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Geotechnical • Construction Services • Forensics

File No. 1202.1
November 21, 2011

Ms. Julie Passalacqua, P.E.
Mark Thomas & Co., Inc.
7300 Folsom Boulevard, Suite 203
Sacramento, CA 95826

Subject: **FOUNDATION REPORT ADDENDUM NO. 2**
Dead Horse Slough Bridge (Widen), Bridge No. 12-0135
03-BUT-32, PM 11.08, CU: 03, EA: 1E4901
Butte County, California

Dear Ms. Passalacqua,

At your request, Blackburn Consulting (BCI) prepared this addendum to our September 22, 2010 Foundation Report to provide revised pile tip elevation recommendations for Abutment (Class 90, Alt. X) and Pier (15" PC/PS Pile Extensions) piles with respect to changes in the recommended design scour elevations for this project. Please refer to our Foundation Report dated September 22, 2010 and Foundation Report Addendum No. 1 dated October 27, 2010 for information not contained herein.

Updated Scour Data

WRECO (hydraulics consultant) recently completed an updated "Bridge Design Hydraulic Study Report" (dated November 2011) for the State Route 32 Widening Project. That report and information provided by Mark Thomas and Company, Inc. (MTCo) indicate the following updated scour data for the bridge widening.

Scour Data				
Bridge Support	**Contraction Scour (feet)**	**Maximum Estimated Local Scour (feet)**	**Total Scour Depth (feet)**	**Recommended Design Scour Elevation (feet, NAVD)**
Abutment 1	0.3	2.9	3.2	235.5*
Pier 2	0.3	7.1	7.4	222.8
Pier 3	0.3	7.1	7.4	222.8
Pier 4	0.3	7.1	7.4	222.8
Abutment 5	0.3	3.1	3.4	235.3*

* Bottom of abutments is below the scour depth.

Updated Foundation Data and Foundation Design Loads

MTCo provided the following updated foundation design data and foundation design loads.

Foundation Design Data									
Support No.	Design Method (WSD or LRFD)	Pile Type	Finish Grade Elev. (ft)	Original Ground Elev. (ft)*	Pile Cut-off Elevation (ft)*	Pile Cap Size (ft)		Permissible Settlement – Service Load (in)	Number of Piles per Support
						B	L		
Abut 1	WSD	Class 90 (Alt X)	239.1	N/A	233.8	3.5	68.4	1	8
Pier 2	LRFD	15" Pile Extensions	232.0	232.0 (No Scour) 222.8 (Scour)	241.1	NA	NA	1	10
Pier 3	LRFD	15" Pile Extensions	232.0	232.0 (No Scour) 222.8 (Scour)	241.2	NA	NA	1	10
Pier 4	LRFD	15" Pile Extensions	234.0	234.0 (No Scour) 222.8 (Scour)	241.3	NA	NA	1	10
Abut 5	WSD	Class 90 (Alt Y)	239.3	N/A	234.0	3.5	68.4	1	8

Note: *Indicates average elevation

Foundation Design Loads												
Support No.		Service-I Limit State (kips)			Strength Limit State (Controlling Group, kips)				Extreme Limit State (Controlling Group, kips)			
		Total Load		Permanent Loads	Compression		Tension		Compression		Tension	
		Per Support	Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	-	700	90	290	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pier 2	No Scour	900	90	550	1300	130	0	0	550	55	0	0
	Scour	990	100	640	1400	140						
Pier 3	No Scour	800	80	480	1140	115	0	0	470	45	0	0
	Scour	990	90	570	1250	125						
Pier 4	No Scour	900	90	550	1300	130	0	0	550	55	0	0
	Scour	990	100	640	1400	140						
Abut 5	-	700	90	290	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Revised Foundation Recommendations and Pile Data Table

BCI used the above foundation design data and loading conditions to re-evaluate pier foundations using AASHTO LRFD Bridge Design Specifications-4th Edition with current Caltrans Amendments. BCI evaluated abutment foundations using Caltrans November 2003 Bridge Design Specifications for foundations using Working Stress Design methods. We present our revised foundation recommendations in the following tables.

Abutment Foundation Design Recommendations										
Support	Pile Type	Cut-off Elev. (ft.)	**LRFD Service-I Limit State Load – Compression (kips)**			Required Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
			Per Support		Per Pile	Comp.	Tens.			
			Total	Permanent						
Abut 1	Class 90 (Alt. X)	233.8	700	290	90	180	0	190.0(a)(b), 206.0(c)	190.0	180
Abut 5	Class 90 (Alt. X)	234.0	700	290	90	180	0	190.0(a), 206.0(c)	190.0	180

Notes:
1) Design tip elevations for **Abutments** are controlled by (a) Compression, (b) Scour, and (c) Lateral, respectively.

Pier Foundation Design Recommendations											
Support	Pile Type	Cut-off Elev. (ft.)	LRFD Service-I Limit State Load Per Support – Compression (kips)	Total Permissible Support Settlement (in.)	Required Factored Nominal Resistance (kips) Per Pile				Design Tip Elevations (ft.)	Specified Tip Elevations (ft.)	Nominal Driving Resistance Required (kips)
					Strength Limit		Extreme Event				
					Comp $\varphi = 0.7$	Tens. $\varphi = 0.7$	Comp $\varphi = 1.0$	Tens $\varphi = 1.0$			
Pier 2	15" PC/PS Pile Extensions	241.1	640	1.0	140	0	55	0	188.0(a)(b), 196.0(c)	188.0	200
Pier 3	15" PC/PS Pile Extensions	241.2	570	1.0	125	0	45	0	188.0(a)(b), 196.0(c)	188.0	180
Pier 4	15" PC/PS Pile Extensions	241.3	640	1.0	140	0	55	0	188.0(a)(b), 196.0(c)	188.0	200

Notes:
1) Design tip elevations for **Piers** are controlled by (a) Compression (Strength Limit), (b) Scour, and (c) Lateral, respectively. The Design Tip Elevations for lateral loading were determined by MTCo.
2) The nominal driving resistance is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

Based on our analysis presented in below, BCI presents our revised recommended Pile Data Table:

Pile Data Table						
Support	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	Class 90 (Alt. X)	180	0	190.0(a)(b), 206.0 (c)	190.0	180
Pier 2	15" PC/PS Pile Extensions	200	0	188.0(a)(b), 196.0 (c)	188.0	200
Pier 3	15" PC/PS Pile Extensions	180	0	188.0(a)(b), 196.0 (c)	188.0	180
Pier 4	15" PC/PS Pile Extensions	200	0	188.0(a)(b), 196.0 (c)	188.0	200
Abut 5	Class 90 (Alt. X)	180	0	190.0(a)(b), 206.0(c)	190.0	180

Notes:

1) Design tip elevations for **Abutments** are controlled by (a) Compression, (b) Scour, and (c) Lateral, respectively.
2) Design tip elevations for **Piers** are controlled by (a) Compression (Strength Limit), (b) Scour, and (c) Lateral, respectively. The Design Tip Elevations for lateral loading were determined by MTCo.
3) The nominal driving resistance is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

Abutment Piles (Class 90)

In accordance with current Caltrans specifications, we used the Working Stress Design (WSD) for the abutment piles. BCI evaluated Alternative "X" Class 90 piles with a T dimension of 12 inches for the abutments. BCI presents the results of our compressive resistance and settlement analysis below. No tension demand is indicated for abutment piles.

Compressive Resistance

The tips of the Class 90 precast, prestressed concrete (PPC) piles will bear in very dense gravel and/or sedimentary rock about 42 ft below the existing channel bottom elevation. We neglected the approach fill in our skin friction and end bearing analysis. We modeled the top of abutment piles at elev. 233.8 ft for both abutments. At MTCo's request we also modeled scour level to elev. 229.7 ft, 4.1 ft below the pile cut-off elevation.

We determined the compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

Refer to the Driven output files in Appendix A for the analysis results.

Settlement

We calculated an immediate settlement of less than 0.5 inch for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We include the pile settlement calculations in Appendix A.

Our calculated pile settlement is less than the permissible settlement of 1-inch specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the specified tip elevations.

Lateral Load Analysis

We used LPILE Plus Version 5.0 software to evaluate lateral pile capacity. BCI determined the allowable lateral pile design loads which would produce approximately ¼-inch and 1-inch top-of-pile deflection assuming a pinned head condition. The Foundation Plan indicates a total of eight piles at each abutment, of which three are spaced at about 5B with a p-multiplier of 0.85 and five are spaced at about 10B with a p-multiplier of 1.0. For our analysis, we use a weighted average p-multiplier of 0.94. At MTCo's request we also modeled scour level to elev. 229.7 ft, 4.1 ft below the pile cut-off elevation.

For our analysis, we assumed a free-head condition and applied a minimum axial compression of 36 kips applied to the top of the pile. Below, BCI presents our lateral pile analysis results for both the longitudinal and transverse bridge directions.

For ¼-inch top-of-pile deflection, our analysis yielded a lateral resistance of 7.0 kips per pile for both abutments. For 1-inch top-of-pile deflection, our analysis yielded a lateral resistance of 13.8 kips per pile for both abutments.

BCI calculated a minimum tip elevation of 206.0 feet for both abutments using a factor of safety of 1.5.

Refer to the LPILE output graphs in Appendix A for additional information.

Negative Skin Friction

We do not anticipate negative skin friction at the abutments given the competent soil conditions and nominal new embankment heights.

Pier Piles

We used AASHTO LRFD Bridge Design Specifications-4th Edition and current Caltrans Amendments for evaluating driven 15-inch precast, prestressed concrete pile extensions (Caltrans Slab Bridge Details, Sheet xs1-23) at the piers. BCI presents the results of our compressive resistance and settlement analysis below. No tension demand is indicated for pier piles.

Compressive Resistance

The tips of the 15-inch precast, prestressed concrete pile extensions will bear in very dense gravel and/or rock about 44 ft below the existing channel bottom elevation. Our calculations indicate that the nominal compressive resistance of the piles will essentially be obtained through end bearing. Therefore, we conservatively base our pile tip elevations on end bearing contribution only.

We determined the required nominal compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

The Driven 1.2 computer program calculates compressive resistance for piles with square sides (pile width input, not diameter). For pier piles, we considered an equivalent pile width of 11.8 inches for the pile perimeter (skin friction), and 13.3 inches for the pile tip area (end bearing). We then used an equivalent pile width of 13.3 inches for end bearing contributions and reduced the skin friction contributions by a factor of 0.89 (i.e., 11.8/13.3 = 0.89). We modeled the top of pier piles at elev. 232.0 ft with design scour at elev. 222.8 ft (lowest elevation).

BCI determined the required factored nominal resistance by comparing the highest Factored Strength Limit Load (Geotechnical Resistance Factor = 0.7) with the highest Extreme Event Load (Resistance Factor = 1.0). We then used the higher value as the required factored nominal resistance. In this case, the Factored Strength Limit Load is controlling over the Extreme Event.

Refer to the Driven output files in Appendix B for additional information.

Settlement

We calculated an immediate settlement of less than 0.5 inch for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We include the pile settlement calculations in Appendix B.

Our calculated pile settlement is at the 1-inch permissible settlement level specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the specified pile tip elevation.

Lateral Load Analysis

MTCo indicates no change to the design lateral pile tip at elevation 196.0 for Piers 2, 3, and 4.

Negative Skin Friction

We do not anticipate negative skin friction at the piers.

This Addendum is subject to limitations and recommendations contained within our September 22, 2010 Foundation Report for the project. Please call if you have questions or require additional information.

Sincerely,

BLACKBURN CONSULTING

Reviewed by:

W. Eric Nichols, C.E.G.
Senior Project Manager

David J. Morrell, P.E., G.E.
Senior Project Manager

APPENDIX A

Abutments: Class 90 Pile Calculations, Compression
Abutments: LPILE Output Graphs
Abutment Pile Settlement Calculation

APPENDIX B

Piers: 15-inch PC/PS Concrete Pile Extension Calculations, Compression
Pier Pile Settlement Calculation

APPENDIX A

Abutments: Class 90 Pile Calculations, Compression

Abutments: LPILE Output Graphs

Abutment Pile Settlement Calculation

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1202~1.1SR\ENGINE~1\DRIVEN\ABUTREV.DVN
Project Name: Dead Horse Abutments Project Date: 11/14/2011
Project Client: MTCo
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	4.80 ft
	- Driving/Restrike	4.80 ft
	- Ultimate:	4.80 ft
Ultimate Considerations:	- Local Scour:	4.10 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

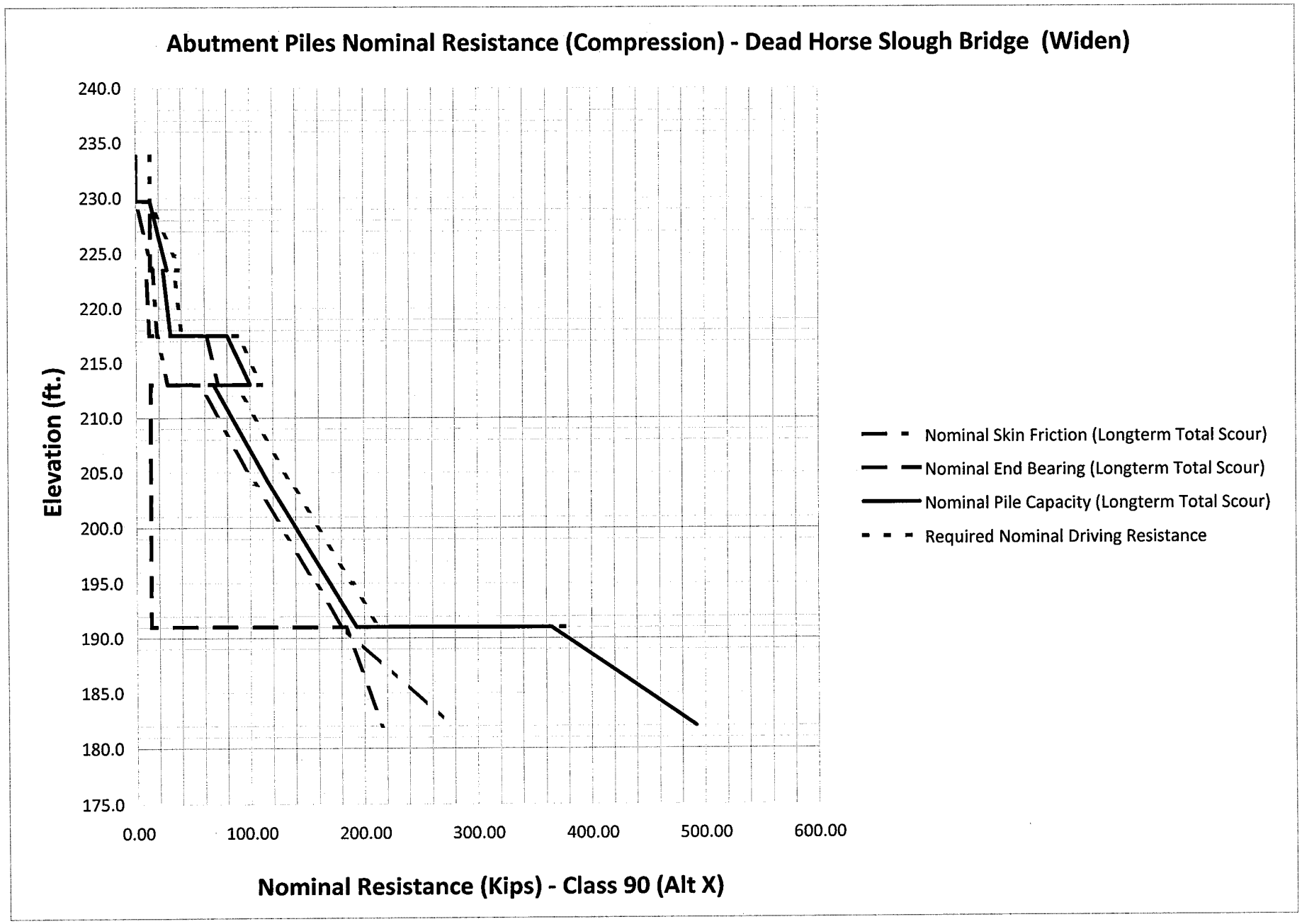
Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	10.30 ft	0.00%	119.00 pcf	1400.00 psf	T-79 Concrete
2	Cohesionless	6.00 ft	0.00%	106.00 pcf	27.0/27.0	Nordlund
3	Cohesionless	4.50 ft	0.00%	107.00 pcf	36.0/36.0	Nordlund
4	Cohesive	22.00 ft	0.00%	106.00 pcf	1400.00 psf	T-79 Concrete
5	Cohesionless	29.00 ft	0.00%	107.00 pcf	38.0/38.0	Nordlund

DRIVING - SUMMARY OF CAPACITIES

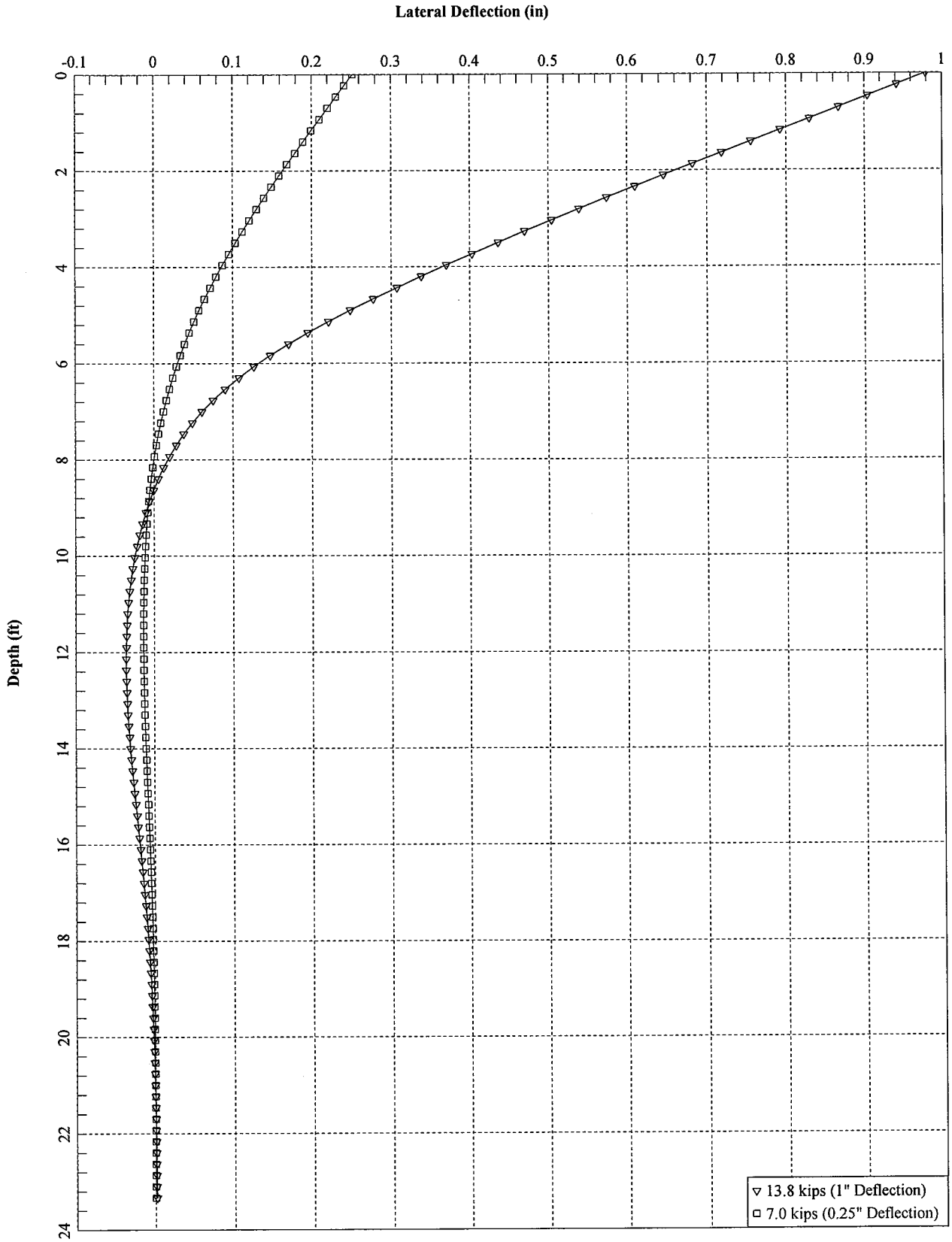
Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	12.60 Kips	12.65 Kips
9.01 ft	42.89 Kips	12.60 Kips	55.49 Kips
10.29 ft	49.07 Kips	12.60 Kips	61.67 Kips
10.31 ft	49.13 Kips	8.99 Kips	58.12 Kips
16.29 ft	56.87 Kips	11.64 Kips	68.51 Kips
16.31 ft	56.92 Kips	61.58 Kips	118.50 Kips
20.79 ft	75.17 Kips	72.30 Kips	147.47 Kips
20.81 ft	75.26 Kips	12.60 Kips	87.86 Kips
29.81 ft	123.57 Kips	12.60 Kips	136.17 Kips
38.81 ft	176.85 Kips	12.60 Kips	189.45 Kips
42.79 ft	200.12 Kips	12.60 Kips	212.72 Kips
42.81 ft	200.27 Kips	183.68 Kips	383.95 Kips
51.81 ft	295.84 Kips	215.68 Kips	511.52 Kips
60.81 ft	406.72 Kips	247.67 Kips	654.39 Kips
69.81 ft	532.91 Kips	268.60 Kips	801.51 Kips
71.79 ft	562.72 Kips	268.60 Kips	831.32 Kips

ULTIMATE - SUMMARY OF CAPACITIES

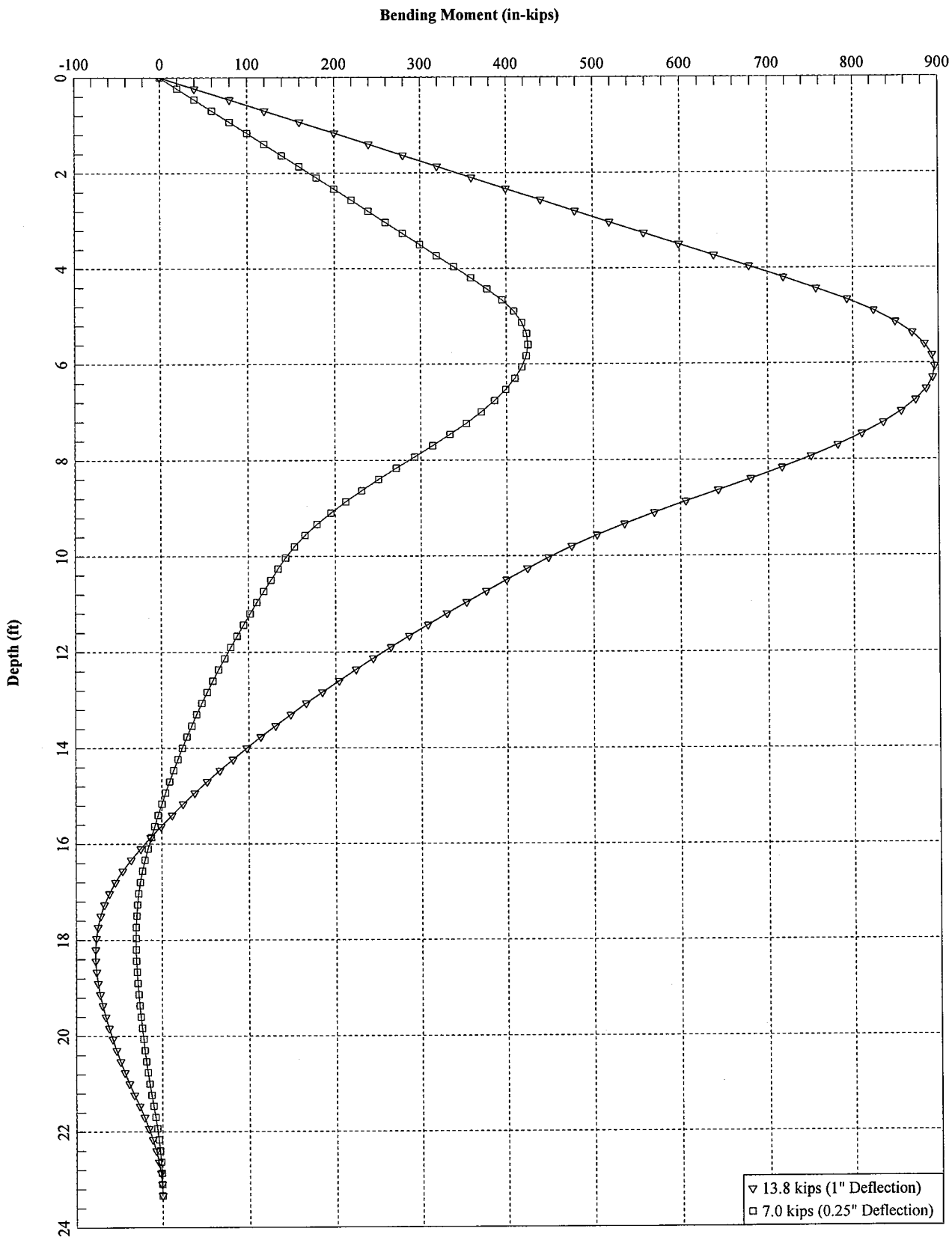
Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.09 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.10 ft	0.00 Kips	12.60 Kips	12.60 Kips
9.01 ft	23.37 Kips	12.60 Kips	35.97 Kips
10.29 ft	29.52 Kips	12.60 Kips	42.12 Kips
10.31 ft	29.58 Kips	8.99 Kips	38.57 Kips
16.29 ft	37.31 Kips	11.64 Kips	48.95 Kips
16.31 ft	37.37 Kips	61.58 Kips	98.95 Kips
20.79 ft	55.61 Kips	72.33 Kips	127.94 Kips
20.81 ft	55.71 Kips	12.60 Kips	68.31 Kips
29.81 ft	104.02 Kips	12.60 Kips	116.62 Kips
38.81 ft	157.30 Kips	12.60 Kips	169.90 Kips
42.79 ft	180.56 Kips	12.60 Kips	193.16 Kips
42.81 ft	180.72 Kips	183.68 Kips	364.40 Kips
51.81 ft	276.28 Kips	215.68 Kips	491.96 Kips
60.81 ft	387.16 Kips	247.67 Kips	634.84 Kips
69.81 ft	513.35 Kips	268.60 Kips	781.95 Kips
71.79 ft	543.17 Kips	268.60 Kips	811.77 Kips



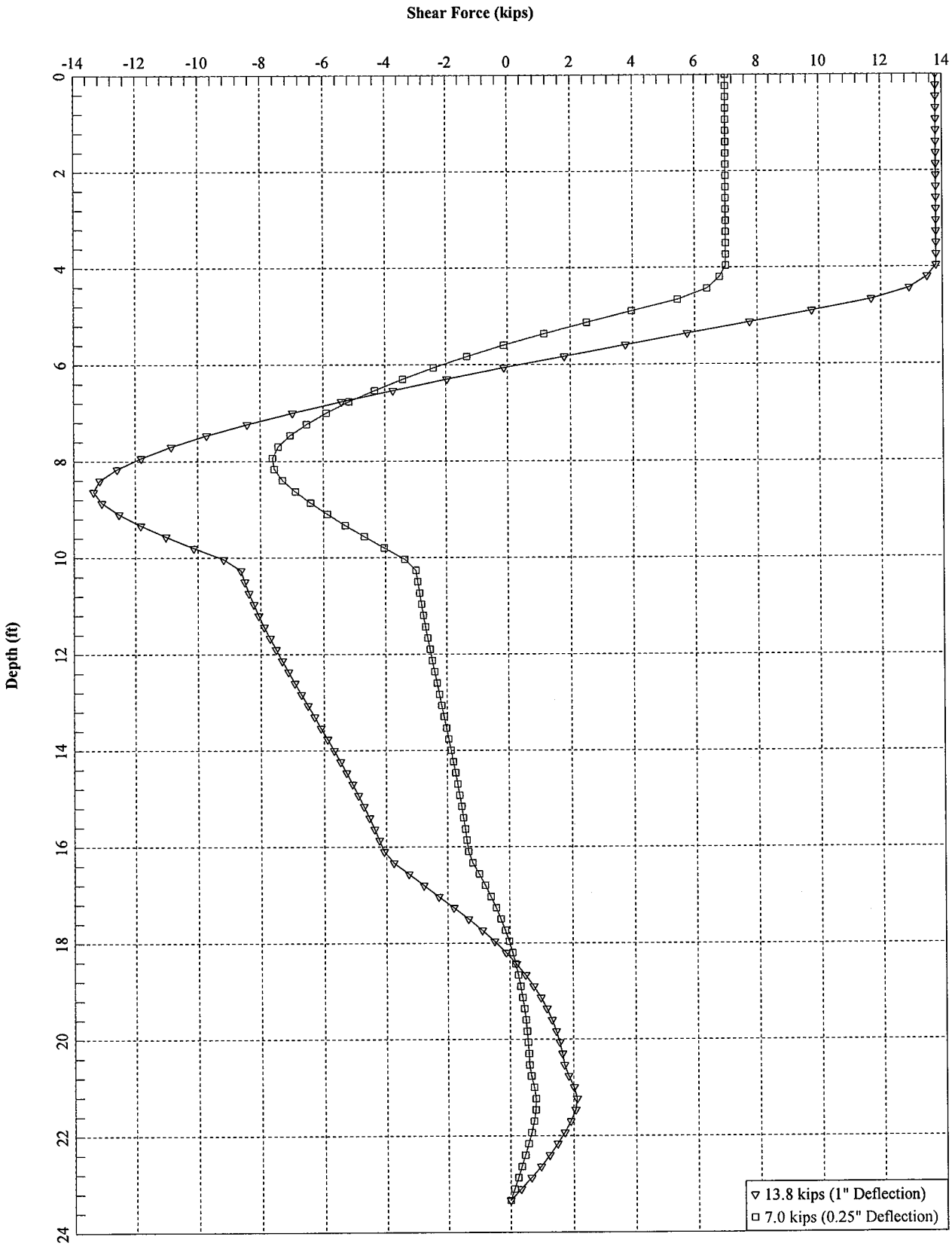
Dead Horse Slough Bridge (Widen)
Bridge No. 12-0135
03-BUT-32, PM 11.08, EA:1E4901



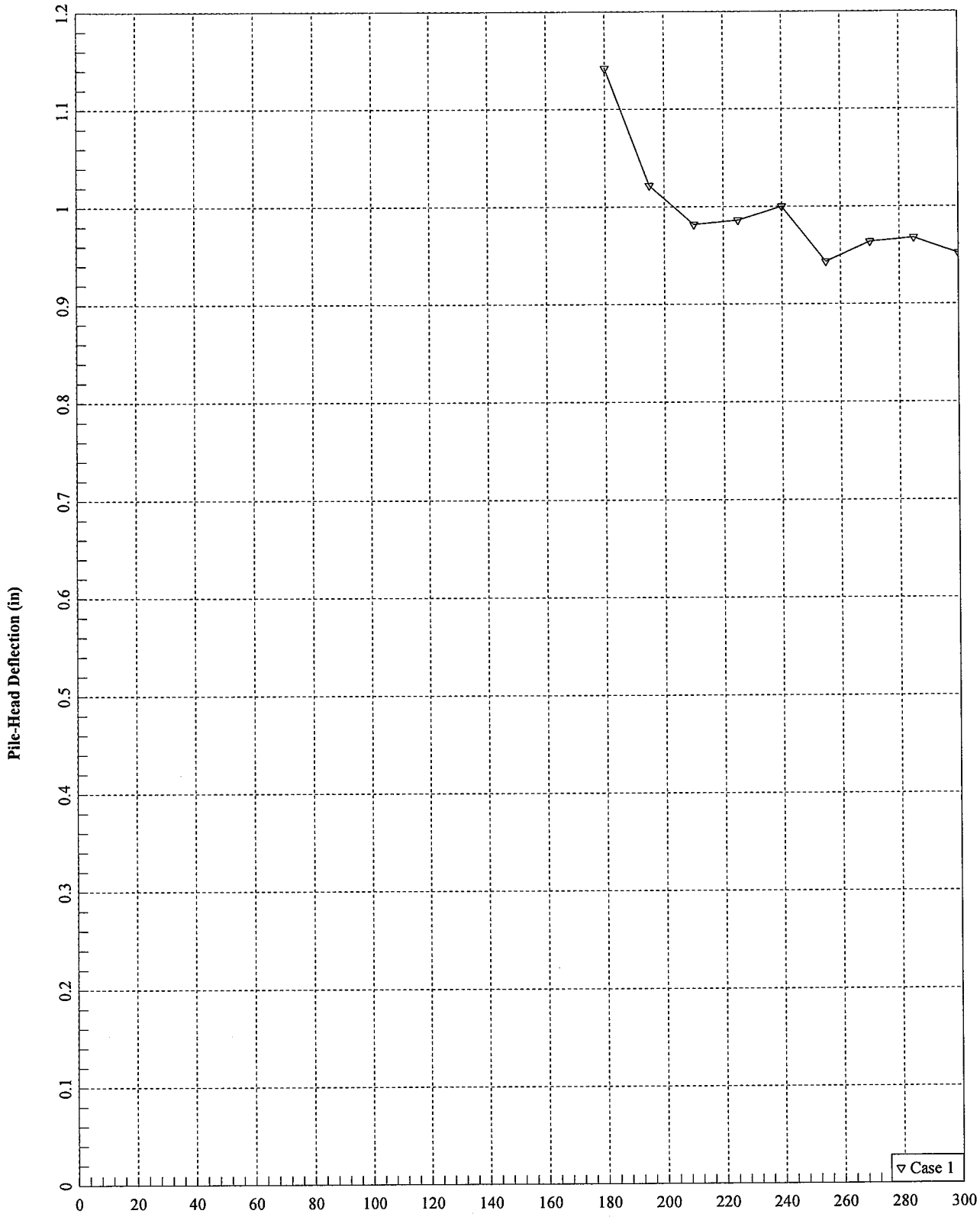
Dead Horse Slough (Widen): Class 90 Abutment Piles



Dead Horse Slough (Widen): Class 90 Abutment Piles



Dead Horse Slough (Widen): Class 90 Abutment Piles



Dead Horse Slough (Widen): Class 90 Abutment Piles

Dead Horse Slough Widen
BCI No. 1202.1
11/14/11
By: WEN

Abutment Pile Settlement Calculations: Class 90 Piles

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		90000
A	*Average Axial Load (lbs)	45000
B	Pile Length (in.)	516
C	Tip Area (sq. in.)	144
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.04**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	625.0
B	Pile Diameter (in.)	12
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	8000
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
Point Settlement (in.)		**0.21**

A = Allowable Pile Capacity / Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = **0.25** in.
6.3 mm

APPENDIX B

Piers: 15-inch PC/PS Concrete Pile Extension Calculations, Compression

Pier Pile Settlement Calculation

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1202~1.1SR\ENGINE~1\DRIVEN\BNTEND.DVN
Project Name: Dead Horse END Project Date: 11/14/2011
Project Client: MTCo
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 13.30 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	5.60 ft
	- Driving/Restrike	5.60 ft
	- Ultimate:	5.60 ft
Ultimate Considerations:	- Local Scour:	7.00 ft
	- Long Term Scour:	0.30 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

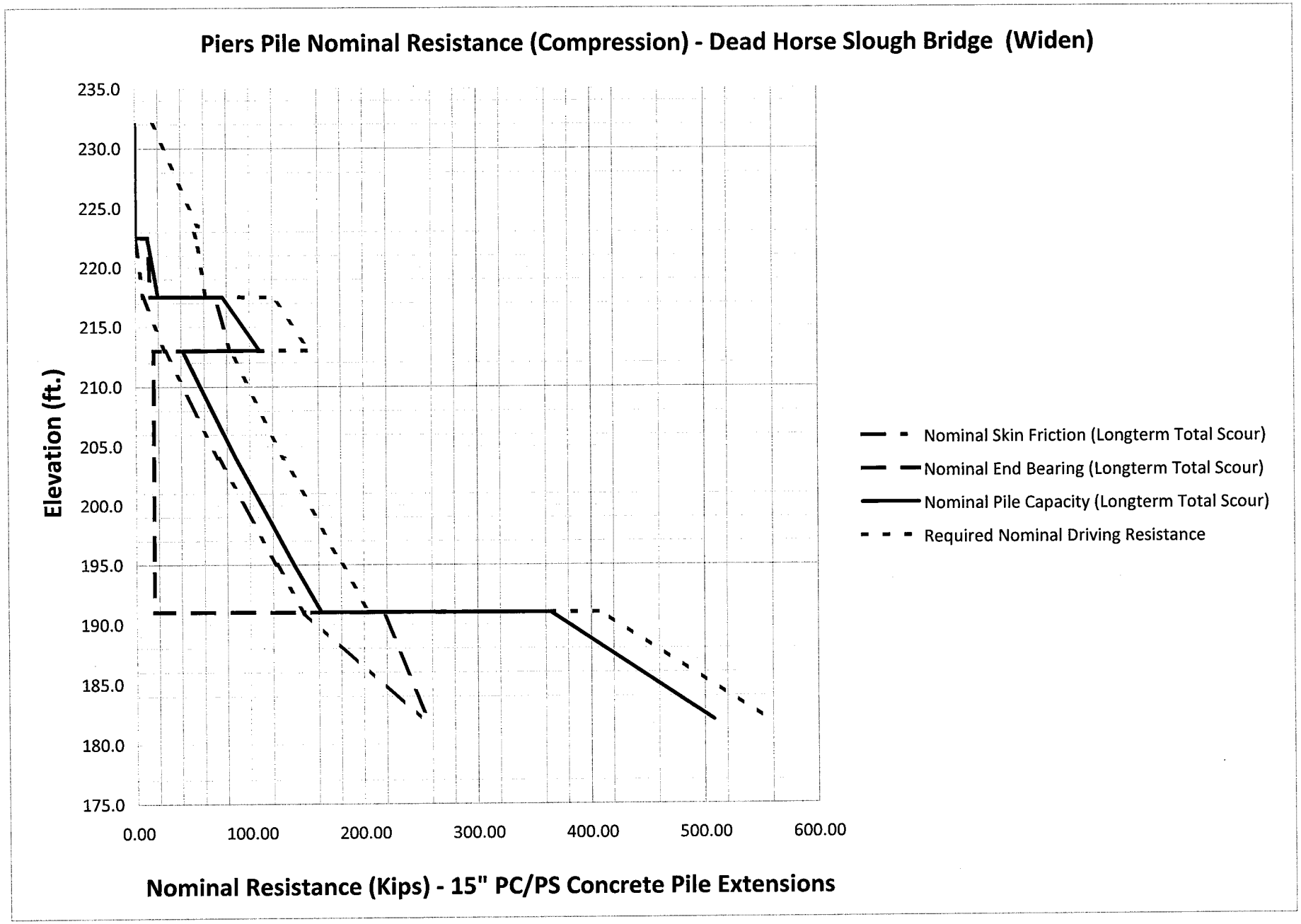
Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	8.50 ft	0.00%	119.00 pcf	1400.00 psf	T-79 Concrete
2	Cohesionless	6.00 ft	0.00%	106.00 pcf	27.0/27.0	Nordlund
3	Cohesionless	4.50 ft	0.00%	107.00 pcf	36.0/36.0	Nordlund
4	Cohesive	22.00 ft	0.00%	106.00 pcf	1400.00 psf	T-79 Concrete
5	Cohesionless	29.00 ft	0.00%	107.00 pcf	38.0/38.0	Nordlund

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	15.48 Kips	15.53 Kips
8.49 ft	44.79 Kips	15.48 Kips	60.27 Kips
8.51 ft	44.86 Kips	10.39 Kips	55.24 Kips
14.49 ft	53.88 Kips	13.65 Kips	67.53 Kips
14.51 ft	53.95 Kips	72.21 Kips	126.16 Kips
18.99 ft	76.05 Kips	85.42 Kips	161.46 Kips
19.01 ft	76.16 Kips	15.48 Kips	91.63 Kips
28.01 ft	128.31 Kips	15.48 Kips	143.79 Kips
37.01 ft	185.44 Kips	15.48 Kips	200.91 Kips
40.99 ft	212.28 Kips	15.48 Kips	227.76 Kips
41.01 ft	212.47 Kips	220.55 Kips	433.02 Kips
50.01 ft	331.58 Kips	259.85 Kips	591.43 Kips
59.01 ft	470.17 Kips	299.16 Kips	769.33 Kips
68.01 ft	628.26 Kips	329.95 Kips	958.21 Kips
69.99 ft	665.65 Kips	329.95 Kips	995.60 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
8.51 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.49 ft	0.00 Kips	0.00 Kips	0.00 Kips
9.50 ft	0.00 Kips	10.48 Kips	10.48 Kips
14.49 ft	7.42 Kips	13.20 Kips	20.62 Kips
14.51 ft	7.48 Kips	69.85 Kips	77.33 Kips
18.99 ft	28.92 Kips	83.06 Kips	111.98 Kips
19.01 ft	29.03 Kips	15.48 Kips	44.51 Kips
28.01 ft	81.19 Kips	15.48 Kips	96.66 Kips
37.01 ft	138.31 Kips	15.48 Kips	153.79 Kips
40.99 ft	165.15 Kips	15.48 Kips	180.63 Kips
41.01 ft	165.34 Kips	217.06 Kips	382.40 Kips
50.01 ft	282.72 Kips	256.36 Kips	539.07 Kips
59.01 ft	419.58 Kips	295.66 Kips	715.24 Kips
68.01 ft	575.93 Kips	329.95 Kips	905.88 Kips
69.99 ft	612.94 Kips	329.95 Kips	942.89 Kips



Dead Horse Slough Bridge (Widen)
Bridge No. 12-0135
03-BUT-32, PM 11.08, EA:1E4901

Dead Horse Slough Widen
BCI No. 1202.1
11/14/10
By: WEN

Pier Pile Settlement Calculations: 15" PC/PS Concrete Pile Extensions

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		100000
A	*Average Axial Load (lbs)	50000
B	Pile Length (in.)	444
C	Tip Area (sq. in.)	177
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.028**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	565.0
B	Pile Diameter (in.)	15
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	8000
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
Point Settlement (in.)		**0.241**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = 0.27 in.
6.8 mm