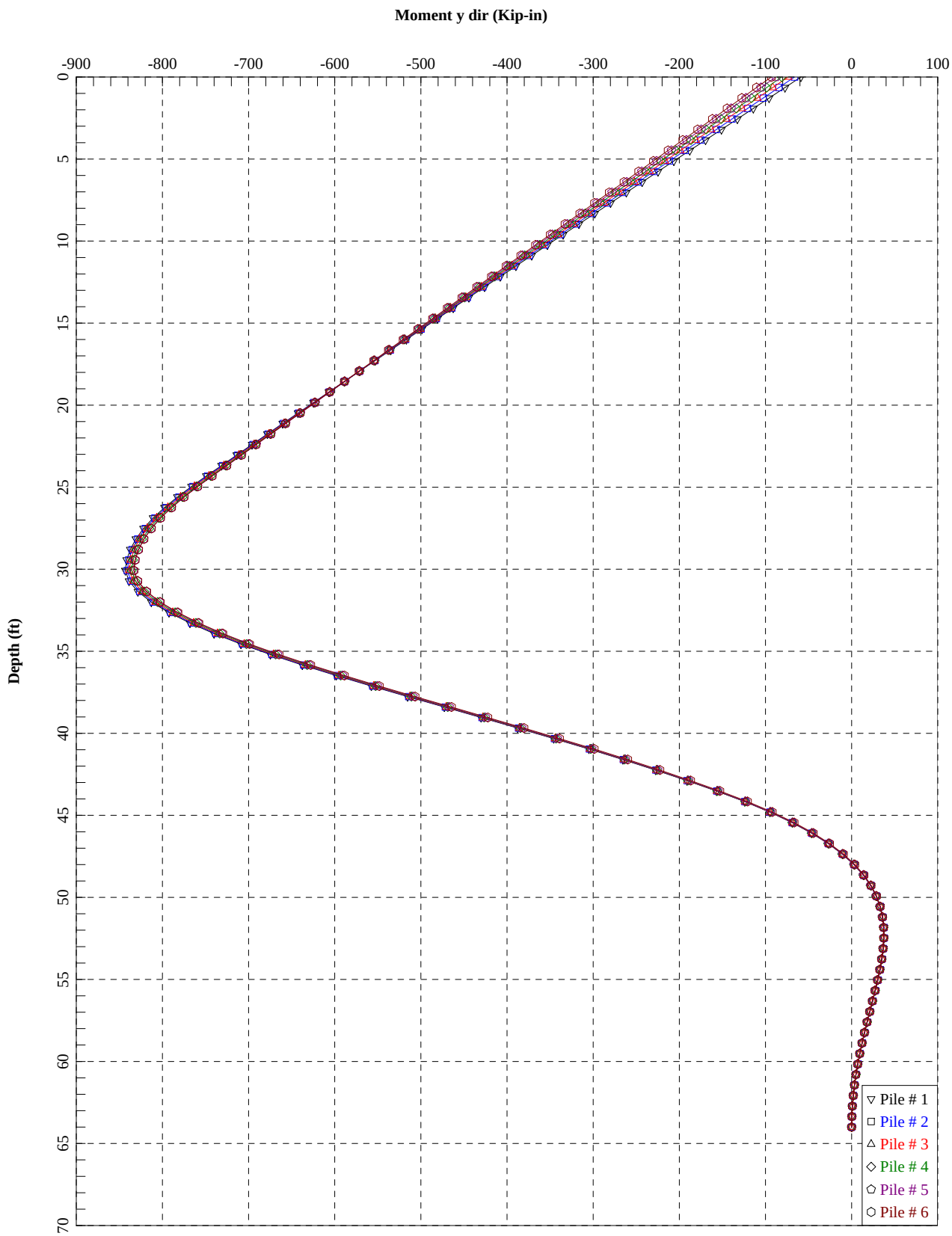

Load Case # 5

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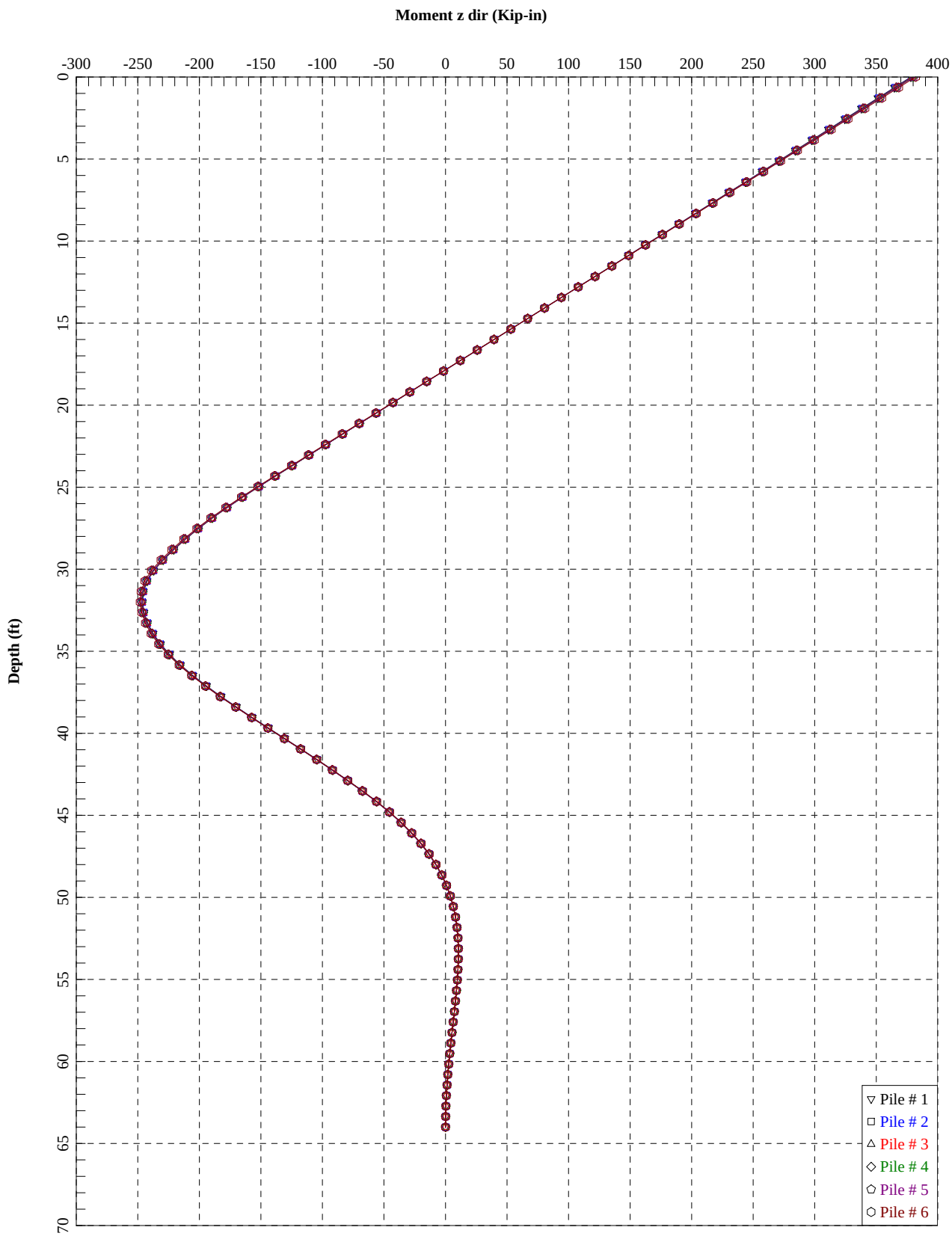

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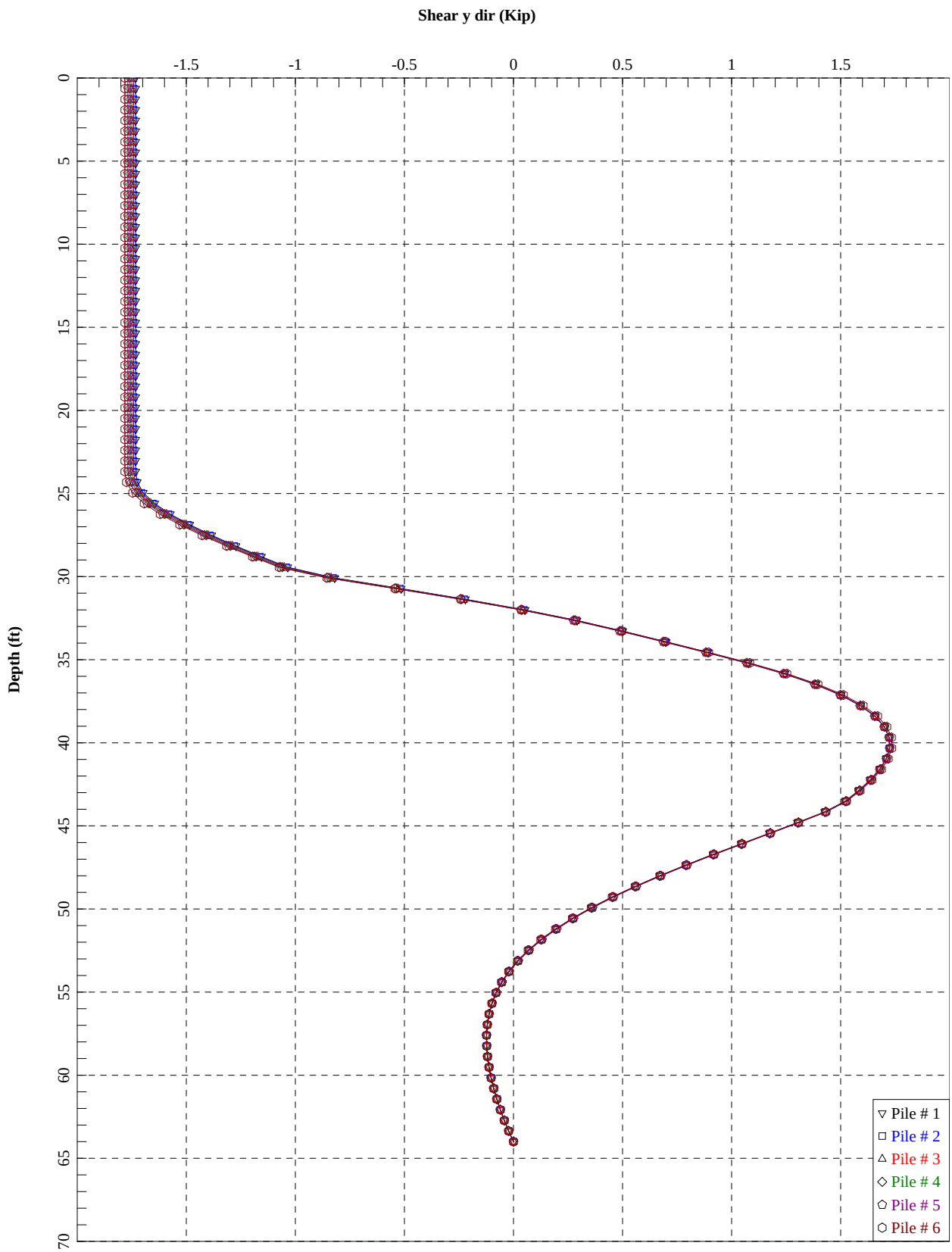

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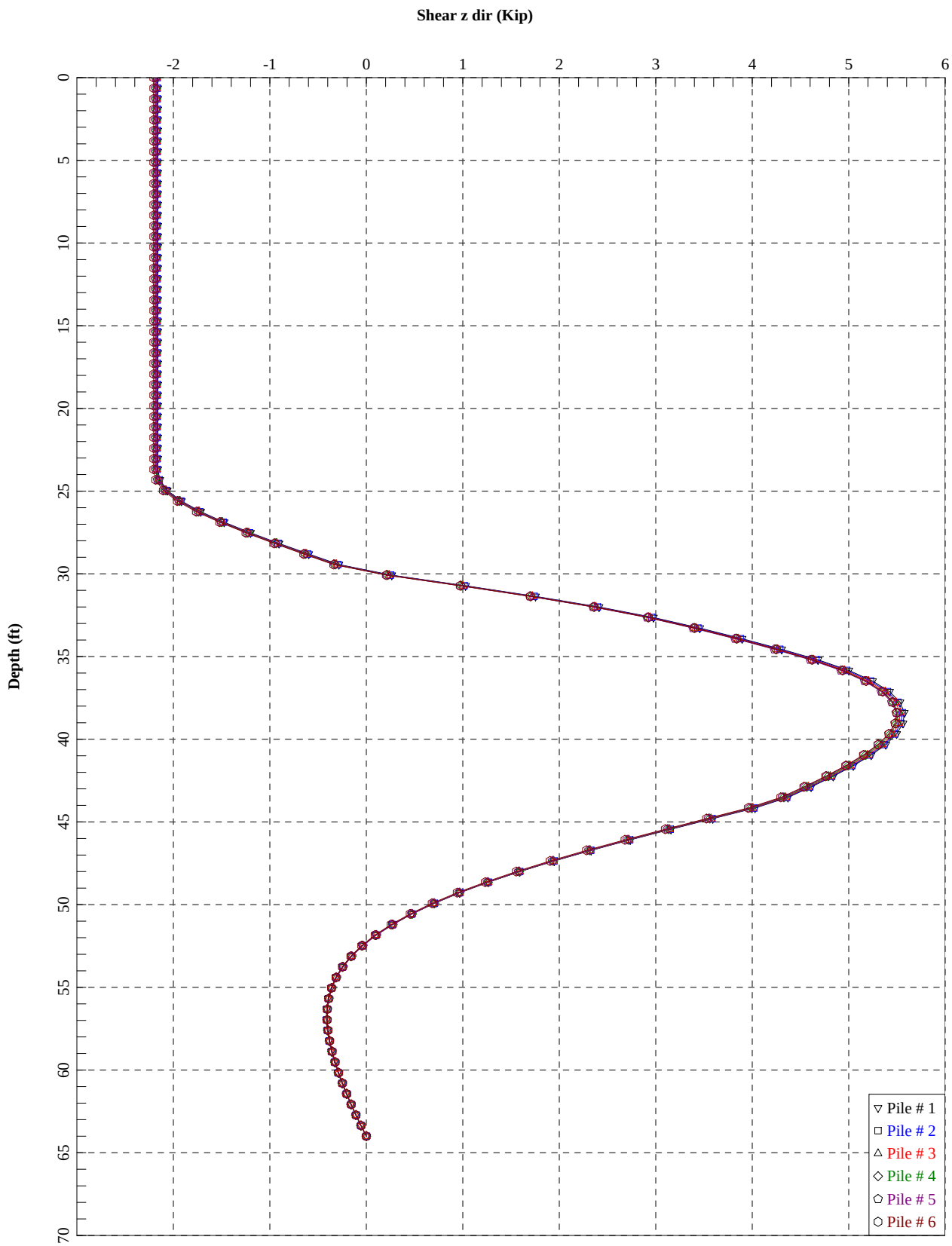

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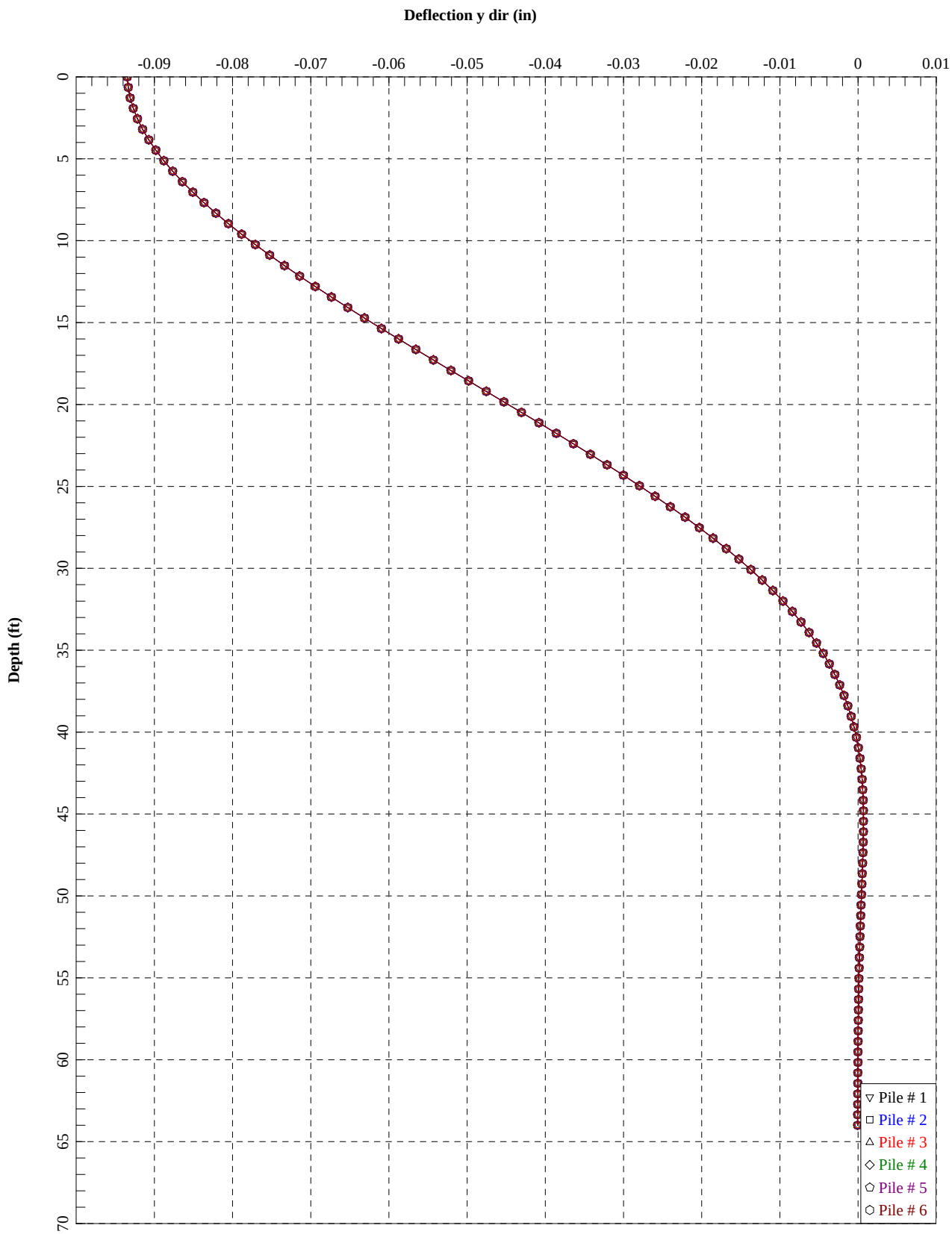

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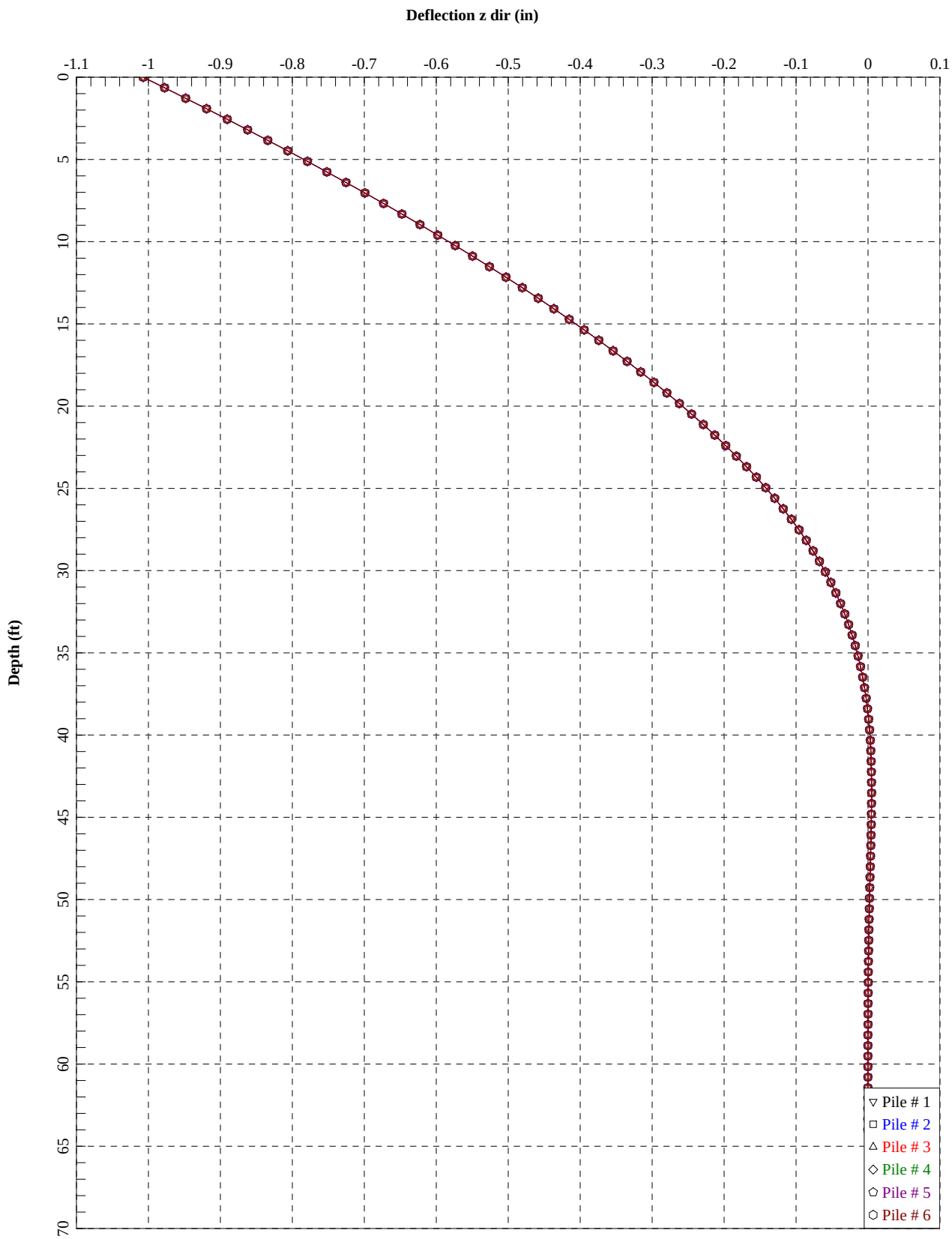
Strength III case 4



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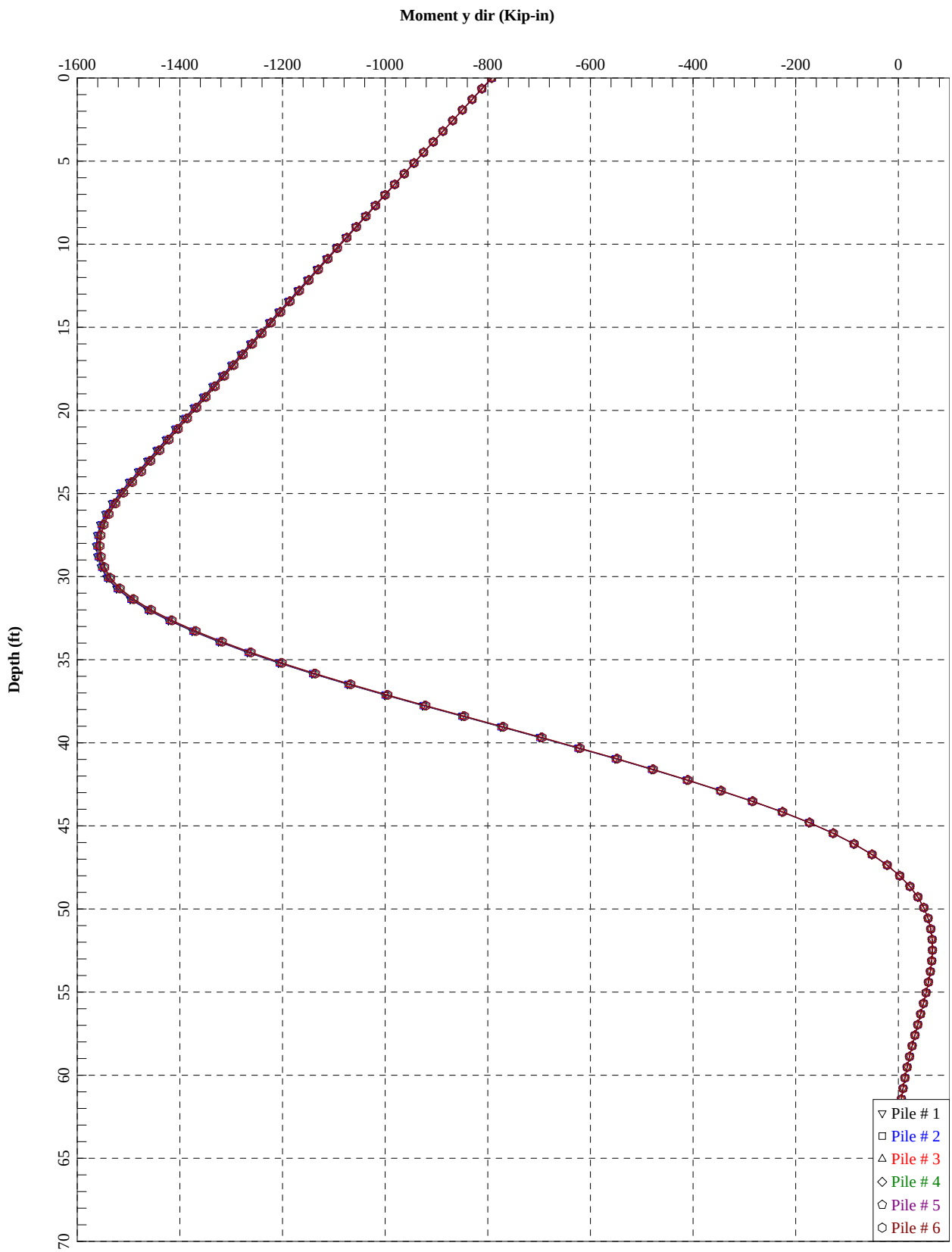

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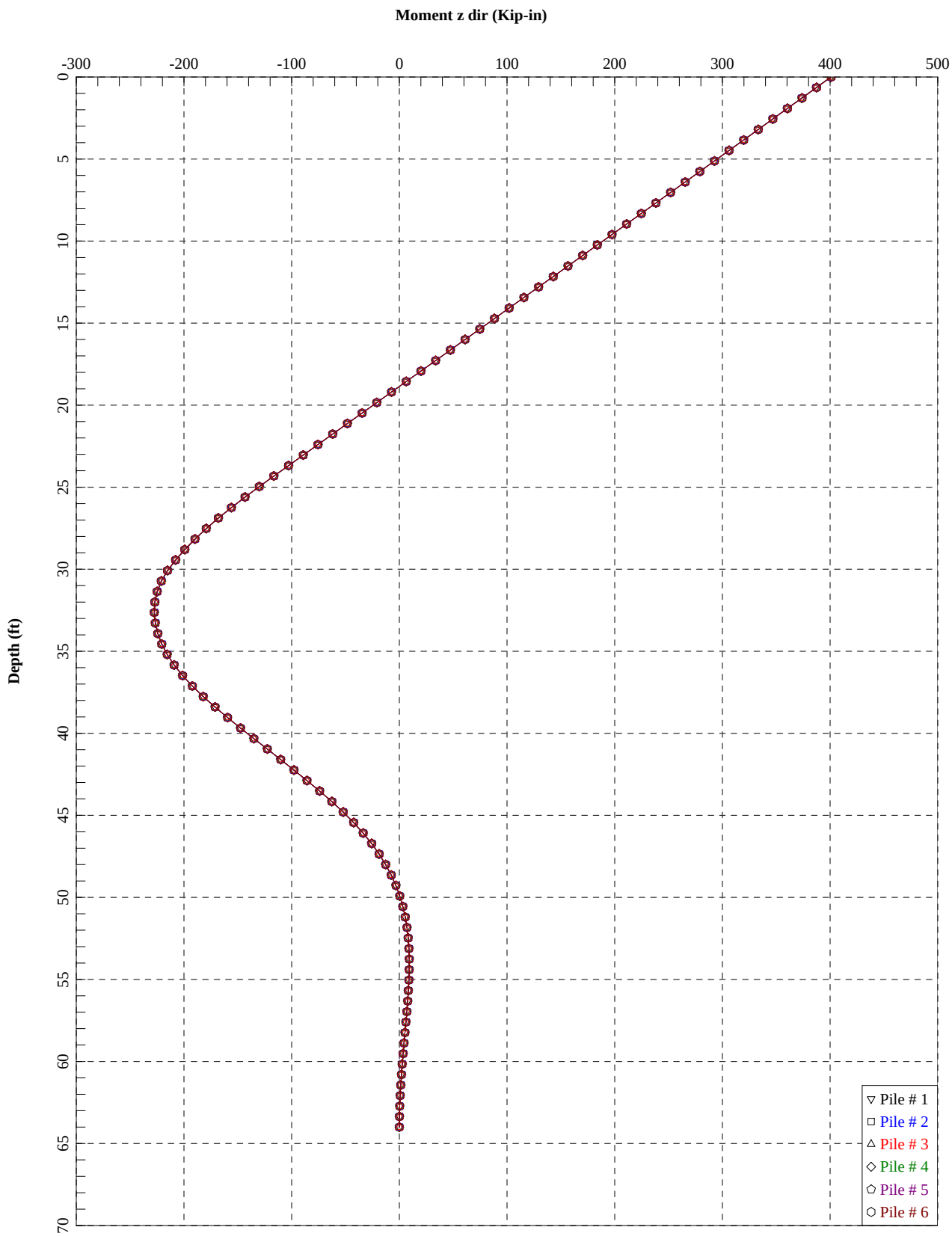

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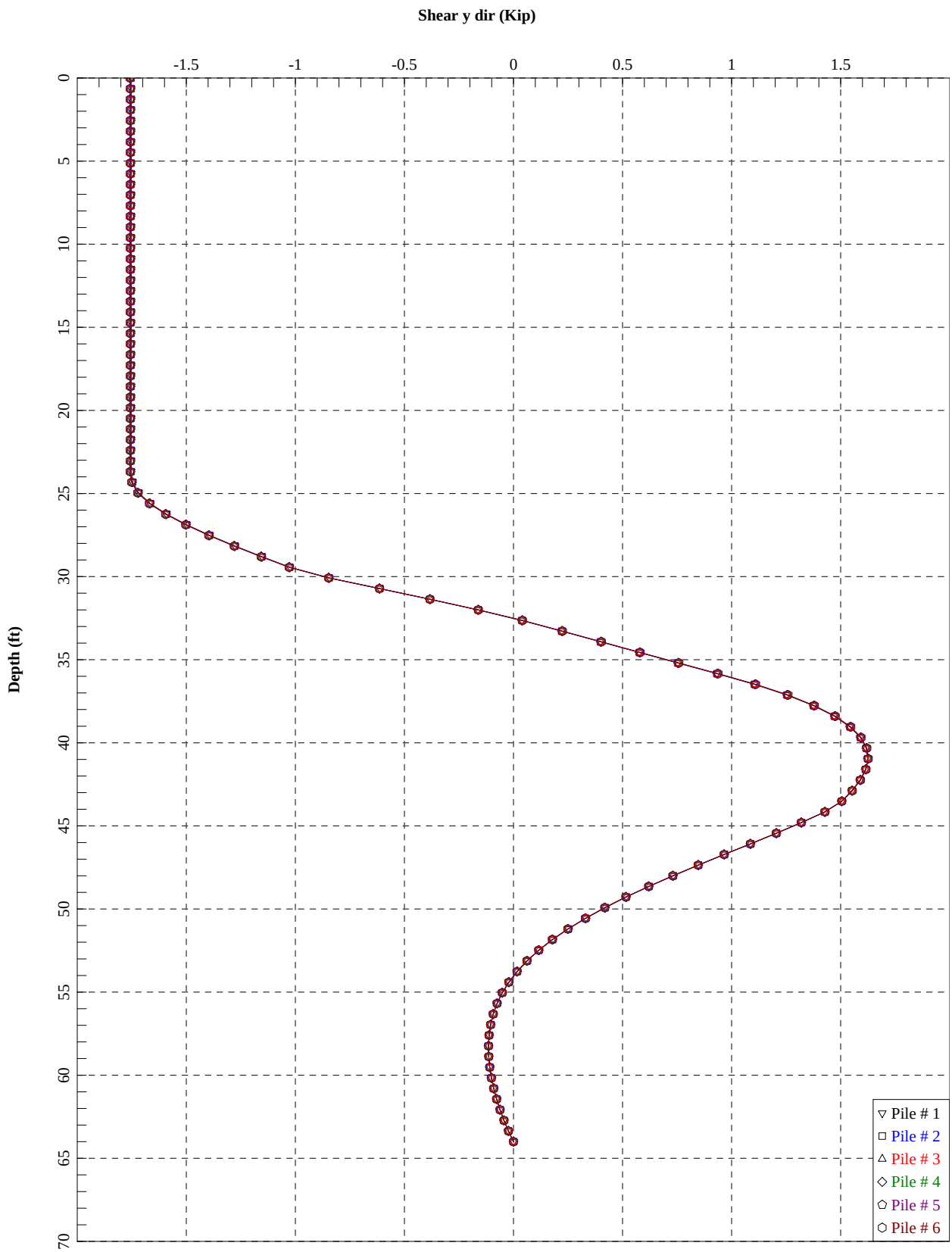

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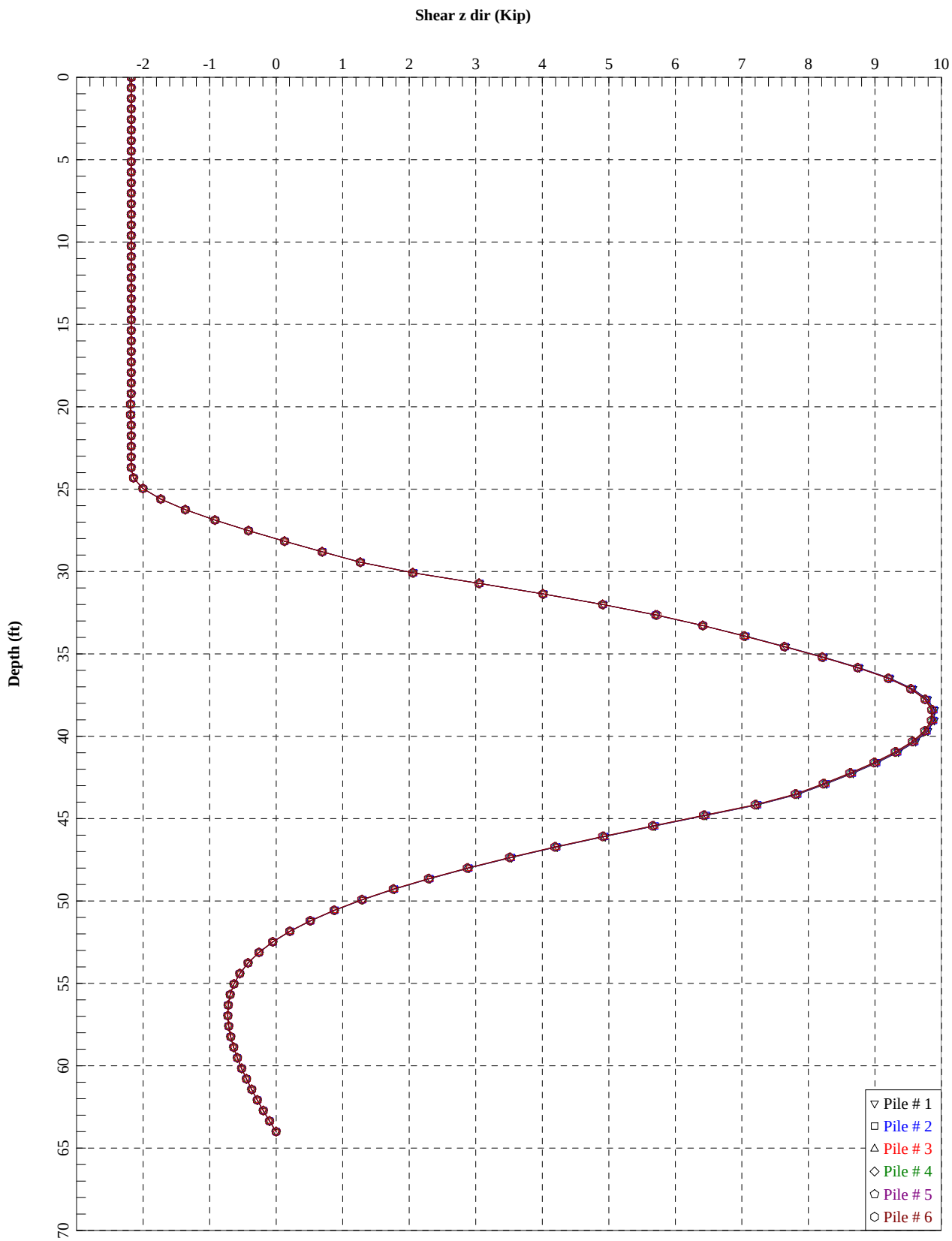

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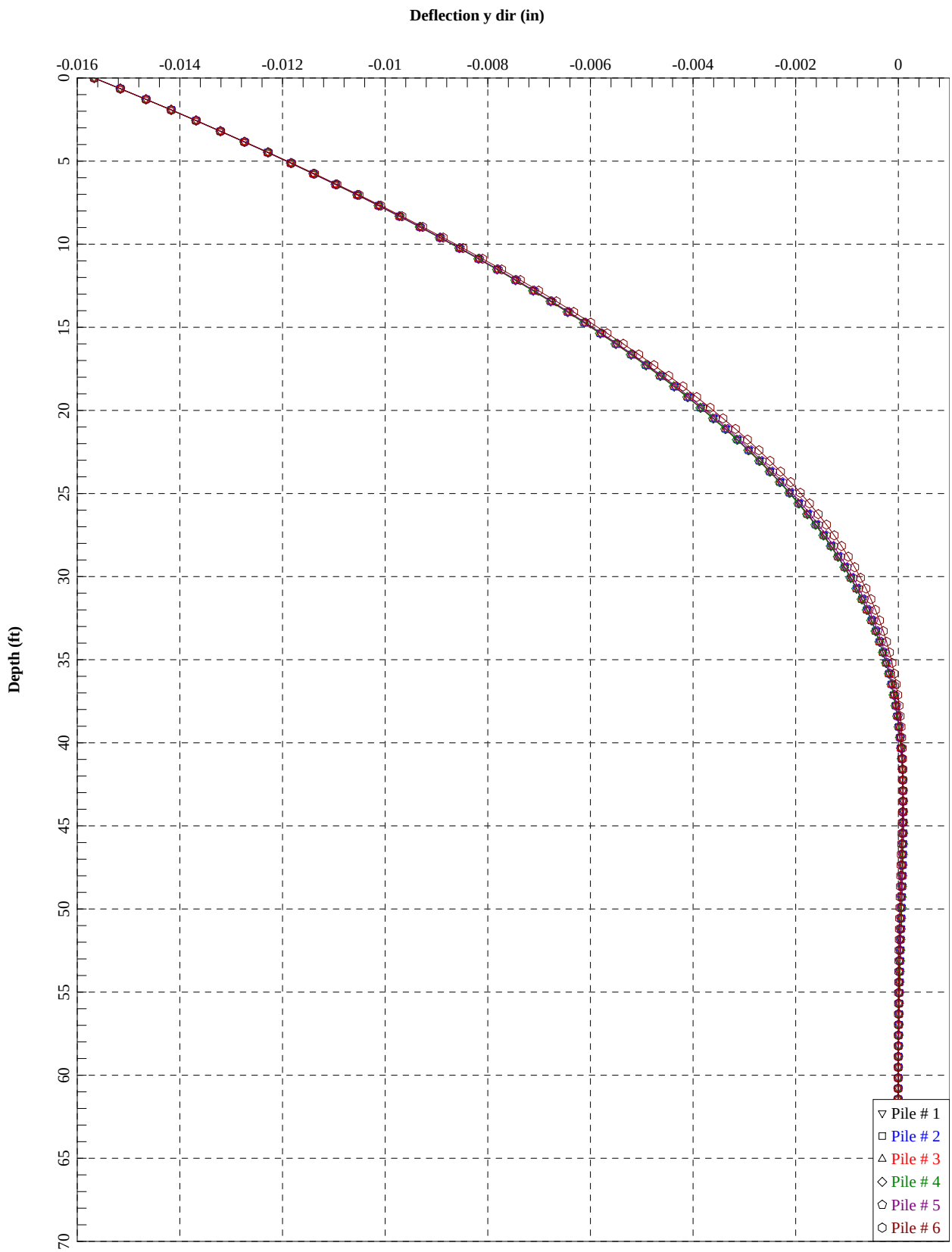
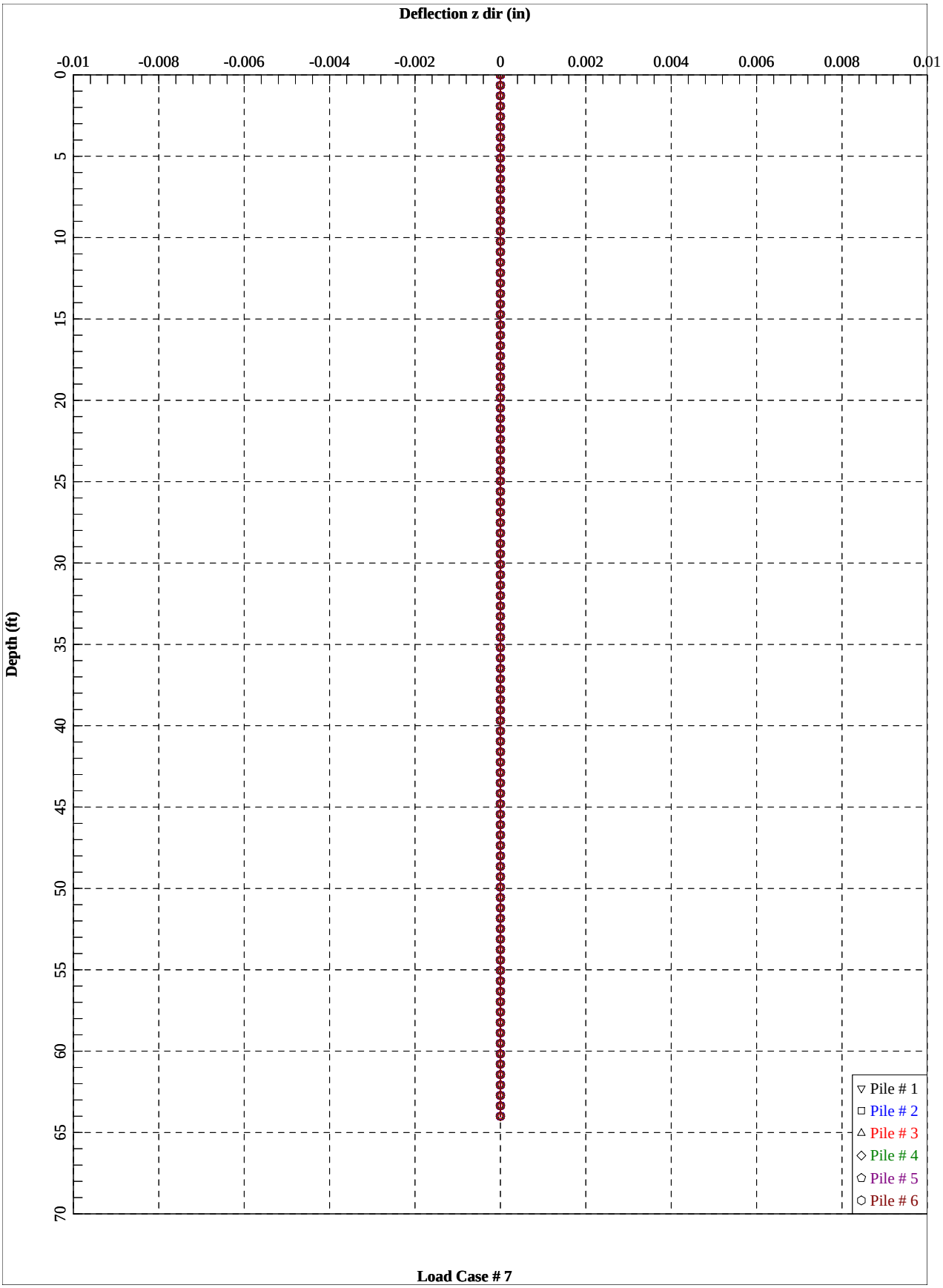
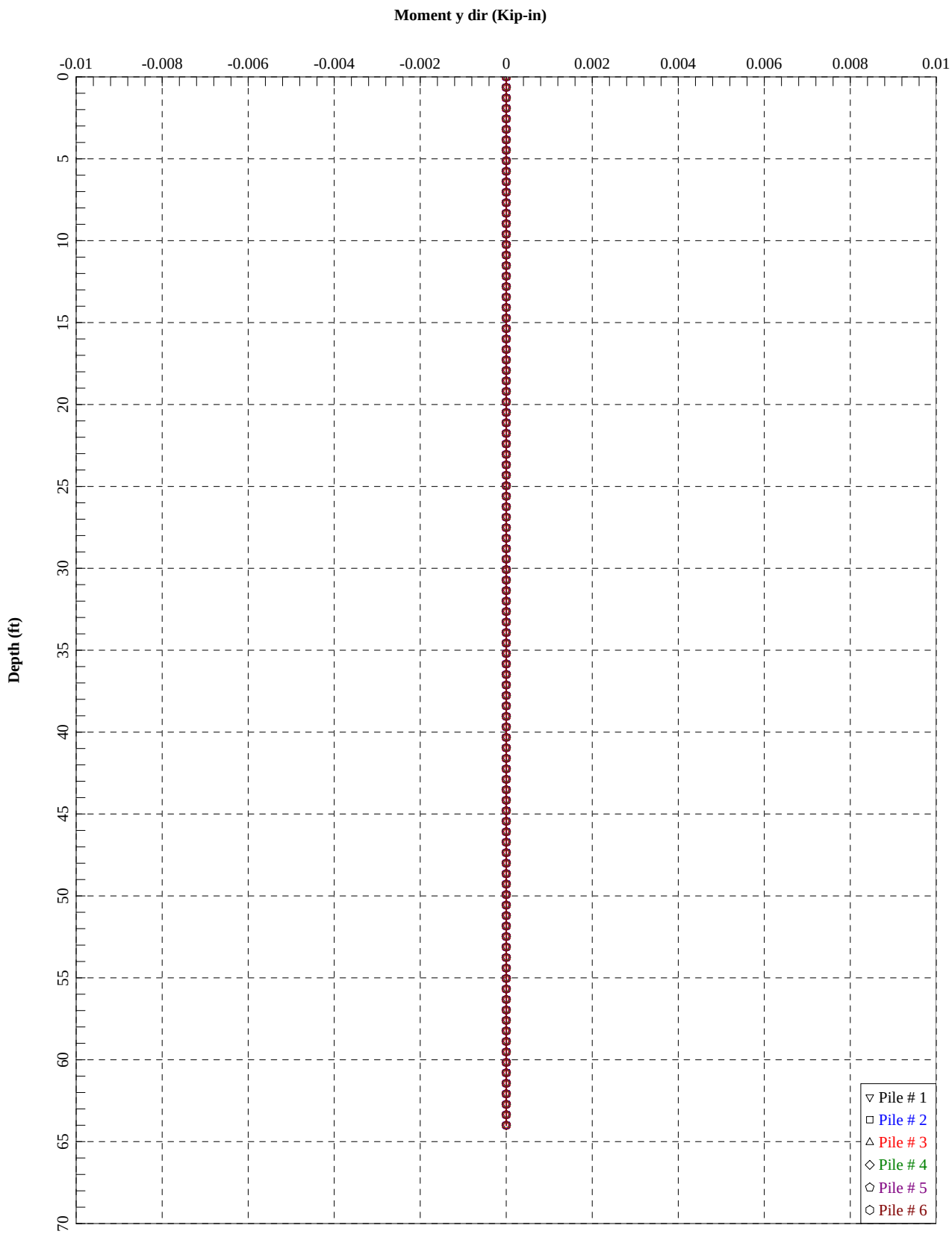


Load Case # 7

Strength IV case 3



Strength IV case 3



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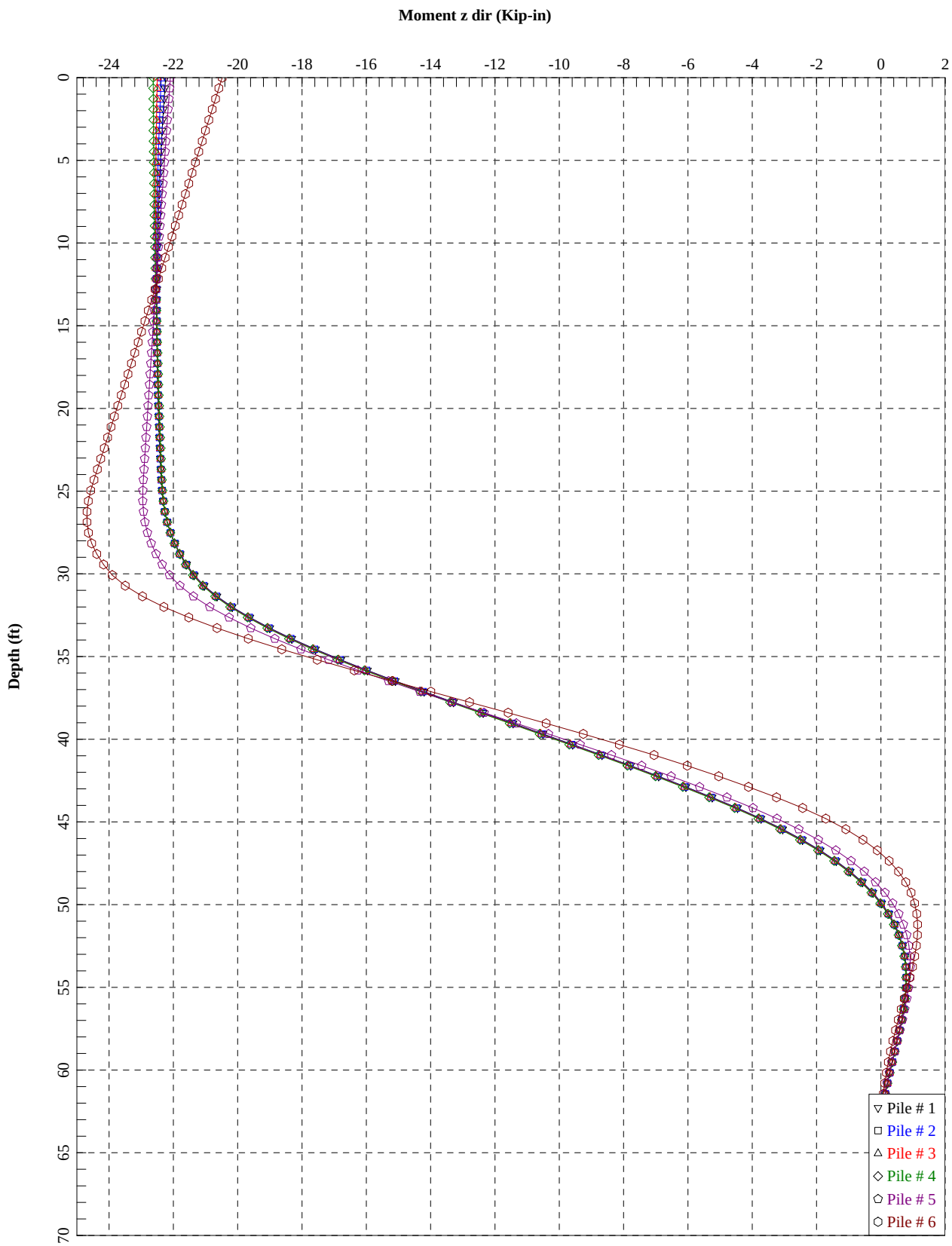
Strength IV case 3



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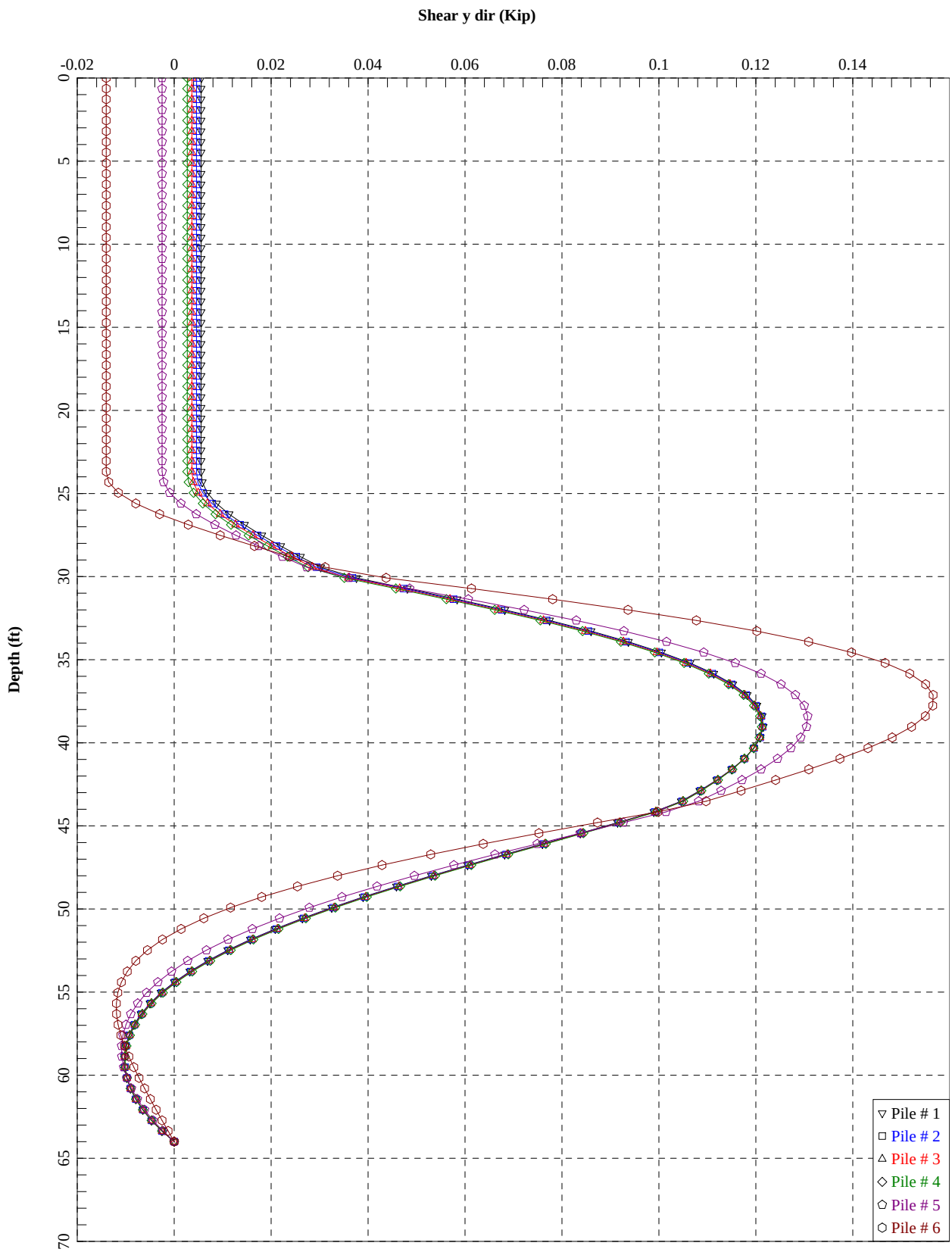

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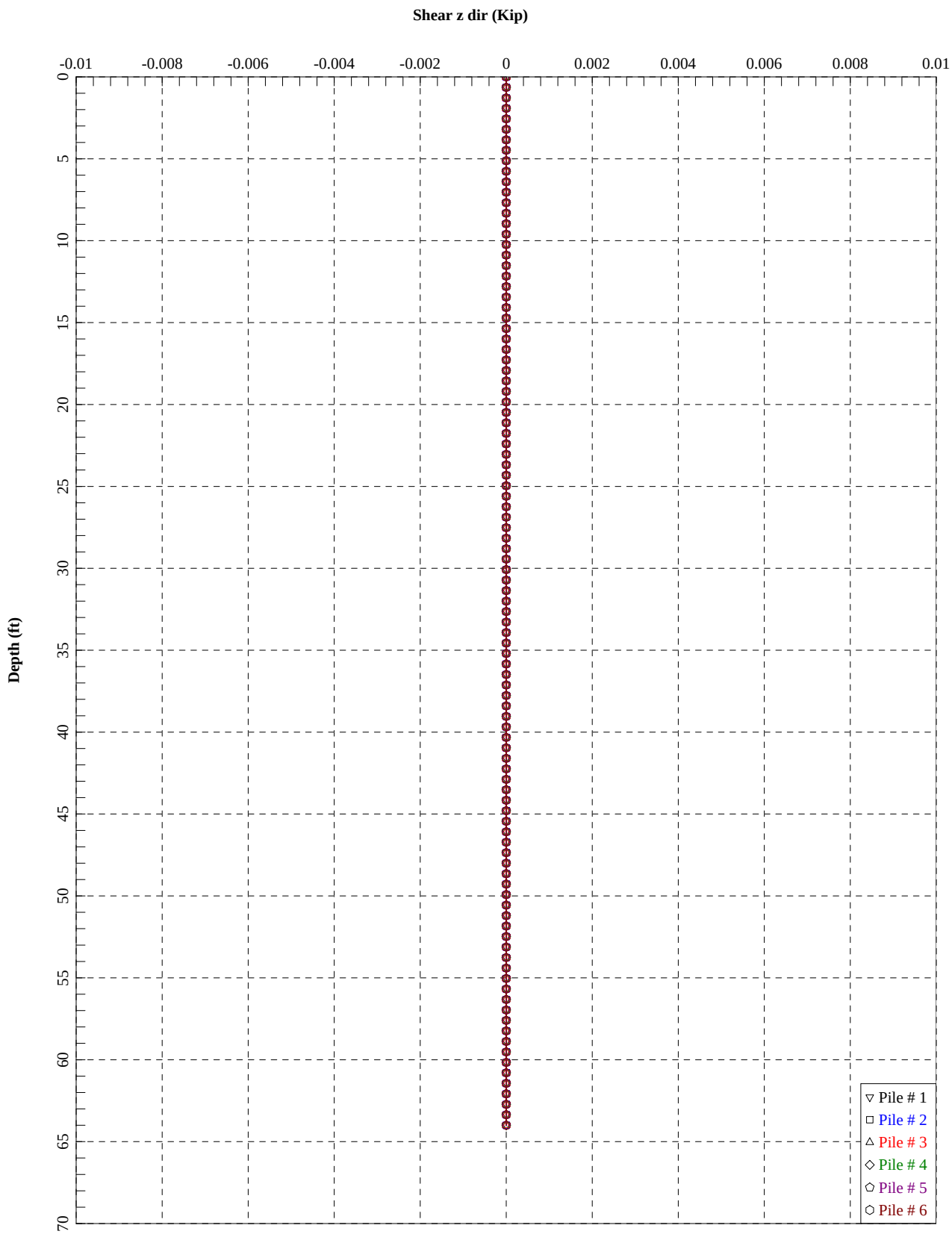

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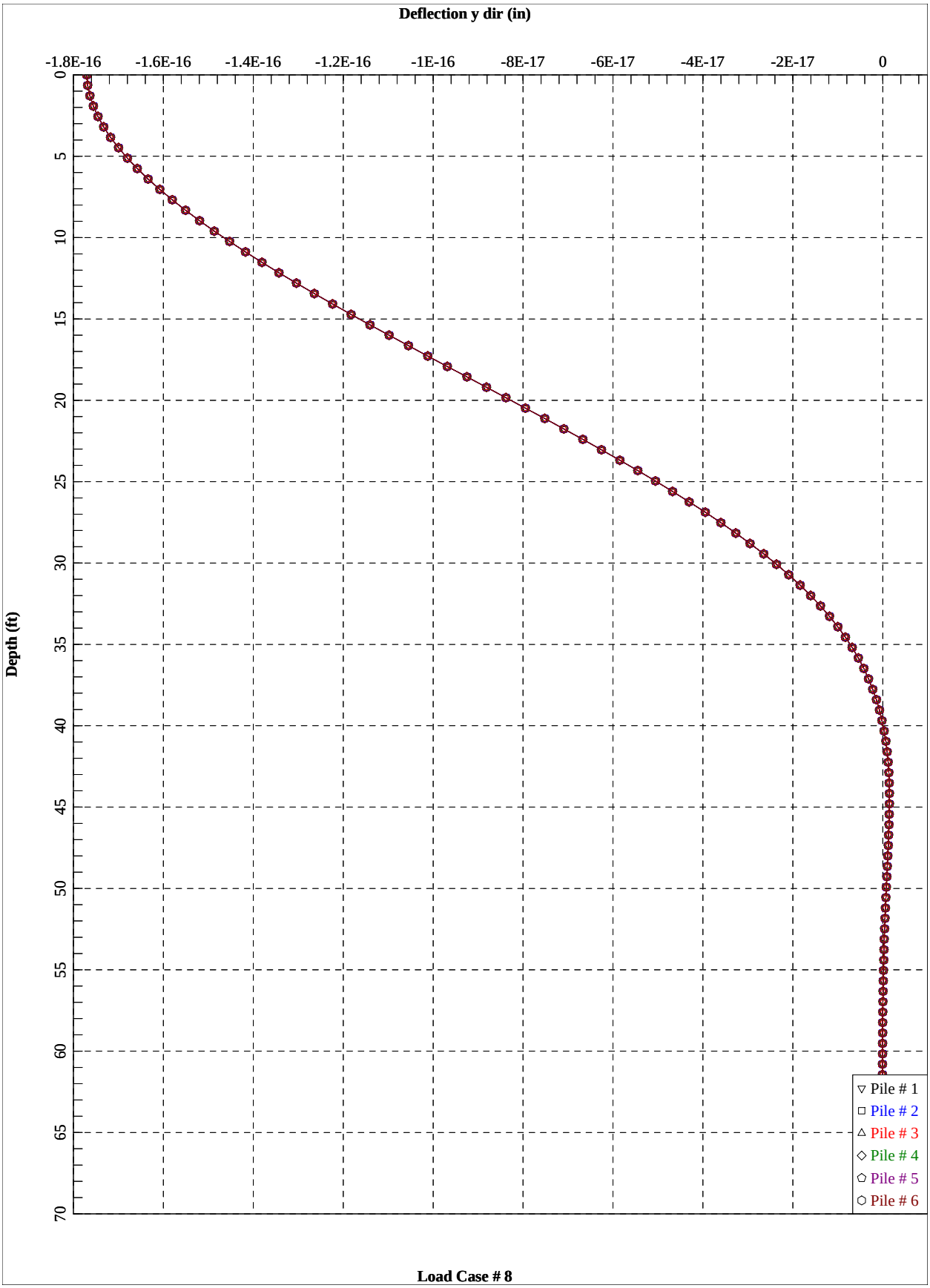

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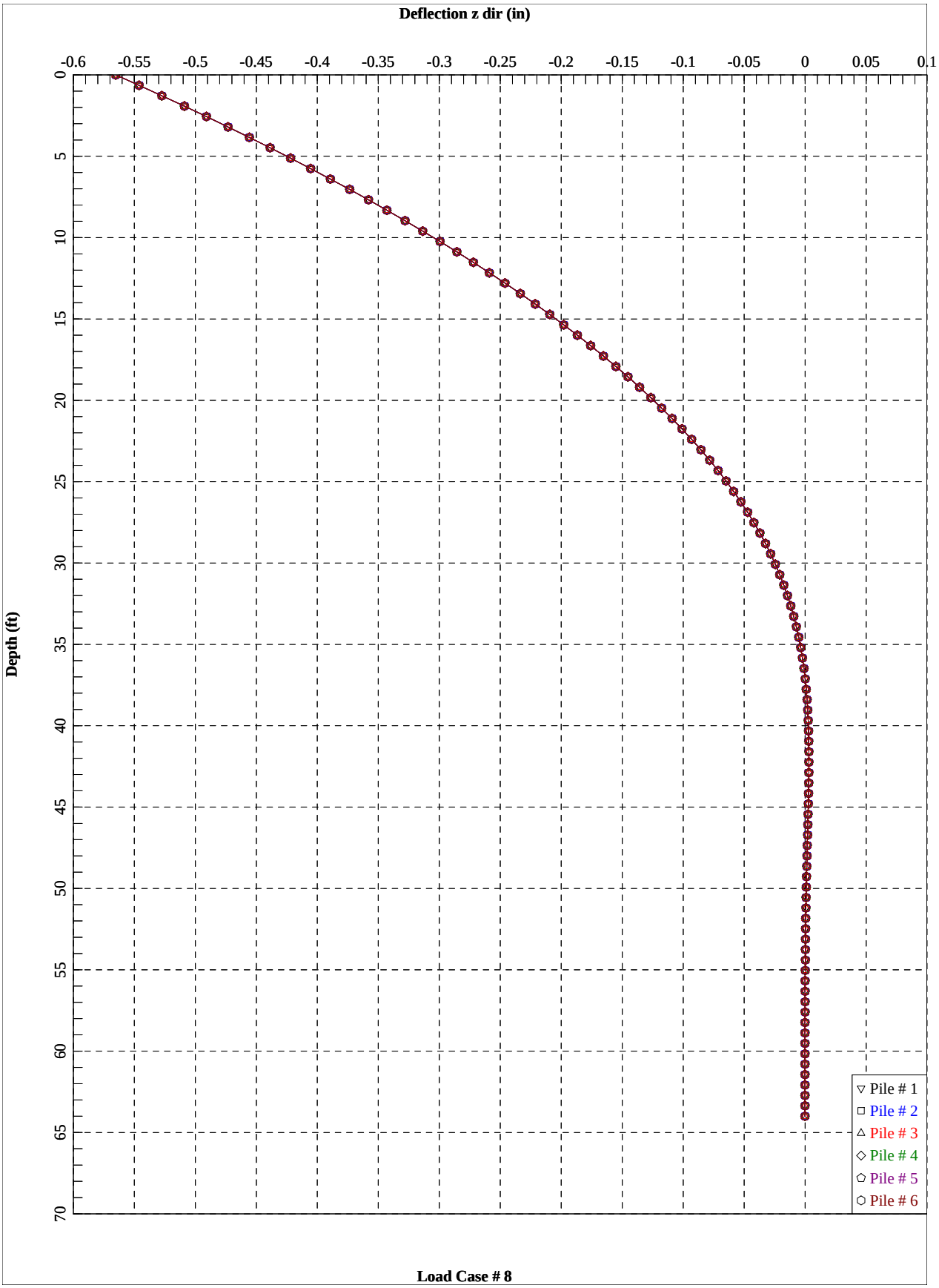

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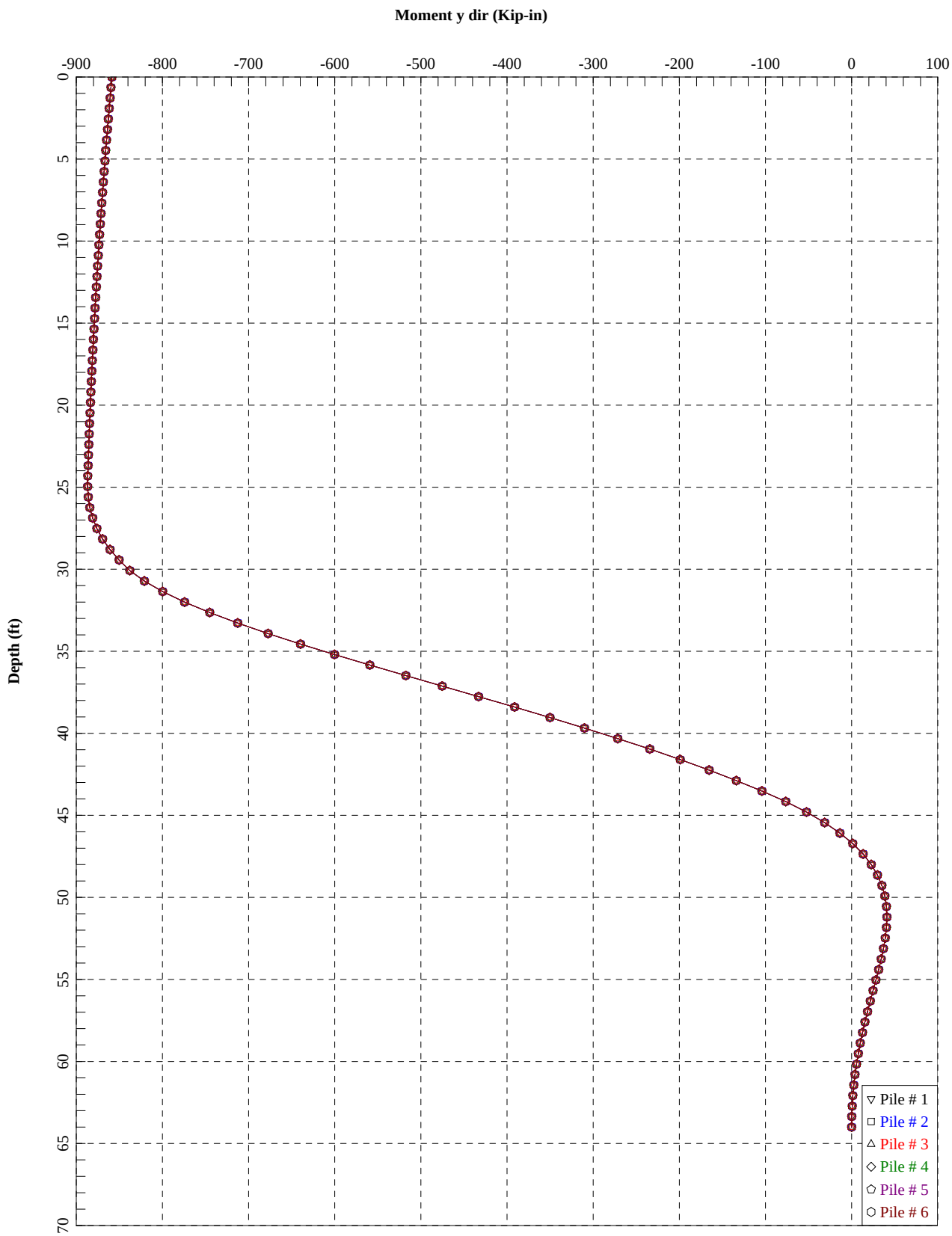

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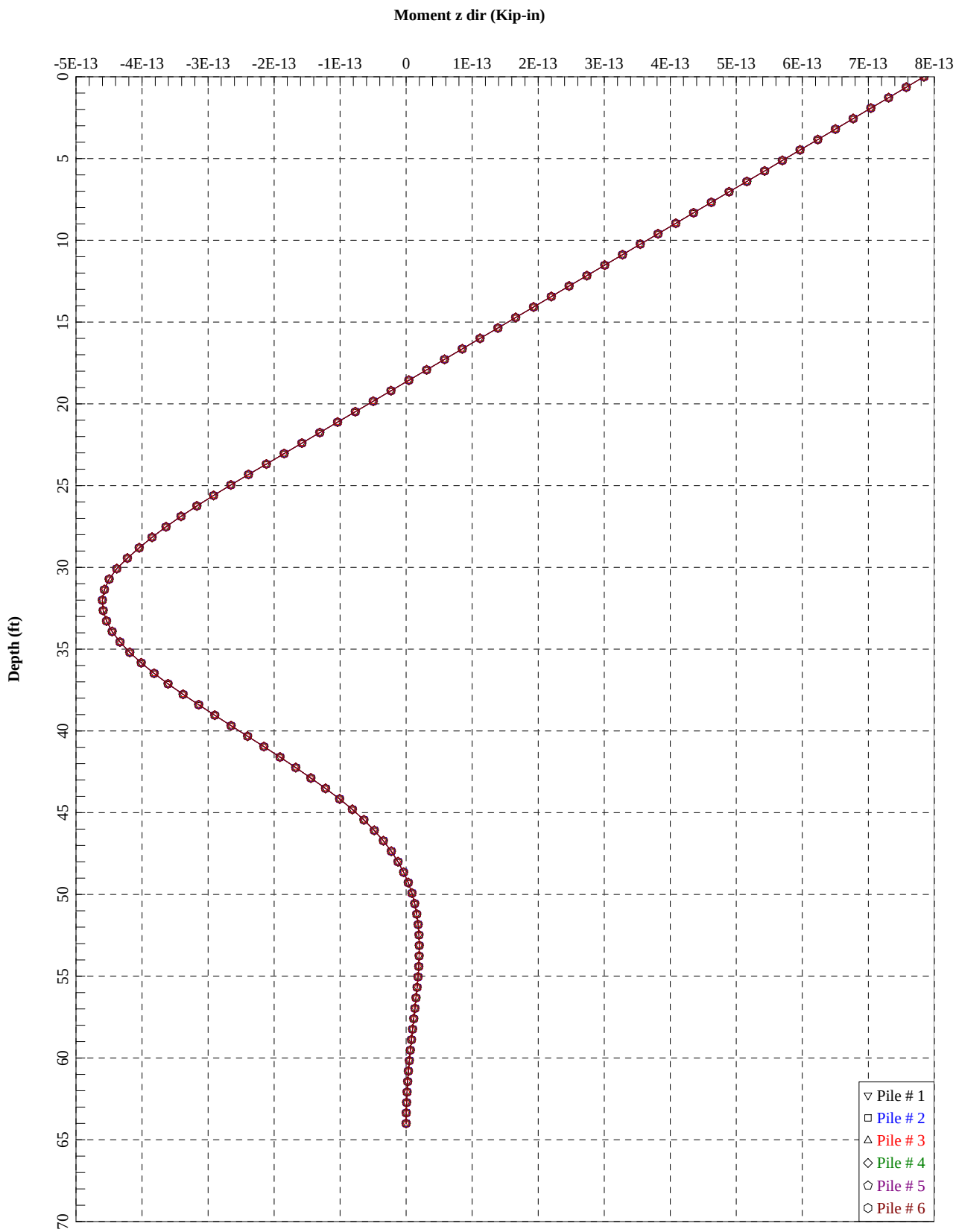

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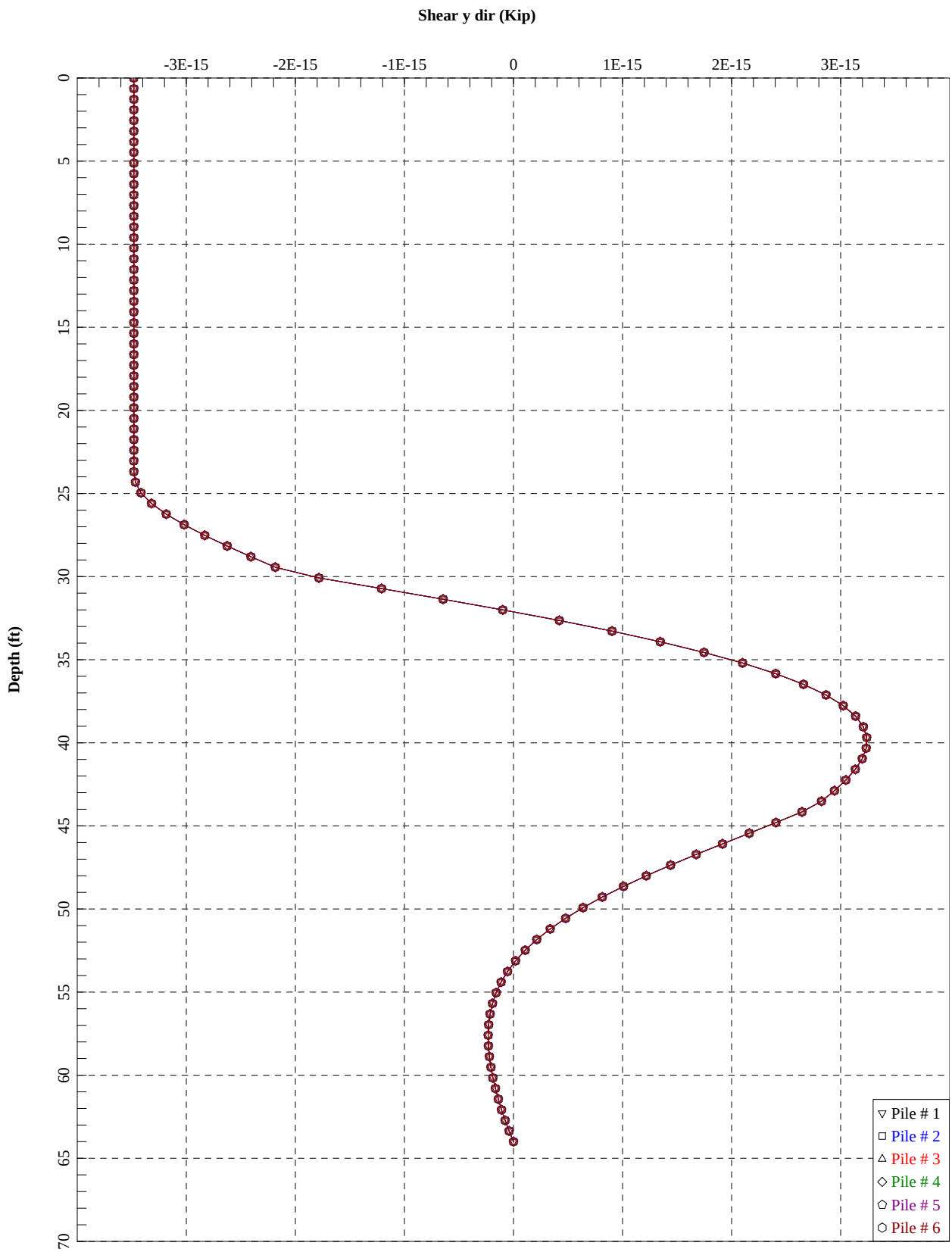

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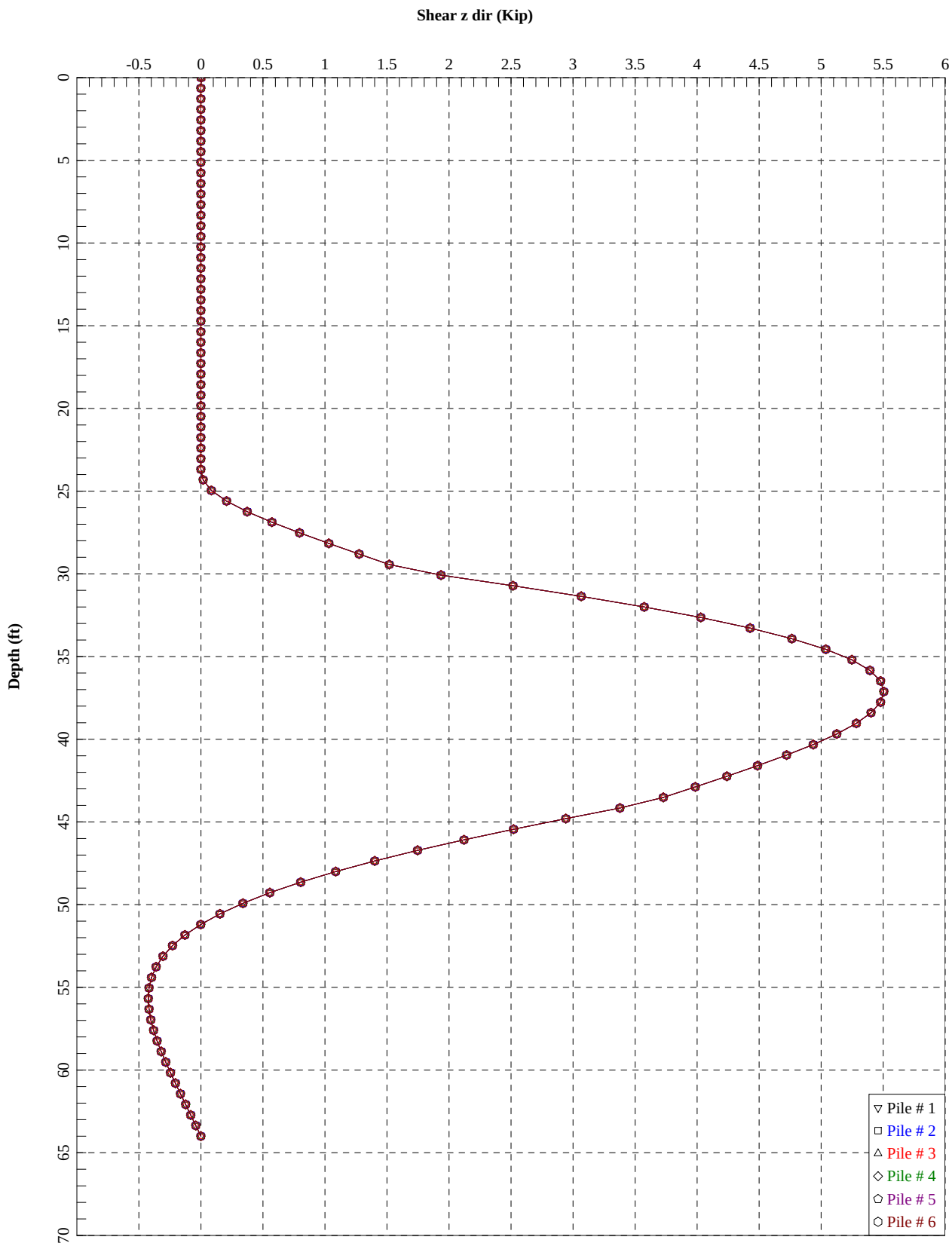

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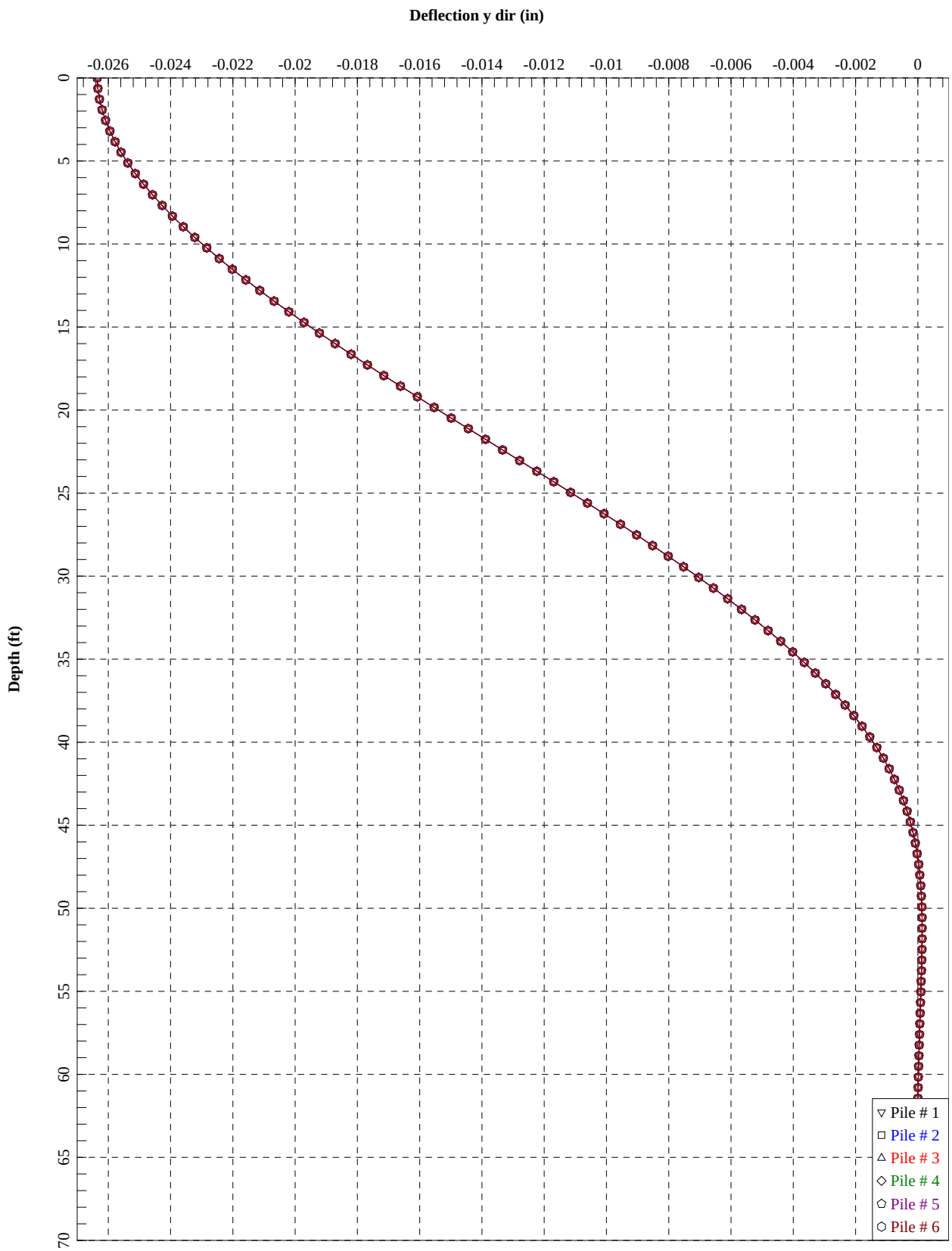
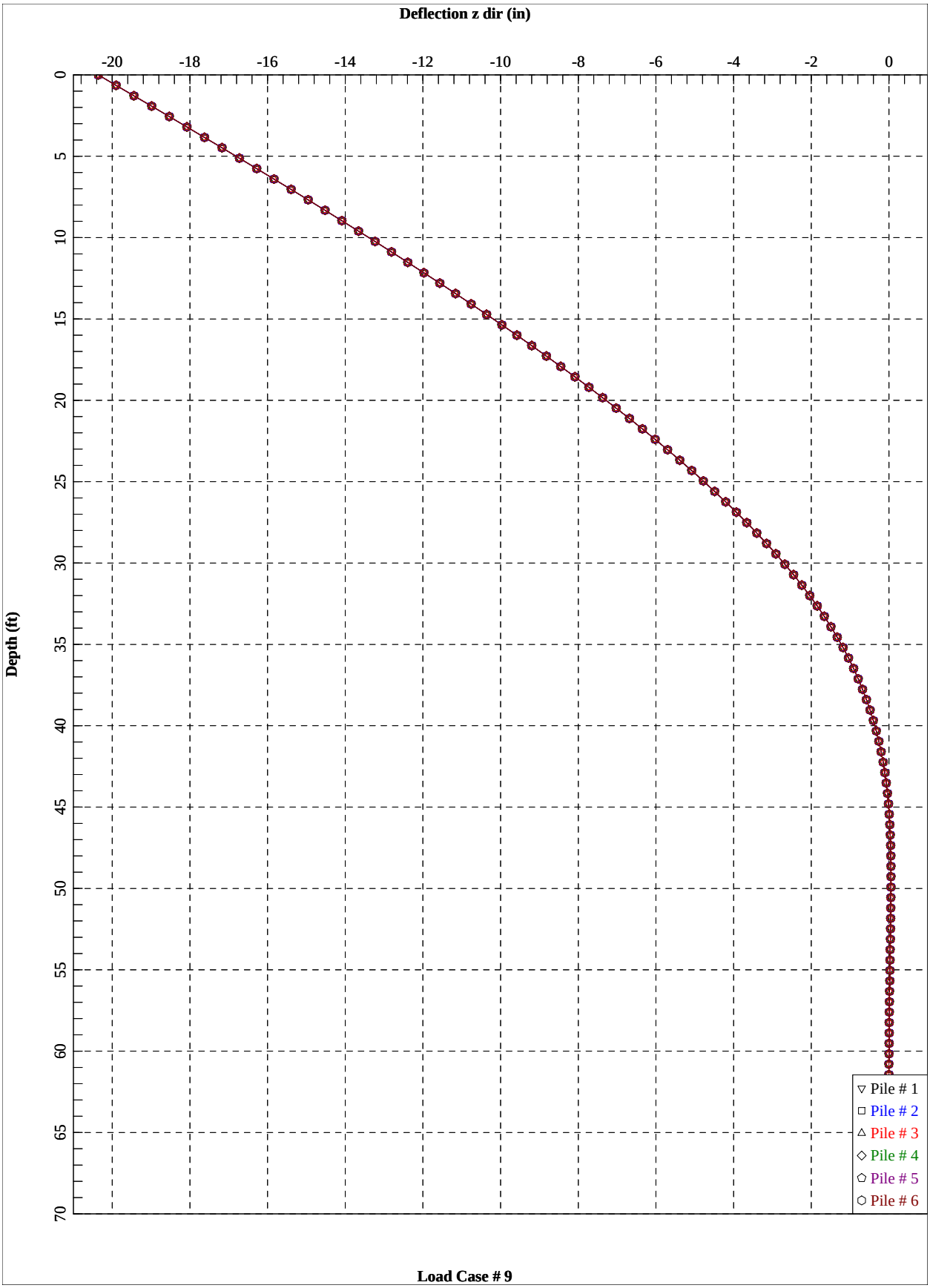
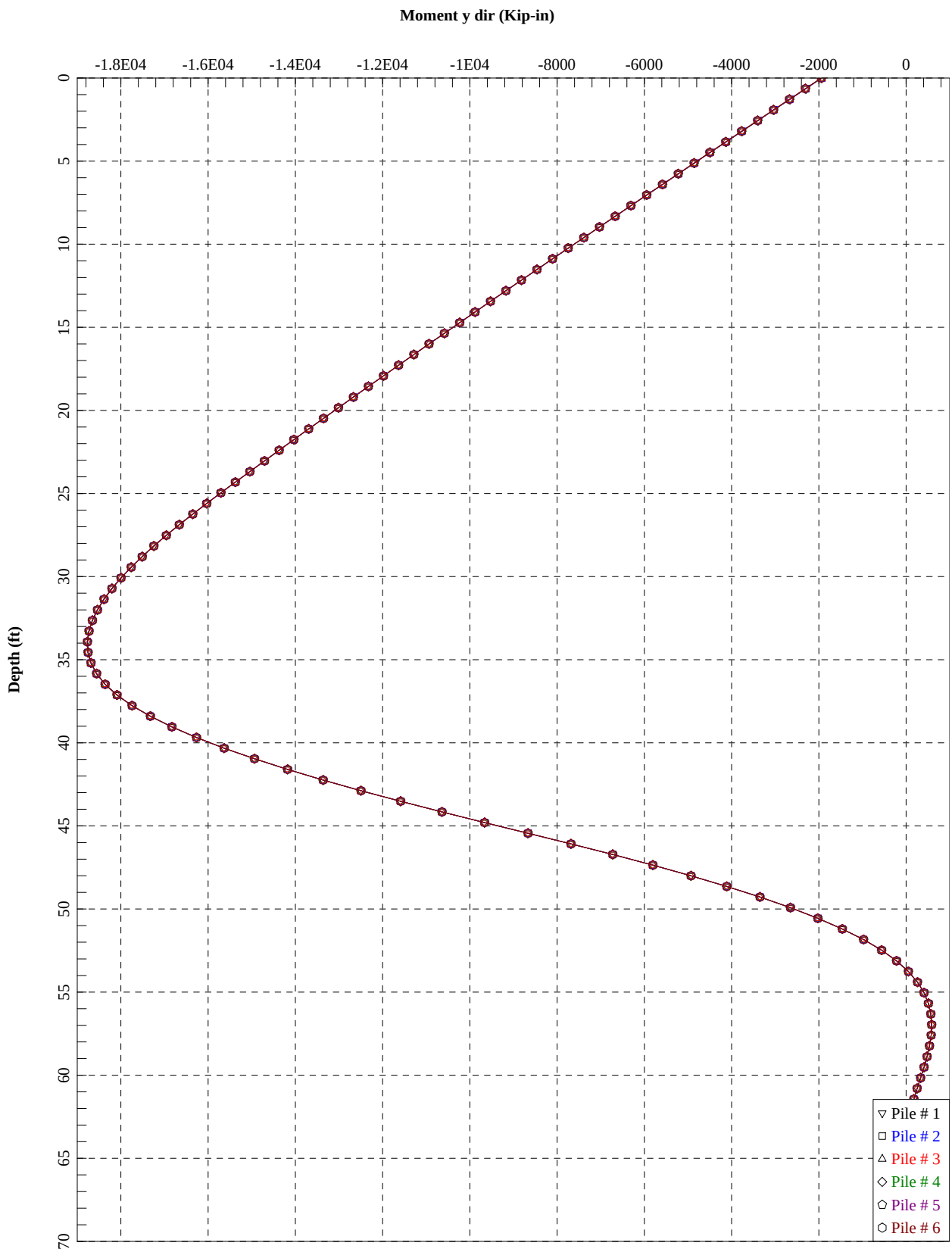


Load Case # 9

Extreme Event I case 1A

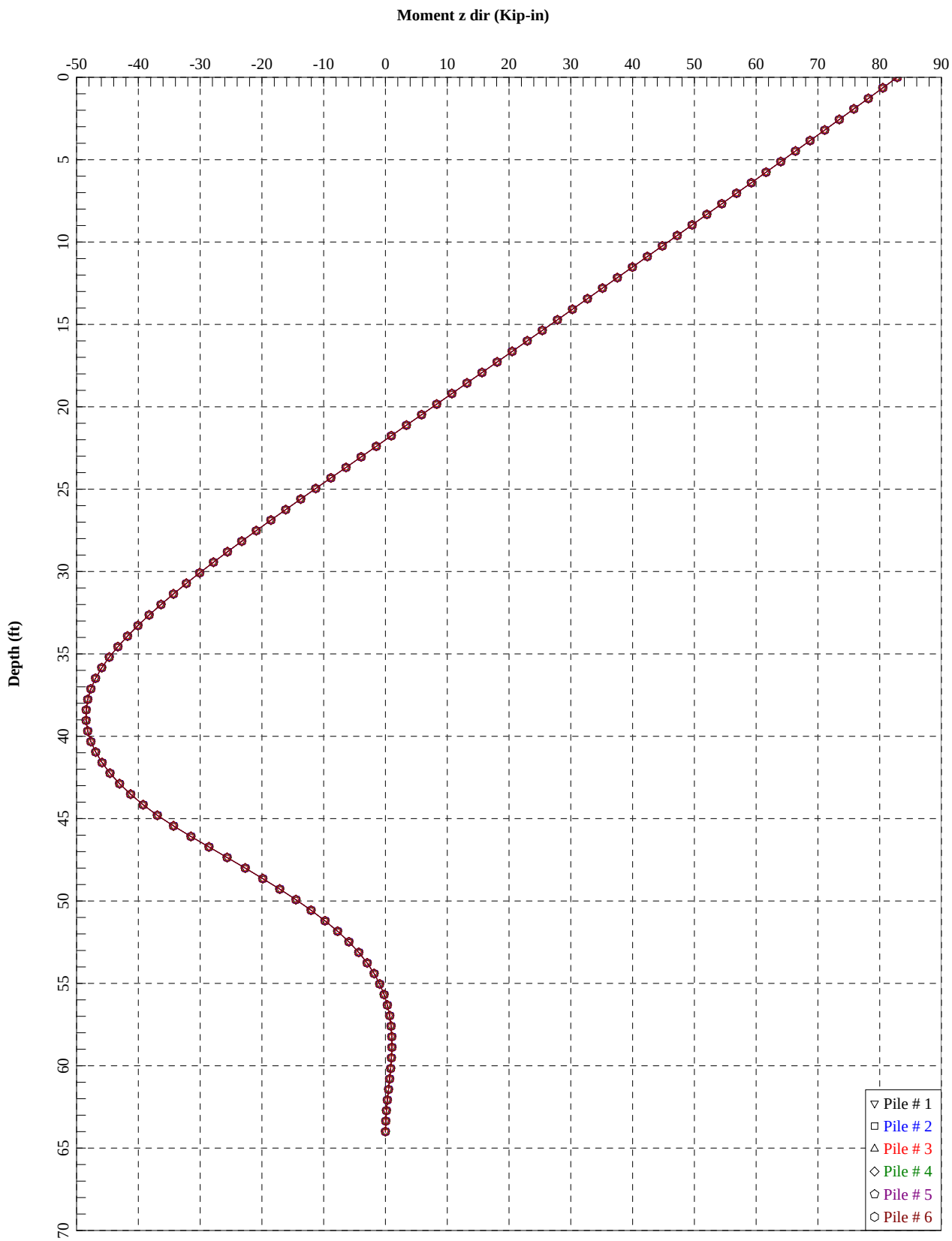


Extreme Event I case 1A



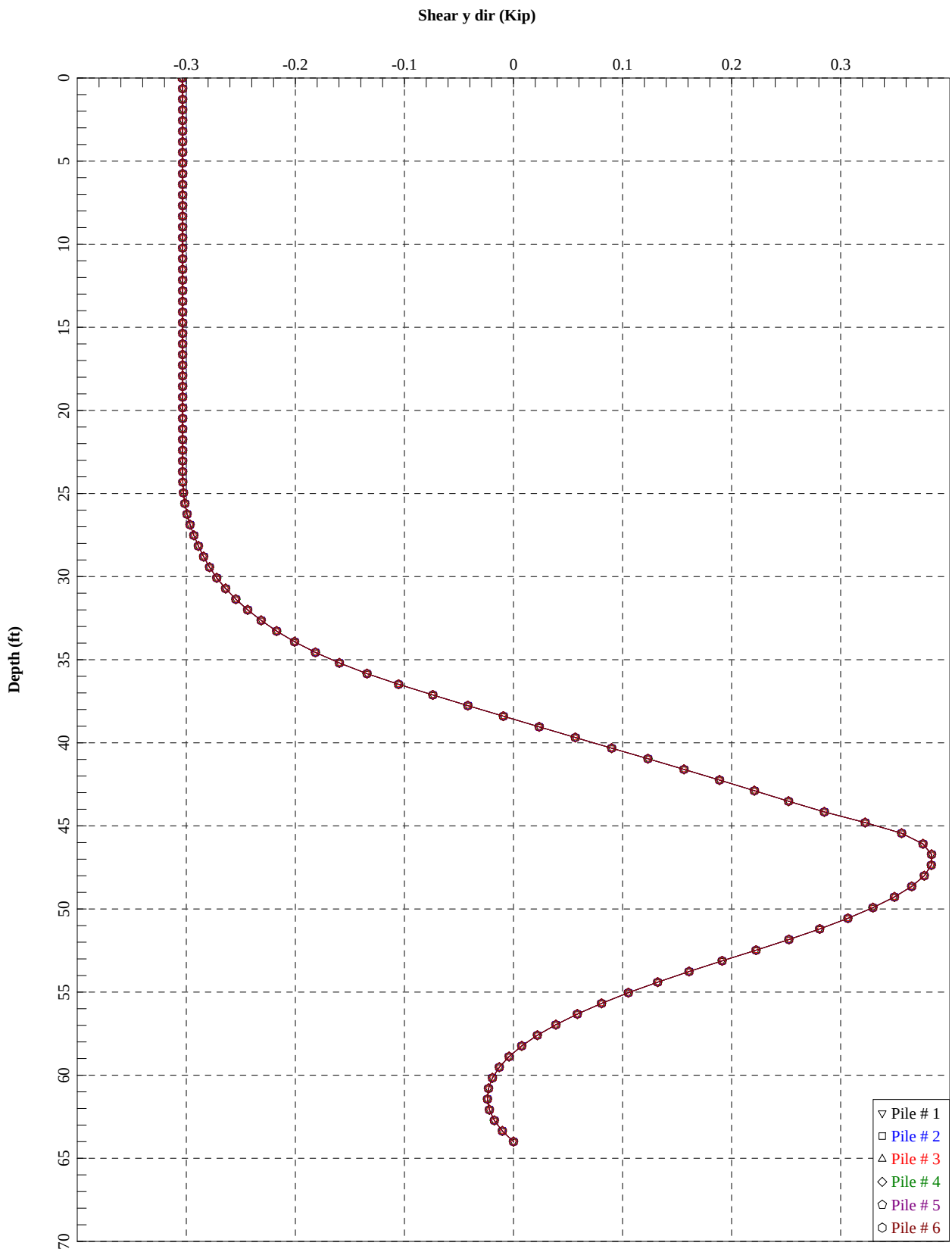
Load Case # 9

Extreme Event I case 1A



Load Case # 9

Extreme Event I case 1A



Load Case # 9

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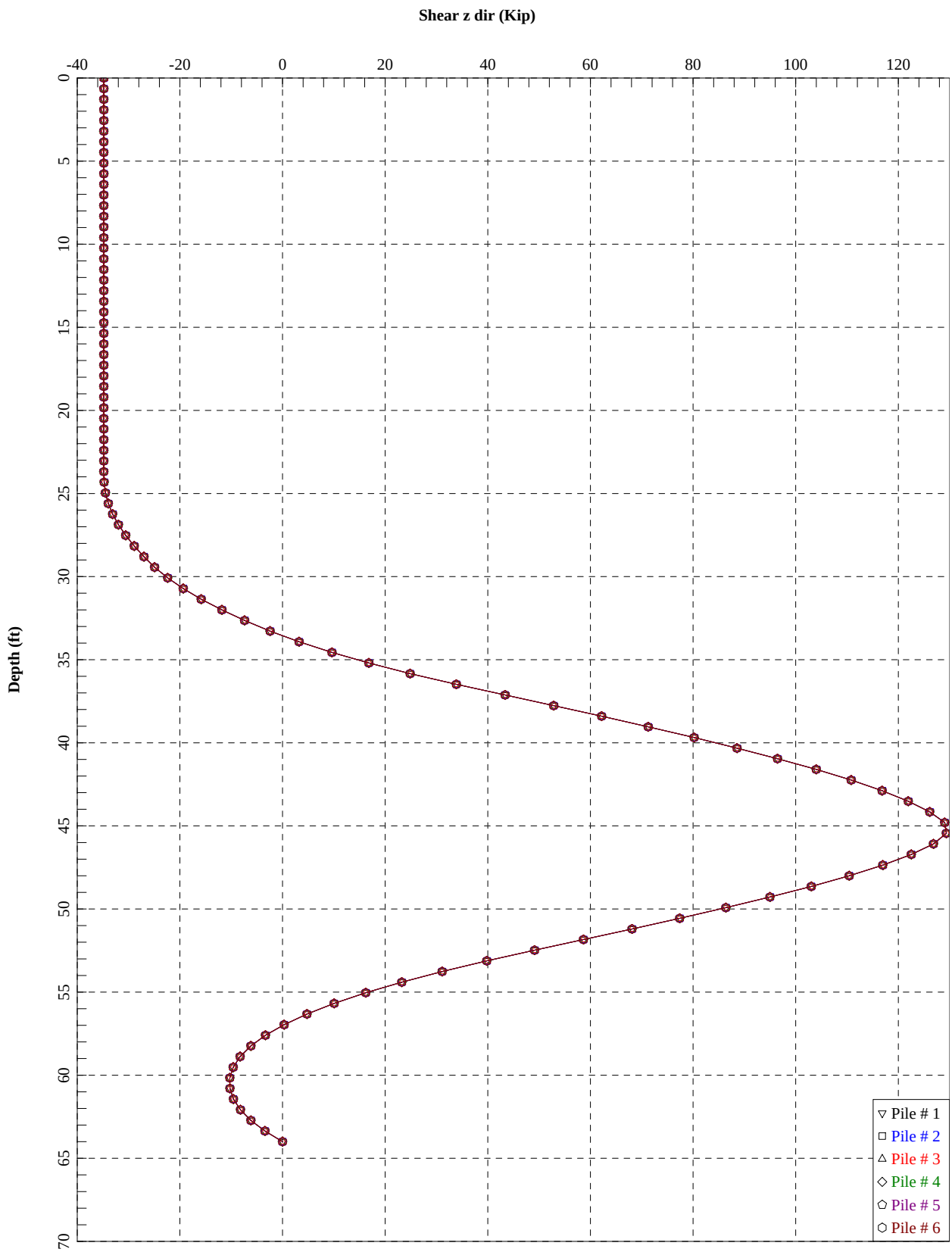

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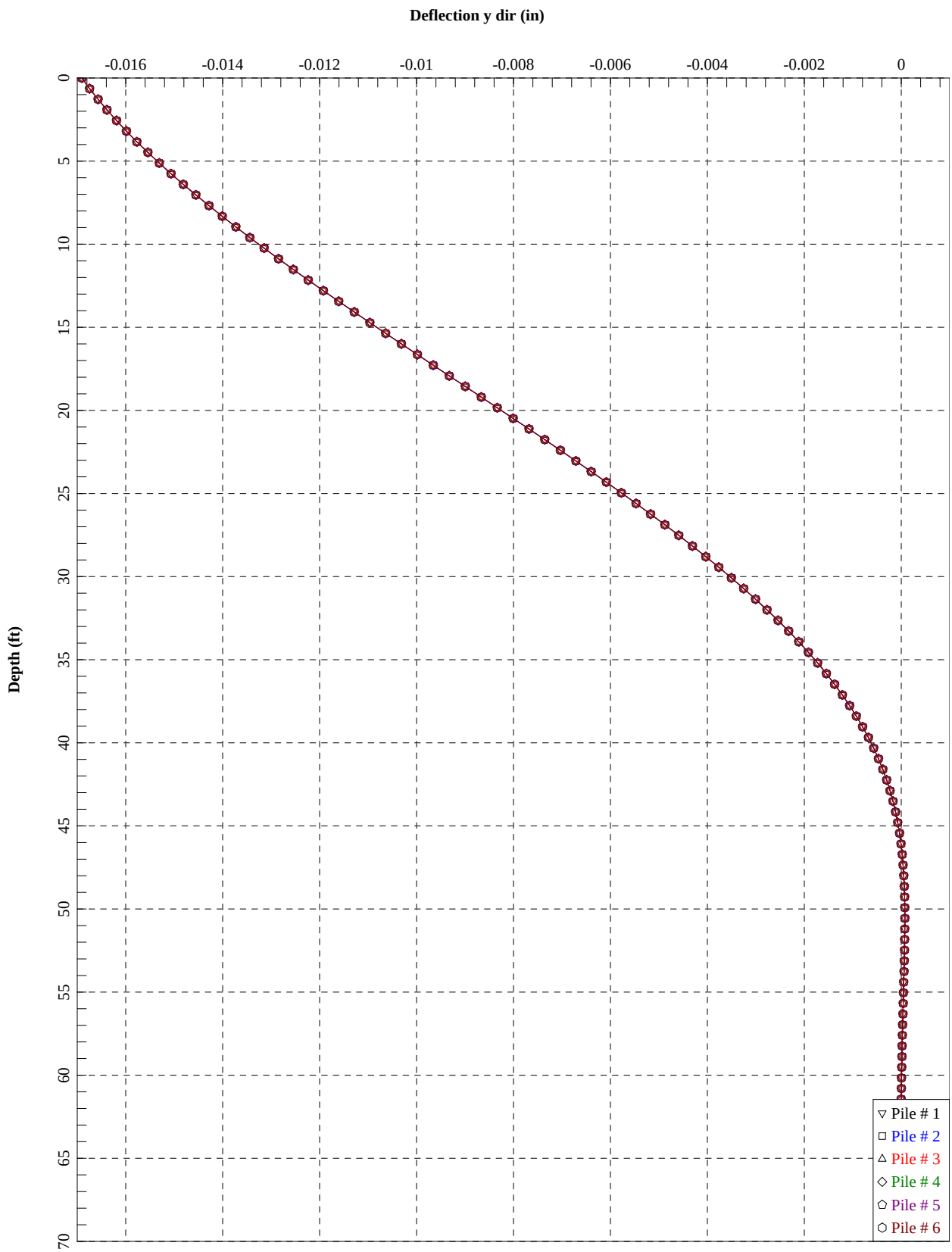
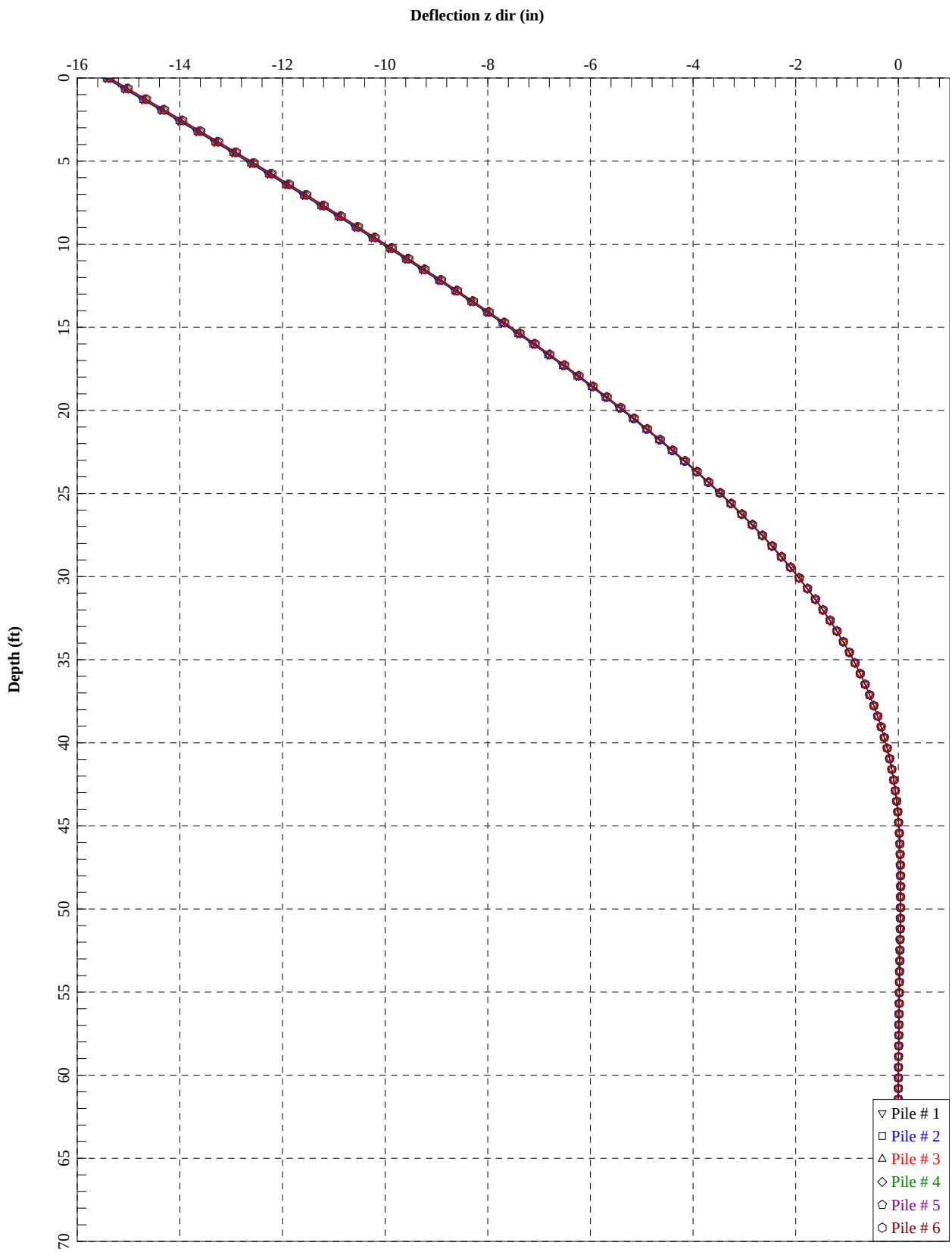
Extreme Event I case 1A



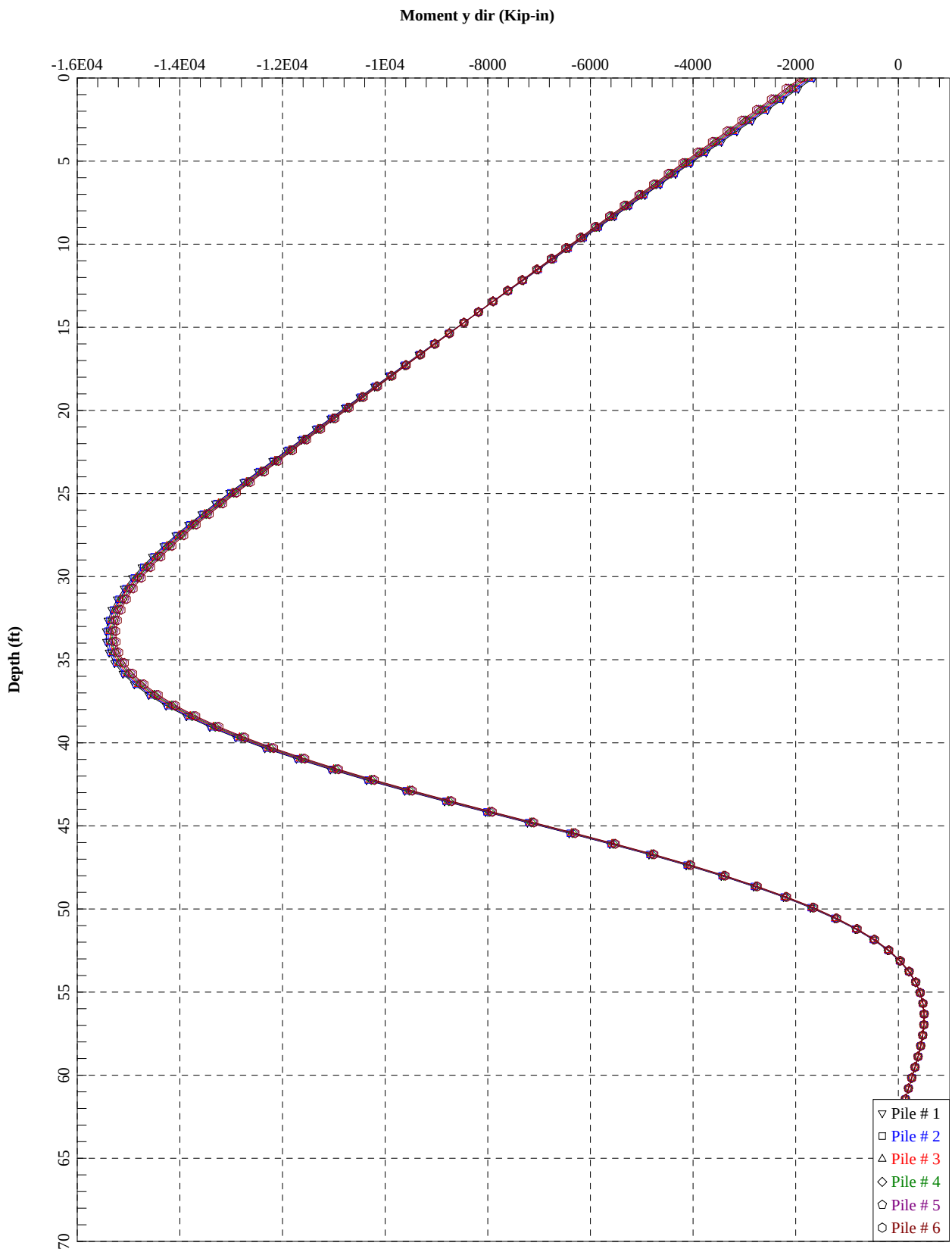
Load Case # 10

Extreme Event I case 2A



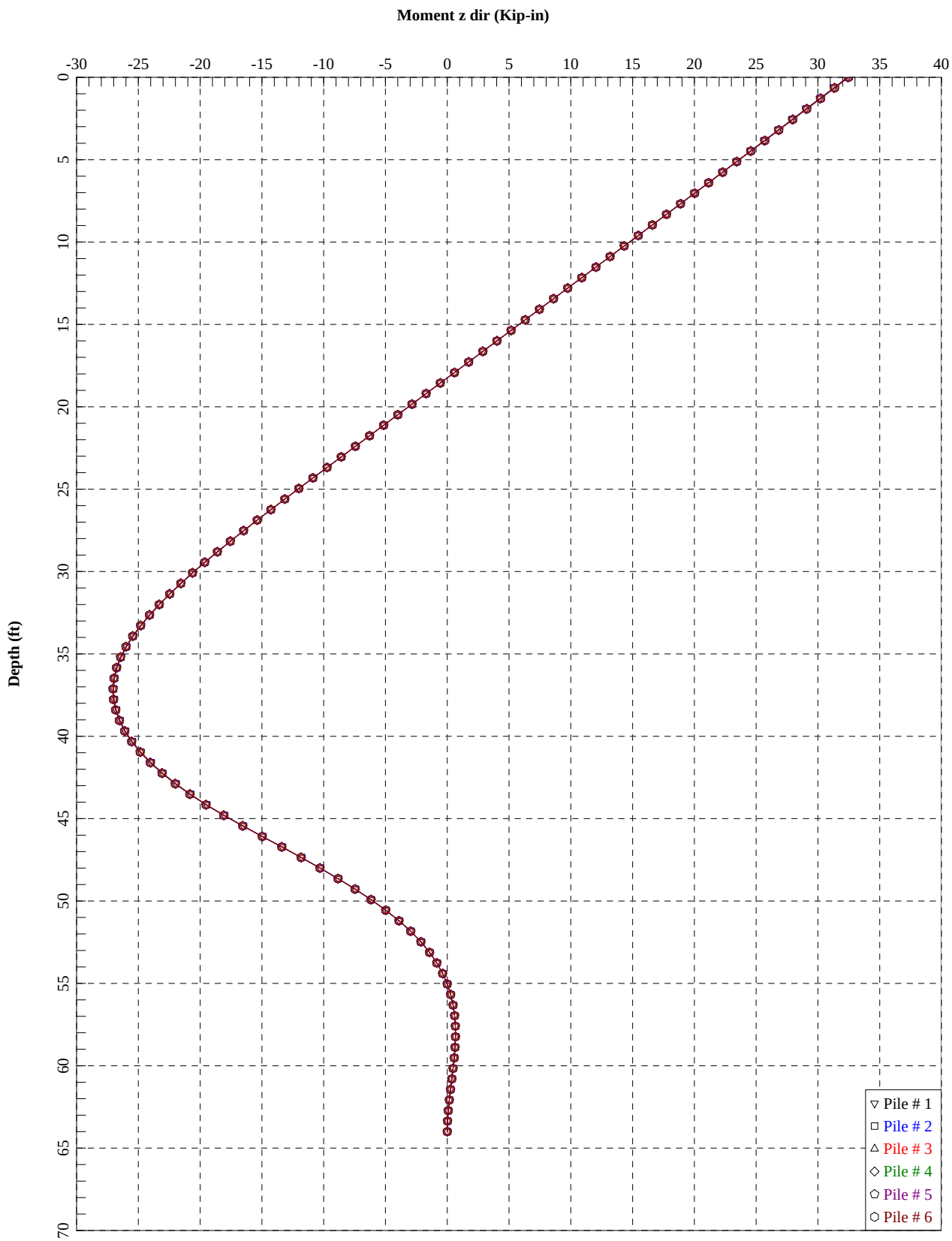
Load Case # 10

Extreme Event I case 2A



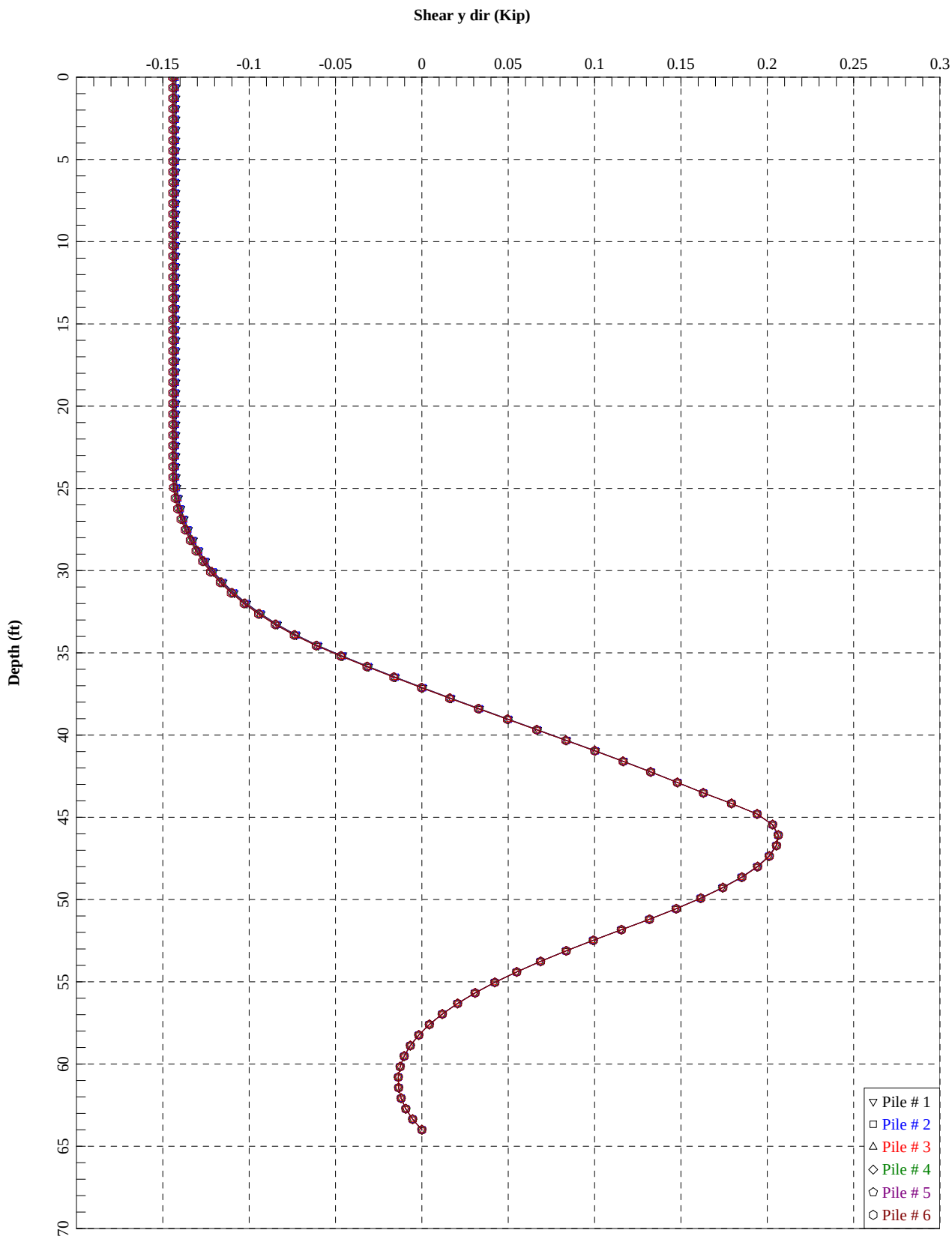
Load Case # 10

Extreme Event I case 2A



Load Case # 10

Extreme Event I case 2A



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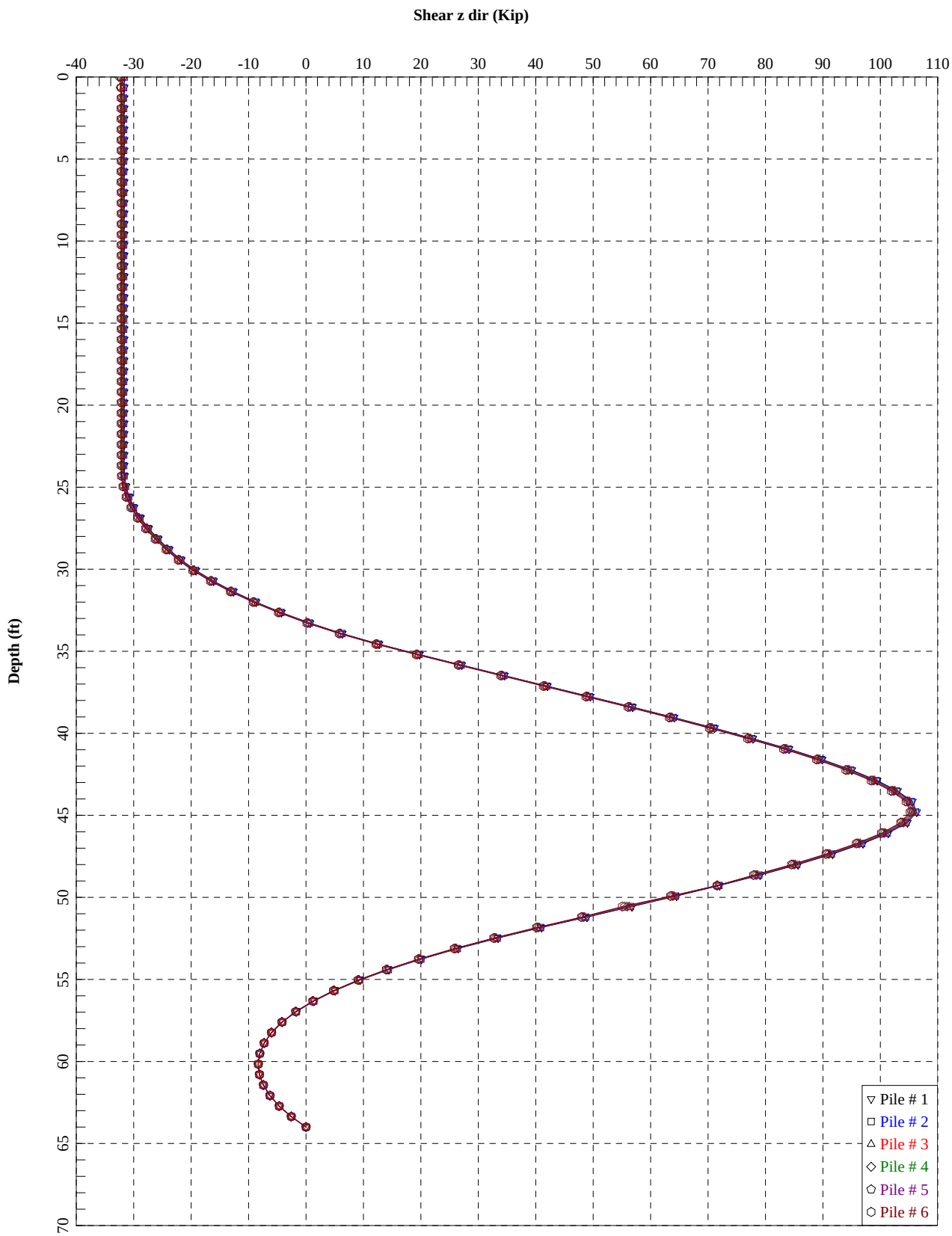
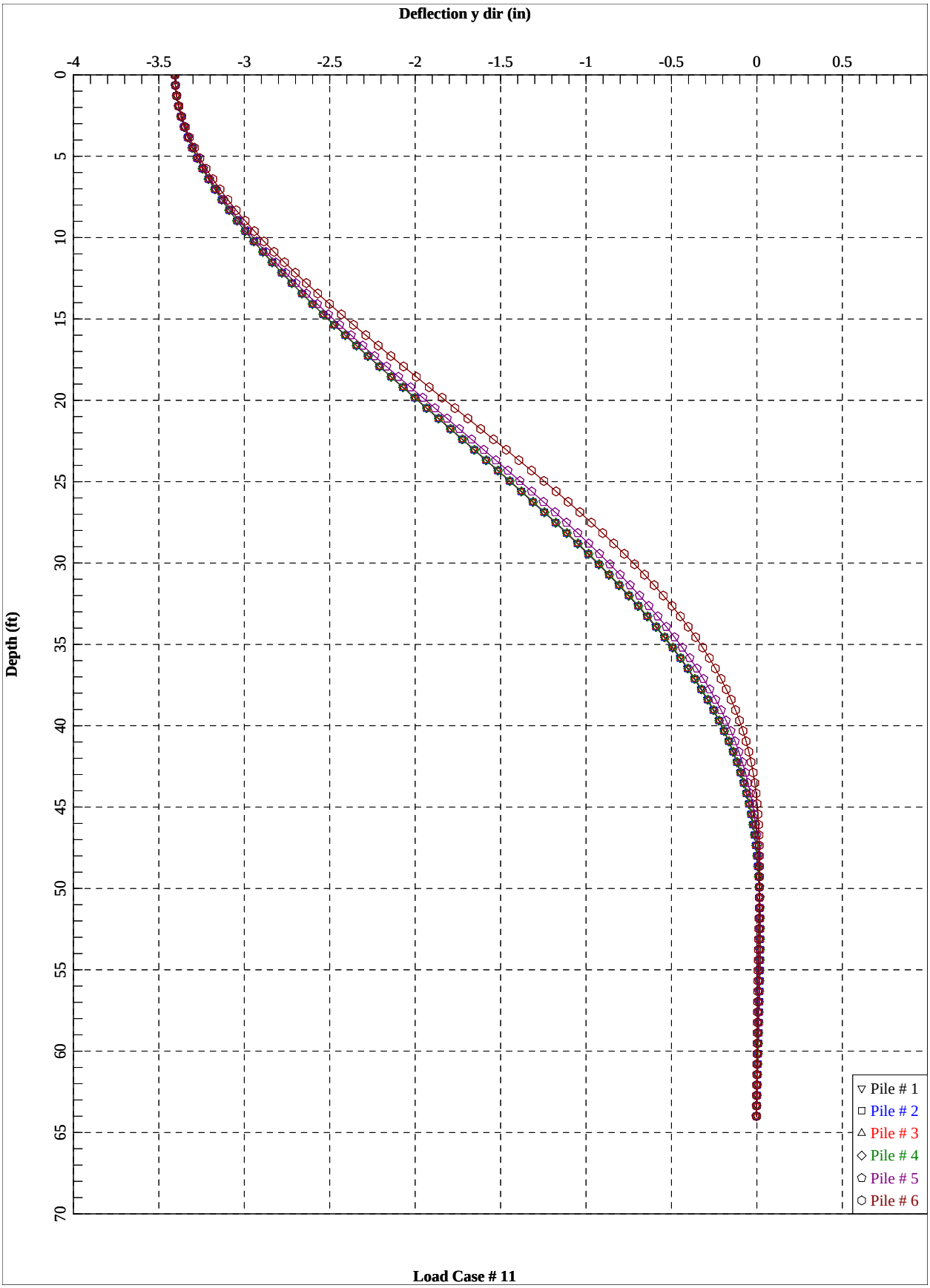
Extreme Event I case 2A

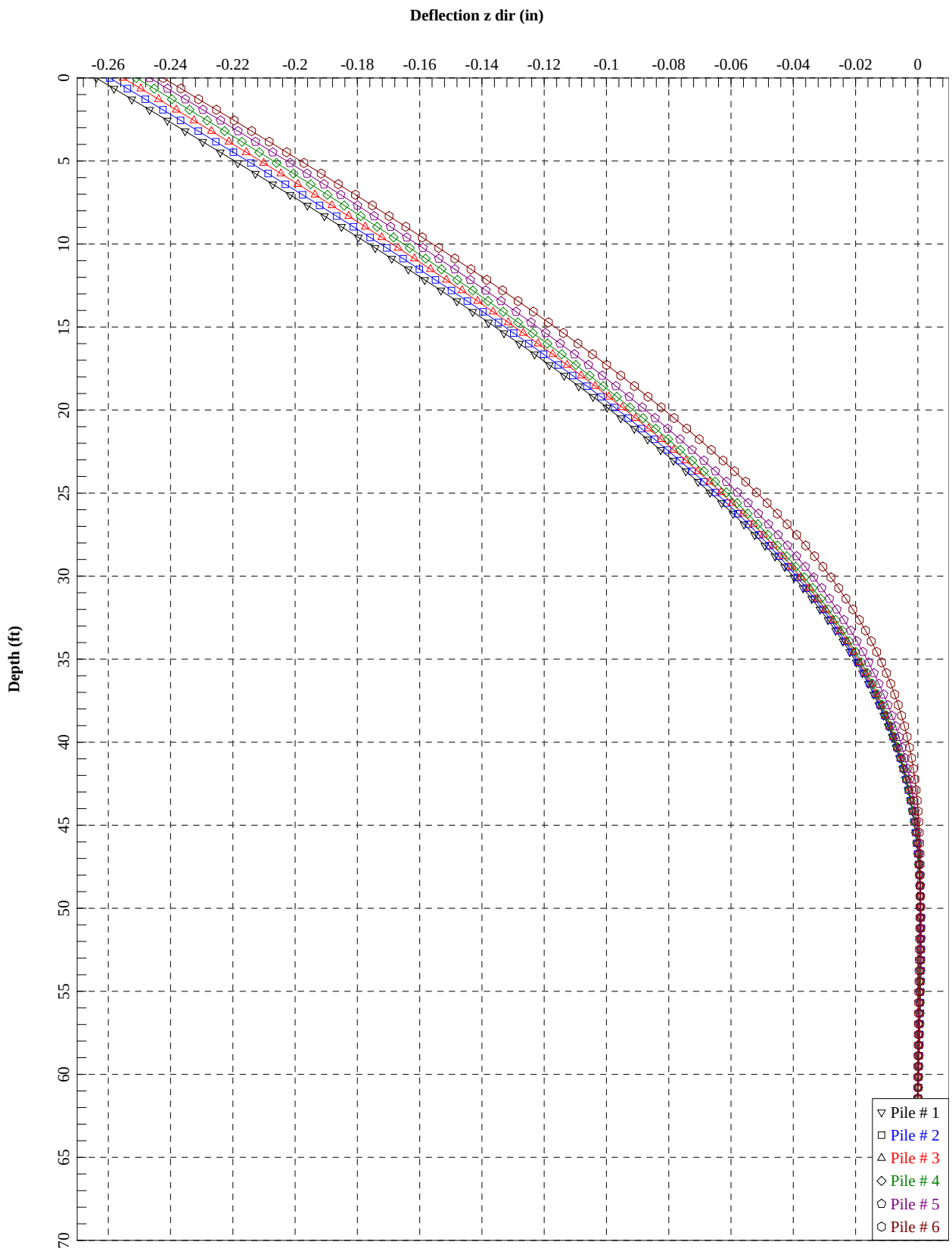


Load Case # 10

Extreme Event I case 2A

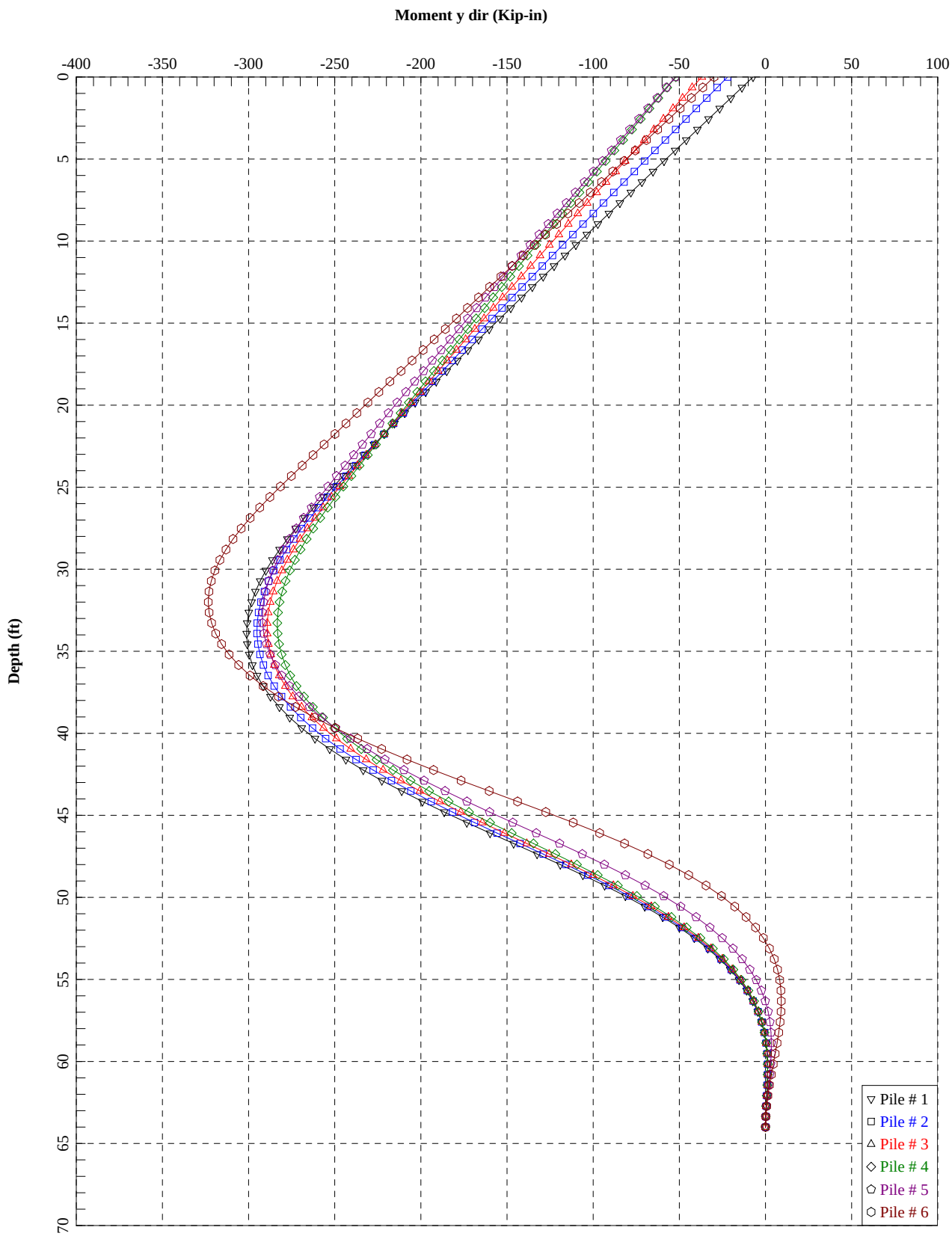


Extreme Event I case 1B



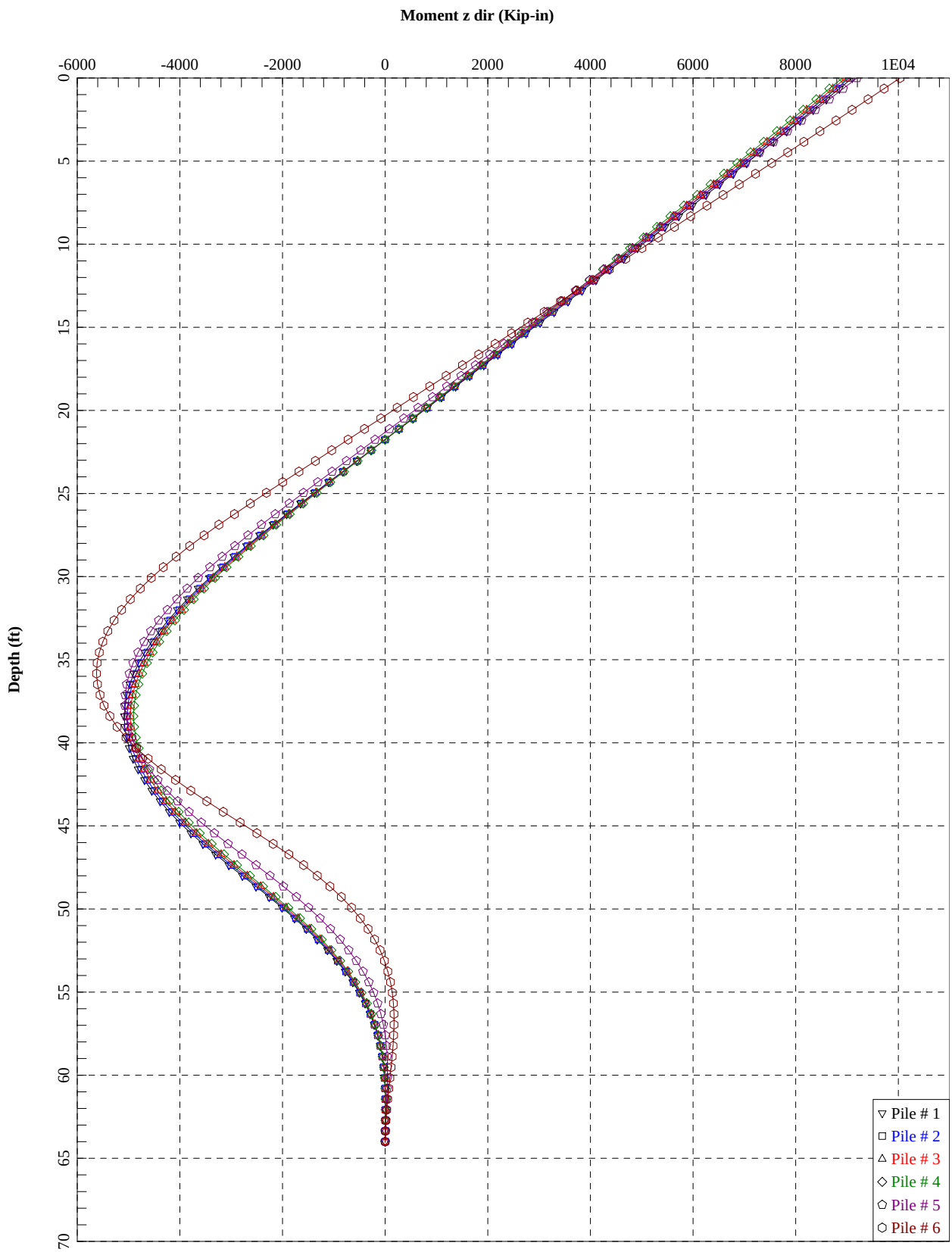
Load Case # 11

Extreme Event I case 1B



Load Case # 11

Extreme Event I case 1B



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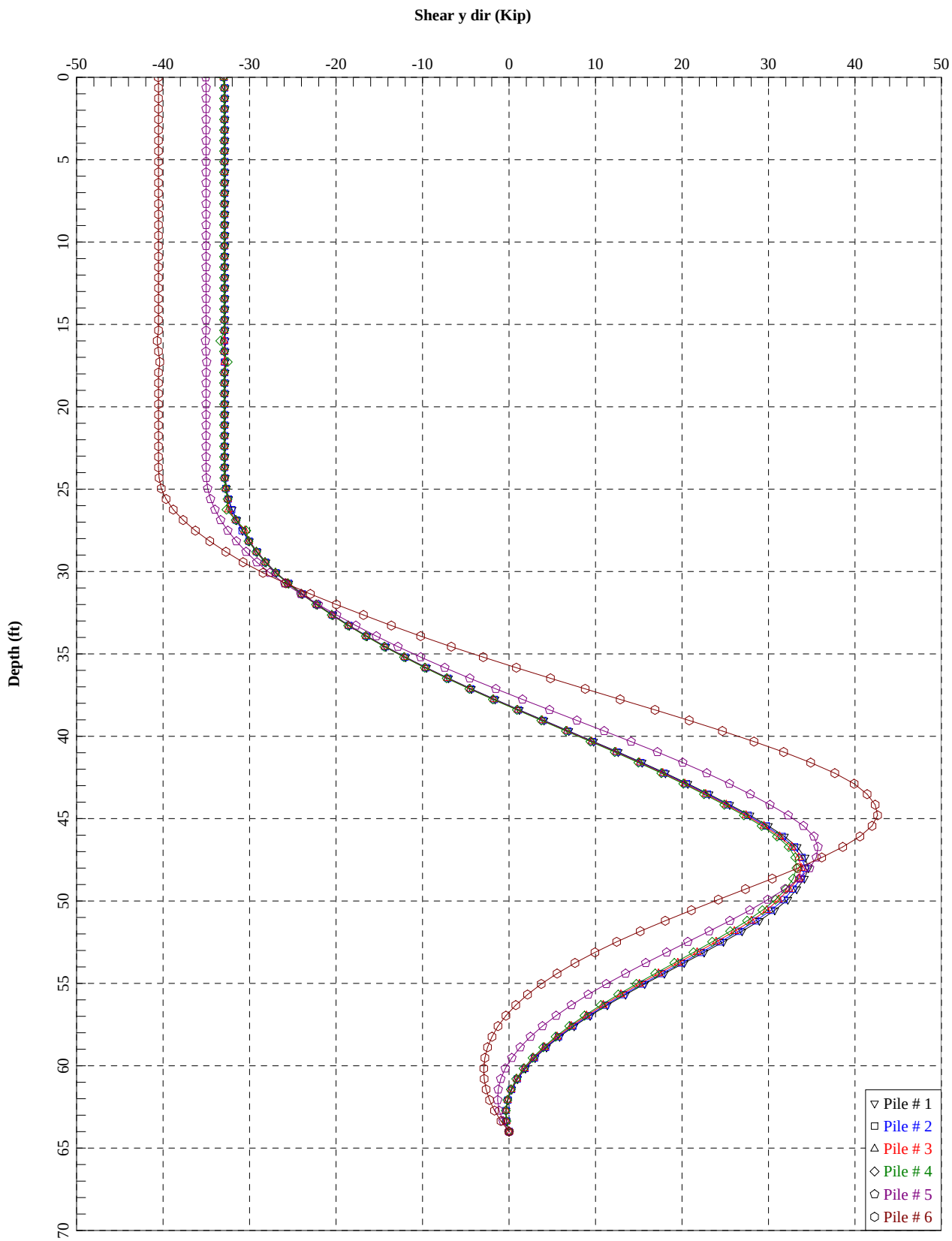

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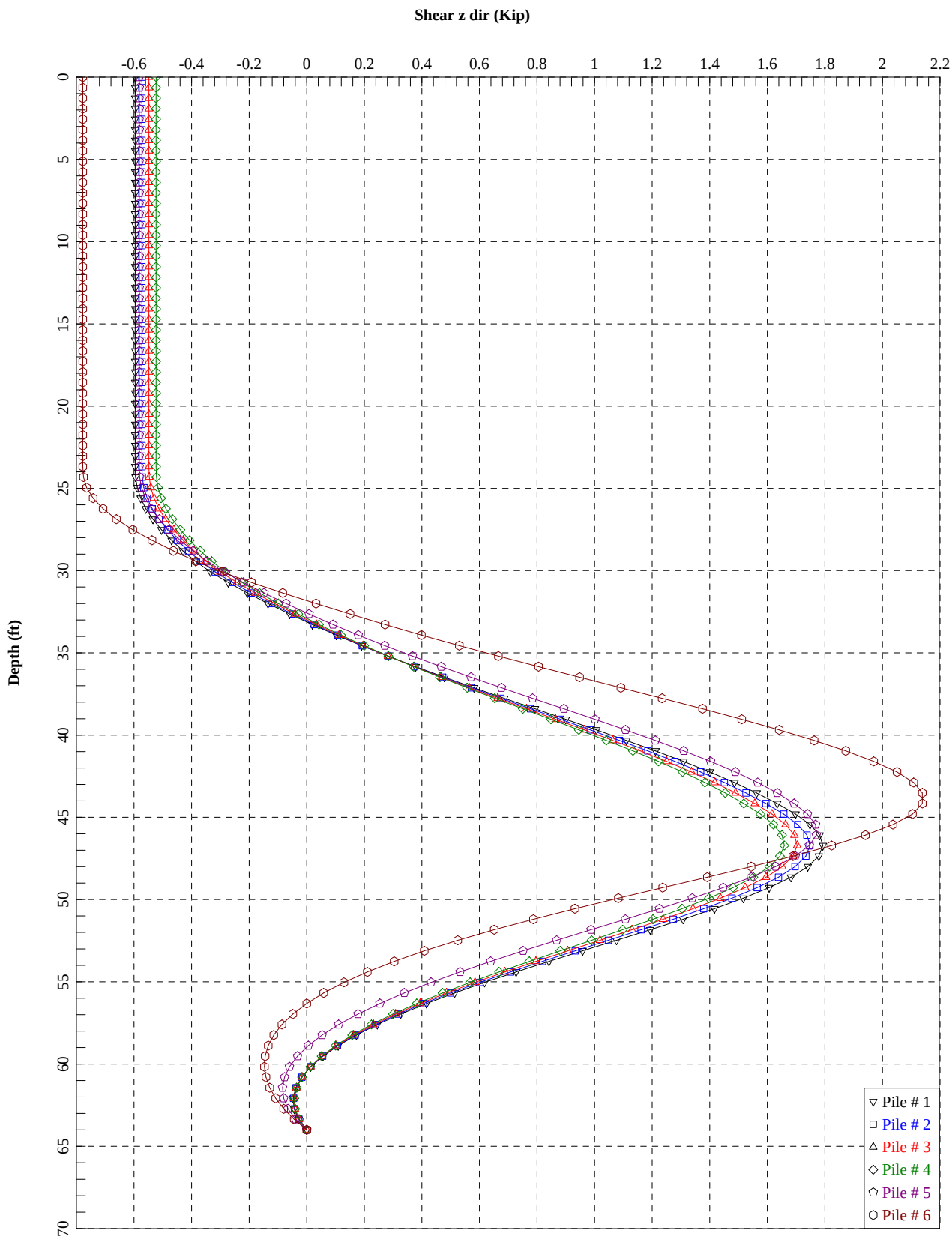

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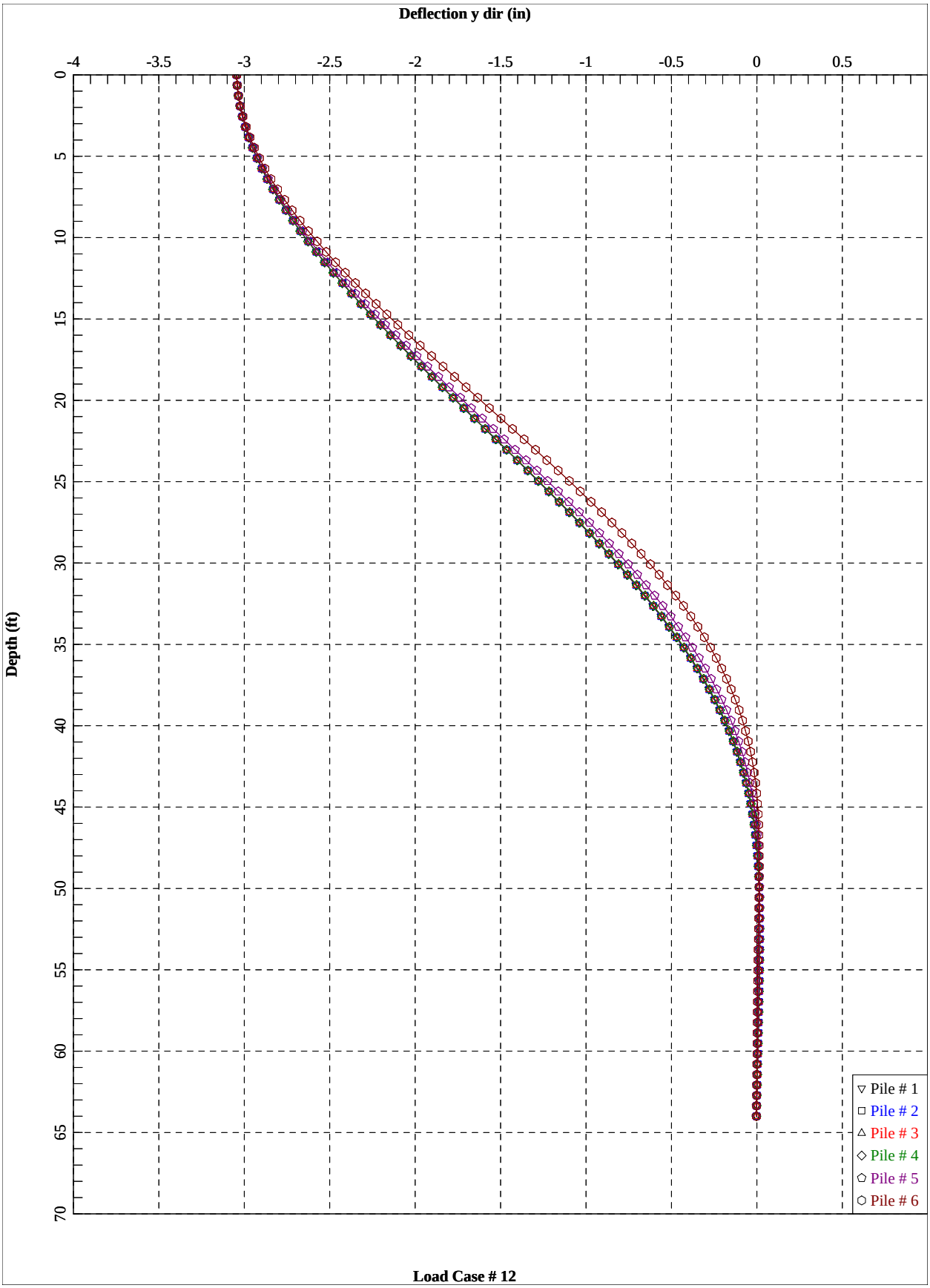
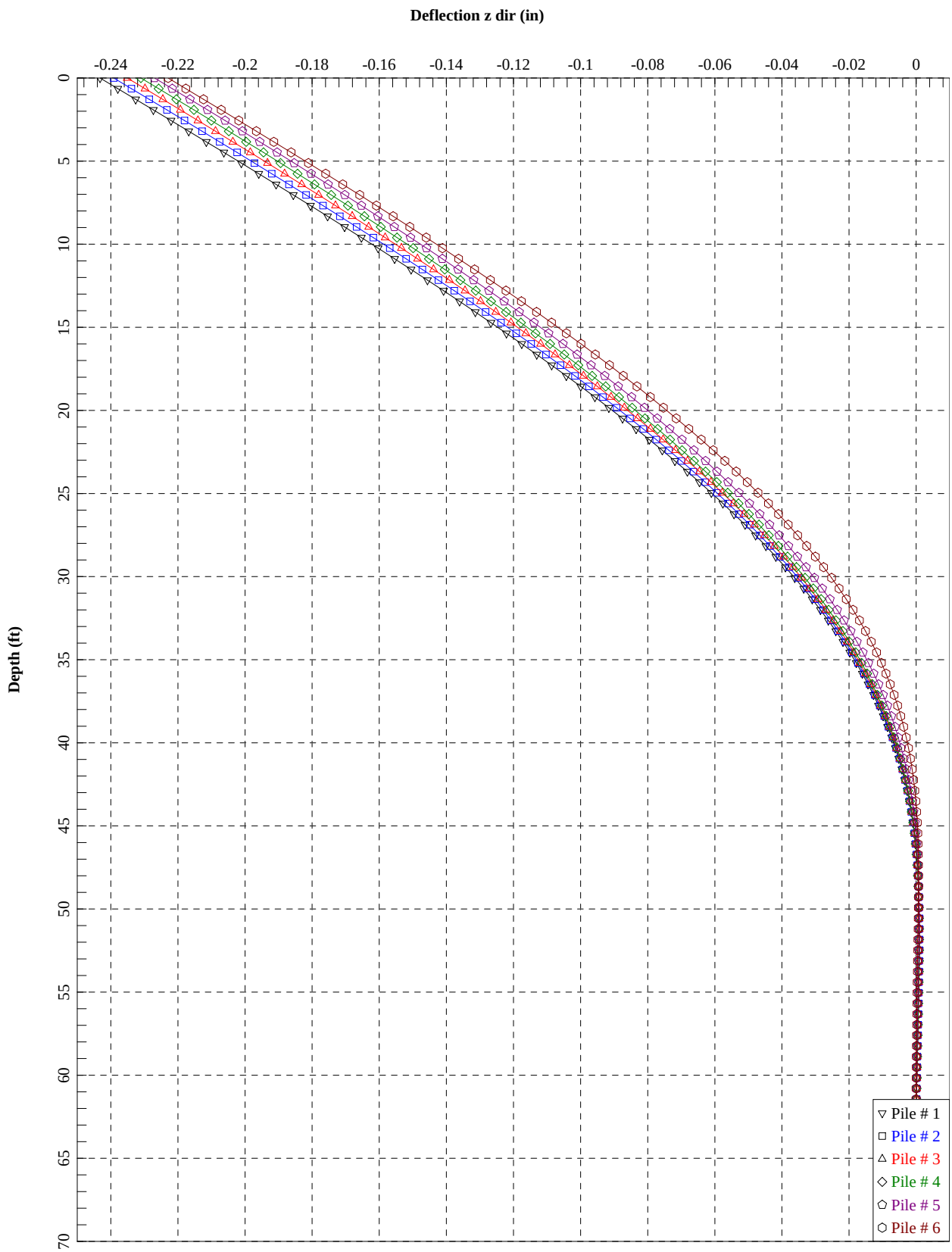
Extreme Event I case 1B

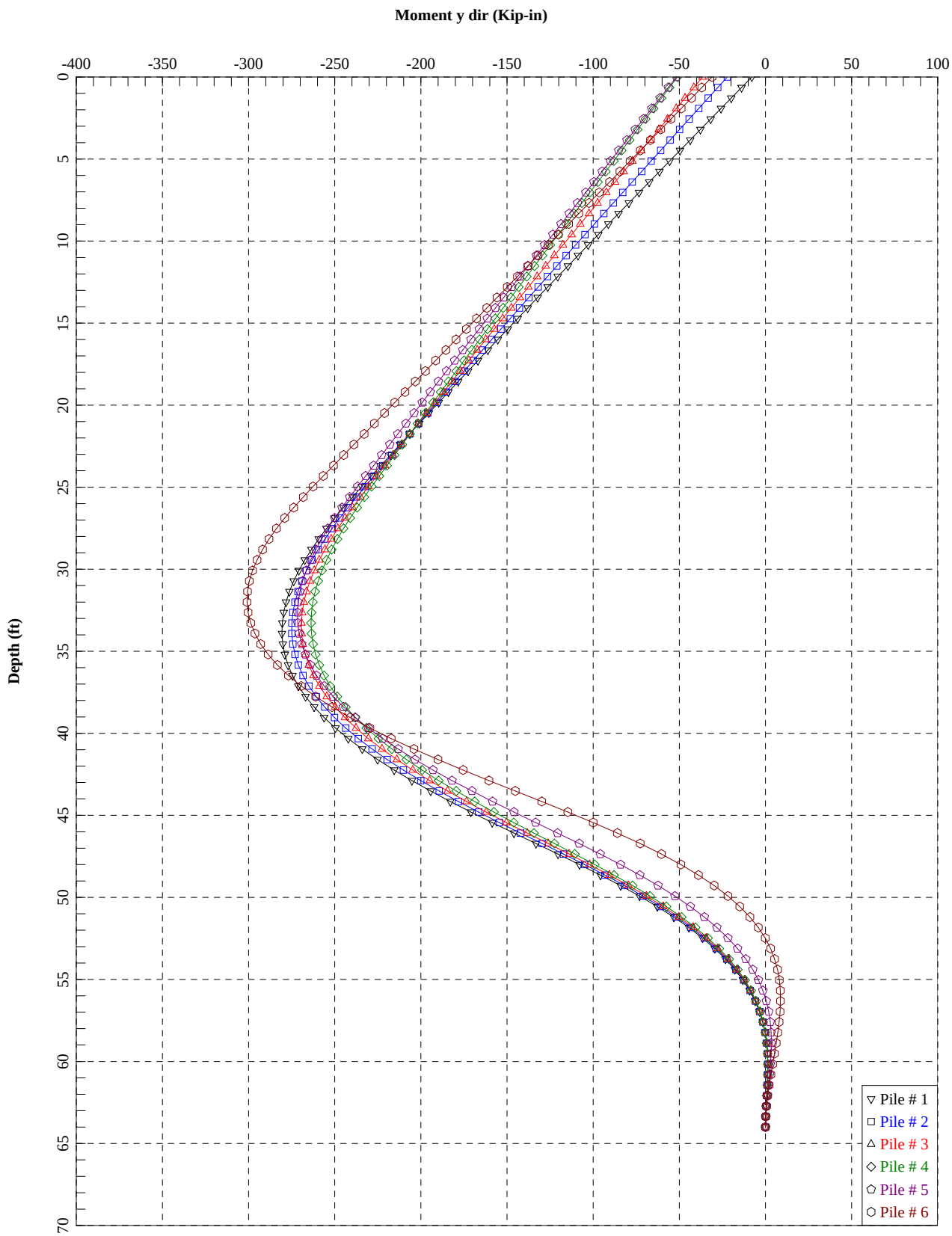


Extreme Event I case 2B



Load Case # 12

Extreme Event I case 2B



Load Case # 12

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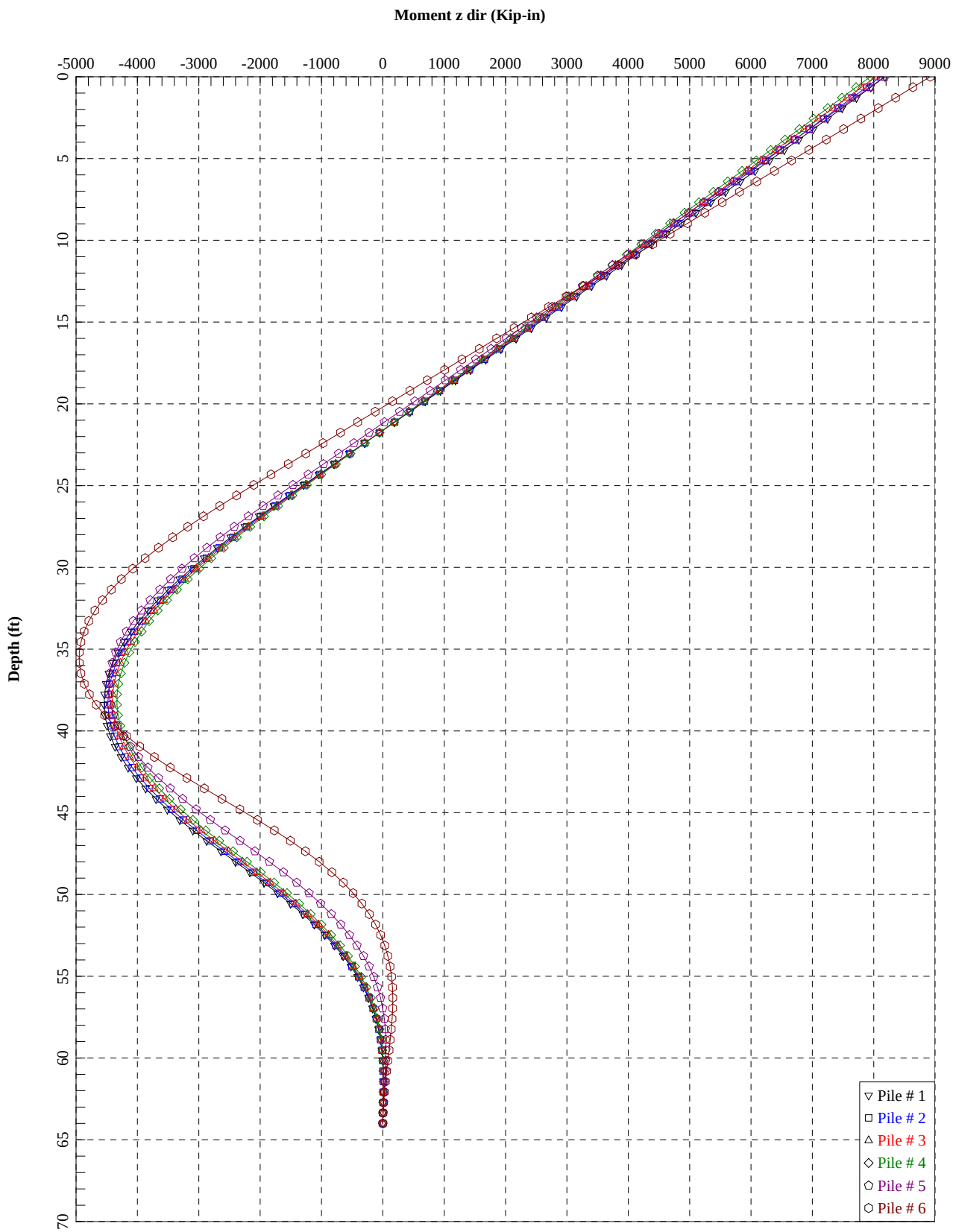
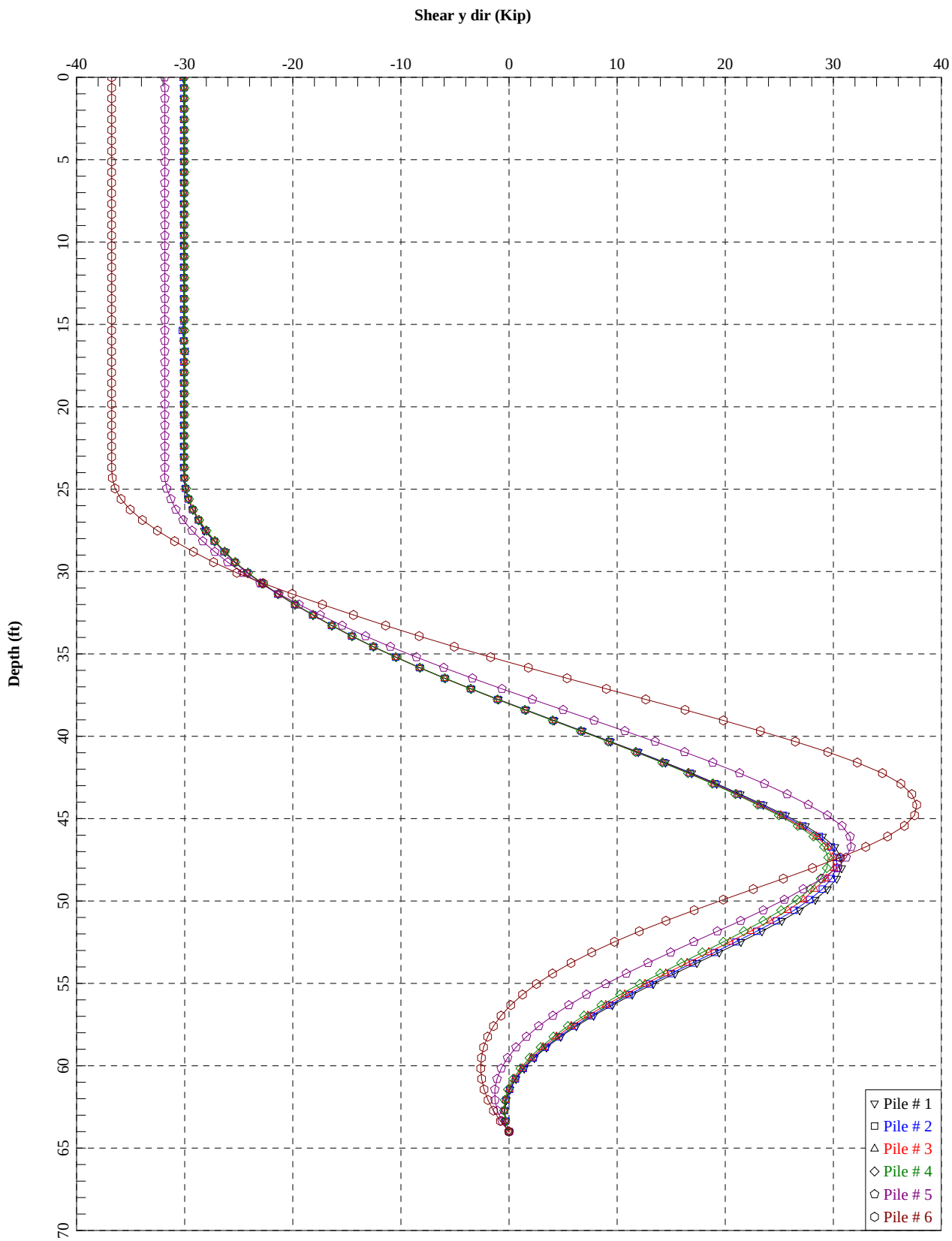


Load Case # 12

Extreme Event I case 2B



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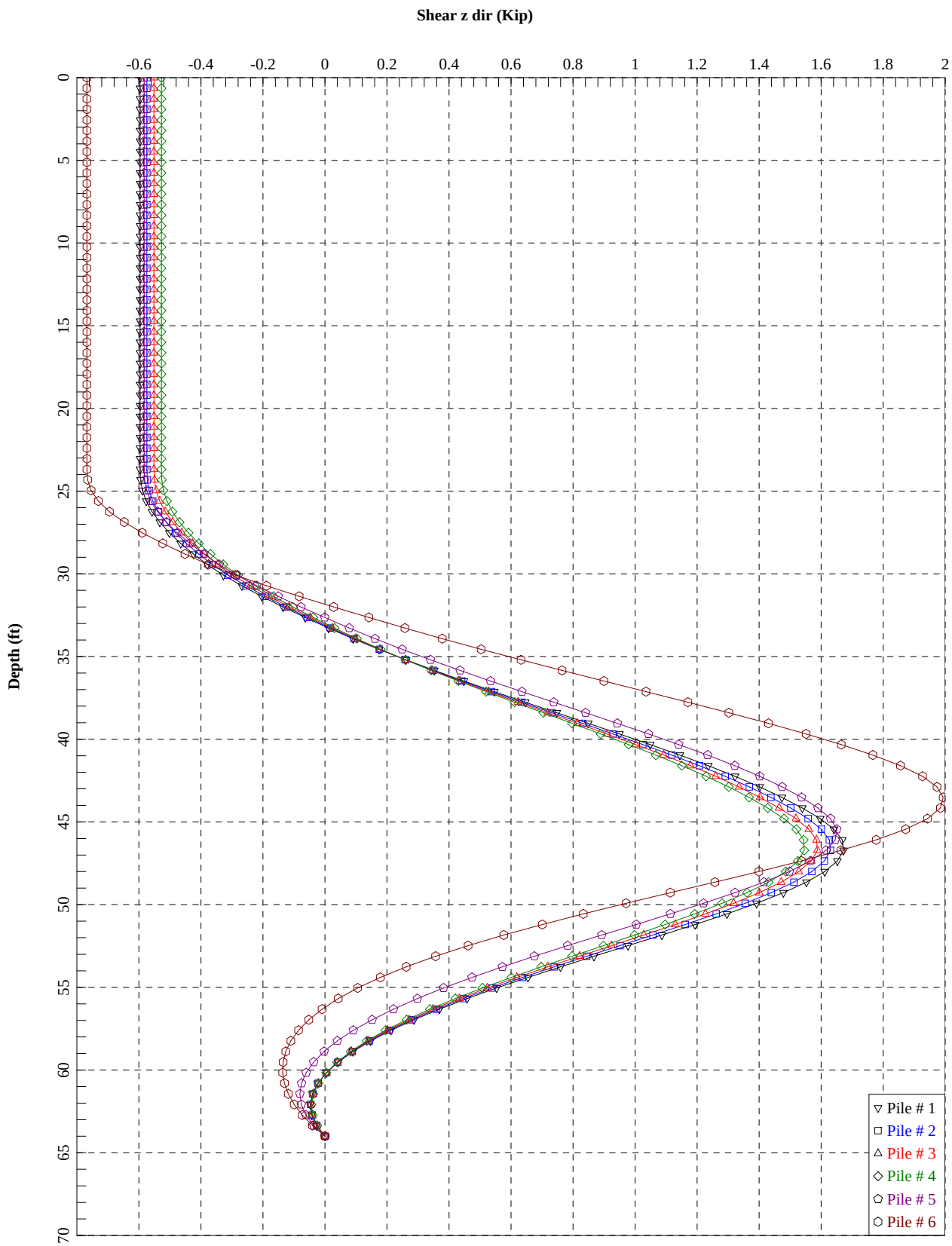
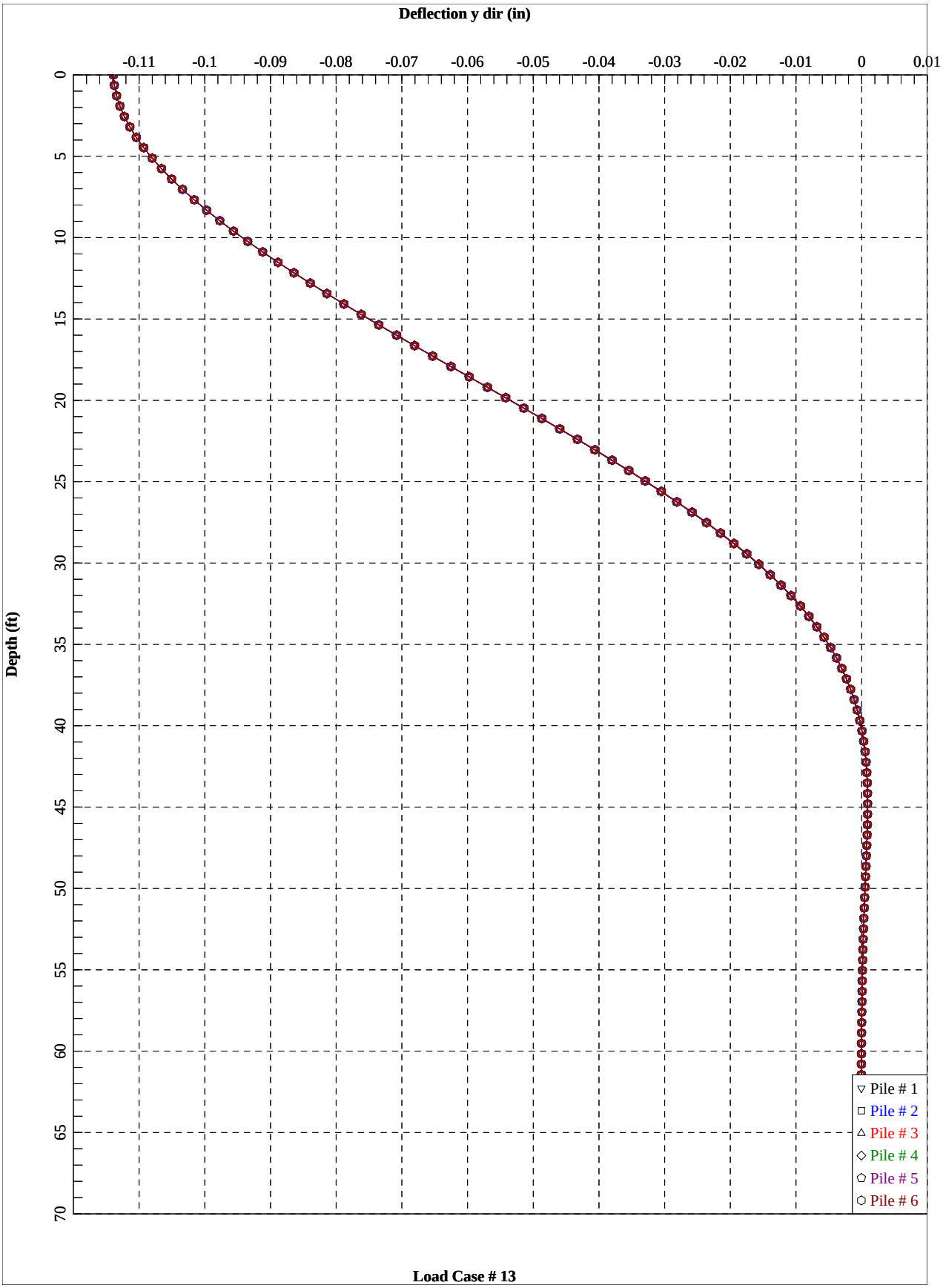
Extreme Event I case 2B

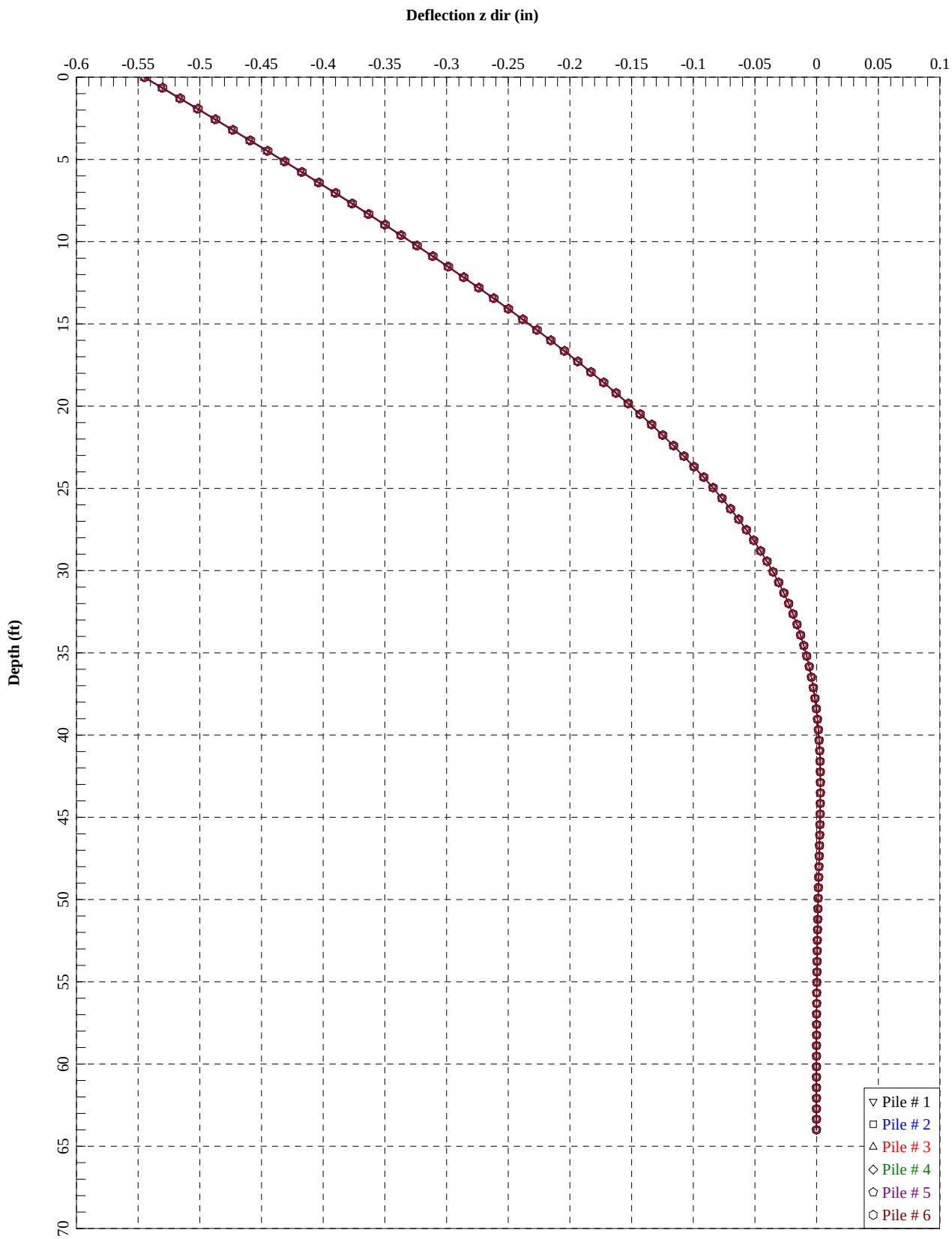


Load Case # 12

Extreme Event I case 2B



Service I case 1



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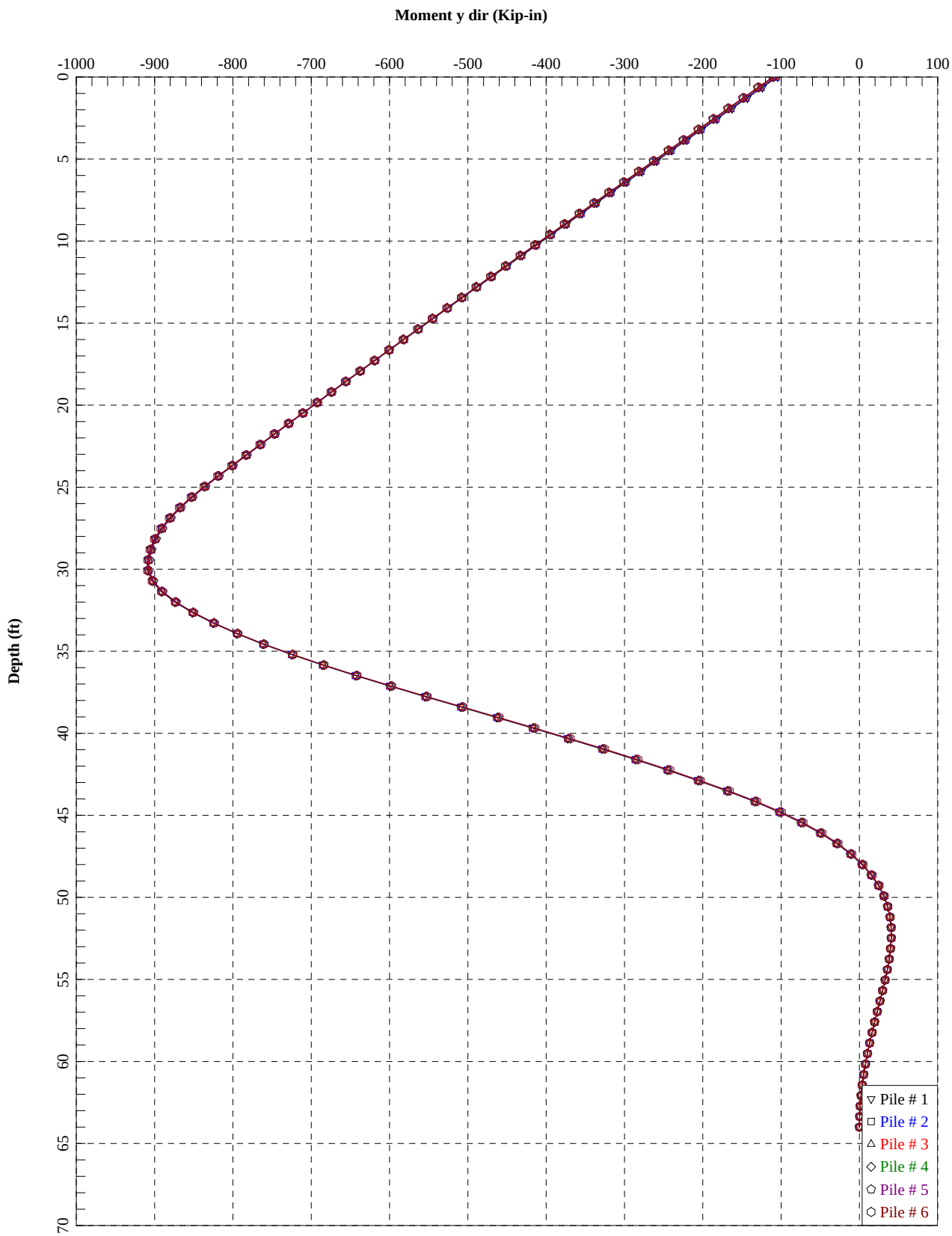

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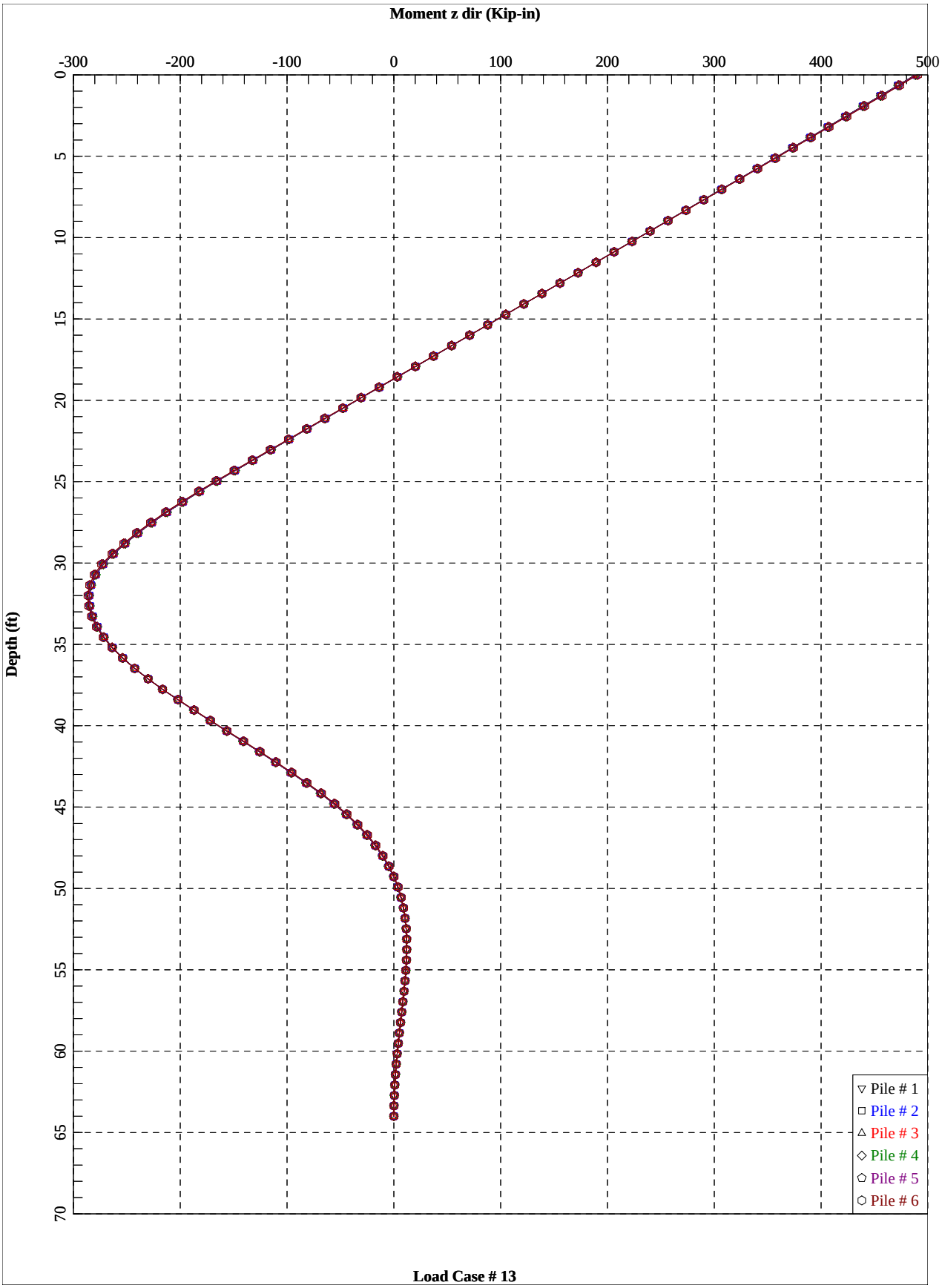

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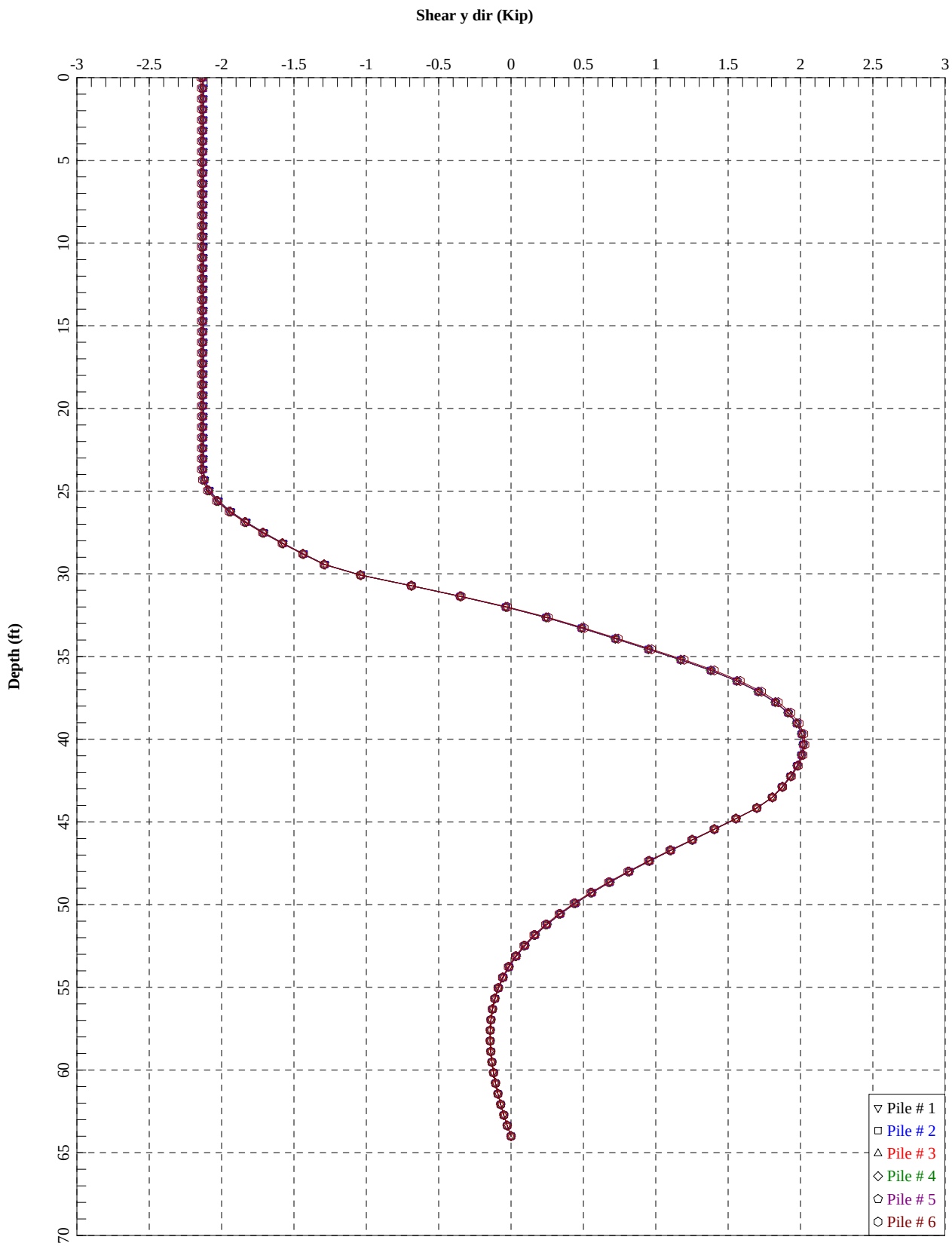

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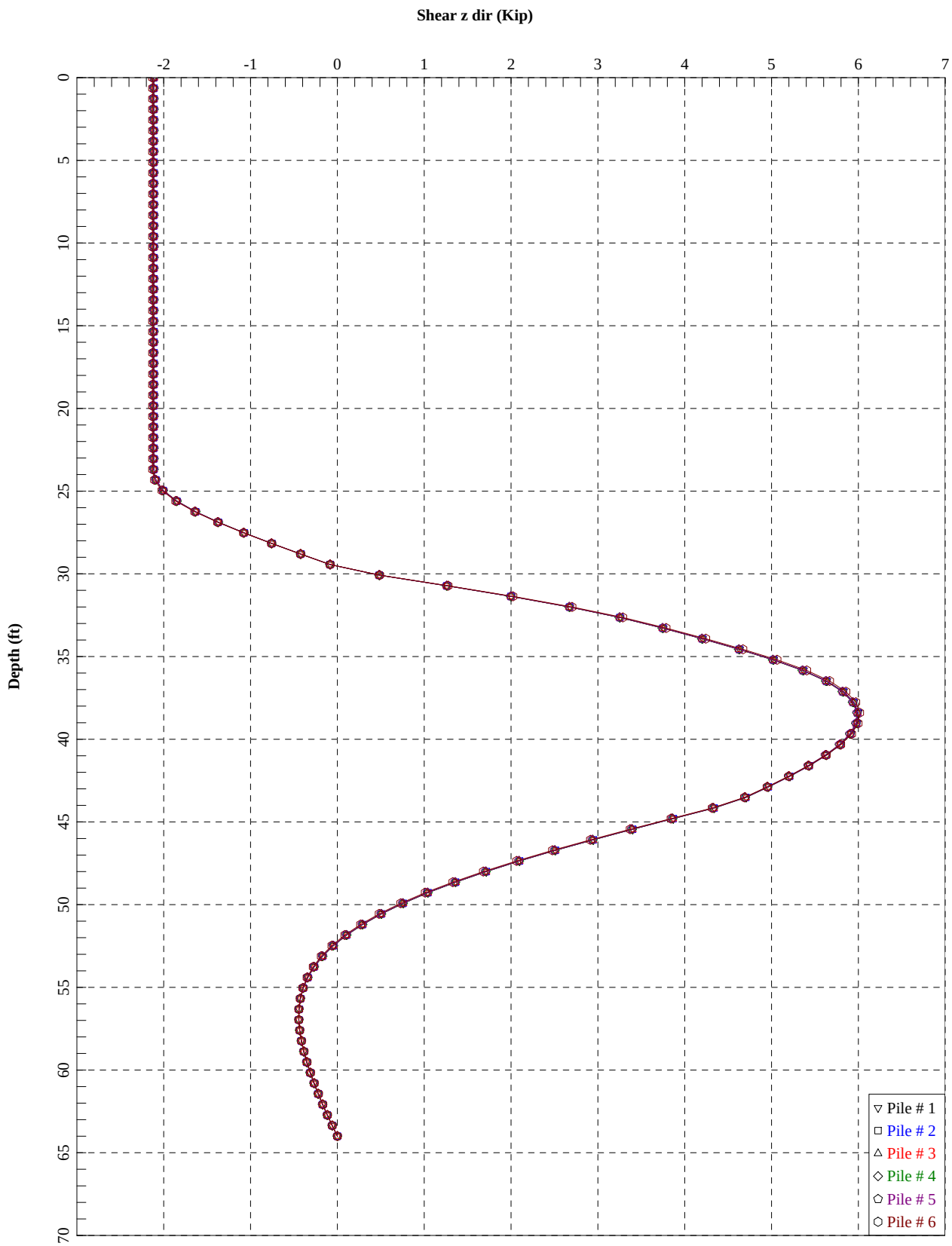

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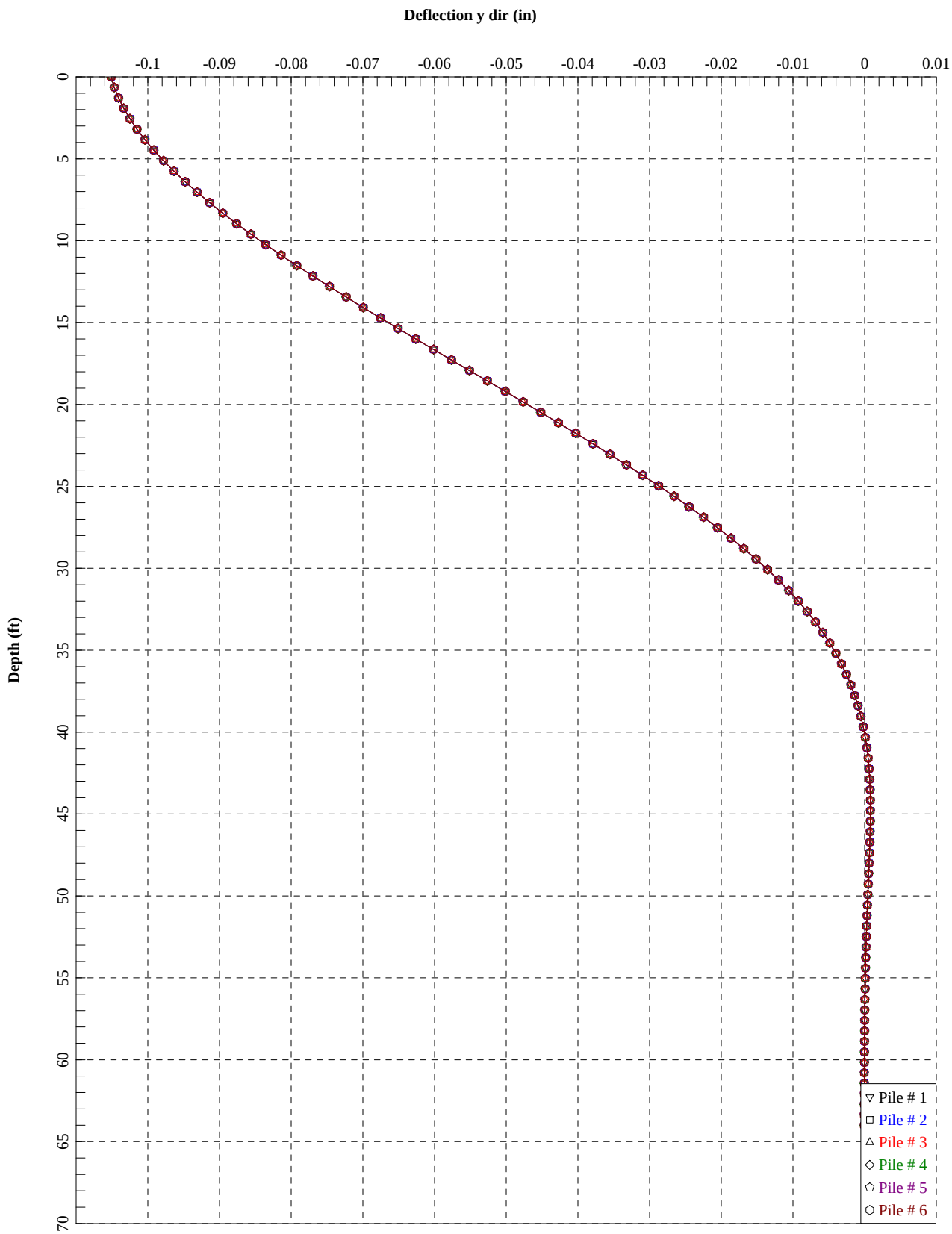

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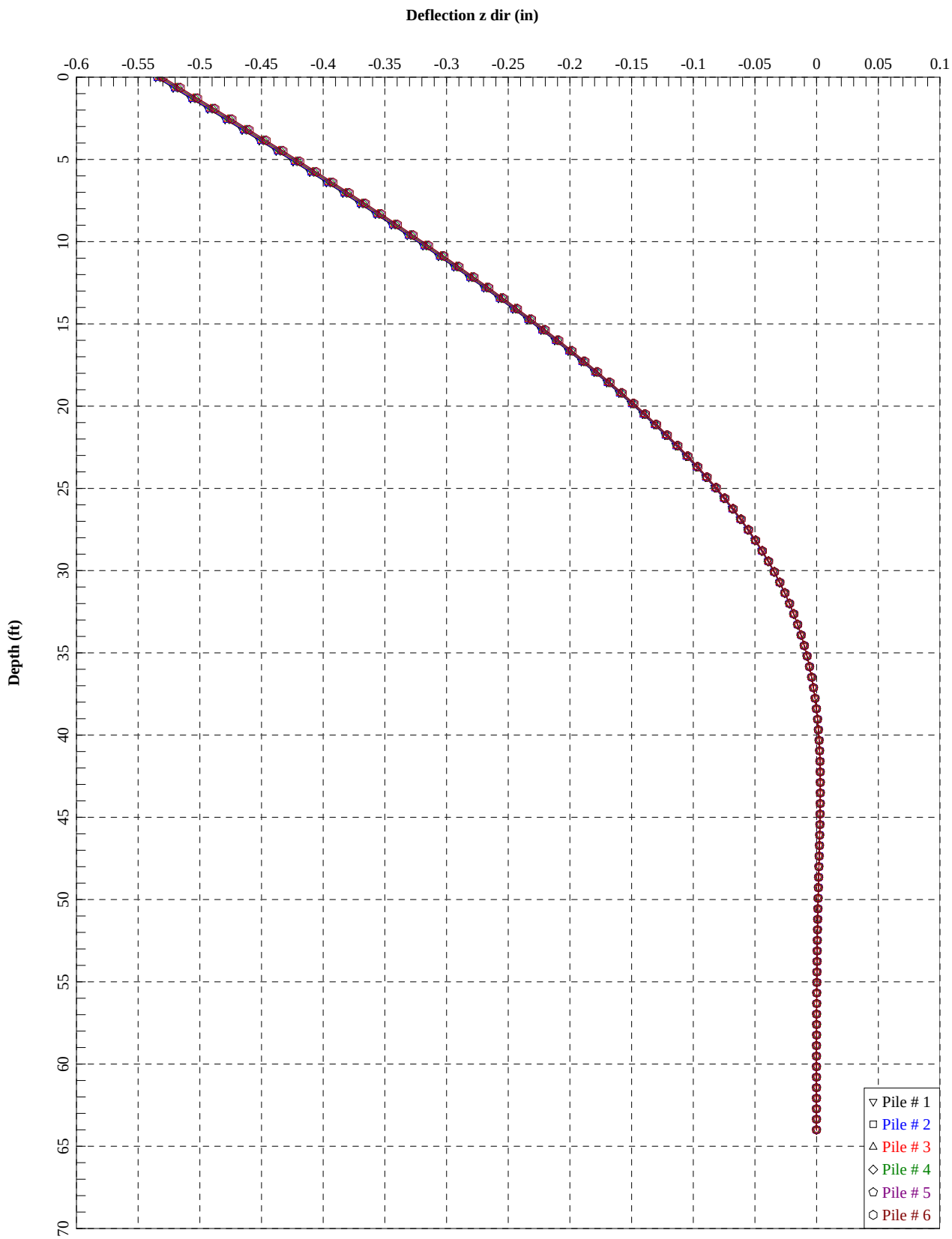

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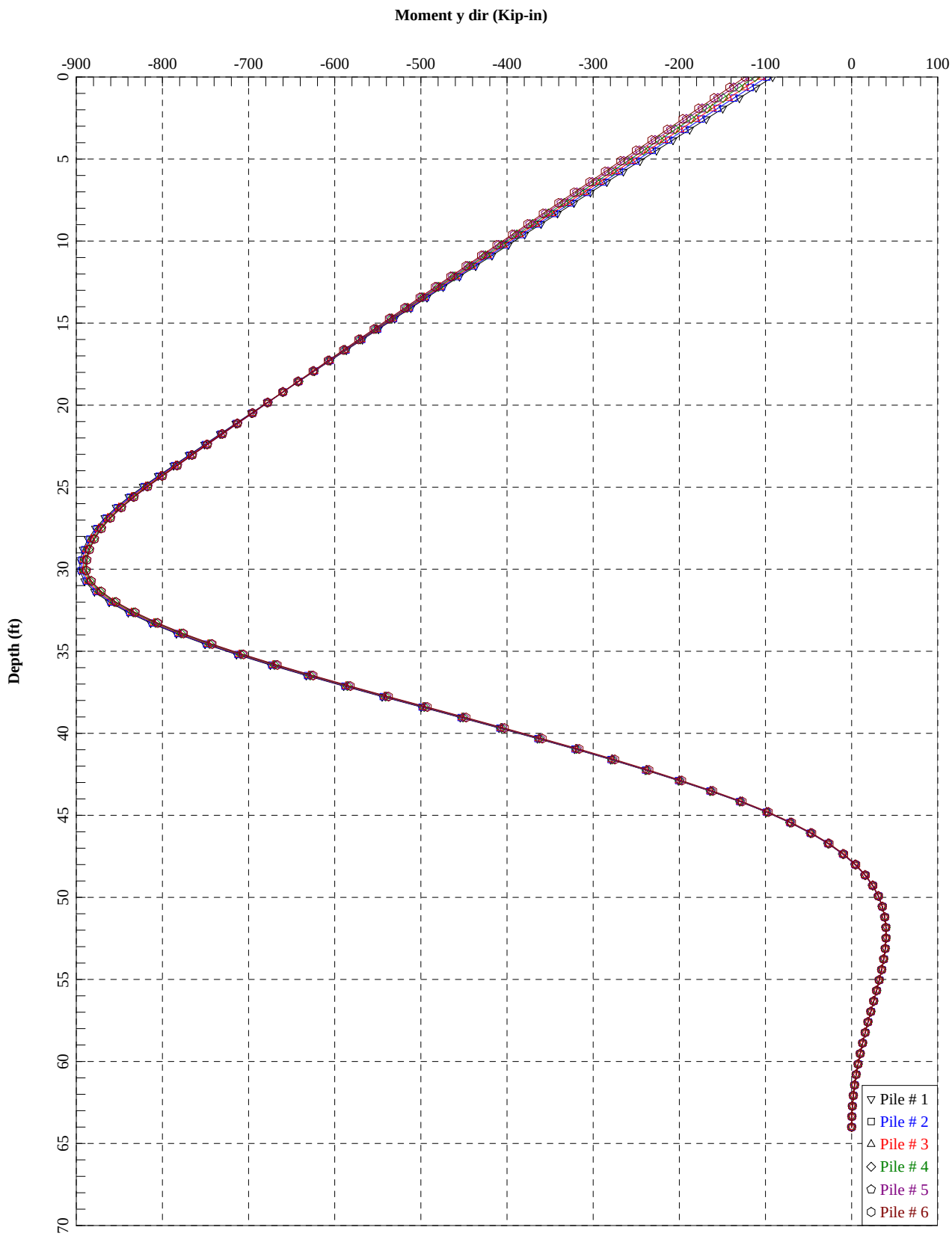

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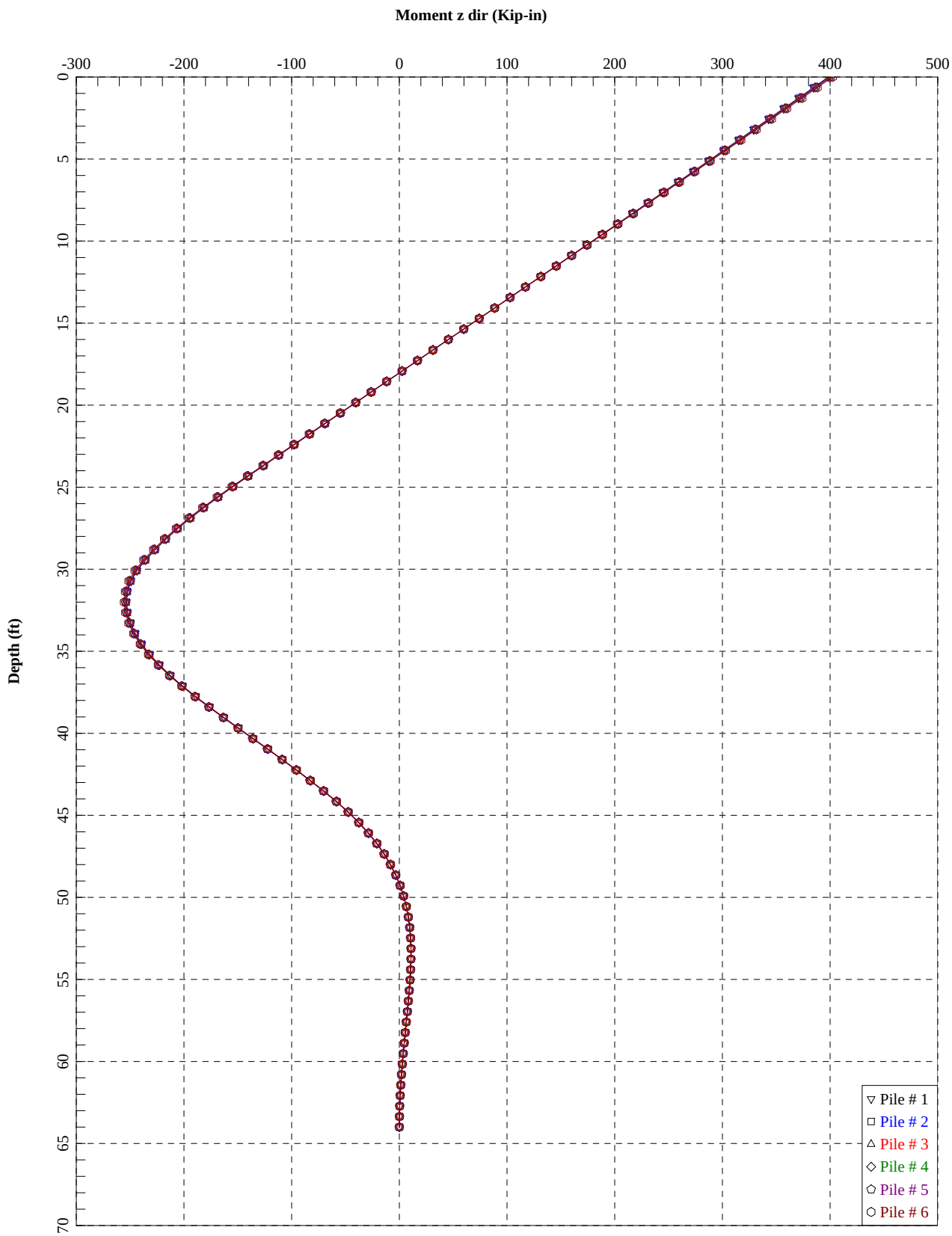

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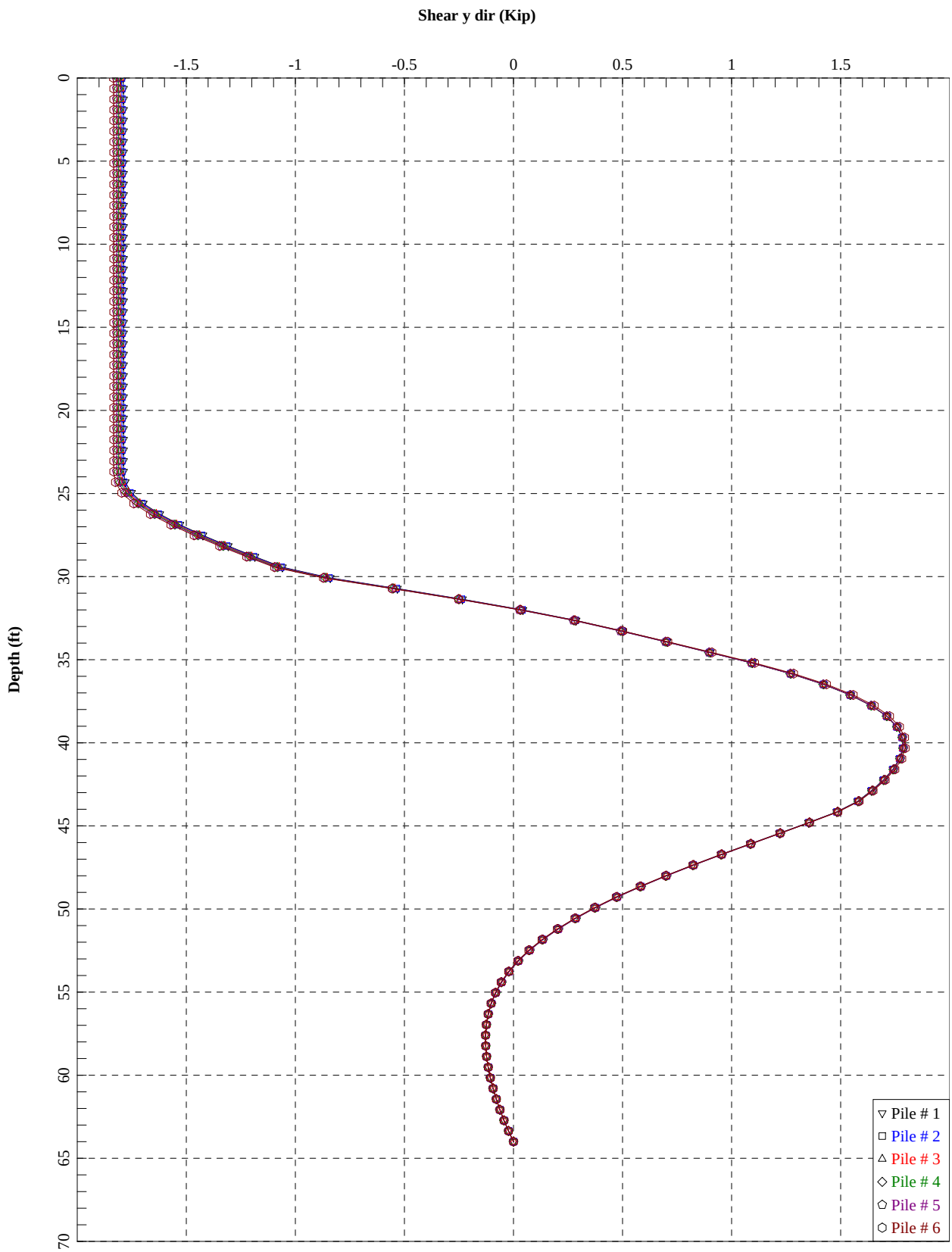

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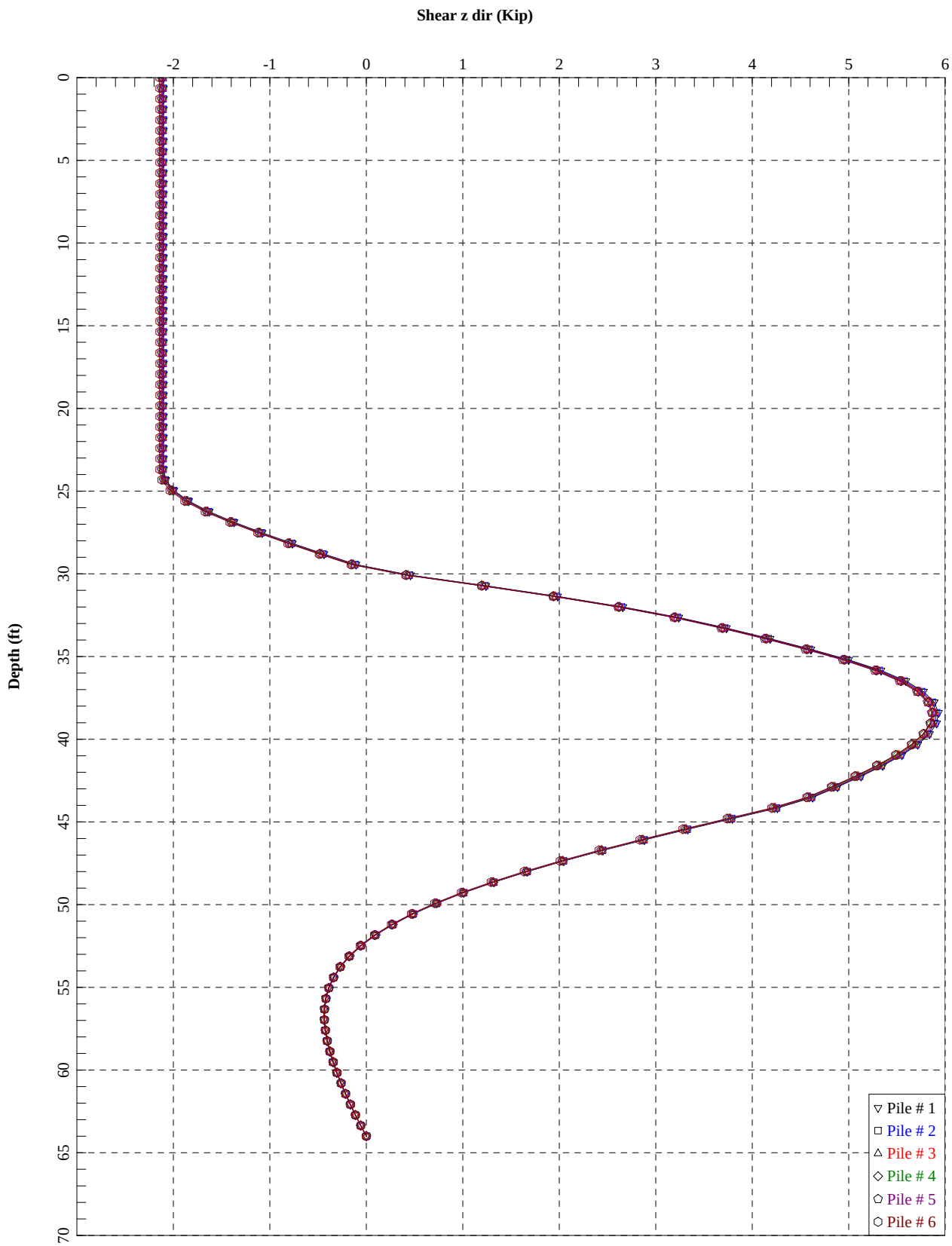

Load Case # 14

Service I case 2

Pine Point Scarborough ME Pier

Hammer Information

Select from following list [3/21/2012-2003]: ID: 11

ID	Name	Type	Ram Wt	Energy/Power
10	DELMAG D 25-32	OED	5.5100	66.340
11	DELMAG D 30	OED	6.6000	59.730
12	DELMAG D 30-02	OED	6.6000	66.198

Hammer parameters

Efficiency	0.8			
Pressure	1415	psi	Fixed	100 %
Stroke	9.05	ft	Variable	

Pile material

○ Concrete ◉ Steel ○ Timber

Cushion Information

	Hammer	Pile	
Area	227.	0.	in^2
Elastic Modulus	530.	0.	ksi
Thickness	2.	0.	in
C.O.R.	0.8	0.	
Stiffness	0.	0.	kips/in
Helmet Weight	1.7		kips

Pile Information

Length	62.	ft	Auto	Segments
Penetration	40.	ft	Auto.	S-Length
Section Area	45.89	in^2	Auto.	S-St, Wt
Elast Modulus	29000.	ksi	0	Splices
Spec Weight	492.0	lb/ft^3		
Toe Area	452.38	in^2	Pile Type:	
Perimeter	6.283	ft	Pipe	
Pile Size	24.	in		

Ultimate Capacities (up to 10)

kips

1	450.0	6	500.0
2	460.0	7	510.0
3	470.0	8	520.0
4	480.0	9	530.0
5	490.0	10	540.0

Incr. 0 Action >>

Soil Parameters

2nd Toe - No

Quake

Shaft	0.1	in	Const
Toe	0.04	in	

Damping

Shaft	0.05	s/ft	Const
Toe	0.15	s/ft	Smith

Shaft Resistance

Percentage 10 %

100%

Dist. Shape Num 0.0

Residual Stress Analysis: No

Nobis Engineering, Inc.
Pine Point Scarborough ME Pier

09-Jul-2015
GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
450.0	27.89	0.73	4.1	7.08	24.52
460.0	28.32	0.69	4.2	7.12	24.62
470.0	28.68	0.67	4.4	7.16	24.69
480.0	28.93	0.72	4.5	7.20	24.80
490.0	29.33	0.78	4.6	7.23	24.90
500.0	29.70	0.82	4.7	7.27	24.98
510.0	30.05	0.87	4.9	7.31	25.07
520.0	30.33	0.95	5.0	7.35	25.16
530.0	30.60	1.03	5.1	7.38	25.26
540.0	31.01	1.09	5.3	7.42	25.41

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MSE Embankment Downdrag on Abutment Piles

Objective: Calculate the downdrag forces on the abutment piles due to the MSE embankment using the Nordlund / Thurman Method.

References:
1) AASHTO LRFD Bridge Design Specifications, 2014.
2) Borings Performed by Nobis
3) Drawings dated June 12, 2015 provided by CHA.
4) MaineDOT Bridge Design Guide: 2003 Edition.

Assumptions:
1) Downdrag does not occur in the Glacial Till layer.
2) Downdrag begins at bottom of Pile Cap.
3) MSE embankment has $\gamma = 130$ pcf & $\phi = 34°$.
4) Fill & Silty Sand layer has $\gamma = 125$ pcf & $\phi = 32°$.
5) Groundwater table is at bottom of MSE.
6) Maximum MSE embankment stress is based on an influence factor (I) of 0.5 for the side of an embankment.
7) Worst Case Soil Condition is at East Abutment.

Solution: Nominal Unit side friction, q_s:

$$q_s = K_\delta C_F \sigma_v' \frac{\sin(\delta + \omega)}{\cos(\omega)} \quad (10.7.3.8.6f\text{-}1, \text{Ref. } 1)$$

K_δ = coeff. of lateral earth pressure at midpoint of soil layer (Figs. 10.7.3.8.6f-1 thru 4, Ref. 1)

C_F = Correction factor for K_δ when $\delta \neq \phi$ (Fig. 10.7.3.8.6f-5, Ref. 1)

σ_v' = Effective overburden stress at midpoint of soil layer (ksf)

δ = friction angle between pile and soil obtained from Fig. 10.7.3.8.6f-6, Ref. 1 (Degrees)

ω = angle of pile taper from vertical (Degrees)

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Downdrag (cont.)

HP 12 x 53 piles have an area of $A = 15.5\ in^2 \approx 0.1\ ft^2$

$$V = A\left(\frac{1\ ft}{ft}\right) = (0.1\ ft^2)\left(\frac{1\ ft}{ft}\right) = 0.1\ ft^3/ft$$

for $\phi = 30°$, $V = 0.1\ ft^3/ft$, $\omega = 0$,

$K_\delta = 0.85$ (Fig. 10.7.3.8.6f-2, Ref. 1)

for $\phi = 35°$, $V = 0.1\ ft^3/ft$, $\omega = 0$,

$K_\delta = 1.15$ (Fig. 10.7.3.8.6f-2, Ref 1)

Using interpolation:

- when $\phi = 32°$, $K_\delta = 0.97$
- when $\phi = 34°$, $K_\delta = 1.03$

- Based on Fig. 10.7.3.8-6f-6, Ref. 1, $\delta/\phi_f = 0.75$

- Based on Fig. 10.7.3.8-6f-5, Ref 1:
  - when $\phi = 32°$, $C_F = 0.90$
  - when $\phi = 34°$, $C_F = 0.87$

For $\phi = 32°$, $\delta = 0.75\,\phi_f = 0.75(32°) = 24°$

For $\phi = 34°$, $\delta = 0.75\,\phi_f = 0.75(34°) = 25.5°$

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Downdrag (cont.)

- Effective Overburden Stress at Midpoint of MSE Embankment:

  Top of MSE Embankment El. = 40.8 ft
  Bottom of Pile Cap El. = 31.5 ft (East Abutment) Ref. 3
  Bottom of MSE Block El. = 7 ft

$$\sigma'_v = (0.5)(130\,pcf)\left(40.8\,ft - \left(\frac{31.5\,ft + 7\,ft}{2}\right)\right) = 1400\ psf$$

- Effective Overburden Stress at Midpoint of Fill & Silty Sand:

  Bottom of Silty Sand layer El. = -1.90 (Ref. 2)

$$\sigma'_v = 0.5(130\,pcf)(40.8\,ft - 7\,ft) + (125\,pcf - 62.4\,pcf)\left(\frac{7\,ft + 1.9\,ft}{2}\right)$$

$$= 2197\ psf + 278.5\ psf = 2478\ psf$$

Nominal Unit Side Friction, q_s:

- for MSE embankment ($\phi = 34°$)

$$q_s = K_\delta C_F \sigma'_v \frac{\sin(\delta + \omega)}{\cos(\omega)} = (1.03)(0.87)(1400\,psf)\frac{\sin(25.5° + 0)}{\cos(0)}$$

$$= \underline{540.1\ psf}$$

- for Fill & Silty Sand Layer ($\phi = 32°$)

$$q_s = K_\delta C_F \sigma'_v \frac{\sin(\delta + \omega)}{\cos(\omega)} = (0.97)(0.90)(2478\,psf)\frac{\sin(24° + 0)}{\cos(0)}$$

$$= \underline{879.9\ psf}$$

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Downdrag (cont.)

Downdrag occurs from bottom of pile cap (El. 31.5) to top of Glacial Till (El. -1.9), for a total length of 33.4 feet.

Per C10.7.3.8.6f, Ref. 1, "For H-piles, the perimeter or 'box' area should generally be used to compute the surface area of the pile side.

HP 12 x 53 has a depth of $d = 11.8$ inches $= 0.98$ ft and a width of $b_f = 12.0$ inches $= 1$ ft

- Downdrag Force in MSE embankment:

$$P_1 = q_s (L_1)(2d + 2b_f)$$
$$= (540.1 \text{ psf})(31.5 \text{ ft} - 7 \text{ ft})[(2 \times 0.98 \text{ ft}) + (2 \times 1 \text{ ft})]$$
$$= 52401 \text{ lb} = \underline{52.40 \text{ kips}}$$

- Downdrag Force in Fill & Silty Sand Layer:

$$P_2 = q_s (L_2)(2d + 2b_f)$$
$$= (879.9 \text{ psf})(7 \text{ ft} - -1.9 \text{ ft})[(2 \times 0.98 \text{ ft}) + (2 \times 1 \text{ ft})]$$
$$= 31011 \text{ lb} = \underline{31.01 \text{ kips}}$$

Total Downdrag $P_1 + P_2 = 52.40 \text{ kips} + 31.01 \text{ kips} = 83.41 \text{ kips}$

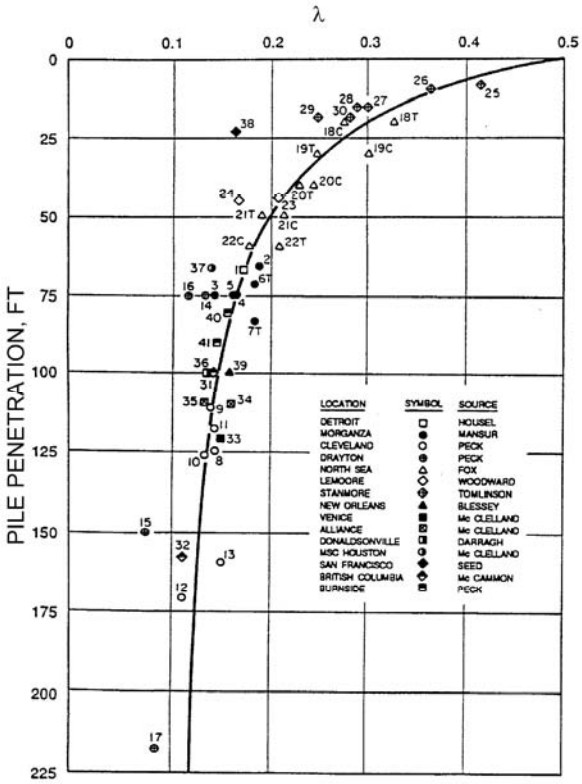

Figure 10.7.3.8.6d-1—λ Coefficient for Driven Pipe Piles after Vijayvergiya and Focht (1972)

10.7.3.8.6e—Tip Resistance in Cohesive Soils

The nominal unit tip resistance of piles in saturated clay, in ksf, shall be taken as:

$$q_p = 9S_u \qquad (10.7.3.8.6e\text{-}1)$$

where:

S_u = undrained shear strength of the clay near the pile tip (ksf)

10.7.3.8.6f—Nordlund/Thurman Method in Cohesionless Soils

This effective stress method should be applied only to sands and nonplastic silts. The nominal unit side resistance, q_s, for this method, in ksf, shall be taken as:

$$q_s = K_\delta C_F \sigma'_v \frac{\sin(\delta + \omega)}{\cos\ \omega} \qquad (10.7.3.8.6f\text{-}1)$$

where:

K_δ = coefficient of lateral earth pressure at mid-point of soil layer under consideration from Figures 10.7.3.8.6f-1 through 10.7.3.8.6f-4 (dim)

C10.7.3.8.6f

Detailed design procedures for the Nordlund/Thurman method are provided in Hannigan et al., (2006). This method was derived based on load test data for piles in sand. In practice, it has been used for gravelly soils as well.

The effective overburden stress is not limited in Eq. 10.7.3.8.6f-1.

For H-piles, the perimeter or "box" area should generally be used to compute the surface area of the pile side.

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C_F = correction factor for K_δ when $\delta \neq \phi_f$, from Figure 10.7.3.8.6f-5

σ'_v = effective overburden stress at midpoint of soil layer under consideration (ksf)

δ = friction angle between pile and soil obtained from Figure 10.7.3.8.6f-6 (degrees)

ω = angle of pile taper from vertical (degrees)

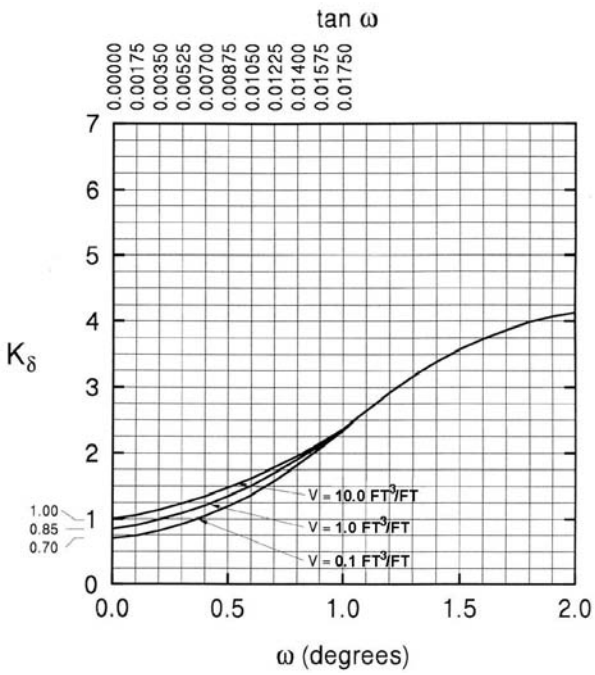

Figure 10.7.3.8.6f-1—Design Curve for Evaluating K_δ for Piles where ϕ_f = 25 degrees (Hannigan et al., 2006 after Nordlund, 1979)

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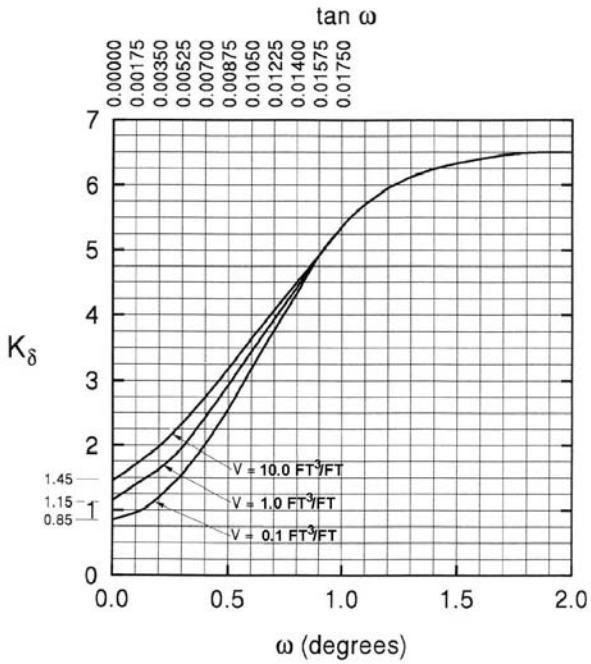

Figure 10.7.3.8.6f-2—Design Curve for Evaluating K_δ for Piles where ϕ_f = 30 degrees (Hannigan et al., 2006 after Nordlund, 1979)

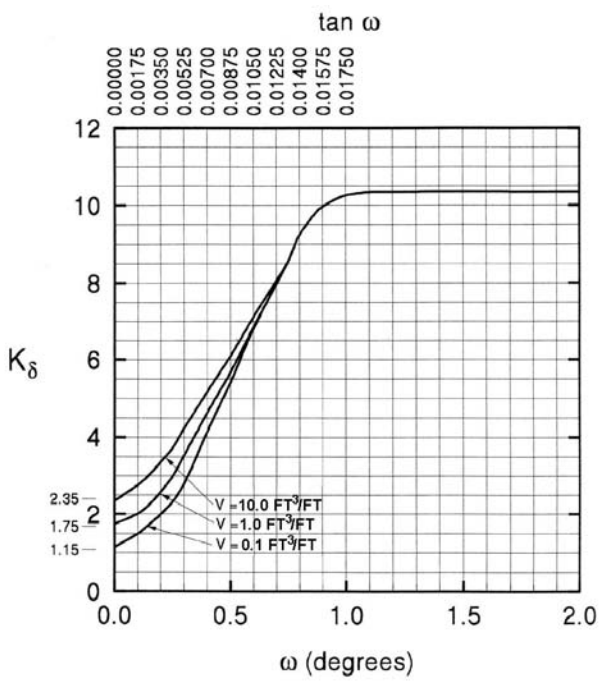

Figure 10.7.3.8.6f-3—Design Curve for Evaluating K_δ for Piles where ϕ_f = 35 degrees (Hannigan et al., 2006 after Nordlund, 1979)

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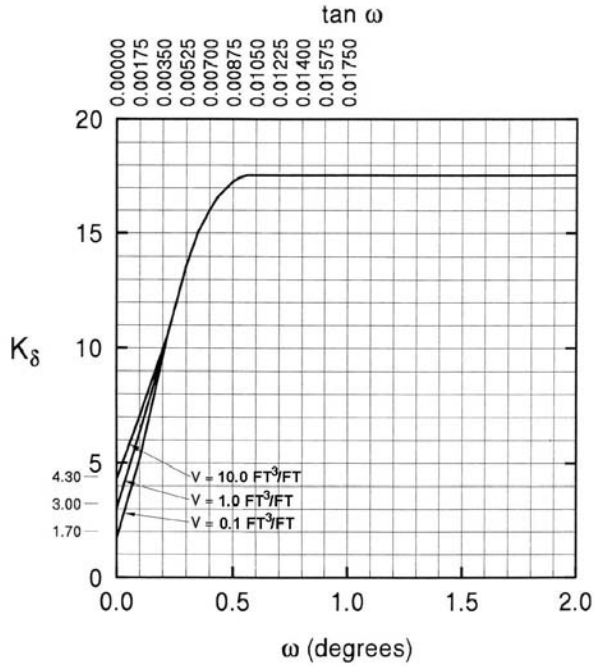

Figure 10.7.3.8.6f-4—Design Curve for Evaluating K_δ for Piles where ϕ_f = 40 degrees (Hannigan et al., 2006 after Nordlund, 1979)

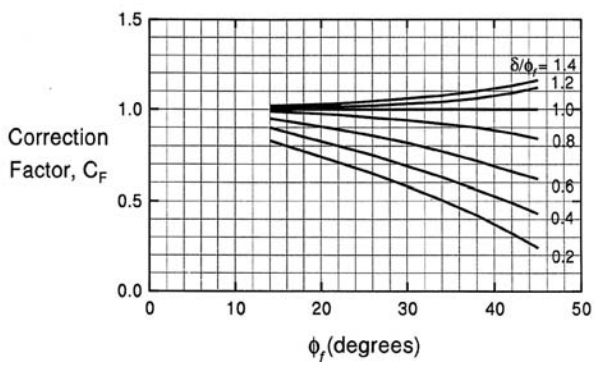

Figure 10.7.3.8.6f-5—Correction Factor for K_δ where $\delta \neq \phi_f$ (Hannigan et al., 2006 after Nordlund, 1979)

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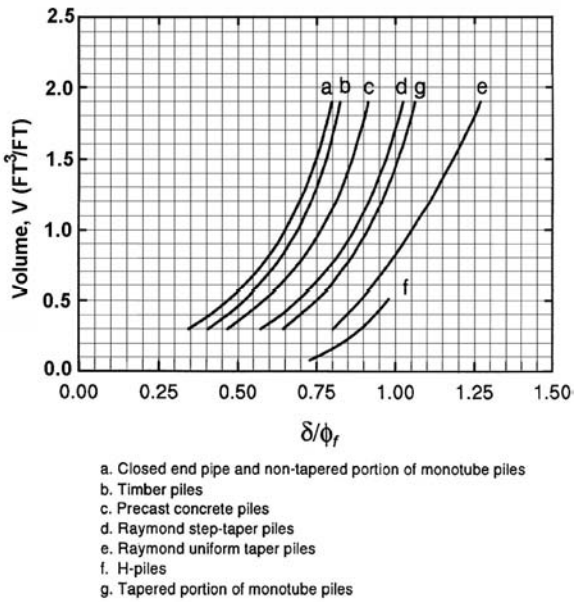

Figure 10.7.3.8.6f-6—Relation of δ/ϕ_f and Pile Displacement, *V*, for Various Types of Piles (Hannigan et al., 2006 after Nordlund, 1979)

The nominal unit tip resistance, q_p, in ksf by the Nordlund/Thurman method shall be taken as:

$$q_p = \alpha_t N'_q \sigma'_v \leq q_L \qquad (10.7.3.8.6f\text{-}2)$$

where:

α_t = coefficient from Figure 10.7.3.8.6f-7 (dim)

N'_q = bearing capacity factor from Figure 10.7.3.8.6f-8

σ'_v = effective overburden stress at pile tip (ksf) $\leq$3.2 ksf

q_L = limiting unit tip resistance from Figure 10.7.3.8.6f-9

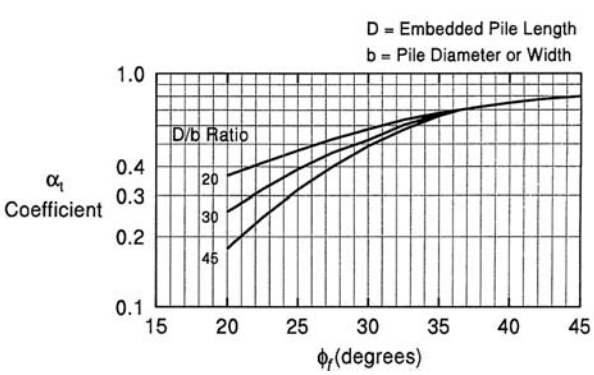

Figure 10.7.3.8.6f-7—α_t Coefficient (Hannigan et al., 2006 modified after Bowles, 1977)

If the friction angle, ϕ_f, is estimated from average, corrected *SPT* blow counts, $N1_{60}$, the $N1_{60}$ values should be averaged over the zone from the pile tip to two diameters below the pile tip.

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Purpose: Perform lateral, axial, and settlement calculations for the West Integral Abutment (WA) of the Pine Point Crossing over B&M Railroad in Scarborough, ME.

References:
1) AASHTO LRFD Bridge Design Specifications, 7th Edition, 2014
2) Computer Program Driven, Version 2001, by FWHA
3) Computer Program L-Pile User's Manual, Version 2015, by Ensoft, INC.
4) Computer Program Group User's Manual, Version 2014, by Ensoft, INC.
5) Sketch Plans received via email on 6/16/2015
6) MaineDOT Bridge Design Manual, 2003, revised through 2008

Given:
1) Loads provided by CHA via email on 6/17/2015
2) Loads are applied at bottom of pile cap, see email from CHA dated 6/17/2015
3) Weight of pile cap was included in loads
4) Fixed head condition between piles and pile cap based on phone call with CHA
5) Bottom of MSE Wall is El. 10 (NAVD 88) from Reference No. 5
6) Bottom of the WA pile cap is El. 35.5 (NAVD 88) from Reference No. 5
7) Pile cap dimensions of 64' x 2.5' x 2' from Reference No. 5
8) 12x53 HP-Piles to be used, per discussion with CHA dated 4/8/2015
9) The proposed bridge is non-essential/non-critical
10) The proposed abutment is integral
11) A downdrag force of 83.4 kips per pile is applied

Assumptions:
1) Groundwater Table at El 15.5 ft, from BB-SBMR-104
2) Geotechnical Axial Resistance Factor of 0.45 (Table 10.5.5.2.3-1 of Reference No. 1), Field Confirmation of Hammer Performance Required
3) No Corrosion

Solution:

Step 1: Soil Properties and Profile

Nobis used subsurface information for the site based on boring data collected by Nobis, see Borings BB-SBMR-104, BB-SBMR-201, and BB-SBMR-208. Elevations and Depths for lateral analyses were based on Boring BB-SBMR-208. Depths listed below were taken from bottom of pile cap (Elevation 35.5 ft.). Soil unit weight (γ_{moist}) and soil friction angle (ϕ) were estimated based on SPT-N Values. The soil modulus parameter (k) was determined using Table 3.7 from Reference No. 4. Uniaxial Compressive Strength was taken from lab data.

Soil Layer	Elevation (ft)	Depth (ft)	γ_{moist} (pcf)	ϕ (°)	k (pci)	U.C.S. (ksi)	ε_{50} or k_rm (dims)
MSE Wall	35.5 to 10	0 to 25.5	130	32	60 (90)	-	-
Silty Sand	10 to 8	25.5 to 27.5	125	32	60	-	-
Glacial Till	8 to -17	27.5 to 52.5	135	37	125	-	-
Bedrock	<-17	>52.5	170	-	-	10300	-

Relative Density	Loose	Medium	Dense
Submerged Sand	20 lb/in^3	60 lb/in^3	125 lb/in^3
	5,430 kN/m^3	16,300 kN/m^3	33,900 kN/m^3
Sand Above WT	25 lb/in^3	90 lb/in^3	225 lb/in^3
	6,790 kN/m^3	24,430 kN/m^3	61,000 kN/m^3

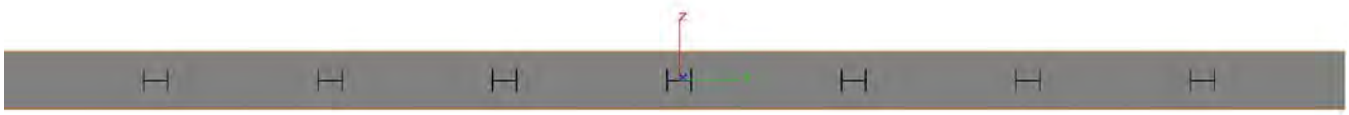
Table 3.7 Soil-Modulus Parameter k for Sands

Step 2: Pile and Pile Cap Properties

Pile:

Pile Type:	HP 12x53	
Yield Stress:	50	ksi
Elastic modulus:	29000	ksi

Pile Cap:	7 piles, 7 x 1. See graphic below	
Cap Length in Y-axis (Transverse):	64	ft
Cap Width in Z-axis (Longitudinal):	2.5	ft
Cap Thickness in X-axis (Vertical):	2	ft
Center to cap edge spacing Z-axis:	1.25	ft
Center-to-center spacing in Y-axis :	7	ft



Graphic of Pile Cap with Piles

Step 3: Lateral Analysis

The Computer Program L-pile, version 2015 by Ensoft, INC. was used for the 2-D lateral analysis. The abutment is integral, so a traditional lateral analysis was not performed. A single pile was analyzed, assuming a number of lateral deflection values in the Z-direction, as well as a 0 degree slope (meaning the pile was free to translate, not rotate). Lateral deflections were assumed to be 0.25-in, 0.5-in, 0.75-in, 1.0-in, 1.25-in, 1.5-in, 1.75-in, and 2.0-in. Linear EI was assumed. Please see attached graphs for lateral deflection, moment, and shear. Structural engineer shall evaluate the adequacy of the piles.

Step 4: Axial and Settlement Analysis

The Computer Program Driven, version 2001 by FHWA was used for the axial analysis. See attached graph for Axial Resistance. Piles do not gain side resistance in the sono tubes (within the MSE Wall). Elastic shortening was used to calculate settlement. Soil layers taken from BB-SBMR-104, as the bedrock was deeper than in BB-SBMR-201 and BB-SBMR-208. The piles will be bearing on bedrock.

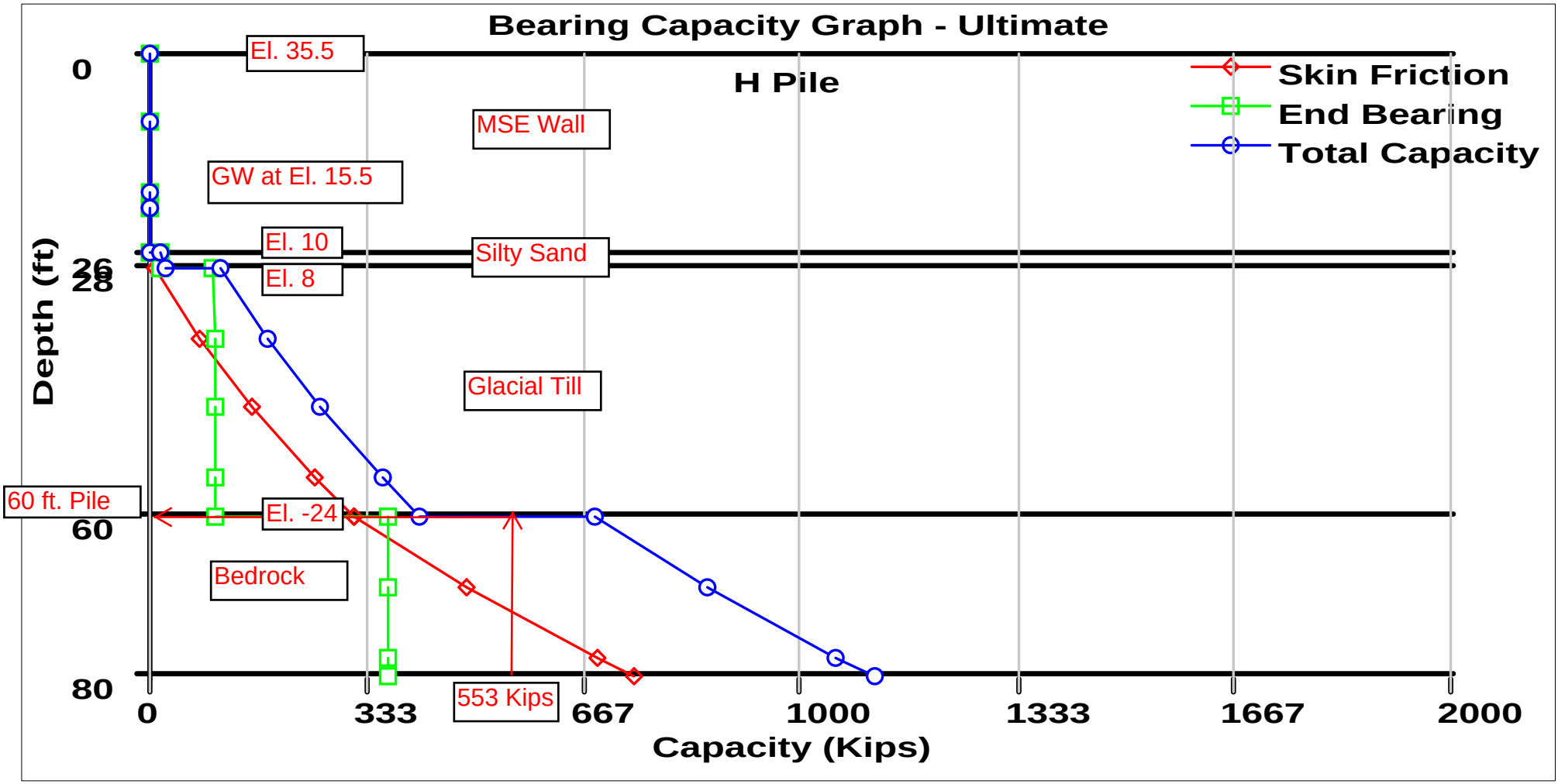
Max. Axial Load on an Individual Pile = [1154 Kips (Strength I, case 1) / 7 piles] + 83.4 Kips/pile ========> **249 Kips/Pile**

Resistance Factor of 0.45 was assumed from Table 10.5.5.2.3-1 of Reference No. 1.

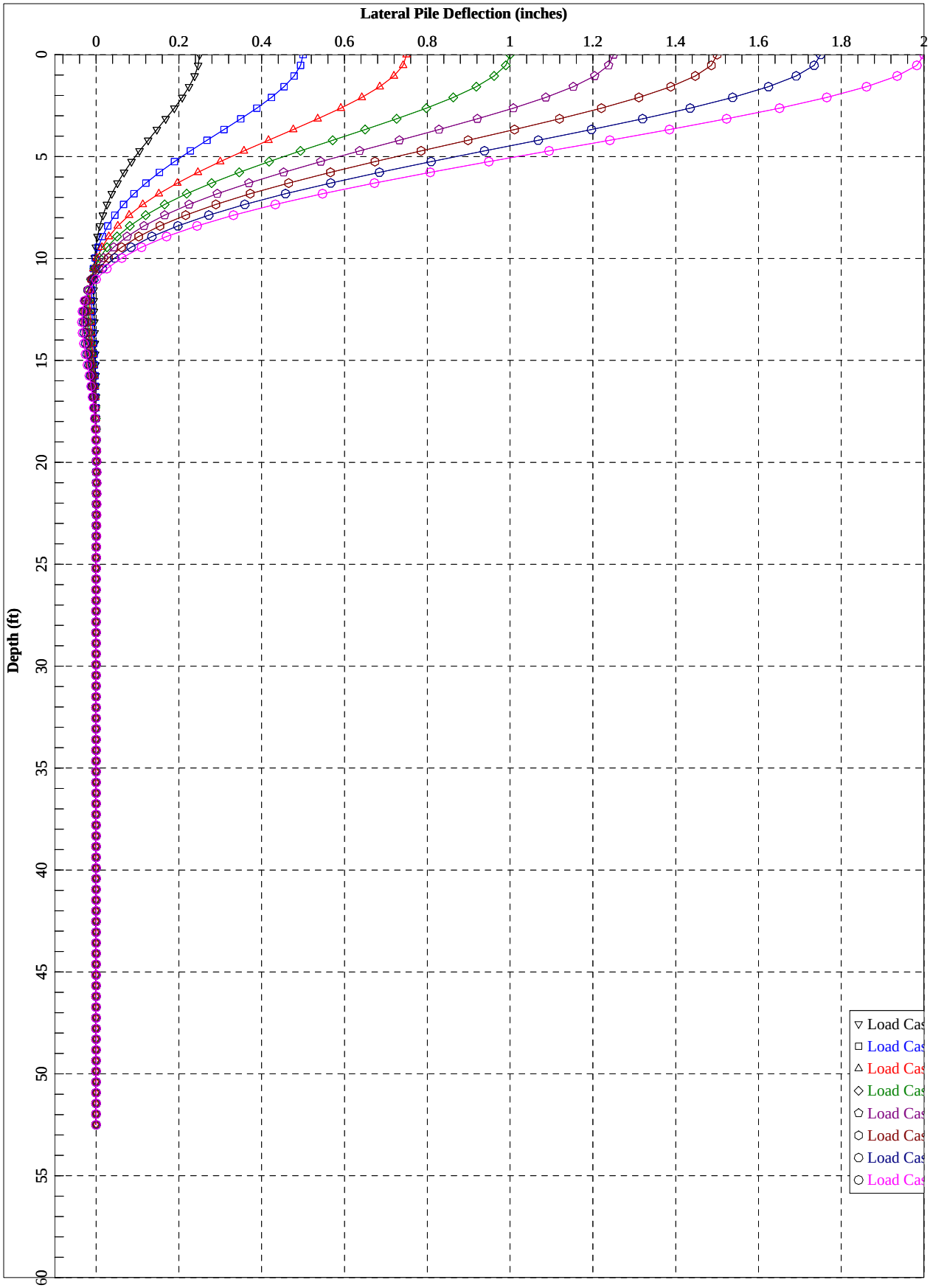
249 Kips / 0.45 ========> 553 Kips ===== From Driven Graph =========> 60 ft

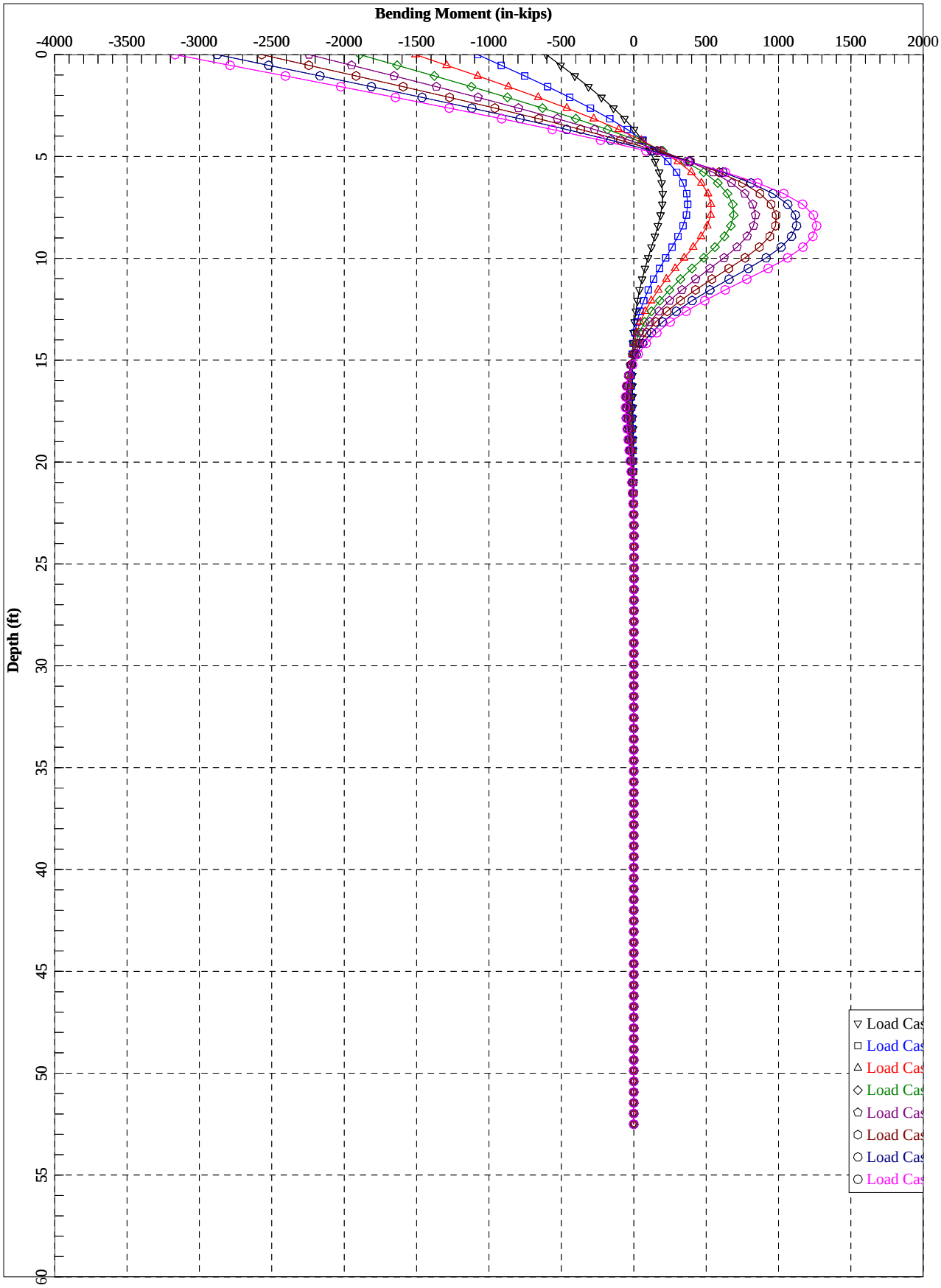
$$\textbf{Settlement} = \frac{PL}{AE} \quad \text{======>} \quad \frac{(249\ \text{kips}) * (85.5\ \text{ft})}{(0.108\ \text{ft}^2) * (4176000\ \text{ksf})} \quad \text{=========>} \quad \textbf{0.047 ft or 0.57 inches}$$

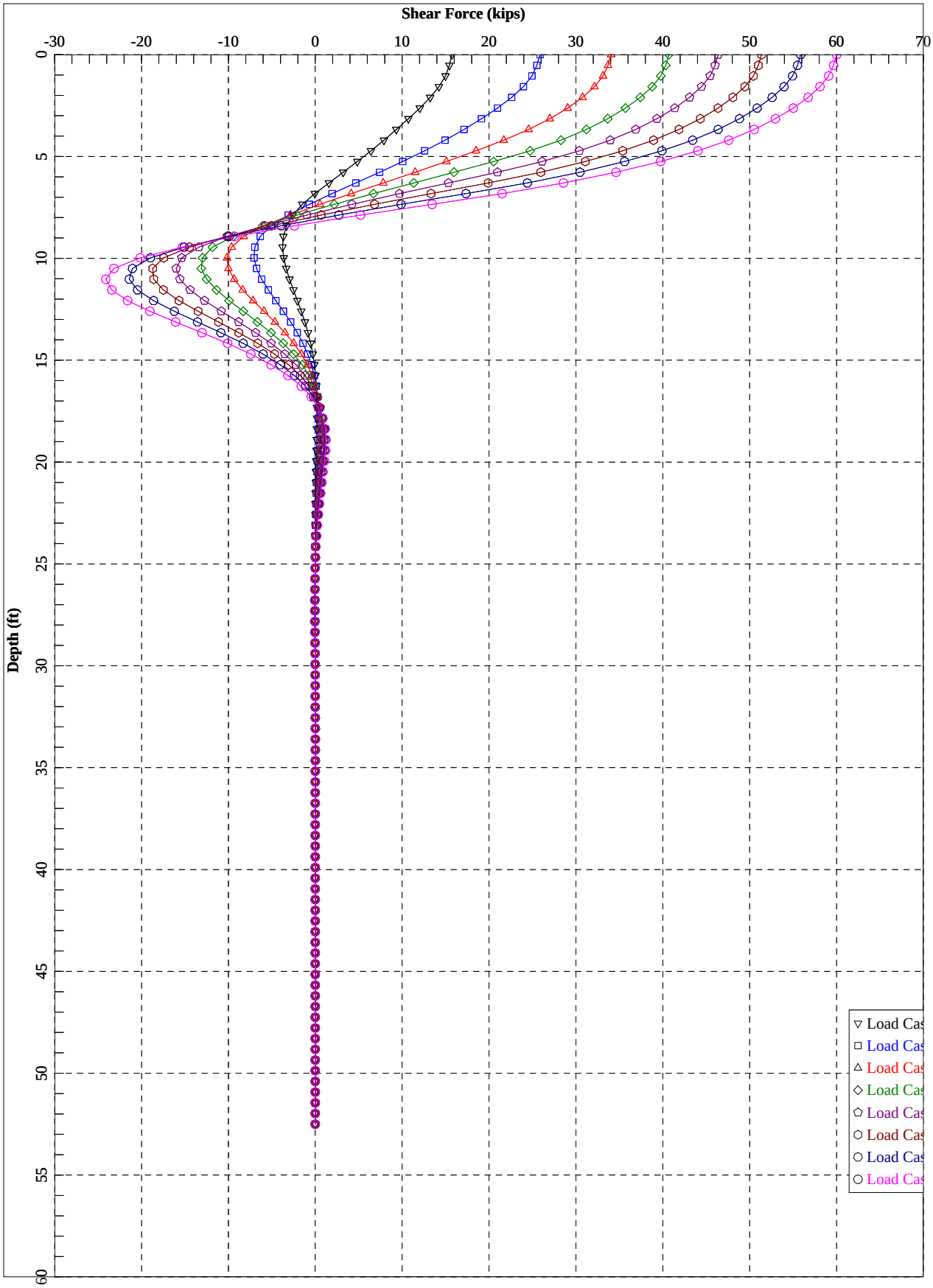
Filename: C:\DOCUME~1\XPMUSER\MYDOCU~1\SCMEWA.DVN



Based on Boring BB-SBMR-104 (Deepest Bedrock)


Lateral Pile Deflection (inches)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas


Bending Moment (in-kips)
-4000
-3500
-3000
-2500
-2000
-1500
-1000
-500
0
500
1000
1500
2000
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas


Shear Force (kips)
-30
-20
-10
0
10
20
30
40
50
60
70
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas

==========

LPile for Windows, Version 2015-08.003

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

Path to file locations:
\Active\85970.01 - Pine Crossing over BM RR Scarborough ME\Geotechnical\Calculations\West Abutment\

Name of input data file:
L-PIle for West Abutment (integral).lp8d

Name of output report file:
L-PIle for West Abutment (integral).lp8o

Name of plot output file:
L-PIle for West Abutment (integral).lp8p

Name of runtime message file:
L-PIle for West Abutment (integral).lp8r

Date and Time of Analysis

Date: June 26, 2015 Time: 14:05:35

Problem Title

Project Name: Pine Point Crossing, Scarborough, ME

Job Number: 85970.01

Client: CHA

Engineer: Rob Clopper

Description: West Abutment (Integral)

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

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

Loading Type and Number of Cycles of Loading:
- Static loading specified

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

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

Pile Structural Properties and Geometry

Total number of pile sections	=	1
Total length of pile	=	52.50 ft
Depth of ground surface below top of pile	=	0.00 ft

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

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

Point	Depth X ft	Pile Diameter in
1	0.00000	11.80000000
2	52.5000000	11.80000000

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Elastic Pile
Cross-sectional Shape	=	Weak H-Pile
Section Length	=	52.500000 ft
Flange Width	=	12.000000 in
Section Depth	=	11.800000 in
Flange Thickness	=	0.435000 in
Web Thickness	=	0.435000 in
Section Area	=	15.194550 sq. in
Moment of Inertia	=	125.354973 in^4
Elastic Modulus	=	29000000. lbs/in^2

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	20.000000 ft
Effective unit weight at top of layer	=	130.000000 pcf
Effective unit weight at bottom of layer	=	130.000000 pcf
Friction angle at top of layer	=	32.000000 deg.
Friction angle at bottom of layer	=	32.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

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

Distance from top of pile to top of layer	=	20.000000 ft
Distance from top of pile to bottom of layer	=	25.500000 ft
Effective unit weight at top of layer	=	68.000000 pcf
Effective unit weight at bottom of layer	=	68.000000 pcf
Friction angle at top of layer	=	32.000000 deg.
Friction angle at bottom of layer	=	32.000000 deg.
Subgrade k at top of layer	=	60.000000 pci
Subgrade k at bottom of layer	=	60.000000 pci

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

Distance from top of pile to top of layer	=	25.500000 ft

```
   Distance from top of pile to bottom of layer        =    27.500000 ft
   Effective unit weight at top of layer               =    63.000000 pcf
   Effective unit weight at bottom of layer            =    63.000000 pcf
   Friction angle at top of layer                      =    32.000000 deg.
   Friction angle at bottom of layer                   =    32.000000 deg.
   Subgrade k at top of layer                          =    60.000000 pci
   Subgrade k at bottom of layer                       =    60.000000 pci


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

   Distance from top of pile to top of layer           =    27.500000 ft
   Distance from top of pile to bottom of layer        =    52.500000 ft
   Effective unit weight at top of layer               =    73.000000 pcf
   Effective unit weight at bottom of layer            =    73.000000 pcf
   Friction angle at top of layer                      =    37.000000 deg.
   Friction angle at bottom of layer                   =    37.000000 deg.
   Subgrade k at top of layer                          =   125.000000 pci
   Subgrade k at bottom of layer                       =   125.000000 pci


Layer 5 is strong rock (vuggy limestone)

   Distance from top of pile to top of layer           =    52.500000 ft
   Distance from top of pile to bottom of layer        =   100.000000 ft
   Effective unit weight at top of layer               =    88.000000 pcf
   Effective unit weight at bottom of layer            =    88.000000 pcf
   Uniaxial compressive strength at top of layer       =       10300. psi
   Uniaxial compressive strength at bottom of layer    =       10300. psi


   (Depth of lowest soil layer extends   47.50 ft below pile tip)


--------------------------------------------------------------------------------
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------

Layer         Soil Type          Layer      Effective    Angle of     Uniaxial
Layer           Name             Depth       Unit Wt.    Friction        qu           kpy
 Num.     (p-y Curve Type)        ft           pcf          deg.         psi          pci
-----   -------------------   ----------   ----------   ----------   ----------   ----------
  1           Sand                0.00     130.0000      32.0000       --          90.0000
         (Reese, et al.)        20.0000     130.0000      32.0000       --          90.0000
  2           Sand              20.0000      68.0000      32.0000       --          60.0000
         (Reese, et al.)        25.5000      68.0000      32.0000       --          60.0000
  3           Sand              25.5000      63.0000      32.0000       --          60.0000
         (Reese, et al.)        27.5000      63.0000      32.0000       --          60.0000
  4           Sand              27.5000      73.0000      37.0000       --         125.0000
         (Reese, et al.)        52.5000      73.0000      37.0000       --         125.0000
  5           Vuggy             52.5000      88.0000       --          10300.       --
            Limestone          100.0000      88.0000       --          10300.       --

--------------------------------------------------------------------------------
                              Static Loading Type
--------------------------------------------------------------------------------

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


--------------------------------------------------------------------------------
                Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------
```

Number of loads specified = 8

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	165000.	N.A.
2	5	y = 0.500000 in	S = 0.0000 in/in	165000.	N.A.
3	5	y = 0.750000 in	S = 0.0000 in/in	165000.	N.A.
4	5	y = 1.000000 in	S = 0.0000 in/in	165000.	N.A.
5	5	y = 1.250000 in	S = 0.0000 in/in	165000.	N.A.
6	5	y = 1.500000 in	S = 0.0000 in/in	165000.	N.A.
7	5	y = 1.750000 in	S = 0.0000 in/in	165000.	N.A.
8	5	y = 2.000000 in	S = 0.0000 in/in	165000.	N.A.

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading.
Axial thrust is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

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

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

---

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

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.250000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 165000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	-603696.	15718.	0.00	39273.	3.64E+09	0.00	0.00	0.00
0.5250	0.2467	-505025.	15433.	-9.61E-04	34629.	3.64E+09	-45.2291	1155.	0.00
1.0500	0.2379	-407240.	14988.	-0.00175	30026.	3.64E+09	-96.1732	2547.	0.00
1.5750	0.2246	-312538.	14238.	-0.00237	25569.	3.64E+09	-141.7290	3975.	0.00
2.1000	0.2080	-222898.	13231.	-0.00284	21350.	3.64E+09	-177.9875	5392.	0.00
2.6250	0.1889	-139921.	12036.	-0.00315	17445.	3.64E+09	-201.5387	6723.	0.00
3.1500	0.1682	-64691.	10717.	-0.00333	13904.	3.64E+09	-217.0083	8126.	0.00
3.6750	0.1469	2042.	9329.	-0.00338	10955.	3.64E+09	-223.7539	9596.	0.00
4.2000	0.1256	59891.	7902.	-0.00333	13678.	3.64E+09	-229.3522	11505.	0.00
4.7250	0.1049	108529.	6413.	-0.00319	15967.	3.64E+09	-243.2674	14605.	0.00

5.2500	0.08546	147316.	4844.	-0.00296	17793.	3.64E+09	-254.8500	18788.	0.00
5.7750	0.06759	175723.	3214.	-0.00268	19130.	3.64E+09	-262.6532	24481.	0.00
6.3000	0.05165	193389.	1563.	-0.00236	19961.	3.64E+09	-261.4154	31889.	0.00
6.8250	0.03781	200330.	-49.7160	-0.00202	20288.	3.64E+09	-250.5381	41746.	0.00
7.3500	0.02616	196967.	-1493.	-0.00168	20130.	3.64E+09	-207.6603	50009.	0.00
7.8750	0.01666	185007.	-2594.	-0.00135	19567.	3.64E+09	-141.7099	53582.	0.00
8.4000	0.00918	167090.	-3302.	-0.00104	18723.	3.64E+09	-83.3128	57154.	0.00
8.9250	0.00353	145564.	-3672.	-7.71E-04	17710.	3.64E+09	-34.0195	60726.	0.00
9.4500	-5.36E-04	122427.	-3762.	-5.39E-04	16621.	3.64E+09	5.4656	64298.	0.00
9.9750	-0.00326	99285.	-3634.	-3.47E-04	15532.	3.64E+09	35.1605	67870.	0.00
10.5000	-0.00491	77360.	-3348.	-1.94E-04	14500.	3.64E+09	55.6568	71442.	0.00
11.0250	-0.00571	57505.	-2958.	-7.71E-05	13566.	3.64E+09	67.9609	75014.	0.00
11.5500	-0.00588	40244.	-2513.	7.60E-06	12753.	3.64E+09	73.3401	78586.	0.00
12.0750	-0.00561	25821.	-2052.	6.48E-05	12074.	3.64E+09	73.1842	82158.	0.00
12.6000	-0.00506	14256.	-1604.	9.96E-05	11530.	3.64E+09	68.8886	85730.	0.00
13.1250	-0.00436	5399.	-1193.	1.17E-04	11113.	3.64E+09	61.7637	89302.	0.00
13.6500	-0.00359	-1015.	-831.3332	1.20E-04	10907.	3.64E+09	52.9700	92875.	0.00
14.1750	-0.00284	-5326.	-527.5171	1.15E-04	11110.	3.64E+09	43.4796	96447.	0.00
14.7000	-0.00215	-7901.	-283.2728	1.03E-04	11231.	3.64E+09	34.0583	100019.	0.00
15.2250	-0.00154	-9110.	-96.3966	8.87E-05	11288.	3.64E+09	25.2675	103591.	0.00
15.7500	-0.00103	-9300.	38.2527	7.28E-05	11297.	3.64E+09	17.4783	107163.	0.00
16.2750	-6.20E-04	-8779.	127.6335	5.71E-05	11272.	3.64E+09	10.8965	110735.	0.00
16.8000	-3.08E-04	-7810.	179.5710	4.27E-05	11227.	3.64E+09	5.5916	114307.	0.00
17.3250	-8.17E-05	-6605.	201.9999	3.02E-05	11170.	3.64E+09	1.5287	117879.	0.00
17.8500	7.27E-05	-5328.	202.4030	1.99E-05	11110.	3.64E+09	-1.4007	121451.	0.00
18.3750	1.69E-04	-4096.	187.4354	1.17E-05	11052.	3.64E+09	-3.3508	125024.	0.00
18.9000	2.20E-04	-2991.	162.7145	5.58E-06	11000.	3.64E+09	-4.4971	128596.	0.00
19.4250	2.39E-04	-2058.	132.7462	1.20E-06	10956.	3.64E+09	-5.0167	132168.	0.00
19.9500	2.35E-04	-1321.	100.9621	-1.72E-06	10921.	3.64E+09	-5.0735	135740.	0.00
20.4750	2.17E-04	-782.1827	75.2524	-3.55E-06	10896.	3.64E+09	-3.0883	89495.	0.00
21.0000	1.91E-04	-364.9887	56.7598	-4.54E-06	10876.	3.64E+09	-2.7824	91876.	0.00
21.5250	1.60E-04	-57.5693	40.4458	-4.91E-06	10862.	3.64E+09	-2.3967	94257.	0.00
22.0500	1.29E-04	154.8287	26.6646	-4.82E-06	10866.	3.64E+09	-1.9783	96639.	0.00
22.5750	9.94E-05	288.4303	15.5103	-4.44E-06	10873.	3.64E+09	-1.5628	99020.	0.00
23.1000	7.30E-05	359.4850	6.8841	-3.88E-06	10876.	3.64E+09	-1.1757	101402.	0.00
23.6250	5.06E-05	383.2295	0.5559	-3.23E-06	10877.	3.64E+09	-0.8333	103783.	0.00
24.1500	3.23E-05	373.2112	-3.7837	-2.58E-06	10877.	3.64E+09	-0.5444	106164.	0.00
24.6750	1.81E-05	340.9138	-6.4810	-1.96E-06	10875.	3.64E+09	-0.3119	108546.	0.00
25.2000	7.62E-06	295.6232	-7.8862	-1.41E-06	10873.	3.64E+09	-0.1342	110927.	0.00
25.7250	3.69E-07	244.4738	-8.3289	-9.39E-07	10871.	3.64E+09	-0.00636	108626.	0.00
26.2500	-4.22E-06	192.6317	-8.1150	-5.61E-07	10868.	3.64E+09	0.07427	111007.	0.00
26.7750	-6.70E-06	143.3905	-7.5014	-2.70E-07	10866.	3.64E+09	0.1205	113389.	0.00
27.3000	-7.61E-06	98.6742	-6.6812	-5.98E-08	10864.	3.64E+09	0.1399	115770.	0.00
27.8250	-7.45E-06	59.3313	-5.4848	7.71E-08	10862.	3.64E+09	0.2399	202935.	0.00
28.3500	-6.64E-06	29.4050	-4.0389	1.54E-07	10861.	3.64E+09	0.2191	207896.	0.00
28.8750	-5.51E-06	8.1213	-2.7625	1.87E-07	10860.	3.64E+09	0.1861	212858.	0.00
29.4000	-4.29E-06	-5.7906	-1.7092	1.89E-07	10859.	3.64E+09	0.1483	217819.	0.00
29.9250	-3.13E-06	-13.8071	-0.8933	1.72E-07	10860.	3.64E+09	0.1108	222780.	0.00
30.4500	-2.13E-06	-17.4028	-0.3023	1.45E-07	10860.	3.64E+09	0.07687	227741.	0.00
30.9750	-1.31E-06	-17.9161	0.09239	1.14E-07	10860.	3.64E+09	0.04842	232703.	0.00
31.5000	-6.91E-07	-16.4755	0.3270	8.41E-08	10860.	3.64E+09	0.02606	237664.	0.00
32.0250	-2.51E-07	-13.9709	0.4395	5.78E-08	10860.	3.64E+09	0.00965	242625.	0.00
32.5500	3.70E-08	-11.0581	0.4653	3.61E-08	10860.	3.64E+09	-0.00146	247586.	0.00
33.0750	2.04E-07	-8.1832	0.4350	1.94E-08	10860.	3.64E+09	-0.00818	252548.	0.00
33.6000	2.81E-07	-5.6180	0.3730	7.44E-09	10859.	3.64E+09	-0.01151	257509.	0.00
34.1250	2.98E-07	-3.4993	0.2977	-4.58E-10	10859.	3.64E+09	-0.01240	262470.	0.00
34.6500	2.76E-07	-1.8667	0.2217	-5.11E-09	10859.	3.64E+09	-0.01170	267431.	0.00
35.1750	2.33E-07	-0.6951	0.1531	-7.33E-09	10859.	3.64E+09	-0.01009	272393.	0.00
35.7000	1.83E-07	0.07716	0.09585	-7.86E-09	10859.	3.64E+09	-0.00807	277354.	0.00
36.2250	1.34E-07	0.5289	0.05146	-7.34E-09	10859.	3.64E+09	-0.00602	282315.	0.00
36.7500	9.09E-08	0.7408	0.01944	-6.24E-09	10859.	3.64E+09	-0.00415	287276.	0.00
37.2750	5.57E-08	0.7868	-0.00176	-4.91E-09	10859.	3.64E+09	-0.00258	292238.	0.00
37.8000	2.90E-08	0.7288	-0.01421	-3.60E-09	10859.	3.64E+09	-0.00137	297199.	0.00
38.3250	1.03E-08	0.6152	-0.02008	-2.44E-09	10859.	3.64E+09	-4.95E-04	302160.	0.00
38.8500	-1.66E-09	0.4809	-0.02139	-1.49E-09	10859.	3.64E+09	8.11E-05	307121.	0.00

39.3750	-8.40E-09	0.3488	-0.01982	-7.67E-10	10859.	3.64E+09	4.16E-04	312083.	0.00
39.9000	-1.13E-08	0.2327	-0.01671	-2.63E-10	10859.	3.64E+09	5.70E-04	317044.	0.00
40.4250	-1.17E-08	0.1388	-0.01303	5.86E-11	10859.	3.64E+09	5.99E-04	322005.	0.00
40.9500	-1.06E-08	0.06837	-0.00941	2.38E-10	10859.	3.64E+09	5.50E-04	326966.	0.00
41.4750	-8.72E-09	0.01967	-0.00623	3.14E-10	10859.	3.64E+09	4.59E-04	331928.	0.00
42.0000	-6.63E-09	-0.01084	-0.00367	3.22E-10	10859.	3.64E+09	3.55E-04	336889.	0.00
42.5250	-4.66E-09	-0.02725	-0.00176	2.89E-10	10859.	3.64E+09	2.53E-04	341850.	0.00
43.0500	-2.99E-09	-0.03357	-4.41E-04	2.36E-10	10859.	3.64E+09	1.65E-04	346811.	0.00
43.5750	-1.68E-09	-0.03330	3.73E-04	1.78E-10	10859.	3.64E+09	9.40E-05	351773.	0.00
44.1000	-7.42E-10	-0.02924	8.02E-04	1.24E-10	10859.	3.64E+09	4.20E-05	356734.	0.00
44.6250	-1.20E-10	-0.02346	9.56E-04	7.85E-11	10859.	3.64E+09	6.88E-06	361695.	0.00
45.1500	2.47E-10	-0.01736	9.32E-04	4.31E-11	10859.	3.64E+09	-1.44E-05	366656.	0.00
45.6750	4.24E-10	-0.01180	8.08E-04	1.79E-11	10859.	3.64E+09	-2.50E-05	371618.	0.00
46.2000	4.72E-10	-0.00721	6.41E-04	1.41E-12	10859.	3.64E+09	-2.82E-05	376579.	0.00
46.7250	4.42E-10	-0.00373	4.68E-04	-8.06E-12	10859.	3.64E+09	-2.67E-05	381540.	0.00
47.2500	3.71E-10	-0.00130	3.12E-04	-1.24E-11	10859.	3.64E+09	-2.27E-05	386501.	0.00
47.7750	2.85E-10	2.28E-04	1.84E-04	-1.33E-11	10859.	3.64E+09	-1.77E-05	391463.	0.00
48.3000	2.02E-10	0.00105	8.84E-05	-1.22E-11	10859.	3.64E+09	-1.27E-05	396424.	0.00
48.8250	1.31E-10	0.00137	2.19E-05	-1.01E-11	10859.	3.64E+09	-8.35E-06	401385.	0.00
49.3500	7.47E-11	0.00135	-1.96E-05	-7.79E-12	10859.	3.64E+09	-4.82E-06	406346.	0.00
49.8750	3.30E-11	0.00114	-4.15E-05	-5.63E-12	10859.	3.64E+09	-2.16E-06	411308.	0.00
50.4000	3.75E-12	8.37E-04	-4.91E-05	-3.92E-12	10859.	3.64E+09	-2.48E-07	416269.	0.00
50.9250	-1.64E-11	5.26E-04	-4.64E-05	-2.74E-12	10859.	3.64E+09	1.10E-06	421230.	0.00
51.4500	-3.08E-11	2.58E-04	-3.64E-05	-2.06E-12	10859.	3.64E+09	2.08E-06	426191.	0.00
51.9750	-4.24E-11	7.13E-05	-2.07E-05	-1.78E-12	10859.	3.64E+09	2.90E-06	431153.	0.00
52.5000	-5.32E-11	0.00	0.00	-1.72E-12	10859.	3.64E+09	3.68E-06	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =    -0.00008550 radians
Maximum bending moment           =       -603696. inch-lbs
Maximum shear force              =         15718. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 165000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	-1078098.	25877.	0.00	61601.	3.64E+09	0.00	0.00	0.00
0.5250	0.4941	-915237.	25517.	-0.00173	53936.	3.64E+09	-57.1885	729.1576	0.00
1.0500	0.4782	-752997.	24945.	-0.00317	46300.	3.64E+09	-124.1958	1636.	0.00
1.5750	0.4541	-594330.	23960.	-0.00434	38832.	3.64E+09	-188.6271	2617.	0.00
2.1000	0.4235	-442078.	22605.	-0.00524	31666.	3.64E+09	-241.4517	3591.	0.00
2.6250	0.3881	-298614.	20975.	-0.00588	24914.	3.64E+09	-275.9792	4480.	0.00
3.1500	0.3495	-165565.	19137.	-0.00628	18652.	3.64E+09	-307.4668	5543.	0.00
3.6750	0.3090	-44421.	17116.	-0.00646	12950.	3.64E+09	-334.1506	6813.	0.00

4.2000	0.2680	63540.	14937.	-0.00645	13850.	3.64E+09	-357.7536	8410.	0.00
4.7250	0.2277	157187.	12589.	-0.00626	18257.	3.64E+09	-387.6087	10723.	0.00
5.2500	0.1892	235168.	10067.	-0.00592	21928.	3.64E+09	-413.1531	13759.	0.00
5.7750	0.1532	296326.	7405.	-0.00546	24806.	3.64E+09	-431.9329	17763.	0.00
6.3000	0.1204	339807.	4666.	-0.00490	26853.	3.64E+09	-437.4190	22882.	0.00
6.8250	0.09139	365315.	1939.	-0.00429	28053.	3.64E+09	-428.4607	29536.	0.00
7.3500	0.06633	373160.	-684.8713	-0.00365	28422.	3.64E+09	-404.3678	38404.	0.00
7.8750	0.04535	364282.	-3108.	-0.00301	28005.	3.64E+09	-364.7660	50670.	0.00
8.4000	0.02835	340271.	-5067.	-0.00240	26874.	3.64E+09	-257.1701	57154.	0.00
8.9250	0.01506	305440.	-6334.	-0.00184	25235.	3.64E+09	-145.1436	60726.	0.00
9.4500	0.00510	264298.	-6955.	-0.00135	23299.	3.64E+09	-52.0814	64298.	0.00
9.9750	-0.00197	220612.	-7053.	-9.31E-04	21243.	3.64E+09	21.1832	67870.	0.00
10.5000	-0.00663	177370.	-6749.	-5.86E-04	19207.	3.64E+09	75.1506	71442.	0.00
11.0250	-0.00935	136791.	-6162.	-3.14E-04	17297.	3.64E+09	111.3450	75014.	0.00
11.5500	-0.01058	100385.	-5395.	-1.08E-04	15584.	3.64E+09	131.9989	78586.	0.00
12.0750	-0.01072	69037.	-4539.	3.84E-05	14108.	3.64E+09	139.7555	82158.	0.00
12.6000	-0.01010	43112.	-3666.	1.36E-04	12888.	3.64E+09	137.4079	85730.	0.00
13.1250	-0.00901	22563.	-2831.	1.93E-04	11921.	3.64E+09	127.6861	89302.	0.00
13.6500	-0.00767	7041.	-2073.	2.18E-04	11191.	3.64E+09	113.0970	92875.	0.00
14.1750	-0.00626	-4005.	-1414.	2.21E-04	11048.	3.64E+09	95.8160	96447.	0.00
14.7000	-0.00489	-11241.	-868.1472	2.08E-04	11388.	3.64E+09	77.6269	100019.	0.00
15.2250	-0.00364	-15375.	-434.9278	1.85E-04	11583.	3.64E+09	59.9031	103591.	0.00
15.7500	-0.00256	-17105.	-108.8264	1.56E-04	11664.	3.64E+09	43.6212	107163.	0.00
16.2750	-0.00167	-17072.	121.1858	1.27E-04	11663.	3.64E+09	29.3985	110735.	0.00
16.8000	-9.67E-04	-15841.	269.0622	9.83E-05	11605.	3.64E+09	17.5464	114307.	0.00
17.3250	-4.35E-04	-13886.	349.9435	7.25E-05	11513.	3.64E+09	8.1303	117879.	0.00
17.8500	-5.36E-05	-11583.	378.8074	5.04E-05	11404.	3.64E+09	1.0329	121451.	0.00
18.3750	2.01E-04	-9218.	369.5024	3.24E-05	11293.	3.64E+09	-3.9869	125024.	0.00
18.9000	3.55E-04	-6994.	334.1345	1.84E-05	11188.	3.64E+09	-7.2410	128596.	0.00
19.4250	4.32E-04	-5046.	282.7624	7.93E-06	11097.	3.64E+09	-9.0676	132168.	0.00
19.9500	4.55E-04	-3448.	223.3451	5.66E-07	11021.	3.64E+09	-9.7951	135740.	0.00
20.4750	4.39E-04	-2233.	172.8307	-4.36E-06	10964.	3.64E+09	-6.2413	89495.	0.00
21.0000	4.00E-04	-1261.	134.8082	-7.38E-06	10919.	3.64E+09	-5.8294	91876.	0.00
21.5250	3.46E-04	-518.8203	100.1240	-8.93E-06	10884.	3.64E+09	-5.1815	94257.	0.00
22.0500	2.87E-04	18.8801	69.9223	-9.36E-06	10860.	3.64E+09	-4.4063	96639.	0.00
22.5750	2.28E-04	381.6589	44.7345	-9.01E-06	10877.	3.64E+09	-3.5898	99020.	0.00
23.1000	1.74E-04	601.2719	24.6200	-8.16E-06	10887.	3.64E+09	-2.7958	101402.	0.00
23.6250	1.26E-04	708.8369	9.2972	-7.03E-06	10893.	3.64E+09	-2.0686	103783.	0.00
24.1500	8.52E-05	733.0227	-1.7404	-5.78E-06	10894.	3.64E+09	-1.4354	106164.	0.00
24.6750	5.28E-05	698.9160	-9.1273	-4.54E-06	10892.	3.64E+09	-0.9096	108546.	0.00
25.2000	2.80E-05	627.4478	-13.5476	-3.39E-06	10889.	3.64E+09	-0.4937	110927.	0.00
25.7250	1.01E-05	535.2555	-15.6529	-2.38E-06	10884.	3.64E+09	-0.1747	108626.	0.00
26.2500	-1.93E-06	435.1655	-16.0961	-1.54E-06	10880.	3.64E+09	0.03401	111007.	0.00
26.7750	-9.24E-06	335.6414	-15.4650	-8.70E-07	10875.	3.64E+09	0.1663	113389.	0.00
27.3000	-1.29E-05	242.1139	-14.1951	-3.69E-07	10871.	3.64E+09	0.2368	115770.	0.00
27.8250	-1.39E-05	157.5497	-12.0398	-2.27E-08	10867.	3.64E+09	0.4474	202935.	0.00
28.3500	-1.32E-05	90.4600	-9.2611	1.92E-07	10863.	3.64E+09	0.4347	207896.	0.00
28.8750	-1.15E-05	40.4605	-6.6712	3.06E-07	10861.	3.64E+09	0.3875	212858.	0.00
29.4000	-9.32E-06	5.7668	-4.4355	3.46E-07	10859.	3.64E+09	0.3223	217819.	0.00
29.9250	-7.11E-06	-16.1460	-2.6282	3.37E-07	10860.	3.64E+09	0.2515	222780.	0.00
30.4500	-5.08E-06	-28.0482	-1.2577	2.98E-07	10860.	3.64E+09	0.1836	227741.	0.00
30.9750	-3.35E-06	-32.6135	-0.2895	2.46E-07	10861.	3.64E+09	0.1238	232703.	0.00
31.5000	-1.98E-06	-32.2068	0.3358	1.90E-07	10861.	3.64E+09	0.07471	237664.	0.00
32.0250	-9.61E-07	-28.7770	0.6877	1.37E-07	10861.	3.64E+09	0.03701	242625.	0.00
32.5500	-2.56E-07	-23.8263	0.8360	9.13E-08	10860.	3.64E+09	0.01005	247586.	0.00
33.0750	1.89E-07	-18.4338	0.8437	5.47E-08	10860.	3.64E+09	-0.00759	252548.	0.00
33.6000	4.33E-07	-13.3091	0.7641	2.72E-08	10860.	3.64E+09	-0.01770	257509.	0.00
34.1250	5.32E-07	-8.8631	0.6385	7.95E-09	10860.	3.64E+09	-0.02214	262470.	0.00
34.6500	5.33E-07	-5.2799	0.4975	-4.30E-09	10859.	3.64E+09	-0.02264	267431.	0.00
35.1750	4.77E-07	-2.5858	0.3612	-1.11E-08	10859.	3.64E+09	-0.02064	272393.	0.00
35.7000	3.93E-07	-0.7061	0.2416	-1.40E-08	10859.	3.64E+09	-0.01731	277354.	0.00
36.2250	3.01E-07	0.4879	0.1446	-1.42E-08	10859.	3.64E+09	-0.01350	282315.	0.00
36.7500	2.15E-07	1.1450	0.07119	-1.27E-08	10859.	3.64E+09	-0.00979	287276.	0.00
37.2750	1.41E-07	1.4114	0.01978	-1.05E-08	10859.	3.64E+09	-0.00653	292238.	0.00
37.8000	8.21E-08	1.4161	-0.01299	-8.08E-09	10859.	3.64E+09	-0.00387	297199.	0.00

38.3250	3.89E-08	1.2645	-0.03107	-5.76E-09	10859.	3.64E+09	-0.00187	302160.	0.00
38.8500	9.58E-09	1.0365	-0.03843	-3.76E-09	10859.	3.64E+09	-4.67E-04	307121.	0.00
39.3750	-8.46E-09	0.7881	-0.03858	-2.18E-09	10859.	3.64E+09	4.19E-04	312083.	0.00
39.9000	-1.79E-08	0.5549	-0.03442	-1.02E-09	10859.	3.64E+09	9.01E-04	317044.	0.00
40.4250	-2.13E-08	0.3565	-0.02816	-2.28E-10	10859.	3.64E+09	0.00109	322005.	0.00
40.9500	-2.08E-08	0.2006	-0.02133	2.55E-10	10859.	3.64E+09	0.00108	326966.	0.00
41.4750	-1.81E-08	0.08720	-0.01493	5.04E-10	10859.	3.64E+09	9.53E-04	331928.	0.00
42.0000	-1.44E-08	0.01142	-0.00950	5.90E-10	10859.	3.64E+09	7.71E-04	336889.	0.00
42.5250	-1.06E-08	-0.03377	-0.00525	5.70E-10	10859.	3.64E+09	5.78E-04	341850.	0.00
43.0500	-7.24E-09	-0.05595	-0.00218	4.92E-10	10859.	3.64E+09	3.99E-04	346811.	0.00
43.5750	-4.44E-09	-0.06222	-1.39E-04	3.90E-10	10859.	3.64E+09	2.48E-04	351773.	0.00
44.1000	-2.33E-09	-0.05852	0.00106	2.85E-10	10859.	3.64E+09	1.32E-04	356734.	0.00
44.6250	-8.47E-10	-0.04949	0.00163	1.92E-10	10859.	3.64E+09	4.87E-05	361695.	0.00
45.1500	9.12E-11	-0.03844	0.00176	1.16E-10	10859.	3.64E+09	-5.31E-06	366656.	0.00
45.6750	6.10E-10	-0.02753	0.00163	5.85E-11	10859.	3.64E+09	-3.60E-05	371618.	0.00
46.2000	8.29E-10	-0.01799	0.00136	1.91E-11	10859.	3.64E+09	-4.95E-05	376579.	0.00
46.7250	8.51E-10	-0.01040	0.00104	-5.51E-12	10859.	3.64E+09	-5.15E-05	381540.	0.00
47.2500	7.59E-10	-0.00483	7.35E-04	-1.87E-11	10859.	3.64E+09	-4.66E-05	386501.	0.00
47.7750	6.15E-10	-0.00110	4.68E-04	-2.38E-11	10859.	3.64E+09	-3.82E-05	391463.	0.00
48.3000	4.59E-10	0.00112	2.56E-04	-2.38E-11	10859.	3.64E+09	-2.89E-05	396424.	0.00
48.8250	3.15E-10	0.00218	1.02E-04	-2.10E-11	10859.	3.64E+09	-2.01E-05	401385.	0.00
49.3500	1.95E-10	0.00245	-7.09E-07	-1.69E-11	10859.	3.64E+09	-1.26E-05	406346.	0.00
49.8750	1.02E-10	0.00221	-6.13E-05	-1.29E-11	10859.	3.64E+09	-6.65E-06	411308.	0.00
50.4000	3.27E-11	0.00170	-8.91E-05	-9.50E-12	10859.	3.64E+09	-2.16E-06	416269.	0.00
50.9250	-1.79E-11	0.00111	-9.21E-05	-7.07E-12	10859.	3.64E+09	1.20E-06	421230.	0.00
51.4500	-5.64E-11	5.59E-04	-7.63E-05	-5.62E-12	10859.	3.64E+09	3.81E-06	426191.	0.00
51.9750	-8.87E-11	1.59E-04	-4.52E-05	-5.00E-12	10859.	3.64E+09	6.07E-06	431153.	0.00
52.5000	-1.19E-10	0.00	0.00	-4.86E-12	10859.	3.64E+09	8.26E-06	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     0.50000000 inches
Computed slope at pile head      =    -0.00014112 radians
Maximum bending moment           =      -1078098. inch-lbs
Maximum shear force              =         25877. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     0.750000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.7500	-1507022.	34056.	0.00	81789.	3.64E+09	0.00	0.00	0.00
0.5250	0.7418	-1292246.	33696.	-0.00243	71680.	3.64E+09	-57.1885	485.7110	0.00
1.0500	0.7194	-1077413.	33124.	-0.00448	61569.	3.64E+09	-124.1958	1088.	0.00
1.5750	0.6853	-865567.	32139.	-0.00616	51598.	3.64E+09	-188.6269	1734.	0.00
2.1000	0.6418	-659649.	30767.	-0.00748	41906.	3.64E+09	-247.0303	2425.	0.00
2.6250	0.5910	-462348.	29055.	-0.00846	32620.	3.64E+09	-296.2782	3158.	0.00

3.1500	0.5352	-275972.	27008.	-0.00910	23848.	3.64E+09	-353.5809	4162.	0.00
3.6750	0.4764	-103134.	24562.	-0.00942	15713.	3.64E+09	-423.1345	5595.	0.00
4.2000	0.4165	53097.	21699.	-0.00947	13358.	3.64E+09	-485.5788	7345.	0.00
4.7250	0.3571	189959.	18510.	-0.00926	19800.	3.64E+09	-526.9227	9295.	0.00
5.2500	0.2998	305565.	15092.	-0.00883	25241.	3.64E+09	-557.9530	11723.	0.00
5.7750	0.2459	398476.	11510.	-0.00822	29614.	3.64E+09	-579.3107	14842.	0.00
6.3000	0.1963	467676.	7831.	-0.00747	32871.	3.64E+09	-588.7004	18893.	0.00
6.8250	0.1518	512668.	4139.	-0.00662	34989.	3.64E+09	-583.3243	24207.	0.00
7.3500	0.1129	533584.	541.2813	-0.00571	35973.	3.64E+09	-558.7657	31175.	0.00
7.8750	0.07985	531362.	-2839.	-0.00479	35868.	3.64E+09	-514.4817	40592.	0.00
8.4000	0.05258	507762.	-5878.	-0.00389	34758.	3.64E+09	-450.1217	53931.	0.00
8.9250	0.03086	465383.	-8233.	-0.00304	32763.	3.64E+09	-297.4432	60726.	0.00
9.4500	0.01422	410360.	-9627.	-0.00229	30173.	3.64E+09	-145.0880	64298.	0.00
9.9750	0.00205	348839.	-10153.	-0.00163	27278.	3.64E+09	-22.1267	67870.	0.00
10.5000	-0.00630	285811.	-9998.	-0.00108	24311.	3.64E+09	71.4368	71442.	0.00
11.0250	-0.01153	225104.	-9341.	-6.36E-04	21454.	3.64E+09	137.3177	75014.	0.00
11.5500	-0.01431	169441.	-8346.	-2.94E-04	18834.	3.64E+09	178.4757	78586.	0.00
12.0750	-0.01523	120557.	-7158.	-4.24E-05	16533.	3.64E+09	198.6557	82158.	0.00
12.6000	-0.01484	79340.	-5896.	1.31E-04	14593.	3.64E+09	201.9736	85730.	0.00
13.1250	-0.01359	45997.	-4653.	2.39E-04	13024.	3.64E+09	192.5694	89302.	0.00
13.6500	-0.01183	20214.	-3497.	2.97E-04	11811.	3.64E+09	174.3363	92875.	0.00
14.1750	-0.00985	1314.	-2473.	3.15E-04	10921.	3.64E+09	150.7296	96447.	0.00
14.7000	-0.00785	-11606.	-1606.	3.07E-04	11405.	3.64E+09	124.6497	100019.	0.00
15.2250	-0.00598	-19558.	-903.3316	2.80E-04	11780.	3.64E+09	98.3918	103591.	0.00
15.7500	-0.00433	-23569.	-361.4055	2.42E-04	11968.	3.64E+09	73.6482	107163.	0.00
16.2750	-0.00293	-24615.	32.9748	2.00E-04	12018.	3.64E+09	51.5519	110735.	0.00
16.8000	-0.00180	-23570.	298.5186	1.59E-04	11969.	3.64E+09	32.7477	114307.	0.00
17.3250	-9.34E-04	-21183.	456.7341	1.20E-04	11856.	3.64E+09	17.4794	117879.	0.00
17.8500	-2.95E-04	-18065.	529.6939	8.58E-05	11709.	3.64E+09	5.6824	121451.	0.00
18.3750	1.47E-04	-14688.	538.3775	5.75E-05	11550.	3.64E+09	-2.9257	125024.	0.00
18.9000	4.29E-04	-11401.	501.5610	3.49E-05	11396.	3.64E+09	-8.7620	128596.	0.00
19.4250	5.87E-04	-8441.	435.1946	1.77E-05	11256.	3.64E+09	-12.3067	132168.	0.00
19.9500	6.52E-04	-5954.	352.1894	5.19E-06	11139.	3.64E+09	-14.0442	135740.	0.00
20.4750	6.52E-04	-4014.	278.7737	-3.45E-06	11048.	3.64E+09	-9.2624	89495.	0.00
21.0000	6.08E-04	-2434.	221.6483	-9.03E-06	10974.	3.64E+09	-8.8727	91876.	0.00
21.5250	5.38E-04	-1202.	168.3341	-1.22E-05	10916.	3.64E+09	-8.0524	94257.	0.00
22.0500	4.55E-04	-287.7508	120.9889	-1.35E-05	10873.	3.64E+09	-6.9778	96639.	0.00
22.5750	3.68E-04	350.2708	80.7678	-1.34E-05	10876.	3.64E+09	-5.7908	99020.	0.00
23.1000	2.86E-04	757.8255	48.0371	-1.25E-05	10895.	3.64E+09	-4.5999	101402.	0.00
23.6250	2.11E-04	981.4432	22.5760	-1.10E-05	10905.	3.64E+09	-3.4829	103783.	0.00
24.1500	1.48E-04	1065.	3.7603	-9.18E-06	10909.	3.64E+09	-2.4903	106164.	0.00
24.6750	9.58E-05	1048.	-9.2811	-7.35E-06	10908.	3.64E+09	-1.6499	108546.	0.00
25.2000	5.52E-05	963.3922	-17.5385	-5.61E-06	10905.	3.64E+09	-0.9715	110927.	0.00
25.7250	2.51E-05	838.5793	-21.9631	-4.04E-06	10899.	3.64E+09	-0.4331	108626.	0.00
26.2500	4.21E-06	695.0670	-23.5610	-2.72E-06	10892.	3.64E+09	-0.07421	111007.	0.00
26.7750	-9.11E-06	547.3574	-23.2785	-1.64E-06	10885.	3.64E+09	0.1639	113389.	0.00
27.3000	-1.64E-05	405.1662	-21.8103	-8.14E-07	10878.	3.64E+09	0.3022	115770.	0.00
27.8250	-1.94E-05	274.2404	-18.8935	-2.25E-07	10872.	3.64E+09	0.6237	202935.	0.00
28.3500	-1.93E-05	167.5767	-14.9239	1.57E-07	10867.	3.64E+09	0.6365	207896.	0.00
28.8750	-1.74E-05	85.8720	-11.0693	3.77E-07	10863.	3.64E+09	0.5872	212858.	0.00
29.4000	-1.45E-05	27.3197	-7.6364	4.75E-07	10860.	3.64E+09	0.5026	217819.	0.00
29.9250	-1.14E-05	-11.3344	-4.7841	4.89E-07	10860.	3.64E+09	0.4029	222780.	0.00
30.4500	-8.38E-06	-33.9763	-2.5612	4.50E-07	10861.	3.64E+09	0.3028	227741.	0.00
30.9750	-5.73E-06	-44.5402	-0.9410	3.82E-07	10861.	3.64E+09	0.2116	232703.	0.00
31.5000	-3.57E-06	-46.6267	0.1492	3.03E-07	10861.	3.64E+09	0.1345	237664.	0.00
32.0250	-1.91E-06	-43.2890	0.8053	2.25E-07	10861.	3.64E+09	0.07372	242625.	0.00
32.5500	-7.35E-07	-36.9472	1.1285	1.55E-07	10861.	3.64E+09	0.02887	247586.	0.00
33.0750	4.15E-08	-29.3928	1.2142	9.77E-08	10861.	3.64E+09	-0.00166	252548.	0.00
33.6000	4.97E-07	-21.8515	1.1450	5.33E-08	10860.	3.64E+09	-0.02031	257509.	0.00
34.1250	7.14E-07	-15.0768	0.9874	2.13E-08	10860.	3.64E+09	-0.02973	262470.	0.00
34.6500	7.66E-07	-9.4547	0.7914	8.14E-11	10860.	3.64E+09	-0.03250	267431.	0.00
35.1750	7.15E-07	-5.1057	0.5917	-1.25E-08	10859.	3.64E+09	-0.03090	272393.	0.00
35.7000	6.08E-07	-1.9737	0.4101	-1.87E-08	10859.	3.64E+09	-0.02675	277354.	0.00
36.2250	4.79E-07	0.1001	0.2581	-2.03E-08	10859.	3.64E+09	-0.02148	282315.	0.00
36.7500	3.52E-07	1.3211	0.1399	-1.91E-08	10859.	3.64E+09	-0.01605	287276.	0.00

37.2750	2.39E-07	1.9026	0.05441	-1.63E-08	10859.	3.64E+09	-0.01109	292238.	0.00
37.8000	1.47E-07	2.0404	-0.00238	-1.29E-08	10859.	3.64E+09	-0.00694	297199.	0.00
38.3250	7.72E-08	1.8993	-0.03590	-9.44E-09	10859.	3.64E+09	-0.00370	302160.	0.00
38.8500	2.81E-08	1.6077	-0.05188	-6.40E-09	10859.	3.64E+09	-0.00137	307121.	0.00
39.3750	-3.42E-09	1.2589	-0.05567	-3.92E-09	10859.	3.64E+09	1.69E-04	312083.	0.00
39.9000	-2.12E-08	0.9144	-0.05177	-2.03E-09	10859.	3.64E+09	0.00107	317044.	0.00
40.4250	-2.90E-08	0.6107	-0.04374	-7.10E-10	10859.	3.64E+09	0.00148	322005.	0.00
40.9500	-3.02E-08	0.3648	-0.03413	1.35E-10	10859.	3.64E+09	0.00157	326966.	0.00
41.4750	-2.73E-08	0.1804	-0.02467	6.07E-10	10859.	3.64E+09	0.00144	331928.	0.00
42.0000	-2.25E-08	0.05273	-0.01634	8.09E-10	10859.	3.64E+09	0.00120	336889.	0.00
42.5250	-1.71E-08	-0.02723	-0.00962	8.31E-10	10859.	3.64E+09	9.29E-04	341850.	0.00
43.0500	-1.20E-08	-0.07026	-0.00461	7.47E-10	10859.	3.64E+09	6.63E-04	346811.	0.00
43.5750	-7.71E-09	-0.08687	-0.00117	6.11E-10	10859.	3.64E+09	4.31E-04	351773.	0.00
44.1000	-4.34E-09	-0.08623	9.64E-04	4.61E-10	10859.	3.64E+09	2.46E-04	356734.	0.00
44.6250	-1.91E-09	-0.07568	0.00208	3.20E-10	10859.	3.64E+09	1.10E-04	361695.	0.00
45.1500	-3.02E-10	-0.06065	0.00248	2.02E-10	10859.	3.64E+09	1.76E-05	366656.	0.00
45.6750	6.41E-10	-0.04481	0.00242	1.11E-10	10859.	3.64E+09	-3.78E-05	371618.	0.00
46.2000	1.10E-09	-0.03039	0.00209	4.58E-11	10859.	3.64E+09	-6.55E-05	376579.	0.00
46.7250	1.22E-09	-0.01851	0.00166	3.41E-12	10859.	3.64E+09	-7.38E-05	381540.	0.00
47.2500	1.14E-09	-0.00953	0.00120	-2.09E-11	10859.	3.64E+09	-6.98E-05	386501.	0.00
47.7750	9.55E-10	-0.00330	7.97E-04	-3.20E-11	10859.	3.64E+09	-5.93E-05	391463.	0.00
48.3000	7.35E-10	5.79E-04	4.64E-04	-3.44E-11	10859.	3.64E+09	-4.63E-05	396424.	0.00
48.8250	5.22E-10	0.00262	2.14E-04	-3.16E-11	10859.	3.64E+09	-3.32E-05	401385.	0.00
49.3500	3.37E-10	0.00334	4.07E-05	-2.64E-11	10859.	3.64E+09	-2.17E-05	406346.	0.00
49.8750	1.89E-10	0.00319	-6.67E-05	-2.08E-11	10859.	3.64E+09	-1.23E-05	411308.	0.00
50.4000	7.54E-11	0.00254	-1.21E-04	-1.58E-11	10859.	3.64E+09	-4.98E-06	416269.	0.00
50.9250	-1.02E-11	0.00169	-1.35E-04	-1.21E-11	10859.	3.64E+09	6.83E-07	421230.	0.00
51.4500	-7.74E-11	8.70E-04	-1.16E-04	-9.91E-12	10859.	3.64E+09	5.23E-06	426191.	0.00
51.9750	-1.35E-10	2.52E-04	-7.05E-05	-8.93E-12	10859.	3.64E+09	9.24E-06	431153.	0.00
52.5000	-1.90E-10	0.00	0.00	-8.72E-12	10859.	3.64E+09	1.31E-05	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     0.75000000 inches
Computed slope at pile head      =    -0.00018610 radians
Maximum bending moment           =      -1507022. inch-lbs
Maximum shear force              =         34056. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              8
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 1.000000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 165000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	-1891600.	40702.	0.00	99890.	3.64E+09	0.00	0.00	0.00
0.5250	0.9897	-1634607.	40342.	-0.00306	87794.	3.64E+09	-57.1885	364.0466	0.00
1.0500	0.9615	-1376939.	39771.	-0.00566	75667.	3.64E+09	-124.1958	813.7624	0.00
1.5750	0.9183	-1121719.	38785.	-0.00783	63654.	3.64E+09	-188.6269	1294.	0.00

2.1000	0.8628	-871966.	37413.	-0.00956	51899.	3.64E+09	-247.0304	1804.	0.00
2.6250	0.7979	-630446.	35702.	-0.01086	40532.	3.64E+09	-296.2782	2339.	0.00
3.1500	0.7260	-399549.	33654.	-0.01175	29664.	3.64E+09	-353.5811	3068.	0.00
3.6750	0.6498	-181967.	31208.	-0.01226	19424.	3.64E+09	-423.1347	4102.	0.00
4.2000	0.5716	19149.	28275.	-0.01240	11760.	3.64E+09	-507.9717	5599.	0.00
4.7250	0.4936	200069.	24725.	-0.01221	20276.	3.64E+09	-618.8375	7899.	0.00
5.2500	0.4178	356067.	20533.	-0.01173	27618.	3.64E+09	-712.1802	10739.	0.00
5.7750	0.3459	483157.	15975.	-0.01100	33600.	3.64E+09	-734.6785	13383.	0.00
6.3000	0.2792	580217.	11331.	-0.01008	38168.	3.64E+09	-739.7541	16692.	0.00
6.8250	0.2189	646872.	6702.	-0.00901	41305.	3.64E+09	-729.6688	21001.	0.00
7.3500	0.1656	683400.	2182.	-0.00786	43024.	3.64E+09	-705.3502	26827.	0.00
7.8750	0.1198	690702.	-2115.	-0.00667	43368.	3.64E+09	-658.5709	34618.	0.00
8.4000	0.08160	670621.	-6041.	-0.00549	42423.	3.64E+09	-587.9917	45396.	0.00
8.9250	0.05067	625994.	-9432.	-0.00437	40322.	3.64E+09	-488.4337	60726.	0.00
9.4500	0.02658	560854.	-11825.	-0.00334	37257.	3.64E+09	-271.2703	64298.	0.00
9.9750	0.00861	483937.	-12972.	-0.00243	33636.	3.64E+09	-92.7525	67870.	0.00
10.5000	-0.00408	402466.	-13118.	-0.00166	29802.	3.64E+09	46.2269	71442.	0.00
11.0250	-0.01237	322106.	-12509.	-0.00104	26019.	3.64E+09	147.2718	75014.	0.00
11.5500	-0.01714	247010.	-11371.	-5.44E-04	22485.	3.64E+09	213.8520	78586.	0.00
12.0750	-0.01922	179957.	-9908.	-1.74E-04	19329.	3.64E+09	250.6779	82158.	0.00
12.6000	-0.01934	122530.	-8290.	8.81E-05	16626.	3.64E+09	263.1242	85730.	0.00
13.1250	-0.01811	75324.	-6652.	2.60E-04	14404.	3.64E+09	256.7366	89302.	0.00
13.6500	-0.01607	38174.	-5097.	3.58E-04	12656.	3.64E+09	236.8372	92875.	0.00
14.1750	-0.01360	10354.	-3695.	4.00E-04	11346.	3.64E+09	208.2366	96447.	0.00
14.7000	-0.01103	-9219.	-2488.	4.01E-04	11293.	3.64E+09	175.0480	100019.	0.00
15.2250	-0.00855	-21828.	-1494.	3.74E-04	11887.	3.64E+09	140.5930	103591.	0.00
15.7500	-0.00631	-28818.	-712.5976	3.30E-04	12216.	3.64E+09	107.3844	107163.	0.00
16.2750	-0.00439	-31493.	-131.2547	2.78E-04	12341.	3.64E+09	77.1689	110735.	0.00
16.8000	-0.00281	-31049.	272.5149	2.24E-04	12321.	3.64E+09	51.0119	114307.	0.00
17.3250	-0.00157	-28525.	525.8355	1.72E-04	12202.	3.64E+09	29.4074	117879.	0.00
17.8500	-6.43E-04	-24782.	657.5308	1.26E-04	12026.	3.64E+09	12.4006	121451.	0.00
18.3750	1.46E-05	-20502.	695.6808	8.67E-05	11824.	3.64E+09	-0.2895	125024.	0.00
18.9000	4.49E-04	-16196.	665.9248	5.49E-05	11621.	3.64E+09	-9.1568	128596.	0.00
19.4250	7.06E-04	-12225.	590.4402	3.02E-05	11435.	3.64E+09	-14.8065	132168.	0.00
19.9500	8.29E-04	-8819.	487.5023	1.20E-05	11274.	3.64E+09	-17.8722	135740.	0.00
20.4750	8.57E-04	-6107.	392.8608	-9.40E-07	11147.	3.64E+09	-12.1728	89495.	0.00
21.0000	8.18E-04	-3867.	316.9555	-9.58E-06	11041.	3.64E+09	-11.9241	91876.	0.00
21.5250	7.36E-04	-2094.	244.7002	-1.47E-05	10958.	3.64E+09	-11.0141	94257.	0.00
22.0500	6.32E-04	-753.5360	179.4770	-1.72E-05	10895.	3.64E+09	-9.6917	96639.	0.00
22.5750	5.19E-04	203.4115	123.2404	-1.77E-05	10869.	3.64E+09	-8.1612	99020.	0.00
23.1000	4.09E-04	836.0750	76.8015	-1.68E-05	10899.	3.64E+09	-6.5813	101402.	0.00
23.6250	3.08E-04	1206.	40.1051	-1.50E-05	10916.	3.64E+09	-5.0684	103783.	0.00
24.1500	2.20E-04	1373.	12.4823	-1.28E-05	10924.	3.64E+09	-3.7008	106164.	0.00
24.6750	1.47E-04	1390.	-7.1284	-1.04E-05	10925.	3.64E+09	-2.5248	108546.	0.00
25.2000	8.86E-05	1304.	-19.9983	-8.06E-06	10921.	3.64E+09	-1.5608	110927.	0.00
25.7250	4.50E-05	1155.	-27.3586	-5.93E-06	10914.	3.64E+09	-0.7758	108626.	0.00
26.2500	1.39E-05	972.0290	-30.5764	-4.09E-06	10905.	3.64E+09	-0.2457	111007.	0.00
26.7750	-6.49E-06	777.8929	-30.9826	-2.57E-06	10896.	3.64E+09	0.1168	113389.	0.00
27.3000	-1.84E-05	586.9903	-29.5480	-1.39E-06	10887.	3.64E+09	0.3387	115770.	0.00
27.8250	-2.40E-05	408.4719	-26.0498	-5.24E-07	10878.	3.64E+09	0.7719	202935.	0.00
28.3500	-2.50E-05	259.8531	-21.0160	5.49E-08	10871.	3.64E+09	0.8261	207896.	0.00
28.8750	-2.33E-05	143.5559	-15.9370	4.04E-07	10866.	3.64E+09	0.7863	212858.	0.00
29.4000	-1.99E-05	58.2065	-11.2887	5.79E-07	10862.	3.64E+09	0.6894	217819.	0.00
29.9250	-1.60E-05	0.1144	-7.3379	6.30E-07	10859.	3.64E+09	0.5648	222780.	0.00
30.4500	-1.20E-05	-35.5602	-4.1918	5.99E-07	10861.	3.64E+09	0.4339	227741.	0.00
30.9750	-8.42E-06	-53.9474	-1.8447	5.22E-07	10862.	3.64E+09	0.3112	232703.	0.00
31.5000	-5.43E-06	-59.8872	-0.2188	4.23E-07	10862.	3.64E+09	0.2050	237664.	0.00
32.0250	-3.10E-06	-57.5839	0.8024	3.21E-07	10862.	3.64E+09	0.1192	242625.	0.00
32.5500	-1.39E-06	-50.4442	1.3498	2.27E-07	10862.	3.64E+09	0.05454	247586.	0.00
33.0750	-2.30E-07	-41.0492	1.5506	1.48E-07	10861.	3.64E+09	0.00922	252548.	0.00
33.6000	4.79E-07	-31.2142	1.5180	8.56E-08	10861.	3.64E+09	-0.01960	257509.	0.00
34.1250	8.48E-07	-22.1008	1.3449	3.94E-08	10860.	3.64E+09	-0.03534	262470.	0.00
34.6500	9.76E-07	-14.3503	1.1031	7.79E-09	10860.	3.64E+09	-0.04142	267431.	0.00
35.1750	9.46E-07	-8.2176	0.8438	-1.18E-08	10860.	3.64E+09	-0.04092	272393.	0.00
35.7000	8.27E-07	-3.6943	0.6001	-2.21E-08	10859.	3.64E+09	-0.03643	277354.	0.00

36.2250	6.68E-07	-0.6102	0.3911	-2.58E-08	10859.	3.64E+09	-0.02994	282315.	0.00
36.7500	5.02E-07	1.2866	0.2246	-2.52E-08	10859.	3.64E+09	-0.02290	287276.	0.00
37.2750	3.50E-07	2.2723	0.1013	-2.21E-08	10859.	3.64E+09	-0.01625	292238.	0.00
37.8000	2.23E-07	2.6090	0.01695	-1.79E-08	10859.	3.64E+09	-0.01053	297199.	0.00
38.3250	1.25E-07	2.5231	-0.03503	-1.35E-08	10859.	3.64E+09	-0.00597	302160.	0.00
38.8500	5.35E-08	2.1955	-0.06207	-9.38E-09	10859.	3.64E+09	-0.00261	307121.	0.00
39.3750	6.38E-09	1.7605	-0.07127	-5.95E-09	10859.	3.64E+09	-3.16E-04	312083.	0.00
39.9000	-2.15E-08	1.3098	-0.06886	-3.29E-09	10859.	3.64E+09	0.00108	317044.	0.00
40.4250	-3.51E-08	0.8997	-0.05980	-1.38E-09	10859.	3.64E+09	0.00179	322005.	0.00
40.9500	-3.88E-08	0.5592	-0.04781	-1.12E-10	10859.	3.64E+09	0.00202	326966.	0.00
41.4750	-3.65E-08	0.2976	-0.03540	6.31E-10	10859.	3.64E+09	0.00192	331928.	0.00
42.0000	-3.09E-08	0.1118	-0.02414	9.85E-10	10859.	3.64E+09	0.00165	336889.	0.00
42.5250	-2.41E-08	-0.00859	-0.01482	1.07E-09	10859.	3.64E+09	0.00131	341850.	0.00
43.0500	-1.73E-08	-0.07716	-0.00770	1.00E-09	10859.	3.64E+09	9.55E-04	346811.	0.00
43.5750	-1.15E-08	-0.1077	-0.00267	8.40E-10	10859.	3.64E+09	6.40E-04	351773.	0.00
44.1000	-6.76E-09	-0.1126	5.48E-04	6.50E-10	10859.	3.64E+09	3.83E-04	356734.	0.00
44.6250	-3.28E-09	-0.1021	0.00235	4.64E-10	10859.	3.64E+09	1.88E-04	361695.	0.00
45.1500	-9.18E-10	-0.08399	0.00311	3.02E-10	10859.	3.64E+09	5.34E-05	366656.	0.00
45.6750	5.28E-10	-0.06359	0.00318	1.74E-10	10859.	3.64E+09	-3.12E-05	371618.	0.00
46.2000	1.28E-09	-0.04431	0.00284	8.09E-11	10859.	3.64E+09	-7.65E-05	376579.	0.00
46.7250	1.55E-09	-0.02799	0.00230	1.82E-11	10859.	3.64E+09	-9.37E-05	381540.	0.00
47.2500	1.51E-09	-0.01533	0.00172	-1.93E-11	10859.	3.64E+09	-9.26E-05	386501.	0.00
47.7750	1.30E-09	-0.00633	0.00117	-3.81E-11	10859.	3.64E+09	-8.10E-05	391463.	0.00
48.3000	1.03E-09	-5.23E-04	7.10E-04	-4.40E-11	10859.	3.64E+09	-6.48E-05	396424.	0.00
48.8250	7.50E-10	0.00271	3.55E-04	-4.21E-11	10859.	3.64E+09	-4.78E-05	401385.	0.00
49.3500	4.99E-10	0.00404	1.03E-04	-3.63E-11	10859.	3.64E+09	-3.22E-05	406346.	0.00
49.8750	2.93E-10	0.00408	-5.87E-05	-2.92E-11	10859.	3.64E+09	-1.91E-05	411308.	0.00
50.4000	1.31E-10	0.00336	-1.46E-04	-2.28E-11	10859.	3.64E+09	-8.67E-06	416269.	0.00
50.9250	6.01E-12	0.00229	-1.75E-04	-1.79E-11	10859.	3.64E+09	-4.02E-07	421230.	0.00
51.4500	-9.42E-11	0.00119	-1.56E-04	-1.49E-11	10859.	3.64E+09	6.37E-06	426191.	0.00
51.9750	-1.81E-10	3.50E-04	-9.69E-05	-1.35E-11	10859.	3.64E+09	1.24E-05	431153.	0.00
52.5000	-2.65E-10	0.00	0.00	-1.32E-11	10859.	3.64E+09	1.83E-05	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =    -0.00022269 radians
Maximum bending moment           =      -1891600. inch-lbs
Maximum shear force              =         40702. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              8
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 5

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.250000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.2500	-2242891.	46376.	0.00	116424.	3.64E+09	0.00	0.00	0.00
0.5250	1.2378	-1949840.	46015.	-0.00363	102631.	3.64E+09	-57.1885	291.0811	0.00

1.0500	1.2042	-1655546.	45444.	-0.00676	88780.	3.64E+09	-124.1958	649.7407	0.00
1.5750	1.1526	-1363199.	44458.	-0.00937	75020.	3.64E+09	-188.6268	1031.	0.00
2.1000	1.0861	-1075882.	43086.	-0.01149	61497.	3.64E+09	-247.0303	1433.	0.00
2.6250	1.0079	-796433.	41375.	-0.01311	48344.	3.64E+09	-296.2781	1852.	0.00
3.1500	0.9210	-527308.	39328.	-0.01426	35678.	3.64E+09	-353.5809	2419.	0.00
3.6750	0.8283	-271266.	36881.	-0.01495	23627.	3.64E+09	-423.1344	3218.	0.00
4.2000	0.7326	-31530.	33948.	-0.01521	12343.	3.64E+09	-507.9712	4368.	0.00
4.7250	0.6366	188101.	30399.	-0.01507	19712.	3.64E+09	-618.8366	6124.	0.00
5.2500	0.5427	382832.	26104.	-0.01458	28878.	3.64E+09	-744.5098	8643.	0.00
5.7750	0.4529	547323.	20971.	-0.01377	36620.	3.64E+09	-884.9018	12309.	0.00
6.3000	0.3691	675707.	15338.	-0.01271	42662.	3.64E+09	-903.5934	15422.	0.00
6.8250	0.2927	767010.	9702.	-0.01146	46960.	3.64E+09	-885.4983	19058.	0.00
7.3500	0.2247	821786.	4233.	-0.01009	49538.	3.64E+09	-850.7772	23855.	0.00
7.8750	0.1656	841314.	-972.5557	-0.00865	50457.	3.64E+09	-801.7027	30496.	0.00
8.4000	0.1157	827507.	-5789.	-0.00720	49807.	3.64E+09	-727.2259	39583.	0.00
8.9250	0.07490	783346.	-10049.	-0.00580	47728.	3.64E+09	-625.2340	52588.	0.00
9.4500	0.04261	712957.	-13388.	-0.00451	44415.	3.64E+09	-434.8963	64298.	0.00
9.9750	0.01811	624024.	-15373.	-0.00335	40230.	3.64E+09	-195.0533	67870.	0.00
10.5000	4.13E-04	526224.	-16002.	-0.00235	35627.	3.64E+09	-4.6807	71442.	0.00
11.0250	-0.01153	427291.	-15584.	-0.00153	30970.	3.64E+09	137.3465	75014.	0.00
11.5500	-0.01882	333040.	-14412.	-8.67E-04	26534.	3.64E+09	234.7294	78586.	0.00
12.0750	-0.02246	247505.	-12750.	-3.64E-04	22508.	3.64E+09	292.9521	82158.	0.00
12.6000	-0.02341	173151.	-10824.	1.65E-07	19009.	3.64E+09	318.5376	85730.	0.00
13.1250	-0.02246	111128.	-8817.	2.46E-04	16090.	3.64E+09	318.3967	89302.	0.00
13.6500	-0.02030	61542.	-6871.	3.96E-04	13756.	3.64E+09	299.2964	92875.	0.00
14.1750	-0.01747	23724.	-5086.	4.70E-04	11976.	3.64E+09	267.4609	96447.	0.00
14.7000	-0.01438	-3521.	-3525.	4.88E-04	11025.	3.64E+09	228.3022	100019.	0.00
15.2250	-0.01133	-21698.	-2219.	4.66E-04	11880.	3.64E+09	186.2710	103591.	0.00
15.7500	-0.00851	-32443.	-1176.	4.19E-04	12386.	3.64E+09	144.8084	107163.	0.00
16.2750	-0.00605	-37382.	-384.4547	3.58E-04	12619.	3.64E+09	106.3794	110735.	0.00
16.8000	-0.00400	-38032.	179.2198	2.93E-04	12649.	3.64E+09	72.5649	114307.	0.00
17.3250	-0.00236	-35733.	547.0039	2.29E-04	12541.	3.64E+09	44.1920	117879.	0.00
17.8500	-0.00111	-31616.	753.8801	1.71E-04	12347.	3.64E+09	21.4830	121451.	0.00
18.3750	-2.12E-04	-26589.	834.8114	1.20E-04	12111.	3.64E+09	4.2095	125024.	0.00
18.9000	4.00E-04	-21347.	822.3622	7.86E-05	11864.	3.64E+09	-8.1616	128596.	0.00
19.4250	7.79E-04	-16391.	745.1908	4.59E-05	11631.	3.64E+09	-16.3372	132168.	0.00
19.9500	9.79E-04	-12053.	627.3049	2.13E-05	11426.	3.64E+09	-21.0868	135740.	0.00
20.4750	0.00105	-8531.	514.0291	3.46E-06	11261.	3.64E+09	-14.8737	89495.	0.00
21.0000	0.00102	-5584.	420.2166	-8.77E-06	11122.	3.64E+09	-14.9080	91876.	0.00
21.5250	9.37E-04	-3218.	329.1200	-1.64E-05	11011.	3.64E+09	-14.0115	94257.	0.00
22.0500	8.16E-04	-1402.	245.5732	-2.04E-05	10925.	3.64E+09	-12.5113	96639.	0.00
22.5750	6.79E-04	-81.1981	172.5239	-2.17E-05	10863.	3.64E+09	-10.6790	99020.	0.00
23.1000	5.42E-04	816.3963	111.3874	-2.11E-05	10898.	3.64E+09	-8.7294	101402.	0.00
23.6250	4.14E-04	1366.	62.3968	-1.92E-05	10923.	3.64E+09	-6.8231	103783.	0.00
24.1500	3.01E-04	1642.	24.9296	-1.66E-05	10936.	3.64E+09	-5.0712	106164.	0.00
24.6750	2.06E-04	1715.	-2.2042	-1.36E-05	10940.	3.64E+09	-3.5427	108546.	0.00
25.2000	1.29E-04	1643.	-20.5195	-1.07E-05	10936.	3.64E+09	-2.2717	110927.	0.00
25.7250	7.04E-05	1478.	-31.4966	-8.03E-06	10929.	3.64E+09	-1.2131	108626.	0.00
26.2500	2.78E-05	1263.	-36.8628	-5.66E-06	10919.	3.64E+09	-0.4905	111007.	0.00
26.7750	-8.97E-07	1026.	-38.3570	-3.67E-06	10907.	3.64E+09	0.01614	113389.	0.00
27.3000	-1.84E-05	787.1970	-37.2392	-2.10E-06	10896.	3.64E+09	0.3387	115770.	0.00
27.8250	-2.74E-05	560.7865	-33.3950	-9.33E-07	10886.	3.64E+09	0.8817	202935.	0.00
28.3500	-3.02E-05	368.3605	-27.4795	-1.28E-07	10876.	3.64E+09	0.9962	207896.	0.00
28.8750	-2.90E-05	214.8116	-21.2564	3.77E-07	10869.	3.64E+09	0.9793	212858.	0.00
29.4000	-2.54E-05	99.7455	-15.4013	6.50E-07	10864.	3.64E+09	0.8794	217819.	0.00
29.9250	-2.08E-05	19.4047	-10.3144	7.53E-07	10860.	3.64E+09	0.7354	222780.	0.00
30.4500	-1.59E-05	-31.7811	-6.1817	7.42E-07	10861.	3.64E+09	0.5765	227741.	0.00
30.9750	-1.14E-05	-60.0286	-3.0342	6.63E-07	10862.	3.64E+09	0.4227	232703.	0.00
31.5000	-7.60E-06	-71.3904	-0.8000	5.49E-07	10863.	3.64E+09	0.2866	237664.	0.00
32.0250	-4.53E-06	-71.2496	0.6520	4.25E-07	10863.	3.64E+09	0.1744	242625.	0.00
32.5500	-2.24E-06	-64.0594	1.4783	3.08E-07	10862.	3.64E+09	0.08793	247586.	0.00
33.0750	-6.46E-07	-53.2639	1.8369	2.06E-07	10862.	3.64E+09	0.02591	252548.	0.00
33.6000	3.63E-07	-41.3441	1.8717	1.24E-07	10861.	3.64E+09	-0.01485	257509.	0.00
34.1250	9.22E-07	-29.9393	1.7040	6.27E-08	10861.	3.64E+09	-0.03839	262470.	0.00
34.6500	1.15E-06	-20.0045	1.4289	1.94E-08	10860.	3.64E+09	-0.04894	267431.	0.00

35.1750	1.17E-06	-11.9760	1.1159	-8.33E-09	10860.	3.64E+09	-0.05041	272393.	0.00
35.7000	1.05E-06	-5.9265	0.8118	-2.38E-08	10859.	3.64E+09	-0.04614	277354.	0.00
36.2250	8.65E-07	-1.6975	0.5443	-3.04E-08	10859.	3.64E+09	-0.03878	282315.	0.00
36.7500	6.64E-07	0.9952	0.3267	-3.11E-08	10859.	3.64E+09	-0.03030	287276.	0.00
37.2750	4.74E-07	2.4837	0.1620	-2.80E-08	10859.	3.64E+09	-0.02200	292238.	0.00
37.8000	3.11E-07	3.0946	0.04648	-2.32E-08	10859.	3.64E+09	-0.01468	297199.	0.00
38.3250	1.82E-07	3.1175	-0.02722	-1.78E-08	10859.	3.64E+09	-0.00872	302160.	0.00
38.8500	8.66E-08	2.7887	-0.06798	-1.27E-08	10859.	3.64E+09	-0.00422	307121.	0.00
39.3750	2.17E-08	2.2874	-0.08467	-8.31E-09	10859.	3.64E+09	-0.00108	312083.	0.00
39.9000	-1.81E-08	1.7392	-0.08519	-4.82E-09	10859.	3.64E+09	9.10E-04	317044.	0.00
40.4250	-3.89E-08	1.2240	-0.07605	-2.25E-09	10859.	3.64E+09	0.00199	322005.	0.00
40.9500	-4.64E-08	0.7856	-0.06219	-5.08E-10	10859.	3.64E+09	0.00241	326966.	0.00
41.4750	-4.53E-08	0.4414	-0.04708	5.56E-10	10859.	3.64E+09	0.00239	331928.	0.00
42.0000	-3.94E-08	0.1912	-0.03291	1.10E-09	10859.	3.64E+09	0.00211	336889.	0.00
42.5250	-3.14E-08	0.02441	-0.02090	1.29E-09	10859.	3.64E+09	0.00171	341850.	0.00
43.0500	-2.32E-08	-0.07479	-0.01151	1.25E-09	10859.	3.64E+09	0.00128	346811.	0.00
43.5750	-1.57E-08	-0.1232	-0.00473	1.08E-09	10859.	3.64E+09	8.77E-04	351773.	0.00
44.1000	-9.61E-09	-0.1366	-2.54E-04	8.50E-10	10859.	3.64E+09	5.44E-04	356734.	0.00
44.6250	-5.00E-09	-0.1282	0.00237	6.21E-10	10859.	3.64E+09	2.87E-04	361695.	0.00
45.1500	-1.79E-09	-0.1081	0.00360	4.16E-10	10859.	3.64E+09	1.04E-04	366656.	0.00
45.6750	2.42E-10	-0.08374	0.00388	2.50E-10	10859.	3.64E+09	-1.43E-05	371618.	0.00
46.2000	1.36E-09	-0.05976	0.00358	1.25E-10	10859.	3.64E+09	-8.12E-05	376579.	0.00
46.7250	1.82E-09	-0.03890	0.00298	4.00E-11	10859.	3.64E+09	-1.10E-04	381540.	0.00
47.2500	1.86E-09	-0.02234	0.00227	-1.31E-11	10859.	3.64E+09	-1.14E-04	386501.	0.00
47.7750	1.66E-09	-0.01028	0.00158	-4.14E-11	10859.	3.64E+09	-1.03E-04	391463.	0.00
48.3000	1.34E-09	-0.00229	9.95E-04	-5.23E-11	10859.	3.64E+09	-8.43E-05	396424.	0.00
48.8250	9.99E-10	0.00236	5.29E-04	-5.22E-11	10859.	3.64E+09	-6.36E-05	401385.	0.00
49.3500	6.83E-10	0.00448	1.90E-04	-4.63E-11	10859.	3.64E+09	-4.40E-05	406346.	0.00
49.8750	4.16E-10	0.00485	-3.46E-05	-3.82E-11	10859.	3.64E+09	-2.71E-05	411308.	0.00
50.4000	2.01E-10	0.00412	-1.62E-04	-3.04E-11	10859.	3.64E+09	-1.33E-05	416269.	0.00
50.9250	3.23E-11	0.00287	-2.11E-04	-2.44E-11	10859.	3.64E+09	-2.16E-06	421230.	0.00
51.4500	-1.06E-10	0.00152	-1.95E-04	-2.06E-11	10859.	3.64E+09	7.14E-06	426191.	0.00
51.9750	-2.27E-10	4.52E-04	-1.24E-04	-1.89E-11	10859.	3.64E+09	1.55E-05	431153.	0.00
52.5000	-3.43E-10	0.00	0.00	-1.85E-11	10859.	3.64E+09	2.37E-05	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     1.25000000 inches
Computed slope at pile head      =    -0.00025393 radians
Maximum bending moment           =      -2242891. inch-lbs
Maximum shear force              =         46376. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              9
Number of zero deflection points =              7
```

```
--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.500000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch

0.00	1.5000	-2569007.	51363.	0.00	131773.	3.64E+09	0.00	0.00	0.00
0.5250	1.4860	-2244243.	51002.	-0.00417	116487.	3.64E+09	-57.1885	242.4585	0.00
1.0500	1.4474	-1917706.	50431.	-0.00778	101119.	3.64E+09	-124.1958	540.5603	0.00
1.5750	1.3880	-1592644.	49446.	-0.01082	85819.	3.64E+09	-188.6269	856.1690	0.00
2.1000	1.3111	-1272199.	48073.	-0.01330	70737.	3.64E+09	-247.0305	1187.	0.00
2.6250	1.2204	-959267.	46362.	-0.01523	56008.	3.64E+09	-296.2785	1529.	0.00
3.1500	1.1192	-656367.	44315.	-0.01663	41752.	3.64E+09	-353.5815	1990.	0.00
3.6750	1.0108	-366317.	41868.	-0.01752	28100.	3.64E+09	-423.1354	2637.	0.00
4.2000	0.8984	-92402.	38935.	-0.01792	15208.	3.64E+09	-507.9729	3562.	0.00
4.7250	0.7850	161518.	35386.	-0.01786	18461.	3.64E+09	-618.8393	4966.	0.00
5.2500	0.6734	390586.	31091.	-0.01738	29243.	3.64E+09	-744.5139	6965.	0.00
5.7750	0.5660	589400.	25958.	-0.01653	38600.	3.64E+09	-884.9080	9849.	0.00
6.3000	0.4651	752030.	19904.	-0.01537	46254.	3.64E+09	-1037.	14050.	0.00
6.8250	0.3724	872136.	13317.	-0.01396	51907.	3.64E+09	-1054.	17826.	0.00
7.3500	0.2892	948850.	6826.	-0.01238	55518.	3.64E+09	-1007.	21936.	0.00
7.8750	0.2164	983890.	680.2511	-0.01071	57167.	3.64E+09	-944.1609	27492.	0.00
8.4000	0.1543	979685.	-5022.	-0.00901	56969.	3.64E+09	-866.0283	35367.	0.00
8.9250	0.1029	939341.	-10138.	-0.00734	55071.	3.64E+09	-758.2697	46439.	0.00
9.4500	0.06173	867210.	-14476.	-0.00578	51676.	3.64E+09	-618.8718	63163.	0.00
9.9750	0.03005	768953.	-17446.	-0.00436	47051.	3.64E+09	-323.7746	67870.	0.00
10.5000	0.00678	656461.	-18708.	-0.00313	41756.	3.64E+09	-76.8468	71442.	0.00
11.0250	-0.00933	539735.	-18600.	-0.00209	36263.	3.64E+09	111.1379	75014.	0.00
11.5500	-0.01955	426449.	-17481.	-0.00125	30931.	3.64E+09	243.8849	78586.	0.00
12.0750	-0.02511	322074.	-15681.	-6.04E-04	26018.	3.64E+09	327.5004	82158.	0.00
12.6000	-0.02716	230118.	-13486.	-1.25E-04	21690.	3.64E+09	369.5717	85730.	0.00
13.1250	-0.02669	152415.	-11130.	2.06E-04	18033.	3.64E+09	378.3490	89303.	0.00
13.6500	-0.02456	89454.	-8797.	4.16E-04	15069.	3.64E+09	362.0649	92875.	0.00
14.1750	-0.02145	40703.	-6622.	5.29E-04	12775.	3.64E+09	328.4124	96447.	0.00
14.7000	-0.01790	4913.	-4693.	5.68E-04	11090.	3.64E+09	284.1805	100019.	0.00
15.2250	-0.01429	-19607.	-3057.	5.55E-04	11782.	3.64E+09	235.0384	103591.	0.00
15.7500	-0.01090	-34763.	-1733.	5.08E-04	12495.	3.64E+09	185.4486	107163.	0.00
16.2750	-0.00789	-42496.	-711.6781	4.41E-04	12859.	3.64E+09	138.6838	110735.	0.00
16.8000	-0.00534	-44648.	30.4776	3.66E-04	12961.	3.64E+09	96.9212	114307.	0.00
17.3250	-0.00328	-42872.	529.1577	2.90E-04	12877.	3.64E+09	61.3899	117879.	0.00
17.8500	-0.00169	-38583.	825.0532	2.19E-04	12675.	3.64E+09	32.5452	121451.	0.00
18.3750	-5.17E-04	-32933.	959.8707	1.57E-04	12409.	3.64E+09	10.2540	125024.	0.00
18.9000	2.95E-04	-26816.	973.1881	1.06E-04	12121.	3.64E+09	-6.0263	128596.	0.00
19.4250	8.14E-04	-20890.	900.3871	6.43E-05	11842.	3.64E+09	-17.0851	132168.	0.00
19.9500	0.00111	-15605.	771.5405	3.27E-05	11594.	3.64E+09	-23.8185	135740.	0.00
20.4750	0.00123	-11237.	641.6438	9.42E-06	11388.	3.64E+09	-17.4185	89495.	0.00
21.0000	0.00122	-7540.	530.5381	-6.85E-06	11214.	3.64E+09	-17.8532	91876.	0.00
21.5250	0.00114	-4538.	420.5783	-1.73E-05	11073.	3.64E+09	-17.0547	94257.	0.00
22.0500	0.00101	-2205.	318.2434	-2.32E-05	10963.	3.64E+09	-15.4326	96639.	0.00
22.5750	8.48E-04	-479.8259	227.6385	-2.55E-05	10882.	3.64E+09	-13.3309	99020.	0.00
23.1000	6.85E-04	716.6642	150.9156	-2.53E-05	10893.	3.64E+09	-11.0256	101402.	0.00
23.6250	5.30E-04	1474.	88.6989	-2.34E-05	10929.	3.64E+09	-8.7258	103783.	0.00
24.1500	3.90E-04	1883.	40.4864	-2.05E-05	10948.	3.64E+09	-6.5798	106164.	0.00
24.6750	2.72E-04	2027.	5.0094	-1.71E-05	10955.	3.64E+09	-4.6827	108546.	0.00
25.2000	1.75E-04	1982.	-19.4610	-1.36E-05	10952.	3.64E+09	-3.0856	110927.	0.00
25.7250	1.00E-04	1810.	-34.6305	-1.03E-05	10944.	3.64E+09	-1.7301	108626.	0.00
26.2500	4.52E-05	1567.	-42.5887	-7.40E-06	10933.	3.64E+09	-0.7963	111007.	0.00
26.7750	7.15E-06	1289.	-45.5028	-4.92E-06	10920.	3.64E+09	-0.1288	113389.	0.00
27.3000	-1.68E-05	1004.	-44.9349	-2.94E-06	10906.	3.64E+09	0.3090	115770.	0.00
27.8250	-2.98E-05	728.7001	-40.9348	-1.43E-06	10893.	3.64E+09	0.9609	202935.	0.00
28.3500	-3.49E-05	490.7142	-34.2815	-3.78E-07	10882.	3.64E+09	1.1513	207896.	0.00
28.8750	-3.46E-05	297.5383	-26.9739	3.05E-07	10873.	3.64E+09	1.1686	212858.	0.00
29.4000	-3.10E-05	150.2086	-19.9123	6.93E-07	10866.	3.64E+09	1.0732	217819.	0.00
29.9250	-2.59E-05	45.2023	-13.6522	8.63E-07	10861.	3.64E+09	0.9141	222780.	0.00
30.4500	-2.02E-05	-23.6032	-8.4760	8.81E-07	10860.	3.64E+09	0.7291	227741.	0.00
30.9750	-1.47E-05	-63.4281	-4.4638	8.06E-07	10862.	3.64E+09	0.5446	232703.	0.00
31.5000	-1.00E-05	-81.5222	-1.5583	6.80E-07	10863.	3.64E+09	0.3777	237664.	0.00
32.0250	-6.17E-06	-84.4769	0.3803	5.37E-07	10863.	3.64E+09	0.2377	242625.	0.00
32.5500	-3.25E-06	-77.8458	1.5316	3.96E-07	10863.	3.64E+09	0.1278	247586.	0.00
33.0750	-1.18E-06	-66.0015	2.0836	2.71E-07	10862.	3.64E+09	0.04742	252548.	0.00
33.6000	1.66E-07	-52.1561	2.2116	1.69E-07	10862.	3.64E+09	-0.00678	257509.	0.00

34.1250	9.45E-07	-38.4858	2.0663	9.04E-08	10861.	3.64E+09	-0.03938	262470.	0.00
34.6500	1.30E-06	-26.3091	1.7678	3.42E-08	10860.	3.64E+09	-0.05537	267431.	0.00
35.1750	1.38E-06	-16.2826	1.4060	-2.69E-09	10860.	3.64E+09	-0.05950	272393.	0.00
35.7000	1.27E-06	-8.5885	1.0423	-2.42E-08	10860.	3.64E+09	-0.05593	277354.	0.00
36.2250	1.07E-06	-3.0987	0.7150	-3.44E-08	10859.	3.64E+09	-0.04798	282315.	0.00
36.7500	8.37E-07	0.4923	0.4436	-3.66E-08	10859.	3.64E+09	-0.03818	287276.	0.00
37.2750	6.09E-07	2.5669	0.2343	-3.40E-08	10859.	3.64E+09	-0.02826	292238.	0.00
37.8000	4.09E-07	3.5154	0.08450	-2.87E-08	10859.	3.64E+09	-0.01930	297199.	0.00
38.3250	2.47E-07	3.6913	-0.01369	-2.25E-08	10859.	3.64E+09	-0.01187	302160.	0.00
38.8500	1.26E-07	3.3896	-0.07045	-1.63E-08	10859.	3.64E+09	-0.00615	307121.	0.00
39.3750	4.17E-08	2.8377	-0.09633	-1.09E-08	10859.	3.64E+09	-0.00207	312083.	0.00
39.9000	-1.16E-08	2.1986	-0.1010	-6.57E-09	10859.	3.64E+09	5.86E-04	317044.	0.00
40.4250	-4.10E-08	1.5788	-0.09254	-3.30E-09	10859.	3.64E+09	0.00210	322005.	0.00
40.9500	-5.32E-08	1.0394	-0.07724	-1.03E-09	10859.	3.64E+09	0.00276	326966.	0.00
41.4750	-5.40E-08	0.6076	-0.05960	4.00E-10	10859.	3.64E+09	0.00284	331928.	0.00
42.0000	-4.81E-08	0.2877	-0.04253	1.18E-09	10859.	3.64E+09	0.00257	336889.	0.00
42.5250	-3.92E-08	0.06931	-0.02773	1.49E-09	10859.	3.64E+09	0.00212	341850.	0.00
43.0500	-2.94E-08	-0.06484	-0.01594	1.49E-09	10859.	3.64E+09	0.00162	346811.	0.00
43.5750	-2.04E-08	-0.1346	-0.00725	1.32E-09	10859.	3.64E+09	0.00114	351773.	0.00
44.1000	-1.28E-08	-0.1589	-0.00137	1.06E-09	10859.	3.64E+09	7.27E-04	356734.	0.00
44.6250	-7.01E-09	-0.1541	0.00218	7.91E-10	10859.	3.64E+09	4.03E-04	361695.	0.00
45.1500	-2.87E-09	-0.1331	0.00398	5.42E-10	10859.	3.64E+09	1.67E-04	366656.	0.00
45.6750	-1.88E-10	-0.1051	0.00454	3.35E-10	10859.	3.64E+09	1.11E-05	371618.	0.00
46.2000	1.35E-09	-0.07654	0.00432	1.78E-10	10859.	3.64E+09	-8.08E-05	376579.	0.00
46.7250	2.05E-09	-0.05103	0.00368	6.74E-11	10859.	3.64E+09	-1.24E-04	381540.	0.00
47.2500	2.20E-09	-0.03037	0.00286	-3.14E-12	10859.	3.64E+09	-1.35E-04	386501.	0.00
47.7750	2.01E-09	-0.01502	0.00204	-4.25E-11	10859.	3.64E+09	-1.25E-04	391463.	0.00
48.3000	1.67E-09	-0.00460	0.00131	-5.95E-11	10859.	3.64E+09	-1.05E-04	396424.	0.00
48.8250	1.27E-09	0.00166	7.30E-04	-6.20E-11	10859.	3.64E+09	-8.06E-05	401385.	0.00
49.3500	8.84E-10	0.00472	2.96E-04	-5.65E-11	10859.	3.64E+09	-5.70E-05	406346.	0.00
49.8750	5.54E-10	0.00551	2.71E-06	-4.76E-11	10859.	3.64E+09	-3.62E-05	411308.	0.00
50.4000	2.84E-10	0.00485	-1.70E-04	-3.86E-11	10859.	3.64E+09	-1.88E-05	416269.	0.00
50.9250	6.69E-11	0.00345	-2.43E-04	-3.14E-11	10859.	3.64E+09	-4.47E-06	421230.	0.00
51.4500	-1.12E-10	0.00185	-2.34E-04	-2.69E-11	10859.	3.64E+09	7.60E-06	426191.	0.00
51.9750	-2.72E-10	5.58E-04	-1.51E-04	-2.48E-11	10859.	3.64E+09	1.86E-05	431153.	0.00
52.5000	-4.25E-10	0.00	0.00	-2.43E-11	10859.	3.64E+09	2.94E-05	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     1.50000000 inches
Computed slope at pile head      =    -0.00028141 radians
Maximum bending moment           =      -2569007. inch-lbs
Maximum shear force              =         51363. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              9
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 7

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     1.750000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     165000.0 lbs
```

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Spr. Es*h	Distrib. Lat. Load

feet	inches	in-lbs	lbs	radians	psi*	in-lb^2	lb/inch	lb/inch	lb/inch
0.00	1.7500	-2875831.	55870.	0.00	146214.	3.64E+09	0.00	0.00	0.00
0.5250	1.7343	-2522393.	55510.	-0.00468	129579.	3.64E+09	-57.1885	207.7422	0.00
1.0500	1.6911	-2166680.	54939.	-0.00874	112837.	3.64E+09	-124.1958	462.6874	0.00
1.5750	1.6242	-1811993.	53953.	-0.01219	96143.	3.64E+09	-188.6268	731.6663	0.00
2.1000	1.5375	-1461529.	52581.	-0.01502	79648.	3.64E+09	-247.0303	1012.	0.00
2.6250	1.4349	-1118236.	50870.	-0.01726	63490.	3.64E+09	-296.2781	1301.	0.00
3.1500	1.3200	-784688.	48823.	-0.01891	47792.	3.64E+09	-353.5808	1688.	0.00
3.6750	1.1966	-463760.	46376.	-0.01999	32687.	3.64E+09	-423.1343	2228.	0.00
4.2000	1.0681	-158791.	43443.	-0.02053	18333.	3.64E+09	-507.9710	2996.	0.00
4.7250	0.9379	126303.	39893.	-0.02056	16804.	3.64E+09	-618.8364	4157.	0.00
5.2500	0.8091	386607.	35599.	-0.02011	29055.	3.64E+09	-744.5094	5797.	0.00
5.7750	0.6845	616666.	30466.	-0.01924	39883.	3.64E+09	-884.9012	8145.	0.00
6.3000	0.5666	810492.	24411.	-0.01801	49006.	3.64E+09	-1037.	11533.	0.00
6.8250	0.4576	961688.	17359.	-0.01647	56122.	3.64E+09	-1202.	16544.	0.00
7.3500	0.3591	1063458.	9869.	-0.01472	60912.	3.64E+09	-1176.	20635.	0.00
7.8750	0.2721	1116635.	2707.	-0.01283	63415.	3.64E+09	-1098.	25410.	0.00
8.4000	0.1974	1124236.	-3920.	-0.01089	63773.	3.64E+09	-1006.	32108.	0.00
8.9250	0.1350	1089878.	-9907.	-0.00897	62156.	3.64E+09	-894.4029	41748.	0.00
9.4500	0.08442	1018057.	-15082.	-0.00714	58775.	3.64E+09	-748.6131	55867.	0.00
9.9750	0.04498	914690.	-18967.	-0.00547	53910.	3.64E+09	-484.6099	67870.	0.00
10.5000	0.01553	790442.	-21048.	-0.00399	48062.	3.64E+09	-176.1669	71442.	0.00
11.0250	-0.00528	657777.	-21405.	-0.00273	41818.	3.64E+09	62.9136	75014.	0.00
11.5500	-0.01892	526424.	-20463.	-0.00171	35636.	3.64E+09	236.0195	78586.	0.00
12.0750	-0.02681	403490.	-18619.	-9.03E-04	29850.	3.64E+09	349.6371	82158.	0.00
12.6000	-0.03029	293707.	-16219.	-2.99E-04	24683.	3.64E+09	412.2543	85730.	0.00
13.1250	-0.03057	199757.	-13555.	1.29E-04	20261.	3.64E+09	433.3682	89302.	0.00
13.6500	-0.02867	122648.	-10858.	4.08E-04	16632.	3.64E+09	422.6455	92875.	0.00
14.1750	-0.02543	62092.	-8301.	5.68E-04	13782.	3.64E+09	389.2649	96447.	0.00
14.7000	-0.02151	16874.	-5999.	6.37E-04	11653.	3.64E+09	341.4449	100019.	0.00
15.2250	-0.01740	-14822.	-4022.	6.39E-04	11557.	3.64E+09	286.1500	103591.	0.00
15.7500	-0.01346	-35134.	-2400.	5.95E-04	12513.	3.64E+09	228.9532	107163.	0.00
16.2750	-0.00990	-46295.	-1130.	5.25E-04	13038.	3.64E+09	174.0278	110735.	0.00
16.8000	-0.00685	-50466.	-190.7408	4.41E-04	13234.	3.64E+09	124.2373	114307.	0.00
17.3250	-0.00434	-49615.	456.6814	3.54E-04	13194.	3.64E+09	81.2935	117879.	0.00
17.8500	-0.00238	-45448.	857.5132	2.72E-04	12998.	3.64E+09	45.9547	121451.	0.00
18.3750	-9.19E-04	-39376.	1060.	1.98E-04	12712.	3.64E+09	18.2392	125024.	0.00
18.9000	1.16E-04	-32508.	1110.	1.36E-04	12389.	3.64E+09	-2.3619	128596.	0.00
19.4250	7.96E-04	-25676.	1050.	8.57E-05	12068.	3.64E+09	-16.6907	132168.	0.00
19.9500	0.00120	-19460.	916.0325	4.66E-05	11775.	3.64E+09	-25.7504	135740.	0.00
20.4750	0.00138	-14231.	773.0683	1.74E-05	11529.	3.64E+09	-19.6351	89495.	0.00
21.0000	0.00141	-9755.	646.2646	-3.42E-06	11318.	3.64E+09	-20.6201	91876.	0.00
21.5250	0.00134	-6081.	518.1997	-1.71E-05	11145.	3.64E+09	-20.0355	94257.	0.00
22.0500	0.00120	-3190.	397.2036	-2.52E-05	11009.	3.64E+09	-18.3760	96639.	0.00
22.5750	0.00102	-1024.	288.7232	-2.88E-05	10907.	3.64E+09	-16.0623	99020.	0.00
23.1000	8.35E-04	507.4788	195.8049	-2.93E-05	10883.	3.64E+09	-13.4356	101402.	0.00
23.6250	6.53E-04	1504.	119.5928	-2.75E-05	10930.	3.64E+09	-10.7587	103783.	0.00
24.1500	4.88E-04	2072.	59.8059	-2.44E-05	10957.	3.64E+09	-8.2213	106164.	0.00
24.6750	3.45E-04	2309.	15.1709	-2.06E-05	10968.	3.64E+09	-5.9486	108546.	0.00
25.2000	2.28E-04	2306.	-16.2047	-1.66E-05	10968.	3.64E+09	-4.0119	110927.	0.00
25.7250	1.36E-04	2139.	-36.2084	-1.28E-05	10960.	3.64E+09	-2.3385	108626.	0.00
26.2500	6.67E-05	1876.	-47.2794	-9.31E-06	10947.	3.64E+09	-1.1761	111007.	0.00
26.7750	1.84E-05	1563.	-52.0250	-6.33E-06	10933.	3.64E+09	-0.3304	113389.	0.00
27.3000	-1.30E-05	1234.	-52.3148	-3.90E-06	10917.	3.64E+09	0.2384	115770.	0.00
27.8250	-3.08E-05	911.7282	-48.4353	-2.05E-06	10902.	3.64E+09	0.9932	202935.	0.00
28.3500	-3.87E-05	627.6013	-41.2795	-7.11E-07	10889.	3.64E+09	1.2784	207896.	0.00
28.8750	-3.98E-05	393.0848	-33.0170	1.73E-07	10878.	3.64E+09	1.3446	212858.	0.00
29.4000	-3.66E-05	211.2268	-24.7999	6.97E-07	10869.	3.64E+09	1.2640	217819.	0.00
29.9250	-3.10E-05	79.1569	-17.3634	9.48E-07	10863.	3.64E+09	1.0968	222780.	0.00
30.4500	-2.46E-05	-9.5237	-11.1062	1.01E-06	10860.	3.64E+09	0.8896	227741.	0.00
30.9750	-1.83E-05	-62.8788	-6.1741	9.46E-07	10862.	3.64E+09	0.6762	232703.	0.00
31.5000	-1.27E-05	-89.2836	-2.5363	8.14E-07	10863.	3.64E+09	0.4787	237664.	0.00
32.0250	-8.05E-06	-96.5282	-0.05213	6.53E-07	10864.	3.64E+09	0.3099	242625.	0.00
32.5500	-4.46E-06	-91.2983	1.4762	4.90E-07	10863.	3.64E+09	0.1752	247586.	0.00

33.0750	-1.87E-06	-78.9483	2.2641	3.43E-07	10863.	3.64E+09	0.07489	252548.	0.00
33.6000	-1.39E-07	-63.4838	2.5179	2.19E-07	10862.	3.64E+09	0.00568	257509.	0.00
34.1250	8.97E-07	-47.6796	2.4180	1.23E-07	10861.	3.64E+09	-0.03738	262470.	0.00
34.6500	1.41E-06	-33.2732	2.1113	5.30E-08	10861.	3.64E+09	-0.05997	267431.	0.00
35.1750	1.57E-06	-21.1873	1.7092	5.82E-09	10860.	3.64E+09	-0.06767	272393.	0.00
35.7000	1.49E-06	-11.7491	1.2900	-2.27E-08	10860.	3.64E+09	-0.06543	277354.	0.00
36.2250	1.28E-06	-4.8866	0.9034	-3.71E-08	10859.	3.64E+09	-0.05731	282315.	0.00
36.7500	1.02E-06	-0.2897	0.5766	-4.16E-08	10859.	3.64E+09	-0.04643	287276.	0.00
37.2750	7.54E-07	2.4649	0.3201	-3.97E-08	10859.	3.64E+09	-0.03499	292238.	0.00
37.8000	5.17E-07	3.8263	0.1330	-3.43E-08	10859.	3.64E+09	-0.02441	297199.	0.00
38.3250	3.22E-07	4.2118	0.00739	-2.73E-08	10859.	3.64E+09	-0.01546	302160.	0.00
38.8500	1.73E-07	3.9761	-0.06791	-2.02E-08	10859.	3.64E+09	-0.00844	307121.	0.00
39.3750	6.75E-08	3.3982	-0.1050	-1.38E-08	10859.	3.64E+09	-0.00334	312083.	0.00
39.9000	-1.15E-09	2.6814	-0.1154	-8.57E-09	10859.	3.64E+09	5.79E-05	317044.	0.00
40.4250	-4.05E-08	1.9621	-0.1087	-4.55E-09	10859.	3.64E+09	0.00207	322005.	0.00
40.9500	-5.84E-08	1.3215	-0.09261	-1.70E-09	10859.	3.64E+09	0.00303	326966.	0.00
41.4750	-6.19E-08	0.7988	-0.07278	1.36E-10	10859.	3.64E+09	0.00326	331928.	0.00
42.0000	-5.67E-08	0.4042	-0.05295	1.18E-09	10859.	3.64E+09	0.00303	336889.	0.00
42.5250	-4.71E-08	0.1292	-0.03534	1.64E-09	10859.	3.64E+09	0.00255	341850.	0.00
43.0500	-3.60E-08	-0.04457	-0.02105	1.71E-09	10859.	3.64E+09	0.00198	346811.	0.00
43.5750	-2.55E-08	-0.1395	-0.01032	1.55E-09	10859.	3.64E+09	0.00142	351773.	0.00
44.1000	-1.64E-08	-0.1778	-0.00290	1.28E-09	10859.	3.64E+09	9.31E-04	356734.	0.00
44.6250	-9.36E-09	-0.1787	0.00173	9.71E-10	10859.	3.64E+09	5.37E-04	361695.	0.00
45.1500	-4.22E-09	-0.1580	0.00419	6.79E-10	10859.	3.64E+09	2.45E-04	366656.	0.00
45.6750	-8.02E-10	-0.1273	0.00511	4.32E-10	10859.	3.64E+09	4.73E-05	371618.	0.00
46.2000	1.22E-09	-0.09450	0.00503	2.40E-10	10859.	3.64E+09	-7.31E-05	376579.	0.00
46.7250	2.22E-09	-0.06440	0.00438	1.02E-10	10859.	3.64E+09	-1.34E-04	381540.	0.00
47.2500	2.51E-09	-0.03952	0.00347	1.18E-11	10859.	3.64E+09	-1.54E-04	386501.	0.00
47.7750	2.36E-09	-0.02066	0.00253	-4.04E-11	10859.	3.64E+09	-1.47E-04	391463.	0.00
48.3000	2.00E-09	-0.00760	0.00167	-6.49E-11	10859.	3.64E+09	-1.26E-04	396424.	0.00
48.8250	1.55E-09	4.86E-04	9.61E-04	-7.10E-11	10859.	3.64E+09	-9.86E-05	401385.	0.00
49.3500	1.10E-09	0.00466	4.27E-04	-6.66E-11	10859.	3.64E+09	-7.11E-05	406346.	0.00
49.8750	7.08E-10	0.00601	5.74E-05	-5.73E-11	10859.	3.64E+09	-4.63E-05	411308.	0.00
50.4000	3.80E-10	0.00550	-1.67E-04	-4.73E-11	10859.	3.64E+09	-2.51E-05	416269.	0.00
50.9250	1.12E-10	0.00399	-2.70E-04	-3.91E-11	10859.	3.64E+09	-7.49E-06	421230.	0.00
51.4500	-1.13E-10	0.00218	-2.70E-04	-3.38E-11	10859.	3.64E+09	7.62E-06	426191.	0.00
51.9750	-3.14E-10	6.65E-04	-1.78E-04	-3.13E-11	10859.	3.64E+09	2.15E-05	431153.	0.00
52.5000	-5.07E-10	0.00	0.00	-3.07E-11	10859.	3.64E+09	3.51E-05	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     1.75000000 inches
Computed slope at pile head      =    -0.00030626 radians
Maximum bending moment           =      -2875831. inch-lbs
Maximum shear force              =         55870. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             10
Number of zero deflection points =              7
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 8

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     2.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	2.0000	-3167947.	60017.	0.00	159963.	3.64E+09	0.00	0.00	0.00
0.5250	1.9827	-2788122.	59657.	-0.00516	142086.	3.64E+09	-57.1885	181.7150	0.00
1.0500	1.9350	-2405544.	59085.	-0.00966	124079.	3.64E+09	-124.1958	404.3642	0.00
1.5750	1.8610	-2023561.	58100.	-0.01350	106101.	3.64E+09	-188.6268	638.5629	0.00
2.1000	1.7649	-1645420.	56728.	-0.01668	88303.	3.64E+09	-247.0302	881.8096	0.00
2.6250	1.6508	-1274119.	55016.	-0.01921	70827.	3.64E+09	-296.2780	1131.	0.00
3.1500	1.5229	-912282.	52969.	-0.02110	53797.	3.64E+09	-353.5806	1463.	0.00
3.6750	1.3849	-562836.	50522.	-0.02238	37350.	3.64E+09	-423.1340	1925.	0.00
4.2000	1.2409	-229169.	47589.	-0.02307	21645.	3.64E+09	-507.9706	2579.	0.00
4.7250	1.0943	84749.	44040.	-0.02319	14848.	3.64E+09	-618.8357	3563.	0.00
5.2500	0.9486	373952.	39746.	-0.02279	28460.	3.64E+09	-744.5083	4944.	0.00
5.7750	0.8071	632933.	34613.	-0.02192	40649.	3.64E+09	-884.8995	6908.	0.00
6.3000	0.6724	855651.	28558.	-0.02063	51132.	3.64E+09	-1037.	9718.	0.00
6.8250	0.5471	1035659.	21505.	-0.01899	59604.	3.64E+09	-1202.	13837.	0.00
7.3500	0.4331	1166107.	13451.	-0.01709	65744.	3.64E+09	-1355.	19714.	0.00
7.8750	0.3318	1240665.	5207.	-0.01500	69253.	3.64E+09	-1262.	23957.	0.00
8.4000	0.2441	1262905.	-2393.	-0.01283	70299.	3.64E+09	-1151.	29706.	0.00
8.9250	0.1702	1237188.	-9262.	-0.01066	69089.	3.64E+09	-1030.	38124.	0.00
9.4500	0.1097	1168375.	-15271.	-0.00858	65850.	3.64E+09	-877.9569	50411.	0.00
9.9750	0.06204	1062611.	-20142.	-0.00665	60872.	3.64E+09	-668.3882	67870.	0.00
10.5000	0.02597	928404.	-23175.	-0.00492	54556.	3.64E+09	-294.4707	71442.	0.00
11.0250	2.82E-05	780837.	-24104.	-0.00344	47610.	3.64E+09	-0.3362	75014.	0.00
11.5500	-0.01739	631850.	-23422.	-0.00222	40598.	3.64E+09	216.8708	78586.	0.00
12.0750	-0.02790	490332.	-21592.	-0.00124	33937.	3.64E+09	363.8618	82158.	0.00
12.6000	-0.03306	362373.	-19029.	-5.05E-04	27915.	3.64E+09	449.9280	85730.	0.00
13.1250	-0.03427	251618.	-16081.	2.66E-05	22702.	3.64E+09	485.7665	89302.	0.00
13.6500	-0.03273	159691.	-13032.	3.83E-04	18375.	3.64E+09	482.4737	92875.	0.00
14.1750	-0.02944	86625.	-10092.	5.96E-04	14936.	3.64E+09	450.7418	96447.	0.00
14.7000	-0.02521	31293.	-7411.	6.99E-04	12332.	3.64E+09	400.2698	100019.	0.00
15.2250	-0.02064	-8209.	-5081.	7.19E-04	11246.	3.64E+09	339.3825	103591.	0.00
15.7500	-0.01616	-34226.	-3147.	6.82E-04	12470.	3.64E+09	274.8346	107163.	0.00
16.2750	-0.01205	-49273.	-1614.	6.10E-04	13178.	3.64E+09	211.7715	110735.	0.00
16.8000	-0.00848	-55826.	-462.1313	5.18E-04	13487.	3.64E+09	153.8094	114307.	0.00
17.3250	-0.00552	-56173.	347.4554	4.21E-04	13503.	3.64E+09	103.2022	117879.	0.00
17.8500	-0.00317	-52324.	864.8806	3.27E-04	13322.	3.64E+09	61.0598	121451.	0.00
18.3750	-0.00139	-45957.	1144.	2.42E-04	13022.	3.64E+09	27.5913	125024.	0.00
18.9000	-1.15E-04	-38412.	1238.	1.69E-04	12667.	3.64E+09	2.3495	128596.	0.00
19.4250	7.41E-04	-30704.	1197.	1.09E-04	12304.	3.64E+09	-15.5404	132168.	0.00
19.9500	0.00126	-23558.	1062.	6.22E-05	11968.	3.64E+09	-27.1780	135740.	0.00
20.4750	0.00152	-17448.	908.4875	2.67E-05	11680.	3.64E+09	-21.6610	89495.	0.00
21.0000	0.00160	-12166.	766.8570	1.04E-06	11432.	3.64E+09	-23.3011	91876.	0.00
21.5250	0.00154	-7788.	620.9804	-1.63E-05	11226.	3.64E+09	-23.0090	94257.	0.00
22.0500	0.00139	-4308.	481.1952	-2.67E-05	11062.	3.64E+09	-21.3673	96639.	0.00
22.5750	0.00120	-1669.	354.4263	-3.19E-05	10938.	3.64E+09	-18.8768	99020.	0.00
23.1000	9.91E-04	223.9390	244.7285	-3.32E-05	10870.	3.64E+09	-15.9479	101402.	0.00
23.6250	7.83E-04	1484.	153.8566	-3.17E-05	10929.	3.64E+09	-12.9004	103783.	0.00
24.1500	5.92E-04	2228.	81.8190	-2.85E-05	10964.	3.64E+09	-9.9687	106164.	0.00
24.6750	4.24E-04	2574.	27.3863	-2.43E-05	10980.	3.64E+09	-7.3115	108546.	0.00
25.2000	2.85E-04	2624.	-11.4660	-1.98E-05	10983.	3.64E+09	-5.0226	110927.	0.00
25.7250	1.75E-04	2470.	-36.7807	-1.54E-05	10975.	3.64E+09	-3.0139	108626.	0.00
26.2500	9.13E-05	2193.	-51.3424	-1.14E-05	10962.	3.64E+09	-1.6089	111007.	0.00
26.7750	3.18E-05	1847.	-58.2111	-7.85E-06	10946.	3.64E+09	-0.5716	113389.	0.00
27.3000	-7.62E-06	1475.	-59.5707	-4.97E-06	10929.	3.64E+09	0.1400	115770.	0.00
27.8250	-3.09E-05	1107.	-55.9949	-2.74E-06	10911.	3.64E+09	0.9951	202935.	0.00
28.3500	-4.21E-05	775.5975	-48.4857	-1.10E-06	10896.	3.64E+09	1.3887	207896.	0.00
28.8750	-4.48E-05	498.1452	-39.3429	-3.21E-10	10883.	3.64E+09	1.5138	212858.	0.00
29.4000	-4.21E-05	279.8781	-29.9907	6.74E-07	10872.	3.64E+09	1.4551	217819.	0.00
29.9250	-3.63E-05	118.8609	-21.3621	1.02E-06	10865.	3.64E+09	1.2841	222780.	0.00
30.4500	-2.92E-05	8.5965	-13.9872	1.13E-06	10860.	3.64E+09	1.0571	227741.	0.00
30.9750	-2.21E-05	-59.7263	-8.0884	1.09E-06	10862.	3.64E+09	0.8155	232703.	0.00
31.5000	-1.56E-05	-95.5739	-3.6698	9.51E-07	10864.	3.64E+09	0.5872	237664.	0.00

32.0250	-1.01E-05	-107.9427	-0.5952	7.75E-07	10864.	3.64E+09	0.3888	242625.	0.00
32.5500	-5.81E-06	-104.6837	1.3485	5.90E-07	10864.	3.64E+09	0.2282	247586.	0.00
33.0750	-2.66E-06	-92.1794	2.4030	4.20E-07	10863.	3.64E+09	0.1066	252548.	0.00
33.6000	-5.18E-07	-75.2789	2.8053	2.75E-07	10863.	3.64E+09	0.02115	257509.	0.00
34.1250	8.02E-07	-57.4032	2.7667	1.60E-07	10862.	3.64E+09	-0.03340	262470.	0.00
34.6500	1.49E-06	-40.7499	2.4617	7.46E-08	10861.	3.64E+09	-0.06343	267431.	0.00
35.1750	1.74E-06	-26.5409	2.0246	1.63E-08	10860.	3.64E+09	-0.07532	272393.	0.00
35.7000	1.70E-06	-15.2736	1.5516	-1.99E-08	10860.	3.64E+09	-0.07484	277354.	0.00
36.2250	1.49E-06	-6.9491	1.1054	-3.92E-08	10859.	3.64E+09	-0.06682	282315.	0.00
36.7500	1.21E-06	-1.2641	0.7216	-4.63E-08	10859.	3.64E+09	-0.05501	287276.	0.00
37.2750	9.08E-07	2.2399	0.4157	-4.54E-08	10859.	3.64E+09	-0.04211	292238.	0.00
37.8000	6.34E-07	4.0685	0.1889	-4.00E-08	10859.	3.64E+09	-0.02990	297199.	0.00
38.3250	4.04E-07	4.7031	0.03367	-3.24E-08	10859.	3.64E+09	-0.01938	302160.	0.00
38.8500	2.26E-07	4.5600	-0.06206	-2.44E-08	10859.	3.64E+09	-0.01101	307121.	0.00
39.3750	9.73E-08	3.9718	-0.1119	-1.70E-08	10859.	3.64E+09	-0.00482	312083.	0.00
39.9000	1.21E-08	3.1851	-0.1290	-1.08E-08	10859.	3.64E+09	-6.10E-04	317044.	0.00
40.4250	-3.83E-08	2.3686	-0.1248	-5.94E-09	10859.	3.64E+09	0.00196	322005.	0.00
40.9500	-6.28E-08	1.6253	-0.1084	-2.48E-09	10859.	3.64E+09	0.00326	326966.	0.00
41.4750	-6.96E-08	1.0085	-0.08655	-2.01E-10	10859.	3.64E+09	0.00366	331928.	0.00
42.0000	-6.53E-08	0.5353	-0.06400	1.14E-09	10859.	3.64E+09	0.00349	336889.	0.00
42.5250	-5.52E-08	0.1997	-0.04356	1.77E-09	10859.	3.64E+09	0.00300	341850.	0.00
43.0500	-4.30E-08	-0.01726	-0.02667	1.93E-09	10859.	3.64E+09	0.00237	346811.	0.00
43.5750	-3.09E-08	-0.1403	-0.01378	1.79E-09	10859.	3.64E+09	0.00173	351773.	0.00
44.1000	-2.04E-08	-0.1946	-0.00471	1.50E-09	10859.	3.64E+09	0.00115	356734.	0.00
44.6250	-1.19E-08	-0.2028	0.00108	1.16E-09	10859.	3.64E+09	6.86E-04	361695.	0.00
45.1500	-5.75E-09	-0.1834	0.00430	8.26E-10	10859.	3.64E+09	3.34E-04	366656.	0.00
45.6750	-1.55E-09	-0.1503	0.00564	5.36E-10	10859.	3.64E+09	9.12E-05	371618.	0.00
46.2000	1.01E-09	-0.1134	0.00573	3.08E-10	10859.	3.64E+09	-6.05E-05	376579.	0.00
46.7250	2.33E-09	-0.07874	0.00510	1.41E-10	10859.	3.64E+09	-1.41E-04	381540.	0.00
47.2500	2.79E-09	-0.04950	0.00411	3.01E-11	10859.	3.64E+09	-1.71E-04	386501.	0.00
47.7750	2.71E-09	-0.02697	0.00304	-3.61E-11	10859.	3.64E+09	-1.69E-04	391463.	0.00
48.3000	2.34E-09	-0.01108	0.00205	-6.91E-11	10859.	3.64E+09	-1.47E-04	396424.	0.00
48.8250	1.84E-09	-0.00101	0.00122	-7.96E-11	10859.	3.64E+09	-1.17E-04	401385.	0.00
49.3500	1.33E-09	0.00440	5.75E-04	-7.66E-11	10859.	3.64E+09	-8.61E-05	406346.	0.00
49.8750	8.76E-10	0.00639	1.24E-04	-6.73E-11	10859.	3.64E+09	-5.72E-05	411308.	0.00
50.4000	4.87E-10	0.00610	-1.57E-04	-5.65E-11	10859.	3.64E+09	-3.22E-05	416269.	0.00
50.9250	1.64E-10	0.00453	-2.93E-04	-4.72E-11	10859.	3.64E+09	-1.10E-05	421230.	0.00
51.4500	-1.09E-10	0.00251	-3.05E-04	-4.12E-11	10859.	3.64E+09	7.35E-06	426191.	0.00
51.9750	-3.54E-10	7.73E-04	-2.05E-04	-3.83E-11	10859.	3.64E+09	2.42E-05	431153.	0.00
52.5000	-5.91E-10	0.00	0.00	-3.76E-11	10859.	3.64E+09	4.09E-05	218057.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 8:

```
Pile-head deflection             =     2.00000000 inches
Computed slope at pile head      =    -0.00032912 radians
Maximum bending moment           =      -3167947. inch-lbs
Maximum shear force              =         60017. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             10
Number of zero deflection points =              7
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

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

Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.2500	S, rad	0.00	165000.	0.2500	-8.55E-05	15718.	-603696.
2	y, in	0.5000	S, rad	0.00	165000.	0.5000	-1.41E-04	25877.	-1078098.
3	y, in	0.7500	S, rad	0.00	165000.	0.7500	-1.86E-04	34056.	-1507022.
4	y, in	1.0000	S, rad	0.00	165000.	1.0000	-2.23E-04	40702.	-1891600.
5	y, in	1.2500	S, rad	0.00	165000.	1.2500	-2.54E-04	46376.	-2242891.
6	y, in	1.5000	S, rad	0.00	165000.	1.5000	-2.81E-04	51363.	-2569007.
7	y, in	1.7500	S, rad	0.00	165000.	1.7500	-3.06E-04	55870.	-2875831.
8	y, in	2.0000	S, rad	0.00	165000.	2.0000	-3.29E-04	60017.	-3167947.

Maximum pile-head deflection = 2.000000000 inches
Maximum pile-head rotation = -0.000329121 radians

The analysis ended normally.

Pine Point Scarborough ME West Abutment

Hammer Information

Select from following list [3/21/2012-2003]: ID: 41

ID	Name	Type	Ram Wt	Energy/Power
40	DELMAG D 19-32	OED	4.0000	42.440
41	DELMAG D 19-42	OED	4.0000	43.240
42	DELMAG D200-42	OED	44.0900	492.044

Hammer parameters

Efficiency	0.8			
Pressure	1368	psi	Fixed	90 %
Stroke	10.81	ft	Variable	

Pile material

Concrete Steel Timber

Cushion Information

	Hammer	Pile	
Area	227.	0.	in^2
Elastic Modulus	530.	0.	ksi
Thickness	2.	0.	in
C.O.R.	0.8	0.	
Stiffness	0.	0.	kips/in
Helmet Weight	1.7		kips

Pile Information

Length	57.5	ft	Auto	Segments
Penetration	52.5	ft	Auto.	S-Length
Section Area	15.5	in^2	Auto.	S-St, Wt
Elast Modulus	29000.	ksi	0	Splices
Spec Weight	492.0	lb/ft^3		
Toe Area	141.9	in^2	Pile Type:	
Perimeter	4.	ft	H Pile	
Pile Size	12.	in		

Ultimate Capacities (up to 10)

kips

1	205.0	6	255.0
2	215.0	7	265.0
3	225.0	8	275.0
4	235.0	9	285.0
5	245.0	10	295.0

Incr. 0 Action >>

Soil Parameters

2nd Toe - No

Quake

Shaft	0.1	in	Const
Toe	0.04	in	

Damping

Shaft	0.05	s/ft	Const
Toe	0.15	s/ft	Smith

Shaft Resistance

Percentage 80 %

100%

Dist. Shape Num 0.0

Residual Stress Analysis: No

Nobis Engineering, Inc.
Pine Point Scarborough ME West Abutment

09-Jul-2015
GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count blows/in	Stroke ft	Energy kips-ft
205.0	25.72	1.68	2.2	6.47	14.67
215.0	25.92	1.63	2.3	6.53	14.57
225.0	26.16	1.37	2.4	6.61	14.57
235.0	26.37	1.02	2.6	6.67	14.52
245.0	26.59	1.04	2.7	6.74	14.56
255.0	26.80	0.97	2.9	6.80	14.70
265.0	26.99	0.86	3.1	6.87	14.78
275.0	27.25	0.78	3.3	6.95	14.93
285.0	27.47	0.85	3.4	7.02	15.06
295.0	27.61	0.94	3.7	7.08	15.08

Purpose: Perform lateral, axial, and settlement calculations for the East Integral Abutment (EA) of the Pine Point Crossing over B&M Railroad in Scarborough, ME.

References:
1) AASHTO LRFD Bridge Design Specifications, 7th Edition, 2014
2) Computer Program Driven, Version 2001, by FWHA
3) Computer Program L-Pile User's Manual, Version 2015, by Ensoft, INC.
4) Computer Program Group User's Manual, Version 2014, by Ensoft, INC.
5) Sketch Plans received via email on 6/16/2015
6) MaineDOT Bridge Design Manual, 2003, revised through 2008

Given:
1) Loads provided by CHA via email on 6/17/2015
2) Loads are applied at bottom of pile cap, see email from CHA dated 6/17/2015
3) Weight of pile cap was included in loads
4) Fixed head condition between piles and pile cap based on phone call with CHA
5) Bottom of MSE Wall varies from El. 12 and El. 7 (NAVD-88) from Reference No. 5
6) Bottom of the EA pile cap is El. 31.5 (NAVD 88) from Reference No. 5
7) Pile cap dimensions of 64' x 2.5' x 2' from Reference No. 5
8) 12x53 HP-Piles to be used, per discussion with CHA dated 4/8/2015
9) The proposed bridge is non-essential/non-critical
10) The proposed abutment is integral
11) A downdrag force of 83.4 kips per pile is applied

Assumptions:
1) Groundwater Table at El. 12
2) Geotechnical Axial Resistance Factor of 0.45 (Table 10.5.5.2.3-1 of Reference No. 1), Field Confirmation of Hammer Performance Required
3) No corrosion

Solution:

Step 1: Soil Properties and Profile

Nobis used subsurface information for the site based on boring data collected by Nobis, see Borings BB-SBMR-102 and BB-SBMR-203. Elevations and Depths for lateral analyses were based on Boring BB-SBMR-102. Depths listed below were taken from bottom of pile cap (Elevation 31.5 ft.). Soil unit weight (γ_{moist}) and soil friction angle (ϕ) were estimated based on SPT-N Values. The soil modulus parameter (k) was determined using Table 3.7 from Reference No. 4. Uniaxial Compressive Strength was taken from lab data.

Soil Layer	Elevation (ft)	Depth (ft)	γ_{moist} (pcf)	ϕ (°)	k (pci)	U.C.S. (ksi)	ε_{50} or k_rm (dims)
MSE Wall	31.5 to 12	0 to 19.5	130	32	90	-	-
Gravel Borrow	12 to 5.5	19.5 to 26	125	32	60	-	-
Silty Sand	5.5 to -2	26 to 33.5	125	32	60	-	-
Glacial Till	-2 to -30.5	33.5 to 62	135	37	125	-	-
Bedrock	<-30.5	>62	170	-	-	10300	-

Relative Density	Loose	Medium	Dense
Submerged Sand	20 lb/in^3	60 lb/in^3	125 lb/in^3
	5,430 kN/m^3	16,300 kN/m^3	33,900 kN/m^3
Sand Above WT	25 lb/in^3	90 lb/in^3	225 lb/in^3
	6,790 kN/m^3	24,430 kN/m^3	61,000 kN/m^3

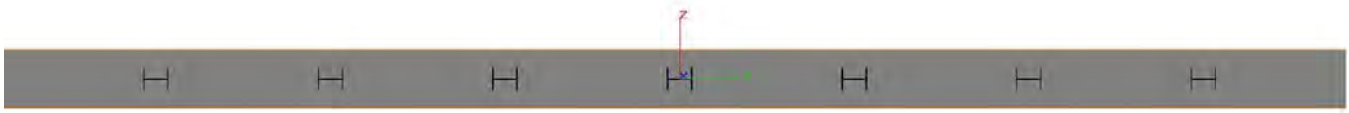
Table 3.7 Soil-Modulus Parameter k for Sands

Step 2: Pile and Pile Cap Properties

Pile:

Pile Type:	HP 12x53	
Yield Stress:	50	ksi
Elastic modulus:	29000	ksi

Pile Cap:	7 piles, 7 x 1. See graphic below	
Cap Length in Y-axis (Transverse):	64	ft
Cap Width in Z-axis (Longitudinal):	2.5	ft
Cap Thickness in X-axis (Vertical):	2	ft
Center to cap edge spacing Z-axis:	1.25	ft
Center-to-center spacing in Y-axis :	7	ft



Graphic of Pile Cap with Piles

Step 3: Lateral Analysis

The Computer Program L-pile, version 2015 by Ensoft, INC. was used for the 2-D lateral analysis. The abutment is integral, so a traditional lateral analysis was not performed. A single pile was analyzed, assuming a number of lateral deflection values in the Z-direction, as well as a 0 degree slope (meaning the pile was free to translate, not rotate). Lateral deflections were assumed to be 0.25-in, 0.5-in, 0.75-in, 1.0-in, 1.25-in, 1.5-in, 1.75-in, and 2.0-in. Linear EI was assumed. Please see attached graphs for lateral deflection, moment, and shear. Structural engineer shall evaluate the adequacy of the piles.

Step 4: Axial and Settlement Analysis

The Computer Program Driven, version 2001 by FHWA was used for the axial analysis. See attached graph for Axial Resistance. Piles do not gain side resistance in the sono tubes (within the MSE Wall). Elastic shortening was used to calculate settlement. Soil layers taken from BB-SBMR-203, as the bedrock was deeper than in BB-SBMR-102. The piles will be bearing on glacial till or bedrock.

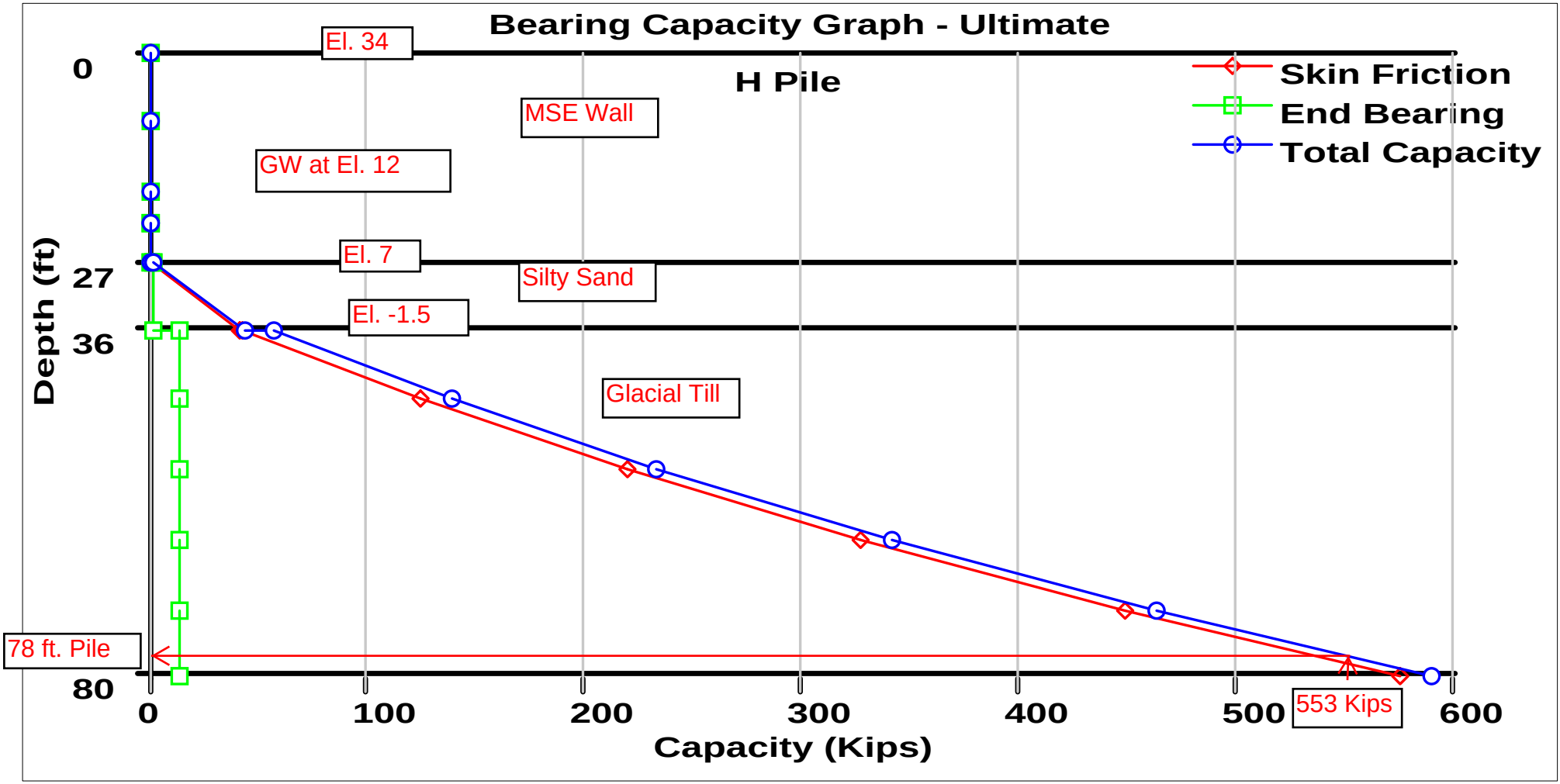
Max. Axial Load on an Individual Pile = [1154 Kips (Strength I, case 1) / 7 piles] + 83.4 Kips/pile ========> **249 Kips/Pile**

Resistance Factor of 0.45 was assumed from Table 10.5.5.2.3-1 of Reference No. 1.

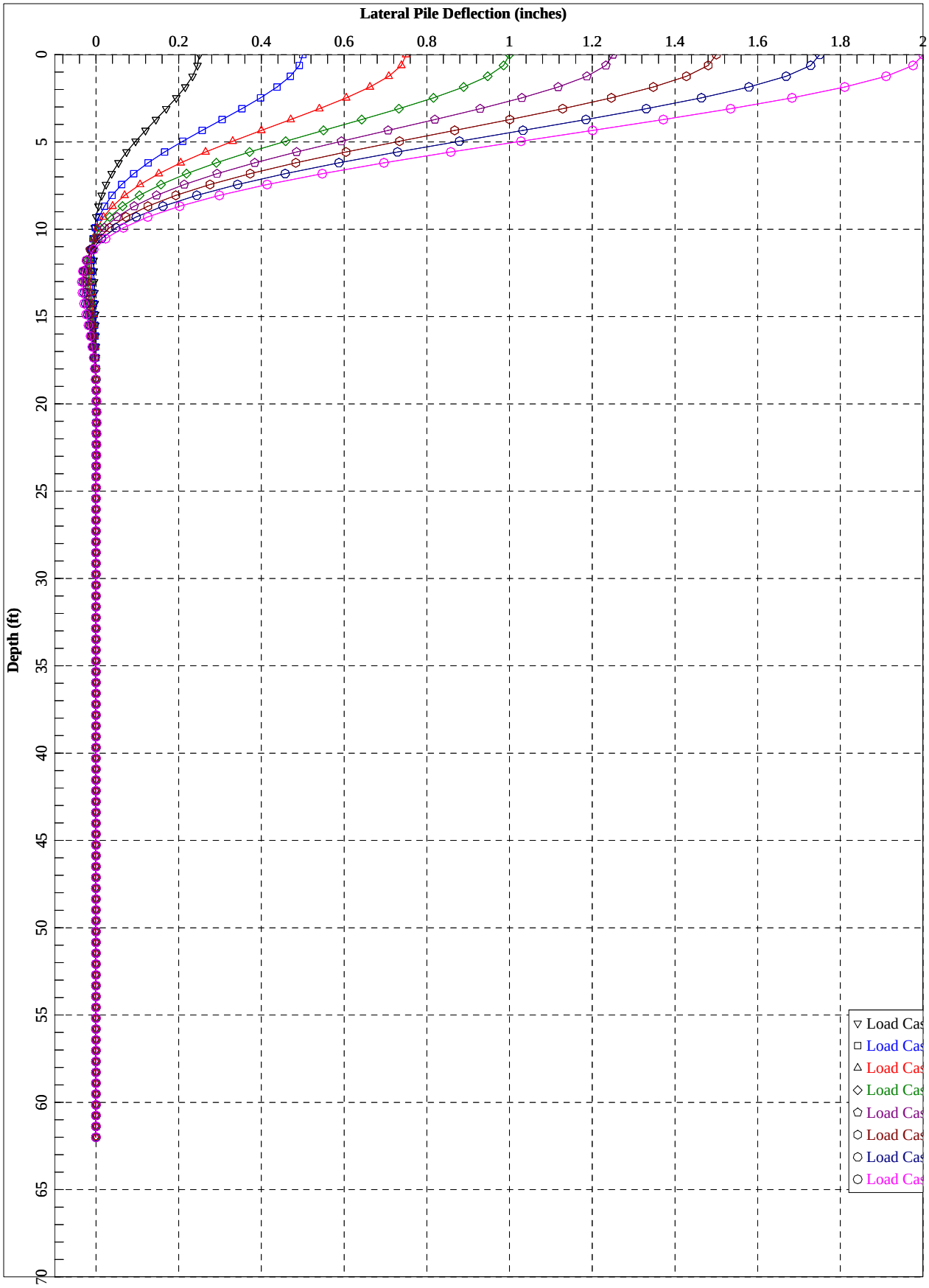
249 Kips / 0.45 ========> 553 Kips ===== From Driven Graph =========> 78ft

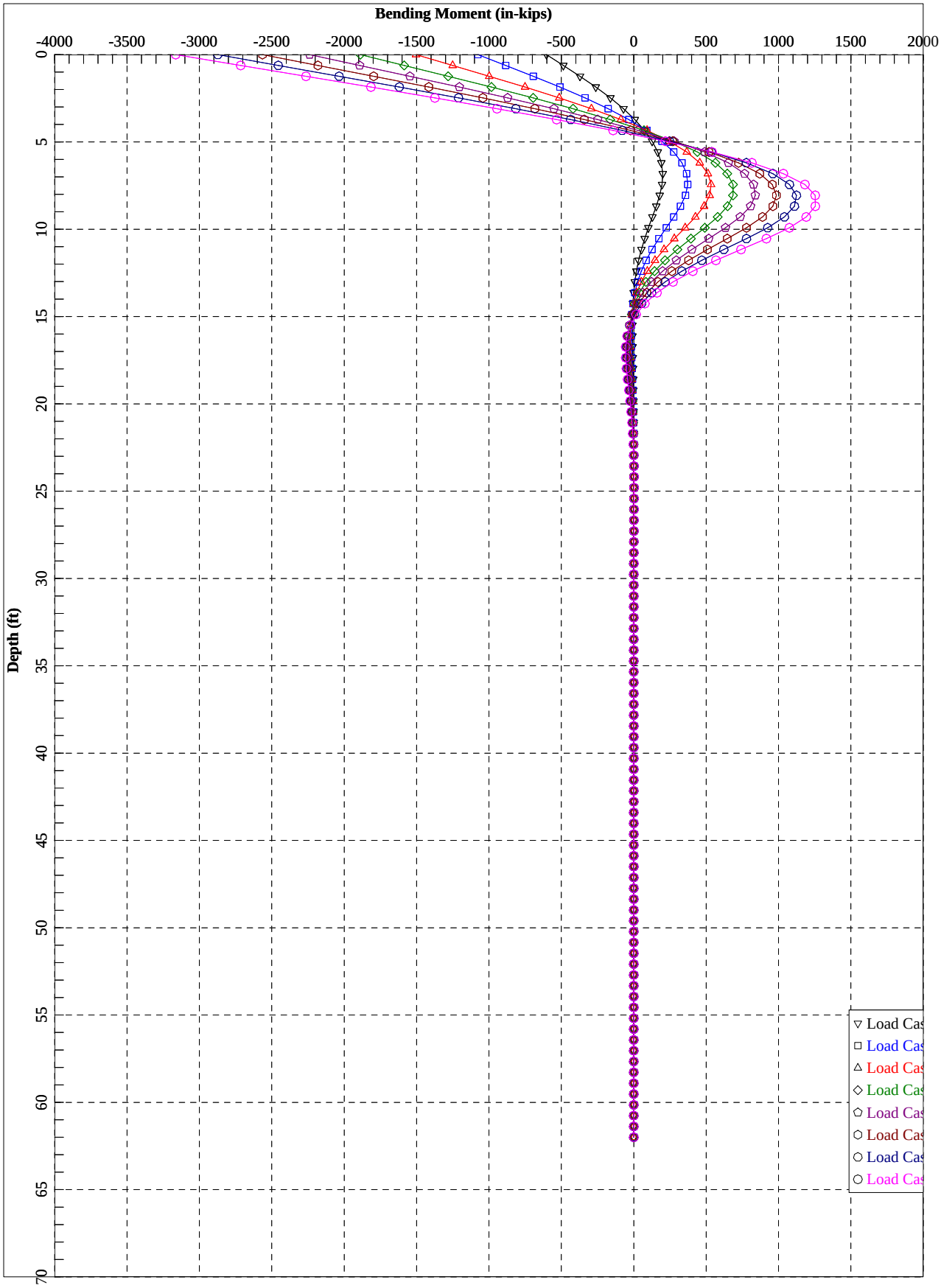
Settlement = $\frac{PL}{AE}$ **======>** $\frac{(249\text{ kips}) * (97.5\text{ ft})}{(0.108\text{ ft}^2) * (4176000\text{ ksf})}$ **=========> 0.0538 ft or 0.65 inches**

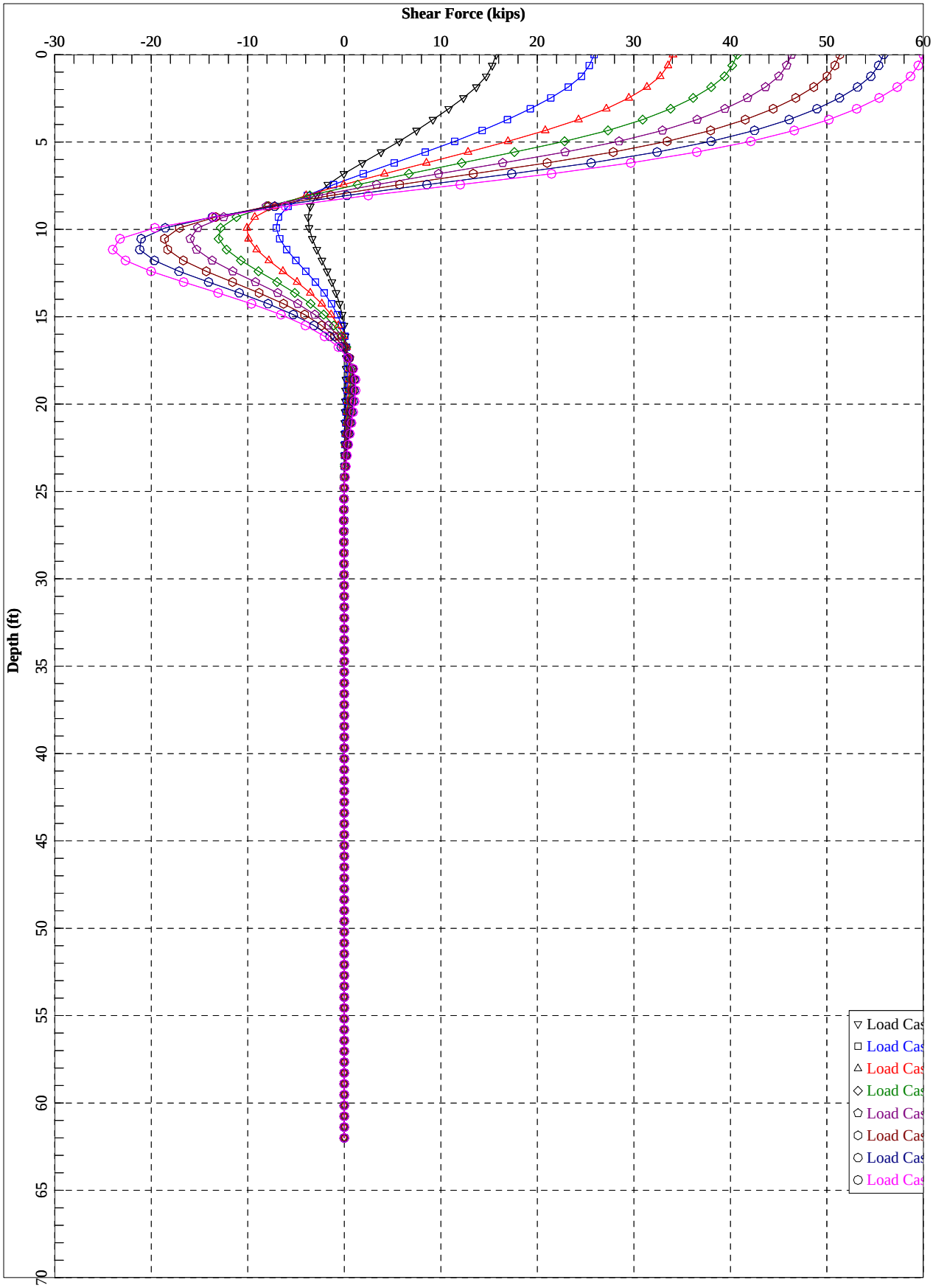
Filename: C:\DOCUME~1\XPMUSER\MYDOCU~1\SCMEEA.DVN



Based on Boring BB-SBMR-203 (Deepest Bedrock)


Lateral Pile Deflection (inches)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas


Bending Moment (in-kips)
-4000
-3500
-3000
-2500
-2000
-1500
-1000
-500
0
500
1000
1500
2000
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas


Shear Force (kips)
-30
-20
-10
0
10
20
30
40
50
60
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas
Load Cas

==========

LPile for Windows, Version 2015-08.003

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

Path to file locations:
\Active\85970.01 - Pine Crossing over BM RR Scarborough ME\Geotechnical\Calculations\East Abutment\

Name of input data file:
L-PIle for East Abutment (integral).lp8d

Name of output report file:
L-PIle for East Abutment (integral).lp8o

Name of plot output file:
L-PIle for East Abutment (integral).lp8p

Name of runtime message file:
L-PIle for East Abutment (integral).lp8r

Date and Time of Analysis

Date: June 26, 2015 Time: 14:14:30

Problem Title

Project Name: Pine Point Crossing, Scarborough, ME

Job Number: 85970.01

Client: CHA

Engineer: Rob Clopper

Description: East Abutment (Integral)

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

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

Loading Type and Number of Cycles of Loading:
- Static loading specified

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

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

Pile Structural Properties and Geometry

Total number of pile sections = 1

Total length of pile = 62.00 ft

Depth of ground surface below top of pile = 0.00 ft

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

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

Point	Depth X ft	Pile Diameter in
1	0.00000	11.80000000
2	62.0000000	11.80000000

Input Structural Properties:

Pile Section No. 1:

Section Type	=	Elastic Pile
Cross-sectional Shape	=	Weak H-Pile
Section Length	=	62.000000 ft
Flange Width	=	12.000000 in
Section Depth	=	11.800000 in
Flange Thickness	=	0.435000 in
Web Thickness	=	0.435000 in
Section Area	=	15.194550 sq. in
Moment of Inertia	=	125.354973 in^4
Elastic Modulus	=	29000000. lbs/in^2

Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	19.500000 ft
Effective unit weight at top of layer	=	130.000000 pcf
Effective unit weight at bottom of layer	=	130.000000 pcf
Friction angle at top of layer	=	32.000000 deg.
Friction angle at bottom of layer	=	32.000000 deg.
Subgrade k at top of layer	=	90.000000 pci
Subgrade k at bottom of layer	=	90.000000 pci

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

Distance from top of pile to top of layer	=	19.500000 ft
Distance from top of pile to bottom of layer	=	26.000000 ft
Effective unit weight at top of layer	=	63.000000 pcf
Effective unit weight at bottom of layer	=	63.000000 pcf
Friction angle at top of layer	=	32.000000 deg.
Friction angle at bottom of layer	=	32.000000 deg.
Subgrade k at top of layer	=	60.000000 pci
Subgrade k at bottom of layer	=	60.000000 pci

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

Distance from top of pile to top of layer	=	26.000000 ft

```
   Distance from top of pile to bottom of layer        =    33.500000 ft
   Effective unit weight at top of layer               =    58.000000 pcf
   Effective unit weight at bottom of layer            =    58.000000 pcf
   Friction angle at top of layer                      =    32.000000 deg.
   Friction angle at bottom of layer                   =    32.000000 deg.
   Subgrade k at top of layer                          =    60.000000 pci
   Subgrade k at bottom of layer                       =    60.000000 pci


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

   Distance from top of pile to top of layer           =    33.500000 ft
   Distance from top of pile to bottom of layer        =    62.000000 ft
   Effective unit weight at top of layer               =    73.000000 pcf
   Effective unit weight at bottom of layer            =    73.000000 pcf
   Friction angle at top of layer                      =    37.000000 deg.
   Friction angle at bottom of layer                   =    37.000000 deg.
   Subgrade k at top of layer                          =   125.000000 pci
   Subgrade k at bottom of layer                       =   125.000000 pci


Layer 5 is strong rock (vuggy limestone)

   Distance from top of pile to top of layer           =    62.000000 ft
   Distance from top of pile to bottom of layer        =   100.000000 ft
   Effective unit weight at top of layer               =    88.000000 pcf
   Effective unit weight at bottom of layer            =    88.000000 pcf
   Uniaxial compressive strength at top of layer       =       10700. psi
   Uniaxial compressive strength at bottom of layer    =       10700. psi


   (Depth of lowest soil layer extends   38.00 ft below pile tip)


--------------------------------------------------------------------------------
                        Summary of Input Soil Properties
--------------------------------------------------------------------------------

Layer         Soil Type          Layer      Effective    Angle of     Uniaxial
Layer           Name             Depth       Unit Wt.    Friction        qu           kpy
 Num.     (p-y Curve Type)        ft           pcf          deg.         psi          pci
-----   -------------------   ----------   ----------   ----------   ----------   ----------
  1           Sand                0.00     130.0000      32.0000       --          90.0000
         (Reese, et al.)        19.5000     130.0000      32.0000       --          90.0000
  2           Sand              19.5000      63.0000      32.0000       --          60.0000
         (Reese, et al.)        26.0000      63.0000      32.0000       --          60.0000
  3           Sand              26.0000      58.0000      32.0000       --          60.0000
         (Reese, et al.)        33.5000      58.0000      32.0000       --          60.0000
  4           Sand              33.5000      73.0000      37.0000       --         125.0000
         (Reese, et al.)        62.0000      73.0000      37.0000       --         125.0000
  5           Vuggy             62.0000      88.0000       --          10700.        --
            Limestone          100.0000      88.0000       --          10700.        --

--------------------------------------------------------------------------------
                              Static Loading Type
--------------------------------------------------------------------------------

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


--------------------------------------------------------------------------------
                Pile-head Loading and Pile-head Fixity Conditions
--------------------------------------------------------------------------------
```

Number of loads specified = 8

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	5	y = 0.250000 in	S = 0.0000 in/in	165000.	N.A.
2	5	y = 0.500000 in	S = 0.0000 in/in	165000.	N.A.
3	5	y = 0.750000 in	S = 0.0000 in/in	165000.	N.A.
4	5	y = 1.000000 in	S = 0.0000 in/in	165000.	N.A.
5	5	y = 1.250000 in	S = 0.0000 in/in	165000.	N.A.
6	5	y = 1.500000 in	S = 0.0000 in/in	165000.	N.A.
7	5	y = 1.750000 in	S = 0.0000 in/in	165000.	N.A.
8	5	y = 2.000000 in	S = 0.0000 in/in	165000.	N.A.

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading.
Axial thrust is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

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

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.250000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 165000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.2500	-602396.	15737.	0.00	39212.	3.64E+09	0.00	0.00	0.00
0.6200	0.2454	-486059.	15333.	-0.00111	33736.	3.64E+09	-54.4298	1650.	0.00
1.2400	0.2334	-371514.	14707.	-0.00199	28345.	3.64E+09	-113.7112	3624.	0.00
1.8600	0.2158	-262330.	13678.	-0.00264	23206.	3.64E+09	-162.9224	5617.	0.00
2.4800	0.1941	-161504.	12345.	-0.00307	18461.	3.64E+09	-195.2952	7484.	0.00
3.1000	0.1700	-71084.	10818.	-0.00331	14205.	3.64E+09	-215.1945	9415.	0.00
3.7200	0.1449	7603.	9188.	-0.00338	11217.	3.64E+09	-223.1192	11459.	0.00
4.3400	0.1198	73921.	7488.	-0.00329	14338.	3.64E+09	-233.8551	14523.	0.00
4.9600	0.09586	127109.	5700.	-0.00309	16842.	3.64E+09	-246.7070	19147.	0.00
5.5800	0.07386	166321.	3814.	-0.00279	18687.	3.64E+09	-260.4256	26234.	0.00

6.2000	0.05439	190699.	1870.	-0.00242	19835.	3.64E+09	-261.9808	35838.	0.00
6.8200	0.03782	200097.	-35.1811	-0.00202	20277.	3.64E+09	-250.2459	49228.	0.00
7.4400	0.02430	195140.	-1692.	-0.00162	20044.	3.64E+09	-195.2546	59782.	0.00
8.0600	0.01375	178885.	-2864.	-0.00123	19279.	3.64E+09	-119.6985	64764.	0.00
8.6800	0.00593	155554.	-3516.	-8.93E-04	18181.	3.64E+09	-55.5493	69746.	0.00
9.3000	4.69E-04	128758.	-3740.	-6.02E-04	16919.	3.64E+09	-4.7107	74727.	0.00
9.9200	-0.00303	101378.	-3637.	-3.66E-04	15631.	3.64E+09	32.4308	79709.	0.00
10.5400	-0.00498	75538.	-3306.	-1.85E-04	14414.	3.64E+09	56.6824	84691.	0.00
11.1600	-0.00578	52646.	-2835.	-5.40E-05	13337.	3.64E+09	69.6855	89673.	0.00
11.7800	-0.00578	33479.	-2303.	3.42E-05	12435.	3.64E+09	73.5643	94655.	0.00
12.4000	-0.00527	18300.	-1766.	8.72E-05	11720.	3.64E+09	70.6170	99636.	0.00
13.0200	-0.00449	6984.	-1269.	1.13E-04	11188.	3.64E+09	63.0694	104618.	0.00
13.6400	-0.00359	-858.4002	-837.4859	1.19E-04	10900.	3.64E+09	52.9001	109600.	0.00
14.2600	-0.00271	-5771.	-485.4451	1.13E-04	11131.	3.64E+09	41.7346	114582.	0.00
14.8800	-0.00192	-8358.	-215.6124	9.81E-05	11253.	3.64E+09	30.8011	119564.	0.00
15.5000	-0.00125	-9220.	-23.1512	8.01E-05	11293.	3.64E+09	20.9358	124546.	0.00
16.1200	-7.25E-04	-8899.	101.6859	6.15E-05	11278.	3.64E+09	12.6226	129527.	0.00
16.7400	-3.35E-04	-7858.	171.1677	4.44E-05	11229.	3.64E+09	6.0553	134509.	0.00
17.3600	-6.45E-05	-6461.	198.1905	2.97E-05	11163.	3.64E+09	1.2089	139491.	0.00
17.9800	1.08E-04	-4982.	194.9153	1.80E-05	11094.	3.64E+09	-2.0893	144473.	0.00
18.6000	2.04E-04	-3605.	171.9126	9.24E-06	11029.	3.64E+09	-4.0942	149455.	0.00
19.2200	2.45E-04	-2446.	137.7530	3.05E-06	10974.	3.64E+09	-5.0885	154437.	0.00
19.8400	2.49E-04	-1563.	105.9948	-1.05E-06	10933.	3.64E+09	-3.4487	102957.	0.00
20.4600	2.29E-04	-866.4647	80.9706	-3.54E-06	10900.	3.64E+09	-3.2782	106278.	0.00
21.0800	1.97E-04	-349.3430	58.0033	-4.78E-06	10876.	3.64E+09	-2.8958	109599.	0.00
21.7000	1.58E-04	8.3633	38.2908	-5.13E-06	10860.	3.64E+09	-2.4033	112920.	0.00
22.3200	1.20E-04	233.0197	22.3624	-4.88E-06	10870.	3.64E+09	-1.8786	116242.	0.00
22.9400	8.57E-05	353.1053	10.2522	-4.28E-06	10876.	3.64E+09	-1.3769	119563.	0.00
23.5600	5.65E-05	396.0890	1.6590	-3.52E-06	10878.	3.64E+09	-0.9331	122884.	0.00
24.1800	3.33E-05	386.4255	-3.9165	-2.72E-06	10877.	3.64E+09	-0.5656	126205.	0.00
24.8000	1.61E-05	344.4811	-7.0619	-1.97E-06	10875.	3.64E+09	-0.2799	129526.	0.00
25.4200	4.06E-06	286.1768	-8.3727	-1.32E-06	10873.	3.64E+09	-0.07244	132848.	0.00
26.0400	-3.61E-06	223.1438	-8.4055	-8.02E-07	10870.	3.64E+09	0.06362	131217.	0.00
26.6600	-7.87E-06	163.0719	-7.6392	-4.07E-07	10867.	3.64E+09	0.1424	134538.	0.00
27.2800	-9.66E-06	110.4714	-6.4439	-1.27E-07	10864.	3.64E+09	0.1789	137859.	0.00
27.9000	-9.76E-06	67.4982	-5.0894	5.55E-08	10862.	3.64E+09	0.1852	141181.	0.00
28.5200	-8.83E-06	34.6050	-3.7625	1.60E-07	10861.	3.64E+09	0.1715	144502.	0.00
29.1400	-7.38E-06	11.1193	-2.5791	2.07E-07	10860.	3.64E+09	0.1466	147823.	0.00
29.7600	-5.75E-06	-4.2801	-1.5989	2.14E-07	10859.	3.64E+09	0.1169	151144.	0.00
30.3800	-4.20E-06	-13.1973	-0.8398	1.96E-07	10860.	3.64E+09	0.08714	154465.	0.00
31.0000	-2.84E-06	-17.2577	-0.2916	1.65E-07	10860.	3.64E+09	0.06024	157787.	0.00
31.6200	-1.75E-06	-17.9403	0.07321	1.29E-07	10860.	3.64E+09	0.03782	161108.	0.00
32.2400	-9.26E-07	-16.4843	0.2900	9.35E-08	10860.	3.64E+09	0.02046	164429.	0.00
32.8600	-3.56E-07	-13.8543	0.3960	6.24E-08	10860.	3.64E+09	0.00803	167750.	0.00
33.4800	2.88E-09	-10.7454	0.4256	3.72E-08	10860.	3.64E+09	-6.63E-05	171071.	0.00
34.1000	1.98E-07	-7.6130	0.3978	1.84E-08	10860.	3.64E+09	-0.00741	278410.	0.00
34.7200	2.77E-07	-4.8719	0.3306	5.67E-09	10859.	3.64E+09	-0.01064	285329.	0.00
35.3400	2.83E-07	-2.7075	0.2498	-2.08E-09	10859.	3.64E+09	-0.01110	292248.	0.00
35.9600	2.46E-07	-1.1505	0.1716	-6.03E-09	10859.	3.64E+09	-0.00991	299168.	0.00
36.5800	1.93E-07	-0.1390	0.1053	-7.35E-09	10859.	3.64E+09	-0.00793	306087.	0.00
37.2000	1.37E-07	0.4338	0.05431	-7.05E-09	10859.	3.64E+09	-0.00576	313006.	0.00
37.8200	8.79E-08	0.6864	0.01881	-5.90E-09	10859.	3.64E+09	-0.00378	319925.	0.00
38.4400	4.92E-08	0.7281	-0.00329	-4.46E-09	10859.	3.64E+09	-0.00216	326844.	0.00
39.0600	2.16E-08	0.6484	-0.01493	-3.05E-09	10859.	3.64E+09	-9.68E-04	333764.	0.00
39.6800	3.85E-09	0.5134	-0.01919	-1.86E-09	10859.	3.64E+09	-1.76E-04	340683.	0.00
40.3000	-6.06E-09	0.3674	-0.01879	-9.56E-10	10859.	3.64E+09	2.83E-04	347602.	0.00
40.9200	-1.04E-08	0.2362	-0.01590	-3.39E-10	10859.	3.64E+09	4.95E-04	354521.	0.00
41.5400	-1.11E-08	0.1318	-0.01205	3.78E-11	10859.	3.64E+09	5.39E-04	361440.	0.00
42.1600	-9.82E-09	0.05684	-0.00823	2.31E-10	10859.	3.64E+09	4.86E-04	368360.	0.00
42.7800	-7.67E-09	0.00868	-0.00499	2.98E-10	10859.	3.64E+09	3.87E-04	375279.	0.00
43.4000	-5.39E-09	-0.01808	-0.00252	2.88E-10	10859.	3.64E+09	2.77E-04	382198.	0.00
44.0200	-3.38E-09	-0.02948	-8.29E-04	2.40E-10	10859.	3.64E+09	1.77E-04	389117.	0.00
44.6400	-1.82E-09	-0.03101	1.90E-04	1.78E-10	10859.	3.64E+09	9.71E-05	396036.	0.00
45.2600	-7.39E-10	-0.02708	7.00E-04	1.18E-10	10859.	3.64E+09	4.00E-05	402956.	0.00
45.8800	-6.58E-11	-0.02088	8.63E-04	6.91E-11	10859.	3.64E+09	3.63E-06	409875.	0.00

46.5000	2.89E-10	-0.01442	8.16E-04	3.30E-11	10859.	3.64E+09	-1.62E-05	416794.	0.00
47.1200	4.25E-10	-0.00882	6.65E-04	9.21E-12	10859.	3.64E+09	-2.42E-05	423713.	0.00
47.7400	4.26E-10	-0.00454	4.84E-04	-4.45E-12	10859.	3.64E+09	-2.47E-05	430632.	0.00
48.3600	3.59E-10	-0.00161	3.13E-04	-1.07E-11	10859.	3.64E+09	-2.11E-05	437552.	0.00
48.9800	2.67E-10	1.51E-04	1.76E-04	-1.22E-11	10859.	3.64E+09	-1.59E-05	444471.	0.00
49.6000	1.77E-10	0.00103	7.65E-05	-1.10E-11	10859.	3.64E+09	-1.07E-05	451390.	0.00
50.2200	1.02E-10	0.00132	1.31E-05	-8.63E-12	10859.	3.64E+09	-6.31E-06	458309.	0.00
50.8400	4.82E-11	0.00125	-2.15E-05	-6.00E-12	10859.	3.64E+09	-3.02E-06	465228.	0.00
51.4600	1.31E-11	0.00101	-3.59E-05	-3.69E-12	10859.	3.64E+09	-8.31E-07	472148.	0.00
52.0800	-6.69E-12	7.24E-04	-3.73E-05	-1.92E-12	10859.	3.64E+09	4.31E-07	479067.	0.00
52.7000	-1.54E-11	4.59E-04	-3.20E-05	0.00	10859.	3.64E+09	1.01E-06	485986.	0.00
53.3200	-1.72E-11	2.49E-04	-2.40E-05	0.00	10859.	3.64E+09	1.14E-06	492905.	0.00
53.9400	-1.52E-11	1.02E-04	-1.60E-05	0.00	10859.	3.64E+09	1.02E-06	499824.	0.00
54.5600	-1.16E-11	1.10E-05	-9.24E-06	0.00	10859.	3.64E+09	7.89E-07	506744.	0.00
55.1800	-7.82E-12	-3.65E-05	-4.30E-06	0.00	10859.	3.64E+09	5.40E-07	513663.	0.00
55.8000	-4.62E-12	-5.41E-05	-1.08E-06	0.00	10859.	3.64E+09	3.23E-07	520582.	0.00
56.4200	-2.24E-12	-5.36E-05	7.12E-07	0.00	10859.	3.64E+09	1.59E-07	527501.	0.00
57.0400	0.00	-4.41E-05	1.49E-06	0.00	10859.	3.64E+09	4.89E-08	534420.	0.00
57.6600	0.00	-3.19E-05	1.61E-06	0.00	10859.	3.64E+09	-1.52E-08	541340.	0.00
58.2800	0.00	-2.04E-05	1.39E-06	0.00	10859.	3.64E+09	-4.52E-08	548259.	0.00
58.9000	0.00	-1.13E-05	1.02E-06	0.00	10859.	3.64E+09	-5.28E-08	555178.	0.00
59.5200	0.00	-5.21E-06	6.47E-07	0.00	10859.	3.64E+09	-4.76E-08	562097.	0.00
60.1400	0.00	-1.68E-06	3.36E-07	0.00	10859.	3.64E+09	-3.61E-08	569016.	0.00
60.7600	0.00	-1.50E-07	1.19E-07	0.00	10859.	3.64E+09	-2.23E-08	575936.	0.00
61.3800	0.00	1.48E-07	5.96E-09	0.00	10859.	3.64E+09	-8.03E-09	582855.	0.00
62.0000	0.00	0.00	0.00	0.00	10859.	3.64E+09	6.43E-09	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.25000000 inches
Computed slope at pile head      =    -0.00011905 radians
Maximum bending moment           =       -602396. inch-lbs
Maximum shear force              =         15737. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              6
Number of zero deflection points =              9
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 2

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.500000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 165000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5000	-1076238.	25899.	0.00	61514.	3.64E+09	0.00	0.00	0.00
0.6200	0.4918	-884106.	25386.	-0.00201	52471.	3.64E+09	-69.0396	1044.	0.00
1.2400	0.4702	-693576.	24577.	-0.00362	43503.	3.64E+09	-148.2734	2346.	0.00
1.8600	0.4379	-509510.	23205.	-0.00485	34840.	3.64E+09	-220.5313	3747.	0.00
2.4800	0.3980	-336371.	21397.	-0.00572	26691.	3.64E+09	-265.6443	4966.	0.00
3.1000	0.3529	-177092.	19279.	-0.00624	19194.	3.64E+09	-303.6521	6402.	0.00
3.7200	0.3051	-34175.	16903.	-0.00646	12468.	3.64E+09	-335.0641	8172.	0.00
4.3400	0.2568	90280.	14293.	-0.00640	15108.	3.64E+09	-366.5089	10620.	0.00

4.9600	0.2098	194220.	11451.	-0.00611	20000.	3.64E+09	-397.3995	14092.	0.00
5.5800	0.1658	275675.	8389.	-0.00563	23834.	3.64E+09	-425.8428	19105.	0.00
6.2000	0.1261	332866.	5180.	-0.00501	26526.	3.64E+09	-436.7215	25777.	0.00
6.8200	0.09134	365046.	1964.	-0.00429	28041.	3.64E+09	-427.7215	34841.	0.00
7.4400	0.06218	372633.	-1106.	-0.00354	28398.	3.64E+09	-397.6337	47579.	0.00
8.0600	0.03870	357274.	-3838.	-0.00279	27675.	3.64E+09	-336.8343	64764.	0.00
8.6800	0.02065	322372.	-5811.	-0.00210	26032.	3.64E+09	-193.6028	69746.	0.00
9.3000	0.00752	275943.	-6813.	-0.00148	23847.	3.64E+09	-75.5107	74727.	0.00
9.9200	-0.00141	224641.	-7037.	-9.71E-04	21432.	3.64E+09	15.1553	79709.	0.00
10.5400	-0.00693	173614.	-6687.	-5.63E-04	19031.	3.64E+09	78.8471	84691.	0.00
11.1600	-0.00980	126515.	-5955.	-2.56E-04	16814.	3.64E+09	118.0582	89673.	0.00
11.7800	-0.01074	85633.	-5008.	-3.90E-05	14890.	3.64E+09	136.6021	94655.	0.00
12.4000	-0.01038	52098.	-3983.	1.02E-04	13311.	3.64E+09	138.9456	99636.	0.00
13.0200	-0.00922	26122.	-2983.	1.82E-04	12089.	3.64E+09	129.6497	104618.	0.00
13.6400	-0.00767	7258.	-2081.	2.16E-04	11201.	3.64E+09	112.9474	109600.	0.00
14.2600	-0.00600	-5373.	-1317.	2.18E-04	11112.	3.64E+09	92.4634	114582.	0.00
14.8800	-0.00442	-12872.	-708.4740	1.99E-04	11465.	3.64E+09	71.0665	119564.	0.00
15.5000	-0.00304	-16404.	-255.0101	1.69E-04	11631.	3.64E+09	50.8324	124546.	0.00
16.1200	-0.00190	-17082.	57.1859	1.35E-04	11663.	3.64E+09	33.0913	129527.	0.00
16.7400	-0.00103	-15885.	249.2228	1.01E-04	11607.	3.64E+09	18.5315	134509.	0.00
17.3600	-3.91E-04	-13623.	345.4425	7.13E-05	11500.	3.64E+09	7.3340	139491.	0.00
17.9800	3.52E-05	-10920.	370.1788	4.61E-05	11373.	3.64E+09	-0.6845	144473.	0.00
18.6000	2.95E-04	-8228.	345.5589	2.65E-05	11246.	3.64E+09	-5.9338	149455.	0.00
19.2200	4.30E-04	-5843.	290.2619	1.21E-05	11134.	3.64E+09	-8.9310	154437.	0.00
19.8400	4.76E-04	-3939.	232.5280	2.14E-06	11045.	3.64E+09	-6.5889	102957.	0.00
20.4600	4.62E-04	-2389.	183.4643	-4.34E-06	10972.	3.64E+09	-6.6003	106278.	0.00
21.0800	4.12E-04	-1198.	136.3559	-8.01E-06	10916.	3.64E+09	-6.0633	109599.	0.00
21.7000	3.43E-04	-339.8924	94.4401	-9.58E-06	10875.	3.64E+09	-5.2044	112920.	0.00
22.3200	2.69E-04	230.8887	59.4431	-9.69E-06	10870.	3.64E+09	-4.2034	116242.	0.00
22.9400	1.99E-04	568.4182	31.9292	-8.87E-06	10886.	3.64E+09	-3.1929	119563.	0.00
23.5600	1.37E-04	727.7833	11.6352	-7.55E-06	10893.	3.64E+09	-2.2625	122884.	0.00
24.1800	8.64E-05	760.0826	-2.2312	-6.03E-06	10895.	3.64E+09	-1.4650	126205.	0.00
24.8000	4.73E-05	709.3776	-10.7458	-4.52E-06	10893.	3.64E+09	-0.8239	129526.	0.00
25.4200	1.91E-05	611.2867	-15.0780	-3.17E-06	10888.	3.64E+09	-0.3407	132848.	0.00
26.0400	1.47E-07	492.8009	-16.3551	-2.04E-06	10882.	3.64E+09	-0.00259	131217.	0.00
26.6600	-1.13E-05	372.9336	-15.6057	-1.15E-06	10877.	3.64E+09	0.2040	134538.	0.00
27.2800	-1.70E-05	263.4234	-13.6725	-5.04E-07	10872.	3.64E+09	0.3156	137859.	0.00
27.9000	-1.88E-05	170.7237	-11.1729	-5.92E-08	10867.	3.64E+09	0.3563	141181.	0.00
28.5200	-1.79E-05	97.3163	-8.5531	2.15E-07	10864.	3.64E+09	0.3480	144502.	0.00
29.1400	-1.56E-05	42.9261	-6.1074	3.59E-07	10861.	3.64E+09	0.3095	147823.	0.00
29.7600	-1.26E-05	5.5580	-4.0054	4.08E-07	10859.	3.64E+09	0.2556	151144.	0.00
30.3800	-9.50E-06	-17.6766	-2.3208	3.96E-07	10860.	3.64E+09	0.1973	154465.	0.00
31.0000	-6.69E-06	-29.9470	-1.0590	3.47E-07	10861.	3.64E+09	0.1419	157787.	0.00
31.6200	-4.34E-06	-34.2864	-0.1816	2.81E-07	10861.	3.64E+09	0.09394	161108.	0.00
32.2400	-2.51E-06	-33.3399	0.3739	2.12E-07	10861.	3.64E+09	0.05539	164429.	0.00
32.8600	-1.18E-06	-29.2439	0.6790	1.48E-07	10861.	3.64E+09	0.02665	167750.	0.00
33.4800	-3.03E-07	-23.5994	0.8041	9.40E-08	10860.	3.64E+09	0.00696	171071.	0.00
34.1000	2.17E-07	-17.5101	0.7998	5.19E-08	10860.	3.64E+09	-0.00811	278410.	0.00
34.7200	4.70E-07	-11.8257	0.7026	2.19E-08	10860.	3.64E+09	-0.01801	285329.	0.00
35.3400	5.43E-07	-7.1087	0.5563	2.53E-09	10859.	3.64E+09	-0.02131	292248.	0.00
35.9600	5.07E-07	-3.5537	0.4012	-8.38E-09	10859.	3.64E+09	-0.02040	299168.	0.00
36.5800	4.18E-07	-1.1189	0.2613	-1.32E-08	10859.	3.64E+09	-0.01719	306087.	0.00
37.2000	3.11E-07	0.3672	0.1486	-1.39E-08	10859.	3.64E+09	-0.01310	313006.	0.00
37.8200	2.11E-07	1.1271	0.06624	-1.24E-08	10859.	3.64E+09	-0.00905	319925.	0.00
38.4400	1.27E-07	1.3832	0.01185	-9.84E-09	10859.	3.64E+09	-0.00557	326844.	0.00
39.0600	6.41E-08	1.3276	-0.01958	-7.06E-09	10859.	3.64E+09	-0.00288	333764.	0.00
39.6800	2.17E-08	1.1093	-0.03397	-4.57E-09	10859.	3.64E+09	-9.93E-04	340683.	0.00
40.3000	-3.87E-09	0.8333	-0.03699	-2.58E-09	10859.	3.64E+09	1.81E-04	347602.	0.00
40.9200	-1.67E-08	0.5652	-0.03336	-1.15E-09	10859.	3.64E+09	7.97E-04	354521.	0.00
41.5400	-2.10E-08	0.3398	-0.02660	-2.25E-10	10859.	3.64E+09	0.00102	361440.	0.00
42.1600	-2.01E-08	0.1700	-0.01911	2.97E-10	10859.	3.64E+09	9.94E-04	368360.	0.00
42.7800	-1.66E-08	0.05474	-0.01230	5.27E-10	10859.	3.64E+09	8.36E-04	375279.	0.00
43.4000	-1.22E-08	-0.01436	-0.00685	5.68E-10	10859.	3.64E+09	6.28E-04	382198.	0.00
44.0200	-8.12E-09	-0.04863	-0.00294	5.04E-10	10859.	3.64E+09	4.24E-04	389117.	0.00
44.6400	-4.74E-09	-0.05928	-4.19E-04	3.93E-10	10859.	3.64E+09	2.52E-04	396036.	0.00

45.2600	-2.26E-09	-0.05583	9.74E-04	2.76E-10	10859.	3.64E+09	1.23E-04	402956.	0.00
45.8800	-6.37E-10	-0.04546	0.00156	1.72E-10	10859.	3.64E+09	3.51E-05	409875.	0.00
46.5000	2.96E-10	-0.03303	0.00163	9.16E-11	10859.	3.64E+09	-1.66E-05	416794.	0.00
47.1200	7.25E-10	-0.02143	0.00141	3.58E-11	10859.	3.64E+09	-4.13E-05	423713.	0.00
47.7400	8.29E-10	-0.01207	0.00108	1.55E-12	10859.	3.64E+09	-4.80E-05	430632.	0.00
48.3600	7.48E-10	-0.00533	7.40E-04	-1.63E-11	10859.	3.64E+09	-4.40E-05	437552.	0.00
48.9800	5.87E-10	-0.00102	4.46E-04	-2.28E-11	10859.	3.64E+09	-3.51E-05	444471.	0.00
49.6000	4.10E-10	0.00136	2.23E-04	-2.24E-11	10859.	3.64E+09	-2.49E-05	451390.	0.00
50.2200	2.54E-10	0.00236	7.25E-05	-1.86E-11	10859.	3.64E+09	-1.56E-05	458309.	0.00
50.8400	1.33E-10	0.00249	-1.66E-05	-1.36E-11	10859.	3.64E+09	-8.34E-06	465228.	0.00
51.4600	5.09E-11	0.00215	-5.97E-05	-8.88E-12	10859.	3.64E+09	-3.23E-06	472148.	0.00
52.0800	1.21E-12	0.00162	-7.20E-05	-5.02E-12	10859.	3.64E+09	-7.77E-08	479067.	0.00
52.7000	-2.38E-11	0.00109	-6.65E-05	-2.25E-12	10859.	3.64E+09	1.56E-06	485986.	0.00
53.3200	-3.23E-11	6.38E-04	-5.27E-05	0.00	10859.	3.64E+09	2.14E-06	492905.	0.00
53.9400	-3.10E-11	3.05E-04	-3.70E-05	0.00	10859.	3.64E+09	2.08E-06	499824.	0.00
54.5600	-2.51E-11	8.64E-05	-2.29E-05	0.00	10859.	3.64E+09	1.71E-06	506744.	0.00
55.1800	-1.79E-11	-3.77E-05	-1.19E-05	0.00	10859.	3.64E+09	1.24E-06	513663.	0.00
55.8000	-1.13E-11	-9.34E-05	-4.40E-06	0.00	10859.	3.64E+09	7.88E-07	520582.	0.00
56.4200	-6.04E-12	-1.05E-04	1.26E-07	0.00	10859.	3.64E+09	4.28E-07	527501.	0.00
57.0400	-2.41E-12	-9.29E-05	2.36E-06	0.00	10859.	3.64E+09	1.73E-07	534420.	0.00
57.6600	0.00	-7.09E-05	3.07E-06	0.00	10859.	3.64E+09	1.51E-08	541340.	0.00
58.2800	0.00	-4.79E-05	2.87E-06	0.00	10859.	3.64E+09	-6.78E-08	548259.	0.00
58.9000	1.32E-12	-2.85E-05	2.25E-06	0.00	10859.	3.64E+09	-9.84E-08	555178.	0.00
59.5200	1.28E-12	-1.44E-05	1.52E-06	0.00	10859.	3.64E+09	-9.70E-08	562097.	0.00
60.1400	1.03E-12	-5.73E-06	8.70E-07	0.00	10859.	3.64E+09	-7.88E-08	569016.	0.00
60.7600	0.00	-1.38E-06	3.78E-07	0.00	10859.	3.64E+09	-5.33E-08	575936.	0.00
61.3800	0.00	1.78E-08	8.48E-08	0.00	10859.	3.64E+09	-2.56E-08	582855.	0.00
62.0000	0.00	0.00	0.00	0.00	10859.	3.64E+09	2.80E-09	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     0.50000000 inches
Computed slope at pile head      =    -0.00019661 radians
Maximum bending moment           =      -1076238. inch-lbs
Maximum shear force              =         25899. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              9
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 3

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head = 0.750000 inches
Rotation of pile head = 0.000E+00 radians
Axial load on pile head = 165000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.7500	-1504257.	34058.	0.00	81659.	3.64E+09	0.00	0.00	0.00
0.6200	0.7385	-1250885.	33545.	-0.00282	69734.	3.64E+09	-69.0396	695.4931	0.00
1.2400	0.7080	-998193.	32736.	-0.00512	57840.	3.64E+09	-148.2735	1558.	0.00
1.8600	0.6623	-751199.	31360.	-0.00691	46215.	3.64E+09	-221.7160	2490.	0.00
2.4800	0.6052	-514592.	29490.	-0.00821	35079.	3.64E+09	-281.0188	3455.	0.00
3.1000	0.5402	-292247.	27154.	-0.00903	24614.	3.64E+09	-346.7589	4775.	0.00

3.7200	0.4708	-88361.	24269.	-0.00942	15018.	3.64E+09	-428.8578	6777.	0.00
4.3400	0.4001	92007.	20822.	-0.00942	15190.	3.64E+09	-497.7468	9257.	0.00
4.9600	0.3307	244592.	16961.	-0.00907	22371.	3.64E+09	-540.0938	12151.	0.00
5.5800	0.2650	366666.	12823.	-0.00845	28117.	3.64E+09	-572.2128	16063.	0.00
6.2000	0.2050	456145.	8511.	-0.00761	32328.	3.64E+09	-587.0669	21308.	0.00
6.8200	0.1519	511982.	4159.	-0.00662	34956.	3.64E+09	-582.6787	28545.	0.00
7.4400	0.1066	534279.	-60.4699	-0.00554	36006.	3.64E+09	-551.7090	38524.	0.00
8.0600	0.06937	524695.	-3947.	-0.00446	35555.	3.64E+09	-493.1839	52896.	0.00
8.6800	0.04017	486493.	-7183.	-0.00343	33757.	3.64E+09	-376.6080	69746.	0.00
9.3000	0.01839	426222.	-9271.	-0.00249	30920.	3.64E+09	-184.6941	74727.	0.00
9.9200	0.00309	354656.	-10081.	-0.00169	27552.	3.64E+09	-33.1357	79709.	0.00
10.5400	-0.00680	280366.	-9917.	-0.00104	24055.	3.64E+09	77.4344	84691.	0.00
11.1600	-0.01243	209657.	-9071.	-5.42E-04	20727.	3.64E+09	149.8024	89673.	0.00
11.7800	-0.01486	146714.	-7811.	-1.77E-04	17764.	3.64E+09	189.0902	94655.	0.00
12.4000	-0.01506	93869.	-6357.	6.92E-05	15277.	3.64E+09	201.7201	99636.	0.00
13.0200	-0.01383	51954.	-4883.	2.18E-04	13304.	3.64E+09	194.5193	104618.	0.00
13.6400	-0.01181	20676.	-3512.	2.93E-04	11832.	3.64E+09	174.0184	109600.	0.00
14.2600	-0.00948	-1021.	-2322.	3.13E-04	10907.	3.64E+09	145.9630	114582.	0.00
14.8800	-0.00716	-14637.	-1351.	2.97E-04	11548.	3.64E+09	115.0302	119564.	0.00
15.5000	-0.00506	-21848.	-607.5877	2.59E-04	11887.	3.64E+09	84.7217	124546.	0.00
16.1200	-0.00330	-24315.	-78.9073	2.12E-04	12004.	3.64E+09	57.3967	129527.	0.00
16.7400	-0.00190	-23543.	262.5866	1.63E-04	11967.	3.64E+09	34.4027	134509.	0.00
17.3600	-8.67E-04	-20808.	451.0632	1.18E-04	11839.	3.64E+09	16.2631	139491.	0.00
17.9800	-1.49E-04	-17121.	522.3102	7.91E-05	11665.	3.64E+09	2.8893	144473.	0.00
18.6000	3.09E-04	-13230.	509.9574	4.80E-05	11482.	3.64E+09	-6.2100	149455.	0.00
19.2200	5.66E-04	-9651.	443.1807	2.46E-05	11313.	3.64E+09	-11.7408	154437.	0.00
19.8400	6.75E-04	-6696.	364.7499	7.87E-06	11174.	3.64E+09	-9.3428	102957.	0.00
20.4600	6.83E-04	-4242.	293.7164	-3.32E-06	11059.	3.64E+09	-9.7522	106278.	0.00
21.0800	6.26E-04	-2318.	223.1513	-1.00E-05	10968.	3.64E+09	-9.2168	109599.	0.00
21.7000	5.33E-04	-897.2808	158.7516	-1.33E-05	10901.	3.64E+09	-8.0949	112920.	0.00
22.3200	4.27E-04	77.2774	103.7997	-1.42E-05	10863.	3.64E+09	-6.6771	116242.	0.00
22.9400	3.23E-04	682.0402	59.6781	-1.34E-05	10891.	3.64E+09	-5.1836	119563.	0.00
23.5600	2.28E-04	998.1610	26.3784	-1.17E-05	10906.	3.64E+09	-3.7680	122884.	0.00
24.1800	1.49E-04	1103.	2.9651	-9.52E-06	10911.	3.64E+09	-2.5259	126205.	0.00
24.8000	8.65E-05	1066.	-12.0319	-7.30E-06	10909.	3.64E+09	-1.5056	129526.	0.00
25.4200	4.03E-05	942.0912	-20.3081	-5.25E-06	10903.	3.64E+09	-0.7192	132848.	0.00
26.0400	8.42E-06	776.3496	-23.5362	-3.49E-06	10896.	3.64E+09	-0.1486	131217.	0.00
26.6600	-1.16E-05	600.4346	-23.3077	-2.08E-06	10887.	3.64E+09	0.2100	134538.	0.00
27.2800	-2.25E-05	434.6336	-20.9755	-1.02E-06	10880.	3.64E+09	0.4170	137859.	0.00
27.9000	-2.68E-05	290.8216	-17.5342	-2.77E-07	10873.	3.64E+09	0.5081	141181.	0.00
28.5200	-2.66E-05	174.4050	-13.7205	1.99E-07	10867.	3.64E+09	0.5171	144502.	0.00
29.1400	-2.38E-05	86.1719	-10.0370	4.66E-07	10863.	3.64E+09	0.4731	147823.	0.00
29.7600	-1.97E-05	23.9112	-6.7889	5.79E-07	10860.	3.64E+09	0.4000	151144.	0.00
30.3800	-1.52E-05	-16.2679	-4.1267	5.86E-07	10860.	3.64E+09	0.3157	154465.	0.00
31.0000	-1.10E-05	-38.9335	-2.0874	5.30E-07	10861.	3.64E+09	0.2325	157787.	0.00
31.6200	-7.32E-06	-48.6289	-0.6327	4.40E-07	10861.	3.64E+09	0.1585	161108.	0.00
32.2400	-4.41E-06	-49.4288	0.3198	3.40E-07	10861.	3.64E+09	0.09755	164429.	0.00
32.8600	-2.26E-06	-44.7045	0.8724	2.44E-07	10861.	3.64E+09	0.05099	167750.	0.00
33.4800	-7.89E-07	-37.0456	1.1296	1.60E-07	10861.	3.64E+09	0.01815	171071.	0.00
34.1000	1.19E-07	-28.2889	1.1806	9.31E-08	10860.	3.64E+09	-0.00443	278410.	0.00
34.7200	5.96E-07	-19.7065	1.0791	4.40E-08	10860.	3.64E+09	-0.02284	285329.	0.00
35.3400	7.73E-07	-12.3392	0.8812	1.12E-08	10860.	3.64E+09	-0.03035	292248.	0.00
35.9600	7.62E-07	-6.6211	0.6543	-8.23E-09	10859.	3.64E+09	-0.03064	299168.	0.00
36.5800	6.50E-07	-2.5823	0.4408	-1.76E-08	10859.	3.64E+09	-0.02676	306087.	0.00
37.2000	4.99E-07	-0.01804	0.2632	-2.03E-08	10859.	3.64E+09	-0.02101	313006.	0.00
37.8200	3.48E-07	1.3832	0.1293	-1.89E-08	10859.	3.64E+09	-0.01497	319925.	0.00
38.4400	2.18E-07	1.9522	0.03795	-1.55E-08	10859.	3.64E+09	-0.00958	326844.	0.00
39.0600	1.18E-07	1.9860	-0.01732	-1.15E-08	10859.	3.64E+09	-0.00528	333764.	0.00
39.6800	4.75E-08	1.7227	-0.04504	-7.67E-09	10859.	3.64E+09	-0.00217	340683.	0.00
40.3000	3.52E-09	1.3347	-0.05373	-4.54E-09	10859.	3.64E+09	-1.65E-04	347602.	0.00
40.9200	-2.01E-08	0.9343	-0.05078	-2.22E-09	10859.	3.64E+09	9.58E-04	354521.	0.00
41.5400	-2.95E-08	0.5845	-0.04189	-6.65E-10	10859.	3.64E+09	0.00143	361440.	0.00
42.1600	-3.00E-08	0.3126	-0.03103	2.53E-10	10859.	3.64E+09	0.00149	368360.	0.00
42.7800	-2.57E-08	0.1221	-0.02068	6.98E-10	10859.	3.64E+09	0.00130	375279.	0.00
43.4000	-1.96E-08	0.00321	-0.01210	8.26E-10	10859.	3.64E+09	0.00101	382198.	0.00

44.0200	-1.34E-08	-0.05998	-0.00574	7.68E-10	10859.	3.64E+09	7.03E-04	389117.	0.00
44.6400	-8.18E-09	-0.08412	-0.00151	6.21E-10	10859.	3.64E+09	4.35E-04	396036.	0.00
45.2600	-4.20E-09	-0.08394	9.58E-04	4.49E-10	10859.	3.64E+09	2.27E-04	402956.	0.00
45.8800	-1.50E-09	-0.07097	0.00211	2.90E-10	10859.	3.64E+09	8.27E-05	409875.	0.00
46.5000	1.19E-10	-0.05324	0.00239	1.63E-10	10859.	3.64E+09	-6.66E-06	416794.	0.00
47.1200	9.27E-10	-0.03575	0.00217	7.21E-11	10859.	3.64E+09	-5.28E-05	423713.	0.00
47.7400	1.19E-09	-0.02108	0.00172	1.39E-11	10859.	3.64E+09	-6.90E-05	430632.	0.00
48.3600	1.13E-09	-0.01019	0.00122	-1.81E-11	10859.	3.64E+09	-6.67E-05	437552.	0.00
48.9800	9.23E-10	-0.00296	7.62E-04	-3.15E-11	10859.	3.64E+09	-5.51E-05	444471.	0.00
49.6000	6.66E-10	0.00122	4.06E-04	-3.33E-11	10859.	3.64E+09	-4.04E-05	451390.	0.00
50.2200	4.27E-10	0.00317	1.58E-04	-2.88E-11	10859.	3.64E+09	-2.63E-05	458309.	0.00
50.8400	2.37E-10	0.00365	5.10E-06	-2.18E-11	10859.	3.64E+09	-1.48E-05	465228.	0.00
51.4600	1.02E-10	0.00330	-7.43E-05	-1.47E-11	10859.	3.64E+09	-6.50E-06	472148.	0.00
52.0800	1.80E-11	0.00258	-1.03E-04	-8.71E-12	10859.	3.64E+09	-1.16E-06	479067.	0.00
52.7000	-2.72E-11	0.00179	-1.00E-04	-4.24E-12	10859.	3.64E+09	1.77E-06	485986.	0.00
53.3200	-4.51E-11	0.00109	-8.28E-05	-1.29E-12	10859.	3.64E+09	2.99E-06	492905.	0.00
53.9400	-4.64E-11	5.61E-04	-6.01E-05	0.00	10859.	3.64E+09	3.12E-06	499824.	0.00
54.5600	-3.91E-11	1.99E-04	-3.86E-05	1.18E-12	10859.	3.64E+09	2.66E-06	506744.	0.00
55.1800	-2.88E-11	-1.61E-05	-2.13E-05	1.37E-12	10859.	3.64E+09	1.99E-06	513663.	0.00
55.8000	-1.88E-11	-1.21E-04	-8.95E-06	1.23E-12	10859.	3.64E+09	1.32E-06	520582.	0.00
56.4200	-1.06E-11	-1.52E-04	-1.26E-06	0.00	10859.	3.64E+09	7.52E-07	527501.	0.00
57.0400	-4.72E-12	-1.42E-04	2.80E-06	0.00	10859.	3.64E+09	3.39E-07	534420.	0.00
57.6600	-1.00E-12	-1.12E-04	4.33E-06	0.00	10859.	3.64E+09	7.30E-08	541340.	0.00
58.2800	1.01E-12	-7.83E-05	4.33E-06	0.00	10859.	3.64E+09	-7.44E-08	548259.	0.00
58.9000	1.83E-12	-4.83E-05	3.54E-06	0.00	10859.	3.64E+09	-1.37E-07	555178.	0.00
59.5200	1.92E-12	-2.57E-05	2.50E-06	0.00	10859.	3.64E+09	-1.45E-07	562097.	0.00
60.1400	1.61E-12	-1.11E-05	1.50E-06	0.00	10859.	3.64E+09	-1.23E-07	569016.	0.00
60.7600	1.14E-12	-3.24E-06	7.13E-07	0.00	10859.	3.64E+09	-8.81E-08	575936.	0.00
61.3800	0.00	-2.83E-07	2.06E-07	0.00	10859.	3.64E+09	-4.83E-08	582855.	0.00
62.0000	0.00	0.00	0.00	0.00	10859.	3.64E+09	-7.08E-09	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 3:

```
Pile-head deflection             =     0.75000000 inches
Computed slope at pile head      =    -0.00025928 radians
Maximum bending moment           =      -1504257. inch-lbs
Maximum shear force              =         34058. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              7
Number of zero deflection points =              9
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.000000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.0000	-1888638.	40710.	0.00	99750.	3.64E+09	0.00	0.00	0.00
0.6200	0.9856	-1585297.	40196.	-0.00355	85473.	3.64E+09	-69.0396	521.1482	0.00
1.2400	0.9471	-1281795.	39388.	-0.00649	71189.	3.64E+09	-148.2734	1165.	0.00
1.8600	0.8891	-983280.	38011.	-0.00881	57139.	3.64E+09	-221.7156	1855.	0.00

2.4800	0.8161	-694567.	36141.	-0.01052	43550.	3.64E+09	-281.0181	2562.	0.00
3.1000	0.7325	-419664.	33806.	-0.01166	30611.	3.64E+09	-346.7575	3522.	0.00
3.7200	0.6425	-162902.	30920.	-0.01226	18526.	3.64E+09	-428.8552	4966.	0.00
4.3400	0.5500	70531.	27329.	-0.01235	14179.	3.64E+09	-536.6264	7258.	0.00
4.9600	0.4587	274083.	22832.	-0.01200	23759.	3.64E+09	-672.1052	10902.	0.00
5.5800	0.3715	439742.	17625.	-0.01127	31556.	3.64E+09	-727.6193	14573.	0.00
6.2000	0.2910	564021.	12169.	-0.01024	37406.	3.64E+09	-739.1804	18902.	0.00
6.8200	0.2190	645966.	6707.	-0.00901	41262.	3.64E+09	-728.9773	24762.	0.00
7.4400	0.1569	685937.	1398.	-0.00764	43144.	3.64E+09	-698.1722	33097.	0.00
8.0600	0.1053	685538.	-3564.	-0.00624	43125.	3.64E+09	-635.6484	44911.	0.00
8.6800	0.06410	648231.	-7936.	-0.00487	41369.	3.64E+09	-539.8411	62661.	0.00
9.3000	0.03276	579413.	-11169.	-0.00362	38130.	3.64E+09	-329.0872	74727.	0.00
9.9200	0.01025	490924.	-12802.	-0.00252	33965.	3.64E+09	-109.8570	79709.	0.00
10.5400	-0.00478	395120.	-13008.	-0.00162	29456.	3.64E+09	54.4283	84691.	0.00
11.1600	-0.01380	301336.	-12187.	-9.04E-04	25042.	3.64E+09	166.3347	89673.	0.00
11.7800	-0.01823	216003.	-10705.	-3.74E-04	21026.	3.64E+09	231.9444	94655.	0.00
12.4000	-0.01937	142965.	-8877.	-7.15E-06	17588.	3.64E+09	259.4413	99636.	0.00
13.0200	-0.01834	83930.	-6953.	2.25E-04	14809.	3.64E+09	257.8564	104618.	0.00
13.6400	-0.01602	38957.	-5115.	3.51E-04	12693.	3.64E+09	236.0591	109600.	0.00
14.2600	-0.01312	6953.	-3486.	3.98E-04	11186.	3.64E+09	202.0284	114582.	0.00
14.8800	-0.01011	-13886.	-2130.	3.91E-04	11513.	3.64E+09	162.4042	119564.	0.00
15.5000	-0.00730	-25700.	-1071.	3.50E-04	12069.	3.64E+09	122.2855	124546.	0.00
16.1200	-0.00490	-30681.	-298.9554	2.92E-04	12303.	3.64E+09	85.2288	129527.	0.00
16.7400	-0.00295	-30867.	216.7119	2.29E-04	12312.	3.64E+09	53.3914	134509.	0.00
17.3600	-0.00148	-28020.	518.6132	1.69E-04	12178.	3.64E+09	27.7648	139491.	0.00
17.9800	-4.35E-04	-23565.	653.3374	1.16E-04	11968.	3.64E+09	8.4514	144473.	0.00
18.6000	2.52E-04	-18584.	665.9738	7.33E-05	11734.	3.64E+09	-5.0545	149455.	0.00
19.2200	6.55E-04	-13836.	596.5557	4.01E-05	11510.	3.64E+09	-13.6063	154437.	0.00
19.8400	8.49E-04	-9806.	502.2514	1.59E-05	11321.	3.64E+09	-11.7443	102957.	0.00
20.4600	8.93E-04	-6401.	411.1319	-6.51E-07	11160.	3.64E+09	-12.7501	106278.	0.00
21.0800	8.39E-04	-3686.	317.7247	-1.10E-05	11033.	3.64E+09	-12.3593	109599.	0.00
21.7000	7.29E-04	-1646.	230.5722	-1.64E-05	10937.	3.64E+09	-11.0688	112920.	0.00
22.3200	5.95E-04	-215.1437	154.8431	-1.83E-05	10869.	3.64E+09	-9.2885	116242.	0.00
22.9400	4.56E-04	702.5920	93.0025	-1.78E-05	10892.	3.64E+09	-7.3353	119563.	0.00
23.5600	3.29E-04	1213.	45.4949	-1.59E-05	10916.	3.64E+09	-5.4355	122884.	0.00
24.1800	2.20E-04	1419.	11.3796	-1.32E-05	10926.	3.64E+09	-3.7353	126205.	0.00
24.8000	1.33E-04	1414.	-11.1228	-1.03E-05	10926.	3.64E+09	-2.3138	129526.	0.00
25.4200	6.71E-05	1278.	-24.1899	-7.53E-06	10919.	3.64E+09	-1.1989	132848.	0.00
26.0400	2.08E-05	1073.	-30.0174	-5.12E-06	10910.	3.64E+09	-0.3676	131217.	0.00
26.6600	-9.12E-06	844.2104	-30.7716	-3.16E-06	10899.	3.64E+09	0.1649	134538.	0.00
27.2800	-2.62E-05	622.6556	-28.3506	-1.66E-06	10888.	3.64E+09	0.4859	137859.	0.00
27.9000	-3.39E-05	426.4353	-24.1532	-5.89E-07	10879.	3.64E+09	0.6424	141181.	0.00
28.5200	-3.50E-05	264.7017	-19.2357	1.18E-07	10872.	3.64E+09	0.6795	144502.	0.00
29.1400	-3.21E-05	139.9167	-14.3362	5.33E-07	10866.	3.64E+09	0.6376	147823.	0.00
29.7600	-2.71E-05	50.0723	-9.9192	7.27E-07	10862.	3.64E+09	0.5498	151144.	0.00
30.3800	-2.13E-05	-9.4660	-6.2311	7.68E-07	10860.	3.64E+09	0.4417	154465.	0.00
31.0000	-1.56E-05	-44.5336	-3.3553	7.13E-07	10861.	3.64E+09	0.3314	157787.	0.00
31.6200	-1.07E-05	-61.1441	-1.2638	6.05E-07	10862.	3.64E+09	0.2308	161108.	0.00
32.2400	-6.62E-06	-64.8240	0.1394	4.76E-07	10862.	3.64E+09	0.1464	164429.	0.00
32.8600	-3.57E-06	-60.2385	0.9837	3.48E-07	10862.	3.64E+09	0.08058	167750.	0.00
33.4800	-1.44E-06	-51.0413	1.4068	2.34E-07	10862.	3.64E+09	0.03315	171071.	0.00
34.1000	-8.68E-08	-39.8809	1.5422	1.41E-07	10861.	3.64E+09	0.00325	278410.	0.00
34.7200	6.61E-07	-28.4406	1.4600	7.14E-08	10860.	3.64E+09	-0.02535	285329.	0.00
35.3400	9.76E-07	-18.3319	1.2231	2.35E-08	10860.	3.64E+09	-0.03832	292248.	0.00
35.9600	1.01E-06	-10.2984	0.9293	-5.77E-09	10860.	3.64E+09	-0.04066	299168.	0.00
36.5800	8.90E-07	-4.4894	0.6419	-2.09E-08	10859.	3.64E+09	-0.03660	306087.	0.00
37.2000	7.00E-07	-0.6952	0.3962	-2.62E-08	10859.	3.64E+09	-0.02945	313006.	0.00
37.8200	5.00E-07	1.4703	0.2067	-2.54E-08	10859.	3.64E+09	-0.02149	319925.	0.00
38.4400	3.22E-07	2.4426	0.07412	-2.14E-08	10859.	3.64E+09	-0.01414	326844.	0.00
39.0600	1.81E-07	2.6259	-0.00873	-1.62E-08	10859.	3.64E+09	-0.00813	333764.	0.00
39.6800	8.05E-08	2.3525	-0.05270	-1.11E-08	10859.	3.64E+09	-0.00369	340683.	0.00
40.3000	1.57E-08	1.8691	-0.06914	-6.81E-09	10859.	3.64E+09	-7.32E-04	347602.	0.00
40.9200	-2.07E-08	1.3404	-0.06819	-3.52E-09	10859.	3.64E+09	9.89E-04	354521.	0.00
41.5400	-3.68E-08	0.8631	-0.05787	-1.27E-09	10859.	3.64E+09	0.00179	361440.	0.00
42.1600	-3.96E-08	0.4824	-0.04393	1.08E-10	10859.	3.64E+09	0.00196	368360.	0.00

42.7800	-3.51E-08	0.2091	-0.03004	8.16E-10	10859.	3.64E+09	0.00177	375279.	0.00
43.4000	-2.75E-08	0.03345	-0.01819	1.06E-09	10859.	3.64E+09	0.00141	382198.	0.00
44.0200	-1.93E-08	-0.06420	-0.00919	1.03E-09	10859.	3.64E+09	0.00101	389117.	0.00
44.6400	-1.21E-08	-0.1058	-0.00304	8.59E-10	10859.	3.64E+09	6.44E-04	396036.	0.00
45.2600	-6.52E-09	-0.1115	6.74E-04	6.37E-10	10859.	3.64E+09	3.53E-04	402956.	0.00
45.8800	-2.63E-09	-0.09734	0.00253	4.23E-10	10859.	3.64E+09	1.45E-04	409875.	0.00
46.5000	-2.26E-10	-0.07492	0.00311	2.47E-10	10859.	3.64E+09	1.26E-05	416794.	0.00
47.1200	1.04E-09	-0.05162	0.00294	1.17E-10	10859.	3.64E+09	-5.92E-05	423713.	0.00
47.7400	1.52E-09	-0.03146	0.00239	3.22E-11	10859.	3.64E+09	-8.79E-05	430632.	0.00
48.3600	1.52E-09	-0.01609	0.00173	-1.65E-11	10859.	3.64E+09	-8.93E-05	437552.	0.00
48.9800	1.27E-09	-0.00562	0.00112	-3.87E-11	10859.	3.64E+09	-7.61E-05	444471.	0.00
49.6000	9.42E-10	6.51E-04	6.23E-04	-4.38E-11	10859.	3.64E+09	-5.72E-05	451390.	0.00
50.2200	6.22E-10	0.00376	2.68E-04	-3.93E-11	10859.	3.64E+09	-3.83E-05	458309.	0.00
50.8400	3.58E-10	0.00473	4.22E-05	-3.06E-11	10859.	3.64E+09	-2.24E-05	465228.	0.00
51.4600	1.67E-10	0.00446	-8.04E-05	-2.12E-11	10859.	3.64E+09	-1.06E-05	472148.	0.00
52.0800	4.30E-11	0.00359	-1.30E-04	-1.29E-11	10859.	3.64E+09	-2.77E-06	479067.	0.00
52.7000	-2.59E-11	0.00256	-1.34E-04	-6.64E-12	10859.	3.64E+09	1.69E-06	485986.	0.00
53.3200	-5.58E-11	0.00161	-1.14E-04	-2.38E-12	10859.	3.64E+09	3.70E-06	492905.	0.00
53.9400	-6.13E-11	8.65E-04	-8.50E-05	0.00	10859.	3.64E+09	4.12E-06	499824.	0.00
54.5600	-5.35E-11	3.45E-04	-5.61E-05	1.39E-12	10859.	3.64E+09	3.65E-06	506744.	0.00
55.1800	-4.06E-11	2.66E-05	-3.21E-05	1.77E-12	10859.	3.64E+09	2.80E-06	513663.	0.00
55.8000	-2.72E-11	-1.37E-04	-1.46E-05	1.66E-12	10859.	3.64E+09	1.90E-06	520582.	0.00
56.4200	-1.59E-11	-1.95E-04	-3.38E-06	1.32E-12	10859.	3.64E+09	1.13E-06	527501.	0.00
57.0400	-7.56E-12	-1.91E-04	2.83E-06	0.00	10859.	3.64E+09	5.43E-07	534420.	0.00
57.6600	-2.15E-12	-1.56E-04	5.43E-06	0.00	10859.	3.64E+09	1.56E-07	541340.	0.00
58.2800	0.00	-1.11E-04	5.77E-06	0.00	10859.	3.64E+09	-6.63E-08	548259.	0.00
58.9000	2.25E-12	-7.05E-05	4.89E-06	0.00	10859.	3.64E+09	-1.68E-07	555178.	0.00
59.5200	2.53E-12	-3.88E-05	3.56E-06	0.00	10859.	3.64E+09	-1.91E-07	562097.	0.00
60.1400	2.21E-12	-1.76E-05	2.22E-06	0.00	10859.	3.64E+09	-1.69E-07	569016.	0.00
60.7600	1.63E-12	-5.66E-06	1.12E-06	0.00	10859.	3.64E+09	-1.26E-07	575936.	0.00
61.3800	0.00	-7.40E-07	3.66E-07	0.00	10859.	3.64E+09	-7.56E-08	582855.	0.00
62.0000	0.00	0.00	0.00	0.00	10859.	3.64E+09	-2.27E-08	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 4:

```
Pile-head deflection             =     1.00000000 inches
Computed slope at pile head      =    -0.00031041 radians
Maximum bending moment           =      -1888638. inch-lbs
Maximum shear force              =         40710. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              8
Number of zero deflection points =              9
```

```
--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 5
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.250000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	1.2500	-2238797.	46348.	0.00	116231.	3.64E+09	0.00	0.00	0.00
0.6200	1.2330	-1893068.	45834.	-0.00423	99959.	3.64E+09	-69.0396	416.6045	0.00

1.2400	1.1871	-1546404.	45026.	-0.00775	83643.	3.64E+09	-148.2735	929.2968	0.00
1.8600	1.1177	-1204063.	43649.	-0.01056	67530.	3.64E+09	-221.7157	1476.	0.00
2.4800	1.0299	-870969.	41779.	-0.01269	51852.	3.64E+09	-281.0183	2030.	0.00
3.1000	0.9289	-551242.	39444.	-0.01414	36804.	3.64E+09	-346.7580	2777.	0.00
3.7200	0.8195	-249325.	36559.	-0.01496	22594.	3.64E+09	-428.8561	3893.	0.00
4.3400	0.7063	29480.	32967.	-0.01519	12247.	3.64E+09	-536.6279	5653.	0.00
4.9600	0.5935	278507.	28471.	-0.01487	23967.	3.64E+09	-672.1077	8425.	0.00
5.5800	0.4850	489631.	22878.	-0.01408	33904.	3.64E+09	-831.3683	12753.	0.00
6.2000	0.3840	653505.	16423.	-0.01291	41617.	3.64E+09	-903.7732	17512.	0.00
6.8200	0.2929	765710.	9770.	-0.01146	46898.	3.64E+09	-884.6177	22473.	0.00
7.4400	0.2134	827024.	3346.	-0.00983	49784.	3.64E+09	-842.3035	29364.	0.00
8.0600	0.1466	839636.	-2679.	-0.00813	50378.	3.64E+09	-777.1827	39452.	0.00
8.6800	0.09249	807119.	-8080.	-0.00644	48847.	3.64E+09	-674.6908	54270.	0.00
9.3000	0.05071	735228.	-12484.	-0.00486	45464.	3.64E+09	-509.3732	74727.	0.00
9.9200	0.02013	633293.	-15181.	-0.00346	40666.	3.64E+09	-215.6578	79709.	0.00
10.5400	-8.13E-04	517830.	-15949.	-0.00228	35232.	3.64E+09	9.2489	84691.	0.00
11.1600	-0.01387	401578.	-15293.	-0.00134	29760.	3.64E+09	167.1663	89673.	0.00
11.7800	-0.02081	293571.	-13686.	-6.33E-04	24676.	3.64E+09	264.7758	94655.	0.00
12.4000	-0.02328	199482.	-11541.	-1.28E-04	20248.	3.64E+09	311.8185	99636.	0.00
13.0200	-0.02272	122152.	-9193.	2.01E-04	16608.	3.64E+09	319.4605	104618.	0.00
13.6400	-0.02029	62198.	-6892.	3.90E-04	13787.	3.64E+09	298.9458	109600.	0.00
14.2600	-0.01692	18637.	-4811.	4.72E-04	11736.	3.64E+09	260.5975	114582.	0.00
14.8800	-0.01326	-10547.	-3048.	4.81E-04	11356.	3.64E+09	213.1725	119564.	0.00
15.5000	-0.00977	-27905.	-1647.	4.41E-04	12173.	3.64E+09	163.5398	124546.	0.00
16.1200	-0.00670	-36140.	-604.8919	3.76E-04	12560.	3.64E+09	116.6231	129527.	0.00
16.7400	-0.00418	-37828.	109.9658	3.00E-04	12640.	3.64E+09	75.5430	134509.	0.00
17.3600	-0.00223	-35240.	546.8046	2.25E-04	12518.	3.64E+09	41.8868	139491.	0.00
17.9800	-8.26E-04	-30245.	762.3167	1.58E-04	12283.	3.64E+09	16.0465	144473.	0.00
18.6000	1.21E-04	-24285.	812.9778	1.02E-04	12002.	3.64E+09	-2.4280	149455.	0.00
19.2200	6.98E-04	-18399.	750.0237	5.88E-05	11725.	3.64E+09	-14.4952	154437.	0.00
19.8400	9.96E-04	-13269.	644.8504	2.64E-05	11484.	3.64E+09	-13.7772	102957.	0.00
20.4600	0.00109	-8868.	535.6338	3.73E-06	11277.	3.64E+09	-15.5821	106278.	0.00
21.0800	0.00105	-5308.	420.0728	-1.08E-05	11109.	3.64E+09	-15.4827	109599.	0.00
21.7000	9.30E-04	-2591.	309.9467	-1.89E-05	10981.	3.64E+09	-14.1211	112920.	0.00
22.3200	7.70E-04	-649.7469	212.6451	-2.22E-05	10890.	3.64E+09	-12.0353	116242.	0.00
22.9400	6.00E-04	627.2805	131.9848	-2.22E-05	10889.	3.64E+09	-9.6476	119563.	0.00
23.5600	4.40E-04	1369.	69.0668	-2.02E-05	10924.	3.64E+09	-7.2659	122884.	0.00
24.1800	3.00E-04	1704.	23.0864	-1.70E-05	10939.	3.64E+09	-5.0945	126205.	0.00
24.8000	1.87E-04	1754.	-7.9559	-1.35E-05	10942.	3.64E+09	-3.2503	129526.	0.00
25.4200	9.98E-05	1619.	-26.6742	-1.00E-05	10935.	3.64E+09	-1.7815	132848.	0.00
26.0400	3.75E-05	1382.	-35.7620	-6.96E-06	10924.	3.64E+09	-0.6614	131217.	0.00
26.6600	-3.72E-06	1104.	-37.9720	-4.41E-06	10911.	3.64E+09	0.06736	134538.	0.00
27.2800	-2.81E-05	827.5229	-35.7817	-2.43E-06	10898.	3.64E+09	0.5214	137859.	0.00
27.9000	-4.00E-05	577.6887	-31.0213	-9.97E-07	10886.	3.64E+09	0.7582	141181.	0.00
28.5200	-4.30E-05	368.3738	-25.0956	-2.89E-08	10876.	3.64E+09	0.8347	144502.	0.00
29.1400	-4.04E-05	204.3378	-19.0053	5.57E-07	10869.	3.64E+09	0.8025	147823.	0.00
29.7600	-3.47E-05	84.2072	-13.3988	8.52E-07	10863.	3.64E+09	0.7047	151144.	0.00
30.3800	-2.77E-05	2.8712	-8.6377	9.42E-07	10859.	3.64E+09	0.5752	154465.	0.00
31.0000	-2.07E-05	-46.6337	-4.8667	8.97E-07	10861.	3.64E+09	0.4385	157787.	0.00
31.6200	-1.44E-05	-71.7475	-2.0786	7.76E-07	10863.	3.64E+09	0.3110	161108.	0.00
32.2400	-9.14E-06	-79.4673	-0.1706	6.21E-07	10863.	3.64E+09	0.2019	164429.	0.00
32.8600	-5.12E-06	-75.8098	1.0103	4.62E-07	10863.	3.64E+09	0.1155	167750.	0.00
33.4800	-2.26E-06	-65.5683	1.6335	3.17E-07	10862.	3.64E+09	0.05204	171071.	0.00
34.1000	-4.02E-07	-52.2817	1.8830	1.97E-07	10862.	3.64E+09	0.01503	278410.	0.00
34.7200	6.64E-07	-38.0316	1.8443	1.04E-07	10861.	3.64E+09	-0.02545	285329.	0.00
35.3400	1.15E-06	-25.0947	1.5816	3.97E-08	10860.	3.64E+09	-0.04516	292248.	0.00
35.9600	1.25E-06	-14.5945	1.2261	-9.47E-10	10860.	3.64E+09	-0.05042	299168.	0.00
36.5800	1.14E-06	-6.8485	0.8647	-2.29E-08	10859.	3.64E+09	-0.04672	306087.	0.00
37.2000	9.13E-07	-1.6714	0.5480	-3.16E-08	10859.	3.64E+09	-0.03842	313006.	0.00
37.8200	6.65E-07	1.3833	0.2987	-3.19E-08	10859.	3.64E+09	-0.02861	319925.	0.00
38.4400	4.38E-07	2.8508	0.1206	-2.76E-08	10859.	3.64E+09	-0.01926	326844.	0.00
39.0600	2.55E-07	3.2450	0.00635	-2.13E-08	10859.	3.64E+09	-0.01144	333764.	0.00
39.6800	1.21E-07	2.9976	-0.05684	-1.49E-08	10859.	3.64E+09	-0.00554	340683.	0.00
40.3000	3.27E-08	2.4359	-0.08314	-9.38E-09	10859.	3.64E+09	-0.00153	347602.	0.00
40.9200	-1.86E-08	1.7835	-0.08553	-5.07E-09	10859.	3.64E+09	8.86E-04	354521.	0.00

41.5400	-4.27E-08	1.1757	-0.07452	-2.04E-09	10859.	3.64E+09	0.00207	361440.	0.00
42.1600	-4.89E-08	0.6797	-0.05779	-1.40E-10	10859.	3.64E+09	0.00242	368360.	0.00
42.7800	-4.48E-08	0.3161	-0.04038	8.79E-10	10859.	3.64E+09	0.00226	375279.	0.00
43.4000	-3.58E-08	0.07668	-0.02513	1.28E-09	10859.	3.64E+09	0.00184	382198.	0.00
44.0200	-2.57E-08	-0.06105	-0.01329	1.30E-09	10859.	3.64E+09	0.00134	389117.	0.00
44.6400	-1.65E-08	-0.1242	-0.00501	1.11E-09	10859.	3.64E+09	8.79E-04	396036.	0.00
45.2600	-9.22E-09	-0.1384	1.17E-04	8.39E-10	10859.	3.64E+09	5.00E-04	402956.	0.00
45.8800	-4.04E-09	-0.1245	0.00280	5.70E-10	10859.	3.64E+09	2.22E-04	409875.	0.00
46.5000	-7.42E-10	-0.09806	0.00378	3.42E-10	10859.	3.64E+09	4.15E-05	416794.	0.00
47.1200	1.06E-09	-0.06906	0.00371	1.71E-10	10859.	3.64E+09	-6.03E-05	423713.	0.00
47.7400	1.81E-09	-0.04321	0.00310	5.64E-11	10859.	3.64E+09	-1.05E-04	430632.	0.00
48.3600	1.90E-09	-0.02305	0.00230	-1.14E-11	10859.	3.64E+09	-1.12E-04	437552.	0.00
48.9800	1.64E-09	-0.00901	0.00152	-4.42E-11	10859.	3.64E+09	-9.78E-05	444471.	0.00
49.6000	1.24E-09	-3.63E-04	8.74E-04	-5.38E-11	10859.	3.64E+09	-7.52E-05	451390.	0.00
50.2200	8.37E-10	0.00412	4.02E-04	-5.00E-11	10859.	3.64E+09	-5.15E-05	458309.	0.00
50.8400	4.96E-10	0.00574	9.50E-05	-3.99E-11	10859.	3.64E+09	-3.10E-05	465228.	0.00
51.4600	2.44E-10	0.00563	-7.79E-05	-2.82E-11	10859.	3.64E+09	-1.55E-05	472148.	0.00
52.0800	7.64E-11	0.00465	-1.54E-04	-1.77E-11	10859.	3.64E+09	-4.92E-06	479067.	0.00
52.7000	-1.98E-11	0.00339	-1.67E-04	-9.46E-12	10859.	3.64E+09	1.29E-06	485986.	0.00
53.3200	-6.44E-11	0.00219	-1.47E-04	-3.75E-12	10859.	3.64E+09	4.27E-06	492905.	0.00
53.9400	-7.57E-11	0.00122	-1.12E-04	0.00	10859.	3.64E+09	5.08E-06	499824.	0.00
54.5600	-6.84E-11	5.26E-04	-7.56E-05	1.52E-12	10859.	3.64E+09	4.66E-06	506744.	0.00
55.1800	-5.31E-11	9.06E-05	-4.46E-05	2.15E-12	10859.	3.64E+09	3.66E-06	513663.	0.00
55.8000	-3.64E-11	-1.43E-04	-2.15E-05	2.10E-12	10859.	3.64E+09	2.55E-06	520582.	0.00
56.4200	-2.19E-11	-2.34E-04	-6.25E-06	1.71E-12	10859.	3.64E+09	1.55E-06	527501.	0.00
57.0400	-1.09E-11	-2.40E-04	2.44E-06	1.23E-12	10859.	3.64E+09	7.86E-07	534420.	0.00
57.6600	-3.64E-12	-2.01E-04	6.35E-06	0.00	10859.	3.64E+09	2.65E-07	541340.	0.00
58.2800	0.00	-1.47E-04	7.18E-06	0.00	10859.	3.64E+09	-4.32E-08	548259.	0.00
58.9000	2.58E-12	-9.53E-05	6.30E-06	0.00	10859.	3.64E+09	-1.92E-07	555178.	0.00
59.5200	3.12E-12	-5.38E-05	4.71E-06	0.00	10859.	3.64E+09	-2.36E-07	562097.	0.00
60.1400	2.84E-12	-2.53E-05	3.02E-06	0.00	10859.	3.64E+09	-2.17E-07	569016.	0.00
60.7600	2.17E-12	-8.68E-06	1.59E-06	0.00	10859.	3.64E+09	-1.68E-07	575936.	0.00
61.3800	1.38E-12	-1.36E-06	5.65E-07	0.00	10859.	3.64E+09	-1.08E-07	582855.	0.00
62.0000	0.00	0.00	0.00	0.00	10859.	3.64E+09	-4.42E-08	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 5:

```
Pile-head deflection             =     1.25000000 inches
Computed slope at pile head      =    -0.00035379 radians
Maximum bending moment           =      -2238797. inch-lbs
Maximum shear force              =         46348. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              8
Number of zero deflection points =              9
```

```
--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 6
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                                =     1.500000 inches
Rotation of pile head                                    =    0.000E+00 radians
Axial load on pile head                                  =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch

0.00	1.5000	-2564569.	51337.	0.00	131564.	3.64E+09	0.00	0.00	0.00
0.6200	1.4805	-2181314.	50823.	-0.00486	113526.	3.64E+09	-69.0396	346.9526	0.00
1.2400	1.4277	-1796400.	50015.	-0.00893	95409.	3.64E+09	-148.2734	772.6598	0.00
1.8600	1.3476	-1415180.	48638.	-0.01221	77467.	3.64E+09	-221.7155	1224.	0.00
2.4800	1.2460	-1042678.	46768.	-0.01473	59934.	3.64E+09	-281.0179	1678.	0.00
3.1000	1.1285	-683111.	44433.	-0.01649	43011.	3.64E+09	-346.7572	2286.	0.00
3.7200	1.0006	-341023.	41547.	-0.01754	26910.	3.64E+09	-428.8546	3189.	0.00
4.3400	0.8675	-21816.	37956.	-0.01791	11886.	3.64E+09	-536.6254	4603.	0.00
4.9600	0.7340	267742.	33459.	-0.01766	23461.	3.64E+09	-672.1035	6813.	0.00
5.5800	0.6046	519423.	27866.	-0.01686	35306.	3.64E+09	-831.3615	10230.	0.00
6.2000	0.4832	723780.	21026.	-0.01558	44925.	3.64E+09	-1007.	15511.	0.00
6.8200	0.3727	870560.	13362.	-0.01395	51833.	3.64E+09	-1053.	21018.	0.00
7.4400	0.2756	956864.	5739.	-0.01208	55895.	3.64E+09	-996.1588	26895.	0.00
8.0600	0.1930	985624.	-1384.	-0.01010	57249.	3.64E+09	-918.6096	35420.	0.00
8.6800	0.1254	961059.	-7820.	-0.00810	56093.	3.64E+09	-811.6378	48174.	0.00
9.3000	0.07238	889153.	-13301.	-0.00621	52708.	3.64E+09	-661.5598	68002.	0.00
9.9200	0.03295	778393.	-17075.	-0.00450	47495.	3.64E+09	-353.0049	79709.	0.00
10.5400	0.00537	646137.	-18615.	-0.00305	41270.	3.64E+09	-61.1333	84691.	0.00
11.1600	-0.01237	508874.	-18288.	-0.00186	34810.	3.64E+09	149.0897	89673.	0.00
11.7800	-0.02236	378585.	-16675.	-9.56E-04	28678.	3.64E+09	284.4911	94655.	0.00
12.4000	-0.02659	263092.	-14292.	-2.99E-04	23242.	3.64E+09	356.0739	99636.	0.00
13.0200	-0.02681	166649.	-11565.	1.41E-04	18703.	3.64E+09	376.9865	104618.	0.00
13.6400	-0.02449	90654.	-8821.	4.04E-04	15126.	3.64E+09	360.8146	109600.	0.00
14.2600	-0.02080	34404.	-6287.	5.32E-04	12478.	3.64E+09	320.2818	114582.	0.00
14.8800	-0.01658	-4204.	-4105.	5.63E-04	11057.	3.64E+09	266.3798	119564.	0.00
15.5000	-0.01242	-28056.	-2340.	5.30E-04	12180.	3.64E+09	207.8970	124546.	0.00
16.1200	-0.00869	-40330.	-1004.	4.60E-04	12757.	3.64E+09	151.2851	129527.	0.00
16.7400	-0.00557	-44128.	-66.5283	3.74E-04	12936.	3.64E+09	100.7811	134509.	0.00
17.3600	-0.00313	-42237.	526.7516	2.85E-04	12847.	3.64E+09	58.7028	139491.	0.00
17.9800	-0.00133	-36990.	841.2544	2.04E-04	12600.	3.64E+09	25.8409	144473.	0.00
18.6000	-9.37E-05	-30220.	944.3857	1.35E-04	12282.	3.64E+09	1.8825	149455.	0.00
19.2200	6.83E-04	-23270.	898.6365	8.06E-05	11954.	3.64E+09	-14.1807	154437.	0.00
19.8400	0.00111	-17047.	788.9644	3.93E-05	11661.	3.64E+09	-15.3010	102957.	0.00
20.4600	0.00127	-11627.	664.6279	1.00E-05	11406.	3.64E+09	-18.1228	106278.	0.00
21.0800	0.00125	-7181.	528.4583	-9.24E-06	11197.	3.64E+09	-18.4820	109599.	0.00
21.7000	0.00113	-3741.	395.8366	-2.04E-05	11035.	3.64E+09	-17.1690	112920.	0.00
22.3200	9.51E-04	-1241.	276.7039	-2.55E-05	10918.	3.64E+09	-14.8559	116242.	0.00
22.9400	7.52E-04	439.1229	176.5096	-2.63E-05	10880.	3.64E+09	-12.0780	119563.	0.00
23.5600	5.59E-04	1450.	97.2337	-2.44E-05	10927.	3.64E+09	-9.2327	122884.	0.00
24.1800	3.88E-04	1946.	38.3737	-2.09E-05	10951.	3.64E+09	-6.5899	126205.	0.00
24.8000	2.48E-04	2072.	-2.1765	-1.68E-05	10957.	3.64E+09	-4.3107	129526.	0.00
25.4200	1.38E-04	1955.	-27.3974	-1.27E-05	10951.	3.64E+09	-2.4691	132848.	0.00
26.0400	5.87E-05	1696.	-40.4350	-8.96E-06	10939.	3.64E+09	-1.0356	131217.	0.00
26.6600	4.98E-06	1375.	-44.6225	-5.82E-06	10924.	3.64E+09	-0.09005	134538.	0.00
27.2800	-2.78E-05	1046.	-43.0397	-3.34E-06	10908.	3.64E+09	0.5155	137859.	0.00
27.9000	-4.47E-05	742.8550	-37.9667	-1.51E-06	10894.	3.64E+09	0.8482	141181.	0.00
28.5200	-5.03E-05	484.7754	-31.1801	-2.52E-07	10882.	3.64E+09	0.9762	144502.	0.00
29.1400	-4.84E-05	279.5132	-23.9682	5.30E-07	10872.	3.64E+09	0.9625	147823.	0.00
29.7600	-4.24E-05	126.8265	-17.1858	9.46E-07	10865.	3.64E+09	0.8607	151144.	0.00
30.3800	-3.44E-05	21.4658	-11.3298	1.10E-06	10860.	3.64E+09	0.7134	154465.	0.00
31.0000	-2.60E-05	-44.4570	-6.6221	1.07E-06	10861.	3.64E+09	0.5521	157787.	0.00
31.6200	-1.84E-05	-79.7084	-3.0880	9.47E-07	10863.	3.64E+09	0.3979	161108.	0.00
32.2400	-1.19E-05	-92.7324	-0.6264	7.71E-07	10864.	3.64E+09	0.2638	164429.	0.00
32.8600	-6.91E-06	-90.9220	0.9341	5.83E-07	10863.	3.64E+09	0.1557	167750.	0.00
33.4800	-3.26E-06	-80.2640	1.7923	4.08E-07	10863.	3.64E+09	0.07499	171071.	0.00
34.1000	-8.38E-07	-65.2537	2.1880	2.59E-07	10862.	3.64E+09	0.03137	278410.	0.00
34.7200	5.91E-07	-48.3427	2.2204	1.43E-07	10861.	3.64E+09	-0.02266	285329.	0.00
35.3400	1.28E-06	-32.5645	1.9485	5.98E-08	10861.	3.64E+09	-0.05043	292248.	0.00
35.9600	1.48E-06	-19.4959	1.5394	6.56E-09	10860.	3.64E+09	-0.05955	299168.	0.00
36.5800	1.38E-06	-9.6749	1.1064	-2.33E-08	10860.	3.64E+09	-0.05683	306087.	0.00
37.2000	1.13E-06	-2.9755	0.7174	-3.62E-08	10859.	3.64E+09	-0.04773	313006.	0.00
37.8200	8.42E-07	1.0895	0.4052	-3.82E-08	10859.	3.64E+09	-0.03622	319925.	0.00
38.4400	5.67E-07	3.1471	0.1779	-3.38E-08	10859.	3.64E+09	-0.02489	326844.	0.00
39.0600	3.39E-07	3.8192	0.02874	-2.67E-08	10859.	3.64E+09	-0.01520	333764.	0.00
39.6800	1.69E-07	3.6404	-0.05661	-1.91E-08	10859.	3.64E+09	-0.00775	340683.	0.00

40.3000	5.50E-08	3.0236	-0.09499	-1.23E-08	10859.	3.64E+09	-0.00257	347602.	0.00
40.9200	-1.31E-08	2.2569	-0.1022	-6.85E-09	10859.	3.64E+09	6.25E-04	354521.	0.00
41.5400	-4.69E-08	1.5192	-0.09143	-2.98E-09	10859.	3.64E+09	0.00228	361440.	0.00
42.1600	-5.75E-08	0.9037	-0.07237	-5.04E-10	10859.	3.64E+09	0.00285	368360.	0.00
42.7800	-5.44E-08	0.4436	-0.05158	8.75E-10	10859.	3.64E+09	0.00274	375279.	0.00
43.4000	-4.45E-08	0.1341	-0.03287	1.47E-09	10859.	3.64E+09	0.00229	382198.	0.00
44.0200	-3.26E-08	-0.04917	-0.01803	1.55E-09	10859.	3.64E+09	0.00170	389117.	0.00
44.6400	-2.14E-08	-0.1381	-0.00747	1.36E-09	10859.	3.64E+09	0.00114	396036.	0.00
45.2600	-1.23E-08	-0.1636	-7.51E-04	1.05E-09	10859.	3.64E+09	6.67E-04	402956.	0.00
45.8800	-5.72E-09	-0.1518	0.00290	7.30E-10	10859.	3.64E+09	3.15E-04	409875.	0.00
46.5000	-1.45E-09	-0.1222	0.00438	4.49E-10	10859.	3.64E+09	8.11E-05	416794.	0.00
47.1200	9.65E-10	-0.08782	0.00447	2.34E-10	10859.	3.64E+09	-5.50E-05	423713.	0.00
47.7400	2.04E-09	-0.05624	0.00383	8.70E-11	10859.	3.64E+09	-1.18E-04	430632.	0.00
48.3600	2.26E-09	-0.03107	0.00289	-2.30E-12	10859.	3.64E+09	-1.33E-04	437552.	0.00
48.9800	2.01E-09	-0.01317	0.00195	-4.76E-11	10859.	3.64E+09	-1.20E-04	444471.	0.00
49.6000	1.55E-09	-0.00188	0.00116	-6.30E-11	10859.	3.64E+09	-9.42E-05	451390.	0.00
50.2200	1.07E-09	0.00421	5.62E-04	-6.06E-11	10859.	3.64E+09	-6.59E-05	458309.	0.00
50.8400	6.51E-10	0.00663	1.65E-04	-4.95E-11	10859.	3.64E+09	-4.07E-05	465228.	0.00
51.4600	3.33E-10	0.00678	-6.51E-05	-3.58E-11	10859.	3.64E+09	-2.12E-05	472148.	0.00
52.0800	1.19E-10	0.00575	-1.72E-04	-2.30E-11	10859.	3.64E+09	-7.65E-06	479067.	0.00
52.7000	-8.20E-12	0.00428	-1.99E-04	-1.27E-11	10859.	3.64E+09	5.35E-07	485986.	0.00
53.3200	-7.01E-11	0.00282	-1.79E-04	-5.43E-12	10859.	3.64E+09	4.64E-06	492905.	0.00
53.9400	-8.90E-11	0.00162	-1.40E-04	0.00	10859.	3.64E+09	5.98E-06	499824.	0.00
54.5600	-8.32E-11	7.43E-04	-9.66E-05	1.54E-12	10859.	3.64E+09	5.67E-06	506744.	0.00
55.1800	-6.61E-11	1.78E-04	-5.86E-05	2.48E-12	10859.	3.64E+09	4.56E-06	513663.	0.00
55.8000	-4.63E-11	-1.34E-04	-2.95E-05	2.52E-12	10859.	3.64E+09	3.24E-06	520582.	0.00
56.4200	-2.85E-11	-2.67E-04	-9.93E-06	2.11E-12	10859.	3.64E+09	2.02E-06	527501.	0.00
57.0400	-1.48E-11	-2.87E-04	1.56E-06	1.55E-12	10859.	3.64E+09	1.07E-06	534420.	0.00
57.6600	-5.52E-12	-2.47E-04	7.02E-06	1.00E-12	10859.	3.64E+09	4.02E-07	541340.	0.00
58.2800	0.00	-1.85E-04	8.51E-06	0.00	10859.	3.64E+09	-2.82E-09	548259.	0.00
58.9000	2.78E-12	-1.22E-04	7.73E-06	0.00	10859.	3.64E+09	-2.07E-07	555178.	0.00
59.5200	3.66E-12	-7.06E-05	5.93E-06	0.00	10859.	3.64E+09	-2.77E-07	562097.	0.00
60.1400	3.46E-12	-3.42E-05	3.91E-06	0.00	10859.	3.64E+09	-2.65E-07	569016.	0.00
60.7600	2.75E-12	-1.23E-05	2.13E-06	0.00	10859.	3.64E+09	-2.13E-07	575936.	0.00
61.3800	1.84E-12	-2.15E-06	8.06E-07	0.00	10859.	3.64E+09	-1.45E-07	582855.	0.00
62.0000	0.00	0.00	0.00	0.00	10859.	3.64E+09	-7.21E-08	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 6:

```
Pile-head deflection             =     1.50000000 inches
Computed slope at pile head      =    -0.00039219 radians
Maximum bending moment           =      -2564569. inch-lbs
Maximum shear force              =         51337. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =              9
Number of zero deflection points =              9
```

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 7

```
Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     1.750000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     165000.0 lbs
```

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Spr. Es*h	Distrib. Lat. Load

feet	inches	in-lbs	lbs	radians	psi*	in-lb^2	lb/inch	lb/inch	lb/inch
0.00	1.7500	-2872469.	55873.	0.00	146056.	3.64E+09	0.00	0.00	0.00
0.6200	1.7281	-2455080.	55359.	-0.00545	126411.	3.64E+09	-69.0396	297.2313	0.00
1.2400	1.6689	-2035344.	54550.	-0.01005	106655.	3.64E+09	-148.2734	661.0148	0.00
1.8600	1.5786	-1618703.	53174.	-0.01379	87046.	3.64E+09	-221.7154	1045.	0.00
2.4800	1.4637	-1210267.	51304.	-0.01668	67822.	3.64E+09	-281.0176	1428.	0.00
3.1000	1.3304	-814346.	48969.	-0.01875	49187.	3.64E+09	-346.7565	1939.	0.00
3.7200	1.1847	-435573.	46083.	-0.02003	31360.	3.64E+09	-428.8535	2693.	0.00
4.3400	1.0324	-79444.	42492.	-0.02056	14598.	3.64E+09	-536.6234	3867.	0.00
4.9600	0.8788	247180.	37995.	-0.02039	22493.	3.64E+09	-672.1001	5690.	0.00
5.5800	0.7290	535980.	32402.	-0.01959	36086.	3.64E+09	-831.3559	8485.	0.00
6.2000	0.5874	777415.	25563.	-0.01824	47449.	3.64E+09	-1007.	12760.	0.00
6.8200	0.4576	961138.	17351.	-0.01646	56096.	3.64E+09	-1200.	19513.	0.00
7.4400	0.3424	1076019.	8566.	-0.01438	61503.	3.64E+09	-1162.	25241.	0.00
8.0600	0.2436	1123898.	285.8485	-0.01213	63757.	3.64E+09	-1064.	32500.	0.00
8.6800	0.1619	1110046.	-7201.	-0.00984	63105.	3.64E+09	-948.4200	43571.	0.00
9.3000	0.09719	1040907.	-13673.	-0.00764	59851.	3.64E+09	-791.3624	60582.	0.00
9.9200	0.04827	925348.	-18541.	-0.00563	54412.	3.64E+09	-517.1625	79709.	0.00
10.5400	0.01345	778837.	-21034.	-0.00388	47516.	3.64E+09	-153.0722	84691.	0.00
11.1600	-0.00952	621897.	-21177.	-0.00245	40130.	3.64E+09	114.7191	89673.	0.00
11.7800	-0.02301	469744.	-19661.	-0.00133	32968.	3.64E+09	292.7915	94655.	0.00
12.4000	-0.02936	332618.	-17109.	-5.12E-04	26514.	3.64E+09	393.1491	99636.	0.00
13.0200	-0.03064	216418.	-14044.	4.96E-05	21045.	3.64E+09	430.7840	104618.	0.00
13.6400	-0.02862	123520.	-10873.	3.97E-04	16673.	3.64E+09	421.5868	109600.	0.00
14.2600	-0.02472	53648.	-7889.	5.79E-04	13384.	3.64E+09	380.7228	114582.	0.00
14.8800	-0.02001	4716.	-5276.	6.39E-04	11081.	3.64E+09	321.5112	119564.	0.00
15.5000	-0.01522	-26431.	-3133.	6.16E-04	12103.	3.64E+09	254.7837	124546.	0.00
16.1200	-0.01084	-43409.	-1483.	5.45E-04	12902.	3.64E+09	188.6530	129527.	0.00
16.7400	-0.00711	-49835.	-302.7433	4.49E-04	13205.	3.64E+09	128.6012	134509.	0.00
17.3600	-0.00415	-49017.	465.0342	3.48E-04	13166.	3.64E+09	77.7906	139491.	0.00
17.9800	-0.00193	-43770.	893.9287	2.53E-04	12919.	3.64E+09	37.5036	144473.	0.00
18.6000	-3.80E-04	-36337.	1062.	1.71E-04	12569.	3.64E+09	7.6348	149455.	0.00
19.2200	6.18E-04	-28390.	1043.	1.05E-04	12195.	3.64E+09	-12.8265	154437.	0.00
19.8400	0.00118	-21082.	933.8861	5.45E-05	11851.	3.64E+09	-16.3791	102957.	0.00
20.4600	0.00143	-14628.	797.0582	1.79E-05	11548.	3.64E+09	-20.4026	106278.	0.00
21.0800	0.00145	-9266.	641.6884	-6.53E-06	11295.	3.64E+09	-21.3635	109599.	0.00
21.7000	0.00133	-5063.	487.0630	-2.12E-05	11097.	3.64E+09	-20.2025	112920.	0.00
22.3200	0.00113	-1966.	345.9518	-2.84E-05	10952.	3.64E+09	-17.7306	116242.	0.00
22.9400	9.09E-04	154.0025	225.6736	-3.02E-05	10866.	3.64E+09	-14.6023	119563.	0.00
23.5600	6.85E-04	1466.	129.2772	-2.86E-05	10928.	3.64E+09	-11.3107	122884.	0.00
24.1800	4.83E-04	2148.	56.7049	-2.49E-05	10960.	3.64E+09	-8.1980	126205.	0.00
24.8000	3.14E-04	2371.	5.8429	-2.03E-05	10971.	3.64E+09	-5.4746	129526.	0.00
25.4200	1.82E-04	2285.	-26.5946	-1.55E-05	10967.	3.64E+09	-3.2451	132848.	0.00
26.0400	8.38E-05	2013.	-44.1647	-1.11E-05	10954.	3.64E+09	-1.4780	131217.	0.00
26.6600	1.65E-05	1655.	-50.7741	-7.35E-06	10937.	3.64E+09	-0.2987	134538.	0.00
27.2800	-2.56E-05	1276.	-50.1227	-4.35E-06	10919.	3.64E+09	0.4738	137859.	0.00
27.9000	-4.82E-05	919.4805	-44.9547	-2.11E-06	10902.	3.64E+09	0.9154	141181.	0.00
28.5200	-5.69E-05	611.7829	-37.4378	-5.39E-07	10888.	3.64E+09	1.1053	144502.	0.00
29.1400	-5.63E-05	363.7294	-29.1679	4.59E-07	10876.	3.64E+09	1.1178	147823.	0.00
29.7600	-5.01E-05	176.6367	-21.2255	1.01E-06	10867.	3.64E+09	1.0172	151144.	0.00
30.3800	-4.12E-05	45.4087	-14.2595	1.24E-06	10861.	3.64E+09	0.8553	154465.	0.00
31.0000	-3.16E-05	-38.5881	-8.5823	1.25E-06	10861.	3.64E+09	0.6708	157787.	0.00
31.6200	-2.27E-05	-85.3558	-4.2622	1.12E-06	10863.	3.64E+09	0.4905	161108.	0.00
32.2400	-1.50E-05	-104.7590	-1.2068	9.25E-07	10864.	3.64E+09	0.3309	164429.	0.00
32.8600	-8.89E-06	-105.5844	0.7693	7.10E-07	10864.	3.64E+09	0.2004	167750.	0.00
33.4800	-4.41E-06	-95.0545	1.8917	5.05E-07	10864.	3.64E+09	0.1014	171071.	0.00
34.1000	-1.38E-06	-78.6745	2.4607	3.27E-07	10863.	3.64E+09	0.05160	278410.	0.00
34.7200	4.53E-07	-59.2408	2.5881	1.86E-07	10862.	3.64E+09	-0.01737	285329.	0.00
35.3400	1.38E-06	-40.6199	2.3214	8.34E-08	10861.	3.64E+09	-0.05432	292248.	0.00
35.9600	1.69E-06	-24.9036	1.8659	1.64E-08	10860.	3.64E+09	-0.06812	299168.	0.00
36.5800	1.63E-06	-12.8956	1.3636	-2.23E-08	10860.	3.64E+09	-0.06690	306087.	0.00
37.2000	1.36E-06	-4.5586	0.9015	-4.02E-08	10859.	3.64E+09	-0.05730	313006.	0.00
37.8200	1.03E-06	0.6181	0.5239	-4.42E-08	10859.	3.64E+09	-0.04422	319925.	0.00
38.4400	7.04E-07	3.3455	0.2443	-4.02E-08	10859.	3.64E+09	-0.03093	326844.	0.00

39.0600	4.31E-07	4.3524	0.05739	-3.23E-08	10859.	3.64E+09	-0.01932	333764.	0.00
39.6800	2.24E-07	4.2787	-0.05261	-2.34E-08	10859.	3.64E+09	-0.01025	340683.	0.00
40.3000	8.19E-08	3.6272	-0.1049	-1.54E-08	10859.	3.64E+09	-0.00382	347602.	0.00
40.9200	-4.80E-09	2.7548	-0.1183	-8.83E-09	10859.	3.64E+09	2.29E-04	354521.	0.00
41.5400	-4.95E-08	1.8882	-0.1085	-4.08E-09	10859.	3.64E+09	0.00241	361440.	0.00
42.1600	-6.55E-08	1.1500	-0.08752	-9.68E-10	10859.	3.64E+09	0.00324	368360.	0.00
42.7800	-6.39E-08	0.5884	-0.06347	8.11E-10	10859.	3.64E+09	0.00322	375279.	0.00
43.4000	-5.34E-08	0.2036	-0.04127	1.62E-09	10859.	3.64E+09	0.00274	382198.	0.00
44.0200	-3.98E-08	-0.02975	-0.02333	1.80E-09	10859.	3.64E+09	0.00208	389117.	0.00
44.6400	-2.66E-08	-0.1479	-0.01032	1.62E-09	10859.	3.64E+09	0.00142	396036.	0.00
45.2600	-1.57E-08	-0.1873	-0.00189	1.27E-09	10859.	3.64E+09	8.51E-04	402956.	0.00
45.8800	-7.65E-09	-0.1791	0.00285	9.00E-10	10859.	3.64E+09	4.21E-04	409875.	0.00
46.5000	-2.32E-09	-0.1472	0.00490	5.66E-10	10859.	3.64E+09	1.30E-04	416794.	0.00
47.1200	7.75E-10	-0.1077	0.00521	3.05E-10	10859.	3.64E+09	-4.42E-05	423713.	0.00
47.7400	2.23E-09	-0.07033	0.00457	1.23E-10	10859.	3.64E+09	-1.29E-04	430632.	0.00
48.3600	2.61E-09	-0.03996	0.00352	1.03E-11	10859.	3.64E+09	-1.53E-04	437552.	0.00
48.9800	2.38E-09	-0.01798	0.00242	-4.90E-11	10859.	3.64E+09	-1.42E-04	444471.	0.00
49.6000	1.88E-09	-0.00382	0.00147	-7.13E-11	10859.	3.64E+09	-1.14E-04	451390.	0.00
50.2200	1.32E-09	0.00404	7.42E-04	-7.11E-11	10859.	3.64E+09	-8.12E-05	458309.	0.00
50.8400	8.20E-10	0.00740	2.50E-04	-5.94E-11	10859.	3.64E+09	-5.12E-05	465228.	0.00
51.4600	4.34E-10	0.00791	-4.33E-05	-4.37E-11	10859.	3.64E+09	-2.75E-05	472148.	0.00
52.0800	1.69E-10	0.00686	-1.86E-04	-2.86E-11	10859.	3.64E+09	-1.09E-05	479067.	0.00
52.7000	8.14E-12	0.00521	-2.29E-04	-1.63E-11	10859.	3.64E+09	-5.31E-07	485986.	0.00
53.3200	-7.33E-11	0.00350	-2.13E-04	-7.36E-12	10859.	3.64E+09	4.85E-06	492905.	0.00
53.9400	-1.01E-10	0.00206	-1.69E-04	-1.66E-12	10859.	3.64E+09	6.81E-06	499824.	0.00
54.5600	-9.80E-11	9.90E-04	-1.19E-04	1.46E-12	10859.	3.64E+09	6.67E-06	506744.	0.00
55.1800	-7.96E-11	2.87E-04	-7.37E-05	2.77E-12	10859.	3.64E+09	5.49E-06	513663.	0.00
55.8000	-5.68E-11	-1.14E-04	-3.85E-05	2.94E-12	10859.	3.64E+09	3.97E-06	520582.	0.00
56.4200	-3.58E-11	-2.94E-04	-1.43E-05	2.53E-12	10859.	3.64E+09	2.54E-06	527501.	0.00
57.0400	-1.92E-11	-3.33E-04	2.64E-07	1.89E-12	10859.	3.64E+09	1.38E-06	534420.	0.00
57.6600	-7.72E-12	-2.95E-04	7.49E-06	1.24E-12	10859.	3.64E+09	5.62E-07	541340.	0.00
58.2800	0.00	-2.25E-04	9.77E-06	0.00	10859.	3.64E+09	5.25E-08	548259.	0.00
58.9000	2.87E-12	-1.51E-04	9.17E-06	0.00	10859.	3.64E+09	-2.14E-07	555178.	0.00
59.5200	4.16E-12	-8.90E-05	7.20E-06	0.00	10859.	3.64E+09	-3.14E-07	562097.	0.00
60.1400	4.09E-12	-4.41E-05	4.87E-06	0.00	10859.	3.64E+09	-3.13E-07	569016.	0.00
60.7600	3.35E-12	-1.64E-05	2.74E-06	0.00	10859.	3.64E+09	-2.60E-07	575936.	0.00
61.3800	2.36E-12	-3.09E-06	1.08E-06	0.00	10859.	3.64E+09	-1.85E-07	582855.	0.00
62.0000	1.33E-12	0.00	0.00	0.00	10859.	3.64E+09	-1.05E-07	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 7:

```
Pile-head deflection             =     1.75000000 inches
Computed slope at pile head      =    -0.00042711 radians
Maximum bending moment           =      -2872469. inch-lbs
Maximum shear force              =         55873. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             10
Number of zero deflection points =              8
```

```
--------------------------------------------------------------------------------
                  Computed Values of Pile Loading and Deflection
                    for Lateral Loading for Load Case Number 8
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Pile-head Rotation (Loading Type 5)
Displacement of pile head                              =     2.000000 inches
Rotation of pile head                                  =    0.000E+00 radians
Axial load on pile head                                =     165000.0 lbs
```

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	2.0000	-3163397.	59990.	0.00	159749.	3.64E+09	0.00	0.00	0.00
0.6200	1.9759	-2715010.	59476.	-0.00602	138645.	3.64E+09	-69.0396	259.9577	0.00
1.2400	1.9105	-2263623.	58668.	-0.01111	117400.	3.64E+09	-148.2733	577.4189	0.00
1.8600	1.8106	-1814757.	57291.	-0.01528	96273.	3.64E+09	-221.7154	911.0591	0.00
2.4800	1.6831	-1373604.	55421.	-0.01855	75510.	3.64E+09	-281.0176	1242.	0.00
3.1000	1.5346	-944555.	53086.	-0.02092	55316.	3.64E+09	-346.7565	1681.	0.00
3.7200	1.3718	-532327.	50201.	-0.02243	35914.	3.64E+09	-428.8534	2326.	0.00
4.3400	1.2009	-142501.	46609.	-0.02312	17566.	3.64E+09	-536.6233	3325.	0.00
4.9600	1.0278	217980.	42113.	-0.02304	21119.	3.64E+09	-672.1000	4865.	0.00
5.5800	0.8580	540710.	36520.	-0.02227	36308.	3.64E+09	-831.3557	7209.	0.00
6.2000	0.6965	816062.	29680.	-0.02088	49268.	3.64E+09	-1007.	10761.	0.00
6.8200	0.5473	1033605.	21468.	-0.01899	59507.	3.64E+09	-1200.	16312.	0.00
7.4400	0.4140	1182125.	12024.	-0.01672	66497.	3.64E+09	-1339.	24062.	0.00
8.0600	0.2986	1253569.	2498.	-0.01423	69860.	3.64E+09	-1222.	30452.	0.00
8.6800	0.2023	1254217.	-6088.	-0.01166	69891.	3.64E+09	-1086.	39937.	0.00
9.3000	0.1251	1191610.	-13559.	-0.00916	66944.	3.64E+09	-922.5907	54876.	0.00
9.9200	0.06603	1074941.	-19619.	-0.00684	61453.	3.64E+09	-706.4863	79603.	0.00
10.5400	0.02335	916464.	-23236.	-0.00480	53994.	3.64E+09	-265.7570	84691.	0.00
11.1600	-0.00538	740974.	-23983.	-0.00310	45734.	3.64E+09	64.8827	89673.	0.00
11.7800	-0.02283	567214.	-22661.	-0.00176	37556.	3.64E+09	290.4553	94655.	0.00
12.4000	-0.03164	408107.	-20005.	-7.67E-04	30067.	3.64E+09	423.7289	99636.	0.00
13.0200	-0.03424	271429.	-16637.	-7.12E-05	23634.	3.64E+09	481.4204	104618.	0.00
13.6400	-0.03270	160718.	-13055.	3.71E-04	18424.	3.64E+09	481.7050	109600.	0.00
14.2600	-0.02872	76267.	-9617.	6.14E-04	14449.	3.64E+09	442.2424	114582.	0.00
14.8800	-0.02357	16104.	-6563.	7.08E-04	11617.	3.64E+09	378.7820	119564.	0.00
15.5000	-0.01818	-23133.	-4022.	7.01E-04	11948.	3.64E+09	304.3261	124546.	0.00
16.1200	-0.01314	-45466.	-2039.	6.31E-04	12999.	3.64E+09	228.7834	129527.	0.00
16.7400	-0.00880	-55020.	-596.3200	5.28E-04	13449.	3.64E+09	159.0093	134509.	0.00
17.3600	-0.00529	-55635.	363.9298	4.15E-04	13478.	3.64E+09	99.1223	139491.	0.00
17.9800	-0.00263	-50623.	922.3367	3.06E-04	13242.	3.64E+09	50.9870	144473.	0.00
18.6000	-7.35E-04	-42661.	1167.	2.10E-04	12867.	3.64E+09	14.7721	149455.	0.00
19.2200	5.05E-04	-33775.	1183.	1.32E-04	12449.	3.64E+09	-10.4903	154437.	0.00
19.8400	0.00123	-25385.	1080.	7.17E-05	12054.	3.64E+09	-17.0465	102957.	0.00
20.4600	0.00157	-17874.	933.5171	2.74E-05	11700.	3.64E+09	-22.4522	106278.	0.00
21.0800	0.00164	-11561.	760.1482	-2.72E-06	11403.	3.64E+09	-24.1523	109599.	0.00
21.7000	0.00153	-6556.	583.8447	-2.13E-05	11168.	3.64E+09	-23.2411	112920.	0.00
22.3200	0.00132	-2821.	420.4825	-3.09E-05	10992.	3.64E+09	-20.6735	116242.	0.00
22.9400	0.00107	-223.6472	279.4824	-3.40E-05	10870.	3.64E+09	-17.2298	119563.	0.00
23.5600	8.18E-04	1421.	165.1467	-3.27E-05	10926.	3.64E+09	-13.5056	122884.	0.00
24.1800	5.85E-04	2314.	77.9984	-2.89E-05	10968.	3.64E+09	-9.9213	126205.	0.00
24.8000	3.87E-04	2652.	16.0085	-2.38E-05	10984.	3.64E+09	-6.7426	129526.	0.00
25.4200	2.30E-04	2611.	-24.3582	-1.85E-05	10982.	3.64E+09	-4.1087	132848.	0.00
26.0400	1.13E-04	2335.	-47.0340	-1.34E-05	10969.	3.64E+09	-1.9870	131217.	0.00
26.6600	3.08E-05	1944.	-56.4963	-9.02E-06	10951.	3.64E+09	-0.5566	134538.	0.00
27.2800	-2.15E-05	1517.	-57.0851	-5.47E-06	10931.	3.64E+09	0.3984	137859.	0.00
27.9000	-5.07E-05	1108.	-52.0254	-2.79E-06	10911.	3.64E+09	0.9618	141181.	0.00
28.5200	-6.30E-05	749.4986	-43.8960	-8.88E-07	10894.	3.64E+09	1.2236	144502.	0.00
29.1400	-6.39E-05	456.9262	-34.6212	3.46E-07	10881.	3.64E+09	1.2696	147823.	0.00
29.7600	-5.78E-05	233.4846	-25.5266	1.05E-06	10870.	3.64E+09	1.1752	151144.	0.00
30.3800	-4.82E-05	74.5055	-17.4296	1.37E-06	10863.	3.64E+09	1.0015	154465.	0.00
31.0000	-3.75E-05	-29.2263	-10.7463	1.41E-06	10861.	3.64E+09	0.7951	157787.	0.00
31.6200	-2.72E-05	-88.8717	-5.5980	1.29E-06	10863.	3.64E+09	0.5888	161108.	0.00
32.2400	-1.82E-05	-115.6997	-1.9074	1.08E-06	10865.	3.64E+09	0.4033	164429.	0.00
32.8600	-1.11E-05	-119.9155	0.5205	8.43E-07	10865.	3.64E+09	0.2494	167750.	0.00
33.4800	-5.70E-06	-110.0243	1.9361	6.08E-07	10864.	3.64E+09	0.1311	171071.	0.00
34.1000	-2.02E-06	-92.5979	2.7051	4.00E-07	10864.	3.64E+09	0.07558	278410.	0.00
34.7200	2.54E-07	-70.7552	2.9501	2.33E-07	10862.	3.64E+09	-0.00972	285329.	0.00
35.3400	1.45E-06	-49.2730	2.7021	1.10E-07	10861.	3.64E+09	-0.05694	292248.	0.00
35.9600	1.90E-06	-30.8187	2.2068	2.84E-08	10861.	3.64E+09	-0.07621	299168.	0.00
36.5800	1.87E-06	-16.5053	1.6369	-2.01E-08	10860.	3.64E+09	-0.07700	306087.	0.00
37.2000	1.60E-06	-6.4128	1.1005	-4.35E-08	10859.	3.64E+09	-0.06718	313006.	0.00

37.8200	1.22E-06	-0.02270	0.6548	-5.01E-08	10859.	3.64E+09	-0.05264	319925.	0.00
38.4400	8.51E-07	3.4535	0.3198	-4.66E-08	10859.	3.64E+09	-0.03740	326844.	0.00
39.0600	5.31E-07	4.8507	0.09207	-3.81E-08	10859.	3.64E+09	-0.02382	333764.	0.00
39.6800	2.85E-07	4.9170	-0.04504	-2.81E-08	10859.	3.64E+09	-0.01303	340683.	0.00
40.3000	1.13E-07	4.2494	-0.1132	-1.87E-08	10859.	3.64E+09	-0.00528	347602.	0.00
40.9200	6.22E-09	3.2787	-0.1339	-1.10E-08	10859.	3.64E+09	-2.96E-04	354521.	0.00
41.5400	-5.07E-08	2.2834	-0.1259	-5.32E-09	10859.	3.64E+09	0.00246	361440.	0.00
42.1600	-7.29E-08	1.4188	-0.1033	-1.53E-09	10859.	3.64E+09	0.00361	368360.	0.00
42.7800	-7.34E-08	0.7503	-0.07608	6.92E-10	10859.	3.64E+09	0.00370	375279.	0.00
43.4000	-6.26E-08	0.2849	-0.05035	1.75E-09	10859.	3.64E+09	0.00321	382198.	0.00
44.0200	-4.74E-08	-0.00318	-0.02917	2.04E-09	10859.	3.64E+09	0.00248	389117.	0.00
44.6400	-3.22E-08	-0.1541	-0.01357	1.88E-09	10859.	3.64E+09	0.00172	396036.	0.00
45.2600	-1.94E-08	-0.2097	-0.00328	1.51E-09	10859.	3.64E+09	0.00105	402956.	0.00
45.8800	-9.81E-09	-0.2066	0.00265	1.08E-09	10859.	3.64E+09	5.40E-04	409875.	0.00
46.5000	-3.34E-09	-0.1730	0.00535	6.92E-10	10859.	3.64E+09	1.87E-04	416794.	0.00
47.1200	4.94E-10	-0.1286	0.00594	3.84E-10	10859.	3.64E+09	-2.81E-05	423713.	0.00
47.7400	2.37E-09	-0.08549	0.00533	1.64E-10	10859.	3.64E+09	-1.37E-04	430632.	0.00
48.3600	2.94E-09	-0.04973	0.00418	2.61E-11	10859.	3.64E+09	-1.73E-04	437552.	0.00
48.9800	2.76E-09	-0.02342	0.00292	-4.87E-11	10859.	3.64E+09	-1.65E-04	444471.	0.00
49.6000	2.22E-09	-0.00617	0.00181	-7.90E-11	10859.	3.64E+09	-1.34E-04	451390.	0.00
50.2200	1.58E-09	0.00365	9.44E-04	-8.16E-11	10859.	3.64E+09	-9.74E-05	458309.	0.00
50.8400	1.00E-09	0.00808	3.49E-04	-6.96E-11	10859.	3.64E+09	-6.26E-05	465228.	0.00
51.4600	5.45E-10	0.00901	-1.31E-05	-5.21E-11	10859.	3.64E+09	-3.46E-05	472148.	0.00
52.0800	2.26E-10	0.00801	-1.96E-04	-3.47E-11	10859.	3.64E+09	-1.46E-05	479067.	0.00
52.7000	2.90E-11	0.00618	-2.57E-04	-2.02E-11	10859.	3.64E+09	-1.89E-06	485986.	0.00
53.3200	-7.41E-11	0.00423	-2.46E-04	-9.53E-12	10859.	3.64E+09	4.91E-06	492905.	0.00
53.9400	-1.13E-10	0.00254	-2.00E-04	-2.60E-12	10859.	3.64E+09	7.58E-06	499824.	0.00
54.5600	-1.13E-10	0.00127	-1.43E-04	1.30E-12	10859.	3.64E+09	7.68E-06	506744.	0.00
55.1800	-9.35E-11	4.14E-04	-9.02E-05	3.02E-12	10859.	3.64E+09	6.46E-06	513663.	0.00
55.8000	-6.79E-11	-8.25E-05	-4.85E-05	3.36E-12	10859.	3.64E+09	4.75E-06	520582.	0.00
56.4200	-4.36E-11	-3.16E-04	-1.93E-05	2.95E-12	10859.	3.64E+09	3.09E-06	527501.	0.00
57.0400	-2.40E-11	-3.78E-04	-1.44E-06	2.24E-12	10859.	3.64E+09	1.73E-06	534420.	0.00
57.6600	-1.02E-11	-3.43E-04	7.75E-06	1.50E-12	10859.	3.64E+09	7.44E-07	541340.	0.00
58.2800	-1.66E-12	-2.66E-04	1.10E-05	0.00	10859.	3.64E+09	1.22E-07	548259.	0.00
58.9000	2.87E-12	-1.82E-04	1.06E-05	0.00	10859.	3.64E+09	-2.14E-07	555178.	0.00
59.5200	4.63E-12	-1.09E-04	8.53E-06	0.00	10859.	3.64E+09	-3.49E-07	562097.	0.00
60.1400	4.73E-12	-5.50E-05	5.89E-06	0.00	10859.	3.64E+09	-3.61E-07	569016.	0.00
60.7600	3.99E-12	-2.10E-05	3.39E-06	0.00	10859.	3.64E+09	-3.09E-07	575936.	0.00
61.3800	2.93E-12	-4.17E-06	1.39E-06	0.00	10859.	3.64E+09	-2.30E-07	582855.	0.00
62.0000	1.81E-12	0.00	0.00	0.00	10859.	3.64E+09	-1.44E-07	294887.	0.00

* The above values of total stress are combined axial and bending stresses.

Output Summary for Load Case No. 8:

```
Pile-head deflection             =     2.00000000 inches
Computed slope at pile head      =    -0.00045883 radians
Maximum bending moment           =      -3163397. inch-lbs
Maximum shear force              =         59990. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             10
Number of zero deflection points =              8
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

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

Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	y, in	0.2500	S, rad	0.00	165000.	0.2500	-1.19E-04	15737.	-602396.
2	y, in	0.5000	S, rad	0.00	165000.	0.5000	-1.97E-04	25899.	-1076238.
3	y, in	0.7500	S, rad	0.00	165000.	0.7500	-2.59E-04	34058.	-1504257.
4	y, in	1.0000	S, rad	0.00	165000.	1.0000	-3.10E-04	40710.	-1888638.
5	y, in	1.2500	S, rad	0.00	165000.	1.2500	-3.54E-04	46348.	-2238797.
6	y, in	1.5000	S, rad	0.00	165000.	1.5000	-3.92E-04	51337.	-2564569.
7	y, in	1.7500	S, rad	0.00	165000.	1.7500	-4.27E-04	55873.	-2872469.
8	y, in	2.0000	S, rad	0.00	165000.	2.0000	-4.59E-04	59990.	-3163397.

Maximum pile-head deflection = 2.000000000 inches
Maximum pile-head rotation = -0.000458835 radians

The analysis ended normally.

Pine Point Scarborough ME East Abutment

Hammer Information

Select from following list [9/14/2010-2003]: ID: 31

ID	Name	Type	Ram Wt	Energy/Power
30	DELMAG D 62-22	OED	13.6600	164.603
31	DELMAG D 80-12	OED	17.6200	186.243
32	DELMAG D 80-23	OED	17.6200	212.497

Hammer parameters

Efficiency	0.8				
Pressure	1170	psi	Fixed	90	%
Stroke	10.57	ft	Variable		of Max

Pile material

Concrete Steel Timber

Cushion Information

	Hammer	Pile	
Area	227.	0.	in^2
Elastic Modulus	530.	0.	ksi
Thickness	2.	0.	in
C.O.R.	0.8	0.	
Stiffness	0.	0.	kips/in
Helmet Weight	1.7		kips

Pile Information

Length	97.5	ft	Auto	Segments
Penetration	78.	ft	Auto.	S-Length
Section Area	15.6	in^2	Auto.	S-St, Wt
Elast Modulus	29000.	ksi	0	Splices
Spec Weight	492.0	lb/ft^3		
Toe Area	141.9	in^2	Pile Type:	
Perimeter	3.971	ft	H Pile	
Pile Size	12.04	in		

Ultimate Capacities (up to 10)

kips

1	345.0	6	395.0
2	355.0	7	405.0
3	365.0	8	415.0
4	375.0	9	425.0
5	385.0	10	435.0

Incr. 0 Action >>

Soil Parameters

2nd Toe - No

Quake

Shaft	0.1	in	Const
Toe	0.04	in	

Damping

Shaft	0.05	s/ft	Const
Toe	0.15	s/ft	Smith

Shaft Resistance

Percentage 80 %

100%

Dist. Shape Num 0.0

Residual Stress Analysis: No

Nobis Engineering, Inc.
Pine Point Scarborough ME East Abutment

21-Jul-2015
GRLWEAP Version 2010

Ultimate Capacity kips	Maximum Compression Stress ksi	Maximum Tension Stress ksi	Blow Count bl/ft	Stroke ft	Energy kips-ft
345.0	38.45	0.00	7.8	5.22	79.94
355.0	38.80	0.00	8.0	5.27	79.65
365.0	39.12	0.00	8.3	5.29	79.17
375.0	39.53	0.00	8.6	5.37	79.49
385.0	39.98	0.00	8.8	5.45	79.93
395.0	40.44	0.00	9.1	5.53	80.39
405.0	40.74	0.00	9.5	5.54	80.00
415.0	41.17	0.00	9.7	5.60	80.35
425.0	41.57	0.00	10.1	5.66	80.54
435.0	42.00	0.00	10.4	5.71	80.81

Calculated by: PN Date: 7/1/2015
Checked by: JPM Date: 7/7/2015

Bearing Resistance and Settlement Calculations - North Side of East Abutment MSE Wall and Part of the Adjacent Northern Wingwall

Objective: Develop a graph for a range of effective footing sizes that can be used to evaluate bearing resistance and settlement based on effective footing width for the north side of the east abutment MSE Wall and part of the adjacent northern wingwall.

References:
1) AASHTO LRFD Bridge Design Specifications: 2014 Edition
2) Borings performed by Nobis in from 2012 to 2015 (BB-SBMR-102 and BB-SBMR-203).
3) Drawings dated June 12, 2015 provided by CHA.
4) Maine DOT Bridge Design Guide: 2003 Edition.

Assumptions:
1) Eccentricity e_B is assumed to be B/6. No eccentricity e_L.
2) Excavation for Gravel Borrow MSE fill zone is at El. 12 across entire footprint.

Solution:

Bearing Soil Properties/Subsurface Information

Unit Weight of Bearing Soil (γ):	125	pcf	Estimated
Unit Weight of Soil Above Footing (γ):	130	pcf	Estimated
Cohesion of Bearing Soil (c):	0	psf	
Friction Angle of Bearing Soil (ϕ'):	31	degrees	Estimated

Soil Description: Minimum 18-inches compacted Gravel Borrow overlying medium dense, Silty SAND with varying amounts of Gravel. See Note 1.

Footing Elevation:	12	ft, NAVD-88	Reference No. 3
Ground Surface (GS) Elevation:	18.3	ft, NAVD-88	Reference No. 3, varies
Groundwater Elevation:	11.2	ft, NAVD-88	Reference No. 2

Footing Geometry

Minimum Footing Depth (D_f):	6.3	ft	ME frost depth = 6.3 feet
Groundwater Depth Below GS:	7.1	ft	
Width (B):	20	ft	Reference No. 3, (0.7*(H+D))
Length (L):	41	ft	Reference No. 3
Width Eccentricity (e_B):	3.3	ft	e_B = B/6 assumed
Length Eccentricity (e_L):	0	ft	Assumed
Effective Width (B'):	13.3	ft	
Effective Length (L'):	41	ft	

Notes:
1) Calculations for bearing resistance and settlement assume footing subgrade is prepared in accordance with the Geotechnical Report. Overexcavation of fill may be required.
2) Graph created using a range of effective footing dimensions can be found on page 4.
3) Example bearing resistance and settlement calculations can be found on pages 2 and 3, respectively.
4) Width of footing includes zone behind MSE wall reinforced with tensile geogrid.

Example Bearing Resistance Calculation

Factored Bearing Resistance: $q_R = q_n * \phi_b$			Eq. 10.6.3.1.1-1
Resistance Factor (ϕ_b) =	0.65		Tb. 11.5.7-1
Nominal Resistance (q_n) =			
$q_n = c*N_{cm} + \gamma*D_f*N_{qm}*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$			Eq. 10.6.3.1.2a-1
$N_{qm} = N_q*s_q*d_q*i_q$			Eq. 10.6.3.1.2a-3
Bearing Capacity Factor (N_q)	20.6		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_q)	1.20	ft	Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_q)			
$i_q = [1-H/(V+cB'L'\cot\phi_f)]^n$	0.50		Assumed
$n = [(2+L'/B')/(1+L'/B')]\cos^2\theta + [(2+B'/L')/(1+B'/L')]\sin^2\theta$	1.75		Eq. 10.6.3.1.2a-9
Load Angle (θ)	90	degrees	Assumed to be 90°
Depth Correction Factor (d_q)	1.0		Tb. 10.6.3.1.2a-4
N_{qm}=	12.31		
$N_{cm} = N_c*s_c*i_c$			Eq. 10.6.3.1.2a-2
Bearing Capacity Factor (N_c)	32.7		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_c)	1.20		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_c)			
$i_c = i_q - [(1-i_q)/N_q-1)]$	0.50		Assumed
N_{cm} =	19.70		
$N_{\gamma m} = N_\gamma*s_\gamma*i_\gamma$			Eq. 10.6.3.1.2a-4
Bearing Capacity Factor (N_γ)	26		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_γ)	0.87		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_γ)			
$i_\gamma = [1-H/(V+cB'L'\cot\phi_f)]^{n+1}$	0.50		Assumed
$N_{\gamma m}$=	11.31		
Groundwater Coefficients			Tb. 10.6.3.1.2a-2
(C_{wq})	1.00		
($C_{w\gamma}$)	0.63		
q_n=	**16.1 ksf**		
q_R=	**10.4 ksf**		

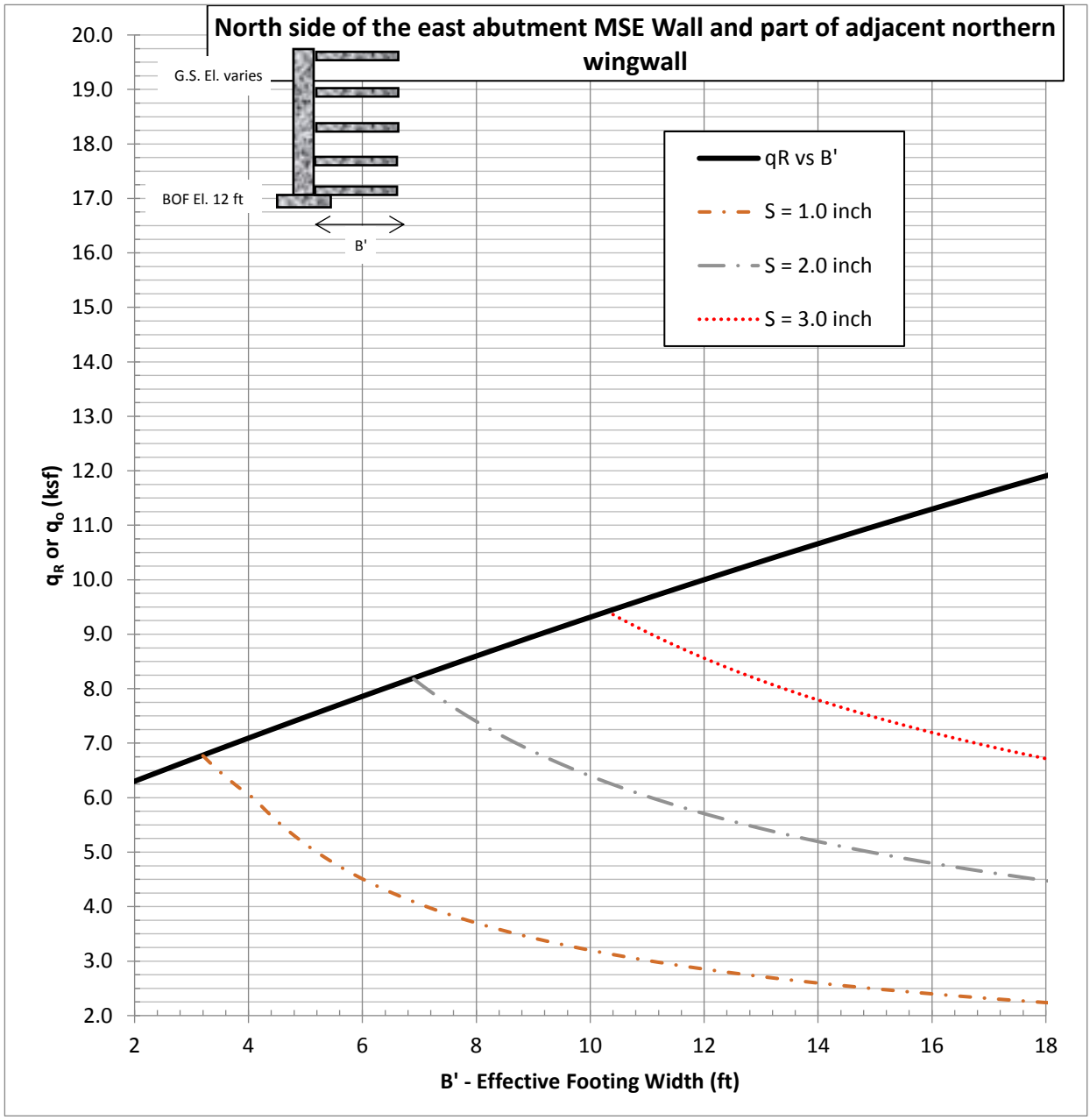
Example Settlement (Elastic) Calculation

$$S_e = \frac{(q_o(1-v^2)\sqrt{A'})}{144 * E_s * \beta_z}$$

Eq. 10.6.2.4.2-1

Poisson's Ratio (v)	0.3		Tb. C10.4.6.3-1
Young's modulus of elasticity (E_s)	4.17	ksi	Tb. C10.4.6.3-1
Flexible or Rigid	Flexible		
Shape Factor (B_z)	1.14		Tb. 10.6.2.4.2-1
Effective Width (B')	13.3	ft	
Effective Area of Footing (A')	546.7	ft^2	B' * L'

Assumed Settlement, S_e (in)	Applied Vertical Stress, q_o (ksf)
1.0	2.7
2.0	5.4
3.0	8.0



Notes:

q_R = Factored Bearing Resistance - Strength Limit State (enter graph with B' and read q_R)

q_0 = Maximum Bearing Pressure - Service Limit State (enter graph with q_0 and read settlement at B')

1. Preliminary q_R vs B' line and settlement curves developed using test boring information performed by Nobis.
2. Bearing capacity and settlements are based on bearing conditions provided on page 1.

Calculated by: ZSM Date: 6/24/2015
Checked by: PN Date: 7/1/2015

Bearing Resistance and Settlement Calculations - South Side of East Abutment MSE Wall and Adjacent Southern Wingwall

Objective: Develop a graph for a range of effective footing sizes that can be used to evaluate bearing resistance and settlement based on effective footing width for the south side of the east abutment MSE Wall and the adjacent southern wingwall.

References:
1) AASHTO LRFD Bridge Design Specifications: 2014 Edition
2) Borings performed by Nobis in from 2012 to 2015 (BB-SBMR-102 and BB-SBMR-203).
3) Drawings dated June 12, 2015 provided by CHA.
4) Maine DOT Bridge Design Guide: 2003 Edition.

Assumptions:
1) Eccentricity e_B is assumed to be B/6. No eccentricity e_L.
2) Excavation for Gravel Borrow MSE fill zone is at El. 7 across entire footprint.

Solution:

Bearing Soil Properties/Subsurface Information

Unit Weight of Bearing Soil (γ):	125	pcf	Estimated
Unit Weight of Soil Above Footing (γ):	130	pcf	Estimated
Cohesion of Bearing Soil (c):	0	psf	
Friction Angle of Bearing Soil (ϕ'):	31	degrees	Estimated

Soil Description: Minimum 18-inches compacted Gravel Borrow overlying medium dense, Silty SAND with varying amounts of Gravel. See Note 1.

Footing Elevation:	7	ft, NAVD-88	Reference No. 3
Ground Surface (GS) Elevation:	13.3	ft, NAVD-88	Reference No. 3, varies
Groundwater Elevation:	11.2	ft, NAVD-88	Reference No. 2

Footing Geometry

Minimum Footing Depth (D_f):	6.3	ft	ME frost depth = 6.3 feet
Groundwater Depth Below GS:	2.1	ft	
Width (B):	23	ft	Reference No. 3, (0.7*(H+D))
Length (L):	71	ft	Reference No. 3
Width Eccentricity (e_B):	3.8	ft	e_B = B/6 assumed
Length Eccentricity (e_L):	0	ft	Assumed
Effective Width (B'):	15.3	ft	
Effective Length (L'):	71	ft	

Notes:
1) Calculations for bearing resistance and settlement assume footing subgrade is prepared in accordance with the Geotechnical Report. Overexcavation of fill may be required.
2) Graph created using a range of effective footing dimensions can be found on page 4.
3) Example bearing resistance and settlement calculations can be found on pages 2 and 3, respectively.
4) Width of footing includes zone behind MSE wall reinforced with tensile geogrid.

Example Bearing Resistance Calculation

Factored Bearing Resistance: $q_R = q_n * \phi_b$			Eq. 10.6.3.1.1-1
Resistance Factor (ϕ_b) =	0.65		Tb. 11.5.7-1
Nominal Resistance (q_n) =			
$q_n = c*N_{cm} + \gamma*D_f*N_m*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$			Eq. 10.6.3.1.2a-1
$N_{qm} = N_q*s_q*d_q*i_q$			Eq. 10.6.3.1.2a-3
Bearing Capacity Factor (N_q)	20.6		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_q)	1.13	ft	Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_q)			
$i_q = [1-H/(V+cB'L'\cot\phi_f)]^n$	0.50		Assumed
$n = [(2+L'/B')/(1+L'/B')]\cos^2\theta + [(2+B'/L')/(1+B'/L')]\sin^2\theta$	1.82		Eq. 10.6.3.1.2a-9
Load Angle (θ)	90	degrees	Assumed to be 90°
Depth Correction Factor (d_q)	1.0		Tb. 10.6.3.1.2a-4
N_{qm}=	11.64		
$N_{cm} = N_c*s_c*i_c$			Eq. 10.6.3.1.2a-2
Bearing Capacity Factor (N_c)	32.7		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_c)	1.14		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_c)			
$i_c = i_q - [(1-i_q)/N_q-1)]$	0.50		Assumed
N_{cm} =	18.57		
$N_{\gamma m} = N_\gamma*s_\gamma*i_\gamma$			Eq. 10.6.3.1.2a-4
Bearing Capacity Factor (N_γ)	26		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_γ)	0.91		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_γ)			
$i_\gamma = [1-H/(V+cB'L'\cot\phi_f)]^{n+1}$	0.50		Assumed
$N_{\gamma m}$=	11.88		
Groundwater Coefficients			Tb. 10.6.3.1.2a-2
(C_{wq})	0.67		
($C_{w\gamma}$)	0.50		
q_n=	**12.0 ksf**		
q_R=	**7.8 ksf**		

Example Settlement (Elastic) Calculation

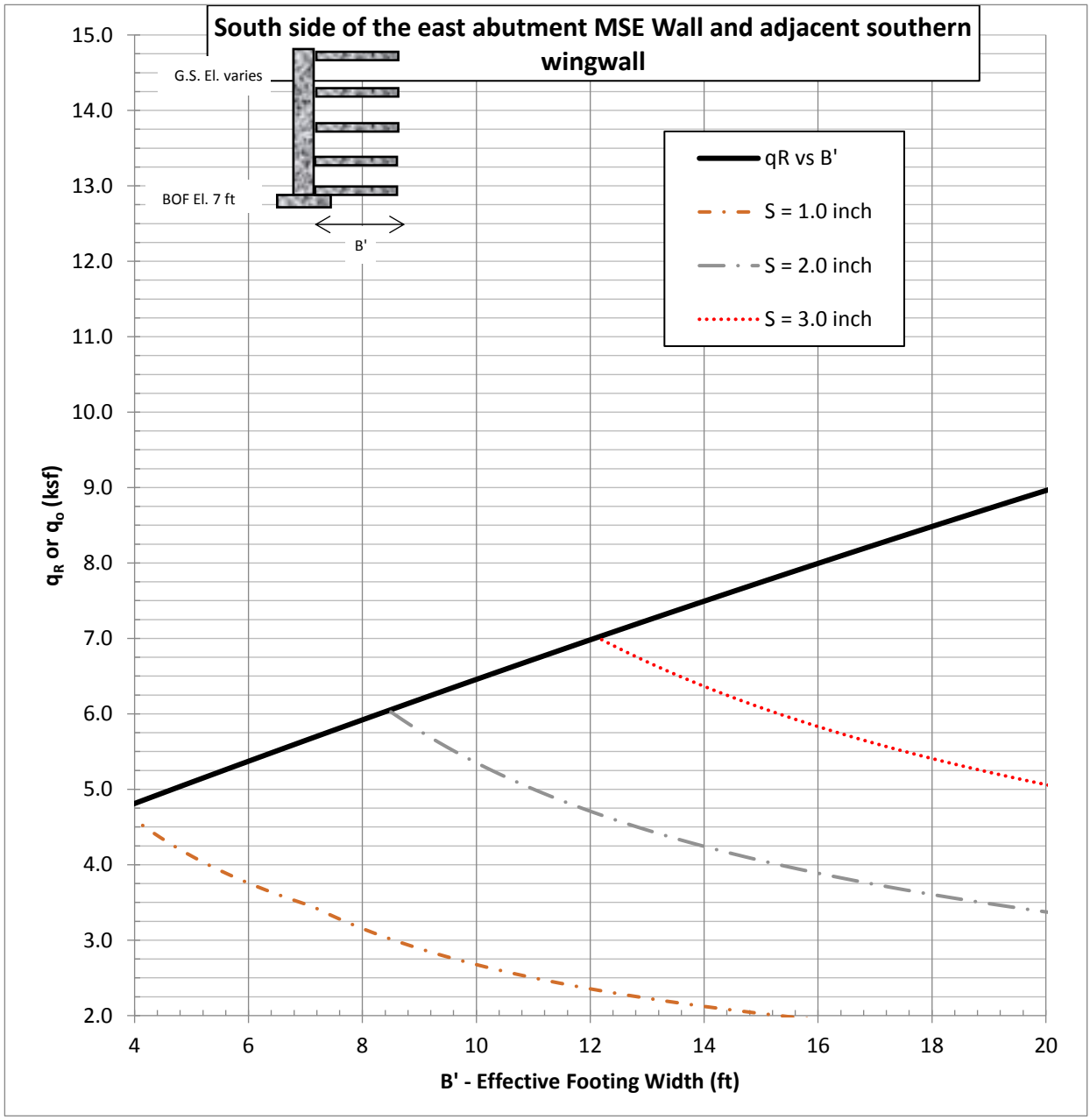
$$S_e = \frac{(q_o(1-v^2)\sqrt{A'})}{144 * E_s * \beta_z}$$

Eq. 10.6.2.4.2-1

Poisson's Ratio (v)	0.3		Tb. C10.4.6.3-1
Young's modulus of elasticity (E_s)	4.17	ksi	Tb. C10.4.6.3-1
Flexible or Rigid	Flexible		
Shape Factor (B_z)	1.20		Tb. 10.6.2.4.2-1
Effective Width (B')	15.3	ft	
Effective Area of Footing (A')	1088.667	ft^2	B' * L'

Assumed Settlement, S_e (in)	Applied Vertical Stress, q_o (ksf)
1.0	2.0
2.0	4.0
3.0	6.0

Calculated by: ZSM Date: 6/24/2015
Checked by: PN Date: 7/1/2015



Notes:

q_R = Factored Bearing Resistance - Strength Limit State (enter graph with B' and read q_R)

q_0 = Maximum Bearing Pressure - Service Limit State (enter graph with q_0 and read settlement at B')

1. Preliminary q_R vs B' line and settlement curves developed using test boring information performed by Nobis.
2. Bearing capacity and settlements are based on bearing conditions provided on page 1.

Calculated by: PN Date: 7/1/2015
Checked by: JPM Date: 7/7/2015

Bearing Resistance and Settlement Calculations - East Side of Bridge, Northern Wingwall

Objective: Develop a graph for a range of effective footing sizes that can be used to evaluate bearing resistance and settlement based on effective footing width for the remainder of the northern wingwall on the east side of the bridge.

References:
1) AASHTO LRFD Bridge Design Specifications: 2014 Edition.
2) Borings performed by Nobis in from 2012 to 2015 (BB-SBMR-102 and BB-SBMR-203).
3) Drawings dated June 12, 2015 provided by CHA.
4) Maine DOT Bridge Design Guide: 2003 Edition.

Assumptions:
1) Eccentricity e_B is assumed to be B/6. No eccentricity e_L.
2) Excavation for Gravel Borrow MSE fill zone is at El. 14.5 across entire footprint.

Solution:

Bearing Soil Properties/Subsurface Information

Unit Weight of Bearing Soil (γ):	125	pcf	Estimated
Unit Weight of Soil Above Footing (γ):	130	pcf	Estimated
Cohesion of Bearing Soil (c):	0	psf	
Friction Angle of Bearing Soil (ϕ'):	31	degrees	Estimated

Soil Description: Minimum 18-inches compacted Gravel Borrow overlying medium dense, Silty SAND with varying amounts of Gravel. See Note 1.

Footing Elevation:	14.5	ft, NAVD-88	Reference No. 3
Ground Surface (GS) Elevation:	20.8	ft, NAVD-88	Reference No. 3, varies
Groundwater Elevation:	11.2	ft, NAVD-88	Reference No. 2

Footing Geometry

Minimum Footing Depth (D_f):	6.3	ft	ME frost depth = 6.3 feet
Groundwater Depth Below GS:	9.6	ft	
Width (B):	10	ft	Reference No. 3, (0.7*(H+D)
Length (L):	10	ft	Reference No. 3
Width Eccentricity (e_B):	1.7	ft	e_B = B/6 assumed
Length Eccentricity (e_L):	0	ft	Assumed
Effective Width (B'):	6.7	ft	
Effective Length (L'):	10	ft	

Notes:
1) Calculations for bearing resistance and settlement assume footing subgrade is prepared in accordance with the Geotechnical Report. Overexcavation of fill may be required.
2) Graph created using a range of effective footing dimensions can be found on page 4.
3) Example bearing resistance and settlement calculations can be found on pages 2 and 3, respectively.
4) Width of footing includes zone behind MSE wall reinforced with tensile geogrid.

Example Bearing Resistance Calculation

Factored Bearing Resistance: $q_R = q_n * \phi_b$			Eq. 10.6.3.1.1-1
Resistance Factor (ϕ_b) =	0.65		Tb. 11.5.7-1
Nominal Resistance (q_n) =			
$q_n = c*N_{cm} + \gamma*D_f*N_m*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$			Eq. 10.6.3.1.2a-1
$N_{qm} = N_q*s_q*d_q*i_q$			Eq. 10.6.3.1.2a-3
Bearing Capacity Factor (N_q)	20.6		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_q)	1.40	ft	Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_q)			
$i_q = [1-H/(V+cB'L'\cot\phi_f)]^n$	0.50		Assumed
$n = [(2+L'/B')/(1+L'/B')]\cos^2\theta + [(2+B'/L')/(1+B'/L')]\sin^2\theta$	1.60		Eq. 10.6.3.1.2a-9
Load Angle (θ)	90	degrees	Assumed to be 90°
Depth Correction Factor (d_q)	1.0		Tb. 10.6.3.1.2a-4
N_{qm}=	14.43		
$N_{cm} = N_c*s_c*i_c$			Eq. 10.6.3.1.2a-2
Bearing Capacity Factor (N_c)	32.7		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_c)	1.42		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_c)			
$i_c = i_q - [(1-i_q)/N_q-1)]$	0.50		Assumed
N_{cm} =	23.22		
$N_{\gamma m} = N_\gamma*s_\gamma*i_\gamma$			Eq. 10.6.3.1.2a-4
Bearing Capacity Factor (N_γ)	26		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_γ)	0.73		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_γ)			
$i_\gamma = [1-H/(V+cB'L'\cot\phi_f)]^{n+1}$	0.50		Assumed
$N_{\gamma m}$=	9.53		
Groundwater Coefficients			Tb. 10.6.3.1.2a-2
(C_{wq})	1.00		
($C_{w\gamma}$)	0.79		
q_n=	**15.0 ksf**		
q_R=	**9.7 ksf**		

Example Settlement (Elastic) Calculation

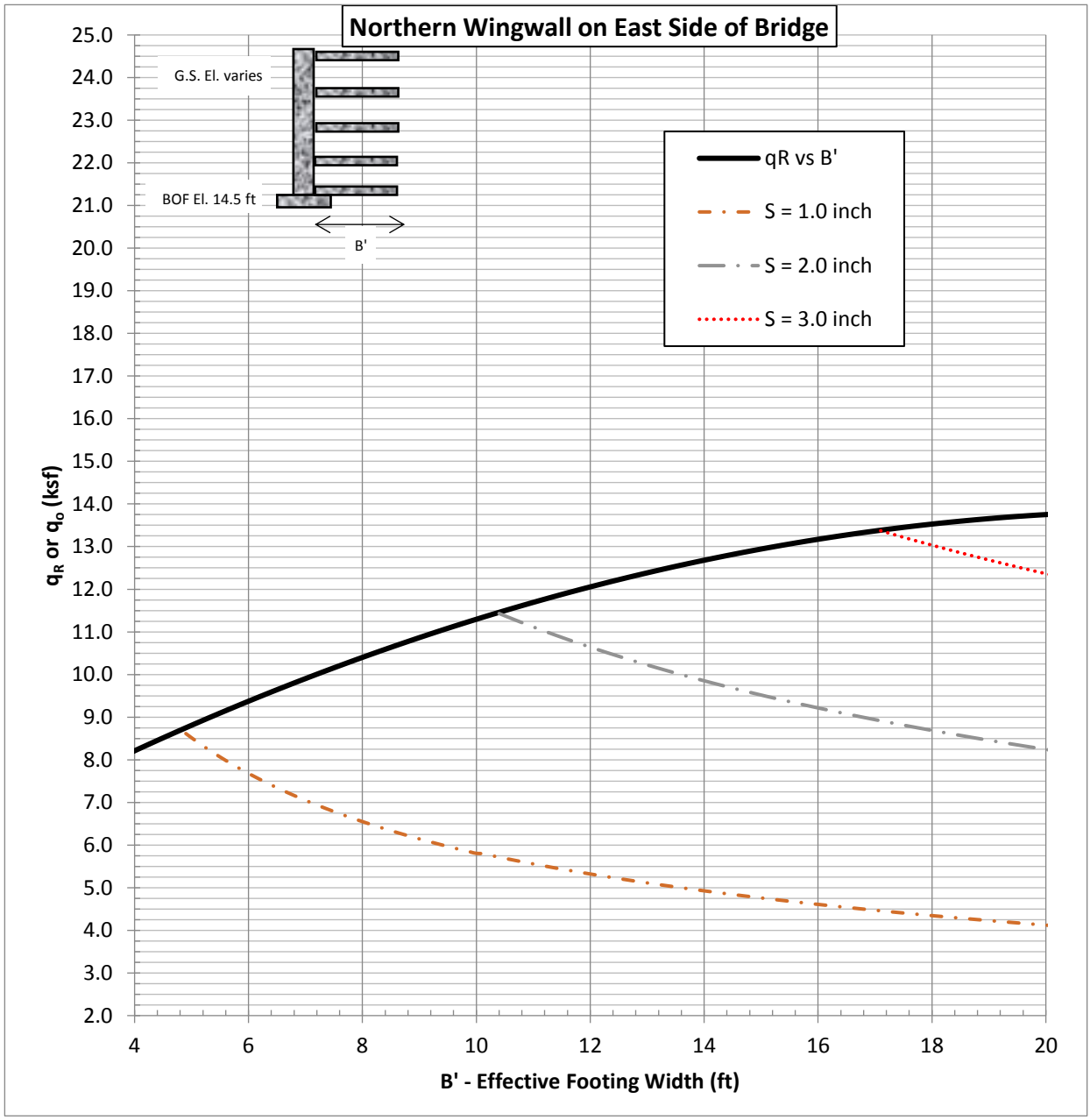
$$S_e = \frac{(q_o(1-v^2)\sqrt{A'})}{144 * E_s * \beta_z}$$

Eq. 10.6.2.4.2-1

Poisson's Ratio (v)	0.3		Tb. C10.4.6.3-1
Young's modulus of elasticity (E_s)	4.17	ksi	Tb. C10.4.6.3-1
Flexible or Rigid	Flexible		
Shape Factor (B_z)	1.08		Tb. 10.6.2.4.2-1
Effective Width (B')	6.7	ft	
Effective Area of Footing (A')	66.7	ft^2	B' * L'

Assumed Settlement, S_e (in)	Applied Vertical Stress, q_o (ksf)
1.0	7.2
2.0	14.5
3.0	21.7

Calculated by: PN Date: 7/1/2015
Checked by: JPM Date: 7/7/2015



Notes:

q_R = Factored Bearing Resistance - Strength Limit State (enter graph with B' and read q_R)

q_0 = Maximum Bearing Pressure - Service Limit State (enter graph with q_0 and read settlement at B')

1. Preliminary q_R vs B' line and settlement curves developed using test boring information performed by Nobis.
2. Bearing capacity and settlements are based on bearing conditions provided on page 1.

Calculated by: PN Date: 7/1/2015
Checked by: JPM Date:7/7/2015

Bearing Resistance and Settlement Calculations - West Abutment MSE Wall and Adjacent Inner Wingwalls

Objective: Develop a graph for a range of effective footing sizes that can be used to evaluate bearing resistance and settlement based on effective footing width for the west abutment MSE Wall and the adjacent inner wingwalls.

References:
1) AASHTO LRFD Bridge Design Specifications: 2014 Edition.
2) Borings performed by Nobis in from 2012 to 2015 (BB-SBMR-104, BB-SBMR-201, and BB-SBMR-208).
3) Drawings dated June 12, 2015 provided by CHA.
4) Maine DOT Bridge Design Guide: 2003 Edition.

Assumptions:
1) Eccentricity e_B is assumed to be B/6. No eccentricity e_L.
2) Excavation for Gravel Borrow MSE fill zone is at El. 10 across entire footprint.

Solution:

Bearing Soil Properties/Subsurface Information

Unit Weight of Bearing Soil (γ):	125	pcf	Estimated
Unit Weight of Soil Above Footing (γ):	130	pcf	Estimated
Cohesion of Bearing Soil (c):	0	psf	
Friction Angle of Bearing Soil (ϕ'):	31	degrees	Estimated

Soil Description: Minimum 18-inches compacted Gravel Borrow overlying medium dense, Silty SAND with varying amounts of Gravel, overlying dense to very dense SAND with varying amounts of Silt and Gravel. See Note 1.

Footing Elevation:	10	ft, NAVD-88	Reference No. 3
Ground Surface (GS) Elevation:	16.3	ft, NAVD-88	Reference No. 3, varies
Groundwater Elevation:	15	ft, NAVD-88	Reference No. 2

Footing Geometry

Minimum Footing Depth (D_f):	6.3	ft	ME frost depth = 6.3 feet
Groundwater Depth Below GS:	1.3	ft	
Width (B):	23.8	ft	Reference No. 3, (0.7*(H+D))
Length (L):	105	ft	Reference No. 3
Width Eccentricity (e_B):	4.0	ft	e_B = B/6 assumed
Length Eccentricity (e_L):	0	ft	Assumed
Effective Width (B'):	15.9	ft	
Effective Length (L'):	105	ft	

Notes:
1) Calculations for bearing resistance and settlement assume footing subgrade is prepared in accordance with the Geotechnical Report. Overexcavation of fill may be required.
2) Graph created using a range of effective footing dimensions can be found on page 4.
3) Example bearing resistance and settlement calculations can be found on pages 2 and 3, respectively.
4) Width of footing includes zone behind MSE wall reinforced with tensile geogrid.

Example Bearing Resistance Calculation

Factored Bearing Resistance: $q_R = q_n * \phi_b$			Eq. 10.6.3.1.1-1
Resistance Factor (ϕ_b) =	0.65		Tb. 11.5.7-1
Nominal Resistance (q_n) =			
$q_n = c*N_{cm} + \gamma*D_f*N_m*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$			Eq. 10.6.3.1.2a-1
$N_{qm} = N_q*s_q*d_q*i_q$			Eq. 10.6.3.1.2a-3
Bearing Capacity Factor (N_q)	20.6		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_q)	1.09	ft	Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_q)			
$i_q = [1-H/(V+cB'L'\cot\phi_f)]^n$	0.50		Assumed
$n = [(2+L'/B')/(1+L'/B')]\cos^2\theta + [(2+B'/L')/(1+B'/L')]\sin^2\theta$	1.87		Eq. 10.6.3.1.2a-9
Load Angle (θ)	90	degrees	Assumed to be 90°
Depth Correction Factor (d_q)	1.0		Tb. 10.6.3.1.2a-4
N_{qm}=	11.24		
$N_{cm} = N_c*s_c*i_c$			Eq. 10.6.3.1.2a-2
Bearing Capacity Factor (N_c)	32.7		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_c)	1.10		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_c)			
$i_c = i_q - [(1-i_q)/N_q-1)]$	0.50		Assumed
N_{cm} =	17.91		
$N_{\gamma m} = N_\gamma*s_\gamma*i_\gamma$			Eq. 10.6.3.1.2a-4
Bearing Capacity Factor (N_γ)	26		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_γ)	0.94		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_γ)			
$i_\gamma = [1-H/(V+cB'L'\cot\phi_f)]^{n+1}$	0.50		Assumed
$N_{\gamma m}$=	12.21		
Groundwater Coefficients			Tb. 10.6.3.1.2a-2
(C_{wq})	0.60		
($C_{w\gamma}$)	0.50		
q_n=	**11.6 ksf**		
q_R=	**7.5 ksf**		

Example Settlement (Elastic) Calculation

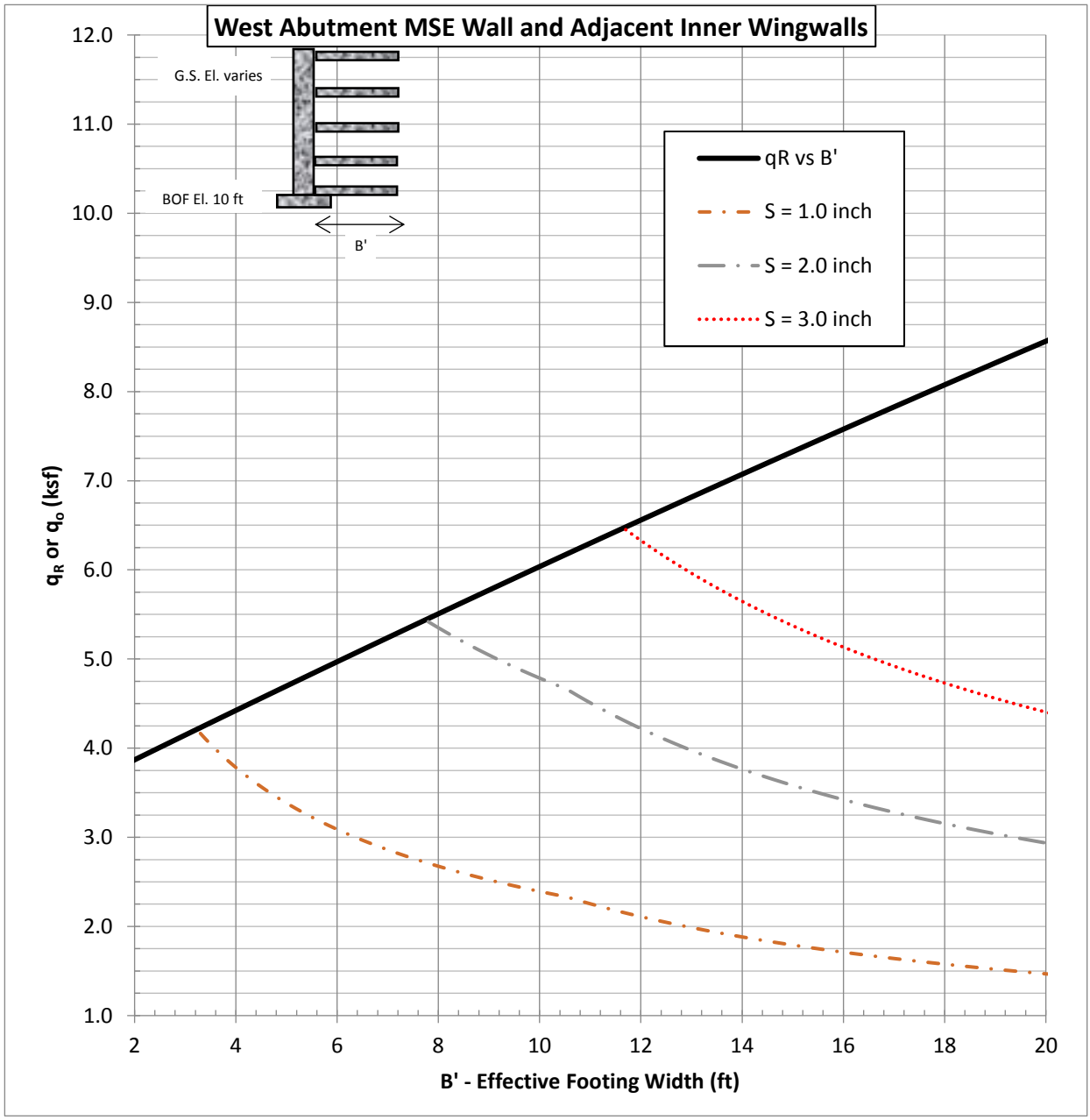
$$S_e = \frac{(q_o(1-v^2)\sqrt{A'})}{144*E_s*\beta_z}$$

Eq. 10.6.2.4.2-1

Poisson's Ratio (v)	0.3		Tb. C10.4.6.3-1
Young's modulus of elasticity (E_s)	4.17	ksi	Tb. C10.4.6.3-1
Flexible or Rigid	Flexible		
Shape Factor (B_z)	1.28		Tb. 10.6.2.4.2-1
Effective Width (B')	15.9	ft	
Effective Area of Footing (A')	1666	ft^2	B' * L'

Assumed Settlement, S_e (in)	Applied Vertical Stress, q_o (ksf)
1.0	1.7
2.0	3.4
3.0	5.2

Calculated by: PN Date: 7/1/2015
Checked by: JPM Date:7/7/2015



Notes:

q_R = Factored Bearing Resistance - Strength Limit State (enter graph with B' and read q_R)

q_0 = Maximum Bearing Pressure - Service Limit State (enter graph with q_0 and read settlement at B')

1. Preliminary q_R vs B' line and settlement curves developed using test boring information performed by Nobis.
2. Bearing capacity and settlements are based on bearing conditions provided on page 1.

Bearing Resistance and Settlement Calculations - West Side of Bridge, Outer Wingwalls

Objective: Develop a graph for a range of effective footing sizes that can be used to evaluate bearing resistance and settlement based on effective footing width for the outer wingwalls on the west side of the bridge.

References:
1) AASHTO LRFD Bridge Design Specifications: 2014 Edition.
2) Borings performed by Nobis in from 2012 to 2015 (BB-SBMR-104, BB-SBMR-201, and BB-SBMR-208).
3) Drawings dated June 12, 2015 provided by CHA.
4) Maine DOT Bridge Design Guide: 2003 Edition.

Assumptions:
1) Eccentricity e_B is assumed to be B/6. No eccentricity e_L.
2) Excavation for Gravel Borrow MSE fill zone is at El. 15 across entire footprint.

Solution:

Bearing Soil Properties/Subsurface Information

Unit Weight of Bearing Soil (γ):	125	pcf	Estimated
Unit Weight of Soil Above Footing (γ):	130	pcf	Estimated
Cohesion of Bearing Soil (c):	0	psf	
Friction Angle of Bearing Soil (ϕ'):	31	degrees	Estimated

Soil Description: Minimum 18-inches compacted Gravel Borrow overlying medium dense, Silty SAND with varying amounts of Gravel. See Note 1.

Footing Elevation:	15	ft, NAVD-88	Reference No. 3
Ground Surface (GS) Elevation:	21.3	ft, NAVD-88	Reference No. 3, varies
Groundwater Elevation:	15	ft, NAVD-88	Reference No. 2

Footing Geometry

Minimum Footing Depth (D_f):	6.3	ft		ME frost depth = 6.3 feet
Groundwater Depth Below GS:	6.3	ft		
Width (B):	14.7	ft		Reference No. 3, (0.7*(H+D))
Length (L):	20	ft	(10ft or 20ft)	Reference No. 3
Width Eccentricity (e_B):	2.5	ft		e_B = B/6 assumed
Length Eccentricity (e_L):	0	ft		Assumed
Effective Width (B'):	9.8	ft		
Effective Length (L'):	20	ft		

Notes:
1) Calculations for bearing resistance and settlement assume footing subgrade is prepared in accordance with the Geotechnical Report. Overexcavation of fill may be required.
2) Graph created using a range of effective footing dimensions can be found on page 4.
3) Example bearing resistance and settlement calculations can be found on pages 2 and 3, respectively.
4) Width of footing includes zone behind MSE wall reinforced with tensile geogrid.

Example Bearing Resistance Calculation

Factored Bearing Resistance: $q_R = q_n * \phi_b$			Eq. 10.6.3.1.1-1
Resistance Factor (ϕ_b) =	0.65		Tb. 11.5.7-1
Nominal Resistance (q_n) =			
$q_n = c*N_{cm} + \gamma*D_f*N_m*C_{wq} + 0.5*\gamma*B'*N_{\gamma m}*C_{w\gamma}$			Eq. 10.6.3.1.2a-1
$N_{qm} = N_q*s_q*d_q*i_q$			Eq. 10.6.3.1.2a-3
Bearing Capacity Factor (N_q)	20.6		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_q)	1.29	ft	Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_q)			
$i_q = [1-H/(V+cB'L'\cot\phi_f)]^n$	0.50		Assumed
$n = [(2+L'/B')/(1+L'/B')]\cos^2\theta + [(2+B'/L')/(1+B'/L')]\sin^2\theta$	1.67		Eq. 10.6.3.1.2a-9
Load Angle (θ)	90	degrees	Assumed to be 90°
Depth Correction Factor (d_q)	1.0		Tb. 10.6.3.1.2a-4
N_{qm}=	13.33		
$N_{cm} = N_c*s_c*i_c$			Eq. 10.6.3.1.2a-2
Bearing Capacity Factor (N_c)	32.7		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_c)	1.31		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_c)			
$i_c = i_q - [(1-i_q)/N_q-1)]$	0.50		Assumed
N_{cm} =	21.40		
$N_{\gamma m} = N_\gamma*s_\gamma*i_\gamma$			Eq. 10.6.3.1.2a-4
Bearing Capacity Factor (N_γ)	26		Tb. 10.6.3.1.2a-1
Shape Correction Factor (s_γ)	0.80		Tb. 10.6.3.1.2a-3
Load Inclination Factor (i_γ)			
$i_\gamma = [1-H/(V+cB'L'\cot\phi_f)]^{n+1}$	0.50		Assumed
$N_{\gamma m}$=	10.45		
Groundwater Coefficients			Tb. 10.6.3.1.2a-2
(C_{wq})	1.00		
($C_{w\gamma}$)	0.50		
q_n=	**14.1 ksf**		
q_R=	**9.2 ksf**		

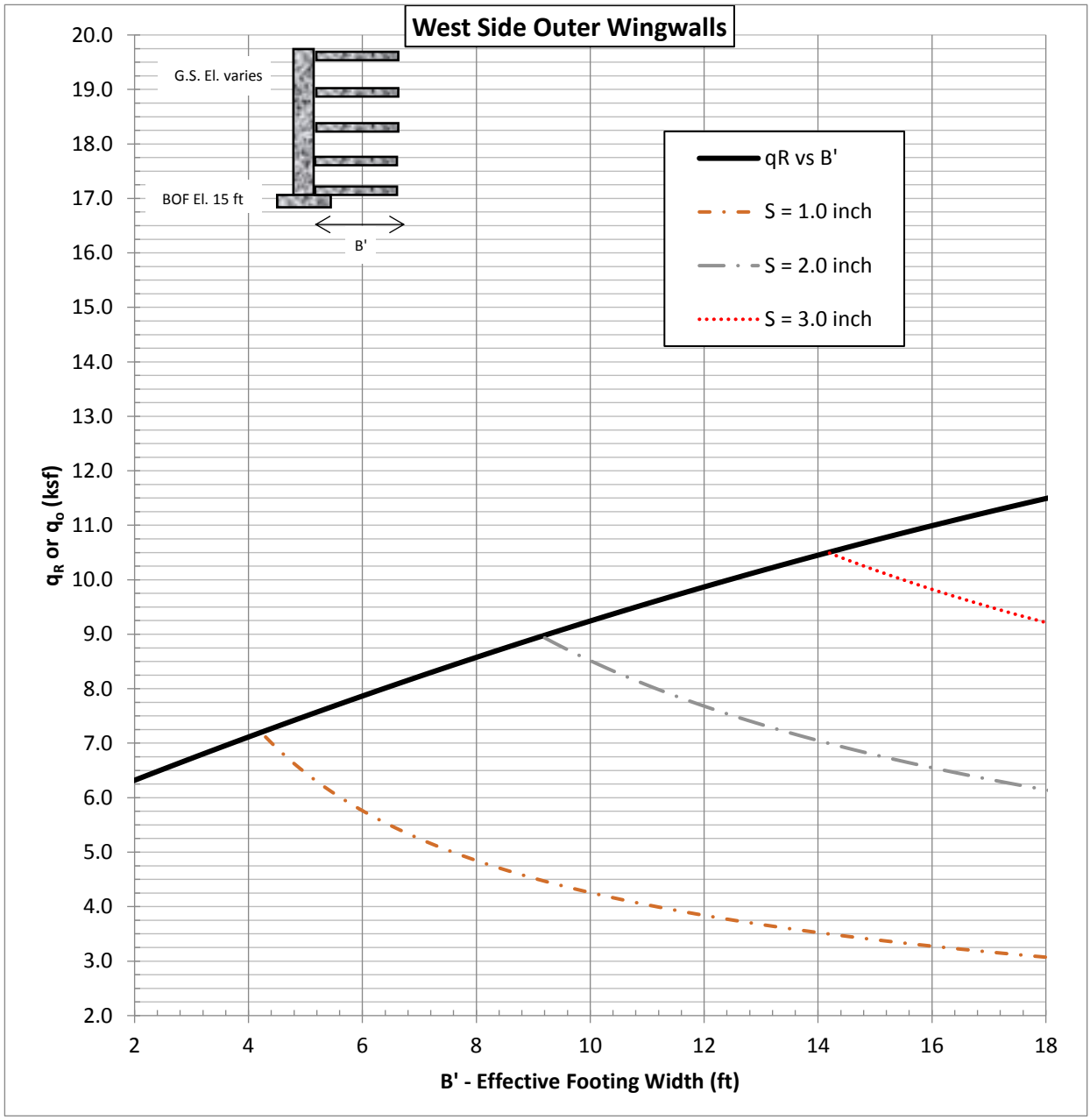
Example Settlement (Elastic) Calculation

$$S_e = \frac{(q_o(1-v^2)\sqrt{A'})}{144 * E_s * \beta_z}$$

Eq. 10.6.2.4.2-1

Poisson's Ratio (v)	0.3		Tb. C10.4.6.3-1
Young's modulus of elasticity (E_s)	4.17	ksi	Tb. C10.4.6.3-1
Flexible or Rigid	Flexible		
Shape Factor (B_z)	1.10		Tb. 10.6.2.4.2-1
Effective Width (B')	9.8	ft	
Effective Area of Footing (A')	196	ft^2	B' * L'

Assumed Settlement, S_e (in)	Applied Vertical Stress, q_o (ksf)
1.0	4.3
2.0	8.6
3.0	12.9



Notes:

q_R = Factored Bearing Resistance - Strength Limit State (enter graph with B' and read q_R)

q_0 = Maximum Bearing Pressure - Service Limit State (enter graph with q_0 and read settlement at B')

1. Preliminary q_R vs B' line and settlement curves developed using test boring information performed by Nobis.
2. Bearing capacity and settlements are based on bearing conditions provided on page 1.

$$N1 = C_N N \qquad (10.4.6.2.4\text{-}1)$$

$N1$ = *SPT* blow count corrected for overburden pressure, σ'_v (blows/ft)

C_N = $[0.77 \log_{10}(40/\sigma'_v)]$, and $C_N < 2.0$

σ'_v = vertical effective stress (ksf)

N = uncorrected *SPT* blow count (blows/ft)

Table 10.6.2.4.2-1—Elastic Shape and Rigidity Factors, EPRI (1983)

L/B	Flexible, β_z (average)	β_z Rigid
Circular	1.04	1.13
1	1.06	1.08
2	1.09	1.10
3	1.13	1.15
5	1.22	1.24
10	1.41	1.41

Table 10.6.3.1.2a-1—Bearing Capacity Factors N_c (Prandtl, 1921), N_q (Reissner, 1924), and N_γ (Vesic, 1975)

ϕ_f	N_c	N_q	N_γ	ϕ_f	N_c	N_q	N_γ
0	5.14	1.0	0.0	23	18.1	8.7	8.2
1	5.4	1.1	0.1	24	19.3	9.6	9.4
2	5.6	1.2	0.2	25	20.7	10.7	10.9
3	5.9	1.3	0.2	26	22.3	11.9	12.5
4	6.2	1.4	0.3	27	23.9	13.2	14.5
5	6.5	1.6	0.5	28	25.8	14.7	16.7
6	6.8	1.7	0.6	29	27.9	16.4	19.3
7	7.2	1.9	0.7	30	30.1	18.4	22.4
8	7.5	2.1	0.9	31	32.7	20.6	26.0
9	7.9	2.3	1.0	32	35.5	23.2	30.2
10	8.4	2.5	1.2	33	38.6	26.1	35.2
11	8.8	2.7	1.4	34	42.2	29.4	41.1
12	9.3	3.0	1.7	35	46.1	33.3	48.0
13	9.8	3.3	2.0	36	50.6	37.8	56.3
14	10.4	3.6	2.3	37	55.6	42.9	66.2
15	11.0	3.9	2.7	38	61.4	48.9	78.0
16	11.6	4.3	3.1	39	67.9	56.0	92.3
17	12.3	4.8	3.5	40	75.3	64.2	109.4
18	13.1	5.3	4.1	41	83.9	73.9	130.2
19	13.9	5.8	4.7	42	93.7	85.4	155.6
20	14.8	6.4	5.4	43	105.1	99.0	186.5
21	15.8	7.1	6.2	44	118.4	115.3	224.6
22	16.9	7.8	7.1	45	133.9	134.9	271.8

Table 10.6.3.1.2a-3—Shape Correction Factors s_c, s_γ, s_q

Factor	Friction Angle	Cohesion Term (s_c)	Unit Weight Term (s_γ)	Surcharge Term (s_q)
Shape Factors s_c, s_γ, s_q	$\phi_f = 0$	$1+\left(\frac{B}{5L}\right)$	1.0	1.0
	$\phi_f > 0$	$1+\left(\frac{B}{L}\right)\left(\frac{N_q}{N_c}\right)$	$1-0.4\left(\frac{B}{L}\right)$	$1+\left(\frac{B}{L}\tan\phi_f\right)$

Table 10.6.3.1.2a-4—Depth Correction Factor d_q

Friction Angle, ϕ_f (degrees)	D_f/B	d_q
32	1	1.20
	2	1.30
	4	1.35
	8	1.40
37	1	1.20
	2	1.25
	4	1.30
	8	1.35
42	1	1.15
	2	1.20
	4	1.25
	8	1.30

Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)

Soil Type	Typical Range of Young's Modulus Values, E_s (ksi)	Poisson's Ratio, ν (dim)
Clay:		
Soft sensitive		0.4–0.5 (undrained)
Medium stiff	0.347–2.08	
to stiff	2.08–6.94	
Very stiff	6.94–13.89	
Loess	2.08–8.33	0.1–0.3
Silt	0.278–2.78	0.3–0.35
Fine Sand:		
Loose	1.11–1.67	0.25
Medium dense	1.67–2.78	
Dense	2.78–4.17	
Sand:		
Loose	1.39–4.17	0.20–0.36
Medium dense	4.17–6.94	
Dense	6.94–11.11	0.30–0.40
Gravel:		
Loose	4.17–11.11	0.20–0.35
Medium dense	11.11–13.89	
Dense	13.89–27.78	0.30–0.40

Estimating E_s from *SPT N* Value	
Soil Type	E_s (ksi)
Silts, sandy silts, slightly cohesive mixtures	$0.056\ N1_{60}$
Clean fine to medium sands and slightly silty sands	$0.097\ N1_{60}$
Coarse sands and sands with little gravel	$0.139\ N1_{60}$
Sandy gravel and gravels	$0.167\ N1_{60}$
Estimating E_s from q_c (static cone resistance)	
Sandy soils	$0.028q_c$

For $\phi_f = 0$:

$$i_c = 1 - (nH/cBLN_c) \quad (10.6.3.1.2a\text{-}5)$$

For $\phi_f > 0$:

$$i_c = i_q - [(1 - i_q)/(N_q - 1)] \quad (10.6.3.1.2a\text{-}6)$$

in which:

$$i_q = \left[1 - \frac{H}{(V + cBL\cot\phi_f)}\right]^n \quad (10.6.3.1.2a\text{-}7)$$

$$i_\gamma = \left[1 - \frac{H}{V + cBL\cot\phi_f)}\right]^{(n+1)} \quad (10.6.3.1.2a\text{-}8)$$

c = cohesion, taken as undrained shear strength (ksf)

N_c = cohesion term (undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

N_q = surcharge (embedment) term (drained or undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

N_γ = unit weight (footing width) term (drained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

γ = total (moist) unit weight of soil above or below the bearing depth of the footing (kcf)

D_f = footing embedment depth (ft)

B = footing width (ft)

$C_{wq}, C_{w\gamma}$ = correction factors to account for the location of the groundwater table as specified in Table 10.6.3.1.2a-2 (dim)

s_c, s_γ, s_q = footing shape correction factors as specified in Table 10.6.3.1.2a-3 (dim)

d_q = correction factor to account for the shearing resistance along the failure surface passing through cohesionless material above the bearing elevation as specified in Table 10.6.3.1.2a-4 (dim)

i_c, i_γ, i_q = load inclination factors determined from Eqs. 10.6.3.1.2a-5 or 10.6.3.1.2a-6, and 10.6.3.1.2a-7 and 10.6.3.1.2a-8 (dim)

$$S_e = \frac{\left[q_o\left(1-\nu^2\right)\sqrt{A'}\right]}{144\ E_s\beta_z} \qquad (10.6.2.4.2\text{-}1)$$

where:

q_o = applied vertical stress (ksf)

A' = effective area of footing (ft^2)

E_s = Young's modulus of soil taken as specified in Article 10.4.6.3 if direct measurements of E_s are not available from the results of in situ or laboratory tests (ksi)

β_z = shape factor taken as specified in Table 10.6.2.4.2-1 (dim)

ν = Poisson's Ratio, taken as specified in Article 10.4.6.3 if direct measurements of ν are not available from the results of in situ or laboratory tests (dim)

$$q_n = cN_{cm} + \gamma D_f N_{qm} C_{wq} + 0.5\gamma \quad BN_{\gamma m} C_{w\gamma} \qquad (10.6.3.1.2a\text{-}1)$$

$$N_{cm} = N_c s_c i_c \qquad (10.6.3.1.2a\text{-}2)$$

$$N_{qm} = N_q s_q d_q i_q \qquad (10.6.3.1.2a\text{-}3)$$

$$N_\gamma m = N_\gamma s_\gamma i_\gamma \qquad (10.6.3.1.2a\text{-}4)$$

Table 10.6.3.1.2a-2—Coefficients C_{wq} and $C_{w\gamma}$ for Various Groundwater Depths

D_w	C_{wq}	$C_{w\gamma}$
0.0	0.5	0.5
D_f	1.0	0.5
$>1.5B + D_f$	1.0	1.0

Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State

Method/Soil/Condition			Resistance Factor
Bearing Resistance	φ_b	Theoretical method (Munfakh et al., 2001), in clay	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *CPT*	0.50
		Theoretical method (Munfakh et al., 2001), in sand, using *SPT*	0.45
		Semi-empirical methods (Meyerhof, 1957), all soils	0.45
		Footings on rock	0.45
		Plate Load Test	0.55
Sliding	φ_τ	Precast concrete placed on sand	0.90
		Cast-in-Place Concrete on sand	0.80
		Cast-in-Place or precast Concrete on Clay	0.85
		Soil on soil	0.90
	φ_{ep}	Passive earth pressure component of sliding resistance	0.50

Table 11.5.7-1—Resistance Factors for Permanent Retaining Walls

Wall-Type and Condition		Resistance Factor
Nongravity Cantilevered and Anchored Walls		
Axial compressive resistance of vertical elements		Article 10.5 applies
Passive resistance of vertical elements		0.75
Pullout resistance of anchors [1]	• Cohesionless (granular) soils • Cohesive soils • Rock	0.65 [1] 0.70 [1] 0.50 [1]
Pullout resistance of anchors [2]	• Where proof tests are conducted	1.0 [2]
Tensile resistance of anchor tendon	• Mild steel (e.g., ASTM A615 bars) • High strength steel (e.g., ASTM A722 bars)	0.90 [3] 0.80 [3]
Flexural capacity of vertical elements		0.90
Mechanically Stabilized Earth Walls, Gravity Walls, and Semigravity Walls		
Bearing resistance	• Gravity and semigravity walls • MSE walls	0.55 0.65
Sliding		1.0
Tensile resistance of metallic reinforcement and connectors	Strip reinforcements [4] • Static loading Grid reinforcements [4] [5] • Static loading	 0.75 0.65
Tensile resistance of geosynthetic reinforcement and connectors	• Static loading	0.90
Pullout resistance of tensile reinforcement	• Static loading	0.90
Prefabricated Modular Walls		
Bearing		Article 10.5 applies
Sliding		Article 10.5 applies
Passive resistance		Article 10.5 applies

(1) Apply to presumptive ultimate unit bond stresses for preliminary design only in Article C11.9.4.2.

(2) Apply where proof test(s) are conducted on every production anchor to a load of 1.0 or greater times the factored load on the anchor.

(3) Apply to maximum proof test load for the anchor. For mild steel apply resistance factor to F_y. For high-strength steel apply the resistance factor to guaranteed ultimate tensile strength.

(4) Apply to gross cross-section less sacrificial area. For sections with holes, reduce gross area in accordance with Article 6.8.3 and apply to net section less sacrificial area.

(5) Applies to grid reinforcements connected to a rigid facing element, e.g., a concrete panel or block. For grid reinforcements connected to a flexible facing mat or which are continuous with the facing mat, use the resistance factor for strip reinforcements.

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JOB 85970 Pine Point Road over B&M Railroad
SHEET NO. _____ OF _____
CALCULATED BY AMR DATE 10-9-12
CHECKED BY JPM DATE 10/17/12
SCALE N-7-S

Estimate Frost Penetration Depth

Reference: Maine DOT Bridge Design Guide Section 5.2.1

Assumed
Soil Conditions: Coarse Grained
WC = 10%

Design Freezing Index: 1275 ← interpolated from Figure 5-1

Depth of Frost Penetration: 75.5 inches = 6.3 feet ← interpolated from Table 5-1

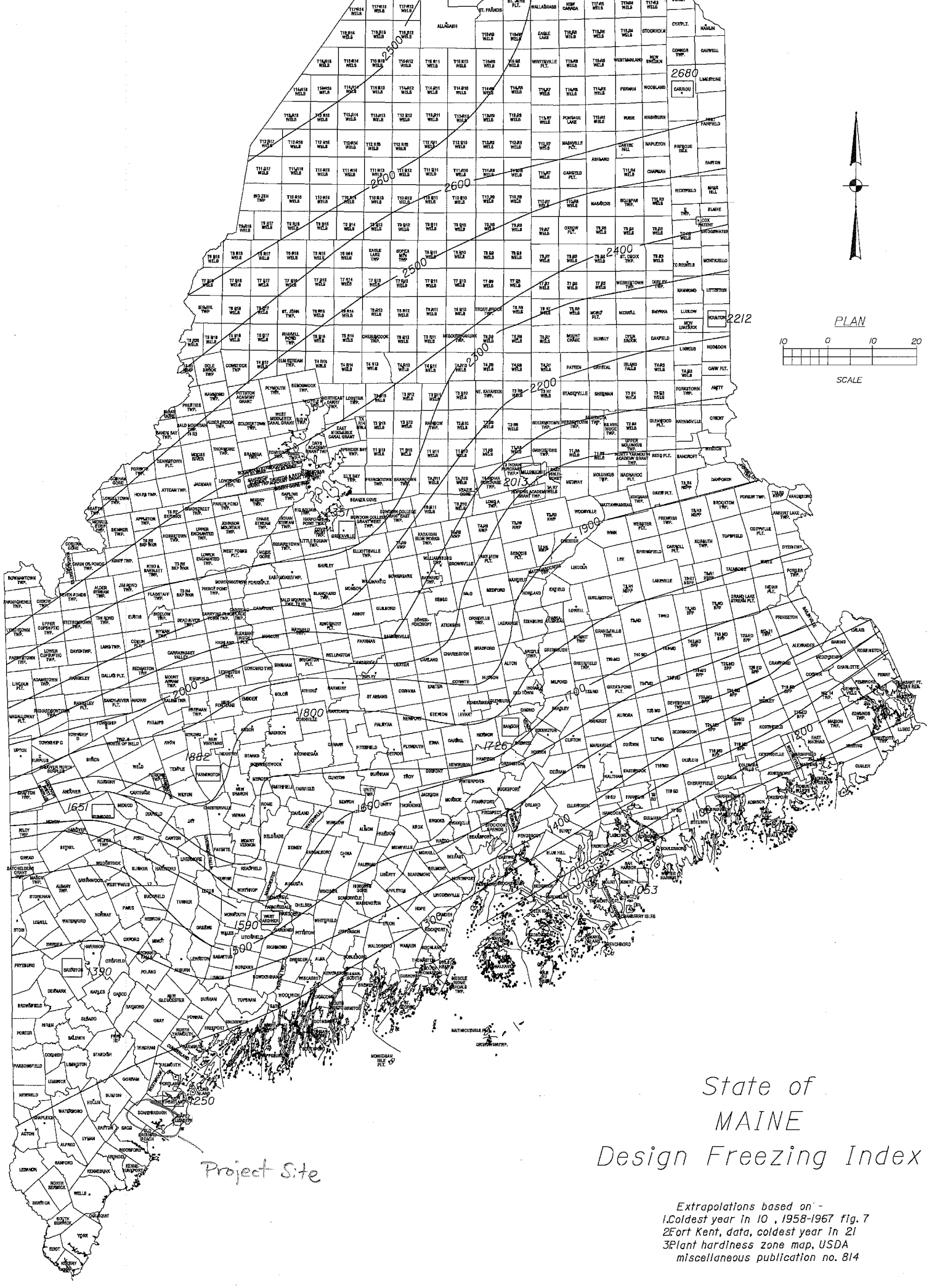
In order to estimate the depth of frost penetration at a site, Table 5-1 has been developed using the Modified Berggren equation and Figure 5-1 Maine Design Freezing Index Map. The use of Table 5-1 assumes site specific, uniform soil conditions where the Geotechnical Designer has evaluated subsurface conditions. Coarse-grained soils are defined as soils with sand as the major constituent. Fine-grained soils are those having silt and/or clay as the major constituent. If the make-up of the soil is not easily discerned, consult the Geotechnical Designer for assistance. In the event that specific site soil conditions vary, the depth of frost penetration should be calculated by the Geotechnical Designer.

Table 5-1 Depth of Frost Penetration

Design Freezing Index	Frost Penetration (in)					
	Coarse Grained			Fine Grained		
	w=10%	w=20%	w=30%	w=10%	w=20%	w=30%
1000	66.3	55.0	47.5	47.1	40.7	36.9
1100	69.8	57.8	49.8	49.6	42.7	38.7
1200	73.1	60.4	52.0	51.9	44.7	40.5
1275 → 1300	76.3	63.0	54.3	54.2	46.6	42.2
1400	79.2	65.5	56.4	56.3	48.5	43.9
1500	82.1	67.9	58.4	58.3	50.2	45.4
1600	84.8	70.2	60.3	60.2	51.9	46.9
1700	87.5	72.4	62.2	62.2	53.5	48.4
1800	90.1	74.5	64.0	64.0	55.1	49.8
1900	92.6	76.6	65.7	65.8	56.7	51.1
2000	95.1	78.7	67.5	67.6	58.2	52.5
2100	97.6	80.7	69.2	69.3	59.7	53.8
2200	100.0	82.6	70.8	71.0	61.1	55.1
2300	102.3	84.5	72.4	72.7	62.5	56.4
2400	104.6	86.4	74.0	74.3	63.9	57.6
2500	106.9	88.2	75.6	75.9	65.2	58.8
2600	109.1	89.9	77.1	77.5	66.5	60.0

Note: Where the Freezing Index and/or water content is between the presented values, linear interpretation may be used to determine the frost penetration.

Figure 5-1 Maine Design Freezing Index Map



Extrapolations based on -
1.Coldest year in 10 , 1958-1967 fig. 7
2Fort Kent, data, coldest year in 21
3Plant hardiness zone map, USDA
miscellaneous publication no. 814

Pine Point Bridge over B&M Railroad
MSE Wall @ STA 14+40
Scarborough, ME

Discipline: Geotechnical

Title: Global Stability Analysis for Proposed MSE Wall @ STA 14+40

MaineDOT PIN: 18229.00

Design Basis/Assumptions:

Purpose: Perform global stability analyses at proposed MSE Wall @ STA 14+40.

Assumptions:

1) Granular Borrow: Unit Weight = 125 pcf, Angle of Internal Friction = 32° from Table 3-3 in MaineDOT Bridge Design Guide.
2) MSE Block: Unit Weight = 130 pcf, Angle of Internal Friction = 34°, Cohesion = 1450 psf based upon State of the Practice of MSE Wall Design for Highway Structures.
3) Engineering properties for existing fill and the native silty sand soils encountered in borings BB-SBMR-201, SS-SBMR-208, BB-SBMR-103, BB-SBMR-104, and BB-SBMR-105 developed from standard penetration test (SPT) data, laboratory test results, and engineering judgment based on visual classification.
4) Groundwater conditions the same or similar to those observed in the subsurface explorations by Nobis. Groundwater modeled approximately EL. 15.0 to 8.8 feet, using vertical datum NAVD-88.
5) Surcharge loading of 250 psf, Seismic loading of 0.141g (Reference 4).
6) A footing embedment depth of 6.0 feet below ground surface under both static and seismic conditions.

Approach:

Use the computer slope stability analysis software Slide 6.0, by RocScience, Inc., to perform global stability analyses at the proposed MSE Wall @ STA 14+40 provided by Clough Harbour & Associates (CHA) (Reference 1).

References:

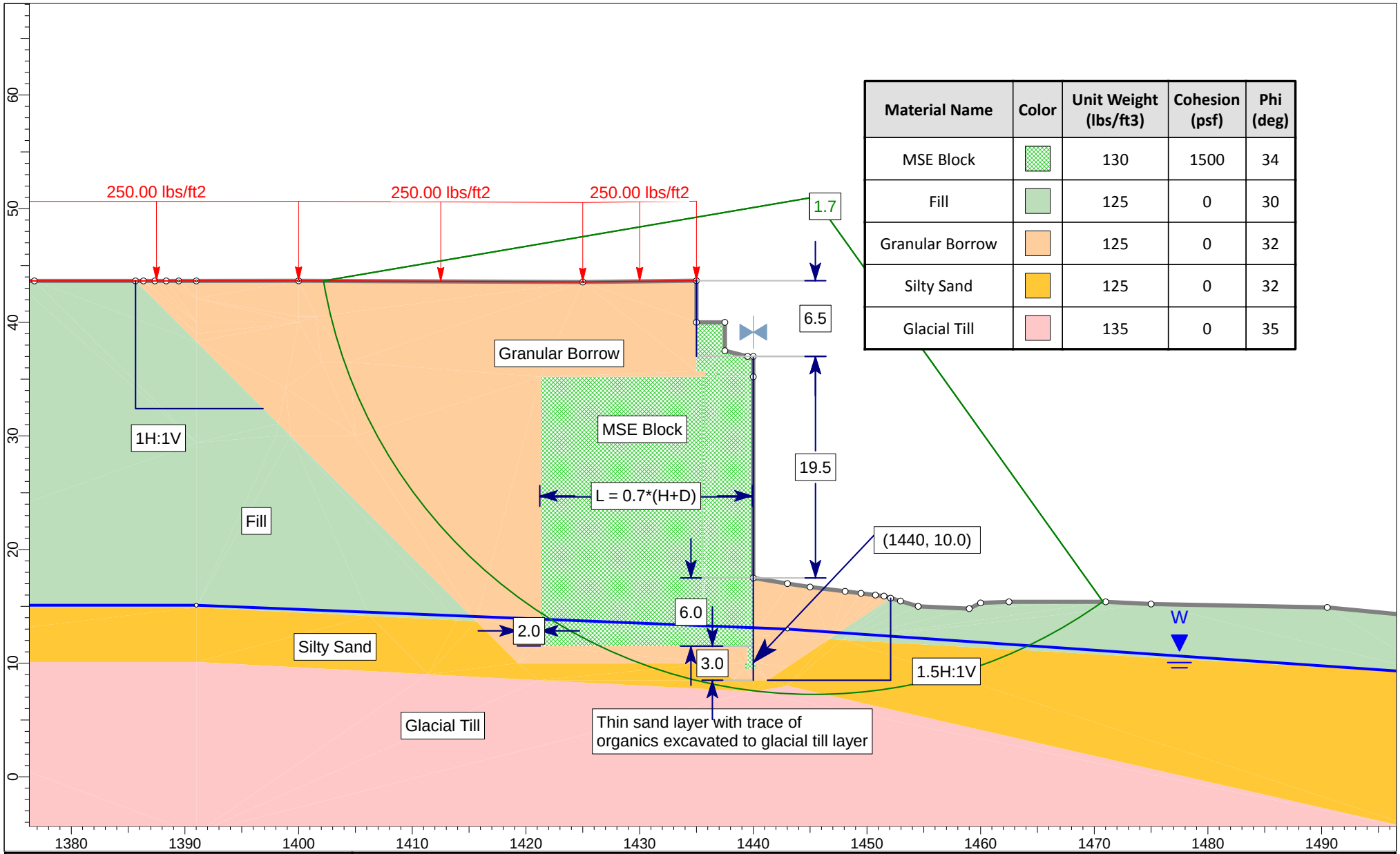
1) Design drawings provided by CHA, sent on June 17, 2015.
2) Laboratory test results provided by GeoTesting Express of Acton, Massachusetts.
3) SPT data and field classifications by Nobis at borings performed nearest to proposed MSE Wall (BB-SBMR-201, SS-SBMR-208, BB-SBMR-103, BB-SBMR-104, and BB-SBMR-105).
4) Seismic site classification and seismic parameters developed by Nobis.

Remarks/Conclusions:

Based on the Slide analysis, the minimum factor of safety against global slope failure is 1.7 under static conditions and 1.3 under seismic load conditions, assuming an embedment depth of 6.0 feet below ground surface.

Originated By: Kamil Kocia, Staff Engineer Date: 6/22/2015

Approved By: Justin Mailloux, PE Date: 6/29/2015

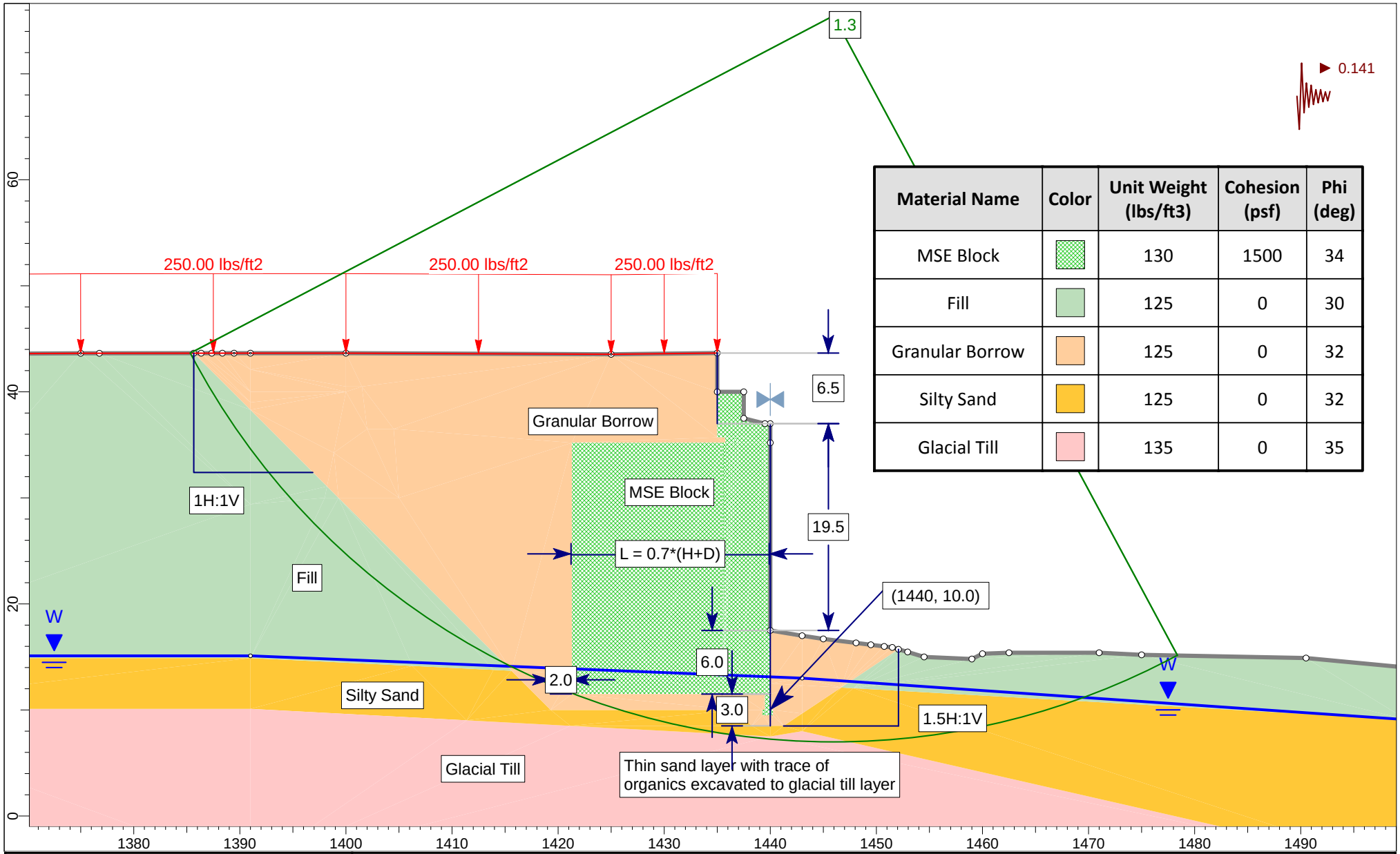


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
MSE Block		130	1500	34
Fill		125	0	30
Granular Borrow		125	0	32
Silty Sand		125	0	32
Glacial Till		135	0	35

Nobis
Engineering a Sustainable Future

Project	West Abutment - Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Slope Stability		
Drawn By	KK chk: JM	Scale	1:140
Company	Nobis Engineering Inc.		
Date	7/9/2015	File Name	MSE Wall - West Abutment.slim

SLIDEINTERPRET 6.020



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
MSE Block		130	1500	34
Fill		125	0	30
Granular Borrow		125	0	32
Silty Sand		125	0	32
Glacial Till		135	0	35

Nobis
Engineering a Sustainable Future

Project	West Abutment - Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Slope Stability		
Drawn By	KK chk: JM	Scale 1:150	Company Nobis Engineering Inc.
Date	7/9/2015		File Name MSE Wall - West Abutment.slim

SLIDEINTERPRET 6.020

Pine Point Bridge over B&M Railroad
MSE Wall @ STA 15+61
Scarborough, ME

Discipline: Geotechnical

Title: Global Stability Analysis for Proposed MSE Wall @ STA 15+61

MaineDOT PIN: 18229.00

Design Basis/Assumptions:

Purpose: Perform global stability analyses at proposed MSE Wall @ STA 15+61.

Assumptions:

1) Granular Borrow: Unit Weight = 125 pcf, Angle of Internal Friction = 32° from Table 3-3 in MaineDOT Bridge Design Guide.
2) MSE Block: Unit Weight = 130 pcf, Angle of Internal Friction = 34°, Cohesion = 1450 psf based upon State of the Practice of MSE Wall Design for Highway Structures.
3) Engineering properties for existing fill and the native silty sand soils encountered in borings BB-SBMR-101, BB-SBMR-102, and BB-SBMR-203 developed from standard penetration test (SPT) data, laboratory test results, and engineering judgment based on visual classification.
4) Groundwater conditions the same or similar to those observed in the subsurface explorations by Nobis. Groundwater modeled at approximately EL. 9.5 feet, using vertical datum NAVD-88.
5) Surcharge loading of 250 psf, Seismic loading of 0.141g (Reference 4).
6) A footing embedment depth of 4.8 feet below ground surface under both static and seismic conditions.

Approach:

Use the computer slope stability analysis software Slide 6.0, by RocScience, Inc., to perform global stability analyses at the proposed MSE Wall @ STA 15+61 provided by Clough Harbour & Associates(CHA) (Reference 1).

References:

1) Design drawings provided by CHA, sent on June 17, 2015.
2) Laboratory test results provided by GeoTesting Express of Acton, Massachusetts.
3) SPT data and field classifications by Nobis at borings performed nearest to proposed MSE Wall (BB-SBMR-101, BB-SBMR-102, and BB-SBMR-203).
4) Seismic site classification and seismic parameters developed by Nobis.

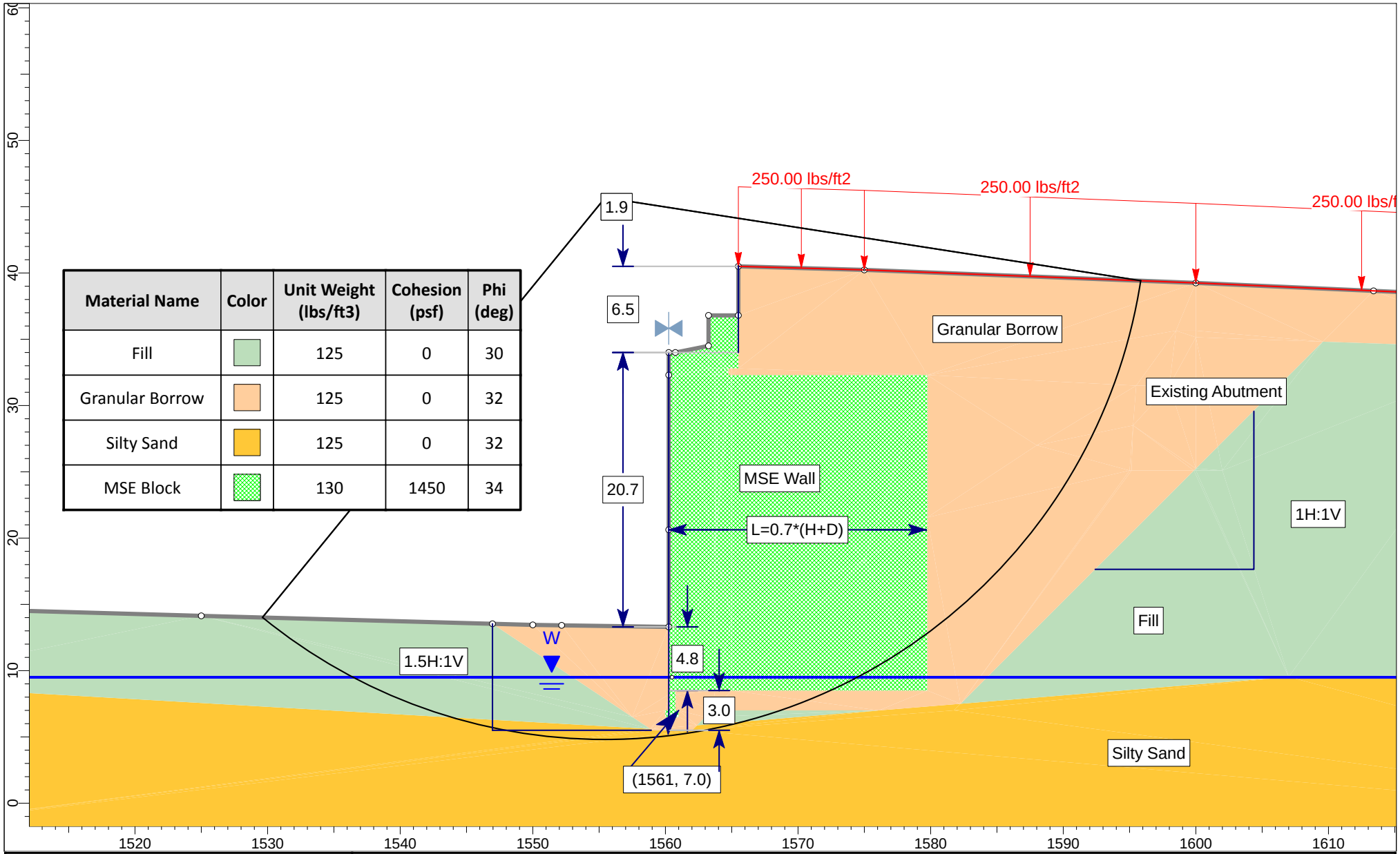
Remarks/Conclusions:

Based on the Slide analysis, the minimum factor of safety against global slope failure is 1.9 under static conditions and 1.4 under seismic load conditions, assuming an embedment depth of 4.8 feet below ground surface.

Originated By: Kamil Kocia, Staff Engineer Date: 6/22/2015

Approved By: Justin Mailloux, PE Date: 6/29/2015

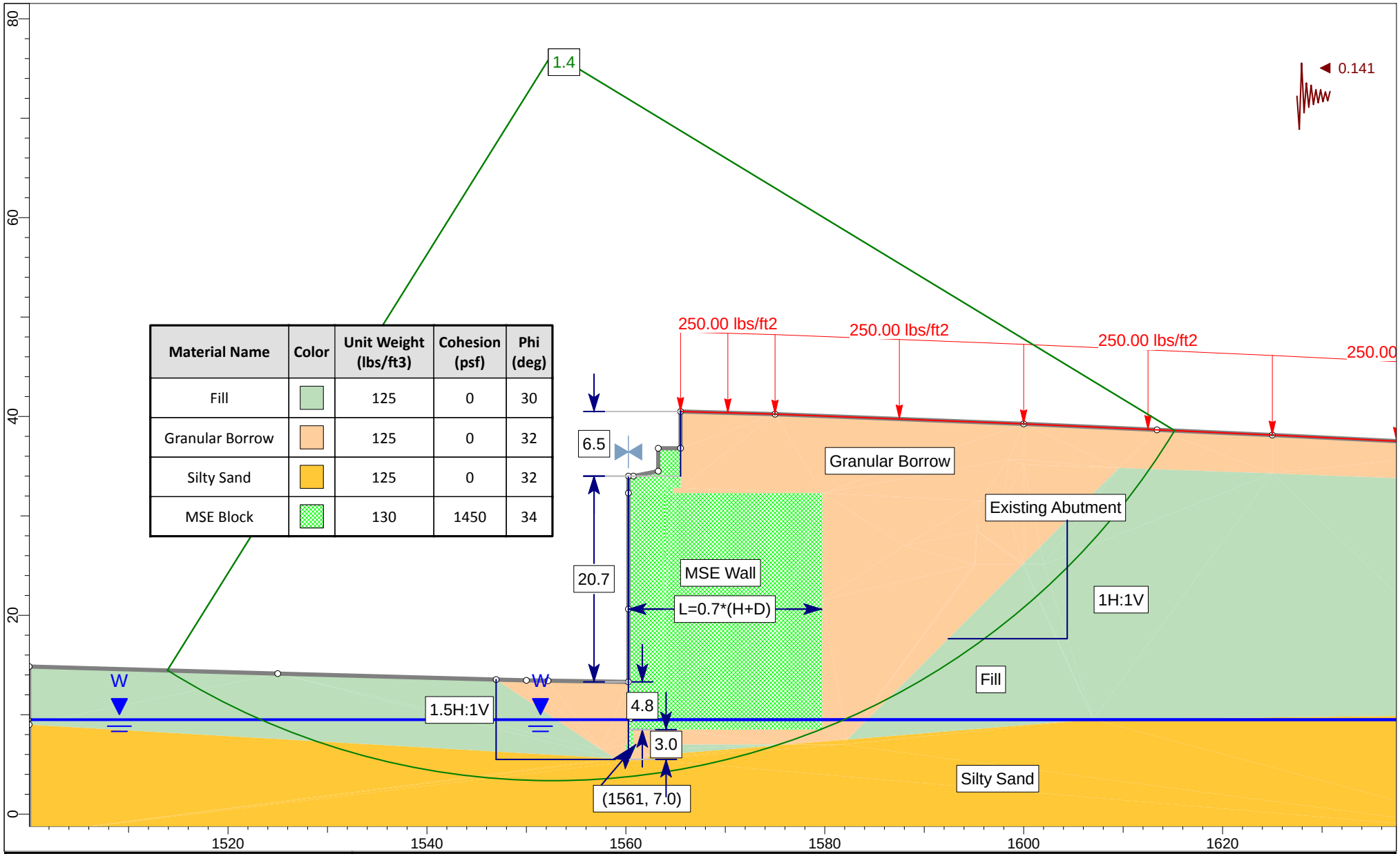
Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Fill		125	0	30
Granular Borrow		125	0	32
Silty Sand		125	0	32
MSE Block		130	1450	34



Nobis
Engineering a Sustainable Future

Project	East Abutment - Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Slope Stability		
Drawn By	KK chk: JM	Scale 1:120	Company Nobis Engineering Inc.
Date	7/10/2015		File Name MSE Wall - East Abutment (seismic).slim

SLIDEINTERPRET 6.020



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Fill		125	0	30
Granular Borrow		125	0	32
Silty Sand		125	0	32
MSE Block		130	1450	34

Nobis
Engineering a Sustainable Future

Project	East Abutment - Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Slope Stability		
Drawn By	KK chk: JM	Scale 1:160	Company Nobis Engineering Inc.
Date	7/10/2015		File Name MSE Wall - East Abutment (seismic).slim

SLIDEINTERPRET 6.020

Calculated by: RAC Date: 5/13/2015
Checked by: BTW Date: 5/17/2015

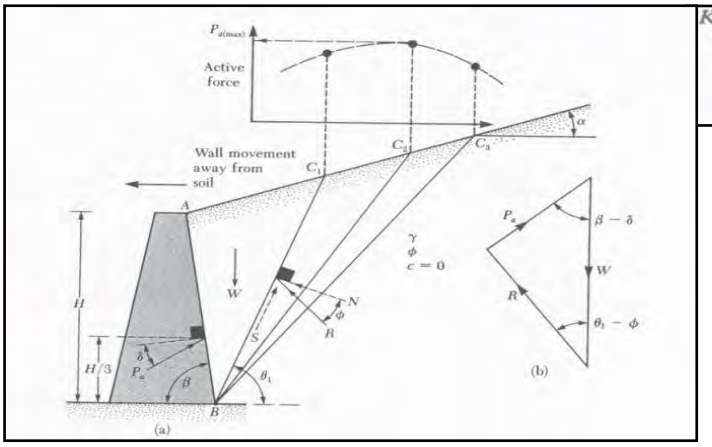
Objective: Calculate lateral earth pressure coefficients for the MSE walls on the east and west abutments.

Approach: Use Coulomb's method to determine active earth pressure coefficient and Rankine's method to determine passive earth pressure coefficients in accordance with MaineDOT Bridge Design Manual.

References:
1. MaineDOT Bridge Design Guide, 2003, with revisions through 2008.
2. Principles of Foundation Engineering, Second Edition, Das.
3. AASHTO Bridge Design Specifications, 2014.
4. NAVFAC DM 7.02

Assumptions:
1. Retained soil is granular borrow, γ = 125 pcf, ϕ' 32°, in accordance with Table 3-3 from Reference No 1.
2. δ = 0°.

Active Earth Pressure using Coulomb's Method (Principles of Foundation Engineering, Second Edition, Das)



K_a = Coulomb's active earth pressure coefficient

$$= \frac{\sin^2(\beta+\phi)}{\sin^2\beta \cdot \sin(\beta-\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\cdot\sin(\phi-\alpha)}{\sin(\beta-\delta)\cdot\sin(\alpha+\beta)}}\right]^2}$$

α = backslope angle
β = wall batter angle
ϕ = soil friction angle
δ = soil/wall friction angle

Proposed Wall

α	β	ϕ	δ
0	90	32	0

K_a = 0.31 **(Use for proposed walls)**

Passive Earth Pressure using Rankine's Method (Principles of Foundation Engineering, Second Edition, Das)

K_p = 3.25

$$K_{p(R)} = \cos\alpha \frac{\cos\alpha + \sqrt{\cos^2\alpha - \cos^2\phi'}}{\cos\alpha - \sqrt{\cos^2\alpha - \cos^2\phi'}}$$

Pine Point Bridge over B&M Railroad
Sheet Pile Wall @ STA 16+00
Scarborough, ME

Discipline: Geotechnical

Title: Global Stability Analysis for Proposed Sheet Pile Wall @ STA 16+00

MaineDOT PIN: 18229.00

Design Basis/Assumptions:

Purpose: Perform global stability analyses on proposed Sheet Pile Wall @ STA 16+00.

Assumptions:

1) Granular Borrow: Unit Weight = 125 pcf, Angle of Internal Friction = 32° from Table 3-3 in MaineDOT Bridge Design Guide.
2) Engineering properties for existing fill and the native silty sand soils encountered in borings BB-SBMR-101, BB-SBMR-207, B-6, and B-7 developed from standard penetration test (SPT) data, laboratory test results, and engineering judgment based on visual classification.
3) Groundwater conditions the same or similar to those observed in the subsurface explorations by Nobis. Groundwater modeled approximately 9.2 feet, using a vertical datum of NAVD-88.
4) Surcharge loading of 250 psf, Seismic loading of 0.141g (Reference 4).
5) A wall embedment depth of 21.2 feet below ground surface under both static and seismic conditions.

Approach:

Use the computer slope stability analysis software Slide 6.0, by RocScience, Inc., to perform global stability analyses based on the proposed Sheet Pile Wall @ STA 16+00 provided by Clough Harbour & Associates(CHA) (Reference 1).

References:

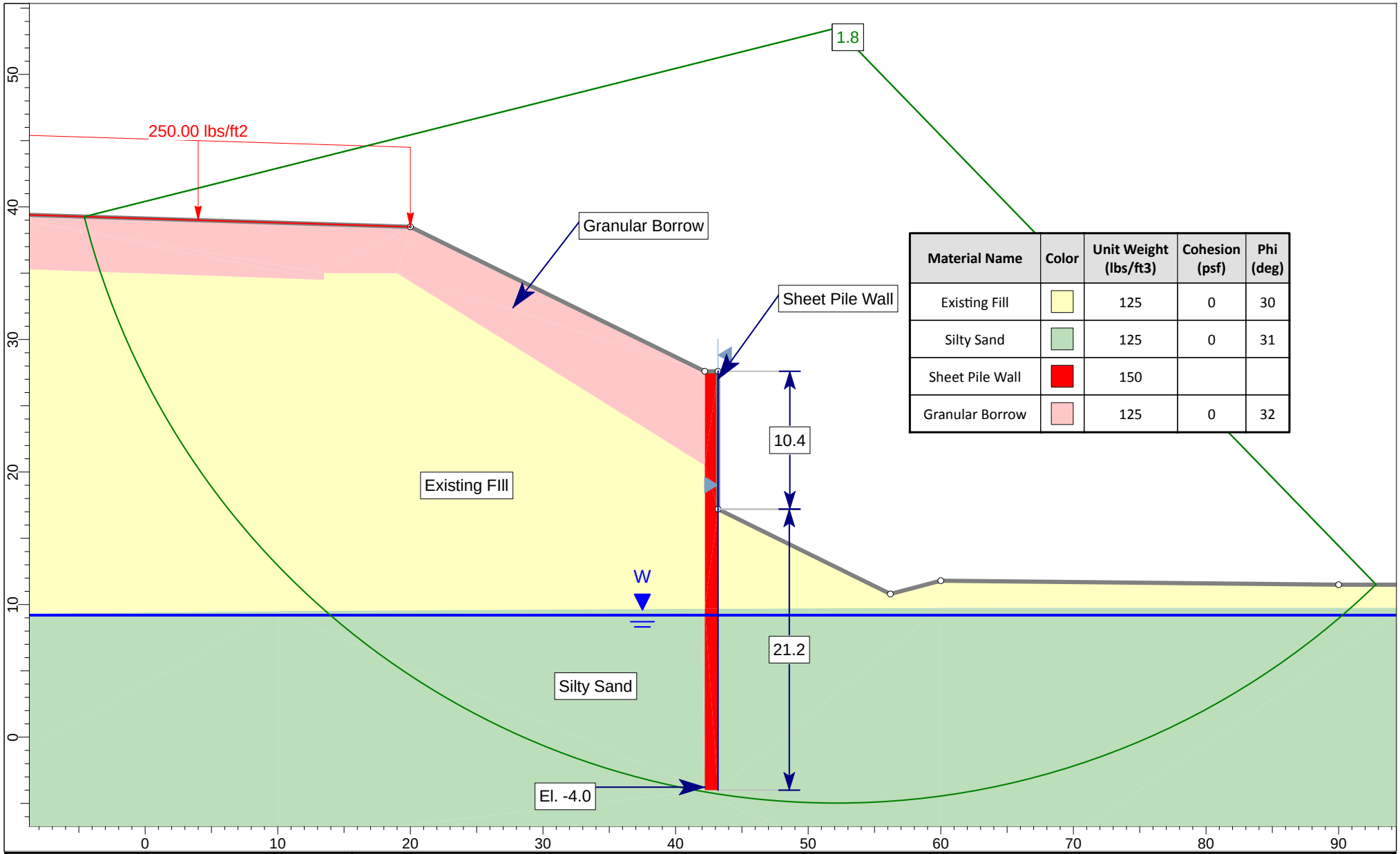
1) Design drawings provided by CHA, sent on June 17, 2015.
2) Laboratory test results provided by GeoTesting Express of Acton, Massachusetts.
3) SPT data and field classifications by Nobis and others at borings performed nearest proposed Retaining Wall (BB-BSMR-101, BB-SBMR-207, B-6, and B-7).
4) Seismic site classification and seismic parameters developed by Nobis.

Remarks/Conclusions:

Based on the Slide analysis, the minimum factor of safety against global slope failure is 1.8 under static conditions and 1.3 under seismic load conditions, assuming a wall embedment depth of 21.2 feet below ground surface.

Originated By: Rob Clopper, EIT; Kamil Kocia, Staff Engineer Date: 6/17/2015

Approved By: Patrick Clarke, EIT; Justin Mailloux, PE Date: 6/26/2015

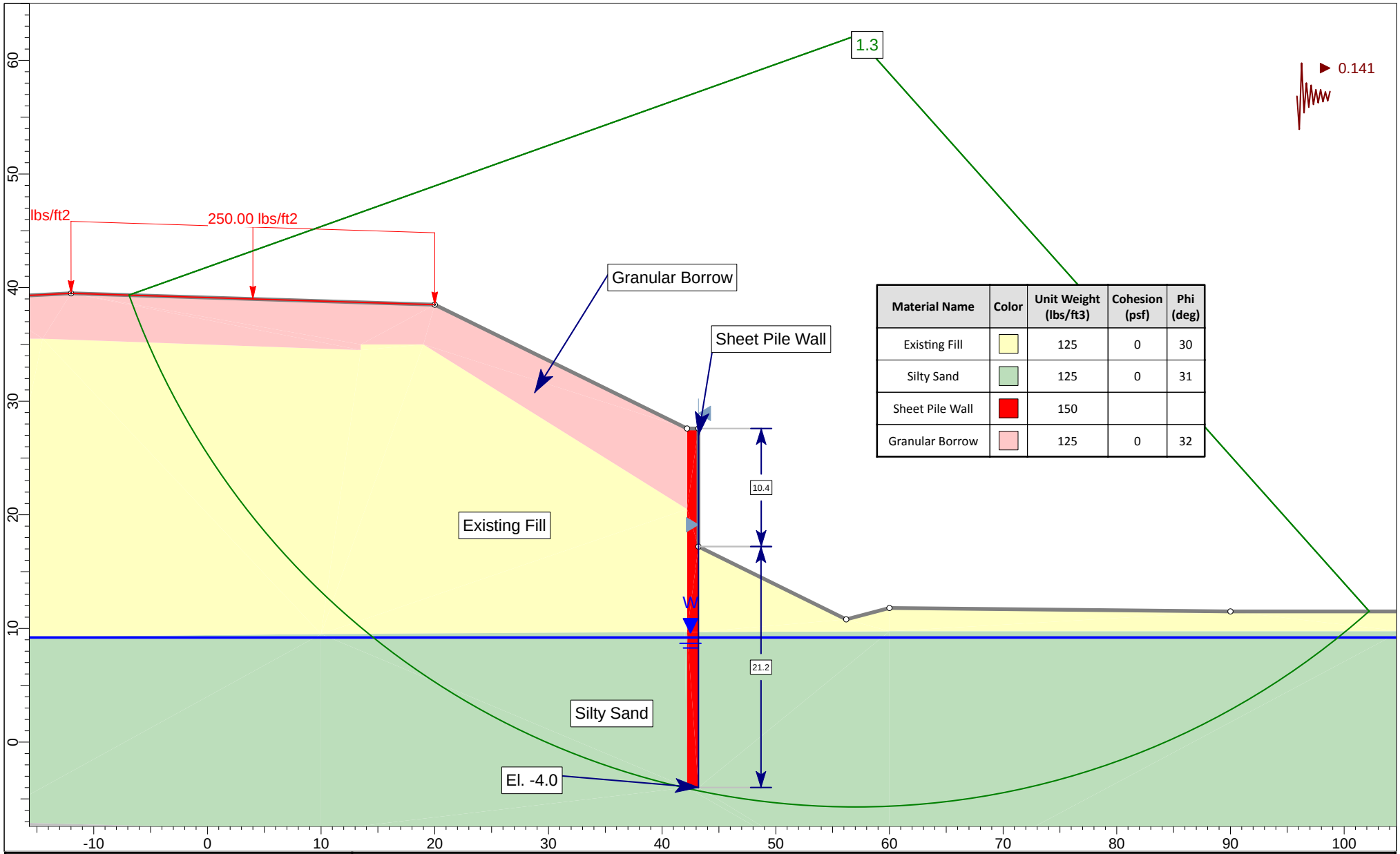


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Sheet Pile Wall		150		
Granular Borrow		125	0	32

Nobis
Engineering a Sustainable Future

Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for Sheetpile Wall @ STA 16+00		
Drawn By	RC/KK chk: PCC	Scale 1:120	Company Nobis Engineering, Inc.
Date	6/29/2015		File Name STA 16+00.slim

SLIDEINTERPRET 6.020



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Sheet Pile Wall		150		
Granular Borrow		125	0	32

Nobis
Engineering a Sustainable Future

Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for Sheetpile Wall @ STA 16+00		
Drawn By	RC/KK chk: PCC	*Scale* 1:140	*Company* Nobis Engineering, Inc.
Date	6/29/2015		*File Name* STA 16+00 (seismic).slim

SLIDEINTERPRET 6.020

Calculated by: RAC Date: 5/13/2015
Checked by: BTW Date: 5/16/2015

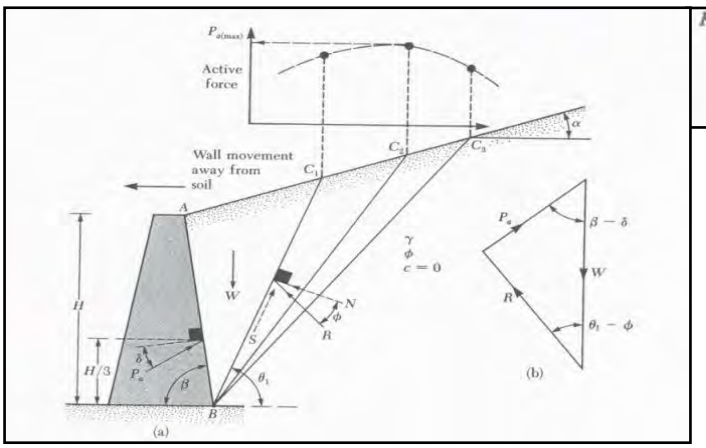
Objective: Calculate lateral earth pressure coefficients for the sheet pile retaining wall along the east embankment.

Approach: Use Coulomb's method to determine active earth pressure coefficient and Rankine's method to determine passive earth pressure coefficients in accordance with MaineDOT Bridge Design Manual.

References:
1. MaineDOT Bridge Design Guide, 2003, with revisions through 2008.
2. Principles of Foundation Engineering, Second Edition, Das.
3. AASHTO Bridge Design Specifications, 2014.
4. NAVFAC DM 7.02

Assumptions:
1. Retained soil is granular borrow, γ = 125 pcf, ϕ' 32°, in accordance with Table 3-3 from Reference No 1.
2. δ = 14°, interface of sheet pile wall and silty sand, in accordance with Table 1 from Reference No. 4

Active Earth Pressure using Coulomb's Method (Principles of Foundation Engineering, Second Edition, Das)



K_a = Coulomb's active earth pressure coefficient

$$= \frac{\sin^2(\beta+\phi)}{\sin^2\beta \cdot \sin(\beta-\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\cdot\sin(\phi-\alpha)}{\sin(\beta-\delta)\cdot\sin(\alpha+\beta)}}\right]^2}$$

α = backslope angle
β = wall batter angle
ϕ = soil friction angle
δ = soil/wall friction angle

Proposed Wall

α	β	ϕ	δ
26.6	90	27.0	11

K_a = 0.71 **(Use for proposed walls)**

Passive Earth Pressure using Rankine's Method (Principles of Foundation Engineering, Second Edition, Das)

K_p = 1.06

$$K_{p(R)} = \cos\alpha \frac{\cos\alpha + \sqrt{\cos^2\alpha - \cos^2\phi'}}{\cos\alpha - \sqrt{\cos^2\alpha - \cos^2\phi'}}$$

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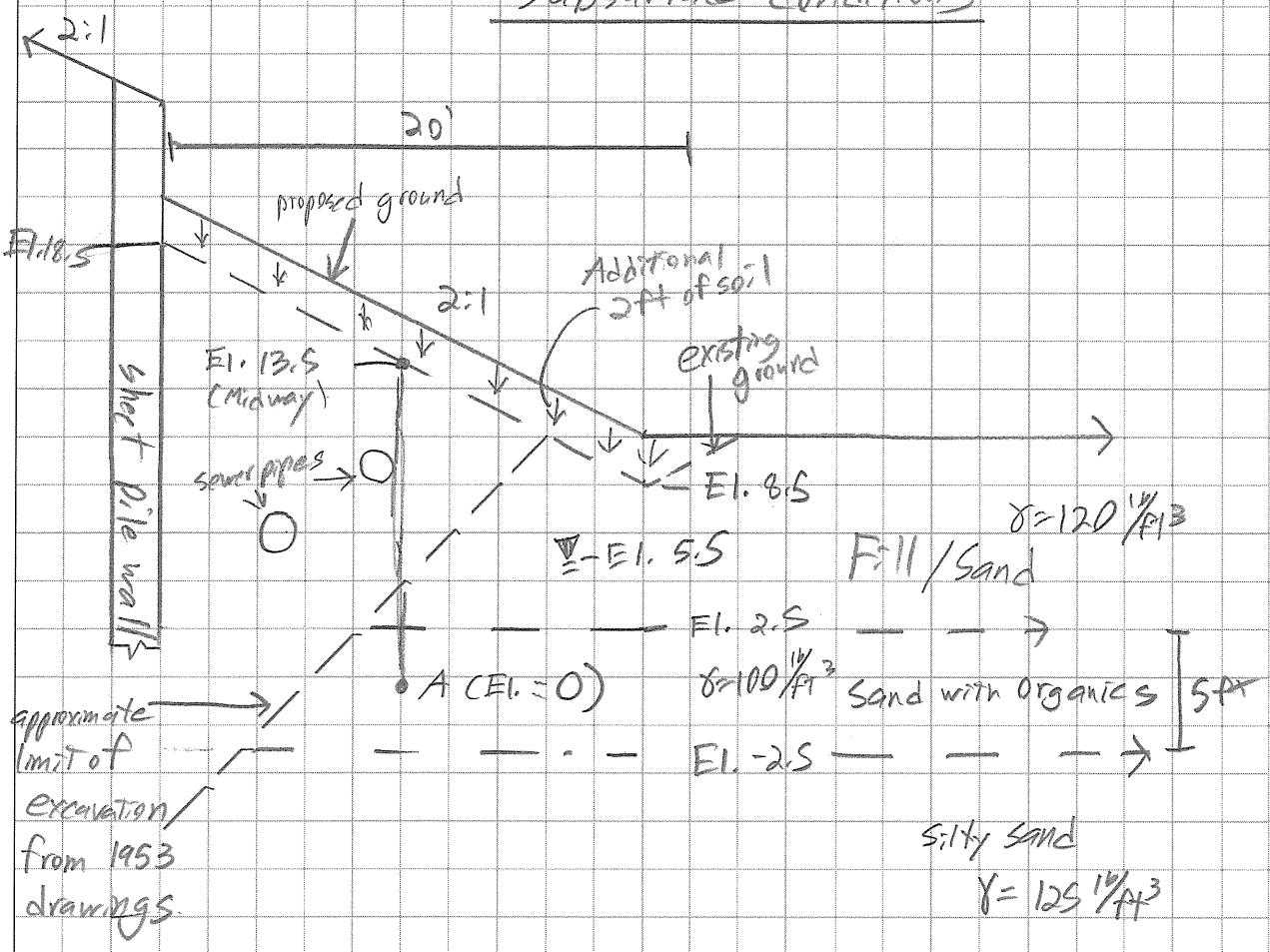
Consolidation Settlement from Organics

Purpose - Determine Primary & Secondary consolidation settlement of organics encountered at eastern bankment, induced by proposed fill above the existing sewer lines.

References -
1.) An Introduction to Geotechnical Engineering, Holtz & Kovacs
2.) Nobis Boring Log BB-SBMR-206
3.) Drawings provided by CHA dated February 2015.
4.) Lab data for organic layer
5.) Historic Drawings from 1953

Solution -

Subsurface Conditions



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JOB 85970.01 – Scarborough, ME Settlement
SHEET NO. 2 OF 6
CALCULATED BY RAC DATE 5/26/2015
CHECKED BY BTW DATE 5/27/2015
SCALE

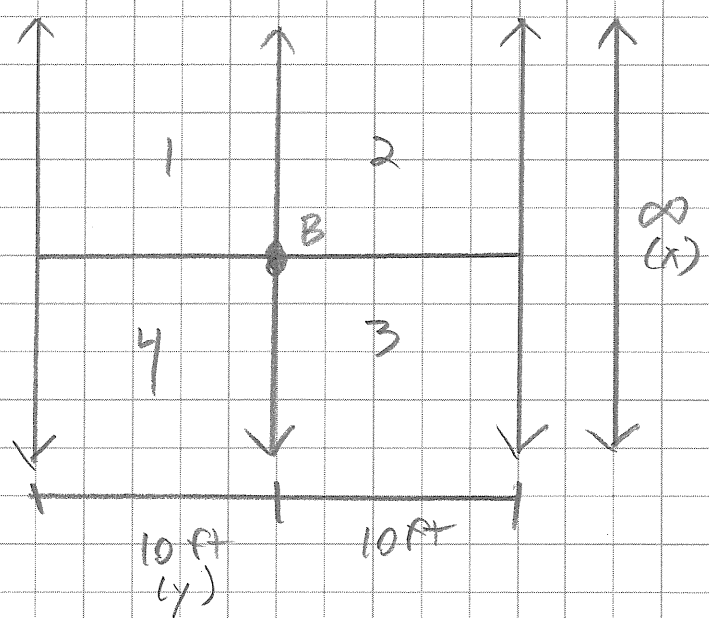
* compute Effective stress at Point A [σ_i']

$$\sigma_i' = (120\,\text{lb/ft}^3)(8\,\text{ft}) + (120\,\text{lb/ft}^3 - 62.4\,\text{lb/ft}^3)(3\,\text{ft}) + (100\,\text{lb/ft}^3 - 62.4\,\text{lb/ft}^3)(2.5\,\text{ft})$$

$$\sigma_i' = 1.23\,\text{ksf}$$

* Compute Change in Effective stress at Point A ($\Delta\sigma'_A$)

$\Delta\sigma' = q_o * I$ from Eq 8-30, Reference 1, for corner.



Distance from point B (El 13.5) To point A (El. 0)

$Z = 13.5$ ft.

$m = \frac{x}{z} \Rightarrow \frac{\infty}{13.5} \Rightarrow m = \infty$

$n = \frac{y}{z} \Rightarrow \frac{10\,\text{ft}}{13.5\,\text{ft}} \Rightarrow n = 0.74$

For $m = \infty$ & $n = 0.74 \Rightarrow I = 0.182$

So $\Delta\sigma' = (4)(q_o)(I) \Rightarrow (4)(0.250\,\text{ksf})(0.182) \Rightarrow \Delta\sigma' = 0.182\,\text{ksf}$

* Compute Primary Consolidation Settlement

Assume OCR = 1, C_c will govern, $C_c = 1.15 \times 10^{-2}$ (mc) [1.15% [C_c from Table 8-2, Ref 1]] $\Rightarrow C_c = 1.9$

$$S_c = \left(\frac{C_c}{1+e_o}\right)(H_o)\log\left[\frac{\sigma_i' + \Delta\sigma'}{\sigma_i'}\right] \Rightarrow \left(\frac{1.9}{1+4}\right)(5\,\text{ft})\log\left[\frac{1.23 + 0.182}{1.23}\right] \Rightarrow .113\,\text{ft}$$

or 1.37 in

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JOB 65970.01 – Scarborough, ME - settlement
SHEET NO. 3 OF 6
CALCULATED BY RAC DATE 5/26/2015
CHECKED BY BTW DATE 5/27/2015
SCALE

* compute Secondary Consolidation settlement

Time of EOP consolidation => $t = \frac{T * H_{dr}^2}{C_v}$

where $T = 0.848$ for $U_{ave} = 90\%$, Table 9-1, Reference No. 1

$H_{dr} = 2.5$ ft [dual drainage of 5 ft layer]

$C_v = 3\ m^2/yr$ from Table 9-3, Ref. 1 for Organic Silt

$\Downarrow$ $32\ ft^2/year$

so $t = \frac{0.848 * 2.5\ ft^2}{32\ ft^2/year} \Rightarrow t = 0.1656$ year ✓

$S_s = C_{\alpha\epsilon} * H_o\ (\Delta \log t)$

where $C_{\alpha\epsilon} = 0.013$ from Figure 9.12, Reference No. 1

For 50 year design life => $S_s = (0.013)(5\ ft) \log\left(\frac{50\ years}{0.1656\ years}\right) \Rightarrow S_s = 0.16$ ft or 1.93 in

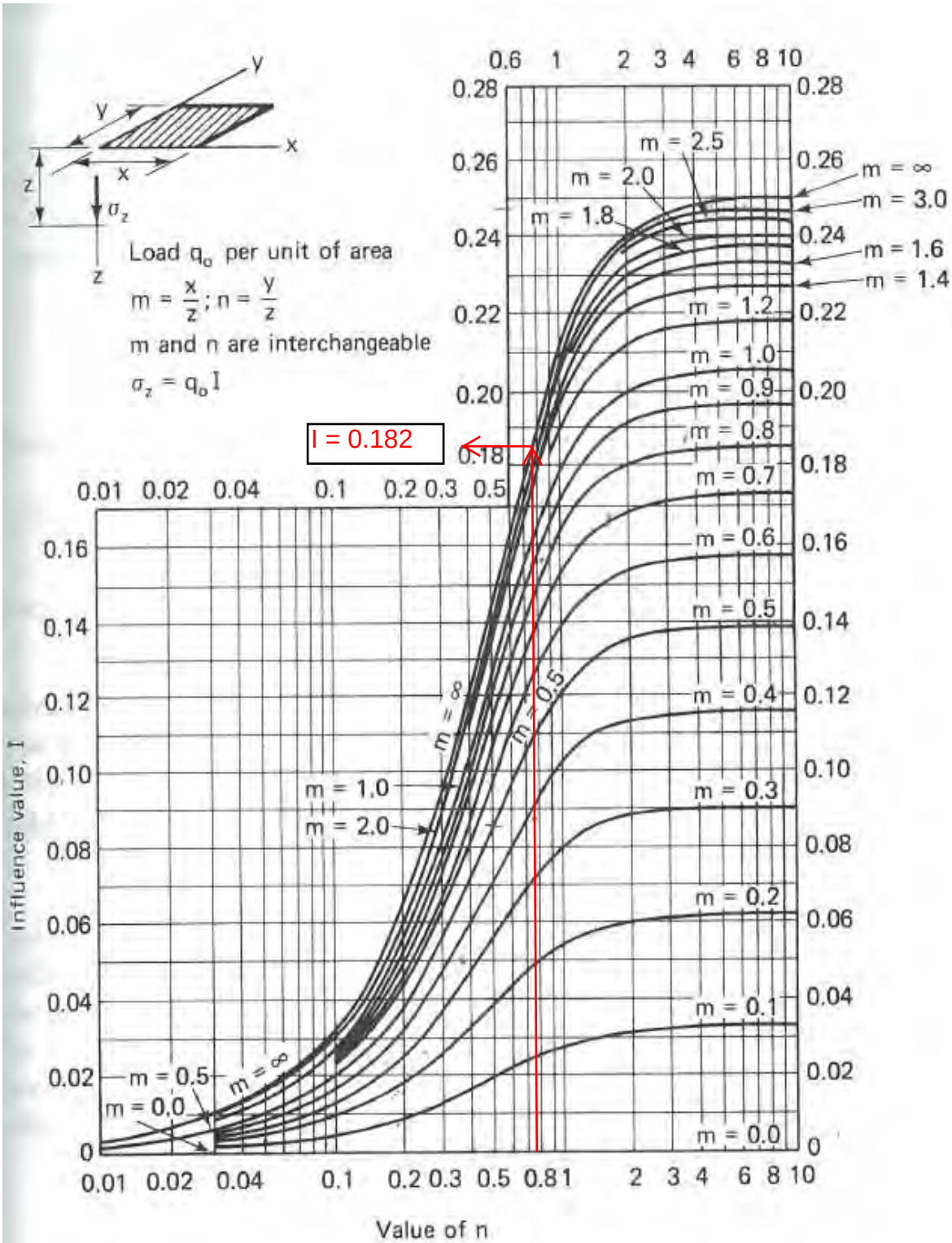


Fig. 8.21 Influence value for vertical stress under corner of a uniformly loaded rectangular area (after U.S. Navy, 1971).

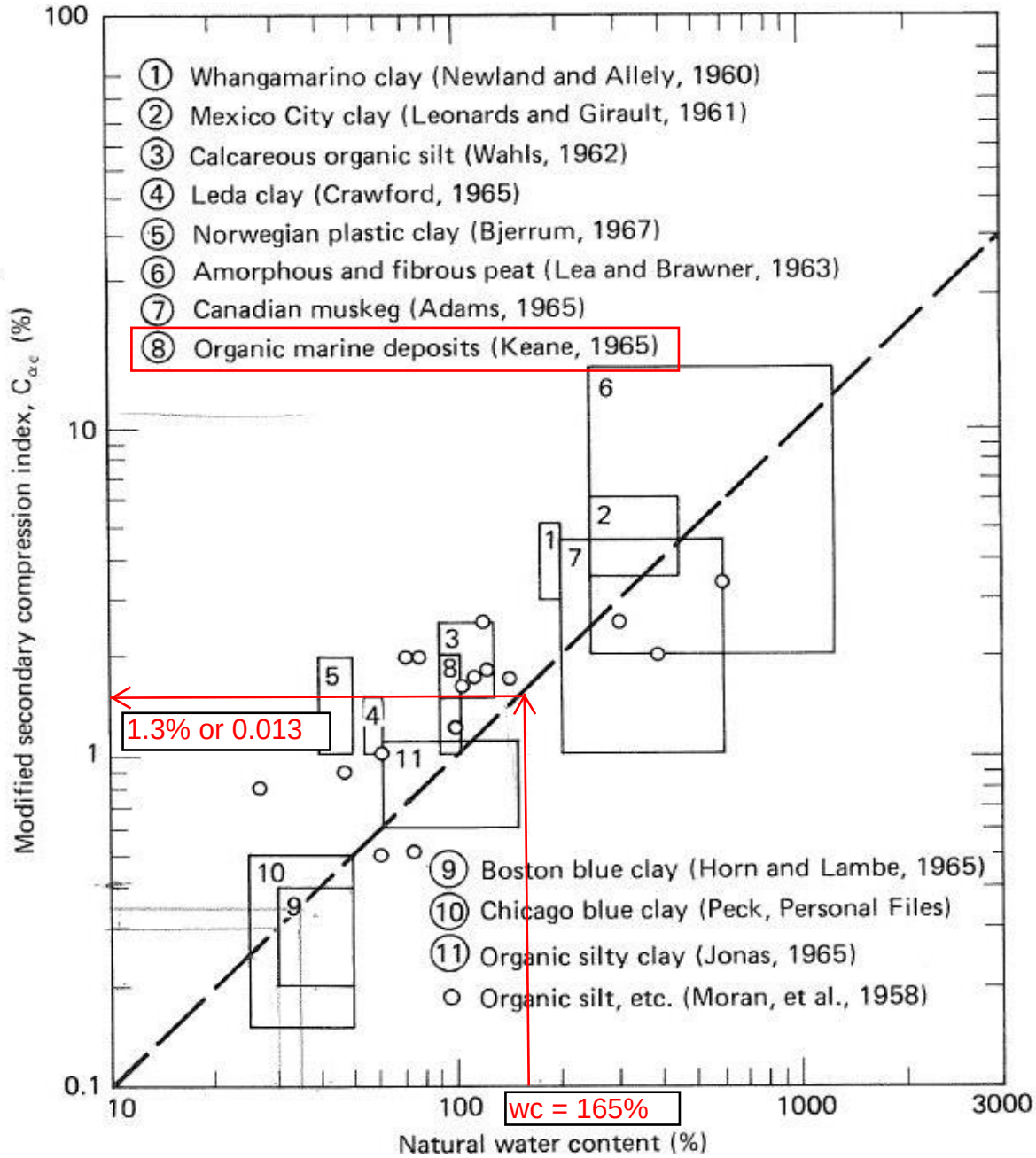


Fig. 9.12 Modified secondary compression index versus natural water content. (After Mesri, 1973. See Mesri, 1973 for details of the references included in this figure.)

TABLE 9-1

U_{avg}	T
0.1	0.008
0.2	0.031
0.3	0.071
0.4	0.126
0.5	0.197
0.6	0.287
0.7	0.403
0.8	0.567
0.9	0.848
0.95	1.163
1.0	∞

TABLE 8-2 Some Empirical Equations for C_c and $C_{c\epsilon}$*

Equation	Regions of Applicability
$C_c = 0.007\,(LL - 7)$	Remolded clays
$C_{c\epsilon} = 0.208 e_o + 0.0083$	Chicago clays
$C_c = 17.66 \times 10^{-5} w_n^2 + 5.93 \times 10^{-3} w_n - 1.35 \times 10^{-1}$	Chicago clays
$C_c = 1.15(e_o - 0.35)$	All clays
$C_c = 0.30(e_o - 0.27)$	Inorganic, cohesive soil; silt, some clay; silty clay; clay
$C_c = 1.15 \times 10^{-2} w_n$	Organic soils–meadow mats, peats, and organic silt and clay
$C_c = 0.75(e_o - 0.50)$	Soils of very low plasticity
$C_{c\epsilon} = 0.156 e_o + 0.0107$	All clays
$C_c = 0.01 w_n$	Chicago clays

*As summarized by Azzouz, Krizek, and Corotis (1976).
Note: w_n = natural water content.

TABLE 9-3 Typical Values of the Coefficient of Consolidation c_v

Soil	c_v cm²/s, $\times 10^{-4}$	c_v m²/yr
Boston blue clay (CL) (Ladd and Luscher, 1965)	40 ± 20	12 ± 6
Organic silt (OH) (Lowe, Zaccheo, and Feldman, 1964)	2–10	0.6–3
Glacial lake clays (CL) (Wallace and Otto, 1964)	6.5–8.7	2.0–2.7
Chicago silty clay (CL) (Terzaghi and Peck, 1967)	8.5	2.7
Swedish medium sensitive clays (CL-CH) (Holtz and Broms, 1972)		
1. laboratory	0.4–0.7	0.1–0.2
2. field	0.7–3.0	0.2–1.0
San Francisco Bay Mud (CL)	2–4	0.6–1.2
Mexico City clay (MH) (Leonards and Girault, 1961)	0.9–1.5	0.3–0.5

Pine Point Bridge over B&M Railroad
Embankments @ STA 14+00
Scarborough, ME

Discipline: Geotechnical

Title: Global Stability Analysis for Proposed Embankments @ STA 14+00

MaineDOT PIN: 18229.00

Design Basis/Assumptions:

Purpose: Perform global stability analyses on proposed Embankments @ STA 14+00.

Assumptions:

1) Granular Borrow: Unit Weight = 125 pcf, Angle of Internal Friction = 32° from Table 3-3 in MaineDOT Bridge Design Guide.
2) Engineering properties for existing fill and the native silty sand soils encountered in borings BB-SBMR-105, BB-SBMR-201, BB-SBMR-208, B-1 and B-10 developed from standard penetration test (SPT) data, laboratory test results, and engineering judgment based on visual classification.
3) Groundwater conditions the same or similar to those observed in the subsurface explorations by Nobis. Groundwater modeled approximately 9.2 feet, using a vertical datum of NAVD-88.
4) Evaluate both sides of the embankment (North & South) under static and seismic conditions.
5) Surcharge loading of 250 psf, Seismic loading of 0.141g (Reference 4).

Approach:

Use the computer slope stability analysis software Slide 6.0, by RocScience, Inc., to perform global stability analyses based on the proposed Embankments @ STA 14+00 provided by Clough Harbour & Associates(CHA) (Reference 1).

References:

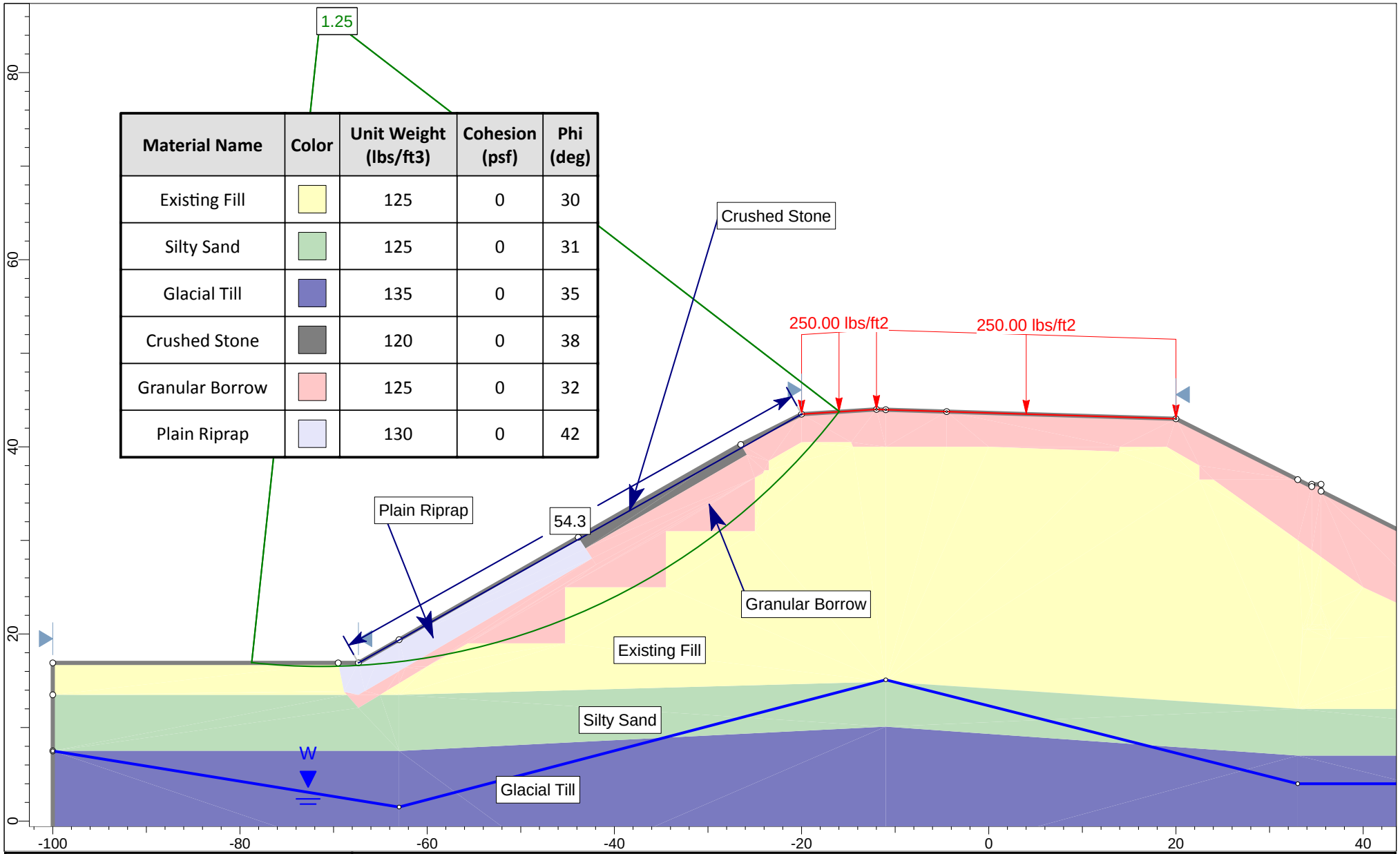
1) Design drawings provided by CHA, sent on June 17, 2015.
2) Laboratory test results provided by GeoTesting Express of Acton, Massachusetts.
3) SPT data and field classifications by Nobis and others at borings performed nearest proposed Retaining Wall (BB-SBMR-105, BB-SBMR-201, and BB-SBMR-208, B-1 and B-10).
4) Seismic site classification and seismic parameters developed by Nobis.

Remarks/Conclusions:

Based on the Slide analysis, the minimum factor of safety against global slope failure is 1.25 under static conditions and 1.0 under seismic load conditions for the North side. For the South side, the minimum factor of safety against global slope failure is 1.33 under static conditions and 1.0 under seismic load conditions.

Originated By: Kamil Kocia, Staff Engineer Date: 7/2/2015

Approved By: Justin Mailloux, PE Date: 7/17/2015



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Glacial Till		135	0	35
Crushed Stone		120	0	38
Granular Borrow		125	0	32
Plain Riprap		130	0	42

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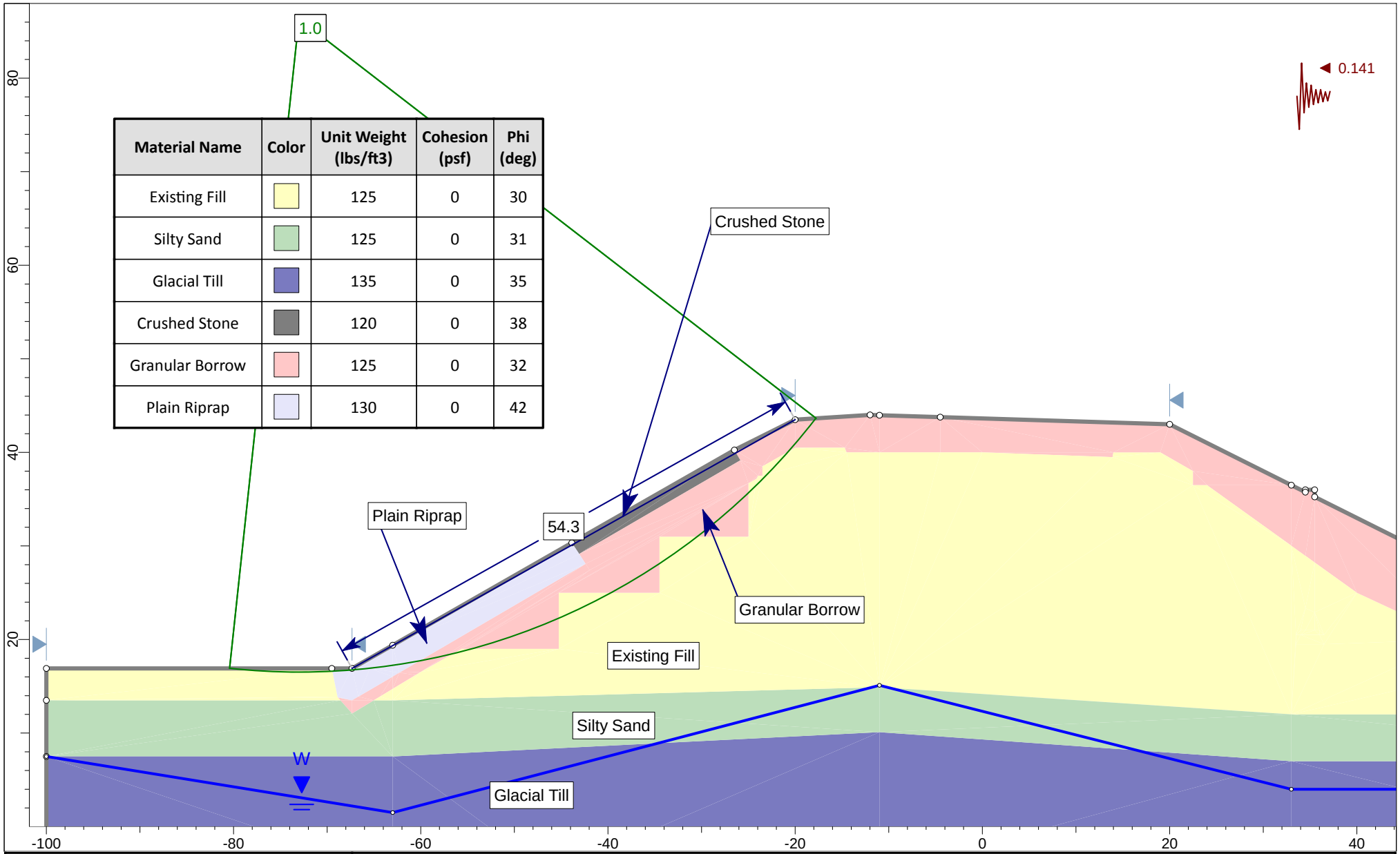
Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for North Embankment @ STA 14+00 (static)		
Drawn By	RC/KK chk: PCC	Scale 1:170	Company Nobis Engineering, Inc.
Date	7/21/2015		File Name Emb. (wetland) STA 14+00.slim

SLIDEINTERPRET 6.020

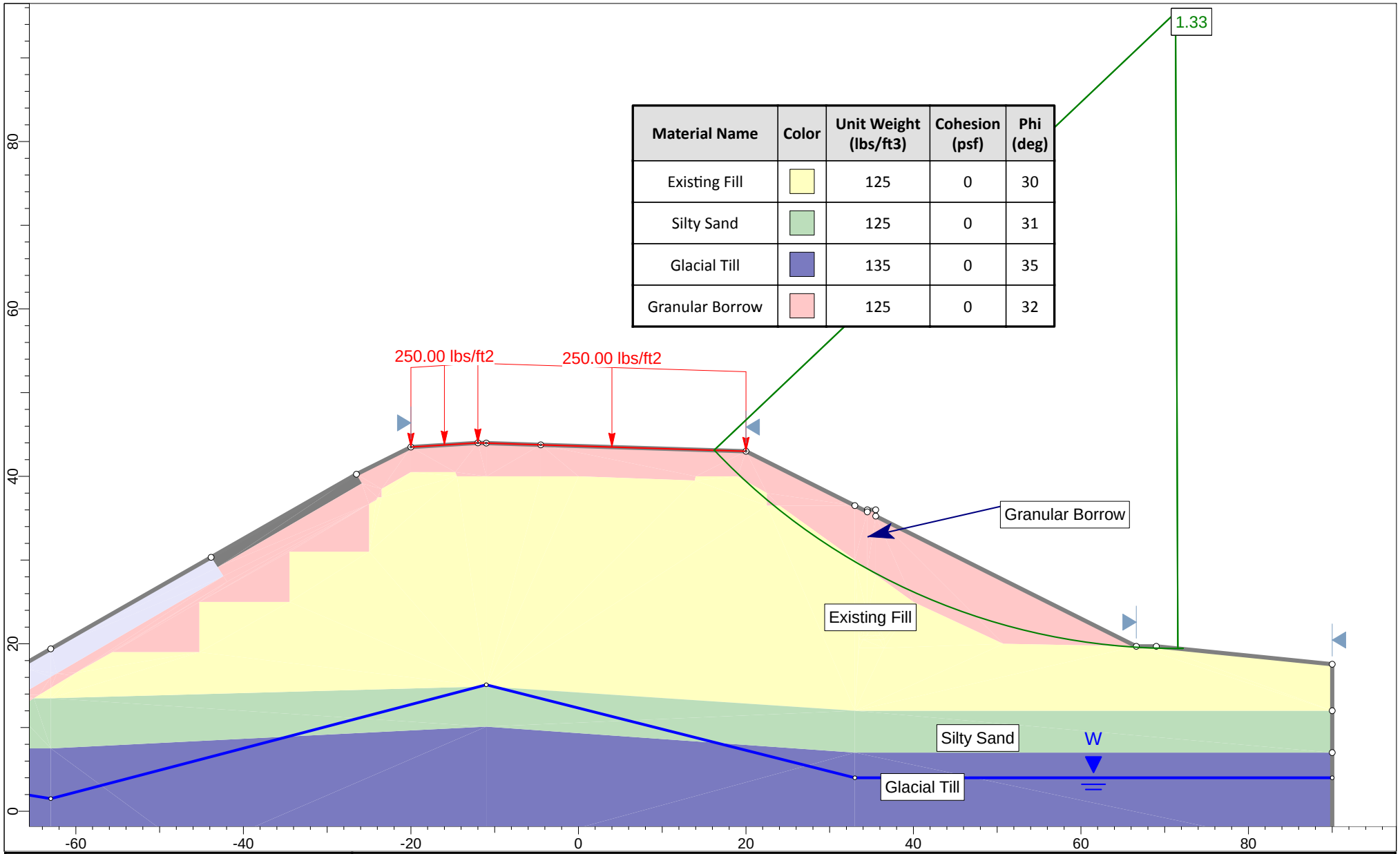


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Glacial Till		135	0	35
Crushed Stone		120	0	38
Granular Borrow		125	0	32
Plain Riprap		130	0	42

Nobis
Engineering a Sustainable Future

Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for North Embankment @ STA 14+00 (seismic)		
Drawn By	RC/KK chk: PCC	Scale 1:170	Company Nobis Engineering, Inc.
Date	7/21/2015		File Name Emb. (wetland) STA 14+00.slim

SLIDEINTERPRET 6.020

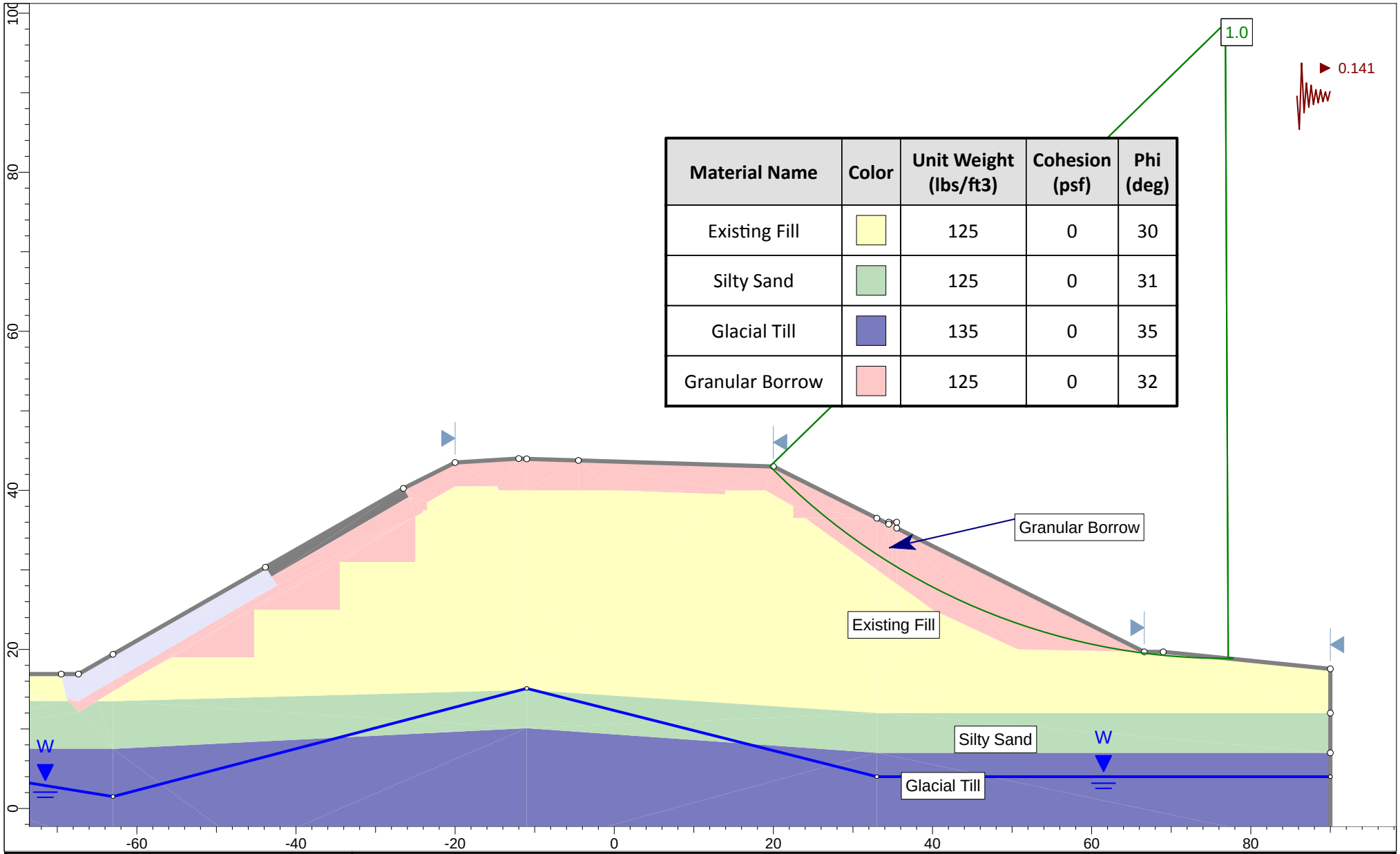


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Glacial Till		135	0	35
Granular Borrow		125	0	32

Nobis
Engineering a Sustainable Future

Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for South Embankment @ STA 14+00 (static)		
Drawn By	RC/KK chk: PCC	Scale 1:190	Company Nobis Engineering, Inc.
Date	7/21/2015		File Name Emb. (south) STA 14+00.slim

SLIDEINTERPRET 6.020



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Glacial Till		135	0	35
Granular Borrow		125	0	32

Nobis
Engineering a Sustainable Future

Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for South Embankment @ STA 14+00 (seismic)		
Drawn By	RC/KK chk: PCC	Scale 1:200	Company Nobis Engineering, Inc.
Date	7/21/2015		File Name Emb. (south) STA 14+00.slim

SLIDEINTERPRET 6.020

Pine Point Bridge over B&M Railroad
Embankment @ STA 16+00
Scarborough, ME

Discipline: Geotechnical

Title: Global Stability Analysis for Proposed North Embankment @ STA 16+00

MaineDOT PIN: 18229.00

Design Basis/Assumptions:

Purpose: Perform global stability analyses at proposed North Embankment @ STA 16+00.

Assumptions:

1) Granular Borrow: Unit Weight = 125 pcf, Angle of Internal Friction = 32° from Table 3-3 in MaineDOT Bridge Design Guide.
2) Engineering properties for existing fill and the native silty sand soils encountered in borings BB-SBMR-101, BB-SBMR-203, B-6 and B-7 developed from standard penetration test (SPT) data, laboratory test results, and engineering judgment based on visual classification.
3) Groundwater conditions the same or similar to those observed in the subsurface explorations by Nobis. Groundwater modeled at approximately EL. 9.2 feet, using vertical datum NAVD-88.
4) Surcharge loading of 250 psf, Seismic loading of 0.141g (Reference 4).

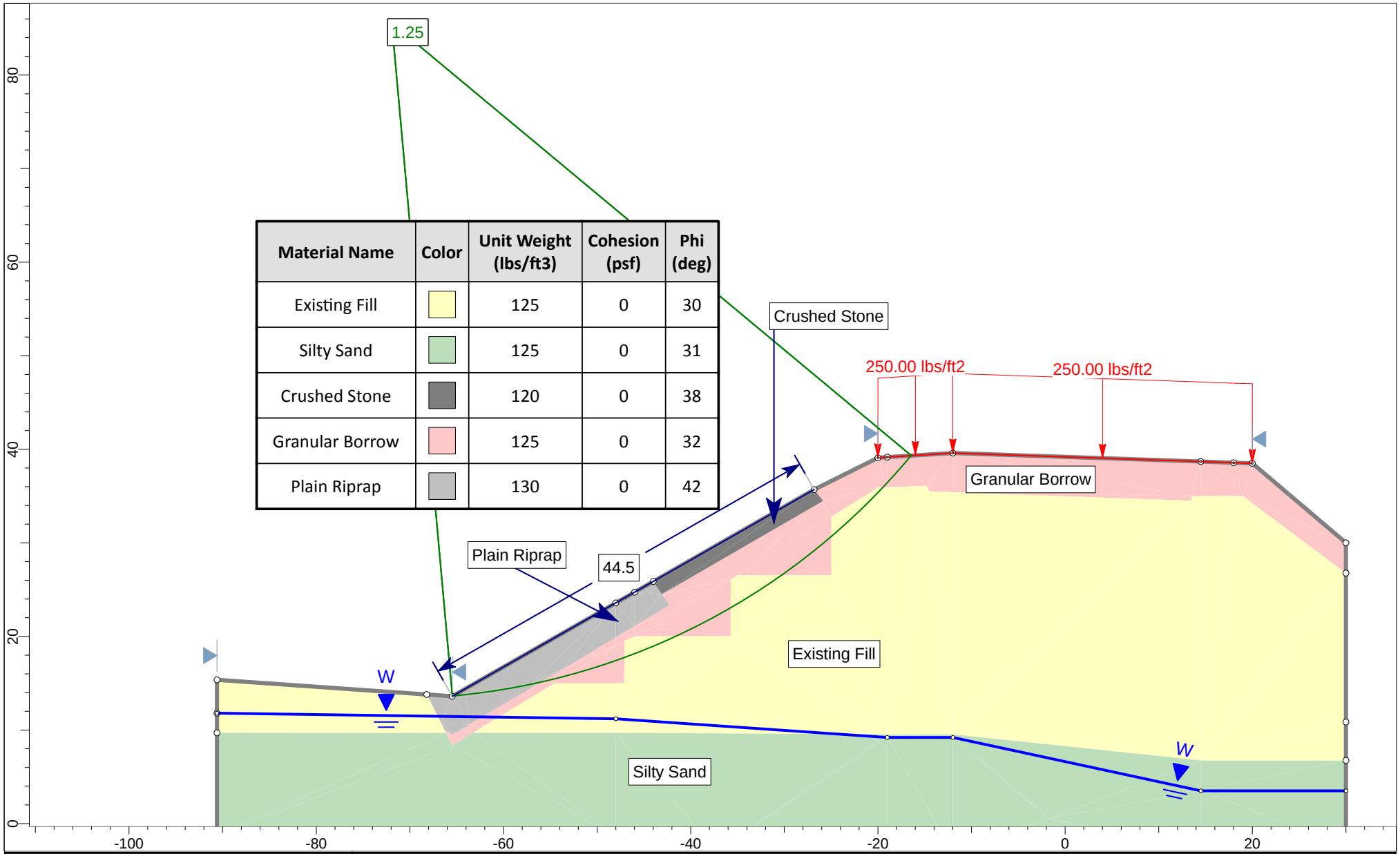
Approach:
Use the computer slope stability analysis software Slide 6.0, by RocScience, Inc., to perform global stability analyses at the proposed embankment @ STA 16+00 provided by Clough Harbour & Associates (CHA) (Reference 1).

References:
1) Design drawings provided by CHA, sent on June 17, 2015.
2) Laboratory test results provided by GeoTesting Express of Acton, Massachusetts.
3) SPT data and field classifications by Nobis at borings performed nearest to proposed MSE Wall (BB-SBMR-101, BB-SBMR-203, B-6 and B-7).
4) Seismic site classification and seismic parameters developed by Nobis.

Remarks/Conclusions:
Based on the Slide analysis, the minimum factor of safety against global slope failure is 1.25 under static conditions and 1.0 under seismic load conditions.

Originated By: Kamil Kocia, Staff Engineer Date: 7/1/2015

Approved By: Justin Mailloux, PE Date: 7/17/2015

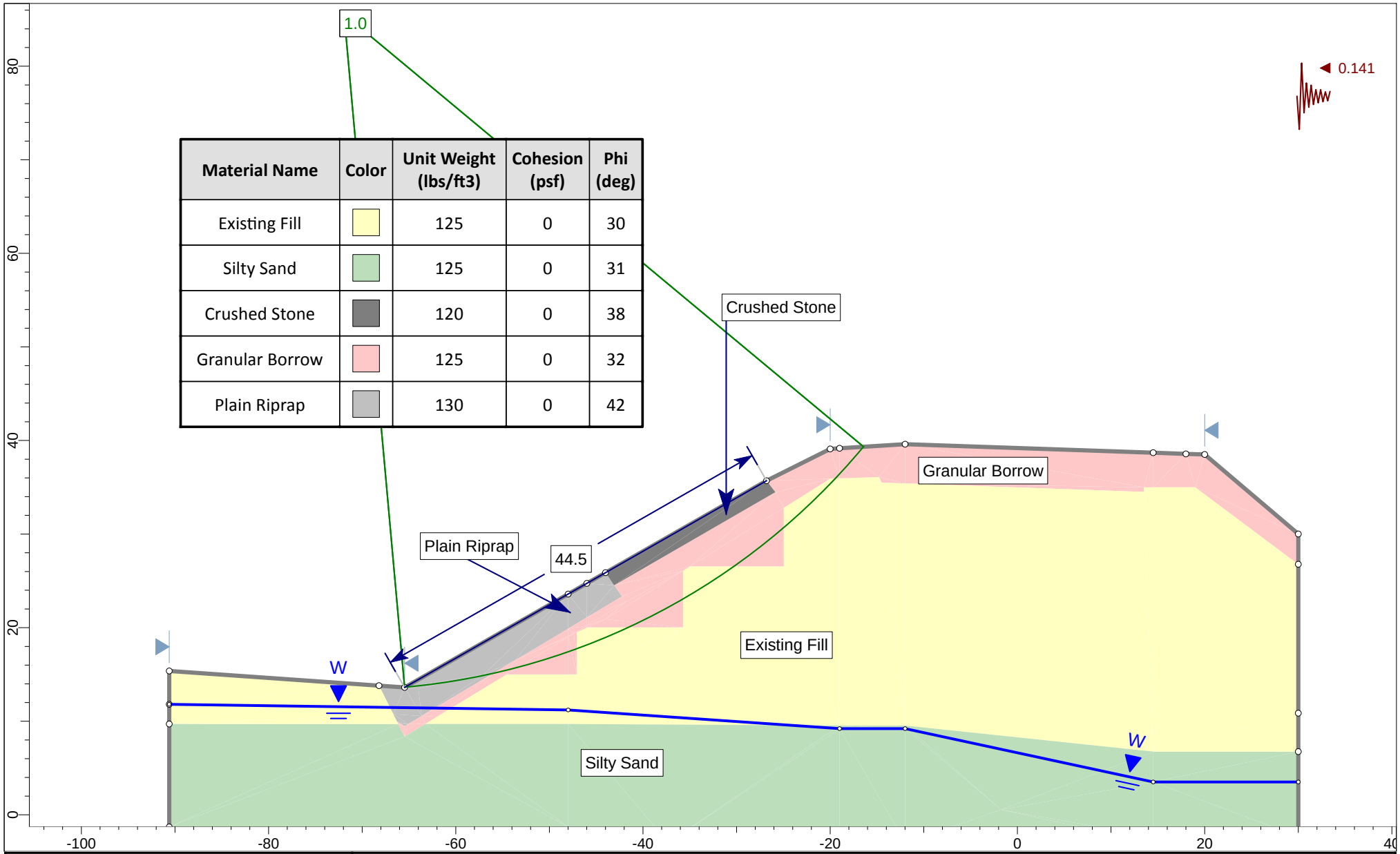


Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Crushed Stone		120	0	38
Granular Borrow		125	0	32
Plain Riprap		130	0	42

Nobis
Engineering a Sustainable Future

Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for North Embankment @ STA 16+00 (static)		
Drawn By	KK chk: JM	Scale 1:170	Company Nobis Engineering, Inc.
Date	7/21/2015		File Name Emb. STA 16+00.slim

SLIDEINTERPRET 6.020



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Existing Fill		125	0	30
Silty Sand		125	0	31
Crushed Stone		120	0	38
Granular Borrow		125	0	32
Plain Riprap		130	0	42

Nobis
Engineering a Sustainable Future

Project	Pine Point Bridge over B&M Railroad in Scarborough, ME		
Analysis Description	Global Stability Analysis for North Embankment @ STA 16+00 (seismic)		
Drawn By	KK chk: JM	Scale 1:170	Company Nobis Engineering, Inc.
Date	7/21/2015		File Name Emb. STA 16+00.slim

SLIDEINTERPRET 6.020

Preliminary seismic site classification for the Pine Point Crossing over B&M Railroad

Objective: Evaluate seismic site classification for the above mentioned project site.

References:

1) AASHTO LRFD Bridge Design Specifications, 7th Edition, 2014.
2) Borings Observed by Nobis Engineering in 2012, 2014, and 2015.
3) MaineDOT Bridge Deesign Manual, 2003, with revisions through 2008.

Solution:

AASHTO Section 3.10 was used to determine the seismic site classification for the Pine Point Crossing project site, as follows:

Step 1: Check for the three categories of Site Class F as described in Table 3.10.3.1-1 - Site Classification Definitions, as follows:

1. Peats or highly organic clays (H>10 ft of peat or highly organic clay where H = thickness of soil).
2. Very high plasticity clays (H>25 ft with PI >75).
3. Very thick soft/medium stiff clays (H > 120 ft).

Soil conditions for Site Class F were not shown on the Nobis Boring Logs.

Step 2: Check for existence of a soft layer with total thickness >10 ft, where soft layer is defined by su<0.5 ksf, w>40%, and PI>20. If these criteria are met, classify site as Site Class E.

Soil conditions for Site Class E were not shown on the Nobis Boring Logs.

Step 3: Categorize the site using one of three methods (i.e. A, B, or C).

Method B (N-bar Method) was used to determine the average Standard Penetration Test (SPT) blow count (blows/ft) for the upper 100 ft of the soil profile using the 2014 borings. See attached Table 3.10.3.1-1. The 2014 borings were performed in general accordance with ASTM D1586. The samples were obtained using a 1-3/8" diameter sampler driven with a 140-lb safety hammer dropping a distance of 30 inches.

Conclusion:

The average Standard Penetration Resistance, N-bar, for the site ranges from 18 to 58 based on the Nobis boring logs. The seismic site classification for the project site is **Site Class D.** The calculated values for the borings are summarized in the following table. See attached tables presenting the value of SPT-N vs. depth for the respective borings.

Sample Calculation: Consider Boring BB-SBMR-206

Determine N-bar: Use the average N value of each layer, N_i,for each layer provided in the table toward the end of this report.

$$\overline{N} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{N_i}}$$

$$\overline{N} = \frac{3.5' + 5' + 5' + 5' + 5' + 76.5'}{\frac{3.5'}{8} + \frac{5'}{10} + \frac{5'}{2} + \frac{5'}{18} + \frac{5'}{9} + \frac{76.5'}{62}} = 18\ bpf$$

Determine the site class for this boring using the Site Class Definitions, attached (Table 3.10.3.1-1, Reference 1

An N-bar of 18 bpf does not meet the criteria for Site Class C. Boring BB-SBMR-206 is classified as **Site Class D** as its standard penetration resistance of 18 bpf is less than 50 bpf. Below, summary tables provide general information for all of the borings considered in this analysis.

Table: Summary of Seismic Site Classification from Borings Performed by Nobis Engineering

Boring No.	N-bar (bpf)	Site Class	Comments
BB-SBMR-101	**27**	Site Class D	Boring terminated at 100.5 feet bgs
BB-SBMR-102	**34**	Site Class D	Boring terminated at 55.0 feet bgs
BB-SBMR-103	**32**	Site Class D	Boring terminated at 49.3 feet bgs
BB-SBMR-104	**54**	Site Class C	Boring terminated at 51.6 feet bgs
BB-SBMR-105	**26**	Site Class D	Boring terminated at 60.4 feet bgs
BB-SBMR-201	**29**	Site Class D	Boring terminated at 39.1 feet bgs
BB-SBMR-202	**37**	Site Class D	Boring terminated at 73.6 feet bgs
BB-SBMR-203	**39**	Site Class D	Boring terminated at 80.0 feet bgs
BB-SBMR-204	**23**	Site Class D	Boring terminated at 52.0 feet bgs
BB-SBMR-205	**18**	Site Class D	Boring terminated at 58.0 feet bgs
BB-SBMR-206	**23**	Site Class D	Boring terminated at 32.0 feet bgs
BB-SBMR-207	**32**	Site Class D	Boring terminated at 38.0 feet bgs
BB-SBMR-208	**58**	Site Class C	Boring terminated at 45.5 feet bgs

Note: The SPT-N values were corrected to N_{60} values assuming the automatic hammer used delivered 71.9% energy, except for BB-SBMR-201, BB-SBMR-202, BB-SBMR-203, and BB-SBMR-208, which used 71.2% energy.

Data from Boring BB-SBMR-101 (performed September 2012)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	4	4	26	0.152	
2	4	8.5	4.5	13	0.341	
3	8.5	13.5	5	20	0.245	
4	13.5	18.5	5	19	0.261	
5	18.5	25.7	7.2	23	0.316	
6	25.7	28.5	2.8	16	0.180	
7	28.5	33.5	5	14	0.348	
8	33.5	38.5	5	12	0.417	
9	38.5	43	4.5	16	0.289	
10	43	48.5	5.5	53	0.104	
11	48.5	53.5	5	68	0.073	
12	53.5	58.5	5	52	0.097	
13	58.5	63.5	5	49	0.102	
14	63.5	68.5	5	52	0.097	
15	68.5	73.5	5	52	0.097	
16	73.5	78.5	5	36	0.139	
17	78.5	85	6.5	54	0.121	
18	85	90	5	25	0.199	
19	90	90.8	0.8	100	0.008	
20	90.8	100	9.2	100	0.092	
SUM			**100**		**3.678**	

N-bar	**27**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-102 (performed September 2012)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	3.5	3.5	11	0.325	
2	3.5	7.5	4	4	1.113	
3	7.5	15	7.5	19	0.391	
4	15	18.5	3.5	41	0.086	
5	18.5	23.5	5	100	0.050	
6	23.5	28.5	5	46	0.110	
7	28.5	33.5	5	40	0.126	
8	33.5	38.5	5	40	0.126	
9	38.5	43.7	5.2	100	0.052	
10	43.7	100	56.3	100	0.563	
SUM			**100**		**2.942**	

N-bar	**34**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-103 (performed September 2012)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2	2	16	0.128	
2	2	4.5	2.5	6	0.417	
3	4.5	7	2.5	2	1.043	
4	7	9.5	2.5	13	0.190	
5	9.5	12	2.5	28	0.091	
6	12	14.5	2.5	26	0.095	
7	14.5	17	2.5	16	0.160	
8	17	20	3	24	0.125	
9	20	22	2	43	0.046	
10	22	24.5	2.5	53	0.047	
11	24.5	28.5	4	72	0.056	
12	28.5	33.5	5	58	0.087	
13	33.5	39.9	6.4	100	0.064	
14	39.9	100	60.1	100	0.601	
SUM			**100**		**3.151**	

N-bar	**32**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-104 (performed September 2012)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2.5	2.5	6	0.417	
2	2.5	5	2.5	26	0.095	
3	5	7.5	2.5	11	0.232	
4	7.5	10	2.5	25	0.099	
5	10	12.5	2.5	43	0.058	
6	12.5	15	2.5	78	0.032	
7	15	16.25	1.25	100	0.013	
8	16.25	20	3.75	100	0.038	
9	20	23.5	3.5	86	0.041	
10	23.5	28.5	5	79	0.063	
11	28.5	33.5	5	59	0.085	
12	33.5	38.5	5	75	0.066	
13	38.5	41.3	2.8	100	0.028	
14	41.3	100	58.7	100	0.587	
SUM			**100**		**1.853**	

N-bar	**54**	**Site Class C - Very Dense Soil & Soft Rock**

Data from Boring BB-SBMR-105 (performed September 2012)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	3	3	22	0.139	
2	3	8.5	5.5	11	0.510	
3	8.5	13.5	5	8	0.596	
4	13.5	18.5	5	22	0.232	
5	18.5	25.2	6.7	7	0.932	
6	25.2	30	4.8	7	0.668	
7	30	33.5	3.5	37	0.094	
8	33.5	38.5	5	74	0.067	
9	38.5	43.5	5	81	0.061	
10	43.5	47.5	4	100	0.040	
11	47.5	50.8	3.3	100	0.033	
12	50.8	100	49.2	100	0.492	
SUM			**100**		**3.864**	

N-bar	**26**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-201 (performed April 2015)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2	2	6	0.343	
2	2	4	2	4	0.571	
3	4	8	4	7	0.571	
4	8	11.5	3.5	63	0.056	
5	11.5	16.5	5	38	0.132	
6	16.5	21.5	5	25	0.204	
7	21.5	26.5	5	17	0.294	
8	26.5	31.5	5	12	0.429	
9	31.5	36.5	5	34	0.148	
10	36.5	100	63.5	93	0.683	
SUM			**100**		**3.430**	

N-bar	**29**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-202 (performed April 2015)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2	2	39	0.052	
2	2	4	2	12	0.171	
3	4	9	5	6	0.857	
4	9	13.5	4.5	32	0.143	
5	13.5	18.5	5	77	0.065	
6	18.5	23.5	5	38	0.132	
7	23.5	28.5	5	39	0.130	
8	28.5	33.5	5	38	0.132	
9	33.5	38.5	5	61	0.082	
10	38.5	43.5	5	50	0.100	
11	43.5	48.5	5	100	0.050	
12	48.5	53.5	5	100	0.050	
13	53.5	60	6.5	21	0.310	
14	60	60.7	0.7	100	0.007	
15	60.7	100	39.3	100	0.393	
SUM			**100**		**2.673**	

N-bar	**37**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-203 (performed April 2015)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2	2	14	0.143	
2	2	4	2	26	0.078	
3	4	8	4	8	0.490	
4	8	15	7	19	0.375	
5	15	18.5	3.5	58	0.060	
6	18.5	23.5	5	100	0.050	
7	23.5	28.5	5	62	0.081	
8	28.5	33.5	5	46	0.110	
9	33.5	38.5	5	64	0.078	
10	38.5	43.5	5	53	0.095	
11	43.5	48.5	5	46	0.110	
12	48.5	53.5	5	57	0.088	
13	53.5	58.5	5	32	0.159	
14	58.5	62.5	4	100	0.040	
15	62.5	78	15.5	42	0.369	
16	78	100	22	100	0.220	
SUM			**100**		**2.545**	

N-bar	**39**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-204 (performed December 2014)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	3	3	42	0.072	
2	3	8.5	5.5	14	0.382	
3	8.5	13.5	5	5	1.043	
4	13.5	18.5	5	49	0.102	
5	18.5	23	4.5	18	0.250	
6	23	28.5	5.5	10	0.574	
7	28.5	33.5	5	16	0.321	
8	33.5	38.5	5	7	0.695	
9	38.5	43	4.5	17	0.268	
10	43	48.5	5.5	38	0.143	
11	48.5	100	51.5	100	0.515	
SUM			**100**		**4.366**	

N-bar	**23**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-205 (performed December 2014)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	3	3	26	0.114	
2	3	8.5	5.5	16	0.353	
3	8.5	13.5	5	20	0.245	
4	13.5	18.5	5	23	0.220	
5	18.5	22	3.5	23	0.154	
6	22	27	5	2	2.500	
7	27	33.5	6.5	8	0.775	
8	33.5	38.5	5	18	0.278	
9	38.5	43.5	5	17	0.298	
10	43.5	48.5	5	100	0.050	
11	48.5	51.7	3.2	96	0.033	
12	51.7	100	48.3	100	0.483	
SUM			**100**		**5.503**	

N-bar	**18**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-206 (performed December 2014)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2	2	11	0.185	
2	2	6.2	4.2	13	0.319	
3	6.2	11.1	4.9	2	2.045	
4	11.1	18.5	7.4	19	0.386	
5	18.5	25	6.5	10	0.678	
6	23.5	28.3	4.8	62	0.077	
7	28.3	100	71.7	100	0.717	
SUM			**101.5**		**4.407**	

N-bar	**23**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-207 (performed December 2014)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2	2	19	0.104	
2	2	7	5	23	0.220	
3	7	13.5	6.5	14	0.452	
4	13.5	18.5	5	7	0.695	
5	18.5	24.5	6	7	0.834	
6	24.5	28.5	4	91	0.044	
7	28.5	34	5.5	34	0.164	
8	34	100	66	100	0.660	
SUM			**100**		**3.174**	

N-bar	**32**	**Site Class D - Stiff Soil**

Data from Boring BB-SBMR-208 (performed April 2015)

Layer	Depth Range		Thickness (d_i)	N_i	d_i/N_i	Comments
	Start [ft]	End [ft]	[ft]	blows/ft		
1	0	2	2	8	0.245	
2	2	4	2	12	0.171	
3	4	9	5	17	0.294	
4	9	12.5	3.5	40	0.088	
5	12.5	17.5	5	95	0.053	
6	17.5	22.5	5	75	0.067	
7	22.5	27.5	5	75	0.067	
8	27.5	33.5	6	100	0.060	
9	33.5	100	66.5	100	0.665	
SUM			**100**		**1.710**	

N-bar	**58**	**Site Class C - Very Dense Soil & Soft Rock**

Table 3.10.3.1-1—Site Class Definitions

Site Class	Soil Type and Profile
A	Hard rock with measured shear wave velocity, $\bar{v}_s > 5{,}000$ ft/s
B	Rock with 2,500 ft/sec < $\bar{v}_s < 5{,}000$ ft/s
C	Very dense soil and soil rock with 1,200 ft/sec < $\bar{v}_s < 2{,}500$ ft/s, or with either $\bar{N} > 50$ blows/ft, or $\bar{s}_u > 2.0$ ksf
D	Stiff soil with 600 ft/s < $\bar{v}_s < 1{,}200$ ft/s, or with either $15 < \bar{N} < 50$ blows/ft, or $1.0 < \bar{s}_u < 2.0$ ksf
E	Soil profile with $\bar{v}_s < 600$ ft/s or with either $\bar{N} < 15$ blows/ft or $\bar{s}_u < 1.0$ ksf, or any profile with more than 10 ft of soft clay defined as soil with $PI > 20$, $w > 40$ percent and $\bar{s}_u < 0.5$ ksf
F	Soils requiring site-specific evaluations, such as: • Peats or highly organic clays ($H > 10$ ft of peat or highly organic clay where H = thickness of soil) • Very high plasticity clays ($H > 25$ ft with $PI > 75$) • Very thick soft/medium stiff clays ($H > 120$ ft)

Exceptions: Where the soil properties are not known in sufficient detail to determine the site class, a site investigation shall be undertaken sufficient to determine the site class. Site classes E or F should not be assumed unless the authority having jurisdiction determines that site classes E or F could be present at the site or in the event that site classes E or F are established by geotechnical data.

where:

$\bar{v}_s$ = average shear wave velocity for the upper 100 ft of the soil profile
$\bar{N}$ = average Standard Penetration Test (SPT) blow count (blows/ft) (ASTM D1586) for the upper 100 ft of the soil profile
$\bar{s}_u$ = average undrained shear strength in ksf (ASTM D2166 or ASTM D2850) for the upper 100 ft of the soil profile
PI = plasticity index (ASTM D4318)
w = moisture content (ASTM D2216)

Determination of Seismic Design Parameters using Reference 1

Site Class: D (Section 3.10)
Peak Ground Acceleration, PGA=0.088g (1000-Year Event 7% PE in 75 years)
Spectral Response Accelerations: Ss = 0.175g and S1 = 0.045g (1000-Year Event 7% PE in 75 years)
Site Coefficients: Fpga = 1.6, Fa = 1.6, and Fv = 2.4 (Section 3.10)
As = 0.141, SDS = 0.280, and SD1 = 0.070

$$A_S = F_{pga}\, PGA \qquad (3.10.4.2\text{-}2)$$

$$S_{DS} = F_a\, S_S \qquad (3.10.4.2\text{-}3)$$

$$S_{D1} = F_v\, S_1 \qquad (3.10.4.2\text{-}6)$$

Table 3.10.3.2-2—Values of Site Factor, F_a, for Short-Period Range of Acceleration Spectrum

Site Class	Spectral Acceleration Coefficient at Period 0.2 sec (S_S)[1]				
	$S_S <$ 0.25	$S_S =$ 0.50	$S_S =$ 0.75	$S_S =$ 1.00	$S_S >$ 1.25
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F[2]	*	*	*	*	*

Notes:

[1]Use straight-line interpolation for intermediate values of S_s.

[2]Site-specific geotechnical investigation and dynamic site response analysis should be performed for all sites in Site Class F.

Table 3.10.3.2-3—Values of Site Factor, F_v, for Long-Period Range of Acceleration Spectrum

Site Class	Spectral Acceleration Coefficient at Period 1.0 sec (S_1)[1]				
	$S_1 <$ 0.1	$S_1 =$ 0.2	$S_1 =$ 0.3	$S_1 =$ 0.4	$S_1 >$ 0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F[2]	*	*	*	*	*

Notes:

[1]Use straight-line interpolation for intermediate values of S_1.

[2]Site-specific geotechnical investigation and dynamic site response analysis should be performed for all sites in Site Class F.

Table 3.10.6-1—Seismic Zones

Acceleration Coefficient, S_{D1}	Seismic Zone
$S_{D1} \leq 0.15$	1
$0.15 < S_{D1} \leq 0.30$	2
$0.30 < S_{D1} \leq 0.50$	3
$0.50 < S_{D1}$	4