APPENDIX H

STABILITY ANALYSES

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APPENDIX H.1

GENERAL METHODOLOGY FOR ROCK CUTSLOPE, COMPACTED FILL SLOPE, AND INTERMEDIATE PHASE I CLOSURE STABILITY ANALYSES

ENVIRONMENTAL SOLUTIONS, INC.

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GENERAL

B-18 LANDFILL

SLOPE STABILITY ANALYSIS

ENVIRONMENTAL SOLUTIONS, INC.

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SLOPE STABILITY ANALYSIS

OBJECTIVE Evaluate the static and seismic stability of the slopes for the following cases:

- Rock cuts
- Compacted fill embankments
- Temporary Phase I intermediate waste fill
- Closure conditions

REFERENCES

1- Permanent displacements of earth embankments by Newmark sliding block analysis. Franklin and Chang, U.S. Army Engineers Waterways Experiment Station, November 1977.

2. Fifth Rankine Lecture, Effects of Earthquakes on Dams and Embankments, N.M Newmark, 1965

3 A Practitioner's View of Site Effects on Strong Ground Motion. Neville Donovan. Proceedings of Conference XXII. U.S. Department of the Interior Geological Survey, Santa Fe New Mexico, July 1983.

4 Seismic Stability Evaluation for the Toe Buttress Construction, Operating Industries, Inc. Site, Montedey Park, California. Document No 120-R12-RT-EPNN-1, prepared for U.S. EPA by Woodward-Clyde Consultants

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5 ENGINEERING REPORT, CHEMICAL WASTE MANAGEMENT, INC KETTLEMAN HILLS FACILITY, LANDFILL B-19, PHASES II AND III, DONOHUE & ASSOCIATES, OCTOBER 1983.

6 SLOPE STABILITY FAILURE INVESTIGATION, LANDFILL UNIT B-19, PHASE I-A, KETTLEMAN HILLS, CALIFORNIA, SEED R.B ET AL U.C.B, July 1988

7 OPERATIONS PLAN FOR LANDFILL UNIT B-19, CWI, KETTLEMAN HILLS FACILITY, REVISION 0, JUNE 26, 1989.

8 FEASIBILITY STUDY FOR FINAL LANDFILL COVER SYSTEMS, KETTLEMAN HILLS FACILITY - DRAFT- GOLDER ASSOCIATES INC., AUGUST 1989

9 DIRECT SHEAR TESTING PROGRAM FOR LANDFILL COVER DESIGN KETTLEMAN HILLS FACILITY, GOLDER ASSOCIATES, JUNE 29, 1990

10 UPDATED EVALUATION OF SITE DESIGN GROUND MOTIONS FOR THE CWM KETTLEMAN HILLS FACILITY, GOLDER ASSOCIATES, SEPTEMBER 1988.

11 FILLING PLAN LANDFILL B-19, PHASES II AND III, KETTLEMAN HILLS FACILITY, GOLDER ASSOCIATES, MAY 1989.

12 SUPPORTING CALCULATIONS FOR THE LANDFILL B-15 CLOSURE PLAN, KETTLEMAN HILLS FACILITY, GOLDER ASSOCIATES, DECEMBER 1989

13 CLOSURE PLAN FOR LANDFILL B-16, KETTLEMAN HILLS FACILITY, KETTLEMAN CITY, CALIFORNIA, GOLDER ASSOCIATES, April 23, 1990

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14 COMBINED CLOSURE PLAN FOR LANDFILLS B-1/4/5/6/7, B-8/9/9 EXPANSION/9 EXTENSION/10/11, SURFACE IMPOUNDMENTS P-5/12/12A/13/17 AND AREA S-3. REVISION 2 - DRAFT - KETTLEMAN HILLS FACILITY, GOLDER ASSOCIATES JUNE 1990

15 DIRECT SHEAR. INTERFACE STRENGTH TESTING SELECTED GEOTEXTILE INTERFACES, GeoSerVICES INC. CONSULTING ENGINEERS, APRIL 5 1990.

16 GEOSYNTEC PROJECT G88-383, FINAL REPORT ON THE DIRECT SHEAR TESTING FOR THE WASTE MANAGEMENT, INC. NEW MILFORD, CONNECTICUT, LANDFILL, GeoSERVICES INC. CONSULTING ENGINEERS, OCTOBER 11, 1988

17 FRICTION FLEY™ APPLICATION DATA, SLT NORTH AMERICA, INC

18 DIRECT SHEAR TESTING OF FRICTION LINER MATERIALS, GUNDLE LINING SYSTEMS, INC, (SEVERAL SEPARATE REPORTS)

19 TECHNICAL GUIDANCE DOCUMENT: FINAL COVERS ON HAZARDOUS WASTE LANDFILLS AND SURFACE IMPOUNDMENTS, EPA/530-SW-89-047 JULY 1989.

20 STABL5 USER MANUAL - SCHOOL OF CIVIL ENGINEERING, INDIANA DEPARTMENT OF HIGHWAYS, RONALD A. SIEGEL, JUNE 4, 1975

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21 DYNAMIC STABILITY OF CUT SLOPES IN BEDROCK, LANDFILL B-19, GOLDER ASSOCIATES, JUNE 1989

22 Lambe, Whitman, Soil Mechanics, John Wiley & Sons, Inc, 1969

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EARTHQUAKE GROUND MOTION PARAMETERS

THE SEISMIC DESIGN OF THE B-18 LANDFILL SHOULD BE BASED ON THE MAXIMUM CREDIBLE EARTHQUAKE (MCE) ACCORDING TO 22 CAC 67108(b). THE MCE IS THE LARGEST EARTHQUAKE CONSIDERED POSSIBLE TO OCCUR ON A FAULT UNDER PRESENT GEOLOGIC CONDITIONS WITHOUT REGARD TO RECURRENCE INTERVAL.

THE IDENTIFICATION AND CHARACTERIZATION OF POTENTIAL SOURCES OF EARTHQUAKES IS PRESENTED IN REFERENCE 10

FROM REFERENCE 10, THE DOMINANT SEISMIC SOURCE IS:

- Coalinga-Type EARTHQUAKE
- North Dome SEGMENT OF THE RAMP-THRUST

- $M_S = 7.0$

- FOCAL DEPTH 10 KM

- HIGHEST POTENTIAL MEAN PEAK ACCELERATION IS 0.43g. THE 0.43g VALUE IS THE RESULT OF ADDING A FACTOR OF 20% TO THE BASE ACCELERATION OF 0.36g BECAUSE THE SOURCE STRUCTURE IS A THRUST FAULT. (REFERENCE 10)

COMPUTER PROGRAM "STABL5" DEVELOPED BY PURDUE UNIVERSITY (REFERENCE 20). THE PROGRAM CALCULATES THE FACTOR OF SAFETY AGAINST SLOPE FAILURE BY A TWO-DIMENSIONAL LIMITING EQUILIBRIUM METHOD.
THE CALCULATION OF THE FACTOR OF SAFETY AGAINST SLOPE INSTABILITY IS PERFORMED USING:

- Modified Bishop METHOD OF SLICES (CIRCULAR FAILURE SURFACES)
- Modified JANBU METHOD OF SLICES (BLOCK, WEDGE FAILURE MODE)

SEISMICALLY-INDUCED PERMANENT DISPLACEMENTS

THE AMPLITUDE OF SEISMICALLY-INDUCED PERMANENT DISPLACEMENT IS CALCULATED USING THE METHOD SUGGESTED by Newmark (REFERENCE 2) AND EXPANDED BY FRANKLIN & CHAN (REFERENCE 1). THIS METHOD OF ANALYSIS INVOLVES CALCULATING THE EARTHQUAKE-INDUCED INERTIA FORCE (THE DRIVING FORCE) ON A POTENTIAL SLIDING MASS AND COMPARING THIS DRIVING FORCE WITH THE RESISTING FORCE DUE TO THE SHEAR STRENGTH OF THE MATERIALS. THE SEISMICALLY-INDUCED PERMANENT DISPLACEMENT OF THE POTENTIAL SLIDE MASS OCCURS WHENEVER THE DRIVING FORCE EXCEED THE RESISTING FORCE. THEREFORE, IF THE AVERAGE INDUCED ACCELERATION ON A POTENTIAL SLIDE MASS IS LARGER THAN ITS YIELD ACCELERATION (THE ACCELERATION AT WHICH THE POTENTIAL MASS WILL JUST BEGIN TO MOVE), THE MOVEMENT WILL START AND STOP WHEN THE DIRECTION OF THE GROUND

ACCELERATION IS REVERSED AND THE AVERAGE ACCELERATION BECOMES LESS THAN THE YIELD ACCELERATION. BY DOUBLE INTEGRATION OF THE PART OF THE AVERAGE ACCELERATION TIME HISTORY THAT EXCEEDS THE YIELD ACCELERATION, PERMANENT DISPLACEMENTS CAN BE CALCULATED. THIS PROCEDURE IS SHOWN IN FIGURE 1.

THE YIELD ACCELERATION FOR A GIVEN SLOPE CONFIGURATION IS DETERMINED BY ESTIMATING THE HORIZONTAL EARTHQUAKE LOADING COEFFICIENT "K" WHICH RESULTS IN A PSEUDOSTATIC FACTOR OF SAFETY EQUAL TO 1.

K IS GIVEN IN TERMS OF g, THEREFORE REPRESENTS THE HORIZONTAL ACCELERATION APPLIED TO THE SLIDING MASS.

PERMANENT DISPLACEMENTS ARE CALCULATED AS A FUNCTION OF THE YIELD ACCELERATION USING FRANKLIN & CHAN UPPER BOUND ENVELOPE CURVES SHOWN IN FIGURE 2. (REFERENCE 1)
FRANKLIN AND CHAN EXPANDED NEWMARK'S DATA BASE. ALL EARTHQUAKE RECORDS WERE SCALED TO 0.5 g PEAK ACCELERATION AND 30-IN./SEC PEAK VELOCITY AND THE RESULTING SCALED PERMANENT DISPLACEMENTS ARE PLOTTED AGAINST THE RATIO N/A ON A LOGARITHMIC PLOT. IN THIS PLOT UPPER BOUND CURVES ARE PRESENTED FOR VARIOUS RANGES IN THE VALUE OF N/A WHERE N IS THE YIELD ACCELERATION AND A IS THE MAXIMUM EARTHQUAKE ACCELERATION ACTING UPON THE POTENTIAL MOVING MASS. THE PROPOSED UPPER BOUND CURVES ARE DESCRIBED IN THE LEGEND OF FIGURE 2 (UPPER RIGHT HAND CURVES)

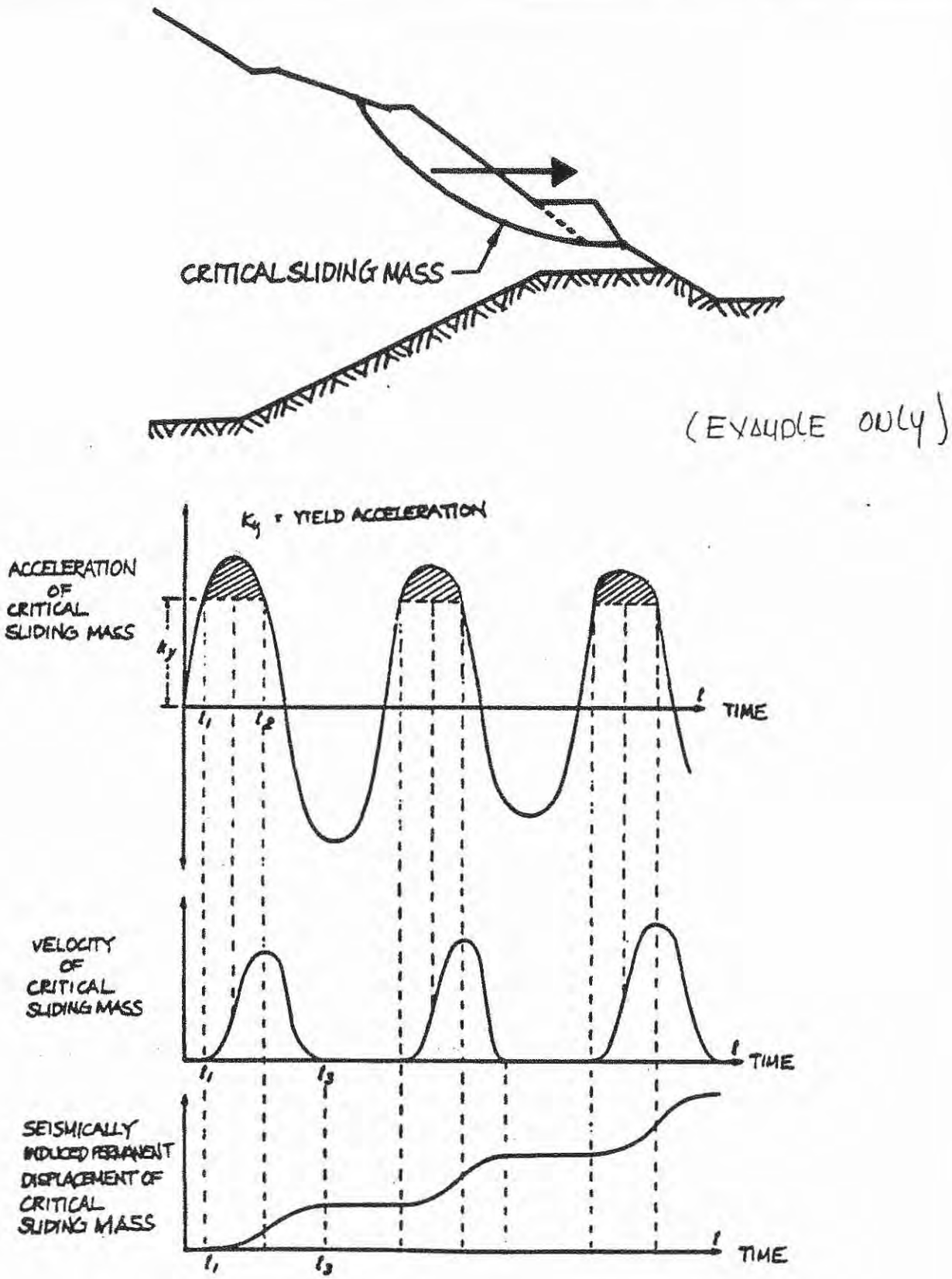
CRITICAL SLIDING MASS
(EXAMPLE ONLY)
K_y = YIELD ACCELERATION
ACCELERATION OF CRITICAL SLIDING MASS
K_y
t_1
t_2
t
TIME
VELOCITY OF CRITICAL SLIDING MASS
t_1
t_3
t
TIME
SEISMICALLY INDUCED PERMANENT DISPLACEMENT OF CRITICAL SLIDING MASS
t_1
t_3
t
TIME

FIGURE 1

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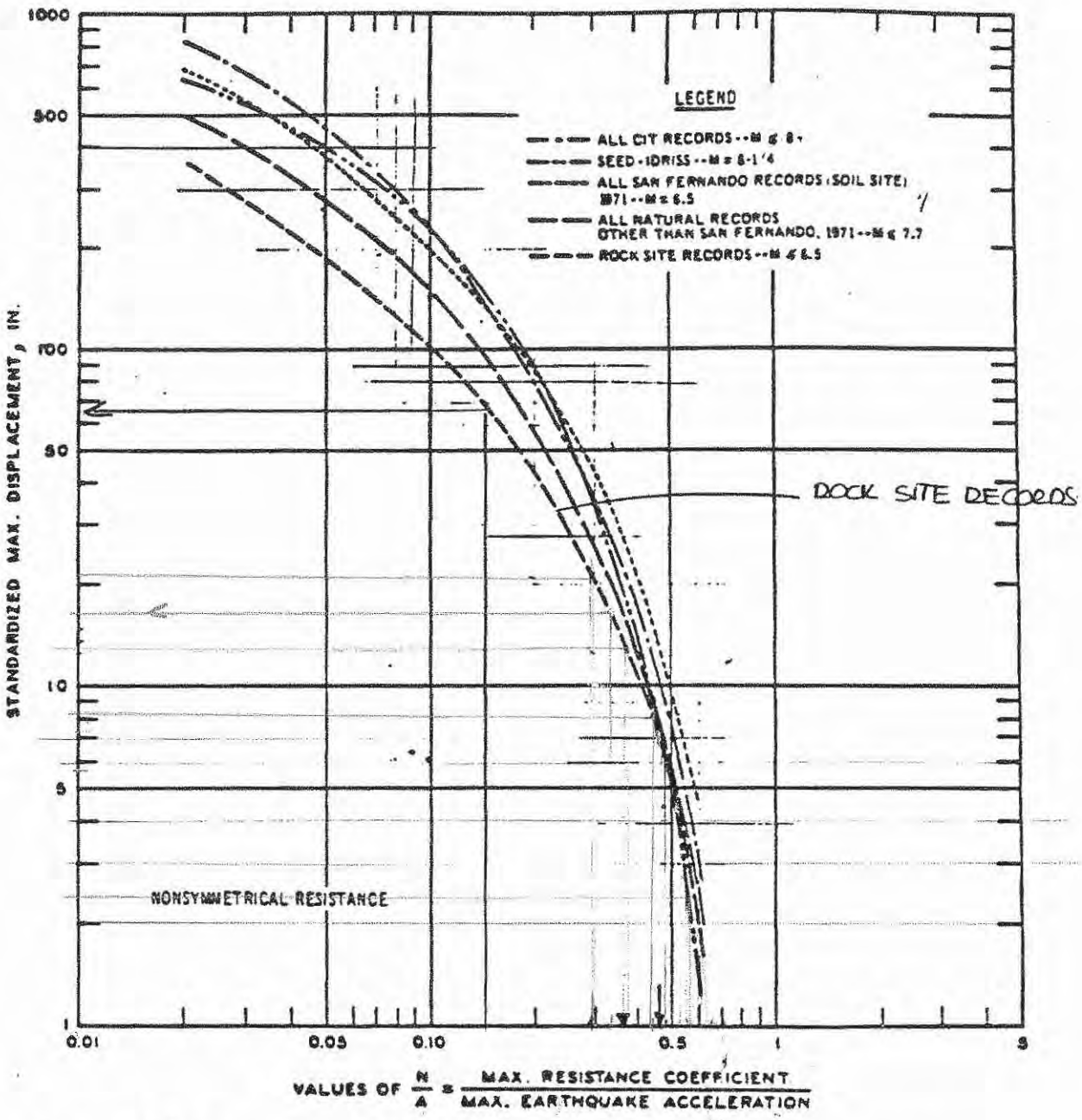

Figure 16. Upper bound envelope curves of permanent displacements for all natural and synthetic records analyzed

(REFERENCE 1)

FIGURE 2

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SOIL PROFILE AVAILABLE SUBSURFACE INFORMATION AND SITE GEOLOGY INDICATE THAT THE B-18 SITE IS CONSIDERED AS A "ROCK" SITE. CONSEQUENTLY THE UPPER BOUND CURVE IN FIGURE 2 DESIGNATED AS ROCK SITE RECORDS IS USED IS THIS ANALYSIS.

ANALYSIS PROCEDURE

THE PROCEDURE TO OBTAIN UNSCALED PERMANENT DISPLACEMENTS FOR A GIVEN SLOPE CONFIGURATION IS AS FOLLOWS:

OBTAIN K_y (YIELD ACCELERATION) BY USING STABL 5 COMPUTER PROGRAM. K VARIES TO OBTAIN A S.F = 1

↓

ASSUME THREE DIFFERENT VALUES OF A (A_1, A_2 & A_3). A IS THE MAXIMUM GROUND ACCELERATION

↓

OBTAIN $\frac{K_y}{A_1}$, $\frac{K_y}{A_2}$, $\frac{K_y}{A_3}$

↓

$K_y = N \Rightarrow$ WITH $\frac{N}{A_1}$, $\frac{N}{A_2}$ AND $\frac{N}{A_3}$ ENTER FIGURE 2.

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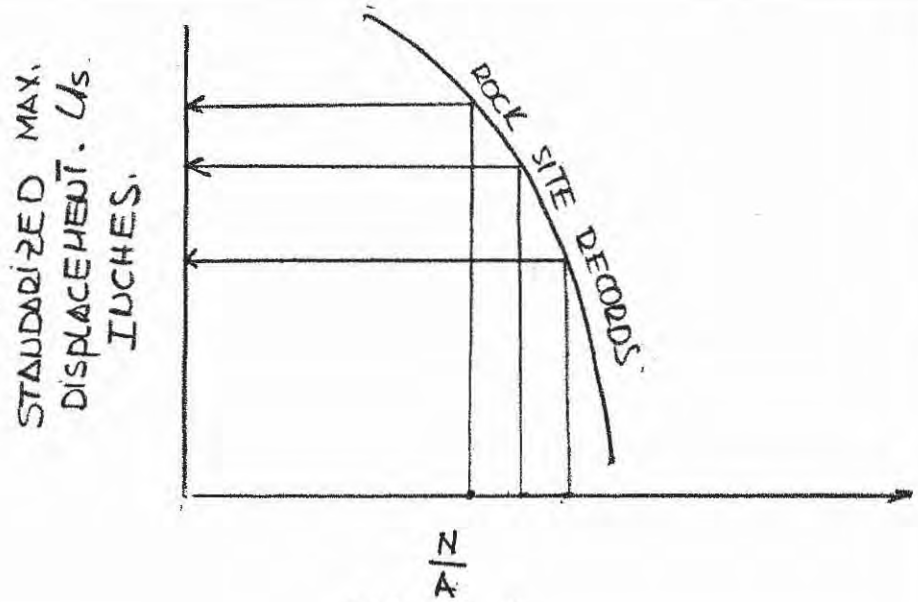
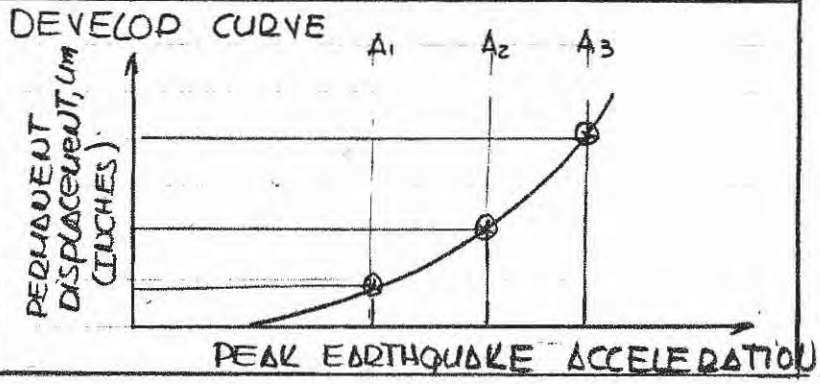


FIGURE 2

OBTAIN PERMANENT DISPACEMENT VALUES BASED ON:

- $\frac{V}{A} = 30$ (SITE SPECIFIC PARAMETER)
- $U_m = U_s \frac{V^2}{1,800 A}$ (FROM REFERENCE 1)

DEVELOP CURVE



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VELOCITY / ACCELERATION (V/A) RATIO

From REFERENCE 3. Donovan proposes relationships for site dependent $\frac{V}{A}$ ratios. Range of $\frac{V}{A}$ values for rock and soil sites are shown in FIGURE 3

A conservative estimate of $\frac{V}{A}$ ratio for the KHF is obtained by

$$\left(\frac{V}{A}\right)_{KHF} = \frac{\left(\frac{V}{A}\right)_{\text{AVERAGE ROCK SITES}} + \left(\frac{V}{A}\right)_{\text{AVERAGE SOIL SITES}}}{2}$$

$$\left(\frac{V}{A}\right)_{KHF} = \frac{37 + 23}{2} = 30$$

⇒ ESTIMATE PERMANENT DISPLACEMENTS FOR A RANGE OF PEAK GROUND ACCELERATIONS (.3g to .5g) FOR THE SITE SPECIFIC $\frac{V}{A}$ RATIO OF 30.

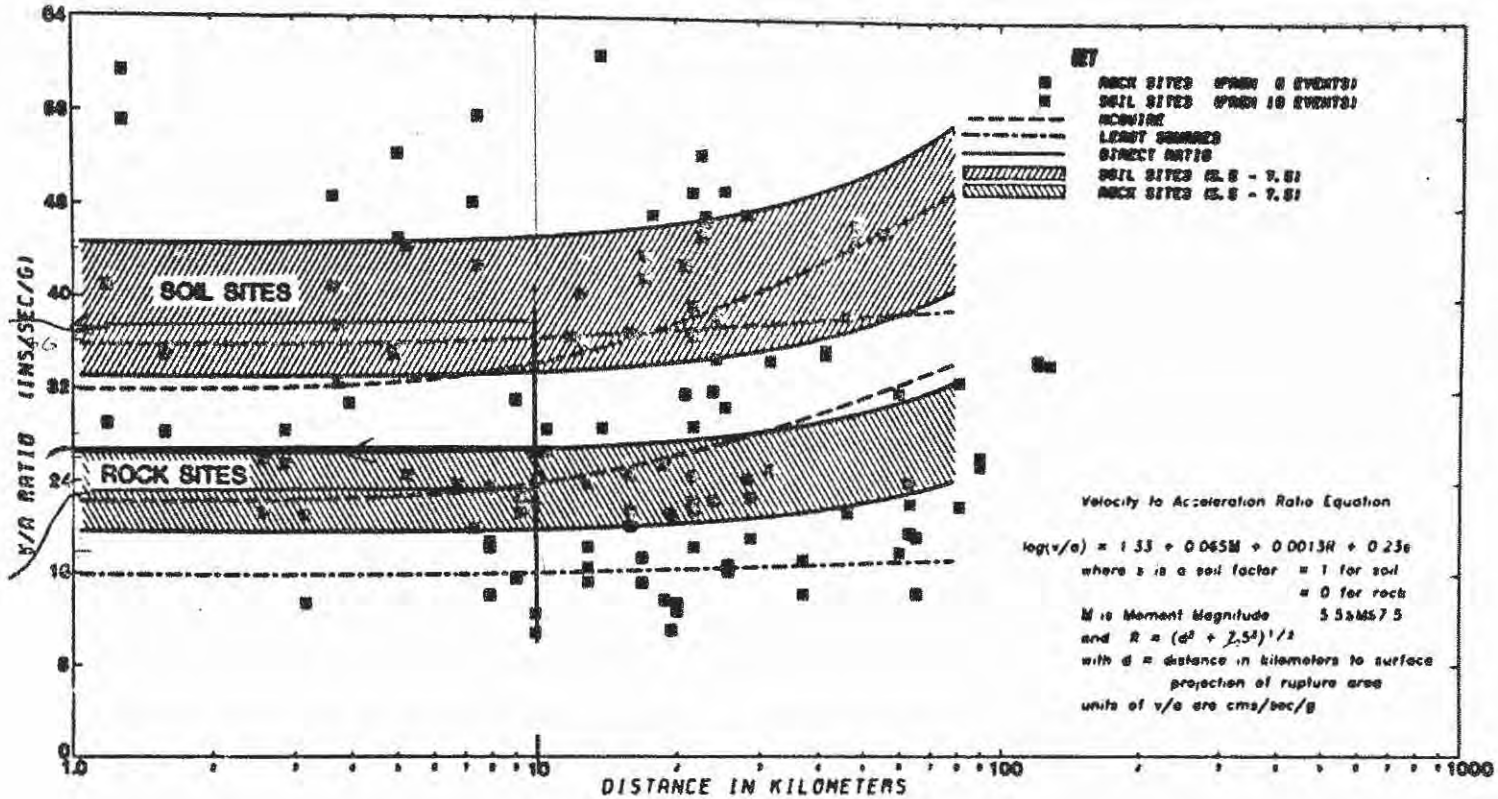

Figure 3. Measured velocity/acceleration (V/A) ratios and derived V/A equations. Shaded areas show range of values obtained using equation for rock and soil sites.

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UNSCALED PERMANENT DISPLACEMENTS

FROM REFERENCE 1 (PAGE 20)

$$U_m = U_s \cdot \frac{V^2}{1{,}800\ A}$$

U_m = UNSCALED PERMANENT DISPLACEMENT
A = MAXIMUM GROUND ACCELERATION
V = MAXIMUM GROUND VELOCITY
U_s = STANDARDIZED MAXIMUM DISPLACEMENT (FROM FIG 2)

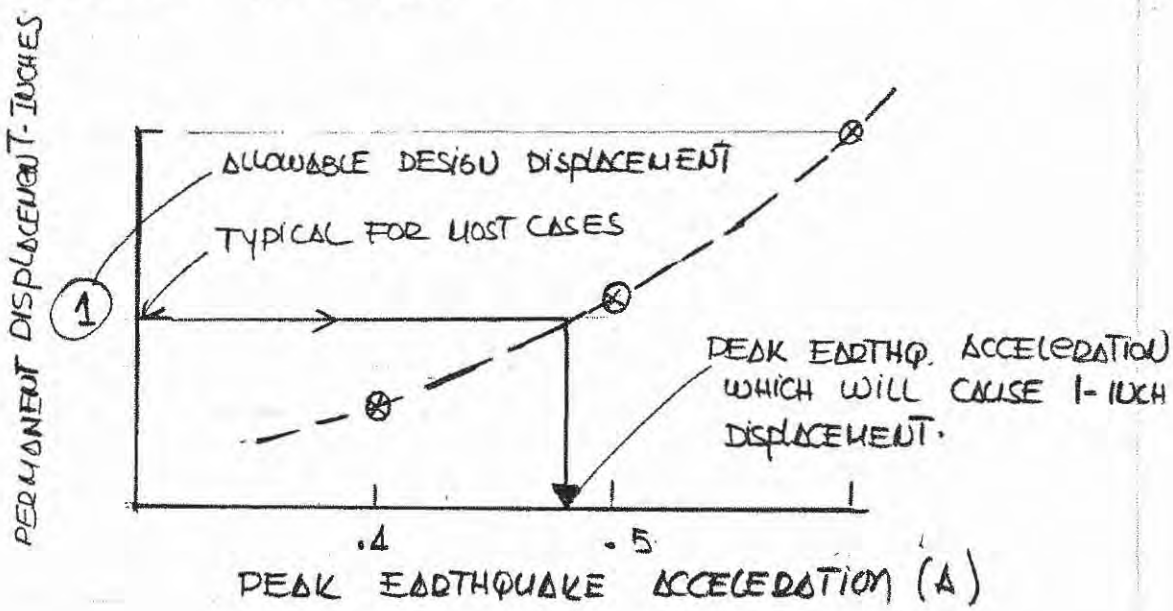
FOR $\frac{V}{A} = 30$

$$\boxed{V = 30 \cdot A}$$

A	V (INCH/sec)	$U_m = U_s \cdot \frac{V^2}{1800A}$
.3	9.0	$U_m = .15\ U_s$
.4	12.0	$U_m = .20\ U_s$
.5	15.0	$U_m = .25\ U_s$
.6	18.0	$U_m = .30\ U_s$
.7	21.0	$U_m = .35\ U_s$

ALLOWABLE DESIGN DISPLACEMENT FOR THE MCE

FOR EACH CONDITION THE PEAK EARTHQUAKE ACCELERATION WHICH WILL CAUSE THE ALLOWABLE DESIGN DISPLACEMENT IS ESTIMATED AS FOLLOWS

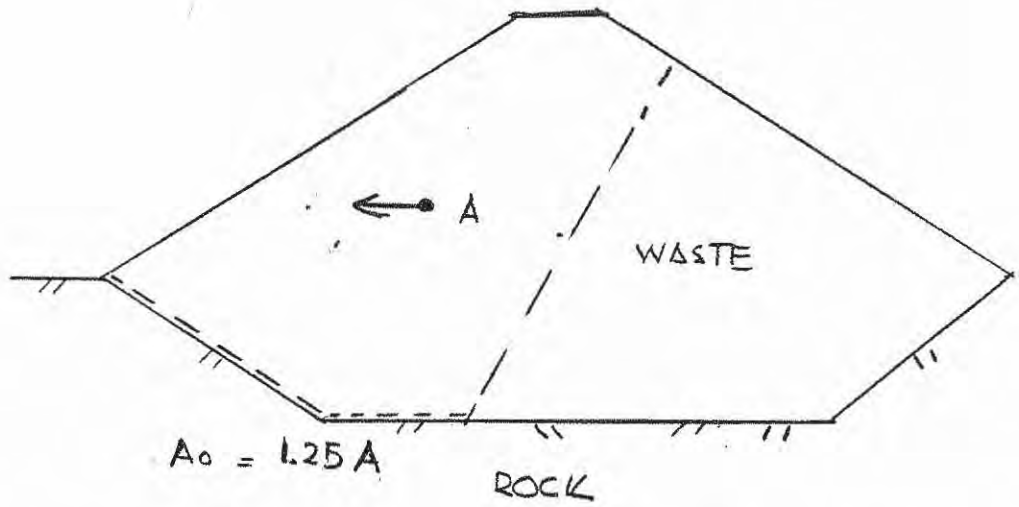


BECAUSE OF THE WAY SEISMIC WAVES PROPAGATE, ATTENUATION FACTORS ARE CONSIDERED TO TAKE INTO ACCOUNT THE EFFECT OF THE WASTE PILE ON THE SEISMIC DEFORMATIONS.

FOR DEEP FAILURE MODE, THE ACCELERATION IN THE SLIDING MASS IS ASSUMED TO BE .8 TIMES THE PEAK BASE ACCELERATION (A_0)

$$A = .8\,A_0$$

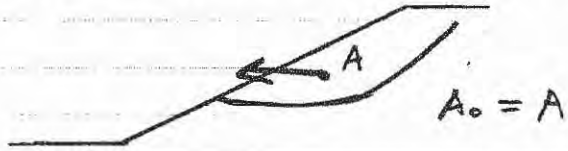
OR $A_o = 1.25\ A$



THIS RELATIONSHIP IS CONSERVATIVE BASED ON THE RESULTS OF DYNAMIC RESPONSE ANALYSIS FOR THE OPERATING INDUSTRIES LANDFILL (REFERENCE 4) FOR 0.50 g AND 0.25 g AS SHOWN IN FIGURES 5 AND 6 RESPECTIVELY.

- NOTE THAT FOUNDATION CONDITIONS FOR BOTH LANDFILLS ARE SIMILAR. REUSER WASTE MATERIALS WILL BE PLACED AT THE B-18 LANDFILL, THEREFORE A HIGHER ATTENUATION FACTOR IS CONSIDERED (.8 AS OPPOSED TO .7 FOR .25 g)

- THE ACCELERATION IN THE SLIDING MASS (A) IS ASSUMED TO BE THE SAME AS THE PEAK BASE ACCELERATION FOR SHALLOW FAILURE MODE SUCH AS THE COVER LINER SLIDING. (SEE FIGURE 6)



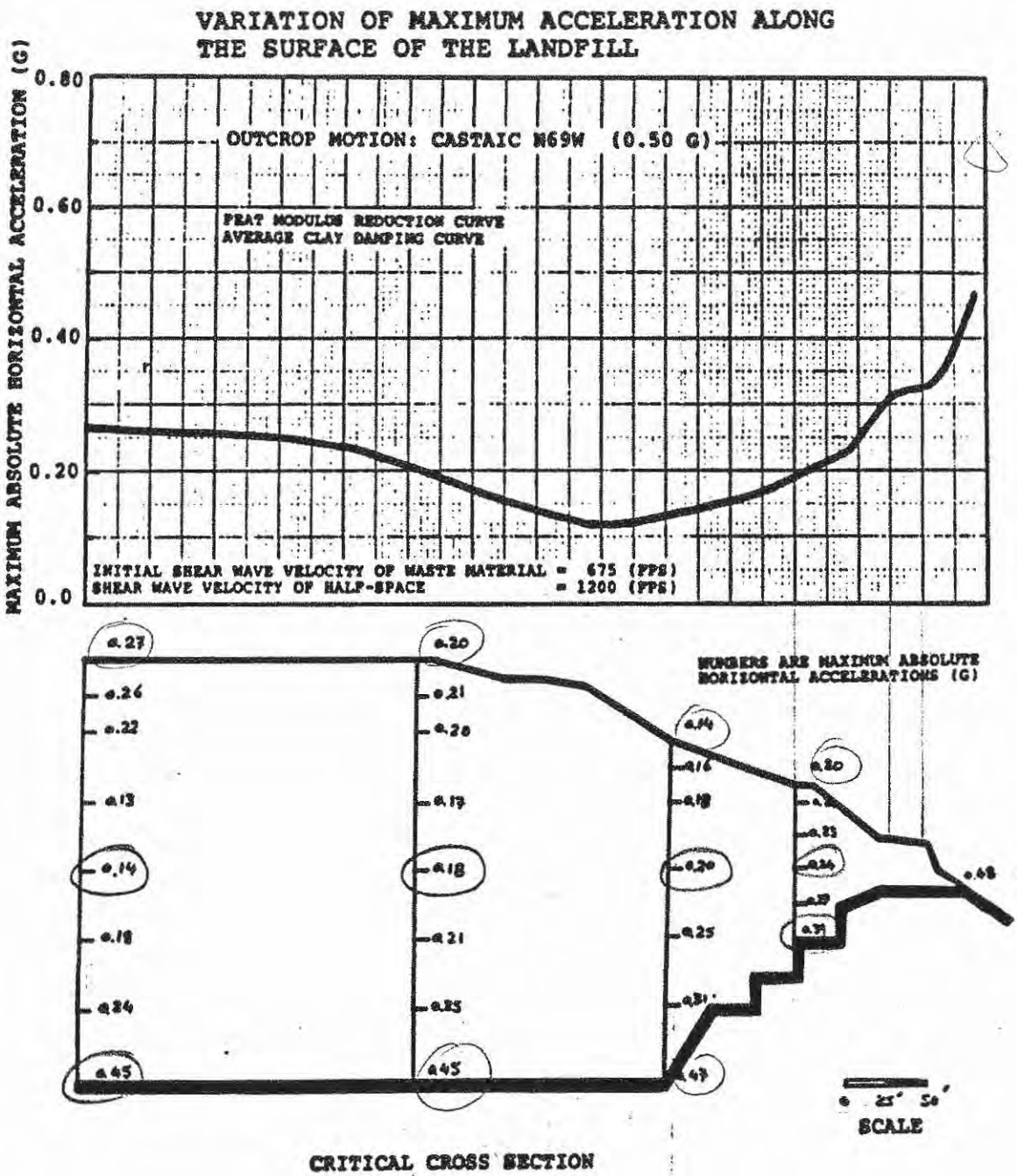
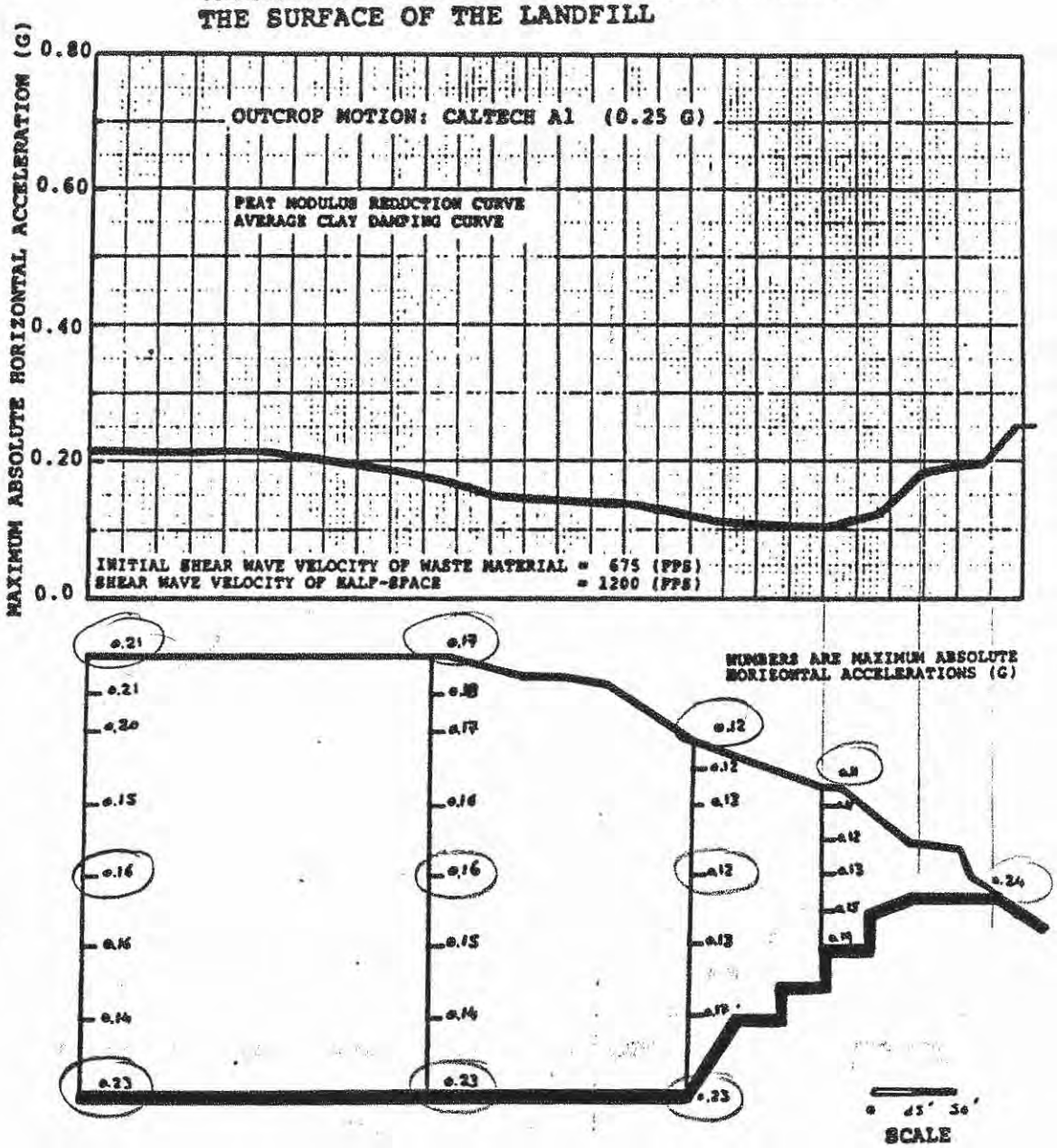


FIGURE 5

Project: OPERATING INDUSTRIES LANDFILL Project No. 120R12	RESULTS OF DYNAMIC RESPONSE ANALYSIS – CASE 1	Fig. E-5

VARIATION OF MAXIMUM ACCELERATION ALONG THE SURFACE OF THE LANDFILL

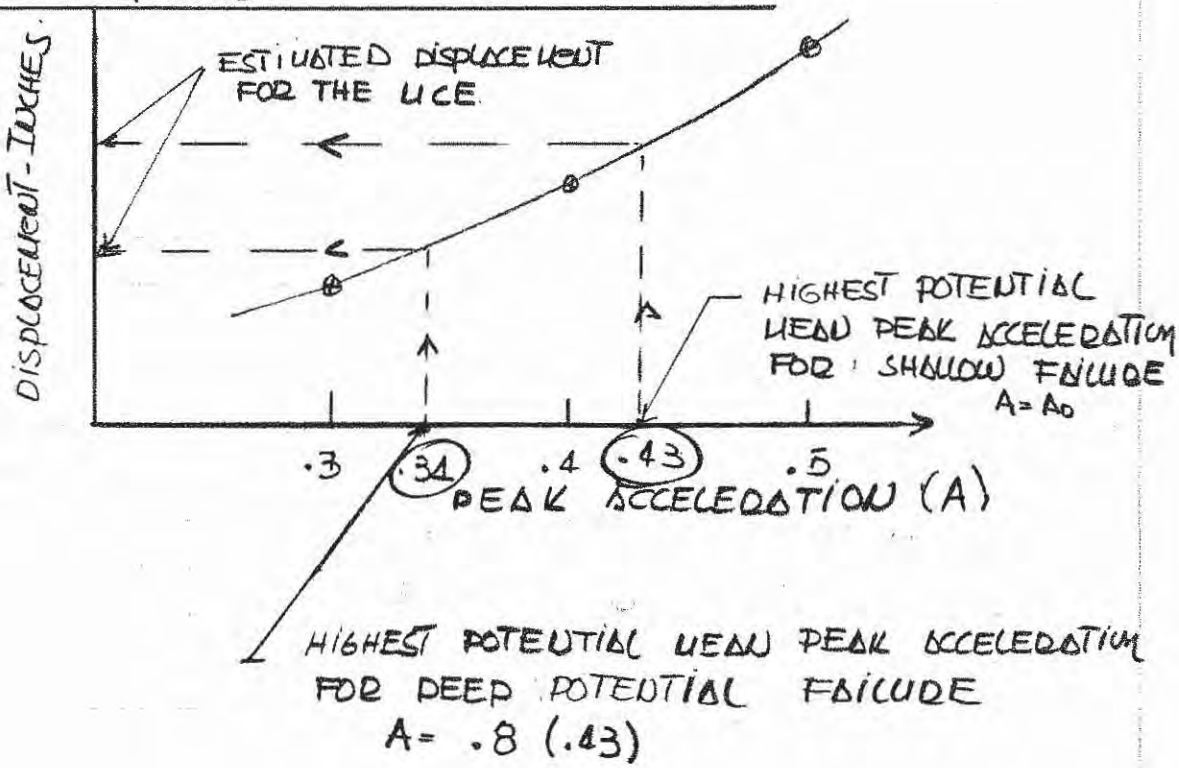


CRITICAL CROSS SECTION

FIGURE 6

Project: OPERATING INDUSTRIES LANDFILL Project No. 120R12	RESULTS OF DYNAMIC RESPONSE ANALYSIS – CASE 3	Fig. E-7

ESTIMATED DISPLACEMENT FOR THE MCE



RISK ASSESSMENT FOR DYNAMIC CONDITIONS

A PROBABILISTIC ASSESSMENT OF DESIGN GROUND MOTIONS FOR THE KETTLEMAN HILLS FACILITY IS PRESENTED IN REFERENCE 10 (GOLDER ASSOCIATES)

FIGURE 4 (FROM REFERENCE 10) PRESENTS THE RELATIONSHIP BETWEEN THE PROBABILITY OF EXCEEDANCE AND PEAK ACCELERATION (g) FOR TIME PERIODS OF 1, 20, AND 50 YEARS.

BASED ON THIS FIGURE THE PROBABILITY OF EXCEEDANCE

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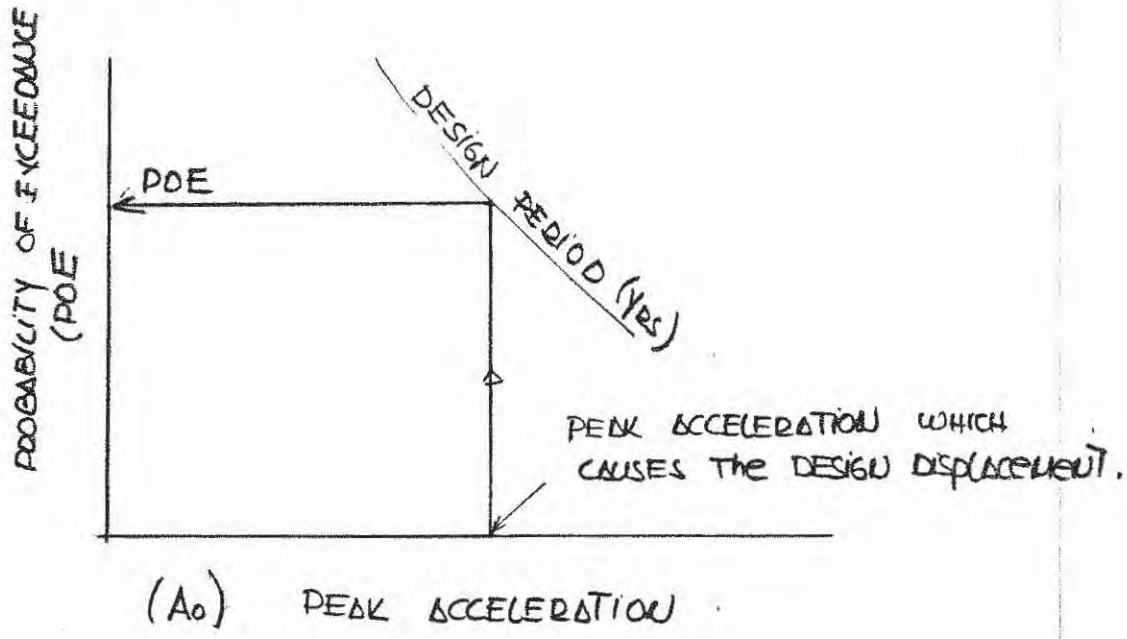
(POE) FOR THE ALLOWABLE DESIGN DISPLACEMENT IS ESTIMATED.

AS SHOWN IN FIGURE 4:



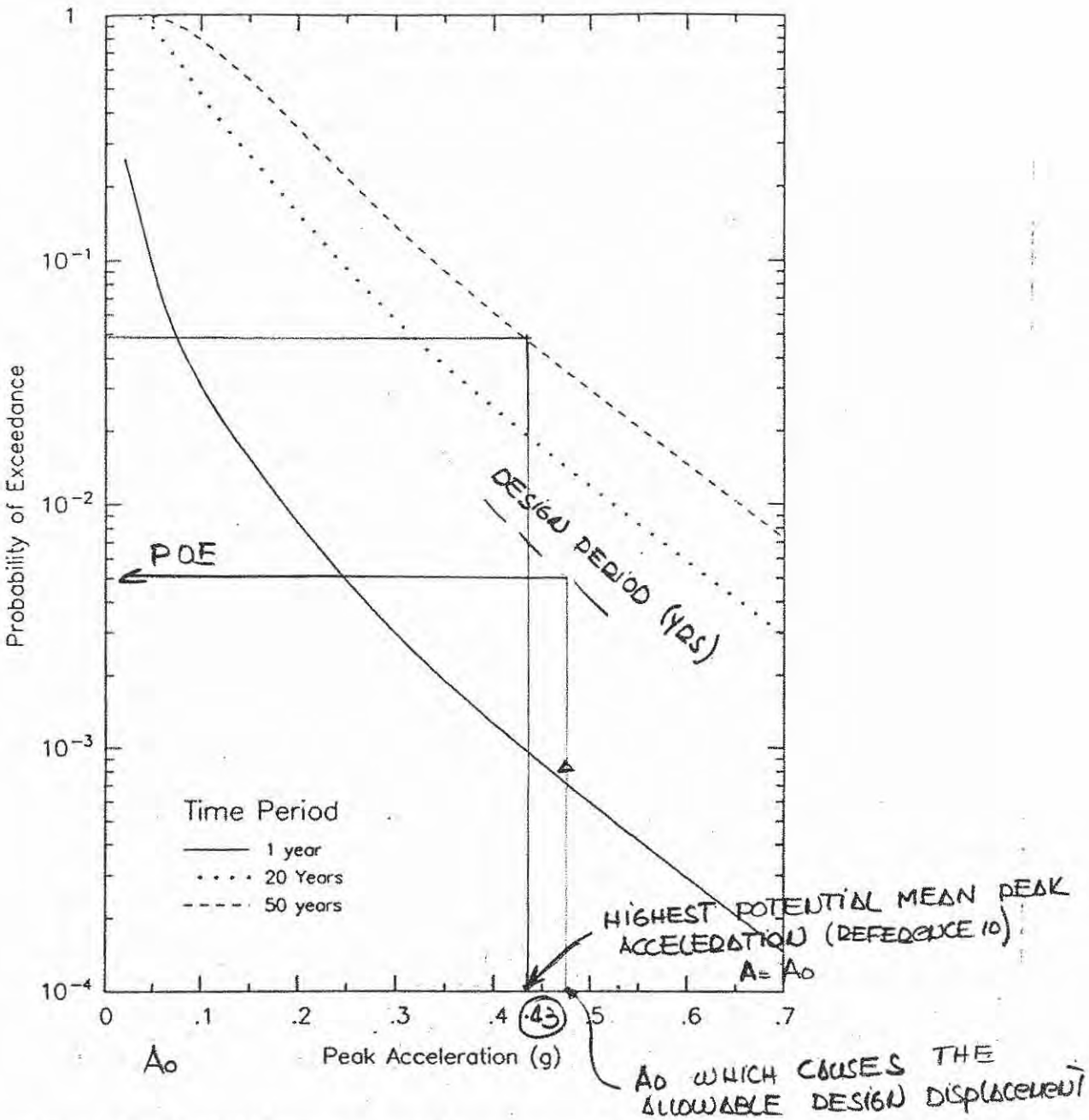


Figure 3. Probability of exceedance as a function of time period

FIGURE 4

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CASES TO BE ANALYZED

I - ROCK CUTS

a- 2:1 SLOPES WITH POTENTIAL SLIDING ACCROSS BEDDING PLANES

b -3:1 SLOPES WITH POTENTIAL SLIDING ALONG BEDDING PLANES.

II COMPACTED FILL EMBANKMENTS

a- RUNOFF RETENTION BASIN

b. Small EMBANKMENT TO COMPLETE PHASE I/II BERM

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III TEMPORARY PHASE I INTERMEDIATE WASTE FILL

a- WEDGE MOVEMENT ALONG THE LINER SURFACE
- ENTIRELY ALONG INTERFACE
- THROUGH WASTE AT BASE / BERM INTERSECTION

b- CIRCULAR FAILURE WITHIN THE WASTE
- WITH WASTE STRENGTH: $\phi = 31°$, $c = 0$
- WITH WASTE STRENGTH $\phi = 27°$, $c = 300$ psf

IV FINAL CLOSURE CONDITIONS

a- 3.6 : 1 SLOPE BETWEEN BENCHES (INFINITE SLOPE MODEL)

1- AT CLAY / OPERATION LAYER INTERFACE

2- AT ROUGHENED HDPE / CLAY INTERFACE

3- AT GEOCOMPOSITE / ROUGHENED HDPE INTERFACE (NO COHESION ALLOWANCE)

4- AT GEOCOMPOSITE / ROUGHENED HDPE INTERFACE ($c = 50$ psf)

b- WEDGE MOVEMENT ALONG THE LINER SURFACE.

1- ENTIRELY ALONG INTERFACE

2- THROUGH WASTE AT BASE / SLOPE INTERSECTION.

c- CIRCULAR FAILURE WITHIN THE WASTE

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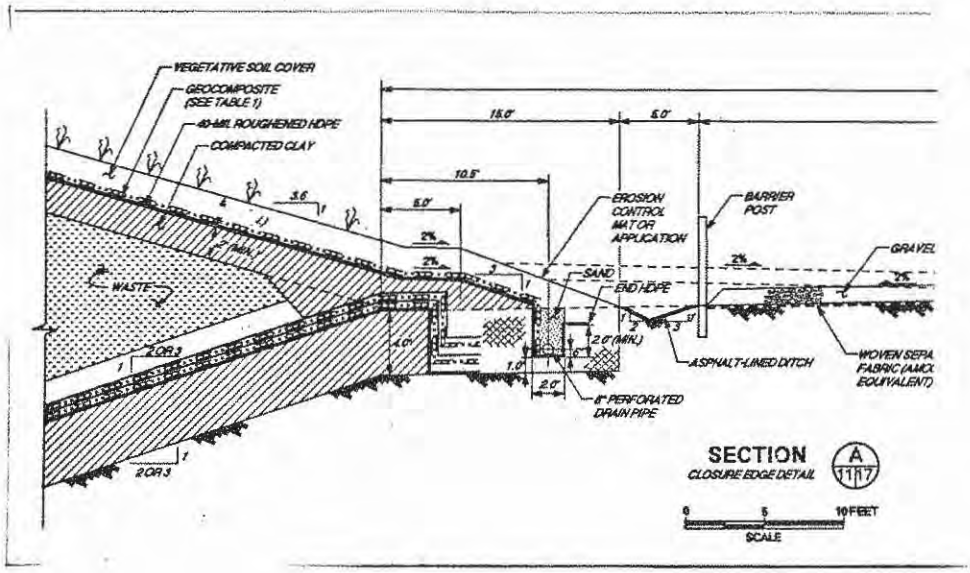
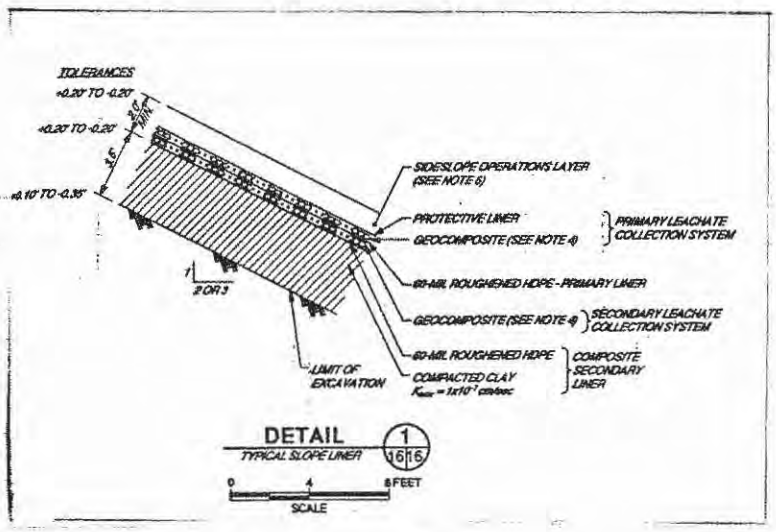
TYPICAL LINER SYSTEM DETAILS.





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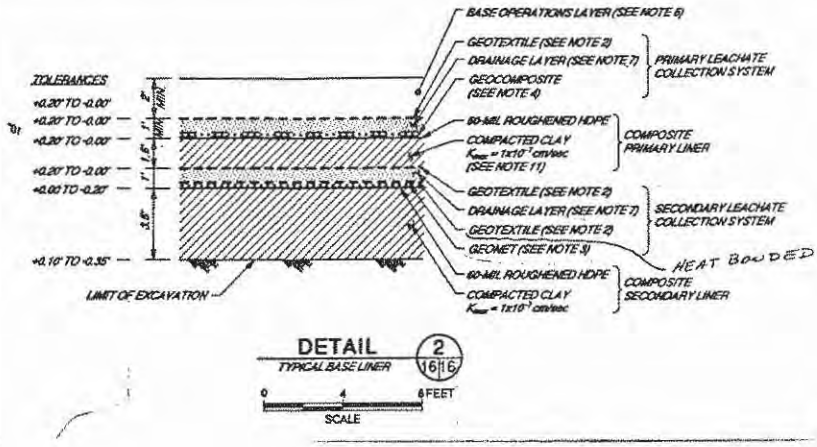

BOTTOM LINER SYSTEM

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MATERIAL AND INTERFACE STRENGTH PARAMETERS USED FOR STABILITY CALCULATIONS -

MATERIAL OR INTERFACE	DESIGN STRENGTH PARAMETERS			SOURCE / REMARKS
	TOTAL UNIT WEIGHT (PCF)	C (PSF)	ϕ (DEGREES)	
WASTE/OPERATIONS LAYER (SHALLOW FAILURE PLANES)	115	30	27	USED AS A CONSERVATIVE PARAMETER
WASTE/OPERATIONS LAYER (DEEP FAILURE PLANES)	115	0	31	Golder Associates, December 1989. Conservative
CROSS BEDDING				
CLAYSTONE	130	800	40	· Donohue & Associates, Inc, October 1988. Confirmed by Direct Shear Tests
SILTSTONE	130	800	40	
SANDSTONE	130	800	40	
ALONG BEDDING				
CLAYSTONE	130	0	36	· Donohue & Associates, Inc, October 1988. Confirmed by UU Triaxial Tests
SILTSTONE	130	0	36	
SANDSTONE	130	0	36	
STRUCTURAL FILL	125	2,000	30	CONSERVATIVE VALUE BASED ON UU TRIAXIAL TEST ON SANDSTONE COMPACTED TO 95% RELATIVE COMPACTION

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 26 of 28

Chkd. By GSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

MATERIAL OR INTERFACE	DESIGN STRENGTH PARAMETERS: TOTAL UNIT WEIGHT (PCF)	C (PSF)	ϕ (DEGREES)	SOURCE / REMARKS
LINER SYSTEM: BASE AND SIDE SLOPES				
- COMPACTED CLAY - (LONG TERM)	125	1,150 (1)	20°	CU TRIAXIAL TESTS ON claystone COMPACTED TO 90% RELATIVE COMPACTION
- COMPACTED CLAY / ROUGHENED HDPE LINER - (LONG TERM)	125	1,150 (1)	20°	
- COMPACTED CLAY (SHORT TERM OR LOW CONFINING STRESS	125	3,600	0	UU TRIAXIAL TEST ON claystone COMPACTED TO 90% RELATIVE COMPACTION
- COMPACTED CLAY / ROUGHENED HDPE LINER (SHORT TERM OR LOW CONFINING STRESS)	125	3,600	0	UU TRIAXIAL TEST ON CLAYSTONE COMPACTED TO 90% RELATIVE COMPACTION
ROUGHENED HDPE / GEONET	–	0	15°	CUNTROLS. Gundle, March 11 1987 - GeoSynTec, Inc, October 11, 1988
GEONET / GEOTEXTILE (HEAT BONDED)	–	0	>30°	Fluid Systems, Inc
GEOTEXTILE / DRAINAGE LAYER	–	0	>25°	
GEOTEXTILE / COMPACTED CLAY	–	0	21°	Golder Associates, June 29, 1990
ROUGHENED HDPE / GEOCOMPOSITE	–	0	24°	Golder Associates, June 29, 1990
		50	24°	" " "
GEOCOMPOSITE / DRAINAGE LAYER	–	0	>21°	ANTICIPATED TO BE HIGHER THAN GEOTEXTILE / COMPACTED CLAY
GEOTEXTILE / BASE OPERATIONS LAYER	–	300	27° (SHALLOW FAILURE)	
	–	0	31 (DEEP FAILURE)	THE SHEAR STRENGTH OF

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 27 of 28
Chkd. By GAC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

MATERIAL OR INTERFACE	DESIGN STRENGTH PARAMETERS			SOURCE / REMARKS
	TOTAL UNIT WEIGHT (PCF)	C (PSF)	ϕ (DEGREES)	
				THE BASE OPERATIONS LAYER CONTROLS. PROPERTIES OF THE BASE OPERATIONS LAYER ARE CONSIDERED TO BE THE SAME AS THOSE OF THE WASTE.
LINER SYSTEM - FINAL COVER (CLOSURE)				
COMPACTED CLAY - (SHORT TERM OR LOW CONFINING STRESS)	125	3,600	0	U U TRIAXIAL TEST ON CLAYSTONE COMPACTED TO 90% RELATIVE COMPACTION
COMPACTED CLAY / ROUGHENED HDPE LINER - LOW CONFINING STRESS.	-	0	32	Golder Associates, June 29, 1990
ROUGHENED HDPE / GEOCOMPOSITE -		0	24	Golder Associates, JUNE 29, 1990
GEOCOMPOSITE / VEGETATIVE SOIL COVER	-	100	22	Golder Associates, JUNE 29, 199
VEGETATIVE SOIL COVER		40	26°	ASSUMED FOR MEDIUM DENSE CLAYEY SAND

(1) BASED ON DT-A, B-2 TEST RESULTS. DT-C, B-1 IS LESS PLASTIC and STRONGER

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/9/90 Subject B-18 LANDFILL SLOPE STABILITY ANALYSIS Sheet No. 28 of 28

Chkd. By GSC Date 8/13/90 Proj. No. 89-977

PERFORMANCE CRITERIA (GENERAL)

STATIC FACTOR OF SAFETY : 1.5 (MINIMUM)

ALLOWABLE SEISMIC DEFORMATION : 1-INCH FOR FAILURE SURFACE THROUGH THE LINER SYSTEM. LARGER DEFORMATIONS ARE ACCEPTABLE FOR FAILURE MODES THROUGH THE WASTE PILE OR VEGETATIVE COVER

COMPUTER OUTPUT · REFER TO COMPUTER OUTPUT FOR EACH CASE. (CONTAINED IN A SEPARATE VOLUME). FILE NAME, FAILURE MODE, CALCULATED FACTORS OF SAFETY AND YIELD ACCELERATION ARE LISTED FOR EACH SPECIFIC CASE.

APPENDIX H.2
ROCK CUTSLOPE STABILITY

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 0 of 13

Chkd. By ___ Date ___ SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE I

STABILITY OF CUT SLOPES.

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 1 of 13

Chkd. By CSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE IA

2:1 SLOPE.

(CROSS BEDDING STRENGTH)

(DESIGN PERIOD: 5 YRS)

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 2 of 13
Chkd. By GSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE I-A

PERFORMANCE CRITERIA

- MINIMUM STATIC FACTOR OF SAFETY: 1.5
- ALLOWABLE MAXIMUM DISPLACEMENT FOR THE DESIGN EARTHQUAKE PEAK ACCELERATION: 1 INCH

PLAN VIEW OF PHASE I EXCAVATION IS SHOWN IN FIGURE 7

SLOPE STABILITY MODEL IS SHOWN IN FIGURE 8

FILE NAME	E = EARTHQUAKE S = STATIC	FAILURE MODE	K (1)	FACTOR OF SAFETY	REMARKS
RUN 4 CUT	E	CIRCL2	.5	1.06 (2)	
RUN 5 CUT	E	CIRCL2	.54	1.0 (2)	
RUN 6 CUT	S	CIRCL2	0	2.42 (3)	

(1) HORIZONTAL EARTHQUAKE LOADING COEFFICIENT
(2) PSEUDOSTATIC
(3) STATIC

$N = K_y = .54$; FOR $A = .7$, $\frac{N}{A} = \frac{.54}{.7} = .77$

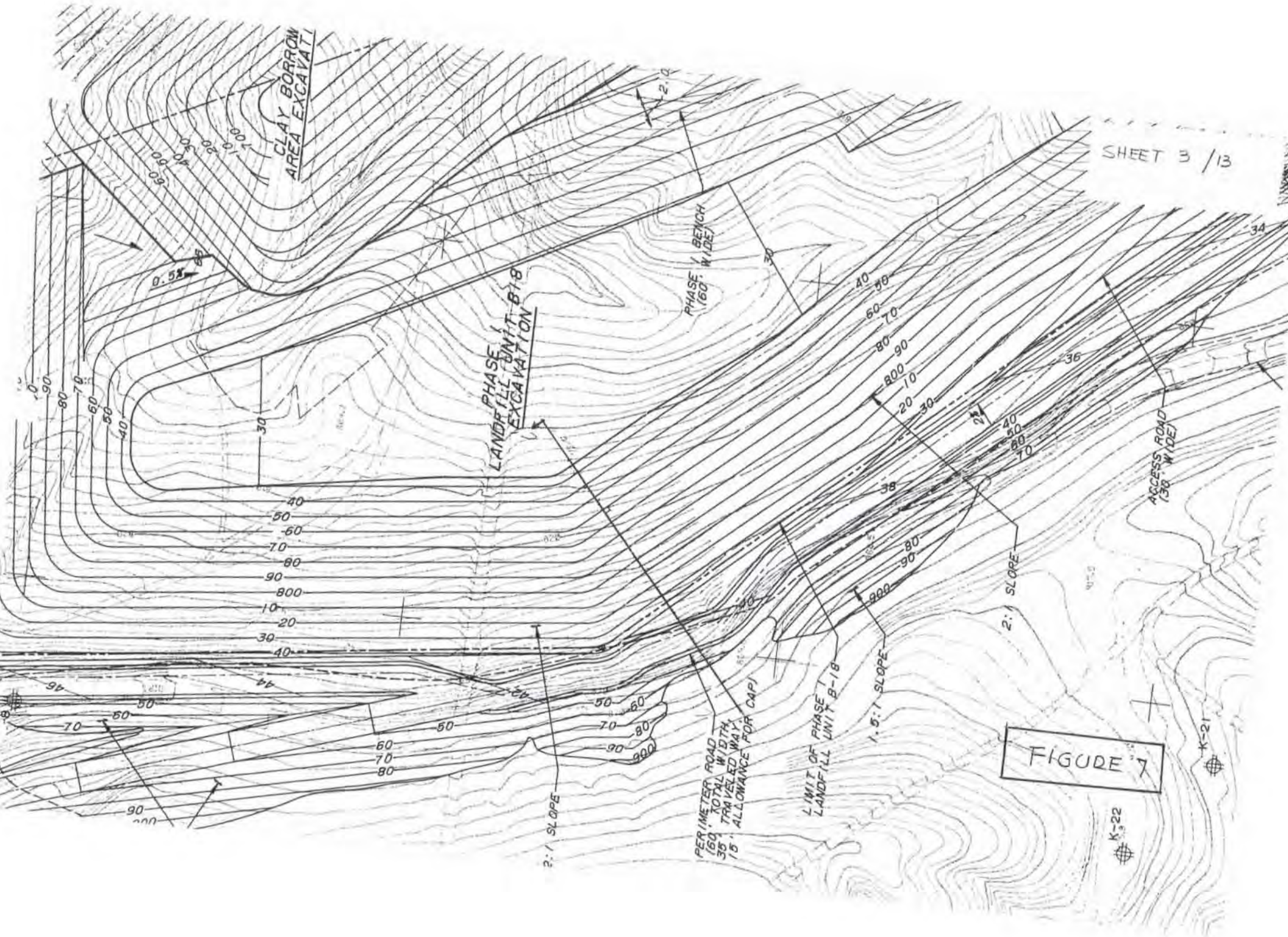

SHEET 3 /13
CLAY BORROW AREA EXCAVATI
PHASE I LANDFILL UNIT B-18 EXCAVATION
PHASE I BENCH (160' WIDE)
ACCESS ROAD (30' WIDE)
2:1 SLOPE
1.5:1 SLOPE
PERIMETER ROAD (160' TOTAL WIDTH, 35' TRAVELED WAY, 15' ALLOWANCE FOR CAP)
LIMIT OF PHASE I LANDFILL UNIT B-18
K-21
K-22

FIGURE 7

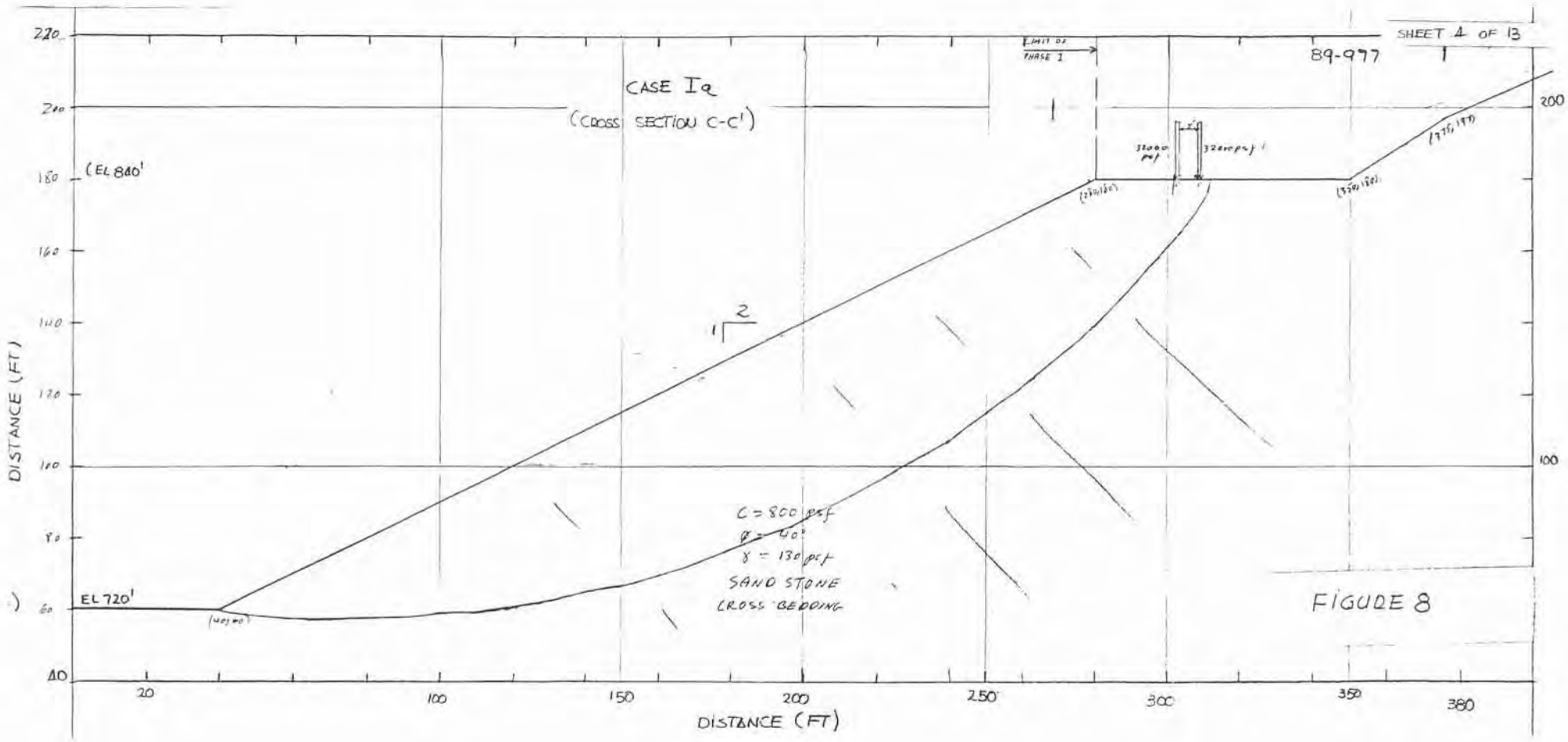

SHEET 4 OF 13
89-977
CASE Ia
(CROSS SECTION C-C')
LIMIT OF PHASE 1
(EL 840'
EL 720'
1
2
C = 800 psf
φ = 40°
γ = 130 pcf
SAND STONE
CROSS BEDDING
DISTANCE (FT)
DISTANCE (FT)
220
200
180
160
140
120
100
80
60
40
20
100
150
200
250
300
350
380

FIGURE 8

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 5 of 13
Chkd. By GSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

⇒ FROM FIGURE 2, N/A = .77 THE STANDARIZED MAXIMUM DISPLACEMENT IS LESS THAN 1 INCH. NO PERMANENT SEISMIC DISPLACEMENT
A = Ao ,

⇒ FROM FIGURE 9 POE IS < 4.0×10^{-4} FOR 5 YEARS ;

CONCLUSION

- S.F > 1.5 OK.
- NEGLIGIBLE SEISMIC DISPLACEMENT
- Ky = .54
- POE < 4.0×10^{-4} FOR 5 YEARS WHICH IS THE DESIGN RECURRENCE PERIOD

TEMPORARY ROCK CUT ; 2:1 SLOPE , CROSS BEDDING STRENGTH
CASE IA

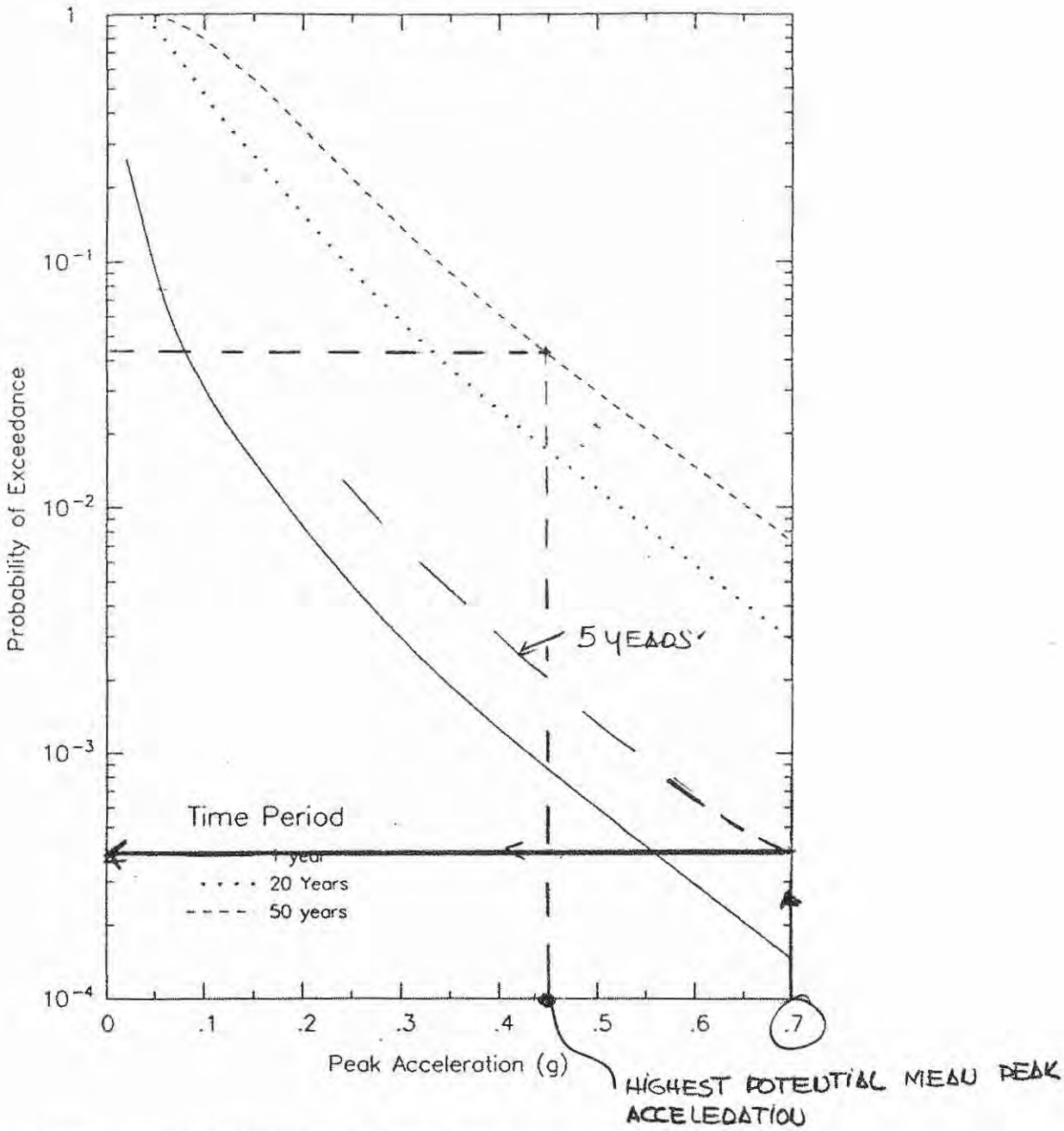


Figure 3. Probability of exceedance as a function of time period

FIGURE 9

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 7 of 13

Chkd. By GSC Date 8/12/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE I B

ROCK CUT

3:1 SLOPE

(ALONG BEDDING STRENGTH)

(DESIGN PERIOD 5 YEARS).

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 8 of 13
Chkd. By FSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE I B

PERFORMANCE CRITERIA SAME AS CASE IA

- PLAN VIEW OF PHASE II EXCAVATION IS SHOWN IN FIGURE 10
- SLOPE STABILITY MODEL IS SHOWN IN FIGURE 11

FILE NAME	E = EARTHQUAKE S = STATIC	FAILURE MODE	K (1)	SAFETY FACTOR	REMARKS
RUN 7 CUT	E	CIRCL2	.5	.73 (2)	
RUN 8 CUT	E	CIRCL2	.32	1.0 (2)	
RUN 9 CUT	S	CIRCL2	0	2.19	

(1) HORIZONTAL EARTHQUAKE LOADING COEFFICIENT
(2) PSEUDOSTATIC FACTOR OF SAFETY. USED TO ESTIMATE YIELD ACCELERATION; IN THIS CASE $K_y = .32$ (FILE NAME RUN8CUT)

ESTIMATE SEISMIC DEFORMATIONS FOR A = .5, .6 AND .7

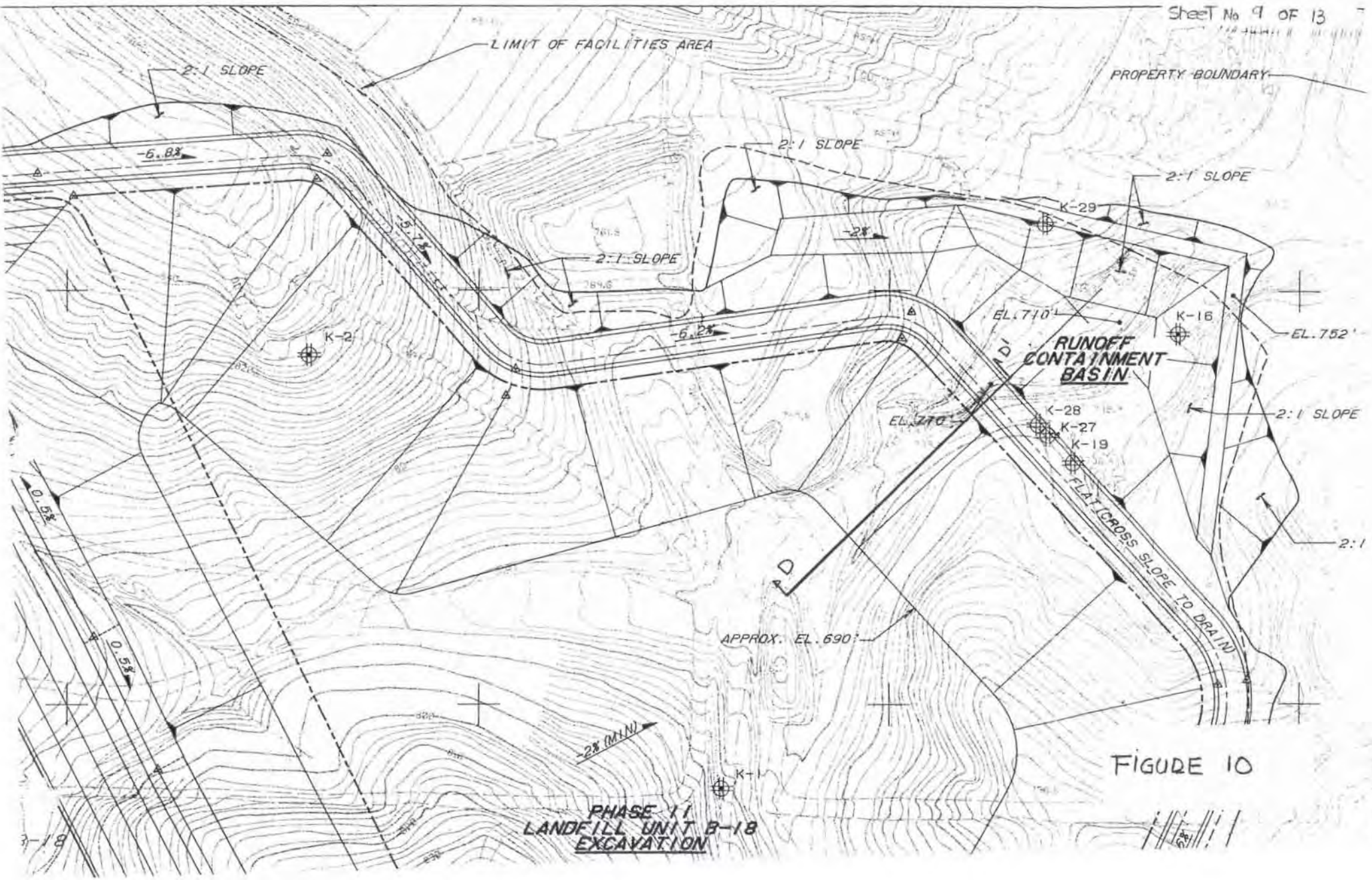

LIMIT OF FACILITIES AREA
PROPERTY BOUNDARY
2:1 SLOPE
2:1 SLOPE
2:1 SLOPE
2:1 SLOPE
2:1 SLOPE
2:1
-6.8%
-5.7%
-6.2%
-2%
0.5%
0.5%
-2% (MIN)
K-2
K-29
K-16
K-28
K-27
K-19
K-1
EL. 710'
EL. 710'
EL. 752'
RUNOFF CONTAINMENT BASIN
FLAT CROSS SLOPE TO DRAIN
APPROX. EL. 690'
D
D'
PHASE II
LANDFILL UNIT B-18
EXCAVATION

FIGURE 10

CHEM WASTE MANAG. INC.
SLOPE STABILITY ANALYSIS

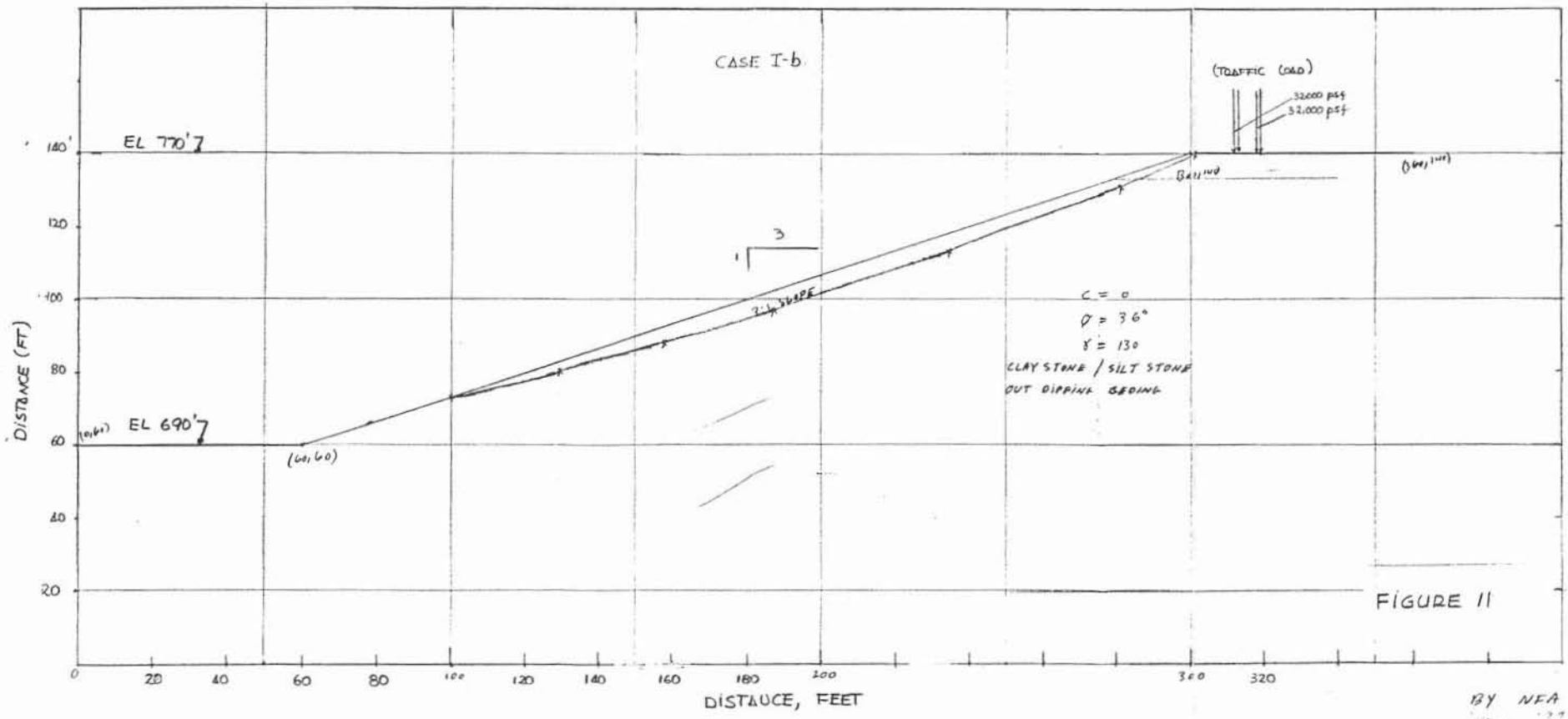


FIGURE 11

BY NFA

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 11 of 13

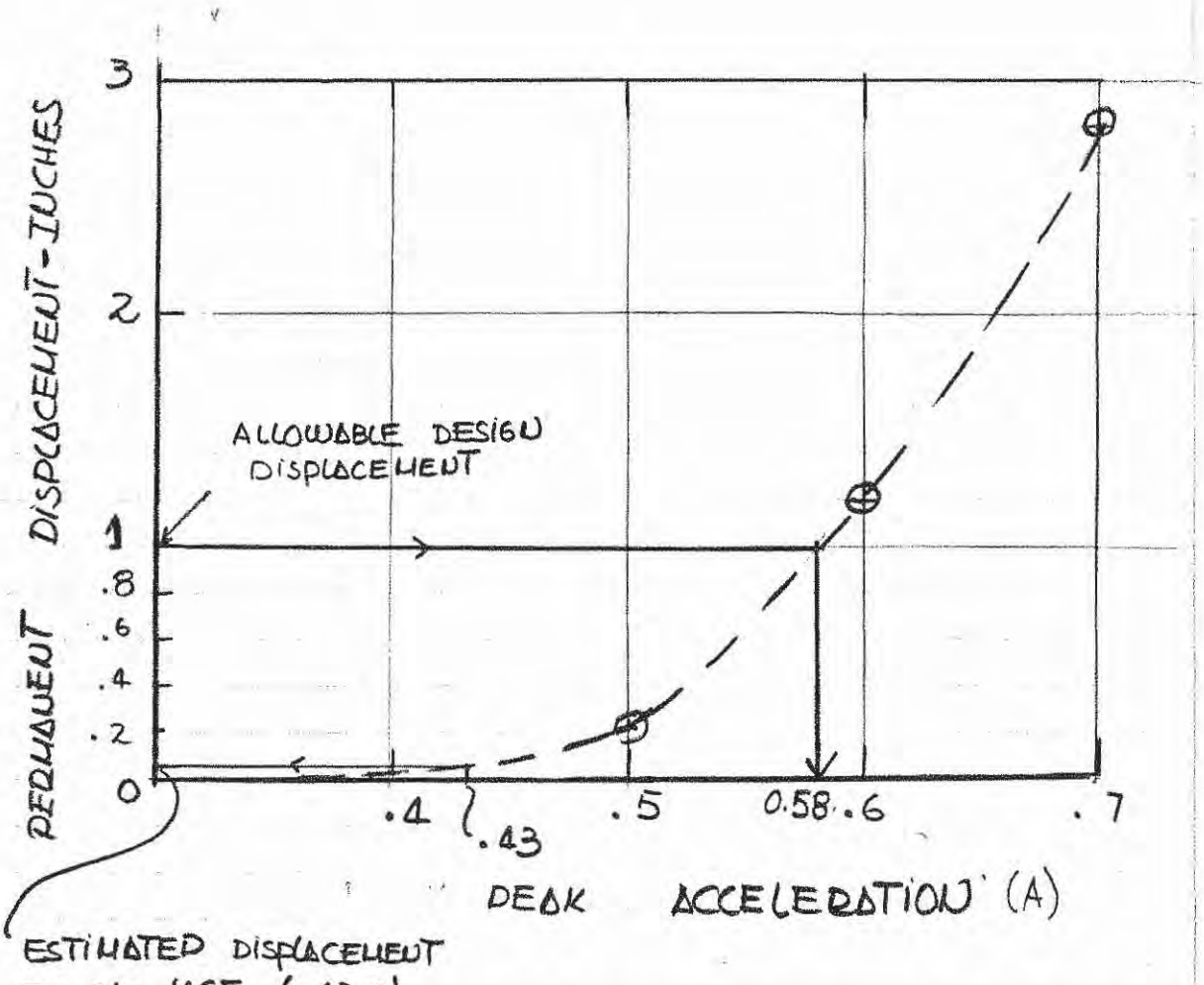
Chkd. By GSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE I-b

$K_y = N$	A	K_y/A	U_s * (INCHES)	$\frac{V}{A}$	$U_m = \frac{U_s V^2}{1,800 A}$	U_m ** (INCHES)
.32	.5	.64	1	30	$U_m = .25\ U_s$	.25
.32	.6	.53	4	30	$U_m = .30\ U_s$	1.20
.32	.7	.46	8	30	$U_m = .35\ U_s$	2.80

* FROM FIGURE 2

** PERMANENT DISPLACEMENT



ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/9/90 Subject B-18 LANDFILL Sheet No. 12 of 13
Chkd. By GSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

$A_o = A$

FROM FIG 12 POE = 8.0×10^{-4} FOR 5 YEARS
FOR 1-INCH DEFORMATION : .58g > .43g OK.

CONCLUSION

STATIC SAFETY FACTOR = 2.2 > 1.5 OK.

- SEISMIC DISPLACEMENT MINIMAL
- POE FOR 1-INCH DISPLACEMENT = 8.0×10^{-4} (5 YEARS)
- K_y = .32 (YIELD)

CASE I-b.

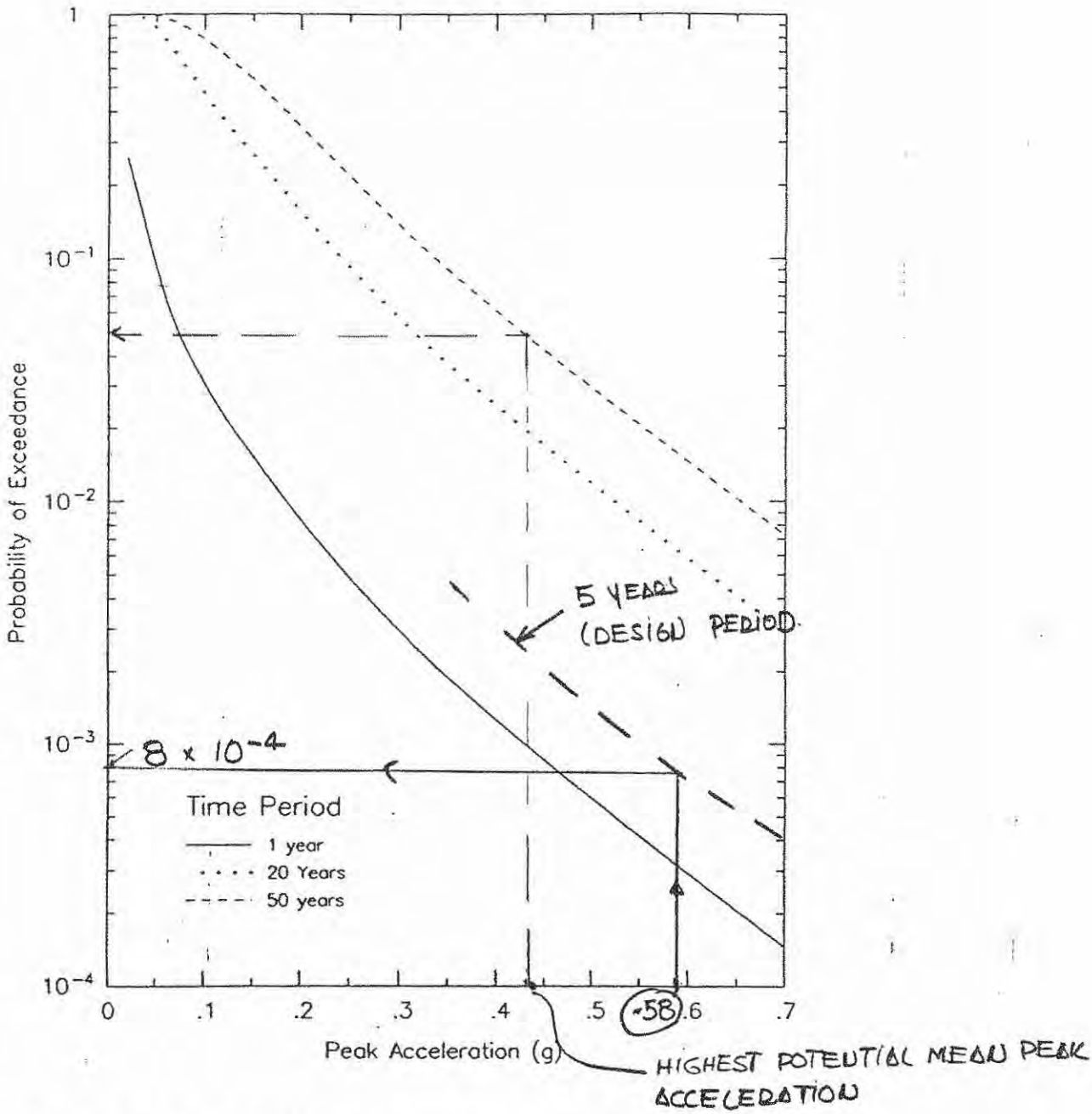


Figure 3. Probability of exceedance as a function of time period

FIGURE 12

APPENDIX H.3
COMPACTED FILL SLOPE STABILITY

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 0 of 12

Chkd. By gsc Date 8/11/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE II

STABILITY OF COMPACTED FILL EMBANKMENT

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 1 of 12
Chkd. By GSC Date 8/11/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE II-A

RUNOFF RETENTION BASIN

(DESIGN PERIOD: 20 YEARS)

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 2 of 12
Chkd. By GSC Date 8/11/90 SLOPE STABILITY Proj. No. 89-977

CASE II-A

PERFORMANCE CRITERIA

- MINIMUM STATIC FACTOR OF SAFETY : 1.5
- ALLOWABLE MAXIMUM DISPLACEMENT FOR THE DESIGN EARTHQUAKE PEAK ACCELERATION : 3-INCH

PLAN VIEW OF THE RETENTION BASIN IS SHOWN IN FIGURE 13

SLOPE STABILITY MODEL (SECTION A) IS PRESENTED IN FIGURE 14

AS SHOWN IN FIGURE 14, THE CRITICAL SLOPE IS ON THE SOUTH WASTE SIDE FOR DEEP FAILURE MODE

- COMPUTED FACTOR OF SAFETY ARE PRESENTED IN SHEET 5

- THE YIELD ACCELERATION FOR THE SOUTH WEST SLOPE IS ABOUT .5 (FILE NAME RNIBM2S.SW)

SEISMIC DEFORMATIONS * FROM FIGURE 2.

$K_y = N$	A	K_y/A	U_s* (INCHES)	$\frac{V}{A}$	U_m (INCHES)
.5	.7	.71	.70	30	NEGLIGIBLE
.5	.6	.83	< 1.0	30	"
.5	.5	1.0	< 1.0	30	"

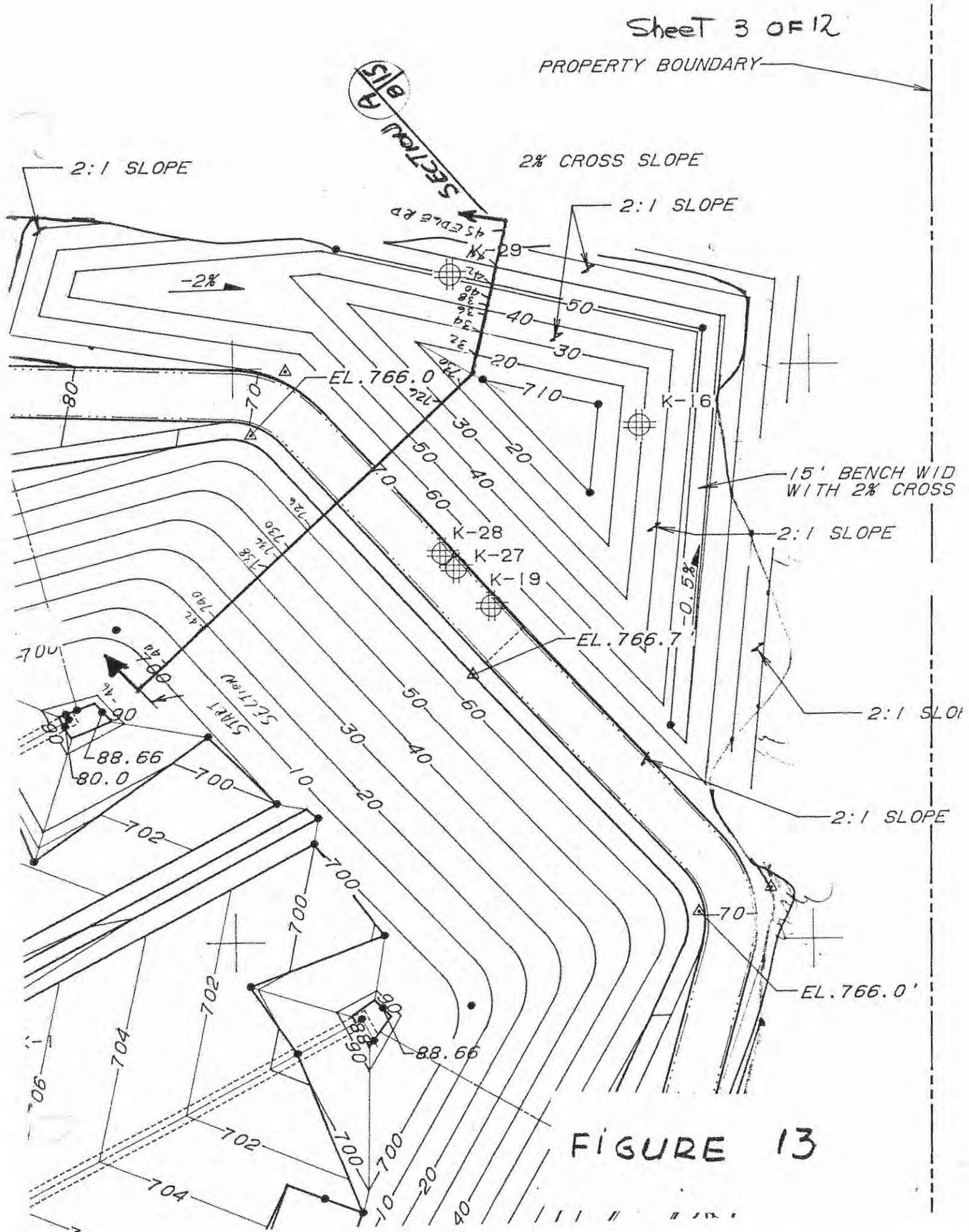
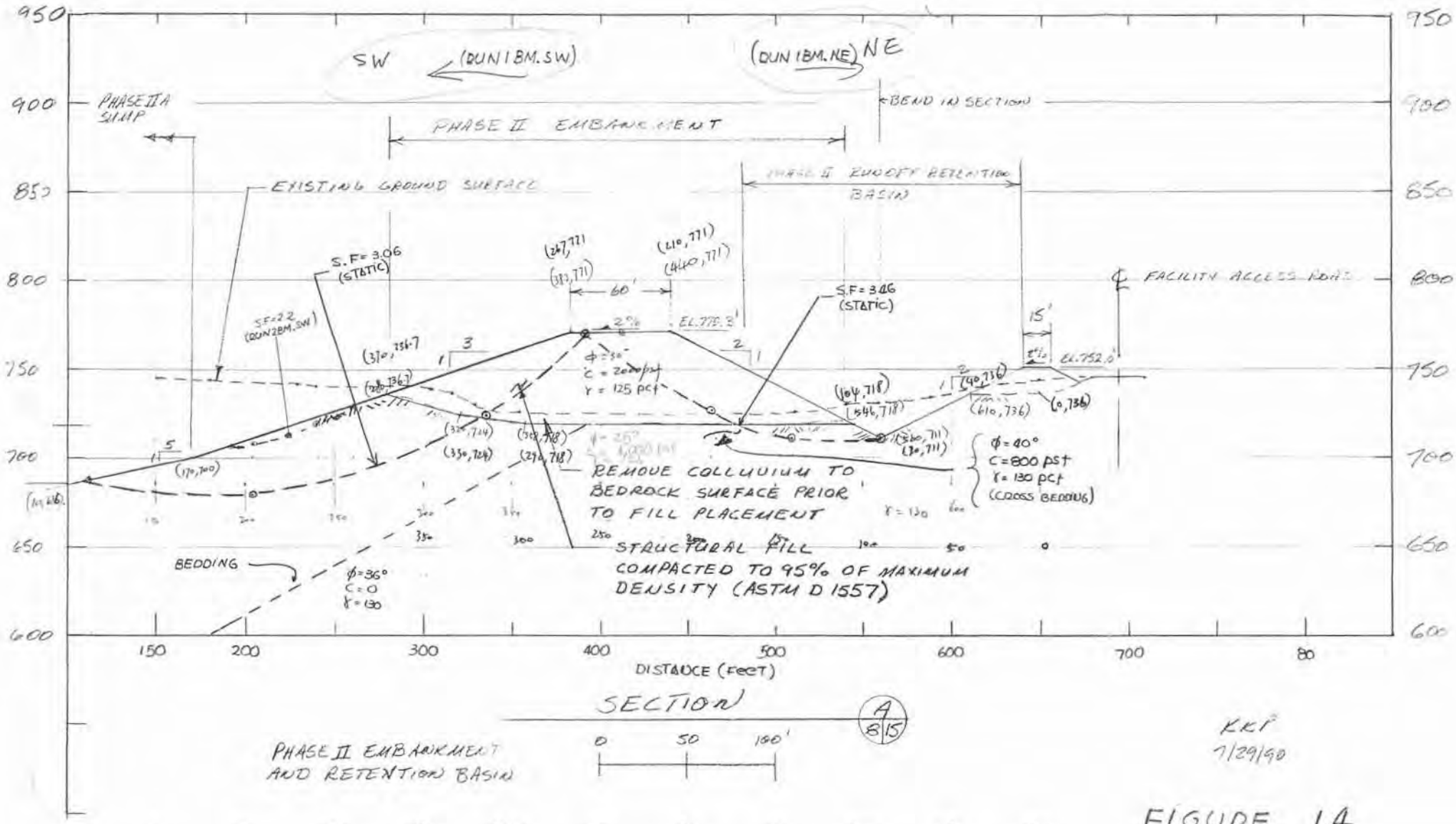

PROPERTY BOUNDARY
SECTION A/B
2:1 SLOPE
2% CROSS SLOPE
2:1 SLOPE
-2%
K-29
EL.766.0
K-16
15' BENCH WID
WITH 2% CROSS
2:1 SLOPE
K-28
K-27
K-19
-0.5%
EL.766.7
2:1 SLOPE
START SECTION
88.66
80.0
2:1 SLOPE
EL.766.0'
88.66

FIGURE 13



SECTION 4/8/15

PHASE II EMBANKMENT AND RETENTION BASIN

0 50 100'

KKT
7/29/90

FIGURE 14

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 5 of 12

Chkd. By GSC Date 8/11/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

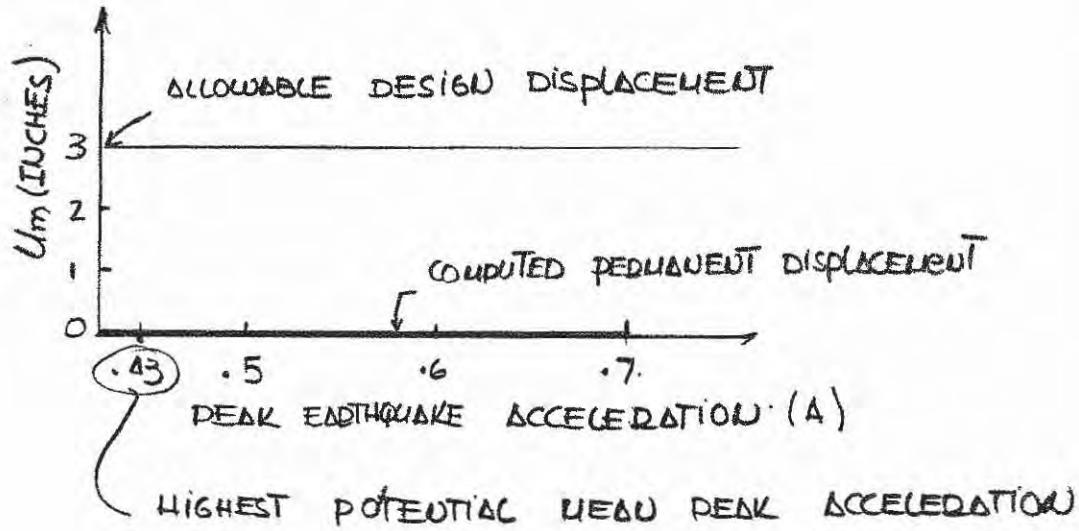
RUNOFF RETENTION BASIN

RUN Nº	FILE NAME	S = STATIC E = EARTHQUAKE	FAILURE MODE	K (1)	SAFETY FACTOR	REMARKS
						(1) HORIZONTAL EARTHQUAKE LOADING COEFFICIENT (2) STATIC (3) PSEUDOSTATIC. USED TO ESTIMATE SEISMIC DISPLACEMENTS (4) A PSEUDOSTATIC F.S <1.0 DOES NOT IMPLY FAILURE CONDITIONS
1	RN1BM1S.SW	E	CIRCL2	0.4	1.21 (3)	DEEP FAILURE - SOUTH WEST SLOPE THROUGH STRUCTURAL FILL AND NATURAL MATERIAL
2	RN1BM2S.SW	E	CIRCL2	0.5	1.03 (3)	(SAME)
3	RUN1BU.SW	S	CIRCL2	0	3.06 (2)	(SAME)
4	RN2BM1S.SW	E	CIRCL2	0.4	0.87 (3)(4)	SHALLOW FAILURE - SOUTH WEST SLOPE
5	RN2BM2S.SW	E	CIRCL2	0.2	1.29 (3)	SHALLOW FAILURE - SOUTH WEST SLOPE
6	RN2BM3S.SW	E	CIRCL2	0.3	1.05 (3)	SHALLOW FAILURE - SOUTH WEST SLOPE
7	RUN2BM.SW	S	CIRCL2	0	2.20 (2)	SHALLOW FAILURE WITHIN NATURAL MATERIAL (LOCAL)
8	RUN3BM.SW	S	CIRCL2	0	5.15 (2)	FAILURE WITHIN STRUCTURAL FILL
9	RUN1BM.NE	S	CIRCL2	0	3.46 (2)	SLOPE ON NE SLOPE
10	RUN1BM1S.NE	E	CIRCL2	0.5	1.48 (3)	SLOPE ON NE SLOPE

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 6 of 12
Chkd. By JSC Date 8/14/90 SLOPE STABILITY Proj. No. 89-977

FROM Sheet 2, Um (PERMANENT DISPLACEMENTS) ARE NEGLIGIBLE



FROM FIGURE 15, POE < 30×10^{-3} (20 yrs)

CONCLUSIONS

STATIC FACTOR OF SAFETY > 1.5

- PERMANENT SEISMIC DISPLACEMENTS: NONE
- $K_y = .5g$
- POE < 30×10^{-3} FOR 20 YEARS

CASE II-A
CASE II-B

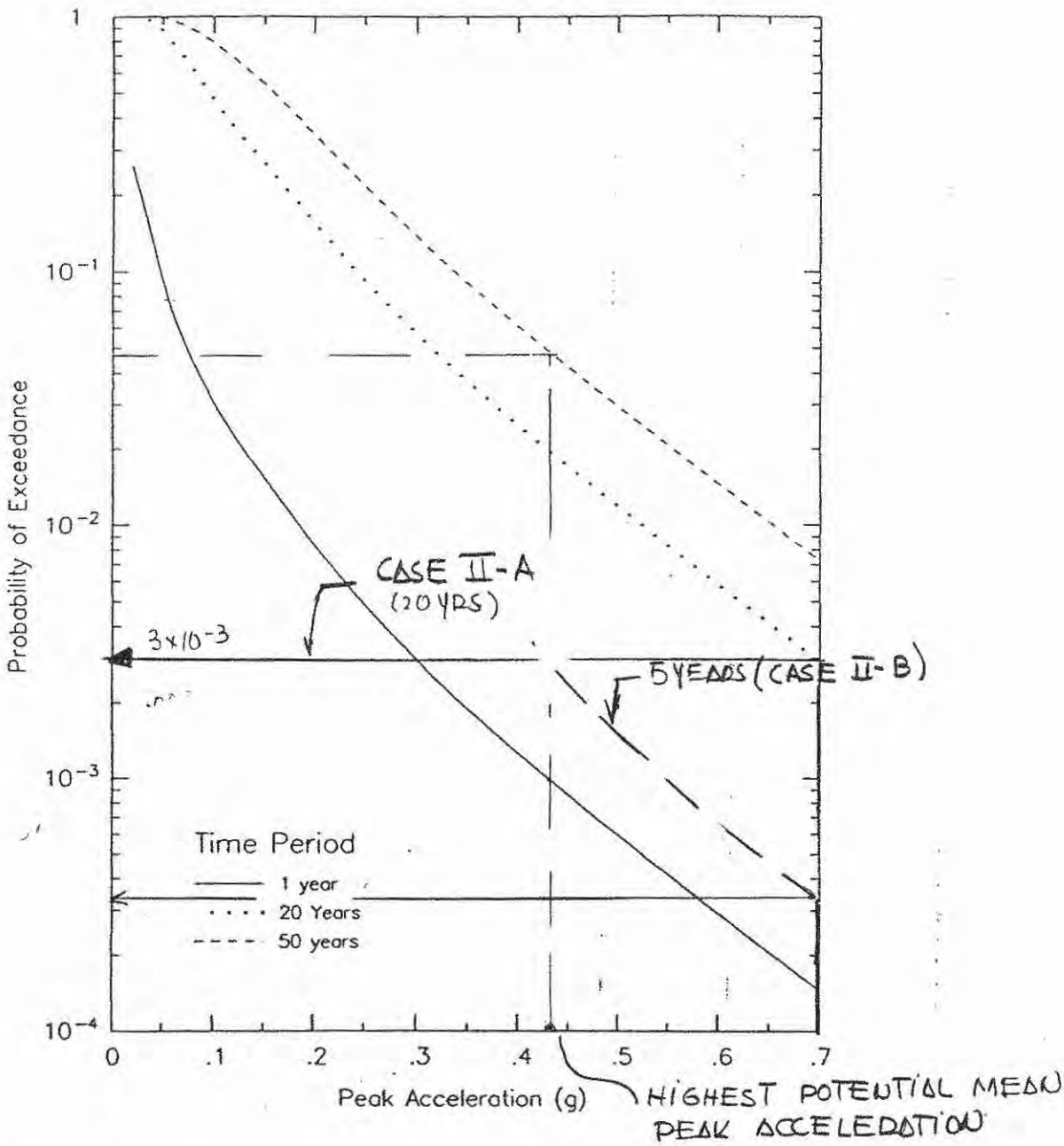


Figure 3. Probability of exceedance as a function of time period

FIGURE 15

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 8 of 12
Chkd. By GSC Date 8/11/90 SLOPE STABILITY ANALYSIS Proj. No. 89-997

CASE II-B.

(SMALL EMBANKMENT TO COMPLETE PHASE I/II BERM)

(DESIGN PERIOD 5 YEARS)

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL SLOPE STABILITY ANALYSIS Sheet No. 9 of 12
Chkd. By GSC Date 8/11/90 Proj. No. 84-977

CASE II-B

PERFORMANCE CRITERIA

1- MINIMUM STATIC FACTOR OF SAFETY = 1.5
2 - ALLOWABLE MAXIMUM DISPLACEMENT FOR THE DESIGN EARTHQUAKE PEAK ACCELERATION = 1- INCH

PLAN VIEW OF THE CLAY BORROW AREA IS SHOWN IN FIGURE 16

SLOPE STABILITY MODEL IS SHOWN IN FIGURE 17.

- FINAL BENCH ELEVATION IS 720' AS OPPOSED TO 710' AS SHOWN IN THE MODEL. THIS MINOR DISCREPANCY SHOULD NOT AFFECT THE ANALYSIS RESULTS

- BENCHES BETWEEN THE FILL AND NATIVE MATERIAL WERE NOT INCLUDED IN THE MODEL FOR SIMPLICITY. THIS SHOULD NOT AFFECT THE ANALYSIS RESULTS.

CALCULATED FACTORS OF SAFETY ARE SHOWN IN sheet 12

THE YIELD ACCELERATION IS GREATER THAN 0.6 ⇒ THE PEAK ACCELERATION TO INDUCE A PERMANENT DISPLACEMENT IS GREATER THAN 0.7 BASED ON PREVIOUS RESULTS ⇒ SEISMIC DISPLACEMENTS ARE NEGLIGIBLE

POE $<< 3.0 \times 10^{-4}$ (5 yrs) AS SHOWN IN FIGURE 15 FOR THE RUNOFF RETENTION BASIN EMBANKMENT. ACTUAL LIFE OF CLAY BORROW AREA EMBANKMENT IS ABOUT 5 YEARS

CONCLUSIONS
- STATIC FACTOR OF SAFETY > 1.5
- SEISMIC DISPLACEMENTS : NEGLIGIBLE
- $K_y > .6$

POE $<< 3.0 \times 10^{-3}$ FOR 5 YEARS

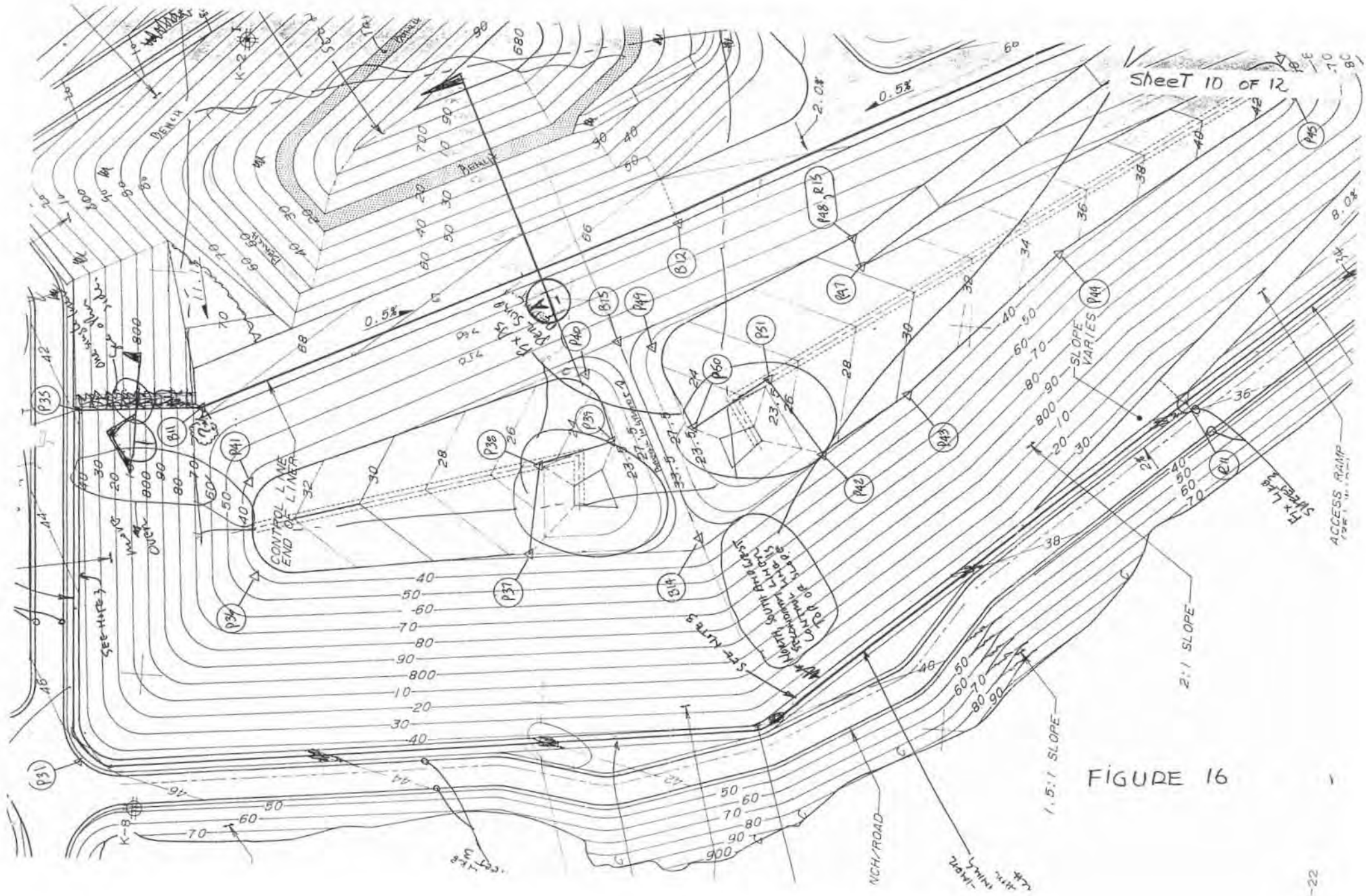

SHEET 10 OF 12
0.5%
2.0%
8.0%
BENCH
CONTROL LINE END OF LINER
SEE HATCH
SEE LINES
NORTH SIDE AND WEST SECTIONAL LINES TOP OF SLOPE
SLOPE VARIES
2:1 SLOPE
1.5:1 SLOPE
ACCESS RAMP
4" x 4" SLEEVE
NCH/ROAD
P31
P34
P35
P36
P37
P38
P41
P42
P43
P44
P45
P48, P15
P49
P50
P51
B11
B12
B14
B15
K-2
K-8

FIGURE 16

Job No. 89-977
by J.B 7/28/90
SHEET 11 OF 12

CASE II-B'
(CLAY BORROW AREA)

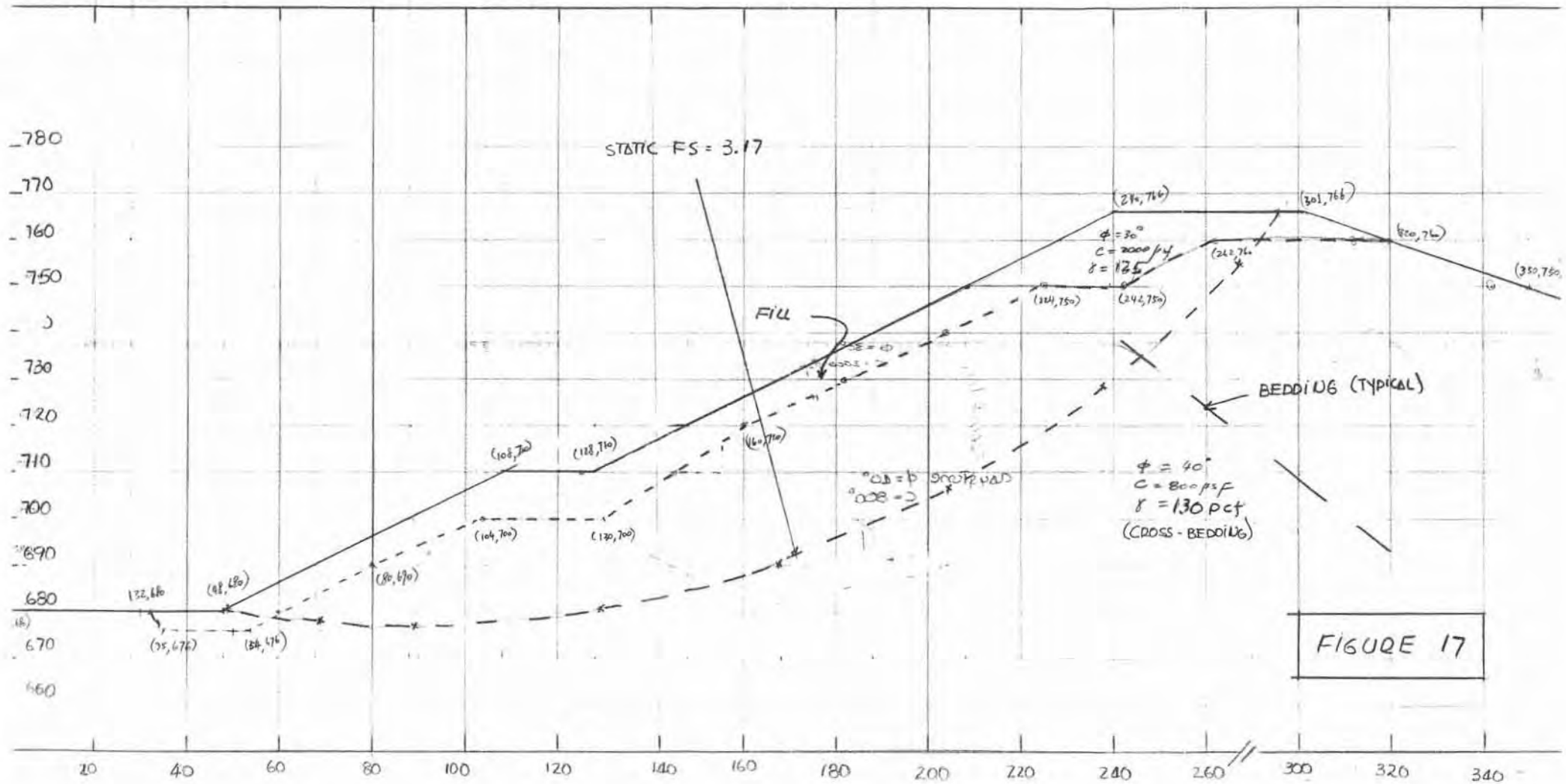


FIGURE 17

SMALL EMBANKMENT TO COMPLETE PHASE I/II BERM)

	FILE NAME	S = STATIC E = EARTHQ.	FAILURE MODE	(3) K	FACTOR OF SAFETY	REMARKS
1	RUN 1 BERM	S	CIRCL2	0	3.17 (2)	THREE RUN WITH DIFFERENT INITIATION POINTS
2	RUN 2 BERM	E	CIRCL2	0.3	1.69 (1)	✓
3	RUN 3 BERM	E	CIRCL2	0.5	1.25 (1)	✓
4	RUN 4 BERM	E	CIRCL2	0.6	1.09 (1)	

(1) PSEUDOSTATIC , (2) STATIC

(3) K = HORIZONTAL EARTHQUAKE LOADING COEFFICIENT

$K_y > .6$ (FILE NAME RUN 4 BERM)

⇒ MINIMAL DEFORMATIONS

ALLOWABLE DESIGN DISPLACEMENT FOR THE MCE: 1 INCH

ESTIMATED DISPLACEMENT FOR THE MCE = 0

APPENDIX H.4

INTERMEDIATE PHASE I CLOSURE AND INTERMEDIATE PHASE IIIA WASTE SLOPE STABILITY

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 0 of 24

Chkd. By GSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE III

STABILITY OF TEMPORARY PHASE I
INTERMEDIATE WASTE FILL

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 1 of 24
Chkd. By GSC Date 9/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-997

CASE III - A

WEDGE MOVEMENT ALONG THE LINER SURFACE

(DESIGN PERIOD 10 YRS)

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 2 of 21
Chkd. By GSC Date 9/13/90 SLOPE STABILITY Proj. No. 89-977

CASE III - A 1

PERFORMANCE CRITERIA

- MINIMUM STATIC FACTOR OF SAFETY : 1.5
- MAXIMUM ALLOWABLE DISPLACEMENT FOR THE DESIGN EARTHQUAKE PEAK ACCELERATION : 1- INCH

PLAN VIEW OF THE TOP OF THE LINER AND TEMPORARY COVER ARE SHOWN IN FIGURES 18 AND 19 RESPECTIVELY.

- SLOPE STABILITY MODEL IS SHOWN IN FIGURE 20

COMPUTED FACTORS OF SAFETY ARE:

FILE NAME	S = STATIC E = EARTHQUAKE	FAILURE MODE	K (1)	SAFETY FACTOR	REMARKS
KH7BL.1S	S	BLOCK 2	0	2.54 (2)	FOR ALL CASES: GEOCOMPOSITE on 3:1 slope, $\phi = 24°$, $c=0$
KH7BL.1E	E	BLOCK 2	0.3	1.11 (3)	CLAY LINER $c = 3{,}600$ psf $\phi = 0$
KH7BL.2E	E	BLOCK 2	0.4	0.87 (3)	$\phi = 15°$ GEONET/ ROUGHENED HDPE AT BOTTOM
KH7BL.3E	E	BLOCK 2	0.35	0.98 (3)	

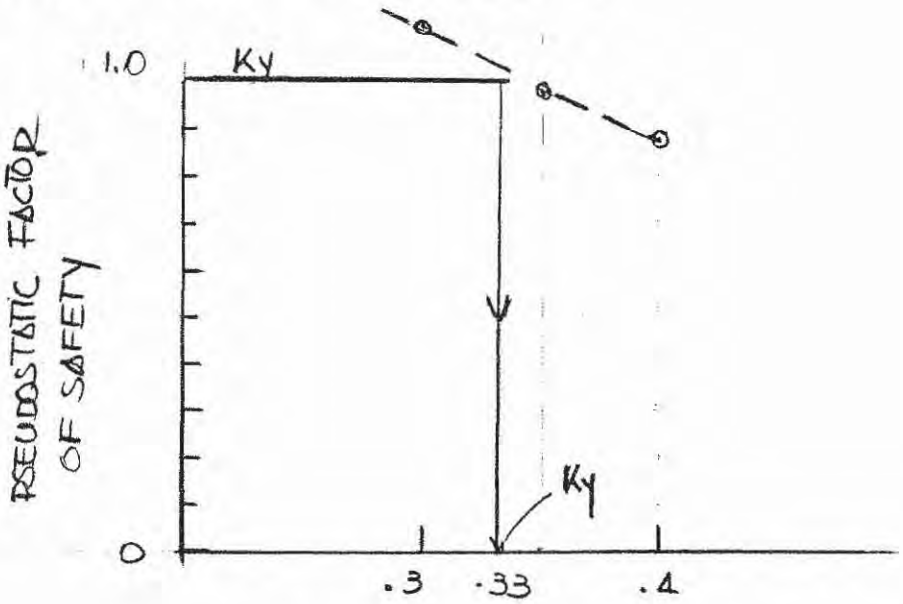
(1) HORIZONTAL EARTHQUAKE LOADING COEFFICIENT

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 3 of 24
Chkd. By ___ Date ___ SLOPE STABILITY Proj. No. 89-979

(2) STATIC

(3) PSEUDOSTATIC. A VALUE LESS THAN 1 DOES NOT NECESSARILY IMPLY FAILURE. THEY ARE USED TO ESTIMATE THE YIELD ACCELERATION WHICH RELATED TO THE PERMANENT DISPLACEMENT BY THE N/A RATIO SHOWN IN FIGURE 2.



$K_y = .33$ (CONSERVATIVE)

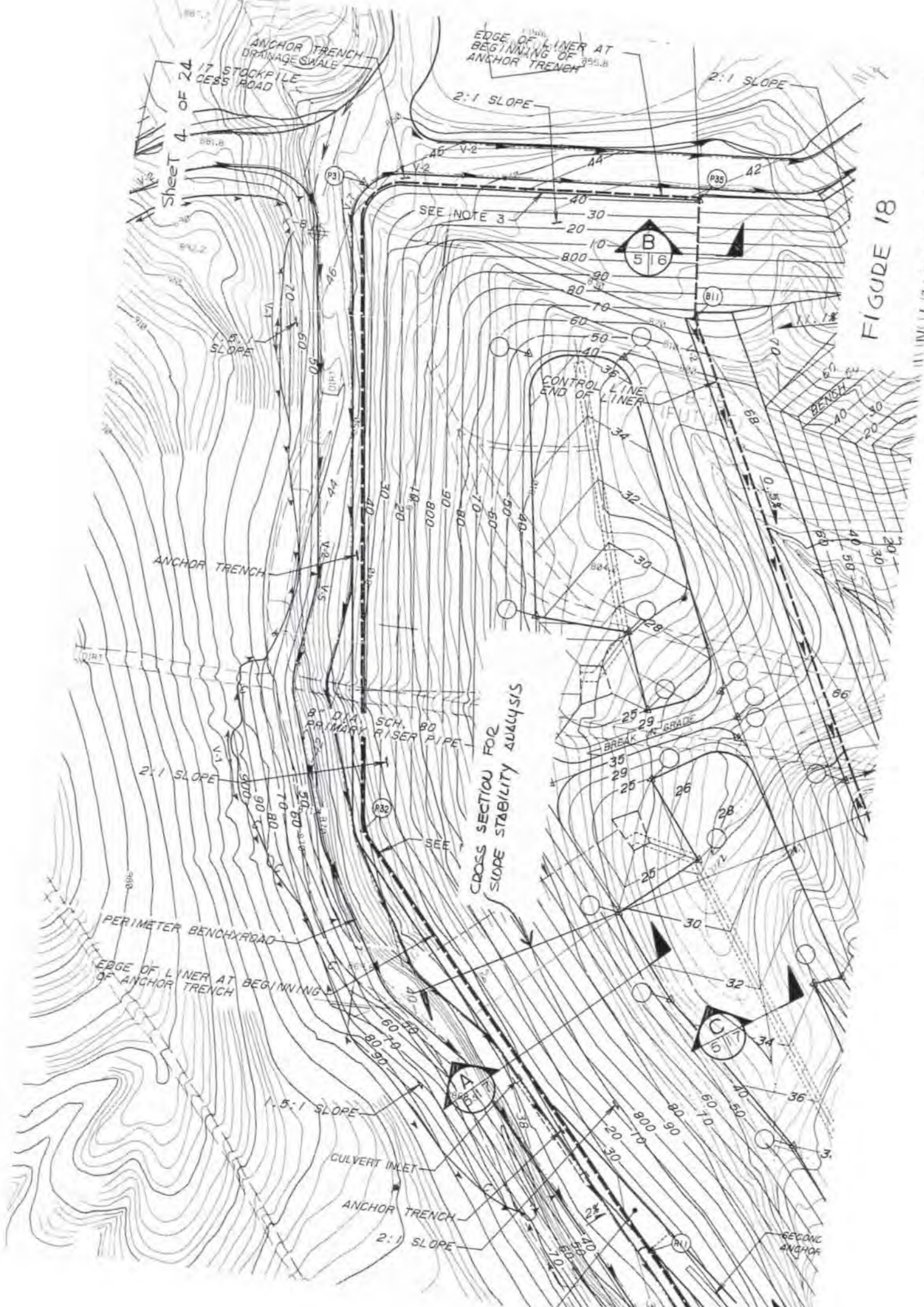

Sheet 4 of 24
ANCHOR TRENCH
DRAINAGE SWALE
STOCKPILE
ACCESS ROAD
EDGE OF LINER AT BEGINNING OF ANCHOR TRENCH
2:1 SLOPE
2:1 SLOPE
SEE NOTE 3
B
5 | 6
CONTROL LINE END OF LINER
BENCH
1.5:1 SLOPE
ANCHOR TRENCH
8" DIA PRIMARY SCH. 80 RISER PIPE
2:1 SLOPE
CROSS SECTION FOR SLOPE STABILITY ANALYSIS
BREAK IN GRADE
PERIMETER BENCH/ROAD
EDGE OF LINER AT BEGINNING OF ANCHOR TRENCH
A
6
C
5 | 7
1.5:1 SLOPE
CULVERT INLET
ANCHOR TRENCH
2:1 SLOPE
SECONC ANCHOR

FIGURE 18

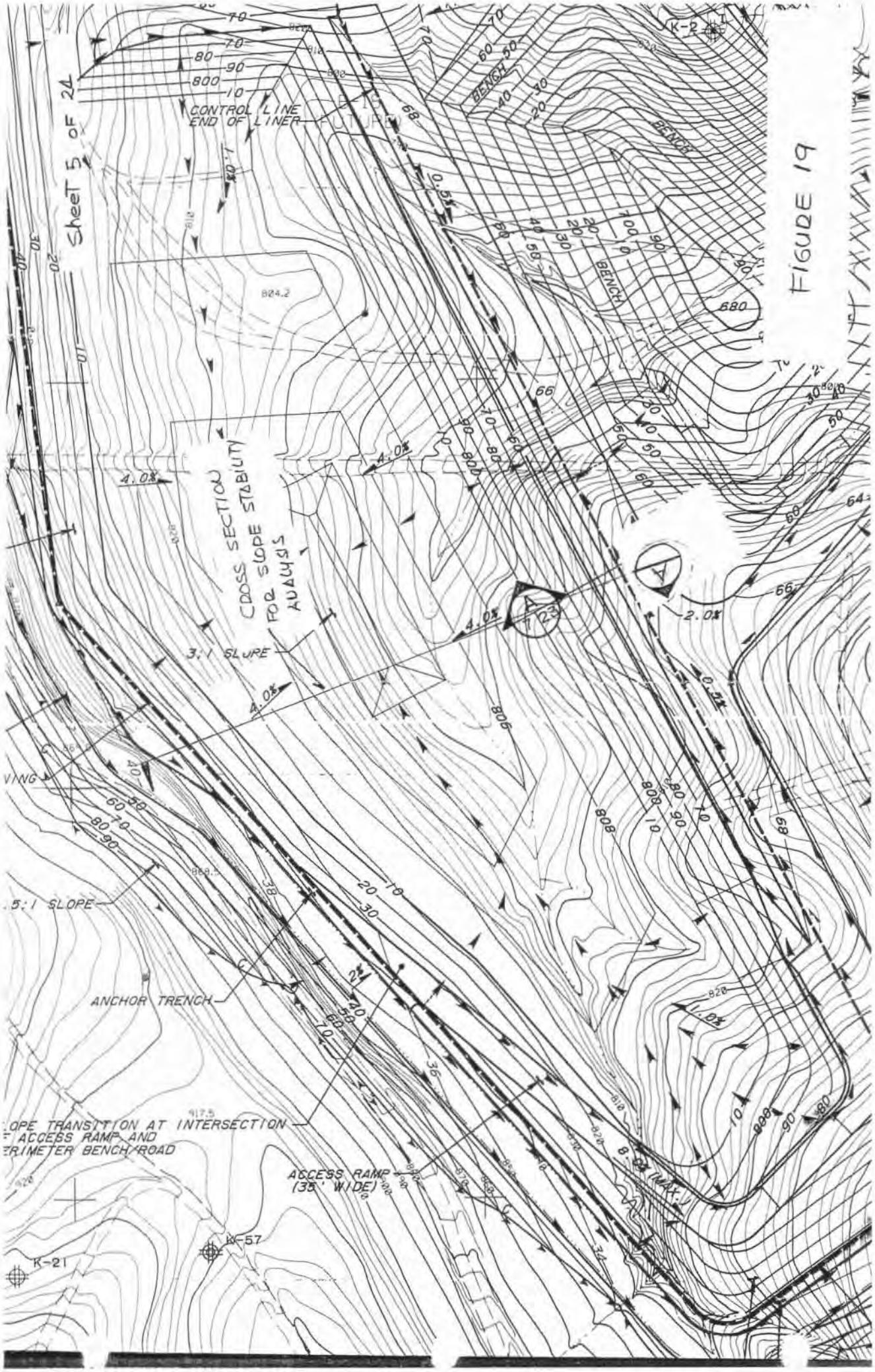

Sheet 5 of 24
CONTROL LINE
END OF LINER
FUTURE
BENCH
BENCH
BENCH
K-2
K-57
K-21
CROSS SECTION FOR SLOPE STABILITY ANALYSIS
3:1 SLOPE
.5:1 SLOPE
ANCHOR TRENCH
ACCESS RAMP (35' WIDE)
4.0%
0.5%
2.0%
1.0%
8.0% (MAX.)

FIGURE 19

CASES III-a AND b

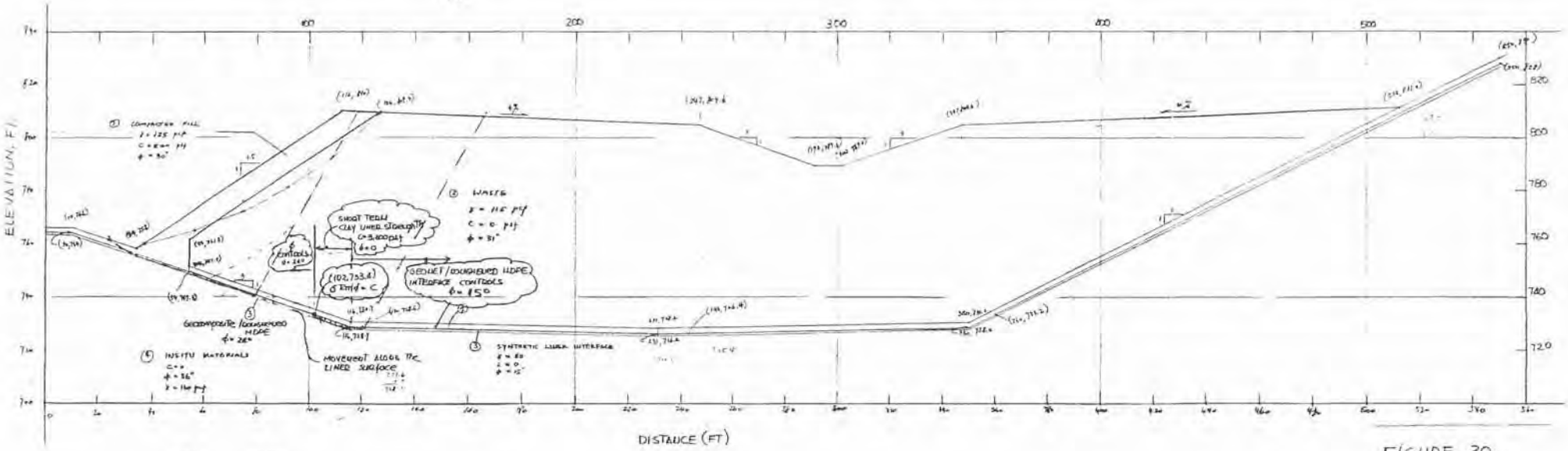


FIGURE 20

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 7 of 21
Chkd. By GSC Date 8/13/90 SLOPE STABILITY Proj. No. 89-977

CRITICAL INTERFACE on 3:1 slope is ROUGHENED HDPE/ GEOCOMPOSITE, $\phi = 21°$ (See Sheet 21)

CRITICAL INTERFACE AT THE BOTTOM PART OF THE LANDFILL: GEONET / ROUGHENED HDPE, $\phi = 15°$. (SEE SHEET 21)

$K_y \approx .33$

CASE III - A(1)

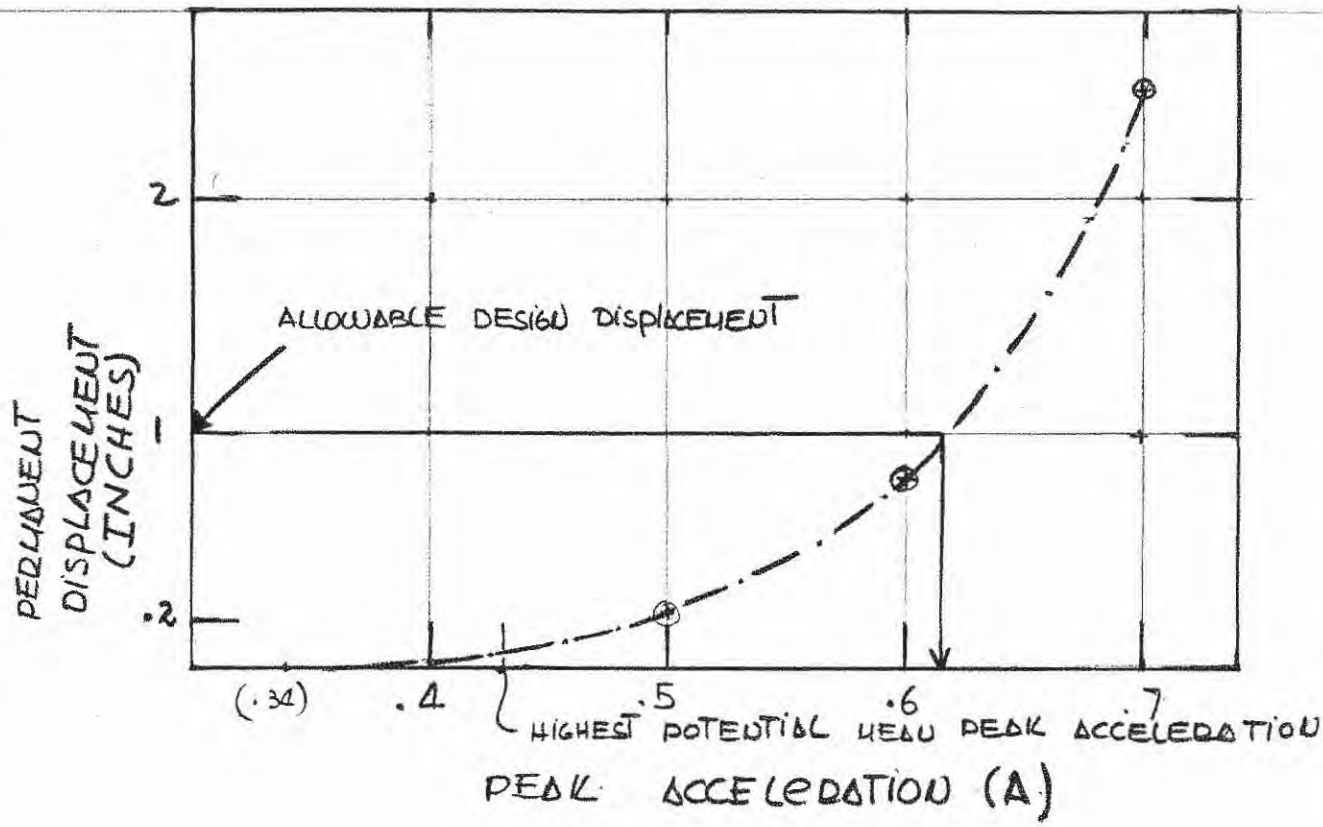
K_y	A	$\frac{K_y}{A}$	U_s * (INCHES)	$U_m = \frac{U_s V^2}{11800 A}$	$\frac{V}{A}$	U_m ** (INCHES)
.33	.5	.66	1	$U_m = .25 U_s$	30	.25
.33	.6	.55	2.6	$U_m = .30 U_s$	30	.80
.33	.7	.47	7	$U_m = .35 U_s$	30	2.45

* FROM FIGURE 2

** PERMANENT DISPLACEMENTS

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 8 of 24
Chkd. By GSC Date 8/13/90 SLOPE STABILITY Proj. No. 89-977



$A \approx .62$, $A_o = \frac{A}{.8}$ (DEEP FAILURE MODE)

$A_o = \frac{.61}{.8} = .76$

OPERATION PERIOD: ABOUT 10 YEARS
FROM FIGURE 21 POE $< 6 \times 10^{-4}$ FOR 10 YEARS

CONCLUSION

- STATIC FACTOR OF SAFETY 2.54 > 1.5 OK
- SEISMIC DISPLACEMENT 1-INCH FOR $A_o > .7$
- POE 6×10^{-4} FOR 10 YEARS

CASE III - A1

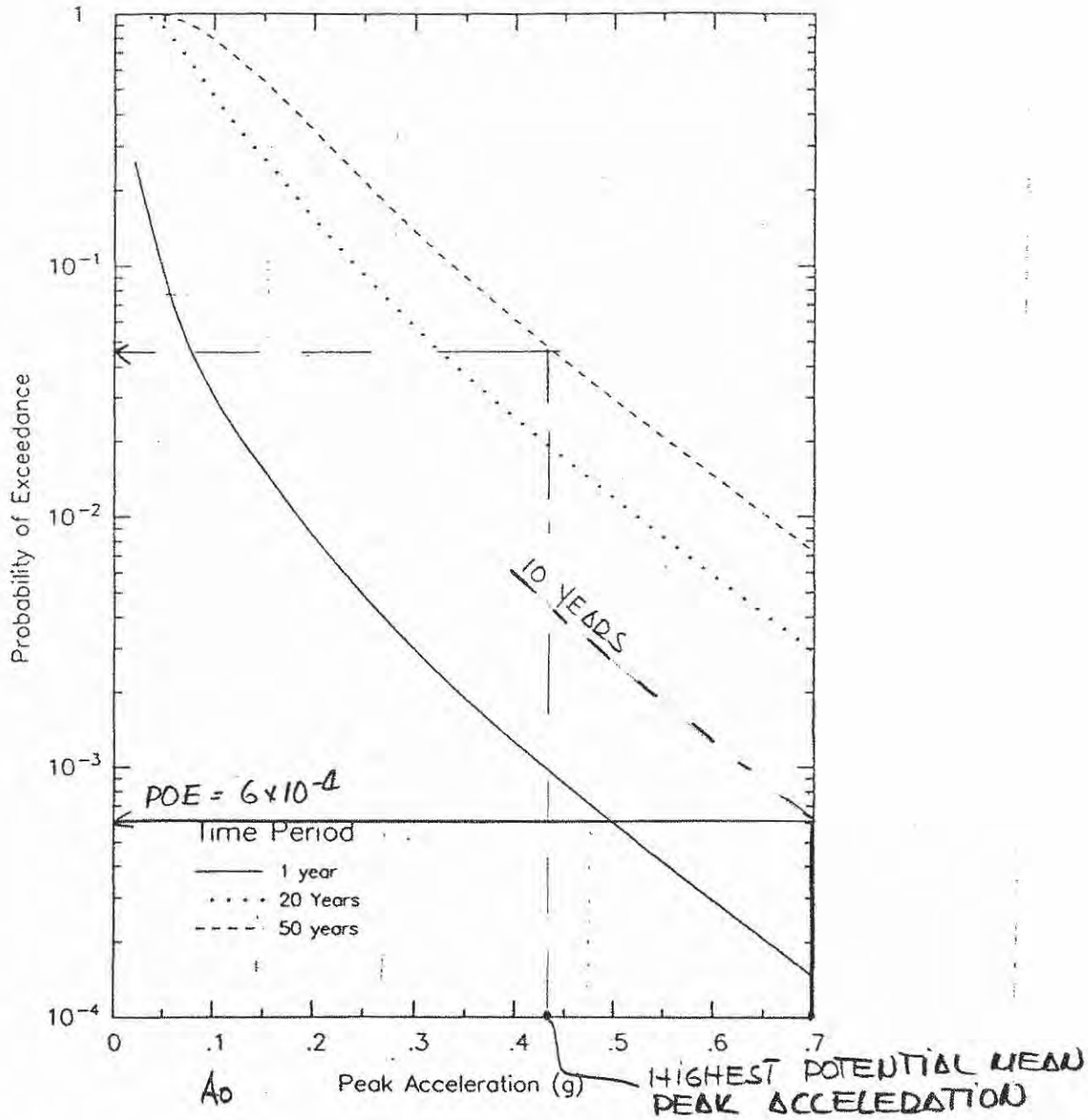


Figure 3. Probability of exceedance as a function of time period

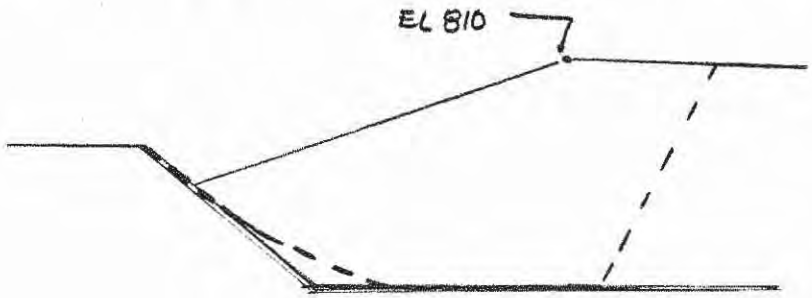
FIGURE 20-A

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/13/90 Subject B-18 LANDFILL Sheet No. 10 of 21
Chkd. By GSC Date 8/15/90 SLOPE STABILITY Proj. No. 89977

CASE III - A.2

FAILURE THROUGH THE LINER SYSTEM AT THE BASE AND THROUGH THE WASTE AT BASE/SLOPE INTERSECTION



PERFORMANCE CRITERIA

SAME AS CASE III - A.1

SLOPE STABILITY MODEL IS SHOWN IN FIGURE 20-A

COMPUTED FACTORS OF SAFETY ARE

FILE NAME	S = STATIC E = EARTHQUAKE	FAILURE MODE	K (1)	SAFETY FACTOR	REMARKS
NH 7BL.1S	S	BLOCK 2	0	3.10(2)	(1) HORIZONTAL EARTHQUAKE LOADING COEFFICIENT
NH 7BL.1E	E	BLOCK 2	0.30	1.37(3)	
NH 7BL.2E	E	BLOCK 2	0.40	1.15(3)	(2) STATIC
NH 7BL.3E	E	BLOCK 2	0.49	1.0 (3)	(3) PSEUDOSTATIC

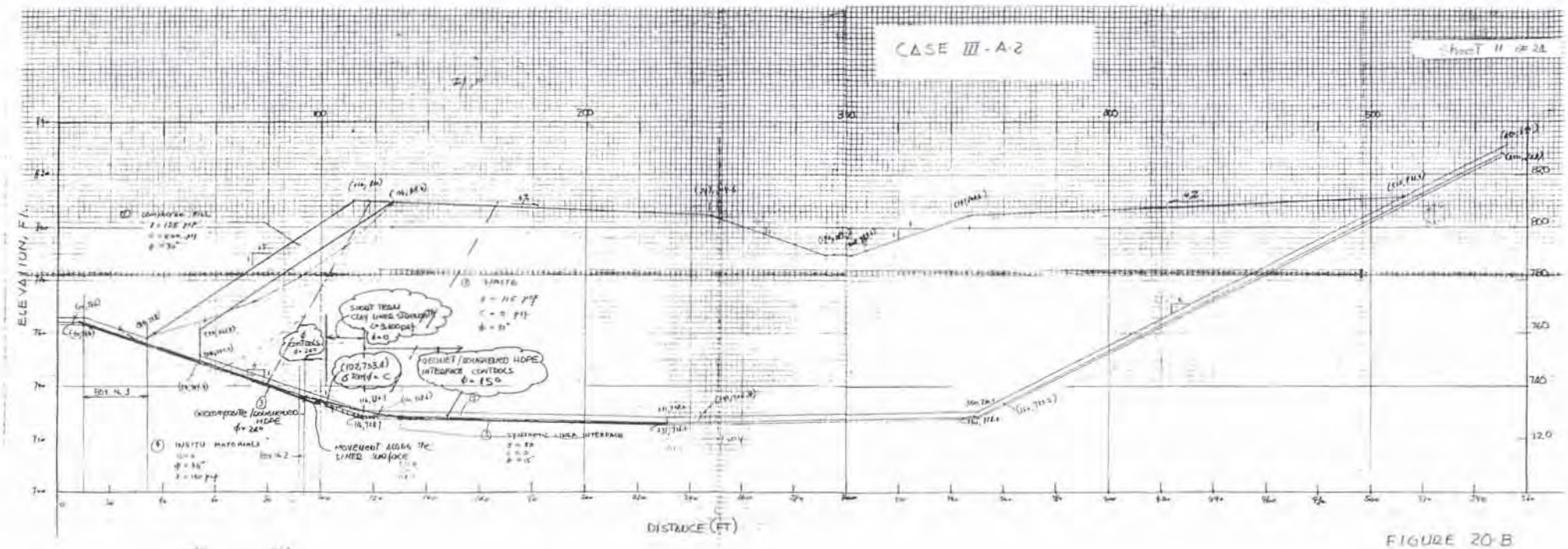

CASE III - A-2
ELEVATION, FT.
DISTANCE (FT)
SHORT TERM CLAY LINER STRENGTH
GEOMEMBRANE/GEOTEXTILE INTERFACE CONTROLS
MOVEMENT ALONG THE LINER SURFACE
INSITU MATERIALS

FIGURE 20-B

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/14/90 Subject B-18 LANDFILL Sheet No. 12 of 24
Chkd. By SSC Date 8/15/90 SLOPE STABILITY Proj. No. 84-977

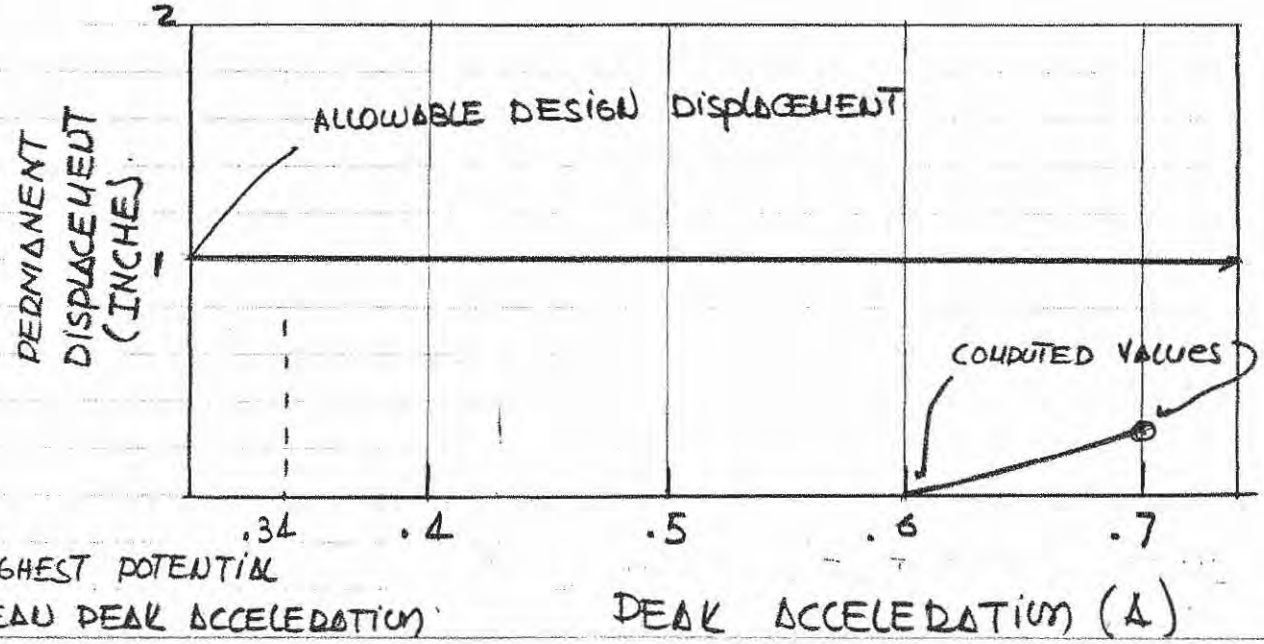
$K_y = .49$ (FROM SHEET 59-A, FILE NAME: NH7BL.3E

CASE III - A.2

SEISMIC DISPLACEMENT

K_y	A	$\frac{K_y}{A}$	U_s* (INCHES)	$U_m = U_s \times \frac{V^2}{1{,}800\ A}$	$\frac{V}{A}$	U_m (INCHES)
.49	.5	.98	0	$U_m = .25\ U_s$	30	0
.49	.6	.82	0	$U_m = .30\ U_s$	30	0
.49	.7	.70	.8	$U_m = .35\ U_s$	30	.28

* FROM FIGURE 2



ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/14/90 Subject B-18 LANDFILL. Sheet No. 13 of 24
Chkd. By GSC Date 8/15/90 SLOPE STABILITY Proj. No. 89-977

FOR 1 INCH DISPLACEMENT $A > .7$

$A_o >> .7$

OPERATION PERIOD: ABOUT 10 YEARS

FROM FIGURE 20-C: POE $< 6.0 \times 10^{-4}$

CONCLUSION

STATIC SAFETY FACTOR > 1.5.

SEISMIC DISPLACEMENT: 0

POE $< 6.0 \times 10^{-4}$

CASE III- A·2

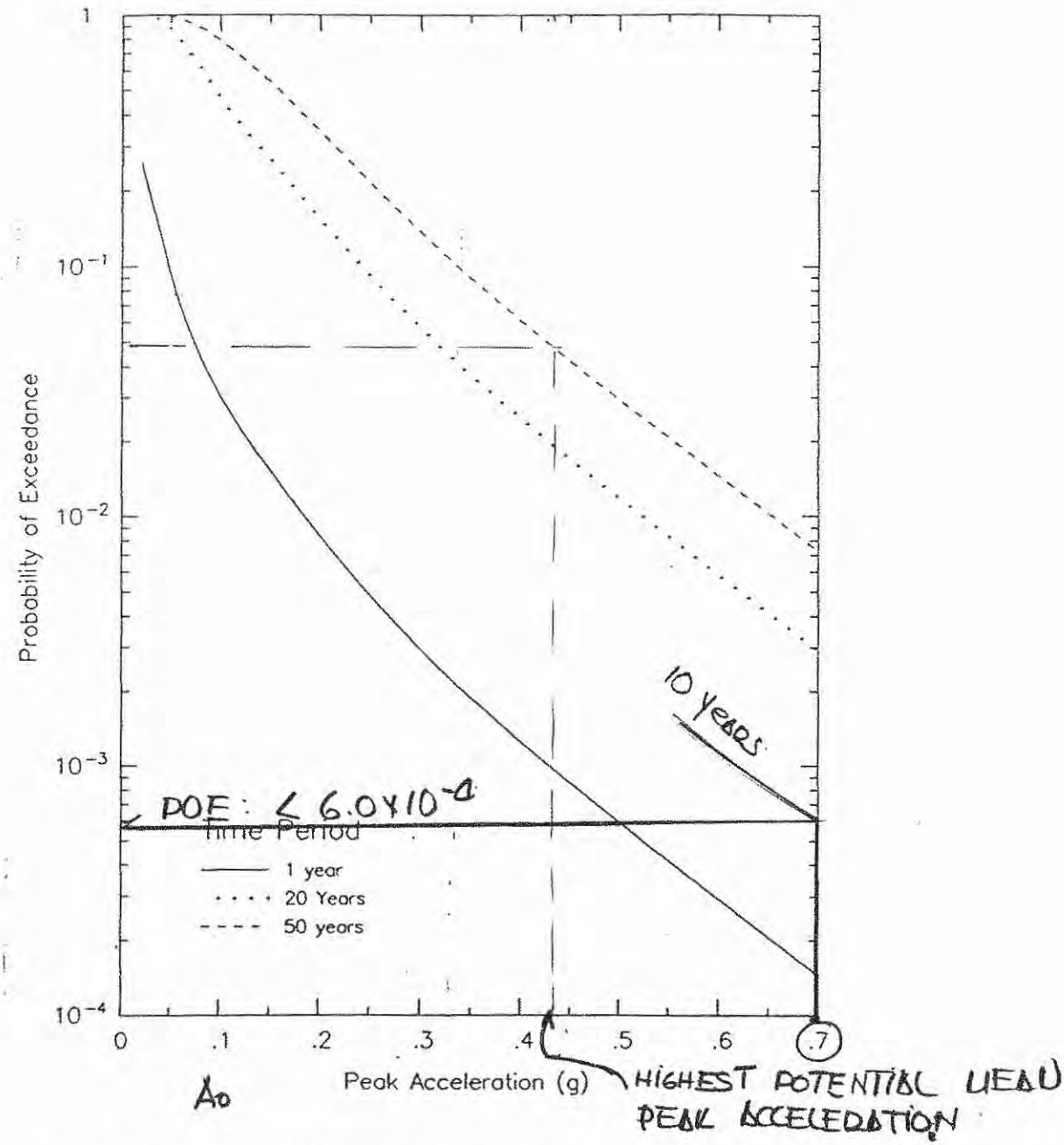


Figure 3. Probability of exceedance as a function of time period

FIGURE 20-C

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 15 of 21
Chkd. By GSC Date 8/13/90 SLOPE STABILITY ANALYSIS Proj. No. 89-977

CASE III - B

(CIRCULAR FAILURE THROUGH THE WASTE).

III B - 1. NO COHESION ALLOWED FOR WASTE

III B - 2. COHESION ALLOWED FOR WASTE

(DESIGN PERIOD 10 YEARS)

ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL SLOPE STABILITY Sheet No. 16 of 24
Chkd. By GSC Date 8/13/90 Proj. No. 89-977

CASE III - B (1).

PERFORMANCE CRITERIA

- MINIMUM STATIC FACTOR OF SAFETY : 1.5.
- MAXIMUM ALLOWABLE DISPLACEMENT FOR THE DESIGN EARTHQUAKE PEAK ACCELERATION > 6 INCHES
- SLOPE STABILITY MODEL IS SHOWN IN FIGURE 21

FACTORS OF SAFETY WERE COMPUTED USING TWO DIFFERENT STRENGTH PARAMETERS FOR THE WASTE

SHORT TERM $c = 300$ psf
$\phi = 27°$
$\gamma = 115$ pcf

LONG TERM $c = 0$
$\phi = 31°$
$\gamma = 115$ pcf

HORIZONTAL EARTHQUAKE LOADING COEFFICIENT

MAX WASTE ELEV.	FILE NAME	FAILURE MODE	E=EARTHQUAKE S=STATIC	K	SAFETY FACTOR	(1) STATIC (2) PSEUDOSTATIC. USED TO ESTIMATE Ky. REMARKS
810	KHICR.1S	CIRCL2	S	0	1.33 (1)	WASTE c=0, φ=31°
810	KHICR.1E	CIRCL2	E	.3	.80 (2)	" "
810	KHICR.2E	CIRCL2	E	.20	.93 (2)	" "
810	KHICR.3E	CIRCL2	E	.14	1.03 (2)	" "
810	KHICR.2S	CIRCL2	S	0	1.5 (1)	WASTE c=300 psf, φ=27°

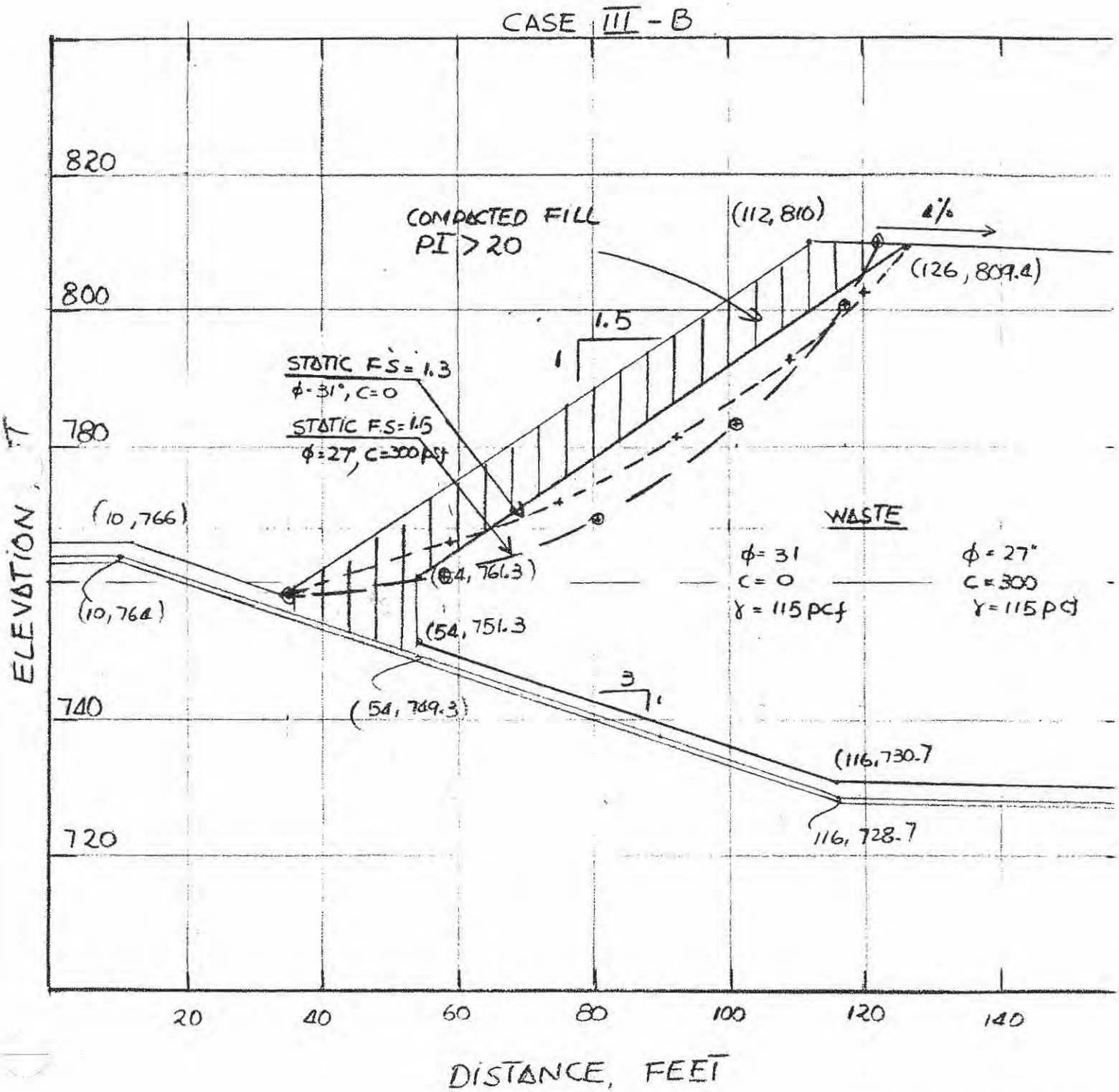

CASE III - B
820
800
780
740
720
ELEVATION, FT
20
40
60
80
100
120
140
DISTANCE, FEET
COMPACTED FILL
PI > 20
(112, 810)
4%
(126, 809.4)
1.5
1
STATIC F.S = 1.3
φ = 31°, C = 0
STATIC F.S = 1.5
φ = 27, C = 300 psf
(10, 766)
(10, 764)
(64, 761.3)
(54, 751.3
(54, 749.3)
3
1
WASTE
φ = 31
C = 0
γ = 115 pcf
φ = 27°
C = 300
γ = 115 pcf
(116, 730.7
116, 728.7

FIGURE 21

ENVIRONMENTAL SOLUTIONS, INC.

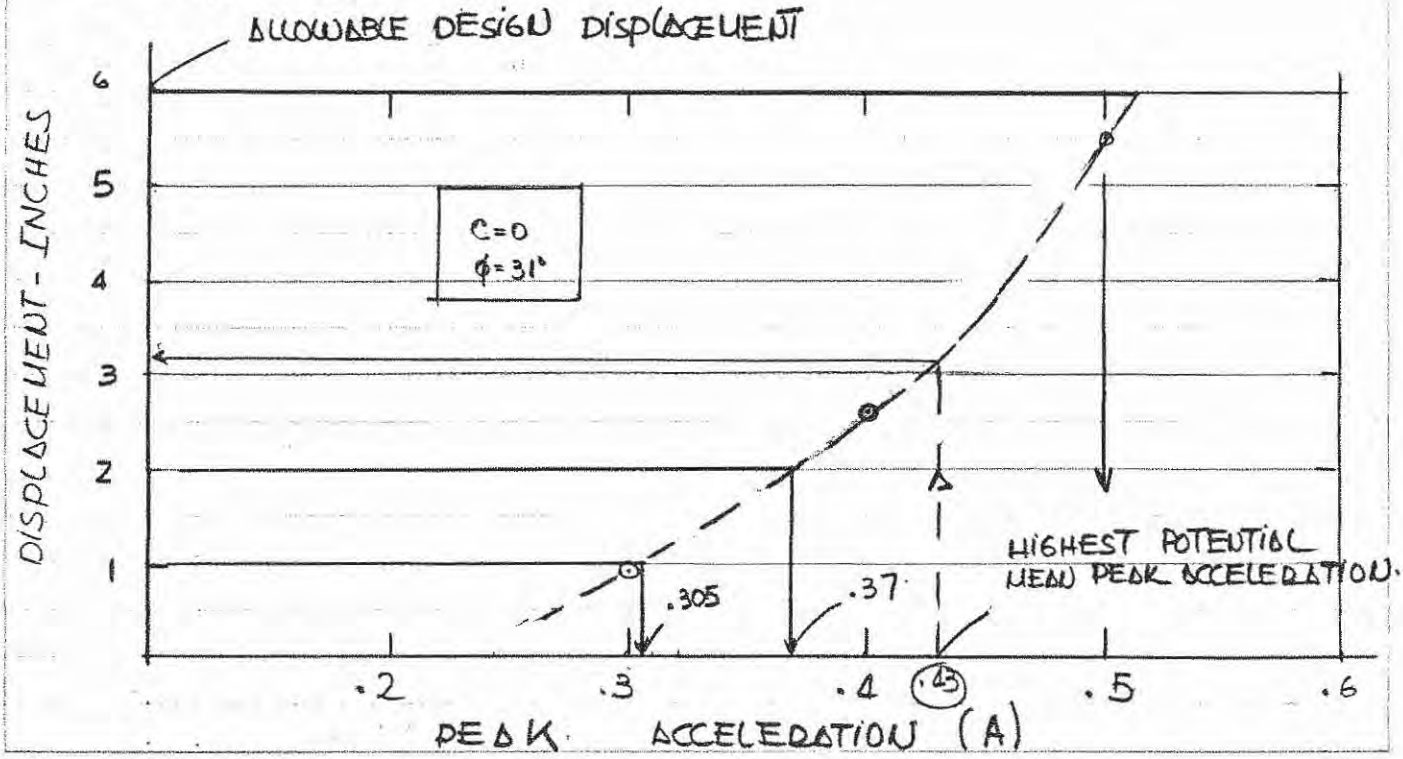
By J. B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 18 of 24
Chkd. By GSC Date 8/13/90 SLOPE STABILITY Proj. No. 89-977

K_y = .145 (FILE NAME: KHICR.3E)

CASE III - B(1)

K_y	A	$\frac{K_y}{A}$	U_s * (INCHES)	$\frac{V}{A}$	$U_m = \frac{U_s V^2}{1{,}800\ A}$	U_m (INCHES)
.145	.3	.48	6	30	U_m = .15 U_s	.90
.145	.4	.36	13	30	U_m = .20 U_s	2.60
.145	.5	.29	22	30	U_m = .25 U_s	5.50

* FROM FIGURE 2



ENVIRONMENTAL SOLUTIONS, INC.

By J.B Date 8/10/90 Subject B-18 LANDFILL Sheet No. 19 of 24
Chkd. By GSC Date 8/13/90 SLOPE STABILITY Proj. No. 89-977

FOR SHALLOW FAILURE $A = A_0$

DESIGN PERIOD = 10 YEARS

$A = .5$ FOR AN ALLOWABLE DESIGN PERMANENT DISPLACEMENT OF 6 INCHES

FROM FIGURE 22 POE = 3.0×10^{-3}

CONCLUSION

1 - STATIC FACTOR OF SAFETY = 1.3 < 1.5. SHALLOW FAILURE. CONSERVATIVE SINCE COHESION IS NOT ALLOWED FOR THE WASTE. IN REALITY, SOME COHESION (~ 300 psf) SHOULD BE CONSIDERED FOR WASTE MATERIALS

- $K_y = .145$

- POE = 3.0×10^{-3} FOR 6-INCH DISPLACEMENT

- AN ALLOWABLE MAXIMUM DEFORMATION OF 6 INCHES IN THE WASTE PILE IS ACCEPTABLE BASED ON THE SLOPE CONFIGURATION AT THE TOE AND THE FACT THAT HIGHER FACTORS OF SAFETY WERE CALCULATED FOR THE CASE III - A.

- STATIC FACTOR OF SAFETY FOR C = 300 psf and $\phi = 27°$ (WASTE) = 1.5 OK.

CASE III-b

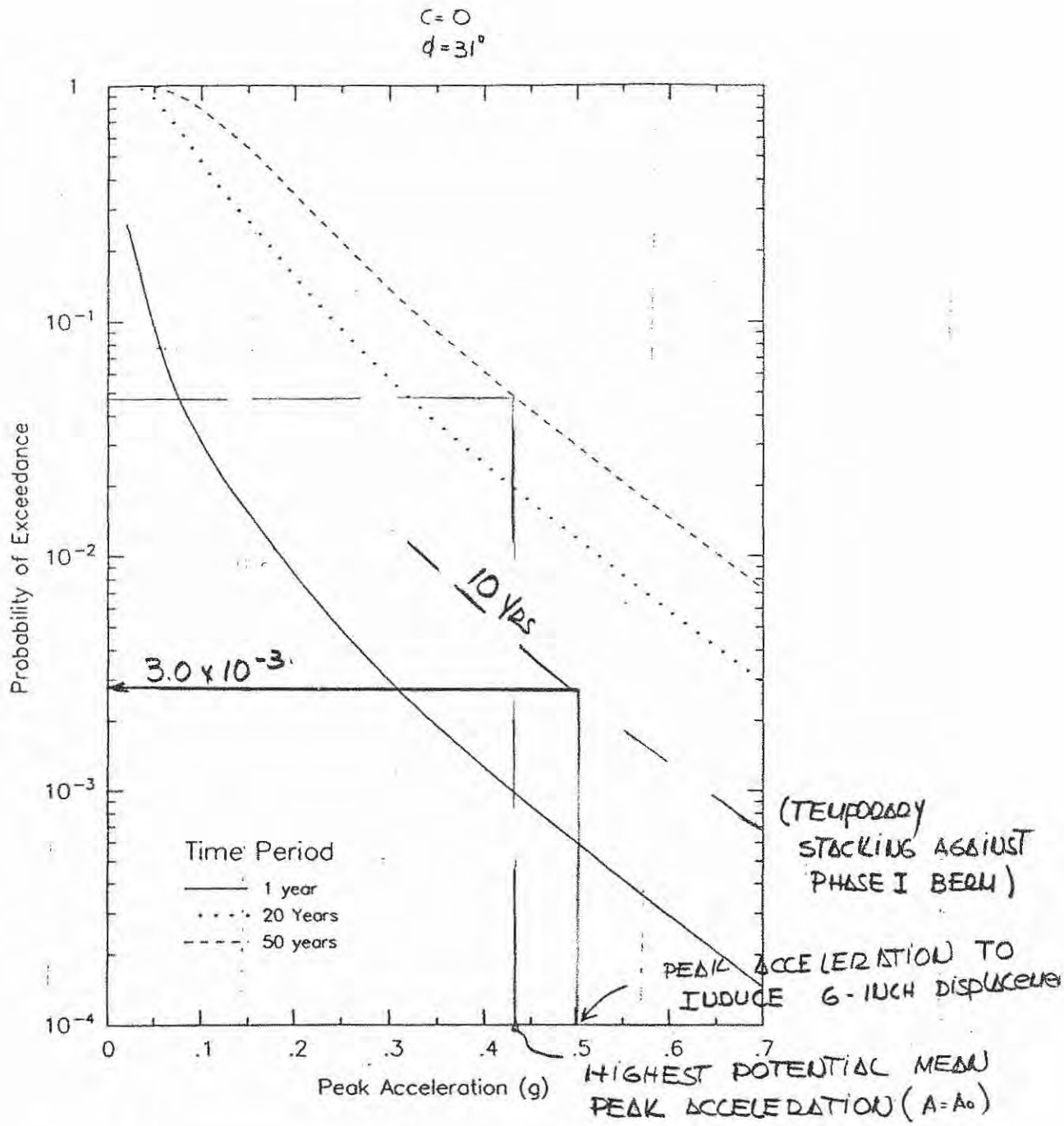


Figure 3. Probability of exceedance as a function of time period

FIGURE 22

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/13/90 Subject B-18 LANDFILL Sheet No. 21 of 21
Chkd. By GSC Date 8/15/90 SLOPE STABILITY Proj. No. 89-977

CASE III - B(2) - COHESION ALLOWED FOR WASTE

$c = 300$ psf
$\phi = 27°$
$\gamma = 115$ pcf

PERFORMANCE CRITERIA

SAME AS III - B(1)

SLOPE STABILITY MODEL IS SHOWN IN FIGURE 21

FACTORS OF SAFETY ARE AS FOLLOWS

MAX. WASTE ELEV.	FILE NAME	FAILURE MODE	E=EARTHQ. S=STATIC	(1) K	SAFETY FACTOR	REMARKS
810	KH1CR.2S	CIRCL2	S	0	1.5 (2)	WASTE
810	NH1CR.2S	CIRCL2	E	.3	.92 (3)	c = 300 psf
810	NH1CR.3S	CIRCL2	E	.24	1.0 (3)	$\phi = 27°$

(1) HORIZONTAL EARTHQUAKE LOADING COEFFICIENT

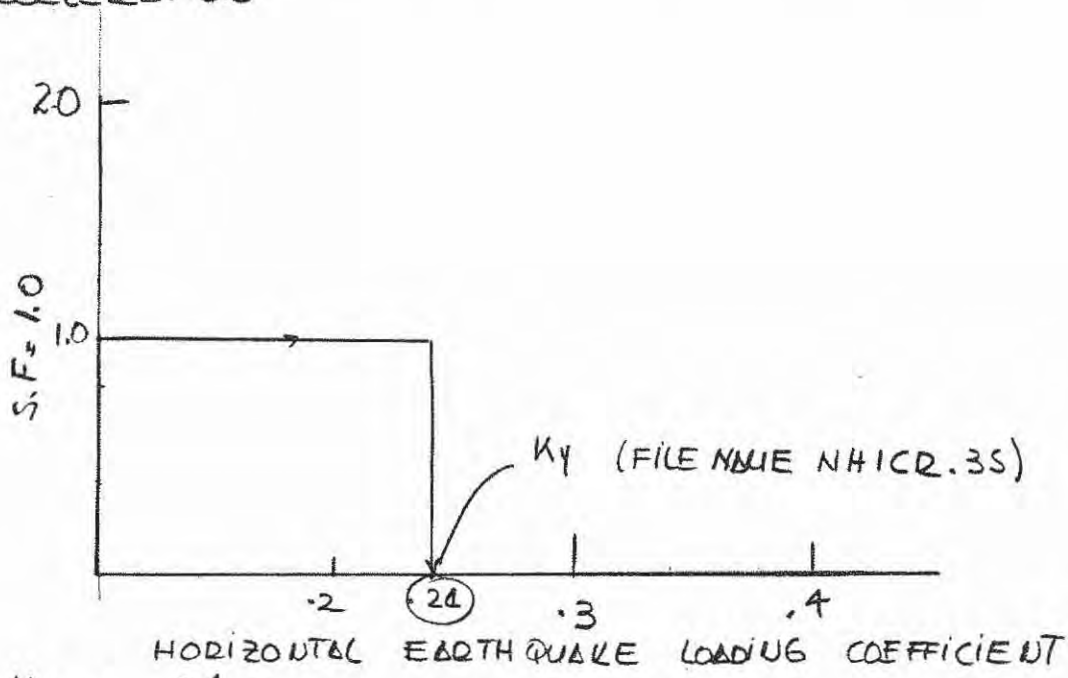
(2) STATIC

(3) PSEUDOSTATIC. A VALUE LESS THAN 1 DOES NOT necessarily imply FAILURE.

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/13/90 Subject B-18 LANDFILL Sheet No. 22 of 24
Chkd. By GSC Date 8/15/90 SLOPE STABILITY Proj. No. 89-977

YIELD ACCELERATION



Ky = .24

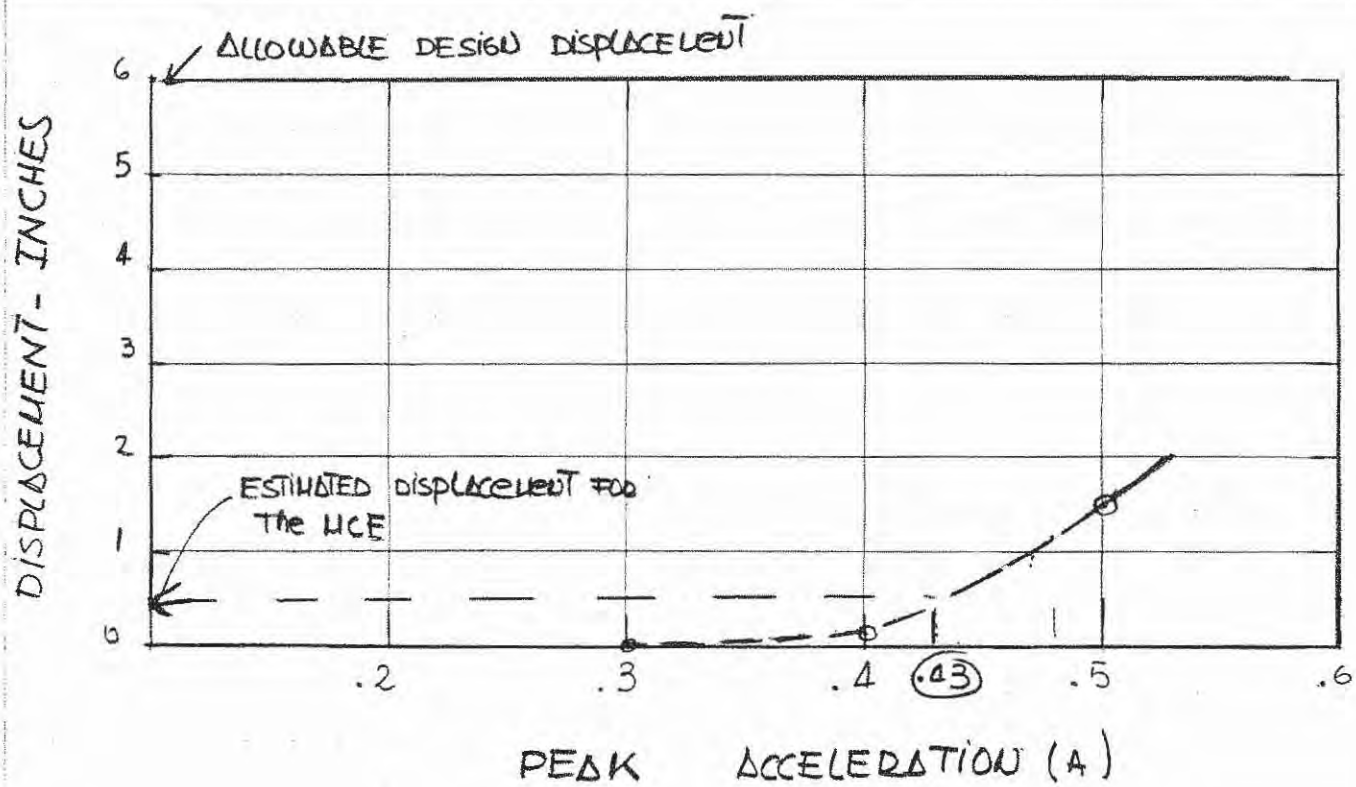
CASE III - B(2)

Ky	A	Ky/A	Us* (INCHES)	V/A	Um = Us V²/1,800 A	Um INCHES
.24	.3	.80	0	30	Um = .15 Us	0
.24	.4	.60	1	30	Um = .20 Us	.2
.24	.5	.48	6	30	Um = .25 Us	1.50

* FROM FIGURE 2

ENVIRONMENTAL SOLUTIONS, INC.

By J. B Date 8/13/90 Subject B-18 LANDFILL Sheet No. 23 of 24
Chkd. By GSC Date 8/15/90 SLOPE STABILITY Proj. No. 89-977



FOR SHALLOW FAILURE $A = A_o$

FROM FIGURE 22X.

$A \approx .6$ FOR 6-INCH DISPLACEMENT CONSERVATIVE
$A = A_o$

POE = 10^{-3} (DESIGN PERIOD 10 YRS)

CONCLUSION

- STATIC FACTOR OF SAFETY 1.5
- ESTIMATED DISPLACEMENT FOR THE MCE = 0.5" < 6" OK
- DOE = 10^{-3} (10 YRS)

CASE III - B(2)

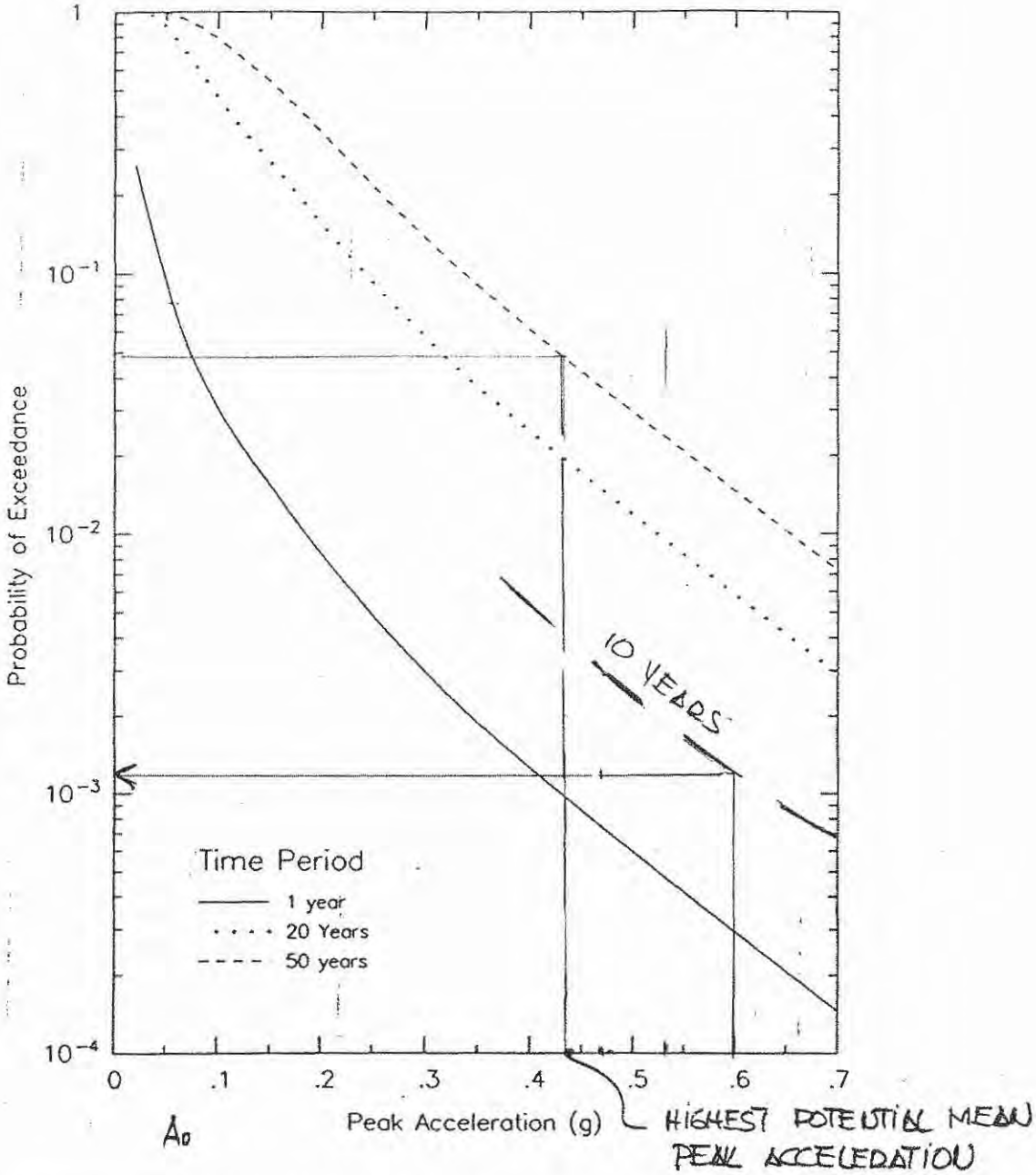


Figure 3. Probability of exceedance as a function of time period

FIGURE 22-A

HUSHMAND ASSOCIATES, INCORPORATED
Geotechnical, Earthquake and Environmental Engineers

May 2, 2011

Golder Associates Inc.
230 Commerce, Suite 200
Irvine, California, USA 92602
Mr. Ryan Hillman, P.E.

SUBJECT: SLOPE STABILITY ANALYSIS
KETTLEMAN HILLS FACILITY
LANDFILL UNIT B-18, PHASE IIIA EXPANSION
KETTLEMAN CITY, KINGS COUNTY, CALIFORNIA
HAI PROJECT NO. GLD-11-001

This letter report summarizes the results of Hushmand Associates, Inc. (HAI) slope stability analyses for the proposed Phase IIIA temporary waste slopes of the Class I/II (hazardous and designated wastes) Landfill Unit B-18 at Chemical Waste Management (CWM) Kettleman Hills Facility (KHF). The KHF is located in Kettleman City, Kings County, California approximately one mile north of State Route 41 and 2.5 miles west of Interstate Freeway 5.

CWM is planning to construct the proposed Landfill B-18 Phase III expansion in 2 phases – Phase IIIA and Phase IIIB. The proposed final cover grades analyzed previously (HAI 2008 and 2009) are not changing; however, CWM has requested a static stability analysis be conducted for the temporary waste slope that would be formed at the Phase IIIA-IIIB interface.

This report presents the results of static slope stability evaluations for the most critical slope cross section of the temporary Phase IIIA expansion area of the landfill, identified and provided by Golder Associates Inc. (Golder). More details on the project background, project description, and regulatory requirements are provided in Golder's report (2011).

Material Properties

Key material properties of various components of the landfill needed to perform static slope stability analyses are: (1) unit weight, and (2) shear strength parameters.

Detailed site-specific information on waste, existing liner systems, and foundation bedrock material properties are provided in the design and conformance testing reports prepared during early 1990's (Golder, 1990, 1991; ESI, 1990, 1992, 1993), and more recent reports prepared for Kettleman Hills Facility (Rust, 1998; URS, 2005; HAI, 2008, 2009). HAI (2008) recommended that assumed properties used for design be further verified by performing site-specific tests on the actual materials that would be used during construction. Golder performed site-specific laboratory testing on the proposed liner system materials for the landfill expansion area to verify the interface properties. The proposed Phase III liner system configuration is shown in Appendix

A. Interface shear strength testing was performed on the sandwich-like multilayer structure of the Phase III liner system. The test results indicated that the weakest interface was the double sided (DS) geocomposite and 60-mil textured HDPE geomembrane for all applied normal loads. The peak interface shear strength properties were measured as approximately $\phi = 26°$ and $C = 0$. Additional testing also confirmed these results. Appendix A provides results of the interface shear tests performed on the Phase III proposed liner system materials. To be conservative reduced shear strength properties of $\phi = 22°$ and $C = 0$ were chosen for this static slope stability analyses. The material properties of the waste and liner interfaces used in the static stability analyses of Phase IIIA temporary slopes are shown in Table 1.

Table 1. Selected Material Properties for Static Stability Analysis

Material/Interface	Unit Weight	ϕ (degree)	C (psf)
HW [1]	115 pcf	31	0
Bedrock [1]	150 pcf	40	800
Expansion Area Liner Interface [2]	----	22	0

(1) Environmental Solutions, Inc. (1990, 1992, 1993); Rust Environmental & Infrastructure, Inc. (1998); URS (2005).
(2) Golder Associates, Inc. (2011).

Stability Analysis

Conventional two-dimensional (2-D) limit-equilibrium stability analyses were performed for the existing bottom/side slope liner and waste fill slopes using landfill cross section B-B' (see Figure 1). The computer program GSTABL7 v. 2.005 developed by Gregory Geotechnical Software was used to calculate the factors of safety against potential failure. The program uses 2-D limit equilibrium theory to provide general solutions for slope stability problems with provisions of using the Modified Bishop, Modified Janbu, or Spencer Methods. Both circular and non-circular potential sliding surfaces can be prespecified or randomly generated. The Spencer, and Modified Janbu methods were used for this study. The minimum factor of safety was obtained by varying the initiation and exit points of the trial failure planes.

The Modified Janbu Method of analysis, which normally provides conservative results, was initially used to evaluate a large number of potential failure mechanisms for each cross section analyzed. At least hundred (100) potential failure surfaces are randomly generated by the program and the most critical surface resulting in the lowest factor of safety is identified. The most critical failure plane determined by the Modified Janbu Method is then reanalyzed using the Spencer Method. This method satisfies both force and moment equilibrium and thus provides more realistic (usually higher) estimates of the factors of safety. The Janbu method is generally more conservative compared with the more rigorous Spencer Method and typically results in lower factors of safety than the Spencer Method.

The GSTABL7 output plots, presented in Appendix B, illustrate the 2-D cross section, various potential failure surface conditions considered, and the most critical failure surfaces analyzed in the stability analysis of the proposed landfill temporary fill slopes. The failure surface with the lowest factor of safety is identified with two arrows at its initiation and termination points. The factor of safety for the most critical potential failure plane (a deep failure plane along the Phase IIIA liner) computed using Spencer method was equal to 1.52.

Conclusion

This report addresses static stability of the landfill slopes for the proposed temporary Phase IIIA fill configuration of the Landfill B-18. The presented analyses demonstrated that computed static factors of safety is higher than 1.5 for the analyzed section. The analyses indicated that the proposed Phase IIIA temporary landfill configuration would result in a stable configuration under static loading conditions in compliance with applicable regulations.

Closure

We trust this report meets your present requirements. If you have any questions regarding this report, please contact this office at your convenience. We appreciate this opportunity to provide our professional services to Golder.

Sincerely yours,

Very truly yours,

HUSHMAND ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER
BEHNAM HUSHMAND
No. C 044777
Exp. 3-31-12
CIVIL
STATE OF CALIFORNIA

Naz Mokarram

Naz Mokarram, Ph.D.
Senior Staff Engineer

Ben Hushmand

Ben Hushmand, Ph.D., P.E. 44777
President, Principal Engineer

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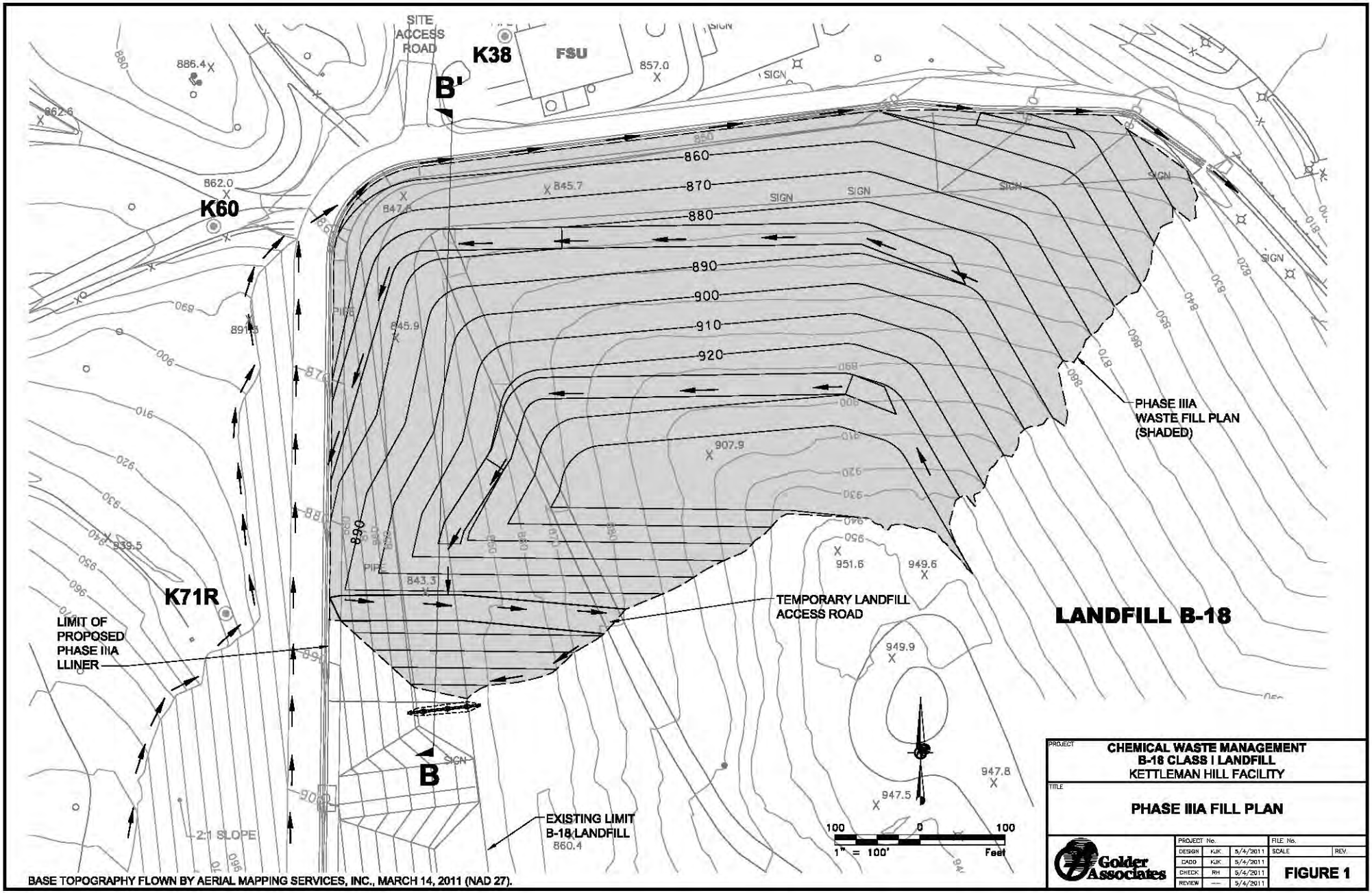
URS (2005) "Preliminary Stability Analyses, Kettleman Hills Facility Expansion, Kettleman City, California," prepared for Chemical West Management, Inc.

FIGURES



PROJECT: CHEMICAL WASTE MANAGEMENT
B-18 CLASS I LANDFILL
KETTLEMAN HILL FACILITY

TITLE: PHASE IIIA FILL PLAN

Golder Associates

PROJECT No.			FILE No.	
DESIGN	KJK	5/4/2011	SCALE	REV.
CADD	KJK	5/4/2011		
CHECK	RH	5/4/2011	FIGURE 1	
REVIEW	---	5/4/2011		

APPENDIX A

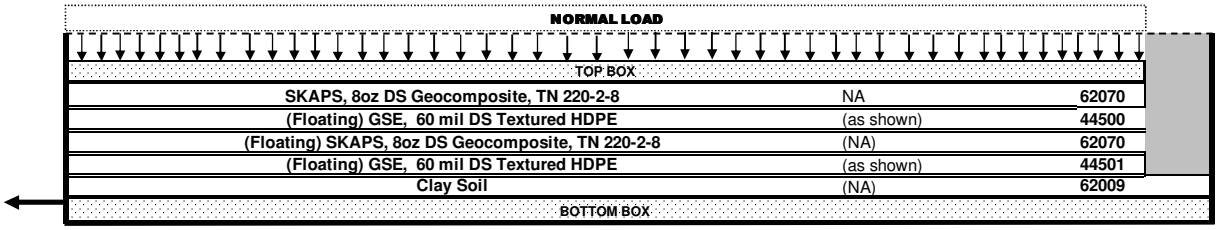
INTERFACE SHEAR TEST RESULTS

TABLE 1
CLIENT: GOLDER & ASSOCIATES
PROJECT: KETTLEMAN HILLS

INTERFACE SHEAR TEST RESULT (ASTM D5321/6243)
PGL Job No. G090907

Reviewed By
Date: 2-Oct-09

TEST CONFIGURATION 1



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is **111.8** **pcf** at **16.4%** Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to **102.86** **pcf** ; i.e.. **92.0%** of MDD at **20.5%** moisture content. (forming 2 inch layer in the TOP and BOTTOM boxes).
4. The three intermediate geosynthetic specimens were floating during shear run.

CONSOLIDATION:

1. Each set of specimen was consolidated under **Dry** condition for **24 hrs** @ normal load before shearing.
2. Normal loads were applied using **Hydraulics** for the highest load, **Bladder** for the intermediate and lowest loads.

SHEAR TEST:

1. Shear test was conducted @ **0.040** in/ min.
2. Sheared @ minimu **3.0** inch horizontal displacement.
3. Test specimens were sheared i **Dry** condition.
4. Test were performed in general accordance with ASTM D6243 / ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights (C#44500)				Asperity Heights (C# 44501)				Moisture Content (Soil)		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		UP		DOWN		UP		DOWN				Shear Stress	Secant Angle	Shear Stress	Secant Angle
		Before	After	Before	After	Before	After	Before	After	Before	After				
(psi)	(psf)	(mils)	(mils)	(mils)	(mils)	(mils)	(mils)	(mils)	(mils)	(%)	(%)	(psf)	(degrees)	(psf)	(degrees)
34.7	5,000	23.7	23.1	24.4	23.2	23.5	19.4	24.4	23.7	20.5	18.6	2,709	28	1,148	13
69.4	10,000	23.7	22.9	23.7	22.3	22.9	17.7	24.3	22.1	20.5	19.8	4,737	25	2,032	11
104.2	15,000	24.6	22.8	25.3	24.6	24.8	16.3	24.0	23.0	20.5	20.1	7,953	28	3,283	12
Note: N/A - Not Applicable												**COHESION (psf) :**		**0**	**19**
												COEFFICIENT OF FRICTION :		**0.52**	**0.21**
												FRICTION ANGLE (degrees) :		**27.7**	**12.1**

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the DS Geocomposite (C# 62070) and 60 mil HDPE (C# 44501) on all loads. See attached photos (907-1-15,000 psf / 907-1-10,000 psf / 907-1-5,000 psf).

Figure #1
Normal Stress/ Interface Stress

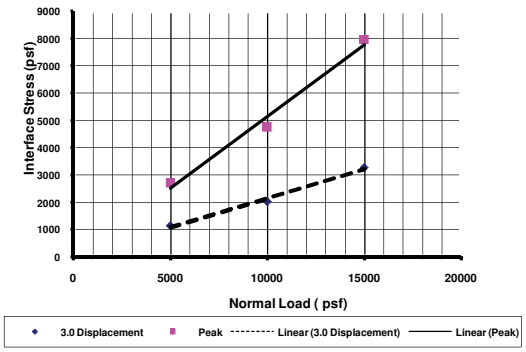


Figure #2
Shear Stress/ Displacement Curve

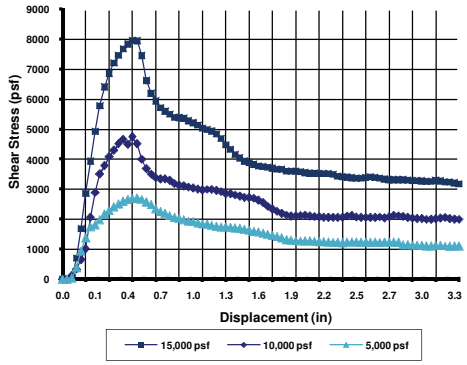
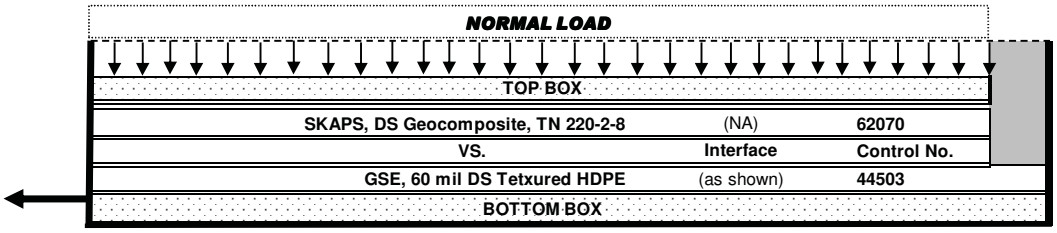


TABLE 1-A
CLIENT: GOLDER & ASSOCIATES
PROJECT: KETTLEMAN HILLS

INTERFACE SHEAR TEST RESULT (ASTM D5321/6243)
PGL Job No. G091078

Reviewed By: _____
Date: 19-Oct-09

TEST CONFIGURATION **1-A**



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. The specimen was consolidated under **Dry** condition for **2 hrs** @ normal load before shearing.
2. Normal load was applied using **Bladder**

SHEAR TEST:

1. Shear test was conducted @ **0.04** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **Dry** condition .
4. Test were performed in general accordance with ASTM D6243 / ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		mils		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	Before	After	(psf)	(degrees)	(psf)	(degrees)
69.44	10,000	25.5	18.4	4940	26	2135	12

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

Figure #2
Shear Stress/ Displacement Curve

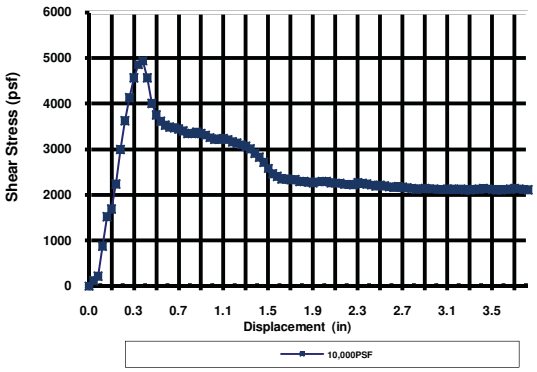
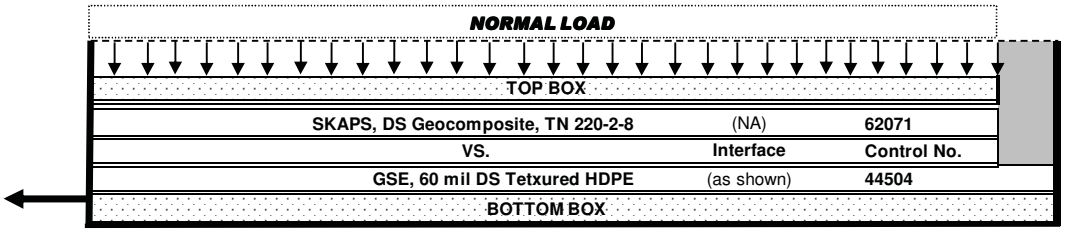


TABLE 1-B
CLIENT: GOLDER & ASSOCIATES
PROJECT: KETTLEMAN HILLS

INTERFACE SHEAR TEST RESULT (ASTM D5321/6243)
PGL Job No. G091078

Reviewed By: _____
Date: 19-Oct-09

TEST CONFIGURATION **1-B**



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. The specimen was consolidated under **Dry** condition for **2 hrs** @ normal load before shearing.
2. Normal load was applied using **Bladder**

SHEAR TEST:

1. Shear test was conducted @ **0.04** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **Dry** condition .
4. Test were performed in general accordance with ASTM D6243 / ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

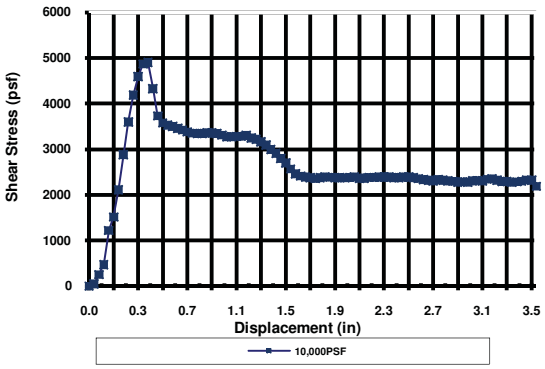
TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		mils		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	Before	After	(psf)	(degrees)	(psf)	(degrees)
69.44	10,000	24.8	19.3	4903	26	2282	13

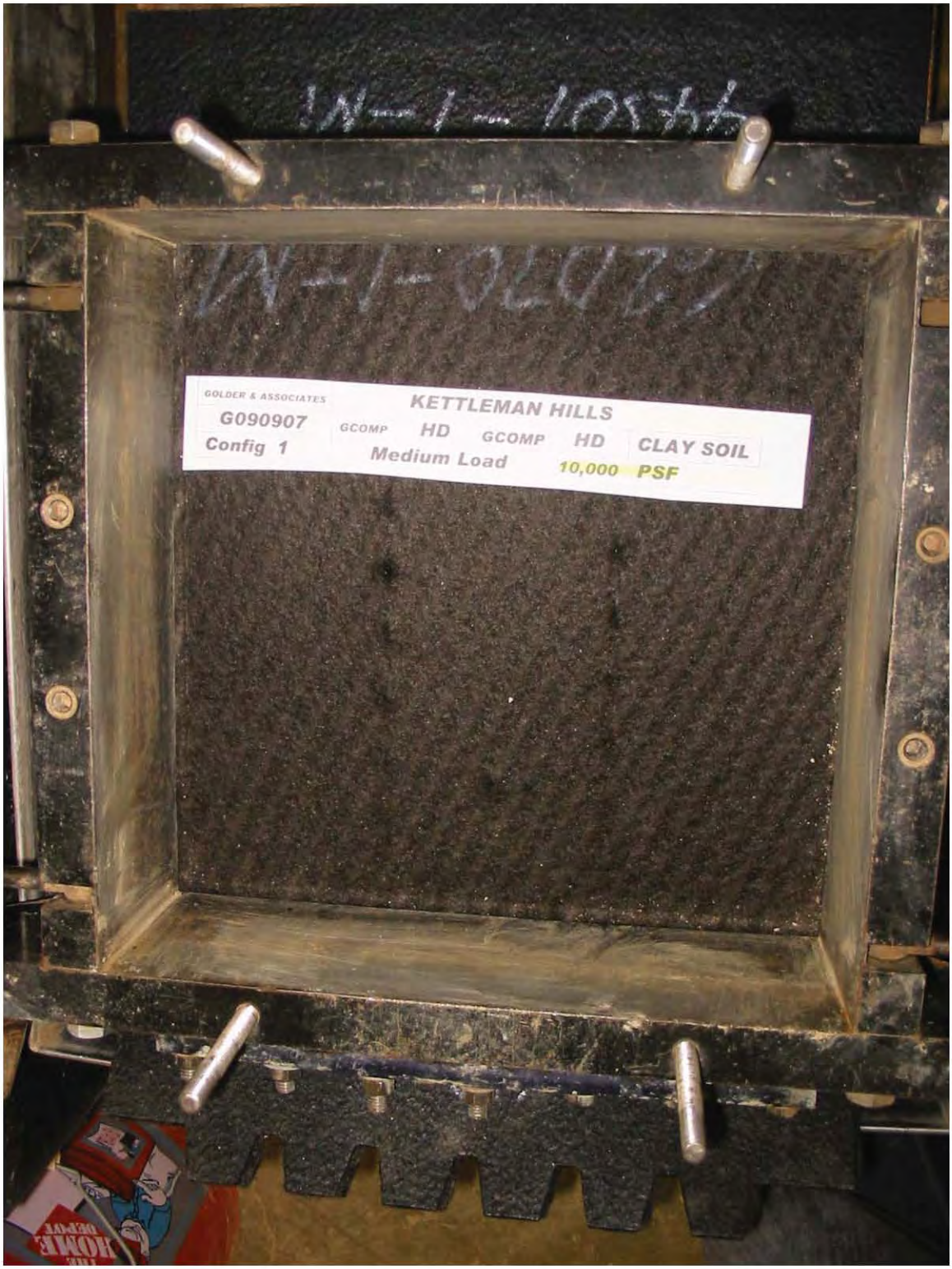
OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

Figure #2
Shear Stress/ Displacement Curve



@ 15,000 psf


GOLDER & ASSOCIATES
KETTLEMAN HILLS
G090907
GCOMP
HD
GCOMP
HD
CLAY SOIL
Config 1
Medium Load
10,000
PSF

@ 10,000 psf

H-10Slb
GOLDER & ASSOCIATES
KETTLEMAN HILLS
G090907
GCOMP
HD
GCOMP
HD
CLAY SOIL
Config 1
Low Load
5,000 PSF

@ 5,000 psf

APPENDIX B

SLOPE STABILITY ANALYSIS PLOTS

Kettleman Hills Landfill B-18 Phase IIIA Interim Slope

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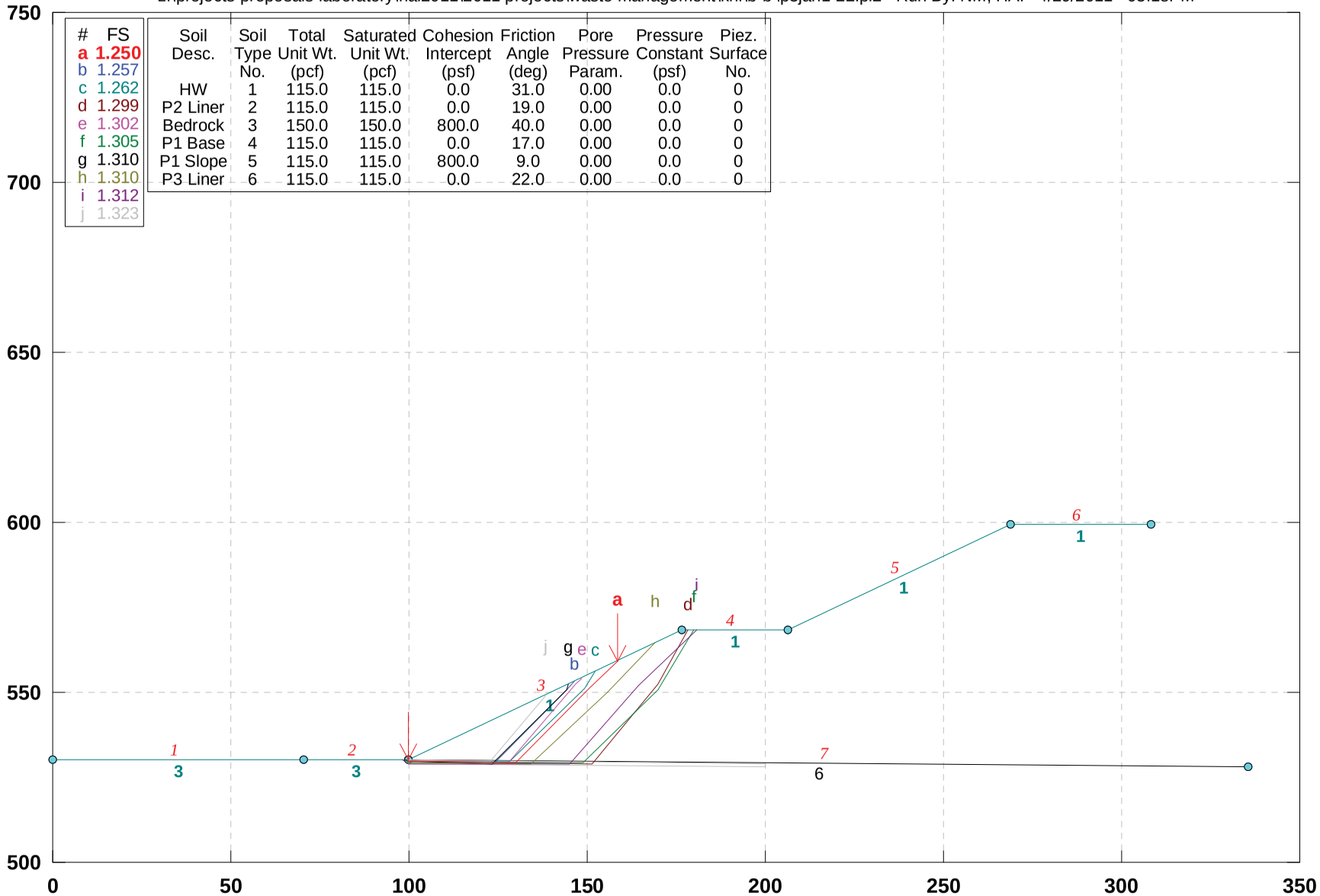


Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
HW	1	115.0	115.0	0.0	31.0	0.00	0.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0.00	0.0	0
Bedrock	3	150.0	150.0	800.0	40.0	0.00	0.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0.00	0.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0.00	0.0	0
P3 Liner	6	115.0	115.0	0.0	22.0	0.00	0.0	0

GSTABL7 v.2 FSmin=1.250

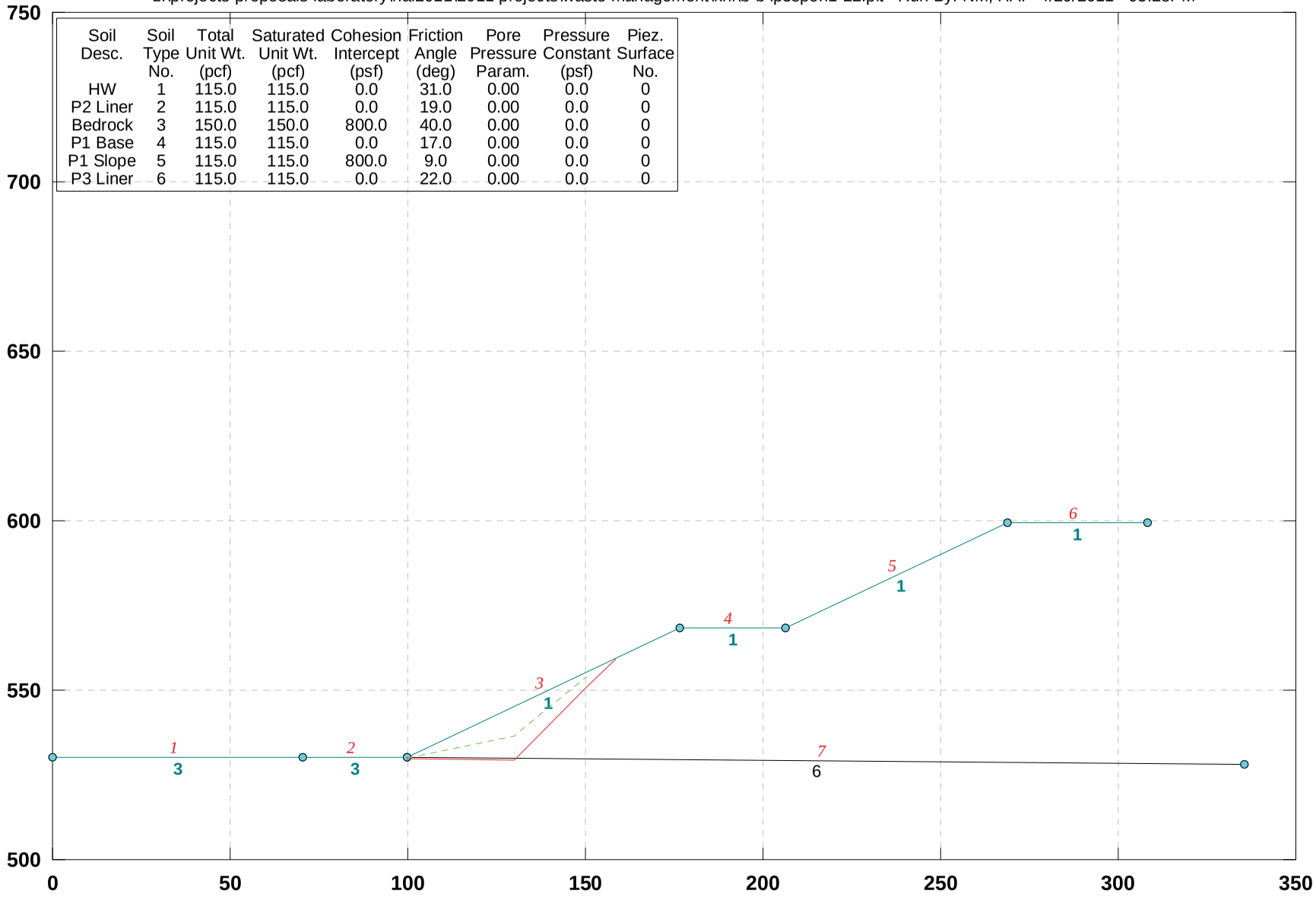
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

Kettleman Hills Landfill B-18 Phase IIIA Interim Slope

z:\projects-proposals-laboratory\hai2011\2011 projects\waste management\khf\b-b'\p3spen1-22.plt Run By: NM, HAI 4/29/2011 03:28PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
HW	1	115.0	115.0	0.0	31.0	0.00	0.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0.00	0.0	0
Bedrock	3	150.0	150.0	800.0	40.0	0.00	0.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0.00	0.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0.00	0.0	0
P3 Liner	6	115.0	115.0	0.0	22.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.521

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

APPENDIX H.5
FINAL CLOSURE STABILITY

Golder Associates

HUSHMAND ASSOCIATES, INCORPORATED
Geotechnical, Earthquake and Environmental Engineers

SLOPE STABILITY ANALYSIS REPORT

KETTLEMAN HILLS FACILITY
HAZARDOUS WASTE LANDFILL
UNIT B-18 EXPANSION
KETTLEMAN CITY, KINGS COUNTY, CALIFORNIA

Prepared for:

Chemical Waste Management, Inc.
Kettleman Hills Facility, 35251 Old Skyline Road
Kettleman City, California 93239

Prepared by:

Hushmand Associates, Inc.
250 Goddard
Irvine, California 92618

September 2008

250 Goddard • Irvine, California 92618 • Tel (949) 777-1266 • Fax (949) 777-1276
www.hushmand-associates.com

HAI **HUSHMAND ASSOCIATES, INCORPORATED**
Geotechnical, Earthquake and Environmental Engineers

September 15, 2008

Golder Associates Inc.
230 Commerce, Suite 200
Irvine, California, USA 92602

Attn: Mr. Scott Sumner, P.E.
Principal

SUBJECT: SLOPE STABILITY ANALYSIS REPORT
KETTLEMAN HILLS FACILITY
HAZARDOUS WASTE LANDFILL UNIT B-18 EXPANSION
KETTLEMAN CITY, KINGS COUNTY, CALIFORNIA
HAI PROJECT No. 08-0228

Dear Mr. Sumner:

Hushmand Associates, Inc. (HAI) is pleased to submit to Golder Associates, Inc. (Golder) four (4) copies of the slope stability evaluation report for the Class I/II hazardous waste landfill unit B-18 (Landfill B-18) expansion at Waste Management, Inc. (WMI) Kettleman Hills Facility.

We trust this report meets your present requirements. If you have any questions regarding this report, please contact this office at your convenience. We appreciate this opportunity to provide our professional services to Golder.

Sincerely yours,

HUSHMAND ASSOCIATES, INC.

Ben Hushmand, PhD, PE 44777
President, Principal Engineer

REGISTERED PROFESSIONAL ENGINEER BEHNAM HUSHMAND No. C 044777 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

S. Ali Bastani, PhD, PE, GE
Vice President, Principal Engineer

REGISTERED PROFESSIONAL ENGINEER SEYED ALI BASTANI GE2458 Exp. 12/31/09 GEOTECHNICAL STATE OF CALIFORNIA

250 Goddard • Irvine, California 92618 • Tel (949) 777-1266 • Fax (949) 777-1276
www.hushmand-associates.com

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SLOPE STABILITY ANALYSIS REPORT

KETTLEMAN HILLS FACILITY
HAZARDOUS WASTE LANDFILL UNIT B-18 EXPANSION
KETTLEMAN CITY, KINGS COUNTY, CALIFORNIA

1.0 INTRODUCTION

1.1 GENERAL

This report summarizes the results of Hushmand Associates, Inc. (HAI) slope stability analyses for the proposed expansion of the existing Class I/II (hazardous and designated wastes) Landfill Unit B-18 at Chemical Waste Management (CWM) Kettleman Hills Facility (KHF). The KHF is located in Kettleman City, Kings County, California approximately one mile north of State Route 41 and 2.5 miles west of Interstate Freeway 5.

In 2005, URS Corporation (URS) prepared a stability analysis report as part of an Environmental Impact Report (EIR) for the proposed Landfill Unit B-18 expansion (URS, 2005). To improve the proposed landfill expansion design, Golder Associates, Inc. (Golder) recently proposed some modifications to the URS final fill plan (Golder, 2008a, 2008b). These modifications required additional slope stability evaluations to demonstrate conformance of the proposed revised fill plan with regulatory requirements. A preliminary slope stability analysis report was then prepared by HAI (2008) in support of the EIR preparation for the proposed landfill expansion (CH2M Hill, 2008).

This report provides detailed stability evaluations for design of the revised landfill expansion fill plan, and is an appendix to a comprehensive design report prepared by Golder for the proposed landfill expansion (Golder, 2008b). The scope of this report is to evaluate static and seismic slope stability for the proposed Landfill Unit B-18 expansion fill plan configuration geometry as provided by Golder. Stability of landfill liner and waste slopes were analyzed to meet the design criteria discussed in Section 1.3. More details on the project background, project description, and regulatory requirements are provided in the landfill expansion EIR and design report (CH2M Hill, 2008; Golder, 2008b).

The following sections discuss the site design criteria, design earthquake motions, material properties used in static and pseudo-static slope stability and seismic deformation analyses, static slope stability and seismic deformation analysis methods, and results of the analyses.

1.2 BACKGROUND AND PROJECT DESCRIPTION

1.2.1 Background

The presently permitted design of the Class I/II Landfill Unit B-18 was developed in 1990 based on the results of detailed seismicity and static and dynamic slope stability analyses (Environmental Solutions, Inc. [ESI], 1990 and 1992). The landfill was constructed in two phases in early 1990's, designated as Phases I and II (see Figure A-1 of Appendix A) with corresponding leachate collection and removal systems (LCRSs). The existing liner systems in the Phase I and II areas meet applicable California Code of Regulations (CCR) Title 22 requirements. The configuration of the final fill plan for the 1990 design and existing liner systems for the landfill Phases I and II are provided in Appendix A (Figures A-2 to A-4).

1.2.2 Project Description and Scope

The CWM has proposed to expand the existing Class I/II Landfill Unit B-18 to provide an additional 5.0 million cubic yards of air space for a total capacity of approximately 15.7 million cubic yards. The proposed expansion design modifications to the 1990 ESI landfill liner grades and final grading plans includes expansion of the landfill footprint (mainly to the west and northwest of the site) requiring placement of approximately 12 acres of new composite liner, and increasing the landfill height and slope steepness (Figures 1 and 2, respectively). The expansion will also require rerouting of surface water and development of a new lined retention basin southeast of the landfill. Expansion of the site requires performing new analyses to demonstrate its conformance with applicable federal and state regulations for design of Class I/II landfills. These analyses include:

- Updating site seismicity and design ground motions using the recent attenuation relationships,
- Static and seismic stability of landfill slopes and liner system for final fill configuration,
- Landfill final cover stability, and
- Waste settlement and its effects on landfill final cover performance.

This report addresses the first three analysis items listed above (seismicity and ground motions, static and seismic stability of landfill slopes and liner system, and landfill final cover stability) and includes effects of increased landfill height and slope steepness on stability evaluations. The stability report presented here will be included as part of the Design Report being prepared by Golder for the proposed landfill expansion evaluation. The design issues associated with the landfill settlement and its effects on landfill cover performance are addressed in the Design Report.

The proposed final fill plan and landfill cover grades modified from the 1990 ESI final fill plan design are shown in Figure 2. A preliminary fill plan for the proposed Landfill B-18 expansion was initially developed, which was then refined based on the results of slope stability analysis iterations to arrive at the final fill plan design shown in Figure 2. Locations and configurations of the cross sections, which were evaluated for stability, are shown in Figures 1 through 4.

1.3 REGULATORY REQUIREMENTS FOR STATIC AND SEISMIC STABILITY

The existing Class I/II Landfill B-18 was designed in accordance with applicable regulations in CCR Titles 22 and 23 and the specific conditions in the site hazardous waste facility permit. CCR Titles 22 and 23 require consideration of the Maximum Credible Earthquake (MCE) for Class I landfills.

MCE is defined by California Geological Survey (CGS) as "the maximum earthquake that appears capable of occurring under the presently known tectonic framework." Thus, for stability evaluations of the expanded Landfill Unit B-18, the MCE is used as the design earthquake and is evaluated for faults determined to produce potentially damaging ground motions at the site. Near- and far-field seismic events are evaluated to assure that both higher intensity and lower intensity earthquakes are considered. Near-field events at this site generate shorter duration, higher intensity, and higher frequency ground shaking compared to far-field earthquakes that result in longer duration but lower intensity and lower frequency ground shaking.

For seismic stability, the present state-of-the-practice is to estimate landfill slope displacements for design earthquakes, using a Newmark (Newmark, 1965) equivalent method, and demonstrate that they are below an allowable value that maintains the integrity of the landfill. Current engineering practice for slope stability evaluation along the landfill liner is to allow a maximum seismically-induced permanent slope displacement of six to twelve inches to correspond to acceptable performance for well-designed liner systems (Seed and Bonaparte, 1992). Class I landfills at KHF are designed to meet the lower bound displacement (more conservative) by limiting the maximum allowable slope displacement along the landfill liner to only six inches, which is also used in the design of the Class I/II Landfill Unit B-18 in this report. The criteria commonly used for landfill cover design, which allows a maximum seismically-induced permanent displacement of up to twenty four inches (2 feet) of the final covers, is based on the understanding that these would be relatively easily accessible and thus quickly repairable in the event of damage by a major seismic occurrence.

2.0 SITE DESIGN GROUND MOTIONS

2.1 PREVIOUS SITE DESIGN GROUND MOTIONS

A detailed discussion of the site geology, faulting, and seismicity was presented in the design report prepared for Landfill Unit B-18 (ESI, 1990) and more recent reports prepared for Landfill Unit B-19 at Kettleman Hills Facility (Rust Environment & Infrastructure [Rust], 1998; URS, 2005; HAI, 2006). Deterministic and probabilistic seismic hazard evaluations of the site were performed by Rust (1998), and also independently by William Lettis & Associates (WLA), reported as Appendix A of the 1998 Rust report. The ground motions and seismic design parameters presented in the 1998 Rust report were used in the 2005 URS and 2006 HAI reports, which were also used in the preliminary seismic deformation analyses performed for the Landfill B-18 expansion EIR preparation (HAI, 2008a). The following summarizes results of the 1998 seismic ground shaking evaluations and the selected ground motions used in two-dimensional seismic response analyses at the KHF site:

- The closest seismic sources to the site are segments of the blind Ramp Thrust Fault that is present beneath the site at approximate distances of 8 to 27 km, while the most active sources in the site area are associated with the San Andreas Fault zone at a distance of about 35 km from the site.
- No evidence of fault rupture hazard is known to exist at the project site (i.e., within 200 feet of Landfill Unit B-18).
- The Ramp Thrust Kettleman Hills North Dome segment (Magnitude [M_w] 6.6) of the blind Ramp Thrust faults and the San Andreas Slack Canyon-Cajon Pass segment (M_w 7.8) will produce the highest near-field and far-field ground motions at the site, respectively. The MCE's associated with these faults were selected as the site design events.
- The deterministic values of peak horizontal ground accelerations (PHGA) for the near-field and far-field design events were estimated as 0.57g and 0.21g, respectively. The calculated PHGA of 0.57g approximately corresponds to an average probabilistic return period of 1,000 years (RUST, 1998).
- Duration of ground shaking is a major factor influencing the level of seismic-induced slope displacements. Empirical relations are available that provide an estimate of earthquake shaking duration as a function of earthquake magnitude, distance, and site condition (Abrahamson and Silva, 1996). Using the Abrahamson and Silva empirical relationship the ground shaking duration for Landfill Unit B-18, which is characterized as rock site, is estimated to be about 10 seconds and 32 seconds for the near-field design event (M = 6.6, r = 10 km) and far-field design event (M = 7.8, r = 35 km), respectively. Duration of the ground shaking was used in the simplified Newmark-type seismic deformation analyses for the proposed site expansion EIR (HAI, 2008a).

- One "distant" (far-field) and three "local" (near-field) earthquake records were selected and scaled to correspond to the design peak horizontal accelerations in rock as design input motions. These records have a peak acceleration, frequency content, and duration representative of the expected earthquake motions at the site. The selected records were:
  1) Caltech A-1 synthetic acceleration time history simulating a M 8+ earthquake on the San Andreas Fault, scaled to peak amplitude 0.21g,
  2) Seed-Hayward synthetic acceleration time history simulating a M ~ 7 earthquake matched to the site design response spectrum to approximate the near-field MCE,
  3) Castaic Old Ridge Route, sedimentary rock outcrop, Ch 1 (90 deg Component) acceleration record from the 1994 ($M_W \approx 6.7$) Northridge, California earthquake scaled to a peak amplitude of 0.57g, and
  4) Pacoima-Kagel Canyon, sedimentary rock outcrop, Ch 3 (360 deg Component) acceleration record from the 1994 ($M_W \approx 6.7$) Northridge, California earthquake scaled to a peak amplitude of 0.57g.

Details of the above site design earthquake parameters derivation, including figures illustrating time histories of the selected acceleration records and a comparison of their response spectra with the site design response spectrum are provided in the 1998 Rust report. The 1998 ground motion time history and response spectrum plots are also provided in Appendix A of this report. These acceleration time histories were adjusted by scaling the peak ground acceleration (PGA).

2.2 SITE DESIGN GROUND MOTIONS UPDATE

2.2.1 Site Design Response Spectra

Deterministic seismic hazard analyses (DSHA) were performed for the Ramp Thrust Kettleman Hills North Dome segment of the blind Ramp Thrust faults (Great Valley Fault, Segment 14) and an earthquake scenario similar to the San Andreas 1857 earthquake using the latest attenuation relationships and the site faulting and seismicity data. As discussed above, these faults produce the highest near-field and far-field ground motions at the site, respectively. The MCE's associated with these faults were selected as the site design events. The MCE magnitude and closest source to site distance for these faults were updated based on the latest information on the site faulting and seismicity. For the near-field source two different fault geometry models were used in the analyses. The first one was based on the fault database developed for the 2008 update of the national seismic hazard maps (Petersen et al., 2008) representing the site with averaged seismicity parameters from adjacent faults around the site, while the second one was based on an older but site-specific local seismicity investigation (Stein and Ekstrom, 1992; Ekstrom et al., 1992). The magnitude and distance values used in the deterministic seismic hazard analyses were:

- Ramp Thrust Kettleman Hills North Dome:
  - (Case 1) $M_w \cong 7$, Rx ≅ 6.5 km, Rrup ≅ 10 km, Rupture Width ≅ 38.4 km, Top of Rupture ≅ 8.1 km, and Dip Angle ≅ 22 degrees (Petersen et al., 2008)

  - (Case 2) $M_w \cong 7$, Rx ≅ 8 km, Rrup ≅ 8 km, Rupture Width ≅ 17 km, Top of Rupture ≅ 6 km and Dip Angle ≅ 45 degrees (Stein and Ekstrom, 1992; Ekstrom et al., 1992)

- San Andreas 1857 Earthquake: $M_w \cong 8$ and Distance ≅ 35 km (Petersen et al., 2008)

For the near-field source, using the above fault geometries, initially two different deterministic design response spectra were developed, and then the site final design response spectrum was generated by averaging these two response spectra. Based on the subsurface geology and results of exploratory borings drilled at the site (ESI, 1990; Rust, 1998), ground motion evaluations for the project site were performed using four recently developed attenuation relationships for an average shear wave velocity of approximately 760 m/s (~ 2500 ft/sec) estimated for the upper 30 meters (~ 100 feet) of the site.

Attenuation relationships describe the relation of ground motion levels with earthquake magnitude and distance (closest distance between site and earthquake rupture plane). These empirical relationships are used to describe the variation of response spectral accelerations at specific structural periods of vibration and damping ratios with earthquake magnitude and distance, and to incorporate the local geologic conditions and the near-source effects. The selected attenuation relationships are based on the Next Generation Attenuation (NGA) relationships as listed below:

- Abrahamson and Silva, 2008
- Campbell and Bozorgnia, 2008
- Boore and Atkinson, 2007
- Chiou and Young, 2006

Figure 5 presents the estimated site design response spectra for the near-field and far-field seismic sources (Ramp Thrust Kettleman Hills North Dome and San Andreas faults, respectively). Based on this figure, the deterministic values of PHGA for the near-field and far-field design events were estimated as 0.62g and 0.16g, respectively.

2.2.2 Design Ground Motions

One "distant" (far-field) and three "local" (near-field) earthquake records were selected and matched to the respective site design response spectrum to be used as input motions in site response analysis for the landfill. These records have a peak acceleration, frequency content, and duration approximately representative of the expected earthquake motions at the site. The selected records were from the Strong Motion Database of **P**acific **E**arthquake **E**ngineering **R**esearch (PEER) Center (http://peer.berkeley.edu/smcat/search.html) as listed below:

- The CHY042, USGS Class B site (Vs^* = 360-750 m/s), north component acceleration record from the 1999 ($M_W \approx 7.6$) Chi-Chi, Taiwan earthquake
- The Castaic Old Ridge Route, sedimentary rock outcrop (USGS Class B site, Vs^* = 360-750 m/s), Ch 1 (90 deg Component) acceleration record from the 1994 ($M_W \approx 6.7$) Northridge, California earthquake

- The Gilroy Array #1, sedimentary rock outcrop (USGS Class A site, $Vs^* > 750$ m/s), 90 deg component acceleration record from the 1989 ($M_W \approx 6.9$) Loma Prieta, California earthquake
- The Pacoima-Kagel Canyon, sedimentary rock outcrop (USGS Class B site, $Vs^* = 360$-750 m/s), Ch 3 (360 deg Component) acceleration record from the 1994 ($M_W \approx 6.7$) Northridge, California earthquake

Where Vs^* is the average shear wave velocity to a depth of 30 m (~ 100 ft).

The above candidate earthquake records were selected based on the following seismological properties:

- Spectral content (initial recordings with energy in the matching frequency band),
- Magnitude of the design earthquake ± 0.5,
- Source to site distance (source to recording station distances of 8 to 35 km), and
- Rupture directivity.

Once the reference time histories were selected, they were adjusted to provide the response spectrum compatible time histories according to the following approach and criteria:

1. Adjustment of the response spectrum of the reference time histories was performed using a time-domain procedure described by Abrahamson (1991, 1998).
2. The response spectrum of the spectrum compatible time histories should follow reasonably the recommended design response spectra.

The program EZ-FRISK version 7.26 spectral matching routine (Risk Engineering, 2008) was used to develop spectrum-compatible horizontal motions using the above-mentioned startup motions. The spectral matching was performed within the frequency range of PGA to 10.0 seconds. In order to remove the drift induced in displacement time histories as a result of spectral matching, the baseline correction module of EZ-FRISK was applied to the spectrally-matched ground motions. The final design ground motions are baseline-corrected.

Figures 6 through 17 illustrate plots of the original natural records and the final (the response spectrum compatible) time histories and response spectra for the selected earthquake records. Acceleration, velocity, and displacement time histories and 5-percent damped acceleration response spectra are provided in these plots.

These four spectrum compatible records were selected as the updated input ground motions for the landfill dynamic response analysis based on the site design spectra and seismological properties. These motions provide an estimate of the landfill median dynamic response. The selected records were used as input motion in two-dimensional seismic response analysis of the proposed Landfill Unit B-18 expansion. Digitized time history data for the spectrum compatible earthquake records are provided in electronic format for use in the analysis.

2.3 LIQUEFACTION

The potential for liquefaction occurrence in the area of the proposed landfill expansion is considered to be very low or non-existent. The KHF site is underlain by Tertiary sedimentary rocks of the Etchegoin-Jacalitos (Te), San Joaquin (Ts), and Tulare (Tt) Formations. The Landfill Unit B-18 is located within the San Joaquin Formation sedimentary bedrock. The San Joaquin Formation consists primarily of fine-grained sedimentary rocks, principally shale, claystone, and sandstone, which are not susceptible to liquefaction. Groundwater at the site is also deeper than 50 feet. Therefore, based on the site subsurface geology, the potential for liquefaction at the site is very low.

2.4 SEISMIC SETTLEMENT

Similarly, the potential for seismically-induced settlements of the landfill foundation materials was estimated to be negligible based on the subsurface geology and cemented nature of the bedrock. The site foundation materials are classified primarily as the Tertiary sedimentary rocks, which are not susceptible to seismically-induced settlement.

3.0 SLOPE STABILITY AND LANDFILL DISPLACEMENT ANALYSIS

3.1 GENERAL

The slopes of the proposed Class I/II Landfill B-18 expansion were evaluated for stability under both static and dynamic loading conditions. As part of this evaluation, the effects of dynamic landfill deformations were considered relative to performance of the base liner system during the estimated design ground motions due to the MCE as required by the California Code of Regulations for seismic design of Class I and Class II landfills (see Section 1.3 of the report). The approach used in evaluating the stability and deformation of the slopes involved conventional analytical methods of slope stability evaluation and a refined Newmark-type (Newmark, 1965) seismic deformation analysis including dynamic site response analysis using two-dimensional (2-D) equivalent-linear wave propagation and finite element models.

The information required for the slope stability and landfill deformation analyses consisted of the site geology and seismicity, geometry of the fill plan and landfill bottom excavation and side slopes, and material parameters for waste, the liner systems, and the foundation bedrock. This information was based on the site-specific data gathered for the analysis including laboratory test data (ESI, 1990, 1992; Rust, 1998; URS, 2005; HAI, 2006), design of preliminary proposed fill plans for expanded landfill configuration (URS, 2005; CH2M Hill, 2008; HAI, 2008; Golder, 2008a), in-house compiled database of material properties, and a literature survey of published data on slope stability and seismic deformation analysis of landfills.

The site geology and seismicity is described in detail in the ESI (1990) and Rust (1998) reports. The landfill bottom excavation and side slopes, and proposed new fill plan and cover grades are shown in Figures 1 and 2. A fill plan for the proposed new design of Landfill Unit B-18 expansion was developed by Golder. This fill plan shown in Figure 2, is evaluated for stability using the results of static and seismic slope stability analyses presented in this report.

3.2 LANDFILL GEOMETRY AND ANALYSIS SECTIONS

Figures 1 and 2 present plan views of the Landfill Unit B-18 base and the proposed final fill plan contours, respectively. Six cross sections of the landfill were analyzed for slope stability including waste slopes and landfill liner system. These cross sections (A-A', B-B', C-C', D-D', E-E', and F-F') are shown in Figures 3 and 4, and their locations are shown on Figures 1 and 2.

Stability of the bottom/side slope and waste fill slopes were analyzed using representative cross sections selected through critical areas of the landfill. Locations of the stability analysis sections were selected based on variations in the landfill geometry such as height and steepness of waste slopes, orientation, height, and steepness of landfill bottom and side slopes around the landfill perimeter.

3.3 LANDFILL LINER DESIGN

Configurations of the existing landfill bottom/side slope liners that comply with state and federal regulations are provided in the ESI 1990 and 2005 URS reports. Figures from the 1990 and 2005 reports are presented in Appendix A of this report illustrating the liner designs for the bottom/side slopes. Figure 18 presents configuration of the proposed liner system for the expansion areas of the landfill. In the slope stability analyses, for each liner configuration, the weakest interface in the composite liner system is expected to provide the preferred failure path for potential failure planes.

3.4 MATERIAL PROPERTIES

Key material properties of various components of the landfill needed to perform static and seismic slope stability analyses are: (1) unit weight, (2) shear strength parameters (static and dynamic), (3) dynamic small-strain shear modulus (or shear wave velocity) and damping ratio properties, and (4) variation of the shear modulus and damping ratio with shear strain during shaking.

Detailed site-specific information on waste, existing liner systems, and foundation bedrock material properties are provided in the Golder and ESI design and conformance testing reports prepared during early 1990's (Golder, 1990, 1991; ESI, 1990, 1992, 1993), and more recent reports prepared for Kettleman Hills Facility (Rust, 1998; URS, 2005; HAI, 2006). The preliminary stability evaluations performed in support of the EIR preparation for the proposed Landfill Unit B-18 expansion (URS, 2005; HAI, 2008) used the same material properties as in the earlier investigations listed above except for the liner interface shear strength properties in the Phase II area of the landfill. In 2003, URS obtained samples of the landfill Phase II liner system that were archived at the KHF site. Interface shear strength testing was performed on the sandwich-like multilayer structure of the liner system and the results were used to refine the interface properties reported in the previous investigations (URS, 2005). In this report, the material properties from the previous investigations (Phase I liner system) and the URS (2005) report for the Phase II liner system were used for the static and seismic slope stability analyses. The Class I waste and foundation bedrock shear strength and unit weight properties, liner interface shear strength values, and dynamic waste, clay liner, and bedrock properties used in the analyses presented in this report are provided in Table 1. The assumed properties used for design should be further verified by performing site-specific tests on the actual materials that will be used during construction. More detailed discussion of the material properties used is provided below.

<u>Hazardous Waste Material Properties</u>

The unit weight, shear strength, and dynamic properties of the existing hazardous (Class I) waste materials in the landfill were based on the prior KHF landfill investigations by Golder (1990, 1991), ESI (1990, 1993), and HAI (2006). The landfill Class I waste material was characterized as having static and dynamic properties similar to those for relatively dense cohesionless sand material with a Poisson's ratio of 0.35. The total unit weight of the waste was assumed as 115 pcf in stability and dynamic response analyses, and its shear strength parameters (friction angle and cohesion) were assumed to be 31 degrees and 0 psf, respectively.

The low-strain shear modulus of the Class I waste was assumed to be a function of the mean effective confining pressure as shown below (Seed and Idriss, 1970):

$$G_{max} = 1000\ K_2\ (\sigma'_m)^{1/2}$$

Where G_{max} and σ'_m represent the soil maximum (low-strain) shear modulus and mean effective stress, respectively, and are in psf. The dimensionless parameter K_2 is determined from the void ratio or relative density. The K_2 was assumed as 60, which is a typical value for relatively dense sands (Seed and Idriss, 1970).

Liner Interface Shear Strength and Dynamic Properties

In the slope stability analyses for Landfill Unit B-18, potential failure surfaces pass through the waste and the weakest interface in the liner above the landfill foundation bedrock due to relatively low interface shear strength properties of the liner and high strength of the bedrock. Based on the site-specific data from the earlier studies at Kettleman Hills Facility (Golder, 1990, 1991; ESI, 1990, 1992) and our in-house database and literature survey for existing liner system configurations, an interface friction angle of 17 and 9 degrees for the Phase I base liner and slope liner were used, respectively. An interface friction angle of 19 degrees was measured in the recent interface shear tests performed on the "sandwich-like" specimens of the Phase II liner system (URS, 2005). The same type of liner as in the Phase II liner system was assumed to be used for the proposed landfill expansion area. Adhesion coefficient for the liner interfaces is assumed to be zero except for the Phase I slope liner where an adhesion value of 800 psf was used (ESI, 1992). The assumed interface strength properties for the proposed new liner in the expanded landfill areas should be further evaluated by conformance testing on the materials used during construction.

The total unit weight of the clay used in the liner system was assumed as 115 pcf in stability and dynamic response analyses. The clay material used in the liner system was characterized as having a Poisson's ratio of 0.35 and a nonlinear shear modulus given by the relation shown below for the low-strain conditions (Hardin and Drenevich, 1972):

$$G_{max} = 14760\ [(2.973-e)^2/(1+e)]\ (OCR)^a\ (\sigma'_m)^{1/2}$$

Where G_{max} and σ'_m represent the soil maximum shear modulus and mean effective stress, respectively, and are in psf, "e" is void ratio and OCR is overconsolidation ratio, and the value of power "a" depends on the plasticity index of soil.

Bedrock Properties

Shear strength parameters for the foundation bedrock materials were estimated based on the previous KHF landfill investigations. A cohesion value of 800 psf and friction angle of 40 degrees were used in the stability analyses. The shear wave velocity and unit weight of the foundation rock were estimated to be about 2,500 fps and 150 pcf, respectively.

Modulus and Damping Ratio Variation

The nonlinear modulus reduction and damping ratio increase curves used in the dynamic response analyses for the landfill waste, clay liner, and foundation bedrock materials are the same as those used in the previous KHF investigations and are presented in Figure 19. The figure illustrates how the shear modulus and damping ratio change with the level of induced cyclic shear strains for different landfill materials.

3.5 ANALYSIS APPROACH

Landfill liners in seismically active areas such as California undergo dynamic loads during earthquakes in addition to static loads generated by the dead weight of the waste. Liners, particularly along landfill side slopes, are subjected to tensile stresses due to settlement and creep-induced downward movement of the waste mass. During earthquakes, the landfill mass moves dynamically under the effects of ground accelerations and generates additional stresses in the landfill liner.

CCR Title 22 requires that slopes of a landfill and the foundation beneath the slopes maintain a minimum factor of safety of 1.5 under seismic loading conditions. The factor of safety is usually calculated using pseudo-static limit equilibrium analytical methods. Since achieving a pseudo-static factor of safety of 1.5 for relatively high accelerations generated during MCE events is difficult and costly, the regulations allow for an alternate, more rigorous and detailed design approach involving quantified evaluation of the seismic deformations and displacements of the landfill mass in lieu of the pseudo-static analysis. At present the evaluation of seismic deformations is the most common approach for seismic design of waste fills in California.

The present state-of-practice in seismic design of landfills is based on Newmark (Newmark, 1965) or a simplified Newmark-type method (e.g. Franklin and Chang, 1977; Makdisi-Seed, 1978; Bray et al., 1998) to estimate the order of magnitude of seismically-induced permanent displacements of landfill slopes. Additionally, the current practice relies on engineering judgment by establishing an allowable deformation (about 6 inches) to compare with displacements computed from Newmark method along the liner system.

Our analyses were conducted in the following evaluation/computational sequence:

- Static slope stability and selection of critical failure surfaces;
- Evaluation of yield acceleration coefficients for the critical failure surfaces determined from static slope stability analyses;
- Dynamic site response analysis and calculation of potential slide mass average acceleration; and
- Estimation of seismically-induced permanent deformations for the design “local” and “distant” MCE events.

The above approach originally developed by Seed and Martin (1966) and later used by Makdisi and Seed (1978) for seismic analysis of earth dams, generally results in conservative (larger) permanent displacements, compared to more rigorous fully coupled nonlinear dynamic deformation analysis (Lin and Whitman, 1983).
The four stages of the approach used in this study are further described in the following sections.

3.6 STATIC AND PSEUDO-STATIC STABILITY ANALYSES

Analysis Method

Conventional two-dimensional (2-D) limit-equilibrium stability analyses were performed for the existing and proposed bottom/side slope liner and waste fill slopes using landfill cross sections A-A', B-B', C-C', D-D', E-E', and F-F'.

The computer program GSTABL7 v. 2.003 developed by Gregory Geotechnical Software was used to calculate the factors of safety against potential failure. This program was originally developed based on the computer program PC STABL 5M (Achilleos, 1988). The program uses 2-D limit equilibrium theory to provide general solutions for slope stability problems with provisions of using the Modified Bishop, Modified Janbu, or Spencer Methods. Both circular and non-circular potential sliding surfaces can be prespecified or randomly generated. The Spencer, Modified Janbu and Modified Bishop methods were used for this study. The minimum factor of safety was obtained by varying the initiation and exit points of the trial failure planes.

The Modified Janbu Method of analysis, which normally provides conservative results, was initially used to evaluate a large number of potential failure mechanisms for each cross section analyzed. In each analysis case, at least one thousand (1000) potential failure surfaces were randomly generated by the program and the most critical surface resulting in the lowest factor of safety was identified. The most critical failure plane determined by the Modified Janbu Method was then reanalyzed using the Spencer Method. This method satisfies both force and moment equilibrium and thus provides more realistic (usually higher) estimates of the factors of safety and yield acceleration coefficients. The Janbu method is generally more conservative compared with the more rigorous Spencer Method and typically results in lower factors of safety than the Spencer Method (Duncan, 1992). The modified Bishop method was used to analyze circular failure surfaces.

The GSTABL7 output plots, presented in Appendix B, illustrate the 2-D cross sections, various potential failure surface conditions considered, and the most critical failure surfaces analyzed in the stability analysis of the final fill slopes of the proposed landfill expansion.

The appendix presents computer plots for all the cases analyzed illustrating geometry of landfill cross-sections and the ten most critical potential failure planes searched by the program, as well as computed factors of safety. The failure surface with the lowest factor of safety is identified with two arrows at its initiation and termination points.

The material properties of the waste and liner interfaces used in the static and pseudo-static stability analyses are shown in Table 1 and the results of the analyses are summarized in Table 2 and on Figures 3 and 4.

3.6.1 Liner and Waste Mass Static Stability

Slope stability analyses were performed for the final fill plan geometry. Six cross sections at different locations across the landfill were selected for analysis. Figures 1 and 2 show plan views of the Landfill B-18 excavation and the final fill/landfill cover geometry, respectively, and the locations of the cross sections selected for the analysis. In each part of the landfill where its cross section configuration changes, one or more sections were selected for two-dimensional stability evaluations. The configuration of the proposed landfill expansion final fill slopes are illustrated by the selected cross sections shown in Figures 3 and 4.

The most important potential failure mechanism considered was for a wedge (block failure) sliding through the waste mass and along the existing and expanded landfill base liner system. Potential failure surfaces were assumed to pass along the weakest interface in the lining system and then through the landfill mass to the surface. Stability of the slopes against circular failure through the waste mass was also investigated.

The slope stability analyses for Landfill Unit B-18 showed that sliding along the liner systems and/or waste mass was consistently more critical than a sliding surface through the foundation material. Therefore, in the stability analyses, the foundation bedrock was modeled as being impenetrable.

3.6.2 Pseudo-Static Stability Analyses

Pseudo-static analyses, necessary to compute yield acceleration coefficient (K_y), were performed for the critical potential failure surfaces through waste and base liner system, identified from results of the static slope stability analyses discussed in Section 3.6.1 for the selected cross sections (Table 2 and Figures 3 and 4). The yield acceleration is defined as the acceleration which results in a pseudo-static factor of safety of 1.0. The computed yield acceleration, K_y, represents limiting value of the horizontal seismic coefficient beyond which movement of a potential slide mass will occur.

For each cross section, pseudo-static analysis using the Spencer Method was performed to compute an estimate of yield acceleration coefficient (K_y) for the most critical potential failure plane identified from the static slope stability analysis for that section. Density and shear strength properties summarized in Table 1 were also used for the pseudo-static stability analyses.

<u>Stability Results</u>

Table 2 presents a summary of the computed static factors of safety and yield acceleration coefficients for the critical cases analyzed in this study.

Appendix B presents plots of all the cases analyzed illustrating geometry of landfill cross-sections, the most critical potential failure surfaces, and values of computed static factors of safety and yield accelerations for these surfaces searched by the program. Sample printouts of input and output files providing details of the analysis results are also presented in Appendix B.

For all final (long-term) static conditions, the minimum acceptable factor of safety is 1.5. This criterion was satisfied by the potential failure surfaces analyzed for the proposed fill plan, base liner designs, and the estimated material properties.

The results of the pseudo-static stability analyses show that the lowest yield acceleration coefficient was approximately equal to 0.23 for failure along the liner and waste mass in cross sections A-A' (east), D-D' (east), E-E' (east), and F-F' (east).

The combination of yield acceleration coefficient and slide mass geometry that could potentially result in the largest estimates of the seismically-induced displacements were used in the site response and Newmark displacement analyses described in the following sections. Based on the computed yield accelerations presented in Table 2 and landfill cross sections geometry (Figure 4), the potential failure planes #1 and #3 associated with cross sections D-D' and F-F', respectively were judged to produce the largest seismic displacements and thus, were selected for dynamic site response and seismic deformation analyses.

3.7 SEISMIC DEFORMATION ANALYSES

The acceptability of a slope for earthquake conditions is generally determined by the magnitude of the seismically-induced permanent displacement resulting from the design earthquake.

A small allowable displacement is intended to preclude the possibility of large displacements that might disrupt the flexible membrane liner (FML)/clay composite layers or other components of the leachate collection and removal (LCR) system. A conservative value of the allowable displacement along the landfill liner on the order of 6 inches was considered acceptable for Landfill B-18. This is equal to the lower bound of the allowable displacement range commonly used in the industry (6 to 12 inches) as suggested by Seed and Bonaparte (1992).

Preliminary estimates of the landfill slopes seismic deformations were obtained previously (HAI, 2008) using the simplified analysis method by Bray et al. (1998) and are presented in the following section. A more detailed evaluation of the seismic deformations using two-dimensional site response analyses and Newmark (1965) slope displacement calculation method was performed for this study and is presented in Section 3.7.2 below.

3.7.1 Simplified Analysis of Landfill Slopes Seismic Deformations

Preliminary estimates of the landfill slopes seismic deformations were obtained using the simplified analysis method by Bray et al. (1998).

This method requires estimating the yield acceleration (k_y) for the potential slide mass, the ground motion parameters (MHA_r, T_m, and $D_{5\text{-}95}$), fundamental period of equivalent 1-D slide mass at small strains (T_s), and maximum horizontal equivalent acceleration (MHEA) for the potential slide mass. The ground motion parameters are defined as:

MHA_r = Maximum Horizontal Acceleration expected at the site at rock level (g),

T_m = Mean period of input rock motion (sec), and

$D_{5\text{-}95}$ = Significant duration of shaking, i.e., 5-95% normalized Arias intensity (sec).

The MHA_r and $D_{5\text{-}95}$ values for the site design ground motions are provided in Section 2.0 and T_m can be estimated from the following relationships:

$$\ln(T_m) = \ln(C_1 + C_2 \cdot (M\text{-}6) + C_3 \cdot r) \qquad M \leq 7.25$$

$$\ln(T_m) = \ln(C_1 + 1.25 \cdot C_2 + C_3 \cdot r) \qquad 7.25 \leq M \leq 8.0$$

where M and r are the earthquake magnitude and distance and parameters C_1, C_2, and C_3 and the standard error (ε_r) for a rock site condition are as listed below:

$C_1 = 0.411$, $C_2 = 0.0837$, $C_3 = 0.00208$, and $\varepsilon_r = 0.437$

The fundamental period of slide mass (T_s) is calculated using the equation $T_s = 4H/V_s$, where H is the maximum vertical distance between the ground surface and slip surface used to determine k_y and V_s is representative small-strain shear wave velocity of materials above sliding mass. The landfill shear wave velocity profile provided in the 2005 URS report was used to calculate the values of parameter T_s for this study.

Charts provided by Bray et al. (1998) were then used to estimate the normalized MHEA and sliding mass displacement for deep-seated slide surfaces. The normalized MHEA is defined as a function of the normalized fundamental period of slide mass (T_s/T_m). The normalized displacement of the potential slide mass is correlated to the ratio of k_y/k_{max}, where k_{max} = MHEA/g.

Table 3 provides results of the simplified seismic deformation analyses. The table provides yield accelerations, maximum horizontal equivalent accelerations (MHEA), k_y/k_{max} ratios, and estimated slope displacements for the cross sections analyzed.

As seen from Table 3, for potential deep failure planes along the landfill bottom liner the estimated permanent displacements are consistently less than 1 inch except for the western part of cross section B-B' where a slope displacement of about 1 inch was estimated. These preliminary estimated values of the seismic displacements are considerably smaller than the maximum allowable displacement of 6 inches commonly used in the industry (Seed and Bonaparte, 1992). These displacements are also in agreement with the seismic displacements estimated by URS (2005).

3.7.2 Site Response and Newmark Slope Deformation Analyses

Two-Dimensional Dynamic Site Response Analyses

After yield acceleration coefficients were determined, dynamic response of the landfill and average acceleration time histories of the potential sliding masses were evaluated for three representative "local" (near-field) and one "distant" (far-field) input ground motions. The analyses provide a measure of earthquake energy attenuation/amplification characteristics of the landfill.

To account for the uncertainties introduced by variation of the landfill geometry, two-dimensional finite element computer program QUAD4M (Hudson et al., 1994) was used to evaluate dynamic response of the landfill and average acceleration time histories of the potential sliding waste masses identified from the stability analyses. The two-dimensional analyses provide a more realistic estimate of the seismically-induced displacements of waste slopes compared to one-dimensional site response analysis computer codes such as SHAKE91 (Schnabel et al., 1972; Idriss and Sun, 1991). However, it should be noted that because the landfill geometry is three-dimensional, the use of two-dimensional site response analyses generally provides a conservative estimate of the landfill dynamic response.

QUAD4M was recently developed by modifying and improving QUAD4 program which was initially developed in 1973 (Idriss et al., 1973). The main changes in QUAD4M are: 1) addition of energy absorbing boundaries that can be used to model the material underlying the finite element model as a linear elastic half space, 2) computing average acceleration time history (seismic coefficients) of a defined potential failure mass, and 3) a new method for formulation of damping. QUAD4M approximately incorporates the nonlinear material properties of soil and waste in the analyses by using the equivalent linear method (Seed and Idriss, 1970). In this method, the strain-dependent shear modulus and damping ratio of the material are selected to be compatible with the computed level of strain in each element. The dynamic response is computed repeatedly until the dynamic properties determined from the two sequential cycles differ by less than a specified value. This analysis is done in the time domain, and for any set of properties it is a linear analysis.

QUAD4M analyses were performed for Cross Sections D-D' and F-F' and their most critical failure planes (failure planes 1 and 3 in Figure 4, respectively). These cross sections represent the most critical cases based on their geometry, factor of safeties and the minimum K_y values computed from the pseudo-static stability analyses. The finite element meshes used to model these cross sections are shown in Figures 20a and 20b. The "seismic coefficient" option in QUAD4M was used to calculate the average acceleration time history of potential deep failure mass sliding along the landfill bottom. This is done using the computed time histories of the shear forces for the elements along the bottom and dividing the resultant shear force by the mass of the waste bounded by the potential failure plane along the liner (Seed and Martin, 1966).

The input design ground motions were applied as outcrop motions at the top of the bedrock underlying the landfill, i.e., the "elastic halfspace" below the finite element mesh. The analyses were performed for two sets of ground motions:

1 - The near-field and far-field MCE ground motions used previously (see Section 2.1) for seismic deformation analyses of the KHF landfill units B-19 and B-18 (RUST, 1998; URS, 2005, and HAI, 2006), and

2 - The updated site design near-field and far-field MCE ground motions developed in this study (see Section 2.2.2).

This provides a comparison of the new landfill design seismic deformations for the old and updated ground motions, and also a comparison of the landfill response for scaled versus spectrally matched ground motions.

The finite element meshes for the cross sections analyzed (Figures 20a and 20b) show the critical potential failure surfaces that were specified for calculation of the average acceleration time histories (seismic coefficients) in the QUAD4M analyses. These seismic coefficient time histories were later used in a Newmark-type analysis method (Newmark, 1965) as described in the following section to estimate the order of magnitude of the permanent seismically-induced displacements along the liner.

Seismically-Induced Permanent Displacements

The consequences of earthquake shaking on the landfill slopes were evaluated using Makdisi and Seed's procedure (1978) which is a type of Newmark pseudo-dynamic double-integration displacement analysis. This approach is most appropriate for slopes consisting of materials that are not likely to suffer any significant loss of their shear strength due to seismic shaking. The waste and liner materials in the Landfill B-18 are such materials.

During an earthquake, over numerous cycles of loading, a slide mass can move incrementally along a potential failure plane through displacement accumulation. Based on this concept, the Newmark method computes, from a series of pseudo-static analyses, the yield acceleration, K_y beyond which movement of a slide mass will occur. The permanent displacement resulting from an earthquake is then computed by double integration of the slide mass average acceleration time history whenever the acceleration exceeds K_y.

The average acceleration time histories computed in the QUAD4M response analyses for the most critical potential failure mass identified in the pseudo-static analyses were used as input for Newmark deformation analyses to evaluate the permanent seismically-induced displacements along the liner system. The displacement calculated by this method is a function of the yield accelerations which were computed in the pseudo-static stability analyses. Figures 21 and 22 illustrate variation of potential slide mass displacement (δ) versus the yield acceleration K_y for Cross Section D-D' and for the two sets of design ground motions used in the analyses (the RUST 1998 design ground motions and the updated ground motions developed for this study). Figures 23 and 24 illustrate variation of potential slide mass displacement (δ) versus the yield acceleration K_y for Cross Section F-F' and for the two sets of design ground motions discussed above. Tables 4 and 5 and Figures 21 through 24 summarize the results of calculated seismically-induced permanent displacement (δ) using the average acceleration time history of the waste mass computed from the QUAD4M analyses as input in the Newmark double-integration method for cross sections D-D' and F-F'.

As seen from Figures 21 through 24, for the potential deep failure plane # 1 located in the northeastern part of cross section D-D', and the potential deep failure plane # 3 located in the northeastern part of cross section F-F' (Figure 4) the largest permanent displacements are induced for the 1994 Northridge earthquake Pacoima-Kagel Canyon and Castaic Old Ridge Route accelerograms scaled to a PHGA of 0.57g. However, calculated displacements for K_y values larger than 0.12 are less than 1 inch. Additionally, the Newmark deformation analyses show that the calculated seismically-induced permanent displacements of the critical potential slide mass are nearly zero for K_y values larger than 0.12 for the "distant" Caltech A-1 synthetic record and CHY042N Chi-Chi earthquake record scaled to 0.21g and 0.16g, respectively. These estimated values of the seismic displacements are considerably smaller than the maximum allowable displacement of 6 inches commonly used in the industry (Seed and Bonaparte, 1992).

3.8 STATIC AND SEISMIC STABILITY OF FINAL COVER

A preliminary estimate of the final cover seismic deformations was obtained by using the simplified analysis method by Franklin and Chang (1977). A more detailed evaluation of the landfill cover seismic deformations using two-dimensional site response analysis and Newmark (1965) displacement calculation method was also performed. The above analyses are presented below.

Simplified Analysis of Landfill Cover

Static and seismic stability of the landfill final cover were evaluated using the infinite slope stability analysis model. Effect of the slope benches were also considered in the analyses. The landfill final cover slope will have an overall inclination of 4.0H:1V with localized inclinations of approximately 3.5H:1V to allow for benching. The cover soils will not become fully saturated given the low annual rate of precipitation in the area, drainage through geotextile in the cover, and the steepness of the final cover slopes.

The proposed final cover for Landfill B-18, shown in Figure 25, includes a 40-mil textured HDPE geomembrane overlain by a geotextile and an approximately 2.5-foot-thick vegetative soil cover over the geosynthetics. The geotextile is a 12-oz/sy non-woven layer that cushions the HDEP geomembrane and provides some drainage. The slope stability analyses were performed for the weakest interface strength in the final cover. The weakest interface is assumed to be along the geomemberane/geotextile interface (see Appendix C).

Peak strength values were used for analysis of seismic loading and the partially saturated final cover condition. Access is available for the final cover to make any necessary repairs after a seismic event; therefore, residual strengths to evaluate short-term impacts are not appropriate.

Appendix C provides the cover soil and interface properties used in the stability analyses, and the detailed static and seismic stability calculations for the cover system described above. The appendix shows that the cover system is stable for both static and seismic loading conditions; however, the estimated permanent displacement is about 12 inches. Hence, a more rigorous two-dimensional dynamic site response and Newmark displacement analysis was performed to more accurately calculate the final cover displacement.

Two-Dimensional Dynamic Cover Response Analyses

After yield acceleration coefficient for the cover was determined (see Appendix C), dynamic response of the landfill and average acceleration time histories of the potential sliding cover section were evaluated for three representative "local" (near-field) and one "distant" (far-field) input ground motions. To account for the uncertainties introduced by variation of the landfill geometry, two-dimensional finite element computer program QUAD4M was used to evaluate dynamic response of the landfill and average acceleration time histories of the potential sliding cover section identified from the stability analyses. The two-dimensional analyses provide a more realistic estimate of the seismically-induced displacements of the cover compared to the simplified methods.

QUAD4M analysis was performed for the cover section of Cross Section D-D'. The finite element mesh used to model the cross section is shown in Figure 20c. The input design ground motions were applied as outcrop motions at the top of the bedrock underlying the landfill, i.e., the "elastic halfspace" below the finite element mesh. The analyses were performed for the same ground motions used for the liner stability analysis discussed in Section 3.7.2.

The finite element mesh for the cross section analyzed (Figure 20c) shows the critical potential failure surface through the landfill cover that was specified for calculation of the average acceleration time histories in the QUAD4M analyses. The computed average acceleration time history of the specified cover section was then used in a Newmark-type analysis method (Newmark, 1965) as described in the following section to estimate the order of magnitude of the seismically-induced permanent displacements of the cover.

Seismically-Induced Permanent Displacements

The permanent displacement resulting from the earthquakes are then computed by double integration of the slide mass average acceleration time history whenever the acceleration exceeds K_y.

The average acceleration time history computed from the QUAD4M dynamic response analyses for the most critical potential failure mass identified in the pseudo-static analyses was used as input for Newmark deformation analyses to evaluate the permanent seismically-induced displacements of the failure mass. The displacement calculated by this method is a function of the yield acceleration computed in the Appendix C ($K_y \sim 0.2g$). Table 6 summarizes the results of calculated landfill cover seismically-induced permanent displacement (δ) using the average acceleration time history of the potential failure section computed from the QUAD4M analyses as input in the Newmark double-integration method for cross section D-D'.

The Newmark deformation analyses show that the calculated seismically-induced permanent displacements of the landfill cover are considerably less than the maximum allowable displacement of 12 inches commonly used in the industry (Seed and Bonaparte, 1992).

4.0 CONCLUSIONS

This report addresses static and seismic stability of the landfill slopes for a proposed expansion of the Landfill B-18. The stability report presented here will be included as part of the design report, being prepared by Golder Associates, Inc. for the proposed Landfill B-18 expansion.

The following changes from the original design were implemented and evaluated in this report:

- Final fill plan geometry was modified to enhance landfill capacity while maintaining staticand seismic stability of the landfill slopes.

- The landfill footprint was expanded in the west-northwestern area, using the existing cut slopes in the hills west and northwest of the site to buttress the landfill slopes and enhance stability.

A deterministic seismic hazard analysis was performed to update the site seismic design response spectrum and ground motions. Static and seismic stability evaluations of the proposed final fill slopes and landfill base liner and cover systems were conducted for the new Landfill B-18 fill design. The presented analyses demonstrated that computed static factors of safety were higher than 1.5 for all analyzed sections.

The seismic stability analyses were conducted for the MCE design ground motions. The postulated near-field and far-field MCEs for Landfill B-18 were characterized by a peak horizontal acceleration in lithified earth material of approximately 0.62g and 0.16g, respectively.

The analyses indicated that the proposed new landfill expansion design (Golder, 2008) would result in a stable configuration under both static and seismic loading conditions in compliance with applicable regulations. The acceptability of the landfill slopes for earthquake loading conditions was determined by the relatively small magnitude of the seismically-induced permanent displacements resulting from the local and distant MCE design earthquake events. The results of the conservative Newmark-type permanent displacement analyses presented in this study indicated that computed maximum displacements along the liner system during the design earthquake events are less than 1 inch. Maximum seismically-induced permanent displacement within the waste prism in the cover/gas collection system is about 6 inches which is less than the maximum allowable value of 12 inches.

The analyses were performed for the landfill final fill configurations. Slope stability analyses are required for design of the proposed landfill expansion interim fill conditions. Site-specific laboratory testing of the proposed materials to be used in the liner systems should be performed for design of the landfill expansion. Additionally, conformance testing of the liner materials should be performed during construction to verify properties used in the design of the landfill expansion.

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Table 1. Selected Material Properties for Static and Seismic Stability Analyses

Material/Interface	Unit Weight	Shear Strength Properties		Shear Wave Velocity (V_s - ft/sec) or Shear Modulus (G, psf) Relation	Modulus Reduction & Damping Curves
		Friction Angle (degree)	Cohesion (psf)		
HW [1]	115 pcf	31	0	$G = 1000\ K_2\ (\sigma'_m)^{1/2}$ $K_2 = 60$ for relatively dense sands (Seed and Idriss, 1970)	See Figure 19 Relatively dense sand (Seed et al., 1984)
Clay Liner [1, 2]	115 pcf	20	1,150	$G = \frac{14{,}760(2.97 - e)^2}{1 + e}(OCR)^K \sigma_m^{\ 0.5}$ (Hardin and Drenvich, 1972)	See Figure 19 (Seed and Idriss, 1970)
Bedrock [1]	150 pcf	40	800	$V_s = 2500$ fps	See Figure 19 (Schnabel et al. 1972)
Phase I Bottom Liner Interface [1]	----	17	0	----	----
Phase I Side Slope Liner Interface [1]	----	9	800	----	----
Phase II Bottom Liner Interface [1]	----	19	0	----	----
Phase II Side Slope Liner Interface [1]	----	19	0	----	----
Expansion Area Liner Interface [3]	----	19	0	----	----

(1) Environmental Solutions, Inc. (1990, 1992, 1993); Rust Environmental & Infrastructure, Inc. (1998); URS (2005).
(2) Modeled as a layer in site dynamic response analysis to include effects of softer clay layer on ground motion.
(3) Golder Associates, Inc. (2008b).

Table 2a. Summary of Slope Stability Analysis Results (Landfill East and North Sides)

Cross Section	Failure Plane Number	Description	Static Factor of Safety	Yield Acceleration, k_y (g)
A-A'	1	Deep Block Failure through Bottom Liner	2.589	0.254
	2	Deep Block Failure through Bottom Liner	2.689	0.225
	3	Deep Block Failure through Bottom Liner	2.722	0.237
B-B'	1	Deep Block Failure through Bottom Liner	6.8	0.453
	2	Deep Block Failure through Bottom Liner	8.59	0.385
	3	Deep Block Failure through Bottom Liner	6.54	0.356
C-C'	1	Deep Block Failure through Bottom Liner	3.06	0.395
	2	Deep Block Failure through Bottom Liner	4.35	0.47
D-D'	1	Deep Block Failure through Bottom Liner	2.34	0.232
	2	Deep Block Failure through Bottom Liner	2.82	0.273
E-E'	1	Deep Block Failure through Bottom Liner	2.743	0.265
	2	Deep Block Failure through Bottom Liner	2.747	0.23
	3	Deep Block Failure through Bottom Liner	2.73	0.237
F-F'	1	Deep Block Failure through Bottom Liner	2.805	0.252
	2	Deep Block Failure through Bottom Liner	2.467	0.225
	3	Deep Block Failure through Bottom Liner	2.46	0.225

Table 2b. Summary of Slope Stability Analysis Results (Landfill West and South Sides)

Cross Section	Failure Plane Number	Description	Static Factor of Safety	Yield Acceleration, k_y (g)
A-A'	I	Deep Block Failure through Bottom Liner	4.194	0.42
	II	Deep Block Failure through Bottom Liner	7.249	0.315
B-B'	I	Deep Block Failure through Bottom Liner	3.5	0.395
	II	Deep Block Failure through Bottom Liner	8.93	0.487
C-C'	I	Deep Block Failure through Bottom Liner	4.92	0.345
	II	Deep Block Failure through Bottom Liner	5.64	0.34
D-D'	I	Deep Block Failure through Bottom Liner	3.88	0.375
	II	Circular Failure	2.5	0.32
	III	Circular Failure	2.18	0.26
E-E'	I	Deep Block Failure through Bottom Liner	5.431	0.425
	II	Deep Block Failure through Bottom Liner	8.879	0.344
F-F'	I	Circular Failure	2.578	0.325
	II	Deep Block Failure through Bottom Liner	5.894	0.435
	III	Deep Block Failure through Bottom Liner	7.205	0.375

Table 3 - Results of Simplified Seismic Deformation Analyses for Landfill Liner

Analyzed Cross Section	Yield Acceleration K_y (g)	Maximum Horizontal Acceleration K_{max} (g)	K_y/K_{max}	Estimated Slope Deformation(1) (in)
A-A' - East	0.225	0.218	1.03	<1
A-A' - West	0.315	0.275	1.15	<1
B-B' - East	0.356	0.193	1.84	<1
B-B' - West	0.395	0.504	0.78	~ 1.0
C-C' - North	0.395	0.197	2.01	<1
C-C' - South	0.340	0.249	1.37	<1
D-D' - East	0.232	0.223	1.04	<1
D-D' - West	0.375	0.281	1.33	<1
E-E' - East	0.230	0.203	1.13	<1
E-E' - West	0.344	0.374	0.92	<1
F-F' - East	0.225	0.203	1.11	<1
F-F' - West	0.375	0.374	1.00	<1

Notes:

(1) Estimated seismic deformations in above table are for the local design earthquake on the blind Ramp Thrust at a distance of 10 km. Seismic deformations computed for the distant seismic event on the San Andreas Fault zone at 35 km from the site were negligible.

Table 4. Seismically-Induced Permanent Displacements from Newmark Deformation Analyses (Cross Section D-D', Failure Surface 1 along Landfill Liner)

	Ground Motion	Yield Acceleration Ky (g)	Maximum Acceleration Kmax (g)	Permanent Displacement (in)
Old Records[1]	Pacoima	0.232	0.187	<1
	Castaic	0.232	0.192	<1
	Seed Hayward	0.232	0.133	<1
	Caltech Synthetic Record A1	0.232	0.109	<1
New Records[2]	Pacoima	0.232	0.189	<1
	Castaic	0.232	0.145	<1
	Gilroy	0.232	0.183	<1
	Chi Chi	0.232	0.074	<1

Notes:
(1) Records scaled to design PGA used in the previous analyses of KHF Landfills (Rust, 1998; URS, 2005; HAI, 2006).
(2) Spectrally matched records developed based on an updated seismic hazard analysis in 2008 used for this project.

Table 5. Seismically-Induced Permanent Displacements from Newmark Deformation Analyses (Cross Section F-F', Failure Surface 3 along Landfill Liner)

	Ground Motion	Yield Acceleration Ky (g)	Maximum Acceleration Kmax (g)	Permanent Displacement (in)
Old Records[1]	Pacoima	0.225	0.184	<1
	Castaic	0.225	0.189	<1
	Seed Hayward	0.225	0.128	<1
	Caltech Synthetic Record A1	0.225	0.104	<1
New Records[2]	Pacoima	0.225	0.179	<1
	Castaic	0.225	0.137	<1
	Gilroy	0.225	0.175	<1
	Chi Chi	0.225	0.068	<1

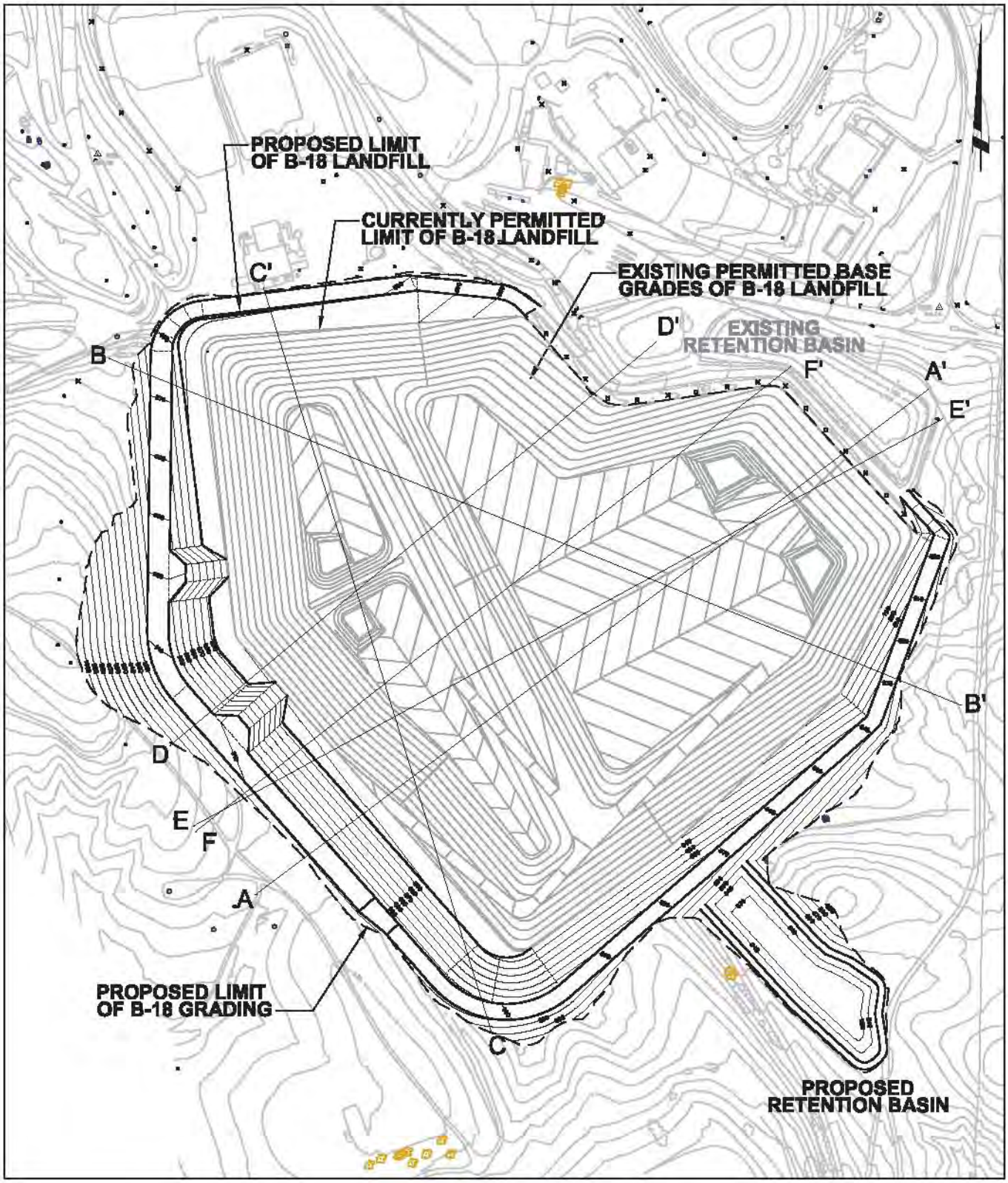
Notes:
(1) Records scaled to design PGA used in the previous analyses of KHF Landfills (Rust, 1998; URS, 2005; HAI, 2006).
(2) Spectrally matched records developed based on an updated seismic hazard analysis in 2008 used for this project.

Table 6. Seismically-Induced Permanent Displacements from Newmark Deformation Analyses (Cross Section D-D', Cover Analysis)

Record Sets	Ground Motion	Yield Acceleration Ky (g)	Maximum Acceleration Kmax (g)	Permanent Displacement (in)
Old Records[1]	Pacoima	0.2	0.58	6.29
	Castaic	0.2	0.42	3.73
	Seed Hayward	0.2	0.29	<1
	Caltech Synthetic Record A1	0.2	0.23	<1
New Records[2]	Pacoima	0.2	0.51	2.71
	Castaic	0.2	0.31	~1
	Gilroy	0.2	0.40	1.36
	Chi Chi	0.2	0.15	<1

Notes:
(1) Records scaled to design PGA used in the previous analyses of KHF Landfills (Rust, 1998; URS, 2005; HAI, 2006).
(2) Spectrally matched records developed based on an updated seismic hazard analysis in 2008 used for this project.

FIGURES



0 400 800 FEET

SCALE

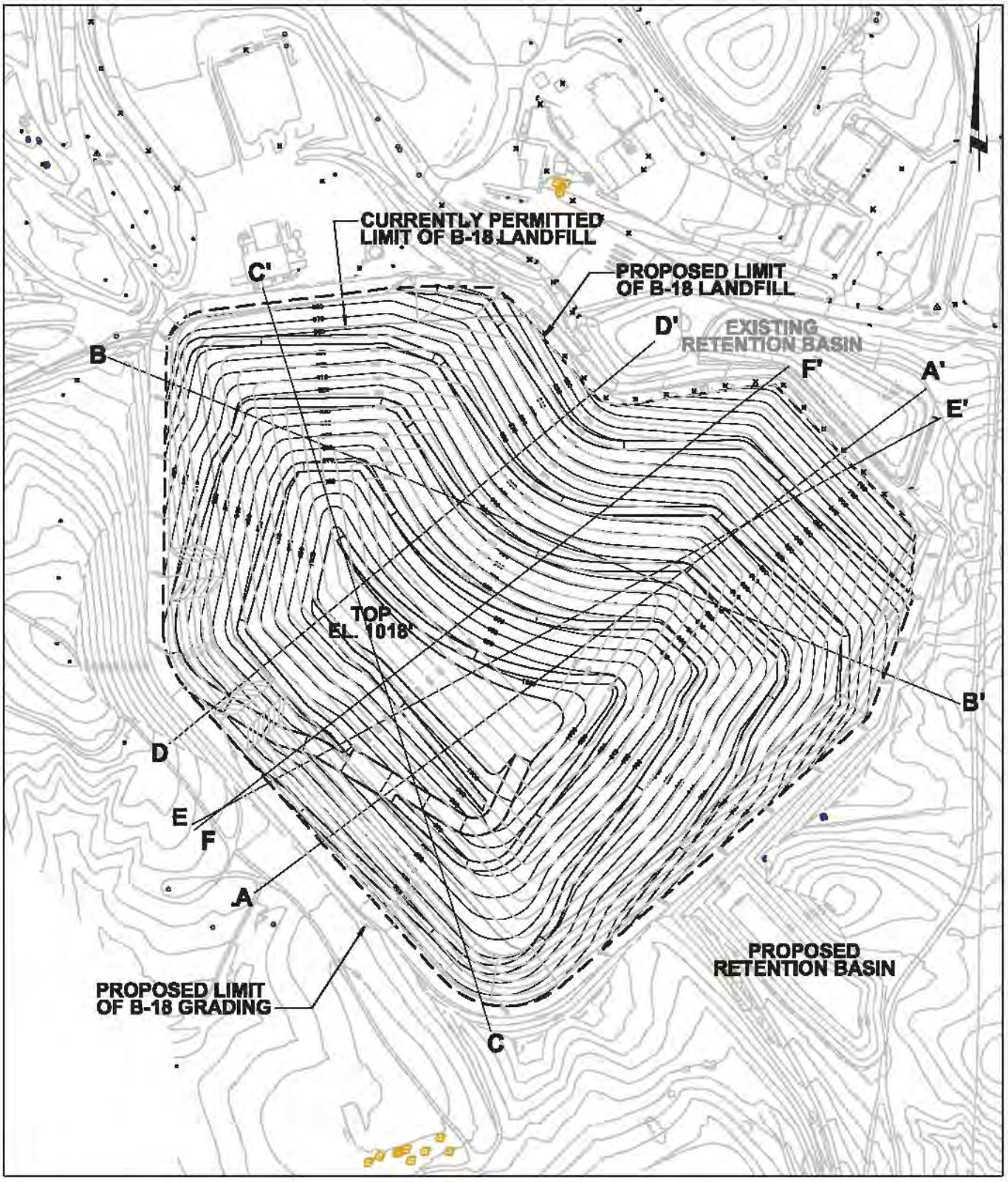
HAI

Project No.: 08-0228	Date: JULY, 2008
Drawn by: K.J.Kavli	Checked by: SGS

FIGURE 1

PROPOSED B-18 LANDFILL LINER GRADES

KETTLEMAN HILLS LANDFILL FACILITY



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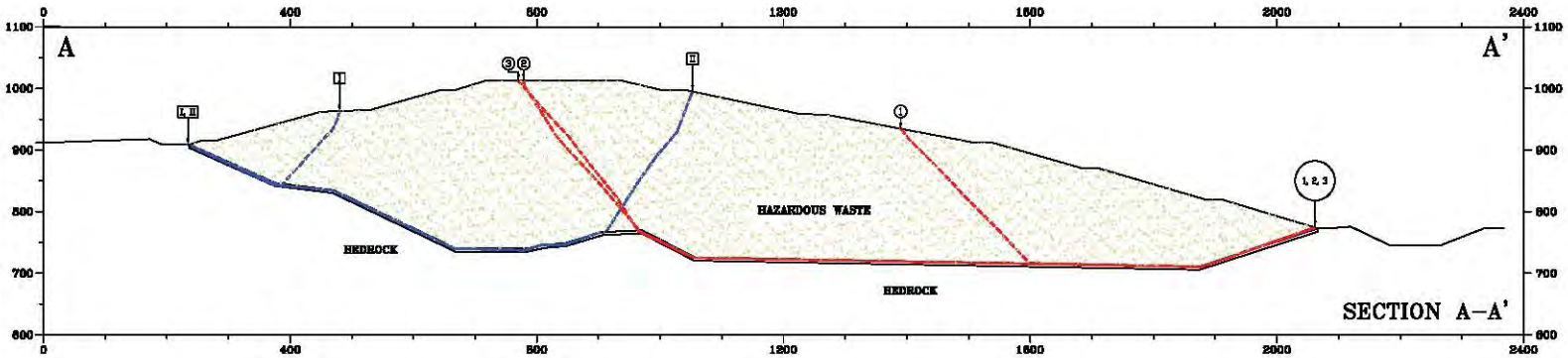
SCALE

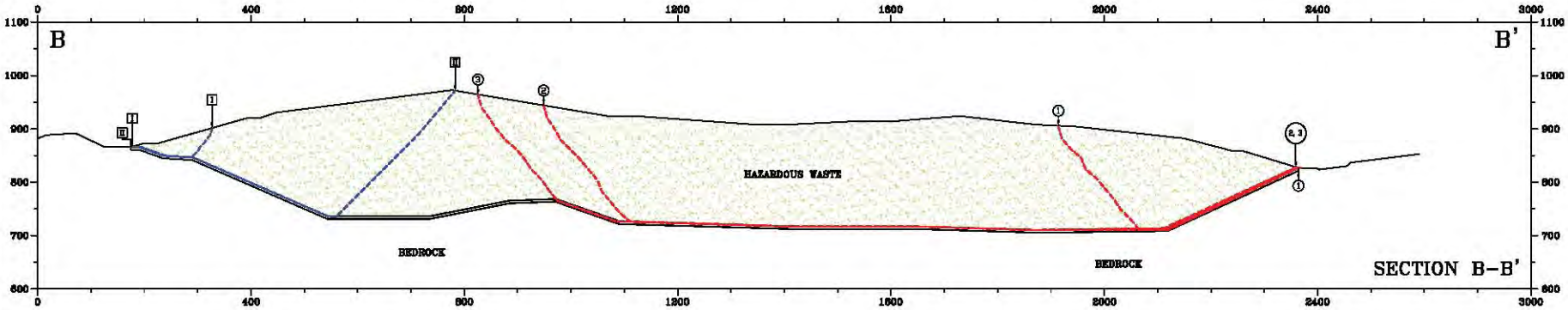
HAI	Project No.: 08-0228	Date: JULY, 2008
	Drawn by: K.J.Kavil	Checked by: SGS

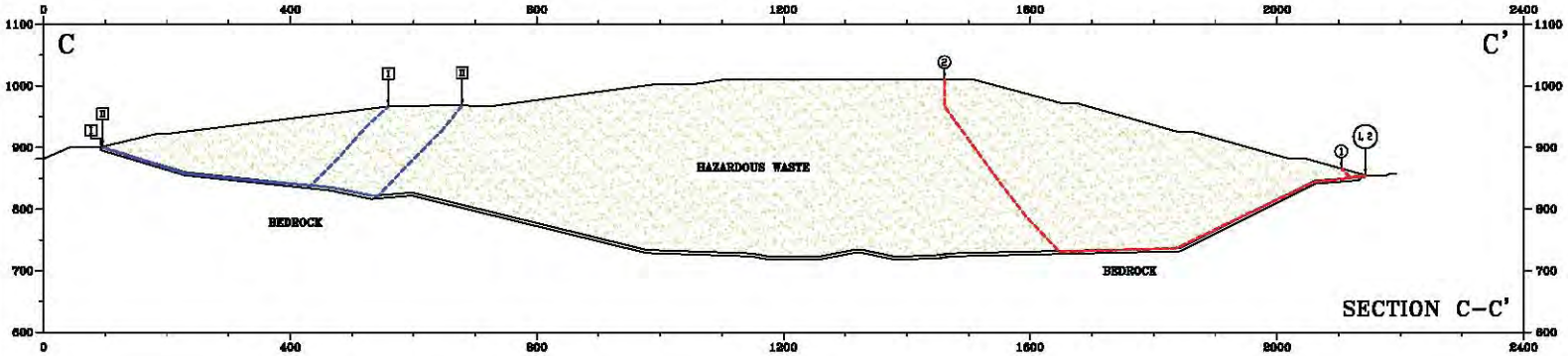
FIGURE 2

PROPOSED B-18 LANDFILL FINAL GRADING

KETTLEMAN HILLS LANDFILL FACILITY







SUMMARY OF SLOPE STABILITY ANALYSIS RESULTS

SECTION	CASE NO.	FS	Ky
A–A'	1	2.69	0.254
	2	2.69	0.225
	3	2.72	0.237
	I	>4.00	0.420
	II	>4.00	0.315
B–B'	1	>4.00	0.453
	2	>4.00	0.385
	3	>4.00	0.358
	I	3.50	0.395
	II	>4.00	0.487
C–C'	1	3.06	0.395
	2	>4.00	0.470
	I	>4.00	0.345
	II	>4.00	0.340

LEGEND:

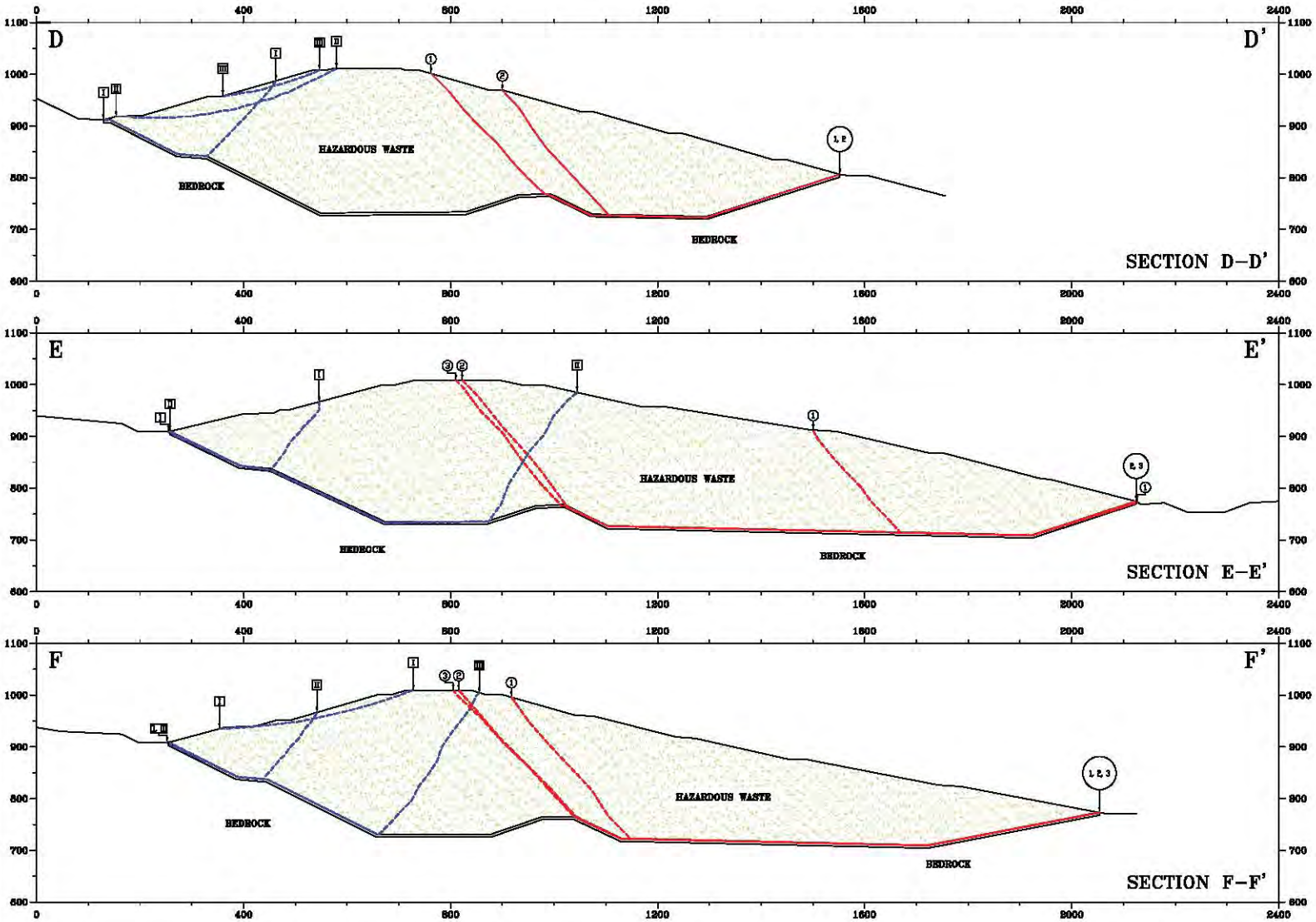
NORTH OR EAST FAILURE PLANE — ② NORTH OR EAST PLANE NUMBER

WEST OR SOUTH FAILURE PLANE — [I] WEST OR SOUTH PLANE NUMBER

SCALE 1 inch = 200 ft

0' 50' 100' 200'

Project No. 06–0225	Kettleman Hills Facility – Unit B-15 Kettleman City, Kings County, California	ANALYSIS CROSS SECTIONS A–A', B–B', C–C' AND POTENTIAL FAILURE PLANES	Figure 3
HAI	HUSHMAND ASSOCIATES INC. Geotechnical, Earthquake and Environmental Engineers		



SUMMARY OF SLOPE STABILITY ANALYSIS RESULTS

SECTION	CASE NO.	FS	Ky
D–D'	1	2.34	0.232
	2	2.52	0.273
	I	3.26	0.375
	II	2.50 *	0.320*
	III	2.19 *	0.260*
E–E'	1	2.74	0.265
	2	2.75	0.230
	3	2.73	0.237
	I	>4.00	0.425
	II	>4.00	0.344
F–F'	1	2.81	0.252
	2	2.47	0.225
	3	2.46	0.225
	I	2.58 *	0.325*
	II	>4.00	0.435
	III	>4.00	0.375

*Using Modified Bishop Method.

LEGEND:

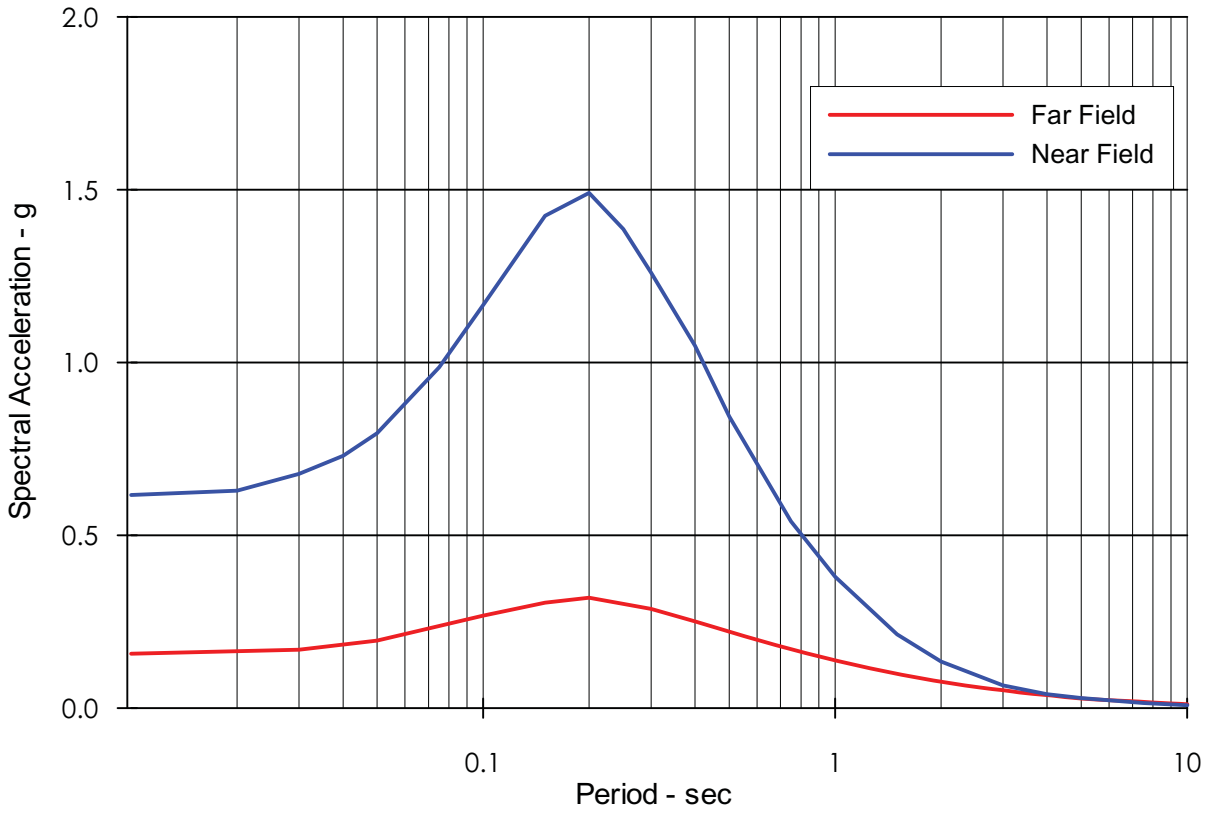
NORTH OR EAST FAILURE PLANE — ② NORTH OR EAST PLANE NUMBER

WEST OR SOUTH FAILURE PLANE — I WEST OR SOUTH PLANE NUMBER

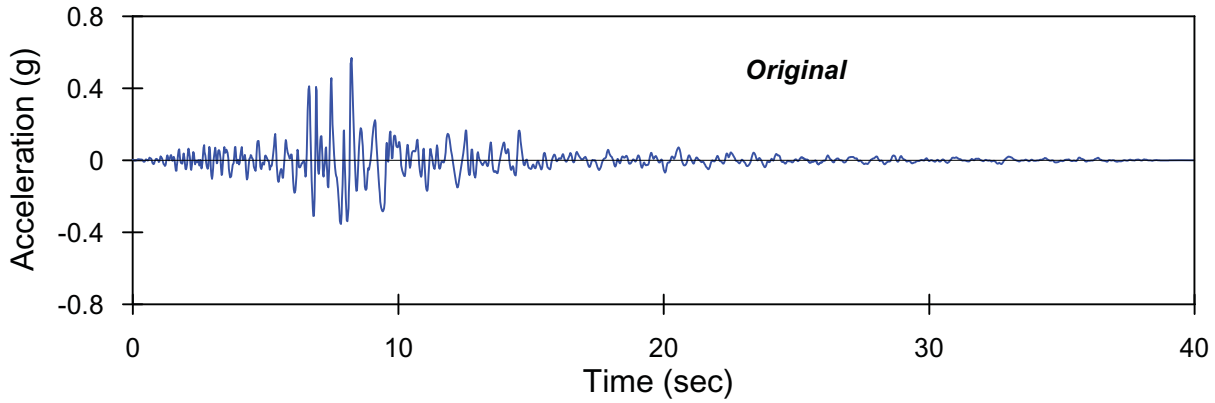
SCALE 1 inch = 200 ft

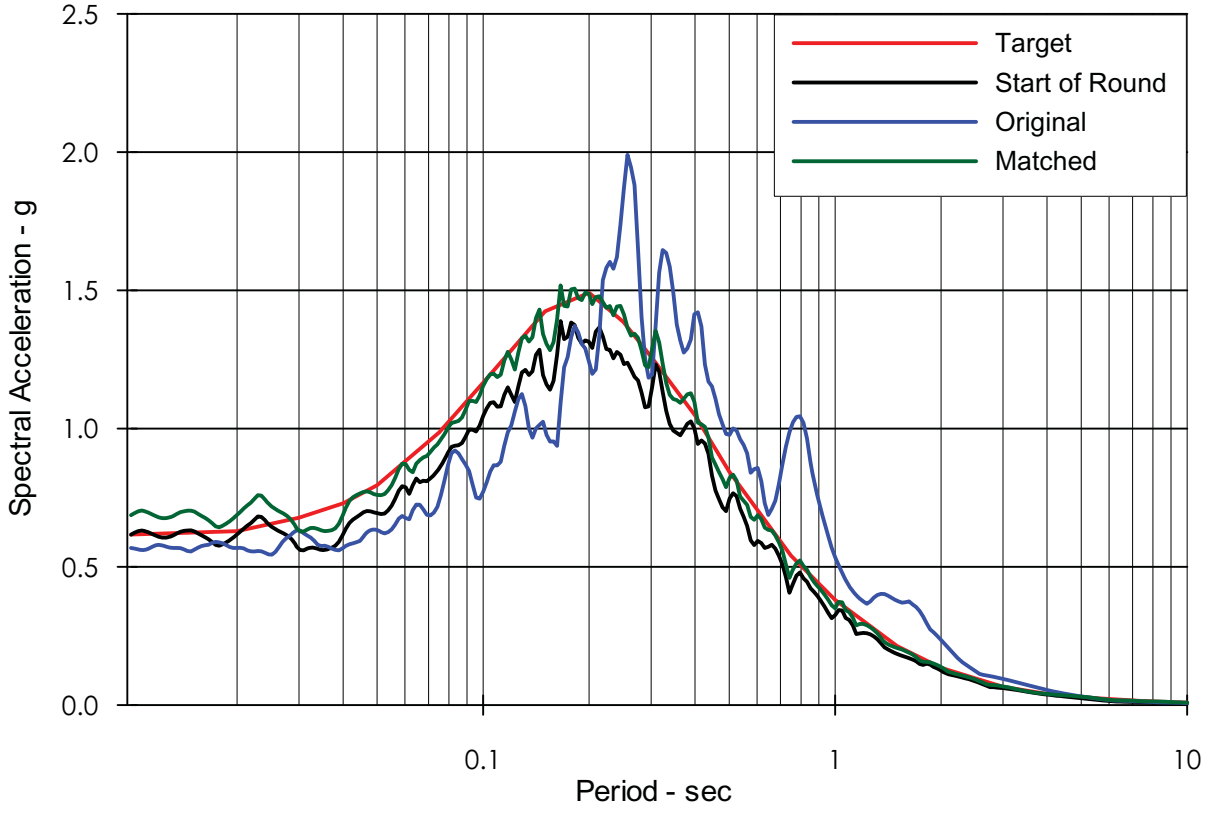
0' 50' 100' 200'

Project No. 06–0226	Kettleman Hills Facility – Unit B-18 Kettleman City, Kings County, California	ANALYSIS CROSS SECTIONS D–D', E–E', F–F' AND POTENTIAL FAILURE PLANES	Figure 4
HAI	HUSHMAND ASSOCIATES INC. Geotechnical, Earthquake and Environmental Engineers		

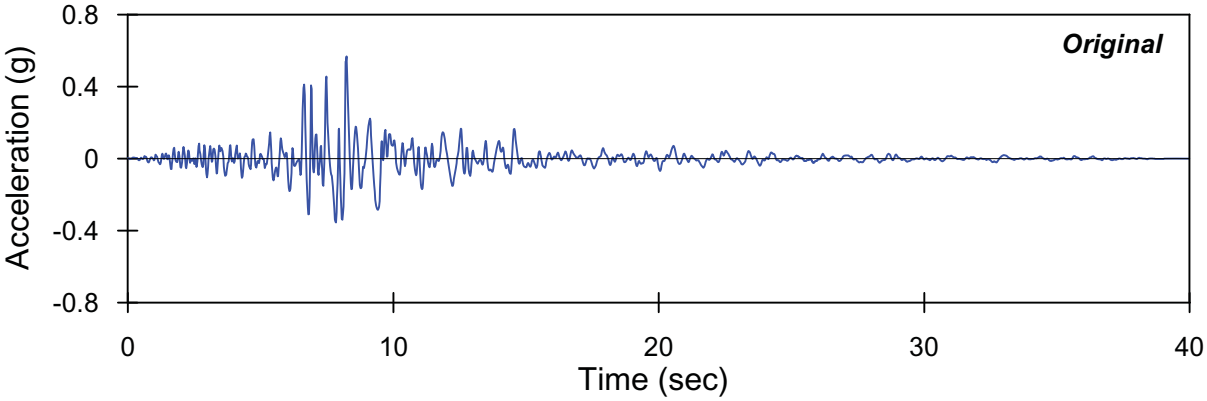


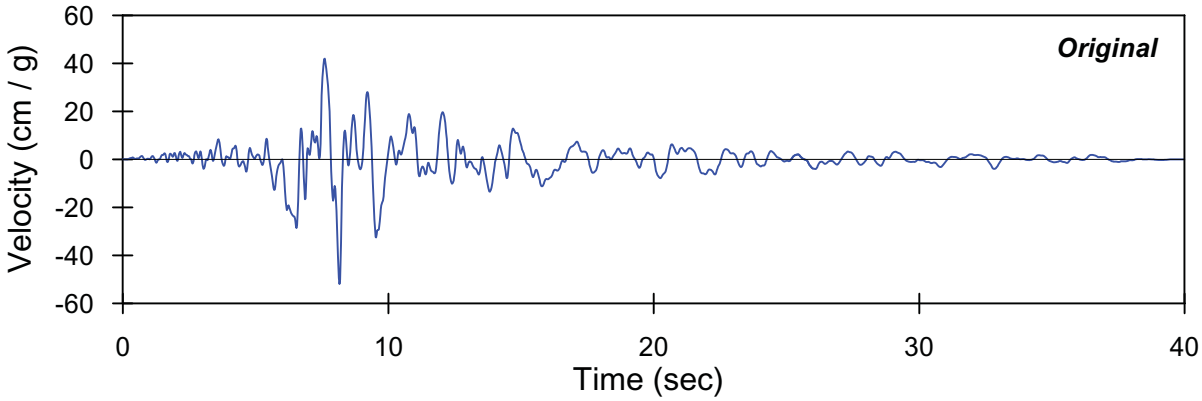
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	5-PERCENT DAMPED SITE DESIGN RESPONSE SPECTRA FOR NEAR-FIELD AND FAR-FIELD EARTHQUAKES	Figure 5
HAI	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		

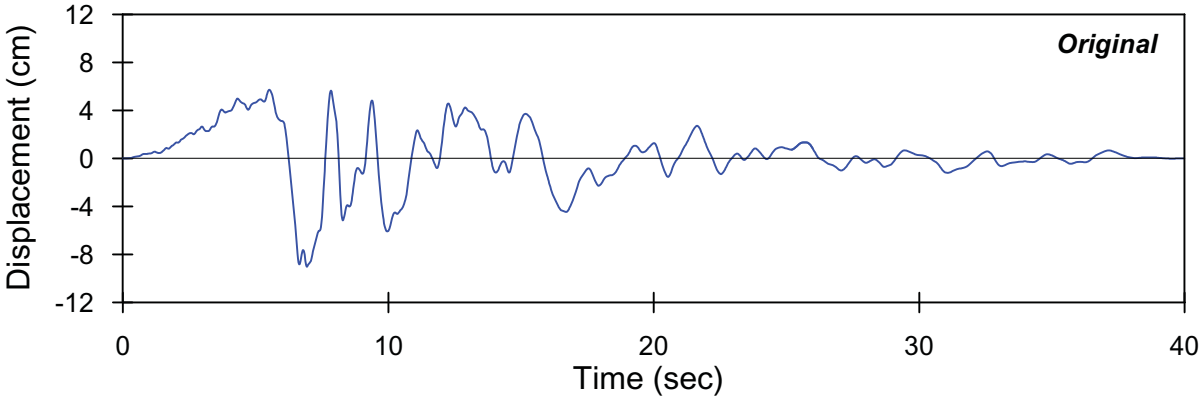




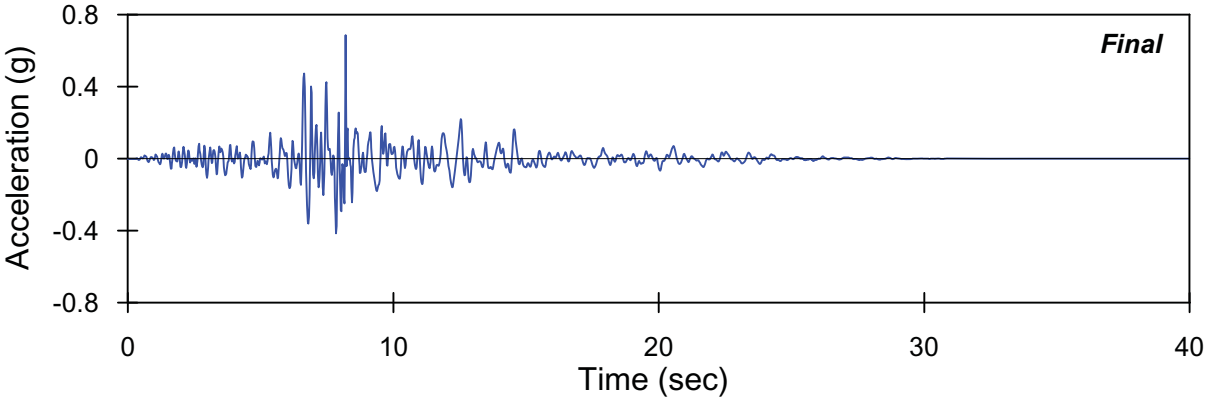
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL HORIZONTAL ACCELERATION RECORD & RESPONSE SPECTRUM MATCHED TO DESIGN RESPONSE SPECTRUM 1994 NORTHRIDGE EQ. CASTAIC 090	Figure 6
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

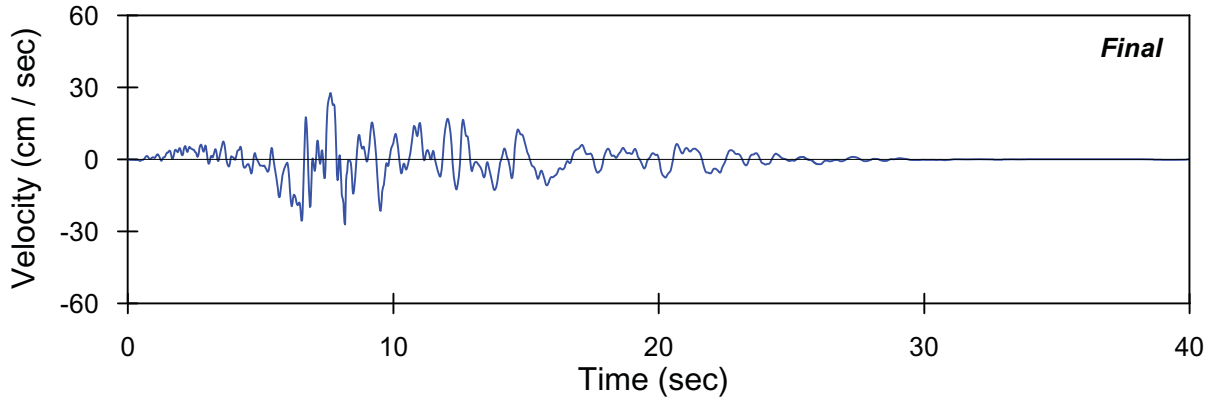


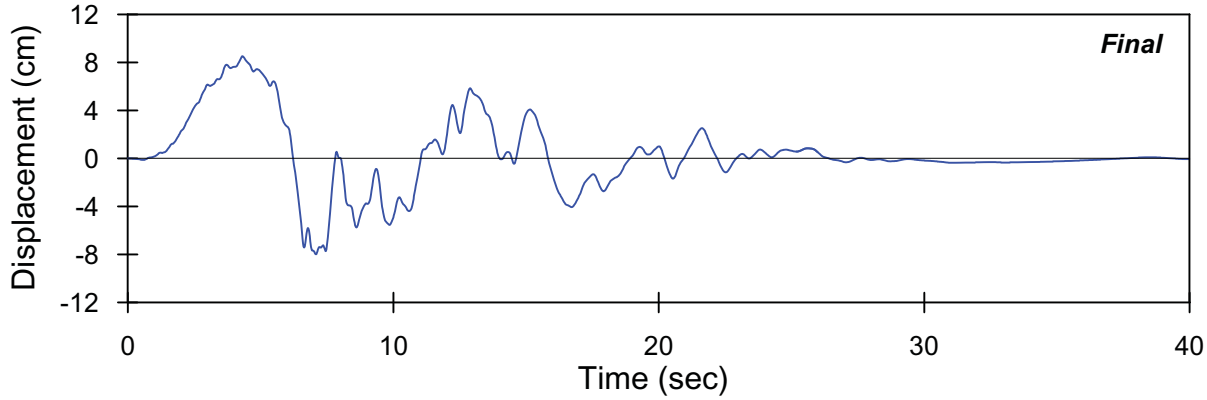




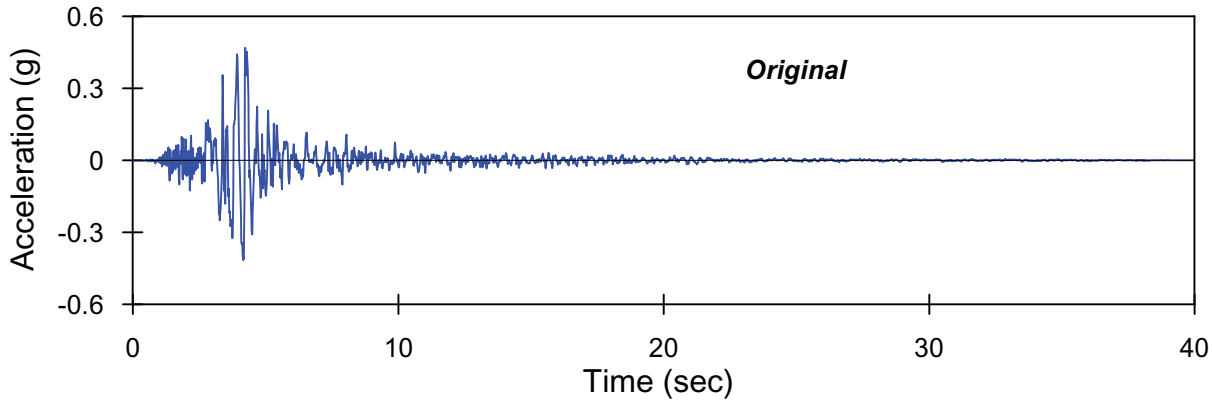
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL CORRECTED TIME HISTORIES 1994 NORTHRIDGE EARTHQUAKE STATION: CASTAIC OLD RIDGE_090	Figure 7
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

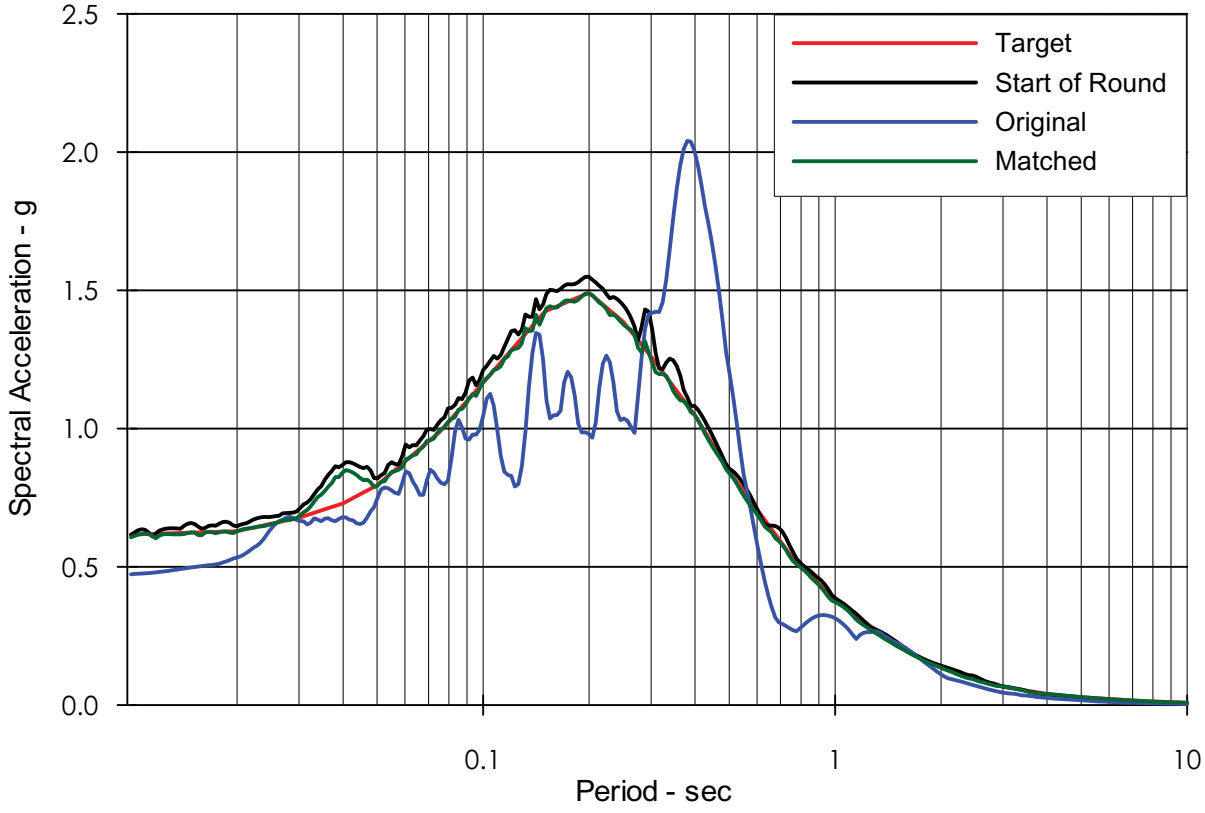




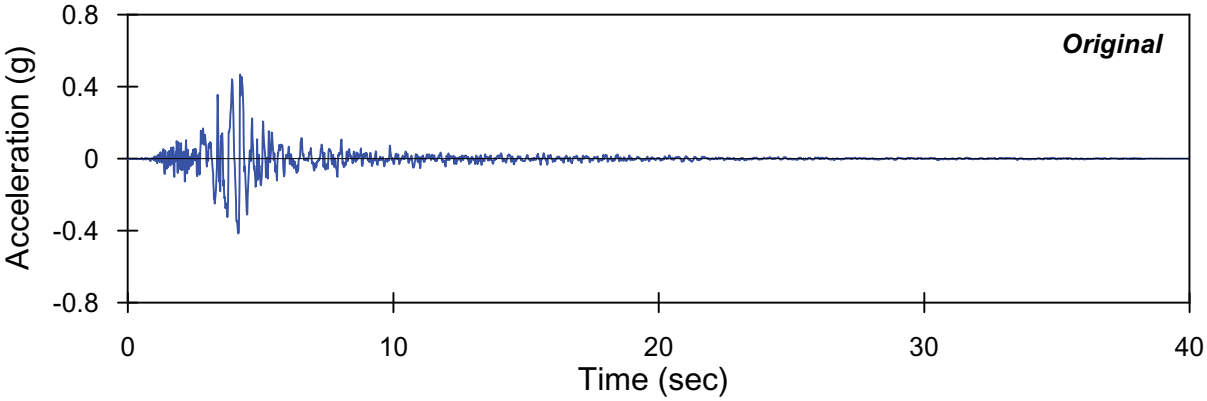


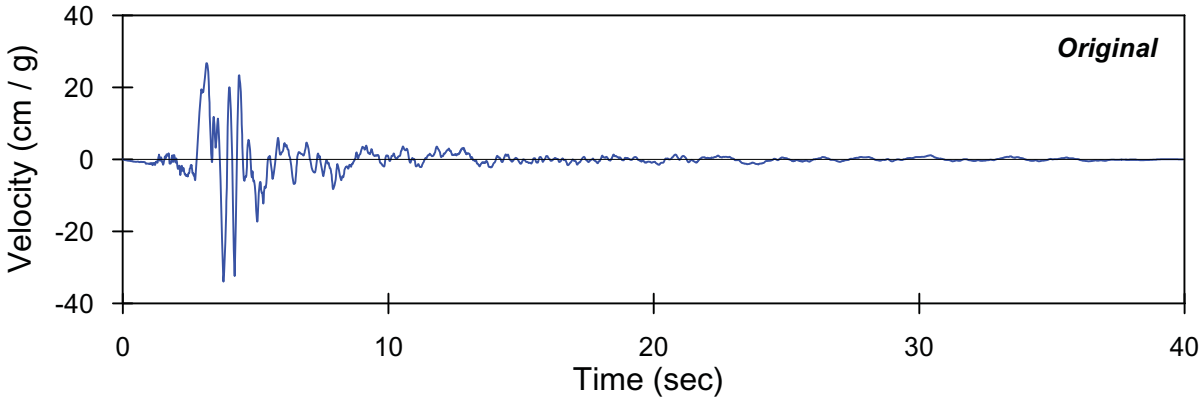
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	SPECTRUM COMPATIBLE TIME HISTORIES 1994 NORTHRIDGE EARTHQUAKE STATION: CASTAIC OLD RIDGE_090	Figure 8
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

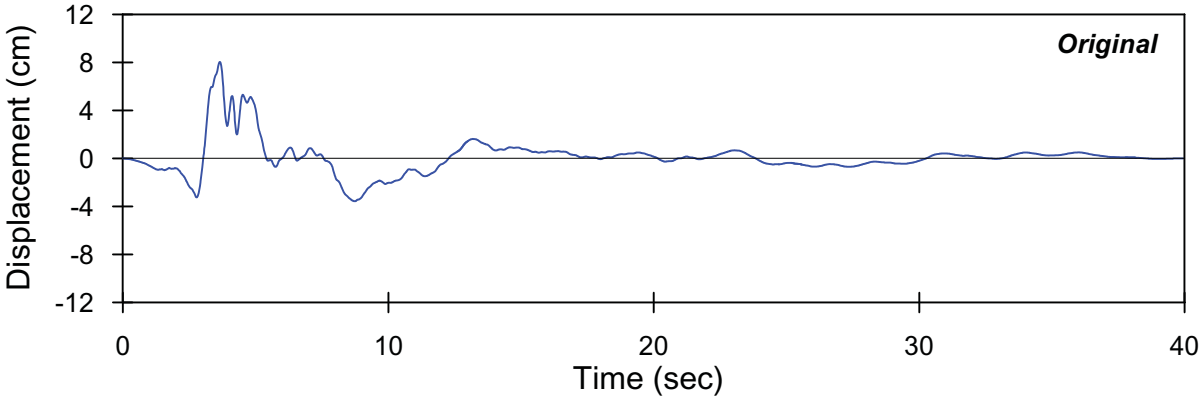




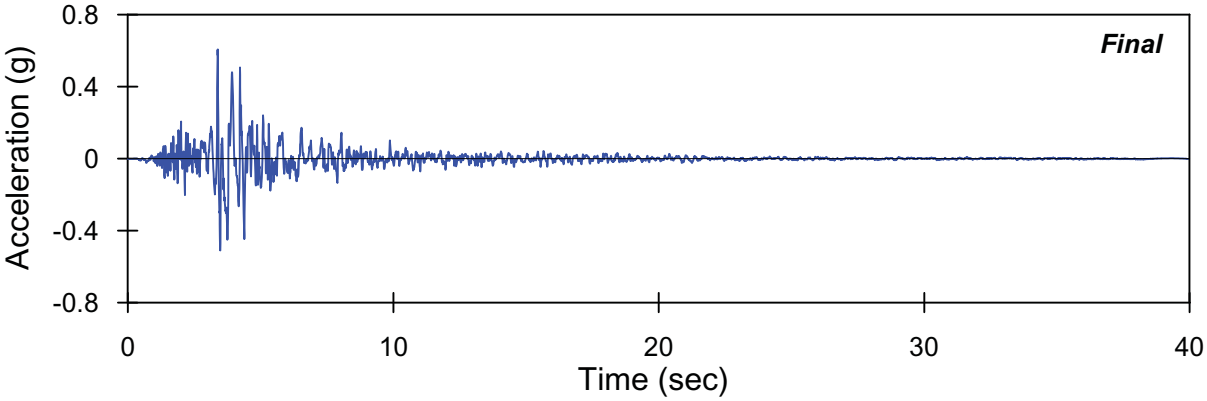
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL HORIZONTAL ACCELERATION RECORD & RESPONSE SPECTRUM MATCHED TO DESIGN RESPONSE SPECTRUM 1989 LOMA PRIETA EQ. GILROY ARRAY 090 RECORD	Figure 9
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

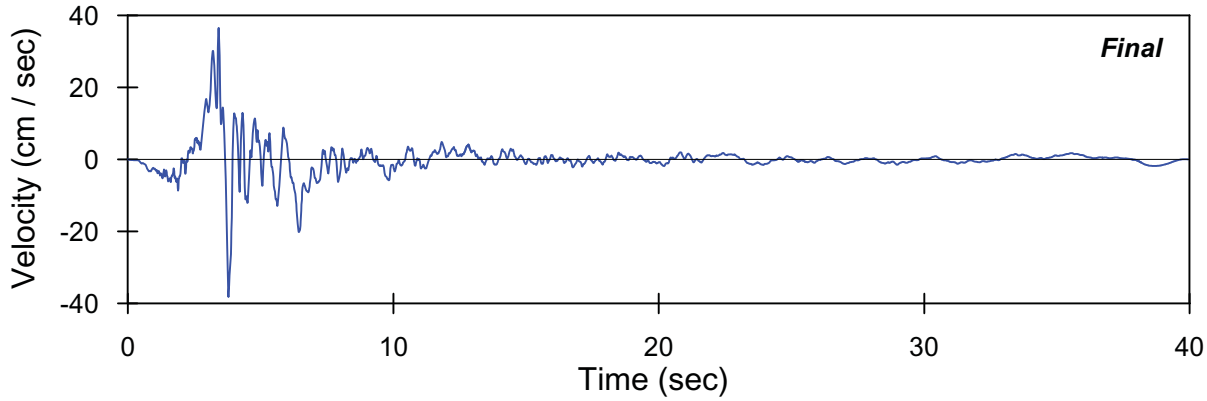


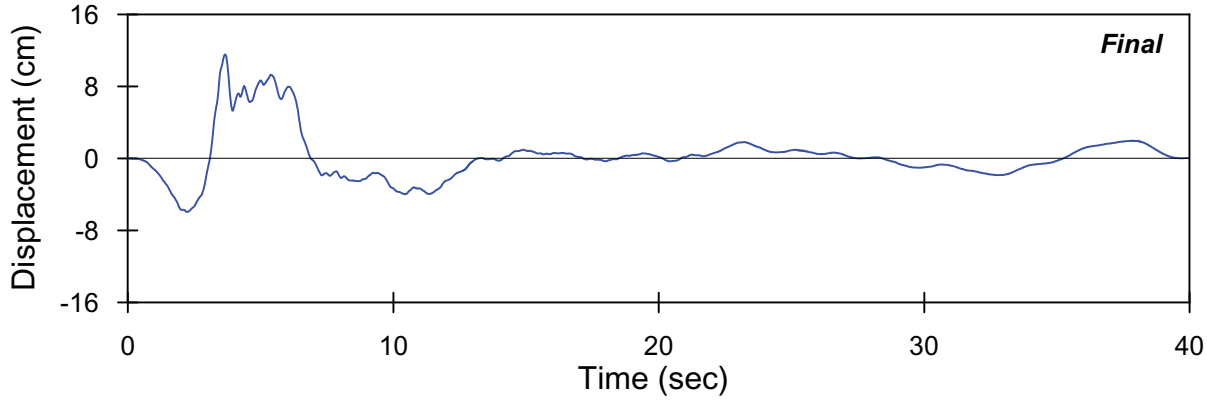




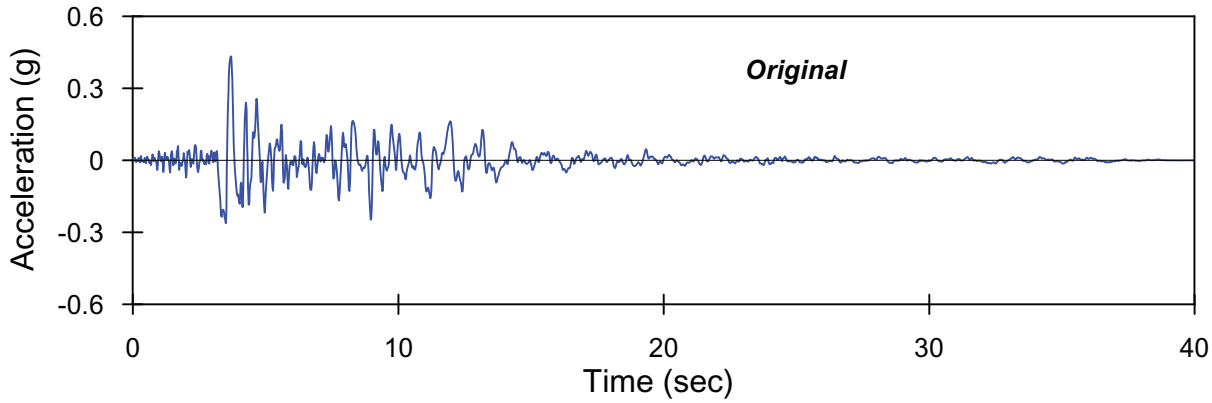
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL CORRECTED TIME HISTORIES 1989 LOMA PRIETA EARTHQUAKE STATION: GILROY ARRAY 090	Figure 10
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

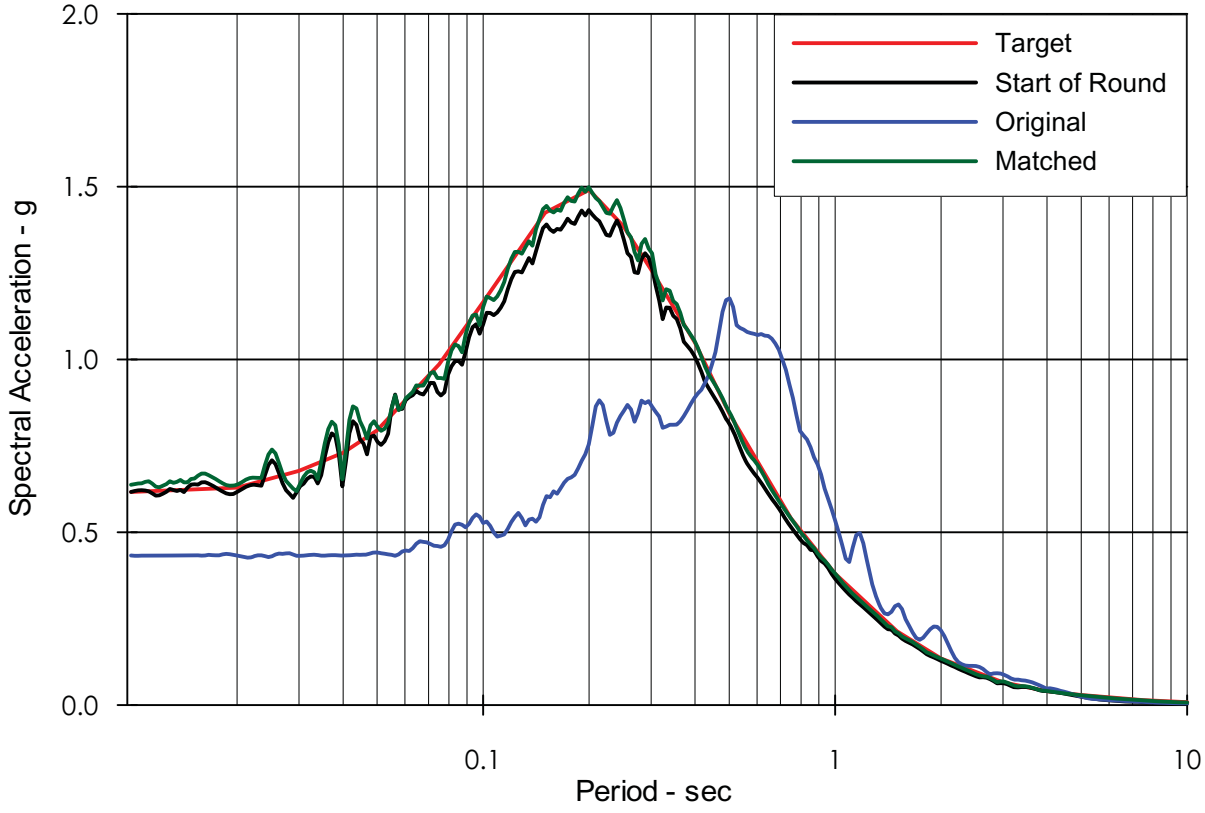




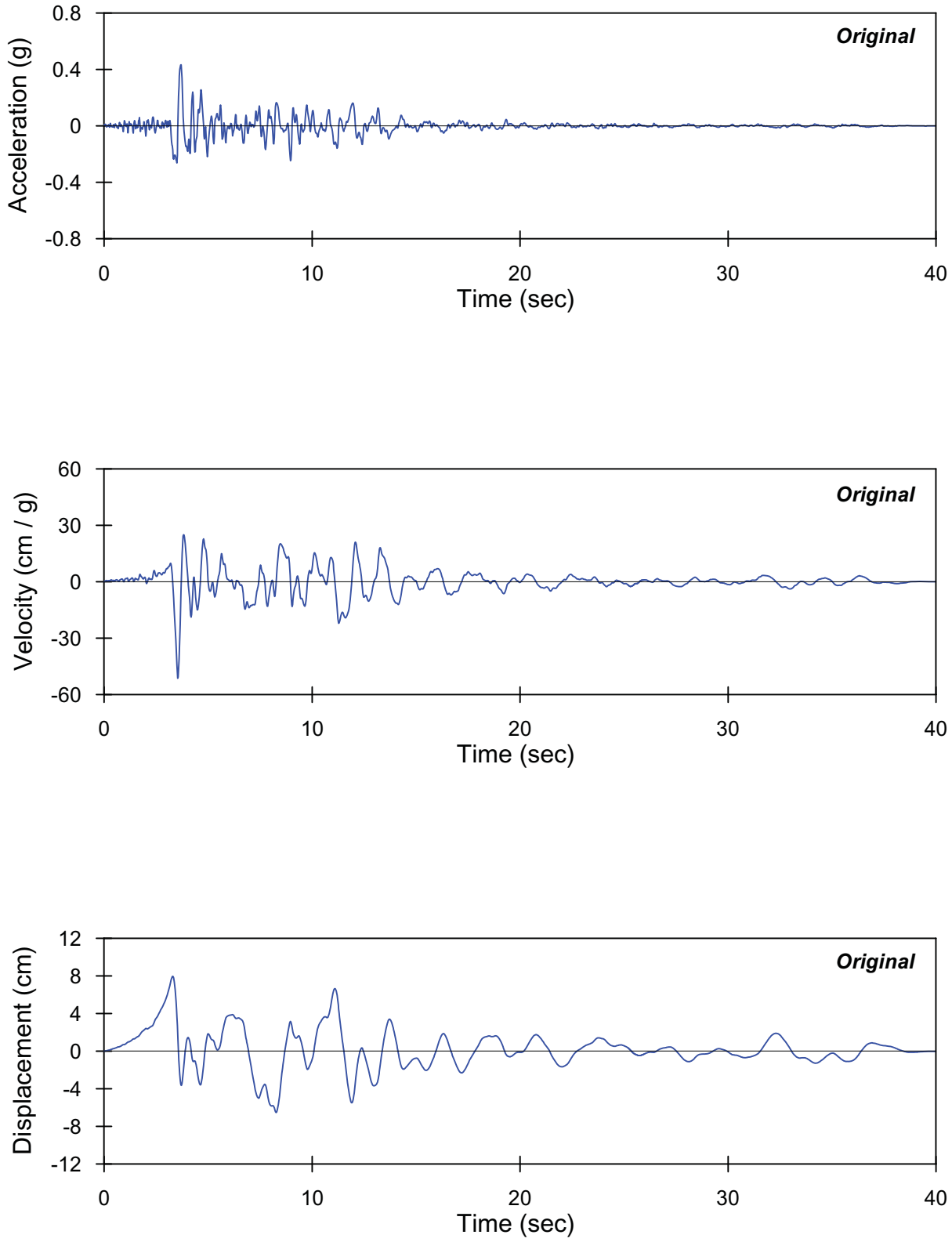


Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	SPECTRUM COMPATIBLE TIME HISTORIES 1989 LOMA PRIETA EARTHQUAKE STATION: GILROY ARRAY 090	Figure 11
HAI	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		

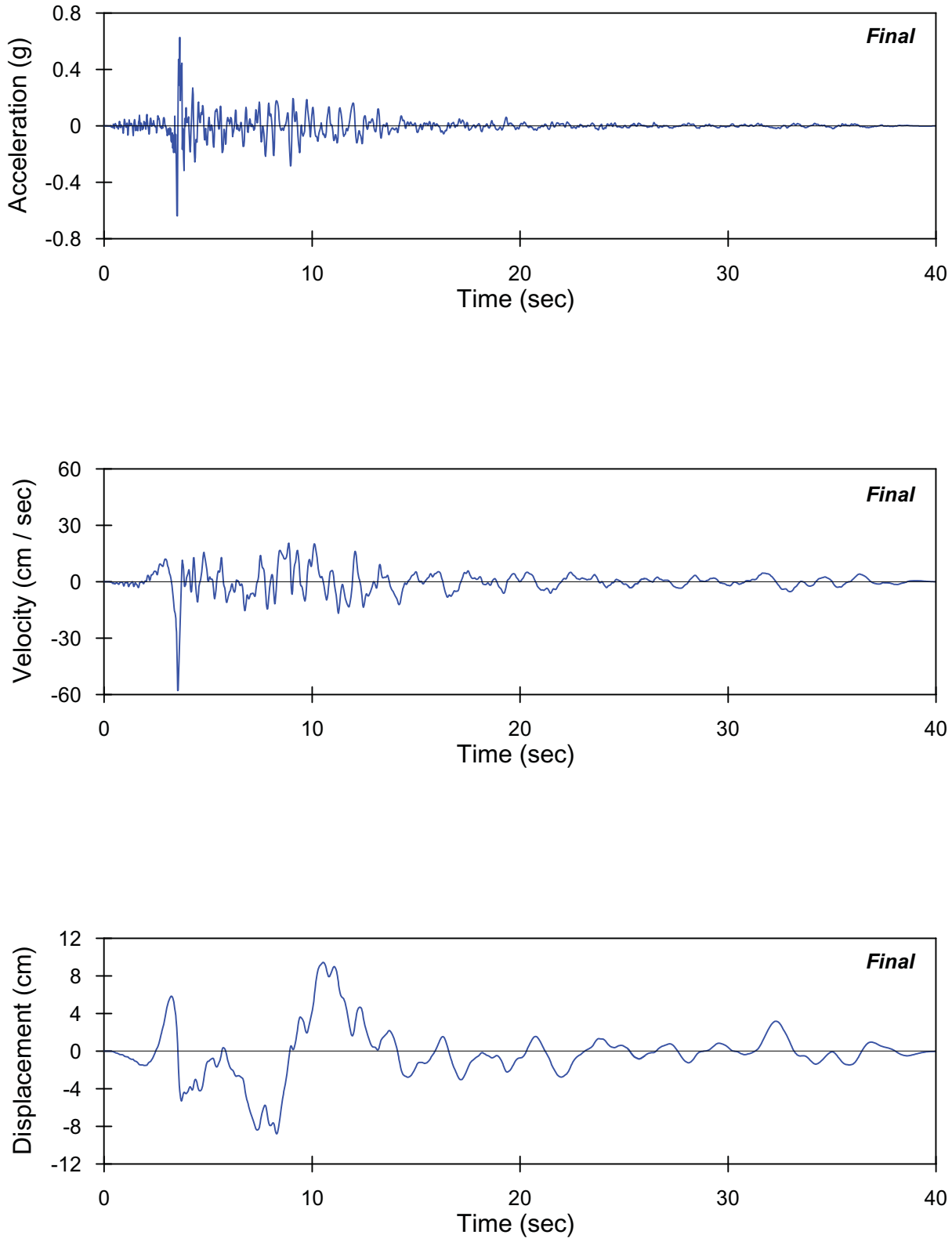




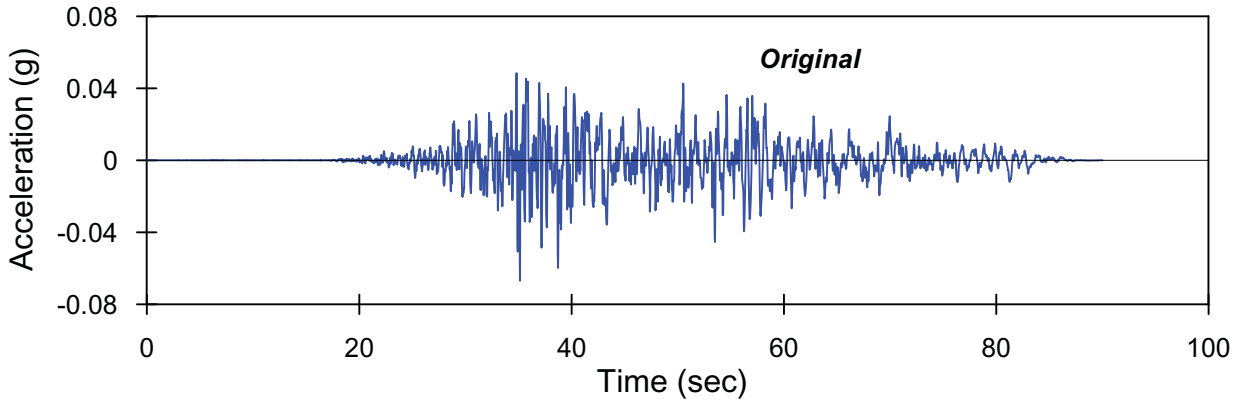
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL HORIZONTAL ACCELERATION RECORD & RESPONSE SPECTRUM MACHED TO DESIGN RESPONSE SPECTRUM 1994 NORTHRIDGE EQ. PACOIMA KAGEL CANYON 360 RECORD	Figure 12
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

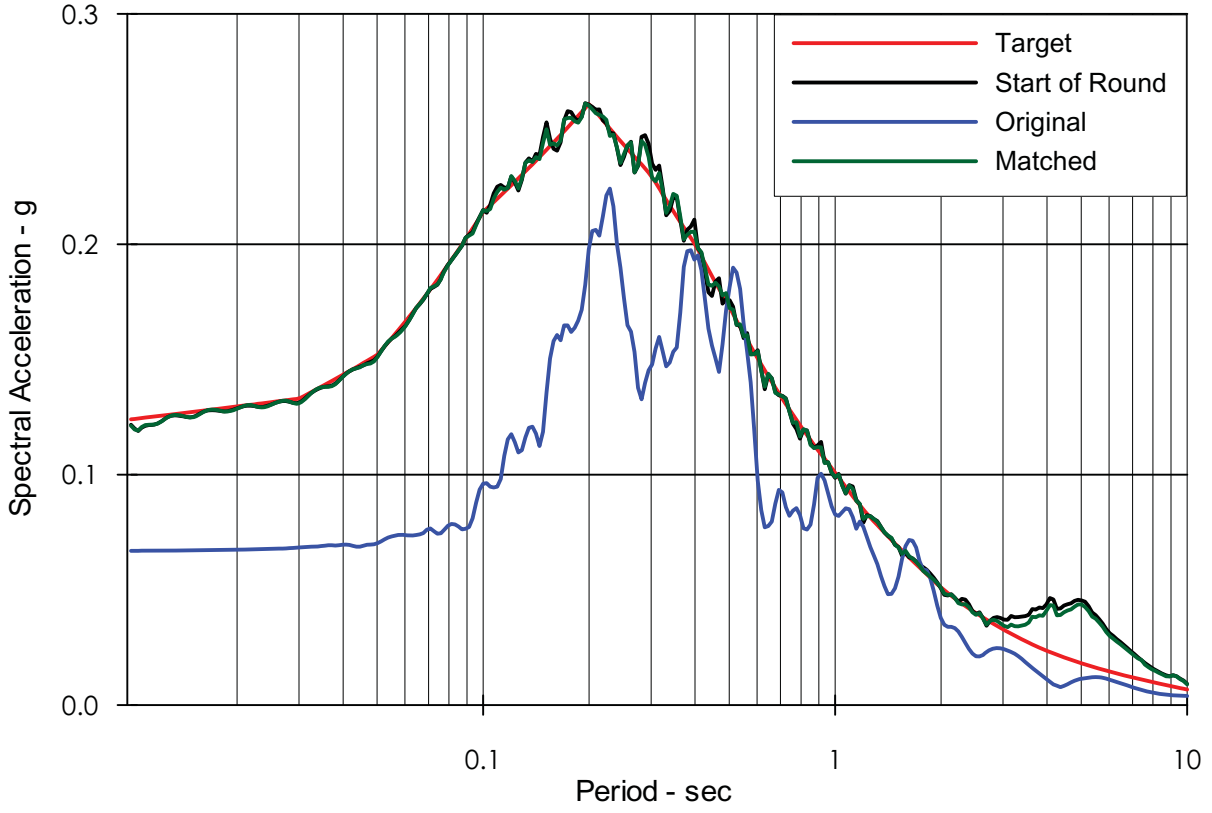


Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL CORRECTED TIME HISTORIES 1994 NORTHRIDGE EARTHQUAKE STATION: PACOIMA KAGEL CANYON 360	Figure 13
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

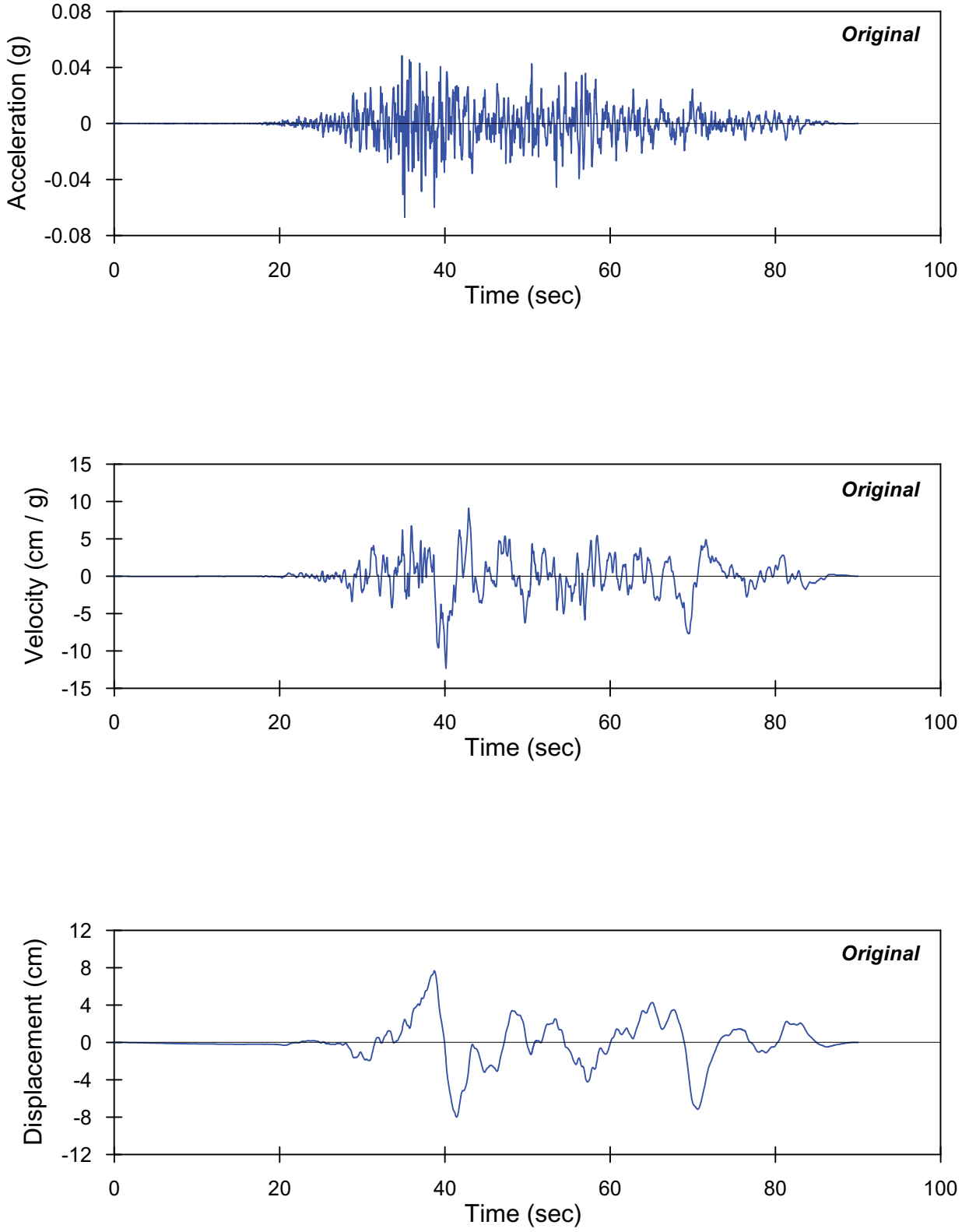


Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	SPECTRUM COMPATIBLE TIME HISTORIES 1994 NORTHRIDGE EARTHQUAKE STATION: PACOIMA KAGEL CANYON 360	Figure 14
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

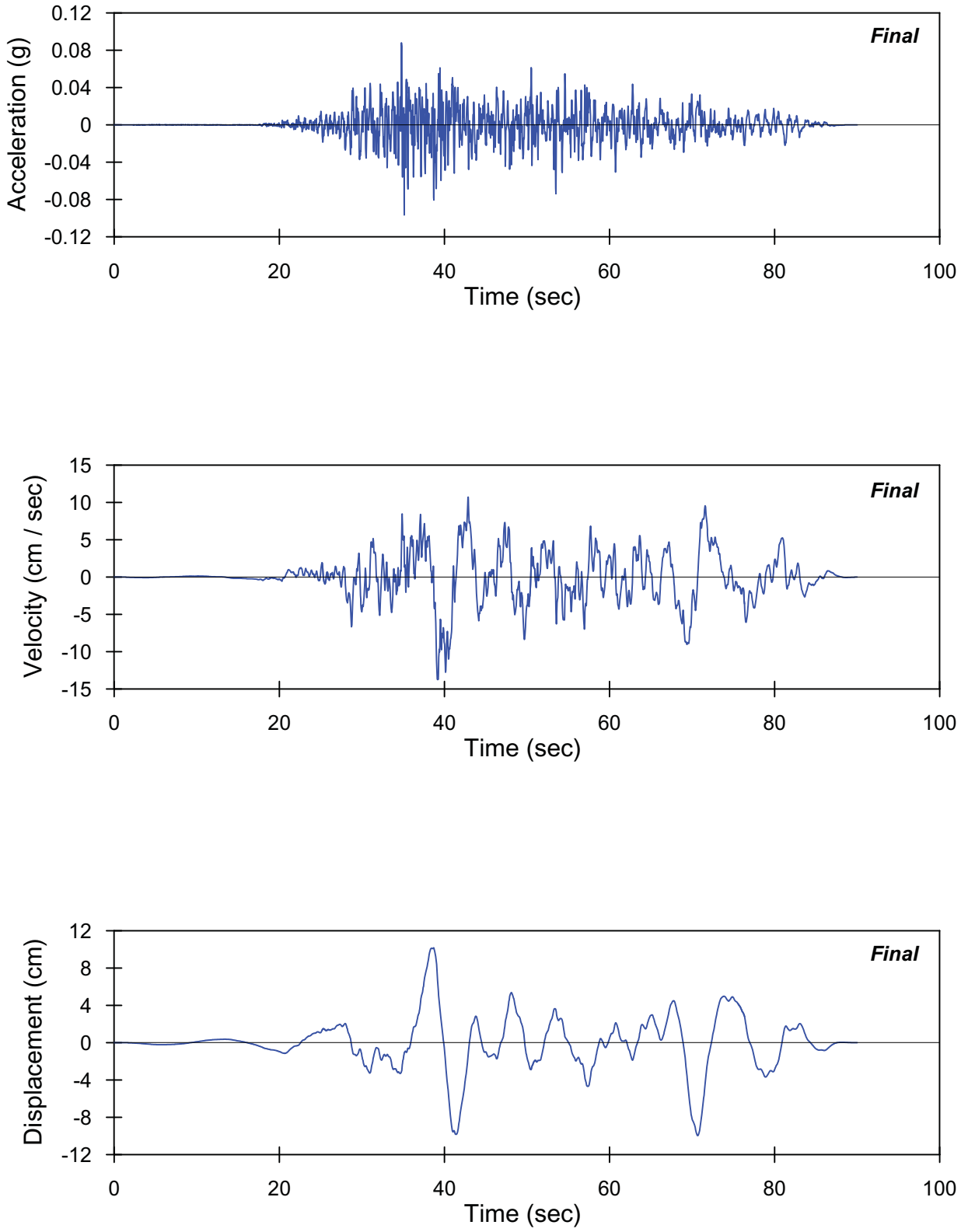




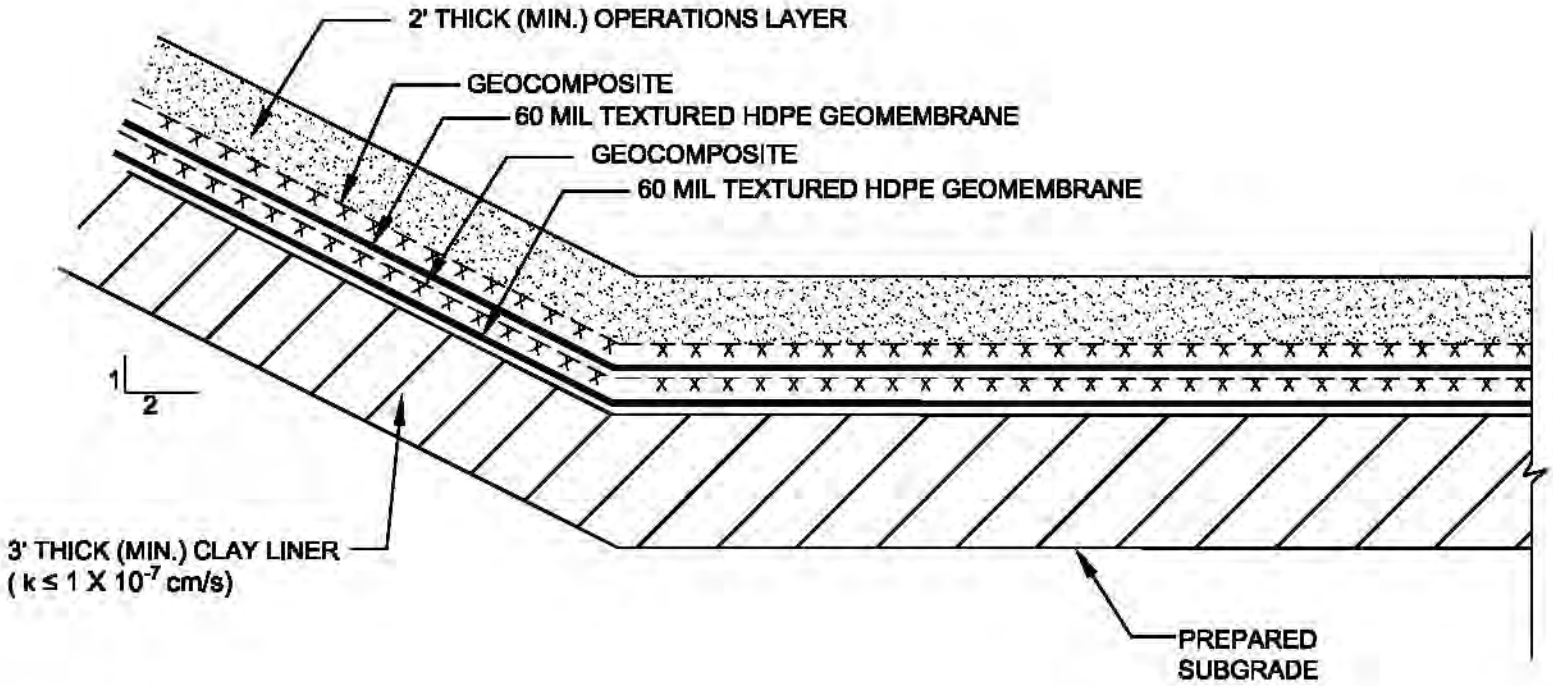
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL HORIZONTAL ACCELERATION RECORD & RESPONSE SPECTRUM MATCHED TO DESIGN RESPONSE SPECTRUM 1999 CHI CHI EQ. CHY042 N RECORD	Figure 15
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		



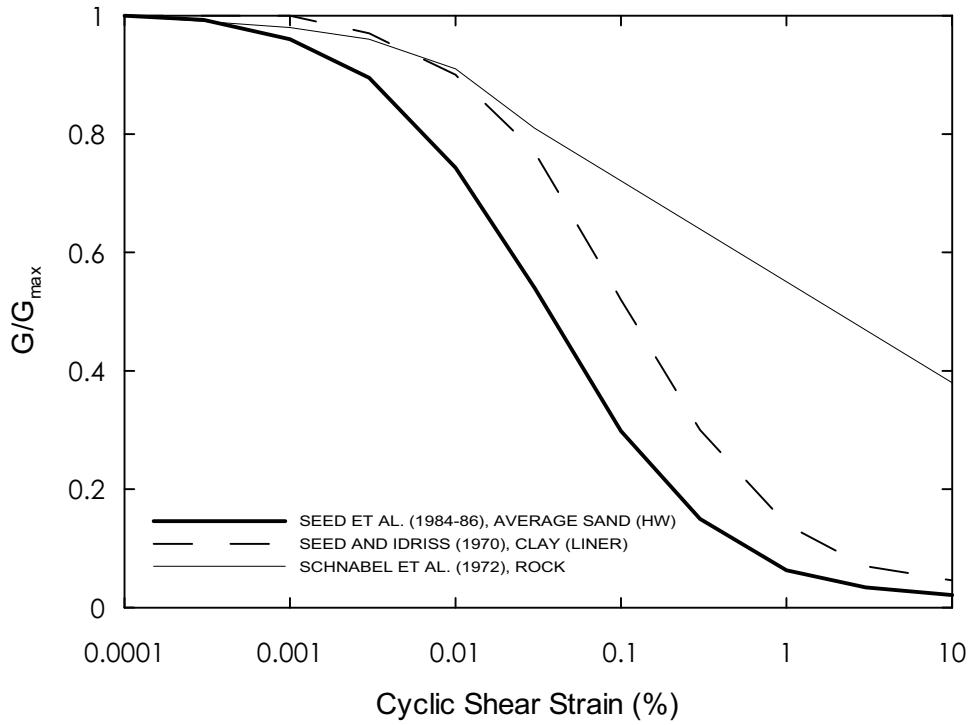
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	ORIGINAL CORRECTED TIME HISTORIES 1999 CHI CHI EARTHQUAKE STATION:CHY042 N	Figure 16
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		

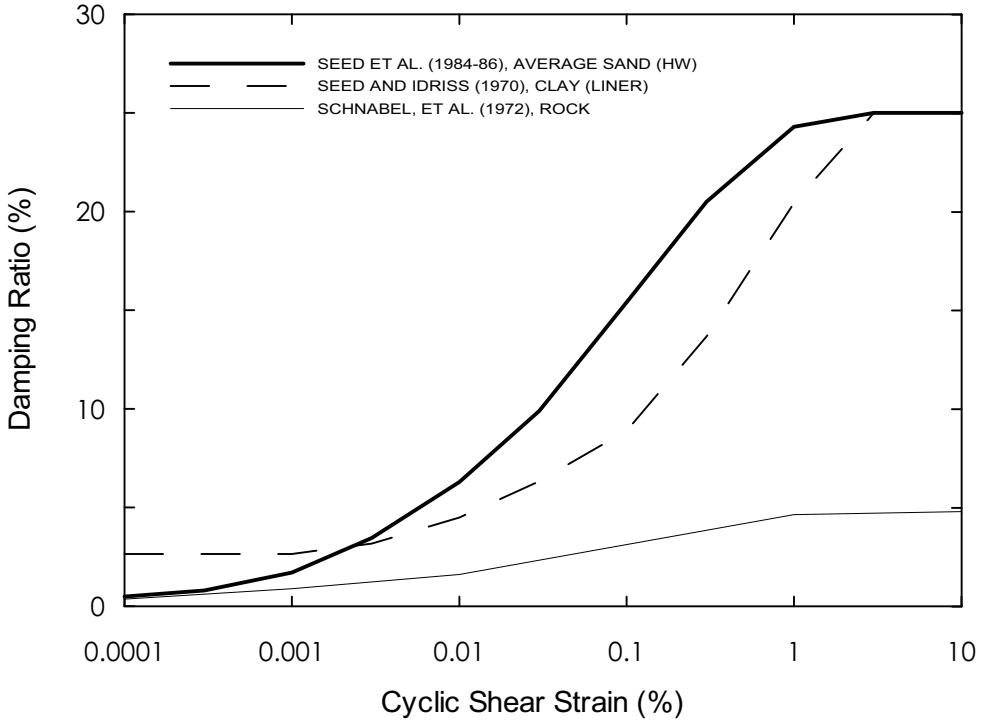


Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, CA	SPECTRUM COMPATIBLE TIME HISTORIES 1999 CHI CHI EARTHQUAKE STATION:CHY042 N	Figure 17
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		



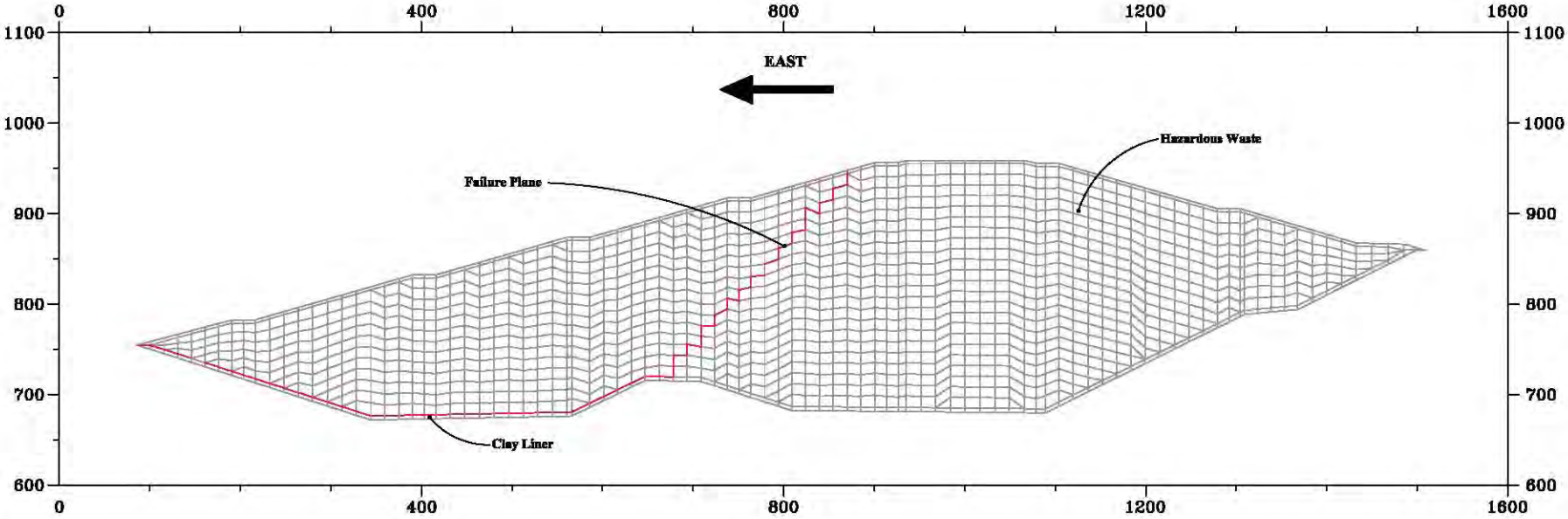
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman, Kings County, California	PROPOSED LANDFILL LINER SYSTEM	Figure 18
HAI	HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers		





HW: Hazardous Waste

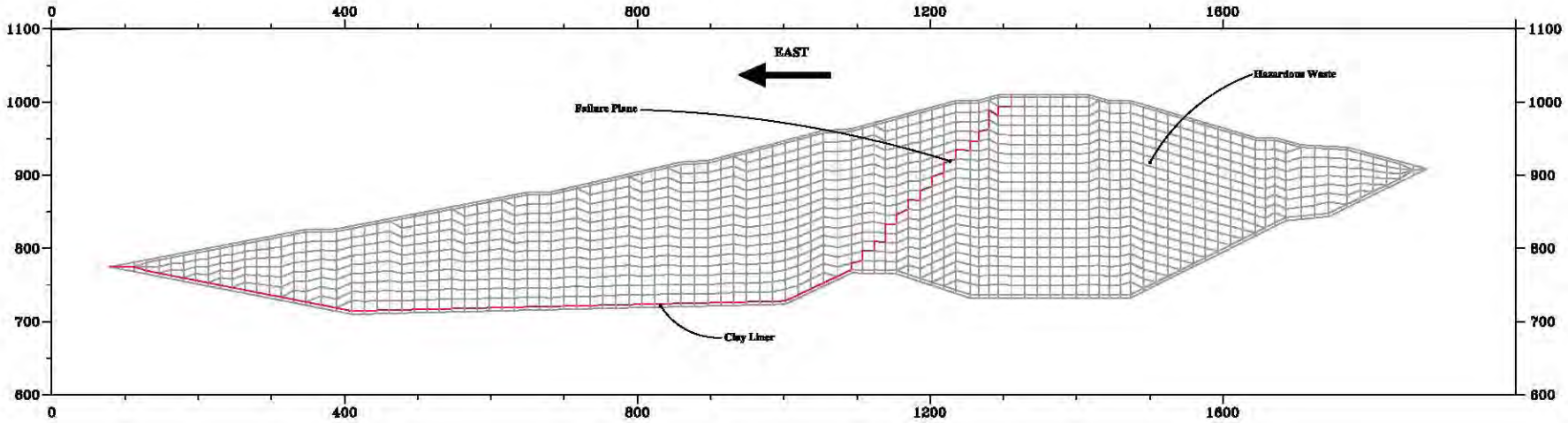
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, California	SHEAR MODULUS REDUCTION AND DAMPING CURVES FOR SAND (Hazardous Waste) AND CLAY (Liner) USED IN THIS STUDY	Figure 19
HAI	***HUSHMAND ASSOCIATES INC.*** ***Geotechnical and Earthquake Engineers***		



SCALE 1 inch = 120 ft

0' 30' 60' 120'

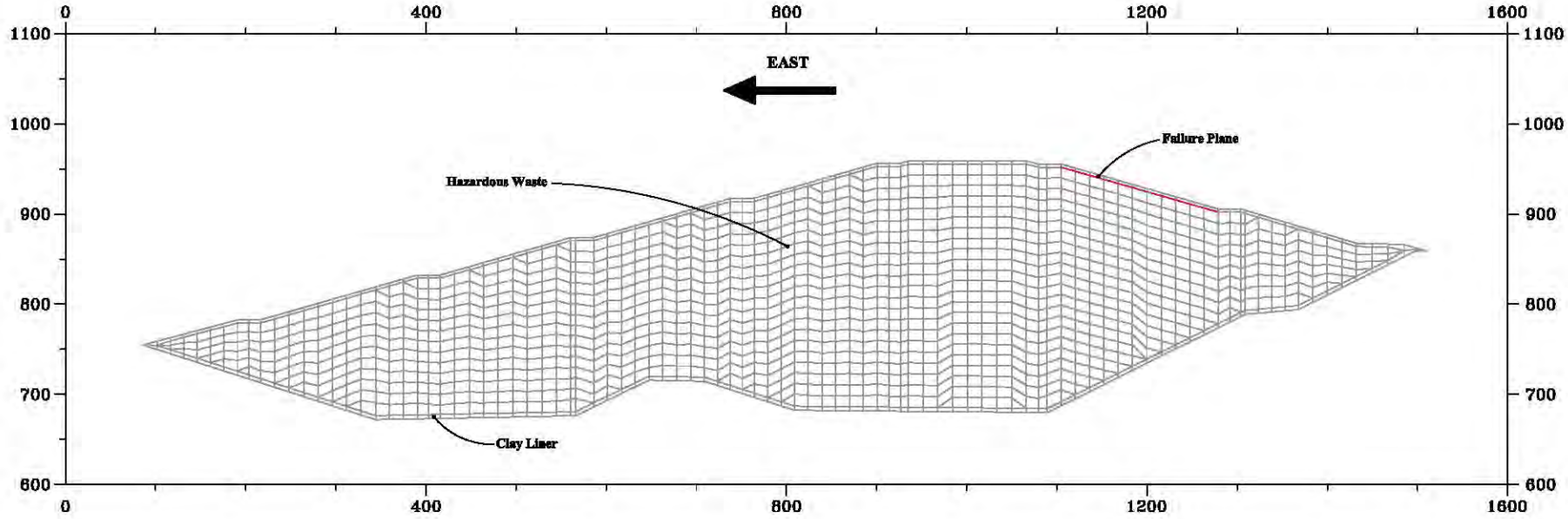
Project No. 06-0225	Landfill B-18 Expansion Project Kettleman City, Kings County, California	SECTION D – D' FINITE ELEMENT (QUAD4M) MESH
HAI	HUSHMAND ASSOCIATES INC. Geotechnical, Earthquake and Environmental Engineers	Figure 20a



SCALE 1 inch = 150 ft

0' 37.5' 75' 150'

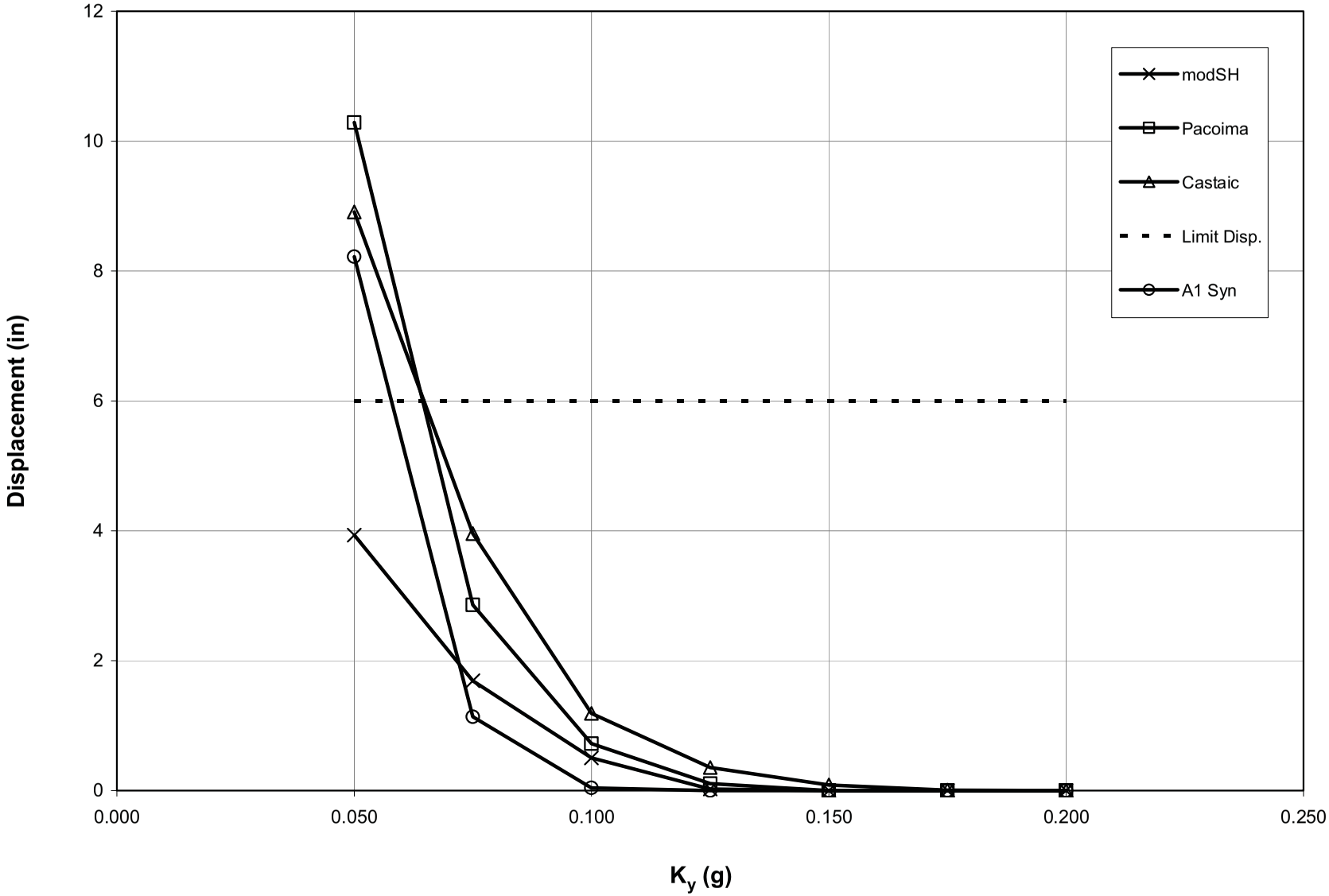
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, California	SECTION F – F' FINITE ELEMENT (QUAD4M) MESH	Figure 20b
HAI	HUSHMAND ASSOCIATES INC. Geotechnical, Earthquake and Environmental Engineers		



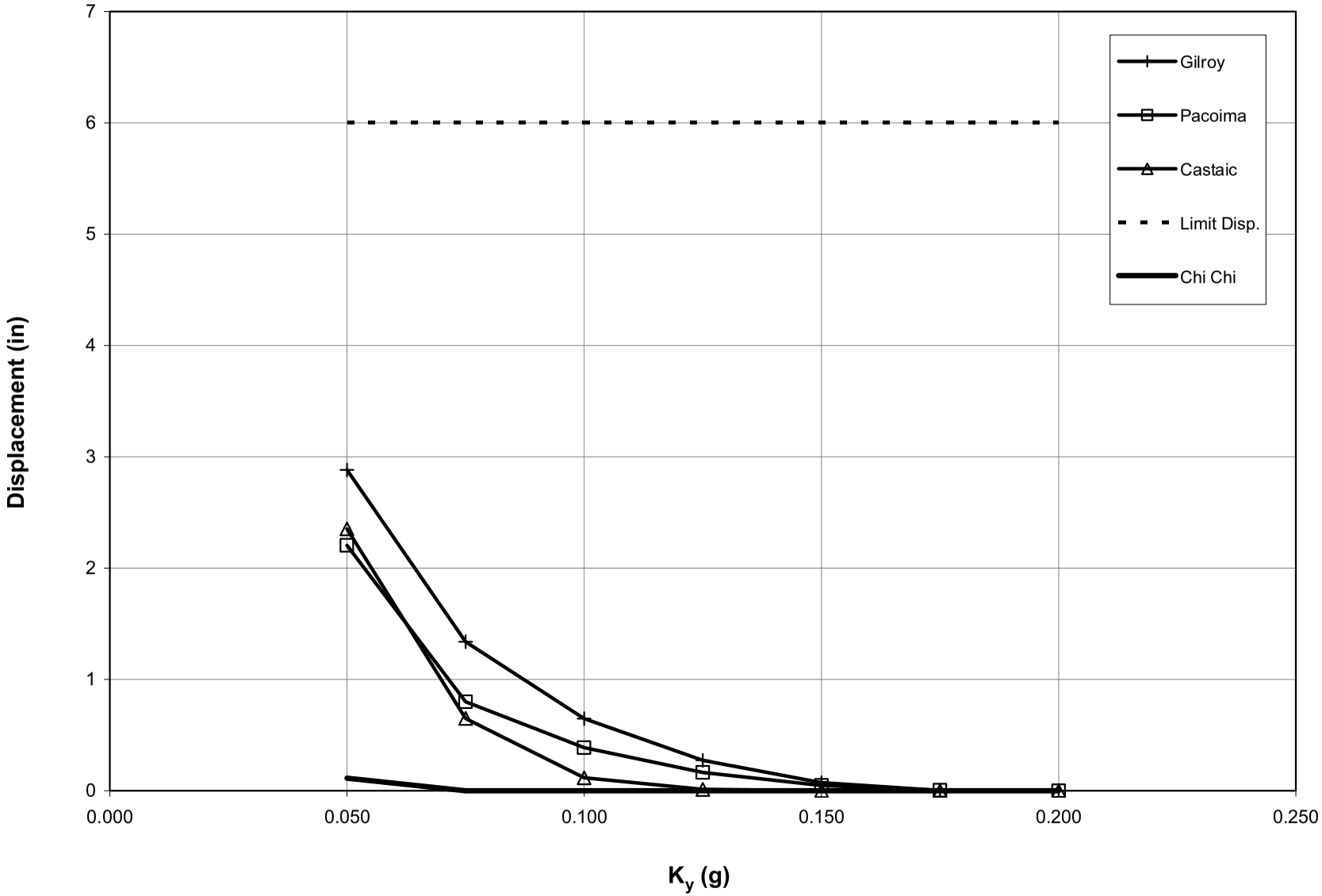
SCALE 1 inch = 120 ft

0' 30' 60' 120'

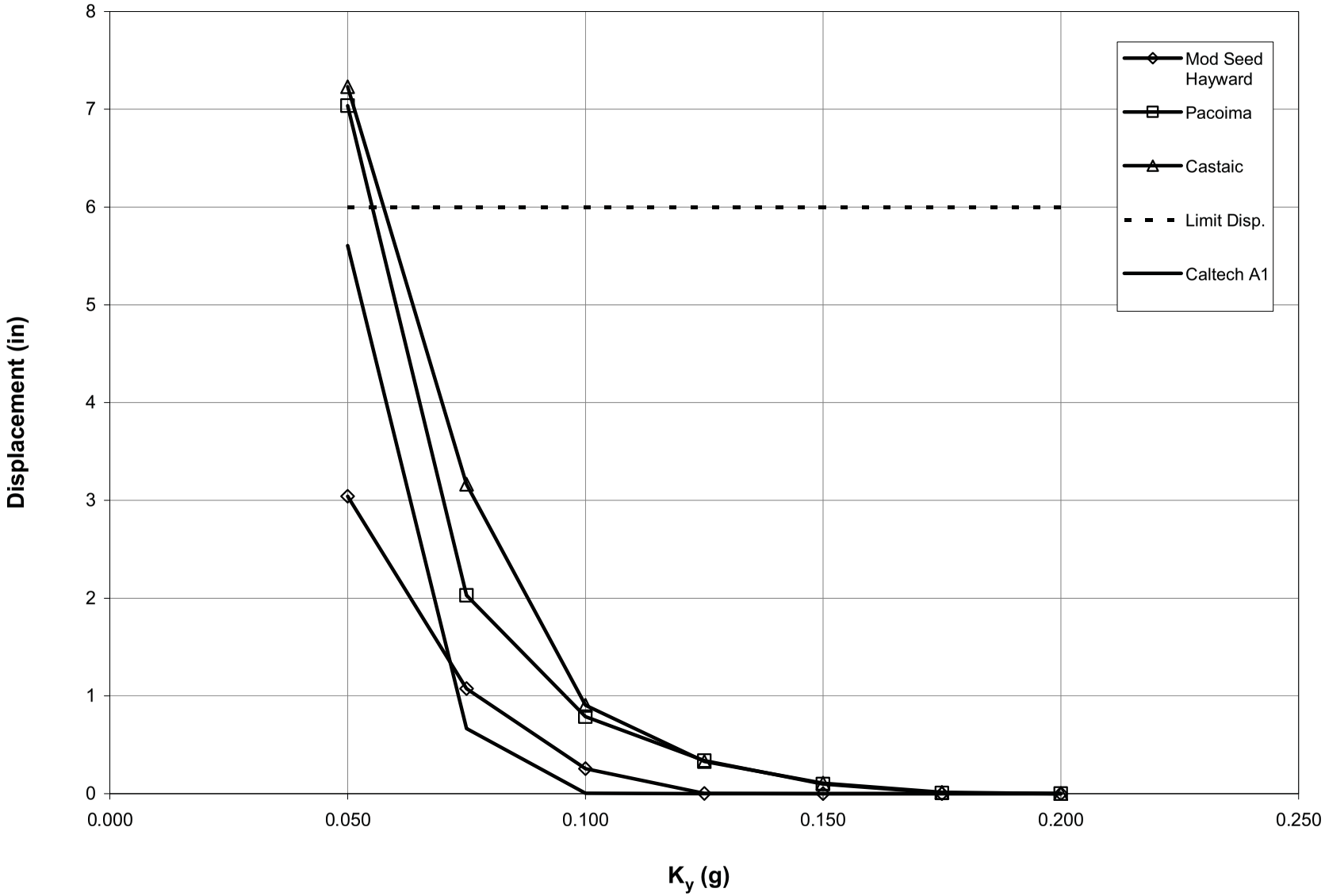
Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, California	SECTION D – D' FINITE ELEMENT (QUAD4M) MESH	Figure 20c
HAI	HUSHMAND ASSOCIATES INC. Geotechnical, Earthquake and Environmental Engineers		



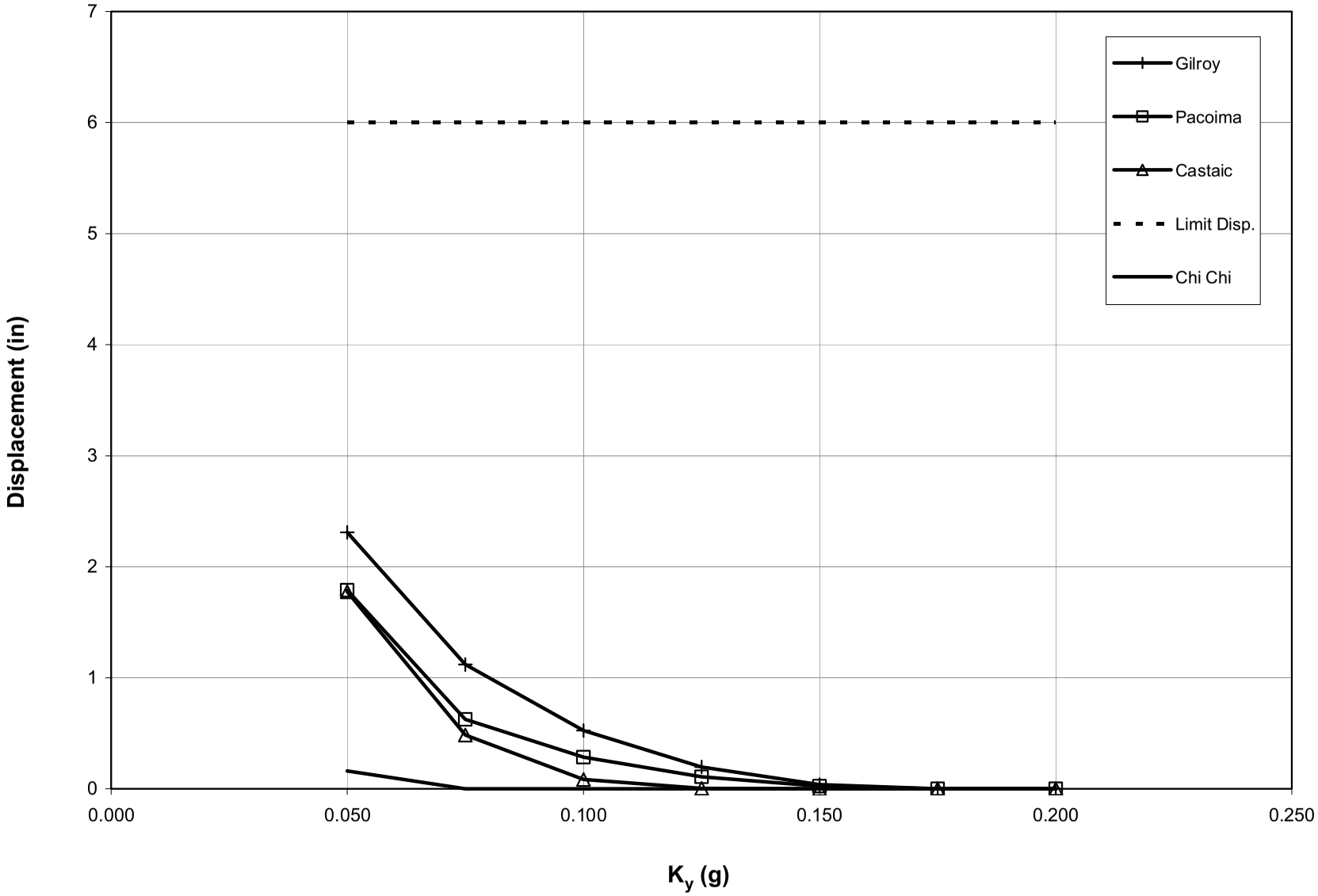
Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**EARTHQUAKE INDUCED DISPLACEMENTS SECTION D-D' – FAILURE PLANE 1 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (PREVIOUS GROUND MOTIONS)**	Figure 21
	HUSHMAND ASSOCIATES INC. *Geotechnical and Earthquake Engineers*		



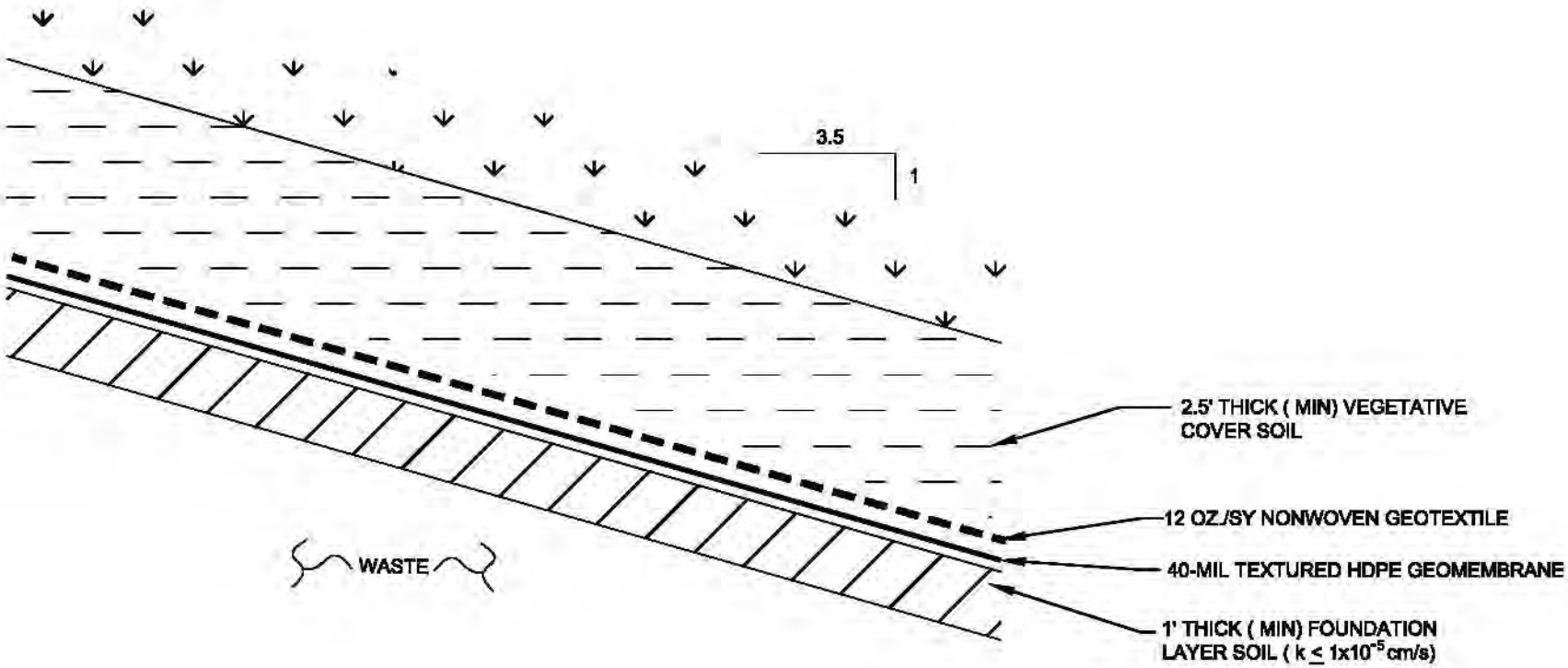
Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**EARTHQUAKE INDUCED DISPLACEMENTS SECTION D-D' – FAILURE PLANE 1 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (RECENT GROUND MOTIONS)**	Figure 22
	HUSHMAND ASSOCIATES INC. *Geotechnical and Earthquake Engineers*		



Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**EARTHQUAKE INDUCED DISPLACEMENTS SECTION F-F' – FAILURE PLANE 3 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (PREVIOUS GROUND MOTIONS)**	Figure 23
	HUSHMAND ASSOCIATES INC. *Geotechnical and Earthquake Engineers*		

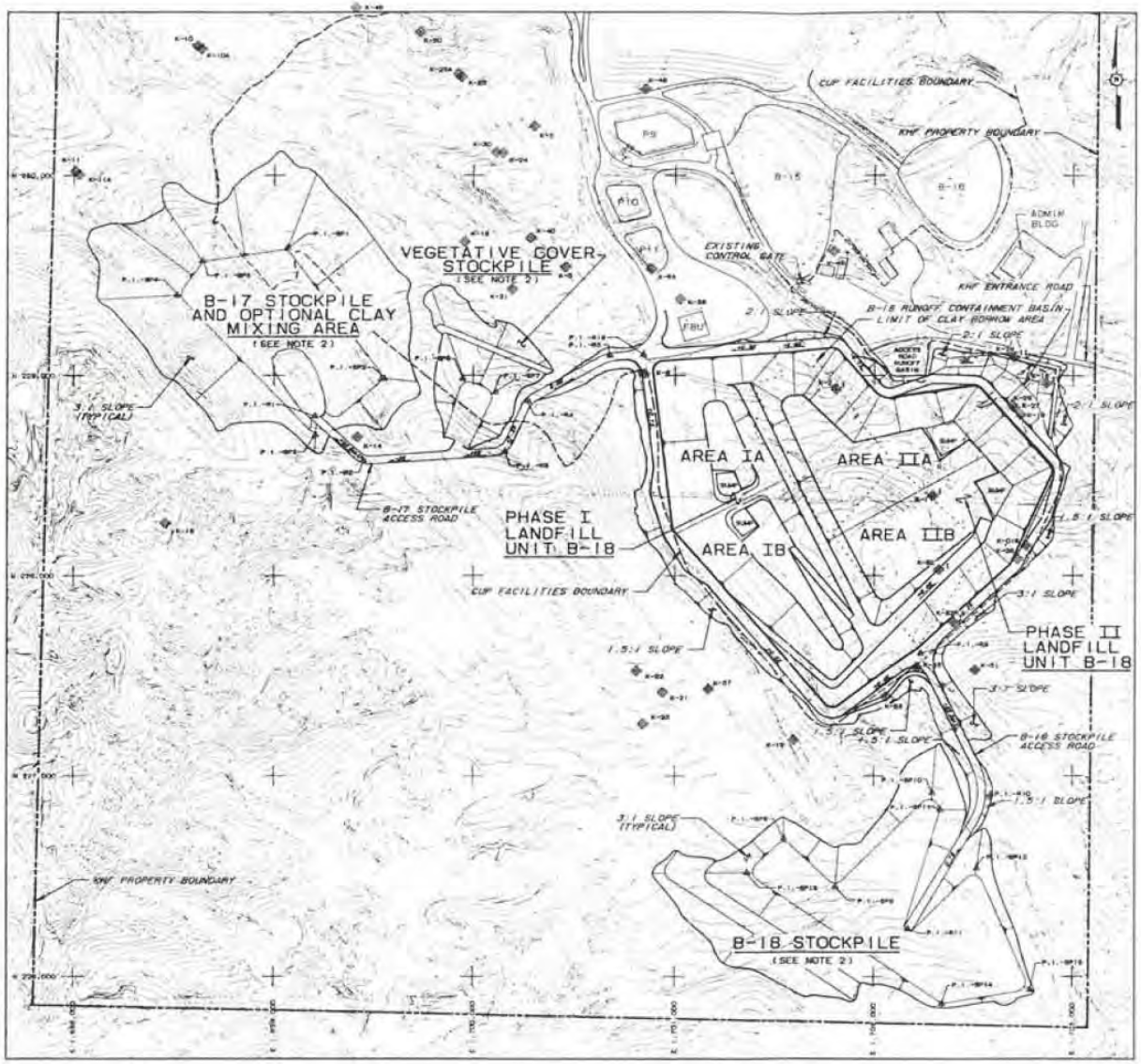


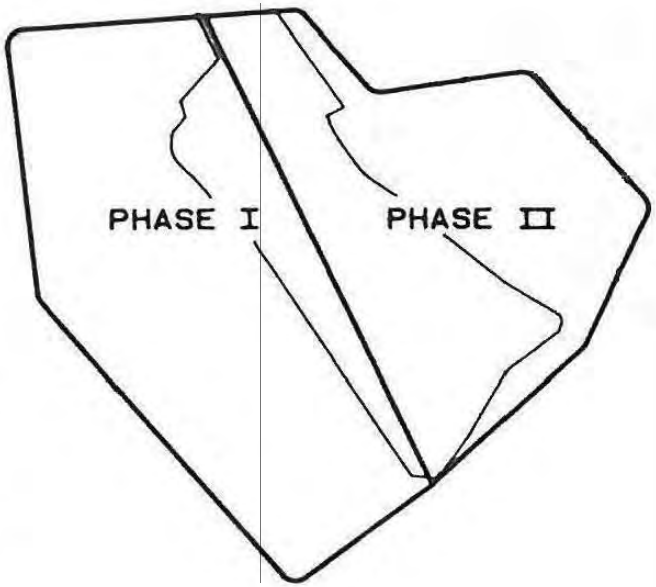
Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**EARTHQUAKE INDUCED DISPLACEMENTS SECTION F-F' – FAILURE PLANE 3 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (RECENT GROUND MOTIONS)**	Figure 24
	HUSHMAND ASSOCIATES INC. *Geotechnical and Earthquake Engineers*		



Project No. 08-0228	Landfill B-18 Expansion Project Kettleman, Kings County, California	PROPOSED LANDFILL FINAL COVER	Figure 25
HAI	HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers		

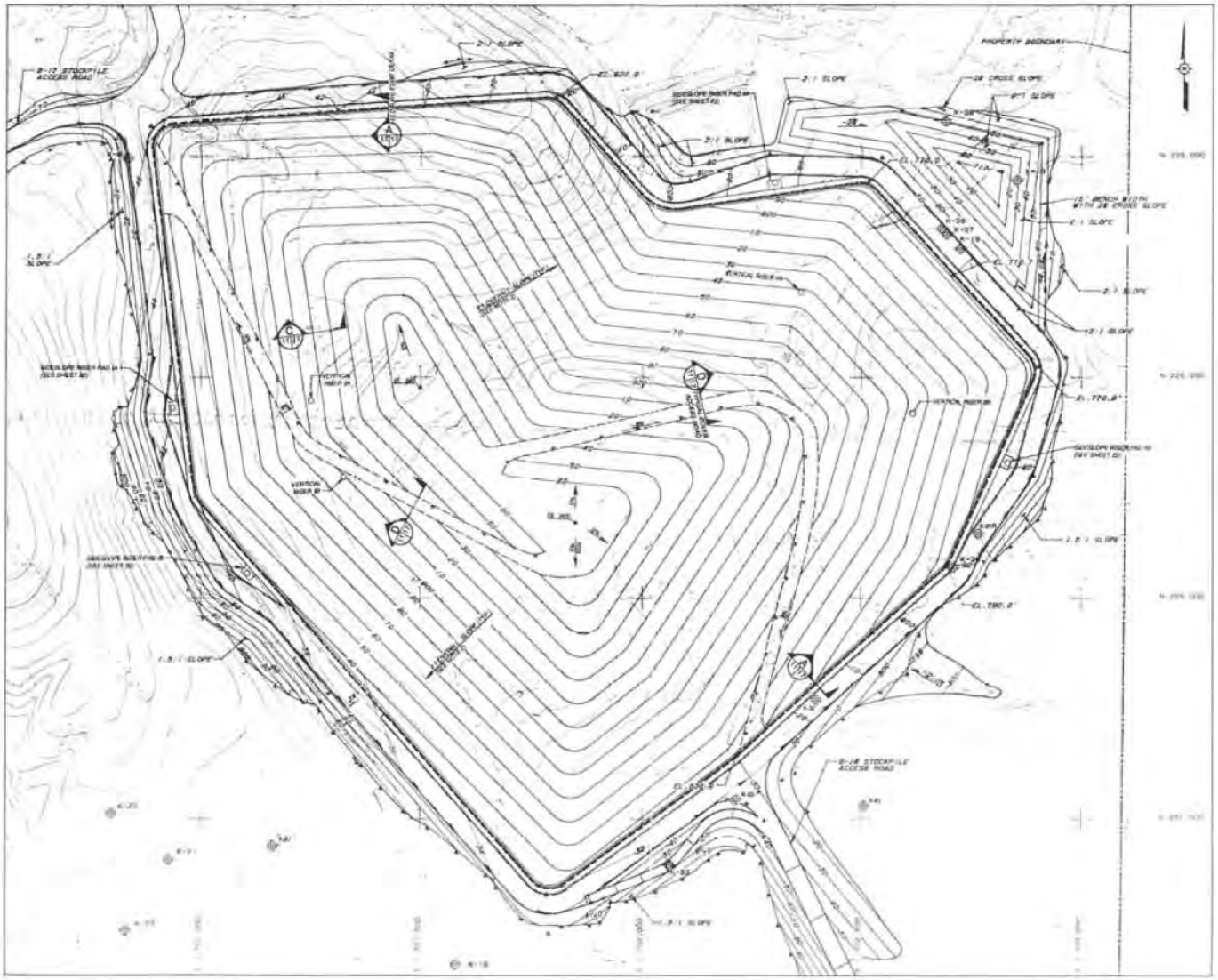
APPENDIX A





SOURCE: ENVIRONMENTAL SOLUTIONS, INC., 1990

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**PROJECT PLAN** **(Landfill Unit B-18 Construction Plans)**	Figure A-1
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*		

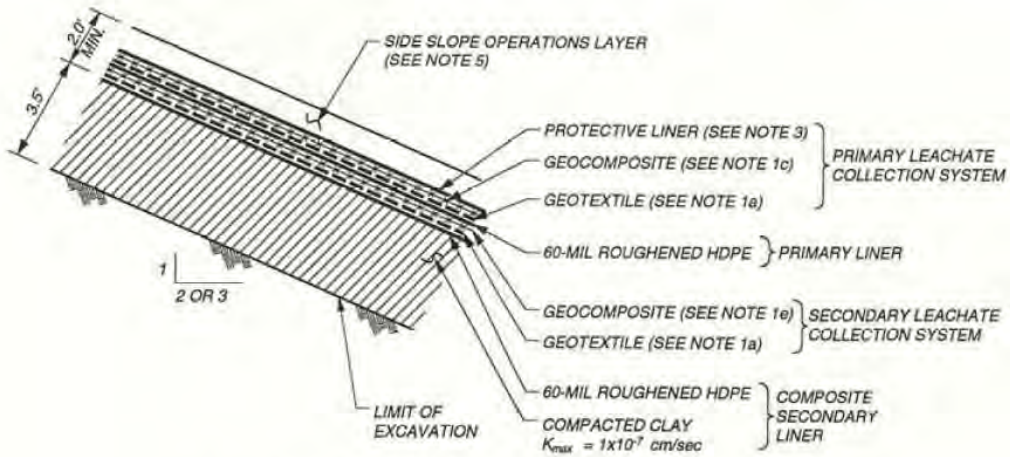


NOTES

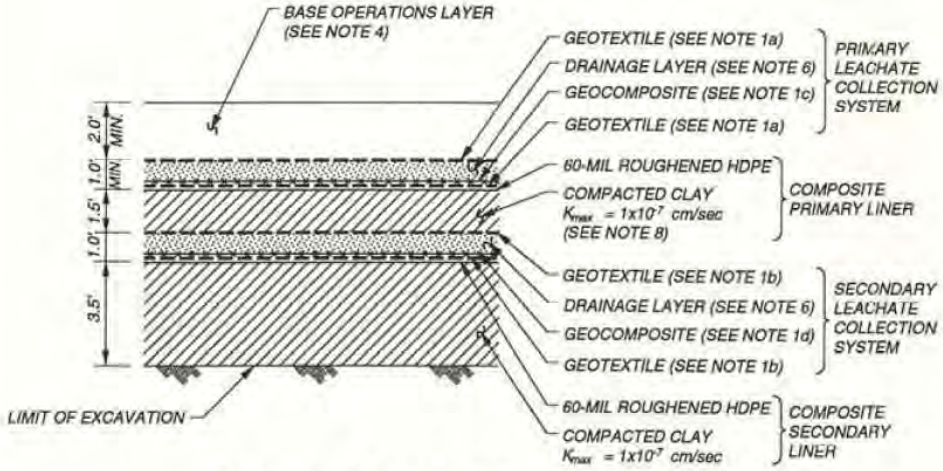
1. SEE SHEET 1 FOR LEGEND AND GENERAL NOTES
2. BENCHES WILL BE PROVIDED AT APPROXIMATELY 50-FOOT INTERVALS AS SHOWN ON SECTION B, SHEET 17. INTERMEDIATE BETWEEN BENCHES WILL HAVE A SLOPE OF APPROXIMATELY 3.6:1. THE BENCHES WILL SLOPE AT 3% TO CONTROL DRAINAGE.

SOURCE: ENVIRONMENTAL SOLUTIONS, INC., 1990

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**PHASE I AND II FINAL CLOSURE PLAN (Landfill Unit B-18 Construction Plans)**	Figure A-2
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*		



TYPICAL SLOPE LINER



TYPICAL BASE LINER

NOTES

1a. GEOTEXTILE SHALL BE TREVIRA 1125 OR EQUAL.
1b. GEOTEXTILE SHALL BE TREVIRA 1155 OR EQUAL.
1c. GEOCOMPOSITE SHALL BE TREVIRA 1125 HEAT BONDED TO POLYNET 3000.
1d. GEOCOMPOSITE SHALL BE TREVIRA 1125 OR 1155 HEAT BONDED TO POLYNET 3000.
1e. GEOCOMPOSITE SHALL BE TREVIRA 1125 OR 1155 HEAT BONDED TO POLYNET 3000 AT THE OPTION OF THE OWNER.
} SEE NOTE 1f AND 2
1f. GEOTEXTILE SHALL ALWAYS BE FACING UP.

2. GEONET SHALL BE POLYNET 3000 OR EQUAL.

3. PROTECTIVE LINER SHALL BE REMOVED BY OPERATIONS STAFF PRIOR TO PLACEMENT OF OPERATIONS LAYER.

4. BASE OPERATIONS LAYER SHALL CONSIST OF SOILS EXCAVATED FROM ONSITE SOURCES. SOIL PARTICLE SIZE SHALL HAVE MAXIMUM DIAMETER OF 6 INCHES.

5. SIDE SLOPE OPERATIONS LAYER SHALL CONSIST OF SOILS EXCAVATED FROM ONSITE SOURCES. SOIL PARTICLE SIZE SHALL HAVE MAXIMUM DIAMETER OF 1 INCH.

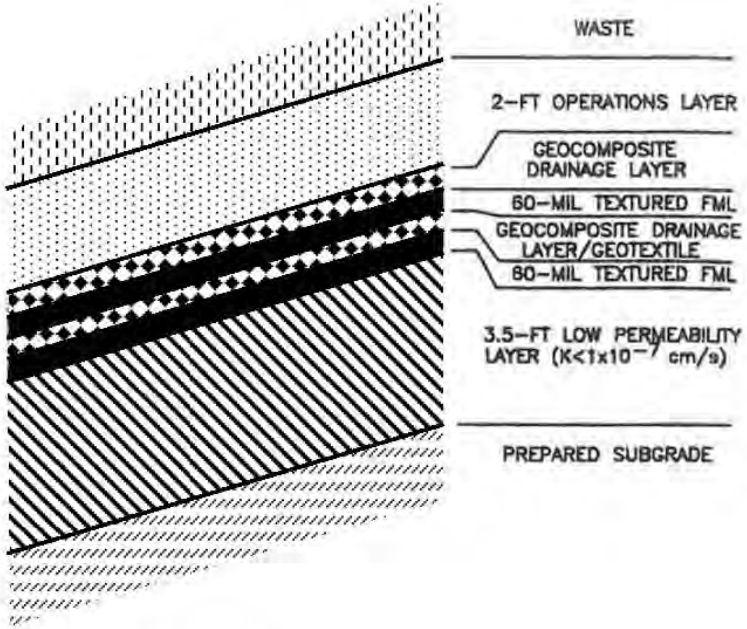
6. DRAINAGE LAYER MATERIAL SHALL CONSIST OF A SUB-ANGULAR TO ROUNDED WASHED GRAVEL MEETING THE GRADATION REQUIREMENTS SPECIFIED IN SECTION 02924 OF THE SPECIFICATIONS.

7. LINER SYSTEM SCALES ARE EXAGGERATED FOR CLARITY.

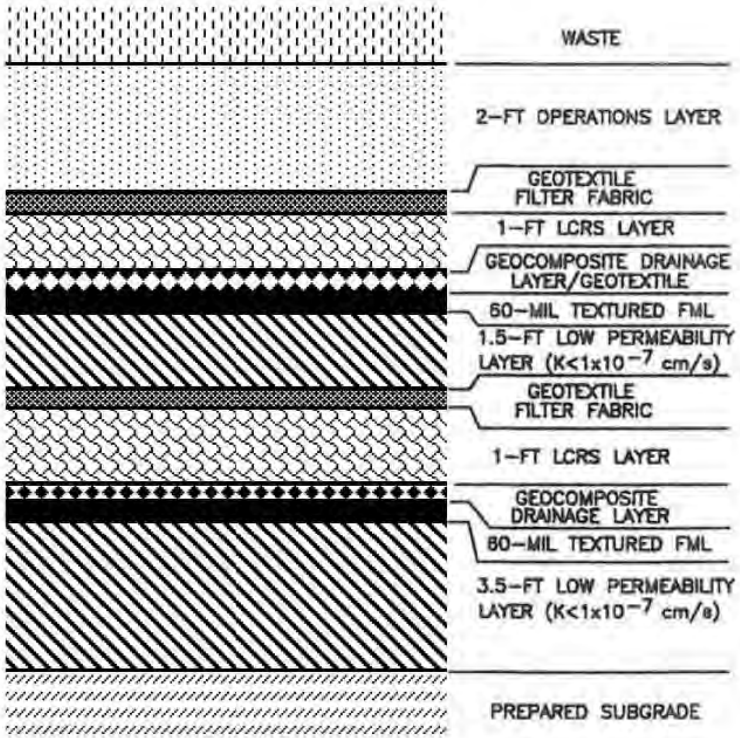
8. THE BOTTOM 12" OF PRIMARY CLAY LINER SHALL BE CONSTRUCTED IN ONE LIFT TO PROTECT UNDERLYING GEOSYNTHETIC LINER SYSTEM. THE UPPER 12" WILL HAVE A PERMEABILITY OF K_{max} = 10^{-7} cm/sec.

SOURCE: ENVIRONMENTAL SOLUTIONS, INC., 1990

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**DETAILS OF THE LANDFILL BASE GEOCOMPOSITE LINER SYSTEM**	Figure
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*	**EXISTING PHASE 1 LINER**	A-3



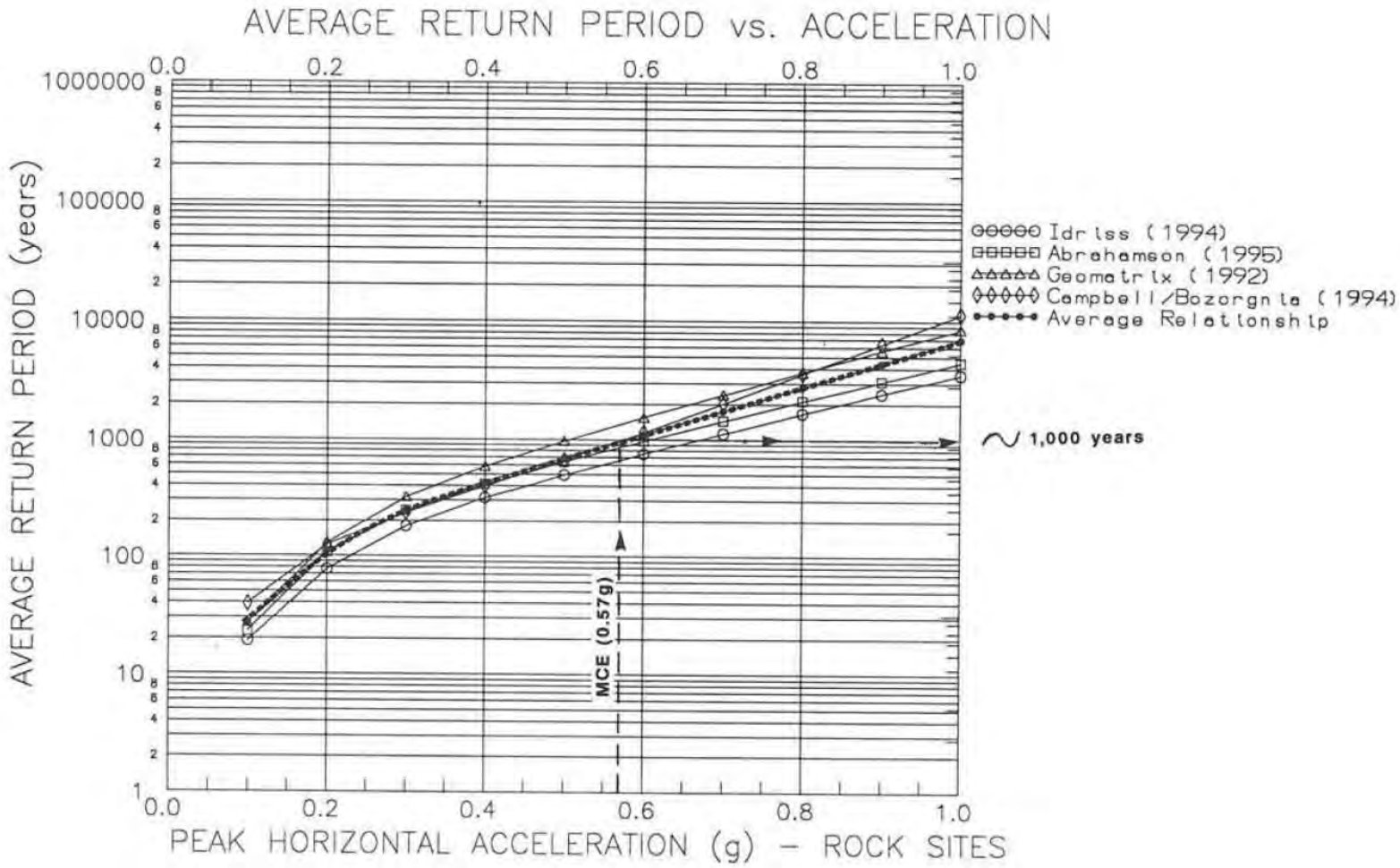
SLOPE LINER
SCALE: NTS



BOTTOM LINER
SCALE: NTS

SOURCE: URS, 2005

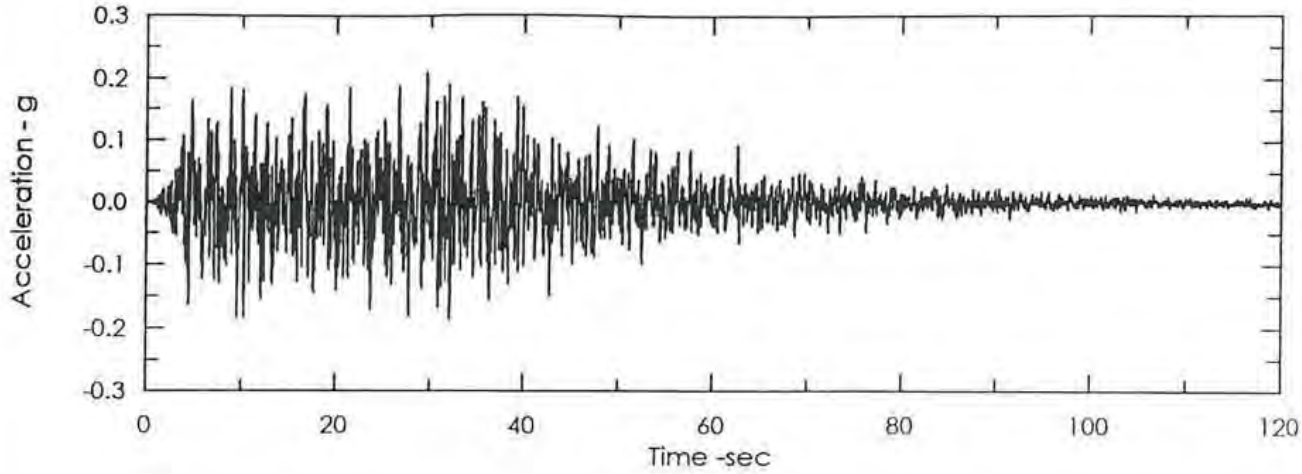
Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**PROPOSED LINER SYSTEM**	Figure A-4
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*		



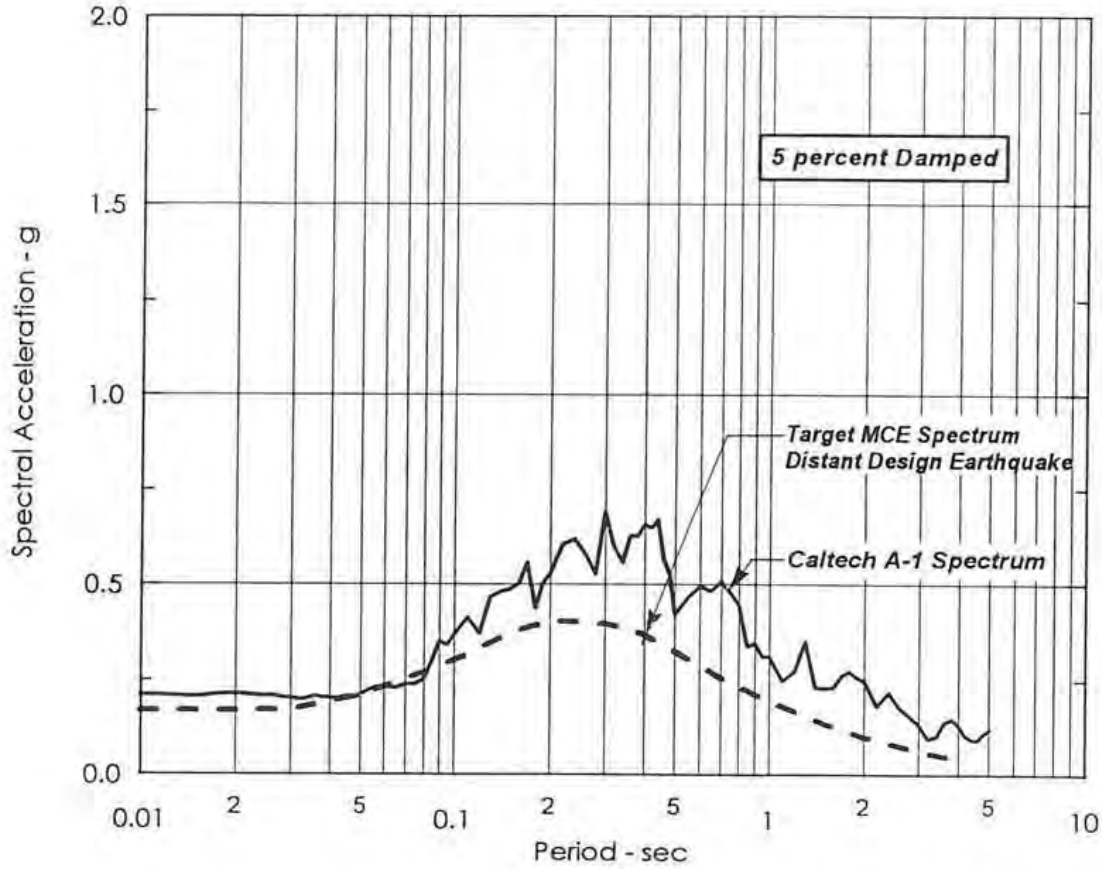
Seismic Hazard Evaluation, Landfill Unit B–19, Kettleman Hills Facility
Attenuation relations for blind thrust faults and rock sites.

SOURCE: RUST, 1998

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**PEAK HORIZONTAL ACCELERATION IN ROCK VERSUS AVERAGE RETURN PERIOD**	Figure A-5
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*		



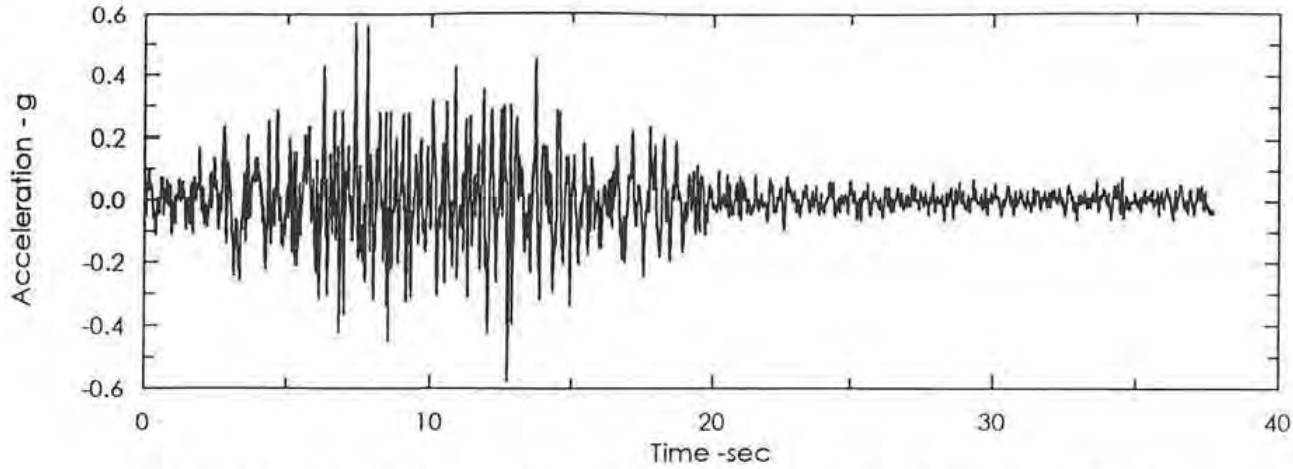
(a) Caltech A-1 Synthetic Record Scaled to 0.21g Peak Acceleration



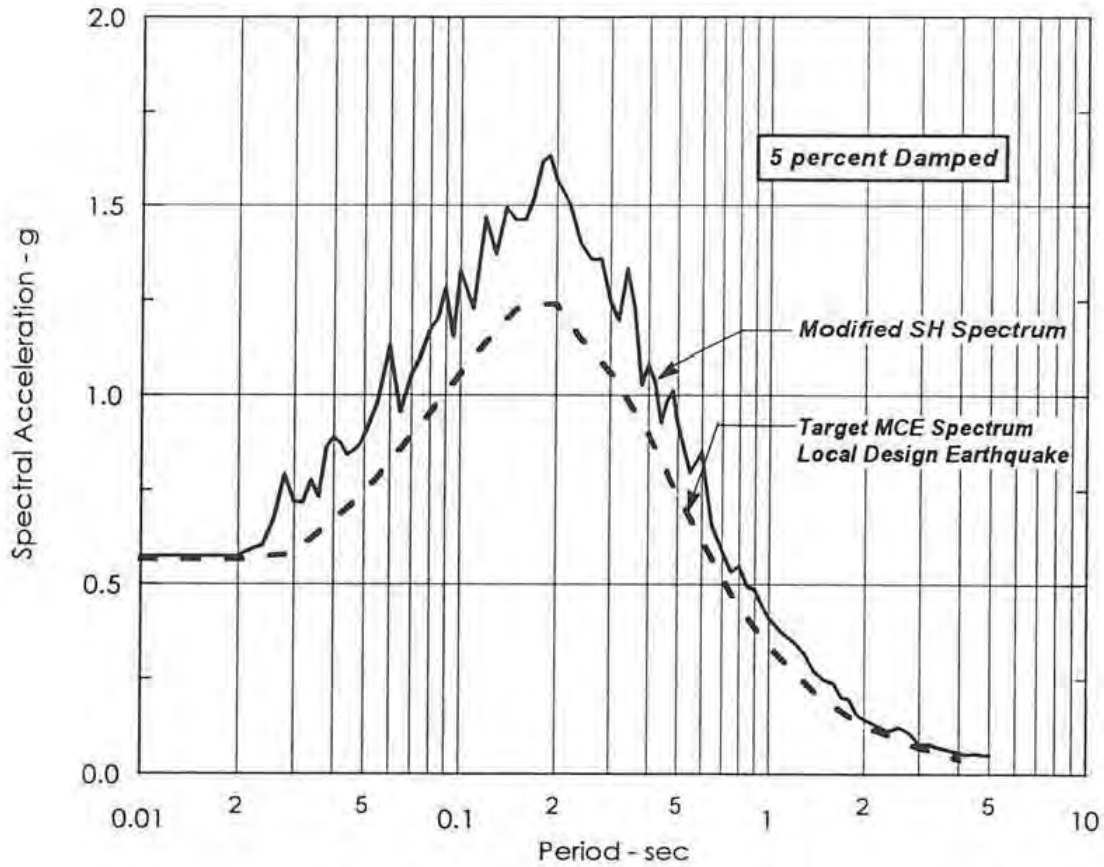
(b) Comparison of Pseudo-Acceleration Response Spectrum of Caltech A-1 Synthetic Earthquake Record and Target Design Spectrum (Peak Acceleration Scaled to 0.21g)

SOURCE: RUST, 1998

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**CALTECH A-1 SYNTHETIC ACCELERATION RECORD AND DYNAMIC RESPONSE SPECTRUM**	Figure
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*	**DISTANT DESIGN EARTHQUAKE**	A-6



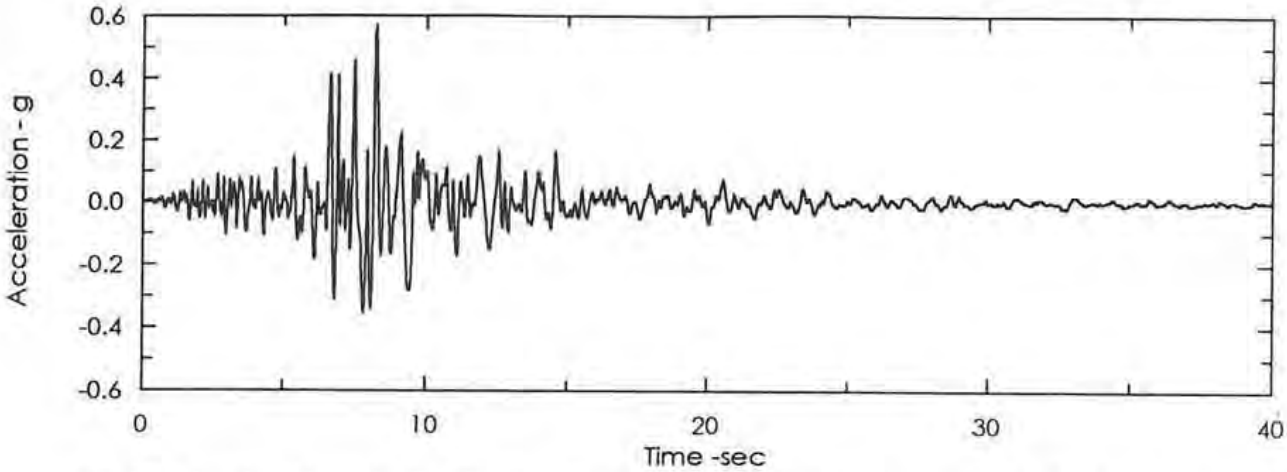
(a) Modified Seed-Hayward Synthetic Record Scaled to 0.57g Peak Acceleration



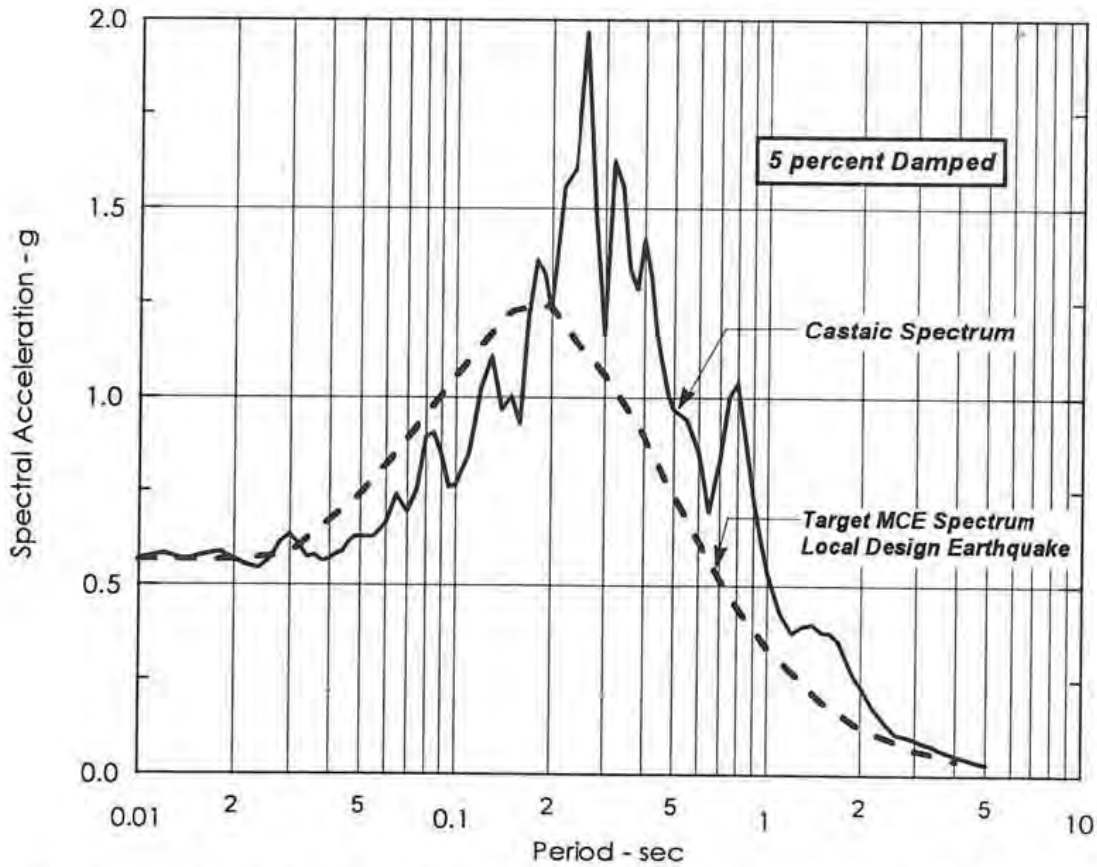
(b) Comparison of Pseudo-Acceleration Response Spectrum of the Modified Seed-Hayward Synthetic Earthquake Accelerogram and Target Design Spectrum (Peak Acceleration of Synthetic Record Scaled to 0.57g)

SOURCE: RUST, 1998

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**MODIFIED SEED-HAYWARD SYNTHETIC ACCELERATION RECORD AND DYNAMIC RESPONSE SPECTRUM SCALED TO TARGET MCE RESPONSE SPECTRUM**	Figure
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*	**LOCAL DESIGN EARTHQUAKE**	A-7



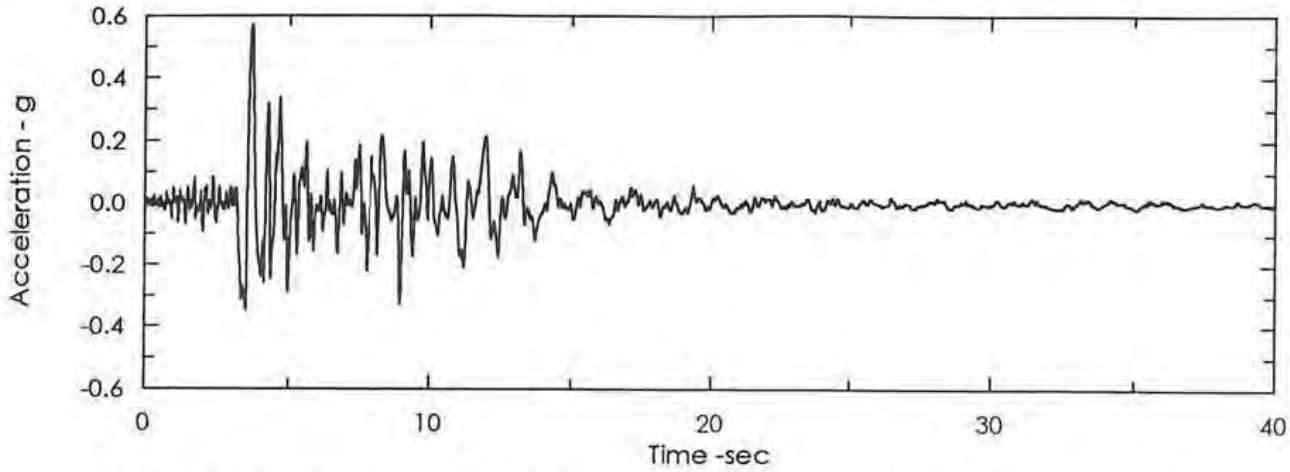
(a) Northridge Castaic Old Ridge Route CH 1 Record Scaled to 0.57g Peak Acceleration



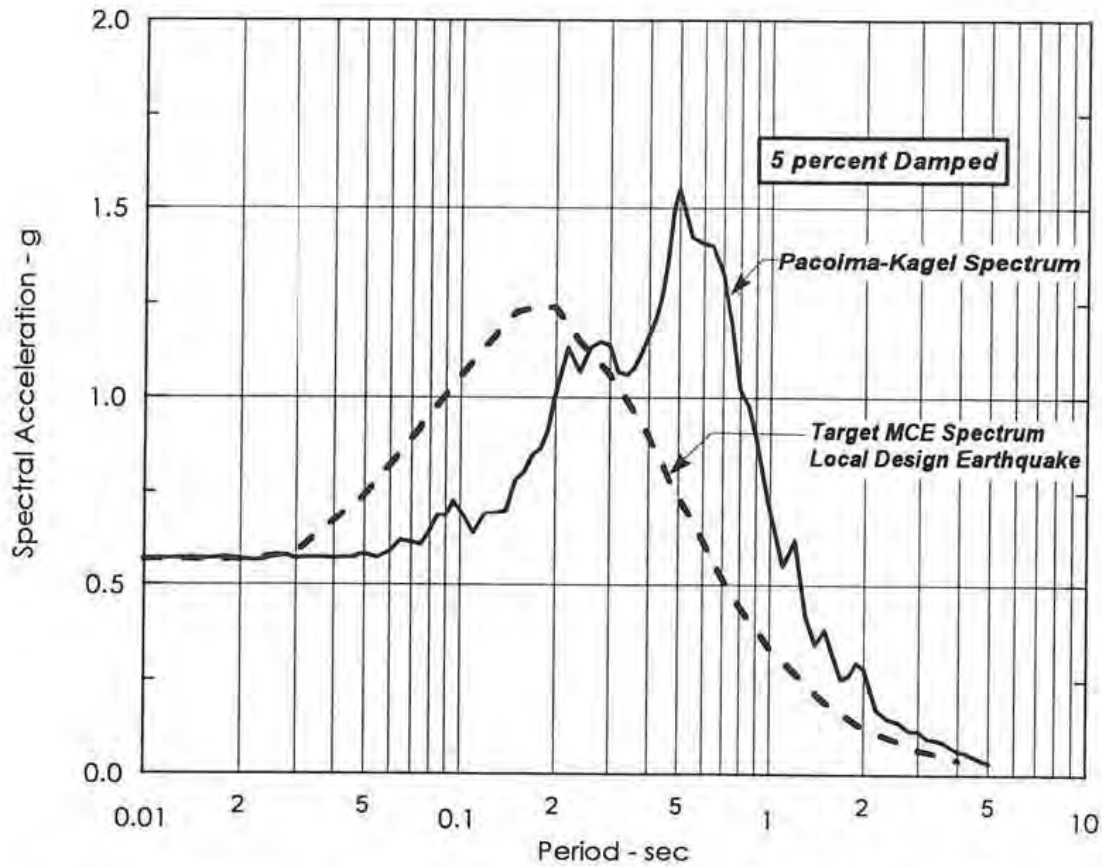
(b) Comparison of Pseudo-Acceleration Response Spectrum of M6.7 January 17, 1994 Northridge Earthquake Castaic - Old Ridge Route, CHN 1:90 DEG Record and Target Design Spectrum (Peak Acceleration Scaled to 0.57g)

SOURCE: RUST, 1998

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**CASTAIC ACCELERATION RECORD AND DYNAMIC RESPONSE SPECTRUM**	Figure
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*	**LOCAL DESIGN EARTHQUAKE**	A-8



(a) Northridge Pacoima - Kagel Canyon CH 3 Record Scaled to 0.57g Peak Acceleration



(b) Comparison of Pseudo-Acceleration Response Spectrum of M6.7 January 17, 1994 Northridge Earthquake Pacoima - Kagel Canyon, CHN 3:360 DEG Record and Target Design Spectrum (Peak Acceleration Scaled to 0.57g)

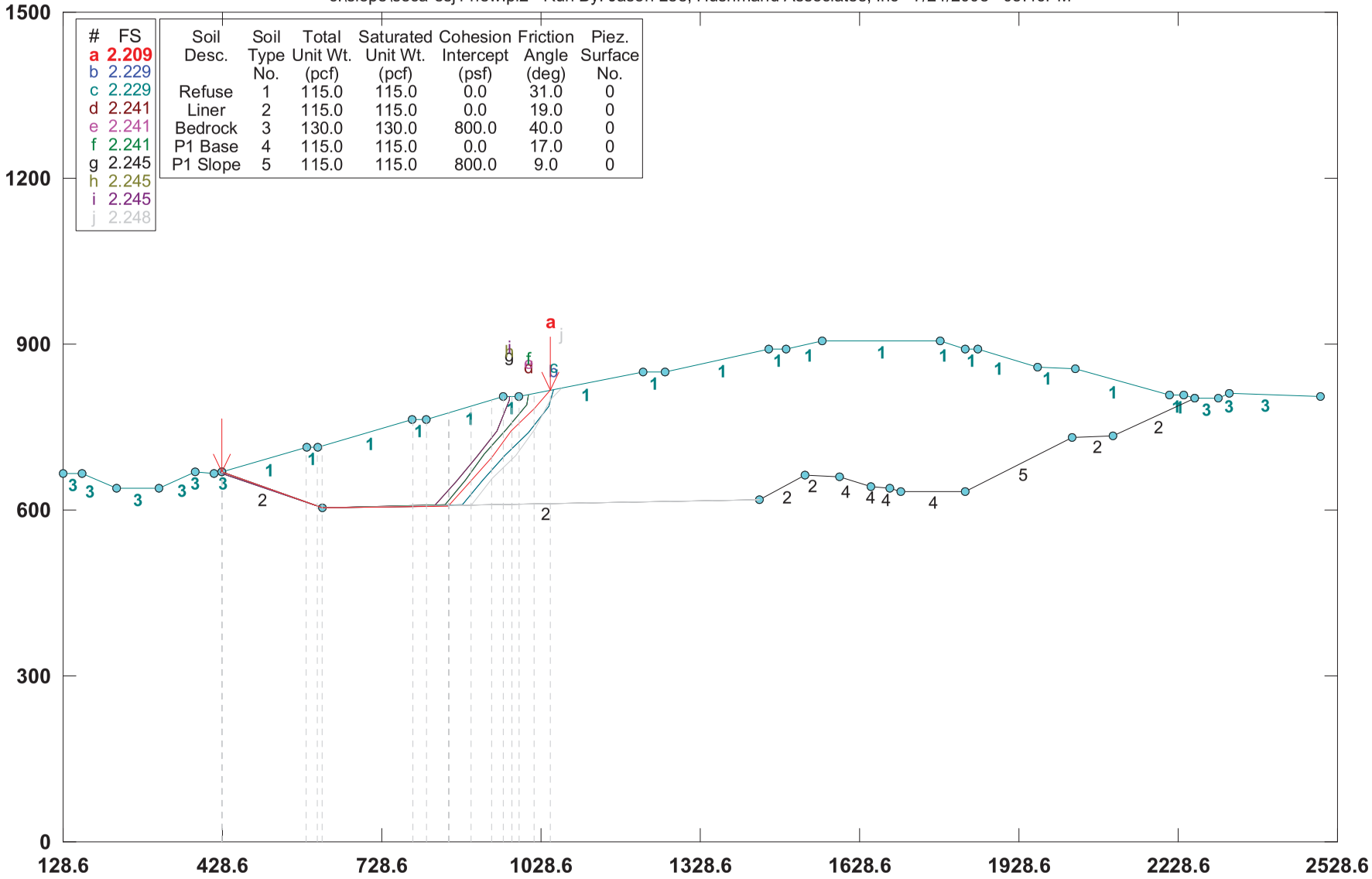
SOURCE: RUST, 1998

Project No. 08-0228	**Landfill B-18 Expansion Project** Kettleman City, Kings County, California	**PACOIMA-KAGEL CANYON ACCELERATION RECORD AND DYNAMIC RESPONSE SPECTRUM**	Figure
HAI	***HUSHMAND ASSOCIATES INC.*** *Geotechnical and Earthquake Engineers*	**LOCAL DESIGN EARTHQUAKE**	A-9

APPENDIX B

KHF, SECTION A-A', EAST, STATIC, FAILURE PLANE 1

c:\slope\seca-esj1 new.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 05:46PM



#	FS
a	2.209
b	2.229
c	2.229
d	2.241
e	2.241
f	2.241
g	2.245
h	2.245
i	2.245
j	2.248

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

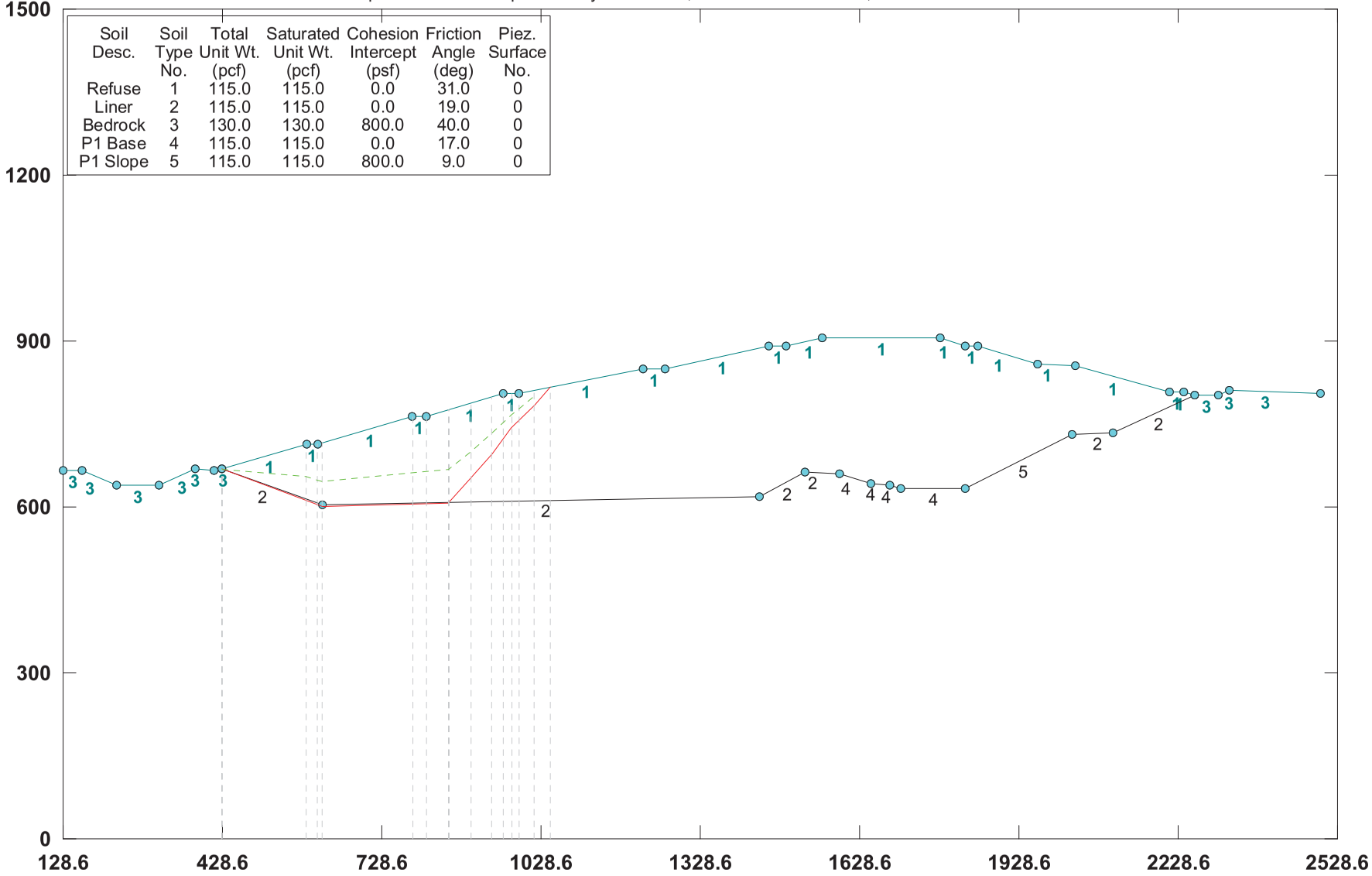
GSTABL7 v.2 FSmin=2.209

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION A-A', EAST, STATIC, FAILURE PLANE 1

c:\slope\seca-ess1 new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 05:50PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.589

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

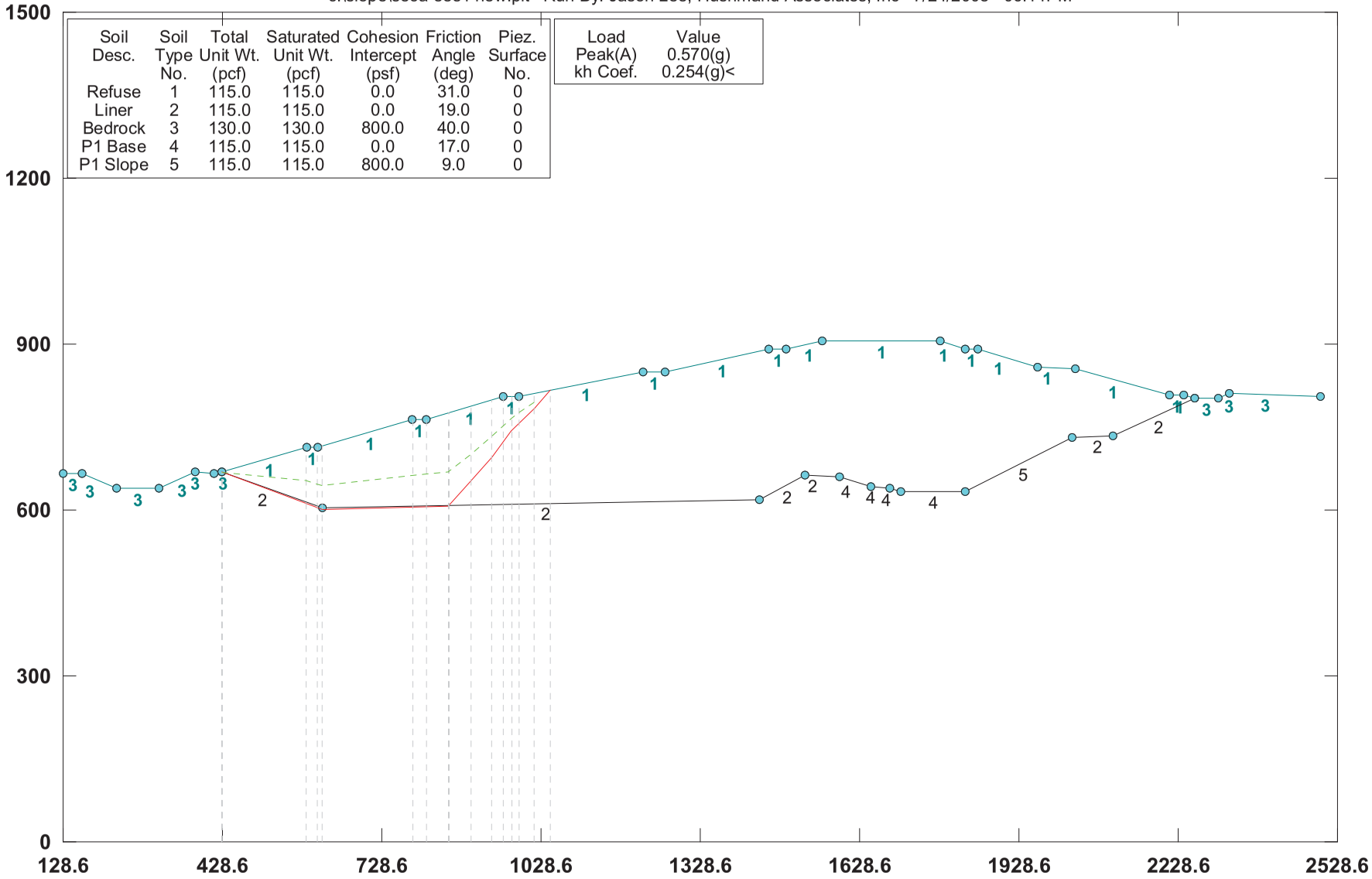
GSTABL7

KHF, SECTION A-A', EAST, STATIC, FAILURE PLANE 1

c:\slope\seca-ees1 new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 06:11PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.254(g)<

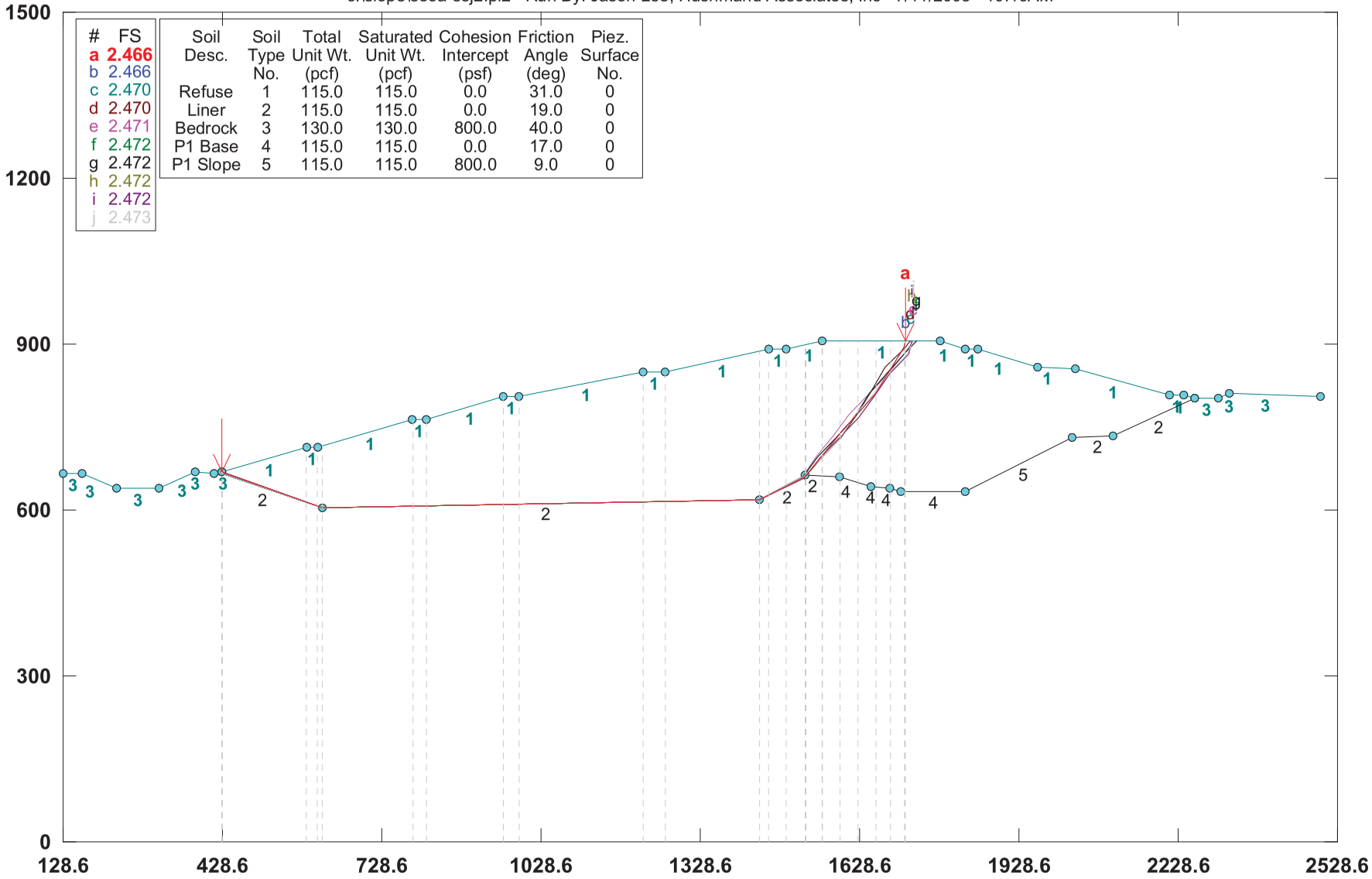


GSTABL7 v.2 FSmin=1.021

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION A-A', EAST, STATIC, FAILURE PLANE 2

c:\slope\seca-esj2.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 10:16AM



#	FS
a	2.466
b	2.466
c	2.470
d	2.470
e	2.471
f	2.472
g	2.472
h	2.472
i	2.472
j	2.473

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

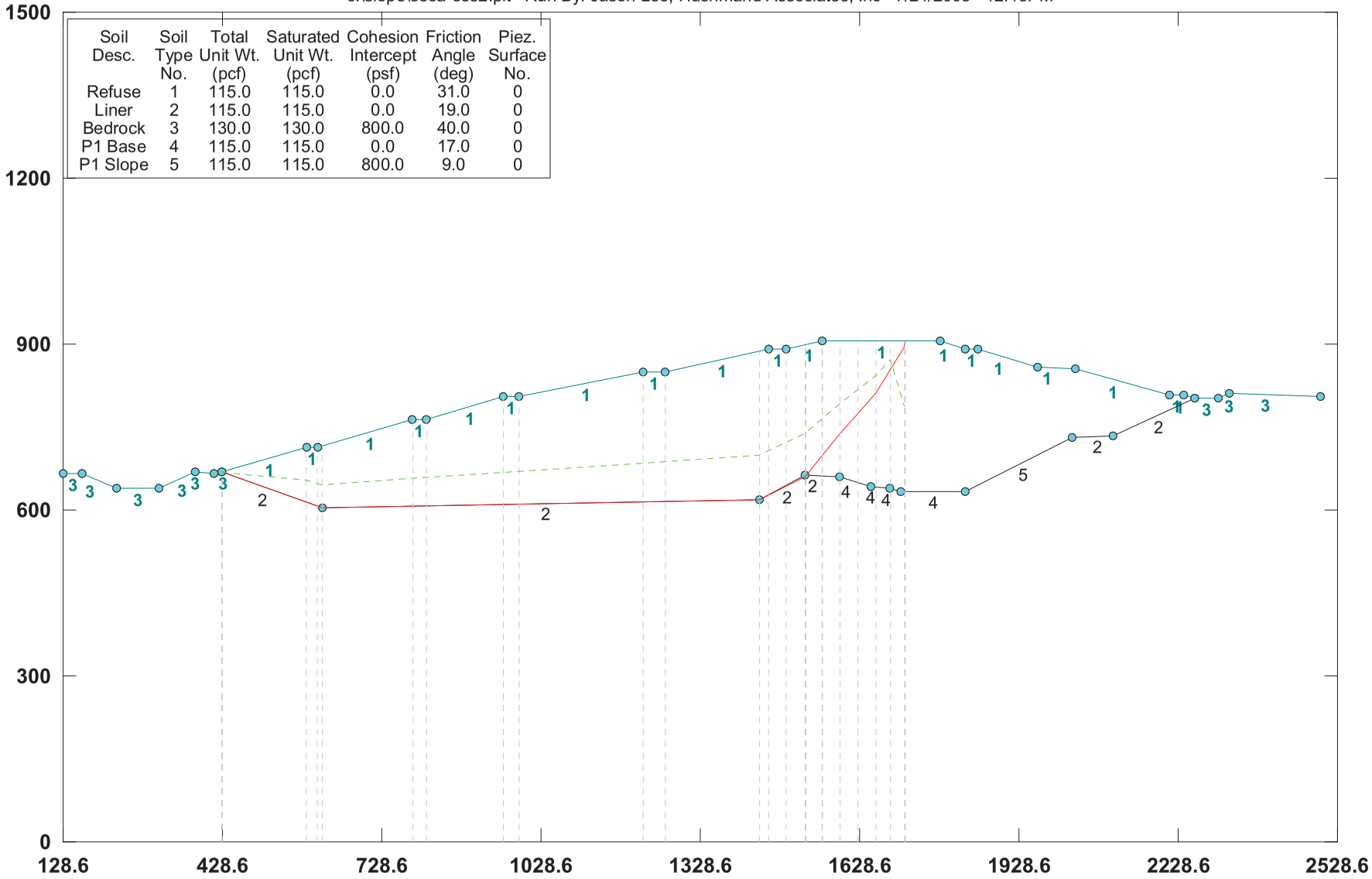
GSTABL7 v.2 FSmin=2.466

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION A-A', EAST, STATIC, FAILURE PLANE 2

c:\slope\seca-ess2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 12:13PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.689

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

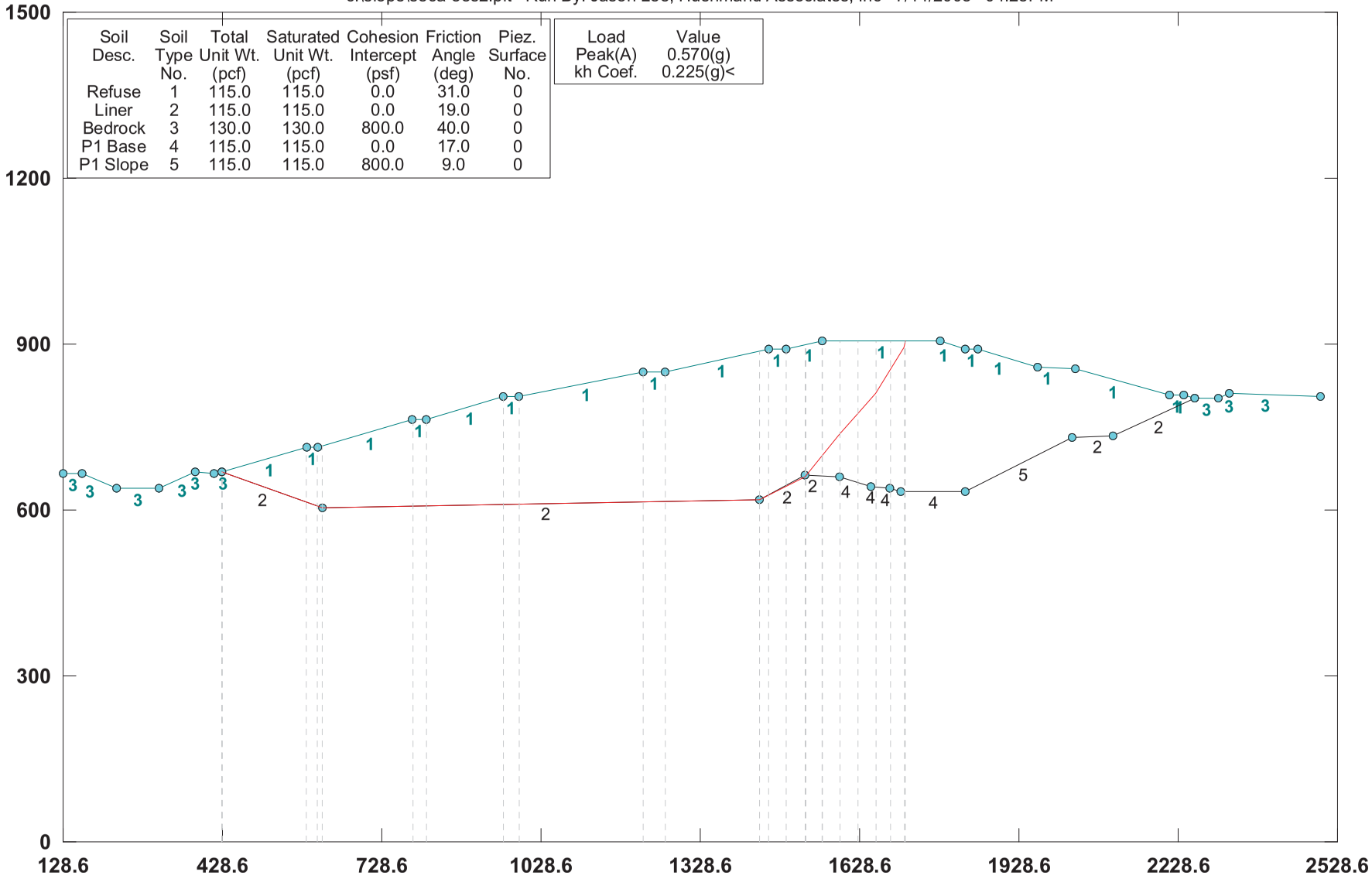
GSTABL7

KHF, SECTION A-A', EAST, PSEUD-STATIC, FAILURE PLANE 2

c:\slope\seca-ees2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 04:28PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.225(g)<

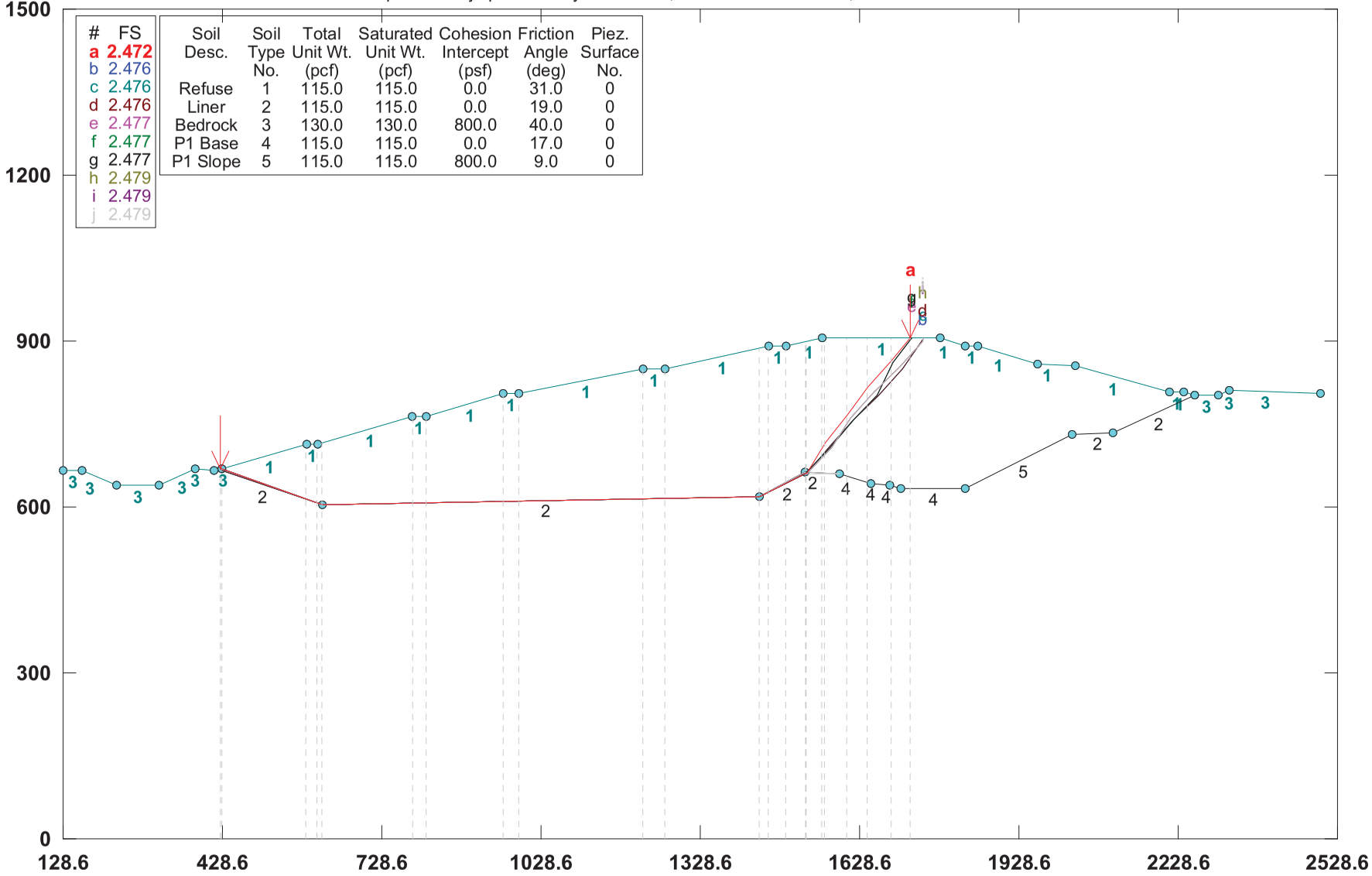


GSTABL7 v.2 FSmin=1.008

Factor Of Safety Is Calculated By The Simplified Janbu Method

KHF, SECTION A-A', EAST, STATIC, FAILURE PLANE 3

c:\slope\seca-esj3.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 10:42AM



#	FS
a	2.472
b	2.476
c	2.476
d	2.476
e	2.477
f	2.477
g	2.477
h	2.479
i	2.479
j	2.479

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

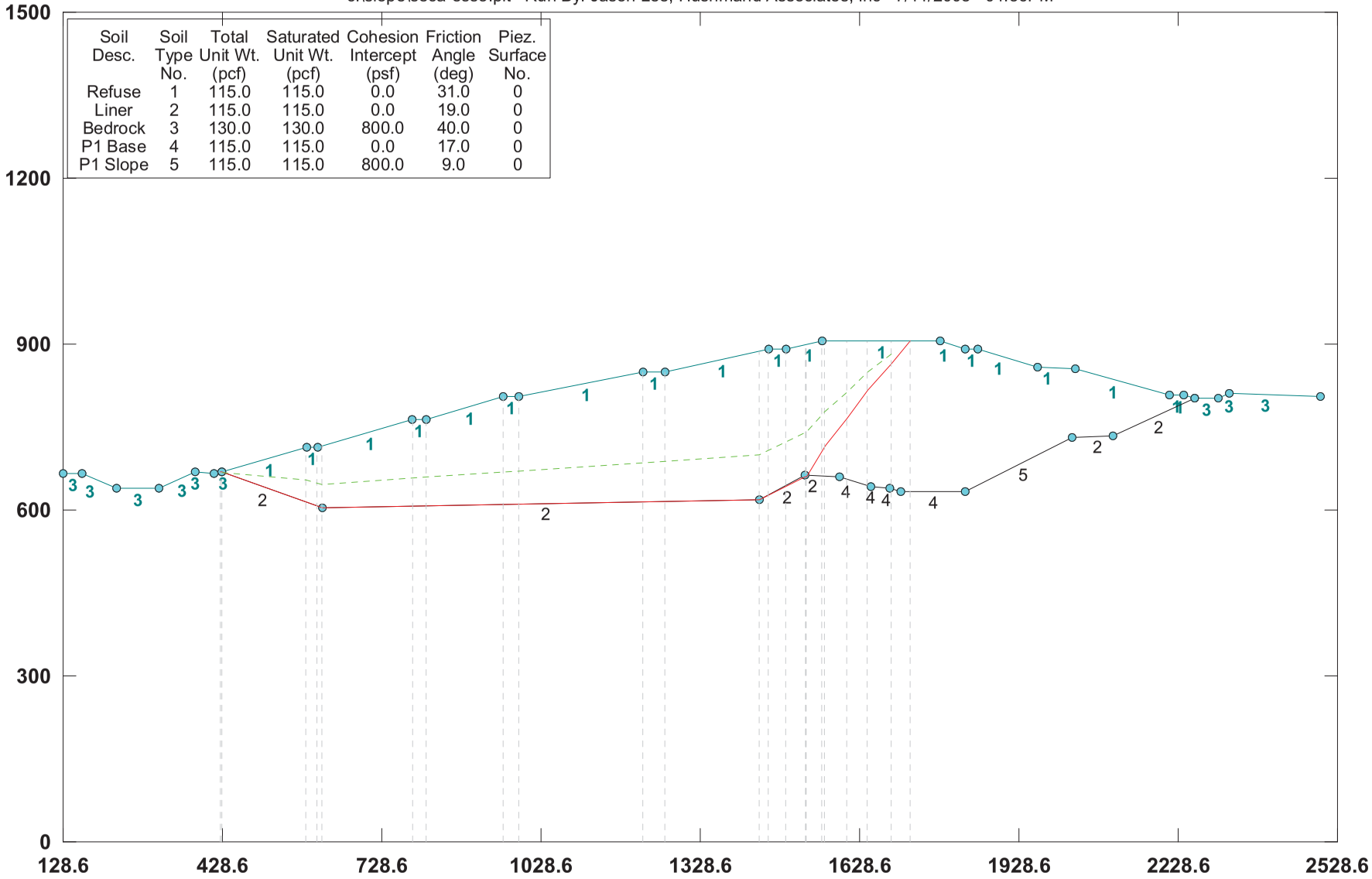
GSTABL7 v.2 FSmin=2.472

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION A-A', EAST, STATIC, FAILURE PLANE 3

c:\slope\seca-ess3.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 04:36PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.722

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

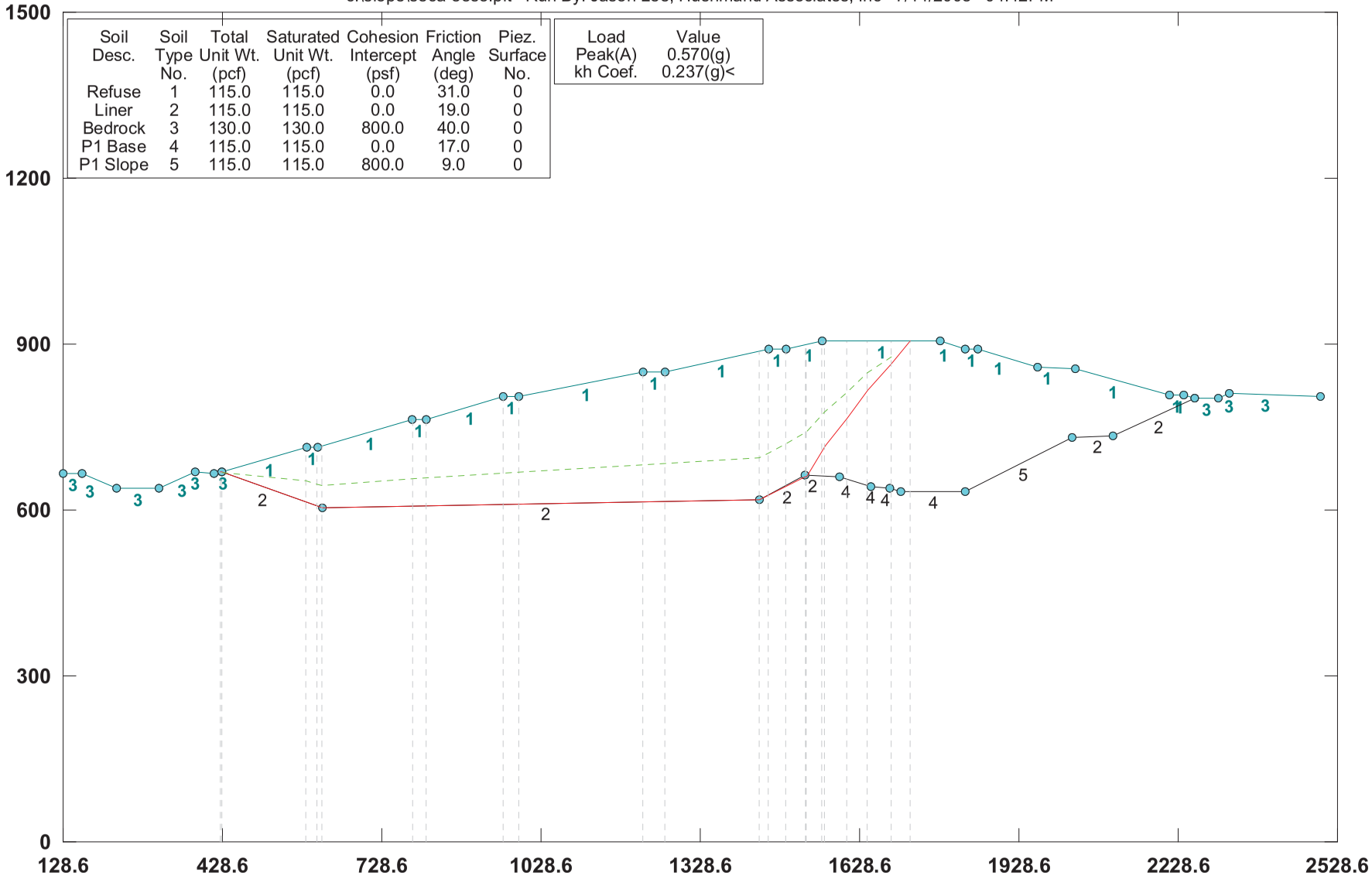
GSTABL7

KHF, SECTION A-A', EAST, PSEUD-STATIC, FAILURE PLANE 3

c:\slope\seca-ees3.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 04:42PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.237(g)<

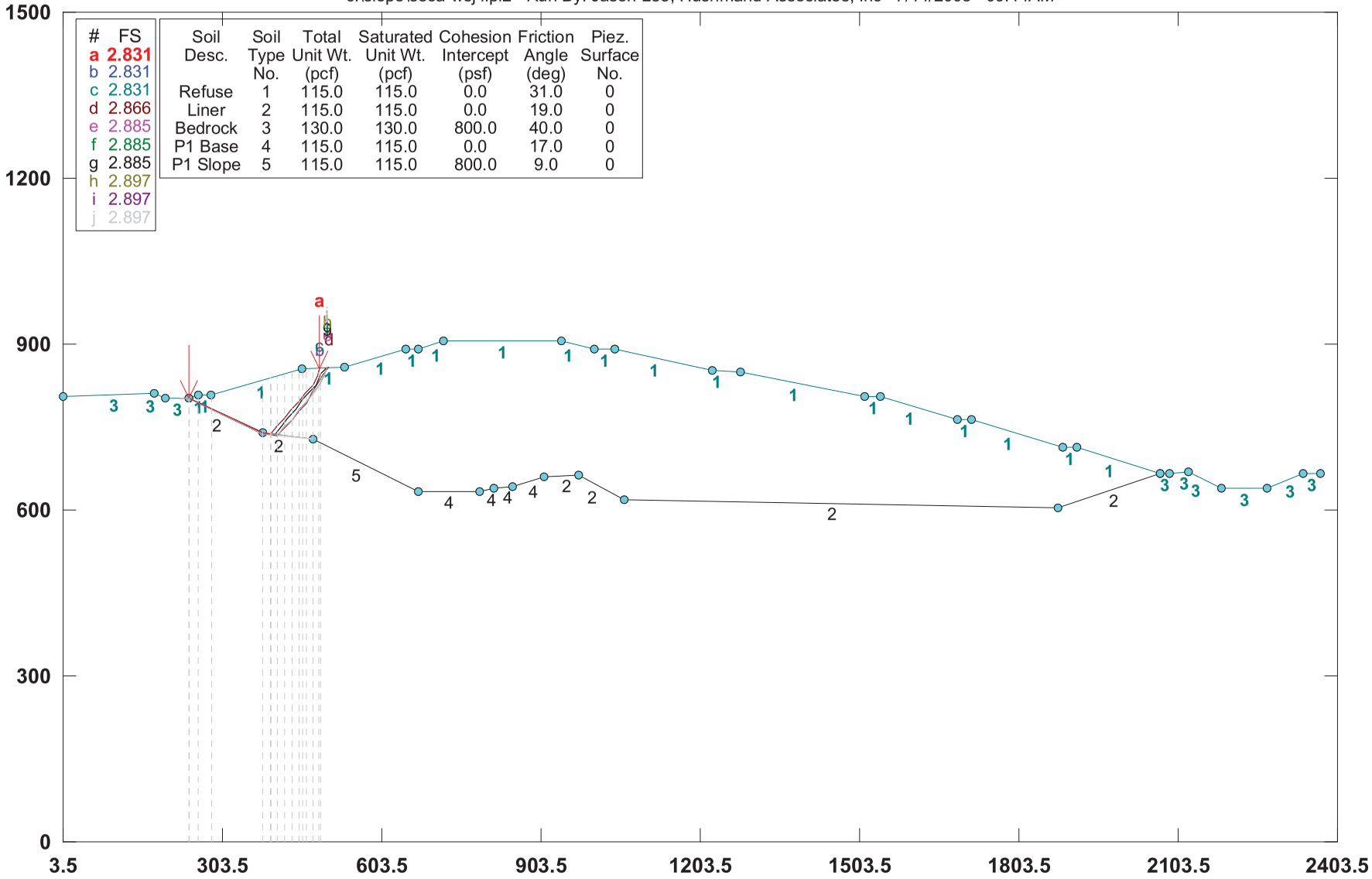


GSTABL7 v.2 FSmin=1.005

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION A-A', WEST, STATIC, FAILURE PLANE I

c:\slope\seca-wsj i.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:14AM



#	FS
a	2.831
b	2.831
c	2.831
d	2.866
e	2.885
f	2.885
g	2.885
h	2.897
i	2.897
j	2.897

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.831

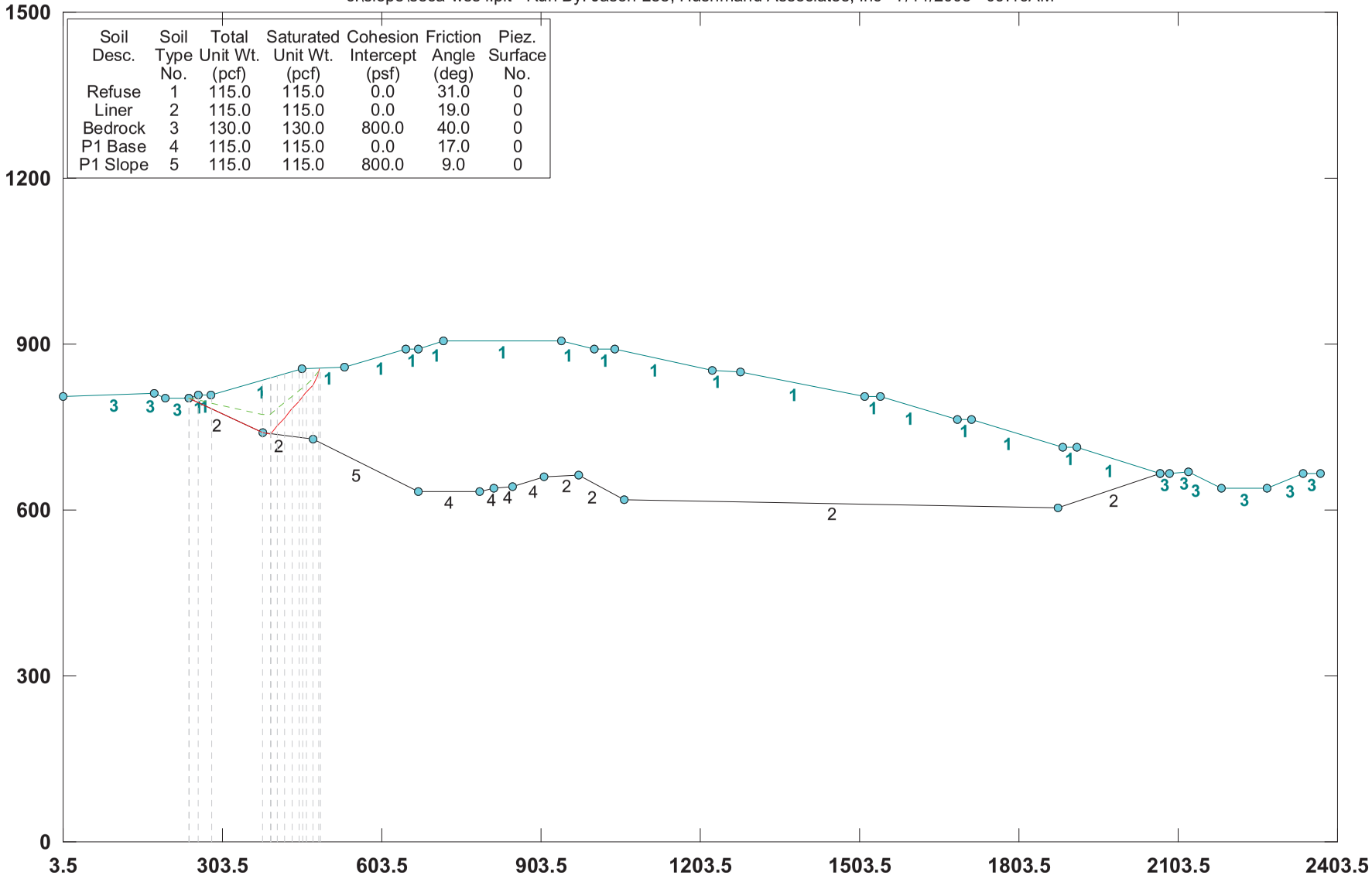
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION A-A', WEST, STATIC, FAILURE PLANE I

c:\slope\seca-wss i.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:16AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0



GSTABL7 v.2 FSmin=4.194

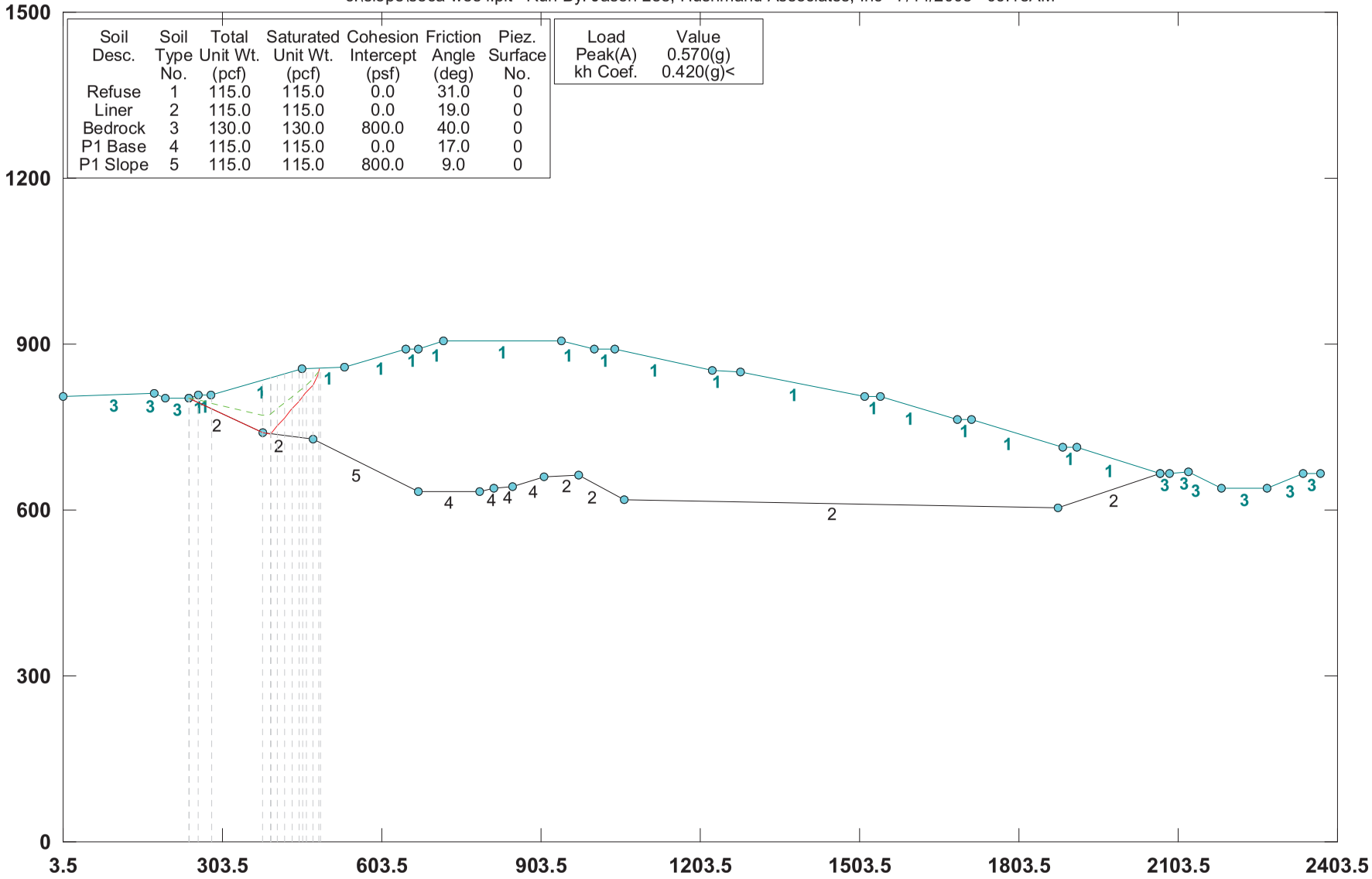
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION A-A', WEST, PSEUD-STATIC, FAILURE PLANE I

c:\slope\seca-wes i.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:18AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.420(g)<

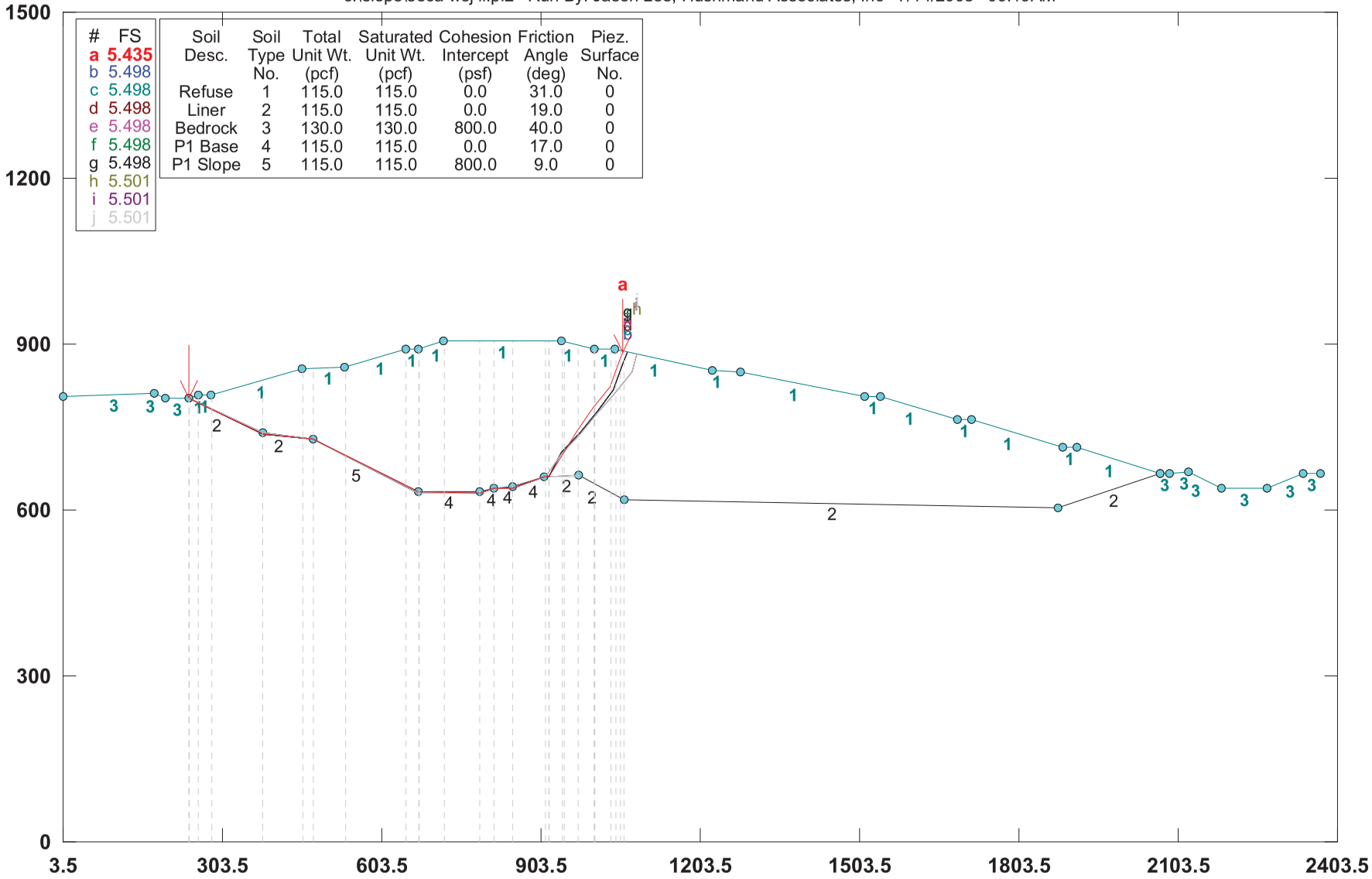


GSTABL7 v.2 FSmin=1.002

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION A-A', WEST, STATIC, FAILURE PLANE II

c:\slope\seca-wsj ii.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:19AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

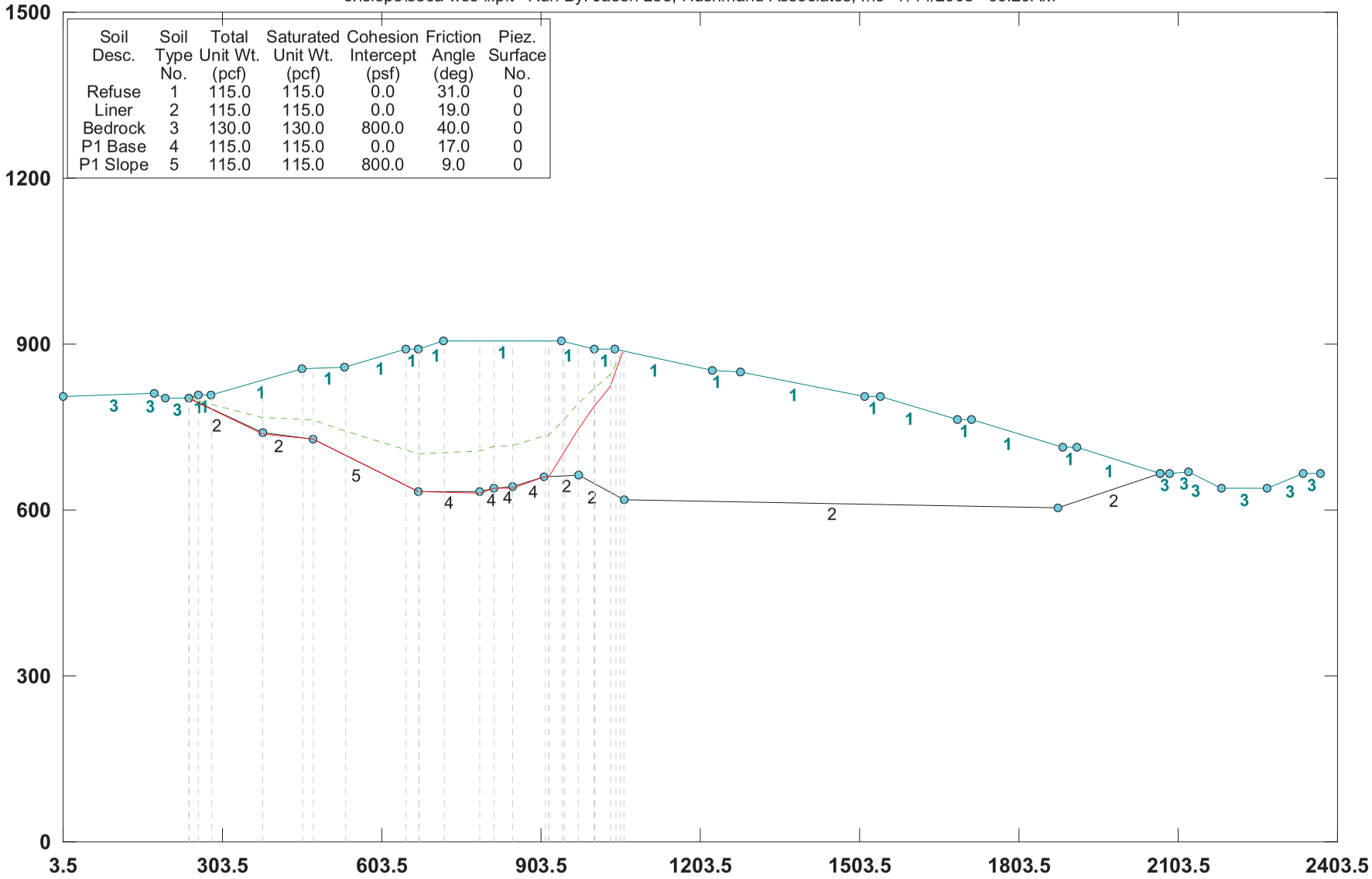
GSTABL7 v.2 FSmin=5.435

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION A-A', WEST, STATIC, FAILURE PLANE II

c:\slope\seca-wss ii.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:20AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=7.249

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

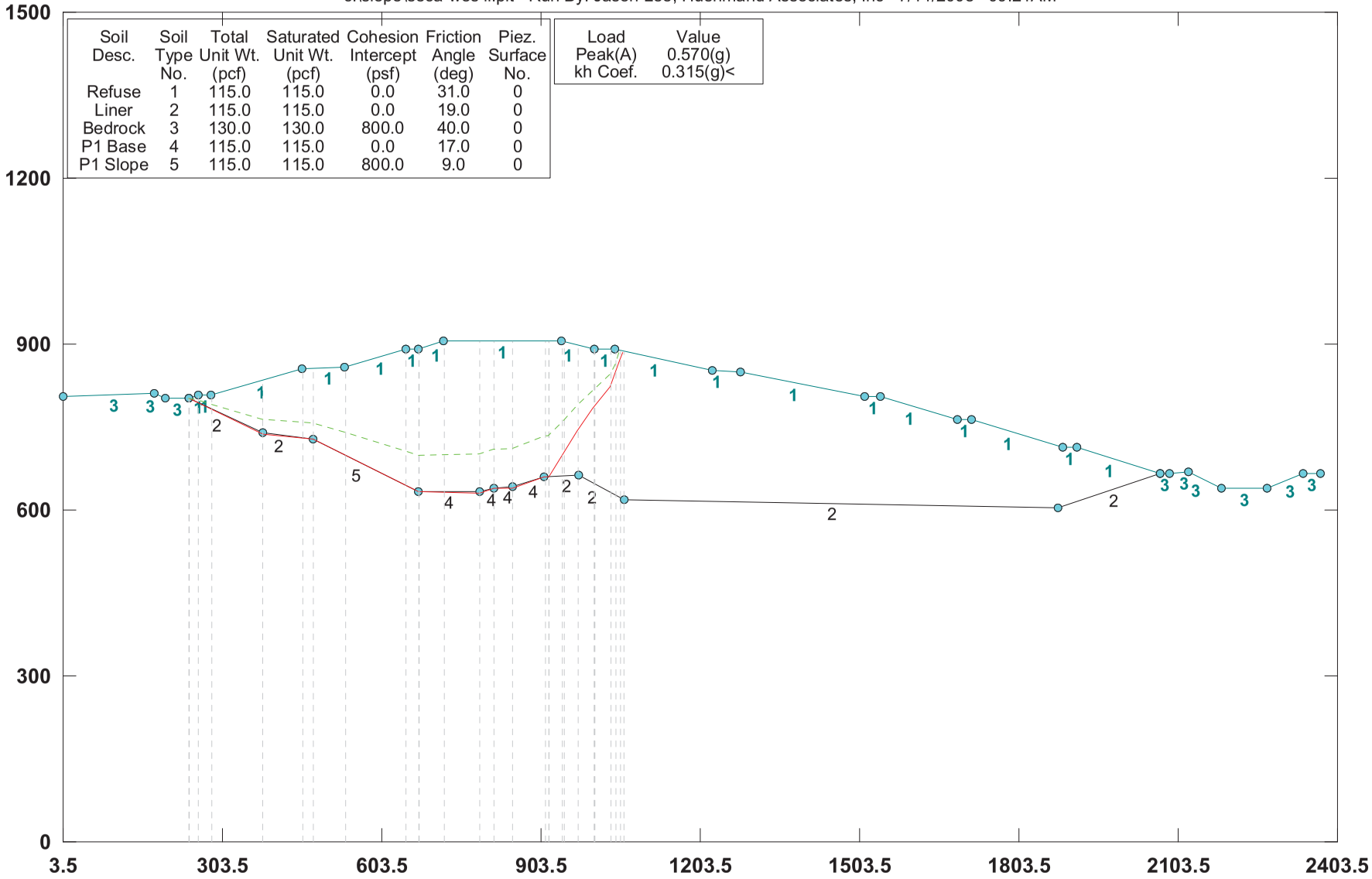
GSTABL7

KHF, SECTION A-A', WEST, PSEUD-STATIC, FAILURE PLANE II

c:\slope\seca-wes ii.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:21AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.315(g)<



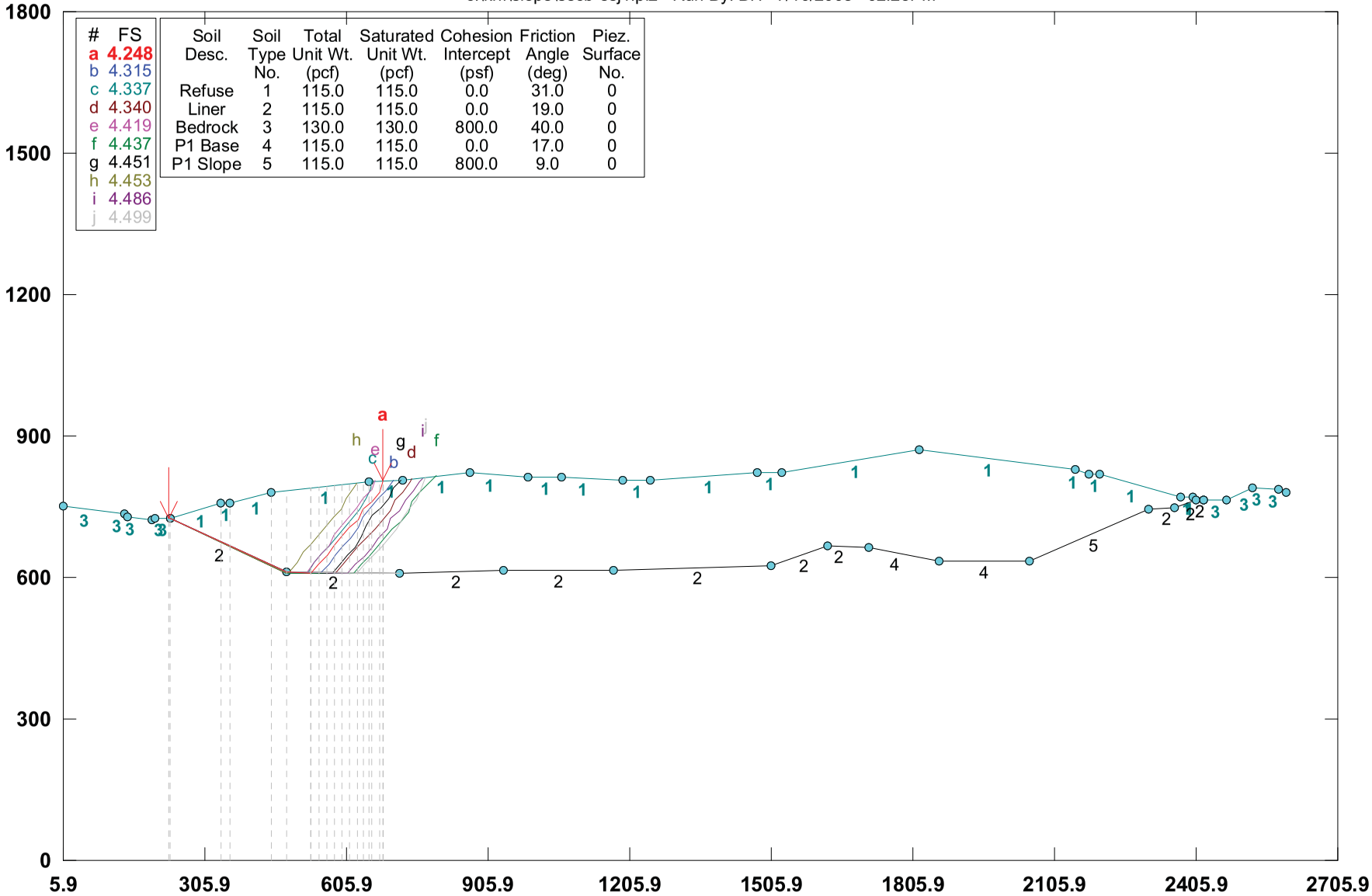
GSTABL7 v.2 FSmin=1.004

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 1

c:\khf\slope\secb-esj1.pl2 Run By: BH 7/10/2008 02:23PM



#	FS
a	4.248
b	4.315
c	4.337
d	4.340
e	4.419
f	4.437
g	4.451
h	4.453
i	4.486
j	4.499

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=4.248

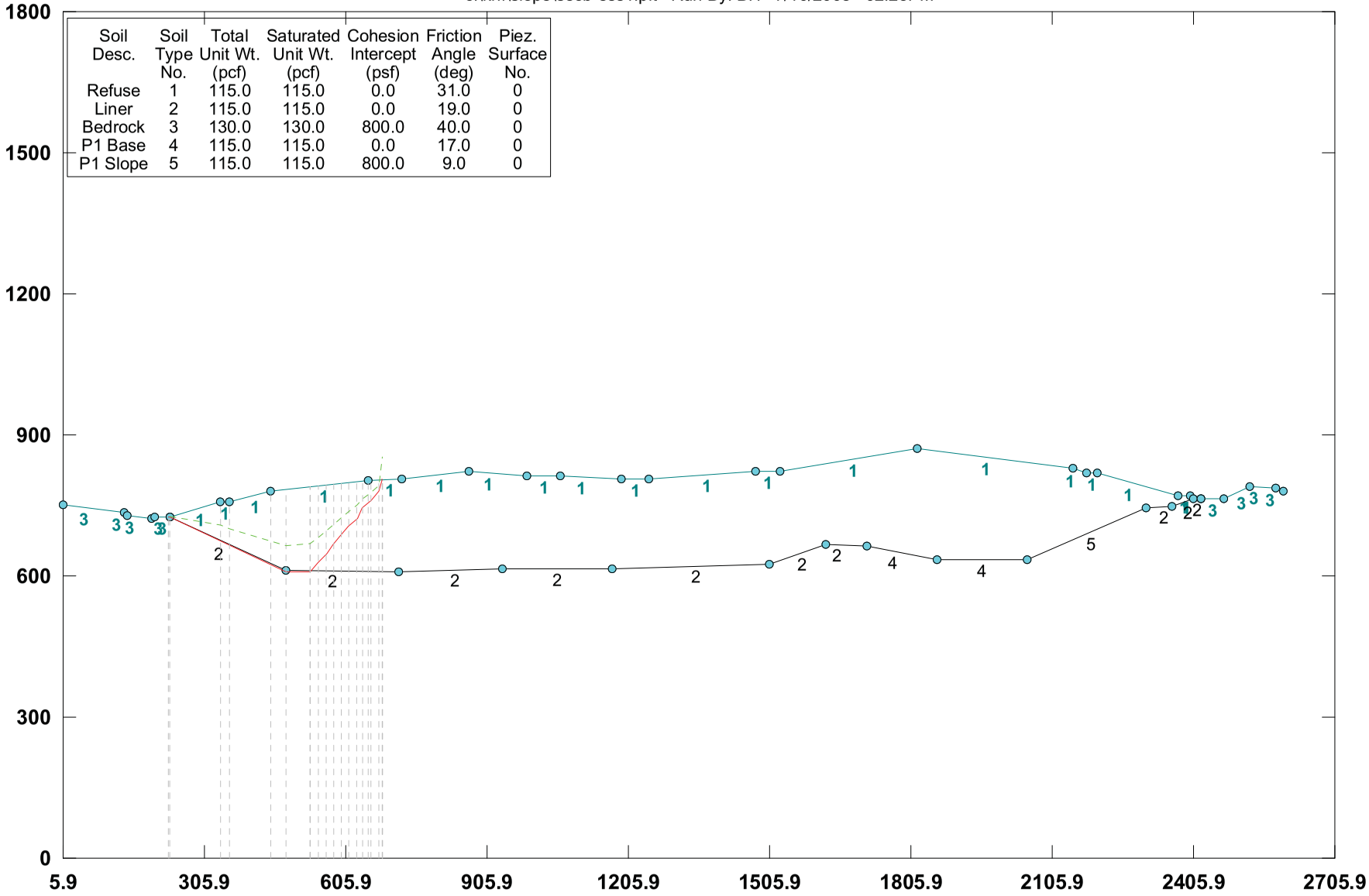
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 1

c:\khf\slope\secb-ess1.plt Run By: BH 7/10/2008 02:25PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0



GSTABL7 v.2 FSmin=6.798

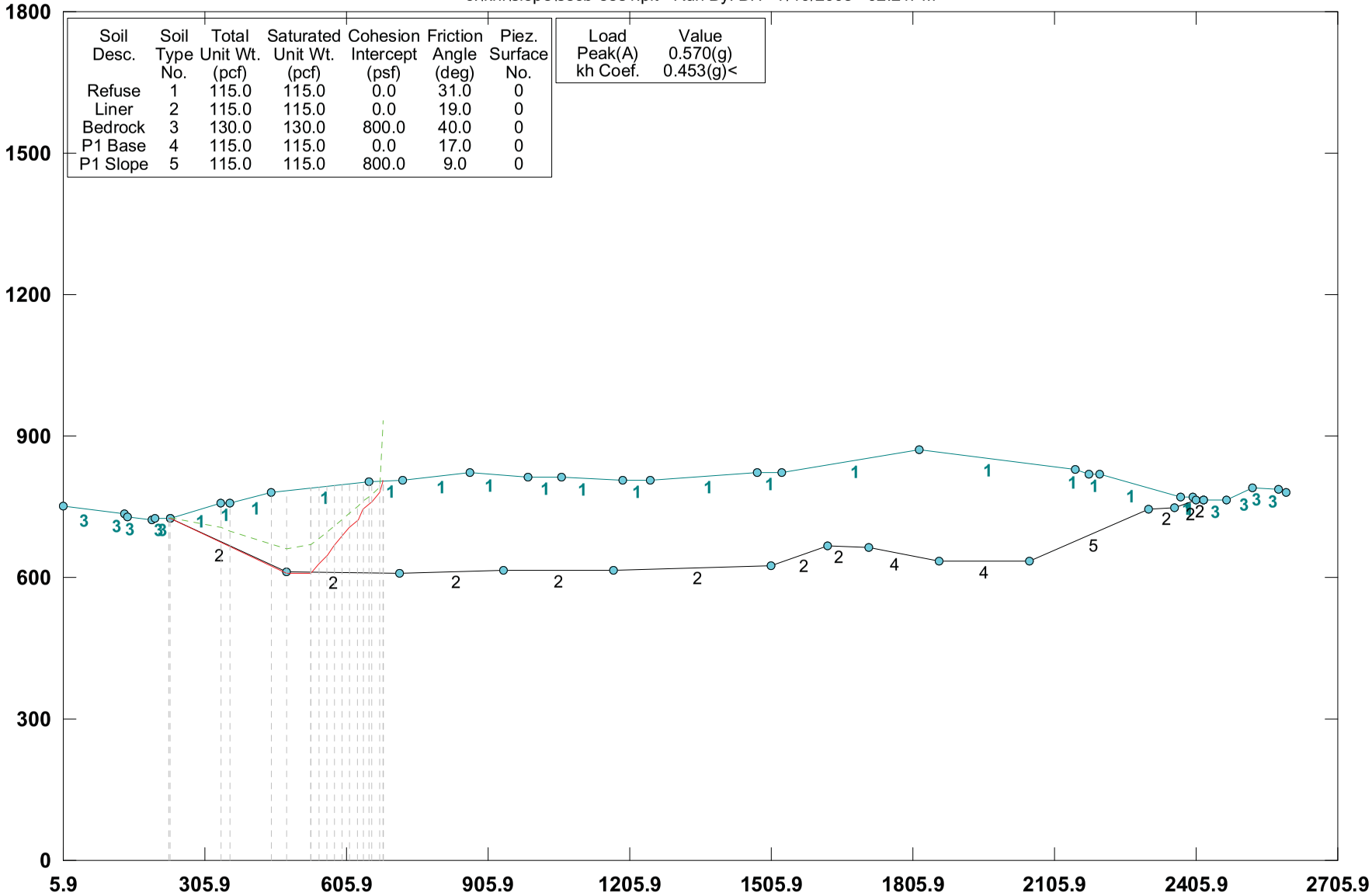
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', EAST, PSEUD-STATIC, FAILURE PLANE 1

c:\khf\slope\secb-ees1.plt Run By: BH 7/10/2008 02:21PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.453(g)<

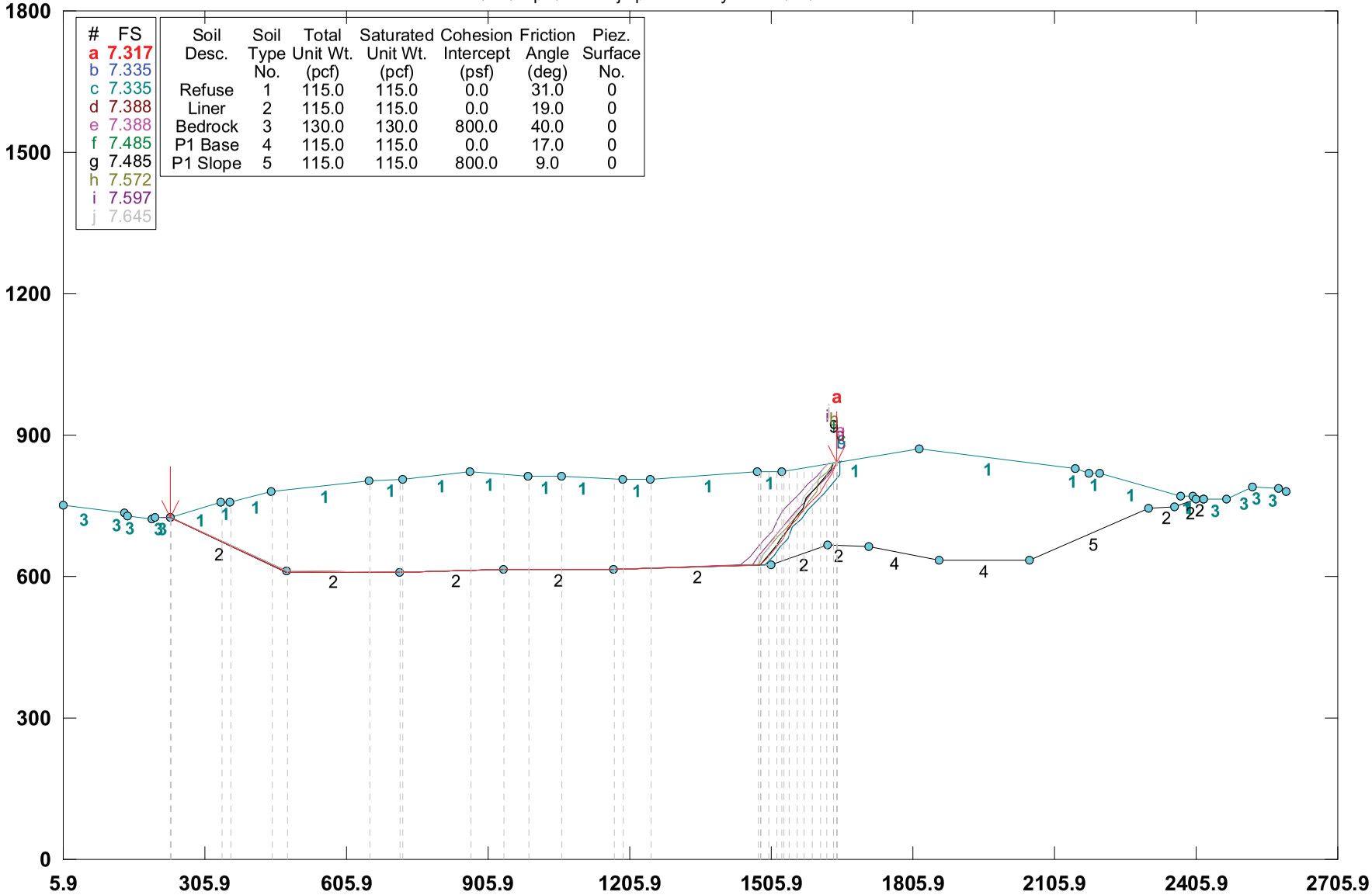


GSTABL7 v.2 FSmin=1.001

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 2

c:\khf\slope\secb-esj2.pl2 Run By: BH 7/11/2008 03:34PM



#	FS
a	7.317
b	7.335
c	7.335
d	7.388
e	7.388
f	7.485
g	7.485
h	7.572
i	7.597
j	7.645

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=7.317

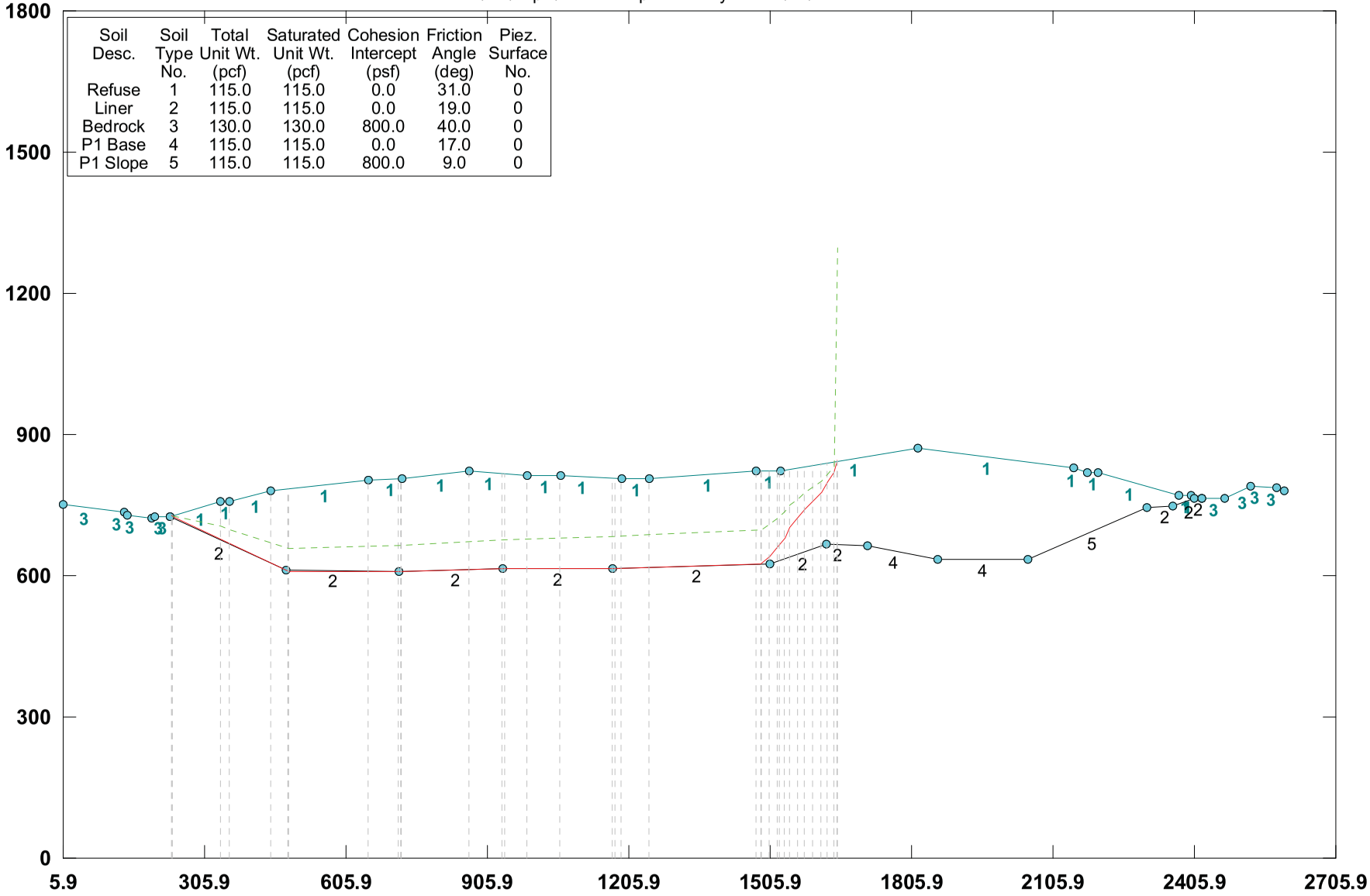
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 2

c:\khf\slope\secb-ess2.plt Run By: BH 7/11/2008 03:35PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0



GSTABL7 v.2 FSmin=8.590

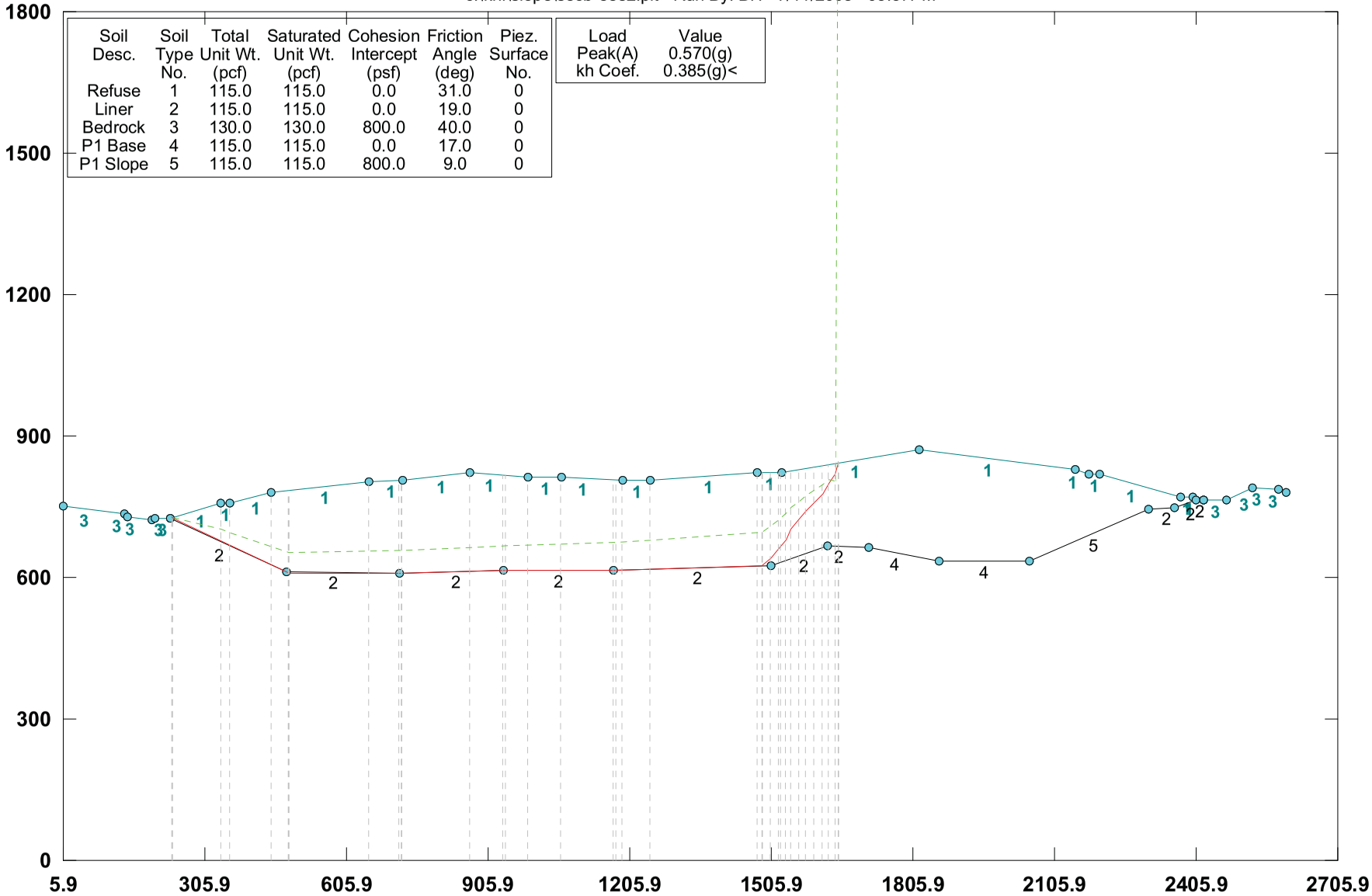
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', EAST, PSEUD-STATIC, FAILURE PLANE 2

c:\khf\slope\secb-ees2.plt Run By: BH 7/11/2008 03:37PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.385(g)<

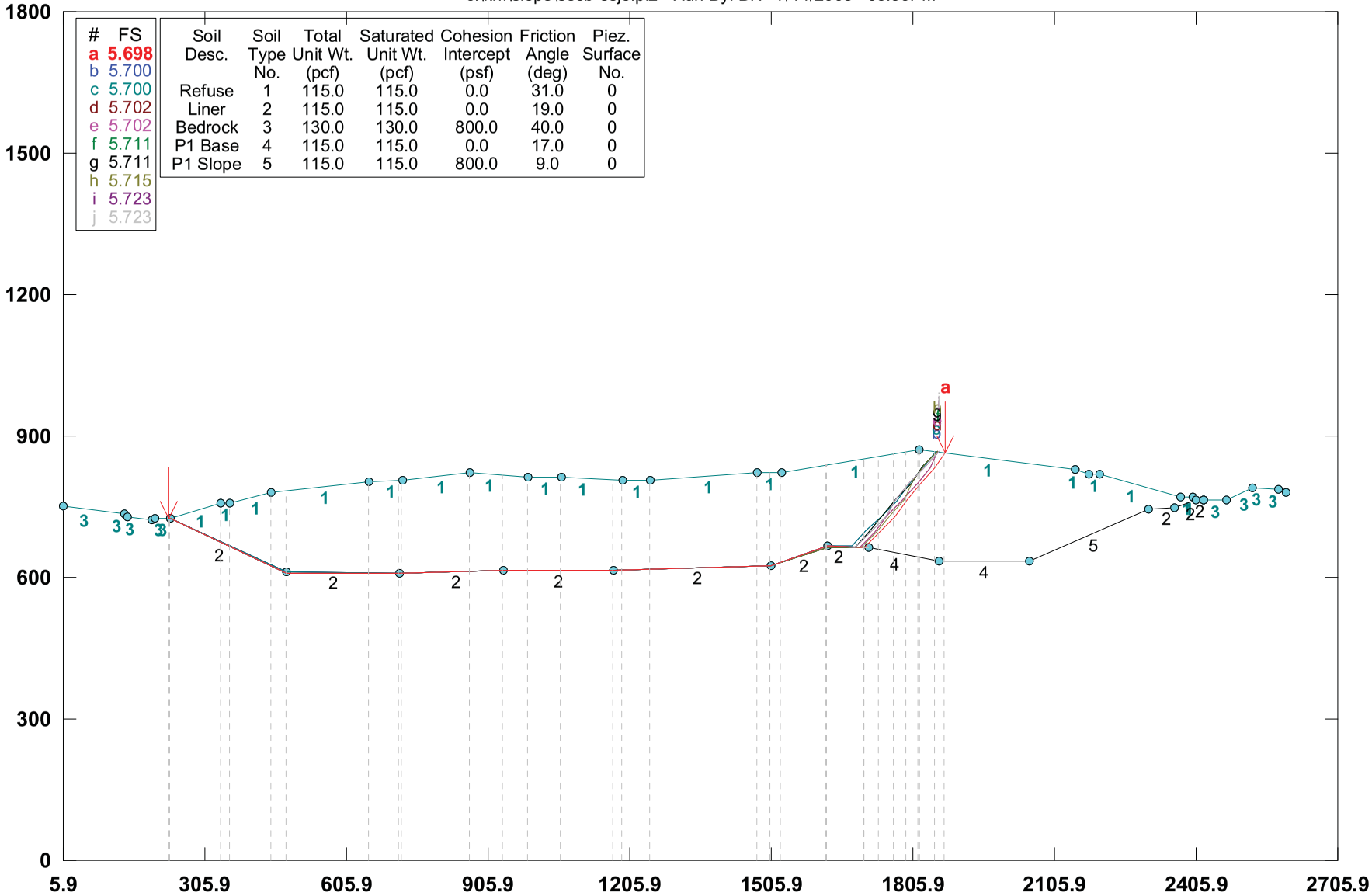


GSTABL7 v.2 FSmin=1.009

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 3

c:\khf\slope\secb-esj3.pl2 Run By: BH 7/11/2008 03:39PM



#	FS
a	5.698
b	5.700
c	5.700
d	5.702
e	5.702
f	5.711
g	5.711
h	5.715
i	5.723
j	5.723

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=5.698

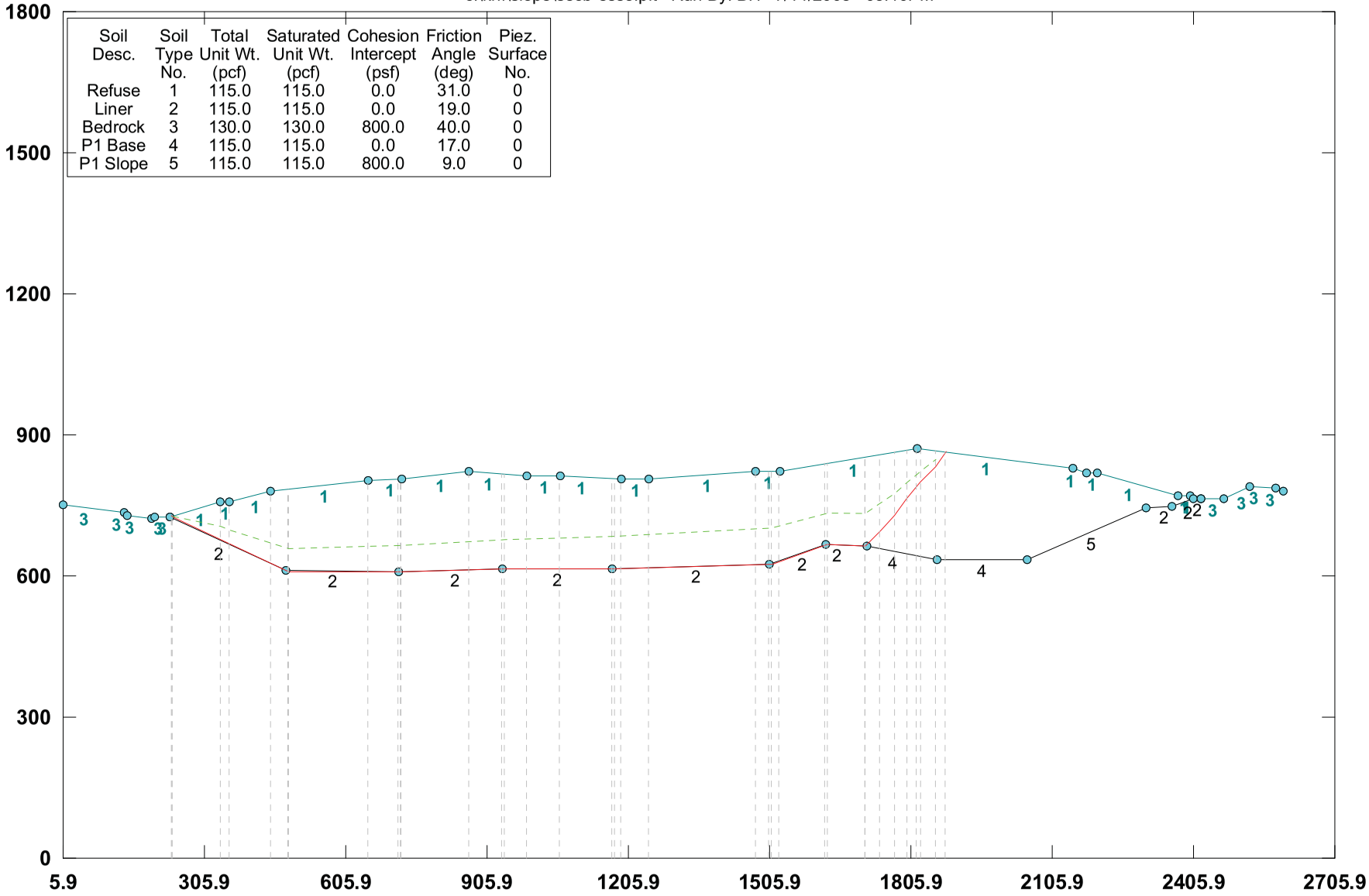
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 3

c:\khf\slope\secb-ess3.plt Run By: BH 7/11/2008 03:40PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0



GSTABL7 v.2 FSmin=6.542

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

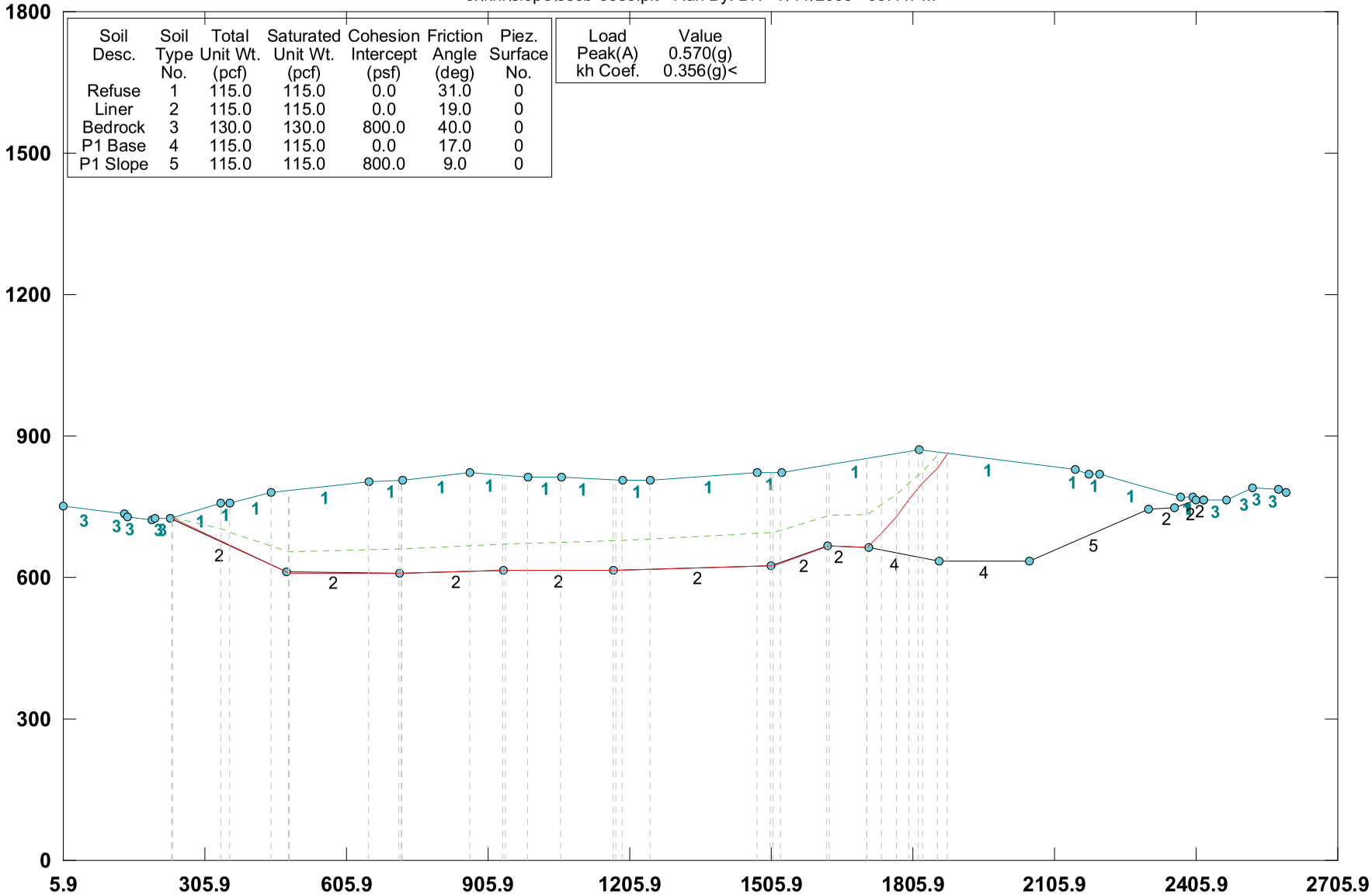
GSTABL7

KHF, SEC. B-B', EAST, PSEUD-STATIC, FAILURE PLANE 3

c:\khf\slope\secb-ees3.plt Run By: BH 7/11/2008 03:41PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.356(g)<

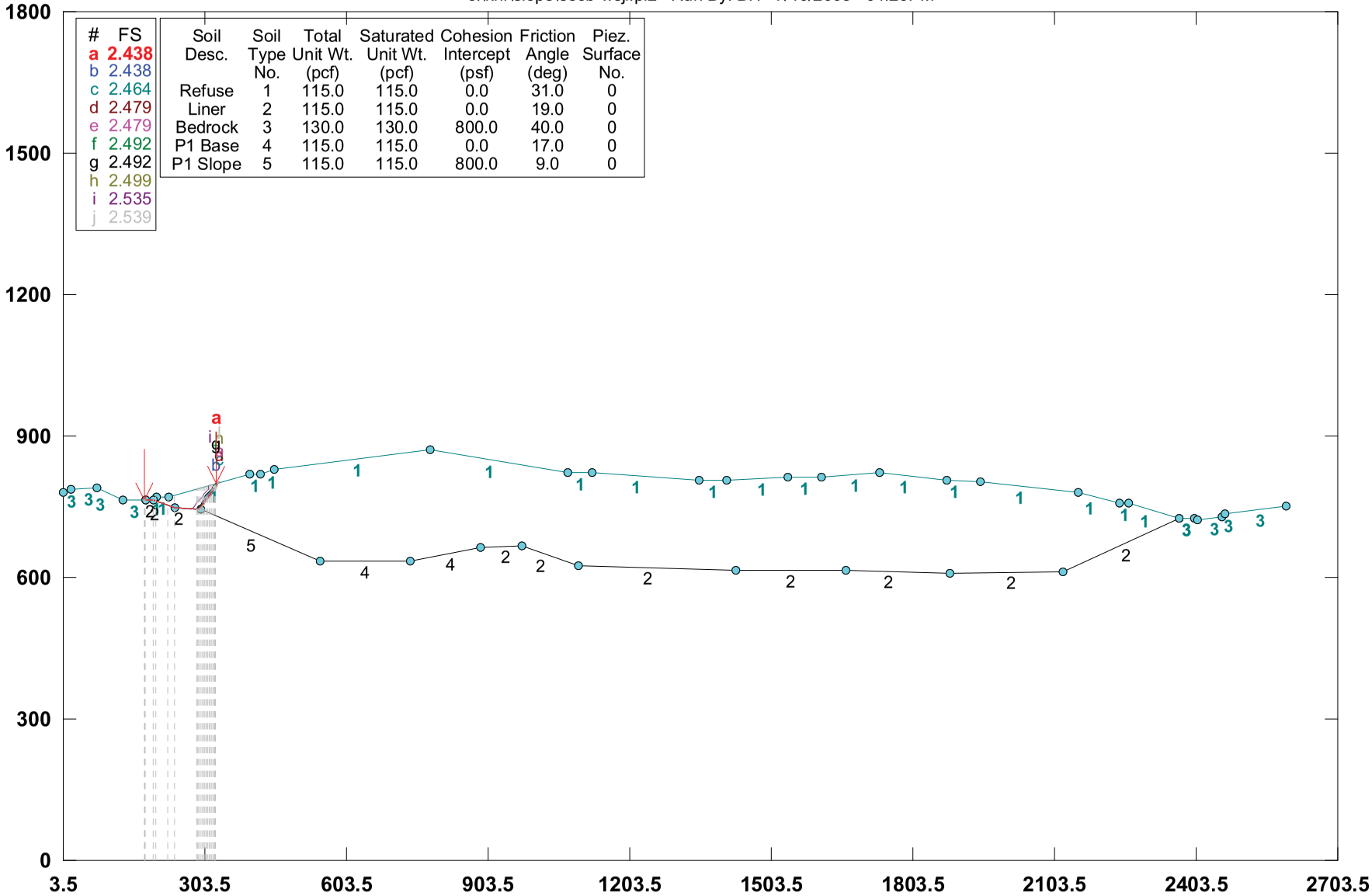


GSTABL7 v.2 FSmin=1.008

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', WEST, STATIC, FAILURE PLANE I

c:\khf\slope\secb-wsji.pl2 Run By: BH 7/10/2008 04:29PM



#	FS
a	2.438
b	2.438
c	2.464
d	2.479
e	2.479
f	2.492
g	2.492
h	2.499
i	2.535
j	2.539

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.438

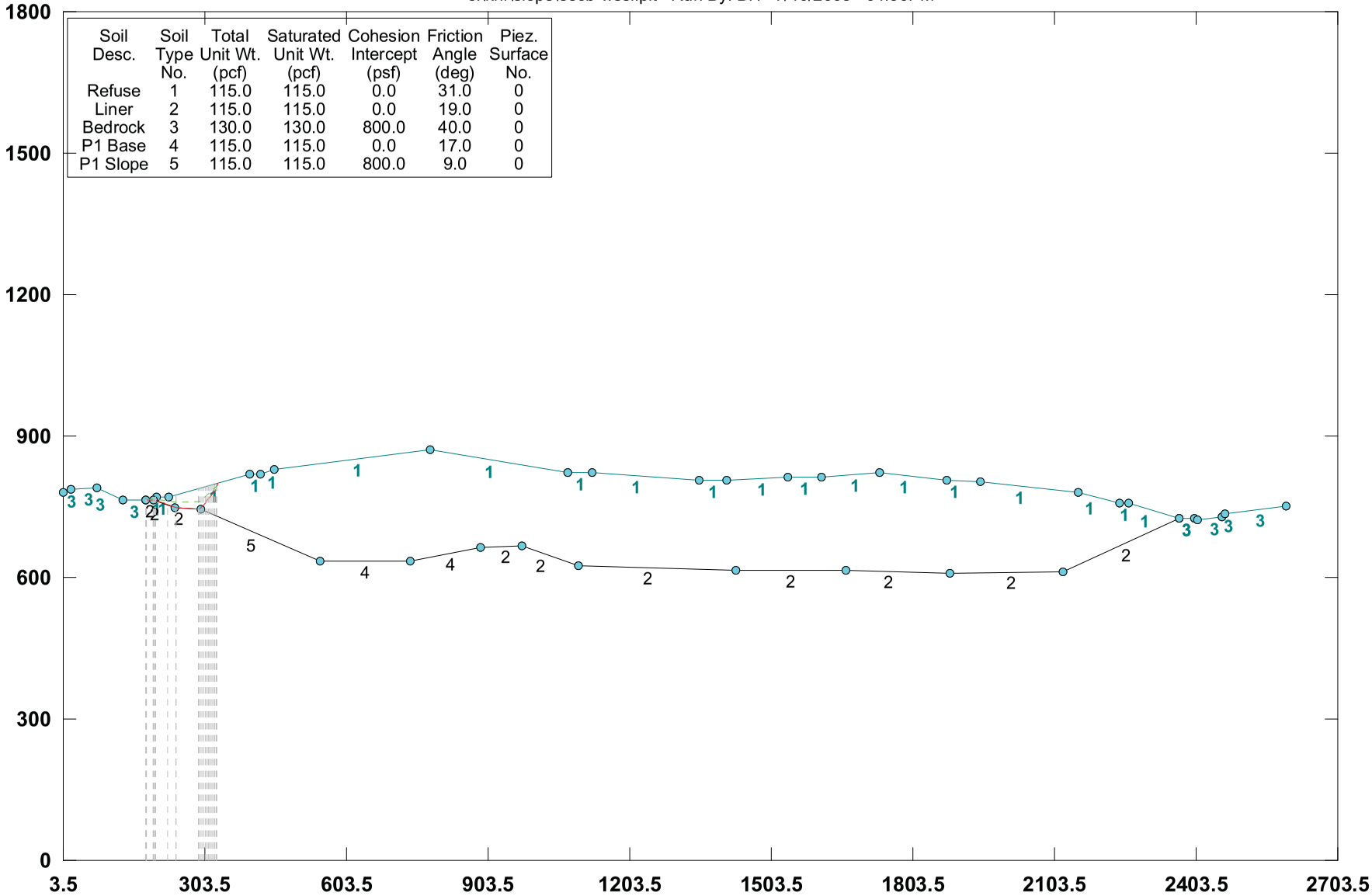
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', WEST, STATIC, FAILURE PLANE I

c:\khf\slope\secb-wssi.plt Run By: BH 7/10/2008 04:30PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0



GSTABL7 v.2 FSmin=3.500

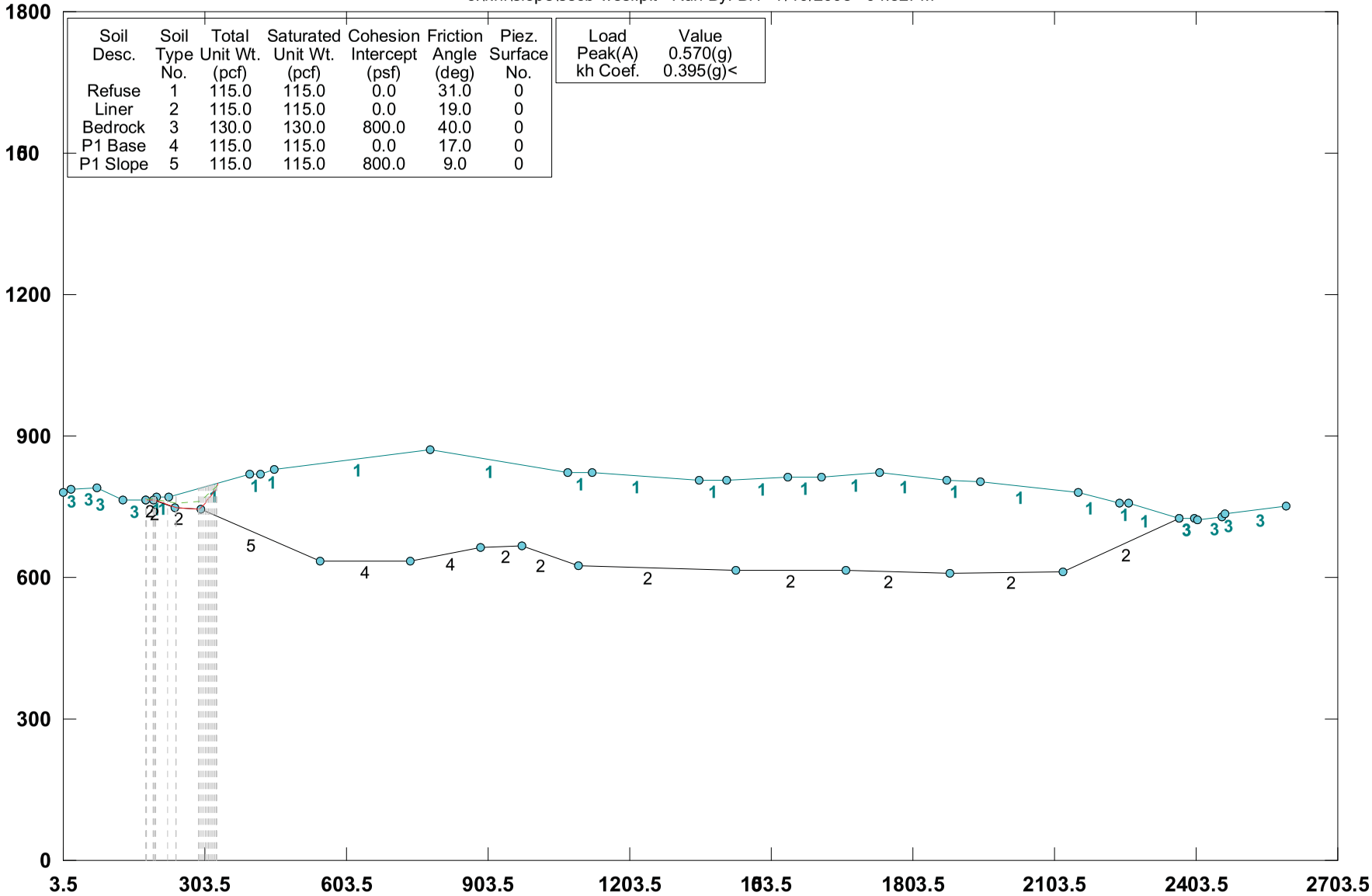
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', WEST, PSEUDO-STATIC, FAILURE PLANE I

c:\khf\slope\secb-wesi.plt Run By: BH 7/10/2008 04:32PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.395(g)<

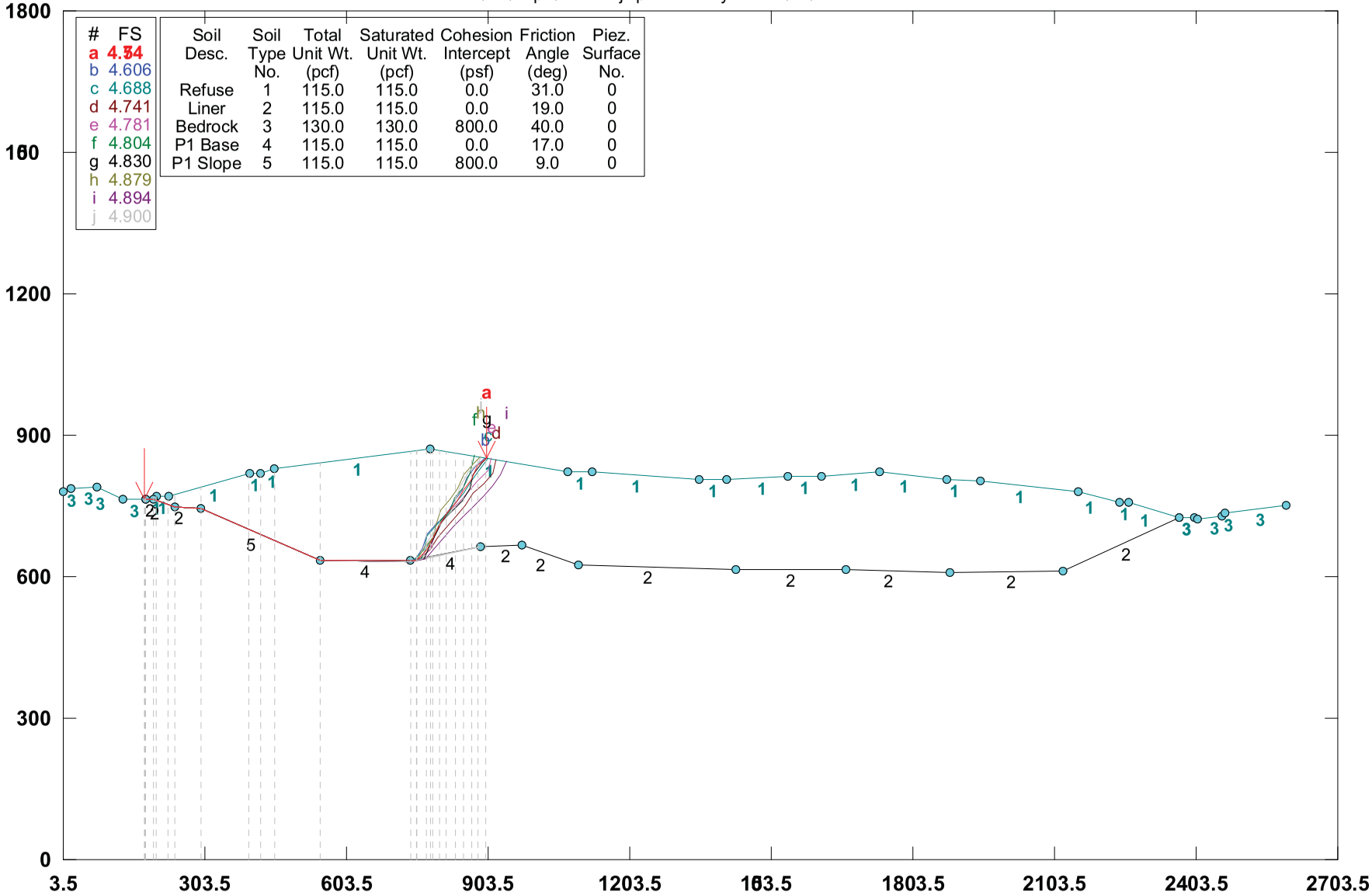


GSTABL7 v.2 FSmin=1.001

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', WST, STATIC, FAILURE PLANE II

c:\khf\slope\secb-wsjii.pl2 Run By: BH 7/10/2008 05:28PM



#	FS
a	4.534
b	4.606
c	4.688
d	4.741
e	4.781
f	4.804
g	4.830
h	4.879
i	4.894
j	4.900

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=4.534

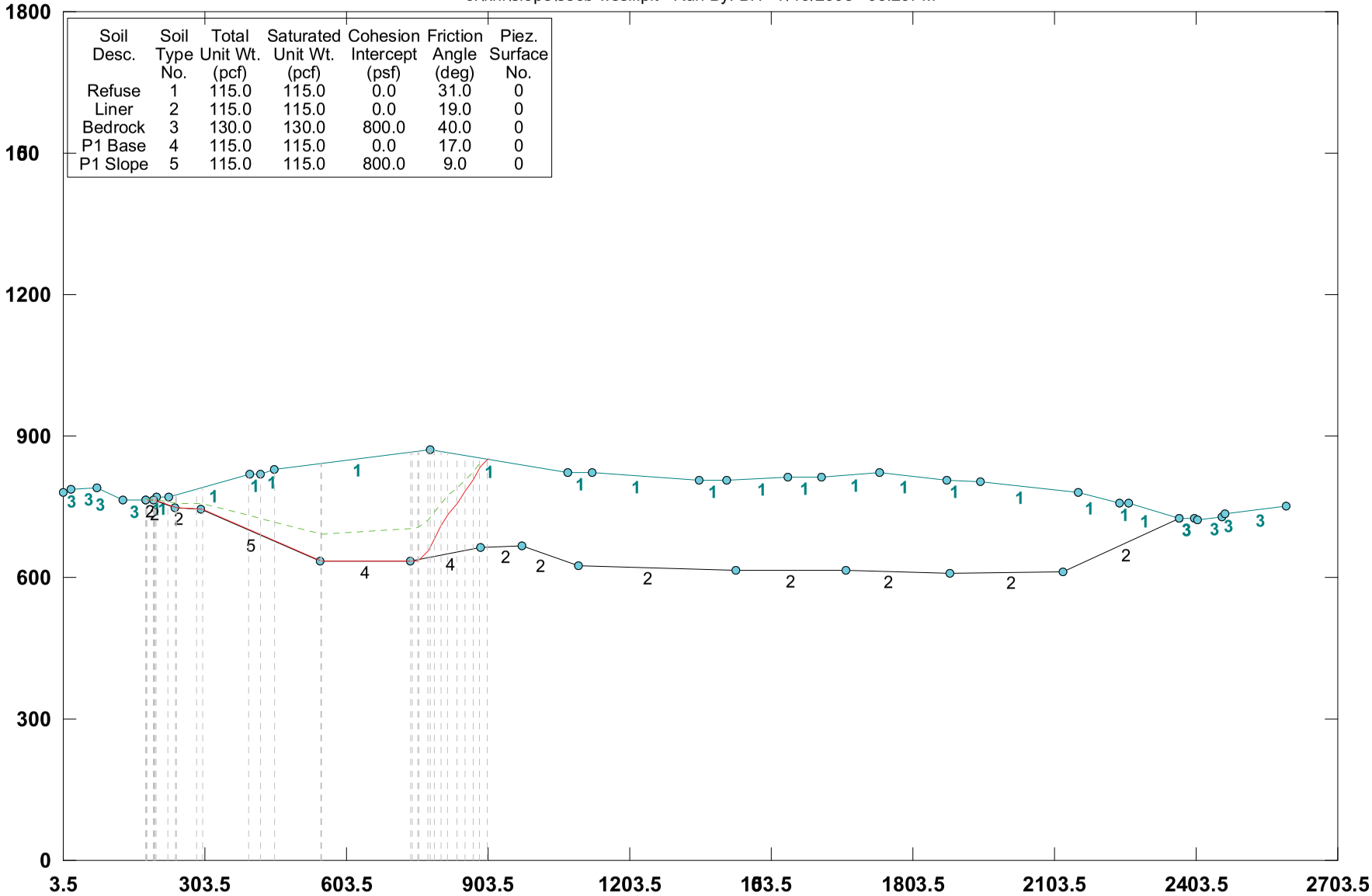
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', WST, STATIC, FAILURE PLANE II

c:\khf\slope\secb-wssii.plt Run By: BH 7/10/2008 05:29PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0



GSTABL7 v.2 FSmin=8.928

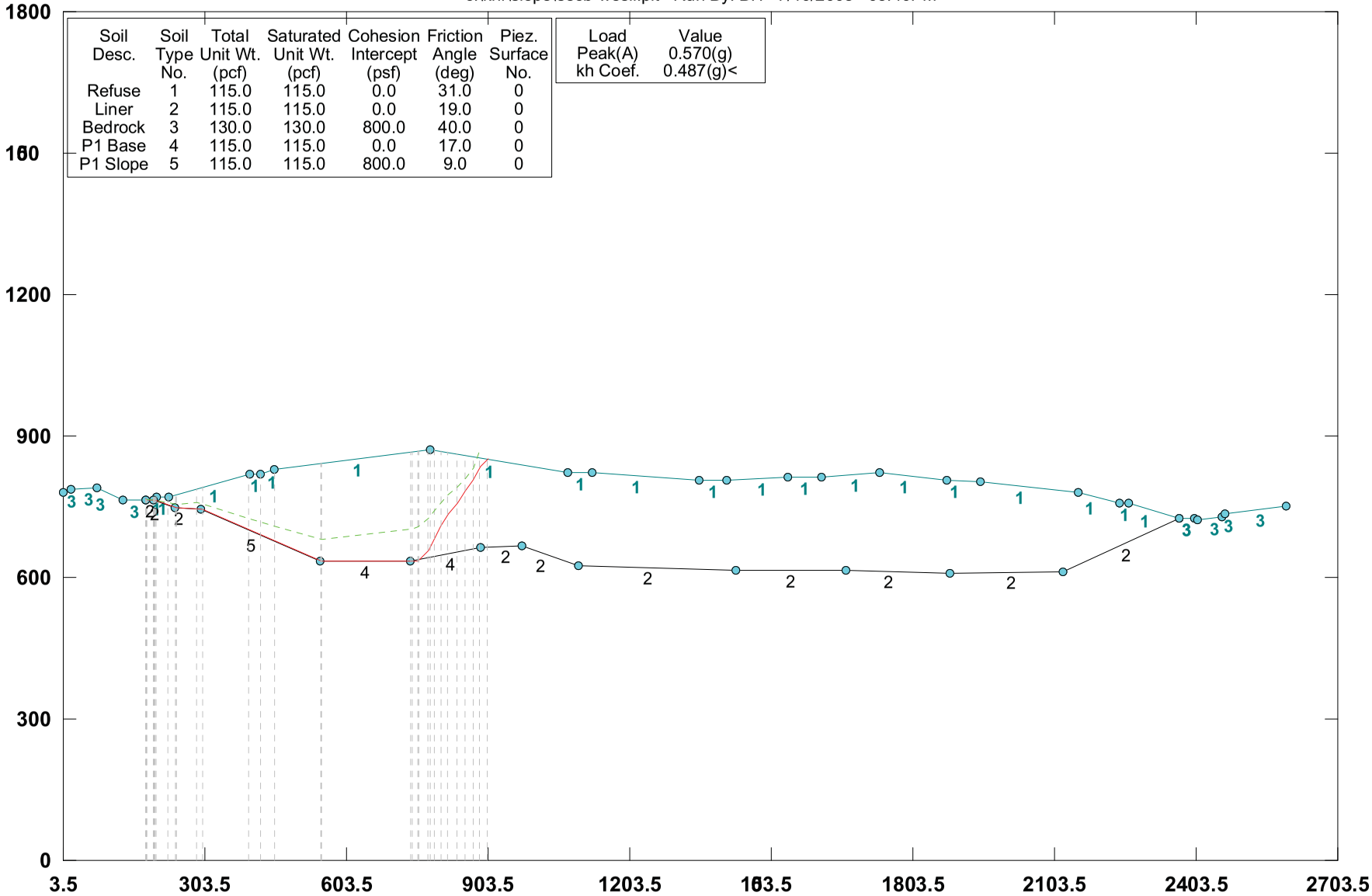
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. B-B', WEST, PSEUDO-STATIC, FAILURE PLANE II

c:\khf\slope\secb-wesii.plt Run By: BH 7/10/2008 05:40PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.487(g)<

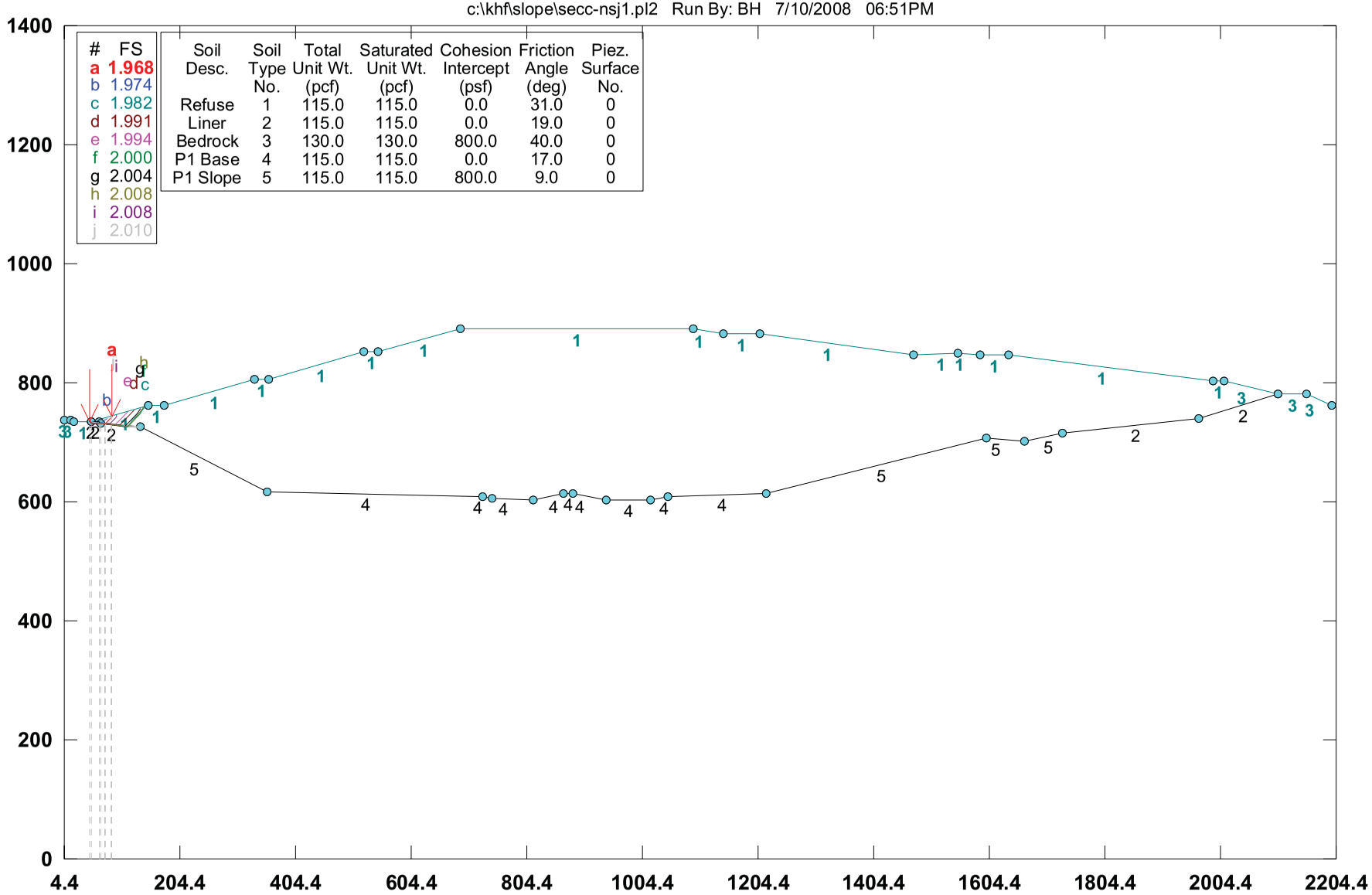


GSTABL7 v.2 FSmin=1.099

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. C-C', NORTH, STATIC, FAILURE SURFACE 1

c:\khf\slope\secc-nsj1.pl2 Run By: BH 7/10/2008 06:51PM



#	FS
a	1.968
b	1.974
c	1.982
d	1.991
e	1.994
f	2.000
g	2.004
h	2.008
i	2.008
j	2.010

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

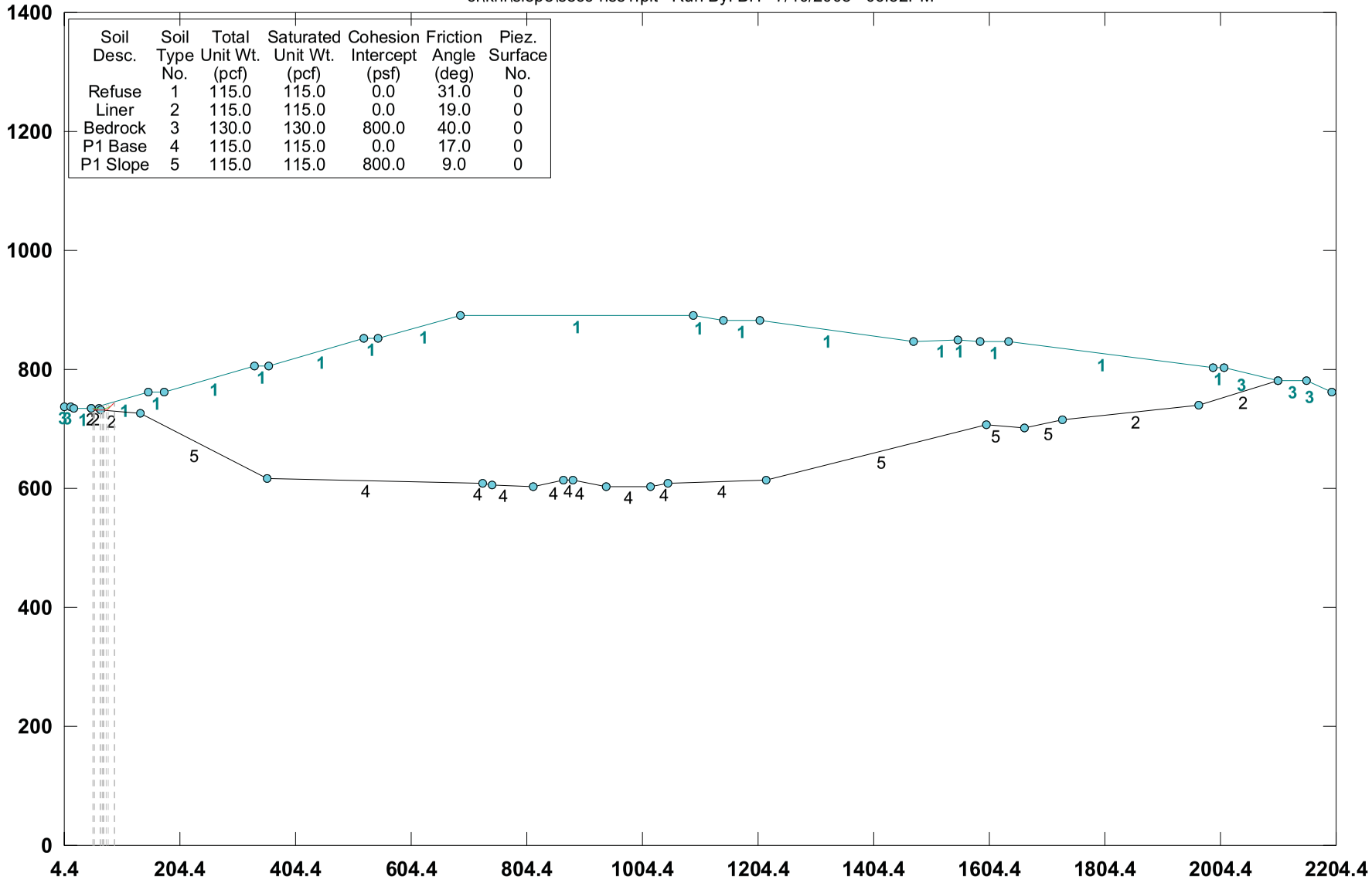
GSTABL7 v.2 FSmin=1.968

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. C-C', NORTH, STATIC, FAILURE SURFACE 1

c:\khf\slope\secc-nss1.plt Run By: BH 7/10/2008 06:52PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=3.08

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

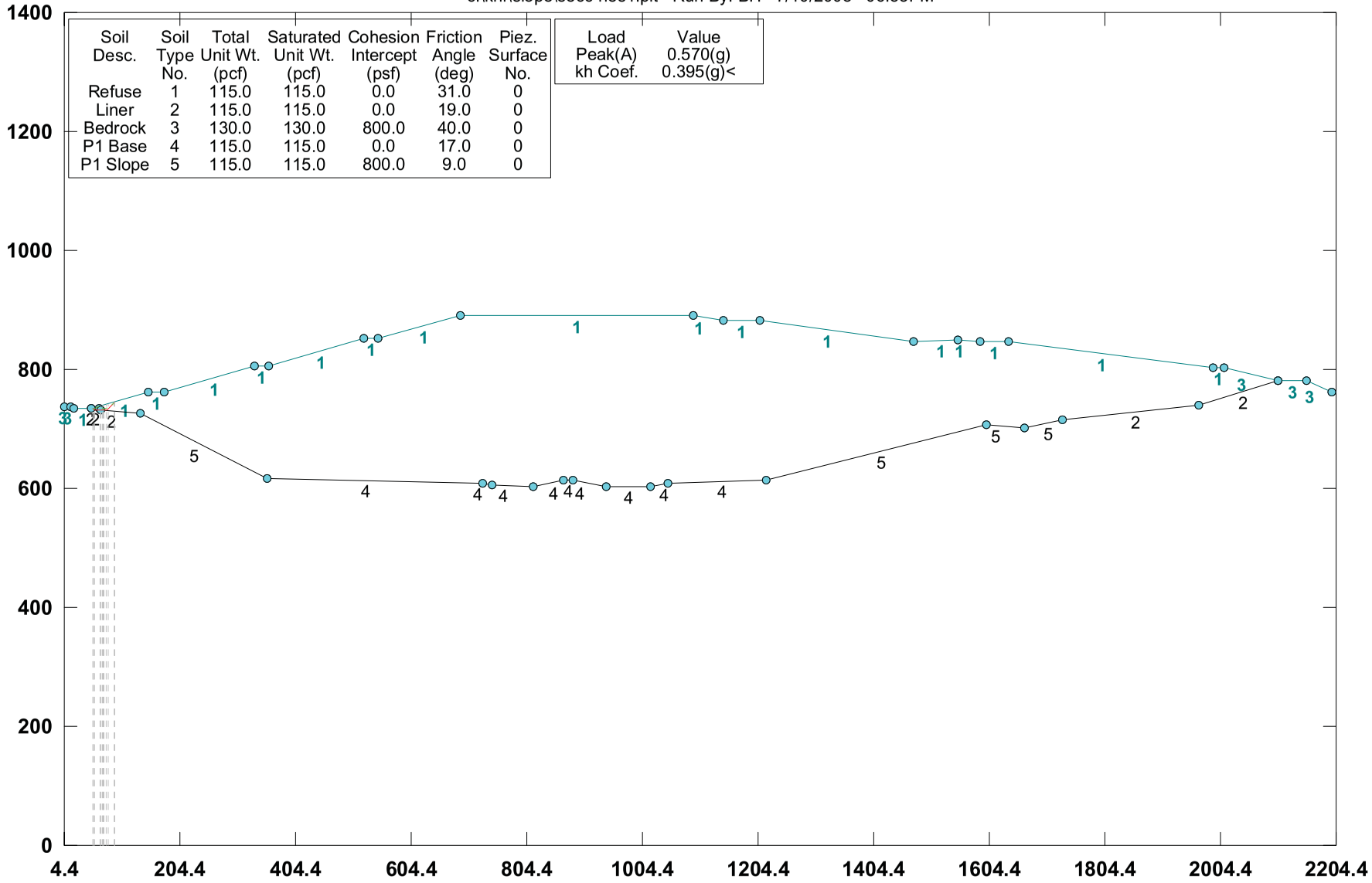
GSTABL7

KHF, SEC. C-C', NORTH, PSEUDO-STATIC, FAILURE SURFACE 1

c:\khf\slope\secc-nes1.plt Run By: BH 7/10/2008 06:53PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.395(g)<

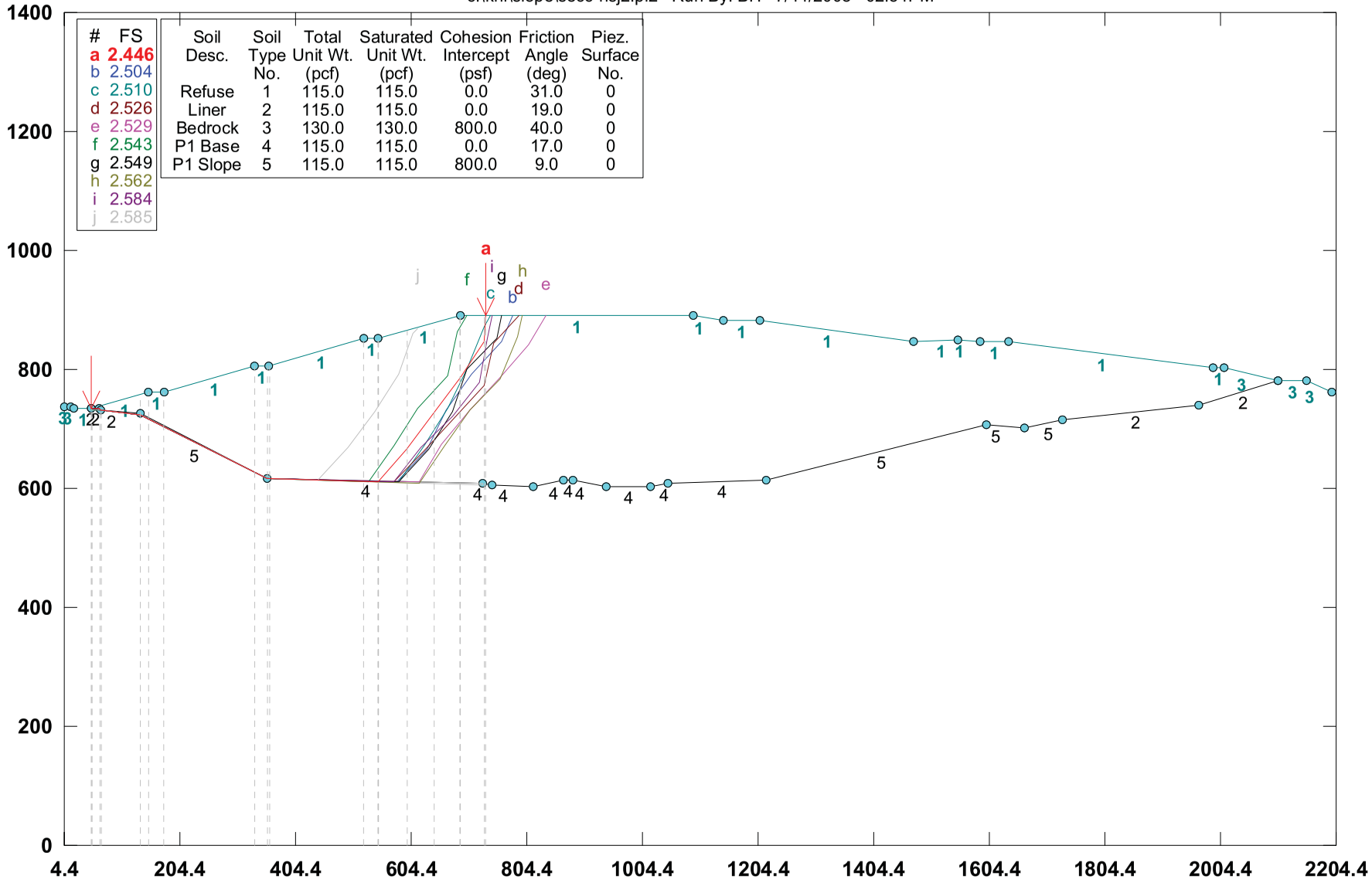


GSTABL7 v.2 FSmin=1.002

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. C-C', NORTH, STATIC, FAILURE SURFACE 2

c:\khf\slope\secc-nsj2.pl2 Run By: BH 7/11/2008 02:51PM



#	FS
a	2.446
b	2.504
c	2.510
d	2.526
e	2.529
f	2.543
g	2.549
h	2.562
i	2.584
j	2.585

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

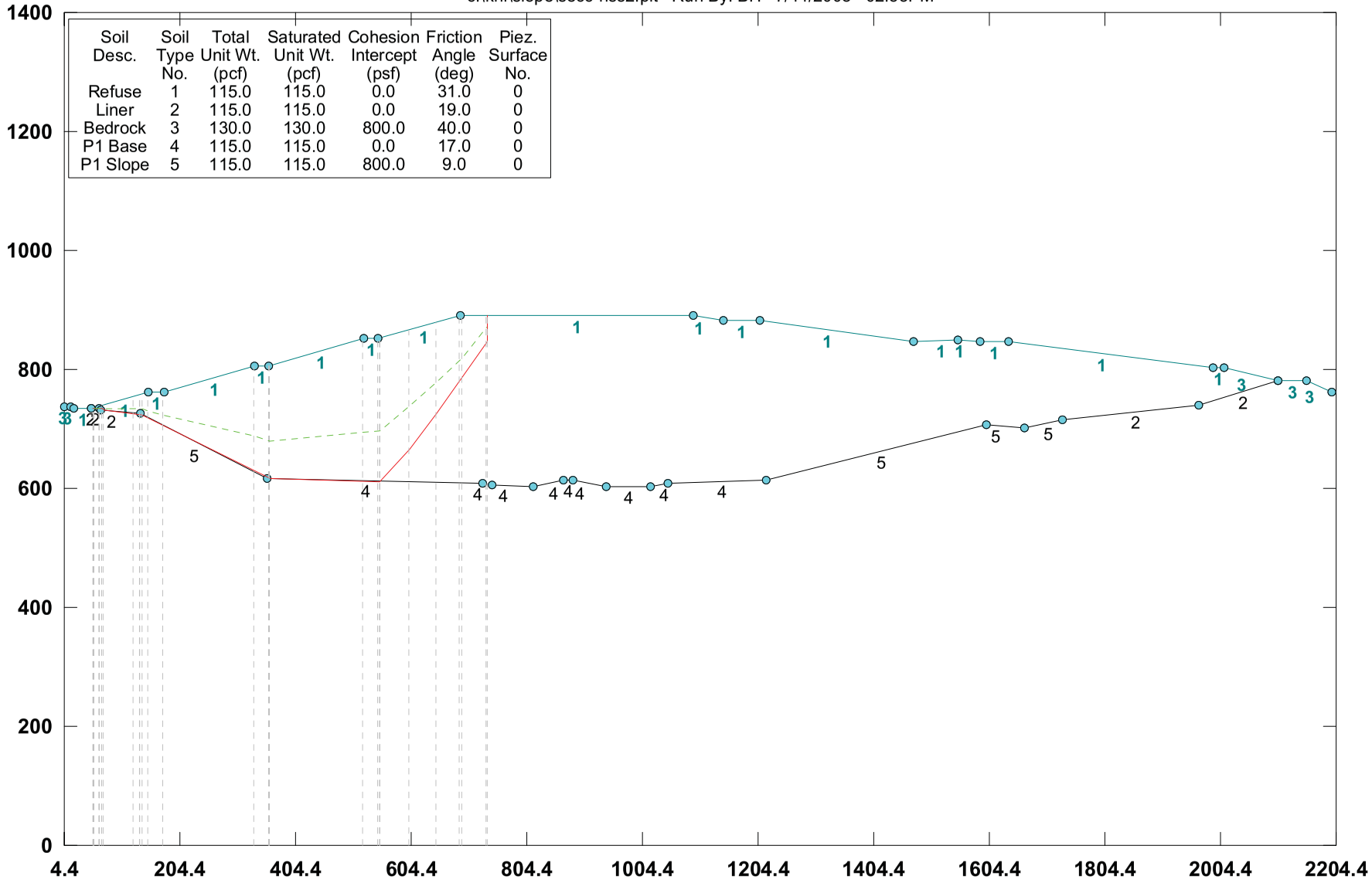
GSTABL7 v.2 FSmin=2.446

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. C-C', NORTH, STATIC, FAILURE SURFACE 2

c:\khf\slope\secc-nss2.plt Run By: BH 7/11/2008 02:53PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=4.346

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

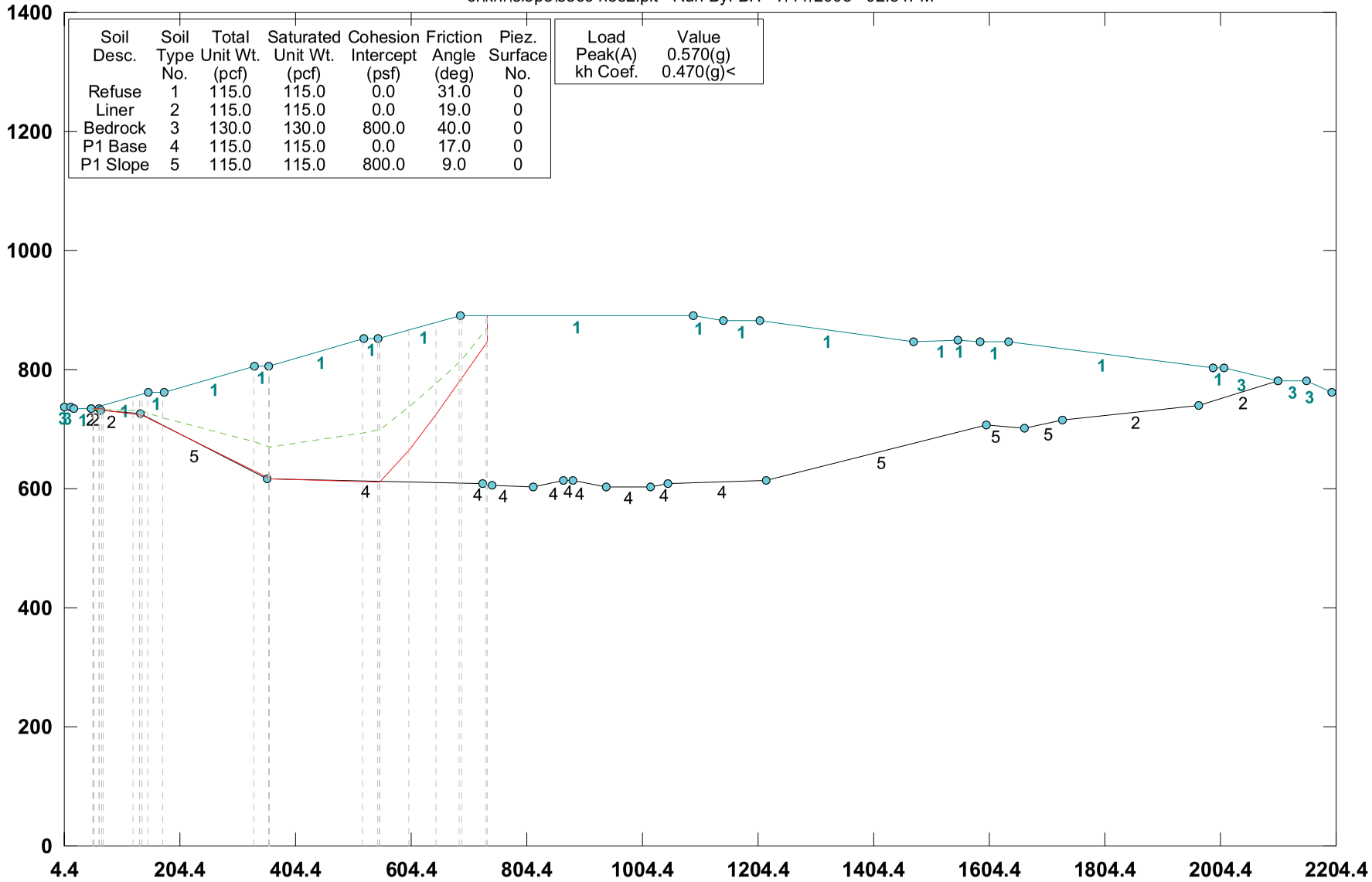
GSTABL7

KHF, SEC. C-C', NORTH, PSEUDO-STATIC, FAILURE SURFACE 2

c:\khf\slope\secc-nes2.plt Run By: BH 7/11/2008 02:54PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.470(g)<



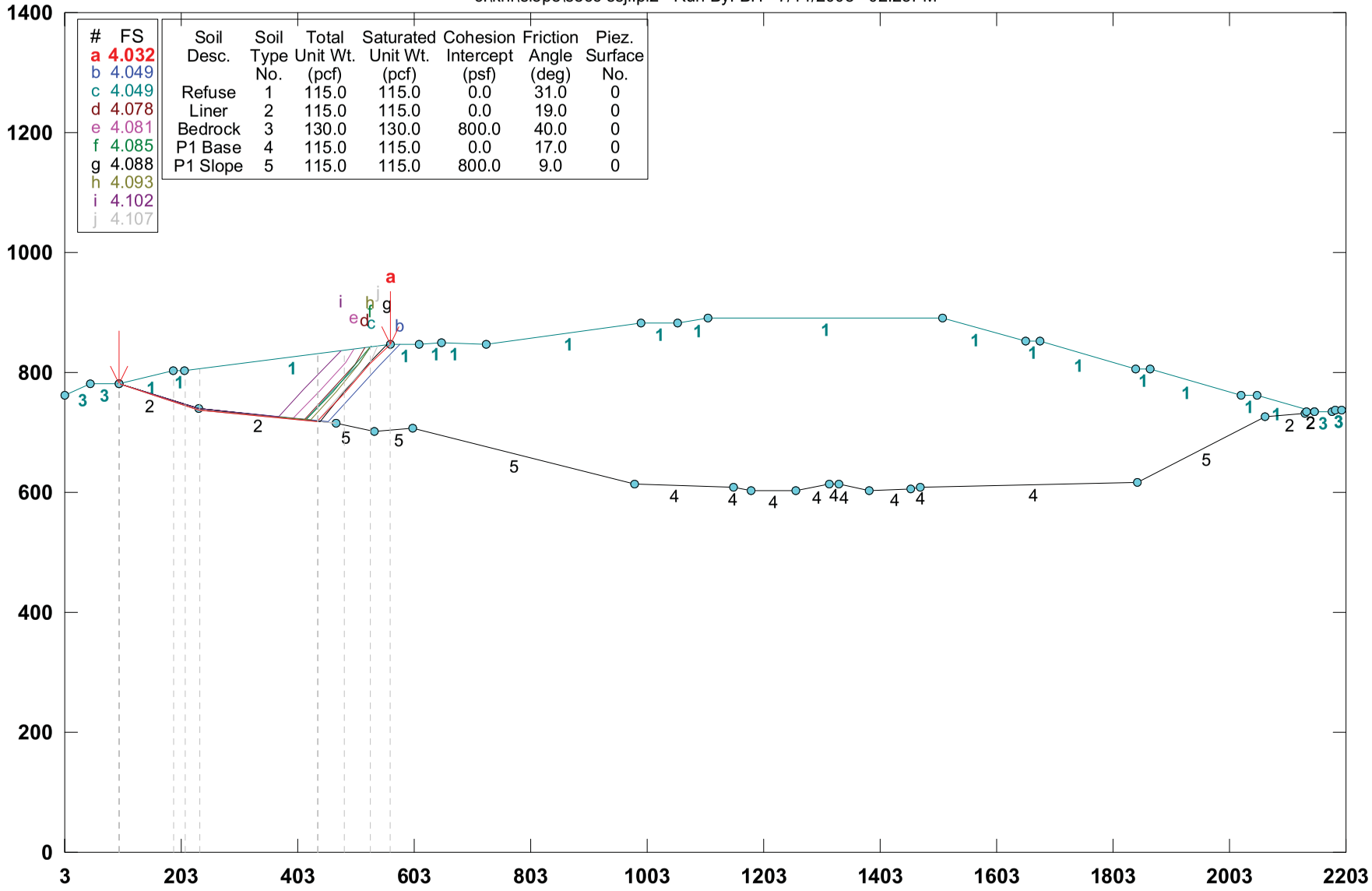
GSTABL7 v.2 FSmin=1.018

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. C-C', SOUTH, STATIC, FAILURE SURFACE I

c:\khf\slope\secc-ssji.pl2 Run By: BH 7/11/2008 02:25PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

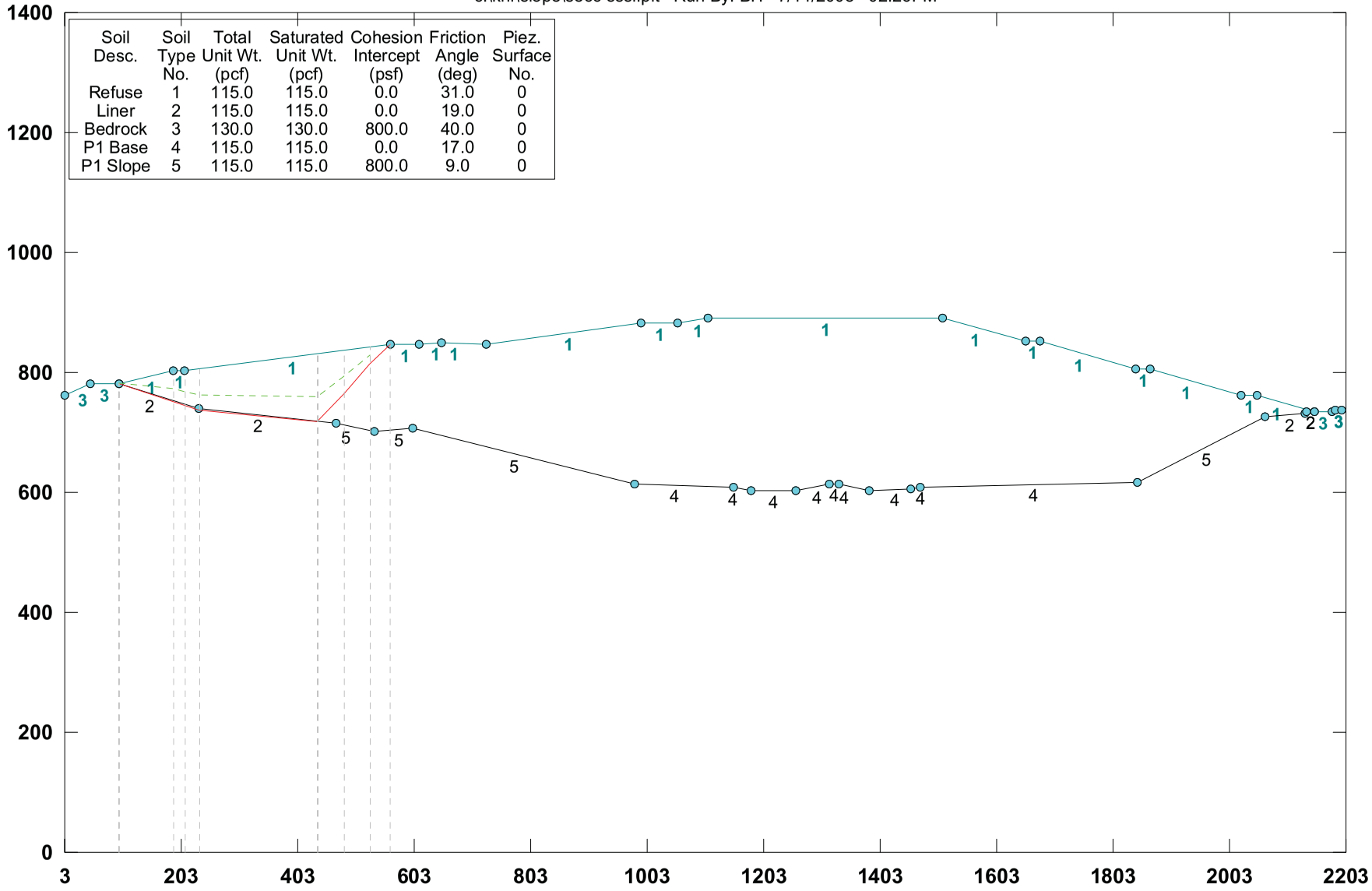
GSTABL7 v.2 FSmin=4.032

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. C-C', SOUTH, STATIC, FAILURE SURFACE I

c:\khf\slope\secc-sssi.plt Run By: BH 7/11/2008 02:26PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=4.920

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

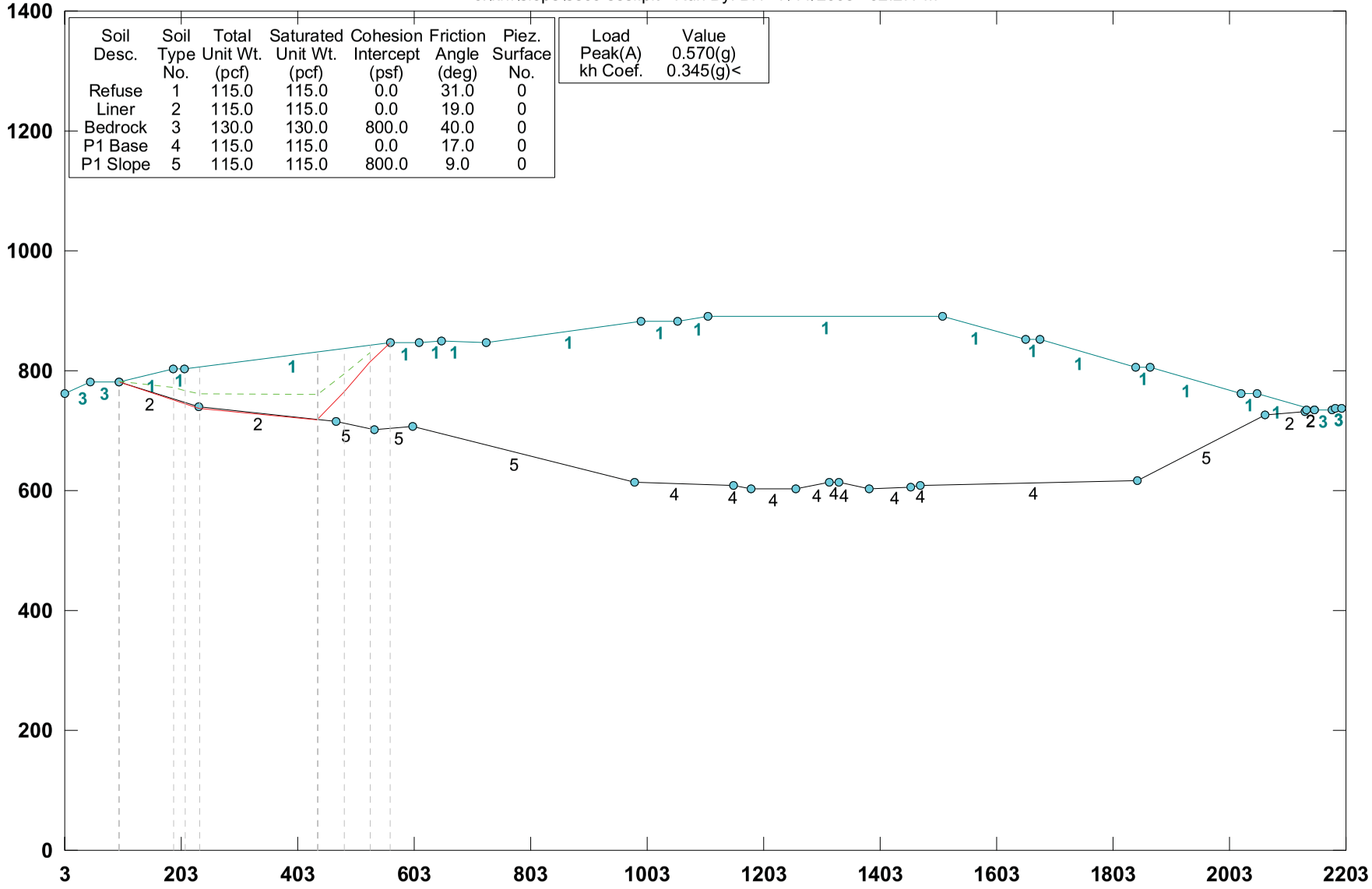
GSTABL7

KHF, SEC. C-C', SOUTH, PSEUDO-STATIC, FAILURE SURFACE I

c:\khf\slope\secc-sesi.plt Run By: BH 7/11/2008 02:27PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.345(g)<



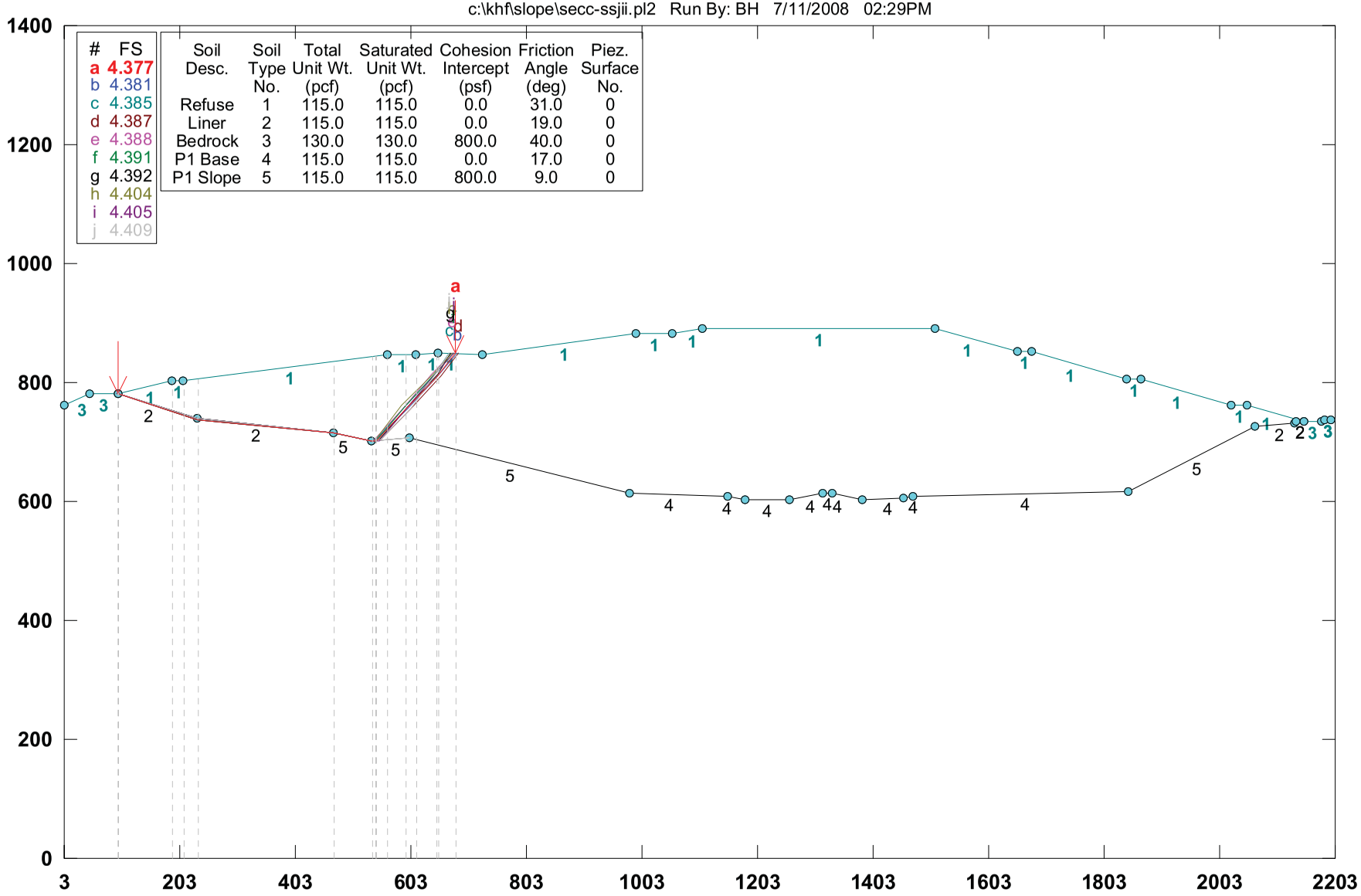
GSTABL7 v.2 FSmin=1.002

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. C-C', SOUTH, STATIC, FAILURE SURFACE II

c:\khf\slope\secc-ssjii.pl2 Run By: BH 7/11/2008 02:29PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

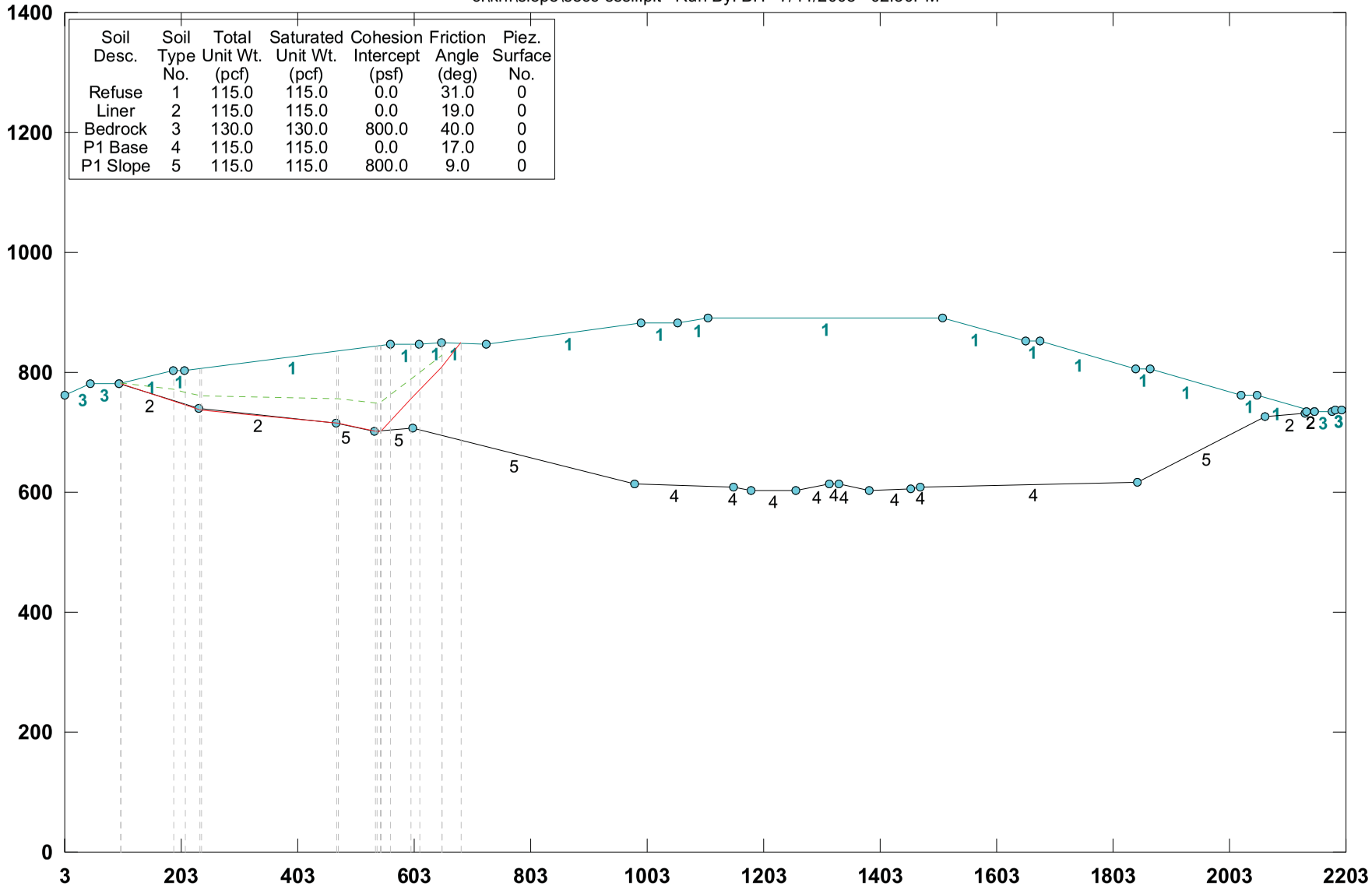
GSTABL7 v.2 FSmin=4.377

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. C-C', SOUTH, STATIC, FAILURE SURFACE II

c:\khf\slope\secc-sssii.plt Run By: BH 7/11/2008 02:30PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=5.639

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

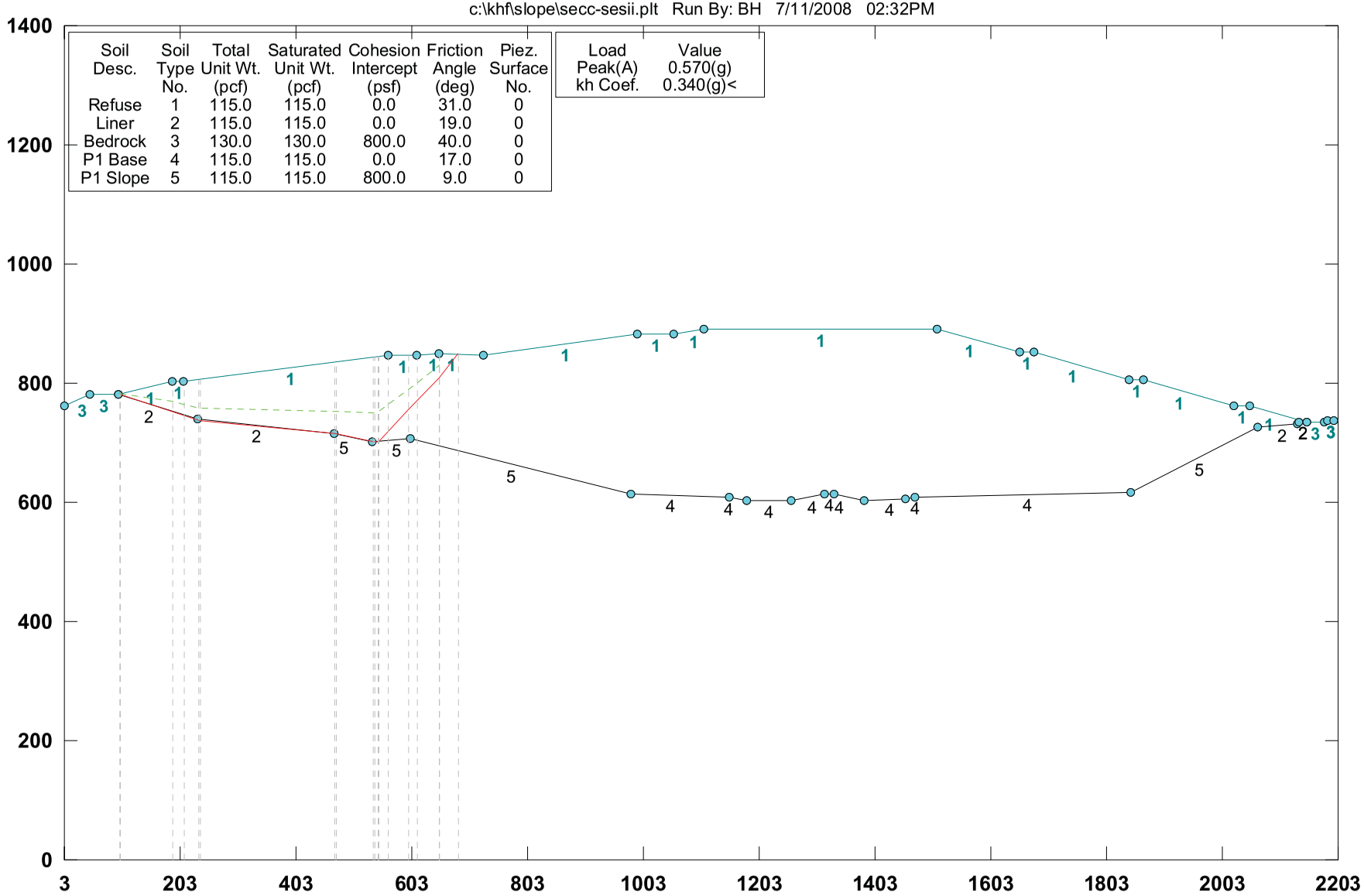
GSTABL7

KHF, SEC. C-C', SOUTH, PSEUDO-STATIC, FAILURE SURFACE II

c:\khf\slope\secc-sesii.plt Run By: BH 7/11/2008 02:32PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.340(g)<

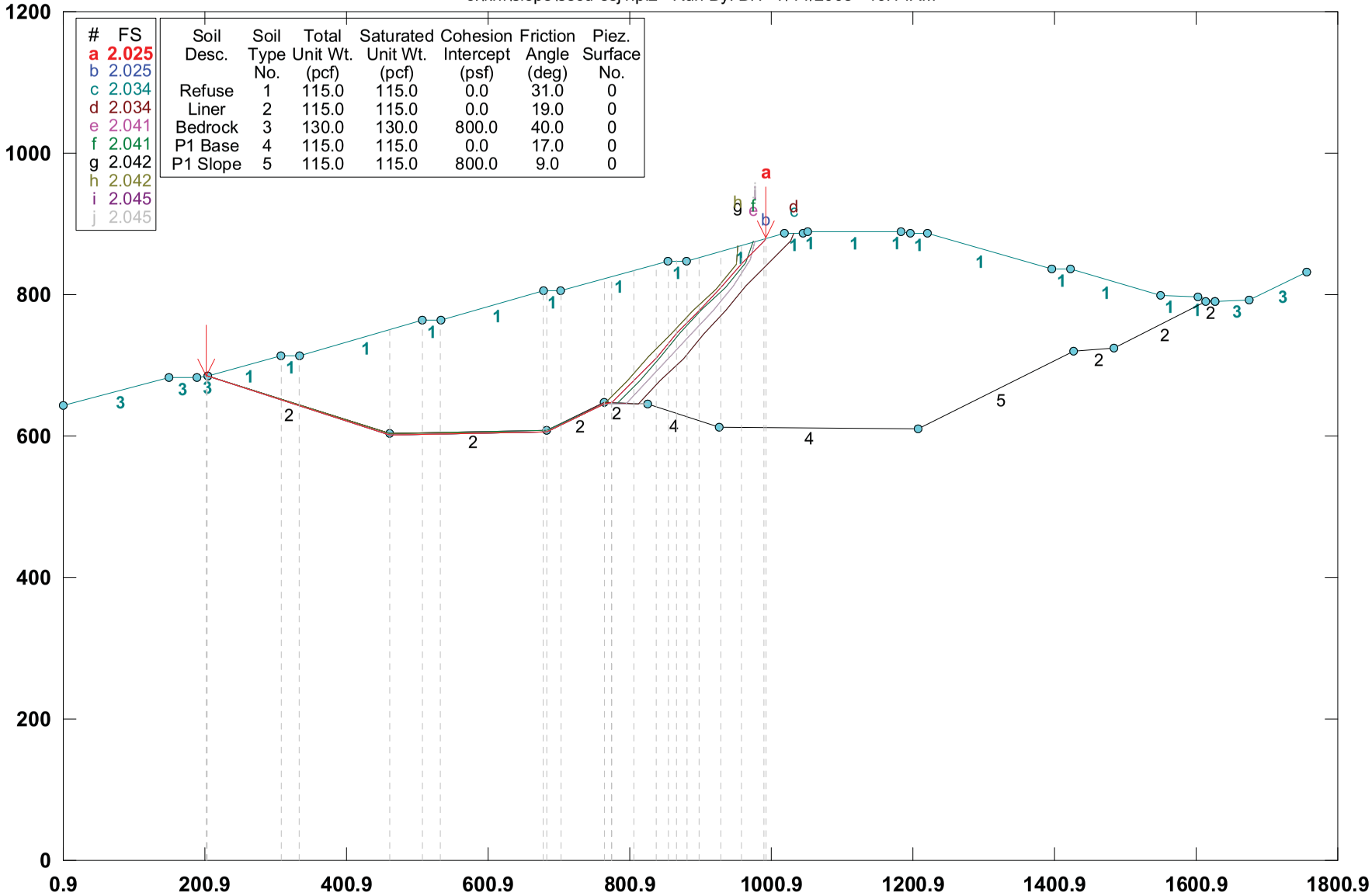


GSTABL7 v.2 FSmin=1.05

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. D-D', EAST, STATIC, FAILURE SURFACE 1

c:\khf\slope\secd-esj1.pl2 Run By: BH 7/11/2008 10:14AM



#	FS
a	2.025
b	2.025
c	2.034
d	2.034
e	2.041
f	2.041
g	2.042
h	2.042
i	2.045
j	2.045

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

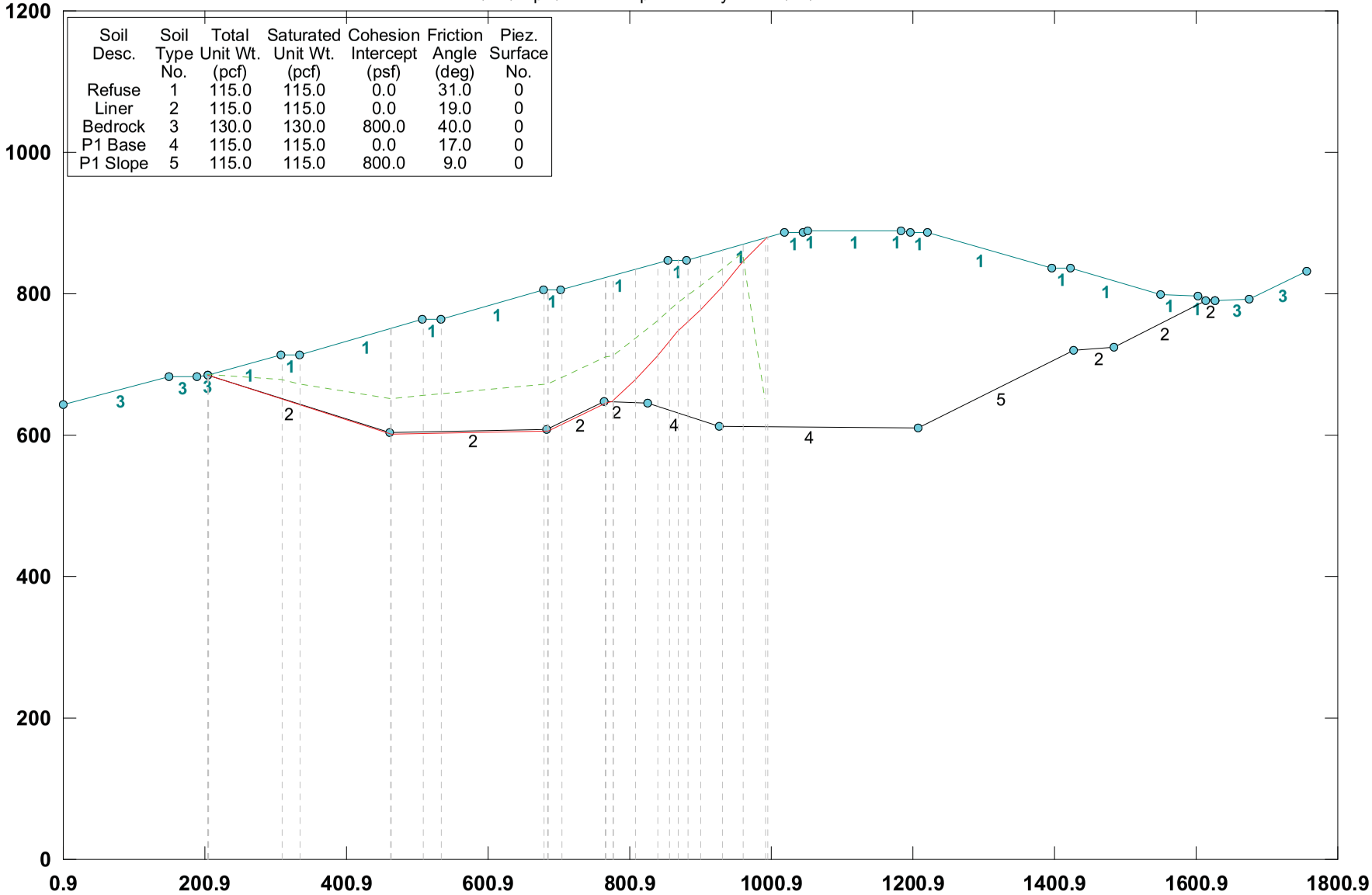
GSTABL7 v.2 FSmin=2.025

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. D-D', EAST, STATIC, FAILURE SURFACE 1

c:\khf\slope\secd-ess1.plt Run By: BH 7/11/2008 10:15AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.337

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

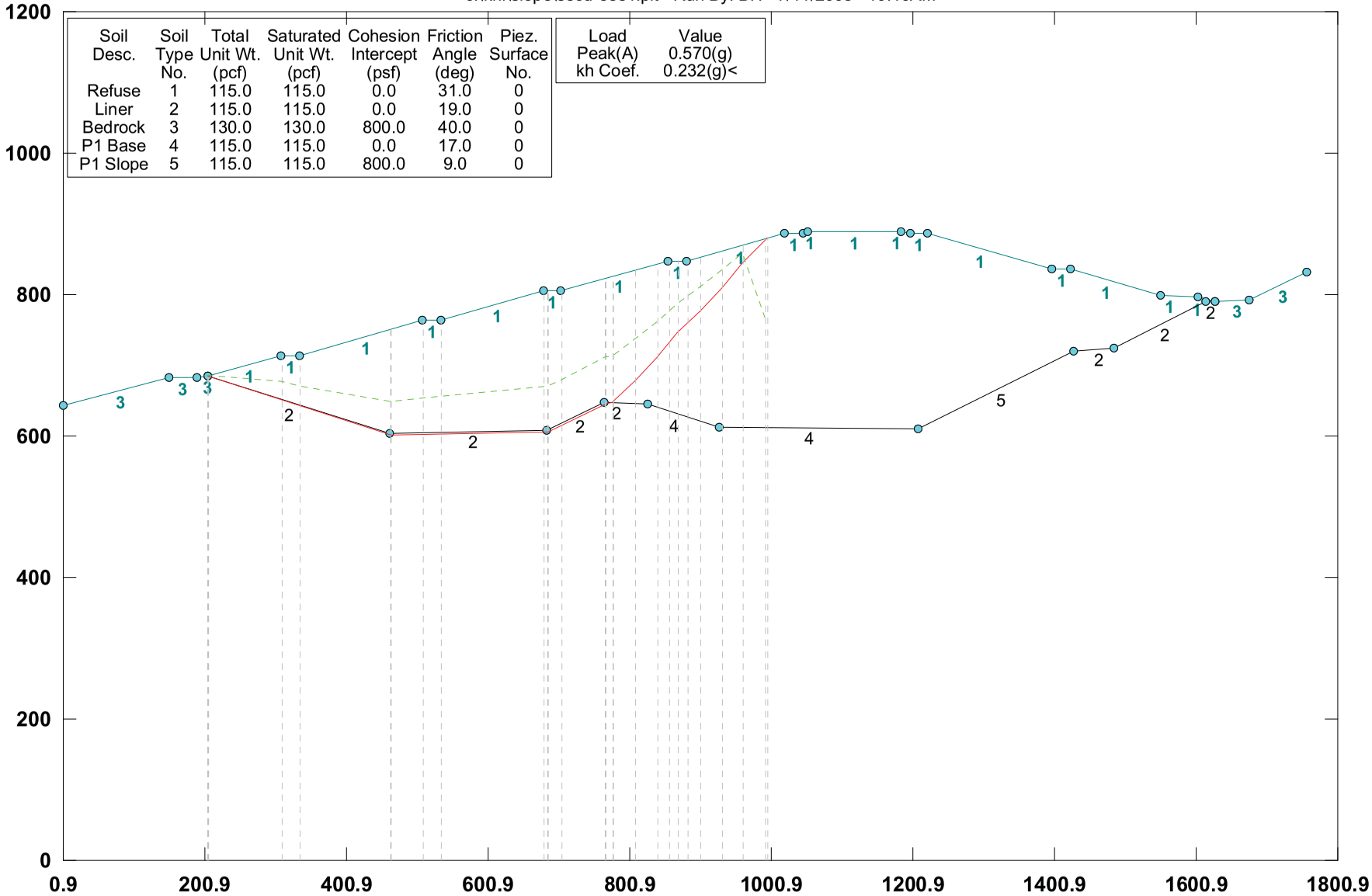
GSTABL7

KHF, SEC. D-D', EAST, PSEUDO-STATIC, FAILURE SURFACE 1

c:\khf\slope\secd-ees1.plt Run By: BH 7/11/2008 10:16AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.232(g)<



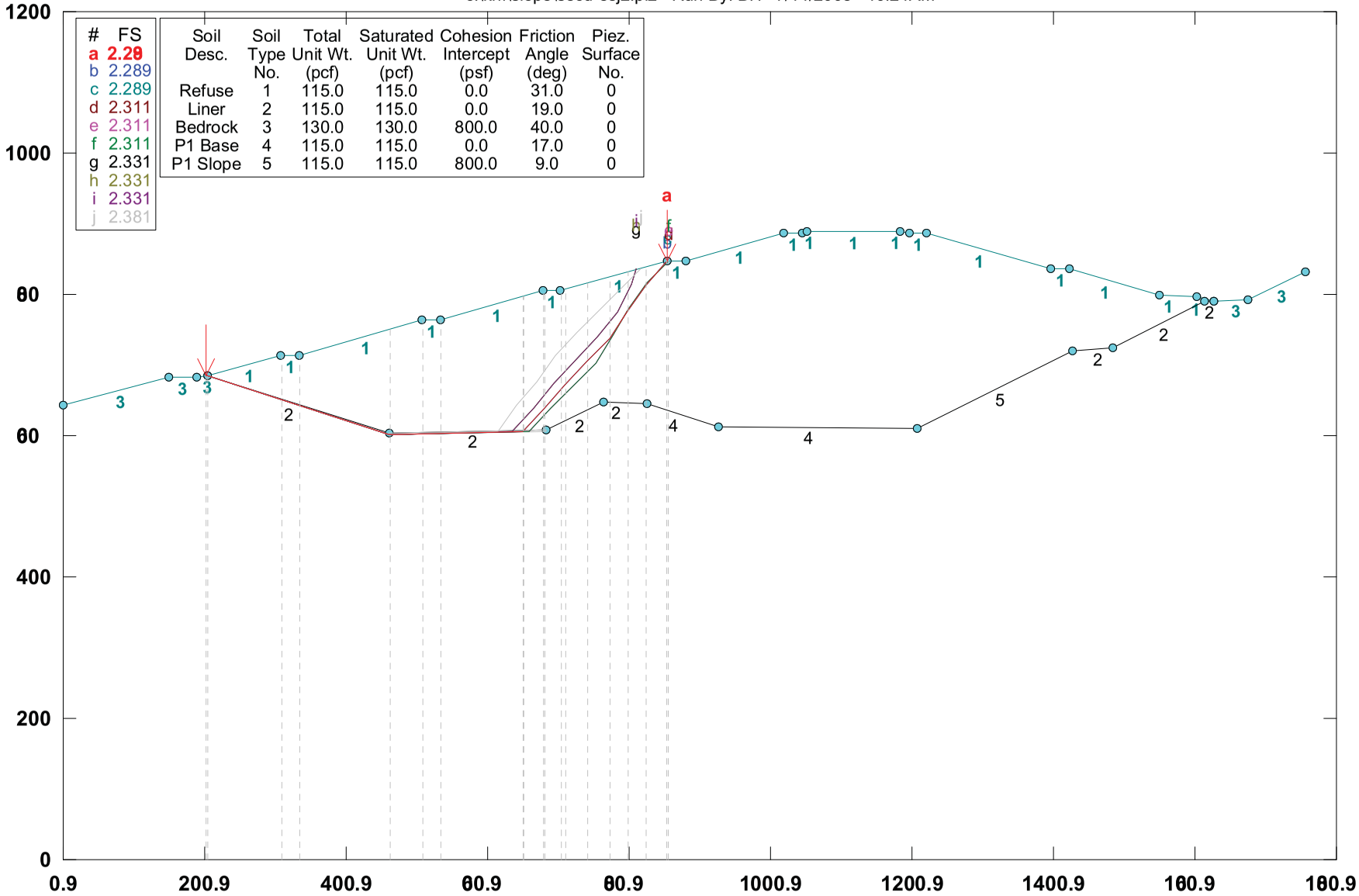
GSTABL7 v.2 FSmin=1.004

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. D, EAST, STATIC, FAILURE SURFACE 2

c:\khf\slope\secd-esj2.pl2 Run By: BH 7/11/2008 10:21AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

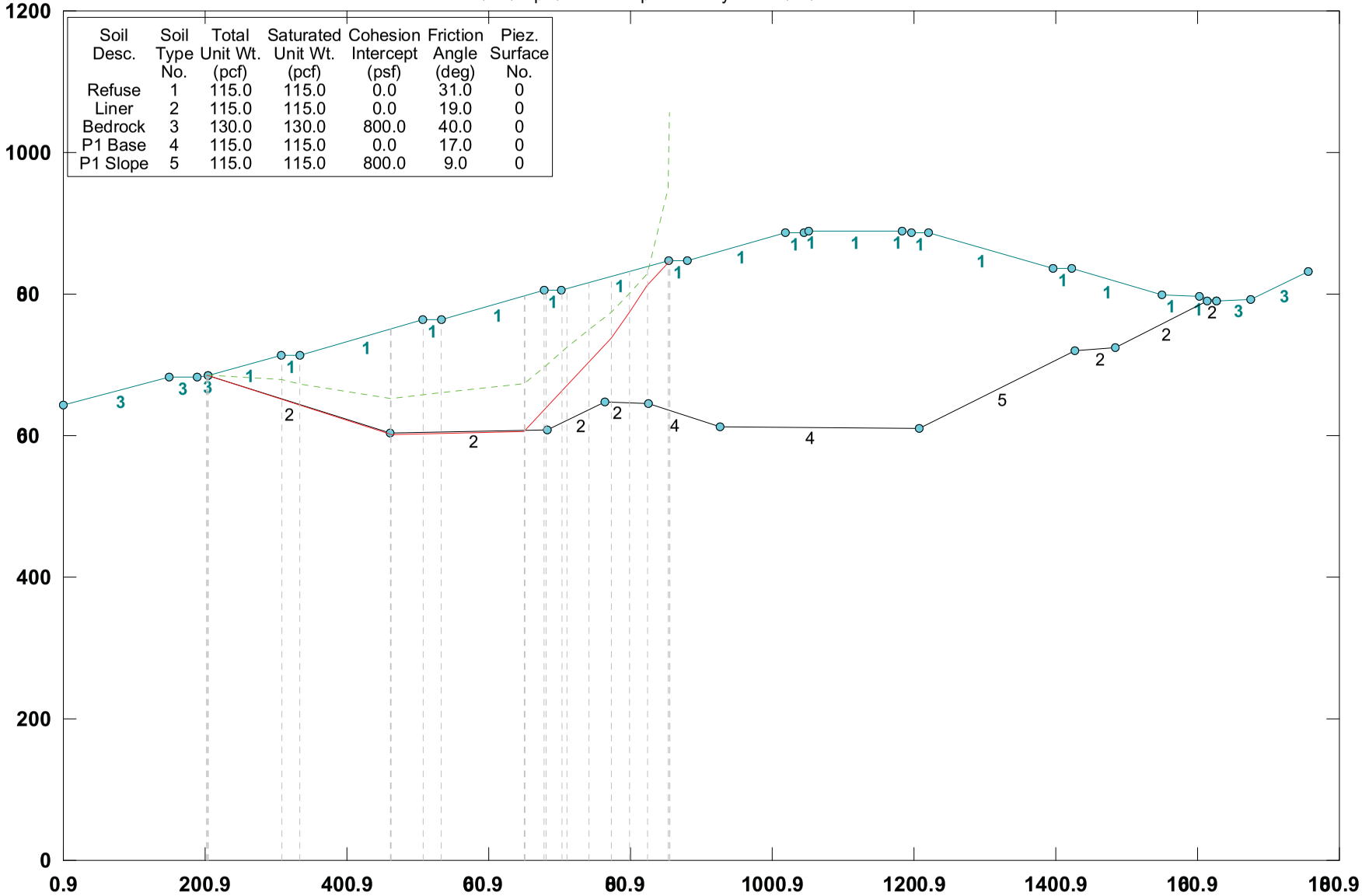
GSTABL7 v.2 FSmin=2.289

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. D, EAST, STATIC, FAILURE SURFACE 2

c:\khf\slope\secd-ess2.plt Run By: BH 7/11/2008 10:24AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.87

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

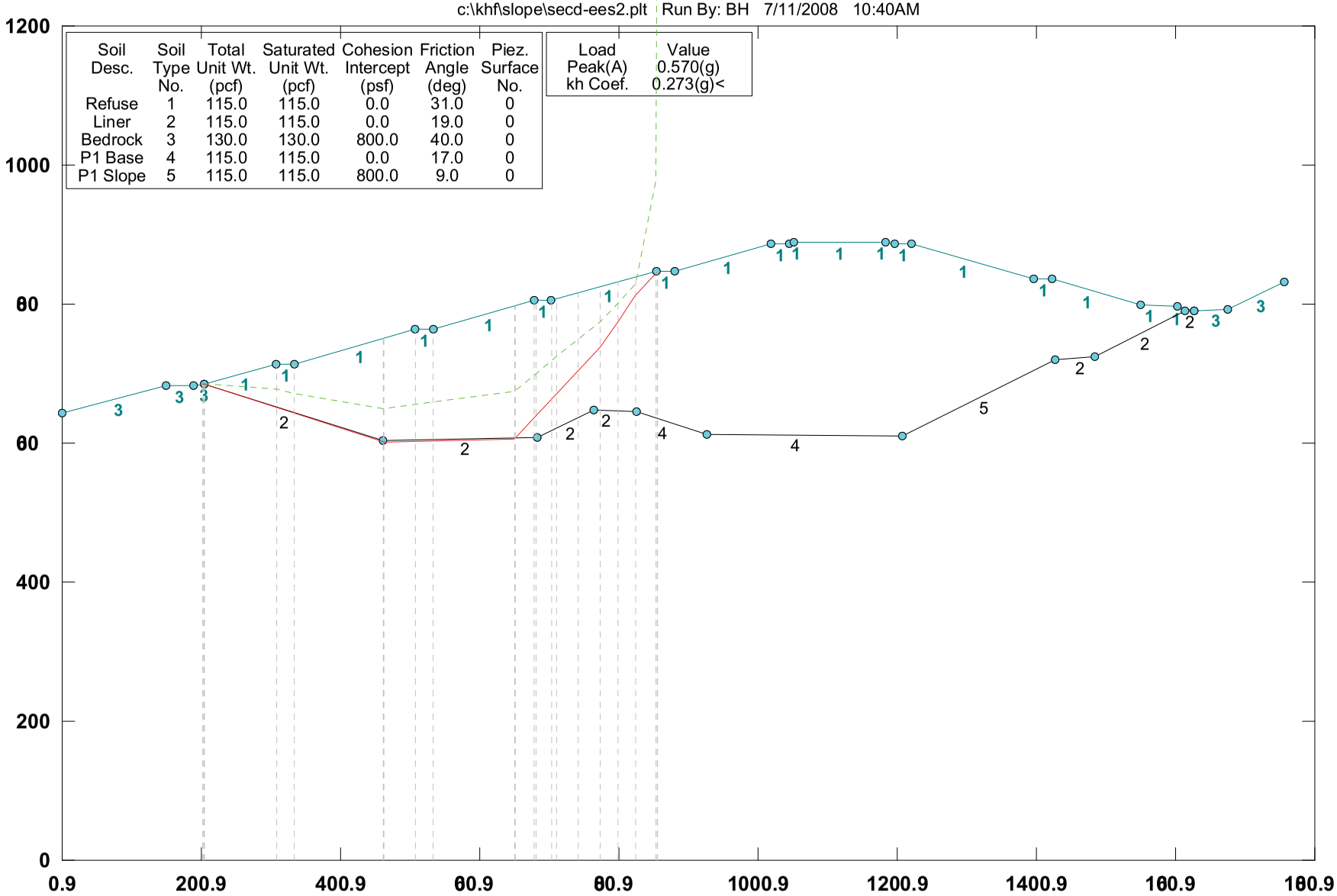
GSTABL7

KHF, SEC. D, EAST, PSEUDO-STATIC, FAILURE SURFACE 2

c:\khf\slope\secd-ees2.plt Run By: BH 7/11/2008 10:40AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.273(g)<

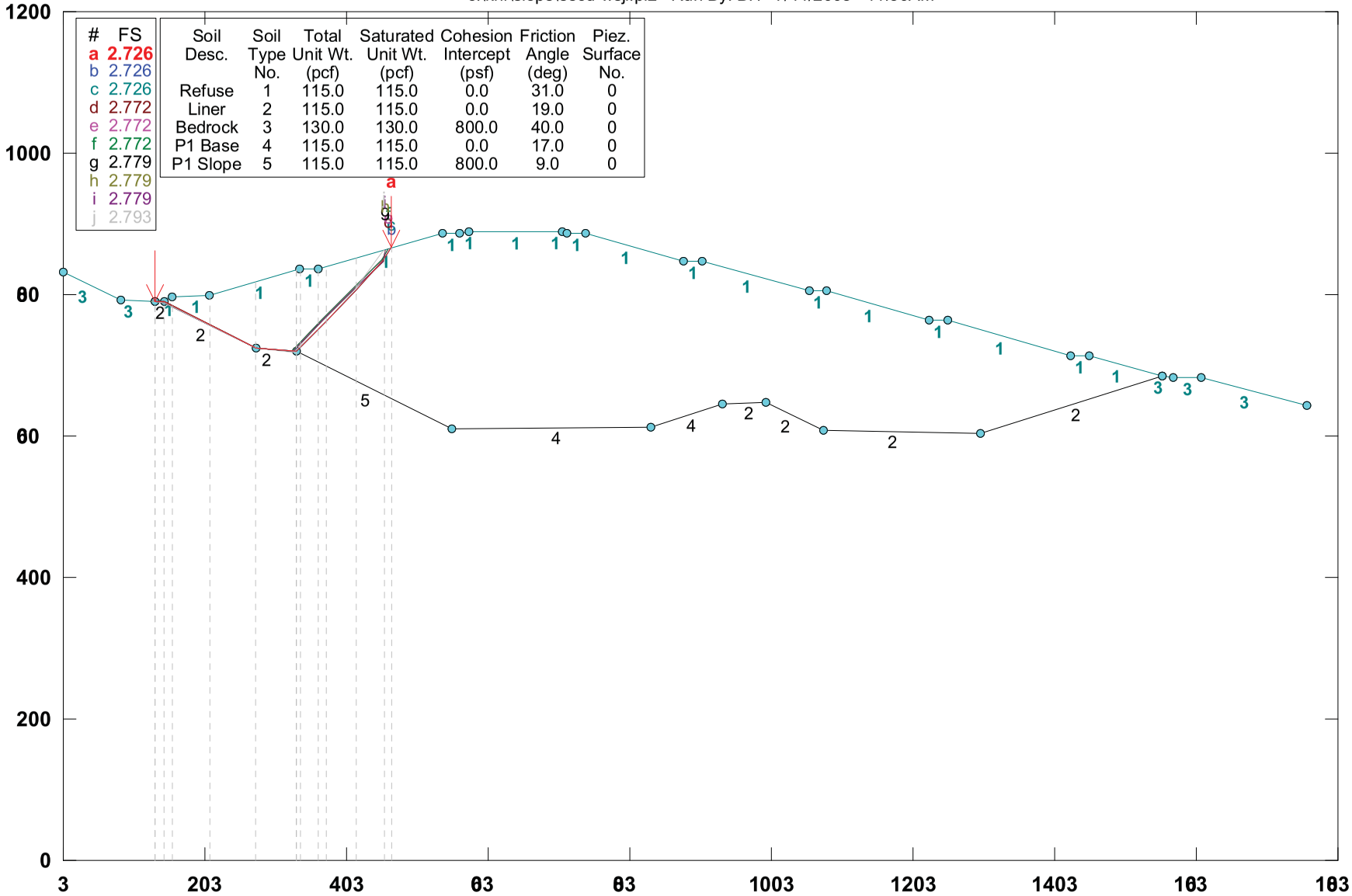


GSTABL7 v.2 FSmin=1.025

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. D, WEST, STATIC, FAILURE PLANE I

c:\khf\slope\secd-wsji.pl2 Run By: BH 7/11/2008 11:30AM



#	FS
a	2.726
b	2.726
c	2.726
d	2.772
e	2.772
f	2.772
g	2.779
h	2.779
i	2.779
j	2.793

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

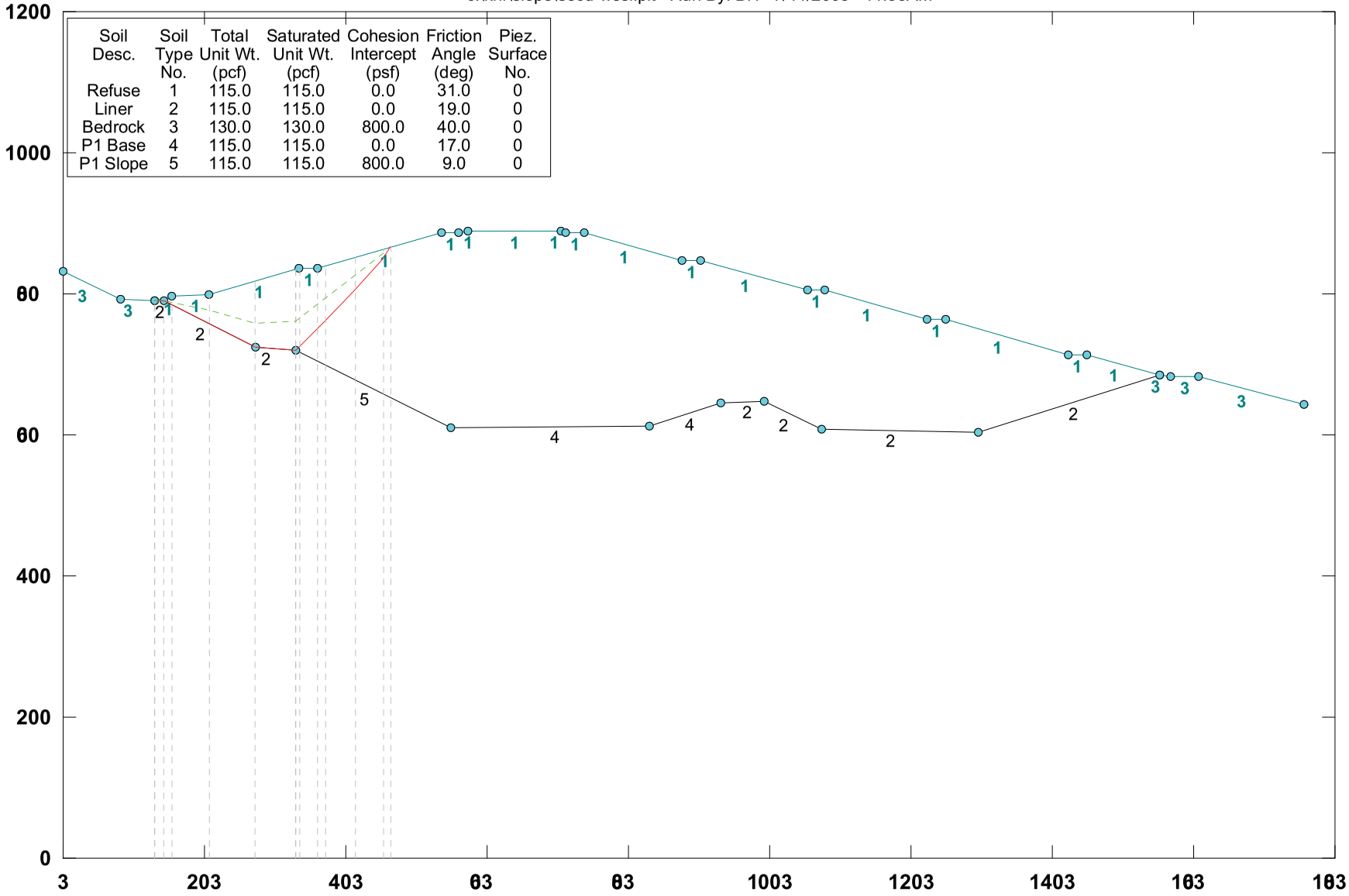
GSTABL7 v.2 FSmin=2.726

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. D, WEST, STATIC, FAILURE SURFACE I

c:\khf\slope\secd-wssi.plt Run By: BH 7/11/2008 11:35AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=3.8

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

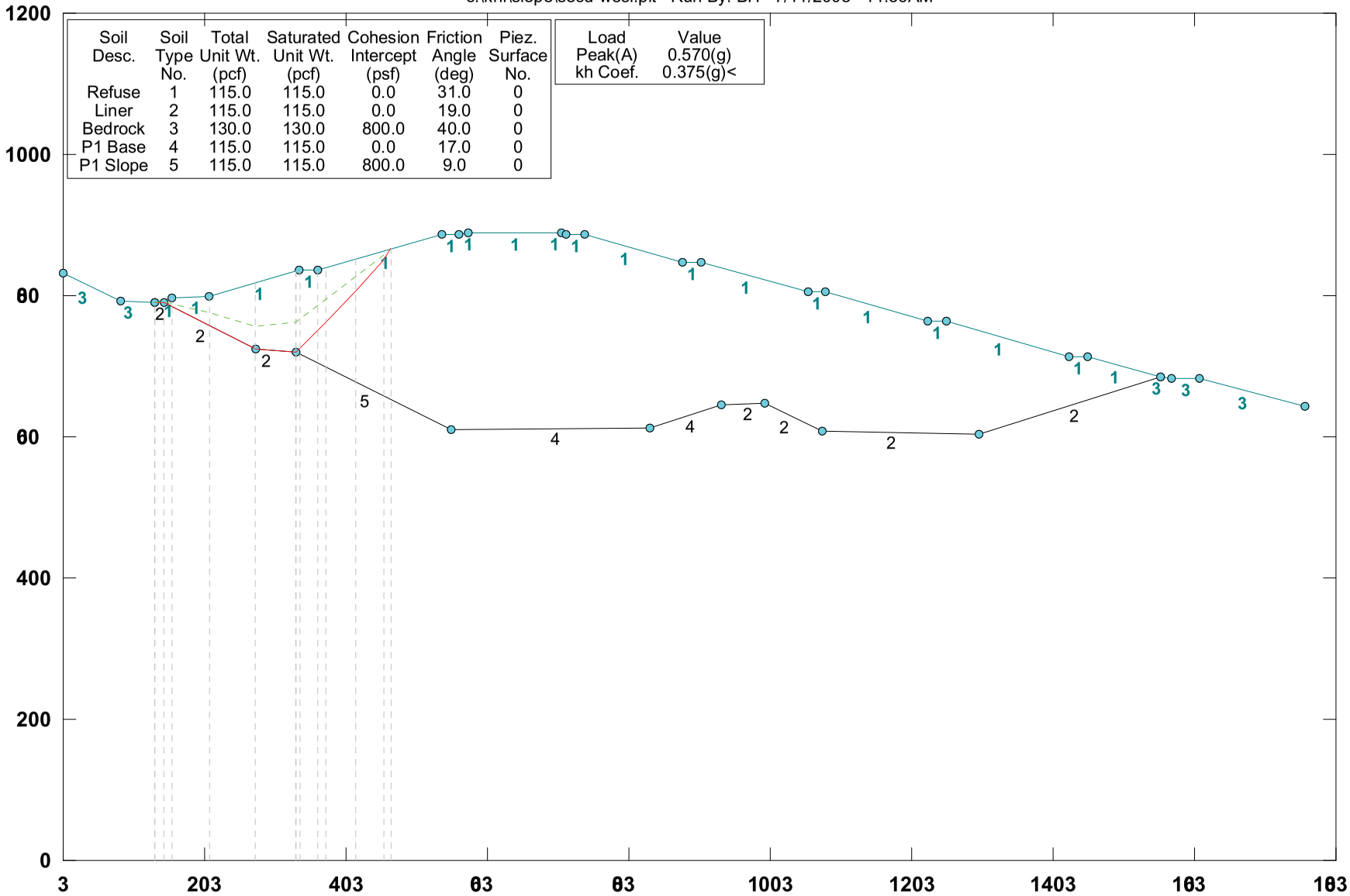
GSTABL7

KHF, SEC. D, WEST, PSEUDO-STATIC, FAILURE SURFACE I

c:\khf\slope\secd-wesi.plt Run By: BH 7/11/2008 11:36AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.375(g)<

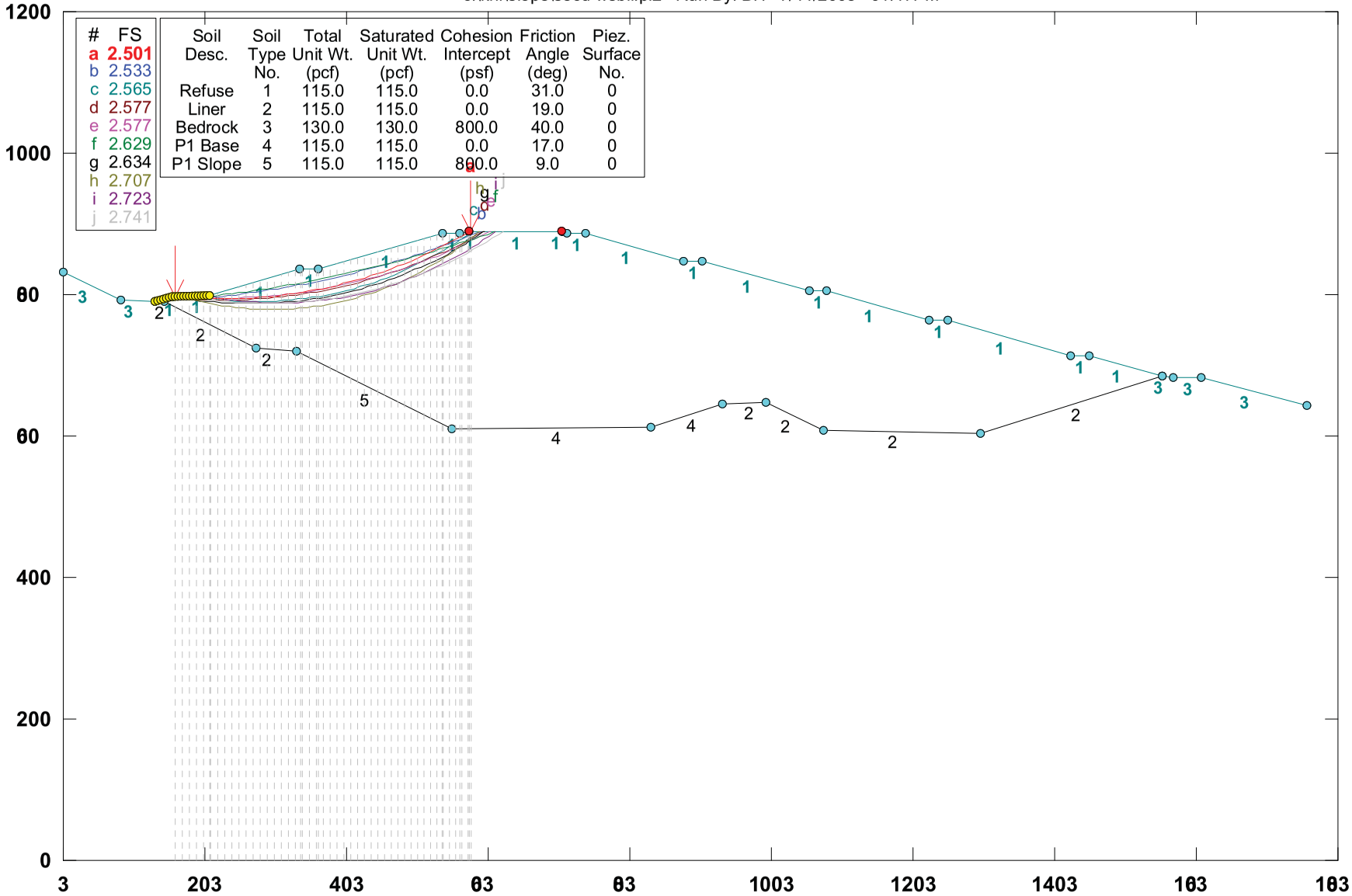


GSTABL7 v.2 FSmin=1.009

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SEC. D, WEST, STATIC, FAILURE PLANE II

c:\khf\slope\secd-wsbii.pl2 Run By: BH 7/11/2008 01:17PM



GSTABL7 v.2 FSmin=2.501

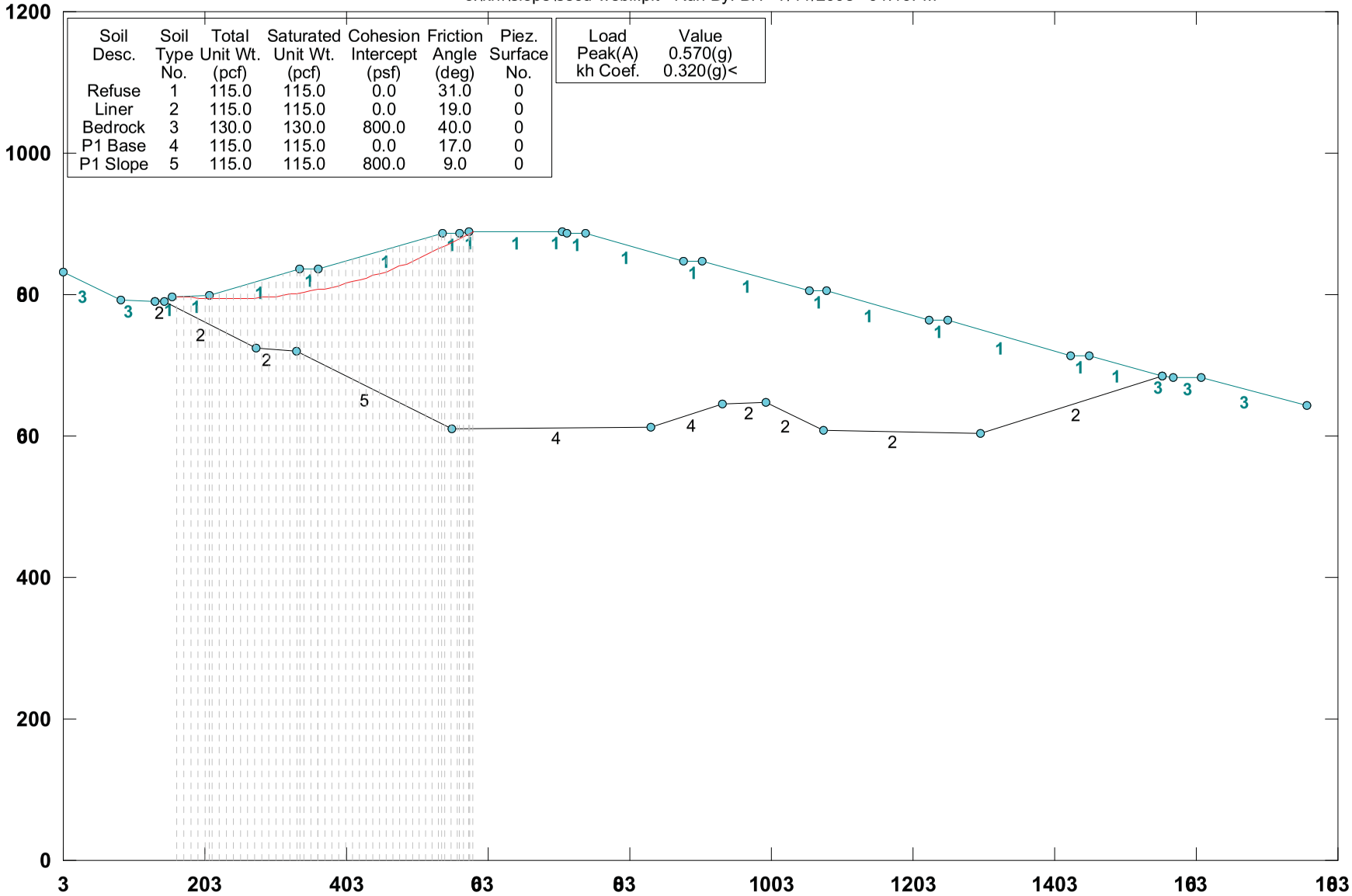
Safety Factors Are Calculated By The Modified Bishop Method

KHF, SEC. D, WEST, PSEUDO-STATIC, FAILURE PLANE II

c:\khf\slope\secd-webii.plt Run By: BH 7/11/2008 01:16PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.320(g)<

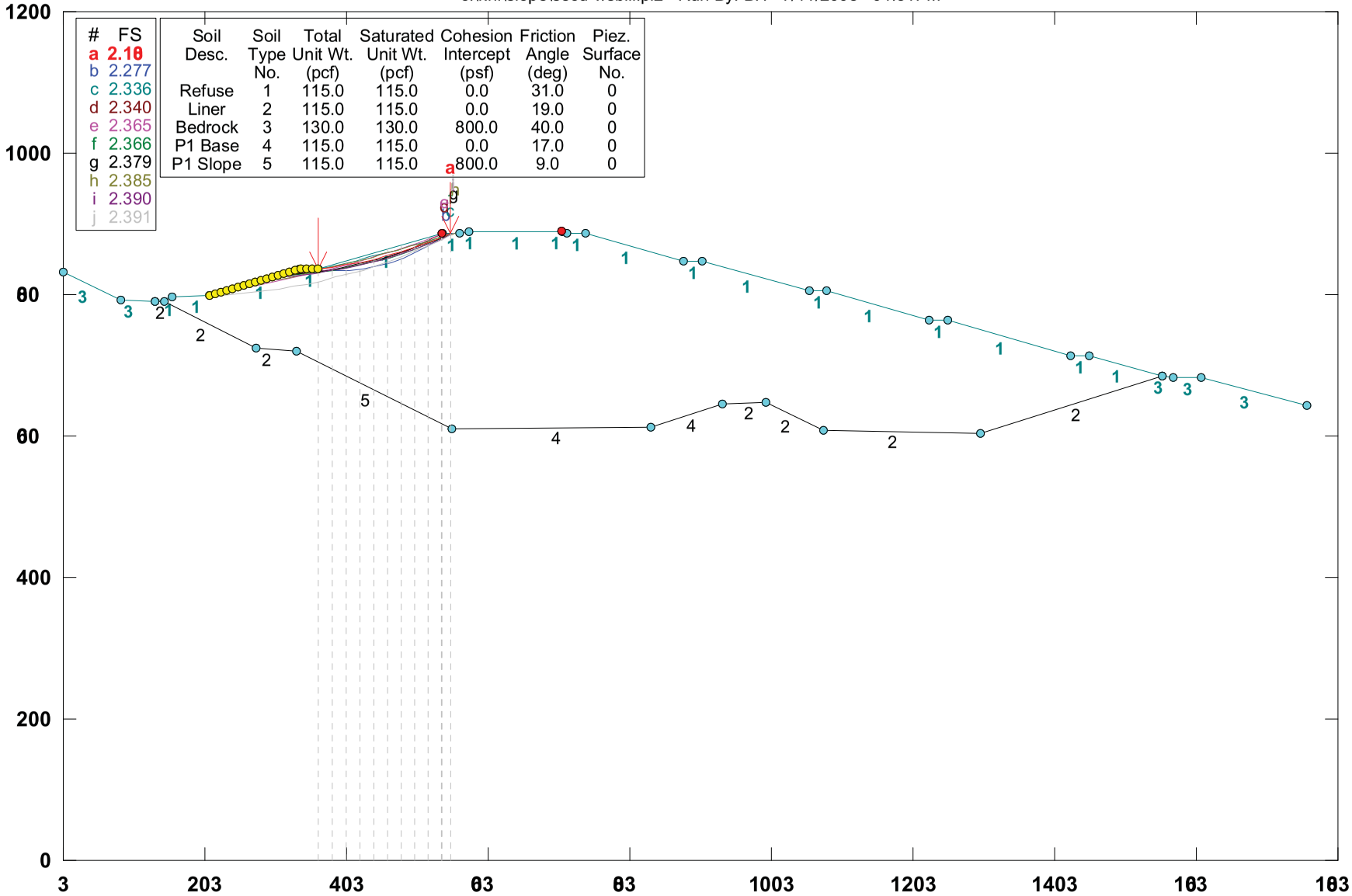


GSTABL7 v.2 FSmin=1.019

Factor Of Safety Is Calculated By The Modified Bishop Method

KHF, SEC. D, WEST, STATIC, FAILURE PLANE III

c:\khf\slope\secd-wsbiii.pl2 Run By: BH 7/11/2008 01:31PM



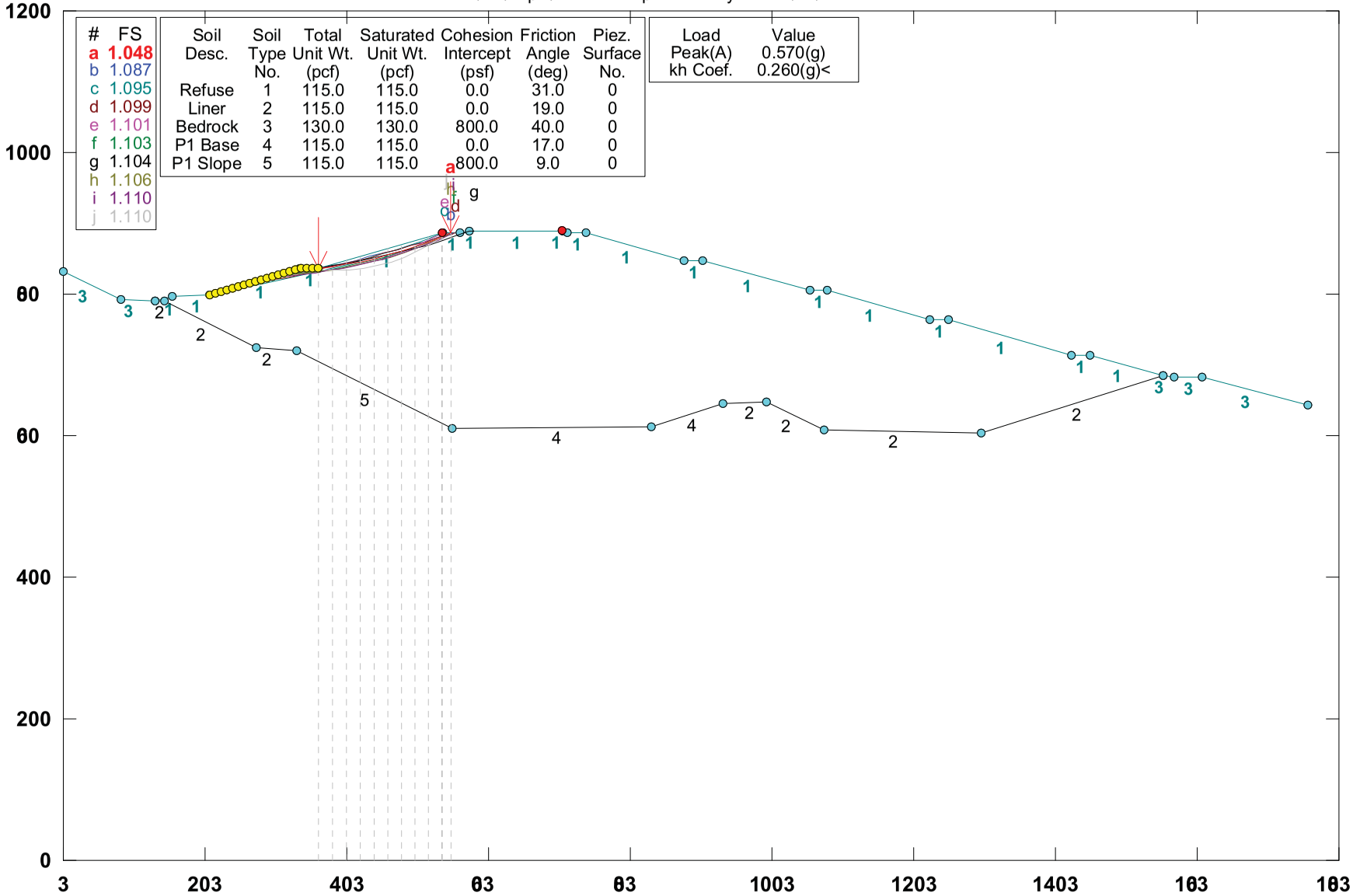
GSTABL7 v.2 FSmin=2.180

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

KHF, SEC. D, WEST, PSEUDO-STATIC, FAILURE PLANE III

c:\khf\slope\secd-webiii.pl2 Run By: BH 7/11/2008 01:33PM



#	FS
a	1.048
b	1.087
c	1.095
d	1.099
e	1.101
f	1.103
g	1.104
h	1.106
i	1.110
j	1.110

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

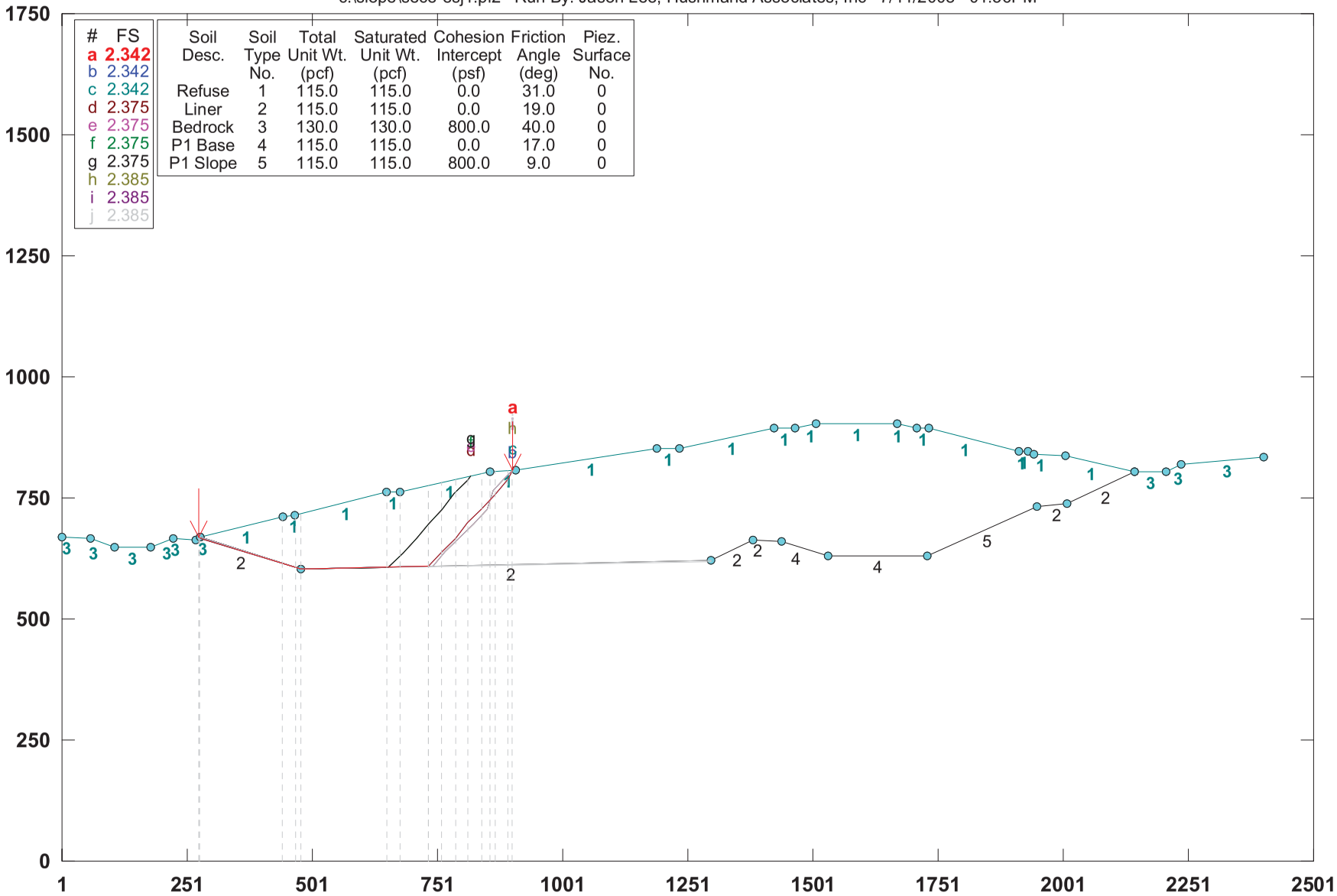
Load	Value
Peak(A)	0.570(g)
kh Coef.	0.260(g)<

GSTABL7 v.2 FSmin=1.048

Safety Factors Are Calculated By The Modified Bishop Method

KHF, SECTION E-E', EAST, STATIC, FAILURE PLANE 1

c:\slope\sece-esj1.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 01:56PM



#	FS
a	2.342
b	2.342
c	2.342
d	2.375
e	2.375
f	2.375
g	2.375
h	2.385
i	2.385
j	2.385

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

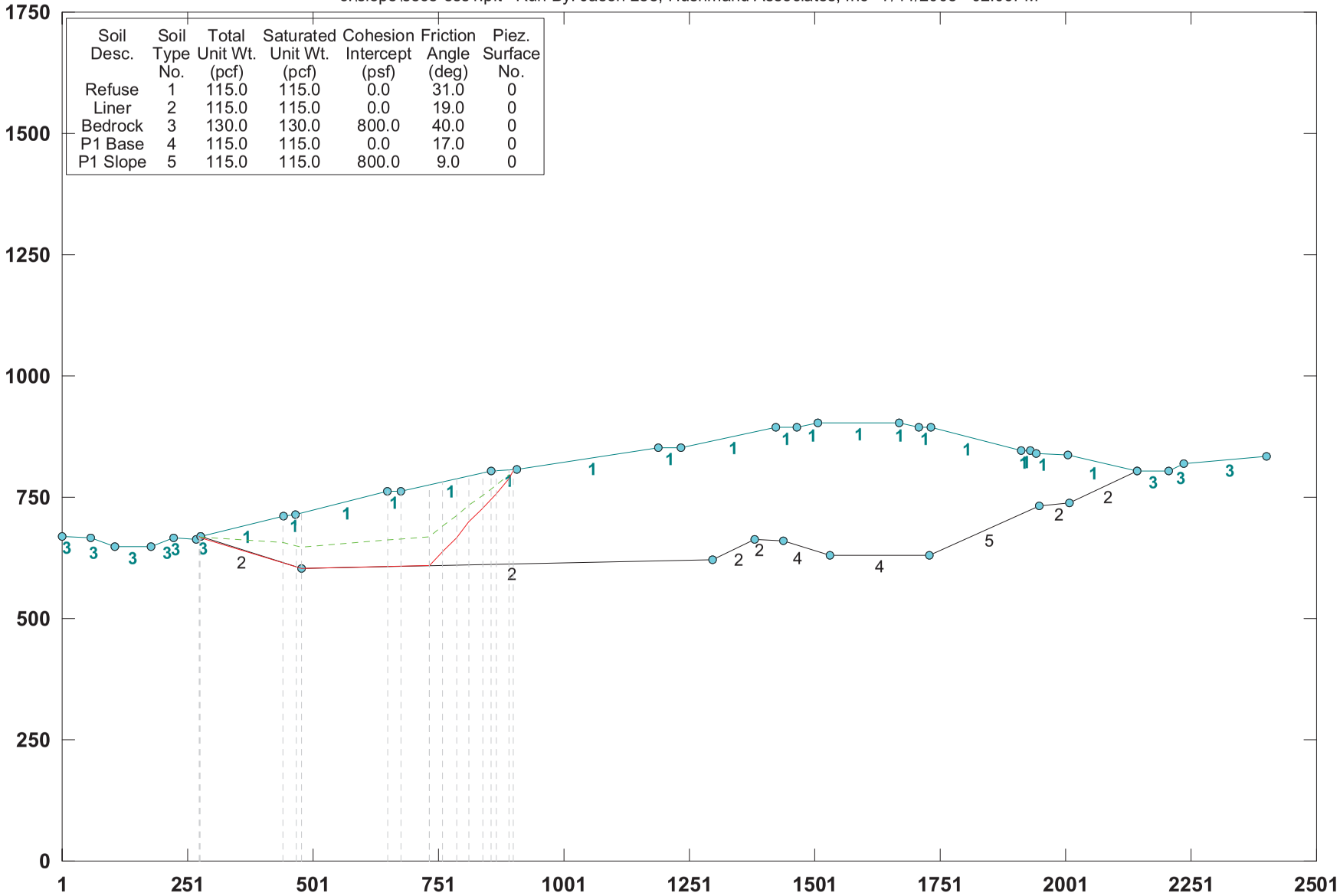
GSTABL7 v.2 FSmin=2.342

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION E-E', EAST, STATIC, FAILURE PLANE 1

c:\slope\sece-ess1.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 02:06PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

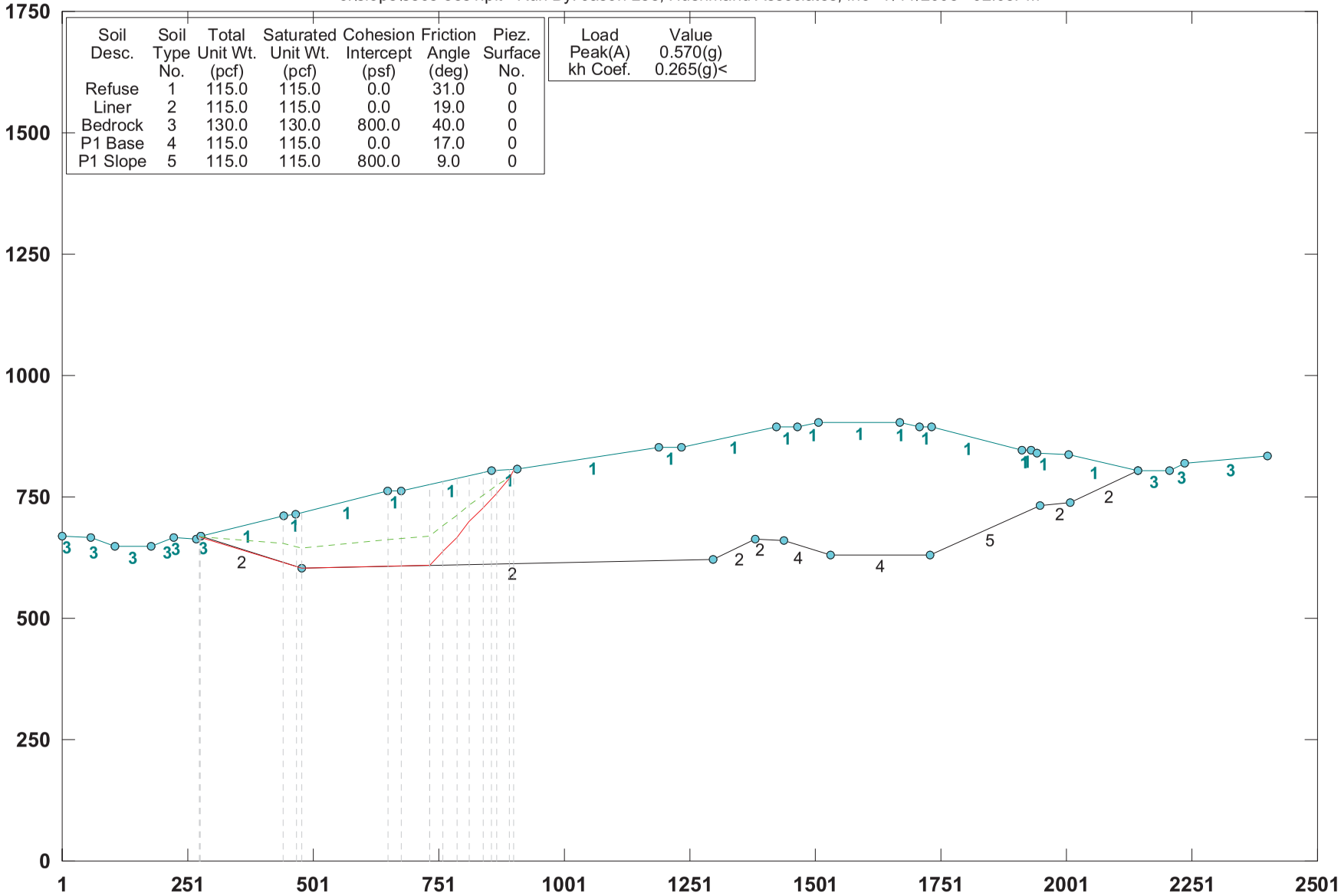
GSTABL7 v.2 FSmin=2.743

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SECTION E-E', EAST, PSEUD-STATIC, FAILURE PLANE 1

c:\slope\sece-ees1.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 02:08PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

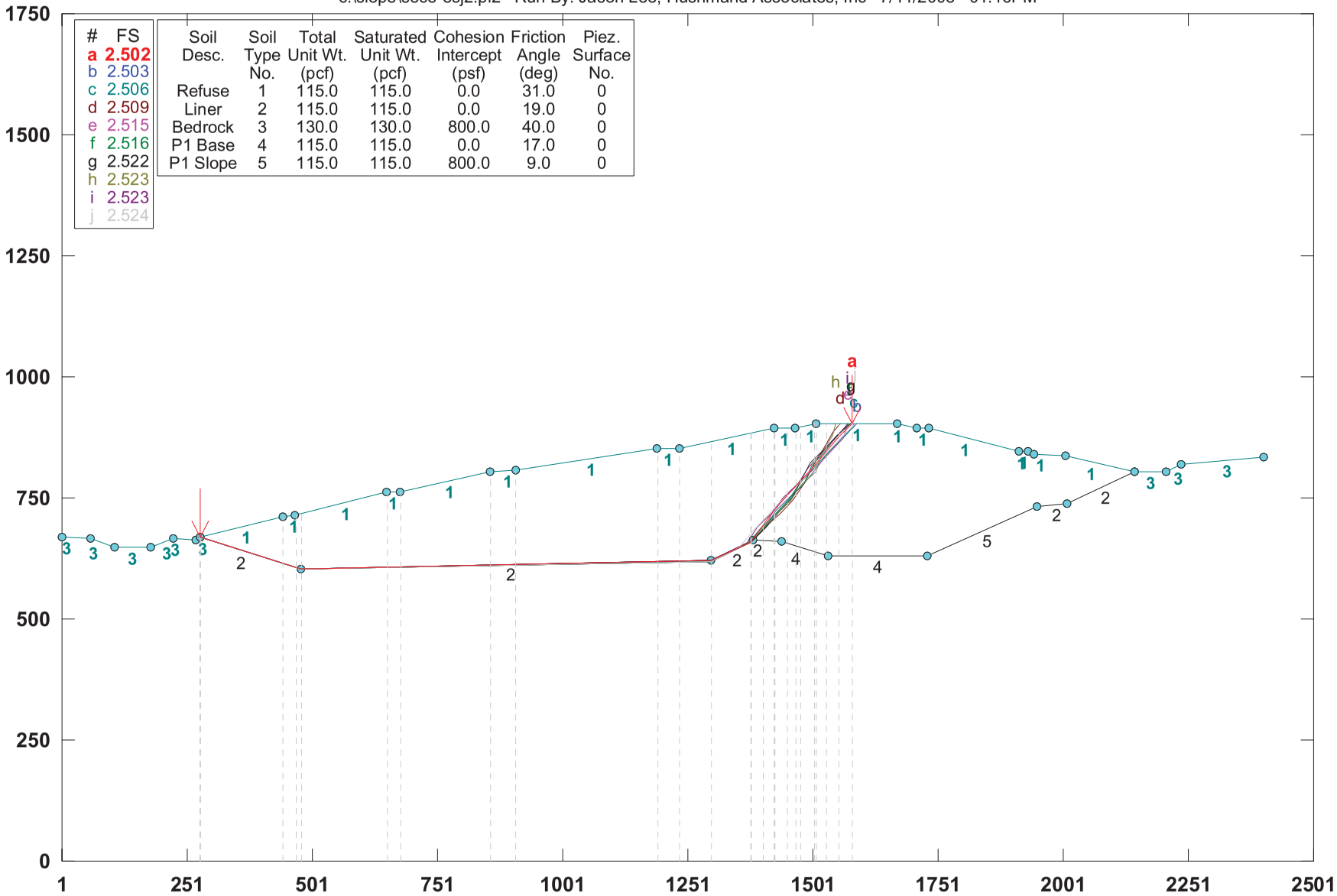
Load	Value
Peak(A)	0.570(g)
kh Coef.	0.265(g)<

GSTABL7 v.2 FSmin=1.004

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION E-E', EAST, STATIC, FAILURE PLANE 2

c:\slope\sece-esj2.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 01:46PM



#	FS
a	2.502
b	2.503
c	2.506
d	2.509
e	2.515
f	2.516
g	2.522
h	2.523
i	2.523
j	2.524

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

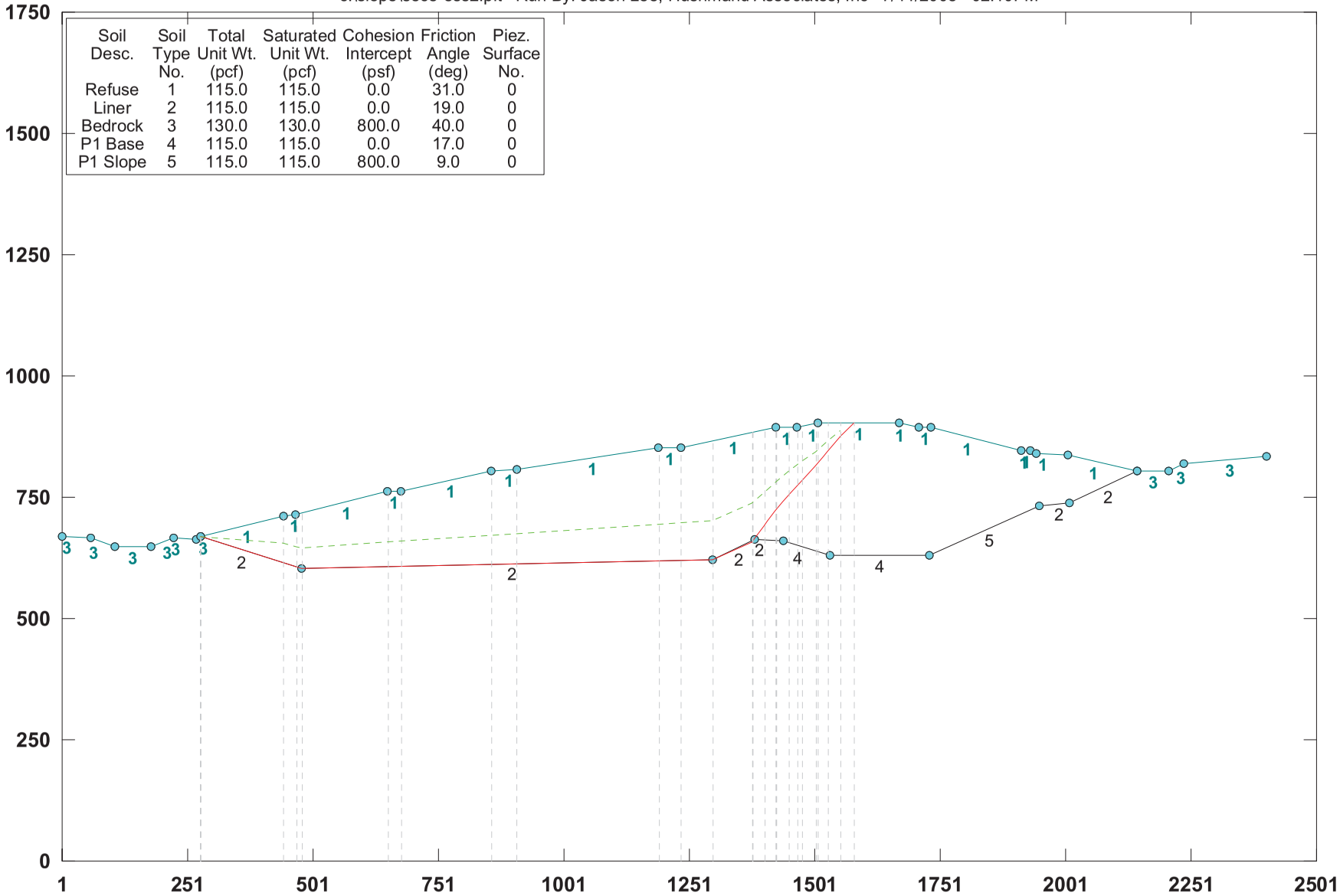
GSTABL7 v.2 FSmin=2.502

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION E-E', EAST, STATIC, FAILURE PLANE 2

c:\slope\sece-ess2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 02:10PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.747

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

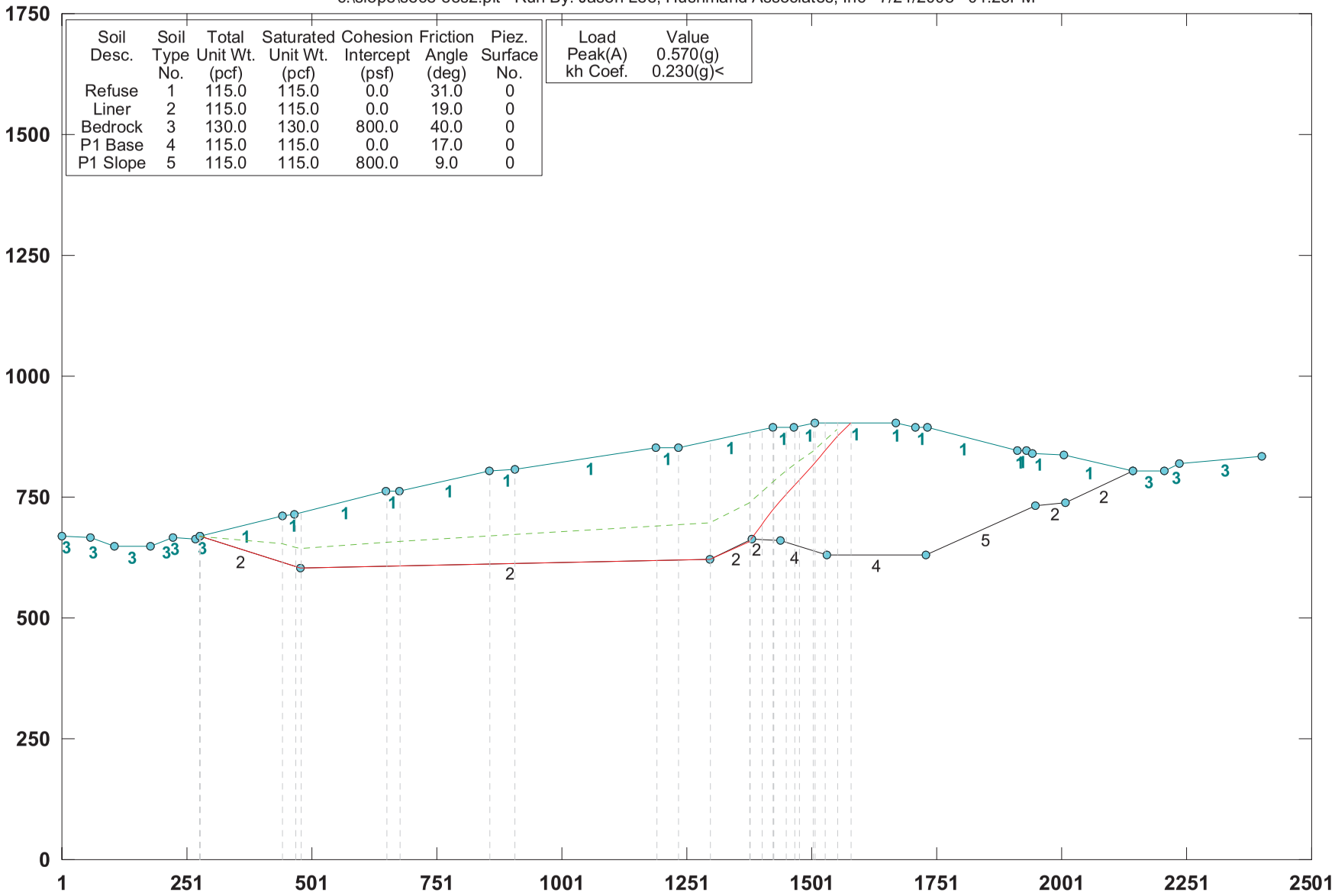
GSTABL7

KHF, SECTION E-E', EAST, PSEUD-STATIC, FAILURE PLANE 2

c:\slope\sece-ees2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 01:23PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.230(g)<



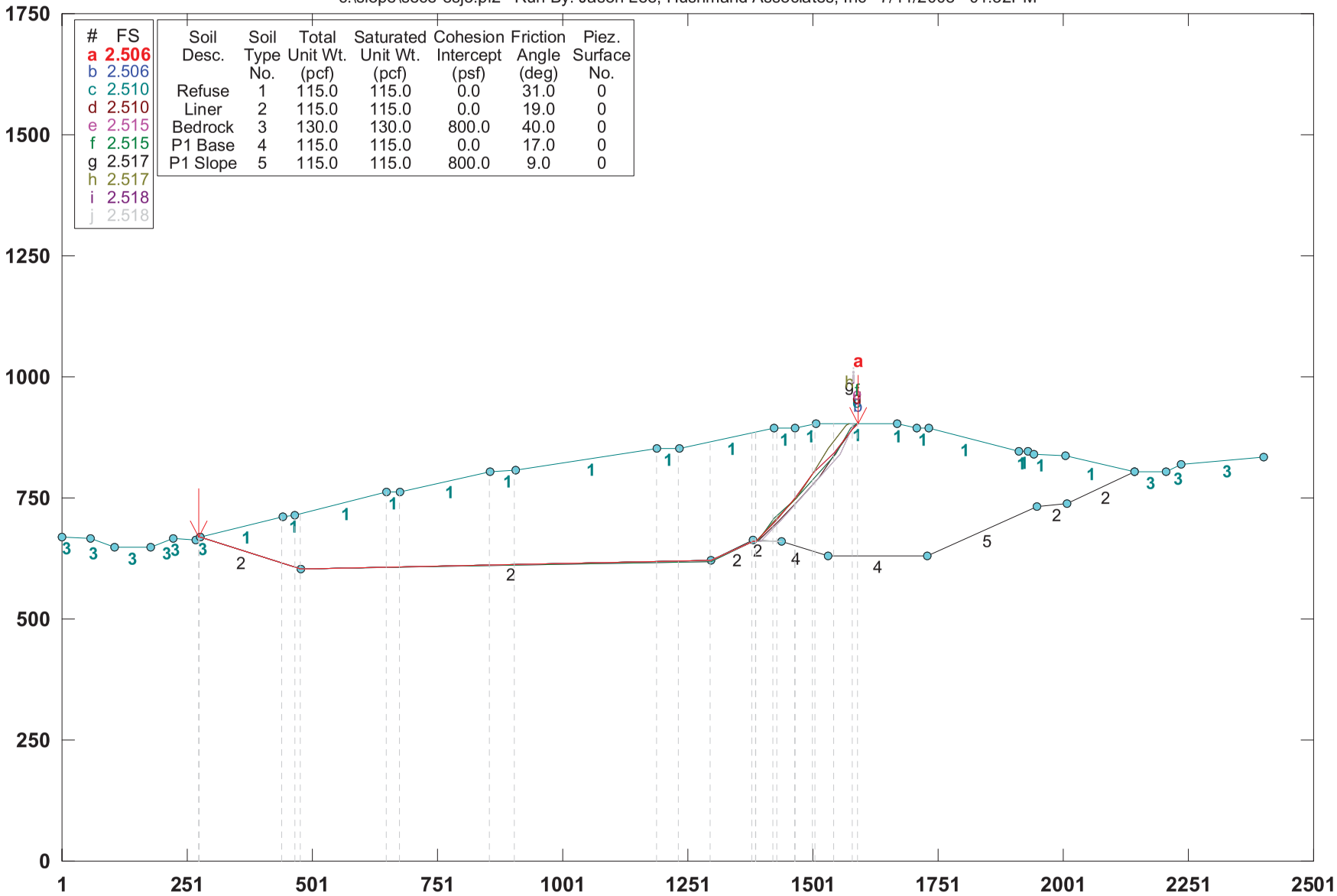
GSTABL7 v.2 FSmin=1.030

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SECTION E-E', EAST, STATIC, FAILURE PLANE 3

c:\slope\sece-esj3.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 01:32PM



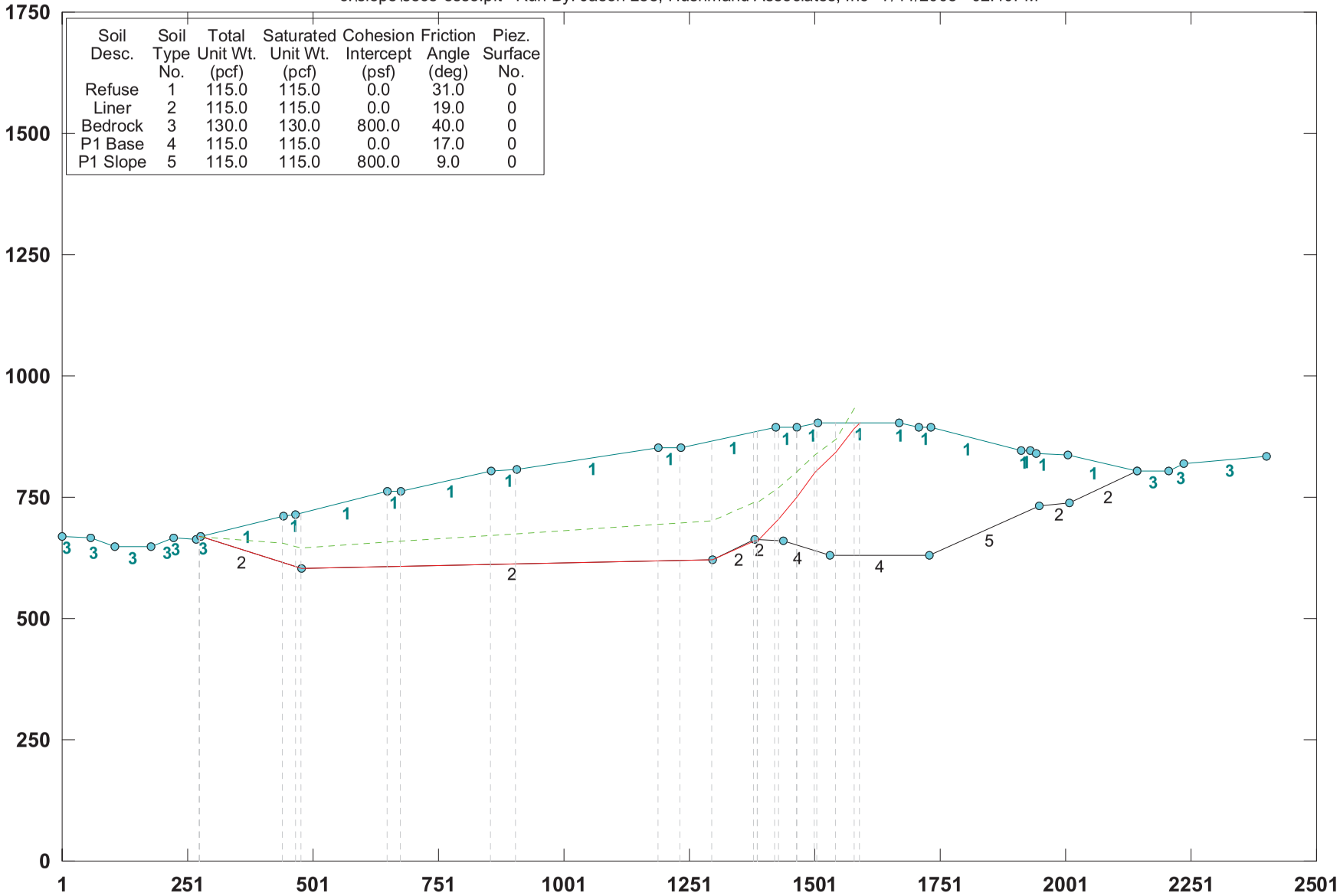
GSTABL7 v.2 FSmin=2.506

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION E-E', EAST, STATIC, FAILURE PLANE 3

c:\slope\sece-ess3.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 02:40PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.730

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

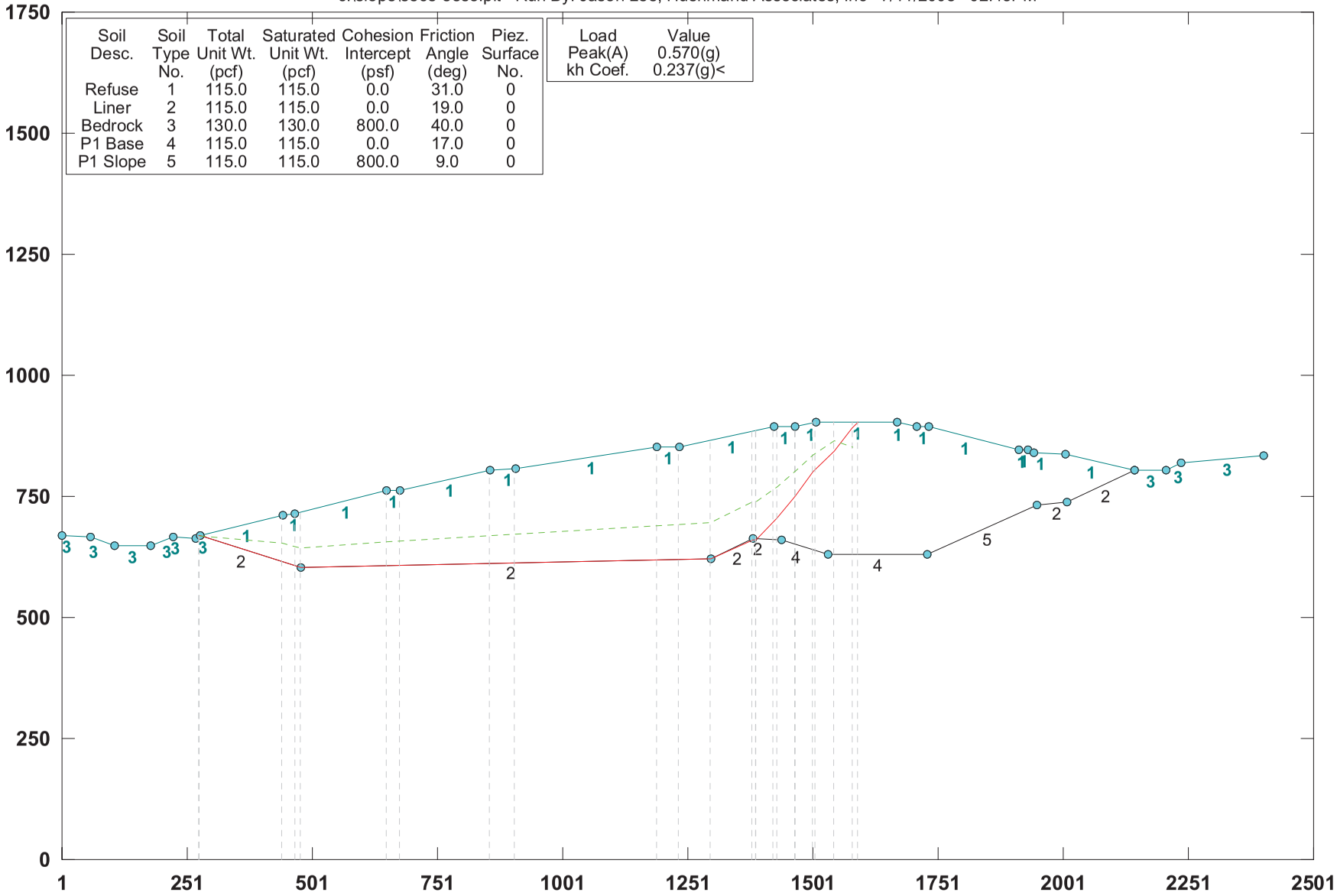
GSTABL7

KHF, SECTION E-E', EAST, PSEUD-STATIC, FAILURE PLANE 3

c:\slope\sece-ees3.plt Run By: Jason Lee, Hushmand Associates, Inc 7/11/2008 02:43PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.237(g)<

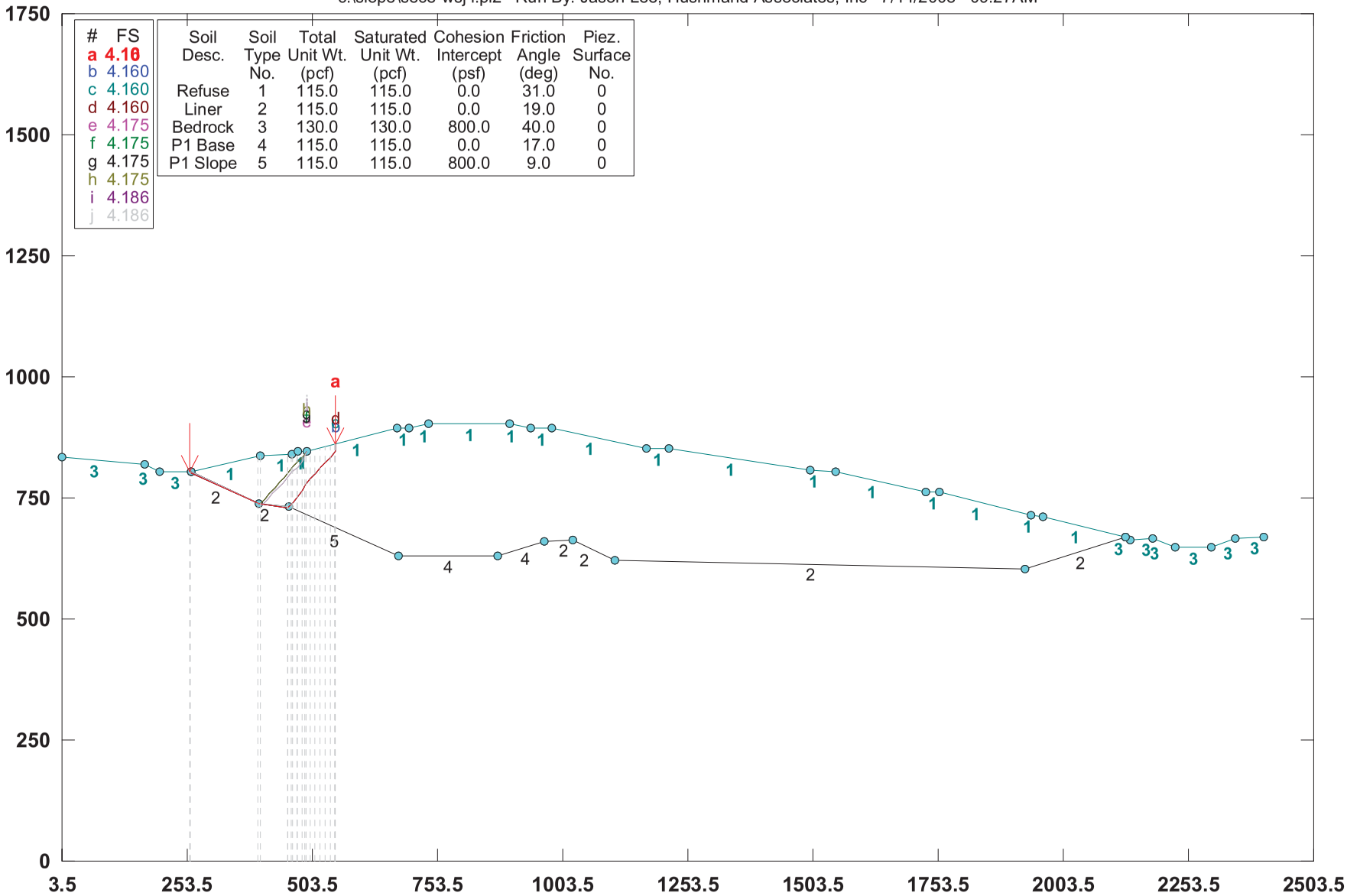


GSTABL7 v.2 FSmin=1.006

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION E-E' WEST, STATIC, FAILURE PLANE I

c:\slope\sece-wsj i.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:27AM



#	FS
a	4.160
b	4.160
c	4.160
d	4.160
e	4.175
f	4.175
g	4.175
h	4.175
i	4.186
j	4.186

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

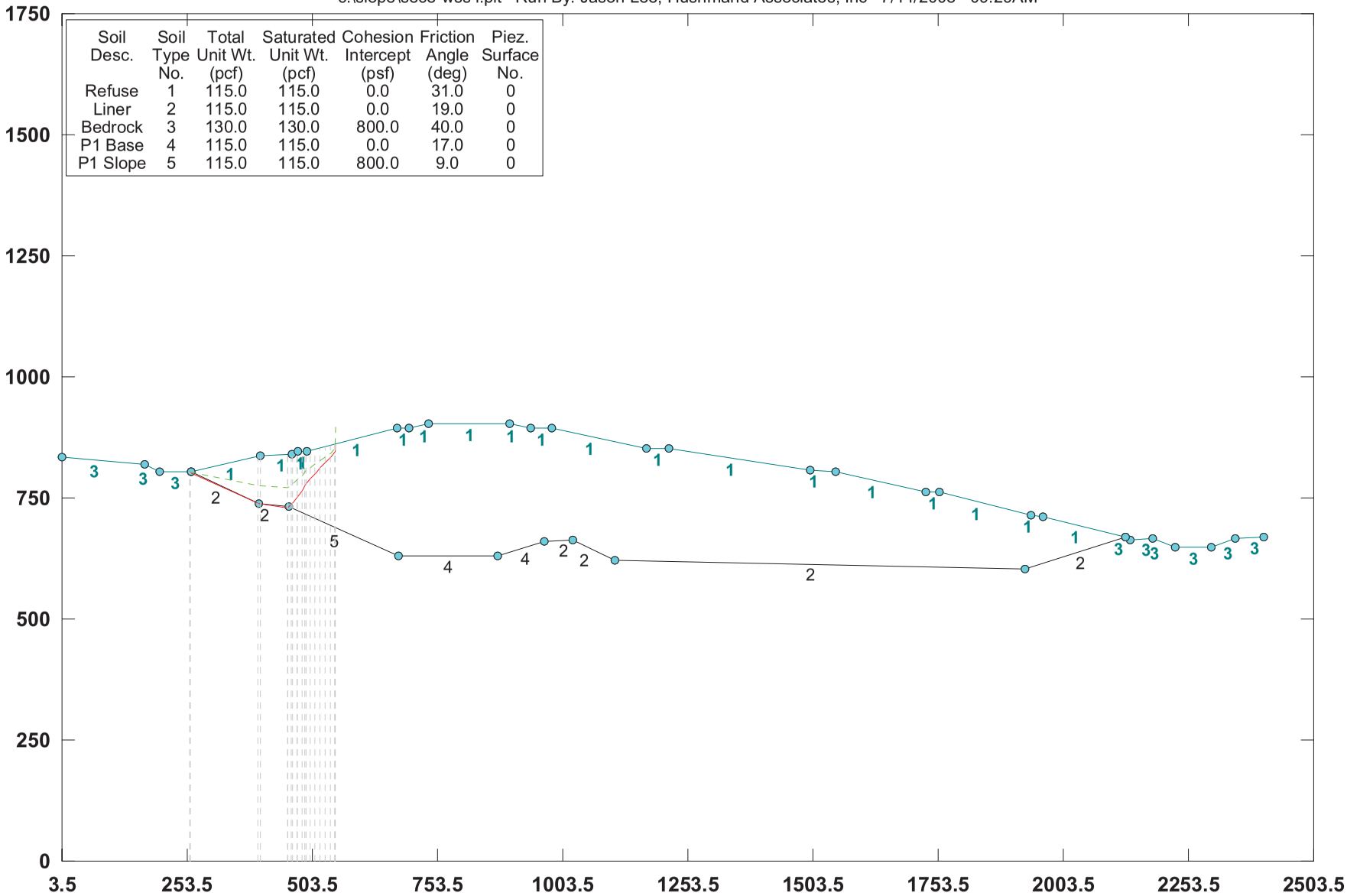
GSTABL7 v.2 FSmin=4.160

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION E-E', WEST, STATIC, FAILURE PLANE I

c:\slope\sece-wss i.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:29AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=5.431

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

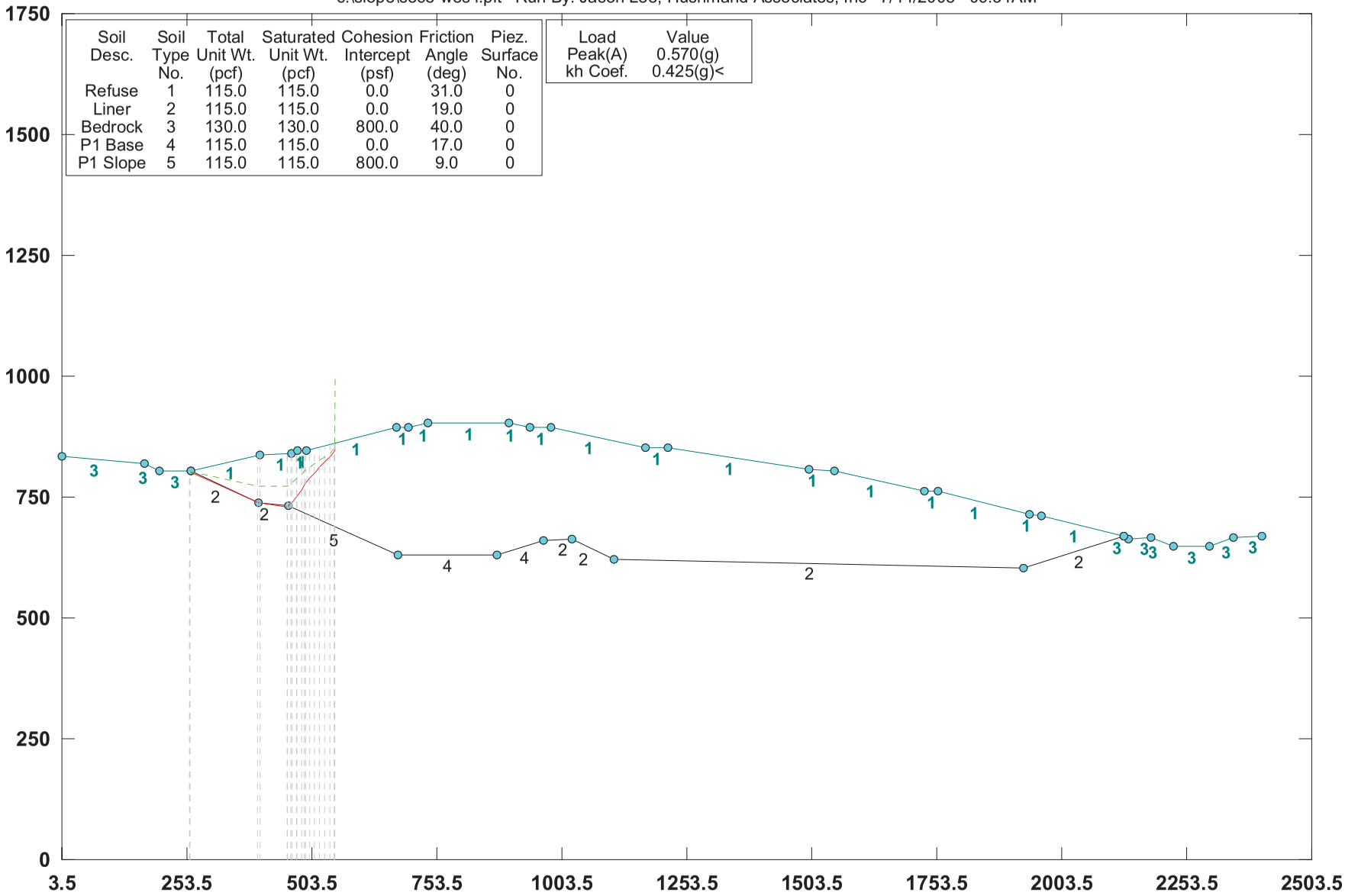
GSTABL7

KHF, SECTION E-E', WEST, PSEUD-STATIC, FAILURE PLANE I

c:\slope\sece-wes i.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:31AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.425(g)<



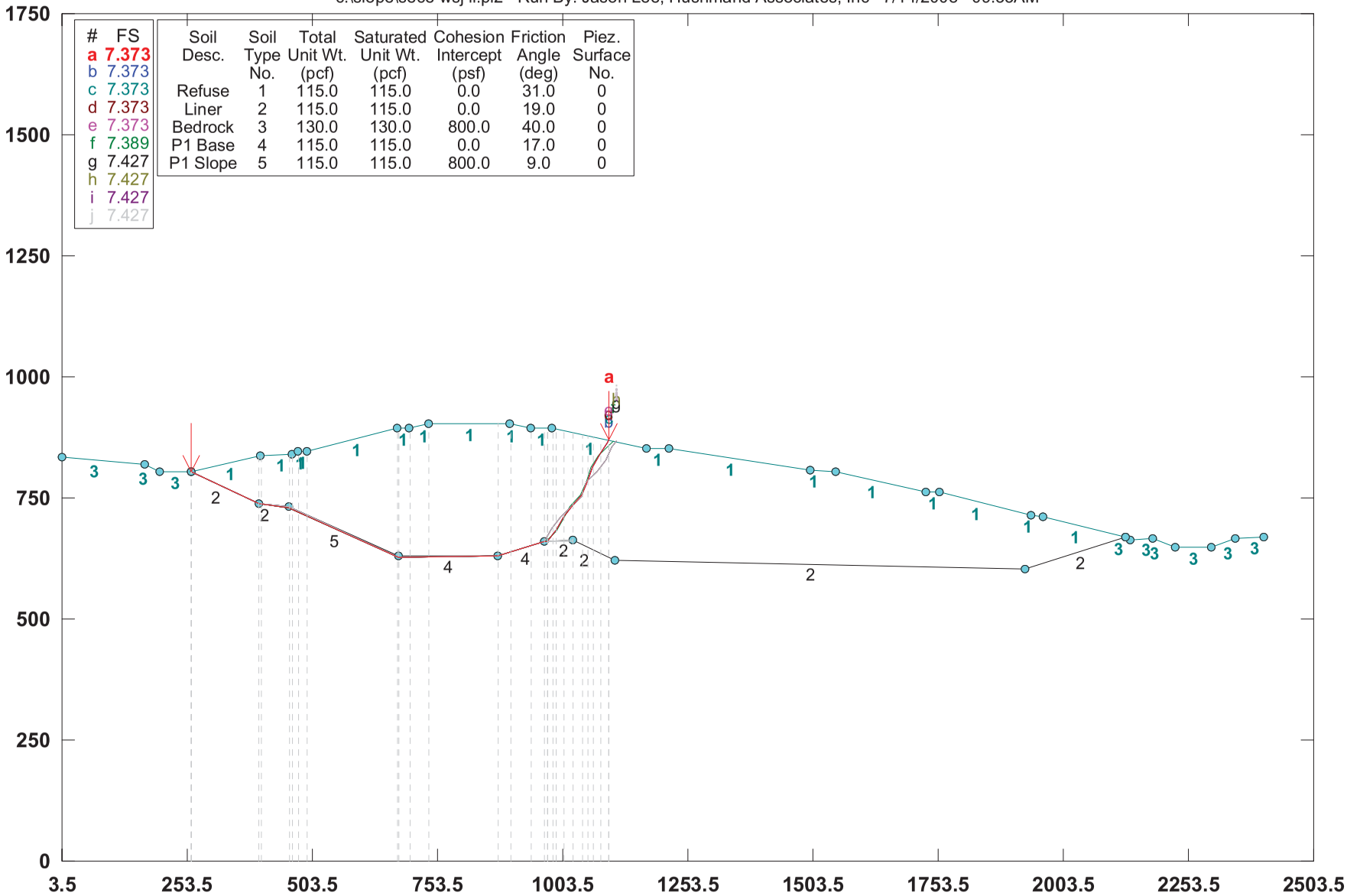
GSTABL7 v.2 FSmin=1.000

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SECTION E-E', WEST, STATIC, FAILURE PLANE II

c:\slope\sece-wsj ii.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:33AM



#	FS
a	7.373
b	7.373
c	7.373
d	7.373
e	7.373
f	7.389
g	7.427
h	7.427
i	7.427
j	7.427

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

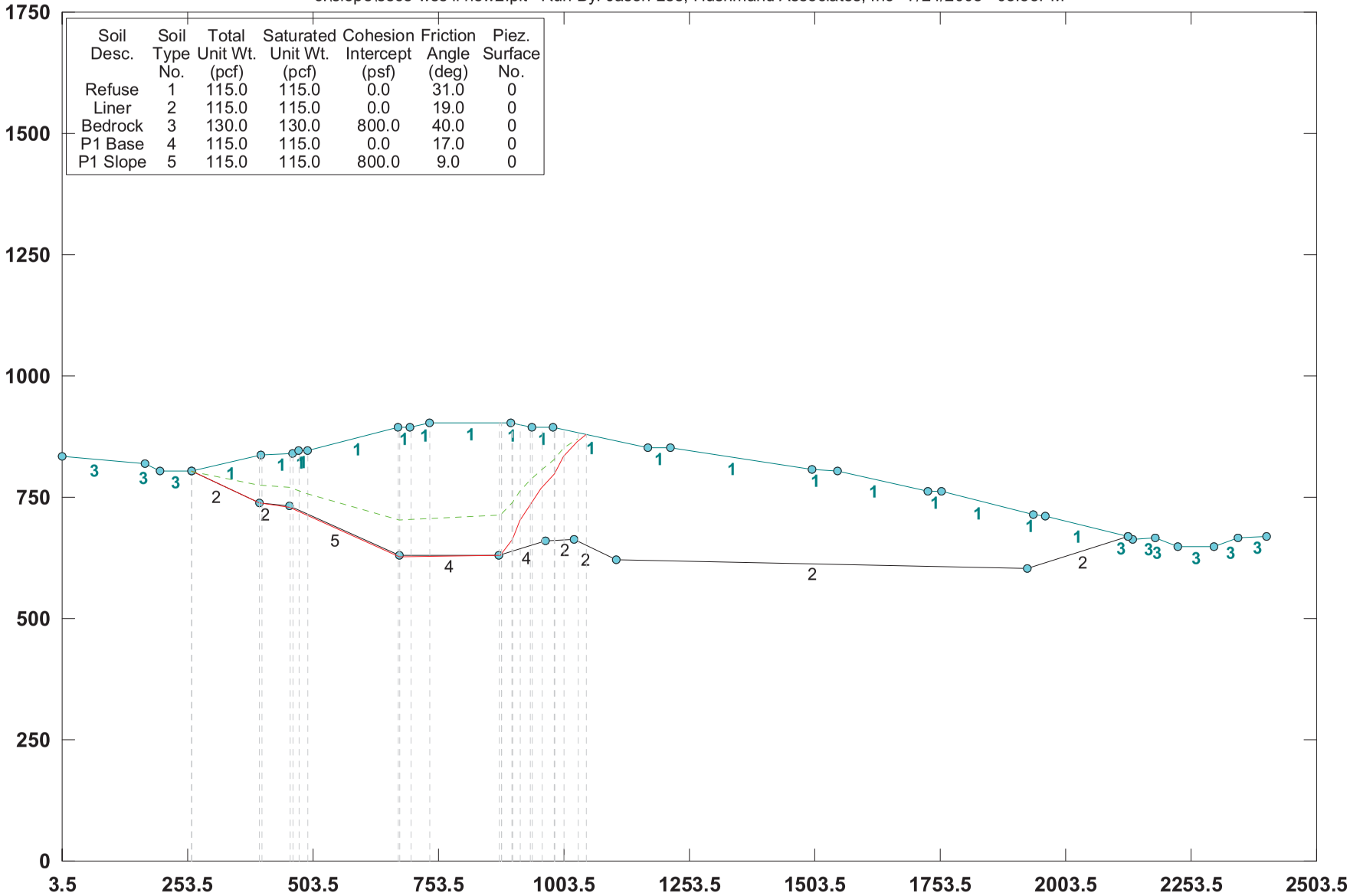
GSTABL7 v.2 FSmin=7.373

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION E-E', WEST, STATIC, FAILURE PLANE II

c:\slope\sece-wss ii new2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 03:53PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=8.89

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

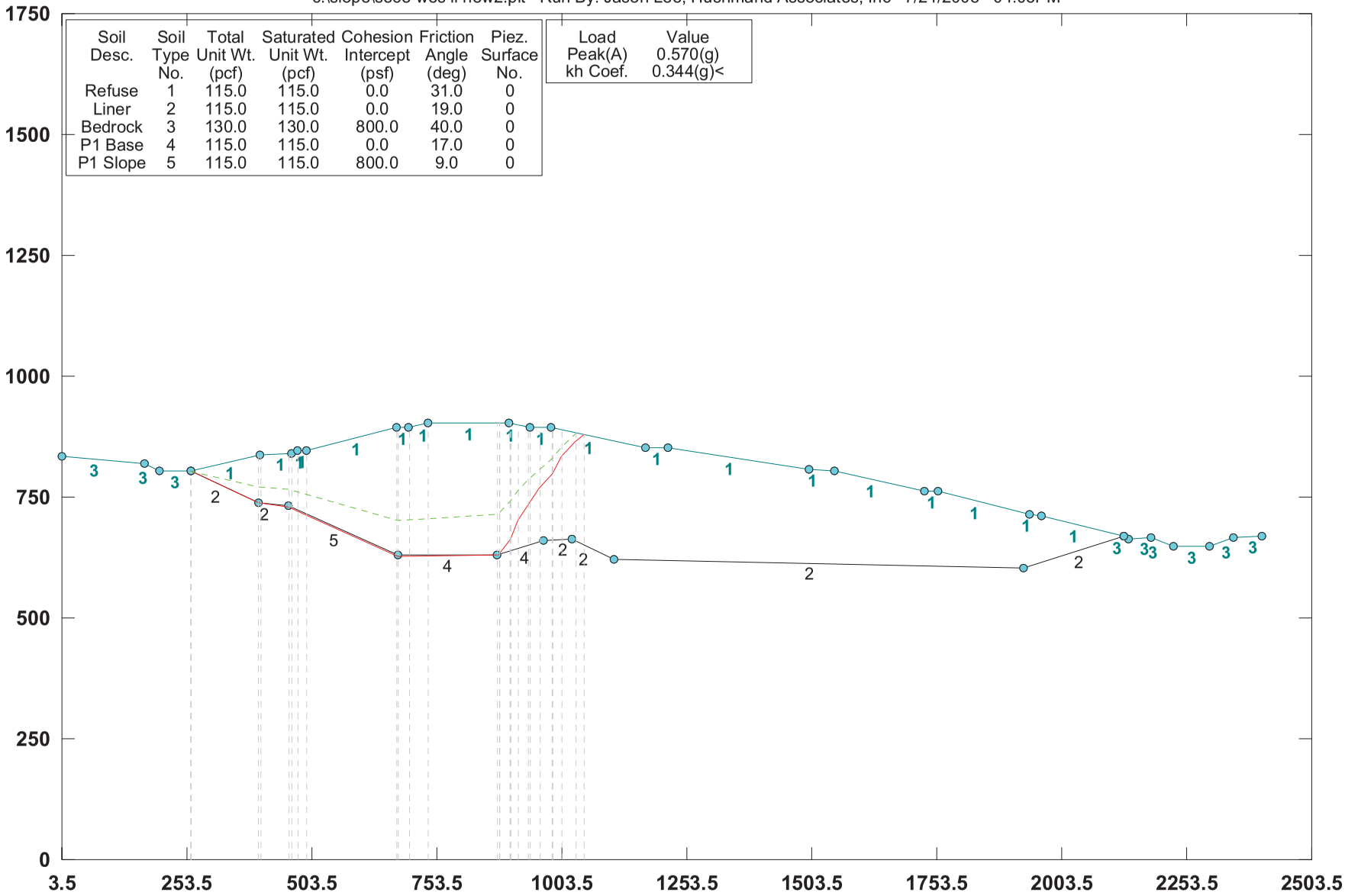
GSTABL7

KHF, SECTION E-E', WEST, STATIC, FAILURE PLANE II

c:\slope\sece-wes ii new2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 04:03PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.344(g)<



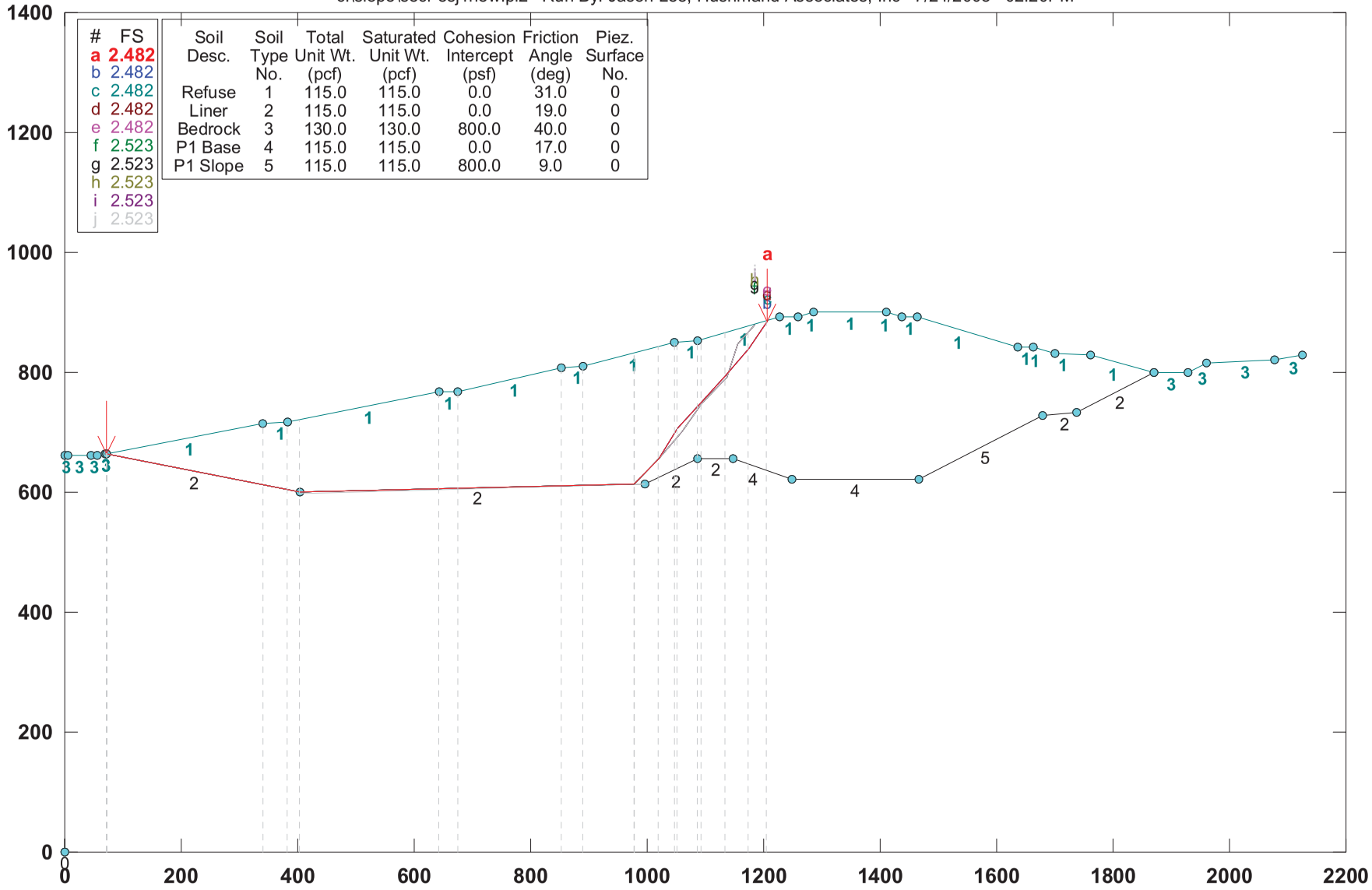
GSTABL7 v.2 FSmin=1.004

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SECTION F-F', EAST, STATIC, FAILURE PLANE 1

c:\slope\secf-esj1new.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 02:20PM



#	FS
a	2.482
b	2.482
c	2.482
d	2.482
e	2.482
f	2.523
g	2.523
h	2.523
i	2.523
j	2.523

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

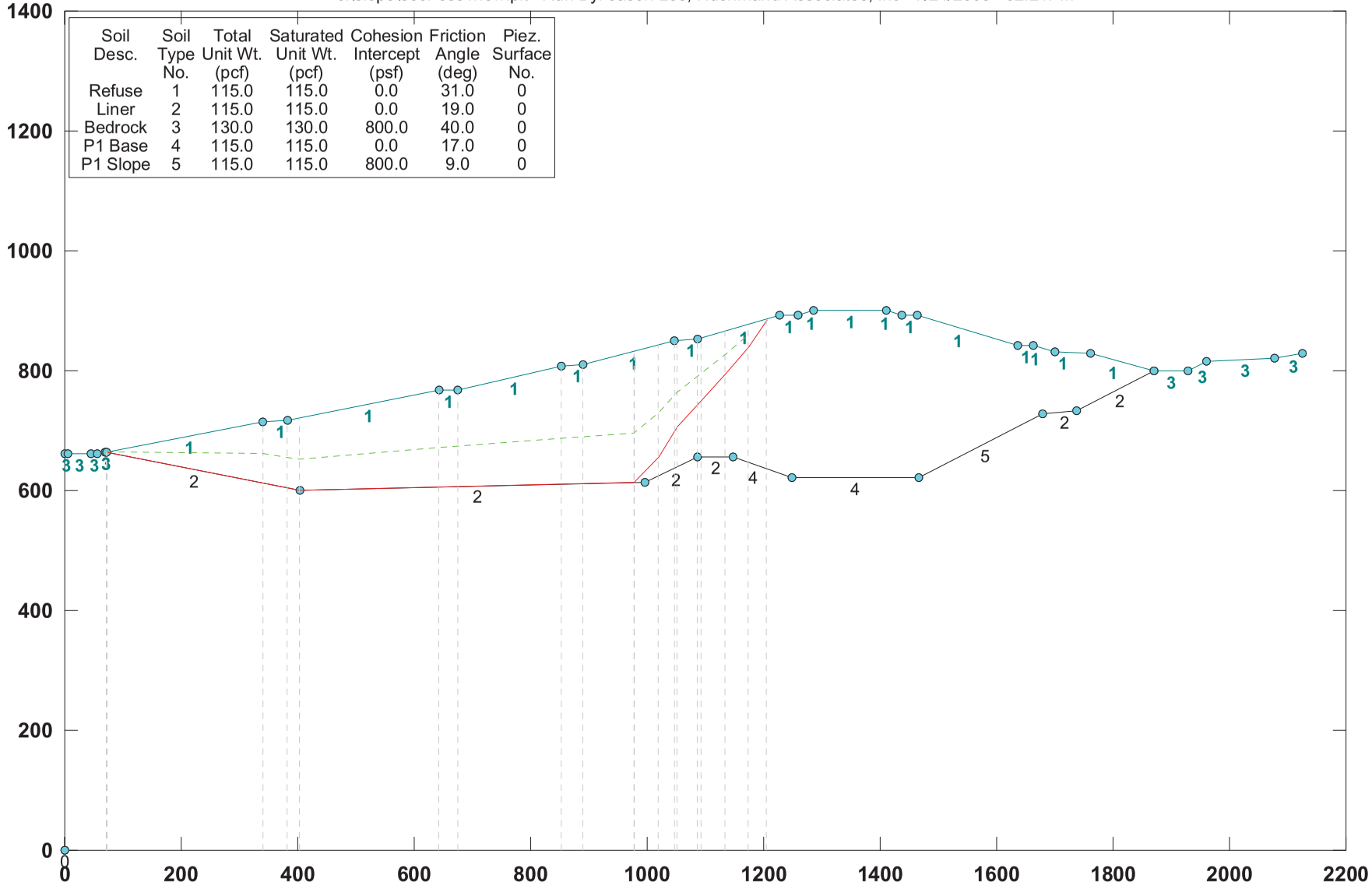
GSTABL7 v.2 FSmin=2.482

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION F-F', EAST, STATIC, FAILURE PLANE 1

c:\slope\secf-ess1new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 02:21PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.805

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

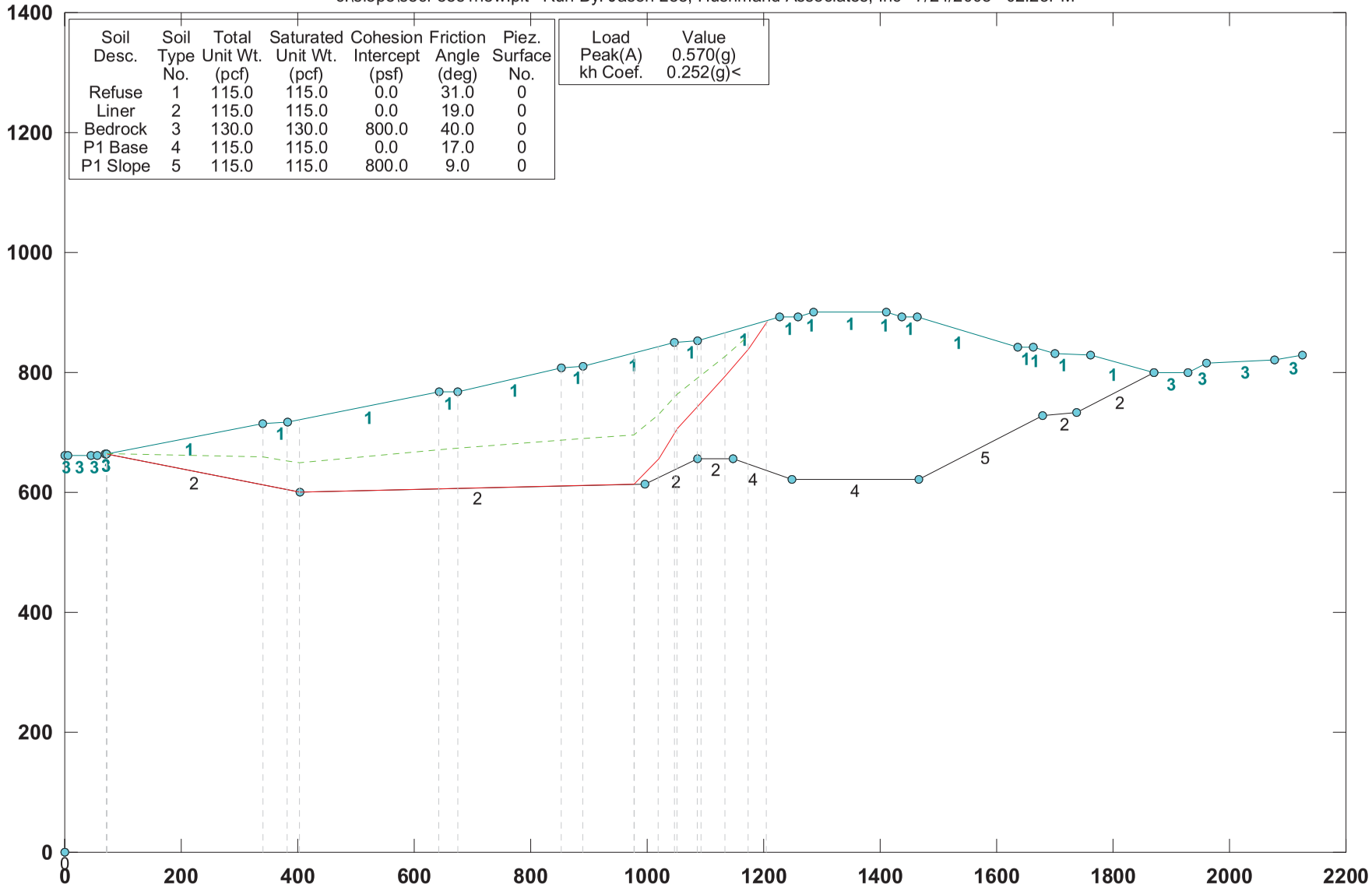
GSTABL7

KHF, SECTION F-F', EAST, STATIC, FAILURE PLANE 1

c:\slope\secf-ees1new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/24/2008 02:23PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.252(g)<

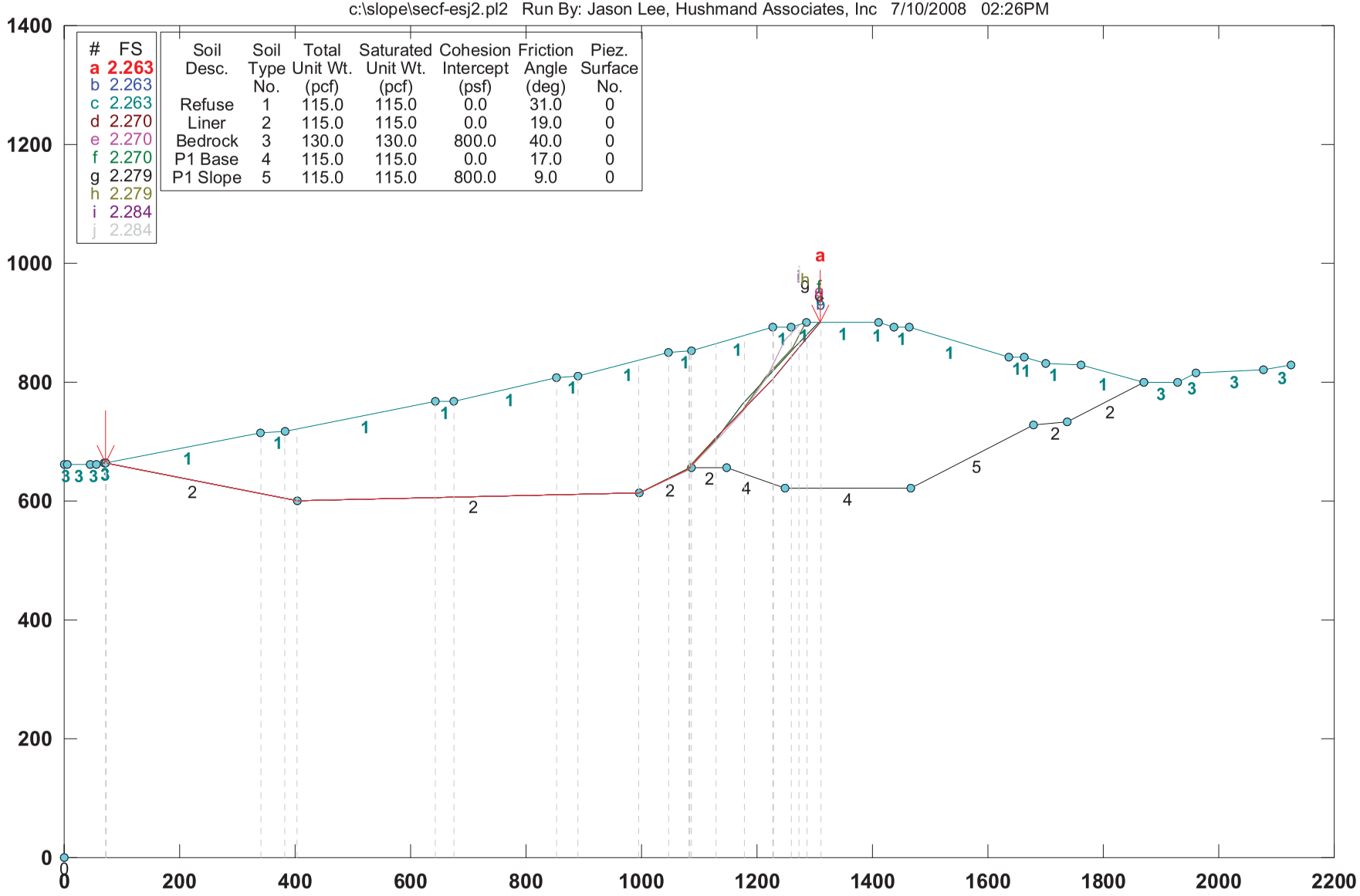


GSTABL7 v.2 FSmin=1.005

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION F-F', EAST, STATIC, FAILURE PLANE 2

c:\slope\secf-esj2.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 02:26PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

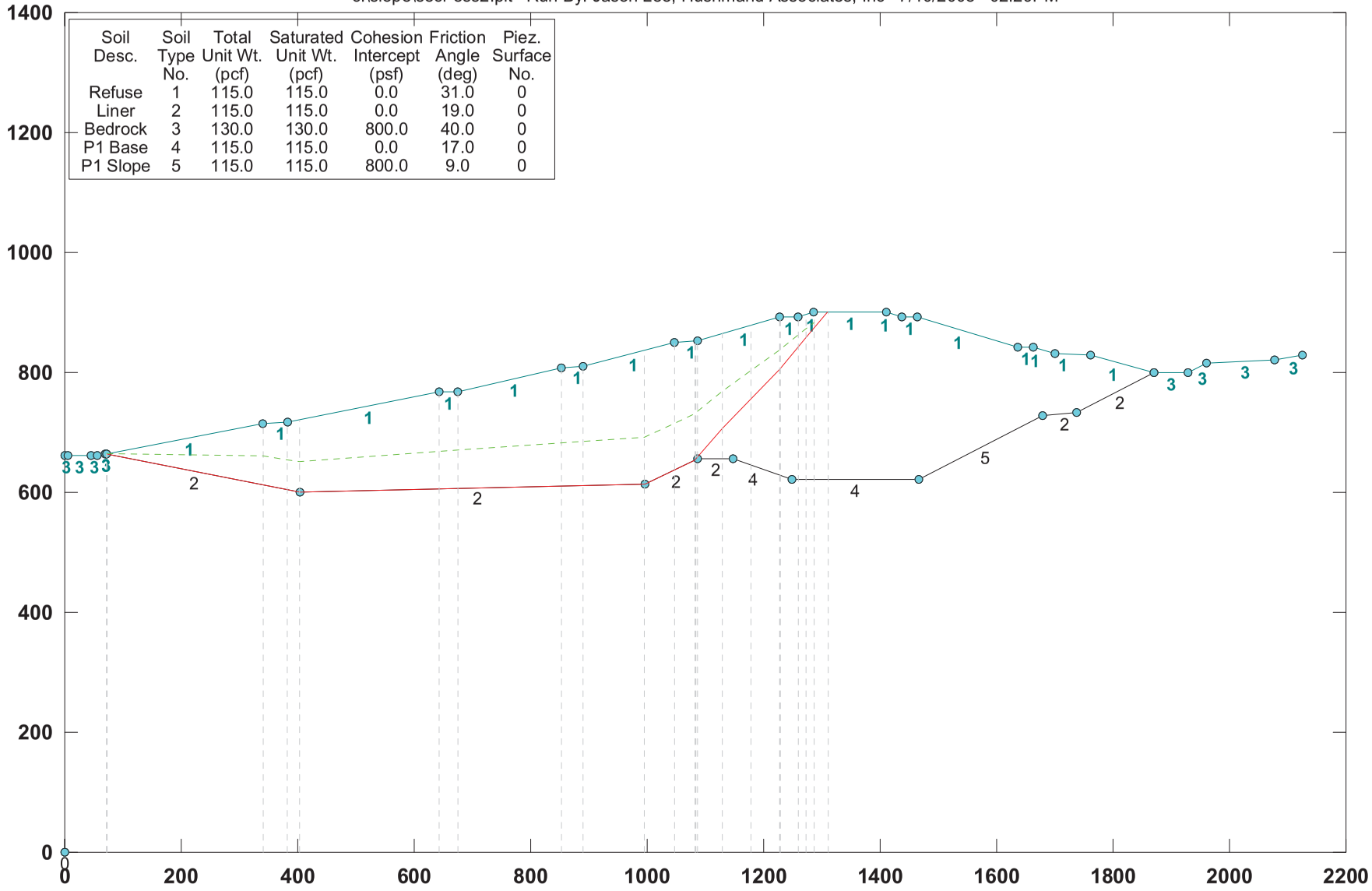
GSTABL7 v.2 FSmin=2.263

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION F-F', EAST, STATIC, FAILURE PLANE 2

c:\slope\secf-ess2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 02:29PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.467

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

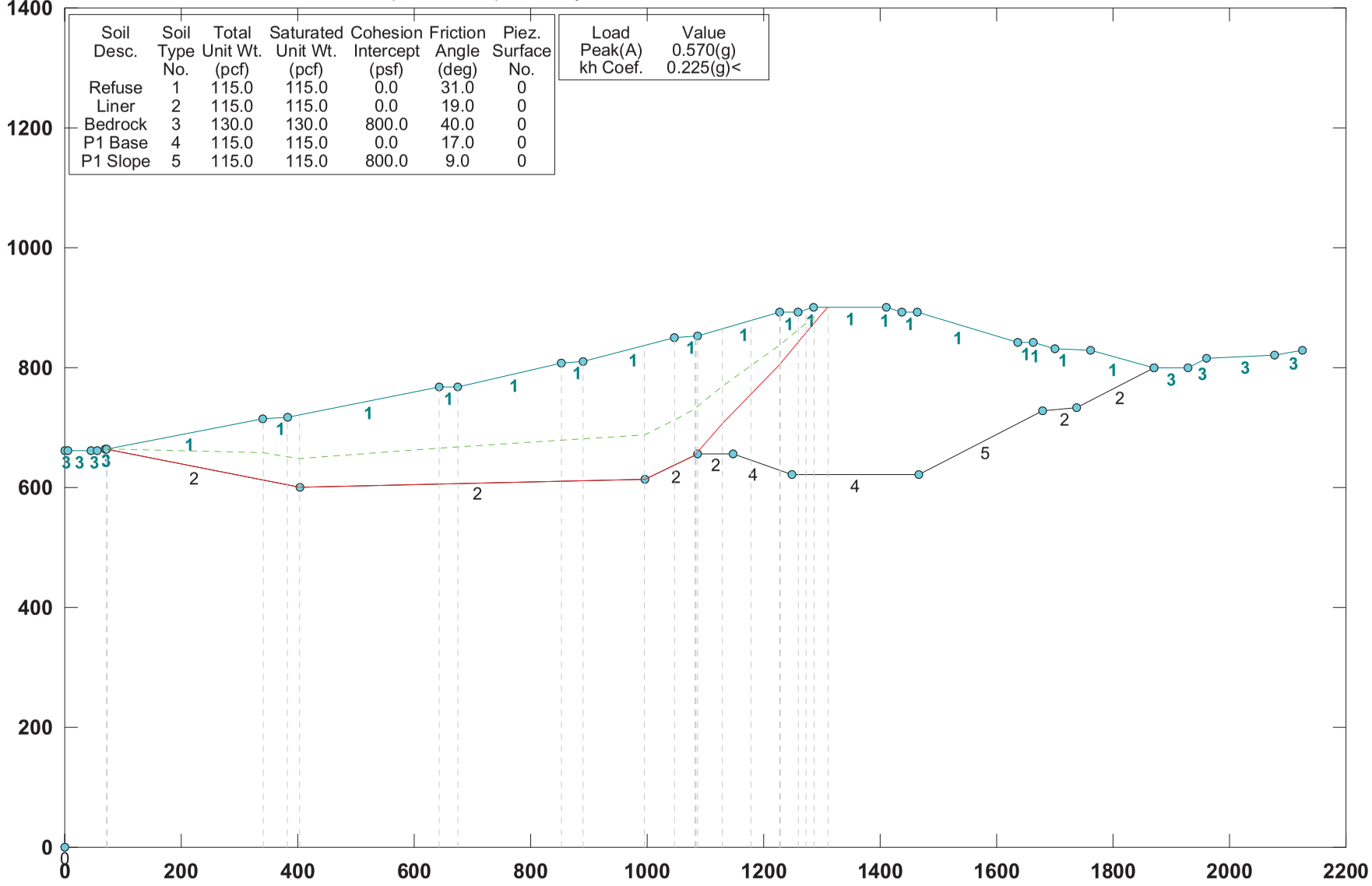
GSTABL7

KHF, SECTION F-F', EAST, PSEUDO-STATIC, FAILURE PLANE 2

c:\slope\secf-ees2.plt Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 02:42PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.225(g)<

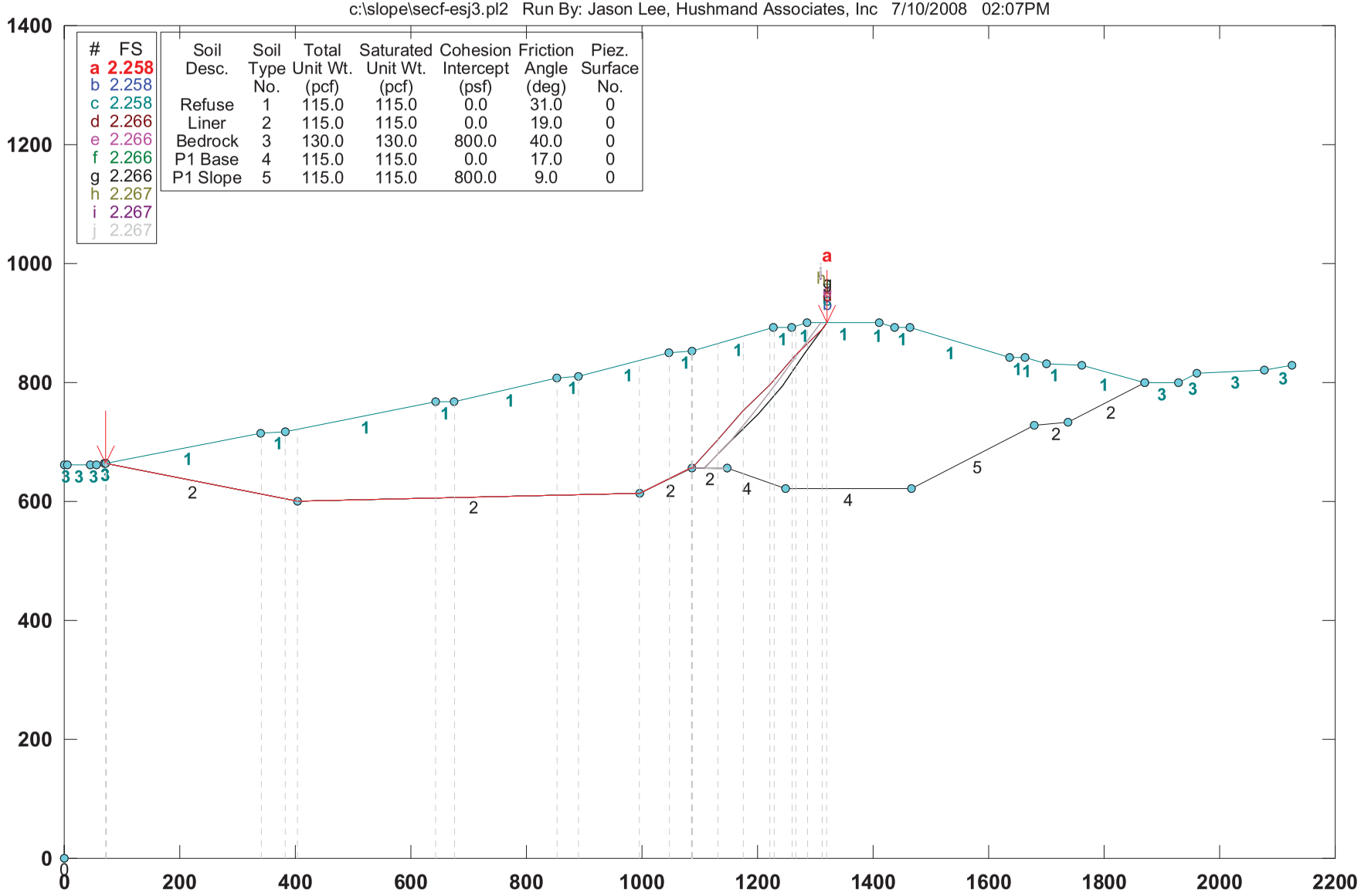


GSTABL7 v.2 FSmin=1.004

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION F-F', EAST, STATIC, FAILURE PLANE 3

c:\slope\secf-esj3.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 02:07PM



#	FS
a	2.258
b	2.258
c	2.258
d	2.266
e	2.266
f	2.266
g	2.266
h	2.267
i	2.267
j	2.267

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

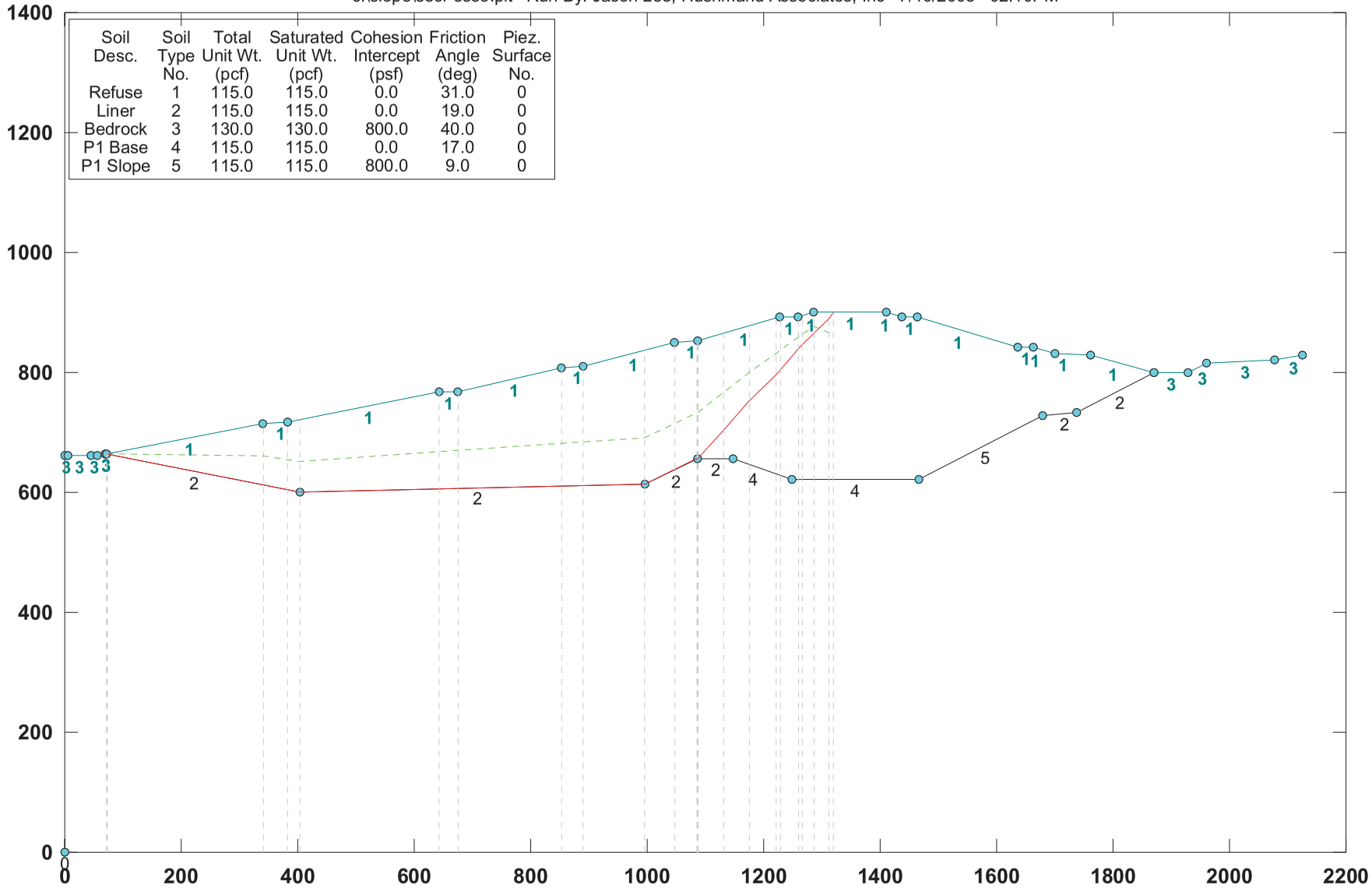
GSTABL7 v.2 FSmin=2.258

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION F-F', EAST, STATIC, FAILURE PLANE 3

c:\slope\secf-ess3.plt Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 02:10PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=2.460

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

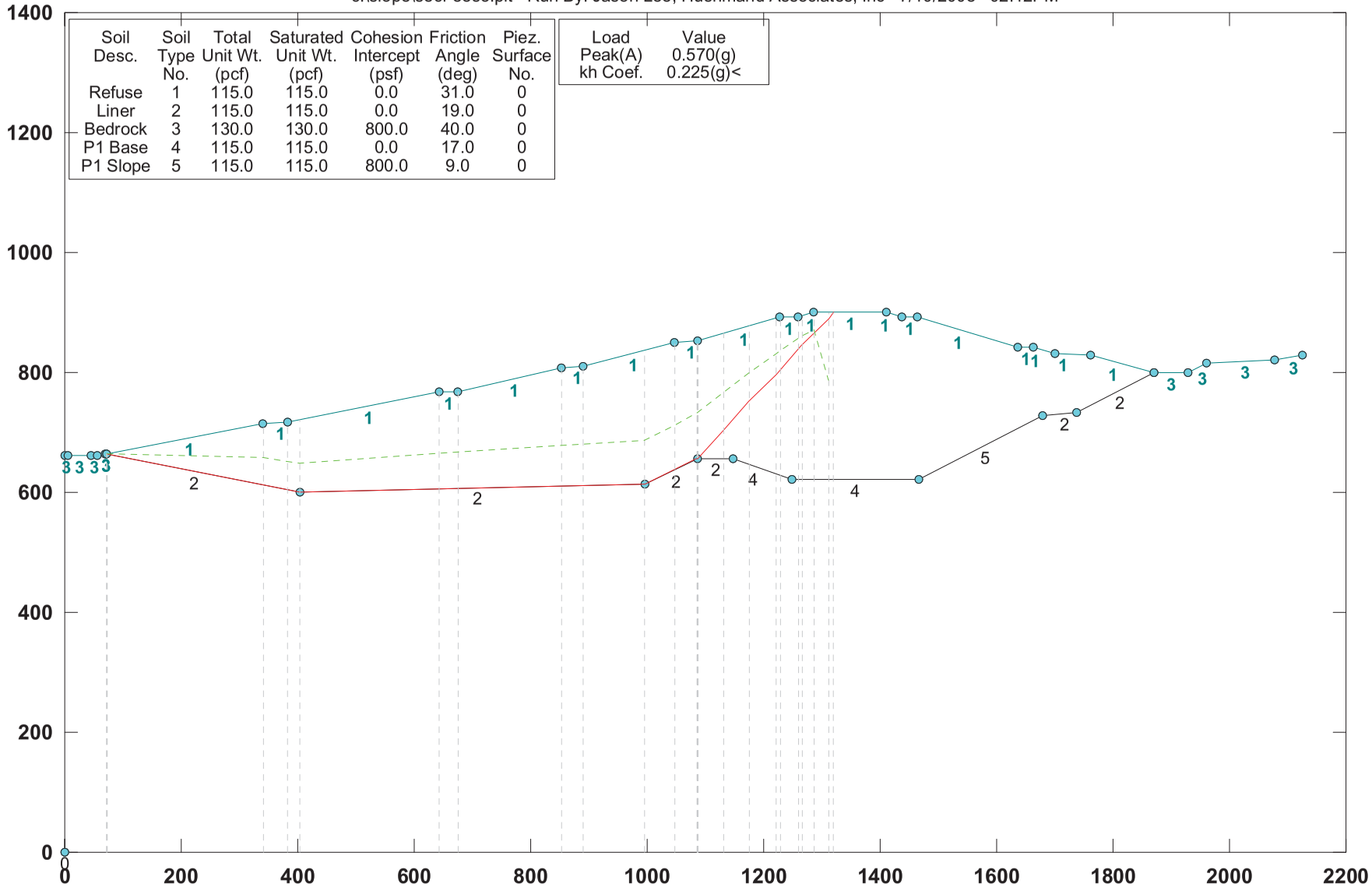
GSTABL7

KHF, SECTION F-F', EAST, PSEUDO-STATIC, FAILURE PLANE 3

c:\slope\secf-ees3.plt Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 02:12PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.225(g)<

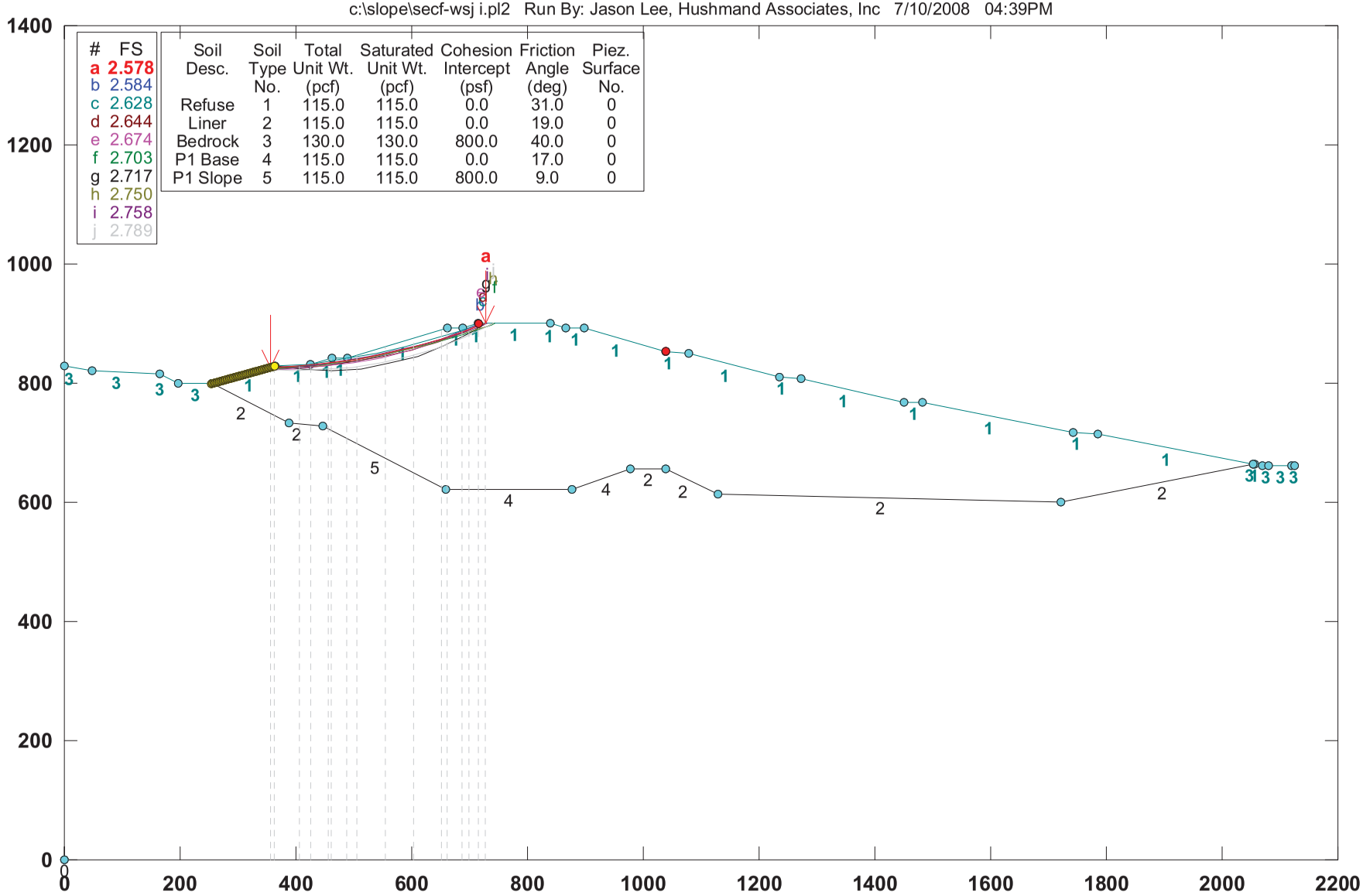


GSTABL7 v.2 FSmin=1.002

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE I

c:\slope\secf-wsj i.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 04:39PM



#	FS
a	2.578
b	2.584
c	2.628
d	2.644
e	2.674
f	2.703
g	2.717
h	2.750
i	2.758
j	2.789

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

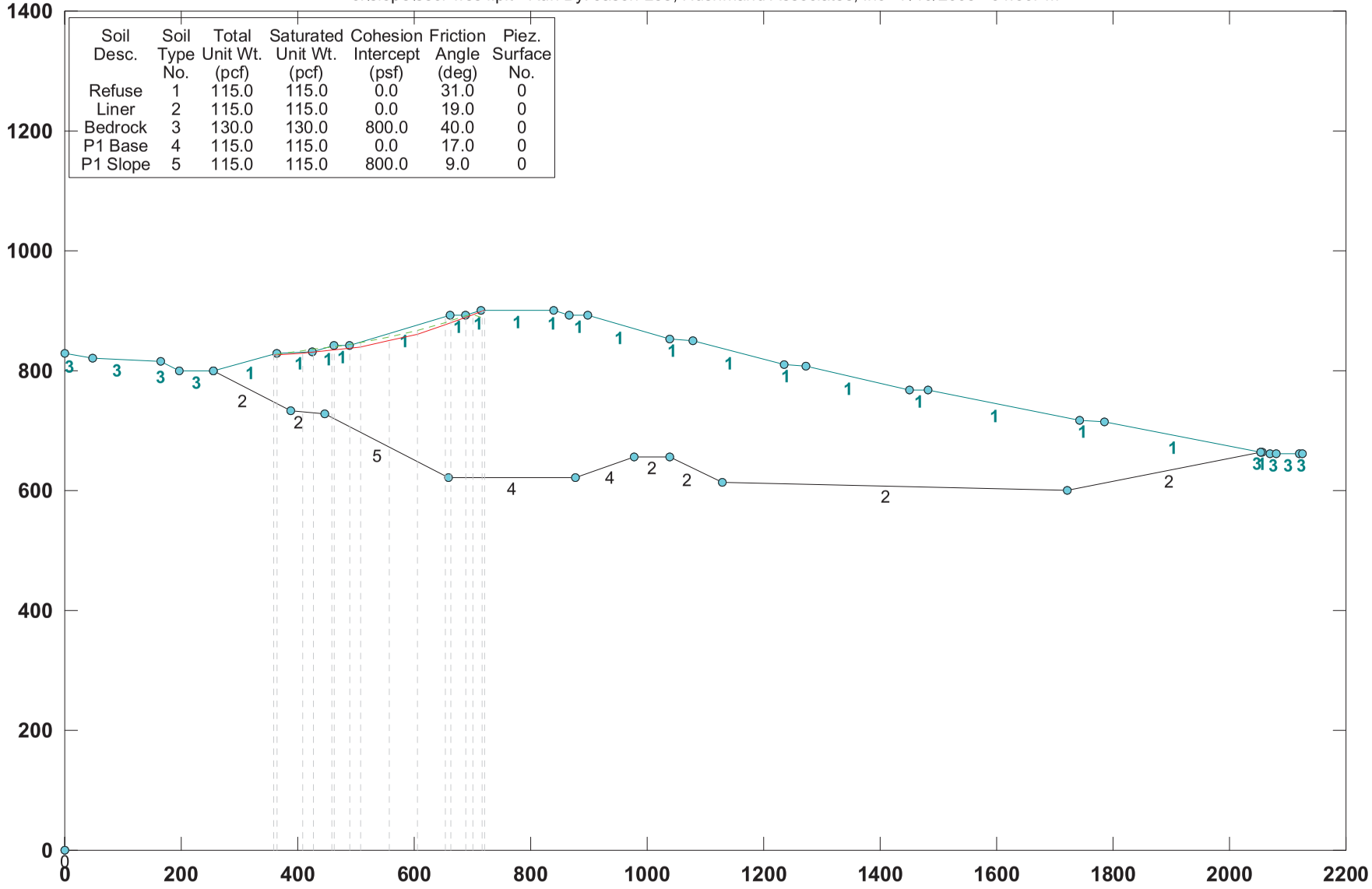
GSTABL7 v.2 FSmin=2.578

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE I

c:\slope\secf-wss i.plt Run By: Jason Lee, Hushmand Associates, Inc 7/10/2008 04:30PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

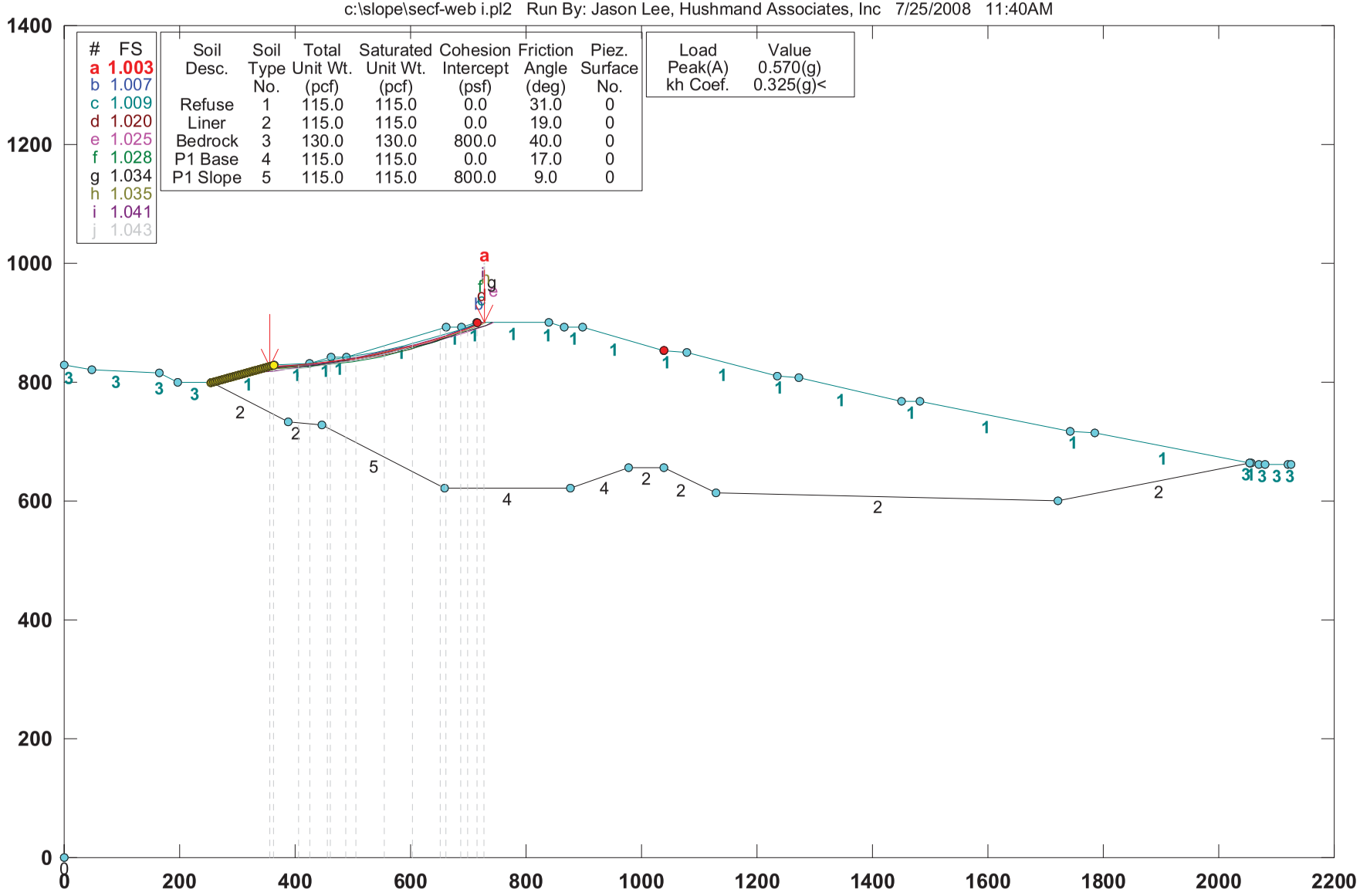
GSTABL7 v.2 FSmin=2.547

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE I

c:\slope\secf-web i.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/25/2008 11:40AM



#	FS
a	1.003
b	1.007
c	1.009
d	1.020
e	1.025
f	1.028
g	1.034
h	1.035
i	1.041
j	1.043

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.325(g)<

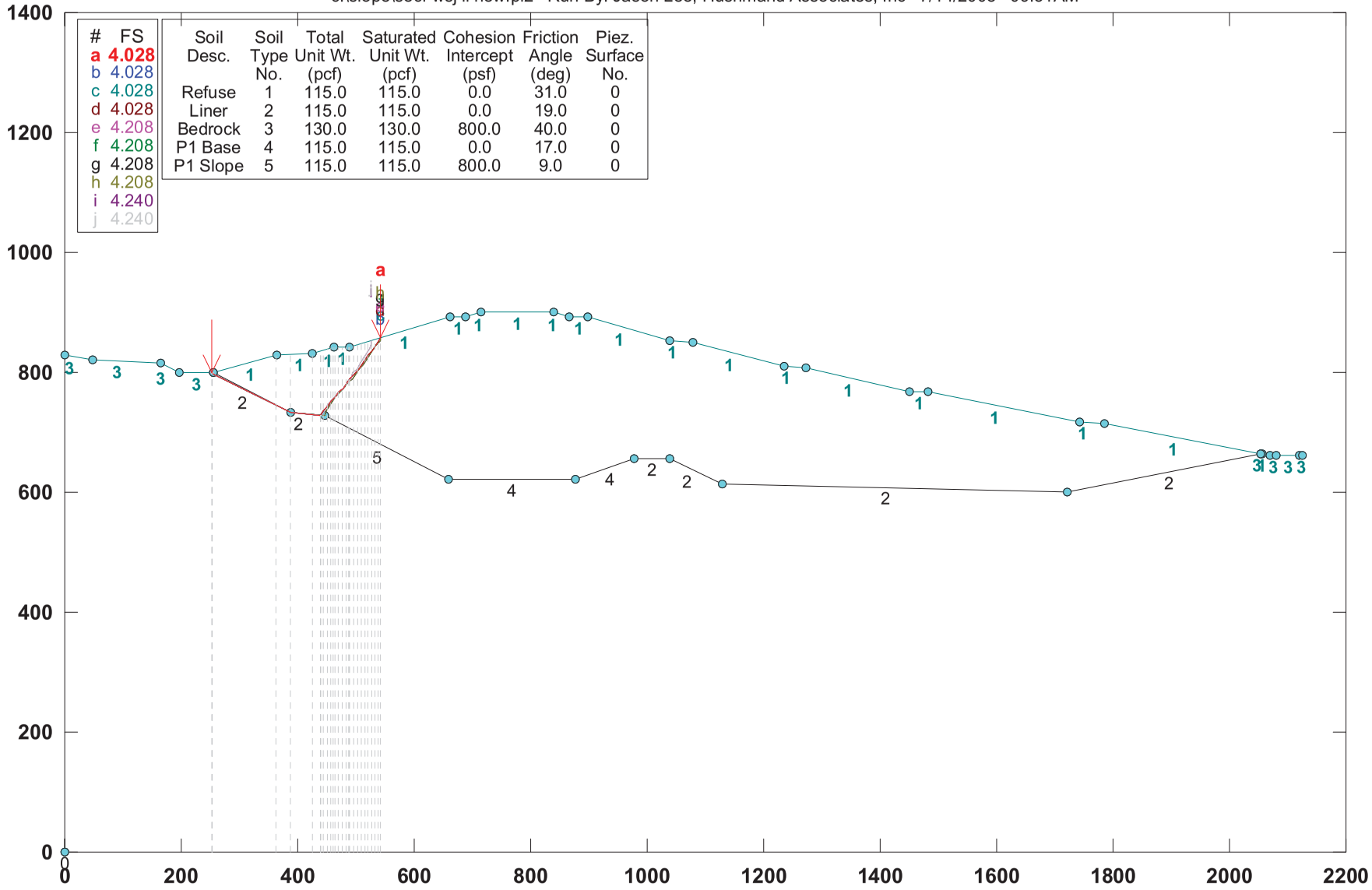
GSTABL7 v.2 FSmin=1.003

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE II

c:\slope\secf-wsj ii new.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:51AM



#	FS
a	4.028
b	4.028
c	4.028
d	4.028
e	4.208
f	4.208
g	4.208
h	4.208
i	4.240
j	4.240

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

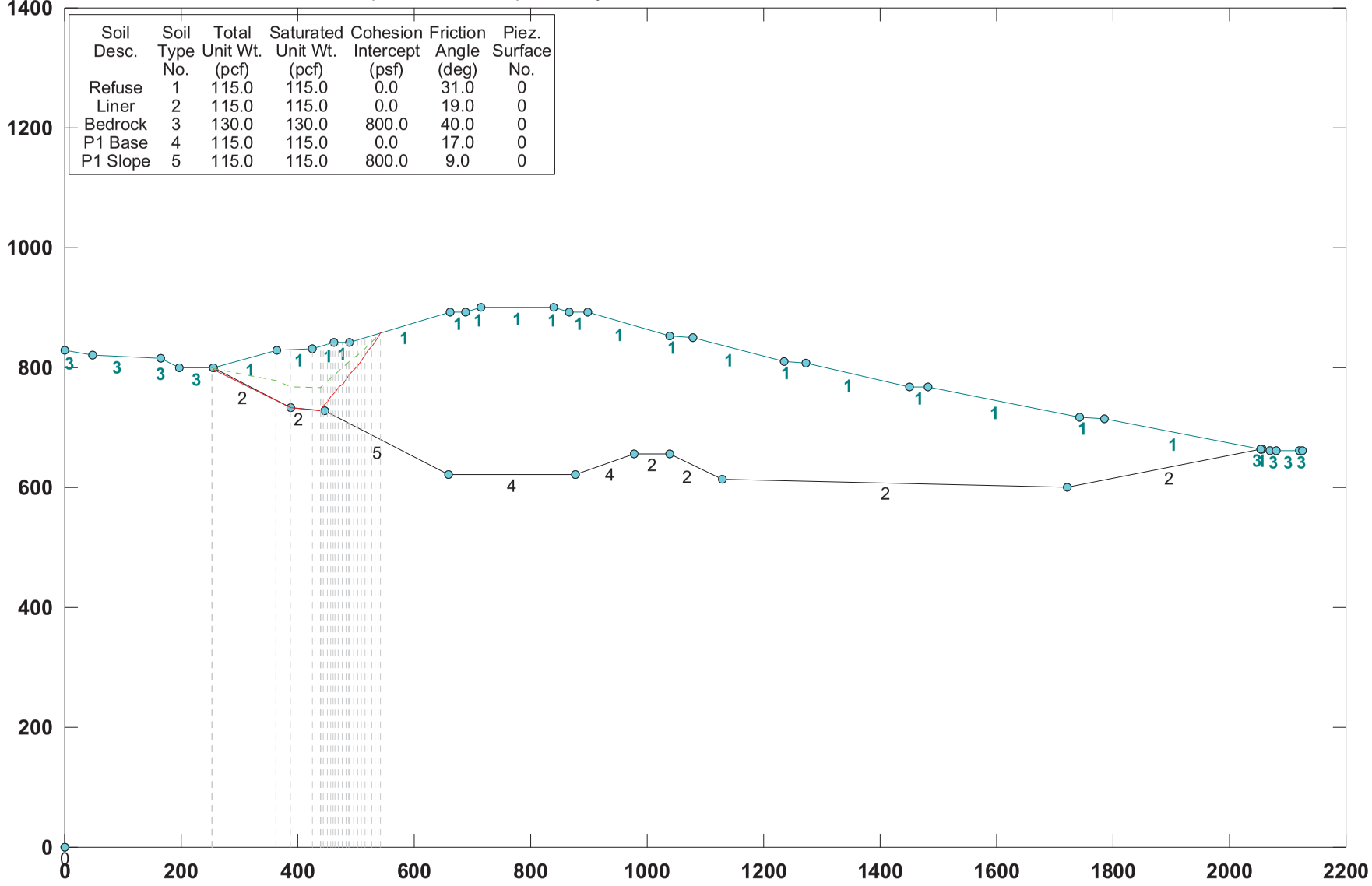
GSTABL7 v.2 FSmin=4.028

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE II

c:\slope\secf-wss ii new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:53AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=5.894

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

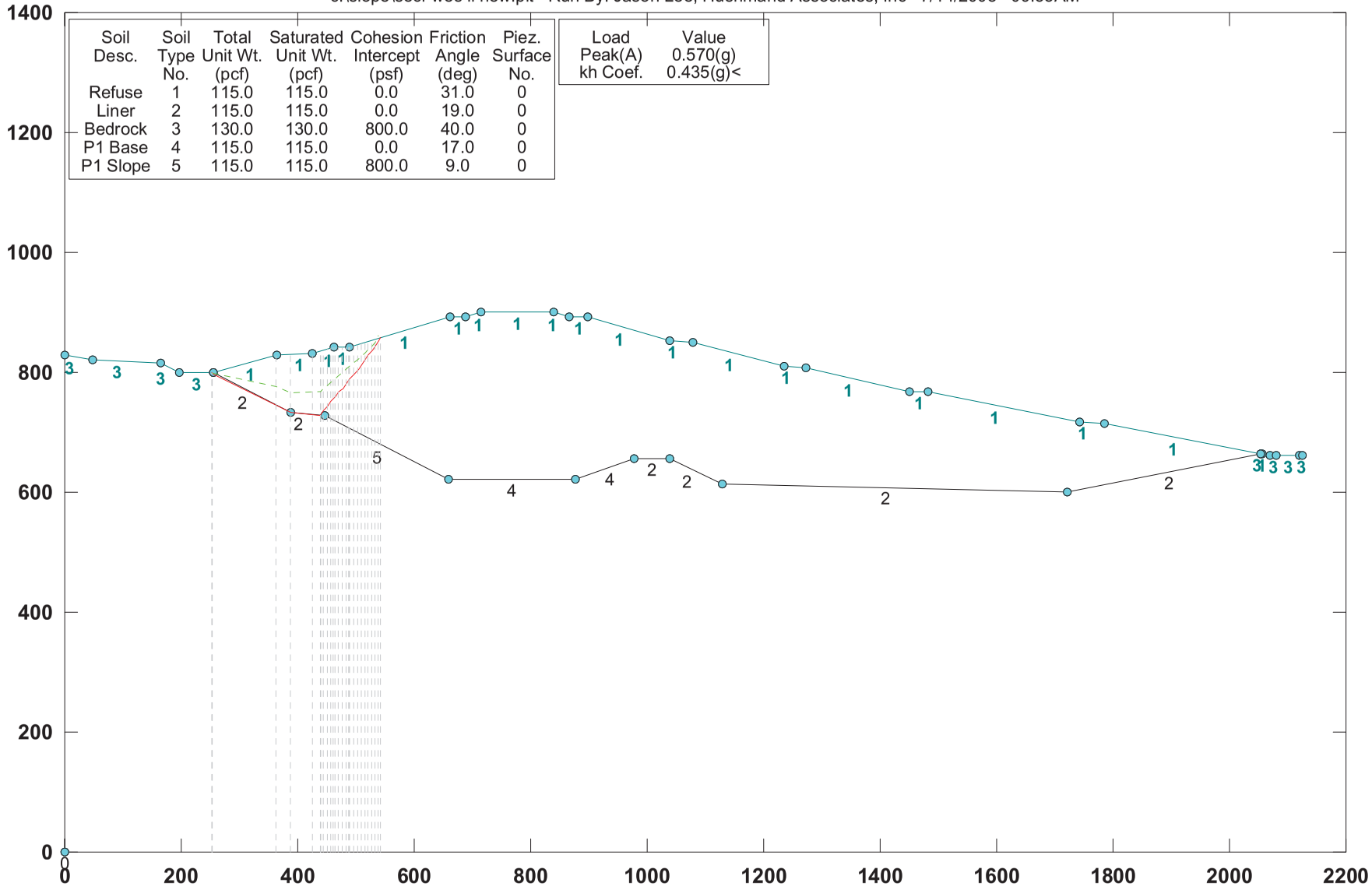
GSTABL7

KHF, SECTION F-F', WEST, PSEUDO-STATIC, FAILURE PLANE II

c:\slope\secf-wes ii new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:55AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.435(g)<

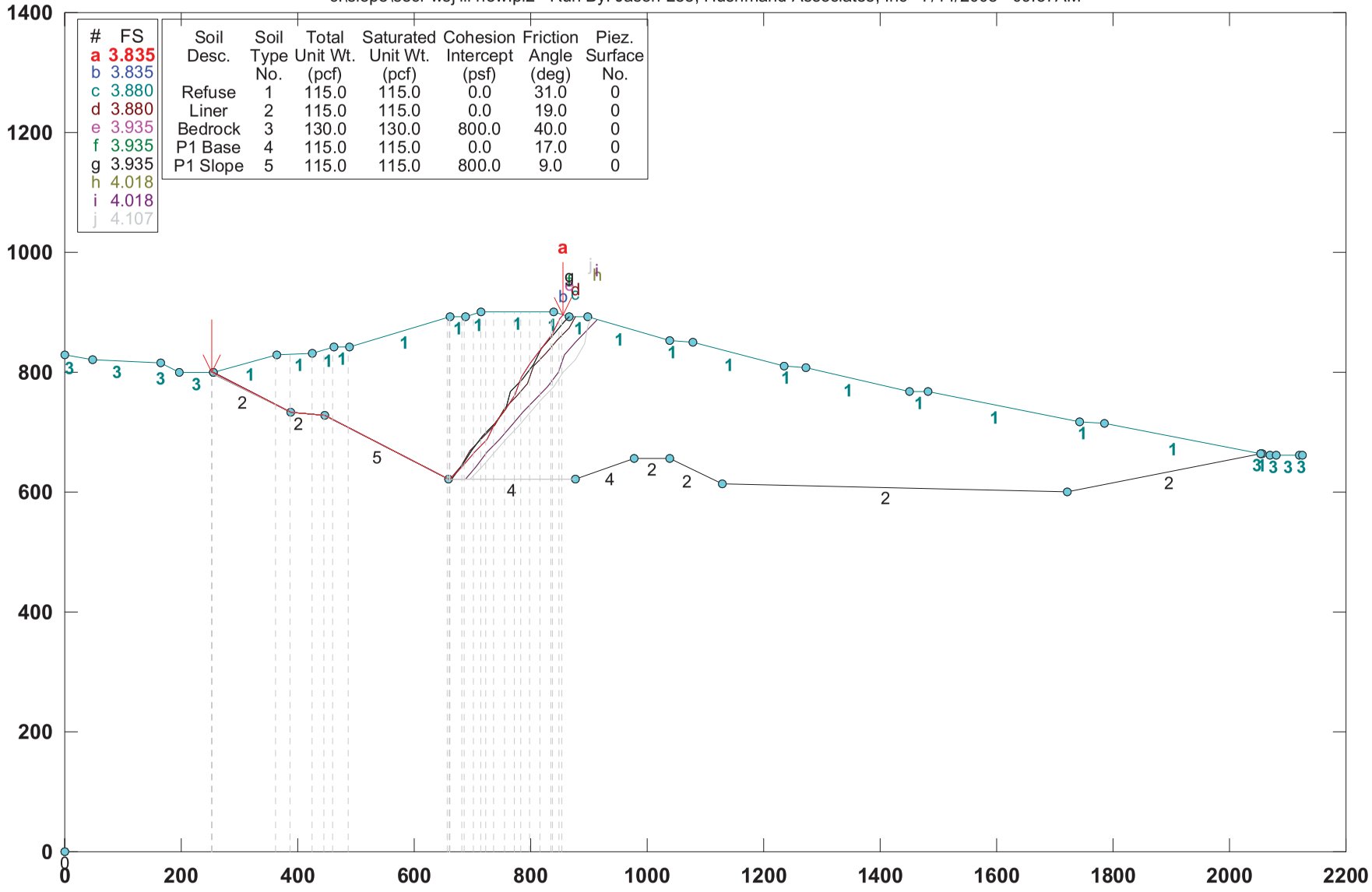


GSTABL7 v.2 FSmin=1.006

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE III

c:\slope\secf-wsj iii new.pl2 Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:57AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

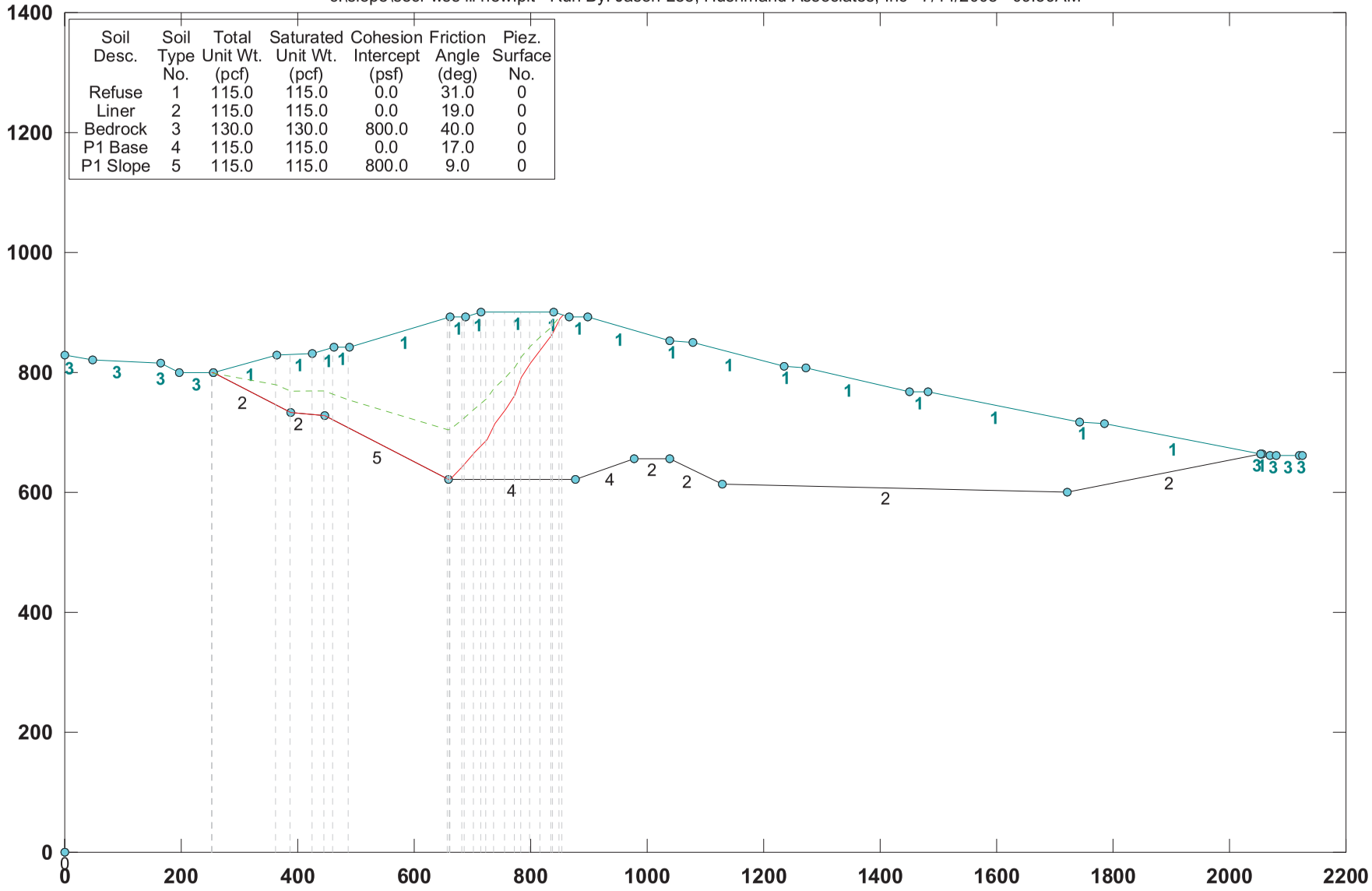
GSTABL7 v.2 FSmin=3.835

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE III

c:\slope\secf-wss iii new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 09:59AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

GSTABL7 v.2 FSmin=7.205

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

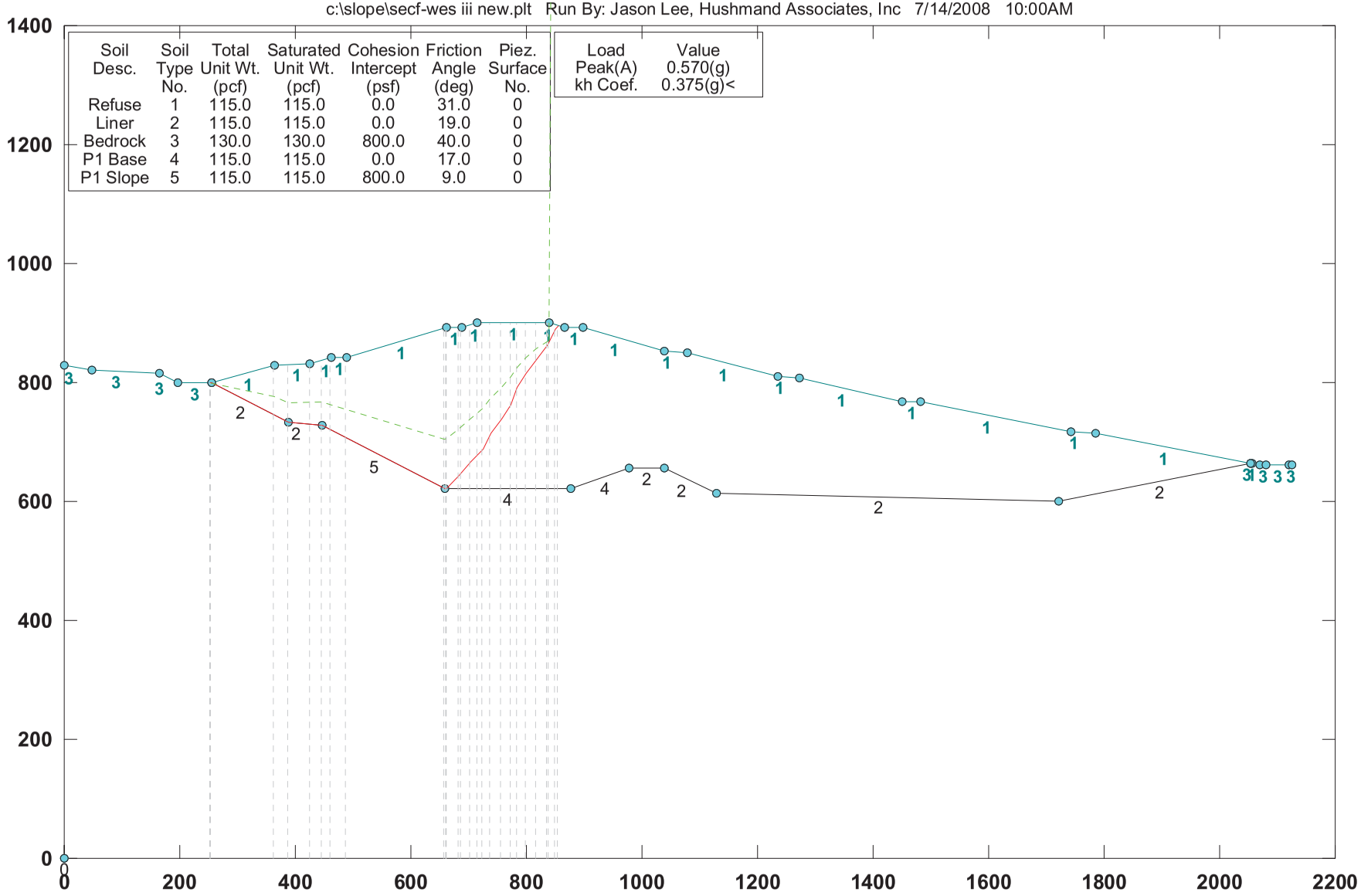
GSTABL7

KHF, SECTION F-F', WEST, PSEUDO-STATIC, FAILURE PLANE III

c:\slope\secf-wes iii new.plt Run By: Jason Lee, Hushmand Associates, Inc 7/14/2008 10:00AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.375(g)<



GSTABL7 v.2 FSmin=1.006

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

```
Kettelman Hills Landfill B-18 Site Response, F East, Pacoima 360
UNITS (E for English, S for SI):                                  *** (A1)
***
E
       DRF        PRM    ROCKVP    ROCKVS   ROCKRHO                 *** (5F10.0)
***
         1       0.65   3000.00   2500.00    150.00
 NELM NDPT NSLP                                                   *** (3I5)
***
 1504 1586    1
KGMAX KGEQ N1EQ N2EQ N3EQ NUMB   KV KSAV                           *** (8I5)
***
 2000 2000    1    1 2000    4    1
      DTEQ    EQMUL1    EQMUL2    UGMAX1    UGMAX2 HDRX HDRY NPLX NPLY   PRINPUT ***
(5F10.0,4I5,F10.0) ***
      0.02       1.0       0.0       0.0       0.0    5    0    0    0      0.20
EARTHQUAKE INPUT FILE NAME(S) & FORMAT(S) (* for FREE FORMAT)    *** (A)
***
pac360A.DAT
*
 SOUT AOUT KOUT                                                   *** (3I5)
***
    0    0    1
SEISMIC COEFF OUTPUT FORMAT (M or C), FILE PREFIX, AND SUFFIX: *** (A)
***
C
fEpac2
Q4K
 NSEG ESEG                                                        *** (2I5)
***
   91  771
NOSEG                                                             *** (15I5)
***
    2    3    6   11   16   22   28   35   42   50   58   67   76   85   94
  104  114  125  136  148  160  172  184  197  210  223  236  249  263  277
  291  305  320  335  350  365  380  395  411  427  443  459  476  493  510
  528  546  564  582  600  619  638  657  676  695  714  733  751  769  768
  786  785  803  802  821  820  819  838  837  856  855  875  874  894  893
  914  913  935  934  957  956  955  978  977 1000  999 1023 1022 1046 1045
 1044
ELSEG                                                             *** (15I5)
***
    3    5    6    7    9   10   11   13   14   15   16   18   19   20   21
   23   24   25   26   27   29   30   31   32   33   35   36   37   38   39
   40   42   43   44   45   46   47   49   50   51   52   53   54   55   57
   58   59   60   61   62   63   65   66   67   68   69   70   71   73   74
   75   76   77   78   79   81   82   83   84   85   86   87   88   90   91
   92   93   94   95   96   97   99  100  101  102  103  104  105  106  107
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  866  867  868  884  885  886  887  888  889  906  907  908  909  928  929
  930  950  951  952  973  974
    N  NP1  NP2  NP3  NP4 TYPE       DENS         PO        GMX          G         XL
LSTR  *** (6I5,5F10.0,I5) ***
    1    1    3    2    2    3     115.00       0.35     257.69     206.16       0.05
    2    1    1    4    3    3     115.00       0.35     579.81     463.85       0.05
    3    2    3    6    5    3     115.00       0.35     579.81     463.85       0.05
    4    3    4    7    6    3     115.00       0.35    1376.02    1100.82       0.05
    5    5    6    9    8    3     115.00       0.35     595.55     476.44       0.05
    6    6   10    9    9    2     115.00       0.35    1283.92    1027.14       0.05
    7    6   11   10   10    2     115.00       0.35    1582.02    1265.62       0.05
    8    6    7   12   11    3     115.00       0.35    1866.26    1493.01       0.05
    9    8    9   14   13    3     115.00       0.35     418.01     334.41       0.05
   10    9   10   15   14    2     115.00       0.35    1344.20    1075.36       0.05
   11   10   11   16   15    2     115.00       0.35    1918.08    1534.47       0.05
   12   11   12   17   16    3     115.00       0.35    2408.69    1926.95       0.05
   13   13   14   19   18    3     115.00       0.35     418.01     334.41       0.05
   14   14   15   20   19    2     115.00       0.35    1391.43    1113.14       0.05
   15   15   16   21   20    2     115.00       0.35    2059.77    1647.81       0.05
   16   16   22   21   21    2     115.00       0.35    2495.46    1996.37       0.05
   17   16   17   23   22    3     115.00       0.35    2728.91    2183.13       0.05
   18   18   19   25   24    3     115.00       0.35     418.01     334.41       0.05
   19   19   20   26   25    2     115.00       0.35    1417.53    1134.03       0.05
   20   20   21   27   26    2     115.00       0.35    2138.08    1710.47       0.05
   21   21   22   28   27    2     115.00       0.35    2665.82    2132.66       0.05
   22   22   23   29   28    3     115.00       0.35    3049.14    2439.31       0.05
   23   24   25   31   30    3     115.00       0.35     418.01     334.41       0.05
   24   25   26   32   31    2     115.00       0.35    1441.15    1152.92       0.05
   25   26   27   33   32    2     115.00       0.35    2208.92    1767.14       0.05
   26   27   28   34   33    2     115.00       0.35    2739.18    2191.34       0.05
   27   28   35   34   34    2     115.00       0.35    3105.84    2484.67       0.05
   28   28   29   36   35    3     115.00       0.35    3369.36    2695.49       0.05
   29   30   31   38   37    3     115.00       0.35     418.01     334.41       0.05
   30   31   32   39   38    2     115.00       0.35    1454.20    1163.36       0.05
```

31	32	33	40	39	2	115.00	0.35	2248.08	1798.47	0.05
32	33	34	41	40	2	115.00	0.35	2779.73	2223.78	0.05
33	34	35	42	41	2	115.00	0.35	3272.98	2618.39	0.05
34	35	36	43	42	3	115.00	0.35	3617.09	2893.67	0.05
35	37	38	45	44	3	115.00	0.35	418.01	334.41	0.05
36	38	39	46	45	2	115.00	0.35	1468.37	1174.70	0.05
37	39	40	47	46	2	115.00	0.35	2290.59	1832.47	0.05
38	40	41	48	47	2	115.00	0.35	2823.74	2259.00	0.05
39	41	42	49	48	2	115.00	0.35	3331.82	2665.46	0.05
40	42	50	49	49	2	115.00	0.35	3630.65	2904.52	0.05
41	42	43	51	50	3	115.00	0.35	3862.80	3090.24	0.05
42	44	45	53	52	3	115.00	0.35	418.01	334.41	0.05
43	45	46	54	53	2	115.00	0.35	1476.20	1180.96	0.05
44	46	47	55	54	2	115.00	0.35	2314.08	1851.27	0.05
45	47	48	56	55	2	115.00	0.35	2848.07	2278.46	0.05
46	48	49	57	56	2	115.00	0.35	3357.96	2686.37	0.05
47	49	50	58	57	2	115.00	0.35	3757.42	3005.94	0.05
48	50	51	59	58	3	115.00	0.35	4108.52	3286.81	0.05
49	52	53	61	60	3	115.00	0.35	418.01	334.41	0.05
50	53	54	62	61	2	115.00	0.35	1485.65	1188.52	0.05
51	54	55	63	62	2	115.00	0.35	2342.42	1873.93	0.05
52	55	56	64	63	2	115.00	0.35	2877.42	2301.93	0.05
53	56	57	65	64	2	115.00	0.35	3389.48	2711.59	0.05
54	57	58	66	65	2	115.00	0.35	3797.95	3038.36	0.05
55	58	67	66	66	2	115.00	0.35	4101.96	3281.57	0.05
56	58	59	68	67	3	115.00	0.35	4320.17	3456.14	0.05
57	60	61	70	69	3	115.00	0.35	418.01	334.41	0.05
58	61	62	71	70	2	115.00	0.35	1490.87	1192.69	0.05
59	62	63	72	71	2	115.00	0.35	2354.82	1883.86	0.05
60	63	64	73	72	2	115.00	0.35	2893.64	2314.91	0.05
61	64	65	74	73	2	115.00	0.35	3406.91	2725.52	0.05
62	65	66	75	74	2	115.00	0.35	3820.36	3056.28	0.05
63	66	67	76	75	2	115.00	0.35	4208.00	3366.40	0.05
64	67	68	77	76	3	115.00	0.35	4527.32	3621.85	0.05
65	69	70	79	78	3	115.00	0.35	418.01	334.41	0.05
66	70	71	80	79	2	115.00	0.35	1533.11	1226.49	0.05
67	71	72	81	80	2	115.00	0.35	2433.56	1946.85	0.05
68	72	73	82	81	2	115.00	0.35	3024.88	2419.90	0.05
69	73	74	83	82	2	115.00	0.35	3547.89	2838.31	0.05
70	74	75	84	83	2	115.00	0.35	4001.62	3201.30	0.05
71	75	76	85	84	2	115.00	0.35	4394.77	3515.82	0.05
72	76	77	86	85	3	115.00	0.35	4734.46	3787.57	0.05
73	78	79	88	87	3	115.00	0.35	418.01	334.41	0.05
74	79	80	89	88	2	115.00	0.35	1575.36	1260.29	0.05
75	80	81	90	89	2	115.00	0.35	2512.31	2009.84	0.05
76	81	82	91	90	2	115.00	0.35	3156.11	2524.89	0.05
77	82	83	92	91	2	115.00	0.35	3688.87	2951.10	0.05
78	83	84	93	92	2	115.00	0.35	4165.07	3332.06	0.05
79	84	85	94	93	2	115.00	0.35	4581.54	3665.23	0.05
80	85	86	95	94	3	115.00	0.35	4922.06	3937.64	0.05
81	87	88	97	96	3	115.00	0.35	418.01	334.41	0.05
82	88	89	98	97	2	115.00	0.35	1576.07	1260.86	0.05
83	89	90	99	98	2	115.00	0.35	2513.63	2010.91	0.05
84	90	91	100	99	2	115.00	0.35	3158.33	2526.66	0.05
85	91	92	101	100	2	115.00	0.35	3691.25	2953.00	0.05
86	92	93	102	101	2	115.00	0.35	4167.65	3334.12	0.05
87	93	94	103	102	2	115.00	0.35	4584.69	3667.75	0.05
88	94	104	103	103	2	115.00	0.35	4870.74	3896.59	0.05
89	94	95	105	104	3	115.00	0.35	5104.56	4083.64	0.05
90	96	97	107	106	3	115.00	0.35	418.01	334.41	0.05
91	97	98	108	107	2	115.00	0.35	1571.88	1257.51	0.05
92	98	99	109	108	2	115.00	0.35	2505.83	2004.66	0.05
93	99	100	110	109	2	115.00	0.35	3145.32	2516.26	0.05

94	100	101	111	110	2	115.00	0.35	3677.28	2941.82	0.05
95	101	102	112	111	2	115.00	0.35	4152.50	3322.00	0.05
96	102	103	113	112	2	115.00	0.35	4566.18	3652.95	0.05
97	103	104	114	113	2	115.00	0.35	4951.10	3960.88	0.05
98	104	105	115	114	3	115.00	0.35	5287.06	4229.64	0.05
99	106	107	117	116	3	115.00	0.35	418.01	334.41	0.05
100	107	108	118	117	2	115.00	0.35	1567.48	1253.98	0.05
101	108	109	119	118	2	115.00	0.35	2497.62	1998.10	0.05
102	109	110	120	119	2	115.00	0.35	3131.65	2505.32	0.05
103	110	111	121	120	2	115.00	0.35	3662.59	2930.07	0.05
104	111	112	122	121	2	115.00	0.35	4136.58	3309.26	0.05
105	112	113	123	122	2	115.00	0.35	4546.72	3637.38	0.05
106	113	114	124	123	2	115.00	0.35	4930.83	3944.67	0.05
107	114	125	124	124	2	115.00	0.35	5194.55	4155.64	0.05
108	114	115	126	125	3	115.00	0.35	5431.53	4345.23	0.05
109	116	117	128	127	3	115.00	0.35	418.01	334.41	0.05
110	117	118	129	128	2	115.00	0.35	1560.84	1248.68	0.05
111	118	119	130	129	2	115.00	0.35	2485.25	1988.20	0.05
112	119	120	131	130	2	115.00	0.35	3111.03	2488.82	0.05
113	120	121	132	131	2	115.00	0.35	3640.44	2912.35	0.05
114	121	122	133	132	2	115.00	0.35	4112.57	3290.06	0.05
115	122	123	134	133	2	115.00	0.35	4517.38	3613.90	0.05
116	123	124	135	134	2	115.00	0.35	4895.62	3916.50	0.05
117	124	125	136	135	2	115.00	0.35	5243.52	4194.82	0.05
118	125	126	137	136	3	115.00	0.35	5545.12	4436.09	0.05
119	127	128	139	138	3	115.00	0.35	418.01	334.41	0.05
120	128	129	140	139	2	115.00	0.35	1557.38	1245.90	0.05
121	129	130	141	140	2	115.00	0.35	2478.79	1983.03	0.05
122	130	131	142	141	2	115.00	0.35	3100.26	2480.21	0.05
123	131	132	143	142	2	115.00	0.35	3628.87	2903.10	0.05
124	132	133	144	143	2	115.00	0.35	4100.04	3280.03	0.05
125	133	134	145	144	2	115.00	0.35	4502.05	3601.64	0.05
126	134	135	146	145	2	115.00	0.35	4879.67	3903.73	0.05
127	135	136	147	146	2	115.00	0.35	5225.12	4180.09	0.05
128	136	148	147	147	2	115.00	0.35	5473.42	4378.74	0.05
129	136	137	149	148	3	115.00	0.35	5706.88	4565.50	0.05
130	139	151	150	138	3	115.00	0.35	418.01	334.41	0.05
131	140	152	151	139	2	115.00	0.35	1550.09	1240.07	0.05
132	141	153	152	140	2	115.00	0.35	2465.20	1972.16	0.05
133	142	154	153	141	2	115.00	0.35	3077.60	2462.08	0.05
134	143	155	154	142	2	115.00	0.35	3604.53	2883.63	0.05
135	144	156	155	143	2	115.00	0.35	4073.65	3258.92	0.05
136	145	157	156	144	2	115.00	0.35	4469.81	3575.85	0.05
137	146	158	157	145	2	115.00	0.35	4846.09	3876.87	0.05
138	147	159	158	146	2	115.00	0.35	5195.11	4156.09	0.05
139	148	160	159	147	2	115.00	0.35	5527.43	4421.94	0.05
140	149	161	160	148	3	115.00	0.35	5848.66	4678.93	0.05
141	151	163	162	150	3	115.00	0.35	418.01	334.41	0.05
142	152	164	163	151	2	115.00	0.35	1566.53	1253.23	0.05
143	153	165	164	152	2	115.00	0.35	2495.85	1996.68	0.05
144	154	166	165	153	2	115.00	0.35	3128.70	2502.96	0.05
145	155	167	166	154	2	115.00	0.35	3659.42	2927.54	0.05
146	156	168	167	155	2	115.00	0.35	4133.15	3306.52	0.05
147	157	169	168	156	2	115.00	0.35	4542.52	3634.02	0.05
148	158	170	169	157	2	115.00	0.35	4921.80	3937.44	0.05
149	159	171	170	158	2	115.00	0.35	5279.70	4223.76	0.05
150	160	172	171	159	2	115.00	0.35	5605.76	4484.61	0.05
151	161	173	172	160	3	115.00	0.35	5916.56	4733.25	0.05
152	163	175	174	162	3	115.00	0.35	418.01	334.41	0.05
153	164	176	175	163	2	115.00	0.35	1579.10	1263.28	0.05
154	165	177	176	164	2	115.00	0.35	2519.28	2015.43	0.05
155	166	178	177	165	2	115.00	0.35	3167.74	2534.19	0.05
156	167	179	178	166	2	115.00	0.35	3701.36	2961.09	0.05

157	168	180	179	167	2	115.00	0.35	4178.61	3342.89	0.05
158	169	181	180	168	2	115.00	0.35	4598.09	3678.47	0.05
159	170	182	181	169	2	115.00	0.35	4979.66	3983.73	0.05
160	171	183	182	170	2	115.00	0.35	5340.05	4272.04	0.05
161	172	184	183	171	2	115.00	0.35	5674.17	4539.33	0.05
162	173	185	184	172	3	115.00	0.35	5984.27	4787.41	0.05
163	175	187	186	174	3	115.00	0.35	418.01	334.41	0.05
164	175	188	187	187	2	115.00	0.35	1381.68	1105.34	0.05
165	176	189	188	175	2	115.00	0.35	2051.26	1641.01	0.05
166	177	190	189	176	2	115.00	0.35	2794.67	2235.73	0.05
167	178	191	190	177	2	115.00	0.35	3401.30	2721.04	0.05
168	179	192	191	178	2	115.00	0.35	3885.09	3108.07	0.05
169	180	193	192	179	2	115.00	0.35	4321.87	3457.49	0.05
170	181	194	193	180	2	115.00	0.35	4726.06	3780.85	0.05
171	182	195	194	181	2	115.00	0.35	5085.38	4068.30	0.05
172	183	196	195	182	2	115.00	0.35	5426.37	4341.10	0.05
173	184	197	196	183	2	115.00	0.35	5751.22	4600.98	0.05
174	185	198	197	184	3	115.00	0.35	6051.98	4841.58	0.05
175	187	200	199	186	3	115.00	0.35	418.01	334.41	0.05
176	188	201	200	187	2	115.00	0.35	1549.54	1239.63	0.05
177	189	202	201	188	2	115.00	0.35	2464.18	1971.35	0.05
178	190	203	202	189	2	115.00	0.35	3075.91	2460.73	0.05
179	191	204	203	190	2	115.00	0.35	3602.71	2882.17	0.05
180	192	205	204	191	2	115.00	0.35	4071.68	3257.35	0.05
181	193	206	205	192	2	115.00	0.35	4467.40	3573.92	0.05
182	194	207	206	193	2	115.00	0.35	4843.58	3874.87	0.05
183	195	208	207	194	2	115.00	0.35	5192.22	4153.77	0.05
184	196	209	208	195	2	115.00	0.35	5513.29	4410.63	0.05
185	197	210	209	196	2	115.00	0.35	5822.57	4658.06	0.05
186	198	211	210	197	3	115.00	0.35	6119.69	4895.75	0.05
187	200	213	212	199	3	115.00	0.35	418.01	334.41	0.05
188	201	214	213	200	2	115.00	0.35	1560.85	1248.68	0.05
189	202	215	214	201	2	115.00	0.35	2485.27	1988.21	0.05
190	203	216	215	202	2	115.00	0.35	3111.05	2488.84	0.05
191	204	217	216	203	2	115.00	0.35	3640.46	2912.37	0.05
192	205	218	217	204	2	115.00	0.35	4112.60	3290.08	0.05
193	206	219	218	205	2	115.00	0.35	4517.41	3613.93	0.05
194	207	220	219	206	2	115.00	0.35	4895.65	3916.52	0.05
195	208	221	220	207	2	115.00	0.35	5252.30	4201.84	0.05
196	209	222	221	208	2	115.00	0.35	5574.85	4459.88	0.05
197	210	223	222	209	2	115.00	0.35	5885.84	4708.68	0.05
198	211	224	223	210	3	115.00	0.35	6187.41	4949.92	0.05
199	213	226	225	212	3	115.00	0.35	418.01	334.41	0.05
200	214	227	226	213	2	115.00	0.35	1572.16	1257.73	0.05
201	215	228	227	214	2	115.00	0.35	2506.35	2005.08	0.05
202	216	229	228	215	2	115.00	0.35	3146.19	2516.95	0.05
203	217	230	229	216	2	115.00	0.35	3678.21	2942.57	0.05
204	218	231	230	217	2	115.00	0.35	4153.52	3322.81	0.05
205	219	232	231	218	2	115.00	0.35	4567.42	3653.94	0.05
206	220	233	232	219	2	115.00	0.35	4947.73	3958.18	0.05
207	221	234	233	220	2	115.00	0.35	5306.74	4245.39	0.05
208	222	235	234	221	2	115.00	0.35	5636.41	4509.13	0.05
209	223	236	235	222	2	115.00	0.35	5949.12	4759.29	0.05
210	224	237	236	223	3	115.00	0.35	6255.12	5004.09	0.05
211	226	239	238	225	3	115.00	0.35	418.01	334.41	0.05
212	227	240	239	226	2	115.00	0.35	1583.48	1266.78	0.05
213	228	241	240	227	2	115.00	0.35	2527.44	2021.95	0.05
214	229	242	241	228	2	115.00	0.35	3181.33	2545.07	0.05
215	230	243	242	229	2	115.00	0.35	3715.97	2972.77	0.05
216	231	244	243	230	2	115.00	0.35	4194.44	3355.55	0.05
217	232	245	244	231	2	115.00	0.35	4617.43	3693.95	0.05
218	233	246	245	232	2	115.00	0.35	4999.80	3999.84	0.05
219	234	247	246	233	2	115.00	0.35	5361.06	4288.85	0.05

220	235	248	247	234	2	115.00	0.35	5697.98	4558.38	0.05
221	236	249	248	235	2	115.00	0.35	6012.39	4809.91	0.05
222	237	250	249	236	3	115.00	0.35	6322.61	5058.09	0.05
223	239	252	251	238	3	115.00	0.35	418.01	334.41	0.05
224	239	253	252	252	2	115.00	0.35	1386.46	1109.17	0.05
225	240	254	253	239	2	115.00	0.35	2063.90	1651.12	0.05
226	241	255	254	240	2	115.00	0.35	2809.31	2247.45	0.05
227	242	256	255	241	2	115.00	0.35	3417.75	2734.20	0.05
228	243	257	256	242	2	115.00	0.35	3906.74	3125.39	0.05
229	244	258	257	243	2	115.00	0.35	4344.51	3475.61	0.05
230	245	259	258	244	2	115.00	0.35	4749.88	3799.90	0.05
231	246	260	259	245	2	115.00	0.35	5113.07	4090.46	0.05
232	247	261	260	246	2	115.00	0.35	5454.90	4363.92	0.05
233	248	262	261	247	2	115.00	0.35	5780.98	4624.78	0.05
234	249	263	262	248	2	115.00	0.35	6082.93	4866.34	0.05
235	250	264	263	249	3	115.00	0.35	6385.64	5108.51	0.05
236	252	266	265	251	3	115.00	0.35	418.01	334.41	0.05
237	253	267	266	252	2	115.00	0.35	1556.20	1244.96	0.05
238	254	268	267	253	2	115.00	0.35	2476.61	1981.28	0.05
239	255	269	268	254	2	115.00	0.35	3096.61	2477.29	0.05
240	256	270	269	255	2	115.00	0.35	3624.95	2899.96	0.05
241	257	271	270	256	2	115.00	0.35	4095.79	3276.63	0.05
242	258	272	271	257	2	115.00	0.35	4496.87	3597.49	0.05
243	259	273	272	258	2	115.00	0.35	4874.26	3899.41	0.05
244	260	274	273	259	2	115.00	0.35	5227.62	4182.09	0.05
245	261	275	274	260	2	115.00	0.35	5549.56	4439.65	0.05
246	262	276	275	261	2	115.00	0.35	5859.85	4687.88	0.05
247	263	277	276	262	2	115.00	0.35	6153.62	4922.90	0.05
248	264	278	277	263	3	115.00	0.35	6448.66	5158.93	0.05
249	266	280	279	265	3	115.00	0.35	418.01	334.41	0.05
250	267	281	280	266	2	115.00	0.35	1566.49	1253.19	0.05
251	268	282	281	267	2	115.00	0.35	2495.77	1996.62	0.05
252	269	283	282	268	2	115.00	0.35	3128.56	2502.85	0.05
253	270	284	283	269	2	115.00	0.35	3659.27	2927.42	0.05
254	271	285	284	270	2	115.00	0.35	4132.99	3306.39	0.05
255	272	286	285	271	2	115.00	0.35	4542.33	3633.86	0.05
256	273	287	286	272	2	115.00	0.35	4921.60	3937.28	0.05
257	274	288	287	273	2	115.00	0.35	5279.49	4223.59	0.05
258	275	289	288	274	2	115.00	0.35	5605.53	4484.42	0.05
259	276	290	289	275	2	115.00	0.35	5917.37	4733.90	0.05
260	277	291	290	276	2	115.00	0.35	6217.12	4973.70	0.05
261	278	292	291	277	3	115.00	0.35	6511.69	5209.35	0.05
262	280	294	293	279	3	115.00	0.35	418.01	334.41	0.05
263	281	295	294	280	2	115.00	0.35	1576.77	1261.42	0.05
264	282	296	295	281	2	115.00	0.35	2514.94	2011.95	0.05
265	283	297	296	282	2	115.00	0.35	3160.51	2528.41	0.05
266	284	298	297	283	2	115.00	0.35	3693.59	2954.87	0.05
267	285	299	298	284	2	115.00	0.35	4170.19	3336.15	0.05
268	286	300	299	285	2	115.00	0.35	4587.79	3670.24	0.05
269	287	301	300	286	2	115.00	0.35	4968.94	3975.15	0.05
270	288	302	301	287	2	115.00	0.35	5328.87	4263.09	0.05
271	289	303	302	288	2	115.00	0.35	5661.49	4529.19	0.05
272	290	304	303	289	2	115.00	0.35	5974.89	4779.91	0.05
273	291	305	304	290	2	115.00	0.35	6276.30	5021.04	0.05
274	292	306	305	291	3	115.00	0.35	6574.71	5259.77	0.05
275	294	308	307	293	3	115.00	0.35	418.01	334.41	0.05
276	294	309	308	308	2	115.00	0.35	1384.17	1107.33	0.05
277	295	310	309	294	2	115.00	0.35	2055.12	1644.10	0.05
278	296	311	310	295	2	115.00	0.35	2797.23	2237.79	0.05
279	297	312	311	296	2	115.00	0.35	3403.40	2722.72	0.05
280	298	313	312	297	2	115.00	0.35	3887.31	3109.85	0.05
281	299	314	313	298	2	115.00	0.35	4323.85	3459.08	0.05
282	300	315	314	299	2	115.00	0.35	4727.89	3782.31	0.05

283	301	316	315	300	2	115.00	0.35	5087.31	4069.85	0.05
284	302	317	316	301	2	115.00	0.35	5428.20	4342.56	0.05
285	303	318	317	302	2	115.00	0.35	5753.14	4602.51	0.05
286	304	319	318	303	2	115.00	0.35	6052.10	4841.68	0.05
287	305	320	319	304	2	115.00	0.35	6341.58	5073.26	0.05
288	306	321	320	305	3	115.00	0.35	6637.74	5310.19	0.05
289	308	323	322	307	3	115.00	0.35	418.01	334.41	0.05
290	309	324	323	308	2	115.00	0.35	1550.73	1240.58	0.05
291	310	325	324	309	2	115.00	0.35	2466.39	1973.12	0.05
292	311	326	325	310	2	115.00	0.35	3079.59	2463.68	0.05
293	312	327	326	311	2	115.00	0.35	3606.67	2885.34	0.05
294	313	328	327	312	2	115.00	0.35	4075.97	3260.78	0.05
295	314	329	328	313	2	115.00	0.35	4472.64	3578.12	0.05
296	315	330	329	314	2	115.00	0.35	4849.04	3879.23	0.05
297	316	331	330	315	2	115.00	0.35	5198.52	4158.81	0.05
298	317	332	331	316	2	115.00	0.35	5519.75	4415.80	0.05
299	318	333	332	317	2	115.00	0.35	5829.21	4663.37	0.05
300	319	334	333	318	2	115.00	0.35	6119.75	4895.80	0.05
301	320	335	334	319	2	115.00	0.35	6402.14	5121.71	0.05
302	321	336	335	320	3	115.00	0.35	6700.76	5360.61	0.05
303	322	323	338	337	3	115.00	0.35	418.01	334.41	0.05
304	323	324	339	338	2	115.00	0.35	1555.34	1244.27	0.05
305	324	325	340	339	2	115.00	0.35	2474.99	1979.99	0.05
306	325	326	341	340	2	115.00	0.35	3093.91	2475.13	0.05
307	326	327	342	341	2	115.00	0.35	3622.06	2897.64	0.05
308	327	328	343	342	2	115.00	0.35	4092.65	3274.12	0.05
309	328	329	344	343	2	115.00	0.35	4493.02	3594.42	0.05
310	329	330	345	344	2	115.00	0.35	4870.26	3896.21	0.05
311	330	331	346	345	2	115.00	0.35	5223.00	4178.40	0.05
312	331	332	347	346	2	115.00	0.35	5544.83	4435.87	0.05
313	332	333	348	347	2	115.00	0.35	5854.99	4683.99	0.05
314	333	334	349	348	2	115.00	0.35	6148.25	4918.60	0.05
315	334	335	350	349	2	115.00	0.35	6431.19	5144.95	0.05
316	335	336	351	350	3	115.00	0.35	6731.58	5385.27	0.05
317	337	338	353	352	3	115.00	0.35	418.01	334.41	0.05
318	338	339	354	353	2	115.00	0.35	1558.76	1247.01	0.05
319	339	340	355	354	2	115.00	0.35	2481.37	1985.10	0.05
320	340	341	356	355	2	115.00	0.35	3104.56	2483.65	0.05
321	341	342	357	356	2	115.00	0.35	3633.49	2906.79	0.05
322	342	343	358	357	2	115.00	0.35	4105.04	3284.03	0.05
323	343	344	359	358	2	115.00	0.35	4508.17	3606.54	0.05
324	344	345	360	359	2	115.00	0.35	4886.03	3908.83	0.05
325	345	346	361	360	2	115.00	0.35	5241.20	4192.96	0.05
326	346	347	362	361	2	115.00	0.35	5563.48	4450.78	0.05
327	347	348	363	362	2	115.00	0.35	5874.16	4699.32	0.05
328	348	349	364	363	2	115.00	0.35	6169.43	4935.55	0.05
329	349	350	365	364	2	115.00	0.35	6440.83	5152.66	0.05
330	350	351	366	365	3	115.00	0.35	6730.20	5384.16	0.05
331	353	368	367	352	3	115.00	0.35	418.01	334.41	0.05
332	354	369	368	353	2	115.00	0.35	1564.64	1251.71	0.05
333	355	370	369	354	2	115.00	0.35	2492.33	1993.86	0.05
334	356	371	370	355	2	115.00	0.35	3122.81	2498.25	0.05
335	357	372	371	356	2	115.00	0.35	3653.10	2922.48	0.05
336	358	373	372	357	2	115.00	0.35	4126.30	3301.04	0.05
337	359	374	373	358	2	115.00	0.35	4534.15	3627.32	0.05
338	360	375	374	359	2	115.00	0.35	4913.09	3930.47	0.05
339	361	376	375	360	2	115.00	0.35	5270.61	4216.48	0.05
340	362	377	376	361	2	115.00	0.35	5595.46	4476.37	0.05
341	363	378	377	362	2	115.00	0.35	5907.03	4725.62	0.05
342	364	379	378	363	2	115.00	0.35	6205.76	4964.61	0.05
343	365	380	379	364	2	115.00	0.35	6477.87	5182.29	0.05
344	366	381	380	365	3	115.00	0.35	6768.67	5414.94	0.05
345	368	383	382	367	3	115.00	0.35	418.01	334.41	0.05

346	369	384	383	368	2	115.00	0.35	1574.57	1259.66	0.05
347	370	385	384	369	2	115.00	0.35	2510.84	2008.67	0.05
348	371	386	385	370	2	115.00	0.35	3153.67	2522.94	0.05
349	372	387	386	371	2	115.00	0.35	3686.25	2949.00	0.05
350	373	388	387	372	2	115.00	0.35	4162.23	3329.78	0.05
351	374	389	388	373	2	115.00	0.35	4578.07	3662.45	0.05
352	375	390	389	374	2	115.00	0.35	4958.81	3967.05	0.05
353	376	391	390	375	2	115.00	0.35	5318.30	4254.64	0.05
354	377	392	391	376	2	115.00	0.35	5649.52	4519.62	0.05
355	378	393	392	377	2	115.00	0.35	5962.59	4770.07	0.05
356	379	394	393	378	2	115.00	0.35	6263.64	5010.91	0.05
357	380	395	394	379	2	115.00	0.35	6547.14	5237.71	0.05
358	381	396	395	380	3	115.00	0.35	6843.78	5475.02	0.05
359	383	398	397	382	3	115.00	0.35	418.01	334.41	0.05
360	383	399	398	398	2	115.00	0.35	1386.65	1109.32	0.05
361	384	400	399	383	2	115.00	0.35	2060.02	1648.02	0.05
362	385	401	400	384	2	115.00	0.35	2801.74	2241.40	0.05
363	386	402	401	385	2	115.00	0.35	3407.98	2726.39	0.05
364	387	403	402	386	2	115.00	0.35	3893.02	3114.42	0.05
365	388	404	403	387	2	115.00	0.35	4329.61	3463.69	0.05
366	389	405	404	388	2	115.00	0.35	4733.81	3787.04	0.05
367	390	406	405	389	2	115.00	0.35	5094.06	4075.25	0.05
368	391	407	406	390	2	115.00	0.35	5435.05	4348.04	0.05
369	392	408	407	391	2	115.00	0.35	5760.28	4608.23	0.05
370	393	409	408	392	2	115.00	0.35	6059.79	4847.83	0.05
371	394	410	409	393	2	115.00	0.35	6349.39	5079.51	0.05
372	395	411	410	394	2	115.00	0.35	6628.16	5302.53	0.05
373	396	412	411	395	3	115.00	0.35	6918.89	5535.11	0.05
374	398	414	413	397	3	115.00	0.35	418.01	334.41	0.05
375	399	415	414	398	2	115.00	0.35	1556.86	1245.49	0.05
376	400	416	415	399	2	115.00	0.35	2477.83	1982.26	0.05
377	401	417	416	400	2	115.00	0.35	3098.65	2478.92	0.05
378	402	418	417	401	2	115.00	0.35	3627.14	2901.71	0.05
379	403	419	418	402	2	115.00	0.35	4098.16	3278.53	0.05
380	404	420	419	403	2	115.00	0.35	4499.76	3599.81	0.05
381	405	421	420	404	2	115.00	0.35	4877.28	3901.82	0.05
382	406	422	421	405	2	115.00	0.35	5231.10	4184.88	0.05
383	407	423	422	406	2	115.00	0.35	5553.13	4442.50	0.05
384	408	424	423	407	2	115.00	0.35	5863.52	4690.81	0.05
385	409	425	424	408	2	115.00	0.35	6157.67	4926.14	0.05
386	410	426	425	409	2	115.00	0.35	6435.51	5148.41	0.05
387	411	427	426	410	2	115.00	0.35	6705.42	5364.33	0.05
388	412	428	427	411	3	115.00	0.35	6994.00	5595.20	0.05
389	414	430	429	413	3	115.00	0.35	418.01	334.41	0.05
390	415	431	430	414	2	115.00	0.35	1567.90	1254.32	0.05
391	416	432	431	415	2	115.00	0.35	2498.41	1998.73	0.05
392	417	433	432	416	2	115.00	0.35	3132.95	2506.36	0.05
393	418	434	433	417	2	115.00	0.35	3663.99	2931.19	0.05
394	419	435	434	418	2	115.00	0.35	4138.10	3310.48	0.05
395	420	436	435	419	2	115.00	0.35	4548.58	3638.86	0.05
396	421	437	436	420	2	115.00	0.35	4928.10	3942.48	0.05
397	422	438	437	421	2	115.00	0.35	5286.27	4229.02	0.05
398	423	439	438	422	2	115.00	0.35	5613.22	4490.57	0.05
399	424	440	439	423	2	115.00	0.35	5925.27	4740.22	0.05
400	425	441	440	424	2	115.00	0.35	6225.25	4980.20	0.05
401	426	442	441	425	2	115.00	0.35	6505.10	5204.08	0.05
402	427	443	442	426	2	115.00	0.35	6776.45	5421.16	0.05
403	428	444	443	427	3	115.00	0.35	7069.11	5655.29	0.05
404	430	446	445	429	3	115.00	0.35	418.01	334.41	0.05
405	431	447	446	430	2	115.00	0.35	1578.94	1263.15	0.05
406	432	448	447	431	2	115.00	0.35	2518.99	2015.19	0.05
407	433	449	448	432	2	115.00	0.35	3167.25	2533.80	0.05
408	434	450	449	433	2	115.00	0.35	3700.84	2960.67	0.05

409	435	451	450	434	2	115.00	0.35	4178.04	3342.43	0.05
410	436	452	451	435	2	115.00	0.35	4597.39	3677.91	0.05
411	437	453	452	436	2	115.00	0.35	4978.93	3983.14	0.05
412	438	454	453	437	2	115.00	0.35	5339.29	4271.43	0.05
413	439	455	454	438	2	115.00	0.35	5673.30	4538.64	0.05
414	440	456	455	439	2	115.00	0.35	5987.03	4789.62	0.05
415	441	457	456	440	2	115.00	0.35	6288.78	5031.03	0.05
416	442	458	457	441	2	115.00	0.35	6574.68	5259.74	0.05
417	443	459	458	442	2	115.00	0.35	6847.49	5477.99	0.05
418	444	460	459	443	3	115.00	0.35	7144.22	5715.37	0.05
419	446	462	461	445	3	115.00	0.35	418.01	334.41	0.05
420	446	463	462	462	2	115.00	0.35	1390.46	1112.37	0.05
421	447	464	463	446	2	115.00	0.35	2070.56	1656.45	0.05
422	448	465	464	447	2	115.00	0.35	2814.27	2251.42	0.05
423	449	466	465	448	2	115.00	0.35	3422.18	2737.75	0.05
424	450	467	466	449	2	115.00	0.35	3911.81	3129.45	0.05
425	451	468	467	450	2	115.00	0.35	4349.32	3479.46	0.05
426	452	469	468	451	2	115.00	0.35	4754.58	3803.66	0.05
427	453	470	469	452	2	115.00	0.35	5118.24	4094.59	0.05
428	454	471	470	453	2	115.00	0.35	5460.00	4368.00	0.05
429	455	472	471	454	2	115.00	0.35	5786.06	4628.85	0.05
430	456	473	472	455	2	115.00	0.35	6088.40	4870.72	0.05
431	457	474	473	456	2	115.00	0.35	6378.65	5102.92	0.05
432	458	475	474	457	2	115.00	0.35	6659.17	5327.33	0.05
433	459	476	475	458	2	115.00	0.35	6923.47	5538.78	0.05
434	460	477	476	459	3	115.00	0.35	7216.43	5773.15	0.05
435	462	479	478	461	3	115.00	0.35	418.01	334.41	0.05
436	463	480	479	462	2	115.00	0.35	1562.18	1249.75	0.05
437	464	481	480	463	2	115.00	0.35	2487.75	1990.20	0.05
438	465	482	481	464	2	115.00	0.35	3115.19	2492.15	0.05
439	466	483	482	465	2	115.00	0.35	3644.91	2915.93	0.05
440	467	484	483	466	2	115.00	0.35	4117.42	3293.93	0.05
441	468	485	484	467	2	115.00	0.35	4523.30	3618.64	0.05
442	469	486	485	468	2	115.00	0.35	4901.78	3921.43	0.05
443	470	487	486	469	2	115.00	0.35	5258.82	4207.05	0.05
444	471	488	487	470	2	115.00	0.35	5582.10	4465.68	0.05
445	472	489	488	471	2	115.00	0.35	5893.29	4714.63	0.05
446	473	490	489	472	2	115.00	0.35	6190.58	4952.47	0.05
447	474	491	490	473	2	115.00	0.35	6469.06	5175.25	0.05
448	475	492	491	474	2	115.00	0.35	6739.67	5391.73	0.05
449	476	493	492	475	2	115.00	0.35	6999.56	5599.65	0.05
450	477	494	493	476	3	115.00	0.35	7287.47	5829.98	0.05
451	479	496	495	478	3	115.00	0.35	418.01	334.41	0.05
452	480	497	496	479	2	115.00	0.35	1572.44	1257.95	0.05
453	481	498	497	480	2	115.00	0.35	2506.86	2005.49	0.05
454	482	499	498	481	2	115.00	0.35	3147.04	2517.63	0.05
455	483	500	499	482	2	115.00	0.35	3679.12	2943.30	0.05
456	484	501	500	483	2	115.00	0.35	4154.50	3323.60	0.05
457	485	502	501	484	2	115.00	0.35	4568.62	3654.90	0.05
458	486	503	502	485	2	115.00	0.35	4948.98	3959.18	0.05
459	487	504	503	486	2	115.00	0.35	5308.05	4246.44	0.05
460	488	505	504	487	2	115.00	0.35	5637.90	4510.32	0.05
461	489	506	505	488	2	115.00	0.35	5950.64	4760.51	0.05
462	490	507	506	489	2	115.00	0.35	6251.35	5001.08	0.05
463	491	508	507	490	2	115.00	0.35	6533.68	5226.94	0.05
464	492	509	508	491	2	115.00	0.35	6805.63	5444.50	0.05
465	493	510	509	492	2	115.00	0.35	7069.59	5655.67	0.05
466	494	511	510	493	3	115.00	0.35	7358.51	5886.81	0.05
467	496	513	512	495	3	115.00	0.35	418.01	334.41	0.05
468	496	514	513	513	2	115.00	0.35	1385.59	1108.47	0.05
469	497	515	514	496	2	115.00	0.35	2056.15	1644.92	0.05
470	498	516	515	497	2	115.00	0.35	2796.50	2237.20	0.05
471	499	517	516	498	2	115.00	0.35	3401.77	2721.42	0.05

472	500	518	517	499	2	115.00	0.35	3884.63	3107.70	0.05
473	501	519	518	500	2	115.00	0.35	4320.70	3456.56	0.05
474	502	520	519	501	2	115.00	0.35	4724.33	3779.47	0.05
475	503	521	520	502	2	115.00	0.35	5082.97	4066.37	0.05
476	504	522	521	503	2	115.00	0.35	5423.56	4338.85	0.05
477	505	523	522	504	2	115.00	0.35	5747.79	4598.23	0.05
478	506	524	523	505	2	115.00	0.35	6046.53	4837.22	0.05
479	507	525	524	506	2	115.00	0.35	6335.79	5068.63	0.05
480	508	526	525	507	2	115.00	0.35	6613.31	5290.65	0.05
481	509	527	526	508	2	115.00	0.35	6875.91	5500.72	0.05
482	510	528	527	509	2	115.00	0.35	7136.69	5709.35	0.05
483	511	529	528	510	3	115.00	0.35	7429.55	5943.64	0.05
484	513	531	530	512	3	115.00	0.35	418.01	334.41	0.05
485	514	532	531	513	2	115.00	0.35	1551.85	1241.48	0.05
486	515	533	532	514	2	115.00	0.35	2468.49	1974.79	0.05
487	516	534	533	515	2	115.00	0.35	3083.09	2466.47	0.05
488	517	535	534	516	2	115.00	0.35	3610.43	2888.34	0.05
489	518	536	535	517	2	115.00	0.35	4080.04	3264.03	0.05
490	519	537	536	518	2	115.00	0.35	4477.62	3582.09	0.05
491	520	538	537	519	2	115.00	0.35	4854.22	3883.38	0.05
492	521	539	538	520	2	115.00	0.35	5204.49	4163.59	0.05
493	522	540	539	521	2	115.00	0.35	5525.87	4420.70	0.05
494	523	541	540	522	2	115.00	0.35	5835.50	4668.40	0.05
495	524	542	541	523	2	115.00	0.35	6126.71	4901.37	0.05
496	525	543	542	524	2	115.00	0.35	6403.94	5123.16	0.05
497	526	544	543	525	2	115.00	0.35	6673.19	5338.55	0.05
498	527	545	544	526	2	115.00	0.35	6927.76	5542.21	0.05
499	528	546	545	527	2	115.00	0.35	7179.99	5743.99	0.05
500	529	547	546	528	3	115.00	0.35	7470.65	5976.52	0.05
501	531	549	548	530	3	115.00	0.35	418.01	334.41	0.05
502	532	550	549	531	2	115.00	0.35	1556.27	1245.02	0.05
503	533	551	550	532	2	115.00	0.35	2476.73	1981.38	0.05
504	534	552	551	533	2	115.00	0.35	3096.81	2477.45	0.05
505	535	553	552	534	2	115.00	0.35	3625.17	2900.14	0.05
506	536	554	553	535	2	115.00	0.35	4096.02	3276.82	0.05
507	537	555	554	536	2	115.00	0.35	4497.15	3597.72	0.05
508	538	556	555	537	2	115.00	0.35	4874.56	3899.65	0.05
509	539	557	556	538	2	115.00	0.35	5227.96	4182.37	0.05
510	540	558	557	539	2	115.00	0.35	5549.91	4439.93	0.05
511	541	559	558	540	2	115.00	0.35	5860.21	4688.17	0.05
512	542	560	559	541	2	115.00	0.35	6154.02	4923.22	0.05
513	543	561	560	542	2	115.00	0.35	6431.79	5145.43	0.05
514	544	562	561	543	2	115.00	0.35	6701.61	5361.29	0.05
515	545	563	562	544	2	115.00	0.35	6958.46	5566.77	0.05
516	546	564	563	545	2	115.00	0.35	7200.53	5760.43	0.05
517	547	565	564	546	3	115.00	0.35	7481.81	5985.45	0.05
518	549	567	566	548	3	115.00	0.35	418.01	334.41	0.05
519	550	568	567	549	2	115.00	0.35	1562.48	1249.99	0.05
520	551	569	568	550	2	115.00	0.35	2488.31	1990.65	0.05
521	552	570	569	551	2	115.00	0.35	3116.12	2492.90	0.05
522	553	571	570	552	2	115.00	0.35	3645.91	2916.73	0.05
523	554	572	571	553	2	115.00	0.35	4118.50	3294.80	0.05
524	555	573	572	554	2	115.00	0.35	4524.63	3619.70	0.05
525	556	574	573	555	2	115.00	0.35	4903.17	3922.53	0.05
526	557	575	574	556	2	115.00	0.35	5260.26	4208.21	0.05
527	558	576	575	557	2	115.00	0.35	5583.73	4466.99	0.05
528	559	577	576	558	2	115.00	0.35	5894.97	4715.98	0.05
529	560	578	577	559	2	115.00	0.35	6192.44	4953.95	0.05
530	561	579	578	560	2	115.00	0.35	6470.95	5176.76	0.05
531	562	580	579	561	2	115.00	0.35	6741.60	5393.28	0.05
532	563	581	580	562	2	115.00	0.35	7001.65	5601.32	0.05
533	564	582	581	563	2	115.00	0.35	7244.40	5795.52	0.05
534	565	583	582	564	3	115.00	0.35	7527.95	6022.36	0.05

535	567	585	584	566	3	115.00	0.35	418.01	334.41	0.05
536	568	586	585	567	2	115.00	0.35	1571.84	1257.47	0.05
537	569	587	586	568	2	115.00	0.35	2505.75	2004.60	0.05
538	570	588	587	569	2	115.00	0.35	3145.18	2516.15	0.05
539	571	589	588	570	2	115.00	0.35	3677.13	2941.71	0.05
540	572	590	589	571	2	115.00	0.35	4152.35	3321.88	0.05
541	573	591	590	572	2	115.00	0.35	4565.99	3652.79	0.05
542	574	592	591	573	2	115.00	0.35	4946.23	3956.99	0.05
543	575	593	592	574	2	115.00	0.35	5305.18	4244.15	0.05
544	576	594	593	575	2	115.00	0.35	5634.65	4507.72	0.05
545	577	595	594	576	2	115.00	0.35	5947.30	4757.84	0.05
546	578	596	595	577	2	115.00	0.35	6247.91	4998.33	0.05
547	579	597	596	578	2	115.00	0.35	6529.92	5223.93	0.05
548	580	598	597	579	2	115.00	0.35	6801.79	5441.43	0.05
549	581	599	598	580	2	115.00	0.35	7065.67	5652.53	0.05
550	582	600	599	581	2	115.00	0.35	7316.18	5852.95	0.05
551	583	601	600	582	3	115.00	0.35	7604.63	6083.70	0.05
552	585	603	602	584	3	115.00	0.35	418.01	334.41	0.05
553	585	604	603	603	2	115.00	0.35	1389.12	1111.29	0.05
554	586	605	604	585	2	115.00	0.35	2063.96	1651.16	0.05
555	587	606	605	586	2	115.00	0.35	2804.47	2243.57	0.05
556	588	607	606	587	2	115.00	0.35	3410.29	2728.23	0.05
557	589	608	607	588	2	115.00	0.35	3895.54	3116.43	0.05
558	590	609	608	589	2	115.00	0.35	4331.92	3465.54	0.05
559	591	610	609	590	2	115.00	0.35	4736.00	3788.80	0.05
560	592	611	610	591	2	115.00	0.35	5096.42	4077.13	0.05
561	593	612	611	592	2	115.00	0.35	5437.33	4349.86	0.05
562	594	613	612	593	2	115.00	0.35	5762.51	4610.01	0.05
563	595	614	613	594	2	115.00	0.35	6062.15	4849.72	0.05
564	596	615	614	595	2	115.00	0.35	6351.71	5081.37	0.05
565	597	616	615	596	2	115.00	0.35	6630.60	5304.48	0.05
566	598	617	616	597	2	115.00	0.35	6893.44	5514.76	0.05
567	599	618	617	598	2	115.00	0.35	7149.59	5719.68	0.05
568	600	619	618	599	2	115.00	0.35	7397.35	5917.88	0.05
569	601	620	619	600	3	115.00	0.35	7679.26	6143.41	0.05
570	603	622	621	602	3	115.00	0.35	418.01	334.41	0.05
571	604	623	622	603	2	115.00	0.35	1560.16	1248.13	0.05
572	605	624	623	604	2	115.00	0.35	2483.99	1987.19	0.05
573	606	625	624	605	2	115.00	0.35	3108.92	2487.13	0.05
574	607	626	625	606	2	115.00	0.35	3638.17	2910.54	0.05
575	608	627	626	607	2	115.00	0.35	4110.12	3288.09	0.05
576	609	628	627	608	2	115.00	0.35	4514.37	3611.50	0.05
577	610	629	628	609	2	115.00	0.35	4892.49	3913.99	0.05
578	611	630	629	610	2	115.00	0.35	5248.65	4198.92	0.05
579	612	631	630	611	2	115.00	0.35	5571.12	4456.89	0.05
580	613	632	631	612	2	115.00	0.35	5882.00	4705.60	0.05
581	614	633	632	613	2	115.00	0.35	6178.11	4942.48	0.05
582	615	634	633	614	2	115.00	0.35	6456.34	5165.07	0.05
583	616	635	634	615	2	115.00	0.35	6726.68	5381.34	0.05
584	617	636	635	616	2	115.00	0.35	6985.53	5588.43	0.05
585	618	637	636	617	2	115.00	0.35	7233.77	5787.02	0.05
586	619	638	637	618	2	115.00	0.35	7474.69	5979.75	0.05
587	620	639	638	619	3	115.00	0.35	7753.89	6203.11	0.05
588	622	641	640	621	3	115.00	0.35	418.01	334.41	0.05
589	623	642	641	622	2	115.00	0.35	1570.41	1256.33	0.05
590	624	643	642	623	2	115.00	0.35	2503.08	2002.46	0.05
591	625	644	643	624	2	115.00	0.35	3140.74	2512.59	0.05
592	626	645	644	625	2	115.00	0.35	3672.36	2937.89	0.05
593	627	646	645	626	2	115.00	0.35	4147.17	3317.74	0.05
594	628	647	646	627	2	115.00	0.35	4559.66	3647.73	0.05
595	629	648	647	628	2	115.00	0.35	4939.65	3951.72	0.05
596	630	649	648	629	2	115.00	0.35	5298.31	4238.65	0.05
597	631	650	649	630	2	115.00	0.35	5626.86	4501.49	0.05

598	632	651	650	631	2	115.00	0.35	5939.30	4751.44	0.05
599	633	652	651	632	2	115.00	0.35	6239.68	4991.74	0.05
600	634	653	652	633	2	115.00	0.35	6520.90	5216.72	0.05
601	635	654	653	634	2	115.00	0.35	6792.59	5434.07	0.05
602	636	655	654	635	2	115.00	0.35	7056.26	5645.01	0.05
603	637	656	655	636	2	115.00	0.35	7306.08	5844.86	0.05
604	638	657	656	637	2	115.00	0.35	7545.80	6036.64	0.05
605	639	658	657	638	3	115.00	0.35	7828.53	6262.82	0.05
606	641	660	659	640	3	115.00	0.35	418.01	334.41	0.05
607	642	661	660	641	2	115.00	0.35	1577.45	1261.96	0.05
608	643	662	661	642	2	115.00	0.35	2516.21	2012.97	0.05
609	644	663	662	643	2	115.00	0.35	3162.63	2530.10	0.05
610	645	664	663	644	2	115.00	0.35	3695.87	2956.70	0.05
611	646	665	664	645	2	115.00	0.35	4172.66	3338.13	0.05
612	647	666	665	646	2	115.00	0.35	4590.81	3672.65	0.05
613	648	667	666	647	2	115.00	0.35	4972.08	3977.67	0.05
614	649	668	667	648	2	115.00	0.35	5332.15	4265.72	0.05
615	650	669	668	649	2	115.00	0.35	5665.21	4532.17	0.05
616	651	670	669	650	2	115.00	0.35	5978.71	4782.97	0.05
617	652	671	670	651	2	115.00	0.35	6280.23	5024.18	0.05
618	653	672	671	652	2	115.00	0.35	6565.31	5252.24	0.05
619	654	673	672	653	2	115.00	0.35	6837.92	5470.34	0.05
620	655	674	673	654	2	115.00	0.35	7102.57	5682.06	0.05
621	656	675	674	655	2	115.00	0.35	7355.82	5884.66	0.05
622	657	676	675	656	2	115.00	0.35	7606.18	6084.94	0.05
623	658	677	676	657	3	115.00	0.35	7903.16	6322.53	0.05
624	659	660	679	678	3	115.00	0.35	418.01	334.41	0.05
625	660	661	680	679	2	115.00	0.35	1578.11	1262.48	0.05
626	661	662	681	680	2	115.00	0.35	2517.43	2013.94	0.05
627	662	663	682	681	2	115.00	0.35	3164.65	2531.72	0.05
628	663	664	683	682	2	115.00	0.35	3698.05	2958.44	0.05
629	664	665	684	683	2	115.00	0.35	4175.01	3340.01	0.05
630	665	666	685	684	2	115.00	0.35	4593.70	3674.96	0.05
631	666	667	686	685	2	115.00	0.35	4975.08	3980.07	0.05
632	667	668	687	686	2	115.00	0.35	5335.28	4268.22	0.05
633	668	669	688	687	2	115.00	0.35	5668.76	4535.00	0.05
634	669	670	689	688	2	115.00	0.35	5982.36	4785.88	0.05
635	670	671	690	689	2	115.00	0.35	6283.97	5027.18	0.05
636	671	672	691	690	2	115.00	0.35	6569.41	5255.53	0.05
637	672	673	692	691	2	115.00	0.35	6842.11	5473.69	0.05
638	673	674	693	692	2	115.00	0.35	7106.85	5685.48	0.05
639	674	675	694	693	2	115.00	0.35	7360.42	5888.34	0.05
640	675	676	695	694	2	115.00	0.35	7610.70	6088.56	0.05
641	676	677	696	695	3	115.00	0.35	7907.91	6326.32	0.05
642	678	679	698	697	3	115.00	0.35	418.01	334.41	0.05
643	679	680	699	698	2	115.00	0.35	1572.36	1257.89	0.05
644	680	681	700	699	2	115.00	0.35	2506.72	2005.38	0.05
645	681	682	701	700	2	115.00	0.35	3146.81	2517.45	0.05
646	682	683	702	701	2	115.00	0.35	3678.88	2943.10	0.05
647	683	684	703	702	2	115.00	0.35	4154.24	3323.39	0.05
648	684	685	704	703	2	115.00	0.35	4568.30	3654.64	0.05
649	685	686	705	704	2	115.00	0.35	4948.65	3958.92	0.05
650	686	687	706	705	2	115.00	0.35	5307.70	4246.16	0.05
651	687	688	707	706	2	115.00	0.35	5637.50	4510.00	0.05
652	688	689	708	707	2	115.00	0.35	5950.23	4760.19	0.05
653	689	690	709	708	2	115.00	0.35	6250.93	5000.74	0.05
654	690	691	710	709	2	115.00	0.35	6533.22	5226.57	0.05
655	691	692	711	710	2	115.00	0.35	6805.16	5444.13	0.05
656	692	693	712	711	2	115.00	0.35	7069.11	5655.29	0.05
657	693	694	713	712	2	115.00	0.35	7319.88	5855.90	0.05
658	694	695	714	713	2	115.00	0.35	7559.38	6047.50	0.05
659	695	696	715	714	3	115.00	0.35	7842.77	6274.21	0.05
660	697	698	717	716	3	115.00	0.35	418.01	334.41	0.05

661	698	699	718	717	2	115.00	0.35	1561.67	1249.34	0.05
662	699	700	719	718	2	115.00	0.35	2486.80	1989.44	0.05
663	700	701	720	719	2	115.00	0.35	3113.60	2490.88	0.05
664	701	702	721	720	2	115.00	0.35	3643.20	2914.56	0.05
665	702	703	722	721	2	115.00	0.35	4115.57	3292.45	0.05
666	703	704	723	722	2	115.00	0.35	4521.04	3616.83	0.05
667	704	705	724	723	2	115.00	0.35	4899.43	3919.54	0.05
668	705	706	725	724	2	115.00	0.35	5256.36	4205.09	0.05
669	706	707	726	725	2	115.00	0.35	5579.32	4463.45	0.05
670	707	708	727	726	2	115.00	0.35	5890.43	4712.34	0.05
671	708	709	728	727	2	115.00	0.35	6187.42	4949.94	0.05
672	709	710	729	728	2	115.00	0.35	6465.84	5172.67	0.05
673	710	711	730	729	2	115.00	0.35	6736.37	5389.10	0.05
674	711	712	731	730	2	115.00	0.35	6996.00	5596.80	0.05
675	712	713	732	731	2	115.00	0.35	7244.41	5795.53	0.05
676	713	714	733	732	2	115.00	0.35	7491.43	5993.14	0.05
677	714	715	734	733	3	115.00	0.35	7777.63	6222.10	0.05
678	716	717	736	735	3	115.00	0.35	418.01	334.41	0.05
679	717	718	737	736	2	115.00	0.35	1563.55	1250.84	0.05
680	718	719	738	737	2	115.00	0.35	2490.30	1992.24	0.05
681	719	720	739	738	2	115.00	0.35	3119.44	2495.55	0.05
682	720	721	740	739	2	115.00	0.35	3649.48	2919.58	0.05
683	721	722	741	740	2	115.00	0.35	4122.37	3297.90	0.05
684	722	723	742	741	2	115.00	0.35	4529.35	3623.48	0.05
685	723	724	743	742	2	115.00	0.35	4908.09	3926.47	0.05
686	724	725	744	743	2	115.00	0.35	5265.39	4212.31	0.05
687	725	726	745	744	2	115.00	0.35	5589.55	4471.64	0.05
688	726	727	746	745	2	115.00	0.35	5900.95	4720.76	0.05
689	727	728	747	746	2	115.00	0.35	6199.05	4959.24	0.05
690	728	729	748	747	2	115.00	0.35	6477.69	5182.15	0.05
691	729	730	749	748	2	115.00	0.35	6748.48	5398.78	0.05
692	730	731	750	749	2	115.00	0.35	7009.07	5607.26	0.05
693	731	732	751	750	2	115.00	0.35	7257.68	5806.15	0.05
694	732	733	751	751	2	115.00	0.35	7449.42	5959.54	0.05
695	733	734	752	751	3	115.00	0.35	7674.21	6139.37	0.05
696	735	736	754	753	3	115.00	0.35	418.01	334.41	0.05
697	736	737	755	754	2	115.00	0.35	1566.66	1253.33	0.05
698	737	738	756	755	2	115.00	0.35	2496.09	1996.87	0.05
699	738	739	757	756	2	115.00	0.35	3129.09	2503.27	0.05
700	739	740	758	757	2	115.00	0.35	3659.85	2927.88	0.05
701	740	741	759	758	2	115.00	0.35	4133.61	3306.89	0.05
702	741	742	760	759	2	115.00	0.35	4543.09	3634.47	0.05
703	742	743	761	760	2	115.00	0.35	4922.39	3937.91	0.05
704	743	744	762	761	2	115.00	0.35	5280.31	4224.25	0.05
705	744	745	763	762	2	115.00	0.35	5606.46	4485.17	0.05
706	745	746	764	763	2	115.00	0.35	5918.33	4734.66	0.05
707	746	747	765	764	2	115.00	0.35	6218.11	4974.49	0.05
708	747	748	766	765	2	115.00	0.35	6497.27	5197.82	0.05
709	748	749	767	766	2	115.00	0.35	6768.47	5414.77	0.05
710	749	750	768	767	2	115.00	0.35	7030.66	5624.53	0.05
711	750	751	769	768	2	115.00	0.35	7259.98	5807.99	0.05
712	751	752	770	769	3	115.00	0.35	7530.69	6024.55	0.05
713	754	772	771	753	3	115.00	0.35	418.01	334.41	0.05
714	755	773	772	754	2	115.00	0.35	1562.05	1249.64	0.05
715	756	774	773	755	2	115.00	0.35	2487.49	1990.00	0.05
716	757	775	774	756	2	115.00	0.35	3114.76	2491.81	0.05
717	758	776	775	757	2	115.00	0.35	3644.45	2915.56	0.05
718	759	777	776	758	2	115.00	0.35	4116.92	3293.54	0.05
719	760	778	777	759	2	115.00	0.35	4522.69	3618.15	0.05
720	761	779	778	760	2	115.00	0.35	4901.15	3920.92	0.05
721	762	780	779	761	2	115.00	0.35	5258.16	4206.53	0.05
722	763	781	780	762	2	115.00	0.35	5581.36	4465.09	0.05
723	764	782	781	763	2	115.00	0.35	5892.53	4714.02	0.05

724	765	783	782	764	2	115.00	0.35	6189.74	4951.79	0.05
725	766	784	783	765	2	115.00	0.35	6468.20	5174.56	0.05
726	767	785	784	766	2	115.00	0.35	6738.79	5391.03	0.05
727	768	786	785	767	2	115.00	0.35	6998.61	5598.89	0.05
728	769	787	786	768	2	115.00	0.35	7227.42	5781.94	0.05
729	770	788	787	769	3	115.00	0.35	7496.45	5997.16	0.05
730	772	790	789	771	3	115.00	0.35	418.01	334.41	0.05
731	773	791	790	772	2	115.00	0.35	1568.19	1254.55	0.05
732	774	792	791	773	2	115.00	0.35	2498.94	1999.15	0.05
733	775	793	792	774	2	115.00	0.35	3133.84	2507.07	0.05
734	776	794	793	775	2	115.00	0.35	3664.95	2931.96	0.05
735	777	795	794	776	2	115.00	0.35	4139.14	3311.31	0.05
736	778	796	795	777	2	115.00	0.35	4549.85	3639.88	0.05
737	779	797	796	778	2	115.00	0.35	4929.43	3943.54	0.05
738	780	798	797	779	2	115.00	0.35	5287.65	4230.12	0.05
739	781	799	798	780	2	115.00	0.35	5614.78	4491.82	0.05
740	782	800	799	781	2	115.00	0.35	5926.88	4741.51	0.05
741	783	801	800	782	2	115.00	0.35	6226.90	4981.52	0.05
742	784	802	801	783	2	115.00	0.35	6506.91	5205.53	0.05
743	785	803	802	784	2	115.00	0.35	6778.30	5422.64	0.05
744	786	804	803	785	2	115.00	0.35	7041.29	5633.03	0.05
745	787	805	804	786	2	115.00	0.35	7290.41	5832.33	0.05
746	788	806	805	787	3	115.00	0.35	7579.69	6063.75	0.05
747	790	808	807	789	3	115.00	0.35	418.01	334.41	0.05
748	790	809	808	808	2	115.00	0.35	1387.39	1109.91	0.05
749	791	810	809	790	2	115.00	0.35	2058.39	1646.72	0.05
750	792	811	810	791	2	115.00	0.35	2797.32	2237.86	0.05
751	793	812	811	792	2	115.00	0.35	3401.97	2721.58	0.05
752	794	813	812	793	2	115.00	0.35	3884.39	3107.51	0.05
753	795	814	813	794	2	115.00	0.35	4320.13	3456.10	0.05
754	796	815	814	795	2	115.00	0.35	4723.51	3778.81	0.05
755	797	816	815	796	2	115.00	0.35	5081.82	4065.45	0.05
756	798	817	816	797	2	115.00	0.35	5422.23	4337.78	0.05
757	799	818	817	798	2	115.00	0.35	5746.16	4596.93	0.05
758	800	819	818	799	2	115.00	0.35	6044.76	4835.81	0.05
759	801	820	819	800	2	115.00	0.35	6333.89	5067.12	0.05
760	802	821	820	801	2	115.00	0.35	6611.16	5288.93	0.05
761	803	822	821	802	2	115.00	0.35	6873.66	5498.92	0.05
762	804	823	822	803	2	115.00	0.35	7129.43	5703.54	0.05
763	805	824	823	804	2	115.00	0.35	7375.74	5900.59	0.05
764	806	825	824	805	3	115.00	0.35	7658.37	6126.69	0.05
765	808	827	826	807	3	115.00	0.35	418.01	334.41	0.05
766	809	828	827	808	2	115.00	0.35	1560.03	1248.03	0.05
767	810	829	828	809	2	115.00	0.35	2483.74	1987.00	0.05
768	811	830	829	810	2	115.00	0.35	3108.51	2486.81	0.05
769	812	831	830	811	2	115.00	0.35	3637.74	2910.19	0.05
770	813	832	831	812	2	115.00	0.35	4109.64	3287.72	0.05
771	814	833	832	813	2	115.00	0.35	4513.80	3611.04	0.05
772	815	834	833	814	2	115.00	0.35	4891.89	3913.51	0.05
773	816	835	834	815	2	115.00	0.35	5247.96	4198.37	0.05
774	817	836	835	816	2	115.00	0.35	5570.41	4456.32	0.05
775	818	837	836	817	2	115.00	0.35	5881.27	4705.02	0.05
776	819	838	837	818	2	115.00	0.35	6177.30	4941.84	0.05
777	820	839	838	819	2	115.00	0.35	6455.52	5164.42	0.05
778	821	840	839	820	2	115.00	0.35	6725.84	5380.67	0.05
779	822	841	840	821	2	115.00	0.35	6984.63	5587.70	0.05
780	823	842	841	822	2	115.00	0.35	7232.85	5786.28	0.05
781	824	843	842	823	2	115.00	0.35	7465.97	5972.77	0.05
782	825	844	843	824	3	115.00	0.35	7737.05	6189.64	0.05
783	826	827	846	845	3	115.00	0.35	418.01	334.41	0.05
784	827	828	847	846	2	115.00	0.35	1561.79	1249.43	0.05
785	828	829	848	847	2	115.00	0.35	2487.02	1989.62	0.05
786	829	830	849	848	2	115.00	0.35	3113.97	2491.18	0.05

787	830	831	850	849	2	115.00	0.35	3643.60	2914.88	0.05
788	831	832	851	850	2	115.00	0.35	4116.00	3292.80	0.05
789	832	833	852	851	2	115.00	0.35	4521.57	3617.26	0.05
790	833	834	853	852	2	115.00	0.35	4899.99	3919.99	0.05
791	834	835	854	853	2	115.00	0.35	5256.94	4205.55	0.05
792	835	836	855	854	2	115.00	0.35	5579.97	4463.98	0.05
793	836	837	856	855	2	115.00	0.35	5891.11	4712.89	0.05
794	837	838	857	856	2	115.00	0.35	6188.17	4950.53	0.05
795	838	839	858	857	2	115.00	0.35	6466.60	5173.28	0.05
796	839	840	859	858	2	115.00	0.35	6737.15	5389.72	0.05
797	840	841	860	859	2	115.00	0.35	6996.85	5597.48	0.05
798	841	842	861	860	2	115.00	0.35	7245.26	5796.21	0.05
799	842	843	862	861	2	115.00	0.35	7478.17	5982.54	0.05
800	843	863	862	862	2	115.00	0.35	7649.11	6119.29	0.05
801	843	844	864	863	3	115.00	0.35	7863.41	6290.73	0.05
802	845	846	866	865	3	115.00	0.35	418.01	334.41	0.05
803	846	847	867	866	2	115.00	0.35	1567.21	1253.77	0.05
804	847	848	868	867	2	115.00	0.35	2497.12	1997.70	0.05
805	848	849	869	868	2	115.00	0.35	3130.81	2504.64	0.05
806	849	850	870	869	2	115.00	0.35	3661.69	2929.35	0.05
807	850	851	871	870	2	115.00	0.35	4135.60	3308.48	0.05
808	851	852	872	871	2	115.00	0.35	4545.53	3636.42	0.05
809	852	853	873	872	2	115.00	0.35	4924.93	3939.94	0.05
810	853	854	874	873	2	115.00	0.35	5282.96	4226.37	0.05
811	854	855	875	874	2	115.00	0.35	5609.46	4487.57	0.05
812	855	856	876	875	2	115.00	0.35	5921.41	4737.13	0.05
813	856	857	877	876	2	115.00	0.35	6221.28	4977.02	0.05
814	857	858	878	877	2	115.00	0.35	6500.75	5200.60	0.05
815	858	859	879	878	2	115.00	0.35	6772.01	5417.61	0.05
816	859	860	880	879	2	115.00	0.35	7034.49	5627.60	0.05
817	860	861	881	880	2	115.00	0.35	7283.51	5826.81	0.05
818	861	862	882	881	2	115.00	0.35	7523.61	6018.88	0.05
819	862	863	883	882	2	115.00	0.35	7752.02	6201.61	0.05
820	863	864	884	883	3	115.00	0.35	8037.45	6429.96	0.05
821	865	866	886	885	3	115.00	0.35	418.01	334.41	0.05
822	866	867	887	886	2	115.00	0.35	1574.59	1259.67	0.05
823	867	868	888	887	2	115.00	0.35	2510.88	2008.70	0.05
824	868	869	889	888	2	115.00	0.35	3153.73	2522.98	0.05
825	869	870	890	889	2	115.00	0.35	3686.31	2949.05	0.05
826	870	871	891	890	2	115.00	0.35	4162.30	3329.84	0.05
827	871	872	892	891	2	115.00	0.35	4578.15	3662.52	0.05
828	872	873	893	892	2	115.00	0.35	4958.90	3967.12	0.05
829	873	874	894	893	2	115.00	0.35	5318.39	4254.72	0.05
830	874	875	895	894	2	115.00	0.35	5649.62	4519.70	0.05
831	875	876	896	895	2	115.00	0.35	5962.69	4770.15	0.05
832	876	877	897	896	2	115.00	0.35	6263.74	5011.00	0.05
833	877	878	898	897	2	115.00	0.35	6547.25	5237.80	0.05
834	878	879	899	898	2	115.00	0.35	6819.49	5455.59	0.05
835	879	880	900	899	2	115.00	0.35	7083.75	5667.00	0.05
836	880	881	901	900	2	115.00	0.35	7335.60	5868.48	0.05
837	881	882	902	901	2	115.00	0.35	7574.84	6059.87	0.05
838	882	883	903	902	2	115.00	0.35	7806.55	6245.24	0.05
839	883	904	903	903	2	115.00	0.35	7989.27	6391.42	0.05
840	883	884	905	904	3	115.00	0.35	8211.48	6569.19	0.05
841	885	886	907	906	3	115.00	0.35	418.01	334.41	0.05
842	886	887	908	907	2	115.00	0.35	1567.27	1253.82	0.05
843	887	888	909	908	2	115.00	0.35	2497.24	1997.79	0.05
844	888	889	910	909	2	115.00	0.35	3131.00	2504.80	0.05
845	889	890	911	910	2	115.00	0.35	3661.90	2929.52	0.05
846	890	891	912	911	2	115.00	0.35	4135.83	3308.67	0.05
847	891	892	913	912	2	115.00	0.35	4545.81	3636.64	0.05
848	892	893	914	913	2	115.00	0.35	4925.22	3940.18	0.05
849	893	894	915	914	2	115.00	0.35	5283.26	4226.61	0.05

850	894	895	916	915	2	115.00	0.35	5609.81	4487.85	0.05
851	895	896	917	916	2	115.00	0.35	5921.77	4737.41	0.05
852	896	897	918	917	2	115.00	0.35	6221.65	4977.32	0.05
853	897	898	919	918	2	115.00	0.35	6501.15	5200.92	0.05
854	898	899	920	919	2	115.00	0.35	6772.42	5417.94	0.05
855	899	900	921	920	2	115.00	0.35	7034.94	5627.95	0.05
856	900	901	922	921	2	115.00	0.35	7283.96	5827.17	0.05
857	901	902	923	922	2	115.00	0.35	7524.05	6019.24	0.05
858	902	903	924	923	2	115.00	0.35	7752.49	6201.99	0.05
859	903	904	925	924	2	115.00	0.35	7980.92	6384.74	0.05
860	904	926	925	925	2	115.00	0.35	8161.49	6529.19	0.05
861	904	905	927	926	3	115.00	0.35	8385.52	6708.42	0.05
862	906	907	929	928	3	115.00	0.35	418.01	334.41	0.05
863	907	908	930	929	2	115.00	0.35	1559.66	1247.73	0.05
864	908	909	931	930	2	115.00	0.35	2483.05	1986.44	0.05
865	909	910	932	931	2	115.00	0.35	3107.35	2485.88	0.05
866	910	911	933	932	2	115.00	0.35	3636.49	2909.19	0.05
867	911	912	934	933	2	115.00	0.35	4108.29	3286.63	0.05
868	912	913	935	934	2	115.00	0.35	4512.14	3609.71	0.05
869	913	914	936	935	2	115.00	0.35	4890.17	3912.13	0.05
870	914	915	937	936	2	115.00	0.35	5245.97	4196.77	0.05
871	915	916	938	937	2	115.00	0.35	5568.37	4454.69	0.05
872	916	917	939	938	2	115.00	0.35	5879.18	4703.34	0.05
873	917	918	940	939	2	115.00	0.35	6174.98	4939.99	0.05
874	918	919	941	940	2	115.00	0.35	6453.16	5162.53	0.05
875	919	920	942	941	2	115.00	0.35	6723.43	5378.74	0.05
876	920	921	943	942	2	115.00	0.35	6982.02	5585.62	0.05
877	921	922	944	943	2	115.00	0.35	7230.20	5784.16	0.05
878	922	923	945	944	2	115.00	0.35	7471.18	5976.95	0.05
879	923	924	946	945	2	115.00	0.35	7696.21	6156.97	0.05
880	924	925	947	946	2	115.00	0.35	7921.24	6336.99	0.05
881	925	926	948	947	2	115.00	0.35	8146.27	6517.01	0.05
882	926	949	948	948	2	115.00	0.35	8325.63	6660.50	0.05
883	926	927	950	949	3	115.00	0.35	8548.57	6838.86	0.05
884	928	929	952	951	3	115.00	0.35	418.01	334.41	0.05
885	929	930	953	952	2	115.00	0.35	1560.87	1248.70	0.05
886	930	931	954	953	2	115.00	0.35	2485.30	1988.24	0.05
887	931	932	955	954	2	115.00	0.35	3111.11	2488.89	0.05
888	932	933	956	955	2	115.00	0.35	3640.53	2912.42	0.05
889	933	934	957	956	2	115.00	0.35	4112.67	3290.14	0.05
890	934	935	958	957	2	115.00	0.35	4517.50	3614.00	0.05
891	935	936	959	958	2	115.00	0.35	4895.75	3916.60	0.05
892	936	937	960	959	2	115.00	0.35	5252.40	4201.92	0.05
893	937	938	961	960	2	115.00	0.35	5574.96	4459.97	0.05
894	938	939	962	961	2	115.00	0.35	5885.96	4708.76	0.05
895	939	940	963	962	2	115.00	0.35	6182.47	4945.98	0.05
896	940	941	964	963	2	115.00	0.35	6460.79	5168.64	0.05
897	941	942	965	964	2	115.00	0.35	6731.23	5384.98	0.05
898	942	943	966	965	2	115.00	0.35	6990.44	5592.36	0.05
899	943	944	967	966	2	115.00	0.35	7238.76	5791.01	0.05
900	944	945	968	967	2	115.00	0.35	7479.59	5983.68	0.05
901	945	946	969	968	2	115.00	0.35	7705.17	6164.13	0.05
902	946	947	970	969	2	115.00	0.35	7930.74	6344.59	0.05
903	947	948	971	970	2	115.00	0.35	8156.31	6525.05	0.05
904	948	949	972	971	2	115.00	0.35	8387.34	6709.88	0.05
905	949	950	973	972	3	115.00	0.35	8679.97	6943.97	0.05
906	952	975	974	951	3	115.00	0.35	418.01	334.41	0.05
907	953	976	975	952	2	115.00	0.35	1569.64	1255.71	0.05
908	954	977	976	953	2	115.00	0.35	2501.65	2001.32	0.05
909	955	978	977	954	2	115.00	0.35	3138.35	2510.68	0.05
910	956	979	978	955	2	115.00	0.35	3669.79	2935.83	0.05
911	957	980	979	956	2	115.00	0.35	4144.39	3315.51	0.05
912	958	981	980	957	2	115.00	0.35	4556.26	3645.01	0.05

913	959	982	981	958	2	115.00	0.35	4936.10	3948.88	0.05
914	960	983	982	959	2	115.00	0.35	5294.62	4235.69	0.05
915	961	984	983	960	2	115.00	0.35	5622.68	4498.14	0.05
916	962	985	984	961	2	115.00	0.35	5935.00	4748.00	0.05
917	963	986	985	962	2	115.00	0.35	6235.25	4988.20	0.05
918	964	987	986	963	2	115.00	0.35	6516.05	5212.84	0.05
919	965	988	987	964	2	115.00	0.35	6787.64	5430.11	0.05
920	966	989	988	965	2	115.00	0.35	7051.21	5640.97	0.05
921	967	990	989	966	2	115.00	0.35	7300.65	5840.52	0.05
922	968	991	990	967	2	115.00	0.35	7540.46	6032.37	0.05
923	969	992	991	968	2	115.00	0.35	7769.96	6215.97	0.05
924	970	993	992	969	2	115.00	0.35	7999.46	6399.57	0.05
925	971	994	993	970	2	115.00	0.35	8228.96	6583.17	0.05
926	972	995	994	971	2	115.00	0.35	8447.64	6758.11	0.05
927	973	996	995	972	3	115.00	0.35	8733.98	6987.19	0.05
928	975	998	997	974	3	115.00	0.35	418.01	334.41	0.05
929	976	999	998	975	2	115.00	0.35	1575.51	1260.40	0.05
930	977	1000	999	976	2	115.00	0.35	2512.58	2010.07	0.05
931	978	1001	1000	977	2	115.00	0.35	3156.57	2525.26	0.05
932	979	1002	1001	978	2	115.00	0.35	3689.37	2951.49	0.05
933	980	1003	1002	979	2	115.00	0.35	4165.61	3332.49	0.05
934	981	1004	1003	980	2	115.00	0.35	4582.20	3665.76	0.05
935	982	1005	1004	981	2	115.00	0.35	4963.11	3970.49	0.05
936	983	1006	1005	982	2	115.00	0.35	5322.79	4258.23	0.05
937	984	1007	1006	983	2	115.00	0.35	5654.60	4523.68	0.05
938	985	1008	1007	984	2	115.00	0.35	5967.81	4774.25	0.05
939	986	1009	1008	985	2	115.00	0.35	6269.01	5015.21	0.05
940	987	1010	1009	986	2	115.00	0.35	6553.02	5242.42	0.05
941	988	1011	1010	987	2	115.00	0.35	6825.38	5460.31	0.05
942	989	1012	1011	988	2	115.00	0.35	7089.76	5671.81	0.05
943	990	1013	1012	989	2	115.00	0.35	7342.06	5873.65	0.05
944	991	1014	1013	990	2	115.00	0.35	7581.19	6064.95	0.05
945	992	1015	1014	991	2	115.00	0.35	7813.32	6250.66	0.05
946	993	1016	1015	992	2	115.00	0.35	8045.45	6436.36	0.05
947	994	1017	1016	993	2	115.00	0.35	8277.57	6622.06	0.05
948	995	1018	1017	994	2	115.00	0.35	8485.53	6788.42	0.05
949	996	1019	1018	995	3	115.00	0.35	8765.14	7012.11	0.05
950	998	1021	1020	997	3	115.00	0.35	418.01	334.41	0.05
951	998	1022	1021	1021	2	115.00	0.35	1390.93	1112.75	0.05
952	999	1023	1022	998	2	115.00	0.35	2068.39	1654.71	0.05
953	1000	1024	1023	999	2	115.00	0.35	2809.33	2247.47	0.05
954	1001	1025	1024	1000	2	115.00	0.35	3415.65	2732.52	0.05
955	1002	1026	1025	1001	2	115.00	0.35	3902.52	3122.02	0.05
956	1003	1027	1026	1002	2	115.00	0.35	4339.17	3471.34	0.05
957	1004	1028	1027	1003	2	115.00	0.35	4743.59	3794.88	0.05
958	1005	1029	1028	1004	2	115.00	0.35	5105.21	4084.17	0.05
959	1006	1030	1029	1005	2	115.00	0.35	5446.37	4357.10	0.05
960	1007	1031	1030	1006	2	115.00	0.35	5771.83	4617.46	0.05
961	1008	1032	1031	1007	2	115.00	0.35	6072.47	4857.98	0.05
962	1009	1033	1032	1008	2	115.00	0.35	6362.24	5089.79	0.05
963	1010	1034	1033	1009	2	115.00	0.35	6642.07	5313.66	0.05
964	1011	1035	1034	1010	2	115.00	0.35	6905.09	5524.07	0.05
965	1012	1036	1035	1011	2	115.00	0.35	7161.44	5729.15	0.05
966	1013	1037	1036	1012	2	115.00	0.35	7410.02	5928.02	0.05
967	1014	1038	1037	1013	2	115.00	0.35	7640.30	6112.24	0.05
968	1015	1039	1038	1014	2	115.00	0.35	7869.01	6295.21	0.05
969	1016	1040	1039	1015	2	115.00	0.35	8097.72	6478.17	0.05
970	1017	1041	1040	1016	2	115.00	0.35	8324.52	6659.62	0.05
971	1018	1042	1041	1017	2	115.00	0.35	8536.22	6828.98	0.05
972	1019	1043	1042	1018	3	115.00	0.35	8824.88	7059.91	0.05
973	1021	1045	1044	1020	3	115.00	0.35	418.01	334.41	0.05
974	1022	1046	1045	1021	2	115.00	0.35	1558.91	1247.13	0.05
975	1023	1047	1046	1022	2	115.00	0.35	2481.64	1985.32	0.05

976	1024	1048	1047	1023	2	115.00	0.35	3105.01	2484.01	0.05
977	1025	1049	1048	1024	2	115.00	0.35	3633.98	2907.18	0.05
978	1026	1050	1049	1025	2	115.00	0.35	4105.57	3284.45	0.05
979	1027	1051	1050	1026	2	115.00	0.35	4508.82	3607.05	0.05
980	1028	1052	1051	1027	2	115.00	0.35	4886.71	3909.36	0.05
981	1029	1053	1052	1028	2	115.00	0.35	5241.97	4193.58	0.05
982	1030	1054	1053	1029	2	115.00	0.35	5564.27	4451.42	0.05
983	1031	1055	1054	1030	2	115.00	0.35	5874.97	4699.98	0.05
984	1032	1056	1055	1031	2	115.00	0.35	6170.33	4936.27	0.05
985	1033	1057	1056	1032	2	115.00	0.35	6448.42	5158.74	0.05
986	1034	1058	1057	1033	2	115.00	0.35	6718.59	5374.87	0.05
987	1035	1059	1058	1034	2	115.00	0.35	6976.80	5581.44	0.05
988	1036	1060	1059	1035	2	115.00	0.35	7224.90	5779.92	0.05
989	1037	1061	1060	1036	2	115.00	0.35	7465.96	5972.77	0.05
990	1038	1062	1061	1037	2	115.00	0.35	7690.65	6152.52	0.05
991	1039	1063	1062	1038	2	115.00	0.35	7915.34	6332.28	0.05
992	1040	1064	1063	1039	2	115.00	0.35	8140.04	6512.03	0.05
993	1041	1065	1064	1040	2	115.00	0.35	8359.15	6687.32	0.05
994	1042	1066	1065	1041	2	115.00	0.35	8567.22	6853.78	0.05
995	1043	1067	1066	1042	3	115.00	0.35	8854.55	7083.64	0.05
996	1045	1069	1068	1044	3	115.00	0.35	418.01	334.41	0.05
997	1046	1070	1069	1045	2	115.00	0.35	1560.02	1248.02	0.05
998	1047	1071	1070	1046	2	115.00	0.35	2483.72	1986.97	0.05
999	1048	1072	1071	1047	2	115.00	0.35	3108.47	2486.78	0.05
1000	1049	1073	1072	1048	2	115.00	0.35	3637.69	2910.15	0.05
1001	1050	1074	1073	1049	2	115.00	0.35	4109.59	3287.68	0.05
1002	1051	1075	1074	1050	2	115.00	0.35	4513.74	3610.99	0.05
1003	1052	1076	1075	1051	2	115.00	0.35	4891.83	3913.46	0.05
1004	1053	1077	1076	1052	2	115.00	0.35	5247.89	4198.31	0.05
1005	1054	1078	1077	1053	2	115.00	0.35	5570.33	4456.27	0.05
1006	1055	1079	1078	1054	2	115.00	0.35	5881.20	4704.96	0.05
1007	1056	1080	1079	1055	2	115.00	0.35	6177.21	4941.77	0.05
1008	1057	1081	1080	1056	2	115.00	0.35	6455.43	5164.35	0.05
1009	1058	1082	1081	1057	2	115.00	0.35	6725.75	5380.60	0.05
1010	1059	1083	1082	1058	2	115.00	0.35	6984.53	5587.63	0.05
1011	1060	1084	1083	1059	2	115.00	0.35	7232.75	5786.20	0.05
1012	1061	1085	1084	1060	2	115.00	0.35	7473.69	5978.95	0.05
1013	1062	1086	1085	1061	2	115.00	0.35	7698.88	6159.10	0.05
1014	1063	1087	1086	1062	2	115.00	0.35	7924.07	6339.25	0.05
1015	1064	1088	1087	1063	2	115.00	0.35	8149.26	6519.41	0.05
1016	1065	1089	1088	1064	2	115.00	0.35	8367.94	6694.35	0.05
1017	1066	1090	1089	1065	2	115.00	0.35	8571.53	6857.22	0.05
1018	1067	1091	1090	1066	3	115.00	0.35	8854.15	7083.32	0.05
1019	1069	1093	1092	1068	3	115.00	0.35	418.01	334.41	0.05
1020	1070	1094	1093	1069	2	115.00	0.35	1559.97	1247.98	0.05
1021	1071	1095	1094	1070	2	115.00	0.35	2483.63	1986.91	0.05
1022	1072	1096	1095	1071	2	115.00	0.35	3108.32	2486.66	0.05
1023	1073	1097	1096	1072	2	115.00	0.35	3637.54	2910.03	0.05
1024	1074	1098	1097	1073	2	115.00	0.35	4109.43	3287.54	0.05
1025	1075	1099	1098	1074	2	115.00	0.35	4513.53	3610.83	0.05
1026	1076	1100	1099	1075	2	115.00	0.35	4891.62	3913.29	0.05
1027	1077	1101	1100	1076	2	115.00	0.35	5247.64	4198.11	0.05
1028	1078	1102	1101	1077	2	115.00	0.35	5570.08	4456.06	0.05
1029	1079	1103	1102	1078	2	115.00	0.35	5880.94	4704.75	0.05
1030	1080	1104	1103	1079	2	115.00	0.35	6176.93	4941.54	0.05
1031	1081	1105	1104	1080	2	115.00	0.35	6455.14	5164.11	0.05
1032	1082	1106	1105	1081	2	115.00	0.35	6725.45	5380.36	0.05
1033	1083	1107	1106	1082	2	115.00	0.35	6984.21	5587.37	0.05
1034	1084	1108	1107	1083	2	115.00	0.35	7232.43	5785.94	0.05
1035	1085	1109	1108	1084	2	115.00	0.35	7473.37	5978.69	0.05
1036	1086	1110	1109	1085	2	115.00	0.35	7698.54	6158.83	0.05
1037	1087	1111	1110	1086	2	115.00	0.35	7923.70	6338.96	0.05
1038	1088	1112	1111	1087	2	115.00	0.35	8148.87	6519.10	0.05

1039	1089	1113	1112	1088	2	115.00	0.35	8367.58	6694.06	0.05
1040	1090	1114	1113	1089	2	115.00	0.35	8571.14	6856.92	0.05
1041	1091	1115	1114	1090	3	115.00	0.35	8853.75	7083.00	0.05
1042	1093	1117	1116	1092	3	115.00	0.35	418.01	334.41	0.05
1043	1094	1118	1117	1093	2	115.00	0.35	1559.93	1247.94	0.05
1044	1095	1119	1118	1094	2	115.00	0.35	2483.55	1986.84	0.05
1045	1096	1120	1119	1095	2	115.00	0.35	3108.18	2486.54	0.05
1046	1097	1121	1120	1096	2	115.00	0.35	3637.38	2909.90	0.05
1047	1098	1122	1121	1097	2	115.00	0.35	4109.26	3287.41	0.05
1048	1099	1123	1122	1098	2	115.00	0.35	4513.33	3610.66	0.05
1049	1100	1124	1123	1099	2	115.00	0.35	4891.40	3913.12	0.05
1050	1101	1125	1124	1100	2	115.00	0.35	5247.39	4197.91	0.05
1051	1102	1126	1125	1101	2	115.00	0.35	5569.83	4455.86	0.05
1052	1103	1127	1126	1102	2	115.00	0.35	5880.68	4704.54	0.05
1053	1104	1128	1127	1103	2	115.00	0.35	6176.64	4941.31	0.05
1054	1105	1129	1128	1104	2	115.00	0.35	6454.85	5163.88	0.05
1055	1106	1130	1129	1105	2	115.00	0.35	6725.16	5380.12	0.05
1056	1107	1131	1130	1106	2	115.00	0.35	6983.89	5587.11	0.05
1057	1108	1132	1131	1107	2	115.00	0.35	7232.10	5785.68	0.05
1058	1109	1133	1132	1108	2	115.00	0.35	7473.04	5978.44	0.05
1059	1110	1134	1133	1109	2	115.00	0.35	7698.19	6158.55	0.05
1060	1111	1135	1134	1110	2	115.00	0.35	7923.34	6338.67	0.05
1061	1112	1136	1135	1111	2	115.00	0.35	8148.49	6518.79	0.05
1062	1113	1137	1136	1112	2	115.00	0.35	8367.21	6693.77	0.05
1063	1114	1138	1137	1113	2	115.00	0.35	8570.76	6856.61	0.05
1064	1115	1139	1138	1114	3	115.00	0.35	8853.35	7082.68	0.05
1065	1117	1141	1140	1116	3	115.00	0.35	418.01	334.41	0.05
1066	1118	1142	1141	1117	2	115.00	0.35	1559.88	1247.91	0.05
1067	1119	1143	1142	1118	2	115.00	0.35	2483.46	1986.77	0.05
1068	1120	1144	1143	1119	2	115.00	0.35	3108.04	2486.43	0.05
1069	1121	1145	1144	1120	2	115.00	0.35	3637.23	2909.78	0.05
1070	1122	1146	1145	1121	2	115.00	0.35	4109.09	3287.27	0.05
1071	1123	1147	1146	1122	2	115.00	0.35	4513.12	3610.50	0.05
1072	1124	1148	1147	1123	2	115.00	0.35	4891.19	3912.95	0.05
1073	1125	1149	1148	1124	2	115.00	0.35	5247.15	4197.72	0.05
1074	1126	1150	1149	1125	2	115.00	0.35	5569.57	4455.66	0.05
1075	1127	1151	1150	1126	2	115.00	0.35	5880.42	4704.33	0.05
1076	1128	1152	1151	1127	2	115.00	0.35	6176.35	4941.08	0.05
1077	1129	1153	1152	1128	2	115.00	0.35	6454.56	5163.64	0.05
1078	1130	1154	1153	1129	2	115.00	0.35	6724.86	5379.89	0.05
1079	1131	1155	1154	1130	2	115.00	0.35	6983.57	5586.85	0.05
1080	1132	1156	1155	1131	2	115.00	0.35	7231.77	5785.42	0.05
1081	1133	1157	1156	1132	2	115.00	0.35	7472.72	5978.18	0.05
1082	1134	1158	1157	1133	2	115.00	0.35	7697.85	6158.28	0.05
1083	1135	1159	1158	1134	2	115.00	0.35	7922.98	6338.38	0.05
1084	1136	1160	1159	1135	2	115.00	0.35	8148.10	6518.48	0.05
1085	1137	1161	1160	1136	2	115.00	0.35	8366.84	6693.47	0.05
1086	1138	1162	1161	1137	2	115.00	0.35	8570.37	6856.30	0.05
1087	1139	1163	1162	1138	3	115.00	0.35	8852.95	7082.36	0.05
1088	1141	1165	1164	1140	3	115.00	0.35	418.01	334.41	0.05
1089	1142	1166	1165	1141	2	115.00	0.35	1559.84	1247.87	0.05
1090	1143	1167	1166	1142	2	115.00	0.35	2483.37	1986.70	0.05
1091	1144	1168	1167	1143	2	115.00	0.35	3107.89	2486.31	0.05
1092	1145	1169	1168	1144	2	115.00	0.35	3637.07	2909.66	0.05
1093	1146	1170	1169	1145	2	115.00	0.35	4108.92	3287.14	0.05
1094	1147	1171	1170	1146	2	115.00	0.35	4512.92	3610.33	0.05
1095	1148	1172	1171	1147	2	115.00	0.35	4890.97	3912.78	0.05
1096	1149	1173	1172	1148	2	115.00	0.35	5246.90	4197.52	0.05
1097	1150	1174	1173	1149	2	115.00	0.35	5569.32	4455.46	0.05
1098	1151	1175	1174	1150	2	115.00	0.35	5880.16	4704.13	0.05
1099	1152	1176	1175	1151	2	115.00	0.35	6176.07	4940.85	0.05
1100	1153	1177	1176	1152	2	115.00	0.35	6454.26	5163.41	0.05
1101	1154	1178	1177	1153	2	115.00	0.35	6724.56	5379.65	0.05

1102	1155	1179	1178	1154	2	115.00	0.35	6983.24	5586.59	0.05
1103	1156	1180	1179	1155	2	115.00	0.35	7231.44	5785.15	0.05
1104	1157	1181	1180	1156	2	115.00	0.35	7472.40	5977.92	0.05
1105	1158	1182	1181	1157	2	115.00	0.35	7697.51	6158.01	0.05
1106	1159	1183	1182	1158	2	115.00	0.35	7922.61	6338.09	0.05
1107	1160	1184	1183	1159	2	115.00	0.35	8147.72	6518.18	0.05
1108	1161	1185	1184	1160	2	115.00	0.35	8366.48	6693.18	0.05
1109	1162	1186	1185	1161	2	115.00	0.35	8569.99	6855.99	0.05
1110	1163	1187	1186	1162	3	115.00	0.35	8852.55	7082.04	0.05
1111	1165	1189	1188	1164	3	115.00	0.35	418.01	334.41	0.05
1112	1166	1190	1189	1165	2	115.00	0.35	1558.54	1246.83	0.05
1113	1167	1191	1190	1166	2	115.00	0.35	2480.96	1984.77	0.05
1114	1168	1192	1191	1167	2	115.00	0.35	3103.88	2483.10	0.05
1115	1169	1193	1192	1168	2	115.00	0.35	3632.76	2906.21	0.05
1116	1170	1194	1193	1169	2	115.00	0.35	4104.25	3283.40	0.05
1117	1171	1195	1194	1170	2	115.00	0.35	4507.20	3605.76	0.05
1118	1172	1196	1195	1171	2	115.00	0.35	4885.02	3908.02	0.05
1119	1173	1197	1196	1172	2	115.00	0.35	5240.03	4192.03	0.05
1120	1174	1198	1197	1173	2	115.00	0.35	5562.29	4449.83	0.05
1121	1175	1199	1198	1174	2	115.00	0.35	5872.93	4698.34	0.05
1122	1176	1200	1199	1175	2	115.00	0.35	6168.08	4934.46	0.05
1123	1177	1201	1200	1176	2	115.00	0.35	6446.12	5156.89	0.05
1124	1178	1202	1201	1177	2	115.00	0.35	6716.24	5372.99	0.05
1125	1179	1203	1202	1178	2	115.00	0.35	6974.26	5579.41	0.05
1126	1180	1204	1203	1179	2	115.00	0.35	7222.32	5777.86	0.05
1127	1181	1205	1204	1180	2	115.00	0.35	7463.43	5970.74	0.05
1128	1182	1206	1205	1181	2	115.00	0.35	7687.95	6150.36	0.05
1129	1183	1207	1206	1182	2	115.00	0.35	7912.48	6329.99	0.05
1130	1184	1208	1207	1183	2	115.00	0.35	8137.01	6509.61	0.05
1131	1185	1209	1208	1184	2	115.00	0.35	8356.27	6685.02	0.05
1132	1186	1210	1209	1185	2	115.00	0.35	8564.56	6851.65	0.05
1133	1187	1211	1210	1186	3	115.00	0.35	8852.14	7081.72	0.05
1134	1189	1213	1212	1188	3	115.00	0.35	418.01	334.41	0.05
1135	1190	1213	1189	1189	2	115.00	0.35	1390.60	1112.48	0.05
1136	1191	1214	1213	1190	2	115.00	0.35	2067.14	1653.72	0.05
1137	1192	1215	1214	1191	2	115.00	0.35	2807.64	2246.11	0.05
1138	1193	1216	1215	1192	2	115.00	0.35	3413.64	2730.91	0.05
1139	1194	1217	1216	1193	2	115.00	0.35	3899.81	3119.85	0.05
1140	1195	1218	1217	1194	2	115.00	0.35	4336.29	3469.03	0.05
1141	1196	1219	1218	1195	2	115.00	0.35	4740.53	3792.42	0.05
1142	1197	1220	1219	1196	2	115.00	0.35	5101.62	4081.30	0.05
1143	1198	1221	1220	1197	2	115.00	0.35	5442.65	4354.12	0.05
1144	1199	1222	1221	1198	2	115.00	0.35	5767.97	4614.38	0.05
1145	1200	1223	1222	1199	2	115.00	0.35	6068.17	4854.54	0.05
1146	1201	1224	1223	1200	2	115.00	0.35	6357.84	5086.27	0.05
1147	1202	1225	1224	1201	2	115.00	0.35	6637.26	5309.81	0.05
1148	1203	1226	1225	1202	2	115.00	0.35	6900.19	5520.15	0.05
1149	1204	1227	1226	1203	2	115.00	0.35	7156.44	5725.15	0.05
1150	1205	1228	1227	1204	2	115.00	0.35	7404.67	5923.73	0.05
1151	1206	1229	1228	1205	2	115.00	0.35	7635.04	6108.03	0.05
1152	1207	1230	1229	1206	2	115.00	0.35	7863.42	6290.73	0.05
1153	1208	1231	1230	1207	2	115.00	0.35	8091.79	6473.43	0.05
1154	1209	1232	1231	1208	2	115.00	0.35	8318.87	6655.09	0.05
1155	1210	1233	1232	1209	2	115.00	0.35	8530.63	6824.51	0.05
1156	1211	1234	1233	1210	3	115.00	0.35	8819.42	7055.54	0.05
1157	1213	1236	1235	1212	3	115.00	0.35	418.01	334.41	0.05
1158	1214	1237	1236	1213	2	115.00	0.35	1574.33	1259.46	0.05
1159	1215	1238	1237	1214	2	115.00	0.35	2510.38	2008.31	0.05
1160	1216	1239	1238	1215	2	115.00	0.35	3152.91	2522.33	0.05
1161	1217	1240	1239	1216	2	115.00	0.35	3685.43	2948.34	0.05
1162	1218	1241	1240	1217	2	115.00	0.35	4161.34	3329.07	0.05
1163	1219	1242	1241	1218	2	115.00	0.35	4576.98	3661.58	0.05
1164	1220	1243	1242	1219	2	115.00	0.35	4957.68	3966.14	0.05

1165	1221	1244	1243	1220	2	115.00	0.35	5317.12	4253.70	0.05
1166	1222	1245	1244	1221	2	115.00	0.35	5648.18	4518.55	0.05
1167	1223	1246	1245	1222	2	115.00	0.35	5961.21	4768.97	0.05
1168	1224	1247	1246	1223	2	115.00	0.35	6262.22	5009.78	0.05
1169	1225	1248	1247	1224	2	115.00	0.35	6545.59	5236.47	0.05
1170	1226	1249	1248	1225	2	115.00	0.35	6817.79	5454.23	0.05
1171	1227	1250	1249	1226	2	115.00	0.35	7082.01	5665.61	0.05
1172	1228	1251	1250	1227	2	115.00	0.35	7333.73	5866.99	0.05
1173	1229	1252	1251	1228	2	115.00	0.35	7573.00	6058.40	0.05
1174	1230	1253	1252	1229	2	115.00	0.35	7804.60	6243.68	0.05
1175	1231	1254	1253	1230	2	115.00	0.35	8036.20	6428.96	0.05
1176	1232	1255	1254	1231	2	115.00	0.35	8267.79	6614.23	0.05
1177	1233	1256	1255	1232	2	115.00	0.35	8475.70	6780.56	0.05
1178	1234	1257	1256	1233	3	115.00	0.35	8754.38	7003.50	0.05
1179	1236	1259	1258	1235	3	115.00	0.35	418.01	334.41	0.05
1180	1237	1260	1259	1236	2	115.00	0.35	1570.28	1256.22	0.05
1181	1238	1261	1260	1237	2	115.00	0.35	2502.84	2002.27	0.05
1182	1239	1262	1261	1238	2	115.00	0.35	3140.33	2512.27	0.05
1183	1240	1263	1262	1239	2	115.00	0.35	3671.92	2937.54	0.05
1184	1241	1264	1263	1240	2	115.00	0.35	4146.70	3317.36	0.05
1185	1242	1265	1264	1241	2	115.00	0.35	4559.09	3647.27	0.05
1186	1243	1266	1265	1242	2	115.00	0.35	4939.05	3951.24	0.05
1187	1244	1267	1266	1243	2	115.00	0.35	5297.69	4238.15	0.05
1188	1245	1268	1267	1244	2	115.00	0.35	5626.15	4500.92	0.05
1189	1246	1269	1268	1245	2	115.00	0.35	5938.57	4750.86	0.05
1190	1247	1270	1269	1246	2	115.00	0.35	6238.93	4991.14	0.05
1191	1248	1271	1270	1247	2	115.00	0.35	6520.08	5216.06	0.05
1192	1249	1272	1271	1248	2	115.00	0.35	6791.75	5433.40	0.05
1193	1250	1273	1272	1249	2	115.00	0.35	7055.41	5644.33	0.05
1194	1251	1274	1273	1250	2	115.00	0.35	7305.16	5844.13	0.05
1195	1252	1275	1274	1251	2	115.00	0.35	7544.90	6035.92	0.05
1196	1253	1276	1275	1252	2	115.00	0.35	7774.68	6219.75	0.05
1197	1254	1277	1276	1253	2	115.00	0.35	8004.47	6403.58	0.05
1198	1255	1278	1277	1254	2	115.00	0.35	8234.25	6587.40	0.05
1199	1256	1279	1278	1255	2	115.00	0.35	8443.74	6754.99	0.05
1200	1257	1280	1279	1256	3	115.00	0.35	8721.05	6976.84	0.05
1201	1259	1282	1281	1258	3	115.00	0.35	418.01	334.41	0.05
1202	1260	1283	1282	1259	2	115.00	0.35	1564.44	1251.55	0.05
1203	1261	1284	1283	1260	2	115.00	0.35	2491.95	1993.56	0.05
1204	1262	1285	1284	1261	2	115.00	0.35	3122.19	2497.75	0.05
1205	1263	1286	1285	1262	2	115.00	0.35	3652.43	2921.94	0.05
1206	1264	1287	1286	1263	2	115.00	0.35	4125.57	3300.45	0.05
1207	1265	1288	1287	1264	2	115.00	0.35	4533.26	3626.61	0.05
1208	1266	1289	1288	1265	2	115.00	0.35	4912.15	3929.72	0.05
1209	1267	1290	1289	1266	2	115.00	0.35	5269.63	4215.71	0.05
1210	1268	1291	1290	1267	2	115.00	0.35	5594.36	4475.49	0.05
1211	1269	1292	1291	1268	2	115.00	0.35	5905.89	4724.72	0.05
1212	1270	1293	1292	1269	2	115.00	0.35	6204.51	4963.61	0.05
1213	1271	1294	1293	1270	2	115.00	0.35	6483.26	5186.61	0.05
1214	1272	1295	1294	1271	2	115.00	0.35	6754.16	5403.33	0.05
1215	1273	1296	1295	1272	2	115.00	0.35	7015.21	5612.17	0.05
1216	1274	1297	1296	1273	2	115.00	0.35	7263.92	5811.14	0.05
1217	1275	1298	1297	1274	2	115.00	0.35	7504.34	6003.47	0.05
1218	1276	1299	1298	1275	2	115.00	0.35	7731.51	6185.21	0.05
1219	1277	1300	1299	1276	2	115.00	0.35	7958.68	6366.94	0.05
1220	1278	1301	1300	1277	2	115.00	0.35	8185.85	6548.68	0.05
1221	1279	1302	1301	1278	2	115.00	0.35	8420.47	6736.38	0.05
1222	1280	1303	1302	1279	3	115.00	0.35	8719.44	6975.55	0.05
1223	1281	1282	1305	1304	3	115.00	0.35	418.01	334.41	0.05
1224	1282	1283	1306	1305	2	115.00	0.35	1563.92	1251.14	0.05
1225	1283	1284	1307	1306	2	115.00	0.35	2490.98	1992.79	0.05
1226	1284	1285	1308	1307	2	115.00	0.35	3120.58	2496.46	0.05
1227	1285	1286	1309	1308	2	115.00	0.35	3650.70	2920.56	0.05

1228	1286	1287	1310	1309	2	115.00	0.35	4123.69	3298.96	0.05
1229	1287	1288	1311	1310	2	115.00	0.35	4530.97	3624.78	0.05
1230	1288	1289	1312	1311	2	115.00	0.35	4909.77	3927.82	0.05
1231	1289	1290	1313	1312	2	115.00	0.35	5267.15	4213.72	0.05
1232	1290	1291	1314	1313	2	115.00	0.35	5591.54	4473.24	0.05
1233	1291	1292	1315	1314	2	115.00	0.35	5903.00	4722.40	0.05
1234	1292	1293	1316	1315	2	115.00	0.35	6201.31	4961.05	0.05
1235	1293	1294	1317	1316	2	115.00	0.35	6480.00	5184.00	0.05
1236	1294	1295	1318	1317	2	115.00	0.35	6750.83	5400.67	0.05
1237	1295	1296	1319	1318	2	115.00	0.35	7011.62	5609.30	0.05
1238	1296	1297	1320	1319	2	115.00	0.35	7260.27	5808.22	0.05
1239	1297	1298	1321	1320	2	115.00	0.35	7500.75	6000.60	0.05
1240	1298	1299	1322	1321	2	115.00	0.35	7727.69	6182.15	0.05
1241	1299	1300	1323	1322	2	115.00	0.35	7954.62	6363.70	0.05
1242	1300	1301	1324	1323	2	115.00	0.35	8181.56	6545.25	0.05
1243	1301	1302	1324	1324	2	115.00	0.35	8377.44	6701.95	0.05
1244	1302	1303	1325	1324	3	115.00	0.35	8610.08	6888.06	0.05
1245	1304	1305	1327	1326	3	115.00	0.35	418.01	334.41	0.05
1246	1305	1306	1328	1327	2	115.00	0.35	1567.40	1253.92	0.05
1247	1306	1307	1329	1328	2	115.00	0.35	2497.46	1997.97	0.05
1248	1307	1308	1330	1329	2	115.00	0.35	3131.38	2505.10	0.05
1249	1308	1309	1331	1330	2	115.00	0.35	3662.30	2929.84	0.05
1250	1309	1310	1332	1331	2	115.00	0.35	4136.27	3309.02	0.05
1251	1310	1311	1333	1332	2	115.00	0.35	4546.34	3637.07	0.05
1252	1311	1312	1334	1333	2	115.00	0.35	4925.78	3940.62	0.05
1253	1312	1313	1335	1334	2	115.00	0.35	5283.84	4227.07	0.05
1254	1313	1314	1336	1335	2	115.00	0.35	5610.46	4488.37	0.05
1255	1314	1315	1337	1336	2	115.00	0.35	5922.45	4737.96	0.05
1256	1315	1316	1338	1337	2	115.00	0.35	6222.34	4977.87	0.05
1257	1316	1317	1339	1338	2	115.00	0.35	6501.91	5201.53	0.05
1258	1317	1318	1340	1339	2	115.00	0.35	6773.20	5418.56	0.05
1259	1318	1319	1341	1340	2	115.00	0.35	7035.78	5628.62	0.05
1260	1319	1320	1342	1341	2	115.00	0.35	7284.81	5827.85	0.05
1261	1320	1321	1343	1342	2	115.00	0.35	7524.89	6019.91	0.05
1262	1321	1322	1344	1343	2	115.00	0.35	7753.38	6202.70	0.05
1263	1322	1323	1345	1344	2	115.00	0.35	7981.87	6385.50	0.05
1264	1323	1324	1345	1345	2	115.00	0.35	8173.61	6538.88	0.05
1265	1324	1325	1346	1345	3	115.00	0.35	8387.43	6709.95	0.05
1266	1326	1327	1348	1347	3	115.00	0.35	418.01	334.41	0.05
1267	1327	1328	1349	1348	2	115.00	0.35	1566.41	1253.13	0.05
1268	1328	1329	1350	1349	2	115.00	0.35	2495.62	1996.50	0.05
1269	1329	1330	1351	1350	2	115.00	0.35	3128.31	2502.65	0.05
1270	1330	1331	1352	1351	2	115.00	0.35	3659.01	2927.21	0.05
1271	1331	1332	1353	1352	2	115.00	0.35	4132.70	3306.16	0.05
1272	1332	1333	1354	1353	2	115.00	0.35	4541.98	3633.58	0.05
1273	1333	1334	1355	1354	2	115.00	0.35	4921.23	3936.98	0.05
1274	1334	1335	1356	1355	2	115.00	0.35	5279.10	4223.28	0.05
1275	1335	1336	1357	1356	2	115.00	0.35	5605.09	4484.07	0.05
1276	1336	1337	1358	1357	2	115.00	0.35	5916.92	4733.54	0.05
1277	1337	1338	1359	1358	2	115.00	0.35	6216.66	4973.33	0.05
1278	1338	1339	1360	1359	2	115.00	0.35	6495.69	5196.55	0.05
1279	1339	1340	1361	1360	2	115.00	0.35	6766.85	5413.48	0.05
1280	1340	1341	1362	1361	2	115.00	0.35	7028.92	5623.13	0.05
1281	1341	1342	1363	1362	2	115.00	0.35	7277.84	5822.27	0.05
1282	1342	1343	1364	1363	2	115.00	0.35	7518.03	6014.43	0.05
1283	1343	1344	1365	1364	2	115.00	0.35	7746.08	6196.87	0.05
1284	1344	1345	1365	1365	2	115.00	0.35	7937.53	6350.02	0.05
1285	1345	1346	1366	1365	3	115.00	0.35	8147.27	6517.82	0.05
1286	1347	1348	1368	1367	3	115.00	0.35	418.01	334.41	0.05
1287	1348	1349	1369	1368	2	115.00	0.35	1565.30	1252.24	0.05
1288	1349	1350	1370	1369	2	115.00	0.35	2493.56	1994.85	0.05
1289	1350	1351	1371	1370	2	115.00	0.35	3124.87	2499.90	0.05
1290	1351	1352	1372	1371	2	115.00	0.35	3655.31	2924.25	0.05

1291	1352	1353	1373	1372	2	115.00	0.35	4128.69	3302.95	0.05
1292	1353	1354	1374	1373	2	115.00	0.35	4537.08	3629.66	0.05
1293	1354	1355	1375	1374	2	115.00	0.35	4916.13	3932.91	0.05
1294	1355	1356	1376	1375	2	115.00	0.35	5273.79	4219.03	0.05
1295	1356	1357	1377	1376	2	115.00	0.35	5599.07	4479.25	0.05
1296	1357	1358	1378	1377	2	115.00	0.35	5910.73	4728.58	0.05
1297	1358	1359	1379	1378	2	115.00	0.35	6209.86	4967.88	0.05
1298	1359	1360	1380	1379	2	115.00	0.35	6488.71	5190.97	0.05
1299	1360	1361	1381	1380	2	115.00	0.35	6759.72	5407.78	0.05
1300	1361	1362	1382	1381	2	115.00	0.35	7021.22	5616.98	0.05
1301	1362	1363	1383	1382	2	115.00	0.35	7270.02	5816.02	0.05
1302	1363	1364	1384	1383	2	115.00	0.35	7510.34	6008.28	0.05
1303	1364	1365	1384	1384	2	115.00	0.35	7701.46	6161.17	0.05
1304	1365	1366	1385	1384	3	115.00	0.35	7907.12	6325.69	0.05
1305	1367	1368	1387	1386	3	115.00	0.35	418.01	334.41	0.05
1306	1368	1369	1388	1387	2	115.00	0.35	1564.05	1251.24	0.05
1307	1369	1370	1389	1388	2	115.00	0.35	2491.23	1992.98	0.05
1308	1370	1371	1390	1389	2	115.00	0.35	3120.99	2496.79	0.05
1309	1371	1372	1391	1390	2	115.00	0.35	3651.14	2920.91	0.05
1310	1372	1373	1392	1391	2	115.00	0.35	4124.17	3299.34	0.05
1311	1373	1374	1393	1392	2	115.00	0.35	4531.55	3625.24	0.05
1312	1374	1375	1394	1393	2	115.00	0.35	4910.38	3928.30	0.05
1313	1375	1376	1395	1394	2	115.00	0.35	5267.78	4214.22	0.05
1314	1376	1377	1396	1395	2	115.00	0.35	5592.26	4473.81	0.05
1315	1377	1378	1397	1396	2	115.00	0.35	5903.73	4722.99	0.05
1316	1378	1379	1398	1397	2	115.00	0.35	6202.12	4961.70	0.05
1317	1379	1380	1399	1398	2	115.00	0.35	6480.83	5184.66	0.05
1318	1380	1381	1400	1399	2	115.00	0.35	6751.68	5401.34	0.05
1319	1381	1382	1401	1400	2	115.00	0.35	7012.53	5610.03	0.05
1320	1382	1383	1402	1401	2	115.00	0.35	7261.20	5808.96	0.05
1321	1383	1384	1402	1402	2	115.00	0.35	7465.42	5972.33	0.05
1322	1384	1385	1403	1402	3	115.00	0.35	7666.96	6133.57	0.05
1323	1386	1387	1405	1404	3	115.00	0.35	418.01	334.41	0.05
1324	1387	1388	1406	1405	2	115.00	0.35	1562.63	1250.10	0.05
1325	1388	1389	1407	1406	2	115.00	0.35	2488.58	1990.86	0.05
1326	1389	1390	1408	1407	2	115.00	0.35	3116.56	2493.25	0.05
1327	1390	1391	1409	1408	2	115.00	0.35	3646.39	2917.11	0.05
1328	1391	1392	1410	1409	2	115.00	0.35	4119.02	3295.22	0.05
1329	1392	1393	1411	1410	2	115.00	0.35	4525.26	3620.21	0.05
1330	1393	1394	1412	1411	2	115.00	0.35	4903.82	3923.06	0.05
1331	1394	1395	1413	1412	2	115.00	0.35	5260.94	4208.75	0.05
1332	1395	1396	1414	1413	2	115.00	0.35	5584.51	4467.61	0.05
1333	1396	1397	1415	1414	2	115.00	0.35	5895.77	4716.62	0.05
1334	1397	1398	1416	1415	2	115.00	0.35	6193.32	4954.66	0.05
1335	1398	1399	1417	1416	2	115.00	0.35	6471.85	5177.48	0.05
1336	1399	1400	1418	1417	2	115.00	0.35	6742.52	5394.01	0.05
1337	1400	1401	1419	1418	2	115.00	0.35	7002.64	5602.11	0.05
1338	1401	1402	1419	1419	2	115.00	0.35	7211.99	5769.59	0.05
1339	1402	1403	1420	1419	3	115.00	0.35	7415.79	5932.64	0.05
1340	1404	1405	1422	1421	3	115.00	0.35	418.01	334.41	0.05
1341	1405	1406	1423	1422	2	115.00	0.35	1560.99	1248.79	0.05
1342	1406	1407	1424	1423	2	115.00	0.35	2485.53	1988.42	0.05
1343	1407	1408	1425	1424	2	115.00	0.35	3111.48	2489.19	0.05
1344	1408	1409	1426	1425	2	115.00	0.35	3640.93	2912.74	0.05
1345	1409	1410	1427	1426	2	115.00	0.35	4113.10	3290.48	0.05
1346	1410	1411	1428	1427	2	115.00	0.35	4518.03	3614.42	0.05
1347	1411	1412	1429	1428	2	115.00	0.35	4896.30	3917.04	0.05
1348	1412	1413	1430	1429	2	115.00	0.35	5253.04	4202.43	0.05
1349	1413	1414	1431	1430	2	115.00	0.35	5575.61	4460.49	0.05
1350	1414	1415	1432	1431	2	115.00	0.35	5886.62	4709.30	0.05
1351	1415	1416	1433	1432	2	115.00	0.35	6183.21	4946.57	0.05
1352	1416	1417	1434	1433	2	115.00	0.35	6461.55	5169.24	0.05
1353	1417	1418	1435	1434	2	115.00	0.35	6732.00	5385.60	0.05

1354	1418	1419	1435	1435	2	115.00	0.35	6950.17	5560.13	0.05
1355	1419	1420	1436	1435	3	115.00	0.35	7154.13	5723.30	0.05
1356	1421	1422	1438	1437	3	115.00	0.35	418.01	334.41	0.05
1357	1422	1423	1439	1438	2	115.00	0.35	1559.09	1247.27	0.05
1358	1423	1424	1440	1439	2	115.00	0.35	2481.99	1985.59	0.05
1359	1424	1425	1441	1440	2	115.00	0.35	3105.59	2484.47	0.05
1360	1425	1426	1442	1441	2	115.00	0.35	3634.59	2907.68	0.05
1361	1426	1427	1443	1442	2	115.00	0.35	4106.24	3284.99	0.05
1362	1427	1428	1444	1443	2	115.00	0.35	4509.63	3607.71	0.05
1363	1428	1429	1445	1444	2	115.00	0.35	4887.56	3910.05	0.05
1364	1429	1430	1446	1445	2	115.00	0.35	5242.96	4194.37	0.05
1365	1430	1431	1447	1446	2	115.00	0.35	5565.28	4452.23	0.05
1366	1431	1432	1448	1447	2	115.00	0.35	5876.01	4700.81	0.05
1367	1432	1433	1449	1448	2	115.00	0.35	6171.48	4937.18	0.05
1368	1433	1434	1450	1449	2	115.00	0.35	6449.59	5159.67	0.05
1369	1434	1435	1450	1450	2	115.00	0.35	6679.01	5343.21	0.05
1370	1435	1436	1451	1450	3	115.00	0.35	6878.15	5502.52	0.05
1371	1437	1438	1453	1452	3	115.00	0.35	418.01	334.41	0.05
1372	1438	1439	1454	1453	2	115.00	0.35	1556.86	1245.49	0.05
1373	1439	1440	1455	1454	2	115.00	0.35	2477.83	1982.27	0.05
1374	1440	1441	1456	1455	2	115.00	0.35	3098.66	2478.93	0.05
1375	1441	1442	1457	1456	2	115.00	0.35	3627.15	2901.72	0.05
1376	1442	1443	1458	1457	2	115.00	0.35	4098.17	3278.54	0.05
1377	1443	1444	1459	1458	2	115.00	0.35	4499.78	3599.82	0.05
1378	1444	1445	1460	1459	2	115.00	0.35	4877.29	3901.83	0.05
1379	1445	1446	1461	1460	2	115.00	0.35	5231.11	4184.89	0.05
1380	1446	1447	1462	1461	2	115.00	0.35	5553.14	4442.52	0.05
1381	1447	1448	1463	1462	2	115.00	0.35	5863.53	4690.83	0.05
1382	1448	1449	1464	1463	2	115.00	0.35	6157.69	4926.15	0.05
1383	1449	1450	1464	1464	2	115.00	0.35	6392.55	5114.04	0.05
1384	1450	1451	1465	1464	3	115.00	0.35	6592.21	5273.77	0.05
1385	1452	1453	1467	1466	3	115.00	0.35	418.01	334.41	0.05
1386	1453	1454	1468	1467	2	115.00	0.35	1558.63	1246.91	0.05
1387	1454	1455	1469	1468	2	115.00	0.35	2481.13	1984.90	0.05
1388	1455	1456	1470	1469	2	115.00	0.35	3104.16	2483.32	0.05
1389	1456	1457	1471	1470	2	115.00	0.35	3633.06	2906.45	0.05
1390	1457	1458	1472	1471	2	115.00	0.35	4104.57	3283.66	0.05
1391	1458	1459	1473	1472	2	115.00	0.35	4507.60	3606.08	0.05
1392	1459	1460	1474	1473	2	115.00	0.35	4885.44	3908.35	0.05
1393	1460	1461	1475	1474	2	115.00	0.35	5240.51	4192.41	0.05
1394	1461	1462	1476	1475	2	115.00	0.35	5562.77	4450.22	0.05
1395	1462	1463	1477	1476	2	115.00	0.35	5860.40	4688.32	0.05
1396	1463	1464	1477	1477	2	115.00	0.35	6095.63	4876.50	0.05
1397	1464	1465	1478	1477	3	115.00	0.35	6296.79	5037.43	0.05
1398	1466	1467	1480	1479	3	115.00	0.35	418.01	334.41	0.05
1399	1467	1468	1481	1480	2	115.00	0.35	1570.17	1256.13	0.05
1400	1468	1469	1482	1481	2	115.00	0.35	2502.63	2002.11	0.05
1401	1469	1470	1483	1482	2	115.00	0.35	3139.99	2511.99	0.05
1402	1470	1471	1484	1483	2	115.00	0.35	3671.55	2937.24	0.05
1403	1471	1472	1485	1484	2	115.00	0.35	4146.30	3317.04	0.05
1404	1472	1473	1486	1485	2	115.00	0.35	4558.60	3646.88	0.05
1405	1473	1474	1487	1486	2	115.00	0.35	4938.54	3950.83	0.05
1406	1474	1475	1488	1487	2	115.00	0.35	5297.16	4237.72	0.05
1407	1475	1476	1489	1488	2	115.00	0.35	5625.55	4500.44	0.05
1408	1476	1477	1489	1489	2	115.00	0.35	5853.45	4682.76	0.05
1409	1477	1478	1490	1489	3	115.00	0.35	6060.60	4848.48	0.05
1410	1479	1480	1492	1491	3	115.00	0.35	418.01	334.41	0.05
1411	1480	1481	1493	1492	2	115.00	0.35	1560.44	1248.35	0.05
1412	1481	1482	1494	1493	2	115.00	0.35	2484.49	1987.60	0.05
1413	1482	1483	1495	1494	2	115.00	0.35	3109.76	2487.81	0.05
1414	1483	1484	1496	1495	2	115.00	0.35	3639.08	2911.26	0.05
1415	1484	1485	1497	1496	2	115.00	0.35	4111.10	3288.88	0.05
1416	1485	1486	1498	1497	2	115.00	0.35	4515.58	3612.46	0.05

1417	1486	1487	1499	1498	2	115.00	0.35	4893.74	3915.00	0.05
1418	1487	1488	1500	1499	2	115.00	0.35	5250.10	4200.08	0.05
1419	1488	1489	1501	1500	2	115.00	0.35	5583.39	4466.71	0.05
1420	1489	1490	1502	1501	3	115.00	0.35	5903.90	4723.12	0.05
1421	1491	1492	1504	1503	3	115.00	0.35	418.01	334.41	0.05
1422	1492	1493	1505	1504	2	115.00	0.35	1551.12	1240.90	0.05
1423	1493	1494	1506	1505	2	115.00	0.35	2467.13	1973.71	0.05
1424	1494	1495	1507	1506	2	115.00	0.35	3080.83	2464.66	0.05
1425	1495	1496	1508	1507	2	115.00	0.35	3608.00	2886.40	0.05
1426	1496	1497	1509	1508	2	115.00	0.35	4077.41	3261.93	0.05
1427	1497	1498	1510	1509	2	115.00	0.35	4474.40	3579.52	0.05
1428	1498	1499	1511	1510	2	115.00	0.35	4850.87	3880.69	0.05
1429	1499	1500	1512	1511	2	115.00	0.35	5190.83	4152.67	0.05
1430	1500	1501	1512	1512	2	115.00	0.35	5454.55	4363.64	0.05
1431	1501	1502	1513	1512	3	115.00	0.35	5672.31	4537.85	0.05
1432	1504	1515	1514	1503	3	115.00	0.35	418.01	334.41	0.05
1433	1505	1515	1504	1504	2	115.00	0.35	1392.48	1113.99	0.05
1434	1506	1516	1515	1505	2	115.00	0.35	2078.11	1662.49	0.05
1435	1507	1517	1516	1506	2	115.00	0.35	2824.57	2259.66	0.05
1436	1508	1518	1517	1507	2	115.00	0.35	3434.40	2747.52	0.05
1437	1509	1519	1518	1508	2	115.00	0.35	3928.33	3142.66	0.05
1438	1510	1520	1519	1509	2	115.00	0.35	4366.88	3493.50	0.05
1439	1511	1521	1520	1510	2	115.00	0.35	4773.24	3818.60	0.05
1440	1512	1522	1521	1511	2	115.00	0.35	5119.15	4095.32	0.05
1441	1513	1523	1522	1512	3	115.00	0.35	5424.26	4339.41	0.05
1442	1514	1515	1525	1524	3	115.00	0.35	418.01	334.41	0.05
1443	1515	1516	1526	1525	2	115.00	0.35	1578.17	1262.54	0.05
1444	1516	1517	1527	1526	2	115.00	0.35	2517.55	2014.04	0.05
1445	1517	1518	1528	1527	2	115.00	0.35	3164.85	2531.88	0.05
1446	1518	1519	1529	1528	2	115.00	0.35	3698.26	2958.61	0.05
1447	1519	1520	1530	1529	2	115.00	0.35	4175.25	3340.20	0.05
1448	1520	1521	1531	1530	2	115.00	0.35	4593.98	3675.18	0.05
1449	1521	1522	1532	1531	2	115.00	0.35	4964.21	3971.37	0.05
1450	1522	1523	1533	1532	3	115.00	0.35	5286.56	4229.25	0.05
1451	1524	1525	1535	1534	3	115.00	0.35	418.01	334.41	0.05
1452	1525	1526	1536	1535	2	115.00	0.35	1548.24	1238.59	0.05
1453	1526	1527	1537	1536	2	115.00	0.35	2461.77	1969.41	0.05
1454	1527	1528	1538	1537	2	115.00	0.35	3071.88	2457.51	0.05
1455	1528	1529	1539	1538	2	115.00	0.35	3598.39	2878.71	0.05
1456	1529	1530	1540	1539	2	115.00	0.35	4066.55	3253.24	0.05
1457	1530	1531	1541	1540	2	115.00	0.35	4461.67	3569.33	0.05
1458	1531	1532	1542	1541	2	115.00	0.35	4862.07	3889.65	0.05
1459	1532	1533	1543	1542	3	115.00	0.35	5208.15	4166.52	0.05
1460	1534	1535	1545	1544	3	115.00	0.35	418.01	334.41	0.05
1461	1535	1536	1546	1545	2	115.00	0.35	1537.48	1229.98	0.05
1462	1536	1537	1547	1546	2	115.00	0.35	2441.70	1953.36	0.05
1463	1537	1538	1548	1547	2	115.00	0.35	3038.44	2430.75	0.05
1464	1538	1539	1549	1548	2	115.00	0.35	3562.47	2849.97	0.05
1465	1539	1540	1550	1549	2	115.00	0.35	4020.36	3216.29	0.05
1466	1540	1541	1551	1550	2	115.00	0.35	4415.22	3532.18	0.05
1467	1541	1542	1551	1551	2	115.00	0.35	4753.96	3803.17	0.05
1468	1542	1543	1552	1551	3	115.00	0.35	4980.59	3984.47	0.05
1469	1544	1545	1554	1553	3	115.00	0.35	418.01	334.41	0.05
1470	1545	1546	1555	1554	2	115.00	0.35	1499.81	1199.85	0.05
1471	1546	1547	1556	1555	2	115.00	0.35	2371.49	1897.19	0.05
1472	1547	1548	1557	1556	2	115.00	0.35	2921.42	2337.14	0.05
1473	1548	1549	1558	1557	2	115.00	0.35	3436.75	2749.40	0.05
1474	1549	1550	1559	1558	2	115.00	0.35	3858.73	3086.98	0.05
1475	1550	1551	1560	1559	2	115.00	0.35	4248.68	3398.95	0.05
1476	1551	1552	1561	1560	3	115.00	0.35	4573.49	3658.79	0.05
1477	1553	1554	1563	1562	3	115.00	0.35	418.01	334.41	0.05
1478	1554	1555	1564	1563	2	115.00	0.35	1441.04	1152.83	0.05
1479	1555	1556	1565	1564	2	115.00	0.35	2208.59	1766.87	0.05

1480	1556	1557	1566	1565	2	115.00	0.35	2738.84	2191.07	0.05
1481	1557	1558	1567	1566	2	115.00	0.35	3215.73	2572.59	0.05
1482	1558	1559	1568	1567	2	115.00	0.35	3606.55	2885.24	0.05
1483	1559	1560	1568	1568	2	115.00	0.35	3938.62	3150.90	0.05
1484	1560	1561	1569	1568	3	115.00	0.35	4130.99	3304.80	0.05
1485	1562	1563	1571	1570	3	115.00	0.35	418.01	334.41	0.05
1486	1563	1564	1572	1571	2	115.00	0.35	1405.47	1124.38	0.05
1487	1564	1565	1573	1572	2	115.00	0.35	2101.90	1681.52	0.05
1488	1565	1566	1574	1573	2	115.00	0.35	2628.36	2102.68	0.05
1489	1566	1567	1575	1574	2	115.00	0.35	3061.06	2448.85	0.05
1490	1567	1568	1575	1575	2	115.00	0.35	3432.52	2746.02	0.05
1491	1568	1569	1576	1575	3	115.00	0.35	3607.27	2885.81	0.05
1492	1570	1571	1578	1577	3	115.00	0.35	418.01	334.41	0.05
1493	1571	1572	1579	1578	2	115.00	0.35	1348.57	1078.86	0.05
1494	1572	1573	1580	1579	2	115.00	0.35	1931.20	1544.96	0.05
1495	1573	1574	1581	1580	2	115.00	0.35	2451.59	1961.27	0.05
1496	1574	1575	1581	1581	2	115.00	0.35	2812.17	2249.74	0.05
1497	1575	1576	1582	1581	3	115.00	0.35	2994.25	2395.40	0.05
1498	1577	1578	1584	1583	3	115.00	0.35	620.95	496.76	0.05
1499	1578	1579	1584	1584	2	115.00	0.35	1316.48	1053.18	0.05
1500	1579	1580	1584	1584	2	115.00	0.35	1657.48	1325.98	0.05
1501	1580	1581	1584	1584	2	115.00	0.35	1998.48	1598.78	0.05
1502	1581	1582	1585	1584	3	115.00	0.35	2217.10	1773.68	0.05
1503	1583	1584	1586	1586	3	115.00	0.35	549.26	439.41	0.05
1504	1584	1585	1586	1586	3	115.00	0.35	1345.47	1076.37	0.05

N	XORD	YORD	BC	OUT	X2IH	X1IH	XIH
X2IV	X1IV	XIV	*** (I5,2F10.0,2I5,6E13.0) ***				
1	72.29	664.77	4				
2	89.05	667.96	0				
3	89.05	664.73	0				
4	89.05	661.49	4				
5	105.80	671.15	0				
6	105.80	664.68	0				
7	105.80	658.21	4				
8	122.56	674.35	0				
9	122.56	670.85	0				
10	122.56	665.14	0				
11	122.56	659.43	0				
12	122.56	654.93	4				
13	139.32	677.54	0				
14	139.32	674.04	0				
15	139.32	665.09	0				
16	139.32	656.15	0				
17	139.32	651.65	4				
18	156.07	680.73	0				
19	156.07	677.23	0				
20	156.07	669.11	0				
21	156.07	660.99	0				
22	156.07	652.86	0				
23	156.07	648.36	4				
24	172.83	683.92	0				
25	172.83	680.42	0				
26	172.83	670.14	0				
27	172.83	659.86	0				
28	172.83	649.58	0				
29	172.83	645.08	4				
30	189.59	687.11	0				
31	189.59	683.61	0				
32	189.59	674.29	0				
33	189.59	664.96	0				
34	189.59	655.63	0				
35	189.59	646.30	0				
36	189.59	641.80	4				

37	206.35	690.31	0
38	206.35	686.81	0
39	206.35	675.86	0
40	206.35	664.91	0
41	206.35	653.97	0
42	206.35	643.02	0
43	206.35	638.52	4
44	223.10	693.50	0
45	223.10	690.00	0
46	223.10	679.95	0
47	223.10	669.89	0
48	223.10	659.84	0
49	223.10	649.79	0
50	223.10	639.74	0
51	223.10	635.24	4
52	239.86	696.69	0
53	239.86	693.19	0
54	239.86	681.84	0
55	239.86	670.50	0
56	239.86	659.15	0
57	239.86	647.80	0
58	239.86	636.46	0
59	239.86	631.96	4
60	256.62	699.88	0
61	256.62	696.38	0
62	256.62	685.85	0
63	256.62	675.31	0
64	256.62	664.78	0
65	256.62	654.25	0
66	256.62	643.71	0
67	256.62	633.18	0
68	256.62	628.68	4
69	273.37	703.07	0
70	273.37	699.57	0
71	273.37	687.96	0
72	273.37	676.35	0
73	273.37	664.73	0
74	273.37	653.12	0
75	273.37	641.51	0
76	273.37	629.90	0
77	273.37	625.40	4
78	290.13	706.26	0
79	290.13	702.76	0
80	290.13	690.07	0
81	290.13	677.38	0
82	290.13	664.69	0
83	290.13	652.00	0
84	290.13	639.31	0
85	290.13	626.61	0
86	290.13	622.11	4
87	306.89	709.46	0
88	306.89	705.96	0
89	306.89	692.19	0
90	306.89	678.42	0
91	306.89	664.64	0
92	306.89	650.87	0
93	306.89	637.10	0
94	306.89	623.33	0
95	306.89	618.83	4
96	323.64	712.65	0
97	323.64	709.15	0
98	323.64	696.42	0
99	323.64	683.69	0

100	323.64	670.96	0
101	323.64	658.24	0
102	323.64	645.51	0
103	323.64	632.78	0
104	323.64	620.05	0
105	323.64	615.55	4
106	340.40	715.84	0
107	340.40	712.34	0
108	340.40	698.78	0
109	340.40	685.23	0
110	340.40	671.67	0
111	340.40	658.11	0
112	340.40	644.56	0
113	340.40	631.00	0
114	340.40	616.77	0
115	340.40	612.27	4
116	361.12	716.24	0
117	361.12	712.74	0
118	361.12	700.24	0
119	361.12	687.73	0
120	361.12	675.23	0
121	361.12	662.73	0
122	361.12	650.22	0
123	361.12	637.72	0
124	361.12	625.22	0
125	361.12	612.72	0
126	361.12	608.22	4
127	381.83	716.64	0
128	381.83	713.14	0
129	381.83	699.92	0
130	381.83	686.70	0
131	381.83	673.49	0
132	381.83	660.27	0
133	381.83	647.05	0
134	381.83	633.83	0
135	381.83	620.62	0
136	381.83	608.66	0
137	381.83	604.16	4
138	403.07	720.72	0
139	403.07	717.22	0
140	403.07	704.89	0
141	403.07	692.57	0
142	403.07	680.24	0
143	403.07	667.91	0
144	403.07	655.59	0
145	403.07	643.26	0
146	403.07	630.93	0
147	403.07	618.61	0
148	403.07	604.50	0
149	403.07	600.00	4
150	420.16	724.00	0
151	420.16	720.50	0
152	420.16	707.65	0
153	420.16	694.81	0
154	420.16	681.96	0
155	420.16	669.12	0
156	420.16	656.27	0
157	420.16	643.43	0
158	420.16	630.58	0
159	420.16	617.74	0
160	420.16	604.89	0
161	420.16	600.39	4
162	437.25	727.28	0

163	437.25	723.78	0
164	437.25	710.61	0
165	437.25	697.45	0
166	437.25	684.28	0
167	437.25	671.11	0
168	437.25	657.95	0
169	437.25	644.78	0
170	437.25	631.62	0
171	437.25	618.45	0
172	437.25	605.28	0
173	437.25	600.78	4
174	454.34	730.56	0
175	454.34	727.06	0
176	454.34	713.57	0
177	454.34	700.09	0
178	454.34	686.60	0
179	454.34	673.11	0
180	454.34	659.62	0
181	454.34	646.14	0
182	454.34	632.65	0
183	454.34	619.16	0
184	454.34	605.68	0
185	454.34	601.18	4
186	471.44	733.84	0
187	471.44	730.34	0
188	471.44	717.91	0
189	471.44	705.49	0
190	471.44	693.06	0
191	471.44	680.63	0
192	471.44	668.20	0
193	471.44	655.78	0
194	471.44	643.35	0
195	471.44	630.92	0
196	471.44	618.50	0
197	471.44	606.07	0
198	471.44	601.57	4
199	488.53	737.12	0
200	488.53	733.62	0
201	488.53	720.91	0
202	488.53	708.19	0
203	488.53	695.47	0
204	488.53	682.76	0
205	488.53	670.04	0
206	488.53	657.33	0
207	488.53	644.61	0
208	488.53	631.89	0
209	488.53	619.18	0
210	488.53	606.46	0
211	488.53	601.96	4
212	505.62	740.40	0
213	505.62	736.90	0
214	505.62	723.90	0
215	505.62	710.89	0
216	505.62	697.89	0
217	505.62	684.88	0
218	505.62	671.88	0
219	505.62	658.87	0
220	505.62	645.87	0
221	505.62	632.86	0
222	505.62	619.86	0
223	505.62	606.85	0
224	505.62	602.35	4
225	522.71	743.68	0

226	522.71	740.18	0
227	522.71	726.89	0
228	522.71	713.60	0
229	522.71	700.30	0
230	522.71	687.01	0
231	522.71	673.71	0
232	522.71	660.42	0
233	522.71	647.13	0
234	522.71	633.83	0
235	522.71	620.54	0
236	522.71	607.24	0
237	522.71	602.74	4
238	539.80	746.96	0
239	539.80	743.46	0
240	539.80	729.88	0
241	539.80	716.30	0
242	539.80	702.72	0
243	539.80	689.13	0
244	539.80	675.55	0
245	539.80	661.97	0
246	539.80	648.39	0
247	539.80	634.80	0
248	539.80	621.22	0
249	539.80	607.64	0
250	539.80	603.14	4
251	556.89	750.25	0
252	556.89	746.75	0
253	556.89	734.13	0
254	556.89	721.52	0
255	556.89	708.91	0
256	556.89	696.30	0
257	556.89	683.69	0
258	556.89	671.08	0
259	556.89	658.47	0
260	556.89	645.86	0
261	556.89	633.25	0
262	556.89	620.64	0
263	556.89	608.03	0
264	556.89	603.53	4
265	573.98	753.53	0
266	573.98	750.03	0
267	573.98	737.15	0
268	573.98	724.28	0
269	573.98	711.41	0
270	573.98	698.53	0
271	573.98	685.66	0
272	573.98	672.79	0
273	573.98	659.91	0
274	573.98	647.04	0
275	573.98	634.17	0
276	573.98	621.29	0
277	573.98	608.42	0
278	573.98	603.92	4
279	591.08	756.81	0
280	591.08	753.31	0
281	591.08	740.17	0
282	591.08	727.04	0
283	591.08	713.90	0
284	591.08	700.76	0
285	591.08	687.63	0
286	591.08	674.49	0
287	591.08	661.36	0
288	591.08	648.22	0

289	591.08	635.09	0
290	591.08	621.95	0
291	591.08	608.81	0
292	591.08	604.31	4
293	608.17	760.09	0
294	608.17	756.59	0
295	608.17	743.19	0
296	608.17	729.79	0
297	608.17	716.39	0
298	608.17	702.99	0
299	608.17	689.60	0
300	608.17	676.20	0
301	608.17	662.80	0
302	608.17	649.40	0
303	608.17	636.00	0
304	608.17	622.60	0
305	608.17	609.21	0
306	608.17	604.71	4
307	625.26	763.37	0
308	625.26	759.87	0
309	625.26	747.35	0
310	625.26	734.82	0
311	625.26	722.30	0
312	625.26	709.78	0
313	625.26	697.26	0
314	625.26	684.73	0
315	625.26	672.21	0
316	625.26	659.69	0
317	625.26	647.17	0
318	625.26	634.64	0
319	625.26	622.12	0
320	625.26	609.60	0
321	625.26	605.10	4
322	642.35	766.65	0
323	642.35	763.15	0
324	642.35	750.47	0
325	642.35	737.79	0
326	642.35	725.11	0
327	642.35	712.42	0
328	642.35	699.74	0
329	642.35	687.06	0
330	642.35	674.38	0
331	642.35	661.70	0
332	642.35	649.02	0
333	642.35	636.34	0
334	642.35	623.66	0
335	642.35	609.99	0
336	642.35	605.49	4
337	658.64	766.96	0
338	658.64	763.46	0
339	658.64	750.70	0
340	658.64	737.94	0
341	658.64	725.19	0
342	658.64	712.43	0
343	658.64	699.67	0
344	658.64	686.91	0
345	658.64	674.15	0
346	658.64	661.40	0
347	658.64	648.64	0
348	658.64	635.88	0
349	658.64	623.12	0
350	658.64	610.36	0
351	658.64	605.86	4

352	674.92	767.27	0
353	674.92	763.77	0
354	674.92	750.91	0
355	674.92	738.06	0
356	674.92	725.20	0
357	674.92	712.34	0
358	674.92	699.49	0
359	674.92	686.63	0
360	674.92	673.78	0
361	674.92	660.92	0
362	674.92	648.06	0
363	674.92	635.21	0
364	674.92	622.35	0
365	674.92	610.74	0
366	674.92	606.24	4
367	692.68	771.34	0
368	692.68	767.84	0
369	692.68	754.78	0
370	692.68	741.73	0
371	692.68	728.67	0
372	692.68	715.61	0
373	692.68	702.55	0
374	692.68	689.49	0
375	692.68	676.44	0
376	692.68	663.38	0
377	692.68	650.32	0
378	692.68	637.26	0
379	692.68	624.20	0
380	692.68	611.14	0
381	692.68	606.64	4
382	710.45	775.42	0
383	710.45	771.92	0
384	710.45	758.55	0
385	710.45	745.19	0
386	710.45	731.83	0
387	710.45	718.46	0
388	710.45	705.10	0
389	710.45	691.73	0
390	710.45	678.37	0
391	710.45	665.01	0
392	710.45	651.64	0
393	710.45	638.28	0
394	710.45	624.92	0
395	710.45	611.55	0
396	710.45	607.05	4
397	728.21	779.49	0
398	728.21	775.99	0
399	728.21	763.37	0
400	728.21	750.75	0
401	728.21	738.14	0
402	728.21	725.52	0
403	728.21	712.90	0
404	728.21	700.28	0
405	728.21	687.67	0
406	728.21	675.05	0
407	728.21	662.43	0
408	728.21	649.81	0
409	728.21	637.19	0
410	728.21	624.58	0
411	728.21	611.96	0
412	728.21	607.46	4
413	745.97	783.56	0
414	745.97	780.06	0

415	745.97	767.16	0
416	745.97	754.26	0
417	745.97	741.36	0
418	745.97	728.46	0
419	745.97	715.56	0
420	745.97	702.66	0
421	745.97	689.76	0
422	745.97	676.87	0
423	745.97	663.97	0
424	745.97	651.07	0
425	745.97	638.17	0
426	745.97	625.27	0
427	745.97	612.37	0
428	745.97	607.87	4
429	763.74	787.64	0
430	763.74	784.14	0
431	763.74	770.95	0
432	763.74	757.77	0
433	763.74	744.59	0
434	763.74	731.41	0
435	763.74	718.23	0
436	763.74	705.05	0
437	763.74	691.86	0
438	763.74	678.68	0
439	763.74	665.50	0
440	763.74	652.32	0
441	763.74	639.14	0
442	763.74	625.96	0
443	763.74	612.77	0
444	763.74	608.27	4
445	781.50	791.71	0
446	781.50	788.21	0
447	781.50	774.74	0
448	781.50	761.28	0
449	781.50	747.82	0
450	781.50	734.35	0
451	781.50	720.89	0
452	781.50	707.43	0
453	781.50	693.96	0
454	781.50	680.50	0
455	781.50	667.04	0
456	781.50	653.57	0
457	781.50	640.11	0
458	781.50	626.65	0
459	781.50	613.18	0
460	781.50	608.68	4
461	799.26	795.78	0
462	799.26	792.28	0
463	799.26	779.52	0
464	799.26	766.75	0
465	799.26	753.99	0
466	799.26	741.23	0
467	799.26	728.46	0
468	799.26	715.70	0
469	799.26	702.94	0
470	799.26	690.17	0
471	799.26	677.41	0
472	799.26	664.64	0
473	799.26	651.88	0
474	799.26	639.12	0
475	799.26	626.35	0
476	799.26	613.59	0
477	799.26	609.09	4

478	817.02	799.85	0
479	817.02	796.35	0
480	817.02	783.33	0
481	817.02	770.30	0
482	817.02	757.28	0
483	817.02	744.25	0
484	817.02	731.23	0
485	817.02	718.20	0
486	817.02	705.18	0
487	817.02	692.15	0
488	817.02	679.12	0
489	817.02	666.10	0
490	817.02	653.07	0
491	817.02	640.05	0
492	817.02	627.02	0
493	817.02	614.00	0
494	817.02	609.50	4
495	834.79	803.93	0
496	834.79	800.43	0
497	834.79	787.14	0
498	834.79	773.85	0
499	834.79	760.57	0
500	834.79	747.28	0
501	834.79	733.99	0
502	834.79	720.70	0
503	834.79	707.42	0
504	834.79	694.13	0
505	834.79	680.84	0
506	834.79	667.55	0
507	834.79	654.27	0
508	834.79	640.98	0
509	834.79	627.69	0
510	834.79	614.40	0
511	834.79	609.90	4
512	852.55	808.00	0
513	852.55	804.50	0
514	852.55	791.92	0
515	852.55	779.35	0
516	852.55	766.77	0
517	852.55	754.19	0
518	852.55	741.61	0
519	852.55	729.04	0
520	852.55	716.46	0
521	852.55	703.88	0
522	852.55	691.31	0
523	852.55	678.73	0
524	852.55	666.15	0
525	852.55	653.57	0
526	852.55	641.00	0
527	852.55	628.42	0
528	852.55	614.81	0
529	852.55	610.31	4
530	871.04	809.00	0
531	871.04	805.50	0
532	871.04	792.82	0
533	871.04	780.13	0
534	871.04	767.45	0
535	871.04	754.76	0
536	871.04	742.08	0
537	871.04	729.39	0
538	871.04	716.71	0
539	871.04	704.03	0
540	871.04	691.34	0

541	871.04	678.66	0
542	871.04	665.97	0
543	871.04	653.29	0
544	871.04	640.61	0
545	871.04	627.92	0
546	871.04	615.24	0
547	871.04	610.74	4
548	889.53	810.00	0
549	889.53	806.50	0
550	889.53	793.70	0
551	889.53	780.89	0
552	889.53	768.09	0
553	889.53	755.29	0
554	889.53	742.49	0
555	889.53	729.68	0
556	889.53	716.88	0
557	889.53	704.08	0
558	889.53	691.27	0
559	889.53	678.47	0
560	889.53	665.67	0
561	889.53	652.87	0
562	889.53	640.06	0
563	889.53	627.26	0
564	889.53	615.66	0
565	889.53	611.16	4
566	907.10	814.59	0
567	907.10	811.09	0
568	907.10	798.09	0
569	907.10	785.09	0
570	907.10	772.08	0
571	907.10	759.08	0
572	907.10	746.08	0
573	907.10	733.08	0
574	907.10	720.08	0
575	907.10	707.08	0
576	907.10	694.07	0
577	907.10	681.07	0
578	907.10	668.07	0
579	907.10	655.07	0
580	907.10	642.07	0
581	907.10	629.07	0
582	907.10	616.06	0
583	907.10	611.56	4
584	924.68	819.18	0
585	924.68	815.68	0
586	924.68	802.40	0
587	924.68	789.12	0
588	924.68	775.84	0
589	924.68	762.55	0
590	924.68	749.27	0
591	924.68	735.99	0
592	924.68	722.71	0
593	924.68	709.43	0
594	924.68	696.15	0
595	924.68	682.87	0
596	924.68	669.59	0
597	924.68	656.31	0
598	924.68	643.03	0
599	924.68	629.75	0
600	924.68	616.47	0
601	924.68	611.97	4
602	942.25	823.77	0
603	942.25	820.27	0

604	942.25	807.55	0
605	942.25	794.84	0
606	942.25	782.13	0
607	942.25	769.42	0
608	942.25	756.70	0
609	942.25	743.99	0
610	942.25	731.28	0
611	942.25	718.57	0
612	942.25	705.86	0
613	942.25	693.14	0
614	942.25	680.43	0
615	942.25	667.72	0
616	942.25	655.01	0
617	942.25	642.29	0
618	942.25	629.58	0
619	942.25	616.87	0
620	942.25	612.37	4
621	959.82	828.35	0
622	959.82	824.85	0
623	959.82	811.88	0
624	959.82	798.91	0
625	959.82	785.93	0
626	959.82	772.96	0
627	959.82	759.99	0
628	959.82	747.01	0
629	959.82	734.04	0
630	959.82	721.06	0
631	959.82	708.09	0
632	959.82	695.12	0
633	959.82	682.14	0
634	959.82	669.17	0
635	959.82	656.20	0
636	959.82	643.22	0
637	959.82	630.25	0
638	959.82	617.27	0
639	959.82	612.77	4
640	977.40	832.94	0
641	977.40	829.44	0
642	977.40	816.21	0
643	977.40	802.97	0
644	977.40	789.74	0
645	977.40	776.50	0
646	977.40	763.27	0
647	977.40	750.03	0
648	977.40	736.80	0
649	977.40	723.56	0
650	977.40	710.32	0
651	977.40	697.09	0
652	977.40	683.85	0
653	977.40	670.62	0
654	977.40	657.38	0
655	977.40	644.15	0
656	977.40	630.91	0
657	977.40	617.68	0
658	977.40	613.18	4
659	994.97	837.53	0
660	994.97	834.03	0
661	994.97	820.70	0
662	994.97	807.36	0
663	994.97	794.03	0
664	994.97	780.70	0
665	994.97	767.36	0
666	994.97	754.03	0

667	994.97	740.70	0
668	994.97	727.36	0
669	994.97	714.03	0
670	994.97	700.70	0
671	994.97	687.36	0
672	994.97	674.03	0
673	994.97	660.69	0
674	994.97	647.36	0
675	994.97	634.03	0
676	994.97	618.08	0
677	994.97	613.58	4
678	1012.30	842.06	0
679	1012.30	838.56	0
680	1012.30	825.29	0
681	1012.30	812.02	0
682	1012.30	798.75	0
683	1012.30	785.48	0
684	1012.30	772.21	0
685	1012.30	758.95	0
686	1012.30	745.68	0
687	1012.30	732.41	0
688	1012.30	719.14	0
689	1012.30	705.87	0
690	1012.30	692.60	0
691	1012.30	679.33	0
692	1012.30	666.07	0
693	1012.30	652.80	0
694	1012.30	639.53	0
695	1012.30	626.26	0
696	1012.30	621.76	4
697	1029.64	846.58	0
698	1029.64	843.08	0
699	1029.64	830.04	0
700	1029.64	817.00	0
701	1029.64	803.96	0
702	1029.64	790.92	0
703	1029.64	777.88	0
704	1029.64	764.84	0
705	1029.64	751.80	0
706	1029.64	738.76	0
707	1029.64	725.72	0
708	1029.64	712.68	0
709	1029.64	699.64	0
710	1029.64	686.60	0
711	1029.64	673.56	0
712	1029.64	660.52	0
713	1029.64	647.48	0
714	1029.64	634.44	0
715	1029.64	629.94	4
716	1046.97	851.11	0
717	1046.97	847.61	0
718	1046.97	834.89	0
719	1046.97	822.16	0
720	1046.97	809.44	0
721	1046.97	796.72	0
722	1046.97	784.00	0
723	1046.97	771.27	0
724	1046.97	758.55	0
725	1046.97	745.83	0
726	1046.97	733.11	0
727	1046.97	720.38	0
728	1046.97	707.66	0
729	1046.97	694.94	0

730	1046.97	682.22	0
731	1046.97	669.49	0
732	1046.97	656.77	0
733	1046.97	642.62	0
734	1046.97	638.12	4
735	1066.38	852.32	0
736	1066.38	848.82	0
737	1066.38	835.68	0
738	1066.38	822.55	0
739	1066.38	809.41	0
740	1066.38	796.27	0
741	1066.38	783.14	0
742	1066.38	770.00	0
743	1066.38	756.86	0
744	1066.38	743.73	0
745	1066.38	730.59	0
746	1066.38	717.46	0
747	1066.38	704.32	0
748	1066.38	691.18	0
749	1066.38	678.05	0
750	1066.38	664.91	0
751	1066.38	651.77	0
752	1066.38	647.27	4
753	1085.78	853.53	0
754	1085.78	850.03	0
755	1085.78	837.15	0
756	1085.78	824.27	0
757	1085.78	811.39	0
758	1085.78	798.50	0
759	1085.78	785.62	0
760	1085.78	772.74	0
761	1085.78	759.86	0
762	1085.78	746.98	0
763	1085.78	734.10	0
764	1085.78	721.22	0
765	1085.78	708.34	0
766	1085.78	695.45	0
767	1085.78	682.57	0
768	1085.78	669.69	0
769	1085.78	660.93	0
770	1085.78	656.43	4
771	1101.03	857.66	0
772	1101.03	854.16	0
773	1101.03	841.26	0
774	1101.03	828.36	0
775	1101.03	815.45	0
776	1101.03	802.55	0
777	1101.03	789.65	0
778	1101.03	776.75	0
779	1101.03	763.85	0
780	1101.03	750.95	0
781	1101.03	738.05	0
782	1101.03	725.15	0
783	1101.03	712.25	0
784	1101.03	699.35	0
785	1101.03	686.45	0
786	1101.03	673.55	0
787	1101.03	660.65	0
788	1101.03	656.15	4
789	1116.27	861.78	0
790	1116.27	858.28	0
791	1116.27	845.09	0
792	1116.27	831.89	0

793	1116.27	818.70	0
794	1116.27	805.50	0
795	1116.27	792.31	0
796	1116.27	779.11	0
797	1116.27	765.92	0
798	1116.27	752.72	0
799	1116.27	739.53	0
800	1116.27	726.33	0
801	1116.27	713.14	0
802	1116.27	699.94	0
803	1116.27	686.75	0
804	1116.27	673.55	0
805	1116.27	660.36	0
806	1116.27	655.86	4
807	1131.52	865.91	0
808	1131.52	862.41	0
809	1131.52	849.77	0
810	1131.52	837.12	0
811	1131.52	824.47	0
812	1131.52	811.83	0
813	1131.52	799.18	0
814	1131.52	786.54	0
815	1131.52	773.89	0
816	1131.52	761.24	0
817	1131.52	748.60	0
818	1131.52	735.95	0
819	1131.52	723.31	0
820	1131.52	710.66	0
821	1131.52	698.01	0
822	1131.52	685.37	0
823	1131.52	672.72	0
824	1131.52	660.08	0
825	1131.52	655.58	4
826	1146.76	870.04	0
827	1146.76	866.54	0
828	1146.76	853.51	0
829	1146.76	840.47	0
830	1146.76	827.44	0
831	1146.76	814.41	0
832	1146.76	801.37	0
833	1146.76	788.34	0
834	1146.76	775.31	0
835	1146.76	762.27	0
836	1146.76	749.24	0
837	1146.76	736.21	0
838	1146.76	723.17	0
839	1146.76	710.14	0
840	1146.76	697.11	0
841	1146.76	684.07	0
842	1146.76	671.04	0
843	1146.76	659.79	0
844	1146.76	655.29	4
845	1163.08	874.46	0
846	1163.08	870.96	0
847	1163.08	858.22	0
848	1163.08	845.49	0
849	1163.08	832.75	0
850	1163.08	820.01	0
851	1163.08	807.28	0
852	1163.08	794.54	0
853	1163.08	781.81	0
854	1163.08	769.07	0
855	1163.08	756.33	0

856	1163.08	743.60	0
857	1163.08	730.86	0
858	1163.08	718.13	0
859	1163.08	705.39	0
860	1163.08	692.66	0
861	1163.08	679.92	0
862	1163.08	667.18	0
863	1163.08	654.45	0
864	1163.08	649.95	4
865	1179.40	878.88	0
866	1179.40	875.38	0
867	1179.40	862.07	0
868	1179.40	848.76	0
869	1179.40	835.45	0
870	1179.40	822.14	0
871	1179.40	808.83	0
872	1179.40	795.52	0
873	1179.40	782.21	0
874	1179.40	768.90	0
875	1179.40	755.59	0
876	1179.40	742.28	0
877	1179.40	728.97	0
878	1179.40	715.66	0
879	1179.40	702.35	0
880	1179.40	689.04	0
881	1179.40	675.73	0
882	1179.40	662.42	0
883	1179.40	649.11	0
884	1179.40	644.61	4
885	1195.71	883.29	0
886	1195.71	879.79	0
887	1195.71	866.68	0
888	1195.71	853.57	0
889	1195.71	840.46	0
890	1195.71	827.34	0
891	1195.71	814.23	0
892	1195.71	801.12	0
893	1195.71	788.00	0
894	1195.71	774.89	0
895	1195.71	761.78	0
896	1195.71	748.67	0
897	1195.71	735.55	0
898	1195.71	722.44	0
899	1195.71	709.33	0
900	1195.71	696.21	0
901	1195.71	683.10	0
902	1195.71	669.99	0
903	1195.71	656.88	0
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905	1195.71	639.26	4
906	1212.03	887.71	0
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908	1212.03	871.28	0
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912	1212.03	819.53	0
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915	1212.03	780.72	0
916	1212.03	767.78	0
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924	1212.03	664.29	0
925	1212.03	651.36	0
926	1212.03	638.42	0
927	1212.03	633.92	4
928	1228.35	892.13	0
929	1228.35	888.63	0
930	1228.35	875.91	0
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944	1228.35	697.77	0
945	1228.35	685.05	0
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947	1228.35	659.60	0
948	1228.35	646.88	0
949	1228.35	633.08	0
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954	1247.50	862.91	0
955	1247.50	849.91	0
956	1247.50	836.91	0
957	1247.50	823.91	0
958	1247.50	810.91	0
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963	1247.50	745.92	0
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972	1247.50	626.81	0
973	1247.50	622.31	4
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985	1259.36	757.35	0
986	1259.36	744.18	0
987	1259.36	731.01	0
988	1259.36	717.84	0
989	1259.36	704.67	0
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993	1259.36	651.98	0
994	1259.36	638.81	0
995	1259.36	626.82	0
996	1259.36	622.32	4
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1116	1356.92	899.95	0
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1127	1356.92	768.08	0
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1371	1535.20	829.29	0
1372	1535.20	816.33	0
1373	1535.20	803.37	0
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1375	1535.20	777.45	0
1376	1535.20	764.49	0
1377	1535.20	751.54	0
1378	1535.20	738.58	0
1379	1535.20	725.62	0
1380	1535.20	712.66	0
1381	1535.20	699.70	0
1382	1535.20	686.74	0
1383	1535.20	673.78	0
1384	1535.20	660.82	0
1385	1535.20	656.32	4
1386	1552.22	866.67	0
1387	1552.22	863.17	0
1388	1552.22	850.24	0
1389	1552.22	837.31	0
1390	1552.22	824.39	0
1391	1552.22	811.46	0
1392	1552.22	798.54	0
1393	1552.22	785.61	0
1394	1552.22	772.69	0
1395	1552.22	759.76	0
1396	1552.22	746.84	0
1397	1552.22	733.91	0
1398	1552.22	720.99	0
1399	1552.22	708.06	0
1400	1552.22	695.14	0
1401	1552.22	682.21	0
1402	1552.22	669.29	0
1403	1552.22	664.79	4
1404	1569.23	861.66	0
1405	1569.23	858.16	0
1406	1569.23	845.28	0
1407	1569.23	832.39	0
1408	1569.23	819.50	0
1409	1569.23	806.62	0
1410	1569.23	793.73	0
1411	1569.23	780.84	0
1412	1569.23	767.96	0
1413	1569.23	755.07	0
1414	1569.23	742.18	0
1415	1569.23	729.30	0
1416	1569.23	716.41	0
1417	1569.23	703.52	0
1418	1569.23	690.64	0
1419	1569.23	677.75	0
1420	1569.23	673.25	4
1421	1586.24	856.66	0
1422	1586.24	853.16	0

1423	1586.24	840.32	0
1424	1586.24	827.48	0
1425	1586.24	814.63	0
1426	1586.24	801.79	0
1427	1586.24	788.95	0
1428	1586.24	776.11	0
1429	1586.24	763.27	0
1430	1586.24	750.43	0
1431	1586.24	737.58	0
1432	1586.24	724.74	0
1433	1586.24	711.90	0
1434	1586.24	699.06	0
1435	1586.24	686.22	0
1436	1586.24	681.72	4
1437	1603.25	851.66	0
1438	1603.25	848.16	0
1439	1603.25	835.37	0
1440	1603.25	822.58	0
1441	1603.25	809.79	0
1442	1603.25	797.00	0
1443	1603.25	784.21	0
1444	1603.25	771.42	0
1445	1603.25	758.63	0
1446	1603.25	745.84	0
1447	1603.25	733.05	0
1448	1603.25	720.26	0
1449	1603.25	707.47	0
1450	1603.25	694.68	0
1451	1603.25	690.18	4
1452	1620.27	846.65	0
1453	1620.27	843.15	0
1454	1620.27	830.43	0
1455	1620.27	817.70	0
1456	1620.27	804.97	0
1457	1620.27	792.24	0
1458	1620.27	779.51	0
1459	1620.27	766.79	0
1460	1620.27	754.06	0
1461	1620.27	741.33	0
1462	1620.27	728.60	0
1463	1620.27	715.87	0
1464	1620.27	703.15	0
1465	1620.27	698.65	4
1466	1637.28	841.65	0
1467	1637.28	838.15	0
1468	1637.28	825.27	0
1469	1637.28	812.39	0
1470	1637.28	799.51	0
1471	1637.28	786.63	0
1472	1637.28	773.75	0
1473	1637.28	760.87	0
1474	1637.28	747.99	0
1475	1637.28	735.11	0
1476	1637.28	722.23	0
1477	1637.28	711.61	0
1478	1637.28	707.11	4
1479	1650.65	841.62	0
1480	1650.65	838.12	0
1481	1650.65	824.80	0
1482	1650.65	811.48	0
1483	1650.65	798.16	0
1484	1650.65	784.85	0
1485	1650.65	771.53	0

1486	1650.65	758.21	0
1487	1650.65	744.90	0
1488	1650.65	731.58	0
1489	1650.65	718.26	0
1490	1650.65	713.76	4
1491	1664.01	841.58	0
1492	1664.01	838.08	0
1493	1664.01	825.70	0
1494	1664.01	813.31	0
1495	1664.01	800.93	0
1496	1664.01	788.55	0
1497	1664.01	776.17	0
1498	1664.01	763.78	0
1499	1664.01	751.40	0
1500	1664.01	739.02	0
1501	1664.01	724.91	0
1502	1664.01	720.41	4
1503	1679.26	837.32	0
1504	1679.26	833.82	0
1505	1679.26	820.98	0
1506	1679.26	808.14	0
1507	1679.26	795.29	0
1508	1679.26	782.45	0
1509	1679.26	769.61	0
1510	1679.26	756.77	0
1511	1679.26	743.93	0
1512	1679.26	732.50	0
1513	1679.26	728.00	4
1514	1699.54	831.65	0
1515	1699.54	828.15	0
1516	1699.54	814.53	0
1517	1699.54	800.92	0
1518	1699.54	787.30	0
1519	1699.54	773.68	0
1520	1699.54	760.07	0
1521	1699.54	746.45	0
1522	1699.54	734.45	0
1523	1699.54	729.95	4
1524	1718.44	830.68	0
1525	1718.44	827.18	0
1526	1718.44	814.19	0
1527	1718.44	801.20	0
1528	1718.44	788.21	0
1529	1718.44	775.23	0
1530	1718.44	762.24	0
1531	1718.44	749.25	0
1532	1718.44	736.26	0
1533	1718.44	731.76	4
1534	1737.33	829.71	0
1535	1737.33	826.21	0
1536	1737.33	814.13	0
1537	1737.33	802.04	0
1538	1737.33	789.95	0
1539	1737.33	777.86	0
1540	1737.33	765.77	0
1541	1737.33	753.69	0
1542	1737.33	738.07	0
1543	1737.33	733.57	4
1544	1762.17	828.44	0
1545	1762.17	824.94	0
1546	1762.17	812.50	0
1547	1762.17	800.06	0
1548	1762.17	787.62	0

1549	1762.17	775.18	0
1550	1762.17	762.74	0
1551	1762.17	750.16	0
1552	1762.17	745.66	4
1553	1780.40	823.52	0
1554	1780.40	820.02	0
1555	1780.40	809.85	0
1556	1780.40	799.69	0
1557	1780.40	789.52	0
1558	1780.40	779.36	0
1559	1780.40	769.19	0
1560	1780.40	759.03	0
1561	1780.40	754.53	4
1562	1798.63	818.59	0
1563	1798.63	815.09	0
1564	1798.63	805.65	0
1565	1798.63	796.21	0
1566	1798.63	786.78	0
1567	1798.63	777.34	0
1568	1798.63	767.90	0
1569	1798.63	763.40	4
1570	1816.86	813.67	0
1571	1816.86	810.17	0
1572	1816.86	801.82	0
1573	1816.86	793.47	0
1574	1816.86	785.12	0
1575	1816.86	776.77	0
1576	1816.86	772.27	4
1577	1835.09	808.74	0
1578	1835.09	805.24	0
1579	1835.09	798.71	0
1580	1835.09	792.18	0
1581	1835.09	785.65	0
1582	1835.09	781.15	4
1583	1853.32	803.82	0
1584	1853.32	796.92	0
1585	1853.32	790.02	4
1586	1871.55	798.89	4

Kettelman Hills Landfill B-18 Site Response, F East, Pacoima 360
Seismic Coefficient Surface Histories

Time-sec	Block 1
.020	-.000004
.040	-.000016
.060	-.000032
.080	-.000048
.100	-.000063
.120	-.000076
.140	-.000086
.160	-.000092
.180	-.000091
.200	-.000080
.220	-.000055
.240	-.000013
.260	.000051
.280	.000149
.300	.000278
.320	.000370
.340	.000371
.360	.000416
.380	.000683
.400	.001138
.420	.001665
.440	.002241
.460	.002553
.480	.002252
.500	.001975
.520	.002433
.540	.003064
.560	.002986
.580	.002300
.600	.001630
.620	.001173
.640	.001070
.660	.001377
.680	.001737
.700	.002254
.720	.002910
.740	.002971
.760	.002088
.780	.000655
.800	-.000272
.820	-.000423
.840	-.000626
.860	-.000947
.880	-.001039
.900	-.000873
.920	-.000282
.940	.001195
.960	.003352
.980	.004516
1.000	.003482
1.020	.001082
1.040	-.001028
1.060	-.001929
1.080	-.001845
1.100	-.001590
1.120	-.001899
1.140	-.002520
1.160	-.001866
1.180	.000812
1.200	.003594

1.220	.004171
1.240	.002720
1.260	.001171
1.280	.000360
1.300	-.000186
1.320	-.000795
1.340	-.001651
1.360	-.002511
1.380	-.002955
1.400	-.002384
1.420	.000002
1.440	.003131
1.460	.004667
1.480	.003835
1.500	.001576
1.520	-.000514
1.540	-.001025
1.560	-.000086
1.580	.000825
1.600	.001411
1.620	.002394
1.640	.003789
1.660	.005241
1.680	.005717
1.700	.004479
1.720	.001708
1.740	-.001707
1.760	-.003507
1.780	-.003309
1.800	-.003223
1.820	-.003830
1.840	-.004393
1.860	-.004221
1.880	-.003126
1.900	-.001785
1.920	-.000759
1.940	-.000697
1.960	-.001728
1.980	-.003070
2.000	-.004231
2.020	-.004531
2.040	-.003906
2.060	-.004178
2.080	-.006837
2.100	-.010547
2.120	-.012922
2.140	-.013447
2.160	-.012517
2.180	-.010145
2.200	-.006827
2.220	-.004264
2.240	-.004163
2.260	-.006305
2.280	-.009108
2.300	-.010945
2.320	-.011208
2.340	-.010912
2.360	-.010893
2.380	-.011102
2.400	-.011780
2.420	-.012773
2.440	-.013201
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2.480	-.012169
2.500	-.011140
2.520	-.009895
2.540	-.008014
2.560	-.005204
2.580	-.003118
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2.620	-.006544
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2.660	-.012723
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2.720	-.016114
2.740	-.014995
2.760	-.013528
2.780	-.011868
2.800	-.010323
2.820	-.009103
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2.860	-.007049
2.880	-.007969
2.900	-.010303
2.920	-.012988
2.940	-.014876
2.960	-.015171
2.980	-.014450
3.000	-.013409
3.020	-.011825
3.040	-.009324
3.060	-.005724
3.080	-.001495
3.100	.002048
3.120	.004775
3.140	.007874
3.160	.011572
3.180	.014837
3.200	.017084
3.220	.018872
3.240	.021509
3.260	.026404
3.280	.032427
3.300	.037228
3.320	.041911
3.340	.048044
3.360	.055265
3.380	.062495
3.400	.068164
3.420	.070810
3.440	.071867
3.460	.075056
3.480	.079391
3.500	.087563
3.520	.107145
3.540	.137652
3.560	.167314
3.580	.178836
3.600	.165358
3.620	.137826
3.640	.109092
3.660	.077475
3.680	.044492
3.700	.018668
3.720	-.005217

3.740	-.031593
3.760	-.058479
3.780	-.078987
3.800	-.084510
3.820	-.083055
3.840	-.079351
3.860	-.068728
3.880	-.056403
3.900	-.050955
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3.960	-.062924
3.980	-.070814
4.000	-.077546
4.020	-.082663
4.040	-.086900
4.060	-.090417
4.080	-.093964
4.100	-.096437
4.120	-.094784
4.140	-.087496
4.160	-.075308
4.180	-.060831
4.200	-.048099
4.220	-.040007
4.240	-.036457
4.260	-.036772
4.280	-.040922
4.300	-.047086
4.320	-.050688
4.340	-.047340
4.360	-.035823
4.380	-.017657
4.400	.003452
4.420	.022560
4.440	.036851
4.460	.047284
4.480	.056103
4.500	.063752
4.520	.067831
4.540	.065412
4.560	.056986
4.580	.046430
4.600	.037466
4.620	.031171
4.640	.026645
4.660	.022221
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4.700	.008681
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5.020	.014669
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5.060	.011618
5.080	.006785
5.100	.002754
5.120	.001034
5.140	.001307
5.160	.002192
5.180	.002581
5.200	.002671
5.220	.003303
5.240	.005328
5.260	.009646
5.280	.016740
5.300	.025898
5.320	.034543
5.340	.039209
5.360	.038329
5.380	.033191
5.400	.026244
5.420	.018856
5.440	.011090
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5.480	-.003677
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5.520	-.011661
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5.560	-.013264
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5.600	-.018047
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5.660	-.039507
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5.760	-.002658
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5.800	.006547
5.820	.008698
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5.920	.034793
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5.960	.032211
5.980	.029336
6.000	.026840
6.020	.025069
6.040	.023551
6.060	.022436
6.080	.021830
6.100	.020612
6.120	.018118
6.140	.014978
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6.220	.013972
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7.980	.019261
8.000	.014397
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8.060	.004035
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8.140	.008197
8.160	.016524
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9.140	.038102
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9.540	.034197
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10.540	.044357
10.560	.048553
10.580	.052561
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28.140	-.011376
28.160	-.012370
28.180	-.013163
28.200	-.013696
28.220	-.014008
28.240	-.014178
28.260	-.014281
28.280	-.014370
28.300	-.014427
28.320	-.014453
28.340	-.014490
28.360	-.014539
28.380	-.014512
28.400	-.014270
28.420	-.013767
28.440	-.013036
28.460	-.012088
28.480	-.010908
28.500	-.009489
28.520	-.007886
28.540	-.006181
28.560	-.004443
28.580	-.002757
28.600	-.001160
28.620	.000388
28.640	.001947
28.660	.003460
28.680	.004737
28.700	.005690
28.720	.006379
28.740	.006903
28.760	.007358
28.780	.007797
28.800	.008185
28.820	.008478
28.840	.008734
28.860	.009012
28.880	.009274
28.900	.009444
28.920	.009415

28.940	.009105
28.960	.008549
28.980	.007868
29.000	.007203
29.020	.006626
29.040	.006098
29.060	.005532
29.080	.004790
29.100	.003779
29.120	.002535
29.140	.001206
29.160	-.000006
29.180	-.000986
29.200	-.001704
29.220	-.002255
29.240	-.002821
29.260	-.003467
29.280	-.004117
29.300	-.004677
29.320	-.005117
29.340	-.005420
29.360	-.005566
29.380	-.005576
29.400	-.005453
29.420	-.005195
29.440	-.004799
29.460	-.004260
29.480	-.003596
29.500	-.002818
29.520	-.001912
29.540	-.000919
29.560	.000088
29.580	.001082
29.600	.002066
29.620	.003005
29.640	.003795
29.660	.004338
29.680	.004605
29.700	.004732
29.720	.004899
29.740	.005146
29.760	.005394
29.780	.005557
29.800	.005644
29.820	.005712
29.840	.005804
29.860	.005937
29.880	.006117
29.900	.006349
29.920	.006634
29.940	.006897
29.960	.007059
29.980	.007118
30.000	.007045
30.020	.006800
30.040	.006483
30.060	.006222
30.080	.005982
30.100	.005672
30.120	.005230
30.140	.004606
30.160	.003818
30.180	.002857

30.200	.001742
30.220	.000568
30.240	-.000609
30.260	-.001732
30.280	-.002732
30.300	-.003537
30.320	-.004056
30.340	-.004278
30.360	-.004288
30.380	-.004178
30.400	-.003983
30.420	-.003714
30.440	-.003404
30.460	-.003057
30.480	-.002661
30.500	-.002230
30.520	-.001813
30.540	-.001456
30.560	-.001217
30.580	-.001194
30.600	-.001375
30.620	-.001645
30.640	-.001892
30.660	-.002109
30.680	-.002372
30.700	-.002627
30.720	-.002756
30.740	-.002764
30.760	-.002729
30.780	-.002726
30.800	-.002852
30.820	-.003125
30.840	-.003448
30.860	-.003734
30.880	-.003897
30.900	-.003862
30.920	-.003675
30.940	-.003427
30.960	-.003185
30.980	-.002946
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31.040	-.002056
31.060	-.001859
31.080	-.001856
31.100	-.002039
31.120	-.002333
31.140	-.002686
31.160	-.003028
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31.200	-.003429
31.220	-.003359
31.240	-.003134
31.260	-.002833
31.280	-.002527
31.300	-.002257
31.320	-.002024
31.340	-.001871
31.360	-.001852
31.380	-.001988
31.400	-.002282
31.420	-.002738
31.440	-.003344

31.460	-.004075
31.480	-.004867
31.500	-.005582
31.520	-.006077
31.540	-.006275
31.560	-.006269
31.580	-.006301
31.600	-.006535
31.620	-.006976
31.640	-.007512
31.660	-.007944
31.680	-.008122
31.700	-.008013
31.720	-.007717
31.740	-.007384
31.760	-.007110
31.780	-.006854
31.800	-.006536
31.820	-.006120
31.840	-.005600
31.860	-.005045
31.880	-.004560
31.900	-.004161
31.920	-.003763
31.940	-.003290
31.960	-.002701
31.980	-.002010
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32.040	.000579
32.060	.001631
32.080	.002678
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32.120	.004603
32.140	.005530
32.160	.006434
32.180	.007282
32.200	.008122
32.220	.009022
32.240	.009930
32.260	.010764
32.280	.011515
32.300	.012213
32.320	.012881
32.340	.013554
32.360	.014211
32.380	.014760
32.400	.015149
32.420	.015376
32.440	.015478
32.460	.015509
32.480	.015546
32.500	.015656
32.520	.015838
32.540	.016037
32.560	.016158
32.580	.016067
32.600	.015701
32.620	.015123
32.640	.014407
32.660	.013555
32.680	.012555
32.700	.011455

32.720	.010351
32.740	.009291
32.760	.008258
32.780	.007233
32.800	.006296
32.820	.005614
32.840	.005257
32.860	.005143
32.880	.005144
32.900	.005109
32.920	.004905
32.940	.004520
32.960	.004039
32.980	.003496
33.000	.002888
33.020	.002226
33.040	.001509
33.060	.000717
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33.100	-.001151
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33.140	-.003232
33.160	-.004332
33.180	-.005499
33.200	-.006633
33.220	-.007570
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33.280	-.008852
33.300	-.009028
33.320	-.009280
33.340	-.009676
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33.580	-.010890
33.600	-.010147
33.620	-.009357
33.640	-.008483
33.660	-.007564
33.680	-.006590
33.700	-.005483
33.720	-.004195
33.740	-.002793
33.760	-.001364
33.780	.000055
33.800	.001419
33.820	.002687
33.840	.003838
33.860	.004847
33.880	.005727
33.900	.006493
33.920	.007110
33.940	.007580
33.960	.007928

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34.020	.008126
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34.060	.007729
34.080	.007393
34.100	.006929
34.120	.006284
34.140	.005430
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34.260	-.002493
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34.300	-.004642
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34.460	-.010258
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34.500	-.010584
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34.560	-.010704
34.580	-.010493
34.600	-.010234
34.620	-.009960
34.640	-.009666
34.660	-.009347
34.680	-.008958
34.700	-.008379
34.720	-.007560
34.740	-.006555
34.760	-.005433
34.780	-.004309
34.800	-.003245
34.820	-.002229
34.840	-.001280
34.860	-.000396
34.880	.000483
34.900	.001390
34.920	.002317
34.940	.003249
34.960	.004163
34.980	.005038
35.000	.005909
35.020	.006852
35.040	.007908
35.060	.009066
35.080	.010225
35.100	.011292
35.120	.012214
35.140	.012979
35.160	.013574
35.180	.013934
35.200	.014141
35.220	.014251

35.240	.014196
35.260	.014002
35.280	.013696
35.300	.013252
35.320	.012659
35.340	.011913
35.360	.011077
35.380	.010278
35.400	.009600
35.420	.009043
35.440	.008529
35.460	.007927
35.480	.007076
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35.520	.004345
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35.680	-.005885
35.700	-.007057
35.720	-.007997
35.740	-.008677
35.760	-.009162
35.780	-.009559
35.800	-.009934
35.820	-.010237
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35.860	-.010399
35.880	-.010287
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36.140	-.010531
36.160	-.010418
36.180	-.010180
36.200	-.009840
36.220	-.009488
36.240	-.009208
36.260	-.008969
36.280	-.008692
36.300	-.008328
36.320	-.007889
36.340	-.007356
36.360	-.006657
36.380	-.005816
36.400	-.004956
36.420	-.004184
36.440	-.003505
36.460	-.002860
36.480	-.002173

36.500	-.001413
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36.540	.000100
36.560	.000796
36.580	.001449
36.600	.002103
36.620	.002808
36.640	.003598
36.660	.004470
36.680	.005357
36.700	.006239
36.720	.007088
36.740	.007854
36.760	.008552
36.780	.009235
36.800	.009917
36.820	.010538
36.840	.011032
36.860	.011390
36.880	.011651
36.900	.011844
36.920	.011943
36.940	.011896
36.960	.011697
36.980	.011406
37.000	.011093
37.020	.010761
37.040	.010359
37.060	.009850
37.080	.009213
37.100	.008504
37.120	.007826
37.140	.007232
37.160	.006690
37.180	.006118
37.200	.005509
37.220	.004900
37.240	.004277
37.260	.003649
37.280	.003038
37.300	.002441
37.320	.001829
37.340	.001169
37.360	.000443
37.380	-.000326
37.400	-.001100
37.420	-.001868
37.440	-.002587
37.460	-.003175
37.480	-.003578
37.500	-.003793
37.520	-.003872
37.540	-.003879
37.560	-.003869
37.580	-.003880
37.600	-.003874
37.620	-.003805
37.640	-.003682
37.660	-.003531
37.680	-.003388
37.700	-.003239
37.720	-.003073
37.740	-.002913

37.760	-.002732
37.780	-.002489
37.800	-.002161
37.820	-.001775
37.840	-.001380
37.860	-.000991
37.880	-.000618
37.900	-.000246
37.920	.000158
37.940	.000594
37.960	.001029
37.980	.001442
38.000	.001809
38.020	.002114
38.040	.002353
38.060	.002531
38.080	.002661
38.100	.002771
38.120	.002877
38.140	.002970
38.160	.003018
38.180	.002983
38.200	.002865
38.220	.002681
38.240	.002434
38.260	.002133
38.280	.001795
38.300	.001451
38.320	.001120
38.340	.000810
38.360	.000524
38.380	.000243
38.400	-.000045
38.420	-.000337
38.440	-.000627
38.460	-.000912
38.480	-.001198
38.500	-.001485
38.520	-.001770
38.540	-.002054
38.560	-.002335
38.580	-.002622
38.600	-.002921
38.620	-.003216
38.640	-.003503
38.660	-.003778
38.680	-.004029
38.700	-.004229
38.720	-.004357
38.740	-.004414
38.760	-.004414
38.780	-.004365
38.800	-.004280
38.820	-.004165
38.840	-.004023
38.860	-.003860
38.880	-.003678
38.900	-.003480
38.920	-.003269
38.940	-.003045
38.960	-.002808
38.980	-.002568
39.000	-.002327

39.020	-.002088
39.040	-.001847
39.060	-.001604
39.080	-.001365
39.100	-.001132
39.120	-.000904
39.140	-.000683
39.160	-.000467
39.180	-.000256
39.200	-.000048
39.220	.000156
39.240	.000352
39.260	.000538
39.280	.000714
39.300	.000879
39.320	.001034
39.340	.001176
39.360	.001306
39.380	.001421
39.400	.001521
39.420	.001605
39.440	.001673
39.460	.001726
39.480	.001764
39.500	.001787
39.520	.001797
39.540	.001793
39.560	.001777
39.580	.001749
39.600	.001710
39.620	.001662
39.640	.001604
39.660	.001539
39.680	.001467
39.700	.001391
39.720	.001311
39.740	.001229
39.760	.001145
39.780	.001062
39.800	.000978
39.820	.000895
39.840	.000813
39.860	.000732
39.880	.000652
39.900	.000573
39.920	.000495
39.940	.000419
39.960	.000345
39.980	.000274
40.000	.000204

APPENDIX C

CLASS I WASTE FINAL COVER STABILITY

Objective:
Evaluate static and seismic stability (long term condition) and temporary stability during construction of the final landfill cover for Class I waste area at Kettleman Hills Facility (KHF) Landfill Unit B-18.

Performance Criteria:

- Static Loading: Minimum Factor of Safety of 1.5.
- Dynamic Loading: Allowable seismic displacements up to 12 inches.
- Temporary Loading Case during Construction: Minimum Factor of Safety 1.25.

Geometry:
The typical cover system for Class I waste is shown in Figure 1.

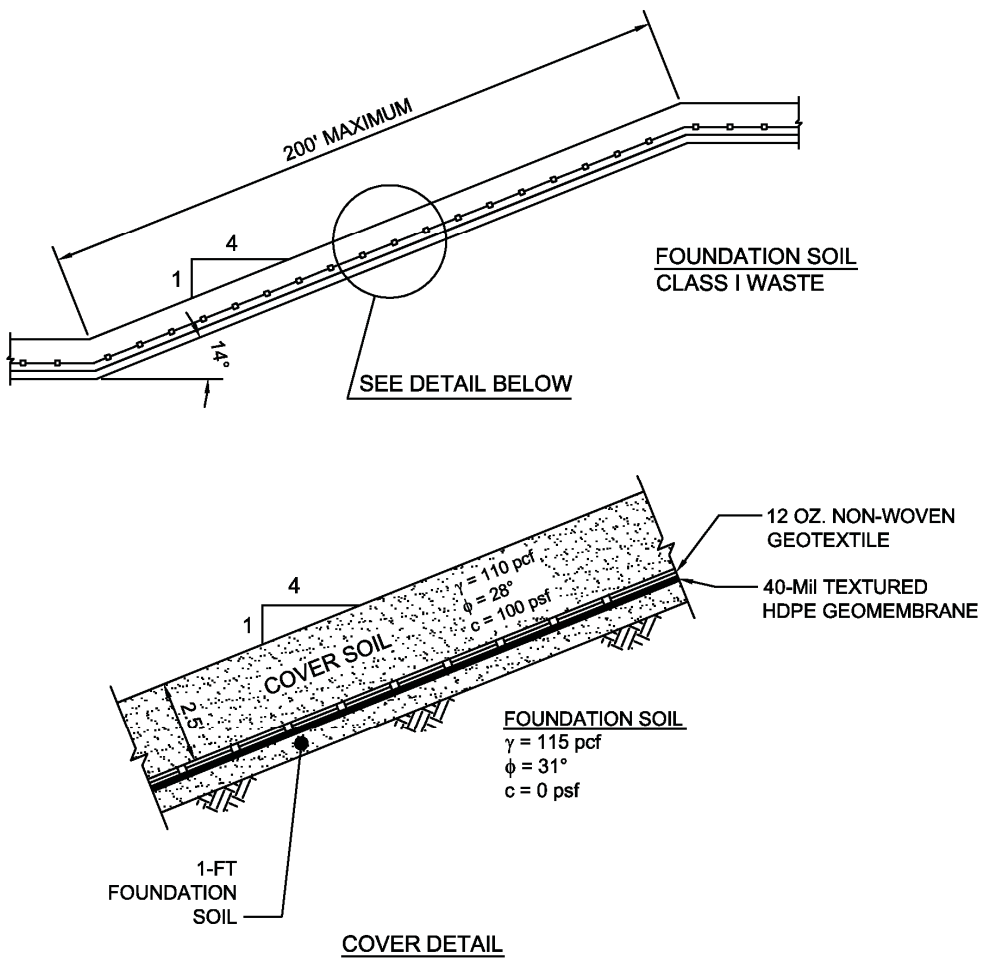

Figure 1. Typical Cover System for Class I Waste

The shear strength parameters of the cover interfaces are shown in Table 1. The site-specific values of these parameters should be verified prior to the construction of the cover.

Table 1. Shear Strength Properties for Interfaces in Figure 1

INTERFACE	STRENGTH PARAMETERS		
	γ (pcf)	c (psf)	ϕ (degrees)
Cover Soil / Geotextile	110	100	21
Geotextile / 40-Mil HDPE	110	0	25*
40-Mil HDPE / Intermediate Soil	110	0	28
Foundation Soil / Class I Waste	110	0	31

* Results of site-specific laboratory interface direct shear tests performed on textured geomembrane and geotextile materials to be used for Class I waste cover construction under low confining pressures (pressure due to the weight of cover soil) indicate a residual friction angle of approximately 28 degrees for this interface (see attached). A conservative value of 25 degrees, however, was used in our analyses.

Design Theory:
The long-term stability of the cover (stability analysis for static case) is based on the infinite slope model shown in Figure 2.

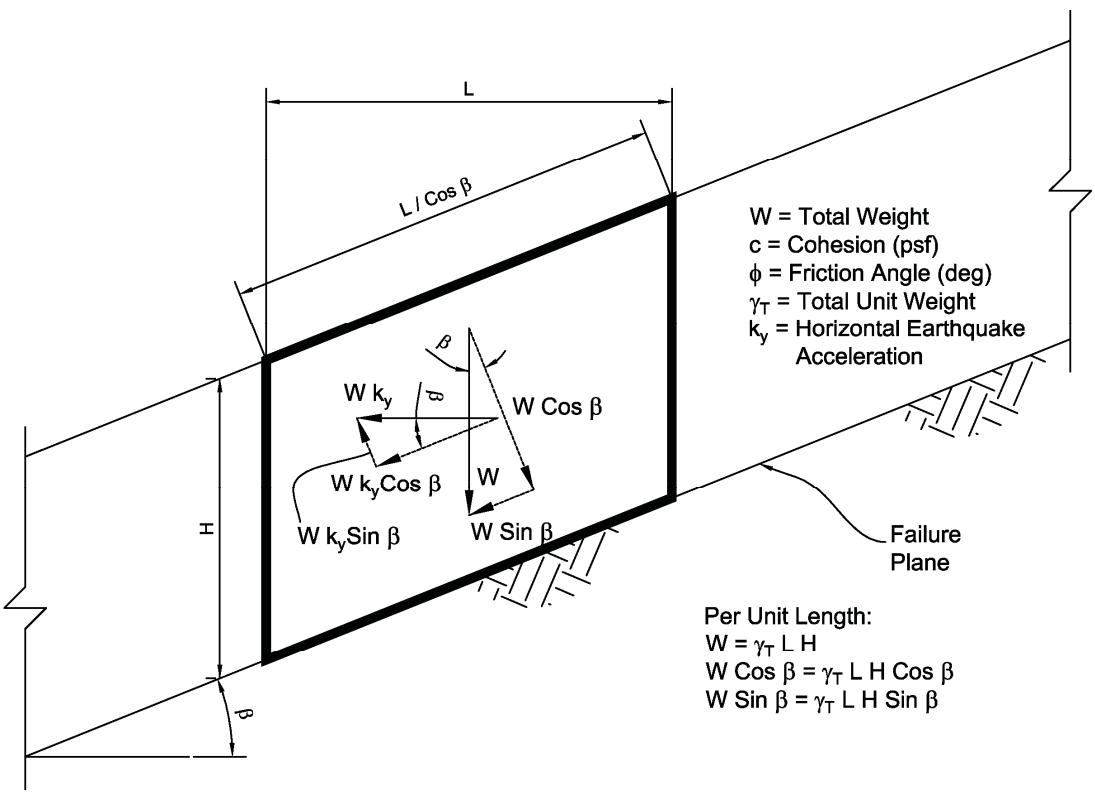

Figure 2. Equilibrium of Loads for a Unit Length of Cover

The safety factor against sliding can be evaluated using the following equation (Huang, 1983):

$$F.S. = \frac{c}{\gamma_T H \cos^2 \beta \tan \beta} + \frac{\tan \phi}{\tan \beta}$$

If $c = 0$, then: $F.S. = \dfrac{\tan \phi}{\tan \beta}$

For seismic case ($k_y > 0$):

$$F.S. = \frac{c(L/\cos\beta) + \gamma_T LH \cos\beta \tan\phi - k_y \gamma_T LH \sin\beta \tan\phi}{\gamma_T LH \sin\beta + k_y \gamma_T LH \cos\beta}$$

Note: This analysis is conservative since the effect of finite slope length and passive resistance wedge at the toe of the slope is not included.

Long-Term Static Stability:
Based on the interface and material properties shown in Table 1, for Class I waste cover the weakest interface of the cover is the Geotextile / HDPE geomembrane interface. The following presents the infinite slope stability analysis performed for the Class I waste cover.

Static Stability for Geotextile / HDPE geomembrane interface:

c = 0 psf, $\phi = 25^o$, $\beta = 16^o$, H = 2.5 / (cos 16) = 2.60 ft, $\gamma = 110$ pcf

$$F.S. = \frac{0}{110 \cdot 2.60 \cdot \cos^2 16 \cdot \tan 16} + \frac{\tan 25}{\tan 16} = 1.63 > 1.5 \text{ o.k.}$$

Construction Stage/Temporary Loading (Short-Term) Static Stability:
The stability of cover needs to be evaluated for the temporary condition during cover placement. It is assumed that the cover is placed from bottom to top (backfilling up slope). When the equipment weight is considered, the stability is evaluated for a finite length of the slope, usually the distance between two benches. The equilibrium of forces for a finite length of the slope is shown on Figure 3 (Qian, Koerner, Gray, 2002). Figure 3 illustrates the forces applied on the cover for this case. The following symbols are used in this figure:

W_A = total weight of the active wedge including additional weight of soil wedge from the upper bench (W_{A1} and W_{A2}) plus equipment weights on the slope and upper bench (W_{e1} and W_{e2});
W_{A1} = weight of soil cover on the slope (included in W_A);
W_{A2} = weight of soil wedge from the upper bench (included in W_A);
W_{e1} = weight of equipment on slope (included in W_A);

W_{e2} = weight of equipment on upper bench (included in W_A);
W_P = total weight of the passive wedge;
N_A = effective force normal to the failure plane of the active wedge;
N_P = effective force normal to the failure plane of the passive wedge;
γ = unit weight of the cover soil;

h = thickness of the cover;
L = length of the slope measured along the slip plane;
β = soil slope angle;
ϕ = friction angle of cover soil;
δ = interface friction angle;
C_a = adhesion force between cover soil of the active wedge and geo-membrane or foundation;
c_a = adhesion between cover soil of the active wedge and geo-membrane or foundation;
C = cohesion force along the failure plane of the passive wedge;
c = cohesion of the cover soil;
E_A = inter-wedge force acting on the active wedge from the passive wedge;
E_P = inter-wedge force acting on the passive wedge from the active wedge;
FS = factor of safety against cover soil sliding.

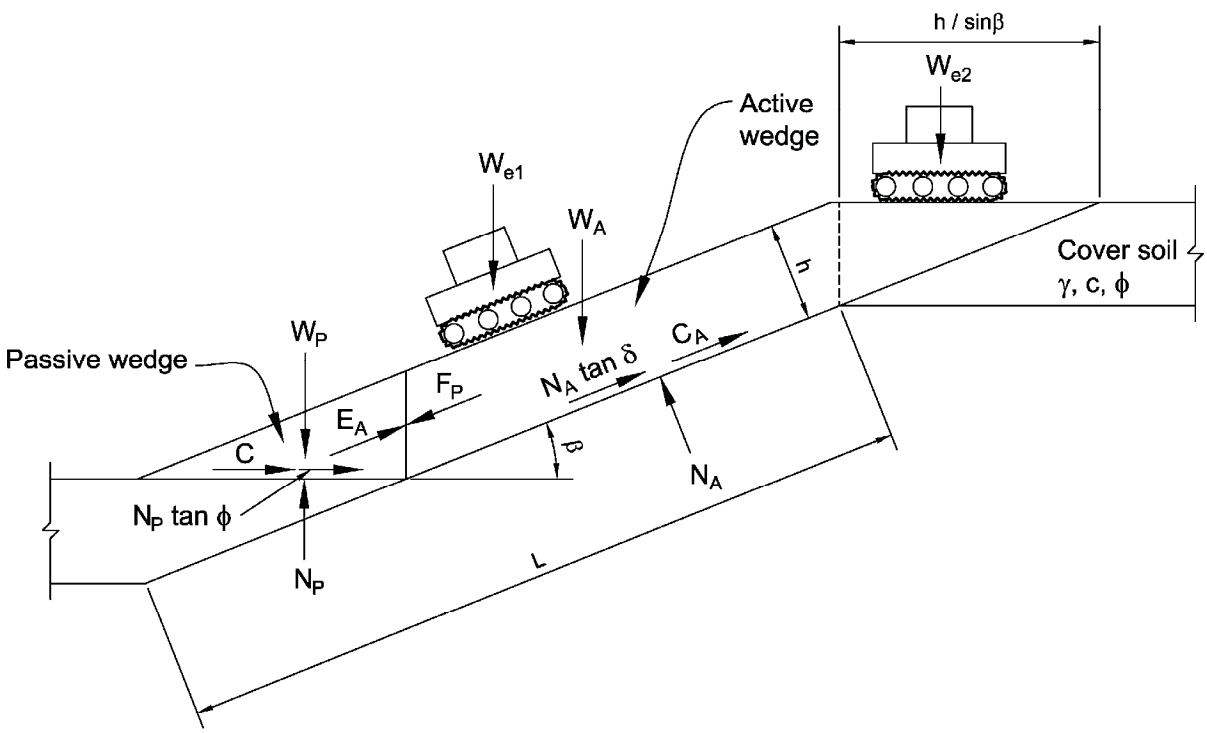

Figure 3. Equilibrium of Forces for a Finite Length Slope of a Uniformly Thick Cover Soil

For this condition the stability of the cover can be evaluated using the following equation:

$$FS = \frac{-b \pm \sqrt{b^2 - 4 \times a \times cc}}{2 \times a}$$

Where:

$a = (W_A - N_A \times \cos\beta) \times \cos\beta$

$b = -[(W_A - N_A \times \cos\beta) \times \sin\beta \times \tan\phi + (N_A \times \tan\delta + C_a) \times \sin\beta \times \cos\beta$
$+ (C + W_P \times \tan\phi) \times \sin\beta]$

$cc = (N_A \times \tan\delta + C_a) \times \sin^2\beta \times \tan\phi$

$W_A = W_{A1} + W_{A2} + W_{e1} + W_{e2}$

$W_{A1} = (\gamma \times h^2) \times [L/h - 1/\sin\beta - \tan(\beta/2)]$

$W_{A2} = (\gamma \times h^2) / (\sin 2\beta)$

$W_P = (\gamma \times h^2) / (\sin 2\beta)$

$N_A = W_A \times \cos\beta$

$C_a = c_a \times (L - h/\sin\beta)$

$C = (c \times h) / (\sin\beta)$

For the up slope backfilling, the dynamic force resulting from acceleration and braking of the construction equipment is not considered. The weight of the equipment is added to the weight of the cover soil.

The pressure at the potential slip interface can be calculated from the following equation:

Equivalent equipment force per unit width at slip plane interface: $W_e = q \times w \times I$

Where:

$q = W_b / (2 \times w \times b)$;
W_b = operating weight of equipment;
w = length of equipment track;
b = width of equipment track;
I = influence factor at slip plane interface.

The contact pressure for a CAT D6N LGP tractor is 4.8 psi, with an operating weight of 40,000 lbs. The track dimensions are length (w) = 122 in and width (b) = 34 in. The track gauge (distance between centers of tracks) is 85 inches.

The influence factor for cover thickness (h) of 2.5 ft can be calculated as:

$b / h = 34 / (2.5 \times 12) = 1.13 \rightarrow I = 0.92$

Using this influence factor, the equivalent pressure is evaluated below:

$q = 40{,}000 / (2\times122\times34) = 4.8$ psi $= 695$ psf

$h = 2.5$ ft ➔ $W_{e1} = 695 \times (122/12) \times 0.92 = 6{,}500$ lbs

We have also included additional surcharge of the construction equipment on the upper bench of the cover veneer. This load is estimated as a 500 psf uniform pressure acting on a length equal to h/sin β.

$\beta = 16°$ ➔ $W_{e2} = 500\times2.5/\sin(16°) = 4{,}550$ lbs

Using these equipment weights, the safety factor for temporary stability of geotextile / HDPE interface is calculated below:

$\gamma = 110$ pcf;
$h = 2.5$ ft;
$L = 182$ ft (Section D-D');
$\beta = 16^o$;
$\phi = 28^o$;
$\delta = 25^o$;
$c_a = 0$ psf;
$c = 100$ psf;
$W_e = 6{,}500 + 4{,}550 = 11{,}050$ lbs.

The following values are calculated using above parameters:

$W_A = 59{,}801$ lbs
$W_P = 1{,}301$ lbs
$N_A = 57{,}500$ lbs
$C_a = 0$ lbs
$C = 910.0$ lbs

a = 4339.4 lb/ft
b = -8181.7 lb/ft
cc = 1075.9 lb/ft

These values result in a factor of safety of 1.74 for finite length cover slope. This value is higher than the factor of safety of 1.63 for infinite slope analysis without the construction equipment weight.

Seismic Stability:
Seismic stability is evaluated for a finite length of the slope, usually the distance between two benches. This provides a more realistic analytical model of the cover stability since it includes the effect of passive

resistance wedge at the toe of the slope. For this case equipment forces shown in Figure 3 will be set equal to zero and seismic acceleration will be applied on the cover mass. For this condition the stability of the cover can be evaluated using the following equation:

$$FS = \frac{-b \pm \sqrt{b^2 - 4 \times a \times cc}}{2 \times a}$$

Where:

$a = (C_S \times W_A + N_A \times \sin\beta) \times \cos\beta + C_S \times W_P \times \cos\beta$

$b = -[(C_S \times W_A + N_A \times \sin\beta) \times \sin\beta \times \tan\phi + (N_A \times \tan\delta + C_a) \times \cos^2\beta$
$+ (C + W_P \times \tan\phi) \times \cos\beta]$

$cc = (N_A \times \tan\delta + C_a) \times \sin\beta \times \cos\beta \times \tan\phi$

C_S = Seismic Coefficient

W_A = total weight of the active wedge = $\gamma \times h^2 \times [L/h - 1/\sin\beta - \tan(\beta/2)] + (\gamma \times h^2) / (\sin 2\beta)$

$W_P = (\gamma \times h^2) / (\sin 2\beta)$

$N_A = W_A \times \cos\beta$

$C_a = c_a \times (L - h/\sin\beta)$

$C = (c \times h) / (\sin\beta)$

Using the above equations, the Yield Acceleration (k_y), corresponding to factor of safety of 1.0 was calculated for Geotextile / HDPE geomembrane interface (weakest interface in Class I waste cover):

L = 182 ft, h = 2.5 ft, γ = 110 pcf, c_a = 0 psf, c = 100 psf, β = 16º, ϕ = 28º, δ = 25º,
H = 2.5 / (cos 16) = 2.60 ft, $F.S. = 1.0 \Longrightarrow k_y = 0.20$

The Newmark Displacement Correlations developed by Franklin and Chang (1977) were used to estimate the permanent seismic deformation of the cover system.

$$U_m = U_S \times \frac{V^2}{1800A}$$

Where: U_m = Unscaled Permanent Displacement (in.)
U_s = Standardized Maximum Displacement (in.)
A = Maximum Ground Acceleration (as fraction of g)
V = Maximum Ground Velocity (in/s)

A conservative V/A ratio of 60 was used in the analyses, resulting in a maximum ground velocity of 34.8 in/s. U_s was obtained from standard displacement chart based on k_y/A ratio.

Based on these assumptions, the seismic displacement value in Table 2 was obtained for Class I waste landfill cover system. Based on our calculation it appears that the permanent seismic displacement is in the

allowable range for the weakest interface of the cover, therefore the cover system meets the static and seismic stability criteria.

Table 2. Permanent Seismic Displacement Evaluation for Class I Waste Cover

Interface	k_y^* (g)	A (g)	V (in/s)	k_y/A	U_s (in)	U_m (in)
Geotextile / HDPE*	0.20	0.58	34.8	0.35	~10.5	~12

References:

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HUSHMAND ASSOCIATES, INCORPORATED
Geotechnical, Earthquake and Environmental Engineers

December 15, 2009

Golder Associates Inc.
230 Commerce, Suite 200
Irvine, California, USA 92602

Mr. Scott Sumner, P.E., Principal

SUBJECT: ADDENDUM REPORT – PHASE III SLOPE STABILITY ANALYSIS KETTLEMAN HILLS FACILITY, HAZARDOUS WASTE LANDFILL UNIT B-18 EXPANSION, KETTLEMAN CITY, KINGS COUNTY, CALIFORNIA - HAI PROJECT No. 08-0228

Dear Mr. Sumner:

Hushmand Associates, Inc. (HAI) is pleased to submit to Golder Associates, Inc. (Golder) this addendum letter report of the slope stability evaluations for the Class I/II hazardous waste landfill unit B-18 (Landfill B-18) expansion at Waste Management, Inc. (WMI) Kettleman Hills Facility.

This addendum updates portions of the HAI "Slope Stability Analysis Report, Kettleman Hills Facility, Hazardous Waste Landfill Unit B-18 Expansion, Kettleman City, Kings County, California," Report to Kettleman Hills Facility, September 2008. The addendum report has been prepared to incorporate revised interface shear strength testing results for the proposed liner system. The addendum report updates only those portions of the original report that are effected by the change in interface shear strength, references are included to sections of the original report as appropriate. This report should therefore be used in conjunction with the original HAI (2008) report.

Introduction

The existing Class I/II (hazardous and designated wastes) Landfill Unit B-18 at Chemical Waste Management (CWM) Kettleman Hills Facility (KHF) in Kettleman City, Kings County, California is proposed to be expanded. The existing landfill was constructed in phases (Phase I and II) in 1990's. For the proposed expansion (Phase III), URS Corporation and Hushmand Associates, Inc. performed slope stability and seismic deformation analyses in support of the EIR

250 Goddard Irvine, California 92618 (949) 777-1266 Fax (949) 777-1276
www.hushmand-associates.com

preparation and design of the landfill expansion, respectively (URS, 2005; HAI, 2008). The results of these analyses were provided in a comprehensive design report by Golder Associates (Golder, 2008).

A number of investigations including site-specific testing on the landfill material properties were performed for design and construction of the earlier phases of the landfill (Golder, 1990, 1991; ESI, 1990, 1992, 1993). In 2003, URS obtained samples of the landfill Phase II liner system that were archived at the KHF site. Interface shear strength testing was performed on the sandwich-like multilayer structure of the liner system and the results (friction angle, ϕ =19° and cohesion/adhesion, C = 0) were used to refine the interface properties reported in the previous investigations (URS, 2005).

Landfill Geometry and Analysis Sections

HAI (2008) developed six cross sections for the proposed landfill expansion (see Figures 1 and 2 of the HAI 2008 Report). These same six cross sections are evaluated in the addendum report using the updated interface shear strength properties.

This addendum report summarizes the results of the slope stability and seismic deformation analyses for the proposed landfill expansion area, extending from the landfill's southeast corner to northwest corner, along its southern and western boundaries.

The expansion area is located on the western and southern sides of cross sections A-A' through F-F' that were used in the previous stability analyses (HAI, 2008). Additionally, east side of Cross Section B-B' also passes through the expansion area and was also analyzed in the addendum. The interface shear strength of Phase I was not modified and therefore analysis of the northern and eastern boundaries for all cross sections except B-B' remains valid.

Liner Interface Shear Strength Properties

HAI (2008), Section 3.4, used the material properties from the previous investigations for Phase I liner system and the URS (2005) report for Phase II liner system for static and seismic slope stability and deformation analyses. For the proposed expansion area liner system, the same interface properties (ϕ =19°, C = 0) measured for the Phase II liner system were used (URS, 2005).

HAI (2008) recommended that assumed properties used for design be further verified by performing site-specific tests on the actual materials that would be used during construction. Golder recently performed site-specific laboratory testing on the proposed standard liner system materials for the landfill expansion area to determine the interface properties for the expansion liner system design.

Interface shear strength testing was performed by Precision Geosynthetic Laboratories of Anaheim, California on the sandwich-like multilayer structure of the liner system. The test results indicated that the weakest interface was the double sided (DS) geocomposite and 60-mil

HDPE for all applied normal loads. The ultimate interface shear strength properties at 3 inch displacement were measured as approximately ϕ = 12° and C = 0. Attachment A provides results of the interface shear tests performed on the Phase III proposed liner system materials. The results were used to refine the slope stability and seismic deformation analyses performed previously (HAI, 2008) for the landfill expansion design.

In the revised slope stability analyses presented here, residual interface shear strength properties measured by URS (2005) and Golder (2009) were used for the Phase II and Phase III slopes, respectively. The Phase I slopes have a slightly different liner system and a residual interface friction angle of 9 degrees was used for the analysis. The material properties for static and seismic stability analyses are summarized in Table 1 (updated version of HAI 2008 Table 1).

Table 1. Selected Material Properties for Static and Seismic Stability Analysis
(Replaces Table 1 of HAI 2008)

Material/Interface	Unit Weight	Shear Strength Properties		Shear Wave Velocity (V_s - ft/sec) or Shear Modulus (G, psf) Relation	Modulus Reduction & Damping Curves
		ϕ (degree)	C (psf)		
HW [1]	115 pcf	31	0	$G = 1000\ K_2\ (\sigma'_m)^{1/2}$ K_2 = 60 for relatively dense sands (Seed and Idriss, 1970)	See Figure 19 Relatively dense sand (Seed et al., 1984)
Clay Liner [1,2]	115 pcf	20	1,150	$G = \frac{14{,}760(2.97-e)^2}{1+e}(OCR)^K \sigma_m^{0.5}$ (Hardin and Drenvich, 1972)	See Figure 19 (Seed and Idriss, 1970)
Bedrock [1]	150 pcf	40	800	V_s = 2500 fps	See Figure 19 (Schnabel et al. 1972)
Phase I Bottom Liner Interface [1]	----	17	0	----	----
Phase I Side Slope Liner Interface [1]	----	9	800	----	----
Phase II Bottom Liner Interface [1]	----	19	0	----	----
Phase II Side Slope Liner Interface [3]	----	19	0	----	----
Revised Expansion Area Liner Interface [4]	----	12	0	----	----

(1) Environmental Solutions, Inc. (1990, 1992, 1993); Rust Environment & Infrastructure, Inc. (1998); URS (2005).
(2) Modeled as a layer in site dynamic response analysis to include effects of softer clay layer on ground motion.
(3) The residual interface shear strength properties measured by URS (2005) were used for the Phase II slopes.
(4) Golder Associates, Inc. (2009).

Static and Pseudo-Static Slope Stability Analyses

The analysis approach discussed in Section 3.5 of the original stability report (HAI 2008) remains unchanged in the addendum report.

As discussed in Section 3.6 of the HAI 2008 report, slope stability analyses were performed for the six cross sections analyzed in the 2008 report. Since the landfill is planned to be expanded mainly along its western and southern boundaries, and the new liner system properties only apply to these areas, potential failure planes on the west and south sides of Cross Sections A-A', B-B', C-C', D-D', E-E', and F-F' were analyzed. Additionally potential failure planes on the east side of Cross Section B-B' were analyzed. The most important potential failure mechanism considered was for a wedge (block failure) sliding through the waste mass and along the existing and expanded landfill base liner system. Potential failure surfaces were assumed to pass along the weakest interface in the lining system and then through the landfill mass to the surface.

Pseudo-static analyses, necessary to compute yield acceleration coefficient (K_y), were also performed for the critical potential failure surfaces through waste and base liner system, identified from results of the static slope stability analyses for the selected cross sections. The yield acceleration is defined as the acceleration which results in a pseudo-static factor of safety of 1.0. The computed yield acceleration, K_y, represents limiting value of the horizontal seismic coefficient beyond which movement of a potential slide mass will occur.

For each cross section, pseudo-static analysis using the Spencer or Janbu Method was performed to compute an estimate of yield acceleration coefficient (K_y) for the most critical potential failure plane identified from the static slope stability analysis for that section. The GSTABL7 output plots are presented in Attachment B for the various potential failure surface conditions considered, and the most critical failure surfaces analyzed in the stability analysis of the final fill slopes of the proposed landfill expansion.

Table 2b (replaces Table 2b of HAI 2008) below presents the results of the updated slope stability analyses (computed static factors of safety and yield acceleration coefficients) for the most critical potential failure surfaces using the new interface properties of $\phi = 12°$ and $C = 0$.

Table 2b. Summary of Slope Stability Analysis Results (Landfill West and South Sides)
(Replaces Table 2b of HAI 2008)

Cross Section	Failure Plane Number	Description	Static Factor of Safety	Yield Acceleration, K_y (g)
A-A' (west)	I	Deep Block Failure through Bottom Liner	2.55*	0.27*
	II	Deep Block Failure through Bottom Liner	5.41*	0.30*
B-B' (west)	I	Deep Block Failure through Bottom Liner	2.41	0.20
	II	Deep Block Failure through Bottom Liner	6.44	0.31
C-C' (south)	I	Deep Block Failure through Bottom Liner	3.74	0.23
	II	Deep Block Failure through Bottom Liner	3.62*	0.23*
D-D' (west)	I	Deep Block Failure through Bottom Liner	3.73	0.27
	II**	Circular Failure	2.50	0.32
	III**	Circular Failure	2.18	0.26
E-E' (west)	I	Deep Block Failure through Bottom Liner	3.42*	0.28*
	II	Deep Block Failure through Bottom Liner	3.90*	0.32*
F-F' (west)	I**	Circular Failure	2.58	0.33
	II	Deep Block Failure through Bottom Liner	4.40	0.29
	III	Deep Block Failure through Bottom Liner	3.31*	0.28*

Notes: * Static Factor of Safety and K_y computed using Janbu's method.
** Circular failure analysis from HAI 2008 included for completeness.
Static factor of safety and K_y for section B-B' (east) changed only slightly and thus are not reported. Static factors of safety and K_y values for Section B-B' are larger than 3.0 and 0.3, respectively.

For all final (long-term) static conditions, the minimum acceptable factor of safety is 1.5. This criterion was satisfied by the potential failure surfaces analyzed for the proposed fill plan, base liner designs, and the site-specific and estimated landfill material properties.

The results of the pseudo-static stability analyses show that the lowest yield acceleration coefficient was approximately equal to 0.20 for failure along the liner and waste mass in cross sections B-B' (west).

The combination of yield acceleration coefficient and slide mass geometry that could potentially result in the largest estimates of the seismically-induced displacements were used in the site response and Newmark displacement analyses as described in detail in the 2008 report (Golder,

2008). Based on the computed yield accelerations presented in Table 2b and landfill cross sections geometry, the potential failure plane #I for cross section B-B' and failure plane #I associated with cross section D-D' were judged to produce the largest seismic displacements and thus, were selected for dynamic site response and seismic deformation analyses. The estimated displacements were calculated based on updated 2008 site specific ground motions for the Kettleman Hills Landfill (HAI 2008).

Seismically-Induced Permanent Displacements

A detailed evaluation of the seismic deformations using two-dimensional finite element site response analyses and Newmark (1965) slope displacement calculation method was performed for this study. The analyses were performed for the most critical combinations of K_y values and failure plane geometries (Sections B-B', Failure Plane I, West and Section D-D', Failure Plane I, West) and the two sets of design earthquake motions used in the 2008 analyses (1994 Northridge Earthquake and 1979 Loma Prieta Earthquake records).

The average acceleration time histories computed in the QUAD4M response analyses for the most critical potential failure mass identified in the pseudo-static analyses were used as input for Newmark deformation analyses to evaluate the permanent seismically-induced displacements along the liner system. The displacement calculated by this method is a function of the yield accelerations which were computed in the pseudo-static stability analyses. Figures 1 through 4 (replace Figures 21 to 24 in HAI 2008) illustrate variation of potential slide mass displacement (δ) versus the yield acceleration K_y for cross sections B-B' and D-D' and for the two sets of design ground motions used in the analyses (Golder, 2008). Based on the K_y values in Table 2b and Figures 1 through 4, for the potential failure plane # I, located in the northwestern part of cross section B-B' the largest permanent displacement (~ 1.5 inch) is induced for the 1994 Northridge earthquake Castaic Old Ridge Route accelerograms scaled to a PHGA of 0.57g. For all other sections and potential failure planes for K_y values larger than 0.2 seismic induced liner displacements are less than 1 inch. These estimated values of the seismic displacements are considerably smaller than the maximum allowable displacement of 6 inches commonly used in the industry (Seed and Bonaparte, 1992). Therefore, the landfill will be stable both statically and seismically for the updated site-specific liner interface properties.

Conclusion

This addendum report summarizes the site specific liner interface shear strength testing performed by Golder and the updated slope stability and seismic deformation analyses for the proposed landfill expansion area slopes using the new strength properties. The site specific testing was performed to verify the strength properties originally used in the landfill expansion design in the HAI 2008 report. The measured liner interface friction angle (ϕ = 12°) was found to be lower than the original value used in the design (ϕ = 19°). Using this new interface friction angle, static and dynamic stability analyses were conducted for various cross sections of the proposed landfill expansion area.

The analyses indicated that the proposed new landfill expansion design (Golder, 2008) would result in a stable configuration under both static and seismic loading conditions in compliance with applicable regulations. The acceptability of the landfill slopes for earthquake loading conditions was determined by the relatively small magnitude of the seismically-induced permanent displacements resulting from the local and distant design earthquake events. The results of the analysis show that the computed static factors of safety are greater than 1.5 for all analyzed sections. The results of the conservative Newmark-type permanent displacement analyses presented in this study indicated that computed maximum displacements along the liner system during the design earthquake events are less than 1.5 inches.

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URS (2005) "Preliminary Stability Analyses, Kettleman Hills Facility Expansion, Kettleman City, California," prepared for Chemical West Management, Inc.

Closure

We trust this addendum report meets your present requirements. If you have any questions regarding this report, please contact this office at your convenience. We appreciate this opportunity to provide our professional services to Golder.

Sincerely yours,

Very truly yours,

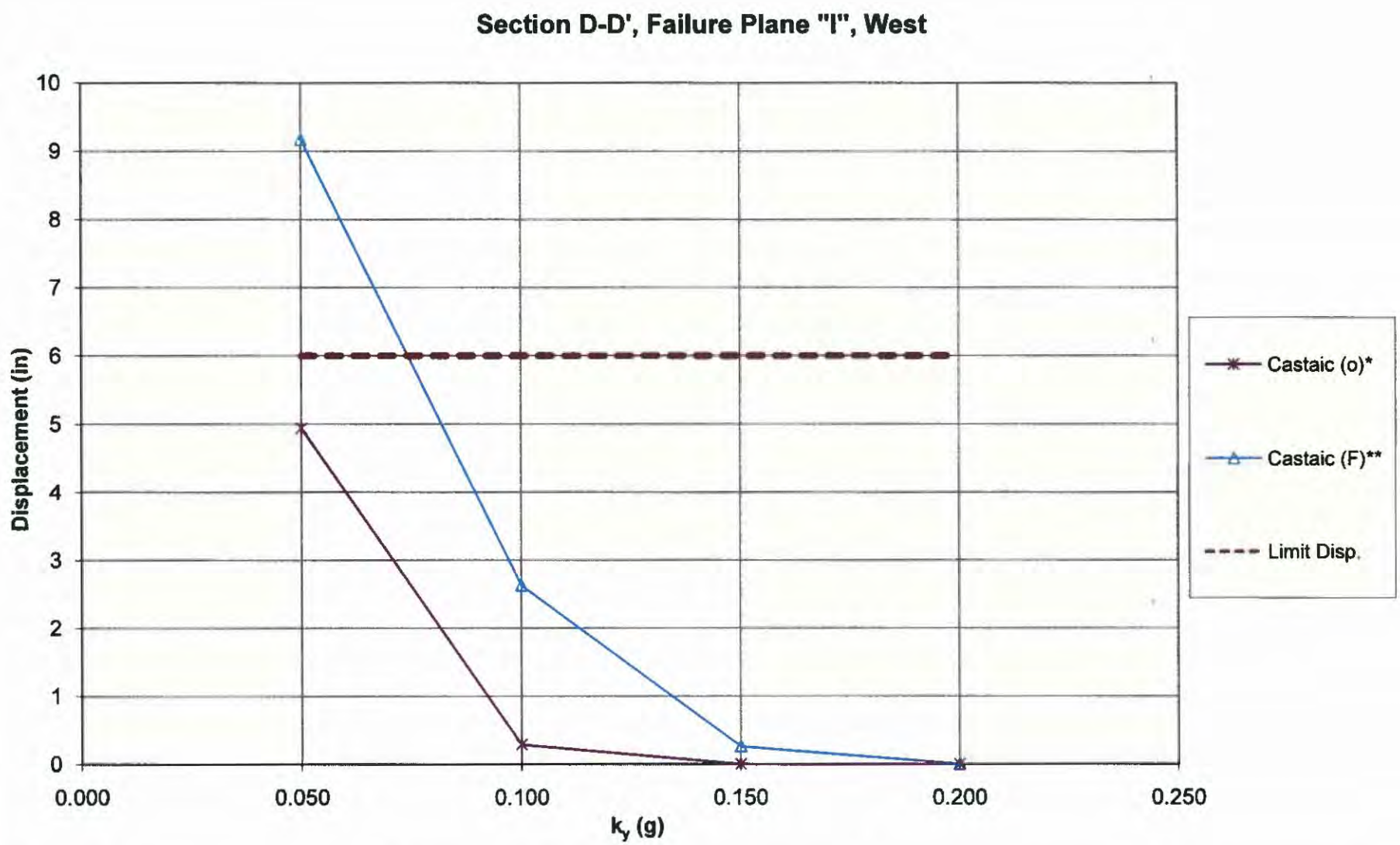
HUSHMAND ASSOCIATES, INC.

Ben Hushmand

REGISTERED PROFESSIONAL ENGINEER
BENHAM HUSHMAND
No. C 044777
Exp. 03-31-10
CIVIL
STATE OF CALIFORNIA

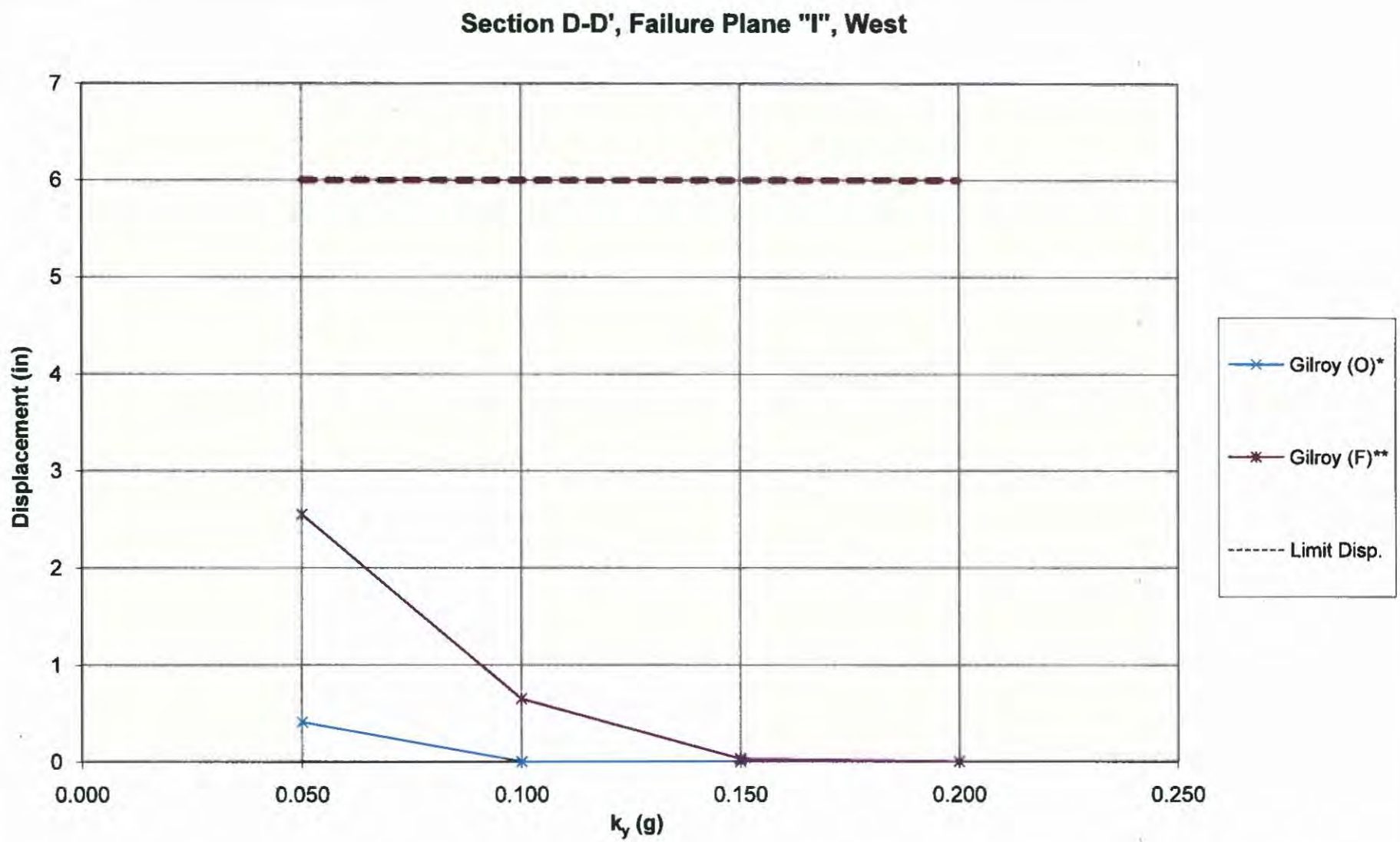
Ben Hushmand, Ph.D., P.E. 44777
President, Principal Engineer

FIGURES



Legend
*(O) Original record
**(F) Flipped record (multiplied by -1)

Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, California	EARTHQUAKE INDUCED DISPLACEMENTS SECTION D-D' – FAILURE PLANE I 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (PREVIOUS GROUND MOTIONS)	Figure 1
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



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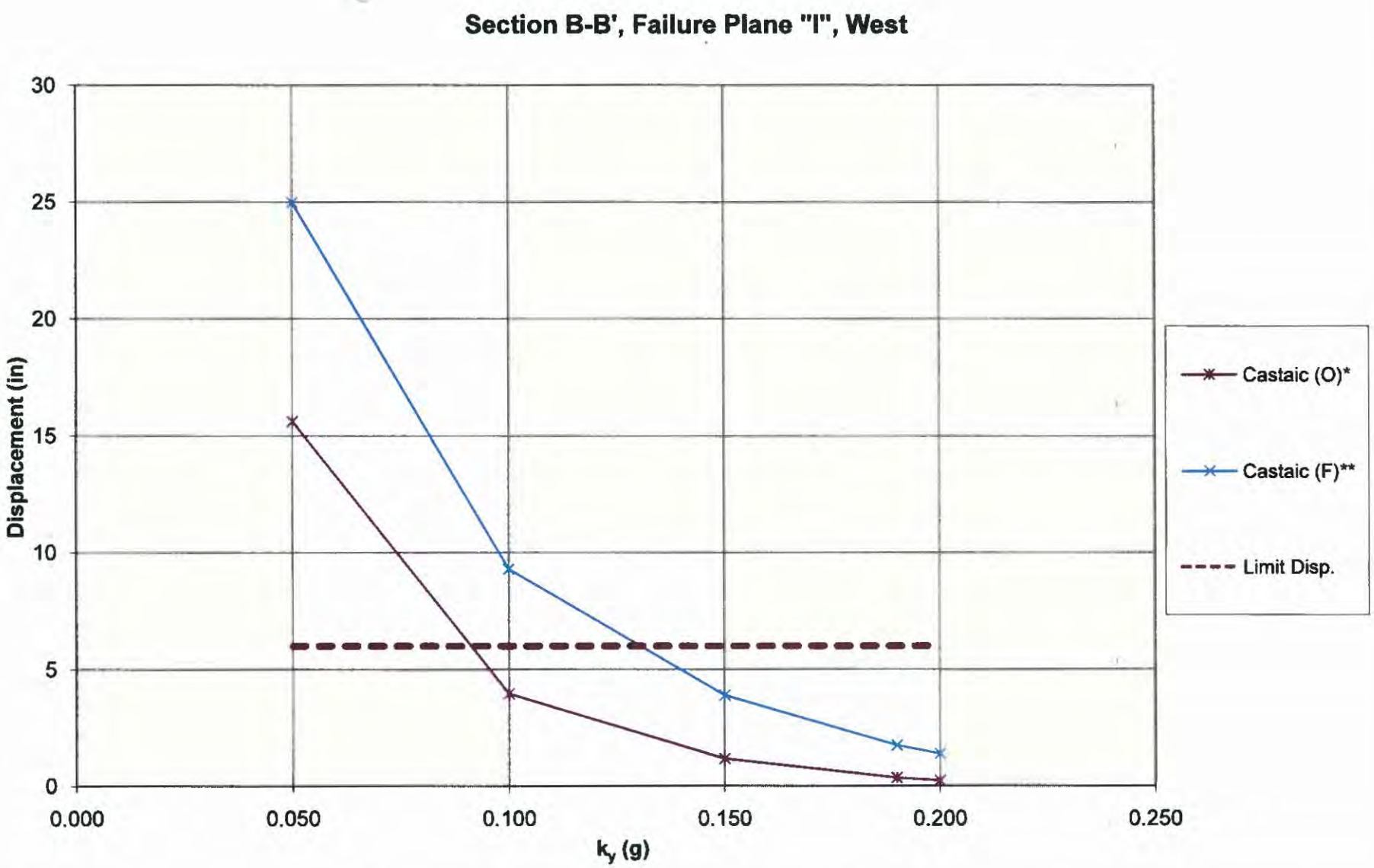
*(O) Original record
**(F) Flipped record (multiplied by -1)

Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, California	EARTHQUAKE INDUCED DISPLACEMENTS SECTION D-D' – FAILURE PLANE I 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (PREVIOUS GROUND MOTIONS)	Figure 2
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



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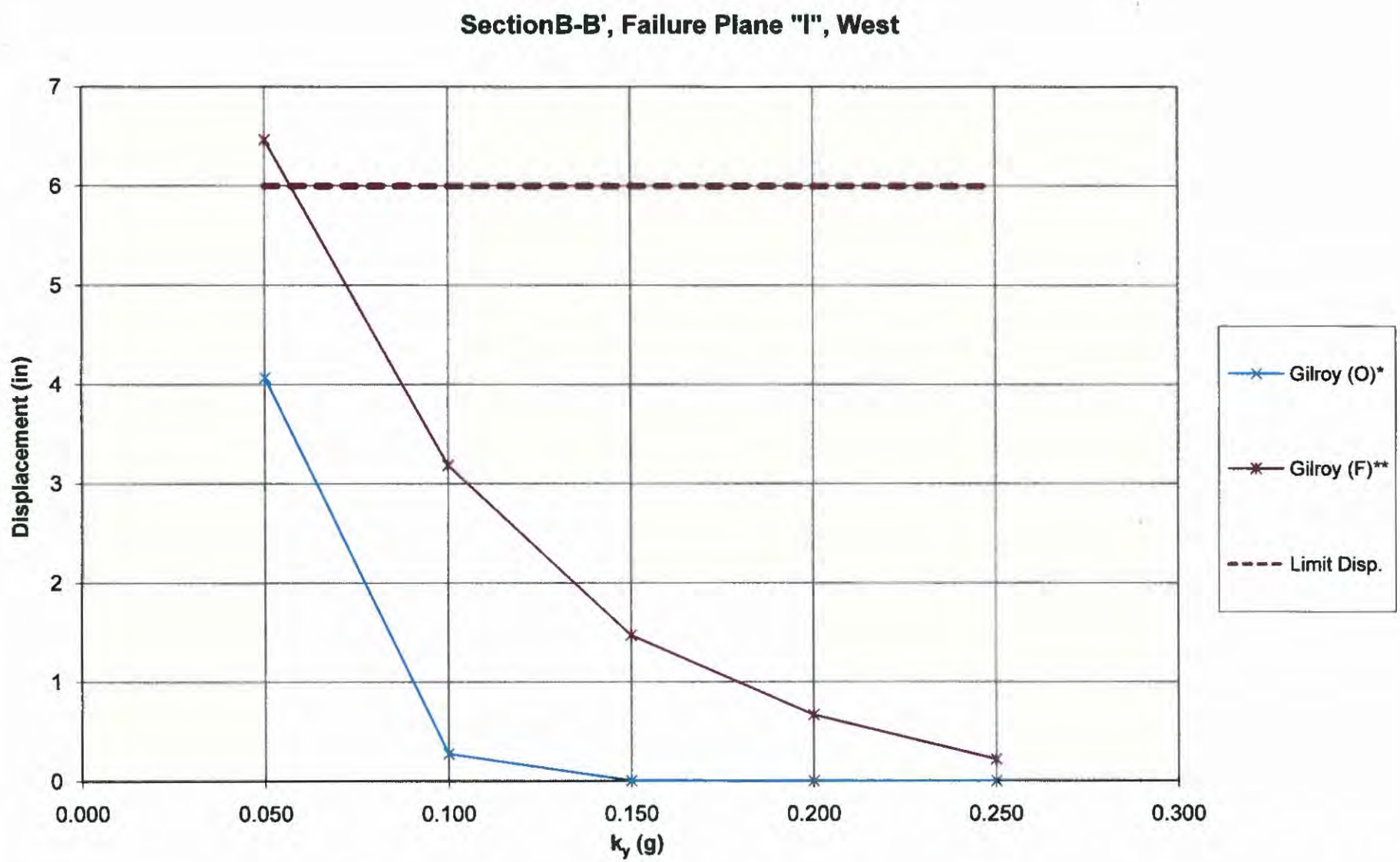
*(O) Original record
**(F) Flipped record (multiplied by -1)

Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, California	EARTHQUAKE INDUCED DISPLACEMENTS SECTION B-B' – FAILURE PLANE I 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (PREVIOUS GROUND MOTIONS)	Figure 3
	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		



Legend
*(O) Original record
**(F) Flipped record (multiplied by -1)

Project No. 08-0228	Landfill B-18 Expansion Project Kettleman City, Kings County, California	EARTHQUAKE INDUCED DISPLACEMENTS SECTION B-B'– FAILURE PLANE I 2-D QUAD4M DYNAMIC RESPONSE ANALYSIS (UPDATED GROUND MOTIONS)	Figure 4
HAI	HUSHMAND ASSOCIATES INC. Geotechnical and Earthquake Engineers		

APPENDIX A

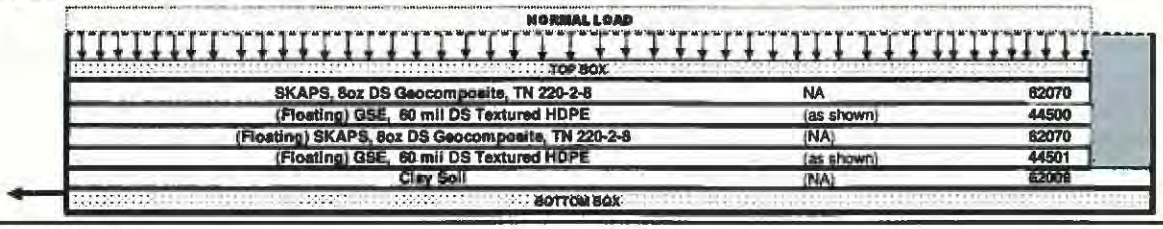
INTERFACE SHEAR TEST RESULTS

TABLE 1
CLIENT: GOLDER & ASSOCIATES
PROJECT: KETTLEMAN HILLS

INTERFACE SHEAR TEST RESULT (ASTM D5321/6243)
PGL Job No. G090907

Reviewed By
Date: 2-Oct-09

TEST CONFIGURATION 1



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. The Maximum Dry Density (MDD) of the soil is 111.8 pcf at 16.4% Optimum Moisture Content (OMC).
3. Soil specimen was remolded to 102.86 pcf ; i.e., 92.0% of MDD at 20.5% moisture content. (forming 2 inch layer in the TOP and BOTTOM boxes)
4. The three intermediate geosynthetic specimens were floating during shear run.

CONSOLIDATION:

1. Each set of specimen was consolidated under Dry condition for 24 hrs @ normal load before shearing.
2. Normal loads were applied using Hydraulics for the highest load, Bladder for the intermediate and lowest loads.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/ min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. Test specimens were sheared in Dry condition.
4. Test were performed in general accordance with ASTM D6243 / ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights (C#44500)				Asperity Heights (C# 44501)				Moisture Content (Soil)		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		UP		DOWN		UP		DOWN				Shear Stress	Secant Angle	Shear Stress	Secant Angle
		Before	After	Before	After	Before	After	Before	After	Before	After				
(psf)	(psf)	(mils)	(mils)	(mils)	(mils)	(mils)	(mils)	(mils)	(mils)	(%)	(%)	(psf)	(degrees)	(psf)	(degrees)
34.7	5,000	23.7	23.1	24.4	23.2	23.5	19.4	24.4	23.7	20.5	18.6	2,709	28	1,148	13
69.4	10,000	23.7	22.9	23.7	22.3	22.9	17.7	24.3	22.1	20.5	19.8	4,737	25	2,032	11
104.2	15,000	24.6	22.8	25.3	24.6	24.6	16.3	24.0	23.0	20.5	20.1	7,953	28	3,283	12
Note: N/A - Not Applicable										COHESION (psf) :		0		19	
										COEFFICIENT OF FRICTION :		0.52		0.21	
										FRICTION ANGLE (degrees) :		27.7		12.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the DS Geocomposite (C# 62070) and 60 mil HDPE (C# 44501) on all loads. See attached photos (907-1-15,000 psf / 907-1-10,000 psf / 907-1-5,000 psf)

Figure #1
Normal Stress/ Interface Stress

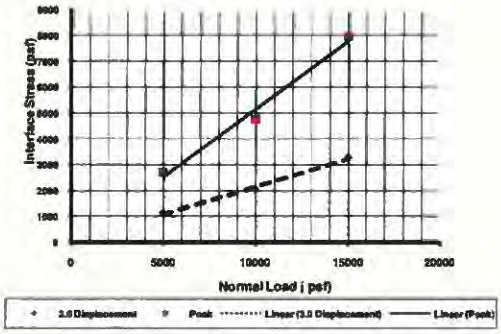


Figure #2
Shear Stress/ Displacement Curve

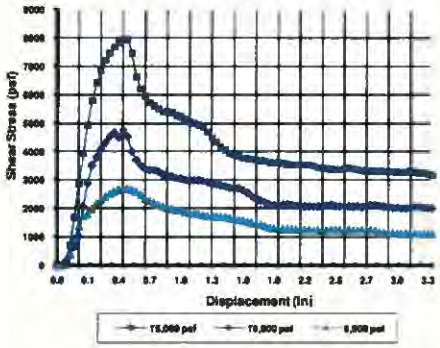
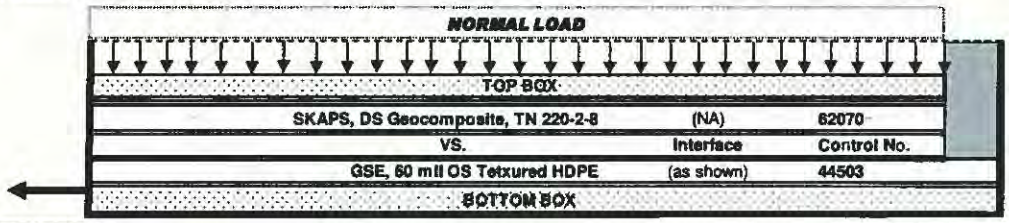


TABLE 1-A
CLIENT: GOLDER & ASSOCIATES
PROJECT: KETTLEMAN HILLS

INTERFACE SHEAR TEST RESULT (ASTM D5321/6243)
PGL Job No. G091078

Reviewed By: _____
Date: 19-Oct-09

TEST CONFIGURATION **1-A**



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. The specimen was consolidated under **Dry** condition for **2 hrs** @ normal load before shearing.
2. Normal load was applied using **Bladder**

SHEAR TEST:

1. Shear test was conducted @ **0.04** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **Dry** condition .
4. Test were performed in general accordance with ASTM D6243 / ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		mils		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	Before	After	(psf)	(degrees)	(psf)	(degrees)
69.44	10,000	25.5	18.4	4940	26	2135	12

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

Figure #2
Shear Stress/ Displacement Curve

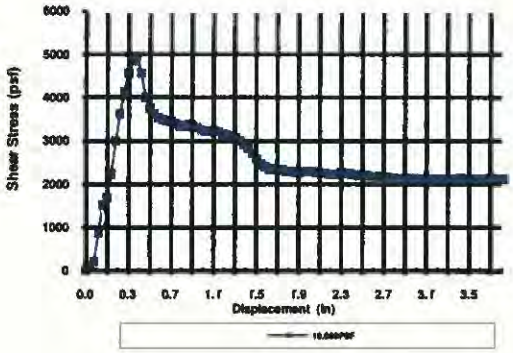
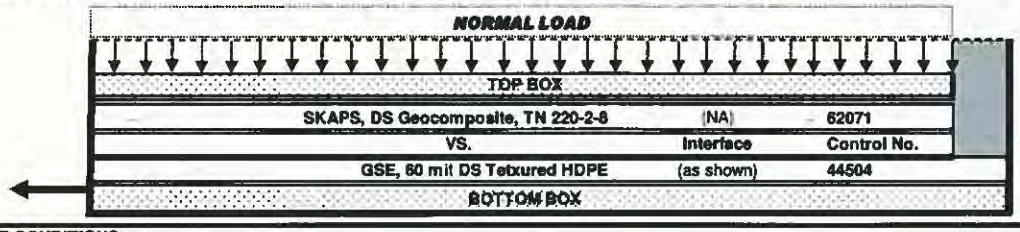


TABLE 1-B
CLIENT: GOLDER & ASSOCIATES
PROJECT: KETTLEMAN HILLS

INTERFACE SHEAR TEST RESULT (ASTM D5321/6243)
PGL Job No. G091078

Reviewed By: _____
Date: 19-Oct-09

TEST CONFIGURATION **1-B**



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. The specimen was consolidated under **Dry** condition for **2 hrs** @ normal load before shearing.
2. Normal load was applied using **Bladder**

SHEAR TEST:

1. Shear test was conducted @ **0.04** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **Dry** condition.
4. Test were performed in general accordance with ASTM D6243 / ASTM D5321 using Brainard-Kilman LG-t12 Direct Shear machine with effective test area of 12 in X 12 in.

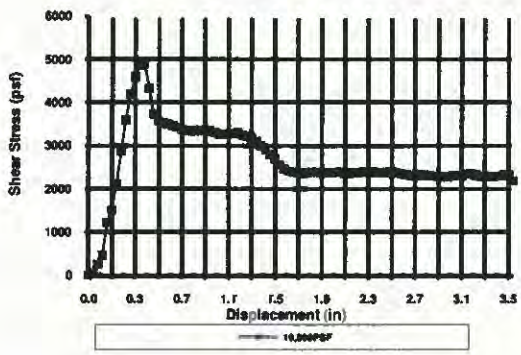
TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		mils		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	Before	After	(psf)	(degrees)	(psf)	(degrees)
69.44	10,000	24.8	19.3	4903	26	2282	13

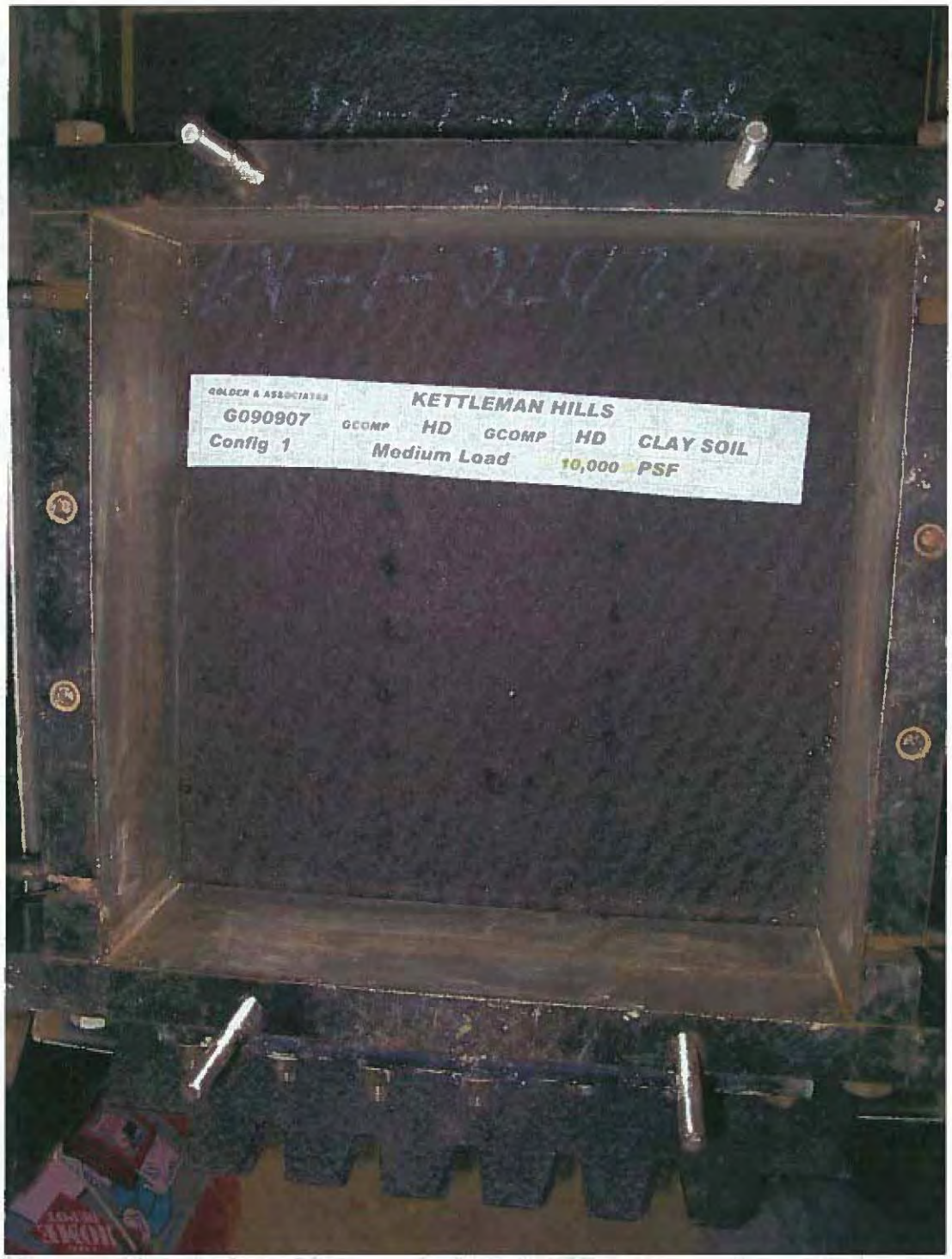
OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

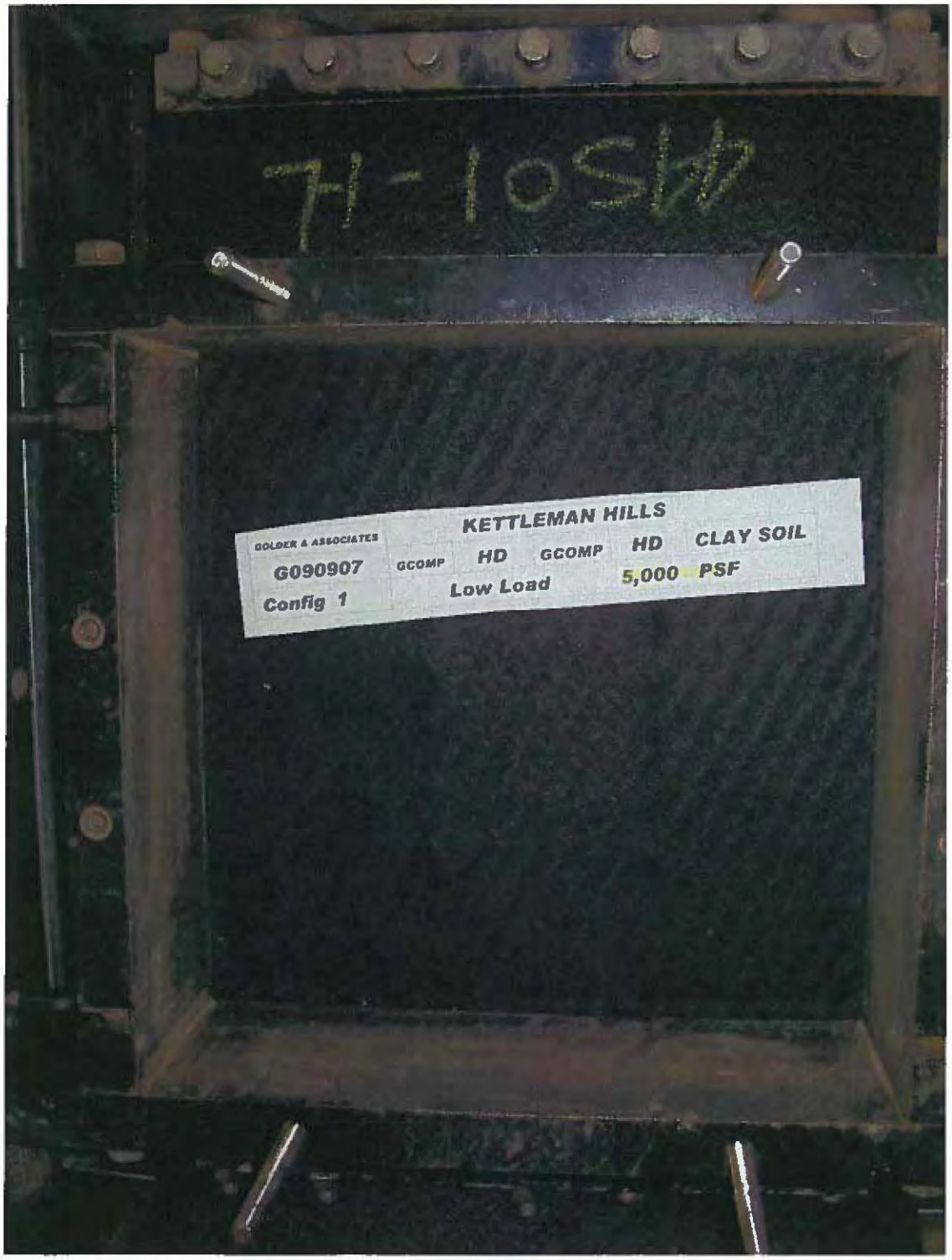
Figure #2
Shear Stress/ Displacement Curve



@ 15,000 psf


GOLDER & ASSOCIATES
KETTLEMAN HILLS
G090907
GCOMP HD GCOMP HD CLAY SOIL
Config 1
Medium Load
10,000 PSF

@ 10,000 psf


H-10SW
GOLDER & ASSOCIATES
KETTLEMAN HILLS
G090907
GCOMP
HD
GCOMP
HD
CLAY SOIL
Config 1
Low Load
5,000 PSF

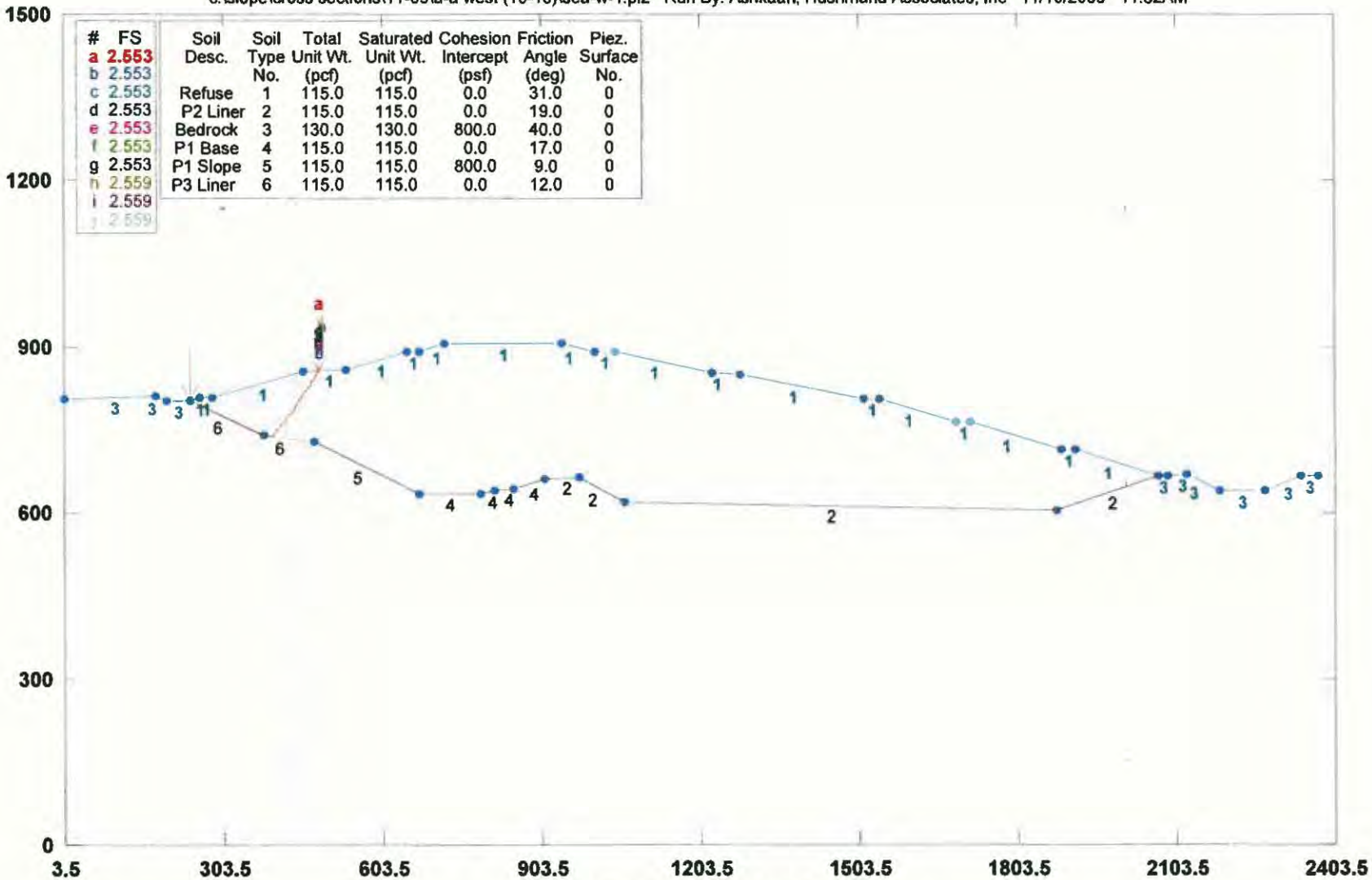
@ 5,000 psf

APPENDIX B

SLOPE STABILITY ANALYSIS PLOTS

KHF, SECTION A-A', WEST, STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\a-a west (10-16)\sea-w-1.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 11:32AM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=2.553

Safety Factors Are Calculated By The Simplified Janbu Method

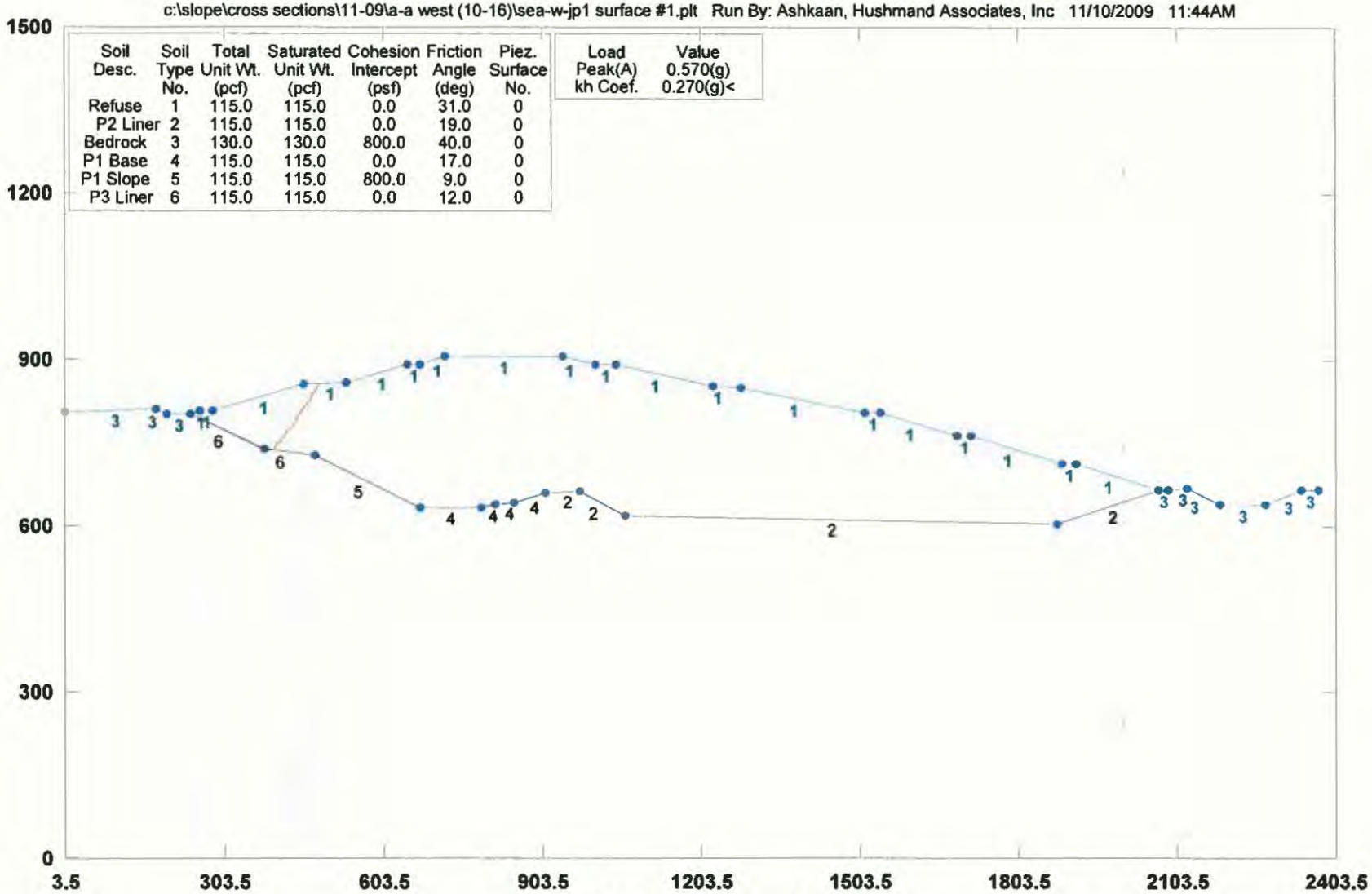
GSTABL7

KHF, SECTION A-A', WEST, PSEUDO-STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\a-a west (10-16)\sea-w-jp1 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 11:44AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.270(g)<



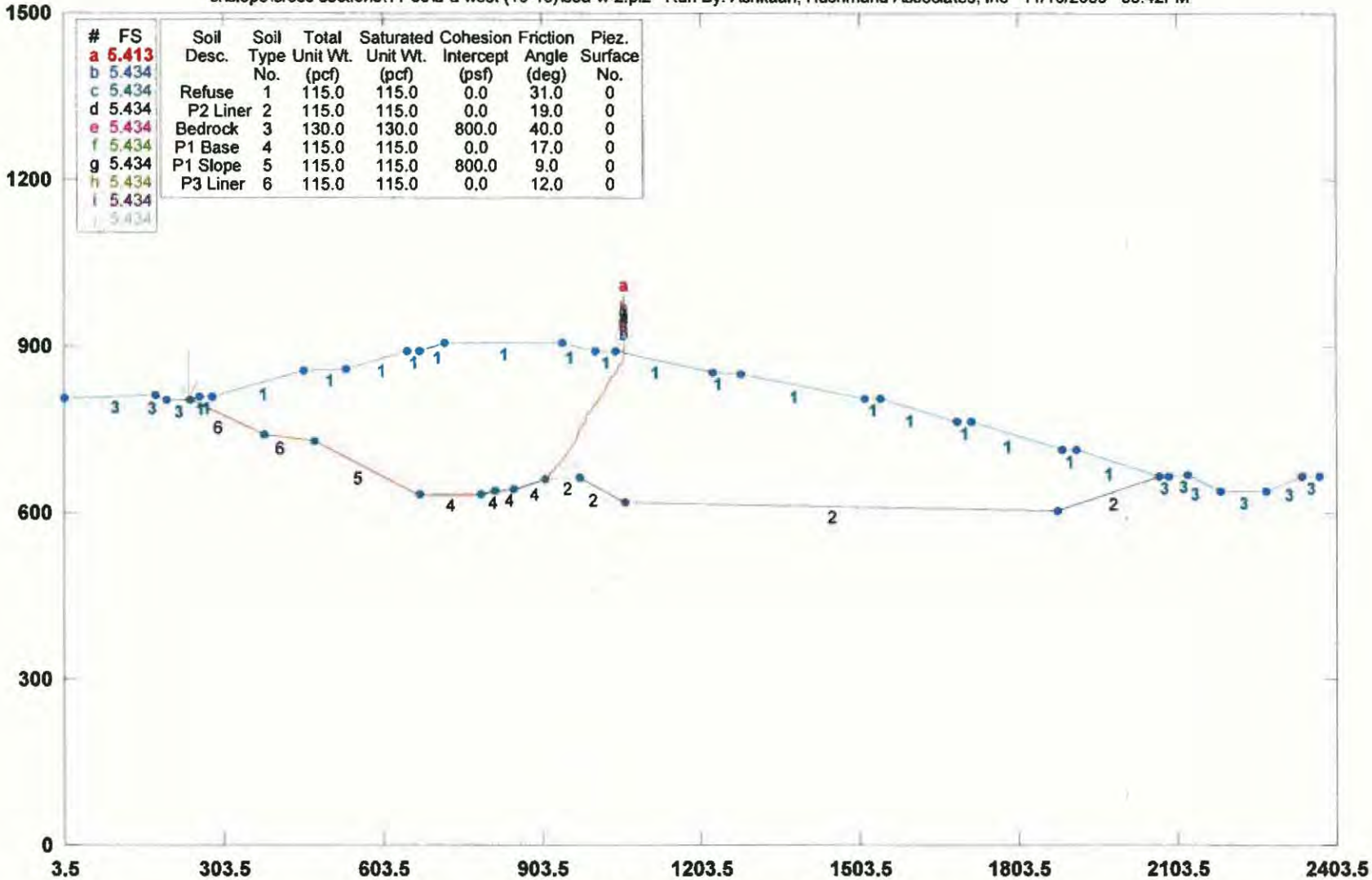
GSTABL7 v.2 FSmin=1.002

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION A-A', WEST, STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\a-a west (10-16)\sea-w-2.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 06:42PM



#	FS
a	5.413
b	5.434
c	5.434
d	5.434
e	5.434
f	5.434
g	5.434
h	5.434
i	5.434
j	5.434

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=5.413

Safety Factors Are Calculated By The Simplified Janbu Method

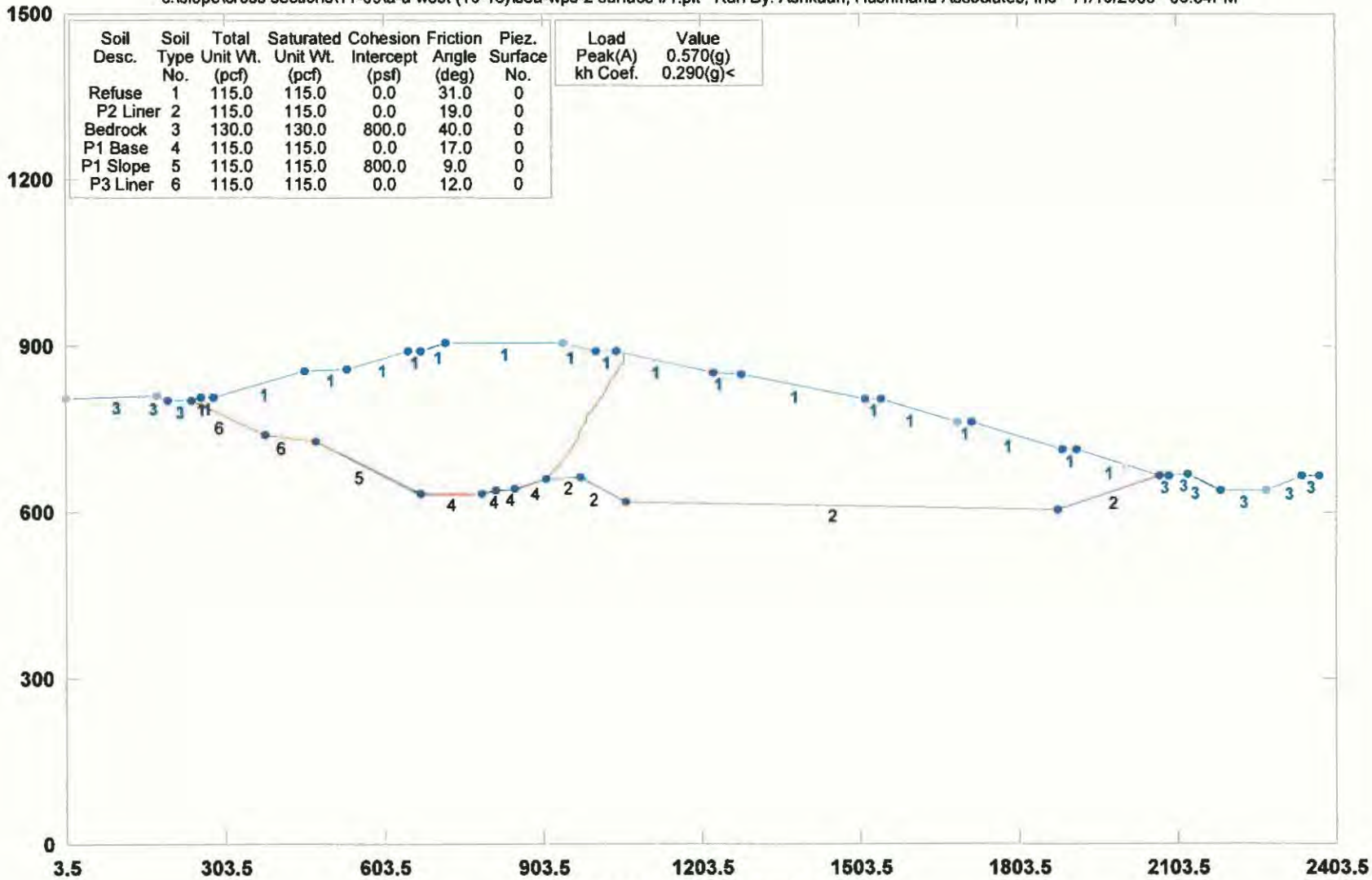
GSTABL7

KHF, SECTION A-A', WEST, PSEUDO-STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\a-a west (10-16)\sea-wps-2 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 06:34PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.290(g)<



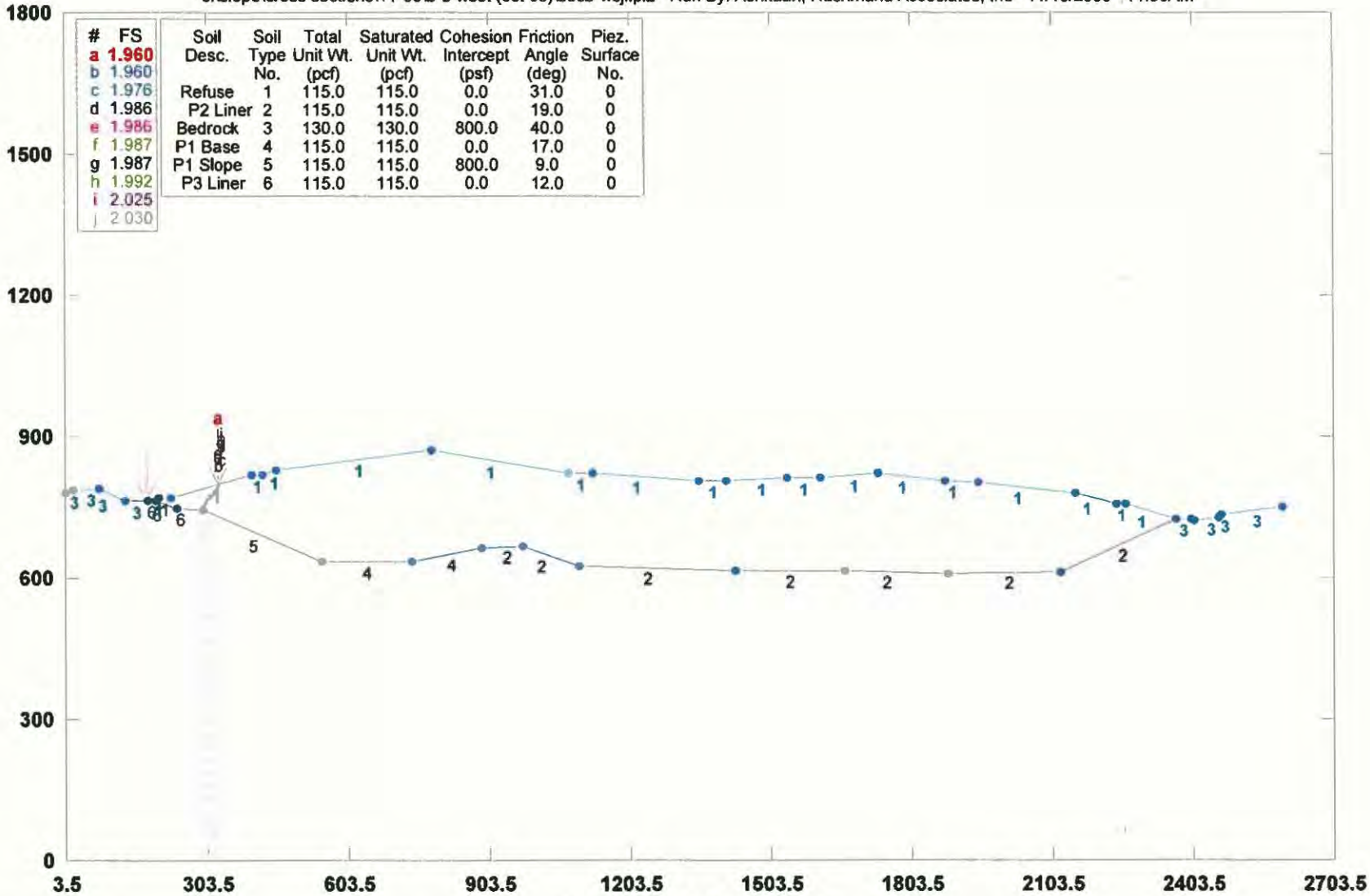
GSTABL7 v.2 FSmin=1.021

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', WEST, STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\b-b west (oct 09)\secb-wsji.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 11:59AM



#	FS
a	1.960
b	1.960
c	1.976
d	1.986
e	1.986
f	1.987
g	1.987
h	1.992
i	2.025
j	2.030

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=1.960

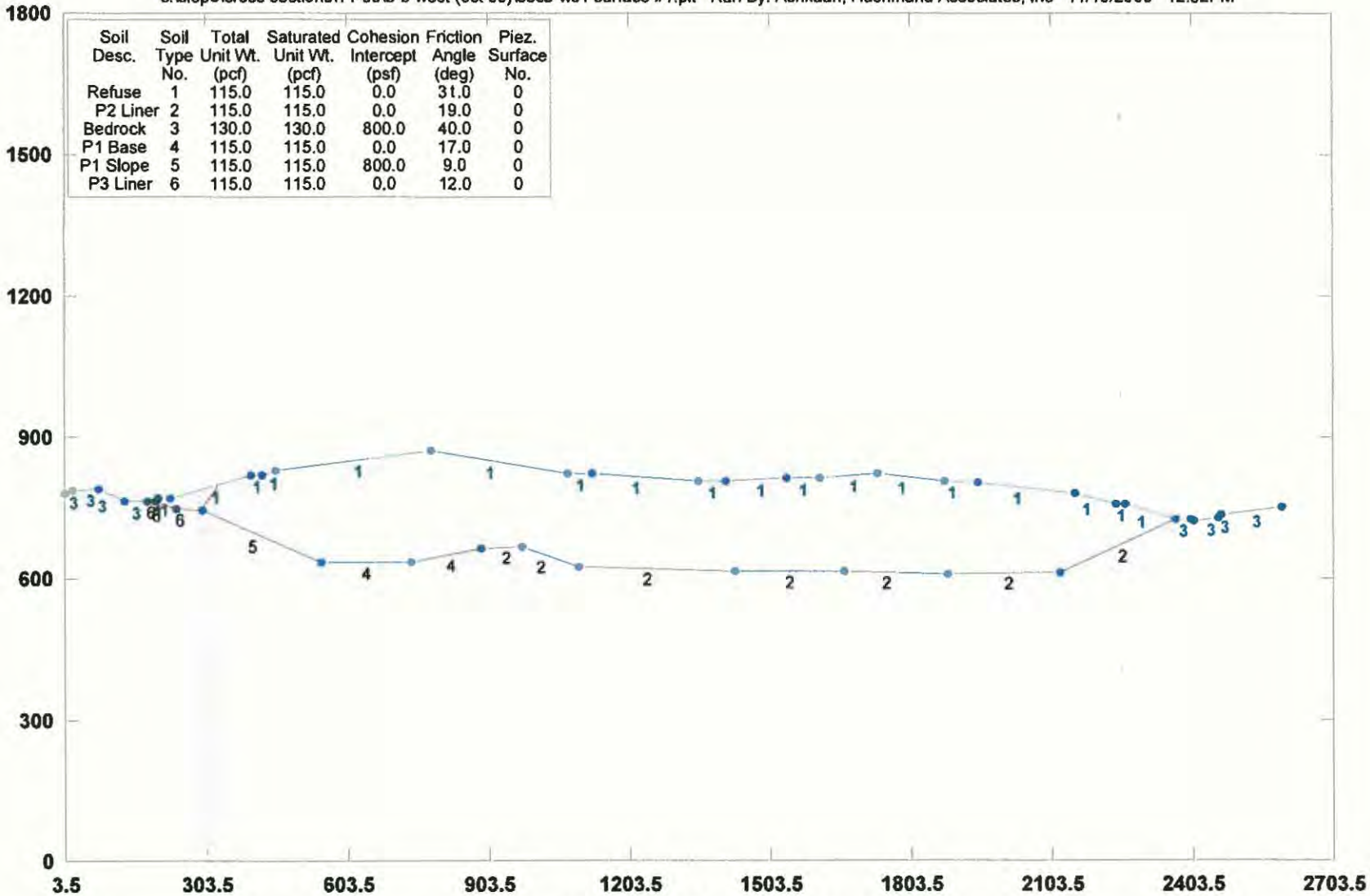
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', WEST, STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\b-b west (oct 09)\secb-ws1 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 12:02PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0



GSTABL7 v.2 FSmin=2.412

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

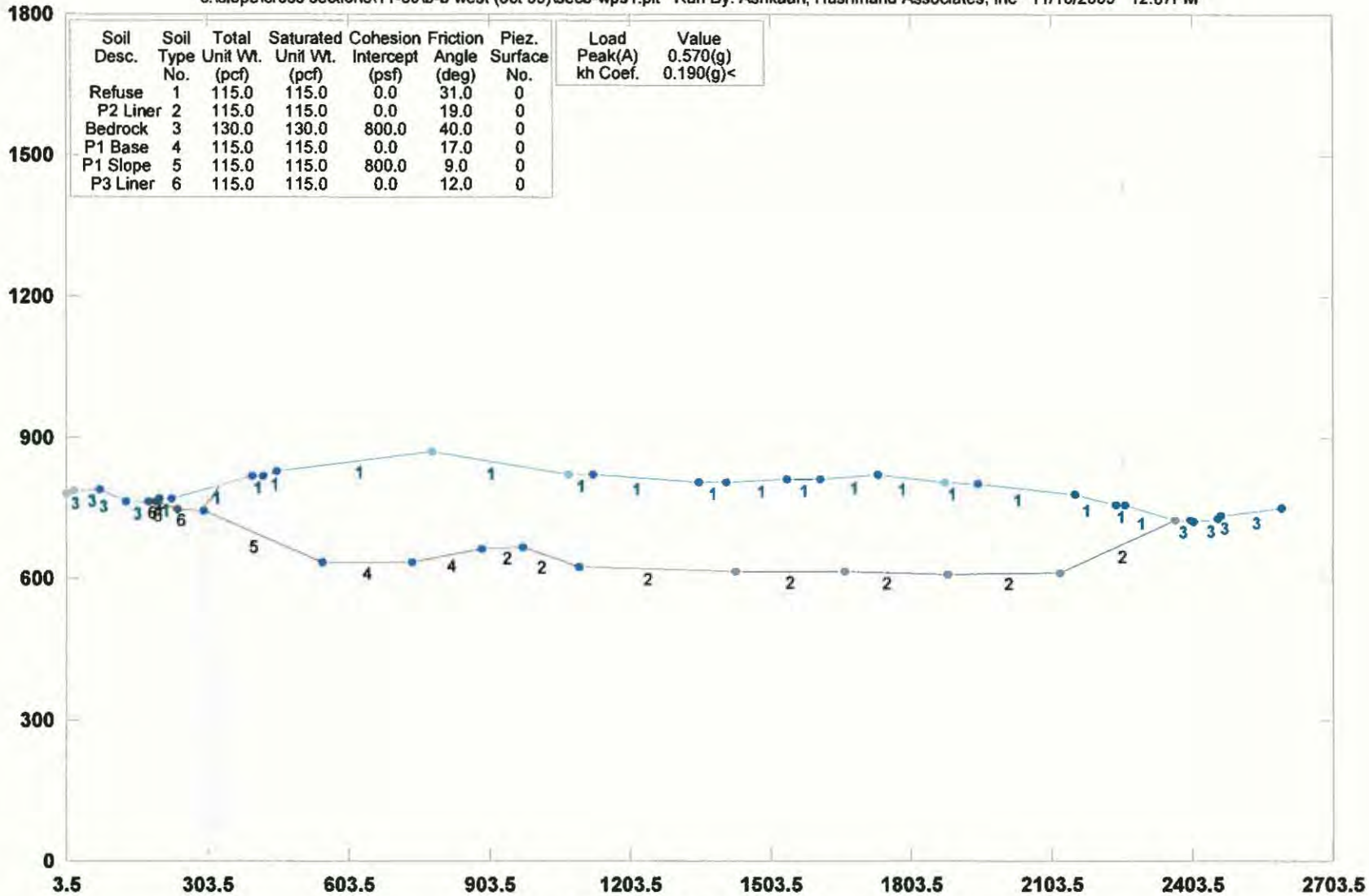
GSTABL7

KHF, SEC. B-B',WEST, PSEUDO-STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\b-b west (oct 09)\secb-wps1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 12:07PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.190(g)<



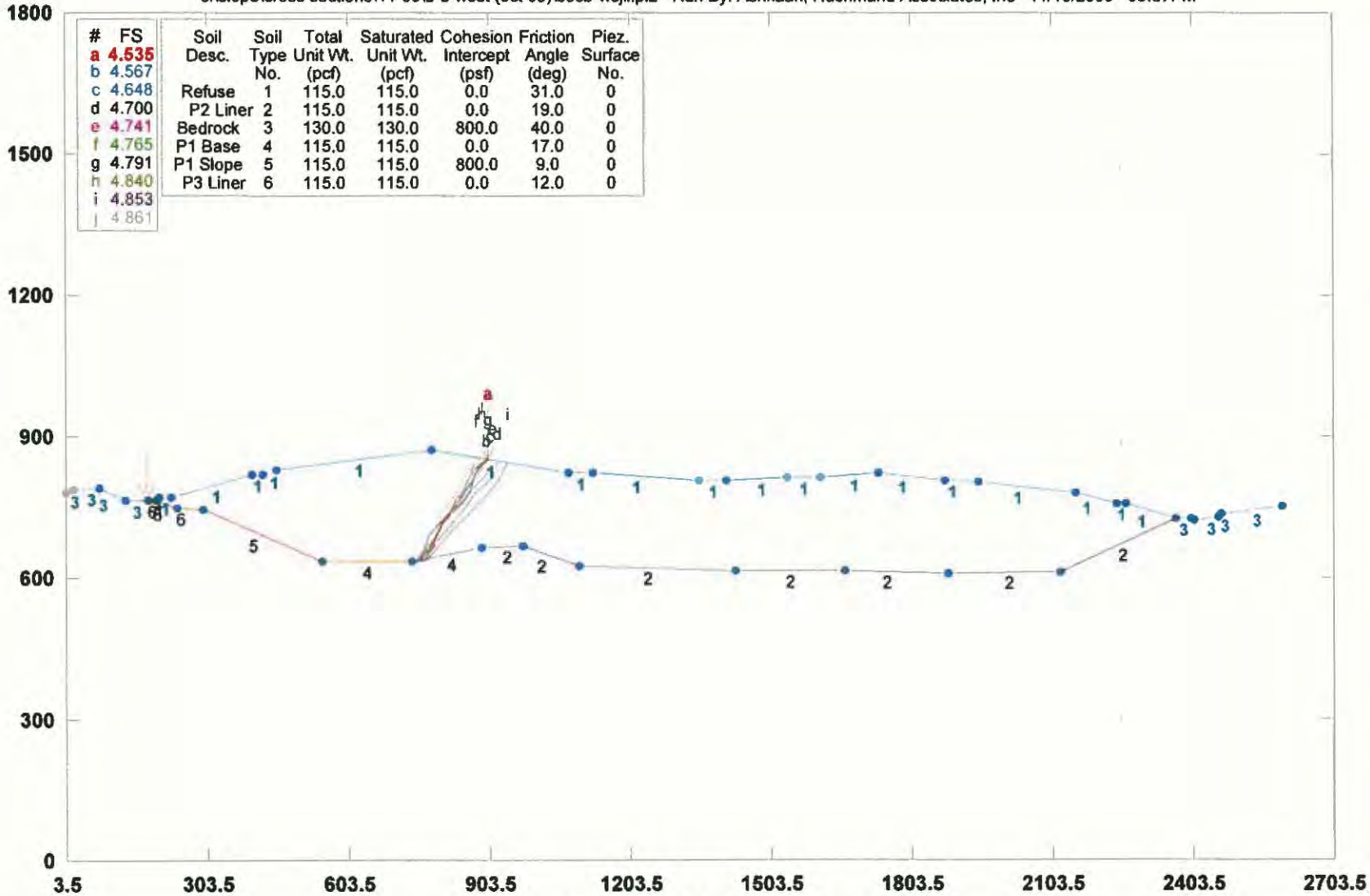
GSTABL7 v.2 FSmin=1.025

Factor Of Safety Is Calculated By GLE (Spencer's) Method (0-2)

GSTABL7

KHF, SEC. B-B', WEST, STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\b-b west (oct 09)\secb-wsjii.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:37PM



#	FS
a	4.535
b	4.567
c	4.648
d	4.700
e	4.741
f	4.765
g	4.791
h	4.840
i	4.853
j	4.861

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

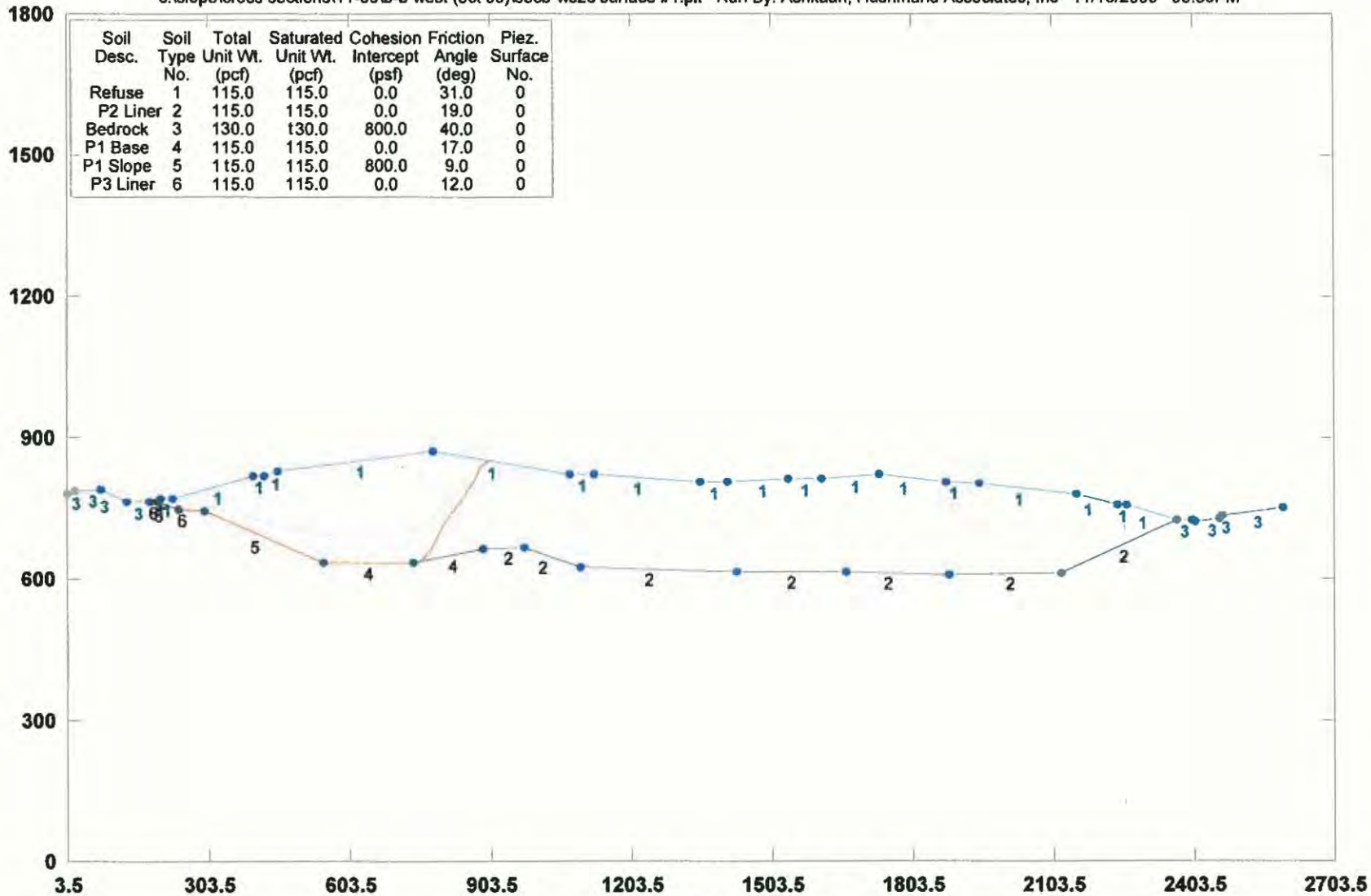
GSTABL7 v.2 FSmin=4.535

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', WEST, STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\b-b west (oct 09)\secb-ws2s surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:39PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=6.443

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

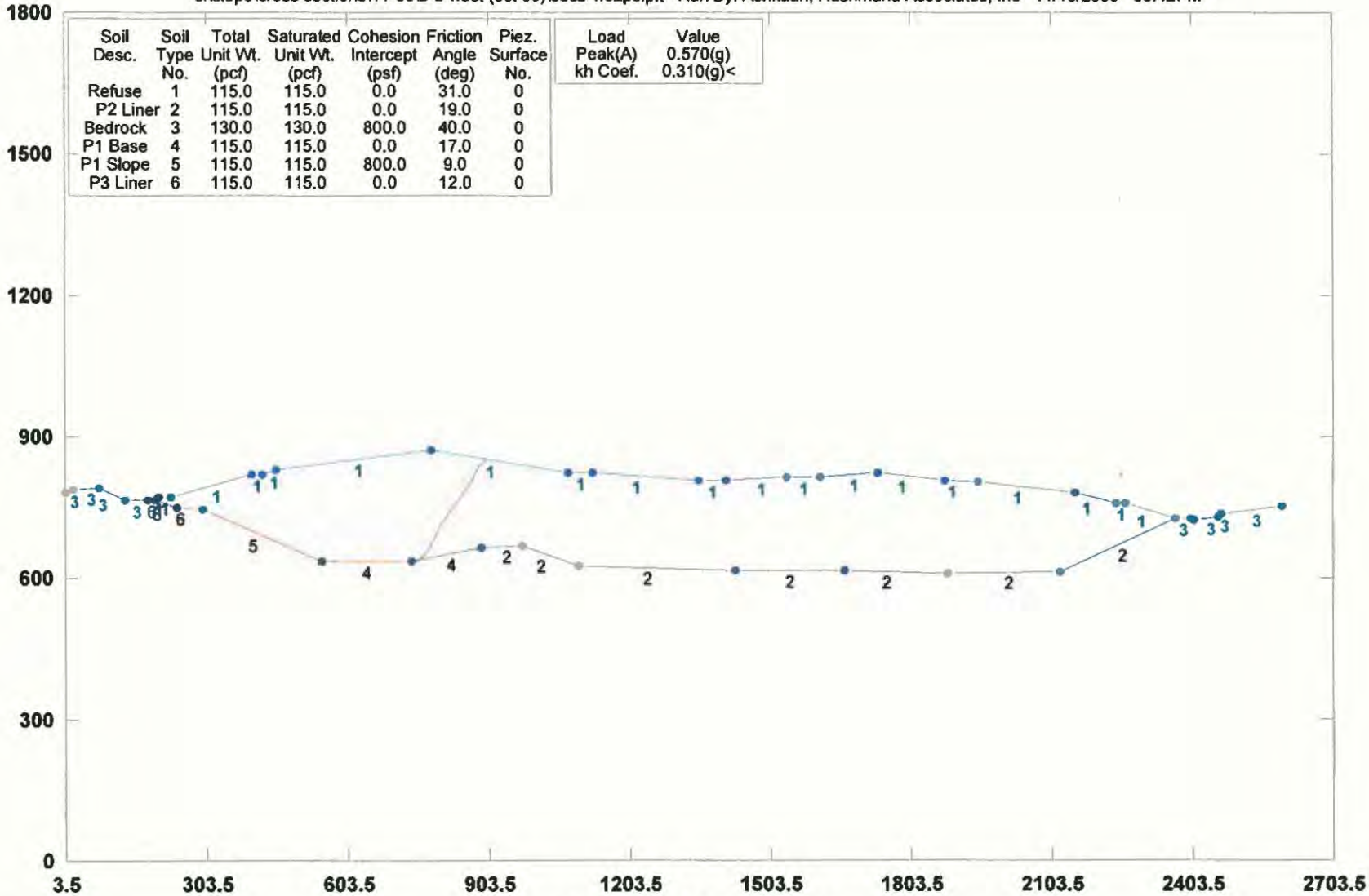
GSTABL7

KHF, SEC. B-B',WEST, PSEUDO-STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\b-b west (oct 09)\secb-ws2ps.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:42PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.310(g)<



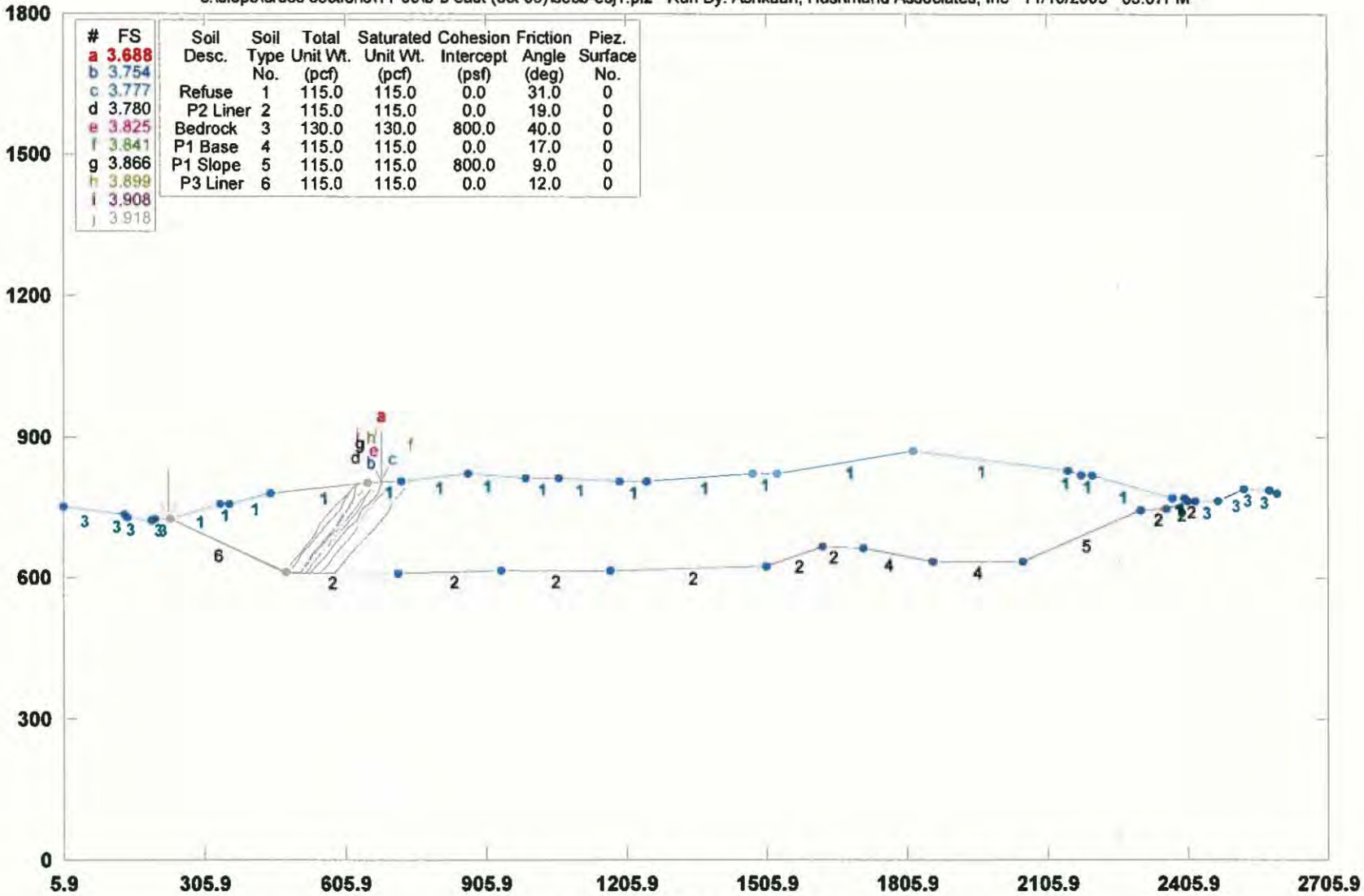
GSTABL7 v.2 FSmin=1.015

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 1 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-esj1.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:07PM



#	FS
a	3.688
b	3.754
c	3.777
d	3.780
e	3.825
f	3.841
g	3.866
h	3.899
i	3.908
j	3.918

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=3.688

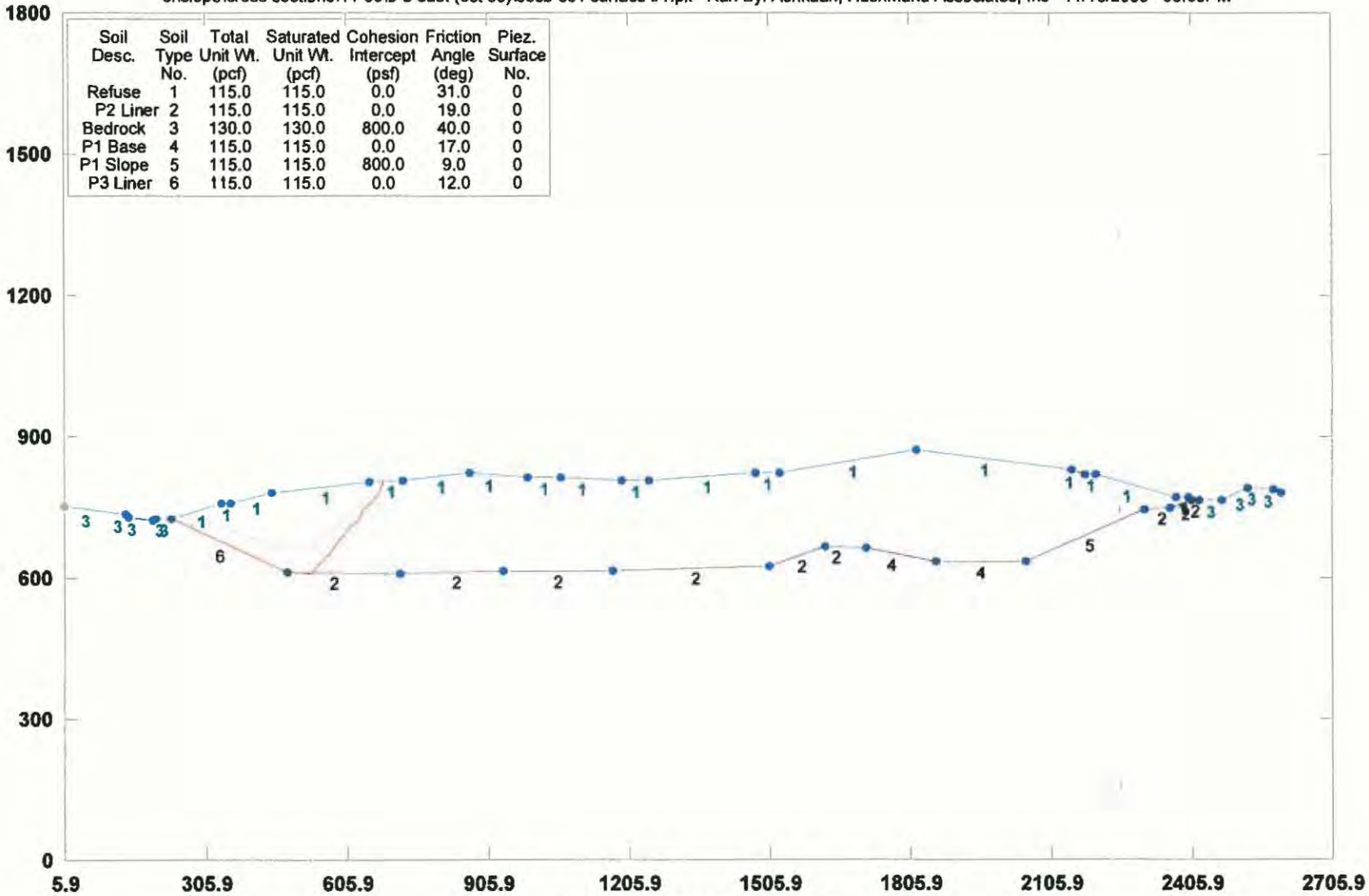
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 1 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-es1 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:09PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0



GSTABL7 v.2 FSmin=5.817

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

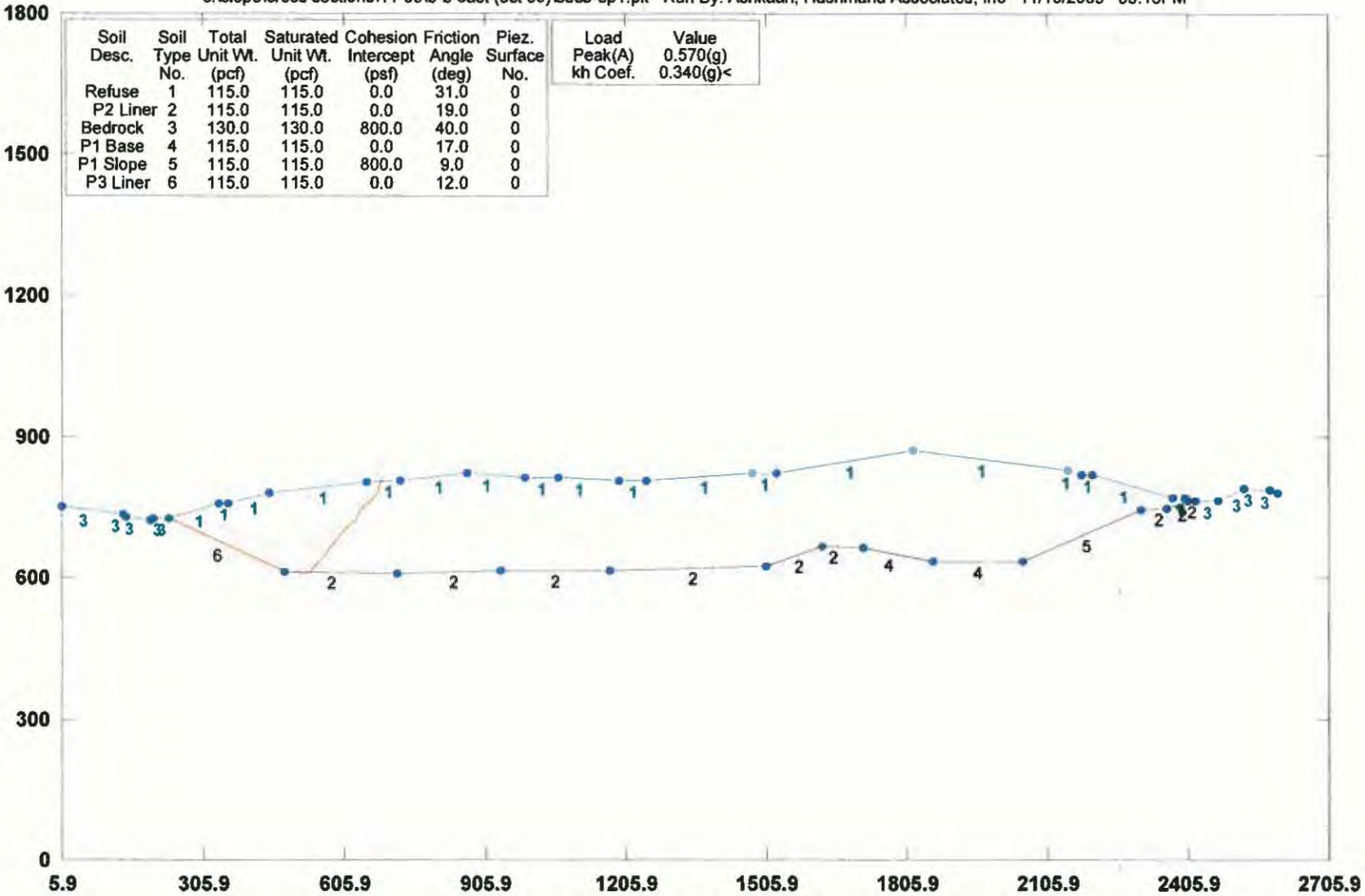
GSTABL7

KHF, SEC. B-B', EAST, PSEUDO-STATIC, FAILURE PLANE 1 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-ep1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:13PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.340(g)<



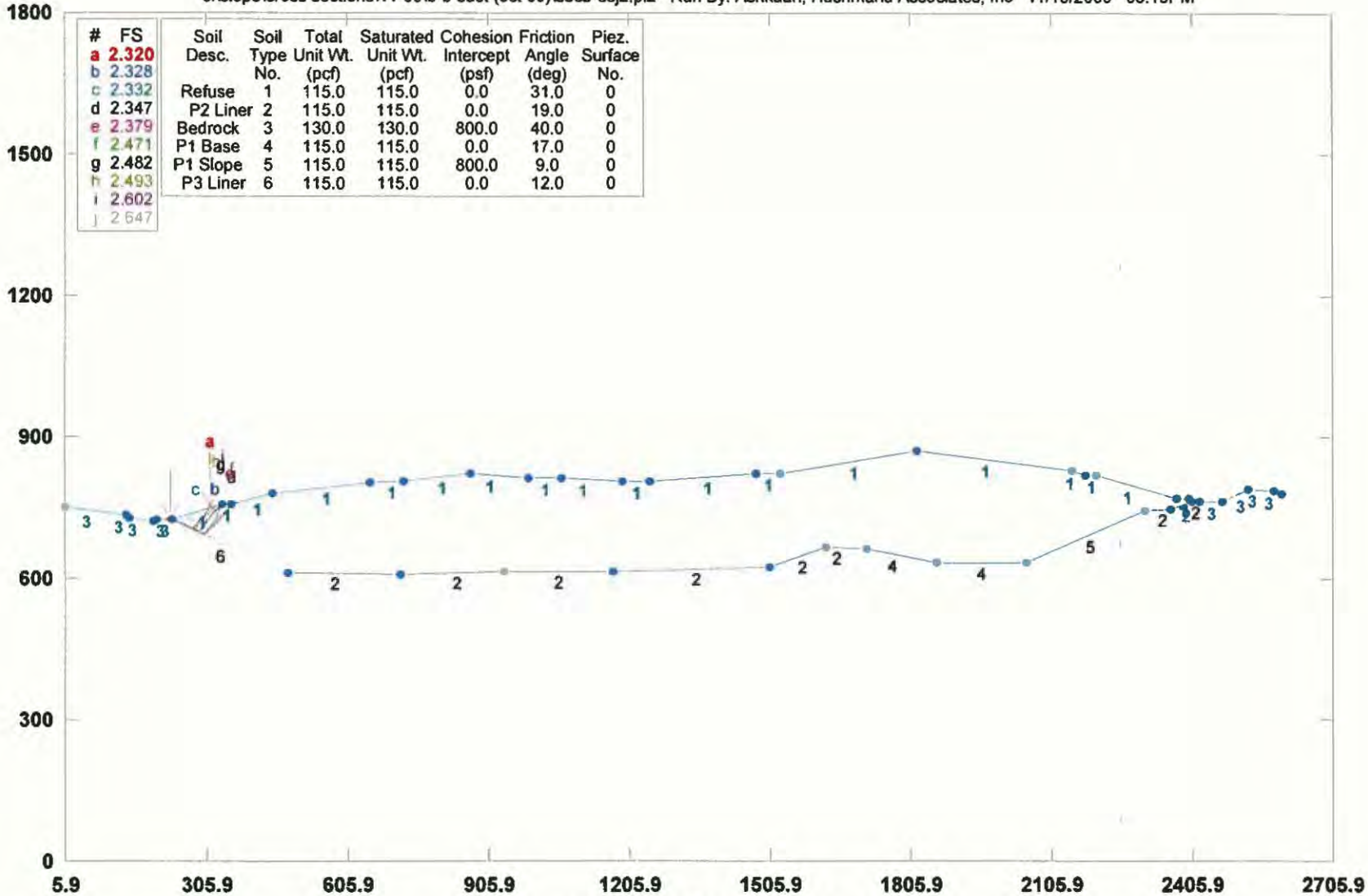
GSTABL7 v.2 FSmin=1.022

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 2 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-esj2.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:15PM



#	FS
a	2.320
b	2.328
c	2.332
d	2.347
e	2.379
f	2.471
g	2.482
h	2.493
i	2.602
j	2.647

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=2.320

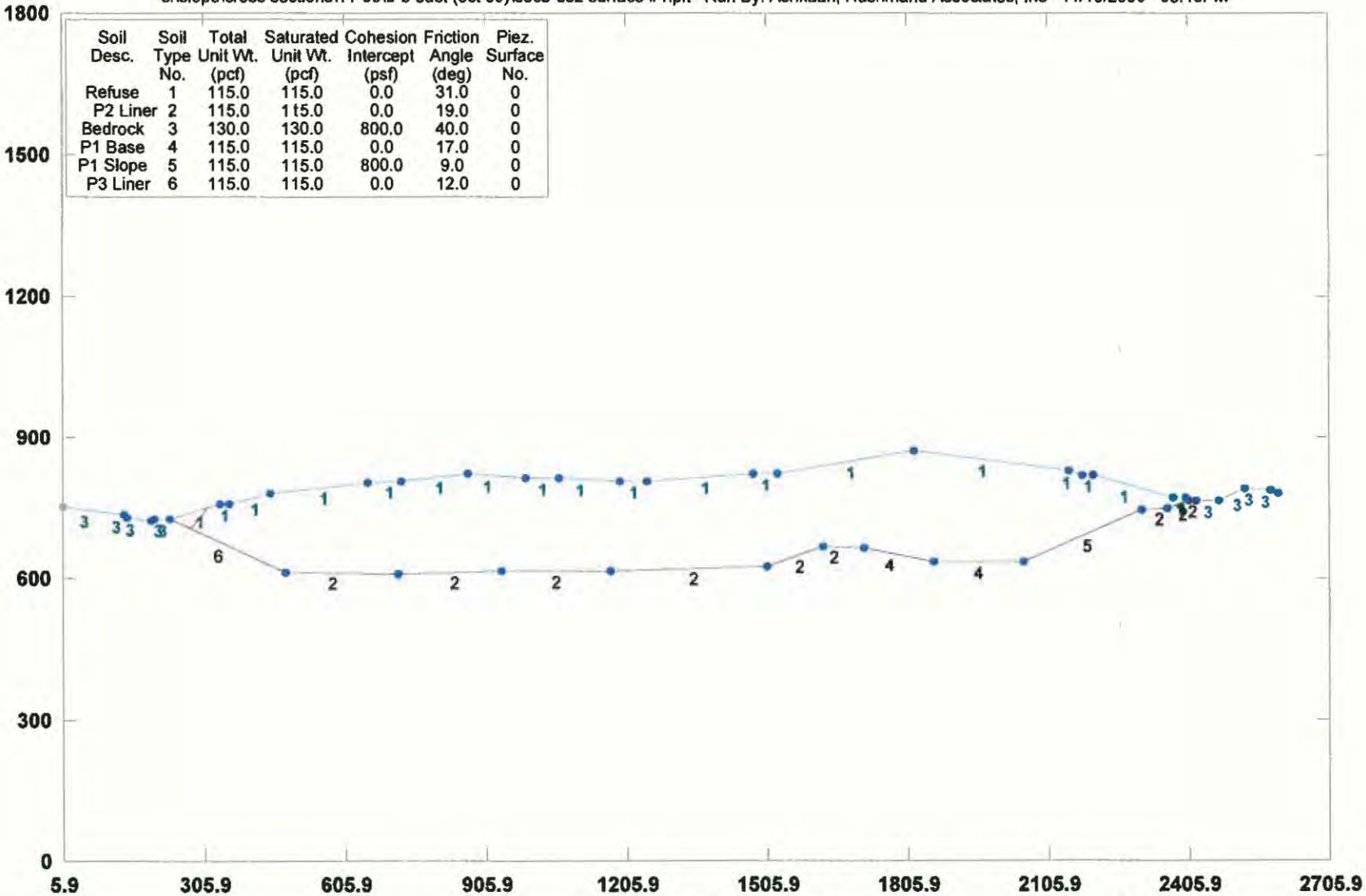
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 2 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-es2 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:16PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0



GSTABL7 v.2 FSmin=3.327

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

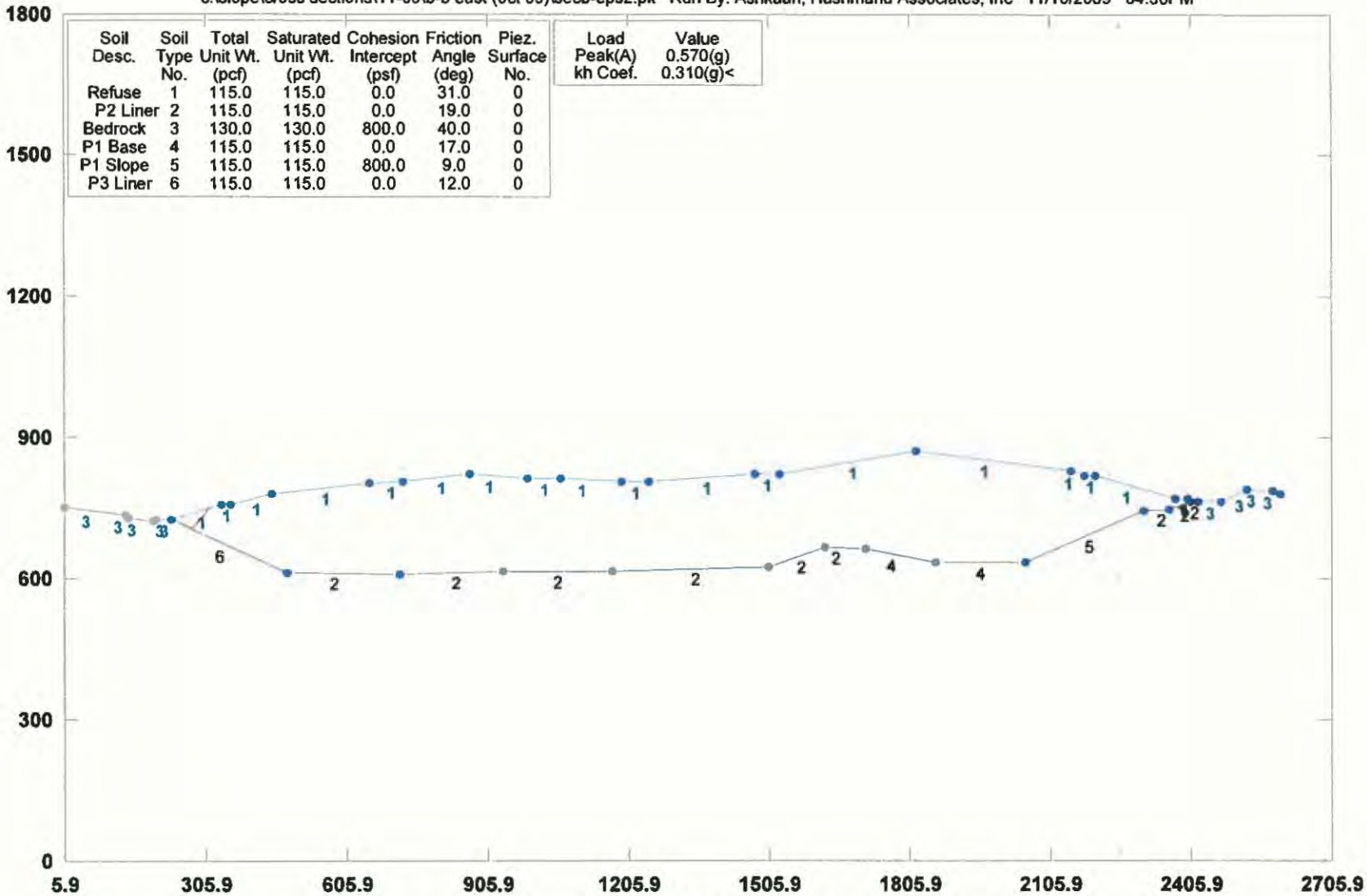
GSTABL7

KHF, SEC. B-B', EAST, PSEUDO-STATIC, FAILURE PLANE 2 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-eps2.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 04:30PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.310(g)<



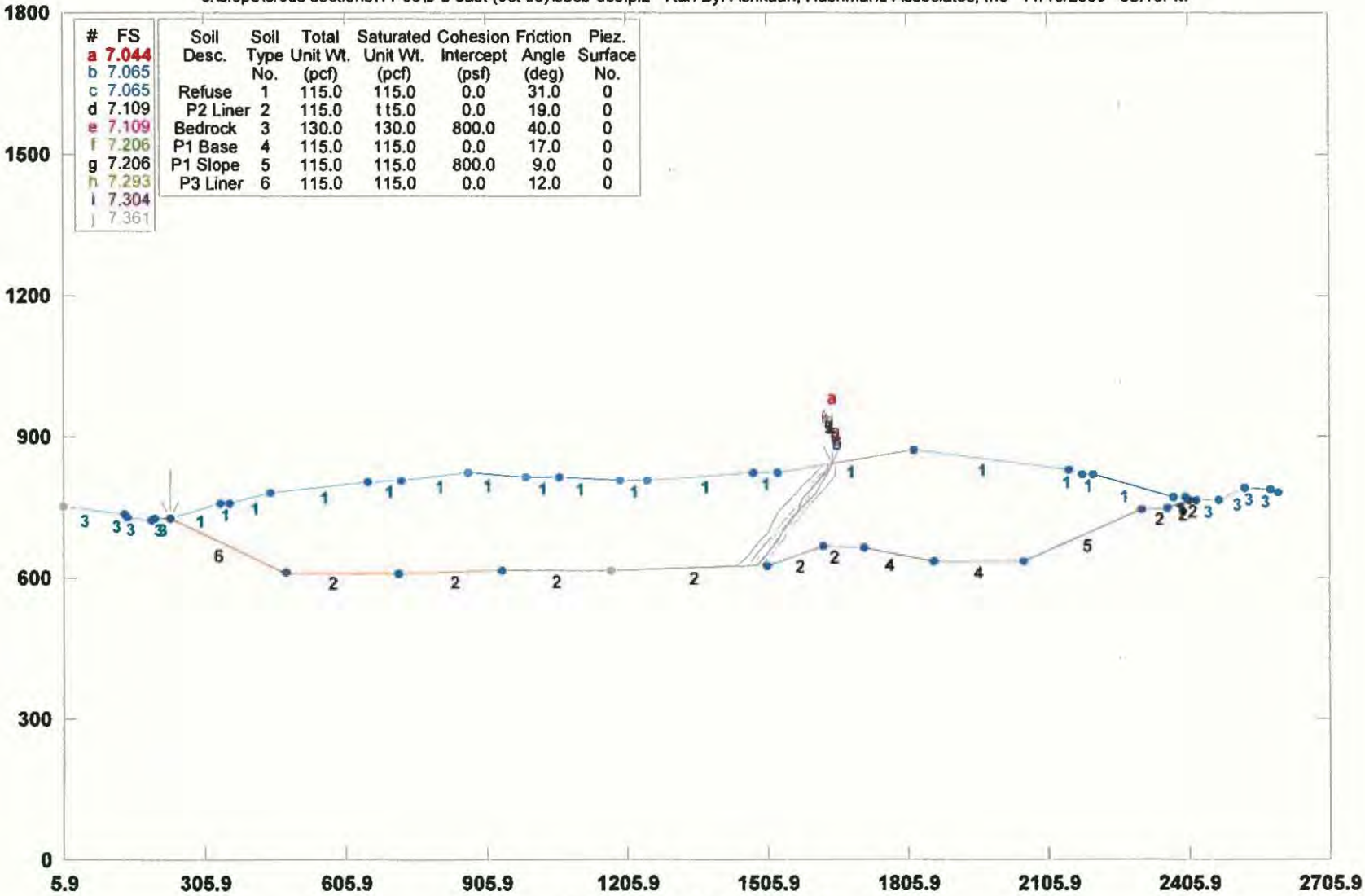
GSTABL7 v.2 FSmin=1.011

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 3 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-es3.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:18PM



#	FS
a	7.044
b	7.065
c	7.065
d	7.109
e	7.109
f	7.206
g	7.206
h	7.293
i	7.304
j	7.361

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	t t5.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=7.044

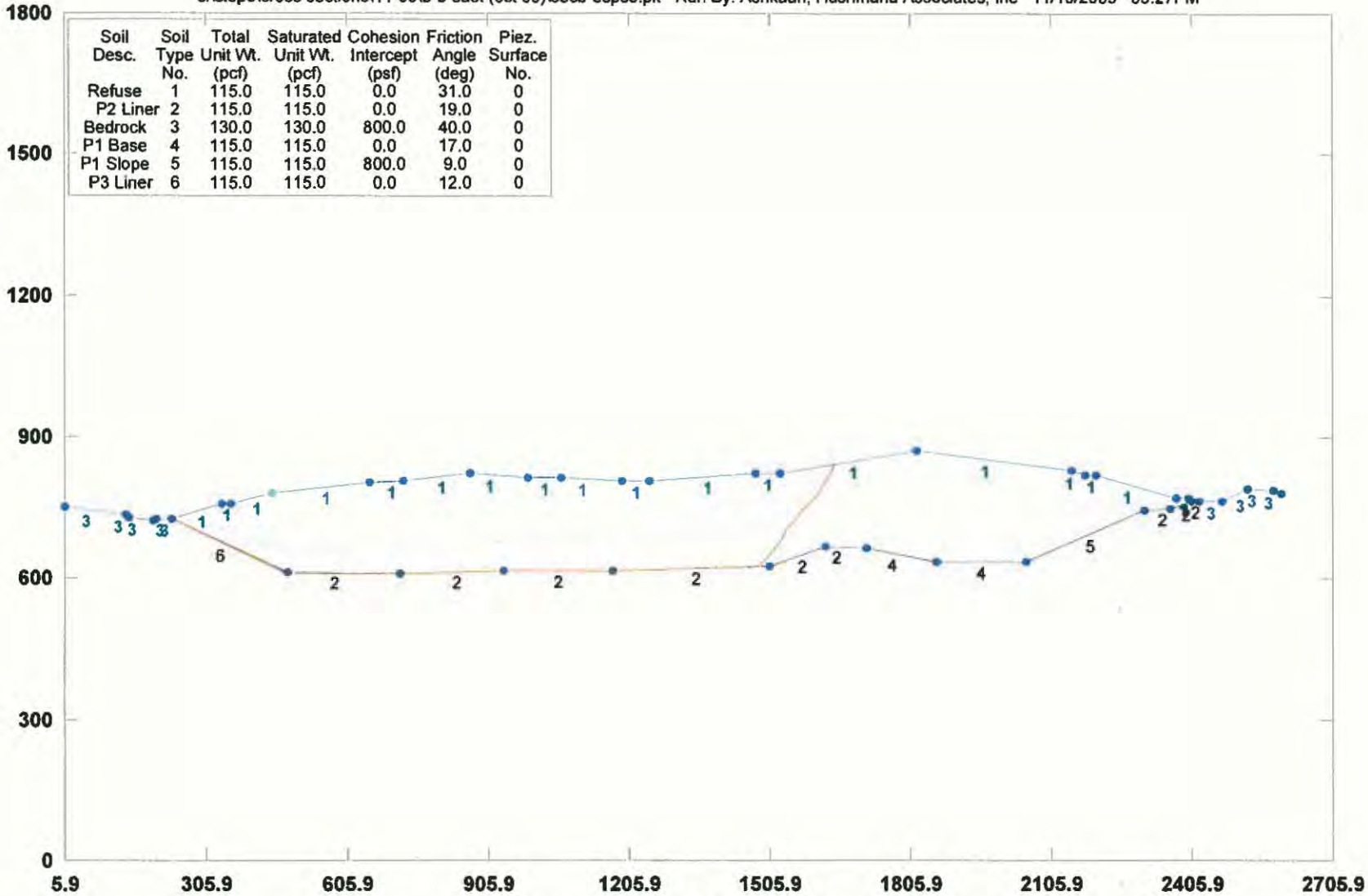
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. B-B', EAST, STATIC, FAILURE PLANE 3 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-esps3.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:27PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0



GSTABL7 v.2 FSmin=7.665

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

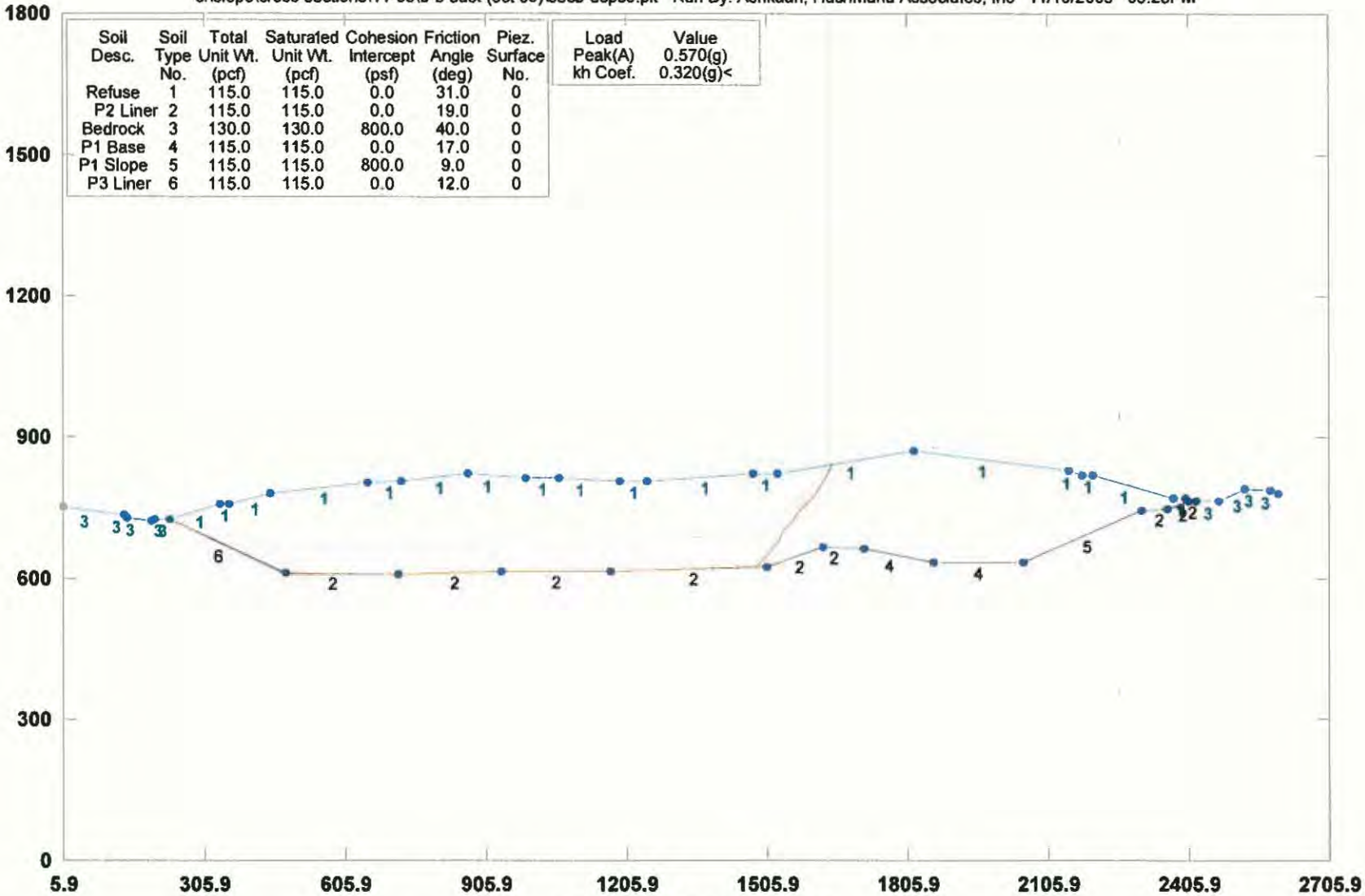
GSTABL7

KHF, SEC. B-B', EAST, PSEUDO-STATIC, FAILURE PLANE 3 (REVISED)

c:\slope\cross sections\11-09\b-b east (oct 09)\secb-esps3.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 05:28PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.320(g)<



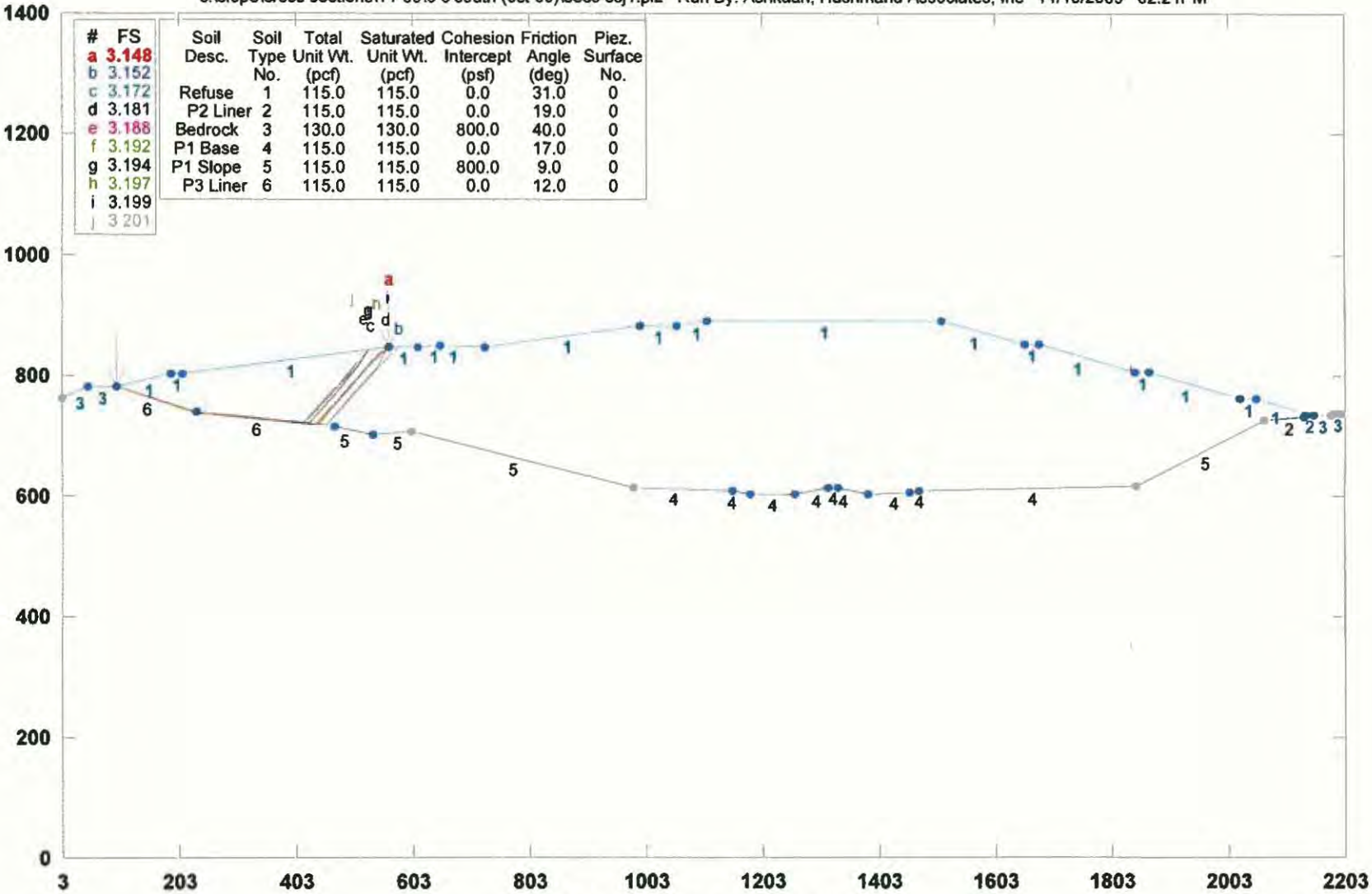
GSTABL7 v.2 FSmin=1.001

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. C-C', SOUTH, STATIC, FAILURE SURFACE I (REVISED)

c:\slope\cross sections\11-09\c-c south (oct 09)\secc-ssj1.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 02:21PM



#	FS
a	3.148
b	3.152
c	3.172
d	3.181
e	3.188
f	3.192
g	3.194
h	3.197
i	3.199
j	3.201

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

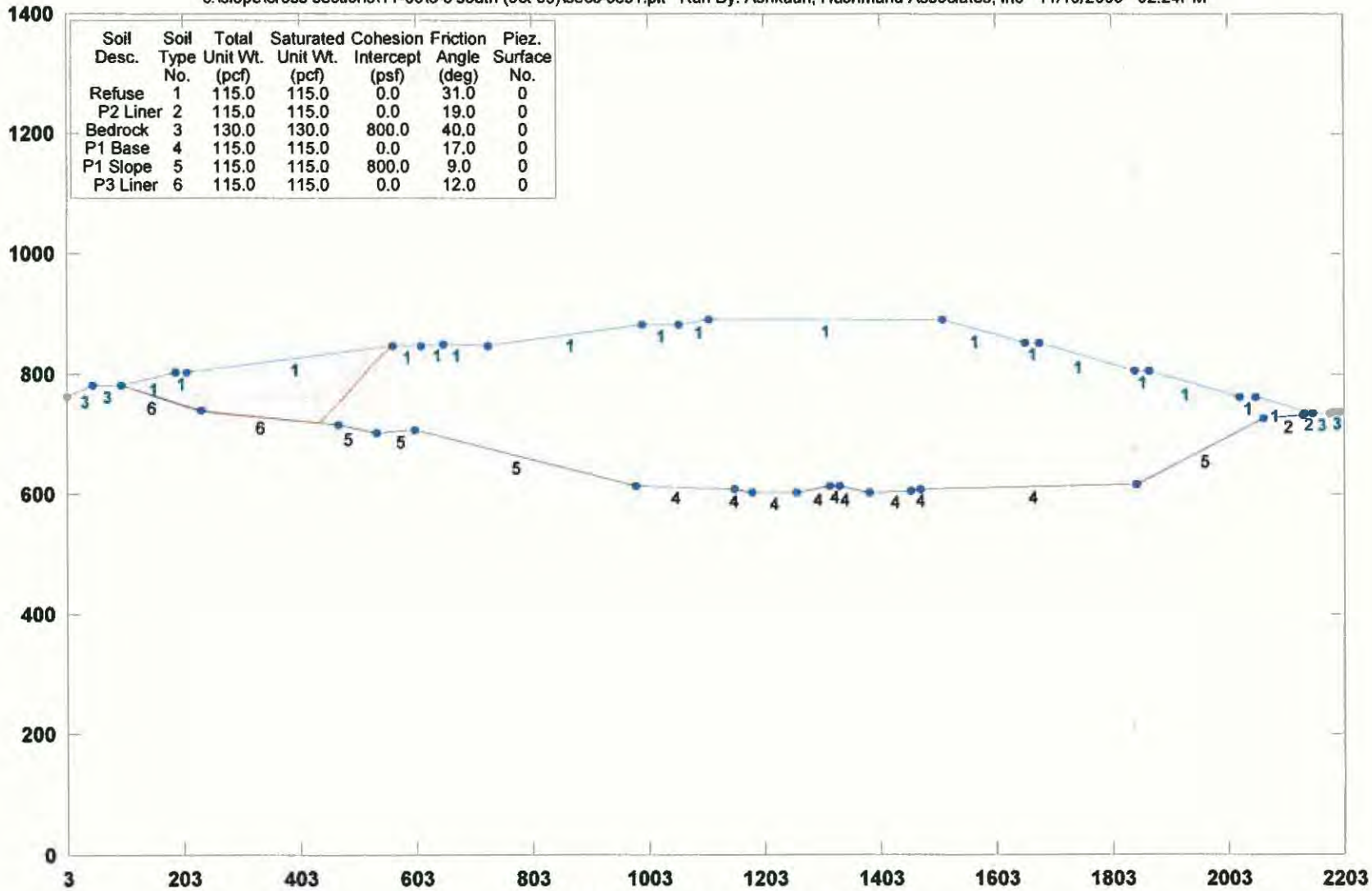
GSTABL7 v.2 FSmin=3.148

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. C-C',SOUTH, STATIC, FAILURE SURFACE I (REVISED)

c:\slope\cross sections\11-09\c-c south (oct 09)\secc-ses1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 02:24PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=3.743

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

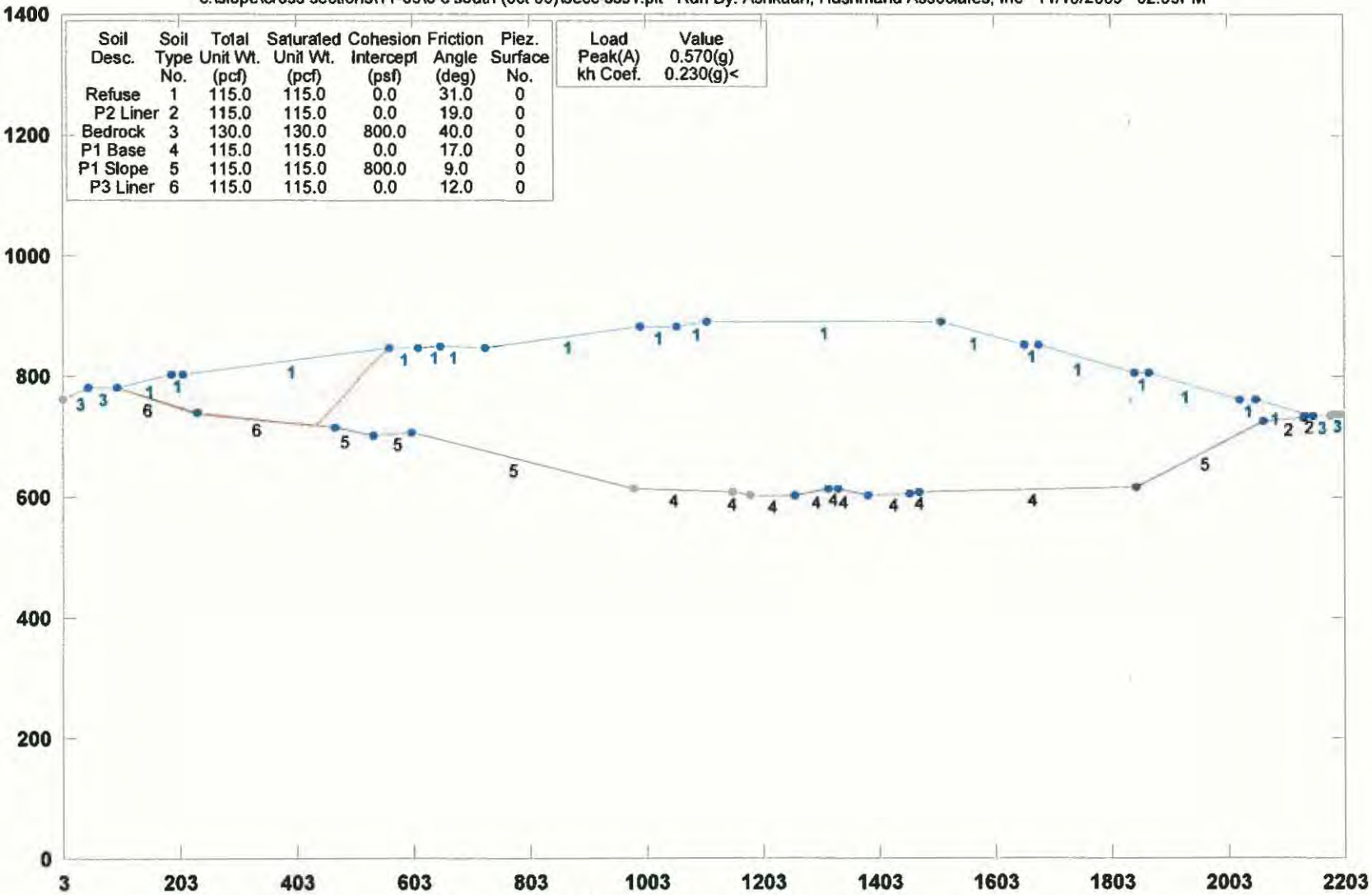
GSTABL7

KHF, SEC. C-C',SOUTH, PSEUDO-STATIC, FAILURE SURFACE I (REVISED)

c:\slope\cross sections\11-09\c-c south (oct 09)\secc-sss1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 02:39PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.230(g)<



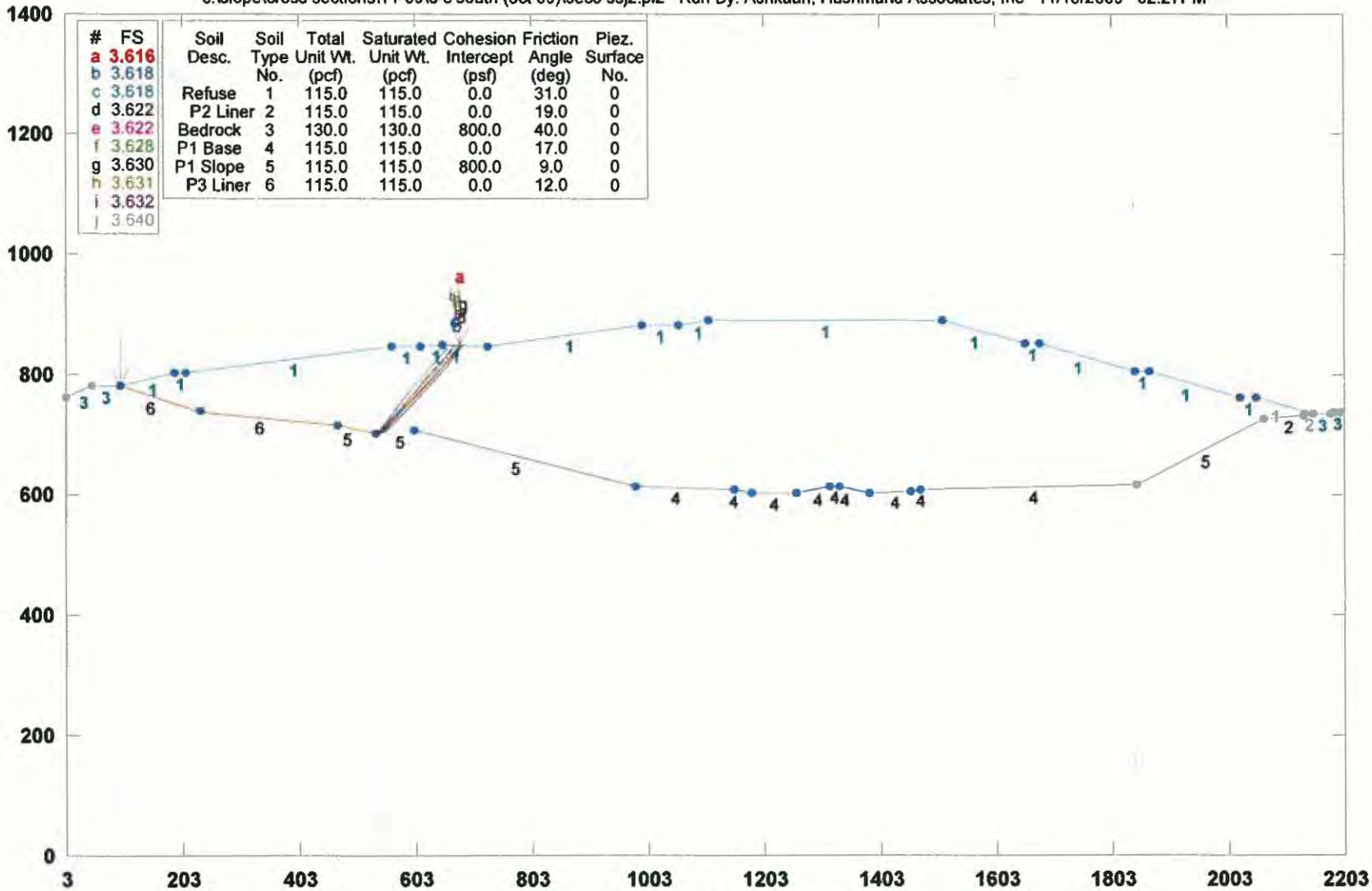
GSTABL7 v.2 FSmin=0.993

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SEC. C-C',SOUTH, STATIC, FAILURE SURFACE II (REVISED)

c:\slope\cross sections\11-09\c-c south (oct 09)\secc-ssj2.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 02:27PM



#	FS
a	3.616
b	3.618
c	3.618
d	3.622
e	3.622
f	3.628
g	3.630
h	3.631
i	3.632
j	3.640

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=3.616

Safety Factors Are Calculated By The Simplified Janbu Method

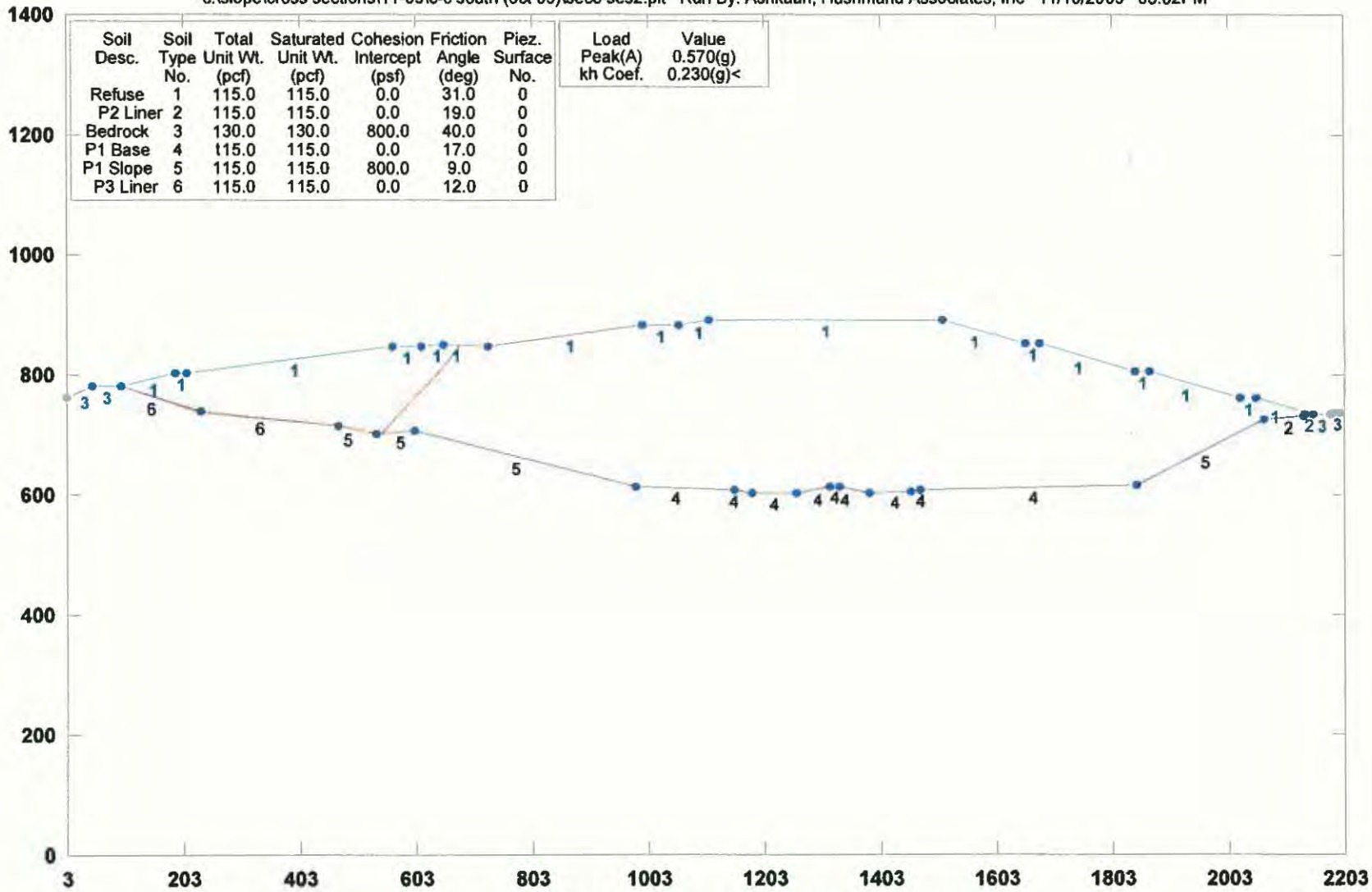
GSTABL7

KHF, SEC. C-C',SOUTH,PSEUDO-STATIC, FAILURE SURFACE II (REVISED)

c:\slope\cross sections\11-09\c-c south (oct 09)\secc-ses2.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:02PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.230(g)<



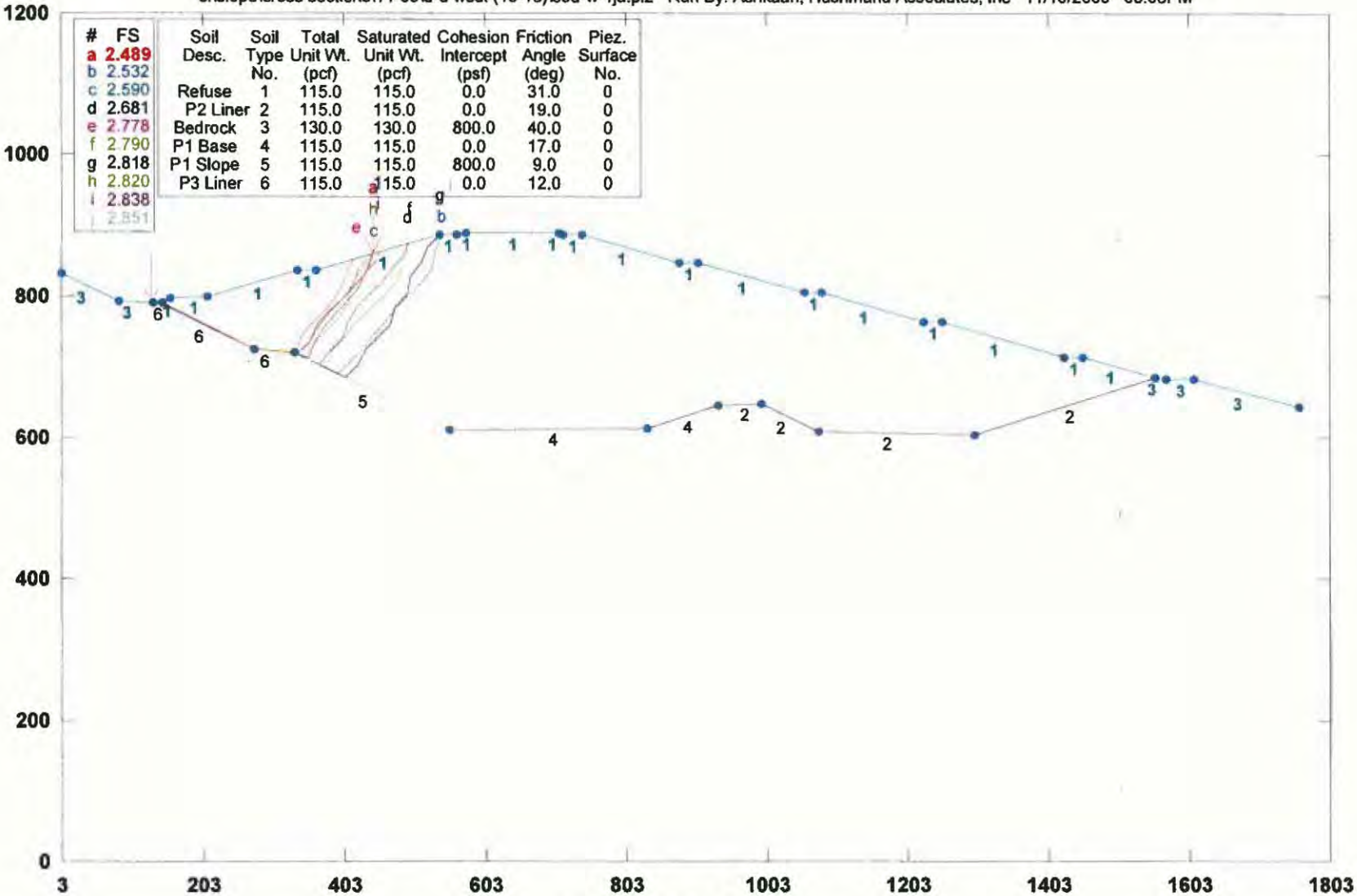
GSTABL7 v.2 FSmin=1.008

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. D-D',WEST, STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\d-d west (10-16)\sed-w-1ja.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:06PM



#	FS
a	2.489
b	2.532
c	2.590
d	2.681
e	2.778
f	2.790
g	2.818
h	2.820
i	2.838
j	2.851

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=2.489

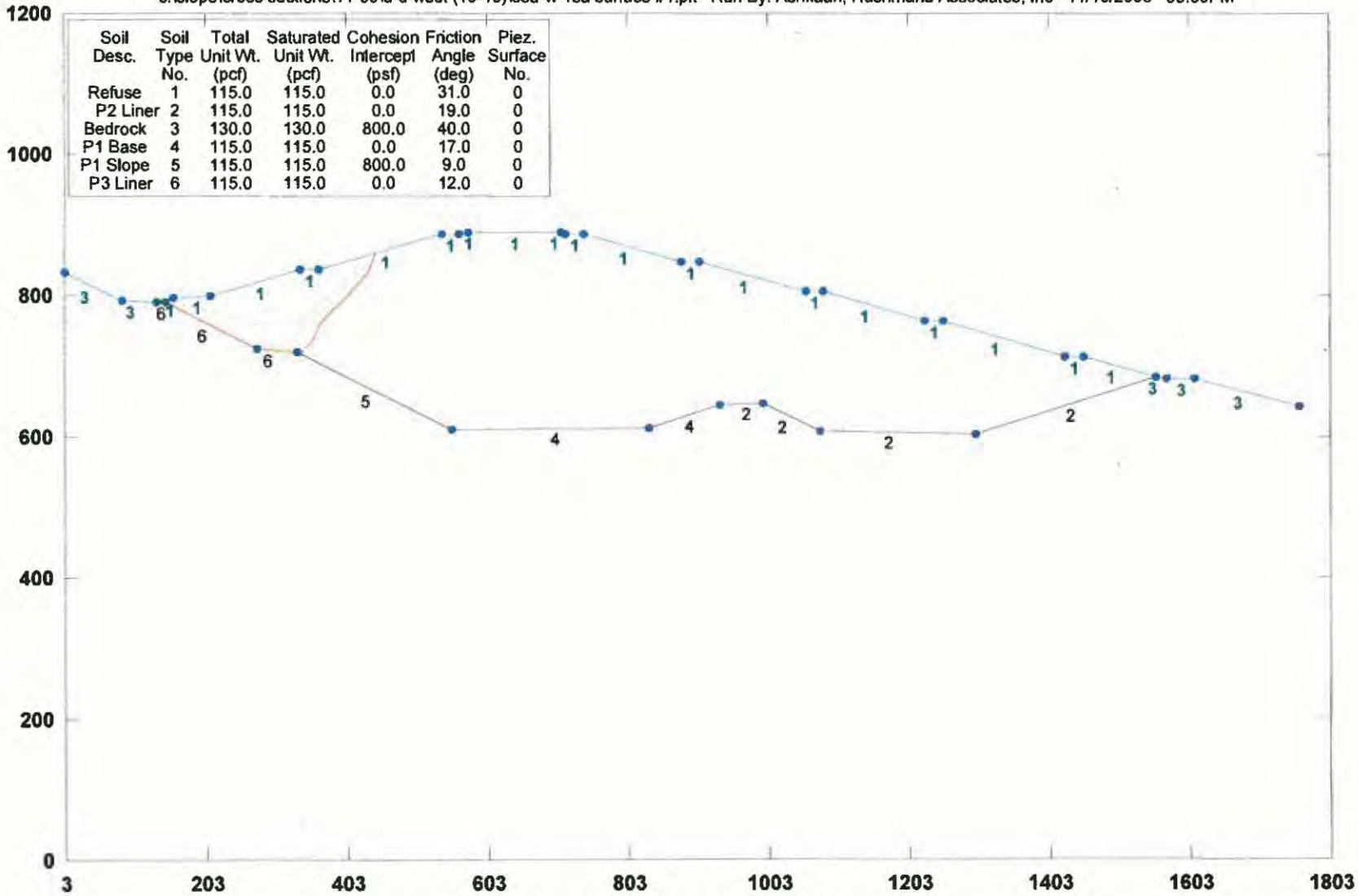
Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SEC. D-D',WEST, STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\d-d west (10-16)\sed-w-1sa surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:09PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0



GSTABL7 v.2 FSmin=3.733

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

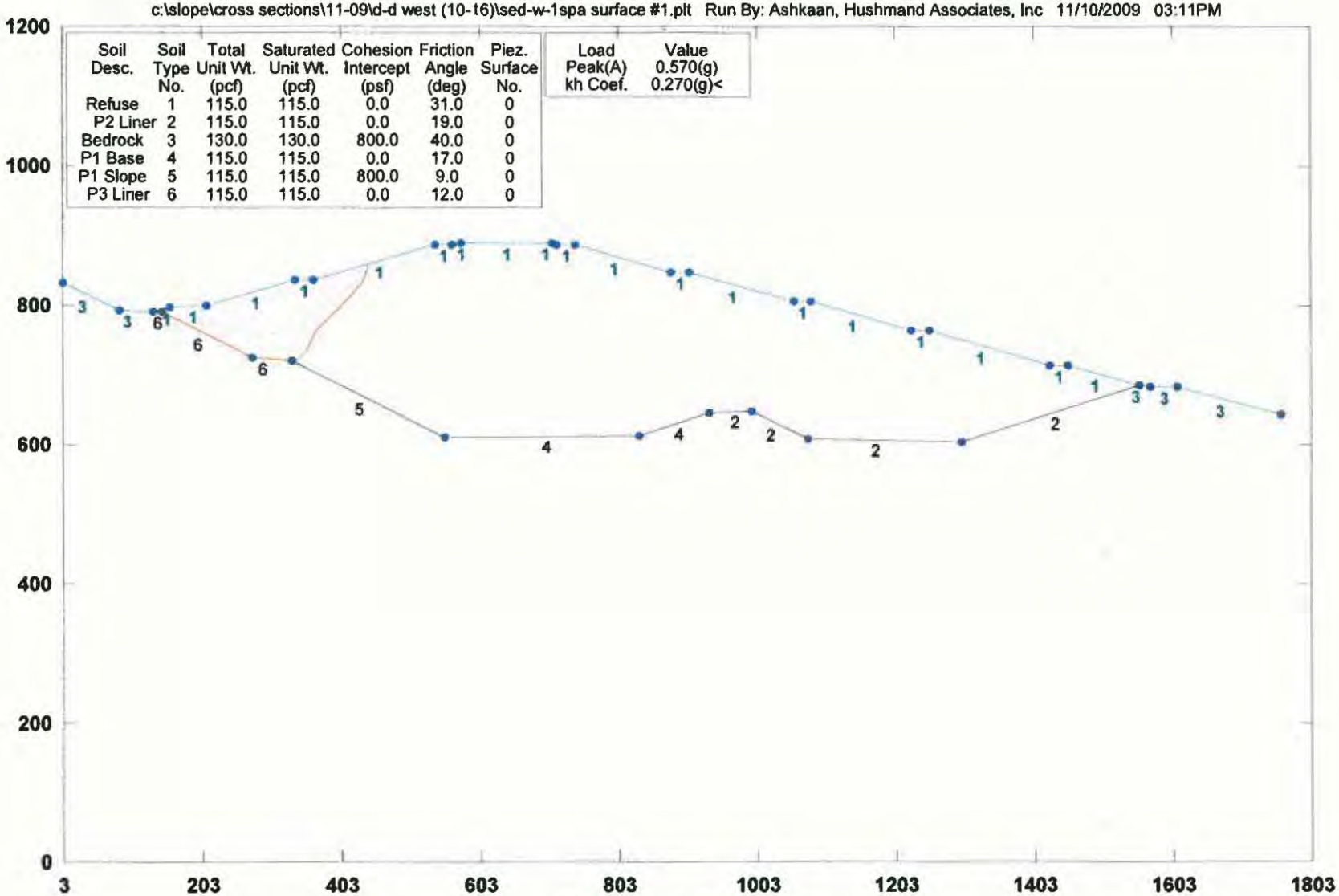
GSTABL7

KHF, SEC. D-D',WEST, PSEUDO-STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\d-d west (10-16)\sed-w-1spa surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:11PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.270(g)<



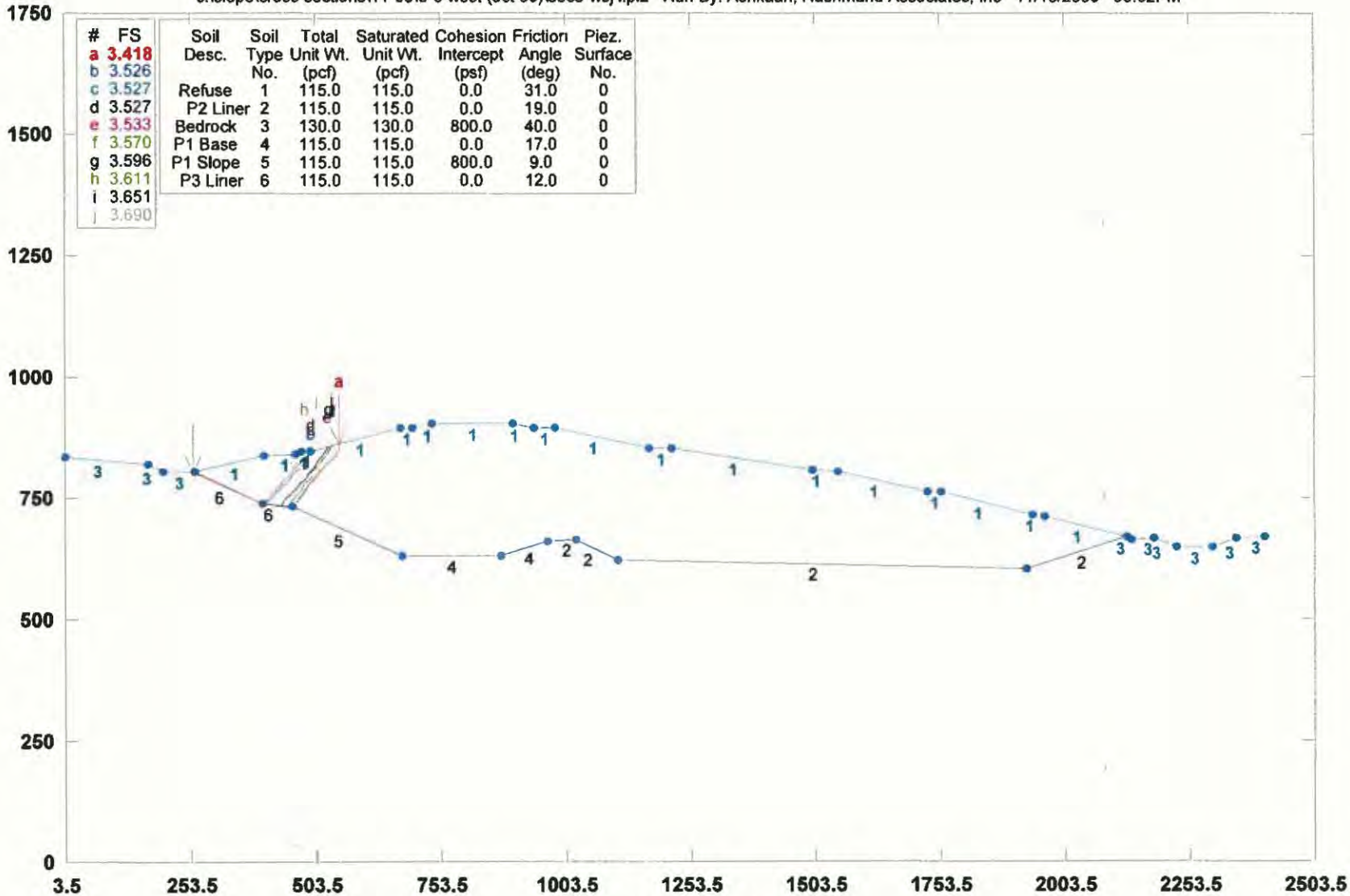
GSTABL7 v.2 FSmin=1.021

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SECTION E-E' WEST, STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\e-e west (oct 09)\sece-wsj i.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 06:02PM



#	FS
a	3.418
b	3.526
c	3.527
d	3.527
e	3.533
f	3.570
g	3.596
h	3.611
i	3.651
j	3.690

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=3.418

Safety Factors Are Calculated By The Simplified Janbu Method

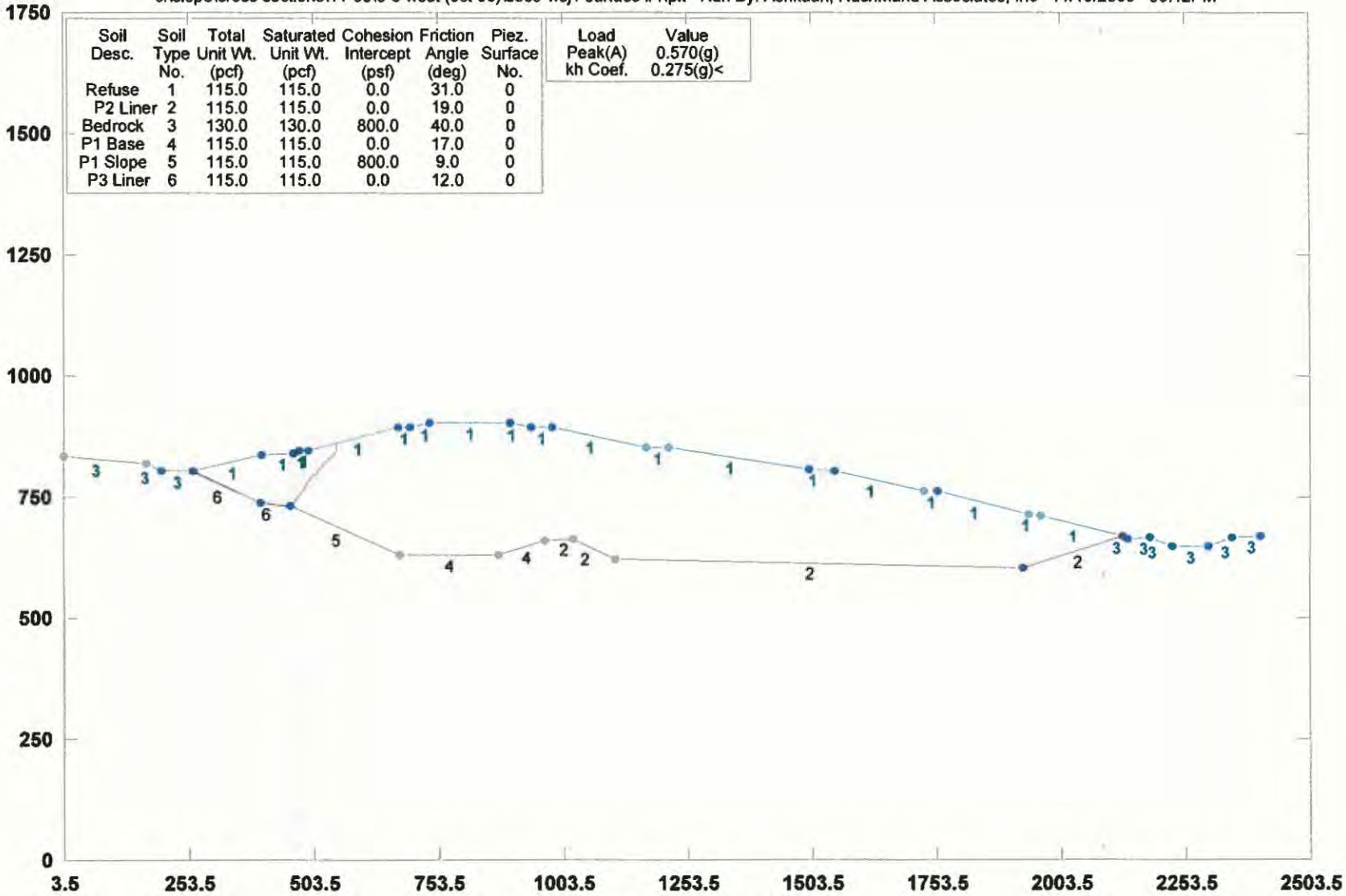
GSTABL7

KHF, SECTION E-E' WEST, PSEUDO-STATIC, FAILURE PLANE I (REVISED)

c:\slope\cross sections\11-09\e-e west (oct 09)\sece-wsj1 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 06:12PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.275(g)<



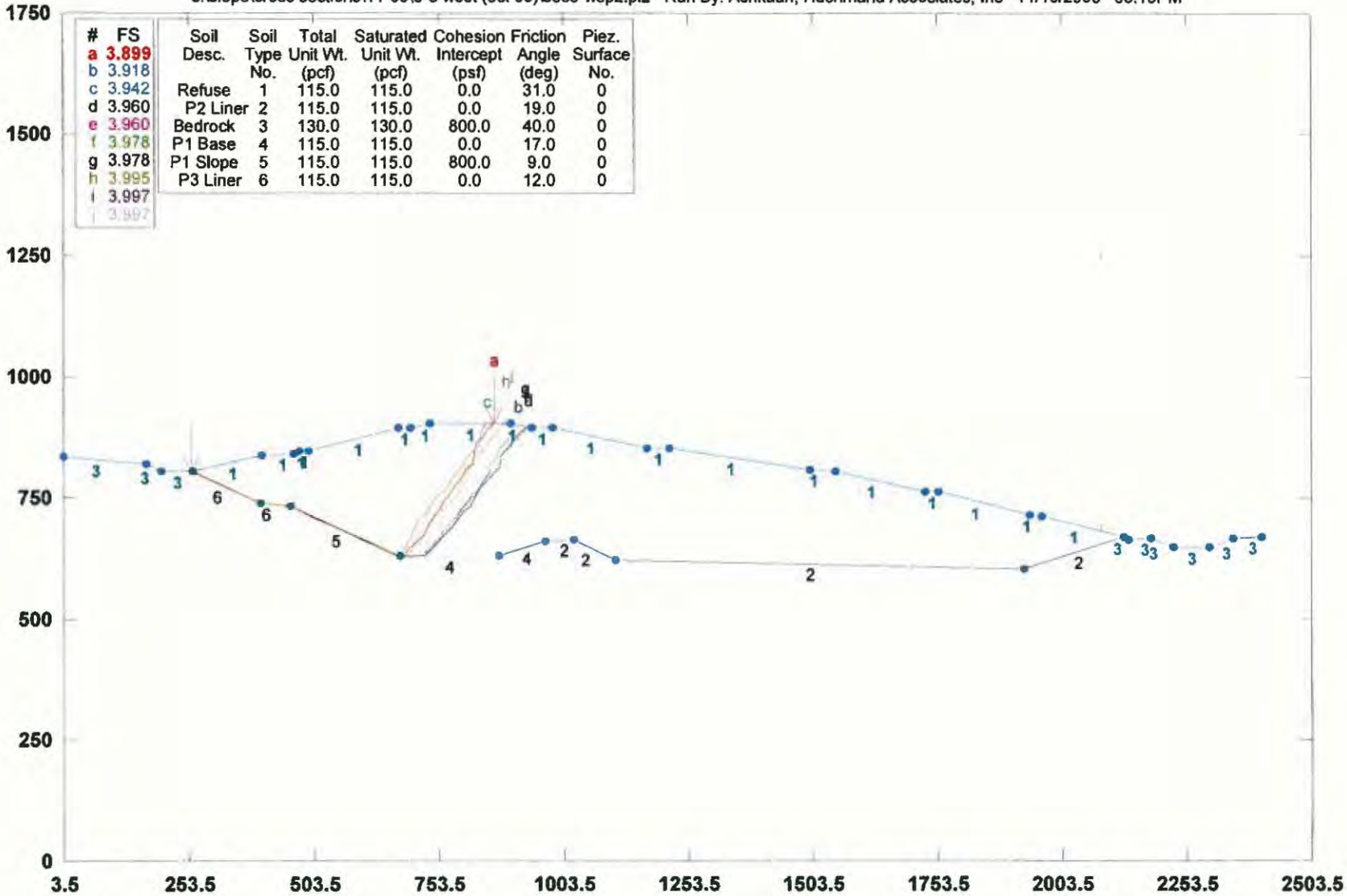
GSTABL7 v.2 FSmin=1.033

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION E-E', WEST, STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\e-e west (oct 09)\sece-wsp2.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 06:15PM



#	FS
a	3.899
b	3.918
c	3.942
d	3.960
e	3.960
f	3.978
g	3.978
h	3.995
i	3.997
j	3.997

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=3.899

Safety Factors Are Calculated By The Simplified Janbu Method

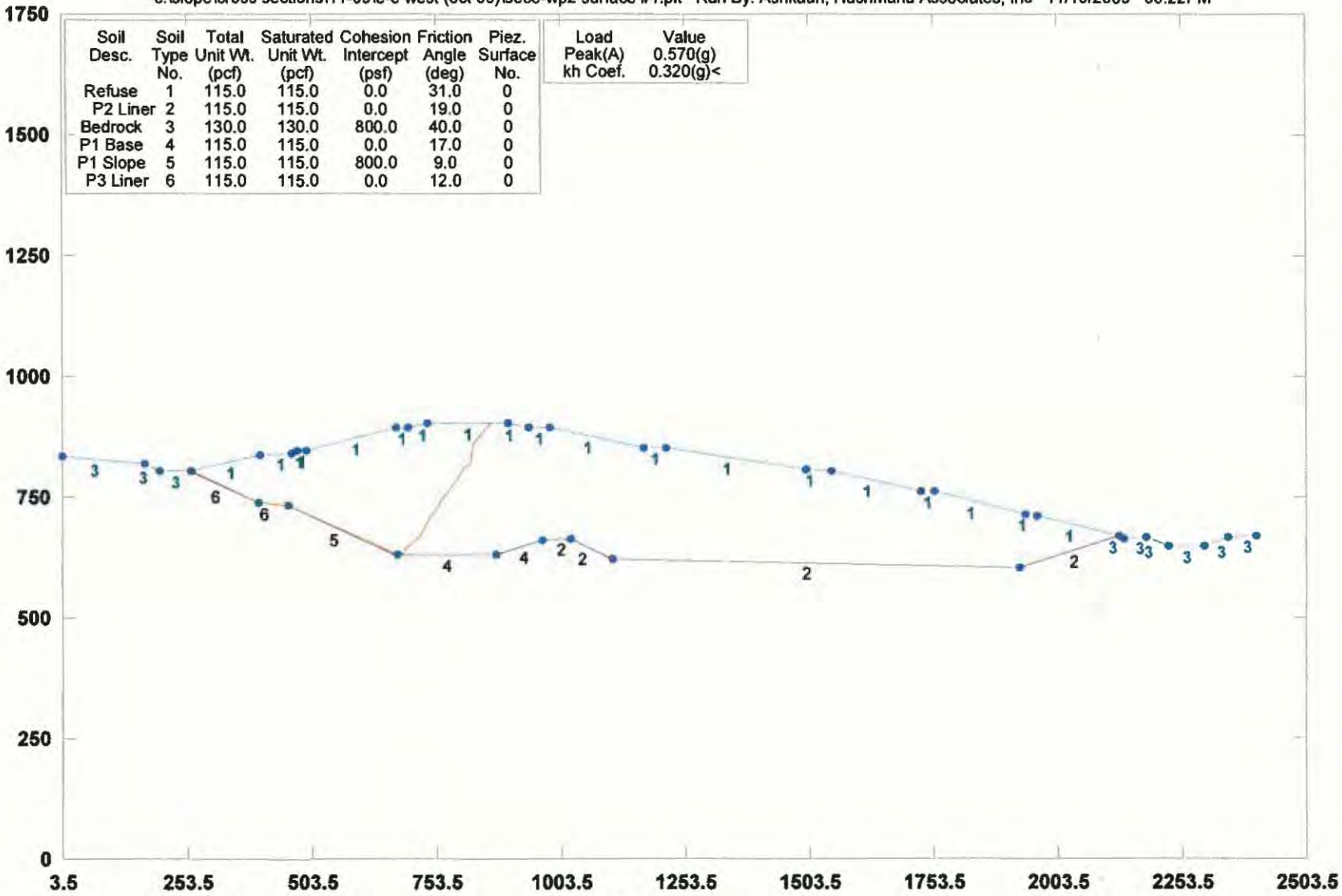
GSTABL7

KHF, SECTION E-E', WEST, PSEUDO-STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\e-e west (oct 09)\sece-wp2 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 06:22PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.320(g)<



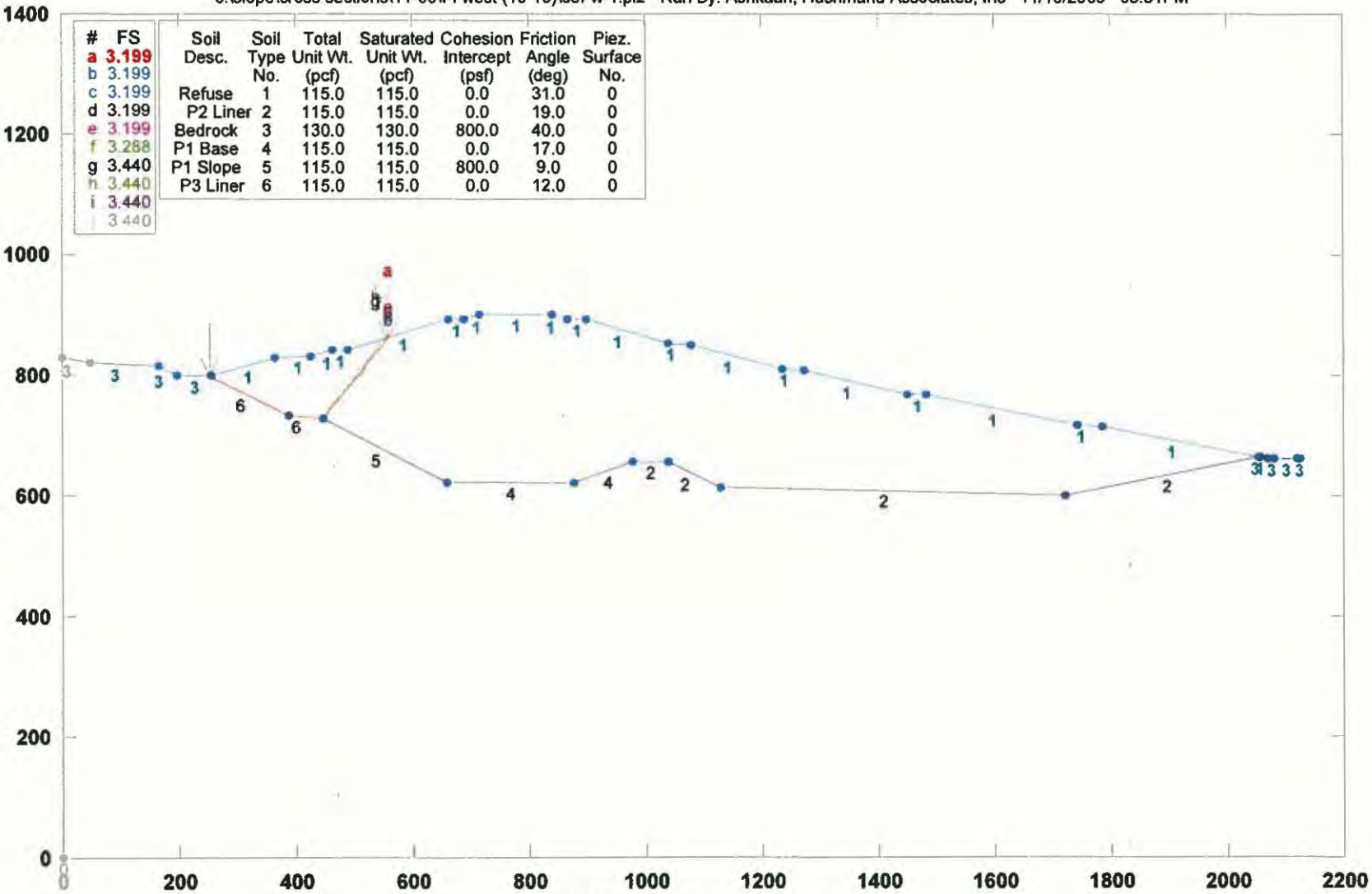
GSTABL7 v.2 FSmin=1.021

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\f-f west (10-19)\sef-w-1.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:31PM



#	FS
a	3.199
b	3.199
c	3.199
d	3.199
e	3.199
f	3.288
g	3.440
h	3.440
i	3.440
j	3.440

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

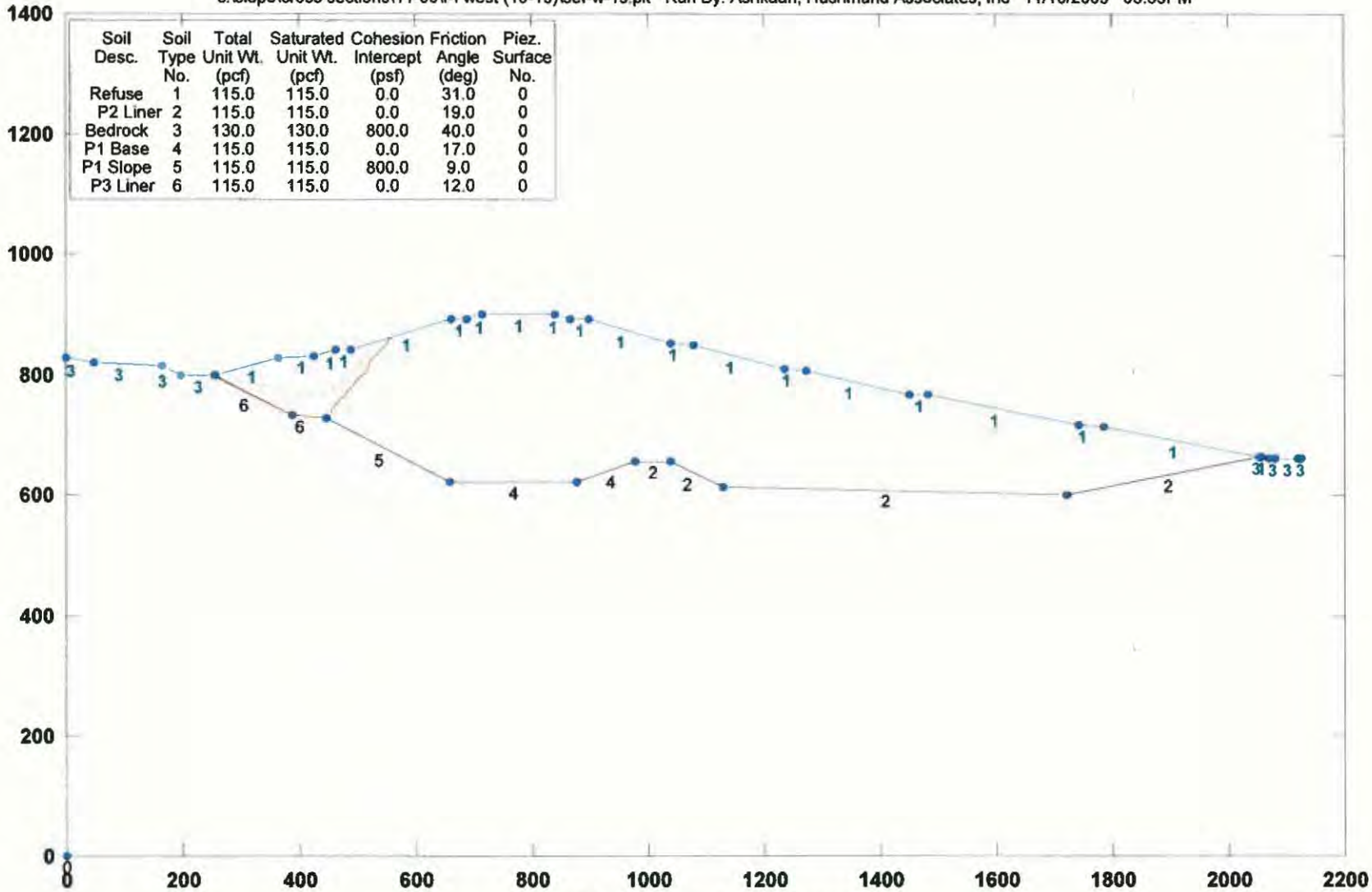
GSTABL7 v.2 FSmin=3.199

Safety Factors Are Calculated By The Simplified Janbu Method

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\f-f west (10-19)\sef-w-1s.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:35PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=4.398

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

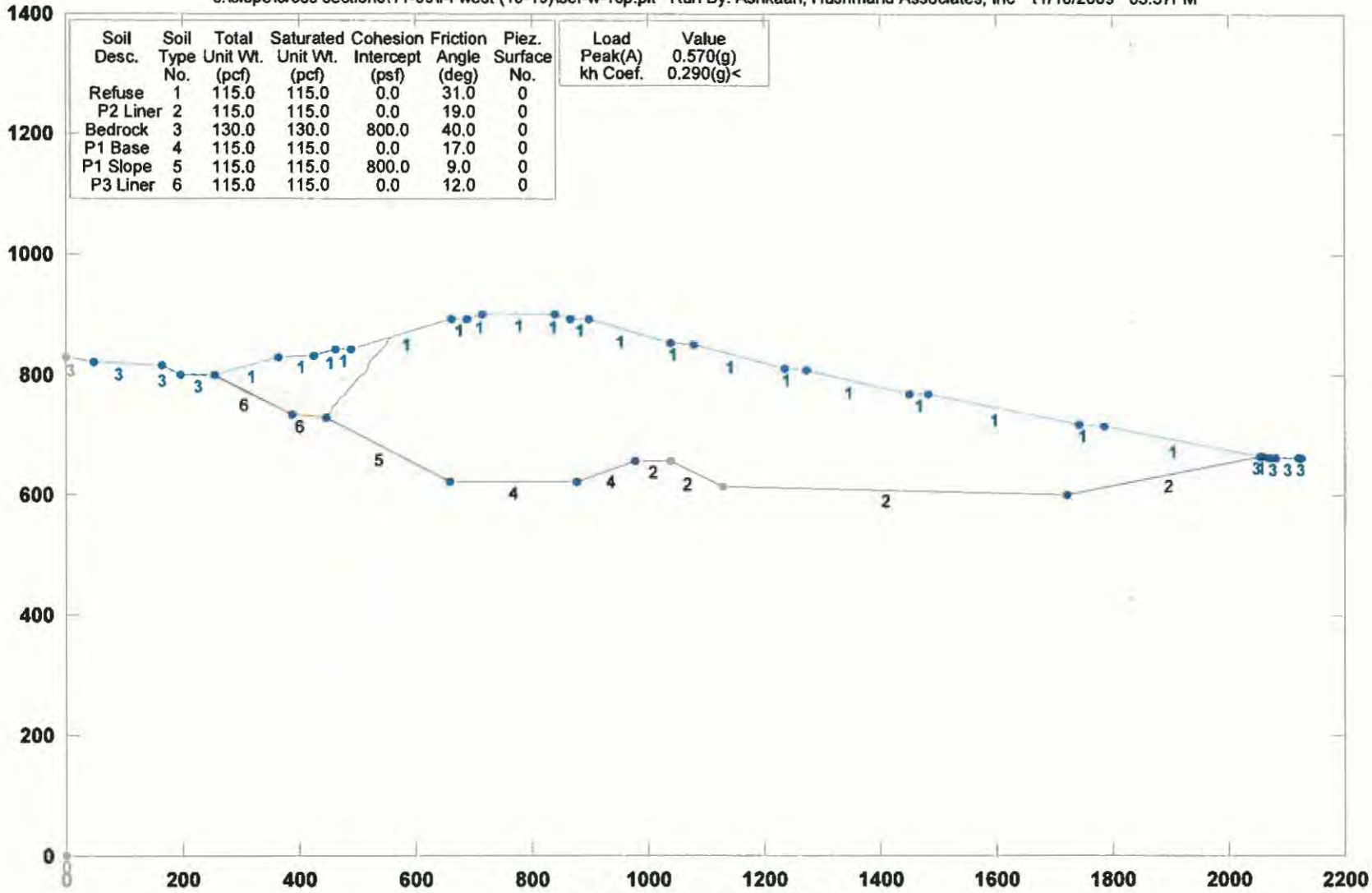
GSTABL7

KHF, SECTION F-F', WEST,PSEUDO-STATIC, FAILURE PLANE II (REVISED)

c:\slope\cross sections\11-09\f-f west (10-19)\sef-w-1sp.plt Run By: Ashkaan, Hushmand Associates, Inc t1/10/2009 03:37PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.290(g)<



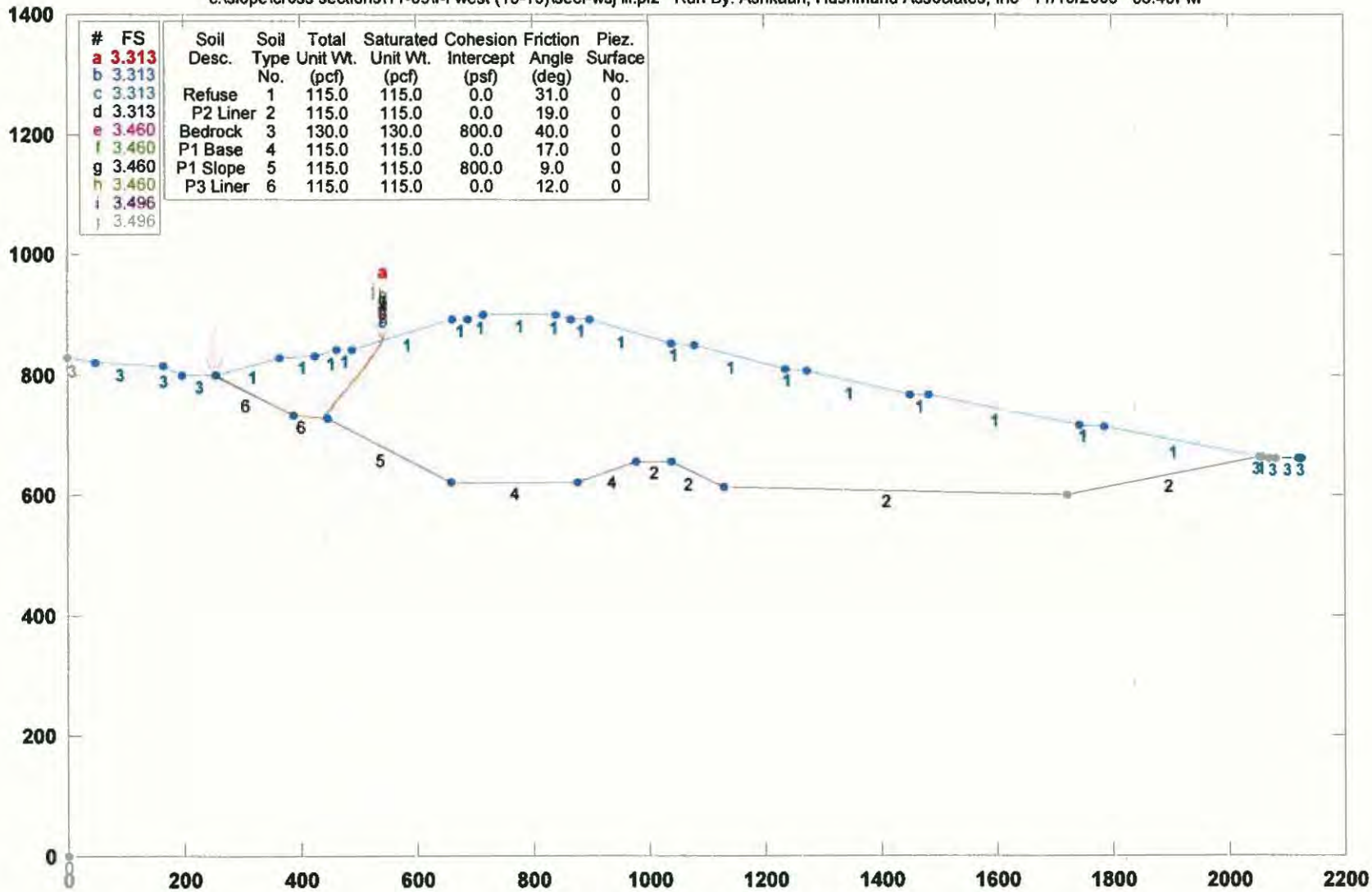
GSTABL7 v.2 FSmin=1.010

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

GSTABL7

KHF, SECTION F-F', WEST, STATIC, FAILURE PLANE III (REVISED)

c:\slope\cross sections\11-09\f-f west (10-19)\secf-wsj iii.pl2 Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:40PM



#	FS
a	3.313
b	3.313
c	3.313
d	3.313
e	3.460
f	3.460
g	3.460
h	3.460
i	3.496
j	3.496

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

GSTABL7 v.2 FSmin=3.313

Safety Factors Are Calculated By The Simplified Janbu Method

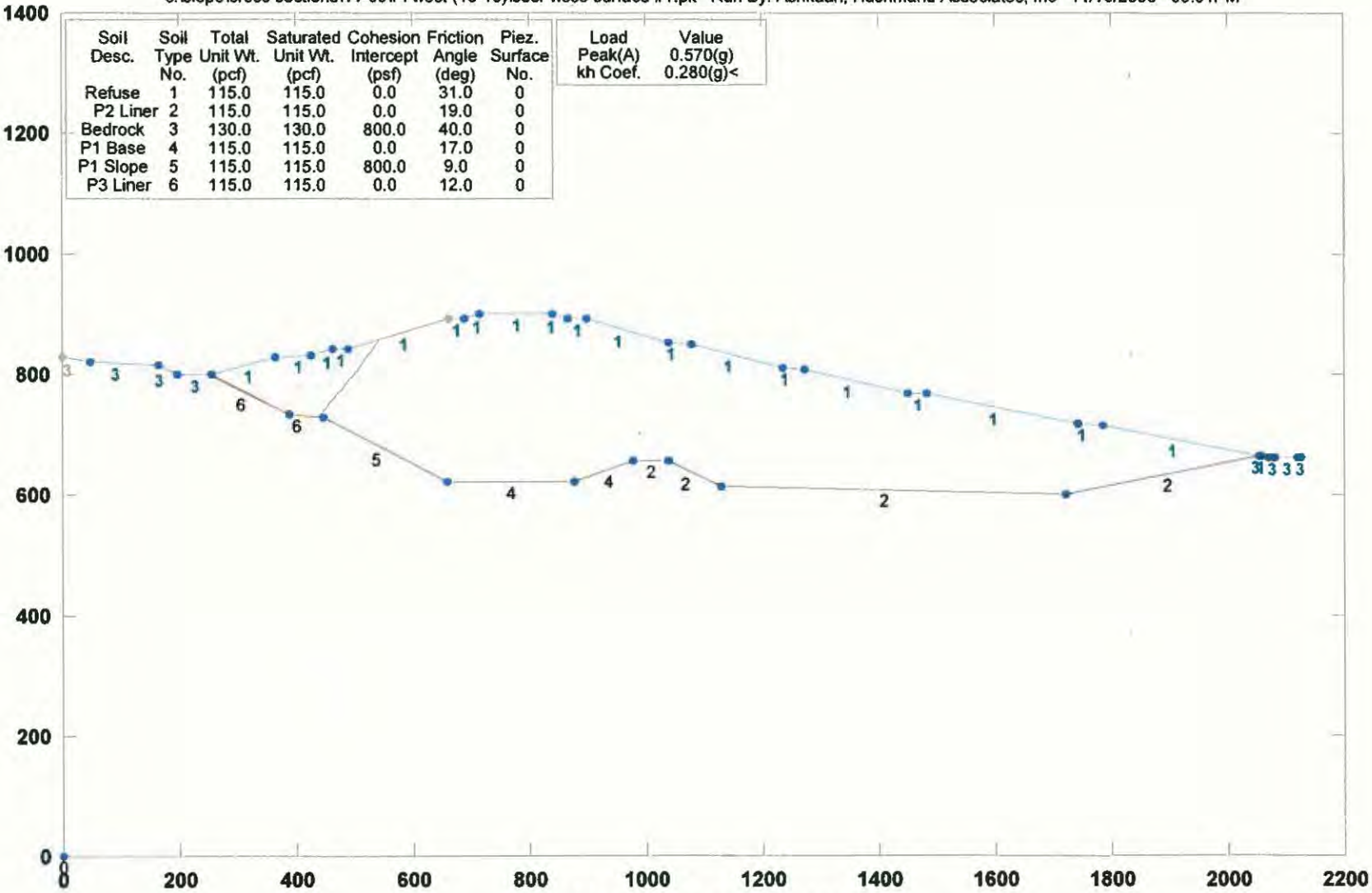
GSTABL7

KHF, SECTION F-F', WEST,PSEUDO-STATIC, FAILURE PLANE III (REVISED)

c:\slope\cross sections\11-09\f-f west (10-19)\secf-wss3 surface #1.plt Run By: Ashkaan, Hushmand Associates, Inc 11/10/2009 03:51PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Refuse	1	115.0	115.0	0.0	31.0	0
P2 Liner	2	115.0	115.0	0.0	19.0	0
Bedrock	3	130.0	130.0	800.0	40.0	0
P1 Base	4	115.0	115.0	0.0	17.0	0
P1 Slope	5	115.0	115.0	800.0	9.0	0
P3 Liner	6	115.0	115.0	0.0	12.0	0

Load	Value
Peak(A)	0.570(g)
kh Coef.	0.280(g)<



GSTABL7 v.2 FSmin=1.018

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7