VALUE ENGINEERING TEAM STUDY

DOD SERVICE: USACE VALUE ENGINEERING OFFICER: Larry Nelson

Value Engineering Study on the

NAPA RIVER

FLOOD CONTROL PROJECT

Napa, California

February 1994

U.S. Army Corps of Engineers, Sacramento District

VALUE ENGINEERING FIRM NAME: HQ, U. S. Army Corps of Engineers, OVEST
P.O. Box 889
Savannah, Georgia 31402-0889
Telephone: 912-652-5448

VALUE ENGINEERING TEAM STUDY

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VALUE ENGINEERING TEAM STUDY

EXECUTIVE SUMMARY

PROJECT TITLE: Napa River Flood Control Project

PROJECT LOCATION: Napa, California

a. Project Description and Background.

(1) The Napa River, Flood Control Project consists of a combination of river widening and deepening, and construction of earthen levees, concrete flood walls, sheet pile flood walls and an oxbow by-pass channel. The plan begins near Kennedy Park and extends north (upstream) approximately 5.7 miles to Trancas Street. This plan prevents Napa River flooding of the downtown area during a 100-year flood event.

(2) From Kennedy Park to Imola Ave, the plan consists of deepening and widening the river and re-construction of the existing earth levees along both banks of the river. The levees are reconstructed to the same height as exists now. About 13 acres of environmental mitigation is also planned for this reach.

(3) From Imola Ave to Pine Street, the river is deepened/ widened and earth levees/concrete flood walls are constructed. On the east bank, new and re-constructed earth levees will be built to a height of 7 feet. Concrete flood walls which average 4 feet in height will be constructed on the west bank.

(4) From Pine Street to Third Street, the river will again be widened and deepened. Along the west bank, vertical sheet pile flood walls will be installed to keep Riverside Drive open. The sheet pile wall is capped with a 3-foot concrete flood wall. The east bank remains natural with a 3-foot high sheet pile wall constructed 25 ft away from the river bank. The existing Third Street Bridge is replaced with a new bridge.

(5) From Third Street to Lincoln Ave, flood walls are constructed along the east bank of the oxbow from Third Street to 1,000 ft north of the First Street Bridge. Along the west bank, intermittent flood walls are installed to reduce flooding. Average height of the flood walls is 4 ft.

(6) A new excavated channel will cut across the "loop" of the river oxbow, which will allow the 100-year flows to pass more quickly through the downtown area. New bridges are required to cross the by-pass channel at First Street, Soscol Avenue, and the Wine Train Crossing.

(7) From Lincoln Ave to Trancas Street, a levee will be constructed along the west bank of the river. The new levee begins at Lincoln Ave and merges into the existing levee surrounding the Lake Park development. The existing levee will also be reconstructed to protect the area against the 100-year flood. No bridges require replacement in this reach and no protection is planned for the east side of the river.

(8) The documents used as a basis for the current design for this VE study are the Feasibility Report (Napa River Alternatives/HTRW IPR -- read-a-head package, dated May 1993), M-CACES cost estimate, and project mapping prepared by the Sacramento District. The current project estimate (CWE) based on October 1992 price levels is $99,240,000.

b. VE Methodology:

(1) This project was studied using the standard Value Engineering (VE) methodology, consisting of six phases: Information, Speculation, Analysis, Development, Presentation, and Implementation.

(2) During the Information Phase, the Team studied the drawings, Design Analysis, and cost estimates to fully understand the work to be performed and the functions to be achieved. Cost models were prepared to determine areas of relative high cost to ensure that the Team focused on those parts of the project which offered the most potential for cost savings (see Appendix C).

(3) The Team then conducted brainstorming sessions to generate ideas for alternative designs (see Appendix B), and analyzed these ideas. The most feasible ideas were then developed and are presented as proposals. OVEST presented the proposals to the Sacramento District on 20 January 1994.

(4) OVEST will be available as needed to assist during the Implementation Phase of this study.

c. Summary of Proposals:

PROPOSAL NO.	DESCRIPTION		POTENTIAL SAVINGS
1	Use Improved Existing Dredge Material Disposal Sites/Delete Haul to Quarry Site		
		Option A	$ 939,962
		Option B	$2,505,915
		Option C	$2,112,123
2	Replace Gabion Mattress at Napa Creek with a Cellular Concrete Mat System.		$ 48,907 (LCC)
3	Replace Concrete Retaining Wall with a Reinforced Earth Retaining Wall.		$ 189,261
4	Design a More Pedestrian-Oriented Island.		$2,088,900
5	Eliminate New Brown Street Footbridge.		$ 327,050
6	Provide Option for Cold Formed and Steel Sheet Piling (If CZ-128, $1,029,891)		$1,064,757

NOTE: The proposals are not additive, since some options are offered and acceptance of some proposals will affect the savings of others. The highest savings potential from all proposals results in total savings in excess of $6,300,000.

VALUE ENGINEERING PROPOSAL

PROPOSAL NO.: 1
PAGE NO.: 1 OF 6

DESCRIPTION: Use Improved Existing Dredge Material Disposal Sites/Delete Haul to Quarry Site

ORIGINAL DESIGN: The current design requires that 1,260,200 CY of dredge material be hauled and disposed of at a quarry site. This dredge material comes from Reaches Numbers One, Two, and Three of the project. The quarry site is approximately 7 miles from the Napa River. The total cost to haul this material is approximately $2,800,000

PROPOSED CHANGE: This proposal recommends that existing dredge material disposal sites adjacent to the Napa River be utilized for the dredged material from this project. Currently, there are two existing sites along the river between Reaches One and Three. One site is by Kennedy Park and the other by the Napa Sanitation Plant. Material dredged from the river by this project could be pumped directly to the adjacent disposal areas and would not have to be double handled and hauled. In order to achieve enough storage space, the existing containment dikes around the disposal areas would have to be raised and possibly some new disposal areas constructed. The Kennedy Park Site appears to have enough capacity for storage if the existing containment dikes are raised, but the disposal site by the Napa Sanitation District is filled and either the existing material needs to be removed before any new material is placed on-site or another location by the district, such as the ponds, needs to be investigated for use as storage. Any new disposal sites will require environmental mitigation. It is also noted that the Kennedy Park Site has existing radio towers located within the disposal area. There is a need to investigate the impact on these towers and the grid system before any new material can be deposited in the site. Three options are offered by this proposal.

Option 1A: Utilize only existing disposal areas and raise the existing containment dikes by 6'. This option allows for approximately 451,111 CY of disposal next to the river and 809,084 CY of haul to quarry site. The existing Napa Sanitation District Disposal Site will have to have all existing material removed, prior to disposition of any other material.

Option 1B: Utilize only existing disposal areas and raise the existing containment dikes by 15'. This option allows for all 1,260,200 cay of spoil to be disposed of next to the river. Again, the prior removal of existing material at the Napa Sanitation District will have to be accomplished.

Option 1C: Utilize existing disposal areas and obtain about 96 acres of new disposal sites adjacent to the river. Existing containment dikes would be raised 6' and new containment dikes would be constructed 6' high. All 1,260,200 CY of dredged material would be directly pumped to the existing and new disposal sites.

(Note: All new containment dike heights include 1'-0" freeboard.)

ADVANTAGES:

1. Reduces construction time and costs.

2. Reduces probability of an environmental accident during hauling.

3. Will enhance real estate on the lower river and provide for a wildlife habitat.

DISADVANTAGES:

1. May have to remove existing material from the Napa Sanitation District Site prior to adding any new material.

2. Need to investigate impact of new material at the Kennedy Park Site due to existing radio towers and grid system.

JUSTIFICATION: This proposal will provide the same basic function as the current design at a lower cost. Dredging operations are more efficient if material is pumped directly to a disposal area without rehandling. There is less of a probability that an environmental accident will occur. Existing disposal areas are located adjacent to the river at Kennedy Park and the Napa Sanitation Facility. Approximately 60 acres are available at these locations. By raising the existing containment dike 6'-0" at these locations, approximately 1/3 of the dredged material for this project can be accommodated. The remainder will have to go to the quarry spoil site. If the exiting containment dikes are raised by 15' or additional land can be made available for dredged material disposal, the material can be accommodated. Three options are offered by this proposal. Raising the containment dikes by 6' at the existing sites and obtaining another 96 acres of new sites with 6' high containment dikes, is the optimum proposal even though 96 other acres will have to be obtained for enviromental mitigation. Also, in order to use the Napa Sanitation Disposal Site, all existing material will probably have to be removed prior to disposing of new dredged material or another location such as, the ponds, will have to be investigated.

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 1

OPTION 1A PAGE NO.: 4 OF 6

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Haul Dredge Material to Quarry Site	CY	451,111	$ 2.07	$933,800
Total Deletions				$933,800

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Construct 6' high containment dike	CY	39,668	$ 1.08	$ 42,841
Total Additions				$ 42,841

Net Savings (Deletes - Adds)	$890,959
* Markups @ 5.5%	49,003
Total Savings	$939,962

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 1

OPTION 1B PAGE NO.: 5 OF 6

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Haul Dredge Material to Quarry Site	CY	1,260,200	$ 2.07	$2,608,614
Total Deletions				$2,608,614

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Construct 15'high containment dike	CY	216,055	$ 1.08	$ 233,339
Total Additions				$ 233,339

Net Savings (Deletes - Adds)	$2,375,275
* Markups @ 5.5%	130,640
Total Savings	$2,505,915

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 1

OPTION 1C PAGE NO.: 6 OF 6

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Haul Dredge Material to Quarry Site	CY	1,260,200	$ 2.07	$2,608,614
Total Deletions				$2,608,614

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Construct 6'High Containment dike	CY	53,224	$ 1.08	$ 57,482
Dredge Material Disposal Easement	AC	96	$ 1.020	97,920
Mitigation Costs	AC	96	$ 4,700	451,200
Total Additions				$606,602

Net Savings (Deletes - Adds)	$2,002,012
* Markups @ 5.5%	110,111
Total Savings	$2,112,123

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

VALUE ENGINEERING PROPOSAL

PROPOSAL NO.: 2
PAGE NO.: 1 OF 3

DESCRIPTION: Replace Gabion Mattress at Napa Creek with a Cellular Concrete Mat System

ORIGINAL DESIGN: The current design for Napa Creek includes a 12-inch thick gabion mattress to cover the invert and side slopes of the entire channel.

PROPOSED CHANGE: This proposal recommends that an interlocking cellular concrete mat system, similar to "Armorflex", be used in lieu of the gabions (see Drawing No. 1). The Armorflex mat is only one of several manufactured types of mats. Please note that the Armorflex mat can be installed on slopes of up to 1:1, without soil anchors. However, other types of mats may need to be anchored to the slope with soil anchors.

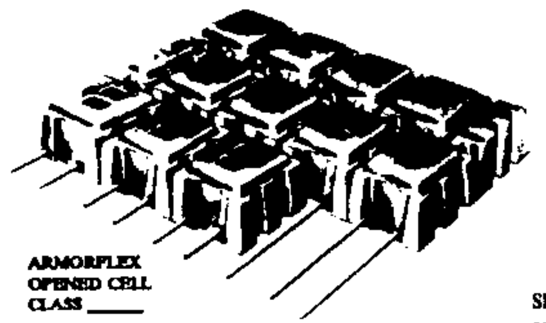
ADVANTAGES:

1. The cellular concrete mat system will be more durable than the gabions. During the VE study, the designers and local sponsor indicated that they had experienced corrosion problems with gabions in this area. The cost estimate for this proposal assumes that the gabions will need to be replaced after 25 years.

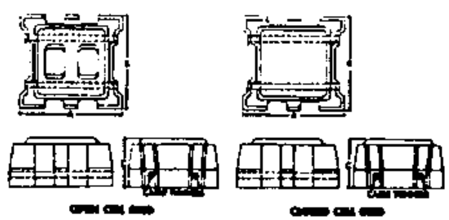
2. The cellular concrete mat system will provide a more pleasing aesthetic appearance to the project because vegetation will grow between the cells of the mat.

DISADVANTAGES: The cellular concrete mat system may require additional maintenance costs to control the growth of vegetation, depending upon the type of vegetation that is used.

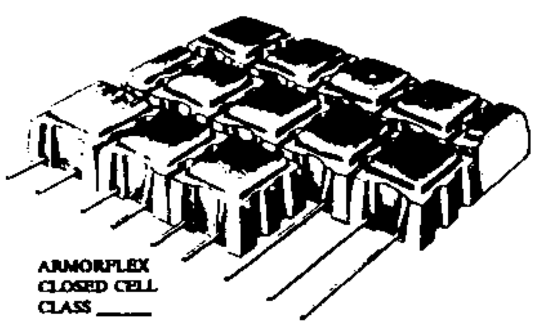
JUSTIFICATION: This proposal was discussed with the hydraulic designer, Mr. Donald Twiss. He said that the District was considering a concrete mat system because of corrosion problems with gabions, and for aesthetic reasons. He indicated that the concrete mat system may be more acceptable even if the initial cost is higher.



ARMORFLEX
OPENED CELL
CLASS ______



30S	45S	13	11.6	4.75
50S	55S	13	11.6	6
40	45	17.6	15.5	4.75
50	55	17.6	15.5	6
60	75	17.6	15.5	7.5
70	85	17.6	15.5	9



ARMORFLEX
CLOSED CELL
CLASS ______

ARMORFLEX

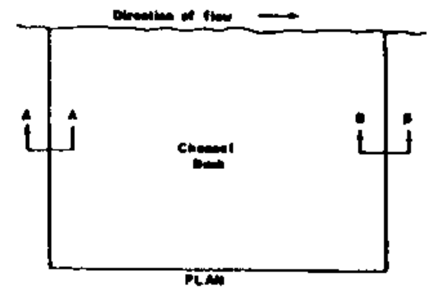
Shown below are typical details of Armorflex Cable-tied concrete block revetment mats which should be included on drawings as appropriate. Cut-off trenches and flank trenches, when used, should be at least 3 ft. deep on upstream side and 2 ft. deep on downstream side.

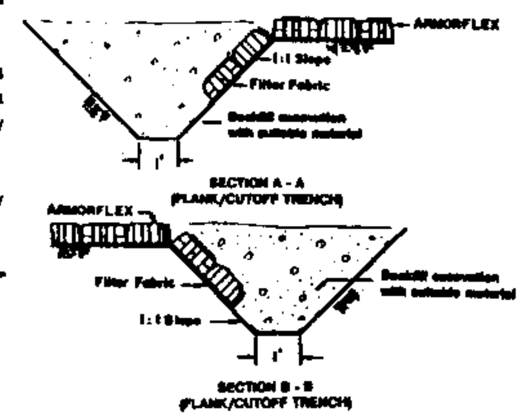
All Armorflex should be placed over filter fabric. Drawings should contain a note indicating whether Armorflex used in trenches (anchor or flank) will or will not be included in pay quantities.

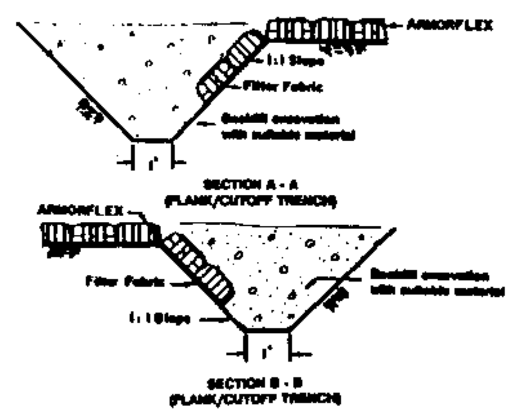
Details of Cross Sections may be emphasized by using any distinctive decorative border tape such as:

"Formaline" 7059K

ARMORTEC







COST ESTIMATING WORKSHEET

PROPOSAL NO.: 2
PAGE NO.: 3 OF 3

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
gabions	CY	5600	$ 144	$ 806,400
filter fabric	SY	17090	2.03	34,693
gabion replacement at year 25 (present worth of $841,093 @ 4.5% interest)	LS			281,934
Total Deletions				$1,123,027

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
6-inch thick cellular concrete mat, incl filter fabric	SF	153810	**$ 7.00	$1,076,670
Total Additions				$1,076,670

** Unit cost provided by Jim Fish, Geo Products, 619-756-3050

Net Savings (Deletes - Adds)	$ 46,357
* Markups @ 5.5%	2,550
Total Savings	$ 48,907

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

VALUE ENGINEERING PROPOSAL

PROPOSAL NO.: 3
PAGE NO.: 1 OF 4

DESCRIPTION: Replace Concrete Retaining Wall with a Reinforced Earth Retaining Wall

ORIGINAL DESIGN: The current design between Stations 251+00 and 256+00 on the left bank and between Stations 250+20 and 256+00 on the right bank includes a T-shaped, reinforced concrete retaining wall located 15 ft behind a steel sheet pile wall. The T-shaped wall is approximately 10 ft high, with 5 ft of exposed wall surface (see Drawing No. 1).

PROPOSED CHANGE: This proposal recommends that the concrete retaining wall be replaced with a 5-foot high reinforced earth retaining wall (see Drawing No. 2). Please note that this sketch of a reinforced earth retaining wall is a generic design based on typical soil and loading conditions. The dimension for "L" is normally equal to approximately 75% of the wall height "H".

ADVANTAGES:

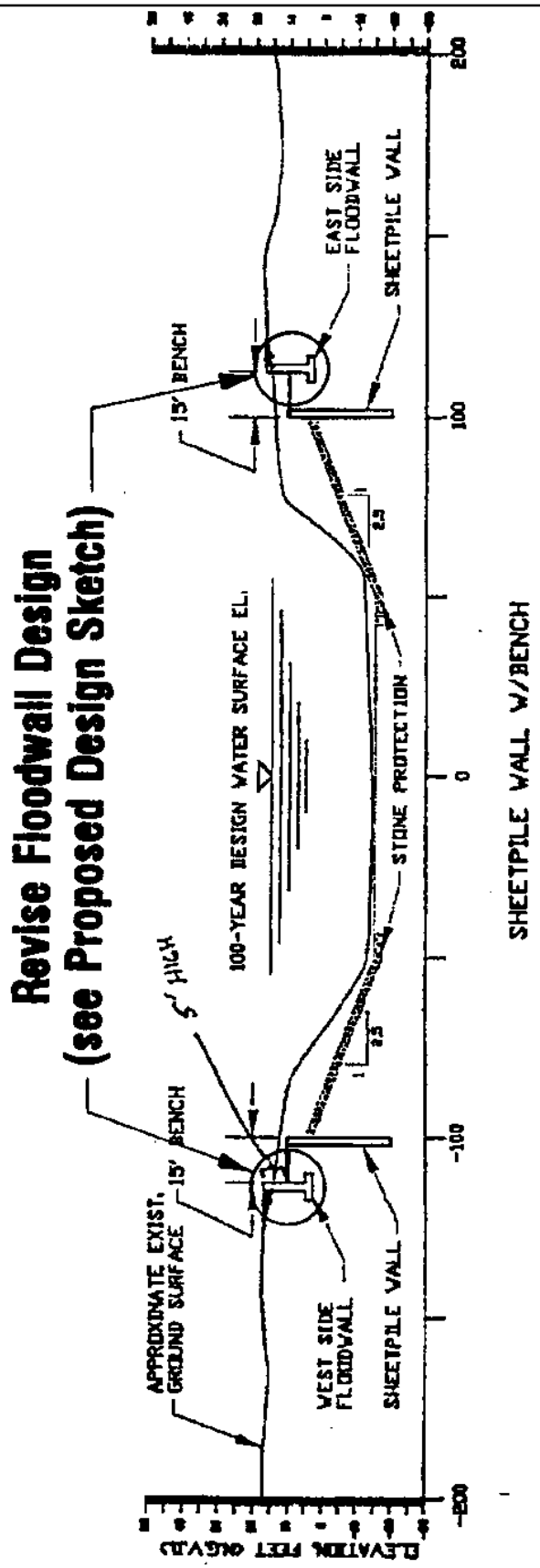
1. Reduces cost and construction time.

2. Reduces the depth of excavation, which may avoid potential problems with ground water and/or unsuitable materials.

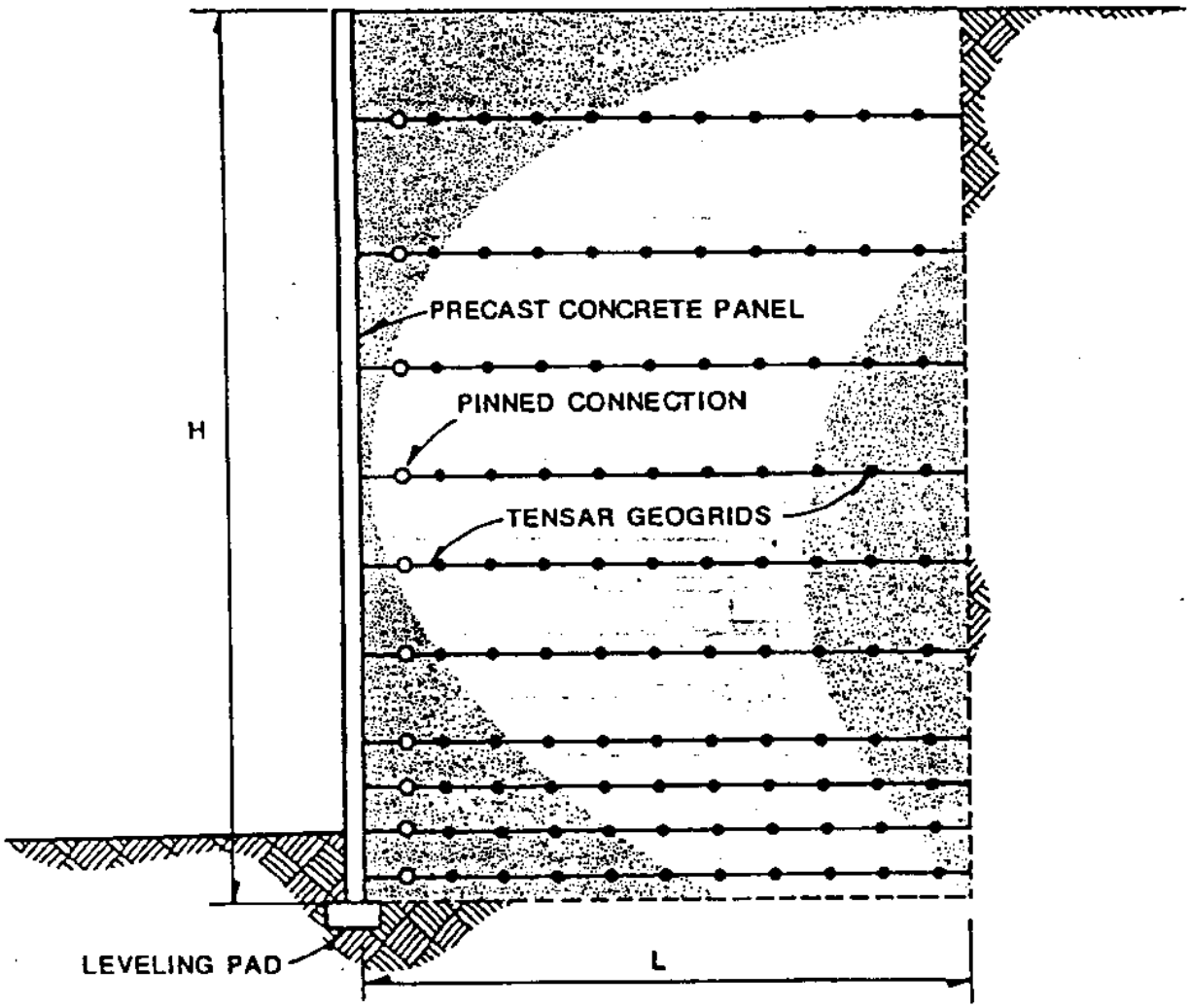
3. Allows for a variety of wall finishes, which may enhance the aesthetic appearance of the project.

DISADVANTAGES: None known.

JUSTIFICATION: This proposal will provide the same function as the current design at a reduced cost. It is noted that the current design information, which was used as a basis for this proposal, was provided to OVEST by the Project Manager, Richard Nishio, as the latest revision to the current design.



CURRENT DESIGN



PROPOSED DESIGN

Reinforced Earth Retaining Wall

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 3
PAGE NO.: 4 OF 4

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
excavation	CY	2800	$ 6.24	$ 17,472
structural backfill	CY	1889	7.20	13,601
concrete, incl reinforcement	CY	911	311	283,321
Total Deletions				$314,394

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
reinforced earth retaining wall, incl excavation, backfill, reinforcement & precast concrete facing panels (unit price per Contech, Inc.)	SF	5400	$ 25	$135,000
Total Additions				$135,000

Net Savings (Deletes - Adds)	$ 179,394
* Markups @ 5.5%	9,867
Total Savings	$ 189,261

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

VALUE ENGINEERING PROPOSAL

PROPOSAL NO.: 4
PAGE NO.: 1 OF 7

DESCRIPTION: Design a More Pedestrian-Oriented Island

ORIGINAL DESIGN: The new oxbow bypass channel is designed to cut across the "loop" in the river oxbow. This construction creates an island which separates the city's downtown area, to the west of the bypass channel, from a large residential area on the east side of the oxbow. New bridges crossing the bypass are to be built at First Street, Soscol Avenue, and the Wine Train crossing. Because of the elevated approach of the new First Street Bridge, the existing First Street Bridge will have to be removed, at an additional cost to the local sponsor. First Street itself will physically divide the new island into two halves. Approximately 600 ft. south of the First Street Bridge is the Third Street Bridge. The latter will also require replacement by a new bridge since the existing structure is too low to pass the 100-year flood. Construction of a new museum/cultural center on the island relating to the area's wine industry is anticipated to create a major tourist magnet in conjunction with the Wine Train.

PROPOSED CHANGE: Consider that the new First Street Bridge construction be deleted from the project and First Street be closed to vehicular traffic, except for emergency vehicles and delivery/ pickup vehicles. (The latter would only be allowed at specified, non-peak hours.) Soscol Avenue would be retained, maintaining its role as a main north-south thoroughfare. This change envisions island (tourist) parking lots off Soscol to the west, and adjacent to the existing First Street Bridge approach to the east at the oxbow. A (basically) pedestrian island is created under this scenario whereby people can freely walk about the island to experience its many planned pleasures. It should be noted that it is the city's decision to make, and that the Corps does not take a position in the matter. (See Telephone Conversation Record Nos. 1, 2, 3, and 6.)

ADVANTAGES/JUSTIFICATION:

1. Will alleviate potential traffic congestion at western-most end of newly created tourist island. Anticipate heavy tourist traffic and normal daily traffic (at times) could "bottleneck" at intersection of First Street Bridge approach and Soscol Avenue Bridge approaches. Also, Wine Train crossing of First Street could cause further periodic congestion.

ADVANTAGES/JUSTIFICATION (Con't):

2. Anticipate the island eventually becoming a major tourist and cultural attraction in the area, infusing significant revenue into the local economy. Construction of the wine museum/cultural center, the existence of the nearby Wine Train, as well as arrival of other tourist amenities and commercial ventures on the island, should secure these conditions. Construction of First Street Bridge will not only contribute to traffic congestion, but will cause the island to be bisected into two halves, impeding the flow of tourist foot traffic from one side of First Street to the other. This island will have all of the important ingredients of a major "people place" in the U.S. if it is free from vehicular traffic, except, of course, for service-type vehicles.

3. OVEST recognizes that First Street is a major artery from the eastern residential area to the downtown commercial area west of Napa Creek. If needed, the project's Third Street replacement Bridge can be redesigned to accommodate re-routed traffic while still directing traffic to the downtown area. (See Telephone Conversation Record Nos. 1, 3, 5, and 7.)

4. Possibility of designing a narrower bypass channel at the First Street Bridge location if the bridge isn't built. This would result in less excavation, hauling, and perhaps, less rip rap bottom and side slope protection. (See Telephone Conversation Record No. 1.)

5. Can also result in cost avoidance by retaining the existing First Street Bridge over Napa Creek. If parking lots serving the downtown stores can be made accessible to the bridge from the area between the bypass channel and Napa Creek, the bridge can be used as a footbridge. And, as an extension of this idea, a newly constructed, less costly footbridge (vice the vehicular bridge in the current design) could link the downtown area, nearby parking lots and the island together, creating a pedestrian linkage between the old and the new.

6. Reduces construction time.

7. Substantial local sponsor cost savings.

DISADVANTAGES:

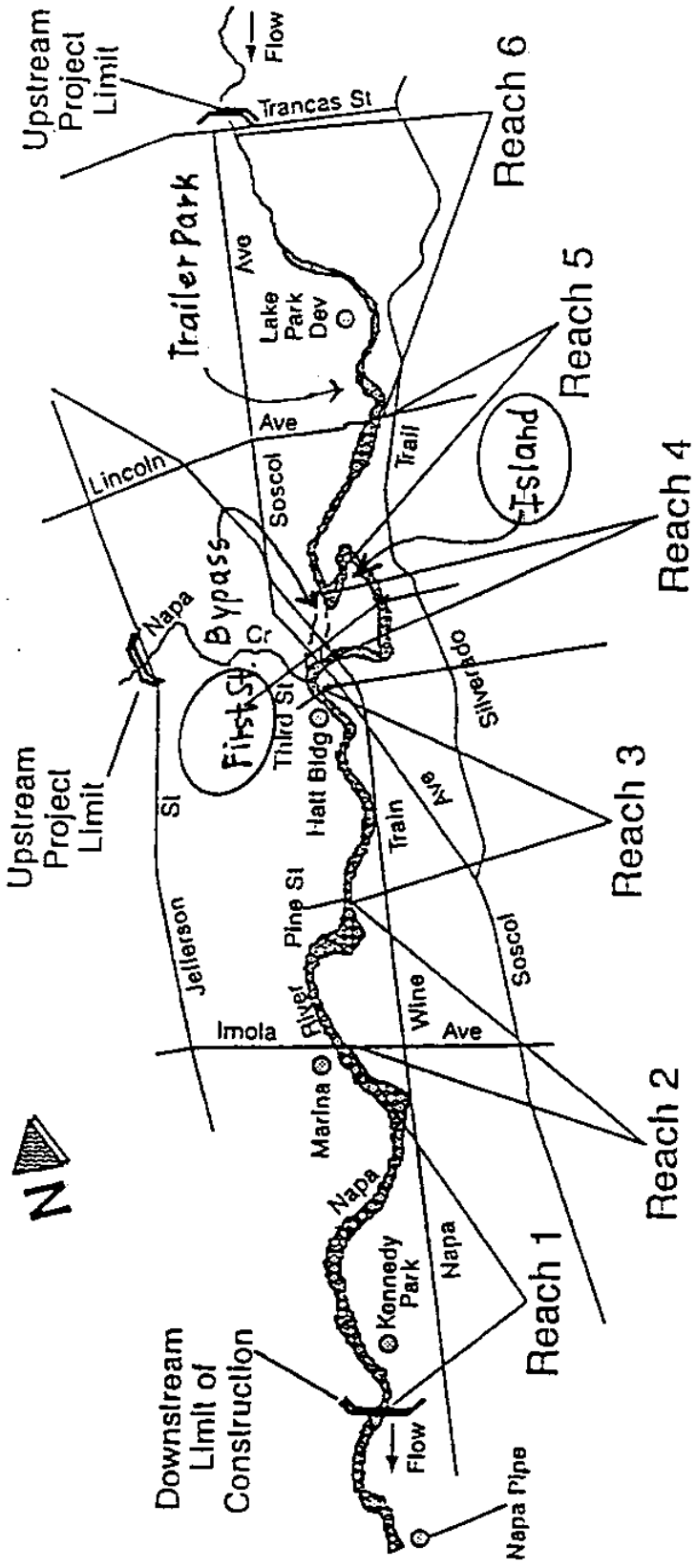
1. Deletion of First Street Bridge will cause permanent re-routing of some vehicular traffic between downtown businesses and the east side of town. Downtown merchants may oppose idea. It should also be noted that temporary re-routing of First Street traffic would be required under the current design due to building the new bridge. (See Telephone Conversation Record Nos. 3 and 7.)

2. Access to east side of town may be a problem for police and fire vehicles located in the downtown area.

3. Will require some redesign, and possibly new construction sequencing.

4. Vehicular access and parking for island merchants/employees will have to be addressed.

Napa River, California
Project Reaches




NAPA CREEK
DOWNTOWN AREA
NEW BRIDGE
RECREATION TRAIL
EXIST'G. BRIDGE
SOSCOL AVENUE
FLOOD WALL WITH RECREATION TRAIL
N
WINE TRAIN BRIDGE (NEW)
FIRST STREET
FLOOD WALL
EXIST'G. BRIDGE
FLOOD WALL
SHEET PILE WALL WITH BENCH
THIRD STREET
LARGE RESIDENTIAL AREA

DRAWING NO. 3: DESIGN DRAWING/PROPOSED DESIGN

PROPOSAL NO.: 4 PAGE NO.: 6 OF 7

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 4
PAGE NO.: 7 OF 7

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
First Street bridge construction	LS			$1,800,000
Existing First Street bridge removal	LS			180,000
Total Deletions				$1,980,000

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
			$	$
Total Additions				$

Net Savings (Deletes - Adds)	$1,980,000
* Markups @ 5.5%	108,900
Total Savings	$2,088,900

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs

VALUE ENGINEERING PROPOSAL

PROPOSAL NO.: 5
PAGE NO.: 1 OF 3

DESCRIPTION: Eliminate New Brown Street Footbridge

ORIGINAL DESIGN: The existing Brown Street Bridge formerly served vehicular traffic across Napa Creek. It now serves only as a footbridge for pedestrians going to the downtown area from nearby parking lots. In the project plan, it will be removed and replaced with a new footbridge since it obstructs flow. Within a distance of approximately 700' east from the proposed footbridge toward the river, there are two existing footbridges, the Main Street Bridge and the Pearl Street Bridge (see Drawing and Telephone Conversation Record No. 5).

PROPOSED CHANGE: Recommend the replacement Brown Street Footbridge be eliminated from the project.

ADVANTAGES:

1. Saves construction time.

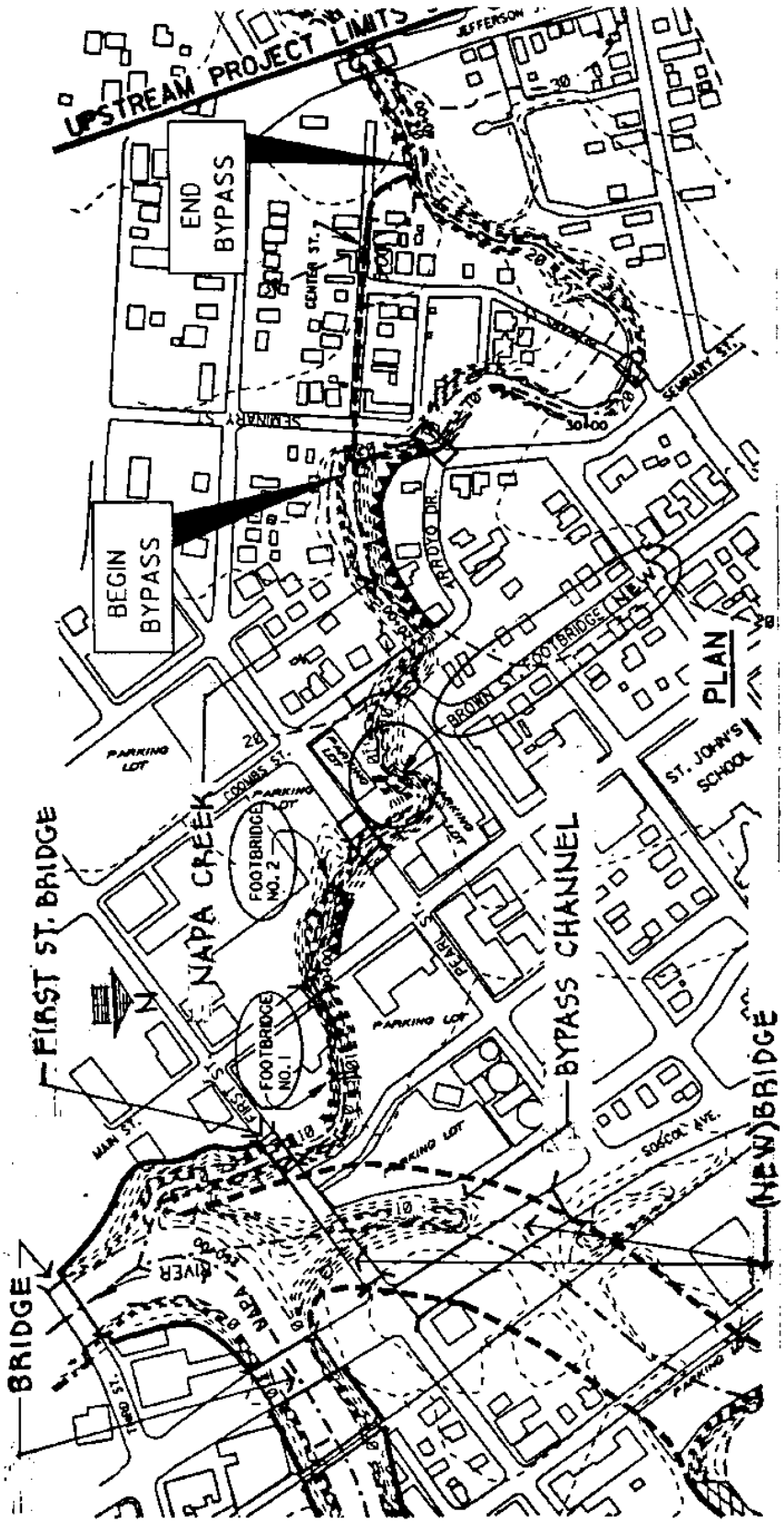
2. Local sponsor cost savings.

DISADVANTAGE: One less creek pedestrian crossing from the parking lots to the downtown area. (See Telephone Conversation Record Nos. 6 and 7.)

JUSTIFICATION:

1. Since the two nearby vehicular bridges also contain sidewalks for pedestrians, there are at least four fairly close locations at which pedestrians can cross the creek. (See Telephone Conversation Record Nos. 6 and 8.)

2. The local sponsor has indicated that a development plan for the area could be interfered with if the bridge is built.


UPSTREAM PROJECT LIMITS
JEFFERSON
END BYPASS
BEGIN BYPASS
CENTER ST.
SEMINARY
SEMINARY ST.
ARROYO DR.
BROWN ST.
FOOTBRIDGE (NEW)
PLAN
PARKING LOT
COOMBS ST.
FOOTBRIDGE NO. 2
FOOTBRIDGE NO. 1
NAPA CREEK
FIRST ST. BRIDGE
MAIN ST.
FIRST ST.
PEARL
PARKING LOT
ST. JOHN'S SCHOOL
BYPASS CHANNEL
SOSCOL AVE.
(NEW) BRIDGE
BRIDGE
NAPA RIVER
LINDEN ST.
N

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 5
PAGE NO.: 3 OF 3

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
footbridge construction	LS	1	$310,000	$ 310,000
Total Deletions				$ 310,000

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
			$	$
Total Additions				$

Net Savings (Deletes - Adds)	$ 310,000
* Markups @ 5.5%	17,050
Total Savings	$ 327,050

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

VALUE ENGINEERING PROPOSAL

PROPOSAL NO.: 6
PAGE NO.: 1 OF 6

DESCRIPTION: Provide Option for Cold Formed Steel Sheet Piling

ORIGINAL DESIGN: The current design provides 174,700 SF of PZ-40 and 32,400 SF of PZ-27 steel sheet pile for retaining walls along approximately 3,400 LF of the Napa River. Exposed walls are two heights - 8 1/2 and 14 feet. Depths are estimated to vary to 40 feet. The typical sections feature a simple I-Wall channel wall from Pine to Fifth Streets (Station 220+00 to Station 251+00), and a shorter wall as part of the bench wall system at Fifth to Third Streets (Station 251+00 to Station 256+00).

PROPOSED DESIGN: It is recommended the option be provided to allow both hot and cold formed steel sheet pile if design conditions are met by both products. Cold formed CZ sections provide two options for the PZ-27. CZ 128 has a section modulus of 35.34 cu. in./LF with a weight advantage of 26.2 (vs. 27 #/SF for PZ-27). CZ 114 has a section modulus of 31.62 with a weight advantage of 23.4 vs. 27 #/SF (saves 3.6 #/SF). It was recommended the designers revisit the requirement for the wall sections currently shown as PZ-40. If the walls can be designed to PZ-35, based on complete project soils data when available, a cold formed section can be used. CZ 148 has a section modulus of 40.92, exceeding the PZ-35 section, and a weight advantage of 30.3 vs. 35 #/SF. Where both materials are specified based on performance to project conditions, competition in bidding will be improved. CASTEEL has over 10 years in production in Canada (has been in the U.S. 3 years), and has furnished products to Corps project in several areas in the U.S. See Appendix G for supporting data. Prices for materials delivered on site were given as follows:

CZ 114	$ 7.02/SF	(With 20% Contingency $8.42)
CZ 128	$ 7.87/SF	(With 20% Contingency $9.44)
CZ 148	$ 9.10/SF	(With 20% Contingency $10.92)

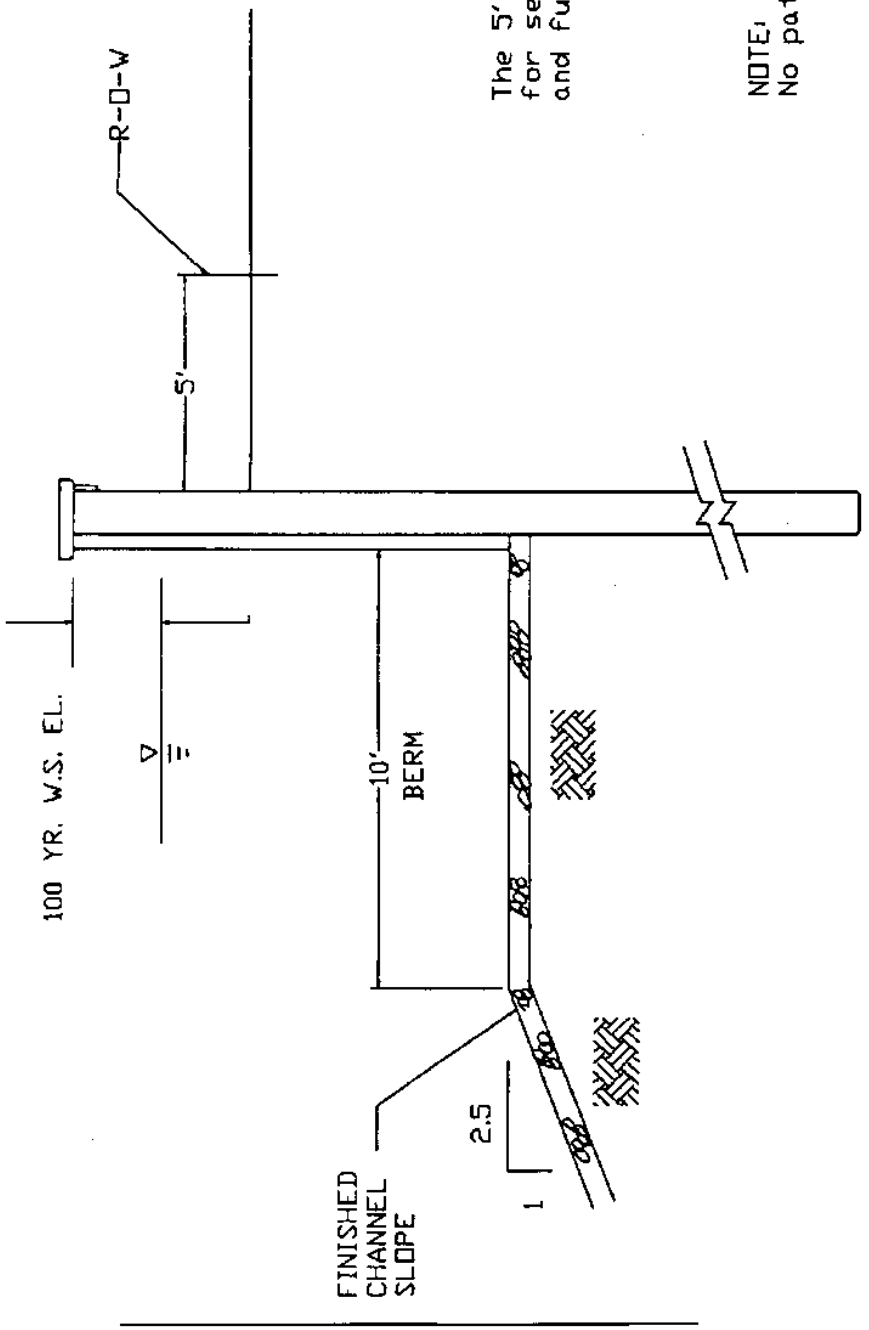
ADVANTAGES:

1. Efficiencies of the cold formed product includes thinner sections produced to specified lengths from minimum yield 50 psi steel as base price.
2. Production and delivery available for Napa River (Bellvue, WA.)
3. May use PZ-40 in reaches if required by design analysis.

DISADVANTAGES: None noted.

JUSTIFICATION: Product performance must meet project design conditions. Savings range $1,064,757 to $1,029,891 if CZ sections can be used. Cold formed CZ steel sheetpile looks similar to PZ sections. Sheetpile widths are approximately 24-inches wide. Technical performance including interlock and resistance to corrosion should be satisfactory for the cold formed sections. The CZ sheetpile systems have been used on Corps projects on the Mississippi River by New Orleans District. Aesthetically, steel sheetpile offers an earth tone brown which could be considered compatible with the Napa River water and earth tones within the river banks.

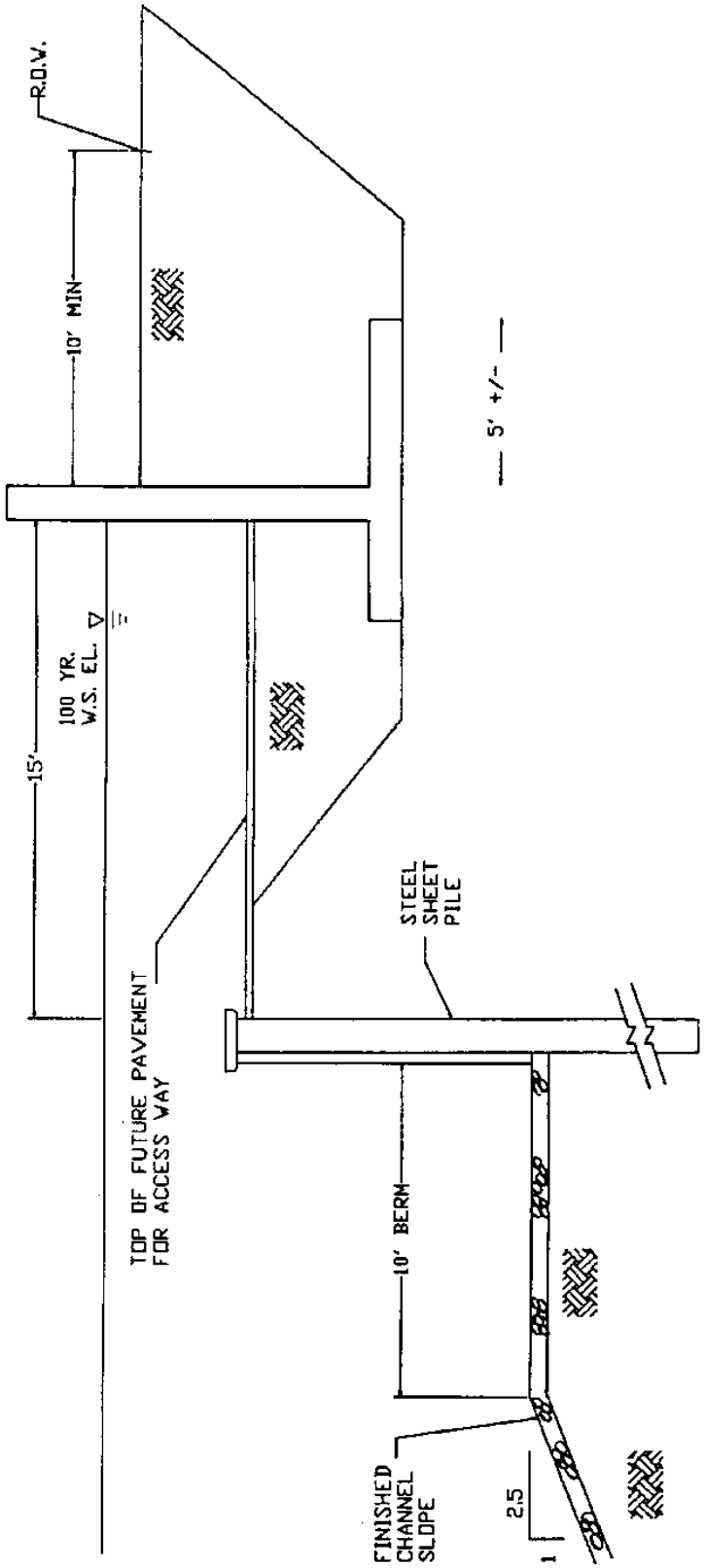
TYPICAL SHEET PILE CHANNEL WALL



TYPICAL SHEET PILE CHANNEL WALL
LEFT WALL = STA. 220+00 TO STA. 251+00
RIGHT WALL = STA. 220+00 TO STA. 250+20

REACH 3
(Pine Street to Fifth Street)

TYPICAL SHEET PILE CHANNEL WALL AND BENCH REACH



TYPICAL SHEET PILE CHANNEL WALL
AND BENCH REACH

LEFT BANK = STA. 251+00 TO STA. 256+00
RIGHT BANK = STA. 250+20 TO STA. 256+00

REACH 3
(Fifth Street to Third Street)

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 6
PAGE NO.: 5 OF 6

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Sheet Pile, PZ-27 (material only)	SF	32400	$11.10	$ 359,640
Sheet Pile, PZ-40 (material only)	SF	174700	16.20	2,830,140
Total Deletions				$3,189,780

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Sheet Pile, CZ-114 (material only)	SF	32400	$ 8.42	$ 272,808
Sheet Pile, CZ-148 (material only)	SF	174700	10.92	1,907,724
Total Additions				$2,180,532

Net Savings (Deletes - Adds)	$1,009,248
* Markups @ 5.5%	55,509
Total Savings	$1,064,757

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

COST ESTIMATING WORKSHEET

PROPOSAL NO.: 6
PAGE NO.: 6 OF 6

DELETIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Sheet Pile, PZ-27 (material only)	SF	32400	$11.10	$359,640
Sheet Pile, PZ-40 (material only)	SF	174700	16.20	2,830,140
Total Deletions				$3,189,780

ADDITIONS

ITEM	U/M	QTY	UNIT COST	TOTAL
Sheet Pile, CZ-128 (material only)	SF	32400	$ 9.44	$ 305,856
Sheet Pile, CZ-148 (material only)	SF	174700	10.92	1,907,724
Total Additions				$2,213,580

Net Savings (Deletes - Adds)	$ 976,200
* Markups @ 5.5%	53,691
Total Savings	$1,029,891

* Markups include S&A (5.5%). Markups for contingencies are included in the unit costs.

COMMENTARY

The following are comments and/or design change recommendations of the VE Team which have not been developed as VE proposals, but could be of assistance to the designer or user sponsor in completing the project design.

1. Re-use Existing Rip Rap - There are at least two existing locations in the project which presently contain extensive rip rap to be removed and hauled away in accordance with the current design in the Feasibility Study. One of the two locations is along the existing levee in Reach 6 adjacent to the Lake Park and mobile home park residential developments. Another is downstream in Reach 3. Recommend that this rip rap be investigated for possible project use in lieu of some of the specified rip rap.

2. Eliminate Floodwall Where Property was Filled, Downstream of Jordan Lane. Presently, a track of land downstream of Jordan Lane has been filled and improved above the 100-year water surface elevation. This track of land abuts the Napa River for approximately 200'. It is recommended that the new floodwall not be constructed across this area. The westside floodwall could be terminated on either side of the track and tied into the high ground. Approximately $6,700 would be saved if this portion of the floodwall were deleted.

3. Steepen Side Slopes of Levee. Currently, the levee design indicates side slopes of 1V on 3H or 1V on 2«H. If these slopes can be steepened to a 1V on 2H due to material characteristics, a $47,520 savings could be achieved for each mile of levee.

4. Reduce the Number of Construction Contracts. As part of the VE study, OVEST discussed the construction contracting plan with the Project Manager, Richard Nishio. He indicated that the current design has separated the work into nine contracts, but that this is only a tentative plan and may be revised prior to completion of the plans and specifications. He said that the hazardous and toxic waste work (HTRW) would probably need to be accomplished first as a separate contract, but that the designers could evaluate the need for eight additional contracts. The work basically consists of approximately $30,000,000 of federal construction work, including excavation, levee and floodwall construction, and sheet pile installation. There are six reaches extending approximately 6 miles. This work could easily be accomplished as a single contract or as two or three contracts. This would reduce the contract administration costs, reduce the construction time, and may reduce construction costs by consolidating the mobilization costs. Another consideration to be evaluated is the number of qualified contractors in the area. If there are sufficient qualified contractors to perform large construction contract work, then OVEST feels the number of contracts should be reduced to six or less, including the HTRW work.

APPENDIX A:

TELEPHONE CONVERSATION RECORDS

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 1

DATE: 5 Nov 93

TO: Bob Sorsen, Project Manager, Flood Control and Water Conservation District, Napa, California, 707/253-4351

FROM: Hugh Bourne, OVEST, 912/652-5170

I mentioned the brainstorming idea of not building the new First Street Bridge across the bypass. Some of Bob's initial thoughts were:

1. Overall, he thinks it's a good idea.

2. Absence of the bridge might result in a narrower channel through the area.

3. Traffic to and from downtown can be re-routed.

4. Speak also with Planning Director, John Yost (707) 257-9530 and the city's Public Works Director, Mike O'Bryon (707) 257-9520 or his assistant, Dick Breuchert.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 2

DATE: 9 Nov 93

TO: John Yost, Planning Director, Napa, California, 707/257-9530

FROM: Hugh Bourne, OVEST, 912/652-5170

After a brief discussion, (in a "nutshell") John feels that the elimination of the new First Street Bridge over the bypass is an interesting idea. He also said he'd pursue the idea with the Public Works Director, Mike O'Bryon.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 3

DATE: 9 Nov 93

TO: Dick Bruechert, Assistant Public Works Director, Napa, California, 707/257-9520

FROM: Hugh Bourne, OVEST, 912/652-5170

Regarding our discussion concerning eliminating the new First Street Bridge, Dick's initial comments were:

1. A large population lives east of the oxbow.

2. First Street is the main artery to downtown, located a little west of Napa Creek. Downtown merchants will complain if First Street is closed.

3. Third Street would probably need widening to handle additional/traffic if First Street is closed.

4. Lincoln Street Bridge is the next bridge north of First Street Bridge.

5. The idea is good from the island land-planning point of view.

6. We both agreed the idea should be in the report as a proposal or a comment.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 4

DATE: 16 Nov 93

TO: Richard Nishio, CESPK-ED-D, 916/557-6645

FROM: Charles Claghorn, OVEST, 912/652-5173

Mr. Nishio told me that the Kennedy Park dredge material disposal site had an area of 2,233,500 sq ft and the Napa Sanitation Plant dredge material disposal site consisted of an area of 202,500 sq ft. The square footages indicate an area of 60 acres for existing dredge material disposal sites.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 5

DATE: 22 Nov 93

TO: John Yost, Planning Director, Napa, California, 707/257-9530

FROM: Hugh Bourne, OVEST, 912/652-5170

As a follow-up to our 9 Nov 93 phone conversation, John added the following comments:

1. Current plans call for the existing Third Street Bridge to be removed and replaced by a new bridge. If needed, the new bridge design can be modified to accommodate an increase in traffic (if the new First Street Bridge isn't built).

2. An alternate approach from Alta Heights to downtown could be to take East Street south to Silverado Trail to Third Street.

3. One gets a "dramatic" view of downtown from the Third Street Bridge which accentuates the river and provides a strong visual image of old downtown.

4. First Street splits downtown.

5. Call Randy Starbuck of the Economic Development Office to discuss idea.

I also discussed the possibility of eliminating the Brown Street Footbridge over Napa Creek. John pointed out that the footbridges connect parking lots to the downtown area.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 6

DATE: 24 Nov 93

TO: Randy Starbuck, Redevelopment Agency, Napa, California, 707/257-9501

FROM: Hugh Bourne, OVEST, 912/652-5170

Randy offered the following comments:

1. He generally likes the idea of making the island more pedestrian.

2. Police and Fire access along First Street would appear to be a major problem to address.

3. Concerning the footbridge issue, he would prefer to keep all footbridges in the project.

4. Brown Street Footbridge could be sacrificed if one foot bridge "should" be sacrificed due to significant cost savings.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 7

DATE: 24 Nov 93

TO: Mike O'Bryon, Public Works Director, Napa, California, 707/257-9520

FROM: Hugh Bourne, OVEST, 912/652-5170

Mike and I also discussed the deletion of the new First Street Bridge idea. His initial thoughts were:

1. Widening the new Third Street Bridge might compensate for the loss of the First Street traffic artery.

2. Some thought has been given to creating a nearby marina to serve the newly created island.

3. He agrees we should present the proposal, but all must recognize that concerns of the downtown merchants are important.

4. Regarding the deletion of the Brown Street Footbridge from the project, he recommended we propose it. Ultimately, the issue will have to be brought before local citizens' groups to determine its fate.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 8

DATE: 30 Nov 93

TO: Richard Nishio, Project Manager, Sacramento District, 916/557-6645

FROM: Hugh Bourne, OVEST, 912/652-5170

1. After I discussed the deletion of the new First Street Bridge idea with Richard, he agreed we should proceed with the idea to retain the existing First Street Bridge over Napa Creek for pedestrian traffic.

2. On another issue, he provided the cost of the replacement Brown Street Footbridge at $260,000 + $50,000 contingency = $310,000. I added that all mark-ups were not included in this latter figure.

3. On the following day, Richard called to inform me that the existing Brown Street (Foot) Bridge would probably cost about $200,000 to remove.

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 9

DATE: 23 Nov 93

TO: (1) Roger Norris, CESPK, 916/557-7299
(2) Mike Garbooshian, CASTEEL/USA,Bellvue, WA, 206/391-7610

FROM: FredMcAuley, OVEST, 912/652-5715

1. A conference call was coordinated to discuss the use of cold-formed steel sheet pile on the Napa River Flood Control Project. Based on discussions it is recommended the option be provided to allow both hot and cold formed steel sheet pile if design conditions are met by both products.

2. Napa River has both PZ-40 and PZ-27 currently planned for retaining walls along some 3,400 LF of the river. Exposed walls are two heights - 8 1/2 and 14 feet. Depths are estimated to vary to 40 feet.

3. Cold formed CZ sections provide two options for the PZ-27. CZ 128 has a section modulus of 35 cu. in./LF with a weight advantage of 26.2 vs. 27 #/SF. CZ 114 has a section modulus of 31.62 with a weight advantage of 23.4 vs. 27 #/SF (saves 3.6 #/SF). It was recommended the designers revisit the requirement for the wall sections currently shown as PZ-40. If the walls can be designed to PZ-35, based on soils data when available, a cold formed section can be used. CZ 148 has a section modulus of 40.92, exceeding the PZ section, and a weight advantage of 30.3 vs. 35 #/SF.

4. Cold formed can be produced from ASTM A 572 Grade 50 steel for higher strength sections than the hot formed ASTM A 328. Interlock swings to 10 - 12 %. This sheet pile was used in tests on the Sacramento River Restoration Project. The District should have data on its performance (See Jerry Blevins, Sacramento District).

5. CASTEEL over 10 years in production in Canada (has been in the U.S. 3 years in Marietta, OH), and has furnished products to Corps project in several areas in the U.S. Prices for materials delivered on site were given as follows:

CZ 114	$ 7.02/SF
CZ 128	$ 7.87/SF
CZ 148	$ 9.10/SF

VALUE ENGINEERING TEAM STUDY

TELEPHONE CONVERSATION RECORD NO. 10

DATE: 20 Jan 94

TO: Charles Claghorn, OVEST, 912/652-5173

FROM: Richard Nishio, CESPK-ED-D, 916/557-6645

1. Richard Nishio provided the mitigation cost for a new disposal site.

2. He stated that the VE report should assume mitigation land required equals the land required for disposal. *

3. He further stated that the VE report should also assume restoring year around wetlands equals $4,700 per acre (1990 price levels). *

* From NED office report April 1990.

APPENDIX B:

SPECULATION LIST

VALUE ENGINEERING TEAM STUDY

SPECULATION LIST

NOTES: _/ = Develop; X = Delete; ? = Investigate; Cmt = Comment

_/ 1. Use reinforced earth in lieu of other type structures.

?/X 2. Use a tie-back system in lieu of thicker steel sheet pile.

X 3. Optimize wall height between sheet pile and real estate.

X 4. Shift channel alignment in lieu of building sheet pile wall.

?/CMT5. Eliminate downstream levees/berms (downstream of Imola). CMT: Reformulate.

X 6. Eliminate freeboard structures.

_/ 7. Emphasize landscaping w/levees.

_/ 8. Shorten (pt 40) sheet pile in combo with concrete retaining wall/reinforce earth.

X 9. Relocate the bypass upstream oxbow.

X 10. Use kingpile design in lieu of sheet pile.

X 11. Eliminate double wall system downtown.

_//CMT12. Hatt Bldg -- make angular wall in lieu of 900 wall. CMT

_//CMT13. Re-use salvage riprap. CMT

û/? 14. Replace gabions w/grouted stone.

X 15. Fill oxbow w/excavated material and eliminate interior hood wall.

X 16. Use trapezoidal concrete channel to eliminate sheet pile.

X 17. Replace earth bypass with conduit (bridge replacement not necessary).

_/ 18. Eliminate 1st Street Bridge across the bypass. (Coordinate with locals.)

_/ 19. Make 1st Street Bridge a pedestrian bridge. (Same as above.)

? 20. Use "L" wall in lieu of "T" wall.

_/ 21. Use a gravity wall in lieu of "7" wall concrete flood walls.

VALUE ENGINEERING TEAM STUDY

SPECULATION LIST (con't)

? 22. PVC sheet pile in lieu of coated steel.

_/ 23. Use a modified cold roll locking steel sheet pile (custom made).

_/ 24. Use separate sheet pile thicks at different depths.

X 25. Utilize channels downstream to eliminate upstream levees.

_/ 26. Revisit the number of contracts. Coordinate w/District. (Local ability to fund.)

X 27. Pond water upstream -- upstream storage.

X 28. Clean up HTW before project is started.

X 29. Revise construction to bypass HTW sites.

X/CMT30. Twelve-foot wide maintenance road. CMT: Real estate.

X 31. Single contractor to do sheet pile, concrete floodwall, excavation, etc.

? 32. Change slope criteria 1/3, 1/2«, etc. CMT

X 33. Napa Creek -- Use low level maintenance team by locals.

X/CMT34. Accelerate the budget process -- get funds early. CMT: Part of Contracting.

X 35. Look at construction cost vs. real estate costs.

û/CMT36. Eliminate floodwall/levee where property was filled -- downstream of Jordan Lane. CMT

?/X 37. Dike the oxbow/eliminate floodwalls -- operate only at flood condition, otherwise, potential flood -- coordinate with locals -- environmental (need of flood warning system).

?/X 38. Upstream portion -- Re-use existing levees and build floodwall on top. (Geotech concerns -- may not be possible.)

X 39. Use interlocking block wall in lieu of concrete wall (second tier) downtown.

? 40. Half wall/half levee.

SPECULATION LIST (con't)

X 41. Napa Creek -- Use stone invert up to normal water -- permanent erosion control mat above.

_/ 42. Napa Creek -- Use CCM mats -- has holes to allow vegetation to grow.

_/ 43. Napa Creek -- Use riprap in lieu of gabions for invert.

X 44. Napa Creek -- Use pool/drop structure to reduce velocities.

_/ 45. Investigate use of pre-cast concrete sheet pile. (Stiff clay layers may hamper drivability.)

X 46. Divert floodwater from Napa Creek to Napa River and eliminate all work in Napa Creek.

X 47. Dispose of excavated material in downstream disposal area to create wetlands. (Westside.)

X 48. Create more dredge disposal sites along river to reduce haul distance to spoil.

_/ 49. Revisit the railroad. Provide temp. maintenance yd during construction and close bridge -- Shoofly.

X 50. Eliminate oxbow and buyout island.

X 51. Eliminate right bank levee below Imula-Tulukay (look upstream).

_/ 52. Revisit railroad construction sequence (see #49).

X 53. Eliminate sheet pile walls on west (left) bank by closing Riverside Drive.

X 54. Use inflatable weir dams.

X 55. Use binwalls at Riverside Drive.

? 56. Use soil nail system in conjunction w/sheet pile system (need temp easements).

X 57. Install concrete step system.

_/ 58. Napa Creek -- Eliminate pedestrian bridge (check w/locals).

_/ 59. Three feet or less retaining/flood wall -- use earth levee (east bank Reach #3).

X 60. Modify existing 3rd Street Bridge to avoid replacement.

X 61. Buy out existing wine train maintenance facility -- relocate to avoid bldg bridge.

X 62. Stop logs/swing gates at 3rd Street -- save bridge.

X 63. Use more floodwalls/less sheet pile walls.

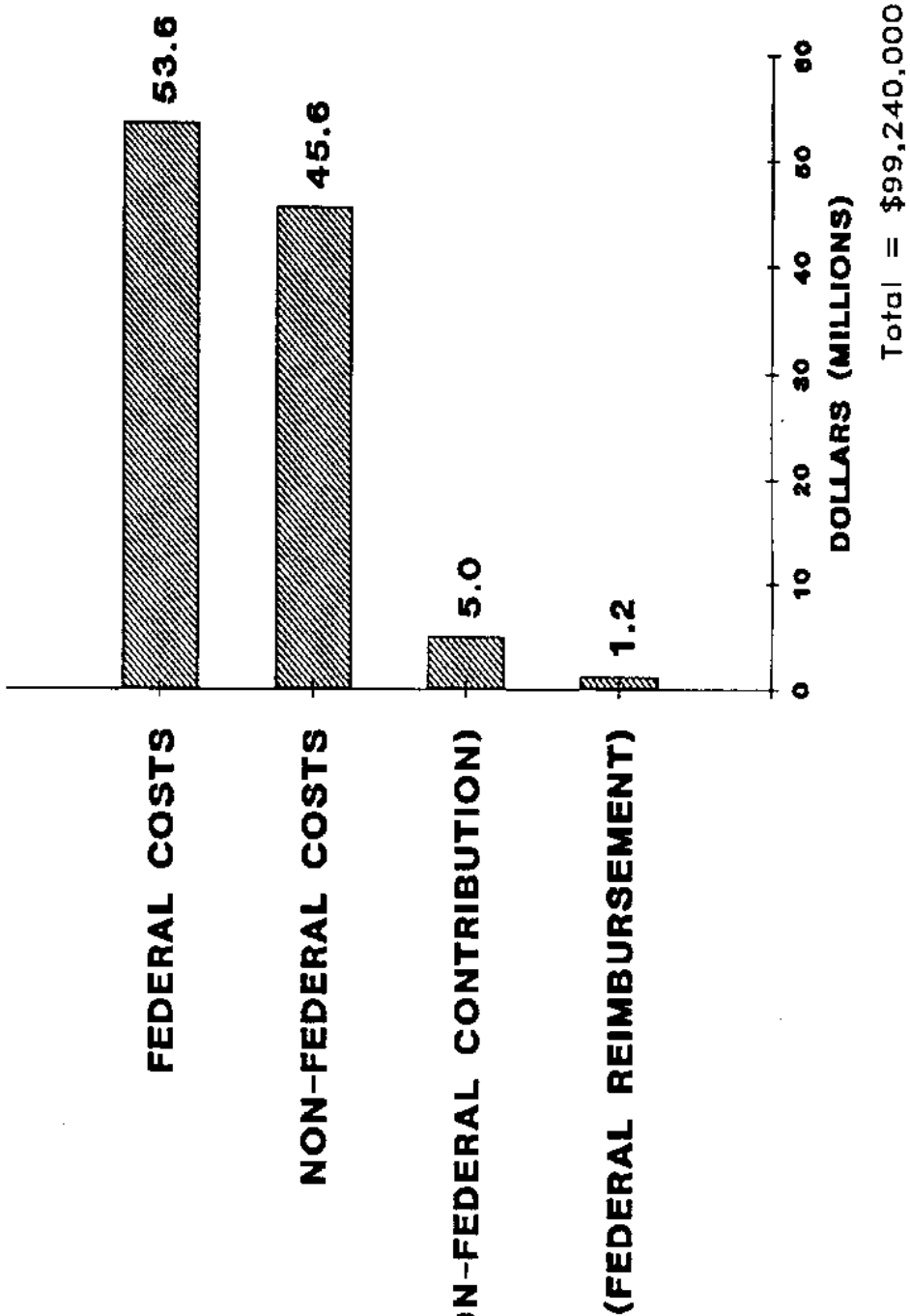
û 64. Use existing dredge material disposal sites -- building containment dikes higher -- delete haul to quarry site.

APPENDIX C:

COST MODELS

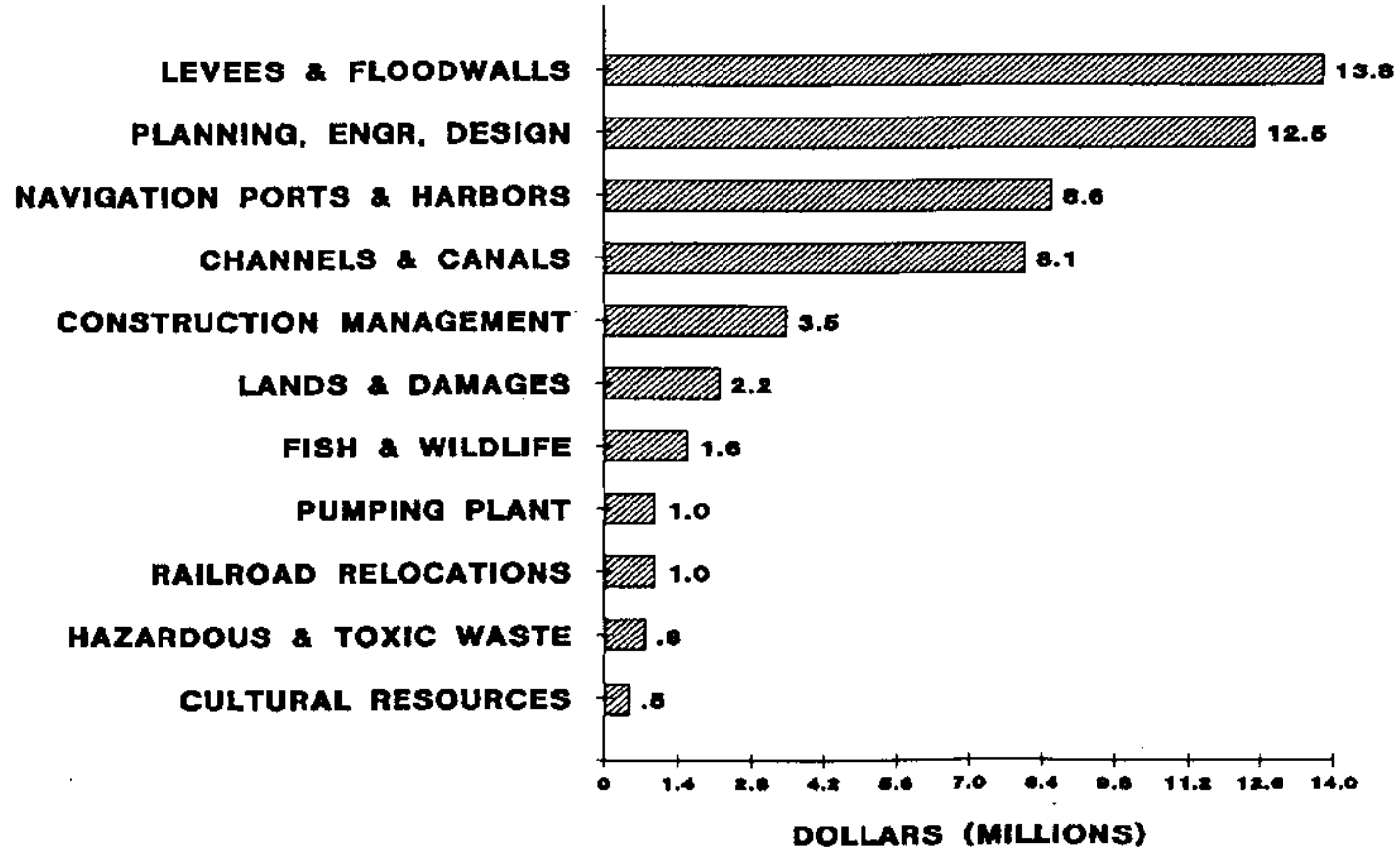
COST MODEL
NAPA RIVER FLOOD CONTROL PROJECT
NAPA, CALIFORNIA

MAJOR COST ITEMS

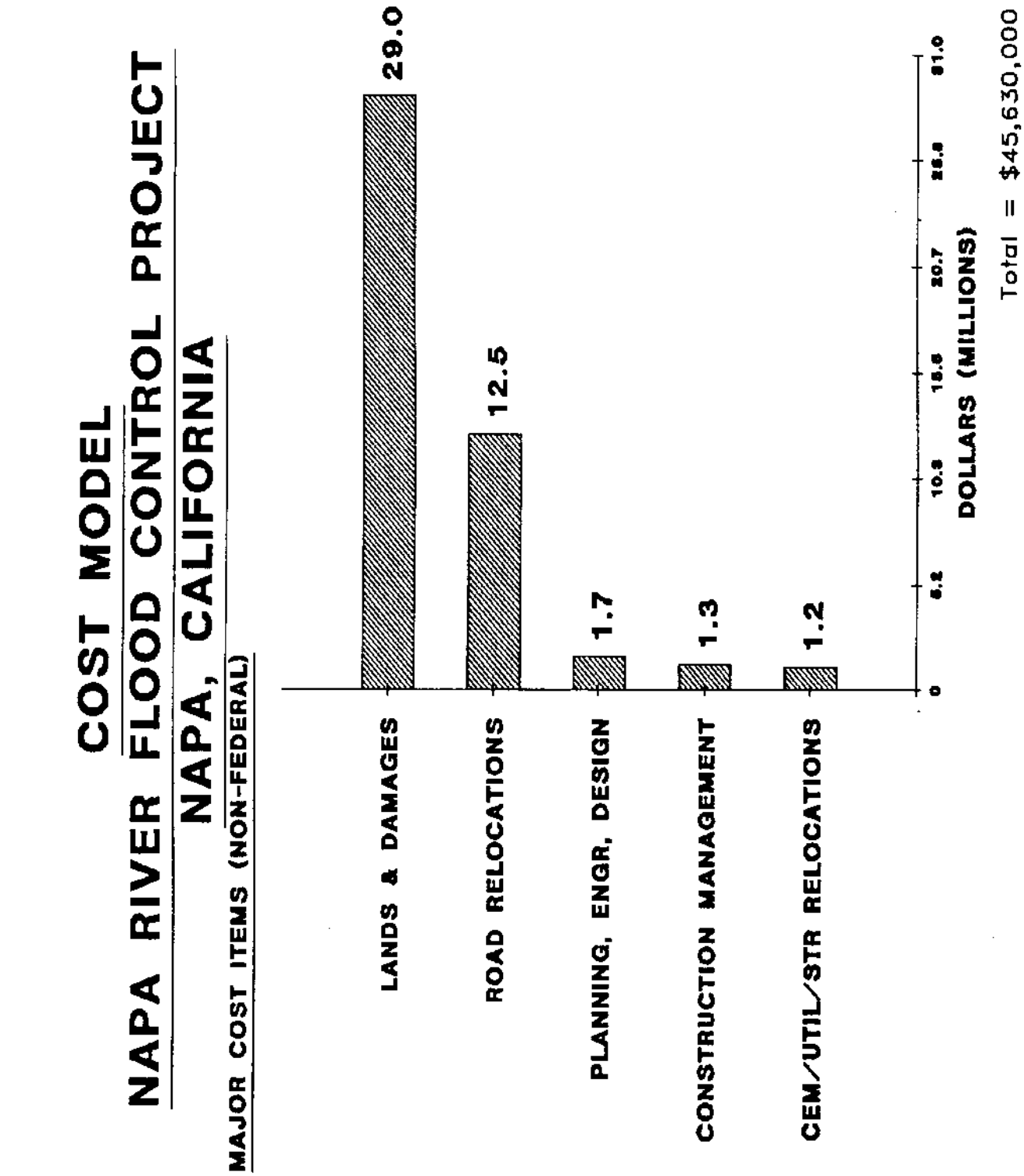


COST MODEL
NAPA RIVER FLOOD CONTROL PROJECT
NAPA, CALIFORNIA

MAJOR COST ITEMS (FEDERAL COSTS)

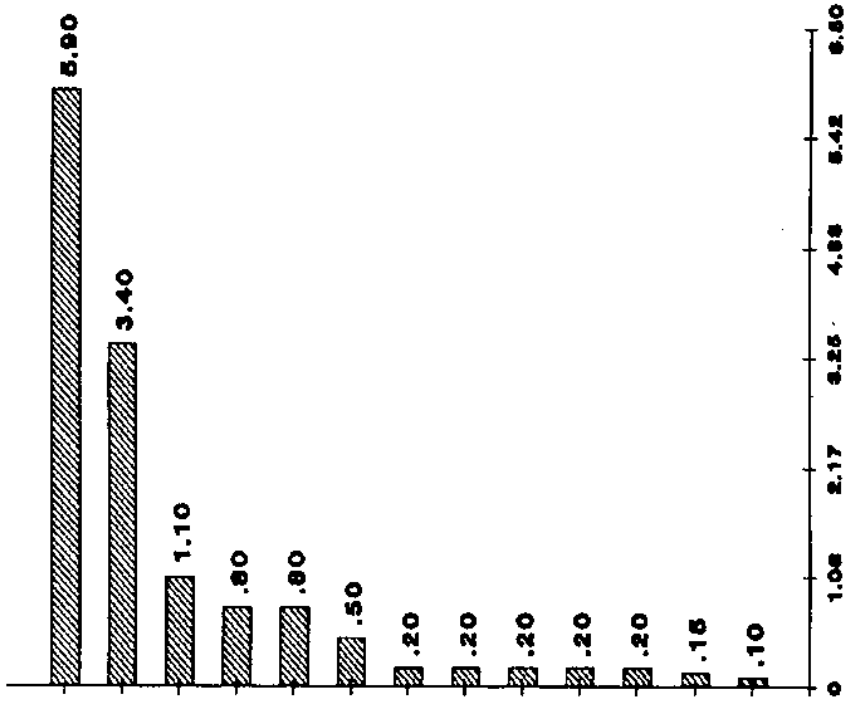


Total = $53,610,000


COST MODEL
NAPA RIVER FLOOD CONTROL PROJECT
NAPA, CALIFORNIA
MAJOR COST ITEMS (NON-FEDERAL)
LANDS & DAMAGES
29.0
ROAD RELOCATIONS
12.5
PLANNING, ENGR, DESIGN
1.7
CONSTRUCTION MANAGEMENT
1.3
CEM/UTIL/STR RELOCATIONS
1.2
0
5.2
10.3
15.5
20.7
25.8
31.0
DOLLARS (MILLIONS)
Total = $45,630,000

COST MODEL
NAPA RIVER FLOOD CONTROL PROJECT
NAPA, CALIFORNIA

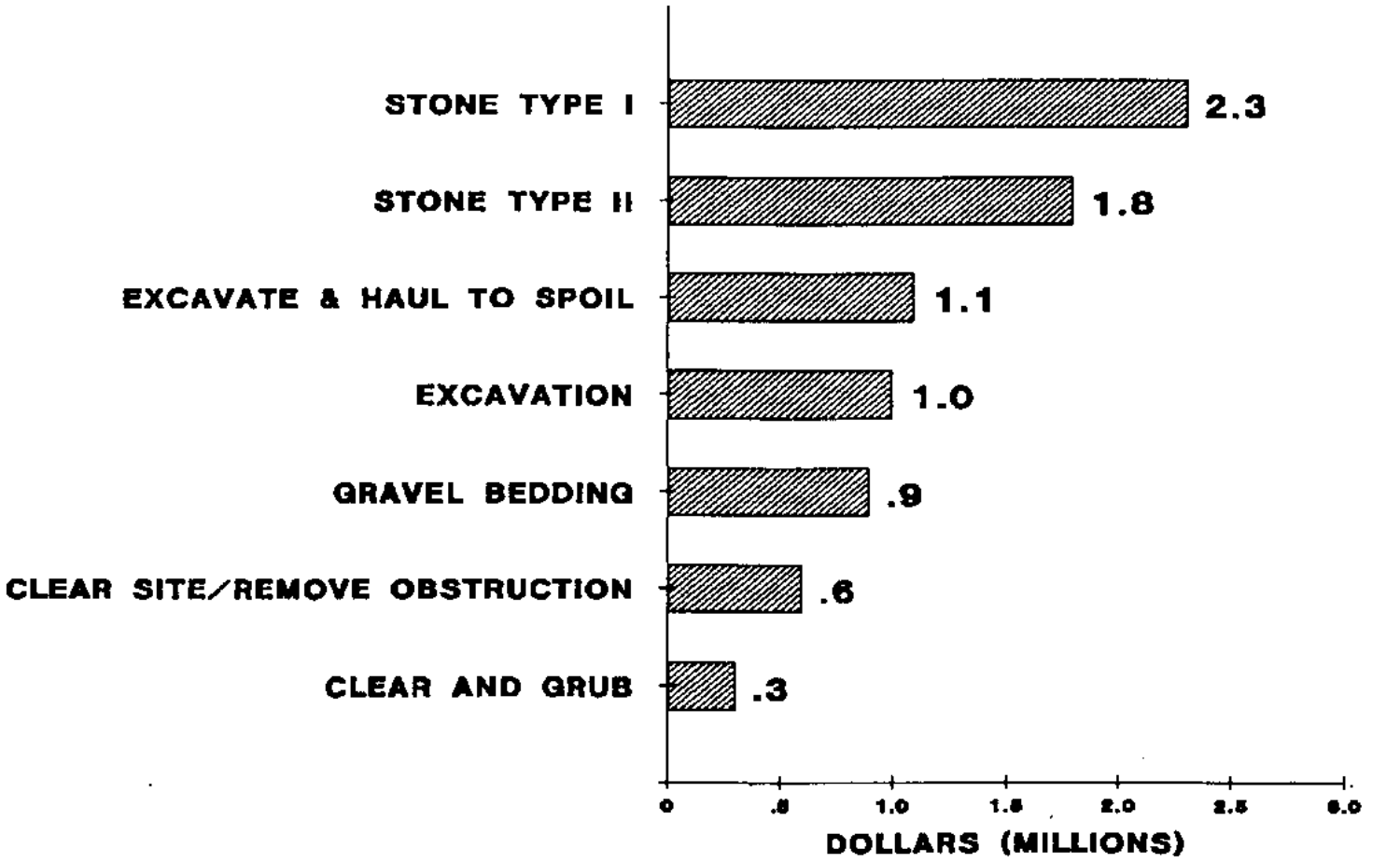
LEVEES AND FLOODWALLS



Total = $13,840,000

COST MODEL
NAPA RIVER FLOOD CONTROL PROJECT
NAPA, CALIFORNIA

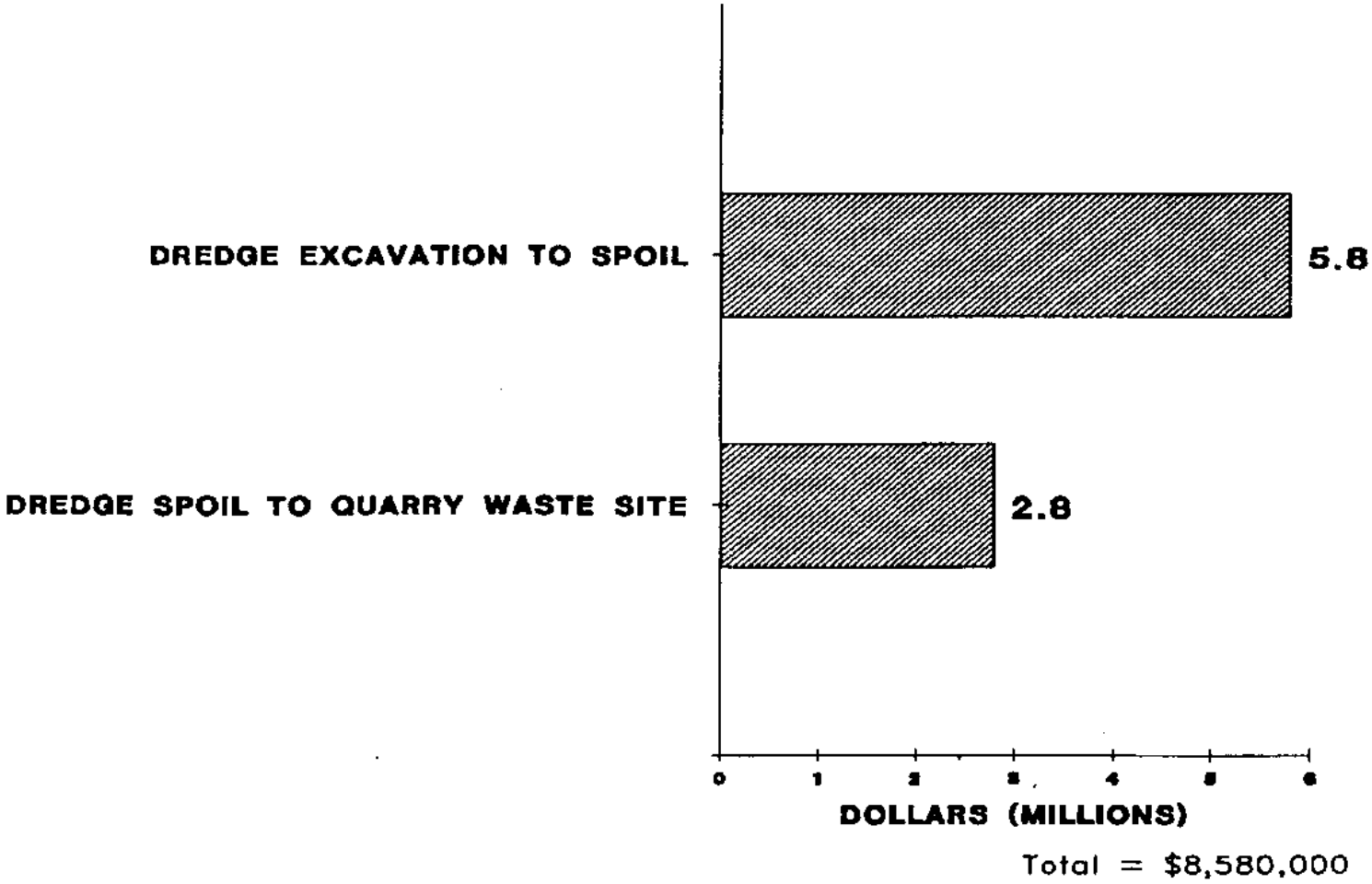
CHANNELS AND CANALS



Total = $8,090,000

COST MODEL
NAPA RIVER FLOOD CONTROL PROJECT
NAPA, CALIFORNIA

NAVIGATION PORTS AND HARBORS



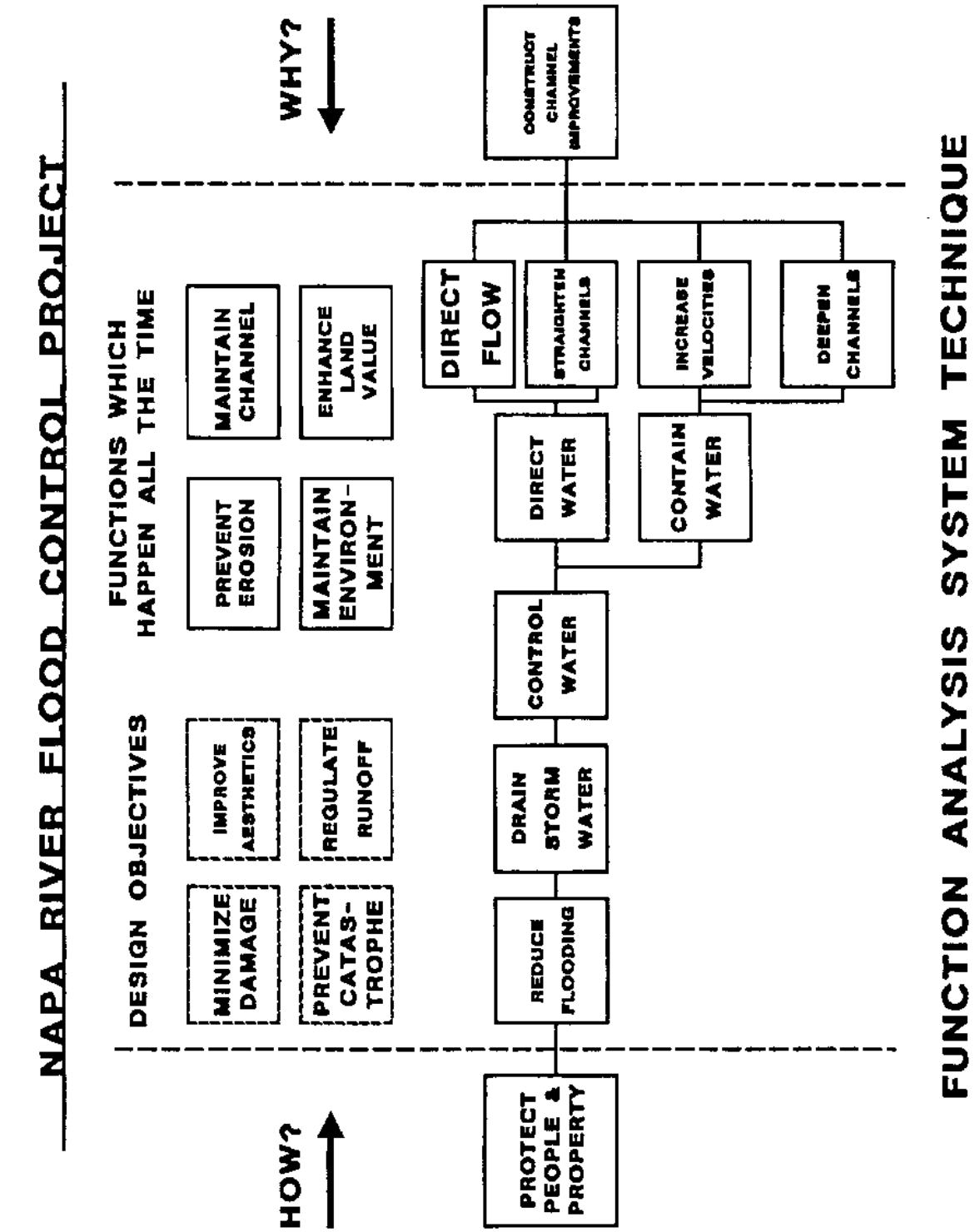
Total = $8,580,000

APPENDIX D:

FAST DIAGRAM

VALUE ENGINEERING TEAM STUDY

FAST DIAGRAM



FUNCTION ANALYSIS SYSTEM TECHNIQUE

(FAST) DIAGRAM

APPENDIX E:

CONTACT DIRECTORY

STUDY TEAM VALUE ENGINEERING TEAM STUDY

CONTACT DIRECTORY

NAME	ORGANIZATION/DISCIPLINE	TELEPHONE
Charles E. Claghorn	OVEST	912-652-5173
Vincent DelGreco	CESPD-ED-A	415-705-1487
Richard Nishio	CESPK-ED-D	916-557-6645
Hugh Bourne	OVEST	912-652-5170
Frank Krhoun	CESPD-ED	415-705-1433
Lorentz Nelson	CESPK-ED-T	916-557-7692
Jill Voeller	CESPK-ED-D	916-557-6638
Al Scheller	OVEST	912-652-5174
Don Twiss	CESPK-ED-A	916-557-7259
Fred McAuley	OVEST	912-652-5715
A. J. Andrews	CESPK-ED-T	916/557-6971
Michael Praul	Napa County F.C.D.	707/253-4351
Joe Sciandrone	CESPK-ED-GS	916/557-7184
Bob Sorsen	Napa County F.C.D. and W.C.D.	707/253-4351

APPENDIX F:

VE STUDY TEAM

STUDY TEAM VALUE ENGINEERING TEAM STUDY

VE STUDY TEAM

NAME	ORGANIZATION/DISCIPLINE	TELEPHONE
Charles E. Claghorn	OVEST	912-652-5173
Vincent DelGreco	CESPD-ED-A	415-705-1487
Richard Nishio	CESPK-ED-D	916-557-6645
Hugh Bourne	OVEST	912-652-5170
Frank Krhoun	CESPD-ED	415-705-1433
Lorentz Nelson	CESPK-ED-T	916-557-7692
Jill Voeller	CESPK-ED-D	916-557-6638
Al Scheller	OVEST	912-652-5174
Don Twiss	CESPK-ED-A	916-557-7259
Fred McAuley	OVEST	912-652-5715

APPENDIX G:

SUPPORTING INFORMATION

SUPPORTING INFORMATION NOT INCLUDED
(SEE HARDCOPY OF VE STUDY REPORT)