Click here to return main document and Bookmarks

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: C-14

DESCRIPTION: Eliminate Pre-Dredge of Inorganic Material along CDF "D" Bulkhead Footprint

ORIGINAL DESIGN:

A3 alternative – cellular sheet-pile wall along original alignment. In this design the underlying organic and inorganic sediments underneath the CDF "D" footprint would be dredged out and replaced with a more suitable foundation material prior to driving the sheeting (See Drawing No. 1).

PROPOSED DESIGN:

A3 alternative – cellular sheet-pile wall along original alignment. In this design only the organic sediments underneath the CDF footprint would be dredged out and replaced with sand. Need to dredge 10 feet of inorganics in the cell and increase cell size to 88 feet in diameter. (See Drawing No. 2).

ADVANTAGES:

1. Reduce cost of dredging this material
2. Reduces the cost/size of the disposal areas for this material
3. Reduces overall material handling cost

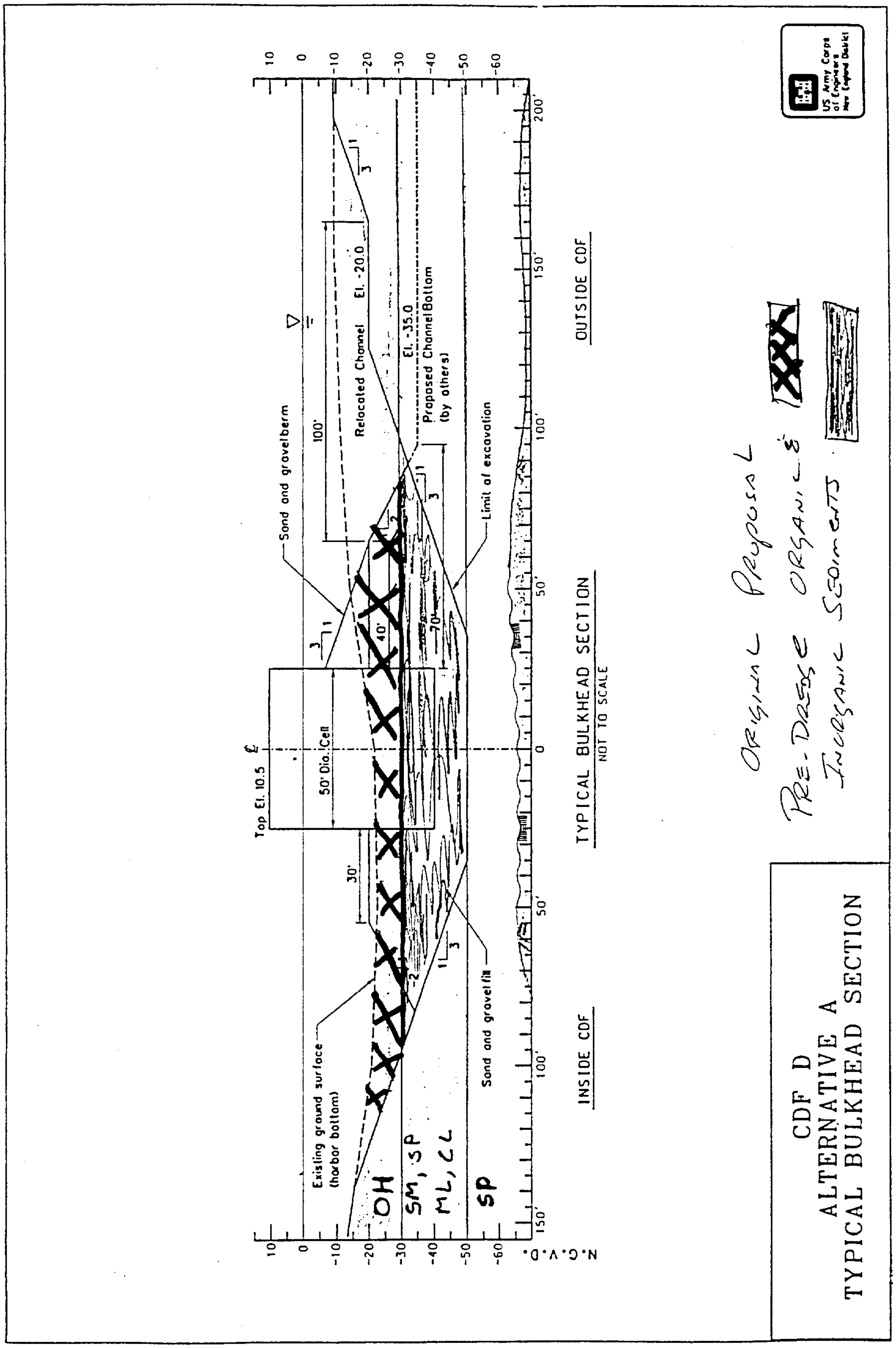
DISADVANTAGES:

Increases the size of the sheet pile cells to accommodate the wall stability. This decreases storage volume and/or increases encroachment toward channel.

JUSTIFICATION:

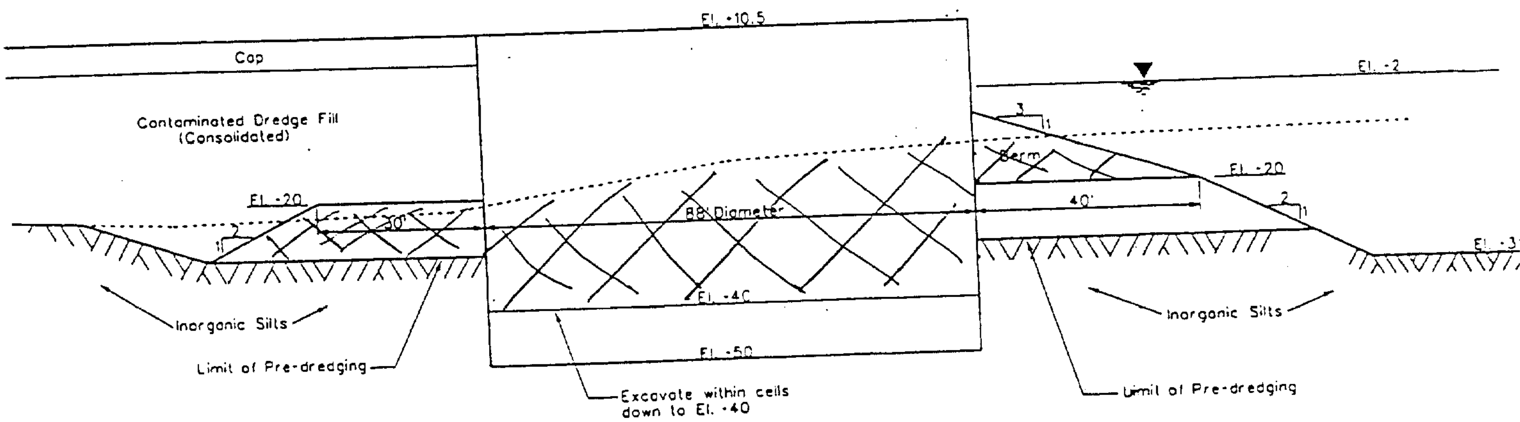
Not economically justified, costs more in cell foundation stabilization.

DRAWING NO. 1


Top El. 10.5
50' Dia. Cell
Sand and gravel berm
Relocated Channel El. -20.0
El. -35.0
Proposed Channel Bottom (by others)
Limit of excavation
Existing ground surface (harbor bottom)
Sand and gravel fill
100'
40'
70'
30'
INSIDE CDF
TYPICAL BULKHEAD SECTION
NOT TO SCALE
OUTSIDE CDF
N.G.V.D.
OH
SM, SP
ML, CL
SP
ORIGINAL PROPOSAL
PRE-DREDGE ORGANIC &
INORGANIC SEDIMENTS
US Army Corps of Engineers New England District
CDF D
ALTERNATIVE A
TYPICAL BULKHEAD SECTION

DRAWING NO. 2

PROPOSED DESIGN
DREDGE ONLY ORGANIC MATERIAL
+ 10 FT OF INORGANIC IN ENTERIOR OF
THE CELL



BULKHEAD CONFIGURATION • 1
CDF-D Plan A

COST ESTIMATE WORKSHEET

** PROPOSAL NO.: C-14a

DELETIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Dredge Organics	CY	75,800	$8.00	$606,400
Material Processing	CY	75,800	$20.00	$1,516,000
Dewater/Handle/Stockpile Sand	CY	18,950	$15.00	$284,250
Dispose of Unsuitable Materials at CDF C	CY	56,850	$7.00	$397,950
Resize CDF C	CY	56,850	$1.27	$72,200
		Total Deletions		$2,876,800

ADDITIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Additional sheetpile installation (required to to construct 88' diameter cells)	LS	1	$3,607,500	$3,607,500
Additional fill for 88' diameter cells	CY	90,000	$22.50	$2,025,000
		Total Additions		$5,632,500
		Net Cost INCREASE		$2,755,701
	*	Markups	84.00%	$2,314,788
		Total Cost INCREASE		$5,070,489

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

** (Plan A-3 is used as basis for cost comparison)

COST ESTIMATE WORKSHEET

** PROPOSAL NO.: C-14b — PAGE 5 OF 5

DELETIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Offsite Disposal at subtitle D landfill	CY	56,850	$60.00	$3,411,000
Material Processing	CY	75,800	$20.00	$1,516,000
Dewater/Handle/Stockpile Sand	CY	18,950	$15.00	$284,250
Dredge Organics	CY	75,800	$8.00	$606,400
		Total Deletions		$5,817,650

ADDITIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Additional sheetpile installation (required to construct 88' diameter cells)	LS	1	$3,607,500	$3,607,500
Additional fill for 88' diameter cells	CY	90,000	$22.50	$2,025,000
		Total Additions		$5,632,500
		Net Cost Savings		$185,150
	*	Markups	84.00%	$155,526
		Total Cost Savings		$340,676

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

** (Plan A-3 is used as basis for cost comparison)

DESCRIPTION: Half Dike

ORIGINAL DESIGN:

The original design provides a cellular bulkhead sheetpile wall with berms and cutoff wall within sheetpile cells. (See Drawing No. 1, Appendix E and Proposal C-02).

PROPOSED DESIGN:

Half embankment (See Drawing No. 2):

- Drive sheetpile wall to refusal
- Dredge to remove organic soils and inorganic silt
- Construct rock fill embankment – drive wharf piles
- Place gravel filter and sand filter with clamshell
- Install geo-membrane liner on sheet-pile wall
- Continue to back fill as dredge fill is placed
- Build wharf and retaining wall
- Place Class I almost at toe
- Possible use of deadman for temporary support

ADVANTAGES:

1. Maintain organics at toe of sheetpile wall
2. Slightly smaller embankment
3. Allows for cutoff wall; can be de-watered with aggressive de-watering
4. Corrosion not an issue because wall not needed in long term

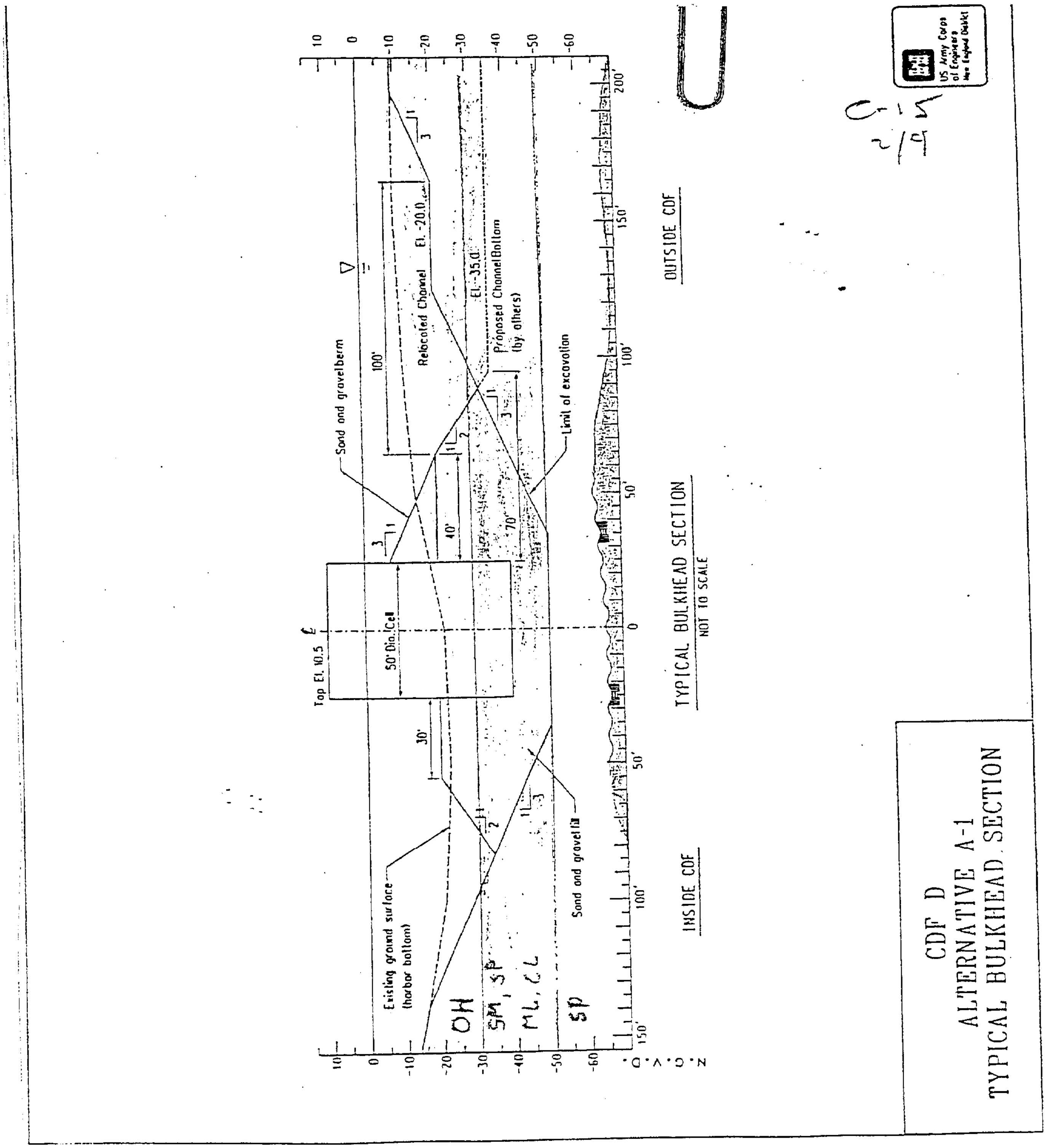
DISADVANTAGES:

1. May be insufficient toe for sheets
2. Back-filling and dredge placement need to occur at same time
3. Deformations of sheetpile wall may be excessive and may damage liner
4. Liner needs to be placed from a barge
5. May be difficult to de-water; may need liner on both sides of sheeting

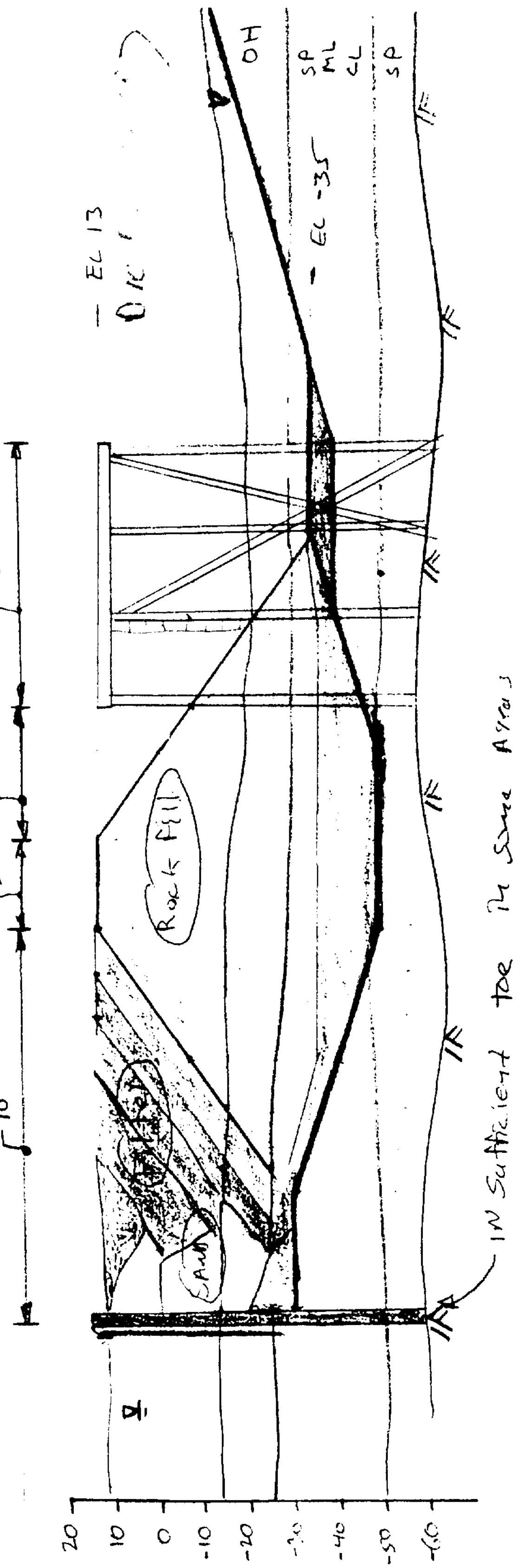
JUSTIFICATION:

Allows for "leaky" cutoff wall, reduced pre-dredging, and slightly smaller embankment.

DRAWING NO. 1

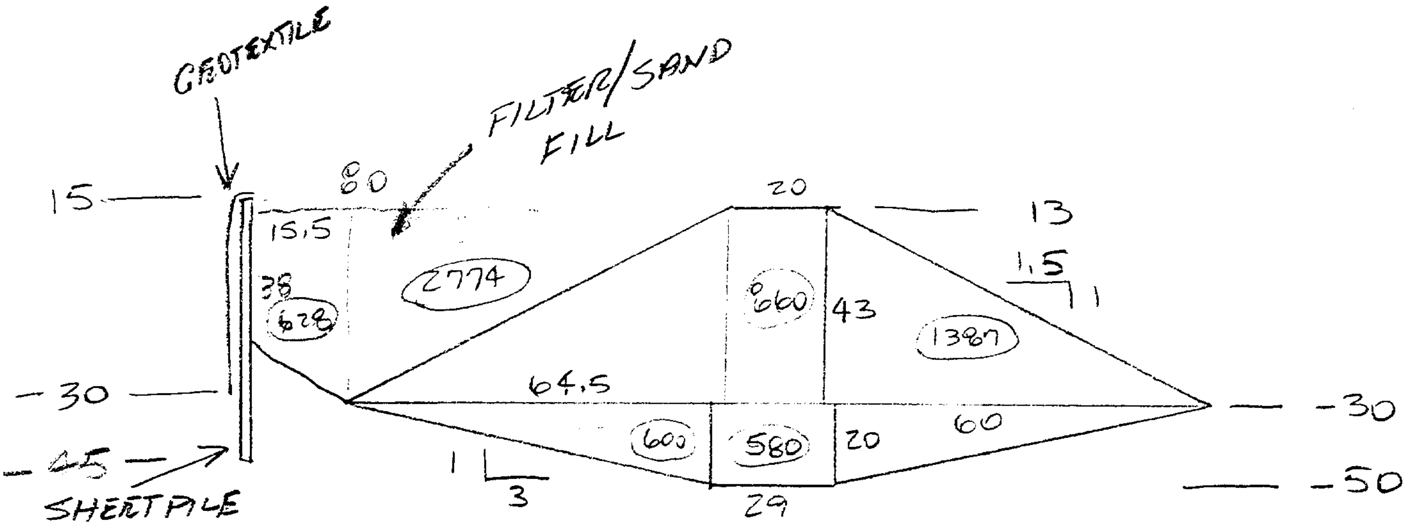

US Army Corps of Engineers New England District
Top El. 10.5
50' Dia. Cell
Sand and gravelberm
Relocated Channel El. -20.0
El. -35.0
Proposed Channel Bottom (by others)
Limit of excavation
Existing ground surface (harbor bottom)
Sand and gravel fill
N.G.V.D.
OH
SM, SP
ML, CL
SP
INSIDE CDF
OUTSIDE CDF
TYPICAL BULKHEAD SECTION
NOT TO SCALE
CDF D
ALTERNATIVE A-1
TYPICAL BULKHEAD SECTION

DRAWING NO. 2



Originals in color.

CALCULATION PAGE



ROCKFILL

AREA = 860
1387
1387
580
600
600
5,414 FT²

FILTER

AREA 2774
628
3402. FT²

LENGTH = 2,430 FT

VOLUME = $5{,}414 \times \frac{2{,}430}{27} \cong 487{,}260$ CY

SHEETPILE = 60' × 2,430 = 145,800 FT²

GEOTEXTILE = 45' × 2,430 = 109,350 FT²

PRETRENCH/BACKFILL FOR GEOMEMBRANE = $45' \times 1' \times \frac{2430}{27} = 4{,}050$ CY

FILTER/SAND FILL = $3{,}402 \times \frac{2{,}430}{27} = 306{,}180$ CY

COST ESTIMATE WORKSHEET

PROPOSAL NO.: C-15

DELETIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Steel sheetpile for cells & arcs, installed	LS	1	$17,075,500.00	$17,075,500
Backfill and compact interior of cells	LS	1	$2,587,500	$2,587,500
Cutoff wall within bulkhead cell	LS	1	$7,050,000	$7,050,000
Backfill & compact foundation	LS	1	$936,000	$936,000
(reused material)				
Backfill & compact foundation	LS	1	$7,830,000.00	$7,830,000
(Additional offsite fill imported)				
		Total Deletions		$35,479,000

ADDITIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Steel sheet pile wall	SF	145,800	$40.00	$5,832,000
** Geomembrane	SF	109,350	$20.00	$2,187,000
Pretrench/backfill (Geomembrane)	CY	4,050	$25.00	$101,250
Fiter/sand fill	CY	306,180	$25.00	$7,654,500
Rock fill (Crushed stone)	CY	487,260	$25.00	$12,181,500
Compaction and shaping	CY	487,260	$5.00	$2,436,300
		Total Additions		$30,392,550
		Net Cost Savings		$5,086,450
	*	Markups	84.00%	$4,272,618
		Total Cost Savings		$9,359,068

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

** Estimate $20/SF cost for vertical installation of geomembrane

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: C-16 PAGE NO: 1 OF 2

DESCRIPTION: Transport to Dispose, Reduce Volume of CDF "D"

ORIGINAL DESIGN:

Option A-3 or D-2 has a large footprint enclosed by a sheet pile cell wall to contain dredged contaminants.

PROPOSED DESIGN:

Reduce the footprint of CDF "D" by transporting 110,000 cubic yards of material (approximately 10% of Plan A-3 CDF "D" volume) to disposal off-site at subtitle D landfill.

ADVANTAGES:

1. Reduces encroachment into the harbor or existing channel.
2. Utilizes options that are a lower unit cost.
3. Removes a percentage of contaminants from the harbor to off-site disposal.
4. Reduced footprint will allow CDF "D" to be reconfigured and constructed over an area with organic or clay layer only.

DISADVANTAGES:

None Known.

JUSTIFICATION:

Mining options allows versatility within the plan to optimize disposal locations or methods based upon changing unit costs for disposal, tipping fees, fuel costs, new environmental restrictions, changed geotechnical or hazardous material conditions based on new information, real estate problems or increasing acquisition cost, etc.

COST ESTIMATE WORKSHEET

PROPOSAL NO.: C-16

DELETIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
**	140' cell wall	LS	10%	$34,728,000	$3,472,800
	Dredge beneath wall	LS	10%	$3,663,500	$366,350
	10% cap area	LS	10%	$10,528,000	$1,052,800
	10% wicks	LS	10%	$790,400	$79,040
			Total Deletions		$4,970,990

ADDITIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
**	Transport and dispose	CY	110,000	$90.00	$9,900,000
	Chemical testing $2000/500 CY)	CY	110,000	$4.00	$440,000
			Total Additions		$10,340,000
			Net Cost INCREASE		$5,369,010
		*	Markups	84.00%	$4,509,968
			Total Cost INCREASE		$9,878,978

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

** Reduce volume of "D" by approximately 110,000 CY (10%)
140' cell wall (10% volume) = 140/1400 = 10% of cell wall cost. 1400 feet is the length of the long side of this rectangular enclosure. Reducing that length by 10% reduces volume 10% (approx).

PROPOSAL NO: C-17

DESCRIPTION: Construct CDF "C", Reduce Volume of CDF "D"

ORIGINAL DESIGN:

Option A-3 or D-2 has a large footprint enclosed by a sheet pile cell wall to contain dredged contamination.

PROPOSED DESIGN:

Reduce the footprint of CDF "D" by constructing CDF "C" and transporting 110,000 cubic yards of material to CDF "C" for disposal.

ADVANTAGES:

1. Reduces encroachment into the harbor or existing channel.
2. Utilizes options that are lower in unit cost.
3. Removes a percentage of contaminants from the harbor to off-site disposal.
4. Reduced footprint will allow CDF "D" to be reconfigured and constructed over area with organic or clay layer only.

DISADVANTAGES:

1. Distributes contaminants to another location (CDF C) within the harbor to require monitoring.

JUSTIFICATION:

Mining options allows versatility within the plan to optimize disposal locations or methods based upon changing unit costs for disposal, tipping fees, fuel costs, new environmental restrictions, changed geotechnical or hazardous material conditions based on new information, real estate problems or increasing acquisition costs, etc.

COST ESTIMATE WORKSHEET

PROPOSAL NO.: C-17 — PAGE 2 OF 2

DELETIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
**	140' cell wall	LS	10%	$34,728,000	$3,472,800
	Dredge beneath wall	LS	10%	$3,663,500	$366,350
	10% cap area	LS	10%	$10,528,000	$1,052,800
	10% wicks	LS	10%	$790,400	$79,040
			Total Deletions		$4,970,990

ADDITIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
	Construct "C"	LS	1	$11,400,000	$11,400,000
			Total Additions		$11,400,000
			Net Cost INCREASE		$6,429,010
		*	Markups	84.00%	$5,400,368
			Total Cost INCREASE		$11,829,378

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

** 140' cell wall (10% volume) = 140/1400 = 10% of cell wall cost. 1400 feet is the length of the long side of this rectangular enclosure. Reducing that length 10% reduces volume 10% (approx).

VALUE ENGINEERING PROPOSAL

PROPOSAL NO:	C-18	PAGE NO: 1 OF 6
DESCRIPTION:	Build CDFs "A", "B", "C" . Delete CDF "D" and Delete All Upland Storage	

ORIGINAL DESIGN:

Plan D2 – New Alignment, no new channel.
Dewater harbor materials
Process/reuse foundation materials
Build 3 Upland Storage Sites
Delete CDFs "A", "B", "C"
CDF "D" el. 10.5

PROPOSED DESIGN:

Plan I1 Construct CDFs "A", "B", and "C"; delete CDF "D"; delete all upland storage sites; excess material to subtitle D and TOSCA landfill; dewater material for off site disposal.

Plan I2 Construct CDFs "A", "B", and "C"; delete CDF "D"; delete all upland storage sites; excess material to subtitle D and TOSCA landfills; dewater all harbor and foundation material.

ADVANTAGES:

1. I1 - No upland storage sites.
2. I2 - Delete complexities & uncertainties of building CDF "D".
3. I2 - Less material due to dewatering and ease of consolidation.

DISADVANTAGES:

1. I1 and I2 - Uncertainties with dewatering costs.
2. No benefits to city due to lack of CDF "D" opportunities.
3. Low public desire.

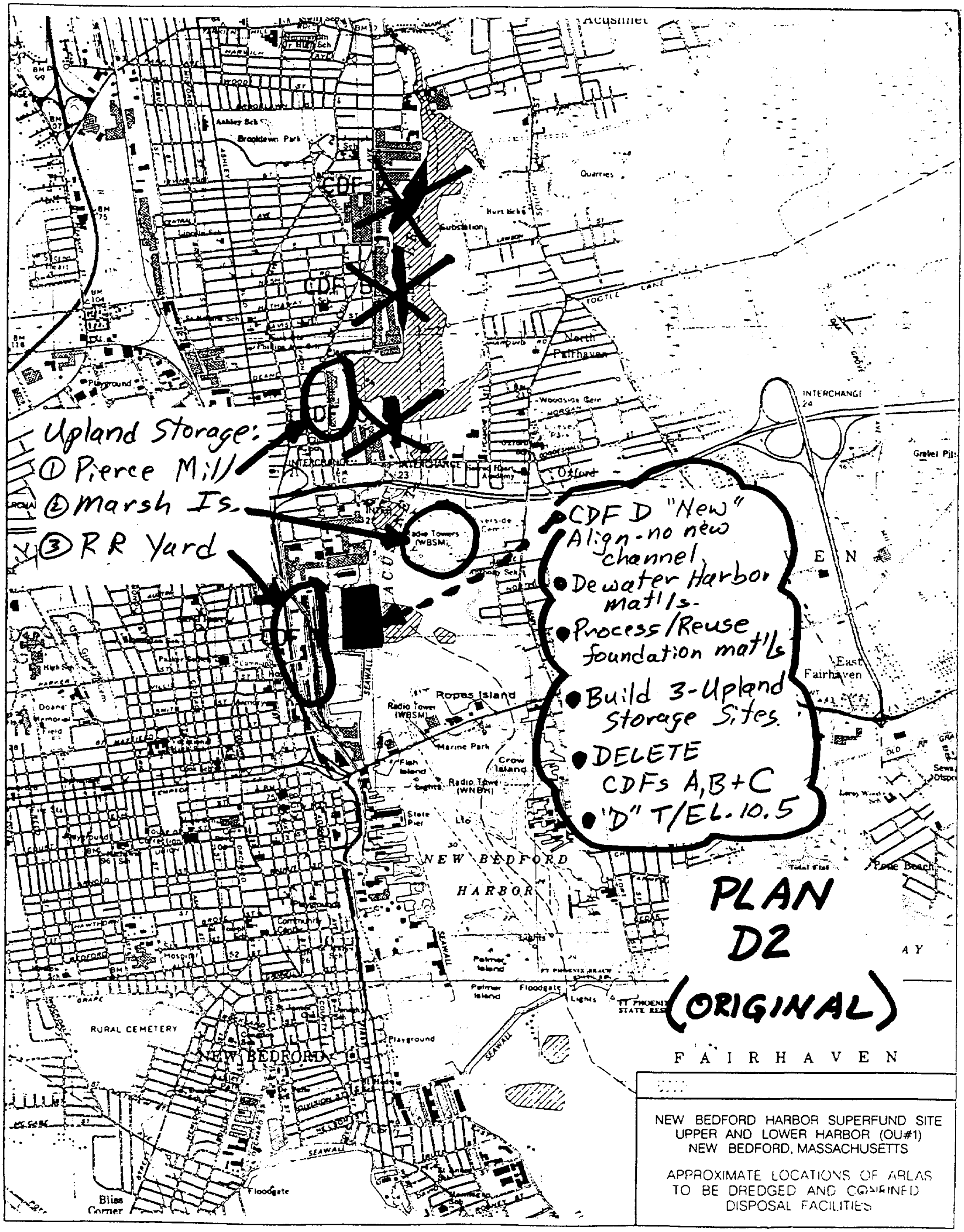
JUSTIFICATION:

Not Economically justified. Both Plans I1 and I2 represent cost increases which exceed the Plan D2 baseline cost estimate by **$61,039,247 and $35,586,140** respectively.

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: C-18 PAGE NO: 2 OF 6

DRAWING NO. 1



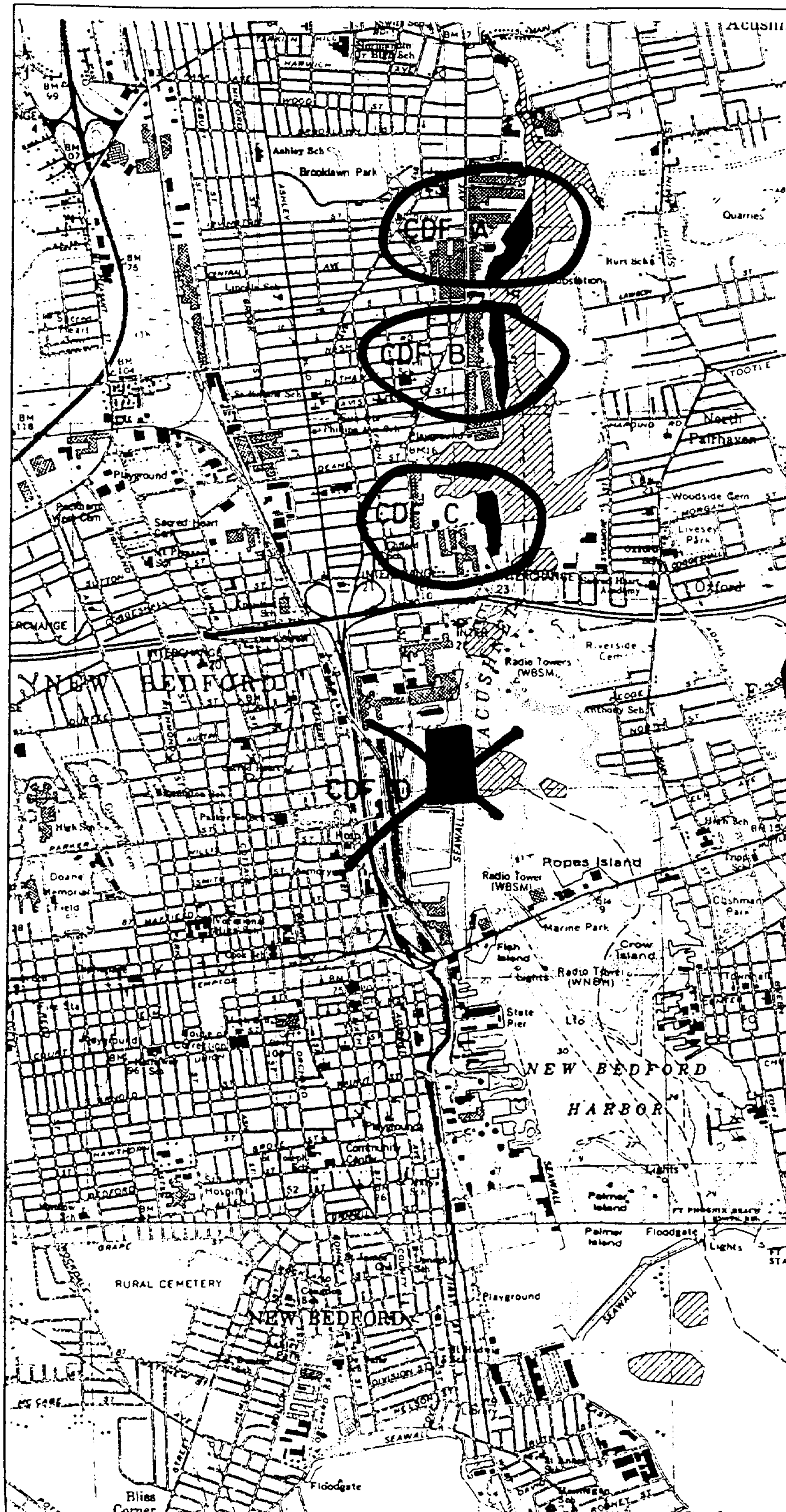
DRAWING NO. 2


CDF A
CDF B
CDF C
CDF D
Build A, B + C
Delete CDF D
Delete all Upland Storage materials
Excess mat'l to Subtitle D + TOSCA landfills
Dewater mat'l for Off-site Disposal
PLAN I1
NEW BEDFORD
NEW BEDFORD HARBOR
FAIRHAVEN
Ropes Island
RURAL CEMETERY
NEW BEDFORD HARBOR SUPERFUND SITE
UPPER AND LOWER HARBOR (OU#1)
NEW BEDFORD, MASSACHUSETTS
APPROXIMATE LOCATIONS OF AREAS TO BE DREDGED AND CONFINED DISPOSAL FACILITIES

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: C-18 PAGE NO: 4 OF 6

DRAWING NO. 3



NEW BEDFORD HARBOR SUPERFUND SITE
UPPER AND LOWER HARBOR (OU#1)
NEW BEDFORD, MASSACHUSETTS

APPROXIMATE LOCATIONS OF AREAS TO BE DREDGED AND CONFINED DISPOSAL FACILITIES

COST ESTIMATE WORKSHEET

PROPOSAL NO.: C-18

DELETIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Plan D2				
CDF D and 3 Upland Storage Sites	LS	1	$138,000,000.00	$138,000,000
CSO D	LS	1	$3,500,000.00	$3,500,000
Real Estate	LS	1	$1,000,000.00	$1,000,000
		Total Deletions		$142,500,000

ADDITIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
	Plan I1				
	Chemical Testing Harbor Material Excess	CY	248,000	$4.00	$992,000
*	Excess Material to Subtitle D Landfill	CY	46,070	$90.00	$4,146,300
	Dewater in-situ material to go offsite	CY	588,000	$20.00	$11,760,000
	Dewater Buildings	EA	2	$365,000.00	$730,000
	Add Material to Restore Wetlands	CY	300,000	$10.00	$3,000,000
	Construct CDFs "A","B" and "C"	LS	1	$44,000,000.00	$44,000,000
**	Excess to TOSCA Landfill	CY	247,850	$232.50	$57,625,125
	Ctg 25% Mu12% on #1	LS	40%	$57,625,125.00	$23,050,050
	Ctg 25% Mu 47% (rest)	LS	84%	$69,328,300.00	$58,235,772
			Total Additions		$203,539,247
			Net Cost INCREASE		$61,039,247
			Markups Included		$0
			Total Cost INCREASE		$61,039,247

* .5 x 129,000 cubic yards / 1.4 bulking factor , $ 60/ton x 1.5tons/cy

** .5 x 694,000 cubic yards / 1.4 bulking factor , $155/ton x 1.5 ton/cy

COST ESTIMATE WORKSHEET

PROPOSAL NO.: C-18

DELETIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
	Plan D2				
	CDF D and 3 Upland Storage Sites	LS	1	$138,000,000.00	$138,000,000
	CSO D	LS	1	$3,500,000.00	$3,500,000
	Real Estate	LS	1	$1,000,000.00	$1,000,000
			Total Deletions		$142,500,000

ADDITIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
	Plan I2				
	Dewater Load, Haul, Spread	CY	246,000	$9.00	$2,214,000
	Back Cutoff Walls for A, B ,& C	LF	4,400	$2,820.00	$12,408,000
*	Dewater all Material	CY	763,000	$20.00	$15,260,000
	Dewater Buildings	EA	2	$365,000.00	$730,000
	Material to Restore Wetlands	CY	300,000	$10.00	$3,000,000
	Construct CDFs "A","B", and "C"	LS	1	$44,500,000.00	$44,500,000
**	Excess to TOSCA Landfill	CY	91,000	$232.50	$21,157,500
***	Excess to Subtitle D Landfill	CY	45,000	$90.00	$4,050,000
	Chemical Testing Harbor Material Excess	LS	1	$364,000	$364,000
	Ctg 25% Mu 12% on #1	LS	40%	$21,157,500	$8,463,000
	Ctg 25% MU 47% (rest)	LS	84%	$82,071,000.00	$68,939,640
			Total Additions		$181,086,140
			Net Cost INCREASE		$38,586,140
			Markups Included		$0
			Total Cost INCREASE		$38,586,140

* 763,000 cubic yards in-situ quantity

** $155/ton x 1.5 ton/cy

*** $60/ton x 1.5 ton/cy

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: C-19 PAGE NO: 1 OF 2
DESCRIPTION: Dispose Clean Pre-Dredging Material at Subtitle D Facility

ORIGINAL DESIGN:

Plan A3 = Base Case, CDF “D” area only:

Clean organics disposal at Marsh Island, Railroad Yard, and Pierce Mill has costs for dike construction and material processing. No real estate costs are included.

PROPOSED DESIGN:

Dispose of "clean" dredged material at a Subtitle D disposal facility.

ADVANTAGES:

None.

DISADVANTAGES:

Costs are greater than on-site disposal. If on-site disposal is not feasible, the off-site disposal costs could be this high for this alternative.

JUSTIFICATION:

Not economically justified.

COST ESTIMATE WORKSHEET				
PROPOSAL NO.: C-19				PAGE 2 OF 2
DELETIONS				
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Berm @ Pierce Mill	CY	5,000	$8.80	$44,000
Berm @ Marsh Island	CY	51,000	$18.00	$918,000
Berm @ RRB	CY	7,000	$13.75	$96,250
Dispose excess unsuitable material:				
RR Yard	CY	21,000	$2.00	$42,000
Pierce Mill	CY	14,900	$2.00	$29,800
Marsh Island	CY	27,000	$2.00	$54,000
		Total Deletions		$1,184,050
ADDITIONS				
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
** Subtitle D disposal of excess unsuitable material (clean organics, clean inorganics, and clean sand)	Tons	654,000	60.00	$39,240,000
		Total Additions		$39,240,000
		Net Cost INCREASE		$38,055,950
	*	Markups	84.00%	$31,966,998
		Total Cost INCREASE		$70,022,948

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

** Qty=[76,000cy (RR yard) + 60,000 (Pierce Mill) + 300,000 (Marsh Isl)] x 1.5 tons/cy = 654,000 tons

This option does not provide savings over on-site disposal.

PROPOSAL NO: S-01
DESCRIPTION: Use Free and/or Recycled Sheet Pile

ORIGINAL DESIGN:

The current design is providing all new sheet pile.

PROPOSED DESIGN:

Use free and/or used sheet pile, for construction of back wall only

ADVANTAGES:

1. Could have cost savings.
2. Could use in all EDF back (land side) walls and/or middle (within dike) walls (does not have as many structural/quality of materials issues as outside walls).
3. Could use in 1/2 dike on CDF "A", "B", and "C" since 1/2 dike sheet pile is not expected to be needed for a permanent structure but needed only during construction.

DISADVANTAGES:

1. May not have the size of sheet pile that is needed.
2. Sheet pile may not be usable, would have to inspected and selected at the current storage location. May want to test/try sections before shipping.
3. Cost savings only if transportation and inspection costs are less than buying new.
4. Quality of sheet pile may be an issue for the contractor. If a problem occurs during construction, then delays in replacement could cost more.
5. May need to coat used sheet piles.

JUSTIFICATION:

Potential savings and an opportunity to recycle existing materials makes this proposal worth investigating. An on-site inspection of sheetpile stockpiles is needed before making a final decision.

Assume use for construction of back wall only, use for constructing main bulkhead cells is not considered feasible. Using recycled sheetpile should not have any impact on the design unless sheet piles are not the same size as the design.

COST ESTIMATE WORKSHEET

PROPOSAL NO.: S-01

DELETIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
CDF "D": Backwall only new sheet pile				
CDF backwall plan A1	SF	53,000	$20.00	$1,060,000
		Total Deletions		$1,060,000

ADDITIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Transport	LS	1	$250,000	$250,000
Inspection	LS	1	$15,000	$15,000
Test	LS	1	$50,000	$50,000
		Total Additions		$315,000
		Net Savings		$745,000
	*	Markups	84.00%	$625,800
		Total Savings		$1,370,800

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: S-02 PAGE NO: 1 OF 4

DESCRIPTION: Weld Interlocks, Plans A-1 and D-2

ORIGINAL DESIGN:

The current design specifies cell and arc construction, 50.14 feet in diameter. The design used as basis for this proposal is Plan A-1. (See Drawing No 1).

PROPOSED DESIGN:

The goal for this proposal is to reduce the size of the cells and to enhance the resistance of the primary mode of failure, vertical shear. The idea is to shop weld two sheet piles (the top 10.5 feet only). In addition to welding the top 10.5 feet, tack weld to the bottom of the paired piles. When the sheets are placed in the field, then field weld the adjoining sheets. In the end there will be all welded sheets, from top of sheet to 10.5 feet below the top of sheet.

ADVANTAGES:

1. Increases disposal volume for material (approximately 58,000 cubic yards for plan A-1.
2. Offers an opportunity to establish a more state-of-the-art CDF that should provide reliable, stable storage.
3. Lowers the project cost yet achieves the intended design goal.

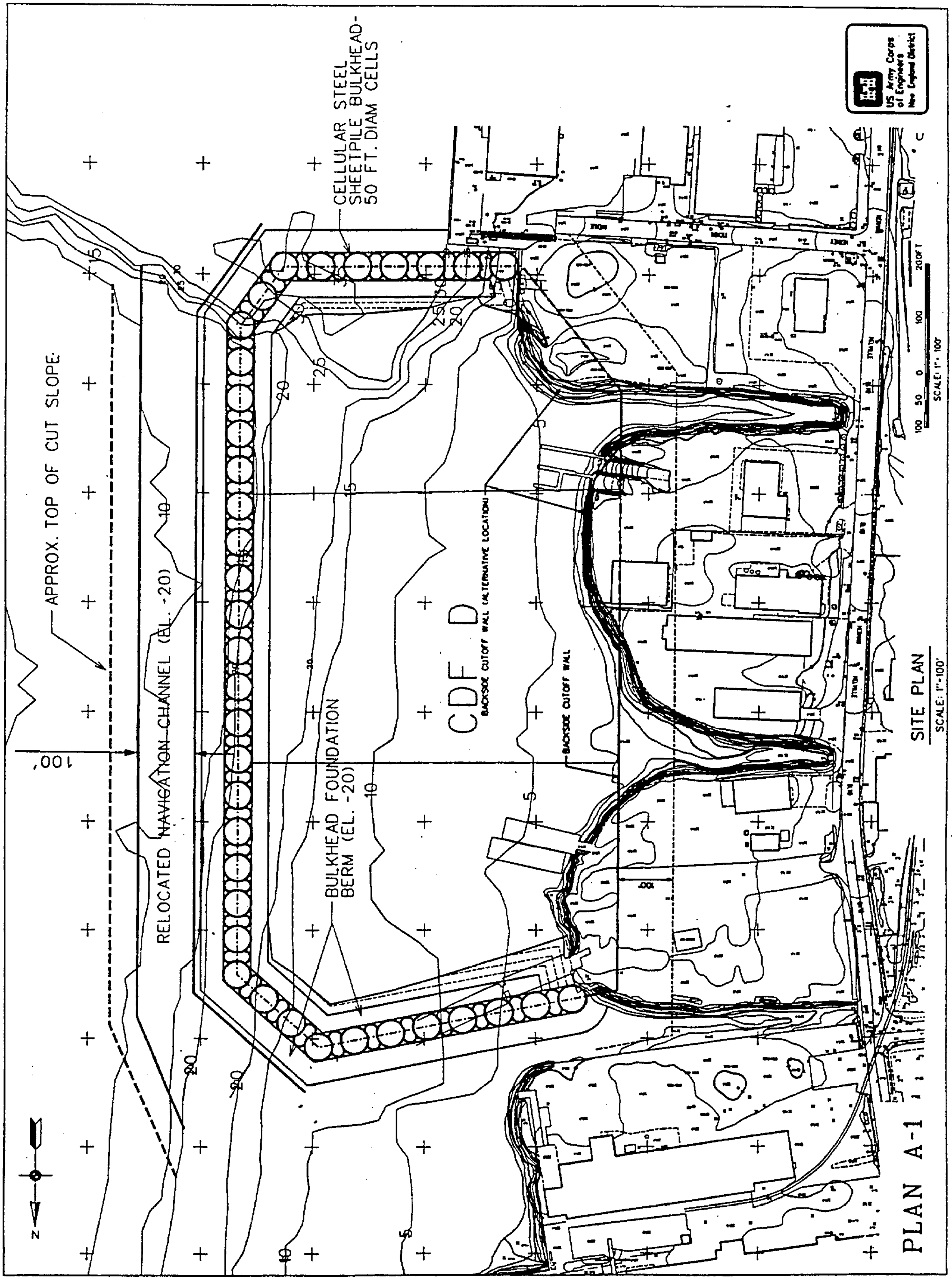
DISADVANTAGES:

1. Welding the top of steel sheet piles is a relatively new concept. Some additional analysis is warranted to validate the concept.
2. There may be another form of failure other than vertical shear, additional analysis is necessary.
3. May be difficult working with the templates, water and welding.

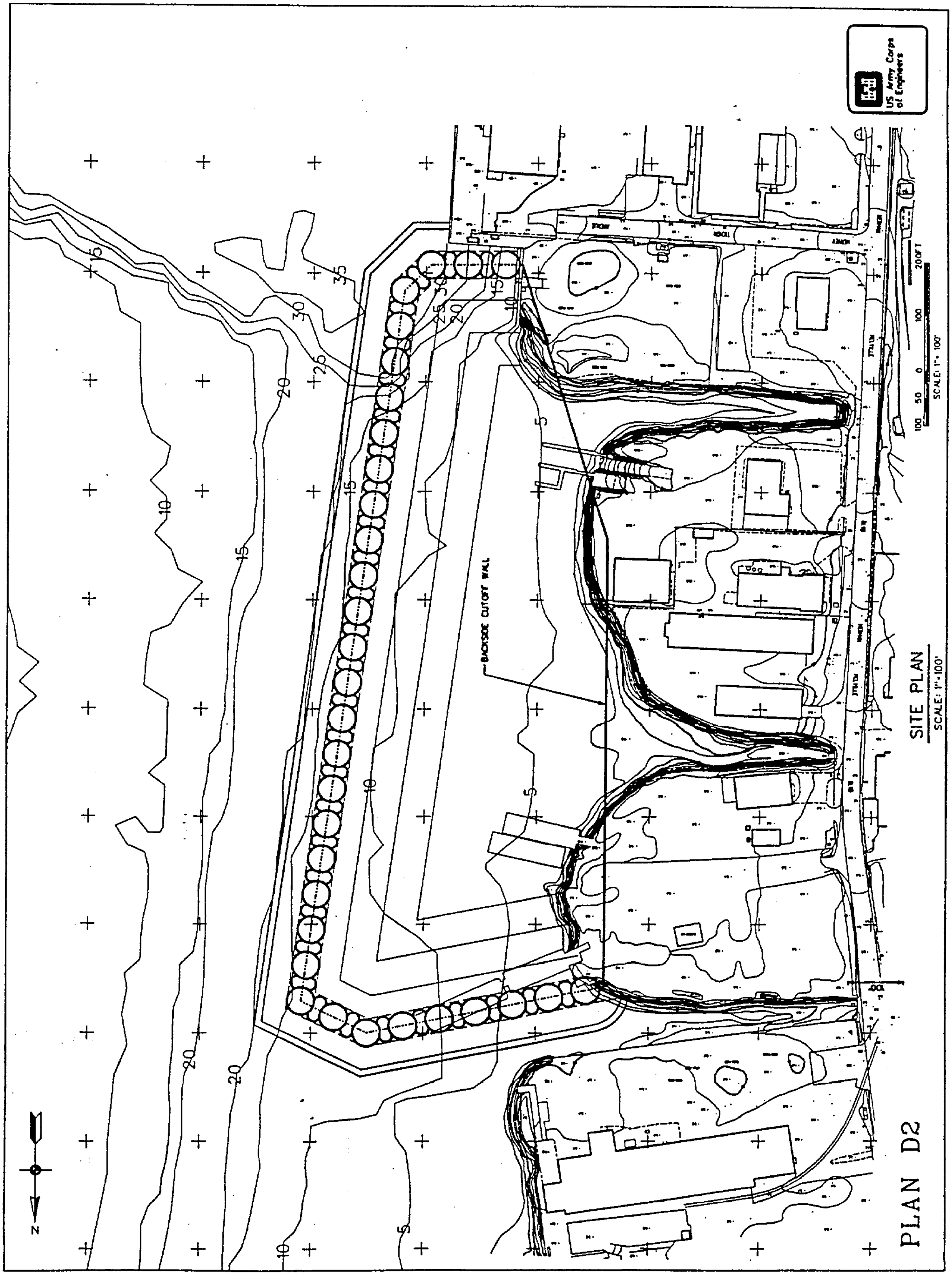
JUSTIFICATION:

Additional capacity is needed for now and the future. There is a need to reclaim and protect the area to keep it from completely eroding away causing additional dredging and reduction of storage area.

DRAWING NO. 1


CELLULAR STEEL SHEETPILE BULKHEAD-50 FT. DIAM CELLS
APPROX. TOP OF CUT SLOPE
RELOCATED NAVIGATION CHANNEL (EL. -20)
100'
BULKHEAD FOUNDATION BERM (EL. -20)
CDF D
BACKSIDE CUTOFF WALL (ALTERNATIVE LOCATION)
BACKSIDE CUTOFF WALL
US Army Corps of Engineers New England District
SITE PLAN
SCALE: 1"=100'
PLAN A-1
N

DRAWING NO. 2


US Army Corps of Engineers
BACKSIDE CUTOFF WALL
SITE PLAN
SCALE: 1"=100'
PLAN D2

COST ESTIMATE WORKSHEET

PROPOSAL NO.: S-02

DELETIONS

	ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
**	Steel sheetpile, cells 50' diameter	EA	37	$138,875.00	$5,138,375
	Steel sheetpile, arcs 50' diameter	EA	36	$59,438.00	$2,139,768
	Fill material, sand and gravel, for cells	EA	37	$88,853.00	$3,287,561
	Fill material, sand and gravel, for arcs	EA	36	$38,491.00	$1,385,676
			Total Deletions		$11,951,380

ADDITIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Steel sheetpile, cells 40' diameter	EA	42	$88,040.00	$3,697,680
Steel sheetpile, arcs 40' diameter	EA	41	$42,495.00	$1,742,295
Fill material, sand and gravel, for cells	EA	42	$34,712.00	$1,457,904
Fill material, sand and gravel, for arcs	EA	41	$18,990.00	$778,590
Shop weld 2 sheetpiles, 10' bead for cells	TN	704	$465.00	$327,360
Shop weld 2 sheetpiles, 10' bead for arcs	TN	298	$465.00	$138,570
Field weld sheets, 10' bead for cells	FT	7,744	$60.00	$464,640
Field weld sheets, 10' bead for arcs	FT	2,882	$60.00	$172,920
		Total Additions		$8,779,959
		Net Savings		$3,171,421
	*	Markups	84.00%	$2,663,994
		Total Savings		$5,835,415

* Markups include:Contingency, OH & Profit, Escalation, E&D and S&A

** Plan A-1 used as basis of cost estimate.

** Unit costs derived during VE Study.

VALUE ENGINEERING PROPOSAL

PROPOSAL NO:	S-03	PAGE NO: 1 OF 5
DESCRIPTION:	Grout Cells, Use Concrete Cells	

ORIGINAL DESIGN:

Cells are filled with engineered and consolidated granular fill (See Drawing No. 1 and Appendix E).

PROPOSED DESIGN:

Fill cells with concrete, soil/cement mixture (batched prior to placement), or jet-grout cell fill materials in place (See Drawing No. 2).

ADVANTAGES:

1. Smaller cell size (approximately 40-foot diameter, load case D + load case C)
2. Reduce cell fill permeability
3. Cell fill would be stable in the event the steel sheets rupture
4. No need to compact the cell fill material
5. Expect smaller deformations

DISADVANTAGES:

1. Can't drive poles through it
2. Potential bearing problems
3. Cost of concrete or batching soil-cement
4. Foundation improvements will still be required

JUSTIFICATION:

Smaller cell size could decrease costs and increase CDF storage capacity.

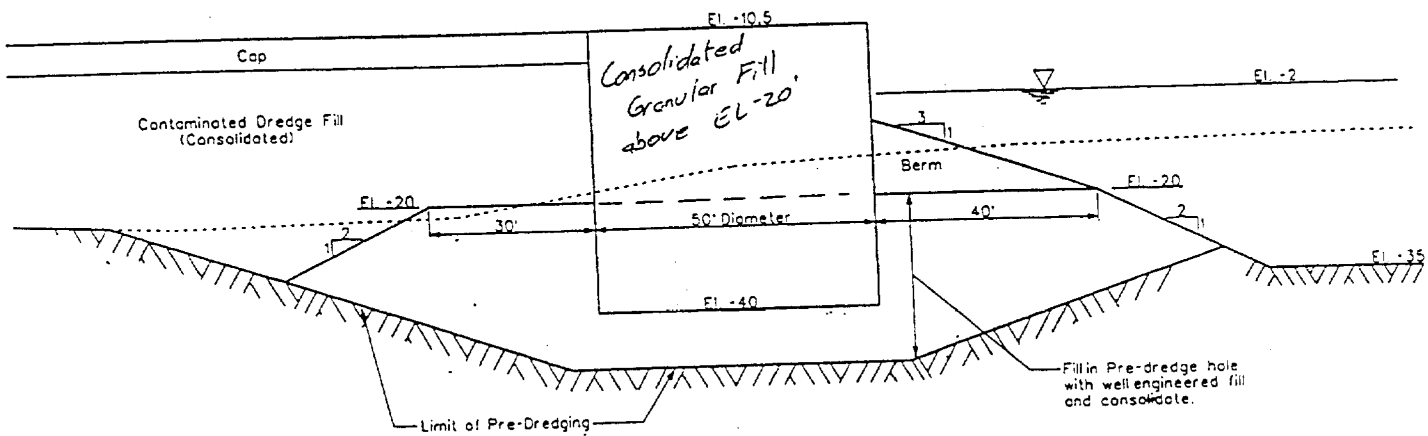
BACKUP:

Increase in steel from 50-foot diameter to 40-foot diameterϕ = .05% Negligible
Original cell fill to elevation –20 = 48.4 cubic yard/foot length of wall
Concrete cell fill to elevation –20 = 39.67 cubic yard/foot length of wall

Savings:
-Don't have to vibro-compact cell fill material
-Eliminate cut-off wall above elevation –20 (Original Height was 70 feet, New height would be 40 feet).

Volume of concrete = (39.67/48.4) (115,000 cubic yards) = 94,257 cubic yards

DRAWING NO. 1

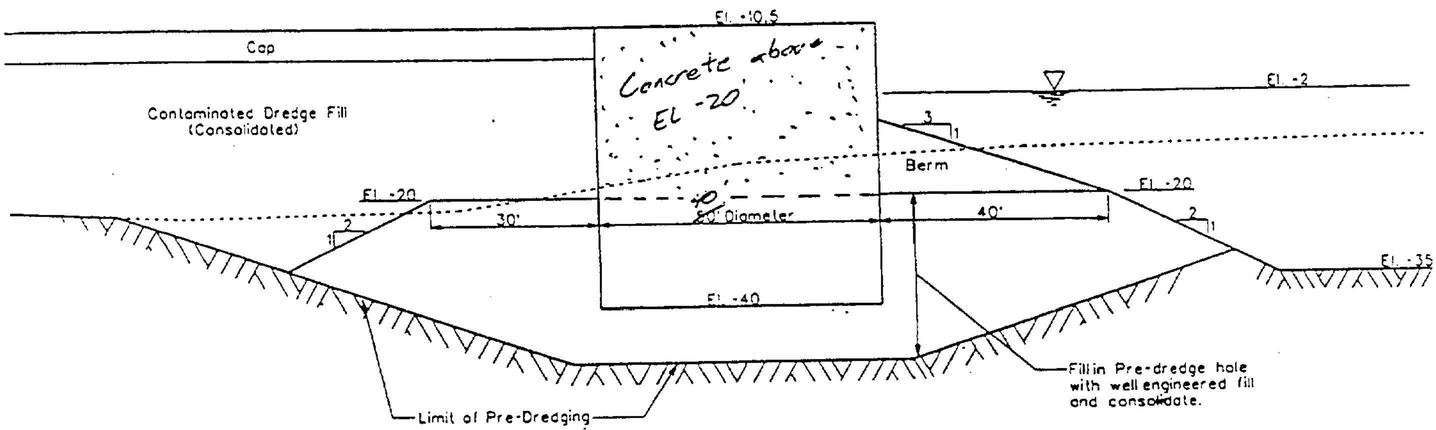


BULKHEAD CONFIGURATION • 2
CDF-D Plan A

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: S-03 PAGE NO: 3 OF 5

DRAWING NO. 2



BULKHEAD CONFIGURATION • 2
CDF-D Plan A

Decrease in Steel From 50' ϕ to 40' ϕ = .05% Negligible

Original Cell Fill - to EL -20' = 48.4 CY / ft. Length of Wall

Conc. Cell Fill - to EL -20' = 39.67 CY/ft length of Wall

Savings:
- Don't have to Vibro Compact Cell Fill Material
- Eliminate Cut-Off Wall above EL -20'
  - Original Ht. = 70'
  - New Ht. = 40'

Vol. Conc. $= \frac{39.67}{48.4}(115{,}000\ CY) = 94{,}257\ CY$

COST ESTIMATE WORKSHEET

PROPOSAL NO.: S-03

DELETIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Cell fill above elevation -20	CY	115,000	$22.50	$2,587,500
Upper 30' of cut-off wall	SF	64,280	$47.00	$3,021,160
		Total Deletions		$5,608,660

ADDITIONS

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Concrete with mixtures and pump	CY	94,257	$75.00	$7,069,275
		Total Additions		$7,069,275
		Net Cost INCREASE		$1,460,615
	*	Markups	84.00%	$1,226,917
		Total Cost INCREASE		$2,687,532

* Markups include:25% contingency, plus 40% (OH,fee,S&A,SS&H, QC, etc.) plus 5% escalation

1. **Solidify Pre-Dredge Material for Re-Use (Speculation List Item 7):** Any cost effective means to render the pre-dredged material re-useable will decrease the overall cost of the project. Solidifying the material by mixing with cement or other stabilizing element may be suitable for the granular portion. However, the organics and clays may prove difficult (or even impossible) to solidify and re-use with reasonable confidence. The material would need to be processed, separating out the suitable material from the unsuitable.

A target location and use of the solidified pre-dredge material needs to be identified. The after treatment, in-place characteristics of the solidified materials must be determined to identify where they would most suitably be used. The following items need to be addressed before this proposal can be evaluated as to any cost benefits:

1. Identify possible solidification techniques and what type materials are applicable for solidification (fine sand, silt, clay, and organics).
2. Identify what processes would be necessary to separate out the useable material, and what percentage of the pre-dredge material fits that description.
3. Identify the likely in-place characteristics would be for the different materials/solidification techniques.
4. Identify where the improved materials could be used throughout the project.
   - Bulkhead foundation
   - Cell fill material
   - Foundation for interior compartment wall
   - Berm in front of the bulkhead

Conclusion: The proposal has merit, but further information/investigation is required before a cost benefit determination can be made.

2. **Determine Critical Load Case for Bulkhead (Speculation List Item 17):** The current plan for CDF D includes development of a multi-modal transportation terminal (MTT) by the city. The critical load case is represented by load case “C” (Fig 5-1) featuring a steel sheet-pile cell: bulkhead on an improved fill foundation (dam to el.-50’) including berms (active and passive), and completed dredge fill with a total 200 psf pre-load berm. Pre-loading is required to achieve consolidation of poor strength dredge material within the CDF, and to provide uniform service loading as a MTT of 800psf. Based on existing agreements negotiations, access to shipping and development of the future MTT by the city, the end-use loading condition, while contributing to the 2,000psf pre-load, are less than the pre-load condition. Therefore, the use of load case “C” is considered logical for design of CDF D bulkhead.

3. **Develop Cap Footprint to Accommodate Future Development, Keep Crane Separate from Bulkhead, Establish Development Restrictions (Speculation List Items 24, 27, and 28):** The end use of CDF D as a MTT will influence certain components of the CDF to be designed and constructed. The CDF will be designed and constructed. The CDF will be developed for an 800 psf uniform service load. This basic load condition is readily achieved for inter-modal container storage and general traffic circulation. More specific components requiring identification, declination, placement and criteria include items such as the rail spur, the container crane, container wharf-dock element, and special foundations (pile supports for light poles, buildings, etc.).

The master plan should identify the initial 14-16 acre MTT and possible future expansion. The combined surface area requirements should consider existing land area and the CDF surface area. Three proposed plans identified vary from plan A1 with a cap surface area of 19.8 acres. To plan A3 with a cap surface area of 12.6 acres. The existing land area between Herman Melville and the CDF is approximately 13 acres (less with setbacks considered). Assume 50% or 7.5 acres are developable for buildings, employee parking and general operational needs. This development should be integrated with the total 14-16 acre MTT master plan (stage I and future expansion)

Specific construction requirements for items which may have special loading conditions such as:

1) Rail spur criteria to be addressed. The rail spur location should consider foundation requirements (pile support or not), location on cells or on cap area, one or two spurs, and looped spur or one way in and out. The rail spur will influence design criteria for bulkhead cells foundation and cap.

2) Container crane criteria to be addressed. Special loading requirements for a one million pound (40 tons) container crane. Crane wheel loads – 100,000 pounds at five-foot spacing clearly supports a separate land independent container wharf-dock to the east of the CDF. This location and independent structure (solution was assumed for the load case "C", discussed above. This item should be made as a permanent restriction for development of the MTT. Further coordination will be required to insure container wharf-dock construction does not impact the CDF bulkhead design and construction. The useable area for the wharf-dock (assume 1.5 acres) should be considered in the master plan.

3) Special foundations criteria to be addressed. Use of pile founded light poles and buildings is likely to be required for the CDF area. This will influence the cap by use of penetration, or by changing the cap from the 4' normal cap to the 7' building cap (allows for utilities and foundations). One building type recognized by the Waterfront Operational Facilities Design Manual, (NAVFAC DM-25, T&D Oct. '71), is the transit sheds (160' by 400'). Note that the existing land acre is available for building development. Exclusions of buildings within the cap area should be considered in identification and navigations of permanent restrictions for CDF "D". A general area high most lighting plan may allow planning and construction of piles and light foundations and the cap details.

Initial and long term development limits and the master plan can support design criteria for CDF "D" addressing the above issues. Flexibility and restriction issues can be worked out sooner. Better planning and design will immediately follow.

4. **Dispose of Highest Contaminants Off-Site (Speculation List Item 32):** The original design is not changed. However, there may be a change in the sequence of off-site disposal, only dispose the most contaminated material off-site. The advantages of this comment are the environmental benefits. Removing the highest concentration of contaminated material and disposing into the RCRA/TSCA facility. These disposal sites are set-up for receiving contaminated material which is a functional and operational advantage.

5. **Divert Sections of River to Excavate in the Dry (Speculation List item 59):** The purpose of this comment is to "Dam and Pump" sections of the river such that the contaminated sediments can be excavated in the "dry". The intent is to reduce excavation (dredge)/de-watering/water treatments costs by doing it in the "dry". This probably would not be a bad idea if the river sediments were stronger. These sediments are so soft that they would not hold the weight of "normal" land based equipment. Thereby, requiring special excavation equipment to be used probably as a cost comparable to a dredge. In addition, exposing the sediments to air will probably evaporate in the air. Emissions at the area are a significant public health concern. Because of these concerns the comment should be eliminated.

6. **Construct In-Water Bird Habitat (Speculation List Item 90):** Consideration should be given to using suitable material dredged from the project to construct in-water bird habitat areas that can be used by nesting and migratory birds. In-water nesting areas are valuable because they control/limit access by predators which me eat the birds or eggs. Suitable habitat can be easily developed by capping the dredged materials with clean sands. Placement of suitable materials from the project will also decrease the size of the disposal area required for the clean-up project.

7. **Pay City (Give Credit) to Replace Existing Navigation Channel (Speculation List Item 97):** This comment works not to reduce overall cost, but allows the city to use the funds to relocate the navigation channel to best meet their future needs. This would be appropriate if the city's plans are far enough along such that they can relocate the channel prior to CDF D construction. The disadvantage of this comment is that it requires close working with the city and a commitment from the city to relocate the channel for CDF D to be constructed. Given the uncertainty of the city's plans and the fact that the city would need to go through Federal/State approval process (which could be lengthy). It probably would be better to keep the location of the channel in the government's preview.

Note: The above assumes the navigation channel needs to be moved prior to CDF D construction. If it does not, this still may be a viable idea to allow the city to more efficiently relocate the channel.

8. **Verify Migration of Contaminants from CDF (Speculation List Items 72 and 142):** Update WES model regarding contaminant migration to account for variable assumptions relative to the initial model, as well as parametric analysis considering different systems currently being considered as liner/cut-offs. If modeling proves cut-offs and liners are not needed, project cost will be reduced by $14 million. (See Proposal C-10).

9. **Take Advantage of Strength Increase of Sediments After Dewatering (Speculation List Item 104):** This comment is being done by way of prudent engineering design within the District. The first issue to resolve is weather or not dewatering is feasible for this project. The pre-design program will also provide an indication of magnitude of dewatering sediment strength's and weather or not this program of dewatering is cost effective as well as convenient.

10. **Reduce Cell Diameter by Improving Fill (Speculation List Item 108):** The cell diameter is only part of the picture when costs of the bulkhead are considered. The differential in quantities of steel required for small to large diameter cells is insignificant. The cost of the cell fill material (and any efforts to improve that material) needs to be optimized with respect to the size of the cells. For instance, a larger size cell filled with compacted sand fill may be less expensive than a smaller cell filled with more expensive materials. (See comments on Proposal S-03).

Although cell diameter has an effect on the storage capacity of the CDF, the impact is minimal. A smaller cell size however would reduce the amount of pre-dredging required for foundation improvements which could reduce costs. Practicality of construction techniques and material availability must also be considered when selecting a cell fill material. Also, some cell fill materials would not allow for placement of the grouted cut-off wall within the cells and could therefore be eliminated from consideration.

The following cell fill materials should be considered to optimize the bulkhead design:

1) Compacted Sands
2) Grouted Sands
3) Jet Grouting
4) Soil-Cement Mixing
5) Stone
6) Concrete (See comments on Proposal S-03)

Conclusion: The use of improved cell fill materials needs to be considered when optimizing the bulkhead design. A firm cost comparison of these different improved cell fill materials must be developed before decisions can be finalized in selection of the cell fill material.

11. **Set Back Surcharge to Reduce Cell Wall Design (Speculation List Item 110):** Reducing loads adjacent to the bulkhead, or restricting heavier surcharge loads to areas further away from the bulkhead, would effectively decrease loading on the structure and result in a smaller cell size. However, these restrictions would need to be fully supported by the future users of the facility and would be difficult to enforce.

It is important for the City to develop preliminary plans and operating procedures for the proposed marine terminal facility, so that the bulkhead design may take advantage of any potential reduced loading adjacent to the structure. Negotiations/discussions would likely be necessary to determine what is agreeable to both the EPA and the City.

Conclusion: The restriction of loads near the bulkhead would likely decrease project costs, but would require close coordination with the City to determine what is reasonable for development of the proposed marine terminal facility.

12. **Use 3-D Modeling to Facilitate Design (foundations, structures, and the design) (Speculation List Item 120):** This comment strongly urges the designers to design using a three-dimensional CAD options. The idea is to produce designs in an illustrative view. This comment does not advocate making physical 3-D models or interactive complex computer models. The 3-D model referred to is an option in the CAD package offered by Microstation. The design would be more clear and shown as a constructed element verses a two dimensional plan and elevation. This comment also applies to geotechnical profiles, which would become 3-D topographic-like illustrations.

13. **Include Dredging Cost in the Estimate (Speculation List Item 121):** Current Foster Wheeler cost for dredging with a Bean hydraulic excavator and slurry processing unit is $31/cubic yard. (This dredging cost includes contractor costs only). This would add $4,460,656 to cost of deleting CDF "A", "B", and "C" if dredging is to 2 feet and $3,690,984 if dredging is to 3 feet.

"A", "B", and "C" areas = 7 acres, 7.2 acres, 10.4 acres for a total of 24.6 acres.

24.6 acres at 2 feet deep = 79,376 cubic yards or $2,460,656.
24.6 acres at 3 feet deep = 119,064 cubic yards or $3,690,904.

$2,460,656 x 1.84 (management, SSSH, QC, contingency, escalation) = $4,527,607.
$3,690,984 x 1.84 (management, SSSH, QC, contingency, escalation) = $6,791,410.

14. **Include Dock/Crane Pier and Navigation Channel in Design Drawings to Show Fairhaven Shore (Speculation List Item 122):** In addition to the construction of CDF "D", the city of New Bedford has plans to develop a multi-modal terminal facility at the disposal site after completion of dredging contaminated materials from the harbor. Their long-term plans include constructing a wharf, berthing area, and channel to elevation –30 feet. A complete drawing of the harbor showing this planned construction as well as both shorelines of the harbor needs to be developed to determine the impacts of this plan. The berth and channel alignments must be determined to plan subsurface investigations to provide assurances requested by the city that the channel could be dredged to –30 feet without hitting rock. The complete plan will also be important in informing interested parties on both side of the harbor of the complete dredging and development plans.

15. **Define Location of 35' MLW (30' at MLW) Channel (Avoid Rock) (Speculation List Item 126):** The required width of the channel is needed from the user. The expected size of the wharf is also needed to project the location of the channel in relation to the bulkhead. Once the parameters for the channel are known, the limits of geophysical investigations would be used to show what obstructions might be encountered within the desired footprint of the channel. The channel location would then be adjusted, and the degree to which obstructions (rock) would be unavoidable could then be ascertained.

16. **Define Minimum/Maximum Wetlands Restoration Necessary/Available (Speculation List Item 129):** The amount of wetlands that need to be excavated and restored is being further evaluated and defined as part of the overall dredging/excavation plans. This is important and needs to be done to develop overall material mass balance. The amount and type of wetland restoration that needs to be done needs to be discussed/negotiated between EPA/USACE and appropriate state and local officials. Currently, there needs to be one-to-one restoration of the wetlands. Therefore, the construction savings will come from the amount and type of restoration that needs to be done and the type of material used to backfill the disturbed wetlands. This needs to be further evaluated to better define overall construction. Also the possibility/feasibility of being able to use reusable pre-dredged material to restore disturbed internal wetlands needs to be looked at. This needs to be negotiated with regulators.

17. **Modify Wetlands Restoration (Speculation List Item 131):** The intent of this comment is to reduce costs by minimizing the amount and type of wetland "restoration" that is done. Generally, a significant amount of wetland restoration is done to restore wetlands to pre-excavation conditions. The question is, Can a modified be done such that the wetland restores itself over time. To do this, this will require negotiations/discussions with appropriate state and local officials to pursue it further. It could be a significant construction savings, but it needs to pass regulatory approval.

18. **Use Hydro-Cyclone/Vortex Technology (More Solids) (Speculation List Item 132):** Dredging and disposal techniques have been developed that result in increased solids concentration of the dredged material and permit the separation of fine material and sands during the dredging operation. Cutterhead dredges utilize ladder pumps to increase the solids concentration where dredging fine-grained materials. This results in a significant decrease in the volume of water required to pump the material as well as decreasing the volume of water placed in the disposal area. Reducing the water in the disposal area reduces the volume of water requiring treatment before returning it to the harbor. It also accelerates the de-watering time of the dredged material. Hydro-cyclone technology has been developed which permits the separation of fine material and sands. This would permit the re-use of sands and decrease the volume of material requiring storage in the CDF. Also, procurements can be injected directly into the hydro-cyclone and this results in reduced settling time of the fine-grained materials in the disposal area.

19. **Use Sheet Pile Joint Seal (Speculation List Item 139):** Sheet pile has a tendency to leak at the joints. Applying a joint sealer to the connecting joints can reduce this leakage. This sealer is expansive upon contact with moisture and fills the gaps in connecting joints. Although difficult to apply during construction of bulkhead cells, it is easily applied during construction of the straight sections of sheet pile wall and sheet pile cut-off walls. Joint sealing is particularly effective with vinyl sheet pile cut-off walls.

20. **Examine Use of a Grout Curtain Wall (Speculation List Item 145):** The current plan calls for a grout curtain wall installed through the center of bulkhead cells, extending down to bedrock. These panels will be approximately 25' wide, and unreinforced concrete. That means an unsealed joint will exist every 25'. This grout wall, being concrete, will crack and leak(Note that concrete used for this grout wall should be flexible concrete, less than 2000psi strength). The intent of this cutoff wall is to provide a barrier to prevent migration of contaminants by seepage by providing a level of impermeability of 10^{-7} cm/sec. Maximum permeability of a grout curtain wall is typically 10^{-5} cm/sec because of unsealed seams and normal temperature cracking which allows leakage. Constructability issues may also prevent installation of a grout curtain wall within the cells. Typical installation equipment require a 50' wide level work platform be provided parallel to the alignment of the proposed grout wall location and at the elevation of top of wall. This will be a difficult requirement to meet at this bulkhead cell wall installation.

A prime analysis of seepage potential should be done early in the design process to determine what contaminant measures (liners, cutoffs, dewatering systems, etc.) will be needed to provide the required level of seepage control. Considering the constructability issues associated with installing a grout curtain wall in the center of bulkhead cells and that the grout curtain wall is not a positive cutoff which can provide the required impermeability of 10^{-7}cm/sec, it is suggested that other more positive methods of seepage control be designed if needed. De-watering systems installed to prevent seepage (while increasing rate of consolidation of dredge material) show the greatest potential for control at minimal cost.

Click here to go to supporting documents