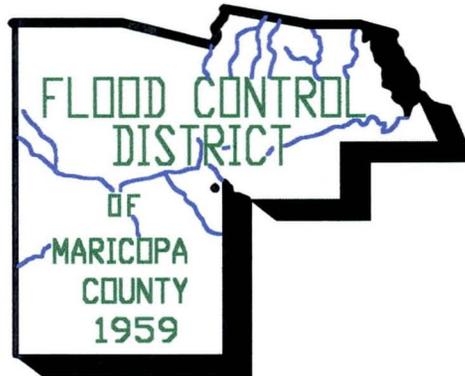


**FLOOD CONTROL DISTRICT
OF
MARICOPA COUNTY**

**VALUE ENGINEERING REPORT
ON
FCD CONTRACT 95-15**

**CAMELBACK RANCH LEVEE - NORTH
CAMELBACK ROAD
TO
BETHANY HOME ROAD
GLENDALE AIRPORT LEVEE**



SUBJECT: Constructability and Cost-Reduction

DATE: September 2, 1998

PREPARED BY: EEC/MKE
3501 North 16th Street
Phoenix, Arizona 85016-6419
(602) 248-7702

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2801 W. Durango
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ATTENDANCE:

Geza Kmetty - Team Leader EEC/MKE 248-7702

<u>Name</u>	<u>Organization</u>	<u>Phone</u>
Tom Johnson	FCD	506-4703
R.W Shobe	FCD	506-4603
Fred Fuller	FCD	506-4728
Laurence Spanulescu	FCD	506-4269
Warren Rosenbraugh	FCD	506-4720
Gary Shapiro	FCD	506-1501
Bob Stevens	FCD	506-1501
Dan Sherwood	City of Glendale	930-3630
Jeff Minch	DMJM	337-2777
Francisco Gutierrez	Wilson & Company	893-8860

AGENDA

8:00 - 8:15	Introductions
8:15 - 8:45	Value Methodology
8:45 - 9:15	Project Background
9:15 - 10:00	Cost Model Analysis
10:00 - 10:15	Break (Refreshments)
10:15 - 11:00	Selection of Elements
11:00 - 12:00	Function Analysis
12:00 - 1:00	Lunch (Provided)
1:00 - 3:00	Brainstorming
3:00 - 3:15	Break (Refreshments)
3:15 - 5:00	Recommendations

OBJECTIVE OF WORKSHOP

The one-day workshop was held on September 2, 1998. The objective was to review constructability and evaluate high cost construction items. The team was assembled from members of the design team, and FCD personnel, and led by a Value Engineering Facilitator. The one-day workshop was designed to use function analysis as the basis of evaluating the existing design and the team proposed alternatives.

SELECTION OF BRAINSTORMING ELEMENTS

Using the current cost estimate, and discussing issues that may present roadblocks during construction, the team selected the following elements for brainstorming:

1. Constructability and phasing of fill construction, (including the force mains).
2. Soil cement and bank protection.
3. El Paso Gas pipeline relocation.
4. Bethany outfall channel.

FUNCTION ANALYSIS

Each selected brainstorming element was discussed and the basic functions identified. The How? and Why? questioning assisted the team in focusing on the relevant issues, and identifying the root causes of the problems (opportunities).

Element: Constructability (Phasing, Earthwork, Pipelines)

<u>Why?</u>	<u>Function</u>	<u>How?</u>
Assure Quality	Identify Source	Obtain Geotech Information
Improve Value	Minimize Cost	Eliminate Problems
Protect Construction Site	Maintain Flood Flows	Allocate Risk
Provide Control	Identify Staging Areas	Optimize Productivity
Provide Conveyance Sequence	Install Pipeline	Identify Construction
Construct Features	Place Fill	Provide Plans
Ensure Constructability	Provide Access	Identify Limits
Avoid Project Delays	Comply with 404/401	Specify Responsibility
Control Flows	Construct Bank Protection	Provide Plans & Spec's
Avoid Damages	Place Toe Backfill	Provide Bid Documents

Element: Soil Cement (Bank Protection)

<u>Why?</u>	<u>Function</u>	<u>How?</u>
Protection	Provides Armoring	Control Scour
Control Quality	Identify Responsibility	Provide Mix Design
	Determine Gradation	
	Provide Mix Design	Moisture Content
	Provide Mix Design	Cement Content
Provide Armor	Place Soil Cement	Compaction
	"	Haul Distance
	"	Haul Time
	"	Temperature/Wind
	"	Curing
	"	Identify Alternatives
	"	Identify Responsibility

Element: El Paso Gas Pipeline Relocation

<u>Why?</u>	<u>Function</u>	<u>How?</u>
Avoid Failure	Protect Pipeline	Lower Profile
	Provides Inspection	
	Allows Re-Coating	
Increase Lifetime	Allows Maintenance	Expose Pipeline
Reduces Levee Cost	Accommodates Levee Construction	Eliminates Conflict

Element: Bethany Outfall Channel

<u>Why?</u>	<u>Function</u>	<u>How?</u>
Provide Outfall	Convey BHOC flows	Provide Blockout
	Discontinuity of Levee	Provide Main Access
	Re-Route Main Road	
	Reduce Risk	Provide Security
	Build Fence	

BRAINSTORMING

During this phase, the team explored various alternatives for the selected elements that would perform the identified required functions at the least cost. After the team identified numerous alternatives, the best alternatives were evaluated and the best ideas developed in the form of recommendations. The list below shows the brainstorming ideas and the team's scoring of each idea. The highest scored alternatives were retained for further development.

Element: Install Pipeline

1. Revise profiles of pipelines - 5
2. Inform contractors (bidders) during pre-bid period - 0
3. Contractor to submit construction action plan for discussion - 0
4. Conduct preparatory meeting of specific phases (tasks) - 5
5. Delay part of pipe construction - 0
6. Re-align pipeline - 0
7. Use Special Provisions to communicate/coordinate with other contractors, WRF, El Paso, Phoenix, SRP, and ADOT - 4

Element: Soil Cement / Bank Protection

1. Provide method Specifications for Soil Cement - 6
2. Evaluate fly-ash - 0
3. Control Gradation - 0
4. Increase Moisture Content optimum to +2% - 0
5. Evaluate Cement Content - 0
6. Abrasion test to determine cement content - 0
7. Set Criteria for Compaction Testing - 0
8. Keep existing Specifications - 6

Element: EL Paso Gas Pipeline

1. Use current design and pay for it - 0
2. Cap/Encase existing pipeline - 1
3. Install collar around pipeline at Levee penetration - 1
4. Use Gabions at pipeline crossing - 1
5. Negotiate cost sharing - 5
6. Leave pipe in place, build cutoff wall around gas pipeline with re-aligning channel - 7

Element: **Bethany Outfall Channel**

1. Use Gabions instead of Soil Cement - 1
2. Used dumped riprap (with or without grouting) - 5
3. Use existing plan and ignore channel - 5
4. Coordinate with ADOT Construction - 0
5. Stop Levee south of Outfall Channel - 0

EVALUATION/DEVELOPMENT OF RECOMMENDATIONS

Examine each selected alternative and answer the following questions:

1. Will it work?
2. Can it be implemented?
3. Will it have a lower life cycle cost?

If yes on all 3 - then:

1. Describe it in detail - The Recommendation
2. Compare to present solution
3. Recommendation for implementation

RECOMMENDATIONS:

1. Install Pipe Lines :

Description:

1. Profile is contingent on existing El Paso Profile.
2. Revise the profile to be 4'-6' below existing grade.
3. Minimize separation between utilities.
4. Slurry backfill to minimum 1' over top of pipe.
5. Profiles across river are unchanged.
6. Profiles East of crossing are 4'-6' below existing.
7. Remove existing Gabions, and construct entire pipeline.

Comparison to existing design:

Eliminates the need to construct any of the pipeline in fill or embankment.

Implementation Plan:

1. Improve the contractor's staging/sequencing.
2. Revise design plans and profiles.
3. Designer to evaluate horizontal separation between potable and non-potable lines, with encased alternative.

2. Soil Cement / Bank Protection :

Description:

Method specifications would place more of the risk on the owner. The owner would be responsible for determining material available, gradation specifications, moisture content and feasibility of fly ash. Owner is responsible for mix design and control of production.

Comparison to existing design:

- Responsibility for Quality Control has shifted to owner.
- Cement cost should lower.
- Aggregate cost should increase.
- Owner inspection costs go up.
- Total cost should decrease.
- Contractor's materials testing cost should decrease.

Implementation Plan:

- Estimate potential savings.
- Determine if specifications can be written in time available.
- Determine who will write specifications.

Overall Recommendation:

If the above conditions can be met, the method specifications should be used.

3. Soil Cement / Bank Protection :

Description:

1. Use current design.
2. Cap/Encase existing pipe.
3. Use Gabions at pipeline crossing.
4. Negotiate cost sharing (re-coat, inspect, protect and increase lifetime).
5. Move channel to gas line (Line channel and extend cut-off wall to proposed tie-down depth).

Implementation Plan:

Meet with El Paso Gas Company and present the above for consideration at our meeting on September 8, 1998.

4. Bethany Outfall Channel :

Description:

Provide a stabilized bank protection other than soil cement it. (grouted riprap, shotcrete)

Comparison to existing design:

- Less expensive
- Provides same level of protection
- Aesthetically less pleasing
- Easy removal for ADOT
- Fulfills agreement with ADOT to provide outlet

Implementation Plan:

Recommend this as solution because it fulfills requirement at less cost.