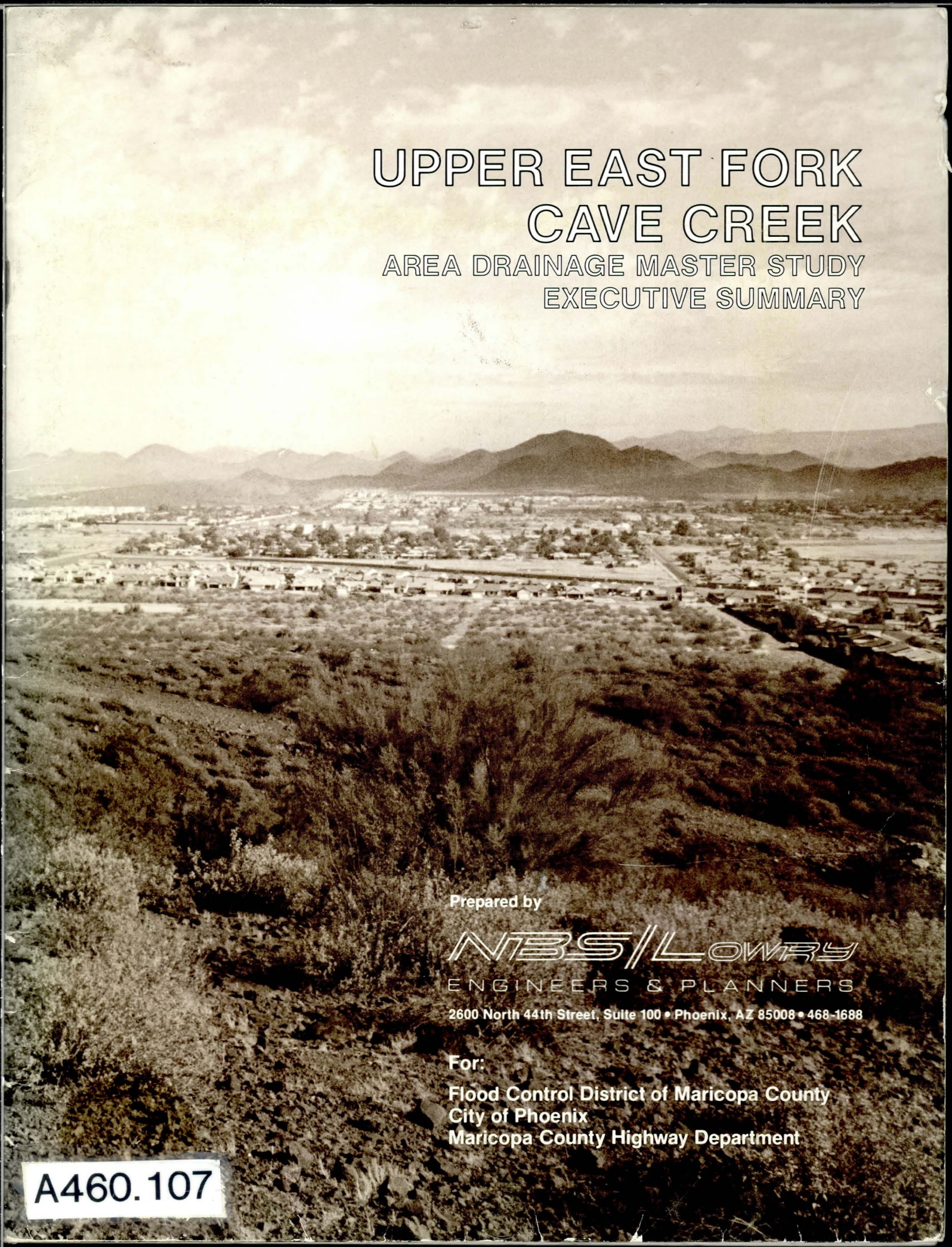
UPPER EAST FORK CAVE CREEK

AREA DRAINAGE MASTER STUDY
EXECUTIVE SUMMARY



Prepared by

NBS/LOWRY

ENGINEERS & PLANNERS

2600 North 44th Street, Suite 100 • Phoenix, AZ 85008 • 468-1688

For:

Flood Control District of Maricopa County
City of Phoenix
Maricopa County Highway Department

A460.107

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

UPPER EAST FORK CAVE CREEK AREA DRAINAGE MASTER STUDY (EXECUTIVE SUMMARY)

PREPARED FOR:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CITY OF PHOENIX

MARICOPA COUNTY HIGHWAY DEPARTMENT

PREPARED BY:

NBS/LOWRY

OCTOBER 1987

UPPER EAST FORK CAVE CREEK AREA DRAINAGE MASTER STUDY

EXECUTIVE SUMMARY

ABSTRACT

This report on the Upper East Fork Cave Creek Area Drainage Master Study has been prepared for the Flood Control District of Maricopa County, the City of Phoenix, and the Maricopa County Highway Department to achieve the following objectives:

1. To document the status of existing runoff and flooding conditions in a 16 square mile study area shown on Figure 1.1.

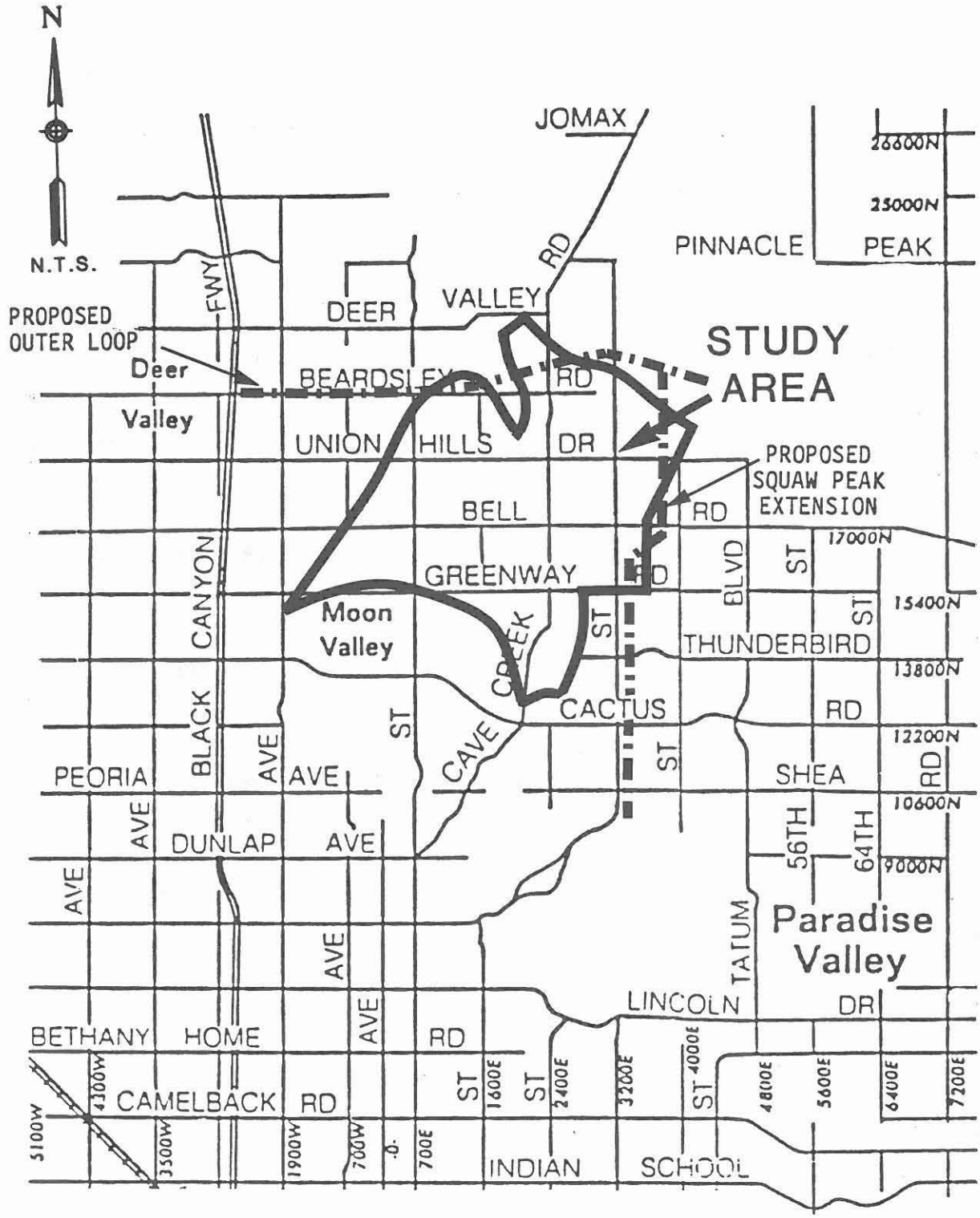
2. To identify and evaluate alternatives for providing 100-year flood protection.

3. To identify improvements needed to implement the recommended alternative.

4. To develop cost estimates and preliminary engineering design data for the proposed flood protection plan.

To meet the first of these objectives, runoff modelling was performed using the Soil Conservation Service TR-20 runoff synthesis model. Using this model, 100-year, 50-year and 10-year flood hydrographs were synthesized throughout the study area. Because Upper East Fork Cave Creek is within an alluvial fan which is characterized by numerous small drainage features which approximate an overland flow condition, a two dimensional diffusion model was applied as an aid in delineating overland flow paths. The final watershed model was found to produce results closely matching results of previous FEMA studies at the outlet of the Upper East Fork Cave Creek watershed.

UPPER EAST FORK - CAVE CREEK AREA DRAINAGE MASTER STUDY



NBS/LOWRY

FIGURE 1.1

Four alternatives were then considered for providing 100-year flood protection. These alternatives included:

Alternative 1; a nonstructural alternative emphasizing right-of-way purchases and regulatory measures as opposed to reliance on capital improvements.

Alternative 2; emphasizing improvement of the designated FEMA floodway and containing flood flows within the floodway limits.

Alternative 3; emphasizing construction of underground collectors along flood paths so that permanent disruption of existing neighborhoods could be minimized.

Alternative 4; a "multi-use" alternative emphasizing joint use of floodways for flood management and recreation.

Improvements were then identified and developed based on the selection of the "multi-use" alternative. The primary feature of this plan was a three-mile long native desert parkway along Upper East Fork Cave Creek, similar in concept to the Indian Bend Wash project in Scottsdale, but using native vegetation. A complete system of major channels, box culverts, detention basins and pipelines along with their costs and relative priority were also developed for budgetary and preliminary layout purposes.

The construction cost of the recommended facilities to provide 100-year flood protection is estimated at $74,000,000. An estimated $40,000,000 is needed to fund construction of the top priority projects. These projects include a new multi-use Upper East Fork Cave Creek channel, new open channel, detention and box culvert improvements along 9th Street, and a system of box culverts under Bell Road.

CONCLUSIONS

The recommendations made in this report are based on the following conclusions:

1. The use of the two-dimensional diffusion model indicated that flow in Upper East Fork Cave Creek splits near Grovers Avenue and 21st Street. One branch follows the delineated FEMA alignment. A second branch turns south and follows 21st and 20th Streets through a series of local collector streets to the Greenway Channel.

2. Plate 2.1 summarizes runoff quantities computed using the TR-20 model for the 100-year storm.

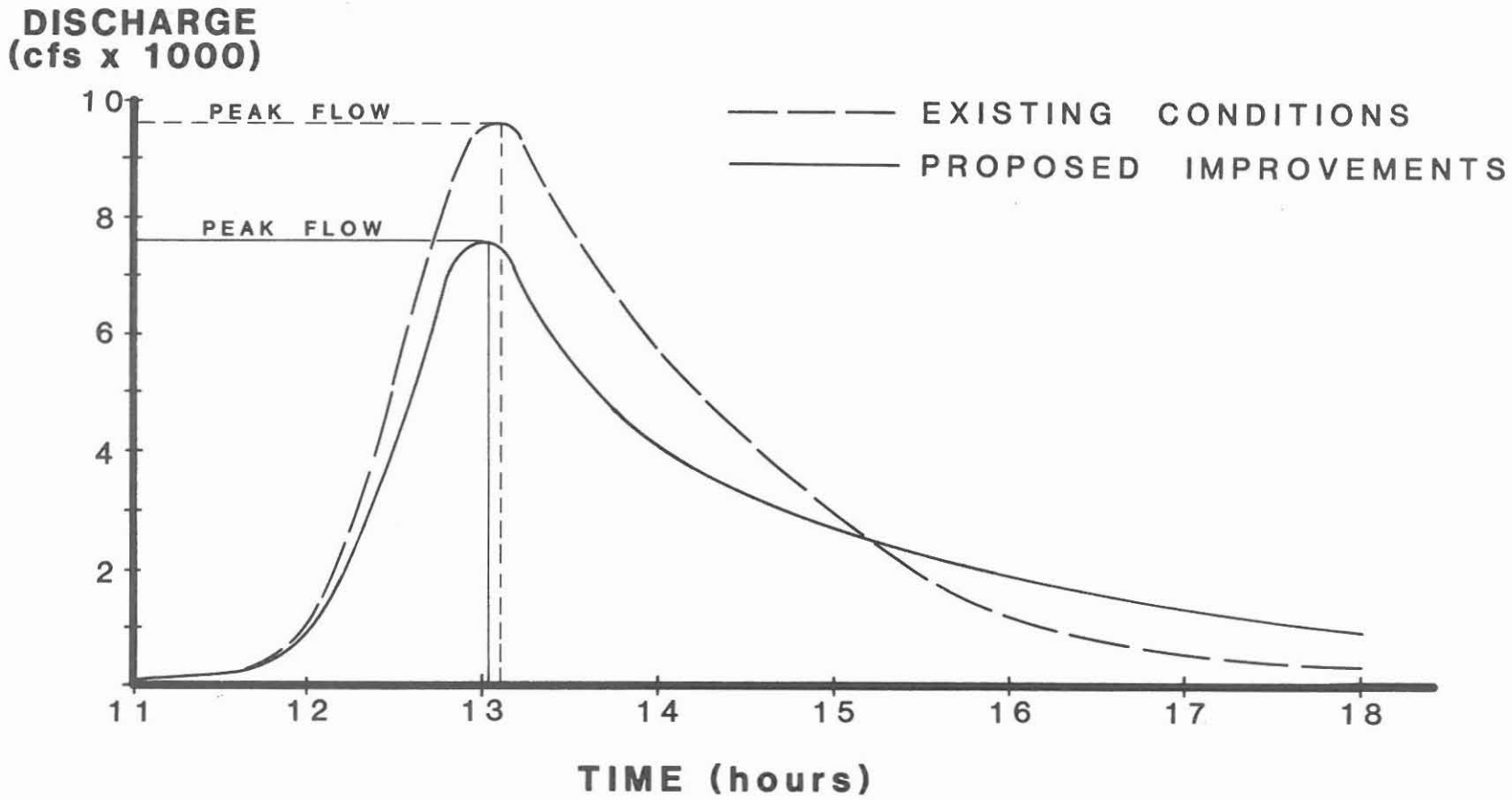
3. Plate 4.1 shows the recommended alternative, including design flows for all conveyance and design facilities. This alternative allows for joint use of the Upper East Fork Cave Creek floodway for flood management and for recreation.

4. Implementation of the recommended alternative will result in changes in the design flows for the Greenway Channel. Design flows downstream from 12th Street have been reduced. Design flows between 12th Street and 20th Street have increased.

5. Figure 4.5 shows a comparison of the existing condition watershed outflow hydrograph and that which would be expected following implementation of the proposed master plan.

6. The recommended master plan facilities, their costs, and allowable downsizing for alternate 50-year and 10-year design frequencies are itemized on Tables 6.1 through 6.7.

OUTFLOW HYDROGRAPHS FROM DRAINAGE AREA



NBS/LOWRY

FIGURE 4.5

COST COMPARISON TABLE - UNION HILLS @ CAVE CREEK

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
UNION HILLS @ CAVE CREEK													
Cave Creek to Central Ave	1,250	206	Earth Apron	$60	$75,000	415	Earth Apron	$80	$100,000	518	Earth Apron	$100	$125,000
Central Ave. to 7th St.	2,650	206	11'x4' BOX	$540	$1,431,000	415	2-11'x4' BOXES	$1,080	$2,862,000	518	2-12'x4' BOXES	$1,152	$3,052,800
	5.74ac		R/W	$40,000	$229,600		R/W	$40,000	$229,600		R/W	$40,000	$229,600
TOTAL FOR U.HILLS @ CC					$1,735,600				$3,191,600				$3,407,400

NBS/LOWRY

TABLE 6.1

COST COMPARISON TABLE - 7TH STREET

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
7TH STREET ==========													
Greenway Channel to Bell Rd.	1,020	282	72" RCP	$288	$293,760	430	84" RCP	$336	$342,720	548	90" RCP	$360	$367,200
Bell Rd. to Campo Bello Dr.	1,320	237	66" RCP	$264	$348,480	394	78" RCP	$312	$411,840	469	84" RCP	$336	$443,520
Campo Bello Dr. to Grovers Ave.	1,320	184	60" RCP	$240	$316,800	310	58"x91" Ell RCP	$292	$385,440	371	58"x91" Ell RCP	$292	$385,440
Grovers Ave. to Michigan Rd.	1,430	136	54" RCP	$216	$308,880	236	53"x83" Ell RCP	$270	$386,100	284	53"x83" Ell RCP	$270	$386,100
TOTAL FOR 7TH STREET					$974,160				$1,183,380				$1,215,060

NBS/LOWRY

TABLE 6.2

COST COMPARISON TABLE - 9TH STREET

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
9TH STREET													
Greenway Channel to Bell Rd.	1,200	362	9'x6' BOX	$576	$691,200	701	2-8'x6' BOXES	$1,080	$1,296,000	782	2-9'x6' BOXES	$1,152	$1,382,400
	0.23ac		R/W	$40,000	$9,200		R/W	$40,000	$9,200		R/W	$40,000	$9,200
Bell Rd. to Helena Dr.	1,000	292	8'x4' BOX	$432	$432,000	531	2-7'x4' BOXES	$782	$782,000	610	2-8'x4' BOXES	$864	$864,000
Helena Dr. to Detention Basin #5	400	292	6'x4' BOX	$360	$144,000	531	2-6'x4' BOXES	$720	$288,000	610	2-6'x4' BOXES	$720	$288,000
Detention Basin #5	26.6ac		R/W	$40,000	$1,064,000		R/W	$40,000	$1,064,000		R/W	$40,000	$1,064,000
			Constr.		$575,000		Constr.		$1,041,000		Constr.		$1,150,000
Detention Basin #5 to Grovers Ave.	660	402	2-8'x4' BOXES	$864	$570,240	735	3-11'x4' BOXES	$1,620	$1,069,200	865	3-11'x4' BOXES	$1,620	$1,069,200
Grovers Ave. to Villa Rita Dr.	1,560	283	8'x4' BOX	$432	$673,920	527	2-7'x4' BOXES	$792	$1,235,520	619	2-8'x4' BOXES	$864	$1,347,840
Villa Rita Dr. to Detention Basin #2	400	283	5'x4' BOX	$342	$136,800	527	7'x4' BOX	$396	$158,400	619	8'x4' BOX	$432	$172,800
Detention Basin #2	10.0ac		R/W	$40,000	$400,000		R/W	$40,000	$400,000		R/W	$40,000	$400,000
			Constr.		$364,000		Constr.		$422,000		Constr.		$459,800
Detention Basin #2 to Morrow Dr.	1,000	656	Modify Ex Channel	$80	$80,000	1,131	Modify Ex Channel	$98	$98,000	1,365	Modify Ex Channel	$150	$150,000
	1.38ac		R/W	$40,000	$55,200		R/W	$40,000	$55,200		R/W	$40,000	$55,200
Morrow Dr. to Utopia Rd.	1,650	208	Use Exist Channel	$0	$0	379	Use Exist Channel	$0	$0	463	Use Exist Channel	$0	$0
	1.14ac		R/W	$40,000	$45,600		R/W	$40,000	$45,600		R/W	$40,000	$45,600
SUBTOTAL					$5,241,160				$7,964,120				$8,458,040

NBS//LOWRY

TABLE 6.3

COST COMPARISON TABLE - 9TH STREET

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
CAMPO BELLO-GROVERS AVE. LATERAL													
Detention Basin #5 to 14th St.	1,320	529	Concrete Channel	$100	$132,000	895	Concrete Channel	$110	$145,200	1,064	Concrete Channel	$120	$158,400
14th St. to Grovers Ave.	1,320	406	2-5'x4' BOXES	$648	$855,360	646	2-7'x4' BOXES	$792	$1,045,440	760	2-8'x4' BOXES	$864	$1,140,480
Grovers Ave. to 16th St.	1,320	358	8'x4' BOX	$432	$570,240	572	11'x4' BOX	$540	$712,800	671	2-7'x4' BOXES	$792	$1,045,440
	3.03ac		R/W	$40,000	$121,200		R/W	$40,000	$121,200		R/W	$40,000	$121,200
SUBTOTAL					$1,678,800				$2,024,640				$2,465,520

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
MORROW DRIVE LATERAL													
9th St. to 12th St.	1,700	341	8'x4' BOX	$432	$734,400	536	12'x4' BOX	$576	$979,200	677	2-8'x4' BOXES	$864	$1,468,800
12th St. to 16th St.	2,670	248	5'x4' BOX	$324	$865,080	407	8'x4' BOX	$432	$1,153,440	481	2-5'x4' BOX	$648	$1,730,160
	0.21ac		R/W	$40,000	$8,400		R/W	$40,000	$8,400		R/W	$40,000	$8,400
SUBTOTAL					$1,607,880				$2,141,040				$3,207,360

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
BELL ROAD LATERAL I													
9th St. to 13th St.	2,000	148	54" RCP	$216	$432,000	263	66" RCP	$264	$528,000	313	72" RCP	$288	$576,000
13th St. to 16th St.	1,870	148	54" RCP	$216	$403,920	263	66" RCP	$264	$493,680	313	66" RCP	$264	$493,680
SUBTOTAL					$835,920				$1,021,680				$1,069,680
TOTAL FOR 9TH ST.					$9,363,760				$13,151,480				$15,200,600

NBS/LOWRY

TABLE 6.3 (Cont.)

COST COMPARISON TABLE - EAST FORK CAVE CREEK

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
EAST FORK CAVE CREEK													
East Fork Cave Creek Multi-Use Channel			Multi-Use Channel		$24,225,309		Multi-Use Channel		$24,225,309		Multi-Use Channel		$24,225,309
BELL ROAD LATERAL II													
East Fork Cave Creek to 22nd St.	1,120	342	12'x4' BOX	$576	$645,120	577	2-11'x4' BOXES	$1,080	$1,209,600	680	3-8'x4' BOXES	$1,296	$1,451,520
22nd St. to Cave Creek Rd.	1,300	322	8'x4' BOX	$432	$561,600	470	2-6'x4' BOXES	$720	$936,000	510	2-6'x4' BOXES	$720	$936,000
Cave Creek Rd. to 24th St.	1,340	231	6'x4' BOX	$360	$482,400	303	8'x4' BOX	$432	$578,880	360	2-5'x4' BOXES	$648	$868,320
24th St. to 28th St.	1,320	153	4'x4' BOX	$288	$380,160	254	6'x4' BOX	$360	$475,200	301	7'x4' BOX	$396	$522,720
SUBTOTAL					$2,069,280				$3,199,680				$3,778,560
20TH STREET LATERAL													
East Fork Cave Creek to Grovers Ave.	900	85	48" RCP	$196	$176,400	141	60" RCP	$240	$216,000	167	60" RCP	$240	$561,600
Grovers Ave. to Union Hills Dr.	2,600	85	42" RCP	$174	$452,400	141	48" RCP	$196	$509,600	167	54" RCP	$216	$216,000
SUBTOTAL					$452,400				$509,600				$777,600

NBS/LOWRY

TABLE 6.4

COST COMPARISON TABLE - EAST FORK CAVE CREEK

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
GROVERS AVENUE LATERAL													
Detention Basin #3 to 26th St.	1,450	219	72" RCP	$288	$417,600	399	90" RCP	$360	$522,000	483	77"x121" Ell. RCP	$400	$580,000
26th St. to 29th St.	2,000	133	60" RCP	$240	$480,000	234	78" RCP	$312	$624,000	282	63"x98" Ell. RCP	$340	$680,000
SUBTOTAL					$897,600				$1,146,000				$1,260,000
UTOPIA ROAD LATERAL													
East Fork Cave Creek to 30th St.	1,920	225	6'x4' BOX	$360	$691,200	433	11'x4' BOX	$540	$1,036,800	532	12'x4' BOX	$576	$1,105,920
30th St. to 32nd St.	1,450	184	5'x4' BOX	$324	$469,800	351	8'x4' BOX	$432	$626,400	431	11'x4' BOXES	$540	$783,000
SUBTOTAL					$1,161,000				$1,663,200				$1,888,920
TOTAL FOR EAST FORK					$28,805,589				$30,743,789				$31,930,389

NBS/LOWRY

TABLE 6.4 (Cont.)

COST COMPARISON TABLE - EAST AREA

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
EAST AREA =========													
Detention Basin #6	20.5ac		R/W		$820,000		R/W		$1,600,000		R/W		$2,740,000
			Constr.		$475,000		Constr.		$884,000		Constr.		$942,590
Detention Basin #6 to 29th St.	1,750	673	Concrete Channel	$100	$175,000	1,144	Concrete Channel	$110	$192,500	1,374	Concrete Channel	$120	$210,000
	2.41ac		R/W		$800,000				$800,000				$800,000
29th St. to Phelps Rd.	1,700	373	12'x4' BOX	$576	$979,200	626	2-11'x4' BOXES	$1,080	$1,836,000	749	2-12'x4' BOXES	$1,152	$1,958,400
Phelps Rd. to Bell Rd.	750	373	8'x4' BOX	$432	$324,000	626	2-7'x4' BOXES	$792	$594,000	749	2-8'x4' BOXES	$864	$648,000
Bell Rd. to 32nd. St.	2,000	309	8'x4' BOX	$432	$864,000	519	12'x4' BOX	$576	$1,152,000	620	2-8'x4' BOXES	$864	$1,728,000
32nd. St. to Grovers Ave.	2,400	128	54" RCP	$216	$518,400	219	66" RCP	$264	$633,600	265	72" RCP	$288	$691,200
Grovers Ave. to Detention Basin #4	260	128	42" RCP	$174	$45,240	219	54" RCP	$216	$56,160	265	54" RCP	$216	$56,160
Detention Basin #4	13.7ac		R/W	$40,000	$548,000		R/W	$40,000	$548,000		R/W	$40,000	$548,000
			Constr.		$460,000		Constr.		$550,000		Constr.		$629,926
Detention Basin #4 to Culvert Outlet	1,550	140	Modify Ex Channel	$50	$77,500	272	Modify Ex Channel	$60	$93,000	336	Modify Ex Channel	$70	$108,500
Culvert under Union Hills Drive	770	100	7'x4' BOX	$396	$304,920	196	11'x4' BOX	$540	$415,800	243	12'x4' BOX	$576	$443,520
SUBTOTAL					$6,391,260				$9,355,060				$11,504,296

NBS/LOWRY

TABLE 6.5

COST COMPARISON TABLE - EAST AREA

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
PARADISE LANE LATERAL													
29th St. to 33rd St.	2,460	183	7'x4' BOX	$396	$974,160	316	11'x4' BOX	$540	$1,328,400	378	12'x4' BOX	$576	$1,416,960
SUBTOTAL					$974,160				$1,328,400				$1,416,960

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
BELL ROAD LATERAL III													
32nd St. to 36th St.	2,000	95	54" RCP	$216	$432,000	158	60" RCP	$240	$480,000	187	66" RCP	$264	$528,000
SUBTOTAL					$432,000				$480,000				$528,000

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
GOLF COURSE LATERAL													
Detention Basin to 38th St.	2,200	175	Earth Channel	$50	$110,000	364	Earth Channel	$50	$110,000	450	Earth Channel	$50	$110,000
38th St. to 39th St.	660	135	"	$40	$26,400	280	"	$40	$26,400	361	"	$40	$26,400
	5.05ac		R/W	$40,000	$202,000		R/W	$40,000	$202,000		R/W	$40,000	$202,000
SUBTOTAL					$338,400				$338,400				$338,400
TOTAL FOR EAST AREA					$8,135,820				$11,501,860				$13,787,656

NBS/LOWRY

TABLE 6.5 (Cont.)

COST COMPARISON TABLE - GREENWAY CHANNEL EXT.

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
GREENWAY CHANNEL EXT.													
Detention Basin #6 to 27th St.	1,430	387	12'x4' BOX	$576	$823,680	653	2-11'x4' BOXES	$1,080	$1,544,400	771	2-12'x4' BOXES	$1,152	$1,647,360
27th St. to 29th St.	1,800	257	11'x4' BOX	$540	$972,000	428	2-11'x4'	$1,080	$1,944,000	508	2-11'x4' BOXES	$1,080	$1,944,000
TOTAL GRNWY CHNL. EXT.					$1,795,680				$3,488,400				$3,591,360

NBS/LOWRY

TABLE 6.6

COST COMPARISON TABLE - SOUTH AREA

DESCRIPTION	LENGTH (ft)	10 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	50 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)	100 YEAR FLOOD Q (cfs)	STRUCTURE	COST UNIT ($)	TOTAL ($)
SOUTH AREA ==========													
Greenway Channel to Waltann Lane	1,250	1,004	Modify Ex Channel	$120	$150,000	1,655	Modify Ex Channel	$120	$150,000	1,953	Modify Ex Channel	$120	$150,000
Waltann Lane to Greenway Rd.	1,220	1,004	2-8'x6' BOXES	$1,080	$1,317,600	1,655	2-10'x7' BOXES	$1,344	$1,639,680	1,953	2-10'x8' BOXES	$1,460	$1,781,200
Greenway Rd. to 21st Way	1,500	784	11'x6' BOX	$648	$972,000	1,277	2-9'x6' BOXES	$1,152	$1,728,000	1,503	2-10'x6' BOXES	$1,224	$1,836,000
21st Wy. to 21st Pl.	1,420	614	8'x6' BOX	$540	$766,800	1,000	11'x6' BOX	$648	$920,160	1,173	12'x6' BOX	$684	$971,280
	1.72ac		R/W	$40,000	$68,800		R/W	$40,000	$68,800		R/W	$40,000	$68,800
TOTAL FOR SOUTH AREA					$3,275,200				$4,506,640				$4,807,280
**** GRAND TOTAL ****					$54,379,569				$68,109,869				$74,306,945

NBS/LOWRY

TABLE 6.7

7. The total cost of all of the recommended facilities for a 100-year design frequency is $74,000,000.

8. Of the recommended facilities, the following projects have been identified as having the highest priority:

A new "multi-use" Upper East Fork Cave Creek Channel	($24,200,000)
9th Street Drainage System	($ 8,500,000)
Bell Road Laterals.	($ 7,100,000)

RECOMMENDATIONS

The following recommendations are made:

1. It is recommended that right-of-way acquisition for recommended detention basin locations, and for the Upper East Fork Cave Creek Channel begin immediately while land for these improvements is still available and affordable.

2. It is recommended that construction of the proposed Bell Road Laterals be incorporated in the design of roadway improvements for Bell Road.

3. It is recommended that conversations between the Flood Control District of Maricopa County and the County and City Parks Departments continue with the objective of developing a joint use concept for the Upper East Fork Cave Creek channel that is attractive to all end users.

4. It is recommended that negotiations begin with ADOT to provide for joint funding and construction of detention facilities recommended north of Beardsley Road.

5. It is recommended that capital improvement plans for drainage improvements be developed using Tables 6.1 through 6.7 as a guide.