

HDR

SFCJPA

**San Francisquito Creek
Flood Wall
Structure Design**



**Prepared For
San Francisquito Creek
Joint Powers Authority**

**November 2012
HDR # 130806**

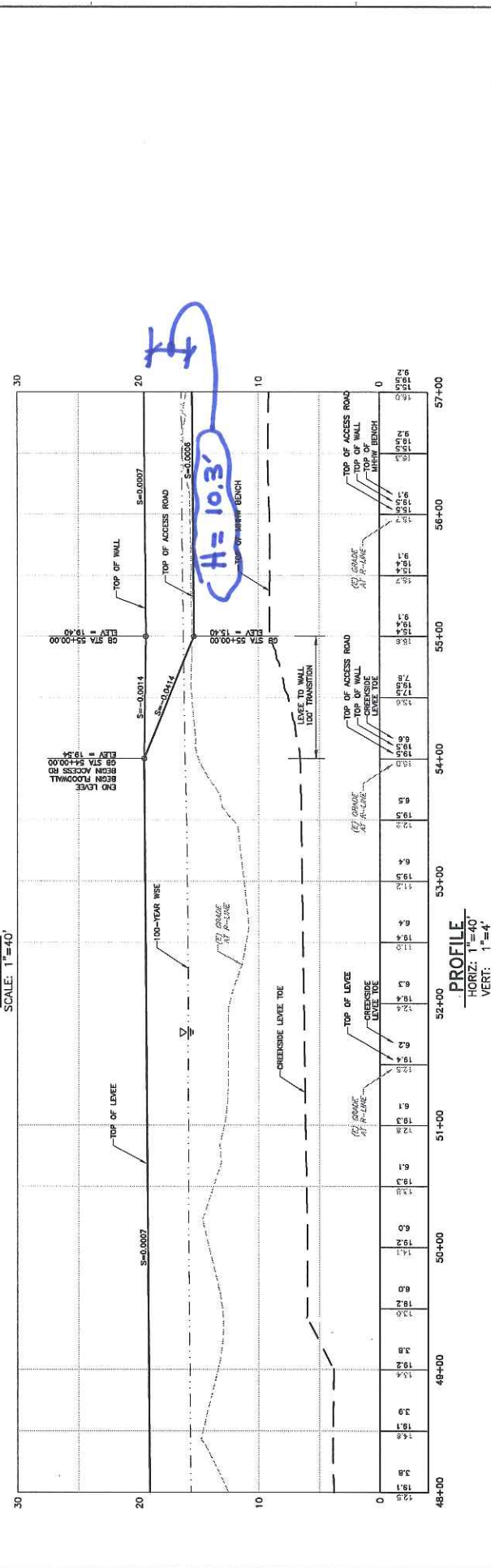
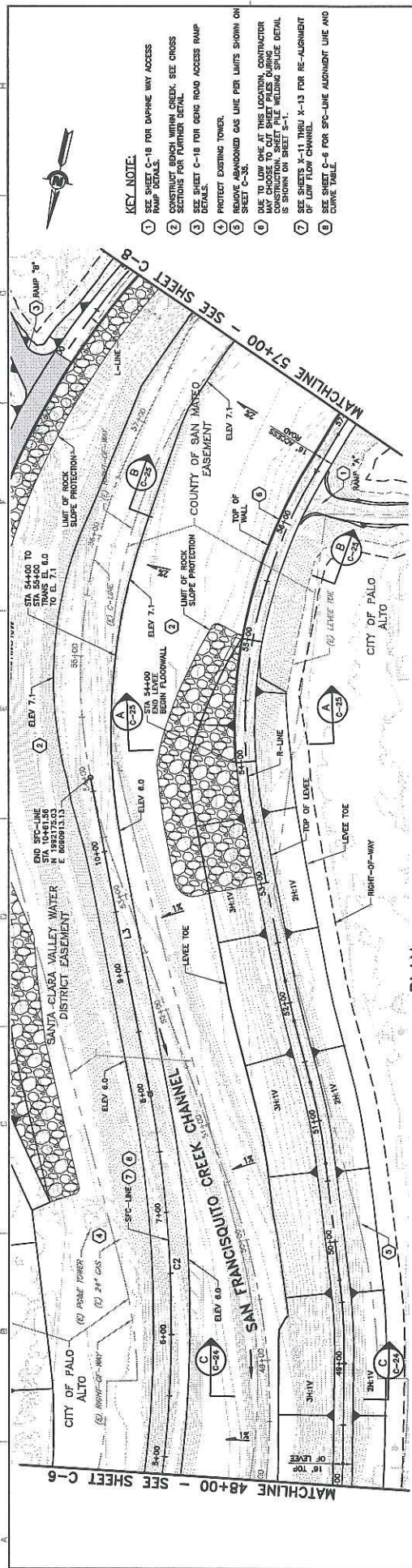
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Structural Calculations

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FLOOD WALL DESIGN.

- * DESIGN SPECIFICATIONS; USACE EM 1110-2-2504
- * WALL HT. DESIGN; 10', 12', 14', 16' & 19'
- * USACE TABLE 5-1, USUAL LOAD CASE FOR DRAIN SOIL CONDITION CONTROLS THE WALL DESIGN. GEOTECH SOIL PRESSURE VALUES GIVEN ON FIG. 8 & USACE TABLE 5-1 USUAL LOAD CASE FOR FINE GRAIN SOIL DONOT GOVERN.
- * WALL ARE DESIGNED FOR POST-SCOUR CONDITION WITH FRONT SOIL/RIP-RAP SLOPED TO 2:1 GRADE.
- * NO FURTHER INCREASE IN SOIL HEIGHT WAS CONSIDERED DUE TO RIP-RAP PROTECTION
- * NO SECTION WAS ASSUMED DUE TO PROTECTIVE COATING APPLIED TO WALL.
- * WALL DEFLECTION CONTROLS THE DESIGN AND WAS LIMITED TO 2% OF WALL HT. 'H'.



95% PRELIMINARY
11-14-2012

DATE APPR: _____

DESCRIPTION: _____

DATE: 09-30-12

DESIGN: L. JONES

DRAWN: H. SUAREZ

CHECKED: _____

ENGINEERING CERTIFICATION: _____

PROJECT ENGINEER: P. HRAHLEH

PROJECT NUMBER: 28284002

SHEET CODE: C-7

SHEET NUMBER: 20 OF 107

SCALE: AS SHOWN

VERIFY SCALES: _____

SCALE ACCURACY: _____

PROJECT NAME AND SHEET DESCRIPTION: **SAN FRANCISCO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT PLAN AND PROFILE - (R-LINE) STATION 48+00 TO 57+00**

PROJECT NUMBER: 28284002

SHEET CODE: C-7

SHEET NUMBER: 20 OF 107

SCALE: AS SHOWN

VERIFY SCALES: _____

SCALE ACCURACY: _____

PROJECT NAME AND SHEET DESCRIPTION: **SAN FRANCISCO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT PLAN AND PROFILE - (R-LINE) STATION 48+00 TO 57+00**

PROJECT NUMBER: 28284002

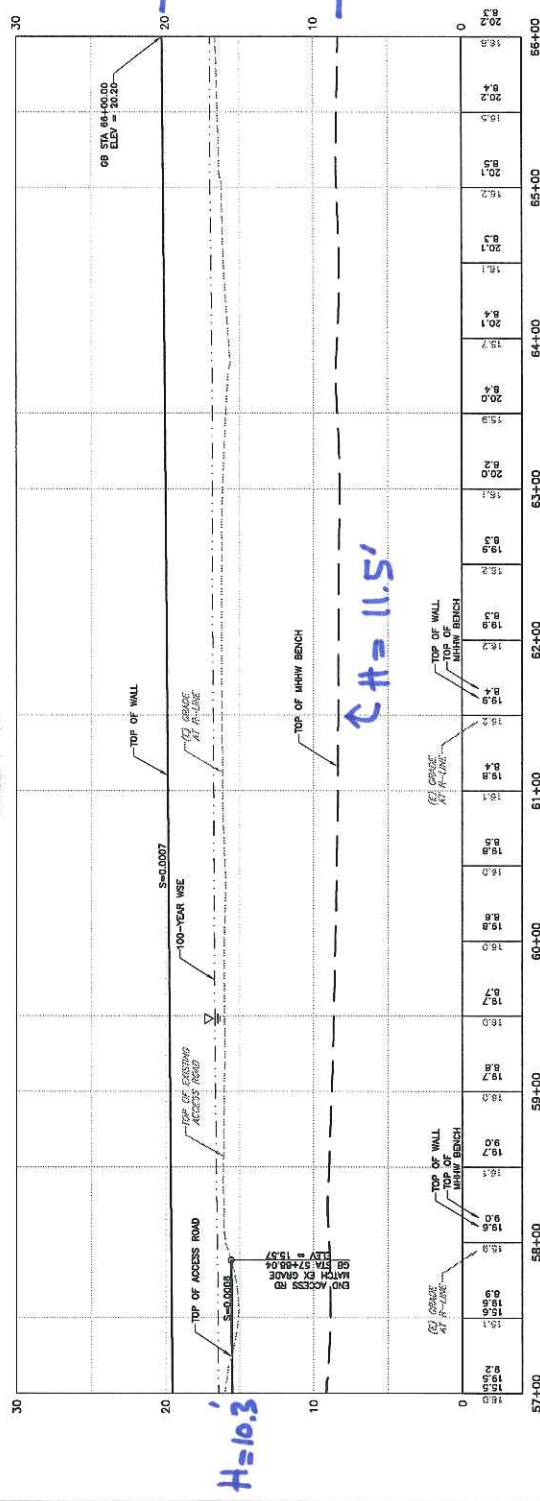
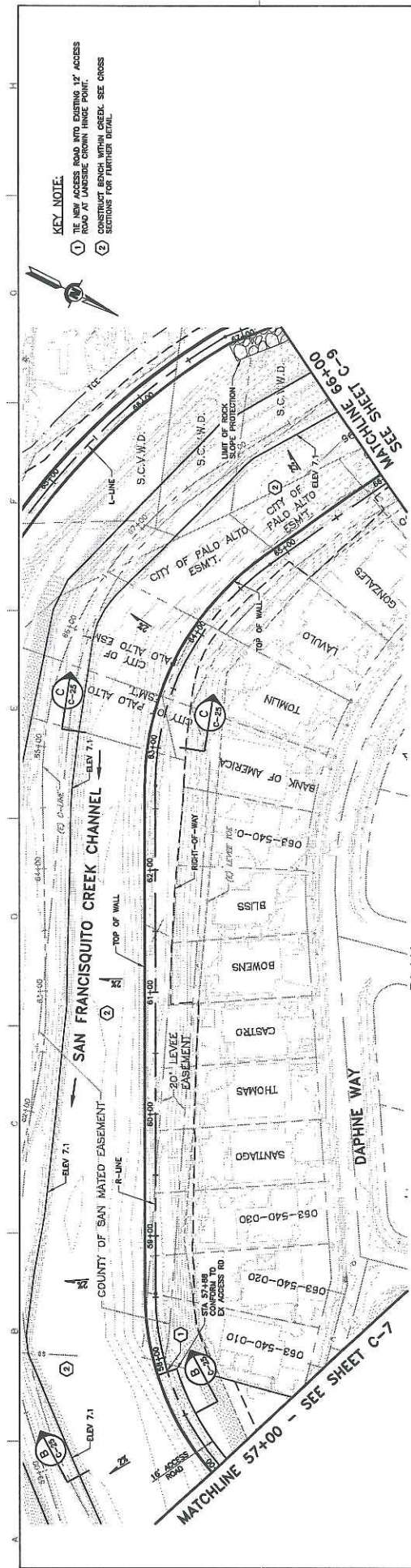
SHEET CODE: C-7

SHEET NUMBER: 20 OF 107

SCALE: AS SHOWN

VERIFY SCALES: _____

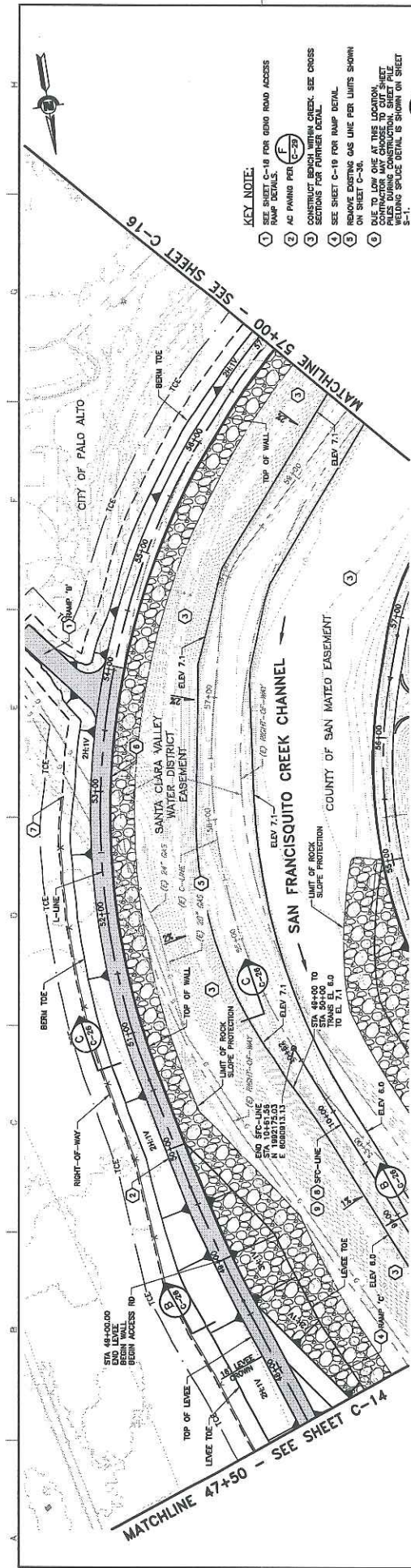
SCALE ACCURACY: _____



REV	DESCRIPTION	DATE	APPR	PROJECT NUMBER	SCALE	PROJECT NAME AND SHEET DESCRIPTION
	95% PRELIMINARY 11-14-2012			26284002	AS SHOWN VERIFY SCALES	SAN FRANCISCO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT PLAN AND PROFILE - (R-LINE) STATION 57+00 TO 66+00
				SHEET CODE: C-8	0 1"=40'	SAN FRANCISCO CREEK JOINT POWERS AUTHORITY
				SHEET NUMBER: 21 OF 107		ACCEPTED BY DISTRICT
						ENGINEERING CERTIFICATION
						DATE
						PROJECT OWNER
						DATE

DOCUMENT NUMBERS: LP-C-102B-XXXXXX

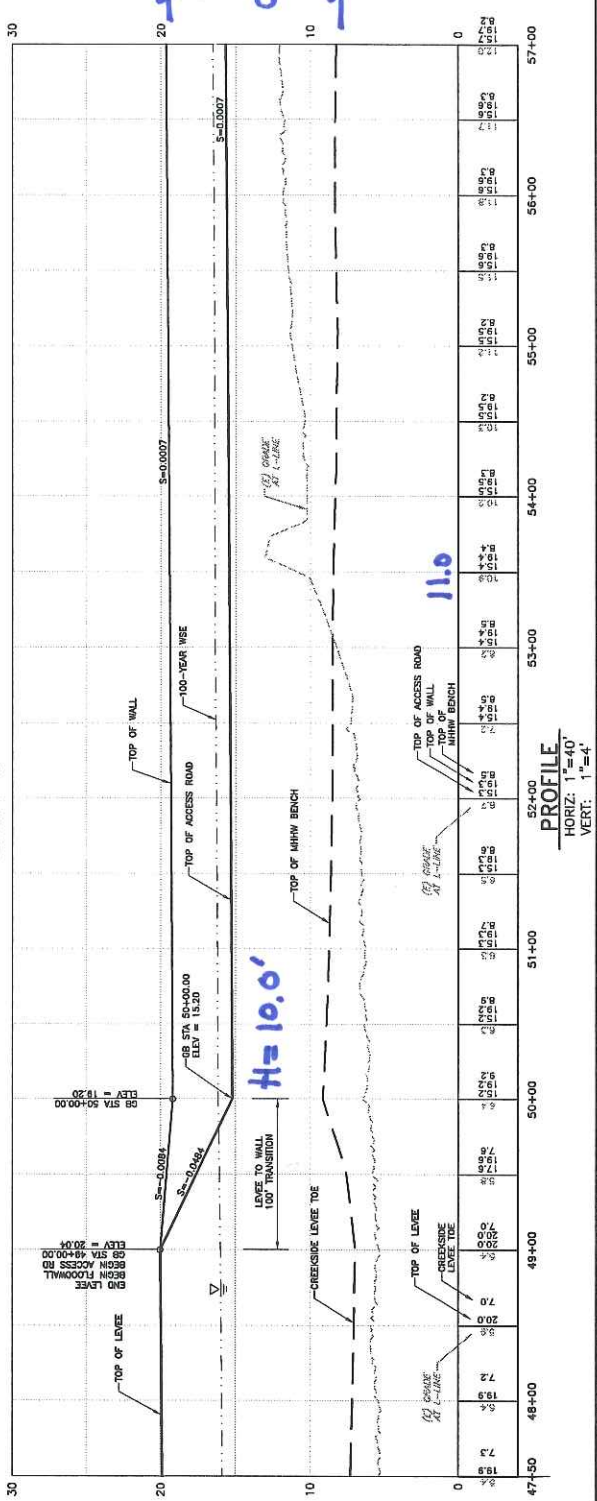
10/28/2012 11:13:11 AM
P:\Projects\2012\11-14-2012\11-14-2012.dwg



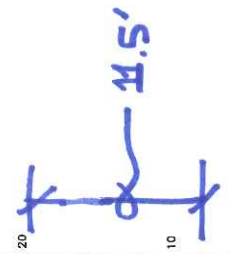
KEY NOTE:

- 1 SEE SHEET C-18 FOR O&G ROAD ACCESS RAMP DETAILS.
- 2 AS PAVING PER (F) (C-29)
- 3 CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS FOR PAVEMENT DETAIL.
- 4 SEE SHEET C-19 FOR RAMP DETAIL.
- 5 SEE SHEET C-19 FOR RAMP DETAIL ON SHEET C-29.
- 6 DUE TO LOW ONE AT THIS LOCATION CONTRACTOR MAY CHOOSE TO CUT SHEET PILING AND CONSTRUCT A BENT PILE WITH A LOW WALL AS SHOWN ON SHEET S-1.
- 7 END OF CHAIN LINK FENCE (C-22) STA 52+45, 32.1' (L) CONNECT TO (E) FENCE.
- 8 SEE SHEETS X-11 THRU X-13 FOR RE-ALIGNMENT OF LOW FLOW CHANNEL.
- 9 SEE SHEET C-8 FOR SFC-LINE ALIGNMENT LINE AND CURVE TABLE.

PLAN SCALE: 1"=40'



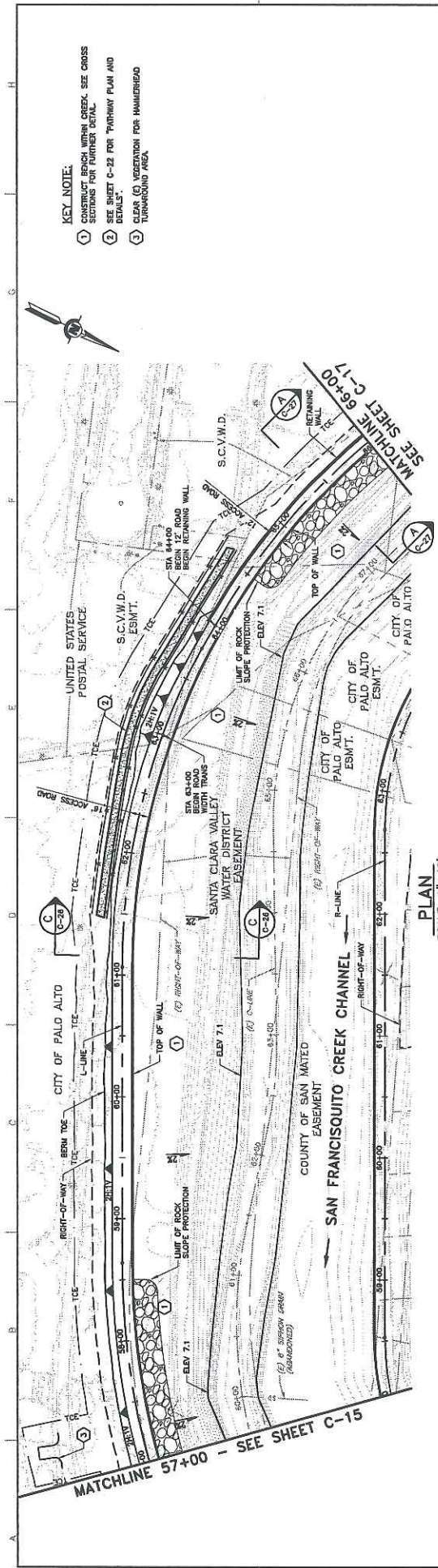
PROFILE SCALE: 1"=40' HORIZ: 1"=40' VERT: 1"=4'



REV	DESCRIPTION	DATE	APPROVED	PROJECT NUMBER	SCALE	AS SHOWN	VERIFY SCALES	PROJECT NAME AND SHEET DESCRIPTION
	95% PRELIMINARY 11-14-2012			26284002	0	0	1"	SAN FRANCISCO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT PLAN AND PROFILE - (L-LINE) STATION 47+50 TO 57+00
								SAN FRANCISCO CREEK JOINT POWERS AUTHORITY
								ACCEPTED BY DISTRICT
								PROJECT NUMBER DATE
								ENGINEERING CERTIFICATION
								DESIGNER L. JONES
								DRAWN H. SUAREZ
								CHECKED P. HINDLEEN
								DATE

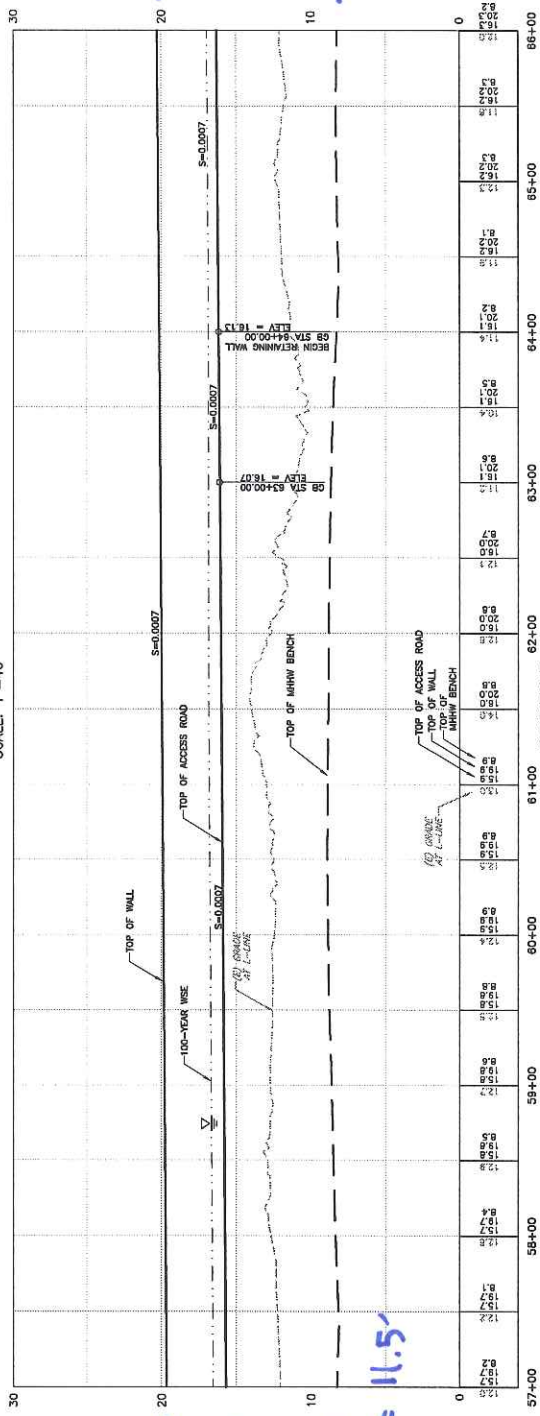
DOCUMENT NUMBER: SFC-LP-C-1026-XXXXXX

DATE: 11/14/2012 10:22:48 AM



- KEY NOTE:**
- ① CONSTRUCT BENCH WITHIN CREEK. SEE CROSS SECTIONS FOR FURTHER DETAIL.
 - ② SEE SHEET C-22 FOR "PATHWAY PLAN AND DETAILS".
 - ③ CLEAR (C) VEGETATION FOR HAMMERHEAD TURNING AREA.

PLAN
SCALE: 1"=40'



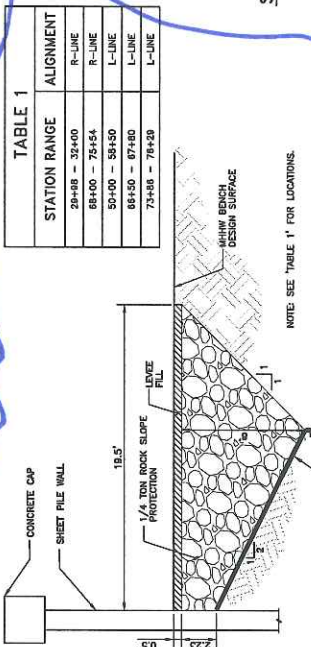
PROFILE
HORIZ. 1"=40'
VERT. 1"=4'

REV	DATE	BY	CHECKED	DATE	PROJECT NUMBER
	09-30-12	L. JONES	H. SUBER		20284002
<p style="text-align: center;">HDR HDR Engineering, Inc.</p>				<p style="text-align: center;">SAN FRANCISCO CREEK JOINT POWERS AUTHORITY</p>	
<p style="text-align: center;">95% PRELIMINARY 11-14-2012</p>				<p style="text-align: center;">SAN FRANCISCO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT PLAN AND PROFILE - (L-LINE) STATION 57+00 TO 66+00</p>	
<p style="text-align: center;">DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX</p>				<p style="text-align: center;">PROJECT NUMBER 20284002</p>	
<p style="text-align: center;">DATE WORK</p>				<p style="text-align: center;">VERIFY SCALES AS SHOWN</p>	
<p style="text-align: center;">SHEET NUMBER</p>				<p style="text-align: center;">SHEET CODE C-16</p>	
<p style="text-align: center;">SHEET NUMBER</p>				<p style="text-align: center;">SHEET NUMBER 28 OF 107</p>	

**SHEET PILE
DESIGN BASED
ON ROCKSLOPE
PROTECTION**

TABLE 1

STATION RANGE	ALIGNMENT
29+88 - 29+00	R-LINE
88+00 - 79+54	R-LINE
50+00 - 81+50	L-LINE
68+50 - 87+80	L-LINE
73+88 - 78+28	L-LINE

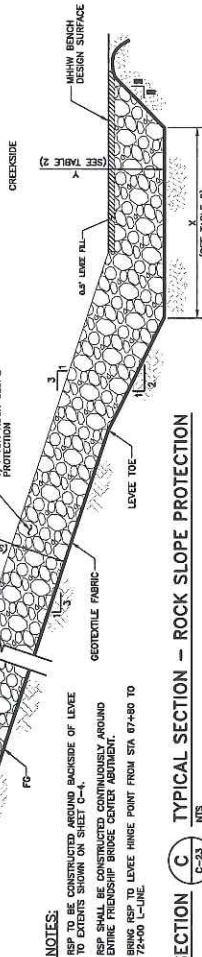


SECTION A ROCK SLOPE PROTECTION AT FLOOD WALL
MIS C-29

NOTE: SEE TABLE 1 FOR LOCATIONS.

TABLE 2

STATION RANGE	ALIGNMENT	X (FT)	Y (FT)	Z (FT)
48+75 - 50+00	L-LINE	8	6	2
22+73 - 28+50	L-LINE	8	8	2
53+00 - 54+00	R-LINE	8	8	2
27+80 - 32+20 (SEE NOTE 2)	C-LINE	8	7	3
28+34 - 29+88 (SEE NOTE 1)	R-LINE	8	7	3
67+80 - 72+20 (SEE NOTE 3)	L-LINE	8	8	2

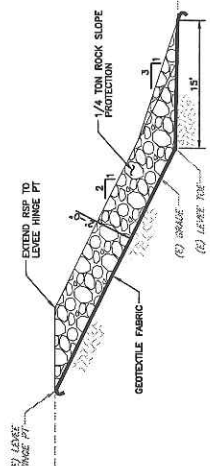


SECTION C TYPICAL SECTION - ROCK SLOPE PROTECTION
MIS C-25

- NOTES:
1. RSP TO BE CONSTRUCTED AROUND BACKSIDE OF LEVEE TO EXTENTS SHOWN ON SHEET C-4.
 2. RSP SHALL BE CONSTRUCTED CONTINUOUSLY AROUND ENTIRE FRIENDSHIP BRIDGE CENTER ABUTMENT.
 3. BRING RSP TO LEVEE HINGE POINT FROM STA 67+80 TO 72+00 L-LINE.

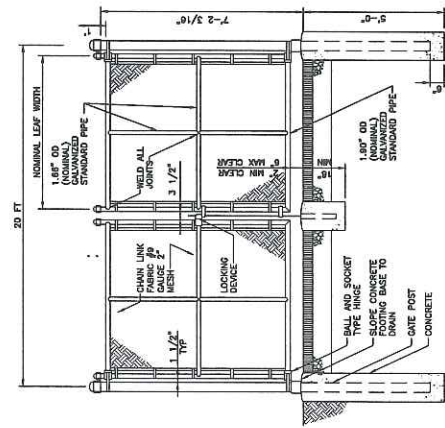
TABLE 3

STATION RANGE	ALIGNMENT
18+50 - 22+73	L-LINE
15+00 - 18+25	R-LINE

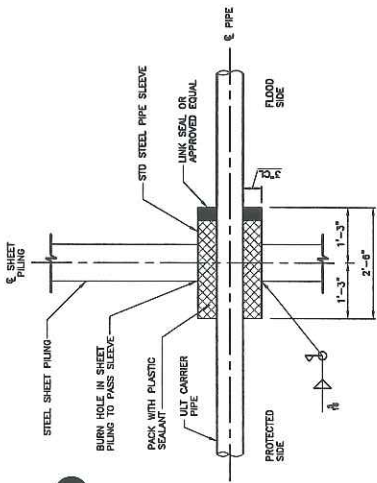


SECTION E TYPICAL SECTION - ROCK SLOPE PROTECTION
MIS C-12

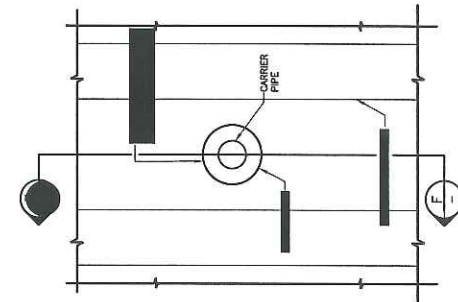
NOTE: SEE TABLE 3 FOR LOCATIONS.



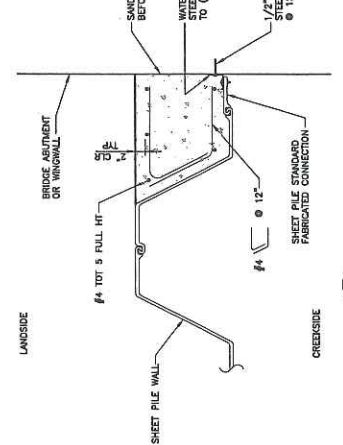
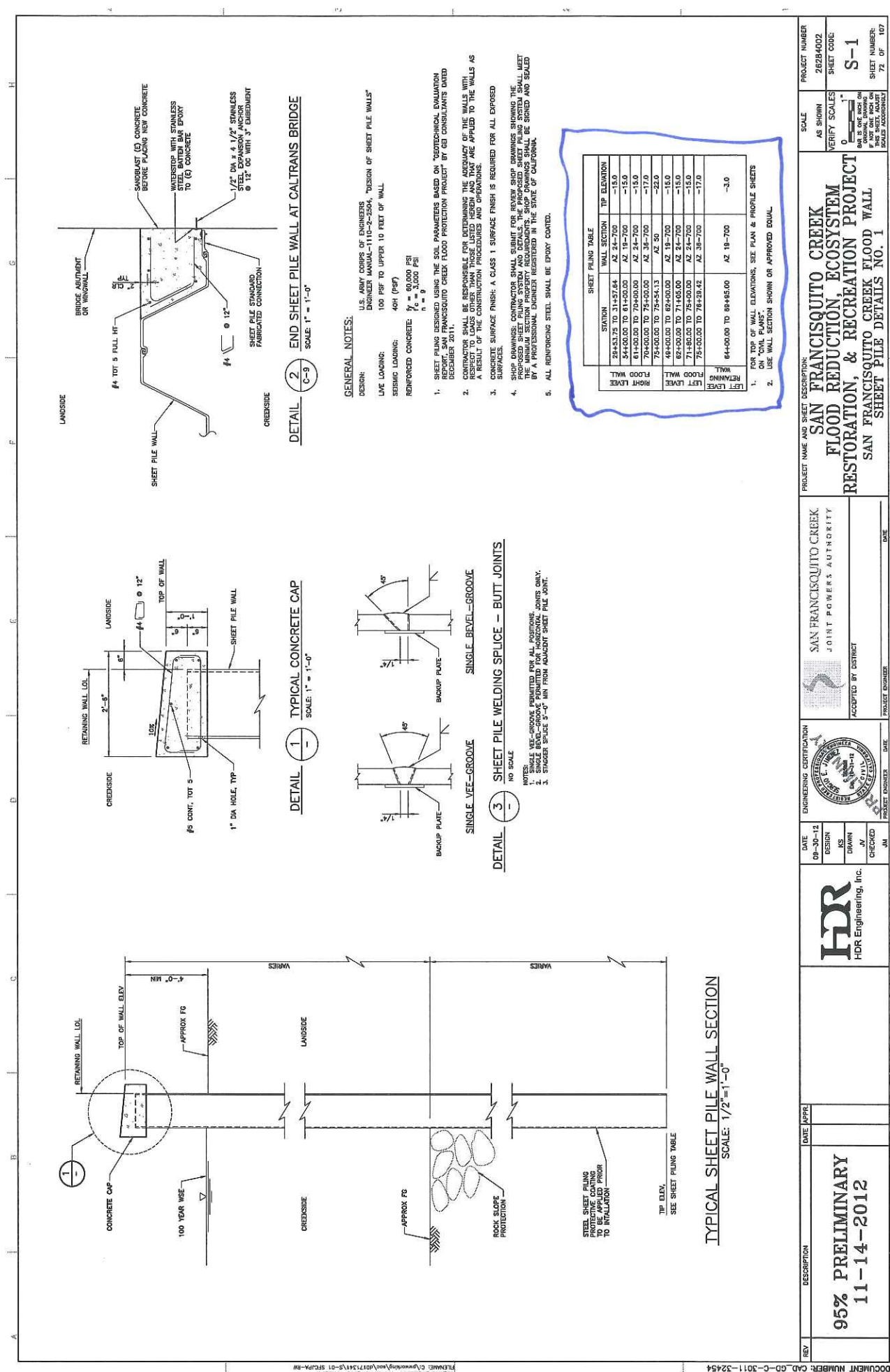
DETAIL 1 20 FOOT WIDE GATE
MIS C-17



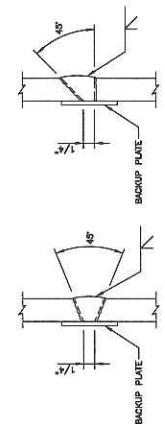
SECTION D PIPE PENETRATION OPENING
MIS C-18



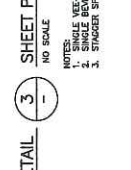
SECTION F



DETAIL 1
TYPICAL CONCRETE CAP
SCALE: 1" = 1'-0"



DETAIL 2
END SHEET PILE WALL AT CALTRANS BRIDGE
SCALE: 1" = 1'-0"



DETAIL 3
SHEET PILE WELDING SPLICE - BUTT JOINTS
NO SCALE

TYPICAL SHEET PILE WALL SECTION
SCALE: 1/2" = 1'-0"

SHEET PILING TABLE

STATION	WALL SECTION	TIP ELEVATION
20+53.75 TO 31+57.64	AZ 24-700	-15.0
34+00.00 TO 61+00.00	AZ 19-700	-15.0
61+00.00 TO 75+00.00	AZ 19-700	-17.0
75+00.00 TO 75+54.13	AZ 34-700	-17.0
75+54.13 TO 82+00.00	AZ 50	-22.0
82+00.00 TO 82+40.00	AZ 19-700	-15.0
82+40.00 TO 71+405.00	AZ 24-700	-15.0
71+405.00 TO 75+00.00	AZ 24-700	-15.0
75+00.00 TO 75+38.42	AZ 35-700	-17.0
64+00.00 TO 64+45.00	AZ 19-700	-3.0

FOR TOP OF WALL ELEVATIONS, SEE PLAN & PROFILE SHEETS
1. ON "OVAL PLANS".
2. USE WALL SECTION SHOWN OR APPROVED SOUL.

GENERAL NOTES:
U.S. ARMY CORPS OF ENGINEERS
ENGINEER MANUAL-1110-2-2504, "DESIGN OF SHEET PILE WALLS"
LIVE LOADING: 100 PSF TO UPPER 10 FEET OF WALL
SEISMIC LOADING: 40H (P&F)
REINFORCED CONCRETE: $f'_c = 60,000$ PSI
 $f_y = 3,000$ PSI
 $n = 9$

- SHEET PILING DESIGNED USING THE SOUL PARAMETERS BASED ON "SYSTEMS ANALYSIS" METHOD DESCRIBED IN ORDER FLEETS PROTECTION PROJECT BY USI CONSULTANTS GROUP DECEMBER 2011.
- CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE ADEQUACY OF THE WALLS WITH RESPECT TO LOADS OTHER THAN THOSE LISTED HEREIN AND THAT ARE APPLIED TO THE WALLS AS A RESULT OF THE CONSTRUCTION PROCEDURES AND OPERATIONS.
- CONCRETE SURFACE FINISH: A CLASS 1 SURFACE FINISH IS REQUIRED FOR ALL EXPOSED SURFACES.
- SHOP DRAWINGS: CONTRACTOR SHALL SUBMIT FOR REVIEW SHOP DRAWINGS SHOWING THE MINIMUM SECTION PROPERTY REQUIREMENTS AND DETAILS. THE PROPOSED SHEET PILING SYSTEM SHALL MEET THE MINIMUM SECTION PROPERTY REQUIREMENTS. SHOP DRAWINGS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF CALIFORNIA.
- ALL REINFORCING STEEL SHALL BE EPOXY COATED.

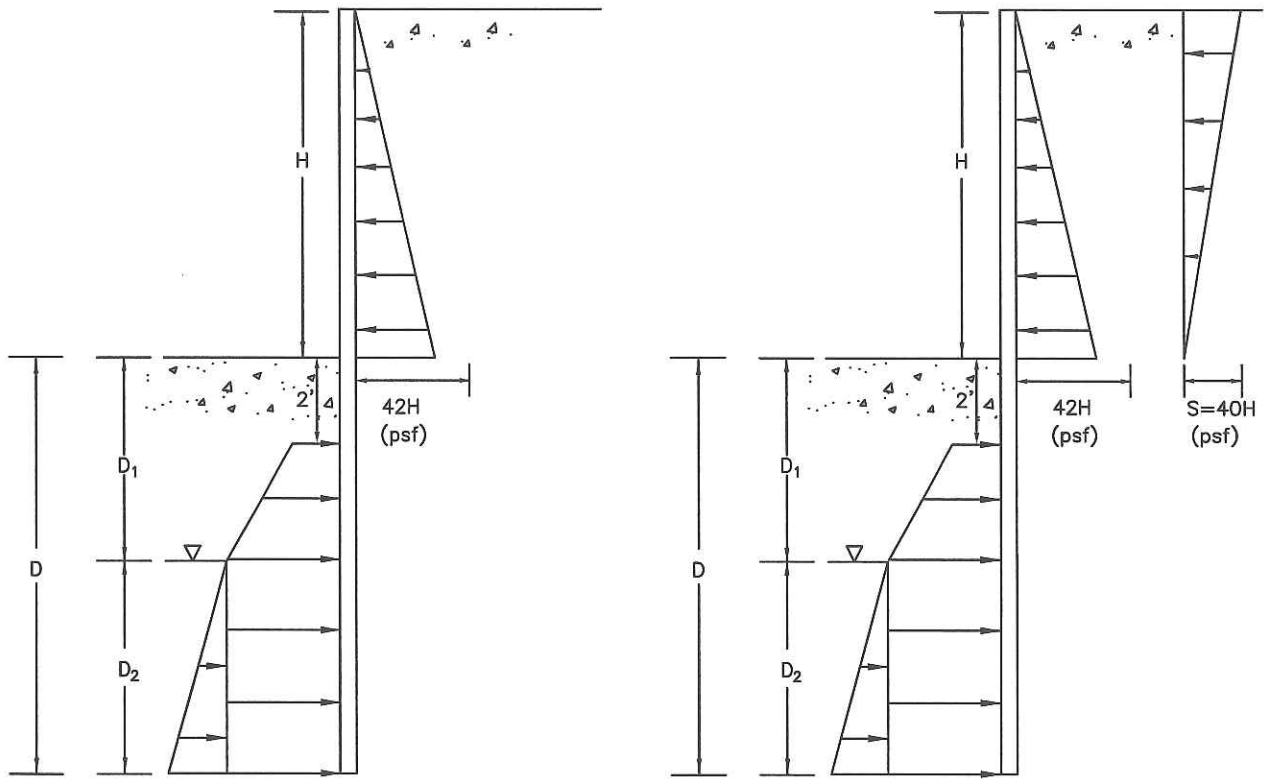
PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISCO CREEK
FLOOD REDUCTION ECOSYSTEM
RESTORATION, & RECREATION PROJECT
SAN FRANCISCO CREEK FLOOD WALL
SHEET PILE DETAILS NO. 1

PROJECT NUMBER: 26284002
SHEET CODE: S-1
SHEET NUMBER: 72 OF 100

SCALE: AS SHOWN
VERIFY SCALES: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

STATIC

DYNAMIC



ABOVE GROUNDWATER: $350 D_1$ (psf)
 BELOW GROUNDWATER: $350 D_1 + 200 D_2$ (psf)

ABOVE GROUNDWATER: $400 D_1$ (psf)
 BELOW GROUNDWATER: $400 D_1 + 200 D_2$ (psf)

LEGEND

- H = HEIGHT OF THE WALL ABOVE THE BOTTOM OF THE CHANNEL EXCAVATION (FEET)
- D = DEPTH OF THE WALL BELOW THE BASE OF THE CHANNEL EXCAVATION (FEET)
- D_1 = DEPTH OF THE WALL ABOVE THE DESIGN WATER LEVEL (FEET)
- D_2 = DEPTH OF THE WALL BELOW THE DESIGN WATER LEVEL (FEET)
- S = SEISMIC PRESSURE

- NOTE: 1. IGNORE PASSIVE RESISTANCE IN UPPER 2 FEET BELOW CHANNEL EXCAVATION.
 2. IF THE WALL IS SUBJECTED TO ADJACENT VEHICULAR LOAD, THE WALL SHOULD BE DESIGNED FOR A UNIFORM PRESSURE OF 100 PSF FOR THE UPPER 10 FEET OF THE WALL.

K:\09285-0 HDR San Francisquito Creek Flood Protection\Geotech Design\Lateral Earth Pressures.dwg

	San Francisquito Creek Flood Protection Project San Mateo & Santa Clara Counties, California	Lateral Earth Pressures	FIGURE 8
GEI Project 09285-0			

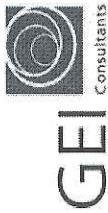


Table 4 - Flood and Retaining Wall Design Parameters
San Francisco Creek Flood Protection Project
San Mateo and Santa Clara Counties, California

Right Bank - East Palo Alto											
*Station From	To	Elevation		Soil Type	Total Density (pcf)	Q (undrained strength)		S (drained strength)			
		Top	Bottom			c (psf)	φ (degrees)	c' (psf)	φ' (degrees)		
76+50	67+00	16	12	Existing Fill	125	750	0	0	0	30	
		12	-5	Recent Alluvium	121	500	0	0	0	30	
		-5	-10	Bay Deposits	107	300	0	0	0	28	
		-10	Depth	Older Alluvium	127	1500	0	0	0	33	
67+00	54+00	16	5	Existing Levee Fill	125	750	0	0	0	30	
		5	-5	Bay Deposits	107	300	0	0	0	28	
		-5	Depth	Older Alluvium	127	1500	0	0	0	33	
		EGS	2	Existing Fill	125	750	0	0	0	30	
30+50	31+50	2	-8	Bay Deposits	107	300	0	0	0	28	
		-8	Depth	Older Alluvium	127	1000	0	0	0	33	
Left Bank - Palo Alto											
*Station From	To	Elevation		Soil Type	Total Density (pcf)	Q (undrained strength)		S (drained strength)			
		Top	Bottom			c (psf)	φ (degrees)	c' (psf)	φ' (degrees)		
76+00	72+00	16	12	Existing Fill	125	750	0	0	0	30	
		12	4	Recent Alluvium	121	500	0	0	0	30	
		4	-1	Bay Deposits	107	300	0	0	0	28	
		-1	Depth	Older Alluvium	127	1500	0	0	0	33	
72+00	71+00	15	-12								
		15	10	Existing Fill	125	750	0	0	0	30	
		10	5	Recent Alluvium	121	500	0	0	0	30	
		5	0	Bay Deposits	107	300	0	0	0	28	
		0	Depth	Older Alluvium	127	1500	0	0	0	33	
		Varies	EGS	New Fill	130	750	0	0	0	30	
		EGS	0	Landfill/ Disposal (Exact Extent Unknown)	100	500	0	0	0	28	
		0	-5	Bay Deposits	107	300	0	0	0	28	
		-5	Depth	Older Alluvium	127	1500	0	0	0	33	
		Varies	EGS	New Fill	130	750	0	0	0	30	
		EGS	1	Recent Alluvium	121	500	0	0	0	30	
		1	-10	Bay Deposits	107	300	0	0	0	28	
-10	Depth	Older Alluvium	127	1500	0	0	0	33			

EGS: Existing Ground Surface Elevation
 * Stationing extents based on HDR 60% design plan for layout of flood control features, provided by HDR December 2011.

Sheet Pile Design According to Blum-Method

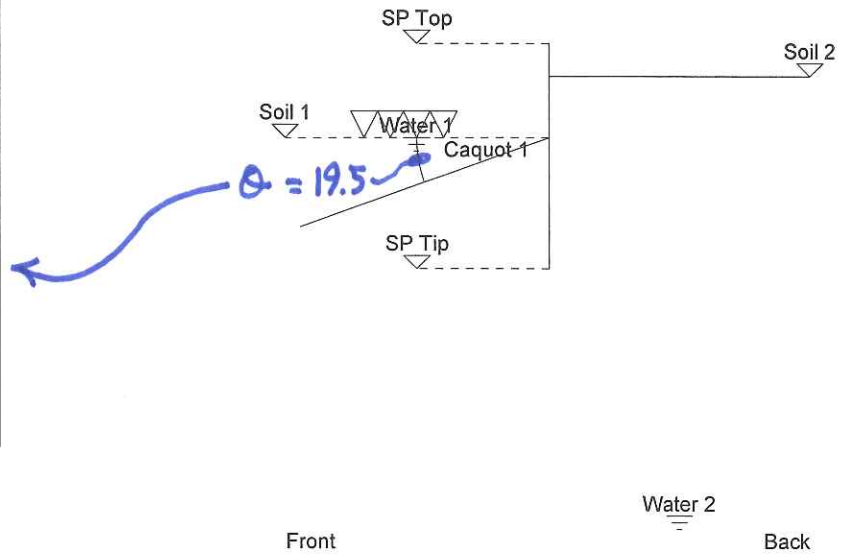
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Project Name: SFCJPA-Sheet Piling Design
Date: 12/24/2012
Author: SP
Company:
Comment: Drained Soil Condition

WALL HEIGHT = 10.0'

Geodata

	Unit
Sheet Pile Top Level [ft]	0.000
Sheet Pile Tip Level [ft]	23.887
Soil Level in Front [ft]	10.000
Soil Level behind [ft]	3.500
Anchorlevel [ft]	0.000
Water Level in Front [ft]	10.000
Water Level behind [ft]	50.000
Soil Surface Inclination in Front [Deg]	-19.500
Soil Surface Inclination behind [Deg]	0.000
Caquot Surcharge in Front [kip/ft2]	0.180
Caquot Surcharge behind [kip/ft2]	0.000
Anchor Inclination [Deg]	0.000
Earth Support	Cantilever



Soil Layers

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Layers in Front

	Layer Tip [ft]	Density Moist [kip/ft ³]	Density Submerged [kip/ft ³]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft ²]
Layer 1	18.000	0.125	0.067	1.082	21.100	0.000	0.000
Layer 2	28.000	0.107	0.067	0.889	19.500	0.000	0.000
Layer 3	80.000	0.127	0.070	1.221	23.400	0.000	0.000

Layers behind

	Layer Tip [ft]	Density Moist [kip/ft ³]	Density Submerged [kip/ft ³]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft ²]
Layer 1	3.500	0.125	0.067	0.333	30.000	0.000	0.000
Layer 2	18.000	0.125	0.067	0.333	30.000	0.000	0.000
Layer 3	28.000	0.107	0.067	0.361	28.000	0.000	0.000
Layer 4	80.000	0.127	0.070	0.000	33.000	0.000	0.000

FOS APPLIED TO SOIL ←
STRENGTH PARAMETERS

$$\tan(\phi_{\text{EFF}}) = \frac{\tan \phi}{1.5} = \frac{\tan 30}{1.5} = 0.385$$

$$\phi_{\text{EFF}} = 21.1$$

Userdefined Pressures

	Pressure Top [kip/ft ²]	Pressure Tip [kip/ft ²]	Depth Top [ft]	Depth Tip [ft]
Strip 1	0.100	0.100	3.500	13.500

↻ LIVE LOAD PRESSURE

Pile Section

17 of 102

Name	AZ 19-700
Inertia [in4/ft]	288.371
Modulus [in3/ft]	34.782
Area [in2/ft]	6.879
Mass [lbs/ft2]	23.410
Steel Grade [lb/in2]	34795.867
Requested Safety	1.500

Extremal Values

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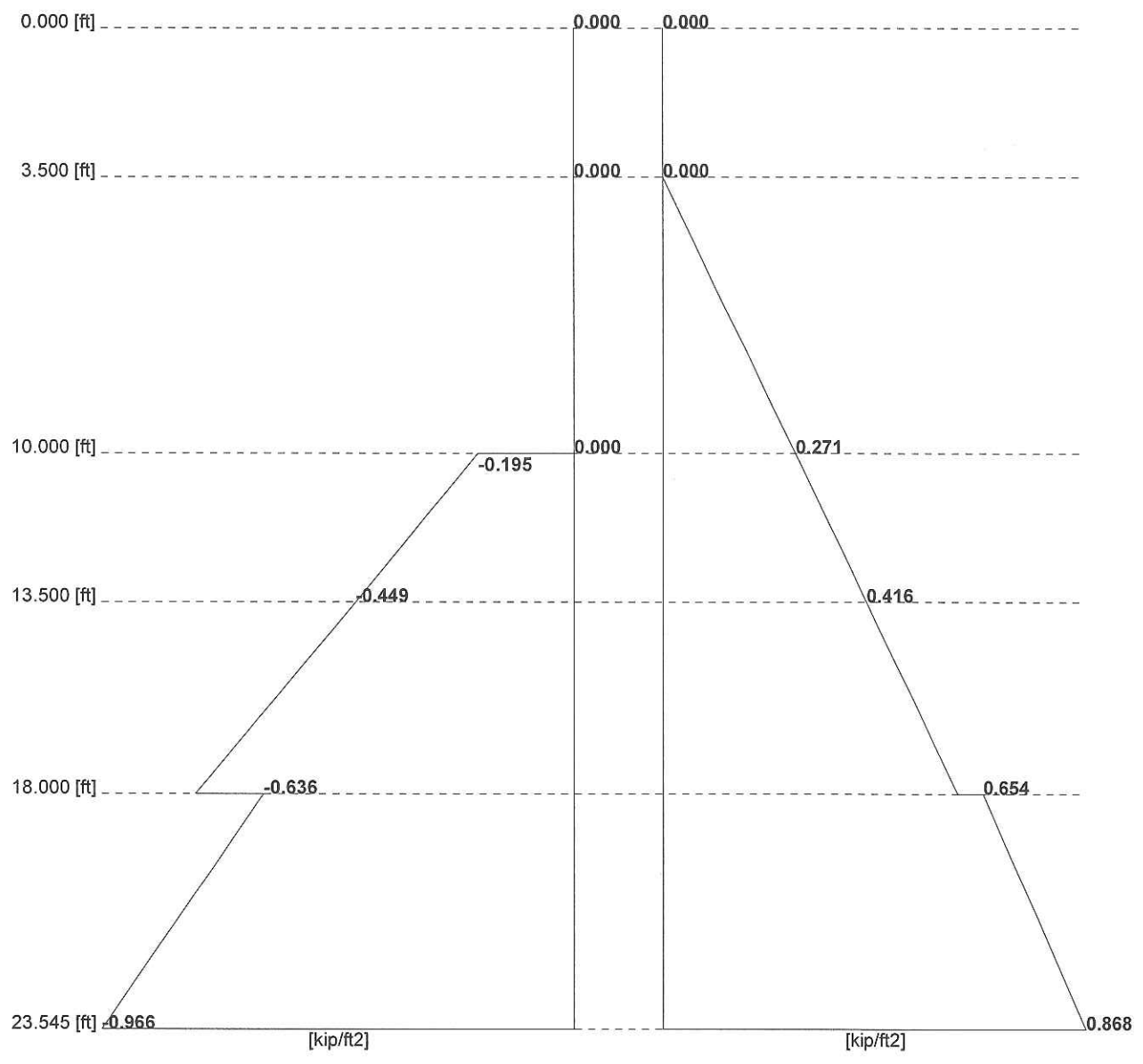
	z Min [ft]	Min	z Max [ft]	Max
Deflection [ft]	0.000	-0.036	23.545	0.000
Cross Force [kip/ft]	23.545	-4.562	11.640	1.690
Moment [kipft/ft]	23.577	-0.297	16.781	12.977

Pile Check

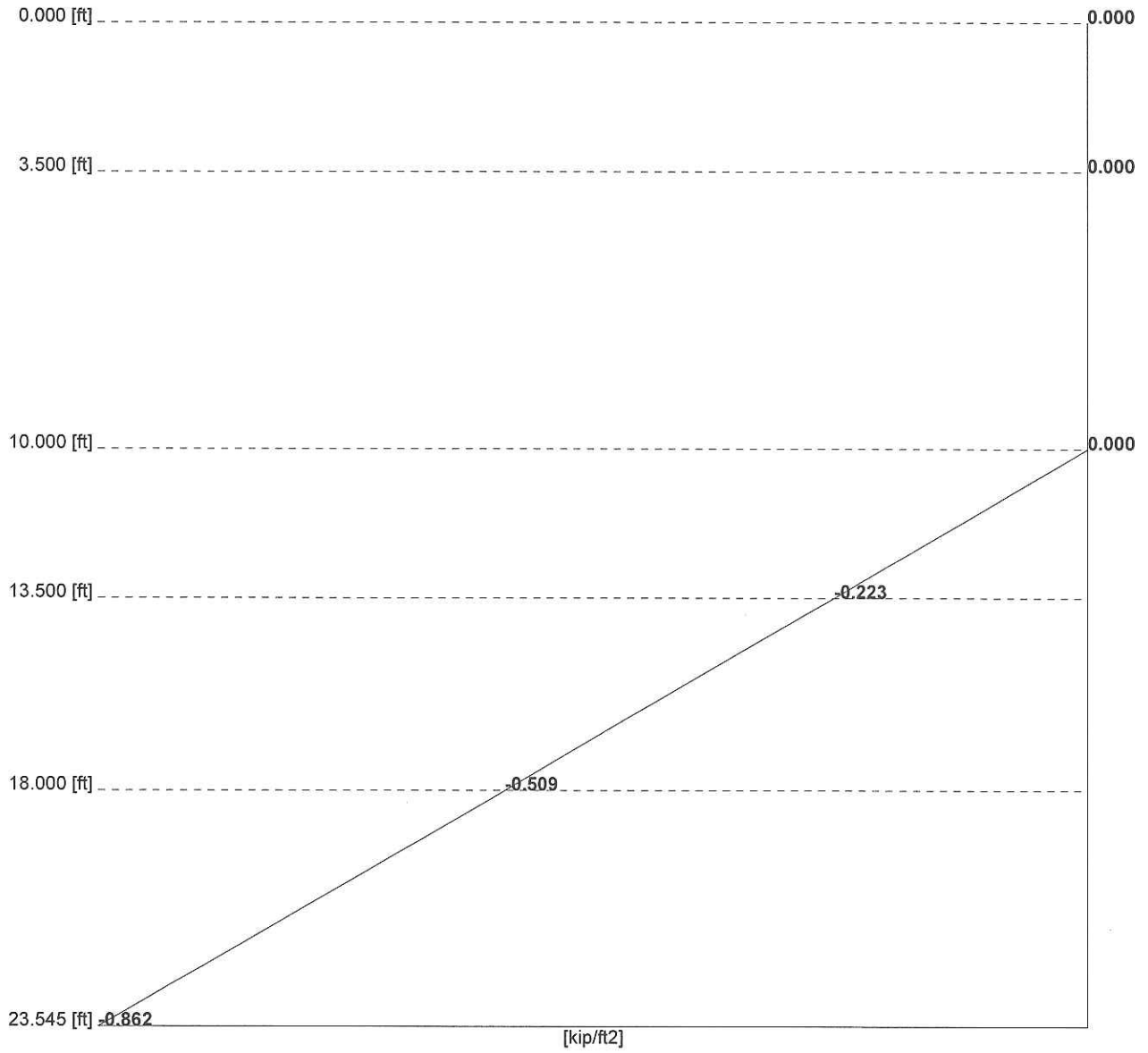
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		Depth [ft]
Name	AZ 19-700	
Inertia [in4/ft]	288.371	
Modulus [in3/ft]	34.782	
Area [in2/ft]	6.879	
Mass [lbs/ft2]	23.410	
Steel Grade [lb/in2]	34795.867	
Minimal Moment [kipft/ft]	-0.297	23.577
Maxmimal Moment [kipft/ft]	12.977	16.781
Normal Forces at Max. Moment [kip/ft]	0.000	23.577
Normal Forces at Min. Moment [kip/ft]	0.000	16.781
Deflection at Min. Moment [ft]	0.000	23.577
Deflection at Max. Moment [ft]	-0.003	16.781
Min. Stress at Min. Moment [lb/in2]	-102.357	23.577
Max. Stress at Min. Moment [lb/in2]	102.357	23.577
Min. Stress at Max. Moment [lb/in2]	-4477.034	16.781
Max. Stress at Max. Moment [lb/in2]	4477.034	16.781
Safety > Req. Safety = 1.500	7.772	
Sheet Pile Top Level [ft]	0.000	
Sheet Pile Tip Level [ft]	23.887	
Sheet Pile Length [ft]	23.887	
Included OverLength [ft]	0.342	
Vertical Equilibrium [kip/ft]	0.000	
Anchor Force (horiz.) [kip/ft]	0.000	

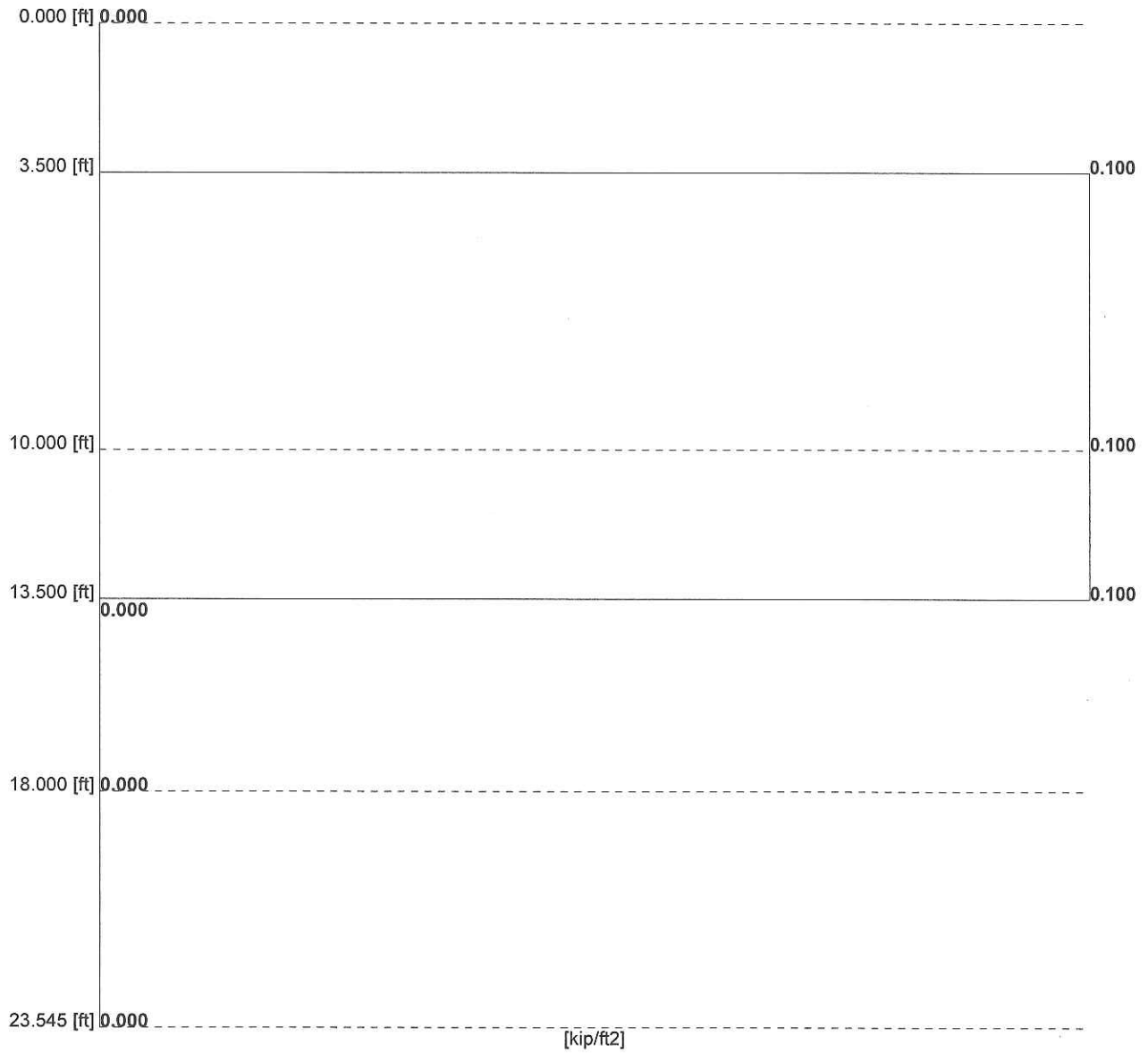
Earth Pressure Diagram



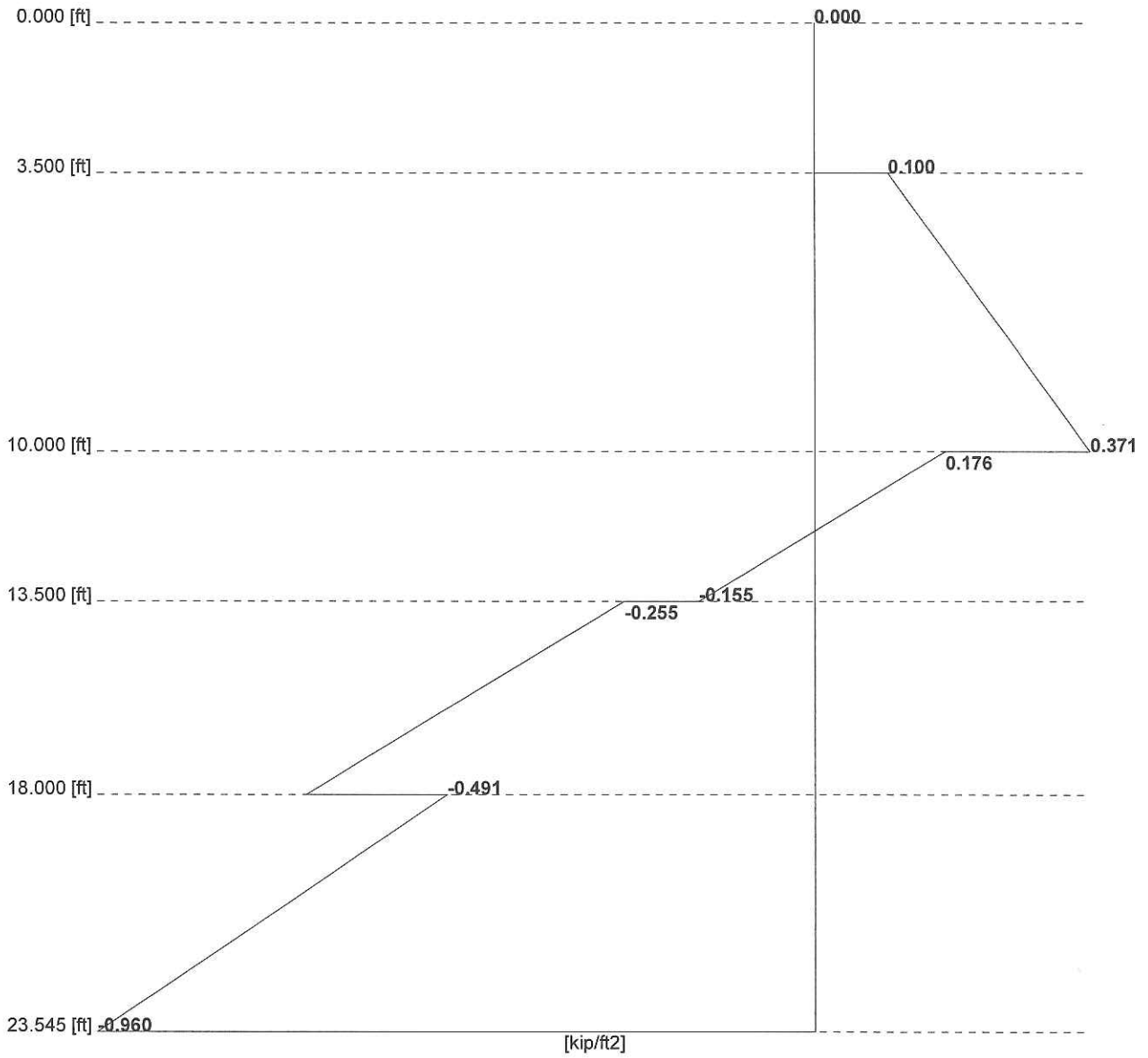
Water Pressure Diagram



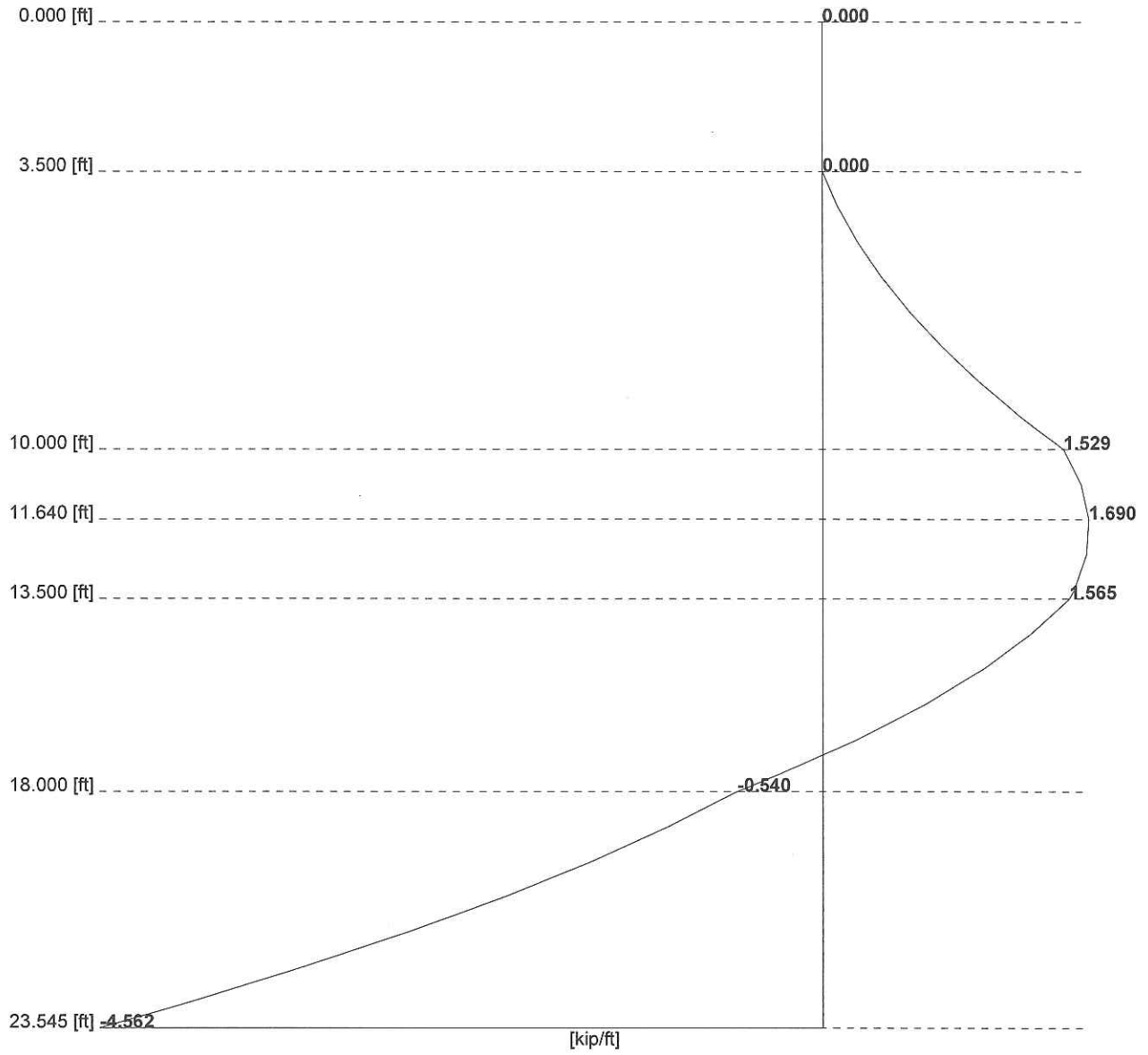
Userdefined Pressure Diagram



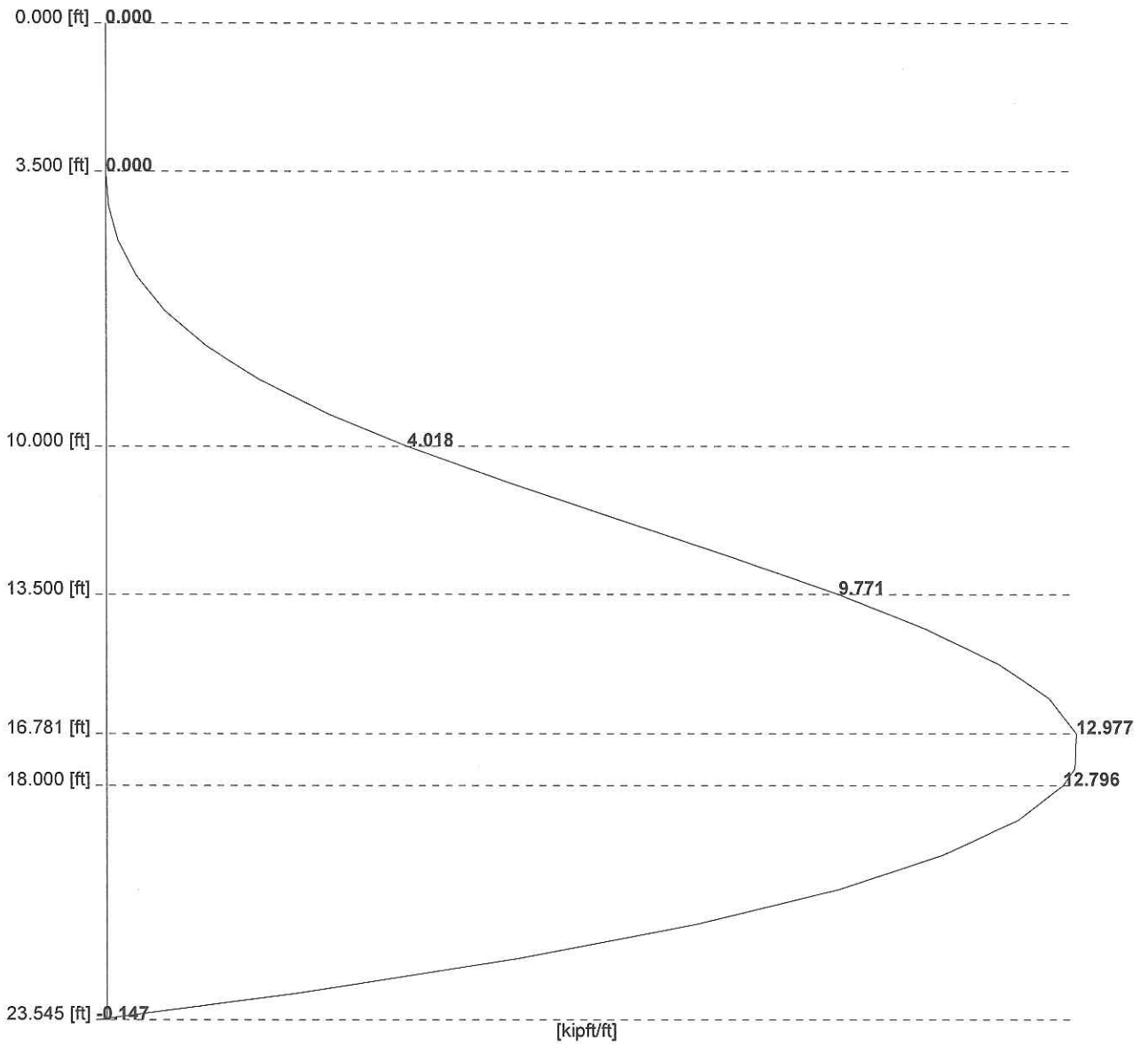
Total Pressure Diagram



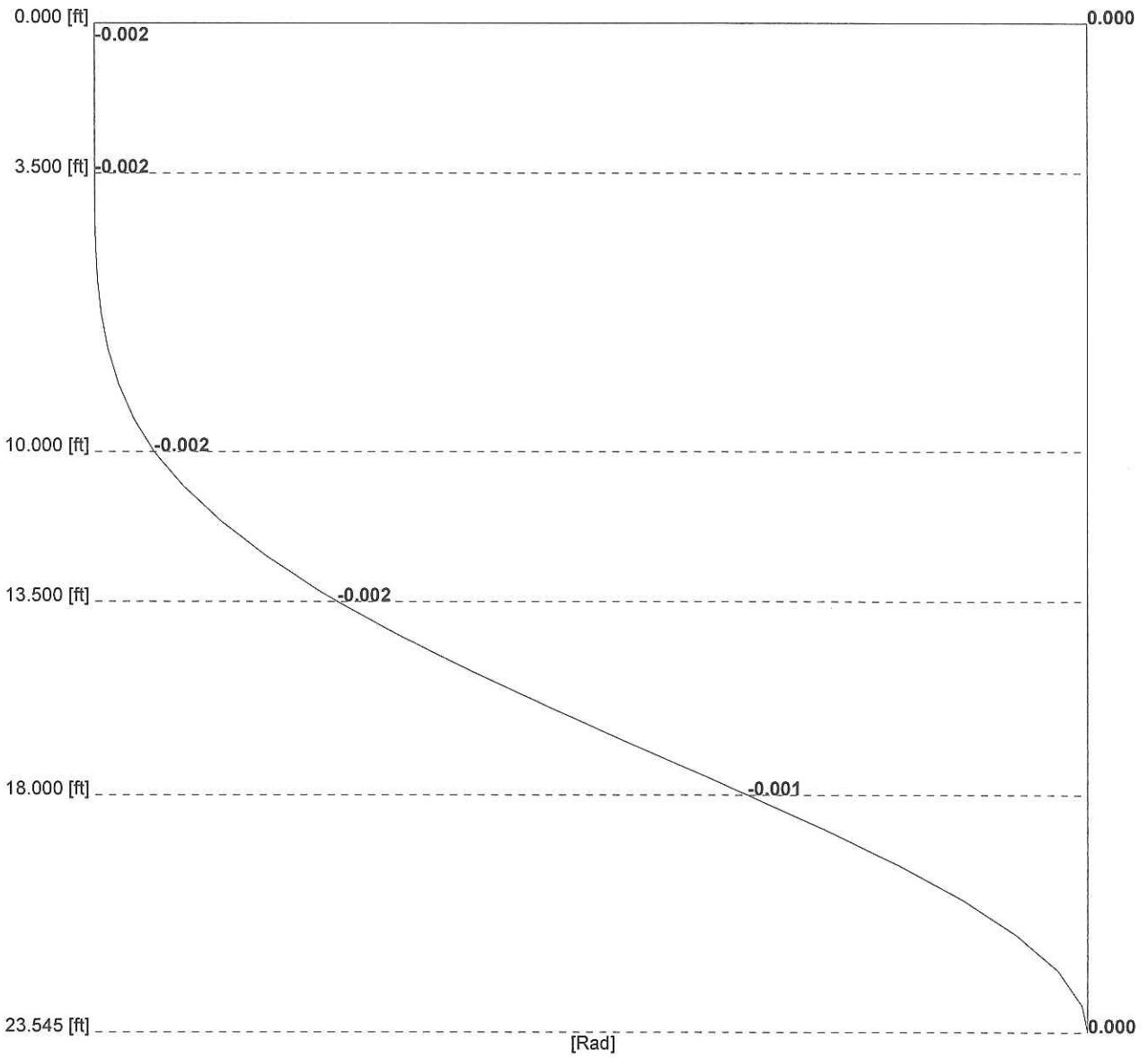
Cross Force Diagram



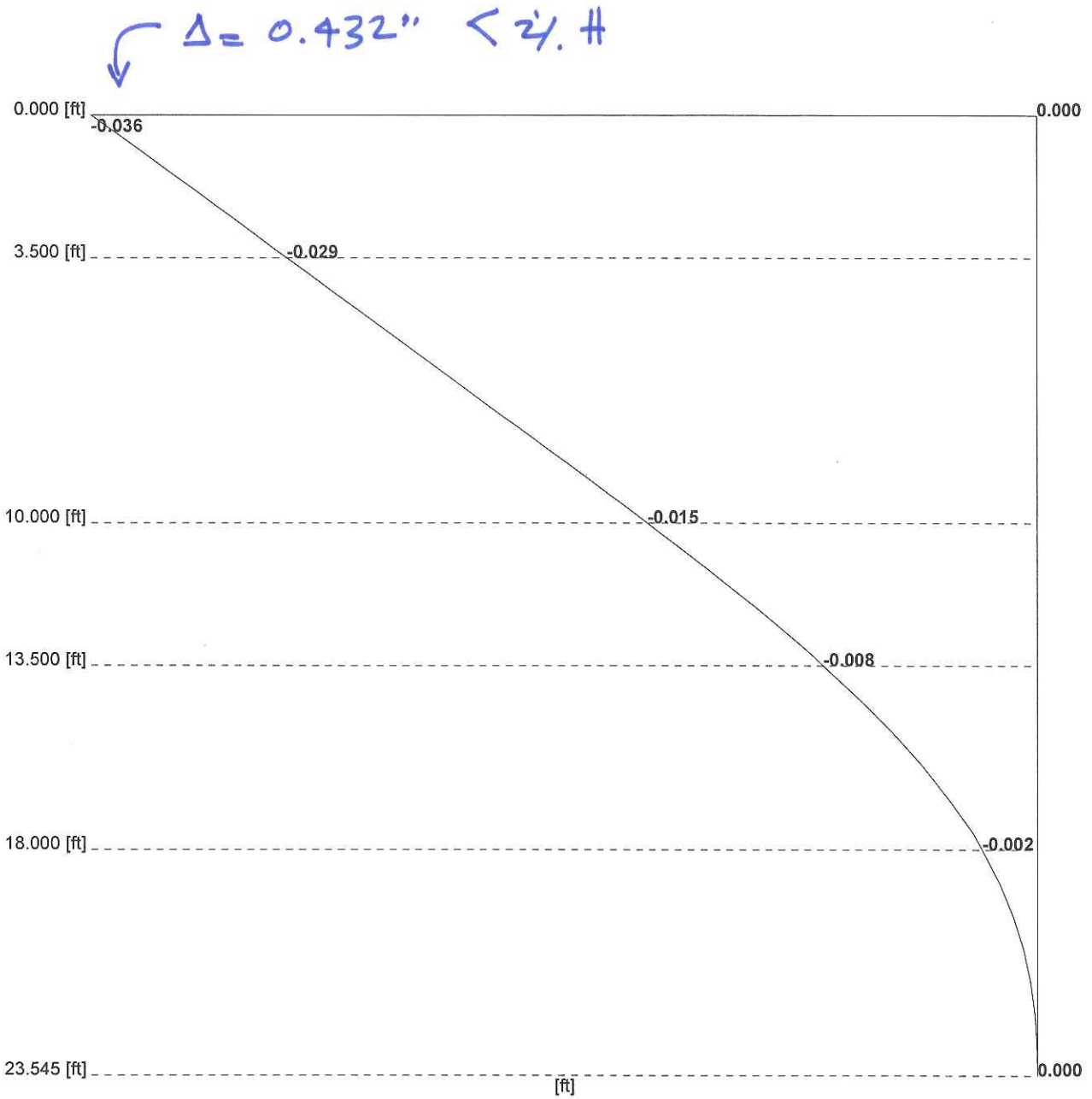
Moment Diagram



Rotation Diagram



Deflection Diagram



.. { SEEPAGE CONTROLS PILE TIP }

Sheet Pile Design According to Blum-Method

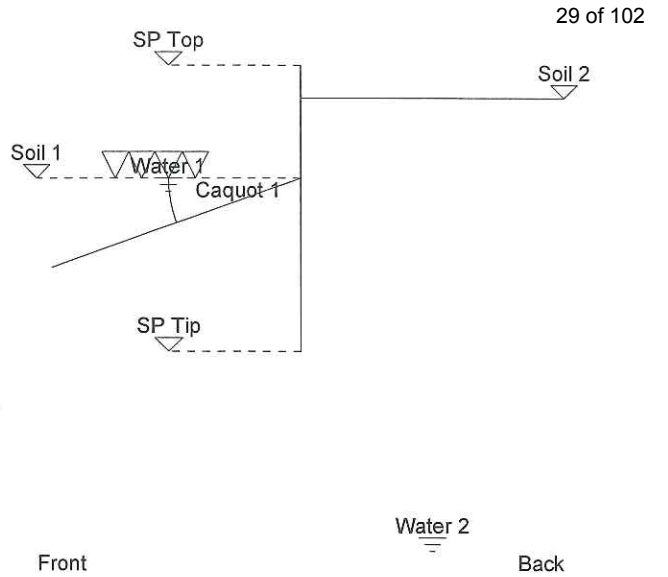
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Project Name: SAC - RA Sheet Piling Design
Date: 11/14/2012
Author: SP
Company:
Comment: Case 2: Clayey Native Material

$$\underline{H_T = 12.0'}$$

Geodata

	Unit
Sheet Pile Top Level [ft]	0.000
Sheet Pile Tip Level [ft]	30.303
Soil Level in Front [ft]	12.000
Soil Level behind [ft]	3.500
Anchorlevel [ft]	0.000
Water Level in Front [ft]	12.000
Water Level behind [ft]	50.000
Soil Surface Inclination in Front [Deg]	-19.500
Soil Surface Inclination behind [Deg]	0.000
Caquot Surcharge in Front [kip/ft2]	0.180
Caquot Surcharge behind [kip/ft2]	0.000
Anchor Inclination [Deg]	0.000
Earth Support	Cantilever



$H_T = 12'$

Soil Layers

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Layers in Front

	Layer Tip [ft]	Density Moist [kip/ft ³]	Density Submerged [kip/ft ³]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft ²]
Layer 1	18.000	0.125	0.067	1.082	21.100	0.000	0.000
Layer 2	28.000	0.107	0.067	0.889	19.500	0.000	0.000
Layer 3	80.000	0.127	0.070	1.221	23.400	0.000	0.000

Layers behind

	Layer Tip [ft]	Density Moist [kip/ft ³]	Density Submerged [kip/ft ³]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft ²]
Layer 1	3.500	0.125	0.067	0.333	30.000	0.000	0.000
Layer 2	18.000	0.125	0.067	0.333	30.000	0.000	0.000
Layer 3	28.000	0.107	0.067	0.361	28.000	0.000	0.000
Layer 4	80.000	0.127	0.070	0.000	33.000	0.000	0.000

$$\tan \phi' = \frac{\tan \phi}{F.S. = 1.5}$$

$$\Rightarrow \phi' = \tan^{-1} \left[\frac{\tan 30}{1.5} \right]$$

$$\phi' = 21.1 \leftarrow \text{REDUCED PASSIVE}$$

Userdefined Pressures

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	Pressure Top [kip/ft ²]	Pressure Tip [kip/ft ²]	Depth Top [ft]	Depth Tip [ft]
Strip 1	0.100	0.100	3.500	13.500

Pile Section

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Name	AZ 24-700
Inertia [in4/ft]	408.757
Modulus [in3/ft]	45.198
Area [in2/ft]	8.225
Mass [lbs/ft2]	27.998
Steel Grade [lb/in2]	34795.867
Requested Safety	1.500



Extremal Values

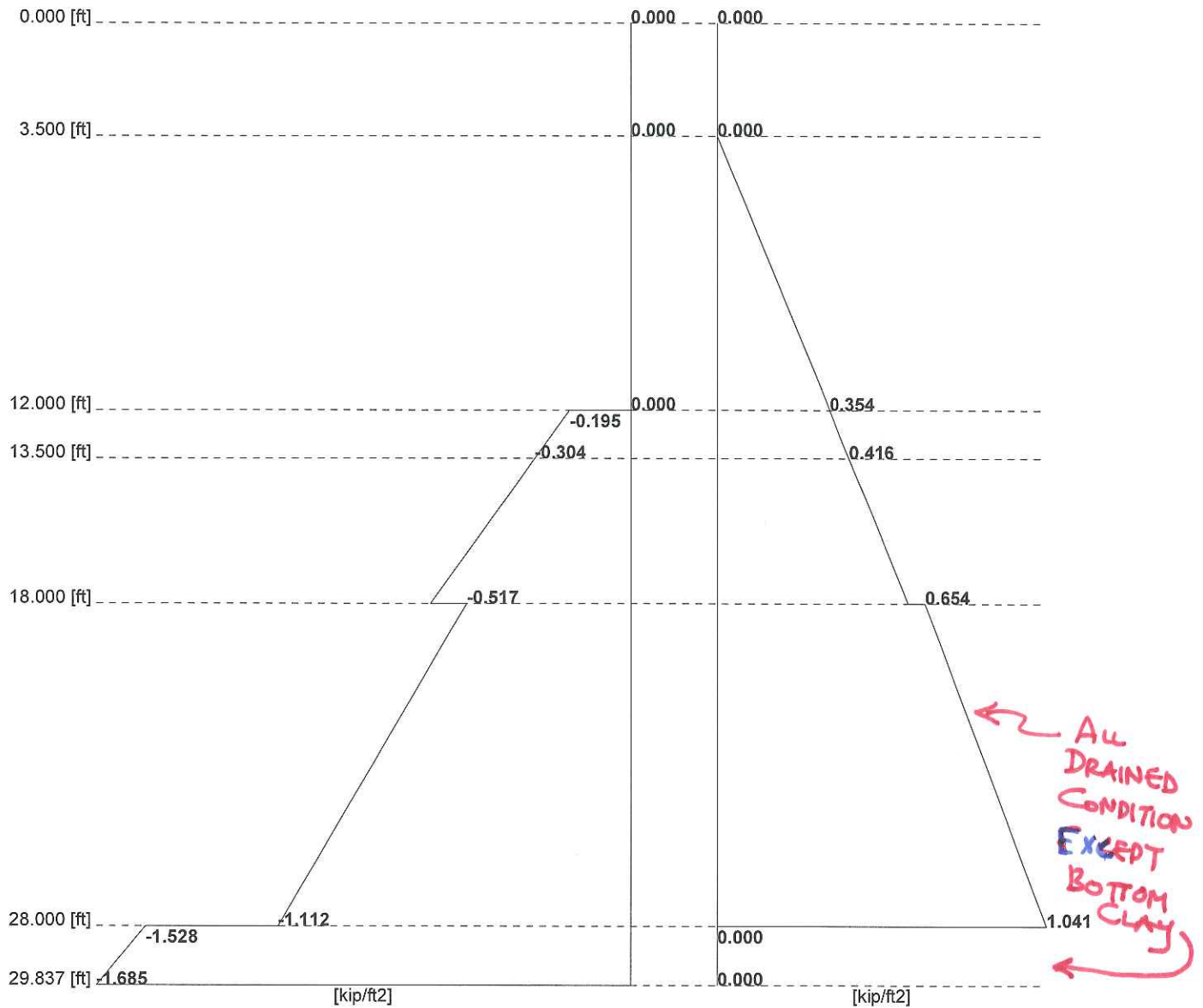
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	z Min [ft]	Min	z Max [ft]	Max
Deflection [ft]	0.000	-0.088	29.837	0.000
Cross Force [kip/ft]	29.837	-9.847	13.500	2.636
Moment [kipft/ft]	29.870	-0.334	22.101	26.413

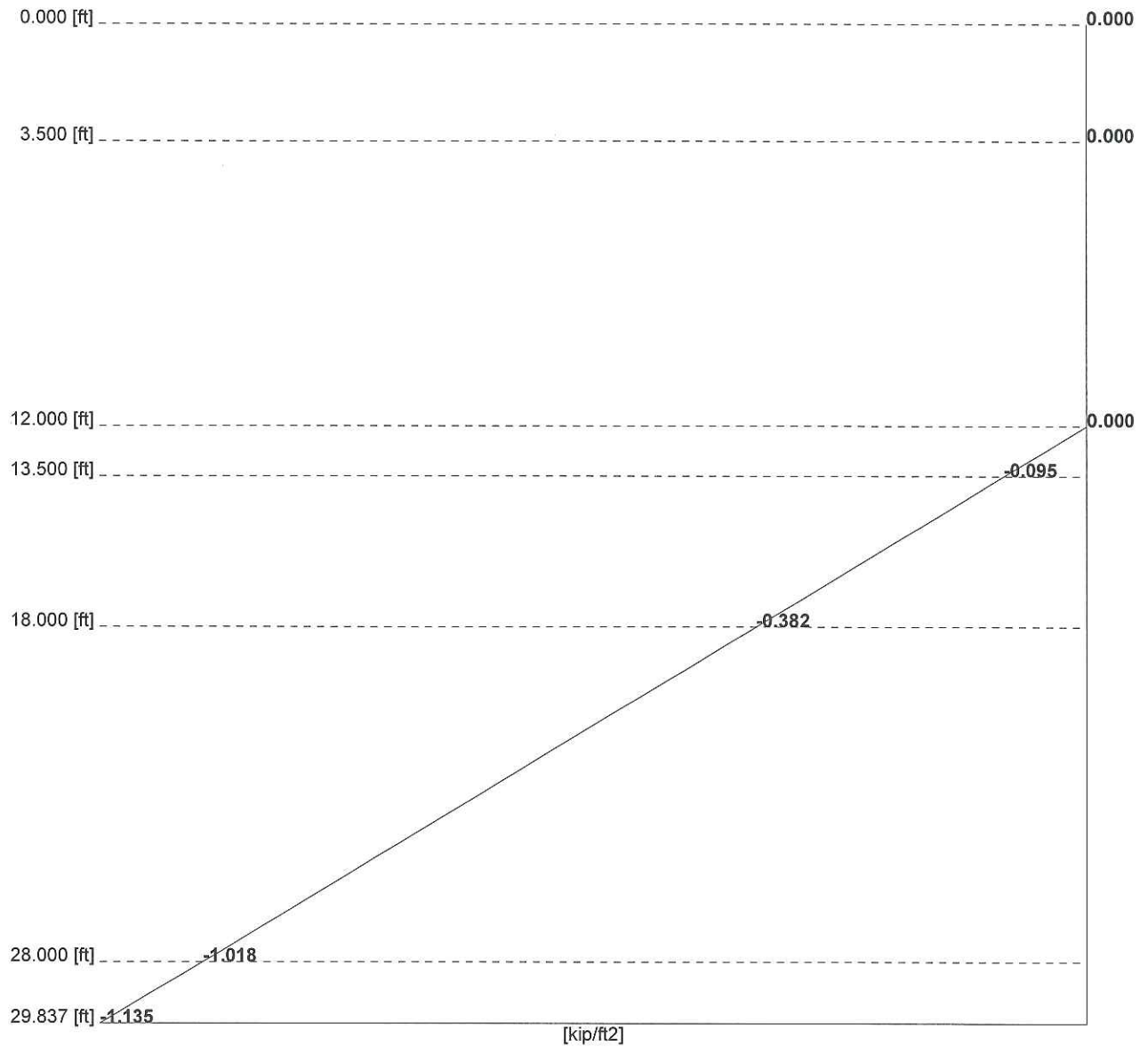
Pile Check

		Depth [ft]
Name	AZ 24-700	
Inertia [in4/ft]	408.757	
Modulus [in3/ft]	45.198	
Area [in2/ft]	8.225	
Mass [lbs/ft2]	27.998	
Steel Grade [lb/in2]	34795.867	
Minimal Moment [kipft/ft]	-0.334	29.870
Maximal Moment [kipft/ft]	26.413	22.101
Normal Forces at Max. Moment [kip/ft]	0.000	29.870
Normal Forces at Min. Moment [kip/ft]	0.000	22.101
Deflection at Min. Moment [ft]	0.000	29.870
Deflection at Max. Moment [ft]	-0.006	22.101
Min. Stress at Min. Moment [lb/in2]	-88.727	29.870
Max. Stress at Min. Moment [lb/in2]	88.727	29.870
Min. Stress at Max. Moment [lb/in2]	-7012.298	22.101
Max. Stress at Max. Moment [lb/in2]	7012.298	22.101
Safety > Req. Safety = 1.500	4.962	
Sheet Pile Top Level [ft]	0.000	
Sheet Pile Tip Level [ft]	30.303	
Sheet Pile Length [ft]	30.303	
Included OverLength [ft]	0.466	
Vertical Equilibrium [kip/ft]	0.000	
Anchor Force (horiz.) [kip/ft]	0.000	

Earth Pressure Diagram

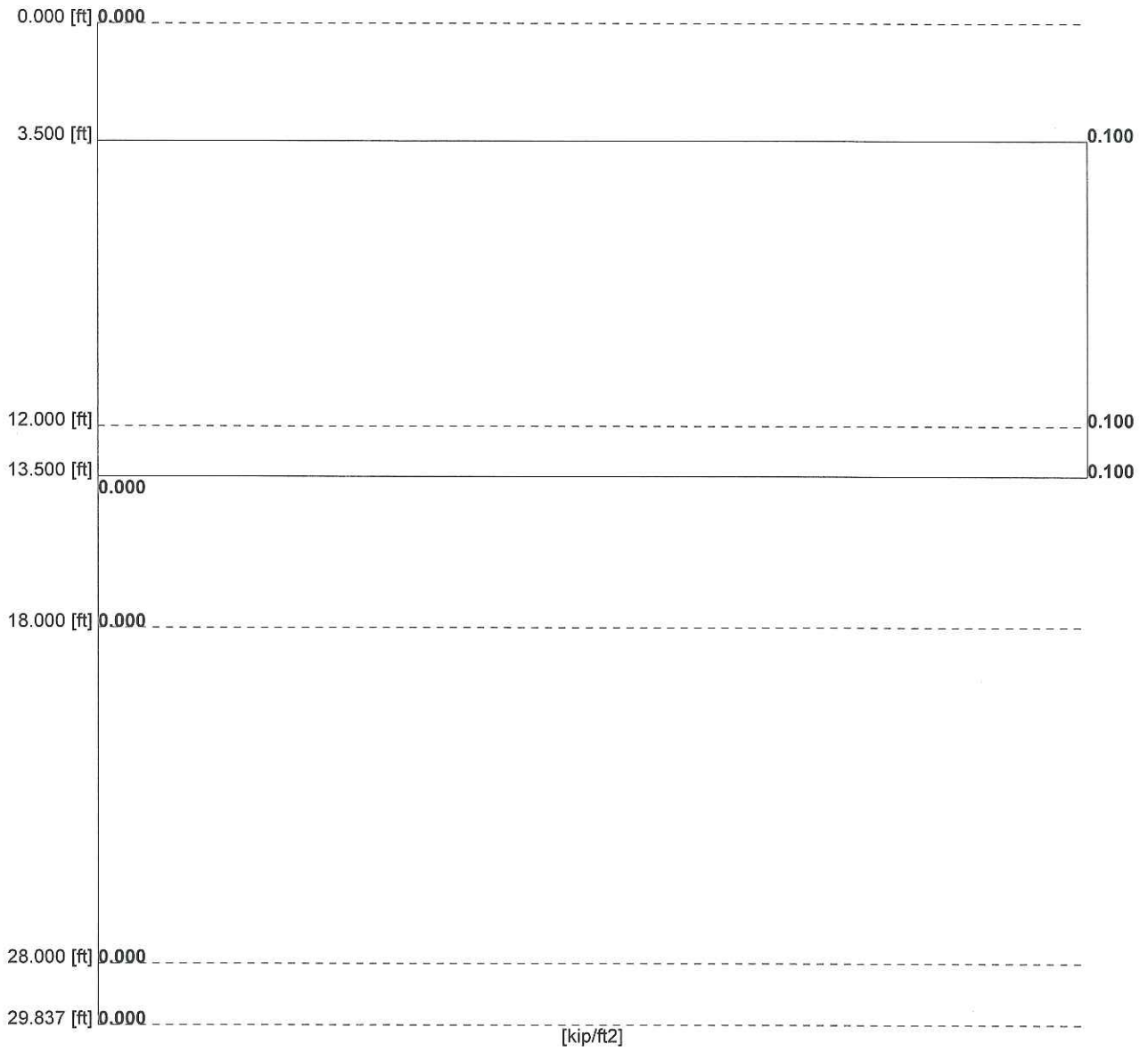


Water Pressure Diagram

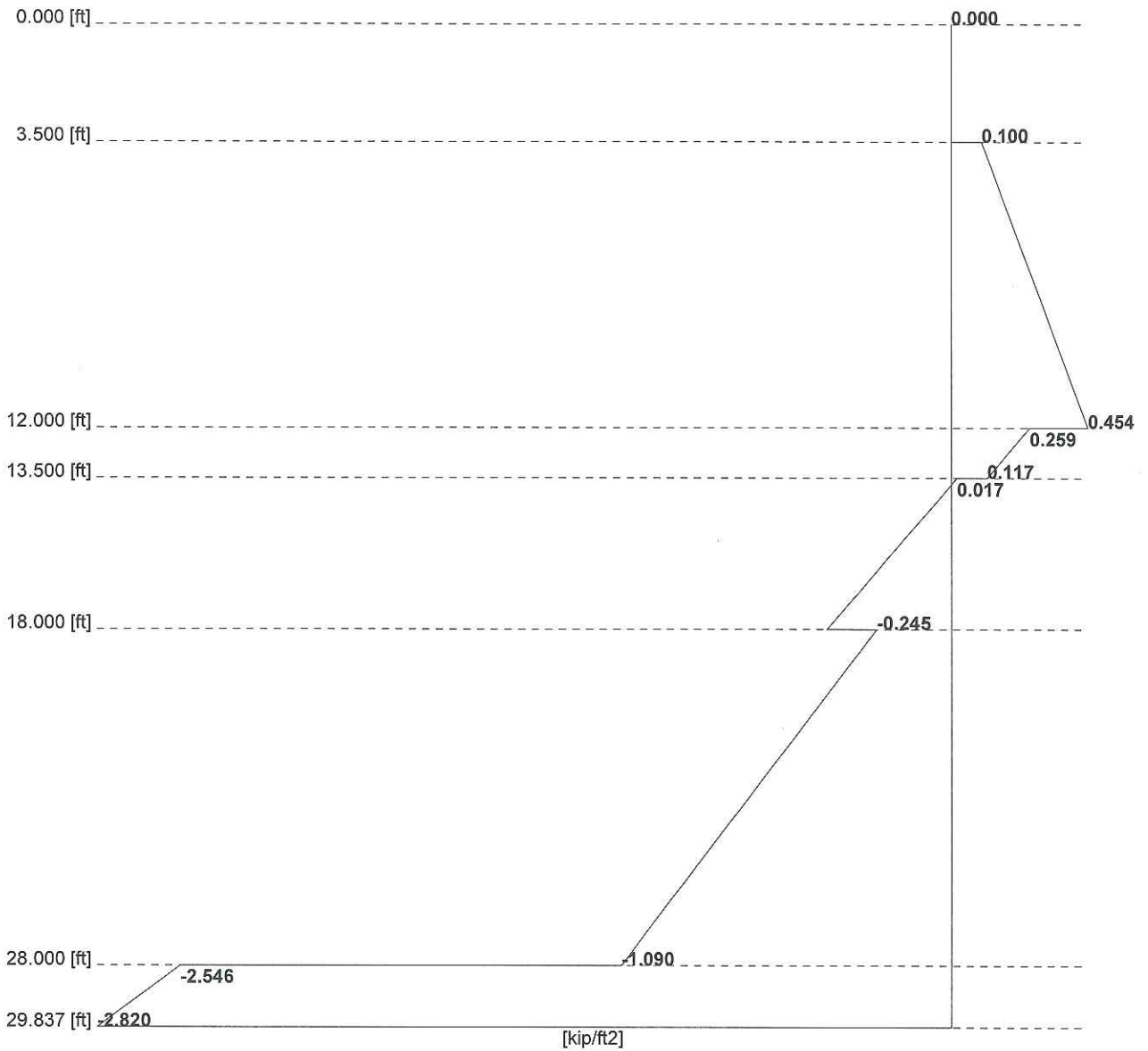


Userdefined Pressure Diagram

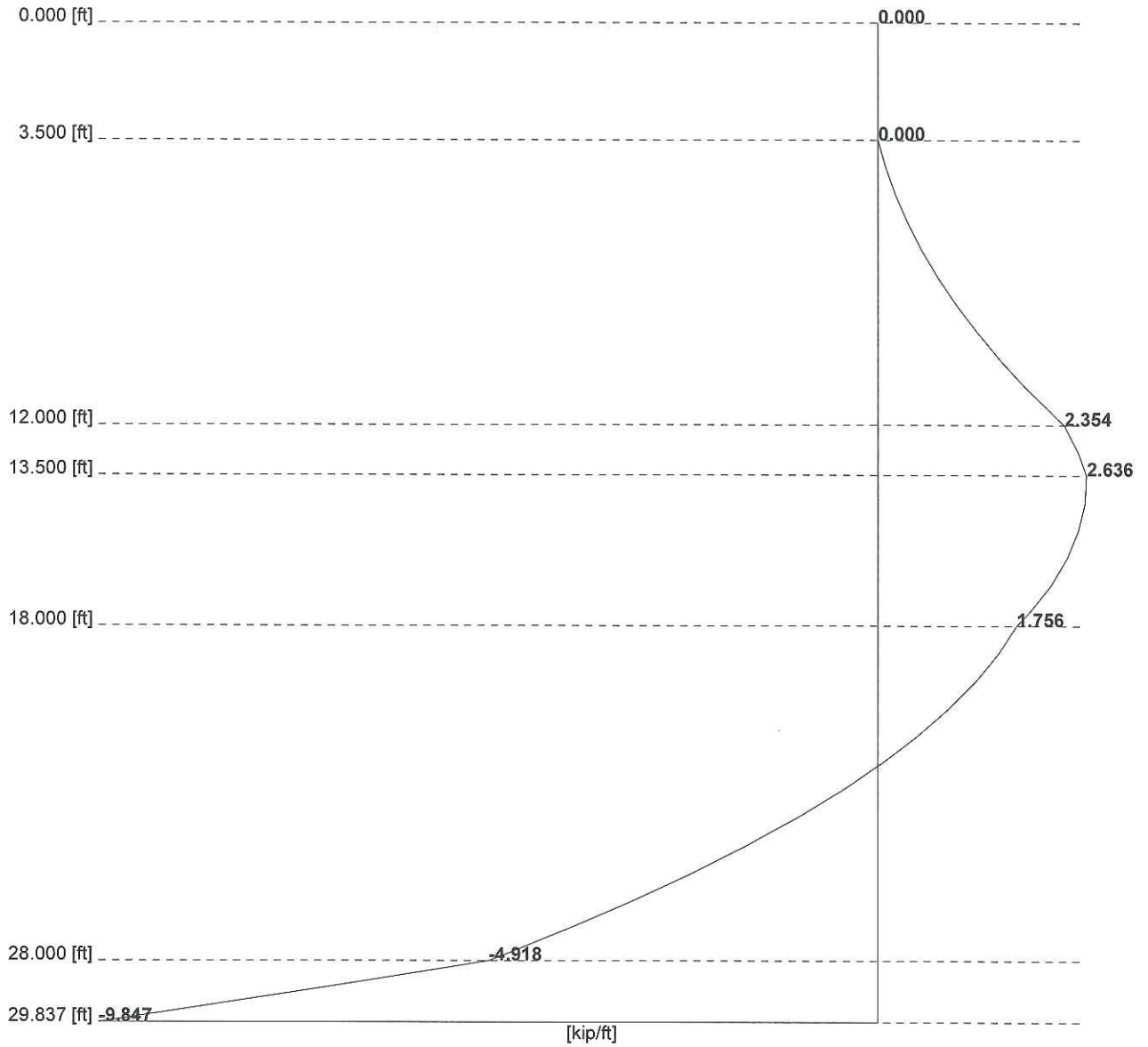
LIVE LOAD PRESSURE OF 100psf TO UPPER 10'



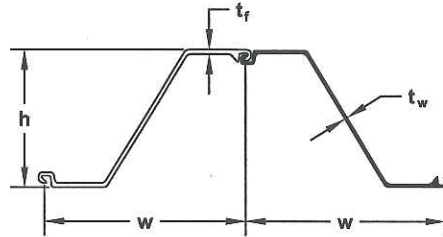
Total Pressure Diagram



Cross Force Diagram

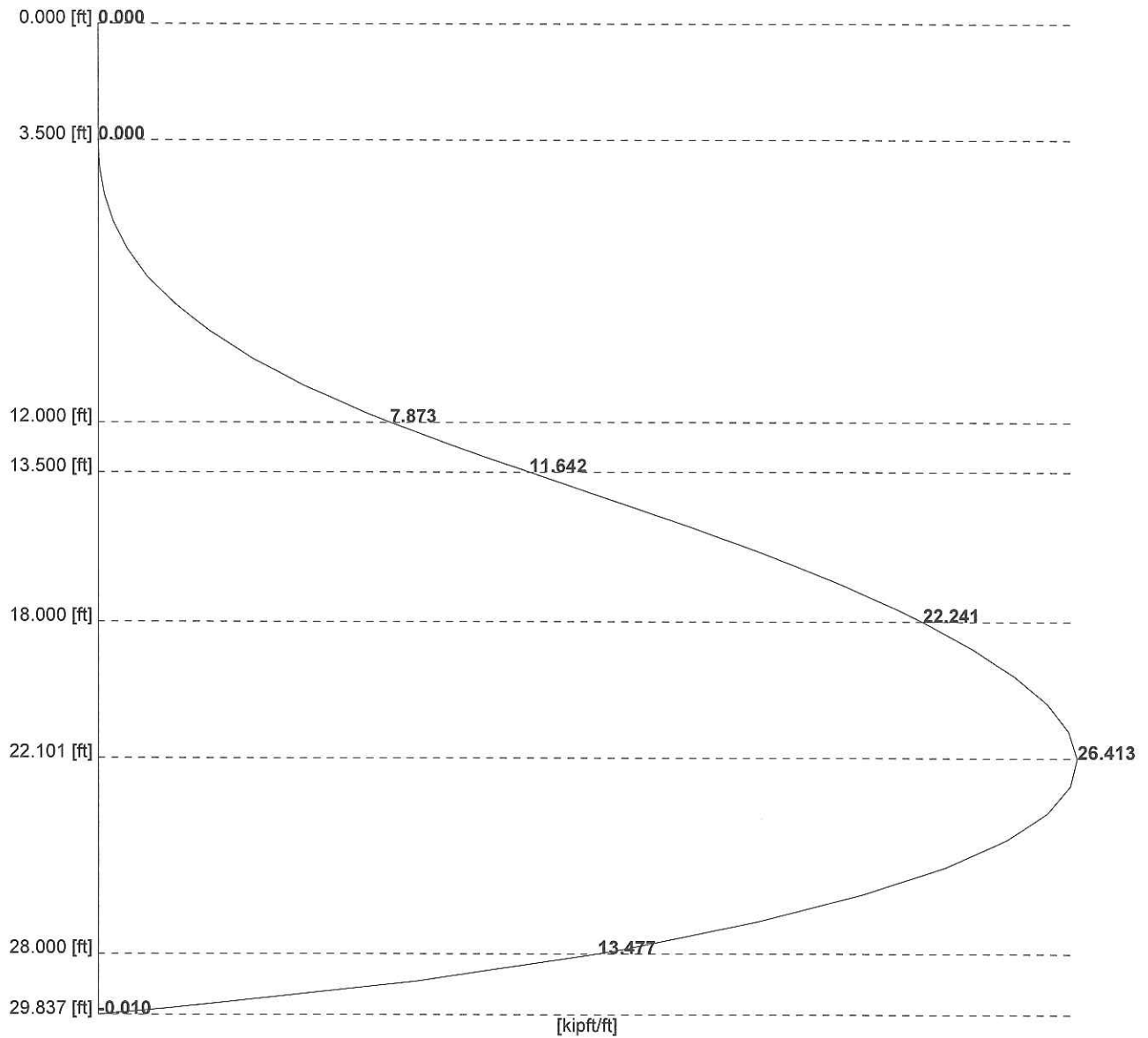


AZ Hot Rolled Steel Sheet Pile



SECTION	Width (w) in (mm)	Height (h) in (mm)	THICKNESS		Cross Sectional Area in ² /ft (cm ² /m)	WEIGHT		SECTION MODULUS		Moment of Inertia in ⁴ /ft (cm ⁴ /m)	COATING AREA	
			Flange (t _f) in (mm)	Web (t _w) in (mm)		Pile lb/ft (kg/m)	Wall lb/ft ² (kg/m ²)	Elastic in ³ /ft (cm ³ /m)	Plastic in ³ /ft (cm ³ /m)		Both Sides ft ² /ft of single (m ² /m)	Wall Surface ft ² /ft ² (m ² /m ²)
AZ 12-770	30.31 770	13.52 343.5	0.335 8.50	0.335 8.50	5.67 120.1	48.78 72.60	19.31 94.30	23.2 1245	27.5 1480	156.9 21430	6.10 1.86	1.20 1.20
AZ 13-770	30.31 770	13.54 344.0	0.354 9.00	0.354 9.00	5.94 125.8	51.14 76.10	20.24 98.80	24.2 1300	28.8 1546	163.7 22360	6.10 1.86	1.20 1.20
AZ 14-770	30.31 770	13.56 344.5	0.375 9.50	0.375 9.50	6.21 131.5	53.42 79.50	21.14 103.20	25.2 1355	30.0 1611	170.6 23300	6.10 1.86	1.20 1.20
AZ 17	24.80 630	14.92 379.0	0.335 8.50	0.335 8.50	6.53 138.3	45.96 68.40	22.24 108.60	31.0 1665	36.2 1944	231.3 31580	5.64 1.72	1.35 1.35
AZ 18	24.80 630	14.96 380.0	0.375 9.50	0.375 9.50	7.11 150.4	49.99 74.40	24.19 118.10	33.5 1800	39.1 2104	250.4 34200	5.64 1.72	1.35 1.35
AZ 19	24.80 630	15.00 381.0	0.413 10.50	0.413 10.50	7.74 163.8	54.43 81.00	26.34 128.60	36.1 1940	42.3 2275	270.8 36980	5.64 1.72	1.35 1.35
AZ 17-700	27.56 700	16.52 419.5	0.335 8.50	0.335 8.50	6.28 133.0	49.12 73.10	21.38 104.40	32.2 1730	37.7 2027	265.3 36230	6.10 1.86	1.33 1.33
AZ 18-700	27.56 700	16.54 420.0	0.354 9.00	0.354 9.00	6.58 139.2	51.41 76.50	22.39 109.30	33.5 1800	39.4 2116	276.8 37800	6.10 1.86	1.33 1.33
AZ 19-700	27.56 700	16.56 420.5	0.375 9.50	0.375 9.50	6.88 145.6	53.76 80.00	23.41 114.30	34.8 1870	41.0 2206	288.4 39380	6.10 1.86	1.33 1.33
AZ 25	24.80 630	16.77 426.0	0.472 12.00	0.441 11.20	8.74 185.0	61.49 91.50	29.74 145.20	45.7 2455	53.4 2873	382.6 52250	5.91 1.80	1.41 1.41
AZ 26	24.80 630	16.81 427.0	0.512 13.00	0.480 12.20	9.35 198.0	65.72 97.80	31.79 155.20	48.4 2600	56.9 3059	406.5 55510	5.91 1.80	1.41 1.41
AZ 28	24.80 630	16.85 428.0	0.551 14.00	0.520 13.20	9.97 211.1	70.15 104.40	33.94 165.70	51.2 2755	60.5 3252	431.6 58940	5.91 1.80	1.41 1.41
AZ 24-700	27.56 700	18.07 459.0	0.441 11.20	0.441 11.20	8.23 174.1	64.30 95.70	28.00 136.70	45.2 2430	53.5 2867	408.8 55820	6.33 1.93	1.38 1.38
AZ 26-700	27.56 700	18.11 460.0	0.480 12.20	0.480 12.20	8.84 187.2	69.12 102.90	30.10 146.90	48.4 2600	57.1 3070	437.3 59720	6.33 1.93	1.38 1.38
AZ 28-700	27.56 700	18.15 461.0	0.520 13.20	0.520 13.20	9.46 200.2	73.93 110.00	32.19 157.20	51.3 2760	60.9 3273	465.9 63520	6.33 1.93	1.38 1.38
AZ 36-700N	27.56 700	19.65 499.0	0.591 15.00	0.441 11.20	10.20 216.0	79.70 118.50	34.61 169.00	66.8 3590	76.5 4110	656.2 89610	6.76 2.06	1.46 1.47
AZ 38-700N	27.56 700	19.69 500.0	0.630 16.00	0.480 12.20	10.87 230.0	84.94 126.40	37.07 181.00	70.6 3795	81.1 4360	694.5 94840	6.76 2.06	1.46 1.47
AZ 40-700N	27.56 700	19.72 501.0	0.669 17.00	0.520 13.20	11.53 244.0	90.18 134.20	39.32 192.00	74.3 3995	85.7 4605	732.9 100080	6.76 2.06	1.46 1.46
AZ 42-700N	27.56 700	19.65 499.0	0.709 18.00	0.551 14.00	12.22 259.0	95.49 142.1	41.57 203.00	78.2 4205	90.3 4855	766.0 104930	6.76 2.06	1.47 1.47
AZ 44-700N	27.56 700	19.69 500.0	0.748 19.00	0.591 15.00	12.89 273.0	100.73 149.9	43.83 214.00	81.9 4405	94.9 5105	804.1 110150	6.76 2.06	1.47 1.47
AZ 46-700N	27.56 700	19.72 501.0	0.787 20.00	0.630 16.00	13.55 287.0	105.97 157.7	46.08 225.00	85.7 4605	99.5 5350	842.2 115370	6.76 2.06	1.47 1.47
AZ 46	22.83 580	18.94 481.0	0.709 18.00	0.551 14.00	13.76 291.2	89.10 132.60	46.82 228.60	85.5 4595	98.5 5295	808.8 110450	6.23 1.90	1.63 1.63
AZ 48	22.83 580	18.98 482.0	0.748 19.00	0.591 15.00	14.48 306.5	93.81 139.60	49.28 240.60	89.3 4800	103.3 5553	847.1 115670	6.23 1.90	1.63 1.63
AZ 50	22.83 580	19.02 483.0	0.787 20.00	0.630 16.00	15.22 322.2	98.58 146.70	51.80 252.9	93.3 5015	108.2 5816	886.5 121060	6.23 1.90	1.63 1.63

Moment Diagram



$$f_a = \frac{M}{S} = \frac{26.413 \times 12}{45.2} = 7 \text{ ksi}$$

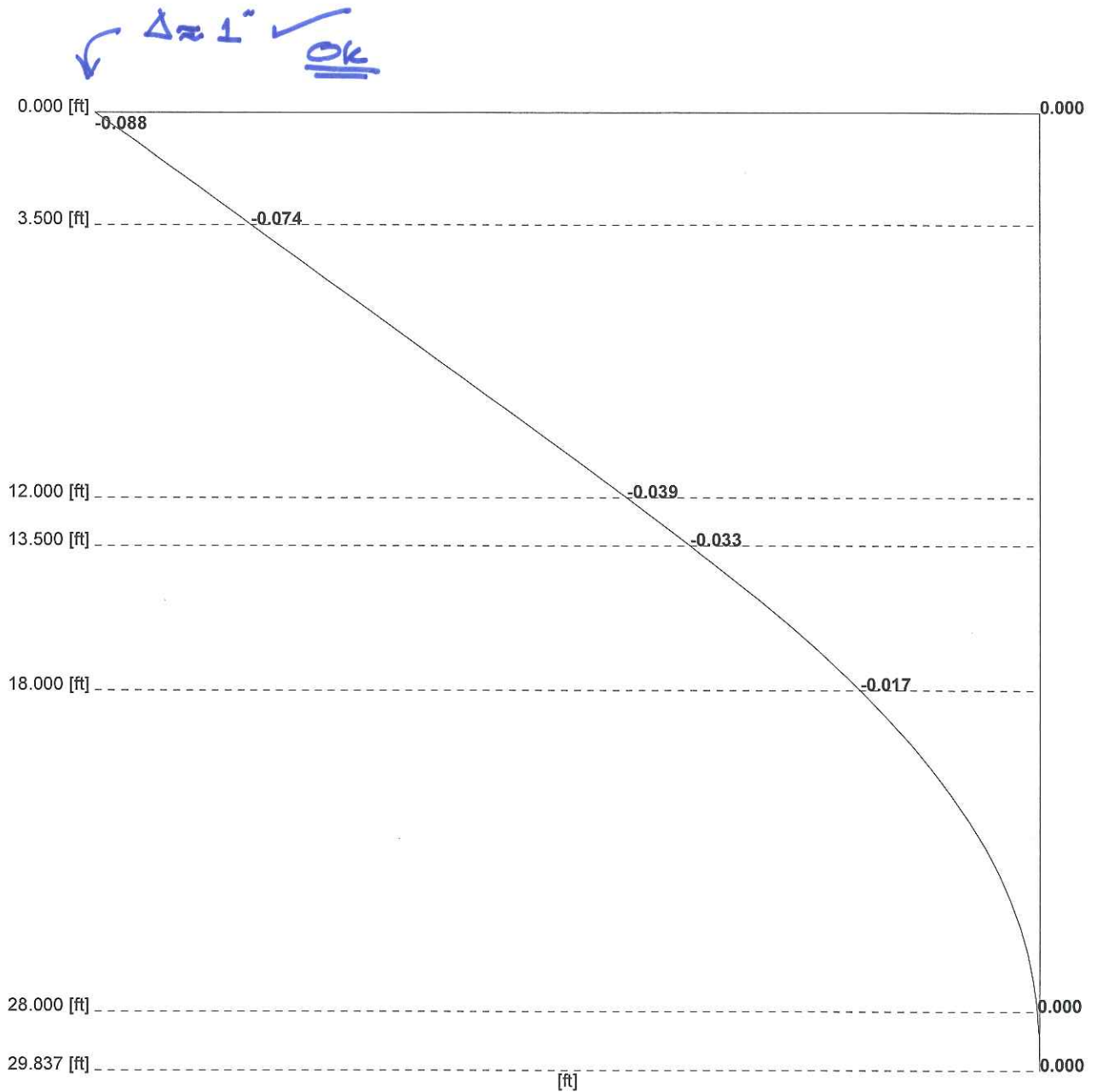
$$f_{allow} = 35 \text{ ksi}$$

$$FOS = \frac{35}{7} = 5.0 \gg 1.0$$

OK

(DEFLECTION CONTROLS)

Deflection Diagram



PILE TIP REQ'D $\approx 20.2 - 29.834' = -9.7'$ ←
@ STA 66+00

SEEPAGE
CONTROLS
PILE TIP
 $\approx -15.0'$

Sheet Pile Design According to Blum-Method

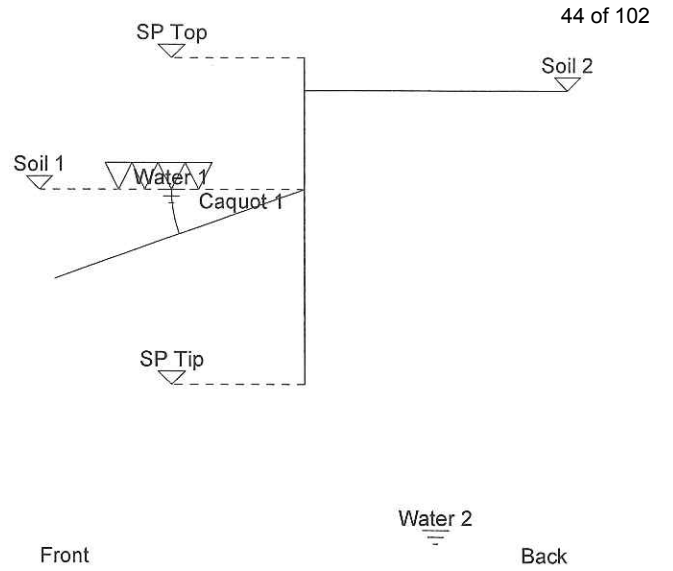
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Project Name: SAC - RA Sheet Piling Design
Date: 11/14/2012
Author: SP
Company:
Comment: Case 2: Clayey Native Material

$$H_T = 14'$$

Geodata

	Unit
Sheet Pile Top Level [ft]	0.000
Sheet Pile Tip Level [ft]	34.616
Soil Level in Front [ft]	14.000
Soil Level behind [ft]	3.500
Anchorlevel [ft]	0.000
Water Level in Front [ft]	14.000
Water Level behind [ft]	50.000
Soil Surface Inclination in Front [Deg]	-19.500
Soil Surface Inclination behind [Deg]	0.000
Caquot Surcharge in Front [kip/ft2]	0.180
Caquot Surcharge behind [kip/ft2]	0.000
Anchor Inclination [Deg]	0.000
Earth Support	Cantilever



Soil Layers

Layers in Front

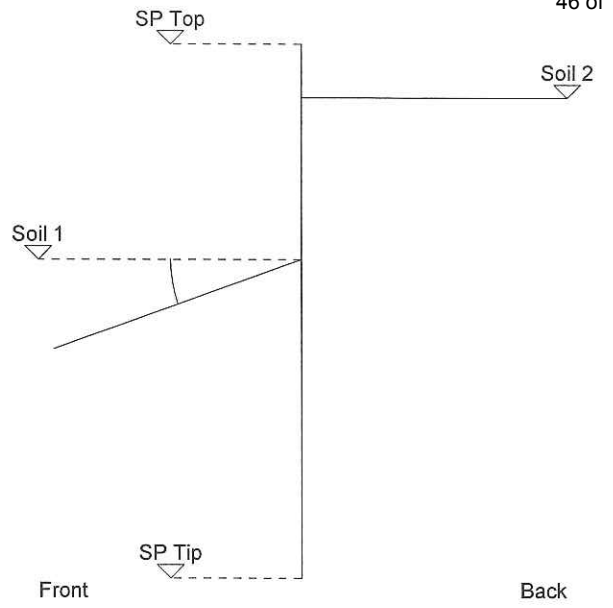
	Layer Tip [ft]	Density Moist [kip/ft3]	Density Submerged [kip/ft3]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft2]
Layer 1	18.000	0.125	0.067	1.082	21.100	0.000	0.000
Layer 2	28.000	0.107	0.067	0.889	19.500	0.000	0.000
Layer 3	80.000	0.127	0.070	1.221	23.400	0.000	0.000

Layers behind

	Layer Tip [ft]	Density Moist [kip/ft3]	Density Submerged [kip/ft3]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft2]
Layer 1	3.500	0.125	0.067	0.333	30.000	0.000	0.000
Layer 2	16.000	0.125	0.067	0.333	30.000	0.000	0.000
Layer 3	18.000	0.125	0.067	0.333	30.000	0.000	0.000
Layer 4	28.000	0.107	0.067	0.361	28.000	0.000	0.000
Layer 5	80.000	0.127	0.070	0.000	33.000	0.000	0.000

Boussinesq

	Distance Wall [ft]	Width Surcharge [ft]	Depth Surcharge [ft]	Surcharge [kip/ft ²]



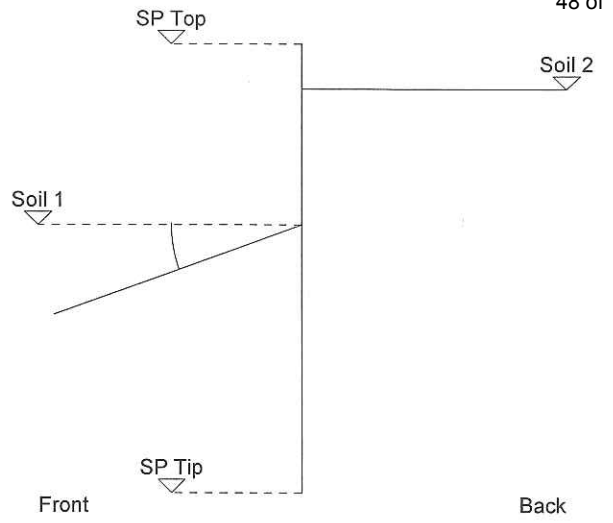
Userdefined Pressures

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	Pressure Top [kip/ft ²]	Pressure Tip [kip/ft ²]	Depth Top [ft]	Depth Tip [ft]
Strip 1	0.100	0.100	3.500	13.500

Concentrated Forces

	Horiz. Component [kip/ft]	Vert. Component [kip/ft]	Depth Horiz. Comp. [ft]



Pile Section

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Name	AZ 24-700
Inertia [in4/ft]	408.757
Modulus [in3/ft]	45.198
Area [in2/ft]	8.225
Mass [lbs/ft2]	27.998
Steel Grade [lb/in2]	34795.867
Requested Safety	1.500

All Values

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Depth [ft]	Deflection [ft]	Rotation [Rad]	Cross Force [kip/ft]	Moment [kipft/ft]	Total Pressure [kip/ft2]	Earth Pressure in Front [kip/ft2]	behind [kip/ft2]	Water Pressure [kip/ft2]	Userdefined Pressure [kip/ft2]
0.000	-0.207	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.820	-0.200	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.820	-0.200	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.640	-0.193	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.640	-0.193	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.461	-0.186	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.461	-0.186	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.281	-0.179	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.281	-0.179	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.500	-0.177	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.500	-0.177	-0.008	0.000	0.000	0.100	0.000	0.000	0.000	0.100
4.320	-0.170	-0.008	0.096	0.037	0.134	0.000	0.034	0.000	0.100
4.320	-0.170	-0.008	0.096	0.037	0.134	0.000	0.034	0.000	0.100
5.140	-0.164	-0.008	0.220	0.165	0.168	0.000	0.068	0.000	0.100
5.140	-0.164	-0.008	0.220	0.165	0.168	0.000	0.068	0.000	0.100
5.961	-0.157	-0.008	0.372	0.406	0.202	0.000	0.102	0.000	0.100
5.961	-0.157	-0.008	0.372	0.406	0.202	0.000	0.102	0.000	0.100
6.781	-0.150	-0.008	0.552	0.783	0.237	0.000	0.137	0.000	0.100
6.781	-0.150	-0.008	0.552	0.783	0.237	0.000	0.137	0.000	0.100
7.601	-0.143	-0.008	0.760	1.319	0.271	0.000	0.171	0.000	0.100
7.601	-0.143	-0.008	0.760	1.319	0.271	0.000	0.171	0.000	0.100
8.421	-0.136	-0.008	0.996	2.038	0.305	0.000	0.205	0.000	0.100
8.421	-0.136	-0.008	0.996	2.038	0.305	0.000	0.205	0.000	0.100
9.242	-0.129	-0.008	1.260	2.961	0.339	0.000	0.239	0.000	0.100
9.242	-0.129	-0.008	1.260	2.961	0.339	0.000	0.239	0.000	0.100
10.062	-0.122	-0.008	1.552	4.113	0.373	0.000	0.273	0.000	0.100
10.062	-0.122	-0.008	1.552	4.113	0.373	0.000	0.273	0.000	0.100
10.882	-0.115	-0.008	1.872	5.515	0.407	0.000	0.307	0.000	0.100
10.882	-0.115	-0.008	1.872	5.515	0.407	0.000	0.307	0.000	0.100
11.702	-0.108	-0.008	2.220	7.192	0.441	0.000	0.341	0.000	0.100
11.702	-0.108	-0.008	2.220	7.192	0.441	0.000	0.341	0.000	0.100
12.522	-0.102	-0.008	2.596	9.165	0.476	0.000	0.376	0.000	0.100
12.522	-0.102	-0.008	2.596	9.165	0.476	0.000	0.376	0.000	0.100
13.343	-0.095	-0.008	3.000	11.459	0.510	0.000	0.410	0.000	0.100
13.343	-0.095	-0.008	3.000	11.459	0.510	0.000	0.410	0.000	0.100
13.500	-0.094	-0.008	3.081	11.937	0.516	0.000	0.416	0.000	0.100
13.500	-0.094	-0.008	3.081	11.937	0.516	0.000	0.416	0.000	0.000
14.000	-0.090	-0.008	3.295	13.531	0.437	0.000	0.437	0.000	0.000
14.000	-0.090	-0.008	3.295	13.531	0.242	-0.195	0.437	0.000	0.000
14.820	-0.083	-0.008	3.461	16.306	0.165	-0.254	0.471	-0.052	0.000
14.820	-0.083	-0.008	3.461	16.306	0.165	-0.254	0.471	-0.052	0.000
15.640	-0.077	-0.008	3.565	19.192	0.087	-0.314	0.505	-0.104	0.000
15.640	-0.077	-0.008	3.565	19.192	0.087	-0.314	0.505	-0.104	0.000
16.000	-0.074	-0.008	3.590	20.478	0.053	-0.340	0.520	-0.127	0.000
16.000	-0.074	-0.008	3.590	20.478	0.053	-0.340	0.520	-0.127	0.000
16.820	-0.067	-0.007	3.602	23.432	-0.024	-0.399	0.554	-0.179	0.000
16.820	-0.067	-0.007	3.602	23.432	-0.024	-0.399	0.554	-0.179	0.000
17.640	-0.061	-0.007	3.550	26.369	-0.102	-0.459	0.589	-0.232	0.000
17.640	-0.061	-0.007	3.550	26.369	-0.102	-0.459	0.589	-0.232	0.000
18.000	-0.059	-0.007	3.507	27.638	-0.136	-0.485	0.604	-0.255	0.000
18.000	-0.059	-0.007	3.507	27.638	0.002	-0.398	0.654	-0.255	0.000
18.820	-0.053	-0.007	3.480	30.508	-0.068	-0.447	0.686	-0.307	0.000
18.820	-0.053	-0.007	3.480	30.508	-0.068	-0.447	0.686	-0.307	0.000
19.640	-0.047	-0.006	3.396	33.332	-0.137	-0.496	0.718	-0.359	0.000
19.640	-0.047	-0.006	3.396	33.332	-0.137	-0.496	0.718	-0.359	0.000
20.461	-0.042	-0.006	3.255	36.063	-0.206	-0.545	0.749	-0.411	0.000
20.461	-0.042	-0.006	3.255	36.063	-0.206	-0.545	0.749	-0.411	0.000
21.281	-0.037	-0.006	3.058	38.656	-0.276	-0.593	0.781	-0.463	0.000
21.281	-0.037	-0.006	3.058	38.656	-0.276	-0.593	0.781	-0.463	0.000
22.101	-0.032	-0.005	2.803	41.064	-0.345	-0.642	0.813	-0.516	0.000
22.101	-0.032	-0.005	2.803	41.064	-0.345	-0.642	0.813	-0.516	0.000
22.921	-0.027	-0.005	2.492	43.239	-0.414	-0.691	0.844	-0.568	0.000
22.921	-0.027	-0.005	2.492	43.239	-0.414	-0.691	0.844	-0.568	0.000
23.742	-0.023	-0.005	2.123	45.136	-0.484	-0.740	0.876	-0.620	0.000

Depth [ft]	Deflection [ft]	Rotation [Rad]	Cross Force [kip/ft]	Moment [kipft/ft]	Total Pressure [kip/ft ²]	Earth Pressure in Front [kip/ft ²]	behind [kip/ft ²]	Water Pressure [kip/ft ²]	Userdefined Pressure [kip/ft ²]
23.742	-0.023	-0.005	2.123	45.136	-0.484	-0.740	0.876	-0.620	0.000
24.562	-0.019	-0.004	1.698	46.707	-0.553	-0.789	0.908	-0.672	0.000
24.562	-0.019	-0.004	1.698	46.707	-0.553	-0.789	0.908	-0.672	0.000
25.382	-0.015	-0.004	1.216	47.906	-0.622	-0.838	0.939	-0.724	0.000
25.382	-0.015	-0.004	1.216	47.906	-0.622	-0.838	0.939	-0.724	0.000
26.202	-0.012	-0.003	0.677	48.686	-0.692	-0.886	0.971	-0.777	0.000
26.202	-0.012	-0.003	0.677	48.686	-0.692	-0.886	0.971	-0.777	0.000
27.022	-0.009	-0.003	0.081	49.001	-0.761	-0.935	1.003	-0.829	0.000
27.022	-0.009	-0.003	0.081	49.001	-0.761	-0.935	1.003	-0.829	0.000
27.843	-0.007	-0.002	-0.571	48.804	-0.830	-0.984	1.034	-0.881	0.000
27.843	-0.007	-0.002	-0.571	48.804	-0.830	-0.984	1.034	-0.881	0.000
28.000	-0.007	-0.002	-0.703	48.704	-0.844	-0.993	1.041	-0.891	0.000
28.000	-0.007	-0.002	-0.703	48.704	-2.255	-1.365	0.000	-0.891	0.000
28.820	-0.005	-0.002	-2.603	47.355	-2.378	-1.435	0.000	-0.943	0.000
28.820	-0.005	-0.002	-2.603	47.355	-2.378	-1.435	0.000	-0.943	0.000
29.640	-0.003	-0.001	-4.604	44.406	-2.500	-1.505	0.000	-0.995	0.000
29.640	-0.003	-0.001	-4.604	44.406	-2.500	-1.505	0.000	-0.995	0.000
30.461	-0.002	-0.001	-6.704	39.776	-2.622	-1.575	0.000	-1.047	0.000
30.461	-0.002	-0.001	-6.704	39.776	-2.622	-1.575	0.000	-1.047	0.000
31.281	-0.001	-0.001	-8.905	33.381	-2.745	-1.645	0.000	-1.100	0.000
31.281	-0.001	-0.001	-8.905	33.381	-2.745	-1.645	0.000	-1.100	0.000
32.101	0.000	0.000	-11.206	25.140	-2.867	-1.715	0.000	-1.152	0.000
32.101	0.000	0.000	-11.206	25.140	-2.867	-1.715	0.000	-1.152	0.000
32.921	0.000	0.000	-13.608	14.970	-2.989	-1.785	0.000	-1.204	0.000
32.921	0.000	0.000	-13.608	14.970	-2.989	-1.785	0.000	-1.204	0.000
33.742	0.000	0.000	-16.110	2.790	-3.111	-1.855	0.000	-1.256	0.000
33.742	0.000	0.000	-16.110	2.790	-3.111	-1.855	0.000	-1.256	0.000
33.938	0.000	0.000	-16.725	-0.442	-3.141	-1.872	0.000	-1.269	0.000

Extremal Values

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	z Min [ft]	Min	z Max [ft]	Max
Deflection [ft]	0.000	-0.207	33.938	0.000
Cross Force [kip/ft]	33.938	-16.725	16.820	3.602
Moment [kipft/ft]	33.971	-0.992	27.022	49.001

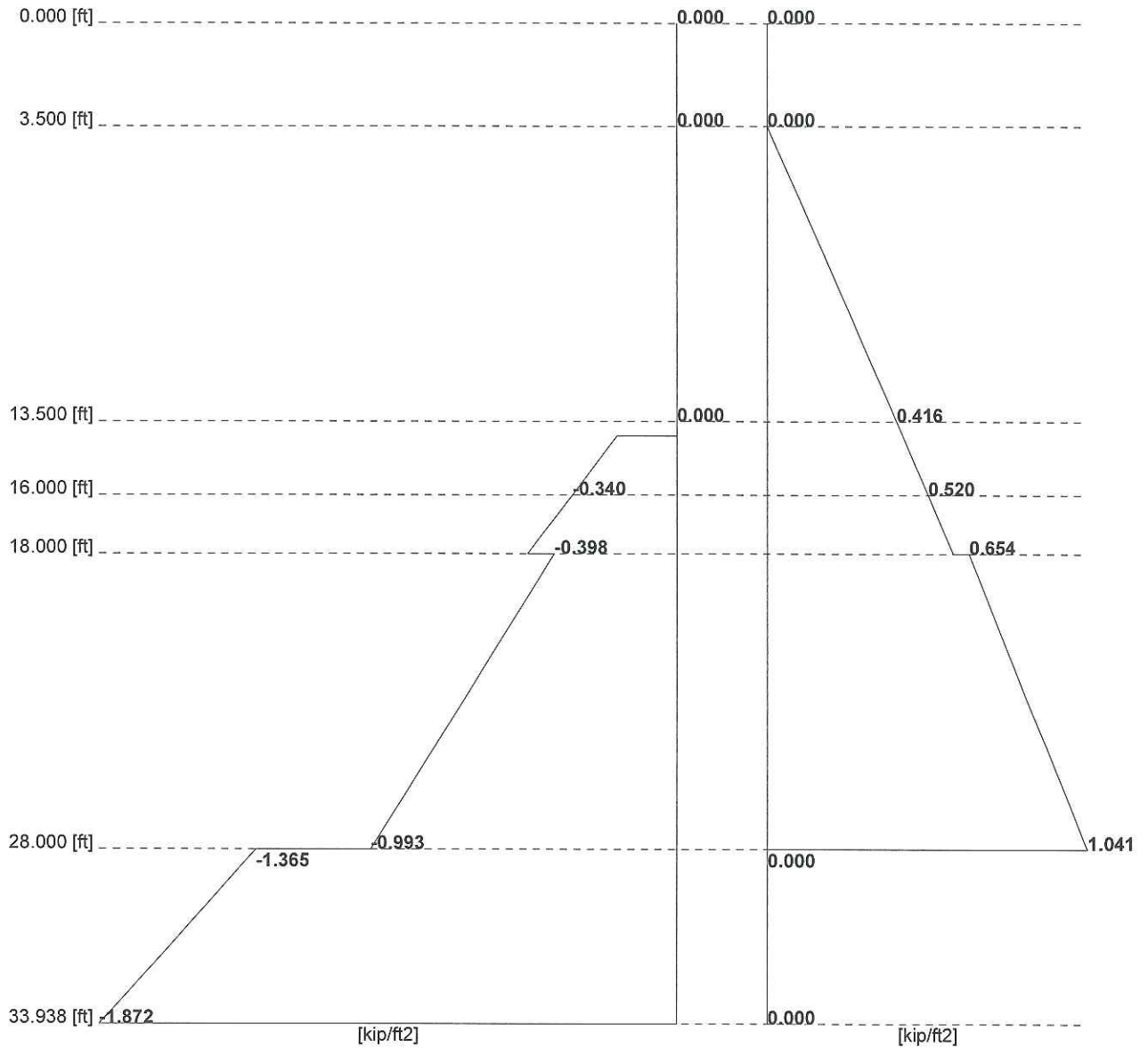
Pile Check

		Depth [ft]
Name	AZ 24-700	
Inertia [in4/ft]	408.757	
Modulus [in3/ft]	45.198	
Area [in2/ft]	8.225	
Mass [lbs/ft2]	27.998	
Steel Grade [lb/in2]	34795.867	
Minimal Moment [kipft/ft]	-0.992	33.971
Maximal Moment [kipft/ft]	49.001	27.022
Normal Forces at Max. Moment [kip/ft]	0.000	33.971
Normal Forces at Min. Moment [kip/ft]	0.000	27.022
Deflection at Min. Moment [ft]	0.000	33.971
Deflection at Max. Moment [ft]	-0.009	27.022
Min. Stress at Min. Moment [lb/in2]	-263.468	33.971
Max. Stress at Min. Moment [lb/in2]	263.468	33.971
Min. Stress at Max. Moment [lb/in2]	-13009.252	27.022
Max. Stress at Max. Moment [lb/in2]	13009.252	27.022
Safety > Req. Safety = 1.500	2.675	
Sheet Pile Top Level [ft]	0.000	
Sheet Pile Tip Level [ft]	34.616	
Sheet Pile Length [ft]	34.616	
Included OverLength [ft]	0.678	
Vertical Equilibrium [kip/ft]	0.000	
Anchor Force (horiz.) [kip/ft]	0.000	

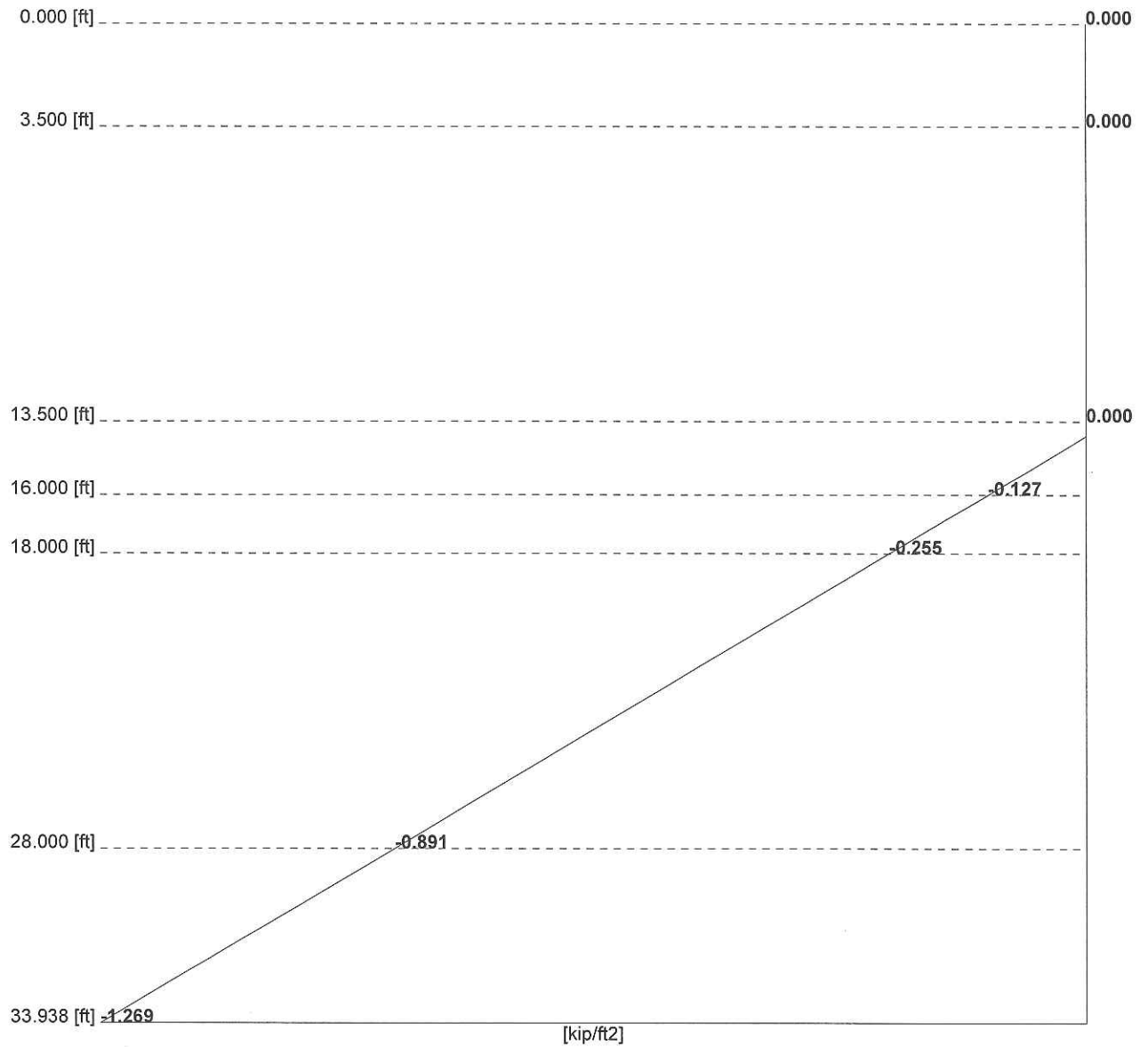


✓
OK

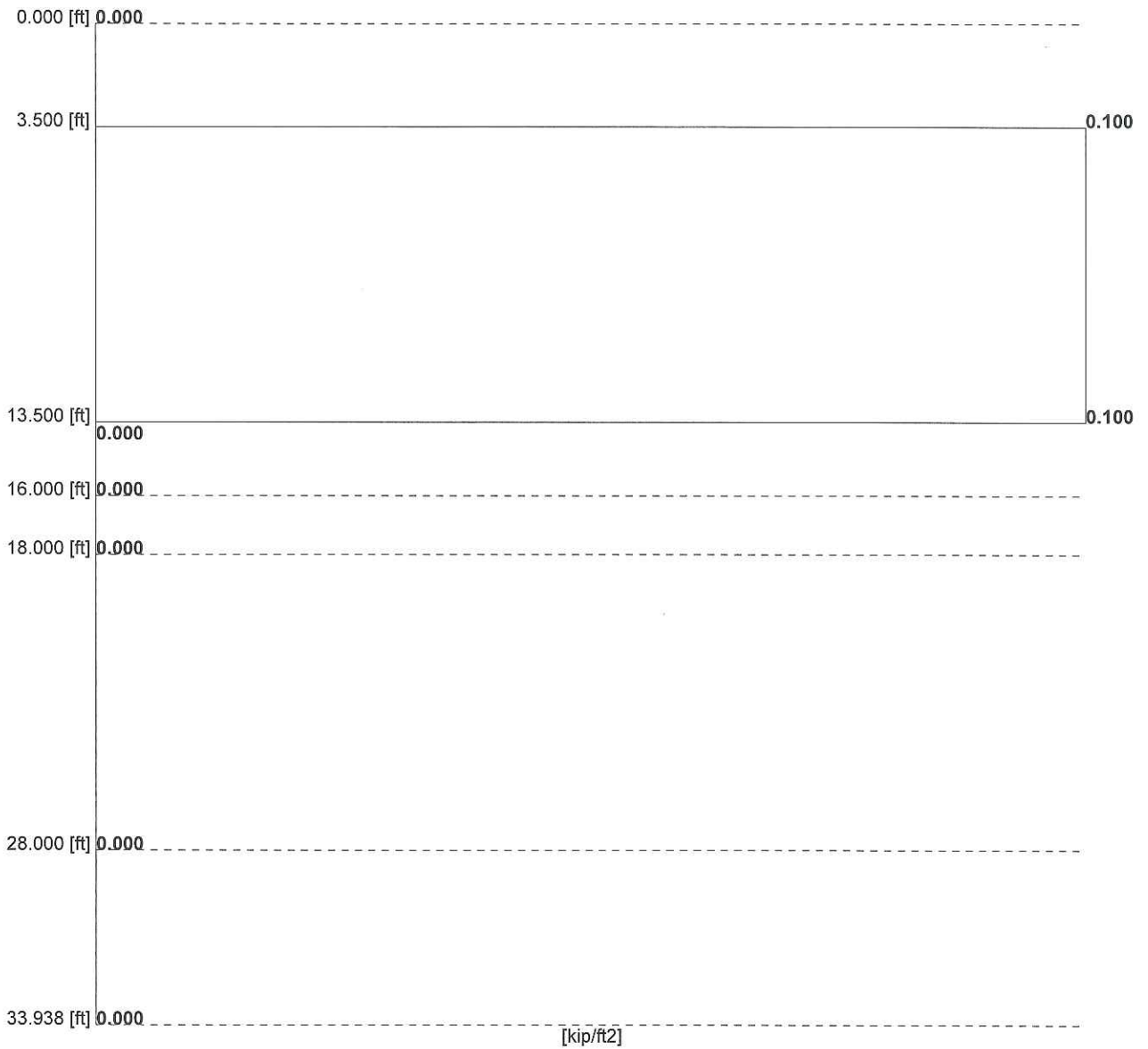
Earth Pressure Diagram



Water Pressure Diagram

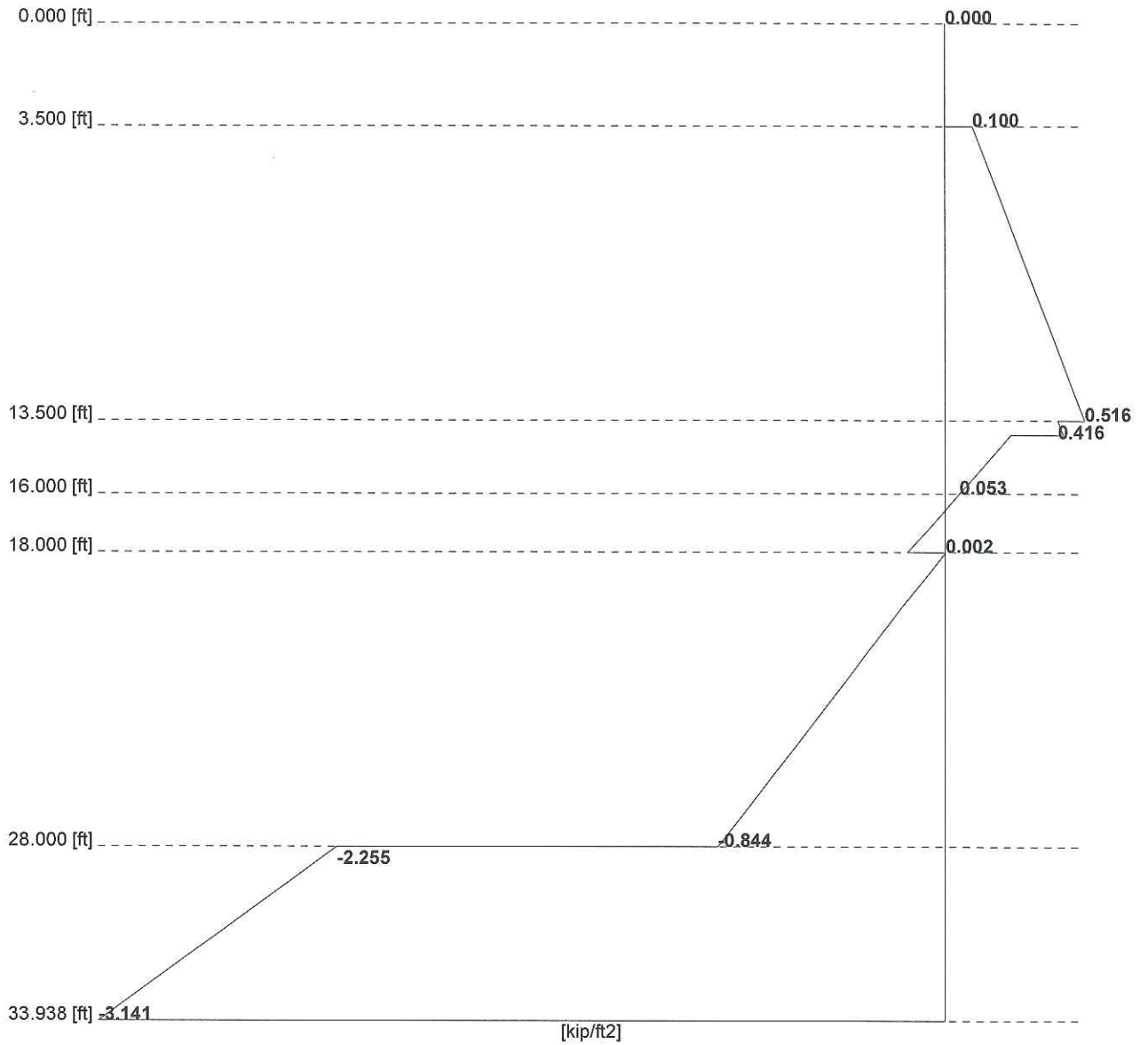


Userdefined Pressure Diagram

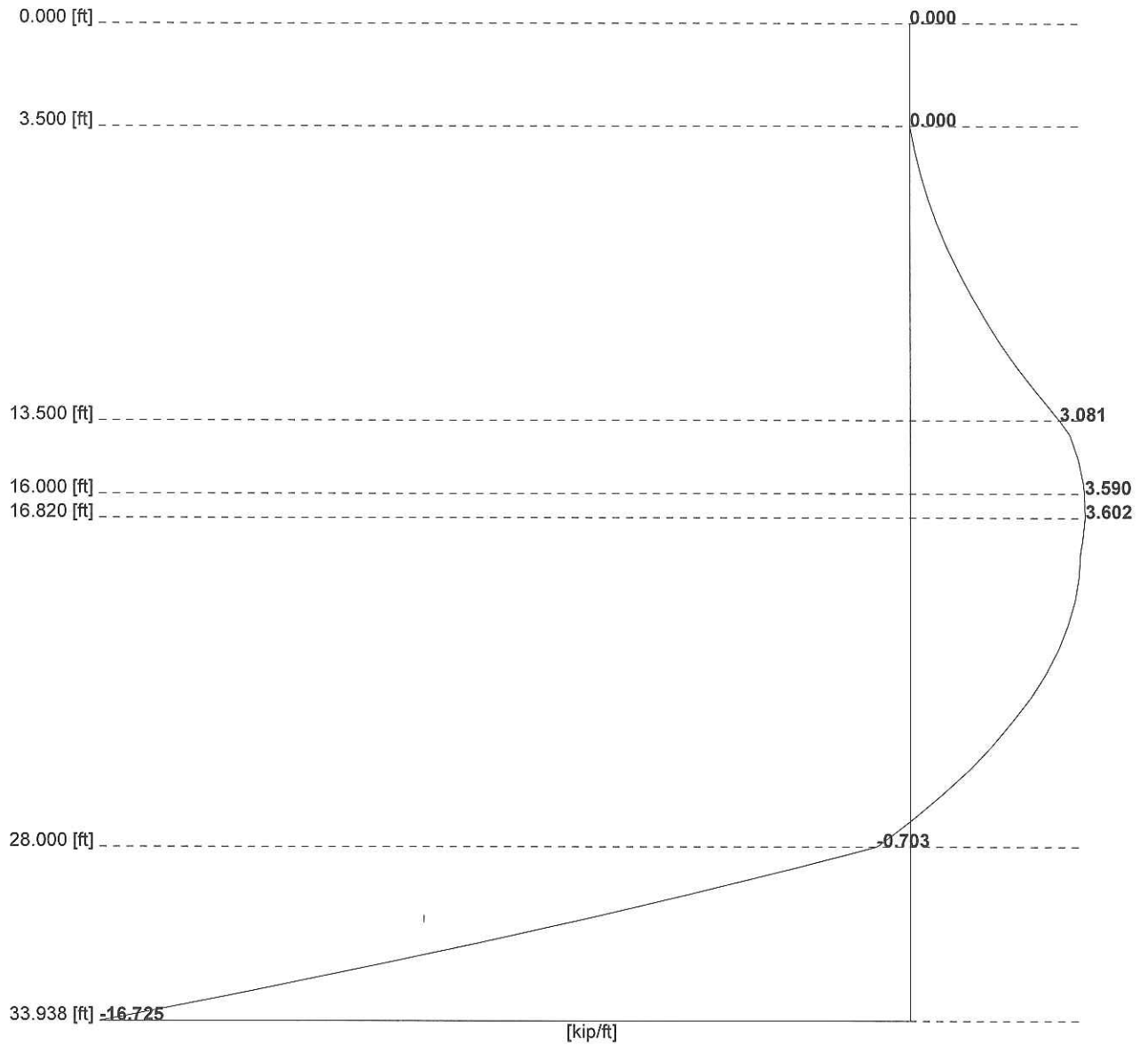


Boussinesq Diagram

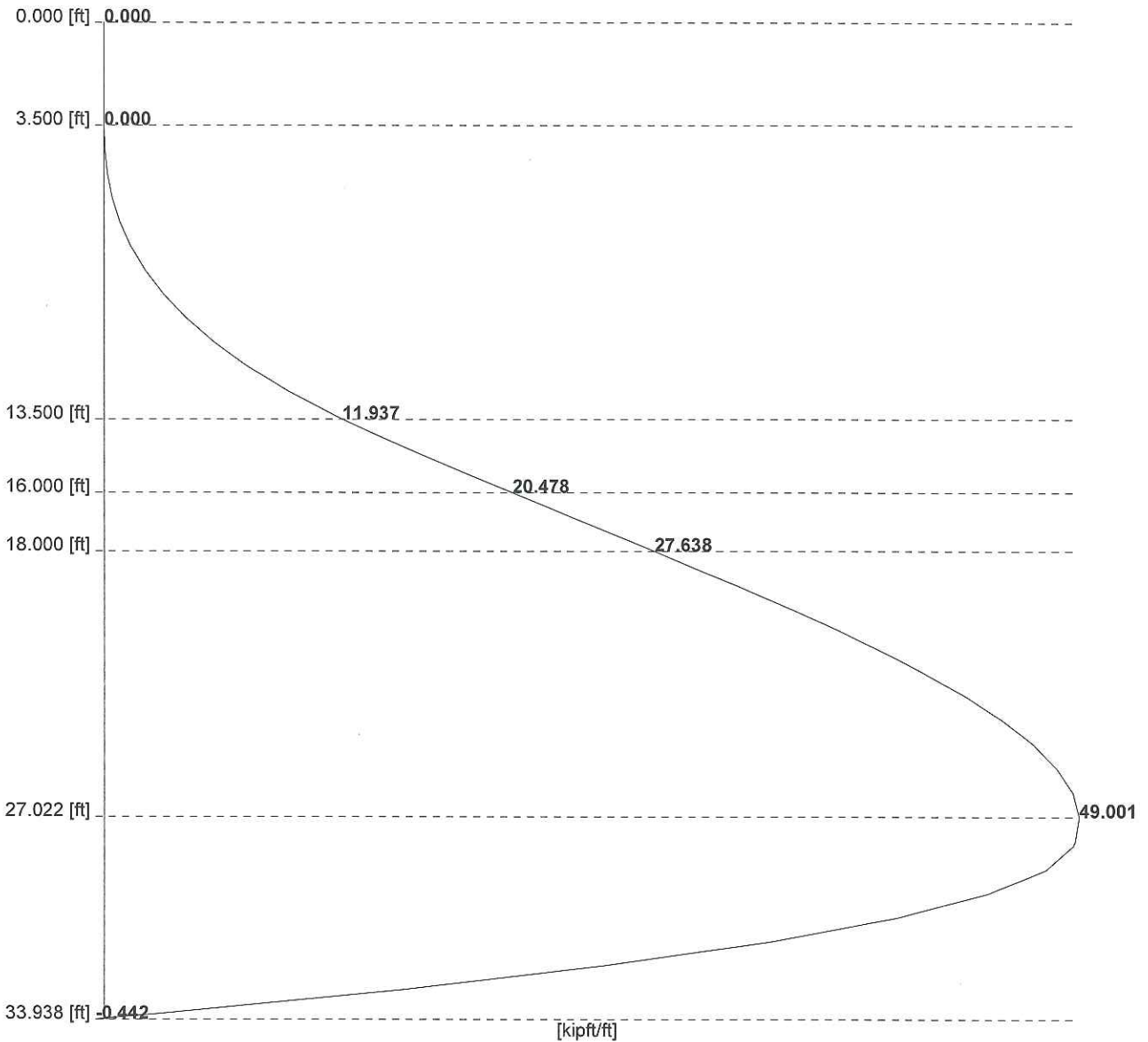
Total Pressure Diagram



Cross Force Diagram



Moment Diagram

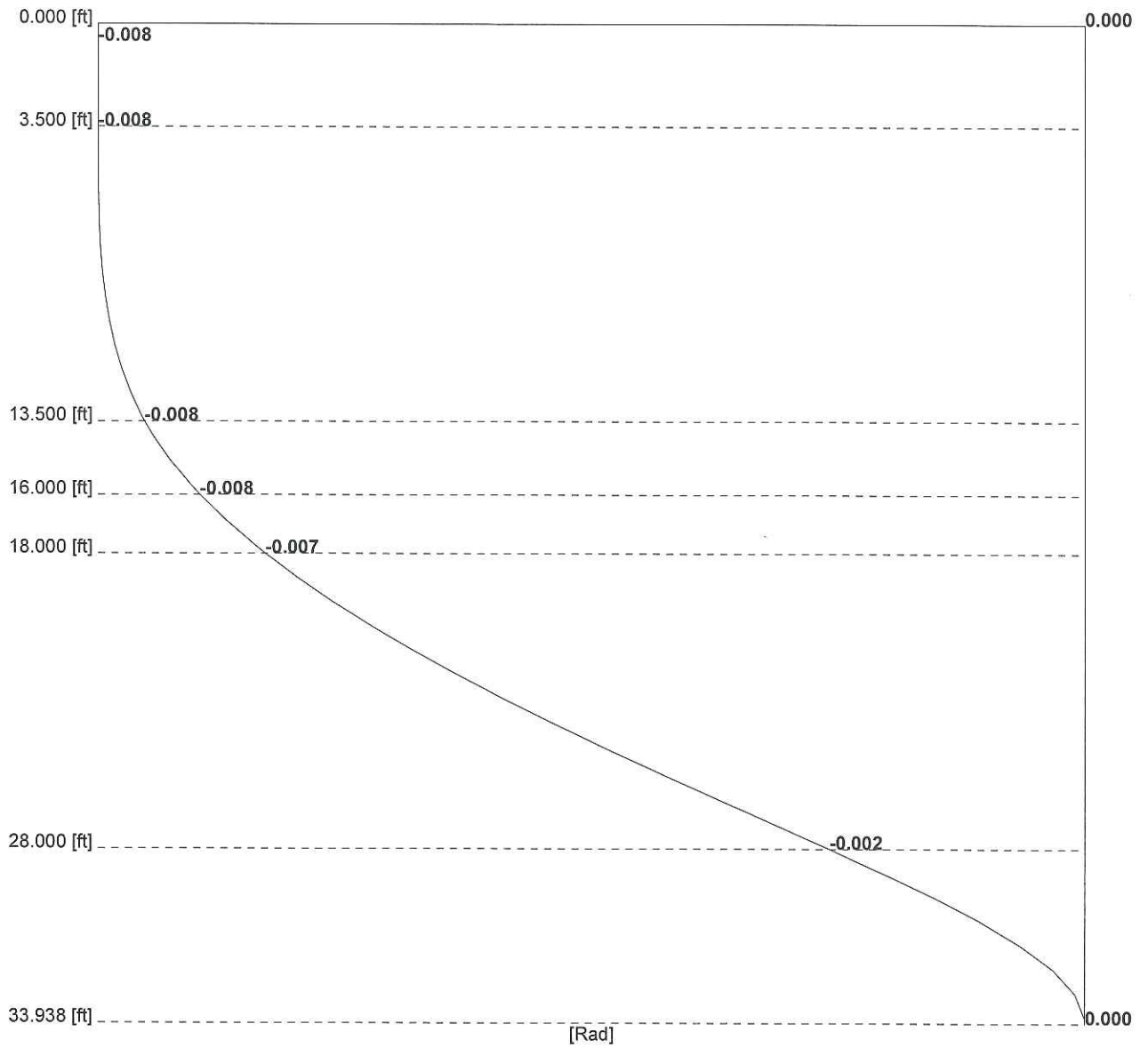


$$f_a = \frac{49}{45.2} \times 12 = 13.01 \text{ ksi}$$

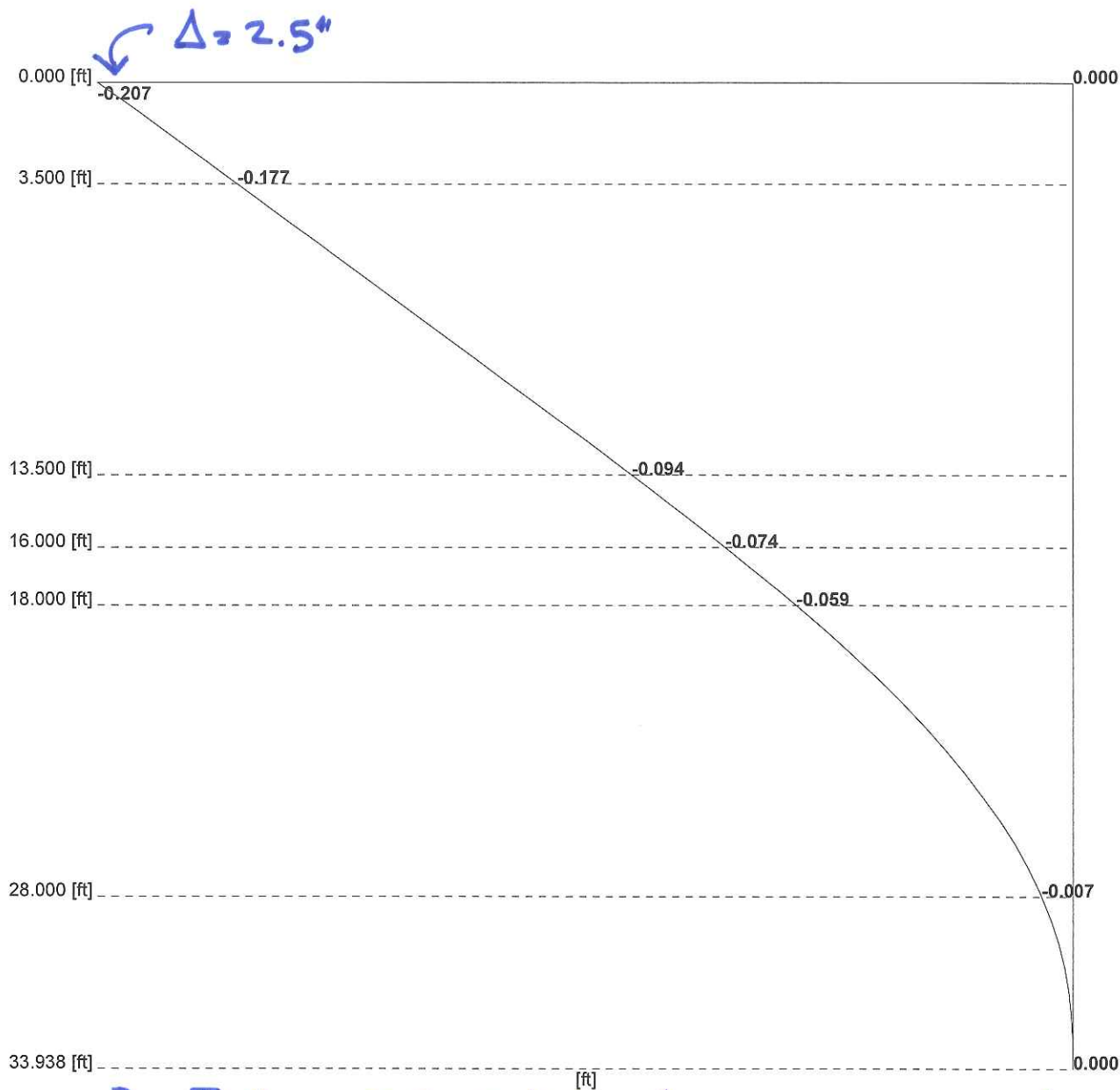
$$FOS = \frac{35}{13.01} = 2.69$$

✓
10k

Rotation Diagram



Deflection Diagram



PILE TIP REQ'D @ STA 70; 20.8' - 33.94 = -13.14'
 -- PILE TIP PER SEEPAGE ANALYSIS x - 15.0' ← CONTROLS
 -- SEEPAGE DEPTH CONTROLS THE PILE TIP ELEVATION

Sheet Pile Design According to Blum-Method

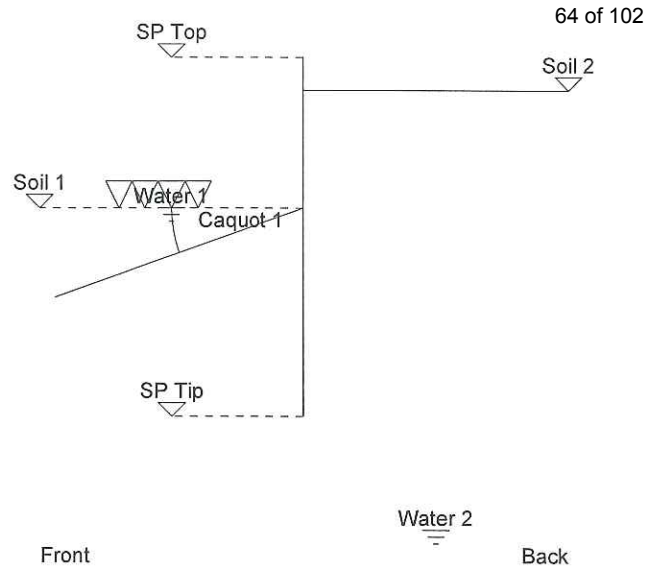
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Project Name: SAC - RA Sheet Piling Design
Date: 11/14/2012
Author: SP
Company:
Comment: Case 2: Clayey Native Material

$$\underline{A_T = 16.0'}$$

Geodata

	Unit
Sheet Pile Top Level [ft]	0.000
Sheet Pile Tip Level [ft]	38.000
Soil Level in Front [ft]	16.000
Soil Level behind [ft]	3.500
Anchorlevel [ft]	0.000
Water Level in Front [ft]	16.000
Water Level behind [ft]	50.000
Soil Surface Inclination in Front [Deg]	-19.500
Soil Surface Inclination behind [Deg]	0.000
Caquot Surcharge in Front [kip/ft ²]	0.180
Caquot Surcharge behind [kip/ft ²]	0.000
Anchor Inclination [Deg]	0.000
Earth Support	Cantilever



Soil Layers

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Layers in Front

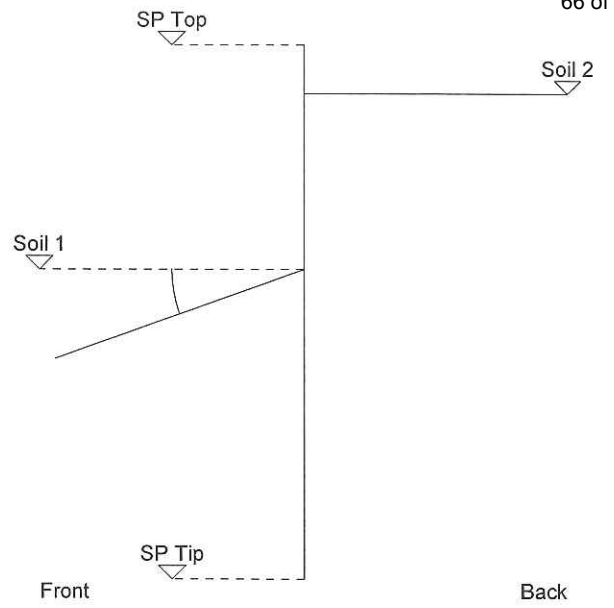
	Layer Tip [ft]	Density Moist [kip/ft3]	Density Submerged [kip/ft3]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft2]
Layer 1	18.000	0.125	0.067	1.082	21.100	0.000	0.000
Layer 2	28.000	0.107	0.067	0.889	19.500	0.000	0.000
Layer 3	60.000	0.127	0.070	1.221	23.400	0.000	0.000

Layers behind

	Layer Tip [ft]	Density Moist [kip/ft3]	Density Submerged [kip/ft3]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft2]
Layer 1	3.500	0.125	0.067	0.333	30.000	0.000	0.000
Layer 2	18.000	0.125	0.067	0.333	30.000	0.000	0.000
Layer 3	28.000	0.107	0.067	0.361	28.000	0.000	0.000
Layer 4	60.000	0.127	0.070	0.000	33.000	0.000	0.000

Boussinesq

	Distance Wall [ft]	Width Surcharge [ft]	Depth Surcharge [ft]	Surcharge [kip/ft2]



Userdefined Pressures

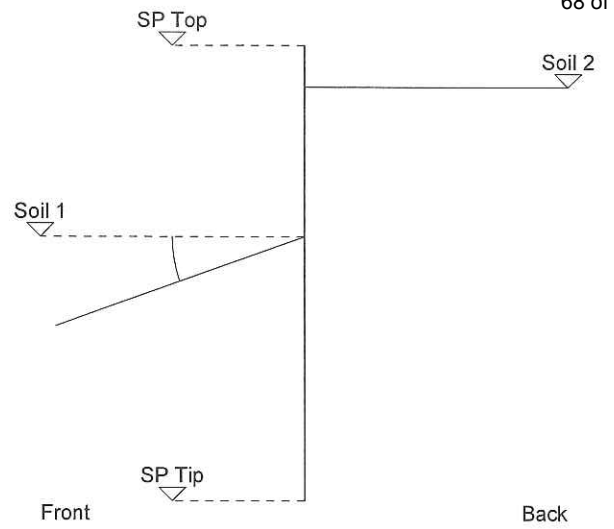
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	Pressure Top [kip/ft2]	Pressure Tip [kip/ft2]	Depth Top [ft]	Depth Tip [ft]
Strip 1	0.100	0.100	3.500	13.500

Concentrated Forces

	Horiz. Component [kip/ft]	Vert. Component [kip/ft]	Depth Horiz. Comp. [ft]

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Pile Section

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Name	AZ 37-700
Inertia [in4/ft]	676.624
Modulus [in3/ft]	68.913
Area [in2/ft]	10.677
Mass [lbs/ft2]	36.334
Steel Grade [lb/in2]	34795.867
Requested Safety	1.500

All Values

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Depth [ft]	Deflection [ft]	Rotation [Rad]	Cross Force [kip/ft]	Moment [kip/ft2]	Total Pressure [kip/ft2]	Earth Pressure in Front [kip/ft2]	behind [kip/ft2]	Water Pressure [kip/ft2]	Userdefined Pressure [kip/ft2]
0.000	-0.224	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.820	-0.218	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.820	-0.218	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.640	-0.211	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.640	-0.211	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.461	-0.204	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.461	-0.204	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.281	-0.197	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.281	-0.197	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.500	-0.195	-0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.500	-0.195	-0.008	0.000	0.000	0.100	0.000	0.000	0.000	0.100
4.320	-0.189	-0.008	0.096	0.037	0.134	0.000	0.034	0.000	0.100
4.320	-0.189	-0.008	0.096	0.037	0.134	0.000	0.034	0.000	0.100
5.140	-0.182	-0.008	0.220	0.165	0.168	0.000	0.068	0.000	0.100
5.140	-0.182	-0.008	0.220	0.165	0.168	0.000	0.068	0.000	0.100
5.961	-0.175	-0.008	0.372	0.406	0.202	0.000	0.102	0.000	0.100
5.961	-0.175	-0.008	0.372	0.406	0.202	0.000	0.102	0.000	0.100
6.781	-0.168	-0.008	0.552	0.783	0.237	0.000	0.137	0.000	0.100
6.781	-0.168	-0.008	0.552	0.783	0.237	0.000	0.137	0.000	0.100
7.601	-0.161	-0.008	0.760	1.319	0.271	0.000	0.171	0.000	0.100
7.601	-0.161	-0.008	0.760	1.319	0.271	0.000	0.171	0.000	0.100
8.421	-0.155	-0.008	0.996	2.038	0.305	0.000	0.205	0.000	0.100
8.421	-0.155	-0.008	0.996	2.038	0.305	0.000	0.205	0.000	0.100
9.242	-0.148	-0.008	1.260	2.961	0.339	0.000	0.239	0.000	0.100
9.242	-0.148	-0.008	1.260	2.961	0.339	0.000	0.239	0.000	0.100
10.062	-0.141	-0.008	1.552	4.113	0.373	0.000	0.273	0.000	0.100
10.062	-0.141	-0.008	1.552	4.113	0.373	0.000	0.273	0.000	0.100
10.882	-0.134	-0.008	1.872	5.515	0.407	0.000	0.307	0.000	0.100
10.882	-0.134	-0.008	1.872	5.515	0.407	0.000	0.307	0.000	0.100
11.702	-0.127	-0.008	2.220	7.192	0.441	0.000	0.341	0.000	0.100
11.702	-0.127	-0.008	2.220	7.192	0.441	0.000	0.341	0.000	0.100
12.522	-0.121	-0.008	2.596	9.165	0.476	0.000	0.376	0.000	0.100
12.522	-0.121	-0.008	2.596	9.165	0.476	0.000	0.376	0.000	0.100
13.343	-0.114	-0.008	3.000	11.459	0.510	0.000	0.410	0.000	0.100
13.343	-0.114	-0.008	3.000	11.459	0.510	0.000	0.410	0.000	0.100
13.500	-0.113	-0.008	3.081	11.937	0.516	0.000	0.416	0.000	0.100
13.500	-0.113	-0.008	3.081	11.937	0.416	0.000	0.416	0.000	0.000
14.320	-0.106	-0.008	3.437	14.608	0.450	0.000	0.450	0.000	0.000
14.320	-0.106	-0.008	3.437	14.608	0.450	0.000	0.450	0.000	0.000
15.140	-0.099	-0.008	3.820	17.583	0.485	0.000	0.485	0.000	0.000
15.140	-0.099	-0.008	3.820	17.583	0.485	0.000	0.485	0.000	0.000
15.961	-0.093	-0.008	4.231	20.883	0.519	0.000	0.519	0.000	0.000
15.961	-0.093	-0.008	4.231	20.883	0.519	0.000	0.519	0.000	0.000
16.000	-0.093	-0.008	4.252	21.049	0.520	0.000	0.520	0.000	0.000
16.000	-0.093	-0.008	4.252	21.049	0.325	-0.195	0.520	0.000	0.000
16.820	-0.086	-0.008	4.487	24.638	0.248	-0.254	0.554	-0.052	0.000
16.820	-0.086	-0.008	4.487	24.638	0.248	-0.254	0.554	-0.052	0.000
17.640	-0.080	-0.007	4.659	28.393	0.170	-0.314	0.589	-0.104	0.000
17.640	-0.080	-0.007	4.659	28.393	0.170	-0.314	0.589	-0.104	0.000
18.000	-0.077	-0.007	4.714	30.078	0.136	-0.340	0.604	-0.127	0.000
18.000	-0.077	-0.007	4.714	30.078	0.248	-0.279	0.654	-0.127	0.000
18.820	-0.071	-0.007	4.889	34.020	0.179	-0.328	0.686	-0.179	0.000
18.820	-0.071	-0.007	4.889	34.020	0.179	-0.328	0.686	-0.179	0.000
19.640	-0.065	-0.007	5.007	38.082	0.109	-0.377	0.718	-0.232	0.000
19.640	-0.065	-0.007	5.007	38.082	0.109	-0.377	0.718	-0.232	0.000
20.461	-0.059	-0.007	5.068	42.218	0.040	-0.426	0.749	-0.284	0.000
20.461	-0.059	-0.007	5.068	42.218	0.040	-0.426	0.749	-0.284	0.000
21.281	-0.053	-0.007	5.072	46.381	-0.029	-0.474	0.781	-0.336	0.000
21.281	-0.053	-0.007	5.072	46.381	-0.029	-0.474	0.781	-0.336	0.000
22.101	-0.048	-0.006	5.020	50.524	-0.099	-0.523	0.813	-0.388	0.000
22.101	-0.048	-0.006	5.020	50.524	-0.099	-0.523	0.813	-0.388	0.000
22.921	-0.043	-0.006	4.911	54.600	-0.168	-0.572	0.844	-0.440	0.000
22.921	-0.043	-0.006	4.911	54.600	-0.168	-0.572	0.844	-0.440	0.000
23.742	-0.038	-0.006	4.744	58.563	-0.237	-0.621	0.876	-0.493	0.000

Depth [ft]	Deflection [ft]	Rotation [Rad]	Cross Force [kip/ft]	Moment [kip/ft]	Total Pressure [kip/ft ²]	Earth Pressure in Front [kip/ft ²]	behind [kip/ft ²]	Water Pressure [kip/ft ²]	Userdefined Pressure of 102 [kip/ft ²]
23.742	-0.038	-0.006	4.744	58.563	-0.237	-0.621	0.876	-0.493	0.000
24.562	-0.033	-0.005	4.521	62.367	-0.307	-0.670	0.908	-0.545	0.000
24.562	-0.033	-0.005	4.521	62.367	-0.307	-0.670	0.908	-0.545	0.000
25.382	-0.028	-0.005	4.241	65.965	-0.376	-0.718	0.939	-0.597	0.000
25.382	-0.028	-0.005	4.241	65.965	-0.376	-0.718	0.939	-0.597	0.000
26.202	-0.024	-0.005	3.904	69.309	-0.445	-0.767	0.971	-0.649	0.000
26.202	-0.024	-0.005	3.904	69.309	-0.445	-0.767	0.971	-0.649	0.000
27.022	-0.020	-0.004	3.510	72.354	-0.515	-0.816	1.003	-0.701	0.000
27.022	-0.020	-0.004	3.510	72.354	-0.515	-0.816	1.003	-0.701	0.000
27.843	-0.017	-0.004	3.060	75.052	-0.584	-0.865	1.034	-0.754	0.000
27.843	-0.017	-0.004	3.060	75.052	-0.584	-0.865	1.034	-0.754	0.000
28.000	-0.016	-0.004	2.967	75.527	-0.597	-0.874	1.041	-0.764	0.000
28.000	-0.016	-0.004	2.967	75.527	-1.965	-1.201	0.000	-0.764	0.000
28.820	-0.013	-0.003	1.305	77.285	-2.087	-1.271	0.000	-0.816	0.000
28.820	-0.013	-0.003	1.305	77.285	-2.087	-1.271	0.000	-0.816	0.000
29.640	-0.010	-0.003	-0.457	77.640	-2.209	-1.341	0.000	-0.868	0.000
29.640	-0.010	-0.003	-0.457	77.640	-2.209	-1.341	0.000	-0.868	0.000
30.461	-0.008	-0.002	-2.319	76.509	-2.331	-1.411	0.000	-0.920	0.000
30.461	-0.008	-0.002	-2.319	76.509	-2.331	-1.411	0.000	-0.920	0.000
31.281	-0.006	-0.002	-4.281	73.809	-2.454	-1.481	0.000	-0.972	0.000
31.281	-0.006	-0.002	-4.281	73.809	-2.454	-1.481	0.000	-0.972	0.000
32.101	-0.004	-0.001	-6.344	69.459	-2.576	-1.551	0.000	-1.025	0.000
32.101	-0.004	-0.001	-6.344	69.459	-2.576	-1.551	0.000	-1.025	0.000
32.921	-0.003	-0.001	-8.507	63.376	-2.698	-1.621	0.000	-1.077	0.000
32.921	-0.003	-0.001	-8.507	63.376	-2.698	-1.621	0.000	-1.077	0.000
33.742	-0.002	-0.001	-10.770	55.477	-2.821	-1.692	0.000	-1.129	0.000
33.742	-0.002	-0.001	-10.770	55.477	-2.821	-1.692	0.000	-1.129	0.000
34.562	-0.001	0.000	-13.133	45.681	-2.943	-1.762	0.000	-1.181	0.000
34.562	-0.001	0.000	-13.133	45.681	-2.943	-1.762	0.000	-1.181	0.000
35.382	0.000	0.000	-15.597	33.905	-3.065	-1.832	0.000	-1.233	0.000
35.382	0.000	0.000	-15.597	33.905	-3.065	-1.832	0.000	-1.233	0.000
36.202	0.000	0.000	-18.161	20.067	-3.187	-1.902	0.000	-1.286	0.000
36.202	0.000	0.000	-18.161	20.067	-3.187	-1.902	0.000	-1.286	0.000
37.022	0.000	0.000	-20.826	4.085	-3.310	-1.972	0.000	-1.338	0.000
37.022	0.000	0.000	-20.826	4.085	-3.310	-1.972	0.000	-1.338	0.000
37.219	0.000	0.000	-21.480	-0.079	-3.339	-1.989	0.000	-1.350	0.000

Extremal Values

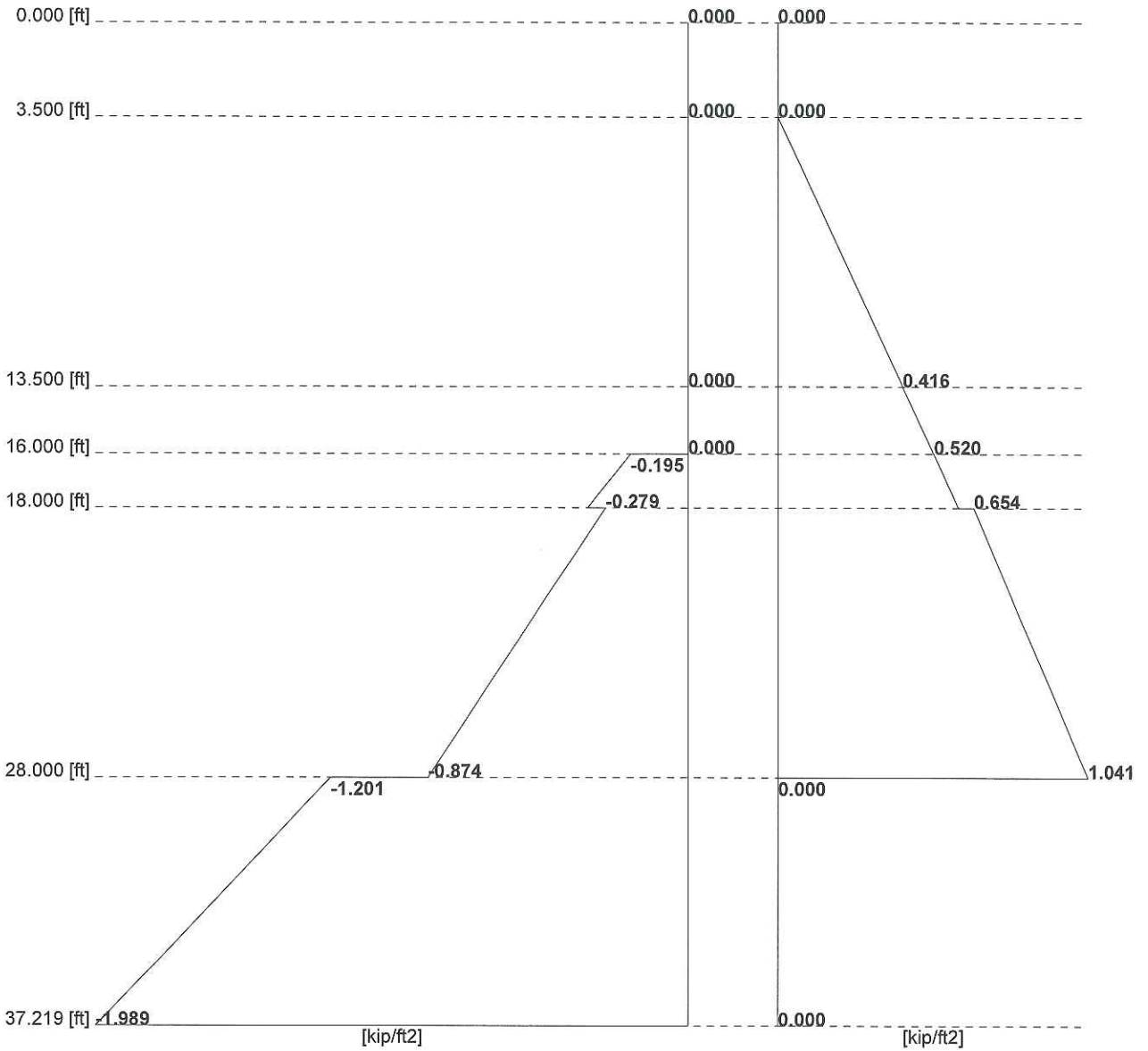
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	z Min [ft]	Min	z Max [ft]	Max
Deflection [ft]	0.000	-0.224	37.219	0.000
Cross Force [kip/ft]	37.219	-21.480	21.281	5.072
Moment [kipft/ft]	37.252	-0.786	29.444	77.688

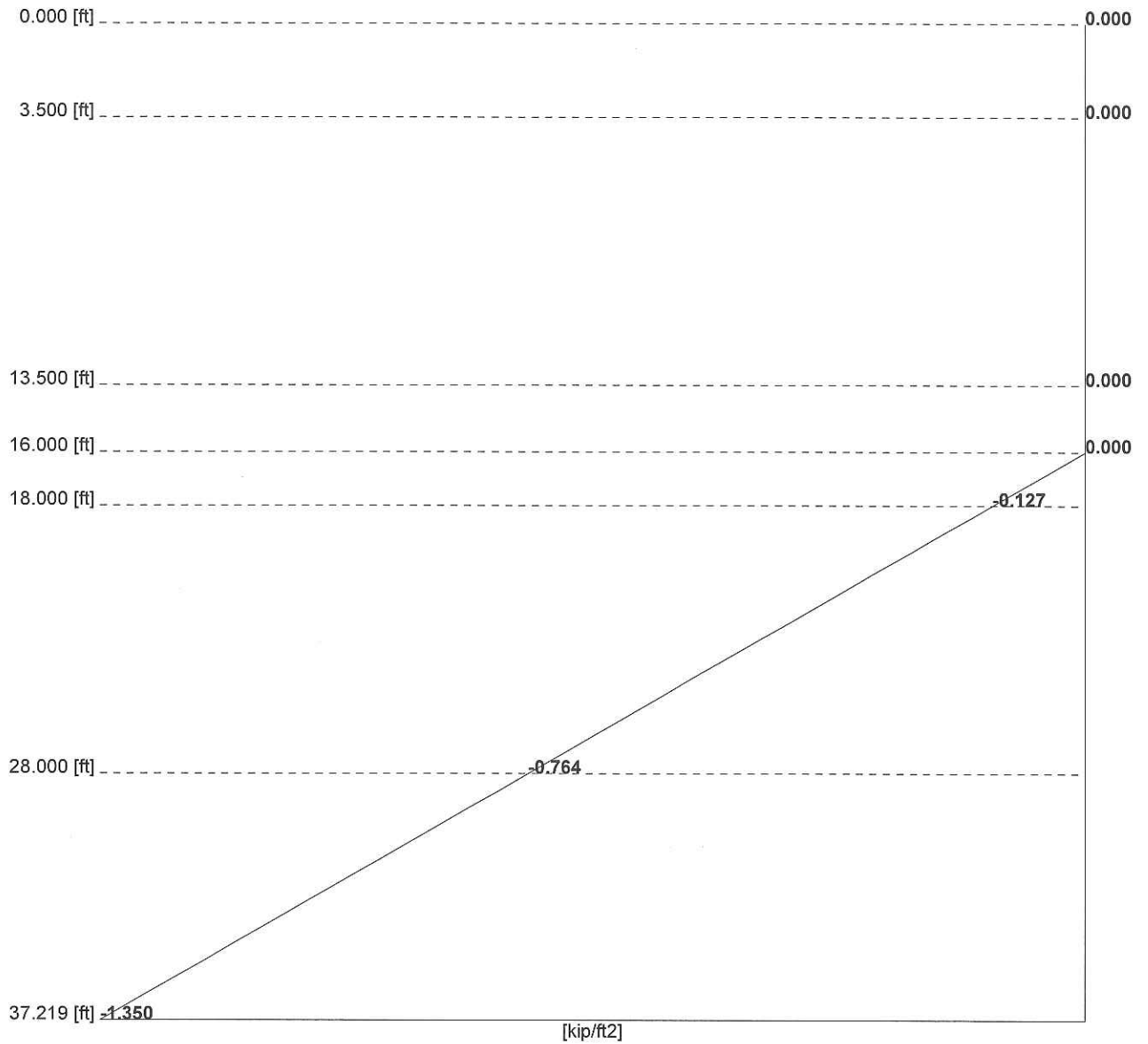
Pile Check

		Depth [ft]
Name	AZ 37-700	
Inertia [in4/ft]	676.624	
Modulus [in3/ft]	68.913	
Area [in2/ft]	10.677	
Mass [lbs/ft2]	36.334	
Steel Grade [lb/in2]	34795.867	
Minimal Moment [kipft/ft]	-0.786	37.252
Maxmimal Moment [kipft/ft]	77.688	29.444
Normal Forces at Max. Moment [kip/ft]	0.000	37.252
Normal Forces at Min. Moment [kip/ft]	0.000	29.444
Deflection at Min. Moment [ft]	0.000	37.252
Deflection at Max. Moment [ft]	-0.010	29.444
Min. Stress at Min. Moment [lb/in2]	-136.792	37.252
Max. Stress at Min. Moment [lb/in2]	136.792	37.252
Min. Stress at Max. Moment [lb/in2]	-13527.431	29.444
Max. Stress at Max. Moment [lb/in2]	13527.431	29.444
Safety > Req. Safety = 1.500	2.572	
Sheet Pile Top Level [ft]	0.000	
Sheet Pile Tip Level [ft]	38.000	
Sheet Pile Length [ft]	38.000	
Included OverLength [ft]	0.781	
Vertical Equilibrium [kip/ft]	0.000	
Anchor Force (horiz.) [kip/ft]	0.000	

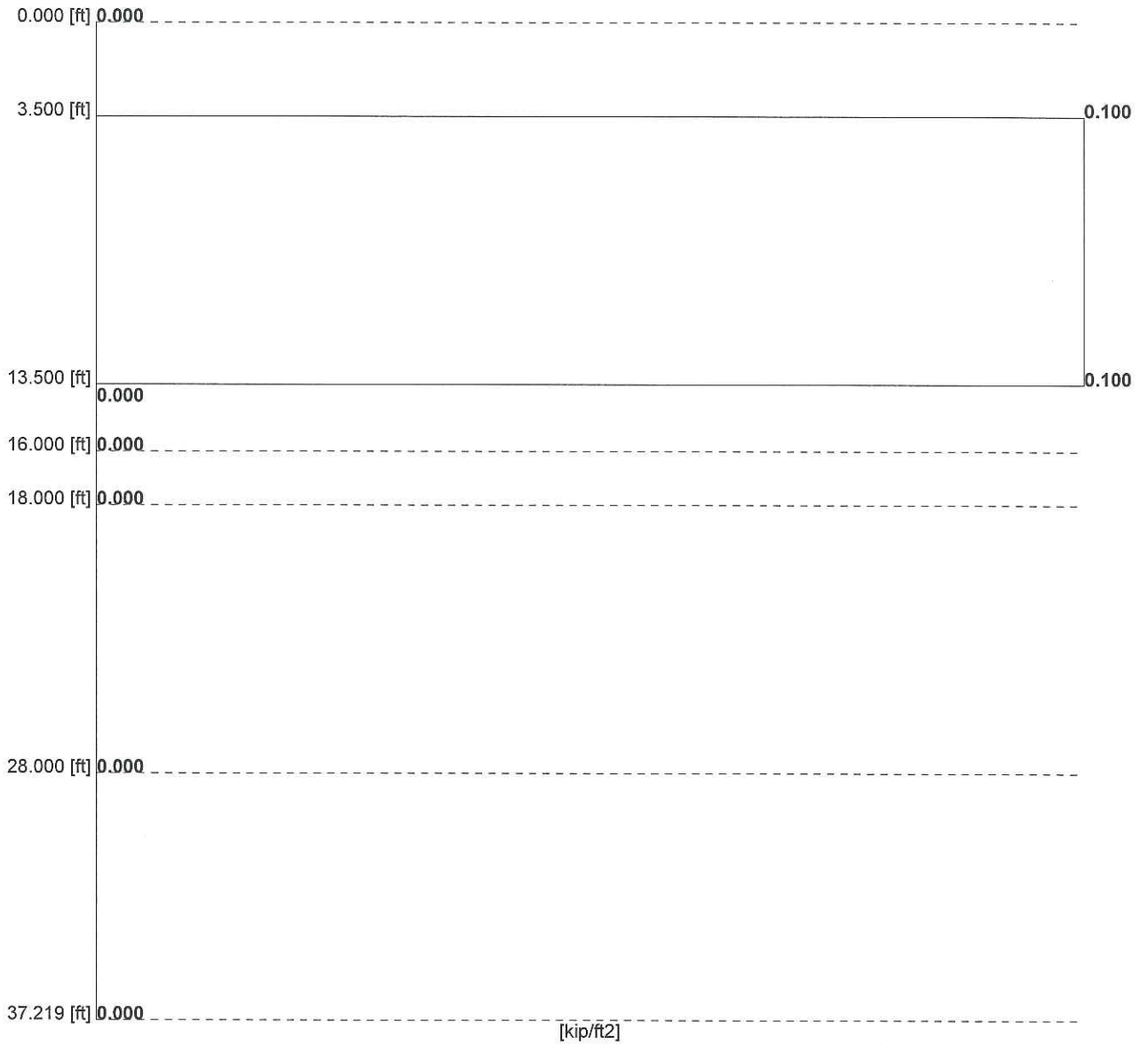
Earth Pressure Diagram



Water Pressure Diagram



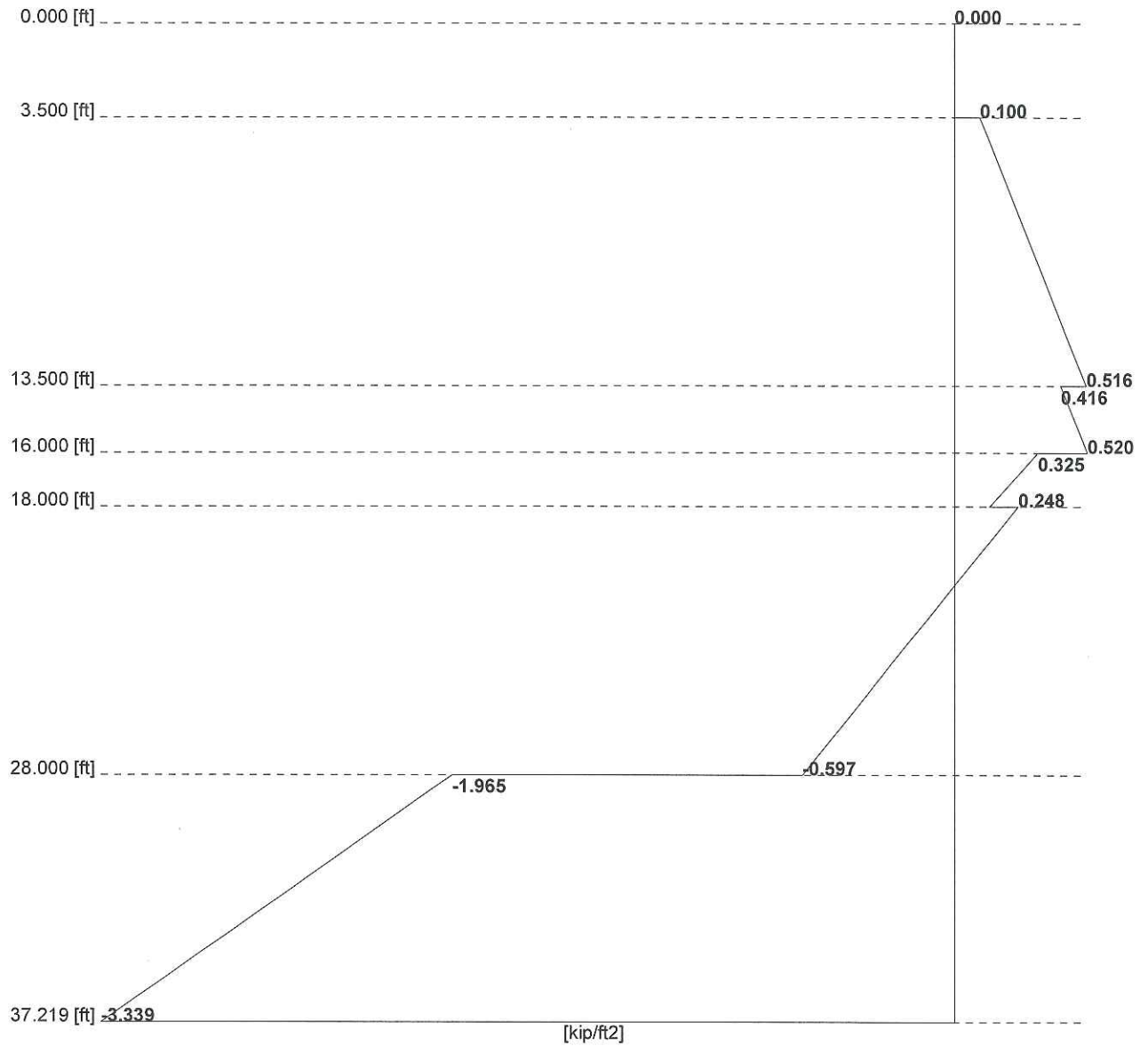
Userdefined Pressure Diagram



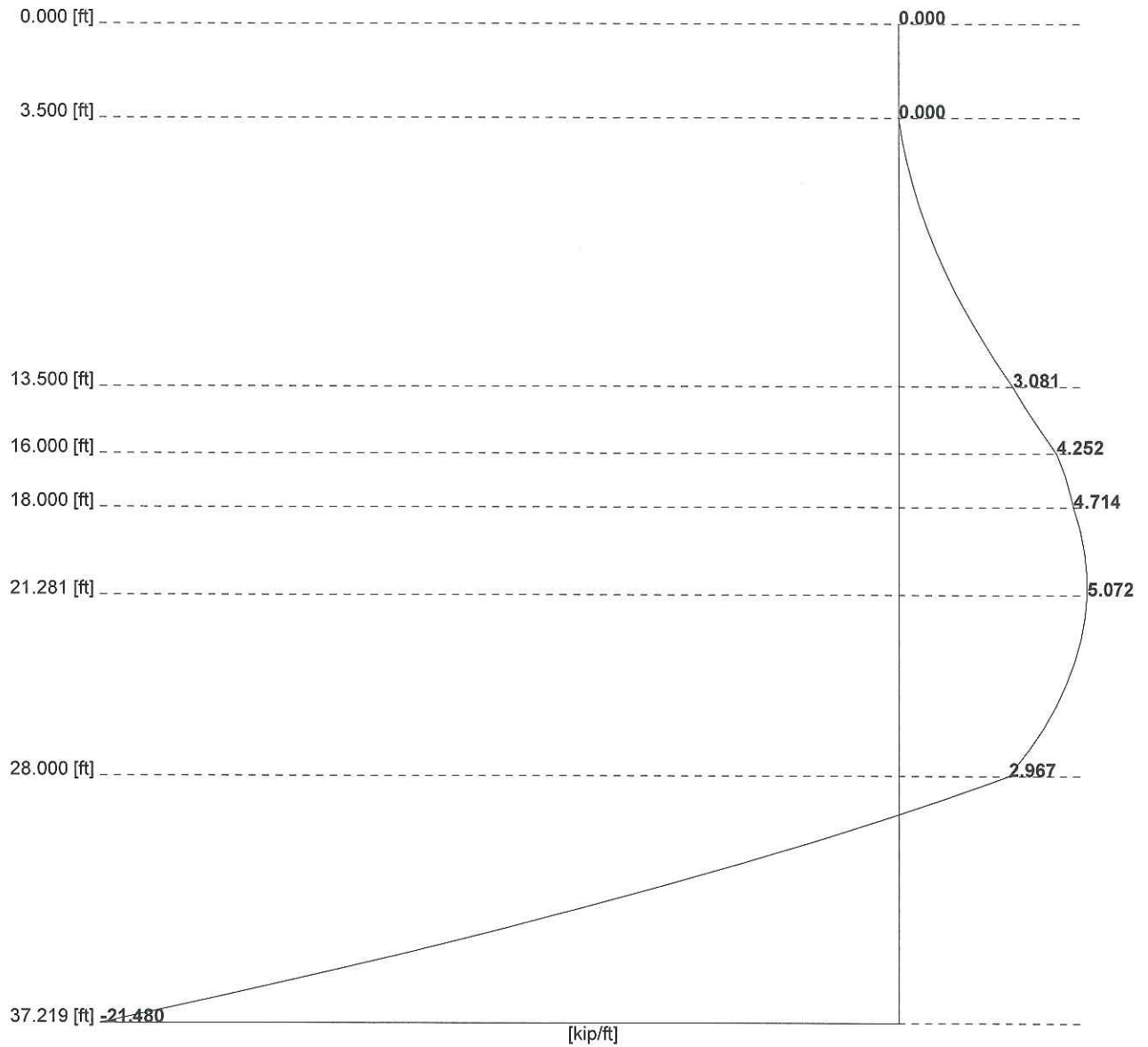
Boussinesq Diagram

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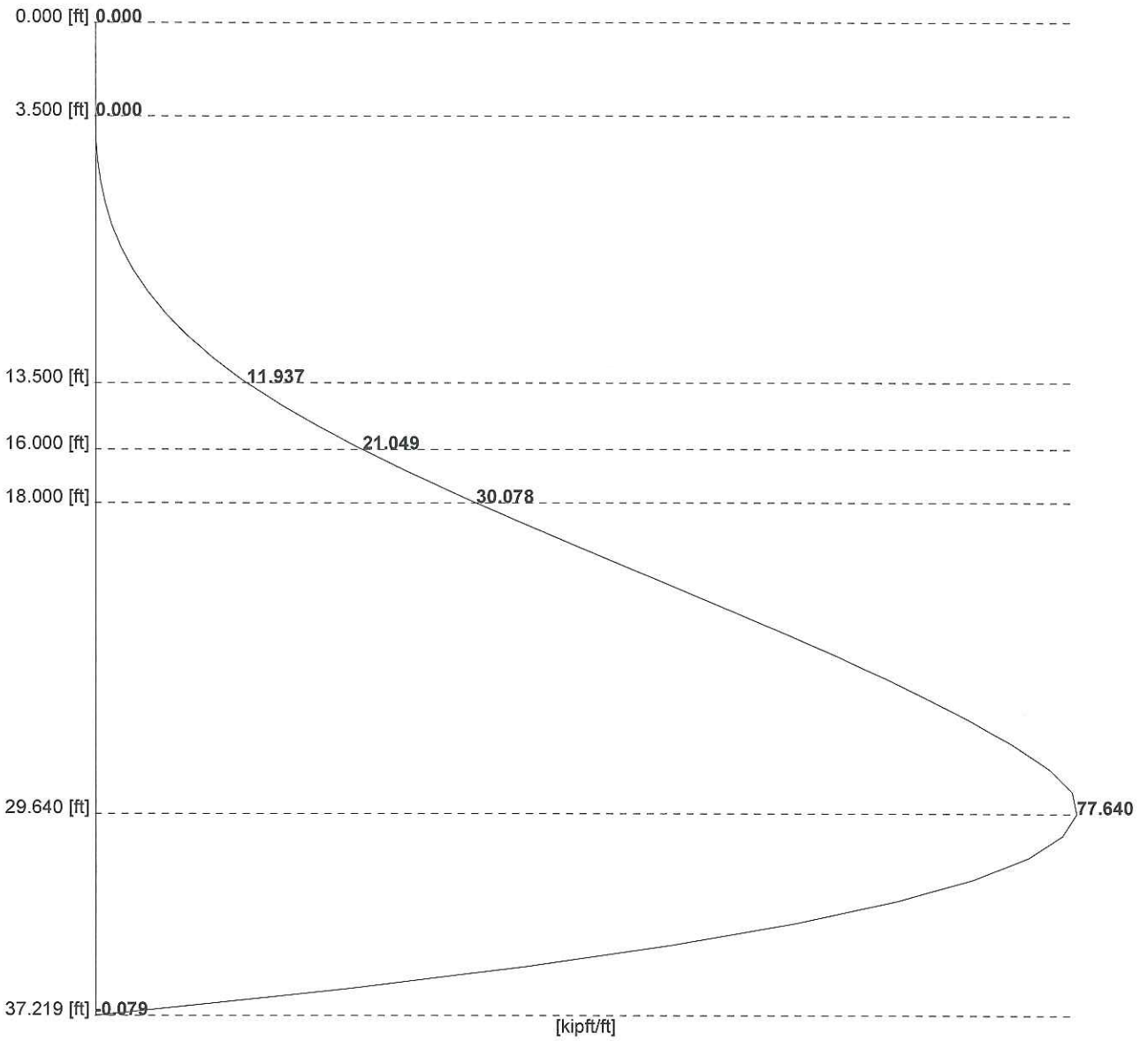
Total Pressure Diagram



Cross Force Diagram



Moment Diagram



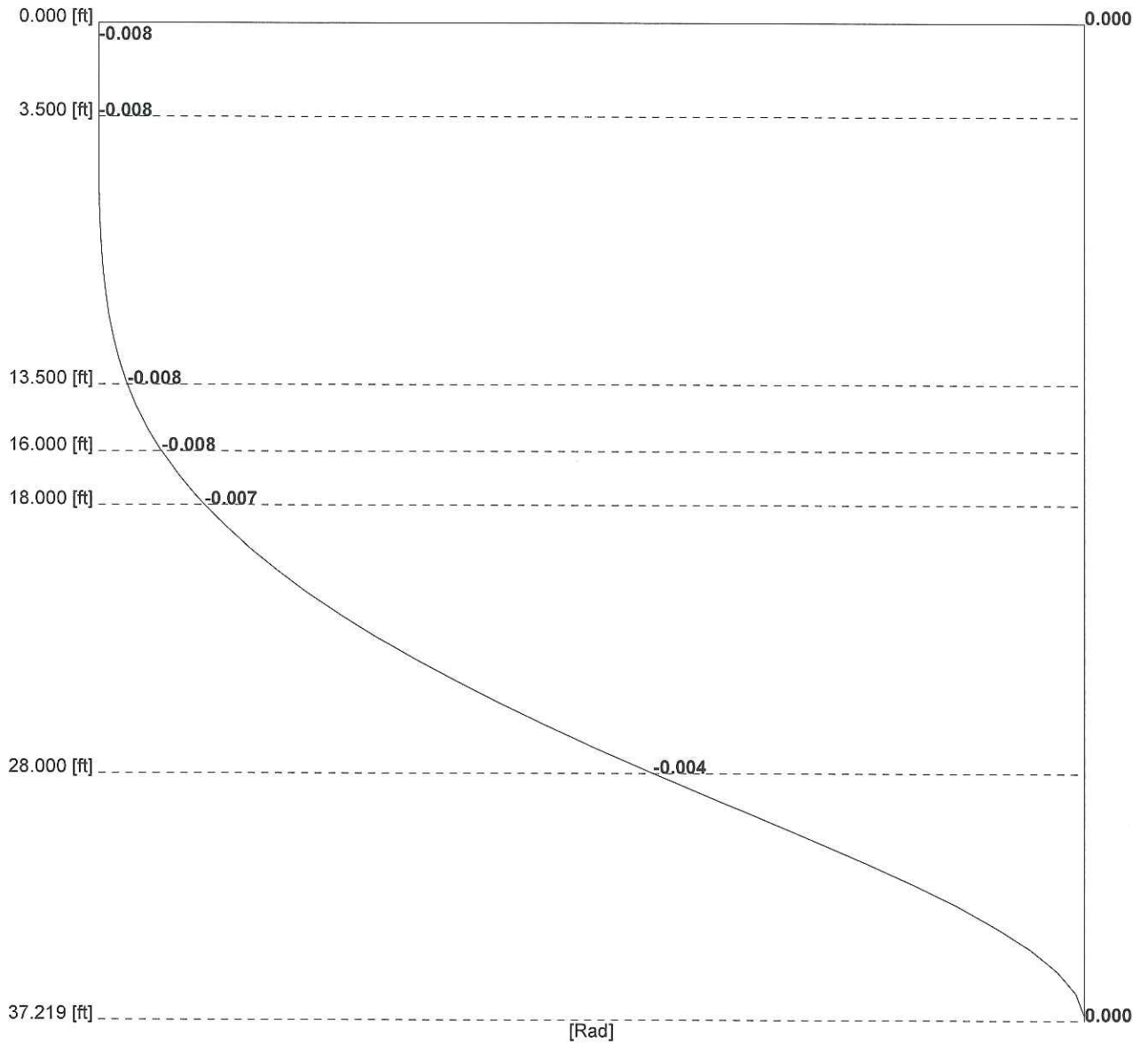
$$M = 77.64 \text{ k}$$

$$f_a = \frac{77.64 \times 12}{66.8} = 13.95$$

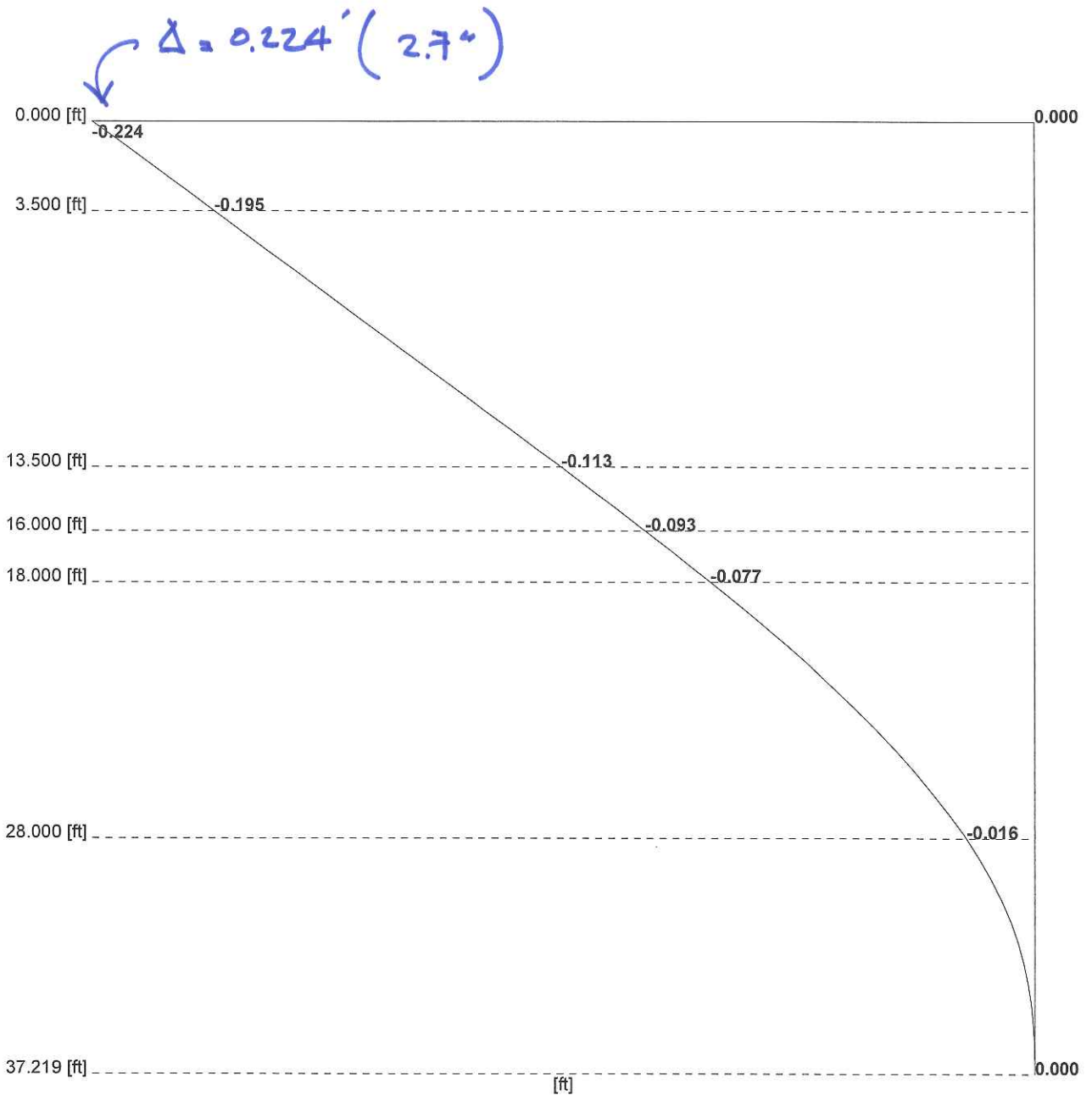
$$FOS = \frac{35}{13.95} = 2.5 \checkmark \underline{\underline{OK}}$$

(DEFLECTION CONTROLS)

Rotation Diagram



Deflection Diagram



PILE TIP REQ'D $\approx 22.1 - 37.22' = -15.12'$

USE PILE TIP OF -17.0'

~~-15.0' FOR LEFT LEVEE~~

FOR RIGHT LEVEE & LEFT LEVEE

Sheet Pile Design According to Blum-Method

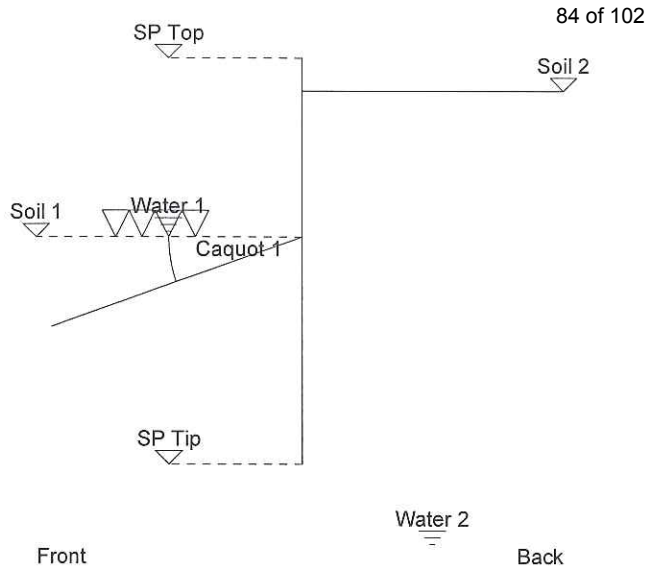
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Project Name: SAC - RA Sheet Piling Design
Date: 11/14/2012
Author: SP
Company:
Comment: Case 2: Clayey Native Material

$$\underline{H_T = 19.0}$$

Geodata

	Unit
Sheet Pile Top Level [ft]	0.000
Sheet Pile Tip Level [ft]	42.982
Soil Level in Front [ft]	19.000
Soil Level behind [ft]	3.500
Anchorlevel [ft]	0.000
Water Level in Front [ft]	17.000
Water Level behind [ft]	50.000
Soil Surface Inclination in Front [Deg]	-19.500
Soil Surface Inclination behind [Deg]	0.000
Caquot Surcharge in Front [kip/ft2]	0.180
Caquot Surcharge behind [kip/ft2]	0.000
Anchor Inclination [Deg]	0.000
Earth Support	Cantilever



Soil Layers

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Layers in Front

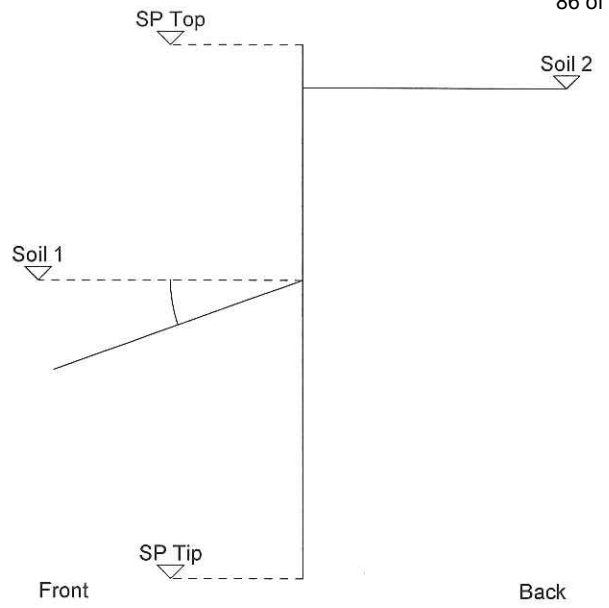
	Layer Tip [ft]	Density Moist [kip/ft3]	Density Submerged [kip/ft3]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft2]
Layer 1	27.000	0.121	0.067	1.082	21.100	0.000	0.000
Layer 2	32.000	0.107	0.067	0.889	19.500	0.000	0.000
Layer 3	60.000	0.127	0.070	1.221	23.400	0.000	0.000

Layers behind

	Layer Tip [ft]	Density Moist [kip/ft3]	Density Submerged [kip/ft3]	Kph	Phi [Deg]	Delta [Deg]	Cohesion [kip/ft2]
Layer 1	3.500	0.125	0.067	0.333	30.000	0.000	0.000
Layer 2	20.000	0.125	0.067	0.333	30.000	0.000	0.000
Layer 3	27.000	0.121	0.000	0.333	30.000	0.000	0.000
Layer 4	32.000	0.107	0.067	0.361	28.000	0.000	0.000
Layer 5	60.000	0.127	0.070	0.000	33.000	0.000	0.000

Boussinesq

	Distance Wall [ft]	Width Surcharge [ft]	Depth Surcharge [ft]	Surcharge [kip/ft ²]



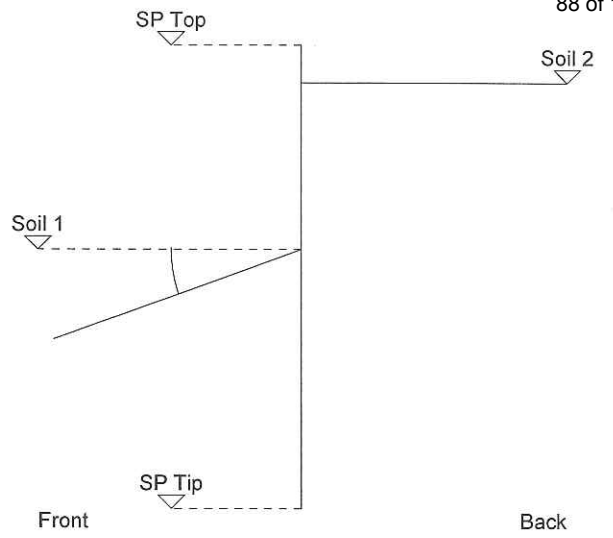
Userdefined Pressures

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	Pressure Top [kip/ft2]	Pressure Tip [kip/ft2]	Depth Top [ft]	Depth Tip [ft]
Strip 1	0.100	0.100	3.500	13.500

Concentrated Forces

	Horiz. Component [kip/ft]	Vert. Component [kip/ft]	Depth Horiz. Comp. [ft]



Pile Section

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Name	AZ 50
Inertia [in4/ft]	886.494
Modulus [in3/ft]	93.279
Area [in2/ft]	15.222
Mass [lbs/ft2]	51.798
Steel Grade [lb/in2]	50000.000
Requested Safety	1.500

All Values

Depth [ft]	Deflection [ft]	Rotation [Rad]	Cross Force [kip/ft]	Moment [kipft/ft]	Total Pressure [kip/ft2]	Earth Pressure in Front [kip/ft2]	behind [kip/ft2]	Water Pressure [kip/ft2]	Userdefined Pressure [kip/ft2]
0.000	-0.314	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.820	-0.306	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.820	-0.306	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.640	-0.297	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.640	-0.297	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.461	-0.289	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.461	-0.289	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.281	-0.280	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.281	-0.280	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.500	-0.278	-0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.500	-0.278	-0.010	0.000	0.000	0.100	0.000	0.000	0.000	0.100
4.320	-0.269	-0.010	0.096	0.037	0.134	0.000	0.034	0.000	0.100
4.320	-0.269	-0.010	0.096	0.037	0.134	0.000	0.034	0.000	0.100
5.140	-0.261	-0.010	0.220	0.165	0.168	0.000	0.068	0.000	0.100
5.140	-0.261	-0.010	0.220	0.165	0.168	0.000	0.068	0.000	0.100
5.961	-0.252	-0.010	0.372	0.406	0.202	0.000	0.102	0.000	0.100
5.961	-0.252	-0.010	0.372	0.406	0.202	0.000	0.102	0.000	0.100
6.781	-0.244	-0.010	0.552	0.783	0.237	0.000	0.137	0.000	0.100
6.781	-0.244	-0.010	0.552	0.783	0.237	0.000	0.137	0.000	0.100
7.601	-0.235	-0.010	0.760	1.319	0.271	0.000	0.171	0.000	0.100
7.601	-0.235	-0.010	0.760	1.319	0.271	0.000	0.171	0.000	0.100
8.421	-0.227	-0.010	0.996	2.038	0.305	0.000	0.205	0.000	0.100
8.421	-0.227	-0.010	0.996	2.038	0.305	0.000	0.205	0.000	0.100
9.242	-0.219	-0.010	1.260	2.961	0.339	0.000	0.239	0.000	0.100
9.242	-0.219	-0.010	1.260	2.961	0.339	0.000	0.239	0.000	0.100
10.062	-0.210	-0.010	1.552	4.113	0.373	0.000	0.273	0.000	0.100
10.062	-0.210	-0.010	1.552	4.113	0.373	0.000	0.273	0.000	0.100
10.882	-0.202	-0.010	1.872	5.515	0.407	0.000	0.307	0.000	0.100
10.882	-0.202	-0.010	1.872	5.515	0.407	0.000	0.307	0.000	0.100
11.702	-0.193	-0.010	2.220	7.192	0.441	0.000	0.341	0.000	0.100
11.702	-0.193	-0.010	2.220	7.192	0.441	0.000	0.341	0.000	0.100
12.522	-0.185	-0.010	2.596	9.165	0.476	0.000	0.376	0.000	0.100
12.522	-0.185	-0.010	2.596	9.165	0.476	0.000	0.376	0.000	0.100
13.343	-0.176	-0.010	3.000	11.459	0.510	0.000	0.410	0.000	0.100
13.343	-0.176	-0.010	3.000	11.459	0.510	0.000	0.410	0.000	0.100
13.500	-0.175	-0.010	3.081	11.937	0.516	0.000	0.416	0.000	0.100
13.500	-0.175	-0.010	3.081	11.937	0.416	0.000	0.416	0.000	0.000
14.320	-0.166	-0.010	3.437	14.608	0.450	0.000	0.450	0.000	0.000
14.320	-0.166	-0.010	3.437	14.608	0.450	0.000	0.450	0.000	0.000
15.140	-0.158	-0.010	3.820	17.583	0.485	0.000	0.485	0.000	0.000
15.140	-0.158	-0.010	3.820	17.583	0.485	0.000	0.485	0.000	0.000
15.961	-0.150	-0.010	4.231	20.883	0.519	0.000	0.519	0.000	0.000
15.961	-0.150	-0.010	4.231	20.883	0.519	0.000	0.519	0.000	0.000
16.781	-0.142	-0.010	4.671	24.532	0.553	0.000	0.553	0.000	0.000
16.781	-0.142	-0.010	4.671	24.532	0.553	0.000	0.553	0.000	0.000
17.000	-0.139	-0.010	4.793	25.568	0.562	0.000	0.562	0.000	0.000
17.000	-0.139	-0.010	4.793	25.568	0.562	0.000	0.562	0.000	0.000
17.820	-0.131	-0.010	5.247	29.687	0.544	0.000	0.596	-0.052	0.000
17.820	-0.131	-0.010	5.247	29.687	0.544	0.000	0.596	-0.052	0.000
18.640	-0.123	-0.010	5.685	34.171	0.526	0.000	0.630	-0.104	0.000
18.640	-0.123	-0.010	5.685	34.171	0.526	0.000	0.630	-0.104	0.000
19.000	-0.120	-0.010	5.873	36.249	0.518	0.000	0.645	-0.127	0.000
19.000	-0.120	-0.010	5.873	36.249	0.323	-0.195	0.645	-0.127	0.000
19.820	-0.112	-0.009	6.106	41.166	0.246	-0.254	0.679	-0.179	0.000
19.820	-0.112	-0.009	6.106	41.166	0.246	-0.254	0.679	-0.179	0.000
20.000	-0.110	-0.009	6.149	42.268	0.229	-0.267	0.687	-0.191	0.000
20.000	-0.110	-0.009	6.149	42.268	0.229	-0.267	0.687	-0.191	0.000
20.820	-0.103	-0.009	6.304	47.379	0.150	-0.327	0.720	-0.243	0.000
20.820	-0.103	-0.009	6.304	47.379	0.150	-0.327	0.720	-0.243	0.000
21.640	-0.095	-0.009	6.395	52.591	0.071	-0.386	0.753	-0.295	0.000
21.640	-0.095	-0.009	6.395	52.591	0.071	-0.386	0.753	-0.295	0.000
22.461	-0.088	-0.009	6.421	57.851	-0.007	-0.446	0.786	-0.347	0.000
22.461	-0.088	-0.009	6.421	57.851	-0.007	-0.446	0.786	-0.347	0.000
23.281	-0.080	-0.008	6.383	63.106	-0.086	-0.505	0.819	-0.400	0.000

Depth [ft]	Deflection [ft]	Rotation [Rad]	Cross Force [kip/ft]	Moment [kipft/ft]	Total Pressure [kip/ft2]	Earth Pressure in Front [kip/ft2]	behind [kip/ft2]	Water Pressure [kip/ft2]	Userdefined Pressure of 102 [kip/ft2]
23.281	-0.080	-0.008	6.383	63.106	-0.086	-0.505	0.819	-0.400	0.000
24.101	-0.073	-0.008	6.280	68.304	-0.165	-0.565	0.852	-0.452	0.000
24.101	-0.073	-0.008	6.280	68.304	-0.165	-0.565	0.852	-0.452	0.000
24.921	-0.067	-0.008	6.113	73.390	-0.243	-0.624	0.885	-0.504	0.000
24.921	-0.067	-0.008	6.113	73.390	-0.243	-0.624	0.885	-0.504	0.000
25.742	-0.060	-0.007	5.881	78.313	-0.322	-0.684	0.918	-0.556	0.000
25.742	-0.060	-0.007	5.881	78.313	-0.322	-0.684	0.918	-0.556	0.000
26.562	-0.054	-0.007	5.585	83.020	-0.400	-0.743	0.951	-0.608	0.000
26.562	-0.054	-0.007	5.585	83.020	-0.400	-0.743	0.951	-0.608	0.000
27.000	-0.051	-0.007	5.400	85.427	-0.443	-0.775	0.969	-0.636	0.000
27.000	-0.051	-0.007	5.400	85.427	-0.222	-0.636	1.050	-0.636	0.000
27.820	-0.045	-0.007	5.189	89.774	-0.292	-0.685	1.082	-0.689	0.000
27.820	-0.045	-0.007	5.189	89.774	-0.292	-0.685	1.082	-0.689	0.000
28.640	-0.039	-0.006	4.921	93.924	-0.361	-0.734	1.114	-0.741	0.000
28.640	-0.039	-0.006	4.921	93.924	-0.361	-0.734	1.114	-0.741	0.000
29.461	-0.034	-0.006	4.597	97.831	-0.430	-0.783	1.145	-0.793	0.000
29.461	-0.034	-0.006	4.597	97.831	-0.430	-0.783	1.145	-0.793	0.000
30.281	-0.029	-0.005	4.216	101.449	-0.500	-0.832	1.177	-0.845	0.000
30.281	-0.029	-0.005	4.216	101.449	-0.500	-0.832	1.177	-0.845	0.000
31.101	-0.025	-0.005	3.777	104.731	-0.569	-0.880	1.209	-0.897	0.000
31.101	-0.025	-0.005	3.777	104.731	-0.569	-0.880	1.209	-0.897	0.000
31.921	-0.021	-0.004	3.282	107.630	-0.638	-0.929	1.240	-0.950	0.000
31.921	-0.021	-0.004	3.282	107.630	-0.638	-0.929	1.240	-0.950	0.000
32.000	-0.020	-0.004	3.232	107.887	-0.645	-0.934	1.243	-0.955	0.000
32.000	-0.020	-0.004	3.232	107.887	-2.237	-1.283	0.000	-0.955	0.000
32.820	-0.017	-0.004	1.347	109.771	-2.360	-1.353	0.000	-1.007	0.000
32.820	-0.017	-0.004	1.347	109.771	-2.360	-1.353	0.000	-1.007	0.000
33.640	-0.013	-0.003	-0.639	110.068	-2.482	-1.423	0.000	-1.059	0.000
33.640	-0.013	-0.003	-0.639	110.068	-2.482	-1.423	0.000	-1.059	0.000
34.461	-0.010	-0.003	-2.725	108.696	-2.604	-1.493	0.000	-1.111	0.000
34.461	-0.010	-0.003	-2.725	108.696	-2.604	-1.493	0.000	-1.111	0.000
35.281	-0.008	-0.002	-4.911	105.571	-2.726	-1.563	0.000	-1.163	0.000
35.281	-0.008	-0.002	-4.911	105.571	-2.726	-1.563	0.000	-1.163	0.000
36.101	-0.006	-0.002	-7.197	100.613	-2.849	-1.633	0.000	-1.216	0.000
36.101	-0.006	-0.002	-7.197	100.613	-2.849	-1.633	0.000	-1.216	0.000
36.921	-0.004	-0.002	-9.584	93.737	-2.971	-1.703	0.000	-1.268	0.000
36.921	-0.004	-0.002	-9.584	93.737	-2.971	-1.703	0.000	-1.268	0.000
37.742	-0.003	-0.001	-12.071	84.864	-3.093	-1.773	0.000	-1.320	0.000
37.742	-0.003	-0.001	-12.071	84.864	-3.093	-1.773	0.000	-1.320	0.000
38.562	-0.002	-0.001	-14.658	73.909	-3.215	-1.843	0.000	-1.372	0.000
38.562	-0.002	-0.001	-14.658	73.909	-3.215	-1.843	0.000	-1.372	0.000
39.382	-0.001	0.000	-17.345	60.791	-3.338	-1.913	0.000	-1.424	0.000
39.382	-0.001	0.000	-17.345	60.791	-3.338	-1.913	0.000	-1.424	0.000
40.202	0.000	0.000	-20.133	45.428	-3.460	-1.984	0.000	-1.477	0.000
40.202	0.000	0.000	-20.133	45.428	-3.460	-1.984	0.000	-1.477	0.000
41.022	0.000	0.000	-23.021	27.736	-3.582	-2.054	0.000	-1.529	0.000
41.022	0.000	0.000	-23.021	27.736	-3.582	-2.054	0.000	-1.529	0.000
41.843	0.000	0.000	-26.010	7.635	-3.705	-2.124	0.000	-1.581	0.000
41.843	0.000	0.000	-26.010	7.635	-3.705	-2.124	0.000	-1.581	0.000
42.138	0.000	0.000	-27.110	-0.207	-3.749	-2.149	0.000	-1.600	0.000

Extremal Values

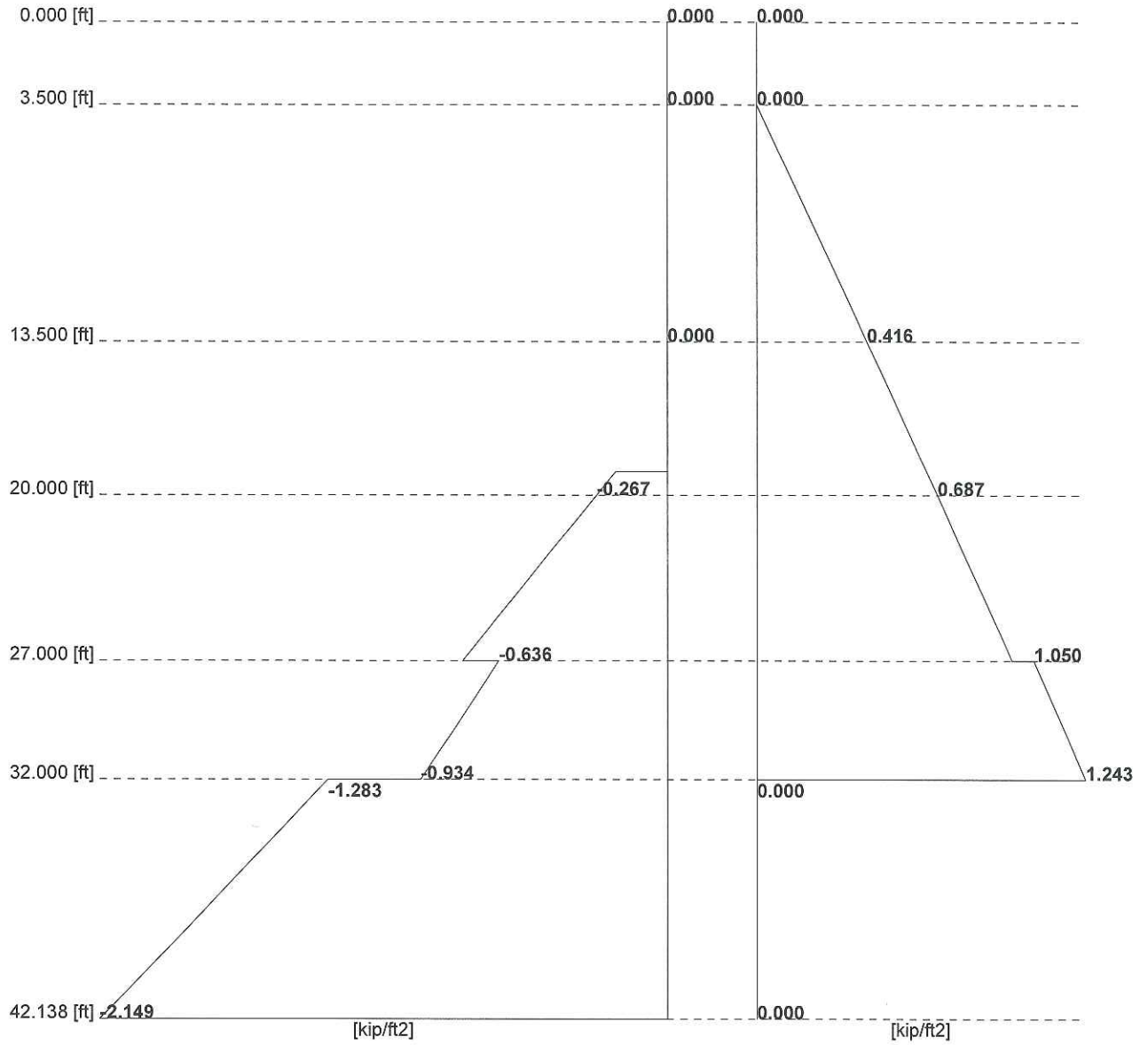
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	z Min [ft]	Min	z Max [ft]	Max
Deflection [ft]	0.000	-0.314	42.138	0.000
Cross Force [kip/ft]	42.138	-27.110	22.461	6.421
Moment [kipft/ft]	42.171	-1.098	33.411	110.150

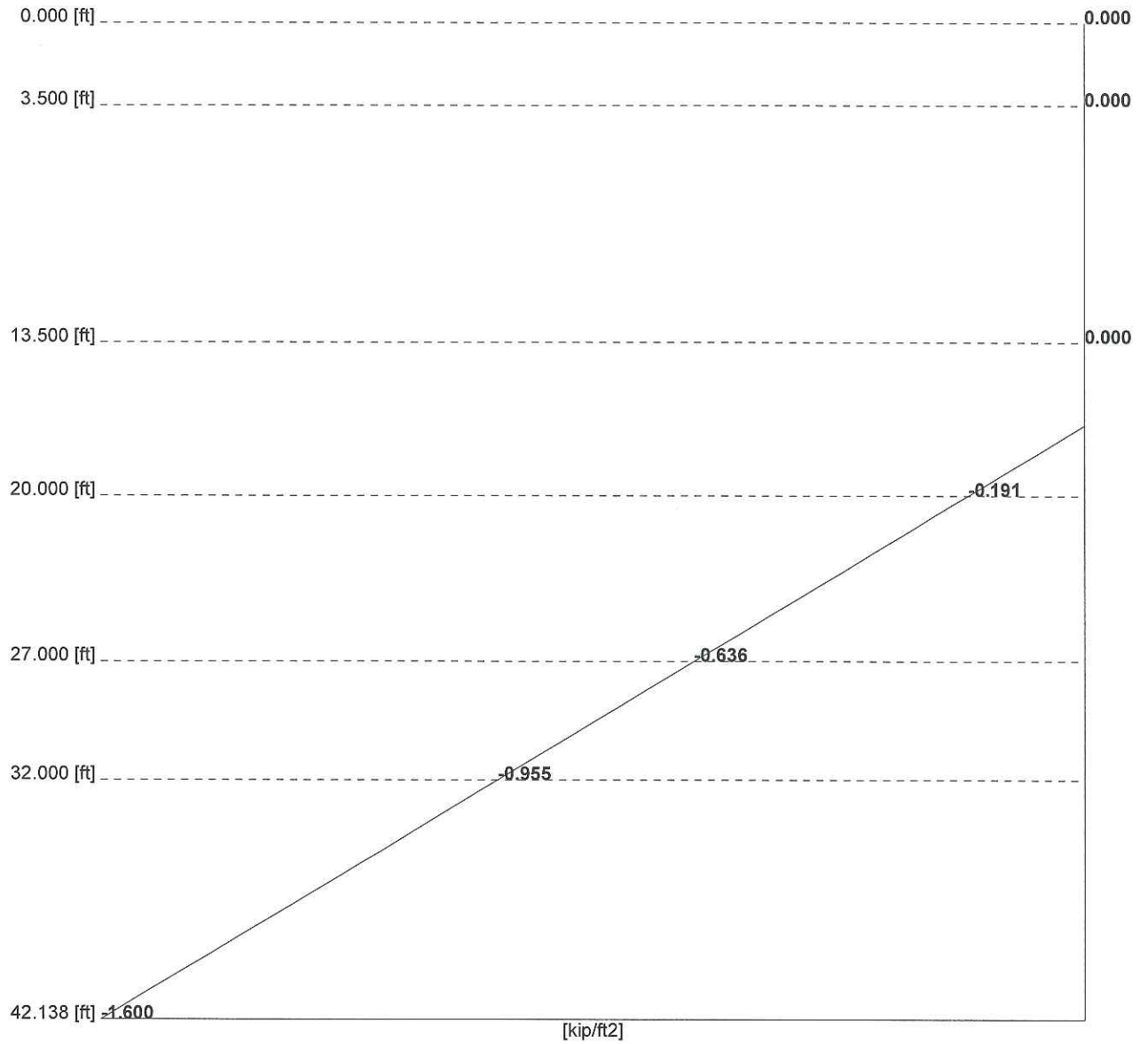
Pile Check

		Depth [ft]
Name	AZ 50	
Inertia [in4/ft]	886.494	
Modulus [in3/ft]	93.279	
Area [in2/ft]	15.222	
Mass [lbs/ft2]	51.798	
Steel Grade [lb/in2]	50000.000	
Minimal Moment [kipft/ft]	-1.098	42.171
Maxmimal Moment [kipft/ft]	110.150	33.411
Normal Forces at Max. Moment [kip/ft]	0.000	42.171
Normal Forces at Min. Moment [kip/ft]	0.000	33.411
Deflection at Min. Moment [ft]	0.000	42.171
Deflection at Max. Moment [ft]	-0.013	33.411
Min. Stress at Min. Moment [lb/in2]	-141.277	42.171
Max. Stress at Min. Moment [lb/in2]	141.277	42.171
Min. Stress at Max. Moment [lb/in2]	-14169.828	33.411
Max. Stress at Max. Moment [lb/in2]	14169.828	33.411
Safety > Req. Safety = 1.500	3.529	
Sheet Pile Top Level [ft]	0.000	
Sheet Pile Tip Level [ft]	42.982	
Sheet Pile Length [ft]	42.982	
Included OverLength [ft]	0.844	
Vertical Equilibrium [kip/ft]	0.000	
Anchor Force (horiz.) [kip/ft]	0.000	

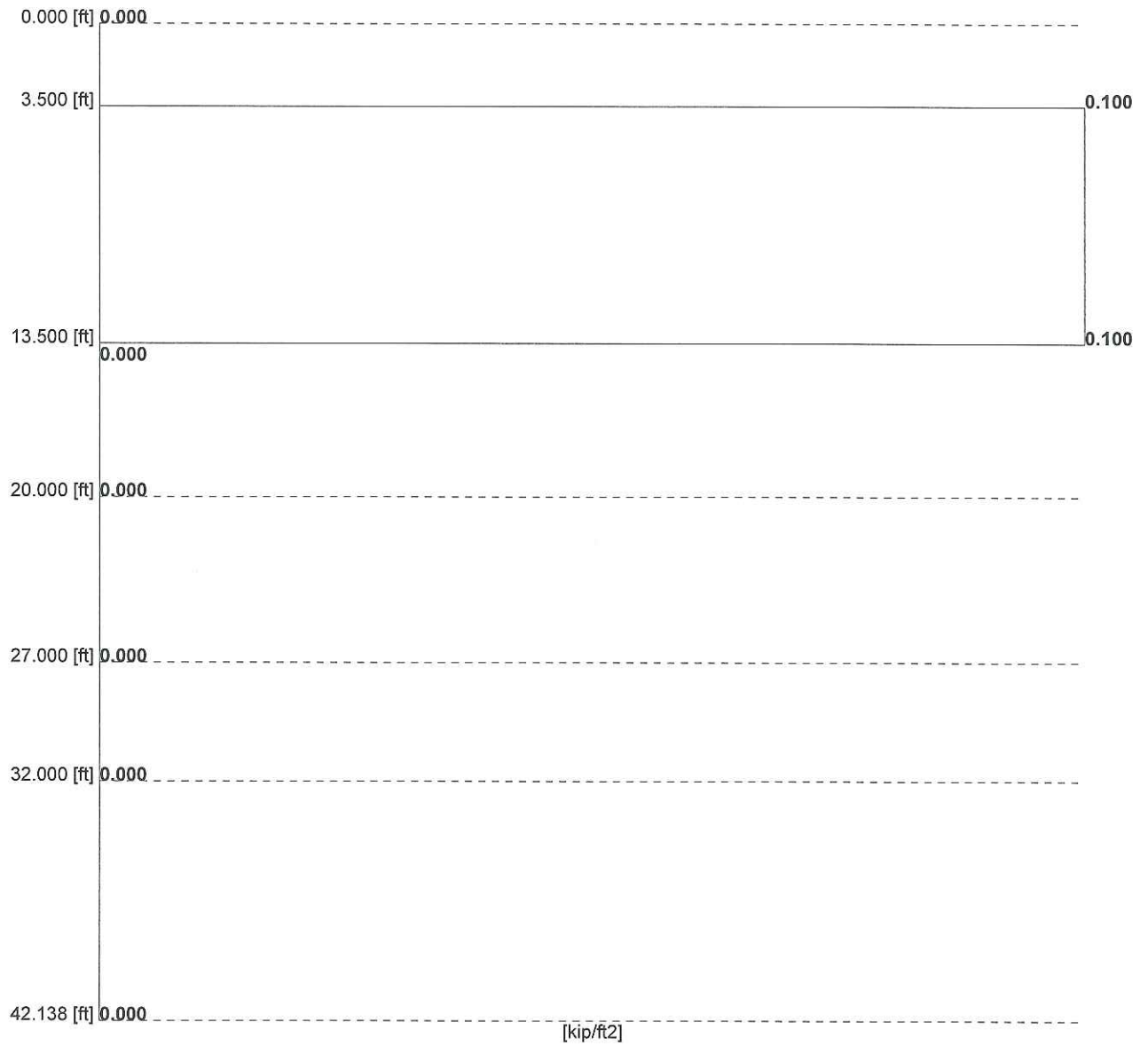
Earth Pressure Diagram



Water Pressure Diagram

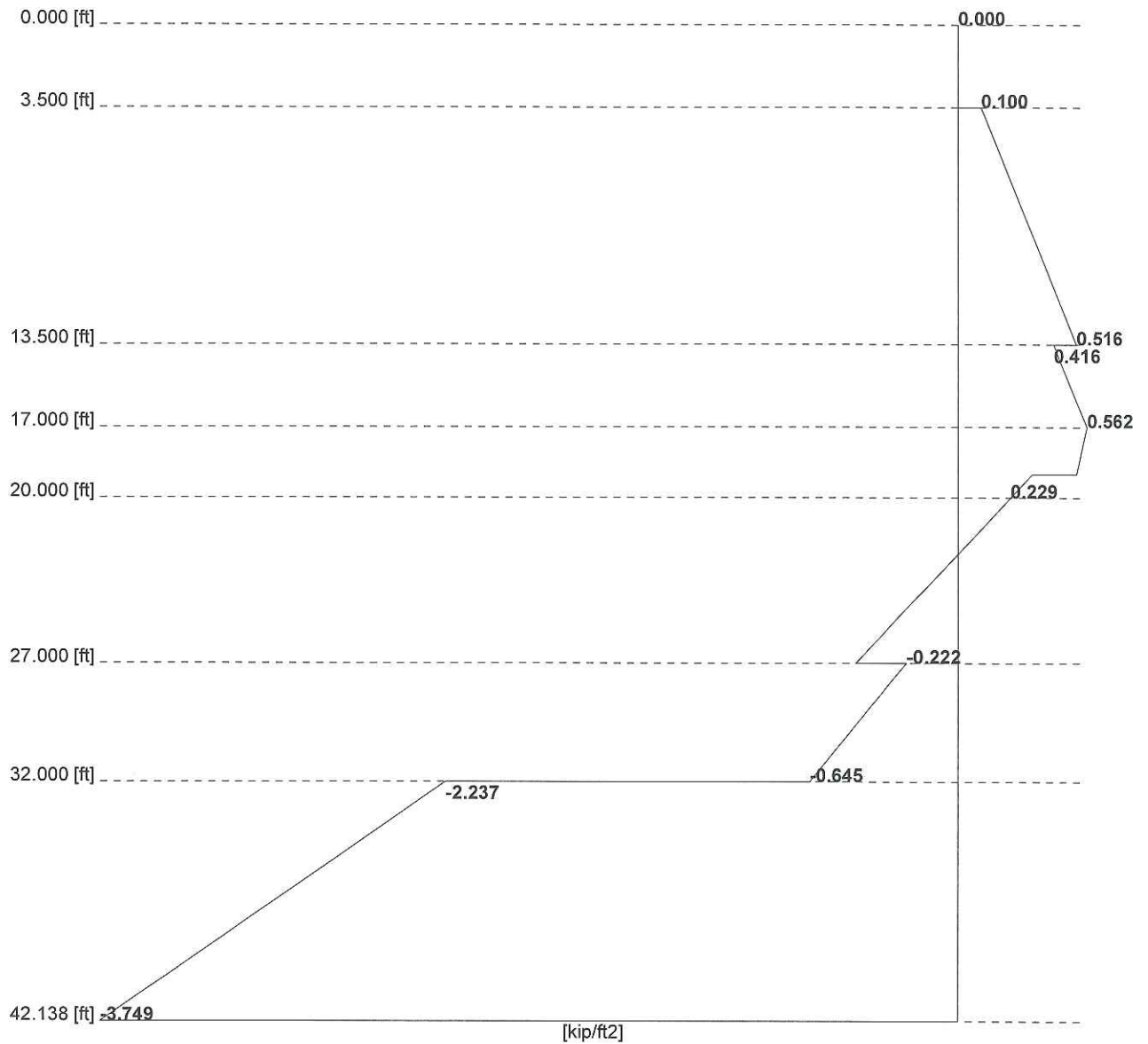


Userdefined Pressure Diagram

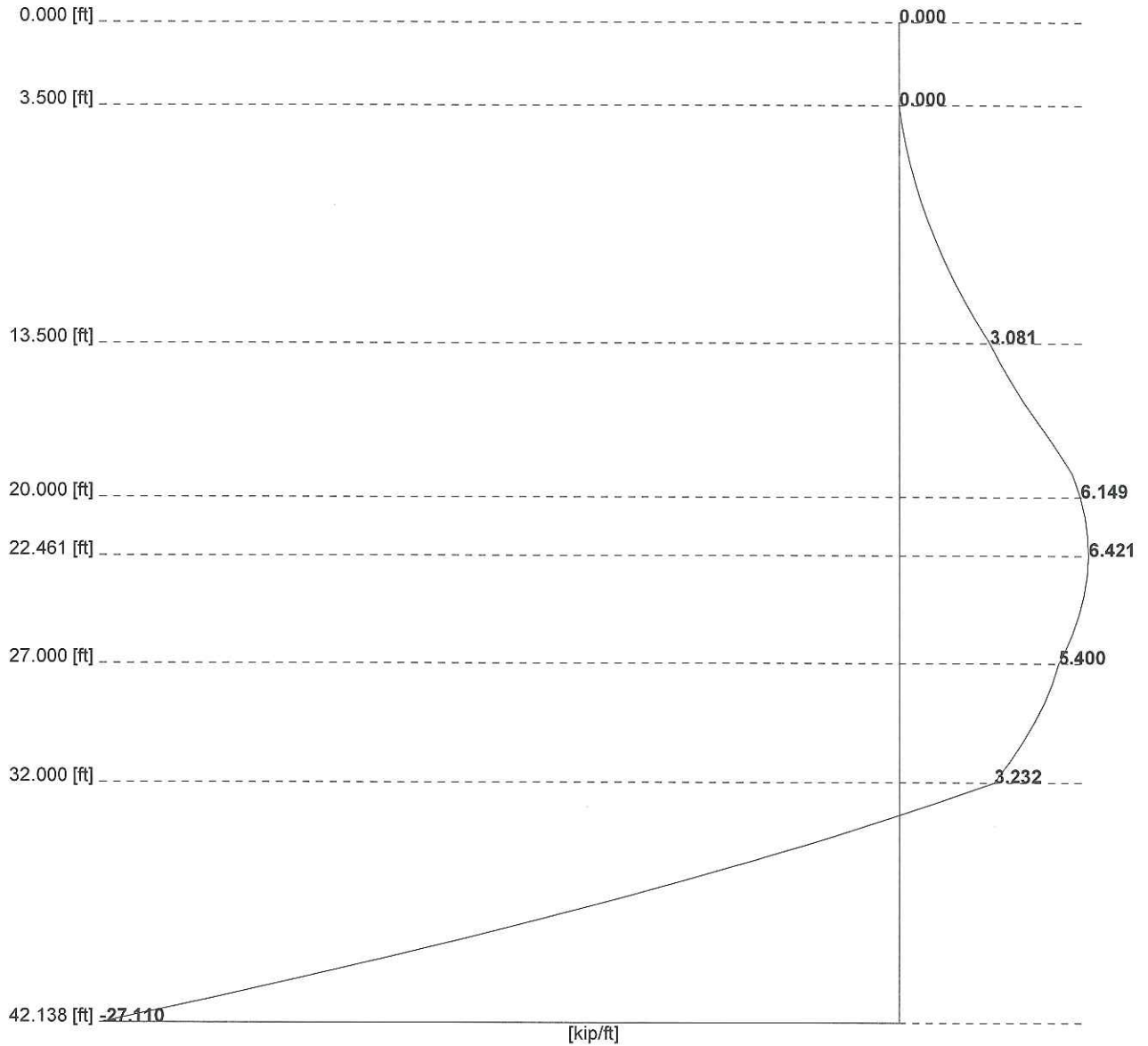


Boussinesq Diagram

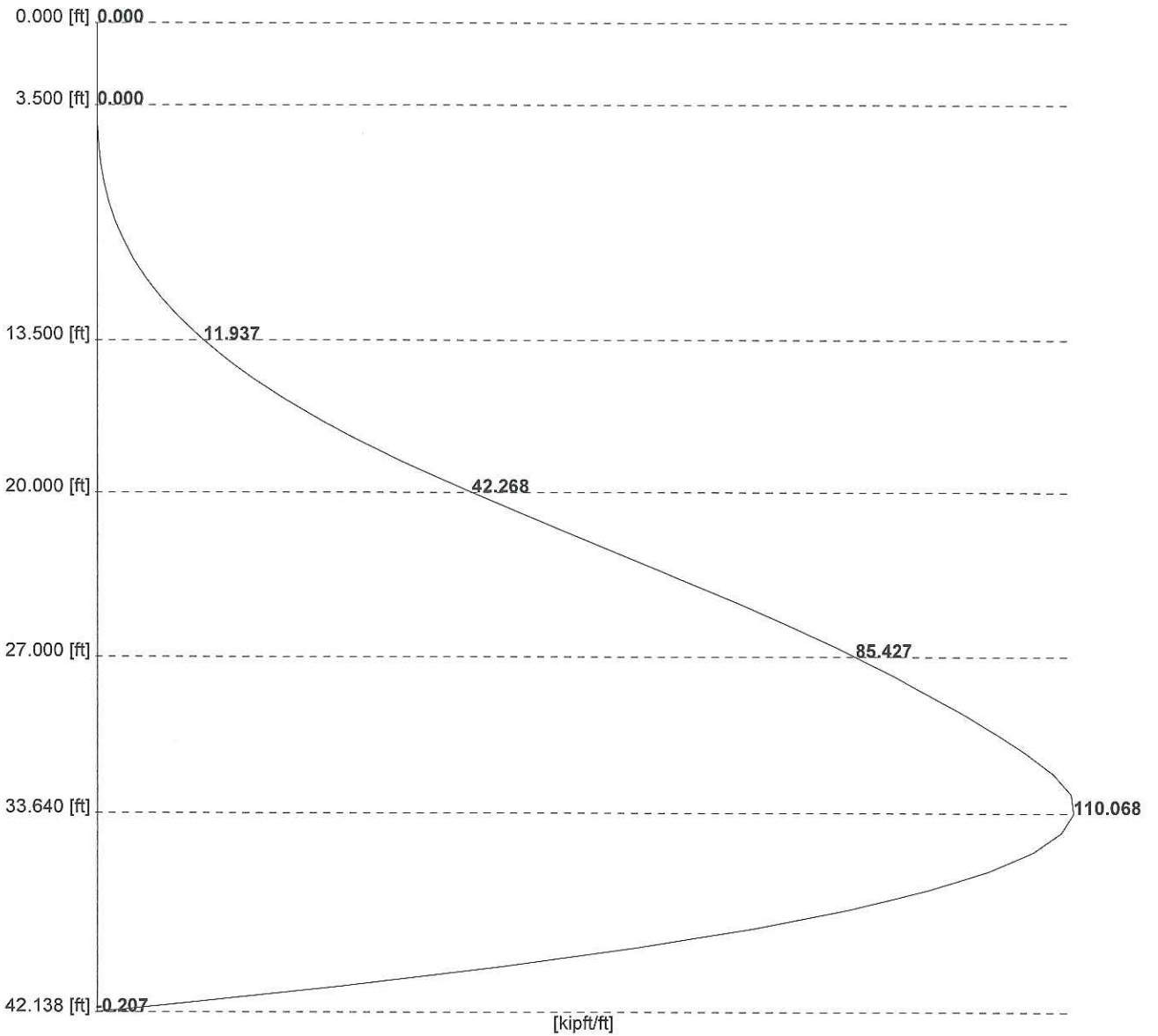
Total Pressure Diagram



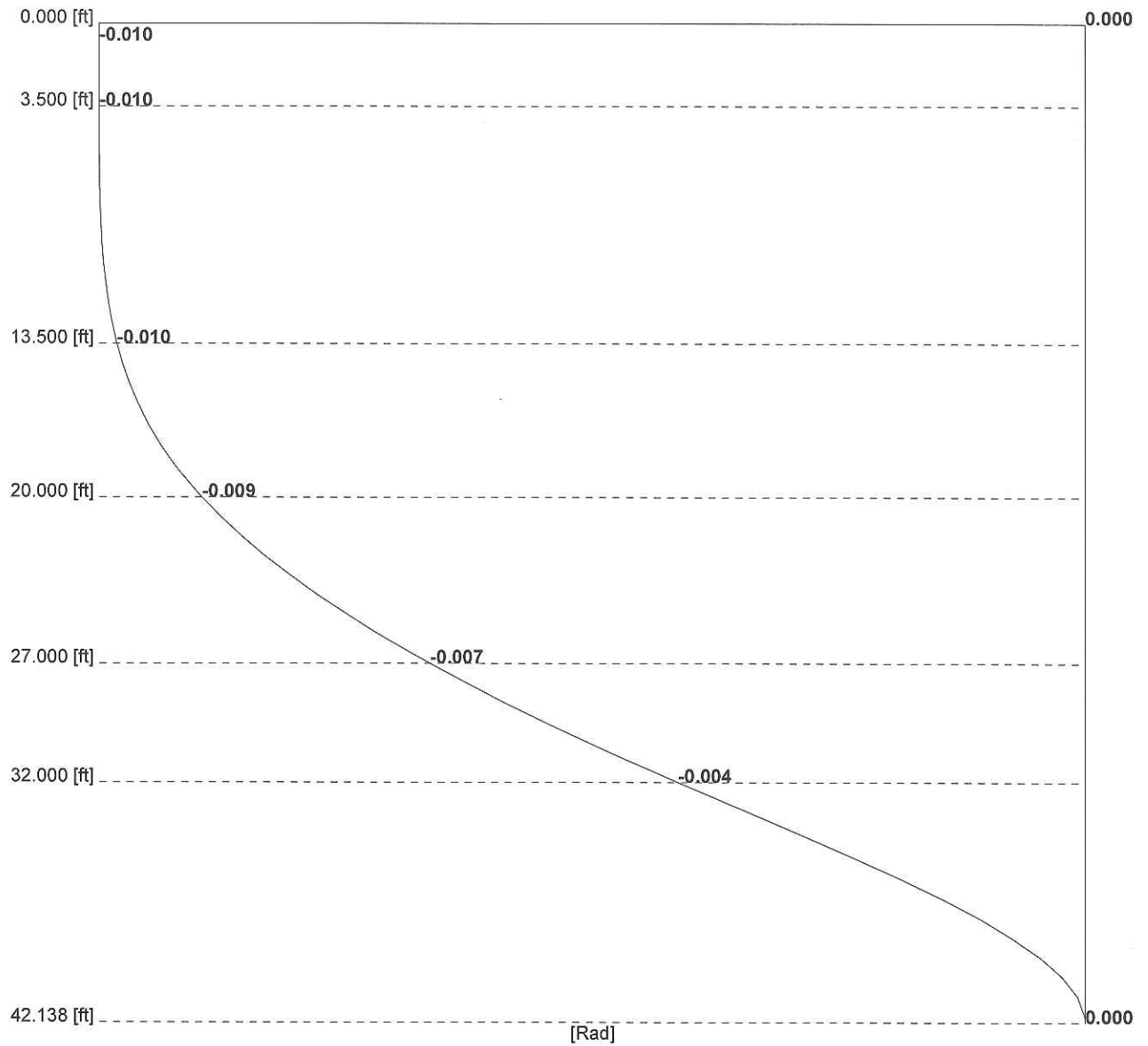
Cross Force Diagram



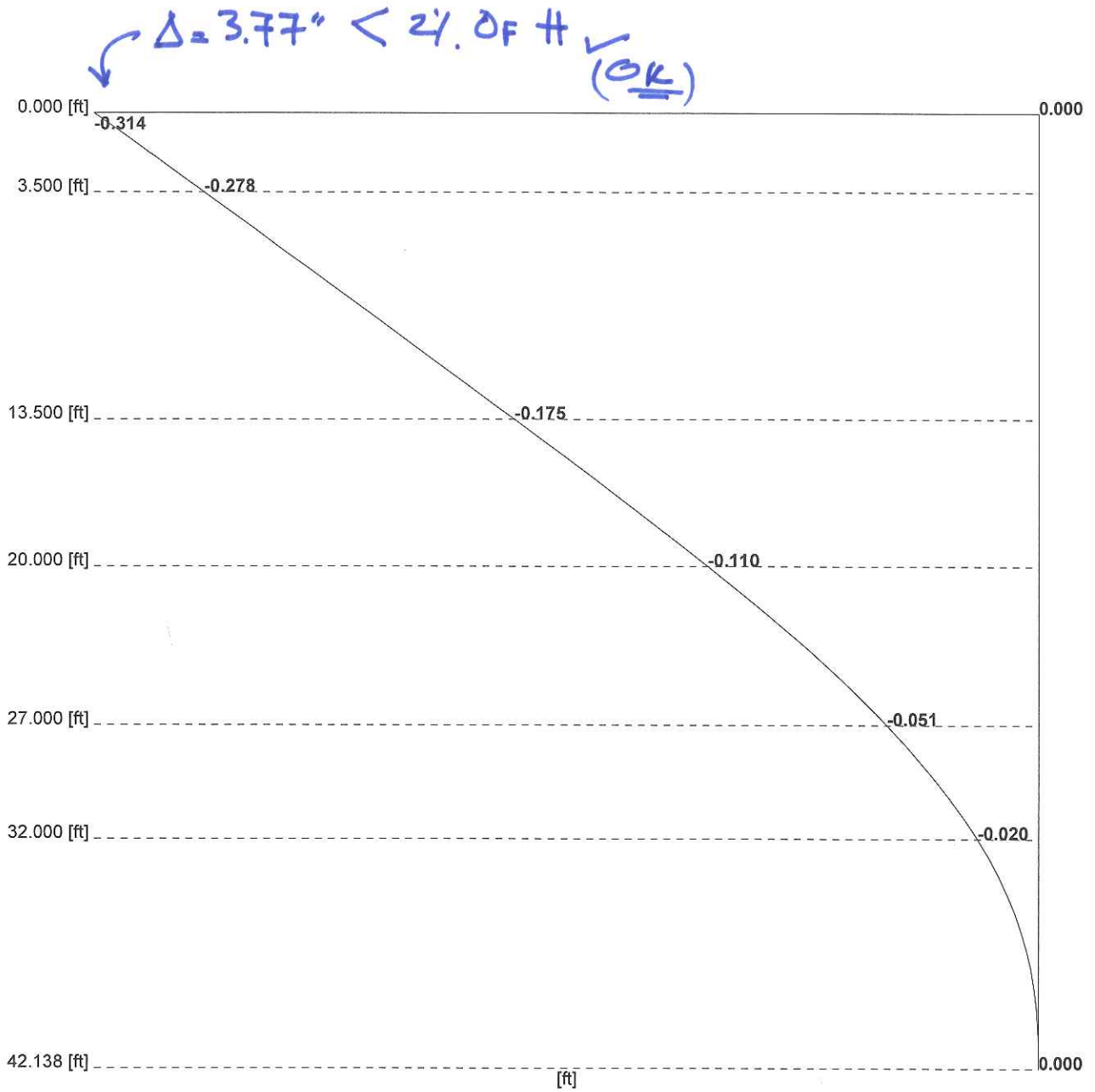
Moment Diagram



Rotation Diagram



Deflection Diagram



② STA 76+10, PILE REQ'D TIP = 22.1 - 42.14 = -20