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PREFERRED ALTERNATIVE PHASE VALUE ENGINEERING REPORT

LOOP 303 / WHITE TANKS AREA DRAINAGE MASTER PLAN

Maricopa County, Arizona

March 14, 2002

Rider Hunt Levett & Bailey
Phoenix

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Maricopa County, Arizona

March 14, 2002

Prepared for:

Flood Control District of Maricopa County
2801 West Durango
PHOENIX, AZ 85009

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1	**Executive Summary** Summary of Value Engineering Alternatives
2	**Summary of Alternatives** Detailed descriptions and Cost Estimates for proposed alternatives
3	**Appendix** VE Conference Agenda VE Conference Attendance List (in-brief) Performance Criteria and Use Matrix Function Analysis System Technique (FAST) Diagram Project Function Cost Distribution Elemental Function Cost Distribution VE Conference Attendance List (out-brief)

SECTION 1 - EXECUTIVE SUMMARY

INTRODUCTION

The Flood Control District of Maricopa County (FCDMC) has commissioned an update of the Loop 303 / White Tanks Area Drainage Master Plan (ADMP) in the northwest valley. The goal of this study is to identify and quantify flood control facilities infrastructure in advance of development in order to achieve a cohesive plan for flood control. The plan is a combination of modifications to existing facilities as well as proposed new facilities. The system should consider multi-use opportunities and linkages to the valley wide trail system. The following municipalities are among the major stakeholders: Avondale, Goodyear, Buckeye, Surprise, Litchfield Park, Glendale and El Mirage. The western portion of the outer Loop 303 freeway bisects the project from north to south.

As part of the FCDMC's on-going commitment to Value Engineering activities, a five day Value Engineering Conference was conducted at the Preferred Alternative Phase of the master planning process.

PROJECT DESCRIPTION

Project Size:	approximately 200 square miles
Project Features:	Grass lined, landscaped, multi-use channels and retention / detention basins.
Estimated Cost:	$400 million (based on preliminary cost estimate prepared by URS)
Design Phase:	Preferred Alternative Phase of Area Drainage Master Plan update
Engineer:	URS
Construction Schedule:	A twelve year phased buildout is anticipated

WORKSHOP OBJECTIVES

The following list of objectives was developed on the beginning of the workshop and became the focus for the workshop:

1. Question need and necessity
2. Achieve best hydraulic performance
3. Achieve multi-use
4. Enhance water quality
5. Minimize environmental impact
6. Economic alternatives – operation & maintenance
7. Identify "implement-able" (realistic) projects
8. Scheduling & phasing (prioritization)
9. Promote coordination with other projects
10. Explore options for funding & cost sharing
11. Provide for public / private partnering
12. Meet public expectations
13. Minimize impact on governmental jurisdictions
14. Floodplain impacts – public safety

The following concerns from project stakeholders were received during the in-brief presentation held on the first day of the workshop

1. Coordination with regional / jurisdictional trail system, area plans and land use plans
2. Communication between jurisdictions, developers and the County
3. Reems Road memorandum of understanding between Surprise and FCDMC
4. Cactus Basin & outfall – El Mirage and FCDMC
5. Relaxed retention and its impact on water quality
6. Goodyear – FCDMC intergovernmental agreement for Bullard Wash
7. Minimize impact on Luke Air Force Base
8. Coordination with El Rio project
9. Explore existing structure "opportunities"

SUMMARY OF VALUE ENGINEERING RESULTS

(a summary of these results is attached at the end of this section and a detailed description of each of the VE alternatives appears in Section 2 of this report)

Ideas Generated:	37
VE Alternatives Developed:	13
Total Potential VE Savings:	$200,760,000

MOST SIGNIFICANT PROPOSALS

A summary of the alternatives with the greatest potential cost savings are as follows:

1.	Reduce landscaping budget to FCDMC minimum (#13)	$76,395000
2.	Use underground box for low flow with swale above for Loop 303 Channel in lieu of current design (#7)	$59,346,000
3.	Estimate Adjustments (#37)	($55,752,000) Add
4.	Delete Reems Road Channel (#25)	$37,593,000
5.	Eliminate channel along RID Canal from 203rd Ave. to Loop 303	$20,911,000

Detailed narratives and cost estimate back-up for all of the recommendations appears under Tab 2 of this report. The value engineering effort generated proposals which could reduce the overall cost of the project. The value of the total savings will be determined by FCDMC and the URS design team at the Implementation Meeting. However, the other opportunities for potential savings and enhancements listed as design suggestions should be considered and estimated by the design team as the design effort progresses.

IMPLEMENTATION PLAN

The following schedule summarizes the tasks that need to occur during the Post Workshop Phase in order to complete the Value Engineering process:

Task	Date	Responsibility
1. Prepare Final Report	by March 14, 2002	Rider Hunt Levett & Bailey (RHLB)
2. Management Team Presentation (communicate key findings)	by March 14, 2002	RHLB / FCDMC
3. Conduct Implementation Meeting	first week in April	FCDMC, URS
4. Implement VE Recommendations	Ongoing through Completion of ADMP	URS

VALUE ENGINEERING ALTERNATIVES	CATEGORY:	Loop 303 & White Tanks ADMP	Rider Hunt Levett & Bailey	PAGE 1 OF 4

CREATIVE / EVALUATION PHASE					DEVELOPMENT PHASE					IMPLEMENTATION PHASE			
					COST SAVINGS								
ITEM NO.	DESCRIPTION	ADVANTAGES	DISADVANTAGES	PRIORITY	ORIGINAL COST	PROPOSED COST	INITIAL COST SAVINGS	O& M COST SAVINGS	TOTAL RECOMMENDED COST SAVINGS	ACCEPT	REJECT	REVIEW	TOTAL IMPLEMENTED COST SAVINGS
1	Eliminate channel along RID Canal from 203rd Ave. to Loop 303	Better hydaulic operation, less R/W required, flood protection for area south of I-10	Additional R/W along Cotton Lane, coordination with ADOT	H	$34,249,000	$13,338,000	($20,911,000)		($20,911,000)				
2	Construct sound berms and / or elevate Loop 303 to utilize dirt from the detention / retention basins and channels	Increased aesthetics, reduce cost of sound walls, potential reduction in earthwork values	Additional R/W, additional maintenance cost	H					Design Suggestion				
3	Re-align Loop 303 along existing AT & SF Railroad alignment			–									
4	Delete west leg of El Mirage Channel	Eliminate from regional plan	Need to add a local program (shift in funding)	H	$4,659,000	$0	($4,659,000)		($4,659,000)				
5	Use low density development in lieu of infrastructure for flood control			–									
6	Use concrete lined channel with recreation corridor for Loop 303 Channel in lieu of current channel design			H									
7	Use underground box for low flow with swale above for Loop 303 Channel in lieu of current design (combined with #23)	Reduction in the required ROW and landscaping	Providing inlets into the boxes	H	$175,458,000	$116,112,000	($59,346,000)		($59,346,000)				
8	Move basins adjacent to railroad crossings at two locations (Tuthill Channel & Reems Road)	Optimizes the drainage systems, reduce the cost of crossings at railroads	Need to acquire the parcels adjacent to the railroad	M			($250,000)		($250,000)				
9	Move basins adjacent to railroad crossings at two locations (Tuthill Channel & Reems Road)			L									
SUB-TOTAL									**($85,166,000)**				

Priority: High (H), Medium (M), Low (L), Design Suggestion (DS)

VALUE ENGINEERING ALTERNATIVES	CATEGORY:	Loop 303 & White Tanks ADMP	Rider Hunt Levett & Bailey	PAGE 2 OF 4

CREATIVE / EVALUATION PHASE					DEVELOPMENT PHASE					IMPLEMENTATION PHASE			
					COST SAVINGS								
ITEM NO.	DESCRIPTION	ADVANTAGES	DISADVANTAGES	PRIORITY	ORIGINAL COST	PROPOSED COST	INITIAL COST SAVINGS	O& M COST SAVINGS	TOTAL RECOMMENDED COST SAVINGS	ACCEPT	REJECT	REVIEW	TOTAL IMPLEMENTED COST SAVINGS
10	Use Beardsley Channel estimate to analyze budget			–									
11	Identified environmental sites 10 & 174 may need further environmental investigation	Potential fatal flaws in the alignments can be identified	Cost of Phase I investigation may not be warranted at this time	DS					Design Suggestion				
12	How was landscaping budget developed? (see #13)			H									
13	Reduce landscaping budget to FCDMC minimum.	Provides a more realistic budget for baseline landscaping budget		H	$192,559,000	$116,164,000	($76,395,000)		($76,395,000)				
14	Investigate Channel alternatives to minimize right-of-way (gabions, soil cement)	Reduces costs associated with ROW acquisitions	Local material within the ADMP is not suitable for soil cement and rock not available for gabion construction. Suggest looking into this further to verify lack of suitable material or options to acquire suitable material.	DS					Design Suggestion				
15	Maximize storage of ADOT basins for I-10			L									
16	Review impacts of local irrigation systems and other utilities			DS					Design Suggestion				
17	Address NPDES outfall Phase II stormwater requirements	Meet NPDES permit requirements, reduce pollutants (TSS and H/C) into waters of the U.S.	Risk of noncompliance with NPDES and reliance on local developments for treatment	DS					Design Suggestion				
18	Revise hydrology to reflect impact of ultimate buildout (considering local retention)	May reduce future flood control construction expenditures based on utilizing recently constructed improvements. (accounting for flow reductions due to	Unknown / none	DS	$317,662,300	$285,896,000	($31,766,300)		0 (not in total)				
SUB-TOTAL									($76,395,000)				

Priority: High (H), Medium (M), Low (L), Design Suggestion (DS)

VALUE ENGINEERING ALTERNATIVES	CATEGORY:	Loop 303 & White Tanks ADMP	Rider Hunt Levett & Bailey	PAGE 3 OF 4

CREATIVE / EVALUATION PHASE					DEVELOPMENT PHASE					IMPLEMENTATION PHASE			
					COST SAVINGS								
ITEM NO.	DESCRIPTION	ADVANTAGES	DISADVANTAGES	PRIORITY	ORIGINAL COST	PROPOSED COST	INITIAL COST SAVINGS	O& M COST SAVINGS	TOTAL RECOMMENDED COST SAVINGS	ACCEPT	REJECT	REVIEW	TOTAL IMPLEMENTED COST SAVINGS
19	Impact of "paper water" on design and development	Reduce costs based on closer design studies of projected flows	Someone will have a concern with removing any safety considerations regardless of their basis or overlap with other contingencies	DS					Design Suggestion				
20	Reduce design criteria from 100 year to 50 year for Loop 303 Channel		Savings may not be significant between the 50 year and 100 year design.	M									
21	Define drainage vs. flood control (local vs. "backbone")			DS					Design Suggestion				
22	Continue Loop 303 drainage south, delete Camelback Channel			H									
23	Use concrete box or channel in lieu of multiple basins (combined with #7)			H									
24	Reems Road Channel as local collector - delete from "regional system"	Transfer channel construction and maintenance to cities and development	Large Q's do seem to indicate need for regional system, therefore channel will remain part of plan	H	$37,593,000	$0	($37,593,000)		($37,593,000)				
25	Lower El Mirage Channel as local improvement - delete from "regional system"	Reduce budget of regional system		H	$7,942,000	$0	($7,942,000)		($7,942,000)				
26	Consider improvements perpendicular to natural flows in lieu of north - south grids			L									
27	Delete Northern Channel (Loop 303 - Reems) all flows south to Bullard Wash, reduce size of basin at end of Reems	Less ROW, less channel maintenance, reduced basin size at Reems. Saves on excavated materials.	Eliminates path / multi-use link to east, underground box / SD maintenance required, construction more complicated	H	$10,918,000	$0	($10,918,000)		($10,918,000)				
	SUB-TOTAL								**($56,453,000)**				

Priority: High (H), Medium (M), Low (L), Design Suggestion (DS)

VALUE ENGINEERING ALTERNATIVES	CATEGORY:	Loop 303 & White Tanks ADMP	Rider Hunt Levett & Bailey	PAGE 4 OF 4

CREATIVE / EVALUATION PHASE					DEVELOPMENT PHASE					IMPLEMENTATION PHASE			
					COST SAVINGS								
ITEM NO.	DESCRIPTION	ADVANTAGES	DISADVANTAGES	PRIORITY	ORIGINAL COST	PROPOSED COST	INITIAL COST SAVINGS	O& M COST SAVINGS	TOTAL RECOMMENDED COST SAVINGS	ACCEPT	REJECT	REVIEW	TOTAL IMPLEMENTED COST SAVINGS
28	Goodyear to cost participate in conveyance improvements across Palm Valley	Reduce cost of the regional plan, encourage jurisdictions to enforce their ordinances	Additional cost to Goodyear / Palm Valley	H	$6,760,000	$0	($6,760,000)		($6,760,000)				
29	Comprehensive review of planned development and potential impact on the system design (see #18)			–									
30	Build flexibility into the design to accommodate future development changes			DS					Design Suggestion				
31	Consider improvement district concept to offset project costs (CFD)			DS					Design Suggestion				
32A	Conduct early identification of right-of-way (commercial property)	Acquire property in advance of potential land value appreciations. Excess property not required may be auctioned off at a higher value than original acquisition cost	Initial property up-front costs to acquire required ROW may be perceived as speculative	H	$96,023,000	$85,920,000	($10,103,000)		Not in total (see #32 B)				
32B	Conduct early identification of right-of-way (effect of escalation)			H	$109,658,000	$85,920,000	($23,738,000)		($23,738,000)				
33	Property owners pay for flood plain reduction or elimination and / or donate right-of-way	Value of property removed from the flood plain	Time required to implement plan, construct facilities and revise floodplain delineation	M	$22,000,000	$14,000,000	($8,000,000)		($8,000,000)				
34	Loop 303 drainage improvements phased from south-north (Loop 303 designed from north-south)	Prevent flooding from construction of new facilities where outfalls and infrastructure to outfalls are not constructed or otherwise not available.	Need ROW sooner for discharge into temporary channels and basins	DS					Design Suggestion				
35	Identify single point of contact, system or review process for liaison with jurisdictions and developers	Developers and agencies have a standardized system to work within and a point person for the life of a projectl (instead of by phases of projects)	Reorganization of resources is initially costly and disruptive both internally and externally	DS					Design Suggestion				
36	Investigate grant sources - federal monies			DS					Design Suggestion				
37	Estimate adjustments	Provide more realistic picture of the project budget		H	$0	$55,752,000	$55,752,000		$55,752,000				
	TOTAL								($200,760,000)				

Priority: High (H), Medium (M), Low (L), Design Suggestion (DS)

VALUE ENGINEERING ALTERNATIVE	No. 1

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Eliminate channel along the RID Canal (203rd Ave. to Loop 303)

ORIGINAL DESIGN: Channel along the RID Canal from Cotton Lane to 203rd Ave/ includes two detention / retention basins. (as shown on the recommended alternative)

ALTERNATIVE DESIGN: Move the channel to the north side of I-10 (Jackrabbit Trail to Cotton Lane) Look into coordinating with ADOT for right-of-way. Eliminate some, or all cross drainage under I-10 in this reach. May require upsizing of proposed basin at I-10 & Cotton Lane (or may require additional basin)

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages) Little, or no slope along RID Canal. Requires online basins in order to physically drain from Cotton Lane to Jackrabbit Trail. Poor hydraulic operation due to back water conditions.

Advantages: Better hydraulic performance, less ROW required, flood protection for area south of I-10 (Cotton Lane to Jackrabbit) Coordination with RID, delete culverts from alt.

Disadvantages: Additional ROW along Cotton Lane, Coordination with ADOT

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 34,249,000
Proposed Design	$	$	$ 13,338,000
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 20,911,000

COST WORKSHEET VE ALTERNATIVE NO. 1

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Eliminate channel along RID Canal

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Per cost estimate				23,164,413
Estimate adjustment for culvert costs				1,162,923
Estimate adjustment for landscaping quantities				2,018,200
SUBTOTAL				26,345,536
MARKUP	30%			7,903,661
TOTAL - ORIGINAL				34,249,197
ALTERNATIVE DESIGN				
See attached calculation				5,260,000
Basin				5,000,000
SUBTOTAL				10,260,000
VE MARKUP	30%			3,078,000
TOTAL - ALTERNATIVE				$ 13,338,000
VE SAVINGS				**$ 20,911,197**

PREMIER
ENGINEERING CORPORATION

SHEET NO _____ OF 1

JOB NUMBER _____

TITLE _____

SUBJECT _____

MADE BY _____ DATE _____ CHECKED BY _____ DATE _____

Channel cost RID / I-10 Alt

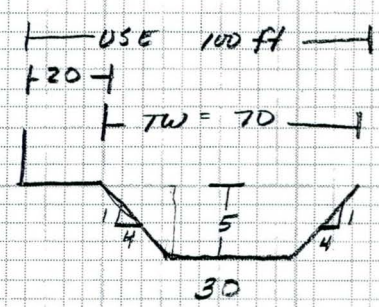
Assume 1500 cfs (average)

Earth Lined $n = 0.03$

Trap channel = 4:1 slopes

BW = 8' min

velocity = 5 fps max



Mannings Eq.

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

A = 250
P = 71

30 = 1450 cfs

EXCAVATION = 122,200 yd^3 @ \$5 = 610,000

* R/W = 30 acres @ 60,000 \$/acre = 1,800,000

landscaping = 70,000 \$/acre = \$ 2,100,000 high !!

check structures (don't know topo) assume 5 @ \$150,000 = 750,000

no culverts required

\$ 5,260,000	channel
5,000,000	assumed basin
10,260,000	sub total
3,078,000	30% cont
13,338,000	Total

* coordinate with ADOT

PREMIER
ENGINEERING CORPORATION

SHEET NO _____ OF 1

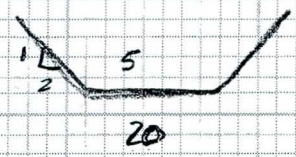
JOB NUMBER _____

TITLE _____

SUBJECT _____

MADE BY _____ DATE _____ CHECKED BY _____ DATE _____

CONCRETE CHANNEL (rough)



Assum 1 yd³ per ft

A 150
P 42 →

Q = 1700

132000 $175/yd³ = 2,310,000

7333 yd³ @ 5 $/yd³ 366,667

could go either landscaped channel or concrete channel

similar cost (landscaping is high item)

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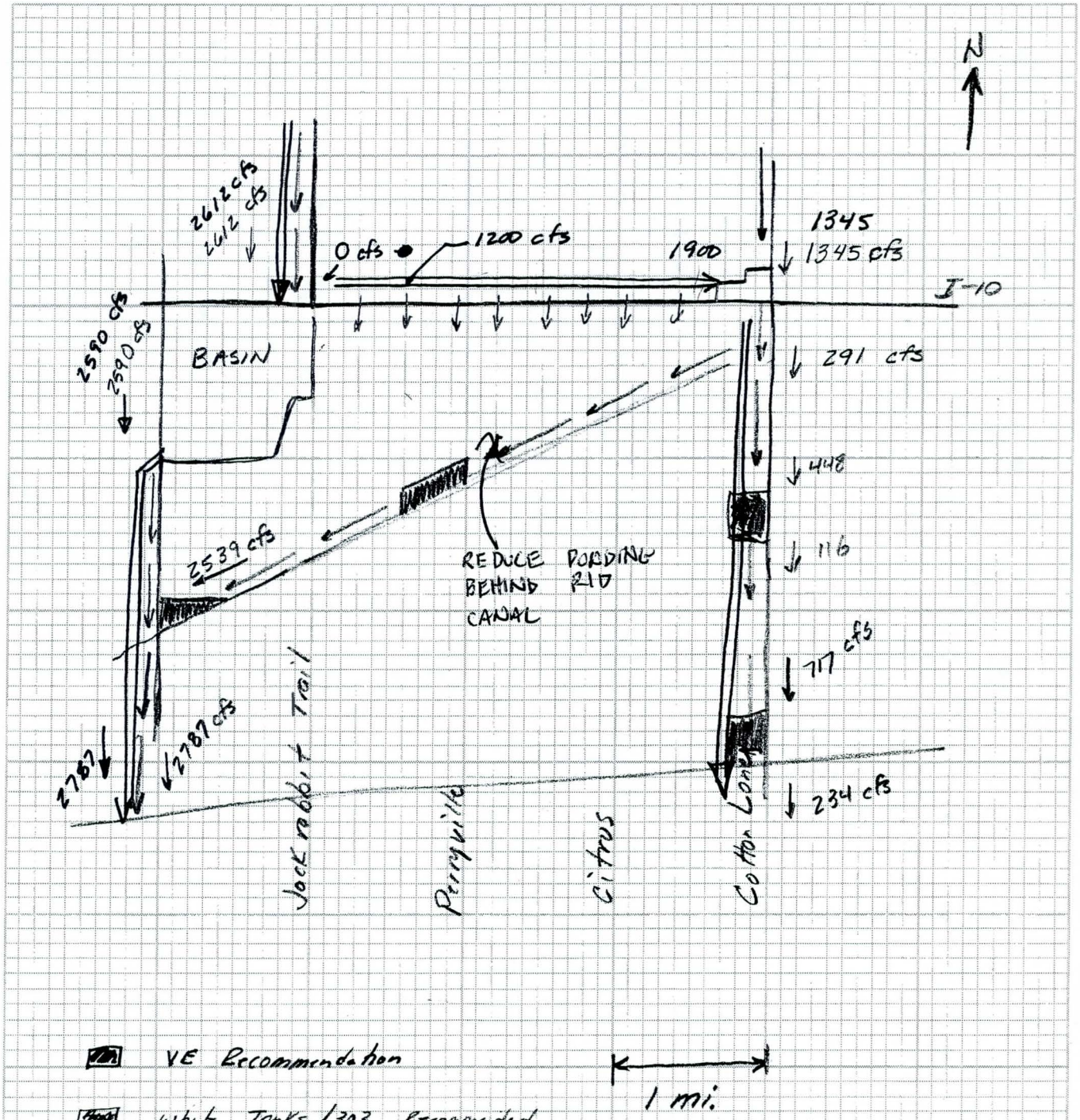
SHEET NO _____ OF 1

JOB NUMBER _____

TITLE _____

SUBJECT _____

MADE BY _____ DATE _____ CHECKED BY _____ DATE _____



Don't have detailed hydrology / hydraulics. May need to increase basin at I-10 Cotton Lane, add basin north of I-10 between Jackrabbit and Cotton Lane, or increase channel along I-10 south of Cotton Lane

VALUE ENGINEERING ALTERNATIVE	No. 2

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Construct sound berms and / or elevate Loop 303 to utilize dirt from the detention / retention basins and channels

ORIGINAL DESIGN: Extensive channel excavation and basin excavation. Leave disposal of dirt to contractor. Estimate assumed $3.25/CY for channels and $5 /CY for basins for excavation. This is a significant portion of the project cost. In reality, the cost per cubic yard could increase to $8 / CY very easily (depending on haul distance)

ALTERNATIVE DESIGN: Slightly elevate the Loop 303 to utilize dirt. Construct sound berms, add landscaping features (hills) to minimize the waste of the projects. If a roadway 100 ft. wide were elevated 2 feet for a distance of 10 miles, the earthwork would increase approximately 400,000 CY. If onsite excavation and placement costs $2 - $3 / CY and offsite disposal costs $8 / CY, the savings to the project could be $2,000,000.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)
Proposed project is a huge waste job. Every cubic yard you utilize in the corridor you save between $2 - $5 / CY. The project needs to partner with MCDOT.

Advantages: Increased aesthetics, reduce costs – eliminate cost of sound walls, potential reduction in earthwork values

Disadvantages: Additional ROW required, additional maintenance costs

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			**$ Design Suggestion**

VALUE ENGINEERING ALTERNATIVE	No. 4

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Delete west leg of El Mirage Channel

ORIGINAL DESIGN: Dual legs of a regional channel from Waddell Road to Greenway Road

ALTERNATIVE DESIGN: Eliminate the west leg of the El Mirage Channel

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)
The proposed project constructs a regional drainage system. The local entities will need to construct the local channels (section road alignments) The proposed regional system appears to include local drainage facilities in the El Mirage area (channels ½ mile apart)

Advantages: Eliminate scope and cost from the regional plan

Disadvantages: Need to add the channel to a local program (shifting funding)

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 4,659,000
Proposed Design	$	$	$ - 0 -
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 4,659,000

COST WORKSHEET VE ALTERNATIVE NO. 4

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Delete west leg of El Mirage Channel

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Per cost estimate: El Mirage East / Half Channel				1,815,310
Estimate adjustment for landscaping quantities				(23,317)
				1,791,993
Length times 2				3,583,986
SUBTOTAL				3,583,986
MARKUP	30%			1,075,196
TOTAL - ORIGINAL				4,659,182
ALTERNATIVE DESIGN				
Delete west leg of El Mirage Channel				-
SUBTOTAL				-
VE MARKUP	30%			-
TOTAL - ALTERNATIVE				$ -
VE SAVINGS				**$ 4,659,182**

PREMIER
ENGINEERING CORPORATION

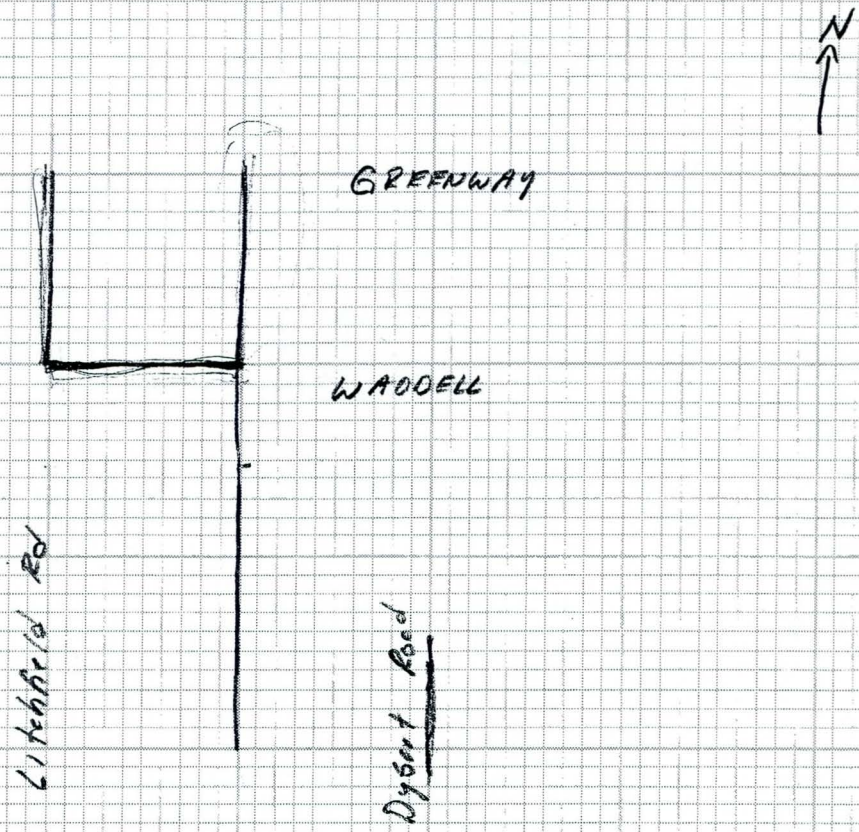
SHEET NO 4 OF ____

JOB NUMBER ____

TITLE El Mirage Channel

SUBJECT ____

MADE BY JH DATE 2/28/02 CHECKED BY ____ DATE ____



VALUE ENGINEERING ALTERNATIVE	No. 6

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Channel design alternatives

ORIGINAL DESIGN: "Kinder, gentler" channel with side slopes of 6:1 with landscaping and aesthetic treatment. Basins off-line except for the Northern Ave. Basin

ALTERNATIVE DESIGN:

A) Concrete channel adjacent to Loop 303, 2:1 side slopes with a 10 ft. bottom width and a 25 ft. recreational trail. Reduce size of basins
B) 6:1 slope grass channel over concrete box

(See attached matrix for costs and other information)

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages:

Disadvantages:

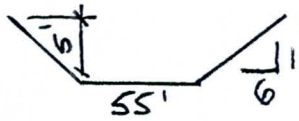
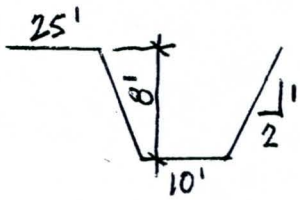
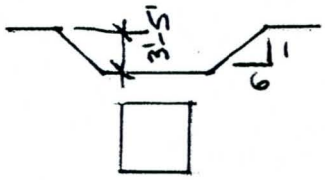
COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			**See attached**

VALUE ENGINEERING ALTERNATIVE **No. 6**

Loop 303 / White Tanks Area Drainage Master Plan

CHANNEL PROFILE OPTIONS

(construction cost per mile of channel at assumed 2000 cfs)

	Proposed	Concrete	Box
Schematic	 grass	 concrete	 grass swale over concrete box
Right-of-Way	$1,104,000	$325,000	$240,000
Construction	$665,000	$804,000	$4,089,000
Landscape	$1,851,000	$203,000	$389,000
Total Cost (per mile)	**$3,620,000**	**$1,332,000**	**$4,718,000**
Operation & Maintenance Costs (qualitative)	High	Low	Medium
Total Basin Cost for System	$40,646,000	$21,736,000	$21,736,000

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT L303 N. Channel #6 PAGE ____ OF ____

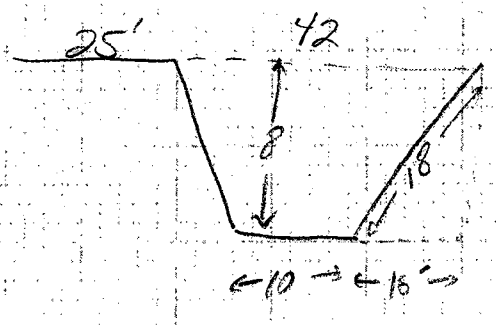
DETAIL Concrete Option COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

cfs channel

Cactus

Based on 2000 cfs



X-sect area = 208 sq ft

perimeter = 18 + 18 + 10 = 46'

concrete costs ⇒ $5280\,ft \times 46\,ft = \frac{241{,}824\,ft^2}{9\,ft^2/yd^2} = 26{,}870\,yd^2 \times \$25/sq\,yd = \$671{,}750$

excavation costs: $\frac{208\,ft^2 \times 5280\,ft}{27\,ft^3/yd^3} \times \$3.25$

$= \$132{,}200$

Channel Costs = $671,750 + $132,200 = $803,950

ROW = $\frac{67\,ft \times 5280\,ft}{43560\,ft^2/acre} = 8.12\,acres \times \$40{,}000 \approx \$325{,}000$

Landscape = $25\,ft \times 5280\,ft \times \$1.54/ft^2 \approx \$203{,}280$

total cost per mile:

VALUE ENGINEERING ALTERNATIVE	No. 7 & 23

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Underground box for low flow with swale above Loop 303. Concrete box / channel in lieu of multiple basins.

ORIGINAL DESIGN:

Northern Channel:	$106,453,000
Southern Channel:	$ 69,005,000
	$175,458,000

ALTERNATIVE DESIGN:

Northern Channel:	$ 65,845,000
Southern Channel:	$ 50,267,000
	$116,112,000

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages:

Disadvantages:

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 175,458,000
Proposed Design	$	$	$ 116,112,000
Savings	$	$	$
ANNUAL O&M SAVINGS			$ 59,346,000
TOTAL SAVINGS			$ 59,346,000

VALUE ENGINEERING ALTERNATIVE	No. 7 & 23 (north)

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Loop 303 north channel / Camelback Channel

ORIGINAL DESIGN: Kinder-gentler (K-G) channel with side slope of 6:1 with landscaping and aesthetic treatment. Basins off-line except for Northern Ave.

ALTERNATIVE DESIGN: Concrete box under channel to carry approximately 50 yr. storm with K-G channel above box to carry flows in excess of 50 yr. flow. Boxes range from 10' x 8' to 10' x 12' assuming 10 fps of velocity. The channel design included a bottom width ranging from 10' – 20' and side slopes of 6:1. Outflows from basin were increased with the basin size reduced proportionately. (culvert costs were not part of the analysis)

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages: Reduce the required ROW and landscaping

Disadvantages: Providing inlets into the boxes. Maintenance access to boxes.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 106,453,000
Proposed Design	$	$	$ 65,845,000
Savings	$	$	$ 40,608,000
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 40,608,000

COST WORKSHEET

VE ALTERNATIVE NO. 7 & 23 (north)

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Loop 303 North Channel / Camelback Channel

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Per cost estimate				69,057,488
Estimate adjustment for culverts				
(from $676,779 to $3,452,874)				2,776,095
Estimate adjustment for landscaping				10,053,192
SUBTOTAL				81,886,775
MARKUP	30%			24,566,033
TOTAL - ORIGINAL				106,452,808
ALTERNATIVE DESIGN				
Refer attached calculation- excluding culverts				47,197,000
Estimate adjustment for culverts (see above)				3,452,874
SUBTOTAL				50,649,874
VE MARKUP	30%			15,194,962
TOTAL - ALTERNATIVE				$ 65,844,836
VE SAVINGS				**$ 40,607,971**

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT L303 North Channel/ Camelback Channel PAGE ____ OF 7123 (Norm)

DETAIL ____ COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

Total Channel Ex:		$562,000	27,028,000
Box		26,466,000	
Land ROW	Channel	1,824,000	
	Basins	4,840,000	6,664,000
		6,664,000	
Aesthetics	channel	2,579,000	
	Basins	8,116,000	
		10,695,000	10,695,000
Basin Ex:		8,810,000	8,810,000
			47,197,000

Original 67,887,000
47,197,000
20,690,000
+ 2,250,000
22,940,000

Culvert costs = $609,169

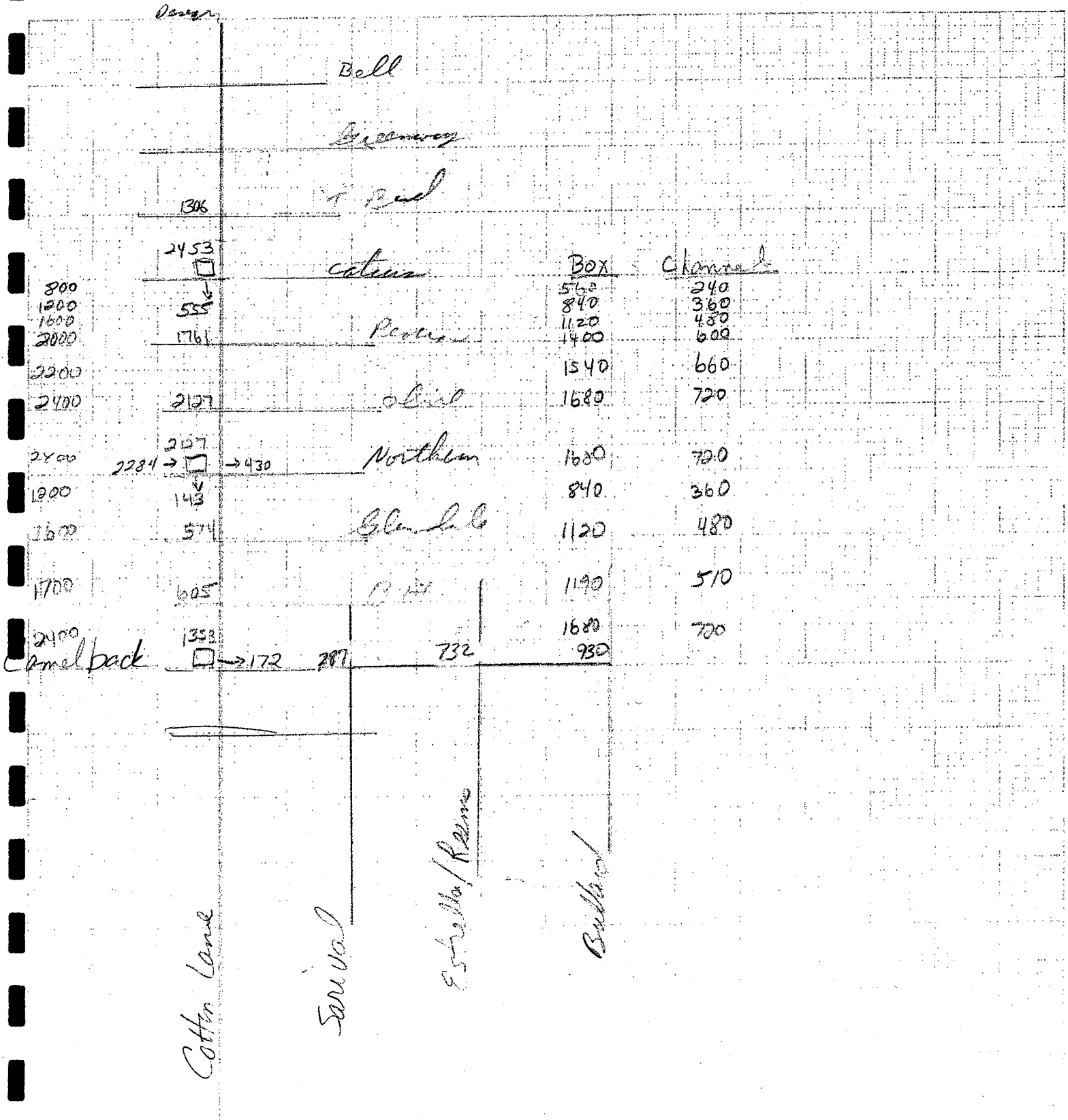
Northern Channel → $1,500,000 x 1.5 = 2,250,000

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT White Tanks ADMP PAGE ____ OF 7 & 23 (North)

DETAIL Loop 303 North channel COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT Channel Costs PAGE ____ OF 7123 (NORTH)

DETAIL ____ COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

	CY	box			Depth	Channel Length	$/cu	$/lf	rest
Cactus	800	8x8	$550/LF	$726,000	25	40	$8000	$49,000	$80,000
	1000	10x12	$800/LF	1,056,000	3'0 -	48	13,500	$58,000	94,000
	1600	10x12	800/c	1,056,000	3.5	52	$18,000	63,000	98,000
Peoria	2000	(2) 10x8	900	1,188,000	4	58	21,600	70,000	117,000
Olive / Northern	2400	(2) 10x8	900	9,504,000	4	20' bottom 68	$244,000	660,000	943,000
½	1200	10x10	700	1,848,000	3'0	48	27,000	116,000	188,000
Glendale	1600	10x12	800	2,112,000	3.5	52	36,000	126,000	196,000
B.H.	1700	10x12	800	4,224,00	3.5	52	72,000	352,000	392,000
Camelback	2400	(2) 10x8	900	4,752,000	4	68	122,000	330,000	471,000
				26,466,000			562,100	1,824,000	2,579,000

	red in size	FP Plan	new	Cost #	ac-ft	new ac	old	new	old	old scope new
Cactus Basin	30%	39 ac	27	1,080,000 old 1,560,000	382	613,000	315,000	218,000	2,816,000	$1,8[illegible]
Northern	50%	84	42	1,680,000 old 3,360,000	838	6,760,000	6,760,000	3,380,000	5,635,000	2,[illegible]
Camelback	150	26	52	+ 2,080,000 1,040,000	323	521,000	2,602,000	5,016,000	1,777,000	3,48[illegible]

Old # 59

new # 4,840,000

8,810,000 8,116,[illegible]

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT _____ PAGE _____ OF 7 (23 north)

DETAIL _____ COMPUTED _____ DATE _____

_____ CHECKED BY _____ DATE _____

D.S.

This option would eliminate Northern Ave Channel from L303 to Reems Rd 4.5 miles = 1,500,000

Northern Ave Basin should be designed as an off line basin to further reduce size.

VALUE ENGINEERING ALTERNATIVE	No. 7 & 23 (south)

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Loop 303 South Channel

ORIGINAL DESIGN: Kinder-gentler (K-G) channel with side slope of 6:1 with landscaping and aesthetic treatment. Basins off-line.

ALTERNATIVE DESIGN: Concrete box under small swale. All flows in box. Boxes range from 8' x 8' to (2) 8' x 10'. Deletion of basin at Yuma Road and Buckeye Road.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)
(culvert costs were not included in the analysis)

Advantages: Reduction in the required ROW and landscaping

Disadvantages: Providing inlets into the boxes, Maintenance access to boxex

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 69,005,000
Proposed Design	$	$	$ 50,267,000
Savings	$	$	$ 18,738,000
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 18,738,000

COST WORKSHEET

VE ALTERNATIVE NO. 7 & 23 (south)

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Loop 303 South Channel

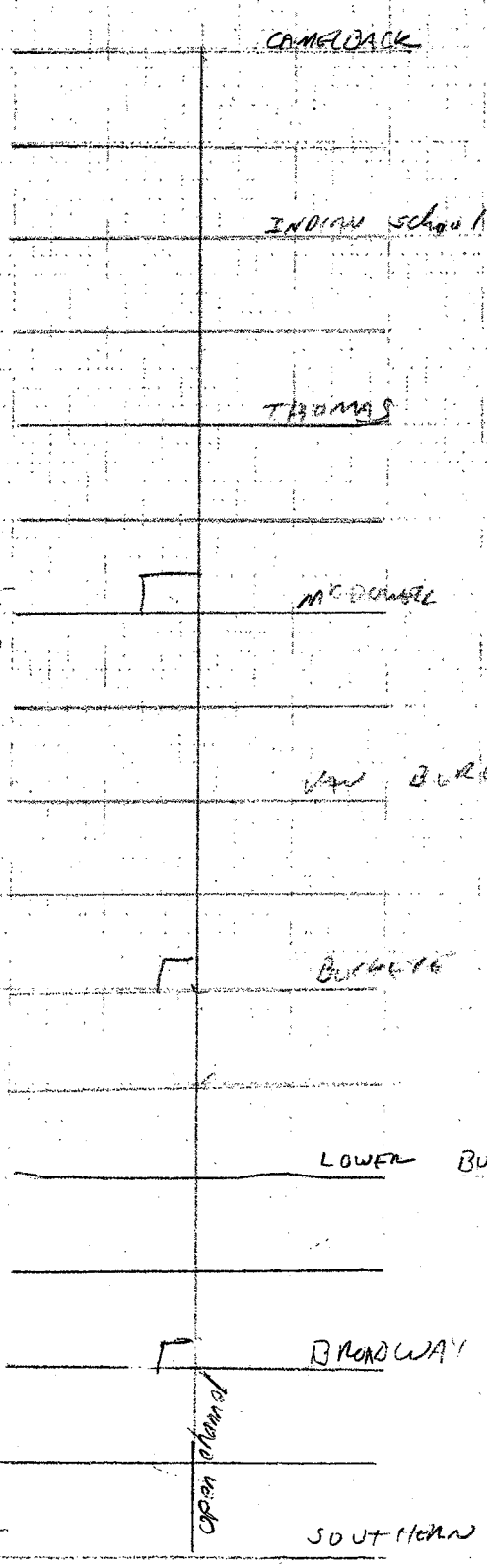
Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Per cost estimate				44,735,797
Estimate adjustment for culverts				
(from $557,233 to $2,236,790)				1,679,557
Estimate adjustment for landscaping				6,665,320
SUBTOTAL				53,080,674
MARKUP	30%			15,924,202
TOTAL - ORIGINAL				69,004,876
ALTERNATIVE DESIGN				
Refer attached calculation- excluding culverts				36,430,000
Estimate adjustment for culverts (see above)				2,236,790
SUBTOTAL				38,666,790
VE MARKUP	30%			11,600,037
TOTAL - ALTERNATIVE				$ 50,266,827
VE SAVINGS				**$ 18,738,049**

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT L303 - South Channel PAGE ____ OF 7 (South)

DETAIL ____ COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____



	Box	channel (swale)	
	570	—	
	630	—	
	1345	—	Basin needed for I-10 channel
	291	—	
	387	—	
	448	—	
	1015	—	
	1050	—	

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT _____ PAGE ____ OF 7

DETAIL _____ COMPUTED _____ DATE South

_____ CHECKED BY _____ DATE _____

Basins	FF acres	$ land	ac-ft	cy	$ ex	$ acst
McDowell	34	1,360,000	320	516,000	$2,581,000	$2,044,000
Yuma	25					
Broadway	51	2,040,000	230	371,000	$1,855,000	$3,066,000
		$3,400,000			$4,436,000	$5,110,000

Total Basin Costs = $8,510,000

total Costs ⇒ 27,920,000
+ 8,510,000
+ 557,000 Culverts
$36,987,000

Savings 44,736,000
− 36,987,000
$7,749,000

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT L303 - South Channel PAGE ____ OF 7 South

DETAIL ____ COMPUTED ____ DATE ____

CHECKED BY ____ DATE ____

Channel

Assuming 7fps in box

Channel	cfs	Box size	$/LF	$	D	Tw	XS	$ chan	$ land	$ ant
N of Indian School	570	8x10	650	1,716,000	1	24	16	$11,700	60,000	$87,500
Indian School to Thomas	630	(2) 8 x 8	800	4,224,000	1	24	16	23,400	120,000	174,800
Thomas to ½ mile	1000	(2) 8x10	900	$2,376,000	1	24	16	$11,700	60,000	$87,500
½ mile to McDowell	1345	(2) 8x12	1100	$2,904,000	1	24	16	$11,700	$60,000	$87,500
Basin size increase attributed to Study #1										
McDowell to Buckeye	448	8x8	550	$5,808,000	1	24	16	$26,800	$240,000	$349,600
Buckeye to ½ mile	600	8x10	650	$1,716,000	1	24	16	$11,700	$60,000	$87,500
½ mile to Lower Buckeye	1015	(2) 8x10	900	2,376,000				11,700	60,000	$87,500
Lower Buckeye to Broadway	1050	(2) 8x10	900	4,752,000				23,400	120,000	$174,800
				$25,872,000				$132,100	$780,000	$1,136,700

TOTAL COST = 27,920,800

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PROJECT _____ PAGE ____ OF 7 south

DETAIL _____ COMPUTED _____ DATE _____

_____ CHECKED BY _____ DATE _____

Basins

	Red in size	F.P. ac	Old $ Land	ac-ft	cy	$ ex	acct $
Yuma (Buckeye)	100%	25	$1,000,000	175	282,333	$1,412,000	$1,503,000
total Basin							

total Savings Basin = $3,915,000

Summary

Channel cost $27,920,000

7 South

Basins

Exc			24,691,065
ROW	149 acres	@ 40,000	5,960,000
H. & T.	149 acres	@ 2,500	372,500
Landscape	6,490,440 SF	@ 1.54	9,996,878
			$ 41,000,000

Proposed

3,623,000 x 6 — 21,738,000
40,000,000
$72,000,000

#7 $23

4,718,000 x 6 — 28,300,000
21,700,000
$ 50,000,000

$ 72,000,000
$ 59,000,000

$ 13,000,000

30% 6,600,000

$ 28,600,000

represents 60% of 7 & 23 combined

$ 28,600,000 × 100/60

= $ 48,000,000 does not account adjusts

compared to $ 59,000,000 reflected savings

VALUE ENGINEERING ALTERNATIVE	No. 8

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Move basins adjacent to railroad crossings (minimize crossings0

ORIGINAL DESIGN: Basin located at Peoria (Reems Road) no basins shown at Tuthill channel crossing

ALTERNATIVE DESIGN: Move basins to location immediately upstream of the railroad tracks. Try to minimize the size of the railroad crossings.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)
Railroad crossings tend to impact cost, schedule and constructability of the projects.

Advantages: Optimize the drainage systems, reduce the cost of the railroad crossings

Disadvantages: Need to acquire the parcels adjacent to the railroad

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			**$ 250,000**

VALUE ENGINEERING ALTERNATIVE	No. 11

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Sites 10 & 174 may need further investigation

ORIGINAL DESIGN: Of the 182 sites identified by the Vista database search, there appear to be two sites that may be within, or in close proximity to current proposed channel or basin alignments. Site 10 located north of Broadway Road between Airport Road and 203rd Ave., was observed only from outside the site boundaries and caution is warranted for excavation activities. Site 174 is approximately located along 303 between Glendale and Bethany Home Road and the exact location of the site and its environmental condition are unknown.

ALTERNATIVE DESIGN: Environmental investigation and remediation are time and cost consumptive. If the ADMP update is to validate possible routes of channels and basin locations, then further investigation (Phase I per ASTM) is warranted to identify the feasibility of routing proposed facilities through these sites. If not done until pre-design, the status of the conditions may change if remediation or attenuation occurs to reduce or eliminate the environmental hazard. Regardless, further investigation must be conducted to properly route the proposed facilities.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Verify likelihood that these two sites will or will not be a factor in routing of the proposed facilities.

Advantages: Phase I investigation on these two sites can answer questions about the suitability of these areas to be considered viable for proposed facilities. In essence, "fatal flaws" in the routes can be identified.

Disadvantages: Cost of Phase I may not be warranted at this time.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			Design Suggestion

VALUE ENGINEERING ALTERNATIVE	No. 12 & 13

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Reduce landscaping budget to FCDMC minimum

ORIGINAL DESIGN: Landscape themes per Logan Simpson Design.

ALTERNATIVE DESIGN: Landscape to FCDMC policy using "maximum cost guideline" for suburban areas.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages: Cost saving on landscape which currently represents 41% of the total project cost.

Disadvantages:

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 192,559,000
Proposed Design	$	$	$ 116,164,000
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 76,395,000

COST WORKSHEET VE ALTERNATIVE NO. 12 & 13

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Reduce landscaping budget to FCDMC minimum

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Refer attached list (averages to $68,958 / acre)				148,122,305
SUBTOTAL				148,122,305
MARKUP	30%			44,436,692
TOTAL - ORIGINAL				192,558,997
ALTERNATIVE DESIGN				
Total Acres	acre	2,148	41,600.00	89,356,800
SUBTOTAL				89,356,800
VE MARKUP	30%			26,807,040
TOTAL - ALTERNATIVE				$ 116,163,840
VE SAVINGS				**$ 76,395,157**

13.

No. 13

Included in estimate

acres			
134	Beardsley Canal		
	H & T	335,252	
	L	7,880,004	8,215,256
107	Jackrabbit Channel		
	H & T	268,316	
	L	7,457,472	7,725,791
425	L303 N Channel / Camelback Channel		
	H & T	1,062,626	
	L	28,510,080	29,572,64
305	L303 Channel south		
	H & T	761,988	
	L	18,334,404	19,096,39
129	Northern Channel		
	H & T	322,954	
	L	8,709,852	9,032,716
		cf	73,642,858

cf 1,100

b/f 73,642,85

acres			
b/f 1,100	Reems Channel		NO. 13
164	H & T	411,141	
	L	10,858,[illegible]	11,269,741
201	El Mirage Channel / AT & SF Railroad Channel		
	H & T	501,731	
	L	14,008,896	14,510,62
39	Lower El Mirage Channel		
	H & T	97,022	
	L	2,718,144	2,815,167
234	Bullard Channel		
	H & T	584,669	
	L	16,206,934	16,791,60
147	R/D Channel		
	H & T	367,604	
	L	10,245,312	10,612,91
			129,642,94
d/f 1885		c/f	

acrs

b/f 129,642,949

NO. 13

b/f 1,885	Tuthill Channel		
	H & T	584,624	
234	L	15,799,212	16,383,836
	I - 10 Channel		
14	H & T	36,000	
	L	976,744	1,011,744
	El Mirage East / ½ Channel		
15	H & T	38,336	
	L	1,045,440	1,083,776
2,148			$ 148,122,305

VALUE ENGINEERING ALTERNATIVE	No. 14

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Alternative to minimize right-of-way; gabions, soil cement

ORIGINAL DESIGN: Assumes earthen channels throughout which requires a substantially wider right-or-way to accommodate channel cross sections.

ALTERNATIVE DESIGN: Utilize gabions or soil cement in an effort to reduce channel cross section widths which translates to a narrower right-or-way width requirement

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages: Reduces costs associated with right-or-way acquisitions

Disadvantages: Local material within this ADMP is not suitable for soil cement and rock not available for gabion construction. Suggest looking into this further to verify lack of suitable material or options to acquire suitable material.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			Design Suggestion

VALUE ENGINEERING ALTERNATIVE	No. 17

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Address NPDES Outfall Phase II

ORIGINAL DESIGN: The original and updated Loop 303 / White Tanks plan does not provide facilities or concepts for design that will treat stormwater to NPDES Phase II standards. By 2003, these standards will be applied to communities of all size. Retention / detention basins shown in the current plan alleviate peaks (offline basins) but the first flush where the majority of pollutants reside, passes through ultimately reaching waters of the US (Gila & Aqua Fria Rivers) Therefore, the current plan philosophy / approach may not allow the communities to meet NPDES regulations and could cause each community or agency (ADOT, MCDOT) to add facilities out-of-sync with the design or to face implications of non-compliance.

ALTERNATIVE DESIGN: The current "normal" standard for design flows for NPDES Phase II compliance is the 100 yr., 2-hour storm flow. (1) The regulation applies to all non point sources including roads and canals, but currently not agricultural (this is expected to be regulated in the near future) While all new development will be required to retain or treat the 100 yr., 2-hour storm or at least the first flush ½" flow. (1) This ADMP should consider the impacts of the existing roads, public facilities like schools, parks, significant developed areas and or course all new facilities serving public facilities. While difficult to quantify this impact on the planned facilities, it is useful to consider the two approaches currently practiced.

1. For discrete areas up to 20 acres, a proprietary pretreatment unit (stormceptor (2) is being used with success to handle first flush flows. These units can be installed in manholes for smaller areas or can be designed on a 625 sf footprint for flows off or 20 acres. Their application on drainage from the 303 and other public facilities is feasible of areas where spills are more likely or integrated as pretreatment into online retention basins that receive first flush flows. In order to be effective, flows may have to be directed off a roadway, for example, by curb and gutter into the stormceptor. Units range in price from $3,000 (3) to $75,000 for a manhole to a twin 12 ft. diameter storage chamber. Operation and maintenance costs are fairly low at $100 - $1,000 / yr. and consists of using a vacuum truck to remove grit and O & G buildup.

2. For major drainage systems serving large areas, the stormceptor can be used to pretreat flows where possible, but retention basins with natural vegetative cover will likely have to be used in the outfall areas. These might be substantial in size and represent a significant cost. As the planning progresses and designs for the new roadways are prepared, where possible the stormceptor or similar pretreatment device should be incorporated in lieu of more land intensive retention basins. If there is a creative way to use the peak-shaving retention / detention basins as dual purpose to handle first flush flows to treat for TSS and hydrocarbons, this would reduce the cost of treating these flows at the outfalls.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Cost of compliance must be added into "normal" cost of public facilities just as it has been added for private developers.

Advantages: Meet NPDES permit, reduce pollutants (TSS and H/C) into waters of the U.S.

Disadvantages: Non compliance with NPDES; potentially expensive for public components, may have to rely solely on new development to treat its runoff and risk non compliance overall

References:
(1) Todd Williams, FCD of Maricopa County
(2) Jim Johnston, Area Marketing Manager, Stormceptor, 909-277-2420, x-302
(3) Jeff Holzmeister, Premier Engineering

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			Design Suggestion

VALUE ENGINEERING ALTERNATIVE	No. 18

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Revise hydrology to reflect impact of ultimate buildout (consider local retention)

ORIGINAL DESIGN: ADMP and its implementation does not allow for impacts due to future development within the watershed. The design of future projects could use reduced design assumptions where development has gotten ahead of implementation of the ADMP and actually reduced flows reaching the regional drainage.

ALTERNATIVE DESIGN: Allows for implementation plan from ADMP to be revised based on actual designs and results of new projects which would have an impact in reducing initial ADMP design and construction considerations. Assume conservative savings estimate of 100% of subtotal.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)
Proposed design utilizes the existing condition model without freeboard. Once the alternative has been selected it may be worthwhile to revise the analysis using the future condition models with the preferred improvements. This may result in a reduction of the capital cost.

Advantages: May reduce future flood control construction expenditures based on utilizing recently constructed improvements. (accounting for flow reductions due to developer's improvements)

Disadvantages: Unknown / none

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 317,662,305
Proposed Design	$	$	$ 285,896,074
Savings	$	$	$ 31,766,231
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 31,766,231

VALUE ENGINEERING ALTERNATIVE	No. 19

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Impact of "paper water" on design

ORIGINAL DESIGN: Assumes contingencies and safety factors which could result in projected flows being 30% higher than actual. In some cases, there may be as many as three different overlapping safety factors.

ALTERNATIVE DESIGN: Verify actual flows with one safety factor instead of 2 or 3 additional levels.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages: Reduce costs based on closer design studies of projected flows.

Disadvantages: Someone will have a concern with removing <u>any</u> safety considerations regardless of their basis or overlap with other contingencies.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			**Design Suggestion**

VALUE ENGINEERING ALTERNATIVE	No. 24

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Delete Reems Road Channel as local collector

ORIGINAL DESIGN: Reems Road Channel from Bell to Northern. 100 yr. F.P. contained within the channel. One basin at Peoria and one basin at Northern.

ALTERNATIVE DESIGN: Delete Reems Road Channel.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)
Regional system is laid out on a 2 – 3 mile grid. Reems Road Channel is only 1.5 miles DS/East of Loop 303. This is more of a local facility.

Advantages: Transfer cost from FCDMC to local jurisdiction. Significant cost savings as well as O & M savings.

Disadvantages: 100 yr. event may only be partially contained i.e. level of service may be lower. Limits aesthetic / multi-use opportunities along Reems Road.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 37,593,000
Proposed Design	$	$	$ - 0 -
Savings	$	$	$ 37,593,000
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 37,593,000

COST WORKSHEET VE ALTERNATIVE NO. 24

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Delete Reems Road Channel (local collector)

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Per cost estimate				22,927,090
Estimate adjustment for culverts				867,628
Estimate adjustment for landscaping				5,122,716
SUBTOTAL				28,917,434
MARKUP	30%			8,675,230
TOTAL - ORIGINAL				37,592,664
ALTERNATIVE DESIGN				
Delete Reems Road Channel				-
SUBTOTAL				-
VE MARKUP	30%			-
TOTAL - ALTERNATIVE				$ -
VE SAVINGS				**$ 37,592,664**

VALUE ENGINEERING ALTERNATIVE	No. 25

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Delete lower El Mirage Channel

ORIGINAL DESIGN: Construct detention / retention basin and outlet channel to the Agua Fria

ALTERNATIVE DESIGN: Eliminate the basin and channel from the regional plan (include in El Mirage projects)

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

This project appears to be a local project more than a regional project

Advantages:

Disadvantages:

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 7,942,000
Proposed Design	$	$	$ - 0 -
Savings	$	$	$ 7,942,000
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 7,942,000

COST WORKSHEET VE ALTERNATIVE NO. 25

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Delete lower El Mirage channel

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Per cost estimate				4,740,138
Estimate adjustment for culverts				179,826
Estimate adjustment for landscaping				1,189,494
SUBTOTAL				6,109,458
MARKUP	30%			1,832,837
TOTAL - ORIGINAL				7,942,295
ALTERNATIVE DESIGN				
Delete lower El Mirage Channel				-
SUBTOTAL				-
VE MARKUP	30%			-
TOTAL - ALTERNATIVE				$ -
VE SAVINGS				$ 7,942,295

PREMIER
ENGINEERING CORPORATION

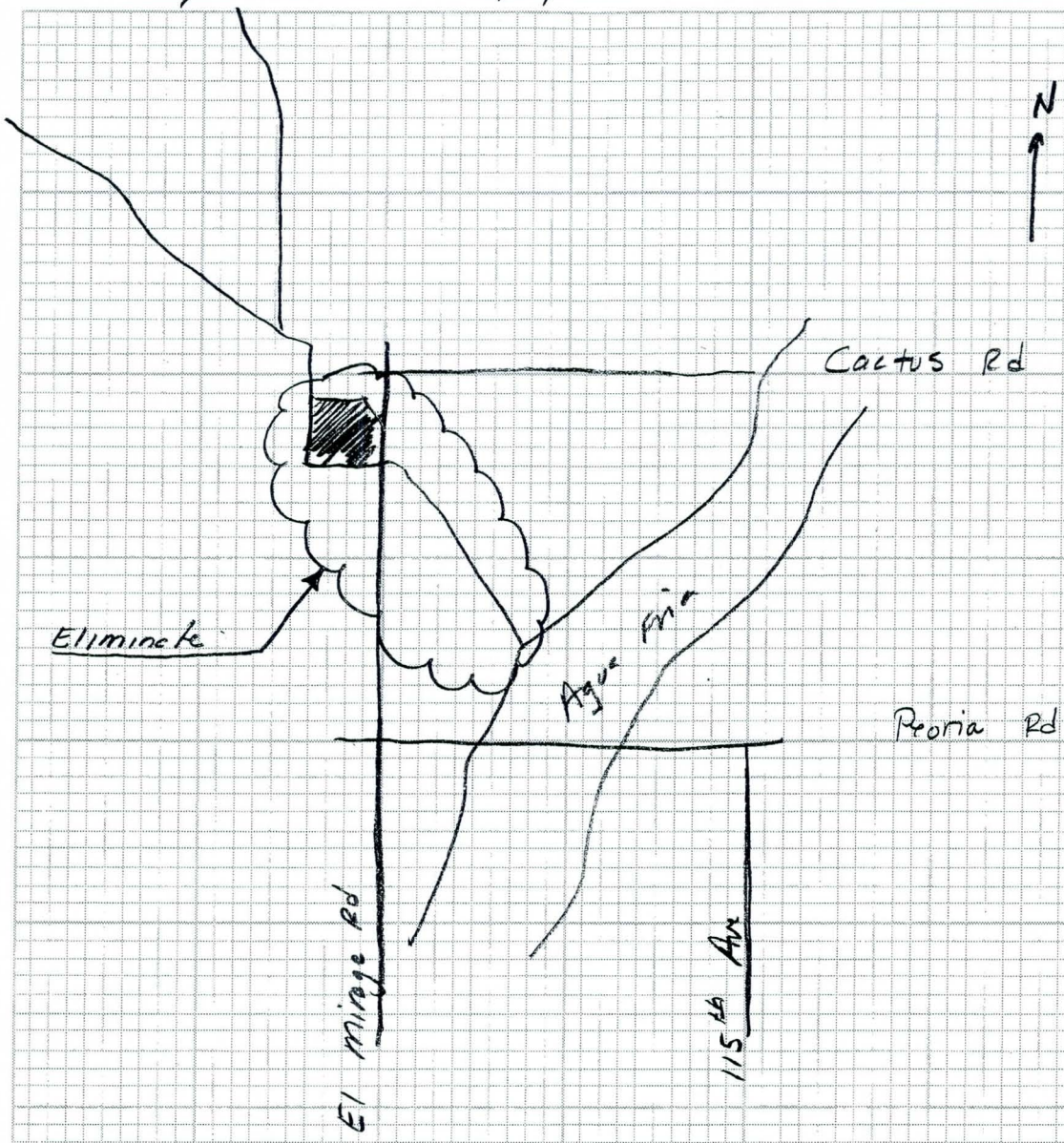
SHEET NO 25 OF

JOB NUMBER

TITLE Lower El Mirage

SUBJECT

MADE BY JH DATE 2/28/02 CHECKED BY DATE



VALUE ENGINEERING ALTERNATIVE	No. 27

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Delete Northern Avenue Channel from Loop 303 to Reems Road

ORIGINAL DESIGN: Split in-flow at Loop 303 and Northern basins south along Loop 303 (1/4) and east along Northern (3/4). All channels open, earthen with grass lining and 6:1 side slopes.

ALTERNATIVE DESIGN: Use composite open channel with underground box / storm drain along Loop 303. Eliminate flow split east along Northern Avenue

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Save ROW along Loop 303, Northern east of Loop 303. Save channel excavation along Northern, reduce basin size required adjacent to Falcon Dunes on west.

Advantages: Less ROW, less channel maintenance, reduced basin size at Reems. Saves on excavated material

Disadvantages: Eliminates path / multi-use link to east. Underground box / SD maintenance required, construction more complicated

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 10,918,000
Proposed Design	$	$	$ - 0 -
Savings	$	$	$ 10,918,000
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 10,918,000

COST WORKSHEET VE ALTERNATIVE NO. 27

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Delete portion of Northern Avenue channel from Loop 303 to Reems Road

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Refer to attached calculations:				
Cut & Fill				1,575,688
Right-of-Way				1,864,864
Hydroseeding				116,554
Landscaping				3,147,798
Culverts				335,245
Downsize detention basin				1,358,267
SUBTOTAL				8,398,416
MARKUP	30%			2,519,525
TOTAL - ORIGINAL				10,917,941
ALTERNATIVE DESIGN				
Delete portion of Northern Avenue channel from				-
Loop 303 to Reems Road				
SUBTOTAL				-
VE MARKUP	30%			-
TOTAL - ALTERNATIVE				$ -
VE SAVINGS				**$ 10,917,941**

ORIG. DESIGN.

TOT. LENGTH ≈ 22,000 LF @ FILL 33,987 CY
@ CUT 1,312,755 CY

L303/ NORTHERN BASIN ≅ 84 AC Q_{IN} = 4351, Q_{OUT} = 573 (430 E.
REEMS BASIN ≅ 50 AC Q_{IN} = 1300, 496 FROM WEST
↓
66 AFTER CH. ELIMINATION

PROPOSED DESIGN

CHANNEL

TOT. LENGTH ≅ 14,080 (64%)

≈ 21,752 FILL @ 3.25 = $70,694
≈ 840,163 CUT @ 3.25 = $2,730,530

$2,801,224

✓ Δ = 1,575,688 CHANNEL SAVINGS

R-O-W = 40K/AC X 0.64 X 129 = $3,302,400

✓ Δ = $1,864,864 R-O-W SAVINGS

HYDROSEEDING = 2.5K X 129 X .64 = 206,400

✓ Δ = $116,554 SAVINGS

LA = 1.55 X 129 X 43560 X .64 = 5,574,286

✓ Δ = $3,147,798 SAVINGS

CULVERT SAVINGS ≅ $335,245

SUB-TOTAL SAVINGS ≅ 7,040,149 ✓

1,358,267

BASIN @ NORTHERN:

$8,398,416

EXIST. IS 50AC, IF Q_{IN} REDUCED FROM 1300 TO 870 THEN ASSUME BASIN SIZE IS APPROX. 70% OF 50 AC OR 35 AC

R-O-W: Δ = (50-35) X 40K = $600,000

EXCAVATION: Δ = (314 AF X 0.7) = 220 AF ∴ $ ~~20,473,200~~ 758,267

VALUE ENGINEERING ALTERNATIVE	No. 28

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Have Goodyear participate in conveyance across Palm Valley

ORIGINAL DESIGN: Palm Valley development designed to retain the 100-yr. 6-hr. storm on-site.(tried to utilize ADOT basins) Conveyance through golf course estimated to be 2200 cfs rather than 3700 cfs identified in the design documents. Since the development was not designed to Goodyear standards the regional system must accommodate additional flow and possibly re-route channels.

ALTERNATIVE DESIGN: Have Goodyear / developer be responsible for the portion of the improvements that are required due to the lack of enforcement of their drainage ordinances.
Value of retention not constructed – net storage required: 276 acre ft. Assuming 3 ft. depth, 4:1 side slopes, assume 130 acres at $40,000 /acre = $5,200,000

(doesn't include Palm Valley / Bullard channel being undersized, 2200 cfs rather than 3700 cfs, cot to mitigate not quantified, URS will need add facilities and cost to mitigate this. New development not included in their estimate)

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Effective implementation of the regional plan will require enforcement of city / county drainage ordinances. Dense development without retention will significantly increase the stormwater runoff

Advantages: Reduce cost of the regional plan, encourage cities to enforce their ordinances

Disadvantages: Additional costs to Goodyear / Palm Valley

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 6,760,000
Proposed Design	$	$	$ - 0 -
Savings	$	$	$ 6,760,000
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 6,760,000

COST WORKSHEET VE ALTERNATIVE NO. 28

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Have Goodyear participate in conveyance across Palm Valley

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Right-of-Way	acre	130	40,000	5,200,000
SUBTOTAL				5,200,000
MARKUP	30%			1,560,000
TOTAL - ORIGINAL				6,760,000
ALTERNATIVE DESIGN				
Goodyear to participate in cost of conveyance across				-
Palm Valley				
SUBTOTAL				-
VE MARKUP	30%			-
TOTAL - ALTERNATIVE				$ -
VE SAVINGS				**$ 6,760,000**

VALUE ENGINEERING ALTERNATIVE	No. 31

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Consider Improvement District concept to offset project costs

ORIGINAL DESIGN: Funding mechanisms have not been identified.

ALTERNATIVE DESIGN: Many communities craft Improvement Districts to fund regional facilities, whereby the development community pays a share of these facilities, sometimes in lieu or in addition to drainage improvements within their development.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Care must be taken to maintain parity among those benefiting from protection of new facilities, versus "growth paying for growth".

Advantages: Cost of regional facilities is borne by existing and new taxpayers; everyone benefiting pays their fair share.

Disadvantages: Costs of regional facilities is borne by growth instead of existing taxpayers. Developers pass costs onto home buyers. Limited Improvement Districts have been met with much contention, particularly where facilities being funded are not solely for benefit of new development.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			Design Suggestion

VALUE ENGINEERING ALTERNATIVE	No. 32-A

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Early identification of Right-of-Way requirements (anticipated cost impact of commercial development)

ORIGINAL DESIGN: $40,000 / acre land value estimate established in original total cost estimate. These values are based on 2002 land values and may increase by the time that implementation of this ADMP is under way.

ALTERNATIVE DESIGN: Purchase proposed right-or-way corridors early in the process to take advantage of current land values and to avoid paying the appreciated land values which will occur as development proceeds and commercial values are established.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages: Acquire property in advance of potential land value appreciations. Excess property not required may be auctioned off at a higher value than original acquisition cost.

Disadvantages: Initial up front costs to acquire required right-of-way may be perceived as speculative.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 96,023,072
Proposed Design	$	$	$ 85,920,000
Savings	$	$	$ 10,103,072
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 10,103,072

COST WORKSHEET VE ALTERNATIVE NO. 32-A

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Early identification of Right-of-Way requirements (commercial impact)

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Right-of-Way	acre	2,148	40,000	85,920,000
SUBTOTAL				85,920,000
MARKUP				
TOTAL - ORIGINAL				85,920,000
ALTERNATIVE DESIGN				
Estimated cost of ROW considering proposed				-
Commercial Development				
Assumptions:				
1. 12 acre commercial sites at arterial intersections				
2. Value based on $5.00 / sf				
3. Area based on 12 acre corner frontage multiplied				
by proposed channel width				
4. 27 commercial sites proposed				96,023,072
SUBTOTAL				-
VE MARKUP				-
TOTAL - ALTERNATIVE				$ 96,023,072
VE SAVINGS				**$ 10,103,072**

COMM ANALYSIS FEB 28, 2002

-	BEARDSLEY	134 AC	NO CHANGE	5,364,032
-	JACKRABBIT	95.18	40K	3,807,200
	COMM	11.82	217,800	2,574,396 =
	ADJ TOTAL	107		6,381,596
-	L303/CAMELBACK	420.58	40K	16,823,200
	COMM	4.42	217,800	962,676 =
	ADJ TOTAL	425		17,785,876
-	L303/SOUTH	295.97	40K	11,838,800
	COMM	9.03	217,800	1,966,734 =
	ADJ TOTAL	305		13,805,534
-	NORTHERN	116.55	40K	4,662,000
	COMM	12.45	217,800	2,711,610 =
	ADJ TOTAL	129		7,373,610
-	PEORIA	154.9	40K	6,196,000
	COMM	9.10	217,800	1,981,980 =
	ADJ TOTAL	164		8,177,980
-	EL MIRAGE ATC	195.76	40K	7,830,400
	COMM	5.24	217,800	1,141,272 =
	ADJ TOTAL	201		8,971,472
-	LOWER EL MIRAGE	39	40K	1,560,000
-	BULLARD	234	40K	9,360,000
-	RID	144.79	40K	5,791,600
	COMM	2.21	217,800	481,338 =
	ADJ TOTAL	147		6,272,938
-	TUTHILL	232.17	40K	9,286,800
	COMM	1.83AC	217,800	398,574 =
	ADJ TOTAL	234		9,685,374
-	I-10	14	40K	560,000
-	EL MIRAGE 1/2	14.3	40K	572,000
	COMM	0.70AC	217,800	152,460 =
	ADJ TOTAL	15		724460
	GRAND TOTAL	2148 ac		96,023,072

FEB 28, 2002

32. EARLY IDENTIFICATION OF RIGHT-OF-WAY

GET AHEAD OF DEVELOPMENT

	ROW	COST
BEARDSLEY CANAL	134 ✓	5,364,032
SONORAN RIDGE ESTATES 1 mile or east side		
NO Arterial Comm		
JACKRABBIT	107 ✓	4,293,057
WHITESTONE 1.75 mi on east side		
C → 4 comm int sec @ 723 LF × 178 channel = ×5 = $2,573,330 or 11.82 AC		
L303 / CAMELBACK	425 ✓	17,002,013
Palm Valley 3.0 mi on north		
C → 2 comm int sec @ 723 × 133 channel × 5 = $961,590 or 4.42 AC		
L303 SOUTH	305 ✓	12,191,809
Palm Valley 3.0 mi on west portion		
C → Cimarron Trails 3.0 mi add to 4 comm int @ 723 × 136 channel $1,966,560 or 9.03 AC		
NORTHERN	129 ✓	5,167,264
Whitetank Foothills 1 mi on south		
C → Whitetank Mtn Ranch 1 mi on south 5 comm int @ 723 × 150 channel $2711250 or 12.45 ac		
REEMS	164 ✓	6,578,261
mountain vista 1 mi east; Cactus Park .5 mil on east		
orchards 1 mi west; Ranch Marbella 1 mi on west		
C → Cimarron 1 mi west 4 comm int @ 723 × 137 channel $1981020 or 9.10 ac		
EL MIRAGE AT SF	201 ✓	8,027,702
mtn gateway 1 mi on west		
C → mtn gate .5 mile on east 2 comm int @ 723 × 158 channel $1,142,340 or 5.24 ac		
LOWER EL MIRAGE	39 ✓	1,552,376
existing GC & Resid 1 mi		
BULLARD	224 ✓	9,354,696
Palm [illegible]	[illegible]	
[illegible]		
RID	147 ✓	5,381,662
C → [illegible] .75 mi @ [illegible] 1 comm int @ 723 × 135 channel $480,795 or 2.21 ac		
VUTHILL	234 ✓	9,353,979
[illegible] 1 mi @ west		
C → 3 comm int @ 723 × 184 channel $399,096 or 1.83 ac		
I-10	14 ✓	576,000
C → EL MIRAGE 1/2	15 ✓	2 comm int @ 723 × 106 channel $153,276 or .70 ac; 613,392

VALUE ENGINEERING ALTERNATIVE	No. 32-B

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Early identification of Right-of-Way requirements (anticipated impact of five year appreciation)

ORIGINAL DESIGN: $40,000 / acre land value estimate established in original total cost estimate. These values are based on 2002 land values and may increase by the time that implementation of this ADMP is under way.

ALTERNATIVE DESIGN: Purchase proposed right-or-way corridors early in the process to take advantage of current land values and to avoid paying the appreciated land values which will occur as development proceeds and commercial values are established.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages: Acquire property in advance of potential land value appreciations. Excess property not required may be auctioned off at a higher value than original acquisition cost.

Disadvantages: Initial up front costs to acquire required right-of-way may be perceived as speculative.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 109,658,100
Proposed Design	$	$	$ 85,920,000
Savings	$	$	$ 23,738,100
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 23,738,100

COST WORKSHEET VE ALTERNATIVE NO. 32-B

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Early identification of Right-of-Way requirements (appreciation impact)

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Right-of-Way	acre	2,148	40,000	85,920,000
(assumes $40,000 / acre is a constant over the				
project life cycle)				
SUBTOTAL				85,920,000
MARKUP				
TOTAL - ORIGINAL				85,920,000
ALTERNATIVE DESIGN				
Assumes ROW is acquired at an average of 5 years				-
from initial project start with a 5% per year				
appreciation	acre	2,148	51,051.00	109,657,548
SUBTOTAL				-
VE MARKUP				-
TOTAL - ALTERNATIVE				$ 109,657,548
VE SAVINGS				**$ 23,737,548**

VALUE ENGINEERING ALTERNATIVE	No. 33

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Property owners pay for flood plain reduction or elimination and / or donate ROW

ORIGINAL DESIGN: Approximately 870 acres of the proposed route is within the floodplain, with an estimated ROW cost of approximately $35 million. Some segments may reduce or eliminate the acreage of land surrounding the improvements that remain in the floodplain. There is value to man properties to restore this contiguous property to a higher use.

ALTERNATIVE DESIGN: Consideration should be given to recognizing the value to property owners of removing their property from the flood plain, in light of the amount of ROW needed from them to construct the facilities that create this restoration of adjacent land use and value. In consideration once more precise information is available, property owners should either pay for the restored value of their adjacent land, or donate the needed ROW to accomplish floodplain reductions on their property, or a combination of both.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

If the message is delivered with education and care, the advantages can be seen to out-weigh the disadvantages.

Advantages: Property owners see the value of their adjacent property restored as it is removed from the floodplain and they can functionally and financially enjoy their property.

Disadvantages: Property owners will have delay in receiving benefit of restoration until facilities are constructed and floodplain delineation are formally changed.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$ 22,000,000
Proposed Design	$	$	$ 14,000,000
Savings	$	$	$ 8,000,000
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			$ 8,000,000

COST WORKSHEET VE ALTERNATIVE NO. 33

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Property owners pay for flood plain reduction or elimination and/or donate ROW

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
2/3 Beardsley	acre	88	40,000	3,520,000
3/4 Jackrabbit	acre	80	40,000	3,200,000
3/4 Reems Road	acre	123	40,000	4,920,000
El Mirage / AT & SF	acre	201	40,000	8,040,000
Bullard	acre	234	40,000	9,360,000
RID	acre	147	40,000	5,880,000
SUBTOTAL				34,920,000
MARKUP	30%			10,476,000
TOTAL - ORIGINAL				45,396,000
ALTERNATIVE DESIGN				
Segments where significant property may be restored				
or removed from the floodplain				
Bullard	acre	234	40,000	9,360,000
Reems Road	acre	123	40,000	4,920,000
El Mirage	acre	201	40,000	8,040,000
				22,320,000
assume 35% of property owners participate				7,812,000
SUBTOTAL				-
VE MARKUP				-
TOTAL - ALTERNATIVE				
VE SAVINGS				**$ 7,812,000**

VALUE ENGINEERING ALTERNATIVE	No. 34

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Loop 303 Drainage Improvements phased from South-North (Loop 303 designed North-South)

ORIGINAL DESIGN: The Loop 303 is being designed and constructed from the North to the South. Regional drainage improvements (associated with the ADMP update) would normally be constructed beginning in the bottom of the watershed at the outfalls, working up to the top of the watershed. MCDOT is constructing the Loop 303 to accommodate traffic patterns which apparently North to South, which is counter to the watershed bottom-to-top philosophy for regional drainage facilities.

ALTERNATIVE DESIGN: The phasing of Loop 303 construction must take into account the temporary routing of stormwater needed to prevent downstream flooding from the new highway segments. The Loop 303 segment will likely have 5 basins (one has been recommended for elimination) and some of these may have to be built ahead of the roadway and channels to prevent flooding using temporary earthen channels.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

The expense of designing Loop 303 drainage, purchasing ROW and constructing temporary facilities which can be readily converted to permanent facilities may offset the cost of other temporary measures that MCDOT would have to provide to prevent downstream flooding by draining their new highway segments or otherwise may be most prudent means of avoiding flooding and property damage.

Advantages: Prevent flooding from construction of new facilities where outfalls and infrastructure to outfalls are not constructed or otherwise not available. May spend money up front for ROW but will purchase it a lower cost (ahead of "cost of money" expenses)

Disadvantages: Need ROW sooner for discharge into temporary channels and basins

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			Design Suggestion

VALUE ENGINEERING ALTERNATIVE	No. 35

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Identify single point of contact or develop system to assist development community and agencies in sharing information and identifying funding fairness and consistency

ORIGINAL DESIGN: The current system at FCD is susceptible to confusing and frustrating developers and other jurisdictions who are working to bring projects from planning through design. The District's organization is based on functions (planning, design, construction, etc.) and not on watersheds.

ALTERNATIVE DESIGN: There may be an opportunity to consider establishing a system that can be used to provide fair and consistent application of standards and funding / cost sharing based on watershed attributes, needs, issues and opportunities. Identifying a point person for each major watershed who shepherds projects through all phases could be very beneficial and in the long run, very cost effective.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages: Developers and agencies have a standardized system to work within and a point person for the life of a project (instead of by phase of projects)

Disadvantages: Reorganization of resources is initially costly and disruptive both internally and externally.

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings	$	$	$
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			Design Suggestion

VALUE ENGINEERING ALTERNATIVE	No. 37

PROJECT: Loop 303 / White Tanks Area Drainage Master Plan

ITEM: Cost estimate adjustments

ORIGINAL DESIGN: Cost estimate prepared by URS.

ALTERNATIVE DESIGN: Unit rate cost adjustments to culverts. Quantity adjustments to landscaping costs.

DISCUSSION / JUSTIFICATION:
(Advantages / Disadvantages)

Advantages:

Disadvantages:

COST SUMMARY	CAPITAL COST	ANNUAL O&M	TOTAL SAVINGS
Original Design	$	$	$
Proposed Design	$	$	$
Savings (Add)	$	$	($ 55,752,000)
ANNUAL O&M SAVINGS			$
TOTAL SAVINGS			($ 55,752,000)

COST WORKSHEET VE ALTERNATIVE NO. 37

Project: Loop 303 / White Tanks Area Drainage Master Plan
Item: Cost Estimate Adjustments

Item	Unit	Quantity	Unit Cost	Total
ORIGINAL DESIGN				
Rate adjustments to culverts (see attached)				11,699,811
Quantity adjustments to landscaping (see attached)				31,186,294
SUBTOTAL				42,886,105
MARKUP	30%			12,865,832
TOTAL - ORIGINAL				55,751,937
ALTERNATIVE DESIGN				
SUBTOTAL				-
VE MARKUP				-
TOTAL - ALTERNATIVE				$ -
VE SAVINGS (Add)				**$ (55,751,937)**

Adjustment to Cost Estimate for landscaping:

Add:

Beardsley Canal
✓ 5,837,040 − 5,841,431 = −4,331 @ 1.35 − 5,928

Jackrabbit Channel
✓ 4,660,920 − 4,211,352 = 449,568 @ 1.60 719,309

L 303 North Channel/
Camelback Channel
✓ 18,813,000 − 11,984,953 = 6,528,047 @ 1.54 10,053,19

L 303 Channel South
✓ 13,285,800 − 8,455,858 = 4,829,942 @ 1.38 6,665,3

Northern Channel
✓ 5,619,240 − 5,627,151 = −8,911 @ 1.55 −13,812

Reems Channel
✓ 7,143,840 − 3,773,632 = 3,370,208 @ 1.52 5,122,71

El Mirage Channel/
AT & SF Railroad Channel
✓ 8,755,560 − 7,116,719 = 1,638,841 @ 1.60 2,622,146

4f

43,680 ¼

b/f 25,162,943

No. 37

Lower El Mirage Channel

✓ 1,698,810 - 955,406 = 743,434 @ 1.60 1,189,494

Bullard Channel

✓ 10,193,040 - 9,651,566 = 541,474 @ 1.59 860,941

R/D Channel

✓ 6,403,320 - 5,141,945 = 1,261,375 @ 1.60 2,018,2

Tuthill Channel

✓ 10,193,040 - 8,898,906 = 1,294,134 @ 1.55 2,005,90

I-10 Channel

✓ 609,840 - 627,264 = -17,424 @ 1.60 - 27,878

El Mirage East ½ Channel

✓ 653,400 - 667,913 = - 14,513 @ 1.60 - 23,317

31,186,290

20% Contingency 7,355,889

$40,542,18

PREFERRED ALTERNATIVE PHASE
5-DAY VALUE ENGINEERING CONFERENCE AGENDA
LOOP 303 WHITE TANKS AREA DRAINAGE MASTER PLAN
PHOENIX, ARIZONA

February 25 – March 1, 2002

Location: Holiday Inn Phoenix West
1500 N. 51st Avenue
Phoenix, AZ 85043
Phone (602) 484-9009
Fax (602) 484-0404

DAY 1 – February 25, 2002 (Cactus Room)

8:00 a.m. **STAKEHOLDER PRESENTATION IN-BRIEF – 8:00 am – 12:00 noon**
(Project Stakeholders & VE Team)

INFORMATION PHASE - INTRODUCTION TO WORKSHOP
(by VE Team Leader, John Pucetas, CVS)

Welcome & Opening Remarks
Team Member Introductions
Briefing: VE Process, Workshop Organization & Agenda
Objectives of Workshop

9:00 **INFORMATION PHASE - PROJECT BRIEFING**
(by URS, FCDMC)

Project Goals
Project Design: Project history & evolution
Presentation of preferred alternative including: hydrology, structures, planning issues, environmental, landscaping, multi-use, constructability
Project Schedule Review
Project Budget Review

10:15 **BREAK**

10:30 **INFORMATION PHASE – (continued)**

Performance Criteria Measurement
Establish "No Build" Baseline
Establish "Expected Performance" of Preferred Alternative

12:00 noon **END OF STAKEHOLDER PRESENTATION**

LUNCH
(VE Team only)

1:00 p.m. **INFORMATION PHASE – (continued)**

VE Team Document Review

5:00 **ADJOURN**

DAY 2 – February 26, 2002 (Boardroom)

8:00 a.m **REVIEW STATUS, PROGRESS & SCHEDULE**

8:30 **FUNCTION ANALYSIS PHASE**

Function Identification
Function Analysis System Technique (FAST) Diagramming
Function - Cost - Worth Relationship
Identification of high cost / worth relationships for Value Improvement

12:00 noon **LUNCH**

1:00 p.m. **FUNCTION ANALYSIS PHASE**

Force Field Analysis: Best Project Features
Weakest Project Features

2:00 **CREATIVE (SPECULATION) PHASE**

Brainstorm Large Variety of Ideas
Generate Ideas for Basic Function
Think of Ideal Solutions
Modify and Combine Ideas
No Judgement

5:00 **ADJOURN**

DAY 3 – February 27, 2002 (Boardroom)

8:00 a.m **REVIEW STATUS, PROGRESS & SCHEDULE**

8:30 **CREATIVE (SPECULATION) PHASE**
(continued)

12:00 noon **LUNCH**

1:00 p.m. **CREATIVE (SPECULATION) PHASE**
(continued)

3:00 **EVALUATION PHASE**

List Idea Advantages and Disadvantages
Establish Evaluation Criteria
Evaluate Ideas By Comparison
Rank Ideas for Further Investigation
Weighted Evaluation (as appropriate)
Select most promising alternatives for development

5:00 **ADJOURN**

DAY 4 – February 28, 2002 (Boardroom)

8:00 a.m **REVIEW STATUS, PROGRESS & SCHEDULE**

Additional Creative Ideas

8:30 **DEVELOPMENT / COSTING PHASE**

Review of Proposal Forms and Final Products
Team Member Proposal Development Assignments
Prepare Design Alternatives
Consultations With Specialists & Manufacturers

12:00 noon **LUNCH**

1:00 p.m. **DEVELOPMENT / COSTING PHASE - Continued**

Written Proposals
Cost Estimate of Alternatives
Sketches of Alternatives
Life Cycle/Energy Impacts of Alternatives

5:00 **ADJOURN**

DAY 5 – March 1, 2002 (Cactus Room)

8:00 a.m **REVIEW STATUS, PROGRESS & SCHEDULE**

8:30 **RECOMMENDATION PHASE**

Finalize Written Proposals (Present, Proposed, Discussion)
Finalize Sketches of Present & Proposed Design
Update Cost Information
Complete Value Summary Sheets
Presentation Preparation

12:00 noon **LUNCH**

1:00 p.m. **RECOMMENDATION PHASE**

Presentation Preparation (continued)

2:00 **STAKEHOLDER PRESENTATION OUT-BRIEF – 2:00 pm – 4:00 pm**

Presentation of VE Results by VE Team Members

3:00 **IMPLEMENTATION PHASE**

Process for Accepting / Rejecting Recommendations
Implementation Tracking Log
Develop Implementation Schedule of Events

3:30 **CLOSING REMARKS**

4:00 **ADJOURN**

VE WORKSHOP ATTENDANCE LIST
WORKSHOP IN-BRIEF

Project Name: LOOP 303 / WHITE TANKS AREA DRAINAGE MASTER PLAN
Project Location: PHOENIX, ARIZONA

VE Study Date: February 25 - March 1, 2002
Project Budget:
VE Study Phase: Preferred Alternative

* denotes VE Team

No.	Name	Position	Organization	Address				Phone No.	Fax No.	E-mail
				Street	City	State	Zip			
1	Elliot Silverston	Project Manager	URS	2720 N. 16th Street, Suite 100	Phoenix	AZ	85020	602-371-1100	602-371-1615	elliot.silverston@urscorp.com
2	Rob Scrivo*	Project Engineer	URS	2720 N. 16th Street, Suite 100	Phoenix	AZ	85020	602-371-1100	602-371-1615	robert.scrivo@urscorp.com
3	Gregory Jones	Project Manager	FCDMC	2801 W. Durango	Phoenix	AZ		602-506-5537		glj@mail.maricopa.gov
4	Adriana Crnjac*	Cost Estimator	Rider Hunt Levett & Bailey	8283 N. Hayden Rd., #258	Scottsdale	AZ	85258	480-368-8333	480-368-8444	avcrnjac@riderhunt.com
5	Curt Johnson *	Director of Planning	Coe & Van Loo	4550 N. 12th Street	Phoenix	AZ	85014	602-264-4831	602-264-4303	cjohnson@cvlci.com
6	Bill Hahn	Branch Manager	MCDOT	2901 W. Durango St.	Phoenix	AZ	85009	602-506-4614	602-506-4882	billhahn@mail.maricopa.gov
7	David Ramirez	City Engineer	City of Goodyear	190 N. Litchfield Road	Goodyear	AZ	85338	623-882-7954	623-932-7748	dramirez@ci.goodyear.az.us
8	Fareed Abu-Haider	Park Designer	Maricopa County Parks & Recreation	411 N. Central Ave.	Phoenix	AZ	85004	602-506-6323	602-506-4692	fareedabouhaidar@mail.maricopa.gov
9	Michael Duncan	Sr. Civil Engineer	FCDMC	2801 W. Durango	Phoenix	AZ	85009	602-506-4732	602-506-4601	mwd@mail.maricopa.gov
10	Punya P. Khanal	Project Manager	City of Avondale	1211 S. 4th St	Avondale	AZ	85373	623-932-1909	623-932-3329	pkhanal@avondale.org
11	Valerie Swick*	Project Manager	FCDMC	2801 W. Durango	Phoenix	AZ	85009	602-506-2729	602-506-4601	vas@mail.maricopa.gov
12	Robin Bain*	District Director	PBS&J	7310 N. 16th St., Suite 310	Phoenix	AZ	85020	602-943-1003, x120	602-943-1303	rbain@pbsj.com
13	Jeff Holzmeister*	Project Manager	Premier Engineering	1600 W. Broadway Rd., #165	Tempe	AZ	85282	480-829-6000	480-829-6016	jholzmeister@pre-engr.com
14	Todd Williams	WQ Branch Manager	FCDMC	2801 W. Durango	Phoenix	AZ	85009	602-506-4113	602-506-4601	tgw@mail.maricopa.gov
15	Scott Vogel	Project Manager	FCDMC	2801 W. Durango	Phoenix	AZ	85009	602-506-4771	602-506-4871	csv@mail.maricopa.gov
16	Bob Stearns	Environmental Planner	FCDMC	2801 W. Durango	Phoenix	AZ	85009	602-506-4073		rbs@mail.maricopa.gov
17	Jackie Nolan	Comp Planner	MCP&D	411 N. Central Ave.	Phoenix	AZ	85004	602-506-8150		jackienolan@mail.maricopa.gov
18	Stu Brackney	City Manager	City of El Mirage	P.O. Box 26	El Mirage	AZ	85335	623-680-9360	623-472-8110	sbrackney@elmirageaz.org
19	Tony Widowski	Planner	City of Avondale	1211 S. 4th St	Avondale	AZ	85323	623-932-6088	623-932-6119	twidowski@avondale.org
20	Dennis Crandall	ADOT Drainage	ADOT	205 S. 17th Ave	Phoenix	AZ	85007	602-712-7197	602-712-3161	

VE WORKSHOP ATTENDANCE LIST

Project Name: LOOP 303 / WHITE TANKS AREA DRAINAGE MASTER PLAN
Project Location: PHOENIX, ARIZONA

VE Study Date: February 25 - March 1, 2002
Project Budget:
VE Study Phase: Preferred Alternative

* denotes VE Team

No.	Name	Position	Organization	Address				Phone No.	Fax No.	E-mail
				Street	City	State	Zip			
19	Brian Pirooz	Assistant City Engineer	City of Surprise							
20	Fred Fuller*	Senior Inspector	PBCS	1501 W. Fountainhead Parkway	Tempe	AZ	85282	602-549-2638	602-237-1053	
21	Tom Johnson	Deputy General Manager	FCDMC	2802 W. Durango	Phoenix	AZ	85009	602-506-4703		
22	John Pucetas	Facilitator	SiteTek Financial Arts, Inc.	16010 Aspen Drive	Fountain Hills	AZ	85268	480-836-0594	480-836-0596	sitetek@earthlink.net
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Performance Criteria Matrix

Project: Loop 303 & White Tanks Area Drainage Master Plan
Location: Maricopa County, Arizona
Study Element:
Date: February 25 - March 1, 2002

Criteria Scoring Matrix

Criteria:	Preference		Preference		Preference		Preference		Preference		Preference	
	A or	B	A or	C	A or	D	A or	E	A or	F	A or	G
A. Flood Protection	4		3		1	1	2		2		2	
	B or	C	B or	D	B or	E	B or	F	B or	G		
B. Multi-use		3		2		3		4		2		
	C or	D	C or	E	C or	F	C or	G				
C. Cost (life-cycle)	2		3		2			2				
Public Acceptance /	D or	E	D or	F	D or	G						
D. Compatibility	2			2		2						
	E or	F	E or	G								
E. Environmental		3		3								
Feasibility	F or	G										
F. (reality check)		2										
Funding												
G. (Partnering)												

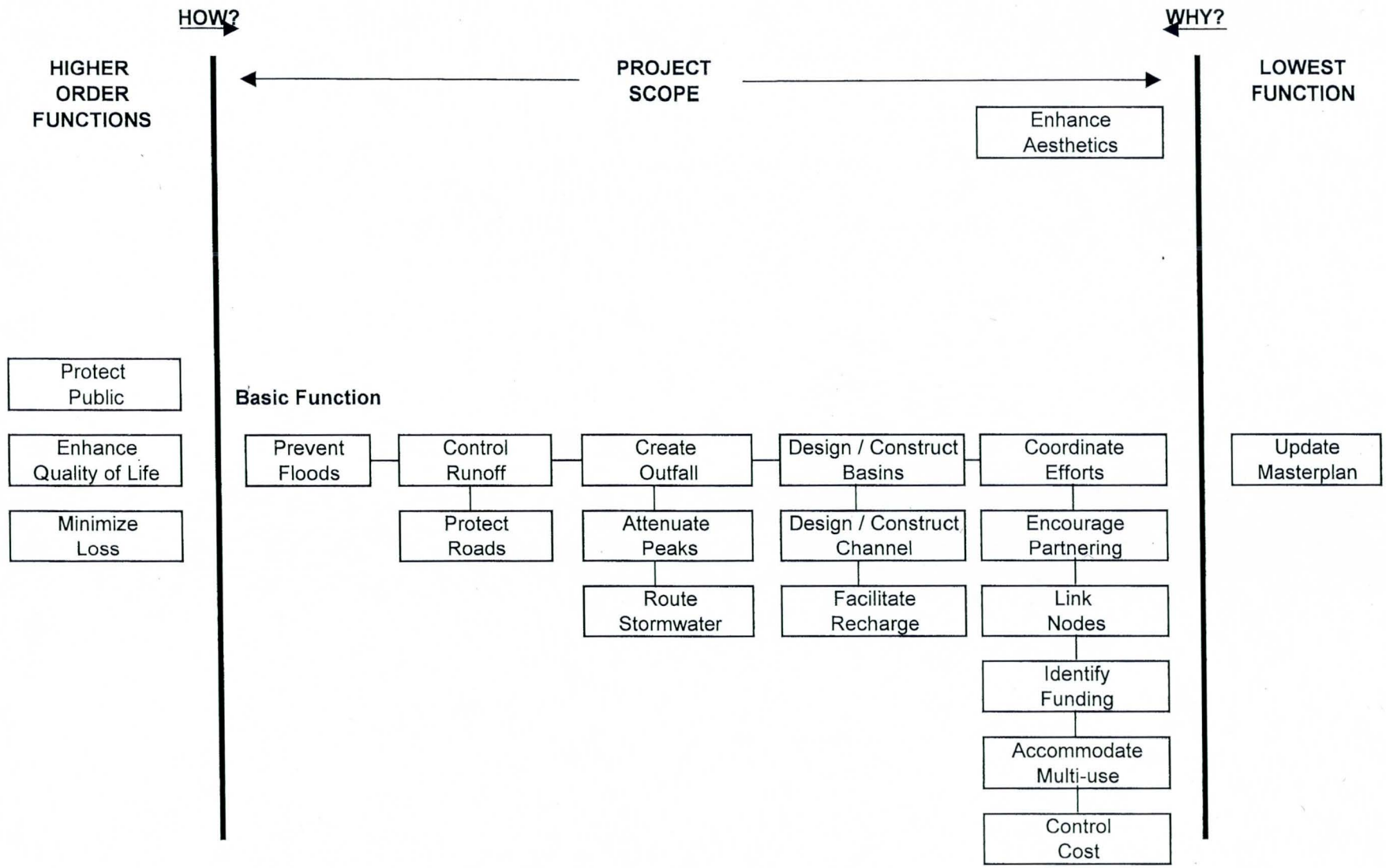
How Important: Major Preference = 4, Medium Preference = 3, Minor Preference = 2, No Preference Each = 1

Analysis Matrix

Criteria	A		B		C		D		E		F		G		
Raw Score	14		0		10		5		3		9		11		
Weight	10		2		8		4		3		8		9		
Alternatives:	Score	W. S.	Score	W. S.	Score	W. S.	Score	W. S.	Score	W. S.	Score	W. S.	Score	W. S.	**Total**
1. Baseline	1	10.00	1	2.00	4	32.00	4	16.00	4	12.00	3	24.00	2	18.00	**114.00**
2. Preferred Alternative	5	50.00	5	10.00	2	16.00	3	12.00	3	9.00	3	24.00	3	27.00	**148.00**
3.		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00
4.		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00
5.		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00
6.		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00
7.		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00
8.		0.00		0.00		0.00		0.00		0.00		0.00		0.00	0.00

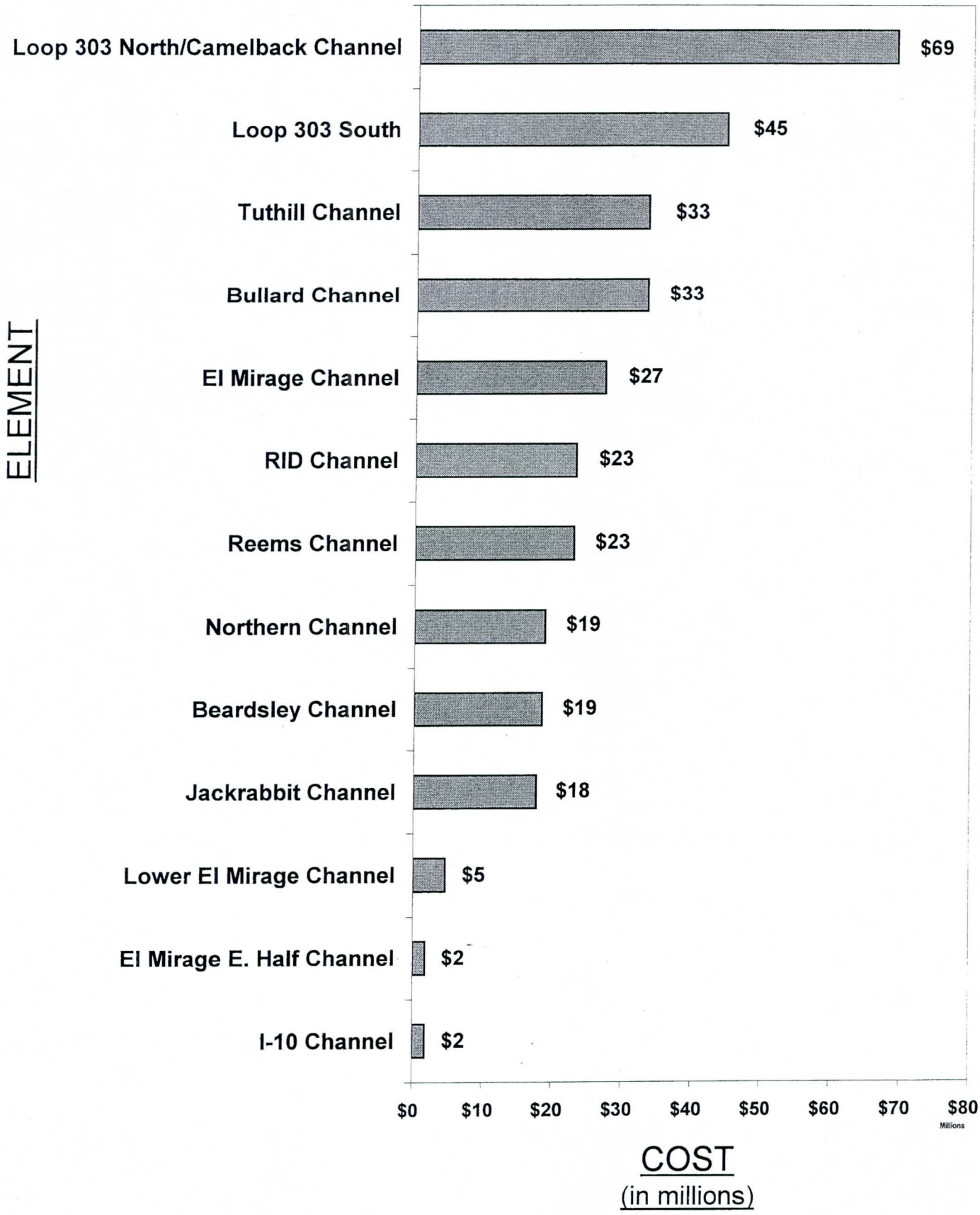
Score: Excellent = 5, Very Good = 4, Good = 3, Fair = 2, Poor = 1

Preferred Alternative Phase
Value Engineering Workshop
Loop 303 / White Tanks ADMP

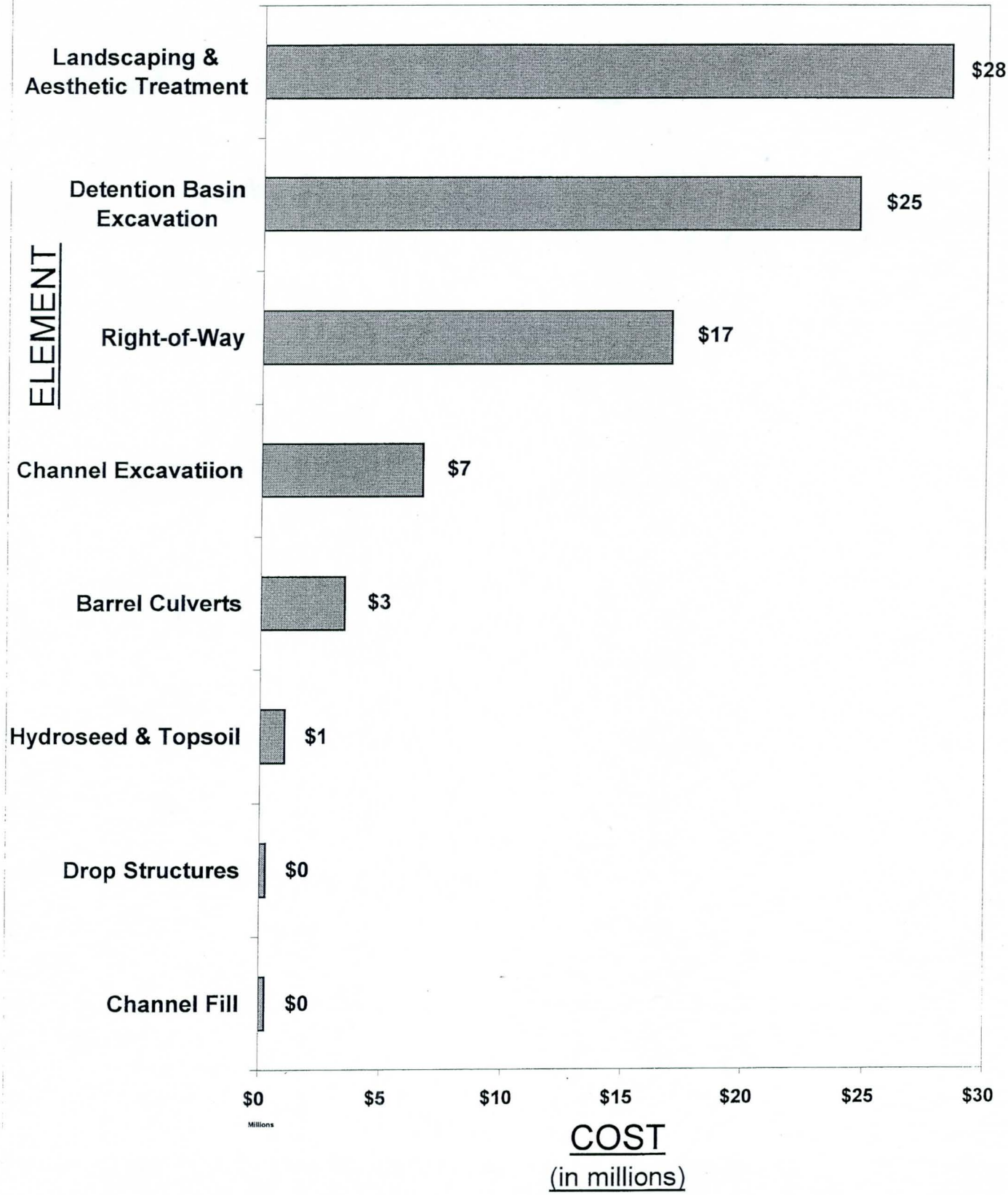


FAST DIAGRAM
(FUNCTION ANALYSIS SYSTEM TECHNIQUE)

FUNCTION / COST DISTRIBUTION
LOOP 303 / WHITE TANKS ADMP



ELEMENTAL FUNCTION / COST DISTRIBUTION
LOOP 303 NORTH CHANNEL / CAMELBACK CHANNEL



VE BRIEFING ATTENDANCE LIST

Project Name: **Loop 303 / White Tanks ADMP**
Project Location: **Maricopa County, Arizona**

Date: 1-Mar-02
Project Budget: $400 million

No.	Name	Organization
1	**Elliot Silverston**	URS
2	**Angeline Fowler**	FCDMC
3	**Punya P. Khanal**	City of Avondale
4	**Tom Johnson**	FCDMC
5	**David Ramirez**	City of Goodyear
6	**Scott Vogel**	FCDMC
7	**Mike Duncan**	FCDMC
8	**Adriana Crnjac**	Rider Hunt Levett & Bailey
9	**John Dunkerley**	Rider Hunt Levett & Bailey
10	**Gregory Jones**	FCDMC
11	**Valerie Swick**	FCDMC
12	**Jeff Holzmeister**	Premier Engineering
13	**Robin Bain**	PBS&J
14	**Curt Johnson**	Coe & Van Loo
15	**John Pucetas**	SiteTek Financial Arts, Inc.