BEL-70-19.17
(PID 107533)

TEMPORARY SHORING CALCULATIONS

FOR

CULVERT MODIFICATIONS
(VARIOUS LOCATIONS)

Dated 4/02/2026
(revised 6/2026)

Prepared By:

GPD GROUP®

520 South Main Street, Suite 2531
Akron, Ohio 44311
(330) 572-2100

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Shoring Calculations Narrative

For the **BEL-70-19.17** project (**PID 107533**), temporary shoring calculations have been prepared for excavation bracing required to access various existing culvert conduits proposed to be modified, rehabilitated or replaced including the installation of new drainage structures along those conduits. The culvert and shoring structures are identified as follows:

- Culvert #3 - Sta. 1093+87, Rt.
- Culvert #5 - Sta. 1162+05, Rt.
- Culvert #5 - Sta. 1162+05, Lt.
- Culvert #6 - Sta. 1183+61, Rt.
- Culvert #8 - Sta. 1206+19, Lt.
- Culvert #9 - Sta. 1222+96, Lt.
- ~~Culvert #10 - Sta. 1243+55, Lt.~~ (temporary shoring for culvert #10 has been deleted from project due to planned earthwork in the vicinity of the existing culvert and proposed culvert work).

No soil borings were advanced for design of the shoring described herein. Per the scope, subsurface ground conditions for the shoring analyses are based on approximations from available historic boring data or based on assumptions that have been noted on the drawings where no nearby data exists.

Cantilever wall shoring calculations were previously prepared using CivilTech Shoring Suite software. The analysis used CivilTech Shoring software's internally generated soil properties for a 60-blow hard clay to simulate the clay shale bedrock. Above the bedrock the soils were modeled using a 6-blow medium clay which the software internally converts to an "equivalent clay" layer with granular properties of 30.3^{o} phi angle and density of 121.9 pcf. Sloping surcharges ground conditions were input to simulate infinite slope conditions where applicable.

Following ODOT's Stage 3 review comments which included additional design criteria for groundwater levels and resulting hydrostatic loading on the shoring structures, the calculations were updated using the LPile program. This provided improved analysis of structure interaction with the variable stiffness of soil and rock and should facilitate ODOT's review of the calculations due to greater familiarity with the LPile program and its capabilities. Distributed lateral load inputs for retained soil, as well as subsurface soils below the excavation line and above bedrock, are based on ODOT BDM Figure 307-1 granular material with density of 120 pcf and internal friction angle of 30 degrees. 2:1 slopes above the wall were considered infinite for calculation of active pressures. Analysis results for the temporary shoring were considered satisfactory when the LRFD factored case executed successfully in combination with a service load deflection at the top not exceeding approximately 1.5% of the retained soil height (compared to 1% max. for a permanent wall) and essentially no movement at the tip of pile under service conditions. Top deflections for walls adjacent to traffic also included a maximum deflection of 2".

Closed cell shoring with driven sheet pile and internal perimeter waler beams at Culvert #6 Sta. 1183+61 remain as previously modeled using Civiltech software with apparent earth pressure for braced excavations.

See the following sections of this report for the LPile and CivilTech shoring analyses input and output as well as related calculations for timber lagging.

Culvert #3 - Sta. 1093+87, Rt.

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1093+87 - Pile 1

Wall Height : 7.5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	5.00	ft
$Depth_1$ for Lateral Soil Pressure =	3.75	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.239	ksf
Lateral Soil Load Lpile Input =	**99.38**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	5.00	ft
$Depth_2$ for Lateral Soil Pressure =	7.5	ft
Lateral Pressure at Top of Layer 2 =	0.239	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.353	ksf
Lateral Soil Load Lpile Input =	**147.08**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	5.00	ft
Depth at Top of Groundwater =	3.75	ft
Depth at Bot of Groundwater =	7.5	ft
Water Pressure at Bot of Layer =	0.234	ksf
Lateral Water Load Lpile Input =	**97.50**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1093+87 - Piles 2, 8

Wall Height : 10 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	8.00	ft
$Depth_1$ for Lateral Soil Pressure =	5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.318	ksf
Lateral Soil Load Lpile Input =	**212.00**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	8.00	ft
$Depth_2$ for Lateral Soil Pressure =	10	ft
Lateral Pressure at Top of Layer 2 =	0.318	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.471	ksf
Lateral Soil Load Lpile Input =	**313.76**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	8.00	ft
Depth at Top of Groundwater =	5.00	ft
Depth at Bot of Groundwater =	10	ft
Water Pressure at Bot of Layer =	0.312	ksf
Lateral Water Load Lpile Input =	**208.00**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1093+87 - Piles 3, 7

Wall Height : 13 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_1$ for Lateral Soil Pressure =	6.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.413	ksf
Lateral Soil Load Lpile Input =	**206.70**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_2$ for Lateral Soil Pressure =	13	ft
Lateral Pressure at Top of Layer 2 =	0.413	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.612	ksf
Lateral Soil Load Lpile Input =	**305.92**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	6.00	ft
Depth at Top of Groundwater =	6.50	ft
Depth at Bot of Groundwater =	13	ft
Water Pressure at Bot of Layer =	0.406	ksf
Lateral Water Load Lpile Input =	**202.80**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1093+87 - Piles 6, 5 & 4

Wall Height : 16.5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	8.00	ft
$Depth_1$ for Lateral Soil Pressure =	8.25	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.525	ksf
Lateral Soil Load Lpile Input =	**349.80**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	8.00	ft
$Depth_2$ for Lateral Soil Pressure =	16.5	ft
Lateral Pressure at Top of Layer 2 =	0.525	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.777	ksf
Lateral Soil Load Lpile Input =	**517.70**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	8.00	ft
Depth at Top of Groundwater =	8.25	ft
Depth at Bot of Groundwater =	16.5	ft
Water Pressure at Bot of Layer =	0.515	ksf
Lateral Water Load Lpile Input =	**343.20**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1093+87 - Piles 9

Wall Height : 5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	3.00	ft
$Depth_1$ for Lateral Soil Pressure =	2.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.159	ksf
Lateral Soil Load Lpile Input =	**39.75**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	3.00	ft
$Depth_2$ for Lateral Soil Pressure =	5	ft
Lateral Pressure at Top of Layer 2 =	0.159	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.235	ksf
Lateral Soil Load Lpile Input =	**58.83**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	3.00	ft
Depth at Top of Groundwater =	2.50	ft
Depth at Bot of Groundwater =	5	ft
Water Pressure at Bot of Layer =	0.156	ksf
Lateral Water Load Lpile Input =	**39.00**	**lb/inch, Bot**

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                            LPile for Version 2022-12.012

                              License ID : 154178656
                          License Type : (Network License)

                  Analysis of Individual Piles and Drilled Shafts
                 Subjected to Lateral Loading Using the p-y Method
                            © 1985-2024 by Ensoft, Inc.
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                 This software is licensed for exclusive use by:
                                    GPD GROUP
                                 Akron, GDP GROUP

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This model was prepared by:
TWASHKO




--------------------------------------------------------------------------------
                             Files Used for Analysis
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Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1093.87 Pile 1.lp12d

Name of the output report file:
BEL-70 1093.87 Pile 1.lp12o

Name of the plot output file:
BEL-70 1093.87 Pile 1.lp12p

Name of the runtime message file:
BEL-70 1093.87 Pile 1.lp12r

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

Date: June 21, 2026 Time: 15:20:46

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1093+87 Pile 1 - 7.5'Ht. (5' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected

 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 22.000 ft
Depth of ground surface below top of pile = 7.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	10.1000
2	7.500	10.1000
3	7.500	24.0000
4	22.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 7.500000 ft
   AISC Section Type = HP

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   AISC Section Name                                = HP10X42


   Pile width                                       =    10.100000 in
   Shear capacity of section                        =      106630. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section                                =    14.500000 ft
   Section Diameter                                 =    24.000000 in
   Shear capacity of section                        =      106630. lbs



---------------------------------------------------------------------------
                      Soil and Rock Layering Information
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The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer        =     7.500000 ft
   Distance from top of pile to bottom of layer     =    19.000000 ft
   Effective unit weight at top of layer            =    57.600000 pcf
   Effective unit weight at bottom of layer         =    57.600000 pcf
   Friction angle at top of layer                   =    30.000000 deg.
   Friction angle at bottom of layer                =    30.000000 deg.
   Subgrade k at top of layer                       =    60.000000 pci
   Subgrade k at bottom of layer                    =    60.000000 pci


Layer 2 is weak rock, p-y criteria by Reese, 1997

   Distance from top of pile to top of layer        =    19.000000 ft
   Distance from top of pile to bottom of layer     =    50.000000 ft
   Effective unit weight at top of layer            =    77.600000 pcf
   Effective unit weight at bottom of layer         =    77.600000 pcf
   Uniaxial compressive strength at top of layer    =   100.000000 psi
   Uniaxial compressive strength at bottom of layer =   100.000000 psi
   Initial modulus of rock at top of layer          =       18000. psi
   Initial modulus of rock at bottom of layer       =       18000. psi
   RQD of rock at top of layer                      =    20.000000 %
   RQD of rock at bottom of layer                   =    20.000000 %
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k rm of rock at top of layer = 0.0005000
k rm of rock at bottom of layer = 0.0005000

(Depth of the lowest soil layer extends 28.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	3.75	99.38
3	7.50	147.08

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	3.75	0.00
2	7.50	97.50

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000

Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	7.500000 ft
Flange Width	=	10.100000 in
Section Depth	=	9.700000 in
Flange Thickness	=	0.420000 in
Web Thickness	=	0.415000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	12.400000 sq. in.
Moment of Inertia	=	210.000000 in^4
Elastic Bending Stiffness	=	6090000. kip-in^2
Plastic Modulus, Z	=	48.300000in^3
Plastic Moment Capacity = Fy Z	=	2415.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	620.000 kips
Nominal Axial Tensile Capacity	=	-620.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	43.4777520338	5992769.	4.8500000000	
0.0000145101	86.9555040676	5992769.	4.8500000000	
0.0000217651	130.4332561015	5992769.	4.8500000000	
0.0000290201	173.9110081353	5992769.	4.8500000000	
0.0000362752	217.3887601691	5992769.	4.8500000000	
0.0000435302	260.8665122029	5992769.	4.8500000000	
0.0000507853	304.3442642367	5992769.	4.8500000000	
0.0000580403	347.8220162706	5992769.	4.8500000000	
0.0000652953	391.2997683044	5992769.	4.8500000000	
0.0000725504	434.7775203382	5992769.	4.8500000000	
0.0000798054	478.2552723720	5992769.	4.8500000000	
0.0000870604	521.7330244059	5992769.	4.8500000000	
0.0000943155	565.2107764397	5992769.	4.8500000000	
0.0001015705	608.6885284735	5992769.	4.8500000000	
0.0001088255	652.1662805073	5992769.	4.8500000000	
0.0001160806	695.6440325411	5992769.	4.8500000000	
0.0001233356	739.1217845750	5992769.	4.8500000000	
0.0001305906	782.5995366088	5992769.	4.8500000000	
0.0001378457	826.0772886426	5992769.	4.8500000000	
0.0001451007	869.5550406764	5992769.	4.8500000000	
0.0001523558	913.0327927102	5992769.	4.8500000000	
0.0001596108	956.5105447441	5992769.	4.8500000000	
0.0001668658	999.9882967779	5992769.	4.8500000000	
0.0001741209	1043.	5992769.	4.8500000000	
0.0001813759	1087.	5992769.	4.8500000000	
0.0001886309	1130.	5992769.	4.8500000000	
0.0001958860	1174.	5992769.	4.8500000000	
0.0002031410	1217.	5992769.	4.8500000000	
0.0002103960	1261.	5992769.	4.8500000000	
0.0002176511	1304.	5992769.	4.8500000000	
0.0002249061	1348.	5992769.	4.8500000000	
0.0002321611	1391.	5992769.	4.8500000000	
0.0002394162	1435.	5992769.	4.8500000000	
0.0002466712	1478.	5992769.	4.8500000000	
0.0002539263	1522.	5992769.	4.8500000000	
0.0002611813	1565.	5992769.	4.8500000000	
0.0002684363	1609.	5992769.	4.8500000000	
0.0002756914	1652.	5992769.	4.8500000000	
0.0002829464	1696.	5992769.	4.8500000000	
0.0002974565	1783.	5992769.	4.8500000000	
0.0003119665	1870.	5992769.	4.8500000000	
0.0003264766	1956.	5992769.	4.8500000000	

0.0003409867	2043.	5992769.	4.8500000000	
0.0003554968	2130.	5992769.	4.8500000000	
0.0003700068	2199.	5942130.	4.8500000000	Y
0.0003845169	2233.	5807975.	4.8500000000	Y
0.0003990270	2245.	5627120.	4.8500000000	Y
0.0004135370	2254.	5451108.	4.8500000000	Y
0.0004280471	2262.	5285148.	4.8500000000	Y
0.0004425572	2269.	5128131.	4.8500000000	Y
0.0004570673	2276.	4979678.	4.8500000000	Y
0.0004715773	2282.	4839137.	4.8500000000	Y
0.0004860874	2287.	4705909.	4.8500000000	Y
0.0005005975	2292.	4579458.	4.8500000000	Y
0.0005151075	2297.	4459307.	4.8500000000	Y
0.0005296176	2301.	4345022.	4.8500000000	Y
0.0005441277	2305.	4236215.	4.8500000000	Y
0.0005586378	2309.	4132530.	4.8500000000	Y
0.0005731478	2312.	4033644.	4.8500000000	Y
0.0005876579	2315.	3939263.	4.8500000000	Y
0.0006021680	2318.	3849104.	4.8500000000	Y
0.0006166780	2320.	3762749.	4.8500000000	Y
0.0006311881	2323.	3680141.	4.8500000000	Y
0.0006456982	2325.	3601052.	4.8500000000	Y
0.0006602083	2327.	3525092.	4.8500000000	Y
0.0006747183	2329.	3452291.	4.8500000000	Y
0.0006892284	2331.	3382319.	4.8500000000	Y
0.0007037385	2333.	3315098.	4.8500000000	Y
0.0007182485	2335.	3250437.	4.8500000000	Y
0.0007327586	2336.	3188206.	4.8500000000	Y
0.0007472687	2338.	3128263.	4.8500000000	Y
0.0007617788	2339.	3070519.	4.8500000000	Y
0.0007762888	2340.	3014790.	4.8500000000	Y
0.0007907989	2342.	2961096.	4.8500000000	Y
0.0008053090	2343.	2909147.	4.8500000000	Y
0.0008198191	2344.	2859037.	4.8500000000	Y
0.0008343291	2345.	2810577.	4.8500000000	Y
0.0008488392	2346.	2763692.	4.8500000000	Y
0.0008633493	2347.	2718382.	4.8500000000	Y
0.0009213896	2350.	2550781.	4.8500000000	Y
0.0009794298	2353.	2402455.	4.8500000000	Y
0.0010374701	2355.	2270298.	4.8500000000	Y
0.0010955104	2357.	2151822.	4.8500000000	Y
0.0011535507	2359.	2045031.	4.8500000000	Y
0.0012115910	2360.	1948248.	4.8500000000	Y
0.0012696313	2362.	1860154.	4.8500000000	Y
0.0013276716	2363.	1779680.	4.8500000000	Y
0.0013857118	2364.	1705811.	4.8500000000	Y
0.0014437521	2365.	1637830.	4.8500000000	Y

```
    0.0015017924             2365.          1575020.       4.8500000000    Y
    0.0015598327             2366.          1516858.       4.8500000000    Y
    0.0016178730             2367.          1462791.       4.8500000000    Y
    0.0016759133             2367.          1412468.       4.8500000000    Y
    0.0017339536             2368.          1365457.       4.8500000000    Y
    0.0017919939             2368.          1321468.       4.8500000000    Y


-------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
-------------------------------------------------------------------------------

                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------         ----------------
  1               0.00000000                   2368.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.



Pile Section No. 2:
-------------------

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
-------------------------------------------------------------------------------

Length of Section                                =    14.500000 ft
Outside Diameter of Casing                       =    24.000000 in
Casing Wall Thickness                            =       0.0000 in
Moment of Inertia of Steel Casing                =       0.0000 in^4
Width Flange of Core/Insert                      =    10.100000 in
Depth of Core/Insert                             =     9.700000 in
Flange Thickness of Core/Insert                  =     0.420000 in
Web Thickness of Core/Insert                     =     0.415000 in
Moment of Inertia of Steel Core/Insert           =   206.834773 in^4
```

```
Yield Stress of Casing                                =       50000. psi
Elastic Modulus of Casing                             =    29000000. psi
Yield Stress of Core/Insert                           =       50000. psi
Elastic Modulus of Core/Insert                        =    29000000. psi
Number of Reinforcing Bars                            =           0 bars
Gross Area of Pile                                    =   452.389342 sq. in.
Area of Concrete                                      =   440.228442 sq. in.
Cross-sectional Area of Steel Casing                  =      0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert             =    12.160900 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)     =    12.160900 sq. in.
Area Ratio of All Steel to Gross Area                 =         2.69 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As    =     2104.822 kips
Tensile Load for Cracking of Concrete                 =     -223.782 kips
Nominal Axial Tensile Capacity                        =     -608.045 kips



Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

   Number     Axial Thrust Force
                   kips
   ------     ------------------
      1               0.000

Definition of Run Messages:

   Y = part of pipe section has yielded.


Axial Thrust Force =      0.000 kips

     Bending            Bending            Bending           Depth to       Run
    Curvature           Moment            Stiffness          N Axis        Msg
     rad/in.            in-kip             kip-in2             in
----------------   ----------------   ----------------   ----------------   ---
    0.0000072550     530.4688702357          73117333.      12.0000000000
    0.0000145101     530.4688702357          36558666.       7.5346432973   C
    0.0000217651     530.4688702357          24372444.       7.5509693177   C
    0.0000290201     573.8604565856          19774556.       7.5673903328   C
    0.0000362752     714.7361369836          19703173.       7.5838762751   C
```

0.0000435302	854.5349048170	19630845.	7.6006151961	C
0.0000507853	993.2347822465	19557544.	7.6176150838	C
0.0000580403	1131.	19483241.	7.6348843122	C
0.0000652953	1267.	19407906.	7.6524316670	C
0.0000725504	1403.	19331507.	7.6702663732	C
0.0000798054	1537.	19254007.	7.6883985918	C
0.0000870604	1669.	19175378.	7.7068375181	C
0.0000943155	1801.	19095579.	7.7255944174	C
0.0001015705	1931.	19014571.	7.7446806026	C
0.0001088255	2060.	18932313.	7.7641080049	C
0.0001160806	2188.	18848762.	7.7838892208	C
0.0001233356	2314.	18763904.	7.8039201862	C
0.0001305906	2439.	18677809.	7.8238464979	C
0.0001378457	2563.	18590324.	7.8441461966	C
0.0001451007	2685.	18501397.	7.8648339000	C
0.0001523558	2805.	18410976.	7.8859251101	C
0.0001596108	2924.	18319004.	7.9074362866	C
0.0001668658	3041.	18225418.	7.9293849286	C
0.0001741209	3157.	18130157.	7.9517896655	C
0.0001813759	3271.	18033150.	7.9746703578	C
0.0001886309	3383.	17934325.	7.9979893773	C
0.0001958860	3491.	17821723.	8.0198685081	CY
0.0002031410	3572.	17584937.	8.0198599416	CY
0.0002103960	3616.	17185839.	7.9890033576	CY
0.0002176511	3651.	16776777.	7.9554828143	CY
0.0002249061	3684.	16382236.	7.9233122209	CY
0.0002321611	3715.	16001668.	7.8923366248	CY
0.0002394162	3743.	15634555.	7.8625747655	CY
0.0002466712	3769.	15280300.	7.8363042206	CY
0.0002539263	3793.	14938361.	7.8102930990	CY
0.0002611813	3815.	14607939.	7.7851355921	CY
0.0002684363	3836.	14288816.	7.7610173485	CY
0.0002756914	3854.	13981037.	7.7383482617	CY
0.0002829464	3872.	13684046.	7.7170393330	CY
0.0002974565	3902.	13119520.	7.6778549283	CY
0.0003119665	3929.	12593495.	7.6433460103	CY
0.0003264766	3951.	12102782.	7.6128213964	CY
0.0003409867	3971.	11644332.	7.5858959176	CY
0.0003554968	3987.	11215358.	7.5620206201	CY
0.0003700068	4001.	10813285.	7.5391130627	CY
0.0003845169	4013.	10436280.	7.5206259707	CY
0.0003990270	4023.	10082484.	7.5034137928	CY
0.0004135370	4032.	9749595.	7.4883916869	CY
0.0004280471	4039.	9435684.	7.4748414923	CY
0.0004425572	4045.	9140071.	7.4631570054	CY
0.0004570673	4050.	8860511.	7.4527115052	CY
0.0004715773	4054.	8596337.	7.4438376166	CY

0.0004860874	4057.	8346000.	7.4354937360	CY
0.0005005975	4059.	8108779.	7.4293988243	CY
0.0005151075	4061.	7883393.	7.4233730110	CY
0.0005296176	4061.	7667409.	7.4355441507	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	4061.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	7.5000	0.00	N.A.	No	0.00	75179.
2	19.0000	11.5000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for

peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
44.88	0.59
47.52	5.46
50.16	11.18
52.80	16.90
55.44	22.62
58.08	28.34
60.72	34.06
63.36	39.78
66.00	45.50
68.64	51.22
71.28	56.94
73.92	62.66
76.56	68.38
79.20	74.10
81.84	79.82
84.48	85.54
87.12	91.26
89.76	56.61

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.46

2.64	5.83
5.28	11.66
7.92	17.49
10.56	23.32
13.20	29.15
15.84	34.98
18.48	40.81
21.12	46.64
23.76	52.47
26.40	58.30
29.04	64.13
31.68	69.96
34.32	75.79
36.96	81.62
39.60	87.45
42.24	93.28
44.88	98.80
47.52	102.05
50.16	104.85
52.80	107.65
55.44	110.45
58.08	113.24
60.72	116.04
63.36	118.84
66.00	121.64
68.64	124.44
71.28	127.24
73.92	130.04
76.56	132.83
79.20	135.63
81.84	138.43
84.48	141.23
87.12	144.03
89.76	86.42

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.74766	4.773E-07	0.000	0.000	5.993E+09
0.22000	0.73447	5.07935	9.61998	0.000	5.993E+09
0.44000	0.72129	50.79352	32.70795	0.000	5.993E+09
0.66000	0.70810	177.77731	71.18788	0.000	5.993E+09
0.88000	0.69491	426.66553	125.05979	0.000	5.993E+09
1.10000	0.68173	838.09301	194.32368	0.000	5.993E+09
1.32000	0.66854	1453.	278.97954	0.000	5.993E+09
1.54000	0.65536	2311.	379.02737	0.000	5.993E+09
1.76000	0.64218	3454.	494.46718	0.000	5.993E+09
1.98000	0.62900	4922.	625.29896	0.000	5.993E+09
2.20000	0.61583	6756.	771.52272	0.000	5.993E+09
2.42000	0.60267	8996.	933.13845	0.000	5.993E+09
2.64000	0.58952	11683.	1110.	0.000	5.993E+09
2.86000	0.57638	14857.	1303.	0.000	5.993E+09
3.08000	0.56326	18560.	1510.	0.000	5.993E+09
3.30000	0.55016	22832.	1734.	0.000	5.993E+09
3.52000	0.53709	27713.	1972.	0.000	5.993E+09
3.74000	0.52404	33244.	2226.	0.000	5.993E+09
3.96000	0.51104	39468.	2500.	0.000	5.993E+09
4.18000	0.49809	46442.	2795.	0.000	5.993E+09
4.40000	0.48518	54224.	3112.	0.000	5.993E+09
4.62000	0.47234	62874.	3452.	0.000	5.993E+09
4.84000	0.45958	72452.	3815.	0.000	5.993E+09
5.06000	0.44690	83016.	4200.	0.000	5.993E+09
5.28000	0.43431	94627.	4607.	0.000	5.993E+09
5.50000	0.42184	107343.	5037.	0.000	5.993E+09
5.72000	0.40949	121224.	5490.	0.000	5.993E+09
5.94000	0.39728	136329.	5965.	0.000	5.993E+09
6.16000	0.38523	152718.	6462.	0.000	5.993E+09
6.38000	0.37335	170450.	6982.	0.000	5.993E+09
6.60000	0.36168	189584.	7525.	0.000	5.993E+09
6.82000	0.35022	210180.	8090.	0.000	5.993E+09
7.04000	0.33901	232297.	8677.	0.000	5.993E+09
7.26000	0.32807	255995.	9287.	0.000	5.993E+09
7.48000	0.31743	281332.	9786.	0.000	5.993E+09
7.70000	0.30712	307667.	9961.	-10.6380	7.312E+10
7.92000	0.29683	333927.	9917.	-22.9528	7.312E+10
8.14000	0.28658	360027.	9839.	-35.6973	7.312E+10
8.36000	0.27636	385879.	9728.	-48.6530	7.312E+10
8.58000	0.26617	411391.	9582.	-61.6998	7.312E+10
8.80000	0.25603	436474.	9402.	-74.8065	7.312E+10
9.02000	0.24593	461035.	9188.	-87.6681	7.312E+10

9.24000	0.23587	484985.	8940.	-100.1068	7.312E+10
9.46000	0.22586	508237.	8660.	-111.9493	7.312E+10
9.68000	0.21589	530709.	8349.	-123.3793	7.166E+10
9.90000	0.20598	552321.	8009.	-134.0743	2.173E+10
10.12000	0.19625	572999.	7643.	-143.8460	1.984E+10
10.34000	0.18671	592674.	7251.	-152.5675	1.976E+10
10.56000	0.17739	611286.	6838.	-160.4966	1.975E+10
10.78000	0.16828	628779.	6404.	-168.3183	1.974E+10
11.00000	0.15939	645099.	5951.	-175.0122	1.973E+10
11.22000	0.15074	660199.	5482.	-180.4851	1.973E+10
11.44000	0.14231	674042.	5000.	-184.6507	1.972E+10
11.66000	0.13412	686597.	4507.	-188.6390	1.972E+10
11.88000	0.12618	697838.	4005.	-191.8518	1.971E+10
12.10000	0.11848	707742.	3496.	-193.8176	1.971E+10
12.32000	0.11103	716294.	2983.	-194.4905	1.970E+10
12.54000	0.10384	723492.	2470.	-193.9738	1.970E+10
12.76000	0.09690	729337.	1960.	-192.7130	1.969E+10
12.98000	0.09022	733839.	1455.	-190.0348	1.969E+10
13.20000	0.08380	737017.	958.27588	-185.9212	1.969E+10
13.42000	0.07764	738899.	474.77081	-180.3705	1.969E+10
13.64000	0.07174	739524.	4.98860	-175.5251	1.969E+10
13.86000	0.06611	738925.	-451.9729	-170.6579	1.969E+10
14.08000	0.06073	737137.	-894.5397	-164.6200	1.969E+10
14.30000	0.05562	734202.	-1320.	-157.4606	1.969E+10
14.52000	0.05076	730169.	-1725.	-149.2501	1.969E+10
14.74000	0.04617	725097.	-2106.	-140.0819	1.970E+10
14.96000	0.04183	719047.	-2463.	-130.0728	1.970E+10
15.18000	0.03775	712092.	-2792.	-119.3642	1.970E+10
15.40000	0.03391	704304.	-3093.	-108.1218	1.971E+10
15.62000	0.03033	695763.	-3369.	-100.9433	1.971E+10
15.84000	0.02699	686518.	-3630.	-97.0787	1.972E+10
16.06000	0.02390	676596.	-3881.	-92.8502	1.972E+10
16.28000	0.02104	666028.	-4120.	-88.2991	1.972E+10
16.50000	0.01842	654844.	-4347.	-83.4739	1.973E+10
16.72000	0.01603	643078.	-4560.	-78.4309	1.974E+10
16.94000	0.01387	630766.	-4760.	-73.2344	1.974E+10
17.16000	0.01193	617943.	-4947.	-67.9584	1.975E+10
17.38000	0.01021	604647.	-5119.	-62.6872	1.976E+10
17.60000	0.008703	590913.	-5279.	-58.2733	1.976E+10
17.82000	0.007404	576774.	-5428.	-54.8881	1.977E+10
18.04000	0.006308	562252.	-5564.	-47.8669	2.076E+10
18.26000	0.005400	547396.	-5682.	-41.8368	2.225E+10
18.48000	0.004664	532249.	-5786.	-36.8746	5.677E+10
18.70000	0.003994	516845.	-5877.	-32.2062	7.312E+10
18.92000	0.003373	501216.	-5957.	-27.7305	7.312E+10
19.14000	0.002799	485394.	-7041.	-793.5087	7.312E+10
19.36000	0.002272	464042.	-9222.	-858.8014	7.312E+10

19.58000	0.001789	436704.	-11554.	-908.4902	7.312E+10
19.80000	0.001347	403034.	-13993.	-939.0617	7.312E+10
20.02000	0.000945	362820.	-16479.	-944.0615	7.312E+10
20.24000	0.000576	316026.	-18925.	-909.2715	7.312E+10
20.46000	0.000238	262894.	-21167.	-788.9596	7.312E+10
20.68000	-7.523E-05	204264.	-21829.	287.08240	7.312E+10
20.90000	-0.000369	147634.	-20111.	1015.	7.312E+10
21.12000	-0.000649	98076.	-17128.	1245.	7.312E+10
21.34000	-0.000919	57199.	-13579.	1443.	7.312E+10
21.56000	-0.001184	26379.	-9526.	1627.	7.312E+10
21.78000	-0.001446	6900.	-4996.	1805.	7.312E+10
22.00000	-0.001708	0.000	0.000	1980.	7.312E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 0.74765801 inches
Computed slope at pile head = -0.0049948 radians
Maximum bending moment = 739524. inch-lbs
Maximum shear force = -21829. lbs
Depth of maximum bending moment = 13.64000000 feet below pile head
Depth of maximum shear force = 20.68000000 feet below pile head
Number of iterations = 51
Number of zero deflection points = 1
Pile deflection at ground = 0.31649235 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
44.88	0.59
47.52	5.46
50.16	11.18
52.80	16.90
55.44	22.62
58.08	28.34
60.72	34.06
63.36	39.78
66.00	45.50
68.64	51.22
71.28	56.94

73.92	62.66
76.56	68.38
79.20	74.10
81.84	79.82
84.48	85.54
87.12	91.26
89.76	56.61

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.46
2.64	5.83
5.28	11.66
7.92	17.49
10.56	23.32
13.20	29.15
15.84	34.98
18.48	40.81
21.12	46.64
23.76	52.47
26.40	58.30
29.04	64.13
31.68	69.96
34.32	75.79
36.96	81.62
39.60	87.45
42.24	93.28
44.88	98.80
47.52	102.05
50.16	104.85
52.80	107.65
55.44	110.45
58.08	113.24
60.72	116.04
63.36	118.84
66.00	121.64
68.64	124.44

71.28	127.24
73.92	130.04
76.56	132.83
79.20	135.63
81.84	138.43
84.48	141.23
87.12	144.03
89.76	86.42

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.36029	7.255E-06	-3.616E-08	0.000	5.993E+09
0.22000	1.33736	7.61903	14.42998	0.000	5.993E+09
0.44000	1.31443	76.19028	49.06192	0.000	5.993E+09
0.66000	1.29151	266.66596	106.78182	0.000	5.993E+09
0.88000	1.26858	639.99830	187.58969	0.000	5.993E+09
1.10000	1.24565	1257.	291.48551	0.000	5.993E+09
1.32000	1.22273	2179.	418.46930	0.000	5.993E+09
1.54000	1.19980	3467.	568.54105	0.000	5.993E+09
1.76000	1.17688	5181.	741.70077	0.000	5.993E+09
1.98000	1.15397	7383.	937.94844	0.000	5.993E+09
2.20000	1.13107	10133.	1157.	0.000	5.993E+09
2.42000	1.10818	13493.	1400.	0.000	5.993E+09
2.64000	1.08530	17524.	1665.	0.000	5.993E+09
2.86000	1.06244	22286.	1954.	0.000	5.993E+09
3.08000	1.03961	27840.	2266.	0.000	5.993E+09
3.30000	1.01681	34248.	2600.	0.000	5.993E+09
3.52000	0.99406	41569.	2958.	0.000	5.993E+09
3.74000	0.97135	49867.	3339.	0.000	5.993E+09
3.96000	0.94869	59201.	3745.	0.000	5.993E+09
4.18000	0.92611	69640.	4177.	0.000	5.993E+09
4.40000	0.90361	81253.	4634.	0.000	5.993E+09

4.62000	0.88120	94109.	5118.	0.000	5.993E+09
4.84000	0.85890	108278.	5629.	0.000	5.993E+09
5.06000	0.83673	123828.	6165.	0.000	5.993E+09
5.28000	0.81470	140829.	6727.	0.000	5.993E+09
5.50000	0.79284	159349.	7316.	0.000	5.993E+09
5.72000	0.77116	179458.	7931.	0.000	5.993E+09
5.94000	0.74969	201225.	8572.	0.000	5.993E+09
6.16000	0.72845	224719.	9239.	0.000	5.993E+09
6.38000	0.70748	250009.	9933.	0.000	5.993E+09
6.60000	0.68680	277164.	10653.	0.000	5.993E+09
6.82000	0.66643	306254.	11398.	0.000	5.993E+09
7.04000	0.64643	337348.	12170.	0.000	5.993E+09
7.26000	0.62682	370514.	12969.	0.000	5.993E+09
7.48000	0.60763	405821.	13620.	0.000	5.993E+09
7.70000	0.58892	442427.	13849.	-12.8161	7.312E+10
7.92000	0.57025	478944.	13795.	-27.6985	7.312E+10
8.14000	0.55163	515267.	13702.	-43.1676	7.312E+10
8.36000	0.53306	551290.	13567.	-58.9844	2.184E+10
8.58000	0.51466	586901.	13390.	-74.9535	1.977E+10
8.80000	0.49647	621991.	13171.	-90.9302	1.975E+10
9.02000	0.47850	656446.	12910.	-106.6837	1.973E+10
9.24000	0.46076	690158.	12609.	-122.0285	1.971E+10
9.46000	0.44327	723019.	12267.	-136.7869	1.970E+10
9.68000	0.42603	754927.	11887.	-151.1465	1.968E+10
9.90000	0.40905	785782.	11470.	-164.7848	1.966E+10
10.12000	0.39236	815488.	11018.	-177.4819	1.965E+10
10.34000	0.37596	843957.	10534.	-189.0442	1.964E+10
10.56000	0.35985	871108.	10021.	-199.7901	1.962E+10
10.78000	0.34406	896867.	9479.	-210.5858	1.961E+10
11.00000	0.32858	921159.	8911.	-220.1569	1.959E+10
11.22000	0.31343	943916.	8319.	-228.3856	1.958E+10
11.44000	0.29862	965081.	7707.	-235.1607	1.957E+10
11.66000	0.28415	984607.	7077.	-241.6438	1.956E+10
11.88000	0.27003	1002449.	6432.	-247.1995	1.955E+10
12.10000	0.25627	1018568.	5774.	-251.3157	1.954E+10
12.32000	0.24287	1032936.	5107.	-253.9237	1.953E+10
12.54000	0.22985	1045534.	4435.	-255.3203	1.953E+10
12.76000	0.21719	1056352.	3759.	-256.7458	1.952E+10
12.98000	0.20491	1065381.	3081.	-256.5549	1.952E+10
13.20000	0.19301	1072622.	2407.	-254.6869	1.951E+10
13.42000	0.18150	1078088.	1739.	-251.0921	1.951E+10
13.64000	0.17037	1081804.	1079.	-248.7379	1.951E+10
13.86000	0.15962	1083786.	425.35782	-246.5776	1.951E+10
14.08000	0.14927	1084050.	-220.7875	-242.9264	1.951E+10
14.30000	0.13930	1082620.	-855.3079	-237.7709	1.951E+10
14.52000	0.12972	1079534.	-1474.	-231.1148	1.951E+10
14.74000	0.12052	1074836.	-2074.	-222.9820	1.951E+10

14.96000	0.11171	1068585.	-2650.	-213.4192	1.951E+10
15.18000	0.10328	1060846.	-3199.	-202.4979	1.952E+10
15.40000	0.09523	1051696.	-3717.	-190.3176	1.952E+10
15.62000	0.08755	1041219.	-4210.	-183.0144	1.953E+10
15.84000	0.08024	1029467.	-4689.	-179.9591	1.954E+10
16.06000	0.07331	1016460.	-5159.	-176.2428	1.954E+10
16.28000	0.06673	1002226.	-5619.	-171.8801	1.955E+10
16.50000	0.06051	986793.	-6066.	-166.8900	1.956E+10
16.72000	0.05465	970197.	-6499.	-161.2964	1.957E+10
16.94000	0.04913	952477.	-6917.	-155.1280	1.958E+10
17.16000	0.04394	933676.	-7318.	-148.4180	1.959E+10
17.38000	0.03909	913840.	-7700.	-141.2045	1.960E+10
17.60000	0.03457	893020.	-8064.	-134.7981	1.961E+10
17.82000	0.03036	871261.	-8413.	-129.4578	1.962E+10
18.04000	0.02647	848599.	-8747.	-123.6632	1.963E+10
18.26000	0.02287	825076.	-9065.	-117.4239	1.964E+10
18.48000	0.01957	800734.	-9367.	-110.7504	1.966E+10
18.70000	0.01655	775620.	-9650.	-103.6530	1.967E+10
18.92000	0.01380	749784.	-9913.	-96.1414	1.968E+10
19.14000	0.01132	723278.	-11526.	-1125.	1.970E+10
19.36000	0.009099	688928.	-14615.	-1215.	1.971E+10
19.58000	0.007119	646110.	-17913.	-1283.	1.973E+10
19.80000	0.005367	594348.	-21358.	-1327.	1.976E+10
20.02000	0.003825	533340.	-24877.	-1339.	2.413E+10
20.24000	0.002437	462997.	-28366.	-1304.	7.312E+10
20.46000	0.001094	383566.	-31612.	-1155.	7.312E+10
20.68000	-0.000214	296083.	-32061.	815.08286	7.312E+10
20.90000	-0.001493	214282.	-29086.	1439.	7.312E+10
21.12000	-0.002751	142509.	-24827.	1787.	7.312E+10
21.34000	-0.003996	83193.	-19717.	2084.	7.312E+10
21.56000	-0.005233	38402.	-13852.	2359.	7.312E+10
21.78000	-0.006467	10054.	-7273.	2625.	7.312E+10
22.00000	-0.007699	0.000	0.000	2885.	7.312E+10

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     1.36028887 inches
Computed slope at pile head      =     -0.0086848 radians
Maximum bending moment           =       1084050. inch-lbs
Maximum shear force              =        -32061. lbs
Depth of maximum bending moment  =    14.08000000 feet below pile head
Depth of maximum shear force     =    20.68000000 feet below pile head
Number of iterations             =            120
Number of zero deflection points =              1
Pile deflection at ground        =     0.60593228 inches
```

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	0.7476580	739524.	-21829.	-0.004995
2	1.3602889	1084050.	-32061.	-0.008685

Maximum pile-head deflection = 1.3602888699 inches
Maximum pile-head rotation = -0.0086847998 radians = -0.497602 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	2368063.	281332.	Pass
	2	1.00	4060795.	739524.	Pass
2	1	1.00	2368063.	405821.	Pass
	2	1.00	4060795.	1084050.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	106630.	9786.	Pass
	2	1.00	106630.	-21829.	Pass
2	1	1.00	106630.	13620.	Pass
	2	1.00	106630.	-32061.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -32061.46 lbs
Factored Shear Capacity at Node = 106630.00 lbs
Fraction of Allowable Shear Capacity = 0.3007

The analysis ended normally.

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

                            LPile for Version 2022-12.012

                              License ID : 154178656
                          License Type : (Network License)

                  Analysis of Individual Piles and Drilled Shafts
                 Subjected to Lateral Loading Using the p-y Method
                            © 1985-2024 by Ensoft, Inc.
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                 This software is licensed for exclusive use by:
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================================================================================


This model was prepared by:
TWASHKO




--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1093.87 Pile 2 8.lp12d

Name of the output report file:
BEL-70 1093.87 Pile 2 8.lp12o

Name of the plot output file:
BEL-70 1093.87 Pile 2 8.lp12p

Name of the runtime message file:
BEL-70 1093.87 Pile 2 8.lp12r

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

Date: June 23, 2026 Time: 15:38:25

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1093+87 Piles 2 8 - 10' Ht. (8' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected

 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 25.000 ft
Depth of ground surface below top of pile = 10.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.7000
2	10.000	14.7000
3	10.000	24.0000
4	25.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 10.000000 ft
   AISC Section Type = HP

```
   AISC Section Name                                = HP14X89


   Pile width                                       =    14.700000 in
   Shear capacity of section                        =      242720. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section                                =    15.000000 ft
   Section Diameter                                 =    24.000000 in
   Shear capacity of section                        =      242720. lbs



--------------------------------------------------------------------------------
                       Soil and Rock Layering Information
--------------------------------------------------------------------------------

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer        =    10.000000 ft
   Distance from top of pile to bottom of layer     =    19.000000 ft
   Effective unit weight at top of layer            =    57.600000 pcf
   Effective unit weight at bottom of layer         =    57.600000 pcf
   Friction angle at top of layer                   =    30.000000 deg.
   Friction angle at bottom of layer                =    30.000000 deg.
   Subgrade k at top of layer                       =    60.000000 pci
   Subgrade k at bottom of layer                    =    60.000000 pci


Layer 2 is weak rock, p-y criteria by Reese, 1997

   Distance from top of pile to top of layer        =    19.000000 ft
   Distance from top of pile to bottom of layer     =    50.000000 ft
   Effective unit weight at top of layer            =    77.600000 pcf
   Effective unit weight at bottom of layer         =    77.600000 pcf
   Uniaxial compressive strength at top of layer    =   100.000000 psi
   Uniaxial compressive strength at bottom of layer =   100.000000 psi
   Initial modulus of rock at top of layer          =       18000. psi
   Initial modulus of rock at bottom of layer       =       18000. psi
   RQD of rock at top of layer                      =    20.000000 %
   RQD of rock at bottom of layer                   =    20.000000 %
```

k rm of rock at top of layer = 0.0005000
k rm of rock at bottom of layer = 0.0005000

(Depth of the lowest soil layer extends 25.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	5.00	212.00
3	10.00	313.76

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	5.00	0.00
2	10.00	208.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000

Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	10.000000 ft
Flange Width	=	14.700000 in
Section Depth	=	13.800000 in
Flange Thickness	=	0.615000 in
Web Thickness	=	0.615000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	26.100000 sq. in.
Moment of Inertia	=	904.000000 in^4
Elastic Bending Stiffness	=	26216000. kip-in^2
Plastic Modulus, Z	=	146.000000in^3
Plastic Moment Capacity = Fy Z	=	7300.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	1305.000 kips
Nominal Axial Tensile Capacity	=	-1305.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049848	128.2663004094	25731729.	6.9000000000	
0.0000099695	256.5326008188	25731729.	6.9000000000	
0.0000149543	384.7989012282	25731729.	6.9000000000	
0.0000199390	513.0652016375	25731729.	6.9000000000	
0.0000249238	641.3315020469	25731729.	6.9000000000	
0.0000299085	769.5978024563	25731729.	6.9000000000	
0.0000348933	897.8641028657	25731729.	6.9000000000	
0.0000398780	1026.	25731729.	6.9000000000	
0.0000448628	1154.	25731729.	6.9000000000	
0.0000498475	1283.	25731729.	6.9000000000	
0.0000548323	1411.	25731729.	6.9000000000	
0.0000598170	1539.	25731729.	6.9000000000	
0.0000648018	1667.	25731729.	6.9000000000	
0.0000697865	1796.	25731729.	6.9000000000	
0.0000747713	1924.	25731729.	6.9000000000	
0.0000797560	2052.	25731729.	6.9000000000	
0.0000847408	2181.	25731729.	6.9000000000	
0.0000897255	2309.	25731729.	6.9000000000	
0.0000947103	2437.	25731729.	6.9000000000	
0.0000996951	2565.	25731729.	6.9000000000	
0.0001046798	2694.	25731729.	6.9000000000	
0.0001096646	2822.	25731729.	6.9000000000	
0.0001146493	2950.	25731729.	6.9000000000	
0.0001196341	3078.	25731729.	6.9000000000	
0.0001246188	3207.	25731729.	6.9000000000	
0.0001296036	3335.	25731729.	6.9000000000	
0.0001345883	3463.	25731729.	6.9000000000	
0.0001395731	3591.	25731729.	6.9000000000	
0.0001445578	3720.	25731729.	6.9000000000	
0.0001495426	3848.	25731729.	6.9000000000	
0.0001545273	3976.	25731729.	6.9000000000	
0.0001595121	4105.	25731729.	6.9000000000	
0.0001644968	4233.	25731729.	6.9000000000	
0.0001694816	4361.	25731729.	6.9000000000	
0.0001744663	4489.	25731729.	6.9000000000	
0.0001794511	4618.	25731729.	6.9000000000	
0.0001844358	4746.	25731729.	6.9000000000	
0.0001894206	4874.	25731729.	6.9000000000	
0.0001944053	5002.	25731729.	6.9000000000	
0.0002043749	5259.	25731729.	6.9000000000	
0.0002143444	5515.	25731729.	6.9000000000	
0.0002243139	5772.	25731729.	6.9000000000	

0.0002342834	6029.	25731729.	6.9000000000	
0.0002442529	6285.	25731729.	6.9000000000	
0.0002542224	6532.	25692352.	6.9000000000	Y
0.0002641919	6693.	25332909.	6.9000000000	Y
0.0002741614	6765.	24675450.	6.9000000000	Y
0.0002841309	6794.	23910678.	6.9000000000	Y
0.0002941004	6819.	23186137.	6.9000000000	Y
0.0003040699	6842.	22500228.	6.9000000000	Y
0.0003140394	6862.	21851576.	6.9000000000	Y
0.0003240089	6881.	21237263.	6.9000000000	Y
0.0003339784	6898.	20654378.	6.9000000000	Y
0.0003439479	6914.	20100970.	6.9000000000	Y
0.0003539174	6928.	19575144.	6.9000000000	Y
0.0003638869	6941.	19075000.	6.9000000000	Y
0.0003738564	6953.	18598822.	6.9000000000	Y
0.0003838259	6964.	18144896.	6.9000000000	Y
0.0003937954	6975.	17711598.	6.9000000000	Y
0.0004037650	6984.	17297906.	6.9000000000	Y
0.0004137345	6993.	16902650.	6.9000000000	Y
0.0004237040	7002.	16524750.	6.9000000000	Y
0.0004336735	7009.	16162385.	6.9000000000	Y
0.0004436430	7016.	15815403.	6.9000000000	Y
0.0004536125	7023.	15482883.	6.9000000000	Y
0.0004635820	7029.	15163248.	6.9000000000	Y
0.0004735515	7035.	14856675.	6.9000000000	Y
0.0004835210	7041.	14561671.	6.9000000000	Y
0.0004934905	7046.	14278150.	6.9000000000	Y
0.0005034600	7051.	14005079.	6.9000000000	Y
0.0005134295	7056.	13742231.	6.9000000000	Y
0.0005233990	7060.	13488699.	6.9000000000	Y
0.0005333685	7064.	13244477.	6.9000000000	Y
0.0005433380	7068.	13008432.	6.9000000000	Y
0.0005533075	7072.	12780893.	6.9000000000	Y
0.0005632770	7075.	12560734.	6.9000000000	Y
0.0005732465	7078.	12348070.	6.9000000000	Y
0.0005832160	7082.	12142520.	6.9000000000	Y
0.0005931856	7085.	11943305.	6.9000000000	Y
0.0006330636	7095.	11207720.	6.9000000000	Y
0.0006729416	7104.	10556656.	6.9000000000	Y
0.0007128196	7111.	9976369.	6.9000000000	Y
0.0007526976	7117.	9455988.	6.9000000000	Y
0.0007925757	7123.	8986794.	6.9000000000	Y
0.0008324537	7127.	8561699.	6.9000000000	Y
0.0008723317	7131.	8174882.	6.9000000000	Y
0.0009122097	7135.	7821253.	6.9000000000	Y
0.0009520877	7138.	7496771.	6.9000000000	Y
0.0009919658	7140.	7198149.	6.9000000000	Y

```
    0.0010318438              7143.           6922149.       6.9000000000    Y
    0.0010717218              7145.           6666587.       6.9000000000    Y
    0.0011115998              7147.           6429079.       6.9000000000    Y
    0.0011514778              7148.           6207865.       6.9000000000    Y
    0.0011913559              7150.           6001447.       6.9000000000    Y
    0.0012312339              7151.           5808077.       6.9000000000    Y
    0.0012711119              7152.           5626841.       6.9000000000    Y


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
--------------------------------------------------------------------------------

                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------         ----------------
  1               0.00000000                  7152.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.



Pile Section No. 2:
-------------------

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
--------------------------------------------------------------------------------

Length of Section                                =    15.000000 ft
Outside Diameter of Casing                       =    24.000000 in
Casing Wall Thickness                            =       0.0000 in
Moment of Inertia of Steel Casing                =       0.0000 in^4
Width Flange of Core/Insert                      =    14.700000 in
Depth of Core/Insert                             =    13.800000 in
Flange Thickness of Core/Insert                  =     0.615000 in
Web Thickness of Core/Insert                     =     0.615000 in
```

```
Moment of Inertia of Steel Core/Insert                =   888.177980 in^4
Yield Stress of Casing                                =       50000. psi
Elastic Modulus of Casing                             =    29000000. psi
Yield Stress of Core/Insert                           =       50000. psi
Elastic Modulus of Core/Insert                        =    29000000. psi
Number of Reinforcing Bars                            =           0 bars
Gross Area of Pile                                    =   452.389342 sq. in.
Area of Concrete                                      =   426.577792 sq. in.
Cross-sectional Area of Steel Casing                  =      0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert             =    25.811550 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)     =    25.811550 sq. in.
Area Ratio of All Steel to Gross Area                 =        5.71 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As    =     2740.942 kips
Tensile Load for Cracking of Concrete                 =     -263.776 kips
Nominal Axial Tensile Capacity                        =    -1290.578 kips



Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

   Number     Axial Thrust Force
                   kips
   ------     ------------------
      1               0.000

Definition of Run Messages:

   Y = part of pipe section has yielded.


Axial Thrust Force =      0.000 kips

     Bending            Bending            Bending           Depth to       Run
    Curvature           Moment            Stiffness          N Axis        Msg
     rad/in.            in-kip             kip-in2             in
---------------   ----------------   ----------------   ----------------   ---
    0.0000049848     450.4737372902          90370331.      12.0000000000
    0.0000099695     450.4737372902          45185166.       8.9753315353   C
    0.0000149543     667.2730925863          44620944.       8.9875631493   C
    0.0000199390     887.6652697516          44519024.       8.9999078903   C
```

0.0000249238	1107.	44416299.	9.0121553316	C
0.0000299085	1325.	44312750.	9.0245146771	C
0.0000348933	1543.	44208361.	9.0369896734	C
0.0000398780	1759.	44103117.	9.0495825542	C
0.0000448628	1974.	43997004.	9.0622956184	C
0.0000498475	2188.	43890005.	9.0751312332	C
0.0000548323	2401.	43782104.	9.0880918365	C
0.0000598170	2612.	43673285.	9.1011799397	C
0.0000648018	2823.	43563530.	9.1143981312	C
0.0000697865	3032.	43452821.	9.1277490791	C
0.0000747713	3241.	43341141.	9.1412355346	C
0.0000797560	3448.	43228470.	9.1548603359	C
0.0000847408	3654.	43114788.	9.1686264115	C
0.0000897255	3858.	43000077.	9.1825367845	C
0.0000947103	4062.	42884315.	9.1965945764	C
0.0000996951	4264.	42767481.	9.2108030116	C
0.0001046798	4465.	42649553.	9.2251479761	C
0.0001096646	4664.	42530507.	9.2395390411	C
0.0001146493	4862.	42410437.	9.2539552165	C
0.0001196341	5059.	42289228.	9.2685278134	C
0.0001246188	5255.	42166854.	9.2832633188	C
0.0001296036	5449.	42043290.	9.2981654330	C
0.0001345883	5642.	41918509.	9.3132379879	C
0.0001395731	5833.	41792486.	9.3284849537	C
0.0001445578	6023.	41665192.	9.3439104449	C
0.0001495426	6211.	41536599.	9.3595187292	C
0.0001545273	6398.	41406677.	9.3753142336	C
0.0001595121	6584.	41275395.	9.3913023646	C
0.0001644968	6768.	41142720.	9.4074869272	C
0.0001694816	6950.	41008621.	9.4239270647	C
0.0001744663	7131.	40873062.	9.4405109875	C
0.0001794511	7310.	40736007.	9.4573073014	C
0.0001844358	7485.	40584841.	9.4730560607	CY
0.0001894206	7625.	40256135.	9.4710293736	CY
0.0001944053	7715.	39683898.	9.4431859322	CY
0.0002043749	7815.	38239961.	9.3528751332	CY
0.0002143444	7905.	36877772.	9.2681926964	CY
0.0002243139	7984.	35591308.	9.1873902697	CY
0.0002342834	8054.	34377102.	9.1107920417	CY
0.0002442529	8117.	33231533.	9.0387378281	CY
0.0002542224	8174.	32151219.	8.9702574761	CY
0.0002641919	8224.	31129724.	8.9044639795	CY
0.0002741614	8270.	30165189.	8.8422872397	CY
0.0002841309	8312.	29254331.	8.7836184252	CY
0.0002941004	8350.	28391986.	8.7269626135	CY
0.0003040699	8385.	27574754.	8.6724353416	CY
0.0003140394	8416.	26800365.	8.6205445498	CY

0.0003240089	8446.	26066109.	8.5711739860	CY
0.0003339784	8473.	25368929.	8.5242978302	CY
0.0003439479	8497.	24705423.	8.4779552934	CY
0.0003539174	8520.	24074235.	8.4337142537	CY
0.0003638869	8541.	23472645.	8.3910800765	CY
0.0003738564	8561.	22899260.	8.3503195279	CY
0.0003838259	8580.	22352983.	8.3114147089	CY
0.0003937954	8597.	21830822.	8.2736415276	CY
0.0004037650	8613.	21330504.	8.2362130078	CY
0.0004137345	8628.	20852842.	8.2003989214	CY
0.0004237040	8641.	20394441.	8.1654851491	CY
0.0004336735	8654.	19956242.	8.1323415758	CY
0.0004436430	8667.	19535033.	8.0997498546	CY
0.0004536125	8679.	19131988.	8.0690966671	CY
0.0004635820	8689.	18743814.	8.0388427554	CY
0.0004735515	8700.	18370835.	8.0088435412	CY
0.0004835210	8700.	17992055.	7.9900437145	CY
0.0004934905	8701.	17631806.	7.9616191282	CY
0.0005034600	8701.	17282662.	7.9528875869	CY
0.0005134295	8701.	16947076.	7.9256207864	CY
0.0005233990	8701.	16624274.	7.9230038846	CY
0.0005333685	8701.	16313540.	7.8970775223	CY
0.0005433380	8701.	16014209.	7.8987428059	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	8701.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	10.0000	0.00	N.A.	No	0.00	42674.
2	19.0000	9.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals
for Layer n. Layering correction equivalent depths are computed only
for soil types with both shallow-depth and deep-depth expressions for
peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
60.00	1.30
63.00	10.40
66.00	20.80
69.00	31.20
72.00	41.60
75.00	52.00
78.00	62.40
81.00	72.80
84.00	83.20
87.00	93.60
90.00	104.00
93.00	114.40
96.00	124.80

99.00	135.20
102.00	145.60
105.00	156.00
108.00	166.40
111.00	176.80
114.00	187.20
117.00	197.60
120.00	102.70

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.65
3.00	10.60
6.00	21.20
9.00	31.80
12.00	42.40
15.00	53.00
18.00	63.60
21.00	74.20
24.00	84.80
27.00	95.40
30.00	106.00
33.00	116.60
36.00	127.20
39.00	137.80
42.00	148.40
45.00	159.00
48.00	169.60
51.00	180.20
54.00	190.80
57.00	201.40
60.00	211.31
63.00	217.09
66.00	222.18
69.00	227.26
72.00	232.35
75.00	237.44

78.00	242.53
81.00	247.62
84.00	252.70
87.00	257.79
90.00	262.88
93.00	267.97
96.00	273.06
99.00	278.14
102.00	283.23
105.00	288.32
108.00	293.41
111.00	298.50
114.00	303.58
117.00	308.67
120.00	156.24

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.89155	3.174E-05	0.000	0.000	2.573E+10
0.25000	1.86185	11.92501	19.87500	0.000	2.573E+10
0.50000	1.83216	119.25001	67.57500	0.000	2.573E+10
0.75000	1.80247	417.37501	147.07500	0.000	2.573E+10
1.00000	1.77278	1002.	258.37500	0.000	2.573E+10
1.25000	1.74308	1968.	401.47500	0.000	2.573E+10
1.50000	1.71339	3411.	576.37500	0.000	2.573E+10
1.75000	1.68370	5426.	783.07500	0.000	2.573E+10
2.00000	1.65402	8109.	1022.	0.000	2.573E+10
2.25000	1.62433	11555.	1292.	0.000	2.573E+10
2.50000	1.59465	15860.	1594.	0.000	2.573E+10
2.75000	1.56497	21119.	1928.	0.000	2.573E+10
3.00000	1.53531	27428.	2294.	0.000	2.573E+10
3.25000	1.50565	34881.	2691.	0.000	2.573E+10

3.50000	1.47600	43574.	3120.	0.000	2.573E+10
3.75000	1.44637	53603.	3581.	0.000	2.573E+10
4.00000	1.41676	65063.	4074.	0.000	2.573E+10
4.25000	1.38717	78049.	4599.	0.000	2.573E+10
4.50000	1.35761	92657.	5156.	0.000	2.573E+10
4.75000	1.32808	108983.	5744.	0.000	2.573E+10
5.00000	1.29858	127121.	6365.	0.000	2.573E+10
5.25000	1.26914	147172.	7025.	0.000	2.573E+10
5.50000	1.23974	169271.	7731.	0.000	2.573E+10
5.75000	1.21040	193556.	8483.	0.000	2.573E+10
6.00000	1.18113	220168.	9282.	0.000	2.573E+10
6.25000	1.15194	249245.	10127.	0.000	2.573E+10
6.50000	1.12284	280928.	11018.	0.000	2.573E+10
6.75000	1.09383	315354.	11956.	0.000	2.573E+10
7.00000	1.06493	352665.	12941.	0.000	2.573E+10
7.25000	1.03616	392998.	13972.	0.000	2.573E+10
7.50000	1.00753	436494.	15049.	0.000	2.573E+10
7.75000	0.97904	483292.	16173.	0.000	2.573E+10
8.00000	0.95073	533532.	17343.	0.000	2.573E+10
8.25000	0.92260	587352.	18560.	0.000	2.573E+10
8.50000	0.89468	644892.	19823.	0.000	2.573E+10
8.75000	0.86699	706291.	21133.	0.000	2.573E+10
9.00000	0.83954	771690.	22489.	0.000	2.573E+10
9.25000	0.81236	841227.	23892.	0.000	2.573E+10
9.50000	0.78547	915041.	25341.	0.000	2.573E+10
9.75000	0.75891	993272.	26837.	0.000	2.573E+10
10.00000	0.73269	1076060.	27984.	0.000	2.573E+10
10.25000	0.70685	1161179.	28347.	-17.2931	4.439E+10
10.50000	0.68124	1246142.	28267.	-35.6502	4.435E+10
10.75000	0.65589	1330783.	28132.	-54.6987	4.431E+10
11.00000	0.63081	1414933.	27939.	-74.0753	4.427E+10
11.25000	0.60601	1498416.	27687.	-93.4672	4.423E+10
11.50000	0.58152	1581058.	27378.	-112.5700	4.419E+10
11.75000	0.55736	1662686.	27013.	-131.0916	4.415E+10
12.00000	0.53353	1743135.	26593.	-148.7548	4.411E+10
12.25000	0.51005	1822245.	26121.	-165.8176	4.407E+10
12.50000	0.48695	1899863.	25600.	-181.6841	4.403E+10
12.75000	0.46424	1975845.	25033.	-196.1366	4.400E+10
13.00000	0.44193	2050062.	24426.	-208.9704	4.396E+10
13.25000	0.42004	2122399.	23779.	-222.2807	4.392E+10
13.50000	0.39859	2192735.	23094.	-234.0682	4.389E+10
13.75000	0.37758	2260964.	22377.	-244.0930	4.385E+10
14.00000	0.35704	2326997.	21633.	-252.1208	4.382E+10
14.25000	0.33698	2390760.	20864.	-260.0418	4.379E+10
14.50000	0.31741	2452183.	20075.	-266.0378	4.375E+10
14.75000	0.29834	2511212.	19271.	-269.9899	4.372E+10
15.00000	0.27979	2567811.	18459.	-271.7920	4.369E+10

15.25000	0.26177	2621964.	17640.	-274.0546	4.367E+10
15.50000	0.24429	2673650.	16818.	-274.0798	4.364E+10
15.75000	0.22737	2722869.	15999.	-271.7579	4.361E+10
16.00000	0.21100	2769643.	15191.	-266.9979	4.359E+10
16.25000	0.19520	2814014.	14392.	-265.5686	4.357E+10
16.50000	0.17999	2855994.	13601.	-261.9965	4.354E+10
16.75000	0.16537	2895617.	12823.	-256.2256	4.352E+10
17.00000	0.15134	2932933.	12067.	-248.2315	4.350E+10
17.25000	0.13792	2968016.	11337.	-238.0282	4.349E+10
17.50000	0.12512	3000956.	10642.	-225.6761	4.347E+10
17.75000	0.11294	3031865.	9986.	-211.2892	4.345E+10
18.00000	0.10138	3060873.	9377.	-195.0441	4.344E+10
18.25000	0.09046	3088125.	8799.	-190.0739	4.342E+10
18.50000	0.08018	3113666.	8238.	-183.9827	4.341E+10
18.75000	0.07055	3137552.	7697.	-176.8003	4.339E+10
19.00000	0.06156	3159846.	5084.	-1565.	4.338E+10
19.25000	0.05324	3168054.	75.50954	-1774.	4.338E+10
19.50000	0.04557	3160300.	-5525.	-1960.	4.338E+10
19.75000	0.03855	3134906.	-11650.	-2123.	4.340E+10
20.00000	0.03219	3090402.	-18229.	-2263.	4.342E+10
20.25000	0.02646	3025535.	-25187.	-2376.	4.346E+10
20.50000	0.02136	2939281.	-32445.	-2463.	4.350E+10
20.75000	0.01687	2830862.	-39919.	-2520.	4.356E+10
21.00000	0.01297	2699765.	-47517.	-2545.	4.363E+10
21.25000	0.009620	2545763.	-55135.	-2534.	4.371E+10
21.50000	0.006796	2368954.	-62658.	-2481.	4.380E+10
21.75000	0.004459	2169815.	-69943.	-2375.	4.390E+10
22.00000	0.002567	1949299.	-76794.	-2193.	4.401E+10
22.25000	0.001074	1709049.	-82878.	-1863.	4.412E+10
22.50000	-7.129E-05	1452032.	-85030.	427.71325	4.425E+10
22.75000	-0.000921	1198866.	-81412.	1984.	4.437E+10
23.00000	-0.001527	963559.	-74895.	2361.	4.448E+10
23.25000	-0.001938	749497.	-67422.	2621.	4.458E+10
23.50000	-0.002198	559027.	-59254.	2824.	4.485E+10
23.75000	-0.002346	393973.	-50531.	2992.	9.037E+10
24.00000	-0.002455	255842.	-41321.	3148.	9.037E+10
24.25000	-0.002538	146045.	-31652.	3298.	9.037E+10
24.50000	-0.002607	65928.	-21539.	3444.	9.037E+10
24.75000	-0.002669	16810.	-10988.	3590.	9.037E+10
25.00000	-0.002729	0.000	0.000	3736.	9.037E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 1.89154528 inches
Computed slope at pile head = -0.0098974 radians
Maximum bending moment = 3168054. inch-lbs
Maximum shear force = -85030. lbs

Depth of maximum bending moment =   19.25000000 feet below pile head
Depth of maximum shear force   =   22.50000000 feet below pile head
Number of iterations   =   31
Number of zero deflection points =   1
Pile deflection at ground   =   0.73268972 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
60.00	1.30
63.00	10.40
66.00	20.80
69.00	31.20
72.00	41.60
75.00	52.00
78.00	62.40
81.00	72.80
84.00	83.20
87.00	93.60
90.00	104.00
93.00	114.40
96.00	124.80
99.00	135.20
102.00	145.60
105.00	156.00
108.00	166.40
111.00	176.80
114.00	187.20
117.00	197.60
120.00	102.70

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.65
3.00	10.60
6.00	21.20
9.00	31.80
12.00	42.40
15.00	53.00
18.00	63.60
21.00	74.20
24.00	84.80
27.00	95.40
30.00	106.00
33.00	116.60
36.00	127.20
39.00	137.80
42.00	148.40
45.00	159.00
48.00	169.60
51.00	180.20
54.00	190.80
57.00	201.40
60.00	211.31
63.00	217.09
66.00	222.18
69.00	227.26
72.00	232.35
75.00	237.44
78.00	242.53
81.00	247.62
84.00	252.70
87.00	257.79
90.00	262.88
93.00	267.97
96.00	273.06
99.00	278.14
102.00	283.23
105.00	288.32
108.00	293.41
111.00	298.50
114.00	303.58
117.00	308.67
120.00	156.24

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	3.09776	-1.397E-05	0.000	0.000	2.573E+10
0.25000	3.05075	17.88749	29.81250	0.000	2.573E+10
0.50000	3.00374	178.87498	101.36250	0.000	2.573E+10
0.75000	2.95673	626.06248	220.61250	0.000	2.573E+10
1.00000	2.90973	1503.	387.56250	0.000	2.573E+10
1.25000	2.86272	2951.	602.21250	0.000	2.573E+10
1.50000	2.81572	5116.	864.56250	0.000	2.573E+10
1.75000	2.76871	8139.	1175.	0.000	2.573E+10
2.00000	2.72171	12164.	1532.	0.000	2.573E+10
2.25000	2.67471	17333.	1938.	0.000	2.573E+10
2.50000	2.62772	23790.	2391.	0.000	2.573E+10
2.75000	2.58074	31679.	2892.	0.000	2.573E+10
3.00000	2.53377	41141.	3440.	0.000	2.573E+10
3.25000	2.48681	52321.	4037.	0.000	2.573E+10
3.50000	2.43988	65361.	4681.	0.000	2.573E+10
3.75000	2.39296	80404.	5372.	0.000	2.573E+10
4.00000	2.34607	97594.	6112.	0.000	2.573E+10
4.25000	2.29922	117074.	6899.	0.000	2.573E+10
4.50000	2.25241	138986.	7733.	0.000	2.573E+10
4.75000	2.20564	163474.	8616.	0.000	2.573E+10
5.00000	2.15894	190681.	9546.	0.000	2.573E+10
5.25000	2.11230	220752.	10528.	0.000	2.573E+10
5.50000	2.06573	253848.	11563.	0.000	2.573E+10
5.75000	2.01926	290130.	12652.	0.000	2.573E+10
6.00000	1.97289	329761.	13796.	0.000	2.573E+10
6.25000	1.92663	372903.	14993.	0.000	2.573E+10
6.50000	1.88050	419719.	16244.	0.000	2.573E+10
6.75000	1.83452	470370.	17550.	0.000	2.573E+10
7.00000	1.78871	525019.	18910.	0.000	2.573E+10
7.25000	1.74308	583829.	20324.	0.000	2.573E+10
7.50000	1.69765	646961.	21792.	0.000	2.573E+10

7.75000	1.65245	714578.	23314.	0.000	2.573E+10
8.00000	1.60750	786843.	24890.	0.000	2.573E+10
8.25000	1.56282	863916.	26520.	0.000	2.573E+10
8.50000	1.51845	945962.	28204.	0.000	2.573E+10
8.75000	1.47440	1033141.	29943.	0.000	2.573E+10
9.00000	1.43072	1125617.	31735.	0.000	2.573E+10
9.25000	1.38743	1223552.	33582.	0.000	2.573E+10
9.50000	1.34457	1327107.	35482.	0.000	2.573E+10
9.75000	1.30218	1436446.	37437.	0.000	2.573E+10
10.00000	1.26029	1551730.	38934.	0.000	2.573E+10
10.25000	1.21894	1670047.	39411.	-19.1249	4.414E+10
10.50000	1.17792	1788193.	39322.	-40.0748	4.409E+10
10.75000	1.13728	1905977.	39168.	-62.5486	4.403E+10
11.00000	1.09702	2023199.	38945.	-86.2452	4.397E+10
11.25000	1.05718	2139645.	38649.	-110.6319	4.391E+10
11.50000	1.01778	2255095.	38280.	-135.5120	4.385E+10
11.75000	0.97884	2369325.	37836.	-160.5674	4.380E+10
12.00000	0.94039	2482110.	37317.	-185.4797	4.374E+10
12.25000	0.90244	2593226.	36723.	-210.4509	4.368E+10
12.50000	0.86504	2702448.	36062.	-230.3174	4.362E+10
12.75000	0.82819	2809597.	35344.	-248.0314	4.357E+10
13.00000	0.79192	2914514.	34577.	-263.6367	4.351E+10
13.25000	0.75625	3017058.	33762.	-279.8107	4.346E+10
13.50000	0.72120	3117084.	32901.	-294.0254	4.341E+10
13.75000	0.68681	3214463.	32001.	-306.1137	4.335E+10
14.00000	0.65308	3309088.	31068.	-315.9227	4.330E+10
14.25000	0.62004	3400869.	30106.	-325.3726	4.325E+10
14.50000	0.58770	3489722.	29119.	-332.6747	4.320E+10
14.75000	0.55610	3575580.	28113.	-337.7403	4.316E+10
15.00000	0.52524	3658400.	27096.	-340.4915	4.311E+10
15.25000	0.49514	3738154.	26067.	-345.4706	4.307E+10
15.50000	0.46582	3814800.	25026.	-348.2573	4.302E+10
15.75000	0.43731	3888311.	23981.	-348.7500	4.298E+10
16.00000	0.40960	3958683.	22937.	-346.8530	4.294E+10
16.25000	0.38273	4025934.	21892.	-350.0364	4.290E+10
16.50000	0.35670	4090034.	20840.	-350.8776	4.287E+10
16.75000	0.33153	4150976.	19790.	-349.2079	4.283E+10
17.00000	0.30723	4208776.	18749.	-344.9017	4.280E+10
17.25000	0.28381	4263472.	17725.	-337.8590	4.277E+10
17.50000	0.26130	4315126.	16726.	-328.0135	4.274E+10
17.75000	0.23969	4363829.	15761.	-315.3414	4.271E+10
18.00000	0.21900	4409693.	14838.	-299.8723	4.268E+10
18.25000	0.19924	4452859.	13943.	-296.7913	4.266E+10
18.50000	0.18043	4493354.	13060.	-292.1835	4.263E+10
18.75000	0.16256	4531219.	12193.	-286.0409	4.261E+10
19.00000	0.14564	4566509.	8852.	-1941.	4.259E+10
19.25000	0.12969	4584329.	2616.	-2216.	4.258E+10

19.50000	0.11472	4582208.	-4410.	-2469.	4.258E+10
19.75000	0.10070	4557868.	-12163.	-2699.	4.259E+10
20.00000	0.08766	4509233.	-20572.	-2907.	4.262E+10
20.25000	0.07556	4434438.	-29565.	-3089.	4.267E+10
20.50000	0.06440	4331843.	-39066.	-3245.	4.273E+10
20.75000	0.05416	4200041.	-48993.	-3373.	4.280E+10
21.00000	0.04479	4037886.	-59256.	-3469.	4.290E+10
21.25000	0.03627	3844505.	-69757.	-3531.	4.301E+10
21.50000	0.02856	3619344.	-80382.	-3552.	4.313E+10
21.75000	0.02160	3362212.	-90997.	-3524.	4.327E+10
22.00000	0.01535	3073365.	-101425.	-3429.	4.343E+10
22.25000	0.009726	2753662.	-111415.	-3232.	4.360E+10
22.50000	0.004673	2404872.	-120515.	-2834.	4.378E+10
22.75000	0.000115	2030573.	-125854.	-725.3446	4.397E+10
23.00000	-0.004027	1649746.	-122430.	3008.	4.415E+10
23.25000	-0.007834	1295991.	-112344.	3716.	4.432E+10
23.50000	-0.0114	975679.	-100382.	4259.	4.447E+10
23.75000	-0.0147	693699.	-86893.	4734.	4.461E+10
24.00000	-0.0179	454324.	-72030.	5174.	4.517E+10
24.25000	-0.0210	261516.	-55876.	5595.	9.037E+10
24.50000	-0.0241	119065.	-38474.	6007.	9.037E+10
24.75000	-0.0272	30674.	-19844.	6413.	9.037E+10
25.00000	-0.0303	0.000	0.000	6816.	9.037E+10

Output Summary for Load Case No. 2:

Pile-head deflection = 3.09775637 inches
Computed slope at pile head = -0.0156691 radians
Maximum bending moment = 4584329. inch-lbs
Maximum shear force = -125854. lbs
Depth of maximum bending moment = 19.25000000 feet below pile head
Depth of maximum shear force = 22.75000000 feet below pile head
Number of iterations = 38
Number of zero deflection points = 1
Pile deflection at ground = 1.26028570 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	1.8915453	3168054.	-85030.	-0.009897

```
  2       3.0977564       4584329.       -125854.      -0.015669


Maximum pile-head deflection = 3.0977563728 inches
Maximum pile-head rotation   = -0.0156691003 radians = -0.897773 deg.

----------------------------------------------------------------------------
                   LRFD Performance by Load Case Combination
----------------------------------------------------------------------------

                                    Factored        Maximum       Pass/Fail
Load                 Resistance       Moment         Moment        for LRFD
Case    Section        Factor        Capacity       Developed       Moment
 No.      No.       for Moment      of Section     in Section     of Section
                                      in-lbs         in-lbs
----    -------    ------------    ------------    ------------    ------------
  1        1           1.00           7152345.        1076060.        Pass
           2           1.00           8701129.        3168054.        Pass
  2        1           1.00           7152345.        1551730.        Pass
           2           1.00           8701129.        4584329.        Pass

All LRFD load combinations have passed for all pile sections.

                                    Factored        Maximum       Pass/Fail
Load                 Resistance       Shear          Shear        for LRFD
Case    Section        Factor        Capacity       Developed       Shear
 No.      No.        for Shear      of Section     in Section     in Section
                                        lbs            lbs
----    -------    ------------    ------------    ------------    ------------
  1        1           1.00            242720.          27984.        Pass
           2           1.00            242720.         -85030.        Pass
  2        1           1.00            242720.          38934.        Pass
           2           1.00            242720.        -125854.        Pass

All LRFD load combinations have passed for all pile sections.


The load case and pile section with the greatest level of developed moment
capacity:

LRFD Load Case No.                   = 2
Pile Section No.                     = 2


The load case and pile section with the greatest level of developed shear
capacity:
```

```
LRFD Load Case No.                    = 2
Pile Section No.                      = 2
Node Number of Maximum Shear Force    = 1
Depth of Maximum Developed Shear      = 0.00 ft
Maximum Developed Shear Force         = -125854.47 lbs
Factored Shear Capacity at Node       = 242720.00 lbs
Fraction of Allowable Shear Capacity  = 0.5185

The analysis ended normally.
```

==

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1093.87 Pile 3 7.lp12d

Name of the output report file:
BEL-70 1093.87 Pile 3 7.lp12o

Name of the plot output file:
BEL-70 1093.87 Pile 3 7.lp12p

Name of the runtime message file:
BEL-70 1093.87 Pile 3 7.lp12r

Date and Time of Analysis

Date: June 23, 2026 Time: 15:40:57

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1093+87 Piles 3 7 - 13' Ht.(6' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 25.000 ft
Depth of ground surface below top of pile = 13.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.9000
2	13.000	14.9000
3	13.000	24.0000
4	25.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 13.000000 ft
   AISC Section Type = HP

   AISC Section Name = HP14X117

   Pile width = 14.900000 in
   Shear capacity of section = 294150. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 12.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 294150. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 13.000000 ft
   Distance from top of pile to bottom of layer = 19.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	19.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 25.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	6.50	206.70
3	13.00	305.92

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	6.50	0.00
2	13.00	202.80

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

---

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	13.000000 ft
Flange Width	=	14.900000 in
Section Depth	=	14.200000 in
Flange Thickness	=	0.805000 in
Web Thickness	=	0.805000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	34.400000 sq. in.
Moment of Inertia	=	1220. in^4
Elastic Bending Stiffness	=	35380000. kip-in^2
Plastic Modulus, Z	=	194.000000in^3

Plastic Moment Capacity = Fy Z = 9700.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 1720.000 kips
Nominal Axial Tensile Capacity = -1720.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	172.6211844549	35100995.	7.1000000000	
0.0000098357	345.2423689099	35100995.	7.1000000000	
0.0000147535	517.8635533648	35100995.	7.1000000000	
0.0000196714	690.4847378198	35100995.	7.1000000000	
0.0000245892	863.1059222747	35100995.	7.1000000000	
0.0000295071	1036.	35100995.	7.1000000000	
0.0000344249	1208.	35100995.	7.1000000000	
0.0000393427	1381.	35100995.	7.1000000000	
0.0000442606	1554.	35100995.	7.1000000000	
0.0000491784	1726.	35100995.	7.1000000000	
0.0000540963	1899.	35100995.	7.1000000000	
0.0000590141	2071.	35100995.	7.1000000000	
0.0000639320	2244.	35100995.	7.1000000000	
0.0000688498	2417.	35100995.	7.1000000000	
0.0000737676	2589.	35100995.	7.1000000000	

0.0000786855	2762.	35100995.	7.1000000000	
0.0000836033	2935.	35100995.	7.1000000000	
0.0000885212	3107.	35100995.	7.1000000000	
0.0000934390	3280.	35100995.	7.1000000000	
0.0000983569	3452.	35100995.	7.1000000000	
0.0001032747	3625.	35100995.	7.1000000000	
0.0001081925	3798.	35100995.	7.1000000000	
0.0001131104	3970.	35100995.	7.1000000000	
0.0001180282	4143.	35100995.	7.1000000000	
0.0001229461	4316.	35100995.	7.1000000000	
0.0001278639	4488.	35100995.	7.1000000000	
0.0001327818	4661.	35100995.	7.1000000000	
0.0001376996	4833.	35100995.	7.1000000000	
0.0001426174	5006.	35100995.	7.1000000000	
0.0001475353	5179.	35100995.	7.1000000000	
0.0001524531	5351.	35100995.	7.1000000000	
0.0001573710	5524.	35100995.	7.1000000000	
0.0001622888	5696.	35100995.	7.1000000000	
0.0001672067	5869.	35100995.	7.1000000000	
0.0001721245	6042.	35100995.	7.1000000000	
0.0001770424	6214.	35100995.	7.1000000000	
0.0001819602	6387.	35100995.	7.1000000000	
0.0001868780	6560.	35100995.	7.1000000000	
0.0001917959	6732.	35100995.	7.1000000000	
0.0002016316	7077.	35100995.	7.1000000000	
0.0002114673	7423.	35100995.	7.1000000000	
0.0002213029	7768.	35100995.	7.1000000000	
0.0002311386	8113.	35100995.	7.1000000000	
0.0002409743	8458.	35100995.	7.1000000000	
0.0002508100	8768.	34956786.	7.1000000000	Y
0.0002606457	8968.	34406082.	7.1000000000	Y
0.0002704814	9073.	33542198.	7.1000000000	Y
0.0002803171	9118.	32525814.	7.1000000000	Y
0.0002901527	9151.	31539616.	7.1000000000	Y
0.0002999884	9182.	30607932.	7.1000000000	Y
0.0003098241	9210.	29725136.	7.1000000000	Y
0.0003196598	9235.	28889181.	7.1000000000	Y
0.0003294955	9258.	28096536.	7.1000000000	Y
0.0003393312	9279.	27344053.	7.1000000000	Y
0.0003491669	9298.	26628906.	7.1000000000	Y
0.0003590025	9316.	25948550.	7.1000000000	Y
0.0003688382	9332.	25300683.	7.1000000000	Y
0.0003786739	9347.	24683214.	7.1000000000	Y
0.0003885096	9361.	24094238.	7.1000000000	Y

0.0003983453	9374.	23532010.	7.1000000000	Y
0.0004081810	9386.	22993958.	7.1000000000	Y
0.0004180167	9397.	22479436.	7.1000000000	Y
0.0004278523	9407.	21987182.	7.1000000000	Y
0.0004376880	9417.	21515064.	7.1000000000	Y
0.0004475237	9426.	21062342.	7.1000000000	Y
0.0004573594	9435.	20628245.	7.1000000000	Y
0.0004671951	9442.	20210614.	7.1000000000	Y
0.0004770308	9450.	19809883.	7.1000000000	Y
0.0004868665	9457.	19423744.	7.1000000000	Y
0.0004967022	9464.	19052717.	7.1000000000	Y
0.0005065378	9470.	18694718.	7.1000000000	Y
0.0005163735	9476.	18350357.	7.1000000000	Y
0.0005262092	9481.	18017531.	7.1000000000	Y
0.0005360449	9486.	17696878.	7.1000000000	Y
0.0005458806	9491.	17387006.	7.1000000000	Y
0.0005557163	9496.	17087665.	7.1000000000	Y
0.0005655520	9501.	16798647.	7.1000000000	Y
0.0005753876	9505.	16518541.	7.1000000000	Y
0.0005852233	9509.	16247851.	7.1000000000	Y
0.0006245661	9523.	15247286.	7.1000000000	Y
0.0006639088	9535.	14361320.	7.1000000000	Y
0.0007032516	9544.	13571868.	7.1000000000	Y
0.0007425943	9553.	12864088.	7.1000000000	Y
0.0007819371	9560.	12226014.	7.1000000000	Y
0.0008212798	9566.	11647588.	7.1000000000	Y
0.0008606225	9571.	11121235.	7.1000000000	Y
0.0008999653	9576.	10640384.	7.1000000000	Y
0.0009393080	9580.	10198808.	7.1000000000	Y
0.0009786508	9584.	9792580.	7.1000000000	Y
0.0010179935	9587.	9417093.	7.1000000000	Y
0.0010573363	9590.	9069525.	7.1000000000	Y
0.0010966790	9592.	8746284.	7.1000000000	Y
0.0011360218	9594.	8445432.	7.1000000000	Y
0.0011753645	9596.	8164483.	7.1000000000	Y
0.0012147072	9598.	7901486.	7.1000000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load	Axial	Nominal Moment

No.	Thrust kips	Capacity in-kips
1	0.00000000	9598.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	12.000000	ft
Outside Diameter of Casing	=	24.000000	in
Casing Wall Thickness	=	0.0000100	in
Moment of Inertia of Steel Casing	=	0.054287	in^4
Width Flange of Core/Insert	=	14.900000	in
Depth of Core/Insert	=	14.200000	in
Flange Thickness of Core/Insert	=	0.805000	in
Web Thickness of Core/Insert	=	0.805000	in
Moment of Inertia of Steel Core/Insert	=	1211.	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Yield Stress of Core/Insert	=	50000.	psi
Elastic Modulus of Core/Insert	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Gross Area of Pile	=	452.389342	sq. in.
Area of Concrete	=	418.264638	sq. in.
Cross-sectional Area of Steel Casing	=	0.0007540	sq. in.
Cross-sectional Area of Steel Core/Insert	=	34.123950	sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	34.124704	sq. in.
Area Ratio of All Steel to Gross Area	=	7.54	percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3128.335 kips
Tensile Load for Cracking of Concrete = -288.133 kips
Nominal Axial Tensile Capacity = -1706.235 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	483.9357842102	98404072.	12.0000000000	
0.0000098357	547.8826412738	55703550.	9.4666463754	C
0.0000147535	819.9912063445	55579326.	9.4784120963	C
0.0000196714	1091.	55454212.	9.4901215149	C
0.0000245892	1360.	55328195.	9.5019179618	C
0.0000295071	1629.	55201261.	9.5138143308	C
0.0000344249	1896.	55073395.	9.5258123298	C
0.0000393427	2162.	54944580.	9.5379137115	C
0.0000442606	2426.	54814803.	9.5501202763	C
0.0000491784	2689.	54684047.	9.5624338723	C
0.0000540963	2951.	54552297.	9.5748563979	C
0.0000590141	3212.	54419534.	9.5873898044	C
0.0000639320	3471.	54285743.	9.6000360960	C

0.0000688498	3728.	54150905.	9.6128474182	C
0.0000737676	3985.	54015003.	9.6257258505	C
0.0000786855	4239.	53878018.	9.6387231789	C
0.0000836033	4493.	53739931.	9.6518416678	C
0.0000885212	4745.	53600722.	9.6650836472	C
0.0000934390	4995.	53460371.	9.6784515155	C
0.0000983569	5244.	53318858.	9.6919477416	C
0.0001032747	5492.	53176161.	9.7055748686	C
0.0001081925	5738.	53032258.	9.7192971758	C
0.0001131104	5982.	52887227.	9.7329868299	C
0.0001180282	6225.	52740970.	9.7468063959	C
0.0001229461	6466.	52593457.	9.7607636254	CY
0.0001278639	6706.	52444654.	9.7748608394	CY
0.0001327818	6944.	52294543.	9.7891013083	CY
0.0001376996	7180.	52143101.	9.8034881614	CY
0.0001426174	7415.	51990304.	9.8180245729	CY
0.0001475353	7648.	51836125.	9.8327137775	CY
0.0001524531	7879.	51680535.	9.8475591253	CY
0.0001573710	8108.	51523508.	9.8625640641	CY
0.0001622888	8336.	51365012.	9.8777328291	CY
0.0001672067	8562.	51205017.	9.8930678183	CY
0.0001721245	8786.	51043492.	9.9085731733	CY
0.0001770424	9008.	50880401.	9.9242536970	CY
0.0001819602	9228.	50715709.	9.9401208970	CY
0.0001868780	9447.	50549383.	9.9561610785	CY
0.0001917959	9651.	50318045.	9.9668111228	CY
0.0002016316	9954.	49366099.	9.9453306184	CY
0.0002114673	10101.	47764234.	9.8614894479	CY
0.0002213029	10213.	46147786.	9.7727637345	CY
0.0002311386	10313.	44619670.	9.6882853707	CY
0.0002409743	10403.	43171706.	9.6068923853	CY
0.0002508100	10485.	41805592.	9.5299814849	CY
0.0002606457	10559.	40512573.	9.4562759960	CY
0.0002704814	10627.	39289466.	9.3851632553	CY
0.0002803171	10689.	38132474.	9.3174730413	CY
0.0002901527	10746.	37036328.	9.2527841774	CY
0.0002999884	10798.	35995792.	9.1898621711	CY
0.0003098241	10847.	35008854.	9.1293730696	CY
0.0003196598	10891.	34072136.	9.0715686721	CY
0.0003294955	10933.	33182446.	9.0162543783	CY
0.0003393312	10972.	32334964.	8.9621850932	CY
0.0003491669	11008.	31526526.	8.9095776402	CY
0.0003590025	11042.	30756383.	8.8591475703	CY
0.0003688382	11073.	30022587.	8.8107164239	CY

0.0003786739	11104.	29322747.	8.7643518898	CY
0.0003885096	11131.	28650794.	8.7180037130	CY
0.0003983453	11157.	28008975.	8.6733314375	CY
0.0004081810	11182.	27395247.	8.6304619153	CY
0.0004180167	11205.	26805998.	8.5887400466	CY
0.0004278523	11228.	26242598.	8.5483571967	CY
0.0004376880	11249.	25700524.	8.5093068685	CY
0.0004475237	11269.	25179781.	8.4708043268	CY
0.0004573594	11270.	24641165.	8.4412080684	CY
0.0004671951	11288.	24161424.	8.4054846878	CY
0.0004770308	11288.	23663250.	8.3852307889	CY
0.0004868665	11292.	23193638.	8.3508081746	CY
0.0004967022	11292.	22734358.	8.3362239021	CY
0.0005065378	11292.	22292914.	8.3032149851	CY
0.0005163735	11292.	21868287.	8.2968564486	CY
0.0005262092	11292.	21459534.	8.2678065035	CY
0.0005360449	11292.	21065781.	8.2669106157	CY
0.0005458806	11292.	20686217.	8.2387811475	CY
0.0005557163	11292.	20320090.	8.2389369493	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	11292.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	13.0000	0.00	N.A.	No	0.00	19235.
2	19.0000	6.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
78.00	0.98
81.00	7.80
84.00	15.60
87.00	23.40
90.00	31.20
93.00	39.00
96.00	46.80
99.00	54.60
102.00	62.40
105.00	70.20
108.00	78.00

111.00	85.80
114.00	93.60
117.00	101.40
120.00	109.20
123.00	117.00
126.00	124.80
129.00	132.60
132.00	140.40
135.00	148.20
138.00	156.00
141.00	163.80
144.00	171.60
147.00	179.40
150.00	187.20
153.00	195.00
156.00	100.43

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.99
3.00	7.95
6.00	15.90
9.00	23.85
12.00	31.80
15.00	39.75
18.00	47.70
21.00	55.65
24.00	63.60
27.00	71.55
30.00	79.50
33.00	87.45
36.00	95.40
39.00	103.35
42.00	111.30

45.00	119.25
48.00	127.20
51.00	135.15
54.00	143.10
57.00	151.05
60.00	159.00
63.00	166.95
66.00	174.90
69.00	182.85
72.00	190.80
75.00	198.75
78.00	206.18
81.00	210.52
84.00	214.33
87.00	218.15
90.00	221.96
93.00	225.78
96.00	229.60
99.00	233.41
102.00	237.23
105.00	241.05
108.00	244.86
111.00	248.68
114.00	252.49
117.00	256.31
120.00	260.13
123.00	263.94
126.00	267.76
129.00	271.57
132.00	275.39
135.00	279.21
138.00	283.02
141.00	286.84
144.00	290.66
147.00	294.47
150.00	298.29
153.00	302.10
156.00	152.48

Computed Values of Pile Loading and Deflection

for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.20826	5.196E-06	2.887E-07	0.000	3.510E+10
0.25000	2.17677	8.94375	14.90625	0.000	3.510E+10
0.50000	2.14527	89.43750	50.68125	0.000	3.510E+10
0.75000	2.11378	313.03125	110.30625	0.000	3.510E+10
1.00000	2.08229	751.27500	193.78125	0.000	3.510E+10
1.25000	2.05080	1476.	301.10625	0.000	3.510E+10
1.50000	2.01931	2558.	432.28125	0.000	3.510E+10
1.75000	1.98782	4069.	587.30625	0.000	3.510E+10
2.00000	1.95633	6082.	766.18125	0.000	3.510E+10
2.25000	1.92484	8666.	968.90625	0.000	3.510E+10
2.50000	1.89336	11895.	1195.	0.000	3.510E+10
2.75000	1.86188	15839.	1446.	0.000	3.510E+10
3.00000	1.83040	20571.	1720.	0.000	3.510E+10
3.25000	1.79893	26160.	2018.	0.000	3.510E+10
3.50000	1.76746	32680.	2340.	0.000	3.510E+10
3.75000	1.73600	40202.	2686.	0.000	3.510E+10
4.00000	1.70455	48797.	3056.	0.000	3.510E+10
4.25000	1.67312	58537.	3449.	0.000	3.510E+10
4.50000	1.64170	69493.	3867.	0.000	3.510E+10
4.75000	1.61030	81737.	4308.	0.000	3.510E+10
5.00000	1.57892	95340.	4773.	0.000	3.510E+10
5.25000	1.54756	110375.	5262.	0.000	3.510E+10
5.50000	1.51623	126912.	5775.	0.000	3.510E+10
5.75000	1.48494	145023.	6311.	0.000	3.510E+10
6.00000	1.45368	164780.	6872.	0.000	3.510E+10
6.25000	1.42246	186254.	7456.	0.000	3.510E+10
6.50000	1.39129	209516.	8065.	0.000	3.510E+10
6.75000	1.36018	234643.	8703.	0.000	3.510E+10
7.00000	1.32912	261735.	9376.	0.000	3.510E+10
7.25000	1.29813	290897.	10083.	0.000	3.510E+10
7.50000	1.26722	322232.	10825.	0.000	3.510E+10
7.75000	1.23639	355846.	11602.	0.000	3.510E+10

8.00000	1.20565	391843.	12414.	0.000	3.510E+10
8.25000	1.17501	430327.	13260.	0.000	3.510E+10
8.50000	1.14449	471403.	14142.	0.000	3.510E+10
8.75000	1.11408	515177.	15058.	0.000	3.510E+10
9.00000	1.08380	561751.	16009.	0.000	3.510E+10
9.25000	1.05367	611231.	16995.	0.000	3.510E+10
9.50000	1.02370	663721.	18016.	0.000	3.510E+10
9.75000	0.99389	719327.	19072.	0.000	3.510E+10
10.00000	0.96427	778151.	20162.	0.000	3.510E+10
10.25000	0.93485	840300.	21288.	0.000	3.510E+10
10.50000	0.90565	905877.	22448.	0.000	3.510E+10
10.75000	0.87667	974987.	23643.	0.000	3.510E+10
11.00000	0.84795	1047735.	24873.	0.000	3.510E+10
11.25000	0.81950	1124225.	26138.	0.000	3.510E+10
11.50000	0.79133	1204561.	27437.	0.000	3.510E+10
11.75000	0.76347	1288849.	28772.	0.000	3.510E+10
12.00000	0.73595	1377192.	30141.	0.000	3.510E+10
12.25000	0.70877	1469696.	31545.	0.000	3.510E+10
12.50000	0.68198	1566464.	32984.	0.000	3.510E+10
12.75000	0.65558	1667602.	34458.	0.000	3.510E+10
13.00000	0.62961	1773214.	35583.	0.000	3.510E+10
13.25000	0.60410	1881102.	35938.	-16.3186	5.508E+10
13.50000	0.57890	1988843.	35863.	-33.5802	5.502E+10
13.75000	0.55402	2096282.	35736.	-51.4227	5.497E+10
14.00000	0.52948	2203258.	35554.	-69.4943	5.492E+10
14.25000	0.50530	2309609.	35319.	-87.5872	5.487E+10
14.50000	0.48151	2415172.	35029.	-105.3651	5.482E+10
14.75000	0.45811	2519786.	34688.	-122.5536	5.477E+10
15.00000	0.43512	2623297.	34295.	-138.8933	5.471E+10
15.25000	0.41256	2725558.	33855.	-154.6590	5.466E+10
15.50000	0.39046	2826427.	33369.	-169.2615	5.461E+10
15.75000	0.36882	2925773.	32842.	-182.4043	5.456E+10
16.00000	0.34766	3023477.	32277.	-193.8457	5.451E+10
16.25000	0.32700	3119437.	31678.	-205.4847	5.446E+10
16.50000	0.30686	3213547.	31047.	-215.4310	5.442E+10
16.75000	0.28725	3305718.	30389.	-223.5089	5.437E+10
17.00000	0.26818	3395878.	29709.	-229.5559	5.432E+10
17.25000	0.24968	3483972.	29011.	-235.4602	5.428E+10
17.50000	0.23176	3569946.	28299.	-239.4281	5.423E+10
17.75000	0.21443	3653766.	27578.	-241.3593	5.419E+10
18.00000	0.19770	3735414.	26854.	-241.1695	5.415E+10
18.25000	0.18160	3814891.	26131.	-240.6875	5.410E+10
18.50000	0.16613	3892201.	25413.	-237.9221	5.406E+10
18.75000	0.15131	3967371.	24707.	-232.8005	5.402E+10

19.00000	0.13715	4040445.	21490.	-1912.	5.398E+10
19.25000	0.12366	4096309.	15337.	-2189.	5.395E+10
19.50000	0.11086	4132469.	8381.	-2448.	5.393E+10
19.75000	0.09874	4146598.	680.59931	-2686.	5.393E+10
20.00000	0.08732	4136552.	-7704.	-2904.	5.393E+10
20.25000	0.07659	4100372.	-16709.	-3099.	5.395E+10
20.50000	0.06654	4036297.	-26266.	-3272.	5.399E+10
20.75000	0.05717	3942776.	-36301.	-3419.	5.404E+10
21.00000	0.04845	3818488.	-46737.	-3538.	5.410E+10
21.25000	0.04037	3662357.	-57484.	-3627.	5.418E+10
21.50000	0.03289	3473584.	-68444.	-3680.	5.428E+10
21.75000	0.02599	3251692.	-79500.	-3690.	5.440E+10
22.00000	0.01963	2996585.	-90505.	-3646.	5.453E+10
22.25000	0.01377	2708662.	-101262.	-3525.	5.467E+10
22.50000	0.008346	2389014.	-111464.	-3277.	5.483E+10
22.75000	0.003318	2039876.	-120480.	-2734.	5.500E+10
23.00000	-0.001376	1666133.	-121132.	2300.	5.518E+10
23.25000	-0.005798	1313086.	-112512.	3447.	5.535E+10
23.50000	-0.0100	991060.	-101155.	4124.	5.549E+10
23.75000	-0.0141	706154.	-87950.	4679.	5.562E+10
24.00000	-0.0180	463362.	-73163.	5179.	9.840E+10
24.25000	-0.0219	267177.	-56920.	5650.	9.840E+10
24.50000	-0.0257	121840.	-39288.	6105.	9.840E+10
24.75000	-0.0296	31447.	-20307.	6550.	9.840E+10
25.00000	-0.0335	0.000	0.000	6988.	9.840E+10

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     2.20825679 inches
Computed slope at pile head      =     -0.0104971 radians
Maximum bending moment           =       4146598. inch-lbs
Maximum shear force              =       -121132. lbs
Depth of maximum bending moment  =    19.75000000 feet below pile head
Depth of maximum shear force     =    23.00000000 feet below pile head
Number of iterations             =             40
Number of zero deflection points =              1
Pile deflection at ground        =     0.62961457 inches
```

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
78.00	0.98
81.00	7.80
84.00	15.60
87.00	23.40
90.00	31.20
93.00	39.00
96.00	46.80
99.00	54.60
102.00	62.40
105.00	70.20
108.00	78.00
111.00	85.80
114.00	93.60
117.00	101.40
120.00	109.20
123.00	117.00
126.00	124.80
129.00	132.60
132.00	140.40
135.00	148.20
138.00	156.00
141.00	163.80
144.00	171.60
147.00	179.40
150.00	187.20
153.00	195.00
156.00	100.43

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in

0.00	1.99
3.00	7.95
6.00	15.90
9.00	23.85
12.00	31.80
15.00	39.75
18.00	47.70
21.00	55.65
24.00	63.60
27.00	71.55
30.00	79.50
33.00	87.45
36.00	95.40
39.00	103.35
42.00	111.30
45.00	119.25
48.00	127.20
51.00	135.15
54.00	143.10
57.00	151.05
60.00	159.00
63.00	166.95
66.00	174.90
69.00	182.85
72.00	190.80
75.00	198.75
78.00	206.18
81.00	210.52
84.00	214.33
87.00	218.15
90.00	221.96
93.00	225.78
96.00	229.60
99.00	233.41
102.00	237.23
105.00	241.05
108.00	244.86
111.00	248.68
114.00	252.49
117.00	256.31
120.00	260.13
123.00	263.94
126.00	267.76

129.00	271.57
132.00	275.39
135.00	279.21
138.00	283.02
141.00	286.84
144.00	290.66
147.00	294.47
150.00	298.29
153.00	302.10
156.00	152.48

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	5.18515	4.157E-05	0.000	0.000	3.510E+10
0.25000	5.11791	13.41559	22.35936	0.000	3.510E+10
0.50000	5.05068	134.15623	76.02188	0.000	3.510E+10
0.75000	4.98345	469.54686	165.45938	0.000	3.510E+10
1.00000	4.91622	1127.	290.67188	0.000	3.510E+10
1.25000	4.84899	2214.	451.65938	0.000	3.510E+10
1.50000	4.78176	3837.	648.42188	0.000	3.510E+10
1.75000	4.71453	6104.	880.95938	0.000	3.510E+10
2.00000	4.64730	9123.	1149.	0.000	3.510E+10
2.25000	4.58008	13000.	1453.	0.000	3.510E+10
2.50000	4.51285	17843.	1793.	0.000	3.510E+10
2.75000	4.44564	23759.	2169.	0.000	3.510E+10
3.00000	4.37842	30856.	2580.	0.000	3.510E+10
3.25000	4.31122	39241.	3027.	0.000	3.510E+10
3.50000	4.24403	49021.	3510.	0.000	3.510E+10
3.75000	4.17685	60303.	4029.	0.000	3.510E+10

4.00000	4.10968	73196.	4584.	0.000	3.510E+10
4.25000	4.04253	87805.	5174.	0.000	3.510E+10
4.50000	3.97541	104239.	5800.	0.000	3.510E+10
4.75000	3.90831	122605.	6462.	0.000	3.510E+10
5.00000	3.84125	143011.	7159.	0.000	3.510E+10
5.25000	3.77422	165562.	7893.	0.000	3.510E+10
5.50000	3.70723	190368.	8662.	0.000	3.510E+10
5.75000	3.64029	217534.	9467.	0.000	3.510E+10
6.00000	3.57341	247169.	10308.	0.000	3.510E+10
6.25000	3.50659	279380.	11184.	0.000	3.510E+10
6.50000	3.43984	314274.	12097.	0.000	3.510E+10
6.75000	3.37317	351961.	13047.	0.000	3.510E+10
7.00000	3.30660	392559.	14038.	0.000	3.510E+10
7.25000	3.24012	436192.	15070.	0.000	3.510E+10
7.50000	3.17376	482979.	16142.	0.000	3.510E+10
7.75000	3.10752	533045.	17255.	0.000	3.510E+10
8.00000	3.04141	586509.	18408.	0.000	3.510E+10
8.25000	2.97546	643494.	19602.	0.000	3.510E+10
8.50000	2.90967	704122.	20837.	0.000	3.510E+10
8.75000	2.84407	768513.	22112.	0.000	3.510E+10
9.00000	2.77865	836791.	23427.	0.000	3.510E+10
9.25000	2.71346	909076.	24783.	0.000	3.510E+10
9.50000	2.64850	985491.	26180.	0.000	3.510E+10
9.75000	2.58379	1066157.	27617.	0.000	3.510E+10
10.00000	2.51935	1151195.	29095.	0.000	3.510E+10
10.25000	2.45521	1240728.	30614.	0.000	3.510E+10
10.50000	2.39138	1334877.	32173.	0.000	3.510E+10
10.75000	2.32790	1433765.	33772.	0.000	3.510E+10
11.00000	2.26479	1537511.	35412.	0.000	3.510E+10
11.25000	2.20207	1646239.	37093.	0.000	3.510E+10
11.50000	2.13977	1760071.	38815.	0.000	3.510E+10
11.75000	2.07792	1879127.	40576.	0.000	3.510E+10
12.00000	2.01656	2003529.	42379.	0.000	3.510E+10
12.25000	1.95571	2133400.	44222.	0.000	3.510E+10
12.50000	1.89541	2268861.	46106.	0.000	3.510E+10
12.75000	1.83568	2410034.	48030.	0.000	3.510E+10
13.00000	1.77658	2557040.	49496.	0.000	3.510E+10
13.25000	1.71813	2707008.	49961.	-19.1249	5.467E+10
13.50000	1.66013	2856804.	49872.	-40.0748	5.460E+10
13.75000	1.60260	3006239.	49718.	-62.5486	5.452E+10
14.00000	1.54556	3155112.	49495.	-86.2451	5.445E+10
14.25000	1.48905	3303208.	49199.	-110.6317	5.437E+10
14.50000	1.43308	3450309.	48830.	-135.5119	5.430E+10
14.75000	1.37769	3596190.	48386.	-160.5672	5.422E+10

15.00000	1.32289	3740626.	47867.	-185.4795	5.414E+10
15.25000	1.26871	3883392.	47273.	-210.4506	5.407E+10
15.50000	1.21518	4024265.	46605.	-234.8151	5.399E+10
15.75000	1.16232	4163024.	45866.	-258.2717	5.392E+10
16.00000	1.11016	4299459.	45057.	-280.5195	5.384E+10
16.25000	1.05871	4433369.	44180.	-304.4094	5.377E+10
16.50000	1.00801	4564540.	43233.	-327.2542	5.370E+10
16.75000	0.95807	4692765.	42218.	-348.8131	5.363E+10
17.00000	0.90892	4817850.	41142.	-368.8450	5.356E+10
17.25000	0.86058	4939617.	40018.	-380.1843	5.349E+10
17.50000	0.81307	5057961.	38868.	-386.9447	5.342E+10
17.75000	0.76641	5172823.	37701.	-390.9591	5.336E+10
18.00000	0.72062	5284167.	36526.	-392.1665	5.329E+10
18.25000	0.67573	5391981.	35343.	-396.5304	5.323E+10
18.50000	0.63175	5496226.	34151.	-398.2385	5.317E+10
18.75000	0.58870	5596887.	32958.	-397.1818	5.311E+10
19.00000	0.54659	5693973.	29242.	-2080.	5.306E+10
19.25000	0.50546	5772339.	22456.	-2444.	5.301E+10
19.50000	0.46530	5828710.	14578.	-2808.	5.298E+10
19.75000	0.42613	5859808.	5608.	-3172.	5.296E+10
20.00000	0.38796	5862358.	-4454.	-3536.	5.296E+10
20.25000	0.35078	5833084.	-15608.	-3900.	5.297E+10
20.50000	0.31460	5768709.	-27854.	-4264.	5.301E+10
20.75000	0.27940	5665959.	-41192.	-4628.	5.307E+10
21.00000	0.24515	5521557.	-55622.	-4992.	5.316E+10
21.25000	0.21184	5332226.	-71144.	-5356.	5.327E+10
21.50000	0.17944	5094691.	-87614.	-5624.	5.340E+10
21.75000	0.14789	4806540.	-104600.	-5700.	5.356E+10
22.00000	0.11714	4467092.	-121698.	-5699.	5.375E+10
22.25000	0.08715	4076355.	-138633.	-5591.	5.396E+10
22.50000	0.05784	3635295.	-154994.	-5316.	5.420E+10
22.75000	0.02913	3146389.	-170027.	-4706.	5.445E+10
23.00000	0.000937	2615132.	-180219.	-2089.	5.472E+10
23.25000	-0.0268	2065074.	-175771.	5055.	5.499E+10
23.50000	-0.0542	1560508.	-158748.	6293.	5.523E+10
23.75000	-0.0814	1112583.	-138419.	7259.	5.544E+10
24.00000	-0.1084	729992.	-115360.	8114.	5.561E+10
24.25000	-0.1353	420422.	-89827.	8909.	9.840E+10
24.50000	-0.1621	191032.	-61958.	9670.	9.840E+10
24.75000	-0.1889	48672.	-31839.	10410.	9.840E+10
25.00000	-0.2157	0.000	0.000	10816.	9.840E+10

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     5.18514563 inches
Computed slope at pile head      =     -0.0224105 radians
Maximum bending moment           =       5862358. inch-lbs
Maximum shear force              =       -180219. lbs
Depth of maximum bending moment  =    20.00000000 feet below pile head
Depth of maximum shear force     =    23.00000000 feet below pile head
Number of iterations             =             83
Number of zero deflection points =              1
Pile deflection at ground        =     1.77658054 inches
```

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	2.2082568	4146598.	-121132.	-0.010497
2	5.1851456	5862358.	-180219.	-0.022410

Maximum pile-head deflection = 5.1851456322 inches
Maximum pile-head rotation = -0.0224104942 radians = -1.284027 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	9597992.	1773214.	Pass
	2	1.00	11292204.	4146598.	Pass
2	1	1.00	9597992.	2557040.	Pass
	2	1.00	11292204.	5862358.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	294150.	35583.	Pass
	2	1.00	294150.	-121132.	Pass
2	1	1.00	294150.	49496.	Pass
	2	1.00	294150.	-180219.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -180219.26 lbs
Factored Shear Capacity at Node = 294150.00 lbs
Fraction of Allowable Shear Capacity = 0.6127

The analysis ended normally.

==========

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==========

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1093.87 Pile 6 5 4.lp12d

Name of the output report file:
BEL-70 1093.87 Pile 6 5 4.lp12o

Name of the plot output file:
BEL-70 1093.87 Pile 6 5 4.lp12p

Name of the runtime message file:
BEL-70 1093.87 Pile 6 5 4.lp12r

Date and Time of Analysis

Date: June 23, 2026 Time: 15:42:38

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1093+87 Piles 6 5 4 - 16.5' Ht.(8' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 28.000 ft
Depth of ground surface below top of pile = 16.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	15.6000
2	16.500	15.6000
3	16.500	24.0000
4	28.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 16.500000 ft
   AISC Section Type = W

   AISC Section Name = W14X159

   Pile width = 15.600000 in
   Shear capacity of section = 272220. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 11.500000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 272220. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 16.500000 ft
   Distance from top of pile to bottom of layer = 19.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	19.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 22.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	8.25	349.80
3	16.50	517.70

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	8.00	0.00
2	16.50	343.20

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

---

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	16.500000 ft
Flange Width	=	15.600000 in
Section Depth	=	15.000000 in
Flange Thickness	=	1.190000 in
Web Thickness	=	0.745000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	46.700000 sq. in.
Moment of Inertia	=	1900. in^4
Elastic Bending Stiffness	=	55100000. kip-in^2
Plastic Modulus, Z	=	287.000000in^3

Plastic Moment Capacity = Fy Z = 14350.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 2335.000 kips
Nominal Axial Tensile Capacity = -2335.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000046972	258.6832079703	55072133.	7.5000000000	
0.0000093943	517.3664159405	55072133.	7.5000000000	
0.0000140915	776.0496239108	55072133.	7.5000000000	
0.0000187887	1035.	55072133.	7.5000000000	
0.0000234859	1293.	55072133.	7.5000000000	
0.0000281830	1552.	55072133.	7.5000000000	
0.0000328802	1811.	55072133.	7.5000000000	
0.0000375774	2069.	55072133.	7.5000000000	
0.0000422745	2328.	55072133.	7.5000000000	
0.0000469717	2587.	55072133.	7.5000000000	
0.0000516689	2846.	55072133.	7.5000000000	
0.0000563660	3104.	55072133.	7.5000000000	
0.0000610632	3363.	55072133.	7.5000000000	
0.0000657604	3622.	55072133.	7.5000000000	
0.0000704576	3880.	55072133.	7.5000000000	

0.0000751547	4139.	55072133.	7.5000000000	
0.0000798519	4398.	55072133.	7.5000000000	
0.0000845491	4656.	55072133.	7.5000000000	
0.0000892462	4915.	55072133.	7.5000000000	
0.0000939434	5174.	55072133.	7.5000000000	
0.0000986406	5432.	55072133.	7.5000000000	
0.0001033378	5691.	55072133.	7.5000000000	
0.0001080349	5950.	55072133.	7.5000000000	
0.0001127321	6208.	55072133.	7.5000000000	
0.0001174293	6467.	55072133.	7.5000000000	
0.0001221264	6726.	55072133.	7.5000000000	
0.0001268236	6984.	55072133.	7.5000000000	
0.0001315208	7243.	55072133.	7.5000000000	
0.0001362179	7502.	55072133.	7.5000000000	
0.0001409151	7760.	55072133.	7.5000000000	
0.0001456123	8019.	55072133.	7.5000000000	
0.0001503095	8278.	55072133.	7.5000000000	
0.0001550066	8537.	55072133.	7.5000000000	
0.0001597038	8795.	55072133.	7.5000000000	
0.0001644010	9054.	55072133.	7.5000000000	
0.0001690981	9313.	55072133.	7.5000000000	
0.0001737953	9571.	55072133.	7.5000000000	
0.0001784925	9830.	55072133.	7.5000000000	
0.0001831897	10089.	55072133.	7.5000000000	
0.0001925840	10606.	55072133.	7.5000000000	
0.0002019783	11123.	55072133.	7.5000000000	
0.0002113727	11641.	55072133.	7.5000000000	
0.0002207670	12158.	55072133.	7.5000000000	
0.0002301614	12675.	55072133.	7.5000000000	
0.0002395557	13119.	54765821.	7.5000000000	Y
0.0002489500	13439.	53984457.	7.5000000000	Y
0.0002583444	13656.	52858927.	7.5000000000	Y
0.0002677387	13772.	51438975.	7.5000000000	Y
0.0002771331	13820.	49867793.	7.5000000000	Y
0.0002865274	13851.	48340345.	7.5000000000	Y
0.0002959218	13879.	46900692.	7.5000000000	Y
0.0003053161	13905.	45541515.	7.5000000000	Y
0.0003147104	13928.	44256335.	7.5000000000	Y
0.0003241048	13949.	43039207.	7.5000000000	Y
0.0003334991	13969.	41885360.	7.5000000000	Y
0.0003428935	13987.	40790150.	7.5000000000	Y
0.0003522878	14003.	39749089.	7.5000000000	Y
0.0003616821	14018.	38758597.	7.5000000000	Y
0.0003710765	14032.	37815274.	7.5000000000	Y

0.0003804708	14045.	36916024.	7.5000000000	Y
0.0003898652	14058.	36058024.	7.5000000000	Y
0.0003992595	14069.	35237488.	7.5000000000	Y
0.0004086538	14079.	34453128.	7.5000000000	Y
0.0004180482	14089.	33702853.	7.5000000000	Y
0.0004274425	14098.	32983152.	7.5000000000	Y
0.0004368369	14107.	32293682.	7.5000000000	Y
0.0004462312	14115.	31631796.	7.5000000000	Y
0.0004556256	14123.	30996190.	7.5000000000	Y
0.0004650199	14130.	30385342.	7.5000000000	Y
0.0004744142	14136.	29797716.	7.5000000000	Y
0.0004838086	14143.	29232163.	7.5000000000	Y
0.0004932029	14149.	28687487.	7.5000000000	Y
0.0005025973	14154.	28162322.	7.5000000000	Y
0.0005119916	14160.	27656266.	7.5000000000	Y
0.0005213859	14165.	27167276.	7.5000000000	Y
0.0005307803	14169.	26695596.	7.5000000000	Y
0.0005401746	14174.	26239628.	7.5000000000	Y
0.0005495690	14178.	25798779.	7.5000000000	Y
0.0005589633	14182.	25372748.	7.5000000000	Y
0.0005965407	14197.	23798465.	7.5000000000	Y
0.0006341180	14209.	22406922.	7.5000000000	Y
0.0006716954	14219.	21168247.	7.5000000000	Y
0.0007092728	14227.	20058684.	7.5000000000	Y
0.0007468501	14234.	19059203.	7.5000000000	Y
0.0007844275	14241.	18154038.	7.5000000000	Y
0.0008220049	14246.	17330538.	7.5000000000	Y
0.0008595822	14251.	16578490.	7.5000000000	Y
0.0008971596	14255.	15888570.	7.5000000000	Y
0.0009347370	14258.	15253750.	7.5000000000	Y
0.0009723143	14261.	14667474.	7.5000000000	Y
0.0010098917	14264.	14124629.	7.5000000000	Y
0.0010474691	14267.	13620232.	7.5000000000	Y
0.0010850464	14269.	13150772.	7.5000000000	Y
0.0011226238	14271.	12712340.	7.5000000000	Y
0.0011602011	14273.	12302175.	7.5000000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load	Axial	Nominal Moment

No.	Thrust kips	Capacity in-kips
1	0.00000000	14273.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	11.500000 ft
Outside Diameter of Casing	=	24.000000 in
Casing Wall Thickness	=	0.0000 in
Moment of Inertia of Steel Casing	=	0.0000 in^4
Width Flange of Core/Insert	=	15.600000 in
Depth of Core/Insert	=	15.000000 in
Flange Thickness of Core/Insert	=	1.190000 in
Web Thickness of Core/Insert	=	0.745000 in
Moment of Inertia of Steel Core/Insert	=	1899. in^4
Yield Stress of Casing	=	50000. psi
Elastic Modulus of Casing	=	29000000. psi
Yield Stress of Core/Insert	=	50000. psi
Elastic Modulus of Core/Insert	=	29000000. psi
Number of Reinforcing Bars	=	0 bars
Gross Area of Pile	=	452.389342 sq. in.
Area of Concrete	=	405.859442 sq. in.
Cross-sectional Area of Steel Casing	=	0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert	=	46.529900 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	46.529900 sq. in.
Area Ratio of All Steel to Gross Area	=	10.29 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3706.417 kips
Tensile Load for Cracking of Concrete = -324.478 kips
Nominal Axial Tensile Capacity = -2326.495 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000046972	542.4094997643	115475792.	12.0000000000	
0.0000093943	1079.	114843003.	12.0000000000	
0.0000140915	1080.	76622770.	10.0028611962	C
0.0000187887	1437.	76477210.	10.0132189483	C
0.0000234859	1793.	76330779.	10.0236489593	C
0.0000281830	2147.	76183466.	10.0341522612	C
0.0000328802	2500.	76035259.	10.0447299081	C
0.0000375774	2852.	75886146.	10.0553829780	C
0.0000422745	3202.	75736115.	10.0661125726	C
0.0000469717	3550.	75585153.	10.0769198180	C
0.0000516689	3898.	75433248.	10.0878058661	C
0.0000563660	4243.	75280386.	10.0987718945	C
0.0000610632	4587.	75126555.	10.1098191080	C

0.0000657604	4930.	74971740.	10.1209487395	C
0.0000704576	5271.	74815929.	10.1321620500	C
0.0000751547	5611.	74659105.	10.1434603304	C
0.0000798519	5949.	74501256.	10.1548558333	C
0.0000845491	6286.	74342365.	10.1663278493	C
0.0000892462	6621.	74182419.	10.1778888359	C
0.0000939434	6954.	74021400.	10.1895402173	C
0.0000986406	7286.	73859302.	10.2012575731	C
0.0001033378	7616.	73696167.	10.2129476836	C
0.0001080349	7944.	73531926.	10.2247304336	C
0.0001127321	8271.	73366563.	10.2366073455	C
0.0001174293	8596.	73200060.	10.2485799801	C
0.0001221264	8919.	73032399.	10.2606499380	C
0.0001268236	9241.	72863562.	10.2728188606	C
0.0001315208	9561.	72693532.	10.2850884318	C
0.0001362179	9879.	72522288.	10.2974603795	C
0.0001409151	10195.	72349813.	10.3099364768	C
0.0001456123	10510.	72176085.	10.3225185442	C
0.0001503095	10822.	72001085.	10.3352084508	C
0.0001550066	11133.	71824791.	10.3480081162	C
0.0001597038	11442.	71647182.	10.3609195789	C
0.0001644010	11749.	71468236.	10.3739447820	C
0.0001690981	12055.	71287930.	10.3870859455	C
0.0001737953	12358.	71106241.	10.4003448403	C
0.0001784925	12659.	70923145.	10.4137238698	C
0.0001831897	12959.	70738591.	10.4272285532	C
0.0001925840	13544.	70327045.	10.4521317935	CY
0.0002019783	14029.	69460172.	10.4460320076	CY
0.0002113727	14358.	67925605.	10.3897069369	CY
0.0002207670	14516.	65751047.	10.2805851946	CY
0.0002301614	14631.	63567755.	10.1663604685	CY
0.0002395557	14735.	61508892.	10.0570670269	CY
0.0002489500	14831.	59572803.	9.9538707255	CY
0.0002583444	14917.	57742205.	9.8543594791	CY
0.0002677387	14998.	56017657.	9.7620066727	CY
0.0002771331	15072.	54384095.	9.6696534052	CY
0.0002865274	15140.	52838694.	9.5827436916	CY
0.0002959218	15203.	51376340.	9.5002422189	CY
0.0003053161	15262.	49987748.	9.4202418978	CY
0.0003147104	15317.	48669125.	9.3435469894	CY
0.0003241048	15368.	47417086.	9.2702488143	CY
0.0003334991	15416.	46224435.	9.1992508897	CY
0.0003428935	15460.	45087838.	9.1305984534	CY
0.0003522878	15503.	44005370.	9.0648294906	CY

0.0003616821	15543.	42973370.	9.0019155447	CY
0.0003710765	15580.	41984675.	8.9399601699	CY
0.0003804708	15614.	41039309.	8.8802657494	CY
0.0003898652	15648.	40135885.	8.8230068963	CY
0.0003992595	15679.	39271219.	8.7683795769	CY
0.0004086538	15707.	38437028.	8.7154758745	CY
0.0004180482	15734.	37638003.	8.6644441981	CY
0.0004274425	15760.	36871103.	8.6149761539	CY
0.0004368369	15785.	36134344.	8.5676091578	CY
0.0004462312	15809.	35427146.	8.5218190141	CY
0.0004556256	15812.	34704813.	8.4862986153	CY
0.0004650199	15831.	34042719.	8.4471855973	CY
0.0004744142	15831.	33368606.	8.4236375224	CY
0.0004838086	15835.	32730491.	8.3865077787	CY
0.0004932029	15835.	32107053.	8.3687312011	CY
0.0005025973	15835.	31506921.	8.3332163354	CY
0.0005119916	15835.	30928813.	8.3257480293	CY
0.0005213859	15835.	30371537.	8.2972046598	CY
0.0005307803	15835.	29833987.	8.2962313496	CY
0.0005401746	15835.	29315135.	8.2681991950	CY
0.0005495690	15835.	28814022.	8.2704231957	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	15835.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	16.5000	0.00	N.A.	No	0.00	3331.
2	19.0000	2.5000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
97.44	4.87
100.80	16.15
104.16	27.46
107.52	38.76
110.88	50.07
114.24	61.37
117.60	72.68
120.96	83.98
124.32	95.29

127.68	106.59
131.04	117.90
134.40	129.20
137.76	140.51
141.12	151.82
144.48	163.12
147.84	174.43
151.20	185.73
154.56	197.04
157.92	208.34
161.28	219.65
164.64	230.95
168.00	242.26
171.36	253.56
174.72	264.87
178.08	276.18
181.44	287.48
184.80	298.79
188.16	310.09
191.52	321.40
194.88	332.70
198.24	146.05

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.97
3.36	11.87
6.72	23.74
10.08	35.62
13.44	47.49
16.80	59.36
20.16	71.23
23.52	83.10
26.88	94.98

30.24	106.85
33.60	118.72
36.96	130.59
40.32	142.46
43.68	154.34
47.04	166.21
50.40	178.08
53.76	189.95
57.12	201.82
60.48	213.70
63.84	225.57
67.20	237.44
70.56	249.31
73.92	261.18
77.28	273.06
80.64	284.93
84.00	296.80
87.36	308.67
90.72	320.54
94.08	332.42
97.44	344.28
100.80	352.85
104.16	358.55
107.52	364.25
110.88	369.95
114.24	375.65
117.60	381.34
120.96	387.04
124.32	392.74
127.68	398.44
131.04	404.14
134.40	409.84
137.76	415.54
141.12	421.23
144.48	426.93
147.84	432.63
151.20	438.33
154.56	444.03
157.92	449.73
161.28	455.42
164.64	461.12
168.00	466.82
171.36	472.52
174.72	478.22

178.08	483.92
181.44	489.61
184.80	495.31
188.16	501.01
191.52	506.71
194.88	512.41
198.24	221.35

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	3.00659	-3.683E-05	3.224E-07	0.000	5.507E+10
0.28000	2.96091	16.75371	24.93120	0.000	5.507E+10
0.56000	2.91523	167.53761	84.76608	0.000	5.507E+10
0.84000	2.86956	586.38176	184.49088	0.000	5.507E+10
1.12000	2.82388	1407.	324.10560	0.000	5.507E+10
1.40000	2.77820	2764.	503.61024	0.000	5.507E+10
1.68000	2.73253	4792.	723.00480	0.000	5.507E+10
1.96000	2.68685	7623.	982.28928	0.000	5.507E+10
2.24000	2.64118	11393.	1281.	0.000	5.507E+10
2.52000	2.59551	16234.	1621.	0.000	5.507E+10
2.80000	2.54984	22283.	1999.	0.000	5.507E+10
3.08000	2.50418	29671.	2418.	0.000	5.507E+10
3.36000	2.45852	38534.	2877.	0.000	5.507E+10
3.64000	2.41287	49005.	3376.	0.000	5.507E+10
3.92000	2.36723	61218.	3914.	0.000	5.507E+10
4.20000	2.32160	75308.	4493.	0.000	5.507E+10
4.48000	2.27599	91409.	5111.	0.000	5.507E+10
4.76000	2.23040	109653.	5769.	0.000	5.507E+10
5.04000	2.18483	130177.	6467.	0.000	5.507E+10

5.32000	2.13929	153113.	7205.	0.000	5.507E+10
5.60000	2.09377	178595.	7983.	0.000	5.507E+10
5.88000	2.04830	206758.	8801.	0.000	5.507E+10
6.16000	2.00287	237736.	9658.	0.000	5.507E+10
6.44000	1.95748	271662.	10556.	0.000	5.507E+10
6.72000	1.91215	308671.	11493.	0.000	5.507E+10
7.00000	1.86689	348897.	12471.	0.000	5.507E+10
7.28000	1.82169	392474.	13488.	0.000	5.507E+10
7.56000	1.77658	439535.	14545.	0.000	5.507E+10
7.84000	1.73156	490215.	15642.	0.000	5.507E+10
8.12000	1.68663	544648.	16787.	0.000	5.507E+10
8.40000	1.64182	603023.	17993.	0.000	5.507E+10
8.68000	1.59714	665564.	19262.	0.000	5.507E+10
8.96000	1.55258	732462.	20587.	0.000	5.507E+10
9.24000	1.50818	803911.	21970.	0.000	5.507E+10
9.52000	1.46395	880101.	23410.	0.000	5.507E+10
9.80000	1.41989	961225.	24907.	0.000	5.507E+10
10.08000	1.37603	1047475.	26461.	0.000	5.507E+10
10.36000	1.33239	1139042.	28072.	0.000	5.507E+10
10.64000	1.28898	1236119.	29740.	0.000	5.507E+10
10.92000	1.24582	1338898.	31466.	0.000	5.507E+10
11.20000	1.20294	1447570.	33249.	0.000	5.507E+10
11.48000	1.16035	1562328.	35088.	0.000	5.507E+10
11.76000	1.11809	1683364.	36985.	0.000	5.507E+10
12.04000	1.07617	1810869.	38939.	0.000	5.507E+10
12.32000	1.03462	1945035.	40950.	0.000	5.507E+10
12.60000	0.99347	2086055.	43019.	0.000	5.507E+10
12.88000	0.95275	2234120.	45144.	0.000	5.507E+10
13.16000	0.91248	2389423.	47327.	0.000	5.507E+10
13.44000	0.87271	2552155.	49566.	0.000	5.507E+10
13.72000	0.83345	2722508.	51863.	0.000	5.507E+10
14.00000	0.79476	2900674.	54217.	0.000	5.507E+10
14.28000	0.75666	3086846.	56628.	0.000	5.507E+10
14.56000	0.71919	3281215.	59096.	0.000	5.507E+10
14.84000	0.68240	3483973.	61622.	0.000	5.507E+10
15.12000	0.64632	3695312.	64204.	0.000	5.507E+10
15.40000	0.61100	3915424.	66844.	0.000	5.507E+10
15.68000	0.57648	4144502.	69540.	0.000	5.507E+10
15.96000	0.54281	4382736.	72294.	0.000	5.507E+10
16.24000	0.51004	4630320.	75105.	0.000	5.507E+10
16.52000	0.47822	4887444.	77140.	-1.1559	7.499E+10
16.80000	0.44713	5148703.	77726.	-17.9552	7.487E+10
17.08000	0.41682	5409759.	77636.	-35.5584	7.475E+10
17.36000	0.38733	5670414.	77486.	-53.4751	7.463E+10

17.64000	0.35869	5930465.	77276.	-71.3068	7.451E+10
17.92000	0.33096	6189711.	77008.	-88.7158	7.439E+10
18.20000	0.30416	6447956.	76682.	-105.1929	7.426E+10
18.48000	0.27834	6705013.	76303.	-120.3372	7.414E+10
18.76000	0.25355	6960712.	75875.	-134.3137	7.402E+10
19.04000	0.22981	7214894.	72057.	-2138.	7.389E+10
19.32000	0.20718	7444936.	64188.	-2546.	7.378E+10
19.60000	0.18569	7646235.	54990.	-2929.	7.368E+10
19.88000	0.16537	7814467.	44629.	-3238.	7.359E+10
20.16000	0.14624	7946141.	33273.	-3521.	7.353E+10
20.44000	0.12834	8038064.	21013.	-3777.	7.348E+10
20.72000	0.11168	8087352.	7943.	-4004.	7.346E+10
21.00000	0.09625	8091441.	-5840.	-4201.	7.346E+10
21.28000	0.08207	8048107.	-20232.	-4366.	7.348E+10
21.56000	0.06913	7955482.	-35124.	-4499.	7.353E+10
21.84000	0.05740	7812071.	-50403.	-4596.	7.360E+10
22.12000	0.04688	7616775.	-65945.	-4655.	7.370E+10
22.40000	0.03752	7368921.	-81619.	-4674.	7.382E+10
22.68000	0.02929	7068295.	-97282.	-4649.	7.396E+10
22.96000	0.02214	6715186.	-112773.	-4572.	7.413E+10
23.24000	0.01601	6310462.	-127905.	-4435.	7.433E+10
23.52000	0.01084	5855665.	-142449.	-4222.	7.454E+10
23.80000	0.006556	5353203.	-156092.	-3899.	7.478E+10
24.08000	0.003081	4806727.	-168308.	-3373.	7.502E+10
24.36000	0.000329	4222173.	-177353.	-2011.	7.529E+10
24.64000	-0.001790	3614912.	-175359.	3198.	7.555E+10
24.92000	-0.003369	3043757.	-163444.	3894.	7.580E+10
25.20000	-0.004495	2516567.	-149794.	4231.	7.603E+10
25.48000	-0.005246	2037141.	-135298.	4398.	7.622E+10
25.76000	-0.005697	1607363.	-120368.	4489.	7.640E+10
26.04000	-0.005909	1228266.	-105215.	4531.	7.655E+10
26.32000	-0.005941	900317.	-89982.	4537.	1.150E+11
26.60000	-0.005884	623584.	-74758.	4526.	1.153E+11
26.88000	-0.005766	397945.	-59590.	4503.	1.155E+11
27.16000	-0.005609	223142.	-44512.	4472.	1.155E+11
27.44000	-0.005430	98827.	-29546.	4436.	1.155E+11
27.72000	-0.005241	24592.	-14706.	4397.	1.155E+11
28.00000	-0.005051	0.000	0.000	4357.	1.155E+11

Output Summary for Load Case No. 1:

Pile-head deflection = 3.00658850 inches
Computed slope at pile head = -0.0135944 radians
Maximum bending moment = 8091441. inch-lbs

Maximum shear force = -177353. lbs
Depth of maximum bending moment = 21.00000000 feet below pile head
Depth of maximum shear force = 24.36000000 feet below pile head
Number of iterations = 36
Number of zero deflection points = 1
Pile deflection at ground = 0.48048980 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
97.44	4.87
100.80	16.15
104.16	27.46
107.52	38.76
110.88	50.07
114.24	61.37
117.60	72.68
120.96	83.98
124.32	95.29
127.68	106.59
131.04	117.90
134.40	129.20
137.76	140.51
141.12	151.82
144.48	163.12
147.84	174.43
151.20	185.73
154.56	197.04
157.92	208.34
161.28	219.65
164.64	230.95
168.00	242.26
171.36	253.56
174.72	264.87
178.08	276.18
181.44	287.48

184.80	298.79
188.16	310.09
191.52	321.40
194.88	332.70
198.24	146.05

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.97
3.36	11.87
6.72	23.74
10.08	35.62
13.44	47.49
16.80	59.36
20.16	71.23
23.52	83.10
26.88	94.98
30.24	106.85
33.60	118.72
36.96	130.59
40.32	142.46
43.68	154.34
47.04	166.21
50.40	178.08
53.76	189.95
57.12	201.82
60.48	213.70
63.84	225.57
67.20	237.44
70.56	249.31
73.92	261.18
77.28	273.06
80.64	284.93
84.00	296.80

87.36	308.67
90.72	320.54
94.08	332.42
97.44	344.28
100.80	352.85
104.16	358.55
107.52	364.25
110.88	369.95
114.24	375.65
117.60	381.34
120.96	387.04
124.32	392.74
127.68	398.44
131.04	404.14
134.40	409.84
137.76	415.54
141.12	421.23
144.48	426.93
147.84	432.63
151.20	438.33
154.56	444.03
157.92	449.73
161.28	455.42
164.64	461.12
168.00	466.82
171.36	472.52
174.72	478.22
178.08	483.92
181.44	489.61
184.80	495.31
188.16	501.01
191.52	506.71
194.88	512.41
198.24	221.35

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	5.48429	0.000139	6.447E-07	0.000	5.507E+10
0.28000	5.40514	25.13074	37.39679	0.000	5.507E+10
0.56000	5.32599	251.30657	127.14912	0.000	5.507E+10
0.84000	5.24684	879.57280	276.73632	0.000	5.507E+10
1.12000	5.16769	2111.	486.15840	0.000	5.507E+10
1.40000	5.08854	4147.	755.41535	0.000	5.507E+10
1.68000	5.00939	7187.	1085.	0.000	5.507E+10
1.96000	4.93024	11434.	1473.	0.000	5.507E+10
2.24000	4.85110	17089.	1922.	0.000	5.507E+10
2.52000	4.77196	24352.	2431.	0.000	5.507E+10
2.80000	4.69282	33424.	2999.	0.000	5.507E+10
3.08000	4.61369	44506.	3627.	0.000	5.507E+10
3.36000	4.53457	57800.	4316.	0.000	5.507E+10
3.64000	4.45546	73507.	5064.	0.000	5.507E+10
3.92000	4.37637	91827.	5871.	0.000	5.507E+10
4.20000	4.29730	112962.	6739.	0.000	5.507E+10
4.48000	4.21825	137113.	7666.	0.000	5.507E+10
4.76000	4.13922	164480.	8654.	0.000	5.507E+10
5.04000	4.06023	195265.	9701.	0.000	5.507E+10
5.32000	3.98128	229669.	10808.	0.000	5.507E+10
5.60000	3.90238	267893.	11974.	0.000	5.507E+10
5.88000	3.82353	310137.	13201.	0.000	5.507E+10
6.16000	3.74475	356604.	14488.	0.000	5.507E+10
6.44000	3.66604	407493.	15834.	0.000	5.507E+10
6.72000	3.58741	463007.	17240.	0.000	5.507E+10
7.00000	3.50888	523346.	18706.	0.000	5.507E+10
7.28000	3.43046	588711.	20232.	0.000	5.507E+10
7.56000	3.35215	659303.	21817.	0.000	5.507E+10
7.84000	3.27398	735323.	23463.	0.000	5.507E+10
8.12000	3.19597	816972.	25176.	0.000	5.507E+10
8.40000	3.11811	904507.	26968.	0.000	5.507E+10
8.68000	3.04045	998199.	28834.	0.000	5.507E+10
8.96000	2.96299	1098274.	30767.	0.000	5.507E+10
9.24000	2.88575	1204954.	32766.	0.000	5.507E+10
9.52000	2.80876	1318464.	34833.	0.000	5.507E+10
9.80000	2.73205	1439029.	36965.	0.000	5.507E+10

10.08000	2.65562	1566872.	39165.	0.000	5.507E+10
10.36000	2.57952	1702217.	41431.	0.000	5.507E+10
10.64000	2.50377	1845289.	43764.	0.000	5.507E+10
10.92000	2.42839	1996311.	46164.	0.000	5.507E+10
11.20000	2.35343	2155509.	48630.	0.000	5.507E+10
11.48000	2.27890	2323106.	51163.	0.000	5.507E+10
11.76000	2.20486	2499325.	53763.	0.000	5.507E+10
12.04000	2.13132	2684392.	56429.	0.000	5.507E+10
12.32000	2.05834	2878531.	59163.	0.000	5.507E+10
12.60000	1.98594	3081965.	61962.	0.000	5.507E+10
12.88000	1.91418	3294918.	64829.	0.000	5.507E+10
13.16000	1.84309	3517616.	67762.	0.000	5.507E+10
13.44000	1.77272	3750281.	70762.	0.000	5.507E+10
13.72000	1.70313	3993139.	73829.	0.000	5.507E+10
14.00000	1.63435	4246412.	76962.	0.000	5.507E+10
14.28000	1.56644	4510326.	80163.	0.000	5.507E+10
14.56000	1.49945	4785105.	83429.	0.000	5.507E+10
14.84000	1.43345	5070972.	86763.	0.000	5.507E+10
15.12000	1.36849	5368152.	90163.	0.000	5.507E+10
15.40000	1.30462	5676868.	93630.	0.000	5.507E+10
15.68000	1.24193	5997346.	97164.	0.000	5.507E+10
15.96000	1.18046	6329809.	100764.	0.000	5.507E+10
16.24000	1.12028	6674481.	104431.	0.000	5.507E+10
16.52000	1.06148	7031587.	107082.	-1.4557	7.398E+10
16.80000	1.00375	7394073.	107844.	-23.1785	7.380E+10
17.08000	0.94715	7756298.	107726.	-47.1150	7.362E+10
17.36000	0.89174	8117990.	107525.	-72.5301	7.344E+10
17.64000	0.83757	8478864.	107241.	-96.5433	7.326E+10
17.92000	0.78472	8838648.	106877.	-119.7199	7.307E+10
18.20000	0.73323	9197081.	106438.	-141.6808	7.289E+10
18.48000	0.68316	9553914.	105928.	-162.0165	7.270E+10
18.76000	0.63458	9908917.	105352.	-180.9076	7.251E+10
19.04000	0.58754	10261879.	101456.	-2138.	7.231E+10
19.32000	0.54210	10590700.	93586.	-2546.	7.213E+10
19.60000	0.49832	10890779.	84347.	-2954.	7.196E+10
19.88000	0.45625	11157513.	73738.	-3361.	7.181E+10
20.16000	0.41594	11386299.	61759.	-3769.	7.168E+10
20.44000	0.37741	11572535.	48411.	-4177.	7.157E+10
20.72000	0.34071	11711618.	33692.	-4584.	7.149E+10
21.00000	0.30587	11798946.	17604.	-4992.	7.144E+10
21.28000	0.27288	11829915.	145.68363	-5400.	7.142E+10
21.56000	0.24177	11799925.	-18682.	-5807.	7.144E+10
21.84000	0.21252	11704371.	-38880.	-6215.	7.149E+10
22.12000	0.18512	11538651.	-60346.	-6563.	7.159E+10

22.40000	0.15954	11298843.	-82648.	-6712.	7.173E+10
22.68000	0.13573	10983255.	-105383.	-6820.	7.191E+10
22.96000	0.11365	10590668.	-128403.	-6882.	7.213E+10
23.24000	0.09323	10120386.	-151540.	-6890.	7.239E+10
23.52000	0.07439	9572322.	-174594.	-6833.	7.269E+10
23.80000	0.05704	8947112.	-197322.	-6695.	7.302E+10
24.08000	0.04106	8246317.	-219397.	-6444.	7.338E+10
24.36000	0.02636	7472765.	-240332.	-6017.	7.376E+10
24.64000	0.01280	6631289.	-259225.	-5230.	7.418E+10
24.92000	0.000249	5730772.	-271421.	-2030.	7.460E+10
25.20000	-0.0114	4807337.	-265855.	5343.	7.502E+10
25.48000	-0.0224	3944224.	-246260.	6321.	7.541E+10
25.76000	-0.0328	3152473.	-223961.	6952.	7.576E+10
26.04000	-0.0427	2439203.	-199807.	7426.	7.606E+10
26.32000	-0.0522	1809772.	-174210.	7810.	7.632E+10
26.60000	-0.0615	1268515.	-147420.	8136.	7.654E+10
26.88000	-0.0706	819111.	-119603.	8421.	1.150E+11
27.16000	-0.0796	464780.	-90877.	8678.	1.155E+11
27.44000	-0.0885	208419.	-61325.	8912.	1.155E+11
27.72000	-0.0975	52676.	-31015.	9129.	1.155E+11
28.00000	-0.1064	0.000	0.000	9332.	1.155E+11

Output Summary for Load Case No. 2:

Pile-head deflection = 5.48428568 inches
Computed slope at pile head = -0.0235565 radians
Maximum bending moment = 11829915. inch-lbs
Maximum shear force = -271421. lbs
Depth of maximum bending moment = 21.28000000 feet below pile head
Depth of maximum shear force = 24.92000000 feet below pile head
Number of iterations = 62
Number of zero deflection points = 1
Pile deflection at ground = 1.06567941 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians

1	3.0065885	8091441.	-177353.	-0.013594
2	5.4842857	11829915.	-271421.	-0.023556

Maximum pile-head deflection = 5.4842856764 inches
Maximum pile-head rotation = -0.0235564879 radians = -1.349687 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	14272997.	4630320.	Pass
	2	1.00	15835292.	8091441.	Pass
2	1	1.00	14272997.	6674481.	Pass
	2	1.00	15835292.	11829915.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	272220.	75105.	Pass
	2	1.00	272220.	-177353.	Pass
2	1	1.00	272220.	104431.	Pass
	2	1.00	272220.	-271421.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -271421.38 lbs
Factored Shear Capacity at Node = 272220.00 lbs
Fraction of Allowable Shear Capacity = 0.9971

The analysis ended normally.

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

                            LPile for Version 2022-12.012

                             License ID : 154178656
                        License Type : (Network License)

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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================================================================================


This model was prepared by:
TWASHKO




--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1093.87 Pile 9.lp12d

Name of the output report file:
BEL-70 1093.87 Pile 9.lp12o

Name of the plot output file:
BEL-70 1093.87 Pile 9.lp12p

Name of the runtime message file:
BEL-70 1093.87 Pile 9.lp12r
```

Date and Time of Analysis

Date: June 23, 2026 Time: 15:43:40

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1093+87 Pile 9 - 5' Ht. (3' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 15.000 ft
Depth of ground surface below top of pile = 5.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	10.1000
2	5.000	10.1000
3	5.000	24.0000
4	15.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 5.000000 ft
   AISC Section Type = HP

   AISC Section Name = HP10X42

   Pile width = 10.100000 in
   Shear capacity of section = 106630. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 10.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 106630. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 5.000000 ft
   Distance from top of pile to bottom of layer = 16.500000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	16.500000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 35.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	2.50	39.75
3	5.00	58.83

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	2.50	0.00
2	5.00	39.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	5.000000 ft
Flange Width	=	10.100000 in
Section Depth	=	9.700000 in
Flange Thickness	=	0.420000 in
Web Thickness	=	0.415000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	12.400000 sq. in.
Moment of Inertia	=	210.000000 in^4
Elastic Bending Stiffness	=	6090000. kip-in^2
Plastic Modulus, Z	=	48.300000in^3

Plastic Moment Capacity = Fy Z = 2415.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 620.000 kips
Nominal Axial Tensile Capacity = -620.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	43.4777520338	5992769.	4.8500000000	
0.0000145101	86.9555040676	5992769.	4.8500000000	
0.0000217651	130.4332561015	5992769.	4.8500000000	
0.0000290201	173.9110081353	5992769.	4.8500000000	
0.0000362752	217.3887601691	5992769.	4.8500000000	
0.0000435302	260.8665122029	5992769.	4.8500000000	
0.0000507853	304.3442642367	5992769.	4.8500000000	
0.0000580403	347.8220162706	5992769.	4.8500000000	
0.0000652953	391.2997683044	5992769.	4.8500000000	
0.0000725504	434.7775203382	5992769.	4.8500000000	
0.0000798054	478.2552723720	5992769.	4.8500000000	
0.0000870604	521.7330244059	5992769.	4.8500000000	
0.0000943155	565.2107764397	5992769.	4.8500000000	
0.0001015705	608.6885284735	5992769.	4.8500000000	
0.0001088255	652.1662805073	5992769.	4.8500000000	

0.0001160806	695.6440325411	5992769.	4.8500000000	
0.0001233356	739.1217845750	5992769.	4.8500000000	
0.0001305906	782.5995366088	5992769.	4.8500000000	
0.0001378457	826.0772886426	5992769.	4.8500000000	
0.0001451007	869.5550406764	5992769.	4.8500000000	
0.0001523558	913.0327927102	5992769.	4.8500000000	
0.0001596108	956.5105447441	5992769.	4.8500000000	
0.0001668658	999.9882967779	5992769.	4.8500000000	
0.0001741209	1043.	5992769.	4.8500000000	
0.0001813759	1087.	5992769.	4.8500000000	
0.0001886309	1130.	5992769.	4.8500000000	
0.0001958860	1174.	5992769.	4.8500000000	
0.0002031410	1217.	5992769.	4.8500000000	
0.0002103960	1261.	5992769.	4.8500000000	
0.0002176511	1304.	5992769.	4.8500000000	
0.0002249061	1348.	5992769.	4.8500000000	
0.0002321611	1391.	5992769.	4.8500000000	
0.0002394162	1435.	5992769.	4.8500000000	
0.0002466712	1478.	5992769.	4.8500000000	
0.0002539263	1522.	5992769.	4.8500000000	
0.0002611813	1565.	5992769.	4.8500000000	
0.0002684363	1609.	5992769.	4.8500000000	
0.0002756914	1652.	5992769.	4.8500000000	
0.0002829464	1696.	5992769.	4.8500000000	
0.0002974565	1783.	5992769.	4.8500000000	
0.0003119665	1870.	5992769.	4.8500000000	
0.0003264766	1956.	5992769.	4.8500000000	
0.0003409867	2043.	5992769.	4.8500000000	
0.0003554968	2130.	5992769.	4.8500000000	
0.0003700068	2199.	5942130.	4.8500000000	Y
0.0003845169	2233.	5807975.	4.8500000000	Y
0.0003990270	2245.	5627120.	4.8500000000	Y
0.0004135370	2254.	5451108.	4.8500000000	Y
0.0004280471	2262.	5285148.	4.8500000000	Y
0.0004425572	2269.	5128131.	4.8500000000	Y
0.0004570673	2276.	4979678.	4.8500000000	Y
0.0004715773	2282.	4839137.	4.8500000000	Y
0.0004860874	2287.	4705909.	4.8500000000	Y
0.0005005975	2292.	4579458.	4.8500000000	Y
0.0005151075	2297.	4459307.	4.8500000000	Y
0.0005296176	2301.	4345022.	4.8500000000	Y
0.0005441277	2305.	4236215.	4.8500000000	Y
0.0005586378	2309.	4132530.	4.8500000000	Y
0.0005731478	2312.	4033644.	4.8500000000	Y

0.0005876579	2315.	3939263.	4.8500000000 Y
0.0006021680	2318.	3849104.	4.8500000000 Y
0.0006166780	2320.	3762749.	4.8500000000 Y
0.0006311881	2323.	3680141.	4.8500000000 Y
0.0006456982	2325.	3601052.	4.8500000000 Y
0.0006602083	2327.	3525092.	4.8500000000 Y
0.0006747183	2329.	3452291.	4.8500000000 Y
0.0006892284	2331.	3382319.	4.8500000000 Y
0.0007037385	2333.	3315098.	4.8500000000 Y
0.0007182485	2335.	3250437.	4.8500000000 Y
0.0007327586	2336.	3188206.	4.8500000000 Y
0.0007472687	2338.	3128263.	4.8500000000 Y
0.0007617788	2339.	3070519.	4.8500000000 Y
0.0007762888	2340.	3014790.	4.8500000000 Y
0.0007907989	2342.	2961096.	4.8500000000 Y
0.0008053090	2343.	2909147.	4.8500000000 Y
0.0008198191	2344.	2859037.	4.8500000000 Y
0.0008343291	2345.	2810577.	4.8500000000 Y
0.0008488392	2346.	2763692.	4.8500000000 Y
0.0008633493	2347.	2718382.	4.8500000000 Y
0.0009213896	2350.	2550781.	4.8500000000 Y
0.0009794298	2353.	2402455.	4.8500000000 Y
0.0010374701	2355.	2270298.	4.8500000000 Y
0.0010955104	2357.	2151822.	4.8500000000 Y
0.0011535507	2359.	2045031.	4.8500000000 Y
0.0012115910	2360.	1948248.	4.8500000000 Y
0.0012696313	2362.	1860154.	4.8500000000 Y
0.0013276716	2363.	1779680.	4.8500000000 Y
0.0013857118	2364.	1705811.	4.8500000000 Y
0.0014437521	2365.	1637830.	4.8500000000 Y
0.0015017924	2365.	1575020.	4.8500000000 Y
0.0015598327	2366.	1516858.	4.8500000000 Y
0.0016178730	2367.	1462791.	4.8500000000 Y
0.0016759133	2367.	1412468.	4.8500000000 Y
0.0017339536	2368.	1365457.	4.8500000000 Y
0.0017919939	2368.	1321468.	4.8500000000 Y

Summary of Results for Nominal Moment Capacity for Section 1

Load	Axial	Nominal Moment

No.	Thrust kips	Capacity in-kips
1	0.00000000	2368.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	10.000000 ft
Outside Diameter of Casing	=	24.000000 in
Casing Wall Thickness	=	0.0000 in
Moment of Inertia of Steel Casing	=	0.0000 in^4
Width Flange of Core/Insert	=	10.100000 in
Depth of Core/Insert	=	9.700000 in
Flange Thickness of Core/Insert	=	0.420000 in
Web Thickness of Core/Insert	=	0.415000 in
Moment of Inertia of Steel Core/Insert	=	206.834773 in^4
Yield Stress of Casing	=	50000. psi
Elastic Modulus of Casing	=	29000000. psi
Yield Stress of Core/Insert	=	50000. psi
Elastic Modulus of Core/Insert	=	29000000. psi
Number of Reinforcing Bars	=	0 bars
Gross Area of Pile	=	452.389342 sq. in.
Area of Concrete	=	440.228442 sq. in.
Cross-sectional Area of Steel Casing	=	0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert	=	12.160900 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	12.160900 sq. in.
Area Ratio of All Steel to Gross Area	=	2.69 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2104.822 kips
Tensile Load for Cracking of Concrete = -223.782 kips
Nominal Axial Tensile Capacity = -608.045 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	530.4688702357	73117333.	12.0000000000	
0.0000145101	530.4688702357	36558666.	7.5346432973	C
0.0000217651	530.4688702357	24372444.	7.5509693177	C
0.0000290201	573.8604565856	19774556.	7.5673903328	C
0.0000362752	714.7361369836	19703173.	7.5838762751	C
0.0000435302	854.5349048170	19630845.	7.6006151961	C
0.0000507853	993.2347822465	19557544.	7.6176150838	C
0.0000580403	1131.	19483241.	7.6348843122	C
0.0000652953	1267.	19407906.	7.6524316670	C
0.0000725504	1403.	19331507.	7.6702663732	C
0.0000798054	1537.	19254007.	7.6883985918	C
0.0000870604	1669.	19175378.	7.7068375181	C
0.0000943155	1801.	19095579.	7.7255944174	C

0.0001015705	1931.	19014571.	7.7446806026	C
0.0001088255	2060.	18932313.	7.7641080049	C
0.0001160806	2188.	18848762.	7.7838892208	C
0.0001233356	2314.	18763904.	7.8039201862	C
0.0001305906	2439.	18677809.	7.8238464979	C
0.0001378457	2563.	18590324.	7.8441461966	C
0.0001451007	2685.	18501397.	7.8648339000	C
0.0001523558	2805.	18410976.	7.8859251101	C
0.0001596108	2924.	18319004.	7.9074362866	C
0.0001668658	3041.	18225418.	7.9293849286	C
0.0001741209	3157.	18130157.	7.9517896655	C
0.0001813759	3271.	18033150.	7.9746703578	C
0.0001886309	3383.	17934325.	7.9979893773	C
0.0001958860	3491.	17821723.	8.0198685081	CY
0.0002031410	3572.	17584937.	8.0198599416	CY
0.0002103960	3616.	17185839.	7.9890033576	CY
0.0002176511	3651.	16776777.	7.9554828143	CY
0.0002249061	3684.	16382236.	7.9233122209	CY
0.0002321611	3715.	16001668.	7.8923366248	CY
0.0002394162	3743.	15634555.	7.8625747655	CY
0.0002466712	3769.	15280300.	7.8363042206	CY
0.0002539263	3793.	14938361.	7.8102930990	CY
0.0002611813	3815.	14607939.	7.7851355921	CY
0.0002684363	3836.	14288816.	7.7610173485	CY
0.0002756914	3854.	13981037.	7.7383482617	CY
0.0002829464	3872.	13684046.	7.7170393330	CY
0.0002974565	3902.	13119520.	7.6778549283	CY
0.0003119665	3929.	12593495.	7.6433460103	CY
0.0003264766	3951.	12102782.	7.6128213964	CY
0.0003409867	3971.	11644332.	7.5858959176	CY
0.0003554968	3987.	11215358.	7.5620206201	CY
0.0003700068	4001.	10813285.	7.5391130627	CY
0.0003845169	4013.	10436280.	7.5206259707	CY
0.0003990270	4023.	10082484.	7.5034137928	CY
0.0004135370	4032.	9749595.	7.4883916869	CY
0.0004280471	4039.	9435684.	7.4748414923	CY
0.0004425572	4045.	9140071.	7.4631570054	CY
0.0004570673	4050.	8860511.	7.4527115052	CY
0.0004715773	4054.	8596337.	7.4438376166	CY
0.0004860874	4057.	8346000.	7.4354937360	CY
0.0005005975	4059.	8108779.	7.4293988243	CY
0.0005151075	4061.	7883393.	7.4233730110	CY
0.0005296176	4061.	7667409.	7.4355441507	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	4061.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	5.0000	0.00	N.A.	No	0.00	53997.
2	16.5000	11.5000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
30.60	0.81
32.40	3.12
34.20	5.46
36.00	7.80
37.80	10.14
39.60	12.48
41.40	14.82
43.20	17.16
45.00	19.50
46.80	21.84
48.60	24.18
50.40	26.52
52.20	28.86
54.00	31.20
55.80	33.54
57.60	35.88
59.40	31.69

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.60

1.80	2.39
3.60	4.77
5.40	7.16
7.20	9.54
9.00	11.93
10.80	14.31
12.60	16.70
14.40	19.08
16.20	21.46
18.00	23.85
19.80	26.23
21.60	28.62
23.40	31.00
25.20	33.39
27.00	35.77
28.80	38.16
30.60	40.11
32.40	41.28
34.20	42.42
36.00	43.57
37.80	44.71
39.60	45.86
41.40	47.00
43.20	48.15
45.00	49.29
46.80	50.43
48.60	51.58
50.40	52.72
52.20	53.87
54.00	55.01
55.80	56.16
57.60	57.30
59.40	48.63

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.14557	-7.187E-07	-1.426E-08	0.000	5.993E+09
0.15000	0.14354	0.96593	2.68313	0.000	5.993E+09
0.30000	0.14151	9.65925	9.12263	0.000	5.993E+09
0.45000	0.13948	33.80738	19.85513	0.000	5.993E+09
0.60000	0.13745	81.13770	34.88063	0.000	5.993E+09
0.75000	0.13542	159.37763	54.19913	0.000	5.993E+09
0.90000	0.13339	276.25455	77.81063	0.000	5.993E+09
1.05000	0.13136	439.49588	105.71513	0.000	5.993E+09
1.20000	0.12933	656.82900	137.91263	0.000	5.993E+09
1.35000	0.12730	935.98133	174.40313	0.000	5.993E+09
1.50000	0.12527	1285.	215.18663	0.000	5.993E+09
1.65000	0.12325	1711.	260.26313	0.000	5.993E+09
1.80000	0.12122	2222.	309.63263	0.000	5.993E+09
1.95000	0.11919	2825.	363.29513	0.000	5.993E+09
2.10000	0.11717	3529.	421.25063	0.000	5.993E+09
2.25000	0.11515	4342.	483.49913	0.000	5.993E+09
2.40000	0.11313	5270.	550.04063	0.000	5.993E+09
2.55000	0.11111	6322.	621.21881	0.000	5.993E+09
2.70000	0.10910	7506.	698.00976	0.000	5.993E+09
2.85000	0.10709	8835.	781.05960	0.000	5.993E+09
3.00000	0.10508	10318.	870.38208	0.000	5.993E+09
3.15000	0.10308	11968.	965.97720	0.000	5.993E+09
3.30000	0.10109	13796.	1068.	0.000	5.993E+09
3.45000	0.09911	15812.	1176.	0.000	5.993E+09
3.60000	0.09713	18029.	1290.	0.000	5.993E+09
3.75000	0.09516	20458.	1411.	0.000	5.993E+09
3.90000	0.09321	23109.	1538.	0.000	5.993E+09
4.05000	0.09126	25995.	1671.	0.000	5.993E+09
4.20000	0.08933	29126.	1811.	0.000	5.993E+09
4.35000	0.08742	32514.	1957.	0.000	5.993E+09
4.50000	0.08552	36169.	2109.	0.000	5.993E+09
4.65000	0.08365	40105.	2267.	0.000	5.993E+09
4.80000	0.08179	44330.	2432.	0.000	5.993E+09
4.95000	0.07996	48858.	2588.	0.000	5.993E+09
5.10000	0.07816	53646.	2657.	-3.6568	7.312E+10
5.25000	0.07636	58422.	2645.	-9.2930	7.312E+10
5.40000	0.07456	63168.	2623.	-15.0611	7.312E+10

5.55000	0.07276	67865.	2591.	-20.9063	7.312E+10
5.70000	0.07097	72495.	2548.	-26.7745	7.312E+10
5.85000	0.06918	77037.	2494.	-32.6123	7.312E+10
6.00000	0.06739	81474.	2430.	-38.3669	7.312E+10
6.15000	0.06561	85787.	2356.	-44.3140	7.312E+10
6.30000	0.06383	89956.	2271.	-50.1884	7.312E+10
6.45000	0.06205	93963.	2175.	-55.9492	7.312E+10
6.60000	0.06028	97788.	2070.	-61.5564	7.312E+10
6.75000	0.05851	101414.	1954.	-66.9708	7.312E+10
6.90000	0.05675	104822.	1829.	-72.1539	7.312E+10
7.05000	0.05499	107997.	1694.	-77.1485	7.312E+10
7.20000	0.05324	110922.	1551.	-82.0310	7.312E+10
7.35000	0.05149	113582.	1399.	-86.6230	7.312E+10
7.50000	0.04975	115960.	1241.	-89.5440	7.312E+10
7.65000	0.04801	118049.	1078.	-91.6004	7.312E+10
7.80000	0.04628	119841.	911.43656	-93.2919	7.312E+10
7.95000	0.04455	121330.	742.31558	-94.6203	7.312E+10
8.10000	0.04283	122513.	571.12840	-95.5876	7.312E+10
8.25000	0.04111	123386.	398.52341	-96.1957	7.312E+10
8.40000	0.03940	123948.	225.14565	-96.4463	7.312E+10
8.55000	0.03769	124197.	51.63685	-96.3413	7.312E+10
8.70000	0.03599	124134.	-121.3645	-95.8825	7.312E+10
8.85000	0.03430	123760.	-293.2233	-95.0717	7.312E+10
9.00000	0.03261	123078.	-463.3074	-93.9106	7.312E+10
9.15000	0.03092	122092.	-630.9878	-92.4009	7.312E+10
9.30000	0.02925	120806.	-795.6385	-90.5443	7.312E+10
9.45000	0.02757	119228.	-956.6365	-88.3423	7.312E+10
9.60000	0.02590	117362.	-1113.	-85.7964	7.312E+10
9.75000	0.02424	115219.	-1265.	-82.9080	7.312E+10
9.90000	0.02258	112808.	-1412.	-79.6786	7.312E+10
10.05000	0.02093	110138.	-1552.	-76.1092	7.312E+10
10.20000	0.01928	107222.	-1685.	-72.2013	7.312E+10
10.35000	0.01764	104071.	-1811.	-67.9557	7.312E+10
10.50000	0.01600	100701.	-1930.	-63.3736	7.312E+10
10.65000	0.01437	97125.	-2039.	-58.4557	7.312E+10
10.80000	0.01274	93360.	-2140.	-53.2029	7.312E+10
10.95000	0.01111	89422.	-2230.	-47.6159	7.312E+10
11.10000	0.009493	85330.	-2311.	-41.6952	7.312E+10
11.25000	0.007876	81103.	-2380.	-35.4413	7.312E+10
11.40000	0.006262	76761.	-2438.	-28.8545	7.312E+10
11.55000	0.004651	72326.	-2484.	-21.9352	7.312E+10
11.70000	0.003044	67819.	-2517.	-14.6834	7.312E+10
11.85000	0.001439	63266.	-2536.	-7.0993	7.312E+10
12.00000	-0.000162	58689.	-2542.	0.81726	7.312E+10

12.15000	-0.001761	54114.	-2533.	9.06637	7.312E+10
12.30000	-0.003358	49569.	-2509.	17.64826	7.312E+10
12.45000	-0.004952	45082.	-2469.	26.56324	7.312E+10
12.60000	-0.006545	40680.	-2413.	35.81167	7.312E+10
12.75000	-0.008135	36394.	-2340.	45.39399	7.312E+10
12.90000	-0.009724	32256.	-2250.	54.54963	7.312E+10
13.05000	-0.0113	28294.	-2149.	57.61064	7.312E+10
13.20000	-0.0129	24519.	-2041.	62.99027	7.312E+10
13.35000	-0.0145	20948.	-1922.	68.29659	7.312E+10
13.50000	-0.0161	17598.	-1795.	73.55529	7.312E+10
13.65000	-0.0177	14486.	-1658.	78.78514	7.312E+10
13.80000	-0.0192	11630.	-1511.	84.00015	7.312E+10
13.95000	-0.0208	9046.	-1355.	89.21102	7.312E+10
14.10000	-0.0224	6751.	-1190.	94.42599	7.312E+10
14.25000	-0.0240	4762.	-1015.	99.65147	7.312E+10
14.40000	-0.0256	3096.	-831.2737	104.89251	7.312E+10
14.55000	-0.0271	1769.	-637.7328	110.15302	7.312E+10
14.70000	-0.0287	799.70576	-434.7026	115.43607	7.312E+10
14.85000	-0.0303	204.24753	-222.1405	120.74404	7.312E+10
15.00000	-0.0319	0.000	0.000	126.07872	7.312E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 0.14557006 inches
Computed slope at pile head = -0.0011277 radians
Maximum bending moment = 124197. inch-lbs
Maximum shear force = 2657. lbs
Depth of maximum bending moment = 8.55000000 feet below pile head
Depth of maximum shear force = 5.10000000 feet below pile head
Number of iterations = 10
Number of zero deflection points = 1
Pile deflection at ground = 0.07936104 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in

30.60	0.81
32.40	3.12
34.20	5.46
36.00	7.80
37.80	10.14
39.60	12.48
41.40	14.82
43.20	17.16
45.00	19.50
46.80	21.84
48.60	24.18
50.40	26.52
52.20	28.86
54.00	31.20
55.80	33.54
57.60	35.88
59.40	31.69

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.60
1.80	2.39
3.60	4.77
5.40	7.16
7.20	9.54
9.00	11.93
10.80	14.31
12.60	16.70
14.40	19.08
16.20	21.46
18.00	23.85
19.80	26.23
21.60	28.62
23.40	31.00

25.20	33.39
27.00	35.77
28.80	38.16
30.60	40.11
32.40	41.28
34.20	42.42
36.00	43.57
37.80	44.71
39.60	45.86
41.40	47.00
43.20	48.15
45.00	49.29
46.80	50.43
48.60	51.58
50.40	52.72
52.20	53.87
54.00	55.01
55.80	56.16
57.60	57.30
59.40	48.63

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.27216	-1.129E-06	-2.852E-08	0.000	5.993E+09
0.15000	0.26844	1.44889	4.02469	0.000	5.993E+09
0.30000	0.26471	14.48887	13.68394	0.000	5.993E+09
0.45000	0.26098	50.71106	29.78269	0.000	5.993E+09
0.60000	0.25726	121.70655	52.32094	0.000	5.993E+09
0.75000	0.25353	239.06644	81.29869	0.000	5.993E+09

0.90000	0.24981	414.38182	116.71594	0.000	5.993E+09
1.05000	0.24608	659.24381	158.57269	0.000	5.993E+09
1.20000	0.24236	985.24350	206.86894	0.000	5.993E+09
1.35000	0.23864	1404.	261.60469	0.000	5.993E+09
1.50000	0.23491	1927.	322.77994	0.000	5.993E+09
1.65000	0.23119	2566.	390.39469	0.000	5.993E+09
1.80000	0.22747	3332.	464.44894	0.000	5.993E+09
1.95000	0.22375	4238.	544.94269	0.000	5.993E+09
2.10000	0.22003	5294.	631.87594	0.000	5.993E+09
2.25000	0.21632	6513.	725.24869	0.000	5.993E+09
2.40000	0.21261	7905.	825.06094	0.000	5.993E+09
2.55000	0.20890	9483.	931.46259	0.000	5.993E+09
2.70000	0.20520	11258.	1045.	0.000	5.993E+09
2.85000	0.20151	13245.	1166.	0.000	5.993E+09
3.00000	0.19782	15455.	1294.	0.000	5.993E+09
3.15000	0.19414	17902.	1429.	0.000	5.993E+09
3.30000	0.19047	20599.	1572.	0.000	5.993E+09
3.45000	0.18681	23559.	1721.	0.000	5.993E+09
3.60000	0.18317	26796.	1879.	0.000	5.993E+09
3.75000	0.17953	30322.	2043.	0.000	5.993E+09
3.90000	0.17592	34152.	2215.	0.000	5.993E+09
4.05000	0.17232	38297.	2394.	0.000	5.993E+09
4.20000	0.16875	42771.	2581.	0.000	5.993E+09
4.35000	0.16519	47587.	2774.	0.000	5.993E+09
4.50000	0.16167	52759.	2975.	0.000	5.993E+09
4.65000	0.15817	58299.	3184.	0.000	5.993E+09
4.80000	0.15470	64220.	3399.	0.000	5.993E+09
4.95000	0.15127	70537.	3603.	0.000	5.993E+09
5.10000	0.14788	77192.	3694.	-4.3168	7.312E+10
5.25000	0.14449	83833.	3680.	-10.9954	7.312E+10
5.40000	0.14110	90439.	3654.	-17.8630	7.312E+10
5.55000	0.13772	96987.	3615.	-24.8579	7.312E+10
5.70000	0.13434	103454.	3564.	-31.9190	7.312E+10
5.85000	0.13096	109818.	3500.	-38.9857	7.312E+10
6.00000	0.12759	116056.	3424.	-45.9978	7.312E+10
6.15000	0.12423	122144.	3335.	-53.1817	7.312E+10
6.30000	0.12087	128061.	3233.	-60.2957	7.312E+10
6.45000	0.11752	133782.	3118.	-67.2915	7.312E+10
6.60000	0.11417	139285.	2990.	-74.1219	7.312E+10
6.75000	0.11083	144547.	2851.	-80.7403	7.312E+10
6.90000	0.10750	149548.	2700.	-87.1011	7.312E+10
7.05000	0.10417	154267.	2538.	-93.2452	7.312E+10
7.20000	0.10085	158684.	2364.	-99.2493	7.312E+10
7.35000	0.09753	162779.	2181.	-104.9194	7.312E+10

7.50000	0.09423	166535.	1987.	-110.2166	7.312E+10
7.65000	0.09093	169933.	1784.	-115.1028	7.312E+10
7.80000	0.08764	172958.	1573.	-119.5413	7.312E+10
7.95000	0.08435	175596.	1354.	-123.4961	7.312E+10
8.10000	0.08108	177834.	1129.	-127.4354	7.312E+10
8.25000	0.07781	179659.	895.81619	-131.1514	7.312E+10
8.40000	0.07455	181059.	656.84131	-134.3763	7.312E+10
8.55000	0.07129	182023.	412.53136	-137.0792	7.312E+10
8.70000	0.06805	182544.	163.85267	-139.2304	7.312E+10
8.85000	0.06481	182613.	-88.1755	-140.8009	7.312E+10
9.00000	0.06159	182226.	-342.4828	-141.7628	7.312E+10
9.15000	0.05837	181380.	-598.8771	-143.1198	7.312E+10
9.30000	0.05515	180071.	-857.2092	-143.9159	7.312E+10
9.45000	0.05195	178294.	-1116.	-144.1256	7.312E+10
9.60000	0.04875	176051.	-1376.	-143.7237	7.312E+10
9.75000	0.04556	173343.	-1633.	-142.6849	7.312E+10
9.90000	0.04238	170172.	-1889.	-140.9839	7.312E+10
10.05000	0.03921	166544.	-2140.	-138.5770	7.312E+10
10.20000	0.03605	162467.	-2386.	-134.9530	7.312E+10
10.35000	0.03289	157953.	-2622.	-126.6789	7.312E+10
10.50000	0.02973	153028.	-2842.	-117.7502	7.312E+10
10.65000	0.02659	147722.	-3045.	-108.1684	7.312E+10
10.80000	0.02345	142066.	-3231.	-97.9347	7.312E+10
10.95000	0.02032	136092.	-3397.	-87.0500	7.312E+10
11.10000	0.01719	129836.	-3543.	-75.5153	7.312E+10
11.25000	0.01407	123336.	-3668.	-63.3313	7.312E+10
11.40000	0.01096	116630.	-3771.	-50.4986	7.312E+10
11.55000	0.007849	109761.	-3850.	-37.0174	7.312E+10
11.70000	0.004745	102771.	-3904.	-22.8880	7.312E+10
11.85000	0.001644	95708.	-3931.	-8.1104	7.312E+10
12.00000	-0.001451	88618.	-3932.	7.31536	7.312E+10
12.15000	-0.004543	81552.	-3904.	23.38967	7.312E+10
12.30000	-0.007632	74562.	-3847.	40.11285	7.312E+10
12.45000	-0.0107	67702.	-3760.	57.48540	7.312E+10
12.60000	-0.0138	61028.	-3643.	71.85883	7.312E+10
12.75000	-0.0169	54587.	-3509.	76.84275	7.312E+10
12.90000	-0.0200	48394.	-3367.	80.86696	7.312E+10
13.05000	-0.0230	42464.	-3217.	85.76280	7.312E+10
13.20000	-0.0261	36812.	-3056.	93.69060	7.312E+10
13.35000	-0.0292	31463.	-2880.	101.56867	7.312E+10
13.50000	-0.0322	26443.	-2690.	109.42987	7.312E+10
13.65000	-0.0353	21778.	-2486.	117.29871	7.312E+10
13.80000	-0.0384	17493.	-2268.	125.19392	7.312E+10
13.95000	-0.0414	13614.	-2035.	133.13009	7.312E+10

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   14.10000      -0.0445       10166.       -1789.    141.11882    7.312E+10
   14.25000      -0.0476        7175.       -1527.    149.16937    7.312E+10
   14.40000      -0.0506        4667.       -1252.    157.28929    7.312E+10
   14.55000      -0.0537        2669.    -961.0386    165.48476    7.312E+10
   14.70000      -0.0568        1208.    -655.7176    173.76083    7.312E+10
   14.85000      -0.0598    308.72476    -335.4233    182.12170    7.312E+10
   15.00000      -0.0629        0.000        0.000    190.57084    7.312E+10

Output Summary for Load Case No. 2:

Pile-head deflection             =     0.27216053 inches
Computed slope at pile head      =     -0.0020697 radians
Maximum bending moment           =        182613. inch-lbs
Maximum shear force              =         -3932. lbs
Depth of maximum bending moment  =     8.85000000 feet below pile head
Depth of maximum shear force     =    12.00000000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =              1
Pile deflection at ground        =     0.15013898 inches


--------------------------------------------------------------------------------
                  Summary of Pile Responses for LRFD Analyses
--------------------------------------------------------------------------------

                        Maximum        Maximum
Load     Pile-head      Moment          Shear        Pile-Head
Case    Deflection      in Pile        in Pile       Rotation
 No.      inches        in-lbs           lbs          radians
----   ------------   ------------   ------------   ------------
  1       0.1455701        124197.          2657.      -0.001128
  2       0.2721605        182613.         -3932.      -0.002070


Maximum pile-head deflection = 0.2721605323 inches
Maximum pile-head rotation   = -0.0020696524 radians = -0.118582 deg.

--------------------------------------------------------------------------------
                   LRFD Performance by Load Case Combination
--------------------------------------------------------------------------------

                                    Factored         Maximum        Pass/Fail
Load                Resistance       Moment          Moment         for LRFD
Case    Section       Factor        Capacity       Developed        Moment
```

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment in Section
1	1	1.00	2368063.	48858.	Pass
	2	1.00	4060795.	124197.	Pass
2	1	1.00	2368063.	70537.	Pass
	2	1.00	4060795.	182613.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	106630.	2588.	Pass
	2	1.00	106630.	2657.	Pass
2	1	1.00	106630.	3603.	Pass
	2	1.00	106630.	-3932.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -3932.13 lbs
Factored Shear Capacity at Node = 106630.00 lbs
Fraction of Allowable Shear Capacity = 0.0369

The analysis ended normally.

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	6' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS		plf	1.75
WA	514.8	plf	1.00
EH	729.5	plf	1.50
Total	**1609.0**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	6.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**7,241**	ft-lbs		ft-lbs	**7,241**	ft-lbs
V (fac.)	**4,827**	lbs		lbs	**4,827**	lbs
f_b (fac.)	**1,177**	psi		psi	**1,177**	psi
f_v (fac.)	**184**	psi		psi	**184**	psi
δ	**0.071**	in		in	**0.07**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	8' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS		plf	1.75
WA	353.0	plf	1.00
EH	234.0	plf	1.50
Total	**704.0**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	8.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**5,632**	ft-lbs		ft-lbs	**5,632**	ft-lbs
V (fac.)	**2,816**	lbs		lbs	**2,816**	lbs
f_b (fac.)	**915**	psi		psi	**915**	psi
f_v (fac.)	**107**	psi		psi	**107**	psi
δ	**0.098**	in		in	**0.10**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	10' LaggingSpan at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS		plf	1.75
WA	514.8	plf	1.00
EH	776.6	plf	1.50
Total	**1679.6**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	10.0	ft
b	5.5	in, actual size
h	11.50	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**63.25**	in^2
S_x	**121.23**	in^3
I_x	**697.07**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**20,995**	ft-lbs		ft-lbs	**20,995**	ft-lbs
V (fac.)	**8,398**	lbs		lbs	**8,398**	lbs
f_b (fac.)	**2,078**	psi		psi	**2,078**	psi
f_v (fac.)	**199**	psi		psi	**199**	psi
δ	**0.339**	in		in	**0.34**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Culvert #5 - Sta. 1162+05, RT.

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1162.05 RT Piles 1, 10

Wall Height : 5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	4.00	ft
$Depth_1$ for Lateral Soil Pressure =	2.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.100	ksf
Lateral Soil Load Lpile Input =	**33.30**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	4.00	ft
$Depth_2$ for Lateral Soil Pressure =	5	ft
Lateral Pressure at Top of Layer 2 =	0.100	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.148	ksf
Lateral Soil Load Lpile Input =	**49.28**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	4.00	ft
Depth at Top of Groundwater =	2.50	ft
Depth at Bot of Groundwater =	5	ft
Water Pressure at Bot of Layer =	0.156	ksf
Lateral Water Load Lpile Input =	**52.00**	**lb/inch, Bot**

Lateral Live Load Surcharge

LL Surcharge Height in ft of soil =	2.00	ft
Constant Lateral LL Surch. Pressure =	0.083	ksf (based on 125 pcf soil for surch.)
Constant Lat. LL Surch. Load Lpile Input =	**28**	**lb/inch**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1162.05 RT Piles 2, 9

Wall Height : 7.5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	7.00	ft
$Depth_1$ for Lateral Soil Pressure =	3.75	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.150	ksf
Lateral Soil Load Lpile Input =	**87.41**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	7.00	ft
$Depth_2$ for Lateral Soil Pressure =	7.5	ft
Lateral Pressure at Top of Layer 2 =	0.150	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.222	ksf
Lateral Soil Load Lpile Input =	**129.37**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	7.00	ft
Depth at Top of Groundwater =	3.75	ft
Depth at Bot of Groundwater =	7.5	ft
Water Pressure at Bot of Layer =	0.234	ksf
Lateral Water Load Lpile Input =	**136.50**	**lb/inch, Bot**

Lateral Live Load Surcharge

LL Surcharge Height in ft of soil =	2.00	ft
Constant Lateral LL Surch. Pressure =	0.083	ksf (based on 125 pcf soil for surch.)
Constant Lat. LL Surch. Load Lpile Input =	**49**	**lb/inch**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1162.05 RT Piles 5, 6

Wall Height : 15 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	7.00	ft
$Depth_1$ for Lateral Soil Pressure =	7.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.300	ksf
Lateral Soil Load Lpile Input =	**174.83**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	7.00	ft
$Depth_2$ for Lateral Soil Pressure =	15	ft
Lateral Pressure at Top of Layer 2 =	0.300	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.444	ksf
Lateral Soil Load Lpile Input =	**258.74**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	7.00	ft
Depth at Top of Groundwater =	7.50	ft
Depth at Bot of Groundwater =	15	ft
Water Pressure at Bot of Layer =	0.468	ksf
Lateral Water Load Lpile Input =	**273.00**	**lb/inch, Bot**

Lateral Live Load Surcharge

LL Surcharge Height in ft of soil =	2.00	ft
Constant Lateral LL Surch. Pressure =	0.083	ksf (based on 125 pcf soil for surch.)
Constant Lat. LL Surch. Load Lpile Input =	**49**	**lb/inch**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1162.05 RT Piles 4, 7

Wall Height : 13.9 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	5.00	ft
$Depth_1$ for Lateral Soil Pressure =	6.95	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.278	ksf
Lateral Soil Load Lpile Input =	**115.72**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	5.00	ft
$Depth_2$ for Lateral Soil Pressure =	13.9	ft
Lateral Pressure at Top of Layer 2 =	0.278	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.411	ksf
Lateral Soil Load Lpile Input =	**171.26**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	5.00	ft
Depth at Top of Groundwater =	6.95	ft
Depth at Bot of Groundwater =	13.9	ft
Water Pressure at Bot of Layer =	0.434	ksf
Lateral Water Load Lpile Input =	**180.70**	**lb/inch, Bot**

Lateral Live Load Surcharge

LL Surcharge Height in ft of soil =	2.00	ft
Constant Lateral LL Surch. Pressure =	0.083	ksf (based on 125 pcf soil for surch.)
Constant Lat. LL Surch. Load Lpile Input =	**35**	**lb/inch**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1162.05 RT Piles 3, 8

Wall Height : 11.2 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_1$ for Lateral Soil Pressure =	5.6	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.224	ksf
Lateral Soil Load Lpile Input =	**111.89**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_2$ for Lateral Soil Pressure =	11.2	ft
Lateral Pressure at Top of Layer 2 =	0.224	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.331	ksf
Lateral Soil Load Lpile Input =	**165.59**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	6.00	ft
Depth at Top of Groundwater =	5.60	ft
Depth at Bot of Groundwater =	11.2	ft
Water Pressure at Bot of Layer =	0.349	ksf
Lateral Water Load Lpile Input =	**174.72**	**lb/inch, Bot**

Lateral Live Load Surcharge

LL Surcharge Height in ft of soil =	2.00	ft
Constant Lateral LL Surch. Pressure =	0.083	ksf (based on 125 pcf soil for surch.)
Constant Lat. LL Surch. Load Lpile Input =	**42**	**lb/inch**

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

                            LPile for Version 2022-12.012

                              License ID : 154178656
                          License Type : (Network License)

                  Analysis of Individual Piles and Drilled Shafts
                 Subjected to Lateral Loading Using the p-y Method
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                 This software is licensed for exclusive use by:
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                                   Akron, GDP GROUP

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


This model was prepared by:
TWASHKO




--------------------------------------------------------------------------------
                            Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1162.0 RT Pile 1 10.lp12d

Name of the output report file:
BEL-70 1162.0 RT Pile 1 10.lp12o

Name of the plot output file:
BEL-70 1162.0 RT Pile 1 10.lp12p

Name of the runtime message file:
BEL-70 1162.0 RT Pile 1 10.lp12r
```

Date and Time of Analysis

Date: June 23, 2026 Time: 11:33:32

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1162+0 RT Piles 1 10 - 5' Ht.(3' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 17.000 ft
Depth of ground surface below top of pile = 5.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	10.1000
2	5.000	10.1000
3	5.000	24.0000
4	17.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 5.000000 ft
   AISC Section Type = HP

   AISC Section Name = HP10X42

   Pile width = 10.100000 in
   Shear capacity of section = 106630. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 12.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 106630. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 5.000000 ft
   Distance from top of pile to bottom of layer = 22.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	22.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 33.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 3

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2
3	Live Load (LL)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	2.50	33.30
3	5.00	49.38

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	2.50	0.00
2	5.00	52.00

Number of Distributed Loading Points Input for Load Group 3 = 2

Point	Depth ft	Distributed Load lb/inch
1	0.00	28.00
2	7.50	28.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 3

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	1
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1

Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*LL + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.75*LL + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section = 5.000000 ft

Flange Width = 10.100000 in
Section Depth = 9.700000 in
Flange Thickness = 0.420000 in
Web Thickness = 0.415000 in
Yield Stress of Pipe = 50.000000 ksi
Elastic Modulus = 29000. ksi
Cross-sectional Area = 12.400000 sq. in.
Moment of Inertia = 210.000000 in^4
Elastic Bending Stiffness = 6090000. kip-in^2
Plastic Modulus, Z = 48.300000in^3
Plastic Moment Capacity = Fy Z = 2415.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 620.000 kips
Nominal Axial Tensile Capacity = -620.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	43.4777520338	5992769.	4.8500000000	
0.0000145101	86.9555040676	5992769.	4.8500000000	
0.0000217651	130.4332561015	5992769.	4.8500000000	
0.0000290201	173.9110081353	5992769.	4.8500000000	
0.0000362752	217.3887601691	5992769.	4.8500000000	

0.0000435302	260.8665122029	5992769.	4.8500000000	
0.0000507853	304.3442642367	5992769.	4.8500000000	
0.0000580403	347.8220162706	5992769.	4.8500000000	
0.0000652953	391.2997683044	5992769.	4.8500000000	
0.0000725504	434.7775203382	5992769.	4.8500000000	
0.0000798054	478.2552723720	5992769.	4.8500000000	
0.0000870604	521.7330244059	5992769.	4.8500000000	
0.0000943155	565.2107764397	5992769.	4.8500000000	
0.0001015705	608.6885284735	5992769.	4.8500000000	
0.0001088255	652.1662805073	5992769.	4.8500000000	
0.0001160806	695.6440325411	5992769.	4.8500000000	
0.0001233356	739.1217845750	5992769.	4.8500000000	
0.0001305906	782.5995366088	5992769.	4.8500000000	
0.0001378457	826.0772886426	5992769.	4.8500000000	
0.0001451007	869.5550406764	5992769.	4.8500000000	
0.0001523558	913.0327927102	5992769.	4.8500000000	
0.0001596108	956.5105447441	5992769.	4.8500000000	
0.0001668658	999.9882967779	5992769.	4.8500000000	
0.0001741209	1043.	5992769.	4.8500000000	
0.0001813759	1087.	5992769.	4.8500000000	
0.0001886309	1130.	5992769.	4.8500000000	
0.0001958860	1174.	5992769.	4.8500000000	
0.0002031410	1217.	5992769.	4.8500000000	
0.0002103960	1261.	5992769.	4.8500000000	
0.0002176511	1304.	5992769.	4.8500000000	
0.0002249061	1348.	5992769.	4.8500000000	
0.0002321611	1391.	5992769.	4.8500000000	
0.0002394162	1435.	5992769.	4.8500000000	
0.0002466712	1478.	5992769.	4.8500000000	
0.0002539263	1522.	5992769.	4.8500000000	
0.0002611813	1565.	5992769.	4.8500000000	
0.0002684363	1609.	5992769.	4.8500000000	
0.0002756914	1652.	5992769.	4.8500000000	
0.0002829464	1696.	5992769.	4.8500000000	
0.0002974565	1783.	5992769.	4.8500000000	
0.0003119665	1870.	5992769.	4.8500000000	
0.0003264766	1956.	5992769.	4.8500000000	
0.0003409867	2043.	5992769.	4.8500000000	
0.0003554968	2130.	5992769.	4.8500000000	
0.0003700068	2199.	5942130.	4.8500000000	Y
0.0003845169	2233.	5807975.	4.8500000000	Y
0.0003990270	2245.	5627120.	4.8500000000	Y
0.0004135370	2254.	5451108.	4.8500000000	Y
0.0004280471	2262.	5285148.	4.8500000000	Y

0.0004425572	2269.	5128131.	4.8500000000	Y
0.0004570673	2276.	4979678.	4.8500000000	Y
0.0004715773	2282.	4839137.	4.8500000000	Y
0.0004860874	2287.	4705909.	4.8500000000	Y
0.0005005975	2292.	4579458.	4.8500000000	Y
0.0005151075	2297.	4459307.	4.8500000000	Y
0.0005296176	2301.	4345022.	4.8500000000	Y
0.0005441277	2305.	4236215.	4.8500000000	Y
0.0005586378	2309.	4132530.	4.8500000000	Y
0.0005731478	2312.	4033644.	4.8500000000	Y
0.0005876579	2315.	3939263.	4.8500000000	Y
0.0006021680	2318.	3849104.	4.8500000000	Y
0.0006166780	2320.	3762749.	4.8500000000	Y
0.0006311881	2323.	3680141.	4.8500000000	Y
0.0006456982	2325.	3601052.	4.8500000000	Y
0.0006602083	2327.	3525092.	4.8500000000	Y
0.0006747183	2329.	3452291.	4.8500000000	Y
0.0006892284	2331.	3382319.	4.8500000000	Y
0.0007037385	2333.	3315098.	4.8500000000	Y
0.0007182485	2335.	3250437.	4.8500000000	Y
0.0007327586	2336.	3188206.	4.8500000000	Y
0.0007472687	2338.	3128263.	4.8500000000	Y
0.0007617788	2339.	3070519.	4.8500000000	Y
0.0007762888	2340.	3014790.	4.8500000000	Y
0.0007907989	2342.	2961096.	4.8500000000	Y
0.0008053090	2343.	2909147.	4.8500000000	Y
0.0008198191	2344.	2859037.	4.8500000000	Y
0.0008343291	2345.	2810577.	4.8500000000	Y
0.0008488392	2346.	2763692.	4.8500000000	Y
0.0008633493	2347.	2718382.	4.8500000000	Y
0.0009213896	2350.	2550781.	4.8500000000	Y
0.0009794298	2353.	2402455.	4.8500000000	Y
0.0010374701	2355.	2270298.	4.8500000000	Y
0.0010955104	2357.	2151822.	4.8500000000	Y
0.0011535507	2359.	2045031.	4.8500000000	Y
0.0012115910	2360.	1948248.	4.8500000000	Y
0.0012696313	2362.	1860154.	4.8500000000	Y
0.0013276716	2363.	1779680.	4.8500000000	Y
0.0013857118	2364.	1705811.	4.8500000000	Y
0.0014437521	2365.	1637830.	4.8500000000	Y
0.0015017924	2365.	1575020.	4.8500000000	Y
0.0015598327	2366.	1516858.	4.8500000000	Y
0.0016178730	2367.	1462791.	4.8500000000	Y
0.0016759133	2367.	1412468.	4.8500000000	Y

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    0.0017339536             2368.          1365457.       4.8500000000    Y
    0.0017919939             2368.          1321468.       4.8500000000    Y


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
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                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------          ----------------
  1               0.00000000                   2368.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.




Pile Section No. 2:
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Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
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Length of Section                                =    12.000000 ft
Outside Diameter of Casing                       =    24.000000 in
Casing Wall Thickness                            =       0.0000 in
Moment of Inertia of Steel Casing                =       0.0000 in^4
Width Flange of Core/Insert                      =    10.100000 in
Depth of Core/Insert                             =     9.700000 in
Flange Thickness of Core/Insert                  =     0.420000 in
Web Thickness of Core/Insert                     =     0.415000 in
Moment of Inertia of Steel Core/Insert           =   206.834773 in^4
Yield Stress of Casing                           =       50000. psi
```

Elastic Modulus of Casing = 29000000. psi
Yield Stress of Core/Insert = 50000. psi
Elastic Modulus of Core/Insert = 29000000. psi
Number of Reinforcing Bars = 0 bars
Gross Area of Pile = 452.389342 sq. in.
Area of Concrete = 440.228442 sq. in.
Cross-sectional Area of Steel Casing = 0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert = 12.160900 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars) = 12.160900 sq. in.
Area Ratio of All Steel to Gross Area = 2.69 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2104.822 kips
Tensile Load for Cracking of Concrete = -223.782 kips
Nominal Axial Tensile Capacity = -608.045 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	530.4688702357	73117333.	12.0000000000	
0.0000145101	530.4688702357	36558666.	7.5346432973	C
0.0000217651	530.4688702357	24372444.	7.5509693177	C

0.0000290201	573.8604565856	19774556.	7.5673903328	C
0.0000362752	714.7361369836	19703173.	7.5838762751	C
0.0000435302	854.5349048170	19630845.	7.6006151961	C
0.0000507853	993.2347822465	19557544.	7.6176150838	C
0.0000580403	1131.	19483241.	7.6348843122	C
0.0000652953	1267.	19407906.	7.6524316670	C
0.0000725504	1403.	19331507.	7.6702663732	C
0.0000798054	1537.	19254007.	7.6883985918	C
0.0000870604	1669.	19175378.	7.7068375181	C
0.0000943155	1801.	19095579.	7.7255944174	C
0.0001015705	1931.	19014571.	7.7446806026	C
0.0001088255	2060.	18932313.	7.7641080049	C
0.0001160806	2188.	18848762.	7.7838892208	C
0.0001233356	2314.	18763904.	7.8039201862	C
0.0001305906	2439.	18677809.	7.8238464979	C
0.0001378457	2563.	18590324.	7.8441461966	C
0.0001451007	2685.	18501397.	7.8648339000	C
0.0001523558	2805.	18410976.	7.8859251101	C
0.0001596108	2924.	18319004.	7.9074362866	C
0.0001668658	3041.	18225418.	7.9293849286	C
0.0001741209	3157.	18130157.	7.9517896655	C
0.0001813759	3271.	18033150.	7.9746703578	C
0.0001886309	3383.	17934325.	7.9979893773	C
0.0001958860	3491.	17821723.	8.0198685081	CY
0.0002031410	3572.	17584937.	8.0198599416	CY
0.0002103960	3616.	17185839.	7.9890033576	CY
0.0002176511	3651.	16776777.	7.9554828143	CY
0.0002249061	3684.	16382236.	7.9233122209	CY
0.0002321611	3715.	16001668.	7.8923366248	CY
0.0002394162	3743.	15634555.	7.8625747655	CY
0.0002466712	3769.	15280300.	7.8363042206	CY
0.0002539263	3793.	14938361.	7.8102930990	CY
0.0002611813	3815.	14607939.	7.7851355921	CY
0.0002684363	3836.	14288816.	7.7610173485	CY
0.0002756914	3854.	13981037.	7.7383482617	CY
0.0002829464	3872.	13684046.	7.7170393330	CY
0.0002974565	3902.	13119520.	7.6778549283	CY
0.0003119665	3929.	12593495.	7.6433460103	CY
0.0003264766	3951.	12102782.	7.6128213964	CY
0.0003409867	3971.	11644332.	7.5858959176	CY
0.0003554968	3987.	11215358.	7.5620206201	CY
0.0003700068	4001.	10813285.	7.5391130627	CY
0.0003845169	4013.	10436280.	7.5206259707	CY
0.0003990270	4023.	10082484.	7.5034137928	CY

0.0004135370	4032.	9749595.	7.4883916869	CY
0.0004280471	4039.	9435684.	7.4748414923	CY
0.0004425572	4045.	9140071.	7.4631570054	CY
0.0004570673	4050.	8860511.	7.4527115052	CY
0.0004715773	4054.	8596337.	7.4438376166	CY
0.0004860874	4057.	8346000.	7.4354937360	CY
0.0005005975	4059.	8108779.	7.4293988243	CY
0.0005151075	4061.	7883393.	7.4233730110	CY
0.0005296176	4061.	7667409.	7.4355441507	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	4061.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head	Equivalent Top Depth Below Grnd Surf	Same Layer Type As Layer	Layer is Rock or is Below	F0 Integral for Layer	F1 Integral for Layer

	ft	ft	Above	Rock Layer	lbs	lbs
1	5.0000	0.00	N.A.	No	0.00	83461.
2	22.0000	17.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals
for Layer n. Layering correction equivalent depths are computed only
for soil types with both shallow-depth and deep-depth expressions for
peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	28.00
2.04	28.00
4.08	28.00
6.12	28.00
8.16	28.00
10.20	28.00
12.24	28.00
14.28	28.00
16.32	28.00
18.36	28.00
20.40	28.00
22.44	28.00
24.48	28.00
26.52	28.00
28.56	28.00
30.60	28.00
32.64	28.00
34.68	28.00
36.72	28.00
38.76	28.00
40.80	28.00

42.84	28.00
44.88	28.00
46.92	28.00
48.96	28.00
51.00	28.00
53.04	28.00
55.08	28.00
57.12	28.00
59.16	28.00
61.20	28.00
63.24	28.00
65.28	28.00
67.32	28.00
69.36	28.00
71.40	28.00
73.44	28.00
75.48	28.00
77.52	28.00
79.56	28.00
81.60	28.00
83.64	28.00
85.68	28.00
87.72	28.00
89.76	17.29

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
30.60	1.11
32.64	4.58
34.68	8.11
36.72	11.65
38.76	15.18
40.80	18.72
42.84	22.26

44.88	25.79
46.92	29.33
48.96	32.86
51.00	36.40
53.04	39.94
55.08	43.47
57.12	47.01
59.16	45.94

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.57
2.04	2.26
4.08	4.53
6.12	6.79
8.16	9.06
10.20	11.32
12.24	13.59
14.28	15.85
16.32	18.12
18.36	20.38
20.40	22.64
22.44	24.91
24.48	27.17
26.52	29.44
28.56	31.70
30.60	33.60
32.64	34.72
34.68	35.81
36.72	36.90
38.76	38.00
40.80	39.09
42.84	40.18
44.88	41.28

46.92	42.37
48.96	43.46
51.00	44.56
53.04	45.65
55.08	46.74
57.12	47.84
59.16	44.57

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.22231	-2.798E-06	9.796E-09	0.000	5.993E+09
0.17000	0.21892	59.44034	60.00711	0.000	5.993E+09
0.34000	0.21554	244.82901	124.05617	0.000	5.993E+09
0.51000	0.21215	565.58953	192.72461	0.000	5.993E+09
0.68000	0.20877	1031.	266.01243	0.000	5.993E+09
0.85000	0.20538	1651.	343.91962	0.000	5.993E+09
1.02000	0.20200	2434.	426.44619	0.000	5.993E+09
1.19000	0.19862	3391.	513.59213	0.000	5.993E+09
1.36000	0.19524	4530.	605.35745	0.000	5.993E+09
1.53000	0.19187	5861.	701.74215	0.000	5.993E+09
1.70000	0.18849	7393.	802.74622	0.000	5.993E+09
1.87000	0.18513	9136.	908.36967	0.000	5.993E+09
2.04000	0.18177	11099.	1019.	0.000	5.993E+09
2.21000	0.17842	13292.	1133.	0.000	5.993E+09
2.38000	0.17507	15724.	1253.	0.000	5.993E+09
2.55000	0.17174	18404.	1378.	0.000	5.993E+09
2.72000	0.16842	21345.	1510.	0.000	5.993E+09
2.89000	0.16512	24566.	1652.	0.000	5.993E+09
3.06000	0.16183	28087.	1804.	0.000	5.993E+09

3.23000	0.15856	31926.	1965.	0.000	5.993E+09
3.40000	0.15532	36103.	2135.	0.000	5.993E+09
3.57000	0.15209	40637.	2315.	0.000	5.993E+09
3.74000	0.14890	45548.	2504.	0.000	5.993E+09
3.91000	0.14574	50854.	2703.	0.000	5.993E+09
4.08000	0.14262	56575.	2911.	0.000	5.993E+09
4.25000	0.13953	62730.	3128.	0.000	5.993E+09
4.42000	0.13649	69338.	3355.	0.000	5.993E+09
4.59000	0.13349	76420.	3592.	0.000	5.993E+09
4.76000	0.13055	83993.	3838.	0.000	5.993E+09
4.93000	0.12767	92078.	4084.	0.000	5.993E+09
5.10000	0.12485	100655.	4229.	-4.1308	7.312E+10
5.27000	0.12203	109332.	4270.	-11.3917	7.312E+10
5.44000	0.11923	118078.	4297.	-18.8793	7.312E+10
5.61000	0.11643	126862.	4307.	-26.5094	7.312E+10
5.78000	0.11363	135653.	4303.	-34.1986	7.312E+10
5.95000	0.11085	144417.	4282.	-41.8644	7.312E+10
6.12000	0.10807	153124.	4246.	-49.6555	7.312E+10
6.29000	0.10530	161741.	4194.	-57.4717	7.312E+10
6.46000	0.10254	170235.	4126.	-65.1706	7.312E+10
6.63000	0.09979	178574.	4042.	-72.6884	7.312E+10
6.80000	0.09705	186727.	3944.	-79.9627	7.312E+10
6.97000	0.09432	194664.	3831.	-86.9323	7.312E+10
7.14000	0.09161	202356.	3703.	-93.7891	7.312E+10
7.31000	0.08890	209774.	3563.	-100.3403	7.312E+10
7.48000	0.08621	216891.	3398.	-106.4852	7.312E+10
7.65000	0.08352	223637.	3192.	-112.1731	7.312E+10
7.82000	0.08085	229916.	2958.	-117.3547	7.312E+10
7.99000	0.07820	235707.	2714.	-121.9826	7.312E+10
8.16000	0.07556	240990.	2460.	-126.8208	7.312E+10
8.33000	0.07293	245745.	2197.	-131.1865	7.312E+10
8.50000	0.07031	249954.	1926.	-134.9935	7.312E+10
8.67000	0.06771	253602.	1647.	-138.2041	7.312E+10
8.84000	0.06512	256674.	1362.	-140.7827	7.312E+10
9.01000	0.06255	259160.	1073.	-142.7612	7.312E+10
9.18000	0.05999	261053.	779.54428	-145.1651	7.312E+10
9.35000	0.05745	262341.	481.55781	-146.9785	7.312E+10
9.52000	0.05493	263018.	180.50101	-148.1753	7.312E+10
9.69000	0.05241	263077.	-122.3438	-148.7314	7.312E+10
9.86000	0.04992	262518.	-425.6471	-148.6247	7.312E+10
10.03000	0.04743	261341.	-728.0425	-147.8413	7.312E+10
10.20000	0.04497	259548.	-1028.	-146.3699	7.312E+10
10.37000	0.04251	257146.	-1324.	-144.1538	7.312E+10
10.54000	0.04007	254144.	-1616.	-141.1805	7.312E+10

10.71000	0.03765	250555.	-1900.	-137.4419	7.312E+10
10.88000	0.03524	246393.	-2175.	-132.9355	7.312E+10
11.05000	0.03285	241679.	-2442.	-128.2067	7.312E+10
11.22000	0.03046	236431.	-2699.	-124.0645	7.312E+10
11.39000	0.02810	230666.	-2947.	-119.2325	7.312E+10
11.56000	0.02574	224405.	-3185.	-113.7125	7.312E+10
11.73000	0.02340	217672.	-3411.	-107.5111	7.312E+10
11.90000	0.02107	210490.	-3623.	-100.6393	7.312E+10
12.07000	0.01875	202890.	-3821.	-93.1130	7.312E+10
12.24000	0.01644	194902.	-4002.	-84.9521	7.312E+10
12.41000	0.01415	186561.	-4166.	-75.4878	7.312E+10
12.58000	0.01186	177906.	-4309.	-64.7508	7.312E+10
12.75000	0.009590	168981.	-4429.	-53.5110	7.312E+10
12.92000	0.007325	159834.	-4527.	-41.7693	7.312E+10
13.09000	0.005069	150512.	-4599.	-29.5260	7.312E+10
13.26000	0.002822	141068.	-4647.	-16.7816	7.312E+10
13.43000	0.000583	131554.	-4667.	-3.5357	7.312E+10
13.60000	-0.001649	122025.	-4661.	10.21203	7.312E+10
13.77000	-0.003874	112539.	-4625.	24.46220	7.312E+10
13.94000	-0.006092	103155.	-4560.	39.21577	7.312E+10
14.11000	-0.008305	93934.	-4466.	52.88276	7.312E+10
14.28000	-0.0105	84932.	-4350.	61.45044	7.312E+10
14.45000	-0.0127	76187.	-4216.	69.59448	7.312E+10
14.62000	-0.0149	67731.	-4066.	77.45482	7.312E+10
14.79000	-0.0171	59598.	-3900.	85.11937	7.312E+10
14.96000	-0.0193	51819.	-3719.	92.64711	7.312E+10
15.13000	-0.0215	44425.	-3521.	101.48255	7.312E+10
15.30000	-0.0237	37454.	-3304.	110.88527	7.312E+10
15.47000	-0.0259	30944.	-3068.	120.47106	7.312E+10
15.64000	-0.0280	24935.	-2812.	130.25652	7.312E+10
15.81000	-0.0302	19469.	-2537.	140.25547	7.312E+10
15.98000	-0.0324	14586.	-2240.	150.47964	7.312E+10
16.15000	-0.0346	10329.	-1922.	160.93913	7.312E+10
16.32000	-0.0367	6743.	-1583.	171.64283	7.312E+10
16.49000	-0.0389	3870.	-1222.	182.59859	7.312E+10
16.66000	-0.0411	1758.	-837.8749	193.81344	7.312E+10
16.83000	-0.0433	451.62752	-430.7856	205.29371	7.312E+10
17.00000	-0.0455	0.000	0.000	217.04514	7.312E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 0.22230698 inches
Computed slope at pile head = -0.0016594 radians
Maximum bending moment = 263077. inch-lbs

Maximum shear force = -4667. lbs
Depth of maximum bending moment = 9.69000000 feet below pile head
Depth of maximum shear force = 13.43000000 feet below pile head
Number of iterations = 18
Number of zero deflection points = 1
Pile deflection at ground = 0.12650679 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	28.00
2.04	28.00
4.08	28.00
6.12	28.00
8.16	28.00
10.20	28.00
12.24	28.00
14.28	28.00
16.32	28.00
18.36	28.00
20.40	28.00
22.44	28.00
24.48	28.00
26.52	28.00
28.56	28.00
30.60	28.00
32.64	28.00
34.68	28.00
36.72	28.00
38.76	28.00
40.80	28.00
42.84	28.00
44.88	28.00
46.92	28.00
48.96	28.00
51.00	28.00

53.04	28.00
55.08	28.00
57.12	28.00
59.16	28.00
61.20	28.00
63.24	28.00
65.28	28.00
67.32	28.00
69.36	28.00
71.40	28.00
73.44	28.00
75.48	28.00
77.52	28.00
79.56	28.00
81.60	28.00
83.64	28.00
85.68	28.00
87.72	28.00
89.76	17.29

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
30.60	1.11
32.64	4.58
34.68	8.11
36.72	11.65
38.76	15.18
40.80	18.72
42.84	22.26
44.88	25.79
46.92	29.33
48.96	32.86
51.00	36.40
53.04	39.94

55.08	43.47
57.12	47.01
59.16	45.94

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.57
2.04	2.26
4.08	4.53
6.12	6.79
8.16	9.06
10.20	11.32
12.24	13.59
14.28	15.85
16.32	18.12
18.36	20.38
20.40	22.64
22.44	24.91
24.48	27.17
26.52	29.44
28.56	31.70
30.60	33.60
32.64	34.72
34.68	35.81
36.72	36.90
38.76	38.00
40.80	39.09
42.84	40.18
44.88	41.28
46.92	42.37
48.96	43.46
51.00	44.56
53.04	45.65
55.08	46.74

57.12 47.84
59.16 44.57

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.63555	-1.599E-07	-3.918E-08	0.000	5.993E+09
0.17000	0.62678	103.72611	104.29067	0.000	5.993E+09
0.34000	0.61801	425.50592	214.64426	0.000	5.993E+09
0.51000	0.60924	979.47470	331.92692	0.000	5.993E+09
0.68000	0.60047	1780.	456.13864	0.000	5.993E+09
0.85000	0.59170	2841.	587.27943	0.000	5.993E+09
1.02000	0.58294	4176.	725.34928	0.000	5.993E+09
1.19000	0.57417	5800.	870.34820	0.000	5.993E+09
1.36000	0.56541	7727.	1022.	0.000	5.993E+09
1.53000	0.55666	9971.	1181.	0.000	5.993E+09
1.70000	0.54791	12546.	1347.	0.000	5.993E+09
1.87000	0.53917	15466.	1520.	0.000	5.993E+09
2.04000	0.53045	18746.	1699.	0.000	5.993E+09
2.21000	0.52173	22399.	1886.	0.000	5.993E+09
2.38000	0.51303	26440.	2079.	0.000	5.993E+09
2.55000	0.50435	30883.	2280.	0.000	5.993E+09
2.72000	0.49569	35744.	2491.	0.000	5.993E+09
2.89000	0.48706	41045.	2711.	0.000	5.993E+09
3.06000	0.47845	46807.	2943.	0.000	5.993E+09
3.23000	0.46988	53052.	3185.	0.000	5.993E+09
3.40000	0.46134	59801.	3437.	0.000	5.993E+09
3.57000	0.45285	67075.	3700.	0.000	5.993E+09
3.74000	0.44440	74898.	3974.	0.000	5.993E+09
3.91000	0.43600	83289.	4258.	0.000	5.993E+09

4.08000	0.42767	92270.	4553.	0.000	5.993E+09
4.25000	0.41939	101864.	4858.	0.000	5.993E+09
4.42000	0.41119	112091.	5174.	0.000	5.993E+09
4.59000	0.40306	122973.	5500.	0.000	5.993E+09
4.76000	0.39502	134532.	5837.	0.000	5.993E+09
4.93000	0.38707	146789.	6173.	0.000	5.993E+09
5.10000	0.37923	159719.	6383.	-5.5155	7.312E+10
5.27000	0.37139	172830.	6461.	-15.2861	7.312E+10
5.44000	0.36357	186082.	6520.	-25.4668	7.312E+10
5.61000	0.35575	199431.	6557.	-35.9577	7.312E+10
5.78000	0.34795	212835.	6573.	-46.6594	7.312E+10
5.95000	0.34015	226249.	6567.	-57.4728	7.312E+10
6.12000	0.33238	239627.	6538.	-68.4228	7.312E+10
6.29000	0.32461	252924.	6487.	-79.4086	7.312E+10
6.46000	0.31686	266095.	6414.	-90.3046	7.312E+10
6.63000	0.30912	279094.	6319.	-101.0273	7.312E+10
6.80000	0.30140	291876.	6202.	-111.4944	7.312E+10
6.97000	0.29370	304399.	6064.	-121.6250	7.312E+10
7.14000	0.28601	316619.	5906.	-131.6096	7.312E+10
7.31000	0.27834	328495.	5728.	-141.2277	7.312E+10
7.48000	0.27069	339988.	5511.	-150.3566	7.312E+10
7.65000	0.26306	350981.	5227.	-158.9270	7.312E+10
7.82000	0.25545	361312.	4894.	-166.8710	7.312E+10
7.99000	0.24786	370949.	4546.	-174.1228	7.312E+10
8.16000	0.24030	379861.	4183.	-181.7910	7.312E+10
8.33000	0.23275	388017.	3805.	-188.8904	7.312E+10
8.50000	0.22522	395387.	3413.	-195.2974	7.312E+10
8.67000	0.21772	401943.	3009.	-200.9576	7.312E+10
8.84000	0.21024	407664.	2594.	-205.8182	7.312E+10
9.01000	0.20279	412528.	2170.	-209.9018	7.312E+10
9.18000	0.19535	416519.	1738.	-214.3478	7.312E+10
9.35000	0.18794	419617.	1297.	-218.0143	7.312E+10
9.52000	0.18056	421808.	848.85173	-220.8615	7.312E+10
9.69000	0.17320	423081.	396.26498	-222.8510	7.312E+10
9.86000	0.16586	423425.	-59.4684	-223.9464	7.312E+10
10.03000	0.15855	422838.	-516.6754	-224.2957	7.312E+10
10.20000	0.15126	421317.	-974.4891	-224.5412	7.312E+10
10.37000	0.14399	418862.	-1432.	-223.7980	7.312E+10
10.54000	0.13675	415475.	-1887.	-222.0263	7.312E+10
10.71000	0.12954	411165.	-2337.	-219.1891	7.312E+10
10.88000	0.12234	405942.	-2780.	-215.2530	7.312E+10
11.05000	0.11517	399824.	-3215.	-211.0836	7.312E+10
11.22000	0.10802	392827.	-3642.	-207.9939	7.312E+10
11.39000	0.10090	384964.	-4062.	-203.8466	7.312E+10

11.56000	0.09379	376253.	-4473.	-198.6038	7.312E+10
11.73000	0.08671	366716.	-4871.	-192.2309	7.312E+10
11.90000	0.07965	356379.	-5256.	-184.6974	7.312E+10
12.07000	0.07261	345273.	-5624.	-175.9776	7.312E+10
12.24000	0.06559	333434.	-5972.	-166.0511	7.312E+10
12.41000	0.05858	320905.	-6300.	-154.9038	7.312E+10
12.58000	0.05160	307731.	-6603.	-142.5279	7.312E+10
12.75000	0.04463	293964.	-6880.	-128.9219	7.312E+10
12.92000	0.03768	279660.	-7128.	-114.0874	7.312E+10
13.09000	0.03075	264882.	-7348.	-101.3342	7.312E+10
13.26000	0.02383	249681.	-7542.	-89.6275	7.312E+10
13.43000	0.01692	234108.	-7711.	-75.2216	7.312E+10
13.60000	0.01003	218222.	-7845.	-56.7190	7.312E+10
13.77000	0.003152	202100.	-7923.	-19.9028	7.312E+10
13.94000	-0.003716	185895.	-7919.	23.91767	7.312E+10
14.11000	-0.0106	169789.	-7833.	60.90869	7.312E+10
14.28000	-0.0174	153937.	-7686.	82.76392	7.312E+10
14.45000	-0.0243	138429.	-7498.	102.13609	7.312E+10
14.62000	-0.0311	123347.	-7271.	120.19729	7.312E+10
14.79000	-0.0379	108764.	-7008.	137.49195	7.312E+10
14.96000	-0.0447	94754.	-6710.	154.32460	7.312E+10
15.13000	-0.0515	81386.	-6377.	172.76256	7.312E+10
15.30000	-0.0584	68737.	-6005.	191.91582	7.312E+10
15.47000	-0.0652	56887.	-5593.	211.32254	7.312E+10
15.64000	-0.0720	45916.	-5142.	231.04041	7.312E+10
15.81000	-0.0788	35907.	-4650.	251.11446	7.312E+10
15.98000	-0.0855	26942.	-4117.	271.58084	7.312E+10
16.15000	-0.0923	19108.	-3542.	292.46931	7.312E+10
16.32000	-0.0991	12491.	-2924.	313.80488	7.312E+10
16.49000	-0.1059	7180.	-2261.	335.60895	7.312E+10
16.66000	-0.1127	3266.	-1554.	357.90011	7.312E+10
16.83000	-0.1195	840.65827	-800.3960	380.69470	7.312E+10
17.00000	-0.1263	0.000	0.000	404.00724	7.312E+10

Output Summary for Load Case No. 2:

Pile-head deflection = 0.63555046 inches
Computed slope at pile head = -0.0042992 radians
Maximum bending moment = 423425. inch-lbs
Maximum shear force = -7923. lbs
Depth of maximum bending moment = 9.86000000 feet below pile head
Depth of maximum shear force = 13.77000000 feet below pile head
Number of iterations = 24
Number of zero deflection points = 1

Pile deflection at ground = 0.38384327 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	0.2223070	263077.	-4667.	-0.001659
2	0.6355505	423425.	-7923.	-0.004299

Maximum pile-head deflection = 0.6355504647 inches
Maximum pile-head rotation = -0.0042992429 radians = -0.246328 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	2368063.	92078.	Pass
	2	1.00	4060795.	263077.	Pass
2	1	1.00	2368063.	146789.	Pass
	2	1.00	4060795.	423425.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	106630.	4084.	Pass
	2	1.00	106630.	-4667.	Pass

2	1	1.00	106630.	6173.	Pass
	2	1.00	106630.	-7923.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -7923.37 lbs
Factored Shear Capacity at Node = 106630.00 lbs
Fraction of Allowable Shear Capacity = 0.0743

The analysis ended normally.

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

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 on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1162.0 RT Pile 2 9.lp12d

Name of the output report file:
BEL-70 1162.0 RT Pile 2 9.lp12o

Name of the plot output file:
BEL-70 1162.0 RT Pile 2 9.lp12p

Name of the runtime message file:
BEL-70 1162.0 RT Pile 2 9.lp12r

Date and Time of Analysis

Date: June 23, 2026 Time: 12:34:03

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1162+0 RT Piles 2 9 - 7.5' Ht.(7' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 25.000 ft
Depth of ground surface below top of pile = 7.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	12.0000
2	7.500	12.0000
3	7.500	24.0000
4	25.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 7.500000 ft
   AISC Section Type = HP

   AISC Section Name = HP12X53

   Pile width = 12.000000 in
   Shear capacity of section = 137880. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 17.500000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 137880. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 7.500000 ft
   Distance from top of pile to bottom of layer = 22.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	22.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 25.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 3

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2
3	Live Load (LL)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	3.75	87.41
3	7.50	129.37

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	3.75	0.00
2	7.50	136.50

Number of Distributed Loading Points Input for Load Group 3 = 2

Point	Depth ft	Distributed Load lb/inch
1	0.00	49.00
2	7.50	49.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 3

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	1
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1

Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*LL + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.75*LL + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section = 7.500000 ft

Flange Width = 12.000000 in
Section Depth = 11.800000 in
Flange Thickness = 0.435000 in
Web Thickness = 0.435000 in
Yield Stress of Pipe = 50.000000 ksi
Elastic Modulus = 29000. ksi
Cross-sectional Area = 15.500000 sq. in.
Moment of Inertia = 393.000000 in^4
Elastic Bending Stiffness = 11397000. kip-in^2
Plastic Modulus, Z = 74.000000in^3
Plastic Moment Capacity = Fy Z = 3700.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 775.000 kips
Nominal Axial Tensile Capacity = -775.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000061063	68.0383642387	11142283.	5.9000000000	
0.0000122126	136.0767284773	11142283.	5.9000000000	
0.0000183190	204.1150927160	11142283.	5.9000000000	
0.0000244253	272.1534569547	11142283.	5.9000000000	
0.0000305316	340.1918211933	11142283.	5.9000000000	

0.0000366379	408.2301854320	11142283.	5.9000000000	
0.0000427443	476.2685496707	11142283.	5.9000000000	
0.0000488506	544.3069139093	11142283.	5.9000000000	
0.0000549569	612.3452781480	11142283.	5.9000000000	
0.0000610632	680.3836423867	11142283.	5.9000000000	
0.0000671695	748.4220066253	11142283.	5.9000000000	
0.0000732759	816.4603708640	11142283.	5.9000000000	
0.0000793822	884.4987351027	11142283.	5.9000000000	
0.0000854885	952.5370993413	11142283.	5.9000000000	
0.0000915948	1021.	11142283.	5.9000000000	
0.0000977011	1089.	11142283.	5.9000000000	
0.0001038075	1157.	11142283.	5.9000000000	
0.0001099138	1225.	11142283.	5.9000000000	
0.0001160201	1293.	11142283.	5.9000000000	
0.0001221264	1361.	11142283.	5.9000000000	
0.0001282328	1429.	11142283.	5.9000000000	
0.0001343391	1497.	11142283.	5.9000000000	
0.0001404454	1565.	11142283.	5.9000000000	
0.0001465517	1633.	11142283.	5.9000000000	
0.0001526580	1701.	11142283.	5.9000000000	
0.0001587644	1769.	11142283.	5.9000000000	
0.0001648707	1837.	11142283.	5.9000000000	
0.0001709770	1905.	11142283.	5.9000000000	
0.0001770833	1973.	11142283.	5.9000000000	
0.0001831897	2041.	11142283.	5.9000000000	
0.0001892960	2109.	11142283.	5.9000000000	
0.0001954023	2177.	11142283.	5.9000000000	
0.0002015086	2245.	11142283.	5.9000000000	
0.0002076149	2313.	11142283.	5.9000000000	
0.0002137213	2381.	11142283.	5.9000000000	
0.0002198276	2449.	11142283.	5.9000000000	
0.0002259339	2517.	11142283.	5.9000000000	
0.0002320402	2585.	11142283.	5.9000000000	
0.0002381466	2653.	11142283.	5.9000000000	
0.0002503592	2790.	11142283.	5.9000000000	
0.0002625718	2926.	11142283.	5.9000000000	
0.0002747845	3062.	11142283.	5.9000000000	
0.0002869971	3198.	11142283.	5.9000000000	
0.0002992098	3323.	11104532.	5.9000000000	Y
0.0003114224	3387.	10876784.	5.9000000000	Y
0.0003236351	3408.	10531350.	5.9000000000	Y
0.0003358477	3423.	10192339.	5.9000000000	Y
0.0003480603	3436.	9872349.	5.9000000000	Y
0.0003602730	3448.	9570768.	5.9000000000	Y

0.0003724856	3459.	9285606.	5.9000000000	Y
0.0003846983	3468.	9016014.	5.9000000000	Y
0.0003969109	3477.	8760856.	5.9000000000	Y
0.0004091236	3485.	8519037.	5.9000000000	Y
0.0004213362	3493.	8289583.	5.9000000000	Y
0.0004335489	3499.	8071617.	5.9000000000	Y
0.0004457615	3506.	7864351.	5.9000000000	Y
0.0004579741	3511.	7667071.	5.9000000000	Y
0.0004701868	3517.	7479130.	5.9000000000	Y
0.0004823994	3521.	7299937.	5.9000000000	Y
0.0004946121	3526.	7128901.	5.9000000000	Y
0.0005068247	3530.	6965287.	5.9000000000	Y
0.0005190374	3534.	6808913.	5.9000000000	Y
0.0005312500	3538.	6659357.	5.9000000000	Y
0.0005434626	3541.	6515822.	5.9000000000	Y
0.0005556753	3544.	6378367.	5.9000000000	Y
0.0005678879	3547.	6246419.	5.9000000000	Y
0.0005801006	3550.	6119696.	5.9000000000	Y
0.0005923132	3553.	5997967.	5.9000000000	Y
0.0006045259	3555.	5880821.	5.9000000000	Y
0.0006167385	3557.	5768150.	5.9000000000	Y
0.0006289511	3560.	5659592.	5.9000000000	Y
0.0006411638	3562.	5554991.	5.9000000000	Y
0.0006533764	3564.	5454173.	5.9000000000	Y
0.0006655891	3565.	5356795.	5.9000000000	Y
0.0006778017	3567.	5262925.	5.9000000000	Y
0.0006900144	3569.	5172090.	5.9000000000	Y
0.0007022270	3570.	5084365.	5.9000000000	Y
0.0007144397	3572.	4999597.	5.9000000000	Y
0.0007266523	3573.	4917427.	5.9000000000	Y
0.0007755029	3578.	4614094.	5.9000000000	Y
0.0008243534	3582.	4345685.	5.9000000000	Y
0.0008732040	3586.	4106518.	5.9000000000	Y
0.0009220546	3589.	3892100.	5.9000000000	Y
0.0009709052	3591.	3698827.	5.9000000000	Y
0.0010197557	3593.	3523766.	5.9000000000	Y
0.0010686063	3595.	3364410.	5.9000000000	Y
0.0011174569	3597.	3218750.	5.9000000000	Y
0.0011663075	3598.	3085203.	5.9000000000	Y
0.0012151580	3599.	2962147.	5.9000000000	Y
0.0012640086	3601.	2848589.	5.9000000000	Y
0.0013128592	3602.	2743305.	5.9000000000	Y
0.0013617098	3602.	2645549.	5.9000000000	Y
0.0014105603	3603.	2554503.	5.9000000000	Y

```
    0.0014594109              3604.           2469458.       5.9000000000    Y
    0.0015082615              3605.           2389922.       5.9000000000    Y


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
--------------------------------------------------------------------------------

                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------          ----------------
  1               0.00000000                    3605.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.




Pile Section No. 2:
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Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
--------------------------------------------------------------------------------

Length of Section                                =    17.500000 ft
Outside Diameter of Casing                       =    24.000000 in
Casing Wall Thickness                            =       0.0000 in
Moment of Inertia of Steel Casing                =       0.0000 in^4
Width Flange of Core/Insert                      =    12.000000 in
Depth of Core/Insert                             =    11.800000 in
Flange Thickness of Core/Insert                  =     0.435000 in
Web Thickness of Core/Insert                     =     0.435000 in
Moment of Inertia of Steel Core/Insert           =   384.614130 in^4
Yield Stress of Casing                           =       50000. psi
```

Elastic Modulus of Casing = 29000000. psi
Yield Stress of Core/Insert = 50000. psi
Elastic Modulus of Core/Insert = 29000000. psi
Number of Reinforcing Bars = 0 bars
Gross Area of Pile = 452.389342 sq. in.
Area of Concrete = 437.194792 sq. in.
Cross-sectional Area of Steel Casing = 0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert = 15.194550 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars) = 15.194550 sq. in.
Area Ratio of All Steel to Gross Area = 3.36 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2246.190 kips
Tensile Load for Cracking of Concrete = -232.671 kips
Nominal Axial Tensile Capacity = -759.727 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000061063	474.5926331527	77721523.	12.0000000000	
0.0000122126	474.5926331527	38860761.	7.9731709081	C
0.0000183190	486.7889108371	26572948.	7.9876086662	C

0.0000244253	647.2007370144	26497160.	8.0022266176	C
0.0000305316	806.6614486352	26420535.	8.0170293598	C
0.0000366379	965.1551187176	26343057.	8.0320216691	C
0.0000427443	1123.	26264724.	8.0470360190	C
0.0000488506	1279.	26185532.	8.0620524475	C
0.0000549569	1435.	26105445.	8.0772642736	C
0.0000610632	1589.	26024442.	8.0926767504	C
0.0000671695	1743.	25942498.	8.1082953465	C
0.0000732759	1895.	25859590.	8.1241257578	C
0.0000793822	2046.	25775693.	8.1401739212	C
0.0000854885	2196.	25690780.	8.1564460276	C
0.0000915948	2345.	25604825.	8.1729485376	C
0.0000977011	2493.	25517799.	8.1896881965	C
0.0001038075	2640.	25429669.	8.2066725255	C
0.0001099138	2785.	25340411.	8.2239078840	C
0.0001160201	2930.	25249989.	8.2414025169	C
0.0001221264	3073.	25158369.	8.2591644987	C
0.0001282328	3214.	25065518.	8.2772022898	C
0.0001343391	3355.	24971538.	8.2951196853	C
0.0001404454	3494.	24876313.	8.3132436520	C
0.0001465517	3632.	24779778.	8.3316557743	C
0.0001526580	3768.	24681893.	8.3503656404	C
0.0001587644	3903.	24582616.	8.3693833301	C
0.0001648707	4036.	24481901.	8.3887194499	C
0.0001709770	4168.	24379702.	8.4083851699	C
0.0001770833	4299.	24275970.	8.4283922661	C
0.0001831897	4426.	24161751.	8.4475111530	CY
0.0001892960	4516.	23856422.	8.4398788336	CY
0.0001954023	4563.	23353647.	8.4029145976	CY
0.0002015086	4603.	22840538.	8.3633675395	CY
0.0002076149	4639.	22343058.	8.3250972693	CY
0.0002137213	4672.	21862569.	8.2883551054	CY
0.0002198276	4704.	21397627.	8.2520562881	CY
0.0002259339	4733.	20948215.	8.2168932510	CY
0.0002320402	4760.	20514021.	8.1831479781	CY
0.0002381466	4785.	20094347.	8.1508352712	CY
0.0002503592	4831.	19296616.	8.0904216805	CY
0.0002625718	4871.	18549478.	8.0348226016	CY
0.0002747845	4905.	17849637.	7.9821672866	CY
0.0002869971	4934.	17193471.	7.9336613070	CY
0.0002992098	4961.	16578835.	7.8892446468	CY
0.0003114224	4983.	16002204.	7.8483820894	CY
0.0003236351	5004.	15460356.	7.8107289184	CY
0.0003358477	5021.	14950187.	7.7748074761	CY

0.0003480603	5036.	14469657.	7.7409367964	CY
0.0003602730	5050.	14016640.	7.7095345818	CY
0.0003724856	5062.	13589132.	7.6804401833	CY
0.0003846983	5072.	13185311.	7.6532879216	CY
0.0003969109	5081.	12802428.	7.6278444061	CY
0.0004091236	5090.	12440337.	7.6040995941	CY
0.0004213362	5097.	12096677.	7.5820951791	CY
0.0004335489	5103.	11770221.	7.5611599587	CY
0.0004457615	5108.	11459979.	7.5408080089	CY
0.0004579741	5113.	11164088.	7.5211235819	CY
0.0004701868	5117.	10882957.	7.5029304877	CY
0.0004823994	5120.	10614051.	7.4854915563	CY
0.0004946121	5123.	10357970.	7.4692344986	CY
0.0005068247	5126.	10113059.	7.4535742354	CY
0.0005190374	5126.	9875105.	7.4538666974	CY
0.0005312500	5126.	9648091.	7.4400839226	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	5126.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	7.5000	0.00	N.A.	No	0.00	135070.
2	22.0000	14.5000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	49.00
3.00	49.00
6.00	49.00
9.00	49.00
12.00	49.00
15.00	49.00
18.00	49.00
21.00	49.00
24.00	49.00
27.00	49.00
30.00	49.00
33.00	49.00
36.00	49.00
39.00	49.00

42.00	49.00
45.00	49.00
48.00	49.00
51.00	49.00
54.00	49.00
57.00	49.00
60.00	49.00
63.00	49.00
66.00	49.00
69.00	49.00
72.00	49.00
75.00	49.00
78.00	49.00
81.00	49.00
84.00	49.00
87.00	49.00
90.00	24.50

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
45.00	1.14
48.00	9.10
51.00	18.20
54.00	27.30
57.00	36.40
60.00	45.50
63.00	54.60
66.00	63.70
69.00	72.80
72.00	81.90
75.00	91.00
78.00	100.10
81.00	109.20
84.00	118.30

87.00	127.40
90.00	67.11

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.46
3.00	5.83
6.00	11.65
9.00	17.48
12.00	23.31
15.00	29.14
18.00	34.96
21.00	40.79
24.00	46.62
27.00	52.45
30.00	58.27
33.00	64.10
36.00	69.93
39.00	75.76
42.00	81.58
45.00	87.03
48.00	90.21
51.00	93.00
54.00	95.80
57.00	98.60
60.00	101.40
63.00	104.19
66.00	106.99
69.00	109.79
72.00	112.59
75.00	115.38
78.00	118.18
81.00	120.98
84.00	123.78

87.00	126.57
90.00	64.34

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.17910	2.474E-06	0.000	0.000	1.114E+10
0.25000	1.15722	227.05575	157.92625	0.000	1.114E+10
0.50000	1.13534	947.55750	331.14925	0.000	1.114E+10
0.75000	1.11346	2214.	521.85425	0.000	1.114E+10
1.00000	1.09158	4079.	730.04125	0.000	1.114E+10
1.25000	1.06971	6594.	955.71025	0.000	1.114E+10
1.50000	1.04784	9813.	1199.	0.000	1.114E+10
1.75000	1.02597	13787.	1459.	0.000	1.114E+10
2.00000	1.00412	18570.	1738.	0.000	1.114E+10
2.25000	0.98229	24213.	2033.	0.000	1.114E+10
2.50000	0.96047	30769.	2346.	0.000	1.114E+10
2.75000	0.93868	38291.	2677.	0.000	1.114E+10
3.00000	0.91692	46830.	3025.	0.000	1.114E+10
3.25000	0.89520	56440.	3390.	0.000	1.114E+10
3.50000	0.87352	67173.	3773.	0.000	1.114E+10
3.75000	0.85190	79081.	4175.	0.000	1.114E+10
4.00000	0.83034	92223.	4603.	0.000	1.114E+10
4.25000	0.80885	106700.	5066.	0.000	1.114E+10
4.50000	0.78745	122619.	5564.	0.000	1.114E+10
4.75000	0.76615	140087.	6099.	0.000	1.114E+10
5.00000	0.74497	159211.	6668.	0.000	1.114E+10
5.25000	0.72391	180098.	7274.	0.000	1.114E+10
5.50000	0.70300	202855.	7915.	0.000	1.114E+10
5.75000	0.68225	227590.	8592.	0.000	1.114E+10

6.00000	0.66169	254408.	9305.	0.000	1.114E+10
6.25000	0.64133	283418.	10053.	0.000	1.114E+10
6.50000	0.62120	314727.	10837.	0.000	1.114E+10
6.75000	0.60132	348441.	11657.	0.000	1.114E+10
7.00000	0.58173	384667.	12512.	0.000	1.114E+10
7.25000	0.56244	423514.	13403.	0.000	1.114E+10
7.50000	0.54350	465087.	14092.	0.000	1.114E+10
7.75000	0.52494	508063.	14302.	-15.5678	2.656E+10
8.00000	0.50654	550900.	14231.	-32.1168	2.654E+10
8.25000	0.48834	593447.	14109.	-49.3106	2.652E+10
8.50000	0.47033	635551.	13934.	-66.8203	2.650E+10
8.75000	0.45254	677053.	13707.	-84.5067	2.648E+10
9.00000	0.43498	717795.	13428.	-102.0137	2.646E+10
9.25000	0.41767	757618.	13096.	-119.0749	2.644E+10
9.50000	0.40061	796370.	12714.	-135.4350	2.642E+10
9.75000	0.38382	833903.	12284.	-151.3424	2.641E+10
10.00000	0.36732	870074.	11808.	-166.1699	2.639E+10
10.25000	0.35112	904749.	11289.	-179.6879	2.637E+10
10.50000	0.33522	937807.	10732.	-191.6776	2.635E+10
10.75000	0.31964	969140.	10138.	-204.0272	2.634E+10
11.00000	0.30440	998637.	9510.	-214.8815	2.632E+10
11.25000	0.28949	1026200.	8852.	-224.0708	2.631E+10
11.50000	0.27494	1051746.	8168.	-231.4356	2.630E+10
11.75000	0.26075	1075210.	7463.	-238.8670	2.629E+10
12.00000	0.24692	1096523.	6738.	-244.5686	2.628E+10
12.25000	0.23348	1115636.	5998.	-248.4335	2.627E+10
12.50000	0.22041	1132512.	5250.	-250.3661	2.626E+10
12.75000	0.20773	1147135.	4496.	-252.4551	2.625E+10
13.00000	0.19545	1159487.	3738.	-252.5405	2.624E+10
13.25000	0.18356	1169565.	2984.	-250.5341	2.624E+10
13.50000	0.17207	1177388.	2238.	-246.3648	2.623E+10
13.75000	0.16099	1182994.	1501.	-245.3850	2.623E+10
14.00000	0.15031	1186392.	768.67717	-242.5918	2.623E+10
14.25000	0.14004	1187606.	47.86091	-237.9523	2.623E+10
14.50000	0.13018	1186679.	-656.2547	-231.4580	2.623E+10
14.75000	0.12073	1183669.	-1338.	-223.1293	2.623E+10
15.00000	0.11168	1178650.	-1992.	-213.0190	2.623E+10
15.25000	0.10303	1171715.	-2614.	-201.2172	2.624E+10
15.50000	0.09479	1162968.	-3197.	-187.8554	2.624E+10
15.75000	0.08695	1152531.	-3758.	-185.8682	2.625E+10
16.00000	0.07950	1140421.	-4311.	-183.0850	2.625E+10
16.25000	0.07244	1126663.	-4855.	-179.5183	2.626E+10
16.50000	0.06577	1111289.	-5387.	-175.1874	2.627E+10
16.75000	0.05948	1094339.	-5905.	-170.1184	2.628E+10

17.00000	0.05356	1075858.	-6407.	-164.3445	2.629E+10
17.25000	0.04802	1055897.	-6890.	-157.9061	2.630E+10
17.50000	0.04283	1034516.	-7353.	-150.8507	2.631E+10
17.75000	0.03800	1011777.	-7800.	-146.5780	2.632E+10
18.00000	0.03351	987718.	-8232.	-141.7776	2.633E+10
18.25000	0.02936	962384.	-8650.	-136.4662	2.634E+10
18.50000	0.02554	935821.	-9050.	-130.6640	2.636E+10
18.75000	0.02204	908082.	-9433.	-124.3954	2.637E+10
19.00000	0.01885	879224.	-9796.	-117.6886	2.638E+10
19.25000	0.01596	849307.	-10138.	-110.5767	2.640E+10
19.50000	0.01336	818394.	-10459.	-103.0982	2.641E+10
19.75000	0.01104	786554.	-10756.	-95.2978	2.643E+10
20.00000	0.008986	753856.	-11021.	-80.8721	2.644E+10
20.25000	0.007188	720430.	-11241.	-65.9894	2.646E+10
20.50000	0.005636	686410.	-11419.	-52.7535	2.647E+10
20.75000	0.004317	651916.	-11560.	-41.1848	2.649E+10
21.00000	0.003220	617050.	-11669.	-31.2937	2.651E+10
21.25000	0.002331	581903.	-11750.	-23.0816	2.652E+10
21.50000	0.001641	546549.	-11810.	-16.5402	2.654E+10
21.75000	0.001136	511045.	-11852.	-11.6517	2.656E+10
22.00000	0.000804	475437.	-12663.	-528.9086	6.169E+10
22.25000	0.000541	435068.	-14301.	-562.8767	7.772E+10
22.50000	0.000329	389634.	-16001.	-570.8891	7.772E+10
22.75000	0.000161	339061.	-17511.	-435.6559	7.772E+10
23.00000	3.341E-05	284568.	-18315.	-100.2357	7.772E+10
23.25000	-6.158E-05	229172.	-18160.	203.20696	7.772E+10
23.50000	-0.000130	175606.	-17153.	468.10778	7.772E+10
23.75000	-0.000178	126252.	-15409.	694.77417	7.772E+10
24.00000	-0.000212	83151.	-13034.	888.90808	7.772E+10
24.25000	-0.000236	48051.	-10198.	1002.	7.772E+10
24.50000	-0.000254	21965.	-7060.	1090.	7.772E+10
24.75000	-0.000270	5688.	-3661.	1177.	7.772E+10
25.00000	-0.000285	0.000	0.000	1264.	7.772E+10

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     1.17910283 inches
Computed slope at pile head      =     -0.0072938 radians
Maximum bending moment           =       1187606. inch-lbs
Maximum shear force              =        -18315. lbs
Depth of maximum bending moment  =    14.25000000 feet below pile head
Depth of maximum shear force     =    23.00000000 feet below pile head
Number of iterations             =             23
Number of zero deflection points =              1
```

Pile deflection at ground = 0.54350250 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	49.00
3.00	49.00
6.00	49.00
9.00	49.00
12.00	49.00
15.00	49.00
18.00	49.00
21.00	49.00
24.00	49.00
27.00	49.00
30.00	49.00
33.00	49.00
36.00	49.00
39.00	49.00
42.00	49.00
45.00	49.00
48.00	49.00
51.00	49.00
54.00	49.00
57.00	49.00
60.00	49.00
63.00	49.00
66.00	49.00
69.00	49.00
72.00	49.00
75.00	49.00
78.00	49.00
81.00	49.00
84.00	49.00
87.00	49.00
90.00	24.50

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
45.00	1.14
48.00	9.10
51.00	18.20
54.00	27.30
57.00	36.40
60.00	45.50
63.00	54.60
66.00	63.70
69.00	72.80
72.00	81.90
75.00	91.00
78.00	100.10
81.00	109.20
84.00	118.30
87.00	127.40
90.00	67.11

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.46
3.00	5.83

6.00	11.65
9.00	17.48
12.00	23.31
15.00	29.14
18.00	34.96
21.00	40.79
24.00	46.62
27.00	52.45
30.00	58.27
33.00	64.10
36.00	69.93
39.00	75.76
42.00	81.58
45.00	87.03
48.00	90.21
51.00	93.00
54.00	95.80
57.00	98.60
60.00	101.40
63.00	104.19
66.00	106.99
69.00	109.79
72.00	112.59
75.00	115.38
78.00	118.18
81.00	120.98
84.00	123.78
87.00	126.57
90.00	64.34

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth	Deflect.	Bending	Shear	Soil Res.	Bending

X	y	Moment	Force	p	Stiffness
feet	inches	in-lbs	lbs	lb/inch	lb-in^2
0.000	2.10601	9.347E-06	-9.163E-08	0.000	1.114E+10
0.25000	2.06862	395.70863	273.63937	0.000	1.114E+10
0.50000	2.03123	1642.	570.22388	0.000	1.114E+10
0.75000	1.99384	3817.	893.03138	0.000	1.114E+10
1.00000	1.95645	7000.	1242.	0.000	1.114E+10
1.25000	1.91907	11269.	1617.	0.000	1.114E+10
1.50000	1.88169	16704.	2019.	0.000	1.114E+10
1.75000	1.84433	23382.	2446.	0.000	1.114E+10
2.00000	1.80699	31383.	2900.	0.000	1.114E+10
2.25000	1.76967	40785.	3381.	0.000	1.114E+10
2.50000	1.73239	51666.	3887.	0.000	1.114E+10
2.75000	1.69515	64106.	4420.	0.000	1.114E+10
3.00000	1.65796	78183.	4978.	0.000	1.114E+10
3.25000	1.62083	93976.	5563.	0.000	1.114E+10
3.50000	1.58378	111564.	6175.	0.000	1.114E+10
3.75000	1.54682	131024.	6813.	0.000	1.114E+10
4.00000	1.50997	152441.	7484.	0.000	1.114E+10
4.25000	1.47324	175930.	8195.	0.000	1.114E+10
4.50000	1.43665	201610.	8945.	0.000	1.114E+10
4.75000	1.40022	229601.	9735.	0.000	1.114E+10
5.00000	1.36398	260022.	10565.	0.000	1.114E+10
5.25000	1.32795	292993.	11435.	0.000	1.114E+10
5.50000	1.29215	328634.	12345.	0.000	1.114E+10
5.75000	1.25663	367065.	13295.	0.000	1.114E+10
6.00000	1.22139	408404.	14285.	0.000	1.114E+10
6.25000	1.18649	452773.	15314.	0.000	1.114E+10
6.50000	1.15195	500289.	16384.	0.000	1.114E+10
6.75000	1.11782	551074.	17493.	0.000	1.114E+10
7.00000	1.08413	605247.	18642.	0.000	1.114E+10
7.25000	1.05093	662927.	19831.	0.000	1.114E+10
7.50000	1.01827	724234.	20745.	0.000	1.114E+10
7.75000	0.98619	787399.	21026.	-19.1250	2.643E+10
8.00000	0.95438	850393.	20938.	-40.0749	2.640E+10
8.25000	0.92286	913025.	20784.	-62.5488	2.637E+10
8.50000	0.89165	975095.	20561.	-85.8679	2.634E+10
8.75000	0.86078	1036392.	20270.	-108.3419	2.630E+10
9.00000	0.83026	1096714.	19912.	-130.4880	2.628E+10
9.25000	0.80011	1155861.	19488.	-151.9747	2.625E+10
9.50000	0.77036	1213641.	19001.	-172.4887	2.622E+10
9.75000	0.74103	1269868.	18454.	-192.2555	2.619E+10
10.00000	0.71214	1324365.	17850.	-210.6501	2.616E+10

10.25000	0.68370	1376966.	17193.	-227.4292	2.613E+10
10.50000	0.65573	1427521.	16488.	-242.3655	2.611E+10
10.75000	0.62826	1475894.	15737.	-257.9099	2.608E+10
11.00000	0.60129	1521946.	14943.	-271.7406	2.606E+10
11.25000	0.57485	1565552.	14110.	-283.6914	2.604E+10
11.50000	0.54896	1606605.	13244.	-293.6070	2.601E+10
11.75000	0.52362	1645015.	12348.	-303.4011	2.599E+10
12.00000	0.49884	1680695.	11426.	-311.2763	2.597E+10
12.25000	0.47465	1713573.	10484.	-317.1314	2.596E+10
12.50000	0.45106	1743597.	9527.	-320.8734	2.594E+10
12.75000	0.42807	1770734.	8556.	-326.5071	2.593E+10
13.00000	0.40569	1794931.	7571.	-330.1441	2.591E+10
13.25000	0.38394	1816158.	6578.	-331.6123	2.590E+10
13.50000	0.36282	1834400.	5585.	-330.6316	2.589E+10
13.75000	0.34233	1849666.	4587.	-334.3834	2.588E+10
14.00000	0.32249	1861923.	3581.	-336.0928	2.588E+10
14.25000	0.30330	1871155.	2574.	-335.6462	2.587E+10
14.50000	0.28476	1877366.	1571.	-332.9457	2.587E+10
14.75000	0.26687	1880581.	579.67892	-327.9132	2.587E+10
15.00000	0.24963	1880844.	-392.9324	-320.4944	2.587E+10
15.25000	0.23305	1878223.	-1340.	-310.6648	2.587E+10
15.50000	0.21713	1872806.	-2253.	-298.4353	2.587E+10
15.75000	0.20185	1864703.	-3149.	-298.9770	2.587E+10
16.00000	0.18722	1853909.	-4046.	-298.4134	2.588E+10
16.25000	0.17324	1840430.	-4938.	-296.7340	2.589E+10
16.50000	0.15990	1824280.	-5824.	-293.9364	2.590E+10
16.75000	0.14719	1805485.	-6700.	-290.0258	2.591E+10
17.00000	0.13511	1784079.	-7563.	-285.0162	2.592E+10
17.25000	0.12365	1760108.	-8409.	-278.9301	2.593E+10
17.50000	0.11280	1733627.	-9235.	-271.7987	2.595E+10
17.75000	0.10255	1704699.	-10045.	-268.0557	2.596E+10
18.00000	0.09289	1673359.	-10842.	-263.5233	2.598E+10
18.25000	0.08381	1639648.	-11625.	-258.2116	2.600E+10
18.50000	0.07530	1603612.	-12390.	-252.1338	2.602E+10
18.75000	0.06735	1565308.	-13136.	-245.3062	2.604E+10
19.00000	0.05993	1524795.	-13861.	-237.7483	2.606E+10
19.25000	0.05304	1482143.	-14562.	-229.4824	2.608E+10
19.50000	0.04666	1437425.	-15237.	-220.5340	2.610E+10
19.75000	0.04078	1390723.	-15884.	-210.9307	2.613E+10
20.00000	0.03538	1342122.	-16501.	-200.7031	2.615E+10
20.25000	0.03044	1291715.	-17087.	-189.8835	2.618E+10
20.50000	0.02594	1239599.	-17640.	-178.5056	2.620E+10
20.75000	0.02187	1185877.	-18157.	-166.6041	2.623E+10
21.00000	0.01821	1130655.	-18639.	-154.2130	2.626E+10

21.25000	0.01493	1074045.	-19082.	-141.3638	2.629E+10
21.50000	0.01203	1016162.	-19476.	-121.2278	2.631E+10
21.75000	0.009466	957189.	-19803.	-97.1191	2.635E+10
22.00000	0.007232	897342.	-21324.	-916.3840	2.637E+10
22.25000	0.005304	829247.	-24193.	-996.4649	2.641E+10
22.50000	0.003660	752184.	-27253.	-1043.	2.644E+10
22.75000	0.002271	665730.	-30387.	-1046.	2.649E+10
23.00000	0.001108	569862.	-33418.	-974.5730	2.653E+10
23.25000	0.000138	465223.	-35565.	-456.9831	7.772E+10
23.50000	-0.000777	356470.	-34637.	1076.	7.772E+10
23.75000	-0.001651	257400.	-30909.	1410.	7.772E+10
24.00000	-0.002496	171016.	-26266.	1686.	7.772E+10
24.25000	-0.003320	99805.	-20823.	1943.	7.772E+10
24.50000	-0.004133	46077.	-14622.	2191.	7.772E+10
24.75000	-0.004941	12071.	-7679.	2437.	7.772E+10
25.00000	-0.005747	0.000	0.000	2682.	7.772E+10

Output Summary for Load Case No. 2:

Pile-head deflection = 2.10601444 inches
Computed slope at pile head = -0.0124644 radians
Maximum bending moment = 1880844. inch-lbs
Maximum shear force = -35565. lbs
Depth of maximum bending moment = 15.00000000 feet below pile head
Depth of maximum shear force = 23.25000000 feet below pile head
Number of iterations = 25
Number of zero deflection points = 1
Pile deflection at ground = 1.01827159 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	1.1791028	1187606.	-18315.	-0.007294
2	2.1060144	1880844.	-35565.	-0.012464

Maximum pile-head deflection = 2.1060144403 inches

Maximum pile-head rotation = -0.0124644139 radians = -0.714158 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	3604627.	465087.	Pass
	2	1.00	5125548.	1187606.	Pass
2	1	1.00	3604627.	724234.	Pass
	2	1.00	5125548.	1880844.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	137880.	14092.	Pass
	2	1.00	137880.	-18315.	Pass
2	1	1.00	137880.	20745.	Pass
	2	1.00	137880.	-35565.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2

```
Pile Section No.                       = 2
Node Number of Maximum Shear Force     = 1
Depth of Maximum Developed Shear       = 0.00 ft
Maximum Developed Shear Force          = -35565.31 lbs
Factored Shear Capacity at Node        = 137880.00 lbs
Fraction of Allowable Shear Capacity   = 0.2579

The analysis ended normally.
```

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

                            LPile for Version 2022-12.012

                             License ID : 154178656
                        License Type : (Network License)

                 Analysis of Individual Piles and Drilled Shafts
                Subjected to Lateral Loading Using the p-y Method
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================================================================================


This model was prepared by:
TWASHKO




--------------------------------------------------------------------------------
                             Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1162.0 RT Pile 3 8.lp12d

Name of the output report file:
BEL-70 1162.0 RT Pile 3 8.lp12o

Name of the plot output file:
BEL-70 1162.0 RT Pile 3 8.lp12p

Name of the runtime message file:
BEL-70 1162.0 RT Pile 3 8.lp12r
```

Date and Time of Analysis

Date: June 22, 2026 Time: 22:54:29

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1162+0 RT Piles 3 8 - 11.2' Ht.(6' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 27.700 ft
Depth of ground surface below top of pile = 11.2000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.9000
2	11.200	14.9000
3	11.200	24.0000
4	27.700	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 11.200000 ft
   AISC Section Type = HP

   AISC Section Name = HP14X117

   Pile width = 14.900000 in
   Shear capacity of section = 294150. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 16.500000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 294150. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 11.200000 ft
   Distance from top of pile to bottom of layer = 22.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	22.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 22.300 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 3

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2
3	Live Load (LL)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	5.60	111.89
3	11.20	165.59

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	5.60	0.00
2	11.20	174.72

Number of Distributed Loading Points Input for Load Group 3 = 2

Point	Depth ft	Distributed Load lb/inch
1	0.00	42.00
2	11.20	42.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 3

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	1
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1

Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*LL + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.75*LL + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section = 11.200000 ft

Flange Width = 14.900000 in
Section Depth = 14.200000 in
Flange Thickness = 0.805000 in
Web Thickness = 0.805000 in
Yield Stress of Pipe = 50.000000 ksi
Elastic Modulus = 29000. ksi
Cross-sectional Area = 34.400000 sq. in.
Moment of Inertia = 1220. in^4
Elastic Bending Stiffness = 35380000. kip-in^2
Plastic Modulus, Z = 194.000000in^3
Plastic Moment Capacity = Fy Z = 9700.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 1720.000 kips
Nominal Axial Tensile Capacity = -1720.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	172.6211844549	35100995.	7.1000000000	
0.0000098357	345.2423689099	35100995.	7.1000000000	
0.0000147535	517.8635533648	35100995.	7.1000000000	
0.0000196714	690.4847378198	35100995.	7.1000000000	
0.0000245892	863.1059222747	35100995.	7.1000000000	

0.0000295071	1036.	35100995.	7.1000000000	
0.0000344249	1208.	35100995.	7.1000000000	
0.0000393427	1381.	35100995.	7.1000000000	
0.0000442606	1554.	35100995.	7.1000000000	
0.0000491784	1726.	35100995.	7.1000000000	
0.0000540963	1899.	35100995.	7.1000000000	
0.0000590141	2071.	35100995.	7.1000000000	
0.0000639320	2244.	35100995.	7.1000000000	
0.0000688498	2417.	35100995.	7.1000000000	
0.0000737676	2589.	35100995.	7.1000000000	
0.0000786855	2762.	35100995.	7.1000000000	
0.0000836033	2935.	35100995.	7.1000000000	
0.0000885212	3107.	35100995.	7.1000000000	
0.0000934390	3280.	35100995.	7.1000000000	
0.0000983569	3452.	35100995.	7.1000000000	
0.0001032747	3625.	35100995.	7.1000000000	
0.0001081925	3798.	35100995.	7.1000000000	
0.0001131104	3970.	35100995.	7.1000000000	
0.0001180282	4143.	35100995.	7.1000000000	
0.0001229461	4316.	35100995.	7.1000000000	
0.0001278639	4488.	35100995.	7.1000000000	
0.0001327818	4661.	35100995.	7.1000000000	
0.0001376996	4833.	35100995.	7.1000000000	
0.0001426174	5006.	35100995.	7.1000000000	
0.0001475353	5179.	35100995.	7.1000000000	
0.0001524531	5351.	35100995.	7.1000000000	
0.0001573710	5524.	35100995.	7.1000000000	
0.0001622888	5696.	35100995.	7.1000000000	
0.0001672067	5869.	35100995.	7.1000000000	
0.0001721245	6042.	35100995.	7.1000000000	
0.0001770424	6214.	35100995.	7.1000000000	
0.0001819602	6387.	35100995.	7.1000000000	
0.0001868780	6560.	35100995.	7.1000000000	
0.0001917959	6732.	35100995.	7.1000000000	
0.0002016316	7077.	35100995.	7.1000000000	
0.0002114673	7423.	35100995.	7.1000000000	
0.0002213029	7768.	35100995.	7.1000000000	
0.0002311386	8113.	35100995.	7.1000000000	
0.0002409743	8458.	35100995.	7.1000000000	
0.0002508100	8768.	34956786.	7.1000000000	Y
0.0002606457	8968.	34406082.	7.1000000000	Y
0.0002704814	9073.	33542198.	7.1000000000	Y
0.0002803171	9118.	32525814.	7.1000000000	Y
0.0002901527	9151.	31539616.	7.1000000000	Y

0.0002999884	9182.	30607932.	7.1000000000	Y
0.0003098241	9210.	29725136.	7.1000000000	Y
0.0003196598	9235.	28889181.	7.1000000000	Y
0.0003294955	9258.	28096536.	7.1000000000	Y
0.0003393312	9279.	27344053.	7.1000000000	Y
0.0003491669	9298.	26628906.	7.1000000000	Y
0.0003590025	9316.	25948550.	7.1000000000	Y
0.0003688382	9332.	25300683.	7.1000000000	Y
0.0003786739	9347.	24683214.	7.1000000000	Y
0.0003885096	9361.	24094238.	7.1000000000	Y
0.0003983453	9374.	23532010.	7.1000000000	Y
0.0004081810	9386.	22993958.	7.1000000000	Y
0.0004180167	9397.	22479436.	7.1000000000	Y
0.0004278523	9407.	21987182.	7.1000000000	Y
0.0004376880	9417.	21515064.	7.1000000000	Y
0.0004475237	9426.	21062342.	7.1000000000	Y
0.0004573594	9435.	20628245.	7.1000000000	Y
0.0004671951	9442.	20210614.	7.1000000000	Y
0.0004770308	9450.	19809883.	7.1000000000	Y
0.0004868665	9457.	19423744.	7.1000000000	Y
0.0004967022	9464.	19052717.	7.1000000000	Y
0.0005065378	9470.	18694718.	7.1000000000	Y
0.0005163735	9476.	18350357.	7.1000000000	Y
0.0005262092	9481.	18017531.	7.1000000000	Y
0.0005360449	9486.	17696878.	7.1000000000	Y
0.0005458806	9491.	17387006.	7.1000000000	Y
0.0005557163	9496.	17087665.	7.1000000000	Y
0.0005655520	9501.	16798647.	7.1000000000	Y
0.0005753876	9505.	16518541.	7.1000000000	Y
0.0005852233	9509.	16247851.	7.1000000000	Y
0.0006245661	9523.	15247286.	7.1000000000	Y
0.0006639088	9535.	14361320.	7.1000000000	Y
0.0007032516	9544.	13571868.	7.1000000000	Y
0.0007425943	9553.	12864088.	7.1000000000	Y
0.0007819371	9560.	12226014.	7.1000000000	Y
0.0008212798	9566.	11647588.	7.1000000000	Y
0.0008606225	9571.	11121235.	7.1000000000	Y
0.0008999653	9576.	10640384.	7.1000000000	Y
0.0009393080	9580.	10198808.	7.1000000000	Y
0.0009786508	9584.	9792580.	7.1000000000	Y
0.0010179935	9587.	9417093.	7.1000000000	Y
0.0010573363	9590.	9069525.	7.1000000000	Y
0.0010966790	9592.	8746284.	7.1000000000	Y
0.0011360218	9594.	8445432.	7.1000000000	Y

```
    0.0011753645             9596.          8164483.       7.1000000000    Y
    0.0012147072             9598.          7901486.       7.1000000000    Y


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
--------------------------------------------------------------------------------

                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------          ----------------
  1               0.00000000                   9598.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.




Pile Section No. 2:
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Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
--------------------------------------------------------------------------------

Length of Section                                =    16.500000 ft
Outside Diameter of Casing                       =    24.000000 in
Casing Wall Thickness                            =       0.0000 in
Moment of Inertia of Steel Casing                =       0.0000 in^4
Width Flange of Core/Insert                      =    14.900000 in
Depth of Core/Insert                             =    14.200000 in
Flange Thickness of Core/Insert                  =     0.805000 in
Web Thickness of Core/Insert                     =     0.805000 in
Moment of Inertia of Steel Core/Insert           =        1211. in^4
Yield Stress of Casing                           =       50000. psi
```

Elastic Modulus of Casing = 29000000. psi
Yield Stress of Core/Insert = 50000. psi
Elastic Modulus of Core/Insert = 29000000. psi
Number of Reinforcing Bars = 0 bars
Gross Area of Pile = 452.389342 sq. in.
Area of Concrete = 418.265392 sq. in.
Cross-sectional Area of Steel Casing = 0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert = 34.123950 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars) = 34.123950 sq. in.
Area Ratio of All Steel to Gross Area = 7.54 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3128.300 kips
Tensile Load for Cracking of Concrete = -288.130 kips
Nominal Axial Tensile Capacity = -1706.197 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	483.9280578262	98402501.	12.0000000000	
0.0000098357	547.8658210217	55701840.	9.4666118792	C
0.0000147535	819.9660048544	55577617.	9.4783778602	C

0.0000196714	1091.	55452505.	9.4900875402	C
0.0000245892	1360.	55326491.	9.5018840041	C
0.0000295071	1629.	55199559.	9.5137803907	C
0.0000344249	1896.	55071694.	9.5257784079	C
0.0000393427	2162.	54942882.	9.5378798087	C
0.0000442606	2426.	54813107.	9.5500863932	C
0.0000491784	2689.	54682353.	9.5624000097	C
0.0000540963	2951.	54550604.	9.5748225567	C
0.0000590141	3211.	54417844.	9.5873559851	C
0.0000639320	3470.	54284054.	9.6000022998	C
0.0000688498	3728.	54149219.	9.6128136507	C
0.0000737676	3984.	54013319.	9.6256921077	C
0.0000786855	4239.	53876336.	9.6386894617	C
0.0000836033	4493.	53738251.	9.6518079772	C
0.0000885212	4745.	53599044.	9.6650499842	C
0.0000934390	4995.	53458695.	9.6784178810	C
0.0000983569	5244.	53317184.	9.6919141367	C
0.0001032747	5492.	53174489.	9.7055412943	C
0.0001081925	5738.	53030588.	9.7192638865	C
0.0001131104	5982.	52885560.	9.7329538297	C
0.0001180282	6225.	52739305.	9.7467734287	C
0.0001229461	6466.	52591796.	9.7607307822	C
0.0001278639	6706.	52443008.	9.7748287202	C
0.0001327818	6944.	52292918.	9.7890701628	C
0.0001376996	7180.	52141499.	9.8034581245	C
0.0001426174	7414.	51988725.	9.8179957178	C
0.0001475353	7647.	51834570.	9.8326861573	C
0.0001524531	7879.	51679004.	9.8475327649	C
0.0001573710	8108.	51522000.	9.8625389744	C
0.0001622888	8336.	51363527.	9.8777090093	C
0.0001672067	8562.	51203554.	9.8930452712	C
0.0001721245	8786.	51042050.	9.9085518865	C
0.0001770424	9008.	50878982.	9.9242335917	C
0.0001819602	9228.	50714314.	9.9401017003	C
0.0001868780	9446.	50548013.	9.9561426736	C
0.0001917959	9651.	50316691.	9.9667928811	CY
0.0002016316	9953.	49364758.	9.9453095387	CY
0.0002114673	10100.	47762925.	9.8614668104	CY
0.0002213029	10212.	46146522.	9.7727410217	CY
0.0002311386	10313.	44618447.	9.6882620100	CY
0.0002409743	10403.	43170524.	9.6068690660	CY
0.0002508100	10485.	41804448.	9.5299580709	CY
0.0002606457	10559.	40511464.	9.4562520233	CY
0.0002704814	10627.	39288392.	9.3851393320	CY

0.0002803171	10689.	38131432.	9.3174490971	CY
0.0002901527	10746.	37035316.	9.2527602315	CY
0.0002999884	10798.	35994808.	9.1898376201	CY
0.0003098241	10846.	35007897.	9.1293485656	CY
0.0003196598	10891.	34071206.	9.0715442645	CY
0.0003294955	10933.	33181540.	9.0162300299	CY
0.0003393312	10972.	32334082.	8.9621602836	CY
0.0003491669	11008.	31525666.	8.9095528857	CY
0.0003590025	11041.	30755544.	8.8591229075	CY
0.0003688382	11073.	30021768.	8.8106918549	CY
0.0003786739	11103.	29321948.	8.7643273751	CY
0.0003885096	11131.	28650012.	8.7179786899	CY
0.0003983453	11157.	28008210.	8.6733064948	CY
0.0004081810	11182.	27394500.	8.6304372118	CY
0.0004180167	11205.	26805267.	8.5887154354	CY
0.0004278523	11228.	26241882.	8.5483328517	CY
0.0004376880	11249.	25699823.	8.5092824497	CY
0.0004475237	11268.	25179093.	8.4707792640	CY
0.0004573594	11270.	24640491.	8.4411834821	CY
0.0004671951	11288.	24160763.	8.4054600230	CY
0.0004770308	11288.	23662603.	8.3852064789	CY
0.0004868665	11292.	23193002.	8.3507840823	CY
0.0004967022	11292.	22733735.	8.3361999768	CY
0.0005065378	11292.	22292303.	8.3031913295	CY
0.0005163735	11292.	21867688.	8.2968304685	CY
0.0005262092	11292.	21458946.	8.2677796966	CY
0.0005360449	11292.	21065204.	8.2668842544	CY
0.0005458806	11292.	20685651.	8.2387547995	CY
0.0005557163	11292.	20319533.	8.2389089316	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	11292.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	11.2000	0.00	N.A.	No	0.00	64635.
2	22.0000	10.8000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	42.00

3.32	42.00
6.65	42.00
9.97	42.00
13.30	42.00
16.62	42.00
19.94	42.00
23.27	42.00
26.59	42.00
29.92	42.00
33.24	42.00
36.56	42.00
39.89	42.00
43.21	42.00
46.54	42.00
49.86	42.00
53.18	42.00
56.51	42.00
59.83	42.00
63.16	42.00
66.48	42.00
69.80	42.00
73.13	42.00
76.45	42.00
79.78	42.00
83.10	42.00
86.42	42.00
89.75	42.00
93.07	42.00
96.40	42.00
99.72	42.00
103.04	42.00
106.37	42.00
109.69	42.00
113.02	42.00
116.34	42.00
119.66	42.00
122.99	42.00
126.31	42.00
129.64	42.00
132.96	39.19

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
66.48	0.35
69.80	6.77
73.13	15.41
76.45	24.06
79.78	32.70
83.10	41.34
86.42	49.98
89.75	58.62
93.07	67.27
96.40	75.91
99.72	84.55
103.04	93.19
106.37	101.84
109.69	110.48
113.02	119.12
116.34	127.76
119.66	136.41
122.99	145.05
126.31	153.69
129.64	162.33
132.96	159.29

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.38

3.32	5.53
6.65	11.07
9.97	16.60
13.30	22.14
16.62	27.67
19.94	33.21
23.27	38.74
26.59	44.28
29.92	49.81
33.24	55.35
36.56	60.88
39.89	66.41
43.21	71.95
46.54	77.48
49.86	83.02
53.18	88.55
56.51	94.09
59.83	99.62
63.16	105.16
66.48	110.58
69.80	113.97
73.13	116.63
76.45	119.28
79.78	121.94
83.10	124.60
86.42	127.25
89.75	129.91
93.07	132.56
96.40	135.22
99.72	137.88
103.04	140.53
106.37	143.19
109.69	145.85
113.02	148.50
116.34	151.16
119.66	153.81
122.99	156.47
126.31	159.13
129.64	161.78
132.96	153.37

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.79285	-5.643E-06	-1.061E-07	0.000	3.510E+10
0.27700	1.76455	239.67238	151.10604	0.000	3.510E+10
0.55400	1.73624	1005.	318.30936	0.000	3.510E+10
0.83100	1.70794	2356.	503.90954	0.000	3.510E+10
1.10800	1.67964	4355.	707.90660	0.000	3.510E+10
1.38500	1.65133	7062.	930.30053	0.000	3.510E+10
1.66200	1.62303	10539.	1171.	0.000	3.510E+10
1.93900	1.59474	14847.	1430.	0.000	3.510E+10
2.21600	1.56644	20048.	1708.	0.000	3.510E+10
2.49300	1.53816	26201.	2004.	0.000	3.510E+10
2.77000	1.50988	33369.	2318.	0.000	3.510E+10
3.04700	1.48161	41613.	2651.	0.000	3.510E+10
3.32400	1.45336	50993.	3002.	0.000	3.510E+10
3.60100	1.42512	61571.	3372.	0.000	3.510E+10
3.87800	1.39690	73408.	3760.	0.000	3.510E+10
4.15500	1.36871	86566.	4166.	0.000	3.510E+10
4.43200	1.34054	101104.	4591.	0.000	3.510E+10
4.70900	1.31240	117086.	5034.	0.000	3.510E+10
4.98600	1.28430	134570.	5496.	0.000	3.510E+10
5.26300	1.25625	153620.	5975.	0.000	3.510E+10
5.54000	1.22824	174295.	6474.	0.000	3.510E+10
5.81700	1.20028	196661.	6999.	0.000	3.510E+10
6.09400	1.17239	220824.	7559.	0.000	3.510E+10
6.37100	1.14457	246910.	8156.	0.000	3.510E+10
6.64800	1.11682	275044.	8791.	0.000	3.510E+10
6.92500	1.08916	305351.	9463.	0.000	3.510E+10
7.20200	1.06160	337955.	10173.	0.000	3.510E+10
7.47900	1.03415	372981.	10921.	0.000	3.510E+10
7.75600	1.00681	410555.	11706.	0.000	3.510E+10
8.03300	0.97960	450800.	12528.	0.000	3.510E+10

8.31000	0.95253	493843.	13388.	0.000	3.510E+10
8.58700	0.92562	539807.	14286.	0.000	3.510E+10
8.86400	0.89888	588818.	15222.	0.000	3.510E+10
9.14100	0.87232	640999.	16194.	0.000	3.510E+10
9.41800	0.84597	696478.	17205.	0.000	3.510E+10
9.69500	0.81983	755377.	18253.	0.000	3.510E+10
9.97200	0.79393	817822.	19338.	0.000	3.510E+10
10.24900	0.76829	883937.	20461.	0.000	3.510E+10
10.52600	0.74293	953849.	21622.	0.000	3.510E+10
10.80300	0.71787	1027680.	22820.	0.000	3.510E+10
11.08000	0.69313	1105557.	24013.	0.000	3.510E+10
11.35700	0.66874	1187322.	24581.	-10.4387	5.540E+10
11.63400	0.64459	1268971.	24514.	-29.9723	5.536E+10
11.91100	0.62069	1350289.	24380.	-50.5136	5.533E+10
12.18800	0.59706	1431049.	24177.	-71.5858	5.529E+10
12.46500	0.57371	1511018.	23904.	-92.8001	5.525E+10
12.74200	0.55067	1589961.	23561.	-113.7391	5.522E+10
13.01900	0.52794	1667648.	23149.	-134.0136	5.518E+10
13.29600	0.50555	1743854.	22671.	-153.4350	5.514E+10
13.57300	0.48351	1818365.	22130.	-171.9502	5.510E+10
13.85000	0.46184	1890976.	21530.	-188.9710	5.507E+10
14.12700	0.44054	1961499.	20877.	-204.2047	5.504E+10
14.40400	0.41964	2029766.	20173.	-219.2003	5.500E+10
14.68100	0.39914	2095611.	19422.	-233.0334	5.497E+10
14.95800	0.37907	2158881.	18627.	-244.8298	5.494E+10
15.23500	0.35943	2219446.	17797.	-254.5601	5.491E+10
15.51200	0.34023	2277198.	16936.	-263.8295	5.488E+10
15.78900	0.32150	2332036.	16047.	-270.8203	5.486E+10
16.06600	0.30323	2383881.	15140.	-275.3690	5.483E+10
16.34300	0.28545	2432683.	14218.	-278.9419	5.481E+10
16.62000	0.26815	2478403.	13287.	-281.4614	5.478E+10
16.89700	0.25136	2521014.	12352.	-281.3099	5.476E+10
17.17400	0.23507	2560516.	11421.	-278.3440	5.474E+10
17.45100	0.21930	2596943.	10496.	-278.5852	5.473E+10
17.72800	0.20406	2630292.	9572.	-277.0287	5.471E+10
18.00500	0.18934	2660580.	8658.	-272.9697	5.470E+10
18.28200	0.17517	2687852.	7762.	-266.3431	5.468E+10
18.55900	0.16153	2712181.	6892.	-257.1245	5.467E+10
18.83600	0.14845	2733670.	6057.	-245.3402	5.466E+10
19.11300	0.13592	2752447.	5265.	-231.0766	5.465E+10
19.39000	0.12394	2768671.	4507.	-224.9181	5.464E+10
19.66700	0.11253	2782410.	3764.	-222.1256	5.463E+10
19.94400	0.10167	2793695.	3033.	-218.0726	5.463E+10
20.22100	0.09138	2802571.	2316.	-212.7644	5.462E+10

20.49800	0.08166	2809095.	1620.	-206.2194	5.462E+10
20.77500	0.07251	2813341.	947.54151	-198.4712	5.462E+10
21.05200	0.06392	2815395.	302.61798	-189.5694	5.462E+10
21.32900	0.05591	2815353.	-314.0803	-181.4885	5.462E+10
21.60600	0.04847	2813307.	-905.9018	-174.6014	5.462E+10
21.88300	0.04159	2809331.	-1473.	-166.7555	5.462E+10
22.16000	0.03528	2803513.	-4267.	-1514.	5.462E+10
22.43700	0.02954	2780962.	-9612.	-1701.	5.463E+10
22.71400	0.02436	2739614.	-15534.	-1862.	5.465E+10
22.99100	0.01974	2677693.	-21944.	-1995.	5.469E+10
23.26800	0.01566	2593731.	-28747.	-2098.	5.473E+10
23.54500	0.01210	2486586.	-35839.	-2169.	5.478E+10
23.82200	0.009039	2355473.	-43108.	-2205.	5.484E+10
24.09900	0.006456	2200001.	-50428.	-2199.	5.492E+10
24.37600	0.004315	2020227.	-57649.	-2145.	5.501E+10
24.65300	0.002580	1816754.	-64576.	-2023.	5.511E+10
24.93000	0.001209	1590923.	-70911.	-1788.	5.521E+10
25.20700	0.000157	1345338.	-75356.	-886.8991	5.533E+10
25.48400	-0.000627	1089953.	-73989.	1710.	5.545E+10
25.76100	-0.001193	853462.	-67620.	2122.	5.556E+10
26.03800	-0.001590	640414.	-60102.	2401.	5.565E+10
26.31500	-0.001860	453901.	-51750.	2624.	9.840E+10
26.59200	-0.002079	296380.	-42689.	2828.	9.840E+10
26.86900	-0.002264	170107.	-32965.	3022.	9.840E+10
27.14600	-0.002430	77226.	-22605.	3212.	9.840E+10
27.42300	-0.002588	19830.	-11616.	3400.	9.840E+10
27.70000	-0.002743	0.000	0.000	3589.	9.840E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 1.79285352 inches
Computed slope at pile head = -0.0085153 radians
Maximum bending moment = 2815395. inch-lbs
Maximum shear force = -75356. lbs
Depth of maximum bending moment = 21.05200000 feet below pile head
Depth of maximum shear force = 25.20700000 feet below pile head
Number of iterations = 30
Number of zero deflection points = 1
Pile deflection at ground = 0.68256483 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	42.00
3.32	42.00
6.65	42.00
9.97	42.00
13.30	42.00
16.62	42.00
19.94	42.00
23.27	42.00
26.59	42.00
29.92	42.00
33.24	42.00
36.56	42.00
39.89	42.00
43.21	42.00
46.54	42.00
49.86	42.00
53.18	42.00
56.51	42.00
59.83	42.00
63.16	42.00
66.48	42.00
69.80	42.00
73.13	42.00
76.45	42.00
79.78	42.00
83.10	42.00
86.42	42.00
89.75	42.00
93.07	42.00
96.40	42.00
99.72	42.00
103.04	42.00
106.37	42.00
109.69	42.00
113.02	42.00
116.34	42.00
119.66	42.00

122.99	42.00
126.31	42.00
129.64	42.00
132.96	39.19

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
66.48	0.35
69.80	6.77
73.13	15.41
76.45	24.06
79.78	32.70
83.10	41.34
86.42	49.98
89.75	58.62
93.07	67.27
96.40	75.91
99.72	84.55
103.04	93.19
106.37	101.84
109.69	110.48
113.02	119.12
116.34	127.76
119.66	136.41
122.99	145.05
126.31	153.69
129.64	162.33
132.96	159.29

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.38
3.32	5.53
6.65	11.07
9.97	16.60
13.30	22.14
16.62	27.67
19.94	33.21
23.27	38.74
26.59	44.28
29.92	49.81
33.24	55.35
36.56	60.88
39.89	66.41
43.21	71.95
46.54	77.48
49.86	83.02
53.18	88.55
56.51	94.09
59.83	99.62
63.16	105.16
66.48	110.58
69.80	113.97
73.13	116.63
76.45	119.28
79.78	121.94
83.10	124.60
86.42	127.25
89.75	129.91
93.07	132.56
96.40	135.22
99.72	137.88
103.04	140.53
106.37	143.19
109.69	145.85
113.02	148.50
116.34	151.16
119.66	153.81

122.99	156.47
126.31	159.13
129.64	161.78
132.96	153.37

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	3.11800	9.876E-06	-2.122E-07	0.000	3.510E+10
0.27700	3.07053	417.51574	261.56107	0.000	3.510E+10
0.55400	3.02307	1739.	547.26804	0.000	3.510E+10
0.83100	2.97561	4056.	860.57031	0.000	3.510E+10
1.10800	2.92815	7460.	1201.	0.000	3.510E+10
1.38500	2.88069	12043.	1570.	0.000	3.510E+10
1.66200	2.83323	17897.	1966.	0.000	3.510E+10
1.93900	2.78578	25113.	2390.	0.000	3.510E+10
2.21600	2.73834	33784.	2841.	0.000	3.510E+10
2.49300	2.69091	44000.	3320.	0.000	3.510E+10
2.77000	2.64349	55855.	3826.	0.000	3.510E+10
3.04700	2.59609	69438.	4360.	0.000	3.510E+10
3.32400	2.54872	84843.	4922.	0.000	3.510E+10
3.60100	2.50136	102160.	5511.	0.000	3.510E+10
3.87800	2.45405	121482.	6128.	0.000	3.510E+10
4.15500	2.40677	142900.	6773.	0.000	3.510E+10
4.43200	2.35953	166506.	7445.	0.000	3.510E+10
4.70900	2.31235	192392.	8144.	0.000	3.510E+10
4.98600	2.26522	220650.	8872.	0.000	3.510E+10
5.26300	2.21817	251370.	9626.	0.000	3.510E+10
5.54000	2.17120	284646.	10409.	0.000	3.510E+10
5.81700	2.12431	320570.	11225.	0.000	3.510E+10

6.09400	2.07753	359270.	12081.	0.000	3.510E+10
6.37100	2.03086	400885.	12979.	0.000	3.510E+10
6.64800	1.98431	445555.	13919.	0.000	3.510E+10
6.92500	1.93791	493419.	14901.	0.000	3.510E+10
7.20200	1.89166	544618.	15925.	0.000	3.510E+10
7.47900	1.84558	599289.	16991.	0.000	3.510E+10
7.75600	1.79969	657573.	18099.	0.000	3.510E+10
8.03300	1.75401	719610.	19249.	0.000	3.510E+10
8.31000	1.70856	785539.	20441.	0.000	3.510E+10
8.58700	1.66335	855499.	21674.	0.000	3.510E+10
8.86400	1.61841	929630.	22950.	0.000	3.510E+10
9.14100	1.57377	1008072.	24268.	0.000	3.510E+10
9.41800	1.52944	1090963.	25628.	0.000	3.510E+10
9.69500	1.48545	1178444.	27029.	0.000	3.510E+10
9.97200	1.44184	1270654.	28473.	0.000	3.510E+10
10.24900	1.39862	1367732.	29959.	0.000	3.510E+10
10.52600	1.35584	1469818.	31486.	0.000	3.510E+10
10.80300	1.31352	1577052.	33056.	0.000	3.510E+10
11.08000	1.27169	1689573.	34612.	0.000	3.510E+10
11.35700	1.23040	1807154.	35354.	-11.7812	5.511E+10
11.63400	1.18947	1924604.	35277.	-34.3837	5.506E+10
11.91100	1.14893	2041675.	35122.	-58.9546	5.500E+10
12.18800	1.10879	2158094.	34882.	-85.0844	5.494E+10
12.46500	1.06909	2273573.	34555.	-112.1140	5.488E+10
12.74200	1.02985	2387813.	34136.	-139.7178	5.483E+10
13.01900	0.99109	2500510.	33626.	-167.4711	5.477E+10
13.29600	0.95283	2611356.	33023.	-195.1213	5.472E+10
13.57300	0.91510	2720047.	32329.	-222.5328	5.467E+10
13.85000	0.87792	2826278.	31550.	-245.9914	5.461E+10
14.12700	0.84131	2929792.	30700.	-265.2295	5.456E+10
14.40400	0.80530	3030375.	29787.	-284.1387	5.451E+10
14.68100	0.76990	3127819.	28814.	-301.5254	5.446E+10
14.95800	0.73513	3221931.	27787.	-316.3830	5.441E+10
15.23500	0.70102	3312547.	26715.	-328.7485	5.436E+10
15.51200	0.66758	3399531.	25603.	-340.2459	5.432E+10
15.78900	0.63484	3482756.	24457.	-349.0783	5.428E+10
16.06600	0.60280	3562124.	23287.	-355.1045	5.423E+10
16.34300	0.57149	3637568.	22097.	-361.0740	5.419E+10
16.62000	0.54092	3709023.	20887.	-367.0397	5.416E+10
16.89700	0.51110	3776422.	19661.	-370.2685	5.412E+10
17.17400	0.48206	3839730.	18430.	-370.6100	5.409E+10
17.45100	0.45380	3898943.	17189.	-376.1518	5.406E+10
17.72800	0.42634	3954001.	15932.	-380.2157	5.403E+10
18.00500	0.39969	4004857.	14665.	-381.8474	5.400E+10

18.28200	0.37385	4051494.	13398.	-380.6926	5.398E+10
18.55900	0.34885	4093925.	12139.	-376.3877	5.395E+10
18.83600	0.32468	4132197.	10901.	-368.7887	5.393E+10
19.11300	0.30136	4166395.	9693.	-357.7912	5.391E+10
19.39000	0.27890	4196639.	8509.	-355.0671	5.390E+10
19.66700	0.25729	4222960.	7327.	-355.7654	5.388E+10
19.94400	0.23655	4245351.	6146.	-354.7503	5.387E+10
20.22100	0.21669	4263822.	4972.	-351.9782	5.386E+10
20.49800	0.19769	4278403.	3809.	-347.4180	5.385E+10
20.77500	0.17958	4289146.	2665.	-341.0532	5.385E+10
21.05200	0.16234	4296121.	1545.	-332.8828	5.384E+10
21.32900	0.14598	4299418.	451.18564	-325.2897	5.384E+10
21.60600	0.13051	4299121.	-619.4143	-318.8740	5.384E+10
21.88300	0.11592	4295300.	-1666.	-310.9916	5.384E+10
22.16000	0.10221	4288043.	-5467.	-1976.	5.385E+10
22.43700	0.08939	4258957.	-12479.	-2244.	5.387E+10
22.71400	0.07743	4205080.	-20340.	-2486.	5.389E+10
22.99100	0.06634	4123735.	-28961.	-2701.	5.394E+10
23.26800	0.05609	4012547.	-38247.	-2887.	5.400E+10
23.54500	0.04666	3869466.	-48097.	-3040.	5.407E+10
23.82200	0.03803	3692797.	-58397.	-3157.	5.417E+10
24.09900	0.03014	3481242.	-69018.	-3233.	5.428E+10
24.37600	0.02297	3233965.	-79806.	-3258.	5.441E+10
24.65300	0.01645	2950692.	-90564.	-3215.	5.455E+10
24.93000	0.01053	2631894.	-101012.	-3071.	5.471E+10
25.20700	0.005143	2279162.	-110655.	-2731.	5.488E+10
25.48400	0.000213	1896261.	-117311.	-1274.	5.507E+10
25.76100	-0.004336	1499280.	-114561.	2929.	5.526E+10
26.03800	-0.008586	1134663.	-103609.	3660.	5.543E+10
26.31500	-0.0126	810487.	-90490.	4233.	5.558E+10
26.59200	-0.0165	533087.	-75569.	4744.	6.124E+10
26.86900	-0.0202	308105.	-59001.	5225.	9.840E+10
27.14600	-0.0240	140849.	-40861.	5690.	9.840E+10
27.42300	-0.0277	36463.	-21187.	6147.	9.840E+10
27.70000	-0.0314	0.000	0.000	6600.	9.840E+10

Output Summary for Load Case No. 2:

Pile-head deflection = 3.11799708 inches
Computed slope at pile head = -0.0142790 radians
Maximum bending moment = 4299418. inch-lbs
Maximum shear force = -117311. lbs
Depth of maximum bending moment = 21.32900000 feet below pile head
Depth of maximum shear force = 25.48400000 feet below pile head

Number of iterations = 35
Number of zero deflection points = 1
Pile deflection at ground = 1.25380467 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	1.7928535	2815395.	-75356.	-0.008515
2	3.1179971	4299418.	-117311.	-0.014279

Maximum pile-head deflection = 3.1179970831 inches
Maximum pile-head rotation = -0.0142789681 radians = -0.818125 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	9597992.	1105557.	Pass
	2	1.00	11291895.	2815395.	Pass
2	1	1.00	9597992.	1689573.	Pass
	2	1.00	11291895.	4299418.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section

1	1	1.00	294150.	24013.	Pass
	2	1.00	294150.	-75356.	Pass
2	1	1.00	294150.	34612.	Pass
	2	1.00	294150.	-117311.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -117310.89 lbs
Factored Shear Capacity at Node = 294150.00 lbs
Fraction of Allowable Shear Capacity = 0.3988

The analysis ended normally.

==

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1162.0 RT Pile 4 7.lp12d

Name of the output report file:
BEL-70 1162.0 RT Pile 4 7.lp12o

Name of the plot output file:
BEL-70 1162.0 RT Pile 4 7.lp12p

Name of the runtime message file:
BEL-70 1162.0 RT Pile 4 7.lp12r

Date and Time of Analysis

Date: June 22, 2026 Time: 22:44:37

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1162+0 RT Piles 4 7 - 13.9' Ht.(5' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 28.400 ft
Depth of ground surface below top of pile = 13.9000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	15.5000
2	13.900	15.5000
3	13.900	24.0000
4	28.400	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 13.900000 ft
   AISC Section Type = W

   AISC Section Name = W14X145

   Pile width = 15.500000 in
   Shear capacity of section = 248470. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 14.500000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 248470. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 13.900000 ft
   Distance from top of pile to bottom of layer = 22.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	22.000000	ft
Distance from top of pile to bottom of layer	=	50.000000	ft
Effective unit weight at top of layer	=	77.600000	pcf
Effective unit weight at bottom of layer	=	77.600000	pcf
Uniaxial compressive strength at top of layer	=	100.000000	psi
Uniaxial compressive strength at bottom of layer	=	100.000000	psi
Initial modulus of rock at top of layer	=	18000.	psi
Initial modulus of rock at bottom of layer	=	18000.	psi
RQD of rock at top of layer	=	20.000000	%
RQD of rock at bottom of layer	=	20.000000	%
k rm of rock at top of layer	=	0.0005000	
k rm of rock at bottom of layer	=	0.0005000	

(Depth of the lowest soil layer extends 21.600 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 3

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2
3	Live Load (LL)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	6.95	115.72
3	13.90	171.26

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	6.95	0.00
2	13.90	180.70

Number of Distributed Loading Points Input for Load Group 3 = 2

Point	Depth ft	Distributed Load lb/inch
1	0.00	35.00
2	13.90	35.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 3

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	1
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1

Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

---

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*LL + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.75*LL + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section = 13.900000 ft

```
Flange Width                                        =    15.500000 in
Section Depth                                       =    14.800000 in
Flange Thickness                                    =     1.090000 in
Web Thickness                                       =     0.680000 in
Yield Stress of Pipe                                =    50.000000 ksi
Elastic Modulus                                     =       29000. ksi
Cross-sectional Area                                =    42.700000 sq. in.
Moment of Inertia                                   =        1710. in^4
Elastic Bending Stiffness                           =    49590000. kip-in^2
Plastic Modulus, Z                                  =   260.000000in^3
Plastic Moment Capacity = Fy Z                      =       13000.in-kip

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = Fy As              =     2135.000 kips
Nominal Axial Tensile Capacity                      =    -2135.000 kips



Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

   Number     Axial Thrust Force
                   kips
   ------     ------------------
      1               0.000

Definition of Run Messages:

   Y = part of pipe section has yielded.


Axial Thrust Force =      0.000 kips

     Bending            Bending            Bending           Depth to       Run
    Curvature           Moment            Stiffness          N Axis        Msg
     rad/in.            in-kip             kip-in2             in
----------------   ----------------   ----------------   ----------------   ---
    0.0000047275     233.6187730474          49417242.       7.4000000000
    0.0000094549     467.2375460949          49417242.       7.4000000000
    0.0000141824     700.8563191423          49417242.       7.4000000000
    0.0000189099     934.4750921898          49417242.       7.4000000000
    0.0000236374              1168.          49417242.       7.4000000000
```

0.0000283648	1402.	49417242.	7.4000000000	
0.0000330923	1635.	49417242.	7.4000000000	
0.0000378198	1869.	49417242.	7.4000000000	
0.0000425473	2103.	49417242.	7.4000000000	
0.0000472747	2336.	49417242.	7.4000000000	
0.0000520022	2570.	49417242.	7.4000000000	
0.0000567297	2803.	49417242.	7.4000000000	
0.0000614572	3037.	49417242.	7.4000000000	
0.0000661846	3271.	49417242.	7.4000000000	
0.0000709121	3504.	49417242.	7.4000000000	
0.0000756396	3738.	49417242.	7.4000000000	
0.0000803671	3972.	49417242.	7.4000000000	
0.0000850945	4205.	49417242.	7.4000000000	
0.0000898220	4439.	49417242.	7.4000000000	
0.0000945495	4672.	49417242.	7.4000000000	
0.0000992770	4906.	49417242.	7.4000000000	
0.0001040044	5140.	49417242.	7.4000000000	
0.0001087319	5373.	49417242.	7.4000000000	
0.0001134594	5607.	49417242.	7.4000000000	
0.0001181869	5840.	49417242.	7.4000000000	
0.0001229143	6074.	49417242.	7.4000000000	
0.0001276418	6308.	49417242.	7.4000000000	
0.0001323693	6541.	49417242.	7.4000000000	
0.0001370968	6775.	49417242.	7.4000000000	
0.0001418242	7009.	49417242.	7.4000000000	
0.0001465517	7242.	49417242.	7.4000000000	
0.0001512792	7476.	49417242.	7.4000000000	
0.0001560067	7709.	49417242.	7.4000000000	
0.0001607341	7943.	49417242.	7.4000000000	
0.0001654616	8177.	49417242.	7.4000000000	
0.0001701891	8410.	49417242.	7.4000000000	
0.0001749166	8644.	49417242.	7.4000000000	
0.0001796440	8878.	49417242.	7.4000000000	
0.0001843715	9111.	49417242.	7.4000000000	
0.0001938265	9578.	49417242.	7.4000000000	
0.0002032814	10046.	49417242.	7.4000000000	
0.0002127364	10513.	49417242.	7.4000000000	
0.0002221913	10980.	49417242.	7.4000000000	
0.0002316463	11447.	49417242.	7.4000000000	
0.0002411012	11867.	49221061.	7.4000000000	Y
0.0002505562	12167.	48560469.	7.4000000000	Y
0.0002600111	12356.	47522139.	7.4000000000	Y
0.0002694661	12459.	46235606.	7.4000000000	Y
0.0002789210	12498.	44809721.	7.4000000000	Y

0.0002883760	12526.	43437678.	7.4000000000	Y
0.0002978309	12552.	42143335.	7.4000000000	Y
0.0003072859	12575.	40921494.	7.4000000000	Y
0.0003167408	12596.	39766298.	7.4000000000	Y
0.0003261958	12615.	38672543.	7.4000000000	Y
0.0003356507	12632.	37635579.	7.4000000000	Y
0.0003451057	12649.	36651240.	7.4000000000	Y
0.0003545606	12663.	35715777.	7.4000000000	Y
0.0003640156	12677.	34825801.	7.4000000000	Y
0.0003734705	12690.	33978245.	7.4000000000	Y
0.0003829255	12702.	33170315.	7.4000000000	Y
0.0003923804	12713.	32398751.	7.4000000000	Y
0.0004018354	12723.	31661575.	7.4000000000	Y
0.0004112903	12732.	30956971.	7.4000000000	Y
0.0004207453	12741.	30282326.	7.4000000000	Y
0.0004302002	12749.	29635857.	7.4000000000	Y
0.0004396552	12757.	29016551.	7.4000000000	Y
0.0004491101	12764.	28421440.	7.4000000000	Y
0.0004585651	12771.	27850558.	7.4000000000	Y
0.0004680200	12778.	27301368.	7.4000000000	Y
0.0004774750	12784.	26773610.	7.4000000000	Y
0.0004869299	12789.	26265169.	7.4000000000	Y
0.0004963849	12795.	25776004.	7.4000000000	Y
0.0005058398	12800.	25303897.	7.4000000000	Y
0.0005152948	12805.	24849115.	7.4000000000	Y
0.0005247497	12809.	24409860.	7.4000000000	Y
0.0005342047	12813.	23985855.	7.4000000000	Y
0.0005436596	12818.	23576400.	7.4000000000	Y
0.0005531146	12821.	23180128.	7.4000000000	Y
0.0005625695	12825.	22797175.	7.4000000000	Y
0.0006003893	12838.	21382866.	7.4000000000	Y
0.0006382091	12849.	20132461.	7.4000000000	Y
0.0006760289	12858.	19019465.	7.4000000000	Y
0.0007138487	12865.	18022514.	7.4000000000	Y
0.0007516685	12872.	17124492.	7.4000000000	Y
0.0007894883	12877.	16311040.	7.4000000000	Y
0.0008273081	12882.	15571184.	7.4000000000	Y
0.0008651279	12887.	14895523.	7.4000000000	Y
0.0009029477	12890.	14275543.	7.4000000000	Y
0.0009407675	12893.	13705224.	7.4000000000	Y
0.0009785873	12896.	13178395.	7.4000000000	Y
0.0010164071	12899.	12690715.	7.4000000000	Y
0.0010542269	12901.	12237473.	7.4000000000	Y
0.0010920467	12903.	11815625.	7.4000000000	Y

```
    0.0011298665             12905.          11421763.       7.4000000000    Y
    0.0011676863             12907.          11053205.       7.4000000000    Y


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
--------------------------------------------------------------------------------

                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------          ----------------
  1               0.00000000                   12907.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.




Pile Section No. 2:
-------------------

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
--------------------------------------------------------------------------------

Length of Section                                =    14.500000 ft
Outside Diameter of Casing                       =    24.000000 in
Casing Wall Thickness                            =       0.0000 in
Moment of Inertia of Steel Casing                =       0.0000 in^4
Width Flange of Core/Insert                      =    15.500000 in
Depth of Core/Insert                             =    14.800000 in
Flange Thickness of Core/Insert                  =     1.090000 in
Web Thickness of Core/Insert                     =     0.680000 in
Moment of Inertia of Steel Core/Insert           =        1705. in^4
Yield Stress of Casing                           =       50000. psi
```

```
Elastic Modulus of Casing                              =    29000000. psi
Yield Stress of Core/Insert                            =       50000. psi
Elastic Modulus of Core/Insert                         =    29000000. psi
Number of Reinforcing Bars                             =           0 bars
Gross Area of Pile                                     =   452.389342 sq. in.
Area of Concrete                                       =   410.017742 sq. in.
Cross-sectional Area of Steel Casing                   =      0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert              =    42.371600 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)      =    42.371600 sq. in.
Area Ratio of All Steel to Gross Area                  =         9.37 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As    =     3512.640 kips
Tensile Load for Cracking of Concrete                  =     -312.295 kips
Nominal Axial Tensile Capacity                         =    -2118.580 kips



Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

   Number     Axial Thrust Force
                   kips
   ------     ------------------
      1               0.000

Definition of Run Messages:

   Y = part of pipe section has yielded.


Axial Thrust Force =      0.000 kips

     Bending            Bending            Bending           Depth to       Run
    Curvature           Moment            Stiffness          N Axis        Msg
     rad/in.            in-kip             kip-in2             in
----------------   ----------------   ----------------   ----------------   ---
    0.0000047275     523.0278744443         110635779.      12.0000000000
    0.0000094549               1040.        109991357.      12.0000000000
    0.0000141824               1040.         73327571.       9.8529510573   C
```

0.0000189099	1334.	70523869.	9.8637330164	C
0.0000236374	1664.	70384272.	9.8745872197	C
0.0000283648	1992.	70243784.	9.8855219415	C
0.0000330923	2320.	70102393.	9.8965384109	C
0.0000378198	2646.	69960084.	9.9076378853	C
0.0000425473	2971.	69816846.	9.9188216514	C
0.0000472747	3294.	69672665.	9.9300910260	C
0.0000520022	3616.	69527527.	9.9414473574	C
0.0000567297	3936.	69381418.	9.9528920256	C
0.0000614572	4255.	69234340.	9.9643517323	C
0.0000661846	4572.	69086297.	9.9758269337	C
0.0000709121	4888.	68937253.	9.9873926060	C
0.0000756396	5203.	68787192.	9.9990502168	C
0.0000803671	5516.	68636100.	10.0108012710	C
0.0000850945	5828.	68483961.	10.0226473108	C
0.0000898220	6138.	68330759.	10.0345899178	C
0.0000945495	6446.	68176476.	10.0466307143	C
0.0000992770	6753.	68021097.	10.0587713636	C
0.0001040044	7058.	67864604.	10.0710135733	C
0.0001087319	7362.	67706979.	10.0833590952	C
0.0001134594	7664.	67548203.	10.0958097278	C
0.0001181869	7964.	67388259.	10.1083673177	C
0.0001229143	8263.	67227127.	10.1210337614	C
0.0001276418	8560.	67064787.	10.1338110069	C
0.0001323693	8856.	66901219.	10.1467010558	C
0.0001370968	9149.	66736402.	10.1597059654	C
0.0001418242	9441.	66570314.	10.1728373440	C
0.0001465517	9731.	66402935.	10.1860775052	C
0.0001512792	10020.	66234241.	10.1994350331	C
0.0001560067	10306.	66064346.	10.2127378158	C
0.0001607341	10591.	65893116.	10.2261595186	C
0.0001654616	10874.	65720522.	10.2397062636	C
0.0001701891	11155.	65546538.	10.2533806681	C
0.0001749166	11434.	65371140.	10.2671847337	C
0.0001796440	11712.	65194301.	10.2811213167	C
0.0001843715	11987.	65015995.	10.2951931030	C
0.0001938265	12516.	64572472.	10.3179293072	CY
0.0002032814	12922.	63565521.	10.2989091244	CY
0.0002127364	13154.	61834407.	10.2207750753	CY
0.0002221913	13266.	59703397.	10.1043499212	CY
0.0002316463	13366.	57700938.	9.9949579222	CY
0.0002411012	13457.	55815242.	9.8903052498	CY
0.0002505562	13540.	54041564.	9.7911041190	CY
0.0002600111	13616.	52367995.	9.6967021944	CY

0.0002694661	13686.	50788192.	9.6059739575	CY
0.0002789210	13750.	49297439.	9.5199799261	CY
0.0002883760	13809.	47885359.	9.4372890408	CY
0.0002978309	13863.	46547968.	9.3577188826	CY
0.0003072859	13914.	45281370.	9.2821391095	CY
0.0003167408	13962.	44078993.	9.2093187473	CY
0.0003261958	14005.	42935184.	9.1388160981	CY
0.0003356507	14046.	41848449.	9.0714233400	CY
0.0003451057	14085.	40814682.	9.0071054741	CY
0.0003545606	14121.	39827344.	8.9440716460	CY
0.0003640156	14155.	38884722.	8.8832712224	CY
0.0003734705	14186.	37985433.	8.8250527111	CY
0.0003829255	14217.	37127047.	8.7692590613	CY
0.0003923804	14245.	36303980.	8.7143646723	CY
0.0004018354	14271.	35515136.	8.6611645751	CY
0.0004112903	14297.	34760397.	8.6101991319	CY
0.0004207453	14321.	34036349.	8.5609732451	CY
0.0004302002	14344.	33341520.	8.5133353800	CY
0.0004396552	14365.	32672966.	8.4663291104	CY
0.0004491101	14385.	32029647.	8.4187037880	CY
0.0004585651	14404.	31412057.	8.3770568764	CY
0.0004680200	14407.	30782612.	8.3417359567	CY
0.0004774750	14424.	30209634.	8.3019375886	CY
0.0004869299	14424.	29623040.	8.2804011288	CY
0.0004963849	14424.	29059001.	8.2441570712	CY
0.0005058398	14424.	28515842.	8.2277824990	CY
0.0005152948	14424.	27992616.	8.1931431145	CY
0.0005247497	14424.	27488244.	8.1808932451	CY
0.0005342047	14424.	27001727.	8.1481966078	CY
0.0005436596	14424.	26532132.	8.1488119268	CY
0.0005531146	14424.	26078591.	8.1219126958	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	14424.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	13.9000	0.00	N.A.	No	0.00	34270.
2	22.0000	8.1000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in

0.00	35.00
3.41	35.00
6.82	35.00
10.22	35.00
13.63	35.00
17.04	35.00
20.45	35.00
23.86	35.00
27.26	35.00
30.67	35.00
34.08	35.00
37.49	35.00
40.90	35.00
44.30	35.00
47.71	35.00
51.12	35.00
54.53	35.00
57.94	35.00
61.34	35.00
64.75	35.00
68.16	35.00
71.57	35.00
74.98	35.00
78.38	35.00
81.79	35.00
85.20	35.00
88.61	35.00
92.02	35.00
95.42	35.00
98.83	35.00
102.24	35.00
105.65	35.00
109.06	35.00
112.46	35.00
115.87	35.00
119.28	35.00
122.69	35.00
126.10	35.00
129.50	35.00
132.91	35.00
136.32	35.00
139.73	35.00
143.14	35.00

146.54	35.00
149.95	35.00
153.36	35.00
156.77	35.00
160.18	35.00
163.58	35.00
166.99	15.53

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
81.79	0.00
85.20	3.90
88.61	11.28
92.02	18.67
95.42	26.05
98.83	33.44
102.24	40.82
105.65	48.20
109.06	55.59
112.46	62.97
115.87	70.36
119.28	77.74
122.69	85.12
126.10	92.51
129.50	99.89
132.91	107.28
136.32	114.66
139.73	122.04
143.14	129.43
146.54	136.81
149.95	144.20
153.36	151.58
156.77	158.96
160.18	166.35

163.58	173.73
166.99	79.44

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.18
3.41	4.73
6.82	9.46
10.22	14.19
13.63	18.91
17.04	23.64
20.45	28.37
23.86	33.10
27.26	37.83
30.67	42.56
34.08	47.29
37.49	52.02
40.90	56.74
44.30	61.47
47.71	66.20
51.12	70.93
54.53	75.66
57.94	80.39
61.34	85.12
64.75	89.85
68.16	94.57
71.57	99.30
74.98	104.03
78.38	108.76
81.79	113.49
85.20	116.92
88.61	119.19
92.02	121.46
95.42	123.73

98.83	126.00
102.24	128.27
105.65	130.54
109.06	132.81
112.46	135.08
115.87	137.34
119.28	139.61
122.69	141.88
126.10	144.15
129.50	146.42
132.91	148.69
136.32	150.96
139.73	153.23
143.14	155.50
146.54	157.77
149.95	160.04
153.36	162.31
156.77	164.58
160.18	166.85
163.58	169.12
166.99	75.76

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.91805	-7.275E-05	1.386E-07	0.000	4.942E+10
0.28400	1.88937	210.11823	129.35214	0.000	4.942E+10
0.56800	1.86069	881.66409	272.80526	0.000	4.942E+10
0.85200	1.83200	2070.	432.37380	0.000	4.942E+10
1.13600	1.80332	3829.	608.05776	0.000	4.942E+10

1.42000	1.77464	6214.	799.85714	0.000	4.942E+10
1.70400	1.74596	9281.	1008.	0.000	4.942E+10
1.98800	1.71729	13083.	1232.	0.000	4.942E+10
2.27200	1.68861	17677.	1472.	0.000	4.942E+10
2.55600	1.65994	23116.	1728.	0.000	4.942E+10
2.84000	1.63128	29456.	2001.	0.000	4.942E+10
3.12400	1.60262	36752.	2289.	0.000	4.942E+10
3.40800	1.57397	45058.	2594.	0.000	4.942E+10
3.69200	1.54534	54430.	2914.	0.000	4.942E+10
3.97600	1.51671	64923.	3251.	0.000	4.942E+10
4.26000	1.48810	76591.	3604.	0.000	4.942E+10
4.54400	1.45951	89489.	3973.	0.000	4.942E+10
4.82800	1.43094	103673.	4358.	0.000	4.942E+10
5.11200	1.40239	119196.	4760.	0.000	4.942E+10
5.39600	1.37387	136115.	5177.	0.000	4.942E+10
5.68000	1.34539	154484.	5611.	0.000	4.942E+10
5.96400	1.31694	174358.	6060.	0.000	4.942E+10
6.24800	1.28853	195791.	6526.	0.000	4.942E+10
6.53200	1.26016	218840.	7008.	0.000	4.942E+10
6.81600	1.23185	243558.	7506.	0.000	4.942E+10
7.10000	1.20360	270000.	8025.	0.000	4.942E+10
7.38400	1.17541	298253.	8572.	0.000	4.942E+10
7.66800	1.14728	328427.	9152.	0.000	4.942E+10
7.95200	1.11924	360635.	9766.	0.000	4.942E+10
8.23600	1.09128	394990.	10412.	0.000	4.942E+10
8.52000	1.06341	431602.	11091.	0.000	4.942E+10
8.80400	1.03565	470585.	11803.	0.000	4.942E+10
9.08800	1.00800	512051.	12548.	0.000	4.942E+10
9.37200	0.98046	556111.	13326.	0.000	4.942E+10
9.65600	0.95306	602878.	14136.	0.000	4.942E+10
9.94000	0.92580	652463.	14980.	0.000	4.942E+10
10.22400	0.89869	704980.	15856.	0.000	4.942E+10
10.50800	0.87175	760540.	16766.	0.000	4.942E+10
10.79200	0.84498	819255.	17708.	0.000	4.942E+10
11.07600	0.81841	881237.	18683.	0.000	4.942E+10
11.36000	0.79205	946598.	19691.	0.000	4.942E+10
11.64400	0.76591	1015452.	20732.	0.000	4.942E+10
11.92800	0.74000	1087909.	21806.	0.000	4.942E+10
12.21200	0.71436	1164081.	22913.	0.000	4.942E+10
12.49600	0.68898	1244082.	24052.	0.000	4.942E+10
12.78000	0.66390	1328023.	25225.	0.000	4.942E+10
13.06400	0.63913	1416015.	26430.	0.000	4.942E+10
13.34800	0.61470	1508172.	27669.	0.000	4.942E+10
13.63200	0.59061	1604606.	28940.	0.000	4.942E+10

13.91600	0.56691	1705428.	29873.	-0.9743	7.036E+10
14.20000	0.54349	1808222.	30130.	-19.0665	7.032E+10
14.48400	0.52036	1910794.	30032.	-38.3196	7.027E+10
14.76800	0.49755	2012921.	29868.	-58.2332	7.023E+10
15.05200	0.47508	2114372.	29635.	-78.4087	7.019E+10
15.33600	0.45295	2214912.	29333.	-98.4886	7.014E+10
15.62000	0.43119	2314308.	28964.	-118.0263	7.010E+10
15.90400	0.40982	2412334.	28530.	-136.6489	7.006E+10
16.18800	0.38884	2508772.	28034.	-154.5754	7.002E+10
16.47200	0.36828	2603415.	27479.	-171.0069	6.998E+10
16.75600	0.34815	2696072.	26872.	-185.5966	6.994E+10
17.04000	0.32847	2786573.	26216.	-199.1485	6.989E+10
17.32400	0.30926	2874761.	25516.	-211.8068	6.986E+10
17.60800	0.29052	2960490.	24776.	-222.2933	6.982E+10
17.89200	0.27227	3043636.	24005.	-230.3662	6.978E+10
18.17600	0.25453	3124107.	23207.	-238.0751	6.974E+10
18.46000	0.23731	3201813.	22386.	-243.4974	6.971E+10
18.74400	0.22063	3276690.	21551.	-246.4202	6.968E+10
19.02800	0.20449	3348706.	20709.	-247.7639	6.965E+10
19.31200	0.18891	3417844.	19865.	-247.6927	6.961E+10
19.59600	0.17389	3484105.	19026.	-244.8114	6.958E+10
19.88000	0.15947	3547523.	18201.	-239.0139	6.956E+10
20.16400	0.14563	3608164.	17392.	-235.7379	6.953E+10
20.44800	0.13239	3666068.	16598.	-230.3117	6.950E+10
20.73200	0.11977	3721297.	15827.	-222.3087	6.948E+10
21.01600	0.10777	3773944.	15087.	-211.7595	6.945E+10
21.30000	0.09640	3824131.	14388.	-198.7645	6.943E+10
21.58400	0.08567	3872010.	13736.	-183.5061	6.941E+10
21.86800	0.07559	3917757.	13140.	-166.2604	6.939E+10
22.15200	0.06617	3961574.	9852.	-1763.	6.937E+10
22.43600	0.05741	3984911.	3427.	-2008.	6.936E+10
22.72000	0.04931	3984932.	-3789.	-2227.	6.936E+10
23.00400	0.04188	3959087.	-11708.	-2421.	6.937E+10
23.28800	0.03512	3905128.	-20241.	-2587.	6.939E+10
23.57200	0.02901	3821125.	-29290.	-2724.	6.943E+10
23.85600	0.02354	3705487.	-38753.	-2830.	6.948E+10
24.14000	0.01868	3556982.	-48521.	-2902.	6.955E+10
24.42400	0.01443	3374771.	-58470.	-2937.	6.963E+10
24.70800	0.01073	3158450.	-68465.	-2928.	6.973E+10
24.99200	0.007561	2908117.	-78341.	-2867.	6.984E+10
25.27600	0.004875	2624482.	-87886.	-2734.	6.997E+10
25.56000	0.002625	2309087.	-96778.	-2484.	7.011E+10
25.84400	0.000757	1964846.	-104288.	-1924.	7.025E+10
26.12800	-0.000786	1598259.	-104080.	2046.	7.041E+10

26.41200	-0.002065	1255438.	-95927.	2739.	7.112E+10
26.69600	-0.003139	944424.	-85826.	3189.	1.101E+11
26.98000	-0.004113	670446.	-74309.	3570.	1.103E+11
27.26400	-0.005017	437931.	-61550.	3918.	1.106E+11
27.54800	-0.005875	250921.	-47634.	4249.	1.106E+11
27.83200	-0.006706	113259.	-32606.	4570.	1.106E+11
28.11600	-0.007526	28679.	-16617.	4813.	1.106E+11
28.40000	-0.008343	0.000	0.000	4939.	1.106E+11

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     1.91804997 inches
Computed slope at pile head      =     -0.0084161 radians
Maximum bending moment           =       3984932. inch-lbs
Maximum shear force              =       -104288. lbs
Depth of maximum bending moment  =    22.72000000 feet below pile head
Depth of maximum shear force     =    25.84400000 feet below pile head
Number of iterations             =             35
Number of zero deflection points =              1
Pile deflection at ground        =     0.56824566 inches
```

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	35.00
3.41	35.00
6.82	35.00
10.22	35.00
13.63	35.00
17.04	35.00
20.45	35.00
23.86	35.00
27.26	35.00
30.67	35.00
34.08	35.00
37.49	35.00

40.90	35.00
44.30	35.00
47.71	35.00
51.12	35.00
54.53	35.00
57.94	35.00
61.34	35.00
64.75	35.00
68.16	35.00
71.57	35.00
74.98	35.00
78.38	35.00
81.79	35.00
85.20	35.00
88.61	35.00
92.02	35.00
95.42	35.00
98.83	35.00
102.24	35.00
105.65	35.00
109.06	35.00
112.46	35.00
115.87	35.00
119.28	35.00
122.69	35.00
126.10	35.00
129.50	35.00
132.91	35.00
136.32	35.00
139.73	35.00
143.14	35.00
146.54	35.00
149.95	35.00
153.36	35.00
156.77	35.00
160.18	35.00
163.58	35.00
166.99	15.53

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
81.79	0.00
85.20	3.90
88.61	11.28
92.02	18.67
95.42	26.05
98.83	33.44
102.24	40.82
105.65	48.20
109.06	55.59
112.46	62.97
115.87	70.36
119.28	77.74
122.69	85.12
126.10	92.51
129.50	99.89
132.91	107.28
136.32	114.66
139.73	122.04
143.14	129.43
146.54	136.81
149.95	144.20
153.36	151.58
156.77	158.96
160.18	166.35
163.58	173.73
166.99	79.44

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth	Distributed Load

in	lb/in
0.00	1.18
3.41	4.73
6.82	9.46
10.22	14.19
13.63	18.91
17.04	23.64
20.45	28.37
23.86	33.10
27.26	37.83
30.67	42.56
34.08	47.29
37.49	52.02
40.90	56.74
44.30	61.47
47.71	66.20
51.12	70.93
54.53	75.66
57.94	80.39
61.34	85.12
64.75	89.85
68.16	94.57
71.57	99.30
74.98	104.03
78.38	108.76
81.79	113.49
85.20	116.92
88.61	119.19
92.02	121.46
95.42	123.73
98.83	126.00
102.24	128.27
105.65	130.54
109.06	132.81
112.46	135.08
115.87	137.34
119.28	139.61
122.69	141.88
126.10	144.15
129.50	146.42
132.91	148.69
136.32	150.96
139.73	153.23

143.14	155.50
146.54	157.77
149.95	160.04
153.36	162.31
156.77	164.58
160.18	166.85
163.58	169.12
166.99	75.76

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	3.50556	-6.991E-05	0.000	0.000	4.942E+10
0.28400	3.45553	365.99071	223.84821	0.000	4.942E+10
0.56800	3.40551	1526.	468.84789	0.000	4.942E+10
0.85200	3.35548	3562.	738.02070	0.000	4.942E+10
1.13600	3.30545	6556.	1031.	0.000	4.942E+10
1.42000	3.25543	10591.	1349.	0.000	4.942E+10
1.70400	3.20541	15750.	1691.	0.000	4.942E+10
1.98800	3.15539	22114.	2056.	0.000	4.942E+10
2.27200	3.10538	29767.	2446.	0.000	4.942E+10
2.55600	3.05538	38790.	2861.	0.000	4.942E+10
2.84000	3.00538	49265.	3299.	0.000	4.942E+10
3.12400	2.95540	61276.	3762.	0.000	4.942E+10
3.40800	2.90543	74905.	4248.	0.000	4.942E+10
3.69200	2.85548	90233.	4759.	0.000	4.942E+10
3.97600	2.80555	107344.	5294.	0.000	4.942E+10
4.26000	2.75564	126319.	5854.	0.000	4.942E+10
4.54400	2.70576	147242.	6437.	0.000	4.942E+10
4.82800	2.65592	170194.	7045.	0.000	4.942E+10

5.11200	2.60612	195258.	7676.	0.000	4.942E+10
5.39600	2.55637	222516.	8332.	0.000	4.942E+10
5.68000	2.50666	252051.	9012.	0.000	4.942E+10
5.96400	2.45702	283945.	9717.	0.000	4.942E+10
6.24800	2.40744	318280.	10445.	0.000	4.942E+10
6.53200	2.35794	355140.	11198.	0.000	4.942E+10
6.81600	2.30852	394605.	11975.	0.000	4.942E+10
7.10000	2.25919	436759.	12779.	0.000	4.942E+10
7.38400	2.20997	481706.	13617.	0.000	4.942E+10
7.66800	2.16086	529573.	14492.	0.000	4.942E+10
7.95200	2.11187	580483.	15404.	0.000	4.942E+10
8.23600	2.06303	634563.	16352.	0.000	4.942E+10
8.52000	2.01432	691938.	17337.	0.000	4.942E+10
8.80400	1.96579	752733.	18359.	0.000	4.942E+10
9.08800	1.91743	817074.	19418.	0.000	4.942E+10
9.37200	1.86926	885085.	20513.	0.000	4.942E+10
9.65600	1.82130	956892.	21645.	0.000	4.942E+10
9.94000	1.77356	1032620.	22814.	0.000	4.942E+10
10.22400	1.72607	1112395.	24020.	0.000	4.942E+10
10.50800	1.67884	1196342.	25263.	0.000	4.942E+10
10.79200	1.63189	1284587.	26542.	0.000	4.942E+10
11.07600	1.58524	1377253.	27858.	0.000	4.942E+10
11.36000	1.53891	1474468.	29211.	0.000	4.942E+10
11.64400	1.49293	1576355.	30601.	0.000	4.942E+10
11.92800	1.44733	1683041.	32027.	0.000	4.942E+10
12.21200	1.40211	1794651.	33490.	0.000	4.942E+10
12.49600	1.35732	1911310.	34990.	0.000	4.942E+10
12.78000	1.31298	2033143.	36527.	0.000	4.942E+10
13.06400	1.26912	2160276.	38100.	0.000	4.942E+10
13.34800	1.22576	2292833.	39710.	0.000	4.942E+10
13.63200	1.18295	2430941.	41357.	0.000	4.942E+10
13.91600	1.14070	2574724.	42563.	-1.1635	6.999E+10
14.20000	1.09888	2721052.	42897.	-23.1785	6.992E+10
14.48400	1.05752	2867111.	42777.	-47.4710	6.986E+10
14.76800	1.01663	3012619.	42570.	-73.5994	6.980E+10
15.05200	0.97624	3157271.	42273.	-100.9959	6.973E+10
15.33600	0.93638	3300751.	41881.	-129.1133	6.967E+10
15.62000	0.89707	3442731.	41393.	-157.3142	6.960E+10
15.90400	0.85833	3582884.	40815.	-181.6965	6.954E+10
16.18800	0.82019	3720926.	40156.	-204.8926	6.948E+10
16.47200	0.78267	3856589.	39422.	-226.1095	6.942E+10
16.75600	0.74580	3989626.	38619.	-244.9845	6.935E+10
17.04000	0.70960	4119817.	37754.	-262.6773	6.929E+10
17.32400	0.67408	4246958.	36830.	-279.4536	6.924E+10

17.60800	0.63928	4370852.	35854.	-293.6988	6.918E+10
17.89200	0.60521	4491336.	34833.	-305.1793	6.912E+10
18.17600	0.57190	4608275.	33775.	-315.9771	6.907E+10
18.46000	0.53937	4721544.	32684.	-324.1772	6.901E+10
18.74400	0.50762	4831048.	31570.	-329.5802	6.896E+10
19.02800	0.47669	4936725.	30439.	-334.2623	6.891E+10
19.31200	0.44660	5038519.	29292.	-338.8518	6.886E+10
19.59600	0.41735	5136377.	28134.	-340.6147	6.882E+10
19.88000	0.38897	5230279.	26975.	-339.3673	6.877E+10
20.16400	0.36147	5320240.	25813.	-342.5632	6.873E+10
20.44800	0.33487	5406222.	24644.	-343.3901	6.869E+10
20.73200	0.30919	5488216.	23478.	-341.0739	6.865E+10
21.01600	0.28443	5566248.	22325.	-335.4425	6.861E+10
21.30000	0.26062	5640384.	21197.	-326.3654	6.857E+10
21.58400	0.23776	5710730.	20107.	-313.7683	6.854E+10
21.86800	0.21587	5777432.	19065.	-297.6497	6.851E+10
22.15200	0.19496	5840676.	14636.	-2301.	6.848E+10
22.43600	0.17504	5877192.	6194.	-2653.	6.846E+10
22.72000	0.15612	5882897.	-3388.	-2971.	6.846E+10
23.00400	0.13819	5854100.	-14009.	-3262.	6.847E+10
23.28800	0.12126	5787412.	-25576.	-3526.	6.850E+10
23.57200	0.10531	5679771.	-37991.	-3760.	6.855E+10
23.85600	0.09032	5528462.	-51147.	-3961.	6.863E+10
24.14000	0.07627	5331152.	-64925.	-4125.	6.872E+10
24.42400	0.06312	5085933.	-79192.	-4247.	6.884E+10
24.70800	0.05083	4791381.	-93791.	-4320.	6.898E+10
24.99200	0.03934	4446653.	-108532.	-4330.	6.914E+10
25.27600	0.02860	4051629.	-123162.	-4256.	6.933E+10
25.56000	0.01854	3607180.	-137313.	-4049.	6.953E+10
25.84400	0.009080	3115706.	-150312.	-3580.	6.975E+10
26.12800	0.000141	2582651.	-158033.	-951.0207	6.998E+10
26.41200	-0.008370	2038551.	-153033.	3886.	7.022E+10
26.69600	-0.0165	1539581.	-138178.	4831.	7.043E+10
26.98000	-0.0245	1096727.	-120446.	5575.	7.265E+10
27.26400	-0.0322	718621.	-100320.	6236.	1.103E+11
27.54800	-0.0399	412947.	-78008.	6857.	1.106E+11
27.83200	-0.0475	186918.	-53618.	7456.	1.106E+11
28.11600	-0.0551	47484.	-27423.	7917.	1.106E+11
28.40000	-0.0627	0.000	0.000	8177.	1.106E+11

Output Summary for Load Case No. 2:

Pile-head deflection = 3.50555703 inches
Computed slope at pile head = -0.0146790 radians

```
Maximum bending moment           =       5882897. inch-lbs
Maximum shear force              =       -158033. lbs
Depth of maximum bending moment  =    22.72000000 feet below pile head
Depth of maximum shear force     =    26.12800000 feet below pile head
Number of iterations             =             41
Number of zero deflection points =              1
Pile deflection at ground        =     1.14308165 inches


--------------------------------------------------------------------------------
                  Summary of Pile Responses for LRFD Analyses
--------------------------------------------------------------------------------

                       Maximum        Maximum
Load     Pile-head     Moment          Shear        Pile-Head
Case    Deflection     in Pile        in Pile       Rotation
 No.      inches       in-lbs           lbs          radians
----   ------------   ------------   ------------   ------------
  1      1.9180500      3984932.       -104288.      -0.008416
  2      3.5055570      5882897.       -158033.      -0.014679


Maximum pile-head deflection = 3.5055570304 inches
Maximum pile-head rotation   = -0.0146789822 radians = -0.841044 deg.

--------------------------------------------------------------------------------
                   LRFD Performance by Load Case Combination
--------------------------------------------------------------------------------

                                  Factored        Maximum       Pass/Fail
Load                Resistance     Moment         Moment        for LRFD
Case    Section       Factor      Capacity       Developed      Moment
 No.      No.       for Moment    of Section     in Section     of Section
                                    in-lbs         in-lbs
----    -------    ------------   ------------   ------------   ------------
  1        1          1.00          12906676.       1604606.       Pass
           2          1.00          14424449.       3984932.       Pass
  2        1          1.00          12906676.       2430941.       Pass
           2          1.00          14424449.       5882897.       Pass

All LRFD load combinations have passed for all pile sections.

                                  Factored        Maximum       Pass/Fail
Load                Resistance      Shear          Shear        for LRFD
```

Case No.	Section No.	Factor for Shear	Capacity of Section lbs	Developed in Section lbs	Shear in Section
1	1	1.00	248470.	28940.	Pass
	2	1.00	248470.	-104288.	Pass
2	1	1.00	248470.	41357.	Pass
	2	1.00	248470.	-158033.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -158033.36 lbs
Factored Shear Capacity at Node = 248470.00 lbs
Fraction of Allowable Shear Capacity = 0.6360

The analysis ended normally.

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LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1162.0 RT Pile 5 6.lp12d

Name of the output report file:
BEL-70 1162.0 RT Pile 5 6.lp12o

Name of the plot output file:
BEL-70 1162.0 RT Pile 5 6.lp12p

Name of the runtime message file:
BEL-70 1162.0 RT Pile 5 6.lp12r

Date and Time of Analysis

Date: June 22, 2026 Time: 22:22:03

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1162+0 RT Piles 5 6 - 15' Ht.(7' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 30.000 ft
Depth of ground surface below top of pile = 15.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	12.9000
2	15.000	12.9000
3	15.000	30.0000
4	30.000	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 15.000000 ft
   AISC Section Type = W

   AISC Section Name = W24X146

   Pile width = 12.900000 in
   Shear capacity of section = 420360. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 15.000000 ft
   Section Diameter = 30.000000 in
   Shear capacity of section = 420360. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 15.000000 ft
   Distance from top of pile to bottom of layer = 21.700000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	21.700000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 20.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 3

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2
3	Live Load (LL)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	7.50	174.83
3	15.00	258.74

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	7.50	0.00
2	15.00	273.00

Number of Distributed Loading Points Input for Load Group 3 = 2

Point	Depth ft	Distributed Load lb/inch
1	0.00	49.00
2	15.00	49.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 3

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	1
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1

Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

---

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*LL + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.75*LL + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section = 15.000000 ft

Flange Width = 12.900000 in
Section Depth = 24.700000 in
Flange Thickness = 1.090000 in
Web Thickness = 0.650000 in
Yield Stress of Pipe = 50.000000 ksi
Elastic Modulus = 29000. ksi
Cross-sectional Area = 43.000000 sq. in.
Moment of Inertia = 4580. in^4
Elastic Bending Stiffness = 132820000. kip-in^2
Plastic Modulus, Z = 418.000000in^3
Plastic Moment Capacity = Fy Z = 20900.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 2150.000 kips
Nominal Axial Tensile Capacity = -2150.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	747.2352199762	131548563.	12.3500000000	
0.0000113606	1494.	131548563.	12.3500000000	
0.0000170409	2242.	131548563.	12.3500000000	
0.0000227212	2989.	131548563.	12.3500000000	
0.0000284015	3736.	131548563.	12.3500000000	

0.0000340818	4483.	131548563.	12.3500000000	
0.0000397621	5231.	131548563.	12.3500000000	
0.0000454424	5978.	131548563.	12.3500000000	
0.0000511227	6725.	131548563.	12.3500000000	
0.0000568030	7472.	131548563.	12.3500000000	
0.0000624833	8220.	131548563.	12.3500000000	
0.0000681636	8967.	131548563.	12.3500000000	
0.0000738439	9714.	131548563.	12.3500000000	
0.0000795242	10461.	131548563.	12.3500000000	
0.0000852045	11209.	131548563.	12.3500000000	
0.0000908848	11956.	131548563.	12.3500000000	
0.0000965651	12703.	131548563.	12.3500000000	
0.0001022454	13450.	131548563.	12.3500000000	
0.0001079257	14197.	131548563.	12.3500000000	
0.0001136060	14945.	131548563.	12.3500000000	
0.0001192863	15692.	131548563.	12.3500000000	
0.0001249666	16439.	131548563.	12.3500000000	
0.0001306469	17186.	131548563.	12.3500000000	
0.0001363272	17934.	131548563.	12.3500000000	
0.0001420075	18654.	131355772.	12.3500000000	Y
0.0001476878	19125.	129498378.	12.3500000000	Y
0.0001533681	19341.	126109474.	12.3500000000	Y
0.0001590484	19437.	122209265.	12.3500000000	Y
0.0001647287	19524.	118520493.	12.3500000000	Y
0.0001704090	19601.	115024731.	12.3500000000	Y
0.0001760893	19672.	111715442.	12.3500000000	Y
0.0001817696	19736.	108576232.	12.3500000000	Y
0.0001874499	19794.	105595295.	12.3500000000	Y
0.0001931302	19847.	102764220.	12.3500000000	Y
0.0001988105	19895.	100072629.	12.3500000000	Y
0.0002044908	19940.	97511170.	12.3500000000	Y
0.0002101711	19981.	95071381.	12.3500000000	Y
0.0002158514	20019.	92745569.	12.3500000000	Y
0.0002215317	20054.	90526548.	12.3500000000	Y
0.0002328923	20116.	86376759.	12.3500000000	Y
0.0002442529	20171.	82581534.	12.3500000000	Y
0.0002556135	20218.	79094155.	12.3500000000	Y
0.0002669741	20258.	75881674.	12.3500000000	Y
0.0002783347	20295.	72914164.	12.3500000000	Y
0.0002896953	20327.	70165142.	12.3500000000	Y
0.0003010559	20355.	67611954.	12.3500000000	Y
0.0003124165	20381.	65235075.	12.3500000000	Y
0.0003237771	20403.	63016840.	12.3500000000	Y
0.0003351377	20424.	60940788.	12.3500000000	Y

0.0003464983	20442.	58996066.	12.3500000000	Y
0.0003578589	20459.	57171239.	12.3500000000	Y
0.0003692195	20474.	55452124.	12.3500000000	Y
0.0003805801	20488.	53833914.	12.3500000000	Y
0.0003919407	20501.	52305498.	12.3500000000	Y
0.0004033013	20512.	50861280.	12.3500000000	Y
0.0004146619	20523.	49493288.	12.3500000000	Y
0.0004260225	20533.	48197176.	12.3500000000	Y
0.0004373831	20542.	46965429.	12.3500000000	Y
0.0004487437	20551.	45796048.	12.3500000000	Y
0.0004601043	20558.	44681519.	12.3500000000	Y
0.0004714648	20565.	43620240.	12.3500000000	Y
0.0004828254	20572.	42608550.	12.3500000000	Y
0.0004941860	20578.	41640974.	12.3500000000	Y
0.0005055466	20584.	40716884.	12.3500000000	Y
0.0005169072	20590.	39833413.	12.3500000000	Y
0.0005282678	20595.	38985744.	12.3500000000	Y
0.0005396284	20600.	38173738.	12.3500000000	Y
0.0005509890	20604.	37395216.	12.3500000000	Y
0.0005623496	20609.	36647530.	12.3500000000	Y
0.0005737102	20612.	35928305.	12.3500000000	Y
0.0005850708	20616.	35237011.	12.3500000000	Y
0.0005964314	20620.	34572052.	12.3500000000	Y
0.0006077920	20624.	33931851.	12.3500000000	Y
0.0006191526	20626.	33313864.	12.3500000000	Y
0.0006305132	20629.	32718146.	12.3500000000	Y
0.0006418738	20632.	32143516.	12.3500000000	Y
0.0006532344	20635.	31588873.	12.3500000000	Y
0.0006645950	20638.	31053192.	12.3500000000	Y
0.0006759556	20640.	30534482.	12.3500000000	Y
0.0007213980	20649.	28622949.	12.3500000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	20649.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	15.000000	ft
Outside Diameter of Casing	=	30.000000	in
Casing Wall Thickness	=	0.0000	in
Moment of Inertia of Steel Casing	=	0.0000	in^4
Width Flange of Core/Insert	=	12.900000	in
Depth of Core/Insert	=	24.700000	in
Flange Thickness of Core/Insert	=	1.090000	in
Web Thickness of Core/Insert	=	0.650000	in
Moment of Inertia of Steel Core/Insert	=	4540.	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Yield Stress of Core/Insert	=	50000.	psi
Elastic Modulus of Core/Insert	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Gross Area of Pile	=	706.858347	sq. in.
Area of Concrete	=	664.098347	sq. in.
Cross-sectional Area of Steel Casing	=	0.0000	sq. in.
Cross-sectional Area of Steel Core/Insert	=	42.760000	sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	42.760000	sq. in.
Area Ratio of All Steel to Gross Area	=	6.05	percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 4395.934 kips
Tensile Load for Cracking of Concrete = -419.269 kips
Nominal Axial Tensile Capacity = -2138.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	1583.	278749290.	15.0000000000	
0.0000113606	1995.	175633799.	11.4700376517	C
0.0000170409	2987.	175290831.	11.4903947159	C
0.0000227212	3975.	174944178.	11.5110091803	C
0.0000284015	4959.	174593753.	11.5318877466	C
0.0000340818	5938.	174239477.	11.5528650295	C
0.0000397621	6914.	173881366.	11.5739195974	C
0.0000454424	7885.	173519267.	11.5952530287	C
0.0000511227	8852.	173153080.	11.6168727306	C
0.0000568030	9815.	172782702.	11.6387864167	C
0.0000624833	10773.	172408023.	11.6611508574	C
0.0000681636	11726.	172028932.	11.6836759884	C
0.0000738439	12675.	171645310.	11.7065184576	C
0.0000795242	13619.	171257036.	11.7296875590	C
0.0000852045	14558.	170863981.	11.7531930032	C
0.0000908848	15493.	170466011.	11.7770449427	C
0.0000965651	16422.	170062988.	11.8012539997	C
0.0001022454	17346.	169654764.	11.8258312957	C

0.0001079257	18265.	169241201.	11.8506729578	C
0.0001136060	19146.	168528854.	11.8657162873	CY
0.0001192863	19688.	165051155.	11.7831221916	CY
0.0001249666	19974.	159837661.	11.6345471858	CY
0.0001306469	20235.	154882963.	11.4914273834	CY
0.0001363272	20473.	150171821.	11.3528021855	CY
0.0001420075	20691.	145703492.	11.2198887082	CY
0.0001476878	20891.	141455748.	11.0905126321	CY
0.0001533681	21077.	137428277.	10.9671004316	CY
0.0001590484	21248.	133597374.	10.8466378179	CY
0.0001647287	21408.	129958962.	10.7311207800	CY
0.0001704090	21557.	126498799.	10.6198466747	CY
0.0001760893	21695.	123203066.	10.5113780281	CY
0.0001817696	21825.	120067246.	10.4075455808	CY
0.0001874499	21946.	117076184.	10.3069067841	CY
0.0001931302	22060.	114221188.	10.2089751569	CY
0.0001988105	22167.	111498742.	10.1152239831	CY
0.0002044908	22269.	108897792.	10.0245487456	CY
0.0002101711	22363.	106404988.	9.9355197038	CY
0.0002158514	22453.	104022139.	9.8500086678	CY
0.0002215317	22539.	101742887.	9.7678691320	CY
0.0002328923	22696.	97452346.	9.6081098129	CY
0.0002442529	22839.	93506579.	9.4593126659	CY
0.0002556135	22968.	89855412.	9.3169915438	CY
0.0002669741	23084.	86466069.	9.1861558392	CY
0.0002783347	23188.	83310946.	9.0628252609	CY
0.0002896953	23272.	80332334.	8.9610384517	CY
0.0003010559	23350.	77560708.	8.8650098337	CY
0.0003124165	23408.	74926899.	8.7885295691	CY
0.0003237771	23461.	72461308.	8.7169348751	CY
0.0003351377	23503.	70129669.	8.6604519306	CY
0.0003464983	23534.	67920832.	8.6184406028	CY
0.0003578589	23563.	65843636.	8.5795168797	CY
0.0003692195	23581.	63866574.	8.5544495665	CY
0.0003805801	23598.	62004152.	8.5298959773	CY
0.0003919407	23612.	60243004.	8.5059914286	CY
0.0004033013	23625.	58578531.	8.4850158121	CY

Summary of Results for Nominal Moment Capacity for Section 2

	Nominal

Load No.	Axial Thrust kips	Moment Capacity in-kips
1	0.00000000	23625.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	15.0000	0.00	N.A.	No	0.00	30270.
2	21.7000	6.7000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	49.00
3.60	49.00
7.20	49.00
10.80	49.00
14.40	49.00
18.00	49.00
21.60	49.00
25.20	49.00
28.80	49.00
32.40	49.00
36.00	49.00
39.60	49.00
43.20	49.00
46.80	49.00
50.40	49.00
54.00	49.00
57.60	49.00
61.20	49.00
64.80	49.00
68.40	49.00
72.00	49.00
75.60	49.00
79.20	49.00
82.80	49.00
86.40	49.00
90.00	49.00
93.60	49.00
97.20	49.00
100.80	49.00
104.40	49.00
108.00	49.00
111.60	49.00
115.20	49.00
118.80	49.00
122.40	49.00
126.00	49.00
129.60	49.00

133.20	49.00
136.80	49.00
140.40	49.00
144.00	49.00
147.60	49.00
151.20	49.00
154.80	49.00
158.40	49.00
162.00	49.00
165.60	49.00
169.20	49.00
172.80	49.00
176.40	49.00
180.00	24.50

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
90.00	1.36
93.60	10.92
97.20	21.84
100.80	32.76
104.40	43.68
108.00	54.60
111.60	65.52
115.20	76.44
118.80	87.36
122.40	98.28
126.00	109.20
129.60	120.12
133.20	131.04
136.80	141.96
140.40	152.88
144.00	163.80
147.60	174.72

151.20	185.64
154.80	196.56
158.40	207.48
162.00	218.40
165.60	229.32
169.20	240.24
172.80	251.16
176.40	262.08
180.00	135.14

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.75
3.60	6.99
7.20	13.99
10.80	20.98
14.40	27.97
18.00	34.97
21.60	41.96
25.20	48.95
28.80	55.95
32.40	62.94
36.00	69.93
39.60	76.93
43.20	83.92
46.80	90.91
50.40	97.90
54.00	104.90
57.60	111.89
61.20	118.88
64.80	125.88
68.40	132.87
72.00	139.86
75.60	146.86

79.20	153.85
82.80	160.84
86.40	167.84
90.00	174.38
93.60	178.19
97.20	181.54
100.80	184.90
104.40	188.26
108.00	191.61
111.60	194.97
115.20	198.32
118.80	201.68
122.40	205.04
126.00	208.39
129.60	211.75
133.20	215.11
136.80	218.46
140.40	221.82
144.00	225.18
147.60	228.53
151.20	231.89
154.80	235.25
158.40	238.60
162.00	241.96
165.60	245.31
169.20	248.67
172.80	252.03
176.40	255.38
180.00	128.95

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth	Deflect.	Bending	Shear	Soil Res.	Bending

X	y	Moment	Force	p	Stiffness
feet	inches	in-lbs	lbs	lb/inch	lb-in^2
0.000	1.30872	-6.311E-05	0.000	0.000	1.315E+11
0.30000	1.28881	328.84899	192.13471	0.000	1.315E+11
0.60000	1.26891	1383.	406.29798	0.000	1.315E+11
0.90000	1.24900	3254.	645.63678	0.000	1.315E+11
1.20000	1.22910	6032.	910.15110	0.000	1.315E+11
1.50000	1.20919	9807.	1200.	0.000	1.315E+11
1.80000	1.18929	14671.	1515.	0.000	1.315E+11
2.10000	1.16939	20713.	1855.	0.000	1.315E+11
2.40000	1.14949	28025.	2220.	0.000	1.315E+11
2.70000	1.12959	36697.	2610.	0.000	1.315E+11
3.00000	1.10970	46820.	3026.	0.000	1.315E+11
3.30000	1.08981	58484.	3467.	0.000	1.315E+11
3.60000	1.06992	71780.	3933.	0.000	1.315E+11
3.90000	1.05005	86798.	4424.	0.000	1.315E+11
4.20000	1.03018	103630.	4940.	0.000	1.315E+11
4.50000	1.01032	122366.	5481.	0.000	1.315E+11
4.80000	0.99048	143096.	6048.	0.000	1.315E+11
5.10000	0.97065	165911.	6640.	0.000	1.315E+11
5.40000	0.95083	190903.	7257.	0.000	1.315E+11
5.70000	0.93104	218160.	7899.	0.000	1.315E+11
6.00000	0.91126	247775.	8566.	0.000	1.315E+11
6.30000	0.89151	279837.	9259.	0.000	1.315E+11
6.60000	0.87179	314438.	9976.	0.000	1.315E+11
6.90000	0.85210	351668.	10719.	0.000	1.315E+11
7.20000	0.83244	391617.	11487.	0.000	1.315E+11
7.50000	0.81282	434376.	12282.	0.000	1.315E+11
7.80000	0.79325	480048.	13115.	0.000	1.315E+11
8.10000	0.77372	528806.	13998.	0.000	1.315E+11
8.40000	0.75425	580835.	14932.	0.000	1.315E+11
8.70000	0.73483	636319.	15918.	0.000	1.315E+11
9.00000	0.71547	695445.	16955.	0.000	1.315E+11
9.30000	0.69618	758396.	18044.	0.000	1.315E+11
9.60000	0.67697	825359.	19183.	0.000	1.315E+11
9.90000	0.65784	896517.	20375.	0.000	1.315E+11
10.20000	0.63880	972057.	21617.	0.000	1.315E+11
10.50000	0.61985	1052162.	22911.	0.000	1.315E+11
10.80000	0.60100	1137019.	24257.	0.000	1.315E+11
11.10000	0.58227	1226812.	25654.	0.000	1.315E+11
11.40000	0.56366	1321726.	27102.	0.000	1.315E+11
11.70000	0.54518	1421945.	28602.	0.000	1.315E+11
12.00000	0.52684	1527656.	30153.	0.000	1.315E+11

12.30000	0.50865	1639044.	31755.	0.000	1.315E+11
12.60000	0.49062	1756292.	33409.	0.000	1.315E+11
12.90000	0.47277	1879587.	35114.	0.000	1.315E+11
13.20000	0.45510	2009113.	36871.	0.000	1.315E+11
13.50000	0.43762	2145055.	38679.	0.000	1.315E+11
13.80000	0.42036	2287598.	40538.	0.000	1.315E+11
14.10000	0.40333	2436928.	42449.	0.000	1.315E+11
14.40000	0.38653	2593229.	44411.	0.000	1.315E+11
14.70000	0.36999	2756686.	46424.	0.000	1.315E+11
15.00000	0.35372	2927485.	47964.	0.000	1.315E+11
15.30000	0.33774	3102024.	48448.	-19.4206	1.752E+11
15.60000	0.32199	3276311.	48341.	-39.7976	1.752E+11
15.90000	0.30648	3450082.	48161.	-60.6767	1.751E+11
16.20000	0.29123	3623067.	47904.	-81.6089	1.750E+11
16.50000	0.27624	3794994.	47573.	-102.6433	1.750E+11
16.80000	0.26154	3965591.	47166.	-123.2891	1.749E+11
17.10000	0.24713	4134591.	46687.	-143.1233	1.749E+11
17.40000	0.23303	4301735.	46138.	-161.8083	1.748E+11
17.70000	0.21924	4466782.	45523.	-179.5002	1.747E+11
18.00000	0.20579	4629503.	44848.	-195.8457	1.747E+11
18.30000	0.19268	4789686.	44117.	-210.3729	1.746E+11
18.60000	0.17992	4947143.	43337.	-222.8311	1.746E+11
18.90000	0.16754	5101711.	42514.	-234.1070	1.745E+11
19.20000	0.15553	5253246.	41653.	-244.3068	1.745E+11
19.50000	0.14391	5401614.	40759.	-252.2299	1.744E+11
19.80000	0.13269	5546713.	39842.	-257.7079	1.744E+11
20.10000	0.12189	5688473.	38907.	-261.4824	1.743E+11
20.40000	0.11151	5826843.	37960.	-264.6139	1.743E+11
20.70000	0.10156	5961785.	37006.	-265.3808	1.742E+11
21.00000	0.09205	6093286.	36054.	-263.7140	1.742E+11
21.30000	0.08300	6221371.	35112.	-259.6595	1.741E+11
21.60000	0.07441	6346090.	34188.	-253.4547	1.741E+11
21.90000	0.06630	6467524.	29959.	-2096.	1.740E+11
22.20000	0.05866	6561793.	21974.	-2340.	1.740E+11
22.50000	0.05152	6625734.	13149.	-2563.	1.740E+11
22.80000	0.04487	6656464.	3563.	-2763.	1.740E+11
23.10000	0.03871	6651388.	-6701.	-2940.	1.740E+11
23.40000	0.03305	6608215.	-17558.	-3092.	1.740E+11
23.70000	0.02788	6524973.	-28915.	-3218.	1.740E+11
24.00000	0.02320	6400025.	-40678.	-3317.	1.741E+11
24.30000	0.01899	6232088.	-52746.	-3387.	1.741E+11
24.60000	0.01525	6020256.	-65008.	-3425.	1.742E+11
24.90000	0.01196	5764030.	-77347.	-3430.	1.743E+11
25.20000	0.009091	5463356.	-89632.	-3395.	1.744E+11

25.50000	0.006631	5118677.	-101713.	-3316.	1.745E+11
25.80000	0.004552	4731025.	-113406.	-3180.	1.747E+11
26.10000	0.002823	4302154.	-124470.	-2966.	1.748E+11
26.40000	0.001414	3834841.	-134519.	-2616.	1.750E+11
26.70000	0.000289	3333618.	-142540.	-1840.	1.751E+11
27.00000	-0.000590	2808551.	-141716.	2298.	1.753E+11
27.30000	-0.001261	2313261.	-132368.	2896.	1.755E+11
27.60000	-0.001762	1855499.	-121260.	3276.	1.967E+11
27.90000	-0.002140	1440192.	-108931.	3573.	2.787E+11
28.20000	-0.002451	1071195.	-95595.	3836.	2.787E+11
28.50000	-0.002712	751908.	-81353.	4076.	2.787E+11
28.80000	-0.002938	485451.	-66268.	4304.	2.787E+11
29.10000	-0.003142	274778.	-50375.	4525.	2.787E+11
29.40000	-0.003333	122749.	-33874.	4642.	2.787E+11
29.70000	-0.003519	30883.	-17048.	4706.	2.787E+11
30.00000	-0.003702	0.000	0.000	4766.	2.787E+11

Output Summary for Load Case No. 1:

Pile-head deflection = 1.30871605 inches
Computed slope at pile head = -0.0055292 radians
Maximum bending moment = 6656464. inch-lbs
Maximum shear force = -142540. lbs
Depth of maximum bending moment = 22.80000000 feet below pile head
Depth of maximum shear force = 26.70000000 feet below pile head
Number of iterations = 32
Number of zero deflection points = 1
Pile deflection at ground = 0.35372137 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	49.00
3.60	49.00
7.20	49.00
10.80	49.00

14.40	49.00
18.00	49.00
21.60	49.00
25.20	49.00
28.80	49.00
32.40	49.00
36.00	49.00
39.60	49.00
43.20	49.00
46.80	49.00
50.40	49.00
54.00	49.00
57.60	49.00
61.20	49.00
64.80	49.00
68.40	49.00
72.00	49.00
75.60	49.00
79.20	49.00
82.80	49.00
86.40	49.00
90.00	49.00
93.60	49.00
97.20	49.00
100.80	49.00
104.40	49.00
108.00	49.00
111.60	49.00
115.20	49.00
118.80	49.00
122.40	49.00
126.00	49.00
129.60	49.00
133.20	49.00
136.80	49.00
140.40	49.00
144.00	49.00
147.60	49.00
151.20	49.00
154.80	49.00
158.40	49.00
162.00	49.00
165.60	49.00
169.20	49.00

172.80	49.00
176.40	49.00
180.00	24.50

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
90.00	1.36
93.60	10.92
97.20	21.84
100.80	32.76
104.40	43.68
108.00	54.60
111.60	65.52
115.20	76.44
118.80	87.36
122.40	98.28
126.00	109.20
129.60	120.12
133.20	131.04
136.80	141.96
140.40	152.88
144.00	163.80
147.60	174.72
151.20	185.64
154.80	196.56
158.40	207.48
162.00	218.40
165.60	229.32
169.20	240.24
172.80	251.16
176.40	262.08
180.00	135.14

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.75
3.60	6.99
7.20	13.99
10.80	20.98
14.40	27.97
18.00	34.97
21.60	41.96
25.20	48.95
28.80	55.95
32.40	62.94
36.00	69.93
39.60	76.93
43.20	83.92
46.80	90.91
50.40	97.90
54.00	104.90
57.60	111.89
61.20	118.88
64.80	125.88
68.40	132.87
72.00	139.86
75.60	146.86
79.20	153.85
82.80	160.84
86.40	167.84
90.00	174.38
93.60	178.19
97.20	181.54
100.80	184.90
104.40	188.26
108.00	191.61
111.60	194.97
115.20	198.32

118.80	201.68
122.40	205.04
126.00	208.39
129.60	211.75
133.20	215.11
136.80	218.46
140.40	221.82
144.00	225.18
147.60	228.53
151.20	231.89
154.80	235.25
158.40	238.60
162.00	241.96
165.60	245.31
169.20	248.67
172.80	252.03
176.40	255.38
180.00	128.95

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.33087	5.860E-05	6.261E-07	0.000	1.315E+11
0.30000	2.29687	572.65347	332.30204	0.000	1.315E+11
0.60000	2.26287	2393.	697.64697	0.000	1.315E+11
0.90000	2.22886	5596.	1101.	0.000	1.315E+11
1.20000	2.19486	10318.	1542.	0.000	1.315E+11
1.50000	2.16086	16695.	2020.	0.000	1.315E+11
1.80000	2.12686	24864.	2537.	0.000	1.315E+11
2.10000	2.09287	34959.	3091.	0.000	1.315E+11

2.40000	2.05888	47118.	3683.	0.000	1.315E+11
2.70000	2.02489	61475.	4312.	0.000	1.315E+11
3.00000	1.99091	78167.	4980.	0.000	1.315E+11
3.30000	1.95693	97330.	5685.	0.000	1.315E+11
3.60000	1.92297	119100.	6428.	0.000	1.315E+11
3.90000	1.88902	143612.	7209.	0.000	1.315E+11
4.20000	1.85508	171004.	8027.	0.000	1.315E+11
4.50000	1.82116	201409.	8884.	0.000	1.315E+11
4.80000	1.78725	234965.	9778.	0.000	1.315E+11
5.10000	1.75338	271808.	10709.	0.000	1.315E+11
5.40000	1.71952	312073.	11679.	0.000	1.315E+11
5.70000	1.68570	355897.	12686.	0.000	1.315E+11
6.00000	1.65192	403414.	13731.	0.000	1.315E+11
6.30000	1.61817	454763.	14814.	0.000	1.315E+11
6.60000	1.58447	510077.	15935.	0.000	1.315E+11
6.90000	1.55082	569493.	17093.	0.000	1.315E+11
7.20000	1.51722	633148.	18289.	0.000	1.315E+11
7.50000	1.48369	701177.	19524.	0.000	1.315E+11
7.80000	1.45023	773724.	20807.	0.000	1.315E+11
8.10000	1.41684	850989.	22146.	0.000	1.315E+11
8.40000	1.38353	933176.	23543.	0.000	1.315E+11
8.70000	1.35032	1020495.	24996.	0.000	1.315E+11
9.00000	1.31721	1113150.	26508.	0.000	1.315E+11
9.30000	1.28421	1211349.	28076.	0.000	1.315E+11
9.60000	1.25133	1315299.	29702.	0.000	1.315E+11
9.90000	1.21857	1425206.	31386.	0.000	1.315E+11
10.20000	1.18596	1541278.	33127.	0.000	1.315E+11
10.50000	1.15350	1663720.	34925.	0.000	1.315E+11
10.80000	1.12121	1792740.	36781.	0.000	1.315E+11
11.10000	1.08909	1928545.	38695.	0.000	1.315E+11
11.40000	1.05716	2071341.	40665.	0.000	1.315E+11
11.70000	1.02543	2221335.	42693.	0.000	1.315E+11
12.00000	0.99392	2378733.	44779.	0.000	1.315E+11
12.30000	0.96265	2543744.	46922.	0.000	1.315E+11
12.60000	0.93163	2716573.	49123.	0.000	1.315E+11
12.90000	0.90087	2897426.	51381.	0.000	1.315E+11
13.20000	0.87041	3086512.	53696.	0.000	1.315E+11
13.50000	0.84024	3284037.	56069.	0.000	1.315E+11
13.80000	0.81040	3490207.	58499.	0.000	1.315E+11
14.10000	0.78090	3705229.	60987.	0.000	1.315E+11
14.40000	0.75177	3929310.	63532.	0.000	1.315E+11
14.70000	0.72302	4162657.	66134.	0.000	1.315E+11
15.00000	0.69469	4405476.	68118.	0.000	1.315E+11
15.30000	0.66679	4653109.	68745.	-23.4288	1.747E+11

15.60000	0.63923	4900439.	68616.	-48.1718	1.746E+11
15.90000	0.61204	5147144.	68396.	-73.7458	1.745E+11
16.20000	0.58523	5392894.	68084.	-99.6798	1.744E+11
16.50000	0.55882	5637351.	67679.	-125.7380	1.743E+11
16.80000	0.53283	5880179.	67180.	-151.4931	1.743E+11
17.10000	0.50728	6121044.	66589.	-176.5462	1.742E+11
17.40000	0.48218	6359621.	65910.	-200.5193	1.741E+11
17.70000	0.45756	6595599.	65147.	-223.4699	1.740E+11
18.00000	0.43342	6828681.	64304.	-244.9853	1.739E+11
18.30000	0.40980	7058587.	63387.	-264.5325	1.738E+11
18.60000	0.38670	7285066.	62403.	-281.8032	1.737E+11
18.90000	0.36415	7507892.	61360.	-297.9412	1.736E+11
19.20000	0.34216	7726857.	60260.	-313.1003	1.736E+11
19.50000	0.32074	7941764.	59110.	-325.7462	1.735E+11
19.80000	0.29992	8152450.	57920.	-335.6556	1.734E+11
20.10000	0.27970	8358785.	56697.	-343.5730	1.733E+11
20.40000	0.26011	8560668.	55447.	-350.6084	1.733E+11
20.70000	0.24116	8758007.	54178.	-354.8901	1.732E+11
21.00000	0.22287	8950746.	52897.	-356.2975	1.731E+11
21.30000	0.20525	9138868.	51617.	-355.1286	1.730E+11
21.60000	0.18831	9322387.	50342.	-352.8537	1.730E+11
21.90000	0.17207	9501334.	44919.	-2660.	1.729E+11
22.20000	0.15654	9645801.	34746.	-2991.	1.728E+11
22.50000	0.14173	9751507.	23422.	-3300.	1.728E+11
22.80000	0.12766	9814440.	11023.	-3588.	1.728E+11
23.10000	0.11432	9830870.	-2372.	-3853.	1.728E+11
23.40000	0.10172	9797359.	-16680.	-4095.	1.728E+11
23.70000	0.08986	9710776.	-31812.	-4312.	1.728E+11
24.00000	0.07872	9568312.	-47677.	-4502.	1.729E+11
24.30000	0.06830	9367503.	-64176.	-4664.	1.729E+11
24.60000	0.05859	9106248.	-81203.	-4796.	1.730E+11
24.90000	0.04955	8782843.	-98643.	-4893.	1.732E+11
25.20000	0.04117	8396021.	-116366.	-4953.	1.733E+11
25.50000	0.03342	7945008.	-134224.	-4968.	1.735E+11
25.80000	0.02626	7429608.	-152039.	-4929.	1.737E+11
26.10000	0.01966	6850329.	-169584.	-4818.	1.739E+11
26.40000	0.01357	6208602.	-186546.	-4605.	1.741E+11
26.70000	0.007940	5507197.	-202419.	-4214.	1.744E+11
27.00000	0.002719	4751183.	-216062.	-3366.	1.747E+11
27.30000	-0.002149	3951548.	-216166.	3308.	1.750E+11
27.60000	-0.006724	3194785.	-201971.	4578.	1.752E+11
27.90000	-0.0111	2497358.	-184032.	5388.	1.754E+11
28.20000	-0.0152	1869756.	-163437.	6054.	1.942E+11
28.50000	-0.0192	1320613.	-140565.	6653.	2.787E+11

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   28.80000      -0.0232      857686.     -115603.        7215.    2.787E+11
   29.10000      -0.0271      488270.      -88654.        7756.    2.787E+11
   29.40000      -0.0311      219375.      -60098.        8109.    2.787E+11
   29.70000      -0.0349       55568.      -30469.        8352.    2.787E+11
   30.00000      -0.0388        0.000        0.000        8575.    2.787E+11

Output Summary for Load Case No. 2:

Pile-head deflection             =     2.33086858 inches
Computed slope at pile head      =     -0.0094449 radians
Maximum bending moment           =       9830870. inch-lbs
Maximum shear force              =       -216166. lbs
Depth of maximum bending moment  =    23.10000000 feet below pile head
Depth of maximum shear force     =    27.30000000 feet below pile head
Number of iterations             =             40
Number of zero deflection points =              1
Pile deflection at ground        =     0.69468947 inches


--------------------------------------------------------------------------------
                  Summary of Pile Responses for LRFD Analyses
--------------------------------------------------------------------------------

                        Maximum        Maximum
Load     Pile-head      Moment          Shear        Pile-Head
Case    Deflection      in Pile        in Pile       Rotation
 No.      inches        in-lbs           lbs          radians
----   ------------   ------------   ------------   ------------
  1       1.3087161       6656464.       -142540.      -0.005529
  2       2.3308686       9830870.       -216166.      -0.009445


Maximum pile-head deflection = 2.3308685757 inches
Maximum pile-head rotation   = -0.0094449389 radians = -0.541155 deg.

--------------------------------------------------------------------------------
                   LRFD Performance by Load Case Combination
--------------------------------------------------------------------------------

                                    Factored        Maximum        Pass/Fail
Load                Resistance       Moment         Moment         for LRFD
Case    Section       Factor        Capacity       Developed       Moment
 No.      No.       for Moment     of Section     in Section     of Section
                                     in-lbs         in-lbs
```

1	1	1.00	20648539.	2927485.	Pass
	2	1.00	23624795.	6656464.	Pass
2	1	1.00	20648539.	4405476.	Pass
	2	1.00	23624795.	9830870.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	420360.	47964.	Pass
	2	1.00	420360.	-142540.	Pass
2	1	1.00	420360.	68118.	Pass
	2	1.00	420360.	-216166.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -216166.45 lbs
Factored Shear Capacity at Node = 420360.00 lbs
Fraction of Allowable Shear Capacity = 0.5142

The analysis ended normally.

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	6' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS	83.3	plf	1.75
WA	374.4	plf	1.00
EH	354.8	plf	1.50
Total	**1052.4**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	6.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**4,736**	ft-lbs		ft-lbs	**4,736**	ft-lbs
V (fac.)	**3,157**	lbs		lbs	**3,157**	lbs
f_b (fac.)	**770**	psi		psi	**770**	psi
f_v (fac.)	**120**	psi		psi	**120**	psi
δ	**0.046**	in		in	**0.05**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	8' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS	83.3	plf	1.75
WA	156.0	plf	1.00
EH	147.9	plf	1.50
Total	**523.5**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	8.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**4,188**	ft-lbs		ft-lbs	**4,188**	ft-lbs
V (fac.)	**2,094**	lbs		lbs	**2,094**	lbs
f_b (fac.)	**681**	psi		psi	**681**	psi
f_v (fac.)	**80**	psi		psi	**80**	psi
δ	**0.073**	in		in	**0.07**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	10' LaggingSpan at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS	83.3	plf	1.75
WA	468.0	plf	1.00
EH	443.6	plf	1.50
Total	**1279.0**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	10.0	ft
b	5.5	in, actual size
h	11.50	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**63.25**	in^2
S_x	**121.23**	in^3
I_x	**697.07**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**15,988**	ft-lbs		ft-lbs	**15,988**	ft-lbs
V (fac.)	**6,395**	lbs		lbs	**6,395**	lbs
f_b (fac.)	**1,583**	psi		psi	**1,583**	psi
f_v (fac.)	**152**	psi		psi	**152**	psi
δ	**0.258**	in		in	**0.26**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Culvert #5 - Sta. 1162+05, LT.

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1162.05 LT Piles 4, 5, 6

Wall Height : 15 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	7.56	ft
$Depth_1$ for Lateral Soil Pressure =	7.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.300	ksf
Lateral Soil Load Lpile Input =	**188.87**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	7.56	ft
$Depth_2$ for Lateral Soil Pressure =	15	ft
Lateral Pressure at Top of Layer 2 =	0.300	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.444	ksf
Lateral Soil Load Lpile Input =	**279.53**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	7.56	ft
Depth at Top of Groundwater =	7.50	ft
Depth at Bot of Groundwater =	15	ft
Water Pressure at Bot of Layer =	0.468	ksf
Lateral Water Load Lpile Input =	**294.94**	**lb/inch, Bot**

Lateral Live Load Surcharge

LL Surcharge Height in ft of soil =	2.00	ft
Constant Lateral LL Surch. Pressure =	0.083	ksf (based on 125 pcf soil for surch.)
Constant Lat. LL Surch. Load Lpile Input =	**52**	**lb/inch**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : **BEL-70 Temp Shoring 1162.05 LT Piles 7, 3**

Wall Height : **11 ft**

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_1$ for Lateral Soil Pressure =	5.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.220	ksf
Lateral Soil Load Lpile Input =	**109.89**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.333	phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_2$ for Lateral Soil Pressure =	11	ft
Lateral Pressure at Top of Layer 2 =	0.220	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.325	ksf
Lateral Soil Load Lpile Input =	**162.64**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	6.00	ft
Depth at Top of Groundwater =	5.50	ft
Depth at Bot of Groundwater =	11	ft
Water Pressure at Bot of Layer =	0.343	ksf
Lateral Water Load Lpile Input =	**171.60**	**lb/inch, Bot**

Lateral Live Load Surcharge

LL Surcharge Height in ft of soil =	2.00	ft
Constant Lateral LL Surch. Pressure =	0.083	ksf (based on 125 pcf soil for surch.)
Constant Lat. LL Surch. Load Lpile Input =	**42**	**lb/inch**

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

                            LPile for Version 2022-12.012

                              License ID : 154178656
                          License Type : (Network License)

                  Analysis of Individual Piles and Drilled Shafts
                 Subjected to Lateral Loading Using the p-y Method
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                                 Akron, GDP GROUP

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


This model was prepared by:
TWASHKO




--------------------------------------------------------------------------------
                            Files Used for Analysis
--------------------------------------------------------------------------------

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1162.0 LT Pile 4 5 6.lp12d

Name of the output report file:
BEL-70 1162.0 LT Pile 4 5 6.lp12o

Name of the plot output file:
BEL-70 1162.0 LT Pile 4 5 6.lp12p

Name of the runtime message file:
BEL-70 1162.0 LT Pile 4 5 6.lp12r
```

Date and Time of Analysis

Date: June 23, 2026 Time: 15:45:01

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1162+0 LT Piles 4 5 6 - 15' Ht.(7.56' rev. design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 47.000 ft
Depth of ground surface below top of pile = 15.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	15.0000
2	15.000	15.0000
3	15.000	36.0000
4	47.000	36.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 15.000000 ft
   AISC Section Type = W

   AISC Section Name = W30X173

   Pile width = 15.000000 in
   Shear capacity of section = 537750. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 32.000000 ft
   Section Diameter = 36.000000 in
   Shear capacity of section = 537750. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 15.000000 ft
   Distance from top of pile to bottom of layer = 43.200000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	43.200000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 3.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 3

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2
3	Live Load (LL)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	7.50	188.87
3	15.00	279.53

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	7.50	0.00
2	15.00	294.94

Number of Distributed Loading Points Input for Load Group 3 = 2

Point	Depth ft	Distributed Load lb/inch
1	0.00	52.00
2	15.00	52.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 3

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	1
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1

Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*LL + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.75*LL + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section = 15.000000 ft

```
Flange Width                                        =    15.000000 in
Section Depth                                       =    30.400000 in
Flange Thickness                                    =     1.070000 in
Web Thickness                                       =     0.655000 in
Yield Stress of Pipe                                =    50.000000 ksi
Elastic Modulus                                     =       29000. ksi
Cross-sectional Area                                =    50.900000 sq. in.
Moment of Inertia                                   =        8230. in^4
Elastic Bending Stiffness                           =   238670000. kip-in^2
Plastic Modulus, Z                                  =   607.000000in^3
Plastic Moment Capacity = Fy Z                      =       30350.in-kip

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = Fy As              =     2545.000 kips
Nominal Axial Tensile Capacity                      =    -2545.000 kips



Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

   Number     Axial Thrust Force
                   kips
   ------     ------------------
      1               0.000

Definition of Run Messages:

   Y = part of pipe section has yielded.


Axial Thrust Force =      0.000 kips

     Bending            Bending            Bending           Depth to       Run
    Curvature           Moment            Stiffness          N Axis        Msg
     rad/in.            in-kip             kip-in2             in
----------------   ----------------   ----------------   ----------------   ---
    0.0000048851              1152.         235732855.      15.2000000000
    0.0000097701              2303.         235732855.      15.2000000000
    0.0000146552              3455.         235732855.      15.2000000000
    0.0000195402              4606.         235732855.      15.2000000000
    0.0000244253              5758.         235732855.      15.2000000000
```

0.0000293103	6909.	235732855.	15.2000000000	
0.0000341954	8061.	235732855.	15.2000000000	
0.0000390805	9213.	235732855.	15.2000000000	
0.0000439655	10364.	235732855.	15.2000000000	
0.0000488506	11516.	235732855.	15.2000000000	
0.0000537356	12667.	235732855.	15.2000000000	
0.0000586207	13819.	235732855.	15.2000000000	
0.0000635057	14970.	235732855.	15.2000000000	
0.0000683908	16122.	235732855.	15.2000000000	
0.0000732759	17274.	235732855.	15.2000000000	
0.0000781609	18425.	235732855.	15.2000000000	
0.0000830460	19577.	235732855.	15.2000000000	
0.0000879310	20728.	235732855.	15.2000000000	
0.0000928161	21880.	235732855.	15.2000000000	
0.0000977011	23031.	235732855.	15.2000000000	
0.0001025862	24183.	235732855.	15.2000000000	
0.0001074713	25335.	235732855.	15.2000000000	
0.0001123563	26486.	235732855.	15.2000000000	
0.0001172414	27461.	234222623.	15.2000000000	Y
0.0001221264	27884.	228319492.	15.2000000000	Y
0.0001270115	28048.	220828599.	15.2000000000	Y
0.0001318966	28194.	213755847.	15.2000000000	Y
0.0001367816	28325.	207083201.	15.2000000000	Y
0.0001416667	28442.	200767656.	15.2000000000	Y
0.0001465517	28548.	194800517.	15.2000000000	Y
0.0001514368	28645.	189152248.	15.2000000000	Y
0.0001563218	28731.	183795754.	15.2000000000	Y
0.0001612069	28810.	178717016.	15.2000000000	Y
0.0001660920	28883.	173896171.	15.2000000000	Y
0.0001709770	28949.	169315384.	15.2000000000	Y
0.0001758621	29010.	164958564.	15.2000000000	Y
0.0001807471	29066.	160811127.	15.2000000000	Y
0.0001856322	29118.	156858097.	15.2000000000	Y
0.0001905172	29165.	153083989.	15.2000000000	Y
0.0002002874	29250.	146042099.	15.2000000000	Y
0.0002100575	29324.	139597894.	15.2000000000	Y
0.0002198276	29388.	133684859.	15.2000000000	Y
0.0002295977	29444.	128240408.	15.2000000000	Y
0.0002393678	29493.	123211825.	15.2000000000	Y
0.0002491379	29536.	118554327.	15.2000000000	Y
0.0002589080	29575.	114229570.	15.2000000000	Y
0.0002686782	29610.	110204476.	15.2000000000	Y
0.0002784483	29641.	106450310.	15.2000000000	Y
0.0002882184	29669.	102938245.	15.2000000000	Y

0.0002979885	29694.	99646752.	15.2000000000	Y
0.0003077586	29717.	96559363.	15.2000000000	Y
0.0003175287	29737.	93652098.	15.2000000000	Y
0.0003272989	29756.	90915193.	15.2000000000	Y
0.0003370690	29774.	88330589.	15.2000000000	Y
0.0003468391	29790.	85888991.	15.2000000000	Y
0.0003566092	29804.	83575753.	15.2000000000	Y
0.0003663793	29818.	81385555.	15.2000000000	Y
0.0003761494	29830.	79302798.	15.2000000000	Y
0.0003859195	29841.	77325496.	15.2000000000	Y
0.0003956897	29852.	75443258.	15.2000000000	Y
0.0004054598	29862.	73648842.	15.2000000000	Y
0.0004152299	29871.	71938869.	15.2000000000	Y
0.0004250000	29880.	70305278.	15.2000000000	Y
0.0004347701	29887.	68742922.	15.2000000000	Y
0.0004445402	29895.	67249242.	15.2000000000	Y
0.0004543103	29903.	65819590.	15.2000000000	Y
0.0004640805	29909.	64446834.	15.2000000000	Y
0.0004738506	29915.	63130687.	15.2000000000	Y
0.0004836207	29921.	61867718.	15.2000000000	Y
0.0004933908	29926.	60654705.	15.2000000000	Y
0.0005031609	29931.	59486120.	15.2000000000	Y
0.0005129310	29936.	58362052.	15.2000000000	Y
0.0005227011	29940.	57280005.	15.2000000000	Y
0.0005324713	29945.	56237666.	15.2000000000	Y
0.0005422414	29949.	55232434.	15.2000000000	Y
0.0005520115	29953.	54261150.	15.2000000000	Y
0.0005617816	29956.	53323650.	15.2000000000	Y
0.0005715517	29960.	52418201.	15.2000000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	29960.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	32.000000	ft
Outside Diameter of Casing	=	36.000000	in
Casing Wall Thickness	=	0.0000	in
Moment of Inertia of Steel Casing	=	0.0000	in^4
Width Flange of Core/Insert	=	15.000000	in
Depth of Core/Insert	=	30.400000	in
Flange Thickness of Core/Insert	=	1.070000	in
Web Thickness of Core/Insert	=	0.655000	in
Moment of Inertia of Steel Core/Insert	=	8138.	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Yield Stress of Core/Insert	=	50000.	psi
Elastic Modulus of Core/Insert	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Gross Area of Pile	=	1018.	sq. in.
Area of Concrete	=	967.265720	sq. in.
Cross-sectional Area of Steel Casing	=	0.0000	sq. in.
Cross-sectional Area of Steel Core/Insert	=	50.610300	sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	50.610300	sq. in.
Area Ratio of All Steel to Gross Area	=	4.97	percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	5819.218	kips

Tensile Load for Cracking of Concrete = -571.624 kips
Nominal Axial Tensile Capacity = -2530.515 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000048851	2669.	546304783.	18.0000000000	
0.0000097701	3145.	321891265.	13.2349905051	C
0.0000146552	4708.	321268279.	13.2601360044	C
0.0000195402	6265.	320638084.	13.2856232634	C
0.0000244253	7816.	320000495.	13.3114618919	C
0.0000293103	9360.	319355317.	13.3376619111	C
0.0000341954	10898.	318702347.	13.3642337780	C
0.0000390805	12429.	318041373.	13.3911884113	C
0.0000439655	13953.	317372176.	13.4185372191	C
0.0000488506	15471.	316694525.	13.4462921286	C
0.0000537356	16981.	316008178.	13.4743255025	C
0.0000586207	18484.	315312940.	13.5026211485	C
0.0000635057	19979.	314609060.	13.5310995787	C
0.0000683908	21468.	313895898.	13.5600243200	C
0.0000732759	22948.	313173176.	13.5894093076	C
0.0000781609	24421.	312440602.	13.6196078128	C
0.0000830460	25885.	311697874.	13.6499361324	C
0.0000879310	27341.	310937010.	13.6806083535	CY
0.0000928161	28418.	306179289.	13.6259389392	CY
0.0000977011	28897.	295773203.	13.4437034314	CY

0.0001025862	29328.	285889808.	13.2667659107	CY
0.0001074713	29718.	276524981.	13.0968719726	CY
0.0001123563	30073.	267661152.	12.9320179443	CY
0.0001172414	30398.	259280524.	12.7748027225	CY
0.0001221264	30695.	251336545.	12.6209427806	CY
0.0001270115	30969.	243831178.	12.4745384056	CY
0.0001318966	31222.	236718282.	12.3325167638	CY
0.0001367816	31456.	229972708.	12.1953912391	CY
0.0001416667	31675.	223589955.	12.0648392653	CY
0.0001465517	31877.	217513647.	11.9363125460	CY
0.0001514368	32067.	211752240.	11.8136241317	CY
0.0001563218	32245.	206274068.	11.6960230492	CY
0.0001612069	32410.	201049044.	11.5800463436	CY
0.0001660920	32567.	196078662.	11.4691294706	CY
0.0001709770	32716.	191344541.	11.3630094164	CY
0.0001758621	32854.	186816375.	11.2585304550	CY
0.0001807471	32984.	182489332.	11.1575875190	CY
0.0001856322	33109.	178357001.	11.0606795184	CY
0.0001905172	33227.	174403166.	10.9672309676	CY
0.0002002874	33442.	166971342.	10.7852807316	CY
0.0002100575	33641.	160150211.	10.6167970519	CY
0.0002198276	33818.	153838505.	10.4541747165	CY
0.0002295977	33980.	147998424.	10.3053445341	CY
0.0002393678	34124.	142558628.	10.1648813157	CY
0.0002491379	34249.	137468399.	10.0396113065	CY
0.0002589080	34351.	132674599.	9.9364828414	CY
0.0002686782	34444.	128198492.	9.8360605458	CY
0.0002784483	34507.	123925493.	9.7664586985	CY
0.0002882184	34565.	119927690.	9.7005125920	CY
0.0002979885	34608.	116137188.	9.6516122962	CY
0.0003077586	34637.	112547299.	9.6171292655	CY
0.0003175287	34664.	109169473.	9.5848438158	CY
0.0003272989	34688.	105982509.	9.5549685903	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips	

1	0.00000000	34688.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	15.0000	0.00	N.A.	No	0.00	913187.
2	43.2000	28.2000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	52.00
5.64	52.00
11.28	52.00
16.92	52.00
22.56	52.00
28.20	52.00
33.84	52.00
39.48	52.00
45.12	52.00
50.76	52.00
56.40	52.00
62.04	52.00
67.68	52.00
73.32	52.00
78.96	52.00
84.60	52.00
90.24	52.00
95.88	52.00
101.52	52.00
107.16	52.00
112.80	52.00
118.44	52.00
124.08	52.00
129.72	52.00
135.36	52.00
141.00	52.00
146.64	52.00
152.28	52.00
157.92	52.00
163.56	52.00
169.20	52.00
174.84	52.00
180.48	21.57

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
90.24	2.72
95.88	19.27
101.52	37.75
107.16	56.24
112.80	74.72
118.44	93.20
124.08	111.68
129.72	130.17
135.36	148.65
141.00	167.13
146.64	185.62
152.28	204.10
157.92	222.58
163.56	241.06
169.20	259.55
174.84	278.03
180.48	120.78

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.96
5.64	11.84
11.28	23.67
16.92	35.51
22.56	47.34
28.20	59.18
33.84	71.02
39.48	82.85
45.12	94.69

50.76	106.52
56.40	118.36
62.04	130.19
67.68	142.03
73.32	153.87
78.96	165.70
84.60	177.54
90.24	188.47
95.88	194.79
101.52	200.47
107.16	206.16
112.80	211.84
118.44	217.52
124.08	223.20
129.72	228.88
135.36	234.56
141.00	240.24
146.64	245.93
152.28	251.61
157.92	257.29
163.56	262.97
169.20	268.65
174.84	274.33
180.48	115.49

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.76085	-1.481E-05	0.000	0.000	2.357E+11
0.47000	1.72800	874.11127	335.00138	0.000	2.357E+11

0.94000	1.69515	3779.	728.41270	0.000	2.357E+11
1.41000	1.66230	9091.	1189.	0.000	2.357E+11
1.88000	1.62945	17186.	1715.	0.000	2.357E+11
2.35000	1.59661	28441.	2309.	0.000	2.357E+11
2.82000	1.56376	43233.	2970.	0.000	2.357E+11
3.29000	1.53093	61939.	3697.	0.000	2.357E+11
3.76000	1.49810	84933.	4491.	0.000	2.357E+11
4.23000	1.46529	112594.	5351.	0.000	2.357E+11
4.70000	1.43248	145297.	6279.	0.000	2.357E+11
5.17000	1.39970	183419.	7273.	0.000	2.357E+11
5.64000	1.36695	227337.	8334.	0.000	2.357E+11
6.11000	1.33422	277427.	9462.	0.000	2.357E+11
6.58000	1.30153	334065.	10656.	0.000	2.357E+11
7.05000	1.26889	397629.	11917.	0.000	2.357E+11
7.52000	1.23630	468493.	13250.	0.000	2.357E+11
7.99000	1.20377	547094.	14687.	0.000	2.357E+11
8.46000	1.17132	634158.	16255.	0.000	2.357E+11
8.93000	1.13895	730454.	17960.	0.000	2.357E+11
9.40000	1.10669	836750.	19802.	0.000	2.357E+11
9.87000	1.07453	953816.	21779.	0.000	2.357E+11
10.34000	1.04250	1082420.	23893.	0.000	2.357E+11
10.81000	1.01062	1223331.	26143.	0.000	2.357E+11
11.28000	0.97891	1377316.	28530.	0.000	2.357E+11
11.75000	0.94738	1545146.	31052.	0.000	2.357E+11
12.22000	0.91605	1727588.	33712.	0.000	2.357E+11
12.69000	0.88497	1925412.	36507.	0.000	2.357E+11
13.16000	0.85414	2139385.	39438.	0.000	2.357E+11
13.63000	0.82360	2370277.	42506.	0.000	2.357E+11
14.10000	0.79338	2618856.	45710.	0.000	2.357E+11
14.57000	0.76351	2885891.	49051.	0.000	2.357E+11
15.04000	0.73404	3172151.	51472.	-3.4966	3.219E+11
15.51000	0.70487	3466501.	52058.	-46.7799	3.217E+11
15.98000	0.67605	3759363.	51663.	-93.1122	3.216E+11
16.45000	0.64760	4049263.	51003.	-141.0752	3.215E+11
16.92000	0.61955	4334676.	50070.	-189.8531	3.214E+11
17.39000	0.59193	4614049.	48863.	-238.1219	3.213E+11
17.86000	0.56477	4885848.	47389.	-284.6009	3.212E+11
18.33000	0.53809	5148594.	45658.	-329.1127	3.211E+11
18.80000	0.51192	5400871.	43685.	-370.4755	3.209E+11
19.27000	0.48629	5641363.	41492.	-407.3499	3.208E+11
19.74000	0.46122	5868898.	39098.	-441.6493	3.208E+11
20.21000	0.43673	6082384.	36517.	-473.5261	3.207E+11
20.68000	0.41284	6280807.	33772.	-499.8538	3.206E+11
21.15000	0.38957	6463330.	30891.	-521.6624	3.205E+11

21.62000	0.36695	6629259.	27894.	-541.1386	3.205E+11
22.09000	0.34498	6777975.	24804.	-554.5071	3.204E+11
22.56000	0.32369	6909052.	21656.	-562.0705	3.203E+11
23.03000	0.30308	7022250.	18468.	-568.1056	3.203E+11
23.50000	0.28317	7117377.	15267.	-567.2158	3.203E+11
23.97000	0.26397	7194461.	12091.	-559.0246	3.202E+11
24.44000	0.24548	7253762.	8942.	-557.7728	3.202E+11
24.91000	0.22771	7295321.	5814.	-551.3518	3.202E+11
25.38000	0.21067	7319342.	2740.	-538.6606	3.202E+11
25.85000	0.19436	7326228.	-244.4897	-519.6539	3.202E+11
26.32000	0.17877	7316584.	-3104.	-494.4309	3.202E+11
26.79000	0.16391	7291212.	-5805.	-463.2616	3.202E+11
27.26000	0.14977	7251105.	-8372.	-446.9475	3.202E+11
27.73000	0.13636	7196780.	-10884.	-443.8330	3.202E+11
28.20000	0.12365	7128336.	-13371.	-438.0601	3.202E+11
28.67000	0.11166	7045959.	-15818.	-429.6536	3.203E+11
29.14000	0.10037	6949914.	-18210.	-418.6679	3.203E+11
29.61000	0.08977	6840552.	-20533.	-405.1879	3.204E+11
30.08000	0.07984	6718300.	-22779.	-391.0571	3.204E+11
30.55000	0.07059	6583610.	-24962.	-383.2645	3.205E+11
31.02000	0.06198	6436728.	-27096.	-373.5350	3.206E+11
31.49000	0.05402	6277964.	-29170.	-361.8753	3.206E+11
31.96000	0.04668	6107688.	-31173.	-348.2990	3.207E+11
32.43000	0.03994	5926334.	-33094.	-332.8265	3.207E+11
32.90000	0.03379	5734392.	-34922.	-315.4828	3.208E+11
33.37000	0.02821	5532415.	-36647.	-296.2946	3.209E+11
33.84000	0.02318	5321014.	-38259.	-275.2862	3.210E+11
34.31000	0.01868	5100855.	-39747.	-252.4725	3.211E+11
34.78000	0.01468	4872665.	-41049.	-209.0318	3.212E+11
35.25000	0.01116	4637826.	-42097.	-162.7356	3.213E+11
35.72000	0.008105	4397811.	-42897.	-120.9100	3.214E+11
36.19000	0.005483	4153949.	-43474.	-83.6571	3.214E+11
36.66000	0.003273	3907426.	-43854.	-51.0408	3.215E+11
37.13000	0.001449	3659280.	-44063.	-23.0881	3.216E+11
37.60000	-1.290E-05	3410399.	-44127.	0.20998	3.217E+11
38.07000	-0.001138	3161525.	-44073.	18.89693	3.219E+11
38.54000	-0.001950	2913252.	-43927.	33.04972	3.952E+11
39.01000	-0.002528	2666031.	-43710.	43.69821	5.463E+11
39.48000	-0.002950	2420199.	-43441.	52.00165	5.463E+11
39.95000	-0.003232	2176022.	-43130.	58.05959	5.463E+11
40.42000	-0.003387	1933691.	-42792.	61.98918	5.463E+11
40.89000	-0.003429	1693332.	-42437.	63.92482	5.463E+11
41.36000	-0.003373	1455007.	-42076.	64.01783	5.463E+11
41.83000	-0.003232	1218718.	-41719.	62.43618	5.463E+11

42.30000	-0.003020	984415.	-41376.	59.36429	5.463E+11
42.77000	-0.002751	752001.	-41053.	55.00290	5.463E+11
43.24000	-0.002438	521336.	-38179.	964.12675	5.463E+11
43.71000	-0.002094	321339.	-32279.	1128.	5.463E+11
44.18000	-0.001732	157226.	-25527.	1266.	5.463E+11
44.65000	-0.001361	33397.	-18087.	1372.	5.463E+11
45.12000	-0.000988	-46798.	-10182.	1432.	5.463E+11
45.59000	-0.000617	-81450.	-2139.	1420.	5.463E+11
46.06000	-0.000252	-70924.	4768.	1029.	5.463E+11
46.53000	0.000110	-27662.	6288.	-490.4212	5.463E+11
47.00000	0.000470	0.000	0.000	-1739.	5.463E+11

Output Summary for Load Case No. 1:

Pile-head deflection = 1.76084832 inches
Computed slope at pile head = -0.0058244 radians
Maximum bending moment = 7326228. inch-lbs
Maximum shear force = 52058. lbs
Depth of maximum bending moment = 25.85000000 feet below pile head
Depth of maximum shear force = 15.51000000 feet below pile head
Number of iterations = 22
Number of zero deflection points = 2
Pile deflection at ground = 0.73654374 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	52.00
5.64	52.00
11.28	52.00
16.92	52.00
22.56	52.00
28.20	52.00
33.84	52.00
39.48	52.00
45.12	52.00

50.76	52.00
56.40	52.00
62.04	52.00
67.68	52.00
73.32	52.00
78.96	52.00
84.60	52.00
90.24	52.00
95.88	52.00
101.52	52.00
107.16	52.00
112.80	52.00
118.44	52.00
124.08	52.00
129.72	52.00
135.36	52.00
141.00	52.00
146.64	52.00
152.28	52.00
157.92	52.00
163.56	52.00
169.20	52.00
174.84	52.00
180.48	21.57

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
90.24	2.72
95.88	19.27
101.52	37.75
107.16	56.24
112.80	74.72
118.44	93.20
124.08	111.68

129.72	130.17
135.36	148.65
141.00	167.13
146.64	185.62
152.28	204.10
157.92	222.58
163.56	241.06
169.20	259.55
174.84	278.03
180.48	120.78

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.96
5.64	11.84
11.28	23.67
16.92	35.51
22.56	47.34
28.20	59.18
33.84	71.02
39.48	82.85
45.12	94.69
50.76	106.52
56.40	118.36
62.04	130.19
67.68	142.03
73.32	153.87
78.96	165.70
84.60	177.54
90.24	188.47
95.88	194.79
101.52	200.47
107.16	206.16
112.80	211.84

118.44	217.52
124.08	223.20
129.72	228.88
135.36	234.56
141.00	240.24
146.64	245.93
152.28	251.61
157.92	257.29
163.56	262.97
169.20	268.65
174.84	274.33
180.48	115.49

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.94041	3.291E-06	2.918E-07	0.000	2.357E+11
0.47000	2.88720	1518.	575.82207	0.000	2.357E+11
0.94000	2.83399	6495.	1239.	0.000	2.357E+11
1.41000	2.78079	15497.	2003.	0.000	2.357E+11
1.88000	2.72758	29087.	2867.	0.000	2.357E+11
2.35000	2.67438	47831.	3830.	0.000	2.357E+11
2.82000	2.62118	72294.	4894.	0.000	2.357E+11
3.29000	2.56800	103039.	6058.	0.000	2.357E+11
3.76000	2.51482	140633.	7323.	0.000	2.357E+11
4.23000	2.46167	185638.	8687.	0.000	2.357E+11
4.70000	2.40854	238622.	10151.	0.000	2.357E+11
5.17000	2.35545	300147.	11716.	0.000	2.357E+11
5.64000	2.30239	370779.	13381.	0.000	2.357E+11
6.11000	2.24939	451083.	15146.	0.000	2.357E+11

6.58000	2.19644	541623.	17011.	0.000	2.357E+11
7.05000	2.14357	642964.	18976.	0.000	2.357E+11
7.52000	2.09079	755671.	21045.	0.000	2.357E+11
7.99000	2.03810	880352.	23241.	0.000	2.357E+11
8.46000	1.98554	1017835.	25587.	0.000	2.357E+11
8.93000	1.93311	1168979.	28086.	0.000	2.357E+11
9.40000	1.88085	1334643.	30736.	0.000	2.357E+11
9.87000	1.82876	1515686.	33539.	0.000	2.357E+11
10.34000	1.77687	1712967.	36495.	0.000	2.357E+11
10.81000	1.72522	1927345.	39602.	0.000	2.357E+11
11.28000	1.67383	2159680.	42862.	0.000	2.357E+11
11.75000	1.62273	2410830.	46274.	0.000	2.357E+11
12.22000	1.57195	2681654.	49839.	0.000	2.357E+11
12.69000	1.52154	2973011.	53556.	0.000	2.357E+11
13.16000	1.47152	3285760.	57425.	0.000	2.357E+11
13.63000	1.42195	3620761.	61446.	0.000	2.357E+11
14.10000	1.37287	3978872.	65620.	0.000	2.357E+11
14.57000	1.32433	4360952.	69946.	0.000	2.357E+11
15.04000	1.27637	4767860.	73070.	-4.2691	3.212E+11
15.51000	1.22889	5185186.	73833.	-57.1630	3.210E+11
15.98000	1.18192	5600693.	73350.	-113.9088	3.209E+11
16.45000	1.13551	6012578.	72542.	-172.8423	3.207E+11
16.92000	1.08969	6418964.	71400.	-232.1658	3.206E+11
17.39000	1.04451	6817965.	69925.	-290.5520	3.204E+11
17.86000	1.00000	7207723.	68129.	-346.6631	3.202E+11
18.33000	0.95621	7586455.	66022.	-400.2305	3.201E+11
18.80000	0.91318	7952455.	63625.	-449.9903	3.199E+11
19.27000	0.87094	8304141.	60961.	-494.5451	3.198E+11
19.74000	0.82952	8640096.	58054.	-536.3982	3.196E+11
20.21000	0.78896	8958989.	54917.	-575.8779	3.195E+11
20.68000	0.74929	9259563.	51575.	-609.3185	3.194E+11
21.15000	0.71055	9540754.	48058.	-637.7590	3.193E+11
21.62000	0.67276	9801659.	44389.	-663.4236	3.191E+11
22.09000	0.63594	10041461.	40593.	-682.5117	3.190E+11
22.56000	0.60013	10259552.	36706.	-695.8553	3.189E+11
23.03000	0.56533	10455508.	32739.	-710.9494	3.189E+11
23.50000	0.53159	10628850.	28708.	-718.5196	3.188E+11
23.97000	0.49890	10779335.	24657.	-717.9946	3.187E+11
24.44000	0.46729	10906981.	20580.	-727.6531	3.187E+11
24.91000	0.43676	11011482.	16465.	-731.7516	3.186E+11
25.38000	0.40734	11092705.	12347.	-728.6326	3.186E+11
25.85000	0.37902	11150751.	8267.	-717.9273	3.186E+11
26.32000	0.35182	11185959.	4270.	-699.3736	3.186E+11
26.79000	0.32573	11198921.	400.80262	-672.8460	3.186E+11

27.26000	0.30076	11190480.	-3362.	-661.5978	3.186E+11
27.73000	0.27691	11160994.	-7102.	-664.6494	3.186E+11
28.20000	0.25417	11110366.	-10850.	-664.1668	3.186E+11
28.67000	0.23255	11038611.	-14584.	-660.0984	3.186E+11
29.14000	0.21202	10945858.	-18285.	-652.4273	3.187E+11
29.61000	0.19259	10832352.	-21933.	-641.1732	3.187E+11
30.08000	0.17424	10698450.	-25514.	-628.4865	3.188E+11
30.55000	0.15695	10544557.	-29043.	-623.0283	3.188E+11
31.02000	0.14072	10370845.	-32534.	-614.9445	3.189E+11
31.49000	0.12552	10177572.	-35972.	-604.2313	3.190E+11
31.96000	0.11134	9965079.	-39342.	-590.8969	3.191E+11
32.43000	0.09815	9733789.	-42630.	-574.9612	3.192E+11
32.90000	0.08593	9484211.	-45821.	-556.4554	3.193E+11
33.37000	0.07466	9216931.	-48900.	-535.4208	3.194E+11
33.84000	0.06430	8932620.	-51853.	-511.9084	3.195E+11
34.31000	0.05483	8632026.	-54667.	-485.9766	3.196E+11
34.78000	0.04623	8315972.	-57328.	-457.6885	3.198E+11
35.25000	0.03845	7985360.	-59824.	-427.1076	3.199E+11
35.72000	0.03146	7641162.	-62140.	-394.2906	3.201E+11
36.19000	0.02523	7284422.	-64265.	-359.2776	3.202E+11
36.66000	0.01973	6916253.	-66146.	-307.6573	3.203E+11
37.13000	0.01491	6538297.	-67683.	-237.5829	3.205E+11
37.60000	0.01074	6152784.	-68846.	-174.8077	3.207E+11
38.07000	0.007185	5761711.	-69676.	-119.3495	3.208E+11
38.54000	0.004199	5366841.	-70213.	-71.1665	3.210E+11
39.01000	0.001744	4969708.	-70499.	-30.1574	3.211E+11
39.48000	-0.000218	4571615.	-70573.	3.83636	3.213E+11
39.95000	-0.001727	4173644.	-70475.	31.02767	3.214E+11
40.42000	-0.002824	3776660.	-70241.	51.68107	3.216E+11
40.89000	-0.003547	3381320.	-69909.	66.11281	3.218E+11
41.36000	-0.003935	2988083.	-69512.	74.68943	3.675E+11
41.83000	-0.004065	2597222.	-69080.	78.53342	5.463E+11
42.30000	-0.004044	2208859.	-68635.	79.49289	5.463E+11
42.77000	-0.003894	1823024.	-68191.	77.86645	5.463E+11
43.24000	-0.003638	1439667.	-64966.	1066.	5.463E+11
43.71000	-0.003299	1090212.	-58396.	1264.	5.463E+11
44.18000	-0.002895	780960.	-50771.	1440.	5.463E+11
44.65000	-0.002447	517517.	-42230.	1589.	5.463E+11
45.12000	-0.001968	304603.	-32953.	1701.	5.463E+11
45.59000	-0.001471	145801.	-23180.	1765.	5.463E+11
46.06000	-0.000966	43137.	-13258.	1753.	5.463E+11
46.53000	-0.000459	-3753.	-3824.	1592.	5.463E+11
47.00000	4.875E-05	0.000	0.000	-235.9635	5.463E+11

Output Summary for Load Case No. 2:

Pile-head deflection = 2.94041203 inches
Computed slope at pile head = -0.0094342 radians
Maximum bending moment = 11198921. inch-lbs
Maximum shear force = 73833. lbs
Depth of maximum bending moment = 26.79000000 feet below pile head
Depth of maximum shear force = 15.51000000 feet below pile head
Number of iterations = 21
Number of zero deflection points = 2
Pile deflection at ground = 1.28045441 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	1.7608483	7326228.	52058.	-0.005824
2	2.9404120	11198921.	73833.	-0.009434

Maximum pile-head deflection = 2.9404120335 inches
Maximum pile-head rotation = -0.0094342473 radians = -0.540543 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	29959713.	2885891.	Pass
	2	1.00	34687953.	7326228.	Pass
2	1	1.00	29959713.	4360952.	Pass
	2	1.00	34687953.	11198921.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	537750.	49051.	Pass
	2	1.00	537750.	52058.	Pass
2	1	1.00	537750.	69946.	Pass
	2	1.00	537750.	73833.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = 73832.75 lbs
Factored Shear Capacity at Node = 537750.00 lbs
Fraction of Allowable Shear Capacity = 0.1373

The analysis ended normally.

==

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1162.0 LT Pile 7 3.lp12d

Name of the output report file:
BEL-70 1162.0 LT Pile 7 3.lp12o

Name of the plot output file:
BEL-70 1162.0 LT Pile 7 3.lp12p

Name of the runtime message file:
BEL-70 1162.0 LT Pile 7 3.lp12r

Date and Time of Analysis

Date: June 23, 2026 Time: 11:14:33

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1162+0 LT Piles 7 3 - 11' Ht.(6' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 36.200 ft
Depth of ground surface below top of pile = 11.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.9000
2	11.200	14.9000
3	11.200	24.0000
4	36.200	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 11.200000 ft
   AISC Section Type = HP

   AISC Section Name = HP14X117

   Pile width = 14.900000 in
   Shear capacity of section = 294150. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 25.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 294150. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 11.000000 ft
   Distance from top of pile to bottom of layer = 43.200000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	43.200000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 13.800 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 3

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2
3	Live Load (LL)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	5.50	109.89
3	11.00	162.64

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	5.50	0.00
2	11.00	171.60

Number of Distributed Loading Points Input for Load Group 3 = 2

Point	Depth ft	Distributed Load lb/inch
1	0.00	42.00
2	11.20	42.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 3

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	1
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1

Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*LL + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.75*LL + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section = 11.200000 ft

Flange Width = 14.900000 in
Section Depth = 14.200000 in
Flange Thickness = 0.805000 in
Web Thickness = 0.805000 in
Yield Stress of Pipe = 50.000000 ksi
Elastic Modulus = 29000. ksi
Cross-sectional Area = 34.400000 sq. in.
Moment of Inertia = 1220. in^4
Elastic Bending Stiffness = 35380000. kip-in^2
Plastic Modulus, Z = 194.000000in^3
Plastic Moment Capacity = Fy Z = 9700.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 1720.000 kips
Nominal Axial Tensile Capacity = -1720.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	172.6211844549	35100995.	7.1000000000	
0.0000098357	345.2423689099	35100995.	7.1000000000	
0.0000147535	517.8635533648	35100995.	7.1000000000	
0.0000196714	690.4847378198	35100995.	7.1000000000	
0.0000245892	863.1059222747	35100995.	7.1000000000	

0.0000295071	1036.	35100995.	7.1000000000	
0.0000344249	1208.	35100995.	7.1000000000	
0.0000393427	1381.	35100995.	7.1000000000	
0.0000442606	1554.	35100995.	7.1000000000	
0.0000491784	1726.	35100995.	7.1000000000	
0.0000540963	1899.	35100995.	7.1000000000	
0.0000590141	2071.	35100995.	7.1000000000	
0.0000639320	2244.	35100995.	7.1000000000	
0.0000688498	2417.	35100995.	7.1000000000	
0.0000737676	2589.	35100995.	7.1000000000	
0.0000786855	2762.	35100995.	7.1000000000	
0.0000836033	2935.	35100995.	7.1000000000	
0.0000885212	3107.	35100995.	7.1000000000	
0.0000934390	3280.	35100995.	7.1000000000	
0.0000983569	3452.	35100995.	7.1000000000	
0.0001032747	3625.	35100995.	7.1000000000	
0.0001081925	3798.	35100995.	7.1000000000	
0.0001131104	3970.	35100995.	7.1000000000	
0.0001180282	4143.	35100995.	7.1000000000	
0.0001229461	4316.	35100995.	7.1000000000	
0.0001278639	4488.	35100995.	7.1000000000	
0.0001327818	4661.	35100995.	7.1000000000	
0.0001376996	4833.	35100995.	7.1000000000	
0.0001426174	5006.	35100995.	7.1000000000	
0.0001475353	5179.	35100995.	7.1000000000	
0.0001524531	5351.	35100995.	7.1000000000	
0.0001573710	5524.	35100995.	7.1000000000	
0.0001622888	5696.	35100995.	7.1000000000	
0.0001672067	5869.	35100995.	7.1000000000	
0.0001721245	6042.	35100995.	7.1000000000	
0.0001770424	6214.	35100995.	7.1000000000	
0.0001819602	6387.	35100995.	7.1000000000	
0.0001868780	6560.	35100995.	7.1000000000	
0.0001917959	6732.	35100995.	7.1000000000	
0.0002016316	7077.	35100995.	7.1000000000	
0.0002114673	7423.	35100995.	7.1000000000	
0.0002213029	7768.	35100995.	7.1000000000	
0.0002311386	8113.	35100995.	7.1000000000	
0.0002409743	8458.	35100995.	7.1000000000	
0.0002508100	8768.	34956786.	7.1000000000	Y
0.0002606457	8968.	34406082.	7.1000000000	Y
0.0002704814	9073.	33542198.	7.1000000000	Y
0.0002803171	9118.	32525814.	7.1000000000	Y
0.0002901527	9151.	31539616.	7.1000000000	Y

0.0002999884	9182.	30607932.	7.1000000000	Y
0.0003098241	9210.	29725136.	7.1000000000	Y
0.0003196598	9235.	28889181.	7.1000000000	Y
0.0003294955	9258.	28096536.	7.1000000000	Y
0.0003393312	9279.	27344053.	7.1000000000	Y
0.0003491669	9298.	26628906.	7.1000000000	Y
0.0003590025	9316.	25948550.	7.1000000000	Y
0.0003688382	9332.	25300683.	7.1000000000	Y
0.0003786739	9347.	24683214.	7.1000000000	Y
0.0003885096	9361.	24094238.	7.1000000000	Y
0.0003983453	9374.	23532010.	7.1000000000	Y
0.0004081810	9386.	22993958.	7.1000000000	Y
0.0004180167	9397.	22479436.	7.1000000000	Y
0.0004278523	9407.	21987182.	7.1000000000	Y
0.0004376880	9417.	21515064.	7.1000000000	Y
0.0004475237	9426.	21062342.	7.1000000000	Y
0.0004573594	9435.	20628245.	7.1000000000	Y
0.0004671951	9442.	20210614.	7.1000000000	Y
0.0004770308	9450.	19809883.	7.1000000000	Y
0.0004868665	9457.	19423744.	7.1000000000	Y
0.0004967022	9464.	19052717.	7.1000000000	Y
0.0005065378	9470.	18694718.	7.1000000000	Y
0.0005163735	9476.	18350357.	7.1000000000	Y
0.0005262092	9481.	18017531.	7.1000000000	Y
0.0005360449	9486.	17696878.	7.1000000000	Y
0.0005458806	9491.	17387006.	7.1000000000	Y
0.0005557163	9496.	17087665.	7.1000000000	Y
0.0005655520	9501.	16798647.	7.1000000000	Y
0.0005753876	9505.	16518541.	7.1000000000	Y
0.0005852233	9509.	16247851.	7.1000000000	Y
0.0006245661	9523.	15247286.	7.1000000000	Y
0.0006639088	9535.	14361320.	7.1000000000	Y
0.0007032516	9544.	13571868.	7.1000000000	Y
0.0007425943	9553.	12864088.	7.1000000000	Y
0.0007819371	9560.	12226014.	7.1000000000	Y
0.0008212798	9566.	11647588.	7.1000000000	Y
0.0008606225	9571.	11121235.	7.1000000000	Y
0.0008999653	9576.	10640384.	7.1000000000	Y
0.0009393080	9580.	10198808.	7.1000000000	Y
0.0009786508	9584.	9792580.	7.1000000000	Y
0.0010179935	9587.	9417093.	7.1000000000	Y
0.0010573363	9590.	9069525.	7.1000000000	Y
0.0010966790	9592.	8746284.	7.1000000000	Y
0.0011360218	9594.	8445432.	7.1000000000	Y

```
    0.0011753645             9596.          8164483.       7.1000000000    Y
    0.0012147072             9598.          7901486.       7.1000000000    Y


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
--------------------------------------------------------------------------------

                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------          ----------------
  1               0.00000000                   9598.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.




Pile Section No. 2:
-------------------

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
--------------------------------------------------------------------------------

Length of Section                                =    25.000000 ft
Outside Diameter of Casing                       =    24.000000 in
Casing Wall Thickness                            =       0.0000 in
Moment of Inertia of Steel Casing                =       0.0000 in^4
Width Flange of Core/Insert                      =    14.900000 in
Depth of Core/Insert                             =    14.200000 in
Flange Thickness of Core/Insert                  =     0.805000 in
Web Thickness of Core/Insert                     =     0.805000 in
Moment of Inertia of Steel Core/Insert           =        1211. in^4
Yield Stress of Casing                           =       50000. psi
```

Elastic Modulus of Casing = 29000000. psi
Yield Stress of Core/Insert = 50000. psi
Elastic Modulus of Core/Insert = 29000000. psi
Number of Reinforcing Bars = 0 bars
Gross Area of Pile = 452.389342 sq. in.
Area of Concrete = 418.265392 sq. in.
Cross-sectional Area of Steel Casing = 0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert = 34.123950 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars) = 34.123950 sq. in.
Area Ratio of All Steel to Gross Area = 7.54 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3128.300 kips
Tensile Load for Cracking of Concrete = -288.130 kips
Nominal Axial Tensile Capacity = -1706.197 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	483.9280578262	98402501.	12.0000000000	
0.0000098357	547.8658210217	55701840.	9.4666118792	C
0.0000147535	819.9660048544	55577617.	9.4783778602	C

0.0000196714	1091.	55452505.	9.4900875402	C
0.0000245892	1360.	55326491.	9.5018840041	C
0.0000295071	1629.	55199559.	9.5137803907	C
0.0000344249	1896.	55071694.	9.5257784079	C
0.0000393427	2162.	54942882.	9.5378798087	C
0.0000442606	2426.	54813107.	9.5500863932	C
0.0000491784	2689.	54682353.	9.5624000097	C
0.0000540963	2951.	54550604.	9.5748225567	C
0.0000590141	3211.	54417844.	9.5873559851	C
0.0000639320	3470.	54284054.	9.6000022998	C
0.0000688498	3728.	54149219.	9.6128136507	C
0.0000737676	3984.	54013319.	9.6256921077	C
0.0000786855	4239.	53876336.	9.6386894617	C
0.0000836033	4493.	53738251.	9.6518079772	C
0.0000885212	4745.	53599044.	9.6650499842	C
0.0000934390	4995.	53458695.	9.6784178810	C
0.0000983569	5244.	53317184.	9.6919141367	C
0.0001032747	5492.	53174489.	9.7055412943	C
0.0001081925	5738.	53030588.	9.7192638865	C
0.0001131104	5982.	52885560.	9.7329538297	C
0.0001180282	6225.	52739305.	9.7467734287	C
0.0001229461	6466.	52591796.	9.7607307822	C
0.0001278639	6706.	52443008.	9.7748287202	C
0.0001327818	6944.	52292918.	9.7890701628	C
0.0001376996	7180.	52141499.	9.8034581245	C
0.0001426174	7414.	51988725.	9.8179957178	C
0.0001475353	7647.	51834570.	9.8326861573	C
0.0001524531	7879.	51679004.	9.8475327649	C
0.0001573710	8108.	51522000.	9.8625389744	C
0.0001622888	8336.	51363527.	9.8777090093	C
0.0001672067	8562.	51203554.	9.8930452712	C
0.0001721245	8786.	51042050.	9.9085518865	C
0.0001770424	9008.	50878982.	9.9242335917	C
0.0001819602	9228.	50714314.	9.9401017003	C
0.0001868780	9446.	50548013.	9.9561426736	C
0.0001917959	9651.	50316691.	9.9667928811	CY
0.0002016316	9953.	49364758.	9.9453095387	CY
0.0002114673	10100.	47762925.	9.8614668104	CY
0.0002213029	10212.	46146522.	9.7727410217	CY
0.0002311386	10313.	44618447.	9.6882620100	CY
0.0002409743	10403.	43170524.	9.6068690660	CY
0.0002508100	10485.	41804448.	9.5299580709	CY
0.0002606457	10559.	40511464.	9.4562520233	CY
0.0002704814	10627.	39288392.	9.3851393320	CY

0.0002803171	10689.	38131432.	9.3174490971	CY
0.0002901527	10746.	37035316.	9.2527602315	CY
0.0002999884	10798.	35994808.	9.1898376201	CY
0.0003098241	10846.	35007897.	9.1293485656	CY
0.0003196598	10891.	34071206.	9.0715442645	CY
0.0003294955	10933.	33181540.	9.0162300299	CY
0.0003393312	10972.	32334082.	8.9621602836	CY
0.0003491669	11008.	31525666.	8.9095528857	CY
0.0003590025	11041.	30755544.	8.8591229075	CY
0.0003688382	11073.	30021768.	8.8106918549	CY
0.0003786739	11103.	29321948.	8.7643273751	CY
0.0003885096	11131.	28650012.	8.7179786899	CY
0.0003983453	11157.	28008210.	8.6733064948	CY
0.0004081810	11182.	27394500.	8.6304372118	CY
0.0004180167	11205.	26805267.	8.5887154354	CY
0.0004278523	11228.	26241882.	8.5483328517	CY
0.0004376880	11249.	25699823.	8.5092824497	CY
0.0004475237	11268.	25179093.	8.4707792640	CY
0.0004573594	11270.	24640491.	8.4411834821	CY
0.0004671951	11288.	24160763.	8.4054600230	CY
0.0004770308	11288.	23662603.	8.3852064789	CY
0.0004868665	11292.	23193002.	8.3507840823	CY
0.0004967022	11292.	22733735.	8.3361999768	CY
0.0005065378	11292.	22292303.	8.3031913295	CY
0.0005163735	11292.	21867688.	8.2968304685	CY
0.0005262092	11292.	21458946.	8.2677796966	CY
0.0005360449	11292.	21065204.	8.2668842544	CY
0.0005458806	11292.	20685651.	8.2387547995	CY
0.0005557163	11292.	20319533.	8.2389089316	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	11292.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	11.0000	0.00	N.A.	No	0.00	610913.
2	43.2000	32.2000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	42.00

4.34	42.00
8.69	42.00
13.03	42.00
17.38	42.00
21.72	42.00
26.06	42.00
30.41	42.00
34.75	42.00
39.10	42.00
43.44	42.00
47.78	42.00
52.13	42.00
56.47	42.00
60.82	42.00
65.16	42.00
69.50	42.00
73.85	42.00
78.19	42.00
82.54	42.00
86.88	42.00
91.22	42.00
95.57	42.00
99.91	42.00
104.26	42.00
108.60	42.00
112.94	42.00
117.29	42.00
121.63	42.00
125.98	42.00
130.32	42.00
134.66	18.45

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in

65.16	0.53
69.50	9.11
73.85	20.40
78.19	31.70
82.54	42.99
86.88	54.29
91.22	65.58
95.57	76.88
99.91	88.17
104.26	99.47
108.60	110.76
112.94	122.05
117.29	133.35
121.63	144.64
125.98	155.94
130.32	147.72

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.81
4.34	7.23
8.69	14.47
13.03	21.70
17.38	28.93
21.72	36.16
26.06	43.40
30.41	50.63
34.75	57.86
39.10	65.09
43.44	72.33
47.78	79.56
52.13	86.79
56.47	94.03
60.82	101.26

65.16	108.31
69.50	112.69
73.85	116.16
78.19	119.63
82.54	123.11
86.88	126.58
91.22	130.05
95.57	133.52
99.91	136.99
104.26	140.47
108.60	143.94
112.94	147.41
117.29	150.88
121.63	154.35
125.98	157.83
130.32	142.85

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.01938	1.487E-05	-9.508E-08	0.000	3.510E+10
0.36200	1.97988	413.33763	202.08494	0.000	3.510E+10
0.72400	1.94039	1756.	431.66161	0.000	3.510E+10
1.08600	1.90089	4164.	692.65738	0.000	3.510E+10
1.44800	1.86140	7774.	985.07226	0.000	3.510E+10
1.81000	1.82191	12722.	1309.	0.000	3.510E+10
2.17200	1.78243	19145.	1664.	0.000	3.510E+10
2.53400	1.74295	27180.	2051.	0.000	3.510E+10
2.89600	1.70350	36963.	2469.	0.000	3.510E+10
3.25800	1.66406	48630.	2918.	0.000	3.510E+10

3.62000	1.62465	62318.	3399.	0.000	3.510E+10
3.98200	1.58527	78164.	3912.	0.000	3.510E+10
4.34400	1.54593	96303.	4455.	0.000	3.510E+10
4.70600	1.50665	116873.	5031.	0.000	3.510E+10
5.06800	1.46743	140010.	5637.	0.000	3.510E+10
5.43000	1.42828	165850.	6276.	0.000	3.510E+10
5.79200	1.38923	194536.	6959.	0.000	3.510E+10
6.15400	1.35027	226314.	7703.	0.000	3.510E+10
6.51600	1.31144	261461.	8511.	0.000	3.510E+10
6.87800	1.27275	300256.	9383.	0.000	3.510E+10
7.24000	1.23422	342978.	10319.	0.000	3.510E+10
7.60200	1.19588	389906.	11319.	0.000	3.510E+10
7.96400	1.15774	441318.	12383.	0.000	3.510E+10
8.32600	1.11985	497493.	13512.	0.000	3.510E+10
8.68800	1.08222	558709.	14705.	0.000	3.510E+10
9.05000	1.04489	625246.	15961.	0.000	3.510E+10
9.41200	1.00789	697381.	17282.	0.000	3.510E+10
9.77400	0.97128	775394.	18667.	0.000	3.510E+10
10.13600	0.93507	859563.	20117.	0.000	3.510E+10
10.49800	0.89933	950166.	21630.	0.000	3.510E+10
10.86000	0.86411	1047483.	23125.	0.000	3.510E+10
11.22200	0.82944	1151076.	23852.	-16.2969	5.542E+10
11.58400	0.79517	1254709.	23759.	-44.9439	5.537E+10
11.94600	0.76132	1357495.	23498.	-75.1725	5.533E+10
12.30800	0.72794	1458861.	23105.	-105.7873	5.527E+10
12.67000	0.69505	1558232.	22580.	-135.8427	5.523E+10
13.03200	0.66270	1655039.	21928.	-164.4866	5.519E+10
13.39400	0.63091	1748742.	21155.	-191.5771	5.514E+10
13.75600	0.59973	1838830.	20270.	-215.9055	5.510E+10
14.11800	0.56917	1924844.	19284.	-237.9001	5.506E+10
14.48000	0.53927	2006369.	18205.	-258.8518	5.501E+10
14.84200	0.51006	2083009.	17043.	-276.2406	5.498E+10
15.20400	0.48156	2154436.	15810.	-291.2188	5.495E+10
15.56600	0.45381	2220368.	14518.	-303.6011	5.491E+10
15.92800	0.42681	2280570.	13181.	-311.9239	5.488E+10
16.29000	0.40061	2334887.	11808.	-320.4155	5.485E+10
16.65200	0.37520	2383157.	10404.	-325.8053	5.483E+10
17.01400	0.35062	2425279.	8987.	-326.8651	5.481E+10
17.37600	0.32687	2461234.	7553.	-333.2201	5.479E+10
17.73800	0.30396	2490900.	6100.	-335.5996	5.478E+10
18.10000	0.28192	2514233.	4647.	-333.6858	5.477E+10
18.46200	0.26074	2531270.	3211.	-327.2202	5.476E+10
18.82400	0.24043	2542132.	1814.	-316.0257	5.475E+10
19.18600	0.22100	2547030.	451.53079	-311.2668	5.475E+10

19.54800	0.20245	2546054.	-907.5030	-314.4394	5.475E+10
19.91000	0.18478	2539145.	-2276.	-315.5208	5.475E+10
20.27200	0.16798	2526283.	-3644.	-314.4507	5.476E+10
20.63400	0.15205	2507486.	-5003.	-311.1916	5.477E+10
20.99600	0.13699	2482817.	-6343.	-305.7309	5.478E+10
21.35800	0.12278	2452378.	-7669.	-304.7170	5.480E+10
21.72000	0.10941	2416190.	-8987.	-302.1206	5.482E+10
22.08200	0.09688	2374301.	-10290.	-297.8267	5.484E+10
22.44400	0.08516	2326791.	-11571.	-291.7940	5.486E+10
22.80600	0.07425	2273775.	-12821.	-283.9814	5.488E+10
23.16800	0.06411	2215400.	-14034.	-274.3452	5.491E+10
23.53000	0.05474	2151849.	-15201.	-262.8349	5.495E+10
23.89200	0.04611	2083337.	-16313.	-249.3868	5.498E+10
24.25400	0.03819	2010120.	-17363.	-233.9142	5.501E+10
24.61600	0.03096	1932488.	-18341.	-216.2904	5.505E+10
24.97800	0.02439	1850775.	-19237.	-196.3203	5.509E+10
25.34000	0.01846	1765358.	-20041.	-173.6849	5.513E+10
25.70200	0.01313	1676663.	-20720.	-139.0062	5.517E+10
26.06400	0.008377	1585344.	-21219.	-90.8560	5.522E+10
26.42600	0.004164	1492312.	-21517.	-46.2446	5.526E+10
26.78800	0.000460	1398406.	-21629.	-5.2299	5.531E+10
27.15000	-0.002766	1304402.	-21570.	32.16727	5.535E+10
27.51200	-0.005548	1211005.	-21357.	65.95917	5.539E+10
27.87400	-0.007917	1118853.	-21005.	96.18868	5.544E+10
28.23600	-0.009906	1028516.	-20529.	122.92683	5.548E+10
28.59800	-0.0115	940498.	-19944.	146.26856	5.551E+10
28.96000	-0.0129	855241.	-19265.	166.33026	5.556E+10
29.32200	-0.0139	773122.	-18506.	183.24731	5.559E+10
29.68400	-0.0147	694461.	-17680.	197.17005	5.562E+10
30.04600	-0.0152	619521.	-16799.	208.26119	5.566E+10
30.40800	-0.0155	548511.	-15876.	216.69366	5.602E+10
30.77000	-0.0156	481590.	-14922.	222.66316	9.840E+10
31.13200	-0.0157	418871.	-13944.	227.36458	9.840E+10
31.49400	-0.0156	360442.	-12949.	230.90320	9.840E+10
31.85600	-0.0155	306370.	-11941.	233.38446	9.840E+10
32.21800	-0.0154	256702.	-10923.	234.91273	9.840E+10
32.58000	-0.0152	211468.	-9901.	235.59005	9.840E+10
32.94200	-0.0149	170678.	-8878.	235.51497	9.840E+10
33.30400	-0.0146	134334.	-7857.	234.78141	9.840E+10
33.66600	-0.0143	102419.	-6840.	233.47750	9.840E+10
34.02800	-0.0140	74911.	-5829.	231.68458	9.840E+10
34.39000	-0.0136	51774.	-4828.	229.47613	9.840E+10
34.75200	-0.0133	32968.	-3836.	226.91679	9.840E+10
35.11400	-0.0129	18443.	-2857.	224.06142	9.840E+10

35.47600	-0.0125	8147.	-1890.	220.95416	9.840E+10
35.83800	-0.0122	2020.	-937.7159	217.62755	9.840E+10
36.20000	-0.0118	0.000	0.000	214.10169	9.840E+10

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     2.01938010 inches
Computed slope at pile head      =     -0.0090923 radians
Maximum bending moment           =       2547030. inch-lbs
Maximum shear force              =         23852. lbs
Depth of maximum bending moment  =    19.18600000 feet below pile head
Depth of maximum shear force     =    11.22200000 feet below pile head
Number of iterations             =             21
Number of zero deflection points =              1
Pile deflection at ground        =     0.85069948 inches
```

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Live Loads

Depth in	Distributed Load lb/in
0.00	42.00
4.34	42.00
8.69	42.00
13.03	42.00
17.38	42.00
21.72	42.00
26.06	42.00
30.41	42.00
34.75	42.00
39.10	42.00
43.44	42.00
47.78	42.00
52.13	42.00
56.47	42.00
60.82	42.00
65.16	42.00
69.50	42.00

73.85	42.00
78.19	42.00
82.54	42.00
86.88	42.00
91.22	42.00
95.57	42.00
99.91	42.00
104.26	42.00
108.60	42.00
112.94	42.00
117.29	42.00
121.63	42.00
125.98	42.00
130.32	42.00
134.66	18.45

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
65.16	0.53
69.50	9.11
73.85	20.40
78.19	31.70
82.54	42.99
86.88	54.29
91.22	65.58
95.57	76.88
99.91	88.17
104.26	99.47
108.60	110.76
112.94	122.05
117.29	133.35
121.63	144.64
125.98	155.94
130.32	147.72

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	1.81
4.34	7.23
8.69	14.47
13.03	21.70
17.38	28.93
21.72	36.16
26.06	43.40
30.41	50.63
34.75	57.86
39.10	65.09
43.44	72.33
47.78	79.56
52.13	86.79
56.47	94.03
60.82	101.26
65.16	108.31
69.50	112.69
73.85	116.16
78.19	119.63
82.54	123.11
86.88	126.58
91.22	130.05
95.57	133.52
99.91	136.99
104.26	140.47
108.60	143.94
112.94	147.41
117.29	150.88
121.63	154.35
125.98	157.83
130.32	142.85

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	3.38925	4.956E-06	-9.508E-08	0.000	3.510E+10
0.36200	3.32464	719.07572	348.73942	0.000	3.510E+10
0.72400	3.26003	3030.	738.71641	0.000	3.510E+10
1.08600	3.19543	7137.	1176.	0.000	3.510E+10
1.44800	3.13082	13245.	1660.	0.000	3.510E+10
1.81000	3.06623	21560.	2191.	0.000	3.510E+10
2.17200	3.00165	32284.	2770.	0.000	3.510E+10
2.53400	2.93708	45625.	3396.	0.000	3.510E+10
2.89600	2.87254	61785.	4068.	0.000	3.510E+10
3.25800	2.80803	80970.	4788.	0.000	3.510E+10
3.62000	2.74356	103384.	5555.	0.000	3.510E+10
3.98200	2.67915	129233.	6369.	0.000	3.510E+10
4.34400	2.61481	158721.	7231.	0.000	3.510E+10
4.70600	2.55056	192052.	8139.	0.000	3.510E+10
5.06800	2.48641	229432.	9094.	0.000	3.510E+10
5.43000	2.42238	271065.	10098.	0.000	3.510E+10
5.79200	2.35849	317161.	11158.	0.000	3.510E+10
6.15400	2.29478	368005.	12287.	0.000	3.510E+10
6.51600	2.23127	423910.	13488.	0.000	3.510E+10
6.87800	2.16798	485186.	14760.	0.000	3.510E+10
7.24000	2.10496	552145.	16104.	0.000	3.510E+10
7.60200	2.04223	625098.	17520.	0.000	3.510E+10
7.96400	1.97983	704357.	19007.	0.000	3.510E+10
8.32600	1.91782	790233.	20566.	0.000	3.510E+10
8.68800	1.85623	883037.	22197.	0.000	3.510E+10
9.05000	1.79512	983081.	23900.	0.000	3.510E+10

9.41200	1.73453	1090677.	25674.	0.000	3.510E+10
9.77400	1.67453	1206135.	27520.	0.000	3.510E+10
10.13600	1.61518	1329767.	29437.	0.000	3.510E+10
10.49800	1.55654	1461885.	31426.	0.000	3.510E+10
10.86000	1.49869	1602800.	33385.	0.000	3.510E+10
11.22200	1.44170	1751932.	34364.	-16.8866	5.514E+10
11.58400	1.38532	1901356.	34295.	-47.4710	5.507E+10
11.94600	1.32958	2049883.	34015.	-81.0385	5.499E+10
12.30800	1.27454	2196882.	33587.	-116.3718	5.492E+10
12.67000	1.22026	2341684.	33003.	-152.5501	5.485E+10
13.03200	1.16679	2483608.	32261.	-188.6995	5.478E+10
13.39400	1.11417	2621970.	31364.	-224.5784	5.471E+10
13.75600	1.06246	2756095.	30314.	-258.8216	5.465E+10
14.11800	1.01170	2885336.	29118.	-291.9111	5.458E+10
14.48000	0.96193	3009069.	27777.	-325.4716	5.452E+10
14.84200	0.91321	3126659.	26296.	-356.3761	5.446E+10
15.20400	0.86557	3237525.	24701.	-377.7817	5.440E+10
15.56600	0.81905	3341262.	23027.	-392.7630	5.435E+10
15.92800	0.77369	3437587.	21300.	-402.5551	5.430E+10
16.29000	0.72953	3526316.	19526.	-414.3847	5.425E+10
16.65200	0.68660	3607226.	17706.	-423.2940	5.421E+10
17.01400	0.64492	3680147.	15858.	-427.6661	5.417E+10
17.37600	0.60452	3744999.	13973.	-440.2034	5.414E+10
17.73800	0.56543	3801544.	12042.	-448.7878	5.411E+10
18.10000	0.52766	3849620.	10083.	-453.0761	5.408E+10
18.46200	0.49124	3889146.	8116.	-452.7393	5.406E+10
18.82400	0.45617	3920129.	6160.	-447.4623	5.405E+10
19.18600	0.42247	3942668.	4215.	-448.4117	5.403E+10
19.54800	0.39015	3956745.	2247.	-457.4656	5.403E+10
19.91000	0.35921	3962190.	245.52628	-464.0456	5.402E+10
20.27200	0.32966	3958878.	-1779.	-467.8476	5.403E+10
20.63400	0.30149	3946738.	-3813.	-468.7571	5.403E+10
20.99600	0.27469	3925752.	-5845.	-466.6871	5.404E+10
21.35800	0.24927	3895960.	-7876.	-468.6925	5.406E+10
21.72000	0.22521	3857323.	-9912.	-468.5950	5.408E+10
22.08200	0.20249	3809844.	-11943.	-466.2612	5.410E+10
22.44400	0.18110	3753566.	-13958.	-461.6380	5.413E+10
22.80600	0.16102	3688577.	-15948.	-454.6778	5.417E+10
23.16800	0.14223	3615008.	-17903.	-445.3367	5.421E+10
23.53000	0.12469	3533035.	-19812.	-433.5720	5.425E+10
23.89200	0.10839	3442881.	-21665.	-419.3390	5.430E+10
24.25400	0.09328	3344814.	-23450.	-402.5860	5.435E+10
24.61600	0.07933	3239149.	-25157.	-383.2474	5.440E+10
24.97800	0.06650	3126253.	-26774.	-361.2325	5.446E+10

25.34000	0.05476	3006540.	-28289.	-336.4091	5.452E+10
25.70200	0.04406	2880479.	-29690.	-308.5743	5.458E+10
26.06400	0.03435	2748595.	-30963.	-277.4035	5.465E+10
26.42600	0.02559	2611477.	-32091.	-242.3502	5.472E+10
26.78800	0.01774	2469785.	-33056.	-201.6403	5.479E+10
27.15000	0.01073	2324288.	-33765.	-124.8026	5.486E+10
27.51200	0.004527	2176436.	-34153.	-53.8181	5.493E+10
27.87400	-0.000932	2027568.	-34245.	11.31863	5.500E+10
28.23600	-0.005694	1878915.	-34067.	70.66828	5.508E+10
28.59800	-0.009814	1731594.	-33643.	124.34431	5.515E+10
28.96000	-0.0133	1586620.	-32999.	172.50537	5.522E+10
29.32200	-0.0163	1444901.	-32156.	215.35177	5.528E+10
29.68400	-0.0188	1307246.	-31139.	253.11886	5.535E+10
30.04600	-0.0209	1174368.	-29968.	286.07262	5.541E+10
30.40800	-0.0225	1046888.	-28663.	314.50367	5.547E+10
30.77000	-0.0238	925342.	-27244.	338.72289	5.552E+10
31.13200	-0.0248	810188.	-25729.	359.05542	5.558E+10
31.49400	-0.0255	701810.	-24133.	375.83728	5.562E+10
31.85600	-0.0259	600524.	-22470.	389.40843	5.567E+10
32.21800	-0.0262	506587.	-20756.	400.11042	7.868E+10
32.58000	-0.0263	420199.	-18998.	409.05928	9.840E+10
32.94200	-0.0264	341531.	-17204.	416.80632	9.840E+10
33.30400	-0.0264	270728.	-15379.	423.53081	9.840E+10
33.66600	-0.0263	207917.	-13527.	429.40311	9.840E+10
34.02800	-0.0262	153209.	-11650.	434.58233	9.840E+10
34.39000	-0.0261	106701.	-9752.	439.21399	9.840E+10
34.75200	-0.0259	68482.	-7835.	443.42762	9.840E+10
35.11400	-0.0258	38631.	-5900.	447.33449	9.840E+10
35.47600	-0.0256	17221.	-3949.	451.02519	9.840E+10
35.83800	-0.0254	4321.	-1982.	454.56736	9.840E+10
36.20000	-0.0252	0.000	0.000	458.00331	9.840E+10

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     3.38925081 inches
Computed slope at pile head      =     -0.0148731 radians
Maximum bending moment           =       3962190. inch-lbs
Maximum shear force              =         34364. lbs
Depth of maximum bending moment  =    19.91000000 feet below pile head
Depth of maximum shear force     =    11.22200000 feet below pile head
Number of iterations             =             18
Number of zero deflection points =              1
Pile deflection at ground        =     1.47665351 inches
```

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	2.0193801	2547030.	23852.	-0.009092
2	3.3892508	3962190.	34364.	-0.014873

Maximum pile-head deflection = 3.3892508078 inches
Maximum pile-head rotation = -0.0148730548 radians = -0.852163 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	9597992.	1047483.	Pass
	2	1.00	11291895.	2547030.	Pass
2	1	1.00	9597992.	1602800.	Pass
	2	1.00	11291895.	3962190.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	294150.	23125.	Pass
	2	1.00	294150.	23852.	Pass
2	1	1.00	294150.	33385.	Pass
	2	1.00	294150.	34364.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = 34364.19 lbs
Factored Shear Capacity at Node = 294150.00 lbs
Fraction of Allowable Shear Capacity = 0.1168

The analysis ended normally.

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	6' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS	83.3	plf	1.75
WA	436.8	plf	1.00
EH	414.0	plf	1.50
Total	**1203.5**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	6.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**5,416**	ft-lbs		ft-lbs	**5,416**	ft-lbs
V (fac.)	**3,610**	lbs		lbs	**3,610**	lbs
f_b (fac.)	**880**	psi		psi	**880**	psi
f_v (fac.)	**138**	psi		psi	**138**	psi
δ	**0.053**	in		in	**0.05**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	10' LaggingSpan at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS	83.3	plf	1.75
WA	468.0	plf	1.00
EH	443.6	plf	1.50
Total	**1279.0**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	10.0	ft
b	5.5	in, actual size
h	11.50	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**63.25**	in^2
S_x	**121.23**	in^3
I_x	**697.07**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**15,988**	ft-lbs		ft-lbs	**15,988**	ft-lbs
V (fac.)	**6,395**	lbs		lbs	**6,395**	lbs
f_b (fac.)	**1,583**	psi		psi	**1,583**	psi
f_v (fac.)	**152**	psi		psi	**152**	psi
δ	**0.258**	in		in	**0.26**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

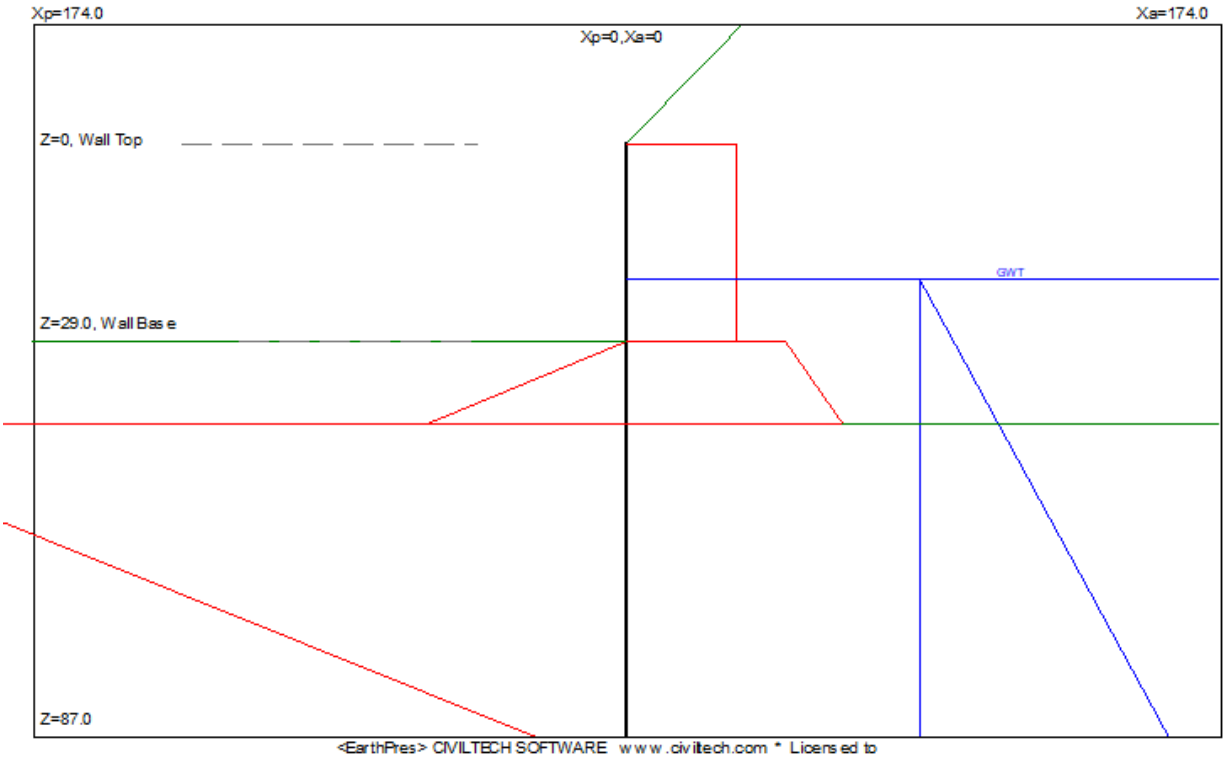
Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Culvert #6 - Sta. 1183+61, Rt.

BEL-70 1183+61 2:1 Slope above wall

Factored Cell



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UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

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* INPUT DATA *

Wall Height=29.0 Total Soil Types= 2

Soil No.	Weight	Saturate	Phi	Cohesion	Nspt	Type	Description
1	121.9	134.1	0.00	0.7	6	1	Eq. Clay
2	140.2	154.3	0.00	7.5	60	2	Weather Shal

Ground Surface at Active Side:

Line	Z1	Xa1	Z2	Xa2	Soil No.	Description
1	0.0	0.0	-148.0	290.0	1	Eq. Clay
2	-148.0	290.0	-148.0	800.0	1	Eq. Clay
3	41.0	0.0	41.0	800.0	2	Weather Shal

Water Table at Active Side:

Point	Z-water	X-water
1	20.0	0.0
2	20.0	800.0

Ground Surface at Passive Side:

Line	Z1	Xp1	Z2	Xp2	Soil No.	Description
1	29.0	0.0	29.0	800.0	1	Eq. Clay
2	41.0	0.0	41.0	800.0	2	Weather Shal

Wall Friction Options: 1.* No wall friction

Wall Batter Angle = 0

Apparent Pressure Conversion: 1.* Default (Terzaghi and Peck)*

Water Density = 62.4

Water Pressure: 1.* No seepage at wall tip

- ANALYSIS BASED ON ZERO EMBEDMENT BELOW CURRENT EXCAVATION EVEN THOUGH PZ35 SHEETING DRIVEN FULL DEPTH ALL AROUND PRIOR TO EXCAVATION AND INSTALLATION OF INTERNAL WALERS IN TOP-DOWN METHOD (CONSERVATIVE).

- CASE TO EVALUATE SHEETING AND WALER STAGED LOADINGS AT CURRENT EXCAVATION WITH WALER #1 & #2 INSTALLED AND PRIOR TO INSTALLING WALER #3.

* OUTPUT RESULTS *

Total Force above Base= 40.85 per one linear foot (or meter) width along wall height
Total Static Force above Base= 40.85. Distributed in Apparent Envelope along wall height. Ignore soil layers and water line

Driving Pressure above Base - Output to Shoring - Multiplier of Pressure = 1.5

Z1	Pa1	Z2	Pa2	Slope	Coef.
0.00	1.83	29.00	1.83	0.0000	0.0000

Driving Pressure below Base - Output to Shoring - Multiplier of Pressure = 1.5

Z1	Pa1	Z2	Pa2	Slope	Ka or Ko
29.00	2.67	41.00	3.62	0.0791	1.1027
41.00	-14.58	87.00	-1.50	0.2843	3.0932

Passive Pressure below Base - Output to Shoring - Multiplier of Pressure = 0.75

Z1	Pp1	Z2	Pp2	Slope	Kp
29.00	0.00	41.00	3.33	0.277	2.2747
41.00	11.80	87.00	17.36	0.121	0.8623

Water Pressure - Output to Shoring - Multiplier of Pressure = 1

No	Z1	Pw1	Z2	Pw2	kw1
0	20.00	0.00	87.00	4.18	0.06

UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

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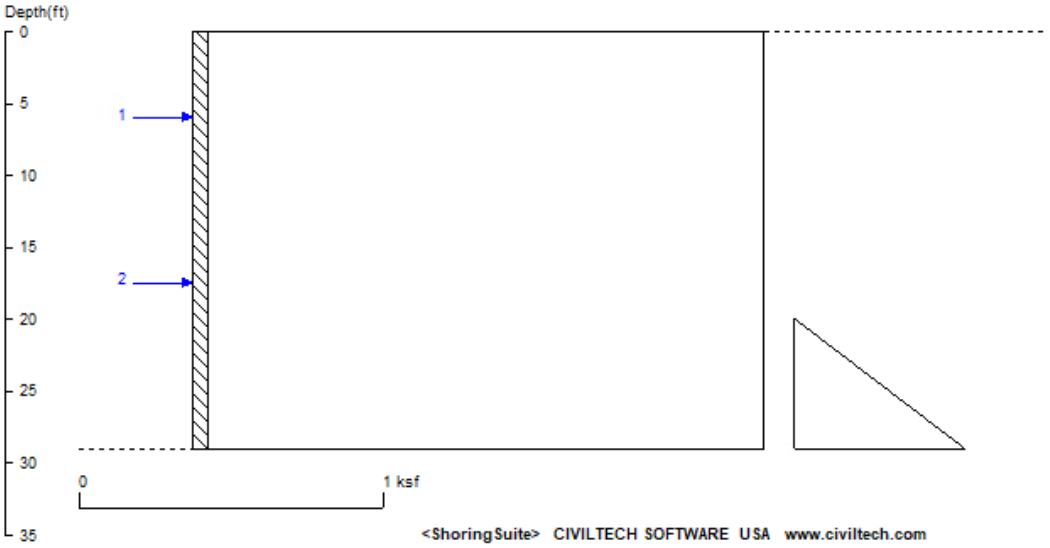
- ANALYSIS BASED ON ZERO EMBEDMENT BELOW CURRENT EXCAVATION EVEN THOUGH PZ35 SHEETING DRIVEN FULL DEPTH ALL AROUND PRIOR TO EXCAVATION AND INSTALLATION OF INTERNAL WALERS IN TOP-DOWN METHOD (CONSERVATIVE).

- CASE TO EVALUATE SHEETING AND WALER STAGED LOADINGS AT CURRENT EXCAVATION WITH WALER #1 & #2 INSTALLED AND PRIOR TO INSTALLING WALER #3.

BEL-70 1183+61 2:1 Slope above wall

Factored Cell



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Wall Height=29.0 Pile Diameter=1.0 Pile Spacing=1.0 Wall Type: 1. Sheet Pile

MOMENT IN PILE: Max. Moment=143.63 per Pile Spacing=1.0 at Depth=17.45

PILE SELECTION:
Request Min. Section Modulus = 38.3 in3/ft=2059.05 cm3/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.90
PZ35 has Section Modulus = 48.5 in3/ft=2607.36 cm3/m. It is greater than Min. Requirements!
Top Deflection = 0.00(in) based on E (ksi)=29000.00 and I (in4)/foot=361.2

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	N/A	N/A
1. Strut	5.9	0.0	1.0	13.5*	13.5	0.0	0.0	0.0
2. Strut	17.5	0.0	1.0	43.9	43.9	0.0	0.0	0.0

* Top Brace increased by 15% (DM7.2-103)

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

- ANALYSIS BASED ON ZERO EMBEDMENT BELOW CURRENT EXCAVATION EVEN THOUGH PZ35 SHEETING DRIVEN FULL DEPTH ALL AROUND PRIOR TO EXCAVATION AND INSTALLATION OF INTERNAL WALERS IN TOP-DOWN METHOD (CONSERVATIVE).

- CASE TO EVALUATE SHEETING AND WALER STAGED LOADINGS AT CURRENT EXCAVATION WITH WALER #1 & #2 INSTALLED AND PRIOR TO INSTALLING WALER #3.

BEL-70 1183+61 2:1 Slope above wall

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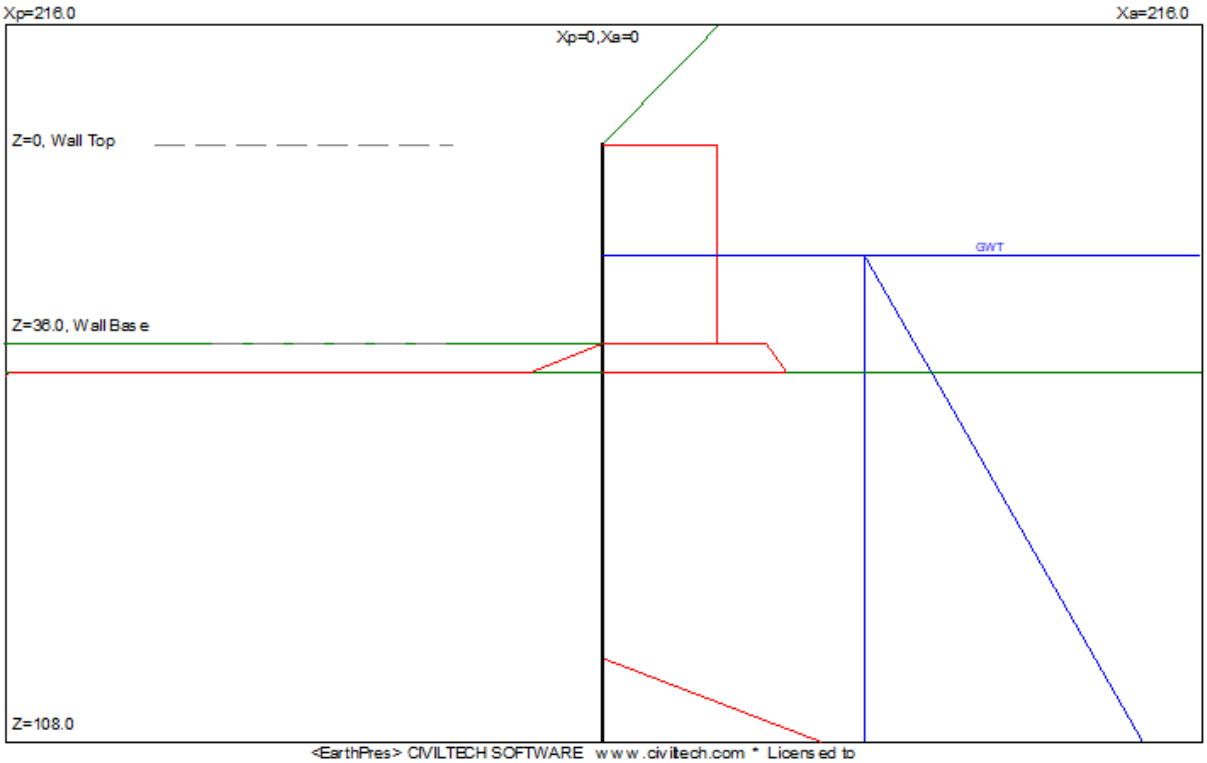

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UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

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* INPUT DATA *

Wall Height=36.0 Total Soil Types= 2

Soil No.	Weight	Saturate	Phi	Cohesion	Nspt	Type	Description
1	121.9	134.1	0.00	0.7	6	1	Eq. Clay
2	140.2	154.3	0.00	7.5	60	2	Weather Shal

Ground Surface at Active Side:

Line	Z1	Xa1	Z2	Xa2	Soil No.	Description
1	0.0	0.0	-148.0	290.0	1	Eq. Clay
2	-148.0	290.0	-148.0	800.0	1	Eq. Clay
3	41.0	0.0	41.0	800.0	2	Weather Shal

Water Table at Active Side:

Point	Z-water	X-water
1	20.0	0.0
2	20.0	800.0

Ground Surface at Passive Side:

Line	Z1	Xp1	Z2	Xp2	Soil No.	Description
1	36.0	0.0	36.0	800.0	1	Eq. Clay
2	41.0	0.0	41.0	800.0	2	Weather Shal

Wall Friction Options: 1.* No wall friction
Wall Batter Angle = 0
Apparent Pressure Conversion: 1.* Default (Terzaghi and Peck)*
Water Density = 62.4
Water Pressure: 1.* No seepage at wall tip

- ANALYSIS BASED ON ZERO EMBEDMENT BELOW CURRENT EXCAVATION EVEN THOUGH PZ35 SHEETING DRIVEN FULL DEPTH ALL AROUND PRIOR TO EXCAVATION AND INSTALLATION OF INTERNAL WALERS IN TOP-DOWN METHOD (CONSERVATIVE).

- CASE TO EVALUATE SHEETING AND WALER STAGED LOADINGS AT CURRENT EXCAVATION WITH WALER #1, #2 & #3 INSTALLED AND PRIOR TO INSTALLING WALER #4.

* OUTPUT RESULTS *

Total Force above Base= 61.50 per one linear foot (or meter) width along wall height
Total Static Force above Base= 61.50. Distributed in Apparent Envelope along wall height. Ignore soil layers and water line

Driving Pressure above Base - Output to Shoring - Multiplier of Pressure = 1.5

Z1	Pa1	Z2	Pa2	Slope	Coef.
0.00	2.22	36.00	2.22	0.0000	0.0000

Driving Pressure below Base - Output to Shoring - Multiplier of Pressure = 1.5

Z1	Pa1	Z2	Pa2	Slope	Ka or Ko
36.00	3.23	41.00	3.62	0.0791	1.1027
92.68	0.00	108.00	4.31	0.2815	3.0635

Passive Pressure below Base - Output to Shoring - Multiplier of Pressure = 0.75

Z1	Pp1	Z2	Pp2	Slope	Kp
36.00	0.00	41.00	1.39	0.277	2.2747
41.00	11.64	108.00	18.77	0.106	0.7594

Water Pressure - Output to Shoring - Multiplier of Pressure = 1

No	Z1	Pw1	Z2	Pw2	kw1
0	20.00	0.00	108.00	5.49	0.06

UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

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- ANALYSIS BASED ON ZERO EMBEDMENT BELOW CURRENT EXCAVATION EVEN THOUGH PZ35 SHEETING DRIVEN FULL DEPTH ALL AROUND PRIOR TO EXCAVATION AND INSTALLATION OF INTERNAL WALERS IN TOP-DOWN METHOD (CONSERVATIVE).

- CASE TO EVALUATE SHEETING AND WALER STAGED LOADINGS AT CURRENT EXCAVATION WITH WALER #1, #2 & #3 INSTALLED AND PRIOR TO INSTALLING WALER #4.

BEL-70 1183+61 2:1 Slope above wall

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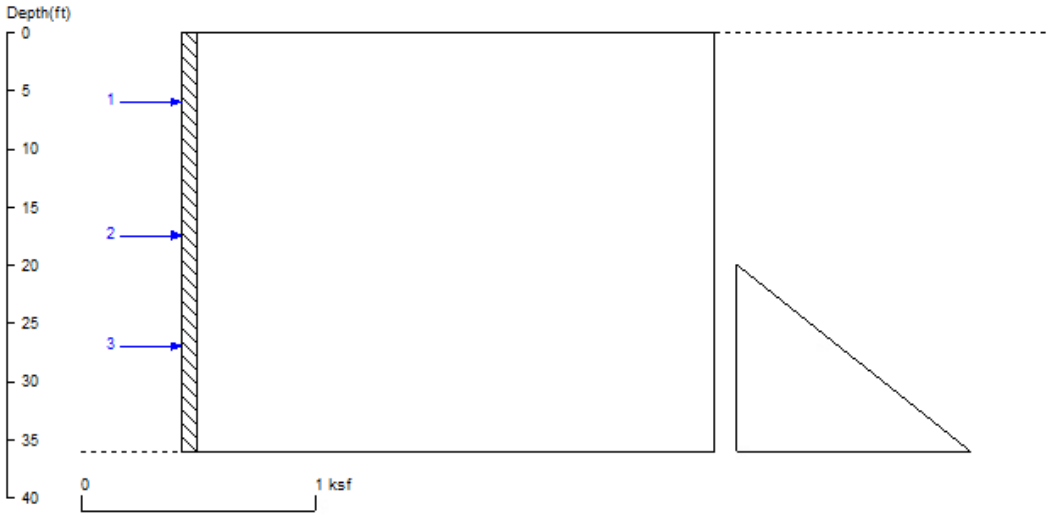

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Wall Height=36.0 Pile Diameter=1.0 Pile Spacing=1.0 Wall Type: 1. Sheet Pile

MOMENT IN PILE: Max. Moment=103.60 per Pile Spacing=1.0 at Depth=26.95

PILE SELECTION:
Request Min. Section Modulus = 27.6 in3/ft=1485.24 cm3/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.90
PZ35 has Section Modulus = 48.5 in3/ft=2607.36 cm3/m. It is greater than Min. Requirements!
Top Deflection = 0.00(in) based on E (ksi)=29000.00 and I (in4)/foot=361.2

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	N/A	N/A
1. Strut	5.9	0.0	1.0	33.8*	33.8	0.0	0.0	0.0
2. Strut	17.5	0.0	1.0	9.4	9.4	0.0	0.0	0.0
3. Strut	27.0	0.0	1.0	51.3	51.3	0.0	0.0	0.0

* Top Brace increased by 15% (DM7.2-103)

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

- ANALYSIS BASED ON ZERO EMBEDMENT BELOW CURRENT EXCAVATION EVEN THOUGH PZ35 SHEETING DRIVEN FULL DEPTH ALL AROUND PRIOR TO EXCAVATION AND INSTALLATION OF INTERNAL WALERS IN TOP-DOWN METHOD (CONSERVATIVE).

- CASE TO EVALUATE SHEETING AND WALER STAGED LOADINGS AT CURRENT EXCAVATION WITH WALER #1, #2 & #3 INSTALLED AND PRIOR TO INSTALLING WALER #4.

BEL-70 1183+61 2:1 Slope above wall

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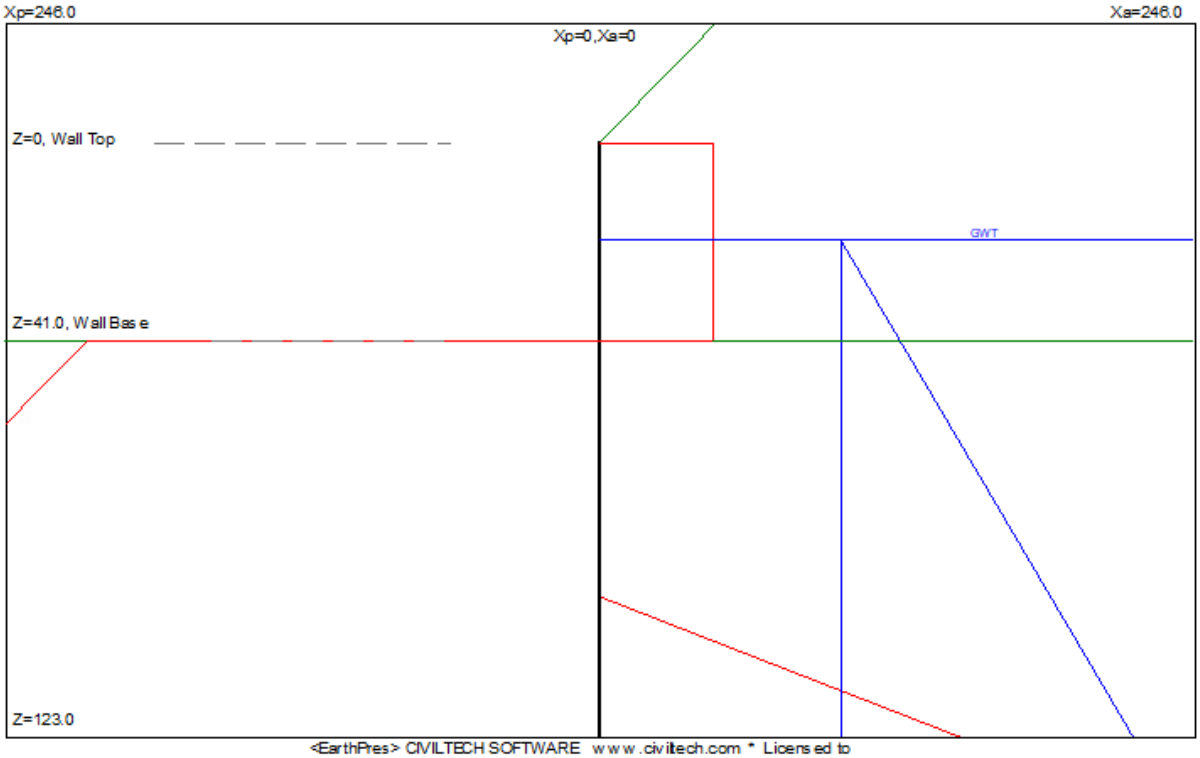

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UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

Date: 3/31/2026 File: O:\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Civiltech\BEL-70 1183.61 Fact 41.0 cell Wale Ex 41 .ej

* INPUT DATA *

Wall Height=41.0 Total Soil Types= 2

Soil No.	Weight	Saturate	Phi	Cohesion	Nspt	Type	Description
1	121.9	134.1	0.00	0.7	6	1	Eq. Clay
2	140.2	154.3	0.00	7.5	60	2	Weather Shal

Ground Surface at Active Side:

Line	Z1	Xa1	Z2	Xa2	Soil No.	Description
1	0.0	0.0	-148.0	290.0	1	Eq. Clay
2	-148.0	290.0	-148.0	800.0	1	Eq. Clay
3	41.0	0.0	41.0	800.0	2	Weather Shal

Water Table at Active Side:

Point	Z-water	X-water
1	20.0	0.0
2	20.0	800.0

Ground Surface at Passive Side:

Line	Z1	Xp1	Z2	Xp2	Soil No.	Description
1	41.0	0.0	41.0	800.0	2	Weather Shal

Wall Friction Options: 1.* No wall friction
Wall Batter Angle = 0
Apparent Pressure Conversion: 1.* Default (Terzaghi and Peck)*
Water Density = 62.4
Water Pressure: 1.* No seepage at wall tip

* OUTPUT RESULTS *

Total Force above Base= 78.63 per one linear foot (or meter) width along wall height
Total Static Force above Base= 78.63. Distributed in Apparent Envelope along wall height. Ignore soil layers and water line

Driving Pressure above Base - Output to Shoring - Multiplier of Pressure = 1.5

Z1	Pa1	Z2	Pa2	Slope	Coef.
0.00	2.49	41.00	2.49	0.0000	0.0000

Driving Pressure below Base - Output to Shoring - Multiplier of Pressure = 1.5

Z1	Pa1	Z2	Pa2	Slope	Ka or Ko
93.71	0.00	123.00	7.97	0.2720	2.9601

Passive Pressure below Base - Output to Shoring - Multiplier of Pressure = 0.75

Z1	Pp1	Z2	Pp2	Slope	Kp
41.00	11.25	123.00	19.87	0.105	0.7500

Water Pressure - Output to Shoring - Multiplier of Pressure = 1

No	Z1	Pw1	Z2	Pw2	kw1
0	20.00	0.00	123.00	6.43	0.06

UNITS: DEPTH/DISTANCE: ft, UNIT WEIGHT: pcf, FORCE: kip/ft, PRESSURE: ksf, SLOPE: kcf

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BEL-70 1183+61 2:1 Slope above wall

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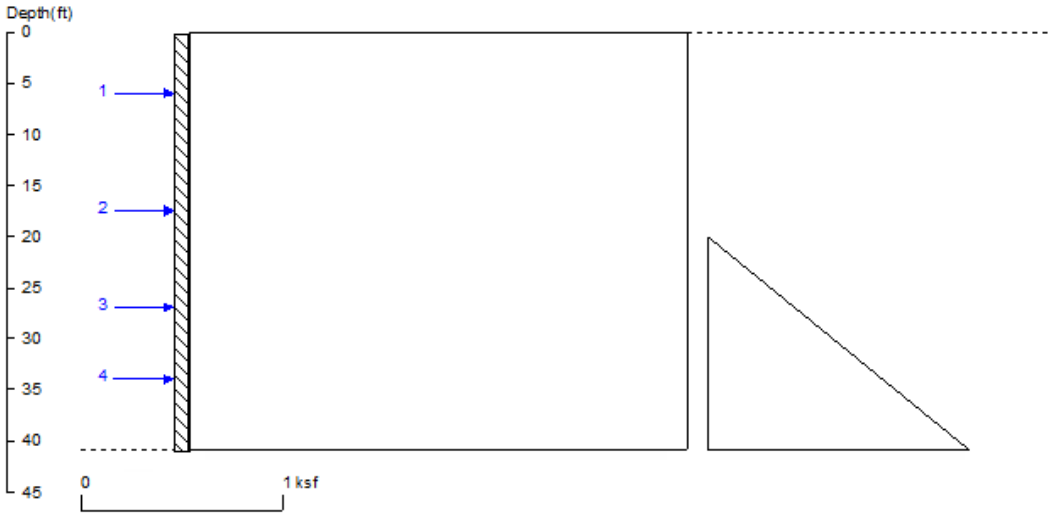

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Wall Height=41.0 Pile Diameter=1.0 Pile Spacing=1.0 Wall Type: 1. Sheet Pile

MOMENT IN PILE: Max. Moment=74.95 per Pile Spacing=1.0 at Depth=33.94

PILE SELECTION:
Request Min. Section Modulus = 20.0 in3/ft=1074.46 cm3/m, Fy= 50 ksi = 345 MPa, Fb/Fy=0.90
PZ35 has Section Modulus = 48.5 in3/ft=2607.36 cm3/m. It is greater than Min. Requirements!
Top Deflection = 0.00(in) based on E (ksi)=29000.00 and I (in4)/foot=361.2

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	N/A	N/A
1. Strut	5.9	0.0	1.0	38.0*	38.0	0.0	0.0	0.0
2. Strut	17.5	0.0	1.0	22.7	22.7	0.0	0.0	0.0
3. Strut	27.0	0.0	1.0	13.0	13.0	0.0	0.0	0.0
4. Strut	34.0	0.0	1.0	49.5	49.5	0.0	0.0	0.0

* Top Brace increased by 15% (DM7.2-103)

UNITS: Width, Diameter, Spacing, Length, Depth, and Height - ft; Force - kip; Bond Strength and Pressure - ksf

- ANALYSIS BASED ON ZERO EMBEDMENT BELOW FINAL EXCAVATION AT TOP OF ROCK.

- CASE TO EVALUATE SHEETING AND WALER LOADINGS WITH WALER #1, #2 , #3 & #4 INSTALLED AT FINAL EXCAVATION DEPTH.

1183+61 CELLULAR SHORING WALER DESIGN:

WALER COMPRESSION FLANGE FULLY SUPPORTED BY WELD CONNECTIONS TO SHEETING. WALER DESIGNED AS SIMPLE SPAN WITH SHORT SIDE WALER FIT BETWEEN FULL-LENGTH LONG SIDE WALERS. WEB OF SHORT SIDE WALER WELDED TO FLANGE OF LONG SIDE WALER.

SHORT SIDE WALER IS ADJACENT TO SLOPED FILL AND SEES HIGHEST LOADS SO WALER DESIGN BASED ON SHORT SIDE. SHORT SIDE WALER CLEAR SPAN ~ **15 FT**.

MAX WALER LOAD = 51.3 K/FT FROM STAGED ANALYSIS CASES:

Mu=1/8 x 51.3k/ft x 1 ft/12in x (15ft x 12in/ft)^2 = 17, 314 k-in

W24x162 WALER Sx=414 in^3. FLEX. STRESS= 17,314 / 414 IN^3 = 41.8 ksi, OK PROVIDES ADD'L MARGIN.

SHORT SIDE WALER WEB TO LONG SIDE WALER FLANGE WELD:

3/8" FILLET WELD (*phi=0.80 used, could use higher phi for temp. const. case*):
FACT. WELD RESISTANCE= 0.8 x 0.6 x 3/8 x .7071 x 70 ksi = 8.91 k/in
END REACTION = 51.3 k/ft x 15 ft /2 = 384.75 k
WELD LENGTH = 384.75 k / 8.91 k/in = 43 in. WELD REQ'D.
DIM 'T' BETWEEN WEB FILLETS OF W24x162 = 21" WHICH PERMITS 42" TOTAL WELD FOR TWO WELD LINES COMPARED TO 43" CALCULATED.
>> SAY OK, WITHIN 2% FOR TEMP. CONSTRUCTION LOADING CONDITION.
WELD phi VALUE COULD BE INCREASED FOR TEMP LOADING CONDITIONS BUT NORMAL DESIGN VALUE USED AS NOTED ABOVE.

Culvert #8 - Sta. 1206+19, Lt.

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1206+19 - Piles 1, 12

Wall Height : 10 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	4.00	ft
$Depth_1$ for Lateral Soil Pressure =	5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.318	ksf
Lateral Soil Load Lpile Input =	**106.00**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	4.00	ft
$Depth_2$ for Lateral Soil Pressure =	10	ft
Lateral Pressure at Top of Layer 2 =	0.318	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.471	ksf
Lateral Soil Load Lpile Input =	**156.88**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	4.00	ft
Depth at Top of Groundwater =	5.00	ft
Depth at Bot of Groundwater =	10	ft
Water Pressure at Bot of Layer =	0.312	ksf
Lateral Water Load Lpile Input =	**104.00**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1206+19 - Piles 2, 11

Wall Height : 12.5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	8.00	ft
$Depth_1$ for Lateral Soil Pressure =	6.25	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.398	ksf
Lateral Soil Load Lpile Input =	**265.00**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	8.00	ft
$Depth_2$ for Lateral Soil Pressure =	12.5	ft
Lateral Pressure at Top of Layer 2 =	0.398	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.588	ksf
Lateral Soil Load Lpile Input =	**392.20**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	8.00	ft
Depth at Top of Groundwater =	6.25	ft
Depth at Bot of Groundwater =	12.5	ft
Water Pressure at Bot of Layer =	0.390	ksf
Lateral Water Load Lpile Input =	**260.00**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1206+19 - Piles 3, 10

Wall Height : 16.5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	7.00	ft
$Depth_1$ for Lateral Soil Pressure =	8.25	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.525	ksf
Lateral Soil Load Lpile Input =	**306.08**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	7.00	ft
$Depth_2$ for Lateral Soil Pressure =	16.5	ft
Lateral Pressure at Top of Layer 2 =	0.525	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.777	ksf
Lateral Soil Load Lpile Input =	**452.99**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	7.00	ft
Depth at Top of Groundwater =	8.25	ft
Depth at Bot of Groundwater =	16.5	ft
Water Pressure at Bot of Layer =	0.515	ksf
Lateral Water Load Lpile Input =	**300.30**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1206+19 - Piles 4 thru 9

Wall Height : 23 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	5.75	ft
$Depth_1$ for Lateral Soil Pressure =	11.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.731	ksf
Lateral Soil Load Lpile Input =	**350.46**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	5.75	ft
$Depth_2$ for Lateral Soil Pressure =	23	ft
Lateral Pressure at Top of Layer 2 =	0.731	ksf
Lateral Soil Pressure at Bot of Layer 2 =	1.082	ksf
Lateral Soil Load Lpile Input =	**518.68**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	5.75	ft
Depth at Top of Groundwater =	11.50	ft
Depth at Bot of Groundwater =	23	ft
Water Pressure at Bot of Layer =	0.718	ksf
Lateral Water Load Lpile Input =	**343.85**	**lb/inch, Bot**

==

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1206.19 Pile 1 12.lp12d

Name of the output report file:
BEL-70 1206.19 Pile 1 12.lp12o

Name of the plot output file:
BEL-70 1206.19 Pile 1 12.lp12p

Name of the runtime message file:
BEL-70 1206.19 Pile 1 12.lp12r

Date and Time of Analysis

Date: June 20, 2026 Time: 22:18:26

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1206+19 Piles 1 12 - 10' Ht.(4.0' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 15.000 ft
Depth of ground surface below top of pile = 9.8000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	10.1000
2	10.000	10.1000
3	10.000	24.0000
4	15.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 10.000000 ft
   AISC Section Type = HP

   AISC Section Name = HP10X42

   Pile width = 10.100000 in
   Shear capacity of section = 106600. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 5.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 106600. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 9.800000 ft
   Distance from top of pile to bottom of layer = 10.800000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	10.800000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 35.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	5.00	106.00
3	10.00	156.88

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	5.00	0.00
2	10.00	104.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	10.000000 ft
Flange Width	=	10.100000 in
Section Depth	=	9.700000 in
Flange Thickness	=	0.420000 in
Web Thickness	=	0.415000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	12.400000 sq. in.
Moment of Inertia	=	210.000000 in^4
Elastic Bending Stiffness	=	6090000. kip-in^2
Plastic Modulus, Z	=	48.300000in^3

Plastic Moment Capacity = Fy Z = 2415.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 620.000 kips
Nominal Axial Tensile Capacity = -620.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	43.4777520338	5992769.	4.8500000000	
0.0000145101	86.9555040676	5992769.	4.8500000000	
0.0000217651	130.4332561015	5992769.	4.8500000000	
0.0000290201	173.9110081353	5992769.	4.8500000000	
0.0000362752	217.3887601691	5992769.	4.8500000000	
0.0000435302	260.8665122029	5992769.	4.8500000000	
0.0000507853	304.3442642367	5992769.	4.8500000000	
0.0000580403	347.8220162706	5992769.	4.8500000000	
0.0000652953	391.2997683044	5992769.	4.8500000000	
0.0000725504	434.7775203382	5992769.	4.8500000000	
0.0000798054	478.2552723720	5992769.	4.8500000000	
0.0000870604	521.7330244059	5992769.	4.8500000000	
0.0000943155	565.2107764397	5992769.	4.8500000000	
0.0001015705	608.6885284735	5992769.	4.8500000000	
0.0001088255	652.1662805073	5992769.	4.8500000000	

0.0001160806	695.6440325411	5992769.	4.8500000000	
0.0001233356	739.1217845750	5992769.	4.8500000000	
0.0001305906	782.5995366088	5992769.	4.8500000000	
0.0001378457	826.0772886426	5992769.	4.8500000000	
0.0001451007	869.5550406764	5992769.	4.8500000000	
0.0001523558	913.0327927102	5992769.	4.8500000000	
0.0001596108	956.5105447441	5992769.	4.8500000000	
0.0001668658	999.9882967779	5992769.	4.8500000000	
0.0001741209	1043.	5992769.	4.8500000000	
0.0001813759	1087.	5992769.	4.8500000000	
0.0001886309	1130.	5992769.	4.8500000000	
0.0001958860	1174.	5992769.	4.8500000000	
0.0002031410	1217.	5992769.	4.8500000000	
0.0002103960	1261.	5992769.	4.8500000000	
0.0002176511	1304.	5992769.	4.8500000000	
0.0002249061	1348.	5992769.	4.8500000000	
0.0002321611	1391.	5992769.	4.8500000000	
0.0002394162	1435.	5992769.	4.8500000000	
0.0002466712	1478.	5992769.	4.8500000000	
0.0002539263	1522.	5992769.	4.8500000000	
0.0002611813	1565.	5992769.	4.8500000000	
0.0002684363	1609.	5992769.	4.8500000000	
0.0002756914	1652.	5992769.	4.8500000000	
0.0002829464	1696.	5992769.	4.8500000000	
0.0002974565	1783.	5992769.	4.8500000000	
0.0003119665	1870.	5992769.	4.8500000000	
0.0003264766	1956.	5992769.	4.8500000000	
0.0003409867	2043.	5992769.	4.8500000000	
0.0003554968	2130.	5992769.	4.8500000000	
0.0003700068	2199.	5942130.	4.8500000000	Y
0.0003845169	2233.	5807975.	4.8500000000	Y
0.0003990270	2245.	5627120.	4.8500000000	Y
0.0004135370	2254.	5451108.	4.8500000000	Y
0.0004280471	2262.	5285148.	4.8500000000	Y
0.0004425572	2269.	5128131.	4.8500000000	Y
0.0004570673	2276.	4979678.	4.8500000000	Y
0.0004715773	2282.	4839137.	4.8500000000	Y
0.0004860874	2287.	4705909.	4.8500000000	Y
0.0005005975	2292.	4579458.	4.8500000000	Y
0.0005151075	2297.	4459307.	4.8500000000	Y
0.0005296176	2301.	4345022.	4.8500000000	Y
0.0005441277	2305.	4236215.	4.8500000000	Y
0.0005586378	2309.	4132530.	4.8500000000	Y
0.0005731478	2312.	4033644.	4.8500000000	Y

0.0005876579	2315.	3939263.	4.8500000000 Y
0.0006021680	2318.	3849104.	4.8500000000 Y
0.0006166780	2320.	3762749.	4.8500000000 Y
0.0006311881	2323.	3680141.	4.8500000000 Y
0.0006456982	2325.	3601052.	4.8500000000 Y
0.0006602083	2327.	3525092.	4.8500000000 Y
0.0006747183	2329.	3452291.	4.8500000000 Y
0.0006892284	2331.	3382319.	4.8500000000 Y
0.0007037385	2333.	3315098.	4.8500000000 Y
0.0007182485	2335.	3250437.	4.8500000000 Y
0.0007327586	2336.	3188206.	4.8500000000 Y
0.0007472687	2338.	3128263.	4.8500000000 Y
0.0007617788	2339.	3070519.	4.8500000000 Y
0.0007762888	2340.	3014790.	4.8500000000 Y
0.0007907989	2342.	2961096.	4.8500000000 Y
0.0008053090	2343.	2909147.	4.8500000000 Y
0.0008198191	2344.	2859037.	4.8500000000 Y
0.0008343291	2345.	2810577.	4.8500000000 Y
0.0008488392	2346.	2763692.	4.8500000000 Y
0.0008633493	2347.	2718382.	4.8500000000 Y
0.0009213896	2350.	2550781.	4.8500000000 Y
0.0009794298	2353.	2402455.	4.8500000000 Y
0.0010374701	2355.	2270298.	4.8500000000 Y
0.0010955104	2357.	2151822.	4.8500000000 Y
0.0011535507	2359.	2045031.	4.8500000000 Y
0.0012115910	2360.	1948248.	4.8500000000 Y
0.0012696313	2362.	1860154.	4.8500000000 Y
0.0013276716	2363.	1779680.	4.8500000000 Y
0.0013857118	2364.	1705811.	4.8500000000 Y
0.0014437521	2365.	1637830.	4.8500000000 Y
0.0015017924	2365.	1575020.	4.8500000000 Y
0.0015598327	2366.	1516858.	4.8500000000 Y
0.0016178730	2367.	1462791.	4.8500000000 Y
0.0016759133	2367.	1412468.	4.8500000000 Y
0.0017339536	2368.	1365457.	4.8500000000 Y
0.0017919939	2368.	1321468.	4.8500000000 Y

Summary of Results for Nominal Moment Capacity for Section 1

Load	Axial	Nominal Moment

No.	Thrust kips	Capacity in-kips
1	0.00000000	2368.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	5.000000 ft
Outside Diameter of Casing	=	24.000000 in
Casing Wall Thickness	=	0.0000 in
Moment of Inertia of Steel Casing	=	0.0000 in^4
Width Flange of Core/Insert	=	10.100000 in
Depth of Core/Insert	=	9.700000 in
Flange Thickness of Core/Insert	=	0.420000 in
Web Thickness of Core/Insert	=	0.415000 in
Moment of Inertia of Steel Core/Insert	=	206.834773 in^4
Yield Stress of Casing	=	50000. psi
Elastic Modulus of Casing	=	29000000. psi
Yield Stress of Core/Insert	=	50000. psi
Elastic Modulus of Core/Insert	=	29000000. psi
Number of Reinforcing Bars	=	0 bars
Gross Area of Pile	=	452.389342 sq. in.
Area of Concrete	=	440.228442 sq. in.
Cross-sectional Area of Steel Casing	=	0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert	=	12.160900 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	12.160900 sq. in.
Area Ratio of All Steel to Gross Area	=	2.69 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2104.822 kips
Tensile Load for Cracking of Concrete = -223.782 kips
Nominal Axial Tensile Capacity = -608.045 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	530.4688702357	73117333.	12.0000000000	
0.0000145101	530.4688702357	36558666.	7.5346432973	C
0.0000217651	530.4688702357	24372444.	7.5509693177	C
0.0000290201	573.8604565856	19774556.	7.5673903328	C
0.0000362752	714.7361369836	19703173.	7.5838762751	C
0.0000435302	854.5349048170	19630845.	7.6006151961	C
0.0000507853	993.2347822465	19557544.	7.6176150838	C
0.0000580403	1131.	19483241.	7.6348843122	C
0.0000652953	1267.	19407906.	7.6524316670	C
0.0000725504	1403.	19331507.	7.6702663732	C
0.0000798054	1537.	19254007.	7.6883985918	C
0.0000870604	1669.	19175378.	7.7068375181	C
0.0000943155	1801.	19095579.	7.7255944174	C

0.0001015705	1931.	19014571.	7.7446806026	C
0.0001088255	2060.	18932313.	7.7641080049	C
0.0001160806	2188.	18848762.	7.7838892208	C
0.0001233356	2314.	18763904.	7.8039201862	C
0.0001305906	2439.	18677809.	7.8238464979	C
0.0001378457	2563.	18590324.	7.8441461966	C
0.0001451007	2685.	18501397.	7.8648339000	C
0.0001523558	2805.	18410976.	7.8859251101	C
0.0001596108	2924.	18319004.	7.9074362866	C
0.0001668658	3041.	18225418.	7.9293849286	C
0.0001741209	3157.	18130157.	7.9517896655	C
0.0001813759	3271.	18033150.	7.9746703578	C
0.0001886309	3383.	17934325.	7.9979893773	C
0.0001958860	3491.	17821723.	8.0198685081	CY
0.0002031410	3572.	17584937.	8.0198599416	CY
0.0002103960	3616.	17185839.	7.9890033576	CY
0.0002176511	3651.	16776777.	7.9554828143	CY
0.0002249061	3684.	16382236.	7.9233122209	CY
0.0002321611	3715.	16001668.	7.8923366248	CY
0.0002394162	3743.	15634555.	7.8625747655	CY
0.0002466712	3769.	15280300.	7.8363042206	CY
0.0002539263	3793.	14938361.	7.8102930990	CY
0.0002611813	3815.	14607939.	7.7851355921	CY
0.0002684363	3836.	14288816.	7.7610173485	CY
0.0002756914	3854.	13981037.	7.7383482617	CY
0.0002829464	3872.	13684046.	7.7170393330	CY
0.0002974565	3902.	13119520.	7.6778549283	CY
0.0003119665	3929.	12593495.	7.6433460103	CY
0.0003264766	3951.	12102782.	7.6128213964	CY
0.0003409867	3971.	11644332.	7.5858959176	CY
0.0003554968	3987.	11215358.	7.5620206201	CY
0.0003700068	4001.	10813285.	7.5391130627	CY
0.0003845169	4013.	10436280.	7.5206259707	CY
0.0003990270	4023.	10082484.	7.5034137928	CY
0.0004135370	4032.	9749595.	7.4883916869	CY
0.0004280471	4039.	9435684.	7.4748414923	CY
0.0004425572	4045.	9140071.	7.4631570054	CY
0.0004570673	4050.	8860511.	7.4527115052	CY
0.0004715773	4054.	8596337.	7.4438376166	CY
0.0004860874	4057.	8346000.	7.4354937360	CY
0.0005005975	4059.	8108779.	7.4293988243	CY
0.0005151075	4061.	7883393.	7.4233730110	CY
0.0005296176	4061.	7667409.	7.4355441507	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	4061.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	9.8000	0.00	N.A.	No	0.00	480.5445
2	10.8000	1.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
59.40	0.04
61.20	2.08
63.00	5.20
64.80	8.32
66.60	11.44
68.40	14.56
70.20	17.68
72.00	20.80
73.80	23.92
75.60	27.04
77.40	30.16
79.20	33.28
81.00	36.40
82.80	39.52
84.60	42.64
86.40	45.76
88.20	48.88
90.00	52.00
91.80	55.12
93.60	58.24
95.40	61.36
97.20	64.48
99.00	67.60
100.80	70.72
102.60	73.84
104.40	76.96
106.20	80.08
108.00	83.20
109.80	86.32
111.60	89.44
113.40	92.56

115.20	95.68
117.00	98.80
118.80	101.92
120.60	17.29

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.80
1.80	3.18
3.60	6.36
5.40	9.54
7.20	12.72
9.00	15.90
10.80	19.08
12.60	22.26
14.40	25.44
16.20	28.62
18.00	31.80
19.80	34.98
21.60	38.16
23.40	41.34
25.20	44.52
27.00	47.70
28.80	50.88
30.60	54.06
32.40	57.24
34.20	60.42
36.00	63.60
37.80	66.78
39.60	69.96
41.40	73.14
43.20	76.32
45.00	79.50
46.80	82.68

48.60	85.86
50.40	89.04
52.20	92.22
54.00	95.40
55.80	98.58
57.60	101.76
59.40	104.92
61.20	107.02
63.00	108.54
64.80	110.07
66.60	111.60
68.40	113.12
70.20	114.65
72.00	116.18
73.80	117.70
75.60	119.23
77.40	120.76
79.20	122.28
81.00	123.81
82.80	125.33
84.60	126.86
86.40	128.39
88.20	129.91
90.00	131.44
91.80	132.97
93.60	134.49
95.40	136.02
97.20	137.55
99.00	139.07
100.80	140.60
102.60	142.12
104.40	143.65
106.20	145.18
108.00	146.70
109.80	148.23
111.60	149.76
113.40	151.28
115.20	152.81
117.00	154.34
118.80	155.86
120.60	26.13

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.46168	-4.312E-06	0.000	0.000	5.993E+09
0.15000	0.45432	1.28790	3.57750	0.000	5.993E+09
0.30000	0.44696	12.87900	12.16350	0.000	5.993E+09
0.45000	0.43961	45.07650	26.47350	0.000	5.993E+09
0.60000	0.43225	108.18360	46.50750	0.000	5.993E+09
0.75000	0.42489	212.50350	72.26550	0.000	5.993E+09
0.90000	0.41753	368.33940	103.74750	0.000	5.993E+09
1.05000	0.41018	585.99450	140.95350	0.000	5.993E+09
1.20000	0.40282	875.77200	183.88350	0.000	5.993E+09
1.35000	0.39546	1248.	232.53750	0.000	5.993E+09
1.50000	0.38811	1713.	286.91550	0.000	5.993E+09
1.65000	0.38075	2281.	347.01750	0.000	5.993E+09
1.80000	0.37340	2962.	412.84350	0.000	5.993E+09
1.95000	0.36605	3767.	484.39350	0.000	5.993E+09
2.10000	0.35870	4706.	561.66750	0.000	5.993E+09
2.25000	0.35135	5789.	644.66550	0.000	5.993E+09
2.40000	0.34400	7027.	733.38750	0.000	5.993E+09
2.55000	0.33666	8429.	827.83350	0.000	5.993E+09
2.70000	0.32933	10007.	928.00350	0.000	5.993E+09
2.85000	0.32200	11770.	1034.	0.000	5.993E+09
3.00000	0.31467	13729.	1146.	0.000	5.993E+09
3.15000	0.30736	15894.	1263.	0.000	5.993E+09
3.30000	0.30005	18275.	1386.	0.000	5.993E+09
3.45000	0.29275	20883.	1515.	0.000	5.993E+09
3.60000	0.28546	23728.	1649.	0.000	5.993E+09
3.75000	0.27819	26821.	1789.	0.000	5.993E+09
3.90000	0.27093	30170.	1935.	0.000	5.993E+09
4.05000	0.26368	33788.	2087.	0.000	5.993E+09
4.20000	0.25646	37684.	2245.	0.000	5.993E+09

4.35000	0.24926	41868.	2408.	0.000	5.993E+09
4.50000	0.24207	46352.	2577.	0.000	5.993E+09
4.65000	0.23492	51144.	2751.	0.000	5.993E+09
4.80000	0.22779	56255.	2931.	0.000	5.993E+09
4.95000	0.22069	61697.	3117.	0.000	5.993E+09
5.10000	0.21362	67478.	3310.	0.000	5.993E+09
5.25000	0.20659	73613.	3511.	0.000	5.993E+09
5.40000	0.19960	80117.	3720.	0.000	5.993E+09
5.55000	0.19266	87004.	3937.	0.000	5.993E+09
5.70000	0.18576	94289.	4163.	0.000	5.993E+09
5.85000	0.17891	101989.	4397.	0.000	5.993E+09
6.00000	0.17212	110117.	4639.	0.000	5.993E+09
6.15000	0.16538	118689.	4890.	0.000	5.993E+09
6.30000	0.15872	127720.	5149.	0.000	5.993E+09
6.45000	0.15212	137224.	5416.	0.000	5.993E+09
6.60000	0.14559	147218.	5692.	0.000	5.993E+09
6.75000	0.13914	157716.	5976.	0.000	5.993E+09
6.90000	0.13278	168732.	6269.	0.000	5.993E+09
7.05000	0.12651	180283.	6570.	0.000	5.993E+09
7.20000	0.12034	192383.	6879.	0.000	5.993E+09
7.35000	0.11427	205048.	7197.	0.000	5.993E+09
7.50000	0.10831	218291.	7523.	0.000	5.993E+09
7.65000	0.10247	232129.	7857.	0.000	5.993E+09
7.80000	0.09676	246576.	8200.	0.000	5.993E+09
7.95000	0.09118	261648.	8551.	0.000	5.993E+09
8.10000	0.08574	277360.	8910.	0.000	5.993E+09
8.25000	0.08045	293725.	9278.	0.000	5.993E+09
8.40000	0.07532	310761.	9654.	0.000	5.993E+09
8.55000	0.07036	328481.	10039.	0.000	5.993E+09
8.70000	0.06557	346901.	10432.	0.000	5.993E+09
8.85000	0.06098	366036.	10833.	0.000	5.993E+09
9.00000	0.05658	385900.	11243.	0.000	5.993E+09
9.15000	0.05239	406509.	11661.	0.000	5.993E+09
9.30000	0.04842	427879.	12087.	0.000	5.993E+09
9.45000	0.04468	450023.	12522.	0.000	5.993E+09
9.60000	0.04118	472957.	12965.	0.000	5.993E+09
9.75000	0.03794	496697.	13416.	0.000	5.993E+09
9.90000	0.03497	521257.	13875.	-1.5968	5.993E+09
10.05000	0.03228	546646.	14139.	-5.8097	2.234E+10
10.20000	0.02967	572158.	14165.	-8.5436	1.991E+10
10.35000	0.02715	597642.	14148.	-10.7504	1.976E+10
10.50000	0.02473	623091.	14127.	-12.4627	1.975E+10
10.65000	0.02241	648499.	14104.	-13.7149	1.973E+10
10.80000	0.02020	673863.	14078.	-14.5431	1.972E+10

10.95000	0.01810	699181.	12919.	-1274.	1.971E+10
11.10000	0.01611	720371.	10553.	-1355.	1.970E+10
11.25000	0.01425	737173.	8049.	-1428.	1.969E+10
11.40000	0.01250	749348.	5422.	-1492.	1.968E+10
11.55000	0.01088	756690.	2686.	-1548.	1.968E+10
11.70000	0.009380	759017.	-141.6900	-1594.	1.968E+10
11.85000	0.008007	756180.	-3044.	-1631.	1.968E+10
12.00000	0.006759	748058.	-6004.	-1658.	1.968E+10
12.15000	0.005634	734565.	-9003.	-1674.	1.969E+10
12.30000	0.004629	715647.	-12023.	-1680.	1.970E+10
12.45000	0.003743	691284.	-15042.	-1675.	1.971E+10
12.60000	0.002970	661494.	-18042.	-1658.	1.973E+10
12.75000	0.002305	626333.	-20999.	-1628.	1.974E+10
12.90000	0.001744	585896.	-23892.	-1586.	1.977E+10
13.05000	0.001278	540321.	-26697.	-1530.	2.321E+10
13.20000	0.000888	489789.	-29381.	-1454.	7.312E+10
13.35000	0.000520	434547.	-31879.	-1321.	7.312E+10
13.50000	0.000170	375026.	-33841.	-858.8500	7.312E+10
13.65000	-0.000162	312721.	-33852.	846.44512	7.312E+10
13.80000	-0.000481	253159.	-31792.	1442.	7.312E+10
13.95000	-0.000788	198270.	-28975.	1687.	7.312E+10
14.10000	-0.001087	148848.	-25757.	1888.	7.312E+10
14.25000	-0.001379	105544.	-22197.	2068.	7.312E+10
14.40000	-0.001667	68940.	-18325.	2235.	7.312E+10
14.55000	-0.001951	39576.	-14159.	2394.	7.312E+10
14.70000	-0.002234	17966.	-9712.	2548.	7.312E+10
14.85000	-0.002515	4612.	-4991.	2698.	7.312E+10
15.00000	-0.002797	0.000	0.000	2847.	7.312E+10

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.46167835 inches
Computed slope at pile head      =     -0.0040876 radians
Maximum bending moment           =        759017. inch-lbs
Maximum shear force              =        -33852. lbs
Depth of maximum bending moment  =    11.70000000 feet below pile head
Depth of maximum shear force     =    13.65000000 feet below pile head
Number of iterations             =             64
Number of zero deflection points =              1
Pile deflection at ground        =     0.03694799 inches
```

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
59.40	0.04
61.20	2.08
63.00	5.20
64.80	8.32
66.60	11.44
68.40	14.56
70.20	17.68
72.00	20.80
73.80	23.92
75.60	27.04
77.40	30.16
79.20	33.28
81.00	36.40
82.80	39.52
84.60	42.64
86.40	45.76
88.20	48.88
90.00	52.00
91.80	55.12
93.60	58.24
95.40	61.36
97.20	64.48
99.00	67.60
100.80	70.72
102.60	73.84
104.40	76.96
106.20	80.08
108.00	83.20
109.80	86.32
111.60	89.44
113.40	92.56
115.20	95.68
117.00	98.80
118.80	101.92
120.60	17.29

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.80
1.80	3.18
3.60	6.36
5.40	9.54
7.20	12.72
9.00	15.90
10.80	19.08
12.60	22.26
14.40	25.44
16.20	28.62
18.00	31.80
19.80	34.98
21.60	38.16
23.40	41.34
25.20	44.52
27.00	47.70
28.80	50.88
30.60	54.06
32.40	57.24
34.20	60.42
36.00	63.60
37.80	66.78
39.60	69.96
41.40	73.14
43.20	76.32
45.00	79.50
46.80	82.68
48.60	85.86
50.40	89.04
52.20	92.22
54.00	95.40
55.80	98.58

57.60	101.76
59.40	104.92
61.20	107.02
63.00	108.54
64.80	110.07
66.60	111.60
68.40	113.12
70.20	114.65
72.00	116.18
73.80	117.70
75.60	119.23
77.40	120.76
79.20	122.28
81.00	123.81
82.80	125.33
84.60	126.86
86.40	128.39
88.20	129.91
90.00	131.44
91.80	132.97
93.60	134.49
95.40	136.02
97.20	137.55
99.00	139.07
100.80	140.60
102.60	142.12
104.40	143.65
106.20	145.18
108.00	146.70
109.80	148.23
111.60	149.76
113.40	151.28
115.20	152.81
117.00	154.34
118.80	155.86
120.60	26.13

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.80340	9.241E-06	0.000	0.000	5.993E+09
0.15000	0.79120	1.93186	5.36625	0.000	5.993E+09
0.30000	0.77900	19.31851	18.24525	0.000	5.993E+09
0.45000	0.76681	67.61476	39.71025	0.000	5.993E+09
0.60000	0.75461	162.27541	69.76125	0.000	5.993E+09
0.75000	0.74241	318.75526	108.39825	0.000	5.993E+09
0.90000	0.73021	552.50911	155.62125	0.000	5.993E+09
1.05000	0.71801	878.99176	211.43025	0.000	5.993E+09
1.20000	0.70581	1314.	275.82525	0.000	5.993E+09
1.35000	0.69362	1872.	348.80625	0.000	5.993E+09
1.50000	0.68142	2569.	430.37325	0.000	5.993E+09
1.65000	0.66923	3421.	520.52625	0.000	5.993E+09
1.80000	0.65703	4443.	619.26525	0.000	5.993E+09
1.95000	0.64484	5651.	726.59025	0.000	5.993E+09
2.10000	0.63266	7059.	842.50125	0.000	5.993E+09
2.25000	0.62047	8684.	966.99825	0.000	5.993E+09
2.40000	0.60829	10540.	1100.	0.000	5.993E+09
2.55000	0.59612	12644.	1242.	0.000	5.993E+09
2.70000	0.58395	15010.	1392.	0.000	5.993E+09
2.85000	0.57180	17655.	1551.	0.000	5.993E+09
3.00000	0.55965	20594.	1718.	0.000	5.993E+09
3.15000	0.54751	23841.	1894.	0.000	5.993E+09
3.30000	0.53539	27413.	2079.	0.000	5.993E+09
3.45000	0.52328	31325.	2272.	0.000	5.993E+09
3.60000	0.51118	35592.	2474.	0.000	5.993E+09
3.75000	0.49911	40231.	2684.	0.000	5.993E+09
3.90000	0.48706	45256.	2903.	0.000	5.993E+09
4.05000	0.47503	50682.	3131.	0.000	5.993E+09
4.20000	0.46303	56526.	3367.	0.000	5.993E+09
4.35000	0.45106	62803.	3611.	0.000	5.993E+09
4.50000	0.43913	69527.	3865.	0.000	5.993E+09
4.65000	0.42723	76716.	4127.	0.000	5.993E+09
4.80000	0.41537	84383.	4397.	0.000	5.993E+09
4.95000	0.40356	92545.	4676.	0.000	5.993E+09

5.10000	0.39180	101217.	4964.	0.000	5.993E+09
5.25000	0.38009	110416.	5262.	0.000	5.993E+09
5.40000	0.36845	120160.	5569.	0.000	5.993E+09
5.55000	0.35687	130465.	5886.	0.000	5.993E+09
5.70000	0.34535	141350.	6213.	0.000	5.993E+09
5.85000	0.33392	152831.	6549.	0.000	5.993E+09
6.00000	0.32257	164927.	6896.	0.000	5.993E+09
6.15000	0.31131	177655.	7252.	0.000	5.993E+09
6.30000	0.30014	191033.	7617.	0.000	5.993E+09
6.45000	0.28908	205078.	7993.	0.000	5.993E+09
6.60000	0.27812	219807.	8378.	0.000	5.993E+09
6.75000	0.26729	235238.	8773.	0.000	5.993E+09
6.90000	0.25658	251389.	9178.	0.000	5.993E+09
7.05000	0.24601	268277.	9592.	0.000	5.993E+09
7.20000	0.23559	285920.	10016.	0.000	5.993E+09
7.35000	0.22532	304335.	10450.	0.000	5.993E+09
7.50000	0.21521	323540.	10894.	0.000	5.993E+09
7.65000	0.20528	343552.	11347.	0.000	5.993E+09
7.80000	0.19553	364389.	11810.	0.000	5.993E+09
7.95000	0.18599	386069.	12283.	0.000	5.993E+09
8.10000	0.17665	408608.	12765.	0.000	5.993E+09
8.25000	0.16753	432024.	13258.	0.000	5.993E+09
8.40000	0.15864	456336.	13760.	0.000	5.993E+09
8.55000	0.15000	481560.	14272.	0.000	5.993E+09
8.70000	0.14162	507714.	14793.	0.000	5.993E+09
8.85000	0.13352	534815.	15324.	0.000	5.993E+09
9.00000	0.12571	562881.	15865.	0.000	5.993E+09
9.15000	0.11820	591930.	16416.	0.000	5.993E+09
9.30000	0.11101	621979.	16977.	0.000	5.993E+09
9.45000	0.10415	653046.	17547.	0.000	5.993E+09
9.60000	0.09765	685148.	18127.	0.000	5.993E+09
9.75000	0.09152	718302.	18716.	0.000	5.993E+09
9.90000	0.08578	752527.	19314.	-2.0226	5.993E+09
10.05000	0.08044	787832.	19657.	-9.4217	1.966E+10
10.20000	0.07524	823291.	19685.	-15.0977	1.964E+10
10.35000	0.07017	858700.	19653.	-20.7015	1.963E+10
10.50000	0.06524	894042.	19611.	-26.1613	1.961E+10
10.65000	0.06046	929299.	19559.	-31.4068	1.959E+10
10.80000	0.05583	964455.	19498.	-36.3699	1.957E+10
10.95000	0.05137	999493.	17978.	-1653.	1.955E+10
11.10000	0.04706	1029175.	14896.	-1771.	1.954E+10
11.25000	0.04293	1053119.	11609.	-1881.	1.952E+10
11.40000	0.03898	1070969.	8132.	-1983.	1.951E+10
11.55000	0.03520	1082395.	4480.	-2076.	1.951E+10

11.70000	0.03160	1087097.	668.14558	-2160.	1.950E+10
11.85000	0.02818	1084801.	-3286.	-2234.	1.951E+10
12.00000	0.02495	1075267.	-7364.	-2298.	1.951E+10
12.15000	0.02189	1058289.	-11548.	-2351.	1.952E+10
12.30000	0.01900	1033694.	-15817.	-2392.	1.953E+10
12.45000	0.01629	1001349.	-20147.	-2419.	1.955E+10
12.60000	0.01375	961166.	-24512.	-2432.	1.957E+10
12.75000	0.01136	913105.	-28885.	-2426.	1.960E+10
12.90000	0.009124	857182.	-33227.	-2399.	1.963E+10
13.05000	0.007030	793487.	-37495.	-2343.	1.966E+10
13.20000	0.005066	722201.	-41625.	-2247.	1.970E+10
13.35000	0.003222	643636.	-45524.	-2085.	1.974E+10
13.50000	0.001483	558315.	-49004.	-1782.	2.119E+10
13.65000	-0.000171	467220.	-49805.	892.59928	7.312E+10
13.80000	-0.001804	379018.	-47195.	2008.	7.312E+10
13.95000	-0.003420	297320.	-43196.	2435.	7.312E+10
14.10000	-0.005023	223512.	-38512.	2769.	7.312E+10
14.25000	-0.006616	158676.	-33266.	3060.	7.312E+10
14.40000	-0.008202	103756.	-27515.	3329.	7.312E+10
14.55000	-0.009784	59621.	-21296.	3582.	7.312E+10
14.70000	-0.0114	27092.	-14627.	3827.	7.312E+10
14.85000	-0.0129	6962.	-7526.	4064.	7.312E+10
15.00000	-0.0145	0.000	0.000	4297.	7.312E+10

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     0.80340226 inches
Computed slope at pile head      =     -0.0067771 radians
Maximum bending moment           =       1087097. inch-lbs
Maximum shear force              =        -49805. lbs
Depth of maximum bending moment  =    11.70000000 feet below pile head
Depth of maximum shear force     =    13.65000000 feet below pile head
Number of iterations             =             38
Number of zero deflection points =              1
Pile deflection at ground        =     0.08960563 inches
```

Summary of Pile Responses for LRFD Analyses

Load Case	Pile-head Deflection	Maximum Moment in Pile	Maximum Shear in Pile	Pile-Head Rotation

No.	inches	in-lbs	lbs	radians
1	0.4616783	759017.	-33852.	-0.004088
2	0.8034023	1087097.	-49805.	-0.006777

Maximum pile-head deflection = 0.8034022590 inches
Maximum pile-head rotation = -0.0067771194 radians = -0.388300 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	2368063.	521257.	Pass
	2	1.00	4060795.	759017.	Pass
2	1	1.00	2368063.	752527.	Pass
	2	1.00	4060795.	1087097.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	106600.	13875.	Pass
	2	1.00	106600.	-33852.	Pass
2	1	1.00	106600.	19314.	Pass
	2	1.00	106600.	-49805.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2

Pile Section No.   = 1

The load case and pile section with the greatest level of developed shear
capacity:

LRFD Load Case No.   = 2
Pile Section No.   = 2
Node Number of Maximum Shear Force   = 1
Depth of Maximum Developed Shear   = 0.00 ft
Maximum Developed Shear Force   = -49804.69 lbs
Factored Shear Capacity at Node   = 106600.00 lbs
Fraction of Allowable Shear Capacity = 0.4672

The analysis ended normally.

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

                            LPile for Version 2022-12.012

                              License ID : 154178656
                          License Type : (Network License)

                  Analysis of Individual Piles and Drilled Shafts
                 Subjected to Lateral Loading Using the p-y Method
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Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1206.19 Pile 2 11.lp12d

Name of the output report file:
BEL-70 1206.19 Pile 2 11.lp12o

Name of the plot output file:
BEL-70 1206.19 Pile 2 11.lp12p

Name of the runtime message file:
BEL-70 1206.19 Pile 2 11.lp12r
```

Date and Time of Analysis

Date: June 20, 2026 Time: 21:02:55

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1206+19 Piles 2 11 - 12.5' Ht.(8.0' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 19.000 ft
Depth of ground surface below top of pile = 12.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.6000
2	12.500	14.6000
3	12.500	24.0000
4	19.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 12.500000 ft
   AISC Section Type = HP

   AISC Section Name = HP14X73

   Pile width = 14.600000 in
   Shear capacity of section = 0.0000 lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 6.500000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 184500. lbs

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is weak rock, p-y criteria by Reese, 1997

   Distance from top of pile to top of layer = 12.500000 ft
   Distance from top of pile to bottom of layer = 50.000000 ft
   Effective unit weight at top of layer = 77.600000 pcf
   Effective unit weight at bottom of layer = 77.600000 pcf
   Uniaxial compressive strength at top of layer = 100.000000 psi
   Uniaxial compressive strength at bottom of layer = 100.000000 psi
   Initial modulus of rock at top of layer = 18000. psi
   Initial modulus of rock at bottom of layer = 18000. psi
   RQD of rock at top of layer = 20.000000 %
   RQD of rock at bottom of layer = 20.000000 %

k rm of rock at top of layer = 0.0005000
k rm of rock at bottom of layer = 0.0005000

(Depth of the lowest soil layer extends 31.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	6.25	265.00
3	12.50	392.20

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch

1	6.25	0.00
2	12.50	260.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type		Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads	(DL)	0.00	0.00	0.00	0
Live Loads	(LL)	0.00	0.00	0.00	0
Earthquake	(EQ)	0.00	0.00	0.00	0
Impact Load	(IM)	0.00	0.00	0.00	0
Wind Loads	(W)	0.00	0.00	0.00	0
Water Loads	(HW)	0.00	0.00	0.00	1
Ice Loads	(Ice)	0.00	0.00	0.00	0
Horiz. Soil	(Hs)	0.00	0.00	0.00	1
Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	12.500000 ft
Flange Width	=	14.600000 in
Section Depth	=	13.600000 in
Flange Thickness	=	0.505000 in
Web Thickness	=	0.505000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	21.400000 sq. in.
Moment of Inertia	=	729.000000 in^4
Elastic Bending Stiffness	=	21141000. kip-in^2
Plastic Modulus, Z	=	118.000000in^3
Plastic Moment Capacity = Fy Z	=	5900.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	1070.000 kips
Nominal Axial Tensile Capacity	=	-1070.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000050189	104.1755221948	20756666.	6.8000000000	
0.0000100378	208.3510443896	20756666.	6.8000000000	
0.0000150567	312.5265665844	20756666.	6.8000000000	
0.0000200756	416.7020887792	20756666.	6.8000000000	
0.0000250945	520.8776109740	20756666.	6.8000000000	
0.0000301134	625.0531331689	20756666.	6.8000000000	
0.0000351323	729.2286553637	20756666.	6.8000000000	
0.0000401512	833.4041775585	20756666.	6.8000000000	
0.0000451701	937.5796997533	20756666.	6.8000000000	
0.0000501889	1042.	20756666.	6.8000000000	
0.0000552078	1146.	20756666.	6.8000000000	
0.0000602267	1250.	20756666.	6.8000000000	
0.0000652456	1354.	20756666.	6.8000000000	
0.0000702645	1458.	20756666.	6.8000000000	
0.0000752834	1563.	20756666.	6.8000000000	
0.0000803023	1667.	20756666.	6.8000000000	
0.0000853212	1771.	20756666.	6.8000000000	
0.0000903401	1875.	20756666.	6.8000000000	
0.0000953590	1979.	20756666.	6.8000000000	
0.0001003779	2084.	20756666.	6.8000000000	
0.0001053968	2188.	20756666.	6.8000000000	
0.0001104157	2292.	20756666.	6.8000000000	
0.0001154346	2396.	20756666.	6.8000000000	
0.0001204535	2500.	20756666.	6.8000000000	
0.0001254724	2604.	20756666.	6.8000000000	
0.0001304913	2709.	20756666.	6.8000000000	
0.0001355102	2813.	20756666.	6.8000000000	

0.0001405291	2917.	20756666.	6.8000000000	
0.0001455479	3021.	20756666.	6.8000000000	
0.0001505668	3125.	20756666.	6.8000000000	
0.0001555857	3229.	20756666.	6.8000000000	
0.0001606046	3334.	20756666.	6.8000000000	
0.0001656235	3438.	20756666.	6.8000000000	
0.0001706424	3542.	20756666.	6.8000000000	
0.0001756613	3646.	20756666.	6.8000000000	
0.0001806802	3750.	20756666.	6.8000000000	
0.0001856991	3854.	20756666.	6.8000000000	
0.0001907180	3959.	20756666.	6.8000000000	
0.0001957369	4063.	20756666.	6.8000000000	
0.0002057747	4271.	20756666.	6.8000000000	
0.0002158125	4480.	20756666.	6.8000000000	
0.0002258503	4688.	20756666.	6.8000000000	
0.0002358880	4896.	20756666.	6.8000000000	
0.0002459258	5105.	20756666.	6.8000000000	
0.0002559636	5313.	20756666.	6.8000000000	
0.0002660014	5447.	20475766.	6.8000000000	Y
0.0002760392	5497.	19913687.	6.8000000000	Y
0.0002860770	5520.	19294249.	6.8000000000	Y
0.0002961148	5540.	18708912.	6.8000000000	Y
0.0003061526	5558.	18155823.	6.8000000000	Y
0.0003161904	5575.	17631964.	6.8000000000	Y
0.0003262282	5590.	17135937.	6.8000000000	Y
0.0003362659	5604.	16665630.	6.8000000000	Y
0.0003463037	5617.	16219158.	6.8000000000	Y
0.0003563415	5628.	15794834.	6.8000000000	Y
0.0003663793	5639.	15391137.	6.8000000000	Y
0.0003764171	5649.	15006694.	6.8000000000	Y
0.0003864549	5658.	14640260.	6.8000000000	Y
0.0003964927	5666.	14290700.	6.8000000000	Y
0.0004065305	5674.	13956977.	6.8000000000	Y
0.0004165683	5681.	13638139.	6.8000000000	Y
0.0004266060	5688.	13332840.	6.8000000000	Y
0.0004366438	5694.	13040564.	6.8000000000	Y
0.0004466816	5700.	12760725.	6.8000000000	Y
0.0004567194	5705.	12492115.	6.8000000000	Y
0.0004667572	5710.	12234370.	6.8000000000	Y
0.0004767950	5715.	11986978.	6.8000000000	Y
0.0004868328	5720.	11748890.	6.8000000000	Y
0.0004968706	5724.	11520256.	6.8000000000	Y
0.0005069084	5728.	11299755.	6.8000000000	Y
0.0005169462	5732.	11087791.	6.8000000000	Y

0.0005269839	5735.	10883101.	6.8000000000	Y
0.0005370217	5739.	10686021.	6.8000000000	Y
0.0005470595	5742.	10495610.	6.8000000000	Y
0.0005570973	5745.	10311881.	6.8000000000	Y
0.0005671351	5748.	10134413.	6.8000000000	Y
0.0005771729	5750.	9962708.	6.8000000000	Y
0.0005872107	5753.	9796873.	6.8000000000	Y
0.0005972485	5755.	9636180.	6.8000000000	Y
0.0006373996	5764.	9042573.	6.8000000000	Y
0.0006775508	5771.	8517218.	6.8000000000	Y
0.0007177019	5777.	8049009.	6.8000000000	Y
0.0007578531	5782.	7629158.	6.8000000000	Y
0.0007980043	5786.	7250621.	6.8000000000	Y
0.0008381554	5790.	6907672.	6.8000000000	Y
0.0008783066	5793.	6595608.	6.8000000000	Y
0.0009184577	5796.	6310217.	6.8000000000	Y
0.0009586089	5798.	6048460.	6.8000000000	Y
0.0009987600	5800.	5807472.	6.8000000000	Y
0.0010389112	5802.	5584837.	6.8000000000	Y
0.0010790624	5804.	5378606.	6.8000000000	Y
0.0011192135	5805.	5187024.	6.8000000000	Y
0.0011593647	5807.	5008517.	6.8000000000	Y
0.0011995158	5808.	4841960.	6.8000000000	Y
0.0012396670	5809.	4685980.	6.8000000000	Y
0.0012798181	5810.	4539738.	6.8000000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	5810.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	6.500000	ft
Outside Diameter of Casing	=	24.000000	in
Casing Wall Thickness	=	0.0000	in
Moment of Inertia of Steel Casing	=	0.0000	in^4
Width Flange of Core/Insert	=	14.600000	in
Depth of Core/Insert	=	13.600000	in
Flange Thickness of Core/Insert	=	0.505000	in
Web Thickness of Core/Insert	=	0.505000	in
Moment of Inertia of Steel Core/Insert	=	716.453023	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Yield Stress of Core/Insert	=	50000.	psi
Elastic Modulus of Core/Insert	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Gross Area of Pile	=	452.389342	sq. in.
Area of Concrete	=	431.285392	sq. in.
Cross-sectional Area of Steel Casing	=	0.0000	sq. in.
Cross-sectional Area of Steel Core/Insert	=	21.103950	sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	21.103950	sq. in.
Area Ratio of All Steel to Gross Area	=	4.66	percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	2521.568	kips
Tensile Load for Cracking of Concrete	=	-249.984	kips
Nominal Axial Tensile Capacity	=	-1055.197	kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000050189	432.1817465260	86110942.	12.0000000000	
0.0000100378	432.1817465260	43055471.	8.6068271721	C
0.0000150567	577.6428769267	38364548.	8.6189827213	C
0.0000200756	768.4660160600	38278648.	8.6312552758	C
0.0000250945	958.4087347826	38192024.	8.6436471492	C
0.0000301134	1147.	38104663.	8.6561607243	C
0.0000351323	1336.	38016549.	8.6687984563	C
0.0000401512	1523.	37927670.	8.6815628754	C
0.0000451701	1709.	37838010.	8.6944565902	C
0.0000501889	1895.	37747556.	8.7074822909	C
0.0000552078	2079.	37656291.	8.7206427525	C
0.0000602267	2262.	37564199.	8.7339408391	C
0.0000652456	2445.	37471264.	8.7473795071	C
0.0000702645	2626.	37377472.	8.7609423566	C
0.0000752834	2807.	37282868.	8.7743922334	C
0.0000803023	2986.	37187388.	8.7879861823	C
0.0000853212	3165.	37091013.	8.8017274046	C
0.0000903401	3342.	36993724.	8.8156192101	C
0.0000953590	3518.	36895504.	8.8296650218	C
0.0001003779	3694.	36796331.	8.8438683818	C
0.0001053968	3868.	36696186.	8.8582329561	C
0.0001104157	4041.	36595047.	8.8727625411	C
0.0001154346	4213.	36492892.	8.8874610698	C
0.0001204535	4383.	36389699.	8.9023326186	C

0.0001254724	4553.	36285444.	8.9173814142	C
0.0001304913	4721.	36180102.	8.9326118412	C
0.0001355102	4888.	36073649.	8.9480284505	C
0.0001405291	5054.	35966057.	8.9636359676	C
0.0001455479	5219.	35857300.	8.9794356497	C
0.0001505668	5382.	35747350.	8.9952839627	C
0.0001555857	5545.	35636313.	9.0112060667	C
0.0001606046	5705.	35524103.	9.0272826391	C
0.0001656235	5865.	35410640.	9.0435710289	C
0.0001706424	6023.	35295893.	9.0600674532	C
0.0001756613	6180.	35179829.	9.0767814323	C
0.0001806802	6323.	34997213.	9.0866553144	CY
0.0001856991	6419.	34568148.	9.0692763059	CY
0.0001907180	6466.	33902972.	9.0237190803	CY
0.0001957369	6510.	33257200.	8.9793962354	CY
0.0002057747	6589.	32021863.	8.8936697461	CY
0.0002158125	6660.	30860265.	8.8142135992	CY
0.0002258503	6723.	29766940.	8.7386487572	CY
0.0002358880	6779.	28736093.	8.6664699660	CY
0.0002459258	6828.	27764193.	8.5988027959	CY
0.0002559636	6873.	26849677.	8.5356931475	CY
0.0002660014	6912.	25985379.	8.4748686066	CY
0.0002760392	6948.	25169225.	8.4170461311	CY
0.0002860770	6980.	24398749.	8.3628155948	CY
0.0002961148	7009.	23670513.	8.3118054375	CY
0.0003061526	7036.	22981064.	8.2629691877	CY
0.0003161904	7060.	22327109.	8.2155005246	CY
0.0003262282	7081.	21707048.	8.1706263132	CY
0.0003362659	7102.	21118974.	8.1279742082	CY
0.0003463037	7120.	20560329.	8.0876562894	CY
0.0003563415	7137.	20028733.	8.0489701760	CY
0.0003663793	7152.	19521675.	8.0110821105	CY
0.0003764171	7167.	19038950.	7.9745658599	CY
0.0003864549	7180.	18578260.	7.9396606931	CY
0.0003964927	7192.	18138256.	7.9061657571	CY
0.0004065305	7203.	17718754.	7.8743125516	CY
0.0004165683	7213.	17316370.	7.8435224268	CY
0.0004266060	7223.	16932203.	7.8142508905	CY
0.0004366438	7232.	16563237.	7.7851353838	CY
0.0004466816	7241.	16209637.	7.7566291498	CY
0.0004567194	7248.	15869753.	7.7293035350	CY
0.0004667572	7255.	15544289.	7.7030893224	CY
0.0004767950	7262.	15230653.	7.6773289858	CY
0.0004868328	7268.	14929633.	7.6529617917	CY

0.0004968706	7274.	14639685.	7.6291697200	CY
0.0005069084	7274.	14349791.	7.6177588020	CY
0.0005169462	7274.	14071154.	7.5953853817	CY
0.0005269839	7274.	13803132.	7.5951170166	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	7274.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
75.24	1.45
77.52	8.74
79.80	16.64

82.08	24.54
84.36	32.45
86.64	40.35
88.92	48.26
91.20	56.16
93.48	64.06
95.76	71.97
98.04	79.87
100.32	87.78
102.60	95.68
104.88	103.58
107.16	111.49
109.44	119.39
111.72	127.30
114.00	135.20
116.28	143.10
118.56	151.01
120.84	158.91
123.12	166.82
125.40	174.72
127.68	182.62
129.96	190.53
132.24	198.43
134.52	206.34
136.80	214.24
139.08	222.14
141.36	230.05
143.64	237.95
145.92	245.86
148.20	253.76
150.48	74.93

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in

0.00	2.01
2.28	8.06
4.56	16.11
6.84	24.17
9.12	32.22
11.40	40.28
13.68	48.34
15.96	56.39
18.24	64.45
20.52	72.50
22.80	80.56
25.08	88.62
27.36	96.67
29.64	104.73
31.92	112.78
34.20	120.84
36.48	128.90
38.76	136.95
41.04	145.01
43.32	153.06
45.60	161.12
47.88	169.18
50.16	177.23
52.44	185.29
54.72	193.34
57.00	201.40
59.28	209.46
61.56	217.51
63.84	225.57
66.12	233.62
68.40	241.68
70.68	249.74
72.96	257.79
75.24	265.08
77.52	269.27
79.80	273.14
82.08	277.01
84.36	280.87
86.64	284.74
88.92	288.61
91.20	292.48
93.48	296.34
95.76	300.21
98.04	304.08

100.32	307.94
102.60	311.81
104.88	315.68
107.16	319.54
109.44	323.41
111.72	327.28
114.00	331.14
116.28	335.01
118.56	338.88
120.84	342.74
123.12	346.61
125.40	350.48
127.68	354.35
129.96	358.21
132.24	362.08
134.52	365.95
136.80	369.81
139.08	373.68
141.36	377.55
143.64	381.41
145.92	385.28
148.20	389.15
150.48	113.37

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.99502	4.433E-06	1.944E-07	0.000	2.076E+10
0.19000	0.97944	5.23478	11.47980	0.000	2.076E+10
0.38000	0.96387	52.34788	39.03132	0.000	2.076E+10

0.57000	0.94830	183.21760	84.95052	0.000	2.076E+10
0.76000	0.93272	439.72225	149.23740	0.000	2.076E+10
0.95000	0.91715	863.74014	231.89196	0.000	2.076E+10
1.14000	0.90158	1497.	332.91420	0.000	2.076E+10
1.33000	0.88601	2382.	452.30412	0.000	2.076E+10
1.52000	0.87044	3560.	590.06172	0.000	2.076E+10
1.71000	0.85486	5073.	746.18700	0.000	2.076E+10
1.90000	0.83929	6962.	920.67996	0.000	2.076E+10
2.09000	0.82373	9271.	1114.	0.000	2.076E+10
2.28000	0.80816	12040.	1325.	0.000	2.076E+10
2.47000	0.79260	15312.	1554.	0.000	2.076E+10
2.66000	0.77704	19128.	1802.	0.000	2.076E+10
2.85000	0.76149	23530.	2069.	0.000	2.076E+10
3.04000	0.74594	28561.	2353.	0.000	2.076E+10
3.23000	0.73040	34262.	2656.	0.000	2.076E+10
3.42000	0.71487	40674.	2978.	0.000	2.076E+10
3.61000	0.69935	47841.	3318.	0.000	2.076E+10
3.80000	0.68384	55803.	3676.	0.000	2.076E+10
3.99000	0.66834	64603.	4052.	0.000	2.076E+10
4.18000	0.65286	74282.	4447.	0.000	2.076E+10
4.37000	0.63740	84882.	4861.	0.000	2.076E+10
4.56000	0.62196	96446.	5292.	0.000	2.076E+10
4.75000	0.60654	109014.	5742.	0.000	2.076E+10
4.94000	0.59115	122630.	6211.	0.000	2.076E+10
5.13000	0.57580	137335.	6697.	0.000	2.076E+10
5.32000	0.56047	153170.	7202.	0.000	2.076E+10
5.51000	0.54519	170178.	7726.	0.000	2.076E+10
5.70000	0.52995	188400.	8268.	0.000	2.076E+10
5.89000	0.51475	207879.	8828.	0.000	2.076E+10
6.08000	0.49961	228656.	9407.	0.000	2.076E+10
6.27000	0.48452	250773.	10004.	0.000	2.076E+10
6.46000	0.46950	274275.	10625.	0.000	2.076E+10
6.65000	0.45454	299223.	11272.	0.000	2.076E+10
6.84000	0.43967	325677.	11946.	0.000	2.076E+10
7.03000	0.42487	353699.	12647.	0.000	2.076E+10
7.22000	0.41016	383349.	13375.	0.000	2.076E+10
7.41000	0.39555	414689.	14130.	0.000	2.076E+10
7.60000	0.38104	447781.	14911.	0.000	2.076E+10
7.79000	0.36664	482685.	15720.	0.000	2.076E+10
7.98000	0.35236	519462.	16555.	0.000	2.076E+10
8.17000	0.33822	558175.	17417.	0.000	2.076E+10
8.36000	0.32421	598883.	18306.	0.000	2.076E+10
8.55000	0.31035	641648.	19221.	0.000	2.076E+10
8.74000	0.29666	686532.	20164.	0.000	2.076E+10

8.93000	0.28313	733594.	21133.	0.000	2.076E+10
9.12000	0.26979	782898.	22129.	0.000	2.076E+10
9.31000	0.25665	834504.	23152.	0.000	2.076E+10
9.50000	0.24371	888472.	24202.	0.000	2.076E+10
9.69000	0.23100	944865.	25279.	0.000	2.076E+10
9.88000	0.21853	1003743.	26382.	0.000	2.076E+10
10.07000	0.20630	1065168.	27513.	0.000	2.076E+10
10.26000	0.19434	1129201.	28670.	0.000	2.076E+10
10.45000	0.18267	1195903.	29854.	0.000	2.076E+10
10.64000	0.17129	1265335.	31065.	0.000	2.076E+10
10.83000	0.16023	1337558.	32302.	0.000	2.076E+10
11.02000	0.14951	1412634.	33567.	0.000	2.076E+10
11.21000	0.13914	1490623.	34858.	0.000	2.076E+10
11.40000	0.12914	1571588.	36177.	0.000	2.076E+10
11.59000	0.11954	1655588.	37522.	0.000	2.076E+10
11.78000	0.11035	1742686.	38894.	0.000	2.076E+10
11.97000	0.10160	1832943.	40292.	0.000	2.076E+10
12.16000	0.09331	1926419.	41718.	0.000	2.076E+10
12.35000	0.08550	2023176.	43170.	0.000	2.076E+10
12.54000	0.07820	2123276.	42171.	-1708.	3.763E+10
12.73000	0.07119	2215474.	38290.	-1884.	3.759E+10
12.92000	0.06448	2297876.	33806.	-2049.	3.754E+10
13.11000	0.05810	2369627.	28960.	-2201.	3.751E+10
13.30000	0.05204	2429934.	23781.	-2341.	3.748E+10
13.49000	0.04632	2478070.	18299.	-2468.	3.745E+10
13.68000	0.04094	2513377.	12543.	-2581.	3.743E+10
13.87000	0.03591	2535266.	6546.	-2680.	3.742E+10
14.06000	0.03124	2543225.	340.03119	-2764.	3.742E+10
14.25000	0.02692	2536816.	-6039.	-2832.	3.742E+10
14.44000	0.02295	2515687.	-12555.	-2884.	3.743E+10
14.63000	0.01933	2479565.	-19170.	-2919.	3.745E+10
14.82000	0.01605	2428271.	-25843.	-2935.	3.748E+10
15.01000	0.01311	2361720.	-32531.	-2932.	3.751E+10
15.20000	0.01050	2279929.	-39188.	-2907.	3.755E+10
15.39000	0.008206	2183025.	-45761.	-2859.	3.760E+10
15.58000	0.006211	2071258.	-52194.	-2784.	3.766E+10
15.77000	0.004503	1945018.	-58421.	-2677.	3.772E+10
15.96000	0.003063	1804861.	-64357.	-2530.	3.779E+10
16.15000	0.001870	1651553.	-69889.	-2323.	3.786E+10
16.34000	0.000905	1486167.	-74829.	-2010.	3.794E+10
16.53000	0.000143	1310332.	-78205.	-951.4545	3.803E+10
16.72000	-0.000439	1129551.	-77239.	1799.	3.811E+10
16.91000	-0.000868	958121.	-72675.	2204.	3.819E+10
17.10000	-0.001166	798151.	-67368.	2451.	3.826E+10

17.29000	-0.001356	650921.	-61582.	2625.	3.833E+10
17.48000	-0.001457	517337.	-55449.	2755.	3.987E+10
17.67000	-0.001491	398073.	-49057.	2853.	8.611E+10
17.86000	-0.001501	293638.	-42453.	2940.	8.611E+10
18.05000	-0.001493	204487.	-35661.	3018.	8.611E+10
18.24000	-0.001473	131026.	-28697.	3090.	8.611E+10
18.43000	-0.001445	73630.	-21575.	3157.	8.611E+10
18.62000	-0.001412	32645.	-14363.	3169.	8.611E+10
18.81000	-0.001378	8135.	-7159.	3150.	8.611E+10
19.00000	-0.001343	0.000	0.000	3130.	8.611E+10

Output Summary for Load Case No. 1:

Pile-head deflection	=	0.99501556 inches
Computed slope at pile head	=	-0.0068302 radians
Maximum bending moment	=	2543225. inch-lbs
Maximum shear force	=	-78205. lbs
Depth of maximum bending moment	=	14.06000000 feet below pile head
Depth of maximum shear force	=	16.53000000 feet below pile head
Number of iterations	=	30
Number of zero deflection points	=	1
Pile deflection at ground	=	0.07973312 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
75.24	1.45
77.52	8.74
79.80	16.64
82.08	24.54
84.36	32.45
86.64	40.35
88.92	48.26
91.20	56.16
93.48	64.06
95.76	71.97

98.04	79.87
100.32	87.78
102.60	95.68
104.88	103.58
107.16	111.49
109.44	119.39
111.72	127.30
114.00	135.20
116.28	143.10
118.56	151.01
120.84	158.91
123.12	166.82
125.40	174.72
127.68	182.62
129.96	190.53
132.24	198.43
134.52	206.34
136.80	214.24
139.08	222.14
141.36	230.05
143.64	237.95
145.92	245.86
148.20	253.76
150.48	74.93

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.01
2.28	8.06
4.56	16.11
6.84	24.17
9.12	32.22
11.40	40.28
13.68	48.34

15.96	56.39
18.24	64.45
20.52	72.50
22.80	80.56
25.08	88.62
27.36	96.67
29.64	104.73
31.92	112.78
34.20	120.84
36.48	128.90
38.76	136.95
41.04	145.01
43.32	153.06
45.60	161.12
47.88	169.18
50.16	177.23
52.44	185.29
54.72	193.34
57.00	201.40
59.28	209.46
61.56	217.51
63.84	225.57
66.12	233.62
68.40	241.68
70.68	249.74
72.96	257.79
75.24	265.08
77.52	269.27
79.80	273.14
82.08	277.01
84.36	280.87
86.64	284.74
88.92	288.61
91.20	292.48
93.48	296.34
95.76	300.21
98.04	304.08
100.32	307.94
102.60	311.81
104.88	315.68
107.16	319.54
109.44	323.41
111.72	327.28
114.00	331.14

116.28	335.01
118.56	338.88
120.84	342.74
123.12	346.61
125.40	350.48
127.68	354.35
129.96	358.21
132.24	362.08
134.52	365.95
136.80	369.81
139.08	373.68
141.36	377.55
143.64	381.41
145.92	385.28
148.20	389.15
150.48	113.37

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.68228	-1.773E-05	1.944E-07	0.000	2.076E+10
0.19000	1.65689	7.85217	17.21970	0.000	2.076E+10
0.38000	1.63150	78.52182	58.54698	0.000	2.076E+10
0.57000	1.60612	274.82640	127.42578	0.000	2.076E+10
0.76000	1.58073	659.58338	223.85610	0.000	2.076E+10
0.95000	1.55535	1296.	347.83794	0.000	2.076E+10
1.14000	1.52996	2246.	499.37130	0.000	2.076E+10
1.33000	1.50458	3573.	678.45618	0.000	2.076E+10
1.52000	1.47919	5339.	885.09258	0.000	2.076E+10
1.71000	1.45381	7609.	1119.	0.000	2.076E+10

1.90000	1.42843	10443.	1381.	0.000	2.076E+10
2.09000	1.40305	13906.	1670.	0.000	2.076E+10
2.28000	1.37768	18060.	1987.	0.000	2.076E+10
2.47000	1.35231	22968.	2332.	0.000	2.076E+10
2.66000	1.32694	28692.	2703.	0.000	2.076E+10
2.85000	1.30158	35296.	3103.	0.000	2.076E+10
3.04000	1.27624	42842.	3530.	0.000	2.076E+10
3.23000	1.25090	51393.	3985.	0.000	2.076E+10
3.42000	1.22557	61011.	4467.	0.000	2.076E+10
3.61000	1.20026	71761.	4976.	0.000	2.076E+10
3.80000	1.17497	83704.	5514.	0.000	2.076E+10
3.99000	1.14970	96904.	6079.	0.000	2.076E+10
4.18000	1.12446	111422.	6671.	0.000	2.076E+10
4.37000	1.09924	127323.	7291.	0.000	2.076E+10
4.56000	1.07405	144669.	7938.	0.000	2.076E+10
4.75000	1.04890	163522.	8613.	0.000	2.076E+10
4.94000	1.02379	183945.	9316.	0.000	2.076E+10
5.13000	0.99873	206002.	10046.	0.000	2.076E+10
5.32000	0.97372	229755.	10804.	0.000	2.076E+10
5.51000	0.94876	255267.	11589.	0.000	2.076E+10
5.70000	0.92387	282600.	12402.	0.000	2.076E+10
5.89000	0.89905	311818.	13242.	0.000	2.076E+10
6.08000	0.87431	342983.	14110.	0.000	2.076E+10
6.27000	0.84966	376159.	15006.	0.000	2.076E+10
6.46000	0.82510	411409.	15931.	0.000	2.076E+10
6.65000	0.80064	448804.	16887.	0.000	2.076E+10
6.84000	0.77629	488415.	17875.	0.000	2.076E+10
7.03000	0.75207	530314.	18894.	0.000	2.076E+10
7.22000	0.72798	574572.	19944.	0.000	2.076E+10
7.41000	0.70403	621260.	21026.	0.000	2.076E+10
7.60000	0.68024	670449.	22138.	0.000	2.076E+10
7.79000	0.65662	722211.	23282.	0.000	2.076E+10
7.98000	0.63317	776617.	24457.	0.000	2.076E+10
8.17000	0.60993	833737.	25664.	0.000	2.076E+10
8.36000	0.58689	893644.	26902.	0.000	2.076E+10
8.55000	0.56407	956409.	28170.	0.000	2.076E+10
8.74000	0.54150	1022102.	29471.	0.000	2.076E+10
8.93000	0.51918	1090795.	30802.	0.000	2.076E+10
9.12000	0.49713	1162559.	32165.	0.000	2.076E+10
9.31000	0.47537	1237466.	33559.	0.000	2.076E+10
9.50000	0.45393	1315586.	34984.	0.000	2.076E+10
9.69000	0.43281	1396992.	36440.	0.000	2.076E+10
9.88000	0.41205	1481753.	37928.	0.000	2.076E+10
10.07000	0.39165	1569943.	39447.	0.000	2.076E+10

10.26000	0.37165	1661630.	40997.	0.000	2.076E+10
10.45000	0.35206	1756888.	42578.	0.000	2.076E+10
10.64000	0.33292	1855787.	44191.	0.000	2.076E+10
10.83000	0.31424	1958398.	45835.	0.000	2.076E+10
11.02000	0.29605	2064793.	47510.	0.000	2.076E+10
11.21000	0.27837	2175043.	49216.	0.000	2.076E+10
11.40000	0.26125	2289219.	50954.	0.000	2.076E+10
11.59000	0.24469	2407392.	52723.	0.000	2.076E+10
11.78000	0.22874	2529634.	54523.	0.000	2.076E+10
11.97000	0.21342	2656015.	56354.	0.000	2.076E+10
12.16000	0.19877	2786608.	58217.	0.000	2.076E+10
12.35000	0.18481	2921483.	60110.	0.000	2.076E+10
12.54000	0.17159	3060712.	58974.	-2079.	3.715E+10
12.73000	0.15879	3190406.	54258.	-2303.	3.708E+10
12.92000	0.14644	3308129.	48765.	-2515.	3.701E+10
13.11000	0.13456	3412777.	42802.	-2716.	3.695E+10
13.30000	0.12315	3503307.	36396.	-2904.	3.690E+10
13.49000	0.11224	3578741.	29575.	-3079.	3.686E+10
13.68000	0.10184	3638168.	22369.	-3241.	3.683E+10
13.87000	0.09195	3680745.	14810.	-3390.	3.680E+10
14.06000	0.08257	3705702.	6929.	-3524.	3.679E+10
14.25000	0.07373	3712340.	-1242.	-3643.	3.679E+10
14.44000	0.06540	3700039.	-9667.	-3747.	3.679E+10
14.63000	0.05760	3668260.	-18310.	-3835.	3.681E+10
14.82000	0.05032	3616546.	-27133.	-3905.	3.684E+10
15.01000	0.04355	3544532.	-36097.	-3957.	3.688E+10
15.20000	0.03727	3451946.	-45157.	-3990.	3.693E+10
15.39000	0.03149	3338616.	-54267.	-4001.	3.700E+10
15.58000	0.02617	3204486.	-63376.	-3989.	3.707E+10
15.77000	0.02130	3049622.	-72424.	-3948.	3.715E+10
15.96000	0.01686	2874232.	-81342.	-3875.	3.725E+10
16.15000	0.01282	2678702.	-90044.	-3759.	3.735E+10
16.34000	0.009149	2463632.	-98415.	-3584.	3.746E+10
16.53000	0.005823	2229931.	-106282.	-3317.	3.758E+10
16.72000	0.002805	1978988.	-113322.	-2859.	3.770E+10
16.91000	6.047E-05	1713181.	-117071.	-428.8436	3.784E+10
17.10000	-0.002449	1445144.	-114197.	2950.	3.796E+10
17.29000	-0.004760	1192442.	-106738.	3593.	3.808E+10
17.48000	-0.006909	958418.	-98009.	4064.	3.819E+10
17.67000	-0.008927	745520.	-88290.	4461.	3.829E+10
17.86000	-0.0108	555815.	-77711.	4819.	3.886E+10
18.05000	-0.0127	391159.	-66344.	5152.	8.611E+10
18.24000	-0.0145	253284.	-54233.	5472.	8.611E+10
18.43000	-0.0163	143857.	-41400.	5784.	8.611E+10

18.62000	-0.0181	64498.	-27973.	5994.	8.611E+10
18.81000	-0.0199	16298.	-14144.	6137.	8.611E+10
19.00000	-0.0217	0.000	0.000	6270.	8.611E+10

Output Summary for Load Case No. 2:

Pile-head deflection = 1.68227666 inches
Computed slope at pile head = -0.0111342 radians
Maximum bending moment = 3712340. inch-lbs
Maximum shear force = -117071. lbs
Depth of maximum bending moment = 14.25000000 feet below pile head
Depth of maximum shear force = 16.91000000 feet below pile head
Number of iterations = 39
Number of zero deflection points = 1
Pile deflection at ground = 0.17436963 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	0.9950156	2543225.	-78205.	-0.006830
2	1.6822767	3712340.	-117071.	-0.011134

Maximum pile-head deflection = 1.6822766588 inches
Maximum pile-head rotation = -0.0111342258 radians = -0.637944 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	5810038.	2023176.	Pass

	2	1.00	7274029.	2543225.	Pass
2	1	1.00	5810038.	2921483.	Pass
	2	1.00	7274029.	3712340.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The analysis ended normally.

==

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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This software is licensed for exclusive use by:
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1206.19 Pile 3 10.lp12d

Name of the output report file:
BEL-70 1206.19 Pile 3 10.lp12o

Name of the plot output file:
BEL-70 1206.19 Pile 3 10.lp12p

Name of the runtime message file:
BEL-70 1206.19 Pile 3 10.lp12r

Date and Time of Analysis

Date: June 20, 2026 Time: 16:23:28

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1206+19 Piles 3 10 - 16.5' Ht.(7.0' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 24.500 ft
Depth of ground surface below top of pile = 16.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.9000
2	16.500	14.9000
3	16.500	24.0000
4	24.500	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 16.500000 ft
   AISC Section Type = HP

   AISC Section Name = HP14X117

   Pile width = 14.900000 in
   Shear capacity of section = 294100. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 8.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 294100. lbs

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is weak rock, p-y criteria by Reese, 1997

   Distance from top of pile to top of layer = 16.500000 ft
   Distance from top of pile to bottom of layer = 50.000000 ft
   Effective unit weight at top of layer = 77.600000 pcf
   Effective unit weight at bottom of layer = 77.600000 pcf
   Uniaxial compressive strength at top of layer = 100.000000 psi
   Uniaxial compressive strength at bottom of layer = 100.000000 psi
   Initial modulus of rock at top of layer = 18000. psi
   Initial modulus of rock at bottom of layer = 18000. psi
   RQD of rock at top of layer = 20.000000 %
   RQD of rock at bottom of layer = 20.000000 %

k rm of rock at top of layer = 0.0005000
k rm of rock at bottom of layer = 0.0005000

(Depth of the lowest soil layer extends 25.500 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	8.25	306.08
3	16.50	452.99

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch

1	8.25	0.00
2	16.50	300.30

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type		Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads	(DL)	0.00	0.00	0.00	0
Live Loads	(LL)	0.00	0.00	0.00	0
Earthquake	(EQ)	0.00	0.00	0.00	0
Impact Load	(IM)	0.00	0.00	0.00	0
Wind Loads	(W)	0.00	0.00	0.00	0
Water Loads	(HW)	0.00	0.00	0.00	1
Ice Loads	(Ice)	0.00	0.00	0.00	0
Horiz. Soil	(Hs)	0.00	0.00	0.00	1
Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	16.500000 ft
Flange Width	=	14.900000 in
Section Depth	=	14.200000 in
Flange Thickness	=	0.805000 in
Web Thickness	=	0.805000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	34.400000 sq. in.
Moment of Inertia	=	1220. in^4
Elastic Bending Stiffness	=	35380000. kip-in^2
Plastic Modulus, Z	=	194.000000in^3
Plastic Moment Capacity = Fy Z	=	9700.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	1720.000 kips
Nominal Axial Tensile Capacity	=	-1720.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	172.6211844549	35100995.	7.1000000000	
0.0000098357	345.2423689099	35100995.	7.1000000000	
0.0000147535	517.8635533648	35100995.	7.1000000000	
0.0000196714	690.4847378198	35100995.	7.1000000000	
0.0000245892	863.1059222747	35100995.	7.1000000000	
0.0000295071	1036.	35100995.	7.1000000000	
0.0000344249	1208.	35100995.	7.1000000000	
0.0000393427	1381.	35100995.	7.1000000000	
0.0000442606	1554.	35100995.	7.1000000000	
0.0000491784	1726.	35100995.	7.1000000000	
0.0000540963	1899.	35100995.	7.1000000000	
0.0000590141	2071.	35100995.	7.1000000000	
0.0000639320	2244.	35100995.	7.1000000000	
0.0000688498	2417.	35100995.	7.1000000000	
0.0000737676	2589.	35100995.	7.1000000000	
0.0000786855	2762.	35100995.	7.1000000000	
0.0000836033	2935.	35100995.	7.1000000000	
0.0000885212	3107.	35100995.	7.1000000000	
0.0000934390	3280.	35100995.	7.1000000000	
0.0000983569	3452.	35100995.	7.1000000000	
0.0001032747	3625.	35100995.	7.1000000000	
0.0001081925	3798.	35100995.	7.1000000000	
0.0001131104	3970.	35100995.	7.1000000000	
0.0001180282	4143.	35100995.	7.1000000000	
0.0001229461	4316.	35100995.	7.1000000000	
0.0001278639	4488.	35100995.	7.1000000000	
0.0001327818	4661.	35100995.	7.1000000000	

0.0001376996	4833.	35100995.	7.1000000000	
0.0001426174	5006.	35100995.	7.1000000000	
0.0001475353	5179.	35100995.	7.1000000000	
0.0001524531	5351.	35100995.	7.1000000000	
0.0001573710	5524.	35100995.	7.1000000000	
0.0001622888	5696.	35100995.	7.1000000000	
0.0001672067	5869.	35100995.	7.1000000000	
0.0001721245	6042.	35100995.	7.1000000000	
0.0001770424	6214.	35100995.	7.1000000000	
0.0001819602	6387.	35100995.	7.1000000000	
0.0001868780	6560.	35100995.	7.1000000000	
0.0001917959	6732.	35100995.	7.1000000000	
0.0002016316	7077.	35100995.	7.1000000000	
0.0002114673	7423.	35100995.	7.1000000000	
0.0002213029	7768.	35100995.	7.1000000000	
0.0002311386	8113.	35100995.	7.1000000000	
0.0002409743	8458.	35100995.	7.1000000000	
0.0002508100	8768.	34956786.	7.1000000000	Y
0.0002606457	8968.	34406082.	7.1000000000	Y
0.0002704814	9073.	33542198.	7.1000000000	Y
0.0002803171	9118.	32525814.	7.1000000000	Y
0.0002901527	9151.	31539616.	7.1000000000	Y
0.0002999884	9182.	30607932.	7.1000000000	Y
0.0003098241	9210.	29725136.	7.1000000000	Y
0.0003196598	9235.	28889181.	7.1000000000	Y
0.0003294955	9258.	28096536.	7.1000000000	Y
0.0003393312	9279.	27344053.	7.1000000000	Y
0.0003491669	9298.	26628906.	7.1000000000	Y
0.0003590025	9316.	25948550.	7.1000000000	Y
0.0003688382	9332.	25300683.	7.1000000000	Y
0.0003786739	9347.	24683214.	7.1000000000	Y
0.0003885096	9361.	24094238.	7.1000000000	Y
0.0003983453	9374.	23532010.	7.1000000000	Y
0.0004081810	9386.	22993958.	7.1000000000	Y
0.0004180167	9397.	22479436.	7.1000000000	Y
0.0004278523	9407.	21987182.	7.1000000000	Y
0.0004376880	9417.	21515064.	7.1000000000	Y
0.0004475237	9426.	21062342.	7.1000000000	Y
0.0004573594	9435.	20628245.	7.1000000000	Y
0.0004671951	9442.	20210614.	7.1000000000	Y
0.0004770308	9450.	19809883.	7.1000000000	Y
0.0004868665	9457.	19423744.	7.1000000000	Y
0.0004967022	9464.	19052717.	7.1000000000	Y
0.0005065378	9470.	18694718.	7.1000000000	Y

0.0005163735	9476.	18350357.	7.1000000000	Y
0.0005262092	9481.	18017531.	7.1000000000	Y
0.0005360449	9486.	17696878.	7.1000000000	Y
0.0005458806	9491.	17387006.	7.1000000000	Y
0.0005557163	9496.	17087665.	7.1000000000	Y
0.0005655520	9501.	16798647.	7.1000000000	Y
0.0005753876	9505.	16518541.	7.1000000000	Y
0.0005852233	9509.	16247851.	7.1000000000	Y
0.0006245661	9523.	15247286.	7.1000000000	Y
0.0006639088	9535.	14361320.	7.1000000000	Y
0.0007032516	9544.	13571868.	7.1000000000	Y
0.0007425943	9553.	12864088.	7.1000000000	Y
0.0007819371	9560.	12226014.	7.1000000000	Y
0.0008212798	9566.	11647588.	7.1000000000	Y
0.0008606225	9571.	11121235.	7.1000000000	Y
0.0008999653	9576.	10640384.	7.1000000000	Y
0.0009393080	9580.	10198808.	7.1000000000	Y
0.0009786508	9584.	9792580.	7.1000000000	Y
0.0010179935	9587.	9417093.	7.1000000000	Y
0.0010573363	9590.	9069525.	7.1000000000	Y
0.0010966790	9592.	8746284.	7.1000000000	Y
0.0011360218	9594.	8445432.	7.1000000000	Y
0.0011753645	9596.	8164483.	7.1000000000	Y
0.0012147072	9598.	7901486.	7.1000000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	9598.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction

factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	8.000000	ft
Outside Diameter of Casing	=	24.000000	in
Casing Wall Thickness	=	0.0000	in
Moment of Inertia of Steel Casing	=	0.0000	in^4
Width Flange of Core/Insert	=	14.900000	in
Depth of Core/Insert	=	14.200000	in
Flange Thickness of Core/Insert	=	0.805000	in
Web Thickness of Core/Insert	=	0.805000	in
Moment of Inertia of Steel Core/Insert	=	1211.	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Yield Stress of Core/Insert	=	50000.	psi
Elastic Modulus of Core/Insert	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Gross Area of Pile	=	452.389342	sq. in.
Area of Concrete	=	418.265392	sq. in.
Cross-sectional Area of Steel Casing	=	0.0000	sq. in.
Cross-sectional Area of Steel Core/Insert	=	34.123950	sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	34.123950	sq. in.
Area Ratio of All Steel to Gross Area	=	7.54	percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	3128.300	kips
Tensile Load for Cracking of Concrete	=	-288.130	kips
Nominal Axial Tensile Capacity	=	-1706.197	kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	483.9280578262	98402501.	12.0000000000	
0.0000098357	547.8658210217	55701840.	9.4666118792	C
0.0000147535	819.9660048544	55577617.	9.4783778602	C
0.0000196714	1091.	55452505.	9.4900875402	C
0.0000245892	1360.	55326491.	9.5018840041	C
0.0000295071	1629.	55199559.	9.5137803907	C
0.0000344249	1896.	55071694.	9.5257784079	C
0.0000393427	2162.	54942882.	9.5378798087	C
0.0000442606	2426.	54813107.	9.5500863932	C
0.0000491784	2689.	54682353.	9.5624000097	C
0.0000540963	2951.	54550604.	9.5748225567	C
0.0000590141	3211.	54417844.	9.5873559851	C
0.0000639320	3470.	54284054.	9.6000022998	C
0.0000688498	3728.	54149219.	9.6128136507	C
0.0000737676	3984.	54013319.	9.6256921077	C
0.0000786855	4239.	53876336.	9.6386894617	C
0.0000836033	4493.	53738251.	9.6518079772	C
0.0000885212	4745.	53599044.	9.6650499842	C
0.0000934390	4995.	53458695.	9.6784178810	C
0.0000983569	5244.	53317184.	9.6919141367	C
0.0001032747	5492.	53174489.	9.7055412943	C
0.0001081925	5738.	53030588.	9.7192638865	C
0.0001131104	5982.	52885560.	9.7329538297	C
0.0001180282	6225.	52739305.	9.7467734287	C
0.0001229461	6466.	52591796.	9.7607307822	C

0.0001278639	6706.	52443008.	9.7748287202	C
0.0001327818	6944.	52292918.	9.7890701628	C
0.0001376996	7180.	52141499.	9.8034581245	C
0.0001426174	7414.	51988725.	9.8179957178	C
0.0001475353	7647.	51834570.	9.8326861573	C
0.0001524531	7879.	51679004.	9.8475327649	C
0.0001573710	8108.	51522000.	9.8625389744	C
0.0001622888	8336.	51363527.	9.8777090093	C
0.0001672067	8562.	51203554.	9.8930452712	C
0.0001721245	8786.	51042050.	9.9085518865	C
0.0001770424	9008.	50878982.	9.9242335917	C
0.0001819602	9228.	50714314.	9.9401017003	C
0.0001868780	9446.	50548013.	9.9561426736	C
0.0001917959	9651.	50316691.	9.9667928811	CY
0.0002016316	9953.	49364758.	9.9453095387	CY
0.0002114673	10100.	47762925.	9.8614668104	CY
0.0002213029	10212.	46146522.	9.7727410217	CY
0.0002311386	10313.	44618447.	9.6882620100	CY
0.0002409743	10403.	43170524.	9.6068690660	CY
0.0002508100	10485.	41804448.	9.5299580709	CY
0.0002606457	10559.	40511464.	9.4562520233	CY
0.0002704814	10627.	39288392.	9.3851393320	CY
0.0002803171	10689.	38131432.	9.3174490971	CY
0.0002901527	10746.	37035316.	9.2527602315	CY
0.0002999884	10798.	35994808.	9.1898376201	CY
0.0003098241	10846.	35007897.	9.1293485656	CY
0.0003196598	10891.	34071206.	9.0715442645	CY
0.0003294955	10933.	33181540.	9.0162300299	CY
0.0003393312	10972.	32334082.	8.9621602836	CY
0.0003491669	11008.	31525666.	8.9095528857	CY
0.0003590025	11041.	30755544.	8.8591229075	CY
0.0003688382	11073.	30021768.	8.8106918549	CY
0.0003786739	11103.	29321948.	8.7643273751	CY
0.0003885096	11131.	28650012.	8.7179786899	CY
0.0003983453	11157.	28008210.	8.6733064948	CY
0.0004081810	11182.	27394500.	8.6304372118	CY
0.0004180167	11205.	26805267.	8.5887154354	CY
0.0004278523	11228.	26241882.	8.5483328517	CY
0.0004376880	11249.	25699823.	8.5092824497	CY
0.0004475237	11268.	25179093.	8.4707792640	CY
0.0004573594	11270.	24640491.	8.4411834821	CY
0.0004671951	11288.	24160763.	8.4054600230	CY
0.0004770308	11288.	23662603.	8.3852064789	CY
0.0004868665	11292.	23193002.	8.3507840823	CY

```
    0.0004967022             11292.          22733735.       8.3361999768   CY
    0.0005065378             11292.          22292303.       8.3031913295   CY
    0.0005163735             11292.          21867688.       8.2968304685   CY
    0.0005262092             11292.          21458946.       8.2677796966   CY
    0.0005360449             11292.          21065204.       8.2668842544   CY
    0.0005458806             11292.          20685651.       8.2387547995   CY
    0.0005557163             11292.          20319533.       8.2389089316   CY


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 2
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                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------          ----------------
  1               0.00000000                   11292.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.




Distributed Lateral Loads for LRFD:
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Sums of Distributed Lateral Load Per Unit Length due to Water Loads

   Depth     Distributed Load
    in            lb/in
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99.96	3.05
102.90	11.83
105.84	20.75
108.78	29.67
111.72	38.58
114.66	47.50
117.60	56.42
120.54	65.34
123.48	74.26
126.42	83.17
129.36	92.09
132.30	101.01
135.24	109.93
138.18	118.85
141.12	127.76
144.06	136.68
147.00	145.60
149.94	154.52
152.88	163.44
155.82	172.35
158.76	181.27
161.70	190.19
164.64	199.11
167.58	208.03
170.52	216.94
173.46	225.86
176.40	234.78
179.34	243.70
182.28	252.62
185.22	261.53
188.16	270.45
191.10	279.37
194.04	288.29
196.98	251.14

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.27
2.94	9.09
5.88	18.18
8.82	27.27
11.76	36.36
14.70	45.45
17.64	54.54
20.58	63.63
23.52	72.72
26.46	81.81
29.40	90.90
32.34	99.99
35.28	109.08
38.22	118.17
41.16	127.26
44.10	136.34
47.04	145.43
49.98	154.52
52.92	163.61
55.86	172.70
58.80	181.79
61.74	190.88
64.68	199.97
67.62	209.06
70.56	218.15
73.50	227.24
76.44	236.33
79.38	245.42
82.32	254.51
85.26	263.60
88.20	272.69
91.14	281.78
94.08	290.87
97.02	299.96
99.96	307.43
102.90	311.87
105.84	316.23
108.78	320.59
111.72	324.96
114.66	329.32
117.60	333.68

120.54	338.04
123.48	342.41
126.42	346.77
129.36	351.13
132.30	355.50
135.24	359.86
138.18	364.22
141.12	368.58
144.06	372.95
147.00	377.31
149.94	381.67
152.88	386.03
155.82	390.40
158.76	394.76
161.70	399.12
164.64	403.49
167.58	407.85
170.52	412.21
173.46	416.57
176.40	420.94
179.34	425.30
182.28	429.66
185.22	434.03
188.16	438.39
191.10	442.75
194.04	447.11
196.98	382.09

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2

0.000	2.16660	1.984E-05	3.067E-07	0.000	3.510E+10
0.24500	2.13354	9.82093	16.70223	0.000	3.510E+10
0.49000	2.10048	98.20912	56.78758	0.000	3.510E+10
0.73500	2.06742	343.73189	123.59649	0.000	3.510E+10
0.98000	2.03436	824.95651	217.12898	0.000	3.510E+10
1.22500	2.00130	1620.	337.38503	0.000	3.510E+10
1.47000	1.96824	2809.	484.36464	0.000	3.510E+10
1.71500	1.93518	4469.	658.06783	0.000	3.510E+10
1.96000	1.90212	6678.	858.49458	0.000	3.510E+10
2.20500	1.86906	9516.	1086.	0.000	3.510E+10
2.45000	1.83601	13062.	1340.	0.000	3.510E+10
2.69500	1.80296	17393.	1620.	0.000	3.510E+10
2.94000	1.76991	22588.	1927.	0.000	3.510E+10
3.18500	1.73687	28726.	2261.	0.000	3.510E+10
3.43000	1.70384	35886.	2622.	0.000	3.510E+10
3.67500	1.67081	44145.	3010.	0.000	3.510E+10
3.92000	1.63780	53583.	3424.	0.000	3.510E+10
4.16500	1.60479	64278.	3865.	0.000	3.510E+10
4.41000	1.57181	76308.	4333.	0.000	3.510E+10
4.65500	1.53884	89753.	4827.	0.000	3.510E+10
4.90000	1.50590	104691.	5348.	0.000	3.510E+10
5.14500	1.47298	121200.	5896.	0.000	3.510E+10
5.39000	1.44009	139359.	6470.	0.000	3.510E+10
5.63500	1.40724	159246.	7072.	0.000	3.510E+10
5.88000	1.37442	180940.	7700.	0.000	3.510E+10
6.12500	1.34165	204520.	8354.	0.000	3.510E+10
6.37000	1.30893	230065.	9036.	0.000	3.510E+10
6.61500	1.27627	257652.	9744.	0.000	3.510E+10
6.86000	1.24366	287360.	10479.	0.000	3.510E+10
7.10500	1.21113	319268.	11241.	0.000	3.510E+10
7.35000	1.17868	353455.	12029.	0.000	3.510E+10
7.59500	1.14632	389998.	12844.	0.000	3.510E+10
7.84000	1.11405	428977.	13686.	0.000	3.510E+10
8.08500	1.08189	470471.	14554.	0.000	3.510E+10
8.33000	1.04984	514557.	15452.	0.000	3.510E+10
8.57500	1.01792	561327.	16384.	0.000	3.510E+10
8.82000	0.98614	610894.	17355.	0.000	3.510E+10
9.06500	0.95451	663375.	18365.	0.000	3.510E+10
9.31000	0.92304	718882.	19415.	0.000	3.510E+10
9.55500	0.89175	777532.	20503.	0.000	3.510E+10
9.80000	0.86065	839440.	21630.	0.000	3.510E+10
10.04500	0.82976	904719.	22797.	0.000	3.510E+10
10.29000	0.79909	973485.	24002.	0.000	3.510E+10

10.53500	0.76866	1045852.	25247.	0.000	3.510E+10
10.78000	0.73849	1121935.	26530.	0.000	3.510E+10
11.02500	0.70859	1201850.	27853.	0.000	3.510E+10
11.27000	0.67899	1285710.	29215.	0.000	3.510E+10
11.51500	0.64971	1373631.	30615.	0.000	3.510E+10
11.76000	0.62076	1465728.	32055.	0.000	3.510E+10
12.00500	0.59218	1562115.	33534.	0.000	3.510E+10
12.25000	0.56398	1662906.	35052.	0.000	3.510E+10
12.49500	0.53619	1768218.	36608.	0.000	3.510E+10
12.74000	0.50883	1878164.	38204.	0.000	3.510E+10
12.98500	0.48194	1992860.	39839.	0.000	3.510E+10
13.23000	0.45554	2112419.	41513.	0.000	3.510E+10
13.47500	0.42966	2236958.	43226.	0.000	3.510E+10
13.72000	0.40433	2366591.	44979.	0.000	3.510E+10
13.96500	0.37958	2501432.	46770.	0.000	3.510E+10
14.21000	0.35545	2641596.	48600.	0.000	3.510E+10
14.45500	0.33197	2787199.	50469.	0.000	3.510E+10
14.70000	0.30917	2938354.	52377.	0.000	3.510E+10
14.94500	0.28710	3095178.	54325.	0.000	3.510E+10
15.19000	0.26579	3257784.	56311.	0.000	3.510E+10
15.43500	0.24528	3426287.	58337.	0.000	3.510E+10
15.68000	0.22562	3600802.	60401.	0.000	3.510E+10
15.92500	0.20684	3781445.	62504.	0.000	3.510E+10
16.17000	0.18900	3968329.	64647.	0.000	3.510E+10
16.41500	0.17213	4161569.	66659.	0.000	3.510E+10
16.66000	0.15629	4360283.	64360.	-2197.	5.381E+10
16.90500	0.14114	4540007.	57497.	-2472.	5.371E+10
17.15000	0.12673	4698364.	49853.	-2728.	5.362E+10
17.39500	0.11308	4833142.	41486.	-2964.	5.355E+10
17.64000	0.10020	4942303.	32457.	-3179.	5.349E+10
17.88500	0.08812	5023988.	22827.	-3372.	5.344E+10
18.13000	0.07686	5076528.	12664.	-3542.	5.341E+10
18.37500	0.06642	5098450.	2034.	-3689.	5.340E+10
18.62000	0.05680	5088486.	-8991.	-3811.	5.340E+10
18.86500	0.04801	5045585.	-20334.	-3906.	5.343E+10
19.11000	0.04003	4968923.	-31917.	-3974.	5.347E+10
19.35500	0.03286	4857915.	-43655.	-4012.	5.353E+10
19.60000	0.02647	4712234.	-55458.	-4018.	5.362E+10
19.84500	0.02084	4531824.	-67228.	-3989.	5.372E+10
20.09000	0.01594	4316931.	-78859.	-3922.	5.383E+10
20.33500	0.01173	4068135.	-90226.	-3810.	5.397E+10
20.58000	0.008174	3786404.	-101183.	-3643.	5.412E+10
20.82500	0.005223	3473181.	-111540.	-3403.	5.428E+10
21.07000	0.002825	3130547.	-121014.	-3042.	5.446E+10

21.31500	0.000924	2761617.	-129008.	-2395.	5.464E+10
21.56000	-0.000540	2371982.	-129332.	2175.	5.484E+10
21.80500	-0.001630	2001145.	-121761.	2976.	5.502E+10
22.05000	-0.002406	1656029.	-112389.	3400.	5.518E+10
22.29500	-0.002923	1340297.	-101961.	3694.	5.533E+10
22.54000	-0.003230	1056499.	-90804.	3895.	5.546E+10
22.78500	-0.003373	806371.	-79289.	3938.	5.558E+10
23.03000	-0.003390	590279.	-67704.	3943.	5.567E+10
23.27500	-0.003315	408268.	-56144.	3921.	9.840E+10
23.52000	-0.003205	260150.	-44665.	3888.	9.840E+10
23.76500	-0.003072	145640.	-33293.	3847.	9.840E+10
24.01000	-0.002926	64385.	-22051.	3801.	9.840E+10
24.25500	-0.002774	15982.	-10950.	3751.	9.840E+10
24.50000	-0.002621	0.000	0.000	3698.	9.840E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 2.16660240 inches
Computed slope at pile head = -0.0112452 radians
Maximum bending moment = 5098450. inch-lbs
Maximum shear force = -129332. lbs
Depth of maximum bending moment = 18.37500000 feet below pile head
Depth of maximum shear force = 21.56000000 feet below pile head
Number of iterations = 34
Number of zero deflection points = 1
Pile deflection at ground = 0.16663266 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
99.96	3.05
102.90	11.83
105.84	20.75
108.78	29.67
111.72	38.58
114.66	47.50

117.60	56.42
120.54	65.34
123.48	74.26
126.42	83.17
129.36	92.09
132.30	101.01
135.24	109.93
138.18	118.85
141.12	127.76
144.06	136.68
147.00	145.60
149.94	154.52
152.88	163.44
155.82	172.35
158.76	181.27
161.70	190.19
164.64	199.11
167.58	208.03
170.52	216.94
173.46	225.86
176.40	234.78
179.34	243.70
182.28	252.62
185.22	261.53
188.16	270.45
191.10	279.37
194.04	288.29
196.98	251.14

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.27
2.94	9.09
5.88	18.18

8.82	27.27
11.76	36.36
14.70	45.45
17.64	54.54
20.58	63.63
23.52	72.72
26.46	81.81
29.40	90.90
32.34	99.99
35.28	109.08
38.22	118.17
41.16	127.26
44.10	136.34
47.04	145.43
49.98	154.52
52.92	163.61
55.86	172.70
58.80	181.79
61.74	190.88
64.68	199.97
67.62	209.06
70.56	218.15
73.50	227.24
76.44	236.33
79.38	245.42
82.32	254.51
85.26	263.60
88.20	272.69
91.14	281.78
94.08	290.87
97.02	299.96
99.96	307.43
102.90	311.87
105.84	316.23
108.78	320.59
111.72	324.96
114.66	329.32
117.60	333.68
120.54	338.04
123.48	342.41
126.42	346.77
129.36	351.13
132.30	355.50
135.24	359.86

138.18	364.22
141.12	368.58
144.06	372.95
147.00	377.31
149.94	381.67
152.88	386.03
155.82	390.40
158.76	394.76
161.70	399.12
164.64	403.49
167.58	407.85
170.52	412.21
173.46	416.57
176.40	420.94
179.34	425.30
182.28	429.66
185.22	434.03
188.16	438.39
191.10	442.75
194.04	447.11
196.98	382.09

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	3.77203	-3.066E-05	-3.067E-07	0.000	3.510E+10
0.24500	3.71675	14.73132	25.05334	0.000	3.510E+10
0.49000	3.66147	147.31360	85.18137	0.000	3.510E+10
0.73500	3.60619	515.59775	185.39474	0.000	3.510E+10
0.98000	3.55091	1237.	325.69347	0.000	3.510E+10

1.22500	3.49562	2431.	506.07754	0.000	3.510E+10
1.47000	3.44034	4213.	726.54696	0.000	3.510E+10
1.71500	3.38506	6703.	987.10174	0.000	3.510E+10
1.96000	3.32979	10017.	1288.	0.000	3.510E+10
2.20500	3.27451	14275.	1628.	0.000	3.510E+10
2.45000	3.21924	19593.	2009.	0.000	3.510E+10
2.69500	3.16397	26089.	2430.	0.000	3.510E+10
2.94000	3.10871	33882.	2891.	0.000	3.510E+10
3.18500	3.05346	43089.	3392.	0.000	3.510E+10
3.43000	2.99821	53828.	3933.	0.000	3.510E+10
3.67500	2.94298	66217.	4515.	0.000	3.510E+10
3.92000	2.88777	80374.	5136.	0.000	3.510E+10
4.16500	2.83258	96417.	5797.	0.000	3.510E+10
4.41000	2.77741	114463.	6499.	0.000	3.510E+10
4.65500	2.72227	134630.	7240.	0.000	3.510E+10
4.90000	2.66716	157036.	8022.	0.000	3.510E+10
5.14500	2.61209	181800.	8844.	0.000	3.510E+10
5.39000	2.55707	209038.	9706.	0.000	3.510E+10
5.63500	2.50210	238869.	10608.	0.000	3.510E+10
5.88000	2.44718	271411.	11550.	0.000	3.510E+10
6.12500	2.39233	306781.	12532.	0.000	3.510E+10
6.37000	2.33756	345097.	13554.	0.000	3.510E+10
6.61500	2.28288	386477.	14616.	0.000	3.510E+10
6.86000	2.22828	431040.	15718.	0.000	3.510E+10
7.10500	2.17380	478902.	16861.	0.000	3.510E+10
7.35000	2.11943	530182.	18043.	0.000	3.510E+10
7.59500	2.06520	584997.	19266.	0.000	3.510E+10
7.84000	2.01110	643466.	20529.	0.000	3.510E+10
8.08500	1.95717	705706.	21831.	0.000	3.510E+10
8.33000	1.90341	771835.	23175.	0.000	3.510E+10
8.57500	1.84984	841977.	24563.	0.000	3.510E+10
8.82000	1.79647	916264.	25996.	0.000	3.510E+10
9.06500	1.74334	994830.	27474.	0.000	3.510E+10
9.31000	1.69044	1077810.	28998.	0.000	3.510E+10
9.55500	1.63782	1165336.	30567.	0.000	3.510E+10
9.80000	1.58548	1257543.	32181.	0.000	3.510E+10
10.04500	1.53345	1354563.	33842.	0.000	3.510E+10
10.29000	1.48175	1456532.	35547.	0.000	3.510E+10
10.53500	1.43041	1563581.	37298.	0.000	3.510E+10
10.78000	1.37946	1675846.	39095.	0.000	3.510E+10
11.02500	1.32892	1793459.	40937.	0.000	3.510E+10
11.27000	1.27882	1916554.	42824.	0.000	3.510E+10
11.51500	1.22919	2045265.	44757.	0.000	3.510E+10
11.76000	1.18007	2179726.	46735.	0.000	3.510E+10

12.00500	1.13148	2320069.	48759.	0.000	3.510E+10
12.25000	1.08347	2466430.	50829.	0.000	3.510E+10
12.49500	1.03606	2618941.	52943.	0.000	3.510E+10
12.74000	0.98930	2777736.	55103.	0.000	3.510E+10
12.98500	0.94322	2942949.	57309.	0.000	3.510E+10
13.23000	0.89786	3114714.	59560.	0.000	3.510E+10
13.47500	0.85328	3293163.	61857.	0.000	3.510E+10
13.72000	0.80950	3478432.	64199.	0.000	3.510E+10
13.96500	0.76658	3670652.	66586.	0.000	3.510E+10
14.21000	0.72456	3869959.	69019.	0.000	3.510E+10
14.45500	0.68350	4076485.	71498.	0.000	3.510E+10
14.70000	0.64344	4290364.	74021.	0.000	3.510E+10
14.94500	0.60444	4511731.	76591.	0.000	3.510E+10
15.19000	0.56655	4740718.	79206.	0.000	3.510E+10
15.43500	0.52982	4977460.	81866.	0.000	3.510E+10
15.68000	0.49432	5222089.	84571.	0.000	3.510E+10
15.92500	0.46011	5474740.	87323.	0.000	3.510E+10
16.17000	0.42725	5735546.	90119.	0.000	3.510E+10
16.41500	0.39580	6004641.	92741.	0.000	3.510E+10
16.66000	0.36582	6280860.	90552.	-2313.	5.270E+10
16.90500	0.33688	6537087.	83228.	-2670.	5.255E+10
17.15000	0.30901	6770239.	74854.	-3026.	5.240E+10
17.39500	0.28226	6977231.	65432.	-3383.	5.227E+10
17.64000	0.25666	7154981.	54961.	-3740.	5.216E+10
17.88500	0.23225	7300405.	43442.	-4097.	5.206E+10
18.13000	0.20905	7410419.	30874.	-4453.	5.199E+10
18.37500	0.18708	7481941.	17302.	-4779.	5.194E+10
18.62000	0.16636	7512156.	2949.	-4985.	5.192E+10
18.86500	0.14689	7499283.	-11972.	-5166.	5.193E+10
19.11000	0.12867	7441760.	-27387.	-5320.	5.197E+10
19.35500	0.11168	7338250.	-43214.	-5447.	5.204E+10
19.60000	0.09591	7187661.	-59369.	-5543.	5.214E+10
19.84500	0.08134	6989158.	-75761.	-5607.	5.226E+10
20.09000	0.06792	6742188.	-92287.	-5635.	5.242E+10
20.33500	0.05561	6446508.	-108836.	-5622.	5.260E+10
20.58000	0.04436	6102233.	-125275.	-5561.	5.281E+10
20.82500	0.03411	5709894.	-141444.	-5439.	5.305E+10
21.07000	0.02479	5270544.	-157135.	-5236.	5.330E+10
21.31500	0.01633	4785940.	-172047.	-4909.	5.357E+10
21.56000	0.008633	4258905.	-185659.	-4350.	5.387E+10
21.80500	0.001624	3694266.	-196425.	-2973.	5.417E+10
22.05000	-0.004796	3103927.	-194858.	4039.	5.447E+10
22.29500	-0.0107	2548502.	-181404.	5113.	5.475E+10
22.54000	-0.0162	2037272.	-165312.	5834.	5.500E+10

22.78500	-0.0215	1576466.	-147544.	6253.	5.522E+10
23.03000	-0.0264	1169711.	-128669.	6587.	5.541E+10
23.27500	-0.0312	819892.	-108892.	6866.	5.558E+10
23.52000	-0.0358	529424.	-88348.	7109.	6.290E+10
23.76500	-0.0404	300405.	-67129.	7326.	9.840E+10
24.01000	-0.0450	134708.	-45299.	7524.	9.840E+10
24.25500	-0.0495	34046.	-22910.	7707.	9.840E+10
24.50000	-0.0540	0.000	0.000	7878.	9.840E+10

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     3.77203425 inches
Computed slope at pile head      =     -0.0188034 radians
Maximum bending moment           =       7512156. inch-lbs
Maximum shear force              =       -196425. lbs
Depth of maximum bending moment  =    18.62000000 feet below pile head
Depth of maximum shear force     =    21.80500000 feet below pile head
Number of iterations             =             52
Number of zero deflection points =              1
Pile deflection at ground        =     0.38539679 inches
```

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	2.1666024	5098450.	-129332.	-0.011245
2	3.7720342	7512156.	-196425.	-0.018803

```
Maximum pile-head deflection = 3.7720342471 inches
Maximum pile-head rotation   = -0.0188034312 radians = -1.077357 deg.
```

LRFD Performance by Load Case Combination

Load	Resistance	Factored Moment	Maximum Moment	Pass/Fail for LRFD

Case No.	Section No.	Factor for Moment	Capacity of Section in-lbs	Developed in Section in-lbs	Moment of Section
1	1	1.00	9597992.	4161569.	Pass
	2	1.00	11291895.	5098450.	Pass
2	1	1.00	9597992.	6004641.	Pass
	2	1.00	11291895.	7512156.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	294100.	66659.	Pass
	2	1.00	294100.	-129332.	Pass
2	1	1.00	294100.	92741.	Pass
	2	1.00	294100.	-196425.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -196424.84 lbs
Factored Shear Capacity at Node = 294100.00 lbs
Fraction of Allowable Shear Capacity = 0.6679

The analysis ended normally.

==

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1206.19 Pile 4to9.lp12d

Name of the output report file:
BEL-70 1206.19 Pile 4to9.lp12o

Name of the plot output file:
BEL-70 1206.19 Pile 4to9.lp12p

Name of the runtime message file:
BEL-70 1206.19 Pile 4to9.lp12r

Date and Time of Analysis

Date: June 20, 2026 Time: 15:54:12

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1206+19 Piles 4 thru 9 - 23' Ht.(5.75' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 33.500 ft
Depth of ground surface below top of pile = 23.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	12.9000
2	23.000	12.9000
3	23.000	30.0000
4	33.500	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 23.000000 ft
   AISC Section Type = W

   AISC Section Name = W24X146

   Pile width = 12.900000 in
   Shear capacity of section = 0.0000 lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 10.500000 ft
   Section Diameter = 30.000000 in
   Shear capacity of section = 0.0000 lbs

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is weak rock, p-y criteria by Reese, 1997

   Distance from top of pile to top of layer = 23.000000 ft
   Distance from top of pile to bottom of layer = 50.000000 ft
   Effective unit weight at top of layer = 77.600000 pcf
   Effective unit weight at bottom of layer = 77.600000 pcf
   Uniaxial compressive strength at top of layer = 100.000000 psi
   Uniaxial compressive strength at bottom of layer = 100.000000 psi
   Initial modulus of rock at top of layer = 18000. psi
   Initial modulus of rock at bottom of layer = 18000. psi
   RQD of rock at top of layer = 20.000000 %
   RQD of rock at bottom of layer = 20.000000 %

k rm of rock at top of layer = 0.0005000
k rm of rock at bottom of layer = 0.0005000

(Depth of the lowest soil layer extends 16.500 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth ft	Distributed Load lb/inch
1	0.00	0.00
2	11.50	350.46
3	23.00	518.68

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch

1	11.50	0.00
2	23.00	343.85

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type		Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads	(DL)	0.00	0.00	0.00	0
Live Loads	(LL)	0.00	0.00	0.00	0
Earthquake	(EQ)	0.00	0.00	0.00	0
Impact Load	(IM)	0.00	0.00	0.00	0
Wind Loads	(W)	0.00	0.00	0.00	0
Water Loads	(HW)	0.00	0.00	0.00	1
Ice Loads	(Ice)	0.00	0.00	0.00	0
Horiz. Soil	(Hs)	0.00	0.00	0.00	1
Live Roof	(Lr)	0.00	0.00	0.00	0
Rain Loads	(Rn)	0.00	0.00	0.00	0
Snow Loads	(Sn)	0.00	0.00	0.00	0
Temperature	(Tm)	0.00	0.00	0.00	0
Special	(Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	23.000000 ft
Flange Width	=	12.900000 in
Section Depth	=	24.700000 in
Flange Thickness	=	1.090000 in
Web Thickness	=	0.650000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	43.000000 sq. in.
Moment of Inertia	=	4580. in^4
Elastic Bending Stiffness	=	132820000. kip-in^2
Plastic Modulus, Z	=	418.000000in^3
Plastic Moment Capacity = Fy Z	=	20900.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	2150.000 kips
Nominal Axial Tensile Capacity	=	-2150.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	747.2352199762	131548563.	12.3500000000	
0.0000113606	1494.	131548563.	12.3500000000	
0.0000170409	2242.	131548563.	12.3500000000	
0.0000227212	2989.	131548563.	12.3500000000	
0.0000284015	3736.	131548563.	12.3500000000	
0.0000340818	4483.	131548563.	12.3500000000	
0.0000397621	5231.	131548563.	12.3500000000	
0.0000454424	5978.	131548563.	12.3500000000	
0.0000511227	6725.	131548563.	12.3500000000	
0.0000568030	7472.	131548563.	12.3500000000	
0.0000624833	8220.	131548563.	12.3500000000	
0.0000681636	8967.	131548563.	12.3500000000	
0.0000738439	9714.	131548563.	12.3500000000	
0.0000795242	10461.	131548563.	12.3500000000	
0.0000852045	11209.	131548563.	12.3500000000	
0.0000908848	11956.	131548563.	12.3500000000	
0.0000965651	12703.	131548563.	12.3500000000	
0.0001022454	13450.	131548563.	12.3500000000	
0.0001079257	14197.	131548563.	12.3500000000	
0.0001136060	14945.	131548563.	12.3500000000	
0.0001192863	15692.	131548563.	12.3500000000	
0.0001249666	16439.	131548563.	12.3500000000	
0.0001306469	17186.	131548563.	12.3500000000	
0.0001363272	17934.	131548563.	12.3500000000	
0.0001420075	18654.	131355772.	12.3500000000	Y
0.0001476878	19125.	129498378.	12.3500000000	Y
0.0001533681	19341.	126109474.	12.3500000000	Y

0.0001590484	19437.	122209265.	12.3500000000	Y
0.0001647287	19524.	118520493.	12.3500000000	Y
0.0001704090	19601.	115024731.	12.3500000000	Y
0.0001760893	19672.	111715442.	12.3500000000	Y
0.0001817696	19736.	108576232.	12.3500000000	Y
0.0001874499	19794.	105595295.	12.3500000000	Y
0.0001931302	19847.	102764220.	12.3500000000	Y
0.0001988105	19895.	100072629.	12.3500000000	Y
0.0002044908	19940.	97511170.	12.3500000000	Y
0.0002101711	19981.	95071381.	12.3500000000	Y
0.0002158514	20019.	92745569.	12.3500000000	Y
0.0002215317	20054.	90526548.	12.3500000000	Y
0.0002328923	20116.	86376759.	12.3500000000	Y
0.0002442529	20171.	82581534.	12.3500000000	Y
0.0002556135	20218.	79094155.	12.3500000000	Y
0.0002669741	20258.	75881674.	12.3500000000	Y
0.0002783347	20295.	72914164.	12.3500000000	Y
0.0002896953	20327.	70165142.	12.3500000000	Y
0.0003010559	20355.	67611954.	12.3500000000	Y
0.0003124165	20381.	65235075.	12.3500000000	Y
0.0003237771	20403.	63016840.	12.3500000000	Y
0.0003351377	20424.	60940788.	12.3500000000	Y
0.0003464983	20442.	58996066.	12.3500000000	Y
0.0003578589	20459.	57171239.	12.3500000000	Y
0.0003692195	20474.	55452124.	12.3500000000	Y
0.0003805801	20488.	53833914.	12.3500000000	Y
0.0003919407	20501.	52305498.	12.3500000000	Y
0.0004033013	20512.	50861280.	12.3500000000	Y
0.0004146619	20523.	49493288.	12.3500000000	Y
0.0004260225	20533.	48197176.	12.3500000000	Y
0.0004373831	20542.	46965429.	12.3500000000	Y
0.0004487437	20551.	45796048.	12.3500000000	Y
0.0004601043	20558.	44681519.	12.3500000000	Y
0.0004714648	20565.	43620240.	12.3500000000	Y
0.0004828254	20572.	42608550.	12.3500000000	Y
0.0004941860	20578.	41640974.	12.3500000000	Y
0.0005055466	20584.	40716884.	12.3500000000	Y
0.0005169072	20590.	39833413.	12.3500000000	Y
0.0005282678	20595.	38985744.	12.3500000000	Y
0.0005396284	20600.	38173738.	12.3500000000	Y
0.0005509890	20604.	37395216.	12.3500000000	Y
0.0005623496	20609.	36647530.	12.3500000000	Y
0.0005737102	20612.	35928305.	12.3500000000	Y
0.0005850708	20616.	35237011.	12.3500000000	Y

```
    0.0005964314            20620.          34572052.      12.3500000000    Y
    0.0006077920            20624.          33931851.      12.3500000000    Y
    0.0006191526            20626.          33313864.      12.3500000000    Y
    0.0006305132            20629.          32718146.      12.3500000000    Y
    0.0006418738            20632.          32143516.      12.3500000000    Y
    0.0006532344            20635.          31588873.      12.3500000000    Y
    0.0006645950            20638.          31053192.      12.3500000000    Y
    0.0006759556            20640.          30534482.      12.3500000000    Y
    0.0007213980            20649.          28622949.      12.3500000000    Y


--------------------------------------------------------------------------------
   Summary of Results for Nominal Moment Capacity for Section 1
--------------------------------------------------------------------------------

                                          Nominal
Load              Axial                   Moment
 No.             Thrust                  Capacity
                  kips                    in-kips
----         ----------------          ----------------
  1               0.00000000                  20649.

Note that the values in the above table are not factored by a strength
reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the
LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to the LRFD structural
design standard being followed.




Pile Section No. 2:
-------------------

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:
--------------------------------------------------------------------------------

Length of Section                                =    10.500000 ft
Outside Diameter of Casing                       =    30.000000 in
Casing Wall Thickness                            =       0.0000 in
```

```
Moment of Inertia of Steel Casing                      =       0.0000 in^4
Width Flange of Core/Insert                            =    12.900000 in
Depth of Core/Insert                                   =    24.700000 in
Flange Thickness of Core/Insert                        =     1.090000 in
Web Thickness of Core/Insert                           =     0.650000 in
Moment of Inertia of Steel Core/Insert                 =        4540. in^4
Yield Stress of Casing                                 =       50000. psi
Elastic Modulus of Casing                              =    29000000. psi
Yield Stress of Core/Insert                            =       50000. psi
Elastic Modulus of Core/Insert                         =    29000000. psi
Number of Reinforcing Bars                             =           0 bars
Gross Area of Pile                                     =   706.858347 sq. in.
Area of Concrete                                       =   664.098347 sq. in.
Cross-sectional Area of Steel Casing                   =       0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert              =    42.760000 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)      =    42.760000 sq. in.
Area Ratio of All Steel to Gross Area                  =         6.05 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:
----------------------------

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As    =     4395.934 kips
Tensile Load for Cracking of Concrete                  =     -419.269 kips
Nominal Axial Tensile Capacity                         =    -2138.000 kips




Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

   Number     Axial Thrust Force
                   kips
   ------     ------------------
      1               0.000

Definition of Run Messages:

   Y = part of pipe section has yielded.


Axial Thrust Force =      0.000 kips
```

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	1583.	278749290.	15.0000000000	
0.0000113606	1995.	175633799.	11.4700376517	C
0.0000170409	2987.	175290831.	11.4903947159	C
0.0000227212	3975.	174944178.	11.5110091803	C
0.0000284015	4959.	174593753.	11.5318877466	C
0.0000340818	5938.	174239477.	11.5528650295	C
0.0000397621	6914.	173881366.	11.5739195974	C
0.0000454424	7885.	173519267.	11.5952530287	C
0.0000511227	8852.	173153080.	11.6168727306	C
0.0000568030	9815.	172782702.	11.6387864167	C
0.0000624833	10773.	172408023.	11.6611508574	C
0.0000681636	11726.	172028932.	11.6836759884	C
0.0000738439	12675.	171645310.	11.7065184576	C
0.0000795242	13619.	171257036.	11.7296875590	C
0.0000852045	14558.	170863981.	11.7531930032	C
0.0000908848	15493.	170466011.	11.7770449427	C
0.0000965651	16422.	170062988.	11.8012539997	C
0.0001022454	17346.	169654764.	11.8258312957	C
0.0001079257	18265.	169241201.	11.8506729578	C
0.0001136060	19146.	168528854.	11.8657162873	CY
0.0001192863	19688.	165051155.	11.7831221916	CY
0.0001249666	19974.	159837661.	11.6345471858	CY
0.0001306469	20235.	154882963.	11.4914273834	CY
0.0001363272	20473.	150171821.	11.3528021855	CY
0.0001420075	20691.	145703492.	11.2198887082	CY
0.0001476878	20891.	141455748.	11.0905126321	CY
0.0001533681	21077.	137428277.	10.9671004316	CY
0.0001590484	21248.	133597374.	10.8466378179	CY
0.0001647287	21408.	129958962.	10.7311207800	CY
0.0001704090	21557.	126498799.	10.6198466747	CY
0.0001760893	21695.	123203066.	10.5113780281	CY
0.0001817696	21825.	120067246.	10.4075455808	CY
0.0001874499	21946.	117076184.	10.3069067841	CY
0.0001931302	22060.	114221188.	10.2089751569	CY
0.0001988105	22167.	111498742.	10.1152239831	CY
0.0002044908	22269.	108897792.	10.0245487456	CY
0.0002101711	22363.	106404988.	9.9355197038	CY
0.0002158514	22453.	104022139.	9.8500086678	CY
0.0002215317	22539.	101742887.	9.7678691320	CY
0.0002328923	22696.	97452346.	9.6081098129	CY

0.0002442529	22839.	93506579.	9.4593126659	CY
0.0002556135	22968.	89855412.	9.3169915438	CY
0.0002669741	23084.	86466069.	9.1861558392	CY
0.0002783347	23188.	83310946.	9.0628252609	CY
0.0002896953	23272.	80332334.	8.9610384517	CY
0.0003010559	23350.	77560708.	8.8650098337	CY
0.0003124165	23408.	74926899.	8.7885295691	CY
0.0003237771	23461.	72461308.	8.7169348751	CY
0.0003351377	23503.	70129669.	8.6604519306	CY
0.0003464983	23534.	67920832.	8.6184406028	CY
0.0003578589	23563.	65843636.	8.5795168797	CY
0.0003692195	23581.	63866574.	8.5544495665	CY
0.0003805801	23598.	62004152.	8.5298959773	CY
0.0003919407	23612.	60243004.	8.5059914286	CY
0.0004033013	23625.	58578531.	8.4850158121	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	23625.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
136.68	0.15
140.70	6.73
144.72	16.74
148.74	26.76
152.76	36.78
156.78	46.79
160.80	56.81
164.82	66.83
168.84	76.84
172.86	86.86
176.88	96.88
180.90	106.89
184.92	116.91
188.94	126.93
192.96	136.94
196.98	146.96
201.00	156.97
205.02	166.99
209.04	177.01
213.06	187.02
217.08	197.04
221.10	207.06
225.12	217.07
229.14	227.09
233.16	237.11
237.18	247.12
241.20	257.14
245.22	267.16
249.24	277.17
253.26	287.19
257.28	297.21
261.30	307.22
265.32	317.24
269.34	327.26
273.36	337.27
277.38	53.76

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.55
4.02	10.21
8.04	20.42
12.06	30.63
16.08	40.84
20.10	51.05
24.12	61.25
28.14	71.46
32.16	81.67
36.18	91.88
40.20	102.09
44.22	112.30
48.24	122.51
52.26	132.72
56.28	142.93
60.30	153.14
64.32	163.34
68.34	173.55
72.36	183.76
76.38	193.97
80.40	204.18
84.42	214.39
88.44	224.60
92.46	234.81
96.48	245.02
100.50	255.23
104.52	265.44
108.54	275.64
112.56	285.85
116.58	296.06
120.60	306.27

124.62	316.48
128.64	326.69
132.66	336.90
136.68	347.03
140.70	353.75
144.72	358.65
148.74	363.55
152.76	368.45
156.78	373.35
160.80	378.25
164.82	383.15
168.84	388.05
172.86	392.95
176.88	397.85
180.90	402.75
184.92	407.65
188.94	412.56
192.96	417.46
196.98	422.36
201.00	427.26
205.02	432.16
209.04	437.06
213.06	441.96
217.08	446.86
221.10	451.76
225.12	456.66
229.14	461.56
233.16	466.46
237.18	471.36
241.20	476.26
245.22	481.16
249.24	486.06
253.26	490.96
257.28	495.86
261.30	500.76
265.32	505.66
269.34	510.56
273.36	515.46
277.38	81.23

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.56975	-6.507E-05	4.496E-07	0.000	1.315E+11
0.33500	2.53129	20.62281	25.65025	0.000	1.315E+11
0.67000	2.49282	206.22797	87.21083	0.000	1.315E+11
1.00500	2.45436	721.79785	189.81180	0.000	1.315E+11
1.34000	2.41589	1732.	333.45317	0.000	1.315E+11
1.67500	2.37742	3403.	518.13492	0.000	1.315E+11
2.01000	2.33896	5898.	743.85706	0.000	1.315E+11
2.34500	2.30050	9383.	1011.	0.000	1.315E+11
2.68000	2.26203	14024.	1318.	0.000	1.315E+11
3.01500	2.22357	19983.	1667.	0.000	1.315E+11
3.35000	2.18511	27428.	2057.	0.000	1.315E+11
3.68500	2.14666	36523.	2488.	0.000	1.315E+11
4.02000	2.10821	47432.	2960.	0.000	1.315E+11
4.35500	2.06976	60322.	3473.	0.000	1.315E+11
4.69000	2.03132	75356.	4027.	0.000	1.315E+11
5.02500	1.99290	92699.	4622.	0.000	1.315E+11
5.36000	1.95448	112518.	5258.	0.000	1.315E+11
5.69500	1.91607	134976.	5935.	0.000	1.315E+11
6.03000	1.87769	160239.	6654.	0.000	1.315E+11
6.36500	1.83932	188472.	7413.	0.000	1.315E+11
6.70000	1.80098	219839.	8213.	0.000	1.315E+11
7.03500	1.76266	254506.	9055.	0.000	1.315E+11
7.37000	1.72437	292637.	9937.	0.000	1.315E+11
7.70500	1.68613	334399.	10860.	0.000	1.315E+11
8.04000	1.64792	379954.	11825.	0.000	1.315E+11
8.37500	1.60975	429470.	12830.	0.000	1.315E+11
8.71000	1.57165	483110.	13877.	0.000	1.315E+11
9.04500	1.53360	541039.	14964.	0.000	1.315E+11
9.38000	1.49561	603423.	16093.	0.000	1.315E+11
9.71500	1.45770	670426.	17263.	0.000	1.315E+11
10.05000	1.41988	742214.	18473.	0.000	1.315E+11

10.38500	1.38214	818952.	19725.	0.000	1.315E+11
10.72000	1.34451	900804.	21018.	0.000	1.315E+11
11.05500	1.30698	987935.	22352.	0.000	1.315E+11
11.39000	1.26958	1080511.	23727.	0.000	1.315E+11
11.72500	1.23231	1178697.	25149.	0.000	1.315E+11
12.06000	1.19518	1282709.	26628.	0.000	1.315E+11
12.39500	1.15822	1392787.	28167.	0.000	1.315E+11
12.73000	1.12142	1509173.	29766.	0.000	1.315E+11
13.06500	1.08481	1632107.	31425.	0.000	1.315E+11
13.40000	1.04840	1761832.	33144.	0.000	1.315E+11
13.73500	1.01220	1898587.	34923.	0.000	1.315E+11
14.07000	0.97624	2042614.	36762.	0.000	1.315E+11
14.40500	0.94053	2194154.	38661.	0.000	1.315E+11
14.74000	0.90509	2353447.	40620.	0.000	1.315E+11
15.07500	0.86994	2520736.	42639.	0.000	1.315E+11
15.41000	0.83510	2696261.	44717.	0.000	1.315E+11
15.74500	0.80059	2880263.	46856.	0.000	1.315E+11
16.08000	0.76643	3072984.	49055.	0.000	1.315E+11
16.41500	0.73265	3274663.	51313.	0.000	1.315E+11
16.75000	0.69927	3485543.	53632.	0.000	1.315E+11
17.08500	0.66632	3705864.	56011.	0.000	1.315E+11
17.42000	0.63383	3935868.	58449.	0.000	1.315E+11
17.75500	0.60182	4175796.	60948.	0.000	1.315E+11
18.09000	0.57032	4425888.	63506.	0.000	1.315E+11
18.42500	0.53937	4686385.	66125.	0.000	1.315E+11
18.76000	0.50899	4957530.	68803.	0.000	1.315E+11
19.09500	0.47922	5239562.	71541.	0.000	1.315E+11
19.43000	0.45010	5532723.	74340.	0.000	1.315E+11
19.76500	0.42165	5837254.	77198.	0.000	1.315E+11
20.10000	0.39392	6153395.	80116.	0.000	1.315E+11
20.43500	0.36695	6481389.	83095.	0.000	1.315E+11
20.77000	0.34077	6821476.	86133.	0.000	1.315E+11
21.10500	0.31544	7173897.	89231.	0.000	1.315E+11
21.44000	0.29098	7538893.	92389.	0.000	1.315E+11
21.77500	0.26745	7916706.	95607.	0.000	1.315E+11
22.11000	0.24489	8307576.	98885.	0.000	1.315E+11
22.44500	0.22335	8711744.	102223.	0.000	1.315E+11
22.78000	0.20289	9129452.	105621.	0.000	1.315E+11
23.11500	0.18354	9560940.	102405.	-2588.	1.729E+11
23.45000	0.16509	9952787.	91516.	-2965.	1.727E+11
23.78500	0.14757	10296726.	78895.	-3314.	1.726E+11
24.12000	0.13101	10587101.	64923.	-3637.	1.725E+11
24.45500	0.11545	10818708.	49715.	-3930.	1.724E+11
24.79000	0.10090	10986811.	33390.	-4192.	1.723E+11

25.12500	0.08738	11087167.	16074.	-4423.	1.723E+11
25.46000	0.07489	11116044.	-2103.	-4620.	1.723E+11
25.79500	0.06346	11070255.	-21004.	-4783.	1.723E+11
26.13000	0.05306	10947176.	-40481.	-4908.	1.723E+11
26.46500	0.04369	10744783.	-60384.	-4994.	1.724E+11
26.80000	0.03532	10461692.	-80546.	-5037.	1.725E+11
27.13500	0.02794	10097194.	-100792.	-5035.	1.727E+11
27.47000	0.02150	9651322.	-120929.	-4983.	1.728E+11
27.80500	0.01596	9124924.	-140739.	-4873.	1.730E+11
28.14000	0.01127	8519777.	-159970.	-4694.	1.733E+11
28.47500	0.007381	7838766.	-178305.	-4427.	1.735E+11
28.81000	0.004220	7086208.	-195298.	-4027.	1.738E+11
29.14500	0.001718	6268567.	-210145.	-3359.	1.741E+11
29.48000	-0.000203	5396646.	-213630.	1625.	1.744E+11
29.81500	-0.001623	4550984.	-203145.	3591.	1.747E+11
30.15000	-0.002622	3763358.	-187472.	4207.	1.750E+11
30.48500	-0.003274	3043713.	-169743.	4614.	1.753E+11
30.82000	-0.003646	2398625.	-150929.	4747.	1.755E+11
31.15500	-0.003796	1830247.	-131749.	4795.	2.015E+11
31.49000	-0.003799	1339360.	-112471.	4796.	2.787E+11
31.82500	-0.003725	925983.	-93237.	4773.	2.787E+11
32.16000	-0.003597	589738.	-74133.	4732.	2.787E+11
32.49500	-0.003435	329956.	-55221.	4677.	2.787E+11
32.83000	-0.003254	145764.	-36543.	4615.	2.787E+11
33.16500	-0.003065	36148.	-18130.	4546.	2.787E+11
33.50000	-0.002873	0.000	0.000	4474.	2.787E+11

Output Summary for Load Case No. 1:

Pile-head deflection = 2.56975260 inches
Computed slope at pile head = -0.0095686 radians
Maximum bending moment = 11116044. inch-lbs
Maximum shear force = -213630. lbs
Depth of maximum bending moment = 25.46000000 feet below pile head
Depth of maximum shear force = 29.48000000 feet below pile head
Number of iterations = 33
Number of zero deflection points = 1
Pile deflection at ground = 0.19018131 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
136.68	0.15
140.70	6.73
144.72	16.74
148.74	26.76
152.76	36.78
156.78	46.79
160.80	56.81
164.82	66.83
168.84	76.84
172.86	86.86
176.88	96.88
180.90	106.89
184.92	116.91
188.94	126.93
192.96	136.94
196.98	146.96
201.00	156.97
205.02	166.99
209.04	177.01
213.06	187.02
217.08	197.04
221.10	207.06
225.12	217.07
229.14	227.09
233.16	237.11
237.18	247.12
241.20	257.14
245.22	267.16
249.24	277.17
253.26	287.19
257.28	297.21
261.30	307.22
265.32	317.24
269.34	327.26
273.36	337.27
277.38	53.76

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.55
4.02	10.21
8.04	20.42
12.06	30.63
16.08	40.84
20.10	51.05
24.12	61.25
28.14	71.46
32.16	81.67
36.18	91.88
40.20	102.09
44.22	112.30
48.24	122.51
52.26	132.72
56.28	142.93
60.30	153.14
64.32	163.34
68.34	173.55
72.36	183.76
76.38	193.97
80.40	204.18
84.42	214.39
88.44	224.60
92.46	234.81
96.48	245.02
100.50	255.23
104.52	265.44
108.54	275.64
112.56	285.85
116.58	296.06
120.60	306.27
124.62	316.48
128.64	326.69

132.66	336.90
136.68	347.03
140.70	353.75
144.72	358.65
148.74	363.55
152.76	368.45
156.78	373.35
160.80	378.25
164.82	383.15
168.84	388.05
172.86	392.95
176.88	397.85
180.90	402.75
184.92	407.65
188.94	412.56
192.96	417.46
196.98	422.36
201.00	427.26
205.02	432.16
209.04	437.06
213.06	441.96
217.08	446.86
221.10	451.76
225.12	456.66
229.14	461.56
233.16	466.46
237.18	471.36
241.20	476.26
245.22	481.16
249.24	486.06
253.26	490.96
257.28	495.86
261.30	500.76
265.32	505.66
269.34	510.56
273.36	515.46
277.38	81.23

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	4.41086	3.615E-05	0.000	0.000	1.315E+11
0.33500	4.34717	30.93436	38.47538	0.000	1.315E+11
0.67000	4.28347	309.34211	130.81624	0.000	1.315E+11
1.00500	4.21978	1083.	284.71771	0.000	1.315E+11
1.34000	4.15609	2598.	500.17976	0.000	1.315E+11
1.67500	4.09239	5104.	777.20239	0.000	1.315E+11
2.01000	4.02870	8847.	1116.	0.000	1.315E+11
2.34500	3.96501	14075.	1516.	0.000	1.315E+11
2.68000	3.90132	21035.	1978.	0.000	1.315E+11
3.01500	3.83764	29975.	2501.	0.000	1.315E+11
3.35000	3.77395	41142.	3086.	0.000	1.315E+11
3.68500	3.71027	54784.	3732.	0.000	1.315E+11
4.02000	3.64660	71149.	4440.	0.000	1.315E+11
4.35500	3.58294	90483.	5210.	0.000	1.315E+11
4.69000	3.51929	113034.	6041.	0.000	1.315E+11
5.02500	3.45565	139049.	6933.	0.000	1.315E+11
5.36000	3.39203	168777.	7887.	0.000	1.315E+11
5.69500	3.32843	202464.	8903.	0.000	1.315E+11
6.03000	3.26486	240359.	9981.	0.000	1.315E+11
6.36500	3.20131	282708.	11119.	0.000	1.315E+11
6.70000	3.13780	329759.	12320.	0.000	1.315E+11
7.03500	3.07433	381759.	13582.	0.000	1.315E+11
7.37000	3.01091	438956.	14905.	0.000	1.315E+11
7.70500	2.94754	501598.	16290.	0.000	1.315E+11
8.04000	2.88423	569932.	17737.	0.000	1.315E+11
8.37500	2.82099	644205.	19245.	0.000	1.315E+11
8.71000	2.75784	724664.	20815.	0.000	1.315E+11
9.04500	2.69477	811559.	22447.	0.000	1.315E+11
9.38000	2.63180	905135.	24139.	0.000	1.315E+11
9.71500	2.56894	1005640.	25894.	0.000	1.315E+11
10.05000	2.50620	1113322.	27710.	0.000	1.315E+11
10.38500	2.44360	1228428.	29588.	0.000	1.315E+11
10.72000	2.38116	1351206.	31527.	0.000	1.315E+11

11.05500	2.31888	1481903.	33527.	0.000	1.315E+11
11.39000	2.25678	1620766.	35590.	0.000	1.315E+11
11.72500	2.19488	1768044.	37716.	0.000	1.315E+11
12.06000	2.13319	1924006.	39912.	0.000	1.315E+11
12.39500	2.07175	2088933.	42176.	0.000	1.315E+11
12.73000	2.01056	2263105.	44511.	0.000	1.315E+11
13.06500	1.94964	2446802.	46916.	0.000	1.315E+11
13.40000	1.88903	2640306.	49390.	0.000	1.315E+11
13.73500	1.82875	2843898.	51934.	0.000	1.315E+11
14.07000	1.76881	3057857.	54548.	0.000	1.315E+11
14.40500	1.70925	3282464.	57232.	0.000	1.315E+11
14.74000	1.65009	3518001.	59985.	0.000	1.315E+11
15.07500	1.59136	3764747.	62809.	0.000	1.315E+11
15.41000	1.53310	4022984.	65702.	0.000	1.315E+11
15.74500	1.47533	4292992.	68665.	0.000	1.315E+11
16.08000	1.41808	4575051.	71698.	0.000	1.315E+11
16.41500	1.36140	4869444.	74801.	0.000	1.315E+11
16.75000	1.30532	5176449.	77973.	0.000	1.315E+11
17.08500	1.24988	5496348.	81215.	0.000	1.315E+11
17.42000	1.19510	5829421.	84528.	0.000	1.315E+11
17.75500	1.14105	6175949.	87909.	0.000	1.315E+11
18.09000	1.08775	6536213.	91361.	0.000	1.315E+11
18.42500	1.03526	6910493.	94883.	0.000	1.315E+11
18.76000	0.98361	7299071.	98474.	0.000	1.315E+11
19.09500	0.93287	7702226.	102135.	0.000	1.315E+11
19.43000	0.88307	8120239.	105866.	0.000	1.315E+11
19.76500	0.83426	8553391.	109667.	0.000	1.315E+11
20.10000	0.78651	9001963.	113538.	0.000	1.315E+11
20.43500	0.73986	9466236.	117478.	0.000	1.315E+11
20.77000	0.69438	9946489.	121489.	0.000	1.315E+11
21.10500	0.65011	10443004.	125569.	0.000	1.315E+11
21.44000	0.60713	10956061.	129719.	0.000	1.315E+11
21.77500	0.56550	11485941.	133938.	0.000	1.315E+11
22.11000	0.52528	12032924.	138228.	0.000	1.315E+11
22.44500	0.48653	12597292.	142587.	0.000	1.315E+11
22.78000	0.44934	13179325.	147016.	0.000	1.315E+11
23.11500	0.41376	13779303.	144039.	-2767.	1.712E+11
23.45000	0.37948	14337396.	132286.	-3255.	1.710E+11
23.78500	0.34656	14842883.	118220.	-3743.	1.707E+11
24.12000	0.31504	15287882.	102193.	-4231.	1.705E+11
24.45500	0.28497	15664511.	84205.	-4719.	1.704E+11
24.79000	0.25639	15964887.	64256.	-5206.	1.703E+11
25.12500	0.22932	16181127.	42476.	-5630.	1.702E+11
25.46000	0.20379	16306390.	19232.	-5934.	1.701E+11

25.79500	0.17981	16335755.	-5168.	-6205.	1.701E+11
26.13000	0.15738	16264843.	-30586.	-6441.	1.701E+11
26.46500	0.13650	16089846.	-56876.	-6639.	1.702E+11
26.80000	0.11714	15807557.	-83885.	-6798.	1.703E+11
27.13500	0.09928	15415414.	-111445.	-6914.	1.705E+11
27.47000	0.08289	14911543.	-139376.	-6983.	1.707E+11
27.80500	0.06790	14294832.	-167478.	-6999.	1.710E+11
28.14000	0.05427	13565018.	-195523.	-6954.	1.713E+11
28.47500	0.04192	12722829.	-223237.	-6834.	1.716E+11
28.81000	0.03076	11770195.	-250275.	-6617.	1.720E+11
29.14500	0.02071	10710619.	-276156.	-6259.	1.724E+11
29.48000	0.01167	9549899.	-300096.	-5651.	1.729E+11
29.81500	0.003516	8297849.	-320213.	-4357.	1.734E+11
30.15000	-0.003863	6975390.	-319656.	4634.	1.739E+11
30.48500	-0.0106	5727818.	-297905.	6187.	1.743E+11
30.82000	-0.0168	4580232.	-271492.	6954.	1.747E+11
31.15500	-0.0226	3545018.	-242467.	7487.	1.751E+11
31.49000	-0.0280	2630798.	-211533.	7903.	1.754E+11
31.82500	-0.0332	1844292.	-179072.	8247.	1.988E+11
32.16000	-0.0383	1191059.	-145322.	8544.	2.787E+11
32.49500	-0.0433	675906.	-110440.	8810.	2.787E+11
32.83000	-0.0482	303124.	-74538.	9052.	2.787E+11
33.16500	-0.0531	76621.	-37702.	9275.	2.787E+11
33.50000	-0.0581	0.000	0.000	9483.	2.787E+11

Output Summary for Load Case No. 2:

Pile-head deflection = 4.41086018 inches
Computed slope at pile head = -0.0158441 radians
Maximum bending moment = 16335755. inch-lbs
Maximum shear force = -320213. lbs
Depth of maximum bending moment = 25.79500000 feet below pile head
Depth of maximum shear force = 29.81500000 feet below pile head
Number of iterations = 50
Number of zero deflection points = 1
Pile deflection at ground = 0.42597137 inches

Summary of Pile Responses for LRFD Analyses

Load	Pile-head	Maximum Moment	Maximum Shear	Pile-Head

Case No.	Deflection inches	in Pile in-lbs	in Pile lbs	Rotation radians
1	2.5697526	11116044.	-213630.	-0.009569
2	4.4108602	16335755.	-320213.	-0.015844

Maximum pile-head deflection = 4.4108601822 inches
Maximum pile-head rotation = -0.0158440884 radians = -0.907799 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	20648539.	9129452.	Pass
	2	1.00	23624795.	11116044.	Pass
2	1	1.00	20648539.	13179325.	Pass
	2	1.00	23624795.	16335755.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The analysis ended normally.

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	6.0' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS		plf	1.75
WA	717.6	plf	1.00
EH	1082.5	plf	1.50
Total	**2341.3**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	6.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**10,536**	ft-lbs		ft-lbs	**10,536**	ft-lbs
V (fac.)	**7,024**	lbs		lbs	**7,024**	lbs
f_b (fac.)	**1,712**	psi		psi	**1,712**	psi
f_v (fac.)	**268**	psi		psi	**268**	psi
δ	**0.103**	in		in	**0.10**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	7.5' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS		plf	1.75
WA	717.6	plf	1.00
EH	1082.5	plf	1.50
Total	**2341.3**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	7.5	ft
b	5.5	in, actual size
h	11.50	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**63.25**	in^2
S_x	**121.23**	in^3
I_x	**697.07**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**16,462**	ft-lbs		ft-lbs	**16,462**	ft-lbs
V (fac.)	**8,780**	lbs		lbs	**8,780**	lbs
f_b (fac.)	**1,630**	psi		psi	**1,630**	psi
f_v (fac.)	**208**	psi		psi	**208**	psi
δ	**0.149**	in		in	**0.15**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	8.0' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Loads			**Fact.**
LS		plf	1.75
WA	514.8	plf	1.00
EH	776.6	plf	1.50
Total	**1679.6**	plf	Fact.

Gravity Loads are not considerd in timer lagging design.

Beam Properties		
L	8.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**13,437**	ft-lbs		ft-lbs	**13,437**	ft-lbs
V (fac.)	**6,719**	lbs		lbs	**6,719**	lbs
f_b (fac.)	**2,184**	psi		psi	**2,184**	psi
f_v (fac.)	**256**	psi		psi	**256**	psi
δ	**0.233**	in		in	**0.23**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Culvert #9 - Sta. 1222+96, Lt.

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1222+96 - Pile 1, 10

Wall Height : 5.5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	3.00	ft
$Depth_1$ for Lateral Soil Pressure =	2.75	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.175	ksf
Lateral Soil Load Lpile Input =	**43.73**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	3.00	ft
$Depth_2$ for Lateral Soil Pressure =	5.5	ft
Lateral Pressure at Top of Layer 2 =	0.175	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.259	ksf
Lateral Soil Load Lpile Input =	**64.71**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	3.00	ft
Depth at Top of Groundwater =	2.75	ft
Depth at Bot of Groundwater =	5.5	ft
Water Pressure at Bot of Layer =	0.172	ksf
Lateral Water Load Lpile Input =	**42.90**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1222+96 - Pile 2

Wall Height : 9.5 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_1$ for Lateral Soil Pressure =	4.75	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.302	ksf
Lateral Soil Load Lpile Input =	**151.05**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_2$ for Lateral Soil Pressure =	9.5	ft
Lateral Pressure at Top of Layer 2 =	0.302	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.447	ksf
Lateral Soil Load Lpile Input =	**223.55**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	6.00	ft
Depth at Top of Groundwater =	4.75	ft
Depth at Bot of Groundwater =	9.5	ft
Water Pressure at Bot of Layer =	0.296	ksf
Lateral Water Load Lpile Input =	**148.20**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1222+96 - Pile 3

Wall Height : 15 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_1$ for Lateral Soil Pressure =	7.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.477	ksf
Lateral Soil Load Lpile Input =	**238.50**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_2$ for Lateral Soil Pressure =	15	ft
Lateral Pressure at Top of Layer 2 =	0.477	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.706	ksf
Lateral Soil Load Lpile Input =	**352.98**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	6.00	ft
Depth at Top of Groundwater =	7.50	ft
Depth at Bot of Groundwater =	15	ft
Water Pressure at Bot of Layer =	0.468	ksf
Lateral Water Load Lpile Input =	**234.00**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1222+96 - Piles 4 thru 7

Wall Height : 20 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	5.75	ft
$Depth_1$ for Lateral Soil Pressure =	10	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.636	ksf
Lateral Soil Load Lpile Input =	**304.75**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	5.75	ft
$Depth_2$ for Lateral Soil Pressure =	20	ft
Lateral Pressure at Top of Layer 2 =	0.636	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.941	ksf
Lateral Soil Load Lpile Input =	**451.03**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	5.75	ft
Depth at Top of Groundwater =	10.00	ft
Depth at Bot of Groundwater =	20	ft
Water Pressure at Bot of Layer =	0.624	ksf
Lateral Water Load Lpile Input =	**299.00**	**lb/inch, Bot**

LPile Lateral Soil and LL Surcharge Input Calculations

Project : BEL-70 Temp Shoring 1222+96 - Pile 8

Wall Height : 11 ft

Soil Lateral Distributed Load

Layer 1 (above GW)

Soil Unit Wt. =	120	pcf
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_1$ for Lateral Soil Pressure =	5.5	ft (depth to design GW)
Lateral Pressure at Top of Layer 1 =	0	ksf
Lateral Soil Pressure at Bot of Layer 1 =	0.350	ksf
Lateral Soil Load Lpile Input =	**174.90**	**lb/inch, Bot Layer 1**

Layer 2 (below GW)

Soil Unit Wt. =	57.6	pcf (submerged)
Retained Fill Ka =	0.530	2:1 phi=30°
Trib Width for Lpile Lateral Load =	6.00	ft
$Depth_2$ for Lateral Soil Pressure =	11	ft
Lateral Pressure at Top of Layer 2 =	0.350	ksf
Lateral Soil Pressure at Bot of Layer 2 =	0.518	ksf
Lateral Soil Load Lpile Input =	**258.85**	**lb/inch, Bot Layer 2**

Groundwater

Unit Wt. =	62.4	pcf
Trib Width for Lpile Lateral Load =	6.00	ft
Depth at Top of Groundwater =	5.50	ft
Depth at Bot of Groundwater =	11	ft
Water Pressure at Bot of Layer =	0.343	ksf
Lateral Water Load Lpile Input =	**171.60**	**lb/inch, Bot**

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LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

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 on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1222.96 Pile 1 10.lp12d

Name of the output report file:
BEL-70 1222.96 Pile 1 10.lp12o

Name of the plot output file:
BEL-70 1222.96 Pile 1 10.lp12p

Name of the runtime message file:
BEL-70 1222.96 Pile 1 10.lp12r

Date and Time of Analysis

Date: June 21, 2026 Time: 13:05:53

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1222+96 Piles 1 10 - 5.5' Ht.(6.00' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 17.500 ft
Depth of ground surface below top of pile = 5.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	10.1000
2	5.500	10.1000
3	5.500	24.0000
4	17.500	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 5.500000 ft
   AISC Section Type = HP

   AISC Section Name = HP10X42

   Pile width = 10.100000 in
   Shear capacity of section = 106630. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 12.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 106630. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 5.500000 ft
   Distance from top of pile to bottom of layer = 20.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	20.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 32.500 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	2.75	43.73
3	5.50	64.71

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	2.75	0.00
2	5.50	42.90

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	5.500000 ft
Flange Width	=	10.100000 in
Section Depth	=	9.700000 in
Flange Thickness	=	0.420000 in
Web Thickness	=	0.415000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	12.400000 sq. in.
Moment of Inertia	=	210.000000 in^4
Elastic Bending Stiffness	=	6090000. kip-in^2
Plastic Modulus, Z	=	48.300000in^3

Plastic Moment Capacity = Fy Z = 2415.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 620.000 kips
Nominal Axial Tensile Capacity = -620.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	43.4777520338	5992769.	4.8500000000	
0.0000145101	86.9555040676	5992769.	4.8500000000	
0.0000217651	130.4332561015	5992769.	4.8500000000	
0.0000290201	173.9110081353	5992769.	4.8500000000	
0.0000362752	217.3887601691	5992769.	4.8500000000	
0.0000435302	260.8665122029	5992769.	4.8500000000	
0.0000507853	304.3442642367	5992769.	4.8500000000	
0.0000580403	347.8220162706	5992769.	4.8500000000	
0.0000652953	391.2997683044	5992769.	4.8500000000	
0.0000725504	434.7775203382	5992769.	4.8500000000	
0.0000798054	478.2552723720	5992769.	4.8500000000	
0.0000870604	521.7330244059	5992769.	4.8500000000	
0.0000943155	565.2107764397	5992769.	4.8500000000	
0.0001015705	608.6885284735	5992769.	4.8500000000	
0.0001088255	652.1662805073	5992769.	4.8500000000	

0.0001160806	695.6440325411	5992769.	4.8500000000	
0.0001233356	739.1217845750	5992769.	4.8500000000	
0.0001305906	782.5995366088	5992769.	4.8500000000	
0.0001378457	826.0772886426	5992769.	4.8500000000	
0.0001451007	869.5550406764	5992769.	4.8500000000	
0.0001523558	913.0327927102	5992769.	4.8500000000	
0.0001596108	956.5105447441	5992769.	4.8500000000	
0.0001668658	999.9882967779	5992769.	4.8500000000	
0.0001741209	1043.	5992769.	4.8500000000	
0.0001813759	1087.	5992769.	4.8500000000	
0.0001886309	1130.	5992769.	4.8500000000	
0.0001958860	1174.	5992769.	4.8500000000	
0.0002031410	1217.	5992769.	4.8500000000	
0.0002103960	1261.	5992769.	4.8500000000	
0.0002176511	1304.	5992769.	4.8500000000	
0.0002249061	1348.	5992769.	4.8500000000	
0.0002321611	1391.	5992769.	4.8500000000	
0.0002394162	1435.	5992769.	4.8500000000	
0.0002466712	1478.	5992769.	4.8500000000	
0.0002539263	1522.	5992769.	4.8500000000	
0.0002611813	1565.	5992769.	4.8500000000	
0.0002684363	1609.	5992769.	4.8500000000	
0.0002756914	1652.	5992769.	4.8500000000	
0.0002829464	1696.	5992769.	4.8500000000	
0.0002974565	1783.	5992769.	4.8500000000	
0.0003119665	1870.	5992769.	4.8500000000	
0.0003264766	1956.	5992769.	4.8500000000	
0.0003409867	2043.	5992769.	4.8500000000	
0.0003554968	2130.	5992769.	4.8500000000	
0.0003700068	2199.	5942130.	4.8500000000	Y
0.0003845169	2233.	5807975.	4.8500000000	Y
0.0003990270	2245.	5627120.	4.8500000000	Y
0.0004135370	2254.	5451108.	4.8500000000	Y
0.0004280471	2262.	5285148.	4.8500000000	Y
0.0004425572	2269.	5128131.	4.8500000000	Y
0.0004570673	2276.	4979678.	4.8500000000	Y
0.0004715773	2282.	4839137.	4.8500000000	Y
0.0004860874	2287.	4705909.	4.8500000000	Y
0.0005005975	2292.	4579458.	4.8500000000	Y
0.0005151075	2297.	4459307.	4.8500000000	Y
0.0005296176	2301.	4345022.	4.8500000000	Y
0.0005441277	2305.	4236215.	4.8500000000	Y
0.0005586378	2309.	4132530.	4.8500000000	Y
0.0005731478	2312.	4033644.	4.8500000000	Y

0.0005876579	2315.	3939263.	4.8500000000 Y
0.0006021680	2318.	3849104.	4.8500000000 Y
0.0006166780	2320.	3762749.	4.8500000000 Y
0.0006311881	2323.	3680141.	4.8500000000 Y
0.0006456982	2325.	3601052.	4.8500000000 Y
0.0006602083	2327.	3525092.	4.8500000000 Y
0.0006747183	2329.	3452291.	4.8500000000 Y
0.0006892284	2331.	3382319.	4.8500000000 Y
0.0007037385	2333.	3315098.	4.8500000000 Y
0.0007182485	2335.	3250437.	4.8500000000 Y
0.0007327586	2336.	3188206.	4.8500000000 Y
0.0007472687	2338.	3128263.	4.8500000000 Y
0.0007617788	2339.	3070519.	4.8500000000 Y
0.0007762888	2340.	3014790.	4.8500000000 Y
0.0007907989	2342.	2961096.	4.8500000000 Y
0.0008053090	2343.	2909147.	4.8500000000 Y
0.0008198191	2344.	2859037.	4.8500000000 Y
0.0008343291	2345.	2810577.	4.8500000000 Y
0.0008488392	2346.	2763692.	4.8500000000 Y
0.0008633493	2347.	2718382.	4.8500000000 Y
0.0009213896	2350.	2550781.	4.8500000000 Y
0.0009794298	2353.	2402455.	4.8500000000 Y
0.0010374701	2355.	2270298.	4.8500000000 Y
0.0010955104	2357.	2151822.	4.8500000000 Y
0.0011535507	2359.	2045031.	4.8500000000 Y
0.0012115910	2360.	1948248.	4.8500000000 Y
0.0012696313	2362.	1860154.	4.8500000000 Y
0.0013276716	2363.	1779680.	4.8500000000 Y
0.0013857118	2364.	1705811.	4.8500000000 Y
0.0014437521	2365.	1637830.	4.8500000000 Y
0.0015017924	2365.	1575020.	4.8500000000 Y
0.0015598327	2366.	1516858.	4.8500000000 Y
0.0016178730	2367.	1462791.	4.8500000000 Y
0.0016759133	2367.	1412468.	4.8500000000 Y
0.0017339536	2368.	1365457.	4.8500000000 Y
0.0017919939	2368.	1321468.	4.8500000000 Y

Summary of Results for Nominal Moment Capacity for Section 1

Load	Axial	Nominal Moment

No.	Thrust kips	Capacity in-kips
1	0.00000000	2368.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	12.000000 ft
Outside Diameter of Casing	=	24.000000 in
Casing Wall Thickness	=	0.0000 in
Moment of Inertia of Steel Casing	=	0.0000 in^4
Width Flange of Core/Insert	=	10.100000 in
Depth of Core/Insert	=	9.700000 in
Flange Thickness of Core/Insert	=	0.420000 in
Web Thickness of Core/Insert	=	0.415000 in
Moment of Inertia of Steel Core/Insert	=	206.834773 in^4
Yield Stress of Casing	=	50000. psi
Elastic Modulus of Casing	=	29000000. psi
Yield Stress of Core/Insert	=	50000. psi
Elastic Modulus of Core/Insert	=	29000000. psi
Number of Reinforcing Bars	=	0 bars
Gross Area of Pile	=	452.389342 sq. in.
Area of Concrete	=	440.228442 sq. in.
Cross-sectional Area of Steel Casing	=	0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert	=	12.160900 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	12.160900 sq. in.
Area Ratio of All Steel to Gross Area	=	2.69 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2104.822 kips
Tensile Load for Cracking of Concrete = -223.782 kips
Nominal Axial Tensile Capacity = -608.045 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000072550	530.4688702357	73117333.	12.0000000000	
0.0000145101	530.4688702357	36558666.	7.5346432973	C
0.0000217651	530.4688702357	24372444.	7.5509693177	C
0.0000290201	573.8604565856	19774556.	7.5673903328	C
0.0000362752	714.7361369836	19703173.	7.5838762751	C
0.0000435302	854.5349048170	19630845.	7.6006151961	C
0.0000507853	993.2347822465	19557544.	7.6176150838	C
0.0000580403	1131.	19483241.	7.6348843122	C
0.0000652953	1267.	19407906.	7.6524316670	C
0.0000725504	1403.	19331507.	7.6702663732	C
0.0000798054	1537.	19254007.	7.6883985918	C
0.0000870604	1669.	19175378.	7.7068375181	C
0.0000943155	1801.	19095579.	7.7255944174	C

0.0001015705	1931.	19014571.	7.7446806026	C
0.0001088255	2060.	18932313.	7.7641080049	C
0.0001160806	2188.	18848762.	7.7838892208	C
0.0001233356	2314.	18763904.	7.8039201862	C
0.0001305906	2439.	18677809.	7.8238464979	C
0.0001378457	2563.	18590324.	7.8441461966	C
0.0001451007	2685.	18501397.	7.8648339000	C
0.0001523558	2805.	18410976.	7.8859251101	C
0.0001596108	2924.	18319004.	7.9074362866	C
0.0001668658	3041.	18225418.	7.9293849286	C
0.0001741209	3157.	18130157.	7.9517896655	C
0.0001813759	3271.	18033150.	7.9746703578	C
0.0001886309	3383.	17934325.	7.9979893773	C
0.0001958860	3491.	17821723.	8.0198685081	CY
0.0002031410	3572.	17584937.	8.0198599416	CY
0.0002103960	3616.	17185839.	7.9890033576	CY
0.0002176511	3651.	16776777.	7.9554828143	CY
0.0002249061	3684.	16382236.	7.9233122209	CY
0.0002321611	3715.	16001668.	7.8923366248	CY
0.0002394162	3743.	15634555.	7.8625747655	CY
0.0002466712	3769.	15280300.	7.8363042206	CY
0.0002539263	3793.	14938361.	7.8102930990	CY
0.0002611813	3815.	14607939.	7.7851355921	CY
0.0002684363	3836.	14288816.	7.7610173485	CY
0.0002756914	3854.	13981037.	7.7383482617	CY
0.0002829464	3872.	13684046.	7.7170393330	CY
0.0002974565	3902.	13119520.	7.6778549283	CY
0.0003119665	3929.	12593495.	7.6433460103	CY
0.0003264766	3951.	12102782.	7.6128213964	CY
0.0003409867	3971.	11644332.	7.5858959176	CY
0.0003554968	3987.	11215358.	7.5620206201	CY
0.0003700068	4001.	10813285.	7.5391130627	CY
0.0003845169	4013.	10436280.	7.5206259707	CY
0.0003990270	4023.	10082484.	7.5034137928	CY
0.0004135370	4032.	9749595.	7.4883916869	CY
0.0004280471	4039.	9435684.	7.4748414923	CY
0.0004425572	4045.	9140071.	7.4631570054	CY
0.0004570673	4050.	8860511.	7.4527115052	CY
0.0004715773	4054.	8596337.	7.4438376166	CY
0.0004860874	4057.	8346000.	7.4354937360	CY
0.0005005975	4059.	8108779.	7.4293988243	CY
0.0005151075	4061.	7883393.	7.4233730110	CY
0.0005296176	4061.	7667409.	7.4355441507	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	4061.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	5.5000	0.00	N.A.	No	0.00	83461.
2	20.0000	14.5000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
33.60	0.84
35.70	3.51
37.80	6.24
39.90	8.97
42.00	11.70
44.10	14.43
46.20	17.16
48.30	19.89
50.40	22.62
52.50	25.35
54.60	28.08
56.70	30.81
58.80	33.54
60.90	36.27
63.00	39.00
65.10	38.66

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.70
2.10	2.78

4.20	5.57
6.30	8.35
8.40	11.13
10.50	13.91
12.60	16.70
14.70	19.48
16.80	22.26
18.90	25.05
21.00	27.83
23.10	30.61
25.20	33.39
27.30	36.18
29.40	38.96
31.50	41.74
33.60	44.08
35.70	45.45
37.80	46.78
39.90	48.12
42.00	49.45
44.10	50.79
46.20	52.12
48.30	53.46
50.40	54.79
52.50	56.13
54.60	57.46
56.70	58.80
58.80	60.13
60.90	61.47
63.00	62.80
65.10	59.51

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.12177	1.320E-07	0.000	0.000	5.993E+09
0.17500	0.11987	1.53403	3.65245	0.000	5.993E+09
0.35000	0.11797	15.34029	12.41833	0.000	5.993E+09
0.52500	0.11607	53.69100	27.02812	0.000	5.993E+09
0.70000	0.11417	128.85840	47.48184	0.000	5.993E+09
0.87500	0.11227	253.11471	73.77947	0.000	5.993E+09
1.05000	0.11037	438.73216	105.92102	0.000	5.993E+09
1.22500	0.10847	697.98298	143.90649	0.000	5.993E+09
1.40000	0.10657	1043.	187.73587	0.000	5.993E+09
1.57500	0.10467	1486.	237.40918	0.000	5.993E+09
1.75000	0.10278	2040.	292.92640	0.000	5.993E+09
1.92500	0.10088	2717.	354.28754	0.000	5.993E+09
2.10000	0.09899	3528.	421.49260	0.000	5.993E+09
2.27500	0.09709	4487.	494.54158	0.000	5.993E+09
2.45000	0.09521	5605.	573.43447	0.000	5.993E+09
2.62500	0.09332	6895.	658.17129	0.000	5.993E+09
2.80000	0.09144	8370.	749.16761	0.000	5.993E+09
2.97500	0.08957	10042.	847.73892	0.000	5.993E+09
3.15000	0.08771	11930.	954.81601	0.000	5.993E+09
3.32500	0.08585	14052.	1070.	0.000	5.993E+09
3.50000	0.08400	16426.	1195.	0.000	5.993E+09
3.67500	0.08217	19069.	1327.	0.000	5.993E+09
3.85000	0.08035	22000.	1468.	0.000	5.993E+09
4.02500	0.07854	25237.	1618.	0.000	5.993E+09
4.20000	0.07676	28797.	1777.	0.000	5.993E+09
4.37500	0.07499	32699.	1943.	0.000	5.993E+09
4.55000	0.07325	36959.	2119.	0.000	5.993E+09
4.72500	0.07154	41597.	2303.	0.000	5.993E+09
4.90000	0.06986	46631.	2495.	0.000	5.993E+09
5.07500	0.06821	52077.	2696.	0.000	5.993E+09
5.25000	0.06660	57954.	2906.	0.000	5.993E+09
5.42500	0.06503	64280.	3116.	0.000	5.993E+09
5.60000	0.06351	71040.	3215.	-3.4647	7.312E+10
5.77500	0.06200	77783.	3201.	-9.7081	7.312E+10
5.95000	0.06049	84484.	3174.	-16.1098	7.312E+10
6.12500	0.05898	91115.	3133.	-22.5885	7.312E+10
6.30000	0.05748	97645.	3079.	-29.0640	7.312E+10
6.47500	0.05599	104047.	3011.	-35.4579	7.312E+10
6.65000	0.05450	110293.	2930.	-42.0282	7.312E+10
6.82500	0.05302	116354.	2835.	-48.5657	7.312E+10

7.00000	0.05154	122200.	2726.	-54.9654	7.312E+10
7.17500	0.05008	127804.	2605.	-60.3923	7.312E+10
7.35000	0.04862	133142.	2474.	-64.7581	7.312E+10
7.52500	0.04717	138194.	2334.	-68.7680	7.312E+10
7.70000	0.04572	142942.	2185.	-72.4253	7.312E+10
7.87500	0.04429	147372.	2030.	-75.7337	7.312E+10
8.05000	0.04286	151467.	1868.	-78.6970	7.312E+10
8.22500	0.04145	155216.	1700.	-81.3190	7.312E+10
8.40000	0.04004	158605.	1526.	-83.6037	7.312E+10
8.57500	0.03864	161626.	1349.	-85.5550	7.312E+10
8.75000	0.03726	164270.	1167.	-87.1770	7.312E+10
8.92500	0.03588	166529.	982.95660	-88.4737	7.312E+10
9.10000	0.03451	168399.	796.13736	-89.4493	7.312E+10
9.27500	0.03315	169873.	607.60227	-90.1079	7.312E+10
9.45000	0.03181	170950.	418.01282	-90.4535	7.312E+10
9.62500	0.03047	171629.	228.02194	-90.4902	7.312E+10
9.80000	0.02914	171908.	38.27407	-90.2221	7.312E+10
9.97500	0.02783	171790.	-150.5948	-89.6530	7.312E+10
10.15000	0.02652	171276.	-337.9568	-88.7870	7.312E+10
10.32500	0.02522	170370.	-523.1922	-87.6278	7.312E+10
10.50000	0.02394	169078.	-705.6894	-86.1790	7.312E+10
10.67500	0.02266	167406.	-884.8441	-84.4445	7.312E+10
10.85000	0.02140	165362.	-1060.	-82.4274	7.312E+10
11.02500	0.02014	162954.	-1231.	-80.1313	7.312E+10
11.20000	0.01890	160193.	-1396.	-77.5593	7.312E+10
11.37500	0.01766	157089.	-1556.	-74.7144	7.312E+10
11.55000	0.01644	153657.	-1710.	-71.5993	7.312E+10
11.72500	0.01522	149908.	-1857.	-68.2169	7.312E+10
11.90000	0.01401	145859.	-1996.	-64.5695	7.312E+10
12.07500	0.01281	141525.	-2128.	-60.6594	7.312E+10
12.25000	0.01162	136923.	-2251.	-56.4887	7.312E+10
12.42500	0.01044	132072.	-2365.	-52.0592	7.312E+10
12.60000	0.009267	126992.	-2469.	-47.3724	7.312E+10
12.77500	0.008100	121703.	-2563.	-42.4300	7.312E+10
12.95000	0.006941	116226.	-2647.	-37.2329	7.312E+10
13.12500	0.005789	110586.	-2719.	-31.7822	7.312E+10
13.30000	0.004644	104805.	-2780.	-26.0787	7.312E+10
13.47500	0.003504	98909.	-2829.	-20.1228	7.312E+10
13.65000	0.002371	92925.	-2864.	-13.9148	7.312E+10
13.82500	0.001244	86879.	-2887.	-7.4548	7.312E+10
14.00000	0.000121	80800.	-2895.	-0.7428	7.312E+10
14.17500	-0.000996	74718.	-2890.	6.22163	7.312E+10
14.35000	-0.002109	68664.	-2869.	13.43894	7.312E+10
14.52500	-0.003218	62669.	-2833.	20.90981	7.312E+10

14.70000	-0.004323	56765.	-2781.	28.63506	7.312E+10
14.87500	-0.005425	50989.	-2712.	36.61568	7.312E+10
15.05000	-0.006523	45373.	-2627.	44.85275	7.312E+10
15.22500	-0.007619	39956.	-2525.	52.12293	7.312E+10
15.40000	-0.008712	34768.	-2410.	57.01363	7.312E+10
15.57500	-0.009804	29832.	-2285.	62.37998	7.312E+10
15.75000	-0.0109	25171.	-2148.	68.58266	7.312E+10
15.92500	-0.0120	20812.	-1997.	74.90158	7.312E+10
16.10000	-0.0131	16784.	-1833.	81.35003	7.312E+10
16.27500	-0.0142	13114.	-1655.	87.93888	7.312E+10
16.45000	-0.0152	9833.	-1463.	94.67721	7.312E+10
16.62500	-0.0163	6968.	-1257.	101.57278	7.312E+10
16.80000	-0.0174	4552.	-1037.	108.63231	7.312E+10
16.97500	-0.0185	2615.	-800.8490	115.86170	7.312E+10
17.15000	-0.0196	1188.	-549.7647	123.26617	7.312E+10
17.32500	-0.0207	305.65382	-282.9423	130.85038	7.312E+10
17.50000	-0.0217	0.000	0.000	138.61851	7.312E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 0.12177480 inches
Computed slope at pile head = -0.0009051 radians
Maximum bending moment = 171908. inch-lbs
Maximum shear force = 3215. lbs
Depth of maximum bending moment = 9.80000000 feet below pile head
Depth of maximum shear force = 5.60000000 feet below pile head
Number of iterations = 7
Number of zero deflection points = 1
Pile deflection at ground = 0.06438228 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
33.60	0.84
35.70	3.51
37.80	6.24

39.90	8.97
42.00	11.70
44.10	14.43
46.20	17.16
48.30	19.89
50.40	22.62
52.50	25.35
54.60	28.08
56.70	30.81
58.80	33.54
60.90	36.27
63.00	39.00
65.10	38.66

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	0.70
2.10	2.78
4.20	5.57
6.30	8.35
8.40	11.13
10.50	13.91
12.60	16.70
14.70	19.48
16.80	22.26
18.90	25.05
21.00	27.83
23.10	30.61
25.20	33.39
27.30	36.18
29.40	38.96
31.50	41.74
33.60	44.08
35.70	45.45

37.80	46.78
39.90	48.12
42.00	49.45
44.10	50.79
46.20	52.12
48.30	53.46
50.40	54.79
52.50	56.13
54.60	57.46
56.70	58.80
58.80	60.13
60.90	61.47
63.00	62.80
65.10	59.51

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	0.19844	-1.810E-06	8.980E-09	0.000	5.993E+09
0.17500	0.19539	2.30104	5.47867	0.000	5.993E+09
0.35000	0.19234	23.01043	18.62749	0.000	5.993E+09
0.52500	0.18928	80.53650	40.54218	0.000	5.993E+09
0.70000	0.18623	193.28759	71.22275	0.000	5.993E+09
0.87500	0.18318	379.67206	110.66920	0.000	5.993E+09
1.05000	0.18013	658.09823	158.88153	0.000	5.993E+09
1.22500	0.17708	1047.	215.85973	0.000	5.993E+09
1.40000	0.17402	1565.	281.60381	0.000	5.993E+09
1.57500	0.17097	2230.	356.11376	0.000	5.993E+09
1.75000	0.16793	3060.	439.38960	0.000	5.993E+09
1.92500	0.16488	4075.	531.43131	0.000	5.993E+09

2.10000	0.16184	5292.	632.23890	0.000	5.993E+09
2.27500	0.15880	6731.	741.81236	0.000	5.993E+09
2.45000	0.15577	8408.	860.15171	0.000	5.993E+09
2.62500	0.15274	10343.	987.25693	0.000	5.993E+09
2.80000	0.14972	12554.	1123.	0.000	5.993E+09
2.97500	0.14671	15061.	1269.	0.000	5.993E+09
3.15000	0.14371	17884.	1424.	0.000	5.993E+09
3.32500	0.14072	21043.	1590.	0.000	5.993E+09
3.50000	0.13775	24561.	1765.	0.000	5.993E+09
3.67500	0.13480	28457.	1950.	0.000	5.993E+09
3.85000	0.13186	32753.	2146.	0.000	5.993E+09
4.02500	0.12896	37469.	2351.	0.000	5.993E+09
4.20000	0.12608	42627.	2566.	0.000	5.993E+09
4.37500	0.12323	48247.	2791.	0.000	5.993E+09
4.55000	0.12041	54350.	3026.	0.000	5.993E+09
4.72500	0.11764	60957.	3271.	0.000	5.993E+09
4.90000	0.11491	68088.	3526.	0.000	5.993E+09
5.07500	0.11223	75766.	3791.	0.000	5.993E+09
5.25000	0.10961	84010.	4066.	0.000	5.993E+09
5.42500	0.10705	92841.	4340.	0.000	5.993E+09
5.60000	0.10455	102237.	4470.	-3.9445	7.312E+10
5.77500	0.10207	111615.	4454.	-11.0754	7.312E+10
5.95000	0.09959	120944.	4423.	-18.4193	7.312E+10
6.12500	0.09712	130192.	4377.	-25.8867	7.312E+10
6.30000	0.09465	139326.	4314.	-33.3894	7.312E+10
6.47500	0.09219	148313.	4236.	-40.8405	7.312E+10
6.65000	0.08975	157119.	4143.	-48.4645	7.312E+10
6.82500	0.08731	165712.	4033.	-56.0566	7.312E+10
7.00000	0.08488	174058.	3907.	-63.5073	7.312E+10
7.17500	0.08246	182123.	3766.	-70.7504	7.312E+10
7.35000	0.08006	189877.	3611.	-77.7211	7.312E+10
7.52500	0.07766	197287.	3440.	-84.3971	7.312E+10
7.70000	0.07528	204326.	3256.	-90.9612	7.312E+10
7.87500	0.07291	210963.	3059.	-97.1411	7.312E+10
8.05000	0.07055	217172.	2849.	-102.8831	7.312E+10
8.22500	0.06821	222928.	2627.	-108.1353	7.312E+10
8.40000	0.06587	228206.	2395.	-112.8476	7.312E+10
8.57500	0.06356	232987.	2153.	-117.3166	7.312E+10
8.75000	0.06125	237250.	1902.	-121.6980	7.312E+10
8.92500	0.05896	240977.	1643.	-125.5260	7.312E+10
9.10000	0.05669	244150.	1376.	-128.7613	7.312E+10
9.27500	0.05443	246756.	1103.	-131.3667	7.312E+10
9.45000	0.05218	248782.	824.79685	-133.3070	7.312E+10
9.62500	0.04995	250220.	542.67229	-135.3830	7.312E+10

9.80000	0.04774	251061.	256.47806	-137.1829	7.312E+10
9.97500	0.04554	251297.	-32.8484	-138.3661	7.312E+10
10.15000	0.04335	250923.	-323.9863	-138.9081	7.312E+10
10.32500	0.04118	249936.	-615.5651	-138.7860	7.312E+10
10.50000	0.03903	248338.	-906.1688	-137.9795	7.312E+10
10.67500	0.03689	246130.	-1194.	-136.3868	7.312E+10
10.85000	0.03477	243322.	-1478.	-133.9174	7.312E+10
11.02500	0.03266	239923.	-1755.	-129.9040	7.312E+10
11.20000	0.03056	235950.	-2023.	-125.4182	7.312E+10
11.37500	0.02848	231425.	-2281.	-120.4646	7.312E+10
11.55000	0.02641	226369.	-2529.	-115.0472	7.312E+10
11.72500	0.02436	220805.	-2764.	-109.1701	7.312E+10
11.90000	0.02232	214760.	-2987.	-102.8367	7.312E+10
12.07500	0.02029	208261.	-3196.	-96.0505	7.312E+10
12.25000	0.01827	201339.	-3390.	-88.8144	7.312E+10
12.42500	0.01627	194025.	-3568.	-81.1311	7.312E+10
12.60000	0.01428	186353.	-3730.	-73.0029	7.312E+10
12.77500	0.01230	178359.	-3874.	-64.4319	7.312E+10
12.95000	0.01033	170081.	-4000.	-55.4196	7.312E+10
13.12500	0.008373	161559.	-4107.	-45.9674	7.312E+10
13.30000	0.006424	152834.	-4193.	-36.0763	7.312E+10
13.47500	0.004484	143950.	-4258.	-25.7470	7.312E+10
13.65000	0.002553	134952.	-4300.	-14.9798	7.312E+10
13.82500	0.000630	125888.	-4320.	-3.7747	7.312E+10
14.00000	-0.001286	116808.	-4316.	7.86854	7.312E+10
14.17500	-0.003194	107762.	-4287.	19.95046	7.312E+10
14.35000	-0.005096	98805.	-4231.	32.47189	7.312E+10
14.52500	-0.006992	89990.	-4150.	45.43387	7.312E+10
14.70000	-0.008882	81376.	-4044.	55.34709	7.312E+10
14.87500	-0.0108	73006.	-3920.	62.74020	7.312E+10
15.05000	-0.0126	64913.	-3781.	69.86447	7.312E+10
15.22500	-0.0145	57127.	-3627.	76.80176	7.312E+10
15.40000	-0.0164	49681.	-3458.	83.60662	7.312E+10
15.57500	-0.0183	42603.	-3275.	91.07353	7.312E+10
15.75000	-0.0201	35927.	-3075.	99.64275	7.312E+10
15.92500	-0.0220	29690.	-2856.	108.38926	7.312E+10
16.10000	-0.0239	23931.	-2619.	117.32828	7.312E+10
16.27500	-0.0257	18690.	-2363.	126.47249	7.312E+10
16.45000	-0.0276	14006.	-2088.	135.83270	7.312E+10
16.62500	-0.0295	9921.	-1792.	145.41826	7.312E+10
16.80000	-0.0313	6478.	-1477.	155.23738	7.312E+10
16.97500	-0.0332	3719.	-1140.	165.29736	7.312E+10
17.15000	-0.0350	1690.	-782.1663	175.60475	7.312E+10
17.32500	-0.0369	434.35134	-402.3077	186.16542	7.312E+10

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   17.50000      -0.0388        0.000        0.000    196.98474    7.312E+10

Output Summary for Load Case No. 2:

Pile-head deflection             =     0.19844132 inches
Computed slope at pile head      =     -0.0014536 radians
Maximum bending moment           =        251297. inch-lbs
Maximum shear force              =          4470. lbs
Depth of maximum bending moment  =     9.97500000 feet below pile head
Depth of maximum shear force     =     5.60000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              1
Pile deflection at ground        =     0.10597920 inches


--------------------------------------------------------------------------------
                  Summary of Pile Responses for LRFD Analyses
--------------------------------------------------------------------------------

                        Maximum        Maximum
Load     Pile-head      Moment          Shear        Pile-Head
Case    Deflection      in Pile        in Pile       Rotation
 No.      inches        in-lbs           lbs          radians
----   ------------   ------------   ------------   ------------
  1       0.1217748        171908.          3215.      -0.000905
  2       0.1984413        251297.          4470.      -0.001454


Maximum pile-head deflection = 0.1984413197 inches
Maximum pile-head rotation   = -0.0014536057 radians = -0.083285 deg.

--------------------------------------------------------------------------------
                   LRFD Performance by Load Case Combination
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                                  Factored        Maximum       Pass/Fail
Load              Resistance       Moment         Moment        for LRFD
Case    Section     Factor        Capacity       Developed       Moment
 No.      No.     for Moment     of Section     in Section     of Section
                                   in-lbs         in-lbs
----    -------   ------------   ------------   ------------   ------------
  1        1          1.00           2368063.         64280.       Pass
           2          1.00           4060795.        171908.       Pass
  2        1          1.00           2368063.         92841.       Pass
```

	2	1.00	4060795.	251297.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	106630.	3116.	Pass
	2	1.00	106630.	3215.	Pass
2	1	1.00	106630.	4340.	Pass
	2	1.00	106630.	4470.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = 4469.92 lbs
Factored Shear Capacity at Node = 106630.00 lbs
Fraction of Allowable Shear Capacity = 0.0419

The analysis ended normally.

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                            LPile for Version 2022-12.012

                              License ID : 154178656
                          License Type : (Network License)

                  Analysis of Individual Piles and Drilled Shafts
                 Subjected to Lateral Loading Using the p-y Method
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This model was prepared by:
TWASHKO




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                            Files Used for Analysis
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Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\L
pile\

Name of the input data file:
BEL-70 1222.96 Pile 2.lp12d

Name of the output report file:
BEL-70 1222.96 Pile 2.lp12o

Name of the plot output file:
BEL-70 1222.96 Pile 2.lp12p

Name of the runtime message file:
BEL-70 1222.96 Pile 2.lp12r
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Date and Time of Analysis

Date: June 21, 2026 Time: 12:45:23

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1222+96 Piles 2 - 9.5' Ht.(6.00' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- 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 narrow report formats
  (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined	=	2
Total length of pile	=	28.000 ft
Depth of ground surface below top of pile	=	9.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.6000
2	9.500	14.6000
3	9.500	24.0000
4	28.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 9.500000 ft
   AISC Section Type = HP

   AISC Section Name = HP14X73

   Pile width = 14.600000 in
   Shear capacity of section = 184530. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 18.500000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 184530. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 9.500000 ft
   Distance from top of pile to bottom of layer = 25.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	25.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 22.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	4.75	151.05
3	9.50	223.55

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	4.75	0.00
2	9.50	148.20

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	9.500000 ft
Flange Width	=	14.600000 in
Section Depth	=	13.600000 in
Flange Thickness	=	0.505000 in
Web Thickness	=	0.505000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	21.400000 sq. in.
Moment of Inertia	=	729.000000 in^4
Elastic Bending Stiffness	=	21141000. kip-in^2
Plastic Modulus, Z	=	118.000000in^3

Plastic Moment Capacity = Fy Z = 5900.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 1070.000 kips
Nominal Axial Tensile Capacity = -1070.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000050189	104.1755221948	20756666.	6.8000000000	
0.0000100378	208.3510443896	20756666.	6.8000000000	
0.0000150567	312.5265665844	20756666.	6.8000000000	
0.0000200756	416.7020887792	20756666.	6.8000000000	
0.0000250945	520.8776109740	20756666.	6.8000000000	
0.0000301134	625.0531331689	20756666.	6.8000000000	
0.0000351323	729.2286553637	20756666.	6.8000000000	
0.0000401512	833.4041775585	20756666.	6.8000000000	
0.0000451701	937.5796997533	20756666.	6.8000000000	
0.0000501889	1042.	20756666.	6.8000000000	
0.0000552078	1146.	20756666.	6.8000000000	
0.0000602267	1250.	20756666.	6.8000000000	
0.0000652456	1354.	20756666.	6.8000000000	
0.0000702645	1458.	20756666.	6.8000000000	
0.0000752834	1563.	20756666.	6.8000000000	

0.0000803023	1667.	20756666.	6.8000000000	
0.0000853212	1771.	20756666.	6.8000000000	
0.0000903401	1875.	20756666.	6.8000000000	
0.0000953590	1979.	20756666.	6.8000000000	
0.0001003779	2084.	20756666.	6.8000000000	
0.0001053968	2188.	20756666.	6.8000000000	
0.0001104157	2292.	20756666.	6.8000000000	
0.0001154346	2396.	20756666.	6.8000000000	
0.0001204535	2500.	20756666.	6.8000000000	
0.0001254724	2604.	20756666.	6.8000000000	
0.0001304913	2709.	20756666.	6.8000000000	
0.0001355102	2813.	20756666.	6.8000000000	
0.0001405291	2917.	20756666.	6.8000000000	
0.0001455479	3021.	20756666.	6.8000000000	
0.0001505668	3125.	20756666.	6.8000000000	
0.0001555857	3229.	20756666.	6.8000000000	
0.0001606046	3334.	20756666.	6.8000000000	
0.0001656235	3438.	20756666.	6.8000000000	
0.0001706424	3542.	20756666.	6.8000000000	
0.0001756613	3646.	20756666.	6.8000000000	
0.0001806802	3750.	20756666.	6.8000000000	
0.0001856991	3854.	20756666.	6.8000000000	
0.0001907180	3959.	20756666.	6.8000000000	
0.0001957369	4063.	20756666.	6.8000000000	
0.0002057747	4271.	20756666.	6.8000000000	
0.0002158125	4480.	20756666.	6.8000000000	
0.0002258503	4688.	20756666.	6.8000000000	
0.0002358880	4896.	20756666.	6.8000000000	
0.0002459258	5105.	20756666.	6.8000000000	
0.0002559636	5313.	20756666.	6.8000000000	
0.0002660014	5447.	20475766.	6.8000000000	Y
0.0002760392	5497.	19913687.	6.8000000000	Y
0.0002860770	5520.	19294249.	6.8000000000	Y
0.0002961148	5540.	18708912.	6.8000000000	Y
0.0003061526	5558.	18155823.	6.8000000000	Y
0.0003161904	5575.	17631964.	6.8000000000	Y
0.0003262282	5590.	17135937.	6.8000000000	Y
0.0003362659	5604.	16665630.	6.8000000000	Y
0.0003463037	5617.	16219158.	6.8000000000	Y
0.0003563415	5628.	15794834.	6.8000000000	Y
0.0003663793	5639.	15391137.	6.8000000000	Y
0.0003764171	5649.	15006694.	6.8000000000	Y
0.0003864549	5658.	14640260.	6.8000000000	Y
0.0003964927	5666.	14290700.	6.8000000000	Y

0.0004065305	5674.	13956977.	6.8000000000	Y
0.0004165683	5681.	13638139.	6.8000000000	Y
0.0004266060	5688.	13332840.	6.8000000000	Y
0.0004366438	5694.	13040564.	6.8000000000	Y
0.0004466816	5700.	12760725.	6.8000000000	Y
0.0004567194	5705.	12492115.	6.8000000000	Y
0.0004667572	5710.	12234370.	6.8000000000	Y
0.0004767950	5715.	11986978.	6.8000000000	Y
0.0004868328	5720.	11748890.	6.8000000000	Y
0.0004968706	5724.	11520256.	6.8000000000	Y
0.0005069084	5728.	11299755.	6.8000000000	Y
0.0005169462	5732.	11087791.	6.8000000000	Y
0.0005269839	5735.	10883101.	6.8000000000	Y
0.0005370217	5739.	10686021.	6.8000000000	Y
0.0005470595	5742.	10495610.	6.8000000000	Y
0.0005570973	5745.	10311881.	6.8000000000	Y
0.0005671351	5748.	10134413.	6.8000000000	Y
0.0005771729	5750.	9962708.	6.8000000000	Y
0.0005872107	5753.	9796873.	6.8000000000	Y
0.0005972485	5755.	9636180.	6.8000000000	Y
0.0006373996	5764.	9042573.	6.8000000000	Y
0.0006775508	5771.	8517218.	6.8000000000	Y
0.0007177019	5777.	8049009.	6.8000000000	Y
0.0007578531	5782.	7629158.	6.8000000000	Y
0.0007980043	5786.	7250621.	6.8000000000	Y
0.0008381554	5790.	6907672.	6.8000000000	Y
0.0008783066	5793.	6595608.	6.8000000000	Y
0.0009184577	5796.	6310217.	6.8000000000	Y
0.0009586089	5798.	6048460.	6.8000000000	Y
0.0009987600	5800.	5807472.	6.8000000000	Y
0.0010389112	5802.	5584837.	6.8000000000	Y
0.0010790624	5804.	5378606.	6.8000000000	Y
0.0011192135	5805.	5187024.	6.8000000000	Y
0.0011593647	5807.	5008517.	6.8000000000	Y
0.0011995158	5808.	4841960.	6.8000000000	Y
0.0012396670	5809.	4685980.	6.8000000000	Y
0.0012798181	5810.	4539738.	6.8000000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Nominal

Load No.	Axial Thrust kips	Moment Capacity in-kips
1	0.00000000	5810.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	18.500000 ft
Outside Diameter of Casing	=	24.000000 in
Casing Wall Thickness	=	0.0000 in
Moment of Inertia of Steel Casing	=	0.0000 in^4
Width Flange of Core/Insert	=	14.600000 in
Depth of Core/Insert	=	13.600000 in
Flange Thickness of Core/Insert	=	0.505000 in
Web Thickness of Core/Insert	=	0.505000 in
Moment of Inertia of Steel Core/Insert	=	716.453023 in^4
Yield Stress of Casing	=	50000. psi
Elastic Modulus of Casing	=	29000000. psi
Yield Stress of Core/Insert	=	50000. psi
Elastic Modulus of Core/Insert	=	29000000. psi
Number of Reinforcing Bars	=	0 bars
Gross Area of Pile	=	452.389342 sq. in.
Area of Concrete	=	431.285392 sq. in.
Cross-sectional Area of Steel Casing	=	0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert	=	21.103950 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	21.103950 sq. in.

Area Ratio of All Steel to Gross Area = 4.66 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 2521.568 kips
Tensile Load for Cracking of Concrete = -249.984 kips
Nominal Axial Tensile Capacity = -1055.197 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000050189	432.1817465260	86110942.	12.0000000000	
0.0000100378	432.1817465260	43055471.	8.6068271721	C
0.0000150567	577.6428769267	38364548.	8.6189827213	C
0.0000200756	768.4660160600	38278648.	8.6312552758	C
0.0000250945	958.4087347826	38192024.	8.6436471492	C
0.0000301134	1147.	38104663.	8.6561607243	C
0.0000351323	1336.	38016549.	8.6687984563	C
0.0000401512	1523.	37927670.	8.6815628754	C
0.0000451701	1709.	37838010.	8.6944565902	C
0.0000501889	1895.	37747556.	8.7074822909	C
0.0000552078	2079.	37656291.	8.7206427525	C
0.0000602267	2262.	37564199.	8.7339408391	C

0.0000652456	2445.	37471264.	8.7473795071	C
0.0000702645	2626.	37377472.	8.7609423566	C
0.0000752834	2807.	37282868.	8.7743922334	C
0.0000803023	2986.	37187388.	8.7879861823	C
0.0000853212	3165.	37091013.	8.8017274046	C
0.0000903401	3342.	36993724.	8.8156192101	C
0.0000953590	3518.	36895504.	8.8296650218	C
0.0001003779	3694.	36796331.	8.8438683818	C
0.0001053968	3868.	36696186.	8.8582329561	C
0.0001104157	4041.	36595047.	8.8727625411	C
0.0001154346	4213.	36492892.	8.8874610698	C
0.0001204535	4383.	36389699.	8.9023326186	C
0.0001254724	4553.	36285444.	8.9173814142	C
0.0001304913	4721.	36180102.	8.9326118412	C
0.0001355102	4888.	36073649.	8.9480284505	C
0.0001405291	5054.	35966057.	8.9636359676	C
0.0001455479	5219.	35857300.	8.9794356497	C
0.0001505668	5382.	35747350.	8.9952839627	C
0.0001555857	5545.	35636313.	9.0112060667	C
0.0001606046	5705.	35524103.	9.0272826391	C
0.0001656235	5865.	35410640.	9.0435710289	C
0.0001706424	6023.	35295893.	9.0600674532	C
0.0001756613	6180.	35179829.	9.0767814323	C
0.0001806802	6323.	34997213.	9.0866553144	CY
0.0001856991	6419.	34568148.	9.0692763059	CY
0.0001907180	6466.	33902972.	9.0237190803	CY
0.0001957369	6510.	33257200.	8.9793962354	CY
0.0002057747	6589.	32021863.	8.8936697461	CY
0.0002158125	6660.	30860265.	8.8142135992	CY
0.0002258503	6723.	29766940.	8.7386487572	CY
0.0002358880	6779.	28736093.	8.6664699660	CY
0.0002459258	6828.	27764193.	8.5988027959	CY
0.0002559636	6873.	26849677.	8.5356931475	CY
0.0002660014	6912.	25985379.	8.4748686066	CY
0.0002760392	6948.	25169225.	8.4170461311	CY
0.0002860770	6980.	24398749.	8.3628155948	CY
0.0002961148	7009.	23670513.	8.3118054375	CY
0.0003061526	7036.	22981064.	8.2629691877	CY
0.0003161904	7060.	22327109.	8.2155005246	CY
0.0003262282	7081.	21707048.	8.1706263132	CY
0.0003362659	7102.	21118974.	8.1279742082	CY
0.0003463037	7120.	20560329.	8.0876562894	CY
0.0003563415	7137.	20028733.	8.0489701760	CY
0.0003663793	7152.	19521675.	8.0110821105	CY

0.0003764171	7167.	19038950.	7.9745658599	CY
0.0003864549	7180.	18578260.	7.9396606931	CY
0.0003964927	7192.	18138256.	7.9061657571	CY
0.0004065305	7203.	17718754.	7.8743125516	CY
0.0004165683	7213.	17316370.	7.8435224268	CY
0.0004266060	7223.	16932203.	7.8142508905	CY
0.0004366438	7232.	16563237.	7.7851353838	CY
0.0004466816	7241.	16209637.	7.7566291498	CY
0.0004567194	7248.	15869753.	7.7293035350	CY
0.0004667572	7255.	15544289.	7.7030893224	CY
0.0004767950	7262.	15230653.	7.6773289858	CY
0.0004868328	7268.	14929633.	7.6529617917	CY
0.0004968706	7274.	14639685.	7.6291697200	CY
0.0005069084	7274.	14349791.	7.6177588020	CY
0.0005169462	7274.	14071154.	7.5953853817	CY
0.0005269839	7274.	13803132.	7.5951170166	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	7274.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	9.5000	0.00	N.A.	No	0.00	160936.
2	25.0000	15.5000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
57.12	1.25
60.48	9.05
63.84	17.78
67.20	26.52
70.56	35.26
73.92	43.99
77.28	52.73
80.64	61.46
84.00	70.20
87.36	78.94
90.72	87.67
94.08	96.41
97.44	105.14
100.80	113.88

104.16	122.62
107.52	131.35
110.88	140.09
114.24	62.71

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.23
3.36	8.90
6.72	17.81
10.08	26.71
13.44	35.62
16.80	44.52
20.16	53.42
23.52	62.33
26.88	71.23
30.24	80.14
33.60	89.04
36.96	97.94
40.32	106.85
43.68	115.75
47.04	124.66
50.40	133.56
53.76	142.46
57.12	150.70
60.48	155.48
63.84	159.75
67.20	164.02
70.56	168.30
73.92	172.57
77.28	176.84
80.64	181.12
84.00	185.39
87.36	189.67

90.72	193.94
94.08	198.21
97.44	202.49
100.80	206.76
104.16	211.03
107.52	215.31
110.88	219.58
114.24	95.41

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.61441	-4.082E-06	0.000	0.000	2.076E+10
0.28000	1.58713	12.56533	18.69840	0.000	2.076E+10
0.56000	1.55986	125.65325	63.57456	0.000	2.076E+10
0.84000	1.53259	439.78637	138.36816	0.000	2.076E+10
1.12000	1.50532	1055.	243.07920	0.000	2.076E+10
1.40000	1.47804	2073.	377.70768	0.000	2.076E+10
1.68000	1.45077	3594.	542.25360	0.000	2.076E+10
1.96000	1.42350	5717.	736.71696	0.000	2.076E+10
2.24000	1.39624	8544.	961.09776	0.000	2.076E+10
2.52000	1.36898	12176.	1215.	0.000	2.076E+10
2.80000	1.34172	16712.	1500.	0.000	2.076E+10
3.08000	1.31448	22253.	1814.	0.000	2.076E+10
3.36000	1.28724	28900.	2158.	0.000	2.076E+10
3.64000	1.26002	36754.	2532.	0.000	2.076E+10
3.92000	1.23283	45914.	2936.	0.000	2.076E+10
4.20000	1.20565	56481.	3369.	0.000	2.076E+10
4.48000	1.17851	68556.	3833.	0.000	2.076E+10
4.76000	1.15141	82240.	4328.	0.000	2.076E+10

5.04000	1.12435	97639.	4859.	0.000	2.076E+10
5.32000	1.09734	114896.	5434.	0.000	2.076E+10
5.60000	1.07040	134157.	6053.	0.000	2.076E+10
5.88000	1.04352	155569.	6715.	0.000	2.076E+10
6.16000	1.01674	179279.	7420.	0.000	2.076E+10
6.44000	0.99005	205434.	8170.	0.000	2.076E+10
6.72000	0.96347	234181.	8963.	0.000	2.076E+10
7.00000	0.93702	265666.	9800.	0.000	2.076E+10
7.28000	0.91071	300037.	10681.	0.000	2.076E+10
7.56000	0.88457	337440.	11605.	0.000	2.076E+10
7.84000	0.85861	378023.	12573.	0.000	2.076E+10
8.12000	0.83286	421932.	13585.	0.000	2.076E+10
8.40000	0.80734	469314.	14640.	0.000	2.076E+10
8.68000	0.78207	520315.	15740.	0.000	2.076E+10
8.96000	0.75708	575084.	16883.	0.000	2.076E+10
9.24000	0.73241	633766.	18069.	0.000	2.076E+10
9.52000	0.70808	696509.	18937.	-1.3193	3.831E+10
9.80000	0.68396	761022.	19166.	-20.6867	3.828E+10
10.08000	0.66006	825301.	19061.	-41.3762	3.825E+10
10.36000	0.63640	889113.	18886.	-62.8873	3.822E+10
10.64000	0.61301	952216.	18638.	-84.7492	3.819E+10
10.92000	0.58990	1014361.	18317.	-106.5456	3.816E+10
11.20000	0.56709	1075304.	17923.	-127.8574	3.813E+10
11.48000	0.54460	1134803.	17459.	-148.2890	3.811E+10
11.76000	0.52244	1192628.	16928.	-168.0090	3.808E+10
12.04000	0.50064	1248557.	16332.	-186.3676	3.805E+10
12.32000	0.47921	1302381.	15678.	-203.0145	3.803E+10
12.60000	0.45816	1353913.	14970.	-218.5278	3.801E+10
12.88000	0.43752	1402979.	14210.	-233.7399	3.798E+10
13.16000	0.41729	1449405.	13402.	-247.0258	3.796E+10
13.44000	0.39750	1493043.	12554.	-258.1609	3.794E+10
13.72000	0.37815	1533766.	11669.	-268.6343	3.792E+10
14.00000	0.35925	1571456.	10751.	-277.3083	3.790E+10
14.28000	0.34082	1606016.	9809.	-283.5655	3.789E+10
14.56000	0.32288	1637374.	8849.	-287.9748	3.787E+10
14.84000	0.30542	1665482.	7874.	-292.5196	3.786E+10
15.12000	0.28845	1690286.	6888.	-294.4600	3.785E+10
15.40000	0.27200	1711767.	5900.	-293.6350	3.784E+10
15.68000	0.25605	1729932.	4912.	-294.4975	3.783E+10
15.96000	0.24062	1744773.	3920.	-295.4893	3.782E+10
16.24000	0.22570	1756277.	2930.	-294.0709	3.781E+10
16.52000	0.21132	1764462.	1948.	-290.1470	3.781E+10
16.80000	0.19746	1769371.	984.50201	-283.6536	3.781E+10
17.08000	0.18413	1771078.	46.69604	-274.5642	3.781E+10

17.36000	0.17132	1769685.	-856.2408	-262.8981	3.781E+10
17.64000	0.15905	1765324.	-1729.	-256.7149	3.781E+10
17.92000	0.14730	1758065.	-2592.	-257.0714	3.781E+10
18.20000	0.13608	1747903.	-3455.	-256.3044	3.782E+10
18.48000	0.12538	1734848.	-4313.	-254.4082	3.782E+10
18.76000	0.11520	1718921.	-5163.	-251.3869	3.783E+10
19.04000	0.10553	1700156.	-6000.	-247.2545	3.784E+10
19.32000	0.09637	1678599.	-6822.	-242.0352	3.785E+10
19.60000	0.08771	1654310.	-7628.	-237.4193	3.786E+10
19.88000	0.07954	1627341.	-8421.	-234.9158	3.787E+10
20.16000	0.07186	1597719.	-9205.	-231.6248	3.789E+10
20.44000	0.06465	1565483.	-9976.	-227.5545	3.791E+10
20.72000	0.05791	1530677.	-10733.	-222.7168	3.792E+10
21.00000	0.05162	1493357.	-11472.	-217.1276	3.794E+10
21.28000	0.04578	1453586.	-12191.	-210.8069	3.796E+10
21.56000	0.04037	1411435.	-12887.	-203.7786	3.798E+10
21.84000	0.03538	1366983.	-13559.	-196.0703	3.800E+10
22.12000	0.03080	1320318.	-14204.	-187.7136	3.802E+10
22.40000	0.02661	1271534.	-14819.	-178.7436	3.804E+10
22.68000	0.02280	1220731.	-15404.	-169.1991	3.807E+10
22.96000	0.01935	1168019.	-15956.	-159.1223	3.809E+10
23.24000	0.01624	1113510.	-16473.	-148.5578	3.812E+10
23.52000	0.01347	1057323.	-16950.	-135.9253	3.814E+10
23.80000	0.01100	999603.	-17369.	-113.2867	3.817E+10
24.08000	0.008836	940603.	-17715.	-92.7588	3.820E+10
24.36000	0.006947	880556.	-17996.	-74.3316	3.822E+10
24.64000	0.005319	819670.	-18218.	-57.9780	3.825E+10
24.92000	0.003932	758129.	-18389.	-43.6536	3.828E+10
25.20000	0.002769	696096.	-19843.	-821.7740	3.831E+10
25.48000	0.001811	624785.	-22678.	-866.0522	3.834E+10
25.76000	0.001037	543697.	-25585.	-863.8356	3.916E+10
26.04000	0.000419	452856.	-28341.	-776.9447	4.212E+10
26.32000	-7.668E-05	353244.	-29211.	259.49322	8.611E+10
26.60000	-0.000526	256561.	-27079.	1009.	8.611E+10
26.88000	-0.000942	171274.	-23240.	1275.	8.611E+10
27.16000	-0.001336	100387.	-18562.	1509.	8.611E+10
27.44000	-0.001716	46541.	-13115.	1732.	8.611E+10
27.72000	-0.002090	12253.	-6926.	1952.	8.611E+10
28.00000	-0.002463	0.000	0.000	2171.	8.611E+10

Output Summary for Load Case No. 1:

Pile-head deflection = 1.61440766 inches
Computed slope at pile head = -0.0081170 radians

Maximum bending moment = 1771078. inch-lbs
Maximum shear force = -29211. lbs
Depth of maximum bending moment = 17.08000000 feet below pile head
Depth of maximum shear force = 26.32000000 feet below pile head
Number of iterations = 22
Number of zero deflection points = 1
Pile deflection at ground = 0.70981790 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
57.12	1.25
60.48	9.05
63.84	17.78
67.20	26.52
70.56	35.26
73.92	43.99
77.28	52.73
80.64	61.46
84.00	70.20
87.36	78.94
90.72	87.67
94.08	96.41
97.44	105.14
100.80	113.88
104.16	122.62
107.52	131.35
110.88	140.09
114.24	62.71

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.23
3.36	8.90
6.72	17.81
10.08	26.71
13.44	35.62
16.80	44.52
20.16	53.42
23.52	62.33
26.88	71.23
30.24	80.14
33.60	89.04
36.96	97.94
40.32	106.85
43.68	115.75
47.04	124.66
50.40	133.56
53.76	142.46
57.12	150.70
60.48	155.48
63.84	159.75
67.20	164.02
70.56	168.30
73.92	172.57
77.28	176.84
80.64	181.12
84.00	185.39
87.36	189.67
90.72	193.94
94.08	198.21
97.44	202.49
100.80	206.76
104.16	211.03
107.52	215.31
110.88	219.58
114.24	95.41

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.62808	2.286E-05	-1.215E-07	0.000	2.076E+10
0.28000	2.58526	18.84803	28.04760	0.000	2.076E+10
0.56000	2.54245	188.47992	95.36184	0.000	2.076E+10
0.84000	2.49963	659.67960	207.55224	0.000	2.076E+10
1.12000	2.45681	1583.	364.61880	0.000	2.076E+10
1.40000	2.41399	3110.	566.56152	0.000	2.076E+10
1.68000	2.37118	5391.	813.38040	0.000	2.076E+10
1.96000	2.32837	8576.	1105.	0.000	2.076E+10
2.24000	2.28556	12817.	1442.	0.000	2.076E+10
2.52000	2.24276	18264.	1823.	0.000	2.076E+10
2.80000	2.19997	25068.	2249.	0.000	2.076E+10
3.08000	2.15719	33380.	2721.	0.000	2.076E+10
3.36000	2.11443	43350.	3237.	0.000	2.076E+10
3.64000	2.07170	55130.	3798.	0.000	2.076E+10
3.92000	2.02899	68871.	4403.	0.000	2.076E+10
4.20000	1.98633	84722.	5054.	0.000	2.076E+10
4.48000	1.94370	102835.	5750.	0.000	2.076E+10
4.76000	1.90114	123360.	6491.	0.000	2.076E+10
5.04000	1.85864	146452.	7280.	0.000	2.076E+10
5.32000	1.81622	172278.	8119.	0.000	2.076E+10
5.60000	1.77390	201011.	9009.	0.000	2.076E+10
5.88000	1.73168	232821.	9951.	0.000	2.076E+10
6.16000	1.68959	267879.	10943.	0.000	2.076E+10
6.44000	1.64765	306356.	11986.	0.000	2.076E+10
6.72000	1.60587	348423.	13080.	0.000	2.076E+10
7.00000	1.56428	394251.	14224.	0.000	2.076E+10
7.28000	1.52291	444011.	15420.	0.000	2.076E+10
7.56000	1.48178	497874.	16667.	0.000	2.076E+10
7.84000	1.44092	556011.	17964.	0.000	2.076E+10

8.12000	1.40036	618593.	19313.	0.000	2.076E+10
8.40000	1.36014	685791.	20712.	0.000	2.076E+10
8.68000	1.32029	757776.	22162.	0.000	2.076E+10
8.96000	1.28085	834719.	23663.	0.000	2.076E+10
9.24000	1.24187	916792.	25215.	0.000	2.076E+10
9.52000	1.20339	1004164.	26347.	-1.4557	3.817E+10
9.80000	1.16520	1093843.	26651.	-23.1785	3.813E+10
10.08000	1.12734	1183261.	26533.	-47.1151	3.809E+10
10.36000	1.08983	1272147.	26332.	-72.8423	3.804E+10
10.64000	1.05269	1360211.	26042.	-99.8221	3.800E+10
10.92000	1.01596	1447148.	25660.	-127.5161	3.796E+10
11.20000	0.97966	1532645.	25184.	-155.5576	3.792E+10
11.48000	0.94382	1616385.	24615.	-183.4995	3.788E+10
11.76000	0.90845	1698055.	23951.	-211.4391	3.784E+10
12.04000	0.87360	1777337.	23201.	-235.1812	3.780E+10
12.32000	0.83927	1853964.	22376.	-255.7427	3.777E+10
12.60000	0.80550	1927704.	21485.	-274.8594	3.773E+10
12.88000	0.77231	1998341.	20530.	-293.6020	3.769E+10
13.16000	0.73971	2065663.	19516.	-309.9384	3.766E+10
13.44000	0.70774	2129486.	18451.	-323.6218	3.763E+10
13.72000	0.67640	2189655.	17343.	-336.2145	3.760E+10
14.00000	0.64572	2246029.	16196.	-346.6455	3.757E+10
14.28000	0.61571	2298489.	15018.	-354.3171	3.754E+10
14.56000	0.58640	2346950.	13817.	-360.2849	3.752E+10
14.84000	0.55779	2391342.	12594.	-367.9425	3.750E+10
15.12000	0.52991	2431581.	11349.	-372.9402	3.748E+10
15.40000	0.50275	2467609.	10093.	-375.1184	3.746E+10
15.68000	0.47634	2499403.	8824.	-380.2371	3.744E+10
15.96000	0.45068	2526904.	7536.	-386.3114	3.743E+10
16.24000	0.42579	2550043.	6231.	-390.0823	3.742E+10
16.52000	0.40166	2568779.	4919.	-391.4087	3.741E+10
16.80000	0.37831	2583096.	3606.	-390.0026	3.740E+10
17.08000	0.35574	2593009.	2303.	-385.5237	3.739E+10
17.36000	0.33395	2598571.	1020.	-377.8446	3.739E+10
17.64000	0.31295	2599866.	-245.1731	-375.4687	3.739E+10
17.92000	0.29273	2596923.	-1514.	-379.8240	3.739E+10
18.20000	0.27329	2589692.	-2795.	-382.7644	3.740E+10
18.48000	0.25464	2578139.	-4084.	-384.2517	3.740E+10
18.76000	0.23677	2562249.	-5375.	-384.2571	3.741E+10
19.04000	0.21967	2542020.	-6663.	-382.7624	3.742E+10
19.32000	0.20333	2517470.	-7945.	-379.7602	3.743E+10
19.60000	0.18776	2488633.	-9216.	-377.1337	3.745E+10
19.88000	0.17293	2455538.	-10483.	-376.6922	3.747E+10
20.16000	0.15885	2418190.	-11746.	-375.1894	3.748E+10

20.44000	0.14549	2376607.	-13002.	-372.6212	3.750E+10
20.72000	0.13285	2330817.	-14248.	-368.9863	3.753E+10
21.00000	0.12091	2280861.	-15480.	-364.2865	3.755E+10
21.28000	0.10966	2226792.	-16694.	-358.5257	3.758E+10
21.56000	0.09907	2168676.	-17887.	-351.7100	3.761E+10
21.84000	0.08914	2106589.	-19056.	-343.8463	3.764E+10
22.12000	0.07983	2040621.	-20196.	-334.9417	3.767E+10
22.40000	0.07114	1970871.	-21305.	-325.0025	3.771E+10
22.68000	0.06304	1897452.	-22379.	-314.0322	3.775E+10
22.96000	0.05551	1820487.	-23414.	-302.0295	3.778E+10
23.24000	0.04852	1740113.	-24406.	-288.9856	3.782E+10
23.52000	0.04205	1656476.	-25354.	-274.8800	3.786E+10
23.80000	0.03607	1569736.	-26252.	-259.6752	3.790E+10
24.08000	0.03057	1480064.	-27097.	-243.3087	3.795E+10
24.36000	0.02550	1387646.	-27885.	-225.6804	3.799E+10
24.64000	0.02084	1292679.	-28611.	-206.6329	3.803E+10
24.92000	0.01657	1195380.	-29267.	-183.9667	3.808E+10
25.20000	0.01265	1096004.	-31595.	-1201.	3.813E+10
25.48000	0.009059	983064.	-35789.	-1295.	3.818E+10
25.76000	0.005757	855503.	-40192.	-1326.	3.823E+10
26.04000	0.002707	712971.	-44501.	-1239.	3.830E+10
26.32000	-0.000132	556456.	-45831.	447.09007	3.884E+10
26.60000	-0.002810	404988.	-42503.	1534.	8.611E+10
26.88000	-0.005435	270836.	-36607.	1976.	8.611E+10
27.16000	-0.008024	158992.	-29318.	2362.	8.611E+10
27.44000	-0.0106	73820.	-20763.	2730.	8.611E+10
27.72000	-0.0132	19466.	-10985.	3090.	8.611E+10
28.00000	-0.0157	0.000	0.000	3449.	8.611E+10

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     2.62808211 inches
Computed slope at pile head      =     -0.0127434 radians
Maximum bending moment           =       2599866. inch-lbs
Maximum shear force              =        -45831. lbs
Depth of maximum bending moment  =    17.64000000 feet below pile head
Depth of maximum shear force     =    26.32000000 feet below pile head
Number of iterations             =             24
Number of zero deflection points =              1
Pile deflection at ground        =     1.20613634 inches
```

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	1.6144077	1771078.	-29211.	-0.008117
2	2.6280821	2599866.	-45831.	-0.012743

Maximum pile-head deflection = 2.6280821085 inches
Maximum pile-head rotation = -0.0127434333 radians = -0.730145 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	5810038.	633766.	Pass
	2	1.00	7274029.	1771078.	Pass
2	1	1.00	5810038.	916792.	Pass
	2	1.00	7274029.	2599866.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	184530.	18069.	Pass
	2	1.00	184530.	-29211.	Pass
2	1	1.00	184530.	25215.	Pass
	2	1.00	184530.	-45831.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -45830.76 lbs
Factored Shear Capacity at Node = 184530.00 lbs
Fraction of Allowable Shear Capacity = 0.2484

The analysis ended normally.

==

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1222.96 Pile 3.lp12d

Name of the output report file:
BEL-70 1222.96 Pile 3.lp12o

Name of the plot output file:
BEL-70 1222.96 Pile 3.lp12p

Name of the runtime message file:
BEL-70 1222.96 Pile 3.lp12r

Date and Time of Analysis

Date: June 21, 2026 Time: 11:42:46

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1222+96 Piles 3 - 15' Ht.(6.00' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 33.500 ft
Depth of ground surface below top of pile = 15.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	12.9000
2	15.000	12.9000
3	15.000	30.0000
4	33.500	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 15.000000 ft
   AISC Section Type = W

   AISC Section Name = W24X146

   Pile width = 12.900000 in
   Shear capacity of section = 420360. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 18.500000 ft
   Section Diameter = 30.000000 in
   Shear capacity of section = 420360. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 15.000000 ft
   Distance from top of pile to bottom of layer = 25.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	25.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 16.500 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	7.50	238.50
3	15.00	352.98

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	7.50	0.00
2	15.00	234.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	15.000000 ft
Flange Width	=	12.900000 in
Section Depth	=	24.700000 in
Flange Thickness	=	1.090000 in
Web Thickness	=	0.650000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	43.000000 sq. in.
Moment of Inertia	=	4580. in^4
Elastic Bending Stiffness	=	132820000. kip-in^2
Plastic Modulus, Z	=	418.000000in^3

Plastic Moment Capacity = Fy Z = 20900.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 2150.000 kips
Nominal Axial Tensile Capacity = -2150.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	747.2352199762	131548563.	12.3500000000	
0.0000113606	1494.	131548563.	12.3500000000	
0.0000170409	2242.	131548563.	12.3500000000	
0.0000227212	2989.	131548563.	12.3500000000	
0.0000284015	3736.	131548563.	12.3500000000	
0.0000340818	4483.	131548563.	12.3500000000	
0.0000397621	5231.	131548563.	12.3500000000	
0.0000454424	5978.	131548563.	12.3500000000	
0.0000511227	6725.	131548563.	12.3500000000	
0.0000568030	7472.	131548563.	12.3500000000	
0.0000624833	8220.	131548563.	12.3500000000	
0.0000681636	8967.	131548563.	12.3500000000	
0.0000738439	9714.	131548563.	12.3500000000	
0.0000795242	10461.	131548563.	12.3500000000	
0.0000852045	11209.	131548563.	12.3500000000	

0.0000908848	11956.	131548563.	12.3500000000	
0.0000965651	12703.	131548563.	12.3500000000	
0.0001022454	13450.	131548563.	12.3500000000	
0.0001079257	14197.	131548563.	12.3500000000	
0.0001136060	14945.	131548563.	12.3500000000	
0.0001192863	15692.	131548563.	12.3500000000	
0.0001249666	16439.	131548563.	12.3500000000	
0.0001306469	17186.	131548563.	12.3500000000	
0.0001363272	17934.	131548563.	12.3500000000	
0.0001420075	18654.	131355772.	12.3500000000	Y
0.0001476878	19125.	129498378.	12.3500000000	Y
0.0001533681	19341.	126109474.	12.3500000000	Y
0.0001590484	19437.	122209265.	12.3500000000	Y
0.0001647287	19524.	118520493.	12.3500000000	Y
0.0001704090	19601.	115024731.	12.3500000000	Y
0.0001760893	19672.	111715442.	12.3500000000	Y
0.0001817696	19736.	108576232.	12.3500000000	Y
0.0001874499	19794.	105595295.	12.3500000000	Y
0.0001931302	19847.	102764220.	12.3500000000	Y
0.0001988105	19895.	100072629.	12.3500000000	Y
0.0002044908	19940.	97511170.	12.3500000000	Y
0.0002101711	19981.	95071381.	12.3500000000	Y
0.0002158514	20019.	92745569.	12.3500000000	Y
0.0002215317	20054.	90526548.	12.3500000000	Y
0.0002328923	20116.	86376759.	12.3500000000	Y
0.0002442529	20171.	82581534.	12.3500000000	Y
0.0002556135	20218.	79094155.	12.3500000000	Y
0.0002669741	20258.	75881674.	12.3500000000	Y
0.0002783347	20295.	72914164.	12.3500000000	Y
0.0002896953	20327.	70165142.	12.3500000000	Y
0.0003010559	20355.	67611954.	12.3500000000	Y
0.0003124165	20381.	65235075.	12.3500000000	Y
0.0003237771	20403.	63016840.	12.3500000000	Y
0.0003351377	20424.	60940788.	12.3500000000	Y
0.0003464983	20442.	58996066.	12.3500000000	Y
0.0003578589	20459.	57171239.	12.3500000000	Y
0.0003692195	20474.	55452124.	12.3500000000	Y
0.0003805801	20488.	53833914.	12.3500000000	Y
0.0003919407	20501.	52305498.	12.3500000000	Y
0.0004033013	20512.	50861280.	12.3500000000	Y
0.0004146619	20523.	49493288.	12.3500000000	Y
0.0004260225	20533.	48197176.	12.3500000000	Y
0.0004373831	20542.	46965429.	12.3500000000	Y
0.0004487437	20551.	45796048.	12.3500000000	Y

0.0004601043	20558.	44681519.	12.3500000000	Y
0.0004714648	20565.	43620240.	12.3500000000	Y
0.0004828254	20572.	42608550.	12.3500000000	Y
0.0004941860	20578.	41640974.	12.3500000000	Y
0.0005055466	20584.	40716884.	12.3500000000	Y
0.0005169072	20590.	39833413.	12.3500000000	Y
0.0005282678	20595.	38985744.	12.3500000000	Y
0.0005396284	20600.	38173738.	12.3500000000	Y
0.0005509890	20604.	37395216.	12.3500000000	Y
0.0005623496	20609.	36647530.	12.3500000000	Y
0.0005737102	20612.	35928305.	12.3500000000	Y
0.0005850708	20616.	35237011.	12.3500000000	Y
0.0005964314	20620.	34572052.	12.3500000000	Y
0.0006077920	20624.	33931851.	12.3500000000	Y
0.0006191526	20626.	33313864.	12.3500000000	Y
0.0006305132	20629.	32718146.	12.3500000000	Y
0.0006418738	20632.	32143516.	12.3500000000	Y
0.0006532344	20635.	31588873.	12.3500000000	Y
0.0006645950	20638.	31053192.	12.3500000000	Y
0.0006759556	20640.	30534482.	12.3500000000	Y
0.0007213980	20649.	28622949.	12.3500000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	20649.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	18.500000	ft
Outside Diameter of Casing	=	30.000000	in
Casing Wall Thickness	=	0.0000	in
Moment of Inertia of Steel Casing	=	0.0000	in^4
Width Flange of Core/Insert	=	12.900000	in
Depth of Core/Insert	=	24.700000	in
Flange Thickness of Core/Insert	=	1.090000	in
Web Thickness of Core/Insert	=	0.650000	in
Moment of Inertia of Steel Core/Insert	=	4540.	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Yield Stress of Core/Insert	=	50000.	psi
Elastic Modulus of Core/Insert	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Gross Area of Pile	=	706.858347	sq. in.
Area of Concrete	=	664.098347	sq. in.
Cross-sectional Area of Steel Casing	=	0.0000	sq. in.
Cross-sectional Area of Steel Core/Insert	=	42.760000	sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	42.760000	sq. in.
Area Ratio of All Steel to Gross Area	=	6.05	percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	4395.934	kips
Tensile Load for Cracking of Concrete	=	-419.269	kips
Nominal Axial Tensile Capacity	=	-2138.000	kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	1583.	278749290.	15.0000000000	
0.0000113606	1995.	175633799.	11.4700376517	C
0.0000170409	2987.	175290831.	11.4903947159	C
0.0000227212	3975.	174944178.	11.5110091803	C
0.0000284015	4959.	174593753.	11.5318877466	C
0.0000340818	5938.	174239477.	11.5528650295	C
0.0000397621	6914.	173881366.	11.5739195974	C
0.0000454424	7885.	173519267.	11.5952530287	C
0.0000511227	8852.	173153080.	11.6168727306	C
0.0000568030	9815.	172782702.	11.6387864167	C
0.0000624833	10773.	172408023.	11.6611508574	C
0.0000681636	11726.	172028932.	11.6836759884	C
0.0000738439	12675.	171645310.	11.7065184576	C
0.0000795242	13619.	171257036.	11.7296875590	C
0.0000852045	14558.	170863981.	11.7531930032	C
0.0000908848	15493.	170466011.	11.7770449427	C
0.0000965651	16422.	170062988.	11.8012539997	C
0.0001022454	17346.	169654764.	11.8258312957	C
0.0001079257	18265.	169241201.	11.8506729578	C
0.0001136060	19146.	168528854.	11.8657162873	CY
0.0001192863	19688.	165051155.	11.7831221916	CY
0.0001249666	19974.	159837661.	11.6345471858	CY
0.0001306469	20235.	154882963.	11.4914273834	CY
0.0001363272	20473.	150171821.	11.3528021855	CY
0.0001420075	20691.	145703492.	11.2198887082	CY
0.0001476878	20891.	141455748.	11.0905126321	CY
0.0001533681	21077.	137428277.	10.9671004316	CY
0.0001590484	21248.	133597374.	10.8466378179	CY

0.0001647287	21408.	129958962.	10.7311207800	CY
0.0001704090	21557.	126498799.	10.6198466747	CY
0.0001760893	21695.	123203066.	10.5113780281	CY
0.0001817696	21825.	120067246.	10.4075455808	CY
0.0001874499	21946.	117076184.	10.3069067841	CY
0.0001931302	22060.	114221188.	10.2089751569	CY
0.0001988105	22167.	111498742.	10.1152239831	CY
0.0002044908	22269.	108897792.	10.0245487456	CY
0.0002101711	22363.	106404988.	9.9355197038	CY
0.0002158514	22453.	104022139.	9.8500086678	CY
0.0002215317	22539.	101742887.	9.7678691320	CY
0.0002328923	22696.	97452346.	9.6081098129	CY
0.0002442529	22839.	93506579.	9.4593126659	CY
0.0002556135	22968.	89855412.	9.3169915438	CY
0.0002669741	23084.	86466069.	9.1861558392	CY
0.0002783347	23188.	83310946.	9.0628252609	CY
0.0002896953	23272.	80332334.	8.9610384517	CY
0.0003010559	23350.	77560708.	8.8650098337	CY
0.0003124165	23408.	74926899.	8.7885295691	CY
0.0003237771	23461.	72461308.	8.7169348751	CY
0.0003351377	23503.	70129669.	8.6604519306	CY
0.0003464983	23534.	67920832.	8.6184406028	CY
0.0003578589	23563.	65843636.	8.5795168797	CY
0.0003692195	23581.	63866574.	8.5544495665	CY
0.0003805801	23598.	62004152.	8.5298959773	CY
0.0003919407	23612.	60243004.	8.5059914286	CY
0.0004033013	23625.	58578531.	8.4850158121	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	23625.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the

LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	15.0000	0.00	N.A.	No	0.00	65292.
2	25.0000	10.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
88.44	0.07
92.46	6.40
96.48	16.85

100.50	27.30
104.52	37.75
108.54	48.20
112.56	58.66
116.58	69.11
120.60	79.56
124.62	90.01
128.64	100.46
132.66	110.92
136.68	121.37
140.70	131.82
144.72	142.27
148.74	152.72
152.76	163.18
156.78	173.63
160.80	184.08
164.82	194.53
168.84	204.98
172.86	215.44
176.88	225.89
180.90	64.21

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.66
4.02	10.65
8.04	21.31
12.06	31.96
16.08	42.61
20.10	53.27
24.12	63.92
28.14	74.57
32.16	85.22
36.18	95.88

40.20	106.53
44.22	117.18
48.24	127.84
52.26	138.49
56.28	149.14
60.30	159.79
64.32	170.45
68.34	181.10
72.36	191.75
76.38	202.41
80.40	213.06
84.42	223.71
88.44	234.33
92.46	241.63
96.48	246.74
100.50	251.86
104.52	256.97
108.54	262.08
112.56	267.20
116.58	272.31
120.60	277.42
124.62	282.54
128.64	287.65
132.66	292.76
136.68	297.88
140.70	302.99
144.72	308.10
148.74	313.22
152.76	318.33
156.78	323.44
160.80	328.56
164.82	333.67
168.84	338.78
172.86	343.90
176.88	349.01
180.90	97.27

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.74389	1.084E-05	0.000	0.000	1.315E+11
0.33500	1.71704	21.51963	26.76567	0.000	1.315E+11
0.67000	1.69019	215.19596	91.00325	0.000	1.315E+11
1.00500	1.66335	753.18579	198.06590	0.000	1.315E+11
1.34000	1.63650	1808.	347.95361	0.000	1.315E+11
1.67500	1.60965	3551.	540.66638	0.000	1.315E+11
2.01000	1.58281	6155.	776.20421	0.000	1.315E+11
2.34500	1.55596	9791.	1055.	0.000	1.315E+11
2.68000	1.52912	14633.	1376.	0.000	1.315E+11
3.01500	1.50228	20852.	1740.	0.000	1.315E+11
3.35000	1.47544	28621.	2147.	0.000	1.315E+11
3.68500	1.44860	38111.	2596.	0.000	1.315E+11
4.02000	1.42177	49495.	3089.	0.000	1.315E+11
4.35500	1.39494	62945.	3624.	0.000	1.315E+11
4.69000	1.36813	78633.	4202.	0.000	1.315E+11
5.02500	1.34132	96731.	4823.	0.000	1.315E+11
5.36000	1.31452	117411.	5487.	0.000	1.315E+11
5.69500	1.28774	140846.	6194.	0.000	1.315E+11
6.03000	1.26098	167207.	6943.	0.000	1.315E+11
6.36500	1.23423	196668.	7735.	0.000	1.315E+11
6.70000	1.20751	229399.	8570.	0.000	1.315E+11
7.03500	1.18082	265573.	9448.	0.000	1.315E+11
7.37000	1.15416	305363.	10369.	0.000	1.315E+11
7.70500	1.12754	348941.	11339.	0.000	1.315E+11
8.04000	1.10096	396527.	12367.	0.000	1.315E+11
8.37500	1.07443	448372.	13458.	0.000	1.315E+11
8.71000	1.04796	504729.	14612.	0.000	1.315E+11
9.04500	1.02154	565849.	15828.	0.000	1.315E+11
9.38000	0.99520	631983.	17106.	0.000	1.315E+11
9.71500	0.96894	703383.	18447.	0.000	1.315E+11
10.05000	0.94276	780300.	19851.	0.000	1.315E+11
10.38500	0.91667	862986.	21318.	0.000	1.315E+11
10.72000	0.89070	951693.	22847.	0.000	1.315E+11
11.05500	0.86484	1046672.	24438.	0.000	1.315E+11

11.39000	0.83910	1148175.	26092.	0.000	1.315E+11
11.72500	0.81351	1256453.	27809.	0.000	1.315E+11
12.06000	0.78808	1371757.	29588.	0.000	1.315E+11
12.39500	0.76281	1494340.	31430.	0.000	1.315E+11
12.73000	0.73773	1624452.	33334.	0.000	1.315E+11
13.06500	0.71284	1762346.	35301.	0.000	1.315E+11
13.40000	0.68817	1908273.	37331.	0.000	1.315E+11
13.73500	0.66374	2062484.	39423.	0.000	1.315E+11
14.07000	0.63956	2225232.	41577.	0.000	1.315E+11
14.40500	0.61565	2396766.	43795.	0.000	1.315E+11
14.74000	0.59204	2577340.	46074.	0.000	1.315E+11
15.07500	0.56874	2767204.	47544.	-5.3863	1.753E+11
15.41000	0.54570	2959591.	47796.	-30.6128	1.753E+11
15.74500	0.52293	3151483.	47619.	-57.2786	1.752E+11
16.08000	0.50046	3342450.	47334.	-84.7620	1.751E+11
16.41500	0.47829	3532047.	46937.	-112.6122	1.751E+11
16.75000	0.45644	3719824.	46428.	-140.4116	1.750E+11
17.08500	0.43495	3905332.	45810.	-167.4966	1.750E+11
17.42000	0.41381	4088133.	45084.	-193.3455	1.749E+11
17.75500	0.39305	4267809.	44257.	-218.0990	1.748E+11
18.09000	0.37268	4443961.	43334.	-241.1037	1.748E+11
18.42500	0.35272	4616217.	42323.	-261.7655	1.747E+11
18.76000	0.33319	4784242.	41235.	-279.7690	1.746E+11
19.09500	0.31411	4947746.	40074.	-297.8609	1.746E+11
19.43000	0.29548	5106437.	38846.	-313.1865	1.745E+11
19.76500	0.27733	5260066.	37562.	-325.4383	1.745E+11
20.10000	0.25966	5408436.	36234.	-335.2777	1.744E+11
20.43500	0.24249	5551388.	34868.	-344.1420	1.744E+11
20.77000	0.22584	5688779.	33474.	-349.8296	1.743E+11
21.10500	0.20971	5820516.	32063.	-352.1675	1.743E+11
21.44000	0.19413	5946562.	30646.	-352.4803	1.742E+11
21.77500	0.17910	6066911.	29234.	-350.2988	1.742E+11
22.11000	0.16462	6181600.	27837.	-344.3685	1.741E+11
22.44500	0.15073	6290724.	26473.	-334.5968	1.741E+11
22.78000	0.13741	6394440.	25142.	-327.3986	1.741E+11
23.11500	0.12469	6492866.	23845.	-318.0923	1.740E+11
23.45000	0.11258	6586151.	22591.	-305.4752	1.740E+11
23.78500	0.10107	6674499.	21395.	-289.6412	1.740E+11
24.12000	0.09019	6758167.	20269.	-270.7733	1.739E+11
24.45500	0.07993	6837458.	19224.	-249.1560	1.739E+11
24.79000	0.07031	6912724.	18270.	-225.1874	1.739E+11
25.12500	0.06133	6984350.	13842.	-1978.	1.739E+11
25.46000	0.05300	7024011.	5360.	-2242.	1.738E+11
25.79500	0.04533	7027447.	-4124.	-2477.	1.738E+11

26.13000	0.03830	6990852.	-14497.	-2683.	1.738E+11
26.46500	0.03193	6910895.	-25636.	-2859.	1.739E+11
26.80000	0.02620	6784742.	-37413.	-3001.	1.739E+11
27.13500	0.02110	6610092.	-49693.	-3108.	1.740E+11
27.47000	0.01661	6385210.	-62329.	-3178.	1.741E+11
27.80500	0.01272	6108966.	-75163.	-3207.	1.742E+11
28.14000	0.009388	5780896.	-88020.	-3190.	1.743E+11
28.47500	0.006597	5401281.	-100701.	-3119.	1.744E+11
28.81000	0.004306	4971263.	-112964.	-2982.	1.746E+11
29.14500	0.002475	4493054.	-124489.	-2752.	1.747E+11
29.48000	0.001060	3970370.	-134749.	-2352.	1.749E+11
29.81500	1.199E-05	3409675.	-139631.	-77.0029	1.751E+11
30.15000	-0.000722	2847734.	-135032.	2365.	1.753E+11
30.48500	-0.001193	2324014.	-124628.	2811.	1.755E+11
30.82000	-0.001450	1845724.	-112771.	3088.	1.985E+11
31.15500	-0.001557	1417336.	-99967.	3282.	2.787E+11
31.49000	-0.001582	1041987.	-86468.	3434.	2.787E+11
31.82500	-0.001546	722133.	-72424.	3553.	2.787E+11
32.16000	-0.001469	459697.	-57957.	3644.	2.787E+11
32.49500	-0.001364	256155.	-43171.	3712.	2.787E+11
32.83000	-0.001245	112605.	-28411.	3631.	2.787E+11
33.16500	-0.001120	27730.	-14006.	3536.	2.787E+11
33.50000	-0.000993	0.000	0.000	3432.	2.787E+11

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     1.74388546 inches
Computed slope at pile head      =     -0.0066783 radians
Maximum bending moment           =       7027447. inch-lbs
Maximum shear force              =       -139631. lbs
Depth of maximum bending moment  =    25.79500000 feet below pile head
Depth of maximum shear force     =    29.81500000 feet below pile head
Number of iterations             =             27
Number of zero deflection points =              1
Pile deflection at ground        =     0.57395845 inches
```

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
88.44	0.07
92.46	6.40
96.48	16.85
100.50	27.30
104.52	37.75
108.54	48.20
112.56	58.66
116.58	69.11
120.60	79.56
124.62	90.01
128.64	100.46
132.66	110.92
136.68	121.37
140.70	131.82
144.72	142.27
148.74	152.72
152.76	163.18
156.78	173.63
160.80	184.08
164.82	194.53
168.84	204.98
172.86	215.44
176.88	225.89
180.90	64.21

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.66
4.02	10.65
8.04	21.31
12.06	31.96

16.08	42.61
20.10	53.27
24.12	63.92
28.14	74.57
32.16	85.22
36.18	95.88
40.20	106.53
44.22	117.18
48.24	127.84
52.26	138.49
56.28	149.14
60.30	159.79
64.32	170.45
68.34	181.10
72.36	191.75
76.38	202.41
80.40	213.06
84.42	223.71
88.44	234.33
92.46	241.63
96.48	246.74
100.50	251.86
104.52	256.97
108.54	262.08
112.56	267.20
116.58	272.31
120.60	277.42
124.62	282.54
128.64	287.65
132.66	292.76
136.68	297.88
140.70	302.99
144.72	308.10
148.74	313.22
152.76	318.33
156.78	323.44
160.80	328.56
164.82	333.67
168.84	338.78
172.86	343.90
176.88	349.01
180.90	97.27

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.79405	-5.784E-05	0.000	0.000	1.315E+11
0.33500	2.75218	32.27939	40.14850	0.000	1.315E+11
0.67000	2.71031	322.79389	136.50488	0.000	1.315E+11
1.00500	2.66844	1130.	297.09885	0.000	1.315E+11
1.34000	2.62657	2711.	521.93042	0.000	1.315E+11
1.67500	2.58470	5326.	810.99958	0.000	1.315E+11
2.01000	2.54283	9232.	1164.	0.000	1.315E+11
2.34500	2.50097	14687.	1582.	0.000	1.315E+11
2.68000	2.45910	21950.	2064.	0.000	1.315E+11
3.01500	2.41724	31279.	2610.	0.000	1.315E+11
3.35000	2.37538	42932.	3220.	0.000	1.315E+11
3.68500	2.33353	57167.	3894.	0.000	1.315E+11
4.02000	2.29168	74243.	4633.	0.000	1.315E+11
4.35500	2.24984	94417.	5436.	0.000	1.315E+11
4.69000	2.20802	117949.	6303.	0.000	1.315E+11
5.02500	2.16621	145096.	7235.	0.000	1.315E+11
5.36000	2.12442	176116.	8230.	0.000	1.315E+11
5.69500	2.08264	211269.	9290.	0.000	1.315E+11
6.03000	2.04090	250811.	10415.	0.000	1.315E+11
6.36500	1.99918	295001.	11603.	0.000	1.315E+11
6.70000	1.95751	344098.	12856.	0.000	1.315E+11
7.03500	1.91587	398360.	14172.	0.000	1.315E+11
7.37000	1.87428	458045.	15554.	0.000	1.315E+11
7.70500	1.83275	523411.	17002.	0.000	1.315E+11
8.04000	1.79128	594737.	18521.	0.000	1.315E+11
8.37500	1.74989	672317.	20113.	0.000	1.315E+11
8.71000	1.70858	756443.	21778.	0.000	1.315E+11
9.04500	1.66736	847409.	23515.	0.000	1.315E+11

9.38000	1.62625	945507.	25326.	0.000	1.315E+11
9.71500	1.58525	1051029.	27209.	0.000	1.315E+11
10.05000	1.54438	1164269.	29166.	0.000	1.315E+11
10.38500	1.50365	1285520.	31195.	0.000	1.315E+11
10.72000	1.46309	1415075.	33297.	0.000	1.315E+11
11.05500	1.42269	1553225.	35471.	0.000	1.315E+11
11.39000	1.38249	1700265.	37719.	0.000	1.315E+11
11.72500	1.34250	1856487.	40040.	0.000	1.315E+11
12.06000	1.30273	2022184.	42433.	0.000	1.315E+11
12.39500	1.26321	2197649.	44899.	0.000	1.315E+11
12.73000	1.22396	2383174.	47438.	0.000	1.315E+11
13.06500	1.18501	2579053.	50050.	0.000	1.315E+11
13.40000	1.14637	2785578.	52735.	0.000	1.315E+11
13.73500	1.10807	3003043.	55493.	0.000	1.315E+11
14.07000	1.07015	3231739.	58323.	0.000	1.315E+11
14.40500	1.03262	3471961.	61226.	0.000	1.315E+11
14.74000	0.99551	3724000.	64203.	0.000	1.315E+11
15.07500	0.95887	3988151.	66118.	-6.4385	1.749E+11
15.41000	0.92259	4255592.	66454.	-36.5976	1.748E+11
15.74500	0.88671	4522442.	66243.	-68.4966	1.747E+11
16.08000	0.85124	4788186.	65901.	-101.4126	1.746E+11
16.41500	0.81622	5052290.	65427.	-134.6415	1.746E+11
16.75000	0.78166	5314219.	64820.	-167.5745	1.744E+11
17.08500	0.74760	5573439.	64081.	-199.6416	1.744E+11
17.42000	0.71405	5829433.	63217.	-230.2901	1.743E+11
17.75500	0.68105	6081706.	62232.	-259.6426	1.742E+11
18.09000	0.64861	6329782.	61134.	-287.0375	1.741E+11
18.42500	0.61675	6573220.	59930.	-311.8783	1.740E+11
18.76000	0.58551	6811618.	58632.	-333.8701	1.739E+11
19.09500	0.55490	7044621.	57244.	-356.3924	1.738E+11
19.43000	0.52494	7271864.	55772.	-376.0967	1.737E+11
19.76500	0.49566	7493029.	54227.	-392.6860	1.737E+11
20.10000	0.46708	7707848.	52620.	-406.6528	1.736E+11
20.43500	0.43922	7916096.	50960.	-419.3303	1.735E+11
20.77000	0.41209	8117567.	49256.	-428.4340	1.734E+11
21.10500	0.38572	8312114.	47523.	-433.7394	1.733E+11
21.44000	0.36012	8499652.	45771.	-437.7592	1.733E+11
21.77500	0.33532	8680115.	44007.	-439.8443	1.732E+11
22.11000	0.31133	8853471.	42243.	-437.7526	1.732E+11
22.44500	0.28816	9019752.	40497.	-431.2863	1.731E+11
22.78000	0.26584	9179064.	38768.	-428.6874	1.730E+11
23.11500	0.24437	9331447.	37055.	-423.8151	1.730E+11
23.45000	0.22377	9476982.	35369.	-414.9596	1.729E+11
23.78500	0.20406	9615811.	33726.	-402.0544	1.729E+11

24.12000	0.18525	9748142.	32144.	-385.1102	1.728E+11
24.45500	0.16736	9874250.	30638.	-364.2310	1.728E+11
24.79000	0.15038	9994472.	29223.	-339.6319	1.727E+11
25.12500	0.13434	10109205.	23704.	-2406.	1.727E+11
25.46000	0.11925	10185051.	13349.	-2745.	1.726E+11
25.79500	0.10511	10216532.	1687.	-3057.	1.726E+11
26.13000	0.09192	10198616.	-11170.	-3340.	1.726E+11
26.46500	0.07969	10126727.	-25104.	-3593.	1.727E+11
26.80000	0.06841	9996776.	-39994.	-3815.	1.727E+11
27.13500	0.05807	9805177.	-55709.	-4004.	1.728E+11
27.47000	0.04864	9548876.	-72113.	-4157.	1.729E+11
27.80500	0.04010	9225389.	-89059.	-4273.	1.730E+11
28.14000	0.03243	8832841.	-106389.	-4348.	1.732E+11
28.47500	0.02558	8370025.	-123925.	-4376.	1.733E+11
28.81000	0.01951	7836484.	-141466.	-4350.	1.735E+11
29.14500	0.01417	7232641.	-158765.	-4256.	1.738E+11
29.48000	0.009499	6560015.	-175499.	-4069.	1.740E+11
29.81500	0.005441	5821628.	-191174.	-3729.	1.743E+11
30.15000	0.001923	5022975.	-204743.	-3021.	1.746E+11
30.48500	-0.001130	4175497.	-205241.	2773.	1.749E+11
30.82000	-0.003798	3372838.	-191772.	3928.	1.751E+11
31.15500	-0.006154	2633651.	-174578.	4627.	1.754E+11
31.49000	-0.008267	1969233.	-154844.	5191.	1.790E+11
31.82500	-0.0102	1388707.	-132967.	5693.	2.787E+11
32.16000	-0.0121	900181.	-109129.	6167.	2.787E+11
32.49500	-0.0139	511311.	-83419.	6624.	2.787E+11
32.83000	-0.0156	229495.	-56374.	6831.	2.787E+11
33.16500	-0.0174	58064.	-28544.	7015.	2.787E+11
33.50000	-0.0191	0.000	0.000	7186.	2.787E+11

Output Summary for Load Case No. 2:

```
Pile-head deflection             =     2.79404627 inches
Computed slope at pile head      =     -0.0104152 radians
Maximum bending moment           =      10216532. inch-lbs
Maximum shear force              =       -205241. lbs
Depth of maximum bending moment  =    25.79500000 feet below pile head
Depth of maximum shear force     =    30.48500000 feet below pile head
Number of iterations             =             37
Number of zero deflection points =              1
Pile deflection at ground        =     0.96707212 inches
```

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	1.7438855	7027447.	-139631.	-0.006678
2	2.7940463	10216532.	-205241.	-0.010415

Maximum pile-head deflection = 2.7940462727 inches
Maximum pile-head rotation = -0.0104151970 radians = -0.596747 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	20648539.	2577340.	Pass
	2	1.00	23624795.	7027447.	Pass
2	1	1.00	20648539.	3724000.	Pass
	2	1.00	23624795.	10216532.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	420360.	46074.	Pass
	2	1.00	420360.	-139631.	Pass
2	1	1.00	420360.	64203.	Pass
	2	1.00	420360.	-205241.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -205241.00 lbs
Factored Shear Capacity at Node = 420360.00 lbs
Fraction of Allowable Shear Capacity = 0.4883

The analysis ended normally.

==========

LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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This software is licensed for exclusive use by:
GPD GROUP
Akron, GDP GROUP

==========

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1222.96 Pile 4to7a.lp12d

Name of the output report file:
BEL-70 1222.96 Pile 4to7a.lp12o

Name of the plot output file:
BEL-70 1222.96 Pile 4to7a.lp12p

Name of the runtime message file:
BEL-70 1222.96 Pile 4to7a.lp12r

Date and Time of Analysis

Date: June 21, 2026 Time: 9:03:28

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1222+96 Piles 4 thru 7 - 20' Ht.(6.75' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 35.500 ft
Depth of ground surface below top of pile = 20.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	12.9000
2	20.000	12.9000
3	20.000	30.0000
4	35.500	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 20.000000 ft
   AISC Section Type = W

   AISC Section Name = W24X146

   Pile width = 12.900000 in
   Shear capacity of section = 420360. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 15.500000 ft
   Section Diameter = 30.000000 in
   Shear capacity of section = 420360. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 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 = 25.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	25.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 14.500 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	10.00	304.75
3	20.00	451.03

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	10.00	0.00
2	20.00	299.00

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	20.000000 ft
Flange Width	=	12.900000 in
Section Depth	=	24.700000 in
Flange Thickness	=	1.090000 in
Web Thickness	=	0.650000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	43.000000 sq. in.
Moment of Inertia	=	4580. in^4
Elastic Bending Stiffness	=	132820000. kip-in^2
Plastic Modulus, Z	=	418.000000in^3

Plastic Moment Capacity = Fy Z = 20900.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 2150.000 kips
Nominal Axial Tensile Capacity = -2150.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	747.2352199762	131548563.	12.3500000000	
0.0000113606	1494.	131548563.	12.3500000000	
0.0000170409	2242.	131548563.	12.3500000000	
0.0000227212	2989.	131548563.	12.3500000000	
0.0000284015	3736.	131548563.	12.3500000000	
0.0000340818	4483.	131548563.	12.3500000000	
0.0000397621	5231.	131548563.	12.3500000000	
0.0000454424	5978.	131548563.	12.3500000000	
0.0000511227	6725.	131548563.	12.3500000000	
0.0000568030	7472.	131548563.	12.3500000000	
0.0000624833	8220.	131548563.	12.3500000000	
0.0000681636	8967.	131548563.	12.3500000000	
0.0000738439	9714.	131548563.	12.3500000000	
0.0000795242	10461.	131548563.	12.3500000000	
0.0000852045	11209.	131548563.	12.3500000000	

0.0000908848	11956.	131548563.	12.3500000000	
0.0000965651	12703.	131548563.	12.3500000000	
0.0001022454	13450.	131548563.	12.3500000000	
0.0001079257	14197.	131548563.	12.3500000000	
0.0001136060	14945.	131548563.	12.3500000000	
0.0001192863	15692.	131548563.	12.3500000000	
0.0001249666	16439.	131548563.	12.3500000000	
0.0001306469	17186.	131548563.	12.3500000000	
0.0001363272	17934.	131548563.	12.3500000000	
0.0001420075	18654.	131355772.	12.3500000000	Y
0.0001476878	19125.	129498378.	12.3500000000	Y
0.0001533681	19341.	126109474.	12.3500000000	Y
0.0001590484	19437.	122209265.	12.3500000000	Y
0.0001647287	19524.	118520493.	12.3500000000	Y
0.0001704090	19601.	115024731.	12.3500000000	Y
0.0001760893	19672.	111715442.	12.3500000000	Y
0.0001817696	19736.	108576232.	12.3500000000	Y
0.0001874499	19794.	105595295.	12.3500000000	Y
0.0001931302	19847.	102764220.	12.3500000000	Y
0.0001988105	19895.	100072629.	12.3500000000	Y
0.0002044908	19940.	97511170.	12.3500000000	Y
0.0002101711	19981.	95071381.	12.3500000000	Y
0.0002158514	20019.	92745569.	12.3500000000	Y
0.0002215317	20054.	90526548.	12.3500000000	Y
0.0002328923	20116.	86376759.	12.3500000000	Y
0.0002442529	20171.	82581534.	12.3500000000	Y
0.0002556135	20218.	79094155.	12.3500000000	Y
0.0002669741	20258.	75881674.	12.3500000000	Y
0.0002783347	20295.	72914164.	12.3500000000	Y
0.0002896953	20327.	70165142.	12.3500000000	Y
0.0003010559	20355.	67611954.	12.3500000000	Y
0.0003124165	20381.	65235075.	12.3500000000	Y
0.0003237771	20403.	63016840.	12.3500000000	Y
0.0003351377	20424.	60940788.	12.3500000000	Y
0.0003464983	20442.	58996066.	12.3500000000	Y
0.0003578589	20459.	57171239.	12.3500000000	Y
0.0003692195	20474.	55452124.	12.3500000000	Y
0.0003805801	20488.	53833914.	12.3500000000	Y
0.0003919407	20501.	52305498.	12.3500000000	Y
0.0004033013	20512.	50861280.	12.3500000000	Y
0.0004146619	20523.	49493288.	12.3500000000	Y
0.0004260225	20533.	48197176.	12.3500000000	Y
0.0004373831	20542.	46965429.	12.3500000000	Y
0.0004487437	20551.	45796048.	12.3500000000	Y

0.0004601043	20558.	44681519.	12.3500000000	Y
0.0004714648	20565.	43620240.	12.3500000000	Y
0.0004828254	20572.	42608550.	12.3500000000	Y
0.0004941860	20578.	41640974.	12.3500000000	Y
0.0005055466	20584.	40716884.	12.3500000000	Y
0.0005169072	20590.	39833413.	12.3500000000	Y
0.0005282678	20595.	38985744.	12.3500000000	Y
0.0005396284	20600.	38173738.	12.3500000000	Y
0.0005509890	20604.	37395216.	12.3500000000	Y
0.0005623496	20609.	36647530.	12.3500000000	Y
0.0005737102	20612.	35928305.	12.3500000000	Y
0.0005850708	20616.	35237011.	12.3500000000	Y
0.0005964314	20620.	34572052.	12.3500000000	Y
0.0006077920	20624.	33931851.	12.3500000000	Y
0.0006191526	20626.	33313864.	12.3500000000	Y
0.0006305132	20629.	32718146.	12.3500000000	Y
0.0006418738	20632.	32143516.	12.3500000000	Y
0.0006532344	20635.	31588873.	12.3500000000	Y
0.0006645950	20638.	31053192.	12.3500000000	Y
0.0006759556	20640.	30534482.	12.3500000000	Y
0.0007213980	20649.	28622949.	12.3500000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	20649.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	15.500000	ft
Outside Diameter of Casing	=	30.000000	in
Casing Wall Thickness	=	0.0000	in
Moment of Inertia of Steel Casing	=	0.0000	in^4
Width Flange of Core/Insert	=	12.900000	in
Depth of Core/Insert	=	24.700000	in
Flange Thickness of Core/Insert	=	1.090000	in
Web Thickness of Core/Insert	=	0.650000	in
Moment of Inertia of Steel Core/Insert	=	4540.	in^4
Yield Stress of Casing	=	50000.	psi
Elastic Modulus of Casing	=	29000000.	psi
Yield Stress of Core/Insert	=	50000.	psi
Elastic Modulus of Core/Insert	=	29000000.	psi
Number of Reinforcing Bars	=	0	bars
Gross Area of Pile	=	706.858347	sq. in.
Area of Concrete	=	664.098347	sq. in.
Cross-sectional Area of Steel Casing	=	0.0000	sq. in.
Cross-sectional Area of Steel Core/Insert	=	42.760000	sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	42.760000	sq. in.
Area Ratio of All Steel to Gross Area	=	6.05	percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	4395.934	kips
Tensile Load for Cracking of Concrete	=	-419.269	kips
Nominal Axial Tensile Capacity	=	-2138.000	kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000056803	1583.	278749290.	15.0000000000	
0.0000113606	1995.	175633799.	11.4700376517	C
0.0000170409	2987.	175290831.	11.4903947159	C
0.0000227212	3975.	174944178.	11.5110091803	C
0.0000284015	4959.	174593753.	11.5318877466	C
0.0000340818	5938.	174239477.	11.5528650295	C
0.0000397621	6914.	173881366.	11.5739195974	C
0.0000454424	7885.	173519267.	11.5952530287	C
0.0000511227	8852.	173153080.	11.6168727306	C
0.0000568030	9815.	172782702.	11.6387864167	C
0.0000624833	10773.	172408023.	11.6611508574	C
0.0000681636	11726.	172028932.	11.6836759884	C
0.0000738439	12675.	171645310.	11.7065184576	C
0.0000795242	13619.	171257036.	11.7296875590	C
0.0000852045	14558.	170863981.	11.7531930032	C
0.0000908848	15493.	170466011.	11.7770449427	C
0.0000965651	16422.	170062988.	11.8012539997	C
0.0001022454	17346.	169654764.	11.8258312957	C
0.0001079257	18265.	169241201.	11.8506729578	C
0.0001136060	19146.	168528854.	11.8657162873	CY
0.0001192863	19688.	165051155.	11.7831221916	CY
0.0001249666	19974.	159837661.	11.6345471858	CY
0.0001306469	20235.	154882963.	11.4914273834	CY
0.0001363272	20473.	150171821.	11.3528021855	CY
0.0001420075	20691.	145703492.	11.2198887082	CY
0.0001476878	20891.	141455748.	11.0905126321	CY
0.0001533681	21077.	137428277.	10.9671004316	CY
0.0001590484	21248.	133597374.	10.8466378179	CY

0.0001647287	21408.	129958962.	10.7311207800	CY
0.0001704090	21557.	126498799.	10.6198466747	CY
0.0001760893	21695.	123203066.	10.5113780281	CY
0.0001817696	21825.	120067246.	10.4075455808	CY
0.0001874499	21946.	117076184.	10.3069067841	CY
0.0001931302	22060.	114221188.	10.2089751569	CY
0.0001988105	22167.	111498742.	10.1152239831	CY
0.0002044908	22269.	108897792.	10.0245487456	CY
0.0002101711	22363.	106404988.	9.9355197038	CY
0.0002158514	22453.	104022139.	9.8500086678	CY
0.0002215317	22539.	101742887.	9.7678691320	CY
0.0002328923	22696.	97452346.	9.6081098129	CY
0.0002442529	22839.	93506579.	9.4593126659	CY
0.0002556135	22968.	89855412.	9.3169915438	CY
0.0002669741	23084.	86466069.	9.1861558392	CY
0.0002783347	23188.	83310946.	9.0628252609	CY
0.0002896953	23272.	80332334.	8.9610384517	CY
0.0003010559	23350.	77560708.	8.8650098337	CY
0.0003124165	23408.	74926899.	8.7885295691	CY
0.0003237771	23461.	72461308.	8.7169348751	CY
0.0003351377	23503.	70129669.	8.6604519306	CY
0.0003464983	23534.	67920832.	8.6184406028	CY
0.0003578589	23563.	65843636.	8.5795168797	CY
0.0003692195	23581.	63866574.	8.5544495665	CY
0.0003805801	23598.	62004152.	8.5298959773	CY
0.0003919407	23612.	60243004.	8.5059914286	CY
0.0004033013	23625.	58578531.	8.4850158121	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	23625.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the

LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	20.0000	0.00	N.A.	No	0.00	17029.
2	25.0000	5.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
119.28	0.58
123.54	8.82
127.80	19.44

132.06	30.05
136.32	40.66
140.58	51.28
144.84	61.89
149.10	72.51
153.36	83.12
157.62	93.74
161.88	104.35
166.14	114.97
170.40	125.58
174.66	136.19
178.92	146.81
183.18	157.42
187.44	168.04
191.70	178.65
195.96	189.27
200.22	199.88
204.48	210.50
208.74	221.11
213.00	231.72
217.26	242.34
221.52	252.95
225.78	263.57
230.04	274.18
234.30	284.80
238.56	246.84

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.70
4.26	10.82
8.52	21.64
12.78	32.46
17.04	43.27

21.30	54.09
25.56	64.91
29.82	75.73
34.08	86.55
38.34	97.37
42.60	108.19
46.86	119.00
51.12	129.82
55.38	140.64
59.64	151.46
63.90	162.28
68.16	173.10
72.42	183.92
76.68	194.74
80.94	205.55
85.20	216.37
89.46	227.19
93.72	238.01
97.98	248.83
102.24	259.65
106.50	270.47
110.76	281.28
115.02	292.10
119.28	302.61
123.54	309.07
127.80	314.26
132.06	319.45
136.32	324.64
140.58	329.84
144.84	335.03
149.10	340.22
153.36	345.42
157.62	350.61
161.88	355.80
166.14	360.99
170.40	366.19
174.66	371.38
178.92	376.57
183.18	381.77
187.44	386.96
191.70	392.15
195.96	397.35
200.22	402.54
204.48	407.73

208.74	412.92
213.00	418.12
217.26	423.31
221.52	428.50
225.78	433.70
230.04	438.89
234.30	444.08
238.56	376.15

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.94622	0.000109	0.000	0.000	1.315E+11
0.35500	2.90155	24.54161	28.80459	0.000	1.315E+11
0.71000	2.85687	245.41519	97.93560	0.000	1.315E+11
1.06500	2.81220	858.95294	213.15396	0.000	1.315E+11
1.42000	2.76752	2061.	374.45966	0.000	1.315E+11
1.77500	2.72285	4049.	581.85270	0.000	1.315E+11
2.13000	2.67818	7019.	835.33308	0.000	1.315E+11
2.48500	2.63351	11166.	1135.	0.000	1.315E+11
2.84000	2.58884	16688.	1481.	0.000	1.315E+11
3.19500	2.54417	23781.	1872.	0.000	1.315E+11
3.55000	2.49950	32640.	2310.	0.000	1.315E+11
3.90500	2.45484	43463.	2794.	0.000	1.315E+11
4.26000	2.41019	56445.	3324.	0.000	1.315E+11
4.61500	2.36554	71784.	3900.	0.000	1.315E+11
4.97000	2.32091	89675.	4522.	0.000	1.315E+11
5.32500	2.27628	110314.	5191.	0.000	1.315E+11
5.68000	2.23167	133898.	5905.	0.000	1.315E+11
6.03500	2.18708	160624.	6665.	0.000	1.315E+11

6.39000	2.14251	190688.	7472.	0.000	1.315E+11
6.74500	2.09797	224285.	8325.	0.000	1.315E+11
7.10000	2.05346	261612.	9223.	0.000	1.315E+11
7.45500	2.00898	302867.	10168.	0.000	1.315E+11
7.81000	1.96455	348244.	11159.	0.000	1.315E+11
8.16500	1.92017	397941.	12196.	0.000	1.315E+11
8.52000	1.87584	452153.	13279.	0.000	1.315E+11
8.87500	1.83157	511077.	14408.	0.000	1.315E+11
9.23000	1.78737	574909.	15583.	0.000	1.315E+11
9.58500	1.74325	643847.	16805.	0.000	1.315E+11
9.94000	1.69922	718085.	18073.	0.000	1.315E+11
10.29500	1.65529	797825.	19395.	0.000	1.315E+11
10.65000	1.61147	883334.	20783.	0.000	1.315E+11
11.00500	1.56777	974899.	22239.	0.000	1.315E+11
11.36000	1.52421	1072807.	23761.	0.000	1.315E+11
11.71500	1.48079	1177344.	25351.	0.000	1.315E+11
12.07000	1.43754	1288797.	27008.	0.000	1.315E+11
12.42500	1.39447	1407453.	28733.	0.000	1.315E+11
12.78000	1.35158	1533600.	30525.	0.000	1.315E+11
13.13500	1.30891	1667523.	32384.	0.000	1.315E+11
13.49000	1.26647	1809511.	34310.	0.000	1.315E+11
13.84500	1.22428	1959849.	36304.	0.000	1.315E+11
14.20000	1.18236	2118824.	38366.	0.000	1.315E+11
14.55500	1.14074	2286724.	40494.	0.000	1.315E+11
14.91000	1.09942	2463835.	42690.	0.000	1.315E+11
15.26500	1.05845	2650445.	44953.	0.000	1.315E+11
15.62000	1.01785	2846839.	47284.	0.000	1.315E+11
15.97500	0.97763	3053305.	49682.	0.000	1.315E+11
16.33000	0.93784	3270130.	52147.	0.000	1.315E+11
16.68500	0.89850	3497601.	54680.	0.000	1.315E+11
17.04000	0.85964	3736004.	57280.	0.000	1.315E+11
17.39500	0.82129	3985626.	59947.	0.000	1.315E+11
17.75000	0.78350	4246755.	62682.	0.000	1.315E+11
18.10500	0.74629	4519676.	65484.	0.000	1.315E+11
18.46000	0.70971	4804678.	68353.	0.000	1.315E+11
18.81500	0.67379	5102046.	71290.	0.000	1.315E+11
19.17000	0.63857	5412068.	74294.	0.000	1.315E+11
19.52500	0.60410	5735031.	77365.	0.000	1.315E+11
19.88000	0.57042	6071221.	80245.	0.000	1.315E+11
20.23500	0.53758	6418717.	81536.	-17.0389	1.740E+11
20.59000	0.50540	6765903.	81405.	-44.1372	1.739E+11
20.94500	0.47394	7112289.	81157.	-72.1648	1.738E+11
21.30000	0.44321	7457365.	80790.	-100.3431	1.737E+11
21.65500	0.41327	7800620.	80303.	-128.3463	1.735E+11

22.01000	0.38414	8141546.	79699.	-155.2940	1.734E+11
22.36500	0.35586	8479654.	78983.	-180.5410	1.733E+11
22.72000	0.32847	8814485.	78164.	-204.0183	1.732E+11
23.07500	0.30200	9145614.	77250.	-225.2154	1.730E+11
23.43000	0.27650	9472655.	76252.	-243.3622	1.729E+11
23.78500	0.25198	9795281.	75183.	-258.2892	1.728E+11
24.14000	0.22850	10113219.	74053.	-272.2579	1.727E+11
24.49500	0.20608	10426216.	72872.	-282.6027	1.725E+11
24.85000	0.18476	10734084.	71654.	-289.0102	1.724E+11
25.20500	0.16456	11036708.	65420.	-2638.	1.723E+11
25.56000	0.14553	11291466.	53383.	-3014.	1.722E+11
25.91500	0.12769	11491530.	39810.	-3358.	1.721E+11
26.27000	0.11106	11630647.	24840.	-3670.	1.721E+11
26.62500	0.09565	11703170.	8620.	-3946.	1.720E+11
26.98000	0.08149	11704086.	-8700.	-4185.	1.720E+11
27.33500	0.06855	11629047.	-26957.	-4386.	1.721E+11
27.69000	0.05684	11474409.	-45983.	-4546.	1.721E+11
28.04500	0.04635	11237268.	-65598.	-4663.	1.722E+11
28.40000	0.03703	10915511.	-85610.	-4732.	1.723E+11
28.75500	0.02887	10507874.	-105809.	-4751.	1.725E+11
29.11000	0.02181	10014016.	-125968.	-4713.	1.727E+11
29.46500	0.01580	9434625.	-145827.	-4610.	1.729E+11
29.82000	0.01079	8771566.	-165080.	-4429.	1.732E+11
30.17500	0.006688	8028139.	-183334.	-4141.	1.735E+11
30.53000	0.003430	7209559.	-200001.	-3684.	1.738E+11
30.88500	0.000926	6324130.	-213779.	-2785.	1.741E+11
31.24000	-0.000919	5388159.	-213522.	2906.	1.744E+11
31.59500	-0.002204	4504920.	-199289.	3777.	1.747E+11
31.95000	-0.003021	3690220.	-182171.	4260.	1.750E+11
32.30500	-0.003455	2952825.	-163333.	4584.	1.753E+11
32.66000	-0.003583	2298626.	-143502.	4726.	1.755E+11
33.01500	-0.003474	1730190.	-123447.	4689.	2.246E+11
33.37000	-0.003225	1246856.	-103654.	4603.	2.787E+11
33.72500	-0.002895	847057.	-84306.	4481.	2.787E+11
34.08000	-0.002509	528571.	-65553.	4324.	2.787E+11
34.43500	-0.002089	288546.	-47546.	4130.	2.787E+11
34.79000	-0.001651	123476.	-30454.	3894.	2.787E+11
35.14500	-0.001204	29077.	-14492.	3599.	2.787E+11
35.50000	-0.000756	0.000	0.000	3205.	2.787E+11

Output Summary for Load Case No. 1:

Pile-head deflection = 2.94622032 inches
Computed slope at pile head = -0.0104868 radians

Maximum bending moment = 11704086. inch-lbs
Maximum shear force = -213779. lbs
Depth of maximum bending moment = 26.98000000 feet below pile head
Depth of maximum shear force = 30.88500000 feet below pile head
Number of iterations = 31
Number of zero deflection points = 1
Pile deflection at ground = 0.55931643 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
119.28	0.58
123.54	8.82
127.80	19.44
132.06	30.05
136.32	40.66
140.58	51.28
144.84	61.89
149.10	72.51
153.36	83.12
157.62	93.74
161.88	104.35
166.14	114.97
170.40	125.58
174.66	136.19
178.92	146.81
183.18	157.42
187.44	168.04
191.70	178.65
195.96	189.27
200.22	199.88
204.48	210.50
208.74	221.11
213.00	231.72
217.26	242.34
221.52	252.95

225.78	263.57
230.04	274.18
234.30	284.80
238.56	246.84

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.70
4.26	10.82
8.52	21.64
12.78	32.46
17.04	43.27
21.30	54.09
25.56	64.91
29.82	75.73
34.08	86.55
38.34	97.37
42.60	108.19
46.86	119.00
51.12	129.82
55.38	140.64
59.64	151.46
63.90	162.28
68.16	173.10
72.42	183.92
76.68	194.74
80.94	205.55
85.20	216.37
89.46	227.19
93.72	238.01
97.98	248.83
102.24	259.65
106.50	270.47
110.76	281.28

115.02	292.10
119.28	302.61
123.54	309.07
127.80	314.26
132.06	319.45
136.32	324.64
140.58	329.84
144.84	335.03
149.10	340.22
153.36	345.42
157.62	350.61
161.88	355.80
166.14	360.99
170.40	366.19
174.66	371.38
178.92	376.57
183.18	381.77
187.44	386.96
191.70	392.15
195.96	397.35
200.22	402.54
204.48	407.73
208.74	412.92
213.00	418.12
217.26	423.31
221.52	428.50
225.78	433.70
230.04	438.89
234.30	444.08
238.56	376.15

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	4.74211	-0.000103	-7.557E-07	0.000	1.315E+11
0.35500	4.67193	36.81231	43.20690	0.000	1.315E+11
0.71000	4.60174	368.12271	146.90341	0.000	1.315E+11
1.06500	4.53156	1288.	319.73094	0.000	1.315E+11
1.42000	4.46137	3092.	561.68949	0.000	1.315E+11
1.77500	4.39119	6074.	872.77905	0.000	1.315E+11
2.13000	4.32101	10528.	1253.	0.000	1.315E+11
2.48500	4.25082	16750.	1702.	0.000	1.315E+11
2.84000	4.18064	25032.	2221.	0.000	1.315E+11
3.19500	4.11047	35671.	2808.	0.000	1.315E+11
3.55000	4.04030	48960.	3465.	0.000	1.315E+11
3.90500	3.97013	65195.	4191.	0.000	1.315E+11
4.26000	3.89998	84668.	4986.	0.000	1.315E+11
4.61500	3.82983	107676.	5850.	0.000	1.315E+11
4.97000	3.75971	134512.	6783.	0.000	1.315E+11
5.32500	3.68960	165471.	7786.	0.000	1.315E+11
5.68000	3.61951	200848.	8857.	0.000	1.315E+11
6.03500	3.54945	240936.	9998.	0.000	1.315E+11
6.39000	3.47942	286031.	11208.	0.000	1.315E+11
6.74500	3.40944	336427.	12487.	0.000	1.315E+11
7.10000	3.33950	392419.	13835.	0.000	1.315E+11
7.45500	3.26961	454300.	15252.	0.000	1.315E+11
7.81000	3.19979	522366.	16738.	0.000	1.315E+11
8.16500	3.13003	596911.	18294.	0.000	1.315E+11
8.52000	3.06037	678229.	19918.	0.000	1.315E+11
8.87500	2.99079	766615.	21612.	0.000	1.315E+11
9.23000	2.92132	862364.	23375.	0.000	1.315E+11
9.58500	2.85197	965770.	25207.	0.000	1.315E+11
9.94000	2.78275	1077127.	27108.	0.000	1.315E+11
10.29500	2.71368	1196732.	29083.	0.000	1.315E+11
10.65000	2.64478	1324911.	31134.	0.000	1.315E+11
11.00500	2.57606	1461996.	33264.	0.000	1.315E+11
11.36000	2.50754	1608323.	35473.	0.000	1.315E+11
11.71500	2.43924	1764225.	37760.	0.000	1.315E+11
12.07000	2.37119	1930037.	40125.	0.000	1.315E+11
12.42500	2.30340	2106091.	42569.	0.000	1.315E+11
12.78000	2.23590	2292723.	45091.	0.000	1.315E+11
13.13500	2.16872	2490266.	47691.	0.000	1.315E+11
13.49000	2.10188	2699054.	50370.	0.000	1.315E+11
13.84500	2.03542	2919421.	53128.	0.000	1.315E+11

14.20000	1.96935	3151702.	55963.	0.000	1.315E+11
14.55500	1.90373	3396229.	58877.	0.000	1.315E+11
14.91000	1.83857	3653338.	61870.	0.000	1.315E+11
15.26500	1.77391	3923361.	64941.	0.000	1.315E+11
15.62000	1.70980	4206634.	68090.	0.000	1.315E+11
15.97500	1.64626	4503490.	71318.	0.000	1.315E+11
16.33000	1.58335	4814263.	74624.	0.000	1.315E+11
16.68500	1.52110	5139287.	78009.	0.000	1.315E+11
17.04000	1.45956	5478895.	81471.	0.000	1.315E+11
17.39500	1.39878	5833423.	85013.	0.000	1.315E+11
17.75000	1.33880	6203204.	88632.	0.000	1.315E+11
18.10500	1.27968	6588572.	92331.	0.000	1.315E+11
18.46000	1.22146	6989861.	96107.	0.000	1.315E+11
18.81500	1.16421	7407405.	99962.	0.000	1.315E+11
19.17000	1.10799	7841538.	103895.	0.000	1.315E+11
19.52500	1.05284	8292593.	107907.	0.000	1.315E+11
19.88000	0.99884	8760906.	111660.	0.000	1.315E+11
20.23500	0.94604	9243937.	113344.	-20.6191	1.730E+11
20.59000	0.89422	9726595.	113186.	-53.3533	1.728E+11
20.94500	0.84342	10208284.	112887.	-87.1759	1.726E+11
21.30000	0.79369	10688391.	112443.	-121.2019	1.724E+11
21.65500	0.74508	11166299.	111855.	-154.6858	1.722E+11
22.01000	0.69766	11641399.	111128.	-186.9545	1.721E+11
22.36500	0.65146	12113107.	110266.	-217.3741	1.719E+11
22.72000	0.60654	12580870.	109280.	-245.9104	1.717E+11
23.07500	0.56295	13044170.	108176.	-272.1030	1.715E+11
23.43000	0.52073	13502532.	106968.	-295.2370	1.713E+11
23.78500	0.47995	13955536.	105668.	-315.2098	1.711E+11
24.14000	0.44065	14402820.	104284.	-334.5697	1.709E+11
24.49500	0.40288	14844033.	102825.	-350.0032	1.707E+11
24.85000	0.36669	15278893.	101311.	-361.1142	1.706E+11
25.20500	0.33212	15707201.	94368.	-2898.	1.704E+11
25.56000	0.29923	16082907.	80919.	-3415.	1.702E+11
25.91500	0.26805	16396633.	65269.	-3932.	1.701E+11
26.27000	0.23862	16638997.	47430.	-4443.	1.700E+11
26.62500	0.21097	16800737.	27725.	-4808.	1.699E+11
26.98000	0.18511	16875214.	6538.	-5138.	1.699E+11
27.33500	0.16105	16856444.	-15973.	-5430.	1.699E+11
27.69000	0.13880	16739127.	-39644.	-5683.	1.699E+11
28.04500	0.11833	16518680.	-64302.	-5894.	1.700E+11
28.40000	0.09963	16191274.	-89765.	-6061.	1.702E+11
28.75500	0.08265	15753884.	-115837.	-6180.	1.703E+11
29.11000	0.06735	15204342.	-142308.	-6248.	1.706E+11
29.46500	0.05367	14541416.	-168947.	-6259.	1.709E+11

29.82000	0.04153	13764914.	-195491.	-6203.	1.712E+11
30.17500	0.03085	12875835.	-221630.	-6069.	1.716E+11
30.53000	0.02154	11876624.	-246975.	-5830.	1.720E+11
30.88500	0.01348	10771611.	-270973.	-5437.	1.724E+11
31.24000	0.006547	9567935.	-292669.	-4749.	1.729E+11
31.59500	0.000623	8278073.	-308652.	-2755.	1.734E+11
31.95000	-0.004434	6938216.	-304532.	4689.	1.739E+11
32.30500	-0.008768	5683460.	-282218.	5787.	1.743E+11
32.66000	-0.0125	4533719.	-256132.	6460.	1.747E+11
33.01500	-0.0158	3501212.	-227790.	6846.	1.751E+11
33.37000	-0.0187	2592950.	-197995.	7142.	1.754E+11
33.72500	-0.0213	1814297.	-167059.	7382.	2.047E+11
34.08000	-0.0238	1169608.	-135174.	7588.	2.787E+11
34.43500	-0.0262	662615.	-102458.	7772.	2.787E+11
34.79000	-0.0286	296669.	-68987.	7942.	2.787E+11
35.14500	-0.0309	74843.	-34820.	8099.	2.787E+11
35.50000	-0.0332	0.000	0.000	8248.	2.787E+11

Output Summary for Load Case No. 2:

Pile-head deflection = 4.74210990 inches
Computed slope at pile head = -0.0164752 radians
Maximum bending moment = 16875214. inch-lbs
Maximum shear force = -308652. lbs
Depth of maximum bending moment = 26.98000000 feet below pile head
Depth of maximum shear force = 31.59500000 feet below pile head
Number of iterations = 43
Number of zero deflection points = 1
Pile deflection at ground = 0.98099242 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	2.9462203	11704086.	-213779.	-0.010487
2	4.7421099	16875214.	-308652.	-0.016475

Maximum pile-head deflection = 4.7421098985 inches
Maximum pile-head rotation = -0.0164752427 radians = -0.943962 deg.

LRFD Performance by Load Case Combination

Load Case No.	Section No.	Resistance Factor for Moment	Factored Moment Capacity of Section in-lbs	Maximum Moment Developed in Section in-lbs	Pass/Fail for LRFD Moment of Section
1	1	1.00	20648539.	6071221.	Pass
	2	1.00	23624795.	11704086.	Pass
2	1	1.00	20648539.	8760906.	Pass
	2	1.00	23624795.	16875214.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	420360.	80245.	Pass
	2	1.00	420360.	-213779.	Pass
2	1	1.00	420360.	111660.	Pass
	2	1.00	420360.	-308652.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

```
LRFD Load Case No.                     = 2
Pile Section No.                       = 2
Node Number of Maximum Shear Force     = 1
Depth of Maximum Developed Shear       = 0.00 ft
Maximum Developed Shear Force          = -308652.42 lbs
Factored Shear Capacity at Node        = 420360.00 lbs
Fraction of Allowable Shear Capacity   = 0.7343

The analysis ended normally.
```

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LPile for Version 2022-12.012

License ID : 154178656
License Type : (Network License)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Akron, GDP GROUP

==

This model was prepared by:
TWASHKO

Files Used for Analysis

Path to file locations on this computer:
\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\Culvert Shoring\Lpile\

Name of the input data file:
BEL-70 1222.96 Pile 8.lp12d

Name of the output report file:
BEL-70 1222.96 Pile 8.lp12o

Name of the plot output file:
BEL-70 1222.96 Pile 8.lp12p

Name of the runtime message file:
BEL-70 1222.96 Pile 8.lp12r

Date and Time of Analysis

Date: June 21, 2026 Time: 12:24:41

Problem Title

Project Name: BEL-70 Temp Shoring

Job Number: 2024045

Client: ODOT

Engineer: TJW

Description: 1222+96 Piles 8 - 11' Ht.(6.00' design spacing)

Program Options and Settings

Computational Options:
- Use Load and Resistance Factors (LRFD) in computations

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
 - Analysis uses layering correction (Method of Georgiadis)
 - No distributed lateral loads are entered
 - Loading by lateral soil movements acting on pile not selected
 - Input of shear resistance at the pile tip not selected
 - Input of moment resistance at the pile tip not selected
 - 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 narrow report formats
   (Note: Some output information is omitted from the narrow report formats)

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 27.000 ft
Depth of ground surface below top of pile = 11.0000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	14.9000
2	11.000	14.9000
3	11.000	24.0000
4	27.000	24.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

   Section 1 is a AISC strong axis steel pile
   Length of section = 11.000000 ft
   AISC Section Type = HP

   AISC Section Name = HP14X117

   Pile width = 14.900000 in
   Shear capacity of section = 294150. lbs

Pile Section No. 2:

   Section 2 is a drilled shaft with casing and H section core/insert
   Length of section = 16.000000 ft
   Section Diameter = 24.000000 in
   Shear capacity of section = 294150. lbs

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 11.000000 ft
   Distance from top of pile to bottom of layer = 21.000000 ft
   Effective unit weight at top of layer = 57.600000 pcf
   Effective unit weight at bottom of layer = 57.600000 pcf
   Friction angle at top of layer = 30.000000 deg.
   Friction angle at bottom of layer = 30.000000 deg.
   Subgrade k at top of layer = 60.000000 pci
   Subgrade k at bottom of layer = 60.000000 pci

Layer 2 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	21.000000 ft
Distance from top of pile to bottom of layer	=	50.000000 ft
Effective unit weight at top of layer	=	77.600000 pcf
Effective unit weight at bottom of layer	=	77.600000 pcf
Uniaxial compressive strength at top of layer	=	100.000000 psi
Uniaxial compressive strength at bottom of layer	=	100.000000 psi
Initial modulus of rock at top of layer	=	18000. psi
Initial modulus of rock at bottom of layer	=	18000. psi
RQD of rock at top of layer	=	20.000000 %
RQD of rock at bottom of layer	=	20.000000 %
k rm of rock at top of layer	=	0.0005000
k rm of rock at bottom of layer	=	0.0005000

(Depth of the lowest soil layer extends 23.000 ft below the pile tip)

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Loading Groups for LRFD Analysis

Number of Loading Groups = 2

Load Group	Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Dist. Lds.
1	Horiz. Soil (Hs)	0.00	0.00	0.00	3
2	Water Load (HW)	0.00	0.00	0.00	2

Number of Distributed Loading Points Input for Load Group 1 = 3

Point	Depth	Distributed Load

	ft	lb/inch
1	0.00	0.00
2	5.50	174.90
3	11.00	258.85

Number of Distributed Loading Points Input for Load Group 2 = 2

Point	Depth ft	Distributed Load lb/inch
1	5.50	0.00
2	11.00	171.60

Totals of Loads by Load Type for LRFD Analyses:

Number of Defined Load Cases = 2

This table presents the sum of pile-head loads for each load type.

Load Type	Horiz. Force lbs	Moment in-lbs	Axial Force lbs	Number of Loads
Dead Loads (DL)	0.00	0.00	0.00	0
Live Loads (LL)	0.00	0.00	0.00	0
Earthquake (EQ)	0.00	0.00	0.00	0
Impact Load (IM)	0.00	0.00	0.00	0
Wind Loads (W)	0.00	0.00	0.00	0
Water Loads (HW)	0.00	0.00	0.00	1
Ice Loads (Ice)	0.00	0.00	0.00	0
Horiz. Soil (Hs)	0.00	0.00	0.00	1
Live Roof (Lr)	0.00	0.00	0.00	0
Rain Loads (Rn)	0.00	0.00	0.00	0
Snow Loads (Sn)	0.00	0.00	0.00	0
Temperature (Tm)	0.00	0.00	0.00	0
Special (Sp)	0.00	0.00	0.00	0

Load and Resistance Factors by Load Combinations for LRFD Analyses

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Number of Factored Load Combinations = 2

Computed Factored Loads for LRFD Analyses

Factored Load Combination No. 1

Load Combination Name = Service Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.00*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Factored Load Combination No. 2

Load Combination Name = Factored Load

Structural Resistance Factor for Flexure = 1.000
Structural Resistance Factor for Shear = 1.000

Factored Load = + 1.00*HW + 1.50*Hs

Factored Horizontal Force = 0.00 lbs
Factored Vertical Force = 0.00 lbs
Factored Moment = 0.00 in-lbs

Totals of Factored Loads by Load Combination:

Load Combination Number	Factored Horiz. Force lbs	Factored Moment in-lbs	Factored Vert. Force lbs
1	0.00	0.00	0.00
2	0.00	0.00	0.00

Sorted Values of Axial Thrust Forces Sorted for LRFD Computations:

Number of Unique Axial Thrust Values = 1

Number	Factored Axial Thrust
1	0.000

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from LRFD load combinations

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel AISC Strong Axis:

Length of Section	=	11.000000 ft
Flange Width	=	14.900000 in
Section Depth	=	14.200000 in
Flange Thickness	=	0.805000 in
Web Thickness	=	0.805000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	34.400000 sq. in.
Moment of Inertia	=	1220. in^4
Elastic Bending Stiffness	=	35380000. kip-in^2
Plastic Modulus, Z	=	194.000000in^3

Plastic Moment Capacity = Fy Z = 9700.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 1720.000 kips
Nominal Axial Tensile Capacity = -1720.000 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	172.6211844549	35100995.	7.1000000000	
0.0000098357	345.2423689099	35100995.	7.1000000000	
0.0000147535	517.8635533648	35100995.	7.1000000000	
0.0000196714	690.4847378198	35100995.	7.1000000000	
0.0000245892	863.1059222747	35100995.	7.1000000000	
0.0000295071	1036.	35100995.	7.1000000000	
0.0000344249	1208.	35100995.	7.1000000000	
0.0000393427	1381.	35100995.	7.1000000000	
0.0000442606	1554.	35100995.	7.1000000000	
0.0000491784	1726.	35100995.	7.1000000000	
0.0000540963	1899.	35100995.	7.1000000000	
0.0000590141	2071.	35100995.	7.1000000000	
0.0000639320	2244.	35100995.	7.1000000000	
0.0000688498	2417.	35100995.	7.1000000000	
0.0000737676	2589.	35100995.	7.1000000000	

0.0000786855	2762.	35100995.	7.1000000000	
0.0000836033	2935.	35100995.	7.1000000000	
0.0000885212	3107.	35100995.	7.1000000000	
0.0000934390	3280.	35100995.	7.1000000000	
0.0000983569	3452.	35100995.	7.1000000000	
0.0001032747	3625.	35100995.	7.1000000000	
0.0001081925	3798.	35100995.	7.1000000000	
0.0001131104	3970.	35100995.	7.1000000000	
0.0001180282	4143.	35100995.	7.1000000000	
0.0001229461	4316.	35100995.	7.1000000000	
0.0001278639	4488.	35100995.	7.1000000000	
0.0001327818	4661.	35100995.	7.1000000000	
0.0001376996	4833.	35100995.	7.1000000000	
0.0001426174	5006.	35100995.	7.1000000000	
0.0001475353	5179.	35100995.	7.1000000000	
0.0001524531	5351.	35100995.	7.1000000000	
0.0001573710	5524.	35100995.	7.1000000000	
0.0001622888	5696.	35100995.	7.1000000000	
0.0001672067	5869.	35100995.	7.1000000000	
0.0001721245	6042.	35100995.	7.1000000000	
0.0001770424	6214.	35100995.	7.1000000000	
0.0001819602	6387.	35100995.	7.1000000000	
0.0001868780	6560.	35100995.	7.1000000000	
0.0001917959	6732.	35100995.	7.1000000000	
0.0002016316	7077.	35100995.	7.1000000000	
0.0002114673	7423.	35100995.	7.1000000000	
0.0002213029	7768.	35100995.	7.1000000000	
0.0002311386	8113.	35100995.	7.1000000000	
0.0002409743	8458.	35100995.	7.1000000000	
0.0002508100	8768.	34956786.	7.1000000000	Y
0.0002606457	8968.	34406082.	7.1000000000	Y
0.0002704814	9073.	33542198.	7.1000000000	Y
0.0002803171	9118.	32525814.	7.1000000000	Y
0.0002901527	9151.	31539616.	7.1000000000	Y
0.0002999884	9182.	30607932.	7.1000000000	Y
0.0003098241	9210.	29725136.	7.1000000000	Y
0.0003196598	9235.	28889181.	7.1000000000	Y
0.0003294955	9258.	28096536.	7.1000000000	Y
0.0003393312	9279.	27344053.	7.1000000000	Y
0.0003491669	9298.	26628906.	7.1000000000	Y
0.0003590025	9316.	25948550.	7.1000000000	Y
0.0003688382	9332.	25300683.	7.1000000000	Y
0.0003786739	9347.	24683214.	7.1000000000	Y
0.0003885096	9361.	24094238.	7.1000000000	Y

0.0003983453	9374.	23532010.	7.1000000000	Y
0.0004081810	9386.	22993958.	7.1000000000	Y
0.0004180167	9397.	22479436.	7.1000000000	Y
0.0004278523	9407.	21987182.	7.1000000000	Y
0.0004376880	9417.	21515064.	7.1000000000	Y
0.0004475237	9426.	21062342.	7.1000000000	Y
0.0004573594	9435.	20628245.	7.1000000000	Y
0.0004671951	9442.	20210614.	7.1000000000	Y
0.0004770308	9450.	19809883.	7.1000000000	Y
0.0004868665	9457.	19423744.	7.1000000000	Y
0.0004967022	9464.	19052717.	7.1000000000	Y
0.0005065378	9470.	18694718.	7.1000000000	Y
0.0005163735	9476.	18350357.	7.1000000000	Y
0.0005262092	9481.	18017531.	7.1000000000	Y
0.0005360449	9486.	17696878.	7.1000000000	Y
0.0005458806	9491.	17387006.	7.1000000000	Y
0.0005557163	9496.	17087665.	7.1000000000	Y
0.0005655520	9501.	16798647.	7.1000000000	Y
0.0005753876	9505.	16518541.	7.1000000000	Y
0.0005852233	9509.	16247851.	7.1000000000	Y
0.0006245661	9523.	15247286.	7.1000000000	Y
0.0006639088	9535.	14361320.	7.1000000000	Y
0.0007032516	9544.	13571868.	7.1000000000	Y
0.0007425943	9553.	12864088.	7.1000000000	Y
0.0007819371	9560.	12226014.	7.1000000000	Y
0.0008212798	9566.	11647588.	7.1000000000	Y
0.0008606225	9571.	11121235.	7.1000000000	Y
0.0008999653	9576.	10640384.	7.1000000000	Y
0.0009393080	9580.	10198808.	7.1000000000	Y
0.0009786508	9584.	9792580.	7.1000000000	Y
0.0010179935	9587.	9417093.	7.1000000000	Y
0.0010573363	9590.	9069525.	7.1000000000	Y
0.0010966790	9592.	8746284.	7.1000000000	Y
0.0011360218	9594.	8445432.	7.1000000000	Y
0.0011753645	9596.	8164483.	7.1000000000	Y
0.0012147072	9598.	7901486.	7.1000000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load	Axial	Nominal Moment

No.	Thrust kips	Capacity in-kips
1	0.00000000	9598.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Drilled Shaft (Bored Pile) with Casing and H Strong Axis Core/Insert:

Length of Section	=	16.000000 ft
Outside Diameter of Casing	=	24.000000 in
Casing Wall Thickness	=	0.0000 in
Moment of Inertia of Steel Casing	=	0.0000 in^4
Width Flange of Core/Insert	=	14.900000 in
Depth of Core/Insert	=	14.200000 in
Flange Thickness of Core/Insert	=	0.805000 in
Web Thickness of Core/Insert	=	0.805000 in
Moment of Inertia of Steel Core/Insert	=	1211. in^4
Yield Stress of Casing	=	50000. psi
Elastic Modulus of Casing	=	29000000. psi
Yield Stress of Core/Insert	=	50000. psi
Elastic Modulus of Core/Insert	=	29000000. psi
Number of Reinforcing Bars	=	0 bars
Gross Area of Pile	=	452.389342 sq. in.
Area of Concrete	=	418.265392 sq. in.
Cross-sectional Area of Steel Casing	=	0.0000 sq. in.
Cross-sectional Area of Steel Core/Insert	=	34.123950 sq. in.
Area of All Steel (Casing, Core/Insert, and Bars)	=	34.123950 sq. in.
Area Ratio of All Steel to Gross Area	=	7.54 percent

Note that the core is assumed to be void of concrete.

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 3128.300 kips
Tensile Load for Cracking of Concrete = -288.130 kips
Nominal Axial Tensile Capacity = -1706.197 kips

Number of Axial Thrust Force Values Determined from LRFD Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Run Msg
0.0000049178	483.9280578262	98402501.	12.0000000000	
0.0000098357	547.8658210217	55701840.	9.4666118792	C
0.0000147535	819.9660048544	55577617.	9.4783778602	C
0.0000196714	1091.	55452505.	9.4900875402	C
0.0000245892	1360.	55326491.	9.5018840041	C
0.0000295071	1629.	55199559.	9.5137803907	C
0.0000344249	1896.	55071694.	9.5257784079	C
0.0000393427	2162.	54942882.	9.5378798087	C
0.0000442606	2426.	54813107.	9.5500863932	C
0.0000491784	2689.	54682353.	9.5624000097	C
0.0000540963	2951.	54550604.	9.5748225567	C
0.0000590141	3211.	54417844.	9.5873559851	C
0.0000639320	3470.	54284054.	9.6000022998	C

0.0000688498	3728.	54149219.	9.6128136507	C
0.0000737676	3984.	54013319.	9.6256921077	C
0.0000786855	4239.	53876336.	9.6386894617	C
0.0000836033	4493.	53738251.	9.6518079772	C
0.0000885212	4745.	53599044.	9.6650499842	C
0.0000934390	4995.	53458695.	9.6784178810	C
0.0000983569	5244.	53317184.	9.6919141367	C
0.0001032747	5492.	53174489.	9.7055412943	C
0.0001081925	5738.	53030588.	9.7192638865	C
0.0001131104	5982.	52885560.	9.7329538297	C
0.0001180282	6225.	52739305.	9.7467734287	C
0.0001229461	6466.	52591796.	9.7607307822	C
0.0001278639	6706.	52443008.	9.7748287202	C
0.0001327818	6944.	52292918.	9.7890701628	C
0.0001376996	7180.	52141499.	9.8034581245	C
0.0001426174	7414.	51988725.	9.8179957178	C
0.0001475353	7647.	51834570.	9.8326861573	C
0.0001524531	7879.	51679004.	9.8475327649	C
0.0001573710	8108.	51522000.	9.8625389744	C
0.0001622888	8336.	51363527.	9.8777090093	C
0.0001672067	8562.	51203554.	9.8930452712	C
0.0001721245	8786.	51042050.	9.9085518865	C
0.0001770424	9008.	50878982.	9.9242335917	C
0.0001819602	9228.	50714314.	9.9401017003	C
0.0001868780	9446.	50548013.	9.9561426736	C
0.0001917959	9651.	50316691.	9.9667928811	CY
0.0002016316	9953.	49364758.	9.9453095387	CY
0.0002114673	10100.	47762925.	9.8614668104	CY
0.0002213029	10212.	46146522.	9.7727410217	CY
0.0002311386	10313.	44618447.	9.6882620100	CY
0.0002409743	10403.	43170524.	9.6068690660	CY
0.0002508100	10485.	41804448.	9.5299580709	CY
0.0002606457	10559.	40511464.	9.4562520233	CY
0.0002704814	10627.	39288392.	9.3851393320	CY
0.0002803171	10689.	38131432.	9.3174490971	CY
0.0002901527	10746.	37035316.	9.2527602315	CY
0.0002999884	10798.	35994808.	9.1898376201	CY
0.0003098241	10846.	35007897.	9.1293485656	CY
0.0003196598	10891.	34071206.	9.0715442645	CY
0.0003294955	10933.	33181540.	9.0162300299	CY
0.0003393312	10972.	32334082.	8.9621602836	CY
0.0003491669	11008.	31525666.	8.9095528857	CY
0.0003590025	11041.	30755544.	8.8591229075	CY
0.0003688382	11073.	30021768.	8.8106918549	CY

0.0003786739	11103.	29321948.	8.7643273751	CY
0.0003885096	11131.	28650012.	8.7179786899	CY
0.0003983453	11157.	28008210.	8.6733064948	CY
0.0004081810	11182.	27394500.	8.6304372118	CY
0.0004180167	11205.	26805267.	8.5887154354	CY
0.0004278523	11228.	26241882.	8.5483328517	CY
0.0004376880	11249.	25699823.	8.5092824497	CY
0.0004475237	11268.	25179093.	8.4707792640	CY
0.0004573594	11270.	24640491.	8.4411834821	CY
0.0004671951	11288.	24160763.	8.4054600230	CY
0.0004770308	11288.	23662603.	8.3852064789	CY
0.0004868665	11292.	23193002.	8.3507840823	CY
0.0004967022	11292.	22733735.	8.3361999768	CY
0.0005065378	11292.	22292303.	8.3031913295	CY
0.0005163735	11292.	21867688.	8.2968304685	CY
0.0005262092	11292.	21458946.	8.2677796966	CY
0.0005360449	11292.	21065204.	8.2668842544	CY
0.0005458806	11292.	20685651.	8.2387547995	CY
0.0005557163	11292.	20319533.	8.2389089316	CY

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	11292.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	11.0000	0.00	N.A.	No	0.00	53997.
2	21.0000	10.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals
for Layer n. Layering correction equivalent depths are computed only
for soil types with both shallow-depth and deep-depth expressions for
peak lateral load transfer. These soil types are soft and stiff clays,
non-liquefied sands, and cemented c-phi soil.

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
64.80	0.07
68.04	5.30
71.28	13.73
74.52	22.15
77.76	30.58
81.00	39.00
84.24	47.42
87.48	55.85
90.72	64.27
93.96	72.70
97.20	81.12

100.44	89.54
103.68	97.97
106.92	106.39
110.16	114.82
113.40	123.24
116.64	131.66
119.88	140.09
123.12	148.51
126.36	156.94
129.60	165.36
132.84	41.07

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.15
3.24	8.59
6.48	17.17
9.72	25.76
12.96	34.34
16.20	42.93
19.44	51.52
22.68	60.10
25.92	68.69
29.16	77.27
32.40	85.86
35.64	94.45
38.88	103.03
42.12	111.62
45.36	120.20
48.60	128.79
51.84	137.38
55.08	145.96
58.32	154.55
61.56	163.13

64.80	171.68
68.04	177.49
71.28	181.62
74.52	185.74
77.76	189.86
81.00	193.98
84.24	198.10
87.48	202.22
90.72	206.34
93.96	210.46
97.20	214.59
100.44	218.71
103.68	222.83
106.92	226.95
110.16	231.07
113.40	235.19
116.64	239.31
119.88	243.43
123.12	247.55
126.36	251.68
129.60	255.80
132.84	62.20

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 1

Load Case No. 1: Service Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	1.66355	-5.940E-06	0.000	0.000	3.510E+10
0.27000	1.63759	11.26655	17.38665	0.000	3.510E+10
0.54000	1.61163	112.66550	59.11461	0.000	3.510E+10
0.81000	1.58567	394.32923	128.66121	0.000	3.510E+10

1.08000	1.55970	946.39014	226.02645	0.000	3.510E+10
1.35000	1.53374	1859.	351.21033	0.000	3.510E+10
1.62000	1.50778	3222.	504.21285	0.000	3.510E+10
1.89000	1.48182	5126.	685.03401	0.000	3.510E+10
2.16000	1.45586	7661.	893.67381	0.000	3.510E+10
2.43000	1.42991	10917.	1130.	0.000	3.510E+10
2.70000	1.40395	14985.	1394.	0.000	3.510E+10
2.97000	1.37800	19953.	1687.	0.000	3.510E+10
3.24000	1.35206	25913.	2006.	0.000	3.510E+10
3.51000	1.32613	32955.	2354.	0.000	3.510E+10
3.78000	1.30020	41168.	2730.	0.000	3.510E+10
4.05000	1.27429	50643.	3133.	0.000	3.510E+10
4.32000	1.24839	61470.	3564.	0.000	3.510E+10
4.59000	1.22251	73740.	4023.	0.000	3.510E+10
4.86000	1.19666	87541.	4510.	0.000	3.510E+10
5.13000	1.17082	102965.	5025.	0.000	3.510E+10
5.40000	1.14502	120101.	5567.	0.000	3.510E+10
5.67000	1.11926	139041.	6142.	0.000	3.510E+10
5.94000	1.09354	159899.	6754.	0.000	3.510E+10
6.21000	1.06786	182808.	7407.	0.000	3.510E+10
6.48000	1.04224	207900.	8101.	0.000	3.510E+10
6.75000	1.01669	235305.	8836.	0.000	3.510E+10
7.02000	0.99120	265156.	9611.	0.000	3.510E+10
7.29000	0.96579	297585.	10427.	0.000	3.510E+10
7.56000	0.94047	332722.	11283.	0.000	3.510E+10
7.83000	0.91525	370701.	12180.	0.000	3.510E+10
8.10000	0.89014	411652.	13118.	0.000	3.510E+10
8.37000	0.86516	455707.	14097.	0.000	3.510E+10
8.64000	0.84031	502998.	15116.	0.000	3.510E+10
8.91000	0.81561	553656.	16175.	0.000	3.510E+10
9.18000	0.79107	607814.	17276.	0.000	3.510E+10
9.45000	0.76672	665603.	18417.	0.000	3.510E+10
9.72000	0.74257	727155.	19598.	0.000	3.510E+10
9.99000	0.71863	792601.	20821.	0.000	3.510E+10
10.26000	0.69494	862073.	22084.	0.000	3.510E+10
10.53000	0.67150	935702.	23387.	0.000	3.510E+10
10.80000	0.64834	1013622.	24731.	0.000	3.510E+10
11.07000	0.62548	1095962.	25574.	-4.4605	5.545E+10
11.34000	0.60283	1179339.	25697.	-22.5468	5.540E+10
11.61000	0.58040	1262480.	25593.	-41.6969	5.537E+10
11.88000	0.55821	1345183.	25426.	-61.4731	5.533E+10
12.15000	0.53628	1427241.	25194.	-81.5049	5.529E+10
12.42000	0.51462	1508443.	24898.	-101.4550	5.525E+10
12.69000	0.49325	1588580.	24538.	-120.9396	5.522E+10

12.96000	0.47218	1667448.	24116.	-139.6181	5.518E+10
13.23000	0.45142	1744850.	23634.	-157.6382	5.514E+10
13.50000	0.43100	1820597.	23096.	-174.4868	5.510E+10
13.77000	0.41092	1894512.	22506.	-189.8229	5.507E+10
14.04000	0.39121	1966435.	21868.	-203.7008	5.503E+10
14.31000	0.37187	2036219.	21186.	-217.6229	5.500E+10
14.58000	0.35292	2103719.	20461.	-229.6979	5.497E+10
14.85000	0.33437	2168808.	19701.	-239.7012	5.494E+10
15.12000	0.31623	2231380.	18910.	-248.3591	5.491E+10
15.39000	0.29852	2291345.	18093.	-256.0305	5.488E+10
15.66000	0.28125	2348622.	17255.	-261.5067	5.485E+10
15.93000	0.26443	2403155.	16402.	-264.6482	5.482E+10
16.20000	0.24807	2454909.	15540.	-267.3570	5.480E+10
16.47000	0.23218	2503856.	14673.	-268.3237	5.477E+10
16.74000	0.21677	2549987.	13806.	-266.7242	5.475E+10
17.01000	0.20185	2593317.	12948.	-262.6651	5.473E+10
17.28000	0.18743	2633891.	12098.	-261.8776	5.471E+10
17.55000	0.17351	2671715.	11255.	-258.7803	5.469E+10
17.82000	0.16010	2706823.	10425.	-253.3060	5.467E+10
18.09000	0.14722	2739271.	9617.	-245.4240	5.466E+10
18.36000	0.13486	2769143.	8839.	-235.1478	5.464E+10
18.63000	0.12303	2796547.	8097.	-222.5439	5.463E+10
18.90000	0.11174	2821615.	7400.	-207.7408	5.461E+10
19.17000	0.10099	2844501.	6740.	-199.8214	5.460E+10
19.44000	0.09079	2865291.	6099.	-195.8131	5.459E+10
19.71000	0.08114	2884024.	5473.	-190.6274	5.458E+10
19.98000	0.07205	2900757.	4866.	-184.2836	5.457E+10
20.25000	0.06351	2915554.	4281.	-176.8160	5.457E+10
20.52000	0.05553	2928496.	3722.	-168.2758	5.456E+10
20.79000	0.04812	2939671.	3192.	-158.7325	5.456E+10
21.06000	0.04127	2949180.	544.02427	-1476.	5.455E+10
21.33000	0.03499	2943197.	-4557.	-1673.	5.455E+10
21.60000	0.02928	2919650.	-10258.	-1846.	5.457E+10
21.87000	0.02413	2876727.	-16476.	-1993.	5.459E+10
22.14000	0.01953	2812886.	-23126.	-2112.	5.462E+10
22.41000	0.01547	2726872.	-30115.	-2202.	5.466E+10
22.68000	0.01194	2617741.	-37344.	-2260.	5.472E+10
22.95000	0.008907	2484884.	-44704.	-2283.	5.478E+10
23.22000	0.006351	2328059.	-52073.	-2266.	5.486E+10
23.49000	0.004241	2147451.	-59307.	-2200.	5.495E+10
23.76000	0.002541	1943752.	-66221.	-2069.	5.505E+10
24.03000	0.001211	1718339.	-72536.	-1830.	5.515E+10
24.30000	0.000209	1473718.	-77453.	-1205.	5.527E+10
24.57000	-0.000513	1216446.	-76724.	1655.	5.539E+10

24.84000	-0.001005	976548.	-70699.	2064.	5.550E+10
25.11000	-0.001312	758313.	-63600.	2319.	5.560E+10
25.38000	-0.001476	564422.	-55785.	2505.	5.569E+10
25.65000	-0.001533	396823.	-47441.	2646.	9.840E+10
25.92000	-0.001548	257006.	-38665.	2771.	9.840E+10
26.19000	-0.001536	146276.	-29505.	2883.	9.840E+10
26.46000	-0.001508	65812.	-19995.	2987.	9.840E+10
26.73000	-0.001473	16706.	-10156.	3086.	9.840E+10
27.00000	-0.001436	0.000	0.000	3183.	9.840E+10

Output Summary for Load Case No. 1:

Pile-head deflection	=	1.66355127 inches
Computed slope at pile head	=	-0.0080130 radians
Maximum bending moment	=	2949180. inch-lbs
Maximum shear force	=	-77453. lbs
Depth of maximum bending moment	=	21.06000000 feet below pile head
Depth of maximum shear force	=	24.30000000 feet below pile head
Number of iterations	=	28
Number of zero deflection points	=	1
Pile deflection at ground	=	0.63140401 inches

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Water Loads

Depth in	Distributed Load lb/in
64.80	0.07
68.04	5.30
71.28	13.73
74.52	22.15
77.76	30.58
81.00	39.00
84.24	47.42
87.48	55.85
90.72	64.27
93.96	72.70
97.20	81.12

100.44	89.54
103.68	97.97
106.92	106.39
110.16	114.82
113.40	123.24
116.64	131.66
119.88	140.09
123.12	148.51
126.36	156.94
129.60	165.36
132.84	41.07

Distributed Lateral Loads for LRFD:

Sums of Distributed Lateral Load Per Unit Length due to Horizontal Soil Pressures

Depth in	Distributed Load lb/in
0.00	2.15
3.24	8.59
6.48	17.17
9.72	25.76
12.96	34.34
16.20	42.93
19.44	51.52
22.68	60.10
25.92	68.69
29.16	77.27
32.40	85.86
35.64	94.45
38.88	103.03
42.12	111.62
45.36	120.20
48.60	128.79
51.84	137.38
55.08	145.96
58.32	154.55
61.56	163.13

64.80	171.68
68.04	177.49
71.28	181.62
74.52	185.74
77.76	189.86
81.00	193.98
84.24	198.10
87.48	202.22
90.72	206.34
93.96	210.46
97.20	214.59
100.44	218.71
103.68	222.83
106.92	226.95
110.16	231.07
113.40	235.19
116.64	239.31
119.88	243.43
123.12	247.55
126.36	251.68
129.60	255.80
132.84	62.20

Computed Values of Pile Loading and Deflection
for Lateral Loading for LRFD Load Case Number 2

Load Case No. 2: Factored Load

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Soil Res. p lb/inch	Bending Stiffness lb-in^2
0.000	2.68160	4.306E-05	0.000	0.000	3.510E+10
0.27000	2.64097	16.89989	26.07998	0.000	3.510E+10
0.54000	2.60033	168.99830	88.67192	0.000	3.510E+10
0.81000	2.55970	591.49390	192.99182	0.000	3.510E+10

1.08000	2.51907	1420.	339.03968	0.000	3.510E+10
1.35000	2.47844	2788.	526.81550	0.000	3.510E+10
1.62000	2.43781	4833.	756.31928	0.000	3.510E+10
1.89000	2.39718	7689.	1028.	0.000	3.510E+10
2.16000	2.35655	11492.	1341.	0.000	3.510E+10
2.43000	2.31592	16376.	1695.	0.000	3.510E+10
2.70000	2.27531	22477.	2092.	0.000	3.510E+10
2.97000	2.23469	29930.	2530.	0.000	3.510E+10
3.24000	2.19409	38870.	3010.	0.000	3.510E+10
3.51000	2.15350	49432.	3531.	0.000	3.510E+10
3.78000	2.11292	61752.	4095.	0.000	3.510E+10
4.05000	2.07236	75965.	4700.	0.000	3.510E+10
4.32000	2.03183	92205.	5346.	0.000	3.510E+10
4.59000	1.99132	110609.	6035.	0.000	3.510E+10
4.86000	1.95084	131312.	6765.	0.000	3.510E+10
5.13000	1.91041	154447.	7537.	0.000	3.510E+10
5.40000	1.87002	180152.	8351.	0.000	3.510E+10
5.67000	1.82968	208561.	9208.	0.000	3.510E+10
5.94000	1.78941	239820.	10112.	0.000	3.510E+10
6.21000	1.74921	274083.	11062.	0.000	3.510E+10
6.48000	1.70909	311504.	12060.	0.000	3.510E+10
6.75000	1.66906	352235.	13106.	0.000	3.510E+10
7.02000	1.62914	396430.	14199.	0.000	3.510E+10
7.29000	1.58934	444242.	15339.	0.000	3.510E+10
7.56000	1.54967	495825.	16526.	0.000	3.510E+10
7.83000	1.51015	551331.	17761.	0.000	3.510E+10
8.10000	1.47079	610915.	19043.	0.000	3.510E+10
8.37000	1.43162	674729.	20372.	0.000	3.510E+10
8.64000	1.39264	742927.	21749.	0.000	3.510E+10
8.91000	1.35389	815663.	23173.	0.000	3.510E+10
9.18000	1.31539	893088.	24644.	0.000	3.510E+10
9.45000	1.27715	975358.	26163.	0.000	3.510E+10
9.72000	1.23920	1062625.	27729.	0.000	3.510E+10
9.99000	1.20157	1155042.	29342.	0.000	3.510E+10
10.26000	1.16429	1252763.	31003.	0.000	3.510E+10
10.53000	1.12738	1355941.	32711.	0.000	3.510E+10
10.80000	1.09088	1464729.	34466.	0.000	3.510E+10
11.07000	1.05481	1579282.	35565.	-5.1536	5.522E+10
11.34000	1.01905	1695190.	35731.	-26.4724	5.516E+10
11.61000	0.98360	1810821.	35608.	-49.7934	5.511E+10
11.88000	0.94851	1925929.	35406.	-74.7374	5.506E+10
12.15000	0.91377	2040253.	35122.	-100.8003	5.500E+10
12.42000	0.87943	2153518.	34754.	-126.1251	5.495E+10
12.69000	0.84550	2265459.	34307.	-150.0512	5.489E+10

12.96000	0.81201	2375825.	33784.	-172.8988	5.484E+10
13.23000	0.77897	2484376.	33188.	-194.7555	5.478E+10
13.50000	0.74640	2590883.	32524.	-215.0571	5.473E+10
13.77000	0.71433	2695132.	31797.	-233.4205	5.468E+10
14.04000	0.68278	2796931.	31014.	-249.9525	5.463E+10
14.31000	0.65177	2896106.	30178.	-266.6366	5.458E+10
14.58000	0.62131	2992481.	29290.	-281.2127	5.453E+10
14.85000	0.59143	3085905.	28359.	-293.4705	5.448E+10
15.12000	0.56214	3176248.	27391.	-304.1558	5.443E+10
15.39000	0.53347	3263398.	26390.	-313.6511	5.439E+10
15.66000	0.50543	3347256.	25362.	-320.7669	5.435E+10
15.93000	0.47803	3427746.	24316.	-325.3817	5.430E+10
16.20000	0.45129	3504820.	23253.	-330.7487	5.426E+10
16.47000	0.42524	3578423.	22174.	-334.8678	5.423E+10
16.74000	0.39987	3648510.	21087.	-336.4701	5.419E+10
17.01000	0.37522	3715065.	19998.	-335.5437	5.416E+10
17.28000	0.35128	3778097.	18905.	-339.2651	5.412E+10
17.55000	0.32808	3837568.	17804.	-340.4481	5.409E+10
17.82000	0.30562	3893466.	16703.	-338.9314	5.406E+10
18.09000	0.28392	3945805.	15612.	-334.5773	5.403E+10
18.36000	0.26298	3994632.	14540.	-327.2788	5.401E+10
18.63000	0.24282	4040023.	13496.	-316.9691	5.398E+10
18.90000	0.22344	4082087.	12491.	-303.6320	5.396E+10
19.17000	0.20486	4120964.	11517.	-297.4530	5.394E+10
19.44000	0.18709	4156718.	10557.	-295.4390	5.392E+10
19.71000	0.17012	4189370.	9605.	-291.8619	5.390E+10
19.98000	0.15396	4218959.	8668.	-286.7073	5.389E+10
20.25000	0.13863	4245538.	7750.	-279.9760	5.387E+10
20.52000	0.12413	4269178.	6856.	-271.6858	5.386E+10
20.79000	0.11046	4289966.	5992.	-261.8737	5.385E+10
21.06000	0.09762	4308004.	2603.	-1830.	5.384E+10
21.33000	0.08563	4306831.	-3752.	-2092.	5.384E+10
21.60000	0.07447	4283691.	-10918.	-2331.	5.385E+10
21.87000	0.06415	4236082.	-18816.	-2544.	5.388E+10
22.14000	0.05466	4161762.	-27364.	-2732.	5.392E+10
22.41000	0.04597	4058766.	-36473.	-2891.	5.397E+10
22.68000	0.03808	3925419.	-46049.	-3020.	5.404E+10
22.95000	0.03094	3760365.	-55992.	-3117.	5.413E+10
23.22000	0.02454	3562592.	-66187.	-3176.	5.423E+10
23.49000	0.01883	3331474.	-76505.	-3193.	5.435E+10
23.76000	0.01376	3066841.	-86788.	-3155.	5.449E+10
24.03000	0.009276	2769085.	-96830.	-3044.	5.464E+10
24.30000	0.005328	2439380.	-106313.	-2810.	5.481E+10
24.57000	0.001848	2080176.	-114558.	-2279.	5.498E+10

24.84000	-0.001236	1697045.	-114730.	2173.	5.516E+10
25.11000	-0.003996	1336726.	-106247.	3063.	5.534E+10
25.38000	-0.006503	1008562.	-95407.	3628.	5.548E+10
25.65000	-0.008819	718487.	-82891.	4097.	5.561E+10
25.92000	-0.0110	471426.	-68927.	4522.	9.840E+10
26.19000	-0.0131	271839.	-53617.	4928.	9.840E+10
26.46000	-0.0152	123985.	-37011.	5323.	9.840E+10
26.73000	-0.0173	32010.	-19133.	5712.	9.840E+10
27.00000	-0.0194	0.000	0.000	6099.	9.840E+10

Output Summary for Load Case No. 2:

Pile-head deflection = 2.68159796 inches
Computed slope at pile head = -0.0125409 radians
Maximum bending moment = 4308004. inch-lbs
Maximum shear force = -114730. lbs
Depth of maximum bending moment = 21.06000000 feet below pile head
Depth of maximum shear force = 24.84000000 feet below pile head
Number of iterations = 35
Number of zero deflection points = 1
Pile deflection at ground = 1.06416161 inches

Summary of Pile Responses for LRFD Analyses

Load Case No.	Pile-head Deflection inches	Maximum Moment in Pile in-lbs	Maximum Shear in Pile lbs	Pile-Head Rotation radians
1	1.6635513	2949180.	-77453.	-0.008013
2	2.6815980	4308004.	-114730.	-0.012541

Maximum pile-head deflection = 2.6815979597 inches
Maximum pile-head rotation = -0.0125409053 radians = -0.718541 deg.

LRFD Performance by Load Case Combination

	Factored	Maximum	Pass/Fail

Load Case No.	Section No.	Resistance Factor for Moment	Moment Capacity of Section in-lbs	Moment Developed in Section in-lbs	for LRFD Moment of Section
1	1	1.00	9597992.	1013622.	Pass
	2	1.00	11291895.	2949180.	Pass
2	1	1.00	9597992.	1464729.	Pass
	2	1.00	11291895.	4308004.	Pass

All LRFD load combinations have passed for all pile sections.

Load Case No.	Section No.	Resistance Factor for Shear	Factored Shear Capacity of Section lbs	Maximum Shear Developed in Section lbs	Pass/Fail for LRFD Shear in Section
1	1	1.00	294150.	24731.	Pass
	2	1.00	294150.	-77453.	Pass
2	1	1.00	294150.	34466.	Pass
	2	1.00	294150.	-114730.	Pass

All LRFD load combinations have passed for all pile sections.

The load case and pile section with the greatest level of developed moment capacity:

LRFD Load Case No. = 2
Pile Section No. = 2

The load case and pile section with the greatest level of developed shear capacity:

LRFD Load Case No. = 2
Pile Section No. = 2
Node Number of Maximum Shear Force = 1
Depth of Maximum Developed Shear = 0.00 ft
Maximum Developed Shear Force = -114730.03 lbs
Factored Shear Capacity at Node = 294150.00 lbs
Fraction of Allowable Shear Capacity = 0.3900

The analysis ended normally.

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	6.0' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Gravity Loads are not considerd in timber lagging design.

Loads			**Fact.**
LS		plf	1.75
WA	624.0	plf	1.00
EH	941.3	plf	1.50
Total	**2035.9**	plf	Fact.

Beam Properties

L	6.0	ft
b	3.5	in, actual size
h	11.25	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**39.375**	in^2
S_x	**73.83**	in^3
I_x	**415.28**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**9,162**	ft-lbs		ft-lbs	**9,162**	ft-lbs
V (fac.)	**6,108**	lbs		lbs	**6,108**	lbs
f_b (fac.)	**1,489**	psi		psi	**1,489**	psi
f_v (fac.)	**233**	psi		psi	**233**	psi
δ	**0.089**	in		in	**0.09**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

Client:	ODOT		Job No.:	2024045	
Project:	BEL-70 Temp Shoring		Sheet No:	1	Of
Subject:	7.5' Lagging Span at Max Depth		Made By:	JKM	Date: 6/19/2026
			Chk'd By:	TJW	Date: 6/19/2026

Sawn Lumber Design (LRFD Method)

Gravity Loads are not considerd in timber lagging design.

Loads			**Fact.**
LS		plf	1.75
WA	624.0	plf	1.00
EH	941.3	plf	1.50
Total	**2035.9**	plf	Fact.

Beam Properties

L	7.5	ft
b	5.5	in, actual size
h	11.50	in, actual size
G	0.55	
γ_w	62.4	pcf
A	**63.25**	in^2
S_x	**121.23**	in^3
I_x	**697.07**	in^4

Applied Loads/Stress			**Override**		**Used**	
γ	**34.3**	pcf	50.0	pcf	**50.0**	pcf
M (fac.)	**14,315**	ft-lbs		ft-lbs	**14,315**	ft-lbs
V (fac.)	**7,635**	lbs		lbs	**7,635**	lbs
f_b (fac.)	**1,417**	psi		psi	**1,417**	psi
f_v (fac.)	**181**	psi		psi	**181**	psi
δ	**0.130**	in		in	**0.13**	in
$\delta_{allowable}$		in				

C_d	Deck Factor		
C_M	Wet Service Factor	Service Type:	Wet Service
C_λ	Time Effect Factor		
C_L	Beam Stability Factor	Bracing Conditions:	Adequate Bracing
C_{fu}	Flat Use Factor	Beam Orientation:	Loaded on Wide Face
C_i	Incising Factor	Is Incising Present?:	No Incising
C_{KF}	Format Conversion Factor		

Wood: Southern Yellow Pine No. 1

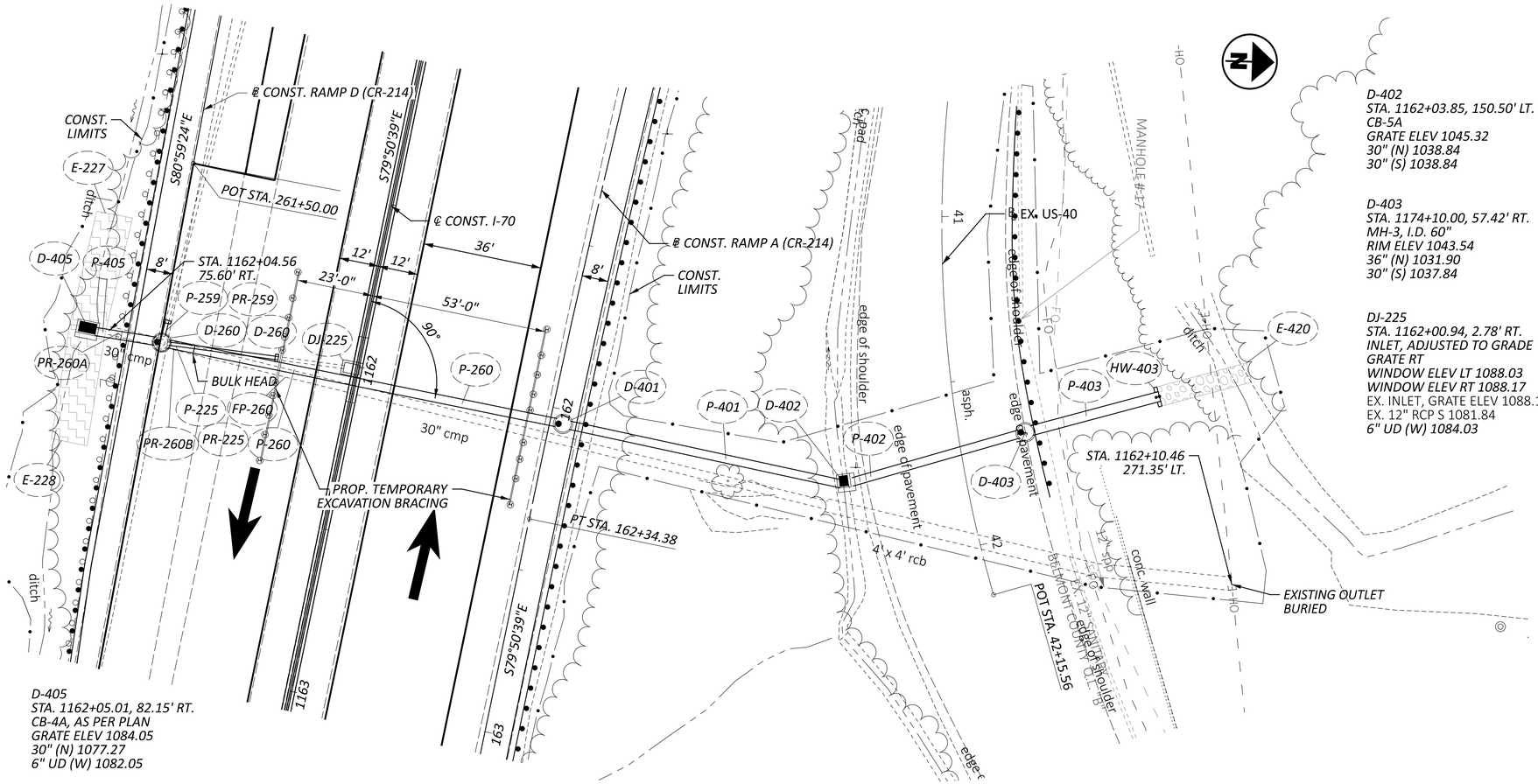
Factored Resistance - Bending Stress				**Override**	**Used**	
F_b	1,500	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_d	1.0		*AASHTO LRFD 8.4.4.8-1, Deck Factor*		**1.0**	
C_{fu}	1.1		*AASHTO LRFD Table 8.4.4.6-1 Flat-Use Fact.*		**1.1**	
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temporary structure, wood not treated
C_{KF}	2.94		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.35	**2.35**	Typical C_{KF} = 2.5 / ϕ
C_F	1.00		*AASHTO LRFD 8.4.4.4, Size Factor*		**1.00**	

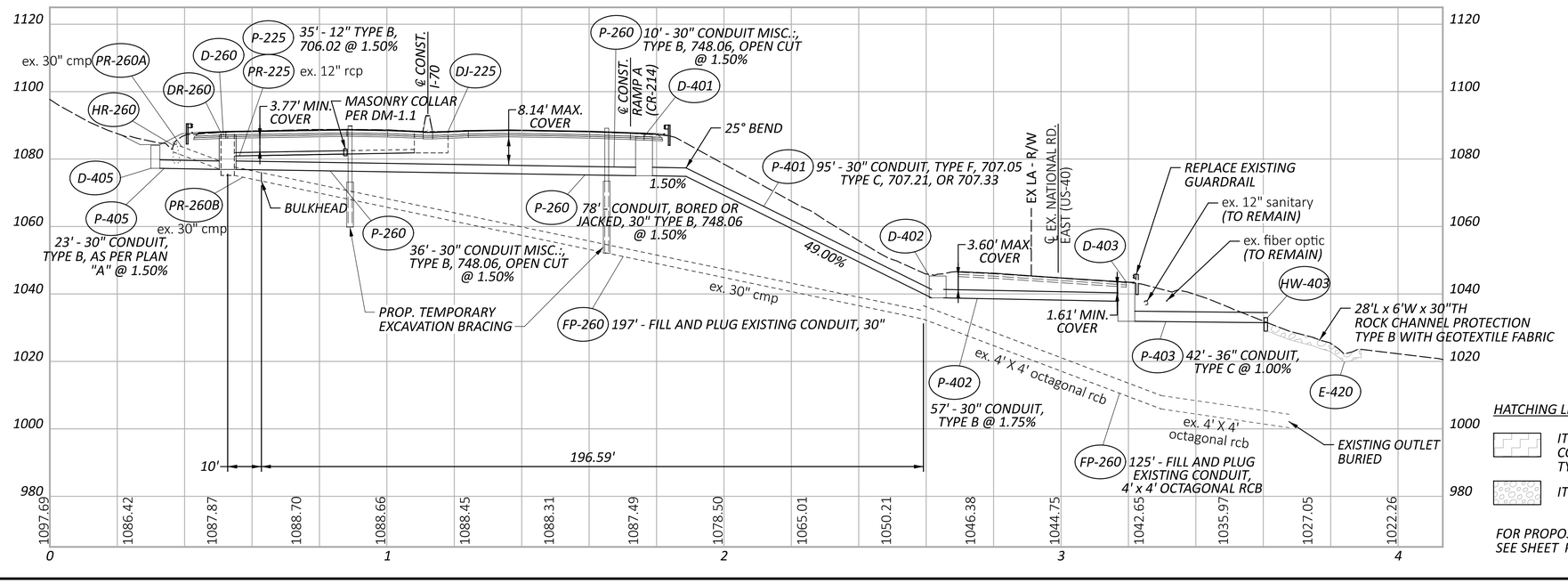
F_b' **2,640** psi **OK** resistance factor ϕ 0.85 AASHTO LRFD 8.4.4.1-1 $F_b = F_{bo} * C_{KF} * C_M * C_{fu} * C_i * C_d * C_\lambda$

Factored Resistance - ShearStress Parallel to Grain				**Override**	**Used**	
F_v	175	psi	*AASHTO LRFD Table 8.4.1.1.4-1*			
C_λ	0.8		*AASHTO LRFD 8.4.4.9-1, Time Effect Factor*		**0.8**	
C_M	1.0		*AASHTO LRFD 8.4.4.3, Wet Service Factor*		**1.0**	
C_{KF}	3.33		*AASHTO LRFD 8.4.4.2, Conversion Factor*	2.00	**2.00**	Typical C_{KF} = 2.5 / ϕ
C_i	0.8		*AASHTO LRFD 8.4.4.7, Incising Factor*	1	**1.0**	temprary structure, wood not treated

F_v' **280** psi **OK** resistance factor ϕ 0.75 AASHTO LRFD 8.4.4.1-2 $Fv = F_{vo} * C_{KF} * C_M * C_{fu} * C_i * C_\lambda$

APPENDIX A – PLAN SHEETS





HATCHING LEGEND

ITEM 836 - SEEDING AND EROSION CONTROL W/ TURF REINFORCING MAT, TYPE 1

ITEM 601 - ROCK CHANNEL PROTECTION

FOR PROPOSED TEMPORARY SHORING DETAIL, SEE SHEET P.837

PIPE PROFILE

P-260, P-401, P-402, P-403, P-405

DESIGN AGENCY

GPD GROUP

DESIGNER ATR

REVIEWER CWL 6-15-26

PROJECT ID 107533

SHEET P.836 TOTAL 1033

BEL-70-19.17

MODEL: Profile Run-1 - Plan 1 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 6/23/2026 TIME: 5:45:40 PM USER: JMarscio
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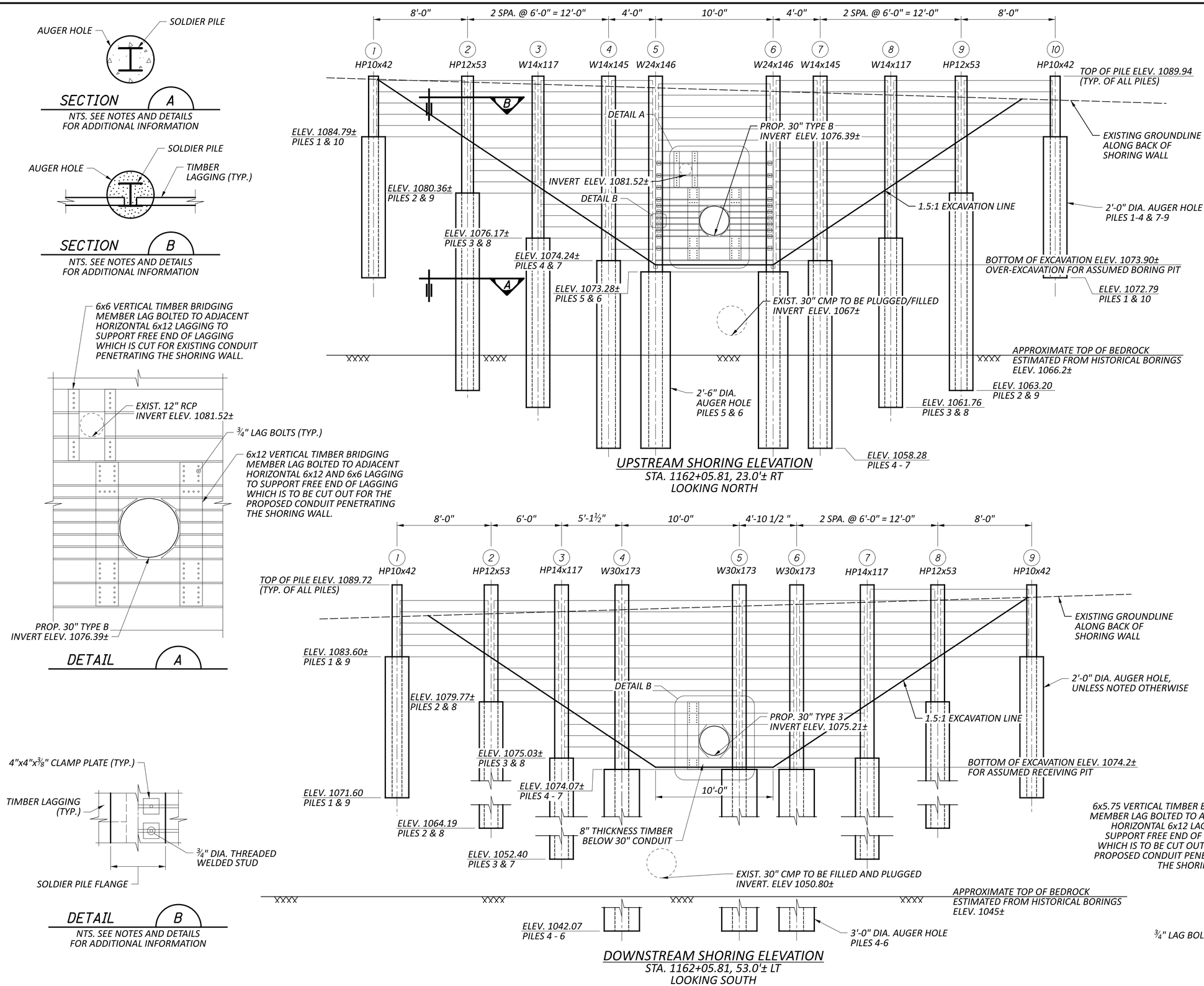
SECTION A

NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION

SECTION B

NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION

DETAIL A



UPSTREAM SHORING ELEVATION

STA. 1162+05.81, 23.0'± RT

LOOKING NORTH

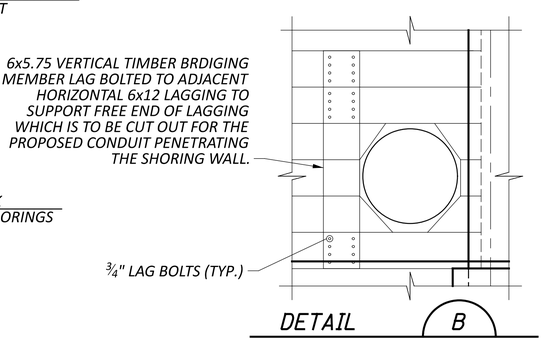
DOWNSTREAM SHORING ELEVATION

STA. 1162+05.81, 53.0'± LT

LOOKING SOUTH

DETAIL B

NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION



DETAIL B

HATCHING LEGEND:

CLASS QC1 CONCRETE

LOW STRENGTH MORTAR BACKFILL

NOTES:

1. HISTORICAL BORING DATA WAS USED FOR PREPARATION OF THIS PLAN. APPROXIMATE BEDROCK ELEVATIONS ARE BASED ON ORIGINAL BORINGS AT STA. 1162+35.00, 62 RT. & 1161+96.00, 9' RT. ACTUAL ELEVATION OF BEDROCK AT EACH WALL LOCATION AND ALONG EACH WALL COULD VARY. NOTIFY ENGINEER IF FIELD CONDITIONS DO NOT MATCH THE PLANS.
2. SOLDIER PILE MATERIAL SHALL BE ASTM A572 GRADE 50 STEEL. LAGGING CLAMP PLATES SHALL BE ASTM A36 WITH MINIMUM YIELD STRESS OF 36 KSI.
3. TIMBER LAGGING SHALL BE SOUTHERN YELLOW PINE NO. 1, MINIMUM ALLOWABLE BENDING STRESS OF 1,500 PSI BEFORE APPLICATION OF ADJUSTMENT FACTORS. LAGGING SHALL BE 6" MINIMUM NOMINAL THICKNESS BETWEEN PILES SPACED 10' HORIZONTALLY AND 4" MINIMUM NOMINAL THICKNESS ELSEWHERE, UNLESS NOTED OTHERWISE.
4. ENCASEMENT OF SOLDIER PILES WITHIN THE AUGER HOLES SHALL CONSIST OF QC1 CONCRETE WITHIN THE STRUCTURAL EMBEDMENT REGION BELOW THE LAGGING. ABOVE THE LAGGING, AUGER HOLE BACKFIELD SHALL BE LOW STRENGTH MORTAR PER CMS 613 TO ALLOW FOR SUBSEQUENT EXCAVATION TO INSTALL LAGGING.
5. SHEET PILE WAS CONSIDERED FOR THE DOWNSTREAM WALL LOCATION BUT THE REQUIRED EMBEDMENT LENGTH EXTENDS BELOW THE EXISTING 30" CMP CULVERT. POTENTIAL PRESENCE OF SHALE BEDROCK WITHIN THE WALL LIMITS COULD ALSO PRECLUDE THE USE OF SHEET PILE.
6. ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO CONSTRUCT THE COMPLETE TEMPORARY SHORING WALL SHALL BE INCLUDED WITH THE ITEM 503 - COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN.
7. THE DESIGN SHOWN ON THE PLANS FOR TEMPORARY SUPPORT TO EXCAVATION IS ONE REPRESENTATIVE DESIGN THAT MAY BE USED TO CONSTRUCT THE PROEJCT.THE CONTRACTOR MAY CONSTRUCT THE DESIGN SHOWN ON THE PLANS OR PREPARE AND ALTERNATE DESIGN TO SUPPORT THE SIDES OF EXCAVATIONS. IF CONSTRUCTING AN ALTERNATE DESIGN FOR TEMPORARY SUPPORT OF EXCAVATION, PREPARE AND PROVIDE PLANS IN ACCORDANCE WITH CMS 501.05. THE DEPARTMENT WILL PAY FOR THE TEMPORARY SUPPORT OF EXCAVATION AT THE CONTRACT LUMP SUM PRICE FOR COFFERDAMS AND EXCAVATION BRACING. THE DEPARTMENT WILL NOT MAKE ADDITIONAL PAYMENT FOR PROVIDING AN ALTERNATE DESIGN.

HORIZONTAL SCALE IN FEET
0 2 4 8

TEMPORARY SHORING DETAILS
CL CONST. I-70 STA. 1162+05.81 (CULVERT #5)

DESIGN AGENCY
GPD GROUP*

DESIGNER JKM

REVIEWER TJW 6-15-26

PROJECT ID 107533

SHEET P.837 TOTAL 1033

BEL-70-19.17

MODEL: Shoring Elevation - Culvert #5 PAPERSIZE: 34x22 (in.) DATE: 6/24/2026 TIME: 9:44:15 AM USER: JMarscio
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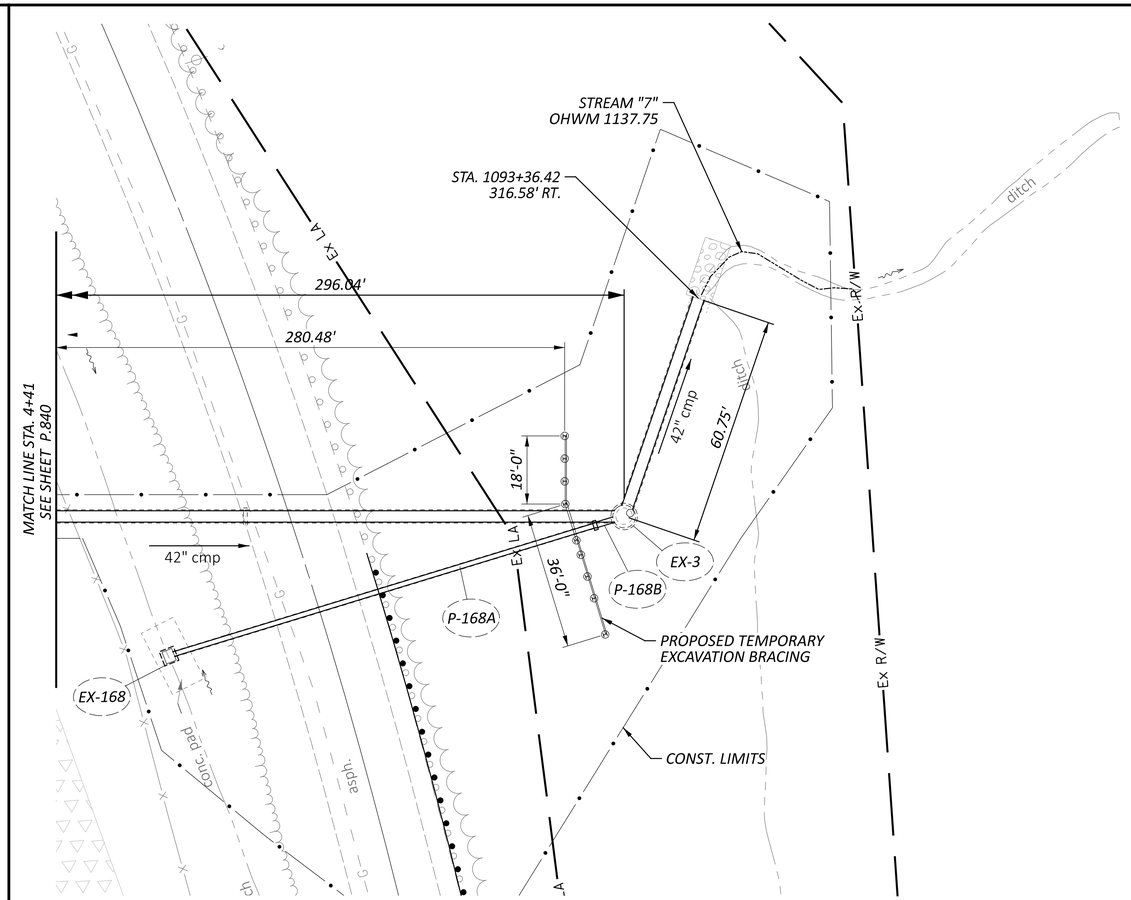

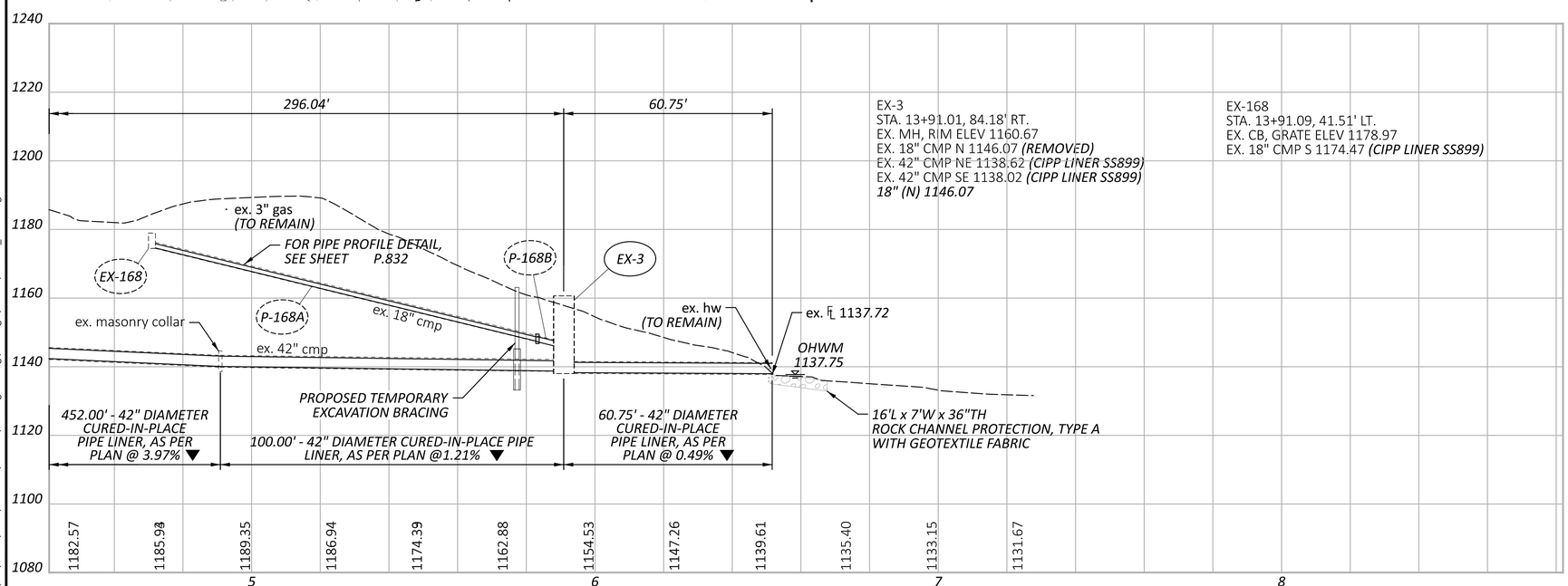

HYDRAULIC DATA

DRAINAGE AREA = 46 ACRES

Q (2%) =	146 CFS	V (2%) =	17.4 FT/S	HW (2%) =	1174.76 FT
Q (1%) =	159 CFS	V (1%) =	18.9 FT/S	HW (1%) =	1177.05 FT

ORDINARY HIGH WATER MARK: 1137.75 FT (OUTLET)

DESIGN SERVICE LIFE: 75 YEARS

ABRASION LEVEL: 2

pH: 8.1

EXISTING STRUCTURE

TYPE: CMP

SIZE: 42"

SKEW: 20°

ALIGNMENT: ℄ R/W I-70

DATE BUILT: 1956/1979

CONDITION: 5

CFN: 1856661

PROPOSED STRUCTURE

TYPE: 42" CIPP LINER (SS899)

SKEW: 20°

ALIGNMENT: ℄ CONST. I-70

CFN: 1856661

HATCHING LEGEND

ITEM 601 - ROCK CHANNEL PROTECTION

FOR PROPOSED TEMPORARY SHORING DETAIL, SEE SHEET P.842

▼ FOR CULVERT #3 NOTE, SEE SHEET P.43 .

HORIZONTAL SCALE IN FEET
0 10 20 40

CULVERT DETAILS
CL CONST. I-70 STA. 1093+87.25 (CULVERT #3)

DESIGN AGENCY
GPD GROUP®

DESIGNER
ATR

REVIEWER
CWL 6-15-26

PROJECT ID
107533

SHEET P.841 TOTAL 1033

BEL-70-19.17

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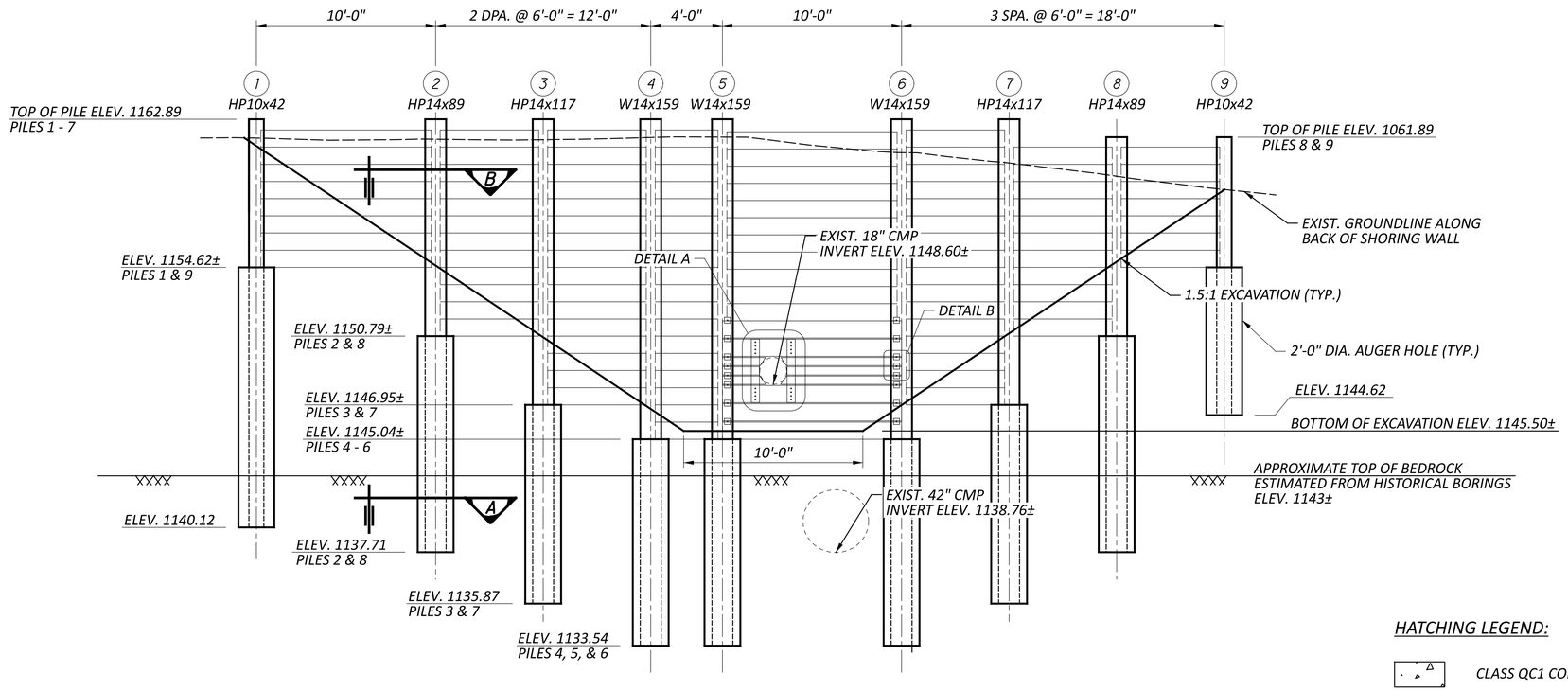


SHORING ELEVATION

HORIZONTAL SCALE IN FEET
0 2 4 8

HATCHING LEGEND:

CLASS QC1 CONCRETE

LOW STRENGTH MORTAR BACKFILL

NOTES:

1. HISTORICAL BORING DATA WAS USED FOR PREPARATION OF THIS PLAN. APPROXIMATE BEDROCK ELEVATION IS BASED ON ORIGINAL RELOCATED TWP. ROAD 219 BORING AT STA. 14+00±, 13' LT. ACTUAL ELEVATION OF BEDROCK AT WALL LOCATION COULD VARY. NOTIFY ENGINEER IF FIELD CONDITIONS DO NOT MATCH THE PLANS.

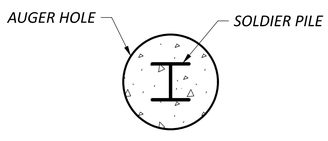
2. SOLDIER PILE MATERIAL SHALL BE ASTM A572 GRADE 50 STEEL. LAGGING CLAMP PLATE SHALL BE ASTM A36 WITH MINIMUM YIELD STRESS OF 36 KSI.

3. TIMBER LAGGING SHALL BE SOUTHERN YELLOW PINE NO. 1, MINIMUM ALLOWABLE BENDING STRESS OF 1,500 PSI BEFORE APPLICATION OF ADJUSTMENT FACTORS. LAGGING SHALL BE 6" MINIMUM NOMINAL THICKNESS BETWEEN PILES SPACED 10' HORIZONTALLY AND 4" MINIMUM NOMINAL THICKNESS ELSEWHERE.

4. ENCASEMENT OF SOLDIER PILES WITHIN THE AUGER HOLES SHALL CONSIST OF QC1 CONCRETE WITHIN THE STRUCTURAL EMBEDMENT REGION BELOW THE LAGGING. ABOVE THE LAGGING, AUGER HOLE BACKFIELD SHALL BE LOW STRENGTH MORTAR PER CMS 613 TO ALLOW FOR SUBSEQUENT EXCAVATION TO INSTALL LAGGING.

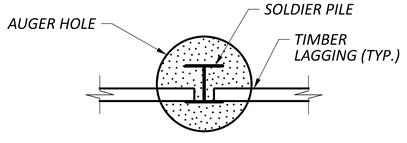
5. ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO CONSTRUCT THE COMPLETE TEMPORARY SHORING WALL SHALL BE INCLUDED WITH THE ITEM 503 - COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN.

6. THE DESIGN SHOWN ON THE PLANS FOR TEMPORARY SUPPORT TO EXCAVATION IS ONE REPRESENTATIVE DESIGN THAT MAY BE USED TO CONSTRUCT THE PROEJCT.THE CONTRACTOR MAY CONSTRUCT THE DESIGN SHOWN ON THE PLANS OR PREPARE AND ALTERNATE DESIGN TO SUPPORT THE SIDES OF EXCAVATIONS. IF CONSTRUCTING AN ALTERNATE DESIGN FOR TEMPORARY SUPPORT OF EXCAVATION, PREPARE AND PROVIDE PLANS IN ACCORDANCE WITH CMS 501.05. THE DEPARTMENT WILL PAY FOR THE TEMPORARY SUPPORT OF EXCAVATION AT THE CONTRACT LUMP SUM PRICE FOR COFFERDAMS AND EXCAVATION BRACING. THE DEPARTMENT WILL NOT MAKE ADDITIONAL PAYMENT FOR PROVIDING AN ALTERNATE DESIGN.



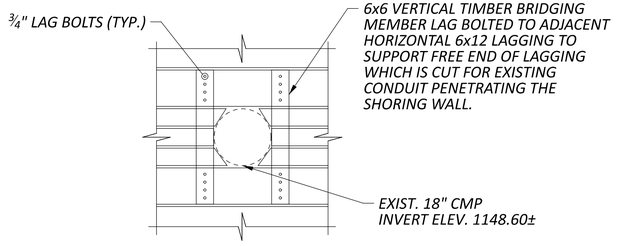
SECTION A

NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION

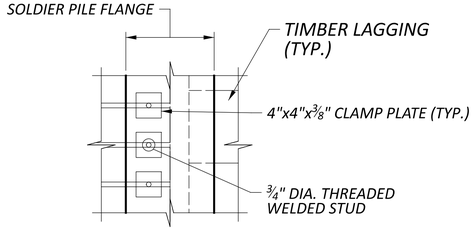


SECTION B

NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION



DETAIL A



DETAIL B

NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION

TEMPORARY SHORING DETAILS
CL CONST. I-70 STA. 1093+87.25 (CULVERT #3)

DESIGN AGENCY
GPD GROUP*
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DESIGNER JKM
REVIEWER TJW 6-15-26
PROJECT ID 107533
SHEET P.842 TOTAL 1033

BEL-70-19.17

MODEL: Shoring Details - Culvert 3 PAPERSIZE: 34x22 (in.) DATE: 6/23/2026 TIME: 4:36:03 PM USER: JMarscio
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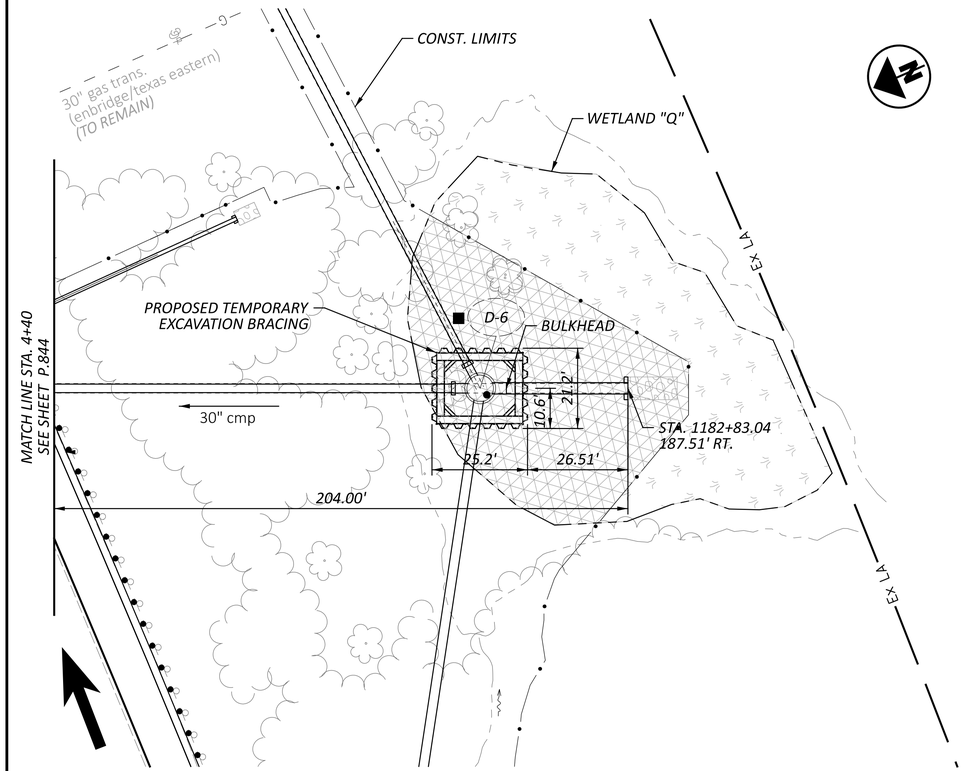

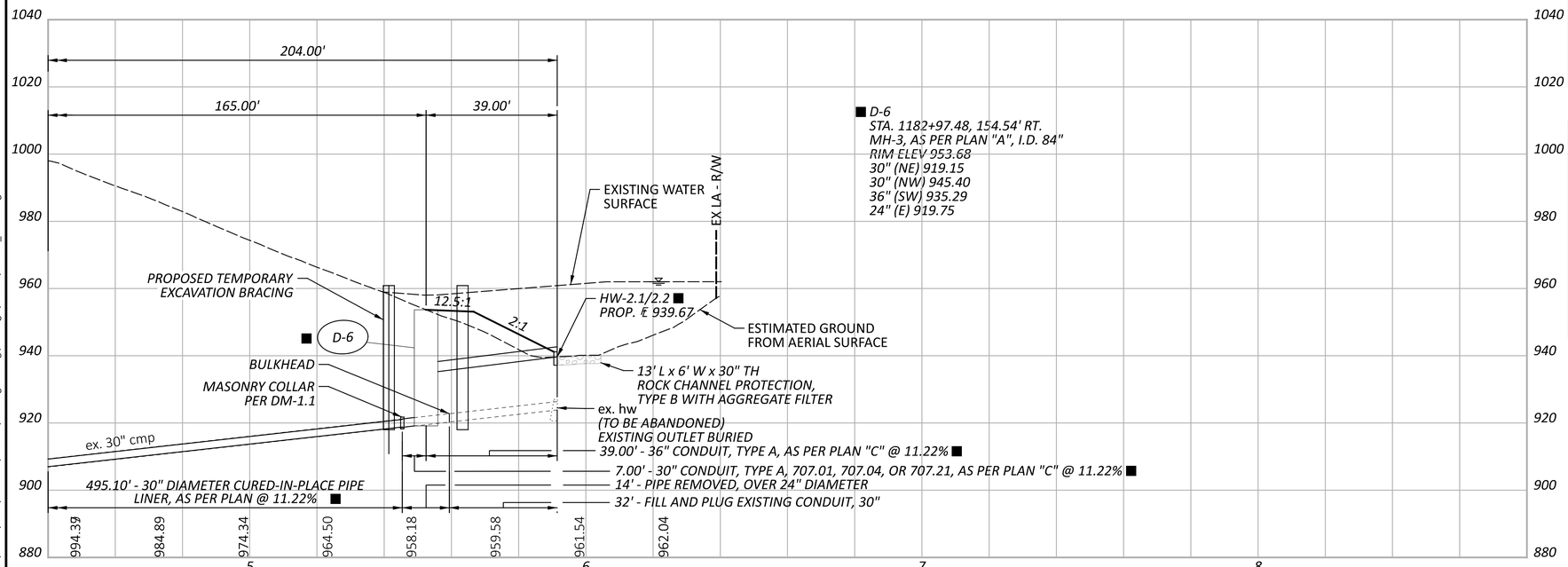

HYDRAULIC DATA

DRAINAGE AREA = 61 ACRES

Q (2%) =	105 CFS	*V (2%) =*	38.6 FT/S	*HW (2%) =*	988.76 FT
Q (1%) =	114 CFS	*V (1%) =*	42.0 FT/S	*HW (1%) =*	1011.31 FT

ORDINARY HIGH WATER MARK: 863.45 FT (OUTLET)
DESIGN SERVICE LIFE: 75 YEARS
ABRASION LEVEL: 1
pH: 7.7

EXISTING STRUCTURE

TYPE: CMP
SIZE: 30"
SKEW: 24°
ALIGNMENT: ℄ R/W I-70
DATE BUILT: 1961
CONDITION: 5
CFN: 1992402

PROPOSED STRUCTURE

TYPE: 30" CIPP LINER (SS899)

SKEW: 24°
ALIGNMENT: ℄ CONST. I-70
CFN: 1992402

HATCHING LEGEND

- ITEM 601 - ROCK CHANNEL PROTECTION
- WETLAND AREA TO BE DISTURBED
- WETLAND

FOR PROPOSED TEMPORARY SHORING DETAIL, SEE SHEET P.846
■ *FOR CULVERT #6 AND CULVERT #7 NOTE, SEE SHEET P.43*

HORIZONTAL SCALE IN FEET
0 10 20 40

CL CONST. I-70 STA. 1183+61.73 (CULVERT #6)
CULVERT DETAILS

DESIGN AGENCY
GPD GROUP*

DESIGNER ATR
REVIEWER CWL 6-15-26
PROJECT ID 107533
SHEET P.845 TOTAL 1033

BEL-70-19.17

MODEL: DNC2 - Plan 3 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 6/13/2026 TIME: 3:40:14 PM USER: cluzier
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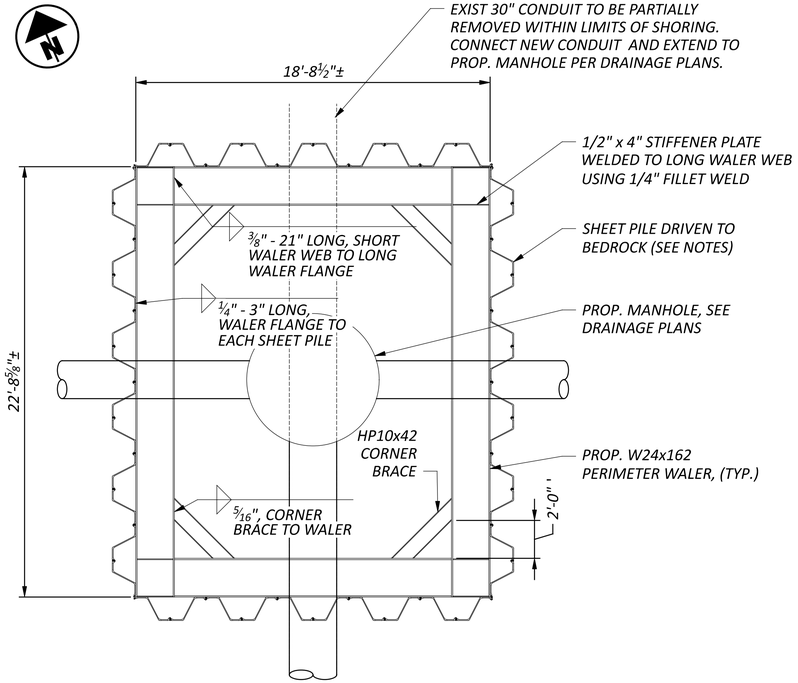
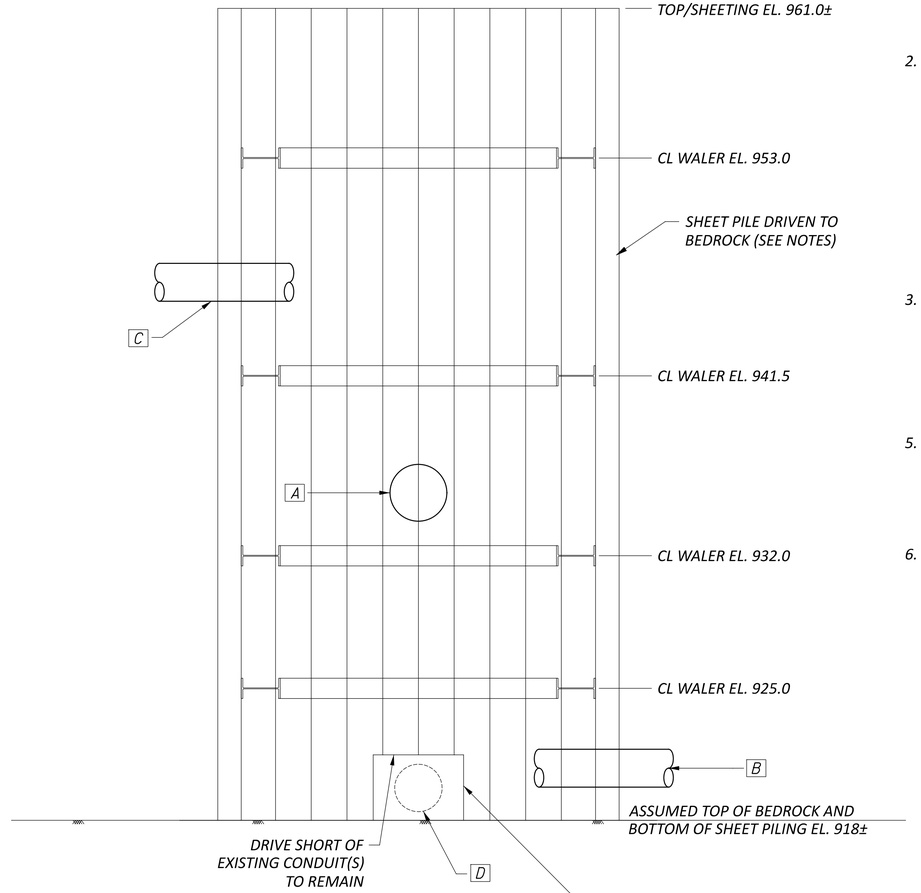


PLAN



SECTION

LEGEND:

- A — *36" PROPOSED CONDUIT THROUGH SOUTH WALL SHORING. INVERT ELEV. 935.29 AT PROPOSED MANHOLE.*
- B — *24" PROPOSED CONDUIT THROUGH EAST WALL SHORING. INVERT ELEV. 919.75 AT PROPOSED MANHOLE.*
- C — *30" PROPOSED CONDUIT THROUGH WEST WALL SHORING. INVERT ELEV. 945.40 AT PROPOSED MANHOLE.*
- D — *30" EXISTING CONDUIT THROUGH NORTH AND SOUTH WALL SHORING. INVERT ELEV. 919.15 AT PROPOSED MANHOLE.*

NOTES:

1. *HISTORICAL BORING DATA WAS INVESTIGATED FOR PREPARATION OF THIS PLAN. NO BORINGS OR SOUNDINGS WERE LOCATED IN THE VICINITY OF THE PROPOSED SHORING. THEREFORE, EXISTING BEDROCK IS ASSUMED TO FOLLOW THE ORIGINAL RAVINE WITH ELEVATION APPROXIMATELY EQUAL TO THE FLOWLINE OF THE EXISTING CULVERT. ACTUAL ELEVATION OF BEDROCK AT WALL LOCATION COULD VARY. NOTIFY ENGINEER IF FIELD CONDITIONS DO NOT MATCH THE PLANS.*
2. *CLOSED CELL SHORING CONSTRUCTION SHALL BE PERFORMED IN A TOP-DOWN MANNER. AFTER INSTALLATION OF THE THE SHEET PILE AROUND THE PERIMETER, PERFORM EXCAVATION INSIDE THE SHORING PROGRESSING DOWNWARD. EXCAVATION SHALL NOT EXTEND MORE THAN 2 FEET BLOW THE CENTERLINE OF EACH WALER AS THEY ARE BEING INSTALLED. BACKFILL THE INSIDE OF THE SHORING AND REMOVE WALERS IN THE SAME MANNER AS FILL IS BEING PLACED FROM BOTTOM UP. DEWATER THE SITE TO ELEVATION 940 OR LOWER DURING WORK OPERATIONS INSIDE THE CLOSED CELL SHORING STRUCTURE.*
3. *SHEET PILE AND WALER BEAM MATERIAL SHALL BE ASTM A572 GRADE 60 STEEL. SHEET PILE SHALL PROVIDE A MINIMUM SECTION MODULUS OF 39 IN/FT. PLAN DIMENSIONS OF CELLULAR SHORING ENCLOSURE ARE BASED ON PZ35 PAIRS. THE PLAN DIMENSIONS OF THE SHORING ENCLOSURE SHALL NOT BE ENLARGED WITHOUT REVIEW AND APPROVAL BY THE ENGINEER.*
5. *ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO CONSTRUCT THE COMPLETE TEMPORARY SHORING WALL SHALL BE INCLUDED WITH THE ITEM 503 - COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN.*
6. *THE DESIGN SHOWN ON THE PLANS FOR TEMPORARY SUPPORT TO EXCAVATION IS ONE REPRESENTATIVE DESIGN THAT MAY BE USED TO CONSTRUCT THE PROEJCT.THE CONTRACTOR MAY CONSTRUCT THE DESIGN SHOWN ON THE PLANS OR PREPARE AND ALTERNATE DESIGN TO SUPPORT THE SIDES OF EXCAVATIONS. IF CONSTRUCTING AN ALTERNATE DESIGN FOR TEMPORARY SUPPORT OF EXCAVATION, PREPARE AND PROVIDE PLANS IN ACCORDANCE WITH CMS 501.05. THE DEPARTMENT WILL PAY FOR THE TEMPORARY SUPPORT OF EXCAVATION AT THE CONTRACT LUMP SUM PRICE FOR COFFERDAMS AND EXCAVATION BRACING. THE DEPARTMENT WILL NOT MAKE ADDITIONAL PAYMENT FOR PROVIDING AN ALTERNATE DESIGN.*

TEMPORARY SHORING DETAILS
CL CONST. I-70 STA. 1183+61.73 (CULVERT #6)

SFN

DESIGN AGENCY

GPD GROUP

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DESIGNER	CHECKER
ATR	

REVIEWER: CWL 6-15-26

PROJECT ID: 107533

SUBSET	TOTAL

SHEET	TOTAL
P.846	1033

BEL-70-19.17

MODEL: Shoring Details - Culvert #6 PAPERSIZE: 34x22 (in.) DATE: 6/24/2026 TIME: 9:41:46 AM USER: JMarscio
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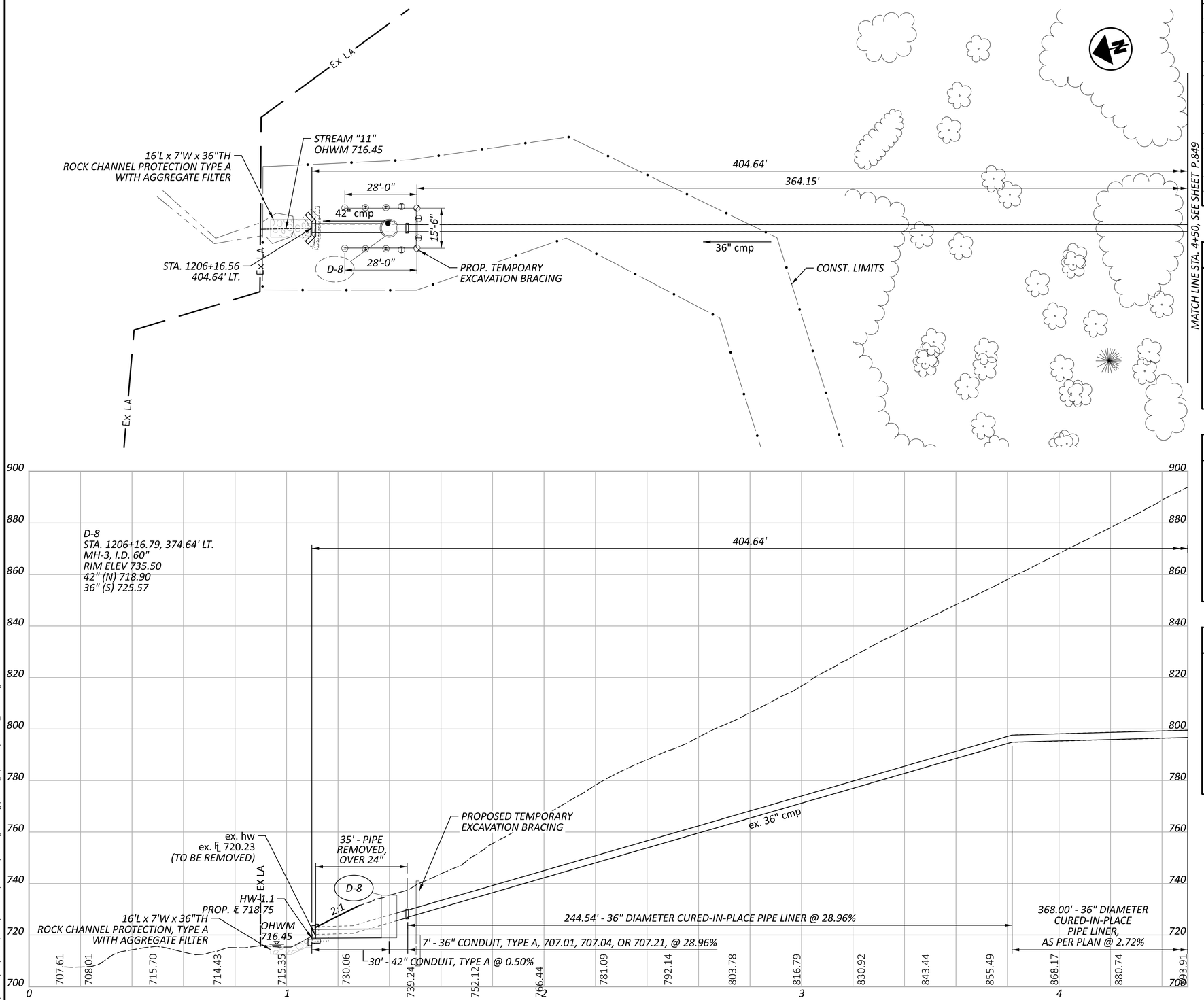

QUANTITIES HAVE BEEN CARRIED TO SUBSUMMARY ON SHEET P.257

ESTIMATED QUANTITIES

ITEM	QUANTITY	UNIT	DESCRIPTION
202	1	EACH	HEADWALL REMOVED
202	35	FT	PIPE REMOVED, OVER 24" DIAMETER
503	LS		COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN, STA. 1206+16.79
518	LS		POROUS BACKFILL WITH GEOTEXTILE FABRIC
601	12	CY	ROCK CHANNEL PROTECTION TYPE A, WITH AGGREGATE FILTER
601	8	CY	ROCK CHANNEL PROTECTION TYPE B, WITH GEOTEXTILE FABRIC
602	7.20	CY	CONCRETE MASONRY INCLUDES REINFORCING
611	7	FT	36" CONDUIT, TYPE A, 707.01, 707.04, OR 707.21
611	30	FT	42" CONDUIT, TYPE A
899	613	FT	36" DIAMETER CURED-IN-PLACE PIPE LINER

HYDRAULIC DATA

DRAINAGE AREA = 64 ACRES

Q (2%) = 153 CFS V (2%) = 15.8 FT/S HW (2%) = 836.68 FT

Q (1%) = 167 CFS V (1%) = 17.2 FT/S HW (1%) = 844.41 FT

ORDINARY HIGH WATER MARK: 808.85 FT (INLET) 716.45 (OUTLET)

DESIGN SERVICE LIFE: 75 YEARS

ABRASION LEVEL: 1

pH: 7.7

EXISTING STRUCTURE

TYPE: CMP

SIZE: 36"

SKEW: 00°

ALIGNMENT: ℄ R/W I-70

DATE BUILT: 1961

CONDITION: 5

CFN: 1848332

PROPOSED STRUCTURE

TYPE: 36" CIPP LINER (SS899)

SKEW: 00°

ALIGNMENT: ℄ CONST. I-70

CFN: 1848332

HATCHING LEGEND

ITEM 601 - ROCK CHANNEL PROTECTION

FOR PROPOSED TEMPORARY SHORING DETAIL, SEE SHEET P.850

HORIZONTAL SCALE IN FEET
0 10 20 40

CULVERT DETAILS
CL CONST. I-70 STA. 1206+19.55 (CULVERT #8)

DESIGN AGENCY
GPD GROUP
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DESIGNER ATR
REVIEWER CWL 6-15-26
PROJECT ID 107533
SHEET P.848 TOTAL 1033

BEL-70-19.17

MODEL: Plan 10 - Plan 10 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 6/13/2026 TIME: 3:41:15 PM USER: cluzier
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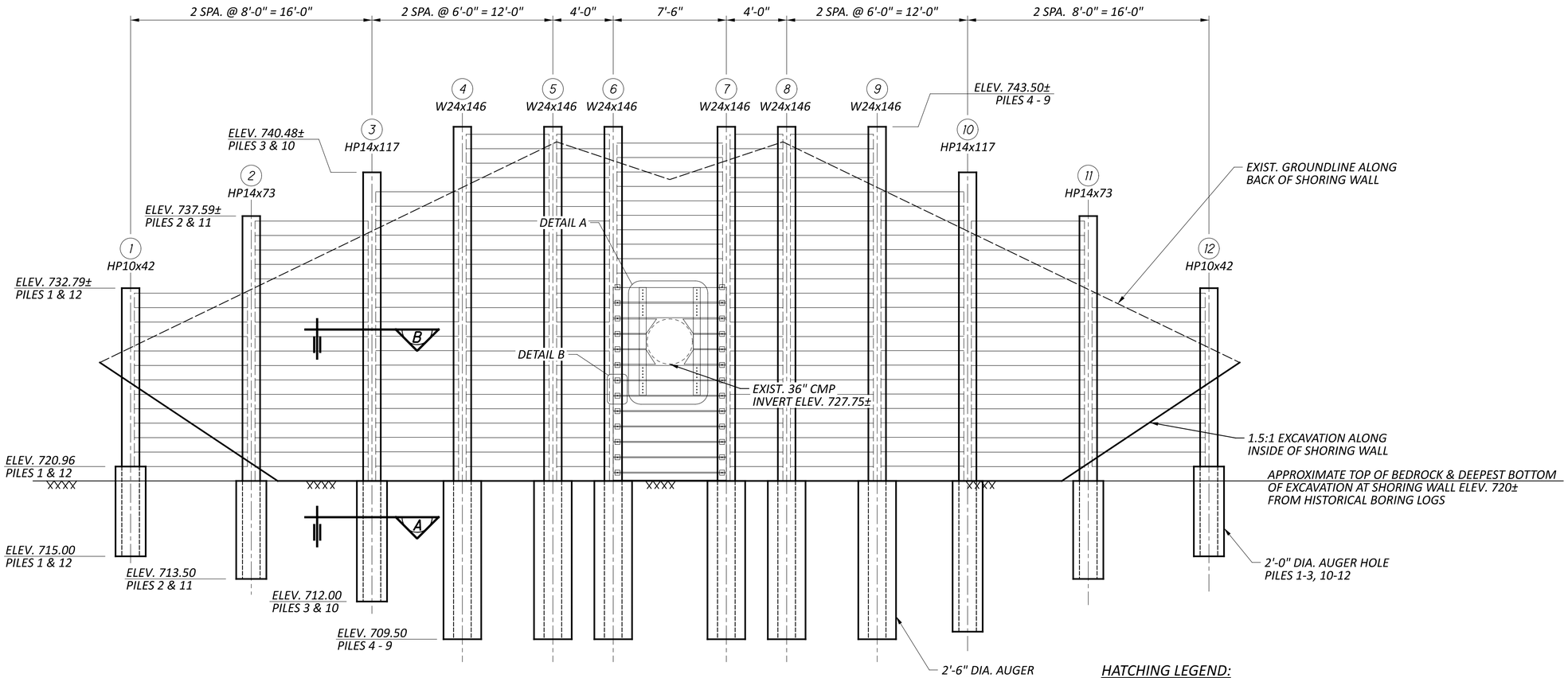
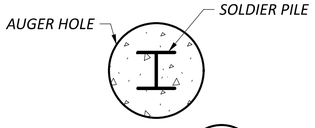
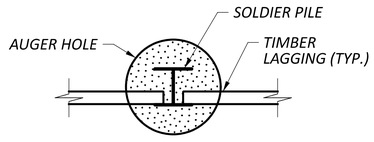


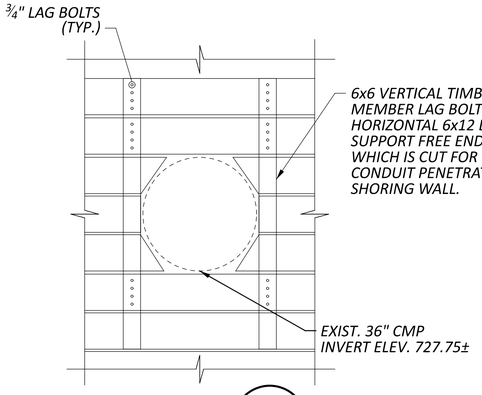
DEVELOPED ELEVATION - SHORING
STA. 1206+15
LOOKING SOUTH



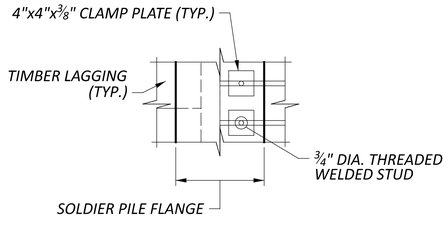
SECTION A
NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION



SECTION B
NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION



DETAIL A
NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION



DETAIL B
NTS. SEE NOTES AND DETAILS FOR ADDITIONAL INFORMATION

HATCHING LEGEND:
- CLASS QC1 CONCRETE
- LOW STRENGTH MORTAR BACKFILL

NOTES:
1. HISTORICAL BORING DATA WAS INVESTIGATED FOR PREPARATION OF THIS PLAN. NO BORINGS OR SOUNDINGS WERE LOCATED IN THE VICINITY OF THE PROPOSED SHORING. THEREFORE, EXISTING BEDROCK IS ASSUMED TO FOLLOW THE ORIGINAL RAVINE WITH ELEVATION APPROXIMATELY EQUAL TO THE FLOWLINE OF THE EXISTING CULVERT OUTLET. ACTUAL ELEVATION OF BEDROCK AT WALL LOCATION AND ALONG WALL COULD VARY. NOTIFY ENGINEER IF FIELD CONDITIONS DO NOT MATCH THE PLANS.
2. SOLDIER PILE MATERIAL SHALL BE ASTM A572 GRADE 50 STEEL. LAGGING CLAMP PLATES SHALL BE ASTM A36 WITH MINIMUM YIELD STRESS OF 36 KSI.
3. TIMBER LAGGING SHALL BE SOUTHERN YELLOW PINE NO. 1, MINIMUM ALLOWABLE BENDING STRESS OF 1,500 PSI BEFORE APPLICATION OF ADJUSTMENT FACTORS. LAGGING SHALL BE 6" MINIMUM NOMINAL THICKNESS BETWEEN PILES #6 AND #7 AND 4" MINIMUM NOMINAL THICKNESS ELSEWHERE.
4. ENCASEMENT OF SOLDIER PILES WITHIN THE AUGER HOLES SHALL CONSIST OF QC1 CONCRETE WITHIN THE STRUCTURAL EMBEDMENT REGION BELOW THE LAGGING. ABOVE THE LAGGING, AUGER HOLE BACKFIELD SHALL BE LOW STRENGTH MORTAR PER CMS 613 TO ALLOW FOR SUBSEQUENT EXCAVATION TO INSTALL LAGGING.
5. ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO CONSTRUCT THE COMPLETE TEMPORARY SHORING WALL SHALL BE INCLUDED WITH THE ITEM 503 - COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN.
6. THE DESIGN SHOWN ON THE PLANS FOR TEMPORARY SUPPORT TO EXCAVATION IS ONE REPRESENTATIVE DESIGN THAT MAY BE USED TO CONSTRUCT THE PROEJCT.THE CONTRACTOR MAY CONSTRUCT THE DESIGN SHOWN ON THE PLANS OR PREPARE AND ALTERNATE DESIGN TO SUPPORT THE SIDES OF EXCAVATIONS. IF CONSTRUCTING AN ALTERNATE DESIGN FOR TEMPORARY SUPPORT OF EXCAVATION, PREPARE AND PROVIDE PLANS IN ACCORDANCE WITH CMS 501.05. THE DEPARTMENT WILL PAY FOR THE TEMPORARY SUPPORT OF EXCAVATION AT THE CONTRACT LUMP SUM PRICE FOR COFFERDAMS AND EXCAVATION BRACING. THE DEPARTMENT WILL NOT MAKE ADDITIONAL PAYMENT FOR PROVIDING AN ALTERNATE DESIGN.

HORIZONTAL SCALE IN FEET
0 2 4 8

TEMPORARY SHORING DETAILS
CL CONST. I-70 STA. 1206+19.55 (CULVERT #8)

DESIGN AGENCY
CPD GROUP®
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DESIGNER JKM
REVIEWER TJW 6-15-26
PROJECT ID 107533
SHEET P.850 TOTAL 1033

BEL-70-19.17

MODEL: Shoring Details - Culvert 8 PAPERSIZE: 34x22 (in.) DATE: 6/23/2026 TIME: 4:36:14 PM USER: JMarscio
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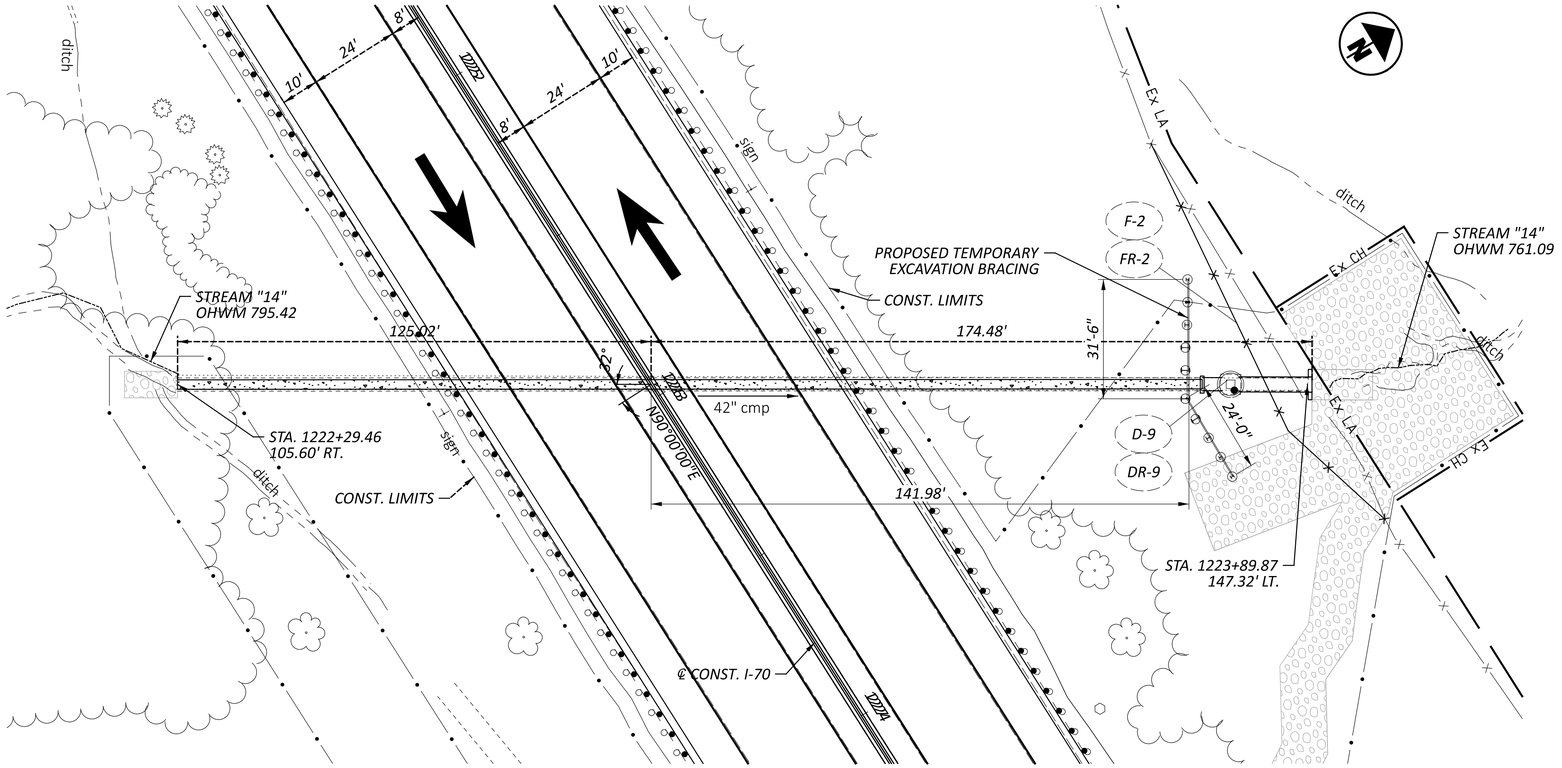

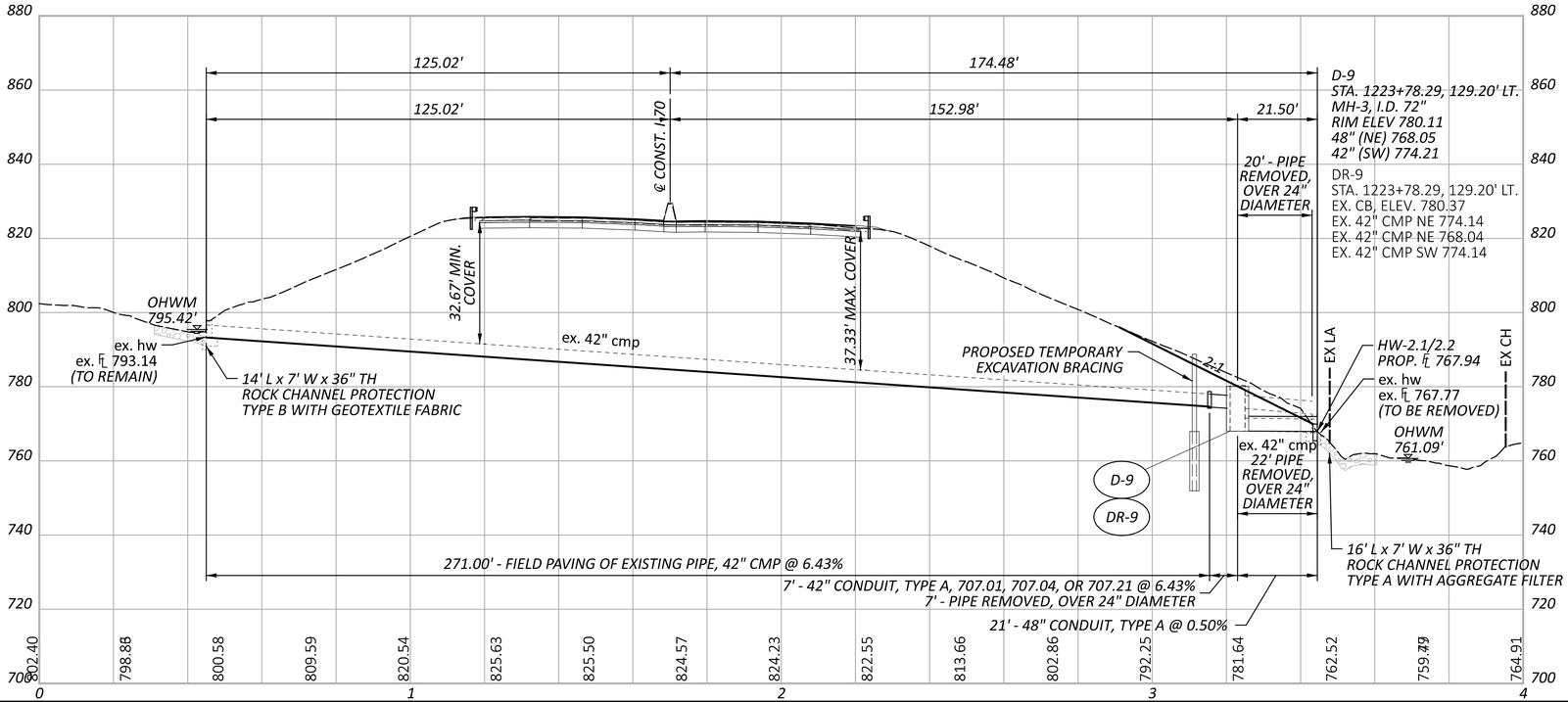

QUANTITIES HAVE BEEN CARRIED TO SUBSUMMARY ON SHEET P.257

ESTIMATED QUANTITIES

ITEM	QUANTITY	UNIT	DESCRIPTION
202	49	FT	PIPE REMOVED, OVER 24" DIAMETER
202	1	EACH	HEADWALL REMOVED
503	LS		COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN, STA. 1223+78.29
601	13	CY	ROCK CHANNEL PROTECTION TYPE A WITH AGGREGATE FILTER
601	11	CY	ROCK CHANNEL PROTECTION TYPE B WITH GEOTEXTILE FABRIC
602	1.10	CY	CONCRETE MASONRY
611	7	FT	42" CONDUIT, TYPE A, 707.01, 707.04, OR 707.21
611	21	FT	48" CONDUIT, TYPE A
611	271	FT	FIELD PAVING OF EXISTING PIPE, 42" CMP

HYDRAULIC DATA

DRAINAGE AREA = 119 ACRES

Q (2%) = 166 CFS V (2%) = 13.1 FT/S HW (2%) = 806.98 FT

Q (1%) = 203 CFS V (1%) = 14.4 FT/S HW (1%) = 812.77 FT

ORDINARY HIGH WATER MARK: 795.42 FT (INLET) 761.09' (OUTLET)

DESIGN SERVICE LIFE: 75 YEARS

ABRASION LEVEL: 1

pH: 8.0

EXISTING STRUCTURE

TYPE: CMP

SIZE: 42"

SKEW: 32°

ALIGNMENT: ℄ R/W I-70

DATE BUILT: 1961

CONDITION: 5

CFN: 1856662

PROPOSED STRUCTURE

TYPE: FIELD PAVING OF EX. 42" CMP

SKEW: 32°

ALIGNMENT: ℄ CONST. I-70

CFN: 1856662

HATCHING LEGEND

ITEM 601 - ROCK CHANNEL PROTECTION

FIELD PAVING

FOR PROPOSED TEMPORARY SHORING DETAIL, SEE SHEET P.852

HORIZONTAL SCALE IN FEET
0 10 20 40

CULVERT DETAILS
CL CONST. I-70 STA. 1222+96.37 (CULVERT #9)

DESIGN AGENCY

GPD GROUP*

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DESIGNER ATR

REVIEWER CWL 6-15-26

PROJECT ID 107533

SHEET P.851 TOTAL 1033

BEL-70-19.17

MODEL: DNC12 - Plan 10 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 6/13/2026 TIME: 3:41:48 PM USER: clozier
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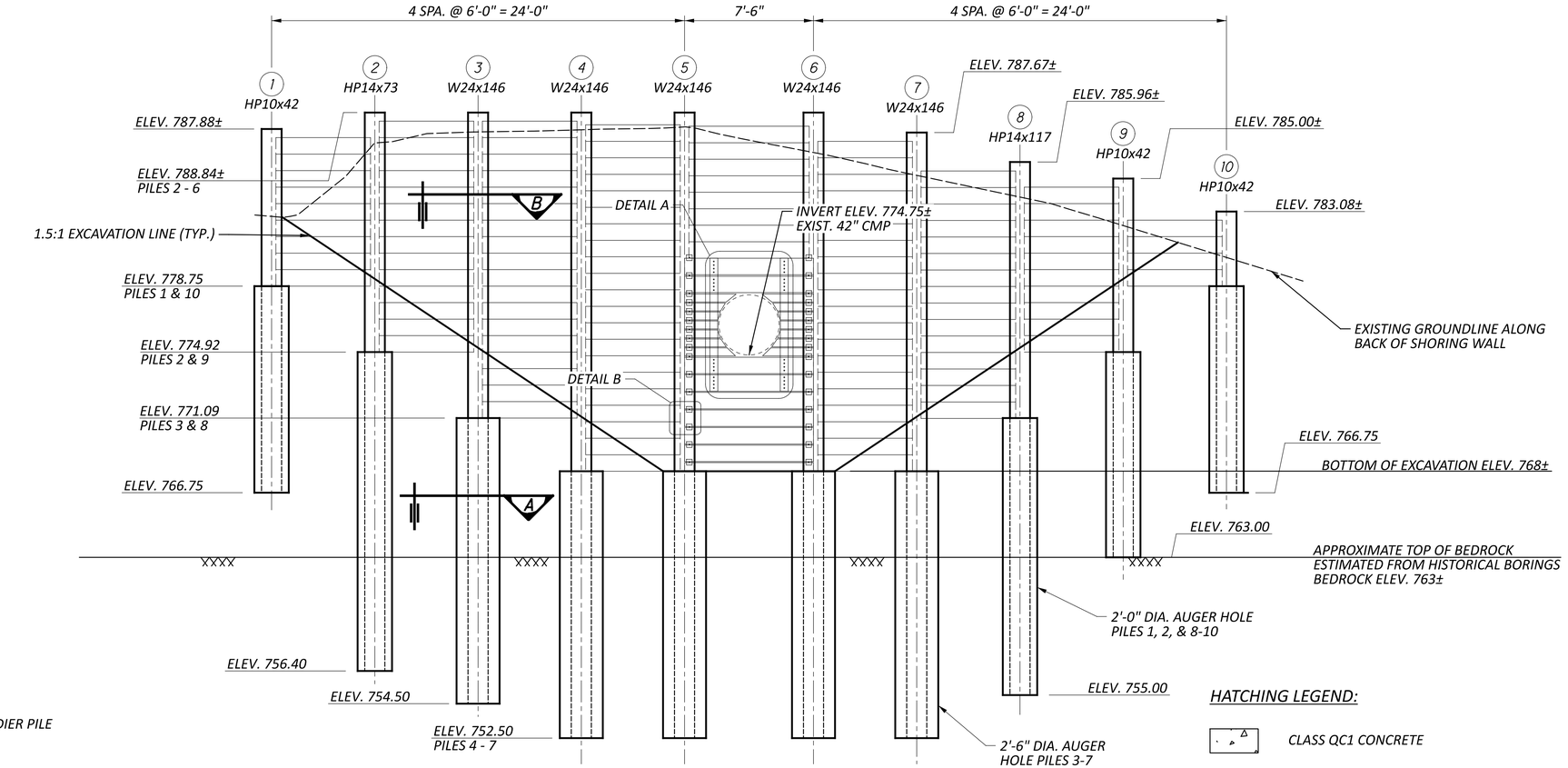
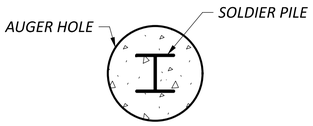
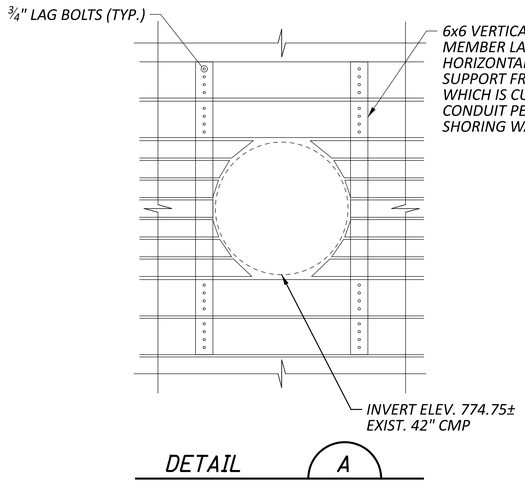


SHORING ELEVATION

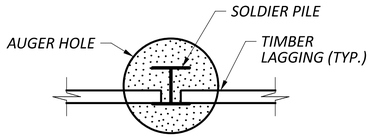


SECTION A

NTS. SEE NOTES AND DETAILS
FOR ADDITIONAL INFORMATION

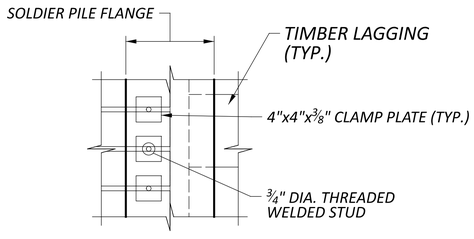


DETAIL A



SECTION B

NTS. SEE NOTES AND DETAILS
FOR ADDITIONAL INFORMATION



DETAIL B

NTS. SEE NOTES AND DETAILS
FOR ADDITIONAL INFORMATION

HATCHING LEGEND:

- CLASS QC1 CONCRETE
- LOW STRENGTH MORTAR BACKFILL

NOTES:

1. HISTORICAL BORING DATA WAS USED FOR PREPARATION OF THIS PLAN. ACTUAL ELEVATION OF BEDROCK AT WALL LOCATION COULD VARY. APPROXIMATE BEDROCK ELEVATION IS BASED ON AN ORIGINAL SOUNDING AT STA. 1222+80.00±, 100' LT. NOTIFY ENGINEER IF FIELD CONDITIONS DO NOT MATCH THE PLANS.
2. SOLDIER PILE MATERIAL SHALL BE ASTM A572 GRADE 50 STEEL. LAGGING CLAMP PLATES SHALL BE ASTM A36 WITH MINIMUM YIELD STRESS OF 36 KSI.
3. TIMBER LAGGING SHALL BE SOUTHER YELLOW PINE NO. 1, MINIMUM ALLOWABLE BENDING STRESS OF 1,500 PSI BEFORE APPLICATION OF ADJUSTMENT FACTORS. LAGGING SHALL BE 6" MINIMUM NOMINAL THICKNESS BETWEEN PILES #5 AND #6 AND 4" MINIMUM NOMINAL THICKNESS ELSEWHERE.
4. ENCASEMENT OF SOLDIER PILES WITHIN THE AUGER HOLES SHALL CONSIST OF QC1 CONCRETE WITHIN THE STRUCTURAL EMBEDMENT REGION BELOW THE LAGGING. ABOVE THE LAGGING, AUGER HOLE BACKFIELD SHALL BE LOW STRENGTH MORTAR PER CMS 613 TO ALLOW FOR SUBSEQUENT EXCAVATION TO INSTALL LAGGING.
5. ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY TO CONSTRUCT THE COMPLETE TEMPORARY SHORING WALL SHALL BE INCLUDED WITH THE ITEM 503 - COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN.
6. THE DESIGN SHOWN ON THE PLANS FOR TEMPORARY SUPPORT TO EXCAVATION IS ONE REPRESENTATIVE DESIGN THAT MAY BE USED TO CONSTRUCT THE PROEJCT.THE CONTRACTOR MAY CONSTRUCT THE DESIGN SHOWN ON THE PLANS OR PREPARE AND ALTERNATE DESIGN TO SUPPORT THE SIDES OF EXCAVATIONS. IF CONSTRUCTING AN ALTERNATE DESIGN FOR TEMPORARY SUPPORT OF EXCAVATION, PREPARE AND PROVIDE PLANS IN ACCORDANCE WITH CMS 501.05. THE DEPARTMENT WILL PAY FOR THE TEMPORARY SUPPORT OF EXCAVATION AT THE CONTRACT LUMP SUM PRICE FOR COFFERDAMS AND EXCAVATION BRACING. THE DEPARTMENT WILL NOT MAKE ADDITIONAL PAYMENT FOR PROVIDING AN ALTERNATE DESIGN.

HORIZONTAL SCALE IN FEET
0 2 4 8

TEMPORARY SHORING DETAILS
CL CONST. I-70 STA. 1222+96.37 (CULVERT #9)

DESIGN AGENCY
GPD GROUP
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DESIGNER JKM
REVIEWER TJW 6-15-26
PROJECT ID 107533
SHEET P.852 TOTAL 1033

BEL-70-19.17

MODEL: Shoring Details PAPERSIZE: 34x22 (In.) DATE: 6/23/2026 TIME: 4:36:18 PM USER: JMarscio
O:\Public\OH\ODOT\2024\2024045\107533\400-Engineering\Structures\107533_SM009.dgn

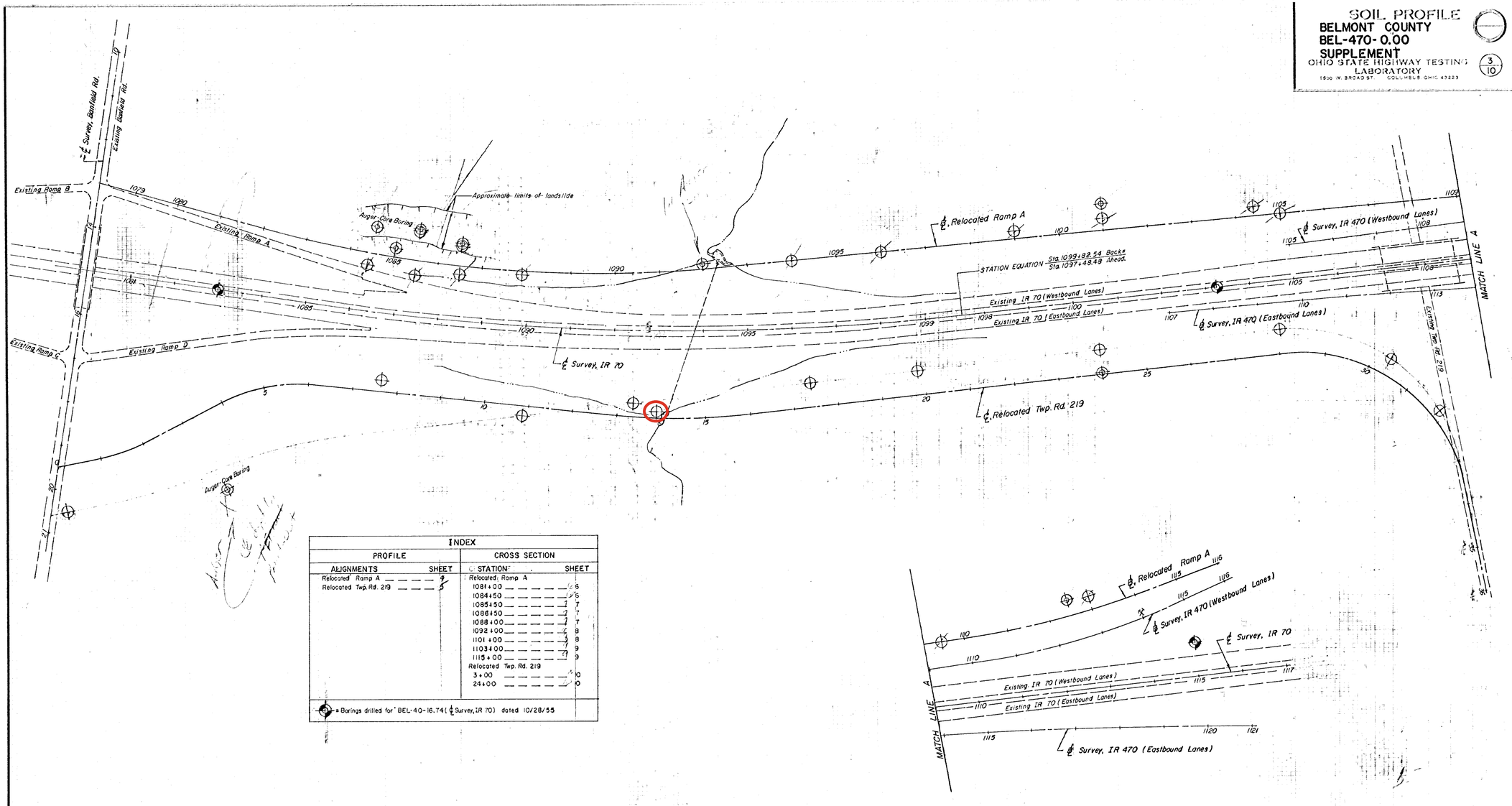
APPENDIX B – Historic Boring Information

TE-178
1000 3-71

SOIL PROFILE
BELMONT COUNTY
BEL-470-0.00
SUPPLEMENT

OHIO STATE HIGHWAY TESTING LABORATORY
1600 W. BROAD ST. COLUMBUS, OHIO 43223

3/10



INDEX

PROFILE		CROSS SECTION	
ALIGNMENTS	SHEET	STATION	SHEET
Relocated Ramp A	9	Relocated Ramp A	
Relocated Twp. Rd. 219	5	1081+00	6
		1084+50	6
		1085+50	7
		1086+50	7
		1088+00	7
		1092+00	8
		1101+00	8
		1103+00	9
		1115+00	9
		Relocated Twp. Rd. 219	
		3+00	10
		24+00	10

= Borings drilled for "BEL-470-16.74 (℄ Survey, IR 70) dated 10/28/55

SOIL PROFILE
BELMONT COUNTY
BEL-40-16.74
STATE HIGHWAY TESTING AND RESEARCH LABORATORY
O. S. U. CAMPUS, COLUMBUS, OHIO

7/9

100'LT ℄ 100'RT

ROAD

WOODS

WOODS

WOODS

WOODS

CORE & AUGER BORINGS

SEE NOTE A

TOP OF SOFT ROCK

SHALE, BROWN, SILICEOUS, MICACEOUS, MEDIUM FIRM TO FIRM, WITH SANDY STRINGERS, GRADING INTERMITTENTLY INTO SANDSTONE, VERY BROKEN AND SOFT IN TOP THIRD.

SANDSTONE, GRAY, FINE GRAINED, MICACEOUS, MEDIUM FIRM.

SHALE BROWN, SILICEOUS, MICACEOUS, FIRM, GRADING INTERMITTENTLY TO SANDSTONE.

CLAY SHALE, GRAY, SLIGHTLY CALCAREOUS IN LOWER THIRD, MEDIUM FIRM TO FIRM, BROKEN.

INTERBEDDED LIMESTONE (LIGHT GRAY, FINE GRAINED, ARGILLACEOUS, SOFT, MEDIUM FIRM TO FIRM) AND CLAY SHALE (GRAY, IN PART SLIGHTLY CALCAREOUS, FIRM TO CRUMBLY).

SHALE, GRAY, SILICEOUS, TO SLIGHTLY SILICEOUS, SLIGHTLY CALCAREOUS, MEDIUM FIRM, VERY BROKEN IN LOWER THIRD.

CLAY SHALE, GRAY, IN PART SLIGHTLY CALCAREOUS, MEDIUM FIRM TO FIRM.

LIMESTONE, DARK GRAY, SILICEOUS, FIRM.

SHALE, GRAY, CALCAREOUS AND SLIGHTLY SILICEOUS TO SILIGHTLY FIRM.

SHALE, GRAY TO VARIEGATED RED AND GRAY, SLIGHTLY SILICEOUS AND CALCAREOUS, MEDIUM FIRM.

SOD & TS=0.2'
23 24 18
REFUSAL

CLAY SHALE, GRAY TO DARK GRAY, FIRM TO MEDIUM FIRM, GRADING TO INDURATED CLAY IN LOWER THIRD.

SHALE, GRAY, CALCAREOUS, SLIGHTLY SILICEOUS AT TOP AND IN LOWER QUARTER, FIRM, HARD, GRADING INTO LIMESTONE FROM 37.8' TO 58.2' AND FROM 63.7' TO 64.2'

SOD & TS=0.2'
15 28
REFUSAL

SOD & TS=0.3'
21 19
REFUSAL

SOD & TS=0.3'
50' RT.
27 35 28

SOD & TS=0.3'
17 29 12

SOD & TS=0.2'
23 20 18 13 8

SOD & TS=0.3'
10' LT.
42 35

SOD & TS=0.3'
23 30
REFUSAL

SOD & TS=0.3'
27 13

CORE & AUGER BORINGS
SOD & TS=0.2'

TOP OF ROCK.

SANDSTONE, BROWN, FINE GRAINED, ARGILLACEOUS, MICACEOUS, FIRM TO MEDIUM FIRM, INTERMITTENTLY CROSS BEDDED.

SHALE, GREENISH BROWN, SILICEOUS, MICACEOUS, FIRM TO MEDIUM FIRM, INTERMITTENTLY CROSS BEDDED.

SHALE, GREENISH BROWN, TO GRAY, SLIGHTLY SILICEOUS, MICACEOUS, MEDIUM FIRM, LIGHT GRAY AND CRUMBLY FROM 24.8 TO 25.4'.

CLAY SHALE, GRAY, MEDIUM FIRM.

COAL.

CLAY SHALE, GRAY, FIRM.

SHALE, GRAY, CALCAREOUS TO SLIGHTLY CALCAREOUS, FIRM TO MEDIUM FIRM GRADING INTO CLAY SHALE BETWEEN 34.1 - 34.4, 35.6-36.0, AND 36.6-37.1.

CLAY SHALE, GRAY, SLIGHTLY CALCAREOUS, FIRM.

SHALE, GRAY, SLIGHTLY CALCAREOUS AND SLIGHTLY SILICEOUS TO SILICEOUS, FIRM.

SANDSTONE, BROWN AND GRAY, FINE GRAINED, MICACEOUS, IN PART ARGILLACEOUS, INTERMITTENTLY CROSS BEDDED, GRADING INTO SILICEOUS SHALE FROM 48.7' TO 50.3' AND 51.3'-52.0'

CLAY SHALE, GRAY TO BROWNISH GRAY IN TOP HALF, FIRM, BROKEN AT BASE.

SHALE, GRAY, CALCAREOUS TO SLIGHTLY CALCAREOUS, FIRM, HARD.

LIMESTONE, GRAY TO LIGHT GRAY, ARGILLACEOUS 59.0 TO 60.1, FIRM TO SOFT, WITH CLAY SEAMS.

SHALE, VERY LIGHT GRAY, VERY CALCAREOUS TO CALCAREOUS, FIRM, BROKEN IN LOWER QUARTER.

CLAY SHALE, GRAY TO DARK GRAY, SLIGHTLY CALCAREOUS, FIRM.

SOD & TS=0.2'
13 12 15 24 33
REFUSAL

COMPOSITE SAMPLE
10-80
MAX. DRY WT. = 113.6 LBS/CU.FT.
OPT. MOIST = 13.6 %
CBR-60-70
MAX. DRY WT. = 110.6 LBS./CU. FT.
OPT. MOIST. = 17.3 %

SHALE, GRAY, SLIGHTLY CALCAREOUS, SLIGHTLY SILICEOUS TO SILICEOUS, FIRM.

SHALE, DARK GREENISH GRAY, SLIGHTLY SILICEOUS, MEDIUM FIRM.

CLAY SHALE, DARK GREENISH GRAY, MEDIUM FIRM TO CRUMBLY.

SHALE, GRAY, CALCAREOUS AND SLIGHTLY SILICEOUS IN LOWER HALF, FIRM AND HARD TO MEDIUM FIRM IN LOWER HALF.

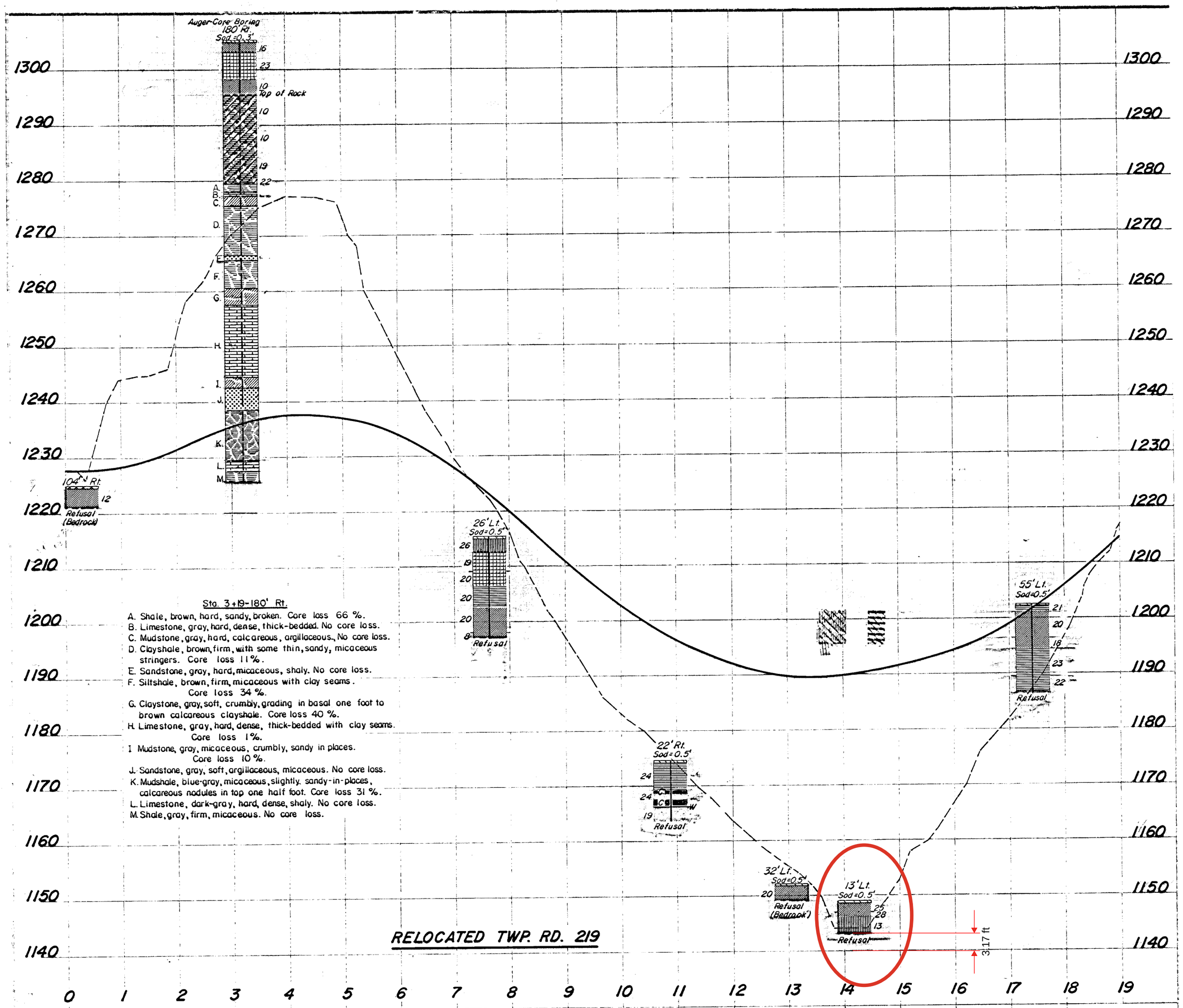
SHALE, VARIEGATED REDDISH BROWN AND GREENISH GRAY, SLIGHTLY SILICEOUS, MEDIUM FIRM.

INDURATED CLAY, GRAY, CRUMBLY.

1280 1270 1260 1250 1240 1230 1220 1210 1200 1190 1180 1170 1160 1150 1140

1310 1300 1290 1280 1270 1260 1250 1240 1230 1220 1210 1200

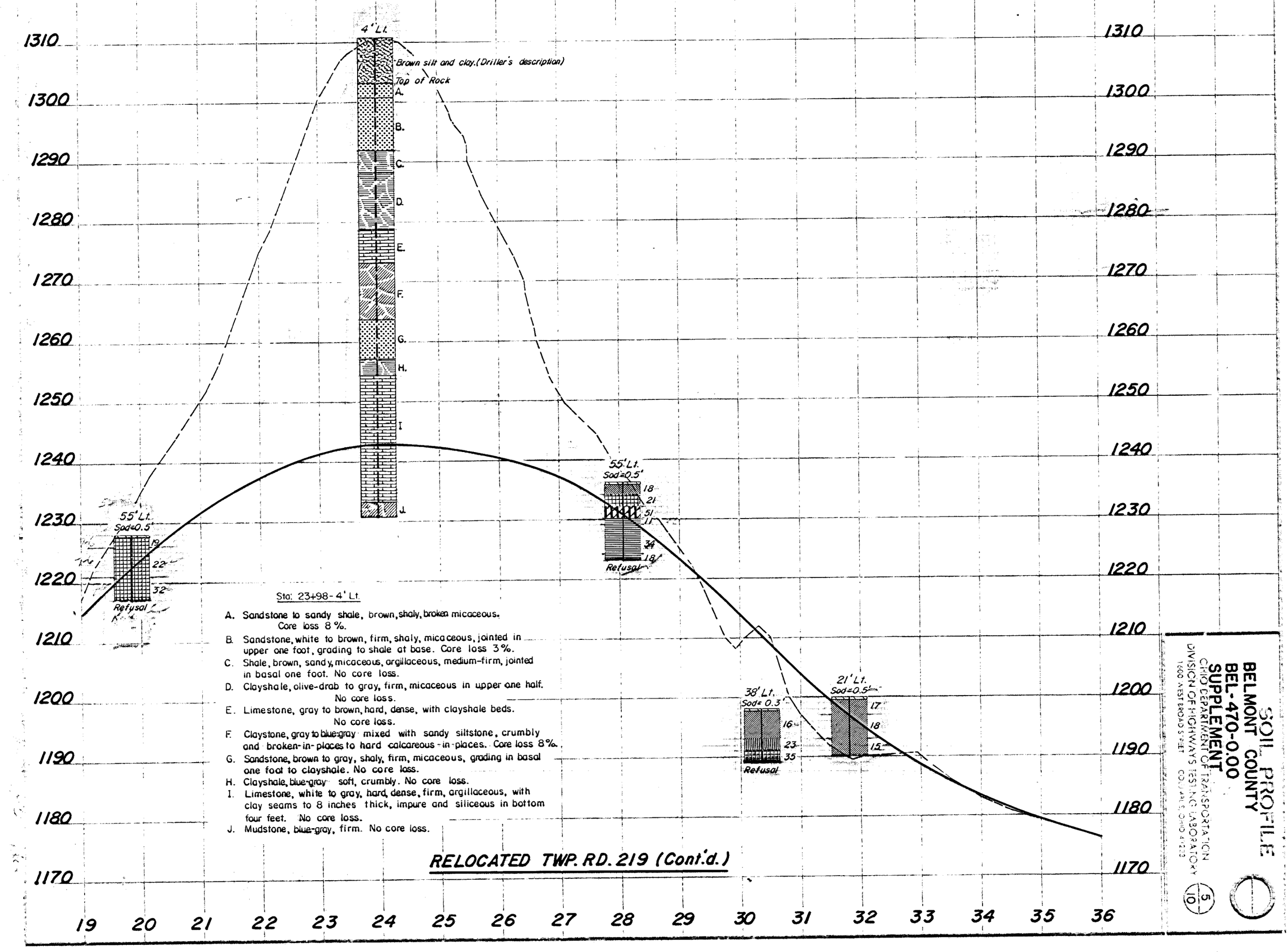
1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104



Sta. 3+19-180' Rt.

A. Shale, brown, hard, sandy, broken. Core loss 66 %.
B. Limestone, gray, hard, dense, thick-bedded. No core loss.
C. Mudstone, gray, hard, calcareous, argillaceous. No core loss.
D. Clayshale, brown, firm, with some thin, sandy, micaceous stringers. Core loss 11%.
E. Sandstone, gray, hard, micaceous, shaly. No core loss.
F. Siltshale, brown, firm, micaceous with clay seams. Core loss 34 %.
G. Claystone, gray, soft, crumbly, grading in basal one foot to brown calcareous clayshale. Core loss 40 %.
H. Limestone, gray, hard, dense, thick-bedded with clay seams. Core loss 1%.
I. Mudstone, gray, micaceous, crumbly, sandy in places. Core loss 10 %.
J. Sandstone, gray, soft, argillaceous, micaceous. No core loss.
K. Mudshale, blue-gray, micaceous, slightly sandy-in-places, calcareous nodules in top one half foot. Core loss 31 %.
L. Limestone, dark-gray, hard, dense, shaly. No core loss.
M. Shale, gray, firm, micaceous. No core loss.

RELOCATED TWP. RD. 219



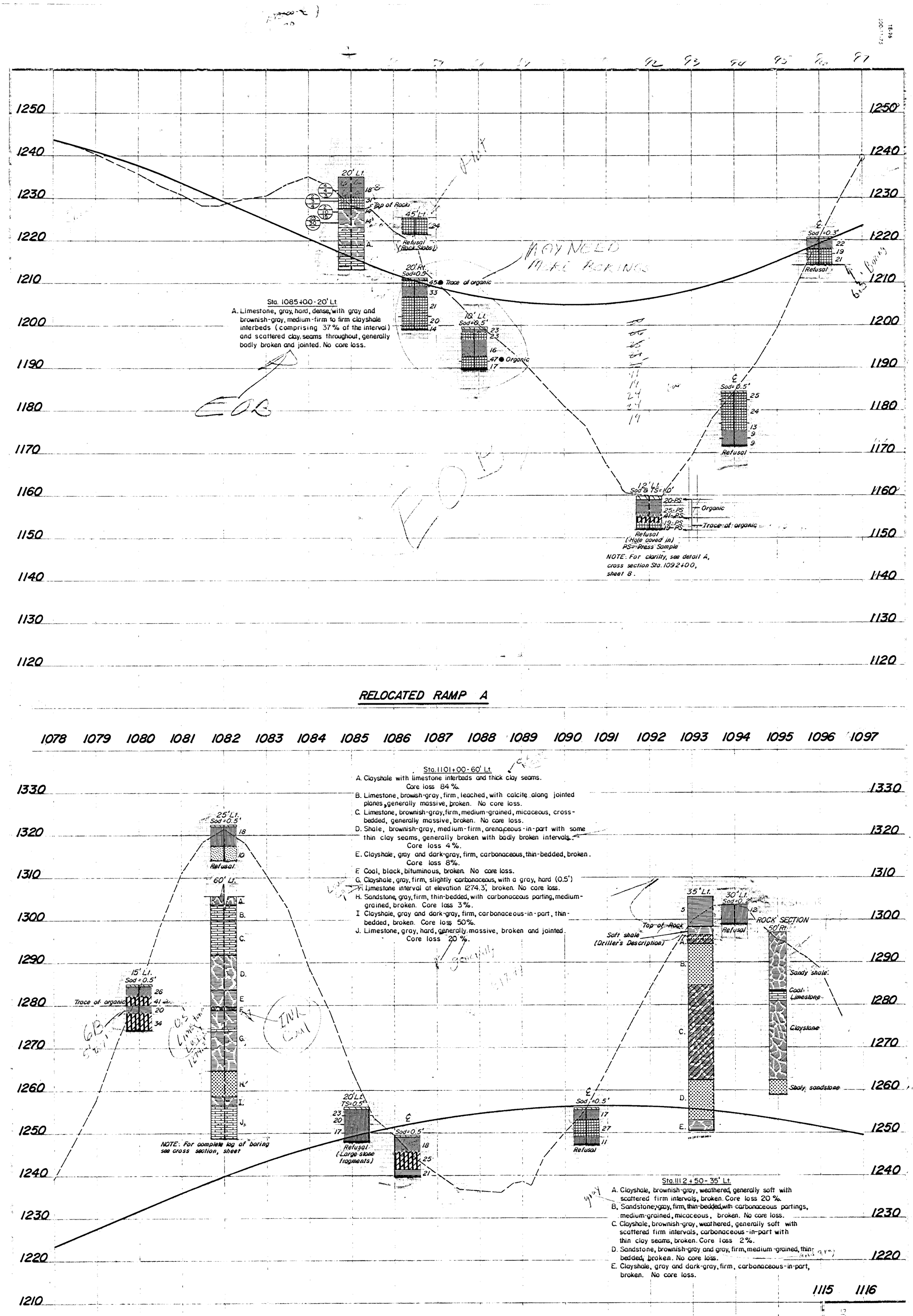
Sta. 23+98-4' Lt.

A. Sandstone to sandy shale, brown, shaly, broken micaceous. Core loss 8 %.
B. Sandstone, white to brown, firm, shaly, micaceous, jointed in upper one foot, grading to shale at base. Core loss 3%.
C. Shale, brown, sandy, micaceous, argillaceous, medium-firm, jointed in basal one foot. No core loss.
D. Clayshale, olive-drab to gray, firm, micaceous in upper one half. No core loss.
E. Limestone, gray to brown, hard, dense, with clayshale beds. No core loss.
F. Claystone, gray to blue-gray mixed with sandy siltstone, crumbly and broken-in-places to hard calcareous-in-places. Core loss 8%.
G. Sandstone, brown to gray, shaly, firm, micaceous, grading in basal one foot to clayshale. No core loss.
H. Clayshale, blue-gray soft, crumbly. No core loss.
I. Limestone, white to gray, hard, dense, firm, argillaceous, with clay seams to 8 inches thick, impure and siliceous in bottom four feet. No core loss.
J. Mudstone, blue-gray, firm. No core loss.

RELOCATED TWP. RD. 219 (Cont'd.)

SOIL PROFILE
BELMONT COUNTY
BEL-470-0.00
SUPPLEMENT
OHIO DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
5
10

TE-96
5-00-11-75



SOIL PROFILE
BELMONT COUNTY
BEL-470-0.00
-SUPPLEMENT
OHIO DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS TESTING LABORATORY
660 WEST BROAD STREET COLUMBUS, OHIO 43215

4
10

SOIL PROFILE
BELMONT COUNTY
BEL-40-21.83 21.83

OHIO STATE HIGHWAY
TESTING LABORATORY

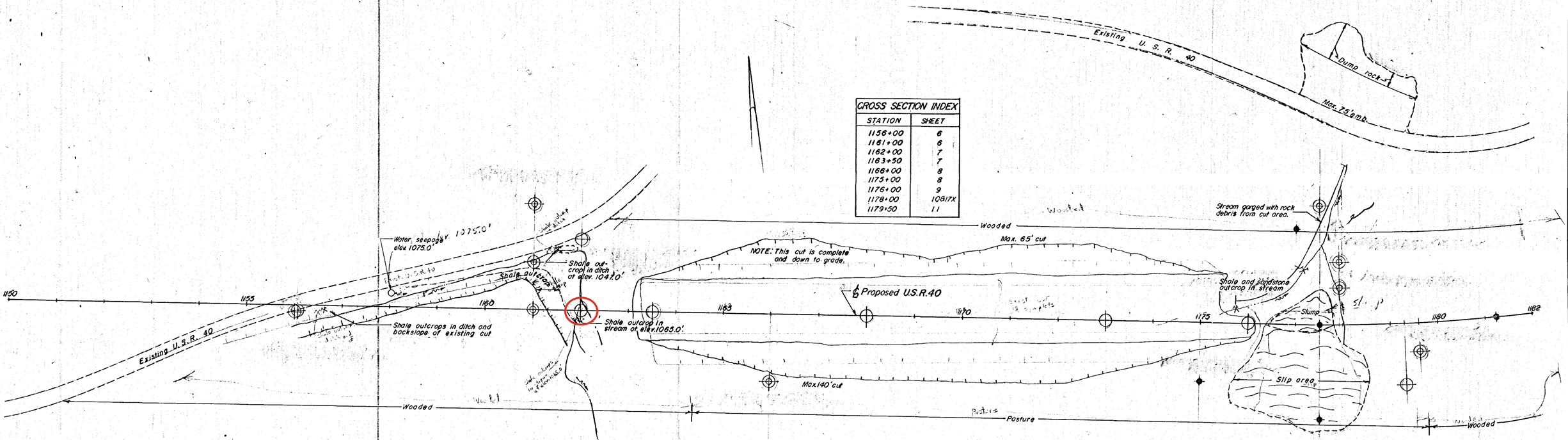
O. S. U. CAMPUS, COLUMBUS, OHIO

2X
15X

2
17A

Revised 2/5/62

CROSS SECTION INDEX	
STATION	SHEET
1156+00	6
1161+00	6
1162+00	7
1163+50	7
1166+00	8
1175+00	8
1176+00	9
1178+00	10&17X
1179+50	11



State of Ohio
Department of Highways
Testing Laboratory

LOG OF BORING

Date Started 7-17-64 Sampler Type S.S. Dia 1 3/8" Water Elev -
Date Completed 7-20-64 Casing Length 5.0' Dia 3 1/2"

Project Identification Belmont
BEL-40-21.83
Settlement Investigation

Boring No. ____ Station & Offset 1161+96, 9' Rt Surface Elev. 1087.9

Elev.	Depth	Sml. Pen. (N)	Rec. ft.	Loss ft.	Description	Field No.	Lab Nos. So	Physical Characteristics % Agg.	% C S	% F S	% Silt	% Clay	LL	PI	WC	SHTL Class
1087.9	0															
1085.4	2															
	4	5/5			Brown Silty Sand with Stone Fragments & Gravel	1	60413	V	I	S	U	A	L	-	24	-
1082.9	6	3/2			Gravel and Stone Fragments with Brown Sand	2	60414	25	45	10	-2	0-	NP	NP	25	A-1-b
1080.4	8	3/2			Brownish Gray Silty Clay and Stone Fragments	3	60415	V	I	S	U	AL	36	10	19	-
1077.9	10	5/6			Brown Silt and Clay with Some Stone Fragments	4	60416	36	3	5	28	28	36	14	23	A-6a
1075.4	12	4/8			Brown Silt & Clay with Gravel & Stone Fragments, Trace of Decayed Wood.	5	60417	38	3	6	28	25	31	11	19	A-6a
1072.9	16	5/6			Brownish Gray Clay with Some Stone Fragments	6	60418	31	2	2	29	36	44	22	26	A-7-6
1070.4	18	5/6			Brown Silt & Clay with Little Stone Fragments	7	60419	19	6	6	35	34	36	11	32	A-6a
1067.9	20	5/6			Brown Silt & Clay with Some Stone Fragments, Trace of Plant Tissue.	8	60420	30	3	5	31	31	28	15	23	A-6a
1065.4	22	8/10			Brown & Gray Silt & Clay with Some Stone Fragments.	9	60421	39	5	3	28	25	30	11	19	A-6a
1062.9	24															
1062.3	26	50*			Brownish Gray Silt & Clay with Some Stone Fragments	10	60422	32	2	4	31	31	30	11	13	A-6a
					TOP OF ROCK											
	28		3.9	0.5	Coal, black, blocky, with many thin carbonaceous shale seams throughout, with gray clay shale above elevation 1062.0. Core loss 11%.											
1057.9	30															
1056.9	32				Shale, brown, extremely siliceous, non-fissile, firm, broken. Core loss 80%.											
	34		1.7	3.3	Clay shale, grey, fissile, siliceous, medium-firm. Core loss 49%.											
	36															

Particle Sizes: Agg= >2.00mm, Coarse Sand=2.00-0.42mm, Fine Sand=0.42-0.074mm, Silt=0.074-0.005mm, Clay= <0.005mm

* - .6' penetration

Boring No. _____ Station & Offset 1161+96, 9' Rt Surface Elev 1087.9 Project BEL-40-21.83

Elev	Depth	Rec. ft.	Loss ft.	Description
1049.9	38	4.0	1.0	Clay shale, gray, fissile, siliceous, medium-firm. Core loss 49%.
	40			
	42			
	44	3.7	1.3	Shale, gray, non-fissile, siliceous, firm, with sandstone stringers and clay seams. Core loss 21%.
1042.9	46			BOTTOM OF BORING
	48			
	50			
	52			
	54			
	56			
	58			
	60			
	62			
	64			
	66			
	68			
	70			
	72			
	74			
	76			
	78			
	80			

SHEET of sheets

State of Ohio
Department of Highways
Testing Laboratory

LOG OF BORING

Date Started 7-21-64 Sampler Type S.S. Dia 1 3/8" Water Elev 1066.8
Date Completed 7-23-64 Casing Length 7.0 Dia 3 1/2"

Project Identification: Belmont
BEL-40-21.83
Settlement Investigation

Boring No. _____ Station & Offset 1162+35, 62' Rt Surface Elev. 1086.8

Elev.	Depth	Std. Pen. (N)	Rec. ft.	Loss ft.	Description	Field No.	Lab. Nos, So	% Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	SHTL Class
1086.8	0															
1084.3	2															
	4	19/19			Brown Silt and Clay and Shale Fragments	1	60801	37	4	4	35	20	31	11	12	A-6a
108[illegible].8	6	10/14			Brown Silt and Clay with Some Soft Shale Fragments	2	60802	22	4	2	39	33	38	12	16	A-6a
1089.3																
1088.6	8	28*			Brown and Gray Silty Clay with Some Soft Shale Fragments	3	60803	27	1	1	25	46	39	16	19	A-6b
1077.5					TOP OF ROCK → Limestone, gray, argillaceous, very hard. No core loss.											
1076.4	10		1.8	0.0	Clay shale, mottled gray and brown, soft and crumbly, fissile, slightly weathered. No core loss.											
1074.3	12		1.0	1.5	Shale, gray, argillaceous, jointed, broken, firm. Core loss 52%.											
	14		0.3	2.2	Clay shale, gray, fissile, soft and crumbly, jointed and moderately weathered. Core loss 88%.											
1070.8	16															
	18															
	20		1.8	0.3	Shale, gray, fissile to non-fissile, soft to hard, extremely weathered above elevation 1067.8, calcareous intervals. Core loss 33%.											
106[illegible].3	22															
1063.3			4.5	0.5	Limestone, gray, very hard. No core loss.											
	24				Clay shale, gray, poorly-fissile, medium-firm, slightly weathered. Core loss 15%.											
1061.3	26															
	28		4.3	0.7	Coal, black, blocky, with extremely carbonaceous shale seams. Core loss 20%.											
1057.3																
1056.3	30				Clay shale, gray, medium firm, non-fissile. Core loss 3%.											
	32		4.4	0.6	Indurated clay, gray, calcareous, medium-firm to firm, slickensided. Core loss 15%.											
	34															
1051.8	36															

Particle Sizes: Agg= >2.00mm, Coarse Sand=2.00-0.42mm, Fine Sand=0.42-0.074mm, Silt=0.074-0.005mm, Clay= <0.005mm

* - 0.7 Penetration

SHEET of sheets

Boring No. _____ Station & Offset 1162+35, 62' Rt Surface Elev. 1086.8 Project HEL-40-21.83

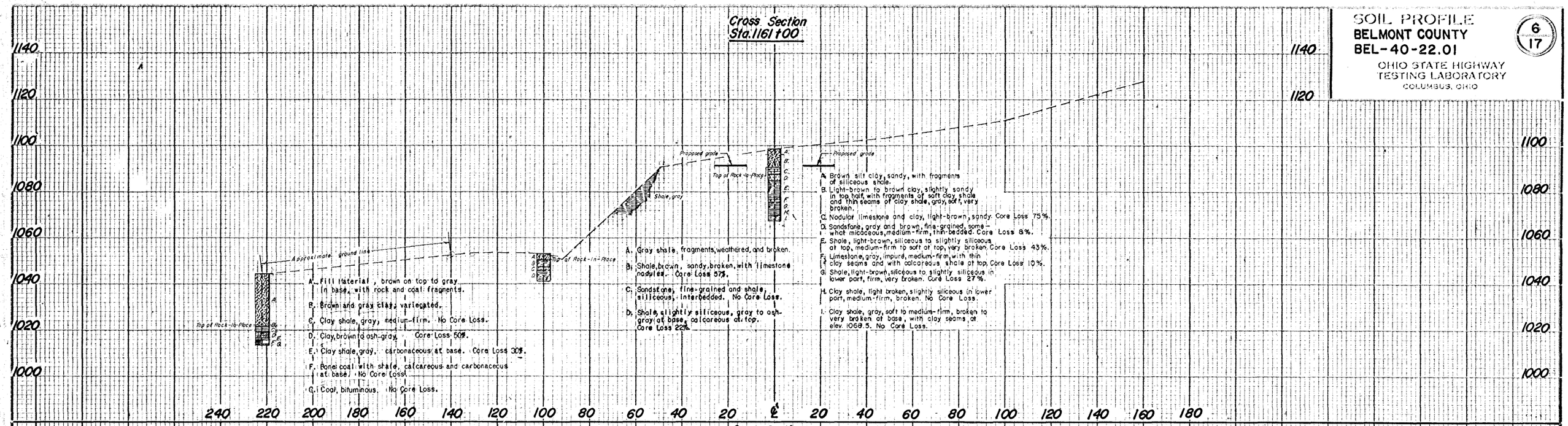
Elev	Depth	Rec. ft	Loss ft	Description
1046.8	38 40	5.0	0.0	Shale, gray, non-fissile with poorly-fissile intervals, siliceous with limy nodules, firm to hard. No core loss.
	42			BOTTOM OF BORING
	44			
	46			
	48			
	50			
	52			
	54			
	56			
	58			
	60			
	62			
	64			
	66			
	68			
	70			
	72			
	74			
	76			
	78			
	80			

SHEET of sheets

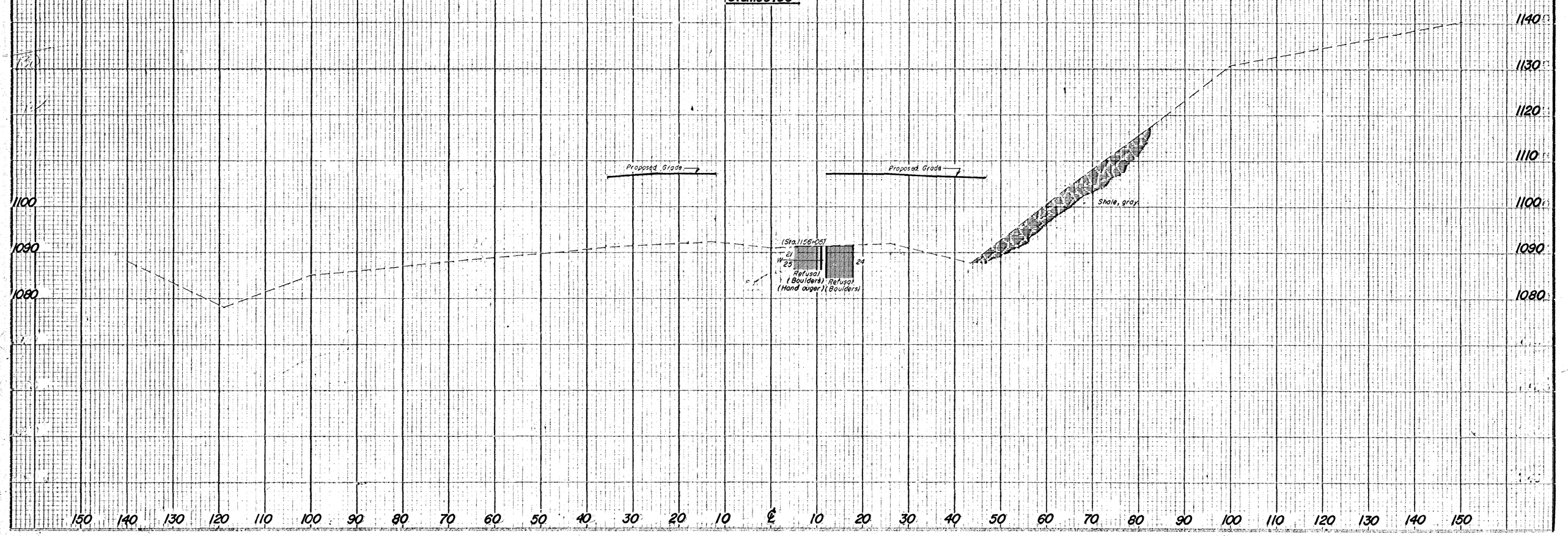
SOIL PROFILE
BELMONT COUNTY
BEL-40-22.01
OHIO STATE HIGHWAY
TESTING LABORATORY
COLUMBUS, OHIO

6
17

Cross Section Sta. 1161+00



Cross Section Sta. 1156+00



2 Dump rock

Max. 50' emb.

Existing U. S. R. 40

Area reportedly covered by fill material.

Shale outcrops in stream bed

Slip area

Wooded

Weeds

Shale outcrops in stream bed.

℄ Proposed U.S.R40

1190

Spring - elev. 1028.5

1185

1182

Wet area

1195

1200

1201

Stream flows on shale and sandstone bedrock.

Wooded

Pasture

Weeds

Wooded

Wooded

NOTE: From Sta. 1192+00 to Sta. 1203+00, slumping is evident.

CROSS SECTION INDEX

STATION	SHEET
1184+12	12 88X
1191+00	13
1194+00	14
1200+00	15

175' Rt.

A. Top of Rock-In-Place

B.

C.

D.

E.

F.

G.

H.

I.

For description of cored intervals see sheet 13.

J.

K.

L.

M.

N.

O.

P.

Q.

R.

S.

T.

U.

V.

W.

X.

Y.

℄

Refusal

℄

Sod=0.2'

25

28

Refusal (Hand auger)

20' Rt.

Sod=0.2'

29

Coal blossom

19

Refusal (Hand auger)

℄

42

Refusal (Boulders)

25' Rt.

A.

B.

C.

Top of Rock-In-Place

D.

E.

F.

G.

H.

I.

J.

For description of cored intervals see sheet 15.

℄

Sod=0.2'

22

Refusal (Hand Auger)

150' Lt.

Sod=0.2'

19

20

14

Refusal

1100 1090 1080 1070 1060 1050 1040 1030 1020 1010 1000 990 980 970 960 950 940 930 920 910 900 890 880 870 860

1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200 1201

Revised 2/5/62

SOIL PROFILE
BELMONT COUNTY
BEL-40-21.83
OHIO STATE HIGHWAY TESTING LABORATORY
COLUMBUS, OHIO

4 / 17 OLD

3X 15X

SOIL PROFILE

BELMONT COUNTY

BEL-40-22.01

OHIO STATE HIGHWAY TESTING LABORATORY
COLUMBUS, OHIO

3
17

1140 1130 1120 1110 1100 1090 1080 1070 1060 1050 1040 1030 1020 1010 1000 990 980 970

1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182

12' Rt. 11' Rt.
21
W
25
24
Refusal
Refusal (Boulders)
(Boulders) (Hand auger)

For description of cored intervals see sheet 6.

A
B
C
D
E
F
G
H
I
Top of Rock-In-Place

22
W
Refusal

150' Lt.
7
Refusal

11
Hand auger

140' Rt.
H
I
J
K
L
M
N
O
P
Q
R
S
For description of cored intervals, see sheet 8.

8
Refusal
(Hand auger)

11
Refusal
(Hand auger)

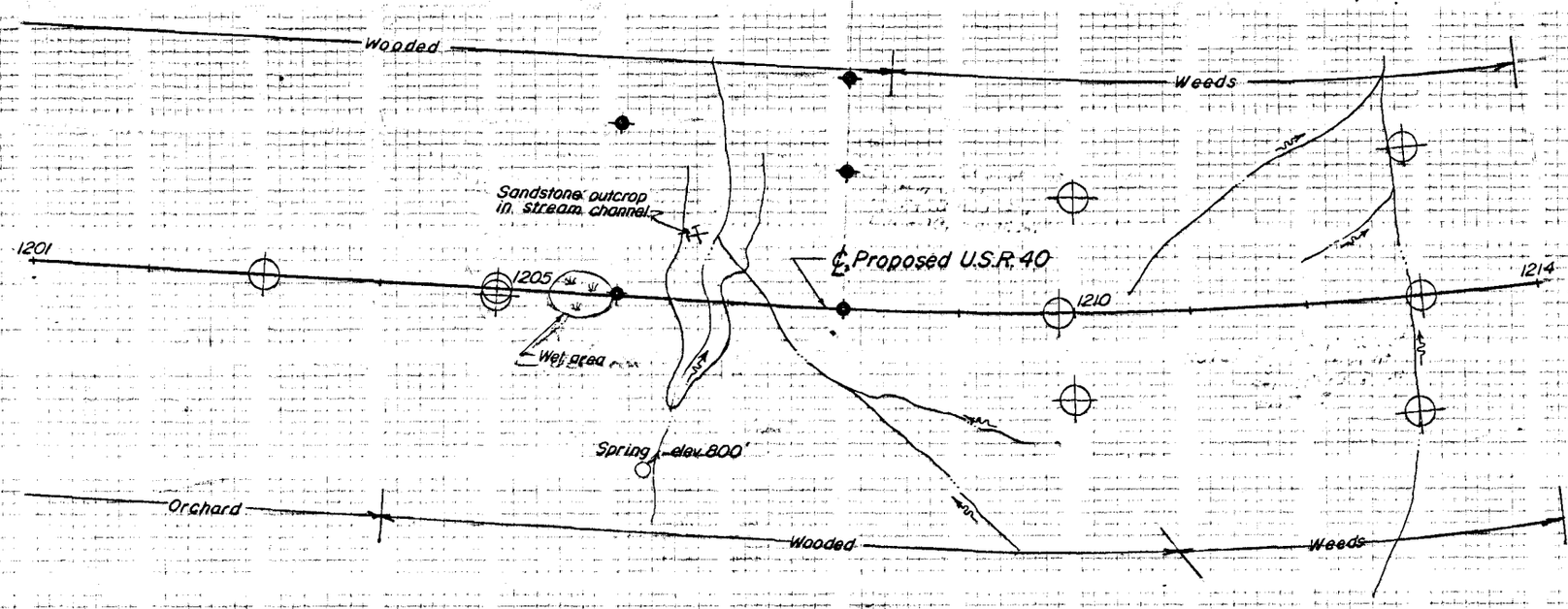
21
Refusal
(Hand auger)

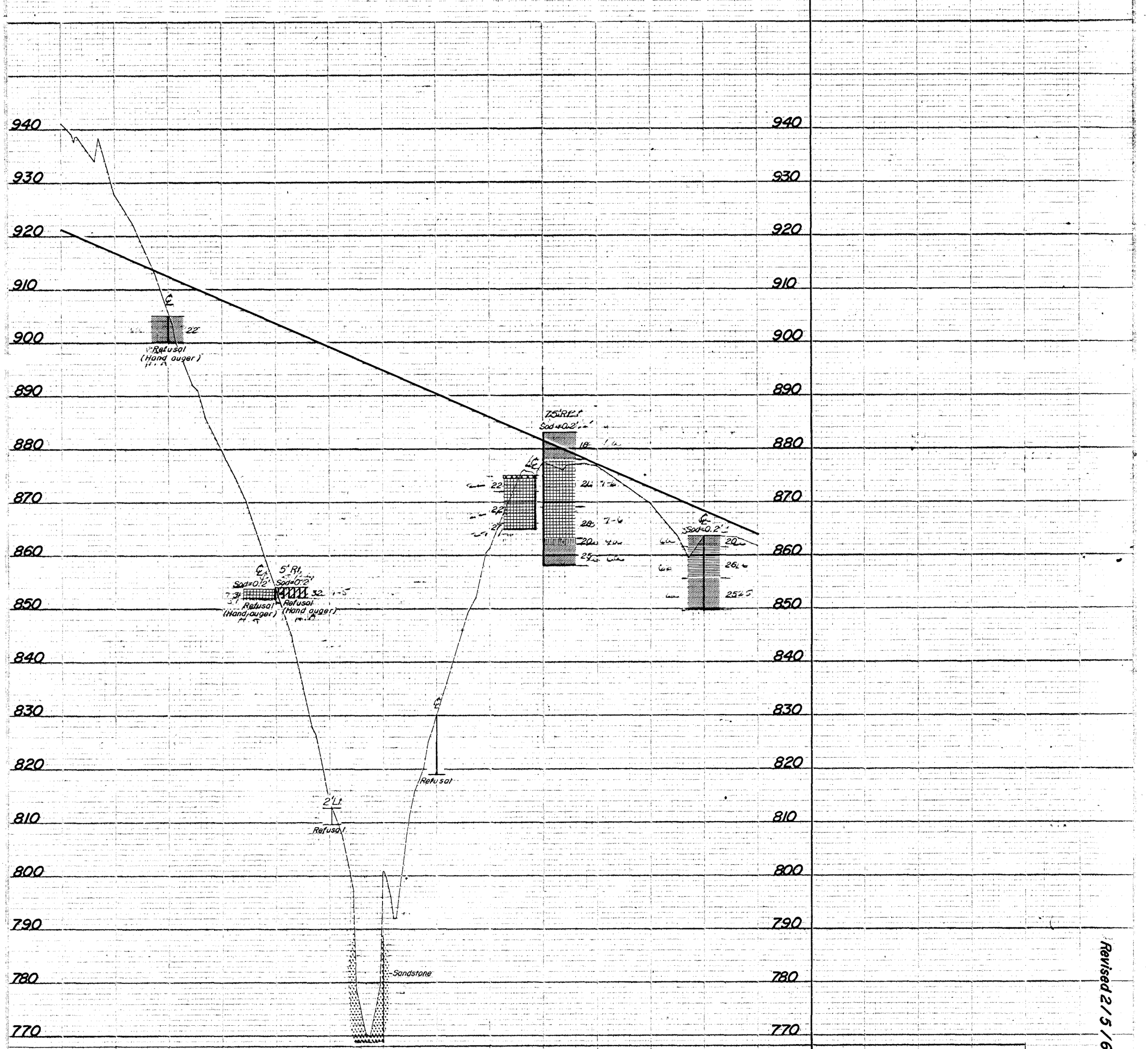
Refusal

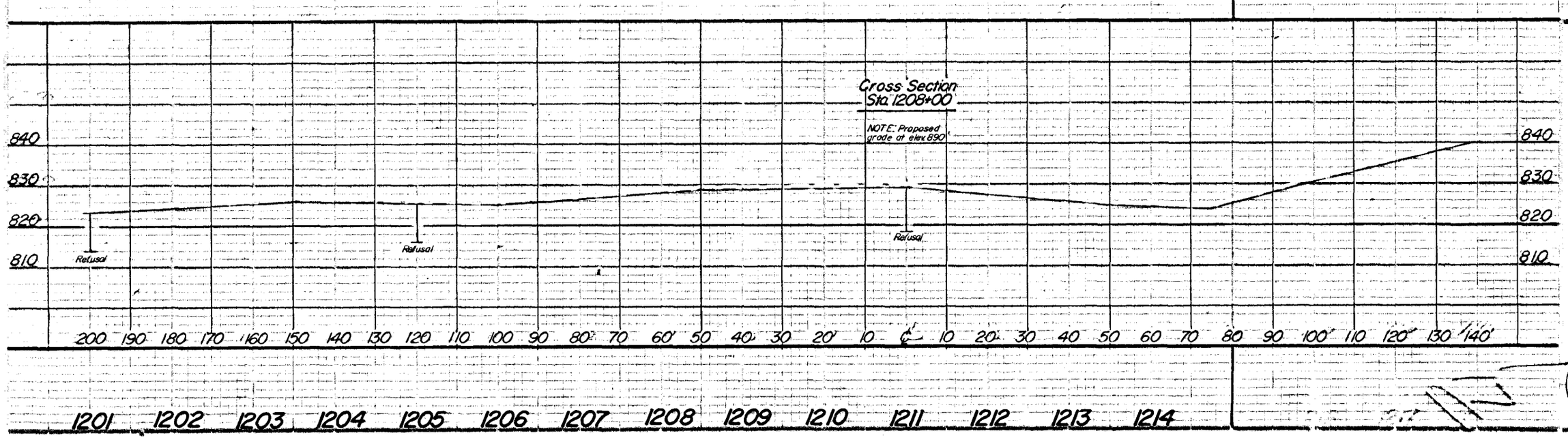
60' Rt.
CB
A
Cod blossom
B
Top of Rock-In-Place
C
D
For description of cored intervals, see sheet 11.
E
F
G
H
I
J
K
CB
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

Refusal

CROSS SECTION INDEX	
STATION	SHEET
1206+00	16
1208+00	This sheet
1210+00	16
1213+00	17





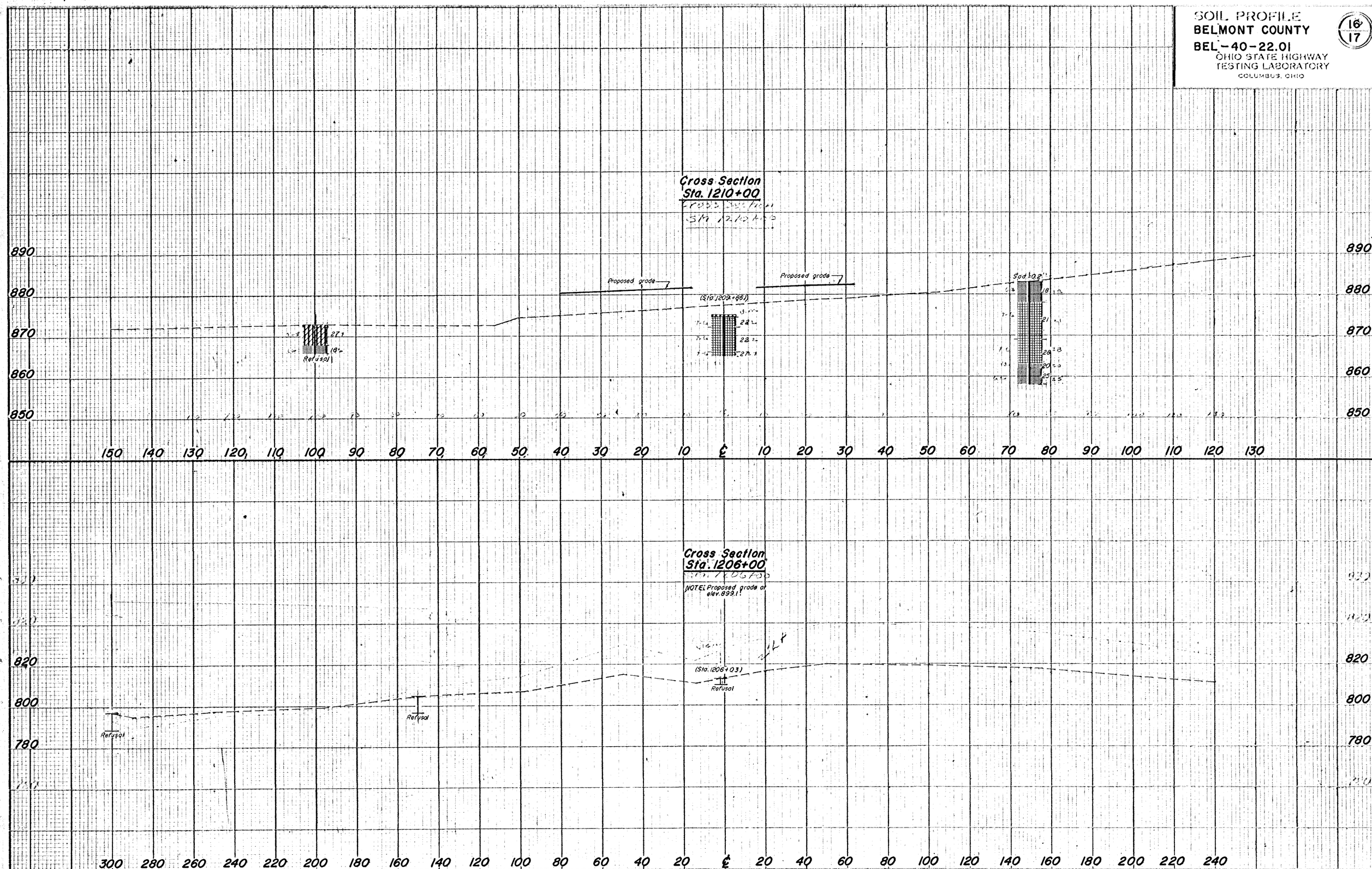


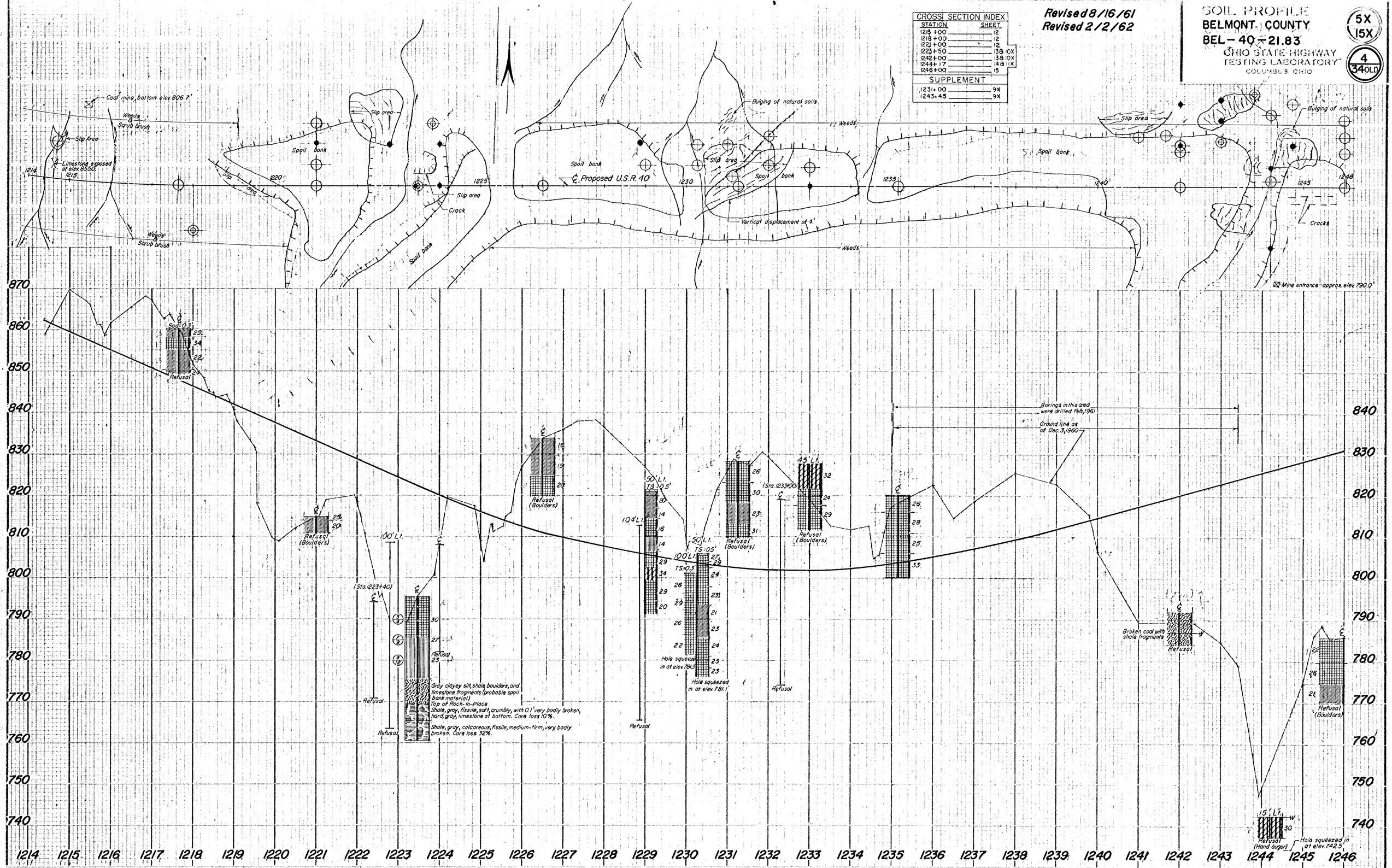
Revised 2/5/62

SOIL PROFILE
BELMONT COUNTY
BEL-40-21.83
OHIO STATE HIGHWAY TESTING LABORATORY
COLUMBUS, OHIO

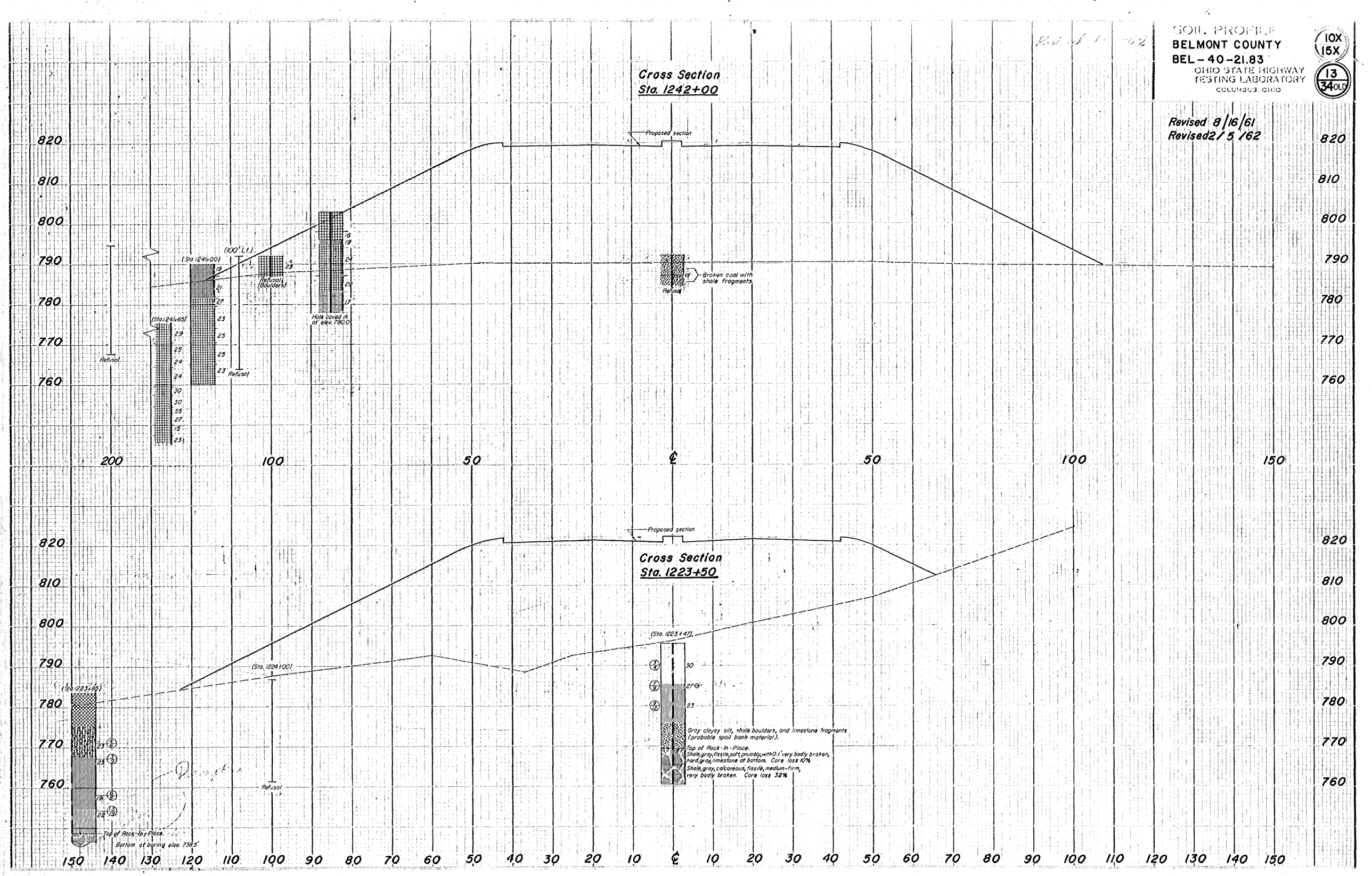
5
17 OLD

4X
15X


SOIL PROFILE
BELMONT COUNTY
BEL-40-22.01
OHIO STATE HIGHWAY
TESTING LABORATORY
COLUMBUS, OHIO
16
17
Cross Section
Sta. 1210+00
Proposed grade
Proposed grade
(Sta. 1209+86)
Refusal
Sod 0.2
Cross Section
Sta. 1206+00
NOTE: Proposed grade at elev. 899.1
(Sta. 1206+03)
Refusal
Refusal
Refusal



Revised 8/16/61
Revised 2/2/62
SOIL PROFILE
BELMONT COUNTY
BEL-40-21.83
OHIO STATE HIGHWAY TESTING LABORATORY
COLUMBUS, OHIO
5X
15X
4
34 OLD
CROSS SECTION INDEX
STATION SHEET
1215+00 12
1218+00 12
1221+00 12
1223+50 13 & 10X
1242+00 13 & 10X
1244+17 14 & 11X
1246+00 15
SUPPLEMENT
1231+00 9X
1243+45 9X
Coal mine, bottom elev. 806.7'
Weeds & Scrub brush
Slip Area
Limestone exposed at elev. 855.0
Slip area
Spoil bank
Crack
Bulging of natural soils
Proposed U.S.R. 40
Vertical displacement of 4'
Cracks
Mine entrance-approx. elev. 790.0'
Borings in this area were drilled Feb. 1961
Ground line as of Dec. 3, 1960
Refusal (Boulders)
Gray clayey silt, shale boulders, and limestone fragments (probable spoil bank material)
Top of Rock-In-Place
Shale, gray, fissile, soft, crumbly, with 0.1' very badly broken, hard, gray, limestone at bottom. Core loss 10%.
Shale, gray, calcareous, fissile, medium-firm, very badly broken. Core loss 32%.
Hole squeezed in at elev. 781.3
Hole squeezed in at elev. 781.1
Broken coal with shale fragments
Refusal (Hand auger)
Hole squeezed in at elev. 742.5



SOIL PROFILE
BELMONT COUNTY
BEL-40-21.83
OHIO STATE HIGHWAY TESTING LABORATORY
COLUMBUS, OHIO
10X 15X
13 34 OLD
Revised 8/16/61
Revised 2/5/62
Cross Section
Sta. 1242+00
Proposed section
(Sta 1241+00)
(100' Lt.)
(Sta 1241+65)
Refusal
Refusal (Boulders)
Hole caved in at elev. 780.0
Broken coal with shale fragments.
Refusal
Cross Section
Sta. 1223+50
Proposed section
(Sta. 1223+47)
(Sta. 1224+00)
(Sta 1223+85)
Refusal
Gray clayey silt, shale boulders, and limestone fragments (probable spoil bank material).
Top of Rock-In-Place.
Shale, gray, fissile, soft, crumbly, with 0.1' very badly broken, hard, gray, limestone at bottom. Core loss 10%
Shale, gray, calcareous, fissile, medium-firm, very badly broken. Core loss 32%
Top of Rock-In-Place.
Bottom of boring elev. 738.5'