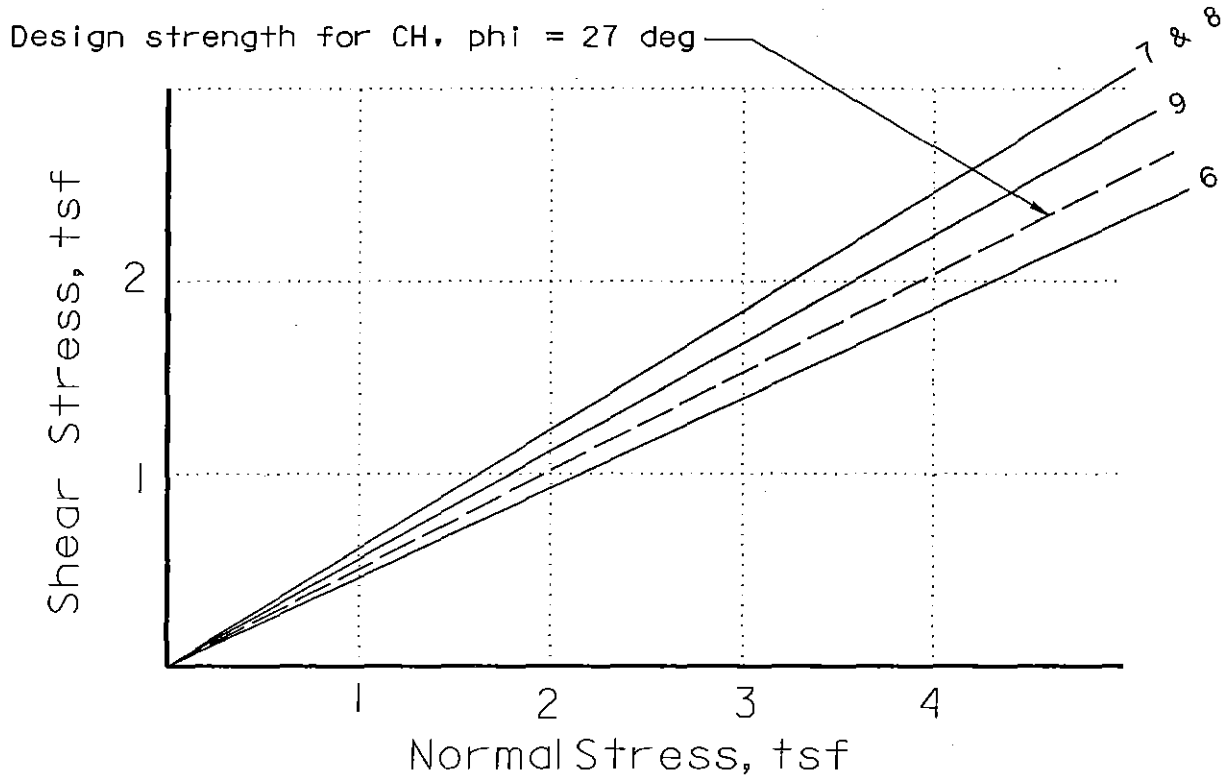
NECHES RIVER AND TRIBUTARIES, TEXAS
NECHES RIVER SALTWATER BARRIER
SUMMARY OF UNDRAINED COMPRESSION TEST DATA

	Boring Number	Sample Elev NGVD	MC	UDW pcf	LL	PL	Gradation Gr	Gradation Sa	Gradation Fines	Shear Strength Su (psf)	Test Type	Classification
Medium	97-34	-9.1	34.4	87.7	62	24	0	1	99	620	UC	CH, w/ organic material, Medium, Gray
	97-36	-4.3	31	90	63	19	0	10	90	740	Q	CH, medium to stiff, brownish gray
Stiff	97-30	0.4	27.7	95.5	61	25	0	4	96	1290	UC	CH, w/ ferrous nodules, Stiff, Gray
	97-31	-5.7	40.5	80.3	82	30				1220	UC	CH, w/ ferrous nodules & sand seams, Stiff, Gray
	97-31	2.3	26.5	93.6	63	24	0	1	99	1320	UC	CH, w/ ferrous nodules & roots, Stiff, Gray
	97-32	-0.2	23.6	100.8	46	20	2	28	70	1270	UC	CL, w/ ferrous nodules & sand seams, Stiff, Gray & Yellowish Gray
	97-33	-6.1	27.3	98.2	36	18	0	4	96	1280	UC	CL, w/ sand pockets & sand seams, Stiff, Gray
	97-33	-0.1	29	94.7	54	22	0	2	98	1050	UC	CH, w/ferrous stains, Stiff, Yellowish Brown
	97-34	-3.1	32.1	88.8	73	26	0	2	98	1210	UC	CH, w/ organic material. Stiff, Yellowish Brown
	97-35	-0.1	21.7	102.6	55	23	0	4	96	1270	UC	CH, w/ fer nod & sand sms, Stiff, Yellowish Brown
	97-36	-6.3	29	92.6	68	27	0	1	99	1110	UC	CH, w/ Organic Material, Stiff, Brown
Very Stiff	97-32	-20.2	20.7	104.7	57	24	0	1	99	2300	UC	CL, w/ silt partings & silt pockets, Very Stiff, Yellowish Brown & Gray
	97-33	-54.1	24.3	100.9	54	23	0	2	98	2380	UC	CH, w/ Calc nodules & fer stains, slickensided, Very Stiff, Red Brown
	97-33	-40.1	22.4	104.7	33	17	0	2	98	2230	UC	CL, w/ silt & red clay layer, Very Stiff, Reddish Brown
	97-34	-66.1	25.1	102.1	54	23	0	1	99	2530	UC	CH, w/ fer stains & silt Seams, Slickensided, Very Stiff, Reddish Brown
	97-34	-30.1	23.3	99	61	19	0	13	87	1880	Q	CH, Very stiff, very fine sand pockets throughout, yellowish brown & gray
	97-34	-24.1	18.4	112.8	43	20	0	13	87	2140	UC	CL, W/ Fer St, Sand Sms, & Snd Poc, Very Stiff, Gray & Yellow Gray
	97-36	-27.3	16	115	26	13	0	35	65	1270	Q	CL, Gray with black iron staining, very stiff, sand is very fine
Hard	97-33	-30.1	20.9	106	59	17	0	4	96	3940	Q	CH, Few scattered calc nod, hard, gray and reddish brown
	97-34	-38.1	18.1	113.1	33	17	0	15	85	3080	UC	CL, w/ Sand Seams, Very Stiff, Gray & Yellowish Gray
	97-35	-29.1	17.9	111.8	56	22	0	4	96	4630	UC	CH, w/ fer stains & Sand Seams, Hard, Brown & Gray

Legend
UC - Unconfined Compression Test
Q - "Q-Test", Confined Undrained Compression

Figure 2-9

Adjusted Direct Shear Tests
CH Material



BORING #	DESCRIPTION	Sample Elev.[1]	Mc	UDW pcf	LL	PL	Gradation Gr	Gradation Sa	Gradation Fines	Shear Data From Direct Shear Test Phi	Shear Data From Direct Shear Test c, psf	Adjusted Phi[2]
97-31	(6) CI (CH), w/Sd, Gr&BrGr, St	-10	38	85	65	19	0	15	85	21.0	320	24.9
97-33	(7) CI (CH), Gr&Br, vSt, Calc Poc	-32	24	100	69	19	0	8	92	25.0	540	31.6
97-33	(8) CI (CH), Br, vSt	-46	30	92	84	25	0	1	99	17.5	1100	31.6
97-34	(9) CI (CH), w/Sd, YBr, Med, SdPoc	-32	20	101	50	14	0	20	80	15.7	1020	29.2

[1]Elevation of Sample is Feet, NGVD '29 Adj.

[2]Adjusted phi is corrected to c = 0 and normal stress at 2 TSF.

NECHES RIVER AND TRIBUTARIES, TEXAS

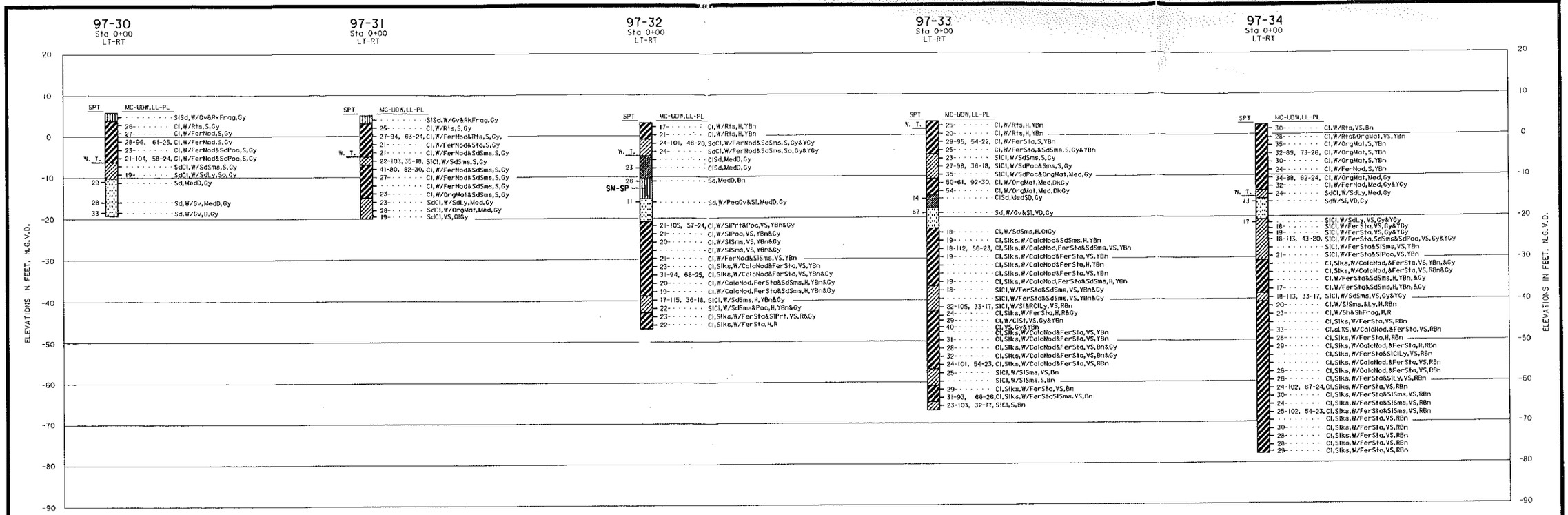
ADJUSTED DIRECT SHEAR TESTS
CH MATERIAL

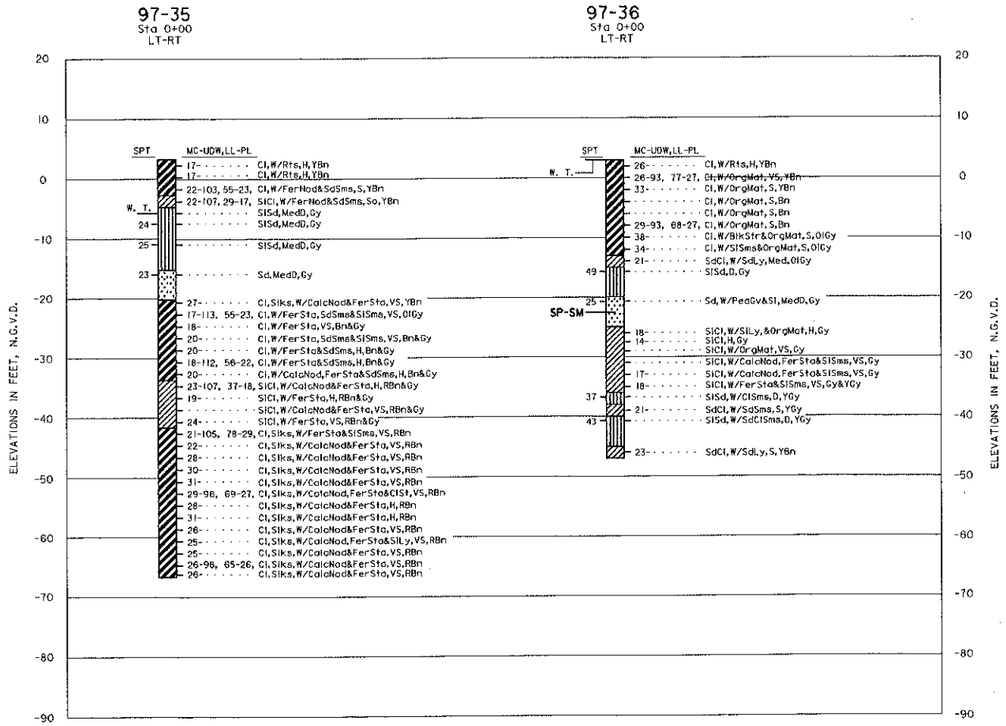
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY GENERAL
REEVALUATION REPORT
DATED: DEC 1997

FILE NO. GRAPH.DGN

FIGURE 2-11





NOTES;

1. SOILS HAVE BEEN CLASSIFIED IN ACCORDANCE WITH ASTM 2487-93 "CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES, ("UNIFIED SOILS CLASSIFICATION SYSTEM)". CONSISTENCY OF SOILS SUCH AS SOFT, MEDIUM, HARD, LOOSE, DENSE, ETC., ARE RELATIVE TERMS BASED ON ESTIMATED UNDISTURBED SHEAR STRENGTH OF THE MATERIAL AS DETERMINED BY VISUAL CLASSIFICATION, POCKET PENETROMETER TESTS, AND PENETRATION RESISTANCE DURING SAMPLING.
2. FIGURES TO THE RIGHT OF BORING LOGS ARE WATER CONTENTS IN PERCENT OF THE DRY WEIGHT, DRY DENSITY, LIQUID LIMIT, AND PLASTIC LIMIT. (MC-UDW), (LL-PL). FIGURES TO THE LEFT OF BORING LOGS ARE BLOWS PER FOOT OF PENETRATION FROM STANDARD PENETRATION TESTING.
3. BORINGS WERE DRILLED USING WET ROTARY DRILLING TECHNIQUES AND UNDISTURBED SAMPLES WERE RECOVERED WITH A 3-INCH DIAMETER THIN WALL SAMPLER WHERE COHESIVE MATERIALS WERE ENCOUNTERED. WHERE COHESIONLESS MATERIALS WERE ENCOUNTERED, DISTURBED SAMPLES WERE TAKEN WITH A SPLIT SPOON SAMPLER DURING PERFORMANCE OF STANDARD PENETRATION TESTING.
4. WATER TABLE LEVELS SHOWN ON BORING LOGS WERE DETERMINED AFTER DRILLING BORINGS BY MEASURING THE TOP OF FLUID LEVELS IN THE BORINGS. INASMUCH AS WET ROTARY DRILLING TECHNIQUES AND DRILLING MUD WERE USED TO DRILL THE HOLES, THE LEVEL OF DRILLING FLUIDS IN THE BORE HOLES MAY NOT HAVE STABILIZED TO THE LEVEL OF THE ACTUAL WATER TABLE. ADDITIONALLY, WATER TABLES IN THE FIELD ARE LIKELY TO FLUCTUATE DEPENDING ON WEATHER CONDITIONS. THEREFORE, SOME VARIATION SHOULD BE ANTICIPATED BETWEEN WATER TABLES INDICATED AND WATER TABLES ENCOUNTERED IN THE FIELD.

LABORATORY CLASSIFICATIONS:

- CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
- CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
- SC CLAYEY SANDS, SAND-CLAY MIXTURES.
- SM SILTY SANDS, SAND-SILT MIXTURES.
- SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

VISUAL CLASSIFICATIONS:

Blk Blackey	Gy Gray(ish)	Pea Pea	Slks Slicken Sides
Brn Brown(ish)	H Hard	Poc Pocket(s)	Sms Seams
Calc Calcareous	Ly Layer(s)	R Redd(ish)	So Soft
Cl Clay(ey)	Med Medium	Rk Rock(s)	St Stone(s)
D Dense	Mot Mottled	Rts Root(s)	V Very
Dk Dark	Nod Nodules	S Stiff	W With
Fer Ferrous	Org Organic	Sd Sand(y)	Y Yellow(ish)
Frag Fragment(s)	Ol Olive	Sh Shell(y)	
Gv Gravel(ly)	Prt Particle(s)	Si Silty	

REVISION	DATE	DESCRIPTION	BY

OFFICE OF THE DISTRICT ENGINEER
U.S. ARMY ENGINEER DISTRICT, GALVESTON
CORPS OF ENGINEERS
GALVESTON, TEXAS

DRAWN BY: P. N.
DESIGNED BY: P. N.
CHECKED BY: I. B.
SUBMITTED BY:
CHIEF
APPROVED:
CHIEF

NECHES RIVER AND TERMINALS, TEXAS
NECHES RIVER SALT WATER BARRIER

LOGS OF BORINGS
X

APPROVED: DATE: X
CHIEF, ENGINEERING DIVISION
(# AS REQUIRED BY ENGINEER CIRCULAR NO. 1110-1-8152)
SCALE: AS SHOWN SPEC. DATE:
DRAWING NUMBER X
SHEET 1 OF X FILE NO. X

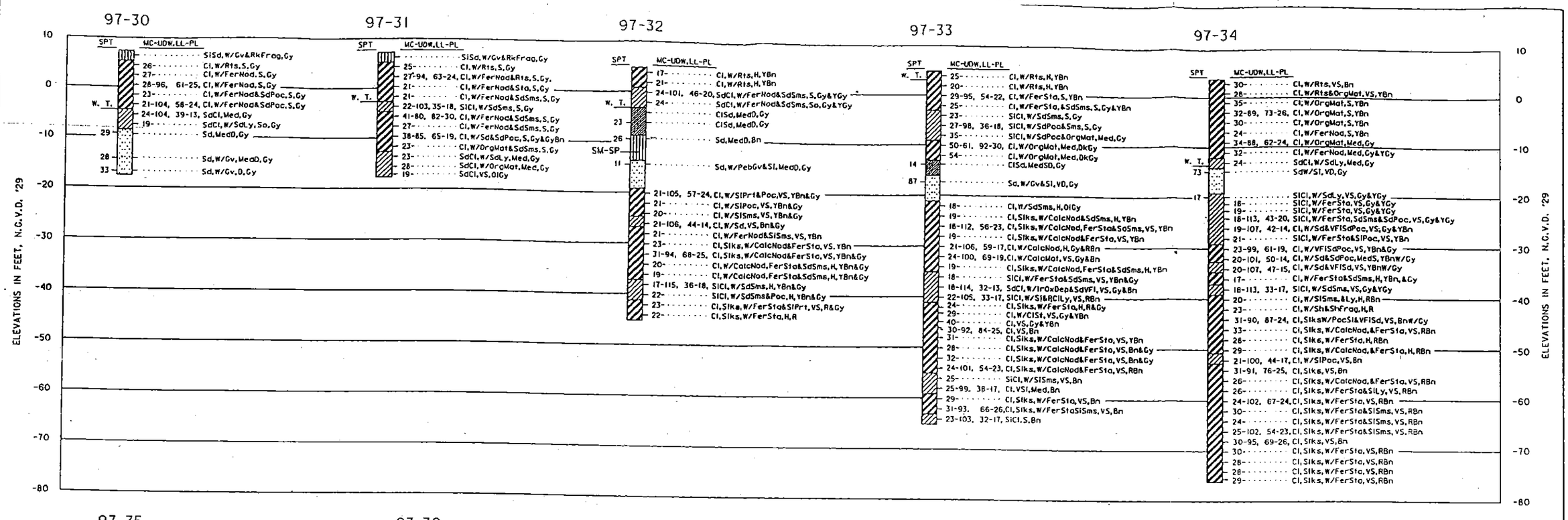
Prepared under the direction of
Erle R. Potts, Col., C.E.,
District Engineer

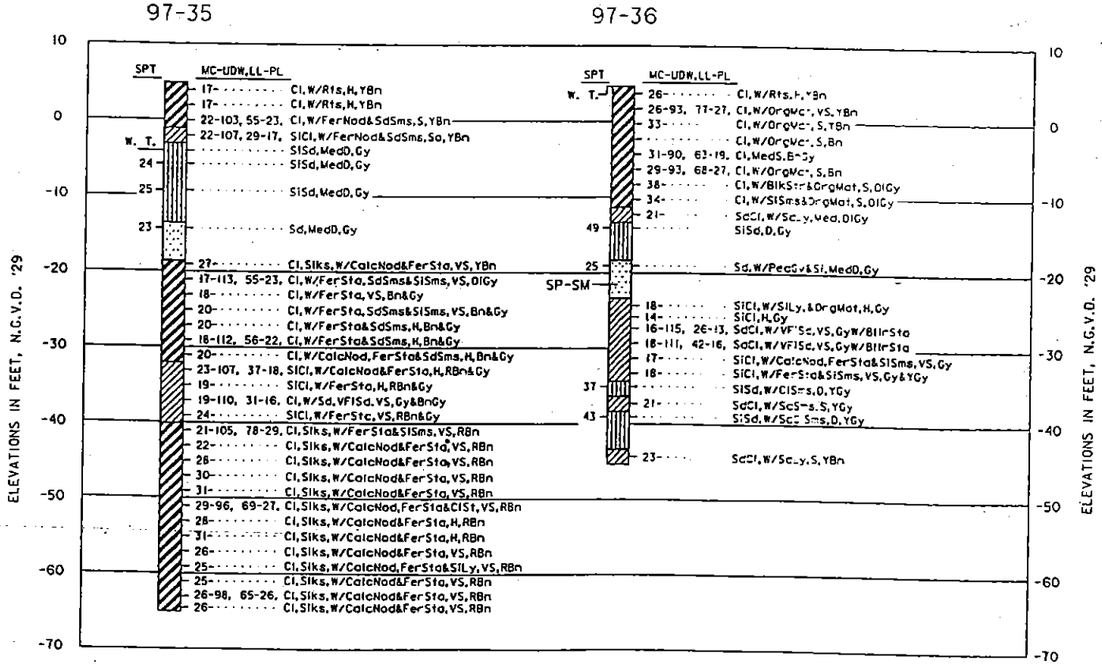
EXHIBIT A-1

DESIGN FILE SPECIFICATION
CREATED BY:
ON
AT:

SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS
NECHES RIVER SALT WATER BARRIER
BEAUMONT, TEXAS
TABLE-

BORING NO.	DEPTH (FT.)	DENSITY DATA Moisture Cont. %	DENSITY DATA Dry Wt (pcf)	MECHANICAL ANALYSIS Gvl.	MECHANICAL ANALYSIS Sand	MECHANICAL ANALYSIS Fine	ATTERBURG LIMITS L.L.	ATTERBURG LIMITS P.L.	% STRAIN @ MAX. STRESS	UNCON. COMP. STR (pcf)	CLASSIFICATION
97-30	6 - 8	27.7	95.5	0	4	96.0	61.0	25.0	3.6	1290	Clay, W / ferrous nodules, Stiff, Gray
97-31	4 - 6	26.5	93.6	0	2	98.0	63.0	24.0	5	1320	Clay, W / ferrous nodules, Stiff, Gray
97-31	12-14	23.6	80.3	-	-	-	82.0	30.0	5.4	1220	Clay, W / ferrous nodules & sand seams, Stiff, Gray
97-32	4 - 6	20.7	100.8	0	30	70.0	46.0	20.0	3.4	1227	Sandy Clay, W / ferrous nodules & sand seams, Stiff, Gray & yellowish gray
97-32	24-26	20.7	104.7	0	1	99.0	57.0	24.0	4.3	2300	Clay, W / Silt parting & silt pockets, Very stiff, Yellowish brown & gray
97-33	4 - 6	29.0	94.7	0	2	98.0	54.0	22.0	2.8	1050	Clay, W / ferrous stains, Stiff, Yellowish brown
97-33	10-12	27.3	98.2	0	4	96.0	36.0	18.0	4	1280	Silty Clay, W / sand pockets & sand seams, Stiff, Gray
97-33	44-46	22.4	104.7	0	2	98.0	33.0	104.7	3.7	2230	Silty Clay, W / silt & red clay layer, Very stiff, Reddish brown
97-33	58-60	24.3	100.9	0	2	98.0	54.0	23.0	2	2380	Clay, W / calc nod & fer stains, Slickensided, Very stiff, Reddish brown
97-34	6 - 8	32.1	88.8	0	2	98.0	73.0	26.0	4	1210	Clay, W / organic material, Stiff, Yellowish brown
97-34	12-14	34.4	87.7	0	1	99.0	62.0	24.0	2.3	620	Clay, W / organic material, Medium Stiff, Gray
97-34	27-29	18.4	112.8	0	13	87.0	43.0	20.0	6	2140	Silty Clay, W / ferrous stains, sand seams,and sand pockets, Very stiff, Gray & yellowish gray
97-34	41-43	18.1	113.1	0	15	85.0	33.0	17.0	3.4	3080	Silty Clay, W / sand seams, Very stiff, Gray & yellowish gray
97-34	69-71	25.1	102.1	0	1	99.0	54.0	23.0	3.2	2530	Clay, W / ferrous stains & silt seams, Slickensided Very stiff, Reddish brown
97-35	4 - 6	21.7	102.6	0	4	96.0	55.6	102.0	3.6	1270	Clay, W / ferrous nodules & sand seams, Stiff, Yellowish brown
97-35	33-35	17.9	111.8	0	4	96.0	56.0	22.0	3	4630	Clay, W / ferrous stains & sand seams, Hard, Brown & Gray
97-36	10-12	29.0	92.6	0	1	99.0	86.0	27.0	2.9	1110	Clay, W / organic material, Stiff, Brown





NOTES:

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VISUAL CLASSIFICATIONS:

Bl Black	Gv Gravel(ly)	Ox Oxide	Si Silty
Blk Blackey	Gy Gray(ish)	Pea Pea Gravel	Slks Slicken Sides
Bn Brown(ish)	H Hard	Peb Pebble(s)	St Shale
Calc Calcareous	Ir Iron	Prt Particle(s)	Sms Seams
Cl Clay(ey)	Ly Layer(s)	Poc Pocket(s)	So Soft
D Dense	Mat Material	R Red(dish)	Sta Stain(s)
Dep Deposit(s)	Med Medium	Rk Rock(s)	St Stone(s)
Dk Dark	Mot Mottled	Rts Root(s)	Str Structure
Fer Ferrous	Nod Nodules	S Stiff	V Very
Fi Fine(s)	Org Organic	Sd Sand(y)	W/ With
Frag Fragment(s)	Ol Olive	Sh Shell(y)	Y Yellow(ish)

LABORATORY CLASSIFICATIONS:

- CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
- CL INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, LEAN CLAYS.
- SC CLAYEY SANDS, SAND-CLAY MIXTURES.
- SM SILTY SANDS, SAND-SILT MIXTURES.
- SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.

NECHES RIVER AND TRIBUTARIES, TEXAS
NECHES RIVER SALTWATER BARRIER

LOGS OF BORINGS

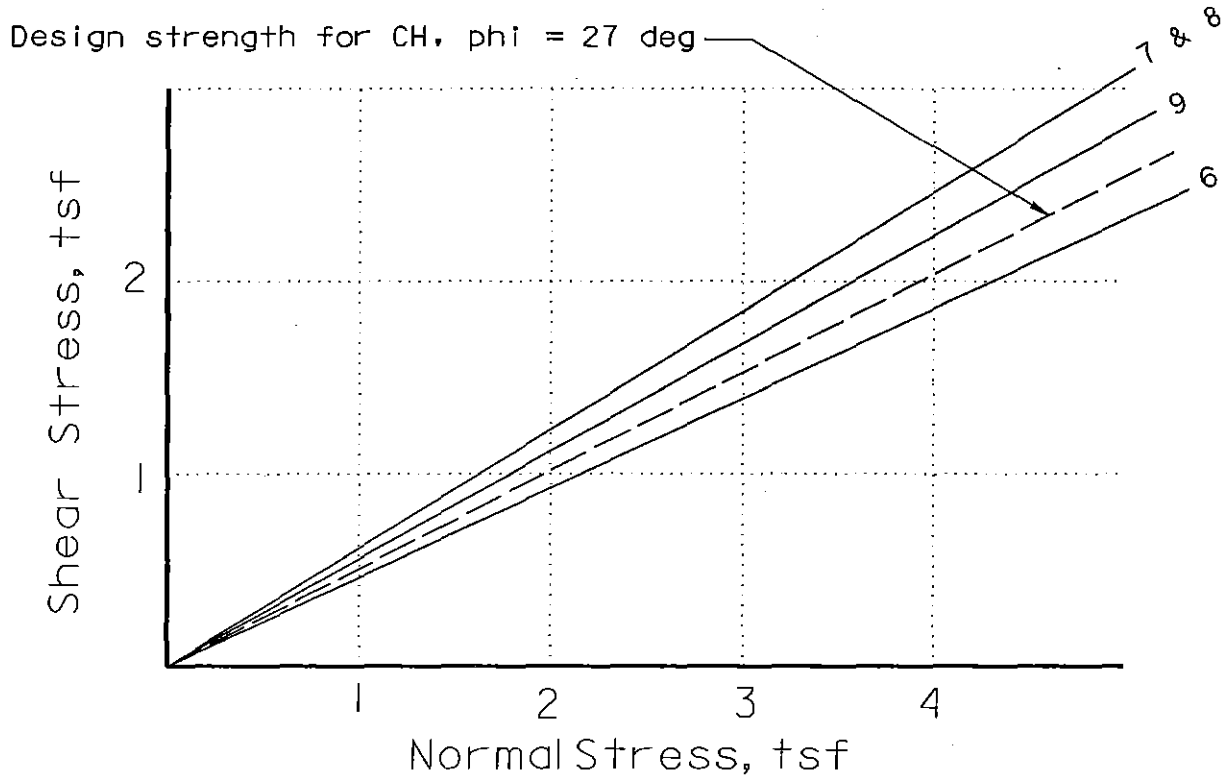
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY GENERAL REEVALUATION REPORT
DATED: DEC 1997

FIGURE 2-6

CADD
AT: 13:19
ON: 07-NOV-1997
CREATED BY: brekman
DESIGN FILE: BORE.DGN
o:\projects\sn\report\sn83\snnbst1.dgn

Adjusted Direct Shear Tests
CH Material



BORING #	DESCRIPTION	Sample Elev.[1]	Mc	UDW pcf	LL	PL	Gradation Gr	Gradation Sa	Gradation Fines	Shear Data From Direct Shear Test Phi	Shear Data From Direct Shear Test c, psf	Adjusted Phi[2]
97-31	(6) CI (CH), w/Sd, Gr&BrGr, St	-10	38	85	65	19	0	15	85	21.0	320	24.9
97-33	(7) CI (CH), Gr&Br, vSt, Calc Poc	-32	24	100	69	19	0	8	92	25.0	540	31.6
97-33	(8) CI (CH), Br, vSt	-46	30	92	84	25	0	1	99	17.5	1100	31.6
97-34	(9) CI (CH), w/Sd, YBr, Med, SdPoc	-32	20	101	50	14	0	20	80	15.7	1020	29.2

[1]Elevation of Sample is Feet, NGVD '29 Adj.

[2]Adjusted phi is corrected to c = 0 and normal stress at 2 TSF.

NECHES RIVER AND TRIBUTARIES, TEXAS

ADJUSTED DIRECT SHEAR TESTS
CH MATERIAL

U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY GENERAL
REEVALUATION REPORT
DATED: DEC 1997

FILE NO. GRAPH.DGN

FIGURE 2-11

Nech1

Boring No. 97-31

HEADING

Neches River Saltwater Barrier

F.S. 4.716

Navigation Channel

Slope Stability Analysis with side slope 1 on 3, End of Construct

PROFILE LINES

1 1

-40.00 5.70

1.10 5.70

7.10 3.70

2 2

-40.00 3.70

7.10 3.70

18.20 .00

31.10 -4.30

3 3

-40.00 -4.30

31.10 -4.30

37.10 -6.30

4 4

-40.00 -6.30

37.10 -6.30

61.10 -14.30

5 5

-40.00 -14.30

61.10 -14.30

73.10 -18.30

6 6

-40.00 -18.30

73.10 -18.30

90.20 -24.00

140.00 -24.00

HEADING

Neches River Saltwater Barrier

Navigation Channel

Slope Stability Analysis with side slope 1 on 3, End of Construct

MATERIAL PROPERTIES

1 Silty Sand, Loose

110.00 Unit Weight

Conventional Shear

.00 27.00

No Pore Pressure

2 Fat Clay, Stiff

118.00 Unit Weight

Conventional Shear

1000.00 .00

Piezometric Line

1.00

3 Silty Clay, Stiff

126.00 Unit Weight

Conventional Shear

1100.00 .00

Piezometric Line

1.00

4 Fat Clay, Stiff

113.00 Unit Weight

Conventional Shear

1000.00 .00

Piezometric Line

1.00

5 Silty Clay, Medium

120.00 Unit Weight

Conventional Shear

600.00 .00

Piezometric Line

1.00

6 Silty Clay, Stiff-V/Stiff

122.00 Unit Weight

Conventional Shear

1600.00 .00

Piezometric Line

1.00

PIEZOMETRIC LINES

1	62.40
-40.00	.00
140.00	.00

SURFACE PRESSURE DATA

18.20	.00	.00	.00
90.20	-24.00	1497.60	.00
140.00	-24.00	1497.60	.00

ANALYSIS/COMPUTATION

Circular Search

55.00	60.00	.50	-50.00

Tangent

-30.00

CRAck depth

3

PROcedure for computation of Factor of Safety

SPENCER

PLOT

PRINT Input Data

COMPUTE

Neches River Saltwater Barrier

Navigation Channel

Slope Stability Analysis with side slope 1 on 3, End of Cons
truct

TABLE NO. 2
****
* NEW PROFILE LINE DATA *
****

PROFILE LINE 1 - MATERIAL TYPE = 1

Point	X	Y
1	-40.000	5.700
2	1.100	5.700
3	7.100	3.700

PROFILE LINE 2 - MATERIAL TYPE = 2

Point	X	Y
1	-40.000	3.700
2	7.100	3.700
3	18.200	.000
4	31.100	-4.300

PROFILE LINE 3 - MATERIAL TYPE = 3

Point	X	Y
1	-40.000	-4.300
2	31.100	-4.300
3	37.100	-6.300

PROFILE LINE 4 - MATERIAL TYPE = 4

Point	X	Y
1	-40.000	-6.300

2	37.100	-6.300
3	61.100	-14.300

PROFILE LINE 5 - MATERIAL TYPE = 5

Point	X	Y
1	-40.000	-14.300
2	61.100	-14.300
3	73.100	-18.300

PROFILE LINE 6 - MATERIAL TYPE = 6

Point	X	Y
1	-40.000	-18.300
2	73.100	-18.300
3	90.200	-24.000
4	140.000	-24.000

All new profile lines defined - No old lines retained
1 UTEXAS3 - VER. 1.120 - 10/08/92 - (C) 1985-1992 S. G. WRIGHT

Date: 9:29:1998 Time: 11:20:29 Input file: C:\WINUT3\NE

Neches River Saltwater Barrier

Navigation Channel

Slope Stability Analysis with side slope 1 on 3, End of Cons
truct

TABLE NO. 3
****
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMP
UTATIONS *
****

DATA FOR MATERIAL TYPE 1
Silty Sand, Loose

Unit weight of material = 110.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS

```
     Cohesion - - - - - - - - -          .000
     Friction angle - - - - -  27.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  2
Fat Clay, Stiff


     Unit weight of material =  118.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - - -    1000.000
     Friction angle - - - - -    .000 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  3
Silty Clay, Stiff


     Unit weight of material =  126.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - - -    1100.000
     Friction angle - - - - -    .000 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  4
Fat Clay, Stiff


     Unit weight of material =  113.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - - -    1000.000
     Friction angle - - - - -    .000 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  5
Silty Clay, Medium
```

```
     Unit weight of material =  120.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     600.000
     Friction angle - - - - -    .000 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

DATA FOR MATERIAL TYPE  6
Silty Clay, Stiff-V/Stiff


     Unit weight of material =  122.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -    1600.000
     Friction angle - - - - -    .000 degrees

     Pore water pressures defined by piezometric line
     Number of the piezometric line used =  1
     Negative pore pressures set to zero

All new material properties defined - No old data retained
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Slope Stability Analysis with side slope 1 on 3, End of Cons
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TABLE NO.  5
*************************************************************
*********
* NEW PIEZOMETRIC LINE DATA - CONVENTIONAL/FIRST-STAGE COMPU
TATIONS *
*************************************************************
*********

Line
 No.    Point       X           Y

  1 - Unit weight of water =   62.40

  1        1     -40.000        .000
```

```
  1        2     140.000        .000

          All new piezometric lines defined - No old lines retained
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          TABLE NO. 10
          ************************************************************
*********
          * NEW SURFACE PRESSURE DATA - CONVENTIONAL/FIRST-STAGE COMPU
TATIONS *
          ************************************************************
*********

          ALL NEW DATA INPUT - NO OLD DATA RETAINED

          Surface Pressures -
                                          Normal        Shear
          Point       X           Y      Pressure      Stress

             1      18.200        .000        .000         .000
             2      90.200     -24.000    1497.600         .000
             3     140.000     -24.000    1497.600         .000
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          TABLE NO. 15
          *********************************
          * NEW ANALYSIS/COMPUTATION DATA *
          *********************************

          Circular Shear Surface(s)

          Automatic Search Performed
```

```
Starting Center Coordinate for Search at -
                                                X =      55.000
                                                Y =      60.000

Required accuracy for critical center (= minimum
spacing between grid points) =        .500

Critical shear surface not allowed to pass below Y =     -50
.000

For the initial mode of search
all circles are tangent to horizontal line at -
                                                Y =     -30.000

Depth of crack =       3.000

Procedure used to compute the factor of safety: SPENCER

-------------------------------------------------------------
---------
THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED
 VALUES:

Initial trial estimate for the factor of safety =   3.000

Initial trial estimate for side force inclination =  15.000
degrees
(Applicable to Spencer's procedure only)

Maximum number of iterations allowed for
calculating the factor of safety =   40

Allowed force imbalance for convergence =     100.000

Allowed moment imbalance for convergence =     100.000

Initial trial values for factor of safety (and side force in
clination
for Spencer's procedure) will be kept constant during search

Maximum subtended angle to be used for subdivision of the
circle into slices =   3.00 degrees

Search will be continued to locate a more critical shear
surface (if one exists) after the initial mode is complete

Depth of water in crack =        .000

Unit weight of water in crack =    62.400
```

Seismic coefficient = .000

Conventional (single-stage) computations to be performed
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TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	-40.000	5.700
2	1.100	5.700
3	7.100	3.700
4	18.200	.000
5	31.100	-4.300
6	37.100	-6.300
7	61.100	-14.300
8	73.100	-18.300
9	90.200	-24.000
10	140.000	-24.000

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TABLE NO. 18
INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Are Tan
gent

to a Horizontal Line at Y = -30.000

Center Coordinates X	Y	Radius	1-Stage Factor of Safety	Side Force Inclination (degrees)	Iterations
40.00	45.00	75.00	5.590	-4.97	8
55.00	45.00	75.00	6.144	-5.70	9
70.00	45.00	75.00	9.095	-3.89	15
40.00	60.00	90.00	5.527	-4.78	7
55.00	60.00	90.00	5.787	-5.64	8
70.00	60.00	90.00	7.850	-5.20	12
40.00	75.00	105.00	5.547	-4.61	8
55.00	75.00	105.00	5.647	-5.45	8
70.00	75.00	105.00	7.182	-5.64	11
25.00	45.00	75.00	5.731	-4.14	8
25.00	60.00	90.00	See Message on Next Line(s)		
CIRCLE DOES NOT INTERSECT SLOPE					
25.00	75.00	105.00	See Message on Next Line(s)		
CIRCLE DOES NOT INTERSECT SLOPE					
37.50	57.50	87.50	5.546	-4.67	8
40.00	57.50	87.50	5.530	-4.82	7
42.50	57.50	87.50	5.530	-4.97	7
37.50	60.00	90.00	5.546	-4.64	8
42.50	60.00	90.00	5.523	-4.94	7
37.50	62.50	92.50	5.548	-4.61	8
40.00	62.50	92.50	5.526	-4.75	7
42.50	62.50	92.50	5.519	-4.90	7
45.00	60.00	90.00	5.536	-5.09	8
45.00	62.50	92.50	5.528	-5.05	7
40.00	65.00	95.00	5.527	-4.72	7
42.50	65.00	95.00	5.517	-4.87	7
45.00	65.00	95.00	5.522	-5.02	7
40.00	67.50	97.50	5.530	-4.69	8
42.50	67.50	97.50	5.518	-4.84	7
45.00	67.50	97.50	5.519	-4.98	7
41.00	63.50	93.50	5.521	-4.80	7
42.50	63.50	93.50	5.518	-4.89	7
44.00	63.50	93.50	5.521	-4.98	7
41.00	65.00	95.00	5.522	-4.78	7
44.00	65.00	95.00	5.518	-4.96	7

41.00	66.50	96.50	5.523	-4.76	7
42.50	66.50	96.50	5.517	-4.85	7
44.00	66.50	96.50	5.517	-4.94	7
45.50	65.00	95.00	5.525	-5.05	7
45.50	66.50	96.50	5.523	-5.03	7
42.50	68.00	98.00	5.518	-4.83	7
44.00	68.00	98.00	5.517	-4.92	7
45.50	68.00	98.00	5.521	-5.01	7
42.50	69.50	99.50	5.519	-4.82	7
44.00	69.50	99.50	5.517	-4.90	7
45.50	69.50	99.50	5.520	-4.99	7
43.50	67.50	97.50	5.516	-4.90	7
44.00	67.50	97.50	5.517	-4.93	7
44.50	67.50	97.50	5.518	-4.96	7
43.50	68.00	98.00	5.516	-4.89	7
44.50	68.00	98.00	5.517	-4.95	7
43.50	68.50	98.50	5.517	-4.88	7
44.00	68.50	98.50	5.517	-4.91	7
44.50	68.50	98.50	5.517	-4.94	7
43.00	67.00	97.00	5.517	-4.87	7
43.50	67.00	97.00	5.516	-4.90	7
44.00	67.00	97.00	5.517	-4.93	7
43.00	67.50	97.50	5.517	-4.87	7
43.00	68.00	98.00	5.517	-4.86	7

At the end of the current mode of search the most critical circle which was found has the following values -
X-center = 43.50 Y-center = 67.50 Radius = 97.50

Factor of Safety = 5.516 Side Force Inclination = -4.90

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Neches River Saltwater Barrier

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Slope Stability Analysis with side slope 1 on 3, End of Construct

TABLE NO. 19
INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Have the Same Radius - Radius = 97.500

```
-
                                                 1-Stage
          Center Coordinates                     Factor   Side Force
                                                   of     Inclination
               X          Y        Radius        Safety   (degrees)    Iterati
ons


               28.50      52.50     97.50 See Message on Next Line(s)
          CIRCLE DOES NOT INTERSECT SLOPE

               43.50      52.50     97.50 See Message on Next Line(s)
          CIRCLE DOES NOT INTERSECT SLOPE

               58.50      52.50     97.50    5.114       -3.78          7
               28.50      67.50     97.50 See Message on Next Line(s)
          CIRCLE DOES NOT INTERSECT SLOPE

               58.50      67.50     97.50    5.905       -5.68          8
               28.50      82.50     97.50    5.407       -4.29          8
               43.50      82.50     97.50    5.806       -5.84          8
               58.50      82.50     97.50    9.936       -5.87         16

               43.50      37.50     97.50 Bottom of circle exceeds allo
wable
                                           depth - CIRCLE REJECTED
               58.50      37.50     97.50 Bottom of circle exceeds allo
wable
                                           depth - CIRCLE REJECTED
               73.50      37.50     97.50 Bottom of circle exceeds allo
wable
                                           depth - CIRCLE REJECTED
               73.50      52.50     97.50    6.129       -3.85          9
               73.50      67.50     97.50    8.313       -5.13         13

               56.00      50.00     97.50    4.951       -3.51          7
               58.50      50.00     97.50    5.036       -3.55          6
               61.00      50.00     97.50    5.138       -3.58          7
               56.00      52.50     97.50    5.022       -3.75          8
               61.00      52.50     97.50    5.223       -3.82          7
               56.00      55.00     97.50    5.105       -4.00          7
               58.50      55.00     97.50    5.205       -4.04          7
               61.00      55.00     97.50    5.325       -4.07          7

               53.50      47.50     97.50    4.824       -3.26          6
               56.00      47.50     97.50    4.891       -3.30          7
               58.50      47.50     97.50    4.971       -3.33          7
               53.50      50.00     97.50    4.879       -3.48          6
               53.50      52.50     97.50    4.945       -3.71          7

               51.00      45.00     97.50 Bottom of circle exceeds allo
```

```
wable
                                        depth - CIRCLE REJECTED
          53.50     45.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          56.00     45.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          51.00     47.50     97.50   4.771      -3.23         6
          51.00     50.00     97.50   4.822      -3.44         6

          48.50     45.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          48.50     47.50     97.50   4.728      -3.20         6
          48.50     50.00     97.50   4.777      -3.40         6

          46.00     45.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          46.00     47.50     97.50 See Message on Next Line(s)
     CIRCLE DOES NOT INTERSECT SLOPE

          46.00     50.00     97.50 See Message on Next Line(s)
     CIRCLE DOES NOT INTERSECT SLOPE


          47.00     46.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          48.50     46.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          50.00     46.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          47.00     47.50     97.50 See Message on Next Line(s)
     CIRCLE DOES NOT INTERSECT SLOPE

          50.00     47.50     97.50   4.752      -3.22         6
          47.00     49.00     97.50 See Message on Next Line(s)
     CIRCLE DOES NOT INTERSECT SLOPE

          48.50     49.00     97.50   4.757      -3.32         6
          50.00     49.00     97.50   4.781      -3.34         6

          48.00     47.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          48.50     47.00     97.50 Bottom of circle exceeds allo
wable
```

```
                                        depth - CIRCLE REJECTED
          49.00     47.00     97.50 Bottom of circle exceeds allo
wable
                                        depth - CIRCLE REJECTED
          48.00     47.50     97.50 See Message on Next Line(s)
     CIRCLE DOES NOT INTERSECT SLOPE

          49.00     47.50     97.50   4.736      -3.20          6
          48.00     48.00     97.50   4.730      -3.23          6
          48.50     48.00     97.50   4.738      -3.24          6
          49.00     48.00     97.50   4.745      -3.24          6

     At the end of the current mode of search the most critical
     circle which was found has the following values -
     X-center =     48.50     Y-center =     47.50     Radius =
   97.50
     Factor of Safety =   4.728     Side Force Inclination =  -3.
20


     ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED F
OR SOME
                         OF GRID POINTS AROUND THE MINIMUM
     ***** RESULTS MAY BE ERRONEOUS *****
1    UTEXAS3 - VER. 1.120 - 10/08/92 - (C) 1985-1992 S. G. WRIGHT

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     Neches River Saltwater Barrier

     Navigation Channel

     Slope Stability Analysis with side slope 1 on 3, End of Cons
truct

     TABLE NO. 18
     INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Are Tan
gent
     to a Horizontal Line at   Y =   -50.000
     ------------------------------------------------------------
----
                                        1-Stage
     Center Coordinates                 Factor  Side Force
                                          of    Inclination
          X         Y        Radius    Safety   (degrees)   Iterati
ons


          33.50     32.50     82.50 See Message on Next Line(s)
     CIRCLE DOES NOT INTERSECT SLOPE
```

```
     48.50      32.50      82.50   4.804      -3.25          6
     63.50      32.50      82.50   5.412      -3.43          8
     33.50      47.50      97.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     63.50      47.50      97.50   5.177      -3.39          7
     33.50      62.50     112.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     48.50      62.50     112.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     63.50      62.50     112.50   5.107      -3.28          7

     46.00      45.00      95.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     48.50      45.00      95.00   4.733      -3.21          6
     51.00      45.00      95.00   4.776      -3.24          6
     46.00      47.50      97.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     51.00      47.50      97.50   4.771      -3.23          6
     46.00      50.00     100.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     48.50      50.00     100.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     51.00      50.00     100.00   4.767      -3.21          6

     47.00      46.00      96.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     48.50      46.00      96.00   4.731      -3.20          6
     50.00      46.00      96.00   4.755      -3.22          6
     47.00      47.50      97.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     50.00      47.50      97.50   4.752      -3.22          6
     47.00      49.00      99.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     48.50      49.00      99.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     50.00      49.00      99.00   4.751      -3.21          6

     48.00      47.00      97.00   4.722      -3.19          6
     48.50      47.00      97.00   4.729      -3.20          6
     49.00      47.00      97.00   4.737      -3.21          6
```

```
     48.00     47.50     97.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     49.00     47.50     97.50   4.736      -3.20          6
     48.00     48.00     98.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     48.50     48.00     98.00   4.728      -3.19          6
     49.00     48.00     98.00   4.735      -3.20          6

     47.50     46.50     96.50   4.716      -3.19          6
     48.00     46.50     96.50   4.723      -3.20          6
     48.50     46.50     96.50   4.730      -3.20          6
     47.50     47.00     97.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     47.50     47.50     97.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE


     47.50     46.00     96.00   4.717      -3.19          6
     48.00     46.00     96.00   4.723      -3.20          6
     47.00     46.50     96.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     47.00     47.00     97.00 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE


At the end of the current mode of search the most critical
circle which was found has the following values -
X-center =     47.50     Y-center =     46.50     Radius =
   96.50
Factor of Safety =   4.716     Side Force Inclination =  -3.
19


***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED F
OR SOME
                          OF GRID POINTS AROUND THE MINIMUM
***** RESULTS MAY BE ERRONEOUS *****
1          UTEXAS3 - VER. 1.120 - 10/08/92 - (C) 1985-1992 S. G. WRIGHT

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Neches River Saltwater Barrier

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Slope Stability Analysis with side slope 1 on 3, End of Cons
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```
TABLE NO. 19
INFORMATION FOR CURRENT MODE OF SEARCH - All Circles Have th
e
Same Radius   -   Radius =    96.500
-----------------------------------------------------------
-
                                        1-Stage
Center Coordinates                      Factor  Side Force
                                          of    Inclination
     X          Y        Radius        Safety   (degrees)   Iterati
ons


     32.50      31.50     96.50 Bottom of circle exceeds allo
wable
                                   depth - CIRCLE REJECTED
     47.50      31.50     96.50 Bottom of circle exceeds allo
wable
                                   depth - CIRCLE REJECTED
     62.50      31.50     96.50 Bottom of circle exceeds allo
wable
                                   depth - CIRCLE REJECTED
     32.50      46.50     96.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     62.50      46.50     96.50   5.139      -3.39          7
     32.50      61.50     96.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     47.50      61.50     96.50   5.147      -4.65          7
     62.50      61.50     96.50   5.874      -5.01          8

     45.00      44.00     96.50 Bottom of circle exceeds allo
wable
                                   depth - CIRCLE REJECTED
     47.50      44.00     96.50 Bottom of circle exceeds allo
wable
                                   depth - CIRCLE REJECTED
     50.00      44.00     96.50 Bottom of circle exceeds allo
wable
                                   depth - CIRCLE REJECTED
     45.00      46.50     96.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     50.00      46.50     96.50   4.754      -3.22          6
     45.00      49.00     96.50 See Message on Next Line(s)
CIRCLE DOES NOT INTERSECT SLOPE

     47.50      49.00     96.50   4.763      -3.40          6
     50.00      49.00     96.50   4.804      -3.43          6
```

```
                46.00     45.00     96.50 Bottom of circle exceeds allo
wable
                                          depth - CIRCLE REJECTED
                47.50     45.00     96.50 Bottom of circle exceeds allo
wable
                                          depth - CIRCLE REJECTED
                49.00     45.00     96.50 Bottom of circle exceeds allo
wable
                                          depth - CIRCLE REJECTED
                46.00     46.50     96.50 See Message on Next Line(s)
           CIRCLE DOES NOT INTERSECT SLOPE

                49.00     46.50     96.50   4.737      -3.21         6
                46.00     48.00     96.50 See Message on Next Line(s)
           CIRCLE DOES NOT INTERSECT SLOPE

                47.50     48.00     96.50   4.743      -3.31         6
                49.00     48.00     96.50   4.765      -3.33         6

                47.00     46.00     96.50 Bottom of circle exceeds allo
wable
                                          depth - CIRCLE REJECTED
                47.50     46.00     96.50 Bottom of circle exceeds allo
wable
                                          depth - CIRCLE REJECTED
                48.00     46.00     96.50 Bottom of circle exceeds allo
wable
                                          depth - CIRCLE REJECTED
                47.00     46.50     96.50 See Message on Next Line(s)
           CIRCLE DOES NOT INTERSECT SLOPE

                48.00     46.50     96.50   4.723      -3.20         6
                47.00     47.00     96.50 See Message on Next Line(s)
           CIRCLE DOES NOT INTERSECT SLOPE

                47.50     47.00     96.50   4.725      -3.23         6
                48.00     47.00     96.50   4.731      -3.24         6

           At the end of the current mode of search the most critical
           circle which was found has the following values -
           X-center =     47.50     Y-center =     46.50     Radius =
   96.50
           Factor of Safety =   4.716     Side Force Inclination =  -3.
19


           ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED F
OR SOME
                                OF GRID POINTS AROUND THE MINIMUM
           ***** RESULTS MAY BE ERRONEOUS *****
```

```
1          UTEXAS3 - VER. 1.120 - 10/08/92 - (C) 1985-1992 S. G. WRIGHT

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           Neches River Saltwater Barrier

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           Slope Stability Analysis with side slope 1 on 3, End of Cons
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           TABLE NO. 21
           *****  1-STAGE FINAL CRITICAL CIRCLE INFORMATION  *****
           X Coordinate of Center - - - - - - - -    47.500
           Y Coordinate of Center - - - - - - - -    46.500
           Radius - - - - - - - - - - - - - - - -    96.500
           Factor of Safety - - - - - - - - - - -     4.716
           Side Force Inclination - - - - - - - -     -3.19

           Number of circles tried  - - - - - - -  183
           No. of circles F calc. for - - - - -  121


           ***** CAUTION ***** FACTOR OF SAFETY COULD NOT BE COMPUTED F
OR SOME
                                OF GRID POINTS AROUND THE MINIMUM
           ***** RESULTS MAY BE ERRONEOUS *****
1          UTEXAS3 - VER. 1.120 - 10/08/92 - (C) 1985-1992 S. G. WRIGHT

           Date:  9:29:1998   Time: 11:20:29   Input file: C:\WINUT3\NE

           Neches River Saltwater Barrier

           Navigation Channel

           Slope Stability Analysis with side slope 1 on 3, End of Cons
truct

           TABLE NO. 26
           ************************************************************
**
           *  Coordinate, Weight, Strength and Pore Water Pressure
 *
           *  Information for Individual Slices for Conventional
 *
           *  Computations or First Stage of Multi-Stage Computations.
 *
           *  (Information is for the Critical Shear Surface in the
 *
           *  Case of an Automatic Search.)
 *
```

Boring No. 97-31

Nech1

HEADING

Neches River Saltwater Barrier

Navigation Channel

Slope Stability Analysis with side slope 1 on 3, Long Term Condit

PROFILE LINES

1	1		
		-40.00	5.70
		1.10	5.70
		7.10	3.70
2	2		
		-40.00	3.70
		7.10	3.70
		18.20	.00
		31.10	-4.30
3	3		
		-40.00	-4.30
		31.10	-4.30
		37.10	-6.30
4	4		
		-40.00	-6.30
		37.10	-6.30
		61.10	-14.30

F.S. @ few locations along the side slope is lower than 1.2 which indicates that ~~the slope~~ a portion of the side slope could slough.

No major slope failure is expected.

```
5    5
     -40.00    -14.30
      61.10    -14.30
      73.10    -18.30

6    6
     -40.00    -18.30
      73.10    -18.30
      90.20    -24.00
     140.00    -24.00


HEADING
    Neches River Saltwater Barrier
    Navigation Channel
    Slope Stability Analysis with side slope 1 on 3, Long Term Condit
MATERIAL PROPERTIES
     1 Silty Sand, Loose
          110.00 Unit Weight
          Conventional Shear
                 .00     27.00
          No Pore Pressure
     2 Fat Clay, Stiff
          118.00 Unit Weight
          Conventional Shear
```

.00 22.00

Piezometric Line

1.00

3 Silty Clay, Stiff

126.00 Unit Weight

Conventional Shear

.00 23.00

Piezometric Line

1.00

4 Fat Clay, Stiff

113.00 Unit Weight

Conventional Shear

.00 22.00

Piezometric Line

1.00

5 Silty Clay, Medium

120.00 Unit Weight

Conventional Shear

.00 22.00

Piezometric Line

1.00

6 Silty Clay, Stiff-V/Stiff

122.00 Unit Weight

Conventional Shear

.00 24.00

Piezometric Line

1.00

PIEZOMETRIC LINES

1	62.40	
	-40.00	.00
	140.00	.00

SURFACE PRESSURE DATA

18.20	.00	.00	.00
90.20	-24.00	1497.60	.00
140.00	-24.00	1497.60	.00

ANALYSIS/COMPUTATION

Circular Search

55.00	60.00	.50	-50.00

Tangent

-30.00

PROcedure for computation of Factor of Safety

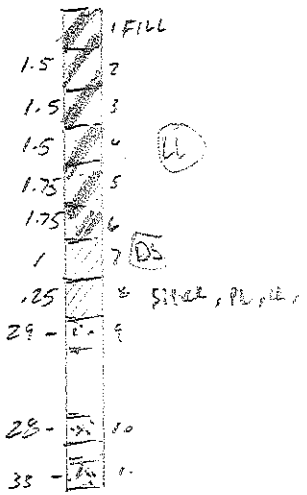
SPENCER

PLOT

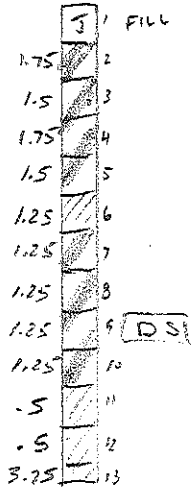
PRINT Input Data

COMPUTE

97-30



97-31



SHEET NO. ..... OF .....

JOB NO. .....

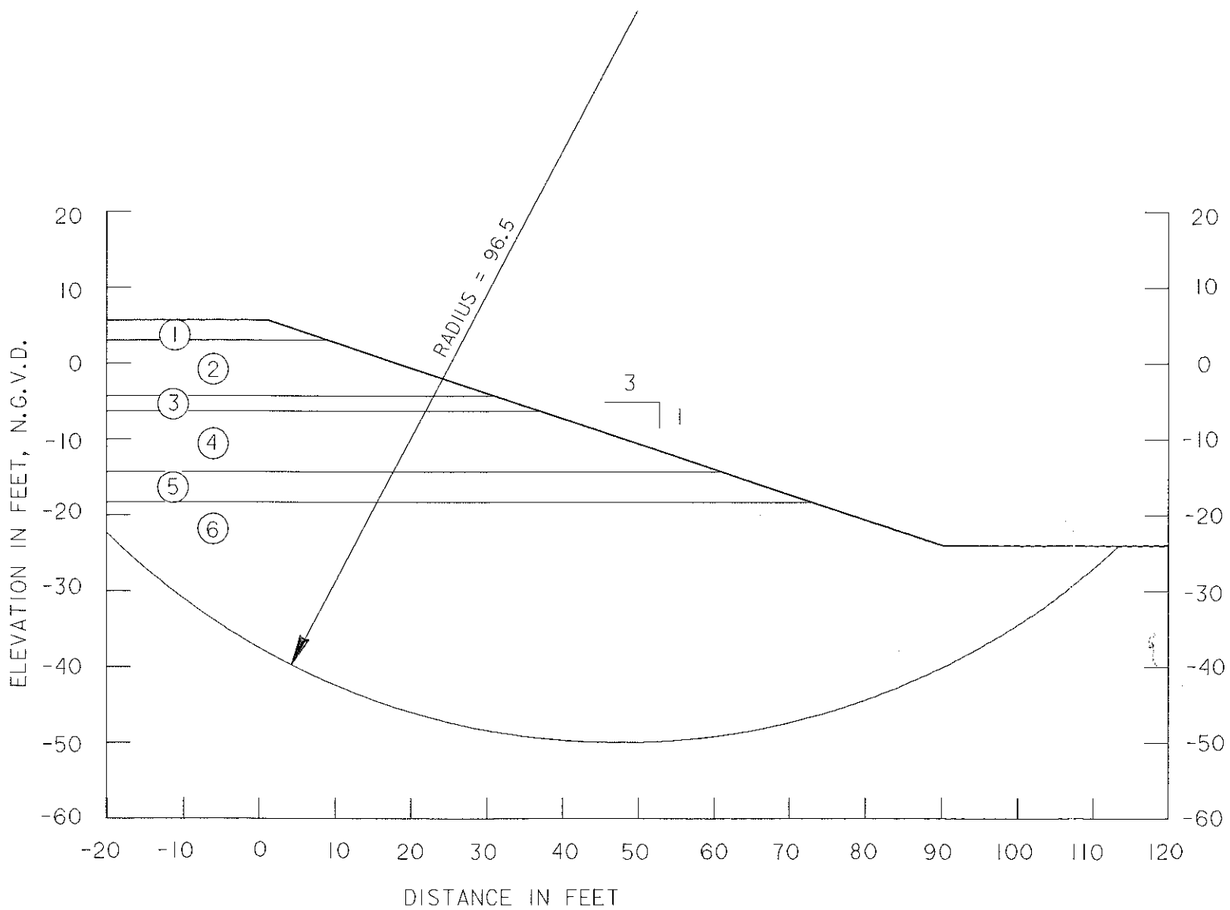
SUBJECT .....

BY ..... DATE .....

CHKD. BY ..... DATE .....

STABILITY ANALYSIS				
ARC	CENTER OF CIRCLE		RADIUS (FT.)	FACTOR OF SAFETY
	X	Y		
1	47.50	46.5	96.5	4.746
2	0	0	0	1.3

SOIL NO.	SOIL TYPE & CONSISTENCY	SOIL PARIMETERS				
		UNIT MOIST. WEIGHT (psf)	SHORT TERM		LONG TERM	
			C (psf)	Φ (degrees)	C (psf)	Φ (degrees)
1	Silty sand,(SM),Loose	110	0	27	0	27
2	Fat clay,(CH),Stiff	118	1000	0	0	22
3	Silty clay,(CL),Stiff	126	1000	0	0	23
4	Fat clay,(CH),Stiff	113	1000	0	0	22
5	Silty clay,(CL),Medium	120	600	0	0	22
6	Silty clay,(CL),Stiff-Very stiff	122	1600	0	0	24



NECHES RIVER SALT WATER BARRIER,
BEAUMONT, TEXAS
NAVIGATION CHANNEL

SLOPE STABILITY ANALYSIS

(SIDE SLOPE 1V:3H)
BORING No. 97-31

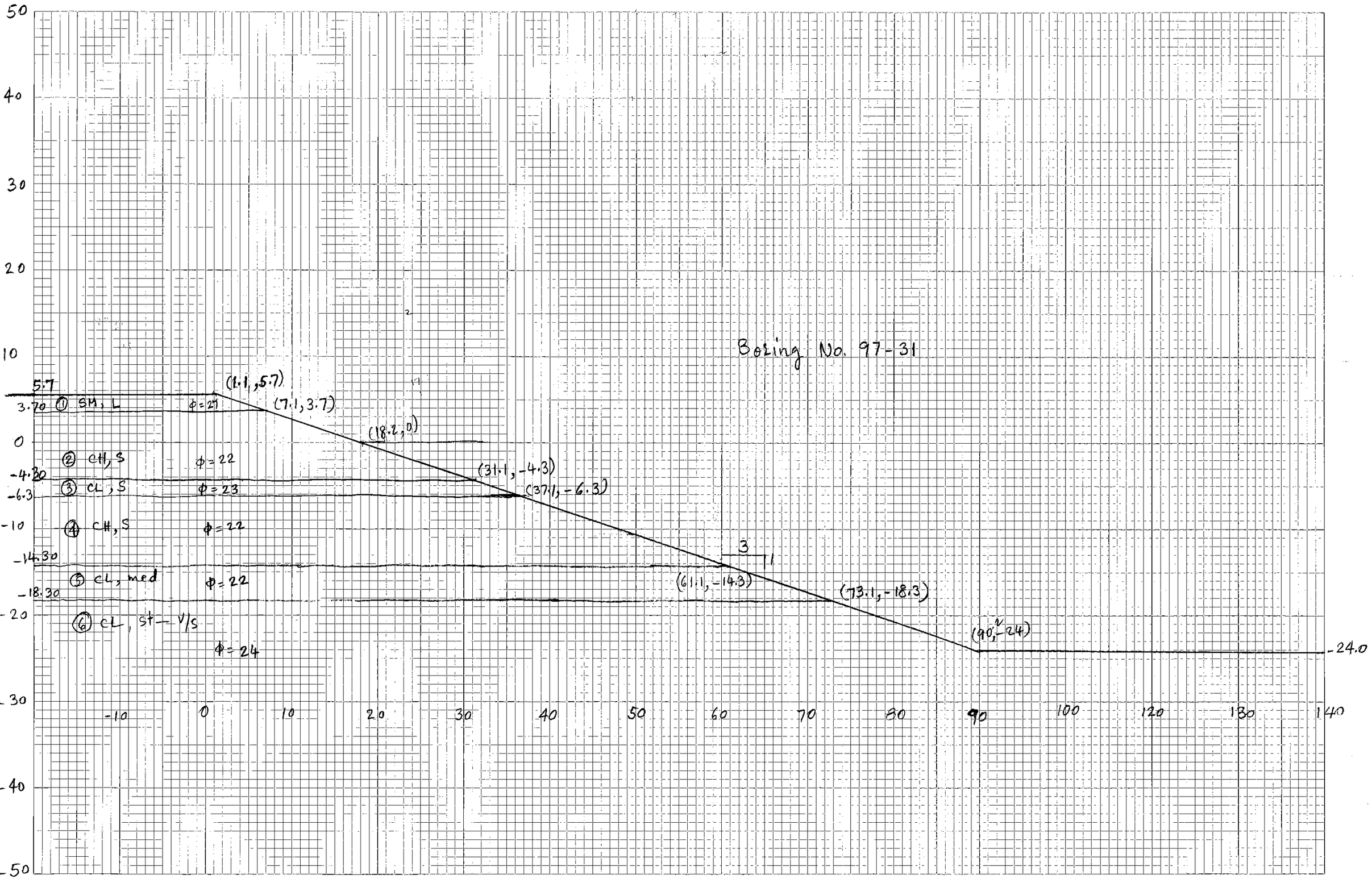
U.S. ARMY ENGINEER DISTRICT, GALVESTON, TEXAS

TO ACCOMPANY DESIGN DOCUMENT REPORT

FILE NO. X

EXHIBIT

\p_norm\netch\slope97-31.dgn Apr 07, 1999 11:19:26



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