# Quantity Estimate Supporting Documents

Quantity Estimation Spread Sheets

The quantity estimation spread sheets were developed based upon the following four (5) input parameters:

- $H_E$: Embankment Height (ft)
- $H_F$: Foundation Height (ft)
- $H_S$: Seafloor Deposits Thickness (ft)
- $N_1$: Number of Stone Column at Upstream or Downstream Slope
- L: Length of Embankment

The embankment height $H_E$ refers to the vertical distance between the dam crest and the top of the soft lacustrine/upper alluvium strata. The foundation height $H_F$ refers to the thickness of the soft lacustrine/upper alluvium strata underneath the embankment.

Based upon these parameters, and the typical dam cross sections, the area and/or linear footage calculation equations for various embankment items were developed. These equations are presented in this part of this appendix. The quantity estimation spread sheets presented in the earlier part of this appendix were established based upon these equations.

The following Table A summarizes the required input parameters for calculating the quantity for each of the embankment items.

Table A – Required Input Parameters For Each Embankment Items

| No. | Item | Unit | Input Parameters Required |
|---|---|---|---|
| 1 | Dredge of Seafloor Deposits | CY | L, $H_E$, $H_S$ |
| 1 | Dredge of Soft Lacustrine/Upper Alluvium | CY | L, $H_E$, $H_F$ |
| 2 | Sand/Gravel Fill Type A in Core | CY | L, $H_E$, $H_F$ |
| 2 | Sand/Gravel Fill Type A in Shell | CY | L, $H_E$ |
| 3 | Sand/Gravel Fill Type B in Shell | CY | L, $H_E$ |
| 5 | Rip Rap | CY | L, $H_E$ |
| 6 | Stone Column | FT | L, $H_E$, $H_F$, $N_1$ |
| 7 | Installation of SCB Wall | SF | L, $H_E$, $H_F$ |
| 4 | Sand Blanket Drain (Type A) | CY | L, $H_E$ |
| 3 | Coarse Blanket Drain (Type B) | CY | L, $H_E$ |
| 8 | Wick Drains | FT | L, $H_E$, $H_F$ |
| 9 | Fine Rock Fill | CY | L, $H_E$ |

The input values for $H_E$, $H_F$ and $H_S$ are related to proposed dam crest elevations as well as interpretation of subsurface information such as the thickness of the seafloor deposits and the soft lacustrine/upper alluvium deposits. For the cost estimation purposes, the subsurface data presented on the geologic cross sections A-A' through E-E' (Figure No. 9 through 13) in the Salton Sea Restoration Project Report prepared by URS were utilized.

Based on the assumed thickness of the seafloor and the soft lacustrine/upper alluvium deposits, the entire length of the proposed embankment was in several cases, divided into multiple sections for quantity estimation calculations. The following Table B summarizes the each section name and corresponding length for the various embankment dam options. The length of each individual section was measured on the maps provided by USBR.

Table B – Section Name and Length for Various Embankment Dam Options

| | Section A (ft) | Section B (ft) | Section C (ft) | Section D (ft) | Section E (ft) |
|---|---|---|---|---|---|
| Mid Sea Dam | 17672 | 8664 | 4854 | 7841 | 2297 |
| Mid Sea Barrier | 17969 | 6761 | 5534 | 5460 | 2366 |
| South Sea Dam | 74310 | | | | |
| North Sea Dam | 122277 | | | | |
| Perimeter Dike | 62555 | 29586 | | | |
| Concentric Ring Dike | 1327920 | | | | |

# A. Subsurface Data

KLEINFELDER

SHEET 1 OF 4

PROJECT Salton Sea PROJECT NO. 71100
SUBJECT Subsurface Condition Summary BY RAA DATE 8/23/06
REVIEWED BY JIE YU DATE 8/30/06

Purpose: Determine the average thickness of the seafloor deposits and the soft lacustrine and the alluvium deposits at different seafloor elevations based on CPT and borehole data.

## MIDSEA DAM

up to elevation -270

Based on B-5, B-26, B-4, CPT-28, CPT-3

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| B-5 | 13' | 13' | 5' |
| B-26 | 15.5 | 23.5 | 4.5 |
| B-4 | 21.5 | 16.5 | 0 |
| CPT-28 | 14 | 25 | 0' |
| CPT-3 | 15 | 26 | 0 |
| AVG | 15.8 | 20.8 | 1.9 |

Average thickness of seafloor deposits: 15.8'
soft lacustrine/alluvium: 22.7'

elevations -260 to -270 (west)
Based on B-7, CPT-29, CPT-8,

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| B-7 | 3 | 5.5 | 23 |
| CPT-29 | 11.8 | 10.6 | 5.9 |
| CPT-8 | 5.9 | 6.5 | 18.2 |
| AVG | 6.9 | 7.5 | 15.7 |

Average thickness of seafloor deposits: 6.9'
Soft lacustrine/alluvium: 23.2'

# KLEINFELDER



PROJECT Salton Sea PROJECT NO. 71100
SUBJECT Subsurface Condition Summary BY RAH DATE 8/23/06
REVIEWED BY JIE YU DATE 8/30/06

elevations -260 to -270 (EAST)
Based on B-2, CPT-27

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| B-2 | 2 | 6 | 0 |
| CPT-27 | 11.8 | 18.8 | 0 |
| AVG | 6.9 | 12.4 | 0 |

Average thickness of seafloor deposits: 6.9'
soft lacustrine/alluvium: 12.4'

elevations -240 to -260 (WEST)
Based on CPT-9, B-7

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| B-7 | 3 | 5.5 | 23 |
| CPT-9 | 3.5 | 0 | 17.6 |
| AVG | 3.3 | 2.8 | 20.3 |

Average thickness of seafloor deposits: 3.3'
soft lacustrine/alluvium: 23'

elevations -240 to -260 (EAST)
Based on B-2, CPT-1

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| B-2 | 2 | 6 | 0 |
| CPT-1 | 6 | 5 | 0 |
| AVG | 4 | 5.5 | 0 |

Average thickness of seafloor deposits: 4'
soft lacustrine/alluvium: 5.5'

PERIMETER DIKE
Based on CPT 10, DH-1, B-11, CPT-12

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| CPT-10 | 3.6 | 1.2 | 14.8 |
| DH-1 | 0 | 5.6 | 17.6 |
| B-11 | 2.4 | 3.2 | 13.2 |
| CPT-12 | 4.4 | 0 | 9.2 |
| AVG | 2.6 | 2.5 | 13.7 |

Average thickness of seafloor deposits: 2.6'
soft lacustrine/alluvium: 16.2'; See notes on page 3

KLEINFELDER

SHEET 3 OF 4

PROJECT Salton Sea PROJECT NO. 71100

SUBJECT Subsurface Condition Summary BY RAA DATE 8/23/06

REVIEWED BY JIE YU DATE 8/30/06

NORTH SEA DAM

Based on B-20, CPT-23

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | | SOFT LACUSTRINE THICKNESS (FEET) | | UPPER ALLUVIUM THICKNESS (FEET) | |
|---|---|---|---|---|---|---|
| B-20 | 3.75 | (5) | 5.6 | (7.5) | 3.8 | (3.8) |
| 260 CPT-23 | 2 | (5) | 0 | (6) | 24 | (15) |
| AVG | 2.9 | (5) | 2.8 | (6.8) | 13.9 | (9.4) |

Average thickness of seafloor deposits: 2.9' (5)

soft lacustrine / alluvium: 16.7' (16.2)

SOUTH SEA DAM

Based on CPT-15, DH-2, B-14, CPT-13

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| CPT-15 | 2.5 | 7.5 | 2.5 |
| DH-2 | 0 | 12 | 0 |
| 250 → B-14 | 0 | 7.5 | 6.25 |
| CPT-13 | 0 | 0 | 8.75 |
| AVG | 0.625 | 6.75 | 4.4 |

Average thickness of seafloor deposits: 0.6'

soft lacustrine / alluvium: 11.1' (13.8)

NOTE:

For South Sea Dam: use subsurface conditions at Elevation -250 in Section C-C' as well as Section B-B'.

| | | | |
|---|---|---|---|
| C-C', near B-11 | 4' | 1' | 10' |
| B-B', near B-14 | 0 | 8.5' | 6.5' |
| AVE: | 2' | 4.75 | 8.25' |

Average Seafloor deposits = 2'

Average Soft Lacustrine/Alluvium = 13'

For perimeter Dike

use subsurface conditions at Elevation -250 in Section C-C' as well as Section A-A'

| | | | |
|---|---|---|---|
| C-C', near CPT-10. | 2.5' | 2' | 15' |
| A-A', near CPT-10 | 4.1' | 0.6' | 18.8' |
| | 3.3' | 1.3' | 16.9' |

Average Seafloor Deposits = 3.3'; Average Soft Lacustrine/Alluvium : 18.2'

**KLEINFELDER** SHEET 4 OF 4

PROJECT Salton Sea PROJECT NO. 71100

SUBJECT Subsurface Condition Summary BY RAA DATE 8/25/06

REVIEWED BY JIE YU DATE 8/30/06

## Concentric Rings

Based on B-5, B-26, B-4, B-7, B-2, B-11, B-20, B-14, B-19, B-6, B-17, B-26
CPT-28, CPT-3, CPT-29, CPT-8, CPT-27, CPT-1, CPT-10, CPT-12
CPT-23, CPT-15, CPT-13, CPT-22, CPT-18, CPT-16, CPT-9, CPT-3
DH-1, DH-2, DH-3

| SOURCE | SEAFLOOR DEPOSITS THICKNESS (FEET) | SOFT LACUSTRINE THICKNESS (FEET) | UPPER ALLUVIUM THICKNESS (FEET) |
|---|---|---|---|
| B-5 | 13 | 13 | 5 |
| B-26 | 15.5 | 23.5 | 4.5 |
| B-4 | 21.5 | 16.5 | 0 |
| B-7 | 3 | 5.5 | 23 |
| B-2 | 2 | 6 | 0 |
| B-11 | 2.4 | 3.2 | 13.2 |
| B-20 | 3.75 | 5.6 | 3.3 |
| B-14 | 6 | 7.5 | 2.5 |
| B-6 | 12 | 14.5 | 0 |
| B-17 | 6 | 2.4 | 0 |
| B-19 | 10 | 14 | 3 |
| B-26 | 15.5 | 23.5 | 4.5 |
| CPT-28 | 14 | 25 | 0 |
| CPT-3 | 15 | 26 | 0 |
| CPT-29 | 11.8 | 10.6 | 5.9 |
| CPT-8 | 5.9 | 6.5 | 18.2 |
| CPT-27 | 11.8 | 18.8 | 0 |
| CPT-1 | 6 | 5 | 0 |
| CPT-10 | 3.6 | 1.2 | 14.8 |
| CPT-12 | 4.4 | 0 | 9.2 |
| CPT-23 | 2 | 0 | 24 |
| CPT-15 | 2.5 | 7.5 | 2.5 |
| CPT-13 | 0 | 0 | 8.8 |
| CPT-22 | 20 | 14 | 10 |
| CPT-18 | 7.2 | 1.6 | 0 |
| CPT-16 | 7.2 | 4 | 4.8 |
| CPT-9 | 3.5 | 0 | 17.6 |
| CPT-3 | 14.1 | 23.5 | 2.4 |
| DH-1 | 0 | 5.6 | 17.6 |
| DH-2 | 0 | 12 | 0 |
| DH-3 | 8 | 4.8 | 0 |
| AVG | 7.8 | 9.3 | 6.3 |

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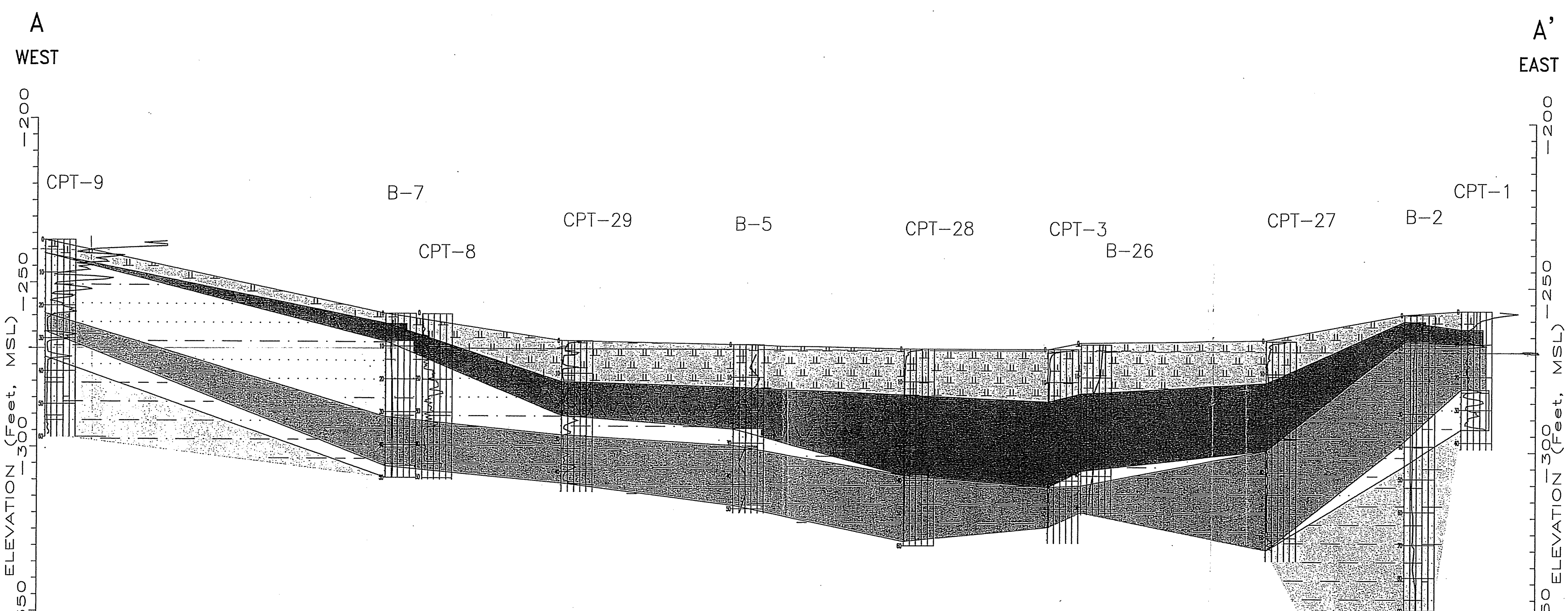
Average thickness of Seafloor deposits: 7.8'
Soft lacustrine/alluvium: 15.6'




Notes:

1. Refer to Figure 2 for section locations.
2. The subsurface conditions illustrated were obtained by interpolation between widely spaced explorations. Information on actual subsurface conditions exists only at locations of explorations; conditions between explorations may vary from those depicted.
3. The discussions in the text of this report should be reviewed to obtain a proper understanding of the nature of the subsurface conditions.
4. Complete boring logs and CPT data are presented in the appendices of this report.

Legend:

Stratigraphy:

- Seafloor Deposits
- Soft Lacustrine Deposits
- Upper Alluvial Deposits
- Upper Stiff Lacustrine Deposits
- Lower Alluvial Deposits
- Lower Stiff Lacustrine Deposits

Data Plotted Next to Exploration:

For CPTs:

Qtn (tsf)

0 50 100 150 200 250

For Borings:

W%

0 100

(VERTICAL SCALE = 100 X HORIZONTAL SCALE)

**GEOLOGIC CROSS SECTION A-A'**

**SALTON SEA RESTORATION PROJECT**

| URS | 1500 0 1500 3000 Feet SCALE: 1"= 3000' | CHECKED BY: AG | DATE: 1-29-04 | FIG. NO: |
|---|---|---|---|---|
| | | PM: LDH | PROJ. NO: 27663042.00005 | 9 |

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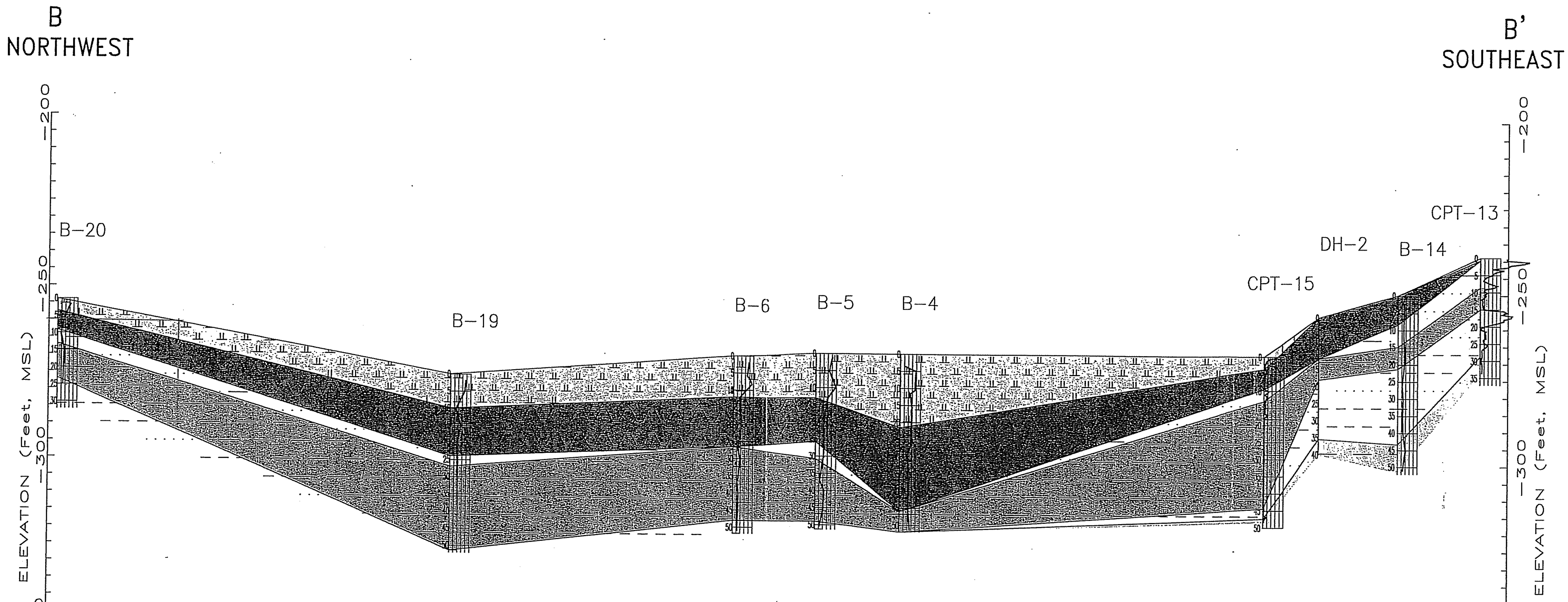


Notes:

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2. The subsurface conditions illustrated were obtained by interpolation between widely spaced explorations. Information on actual subsurface conditions exists only at locations of explorations; conditions between explorations may vary from those depicted.
3. The discussions in the text of this report should be reviewd to obtain a proper understanding of the nature of the subsurface conditions.
4. Complete boring logs and CPT data are presented in the appendices of this report.

Legend:

Stratigraphy:

- Seafloor Deposits
- Soft Lacustrine Deposits
- Upper Alluvial Deposits
- Upper Stiff Lacustrine Deposits
- Lower Alluvial Deposits
- Lower Stiff Lacustrine Deposits

Data Plotted Next to Exploration:

For CPTs:
Qtn (tsf)
0 50 100 150 200 250

For Borings:
W%
0 100

(VERTICAL SCALE = 400 X HORIZONTAL SCALE)

**GEOLOGIC CROSS SECTION B-B'**
**SALTON SEA RESTORATION PROJECT**

| URS | 6250 0 6250 12500 Feet SCALE: 1"= 12500' | CHECKED BY: AG | DATE: 12-10-03 | FIG. NO: |
|---|---|---|---|---|
| | | PM: LDH | PROJ. NO: 27663042.00005 | 10 |

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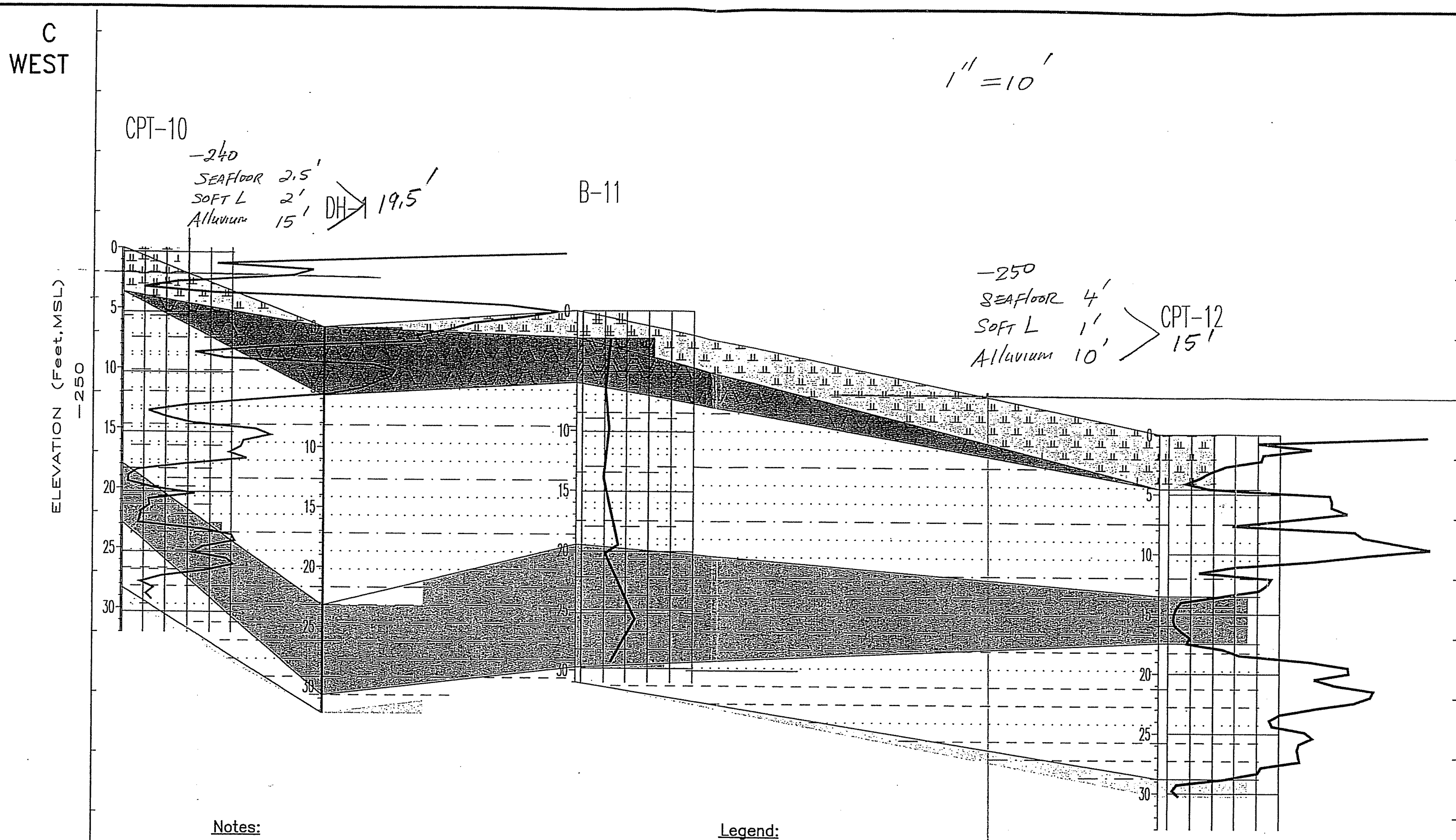


## Notes:

1. Refer to Figure 2 for section locations.
2. The subsurface conditions illustrated were obtained by interpolation between widely spaced explorations. Information on actual subsurface conditions exists only at locations of explorations; conditions between explorations may vary from those depicted.
3. The discussions in the text of this report should be reviewd to obtain a proper understanding of the nature of the subsurface conditions.
4. Complete boring logs and CPT data are presented in the appendices of this report.

## Legend:

Stratigraphy:

- Seafloor Deposits
- Soft Lacustrine Deposits
- Upper Alluvial Deposits
- Upper Stiff Lacustrine Deposits
- Lower Alluvial Deposits
- Lower Stiff Lacustrine Deposits

Data Plotted Next to Exploration:

For CPTs:
Qtn (tsf)
0 50 100 150 200 250

For Borings:
W%
0 100

(VERTICAL SCALE = 100 X HORIZONTAL SCALE)

**GEOLOGIC CROSS SECTION C-C'**
**SALTON SEA RESTORATION PROJECT**

| URS | 500 0 500 1000 Feet SCALE: 1"= 1000' | CHECKED BY: AG | DATE: 1-29-04 | FIG. NO: |
|---|---|---|---|---|
| | | PM: LDH | PROJ. NO: 27663042.00005 | 11 |

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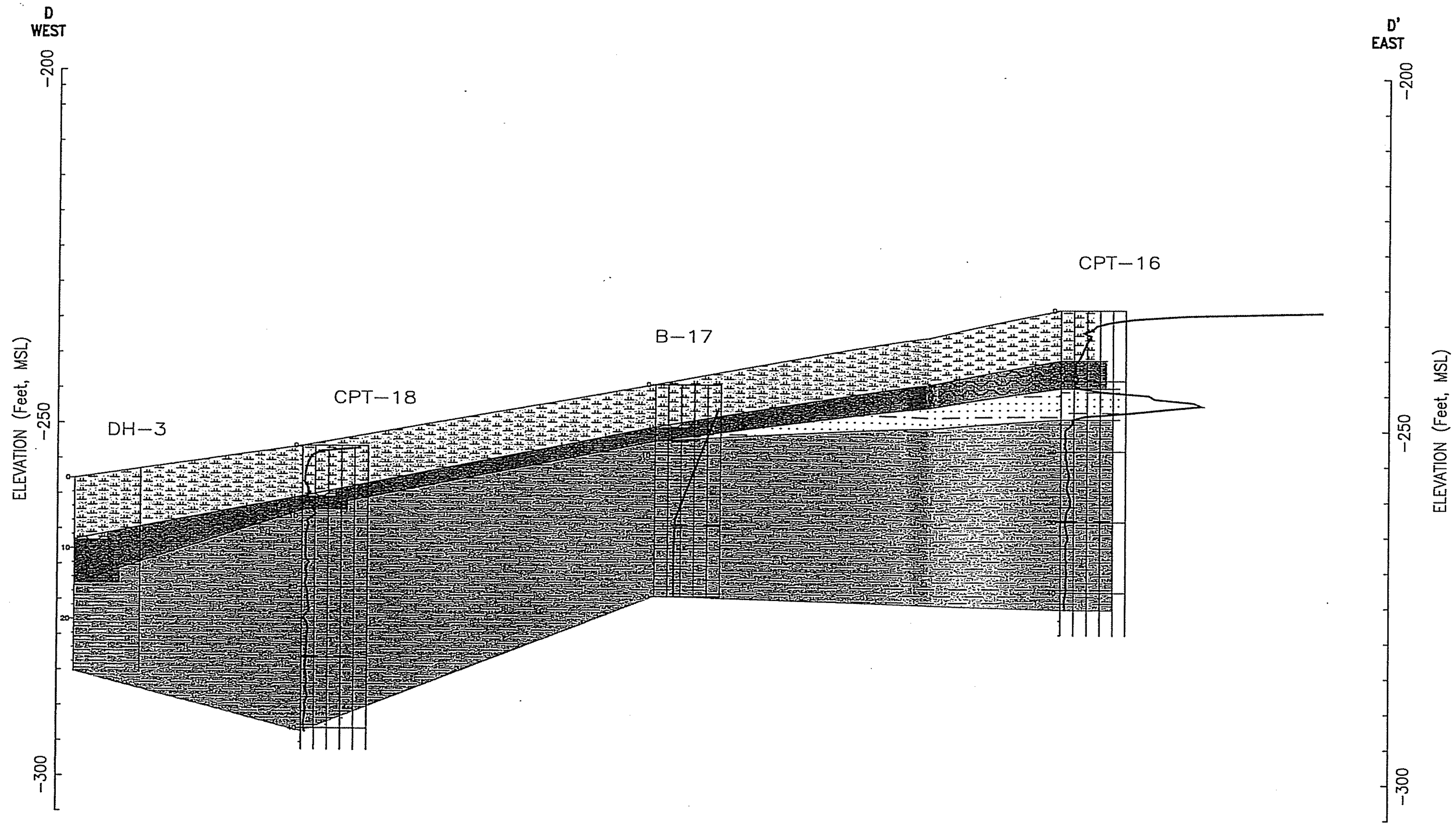


1'/12.5

Legend:

Stratigraphy:

- Seafloor Deposits
- Soft Lacustrine Deposits
- Upper Alluvial Deposits
- Upper Stiff Lacustrine Deposits
- Lower Alluvial Deposits
- Lower Stiff Lacustrine Deposits

Data Plotted Next to Exploration:

For CPTs:

Qtn (tsf)
0 50 100 150 200 250

For Borings:
W%
0 100

Notes:

1. Refer to Figure 2 for section locations.
2. The subsurface conditions illustrated were obtained by interpolation between widely spaced explorations. Information on actual subsurface conditions exists only at locations of explorations; conditions between explorations may vary from those depicted.
3. The discussions in the text of this report should be reviewd to obtain a proper understanding of the nature of the subsurface conditions.
4. Complete boring logs and CPT data are presented in the appendices of this report.

(VERTICAL SCALE = 100 X HORIZONTAL SCALE)

**GEOLOGIC CROSS SECTION D-D'**
**SALTON SEA RESTORATION PROJECT**

| URS | 1000 0 1000 2000 Feet<br>SCALE: 1"= 2000' | CHECKED BY: AG | DATE: 1-29-04 | FIG. NO: |
|---|---|---|---|---|
| | | PM: LDH | PROJ. NO: 27663042.00005 | 12 |

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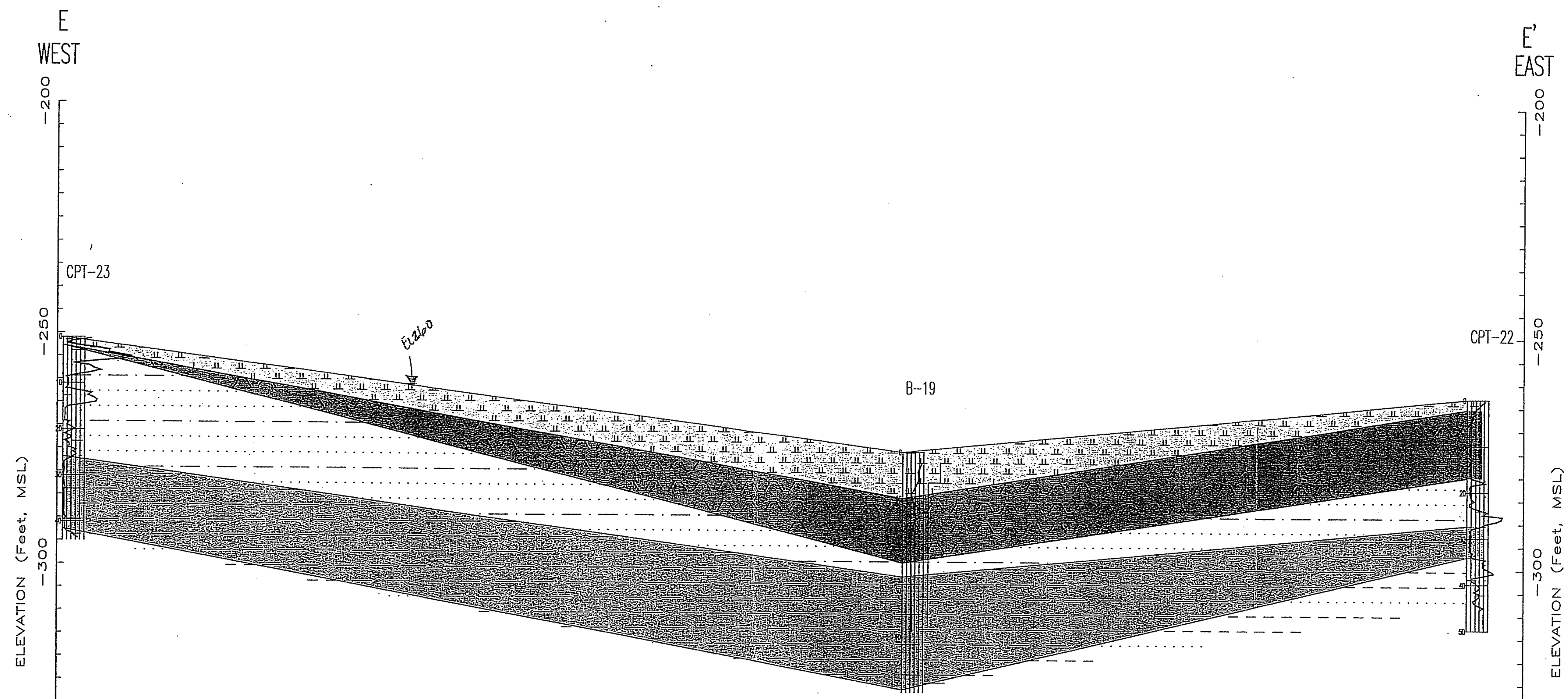


Notes:

1. Refer to Figure 2 for section locations.
2. The subsurface conditions illustrated were obtained by interpolation between widely spaced explorations. Information on actual subsurface conditions exists only at locations of explorations; conditions between explorations may vary from those depicted.
3. The discussions in the text of this report should be reviewd to obtain a proper understanding of the nature of the subsurface conditions.
4. Complete boring logs and CPT data are presented in the appendices of this report.

Legend:

Stratigraphy:

- Seafloor Deposits
- Soft Lacustrine Deposits
- Upper Alluvial Deposits
- Upper Stiff Lacustrine Deposits
- Lower Alluvial Deposits
- Lower Stiff Lacustrine Deposits

Data Plotted Next to Exploration:

For CPTs:
Qtn (tsf)
0 50 100 150 200 250

For Borings:
W%
0 100

(VERTICAL SCALE = 200 X HORIZONTAL SCALE)

**GEOLOGIC CROSS SECTION E-E'**
**SALTON SEA RESTORATION PROJECT**

| | | | | |
|---|---|---|---|---|
| URS | 2500 0 2500 5000 Feet<br>SCALE: 1"= 5000' | CHECKED BY: AG | DATE: 1-29-04 | FIG. NO: |
| | | PM: LDH | PROJ. NO: 27663042.00005 | 13 |

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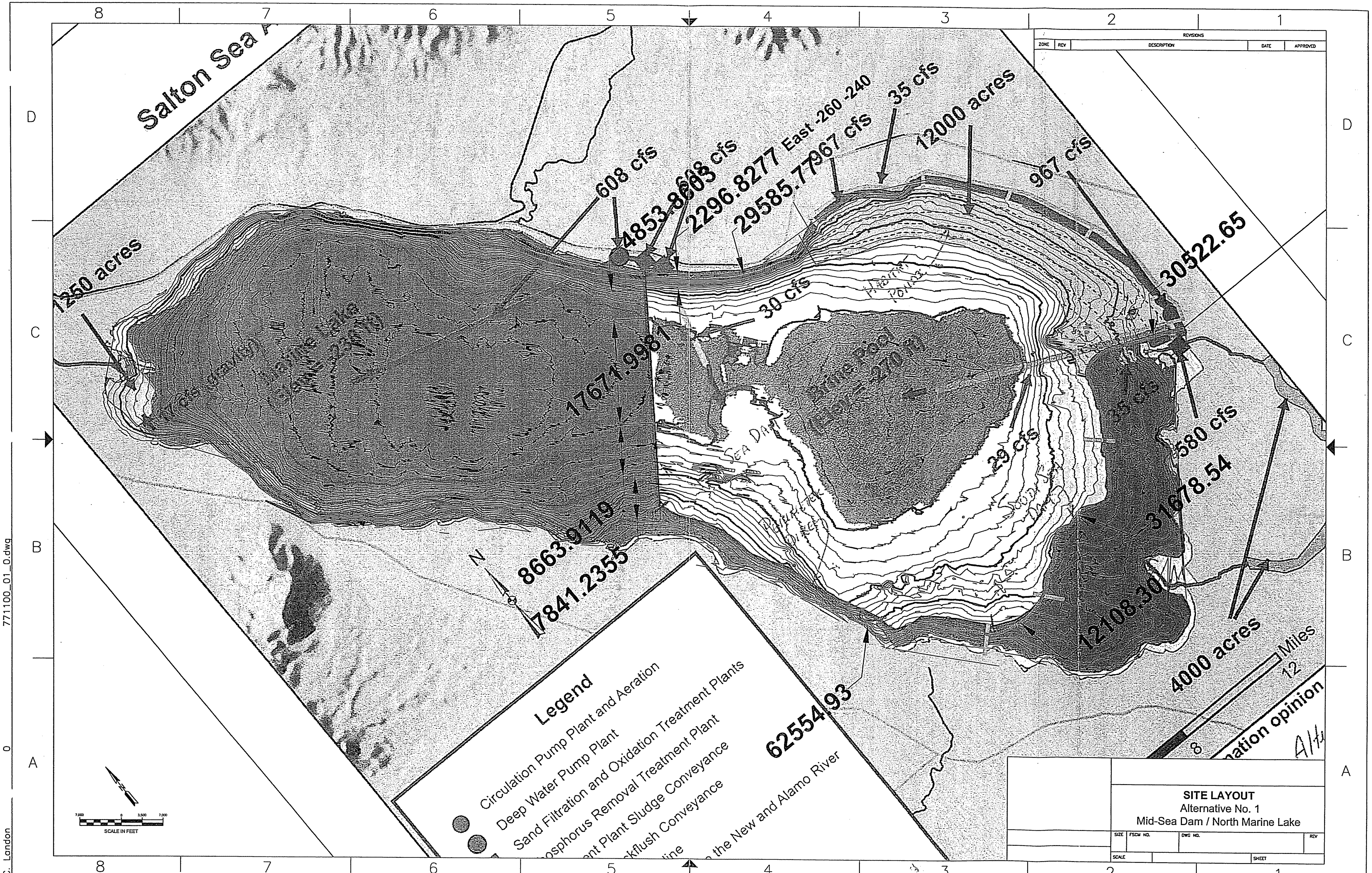


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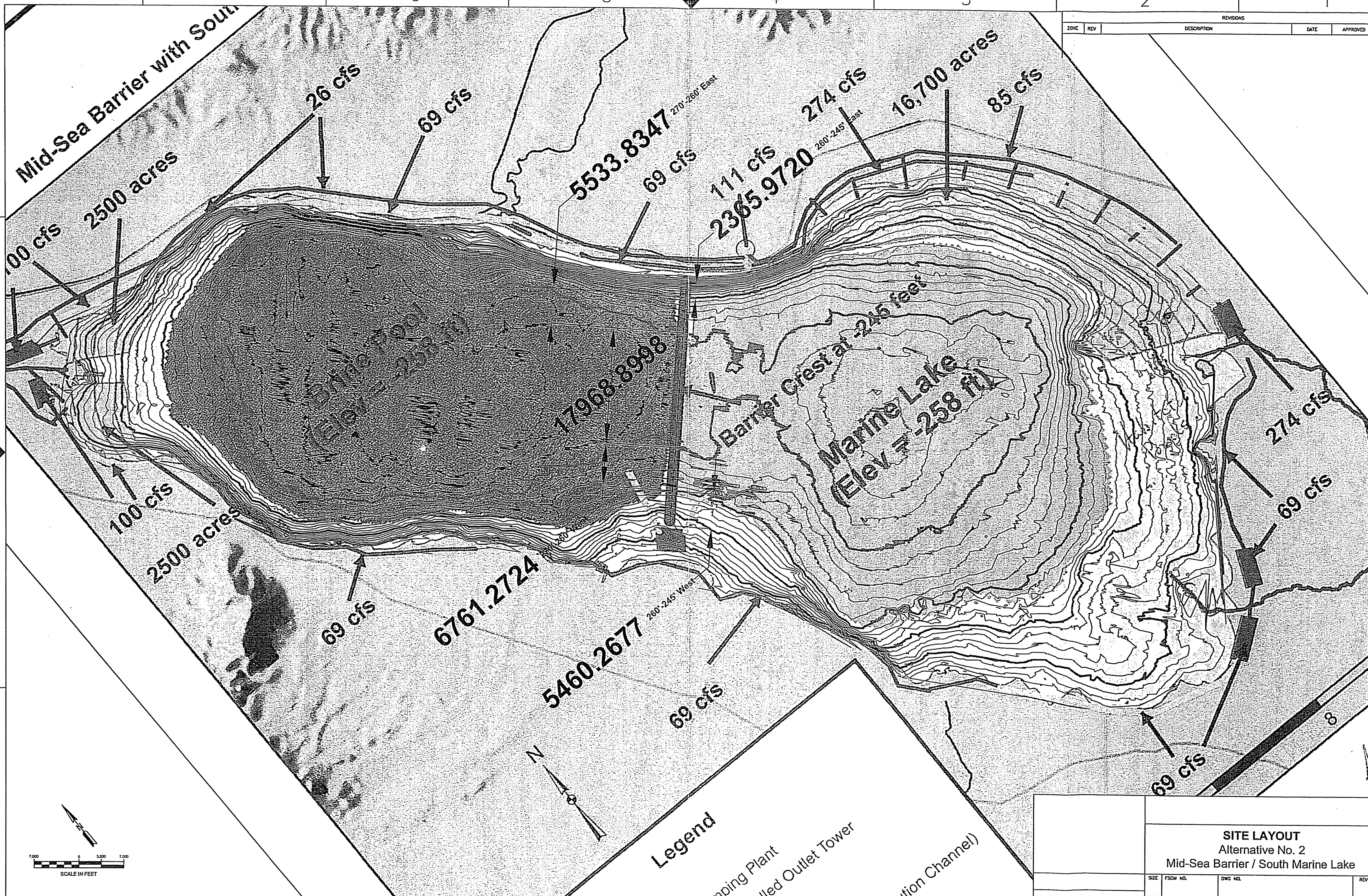
C. Landon




SITE LAYOUT
Alternative No. 2
Mid-Sea Barrier / South Marine Lake

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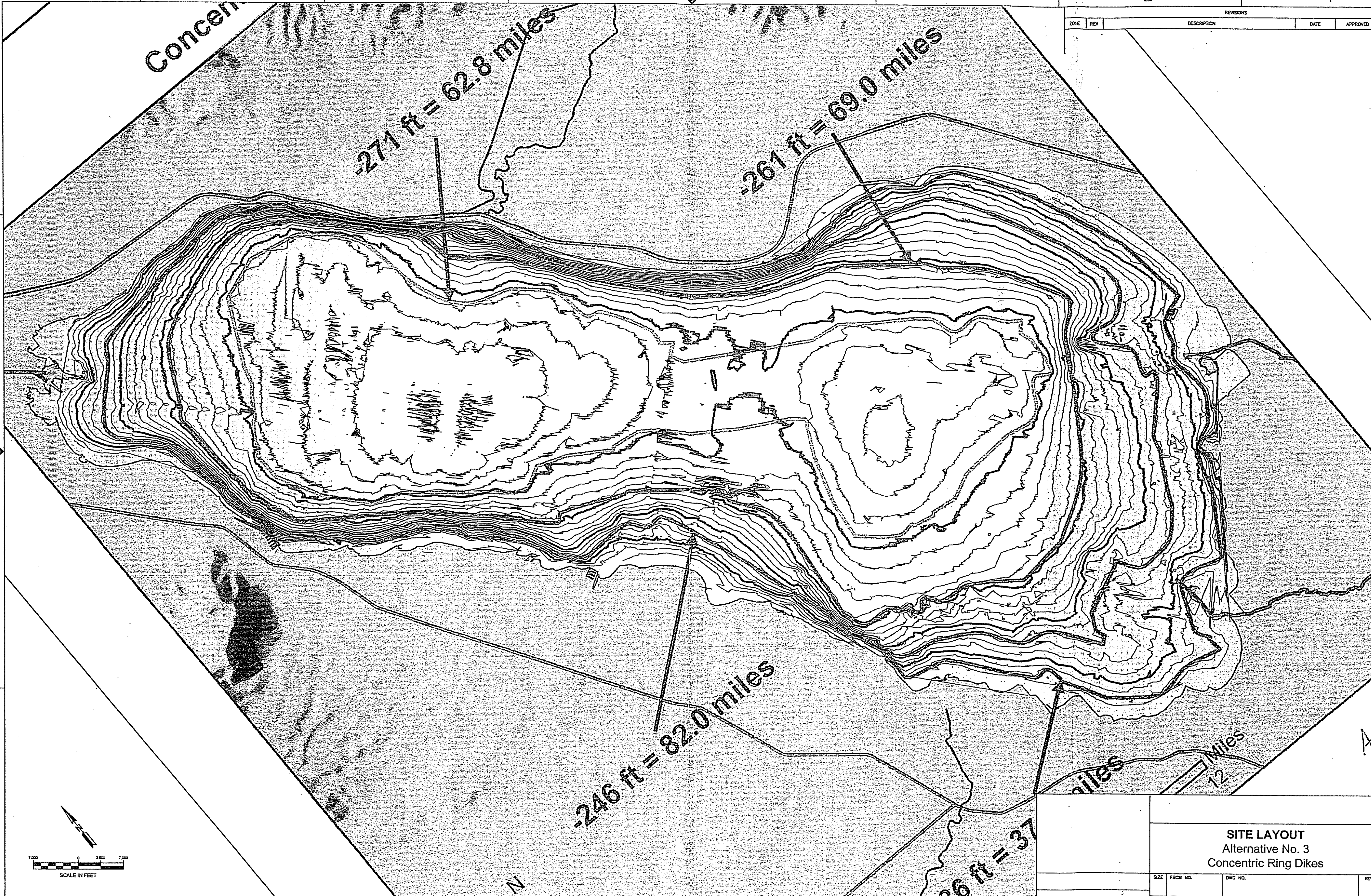
C. Landon




REVISIONS

| ZONE | REV | DESCRIPTION | DATE | APPROVED |
|---|---|---|---|---|

**SITE LAYOUT**
Alternative No. 3
Concentric Ring Dikes

SIZE | FSCM NO. | DWG NO. | REV
SCALE | SHEET

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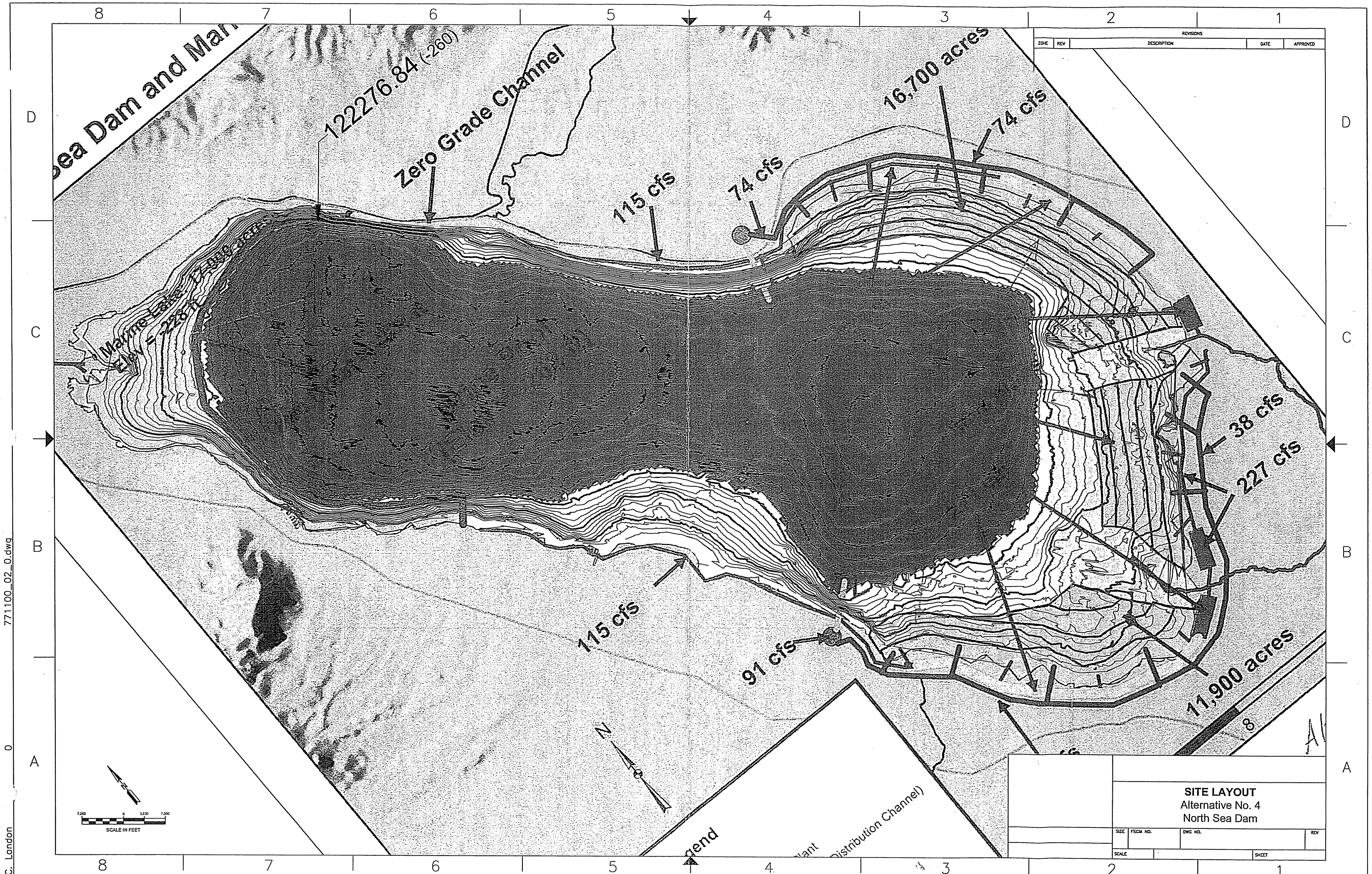
C. Landon


122276.84 (-260)
Zero Grade Channel
115 cfs
74 cfs
16,700 acres
74 cfs
38 cfs
227 cfs
11,900 acres
91 cfs
115 cfs
SCALE IN FEET
REVISIONS
ZONE
REV
DESCRIPTION
DATE
APPROVED
SITE LAYOUT
Alternative No. 4
North Sea Dam
SIZE
FSCM NO.
DWG NO.
REV
SCALE
SHEET
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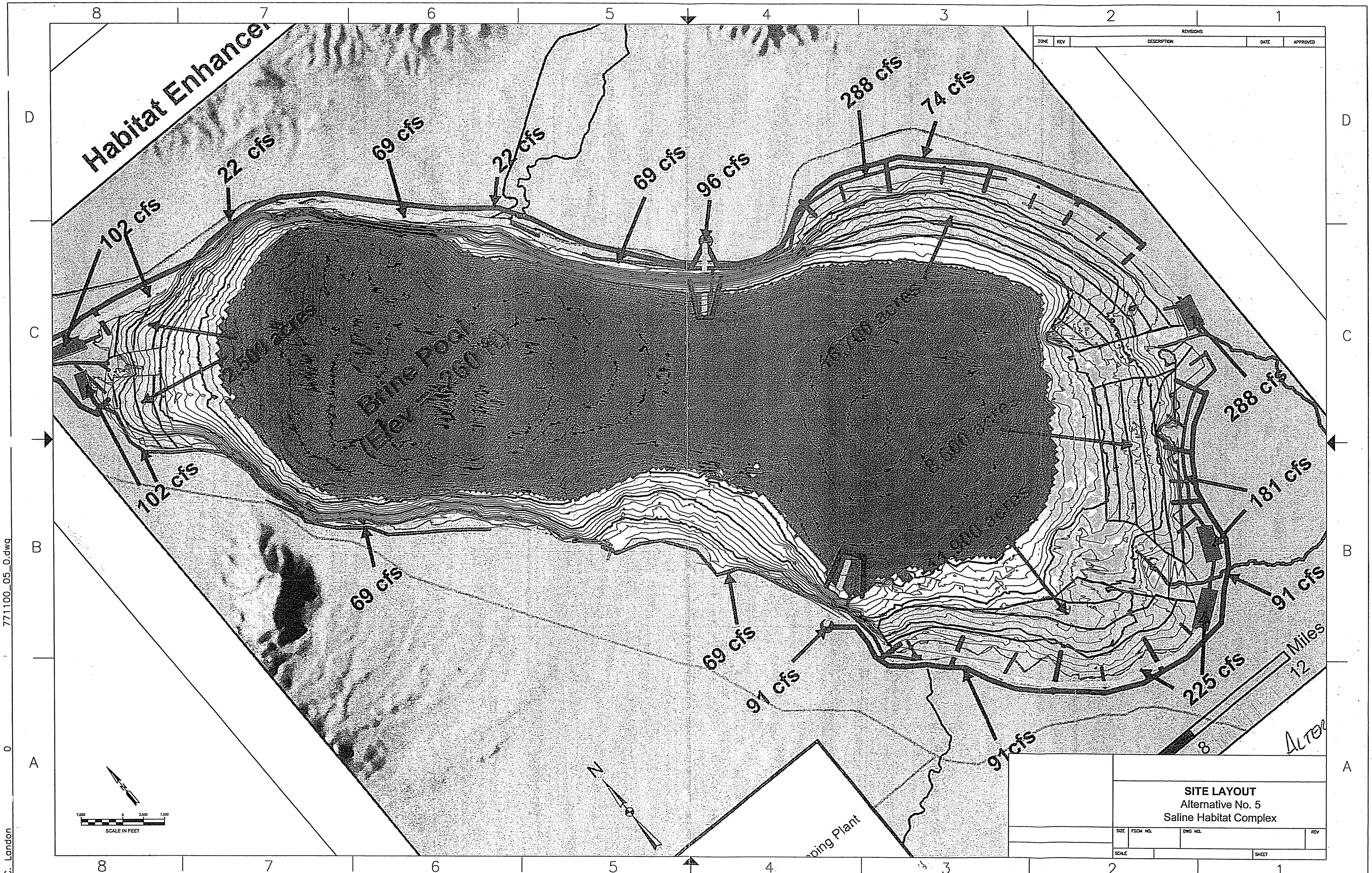
C. Landon

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C. Landon

# B. Embankment Length Estimation

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 2 of 1

Project Salton SEA – HABITAT POND Submitted by JIE YU Date 8/25/06

Project Number 71100 Reviewed by CDS Date 8/25/06

EMBANKMENT DIKE LENGTH ESTIMATION:

FOR 8,600 ACRES OF HABITAT POND AREA (See ATTACHED FIGURE i: ) 1" = 7000'

ESTIMATED LENGTH OF EMBANKMENT DIKE:

$$(3.2'' + 3.3'' + 3.5'' + 4.0'' + 4.7'' + 2.2'' + 2'') \cdot 7000 \text{ Ft/INCH}$$

$$= 22.9'' \cdot 7000 \text{ Ft/INCH} = 160300 \text{ FT.}$$

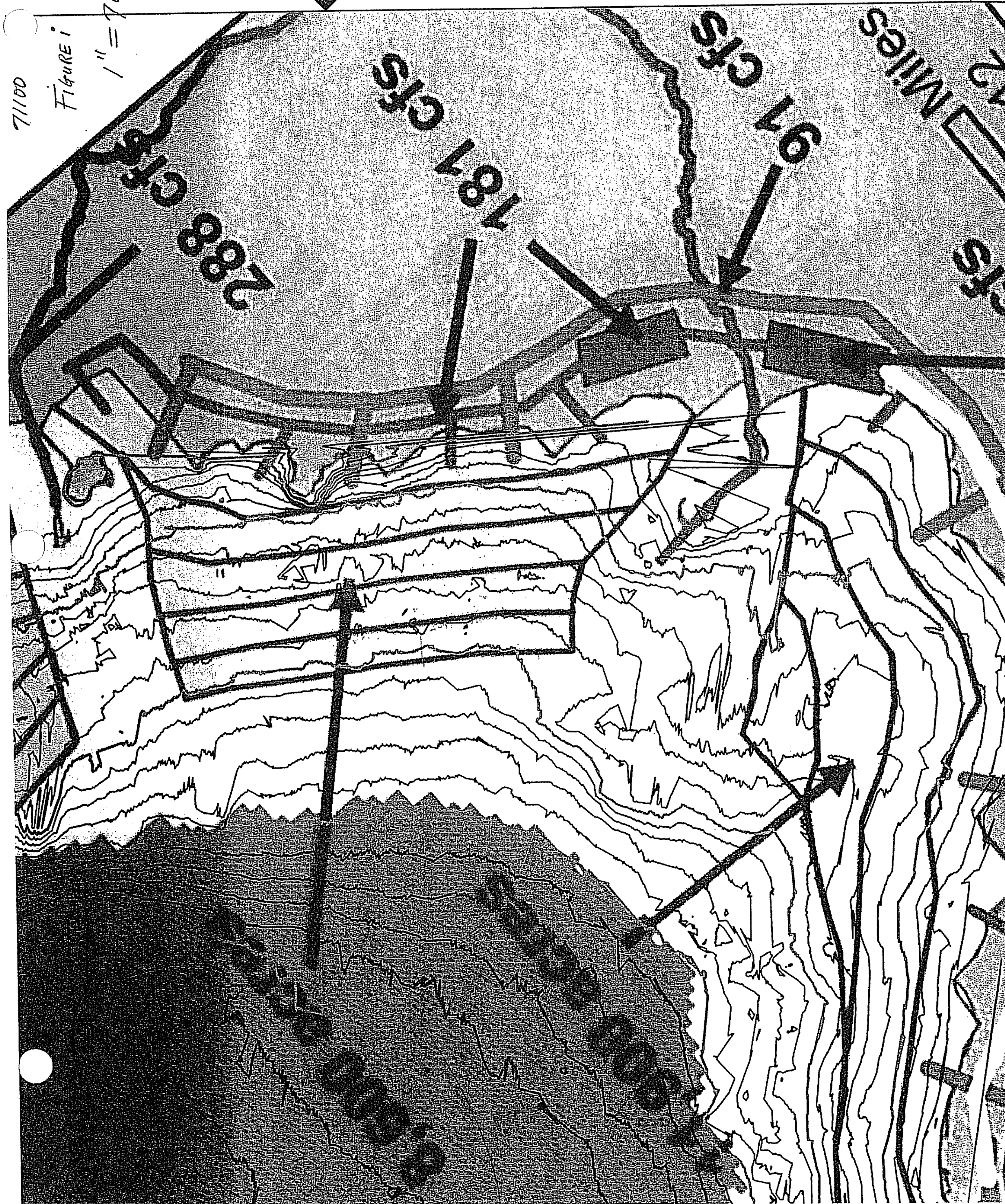
$$\frac{160300 \text{ FT}}{8,600 \text{ Acres}} = 18.64 \text{ FT/Acre}$$

FOR A 2500 Acres HABITAT POND AREA, ESTIMATED LENGTH OF EMBANKMENT DIKE IS APPROXIMATELY 46600 FEET. ✓

sheet 2 OF 2

B

7/100
Figure i
1" = 7000'



# C. Embankment Quantity Calculation

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 1 of 5

Project Salton Sea – MIDSEA DAM Submitted by JIE YU Date 8/21/06

Project Number 71100 Reviewed by CDS Date 8/24/06

MIDSEA DAM CROSS Section CALCULATION:

1. ASSUMPTIONS
   1, CREST ELEVATION: −225′ AND CREST WIDTH: 30′
   2. TOP OF FOUNDATION ELEVATION IS ASSUMED TO BE AT TOP OF SOFT LACUSTRINE AND/OR Alluvium DEPOSITS
   3. BOTTOM OF FOUNDATION ELEVATION IS ASSUMED TO BE AT BOTTOM OF SOFT LACUSTRINE AND/OR ALLUVIUM DEPOSITES.

2. AREA CALCULATION.
   SEE CROSS SECTION SCHEMATIC FIG. A
   EMBANKMENT HEIGHT (FROM TOP OF CREST TO TOP OF FOUNDATION)
   $H_E$
   FOUNDATION HEIGHT (FROM TOP TO BOTTOM OF FOUNDATION)
   $H_F$

   i, SAND/GRAVEL EMBANKMENT FILL (TYPE A)
      A. ABOVE FOUNDATION ELEVATION:
      $$30 \cdot H_E + 3 \cdot H_E \cdot H_E = 3H_E^2 + 30 H_E$$
      B. BELOW FOUNDATION ELEVATION:
      $$\{[(3 \cdot H_E) \cdot 2 + 30] + H_F\} \cdot H_F = [(6H_E + 30) + H_F] H_F = (6H_E + 30) \cdot H_F + H_F^2$$

   ∴ TOTAL SAND/GRAVEL EMBANKMENT FILL (TYPE A)
   $$\underline{3H_E^2 + 30 H_E + (6H_E + 30) \cdot H_F + H_F^2}$$ IN SQUARE FEET

KLEINFELDER

# DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 2 of 5

Project SALTON SEA – MIDSEA DAM    Submitted by JIE YU    Date 8/21/06

Project Number 71100    Reviewed by CDI    Date 8/24/06

ii, SAND/GRAVEL SHELL

STONE Column placement platform Type A material:

$(3H_E)\cdot H_E + (1.5H_E)\cdot H_E = 4.5\,H_E^2$    in SQ. FT. ✓

Stone Column placement platform Type B material

$(5H_E)\cdot H_E - (1.5H_E)\cdot H_E = 3.5\,H_E^2$    IN SQ. FT. ✓

iii length of Stone Column.

$N_1$ : Number of Stone Columns to be installed at <u>upstream</u> or <u>downstream</u> slope of THE Embankment at 10' interval per row.

$N_1 = 3H_E/10$ per Slope    Round down To Nearest INTEGER

$N_2$ : Number of stone Columns to be installed at crest of Embankment ✓

$N_2 = 2$

length of Stone Columns For 8.66' of Embankment (one row)

$$N_1\cdot H_E + 2(N_1)H_F + N_2\,(H_E+H_F)$$

$$=(H_E+2H_F)\cdot N_1 + 2\cdot(H_E+H_F)$$ ✓

length of Stone Columns per yard of Embankment

$$[(H_E+2H_F)\cdot N_1 + 2\,(H_E+H_F)]\cdot 3/8.66$$    IN FEET ✓

$N_1 = 18$

$$(18H_E + 36H_F + 2H_E + 2H_F)\cdot 3/8.66$$ ✓

$$=(20H_E + 38H_F)\cdot 3/8.66$$ ✓

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 3 of 5

Project SALTON SEA – MIDSEA DAM  Submitted by JIE YU  Date 8/21/06

Project Number 71100  Reviewed by CDC  Date 8/24/06

iv DREDGE OF SOFT LACUSTRINE DEPOSITS

$$[(3H_E)\cdot 2' + 30' + H_F]\cdot H_F = \underline{(6H_E + 30 + H_F)H_F}$$ ✓ (IN SQUARE FEET)

v DREDGE OF SEAFLOOR DEPOSITS

ASSUME SEAFLOOR DEPOSITS HEIGHT: $H_S$

$$\{[(3H_E)\cdot 2 + 30 + (5H_E)\cdot 2] + 3H_S\}\cdot H_S$$ ✓ ✓

$$= \{[6H_E + 30 + 10H_E] + 3H_S\}\cdot H_S$$

$$= \underline{[16H_E + 3H_S + 30]\cdot H_S}$$ (IN SQ FT) ✓

vi INSTALLATION OF SBC WALL WITH SYNTHETIC

ASSUMPTIONS: ① WIDTH OF SBC WALL SHOULD BE 5'

② BOTTOM OF SBC WALL SHOULD BE 40' BELOW BOTTOM OF FOUNDATION

∴ LENGTH OF SBC WALL: $\underline{H_E + H_F + 40}$ (IN FEET) ✓ ✓

∴ AREA OF SBC WALL/PER YARD: $3(H_E + H_F + 40)$ (IN SQ. FEET) ✓

**KLEINFELDER** **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 4 of 5

Project Salton Sea – Mid Sea Dam / North Sea Dam Submitted by Jie Yu Date 8/24/06

Project Number 71100 Reviewed by CDS Date 8/25/06

vii 3' FILTER SAND BLANKET (TYPE A) OVER SOFT LACUSTRINE

$5H_E \cdot 3 = 15 H_E$ IN SQ. FT.

viii 5' COARSE BLANKET DRAIN (TYPE B)

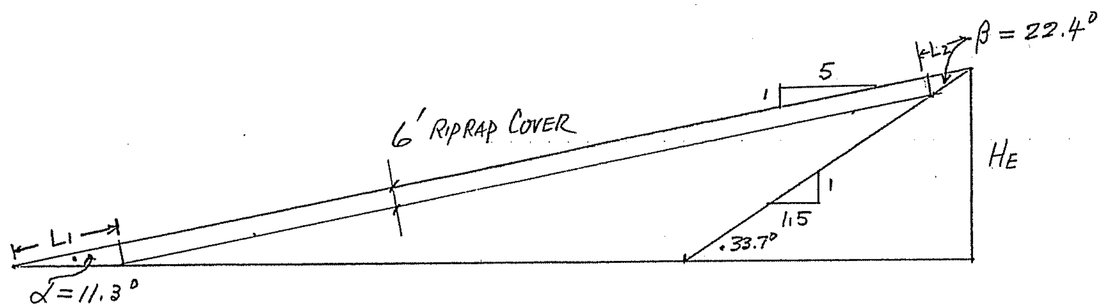
BOTTOM LENGTH: $3H_E + 1.5H_E + 15' - 50' - (1.5) \cdot 3' = 4.5 H_E - 39.5'$

HEIGHT: $5'$

TOTAL AREA $= [(4.5H_E - 39.5') - 5'(1.5)] \cdot 5' = (4.5H_E - 47') \cdot 5'$ IN SQ FT.

Stone Column portion $= [3H_E + 15 - 50 - 3\cdot(3) - \frac{5\cdot(1.5)+5(3)}{2}] \cdot 5 = [3H_E - 44 - 11.3] \cdot 5 = 15H_E - 276.5$ IN SQ FT

ix RIPRAP SLOPE PROTECTION:




$L_1 = \frac{6}{\tan 11.3^\circ} = 30'$

$L_2 = \frac{6}{\tan 22.4^\circ} = 14.6'$

$L_1 + L_2 = 44.6'$

UPSTREAM OR DOWNSTREAM RIPRAP AREA

$(\frac{H_E}{\sin 11.3^\circ} - L_1 - L_2) \cdot 6 + \frac{1}{2} L_1 \cdot 6 + \frac{1}{2} L_2 \cdot 6$

$= (\frac{H_E}{\sin 11.3^\circ} - 44.6) \cdot 6 + 3(L_1 + L_2) = \frac{6H_E}{\sin 11.3^\circ} - 267.6 + 133.8 = \frac{6H_E}{\sin 11.3^\circ} - 133.8$

$= 30.6 H_E - 133.8$ IN SQ.FT.

KLEINFELDER

# DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 5 of 5

Project Salton Sea Submitted by Jie Yu Date 8/29/06

Project Number 71100 Reviewed by ______ Date ______

X. Wick Drains.

$$2 \cdot \left( \frac{5 H_E}{5} + 1 \right) \cdot H_F = 2 \left( H_E + 1 \right) \cdot H_F \quad \text{in FT}$$

→ For 5' of Embankment.

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 1 of 7

Project Salton Sea – Mid Sea Barrier  Submitted by Jie Yu  Date 9/14/2006

Project Number 71100  Reviewed by [signature]  Date 9/18/06

MIDSEA BARRIER (SEISMIC DESIGN) — SEE FIG 4.14

1. ASSUMPTION:
   1. CREST ELEVATION: −245'; CREST WIDTH: 30'
   2. $H_E$: EMBANKMENT HEIGHT
   3. $H_F$: FOUNDATION HEIGHT
   4. $H_S$: SEAFLOOR DEPOSIT HEIGHT

2. AREA CALCULATION:

i, SAND/GRAVEL EMBANKMENT FILL (TYPE A)

A. ABOVE FOUNDATION:

$$30 \cdot H_E + 2H_E \cdot H_E = 2H_E^2 + 30 H_E \checkmark$$

B. BELOW FOUNDATION ELEVATION:

$$[(2H_E) \cdot 2 + 30 - H_F] \cdot H_F$$

$$= (4H_E + 30 - H_F) \cdot H_F \checkmark \quad \text{IN SQUARE FEET}$$

ii SAND/GRAVEL SHELL

STONE COLUMN PLACEMENT PLATFORM TYPE A MATERIAL

$$(1.5 H_E) \cdot H_E + (2.0 H_E) \cdot H_E = 3.5 H_E^2 \checkmark \quad \text{IN SQ FEET}$$

SAND/GRAVEL SHELL TYPE B MATERIAL

$$(3.0 H_E) \cdot H_E - (1.5 H_E) \cdot H_E = 1.5 H_E^2 \checkmark \quad \text{IN SQ. FEET.}$$

KLEINFELDER

# DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 2 of 7

Project Salton Sea – Mid Sea Barrier Submitted by Jie Yu Date 9/14/2006

Project Number 71100 Reviewed by [illegible] Date 9/18/06

iii Length of Stone Column:

$N_1$: Number of Stone Columns to be installed at upstream or downstream slope of the Embankment at 10' interval per row

$$N_1 = 2.0H_E/10 \quad \text{IF } H_E = 41'; \quad \frac{2.0H_E}{10'} = \frac{2\cdot 41'}{10'} = 8.2$$

$$\text{use } N_1 = 8$$

$N_2$: Number of Stone Columns to be installed at crest of Embankment

$$N_2 = 2$$

Length of Stone Columns for 8.66' of Embankment (one row)

$$N_1 \cdot H_E + 2(N_1)\cdot H_F + N_2(H_E + H_F)$$

$$= (H_E + 2H_F)\cdot N_1 + 2(H_E + H_F)$$

iv Dredge of Soft Lacustrine Deposits

$$[(2H_E)\cdot 2 + 30 - H_F]\cdot H_F = (4H_E + 30 - H_F)\cdot H_F \quad \text{in SQ FT.}$$

v Dredge of Seafloor Deposits:

$$[(2H_E)\cdot 2 + 30 + (3H_E)\cdot 2 + 3H_S]\cdot H_S$$

$$= [4H_E + 30 + 6H_E + 3H_S]\cdot H_S$$

$$= (10H_E + 3H_S + 30)\cdot H_S$$

# KLEINFELDER — DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 3 of 7

Project Salton Sea – Mid Sea Barrier    Submitted by Jie Yu    Date 9/14/2006

Project Number ______    Reviewed by Co[illegible]    Date 9/18/06

vi INSTALLATION OF SCB WALL

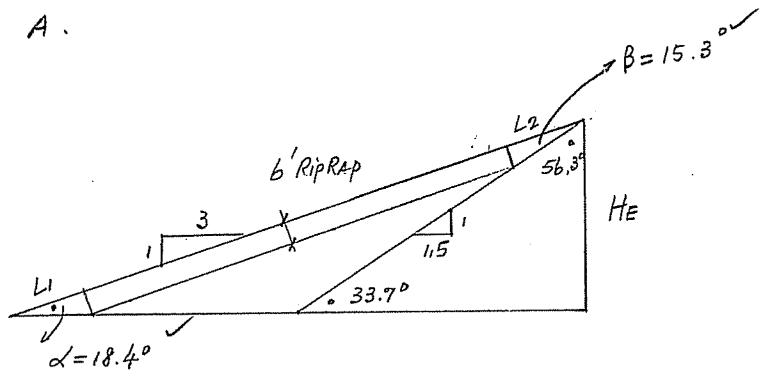
1. WIDTH OF SCB WALL SHOULD BE 5'

2. BOTTOM OF SCB WALL SHOULD BE 40' BELOW BOTTOM OF FOUNDATION

$\therefore$ LENGTH OF SCB WALL : $H_E + H_F + 40$ ✓    IN FT

vii RIPRAP SLOPE PROTECTION

A.




$$L_1 = \frac{6}{\tan 18.4^\circ} = 18.0'$$

$$\therefore L_1 + L_2 = 39.9'$$

$$L_2 = \frac{6}{\tan 15.3^\circ} = 21.9'$$

upstream OR DOWNSTREAM RipRap AREA

$$\left(\frac{H_E}{\sin 18.4^\circ} - L_1 - L_2\right)\cdot 6 + \frac{1}{2} L_1 \cdot 6 + \frac{1}{2} L_2 \cdot 6$$

$$= \left(\frac{H_E}{\sin 18.4^\circ} - 39.9'\right)\cdot 6 + 3\,(39.9') = \frac{6}{\sin 18.4^\circ}\cdot H_E - 3\,(39.9')$$

$$= 19 H_E - 119.7$$ ✓    IN SQ FT

→ B. RipRap ON TOP OF CREST

$$[(2.0 H_E)\cdot 2 + 30 + 6 \cdot 1.5]\cdot 6$$

$$= (4H_E + 30 + 9)\cdot 6$$

$$= (4H_E + 39)\cdot 6 = 24 H_E + 234$$ ✓    IN SQ FT

KLEINFELDER

# DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 4 of 7

Project SALTON SEA - MIDSEA BARRIER Submitted by JIE YU Date 9/14/06

Project Number ______ Reviewed by CGL Date 9/18/06

viii Wick Drains

Assume : Wick Drains will be installed at 5'x5' Grid in Foundation Soil

$$\left[ \left( \frac{3 H_E}{5} + 1 \right) \cdot H_F \right] \cdot 2$$

$$= 2 H_F \left( \frac{3}{5} H_E + 1 \right) ✓$$

**KLEINFELDER** **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 5 of 7

Project SALTON SEA – MIDSEA BARRIER Submitted by JIE YU Date 9/14/06

Project Number 71100 Reviewed by [signature] Date 9/13/06

MIDSEA BARRIER (NON-SEISMIC DESIGN) — SEE FIG 4.14

1. ASSUMPTIONS:

   1, CREST ELEVATION: −245'; CREST WIDTH: 30'

   2. $H_E$: EMBANKMENT HEIGHT

   3. $H_F$: FOUNDATION HEIGHT

   4. $H_S$. SEAFLOOR DEPOSITS HEIGHT

2. AREA CALCULATION:

   i, SAND/GRAVEL EMBANKMENT FILL (TYPE A)

      A. ABOVE FOUNDATION

      $30 H_E + 1.5 H_E \cdot H_E = 1.5 H_E^2 + 30 H_E$ ✓ IN SQ FT

      B. BELOW FOUNDATION

      $[(1.5 H_E) \cdot 2 + 30 - H_F] \cdot H_F$

      $= (3 H_E + 30 - H_F) \cdot H_F$ ✓ IN SQ FT

   ii, SAND/GRAVEL SHELL (TYPE B)

      $(5 H_E) \cdot H_E - (1.5 H_E) \cdot H_E = 3.5 H_E^2$ ✓ IN SQ FT.

   iii LENGTH OF STONE COLUMNS

      (NOT APPLICABLE) ✓

   iv DREDGE OF SOFT LACUSTRINE DEPOSITS

      $[(1.5 H_E) \cdot 2 + 30 - H_F] \cdot H_F = (3 H_E + 30 - H_F) \cdot H_F$ ✓ IN SQ FT

**KLEINFELDER** — **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 6 of 7

Project: SALTON SEA – MID SEA BARRIER    Submitted by: JIE YU    Date: 9/14/06

Project Number: 71100    Reviewed by: COL    Date: 9/18/06

V. DREDGE OF SEAFLOOR DEPOSITS

$$[(5H_E)\cdot 2 + 30 + 3H_s]\cdot H_s$$

$$= (10H_E + 30 + 3H_s)\cdot H_s \quad \text{IN SQ FT}$$

VI INSTALLATION OF SCB WALL

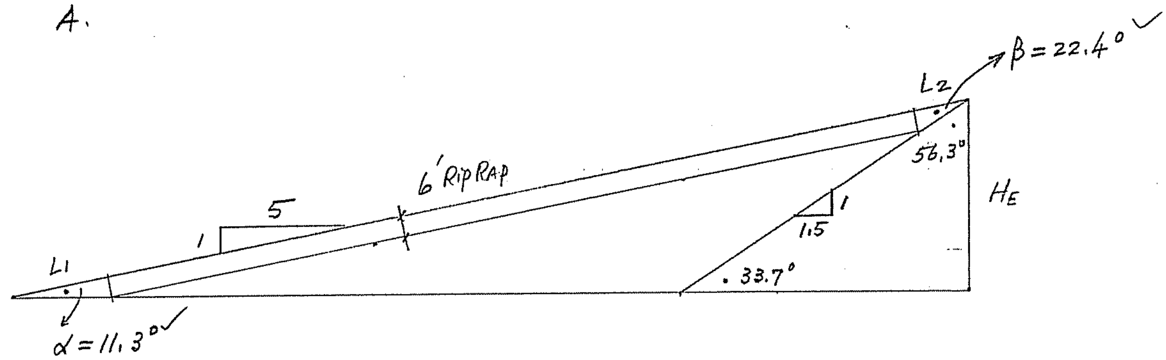
Assume: 1. WIDTH OF SCB WALL SHOULD BE 5'

2. BOTTOM OF SCB WALL SHOULD BE 40' BELOW BOTTOM OF FOUNDATION

∴ LENGTH OF SCB WALL: $H_E + H_F + 40$ IN FT

VII RIPRAP SLOPE PROTECTION:

A.




$$L_1 = \frac{6}{\tan 11.3°} = 30'$$

$$L_2 = \frac{6}{\tan 22.4°} = 14.6'$$

$$\therefore L_1 + L_2 = 44.6'$$

upstream OR Downstream RipRap AREA

$$\left(\frac{H_E}{\sin 11.3°} - L_1 - L_2\right)\cdot 6 + \frac{1}{2}L_1\cdot 6 + \frac{1}{2}L_2\cdot 6 = \frac{6H_E}{\sin 11.3°} - 3(L_1+L_2)$$

$$= 30.6H_E - 133.8 \quad \text{IN SQ FT}$$

**KLEINFELDER** **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 7 of 7

Project SALTON SEA – MIDSEA BARRIER Submitted by JIE YU Date 9/14/06

Project Number 71100 Reviewed by [signature] Date 9/18/06

B. RipRap on Top of CREST

$(30 + 6 \cdot 1.5) \cdot 6 = 39 \cdot 6 = 234$ ✓ IN SQ FT.

viii Wick Drains

Assume : Wick Drains will be installed at 5' x 5' Grid in Foundati Soil.

$$\left[\left(\frac{5H_E - 1.5H_E}{5} + 1\right) \cdot H_F\right] \cdot 2$$

$$= 2H_F\left(\frac{3.5H_E}{5} + 1\right)$$ ✓

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 1 of 4

Project South Sea Dam - Fault movement Resistance Version Submitted by Jie Yu Date 9/29/2006

Project Number 71100 Reviewed by ______ Date ______

South Sea Dam:

1. Assumption:
   1. crest Elevation: $-220$, crest width: $30'$
   2. $H_E$: Embankment Height
   3. $H_F$: Foundation Height
   4. $H_S$: Seafloor Deposits Thickness
   5. upstream pool El: $-230$

2. Area Calculation:

i, Sand/Gravel Embankment Fill (Type A)

A. Embankment

$$30 \cdot H_E + (1.5 H_E) \cdot H_E = 1.5 H_E^2 + 30 H_E \quad \text{in SQ FT}$$

B. Foundation

$$[2(1.5 H_E) + 30 - H_F] \cdot H_F = (3 H_E + 30 - H_F) \cdot H_F \quad \text{in SQ FT}$$

ii Sand/Gravel Shell

Stone Column placement platform Type A Material

$$(1.5 H_E) \cdot H_E + (1.5 H_E) \cdot H_E = 3 H_E^2 \quad \text{in SQ FT}$$

Sand/Gravel Shell Type B Material

$$2 \cdot (20') \cdot H_E = 40 H_E \quad \text{in SQ FT}$$

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 2 of 4

Project South Sea dam – Fault resistance   Submitted by JIE YU   Date 9/29/2006

Project Number 71100   Reviewed by ______ Date ______

iii LENGTH OF STONE Column:

$N_1$ : NUMBER OF STONE Columns TO BE INSTALLED AT upstream OR DOWN Stream slope OF EmBankment

$$N_1 = \frac{1.5 H_E}{10}$$ ROUND down TO NEAREST INTERGER

$N_2$ : NUMBER OF STONE Columns TO BE INSTALLED AT crest OF EmBankment

$$N_2 = 2$$

LENGTH OF stone Column FOR 8.66' OF EmBankment (one row)

$$N_1 \cdot H_E + 2(N_1) \cdot H_F + N_2 (H_E + H_F)$$

$$= (H_E + 2H_F) \cdot N_1 + 2(H_E + H_F)$$

iv DREDGE OF SOFT LACUSTRINE Deposits

$$[(1.5 H_E) \cdot 2 + 30 - H_F] \cdot H_F = (3H_E + 30 - H_F) \cdot H_F$$ IN SQ FT

V DREDGE OF SEAFloor Deposits

$$[(1.5 H_E) \cdot 2 + 30 + (1.5 H_E) \cdot 2 + (40') \cdot 2 + (2.5 H_E - 1.5 H_E) \cdot 2 + 3 H_S] \cdot H_S$$

$$= [3H_E + 30 + 3H_E + 80 + 2H_E + 3H_S] \cdot H_S$$

$$= [8H_E + 110 + 3H_S] \cdot H_S$$

vi INSTALLATION OF SCB WAll

Assume : WIDTH OF SCB WAll is 9'

Bottom OF SCB WAll SHould BE 40' BElow Bottom OF FOUNDATION

$\therefore$ LENGTH OF SCB WAll : $H_E + H_F + 40$   IN FT

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 3 of 4

Project South Sea Dam – Fault resistance  Submitted by JIE YU  Date 9/29/2006

Project Number 71100  Reviewed by ______ Date ______

VI 5' COARSE BLANKET DRAIN LAYER

Bottom LENGTH : $1.5H_E + 1.5H_E + 15' - 20 = 3H_E - 5$

Height : $5'$

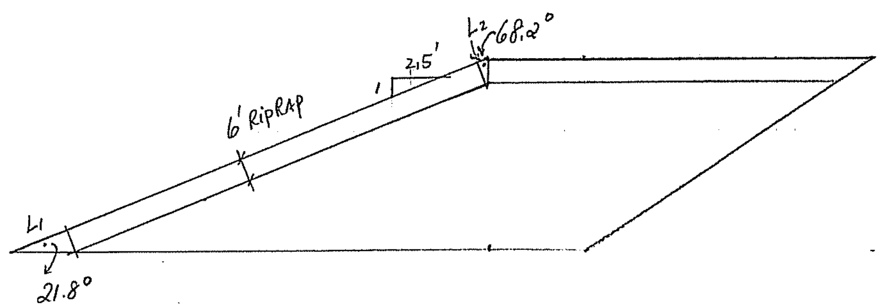
TOTAL AREA $= [3H_E - 5' - 5'(1.5)] \cdot 5'$

$= (3H_E - 5' - 7.5') \cdot 5' = 15H_E - 62.5$ IN SQ FT

Stone Column portion :

$(15H_E - 62.5) - (1.5H_E) \cdot 5 = 7.5H_E - 62.5$ IN SQ FT

VII RipRap




$L_1 = \frac{6}{\tan 21.8°} = 15'$  $L_2 = \frac{6}{\tan 68.2°} = 2.4'$  $L_1 + L_2 = 15 + 2.4 = 17.4'$

ONE SIDE OF EMBANK-MENT

A. upstream or downstream Rip Rap AREA

$(\frac{H_E}{\sin 21.8°} - L_1 - L_2) \cdot 6 + \frac{1}{2} L_1 \cdot 6' + \frac{1}{2} L_2 \cdot 6' = (\frac{H_E}{\sin 21.8°} - 17.4') \cdot 6 + 3(17.4')$

$= \frac{6H_E}{\sin 21.8°} - 3(17.4') = 16.2H_E - 52.2$ IN SQ FT

B. Rip RAP ON Top OF FINE Rock Fill

$[20' - \frac{1}{2} \cdot 6 \cdot (1.5)] \cdot 6' = (20 - 4.5) \cdot 6 = 93$ IN SQ FT

$A + B = 16.2H_E - 52.2 + 93 = \underline{16.2H_E + 40.8}$ IN SQ FT

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 4 of 4

Project South Sea Dam – Fault resistance Submitted by JIE YU Date 9/29/2006

Project Number 7110C Reviewed by ______ Date ______

viii Wick Drain

Assume: Wick Drain will be installed at a 5'x 5' Grid

$$2 \cdot \left[ \frac{1.5H_E + 40' + (2.5H_E - 1.5H_E)}{5} + 1 \right] \cdot H_F$$

$$= 2 \cdot \left[ \frac{2.5H_E + 40'}{5} + 1 \right] \cdot H_F = 2H_F \left( \frac{2.5H_E + 40'}{5} + 1 \right)$$

ix Fine Rock Fill:

$$2 * \left\{ \left[ (2.5H_E - 1.5H_E) + 20' \right] + 20' \right\} \frac{H_E}{2} - \text{RipRap Area}$$

$$= \left\{ (H_E + 20') + 20' \right\} \cdot H_E - 2(16.2H_E + 40.8)$$

$$= (H_E + 40') \cdot H_E - 32.4H_E - 81.6$$

$$= \underline{H_E^2 + 7.6H_E - 81.6}$$ IN SQ FT

# KLEINFELDER — DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 1 of 5

Project: Salton Sea – perimeter Dike and South Sea dam — Submitted by: Jie Yu — Date: 8/23/2006

Project Number: 71100 — Reviewed by: CDS — Date: 8/24/06

PERIMETER DIKE AND SOUTH SEA DAM:

1. ASSUMPTION:
   1. Crest Elevation: −225; Crest width: 20′, ✓
   2. $H_E$: Embankment Height
   3. $H_F$: Foundation Height
   4. $H_S$: Seafloor Deposit Height
   5. upstream pool El: −230

2. AREA Calculation:
   i) SAND/GRAVEL EMBANKMENT Fill (TYPE A)

   A. EMBANKMENT

   $$20 \cdot H_E + (1.5 H_E) \cdot H_E = 1.5 H_E^2 + 20 H_E$$ ✓ IN SQ FT ✓

   B. FOUNDATION

   $$[2(1.5 H_E) + 20' - H_F] \cdot H_F = (3H_E + 20 - H_F) \cdot H_F$$ ✓ IN SQ.FT ✓

   ii) SAND/GRAVEL SHELL

   stone Column placement platform Type A MATERIAL:

   $$(1.5 H_E) \cdot H_E + (1.5 H_E) \cdot H_E = 3 H_E^2$$ ✓ ✓ IN SQ.FT.

   stone Column placement platform Type B MATERIAL:

   $$(2.5 H_E) \cdot H_E - (1.5 H_E) \cdot H_E = 1\ H_E^2$$ ✓ ✓ IN SQ.FT.

   iii) LENGTH OF STONE Column.

   $N_1$: Number of STONE Columns To BE INSTALLED AT upstream OR Downstream slope of The Embankment at 10′ interval per row

   perimeter dike: $N_1 = \frac{1.5 H_E}{10} = \frac{1.5 \cdot 18.3'}{10} = 2.75$ use $N_1 = 2$ For perimeter dike ✓

   South Sea dam: $N_1 = \frac{1.5 H_E}{10} = \frac{1.5 \cdot 27'}{10} = 4.05$ use $N_1 = 4$ FOR South Sea Dam.

   $N_2$: Number of STONE Column To BE INSTALLED AT CREST OF Embankment ✓

   $N_2 = 2$.

**KLEINFELDER** **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 2 of 5

Project Salton Sea – perimeter Dike and South Sea dam Submitted by JIE YU Date 8/23/2006

Project Number 71100 Reviewed by ODS Date 8/24/06

length of Stone Column For 8.66' of Embankment (one Row)

$$N_1 \cdot H_E + 2(N_1) \cdot H_F + N_2(H_E + H_F) = (H_E + 2H_F)N_1 + 2(H_E + H_F$$

length of Stone Column For per yard of Embankment

$$(5H_E + 8H_F) \cdot 3/8.66 \quad \text{in FT.}$$

LDin Perimeter Dike

iv Dredge of Soft Lacustrine Deposits

$$[(1.5H_E) \cdot 2 + 20 - H_F] \cdot H_F = (3H_E + 20 - H_F) \cdot H_F \quad \text{in SQ.FT}$$

v Dredge of Seafloor Deposits

$$[(1.5H_E) \cdot 2 + 20 + (2.5H_E) \cdot 2 + 3H_S] \cdot H_S$$

$$= [3H_E + 20 + 5H_E + 3H_S] \cdot H_S$$

$$= (8H_E + 20 + 3H_S) \cdot H_S \quad \text{in SQ.FT}$$

vi Installation of SBC Wall with Synthetic

Assume: 1. Width of SBC Wall should be 3'

2. Bottom of SBC Wall should be 40' below Bottom of Foundation

∴ length of SBC Wall: $H_E + H_F + 40$ in FT

∴ Area of SBC Wall / per yard of Embankment:

$$3(H_E + H_F + 40) \quad \text{in SQ FT}$$

**KLEINFELDER** **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 3 of 5

Project Salton Sea – perimeter Dike and South Sea dam  Submitted by JIE YU  Date 8/25/06

Project Number 71100  Reviewed by CDS  Date 8/25/06

vi  3' COARSE BLANK DRAIN LAYER (TYPE C)

For perimeter dike  Bottom length: $1.5H_E + 1.5H_E + 10 - 10 = 3H_E$ ✓

HEIGHT: 3'

TOTAL AREA $= [3H_E - 3'(1.5)] \cdot 3' = (3H_E - 4.5) \cdot 3 = \underline{9H_E - 13.5}$ ✓ IN SQ.FT

Stone Column portion $= (9H_E - 13.5) - (1.5H_E) \cdot 3 = 4.5H_E - 13.5$ IN SQ. FT.

For South Sea DAM

Bottom length: $1.5H_E + 1.5H_E + 10 - 20 = 3H_E - 10$

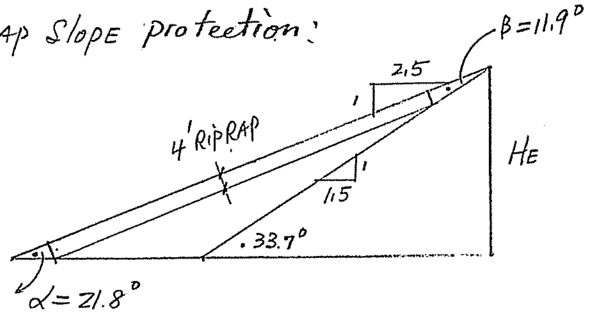
HEIGHT: 3'

TOTAL AREA $= [3H_E - 10' - 3'(1.5)] \cdot 3' = (3H_E - 14.5) \cdot 3 = \underline{9H_E - 43.5}$ ✓ SQ FT

Stone Column portion $= (9H_E - 43.5) - (1.5H_E) \cdot 3 = 4.5H_E - 43.5$ IN SQ.FT. ✓

vii  RipRap Slope protection:

For perimeter Dike:




$L_1 = \frac{4}{\tan 21.8^\circ} = 10$

$L_1 + L_2 = 29$

$L_2 = \frac{4}{\tan 11.9^\circ} = 19$

A. Upstream OR DownStream RipRap AREA

$\left(\frac{H_E}{\sin 21.8} - L_1 - L_2\right) \cdot 4 + \frac{1}{2} L_1 \cdot 4 + \frac{1}{2} \cdot L_2 \cdot 4 = \left(\frac{H_E}{\sin 21.8} - 29\right)4 + 2 \cdot (29)$

$= \underline{10.8 H_E - 58}$  IN SQ.FT ✓

B. RipRap ON Top of CREST

$[(1.5H_E) \cdot 2 + 20 + 4 \cdot 1.5] \cdot 4$ ✓

$= (3H_E + 26) \cdot 4 = \underline{12H_E + 104}$  IN SQ. FT.

# KLEINFELDER DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 4 of 5

Project Salton Sea – perimeter Dike and South Sea dam Submitted by JIE YU Date 8/25/2006

Project Number 71100 Reviewed by ODS Date 8/25/06

For South Sea Dam:

See Above Figure: use 6' of RipRap

$$L_1 = \frac{6}{\tan 21.8^\circ} = 15 \checkmark$$

$$L_1 + L_2 = 43.5$$

$$L_2 = \frac{6}{\tan 11.9^\circ} = 28.5 \checkmark$$

A. upstream or Down stream RipRap AREA

$$\left(\frac{H_E}{\sin 21.8} - L_1 - L_2\right)\cdot 6 + \frac{1}{2}L_1\cdot 6 + \frac{1}{2}L_2\cdot 6$$

$$= \left(\frac{H_E}{\sin 21.8^\circ} - 43.5\right)\cdot 6 + 3\cdot 43.5 = 16.2\,H_E - 3\cdot 43.5$$

$$= \underline{16.2\,H_E - 130.5} \qquad \checkmark \text{ IN SQ. FT}$$

B. RIPRAP ON TOP OF CREST

$$[(1.5H_E)\cdot 2 + 20 + 6\cdot 1.5)]\cdot 6$$

$$= (3H_E + 29)\cdot 6 = \underline{18H_E + 174} \qquad \checkmark \text{ IN SQ. FT.}$$

KLEINFELDER **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 5 of 5

Project Salton SEA – perimeter Dike and South Sea Dam Submitted by JIE YU Date 8/25/2006

Project Number ______ Reviewed by CDl Date 8/25/06

Viii Wick DRAINS

Assume: Wick Drains will be installed at a 5'x5' grid in Foundation

For perimeter dike:

$$2\left(\frac{2.5H_E}{5}+1\right)\cdot H_F = \underbrace{2\left(\frac{H_E}{2}+1\right)}_{\text{For 5' of EmBankment}}\cdot H_F \quad \checkmark \quad \text{IN FT}$$

For South Sea Dam:

$$2\left(\frac{2.5H_E}{5}+1\right)\cdot H_F = \underbrace{2\left(\frac{H_E}{2}+1\right)}_{\text{For 5' OF EmBankment}}\cdot H_F \quad \checkmark \quad \text{IN FT}$$

**KLEINFELDER** **DAILY REPORT**

Date ______ Weather ______ Hours ______ Miles ______ Sheet 1 of 3

Project Salton Sea – North Sea Dam  Submitted by Jie Yu  Date 8/24/2006

Project Number 71100  Reviewed by CDS  Date 8/24/06

North Sea Dam

1. Assumption:

   1, Crest Elevation = −223, Crest width: 30'

   2. $H_E$: Embankment Height

   3. $H_F$: Foundation Height

   4. $H_S$: Sea Floor Deposits Height

2. Area Calculation:

   i, Sand/Gravel Embankment Fill (Type A)

   A. Above Foundation Elevation:

   $$(30)\cdot H_E + (3\cdot H_E)\cdot H_E = 3H_E^2 + 30H_E \quad ✓ \qquad \text{in sq. ft.}$$

   B. Below Foundation Elevation:

   $$\{[(3\cdot H_E)\cdot 2 + 30] + H_F\}\cdot H_F = (6H_E + 30 + H_F)\cdot H_F$$

   $$= (6H_E + 30)\cdot H_F + H_F^2 \quad ✓ \qquad \text{in sq. ft.}$$

   ii) Sand/Gravel Shell

   Stone column placement platform Type A material:

   $$(3H_E)\cdot H_E + (1.5H_E)\cdot H_E = 4.5H_E^2 \; ✓ \qquad \text{in sq. ft.}$$

   Stone column placement platform Type B material:

   $$(5H_E)\cdot H_E - (1.5H_E)\cdot H_E = 3.5H_E^2 \; ✓ \qquad \text{in sq. ft}$$

# KLEINFELDER DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 2 of 3

Project Salton Sea – North Sea Dam Submitted by Jie Yu Date 8/24/2006

Project Number 71100 Reviewed by CPS Date 8/24/06

iii Length of Stone Column

$N_1$: Number of Stone Columns to be installed at upstream or down stream slope of the embankment at 10' interval per row

$$N_1 = \frac{3 \cdot H_E}{10} \quad \text{Round down to Nearest Interger}$$

$N_2$: Number of Stone columns to be installed at crest of embankment

$$N_2 = 2$$

Length of Stone Columns For 8.66' of Embankment (One Row)

$$N_1 \cdot H_E + 2(N_1) \cdot H_F + N_2 (H_E + H_F)$$

$$= (H_E + 2H_F) \cdot N_1 + 2(H_E + H_F) \checkmark$$

iv Dredge of Soft Lacustrine Deposits

$$[(3H_E) \cdot 2 + 30 + H_F] \cdot H_F = (6H_E + 30 + H_F) \cdot H_F \checkmark \quad \text{in SQ.FT}$$

v Dredge of Sea Floor Deposits

$$\{[(3H_E) \cdot 2 + 30 + (5H_E) \cdot 2] + 3H_S\} \cdot H_S$$

$$= \{[6H_E + 30 + 10H_E] + 3H_S\} H_S$$

$$= (16H_E + 30 + 3H_S) \cdot H_S \checkmark \quad \text{in SQ.FT.}$$

vi Installation of SBC Wall with Synthetic

Assumptions: 1. Width of SBC Wall should be 5'

2. Bottom of SBC Wall should be 40' Below Bottom of Foundation

$\therefore$ length of SBC Wall: $H_E + H_F + 40$ (in Feet)

# KLEINFELDER — DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 3 of 3

Project Salton Sea – Mid Sea Dam / North Sea Dam Submitted by Jie Yu Date ______

Project Number 71100 Reviewed by CDS Date 8/25/06

VII 3' FILTER SAND BLANKET (TYPE A) OVER SOFT LACUSTRINE

$5H_E \cdot 3 = 15H_E$ IN SQ.FT.

VIII 5' COARSE BLANKET DRAIN (TYPE B)

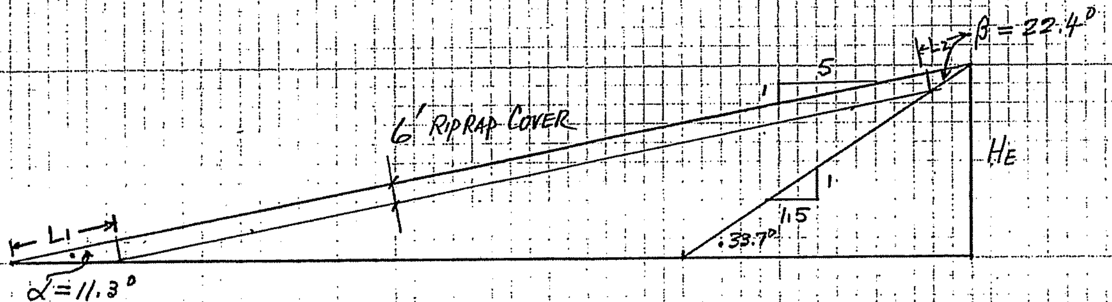
BOTTOM LENGTH: $3H_E + 1.5H_E + 15' - 50' - (1.5)3' = 4.5H_E - 39.5'$

HEIGHT: $5'$

TOTAL AREA $= [(4.5H_E - 39.5') - 5'(1.5)] \cdot 5' = (4.5H_E - 47') \cdot 5'$ IN SQ FT.

Stone Column portion $= [3H_E + 15 - 50 - 3(3) - \frac{5(1.5)+5(3)}{2}] \cdot 5 = [3H_E - 44 - 11.3] \cdot 5 = 15H_E - 276.5$ IN SQF

IX RipRap SLOPE PROTECTION:




$L_1 = \frac{6}{\tan 11.3^\circ} = 30'$

$L_2 = \frac{6}{\tan 22.4^\circ} = 14.6'$

$L_1 + L_2 = 44.6'$

UPSTREAM OR DOWNSTREAM RipRap AREA

$$\left(\frac{H_E}{\sin 11.3^\circ} - L_1 - L_2\right) 6 + \frac{1}{2} L_1 \cdot 6 + \frac{1}{2} L_2 \cdot 6$$

$$= \left(\frac{H_E}{\sin 11.3^\circ} - 44.6\right) \cdot 6 + 3(L_1 + L_2) = \frac{6H_E}{\sin 11.3^\circ} - 267.6 + 133.8 = \frac{6H_E}{\sin 11.3^\circ} - 133.8$$

$= 30.6H_E - 133.8$ IN SQ.FT.

NOTE: WICK DRAIN: SEE MID SEA DAM.

**KLEINFELDER** **DAILY REPORT**

Date 10/27/2006 Weather ______ Hours ______ Miles ______ Sheet 1 of 2

Project Salton Sea – Concentric Ring Dike without stone columns Submitted by Jie Yu Date 10/27/2006

Project Number 71100 Reviewed by ______ Date ______

CONCENTRIC RING DIKE without STONE COLUMNS. — SEE LOWER PORTION OF FIG 5.3

1. ASSUMPTION:
   1. CREST ELEVATION = 10' ABOVE SEAFLOOR; CREST WIDTH = 20'
   2. $H_E$: EMBANKMENT HEIGHT
   3. $H_F$: FOUNDATION HEIGHT
   4. $H_S$: SEAFLOOR DEPOSITS HEIGHT

2. AREA CALCULATION

i SAND/GRAVEL EMBANKMENT FILL (TYPE A)

A. EMBANKMENT

$$20 \cdot H_E + (1.5 H_E) \cdot H_E = \underline{1.5 H_E^2 + 20 H_E} \quad \text{IN SQ. SF}$$

B. FOUNDATION

$$[2(1.5 H_E) + 20' - H_F] \cdot H_F = \underline{(3 H_E + 20 - H_F) \cdot H_F} \quad \text{IN SQ. SF}$$

ii SAND/GRAVEL EMBANKMENT FILL (TYPE B)

$$2 \cdot [(4 H_E - 1.5 H_E) \cdot H_E \cdot \tfrac{1}{2}] = (2.5 H_E) \cdot H_E = \underline{2.5 H_E^2} \quad \text{IN SQ. SF}$$

iii DREDGE OF SOFT LACUSTRINE DEPOSITS

$$[(1.5 H_E) \cdot 2 + 20 - H_F] \cdot H_F = \underline{(3 H_E + 20 - H_F) \cdot H_F} \quad \text{IN SQ. SF}$$

iv DREDGE OF SEAFLOOR DEPOSITS

$$[(4 H_E) \cdot 2 + 20 + 3 H_s] \cdot H_s = \underline{[8 H_E + 20 + 3 H_s] \cdot H_s}$$

KLEINFELDER **DAILY REPORT**

Date 10/27/2006 Weather ______ Hours ______ Miles ______ Sheet ___ of ___

Project Salton Sea — Concentric Ring Dike without Stone Columns Submitted by Jie Yu Date 10/27/06

Project Number 71100 Reviewed by ______ Date ______

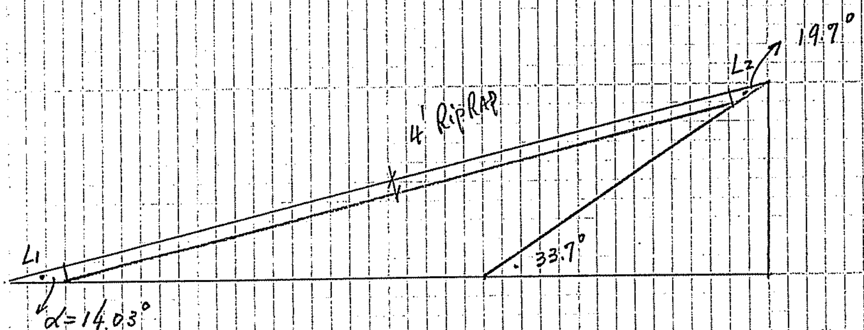
V. 3' Course Blank Drain layer (Type B)

Bottom length: $1.5H_E + 10 - 10 = \underline{1.5H_E}$ in SQ FT

Height: 3'

Total Area: $[1.5H_E - 3' \cdot 1.5] \cdot 3' = \underline{4.5H_E - 13.5}$ in SQ FT

VI. RipRap:




$L_1 = \frac{4}{\tan 14.0°} = 16.04'$ $\quad L_2 = \frac{4}{\tan 19.7°} = 11.2'$

$L_1 + L_2 = 27.6'$

A. upstream or Downstream RipRap Area

$$\left(\frac{H_E}{\sin 14.0°} - L_1 - L_2\right) \cdot 4 + \frac{1}{2} L_1 \cdot 4 + \frac{1}{2} L_2 \cdot 4$$

$$= \left(\frac{H_E}{\sin 14°} - 27.6\right) \cdot 4 + 2(27.6) = \frac{4H_E}{\sin 14°} - 55.2$$

$$= \underline{16.5H_E - 55.2} \text{ in SQ FT.}$$

B. RipRap on Top of Crest

$$[20 + 4 \cdot 1.5] \cdot 4 = \underline{104} \text{ in SQ FT.}$$

VII. Wick Drains:

$$2[(4H_E - 1.5H_E)/5 + 1]H_F = \left(\frac{H_E}{2} + 1\right) \cdot 2 \cdot H_F$$

KLEINFELDER **DAILY REPORT**

Date ________ Weather ________ Hours ________ Miles ________ Sheet 2 of 4

Project Salton Sea — Habitat Pond  Submitted by Jie Yu  Date 8/25/2006

Project Number 71100  Reviewed by CDJ  Date 8/25/06

HABITAT POND:

1. ASSUMPTION:

1, HEIGHT OF EMBANKMENT $= H_E = 7.5'$

2. HEIGHT OF FOUNDATION $= H_F = 10'$

3, CREST WIDTH $= 15'$

4. FOUNDATION WIDTH AT BOTTOM OF EXCAVATION $= 40'$

(SEE FIGURE 5.4)

2. AREA CALCULATION

i, FOUNDATION EXCAVATION AND EMBANKMENT FILL

$$[(2 \cdot H_F) + 40] \cdot H_F = [2 \cdot 10 + 40] \cdot 10 = \underline{600 \text{ SQ. FT.}}$$ ✓

ii FILTER/DRAIN BLANKET

Bottom LENGTH: $\frac{15'}{2} + 3 \cdot H_E - 5' = 3H_E + 2.5'$

HEIGHT: $2'$

$$\text{AREA}: \left[ (3H_E + 2.5') - \frac{1}{2}(2 \cdot 1.5) - \frac{1}{2}(2 \cdot 3) \right] \cdot 2$$

$$= (3H_E + 2.5' - 1.5 - 3) \cdot 2$$

$$= (3H_E - 2) \cdot 2 = 20.5 \cdot 2 = \underline{41 \text{ SQ. FT}}$$ ✓

iii DIKE EMBANKMENT FILL

$$(15 + 3 \cdot H_E) \cdot H_E - 41 = (15 + 3 \cdot 7.5) \cdot 7.5 - 41$$

$$= (15 + 22.5) \cdot 7.5 - 41 = 281.3 - 41 = 240.3 \text{ SQ. FT.}$$ ✓

iv AREA OF GEOGRID/GEOTEXTILE PER FOOT OF EMBANKMENT

$$\left(40 + 2 \cdot \sqrt{10^2 + 20^2}\right) \cdot 1 = 84.7 \text{ SQ FT}$$ ✓

**KLEINFELDER** **DAILY REPORT**

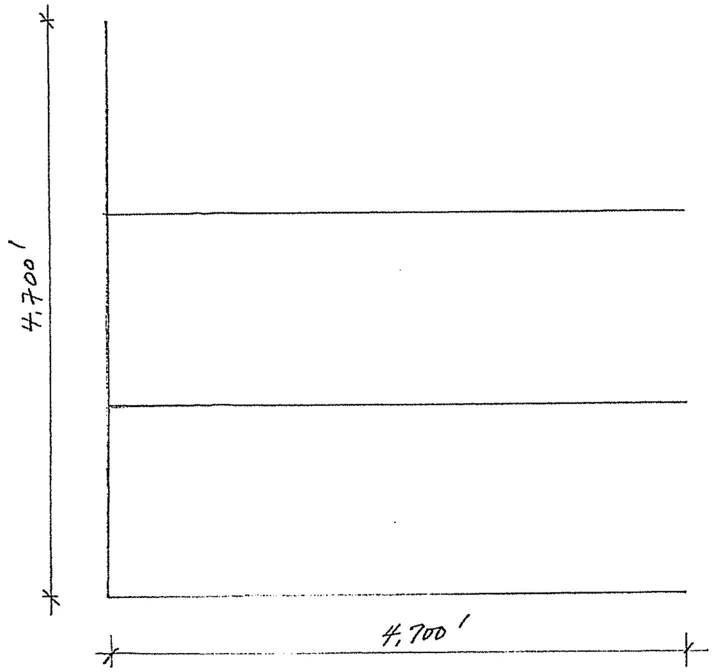
Date ______ Weather ______ Hours ______ Miles ______ Sheet 3 of 4

Project SALTON SEA — HABITAT POND Submitted by JIE YU Date 12/12/2006

Project Number 71100 Reviewed by RAA Date 4/13/07

3. 500-ACRE HABITAT POND EMBANKMENT LENGTH ESTIMATION:

WE ASSUME THAT A 500 ACRE HABITAT POND UNIT WILL INCLUDE FOUR(4) EMBANKMENT SECTIONS. THE EMBANKMENT LENGTH FOR EACH SECTION IS APPROXIMATELY 4,700 FEET.




THE ASSUMED LAYOUT OF THE FOUR(4) EMBANKMENT SECTIONS WITHIN A 500-ACRE HABITAT POND UNIT IS PRESENT LEFT.

∴ THE TOTAL EMBANKMENT LENTH:

$(4)\cdot(4{,}700') = 18{,}800$ FEET

FOR 500-ACRE HABITAT POND UNIT.

4. EXCAVATION AND EMBANKMENT QUANTITY CALCULATION:

i EXCAVATION:

$$\frac{18{,}800'}{3}\cdot\frac{600\text{ SF}}{9} = 417{,}778 \text{ C.Y.}$$

ii EMBANKMENT:

DIKE: $\frac{18{,}800'}{3}\cdot\frac{240.3}{9} = 167{,}320$ (167320)

FILTER MATERIAL:

$\frac{18{,}800'}{3}\cdot\frac{41}{9} = 28{,}548$ (28548)

FOUNDATION:

$\frac{18{,}800'}{3}\cdot\frac{600}{9} = 417{,}778$ (417778)

∴ TOTAL EMBANKMENT INCLUDING FILTER MATERIAL: $167{,}320 + 28{,}548 + 417{,}778$

$= 613{,}646$ C.Y.

613,646 CY

KLEINFELDER

# DAILY REPORT

Date ______ Weather ______ Hours ______ Miles ______ Sheet 4 of 4

Project Salton Sea – Habitat Pond    Submitted by Jie Yu    Date 12/12/2006

Project Number 71100    Reviewed by RAA    Date 4/13/07

5. GeoGrid / Geotextile Quantity Calculation:

$(18{,}800' \cdot 84.7\ ^{SF}/_{FOOT})/9 = 176{,}929$ S.Y. ✓

6. Aerate:

613,646 C.Y. / 22,680 C.Y. / week = 27 weeks. ✓

↳ provided by Mr. Mike Pauletto

KLEINFELDER

SHEET 1 OF 1

PROJECT Salton Sea Restoration PROJECT NO. 71100

SUBJECT Quantity Estimation Notes BY DATE

REVIEWED BY DATE

## Mid Sea Barrier

sand + gravel type A in core = subtract the top layer of rip rap

sand and gravel type A in shell = subtract the total length of rip rap over the top of embankment minus the layer of the core

sand and gravel type B = subtract rip rap over side slopes

## Mid Sea Dam + North Sea

sand and gravel type A in core = subtract the section of coarse filter within the core

sand and gravel type A in shell = subtract the sand and coarse filter that will be in the shell

sand + gravel type B in shell = subtract the total rip rap and subtract the section of sand filter that is in the type B shell

## Perimeter Dike + South Sea Dam

sand + gravel type A in core = subtract the riprap over the top of the c and the section of coarse filter from the core

sand + gravel type A shell = subtract the riprap along the top minus the section over the core and subtract the total coarse grained filter minus the section in the core

sand + gravel type B = subtract rip rap along the sides