TECHNICAL DATA NOTEBOOK

Volume I of III
Appendices A-D

CAREFREE DRAINAGE MASTER PLAN FLOODPLAIN DELINEATION STUDY

Carefree, Arizona

Prepared for
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

CONTRACT NO: FCD 2000C037

in Cooperation with
Town of Carefree
100 Easy Street
Carefree, AZ 85377

Prepared by
CH2MHILL
2625 South Plaza Drive, Suite 300
Tempe, Arizona 85282-3397

September 2003

W042003002PHX_02

Federal Emergency Management Agency

APR 18 2005

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 04-09-1301P

The Honorable Edward C. Morgan
Mayor, Town of Carefree
P.O. Box 740
Carefree, AZ 85377

Community: Town of Carefree, AZ
Community No.: 040126
FIRM Panel Affected: 04013C0808 H, 0809 H
0815 H, and 0820 F

116

Dear Mayor Morgan:

In a Letter of Map Revision (LOMR) dated November 24, 2004, you were notified of proposed modified flood elevation determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for the Town of Carefree, Arizona. These determinations were for Tributary to Galloway Wash Middle Branch, Eastern Pima Wash, Unnamed Central Tributary to Cave Creek, Unnamed Tributary to Stagecoach Pass Wash, Windmill Wash, Windmill Wash North Branch and Windmill Wash South Branch. The 90-day appeal period that was initiated on December 30, 2004, when the Department of Homeland Security's Federal Emergency Management Agency (FEMA) published a notice of proposed Base Flood Elevations (BFEs) in the *Arizona Business Gazette*, has elapsed.

FEMA received no valid requests for changes to the modified BFEs. Therefore, the modified BFEs that became effective on November 24, 2004, remain valid and revise the FIRM and FIS report that were in effect prior to that date.

The modifications are pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. The community numbers and suffix codes are unaffected by this revision. The community number and appropriate suffix code as shown above will be used by the National Flood Insurance Program (NFIP) for all flood insurance policies and renewals issued for your community.

FEMA has developed criteria for floodplain management as required under the above-mentioned Acts of 1968 and 1973. To continue participation in the NFIP, your community must use the modified BFEs to carry out the floodplain management regulations for the NFIP. The modified BFEs will also be used to calculate the appropriate flood insurance premium rates for all new buildings and their contents and for the second layer of insurance on existing buildings and their contents.

If you have any questions regarding the necessary floodplain management measures for your community or the NFIP in general, please call the Director, Federal Insurance and Mitigation Division of FEMA in Oakland, California at (510) 627-7103. If you have any questions regarding the LOMR, the proposed modified BFEs, or mapping issues in general, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

cc: The Honorable Mary Manross
Mayor, City of Scottsdale

Mr. Michael Duncan, P.E., CFM
Floodplain Delineation Branch
Flood Control District of Maricopa County

Mr. Ted Collins
Principal
Floodplain Administration
Food Control District of Maricopa County

Mr. Jonathan H. Pearson
Floodplain Administrator
Town of Carefree

Mr. William Erickson
Floodplain Administrator
Storm Water Division
Transportation Systems Department
City of Scottsdale

Mr. Brian Cosson, CFM
NFIP Coordinator
Arizona Department of Water Resources

Federal Emergency Management Agency

Washington, D.C. 20472

NOV 24 2004

FLOOD CONTROL DISTRICT
RECEIVED
NOV 30 '04

CH & GM	FINANCE
PIO	LANDS
ADMIN	O & M
REG	P & PM
ENG	FILE
CONTRACTS	
ROUTING	

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IN REPLY REFER TO:
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The Honorable Mary Manross
Mayor, City of Scottsdale
3939 North Drinkwater Boulevard
Scottsdale, AZ 85251

Community: City of Scottsdale, AZ
Community No.: 045012
Panels Affected: 04013C0808 H, 0809 H, 0815 H, 0820 F, and 0850 E

Effective Date of This Revision: NOV 24 2004

102-I-A-C

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

Dear Mayor Manross:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated June 23, 2004, Mr. Richard P. Harris, P.E., CFM, Senior Civil Engineer, Flood Delineation Branch, Flood Control District of Maricopa County, requested that FEMA revise the FIRM and FIS report to show the effects of new hydrologic and hydraulic analyses, new topographic data, and a new floodplain delineation for Galloway Wash Middle Branch, Eastern Pima Wash, Unnamed Central Tributary to Cave Creek, Unnamed Tributary to Stagecoach Pass Wash, Windmill Wash, Windmill Wash North Branch, and Windmill Wash South Branch.

On the effective FIRM, the Special Flood Hazard Areas (SFHAs), the areas that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), along Eastern Pima Wash, Unnamed Central Tributary to Cave Creek, Unnamed Tributary to Stagecoach Pass Wash, Windmill Wash, Windmill Wash North Branch, and Windmill Wash South Branch were previously designated Zone X (shaded), areas of moderate flood hazard subject to inundation by the base flood with average depths of less than 1 foot.

All data required to complete our review of this request were submitted with letters from Mr. Harris.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and in the effective FIS report. We have revised the FIRM and FIS report to modify the elevations, floodplain and floodway boundary delineations, and zone designations of the base flood along Galloway Wash Middle Branch from approximately 200 feet upstream to approximately 1,000 feet upstream of Paint Pony Drive. We also have revised the FIRM and FIS report to modify the zone designations and to establish Base Flood Elevations (BFEs) and base floodplain boundary delineations along Eastern Pima Wash from just upstream of Stagecoach Pass to approximately 600 feet upstream of Twilight Trail, along Unnamed Central Tributary to Cave Creek from just upstream of Terravita Sunset Trail to just upstream of Carefree Highway and a portion 100 feet downstream of Scottsdale Road, and along Unnamed Tributary to Stagecoach Pass Wash from the confluence with Stagecoach Pass Wash to approximately 300 feet upstream of Wild Flower Road. The base flood is contained along Unnamed Tributary to Stagecoach Pass Wash from approximately 300 feet upstream of Wild Flower Road to approximately 400 feet upstream of Romping Road; along Windmill Wash from just upstream of Pima Road to the confluence of Windmill Wash North Branch; along Windmill Wash North Branch from the confluence with Windmill Wash to approximately 1,900 feet upstream of Milky Way; and along Windmill Wash South Branch from the

confluence with Windmill Wash to approximately 1,500 feet upstream of Milky Way. BFEs and SFHAs designated Zone AE were added to the FIRM for the reaches described above. The modifications are shown on the enclosed annotated copies of FIRM Panels 04013C0808 H, 04013C0809 H, 04013C0815 H, 04013C0820 F, and 04013C0850 E; Profile Panels 148P through 152P; and affected portions of the Summary of Discharges Table and Floodway Data Table. In addition, Profile Panels 152P(a) and 1268P through 1279P were added to the FIS report. This LOMR hereby revises the above-referenced panels of the effective FIRM and the affected portions of the FIS report, all dated July 19, 2001.

Because this revision request also affects the Town of Carefree, a separate LOMR for that community was issued on the same date as this LOMR.

The modifications are effective as of the date shown above. The map panels as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Galloway Wash Middle Branch:		
Approximately 600 feet upstream of Paint Pony Drive	2,612	2,609
Approximately 800 feet upstream of Paint Pony Drive	2,616	2,615
Eastern Pima Wash:		
Just upstream of Stagecoach Pass	None	2,561
Approximately 600 feet upstream of Twilight Trail	None	2,462
Unnamed Central Tributary to Cave Creek:		
Just upstream of Terravita Sunset Trail	None	2,142
Just downstream of Carefree Highway	None	2,239
Unnamed Tributary to Stagecoach Pass Wash:		
Approximately 100 feet upstream of confluence with Stagecoach Pass Wash	None	2,617
Approximately 250 feet upstream of Wild Flower Road	None	2,683
Windmill Wash:		
Just upstream of Pima Road	None	2,570
At confluence of Windmill Wash North Branch	None	2,597
Windmill Wash North Branch:		
At confluence with Windmill Wash	None	2,597
Approximately 1,200 feet upstream of Milky Way	None	2,634
Windmill Wash South Branch:		
At the confluence with Windmill Wash	None	2,597
Approximately 1,500 feet upstream of Milky Way	None	2,645

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

Public notification of the proposed modified BFEs will be given in the *Arizona Business Gazette* on or about December 23 and December 30, 2004. A copy of this notification is enclosed. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in the *Arizona Business Gazette*, any interested party may request that FEMA reconsider the determination made by this LOMR. Any request for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs made by this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

We are processing a revised FIRM and FIS report for Maricopa County; therefore, we will not physically revise and republish the FIRM and FIS report for your community to incorporate the modifications made by this LOMR at this time. Preliminary copies of the revised countywide FIRM and FIS report were submitted to your community for review on June 17, 2004. We will incorporate the modifications made by this LOMR into the revised FIRM and FIS report before they become effective.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

A Consultation Coordination Officer (CCO) has been designated to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Federal Insurance and Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7103

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please call the CCO for your community at the telephone number cited above. If you have any questions regarding this LOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., CFM, Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

Enclosures

cc: The Honorable Edward C. Morgan
Mayor, Town of Carefree

Mr. ~~Michael Duncan~~ RICHARD HARRIS, P.E., CFM
Floodplain Delineation Branch
Flood Control District of Maricopa County

Mr. William Erickson
Floodplain Administrator
Storm Water Division
Transportation Systems Department
City of Scottsdale

Mr. Ted Collins
Principal
Floodplain Administration
Flood Control District of Maricopa County

Mr. Jonathan H. Pearson
Floodplain Administrator
Town of Carefree

Mr. Brian Cosson
NFIP Coordinator
Arizona Department of Water Resources

CHANGES ARE MADE IN DETERMINATIONS OF BASE FLOOD ELEVATIONS FOR THE TOWN OF CAREFREE AND THE CITY OF SCOTTSDALE, MARICOPA COUNTY, ARIZONA, UNDER THE NATIONAL FLOOD INSURANCE PROGRAM

On July 19, 2001, the Federal Emergency Management Agency identified Special Flood Hazard Areas (SFHAs) in the Town of Carefree and the City of Scottsdale, Maricopa County, Arizona, through issuance of a Flood Insurance Rate Map (FIRM). The Mitigation Division has determined that modification of the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for certain locations in these communities is appropriate. The modified Base Flood Elevations (BFEs) revise the FIRM for the communities.

The changes are being made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65.

A new hydraulic analysis was performed to incorporate the effects of a new hydrologic analysis and new topographic data. This has resulted in a revised delineation of the regulatory floodway, increases and decreases in SFHA width, and increased and decreased BFEs for Galloway Wash Middle Branch and the establishment of BFEs and SFHAs for Tributary to Galloway Wash Middle Branch, Eastern Pima Wash, Unnamed Central Tributary to Cave Creek, Unnamed Tributary to Stagecoach Pass Wash, Windmill Wash, Windmill Wash North Branch and Windmill Wash South Branch. The table below indicates existing and modified BFEs for selected locations along the affected lengths of the flooding source(s) cited above.

Location	Existing BFE (feet)*	Modified BFE (feet)*
Galloway Wash Middle Branch:		
[1]Approximately 700 feet upstream of confluence with Galloway Wash	2,414	2,415
[1]Just upstream of Paint Pony Drive	2,591	2,590
[2]Approximately 600 feet upstream of Paint Pony Drive	2,612	2,609
[2]Approximately 800 feet upstream of Paint Pony Drive	2,616	2,615
[1]Tributary to Galloway Wash Middle Branch:		
At confluence with Galloway Wash Middle Branch	None	2,440
Approximately 750 feet upstream of Paint Pony Drive	None	2,462
[2]Eastern Pima Wash:		
Just upstream of Stagecoach Pass	None	2,561
Approximately 600 feet upstream of Twilight Trail	None	2,462
Unnamed Central Tributary to Cave Creek:		
[2]Just upstream of Terravita Sunset Trail	None	2,142
[2]Just downstream of Carefree Highway	None	2,239
[1]Just upstream of Carefree Highway	None	2,240
[1]Just upstream of Scottsdale Road	None	2,267

[2]Unnamed Tributary to Stagecoach Pass Wash:				
Approximately 100 feet upstream of confluence with Stagecoach Pass Wash	None		2,617	
Approximately 250 feet upstream of Wild Flower Road		None		2,683
Windmill Wash:				
[1]Just upstream of Stagecoach Pass	None		2,488	
[1]Just downstream of Pima Road	None		2,565	
[2]Just upstream of Pima Road	None		2,570	
[2]At confluence of Windmill Wash North Branch	None		2,597	
[2]Windmill Wash North Branch:				
At confluence with Windmill Wash	None		2,597	
Approximately 1,200 feet upstream of Milky Way	None		2,634	
[2]Windmill Wash South Branch:				
At confluence with Windmill Wash	None		2,597	
Approximately 1,500 feet upstream of Milky Way	None		2,645	

*National Geodetic Vertical Datum, rounded to nearest whole foot
[1]Town of Carefree
[2]City of Scottsdale

Under the above-mentioned Acts of 1968 and 1973, the Mitigation Division must develop criteria for floodplain management. To participate in the National Flood Insurance Program (NFIP), the community must use the modified BFEs to administer the floodplain management measures of the NFIP. These modified BFEs will also be used to calculate the appropriate flood insurance premium rates for new buildings and their contents and for the second layer of insurance on existing buildings and contents.

Upon the second publication of notice of these changes in this newspaper, any person has 90 days in which he or she can request, through the Chief Executive Officer of the community, that the Mitigation Division reconsider the determination. Any request for reconsideration must be based on knowledge of changed conditions or new scientific or technical data. All interested parties are on notice that until the 90-day period elapses, the Mitigation Division's determination to modify the BFEs may itself be changed.

Any person having knowledge or wishing to comment on these changes should immediately notify:

The Honorable Edward C. Morgan
Mayor, Town of Carefree
P.O. Box 740
Carefree, AZ 85377

OR

The Honorable Mary Manross
Mayor, City of Scottsdale
3939 North Drinkwater Boulevard
Scottsdale, AZ 85251

Federal Emergency Management Agency

Washington, D.C. 20472

NOV 24 2004

FLOOD CONTROL DISTRICT
RECEIVED
NOV 30 '04
CH & GM | FINANCE
PIO | LANDS
ADMIN | O & M
REG | P & PM
ENG | FILE
CONTRACTS
ROUTING

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

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Panels Affected: 04013C0808 H, 0809 H, 0815 H, and 0820 F
Effective Date of This Revision: **NOV 24 2004**

102-I-A-C

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[2]Windmill Wash North Branch:				
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Carefree, AZ 85377

OR

The Honorable Mary Manross
Mayor, City of Scottsdale
3939 North Drinkwater Boulevard
Scottsdale, AZ 85251

REVISED TO REFLECT LOMR DATED NOV 24 2004

APPROXIMATE SCALE IN FEET

500 250 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 808 OF 4350

(SEE MAP INDEX FOR PANELS NOT PRINTED)

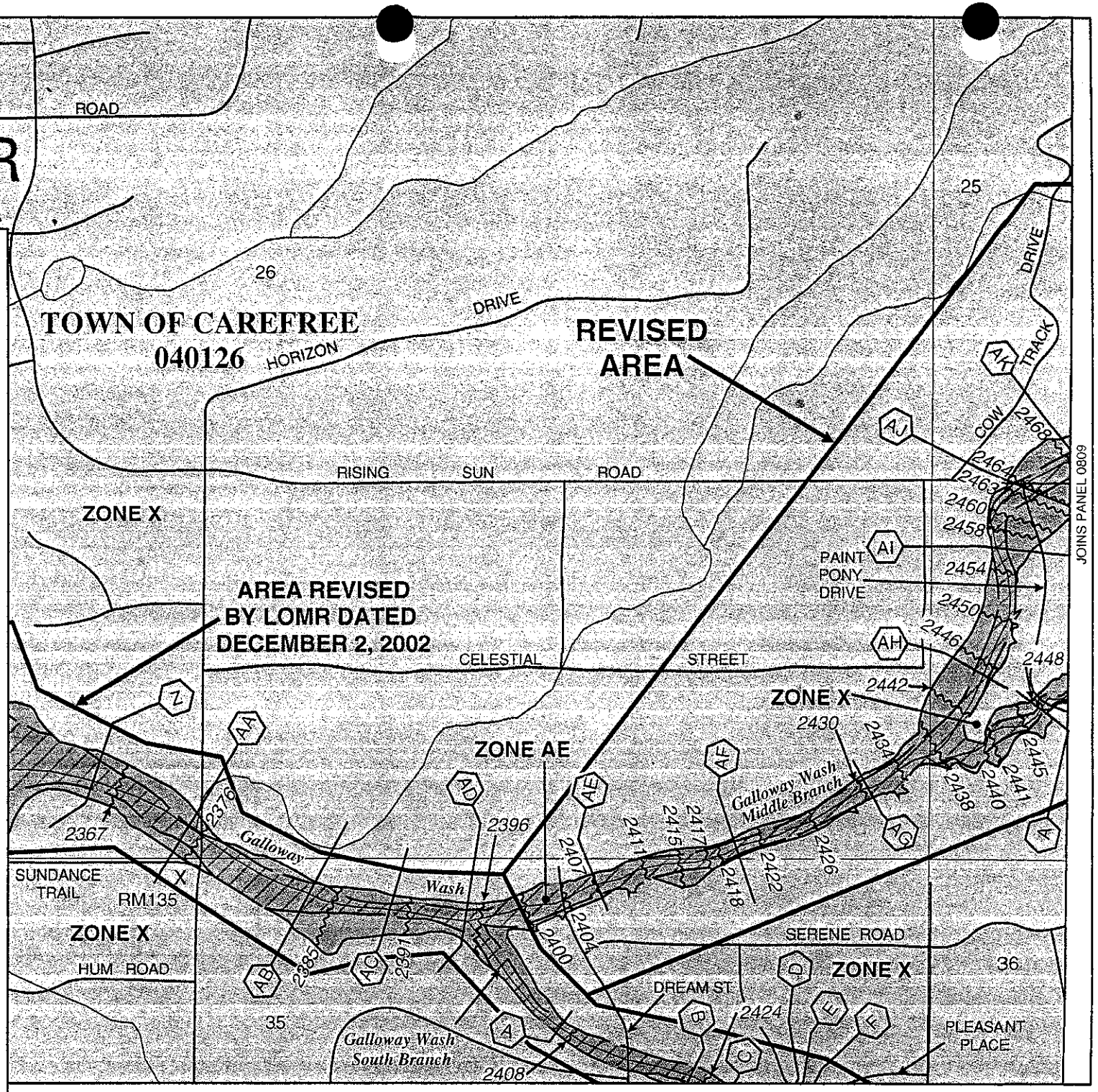
CONTAINS:

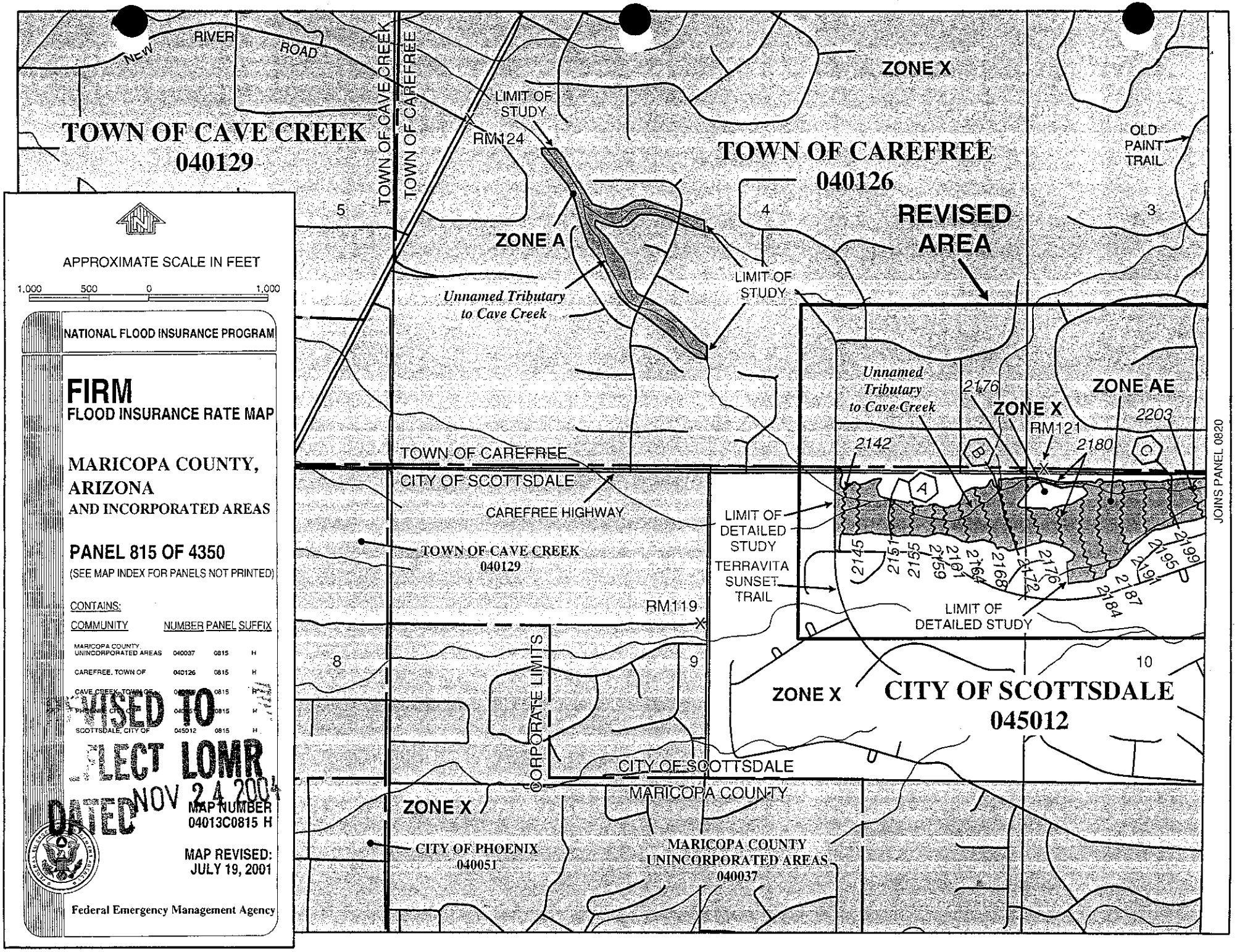
COMMUNITY	NUMBER	PANEL	SUFFIX
CAREFREE, TOWN OF	040126	0808	H
CAVE CREEK, TOWN OF	040129	0808	H
SCOTTSDALE, CITY OF	045012	0808	H

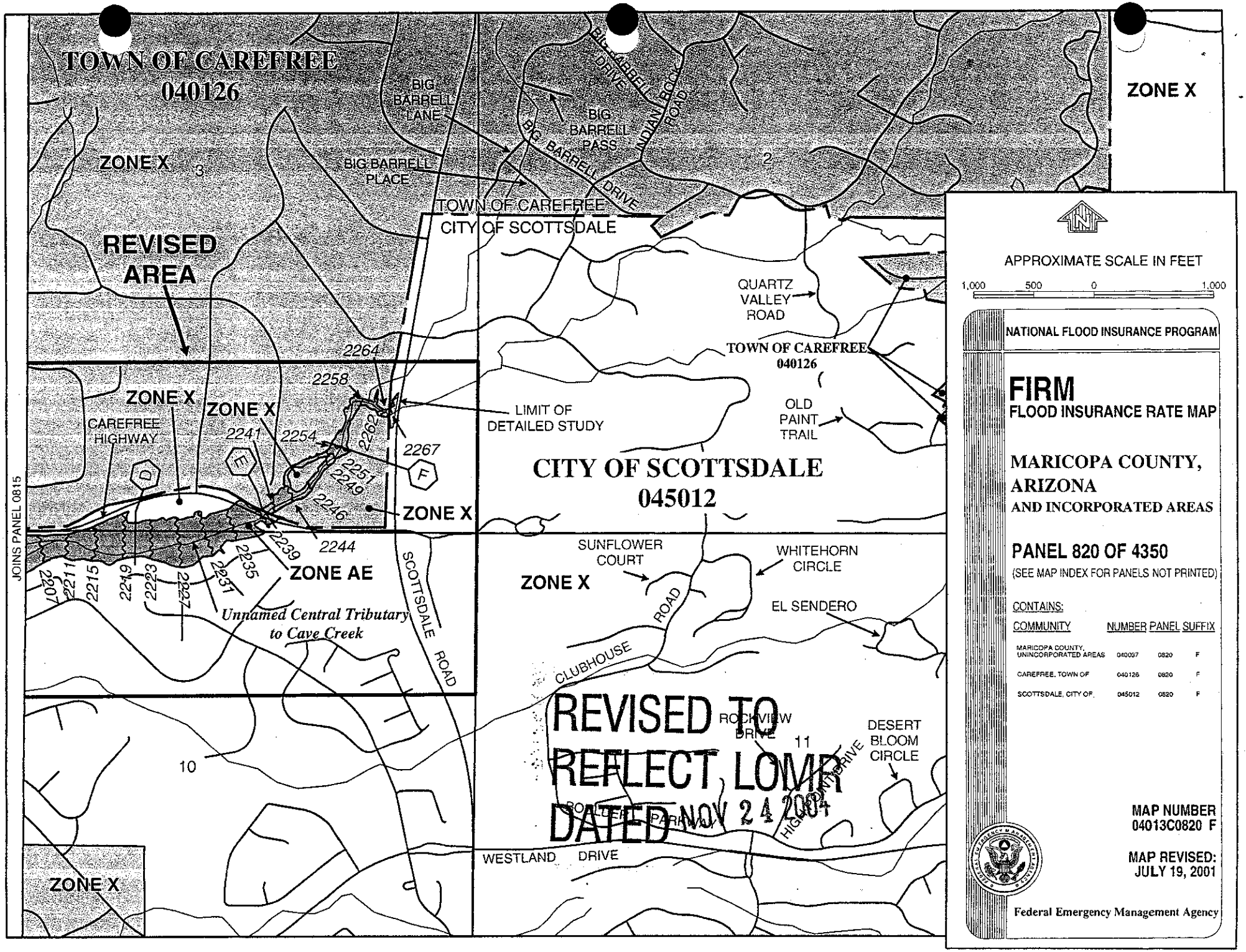
MAP NUMBER
04013C0808 H

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency




APPROXIMATE SCALE IN FEET
1,000 500 0 1,000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
PANEL 815 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
MARICOPA COUNTY UNINCORPORATED AREAS 040037 0815 H
CAREFREE, TOWN OF 040126 0815 H
SCOTTSDALE, CITY OF 045012 0815 H
REVISED TO REFLECT LOMR DATED NOV 24 2004
MAP NUMBER 04013C0815 H
MAP REVISED: JULY 19, 2001
Federal Emergency Management Agency
TOWN OF CAVE CREEK
040129
TOWN OF CAVE CREEK
TOWN OF CAREFREE
NEW RIVER ROAD
LIMIT OF STUDY
RM124
ZONE A
Unnamed Tributary to Cave Creek
ZONE X
TOWN OF CAREFREE
040126
REVISED AREA
OLD PAINT TRAIL
LIMIT OF STUDY
Unnamed Tributary to Cave Creek
ZONE X
ZONE AE
RM121
2176
2203
2142
2180
TOWN OF CAREFREE
CITY OF SCOTTSDALE
CAREFREE HIGHWAY
LIMIT OF DETAILED STUDY
TERRAVITA SUNSET TRAIL
TOWN OF CAVE CREEK
040129
RM119
LIMIT OF DETAILED STUDY
JOINS PANEL 0820
CORPORATE LIMITS
ZONE X
CITY OF SCOTTSDALE
045012
CITY OF SCOTTSDALE
MARICOPA COUNTY
ZONE X
CITY OF PHOENIX
040051
MARICOPA COUNTY UNINCORPORATED AREAS
040037



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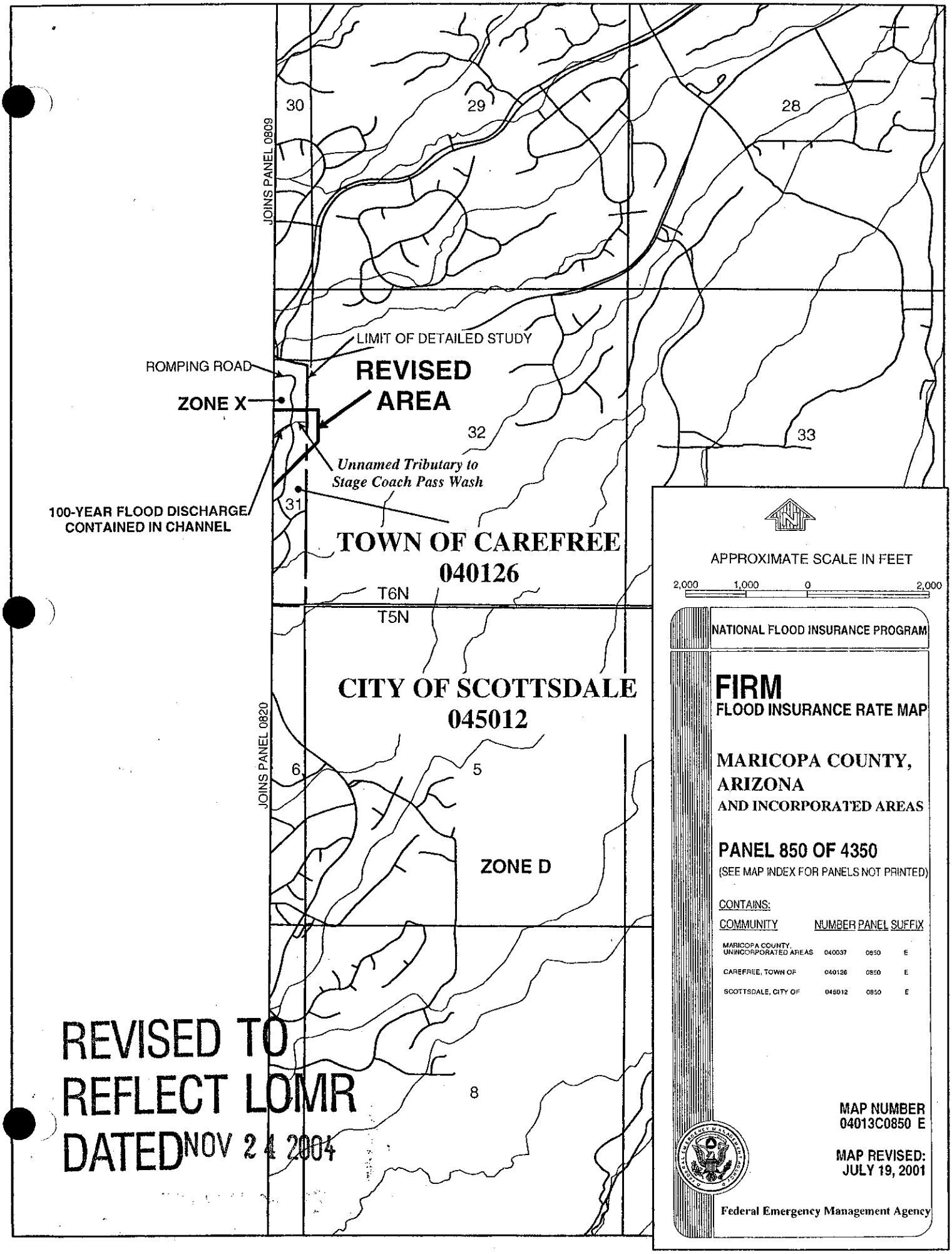

REVISED TO
REFLECT LOMR
DATED NOV 24 2004

Table 3. Summ[illegible]f Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Trilby Wash-CAP to McMicken Dam					
At McMicken Dam	113.00	4,773	8,999	11,688	--[1]
At 195th Avenue (Extended)	112.40[2]	4,730	8,920	11,625	
650 feet upstream of 293rd Avenue (Extended)	111.77[2]	4,690	8,845	11,560	--[1]
500 feet downstream of Deer Valle Road (Extended)	103.94[2]	4,646	8,769	11,499	--[1]
150 feet downstream of Deer Valley Road (Extended)	67.16	3,065	5,750	7,430	--[1]
200 feet upstream of Deer Valley Road (Extended)	27.84	1,488	2,728	3,430	--[1]
1,000 feet upstream of Deer Vall Road (Extended)	--[1]	1,525[3]	2,775[3]	3,420[3]	--[1]
1,050 feet downstream of Pinnacle Peak Road (Extended)	--[1]	1,560[3]	2,825[3]	3,480[3]	--[1]
400 feet upstream of Pinnacle Peak Road (Extended)	--[1]	1,595[3]	2,875[3]	3,480[3]	--[1]
1,350 feet downstream of Happy Valley Road (Extended)	--[1]	1,665[3]	2,975[3]	3,660[3]	--[1]
200 feet downstream of Happy Valley Road (Extended)	--[1]	1,700[3]	3,025[3]	3,720[3]	--[1]
1,350 feet downstream of CAP Canal	--[1]	1,735[3]	3,075[3]	3,780[3]	--[1]
At CAP Canal	--[1]	1,775[3]	3,125[3]	3,845[3]	--[1]
Galloway Wash (Middle Branch)					
At confluence with Galloway Wash	3.32	N/A	N/A	2,423	N/A
At Pima Road	2.8	N/A	N/A	1,574	N/A
Tributary to Galloway Wash (Middle Branch)					
At approximately 390 feet upstream of confluence with Galloway Wash (Middle Branch)	0.18	N/A	N/A	247	--[1]
Galloway Wash (Lower Branch)					
Upstream of confluence with Middle Branch	1.8	N/A	N/A	1,750	N/A
At 800 feet downstream of Pima Road	1.4	N/A	N/A	1,446	N/A
At Pima Road	1.0	N/A	N/A	1,155	N/A

REVISED DATA

[1]Not Computed
[2]Computed by Specific Discharge Transfer Equation
[3]Decrease Due to Storage Behind CAP Canal and Storage in Overbanks

THESE DATA WERE REVISED BY LOMR DATED DECEMBER 5, 2002

REVISED TO REFLECT LOMR DATED NOV 24 2004

Table 3. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Pack Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Eastern Pema Wash At Approximately 40 feet upstream of Stage Coach Pass	0.13	---[1]	---[1]	323	---[1]
Unnamed Tributary to Stagecoach Pass Wash At Confluence with Stagecoach Pass Wash	0.12	---[1]	---[1]	225	---[1]
Unnamed Central Tributary to Cave Creek At Approximately 300 feet upstream of Terravita Sunset Trail	2.44	---[1]	---[1]	2,849	---[1]
Windmill Wash At Approximately 400 feet upstream of Stage Coach Pass	0.04	---[1]	---[1]	338	---[1]
Windmill Wash North Branch At Approximately 6,500 feet upstream of Stage Coach Pass	0.08	---[1]	---[1]	131	---[1]
Windmill Wash South Branch At Approximately 200 feet upstream of confluence with Windmill Wash	0.08	---[1]	---[1]	131	---[1]

[1] Data not Available

REVISED TO
REFLECT LOMR
DATED NOV 24 2004

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Tributary to Galloway Wash Middle Branch								
A	708	21	34	7.2	2,447.7	2,447.7	2,447.9	0.1
B	1,285	56	48	4.7	2,459.0	2,459.0	2,459.3	0.3

REVISED TO REFLECT LOMR DATED NOV 24 2004

1Feet above confluence with Galloway Wash Middle Branch

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

TRIBUTARY TO GALLOWAY WASH MIDDLE BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Galloway Wash (Cont'd)					DATA WERE REVISED BY LOMR DATED DECEMBER 5, 2002			
S	10,607	514	1,026	5.9	2,252.9	2,252.9	2,252.9	0.0
T	11,442	179	1,047	9.3	2,272.3	2,272.3	2,272.3	0.0
U	11,855	148	437	10.1	2,280.6	2,280.6	2,280.6	0.0
V	12,403	95	327	10.5	2,292.4	2,292.4	2,292.4	0.0
W	13,002	129	427	9.5	2,306.5	2,306.5	2,306.5	0.0
X	14,805	98	315	10.2	2,345.3	2,345.3	2,345.3	0.0
Y	15,272	265	509	6.8	2,359.4	2,359.4	2,359.4	0.0
Z	15,607	144	366	9.4	2,366.3	2,366.3	2,366.3	0.0
AA	16,002	90	323	10.7	2,375.2	2,375.2	2,375.2	0.0
AB	16,402	160	389	8.8	2,382.4	2,382.4	2,382.4	0.0
AC	16,802	92	321	10.7	2,391.5	2,391.5	2,391.5	0.0
AD	17,000	96	324	10.6	2,394.7	2,394.7	2,394.7	0.0
Galloway Wash (Middle Branch)				REVISED DATA				
AE	17,495	78	241	10.1	2,407.0	2,407.0	2,407.0	0.0
AF	18,020	51	211	11.5	2,419.9	2,419.9	2,419.9	0.0
AG	18,544	79	242	10.0	2,430.4	2,430.4	2,430.4	0.0
AH	19,155	56	205	10.8	2,445.0	2,445.0	2,445.0	0.0
AI	19,636	63	211	10.5	2,455.6	2,455.6	2,455.6	0.0
AJ	19,908	76	228	9.7	2,463.8	2,463.8	2,464.0	0.2
AK	20,136	77	229	9.6	2,468.7	2,468.7	2,469.0	0.3
AL	20,571	80	237	9.3	2,477.9	2,477.9	2,478.3	0.4
AM	20,996	91	240	9.1	2,487.6	2,487.6	2,488.1	0.5
AN	21,402	153	290	7.5	2,496.9	2,496.9	2,497.4	0.5
AO	21,806	78	236	9.2	2,506.4	2,506.4	2,506.9	0.5

1Feet above confluence with Cave Creek Wash

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

REVISED TO REFLECT LOMR DATED NOV 24 2004

FLOODWAY DATA

GALLOWAY WASH – GALLOWAY WASH MIDDLE BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Galloway Wash (Middle Branch) (Cont'd)			REVISED DATA					
AP	22,101[1]	81	239	9.0	2,513.7	2,513.7	2,513.9	0.2
AQ	22,848[1]	80	266	8.1	2,532.0	2,532.0	2,532.5	0.5
AR	23,437[1]	185	328	6.6	2,545.5	2,545.5	2,545.7	0.2
AS	23,857[1]	148	316	6.8	2,555.1	2,555.1	2,555.7	0.6
AT	24,326[1]	143	314	6.9	2,565.1	2,565.1	2,565.9	0.8
AU	25,272[1]	213	379	5.6	2,587.3	2,587.3	2,587.9	0.6
AV	25,447[1]	105	236	9.0	2,590.4	2,590.4	2,590.4	0.0
AW	25,635[1]	127	258	8.1	2,596.3	2,596.3	2,597.2	0.9
AX	25,875[1]	193	213	7.4	2,605.1	2,605.1	2,606.0	0.9
AY	26,375[1]	158	203	7.8	2,619.3	2,619.3	2,619.4	0.1
Galloway Wash (South Branch)								
A	398[2]	61	181	10.2	2,404.5	2,404.5	2,404.5	0.0
B	821[2]	191	442	4.2	2,418.6	2,418.6	2,418.6	0.0
C	1,222[2]	92	212	8.7	2,426.2	2,426.2	2,426.2	0.0
D	1,422[2]	123	240	7.7	2,430.6	2,430.6	2,430.6	0.0
E	1,539[2]	107	572	5.1	2,434.3	2,434.3	2,434.9	0.6
F	1,589[2]	143	380	6.8	2,434.9	2,434.9	2,434.9	0.0
G	1,664[2]	106	228	7.7	2,436.6	2,436.6	2,436.6	0.0
H	2,022[2]	85	201	8.7	2,445.7	2,445.7	2,445.9	0.2
I	3,022[2]	105	221	7.9	2,470.8	2,470.8	2,470.9	0.1
J	3,221[2]	96	209	8.4	2,475.9	2,475.9	2,475.9	0.0
K	3,422[2]	74	192	9.1	2,480.7	2,480.7	2,480.8	0.1
L	3,621[2]	70	173	9.2	2,486.4	2,486.4	2,486.4	0.0

1Feet above confluence with Cave Creek Wash 2Feet above confluence with Galloway Wash

DATA WERE REVISED BY LOMR DATED DECEMBER 5, 2002

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

GALLOWAY WASH MIDDLE BRANCH – SOUTH BRANCH

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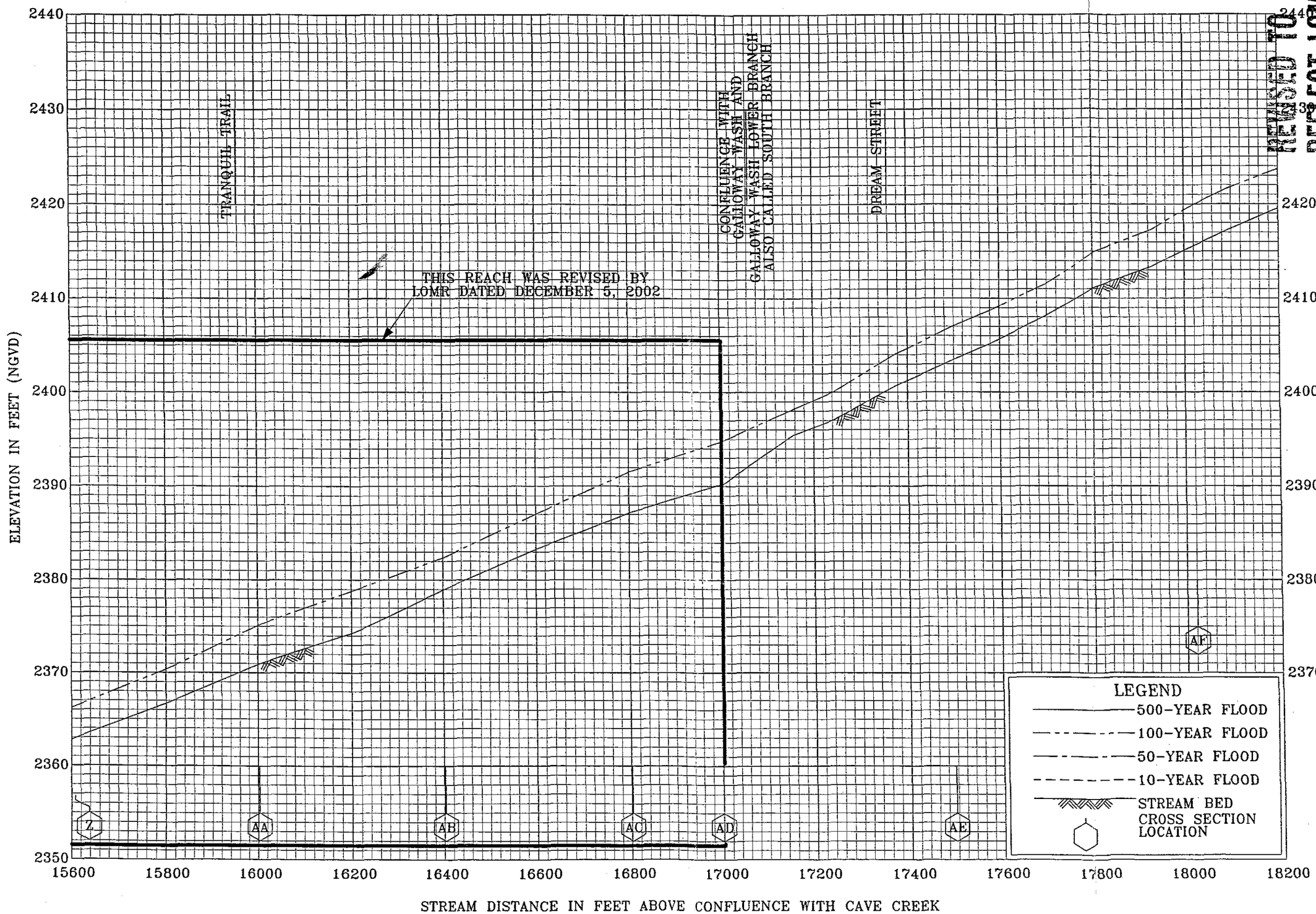

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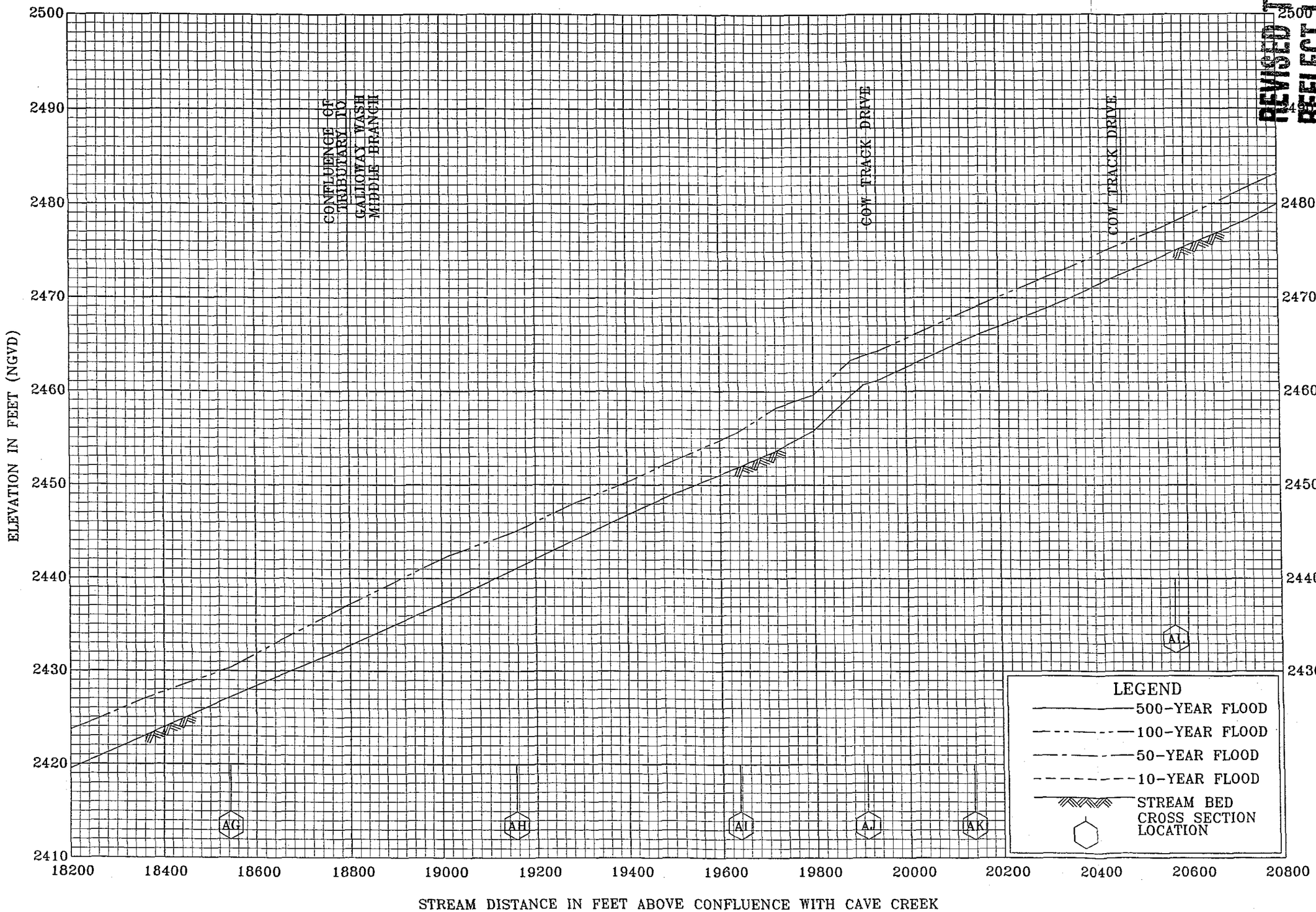
FLOOD PROFILES

GALLOWAY WASH–
GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS



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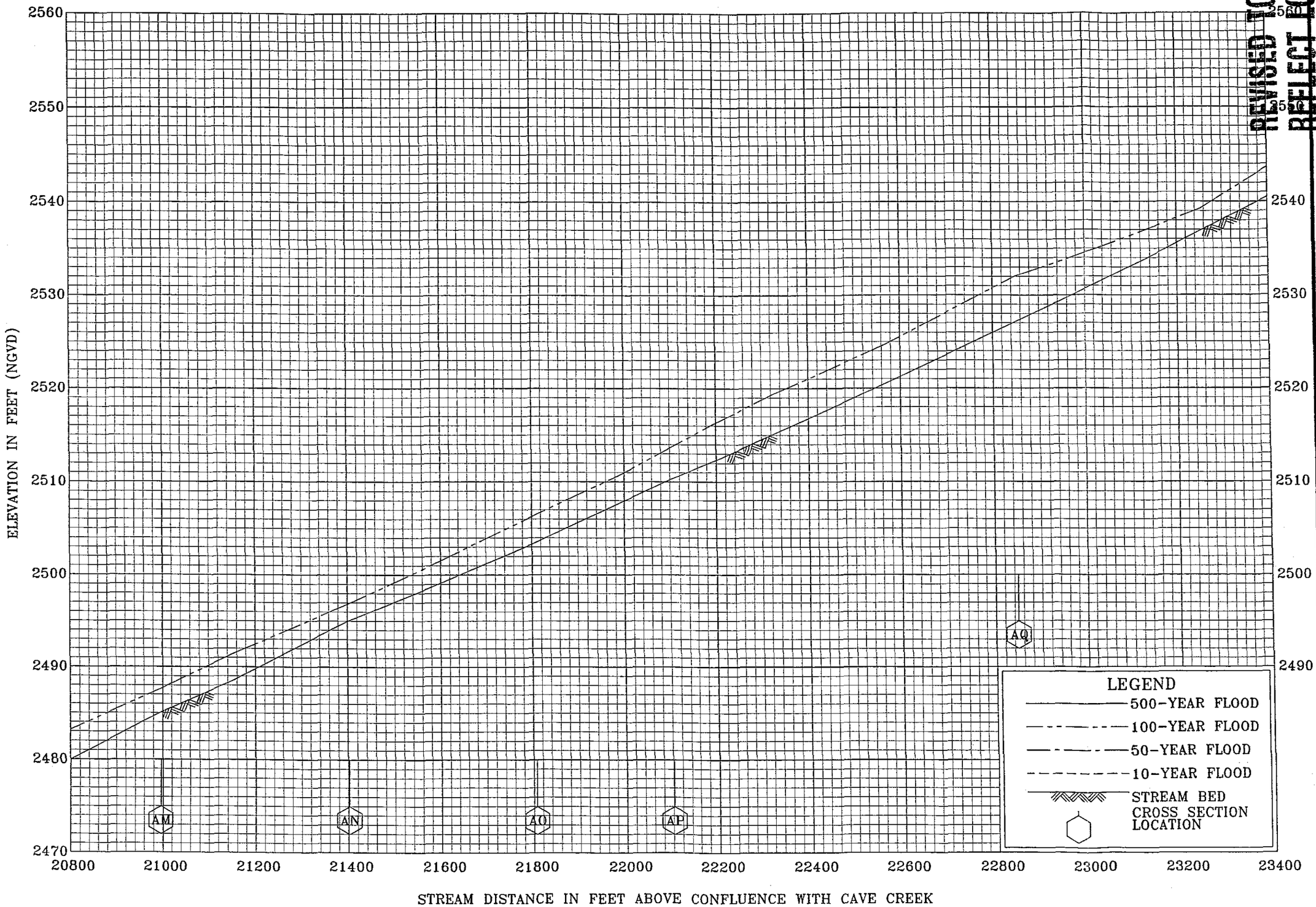
FLOOD PROFILES

GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS



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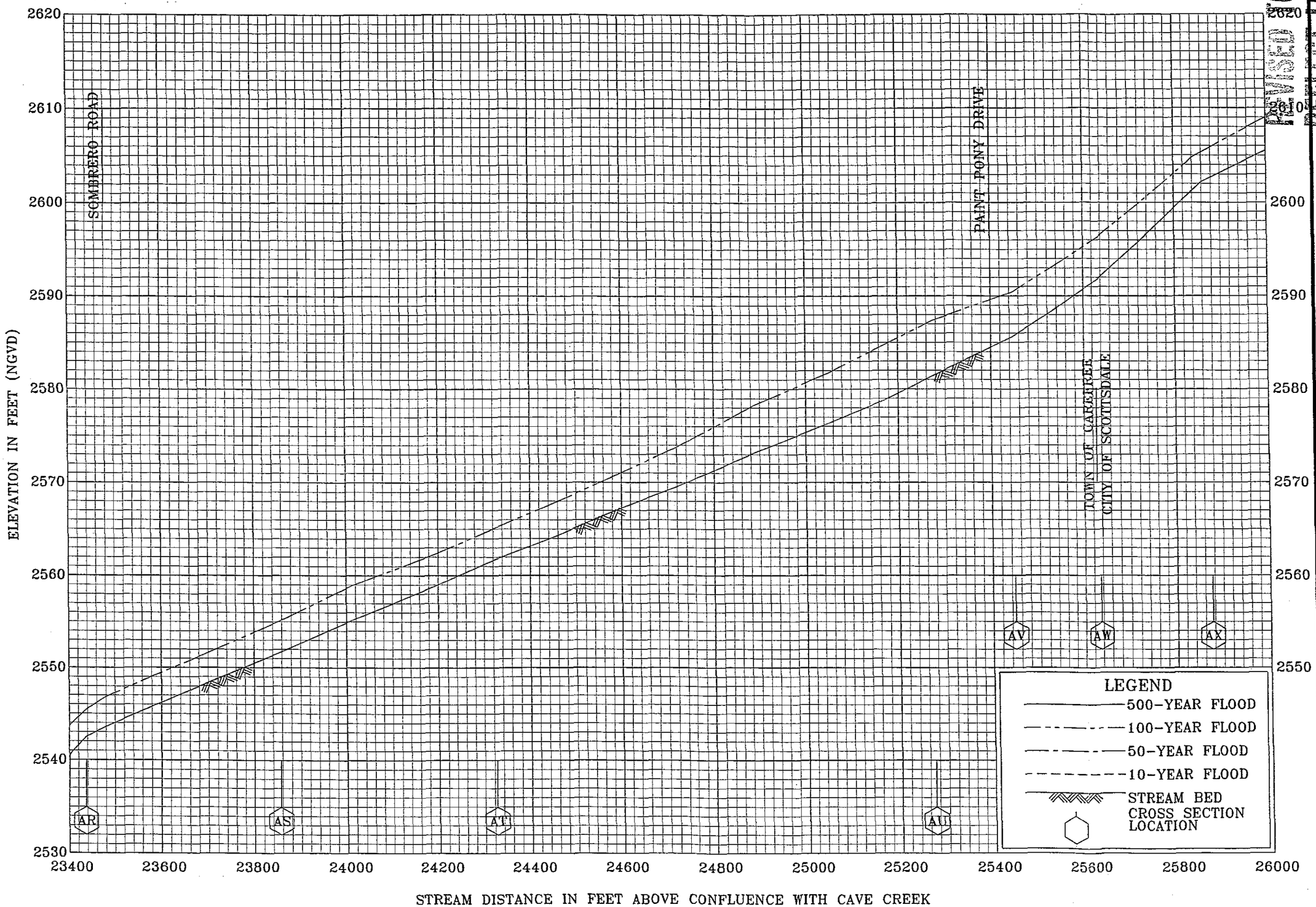
FLOOD PROFILES

GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS



PRELIMINARY DATE NOV 24 2004

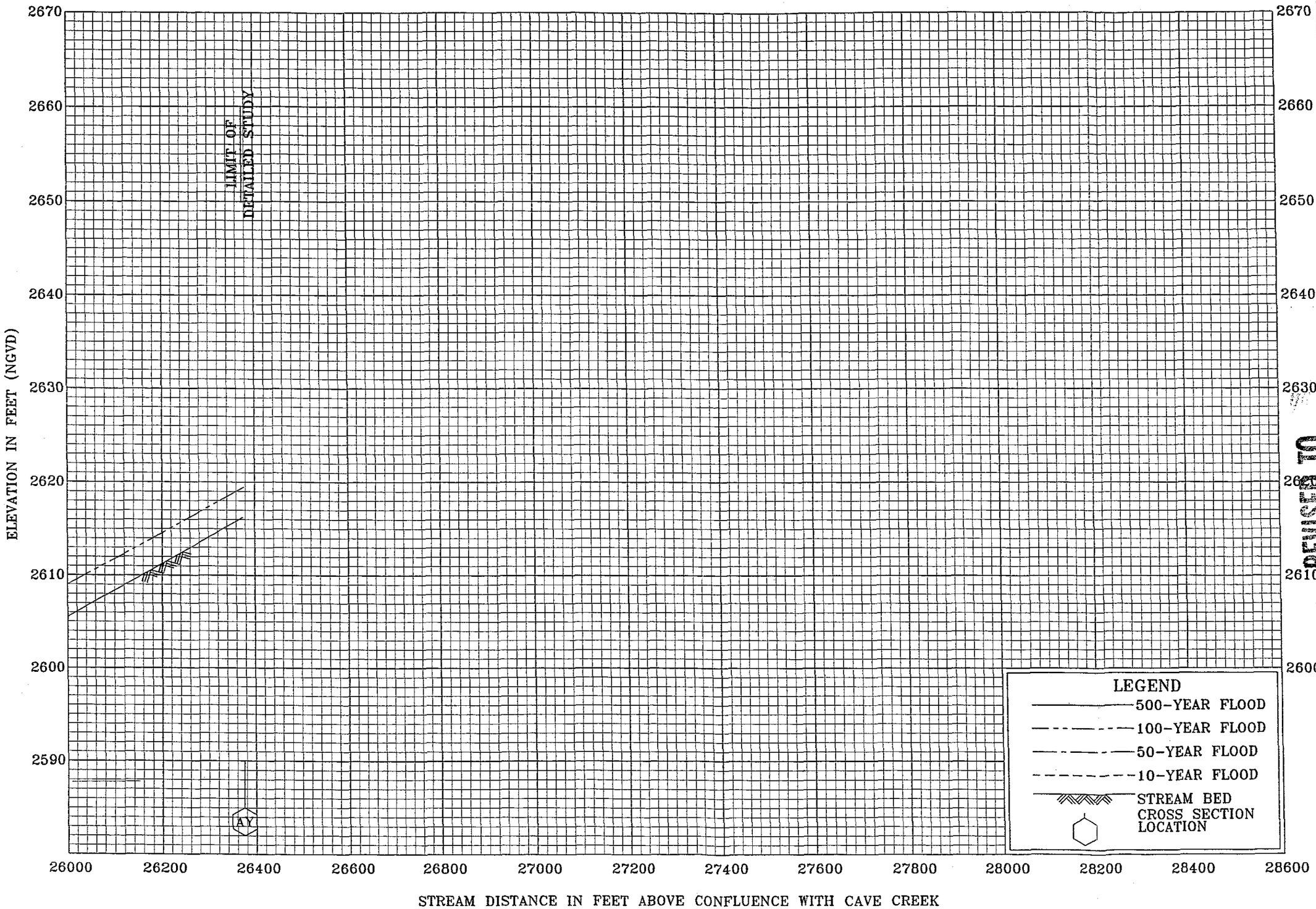
FLOOD PROFILES

GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS



PRELIMINARY

FLOOD PROFILES

GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

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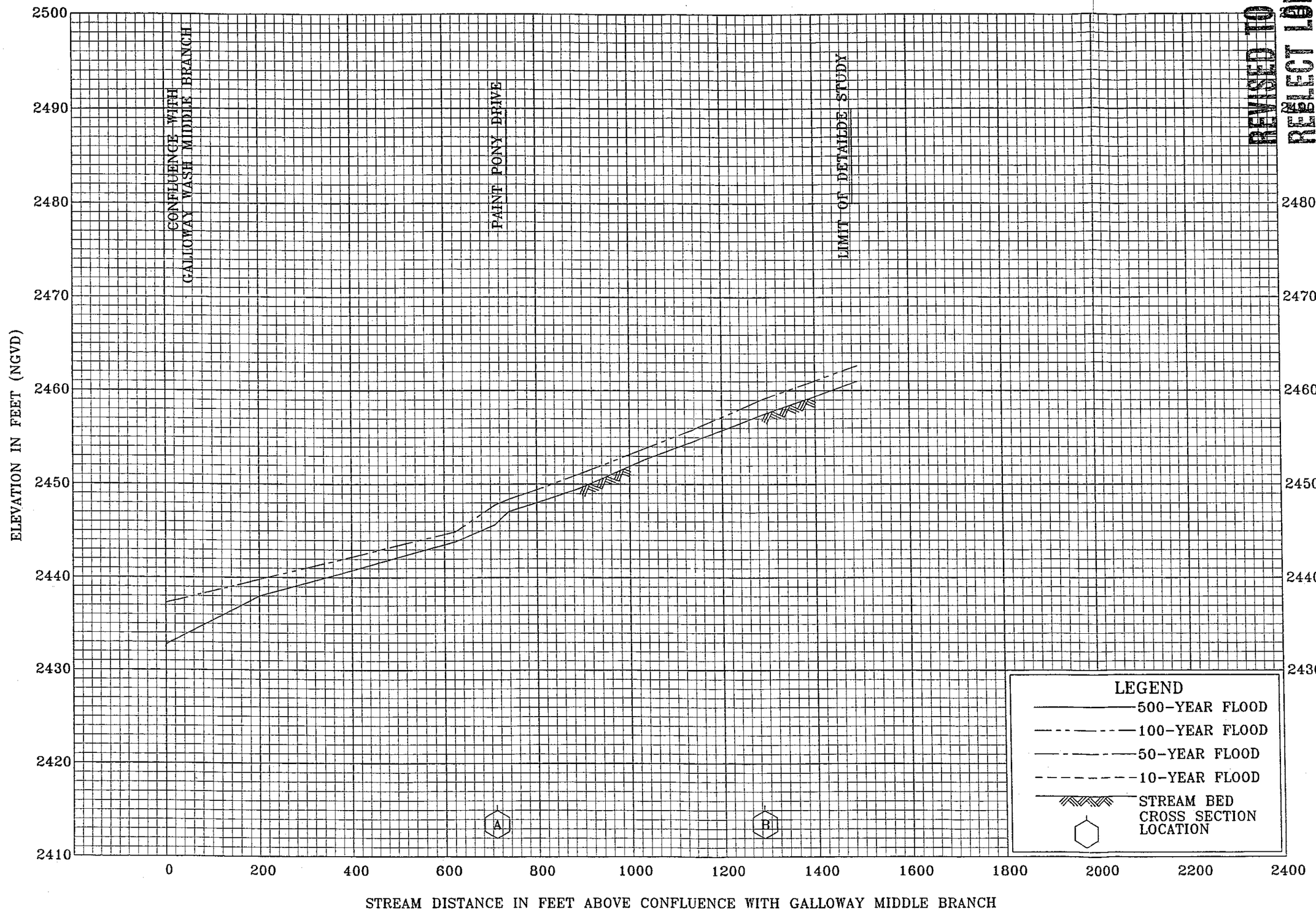

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FLOOD PROFILES

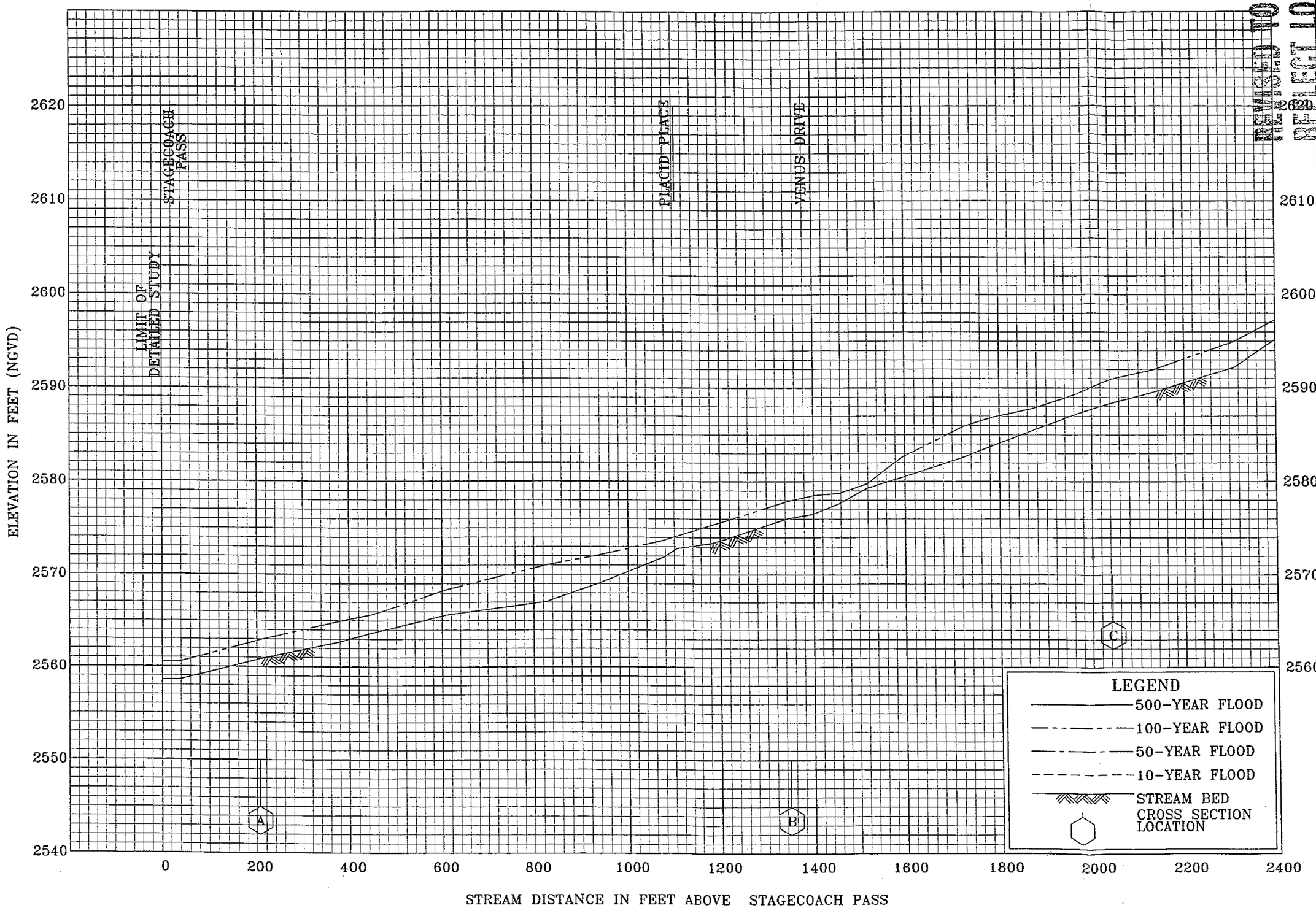
TRIBUTARY TO GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

152P(a)



FLOOD PROFILES

EASTERN PIMA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

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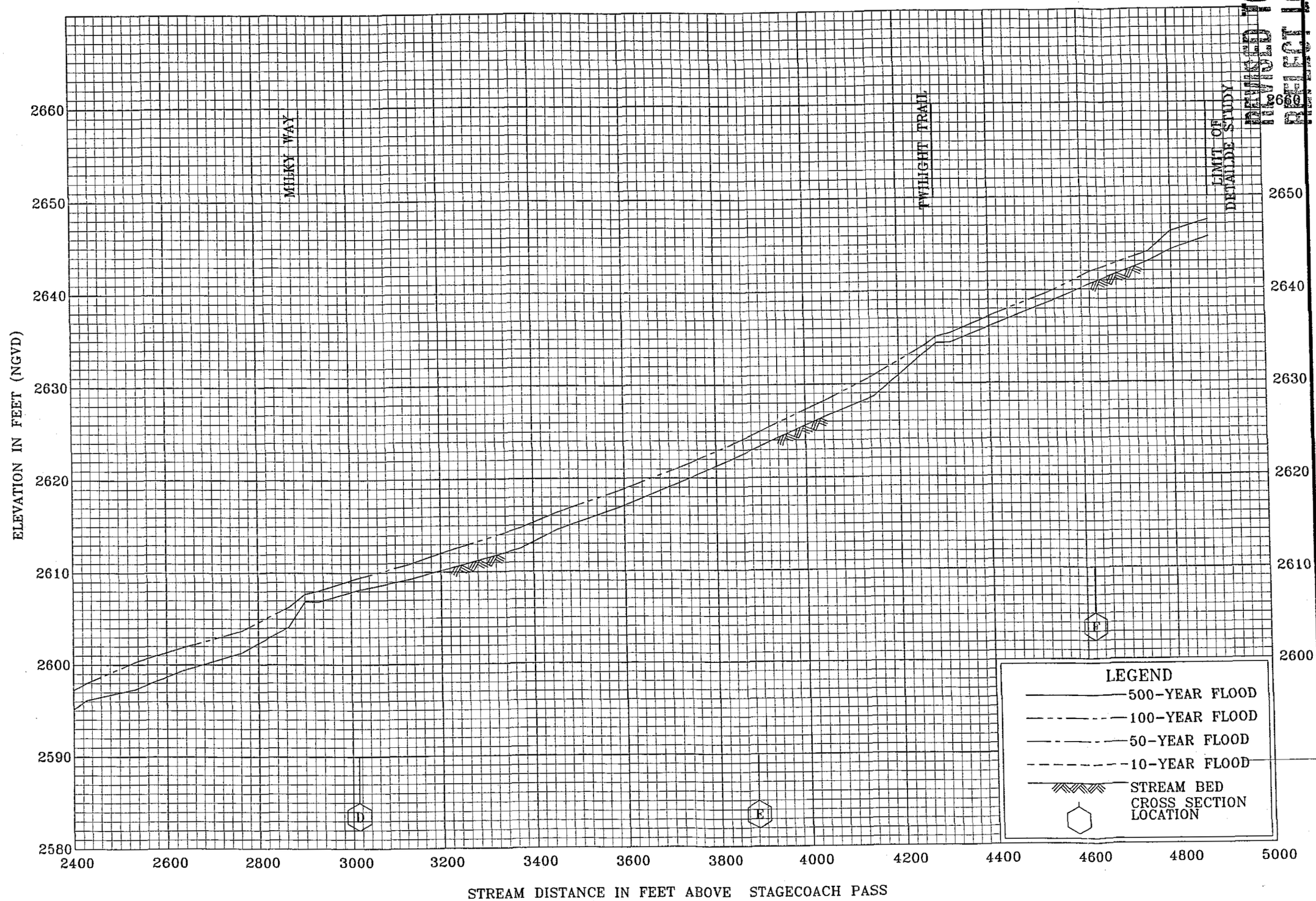

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FLOOD PROFILES

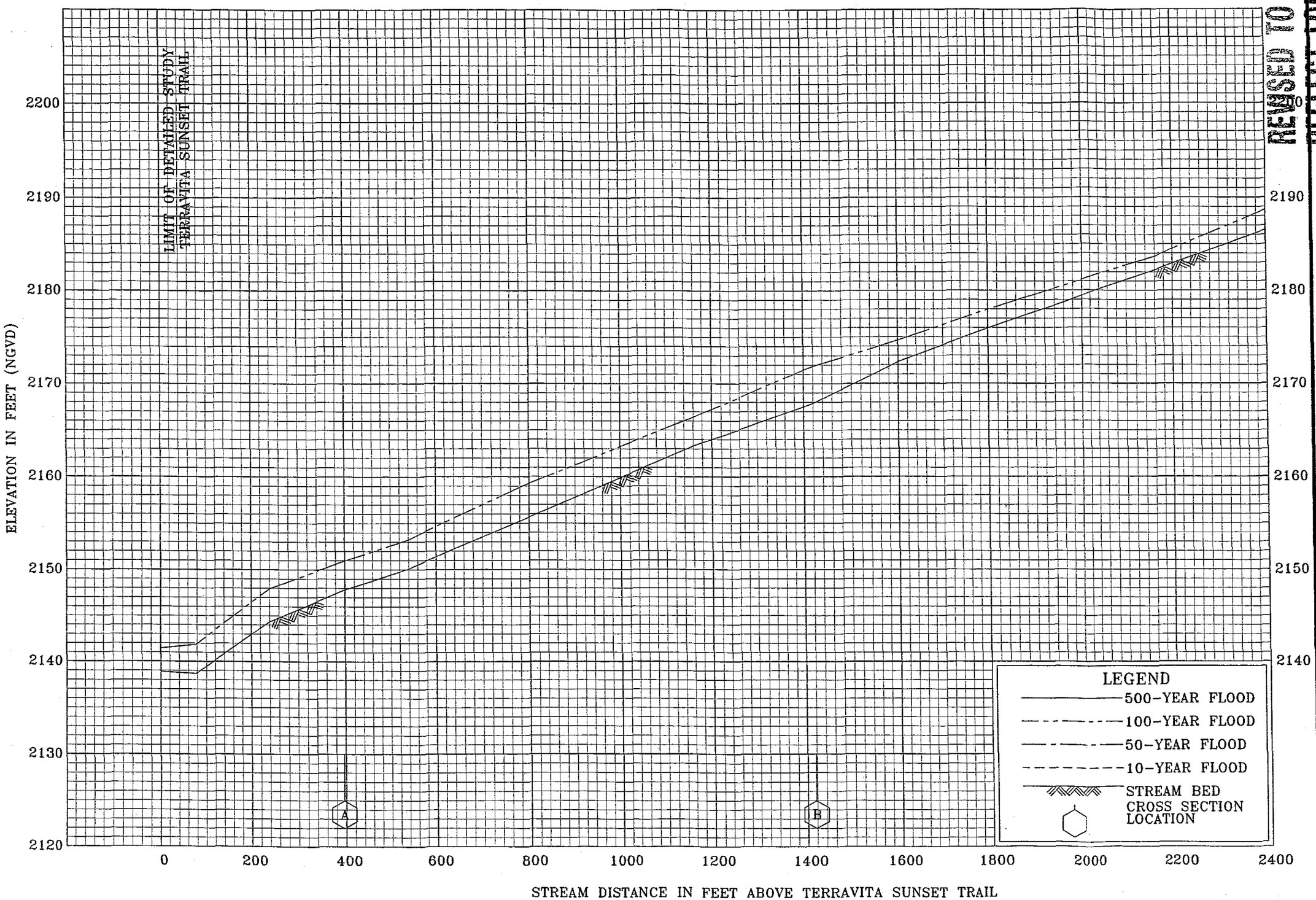
EASTERN PIMA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1269P



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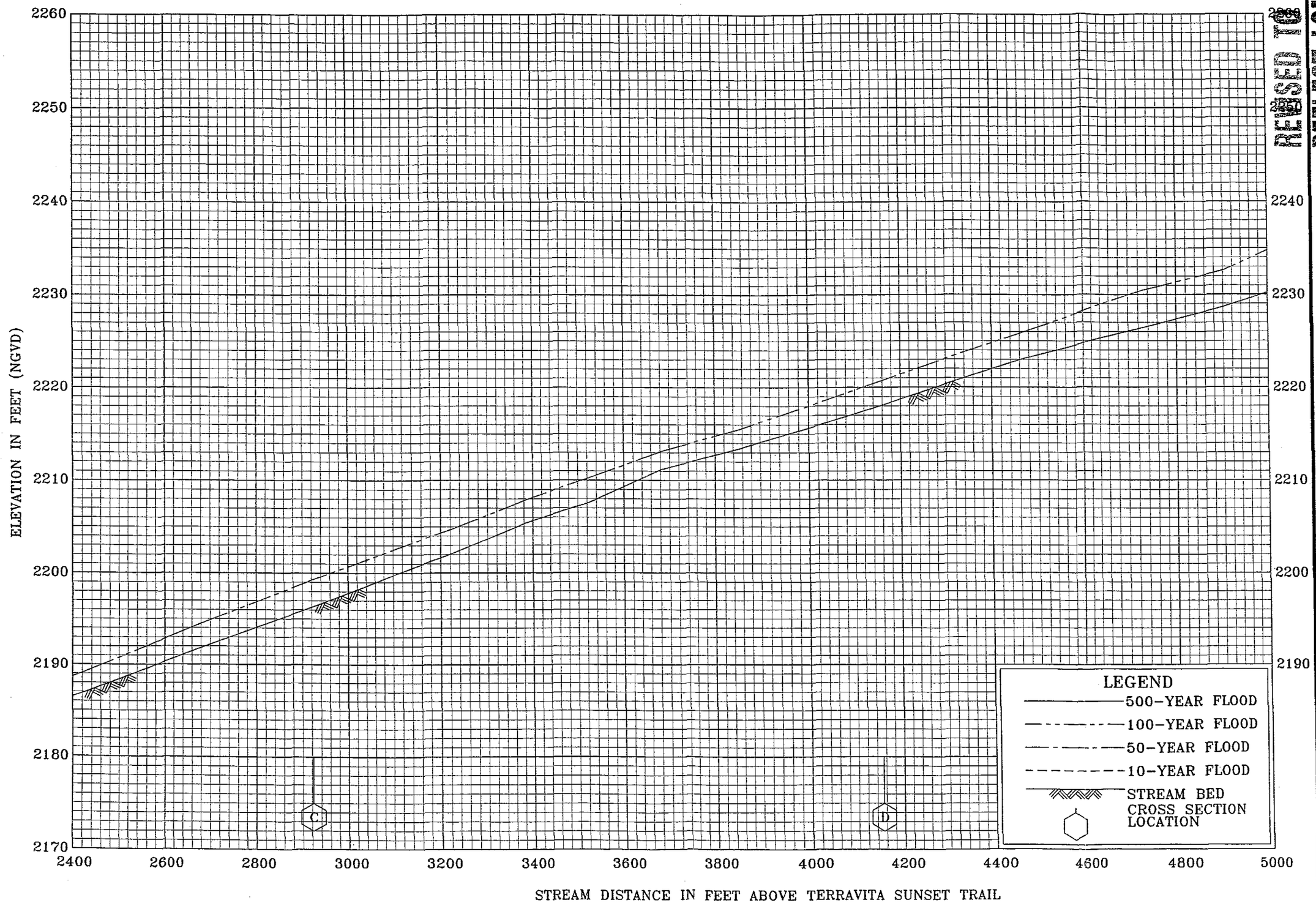
FLOOD PROFILES

UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1270P



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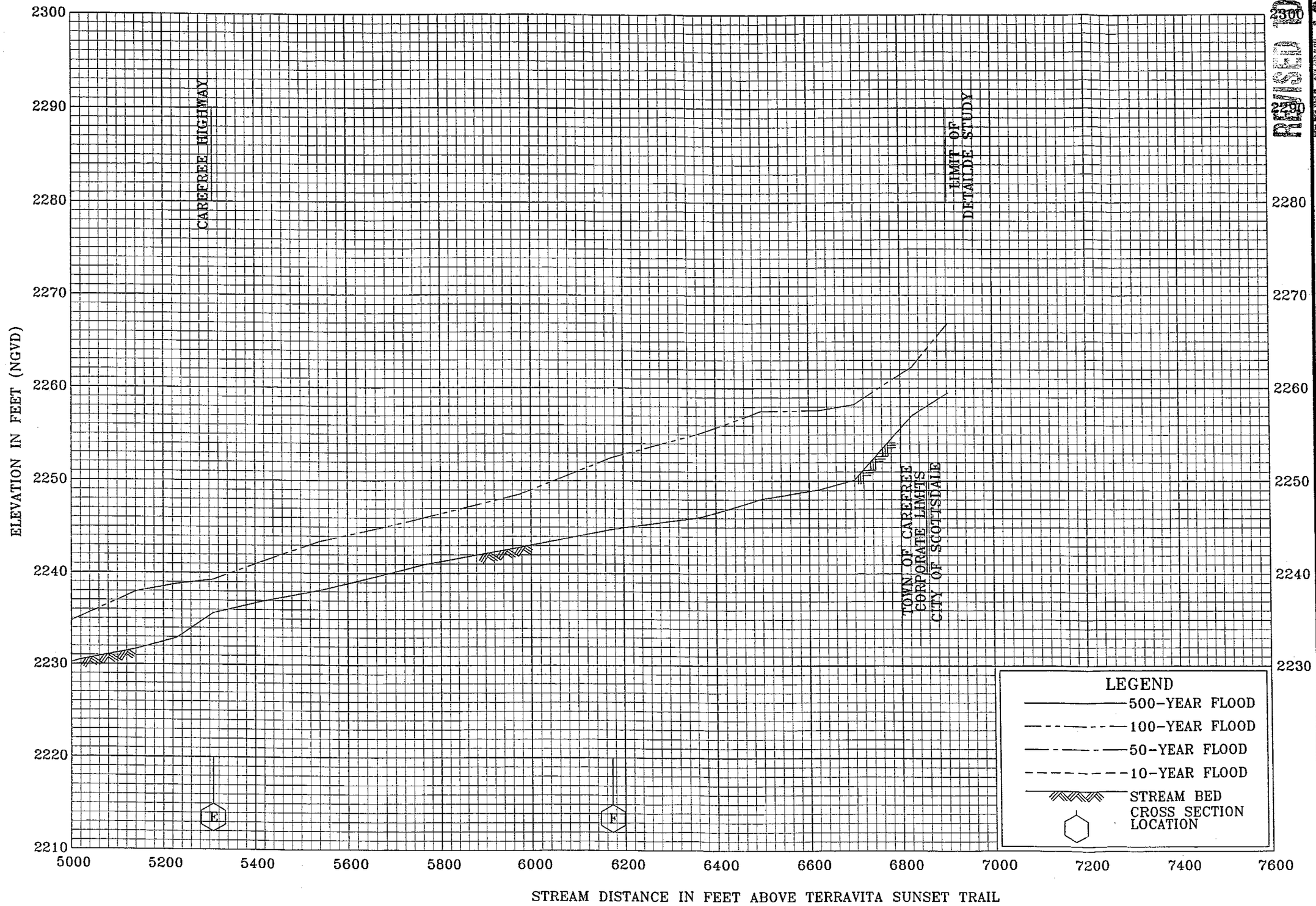
FLOOD PROFILE

UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1271P



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DATED NOV 24 2004

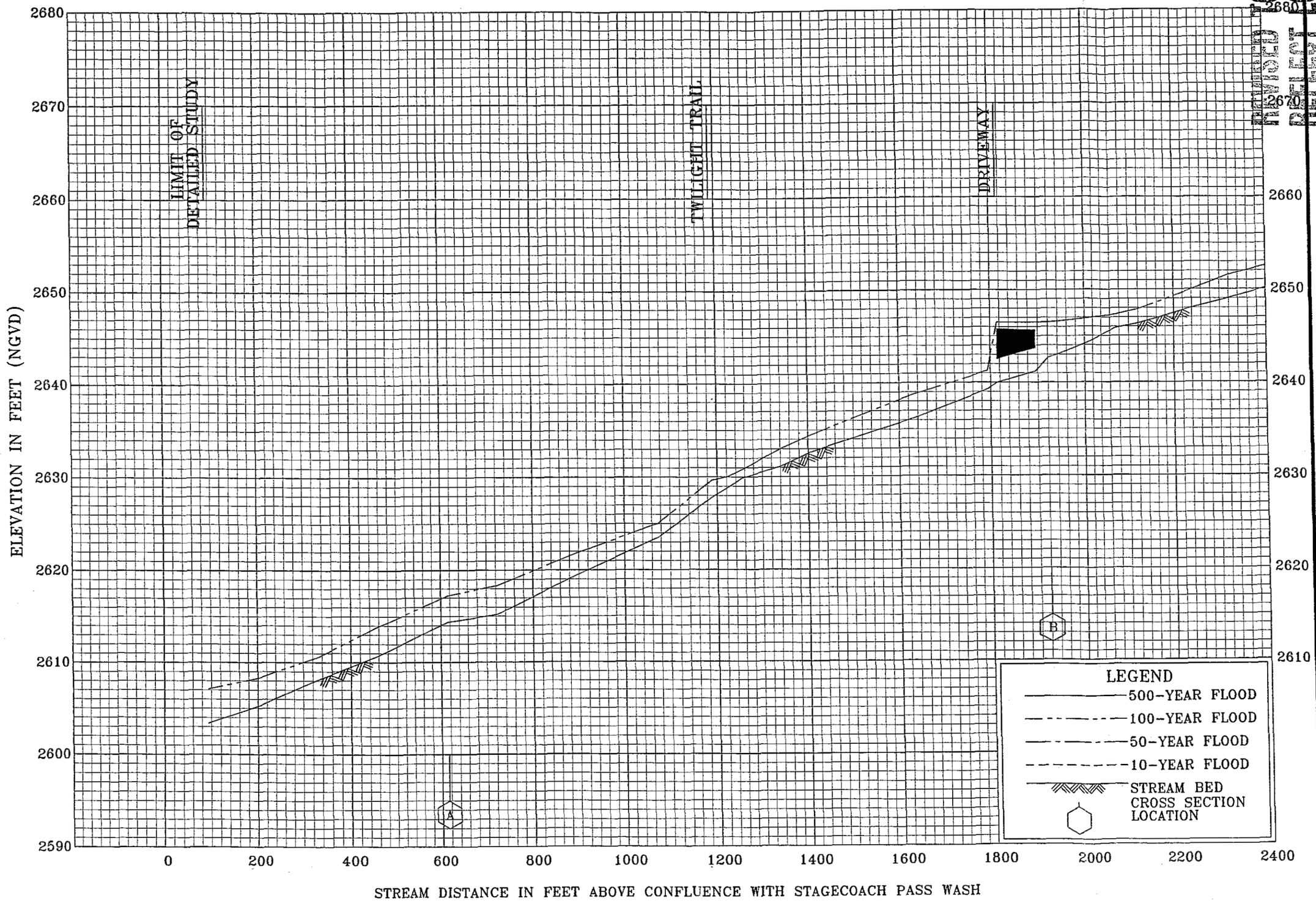
FLOOD PROFILES

UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1272P



REVISED TO REFLECT LOMR DATE NOV 24 2004

FLOOD PROFILES

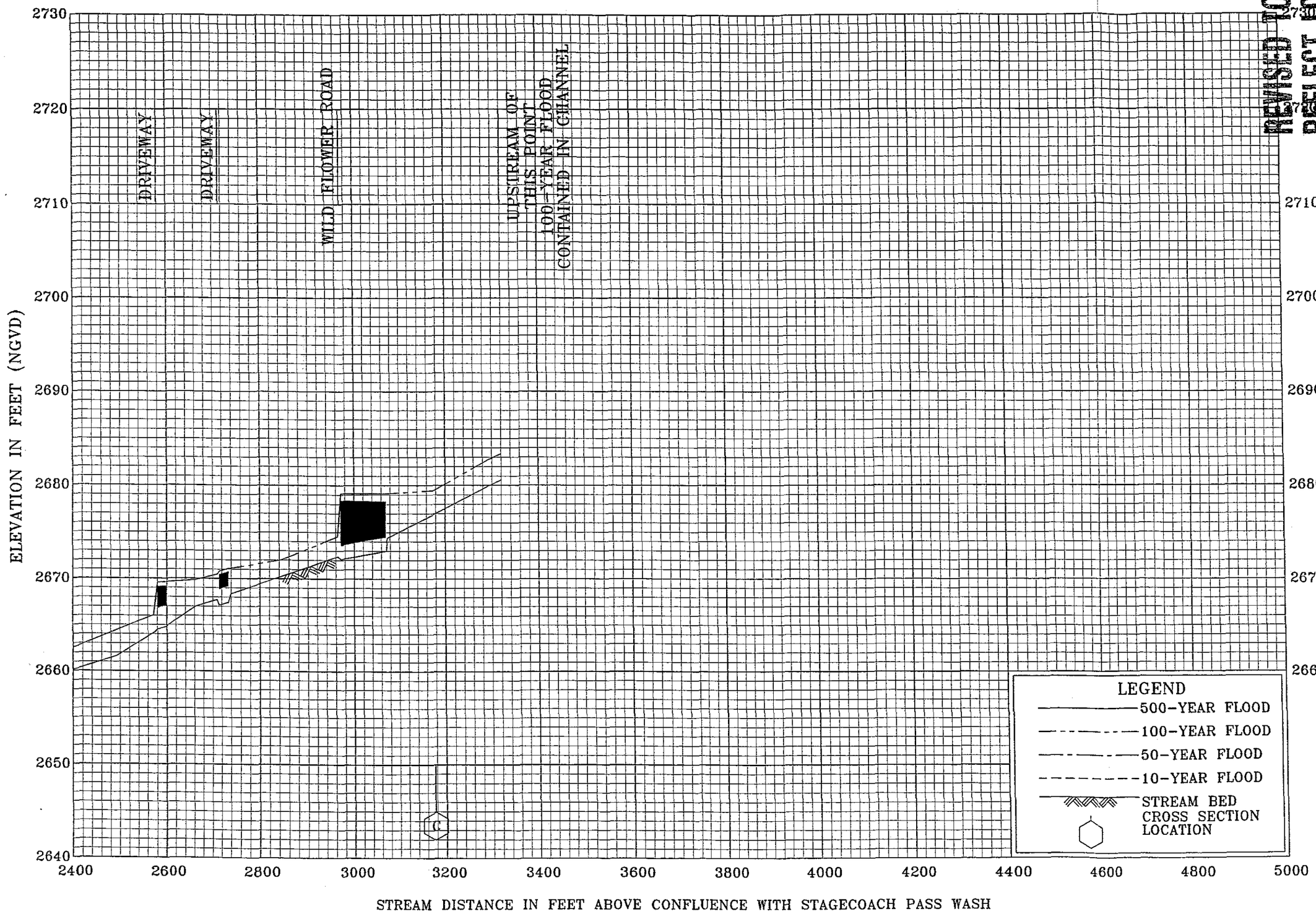
UNNAMED TRIBUTARY TO STAGECOACH PASS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1273P



REVISED TO REFLECT EDMR DATED NOV 24 2004

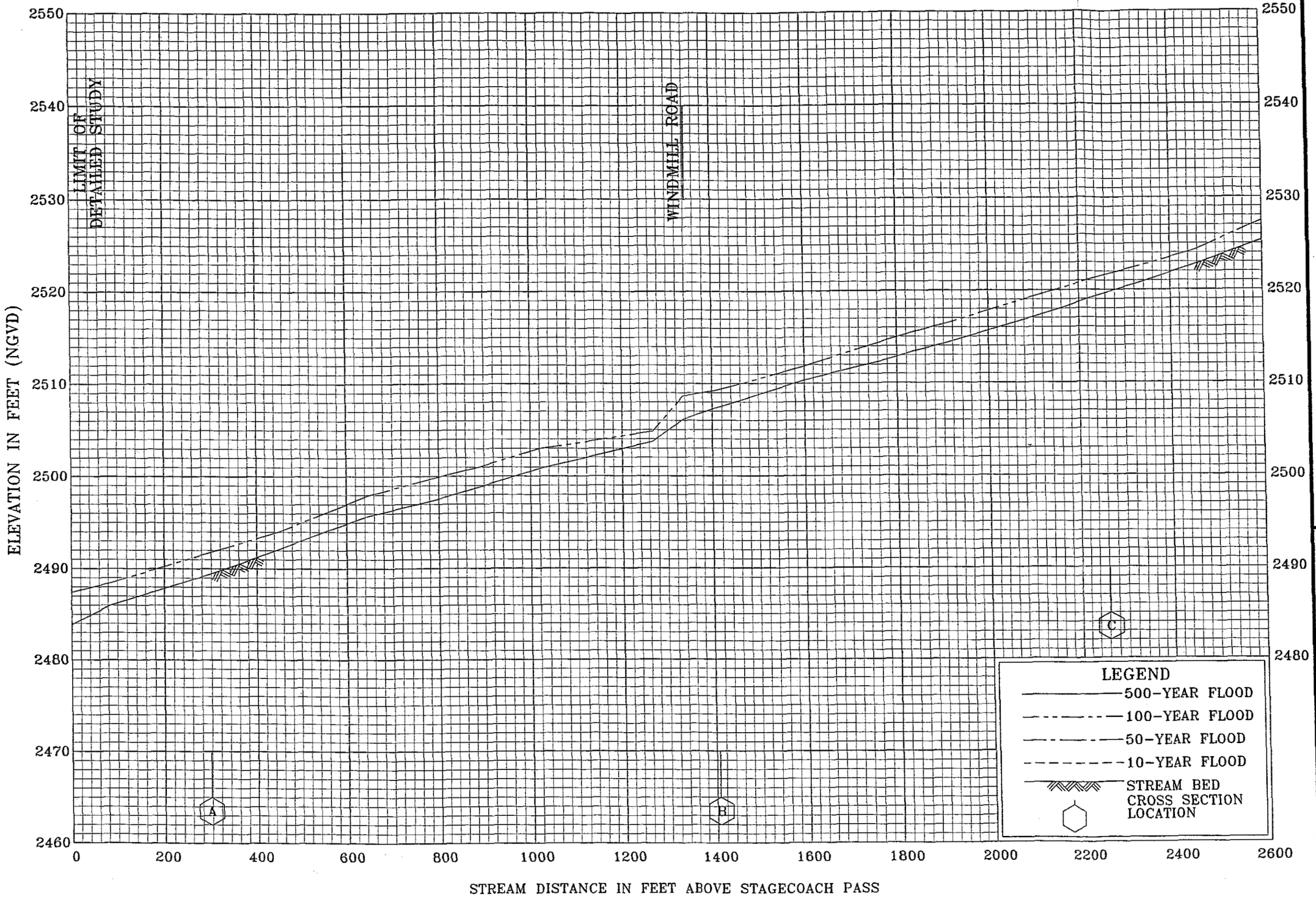
FLOOD PROFILES

UNNAMED TRIBUTARY TO STAGECOACH PASS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1274P



REVISED TO REFLECT LOMR DATED NOV 24 2004

FLOOD PROFILES

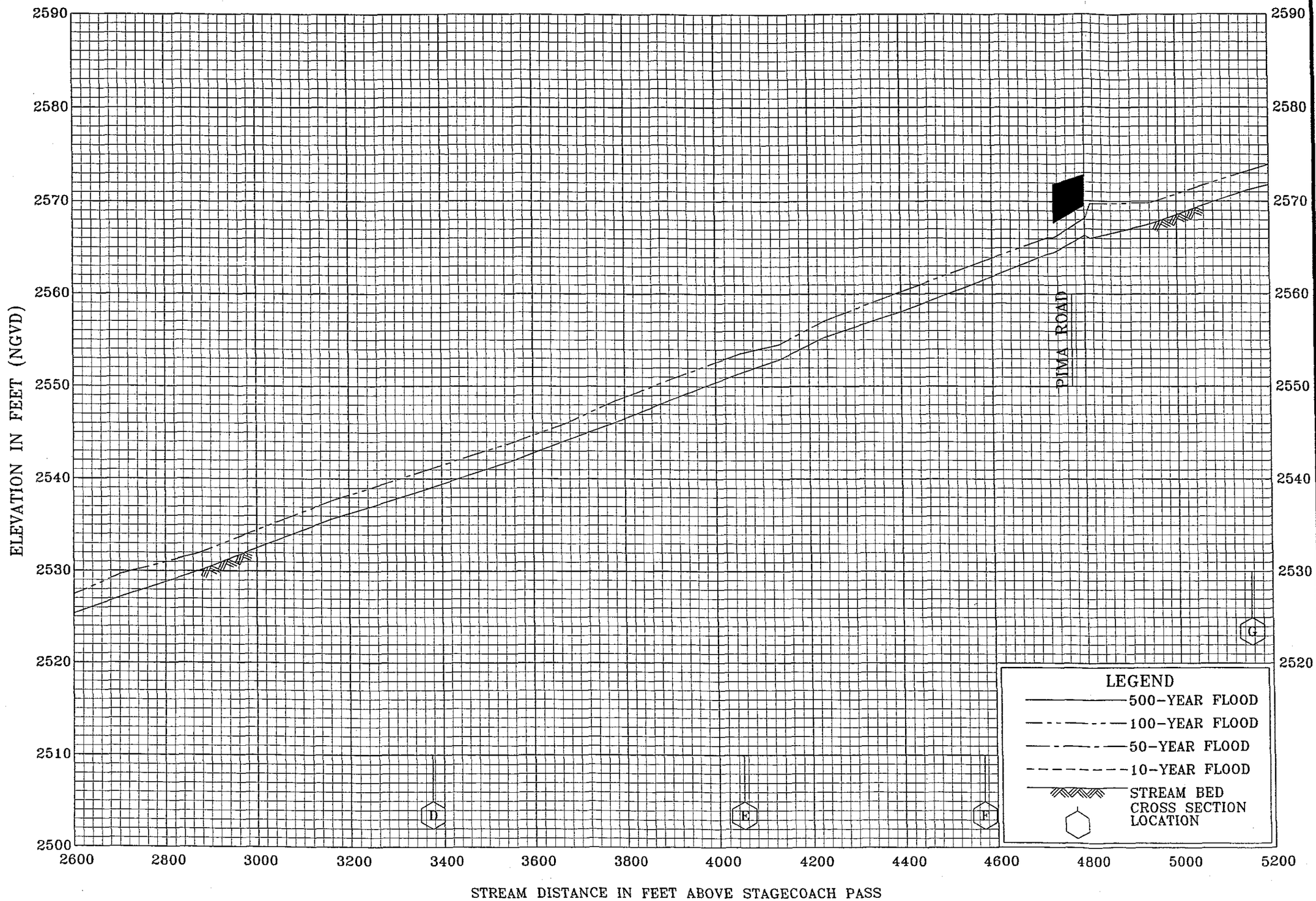
WINDMILL WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1275P



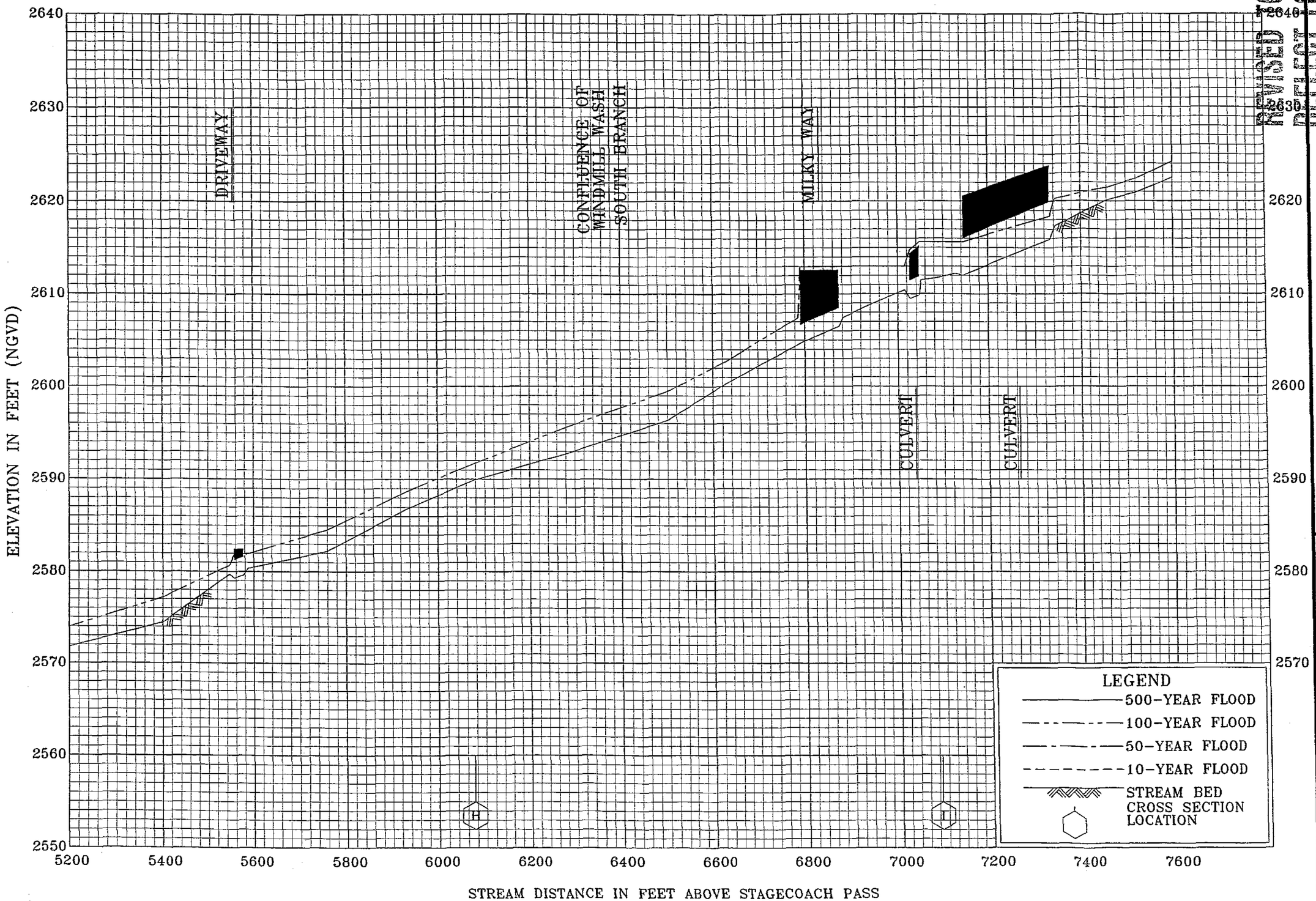
FLOOD PROFILES REVISED TO REFLECT LOMR DATED NOV 24 2004

WINDMILL WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

1276P



REVISED TO REFLECT LOMR DATED NOV 3 2004

FLOOD PROFILES

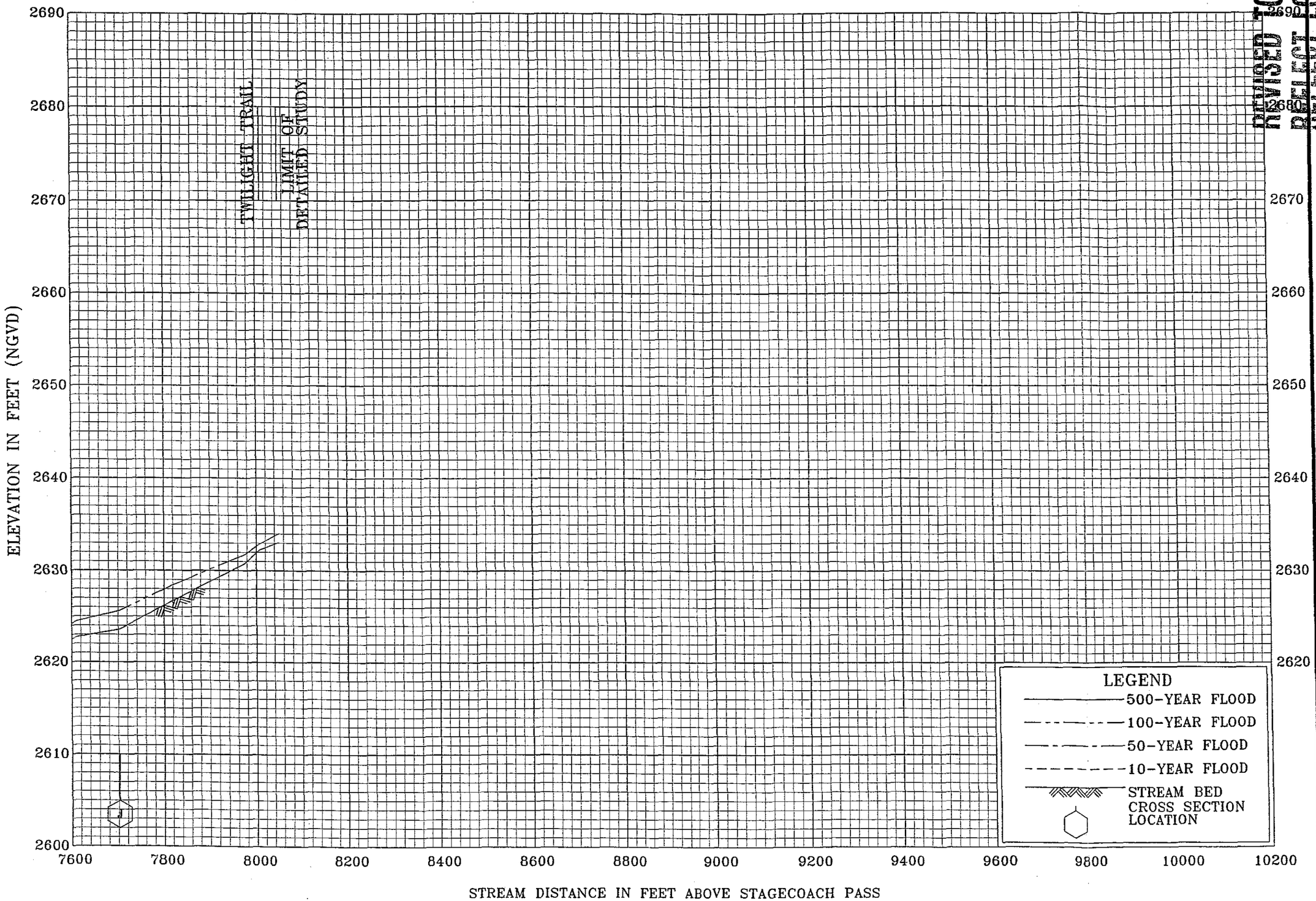
WINDMILL WASH - WINDMILL WASH NORTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1277P



REVISED TO REFLECT FCWR DATED NOV 24 2004

FLOOD PROFILES

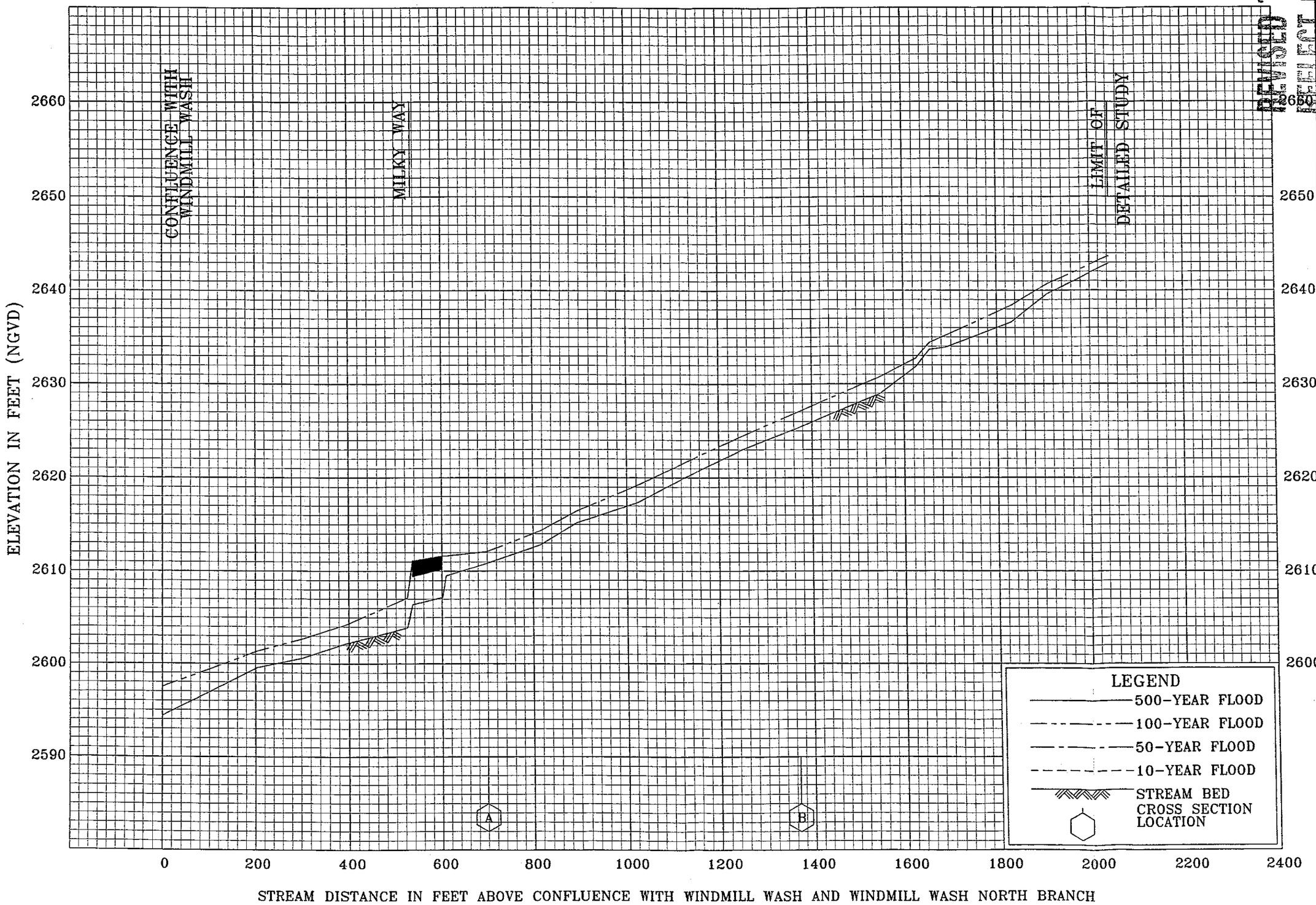
WINDMILL WASH - WINDMILL WASH NORTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1278P



REVISED TO REFLECT LOMR NOV 24 2004

FLOOD PROFILES

WINDMILL WASH SOUTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

AND INCORPORATED AREAS

1279P

NATIONAL FLOOD INSURANCE PROGRAM

FEMA MAP COORDINATION CONTRACTOR

July 14, 2004

Mr. Richard Harris, P.E., CFM
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

IN REPLY REFER TO:
Case No.: 04-09-1301P
Community: Town of Carefree, AZ
Community No.: 040126

316-FEE

Dear Mr. Harris:

This responds to your request dated June 23, 2004, that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. Pertinent information about the request is listed below.

Identifier:	Carefree Drainage Master Plan
Flooding Source:	Galloway Wash Middle Branch
FIRM Panel(s) Affected:	04013C0808 H, 0809 H, 0815 H, 0820 F, and 0850 E

FEMA has implemented a procedure to recover costs associated with reviewing and processing requests for modifications to published flood information and maps. A copy of the notice summarizing the current fee schedule, which was published in the *Federal Register*, is enclosed for your information. In accordance with this schedule, the fee for your request is $4,200 and must be submitted before we can begin processing your request. Payment of this fee must be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program (NFIP), or a credit card payment. For identification purposes, the case number referenced above must be included on the check or money order.

If you choose to forward your payment using the U.S. Postal Service, please send it to the following address:

Federal Emergency Management Agency
Fee-Charge System Administrator
P.O. Box 3173
Merrifield, VA 22116-3173

If you choose to forward your payment using an overnight service, please send it to the following address:

FEMA Fee-Charge System Administrator
c/o Dewberry & Davis
METS Division, Stop 19A
8401 Arlington Boulevard
Fairfax, VA 22031

Upon receipt of the requested payment, we will begin our technical review of your request. When you write to us about your request, please include the case number referenced above in your letter. Unless otherwise directed by you in writing, we will keep the submitted data in our files.

If you have general questions about your request, FEMA policy, or the NFIP, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627). If you have specific questions concerning your request, please call the Revisions Coordinator for your State, Mr. Craig Kennedy, who may be reached at (703) 960-8800, ext. 3091.

Sincerely,

Sheila M. Norlin
National LOMC Manager
Michael Baker Jr., Inc.

Enclosure

Federal Emergency Management Agency

Washington, D.C. 20472

FEE SCHEDULE FOR PROCESSING REQUESTS FOR MAP CHANGES

This notice contains the fee schedule for processing certain types of requests for changes to National Flood Insurance Program (NFIP) maps. The fee schedule allows FEMA to further reduce the expenses to the NFIP by more fully recovering the costs associated with processing conditional and final map change requests. The fee schedule for map changes is effective for all requests dated September 1, 2002, or later and supersedes the fee schedule that was established on June 1, 2000.

To develop the fee schedule for conditional and final map change requests, FEMA evaluated the actual costs of reviewing and processing requests for Conditional Letters of Map Amendment (CLOMAs), Conditional Letters of Map Revision – based on Fill (CLOMR-Fs), Conditional Letters of Map Revision (CLOMRs), Letters of Map Revision – based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs), and Physical Map Revision (PMRs).

Based on our review of actual cost data for Fiscal Years 2000 and 2001, FEMA has established the following review and processing fees, which are to be submitted with all requests that are not otherwise exempted under 44 CFR 72.5.

Fee Schedule for Requests for CLOMAs, CLOMR-Fs, and LOMR-Fs

Request for single-lot/single-structure CLOMA and CLOMR-F	$500
Request for single-lot/single structure LOMR-F	$425
Request for single-lot/single-structure LOMR-F based on as-built information (CLOMR-F previously issued by us)	$325
Request for multiple-lot/multiple-structure CLOMA	$700
Request for multiple-lot/multiple-structure CLOMR-F and LOMR-F	$800
Request for multiple-lot/multiple-structure LOMR-F based on as-built information (CLOMR-F previously issued)	$700

Fee Schedule for Requests for CLOMRs

Request based on new hydrology, bridge, culvert, channel, or combination of any of these	$4,000
Request based on levee, berm, or other structural measure	$4,500

Fee Schedule for Requests for LOMRs and PMRs

Requesters must submit the review and processing fees shown below with requests for LOMRs and PMRs that are not based on structural measures or alluvial fans.

Request based on bridge, culvert, channel, or combination thereof	$4,200
Request based on levee, berm, or other structural measure	$6,000
Request based on as-built information submitted as follow-up to CLOMR	$3,800

Fees for CLOMRs, LOMRs, and PMRs Based on Structural Measures on Alluvial Fans

FEMA has maintained $5,000 as the initial fee for requests for CLOMRs and LOMRs based on structural measures on alluvial fans. FEMA will also continue to recover the remainder of the review and processing costs by invoicing the requester before issuing a determination letter, consistent with current practice. The prevailing private-sector labor rate charged to FEMA ($50 per hour) will continue to be used to calculate the total reimbursable fees.

Payment Submission Requirements

Requesters must make fee payments for non-exempt requests before we render services. This payment must be in the form of a check or money order or by credit card payment. Please make all checks and money orders in U.S. funds payable to the *National Flood Insurance Program.* We will deposit all fees collected to the National Flood Insurance Fund, which is the source of funding for providing this service.

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
Fulton Brock
Andrew Kunasek
Don Stapley
Mary Rose Garrido Wilcox
Max W. Wilson

June 23, 2004

Ms. Pernille Buch-Pedersen, Regional Manager
Michael Baker Jr., Inc.
3601 Eisenhower Avenue, Suite 600
Alexandria, VA 22304-6425

Subject: Carefree Drainage Master Plan Floodplain Delineation Study

FIRM Panels affected: 04013C0815H, 04013C0808H, 04013C0809H, 04013C0820F, 04013C0850E

Dear Ms. Buch-Pedersen:

I herewith submit for review and processing, a floodplain study (3 volumes) for the Town of Carefree and the City of Scottsdale, Arizona. This study includes new Zone AE floodplains and floodway (based on 2-foot-contour mapping). The new Zone AE consists of four new study reaches within the Town and the City, and a restudy of the Galloway Wash Middle Branch within the Town, only. All of these are tributaries to Cave Creek Wash.

Electronic files of the work maps in DXF format are included on the CD at the end of Volume 1. If you have any questions, please contact me at (602) 506-4528, or at rph@mail.maricopa.gov.

Sincerely,

Richard P. Harris, P.E., CFM
Senior Civil Engineer
Flood Delineation Branch

Enclosure

RPH/ag

Copies to:

Max Yuan, P.E., Project Engineer
Hazards Study Branch, Mitigation Directorate
Federal Emergency Management Agency
500 C STREET SW
WASHINGTON DC 20472-0001

Tony Bokich, PE, Project Manager
CH2M Hill
2625 South Plaza Drive
TEMPE, AZ 85285-8440

Brian Cosson, Arizona State Floodplain Coordinator
Arizona Dept. of Water Resources
Office of Water Engineering
500 North 3rd Street
Phoenix, AZ 85004

Bill Erickson, PE, Floodplain Administrator
Stormwater Management Division
City of Scottsdale
7447 E. Indian School Road
Suite 205
Scottsdale AZ 85251

Mr. Jonathan H. Pearson, Town Administrator
Town of Carefree
100 Easy Street
P.O. Box 740
Carefree, AZ 85377

Final Report

Volume I of III
Carefree Drainage Master Plan Floodplain Delineation Study Technical Data Notebook

Report and Appendices A-D

Prepared for

Flood Control District of Maricopa County

2801 West Durango Street
Phoenix, AZ 85009

In Cooperation with

The Town of Carefree

May 2004

Prepared in partnership with
JE Fuller Hydrology and Geomorphology
HDR, Inc.
Logan Simpson Design

Registered Professional Engineer (Civil)
CERTIFICATE NO
24971
TONY A.
BOKICH
Date Signed 5-11-04
ARIZONA, U.S.A.

CH2MHILL
2625 South Plaza Drive
Suite 300
Tempe, AZ 85282-3375
Tel. 480-966-8188
Fax 480-966-9450

Final Report

Volume I of III
Carefree Drainage Master Plan Floodplain Delineation Study Technical Data Notebook

Report and Appendices A-D

Submitted to

Flood Control District of Maricopa County

May 2004

Registered Professional Engineer (Civil)
Certificate No.
24971
TONY A.
BOKICH
Date Signed 5-11-04
ARIZONA, U.S.A.

CH2MHILL

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Acronyms

ADWR	Arizona Department of Water Resources
DDMSW	Drainage Design Manual System for Windows
DEI	DEI Professional Services, LLC
DMP	Drainage Master Plan
DTM	Digital Terrain Model
FCDMC	Flood Control District of Maricopa County
FEMA	Federal Emergency Management Agency
MCUHP1	Maricopa County Unit Hydrograph Procedure 1
MCUHP2	Maricopa County Unit Hydrograph Procedure 2
SCS	Soil Conservation Service
TDN	Technical Data Notebook
TIN	Triangulated Irregular Network
Town	Town of Carefree
USACE	U.S. Army Corps of Engineers
USGS	U. S. Geological Survey

SECTION 1

Introduction

The Flood Control District of Maricopa County (FCDMC) contracted with CH2M HILL in June 2001 to complete the Carefree Drainage Master Plan Floodplain Delineation Study (Carefree DMP) (FCD Contract No. 2000C037). The Carefree DMP study area encompasses the entire Town of Carefree (Town), which contains approximately 9 square miles, as shown in Figure 1. The purpose of the Carefree DMP was to assess the impacts of rainfall runoff and provide a plan to reduce the potential damage to property or loss of life from flooding hazards. Existing and potential flooding problems were identified and evaluated. Erosion and sedimentation issues were analyzed. Essential information regarding flooding, sedimentation, and erosion problems was gathered and distributed to the Town, its residents and the FCDMC.

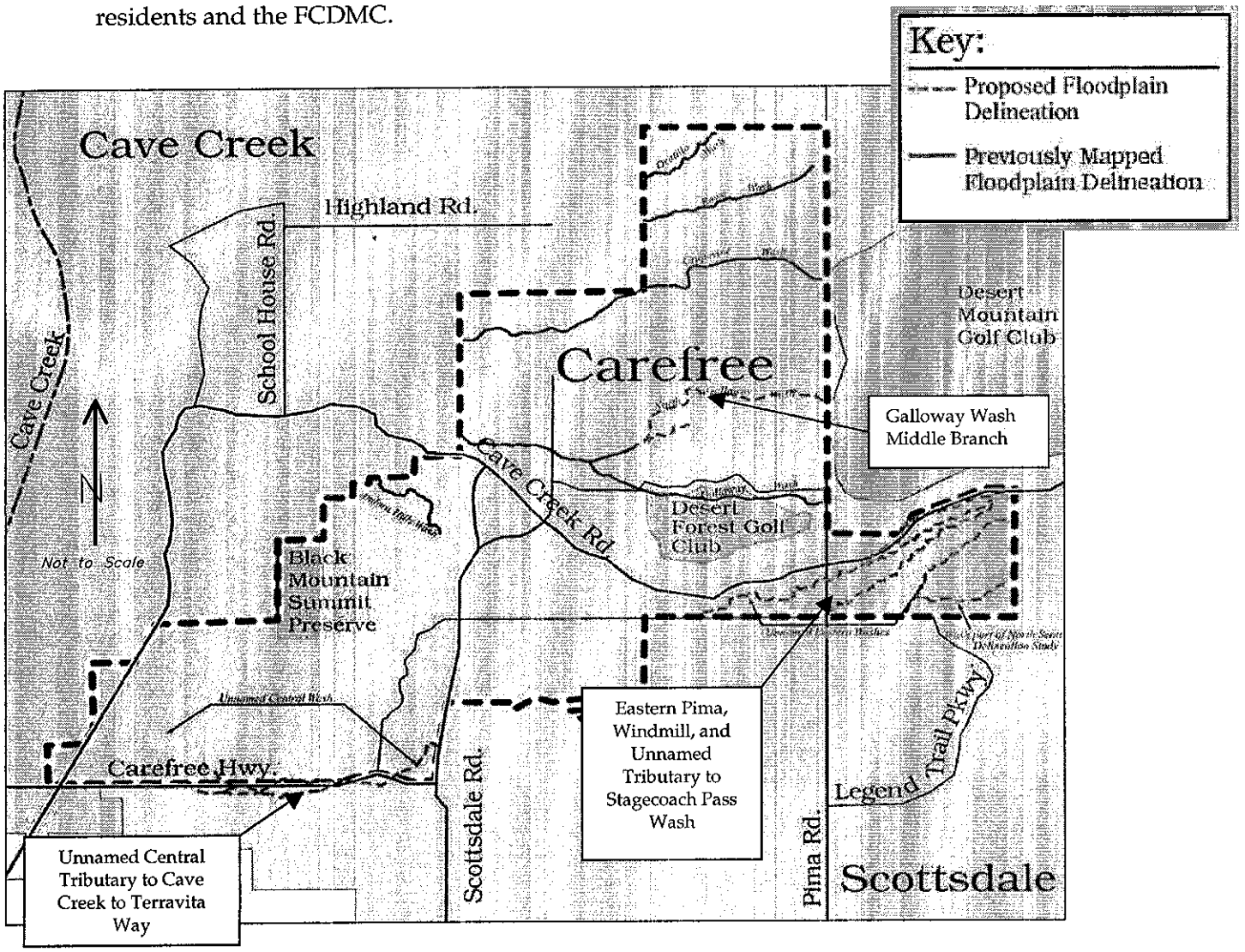

FIGURE 1 – PROJECT LOCATION MAP

The Town currently has several washes mapped with regulatory floodplains and numerous unmapped washes. Floodplain delineation was performed on five of the washes in the Town. Two unnamed washes have been named for the sake of expediency: Eastern Pima Wash and Windmill Wash. The names were selected based upon unofficial but related map features and are recommended for the revised FIRM panels

Some of the washes were new delineation areas, and others were a re-delineation using the more accurate data including new topographic mapping available for this project. These washes are:

- Galloway Wash Middle Branch
- Unnamed Central Tributary to Cave Creek to Terravita Way
- Eastern Pima Wash
- Unnamed Tributary to Stagecoach Pass Wash
- Windmill Wash

Figure 1 shows the locations of the washes mapped as part of the Carefree DMP study. The *Data Collection Report* for the Carefree DMP study, which is included as Appendix D.1 of this Technical Data Notebook (TDN) and documents existing conditions in the Town and generated runoff flow numbers, was completed in November 2002. This TDN contains the following sections, appendices, disks, and maps:

Sections:

Section 1 – Introduction
Section 2 – ADWR/FEMA Forms
Section 3 – Survey and Mapping Information
Section 4 – Hydrology
Section 5 – Hydraulics
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Maps:
A Hydrology Exhibit Maps
B Hydraulics Exhibit Maps
C Floodplain Work Study Maps
D Annotated Firm Panels

1.1 Purpose of the Study

The floodplain delineation portion of the Carefree DMP was initiated by the Town and the FCDMC to define the potential flooding risks for five major washes within the Town of Carefree, Arizona. With the completion and acceptance of this floodplain delineation study, the Town will have a majority of the major washes mapped, either as part of this study or from previous studies.

This data will be submitted to Federal Emergency Management Agency (FEMA) by the FCDMC for final approval to be incorporated into subsequent printing of the Flood Insurance Rate Maps for Maricopa County, Arizona.

1.2 Authority for Study

The Carefree DMP study was prepared by CH2M HILL for the FCDMC in association with the Town of Carefree and City of Scottsdale. The FCDMC contract number with CH2M HILL is FCD 2000C037. The FCDMC project managers are Ms. Marilyn DeRosa and Mr. Doug Williams, who can be reached at 602-506-1501. The CH2M HILL project manager is Mr. Tony Bokich, who can be reached at 480-966-8188.

1.3 Study Location

The Town is located approximately 20 miles north of central Phoenix. The study area for the most part follows the Town boundary and includes Sections 24, 25, 26, 34, 35, and 36 of Township 6 North, Range 4 East, Sections 2, 3, and 4 of Township 5 North, Range 4 East, and Section 31 of Township 6 North, Range 5 East, of the Gila and Salt River Base and Meridian, located in Maricopa County, Arizona.

1.4 Description of Watershed

The watershed contains approximately 24 square miles and is located in portions of the Tonto National Forest, City of Scottsdale, and Town of Carefree. The northern watershed boundary is formed by Continental Mountain and Apache Peak, at elevations in excess of 4,500 feet above mean sea level. Black Mountain and Lone Mountain are located within the watershed. The watershed slopes are relatively steep, ranging from over 40 percent in the steeper mountain areas, to around 2.5 percent in the lower portion. Tributaries are generally well defined and incised in the upper portions of the watershed, becoming less confined in the lower reaches with numerous flow braids.

The majority of the upper portion of the watershed is either undeveloped or developed with large-lot single-family residences and golf courses. The portion of the watershed located within the Town generally contains large-lot residential development, with areas of concentrated commercial and residential development.

1.5 Previous Studies

Numerous previous studies exist in the area. Flood insurance studies were previously completed for Andora Hills Wash, Grapevine Wash, and Galloway Wash in January 1979, April 1988, and July 2001. Copies of portions of these studies are located in Appendix A.1 of this TDN. An ongoing study exists for Stagecoach Pass Wash, which crosses into the far northeast corner of the Town. This is the North Scottsdale Delineation Study being performed by DEI Professional Services, LLC (DEI) under contract FCD 2001C009, Assignment Number 2, for the FCDMC. The HEC-1 output is located in Appendix D.1. Additionally, numerous small-scale drainage reports have been prepared by the many developers in the area. A list of these reports is found in Table 1 of Appendix A.1 of this TDN.

Of the washes mapped as part of this floodplain delineation, the Galloway Wash Middle Branch has existing floodplain and floodway mapping, and a small portion of the Unnamed Central Tributary to Cave Creek has existing floodplain mapping. A copy of the work map from the previous Galloway Wash Middle Branch mapping is included in Appendix A.1 of this TDN. The Eastern Pima Wash, most of the Unnamed Central Tributary to Cave Creek, Unnamed Tributary to Stagecoach Pass Wash, and Windmill Wash have not been mapped previously.

1.6 Methodology

The hydrology for the project was completed as part of the Carefree DMP *Data Collection Report*, included as Appendix D.1 of this TDN. That report used the U.S. Army Corps of Engineers (USACE) HEC-1 software package to generate a rainfall-runoff model for the 100-year, 24-hour and 100-year, 6-hour storm events.

The hydraulic model for the floodplain mapping was created using the USACE HEC-RAS (River System Analysis) computer software program, version 3.0.1.

1.7 Acknowledgments

The preparation of the floodplain delineation portion of the Carefree DMP could not have been completed without the review and input of the following individuals: Mr. Doug Williams/FCDMC, Ms. Marilyn DeRosa/FCDMC, Mr. Tim Murphy/FCDMC, Mr. Richard Harris/FCDMC, Dr. Erich Korsten/Town of Carefree, Mr. Jonathan Pearson/Town of Carefree, and Mr. Bill Erickson/City of Scottsdale. Mr. Jon Fuller/JE Fuller Hydrology & Geomorphology, Inc., provided invaluable assistance from the previous work he performed on Andora Hills and Galloway Washes.

1.8 Study Results

Floodplain delineations were performed on Unnamed Central Tributary to Cave Creek to Terravita Way, Unnamed Tributary to Stagecoach Pass Wash, Windmill Wash, and Eastern Pima Wash. Floodplain and floodway delineations were performed on the Galloway Wash Middle Branch. These delineations were performed using the USACE HEC-RAS computer

software program for the peak 100-year discharges for the 6-hour or 24-hour duration rainfall events.

SECTION 2

ADWR / FEMA Forms

This section contains the Arizona Department of Water Resources (ADWR) form and the FEMA forms:

Galloway Wash Middle Branch
Eastern Pima Wash
Unnamed Tributary to Stagecoach Pass Wash
Unnamed Central Tributary to Cave Creek to Terravita Way
Windmill Wash

Study Documentation Abstract for FEMA Submittals	Initial Study		Restudy		CLOMR		LOMR		Other	

Section 2.1: Study Documentation Abstract for FEMA Submittals

2.1.1	Date Study Accepted	
2.1.2	Study Contractor Contact(s) Address Phone Internal Reference Number	CH2M HILL Tony Bokich 2625 South Plaza Drive, Suite 300 Tempe, AZ 85282 480-966-8188 162944
2.1.3	FEMA Technical Review Contractor Contact(s) Address Phone Internal Reference Number	Baker and Associates Perniel Buch-Pederson 3601 Eisenhower Avenue, Suite 601 Alexandria, VA 22304 703-960-4400
2.1.4	FEMA Regional Reviewer Phone	Ray Lenaburg 510-627-7181
2.1.5	State Technical Reviewer Phone	
2.1.6	Local Technical Reviewer Phone	Flood Control District of Maricopa County 602-506-4605
2.1.7	Reach Description	See Attachment
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date	Cave Creek USGS 7.5' QUADS 1965 (1981 Revision)
2.1.9	Unique Conditions and Problems	See Attachment
2.1.10	Coordination of Q's Discharges (Agency, Date, Comments)	Flood Control District of Maricopa County, 100-Year, 6-Hour and 24-Hour HEC-1 Model Utilized for peak discharges in HEC-RAS models - has been approved by FCDMC.

ADWR Abstract Attachment

TO: ADWR

FROM: Robert Lyons\PHX

DATE: April 30, 2004

2.1.7 Reach Description:

Galloway Wash Middle Branch, Eastern Pima Wash, unnamed tributary to Stage Coach Pass Wash, unnamed Central tributary to Cave Creek, Windmill Wash, panel numbers 0808H, 0809H, 0815H, 0820F, 0850E.

2.1.9 Unique Conditions and Problems

The Unnamed Central Tributary to Cave Creek splits three ways at Terravita Way during the 1% annual chance flood. The majority of the flows remain in the North and West branches with the remainder flowing south. Floodplain delineation downstream of Terravita Way will be performed under a separate study and contract.

Galloway Wash Middle Branch

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040126	Town of Carefree	AZ	04013C	0808H	07/21/01
[illegible]126	Town of Carefree	AZ	04013C	0809H	07/21/01

2. Flooding Source: Galloway Wash Middle Branch

3. Project Name/Identifier: Carefree Drainage Master Plan

4. FEMA zone designations affected: AE,X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☐ Physical Change ☒ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included?

☐ Yes Fee amount: $

☒ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Richard Harris, P.E., C.F.M.	Company: Flood Control District of Maricopa Count	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required):		Date: 06/15/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Jonathan Pearson, Town Administrator		Telephone No.: 480 488 3686
Community Name: Town of Carefree	Community Official's Signature (required):	Date: 6/18/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Tony A Bokich, P.E.	License No.: 24971 (AZ)	Expiration Date: 3/31/2005
Company Name: CH2M HILL	Telephone No.: 480 966 8188	Fax No.: 480 966 9450
Signature:		Date: 6-14-05

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24971
TONY A. BOKICH
Date Signed 9-9-03
ARIZONA, U.S.A.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Galloway Wash Middle Branch
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☐ No existing analysis ☒ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)
Confluence, Lower Branch	3.3	1719	2423
Pima Road	2.8	1574	2124

Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1, Version 4.1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Galloway Wash Confluence	AD, 0.0000	2395, NGVD 1929	2398, NGVD 1929
Upstream Limit	Carefree Town Boundary	AW, 1.6060	2596, NGVD 1929	2596, NGVD 1929

Hydraulic Method Used

Hydraulic Analysis HEC-RAS, Version 3.0.1 [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name: See Attached	Floodway File Name: See Attached
Corrected Effective Model*	Natural File Name: MG_Final.prj	Floodway File Name: MG_Final.prj
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name:	Floodway File Name:
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☒ Yes ☐ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEMA Form Explanations – Galloway Wash Middle Branch

TO: FEMA

FROM: Robert Lyons\PHX

DATE: March 29, 2003

MT-2 Form 2, Section B. Hydraulics, 4: As the Flood Control District of Maricopa County (FCDMC) and Michael Baker, Jr., Inc. agreed on 3-28-03, no duplicate effective model will be necessary in the study submittal for Galloway Wash Middle Branch. This is because wash topography has changed and the hydrology has been updated since the original study acceptance. Therefore, the duplicate effective model would not be relevant. During an information search, FCDMC staff attempted but was not able to recover the effective model. During the forthcoming study review process, Michael Baker, Jr., Inc. , on behalf of FEMA, has agreed to try to locate the model in their hydraulic model archives.

Form 1, Section C. Review Fee: Galloway Wash Middle Branch has not had any flood control structures construction since the original floodplain study. The study is based solely on more detailed data. Therefore, it is exempt from any review fees.

Eastern Pima Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

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A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
[illegible]0126	Town of Carefree	AZ	04013C	0809H	07/21/01
[illegible]126	Town of Carefree	AZ	04013C	0850E	07/21/01

2. Flooding Source: Eastern Pima Wash

3. Project Name/Identifier: Carefree Drainage Master Plan

4. FEMA zone designations affected: AE,X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☒ Improved Methodology/Data

   ☐ Regulatory Floodway Revision ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

   b. The area of revision encompasses the following types of flooding and structures (check all that apply)

   Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

   Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

   ☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $4,200

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Richard Harris, P.E., C.F.M.	Company: Flood Control District of Maricopa Count	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required): Richard P. Harris		Date: 06/15/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Jonathan Pearson, Town Administrator		Telephone No.: 480 488 3686
Community Name: Town of Carefree	Community Official's Signature (required): Jonathan M Pearson	Date: 6/18/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Tony A Bokich, P.E.	License No.: 24971 (AZ)	Expiration Date: 3/31/2005
Company Name: CH2M HILL	Telephone No.: 480 966 8188	Fax No.: 480 966 9450
Signature:		Date: 6-14-04

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Registered Professional Engineer (Civil) CERTIFICATE NO. 24971 TONY A. BOKICH Date Signed 9-9-03 ARIZONA, U.S.A.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Eastern Pima Wash
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☒ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)

Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach *your explanation for why sediment transport was not considered.*

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Stage Coach Pass	0.0069	N/A	2560.50, NGVD 1929
Upstream Limit	R.S. 0.9247	0.9247	N/A	2647.48, NGVD 1929

Hydraulic Method Used

Hydraulic Analysis HEC-RAS [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name: PM_Final.prj	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name:	Floodway File Name:
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

MEMORANDUM CH2MHILL

FEMA Form Explanations - Eastern Pima Wash

TO: FEMA

FROM: Robert Lyons\PHX

DATE: March 29, 2003

Form 1, Section C. Review Fee: Eastern Pima Wash is a new study area.

Unnamed Tributary to Stagecoach Pass Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

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A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040126	Town of Carefree	AZ	04013C	0809H	07/21/01
[illegible]126	Town of Carefree	AZ	04013C	0850E	07/21/01

2. Flooding Source: Unnamed Tributary to Stagecoach Pass Wash

3. Project Name/Identifier: Carefree Drainage Master Plan

4. FEMA zone designations affected: AE,X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☐ Physical Change ☒ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $4,200

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Richard Harris, P.E., C.F.M.	Company: Flood Control District of Maricopa Count	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required): Richard P. Harris		Date: 06/15/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Jonathan Pearson, Town Administrator		Telephone No.: 480 488 3686
Community Name: Town of Carefree	Community Official's Signature (required): Jonathan P. Pearson	Date: 6/18/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Tony A Bokich, P.E.	License No.: 24971 (AZ)	Expiration Date: 3/31/2005
Company Name: CH2M HILL	Telephone No.: 480 966 8188	Fax No.: 480 966 9450
Signature:		Date: 6-14-05

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required If ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Registered Professional Engineer (Civil) CERTIFICATE NO. 24971 TONY A. BOKICH Date Signed 9-9-03 ARIZONA, U.S.A.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Unnamed Tributary to Stagecoach Pass Wash
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☒ No existing analysis ☐ Improved data
☐ *Alternative methodology* ☐ *Proposed Conditions (CLOMR)* ☐ *Changed physical condition of watershed*

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)

Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1, Version 4.1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Stage Coach Pass Wash	0.0186	N/A	2617.10, NGVD 1929
Upstream Limit	Carefree Town Boundary	0.8171	N/A	2706.75, NGVD 1929

Hydraulic Method Used

Hydraulic Analysis HEC-RAS, Version 3.0.1 [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name: SCP_Final.prj	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name:	Floodway File Name:
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

If Yes, *attach evidence of regulatory floodway revision notification.* As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

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Flooding Source: Unnamed Tributary to Stagecoach Pass Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: RM 0.3527 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.3527

   Downstream Limit/Cross Section: 0.3407

   Upstream Limit/Cross Section: 0.3647

2. **Name of Structure: RM 0.4910 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.4910

   Downstream Limit/Cross Section: 0.4880

   Upstream Limit/Cross Section: 0.4940

3. **Name of Structure: RM 0.5170 Private Driveway Culvert**

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.5170

   Downstream Limit/Cross Section: 0.5142

   Upstream Limit/Cross Section: 0.5198

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: Unnamed Tributary to Stagecoach Pass Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... *complete Section B*
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. Name of Structure: Wildflower Road Culvert

Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: RM 0.5727

Downstream Limit/Cross Section: 0.5624

Upstream Limit/Cross Section: 0.5727

2. Name of Structure: Romping Road Culvert

Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: RM 0.7537

Downstream Limit/Cross Section: 0.7448

Upstream Limit/Cross Section: 0.7626

3. Name of Structure:

Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure:

Downstream Limit/Cross Section:

Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

me of Structure:

1. Accessory Structures

   The channelization includes (check one):

   ☐ Levees [Attach Section E (Levee/Floodwall)]
   ☐ Superelevated sections
   ☐ Debris basin/detention basin
   ☐ Other (Describe):
   ☐ Drop structures
   ☐ Transitions in cross sectional geometry
   ☐ Energy dissipator

2. Drawing Checklist

   Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

   The channel was designed to carry (cfs) and/or the -year flood.

   The design elevation in the channel is based on (check one):

   ☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

   If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

   ☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
   ☐ Other locations (specify):

4. Sediment Transport Considerations

   Was sediment transport considered? ☐ Yes ☒ No If Yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Unnamed Tributary to Stagecoach Pass Wash

Name of Structure: All Culverts

1. This revision reflects (check one):

   ☒ New bridge/culvert not modeled in the FIS
   ☐ *Modified bridge/culvert previously modeled in the FIS*
   ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

   ☐ Dimensions (height, width, span, radius, length)
   ☐ Shape (culverts only)
   ☐ Material
   ☐ Beveling or Rounding
   ☐ Wing Wall Angle
   ☐ Skew Angle
   ☐ Distances Between Cross Sections
   ☐ Erosion Protection
   ☐ Low Chord Elevations – Upstream and Downstream
   ☐ Top of Road Elevations – Upstream and Downstream
   ☐ Structure Invert Elevations – Upstream and Downstream
   ☐ Stream Invert Elevations – Upstream and Downstream
   ☐ Cross-Section Locations

4. Sediment Transport Considerations

   Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why sediment transport was not considered.

FEMA Form Explanations – Unnamed Tributary to Stagecoach Pass Wash

TO: FEMA

FROM: Robert Lyons\PHX

DATE: September 2, 2003

Form 3, Section C. Bridge/Culvert, 3: For all culverts refer to Appendix C.2 for surveyed information.

Unnamed Central Tributary to Cave Creek

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

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A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040126	Town of Carefree, City of Scottsdale	AZ	04013C	0815H	07/21/01
040126	Town of Carefree, City of Scottsdale	AZ	04013C	0820F	07/21/01

2. Flooding Source: Unnamed Central Tributary to Cave Creek

3. Project Name/Identifier: Carefree Drainage Master Plan

4. FEMA zone designations affected: AE,X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☐ Physical Change ☒ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $

☒ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Richard Harris, P.E., C.F.M.	Company: Flood Control District of Maricopa Count	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required):		Date: 06/15/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Jonathan Pearson, Town Administrator		Telephone No.: 480 488 3686
Community Name: Town of Carefree	Community Official's Signature (required):	Date: 6/18/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Tony A Bokich, P.E.	License No.: 24971 (AZ)	Expiration Date: 3/31/2005
Company Name: CH2M HILL	Telephone No.: 480 966 8188	Fax No.: 480 966 9450
Signature:		Date: 6-14-05

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Registered Professional Engineer (Civil) CERTIFICATE NO. 24971 TONY A. BOKICH Date Signed 9-9-03 ARIZONA, U.S.A.

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

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[illegible]126	Town of Carefree, City of Scottsdale	AZ	04013C	0820F	07/21/01

2. Flooding Source: Unnamed Central Tributary to Cave Creek

3. Project Name/Identifier: Carefree Drainage Master Plan

4. FEMA zone designations affected: AE,X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

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☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

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☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $4,200

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Richard Harris, P.E., C.F.M.	Company: Flood Control District of Maricopa Count	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required): Richard P. Harris		Date: 06/15/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: William Erickson, Floodplain Administrator		Telephone No.: (480) 312-7080
Community Name: City of Scottsdale	Community Official's Signature (required):	Date: 06/15/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Tony A Bokich, P.E.	License No.: 24971 (AZ)	Expiration Date: 3/31/2005
Company Name: CH2M HILL	Telephone No.: 480 966 8188	Fax No.: 480 966 9450
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Registered Professional Engineer (Civil) CERTIFICATE No. 24971 TONY A. BOKICH Date Signed 6-15-04 ARIZONA, U.S.A.

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: Unnamed Central Tributary to Cave Creek
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☒ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	*Drainage Area (Sq. Mi.)*	*FIS (cfs)*	*Revised (cfs)*

Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1, Version 4.1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Terravita Way	0.8919	N/A	2141.52, NGVD 1929
Upstream Limit	Tom Darlington Drive	2.2214	N/A	2266.55, NGVD 1929

Hydraulic Method Used

Hydraulic Analysis HEC-RAS, Version 3.0.1 [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name: UC_Final.prj	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name:	Floodway File Name:
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Unnamed Central Tributary to Cave Creek
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: East Terravita Way Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.8966

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section: 0.9094

2. **Name of Structure: Tom Darlington Drive Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 2.2214

   Downstream Limit/Cross Section: 2.2064

   Upstream Limit/Cross Section:

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Unnamed Central Tributary to Cave Creek

Name of Structure: All Culverts

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS, CulvertMaster
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

MEMORANDUM CH2MHILL

FEMA Form Explanations – Unnamed Central Tributary to Cave Creek

TO: FEMA

FROM: Robert Lyons\PHX

DATE: September 2, 2003

Form 3, Section C. Bridge/Culvert, 3: For East Terravita Way Culverts: Refer to Section D.5 TDN. For the Tom Darlington Drive culvert, refer to Appendix C.2 for surveyed information.

Windmill Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040126	Town of Carefree	AZ	04013C	0809H	07/21/01
[illegible]126	Town of Carefree	AZ	04013C	0850E	07/21/01

2. Flooding Source: Windmill Wash

3. Project Name/Identifier: Carefree Drainage Master Plan

4. FEMA zone designations affected: AE,X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☒ Improved Methodology/Data

   ☐ Regulatory Floodway Revision ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

   b. The area of revision encompasses the following types of flooding and structures (check all that apply)

   Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

   Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

   ☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $4,200
	☐ No, Attach Explanation	

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Richard Harris, P.E., C.F.M.	Company: Flood Control District of Maricopa Count	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required): Richard P. Harris		Date: 06/15/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Jonathan Pearson, Town Administrator		Telephone No.: 480 488 3686
Community Name: Town of Carefree	Community Official's Signature (required): Jonathan W Pearson	Date: 6/18/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Tony A Bokich, P.E.	License No.: 24971 (AZ)	Expiration Date: 3/31/2005
Company Name: CH2M HILL	Telephone No.: 480 966 8188	Fax No.: 480 966 9450
Signature:		Date: 6-14-05

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Registered Professional Engineer (Civil) CERTIFICATE No. 24971 TONY A. BOKICH Date Signed 9-9-03 ARIZONA, U.S.A.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Windmill Wash
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☒ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)

Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1, Version 4.1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Stage Coach Pass	0.0080	N/A	2488.48, NGVD 1929
Upstream Limit	Twighlight Trail	1.5334	N/A	2634.20, NGVD 1929

Hydraulic Method Used

Hydraulic Analysis HEC-RAS, Version 3.0.1 [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name: WM_Final.prj	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name:	Floodway File Name:
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) -- for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

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Flooding Source: Windmill Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Pima Road Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.9042

   Downstream Limit/Cross Section: 0.9018

   Upstream Limit/Cross Section: 0.9042

2. **Name of Structure: RM 1.0604 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.0604

   Downstream Limit/Cross Section: 1.0584

   Upstream Limit/Cross Section: 1.0661

3. **Name of Structure: Milky Way Culvert**

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.2940

   Downstream Limit/Cross Section: 1.2930

   Upstream Limit/Cross Section: 1.3110

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: Windmill Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: RM 1.3385 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.3385

   Downstream Limit/Cross Section: 1.3364

   Upstream Limit/Cross Section: 1.3431

2. **Name of Structure: RM 1.3786 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.3786

   Downstream Limit/Cross Section: 1.3577

   Upstream Limit/Cross Section: 1.3786

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Windmill Wash South Branch
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization..... complete Section B
Bridge/Culvert..... complete Section C
Dam..... complete Section D
Levee/Floodwall..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Milky Way Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.1083

   Downstream Limit/Cross Section: 0.1002

   Upstream Limit/Cross Section: 0.1163

2. **Name of Structure:**

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Windmill Wash

Name of Structure: All Culverts

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

MEMORANDUM CH2MHILL

FEMA Form Explanations – Windmill Wash

TO: FEMA

FROM: Robert Lyons\PHX

DATE: September 2, 2003

Form 3, Section C. Bridge/Culvert, 3: For all culverts refer to Appendix C.2 for surveyed information.

SECTION 3

Survey and Mapping Information

3.1 Field Survey

Field surveys and controls were provided by Aztec Engineering (Aztec) under subcontract to CH2M HILL. Mr. Al Reece, R.L.S., is the contact person at Aztec, (602) 454-0402. The Survey Report for the project is presented in Appendix C.1 of this TDN. Supplemental field survey work was performed by Aztec between October 2002 and December 2002 to obtain accurate locations and elevations of drainage facilities within the limits of the floodplain models.

Appendix C.2 contains an Existing Facilities map, the Existing Drainage Improvements table and the Carefree Culvert Survey Points table. The Carefree Culvert Survey Points table lists all the survey data points associated with the culverts within the floodplain delineations for the project.

Appendix C.3 contains the survey field notes and survey data points. Field survey control, equipment and accuracy are listed in both the Survey Report in Appendix C.1 and in the field notes in Appendix C.3

3.2 Mapping

Aerial photography was performed by M&B Aerial (M&B internal number FCD-1184) under subcontract to Aztec Engineering. The contact person at M&B was Mr. Robert Moon, R.L.S. The site was flown on August 2, 2001, and topographic mapping for the analyses was prepared by photogrammetric methods to National Map Accuracy Standards. Aerial topographic mapping was prepared at a 1 inch=200 feet horizontal scale and 2-foot contour intervals based on ground control survey data provided by Aztec Engineering. Survey data is presented in the Survey Report for the project in Appendix C.1 of this TDN.

FEMA Form Explanations – Unnamed Central Tributary to Cave Creek

TO: FEMA

FROM: Robert Lyons\PHX

DATE: September 2, 2003

Form 3, Section C. Bridge/Culvert, 3: For East Terravita Way Culverts: Refer to Section D.5 TDN. For the Tom Darlington Drive culvert, refer to Appendix C.2 for surveyed information.

Windmill Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☐ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040126	Town of Carefree	AZ	04013C	0809H	07/21/01
[illegible]126	Town of Carefree	AZ	04013C	0850E	07/21/01

2. Flooding Source: Windmill Wash

3. Project Name/Identifier: Carefree Drainage Master Plan

4. FEMA zone designations affected: AE,X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☐ Physical Change ☒ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $4,200
	☐ No, Attach Explanation	

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Richard Harris, P.E., C.F.M.	Company: Flood Control District of Maricopa Count	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4528	Fax No.: 602-506-4601
	E-Mail Address: rph@mail.maricopa.gov	
Signature of Requester (required): Richard P. Harris		Date: 06/15/04

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Jonathan Pearson, Town Administrator		Telephone No.: 480 488 3686
Community Name: Town of Carefree	Community Official's Signature (required): Jonathan W Pearson	Date: 6/18/04

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Tony A Bokich, P.E.	License No.: 24971 (AZ)	Expiration Date: 3/31/2005
Company Name: CH2M HILL	Telephone No.: 480 966 8188	Fax No.: 480 966 9450
Signature:		Date: 6-14-05

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24971
TONY A.
BOKICH
Date Signed 9-9-03
ARIZONA, U.S.A.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

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Flooding Source: Windmill Wash
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☒ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)

Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1, Version 4.1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Stage Coach Pass	0.0080	N/A	2488.48, NGVD 1929
Upstream Limit	Twighlight Trail	1.5334	N/A	2634.20, NGVD 1929

Hydraulic Method Used

Hydraulic Analysis HEC-RAS, Version 3.0.1 [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name: WM_Final.prj	Floodway File Name: N/A
Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name:	Floodway File Name:
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☐ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: Windmill Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Pima Road Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.9042

   Downstream Limit/Cross Section: 0.9018

   Upstream Limit/Cross Section: 0.9042

2. **Name of Structure: RM 1.0604 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.0604

   Downstream Limit/Cross Section: 1.0584

   Upstream Limit/Cross Section: 1.0661

3. **Name of Structure: Milky Way Culvert**

   Type (check one) ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.2940

   Downstream Limit/Cross Section: 1.2930

   Upstream Limit/Cross Section: 1.3110

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

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Flooding Source: Windmill Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization..... complete Section B
Bridge/Culvert..... complete Section C
Dam..... complete Section D
Levee/Floodwall..... complete Section E
Sediment Transport..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: RM 1.3385 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.3385

   Downstream Limit/Cross Section: 1.3364

   Upstream Limit/Cross Section: 1.3431

2. **Name of Structure: RM 1.3786 Private Driveway Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 1.3786

   Downstream Limit/Cross Section: 1.3577

   Upstream Limit/Cross Section: 1.3786

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

FEDERAL EMERGENCY MANAGEMENT AGENCY

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Flooding Source: Windmill Wash South Branch
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Milky Way Culvert**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: RM 0.1083

   Downstream Limit/Cross Section: 0.1002

   Upstream Limit/Cross Section: 0.1163

2. **Name of Structure:**

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source:

Name of Structure:

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry (cfs) and/or the -year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump *is controlled without affecting the stability of the channel.*

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Windmill Wash

Name of Structure: All Culverts

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ *Modified bridge/culvert previously modeled in the FIS*
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

MEMORANDUM CH2MHILL

FEMA Form Explanations – Windmill Wash

TO: FEMA

FROM: Robert Lyons\PHX

DATE: September 2, 2003

Form 3, Section C. Bridge/Culvert, 3: For all culverts refer to Appendix C.2 for surveyed information.

SECTION 4

Hydrology

4.1 Method Description

The hydrology for the floodplain delineation was previously completed as part of the Carefree DMP *Data Collection Report,* which is included in Appendix D.1 of this TDN.

In the *Data Collection Report,* which is included in Appendix D.1 of this TDN, hydrologic analyses were performed for the 10-year and 100-year frequencies for the 6-hour and 24-hour duration for both the existing and future land use conditions. The 24-hour duration for the 100-year existing conditions model was used in the floodplain modeling effort. The 6-hour duration model time distribution used reflects the time distribution resulting from the August 19, 1954, Queen Creek storm and 13 other heavy storms in central Arizona.

The 24-hour duration models were created using the Soil Conservation Service (SCS) Type II distribution. Rainfall losses were estimated using the Green and Ampt method, and hydrograph generation was by the Clark unit hydrograph method. Routing of hydrographs through the models was accomplished by normal depth storage routing.

The resulting peak flow summary is shown in Table 1 and in Appendix F of the Data Collection Report, which can be found in Appendix D.1 of this report. The flow rates used in the HEC-RAS models were developed directly from the HEC-1 results and in some cases pro-rated between HEC-1 concentration points at roadway crossings or in large HEC-1 sub-basins, refer to Section 5.

Pro-rated flows were made by determining the drainage area contributing to the crossing, and compared to the total area of the respective subbasin or subbasins contributing to the nearest downstream concentration point. The ratio of the area to total area at the downstream concentration point was determined, and the flow to the culvert reduced by that ratio.

4.2 Parameter Estimation

4.2.1 HEC-1 Input Parameters

Peak discharge values were determined using the USACE HEC-1 computer program, version 4.1, dated June 1998, in accordance with the methodology set forth in the *Drainage Design Manual of Maricopa County, Volume I Hydrology.* Input parameters consist of those that characterize precipitation intensity and duration, precipitation losses, and hydrologic routing. Of all these parameters, precipitation intensity and duration exhibit the most variability.

TABLE 1
Flow Summary
From Appendix F

	Total Existing Flows (cfs)				Total Future Flows (cfs)			
Identifier	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**
UC8	39	22	81	82	40	45	82	83
UC9	49	28	83	82	42	46	83	82
CPC8	88	49	163	162	82	90	164	164
RCP89	87	49	161	159	81	87	162	160
UC18	25	12	54	56	43	46	85	82
UC19	19	10	41	39	27	29	54	53
CP1819	131	70	256	250	143	151	287	277
R1819	129	69	254	248	141	148	285	274
UC22	11	12	26	27	22	25	47	48
UC23	13	7	28	27	23	22	41	36
CP2223	150	86	304	295	175	182	356	340
R2223	149	86	301	292	173	180	354	337
UC28	33	39	79	79	66	70	135	126
R28	33	39	79	78	66	69	133	124
UC29	19	22	45	45	38	41	79	76
UC30	8	9	17	18	15	15	29	28
CP2930	204	141	438	427	278	284	573	534
R2930	204	140	436	423	276	280	566	530
UC34	33	31	71	71	59	57	112	99
CP34	232	155	496	477	309	310	630	580
R34	228	152	478	455	300	299	593	551
UC37	101	96	207	197	138	141	276	267
UC35	283	291	591	528	283	291	549	528
CP3537	453	387	917	877	610	644	1152	1158
R3537	450	384	911	872	603	636	1146	1147
UC49	78	74	134	123	78	74	134	123
UC31	215	211	473	814	361	365	748	716
CP3149	623	591	1305	1608	862	987	1668	1802
R3149	622	591	1303	1598	861	984	1663	1797
UC46	63	59	107	94	63	59	107	94
R46	62	57	104	92	62	57	104	92
UC45	157	147	266	235	157	147	266	235
UC47	50	48	87	79	50	48	87	79
CP4547	265	247	451	402	265	247	451	402
R4547	259	240	439	390	259	240	440	390
UC48	226	224	418	397	226	224	410	397
UC50	28	27	51	47	28	27	51	47
CP4850	821	954	1689	2335	1095	1309	2120	2467
R4850	821	948	1683	2308	1091	1298	2113	2449
UC51	95	92	170	156	105	99	190	164
UC57	36	40	74	72	36	40	74	72
CP5157	865	1031	1761	2447	1126	1345	2189	2551
R5157	860	1016	1756	2422	1121	1336	2180	2532
UC58	156	156	284	262	157	157	284	264
UC59	15	18	39	41	30	34	67	67

TABLE 1
Flow Summary
From Appendix F

	Total Existing Flows (cfs)				Total Future Flows (cfs)			
Identifier	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**
CP5859	929	1130	1881	2622	1190	1426	2315	2719
D5859S	462	562	935	1303	591	709	1151	1351
D5859N	467	569	946	1319	599	717	1164	1368
R5859N	466	562	944	1311	597	713	1160	1362
UC68	132	141	259	248	134	142	262	251
CP63	533	663	1064	1489	661	794	1285	1528
R63	532	661	1063	1480	660	793	1283	1522
UC66	31	36	68	79	37	41	78	76
UC62	408	423	791	762	417	431	819	775
CP6266	787	1065	1528	2173	906	1182	1742	2199
R6266	786	1060	1527	2164	906	1177	1740	2187
D5859S	462	562	935	1303	591	709	1151	1351
R5859S	462	561	933	1288	591	707	1147	1342
UC64	6	6	5	5	6	6	12	11
CP64	465	564	935	1290	593	708	1152	1348
D64S	209	254	421	580	267	318	519	606
D64N	256	310	514	709	326	389	634	741
RD64N	255	307	512	697	325	387	630	730
UC87	9	12	24	30	19	28	50	49
CP87	259	317	527	723	331	395	643	743
RD87N	259	318	526	721	330	394	643	743
UC82	23	25	50	48	32	32	63	56
CP82	1030	1382	2017	2849	1216	1554	2343	2882
R82	1030	1380	2015	2842	1216	1550	2340	2875
D84S	93	30	279	686	9	82	492	703
D84N	938	1350	1736	2157	1208	1467	1908	2172
UC84	14	13	24	24	20	15	30	29
CP84	945	1359	1747	2174	1210	1474	1919	2183
R84	941	1329	1738	2153	1200	1454	1909	2163
UC79	58	68	138	139	61	71	145	142
UC78	275	263	103	449	266	263	491	449
CP7879	1019	1411	1837	2328	1265	1531	2076	2331
R7879	1019	1410	1837	2327	1265	1532	2075	2329
UC77	109	115	208	225	113	119	215	205
CP77	1068	1464	1913	2417	1304	1582	2169	2432
R77	1067	1460	1912	2416	1304	1580	2165	2429
UC89	54	61	119	122	74	81	153	148
CP89	1097	1500	1972	2500	1330	1613	2233	2505
R89	1094	1482	1965	2491	1323	1598	2223	2493
UC74	67	139	265	264	171	180	331	317
UC76	42	45	83	81	51	53	97	91
CP7476	81	179	342	339	219	230	426	406
R7476	81	179	341	339	219	230	424	404
UC75	180	292	368	365	220	233	431	410
CP75	246	426	699	692	434	453	852	808

TABLE 1
Flow Summary
From Appendix F

	Total Existing Flows (cfs)				Total Future Flows (cfs)			
Identifier	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**
R75	246	424	696	684	432	452	841	795
UC90	16	21	46	50	33	37	78	76
UC91	39	41	86	84	76	82	153	147
CP90EN	1263	1706	2383	3132	1517	1838	2692	3188
D84S	93	30	279	686	9	82	432	703
RD84S	83	31	279	685	9	84	432	706
D84iiN	80	30	249	576	9	82	372	592
D84iiS	4	1	31	110	1	3	60	114
RD84iS	2	0	21	79	0	1	47	85
UC94	12	11	22	18	12	11	22	18
CP94DS	10	10	37	94	9	10	63	101
R94DS	10	9	36	89	8	10	61	96
D84iiN	80	30	249	576	9	82	372	592
RD84iN	53	6	203	445	5	29	320	471
UC88	38	33	69	58	38	33	69	58
CP88EN	88	43	280	566	39	64	416	603
UC95	34	34	63	58	50	44	82	71
UC93	27	29	53	53	44	12	82	78
UC96	34	35	72	70	65	70	128	124
North Scottsdale Delineation - from DEI Professional Services								
SCP-7c					154		315	
SCP-7b					87		173	
SCP-7a					131		263	
RSCP7b					82		164	
SCP-7d					42		76	
RSCP7c					150		306	
CSCP7d					256		517	
RSCP7d					256		517	
SCP-4b					182		343	
CSCP07					580		1116	
RSCP07					576		1234	
RSCP4B					165		317	
SCP-4A					97		178	
CSCP06					620		1308	
RSCP06					617		1305	
CSCP04					884		1752	
Andora Hills and Galloway Washes Subbasin Flows - From JE Fuller (Appendix C of this report)								
GVW1	2199	2522	3749	4141	2270	2586	3860	4242
GVW2	2564	3256	4686	5492	3164	3937	5447	6408
GWW1_1	1269	1431	2427	2571	1301	1472	2473	2634
GWW1_2	609	593	1155	1110	688	660	1259	1206
GWW1_3	1026	1068	1876	1916	1026	1068	1876	1916
GWW1_4	682	646	1229	1170	686	649	1233	1173
GWW1_5	801	739	1345	1258	914	837	1497	1400
GWW1_6	503	439	899	794	509	443	904	797

TABLE 1
Flow Summary
From Appendix F

	Total Existing Flows (cfs)				Total Future Flows (cfs)			
Identifier	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**	**10-yr 6-hr**	**10-yr 24-hr**	**100-yr 6-hr**	**100-yr 24-hr**
GVW3_1	656	633	1227	1178	694	677	1294	1254
GVW3_2	716	682	1303	1248	739	711	1340	1294
GVW3_3	376	318	643	551	385	325	657	562
AHW1	698	553	1255	811	708	561	1258	814
AHW2	105	82	181	117	105	82	177	121
AHW3	326	265	666	464	422	337	781	520
AHW4	212	168	388	262	214	169	382	271
AHW5	240	191	447	289	299	239	514	321
AHW6	381	329	896	716	704	595	1344	986
AHW7	478	378	862	584	499	393	872	607
AHW8	845	678	1419	849	855	685	1416	862
AHW9	419	337	829	554	458	366	853	595

4.2.2 Rainfall Losses

Precipitation loss rates were estimated using the Green and Ampt Infiltration Equation option in HEC-1. The Green and Ampt Parameters XKSAT (hydraulic conductivity at natural saturation), PSIF (wetting front capillary suction), DTHETA (volumetric soil moisture deficit at the start of rainfall), and IA (surface retention loss parameter) have been determined for each subbasin. The area of each soil unit within each subbasin was computed using maps from the SCS's Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona, then a log-weighted set of Green-Ampt parameters for each subbasin was calculated. Table 4 in Appendix D.1 of this TDN contains a summary of the specific loss parameters for each basin.

4.2.3 Land Usages

Land uses in the Town consist primarily of medium-density residential developments, low-density residential developments, with minor and major streets and highways, commercial development and undeveloped lands. Digital format of existing land use information for the watershed was supplied by the FCDMC. Land use was determined by overlaying the basin boundaries on the existing land uses.

4.2.4 Unit Hydrographs

The Maricopa County Unit Hydrograph Procedure 1 (MCUHP1) program was used to compute Tc and R values for all of models and flow conditions. A summary of these values is contained in Table 8 of Appendix D.1 of this TDN.

4.2.5 Flow Splits and Diversions

The Unnamed Central Wash contains four identified flow splits. These occur at the southernmost portion of the basin, near Carefree Highway. In three out of the four flow

splits (HEC-1 identifiers D5859, D87, and D84), flows remain within the watershed, with portions of the flow transferred to different subbasins. In the remaining flow split at D64, a portion of the flow is transferred offsite to the south, out of the studied watershed.

Flow splits were determined by the hydraulic properties of the channels immediately downstream of the split. A rating curve was developed for each flow split. The division of flow at D84 (of the HEC-1 model), which will occur at Terravita Way immediately south of Carefree Highway (outside the Town limits), will occur at a culvert system with an overland flow component. Detailed floodplain delineation for the Carefree DMP project ends at Terravita Way. Appendix D.5 of this TDN contains the computations associated with the rating curve developments.

4.2.6 Comparison of Results with Regional Regression Equations

The hydrology results were compared with two regional regression equations. These equations were developed as a means to estimate the flood magnitudes on ungauged streams and use the variables of drainage area, mean basin elevation, and mean annual precipitation. The two methods are the USGS Method, as found in the Arizona Department of Transportation *Highway Drainage Design Manual Hydrology*, dated March 1993, and the ADWR Method, found in the Arizona Department of Water Resources' *A Study to Evaluate Existing Methods for Determining Peak Discharges for Ungauged Watersheds in Arizona – Phase II and III*, dated 1995. Table 13 in Appendix A of the *Data Collection Report*, which can be found in Appendix D.1, contains a summary of the equations and results. Appendix F, Flow Summary Table of the Data Collection Report, which can be found in Appendix D.1 of this report, provided the flows used in this analysis. This table also includes the flows determined in previous studies by JE Fuller for Andorra Hills and Galloway Washes (FCD 99-14) and by DEI for the North Scottsdale Delineation Study (FCD 2001C009).

SECTION 5

Hydraulics

5.1 Method Description

Five washes within the Town and City of Scottsdale were mapped as part of this project. They are:

- Galloway Wash Middle Branch
- Unnamed Tributary to Stagecoach Pass Wash
- Eastern Pima Wash
- Windmill Wash
- Unnamed Central Tributary to Cave Creek to Terravita Way

These washes are typical desert washes comprised of mostly sandy to sand/cobble bottoms. While the main channels are typically sparsely vegetated, the overbank areas are composed of desert brush, trees, and cactus. The general slope of the mapped washes is between 2 and 4 percent, and the flow regime is at or near critical depth. Unless an upstream constraint exists, such as a roadway or culvert, the starting water surface elevation used in the HEC-RAS model was set at critical depth. Additionally, cross sections were extended upstream from the delineation limits to ensure that any error that might be caused by the starting water surface elevation would not affect the area subject to floodplain mapping. In the washes that were bounded by an upstream roadway or culvert, a detailed analysis of culvert capacity and overtopping was performed. These analyses are included in Appendix D.5 and Appendix E.4 of this TDN.

In most cases, the Town limits determined the upstream and downstream limits of study. However, Unnamed Central Tributary to Cave Creek mapping includes a portion of the wash within the City of Scottsdale and the detailed floodplain analysis stops at Terravita Way.

The flow rates used in the floodplain models were obtained from the HEC-1 models for the 100-year, 24-hour duration, existing conditions, refer to Section 4. Table 2 contains a Summary of HEC-RAS Model Flow Changes.

The hydraulic analysis of the washes was performed using USACE HEC-RAS River Analysis System computer software program, version 3.0.1 dated March, 2001.

5.2 Work Study Maps

Floodplain maps were prepared from the topographic mapping prepared for the project by M&B Aerial, flown on August 2, 2001. The full-size maps are at a scale of 1 inch = 200 feet with a contour interval of 2 feet, and are included in Volume III of this TDN.

The work study maps follow the format supplied by the FCDMC. Cross section identifiers are based upon river miles above the downstream delineation limits, and correspond to the

TABLE 2
Summary of HEC-RAS Model Flow Changes

Unnamed Central Tributary to Cave Creek

From R.S. to R.S.	Discharge	Flow Equation	Source
Main			
2.2214 to 2.2064	1652	=Flow at Culvert #36 CP3149 + 93% of UC50	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
2.1828 to 2.1684	2335	=CP4850	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
2.1443 to 2.0829	2363	Add 40% of UC57	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
2.0456 to 1.9389	2391	Add 40% of UC57	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.9192 to 1.8424	2447	=CP5157	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.8096 to 1.6113	2467	Add 50% of UC59	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.5812 to 1.5549	2622	=CP5859	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.5234	2822	Add 80% of UC63 and 40% of UC 64	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.4675 to 1.3724	2779	=CP64+CP63	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.3235	2854	Add 80% of UC66 and 40% of UC87	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.2701 to 1.2175	2274	Subtract D64S	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.1824 to 1.0158	2764	=97% of CP82	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.9888 to 0.9593	2849	=CP82	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
North Branch			
0.9285 to 0.9094	2174	=CP84	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04

Galloway Wash Middle Branch

From R.S. to R.S.	Discharge	Flow Equation	Source
Middle Branch 2			
0.2762 to 0.2211	209	=JEF #41	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.2045 to 0.1105	228	=JEF #41 + 1/2*(42-41)	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.101 to 0.0439	247	=JEF #42	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
Middle Branch			
1.6862 to 1.606	2094	=JEF #43	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
1.5884 to 1.4639	2124	=JEF #43 + 1/2*(44-43)	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
1.4317 to 0.9366	2153	=JEF #44	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.9152 to 0.6777	2179	=JEF #44 + 1/2*(45-44)	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.6468 to 0.5644	2204	=JEF #45	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.5272 to 0.3517	2210	=JEF#46	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
Combined			
0.3065 to 0	2423	=CP286R	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02

Unnamed Tributary to Stagecoach Pass Wash

From R.S. to R.S.	Discharge	Flow Equation	Source
Stagecoach Trib			
0.8707 to 0.6242	84	=Flow at Culvert #153 (32% of SCP7A)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.6025 to 0.3933	152	=Flow at Culvert #146 (58% SCP7A)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.3828 to 0.0186	225	=Flow at Culvert #158 (85% SCP7A)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02

TABLE 2
Summary of HEC-RAS Model Flow Changes

Unnamed Central Tributary to Cave Creek

From R.S. to R.S.	Discharge	Flow Equation	Source
South Branch			
0.9065	685	=RD84S	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.8919	576	=D84iiN (142 cfs diverted to the south)	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04

Galloway Wash Middle Branch

From R.S. to R.S.	Discharge	Flow Equation	Source

Unnamed Tributary to Stagecoach Pass Wash

From R.S. to R.S.	Discharge	Flow Equation	Source

Windmill Wash

From R.S. to R.S.	Discharge	Flow Equation	Source
North Branch			
1.6576 to 1.3215	64	=Flow at Culvert #166 (78% of UC8)	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.311	77	=Flow at Culvert #163 (94% of UC8)	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
1.2930 to 1.2388	131	=Flow at Culvert #163 + Flow at Culvert #165	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
South Branch			
0.4414 to 0.1163	54	=Flow at Culvert #165 (66% of UC9)	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.1163 to 0.0395	131	=Flow at Culvert #163 + Flow at Culvert #165	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
Combined Branch			
1.1975 to 0.9441	162	=CPC8	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.9196 to 0.6835	198	Add 64% of UC18	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.6472 to 0.356	250	=CP1819	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.3444 to 0.0644	295	=CP2223	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.0243 to 0.008	338	Add 96% of UC29	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04

Pima Wash

From R.S. to R.S.	Discharge	Flow Equation	Source
Pima			
1.0178 to 0.5707	71	=Flow at Culvert #167 (21% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.5548 to 0.2552	134	=Flow at Culvert #160 (39% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.2246 to 0.0391	295	=Flow at Culvert #161 (86% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.0069	323	=Flow at Culvert #111 (94% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02

Unnamed Central Tributary to Cave Creek - Diversion Branch

From R.S. to R.S.	Discharge	Flow Equation	Source
Main			
0.1797	494	=494 cfs Div for Los Reales	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04
0.1569 to 0.0241	894	=494 cfs Div + 400 cfs (Div. from South Branch)	CH2M HILL, Carefree DMP, Data Collection Report, 03 / 04

length along the hydraulic baseline, also called the thalweg. Water surface elevations are contained in the tables on each map.

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

The procedure presented in *Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona* (USGS, 1991) was used to estimate roughness coefficients for input into the models. The procedure consists of selecting a base roughness coefficient (or "n" value), and then applying adjustments for site-specific factors such as channel irregularity, obstructions, vegetation, and meandering. The formula is as follows:

$$n = (n_b + n_1 + n_2 + n_3) \times M_f$$

Where:
- n = final roughness coefficient
- n_b = base n-value, representative of a straight, uniform channel
- n_1 = surface irregularity factor
- n_2 = obstruction factor
- n_3 = vegetation factor
- M_f = meandering factor

The washes were surveyed for reaches with similar characteristics, and a composite n-value was generated for each similar reach. Instead of calculating one factor for the overbanks and main channel, the "horizontal variation in n-values" feature of HEC-RAS was used, where the program calculates the best composite n-value for each cross section. Appendix E.1 of this TDN contains plots of the entire study area overlain with n-value results. To assist in documenting the n-values, photos were taken of each wash. Prior to photographing each wash, blocks of numbers were assigned to different portions of the wash to aid in tracking the photos. Consequently some numbers or portions of block sequences were not used which results in gaps in the photo sequence located in Appendix E.1 of this TDN. Photo numbers not used are 66, 69, 111-119, 149-159 and 175-179.

5.3.2 Expansion and Contraction Coefficients

Normal expansion and contraction coefficients of 0.1 and 0.3, respectively, were used throughout a majority of the study washes. However, the coefficients were increased in all areas where the water surface top width change was more than 150 percent. This is particularly evident at many of the culvert crossings within the study and, consequently, the expansion and contraction coefficients were set at 0.3 and 0.5 respectively.

5.4 Cross Section Description

Cross sections for the study reaches were generally placed no more than 250 feet apart from one another. However, due to the steep nature of the washes, this distance was generally too great, and the average distance between cross sections is approximately 100 feet. Additional cross sections were added where abrupt flow changes occurred, such as at bends, junctions, and flow expansions and contractions. Angled cross sections were

necessary in some areas to account for the shallow, sheet-flow-type flow conditions that exist in the washes.

Cross sections were obtained using a digital terrain model (DTM) used to create the topographical map for the project. Bentley Civil Engineering SelectCAD with the Storm and Sanitary add-on package allows for the direct import of flow line and section data directly into HEC-RAS and maintains geo-referencing. The software used to extract section geometric data is InRoads SelectCAD Version 8.02.

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and Drop Analysis

Due to the steep slopes of all of the washes in the study, the flow regime tends to be supercritical, therefore critical depth was mapped. No special techniques were employed to model hydraulic jumps or drops.

5.5.2 Bridges and Culverts

Numerous culverts exist in the washes. Information on the culverts, such as size (diameter), inverts, overtopping elevations, headwalls, etc., was obtained from a detailed survey performed for this project. Survey information is found in Appendix C of this TDN.

All culverts were modeled in HEC-RAS with the exception of culverts located at the boundaries of the model. Boundary conditions were analyzed using Haestad Methods computer software and can be located in Appendix D.5.

Terravita Way is the downstream boundary of the Unnamed Central Tributary to Cave Creek floodplain model. A culvert and channel analysis was performed to determine the overtopping water surface elevation to be used in the HEC-RAS model. The analysis was also used to determine the flow split at this location, refer to Section 5.5.4.1.

The stationing of the Unnamed Central Tributary to Cave Creek begins at Cave Creek Road, the original starting point of the delineation. However, the delineation section between Cave Creek Road and Terravita Way was removed from this TDN submittal and resides in the TDN Addendum under separate cover.

Some of the culverts were observed to be partially blocked with sediment. Blockage was accounted for in the HEC-RAS program by using the program's sediment blockage depth option.

5.5.3 Levees and Dikes

There are no engineered levee or dike features within the project area.

5.5.4 Islands and Flow Splits

There are numerous flow splits in the Unnamed Central Tributary to Cave Creek model, and islands exist in this model as well as the Galloway Wash Middle Branch model. Islands were only excluded from the mapped floodplain if they were more than 1 foot above the

calculated water surface elevation or if the floodway was mapped as is the case with the Galloway Wash Middle Branch model.

Detailed analysis and calculations were performed at all flow splits using Haestad Methods computer software. Documentation and explanation of methodology at each flow split is included in Appendix D.5 of this TDN. A general description of each flow split is presented below.

5.5.4.1 Terravita Way

A flow-split analysis was used to define the flow distribution at Terravita Way and downstream boundary conditions for HEC-RAS modeling. Flows can go north through 4-10x4 RCBC's, or north, south, or west over the road. Culvert and channel analyses generated a flow-rating table of box culvert and overtopping flows at four low points on the roadway profile. The analysis determined that 1,578 cfs flows through the box culvert while 142 cfs, 562 cfs, and 514 cfs will flow to the south, west, and north, respectively, of Terravita Way.

The total flow used in the analysis is 2,849 cfs. This figure omits the small side channel flow that enters the north side of the main stream about 70 feet upstream of the culvert. This wash (UC84 in the HEC-1 output) was combined at this location after the initial flow split of 2,092 to the north and 704 to the south. It increased the north peak to 2,116 cfs. The difference in peak flows between the overtopping analysis and the HEC-RAS at Terravita Way is a total of 20 cfs or 0.65% of the total flow.

5.5.4.2 Culvert No. 36

Culvert No. 36 at Tom Darlington Road exists as the upstream boundary condition for the Unnamed Central Wash floodplain delineation. According to the hydrology of the project located in the *Data Collection Report, CH2M HILL, 2004,* 1,652 cfs will arrive at the culvert during the 100-year event. Three 60-inch-diameter CMPs convey flow under Tom Darlington at this location.

An overtopping analysis was performed and the results indicate that of the 1,652 cfs, 721 cfs will flow through the culverts, approximately 803cfs will return to the main channel immediately downstream of the culvert headwall, and 128 cfs will travel south, parallel to the road.

5.5.5 Ineffective Flow Areas

Ineffective flow areas exist near most culvert ends due to the contraction and expansion of flow at these structures. Additionally, ineffective flow was found to exist upstream and downstream at buildings that will be surrounded by floodwaters. Additional documentation on the determination of ineffective flow areas is found in Appendix E.5 of this TDN.

5.5.6 Supercritical Flow

The HEC-RAS program indicates that supercritical flow is possible in the subject washes due to the relatively low main channel roughness coefficients and steep slopes. However, supercritical flow in natural wash systems is unstable and often flows nearer to critical

depth. Therefore, the washes were modeled with critical depth as a conservative estimation of the water surface elevation.

5.6 Floodway Modeling

Floodway modeling was performed only on Galloway Wash Middle Branch due to the presence of an existing floodway on this wash. The previous mapping was performed before the residential development in 1988, using 4-foot contour intervals and a scale of 1 inch=400 feet. The new mapping performed as part of this study used newly generated topography with 2-foot contour intervals and a scale of 1 inch=200 feet.

Encroachment Method 5 was used in the HEC-RAS model to allow a 1-foot rise in the energy grade line per Arizona State Standard 3-94. The results were then imported to Method 1 where the floodway was further revised based on topography and existing development. Where the allowable encroachment is within the wash channel or was negligible due to steep side slopes, the encroachment was set at the floodplain. According to the modeling guidelines found in Arizona State Standard 3-94, supercritical floodway limits shall be determined using the rise in energy grade line (rather than water surface elevation) caused by encroachment. Table 3 shows the modeling results.

TABLE 3
Galloway Wash Middle Branch

Flooding Source		Floodway			Base Flood Water Surface					
Cross Section	Distance[1]	Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory (feet NGVD29)	Without Floodway (feet NGVD29)	With Floodway (feet NGVD29)	Increase	Q (cfs)	Depth (feet)
GalMidBrnch Trib										
0.2437	0.2437	25.15	33.90	6.17	2462.65	2462.65	2463.20	0.54	209	1.68
0.2045	0.2045	55.95	48.10	4.74	2458.98	2458.98	2459.33	0.35	228	1.64
0.1760	0.1760	27.61	35.11	6.49	2455.75	2455.75	2456.37	0.63	228	1.26
0.1568	0.1568	39.85	41.93	5.44	2453.81	2453.81	2454.24	0.42	228	1.18
0.1295	0.1295	24.97	34.72	6.57	2451.00	2451.00	2451.55	0.55	228	1.52
0.1105	0.1105	20.77	32.22	7.08	2449.20	2449.20	2449.70	0.50	228	1.38
0.1010	0.1010	50.34	61.47	4.02	2448.40	2448.40	2448.69	0.29	247	1.32
0.0954	0.0954	21.34	34.10	7.24	2447.75	2447.75	2447.86	0.11	247	2.09
0.0792	0.0792	57.32	48.67	5.08	2444.93	2444.93	2445.01	0.08	247	1.06
0.0439	0.0439	52.74	81.66	3.02	2439.81	2439.81	2440.23	0.42	247	1.81
GalMidBrnch										
1.6190	1.6190	117.36	272.23	7.69	2599.95	2599.95	2600.45	0.50	2094	3.35
1.6060	1.6060	126.78	257.75	8.12	2596.35	2596.35	2597.22	0.87	2094	4.36
1.5884	1.5884	264.48	349.60	6.08	2593.49	2593.49	2594.31	0.82	2124	2.91
1.5702	1.5702	95.13	229.44	9.26	2590.43	2590.43	2590.44	0.01	2124	4.79
1.5371	1.5371	213.14	379.27	5.60	2587.34	2587.34	2587.91	0.57	2124	6.31

TABLE 3
Galloway Wash Middle Branch

Flooding Source		Floodway			Base Flood Water Surface					
Cross Section	Distance[1]	Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory (feet NGVD29)	Without Floodway (feet NGVD29)	With Floodway (feet NGVD29)	Increase	Q (cfs)	Depth (feet)
0.5157	0.5157	76.60	229.44	9.63	2463.25	2463.25	2463.49	0.24	2210	3.74
0.5006	0.5006	66.31	228.30	9.68	2459.60	2459.60	2460.14	0.54	2210	3.83
0.4858	0.4858	53.51	202.91	10.89	2458.26	2458.26	2458.45	0.18	2210	4.59
0.4697	0.4697	62.57	210.86	10.48	2455.57	2455.57	2455.57	0.00	2210	3.72
0.4428	0.4428	71.24	220.34	10.03	2452.44	2452.44	2452.46	0.02	2210	3.53
0.4243	0.4243	73.38	223.21	9.90	2450.23	2450.23	2450.19	-0.04	2210	3.51
0.4037	0.4037	60.38	210.20	10.51	2448.12	2448.12	2448.07	-0.05	2210	3.91
0.3785	0.3785	56.00	204.75	10.79	2445.02	2445.02	2444.94	-0.07	2210	4.00
0.3517	0.3517	55.11	212.36	10.41	2442.41	2442.41	2442.37	-0.04	2210	4.84
GalMidBrnch Comb										
0.3065	0.3065	75.47	245.43	9.87	2436.66	2436.66	2436.62	-0.04	2423	4.40
0.2629	0.2629	78.57	242.17	10.01	2430.38	2430.38	2430.40	0.02	2423	3.19
0.2268	0.2268	58.22	219.07	11.06	2426.94	2426.94	2426.92	-0.02	2423	4.00
0.2090	0.2090	58.91	219.78	11.02	2424.87	2424.87	2424.90	0.03	2423	4.07
0.1766	0.1766	44.55	201.95	12.00	2421.55	2421.55	2421.87	0.32	2423	4.37
0.1637	0.1637	50.59	210.71	11.50	2419.93	2419.93	2419.93	0.00	2423	4.35
0.1462	0.1462	64.08	227.64	10.64	2417.32	2417.32	2417.30	-0.02	2423	3.91
0.1223	0.1223	60.80	224.17	10.81	2414.89	2414.89	2414.82	-0.07	2423	3.80
0.1024	0.1024	74.75	237.96	10.18	2411.49	2411.49	2411.44	-0.05	2423	3.36
0.0806	0.0806	85.47	249.36	9.72	2408.73	2408.73	2408.73	0.00	2423	3.54
0.0643	0.0643	77.50	240.89	10.06	2406.96	2406.96	2406.96	0.00	2423	3.60
0.0415	0.0415	105.10	277.95	8.72	2404.07	2404.07	2404.13	0.06	2423	3.40
0.0164	0.0164	118.57	277.24	8.74	2400.03	2400.03	2400.03	0.00	2423	2.98
0.0000	0.0000	111.97	275.48	8.80	2398.16	2398.16	2398.17	0.01	2423	2.73

[1] Miles above confluence with Galloway Wash

5.7 Problems Encountered During the Study

5.7.1 Special Problems and Solutions

5.7.1.1 Flow Splits

The project area contains flow splits, in the Unnamed Central Tributary to Cave Creek. Each flow split is discussed and documented in Appendix D.5 of this TDN.

TABLE 3
Galloway Wash Middle Branch

Flooding Source		Floodway			Base Flood Water Surface					
Cross Section	Distance[1]	Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory (feet NGVD29)	Without Floodway (feet NGVD29)	With Floodway (feet NGVD29)	Increase	Q (cfs)	Depth (feet)
0.5157	0.5157	76.60	229.44	9.63	2463.25	2463.25	2463.49	0.24	2210	3.74
0.5006	0.5006	66.31	228.30	9.68	2459.60	2459.60	2460.14	0.54	2210	3.83
0.4858	0.4858	53.51	202.91	10.89	2458.26	2458.26	2458.45	0.18	2210	4.59
0.4697	0.4697	62.57	210.86	10.48	2455.57	2455.57	2455.57	0.00	2210	3.72
0.4428	0.4428	71.24	220.34	10.03	2452.44	2452.44	2452.46	0.02	2210	3.53
0.4243	0.4243	73.38	223.21	9.90	2450.23	2450.23	2450.19	-0.04	2210	3.51
0.4037	0.4037	60.38	210.20	10.51	2448.12	2448.12	2448.07	-0.05	2210	3.91
0.3785	0.3785	56.00	204.75	10.79	2445.02	2445.02	2444.94	-0.07	2210	4.00
0.3517	0.3517	55.11	212.36	10.41	2442.41	2442.41	2442.37	-0.04	2210	4.84
GalMidBrnch Comb										
0.3065	0.3065	75.47	245.43	9.87	2436.66	2436.66	2436.62	-0.04	2423	4.40
0.2629	0.2629	78.57	242.17	10.01	2430.38	2430.38	2430.40	0.02	2423	3.19
0.2268	0.2268	58.22	219.07	11.06	2426.94	2426.94	2426.92	-0.02	2423	4.00
0.2090	0.2090	58.91	219.78	11.02	2424.87	2424.87	2424.90	0.03	2423	4.07
0.1766	0.1766	44.55	201.95	12.00	2421.55	2421.55	2421.87	0.32	2423	4.37
0.1637	0.1637	50.59	210.71	11.50	2419.93	2419.93	2419.93	0.00	2423	4.35
0.1462	0.1462	64.08	227.64	10.64	2417.32	2417.32	2417.30	-0.02	2423	3.91
0.1223	0.1223	60.80	224.17	10.81	2414.89	2414.89	2414.82	-0.07	2423	3.80
0.1024	0.1024	74.75	237.96	10.18	2411.49	2411.49	2411.44	-0.05	2423	3.36
0.0806	0.0806	85.47	249.36	9.72	2408.73	2408.73	2408.73	0.00	2423	3.54
0.0643	0.0643	77.50	240.89	10.06	2406.96	2406.96	2406.96	0.00	2423	3.60
0.0415	0.0415	105.10	277.95	8.72	2404.07	2404.07	2404.13	0.06	2423	3.40
0.0164	0.0164	118.57	277.24	8.74	2400.03	2400.03	2400.03	0.00	2423	2.98
0.0000	0.0000	111.97	275.48	8.80	2398.16	2398.16	2398.17	0.01	2423	2.73

[1] Miles above confluence with Galloway Wash

5.7 Problems Encountered During the Study

5.7.1 Special Problems and Solutions

5.7.1.1 Flow Splits

The project area contains flow splits, in the Unnamed Central Tributary to Cave Creek. Each flow split is discussed and documented in Appendix D.5 of this TDN.

5.7.1.2 Boundary Conditions

Roadways exist at the upstream and downstream boundaries of most of the models. Due to the geometry of the roadways and occasional undersized culvert, flow splits and backwater conditions are created at the boundaries. In locations where the boundary conditions cause either flow splits or backwater to occur, Appendix D.5 contains a detailed discussion and documentation of the boundary conditions.

5.7.1.3 CHECK-RAS

The USACE distributes a program called CHECK-RAS, which can be used to identify problems in the HEC-RAS model. This program was run on the HEC-RAS files for the Carefree DMP project. The CHECK-RAS printout is included in Appendix G of this document.

A general message was generated for overbank n-values that are less than 0.035, indicating that overbank n-values are usually larger than 0.035. However, detailed calculation of the n-values, both main channel and overbank, was performed as described in Section 5.3.1 of this TDN. The results indicated that areas of overbank exist within the study area with roughness coefficients less than 0.035.

Another general message indicated that increased expansion and contraction coefficients were used in areas outside of structures. Due to the site-specific geometry of some of the washes, these increased coefficients were occasionally necessary in areas where abrupt transitions in flow top width occurred.

5.7.2 Model Warning and Error Messages

There are a number of warning messages associated with the modeling. These are due to the steep nature of the watershed and the ability of the computer software to calculate water surface elevations within the specified number of iterations. These warnings do not affect the accuracy of the results and are intended to alert the modeler of possible conditions outside the expected normal results. The energy loss warning message is also due to the steepness of the washes. To remove the warning message, cross sections would have to be placed very close together, which is not necessary for the study washes as the results would not change.

5.8 Calibration

No special calibration effort was made. There are no gauge data or physical measurements available to calibrate the HEC-RAS models or compare results.

Floodplain and floodway mapping exists from 1988 for Galloway Wash Middle Branch. This previous mapping on Galloway Wash Middle Branch defined a very similar floodplain and floodway corridor, although flow amounts and topographical detail varied. This can be attributed to the well-defined floodplain and overbank limits of this wash.

5.9 Final Results

5.9.1 Hydraulic Analysis Results

See Floodplain Work Study Maps in the TDN Volume III (Maps) for the hydraulic analysis results.

5.9.2 Verification of Results

The results obtained seem to be reasonable with the assumption of critical-depth water surface elevations providing the most conservative answer for floodplain administration purposes. Observations during past and recent runoff events (from photographs and field observations during runoff events) support a super-critical flow regime in the area. However, please note that none of the observed events were a 100-year event. Topographical land forms and drainage patterns also support the horizontal extent of flood flow as mapped in this study.

SECTION 6

Erosion and Sediment Transport

Erosion and sediment transport were not analyzed in this study.

SECTION 7

Draft FIS Data

7.1 Summary of Discharges

Table 4 contains the Summary of Discharges for the Draft FIS data.

TABLE 4
Summary of Discharges for the Draft FIS data

Flooding Source and Location	Drainage Area	Peak Discharge (cfs)
	Sq Mi	100-Year
Galloway Wash Middle Branch		
At confluence with Galloway Wash	3.32	2,423
At River Mile 0.3517 above confluence with Tributary to Galloway Wash Middle Branch		
Tributary to Galloway Wash Middle Branch		
At River Mile 0.0439 above confluence with Galloway Wash Middle Branch	0.18	247
Eastern Pima Wash		
At River Mile 0.0069 above Stagecoach Pass	0.13	323
Unnamed Tributary to Stagecoach Pass Wash		
At confluence with Stagecoach Pass Wash	0.12	225
Unnamed Central Tributary to Cave Creek		
At River Mile 0.9593 above divergence with North and South Branch	2.44	2,849
Unnamed Central Tributary to Cave Creek - North Branch		
At River Mile 0.0146 above Cave Creek Road	2.90	2,462
Unnamed Central Tributary to Cave Creek - South Branch		
At River Mile 0.0151 above Cave Creek Road	2.58	566
Unnamed Central Tributary to Cave Creek - Diversion Branch		
At River Mile 0.0241	N/A	894
Windmill Wash		
At River Mile 0.0800 above Stagecoach Pass	0.04	338
Windmill Wash North Branch		
At River Mile 1.2388 above confluence with Windmill Wash South Branch	0.08	131
Windmill Wash South Branch		
At River Mile 0.0395 above confluence with Windmill Wash North Branch	0.08	131

Tables 5 through 9 contain the Draft FIS Data.

TABLE 5
Draft FIS Data — Galloway Wash Middle Branch

Flooding Source		Floodway			Base Flood Water Surface						
Cross Section	Distance[1]	Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory (feet NGVD29)	Without Floodway (feet NGVD29)	With Floodway (feet NGVD29)	Difference	Proposed Increase	Q (cfs)	Depth (feet)
GalMidBrnch Trib											
0.2437	0.2437	25.15	33.90	6.17	2462.65	2462.66	2463.20	0.54		209	1.68
0.2045	0.2045	55.95	48.10	4.74	2458.98	2458.98	2459.33	0.35		228	1.64
0.1760	0.1760	27.61	35.11	6.49	2455.75	2455.75	2456.37	0.63		228	1.26
0.1568	0.1568	39.85	41.93	5.44	2453.81	2453.81	2454.24	0.43		228	1.18
0.1295	0.1295	24.97	34.72	6.57	2451.00	2451.00	2451.55	0.55		228	1.52
0.1105	0.1105	20.77	32.22	7.08	2449.20	2449.20	2449.70	0.50		228	1.38
0.1010	0.1010	50.34	61.47	4.02	2448.40	2448.40	2448.69	0.29		247	1.32
0.0954	0.0954	21.34	34.10	7.24	2447.75	2447.75	2447.86	0.11		247	2.09
0.0792	0.0792	57.32	48.67	5.08	2444.93	2444.93	2445.01	0.08		247	1.06
0.0439	0.0439	52.74	81.66	3.02	2439.81	2439.81	2440.23	0.42		247	1.81
GalMidBrnch											
1.6190	1.6190	117.36	272.23	7.69	2599.95	2599.95	2600.45	0.50		2094	3.35
1.6060	1.6060	126.78	257.75	8.12	2596.35	2596.35	2597.22	0.87		2094	4.36
1.5884	1.5884	264.48	349.60	6.08	2593.49	2593.49	2594.31	0.82		2124	2.91
1.5702	1.5702	95.13	229.44	9.26	2590.43	2590.43	2590.44	0.01	0	2124	4.79
1.5371	1.5371	213.14	379.27	5.60	2587.34	2587.33	2587.91	0.24		2124	6.31
1.5177	1.5177	172.05	365.67	5.81	2584.71	2584.71	2585.29	0.58		2124	5.92
1.4952	1.4952	74.00	253.64	8.37	2581.75	2581.74	2581.79	0.05		2124	5.40
1.4639	1.4639	103.32	285.49	7.44	2578.24	2578.25	2578.57	0.32		2124	5.09
1.4317	1.4317	126.82	302.18	7.13	2573.67	2573.67	2574.22	0.55		2153	4.19
1.4056	1.4056	114.70	280.28	7.68	2570.55	2570.55	2571.08	0.53		2153	3.91
1.3816	1.3816	128.61	290.56	7.41	2567.77	2567.77	2568.37	0.59		2153	3.62
1.3579	1.3579	142.98	313.74	6.86	2565.15	2565.15	2565.91	0.76		2153	3.40
1.3323	1.3323	113.89	276.15	7.80	2562.27	2562.27	2562.85	0.58		2153	3.45
1.2985	1.2985	111.09	267.20	8.06	2558.94	2558.94	2559.48	0.54		2153	3.75
1.2690	1.2690	147.80	317.26	6.79	2555.13	2555.13	2555.73	0.60		2153	3.43
1.2355	1.2355	96.44	245.08	8.79	2551.21	2551.21	2551.48	0.27		2153	3.23
1.1974	1.1974	121.20	304.29	7.08	2546.81	2546.81	2547.33	0.51		2153	3.27
1.1895	1.1895	184.94	327.98	6.56	2545.45	2545.45	2545.70	0.25		2153	2.98
1.1825	1.1825	250.00	406.70	5.29	2543.69	2543.69	2544.64	0.95		2153	5.24
1.1546	1.1546	159.53	306.85	7.02	2539.25	2539.25	2539.37	0.12		2153	4.27
1.1118	1.1118	66.99	188.45	11.43	2534.97	2534.97	2535.08	0.11		2153	4.42

TABLE 5
Draft FIS Data — Galloway Wash Middle Branch

Flooding Source		Floodway			Base Flood Water Surface						
Cross Section	Distance[1]	Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory (feet NGVD29)	Without Floodway (feet NGVD29)	With Floodway (feet NGVD29)	Difference	Proposed Increase	Q (cfs)	Depth (feet)
1.0780	1.0780	79.85	265.75	8.10	2532.01	2532.01	2532.53	0.51		2153	4.92
1.0256	1.0256	55.97	203.79	10.56	2524.78	2524.78	2524.81	0.03		2153	4.21
0.9784	0.9784	70.76	243.47	8.84	2519.32	2519.32	2519.66	0.34		2153	4.29
0.9552	0.9552	80.14	241.06	8.93	2516.30	2516.30	2516.51	0.21		2153	3.98
0.9366	0.9366	81.33	238.67	9.02	2513.66	2513.66	2513.95	0.29		2153	3.39
0.9152	0.9152	88.44	249.02	8.75	2510.67	2510.67	2511.08	0.41		2179	2.98
0.8808	0.8808	77.84	235.80	9.24	2506.43	2506.43	2506.91	0.48		2179	2.98
0.8441	0.8441	102.22	247.99	8.79	2501.84	2501.84	2502.32	0.48		2179	2.45
0.8041	0.8041	152.54	289.78	7.52	2496.89	2496.89	2497.40	0.51		2179	1.85
0.7560	0.7560	150.08	291.62	7.47	2491.34	2491.34	2491.39	0.05		2179	2.89
0.7272	0.7272	91.36	239.92	9.08	2487.63	2487.63	2488.09	0.46		2179	2.57
0.6777	0.6777	71.11	217.83	10.00	2481.71	2481.71	2481.71	0.00		2179	3.44
0.6468	0.6468	80.11	236.60	9.32	2477.93	2477.93	2478.34	0.42		2204	3.09
0.5954	0.5954	70.32	221.05	9.97	2472.24	2472.24	2472.47	0.23		2204	3.37
0.5644	0.5644	77.03	228.81	9.63	2468.70	2468.70	2468.97	0.27		2204	3.02
0.5272	0.5272	76.90	226.38	9.76	2464.27	2464.27	2464.49	0.22		2210	3.12
0.5212	0.5212	76.27	228.46	9.67	2463.79	2463.79	2464.03	0.23		2210	3.11
0.5157	0.5157	76.60	229.44	9.63	2463.25	2463.25	2463.49	0.24		2210	3.74
0.5006	0.5006	66.31	228.30	9.68	2459.60	2459.60	2460.14	0.54		2210	3.83
0.4858	0.4858	53.51	202.91	10.89	2458.26	2458.26	2458.45	0.18		2210	4.59
0.4697	0.4697	62.57	210.86	10.48	2455.57	2455.57	2455.57	0.00		2210	3.72
0.4428	0.4428	71.24	220.34	10.03	2452.44	2452.44	2452.46	0.02		2210	3.53
0.4243	0.4243	73.38	223.21	9.90	2450.23	2450.23	2450.19	-0.04	0	2210	3.51
0.4037	0.4037	60.38	210.20	10.51	2448.12	2448.12	2448.07	-0.05	0	2210	3.91
0.3785	0.3785	56.00	204.75	10.79	2445.02	2445.02	2444.94	-0.07	0	2210	4.00
0.3517	0.3517	55.11	212.36	10.41	2442.41	2442.41	2442.37	-0.04	0	2210	4.84
GalMidBrnch Comb											
0.3065	0.3065	75.47	245.43	9.87	2436.66	2436.66	2436.62	-0.04	0	2423	4.40
0.2629	0.2629	78.57	242.17	10.01	2430.38	2430.38	2430.40	0.02		2423	3.19
0.2268	0.2268	58.22	219.07	11.06	2426.94	2426.94	2426.92	-0.02	0	2423	4.00
0.2090	0.2090	58.91	219.78	11.02	2424.87	2424.87	2424.90	0.03		2423	4.07
0.1766	0.1766	44.55	201.95	12.00	2421.55	2421.55	2421.87	0.32		2423	4.37
0.1637	0.1637	50.59	210.71	11.50	2419.93	2419.93	2419.93	0.00		2423	4.35
0.1462	0.1462	64.08	227.64	10.64	2417.32	2417.32	2417.30	-0.02	0	2423	3.91
0.1223	0.1223	60.80	224.17	10.81	2414.89	2414.89	2414.82	-0.07	0	2423	3.80
0.1024	0.1024	74.75	237.96	10.18	2411.49	2411.49	2411.44	-0.05	0	2423	3.36

TABLE 5
Draft FIS Data — Galloway Wash Middle Branch

Flooding Source		Floodway			Base Flood Water Surface						
Cross Section	Distance[1]	Width (feet)	Section Area (square feet)	Mean Velocity (feet per second)	Regulatory (feet NGVD29)	Without Floodway (feet NGVD29)	With Floodway (feet NGVD29)	Difference	Proposed Increase	Q (cfs)	Depth (feet)
0.0806	0.0806	85.47	249.36	9.72	2408.73	2408.73	2408.73	0.00		2423	3.54
0.0643	0.0643	77.50	240.89	10.06	2406.96	2406.96	2406.96	0.00		2423	3.60
0.0415	0.0415	105.10	277.95	8.72	2404.07	2404.07	2404.13	0.06		2423	3.40
0.0164	0.0164	118.57	277.24	8.74	2400.03	2400.03	2400.03	0.00		2423	2.98
0.0000	0.0000	111.97	275.48	8.80	2398.16	2398.16	2398.17	0.01		2423	2.73

1 GalMidBrnch Trib: Miles above confluence with Galloway Wash Middle Branch. GalMidBrnch and GalMidBrnch Comb: Miles above confluence with Galloway Wash

TABLE 6
Draft FIS Data — Windmill Wash

Flooding Source		Base Flood Water Surface Elevation			
Cross section	Distance[1]	Regulatory (feet NGVD29)	Q (cfs)	Velocity (fps)	Depth (feet)
North Branch					
1.6576	1.6576	2646.16	64	5.29	1.94
1.6069	1.6069	2641.73	64	2.50	1.56
1.5545	1.5545	2636.04	64	4.16	1.32
1.5334	1.5334	2634.18	64	3.63	0.98
1.5241	1.5241	2632.89	64	3.72	0.65
1.5180	1.5180	2631.73	64	4.00	0.99
1.4884	1.4884	2628.39	64	4.52	1.72
1.4665	1.4665	2625.60	64	5.33	2.05
1.4494	1.4494	2624.48	64	4.65	1.74
1.4322	1.4322	2622.37	64	3.98	1.48
1.4212	1.4212	2621.50	64	4.75	1.35
1.3983	1.3983	2620.22	64	2.09	2.92

TABLE 6
Draft FIS Data — Windmill Wash

Flooding Source		Base Flood Water Surface Elevation			
Cross section	Distance[1]	Regulatory (feet NGVD29)	Q (cfs)	Velocity (fps)	Depth (feet)
1.3577	1.3577	2615.61	64	0.94	3.39
1.3498	1.3498	2615.61	64	0.62	3.87
1.3431	1.3431	2615.61	64	0.34	4.13
1.3364	1.3364	2612.98	64	1.65	2.54
1.3215	1.3215	2612.99	64	0.45	4.23
1.3110	1.3110	2612.99	77	0.31	5.56
1.2930	1.2930	2607.40	131	4.38	2.91
1.2630	1.2630	2602.71	131	5.54	2.40
1.2388	1.2388	2599.46	131	5.79	3.11
South Branch					
0.4414	0.4414	2649.44	54	3.32	1.55
0.4246	0.4246	2647.52	54	4.61	1.67
0.4064	0.4064	2645.54	54	3.07	1.23
0.3881	0.3881	2643.70	54	3.37	0.79
0.3626	0.3626	2640.70	54	4.06	1.08
0.3477	0.3477	2638.37	54	4.51	1.79
0.3206	0.3206	2635.14	54	2.78	1.26
0.3142	0.3142	2634.40	54	3.01	0.74
0.3087	0.3087	2632.72	54	4.48	0.89
0.2943	0.2943	2630.73	54	5.00	1.80
0.2598	0.2598	2626.96	54	4.69	1.68
0.2381	0.2381	2624.54	54	4.64	1.47
0.2104	0.2104	2621.10	54	4.80	1.63
0.1947	0.1947	2619.21	54	4.92	1.86
0.1700	0.1700	2616.44	54	4.27	1.26
0.1554	0.1554	2614.32	54	4.80	1.78
0.1333	0.1333	2612.10	54	0.92	2.61
0.1163	0.1163	2611.65	54	0.42	2.14
0.1002	0.1002	2607.13	131	6.60	3.23
0.0751	0.0751	2604.19	131	4.46	2.03
0.0582	0.0582	2602.70	131	4.01	2.10
0.0395	0.0395	2601.37	131	3.27	1.80
Combined Branch					
1.1975	1.1975	2595.59	162	3.46	2.87

TABLE 6
Draft FIS Data — Windmill Wash

Flooding Source		Base Flood Water Surface Elevation			
Cross section	Distance[1]	Regulatory (feet NGVD29)	Q (cfs)	Velocity (fps)	Depth (feet)
1.1585	1.1585	2591.64	162	3.38	2.11
1.1312	1.1312	2588.64	162	4.54	1.90
1.0986	1.0986	2584.54	162	3.59	2.31
1.0661	1.0661	2581.93	162	2.48	1.58
1.0584	1.0584	2580.70	162	3.41	0.98
1.0311	1.0311	2577.22	162	5.97	2.73
0.9843	0.9843	2573.23	162	3.66	2.04
0.9441	0.9441	2569.84	162	5.31	2.25
0.9196	0.9196	2569.70	198	1.35	3.76
0.9018	0.9018	2566.10	198	5.75	1.78
0.8739	0.8739	2563.38	198	2.81	2.07
0.8413	0.8413	2560.22	198	2.25	2.17
0.8098	0.8098	2557.08	198	0.92	1.97
0.7913	0.7913	2554.53	198	5.64	1.63
0.7752	0.7752	2553.56	198	4.59	2.14
0.7232	0.7232	2548.34	198	3.73	2.31
0.7029	0.7029	2545.95	198	6.08	1.85
0.6835	0.6835	2544.08	198	5.32	1.97
0.6472	0.6472	2541.08	250	4.91	2.05
0.6074	0.6074	2537.71	250	5.36	1.99
0.5522	0.5522	2531.98	250	6.12	1.92
0.5198	0.5198	2529.69	250	6.99	5.64
0.4721	0.4721	2524.20	250	5.93	2.55
0.4363	0.4363	2521.63	250	5.85	1.97
0.4069	0.4069	2519.41	250	5.78	2.23
0.3669	0.3669	2516.26	250	5.91	2.12
0.3560	0.3560	2515.53	250	4.61	2.10
0.3444	0.3444	2514.58	295	5.85	2.10
0.3105	0.3105	2511.80	295	4.10	1.51
0.2744	0.2744	2509.22	295	4.28	1.89
0.2609	0.2609	2508.63	295	3.63	2.52
0.2482	0.2482	2504.84	295	3.47	1.10
0.2005	0.2005	2502.92	295	3.59	2.15
0.1760	0.1760	2500.96	295	5.45	2.17

TABLE 6
Draft FIS Data — Windmill Wash

Flooding Source		Base Flood Water Surface Elevation			
Cross section	Distance[1]	Regulatory (feet NGVD29)	Q (cfs)	Velocity (fps)	Depth (feet)
0.1577	0.1577	2499.82	295	3.93	2.40
0.1306	0.1306	2497.96	295	5.45	2.22
0.1135	0.1135	2496.14	295	5.63	1.99
0.0933	0.0933	2494.05	295	5.80	1.91
0.0644	0.0644	2491.78	295	6.33	2.36
0.0243	0.0243	2488.48	338	6.41	2.44
0.0080	0.0080	2488.48	338	1.77	4.61

1 North Branch and Combined Branch: Miles above Town Boundary. South Branch: Miles above confluence with North Branch.

TABLE 7
Draft FIS Data — East Pima Wash

Flooding Source		Base Flood Water Surface Elevation			
Cross section	Distance[1]	Regulatory (feet NGVD29)	Q (cfs)	Velocity (fps)	Depth (feet)
1.0178	1.0178	2661.71	71	4.96	1.52
0.9929	0.9929	2657.50	71	4.62	1.77
0.9653	0.9653	2653.04	71	4.19	1.26
0.9247	0.9247	2647.48	71	3.13	1.84
0.9088	0.9088	2646.19	71	5.17	1.96
0.8993	0.8993	2644.06	71	4.54	1.05
0.8747	0.8747	2641.85	71	2.91	1.33
0.8560	0.8560	2639.61	71	3.38	1.07
0.8342	0.8342	2637.29	71	4.25	1.10
0.8168	0.8168	2635.40	71	1.81	1.02
0.8111	0.8111	2635.02	71	3.84	0.69
0.8056	0.8056	2634.01	71	3.79	0.80
0.7856	0.7856	2630.90	71	5.56	2.25
0.7661	0.7661	2628.29	71	4.53	1.72
0.7351	0.7351	2624.58	71	4.66	1.55
0.7049	0.7049	2621.18	71	4.90	1.63
0.6852	0.6852	2619.19	71	4.69	1.78
0.6541	0.6541	2616.40	71	4.98	1.86
0.6387	0.6387	2614.73	71	3.66	2.22

TABLE 7
Draft FIS Data — East Pima Wash

Flooding Source		Base Flood Water Surface Elevation			
0.6098	0.6098	2612.35	71	3.76	1.94
0.5931	0.5931	2610.90	71	4.27	1.63
0.5707	0.5707	2609.41	71	3.39	1.31
0.5548	0.5548	2608.05	134	3.94	1.19
0.5494	0.5494	2607.73	134	4.12	0.80
0.5427	0.5427	2606.28	134	5.11	2.16
0.5234	0.5234	2603.69	134	3.70	2.38
0.4988	0.4988	2601.90	134	4.23	2.54
0.4801	0.4801	2600.30	134	4.23	2.98
0.4600	0.4600	2598.00	134	4.96	2.04
0.4379	0.4379	2594.96	134	5.54	2.76
0.4040	0.4040	2591.97	134	4.24	2.40
0.3869	0.3869	2590.94	134	4.13	2.59
0.3722	0.3722	2589.32	134	4.19	2.13
0.3547	0.3547	2587.82	134	4.24	2.32
0.3381	0.3381	2586.85	134	3.90	3.05
0.3265	0.3265	2585.89	134	6.06	3.28
0.3023	0.3023	2582.66	134	3.73	2.19
0.2875	0.2875	2579.75	134	3.76	0.90
0.2757	0.2757	2578.76	134	2.30	1.12
0.2650	0.2650	2578.51	134	3.11	1.99
0.2552	0.2552	2577.93	134	4.51	1.86
0.2246	0.2246	2575.38	295	3.90	1.96
0.2095	0.2095	2574.18	295	4.67	1.35
0.2043	0.2043	2573.72	295	3.34	1.79
0.1778	0.1778	2572.11	295	4.55	3.02
0.1567	0.1567	2571.03	295	4.06	3.96
0.1156	0.1156	2568.38	295	5.82	2.73
0.0854	0.0854	2565.71	295	4.03	2.00
0.0715	0.0715	2564.93	295	4.40	2.24
0.0391	0.0391	2562.91	295	4.17	2.07
0.0069	0.0069	2560.50	323	2.43	2.73

1 Miles above Town Boundary

TABLE 8
Draft FIS Data — Unnamed Tributary to Stagecoach Pass Wash

Flooding Source		Base Flood Water Surface Elevation			
Cross Section	Distance[1]	Regulatory (Feet NGVD29)	Q (cfs)	Velocity (fps)	Depth (feet)
0.8707	0.8707	2712.74	84	5.51	2.26
0.844	0.844	2710.16	84	5.38	2.33
0.8171	0.8171	2706.75	84	5.17	1.63
0.7934	0.7934	2704.80	84	4.14	1.85
0.7626	0.7626	2702.66	84	1.05	1.97
0.7448	0.7448	2697.97	84	6.45	2.63
0.7265	0.7265	2694.20	84	5.98	2.46
0.6776	0.6776	2688.72	84	5.47	2.74
0.6449	0.6449	2685.16	84	6.20	2.63
0.6242	0.6242	2682.71	84	6.83	2.80
0.6025	0.6025	2679.65	152	4.32	2.73
0.583	0.583	2679.47	152	1.64	5.08
0.5624	0.5624	2674.57	152	5.33	2.14
0.5394	0.5394	2672.02	152	4.25	1.80
0.5198	0.5198	2671.28	152	2.41	2.92
0.5142	0.5142	2670.47	152	4.40	2.73
0.5053	0.5053	2669.86	152	4.26	2.85
0.494	0.494	2669.64	152	1.49	4.67
0.488	0.488	2666.04	152	5.74	1.90
0.473	0.473	2664.42	152	5.18	2.79
0.4567	0.4567	2662.62	152	5.82	2.41
0.4398	0.4398	2661.51	152	3.50	2.51
0.4246	0.4246	2659.92	152	5.14	1.94
0.4017	0.4017	2657.81	152	2.71	1.53
0.3933	0.3933	2657.30	152	4.54	1.44
0.3828	0.3828	2656.96	225	3.19	2.51
0.3647	0.3647	2656.57	225	0.88	3.93
0.3407	0.3407	2651.27	225	6.20	1.96
0.3101	0.3101	2648.77	225	6.05	2.57
0.2669	0.2669	2644.43	225	4.52	1.82
0.2547	0.2547	2643.15	225	4.16	2.04
0.2384	0.2384	2640.79	225	3.97	0.92
0.2321	0.2321	2640.00	225	2.19	1.21
0.2263	0.2263	2639.66	225	4.03	1.83

TABLE 8
Draft FIS Data — Unnamed Tributary to Stagecoach Pass Wash

Flooding Source		Base Flood Water Surface Elevation			
Cross Section	**Distance[1]**	**Regulatory (Feet NGVD29)**	**Q (cfs)**	**Velocity (fps)**	**Depth (feet)**
0.2046	0.2046	2635.08	225	5.39	2.33
0.1698	0.1698	2631.76	225	6.68	2.40
0.1377	0.1377	2628.31	225	5.40	3.12
0.1174	0.1174	2627.26	225	5.34	2.89
0.0867	0.0867	2623.77	225	4.48	3.18
0.0637	0.0637	2620.57	225	5.40	2.45
0.0394	0.0394	2618.33	225	6.50	3.06
0.0186	0.0186	2617.10	225	1.71	3.71

1 Miles above confluence with Stagecoach Pass Wash

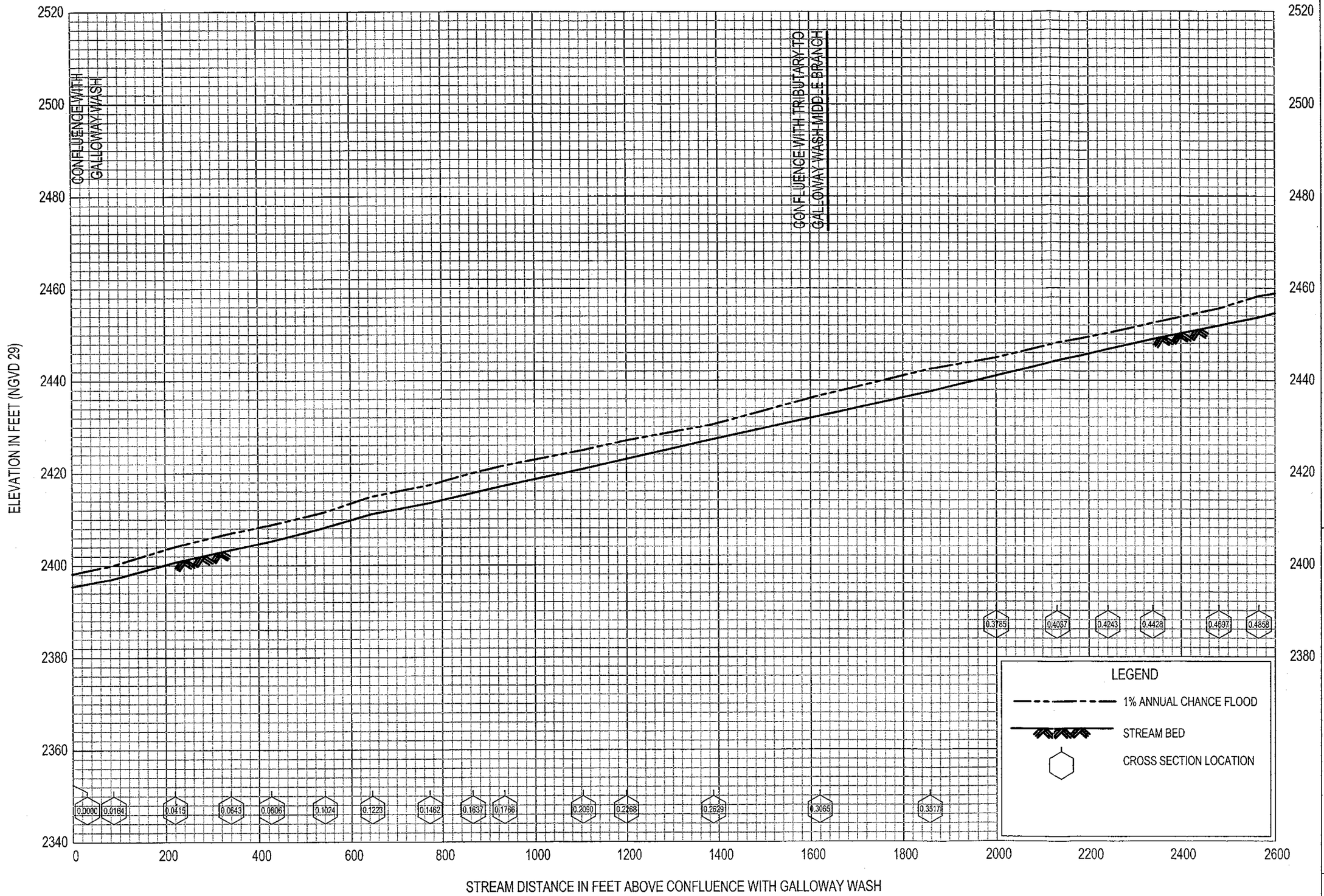
TABLE 9
Draft FIS Data — Unnamed Central Tributary to Cave Creek

Flooding Source		Base Flood Water Surface Elevation			
Cross Section	**Distance[1]**	**Regulatory (Feet NGVD29)**	**Q (cfs)**	**Velocity (fps)**	**Depth (feet)**
Main					
2.2214	2.2214	2267.00	1652	9.76	7.49
2.2064	2.2064	2262.25	1652	9.21	5.22
2.1828	2.1828	2258.25	2335	10.15	8.13
2.1684	2.1684	2257.60	2335	9.53	8.49
2.1443	2.1443	2257.51	2363	6.41	9.46
2.1205	2.1205	2255.17	2363	10.23	9.02
2.0829	2.0829	2252.47	2363	11.49	7.72
2.0456	2.0456	2248.54	2391	9.04	5.72
2.0048	2.0048	2245.97	2391	10.26	5.05
1.9633	1.9633	2243.44	2391	10.32	5.29
1.9389	1.9389	2241.20	2391	9.76	4.31
1.9192	1.9192	2239.28	2447	8.33	3.66
1.9042	1.9042	2238.80	2447	4.73	5.89
1.8875	1.8875	2237.97	2447	5.85	6.27
1.8644	1.8644	2235.19	2447	6.85	4.70
1.8424	1.8424	2232.64	2447	7.51	3.95
1.8096	1.8096	2230.46	2467	5.20	4.04

TABLE 9
Draft FIS Data — Unnamed Central Tributary to Cave Creek

Flooding Source		Base Flood Water Surface Elevation			
Cross Section	Distance[1]	Regulatory (Feet NGVD29)	Q (cfs)	Velocity (fps)	Depth (feet)
1.7593	1.7593	2225.87	2467	5.29	2.97
1.7007	1.7007	2220.63	2467	5.94	2.66
1.6442	1.6442	2215.52	2467	6.16	3.78
1.6113	1.6113	2213.12	2467	5.12	3.71
1.5812	1.5812	2210.25	2622	7.37	3.21
1.5549	1.5549	2207.91	2622	7.26	2.88
1.5234	1.5234	2204.66	2822	6.36	2.66
1.4675	1.4675	2199.30	2779	6.19	2.95
1.4233	1.4233	2194.70	2779	5.34	2.67
1.3724	1.3724	2189.13	2779	5.70	2.64
1.3235	1.3235	2183.71	2854	5.03	2.47
1.2701	1.2701	2179.28	2274	5.52	2.83
1.2175	1.2175	2174.69	2274	5.91	3.04
1.1824	1.1824	2171.81	2764	4.47	4.00
1.1329	1.1329	2166.32	2764	5.28	3.07
1.0627	1.0627	2159.00	2764	5.99	3.65
1.0158	1.0158	2153.21	2764	5.93	3.13
0.9888	0.9888	2150.92	2849	5.87	3.41
0.9593	0.9593	2147.95	2849	5.35	3.61
North					
0.9285	0.9285	2144.99	2116	4.42	3.82
0.9094	0.9094	2141.45	2116	7.42	4.07
South					
0.9065	0.9065	2141.86	704	3.97	3.16
0.8919	0.8919	2141.45	562	1.40	2.56

1 *Main and North:* Miles above Cave Creek Road. South: Miles above Cave Creek Road.



FLOOD PROFILES

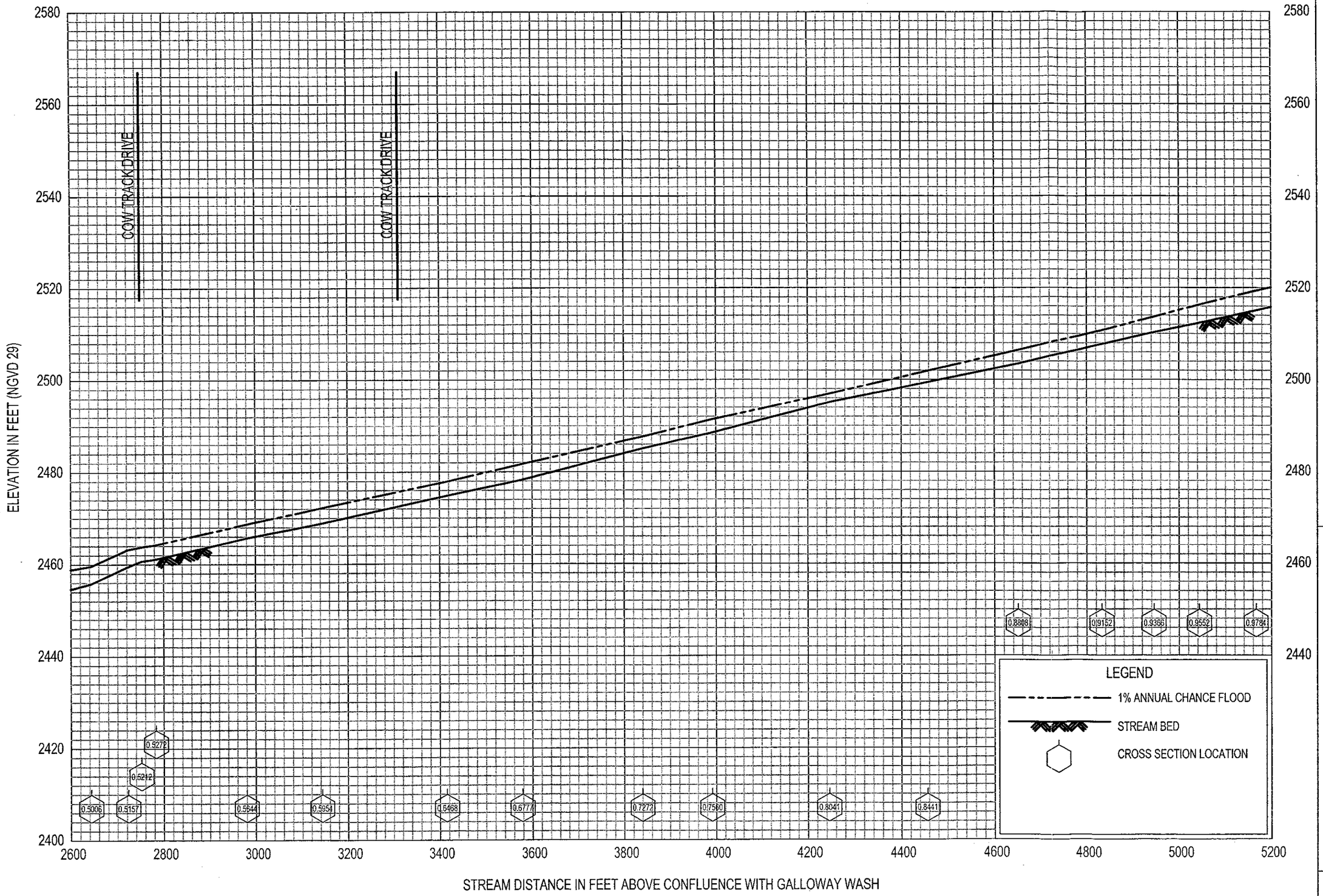
GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

01G



FLOOD PROFILES

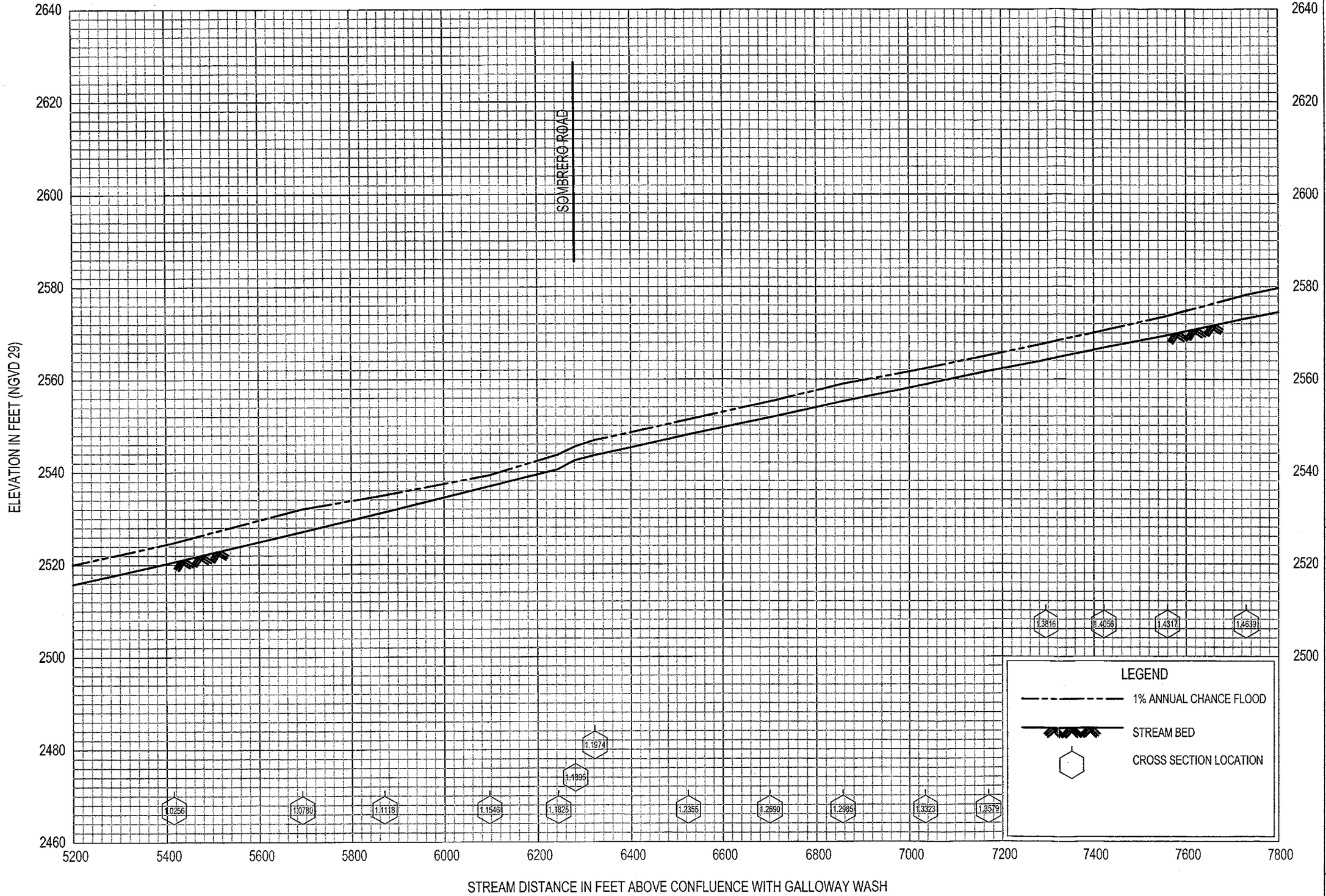
GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

02G



FLOOD PROFILES

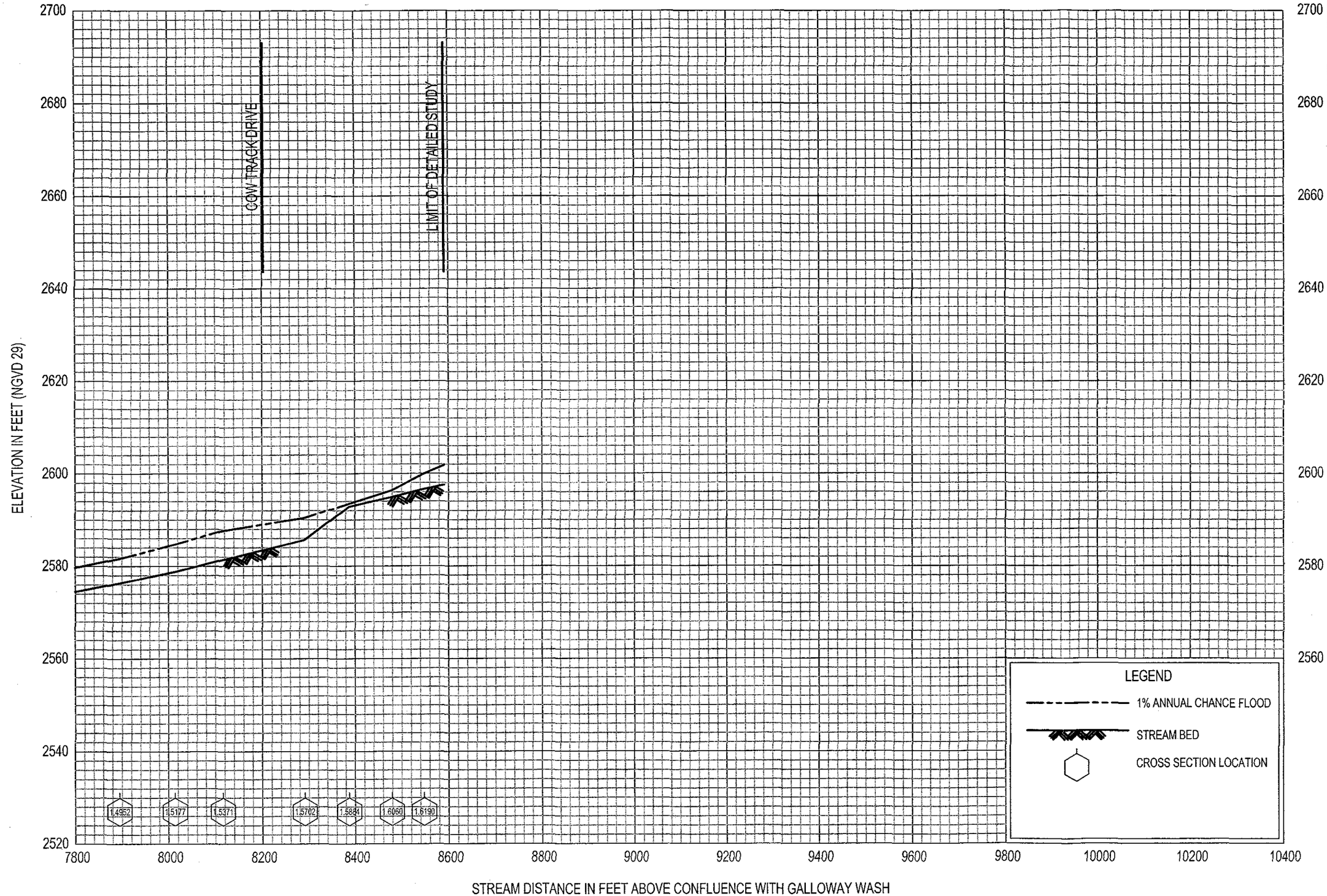
GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

03G



FLOOD PROFILES

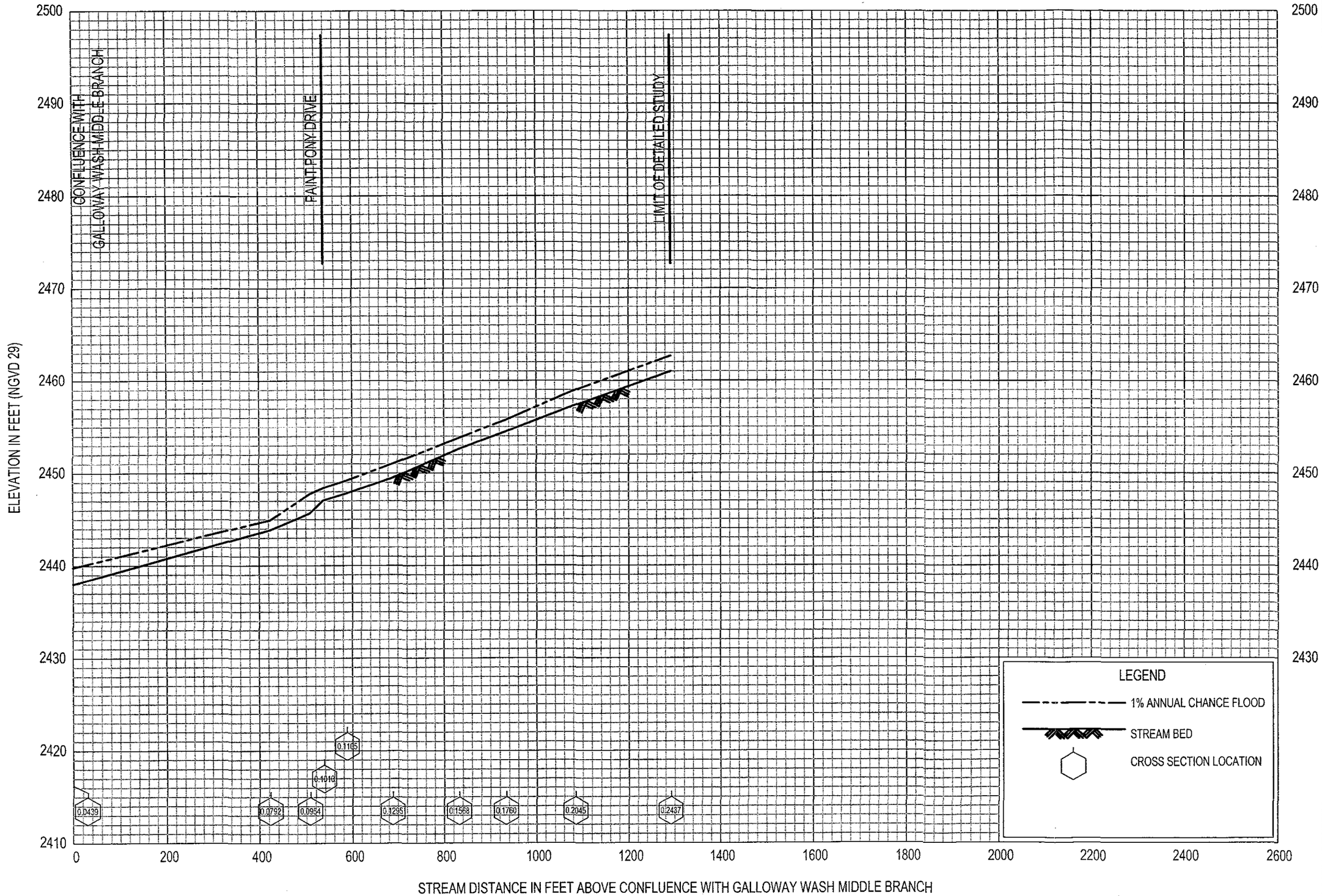
GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

04G



FLOOD PROFILES

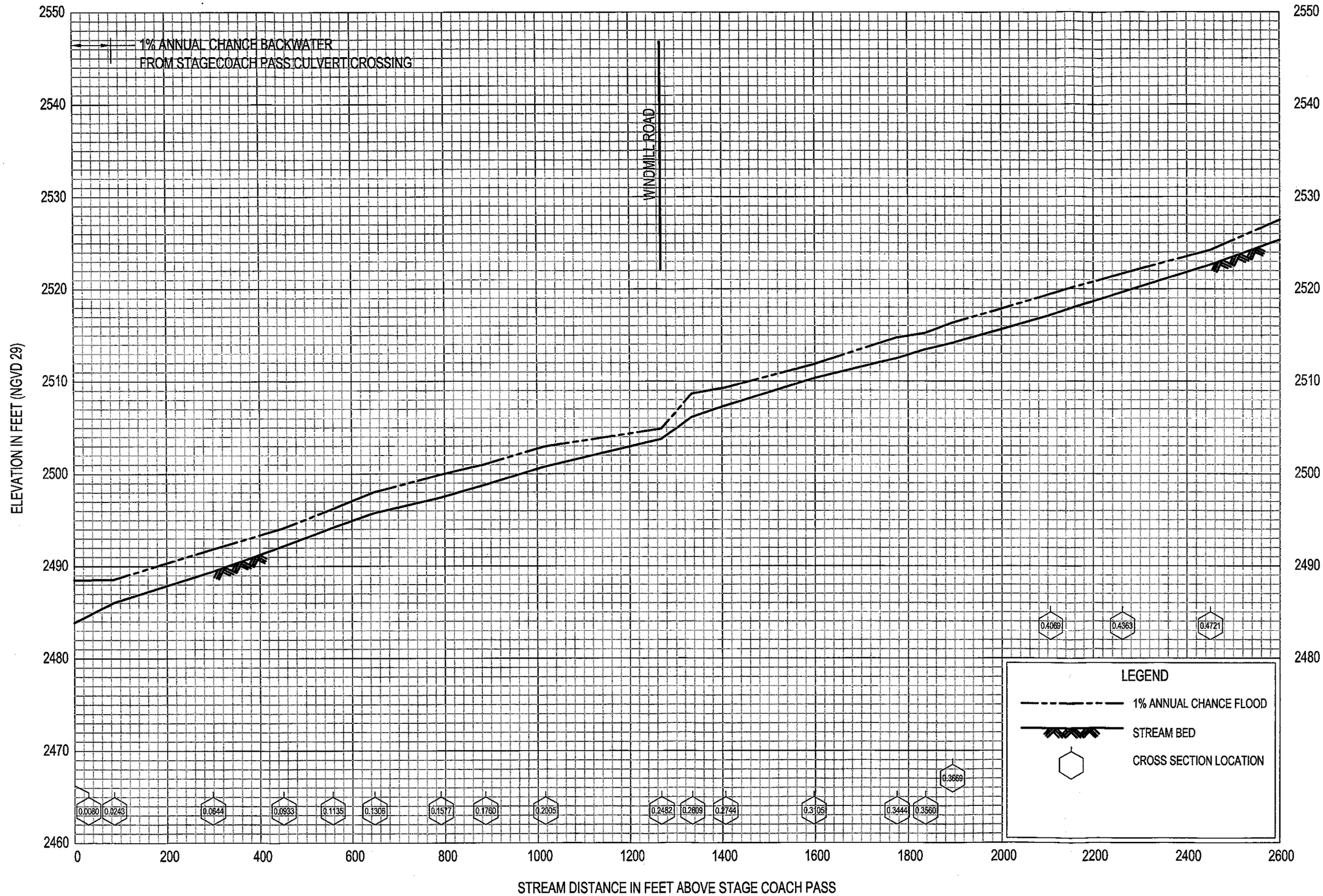
TRIBUTARY TO GALLOWAY WASH MIDDLE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

05G



FLOOD PROFILES

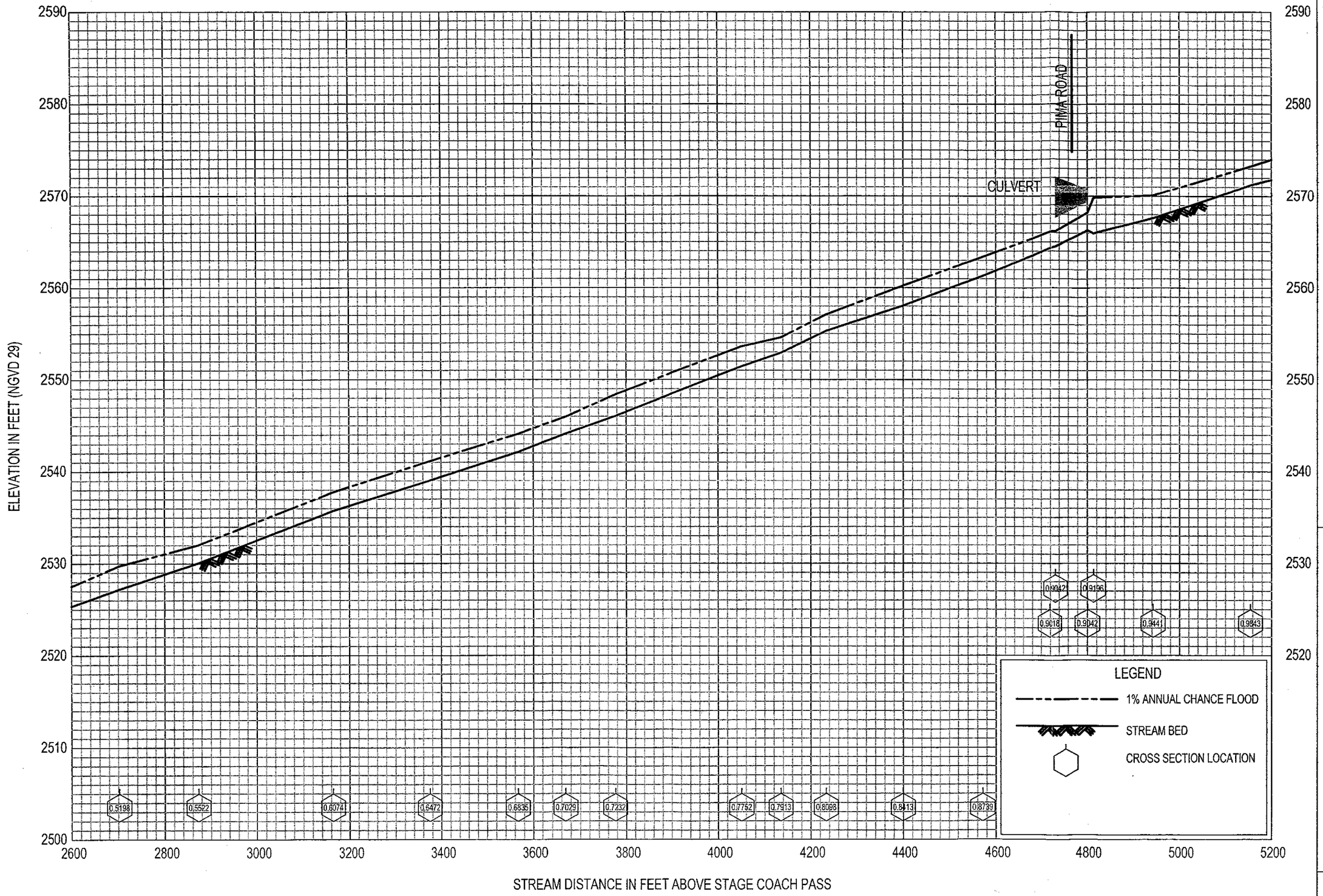
WINDMILL WASH COMBINED BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

01W



FLOOD PROFILES

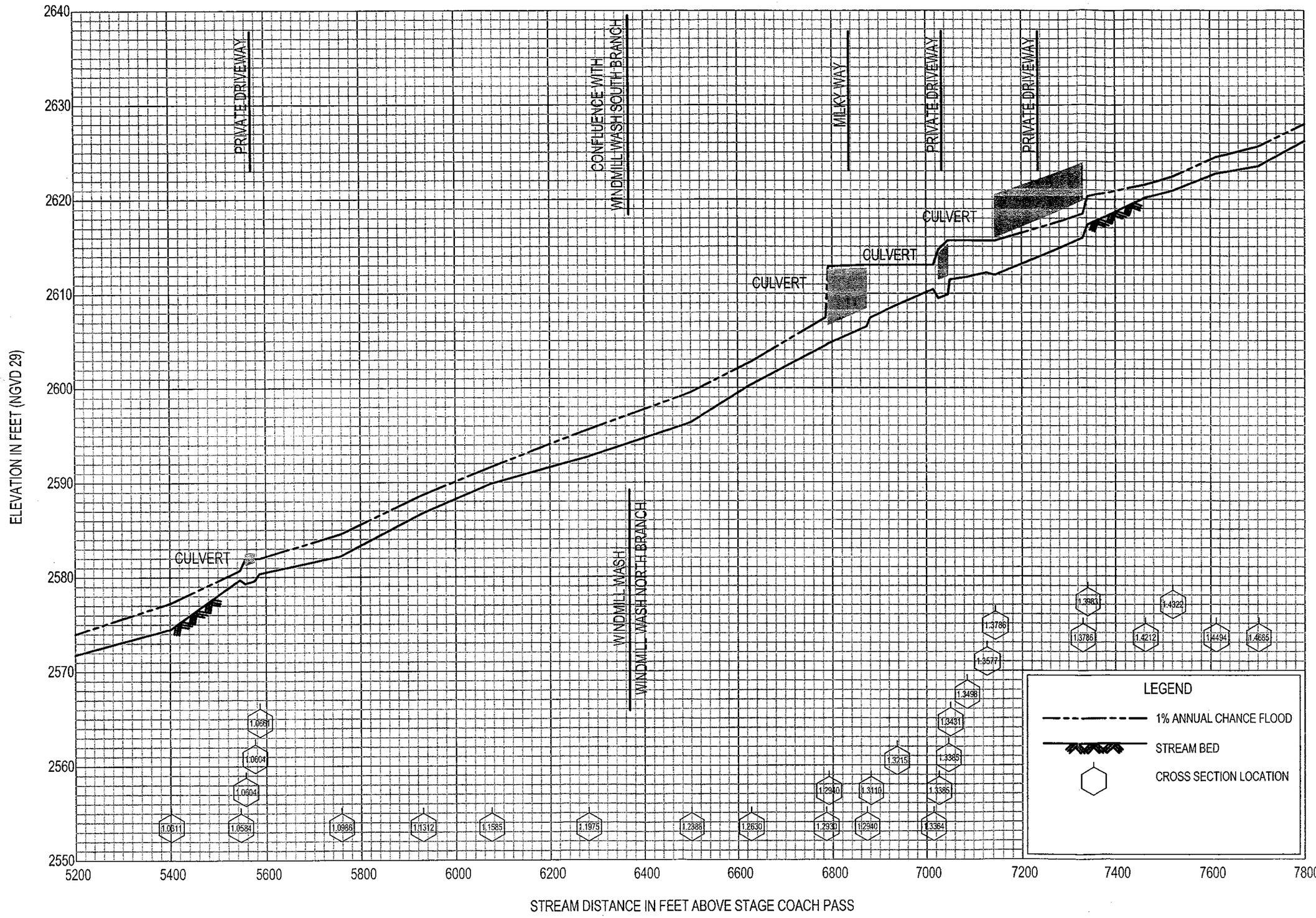
WINDMILL WASH COMBINED BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

02W



FLOOD PROFILES

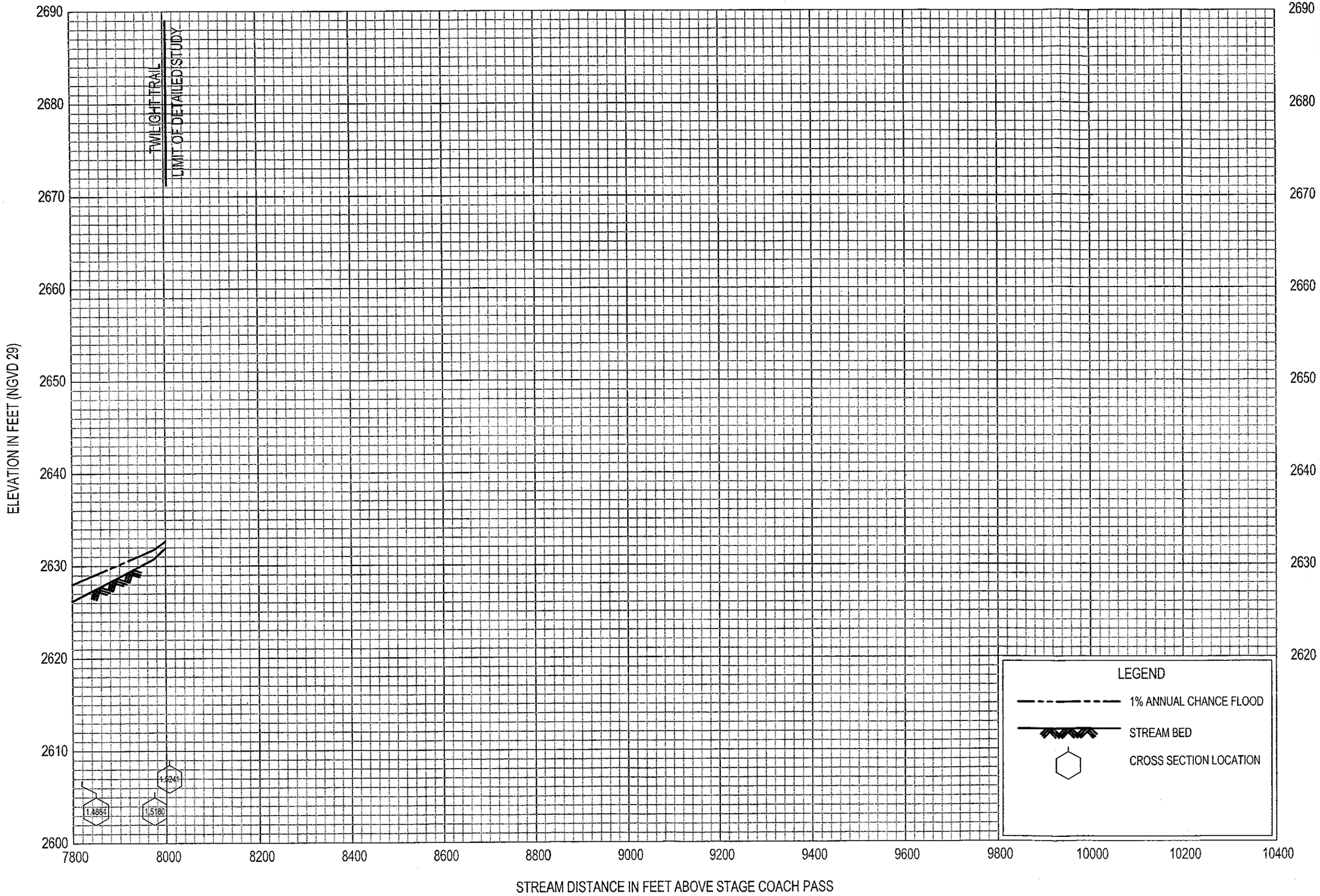
WINDMILL WASH COMBINED BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

03W



FLOOD PROFILES

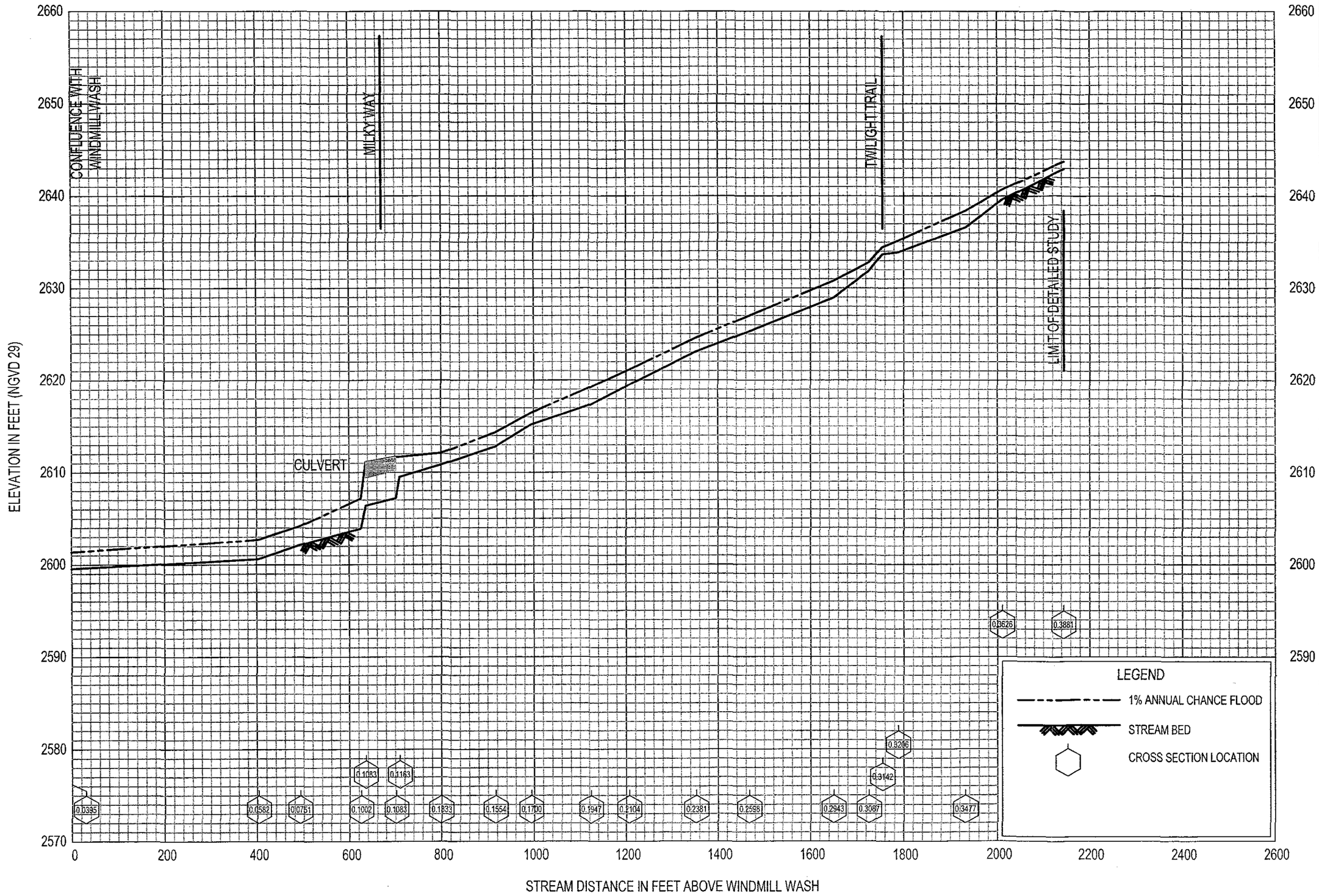
WINDMILL WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

04W



FLOOD PROFILES

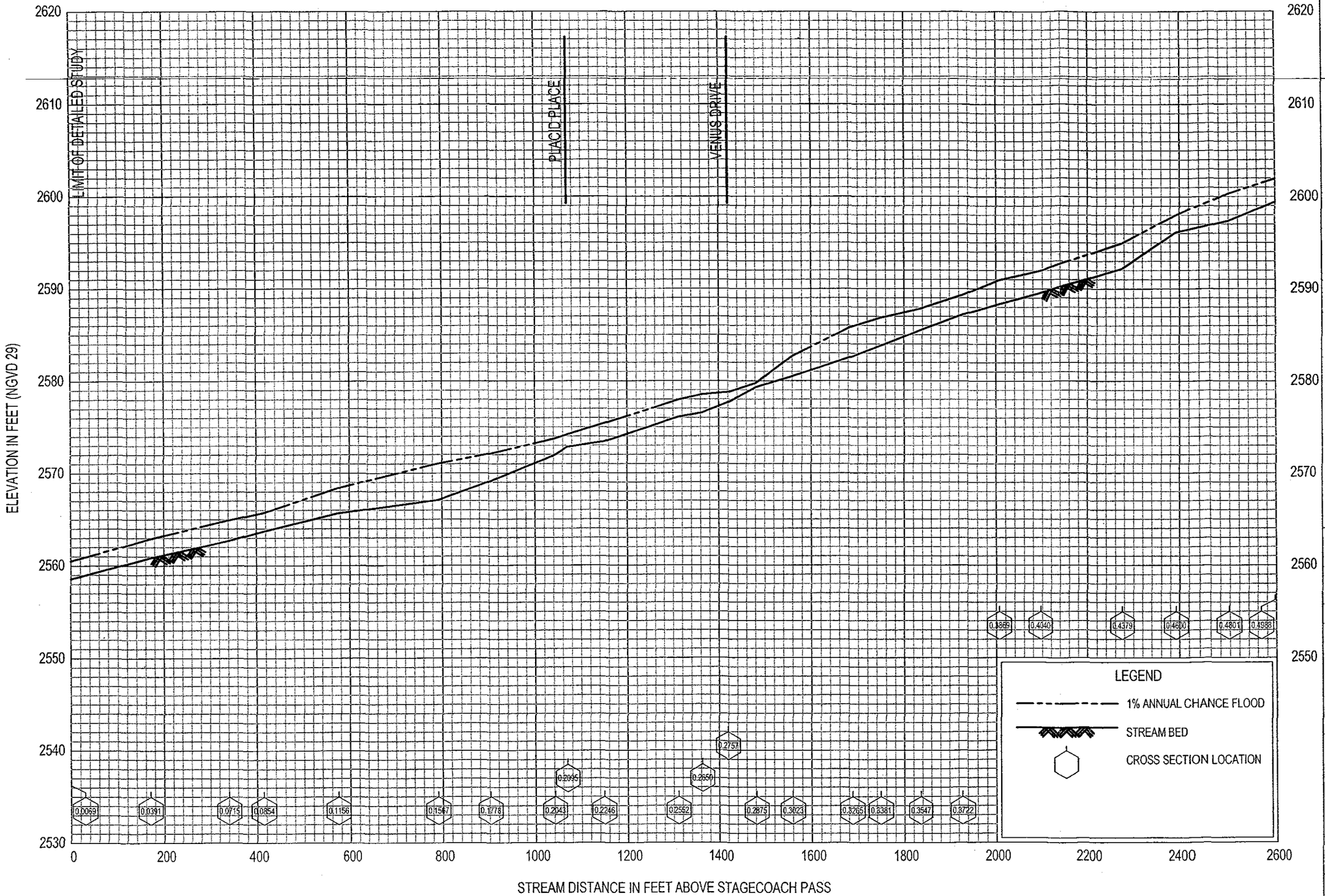
WINDMILL WASH SOUTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

05W



FLOOD PROFILES

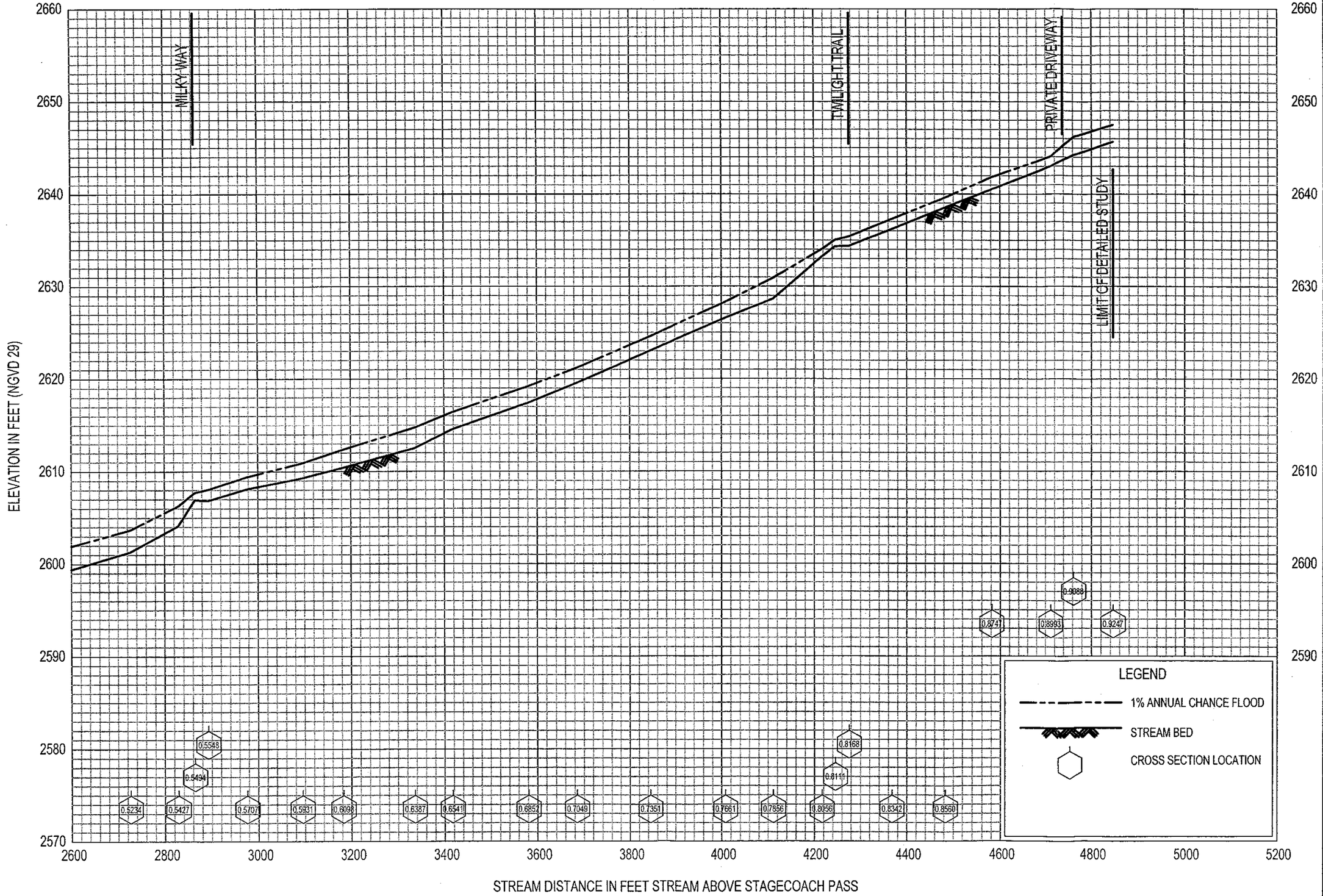
EASTERN PIMA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

01P



FLOOD PROFILES

EASTERN PIMA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

02P

FLOOD PROFILES

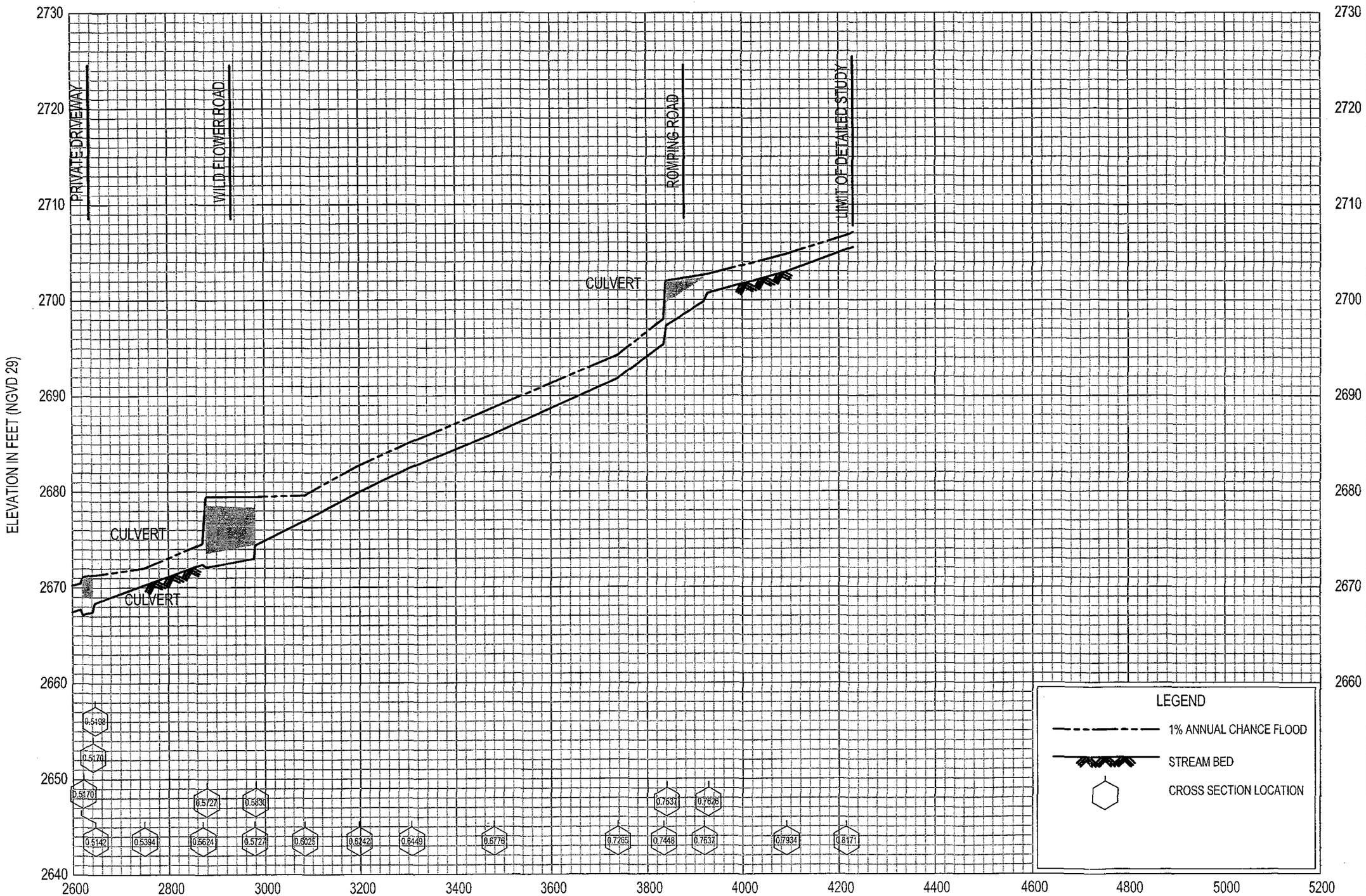
UNNAMED TRIBUTARY TO STAGECOACH PASS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

01S



FLOOD PROFILES

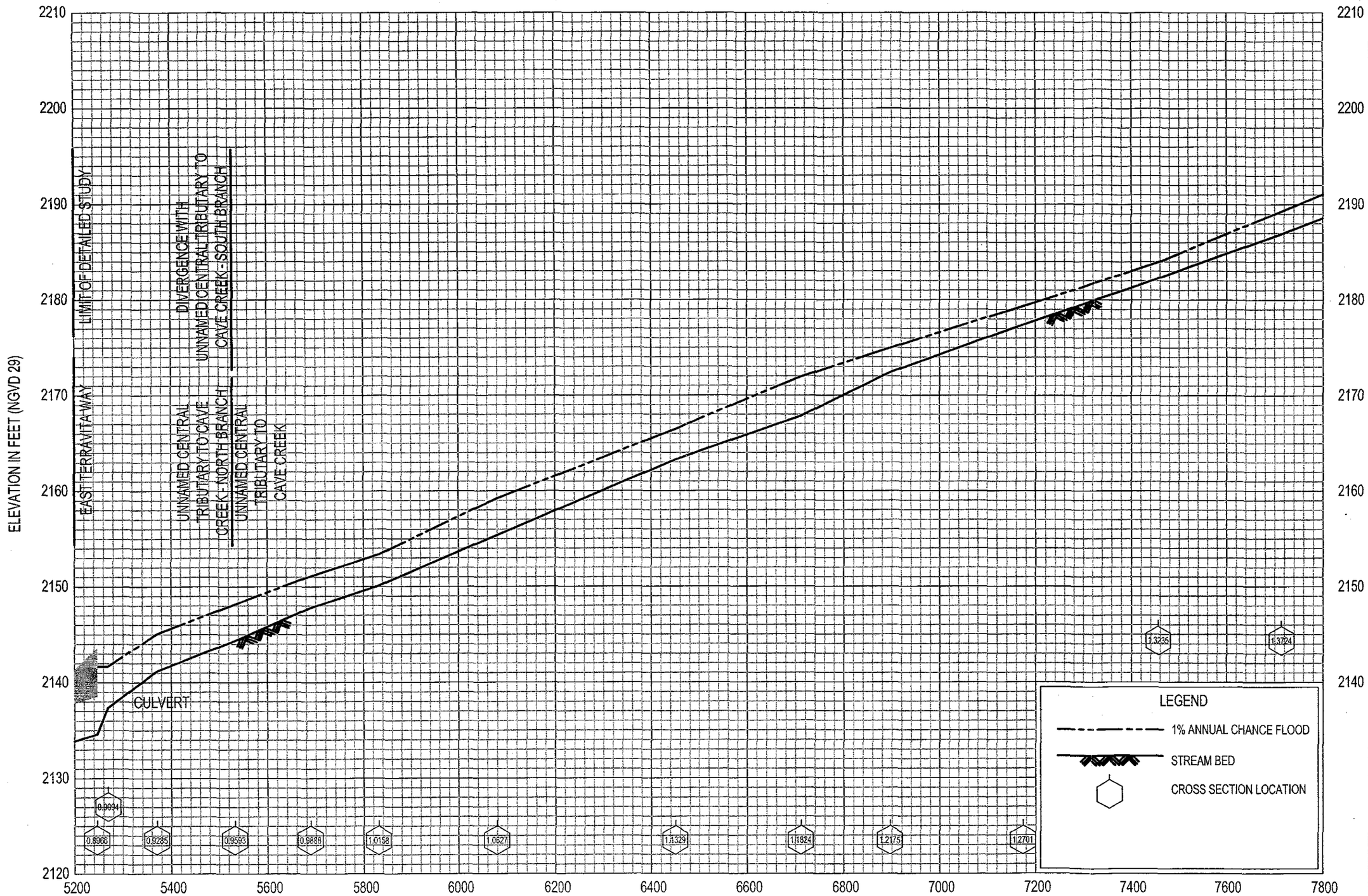
UNNAMED TRIBUTARY TO STAGECOACH PASS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

02S



FLOOD PROFILES

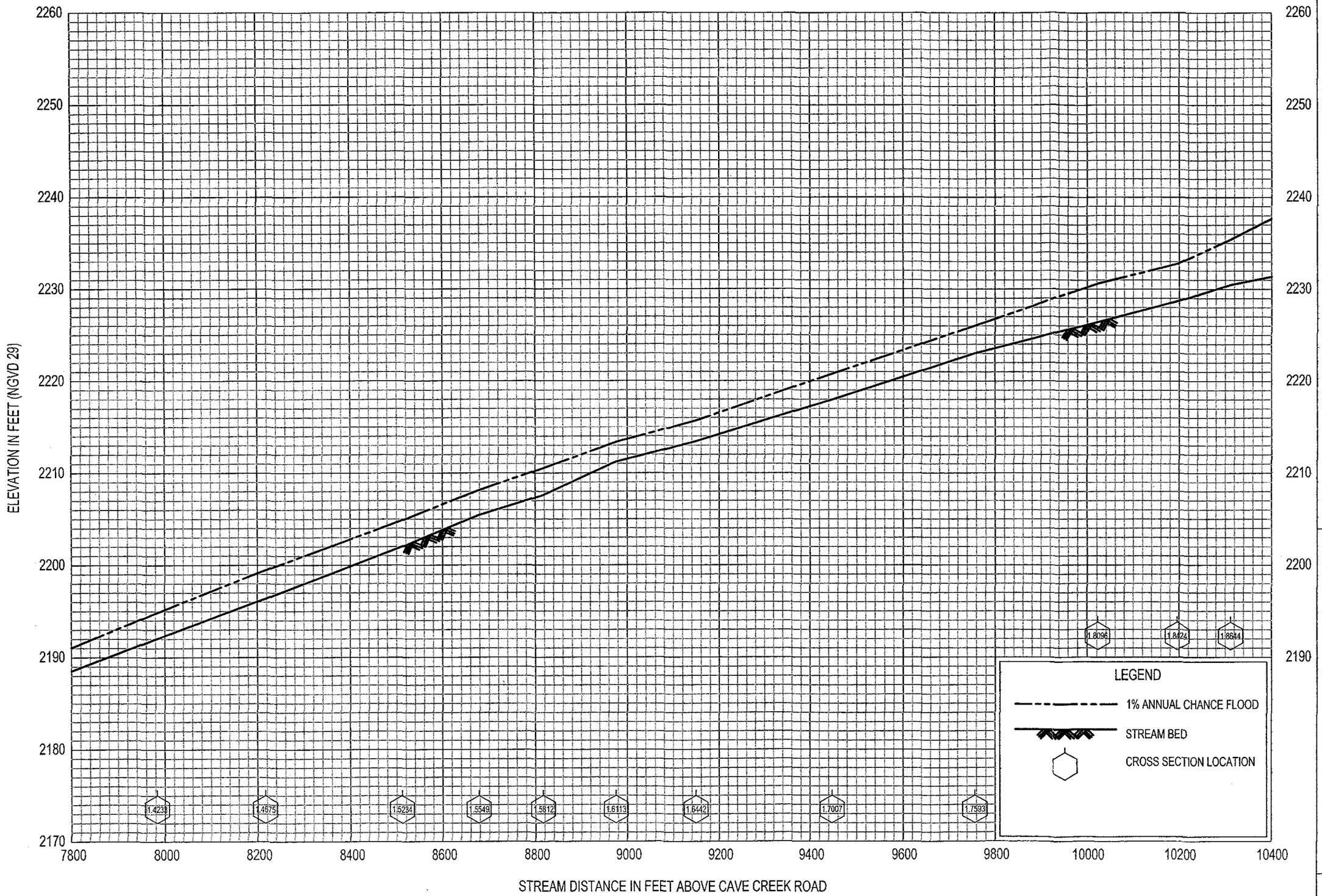
UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK - NORTH BRANCH
UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

01U



FLOOD PROFILES

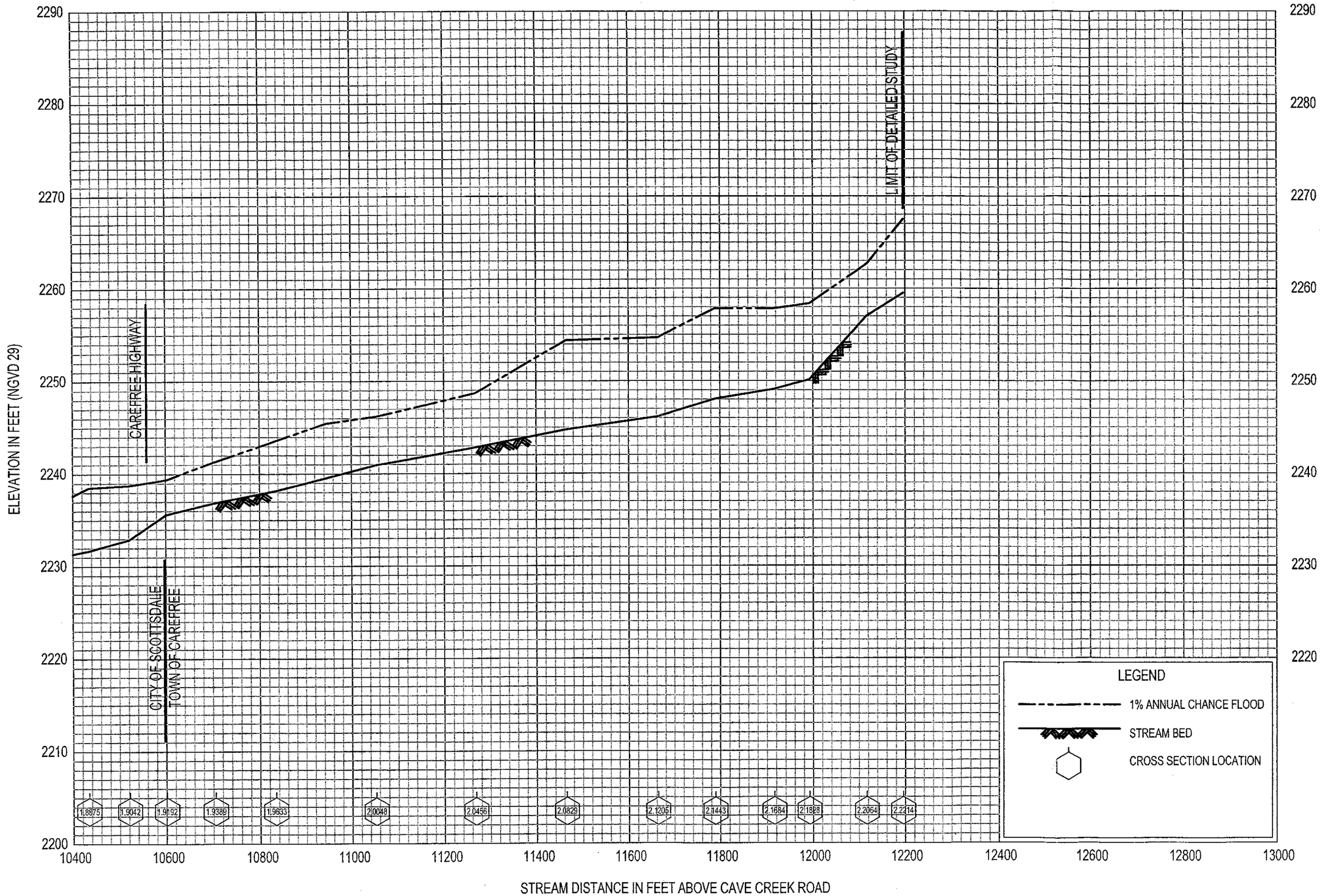
UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

02U



FLOOD PROFILES

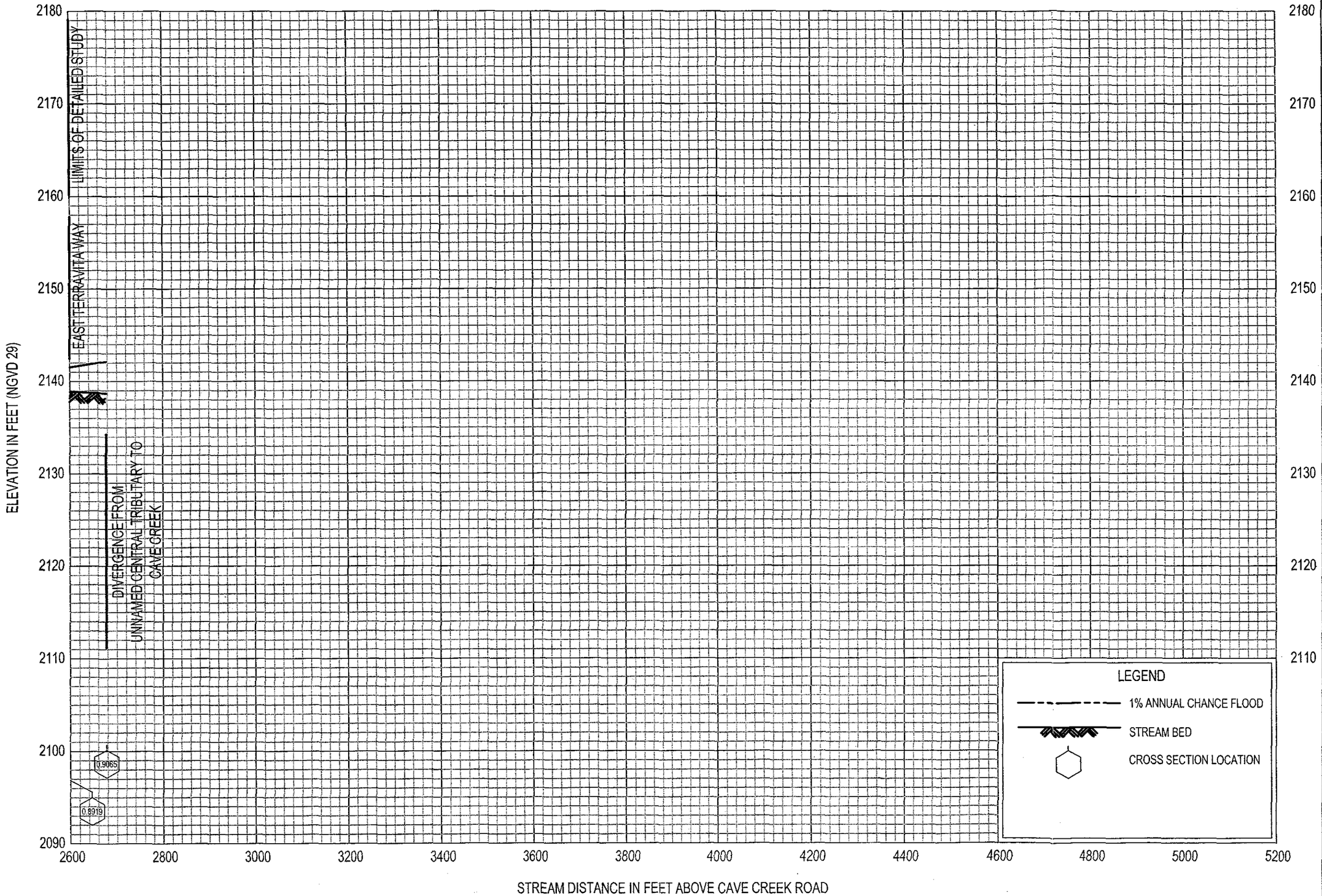
UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

03U



FLOOD PROFILES

UNNAMED CENTRAL TRIBUTARY TO CAVE CREEK - SOUTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CAREFREE, AZ

MARICOPA COUNTY

04U

FLOOD INSURANCE STUDY

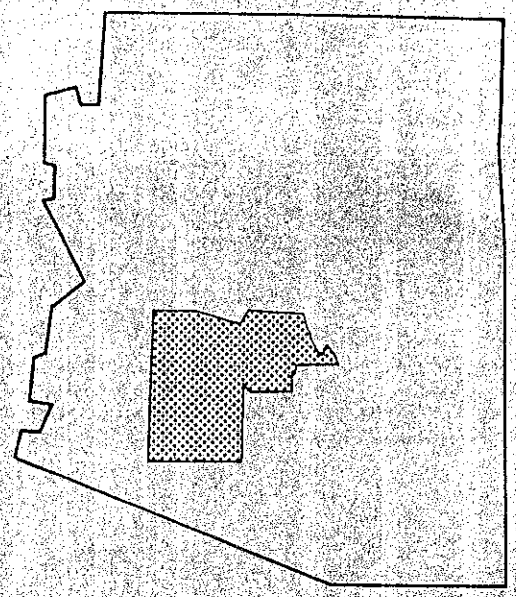
MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

VOLUME 1 OF 16

04013CV001

COMMUNITY NAME	COMMUNITY NUMBER
AVONDALE, CITY OF	040038
BUCKEYE, TOWN OF	040039
CAREFREE, TOWN OF	040126
CAVE CREEK, TOWN OF	040129
CHANDLER, CITY OF	040040
EL MIRAGE, CITY OF	040041
FOUNTAIN HILLS, TOWN OF	040135
GILA BEND, TOWN OF	040043
GILBERT, TOWN OF	040044
GLENDALE, CITY OF	040045
GOODYEAR, CITY OF	040046
GUADALUPE, TOWN OF	040111
LITCHFIELD PARK, CITY OF	040128
MARICOPA COUNTY UNINCORPORATED AREAS	040037
MESA, CITY OF	040048
PARADISE VALLEY, TOWN OF	040049
PEORIA, CITY OF	040050
PHOENIX, CITY OF	040051
QUEEN CREEK, TOWN OF	040132
SCOTTSDALE, CITY OF	045012
SURPRISE, CITY OF	~~045053~~ → 040053
TEMPE, CITY OF	040054
TOLLESON, CITY OF	040055
WICKENBURG, TOWN OF	040056
YOUNGTOWN, TOWN OF	040057



REVISED: JULY 19, 2001

Federal Emergency Management Agency

1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the county.

Peak discharges for the Hassayampa River were developed from discharge-frequency relationships of historic floods and gage records (Reference 32).

In the absence of observed runoff data, present-condition, discharge-frequency values for Scatter Wash and New River were used. Present-condition, discharge-frequency values for Scatter Wash and Skunk Creek below Adobe Dam were based on future condition values modified to reflect present conditions (Reference 33). Discharge-frequency values for the Agua Fria River were determined by routing balanced hydrographs, which were developed from Waddell Dam inflow-volume-frequency relationships, through the dam and downstream, and adding local flows as appropriate. Discharge-frequency relationships for the Salt River and Gila Rivers concentration points were determined by routing period-of-record flows through existing reservoirs using the HEC-5 computer model (Reference 34).

Peak discharge-frequency relationships for Cave Creek (below Cave Creek Dam), East Fork Cave Creek, and Echo Canyon Wash were taken from the Flood Insurance Study for the City of Phoenix (Reference 14).

Peak discharge-frequency relationships for Cave Creek (above Cave Creek Dam), Andora Hills Wash, Galloway Wash, Apache Creek, Rowe Wash, Grapevine Wash, Ocotillo Wash, Willow Springs Wash, Skunk Creek (above Carefree Highway), Mockingbird Wash, Little San Domingo Wash, Wittmann Drainage, Aguila Farm Channel, Grass Wash, Sand Tank Wash, Bender Wash, Rodeo Wash and its tributary, Airport Wash, Scott Avenue Wash, and Martinez Wash were developed using the U.S. Soil Conservation Service (SCS) TR-20 program (Reference 25). In addition, the SCS TR-55 computer program (Reference 36) was used to determine flood peaks for Buckeye Canal; Atchison, Topeka & Santa Fe Railway Channel; Southern

Pacific Railroad Spur at Chandler; Southern Pacific Railroad at Buckeye, Chandler, Gilbert, Goodyear, Tempe, and Tolleson; and Lower El Mirage Wash and its tributary.

Peak discharge-frequency relationships for Sols, Casandro, South Branch Casandro, Flying E, Hospital, and Powder House Washes were taken from the Flood Insurance Study for Wickenburg (Reference 19).

Peak discharge-drainage area relationships for flooding sources studied by detailed methods are shown in Table 3.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

For areas of riverine flooding studied by detailed methods, water-surface elevations for floods of the selected recurrence intervals were computed using the COE HEC-2 computer program (Reference 37).

The cross section data for Agua Fria River were taken from several sources of mapping. A 1981 COE topographic map for New River (Reference 38) was used for the river section from the confluence with the Gila River to the confluence with the New River. From New River to Northern Avenue, 1982 City of Glendale mapping was used (Reference 39). From Northern Avenue to Grand Avenue and from Beardsley Road to Jomax Road, 1983 Maricopa County maps were used (Reference 40). The topographic maps for the reach between Grand Avenue and Bell Road (Reference 41) were furnished by American Engineering Company. For the reach between Bell and Beardsley Roads, maps were provided by the Cella, Barr, Evans and Associates (Reference 42).

Cross sections for the Gila River were digitized from 1983 topographic maps or taken from as-built data for the Bullard Avenue Bridge.

Cross sections for the Salt River between Central Avenue and 115th Avenue were based on digitized data from topographic mapping. From Central Avenue to Country Club Road in Mesa, cross sections were also taken from topographic mapping (References 43 and 44).

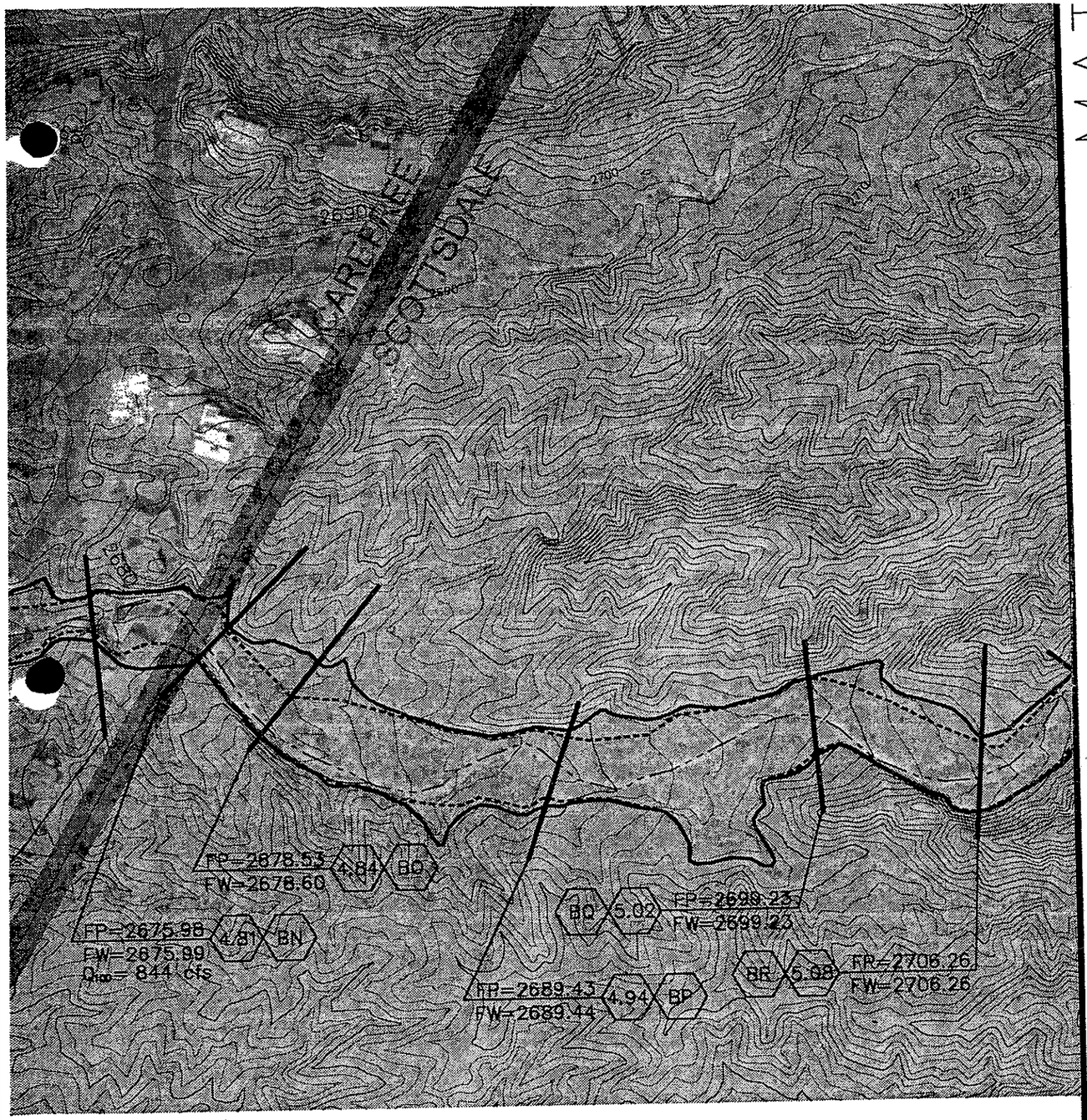
For study purposes, Skunk Creek was divided into two sections. Lower Skunk Creek lies between Adobe Dam outlet channel and the Bell Road Bridge. Upper Skunk Creek is from the Central Arizona Project channel to Adobe Dam. Cross sections for both reaches were generated using 1974 Maricopa County topographic maps at a scale of 1:2,400 with a contour interval of 2 feet. These maps were supplemented by additional mapping from the City of Phoenix

Table 3. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
East Fork Cave Creek	14.4	2,300	6,400	9,000	19,000
At Confluence With Cave Creek	13.8	2,300	6,300	8,900	18,000
Below 7th Avenue Extended	12.4	2,200	5,900	8,400	17,000
Below 7th Street	10.0	1,900	5,300	7,500	15,200
Above 7th Street	3.4	1,100	2,900	4,200	8,200
At Bell Road	3.0	1,000	2,800	3,900	7,900
Below Cave Creek Road	1.8	800	2,100	3,000	5,800
At Utopia Road	1.0	600	1,500	2,100	4,300
At Beardsley Road					
Andora Hills Wash					
Above Confluence With Cave Creek	2.8	1,450	2,280	2,590	3,550
Above School House Road	1.6	1,070	1,620	1,820	2,500
Below Scottsdale Road	0.6	420	640	720	980
Galloway Wash					
At Spur Cross Road	20.5	10,870	16,920	19,180	26,400
Below Confluence With Grapevine Wash	14.6	7,470	11,800	13,430	18,700
1.4 miles Above Confluence With Grapevine Wash	0.4	170	290	330	490
Rowe Wash					
Above Confluence With Galloway Wash	5.5	4,170	6,190	6,940	9,200
2.5 Miles Above Confluence With Galloway Wash	4.8	4,030	5,940	6,650	8,800
Grapevine Wash					
At Mouth	--[1]	4,090	6,420	7,290	10,000
Ocotillo Wash					
Above Confluence With Cave Creek	3.8	3,200	4,820	5,420	7,200
Near Intersection of Rockaway Hills Drive and Fleming Springs Road	2.8	2,800	4,140	4,630	6,200

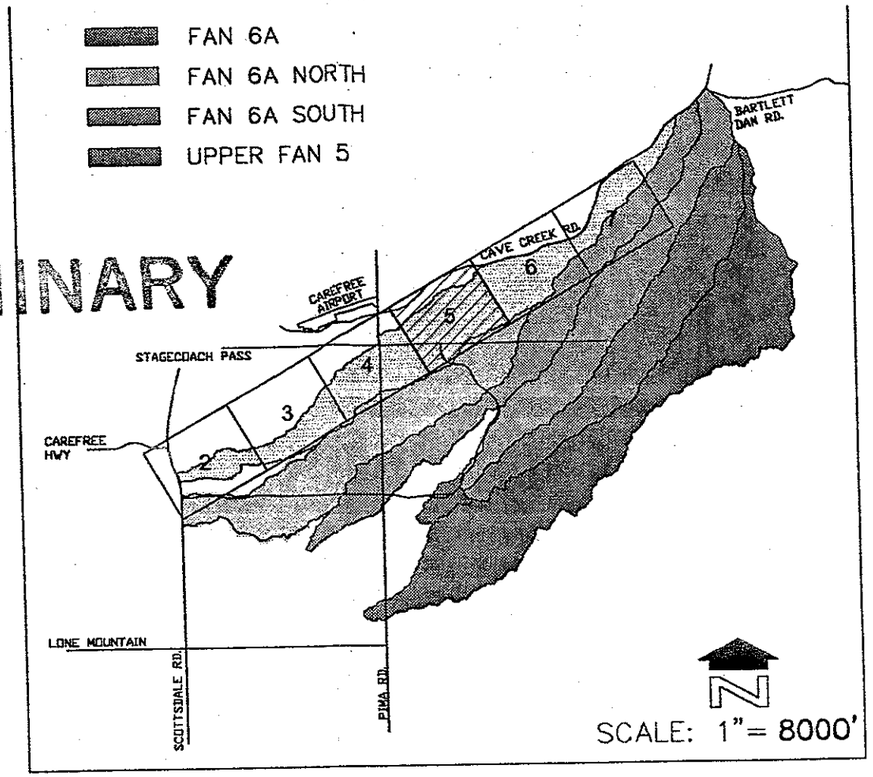
[1]Data Not Available

Table 3. Summary of Discharges (Cont'd)



MAT

PRELIMINARY



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NORTH SCOTTSDALE FLOODPLAIN DELINEATION STUDY
FCD 2001 C009 WORK ORDER #2

PRELIMINARY

Registered Professional Engineer (Civil) CERTIFICATE NO. 16379 HAL E. MARRON Date Signed 10-22-02 ARIZONA, U.S.A.

	BY	DATE
DESIGNED	EC	10/21/02
DRAWN	PMM	10/21/02
CHECKED	HEM	10/21/02

1982-2002 20 YEARS OF EXCELLENCE

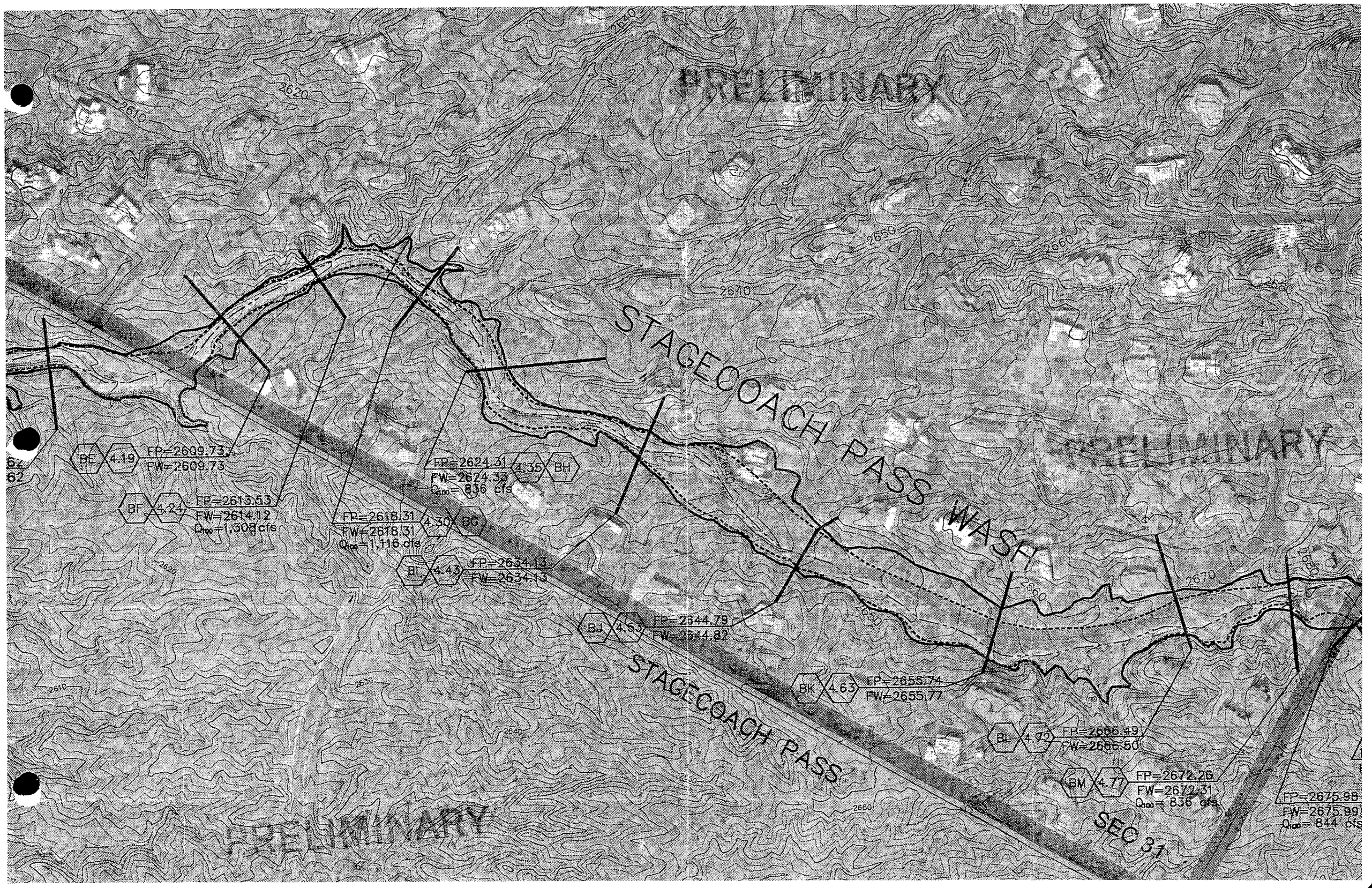
DEI Professional Services, LLC
6225 N. 24th St., Ste. 200
Phoenix, AZ 85016
Phone: (602)954-0038
Fax: (602)944-8605

DRAWING NO.	PLAN SHEET	SHEET
01131-05.DWG	STAGECOACH PASS WASH	5 OF 24

PRELIMINARY

200' 0' 200' 400'

SCALE: 1"= 200'
CONTOUR INTERVAL = 2 FEET


PRELIMINARY
STAGECOACH PASS WASH
STAGECOACH PASS
PRELIMINARY
PRELIMINARY
SEC 31
2610
2620
2630
2640
2650
2660
2670
BE 4.19 FP=2609.73 FW=2609.73
BF 4.24 FP=2613.53 FW=2614.12 Q100=1,308 cfs
FP=2618.31 FW=2618.31 Q100=1,116 cfs
4.30 BG
BI 4.43 FP=2634.13 FW=2634.13
FP=2624.31 FW=2624.33 Q100=836 cfs
4.35 BH
BJ 4.53 FP=2644.79 FW=2644.82
BK 4.63 FP=2655.74 FW=2655.77
BL 4.72 FP=2666.49 FW=2666.50
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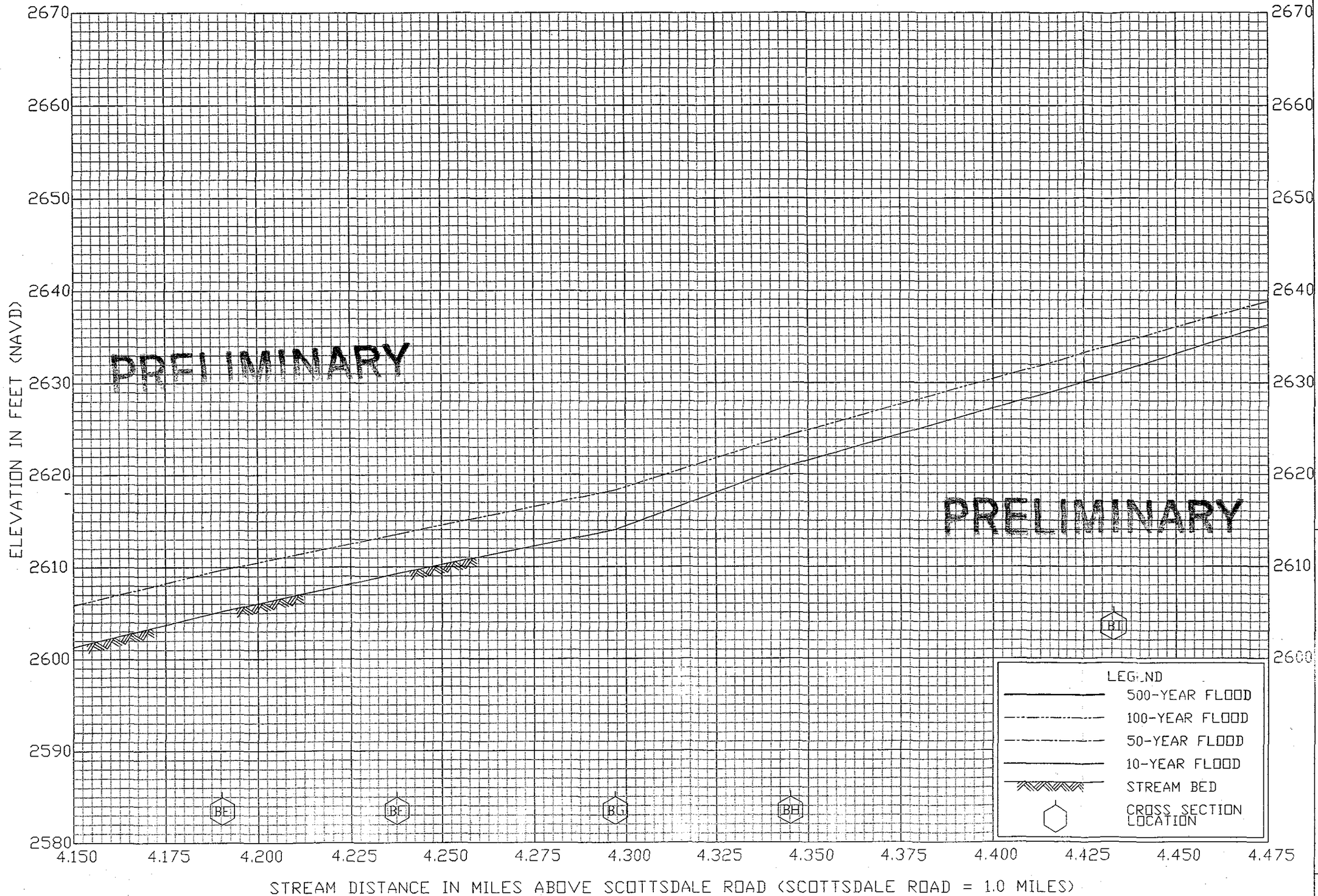

FLOOD PROFILES

STAGECOACH PASS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

Table 1
Data Collection Summary

Name of Reference	Description	Date Prepared	Version	Prepared By	Prepared For	Area Covered	Scale	Obtained From	Reference Number	Notes
Floodplain Delineation Study of Andora Hills and Galloway Washes	Floodplain delineation of washes, offsite hydrology, hydraulics, soil mapping	June, 2001	Draft Final	JE Fuller/ Hydrology and Geomorphology, Inc.	FCDMC	Galloway Wash, Andora Hills Wash (northern portion of Town of Carefree)		JE Fuller on 7/9/01	FCD 99-14	Vol. I and II
Flood Insurance Study, Unincorporated Areas of Maricopa County, AZ	Floodplain delineation of Cave Creek Wash, Andora Hills Wash, Galloway Wash, Grapevine Wash	January, 1979	Final	Harris-Toups Associates	U.S. Dept. Of Housing and Urban Development, FIS	Andora Hills Wash, Galloway Wash, Grapevine Wash		JE Fuller on 7/9/01	80.1-00-8-01/79	Only partial copy obtained, may need more info, has elevation BM info, JE Fuller has raw HEC-2 output on file at their office
Final Hydrologic and Hydraulic Report for Cave Creek/Carefree Flood Delineation Study	Floodplain delineation	March, 1990	Final	CH2M HILL	FCDMC	Grapevine Wash, Row Wash, Galloway Wash		JE Fuller on 7/9/01	FCD 88-53, PHXR4.222.50	Entire Report and Draft Report obtained, Appendix A obtained, model info not copied can get from FCD if needed.
Cave Creek Above Carefree Highway Floodplain Delineation Study	Floodplain delineation	July, 1997		George V. Sabol Consulting Engineers, Inc.	FCDMC	Cave Creek above Carefree Hwy		JE Fuller on 7/9/01	FCD 95-28	Very partial copy, may need more info
Flood Insurance Study, Maricopa County, Arizona and Unincorporated Areas, Vol. 1-8	FEMA FIS	December 23, 1997	Draft	FEMA	FEMA	All		JE Fuller on 7/9/01	1302..021	Text and profiles (not maps)
Final Drainage Report for Crossings at Carefree IV	development drainage report	March 19, 1998	Final	Neil/McGill Consultants, Inc.	developer	24.9 acres, imm. South of Grapevine Wash, SW 1/4 of NW 1/4 Sect. 26, T6N, R4E, North of Stevens Road		Carefree, 7/6/01		development is Crossings at Carefree IV (sometimes called Cow Track)
Letter from Erich Korsten on The Summit at Carefree	letter - No drainage report exists	October 24, 1997		Erich Korsten	Town of Carefree	The Summit at Carefree		Carefree, 7/6/01		Letter requesting drainage report, development is the Summit at Carefree
Final Drainage Report for Ridgeview Estates	development drainage report	September 29, 1994	Final	Neil/McGill Consultants, Inc.	developer	NE 1/4 of NE 1/4 Sect 34, South of Cave Creek Road, West of Tom Darlington		Carefree, 7/6/01		development is Ridgeview Estates, revision to below report
Preliminary Drainage Report for Ridgeview Estates	development drainage report	October 20, 1993	Preliminary	Norman Engineering Group, Inc.	developer	NE 1/4 of NE 1/4 Sect 34, South of Cave Creek Road, West of Tom Darlington		Carefree, 7/6/01		development is Ridgeview Estates
Lost Acres Estates Preliminary Hydrology Report, Preliminary Plat Submission	development drainage report	June, 1993	Preliminary	Louis C. Warner and Company's Surveyors, Inc.	developer	SW 1/4 Sect. 4, southwest corner of town, east of Cave Creek Road, North of Carefree Highway		Carefree, 7/6/01		development is Lost Acres Estates

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Data Collection Summary

Name of Reference	Description	Date Prepared	Version	Prepared By	Prepared For	Area Covered	Scale	Obtained From	Reference Number	Notes
Final Drainage Report for Canyon Creek Estates Subdivision	development drainage report	June 22, 1998	Final	Paulsell Engineering	developer	SW 1/4 Sect. 4, southwest corner of town, east of Cave Creek Road, North of Carefree Highway, right above Lost Acres		Carefree, 7/6/01		development is Canyon Creek Estates
Final Drainage Report for The Crossings at Carefree II	development drainage report	April 18, 1995	Final	Neil/McGill Consultants, Inc.	Crossings II, 94 LP developer	SE 1/4 of NW 1/4 Sect 26, imm. north Stevens Drive		Carefree, 7/6/01		development is the Crossings at Carefree II (sometimes called Cow Track)
Final Drainage Report for Ocotillo Ridge Estates, Unit 1	development drainage report	March 17, 1998	Final	Neil/McGill Consultants, Inc.	developer	NE 1/4 of Sect 26, adj. to the Crossings at Carefree II		Carefree, 7/6/01		development is Ocotillo Ridge Estates
Carefree Zoning Map	Zoning Map	January 18, 2000		Carefree	Carefree	All of Town	1"=700' (Have Electronic Copy also)	Carefree, 7/3/01		Have .dxf format copy w/o text
Carefree Land Use Plan	Land Use Plan	January 5, 1996		Carefree (HNTB)	Carefree	All of Town	1"=2000'	Carefree, 7/3/01		Hard copy only
Cave Creek/Carefree ADMS Scope	data collection and scope letter report	June 19, 2000	Final	Coe and Van Loo LLC	FCDMC	regional		FCDMC, 4/01		City of Phoenix, Carefree, and Cave Creek sections of report not useful
Proposal for a CIP in the Town of Carefree	improvement proposal for downtown	September 24, 1998	Final	Carefree (Jonathan Pearson)	FCDMC	downtown area				
Digital Aerial Photography	aerial photography	September 30, 1999		M&B Aerial Mapping LLC	FCDMC, JE Fuller	Andora Hills and Gallowahy Wash areas	Electronic Copy	JE Fuller, 4/01		
Aerial Photography	aerial photography	January 14, 1999		Rupp Aerial Photography	Carefree	All of Town	1"=200'	**ON FILE AT TOWN**		Not in our possesion, on file at town, copies may be obtained for a fee from Rupp
Aerial Photography	aerial photography	November 6, 1994		Rupp Aerial Photography	Carefree	All of Town	1"=200'	**ON FILE AT TOWN**		Not in our possesion, on file at town, copies may be obtained for a fee from Rupp
Aerial Photography	aerial photography	June 1, 1990		Rupp Aerial Photography	Carefree	All of Town	1"=200'	Carefree, 7/13/01		Copies of Mylars made, Copies may be obtained for a fee from Rupp
Final Drainage Report for the Crossings at Carefree III	Drainage Report	November 19, 1996	Final	Neil/McGill Consultants, Inc.	developer	SW 1/4 of the NW 1/4 Sect. 26, N of Stevens Road		Carefree, 7/13/01		Development is Crossings at Carefree III
Drainage Report for Los Gemelos Subdivision (Note: now called Los Reales)	Drainage Report	June 1996	?, has redlines from Erich Korsten dated 9/17/99	D.N.A. Inc.	Chino North LLC (developer)	Sect. 4, T5N, R4E, Carefree Hwy and 60th St.		Carefree, 7/13/01		Development is called Los Reales, Includes copies of *Entrada Final Hydrologic and Hydraulic Study (Carefree Mountain Estates Unit One) 10/5/92, Hydrology and Hydraulic Report of Carefree Foothills 8/82, Terravita Master Drainage Report, 6/11/93*

Table 1
Data Collection Summary

Name of Reference	Description	Date Prepared	Version	Prepared By	Prepared For	Area Covered	Scale	Obtained From	Reference Number	Notes
Final Drainage Report for Tranquil Place	Drainage Report	October 1995	Final	Pinnacle Engineering, Inc.	developer	SW 1/4 Sect. 26, Tranquil Place		Carefree, 7/13/01		Development is Tranquil Place, text is missing, only maps and appendicies, see Plat Narrative for text (below)
Tranquil Place Preliminary Plat Narrative	Plat Narrative	April 1995	?	Pinnace Engineering, Inc.	Carefree Buena LLC	SW 1/4 Sect. 26, Tranquil Place		Carefree, 7/13/01		Development is Tranquil Place
Addendum to Final Hydrology Study for Wachs Desert Condos	hydrology study	April 1998	Addendum to Final	D.N.A. Inc.	Wachs Desert Condos (developer)	Between Sundance Trail and Hum Road, NW 1/4 Sect 35		Carefree, 7/13/01		Development is Wachs Desert Condos
Final Hydrology Study for Wachs Desert Condos	hydrology study	March 1998	Final	D.N.A. Inc.	Wachs Desert Condos (developer)	Between Sundance Trail and Hum Road, NW 1/4 Sect 35		Carefree, 7/13/01		Development is Wachs Desert Condos
Carefree Mountain Estates Preliminary Plat Narrative (devel. Now called Entrada)	Plat Narrative	May 1992, Revised June 1992	Preliminary	Gilbertson Assoc. Inc.	RJL Properties, Inc.	SW 1/4 Sect 4, Entrada		Carefree, 7/13/01		Development now called Entrada, only three pages copied
Entire drainage folder for Carefree Mountain Estates	Final Drainage Report included	October 1992, Revised November 27, 1992	Final	Gilbertson Assoc. Inc.	RJL Properties, Inc.	SW 1/4 Sect. 4, Entrada		Carefree, 7/13/01		Development now called Entrada, copied entire folder
Carefree Sentinel Rock Estates Improvement Plans	Improvement Plans	August 6, 1985	As-Built	Engineering and Surveying of Arizona, Inc.		North 1/2 Sect. 4	1"=100'	Reviewed at Carefree, 7/19/01		Includes grading and drainage
Cave Creek Wash South Study	Plans	August 1996		Willdan Associates	Flood Control District Report	Offsite areas for this report cover offsite and southern drainage in our area	1"=2000'	FCD, 7/10/01	A267.014.001 through 005	Obtained copies of land use map, basins boundary map, soils map, flow path lengths, routing lengths, and culverts map
Carefree Foothills Sewer Plan	Improvement Plans	February 17, 1983	As-Built			Carefree Foothills development, SE 1/4 Sect. 4		Reviewed at Carefree, 7/19/01	Boxes 34 and 37	Culvert Information obtained
Carefree Improvement District	Improvement Plans	July, 1963				Original Carefree		Reviewed at Carefree, 7/18/01	Kept on top of filing cabinet at Town	Old original mylars for town, culvert information obtained
Crossings at Carefree IV	Improvement Plans				developer	NW 1/4 Sect 26, Crossings at Carefree IV development		Reviewed at Carefree, 7/18/01	Marked Box	Culvert Information and design flow information obtained
Ocotillo Ridge Estates	Improvement Plans	June 25, 1997	Appear to be As-Builts		developer	NE 1/4 Sect 26, Ocotillo Ridge Estates development		Reviewed at Carefree, 7/18/01	Marked Box	Culvert Information and design flow information obtained
Final Hydrologic and Hydraulic Study Parcel J South at the Boulders Community	Drainage Report	May 27, 1992	Final	Gilbertson Assoc. Inc.	developer	near Scottsdale Road and Westland Drive, Parcel J		Scottsdale, 7/23/01	58-45	

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Name of Reference	Description	Date Prepared	Version	Prepared By	Prepared For	Area Covered	Scale	Obtained From	Reference Number	Notes
Final Hydrologic and Hydraulic Study Parcel L The Boulders Community	Drainage Report	January 23, 1991	Final	Gilbertson Assoc. Inc.	developer	near Scottsdale Road and Westland Drive, Parcel L		Scottsdale, 7/23/01	58-45	
Drainage Report for Fifth Green at the Boulders	Drainage Report	April, 1987	unk.	Collar, Williams and White Engineering	Malouf Brothers Development	near Scottsdale Road and Westland Drive		Scottsdale, 7/23/01	58-45	
Preliminary Hydrologic and Hydraulic Study, Parcel Q, Unit 1 The Boulders	Drainage Report	August 13, 1991	Preliminary	Gilbertson Assoc. , Inc.	developer	The Boulders, just south of Town limits		Scottsdale, 7/23/01	58-45	Some of the 11x17 figures got copies at 8.5x11 - may need to get those correctly
Preliminary Hydrologic and Hydraulic Study, Parcel M, The Boulders	Drainage Report	June 11, 1992	Preliminary	Gilbertson Assoc., Inc.	developer	near Scottsdale Road and Westland Drive		Scottsdale, 7/23/01	58-45	
Drainage Study, The Boulders, Sections 2, 11, 3, and 10, T5N, R4E, Maricopa County, AZ	Master Drainage Report	December 1984	unk.	Bookman-Edmonston Engineering, Inc.	The Boulders Joint Venture and Brooks, Hersey and Associates, Inc.	All of the Boulders development, Sections 2, 11, 3, and 10, T5N, R4E		Scottsdale, 7/23/01	58-45	
The Boulders Hydrologic Report Resort Area	Drainage Report	November, 1982	unk.	Brooks, Hersey and Associates, Inc.	Boulders/Carefree Partners	25 Acres on western edge of Boulders in SW 1/4 of Section 2 and NW 1/4 of Section 11		Scottsdale, 7/23/01	58-45	
Master Drainage Plan for Desert Ranch	Drainage Report	November 16, 1987	unk.	Collar, Williams and White Engineering	Blue Road Properties	NE of Stagecoach Road and Pima Road, Scottsdale		Scottsdale, 7/24/01	58-50	
Drainage Study for Desert Ranch	Drainage Report	December 1983	unk.	Bookman-Edmonston Engineering, Inc.	Desert Ranch Properties, Inc. and Brooks, Hersey and Associates, Inc.	NE of Stagecoach Road and Pima Road, Scottsdale		Scottsdale, 7/24/01	58-50	
Preliminary Drainage Report for Parcel G/H Desert Ranch Development	Drainage Report	October 19, 1993	Preliminary	Coe and Van Loo Consultants, Inc.	Desert Ranch Estates Partnership	NE of Stagecoach Road and Pima Road, Scottsdale		Scottsdale, 7/24/01	58-50	
Preliminary Drainage Report for Parcel I/J Desert Ranch Development	Drainage Report	January 14, 1994	Preliminary	Coe and Van Loo Consultants, Inc.	Desert Ranch Estates Partnership	NE of Stagecoach Road and Pima Road, Scottsdale		Scottsdale, 7/24/01	58-50	
Preliminary Drainage Report for Parcel B/C Desert Ranch Development	Drainage Report	October 21, 1993	Preliminary	Coe and Van Loo Consultants, Inc.	Desert Ranch Estates Partnership	NE of Stagecoach Road and Pima Road, Scottsdale		Scottsdale, 7/24/01	58-50	
Improvement Plans for the Crossings at Carefree II	Improvement Plans	April 1995	unk.	Neil/McGill Consultants, Inc.	developer	Stevens Road at Rising Sun, SW 1/4 of NW 4/1 Sect. 26, T6N, R4E	1"=20'	Carefree, 7/24/01	(not in box)	

Table 1
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Name of Reference	Description	Date Prepared	Version	Prepared By	Prepared For	Area Covered	Scale	Obtained From	Reference Number	Notes
Improvement Plans for the Crossings at Carefree III	Improvement Plans	April 1996	As-Built	Neil/McGill Consultants, Inc.	developer	Stevens Road at Rising Sun, SW 1/4 of NW 4/1 Sect. 26, T6N, R4E	1"=20'	Carefree, 7/24/01	(not in box)	
Improvement Plans for Lost Acres Estates	Improvement Plans	October 1993	unk.	Louis C. Warner and Company's Surveyors, Inc.	developer	Perdido Drive at Cave Creek Road, NW 1/4 of SW 1/4 Sect 4, T5N, R4E	1"=20'	Carefree, 7/24/01	(not in box)	
Sky Ranch Phase II Street Survey	As-Built Survey	February 1987		Gilbertson Associates, Inc.	developer	Sky Ranch next to Airport, north of Cave Creek Road, Sect. 36	1"=20'	Carefree, 7/24/01	(not in box)	
Tranquil Place Improvement Plans	Improvement Plans	January 1996	City Revisions	Pinnacle Engineering, Inc.	developer	Tranquil Place off of Tranquil Trail/Rising Sun Road	1"=20'	Carefree, 7/24/01	(not in box)	
Paving Plans for Cave Creek Road from Pima Road to Desert Mountain Parkway	Paving Plans	March 1986	Submittal for Approval	Collar, Williams and White Engineering	Desert Mountain developer	Cave Creek Road between Pima Road and Desert Mtn Pkwy	1"=40'	Carefree, 7/24/01	Box 51	
Plans for the Construction of Stagecoach Pass - Mule Train to 3/4 mile east of Pima Road	Improvement Plans	1985	Preliminary	Maricopa County Highway Department	Maricopa County	Stagecoach Pass between Mule Train Road and Pima Road	1"=40'	Carefree, 7/24/01	Box 152	
The Crossings at Carefree	Improvement Plans	May 1988	unk.	Stanley/Mettee-McGill-Murphy, Inc.	Custom Quality Comminities Inc.	Rising Sun Road, The Crossings, SW 1/4 Sect. 26	1"=40'	Carefree, 7/24/01	Box 58	
Improvement Plans for Ridgeview Estates	Improvement Plans	November 1997	As Built	Neil/McGill Consultants, Inc.	K.W. Group I, L.L.C.	Ridgeview, SE 1/4 Sect. 27 and NE 1/4 Sect. 34, T6N, R4E	1"=20'	Carefree, 7/24/01	Box 141.3	
Improvement Plans for Carefree Villiage	Improvement Plans	January 1987	Preliminary	Lyon Engineering Inc.	Carefree Villiage Development Corp.	Tranquil Trail, Cave Creek Road, Happy Hollow, NE 1/4 Sect. 35	1"=20'	Carefree, 7/24/01	Box 45	Appears that this subdivision was never built. Information on Culverts not entered.
Orthophotography for Portions of Maricopa County	aerial photography	December 2000		FCDMC	FCDMC	All	pixels for 5 scale and 20 scale	FCDMC, 7/16/2001		
Final Drainage Report for Terravita, Parcel J and V	Drainage Report	March 8, 1996	final	JMI and Associates, Inc.	Del Webb Corporation	Scottsdale Road south of Carefree Highway, Terravita		Scottsdale, 7/27/01	58-44	
General Drainage Plan for North Scottsdale, Arizona	Drainage Report	April 14, 1988 June 7, 1989 (revised)	appears final	Water Resources Associates, Inc.	City of Scottsdale	All of North Scottsdale		unk.		Obtained during proposal phase

Table 1
Data Collection Summary

Name of Reference	Description	Date Prepared	Version	Prepared By	Prepared For	Area Covered	Scale	Obtained From	Reference Number	Notes
Terravita Way at Carefree Highway	Improvement Plans	November 1995	unk.	Kirkham Michael and Associates	Terravita	Terravita Way at Carefree Highway		Scottsdale, 8/7/01	25719	Only have one sheet on Terravita Way (doesn't cover Carefree Highway), has flow estimates for split that occurs south of Carefree Highway
City of Scottsdale Grading Plan of Pacel Q and R Terravita	Grading Plans	May 30, 1995	unk.	JMI and Associates, Inc.	Terravita, City of Scottsdale	Terravita Way at Carefree Highway		Scottsdale, 8/7/01	25608	
USGS 7.5 Minute Series Topographic Maps	topographic maps	Photorevised 1981	photorevised	USGS	public	entire project area	1"=2000', 20' contour interval	USGS		
Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona	soil survey	April 1986		USDA, Soil Conservation Service	public	entire project area		SCS		
Town of Carefree Subdivision Ordinance	development regulations	Adopted 4/29/85, amended 1987 through 1999	amended through 1999	Town of Carefree	public	entire Town limits		Town of Carefree		
Town of Carefree Zoning Ordinance	development regulations	Ninth Publication, February 6, 1996	amended through 1996	Town of Carefree	public	entire Town limits		Town of Carefree		
Computer Aided Drafting and Design (C.A.D.D.) Data Delivery Specifications: Rev. 1.0	report data delivery specifications	January 2000	Rev. 1.0	FCDMC	public			FCDMC		
Preliminary Drainage Study, Town Center, Town of Carefree	Drainage Report	September 26, 2000	Preliminary	Erich E. Korsten	Town of Carefree	downtown area		Town of Carefree, 10/23/2001		
Master Drainage Study for the Tranquil Trail Subdivision and Villages at Carefree	Drainage Report	January 3, 1997	unk.	Brooks, Hersey and Associates, Inc.	developer, White Hawke LLC	NE 1/4 Sect 35, north of Cave Creek Rd., adj. Downtown		Town of Carefree, 10/23/2001		
North Scottsdale Floodplain Delineation Study	Preliminary Drainage Report	On-going	Preliminary	DEI Professional Services, LLC	FCDMC	North Scottsdale and southeast portion of Carefree		FCDMC, DEI		Study is on-going
Final Drainage Report Carefree Ironwood Estates	Drainage Report	March 13, 2001	appears final	United Engineering Group	developer, Monterey Homes	SW 1/4 Sect 4, NE corner Carefree Highwy and Cave Creek Road		Town of Carefree, 10/23/2001		

APPENDIX B.1

Special Problem Reports

There were no Special Problem Reports in this study.

APPENDIX B.2

Contact (Telephone) Reports

There were no Special Problem Reports in this study, therefore no correspondence related to special problems.

Carefree Drainage Project Meeting - 4/30/03

ATTENDEES: Doug Williams/FCDMC, Richard Harris/FCDMC, Tim Murphy/FCDMC, Tony Bokich/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: April 30, 2003

The meeting was called to order on 4/30/03 at the FCDMC building.

It was agreed on by CH2M HILL, FCDMC, and Erich Korsten that the floodplain mapping on the Unnamed Central Tributary to Cave Creek downstream of Terravita way would be removed from the TDN and FEMA submittal. The following change to the deliverable is as follows:

CH2M Hill will
1) complete the TDN and FEMA forms with the revised limits of floodplain mapping (downstream end at Terravita Way).
2) Deliver 5 copies of the TDN; 2 for FCD, 1 each for Carefree, FEMA, Scottsdale.
3) complete the DMP and Executive Summary with the revised limits of the floodplain mapping. The only changes to these documents from what was previously expected will be the limits of the floodplain mapping.
4) deliver 3 copies of the DMP; 2 for FCD, 1 for Carefree
5) deliver 30 copies of the Executive Summary; 2 for FCD, 28 for Carefree
6) prepare an addendum to the DMP that includes the floodplain mapping for the deleted downstream portion. This will include flow split analyses, HEC-RAS model, floodplain mapping for the washes downstream of Terravita Way as they are currently mapped (with Q revisions). The addendum is for informational and planning uses only, not for FEMA.
7) Deliver 3 copies of the addendum: 2 for FCD, 1 for Carefree.
8) Prepare a fee estimate for the above work. Some of this work is in scope and some is not. I will send the fee estimate and scope separately.
FCDMC will
1) Confer and decide how best to proceed with the floodplain mapping of the downstream portion. This work will possibly be performed by CH2M Hill in an extended contract or postponed until a later date under separate contract, possibly by others.
Modeling options for the downstream portion include:
a) Have survey and mapping subcontractor complete the missing portion of the 2' contour mapping and complete the mapping with conventional HEC-RAS modeling.
b) "" " " "" 2-D modeling.
c) Either of the above with new 1' contour mapping.

Carefree Drainage Project Meeting - 4/8/03

ATTENDEES: Doug Williams/FCDMC, Tim Murphy/FCDMC, Richard Harris/FCDMC, Erich Korsten/Carefree, Steve Cooke/CH2M HILL, Tony Bokich/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: April 23, 2003

- The meeting was called to order on 4/8/03 at 3:30 pm at the offices of CH2M HILL.

Ideas

- Leave Unnamed Central Tributary to Cave Creek out of submittal and delineate FP with 2D modeling later.
- Letter to FCD to revise "Limits of Detailed Study". Reason: to look at alternatives and to do further study.
- Both ideas above were voted down.
- Next council presentation after runoff election in May.
- Town must accept maintenance agreement of flood walls ("levees") to be included in the floodplain.

Information Erich Korsten Needs

- Old Q's and new Q's.*
- List of homes in FP.*
- List of FF elev's and adjacent ground.*
- List of BFE's at each home.*
- Flow split analysis
- Old flow splits
- The items above with a * by them need to be on the map also.
- Run flow split UC _____ to check results. Use roadway vs. boundary control.
- Talk to Marta Dent to get Terracita mapping.

Carefree Drainage Progress Meeting

ATTENDEES: L. Johnson/CH2M HILL
M. DeRosa/FCDMC
?

FROM: T. Bokich/CH2M HILL

DATE: March 27, 2003

- The meeting was called to order on 9/18/02 at 2:00 pm at the offices of CH2M HILL
- Schedule Meeting with Town
  - Marilyn would like Jon to be there - LSD does not need to go.
  - Pick three alternate dates to present to Town (10/7, 10/9 (am), 10/10 (afternoon)
  - Erich Korsten will be scheduling meeting for Town per Jon's request, attendees include Jon Pearson and Gary Neiss; Erich does not think that Mayor or Council should attend.
- Preliminary Results of Prioritization
  - Review prioritization process for team members that did not attend Brainstorming Session.
  - Results attached - CH2M HILL completed the matrix using example priorities.
- Structure of Meeting with Town
  - Show them example matrix, go through prioritization process, re-score priorities
  - Ask them if they would like Mayor and Council to participate in process.
- Data Collection Report
  - Marilyn to review by Tuesday.
- Change Order Letters
  - Marilyn to e-mail to Tony tomorrow.
- Update on Floodplain Modeling Task
  - Centerlines and cross sections shown on map, preliminary models run. Some areas require calibration, field check, etc.
  - Highlight on split downstream of Terravita Way - Medical building and berm
- Schedule
  - Critical Path schedule completed, still needs refinement.
  - Schedule separate meeting with Marilyn/Doug to discuss in detail (come to District @ 2:30 Thursday). Mike to ask town what is available week of 13th.
  - Public meeting in January - week of 20th
  - Council presentation of 2/4.
- Letters for C.O. - added some optional tasks.
  - What is left to do?
  - Leslie want to do stuff
  - Wants all
  - New items

  - Took all tasks, put in previously existing items
  - Additional effort - good wording
  - Marilyn will e-mail to Tony
  - Tony will have to keep track of where to bill
  - Print, sign, fax back to Marilyn - Marilyn is going to add
  - Leslie should now be available for meetings.
- Mike to check into council member elections/changes
- Before we meet with Town
  - Don't want to give them this many
  - Present to Town - answers to questions/problems we know they're going to ask.
- Marilyn - Monday 30th for field meeting/tour
  - Mark off day where/when
- Categories of problems
  - Color exhibit
  - Simple
  - Categories of problems
  - Frequency
  - Common criteria elements
  - Free to add more
  - Show them an example of prem. Matrix.
  - Work on something like that.
- Diane to run session with Town?
- Get example Tc map from Doug & Marilyn.
- Linda to set up 7th Monday, 9th morning, 10th afternoon
- Mike needs to leave early
- Leslie available 3-5 Tuesday 24th, Wed., 2nd in morning, 8th & 11th no good
- Call Mon. back on 1990 rpt.
- Workplan needs to incorporate Rob & Emili
- Impassable "fix-it" scenarios.
- Preliminary design plans for 8 sites?
- Talk with Fuller about inspection and monitoring plan

Carefree Drainage Project Meeting

ATTENDEES: Richard Harris/FCDMC
Tim Murphy/FCDMC
Linda Johnson/CH2M HILL

FROM: Tony Bokich/CH2M HILL

DATE: March 11, 2003

- The meeting was called to order on 2/19/03.
- Affidavit of Publication
  - Notifying intent to study.
  - M. Lempke will check into.
- Written C.O. documentation and copy of contact.
- Provide GIS submittal
- Flood Profiles for floodplain delineation
  - RAS plot - try it.
- FIS - 1 or 2 paragraphs on why we did report.
- Addendum for hydrology
  - Reference - excerpts in Appendix
- Tabs are preferred to separate report sections
- Flow Split stuff in hydrology addendum
- Riverine structures FEMA form needed as well for existing stuff too.
- Reduced size plans - make sure they match full size exactly - scan only.
- Plan sheets Average conversion on legend.
- Has M & B mapping been approved? Ask for letter from Mark Breuer.
- Generate Report Feature in HECRAS - detailed output at each cross section.
- RAS plot - make separate table for it to work.
- How many copies?
  - 2 TDN's for review, 1 for Carefree - Erich.
  - 2 DMP's, 1 for Marilyn, 1 for Erich.

Carefree Drainage Progress Meeting

ATTENDEES: B. Erickson/City of Scottsdale
J. Kuhn/Kuhn & Associates
R. Harris/FCDMC
L. Johnson/CH2M HILL
M. Brinkley/SHC

FROM: T. Bokich/CH2M HILL

DATE: March 11, 2003

- The meeting was called to order on 2/6/03 in the offices of the City of Scottsdale.
- Put 100% (722 cfs) into downstream.
  - The City of Scottsdale agrees with this.
- Submit to FEMA in May - 1 to 2 years adoption.
- Would need floodplain use permit to build in floodplain.
- When done, give to Bill & John Kuhn.
- Give to Bill to review.
- Kuhn wants a copy with elevations.
- Call John Coutney with COS to see if agreeable with survey.
- Wants M & B internal job number.
- EPM's
  - All on each sheet.
  - Give a consect number - ERM 1 #, ERM 2, etc.
- Get section file from RH.
  - Shapefile of section corners.
- Add NAD 83 note state plane coord.
- Look for town boundaries in shape files.
- Sheet 6 Romping Road add overtopping Q.

Carefree Drainage Progress Meeting

ATTENDEES: T. Murphy/FCDMC, R. Harris/FCDMC, L. Johnson/CH2M HILL, T. Bokich/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 11, 2003

- The meeting was called to order on 2/3/03 at 9:00 am in the offices of FCDMC.
- Flo 2D
  - Maybe do this area?
  - Time consuming
  - Is it worth the effort?
- AO Zone
  - Average depth instead of WSE
  - Have to be at least 1′ above
  - Adjacent ground
  - Would pay lower premiums
  - No, just stick w/AE
- How to best model for completion of this project.
- Another contract to go further
  - Recommendation in DMP
    - 1′ contours.
    - 2D modeling.
- Check with planning (Doug, Marilyn)
- Address limits of flood plain mapping in DMP report
  - Need additional study
- Limit of detailed study
  - Bend back
  - Take off levee, put in ineffective flow
  - Maybe put in language
- Addendum
  - Text with exhibits about flow splits
  - Maybe tables – redo with flow numbers

Carefree Drainage Project Meeting

ATTENDEES:	M. DeRosa/FCDMC	R. Lyons/CH2M HILL
	M. Lempke/FCDMC	T. Bokich/CH2M HILL
	R. Harris/FCDMC	L. Johnson/CH2M HILL
FROM:	T. Bokich/CH2M HILL	
DATE:	March 12, 2003	

- The meeting was called to order on 1/30/03
- M. Lempke will get affidavit of publication.
- Do not extend mapping.
- April 1st is the Public Meeting - Council Presentation.
- Status of letter
  - Marilyn to review
  - Get Erich to send out.
  - Linda to talk to Erich
    - Homeowners to get by next Friday
    - Need 1 week notice
    - Want survey week of 11th of March
- Linda to tell Mike April 1st for PowerPoint.
- Copies of Exec. Summary
  - 30 total:
  - 10 to Town
  - 20 to Marilyn and 1 unbound
- No neg. floodway changes
  - FP=FW
- Profiles - everything labeled
  - Mike Duncan
- Either x or f has been done
  - Mark Brewer's check list

Carefree Drainage Progress Meeting

ATTENDEES:
B. Erickson/COS
L. Johnson/CH2M HILL
R. Harris/FCDMC
T. Murphy/FCDMC
J. Kuhn/Evans, Kuhn & Associates
M. Brinkley/Scottsdale Healthcare

FROM: T. Bokich/CH2M HILL

DATE: March 12, 2003

- The meeting was called to order on 1/29/03 at the City of Scottsdale.
- Scottsdale allows encroachment in floodway.
- Take out floodway from our study in Scottsdale limits.
- Submit LOMR with CLOMR from SHC.
- Put in footprint – lock it in with new building.
- 2 models
  - one with new building
  - one without new building
- Meet again in approximately 1 week or so.
- Pull elev. cert on finished floor for center.

Carefree Drainage Progress Meeting

ATTENDEES: E. Korsten/Town of Carefree, L. Johnson/CH2M HILL, T. Bokich/CH2M HILL, M. Lempke/FCDMC, R. Harris/FCDMC, T. Murphy/FCDMC

FROM: T. Bokich/CH2M HILL

DATE: March 12, 2003

- The meeting was called to order on 1/28/03.
- Get Marilyn fee proposal for surveying.
- 13 houses
- Study needs to have alternatives for flooded houses.
- Erich wants FF done first
  - Elevation certificate with 4 corner adj. Grades.
- Town will determine when submitted to FEMA.
- Town might be willing to kick in many dollars.
- CH2M HILL is to compare FF elevations to WSE.
- Erich would like the thelwag shot as well.
- Shoot thalwag profile down.
- Watch for stepping down FF elevations.
- Letter for Marilyn and Doug - cost proposal.
  - Linda to write letter - look at Rio Verde.
- Provide Town with names
  - If they have questions about survey, call Aztec.
  - If they have questions about floodplain, call Tony or Linda.
- E-mail text to Betsy Wise and ekorsten@gmx.net
- 4 people have not received notification at all
  - Track down owner's association.
  - Betsy or Bev - Melissa
- Check with Aztec - 2 weeks - what is availability?
- Town to send out letters - as long as we provide names and addresses.
- Letter to ask for $$ and time extension at same time.
- Close up map for Entrada highlighted.
- Saturday - bring boards, Doug to do presentation.
- Erich would like to emphasize that our study did not put them in the floodplain.
- Del Webb
  - Tony and Linda met with B. Erickson
- Tomorrow morning - Tim and Richard, Linda and Tony stamp preliminary, highlight building footprints.
- Development - put all 868 through culvert (#3)
- Side weir @ flow split.

- MCFCD
  - 3 volumes - revision, want separate policy/guidelines manual
  - Local drainage regulations
  - Floodplain regulation (FEMA)

Carefree Drainage Progress Meeting

ATTENDEES: B. Erickson/COS
T. Bokich/CH2M HILL
L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 12, 2003

- The meeting was called to order on 1/23/03 at the City of Scottsdale.
- Items for B. Erickson
  - Floodplain
  - Card from concerned citizen
  - Detention basin upstream in O.M.
    - Pump rates?
    - Sediment?
- Desert Mountain
  - Sediment probably filled up
  - Detention basin with pump??
  - Has been cited before
  - One does meet regulatory for dams
  - D.M. responsibility for maintenance

Carefree Drainage Progress Meeting

ATTENDEES: M. Lempke/FCDMC
M. Book/LSD
L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 12, 2003

- The meeting was called to order on 1/21/03 at 3:45 pm at the Flood Control District offices.
- Melissa to bring boards.
- Mike bringing reprinted flyers.
- Linda to bring Nora handout.
- Mike to bring food for us.
- Linda to bring 23 B&W and 2-color presentations
- 6:30 meeting, presentation @ 6:45 pm.
- Linda to talk to Erich - call him
  - Walk went well
  - Councilman Zuker was there.
- Linda to bring packet of things for Erich - plus extension cord.
- Linda to bring datashow to meeting (just in case).
- For Council
  - Slide #6 - add number of sites
  - Slide #7 - add marker at site #3
- Laser pointer - Linda to bring
- Linda to bring access maps (hard copy) - mount (if time)
- Council presentation - funding sources slide - check into Kent's report
- Mike is bringing nametags, sign-up, comment sheets, refreshments
- Linda to burn CD
- Linda to send e-mail to Leslie, Jon, Marilyn, Richard and Bill Erickson.
- Council presentation practice: Tuesday, 1/28/03 at 3:00 at CH2M HILL

Carefree Drainage Progress Meeting

ATTENDEES: M. Book/LSD, T. Bokich/CH2M HILL, D. Williams/FCDMC, L. Johnson/CH2M HILL, M. DeRosa/FCDMC

FROM: T. Bokich/CH2M HILL

DATE: March 12, 2003

- The meeting was called to order on January 13, 2003.
- Check for Marilyn's comments on access plan via e-mail.
- Wash walk is a go - 9:00 at Town Hall.
- Executive Summary of DMP would be good - not in scope.
- Still pull 2 artistic renderings to 2 design slides.
- Leave 4 on other slide title " sustainable design solutions"
- Melissa - other boards for delineations.
- We will provide 25 B & W copies of Powerpoint @ public meeting.
- Marilyn will reserve suburban for wash walk.
- Linda and Fuller to work on itenerary 5 or 6 sites @ wash walk.
- FCD - have Melissa join wash walk.
- Schedule change - end of March.
- Look for dollars for executive summary (10 pages)
  - Prepare like general public handout
- Have Leslie attend public meeting
  - See if she has found any problems
- Meeting - bring past handouts (hurricane Nora stuff)
- Mike to put both presentations on CD.
  - Old and revised, November 12th Powerpoint.
  - For Doug by end of the month.
- Contract end at April 11th (goal: end of March)
- Letter to ensure review time because Town Council postponed meeting. T. Bokich to get letter to Marilyn by end of next week.

Carefree Drainage Public Meeting

ATTENDEES: M. DeRosa/FCDMC, M. Lempke/FCDMC, M. Book/LSD, L. Johnson/CH2M HILL, D. Williams/FCDMC

FROM: T. Bokich/CH2M HILL

DATE: March 13, 2003

- The meeting was called to order on 1/10/03.
- Wash Walk – important, aim for 16th, make sure Jeff is available.
- Environmental Draft – by Monday!! To District or no money.
- Wash Walk – Melissa to look into Republic - 2.5 hours max.
- Public Meeting Format
  - Change color of background a little
  - PowerPoint same at both
  - Brent & Danielle – Graphics
  - 6:45 presentation
  - Practice Meeting @ CH2M HILL, 21st at 9:00 am.
    - Fuller
    - Leslie
    - Melissa
    - Mike Book
    - Doug & Marilyn
    - Warm up for council presentation
- Call council to make sure 4th is confirmed
  - 5:00, leave at 3:00
- 13th – 11:00 – 12:00
- 16th – Wash walk and presentation practice
- Mike to e-mail Melissa a list of mailings.
- Talk to Tony – ok to have change order.
  - Maybe end of March, just for review.
- 404 permit – do jurisdictional limits as well.
- PowerPoint
  - combine some slides
  - Traffic maps in PowerPoint
- Richard will be there for floodplain delineation
- Print out copies of PowerPoint – 2 color copies.
- Press Release? Yes by end of the week.
  - Ad in 4 newspapers
- 2 new boards and in PowerPoint for preliminary design bridges/culverts

Carefree Drainage Progress Meeting

ATTENDEES: R. Harris/FCDMC
M. Lempke/FCDMC
L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 13, 2003

- The meeting was called to order on 1/8/03 at 9:00 am.
- Scottsdale - Public Meeting need representative.
- Need copy of public correspondence, mailing list in TDN.
- TDN additions
  - B.5. - Next after public notification
  - B.6. - FEMA correspondence.
- NG - map floodway? Use rise in EG (can do in HECRAS).
- Check culverts
  - At differeint slopes do for best case/worse case
  - Run in culvert master
    - See if makes a headwater difference
    - Print out for TDN
    - Where there is more than 0.5% slope difference
- Look for total miles of floodplain delineation
  - Mapping floodway, outside of scope on galloway
- Melissa to call PIO for Scottsdale
- Linda to call Bill Erickson again and e-mail, turn on notifications
- Add culverts (draw barrels and headwalls).
- Send Richard 2 survey dgn files.

Carefree Drainage Floodplain Delineation

ATTENDEES:	L. Johnson/CH2M HILL T. Bokich/CH2M HILL	T. Murphy/FCDMC R. Harris/FCDMC
FROM:	T. Bokich/CH2M HILL	
DATE:	March 17, 2003	

- The meeting was called to order on 12/19/02.
- NG – better topo
  - Floodway in HEC RAS
- FEMA process
  - New delineation areas
    - Floodway?
- Public Involvement
  - Admin. Floodways – No
  - Does FCD contact after FEMA approval?
    - Contact district's PM or Town
  - Survey (Elev. certif.) – Ask Marilyn if District wants to do, or add onto our contract
    - No official policy on that by District
  - We eventually need to let them know
  - Floodplain/floodway
- Floodway – Map floodway = floodplain
- Med Center
- Non-certified levee
  - Act like one side fails, then the other
  - Map like a contour map, use worst case for each one
  - (Do This first) – 1 do ignore as if not there
    - (Go all the way, don't remove geometry)
    - Make floodway from this one.
- Submittal to FEMA
  - District will do for Carefree
  - Not under contract for changes
- Survey – Richard wants field notes sealed.
  - Linda to send base topo and cross sections – dgn is fine.
- Terravita Wash – Check with Scottsdale.
- Wednesday, 22nd – Public Meeting
- Ditch @ Wildflower
  - Run full flow like contain
  - Limit of detailed study
  - Put levee down center of road
- Document how n-valves were obtained

- Junction – WSE ok
- Copy Richard on all Town/City transmittal letters
- Column to check stability
- Floodplain delineation meeting
  - Houses in floodplain – LOMA survey
  - Initial submitted
  - Comments
    - UC – Med. Center berm/Scottsdale
    - NG – Tim wants us to compare with old? Floodway per rise in EG.
    - SCP
  - Richard has
    - Pima
    - Windmill
- Sealed survey notes?
- Requested further explanation of raw data
  - Submit – plot?
  - Hard labeled dwg?
- Ask Tim again about modeling all on one side. SCP
  - See note 3 on review summary.
- Junction loss

Carefree Drainage Progress Meeting

ATTENDEES: L. Johnson/CH2M HILL, T. Bokich/CH2M HILL, M. Book/LSD, L. Paty/HDR, J. Fuller/JE Fuller, L. Dornfeld/HDR, M. DeRosa/FCDMC

FROM: T. Bokich/CH2M HILL

DATE: March 17, 2003

- The meeting was called to order on 12/17/02, 9:00 am at the offices of FCDMC.
- Floodplain Delineation
  - Submittals are proceeding with T. Murphy/R. Harris - try to meet this afternoon at 1:00 - T. Murphy and T. Bokich to attend and talk about FEMA.
- Engineering Design Guidelines
  - Marilyn and Jon to review before sending to Town.
- What's left to do?
  - Implementation and Funding Plan - Kent Ennis/CH2M HILL assisting, add improvement - district??
- Jan. 2nd
  - Review due ERA and Eng. Design Guidelines by project team.
  - Wait until team has reviewed.
  - Deliver to Town that Friday or Monday.
- Public Meeting
  - Flyer - Melissa's comments
  - To printer tomorrow
  - Mailing list
  - Floodplain delineation list - Melissa
  - Count up parcels - (done) RL 12/4
  - Post ad 2 weeks before in post office.
    - M. Book will take up and post.
    - Extra flyers @ post office.
  - Send Melissa copy of newspaper notice.
    - Attend?
    - Marilyn to ask Tim - should his group show up?
    - All team members to attend, no extra
  - Tuesday, 7th January - Public Meeting practice Meeting
    - Linda to bring Datashow
    - 9:00 am - look at old show and change.
    - Look at board

Carefree Drainage Naming Convention for Unnamed Washes

ATTENDEES: R. Harris/FCDMC
L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 17, 2003

- The meeting was called to order on 11/26/02.
- TZNR3E536_TI - where it originates
- Ground Profile
- Islands - only if over 1'.
- Detailed
- Uncertainty of flow paper.
- Floodway - floodplain, local community decisions
  - Ask town
- Check junction loss with Fuller's model.
- Model with all flow on either side, or take it out - model as if not there (ground before? No topo).
- Plot cross sections to scale
- Roll plot with n-valves and sections.

Carefree Drainage Progress Meeting

ATTENDEES: J. Fuller/JE Fuller
L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 20, 2003

- The meeting was called to order on 11/13/02 at 1:00 pm.
- Insp. Monitoring & Maint. Plan
  - Channel top width changes
  - Stream
- Structures
- Maint. - how to clear sediment
- Install Markers
- Response to homeowners
  - Talk to Tony abaout who is doing what
  - Archeology subconsultant
- Con Arch prices?
- Software write-up - several alternatives, will determine during study
- Mont. CIP - coordinate with sewer master plan
- Linda to address project expectations

Carefree Drainage Progress Meeting

ATTENDEES: G. Neiss, L. Paty, N. Zeno, L. Dornfeld, J. Pearson, E. Korsten/TOC

FROM: T. Bokich/CH2M HILL

DATE: March 20, 2003

- The meeting was called to order on 11/12/02.
- Trails plan
  - Adopted plan, but no easements
  - Leverage minimal to get new trails provisions
  - Pump station is great opportunity to get trailhead
  - Jon P. thinks that the Scottsdale gated communities would doubtfully like people coming in
  - Desert Mountain trails dedicated during development
  - Suggestions are low-key parking option
  - Private properties?
    - Extend town's liability
    - Not allowed to have fences without floodplain use permit
  - Unknown if trails have support
  - Keep as appendix in Drainage Master Plan report
    - Call a "wash access program" not trails
  - A few pieces of trails exist, Ocotillo Ridge
  - Cave Creek Trail System - none are built, but designated
- Erich wants Town to adopt as a DMP
- Have as a reference, standalone rpt
- Culvert with big erosion hole Silver Saddle @ Golden Spun
- Pipe vs. ditch on romping, wait for direction

Carefree Drainage Progress Meeting

ATTENDEES: J. Fuller/JE Fuller
M. DeRosa/FCDMC
L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 24, 2003

- The meeting was called to order on 11/6/02.
- Houses along Galloway
  - Erosion would need structural protection.
  - Offset levee for avulsive.
  - 25 year or greater with aggrad. happening
- Recommend to buy flood insurance in avulsive areas.
  - Cheaper, good recommendation.
- Add Galloway back in entire reach.
- November 19th
  - Leslie
  - Jon
  - Mike Book
  - Entire Team
- Marilyn busy next week, if we need to talk.

Carefree Drainage Town Council Presentation Practice Session

ATTENDEES: L. Johnson/CH2M HILL
?

FROM: T. Bokich/CH2M HILL

DATE: March 24, 2003

- The meeting was called to order on 11/6/02.
- Russ Miracle promoted taking Tom Johnson's place - new division manager.
- Mailing for flyer? Ask Melissa.
- Reviews from SLT and Richard Harris.
- Change font to sans serif or aerial, make bigger.
- Back-up computer by CH2M HILL.
- Red laser pointer
- Rehearsal meeting
- Meeting for sites to advance to town?
  - E-mail
  - Meet with Fuller either tomorrow or Wednesday
- Meet 4:00 on Wednesday at District for presentation practice
  - Bring DataShow - Doug, Marilyn, Linda
- Want LSD done.
- Tony - bill more!!
  - Must have 2 big bills!
- Leslie needs to do another trail thing after this council meeting.

Carefree Dainage Progress Meeting

ATTENDEES:
N. Zero
J. Pearson
G. Neiss
L. Johnson/CH2M HILL
T. Bokich/CH2M HILL
G. Fudar
L. Dornfeld
D. Williams/FCDMC
E. Korsten/Town of Carefree

FROM: T. Bokich/CH2M HILL

DATE: March 24, 2003

- The meeting was called to order on 10/24/02.
- Keep sconing, describe method
- Nov. 6th - PowerPoint
  - Have Gary and Erich review
  - Send to Betsy Wise
- Thursday, 31st at 8:30 @ CH2M HILL
- Meeting with Richard Harris
  - Stagecoach Pass Wash - not included done by DEI
  - Approximate - no profiles
    - If detailed to FEMA, need profiles
- WSE
  - WSE @ Stagecoach pass wash
  - 2618.0
  - Still preliminary
- Because of momentum set levees @ 2:1 (Hal Marron's reassessing per Richard Harris)

Carefree Drainage Progress Meeting

ATTENDEES: L. Johnson/CH2M HILL
Mark Brewer

FROM: T. Bokich/CH2M HILL

DATE: March 25, 2003

- The meeting was called to order 10/23/02.
- Have not seen corrected mapping submittal.
  - Survey stuff to review has to be part of TDN (seated).
- Entry types: see if it will translate.
- Get xls files off of website. (resources?)
  - Populate with what they want, nothing else in there.
  - Don't format.
  - Copy - paste special - valves only.
- Review based on everything you would see on hard copy map
- Don't deliver any title block stuff.
- Cauto file = everything that doesn't have specific place.
- Galloway Wash where typing in, put in cauto file (just fdpl. limits).
- Leader stuff is cauto file - not in that file.
- Every reach on it's own layer
- They would prefer
- Some river (some river stationary) base it on river name
- River 1 Reach 1
- Deliver in this format: FCD00-37
  ↓
  space
- Robert Moon should have PRJ_RID for Carefree Proj. (CP-326)
- Shouldn't have to deliver soil types.
- Cross Sections on UC - same level xsections same name
- Same stream can be same level.
- UC Reach 1, UC Reach 2.
- New stations, Something different than UC.
- Excel files = Exactly the same sytax and spelling.
- Colors & line styles
  - Do a line style for _____ in web.
- AutoCAD in download from Web.
- Snapping is huge issue - snap to ends _____.
- Drainage basins & flow paths.
- Flow path shapes to basin (can't be same line string)

- Physically close fldpl. Pehygon – any polygon feature
- Surface at elevation – everything else is 2D
- Ask Marilyn – can we submit small packages.

Carefree Drainage Progress Meeting

ATTENDEES: E. Korsten/TOC, M. DeRosa/FCDMC, T. Bokich/CH2M HILL, L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 26, 2003

- The meeting was called to order on 10/16/02.
- Should Town be allowed to do bank protection
  - Do not alter water course.
- $113k _____ St. Bridge
- Category of stuff that affects CF, but not within jurisdiction.
- Lump into groups as part of maint. Project
  - Easily fixed.
- Problems without feasible solutions (i.e. CF Highway)
- Problems that can be fixed, but need funding help.
- Private projects
  - House in island - she should have had flpl use permit
  - Homeowner's Assoc.
- We want Town comfortable with criteria
- Want range of costs in criteria
- Implementation Plan
  - Needs to be realistic
  - Public Works $$
- Town is prepared to adopt
- This is the criteria....

Carefree Drainage Progress Meeting

ATTENDEES: L. Johnson/CH2M HILL
?

FROM: T. Bokich/CH2M HILL

DATE: March 27, 2003

- The meeting was called to order 10/15/02, 9:00 am at the offices of FCDMC.
- The meeting with the Town would be better for 10/24. L. Johnson is to check back in with Jon today. Location will be at the Town.
- Need to meet with Erich, Leslie to talk to Gary about approach – does Erich want to present to Council?
- Town Council Presentation in November
  - 11/5 is election day, confirm that date of meeting is the following Tuesday – Nov. 12th at 5:00 pm.
  - Check Doug's availability on the 12th
  - Make sure they know we are giving solutions
  - Purpose of presentation is Prioritization Process – quick fixes/long term funding – next phase is that we will look for funding.
  - LSD to help prepare Power Point presentation
- Data Collection Report
  - S. Tucker has it, review by next Friday
  - Trails report currently being revised, better copies needed of a few maps.
- Floodplain Mapping
  - See nvalves first, methodology
  - Review format of deliverables and maps – large scale maps for draft – descriptions at every cross section.
  - Set up meeting for submittal.
  - UC wash almost entirely done – preliminary packet example.
  - Marilyn to talk to Tim – on call contract.
  - Talk to Mark Brewer about Design Std's.
- Emergency Access Map
  - Only one rain gauge, cannot give delay time from rain gauge like example maps.
  - Format of final product.
- Implementation and Funding Plan
  - Look at N. Peoria funding matrix.
  - Marilyn suggested that Leslie help prepare plan – bonding, capacity, development fees
  - Strategic plan? More than 5 hours.
  - T. Bokich to call Leslie.

- Monitoring & Inspection Plan
  - Get some sense of maint. Budget and crews
  - JEF can begin
  - Cya statement
  - "this memo covers these issues"
  - Tony, JEF & Linda recommend format to you
- Schedule
  - Critical time path - LSD
  - Mailing List? New Flyer
  - ½ as many
  - Needs to have where we are going, where we've been.
- Nov. 19th @ 9:00 am is the next meeting.

Carefree Drainage Progress Meeting

ATTENDEES: J. Pearson, N. Zeno, G. Neiss, M. DeRosa/FCDMC, L. Dornfeld, T. Bokich/CH2M HILL, L. Johnson/CH2M HILL

FROM: T. Bokich/CH2M HILL

DATE: March 27, 2003

- The meeting was called to order on 10/10/02.
- Add Leslie's report to Data Collection report – final
- Gordon Zucker & Mayor – need to attend next one.
- Council meeting
  - Couple days before get them write up
  - Narrative – 1 page overview.
- Von will coordinate with Mayor and Council.
- 22nd Tuesday
- 24th Thursday – Leslie not available – Jon to let me know.

Carefree Drainage Progress Meeting

ATTENDEES: M. DeRosa/FCDMC
D. Williams/FCDMC

FROM: T. Bokich/CH2M HILL

DATE: March 27, 2003

- The meeting was called to order on 10/4/02.
- Didn't want to show Town all of these...how should we eliminate – in conjunction with traffic access plan?
- Perhaps just explain priorities
  - Cost
  - Ease
  - Etc.
- Have them rate priorities, don't worry about showing them list.
- Do they want to present to Town Council?
  - Doug thinks council meeting is important
  - Nov. 5th – get on agenda
  - For Thursday – background
  - Validate weight of importance
  - Have Fuller review all
- Next Tuesday's meeting is at the District, not CH2M HILL.
- Copy of data collection report for Erich.
- First: Background
- Second: Criteria & weighting
- See what they think
- Exhibit plot out 11 x 17.
- One or two page synopsis on where we've been, where we are going
  - Bullets: problems
    - Features
    - Example locations – talk about procedure
    - Next page – criteria and how we ranked
- Leslie is going Thursday
  - Suburban on Thursday from District
- Call Jon Pearson to confirm meeting
  - Council for Nov.? What is required to get on agenda? No PowerPoint?
- Items for Tony
  - Tc map options – talk to Fuller
  - Lieker – Mtn. View – fence on berm? Call Stacey.
  - Fall AFMA mtg.
  - Mtn. View C.O. letter? – Tony was not done yet.

- Marilyn
  - Get copy of implementation and funding plan from Marilyn.
  - Get CVL updated rpt. - Doug & Geza
  - Review of data collection rpt.?
  - Trip tomorrow - Melissa & Marilyn will get vehicle meet @ 8:30 am @ District
- Do table of contents and e-mail to Marilyn - ASAP
  - Have Steve Tucker look at hydrology again (2 weeks)
  - Have Erich look at data collect report (2 weeks)
- Meeting with Town on Thursday
- Meet here Thursday @ 1:00
  - Pull Fuller off
  - Leslie to meet here @ 1:00
- Meeting reminder
  - Marilyn to send out moved here.
  - Remind Erich he's invited
- Talk about agenda for next Tuesday's
- 2 copies of data collection rpt.

Carefree Drainage Progress Meeting

ATTENDEES: M. Book/LSD, D. Williams/FCDMC, J. Fuller/JE Fuller, T. Bokich/CH2M HILL, L. Johnson/CH2M HILL, M. DeRosa/FCDMC

FROM: T. Bokich/CH2M HILL

DATE: March 27, 2003

- The meeting was called to order on 8/20/02.
- Altern. Analysis - Ident. Problem
  - Preliminary spreadsheet
  - Another map with transportation
    - Impassable map
  - Which ones to put first?
  - We should put first - bigger issues
  - Apply Geza's matrix
    - Do among ourselves in a week or two, or have CH2M go through first
    - E-mail fax results
  - Meet with Town the 2nd week in September.
- Schedule
  - Going to slip behind a little
  - Tony enlisted help to get us back on track.
  - Talk about after meeting.
  - Doug wants this finished before his other projects start.
- November public meeting - slip to January
- Meeting with press - end of October/early November
- Council Meeting - October
  - Council presentation November
  - Keep delineation stuff separate
  - One meeting at end (January)
- N. Scottsdale study - just use 6 hr. for our stuff
- Issue is final - have Marilyn look at before making copies.
- Letter to Erich
  - E-mail to Doug, he will send out.
  - Copy Jon Pearson
- Next 30 days
  - Meet with Town - May or in September
  - Give them final data collection rpt.
  - CH to work through prior - contact via e-mail, meeting if we need to
  - Council presentation in November
    - PowerPoint

  - Final public meeting presentation/open house in January and other council meeting at very end.
  - Mike Book to get council dates.
- Jon is done with data collection.
  - HEC-1
  - Level 1 alt. Analysis
    - General issues
- To do
  - Level 2 - haven't started yet
  - Help with conceptual solutions. Jon would rather do after have prioritization list.
  - Brainstorming
  - VE meeting
- Jon overspent on HEC-1, sed. analysis spent a lot of time (over 5%)
- Write explanation why, in report, that DEI
- Get one copy to Marilyn this week of Data Collection report.
- Move meeting time to 9:00 am.

Patrick Wolf - FCDX

From: Richard Harris - FCDX
Sent: Friday, June 11, 2004 2:39 PM
To: Felicia Terry - FCDX
Cc: Richard Harris - FCDX; Patrick Wolf - FCDX; Michael Duncan - FCDX
Subject: Carefree FDS

Felicia

As requested by Patrick, this message is to confirm that I approve of the technical documentation within the subject study TDN, and recommend that it be sent to FEMA for review now.

If you have any questions, please let me know.

Thanks,

Richard

CH2MHILL TRANSMITTAL

To: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

From: Patrick Wolf
2625 S Plaza Dr
Suite 300
Tempe, AZ 85282

Attn: Richard Harris

Date: June 10, 2004

Re: Carefree Technical Data Notebook (Inserts)

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
2	Technical Data Notebooks – Inserts
2	CD's
2	Memo addressing comments.

If material received is not as listed, please notify us at once

Remarks:

Copy To:

Wolf, Patrick/PHX

From: Erickson, Bill [Berickson@scottsdaleaz.gov]
Sent: June 04, 2004 11:53 AM
To: Wolf, Patrick/PHX; Richard Harris - FCDX (E-mail)
Cc: Bokich, Tony/PHX
Subject: Carefree DMP Review

Patrick:

City staff has reviewed the subject plan, specifically the Carefree Floodplain Delineation within Scottsdale, sheets 2 and 3 of 8 and have no objections.

One question we did observe some buildings on our 2002 and 2004 aerial photography adjacent to the unnamed central tributary to Cave Creek and just south of Stagecoach Pass on the south side of the Carefree Highway on panel 3 of 8 between the match line to sheet 2 and section 1.8424 which are not shown on sheet 3. If these are out-buildings or livestock shelters, this comment is mute. If they are habitable dwellings staff believes they should be shown prior to submitting the package to FEMA.

If I can be of further assistance, please let me know.

Sincerely,
William Erickson
Floodplain Administrator
(480) 312-7652

CH2MHILL TRANSMITTAL

To: Town of Carefree
100 Easy Street
Carefree, AZ 85377
480 488 3686

From: Patrick Wolf
2625 S. Plaza Drive, Suite 300
Tempe, AZ 85282-1843

Attn: Erich Korsten, P.E., Ph.D.

Date: May 28, 2004

Re: Carefree Drainage Master Plan

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	Carefree Drainage Master Plan
11	Carefree DMP – Executive Summaries
17	Carefree DMP – Executive Summary Inserts
2	Carefree DMP – Data Collection Report

If material received is not as listed, please notify us at once

Remarks:

Copy To:

CH2MHILL TRANSMITTAL

To: City of Scottsdale
7447 E. Indian School Rd
Scottdale, AZ 85251
(480)312-7652

From: Patrick Wolf
2625 S. Plaza Drive, Suite 300
Tempe, AZ 85262-1843

Attn: Bill Erickson / Ginny Coltman

Date: May 28, 2004

Re: Carefree Drainage Master Plan

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	Carefree DMP – Floodplain Delineation Study Technical Data Notebooks

If material received is not as listed, please notify us at once

Wolf, Patrick/PHX

From: Pete Brothers [PBrothers@aztec.us]
Sent: May 28, 2004 7:59 AM
To: Wolf, Patrick/PHX
Cc: Al Reece
Subject: RE: Carefree DMP

Patrick,
As per our phone conversation I am responding to this email.

Issue -1,
The points your are inquiring about were surveyed and are in the ASCII file that we sent you. The reason they are not in the field notes is because they are elevation shots only, not critical pipe locations.

Issue -2,
Of the 13 culverts you listed, only three were requested on the scope of the project. They are 243 (survey pts. 1454-1482), 244 (survey pts 1439-1451), and 245 (survey pts 1377-1437). All these points can be found in the ASCII file we sent you. Of the other ten, three of those are outside of the mapping limits that we received from M&B.

If you have any questions please feel free to call me.
Thanks,
Pete Brothers
Survey Coordinator
AZTEC
Address: 3747 E. Grove St. Phoenix AZ 85040
Switchboard: 602 454 0402
Direct Line: 602 458 9276
Fax: 602 458 9359
Web: http://www.aztec.us
Email: pbrothers@aztec.us

-----Original Message-----
From: Al Reece
Sent: Thursday, May 27, 2004 9:20 AM
To: Pete Brothers
Subject: FW: Carefree DMP

Pete, Can you go into az01056 and find these survey points?
Al
-----Original Message-----
From: Patrick.Wolf@CH2M.com [mailto:Patrick.Wolf@CH2M.com]
Sent: Thursday, May 27, 2004 9:16 AM
To: Al Reece
Subject: Carefree DMP

Al-

Can we have your response to these two
Issues for the Carefree DMP?

1.The information for survey points 1508
to 1518 and 1546 to 1555 is missing in
the survey notes in the TDN.

2. I am missing culvert information for
13 culverts from the Carefree DMP. I

need the length, invert elevation, and ground information. They are culverts 221 to 228 and 241 to 245. I have the approximate location for the culverts if you need that information. The reports says these were surveyed, but I can't find that information.

We need these issues resolved before Flood Control will submit to FEMA. Please let me know if you have any questions.

Thanks!

Patrick Wolf, P.E.
CH2M Hill
(480) 377-6273

Response to Review Comments

PREPARED FOR: Richard Harris
Flood Control District of Maricopa County

PREPARED BY: Patrick Wolf

DATE: May 27, 2004

Subject: Carefree TDN Comments Response Memo

Richard-

The following memorandum is in response to your review comments written on May 18 , 2004. The comments from your review memo are included with the response action taken following each comment.

1. Patrick Wolf of your staff brought me revised prints of study sheets 2 and 3 to replace the existing ones, today. Can you please tell me the reason for this, and if there is a need to update the electronic drawing files, also?

Response- The reason the sheets had to be replaced is that there was still concrete structures showing up on the hard copy which did not show up on the mappers drawing. We were instructed to make sure the mappers drawing and our sheet file maps were exactly the same, this is why we made all the veg lines on our sheet file straight lines instead of scalloped lines. The mappers drawing on the cd shows no concrete structures so we could not have them showing up on the hard copy of the maps.

2. The Facilities Map is missing from the TDN. Please replace it.

Response- The Facilities Map was included, but in the wrong location in the report.

3. The missing survey data that has been requested from Al Reece of Aztec Engineering is still needed, and should be added to the TDN before it is sent to FEMA for review. Please address.

Response- An additional email was sent to Aztec Engineering to resolve these issues.

4. The memo from Patrick within appendix D.5 regarding "Boundary Conditions...Unnamed Central Tributary To Cave Creek", lists the amount of flow that will travel south along the eastern roadside channel of Tom Darlington Road as 128 cfs. Please revise the label on Study sheet 3 to reflect this amount.

Response- This flow has been updated to 128 cfs on Study sheet 3.

5. The memo from Patrick within appendix D.5 regarding "Boundary Conditions...Windmill Wash", lists the starting WSEL at culvert #104 as = 2487.42'. However, the starting WSEL in the model as taken from the CD is = 2488.48'. Please rectify.

Response- Due to the new flows, the WSEL changed to 2487.42 at culvert #104, this water surface was updated in the HEC-RAS file.

6. On the CD, files with the name formats Ucdiv_Final.* and UC_Final_NS.* no longer should remain because they are for areas that have been removed from the submittal, west of Terravita Way. Please update the CD accordingly.

Response- The CD has been updated accordingly.

7. For the HEC-RAS model of Galloway Wash Middle Branch, please revise the Title so it doesn't include the word "Test".

Response- The title has been revised.

8. On the CD within the Hydraulics folder of the CAD file, please check for files that still include information for the area west of Terravita Way, and replace/revise accordingly. Also, to avoid possible confusion, please remove files that aren't relevant to the submittal, such as FPZFCD_Old.dxf.

Response- The areas west of Terravita Way have been removed for this submittal.

9. Section 0.8966 on the profile plot sheet O1U is not shown on study sheet 2. Please add it.

Response- This cross section does not exist in the HEC-RAS file and was removed from sheet O1U.

10. Please complete Table 5 by adding all the positive values to the column entitled "Proposed Increase".

Response- Table 5 has been updated.

11. Regarding the comment #18 I made about Rob's misspelling of the word "dessert" in his memos about CHECK-RAS messages, I've found that he also misspelled the first subtitle "coeffiecient", also. Please revise all relevant sheets.

Response- This edit has been made.

12. The Regulatory elevations shown on Table 8 should be checked for the following cross sections: 0.7626, 0.6025, 0.583, 0.5198, 0.3647, and 0.2547. I re-ran the SCP HEC-RAS file from the CD, and then generated a new .REP file to check the differences

myself, and what I found is that the values listed in the table and those generated differed by from 0.09 to 0.32 feet. Please address.

Response- The HEC-RAS was re-run with flow distribution turned on and the new values, which matches the report file, was upated in Table 8.

May 12, 2004
Carefree DMP (FCD 00-37)

Comments to accompany digital data submittal of this date from CH2M HILL appear in red color, and were prepared by Rudy Stricklan, RLS.

CARTO.DXF (CP-201 mapping)

1.[ ] The layer VEG-LINE is depicted on the hard copy maps using a scalloped pattern (ΩΩΩΩ). Digitally, these lines were delivered as straight segments using a continuous linetype. To resolve this issue, choose one of the following methods.
   A. The linetype associated with this feature needs to be a linetype that will produce this symbol (the preferred method).
   B. If the linetype does not produce this symbology, then the line work needs to be delivered such that it matches the scalloped pattern.

   The linetype used to produce the vegetation is now continuous, and appears so on the hardcopy maps.

2.[ ] There are still missing pieces of line work that were contained in the original deliverable. Most of these appear to be related to the misplacement of some of the features that were on a layer called CONCRETE. The remaining features from this layer were deleted. For examples, see image CARTO-MISSING1.JPG, CARTO-MISSING2.JPG, CARTO-MISSING3.JPG, CARTO-MISSING4.JPG, CARTO-MISSING5.JPG and CARTO-MISSING6.JPG. Correct all occurrences.

   All miscellaneous concrete features were removed from the digital files, and therefore no longer appear in the hardcopy maps.

CARTO.DXF, CARTO.XLS (CP-302 study)

1.[ ] There is line work on text levels ermtext and text (based on the XLS file).

   Fixed at this submittal.

2.[ ] Some of the leader lines do not match the leader lines used on the hard copy maps (ex: page 2). The digital files need to match the hard copy maps (be the same, not similar).

   Fixed at this submittal.

3.[ ] The section lines and associated text are missing. If the section lines were obtained from FCD, then you do not need to provide them (the associated text will still need to be provided).

   Fixed at this submittal. The section lines were provided by FCD, and the section numbers are on level 1 in CARTO.DXF.

4.[ ] The existing floodplain line work on page 11 is missing. It needs to be included in this deliverable.

   There is no longer a map page 11, and floodplains in FNZNFCD.DXF now match the hardcopy.

5.[ ] There is text from the legend/title block area. No line work or text from the border, legend or title block area should be submitted.

Fixed at this submittal.

6.[ ] The charts from some hard copy maps were included, but not all of them. Since there is a mixture at this time, please resolve by removing all charts from this deliverable. Please note, this is for this project only.

Fixed at this submittal.

7.[ ] There appears to be some culverts on page 5. If so, they need to be submitted in the culverts deliverable (CP-303). If this line work is not a culvert, then it needs to be included in this deliverable.

The linework in question were culverts, and revised file CULVERT.DXF is again being submitted.

CULVERT.DXF (CP-205)

1.[f] File is now accepted with the April 28, 2003 submittal, based on corrections made by FCD.

File CULVERT.DXF is being resubmitted, due to changes noted in CARTO, item 7.

DRNBSN.DXF, DRNBSN.XLS (CP-305)

Revised files DRNBSN.DXF and DRNBSN.XLS are being submitted to address the following three comments.

1.[ ] Every basin does not have the required text string (HEC1 id) that identifies it.
2.[ ] The revised line work does not match the hard copy map accepted by Steven Tucker (Figure 6 - HEC1 Schematic).
3.[ ] Some of the values for RTIMP do not match the HEC-1 model (per Steven Tucker's review).

DTM FILES (Chapter 1)

The files were tentatively accepted from the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance was based on receiving a response to the following question. No response has been received in four subsequent submittals.

1.[ ] The DTM data exceeds the contour line work extent by 50' +/- in some areas. Since this data is not supported by the sealed contour line work, it will be deleted. Please confirm whether or not the sealed contour line work should cover these areas.

DTM features not covered by contours should be deleted.

ELV.DXF (CP-207)

This file was tentatively accepted with the April 28, 2003 submittal, based on corrections made by FCD. Final acceptance was based on receiving a response to the following question. No response has been received in three subsequent submittals.

1.[ ] The contour line work exceeds the DTM data extent by 35' +/- in some areas (this is in addition to the west side of the northern most area that tied into some existing mapping and used the DTM data from that project to create the contours). Since the contours are to be created/supported by the DTM data, please confirm whether or not the sealed contour line work is supported in the areas with no DTM data.

Contour data not supported by underlying DTM has been imported from adjacent project areas and has been found to be of sufficient

accuracy to merge with contour data derived for this project.

FPBLN.DXF, FPBLN.XLS (CP-310)

1.[ ] The layer names used to create these deliverables were not setup per the specification. They need to be setup using the reach or river name used in the HEC-RAS model/reports. Since the river names were not setup properly in the HEC-RAS model, please use the reach names to make the proper layer setup for these files.

Revised files FPBLN.DXF and FPBLN.XLS are being submitted which resolve this issue.

FPCTLFCD.XLS (CP-109)

1.[ ] This file appears to be missing many of the ERMs listed on the hard copy maps, i.e.: ERM 23, ERM 27, etc.... Please correct or explain.

Revised file FPCTLFCD.XLS is being submitted which correlates to the hardcopy maps..

FPSRFFCD.DXF (CP-311)

1.[ ] A significant amount of line work is on unassigned level(s) for this deliverable (see note 2 under General Requirements).

Revised file FPRSRFFCD.DXF is being submitted and resolves this issue.

2.[ ] All of the line work is not snapped to the floodplain limits (see note 2 under Specific Requirements). For examples, see image FPSRFFCD-SNAP1.JPG and FPSRFFCD-SNAP2.JPG. Correct all occurrences.

Revised file FPRSRFFCD.DXF is being submitted and resolves this issue.

FPXFCD.DXF, FPXFCD.XLS (CP-313)

1.[ ] The layer names used to create these deliverables were not setup per the specification. They need to be setup using the reach or river name used in the HEC-RAS model/reports. Since the river names were not setup properly in the HEC-RAS model, please use the reach names to make the proper layer setup for these files.

Revised files FPXFCD.DXF and FPXFCD.XLS are being submitted and resolve this issue.

FPZNFCD.DXF, FPZNFCD.XLS (CP-315)

1.[ ] There are several zone/polygon areas that are missing the required point in order to identify it's zone type (A, AE, etc...).

2.[ ] The line work has undershoots and overshoots (dangles), i.e.; all of the line work is not snapped to adjoining line work in order to enclose each zone/polygon area. For examples, see image FPZNFCD-DANGLE.JPG. Correct all occurrences. FYI - When this error is corrected, additional points may need to be added to these areas per comment 1.

3.[ ] There are sliver areas created by poor digitizing. For examples, see image FPZNFCD-SLIVER.JPG. Correct all occurrences. FYI - When this error is corrected, it may eliminate some of the missing points described in comment 1.

Revised files FPZNFCD.DXF and FPZNFCD.XLS are being submitted and resolve these issues.

PREPARED FOR: Richard Harris
Flood Control District of Maricopa County

PREPARED BY: Patrick Wolf

DATE: April 23, 2004

Subject: Carefree TDN Comments Response Memo

Richard-

The following memorandum is in reponse to your review comments written on November 12, 2003. The comments from your review memo are included with the response action taken following each comment.

1. In a memo from Emili located within Appendix D.5 for the Terravita Way Split, she says that 1600 cfs will pass through the box culverts and flow north, and an additional 650 will pass over and join the 1600, adding up to 2250 cfs. However, the study map sheet 2 at that location shows a discharge of 2270 cfs, and this value is repeated in the discharge table on the same sheet. This value is also listed on the table called "Summary of HEC-RAS Model Flow Changes" in the text and in Appendix D.5. Please rectify.

Reponse- The flows in this HEC-RAS analysis were changed due to the additional analysis that was performed February 2004. The flow split has been updated, the flow that will pass through the culverts is now 1578 cfs and the flow that overtops the road and rejoins this flow is 514 cfs for a total of 2092 cfs.

2. Please add a label to study map sheet 2 for the 663 cfs that will flow towards the west at Terravita Way.

Reponse- The flow that overtops Terravita Way and continues west is now 562 cfs, a label has been added to sheet 2 to show this flow amount.

3. Within section 2 of the TDN, Rob says in the ADWR Abstract that "The majority of the Wash remains in the North and South...". First, I believe that Rob meant to say that the "...majority of flows remain....", and secondly, I think he meant to say "...West..." instead of "...South...", there. Please check.

Reponse- These two edit changes were made.

4. Within the fourth paragraph of section 4.1, the word "...crossing..." should be plural. Please address.

Reponse- This edit was made.

5. Within the fourth paragraph of section 5.1, the words "...for the Town..." should be removed in describing the limits of study. Currently it looks redundant. Please address.

Reponse- This edit was made.

6. on Table 2, please add the Model Flow change section and amount for Unnamed Central, South Branch.

Reponse- The Unnamed Central, South Branch is already on Table 2, it is on page 5-3.

7. Section 5.6 could be improved by replacing the word "This" in the second sentence, first paragraph, with "The previous". Please address.

Reponse- This edit was made.

8. Table 5 will need to be revised so that it is in a format compatible with previously approved FEMA studies. I have attached a copy of such a table with these comments, and recommend that you contact me with respect to presentation for locations where the "increase" of value due to the "With Floodway" locations, is negative.

Reponse- Table 5 has been revised so that it matches the output from the HEC-RAS Report files for each model. The locations where the "increase" of value due to the "With Floodway" location is negative are all less than –0.1, which is acceptable to FEMA per my conversation with Richard Harris on April 23, 2004.

9. For the Windmill Wash Combined Profile Plot, please change the word "Change" to "Chance" in the upper left hand corner.

Reponse- This edit was made on this plot.

10. Regarding the contents of Appendix C.1, within the hardcopy printout for the file fpctlfcd.xls, the ERM's labeled 119, 120, 133, and 134 could not be found on the study maps. Why? Are they located within the Addendum area of Floodplain Delineation (West of Terravita Way)?

Reponse- The ERM's are not located on the study maps and were removed.

11. With regards to the Table 10 copy within Appendix C.2, why are there so many blank invert and ground elevation entries on the last page? Please address.

Reponse- An email was sent to Aztec Surveying requesting this info. (A copy of that email is attached)

12. Information for survey points 1508-1518 and 1546-1555 for culverts used in the hydraulic analysis, is missing from the sealed survey notes. Please restore.

Reponse- An email was sent to Aztec Surveying requesting this info. (A copy of that email is attached)

13. Within the sealed survey notes, there is a hand-written note for survey points 1120 and 1121 that reads "36" CMP, while the Existing Facilities Map from the DMP lists a 30" culvert (#164). Per that map, the culvert is located at Pima Wash and Milky Way Road, although the HEC-RAS model doesn't reflect this. Please address.

Reponse- The culvert is a 36" CMP and has been updated on the Existing Facilities Map.

14. The culverts listed in the survey notes for culvert #157 are 30" in size. This is reflected in the HEC-RAS model for SCP-Final.prj model at RS 0.5170. However, the size listed on the Existing Facilities Map is 24". Please rectify.

Reponse- The culvert is 30" and has been updated on the Existing Facilities Map.

15. There is a hard-copy list of CD files within Appendix D.6 that should be revised to reflect the model name changes that have been made since the last submittal. Please address.

Reponse- The hard-copy list of the CD files has been updated.

16. On the CD within the TDN, there are a number of CAD files within a folder of the same name. The areal extent of these files passes West of Terravita Way into an area that has been removed from the project insofar as what we want to send to FEMA for a LOMR. The District is interested in receiving and reviewing files for the "removed" area, but the files that we send to FEMA should be truncated at the current study limits in order to avoid confusion. Please revise the files on the TDN CD accordingly.

Reponse- The files on the CD have been updated to the current study limits.

17. Within Appendix E.4 of Volume II, there is a section entitled "Ineffective Flow Area", which addresses hydraulic model blocking for the area West of Terravita Way. Because this area has been removed in terms of what FEMA will be reviewing, the section should be removed to avoid confusion. Please address.

Reponse- This section has been removed.

18. Within Appendix G of Volume II, there is a memo from Rob entitled "Galloway Wash Middle Branch CHECK-RAS Message Explanations. Within the first paragraph the word "desert" is misspelled as "dessert". Further review shows that Rob made this error in all his memos regarding the CHECK-RAS results. Please revise spelling, accordingly.

Reponse- This spelling has been revised for these sheets.

CH2MHILL TRANSMITTAL

To: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

From: Tony Bokich
2625 S Plaza Dr
Suite 300
Tempe, AZ 85282

Attn: Mark Brewer

Date: November 2003

Re: Mapping, Hydrology and Hydraulics CAD Deliverable, FCD 2000C037

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	CD of Mapping, Hydrology and Hydraulic Files

If material received is not as listed, please notify us at once

Remarks:

See Attached.

Copy To:

Mark, CH2M HILL and M&B Aerial have addressed each of your mapping, hydrology and hydraulic submittal comments as stated below.

Current Submittal Comments:
Submitted: September 30, 2003

CARTO.DXF (CP-201 mapping)
1.[ ] The file is named incorrectly (PWRPL.DXF).

The information submitted in PWRPL.dxf has been re-submitted in the file Carto.dxf file.

2.[ ] Almost all of the features were removed from this deliverable. It now contains only power poles. The other carto features need to be placed back into this deliverable (except for the features that were to be moved to the STRTDTL.DXF deliverable).

The complete CARTO.dxf file has been re-submitted with the information originally submitted including the information previously submitted in PWRPL.dxf. Also, the blocks in question have been exploded and assigned layers.

3.[ ] The blocks contained in this file need to be defined on the layer that the feature is associated with, i.e.: block name lipole, (which represents power poles), would need to have the entities that define the block drawn on a layer called powerpole, which can then be inserted into this drawing file (this applies to all blocks, not just the power poles). To rephrase the comment another way, there is line work on a layer called 0. All of the line work must be placed on self-explanatory layer names (see Layer under File Structure). This is associated with blocks that are drawn on layer 0.

All of the blocks were re-created on the layer they ultimately need to be on in the CARTO.dxf deliverable. All of the blocks in CARTO.dxf have been updated with the new blocks on the correct layer.

CARTO.DXF, CARTO.XLS (CP-302 study)
1.[ ] There is line work on text levels ermtext and text (based on the XLS file).

The ERM symbols and the limits of detailed study line work have been moved to their own levels. The CARTO.xls file has been updated to specify this.

CTRL.XLS (CP-105)
1.[f] This file was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed TDN. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

RE: Three re-submittals have been made since this comment was made, but no response has been given. If yes, please explain what the changes are.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this

file.

CULVERT.DXF (CP-205)

1.**[f]** This file was tentatively accepted with the April 28, 2003 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed hard copy maps. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced. Please advise.

RE: Two re-submittals have been made since this comment was made, but no response has been given. If yes, please explain what the changes are.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

DQ.XLS (CP-206)

1.[x] File is now accepted from the November 4, 2002 submittal.

DRNBSN.DXF, DRNBSN.XLS (CP-305)

Files are tentatively accepted at this time based on the following corrections made by FCD and Steven Tucker's review of the XLS file.

1.[f] There are still some sliver drainage basins/polygon areas that remain after the editing/removal of the duplicate line work between basins.

2.[f] The line work has undershoots and overshoots (dangles), i.e.; all line work endpoints are not snapped/connected to the adjoining features line work in order to "close" each drainage basin/polygon area.

The file has been resubmitted as the sub-basin boundaries for UC88 and UC94 have been revised to include a small area to encompass the reach that currently goes outside the basin boundary. A revised HEC-1 diagram has been submitted to update all TDNs reflecting this change. *We have informed Steven Tucker of this change for acceptance.*

DRNPTH.DXF, DRNPTH.XLS (CP-307)

1.[ ] All of the line work is not digitized/drawn in the direction of flow, upstream to downstream (see note 6 under Specific Requirements). For an example, see image DRNPTH-DIRECTION.JPG

The line identified has been corrected.

2.[ ] All of the concentration points are not snapped to the intersection of the flow path and the basin boundary. For examples, see image DRNPTH-SNAP1.JPG, DRNPTH-SNAP2.JPG and DRNPTH-SNAP3.JPG.

The location of concentration points have been reviewed and moved to coincide with the intersections of flow paths and basin boundaries.

3.[ ] All of the line work is not placed on the correct layer representing the type of flow path, i.e.: routing reaches, time-of-concentration and routing reaches/time-of-concentration (see LAYER under FILE STRUCTURE).

This comment has been disregared per the meeting with Mark Brewer on 10-16-2003.

4.[ ] Some of the line work extends outside of the drainage basin boundaries. This line work does not exist and should be removed (per Steven Tucker). The hard copy map "Exhibit 6 - HEC1 SCHEMATIC" will need to be updated in the TDN.

This issue has been resolved with the re-submittal of DRNBSN.dxf with the sub-basin boundary revision, refer to comment 2 in **DRNBSN.DXF, DRNBSN.XLS (CP-305)**

DTM FILES (Chapter 1)

1.[f] The files were tentatively accepted from the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance is based upon:

A. Completion of the ELV.DXF deliverable.

B. The DTM data exceeds the contour line work extent by 50′ +/- in some areas. Since this data is not supported by the sealed contour line work, it will be deleted. Please confirm whether or not the sealed contour line work should cover these areas.

RE: Three re-submittals have been made since this comment was made, but no response has been given. Please respond accordingly.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

ELV.DXF (CP-207)

1.[f] This file was tentatively accepted with the April 28, 2003 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed hard copy maps. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced. Please advise.

RE: Two re-submittals have been made since this comment was made, but no response has been given. If yes, please explain what the changes are.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

2.[f] The contour line work exceeds the DTM data extent by 35′ +/- in some areas (this is in addition to the west side of the northern most area that tied into some existing mapping and used the DTM data from that project to create the contours). Since the contours are to be created/supported by the DTM data, please confirm whether or not the sealed contour line work is supported in the areas with no DTM data.

RE: Two re-submittals have been made since this comment was made, but no response has been given. Please respond accordingly.

FPBLN.DXF, FPBLN.XLS (CP-310)

1.[ ] The names (column REACH_NAME) used in the XLS file do not match all of the names used in the FPXFCD.XLS file. Both of them should match, which in turn should match the HEC-RAS reports.

The reach_name for Galloway Wash Middle Branch has been revised to GalMidBrnch to conform to FPXFCD.xls.

FPCTLFCD.XLS (CP-109)

1.[f] This file was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed TDN. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

RE: Three re-submittals have been made since this comment was made, but no response has been given. If yes, please explain what the changes are.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

FPSRFFCD.DXF (CP-311)

1.[ ] All of the text is on unassigned level(s) for this deliverable (see note 2 under General Requirements).

Text from Layer 0 has been moved to Layer 63.

2.[ ] All of the line work is not snapped to the floodplain limits (see note 2 under Specific Requirements). For examples, see image FPSRFFCD-NOT-SNAP1.JPG, FPSRFFCD-NOT-SNAP2.JPG, FPSRFFCD-NOT-SNAP3.JPG and FPSRFFCD-NOT-SNAP4.JPG.

The line work has been trimmed or extended to the floodplain boundaries.

FPXFCD.DXF, FPXFCD.XLS (CP-313)

1.[ ] Some of the text from the hard copy maps is missing. The text is needed so that each cross section can be identified.

The missing text has been added to the file.

2.[ ] The names (column REACH_NAME) used in the XLS file do not match all of the names used in the FPBLN.XLS file. Both of them should match, which in turn should match the HEC-RAS reports.

The issue has been resolved. The reach_name for Galloway Wash Middle Branch has been revised to GalMidBrnch in FPBLN.xls to conform to FPXFCD.dxf.

FPZNFCD.DXF, FPZNFCD.XLS (CP-315)

1.[ ] Many zone/polygon areas are missing the required point in order to identify it's zone type (A, AE, etc...).

Some of the problem have been eliminated due to correcting the unclosed areas referred to in comment 2 below. Points have been added to the fringe areas for Galloway Wash Middle Branch where needed.

2.[ ] The line work has undershoots and overshoots (dangles), i.e.; all line work endpoints are not snapped/connected to the adjoining features line work in order to "close" each zone/polygon area. For examples, see image FPZNFCD-DANGLE.JPG (green boxes are dangles). FYI - When this error is corrected, additional points may need to be added to these areas per comment 1.

The file was scanned and undershoots and overshoots were corrected.

HEC-RAS REPORTS (CP-319)

1.[ ] Files do not contain all of the required information. Please make sure that all of the appropriate options are selected before making the reports.

The version of HEC-RAS approved for the project, version 3.0.1 does not allow flow distribution to be generated in the report even if the box is checked in the Report Generator dialogue box. The latest version of HEC-RAS version 3.1.1 was used to create new reports for the submittal.

NDXPRJ.DXF (CP-324)

1.[ ] Some of the line work is on unassigned level(s) for this deliverable (see note 2 under General Requirements).

The line work has been moved to level 1.

2.[ ] All of the text is on unassigned level(s) for this deliverable (see note 2 under General Requirements).

The text has been moved to Layer 63.

3.[ ] There is duplicate line work between adjacent sheet boundaries. There can be no partial or full duplication of line work.

Duplicate line work has been eliminated.

4.[ ] The text strings labeling the sheets need to be the sheet/page number and nothing else, i.e. 1, 2, 3, etc....

Non numeric text has been removed.

PRJ.DXF (CP-211)

1.[f] This file was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon completion of the ELV.DXF deliverable. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

RE: Three re-submittals have been made since this comment was made, but no response has been given. If yes, please explain what the changes are.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

RIVER.DXF, RIVER.XLS (CP-213)

1.[f] These files were tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed hard copy maps. These files were delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to these files from when they were originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

RE: Three re-submittals have been made since this comment was made, but no response has been given. If yes, please explain what the changes are.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

STRCT.DXF (CP-217)

1.[x] This file was tentatively accepted with the November 4, 2002 submittal. Final acceptance will be based upon a comparison against the sealed/signed hard copy maps. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

RE: Three re-submittals have been made since this comment was made, but no response has been given. If yes, please explain what the changes are.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

STRTDTL.DXF (CP-220)

File is tentatively accepted at this time based on the following corrections made by FCD and a comparison against the sealed/signed hard copy maps.

1.[f] Some of the line work has undershoots and overshoots (dangles), i.e.; the line work is not snapped to other connecting line work (where appropriate).

2.[f] There is some new line work that has not been a part of any of the deliverables during any submittal. This will be compared to the hard copy maps described above.

Previous Submittal History:

Submitted: March 12, 2002 (mapping)
Submitted: November 4, 2002 (mapping)
Submitted: November 25, 2002 (hydrology)
Submitted: March 24, 2003 (hydrology)
Submitted: April 28, 2003
Submitted: June 20 and July 7, 2003

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

PRJDAT.XLS (CP-212)
1.[f] File accepted with the November 4, 2002 submittal.

Nothing has changed on this file since it's acceptance. Please disregard re-submittals of this file.

mdr
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\\fcdspa\mrb$\word\review_comments\on-going\carefree_1184_fcd00-37\Submittal7.doc

CH2MHILL TRANSMITTAL

To: City of Scottsdale
7447 E. Indian School Rd
Scottdale, AZ 85251
(480)312-7652

From: Rob Lyons
2625 S. Plaza Drive, Suite 300
Tempe, AZ 85282-1843

Attn: Bill Erickson

Date: September 24, 2003

Re: Carefree Drainage Master Plan

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	Carefree DMP – Floodplain Delineation Study Technical Data Notebooks

If material received is not as listed, please notify us at once

CH2MHILL TRANSMITTAL

To: Town of Carefree
100 Easy Street
Carefree, AZ 85377
480 488 3686

From: Rob Lyons
2625 S. Plaza Drive, Suite 300
Tempe, AZ 85282-1843

Attn: Erich Korsten, P.E., Ph.D.

Date: September 24, 2003

Re: Carefree Drainage Master Plan

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	Carefree DMP – Floodplain Delineation Study Technical Data Notebooks
1	*Carefree DMP – Floodplain Delineation Technical Data Notebook Addendums*

If material received is not as listed, please notify us at once

CH2MHILL TRANSMITTAL

To: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

From: Robert Lyons
2625 S Plaza Dr
Suite 300
Tempe, AZ 85282

Attn: Marilyn DeRosa

Date: June 26, 2003

Re: Carefree Drainage Master Plan

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
2	Carefree Drainage Master Plans
1	Technical Data Notebook
1	Technical Data Notebook Addendum
1	Executive Summary

If material received is not as listed, please notify us at once

Remarks:

Marilyn,

I've sent you 1 Technical Data Notebook (TDN) and 1 TDN Addendum for Mark Brewer to review. The hydraulic CAD submittal will be soon to follow.

Thank you,

Rob

Copy To:

CH2MHILL TRANSMITTAL

To: Town of Carefree
100 Easy Street

Carefree, AZ 85377

From: Rob Lyons
2625 S. Plaza Drive, Suite 300
Tempe, AZ 85282-1843

Attn: Erich Korsten, P.E., Ph.D.

Date: June 26, 2003

Re: Carefree Drainage Master Plan

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	Drainage Master Plan
1	Executive Summary

If material received is not as listed, please notify us at once

CH2MHILL TRANSMITTAL

To: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

From: Robert Lyons
2625 S Plaza Dr
Suite 300
Tempe, AZ 85282

Attn: Marilyn DeRosa

Date: June 24, 2003

Re: Carefree Technical Data Notebook

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
~~2~~ 1	Carefree Drainage Master Plan Technical Data Notebooks
~~2~~ 1	Carefree Drainage Master Plan Technical Data Notebook Addendums

If material received is not as listed, please notify us at once

Remarks:

Marilyn,

I've sent you ~~2~~ 1 Technical Data Notebooks (TDN) and ~~2~~ 1 TDN Addendums one of each for both Richard Harris and Mark Brewer to review.

Thank you,

Rob

Copy To:

CH2MHILL TRANSMITTAL

To: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

From: Robert Lyons
2625 S Plaza Dr
Suite 300
Tempe, AZ 85282

Attn: Mark Brewer

Date: June 24, 2003

Re: Mapping and Hydrology CAD Deliverable, FCD 00-37

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	CD of Mapping and Hydrology files

If material received is not as listed, please notify us at once

Remarks:

See Attached.

Copy To:

Marilyn DeRosa

Mark, I've addressed each of your hydrology submittal comments as stated below.

DRNBSN.DXF, DRNBSN.XLS (CP-305)
1.[ ] There is some line work that is placed on unassigned layer(s) for this dataset (for line work).

Some of the drainage basin linework was on a layer called drnbsn1. The linework on this layer was moved to the layer drnbsn and the layer drnbsn1 was deleted.

2.[ ] There is line work that is approximately 1208140' outside of the project extent.

This line work was deleted.

3.[ ] Some of the line work is missing.

Lines dividing the basins UC 47 and 45, UC 77 and 79, and UC 34 and 37 were added.

4.[ ] Column DRNBSN_NM is not populated with the correct value. This column needs to contain the overall watershed name (as defined by the hydrology branch at the District). The hydrologist or project manager should typically be able to give you the value(s) needed for this column.

Steven Tucker, from the Hydrology Branch, FCD instructed us to use use Carefree DMP per phone conversation with T. Bokich 4-17-03. However, this column has been updated with the correct value, Cave Creek, per discussion with Mark Brewer on 5-20-03.

DRNPTH.DXF, DRNPTH.XLS (CP-307)
1.[ ] Some of the line work is missing.

The file was compared to Figure 6 HEC-1 Schematic submitted with the draft TDN. Line work that was shown in Figure 6 that was missing in the CAD file was added.

2.[ ] All of the line work is not digitized/drawn in the direction of flow, upstream to downstream (see note 6 under Specific Requirements).

All line work was revised to represent the direction of flow.

3.[ ] The line work has undershoots and overshoots (dangles), i.e.; some of the flow path line work is not connected to the adjoining flow path line work.
TIP: Use AutoCAD's snap environment (endpoint, near, midpoint, intersection, etc...) when drawing line work and this error will not occur.

The whole CAD file was reviewed for overshoots and undershoots. 5-10 were discovered and corrected.

4.[ ] The line work needs to be setup per the specification to account for the different types of flow path line work, i.e.: routing reaches, time-of-concentration and routing reaches/time-of-concentration (see LAYER under FILE STRUCTURE).

In areas where there is a time-of-concentration and routing reach in common a new line was drawn or the route line was broken and put on the layer route-toc. There are now three layers with line work as follows:

Layer	***Description***
route	*For routing reaches only*
toc	*For time-of-concentration only*
route-toc	*For places with both overlapping*

May 12, 2003

The Flood Control District of
Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Review of project: Carefree DMP (FCD 00-37)

1. Specifications for review: CADD Data Delivery Specification, Revision 1.0
2. Reviewed by: Mark Brewer, G.I.S. Database Administrator (602) 506-2953
3. PRJ_RID number: 1184
4. The deliverables were reviewed as follows:
   [x] Passed the review.
   [f] Failed the review and were corrected by FCD in order to be accepted.
   [ ] Failed the review and need to be addressed.
5. Please enclose a letter upon the next submittal stating what actions were taken for each comment, number by number, so that we know that the comment has been looked at and addressed. DO NOT resubmit approved files with the next submittal.

Current Submittal Comments:
Submitted: April 28, 2003

BRIDGE.DXF (CP-200)

1.**[ ]** Some of the line work does not appear to be a bridge. The line work is not connected to any of the street line work (STRTDTL.DXF). See image BRIDGE-NOT1.JPG.

CARTO.DXF (CP-201)

1.**[ ]** The blocks contained in this file need to be defined on the layer that the feature is associated with, i.e.: block name lipole, (which represents power poles), would need to have the entities that define the block drawn on a layer called powerpole, which can then be inserted into this drawing file.

2.**[ ]** There appears to be some roads, driveways, sidewalks, etc... contained in this deliverable. These features belong in STRTDTL.DXF (see note 1 under Specific Requirements for STRTDTL.DXF). The line work appears to be contained on a layer named CONCRETE. File STRTDTL.DXF was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. If any of this line work is moved to the STRTDTL.DXF deliverable, make sure that those same corrections are made before submitting file STRTDTL.DXF again.

CTRL.XLS (CP-105)

1.**[f]** This file was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed TDN. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

CULVERT.DXF (CP-205)

File is tentatively accepted at this time based on the following correction made by FCD. Final acceptance is based upon a comparison against the sealed/signed hard copy maps.

1.**[f]** Some of the line work has undershoots and overshoots (dangles), i.e.;

the line work is not snapped to other connecting line work (where appropriate).

DQ.XLS (CP-206)

1.**[x]** This file was tentatively accepted with the November 4, 2002 submittal. Final acceptance is based upon a comparison against the sealed/signed hard copy maps.

DRNBSN.DXF, DRNBSN.XLS (CP-305)

1.**[ ]** There is some line work that is placed on unassigned layer(s) for this dataset (for line work).

2.**[ ]** There is line work that is approximately 1208140' outside of the project extent.

3.**[ ]** Some of the line work is missing.

4.**[ ]** Column DRNBSN_NM is not populated with the correct value. This column needs to contain the overall watershed name (as defined by the hydrology branch at the District). The hydrologist or project manager should typically be able to give you the value(s) needed for this column.

DRNPTH.DXF, DRNPTH.XLS (CP-307)

1.**[ ]** Some of the line work is missing.

2.**[ ]** All of the line work is not digitized/drawn in the direction of flow, upstream to downstream (see note 6 under Specific Requirements).

3.**[ ]** The line work has undershoots and overshoots (dangles), i.e.; some of the flow path line work is not connected to the adjoining flow path line work.
TIP: Use AutoCAD's snap environment (endpoint, near, midpoint, intersection, etc...) when drawing line work and this error will not occur.

4.**[ ]** The line work needs to be setup per the specification to account for the different types of flow path line work, i.e.: routing reaches, time-of-concentration and routing reaches/time-of-concentration (see LAYER under FILE STRUCTURE).

DTM FILES (Chapter 1)

1.**[f]** Files are tentatively accepted from the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance is based upon:
A. Completion of the ELV.DXF deliverable.
B. The DTM data exceeds the contour line work extent by 50' +/- in some areas. Since this data is not supported by the sealed contour line work, it will be deleted. Please confirm whether or not the sealed contour line work should cover these areas.

ELV.DXF (CP-207)

File is tentatively accepted at this time based on the following corrections made by FCD. Final acceptance is based upon:

A. A comparison against the sealed/signed hard copy maps.

B. The contour line work exceeds the DTM data extent by 35' +/- in some areas (this is in addition to the west side of the northern most area that tied into some existing mapping and used the DTM data from that project to create the contours). Since the contours are to be created/supported by the DTM data, please confirm whether or not the sealed contour line work is supported in the areas with no DTM data.

1.**[f]** Approximately 81% of the text is on an unassigned layer(s) for this dataset.

2.**[f]** Some line work has undershoots and overshoots (dangles), i.e.; all arcs representing the same contour are not snapped together at their endpoints (where appropriate) in order to connect/continue the same contour line work. For examples, see image ELV-DANGLE1.JPG.

3.**[f]** This comment was made with the previous mapping submittal: "There are many locations where contour line work criss-crosses other contours". Approximately 75% of these errors were corrected leaving 25% that need to be fixed.

FPCTLFCD.XLS (CP-109)

1.**[f]** This file was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed TDN. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

PRJ.DXF (CP-211)

1.**[f]** This file was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon completion of the ELV.DXF deliverable. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

RIVER.DXF, RIVER.XLS (CP-213)

1.**[f]** This file was tentatively accepted with the November 4, 2002 submittal, based on corrections made by FCD. Final acceptance will be based upon a comparison against the sealed/signed hard copy maps. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

STRCT.DXF (CP-217)

1.**[x]** This file was tentatively accepted with the November 4, 2002 submittal. Final acceptance will be based upon a comparison against the sealed/signed hard copy maps. This file was delivered again with this submittal. Since it was previously accepted (tentatively), it was not reviewed. If there were changes to this file from when it was originally accepted (tentatively), you need to let us know (either way) so that a new review can be performed and the original data replaced.

STRTDTL.DXF (CP-220)

1.**[ ]** See comment 2 under the CARTO.DXF deliverable.

Previous Submittal History:

Submitted: March 12, 2002 (mapping)
Submitted: November 4, 2002 (mapping)
Submitted: November 25, 2002 (hydrology)
Submitted: March 24, 2003 (hydrology)

PRJDAT.XLS (CP-212)

1.**[f]** File accepted with the November 4, 2002 submittal.

mdr
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\\fcdspa\mrb$\word\review_comments\on-going\carefree_1184_fcd00-37\Submittal5.doc

CH2MHILL TRANSMITTAL

To: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

From: Robert Lyons
2625 S Plaza Dr
Suite 300
Tempe, AZ 85282

Attn: Mark Brewer

Date: April 25, 2003

Re: Mapping and Hydrology CAD Deliverable, FCD 00-37

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	CD of Mapping and Hydrology files

If material received is not as listed, please notify us at once

Remarks:

Copy To:

Marilyn DeRosa

Carefree DMP Hydrology

TO: Tony Bokich

FROM: Emili Kolevski
CH2M HILL

DATE: April 14, 2003

The hydrology from the Carefree Mountain Estates Drainage Report prepared by Gilbertson and Associates shows a difference in peak flow of approximately one-half of the peak flow in the Carefree Drainage Master Plan (DMP) hydrology. The 100-year, 6-hour flows were compared at concentration points chosen at corresponding basin areas.

Location	Carefree Mountain Estates Peak Flow	Carefree DMP Peak Flow	Basin Area SM
CP1290/CP4850	704cfs	1871cfs	1.89/1.81
CP1310/CP84	878cfs	1840cfs	2.63/2.63
CP1325/CP89	923cfs	2065cfs	3.09/3.05

A comparison of split flow analyses shows that in the Carefree Mountain Estates report a 50/50 flow split was done at the Main Branch Immediately upstream of Terravita Way, while in the Carefree DMP this flow split was 72/28, with 72% going north across the Carefree Highway. Further downstream at 60th Street, the Carefree Mountain Estates report has another 50/50 flow split and in the Carefree DMP a 61/39 flow split was done, again the larger portion is to the north.

The differences in peak flows in the two reports can be attributed to the difference in flow splits and input parameter differences in the analyses. The Carefree Mountain Estates (CME) report uses much lower RTIMP% (% impervious) numbers when compared to the Carefree DMP (DMP) which uses the Maricopa County Flood Control District recommended RTIMP% values. The RTIMP%'s in the CME range between 2 and 11% for the developed conditions HEC-1 model with an unweighted average of 5.7% as compared to a range of 8-36% for the future conditions in the DMP with an unweighted average of 19.4%.

Other factors contributing to the difference in peaks may be attributed to the smaller subbasins used in the DMP as compared to significantly larger subbasins used in the CME. The Clark hydrograph method was used for the smaller subbasins in the DMP and the S-Graph method was used for the larger CME subbasins. The other input parameters IA. XKSAT, PSIF and DTHETA appear to be consistent in the CME and DMP.

A comparison to the JE Fuller Andorra Hills and Galloway Wash hydrology shows consistency between the DMP hydrology and the Fuller hydrology in methodology and in flows.

Flow per square mile (cfs/sq) for the 100-year, 6-hour storm

Basin Area	Andorra Hills/Galloway Wash	DMP	CME
1.8	1028	1040	372
2.2	856	534	360
3.0	716	688	307

In the DMP new topography was obtained with better slope information and better land use information. The DMP was more detailed study with smaller basins that included FCDMC recommended input parameters and more exact flow split calculations. These are all contributing factors as to why there is a significant difference in the DMP as compared to the CME.

CH2MHILL TRANSMITTAL

To: City of Scottsdale
Transportation Department
7447 E. Indian School Road #205
Scottsdale, AZ 85251

From: Tony Bokich/CH2M HILL
2625 S. Plaza Drive, Suite 300
Tempe, AZ 85282-1843

Attn: William Erickson

Date: March 10, 2003

Re: Carefree Drainage

We Are Sending You:

X Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	Carefree Drainage Master Plan Technical Data Notebook (Volume I)
1	Carefree Drainage Master Plan Technical Data Notebook (Volume II)
1	Carefree Drainage Master Plan Technical Data Notebook (Volume III)

FOR YOUR REVIEW. PLEASE RETURN TO MY ATTENTION BY 3/17/03.

THANKS.

If material received is not as listed, please notify us at once

CH2MHILL TRANSMITTAL

To: Dr. Erich Korsten
Town of Carefree
100 Easy Street
Carefree, AZ 85377

From: Linda Johnson, P.E.
CH2M HILL
2625 South Plaza Drive
Suite 300
Tempe, AZ 85282

Attn: Erich Korsten

Date: February 25, 2003

Re: Carefree Drainage Master Plan

We Are Sending You:

Attached	Under separate cover via	
Shop Drawings	Documents	Tracings
Prints	Specifications	Catalogs
Copy of letter	Other:	

Quantity	Description
1	Draft Drainage Master Plan
1	Draft Technical Data Notebook (Floodplain Delineation)

If material received is not as listed, please notify us at once

Remarks:

Please review and comment by March 11, 2003. Thanks, Linda

Copy To:

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO _____ PHONE NO. 4805024218

DATE _____

CALL FROM Tom Whittington 480 502 4218

TIME _____ ☐ AM ☐ PM

MESSAGE TAKEN BY LAJ

PROJECT NO. _____

SUBJECT Entrada Floodplain

Entrada - house on SE Corner CF Mtn & Whitethorn

- Wants Elevation / Floodplain info
  he is closing Escrow late March
- house looks to be just barely out
  of floodplain - need FF to determine

- contact him once Elevation Cert's are done

REV 10/96 FORM 4

Johnson, Linda/PHX

From: Johnson, Linda/PHX
Sent: February 04, 2003 6:33 PM
To: 'capcrystal@yahoo.com'; 'cthompson@cap-az.com'
Cc: Marilyn DeRosa - FCDX; Bokich, Tony/PHX; 'Doug Williams - FCDX'
Subject: Carefree Floodplain

Hello, Crystal:

Marilyn asked that I get back to you concerning the floodplain in Entrada. As of today, your house is not proposed to be placed within the regulatory floodplain. However, we might be adding an additional area of floodplain mapping within Entrada. If this is the case, and it looks like your house might end up in the floodplain, we will let you know immediately.

We should have our results finalized within the next month. Please let me know if you have any questions.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

TO: TONY BOKICH

FR: PAULA + STEVEN PRUETT

RE: WASH STUDY

Please see attached

Comments.

Feb. 3, 2003

ATTN: Tony Bokich

CAREFREE
Drainage Master Plan

Comment Sheet
Public Meeting
January 22, 2003

Please use this sheet to provide us with any additional comments on the Carefree Drainage Master Plan. You can leave the comment sheet with us tonight, mail it by February 5, 2003, to Tony Bokich, CH2M Hill, 2625 S. Plaza Dr., Ste. 300, Tempe, AZ 85282, or fax it to him at (480) 966-9450.

Please Print

Name: Paula + Steven Pruett

Address: 37200 N. Pima Carefree AZ 85377 (PO Box 3075) **E-mail:** pprutt@extremezone.com

Phone Number: 480 488 2024

Comments: We have been concerned about the Galloway wash and its effects on Pima Rd where two washes meet and drain into an overly large "mouth" of Galloway on the west side of Pima just No of Short Putt. This "mouth" is partly on our property. It is also one of the flood control's priorities in servicing. Our bank of property has been eroded as one wash directly drains with great velocity right directly into this eastern most bank of our property. Over the last 10 years, this has gotten much more serious in that the two washes are bigger and the flows are stronger. I was impressed with Doug's presentation and disappointed with some of the residents' feedback. While I realize each property owner has their own interest at heart, they seemed short sighted in not realizing how Carefree needs to address the washes and the effects of the flows all over town. (this applies across

over

Meeting Survey

How did you hear about the meeting tonight? ☐ Newspaper Notice ☐ Letter ☐ Other brochure in mail (Nov. pub. hearing)

How would you rate the overall knowledge and helpfulness of staff members who assisted you?

☑ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Did you receive all the information that you needed? ☐ Yes ☑ No I could not get one of the staff's attention to talk to except Jon Fuller

How would you rate this facility for holding future meetings? Not enough room to see maps

☐ Very Good ☐ Good ☐ Fair ☑ Poor ☐ Very Poor

the board -- there are several critical areas.

With particular attention to our property, we support the measure(s) that have been proposed to alleviate these problems. The suggestion of a bridge with culverts would remedy the force and direction of flows, and enable traffic to still access and use the road.

We think the town and the flood control staff and consultants have done an exemplar job of studying all the problems and offering viable plan/solutions.

We ask that you speed up this process as to the concern of these priority areas, if possible.

Sincerely,
Paula and Steven Pruett
Feb. 3, 2003

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Charles Celaya

PHONE NO. 623-979-4151

DATE 2/3/03

CALL FROM

TIME 3:30 ☐ AM ☒ PM

MESSAGE TAKEN BY LAJ

PROJECT NO. 162944

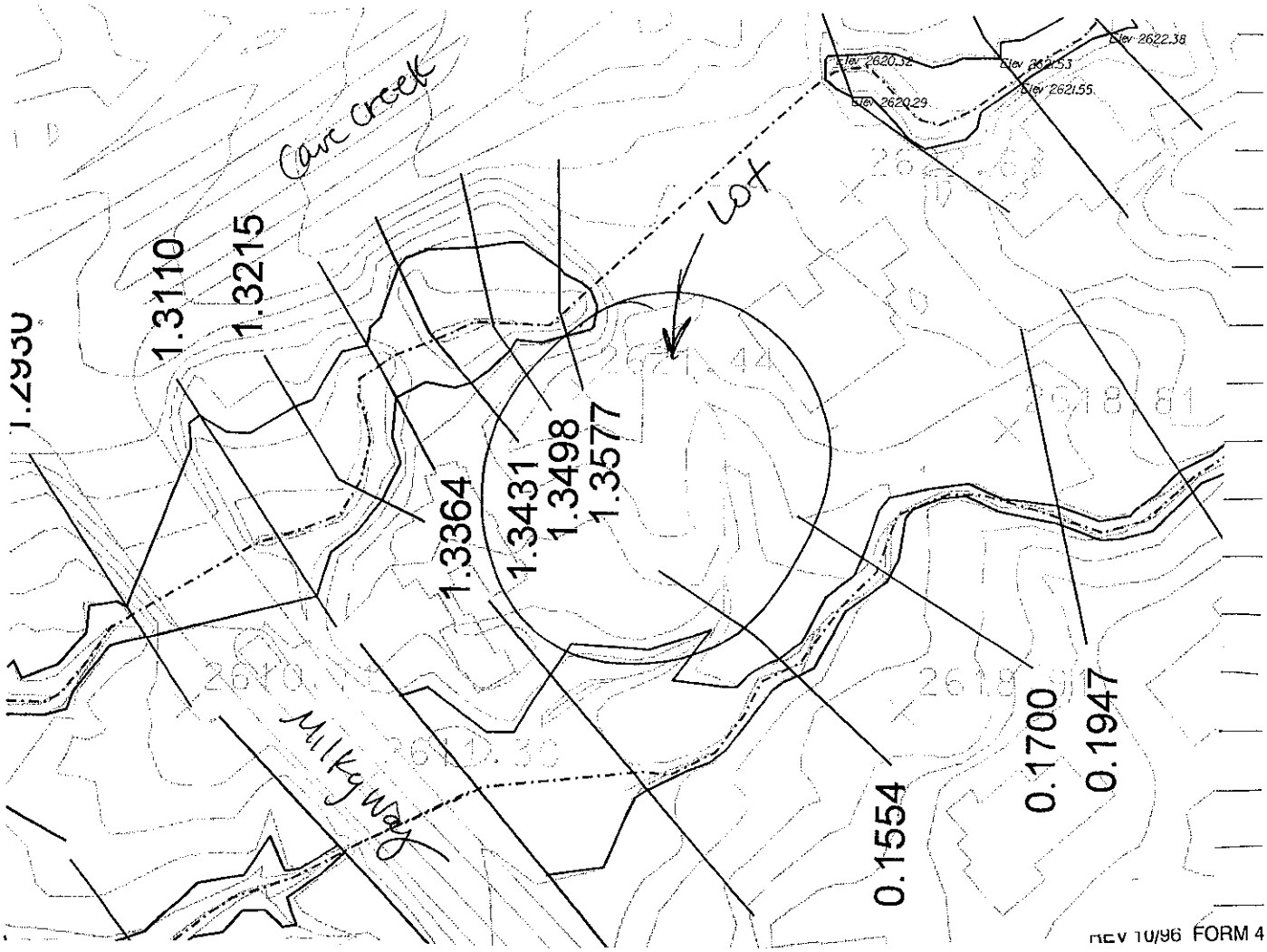
SUBJECT Carefree Floodplain Delineation

- Velvet Shadows : 90th St (Milky Way)
  2nd lot to east on S. side Cave creek

cell (602) 677 1723

- He is having engineering done on his lot now

1" = 100'



REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Jerry Bednarz

PHONE NO. 488-3883

DATE 2/3/03

CALL FROM

TIME ☐ AM ☐ PM

MESSAGE TAKEN BY LAJ

PROJECT NO. 162944

SUBJECT Los Peales home

Called to offer his help - wants to know final results of study.

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO John Lassen

PHONE NO. 480 860 6903

DATE 1/28/03

CALL FROM

TIME ☐ AM ☐ PM

MESSAGE TAKEN BY Linda Johnson

PROJECT NO. 162944

SUBJECT Carefree

Left msg:
- Scottsdale - who to talk to about culvert HW?
- Elevation through main wash

Returned call: left message 1/29/03 @ 1:10 pm
- Gave info to Bill Erickson/COS

Called back 1/30/03
- Told him that I gave info to Bill Erickson

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Brian Fisher (Fish@swgeo.us)

PHONE NO. (602) 861-3747

DATE 1/29/03

CALL FROM Tony Bolich / Linda Johnson

TIME ☐ AM ☐ PM

MESSAGE TAKEN BY

PROJECT NO. 162944

SUBJECT 34659 Los Reales

- Gerald Bednarz is the owner
- Surveyor wants Benchmark Info for area
- Sent him email on 1/29/03 -
  told him that District will be funding Elevation certificates if they can wait 3 to 4 weeks

Brian Fisher
Fish@swgeo.us
602-861-3747

SW Geomatics
34659 Los Reales Lot 17
Gerald Bednarz 424/33

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Sal Discan
(Fred Rosenbaum's Partner)

PHONE NO. 602 996 0850

DATE 1/28/03

CALL FROM

TIME 1:15 ☐ AM ☒ PM

MESSAGE TAKEN BY

PROJECT NO. 162944

SUBJECT NE Corner of Cave Creek/Carefree

- Wanted Flow amounts across his property
- Gave him name & number of FCD & Town rep's that would be able to get him copy of report
- Gave him flow #'s - 868 cfs in main wash
- Wants to set up meeting w/ US & FCD & Town once his Engineer's look @ #'s

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO John ~~Koort~~ Kuhn

PHONE NO. (602) 241-0782

DATE 1/21/03

CALL FROM Linda Johnson

TIME 3:05 ☐ AM ☑ PM

MESSAGE TAKEN BY

PROJECT NO. 162944

SUBJECT Carefree DMP Floodplains

Left message 1/21/03 @ 3:05 pm

John returned my call on 1/22/03 @ 8:20am ±
His property (he represents owners – Scottsdale Health Care) is located on the SW Corner of Carefree Highway and 60th Street. I told them that there is a potential for flooding – that the "berm" that was constructed would not be considered a certified levee by FEMA. He would like to meet w/ FCD representatives and City of Scottsdale. I indicated that I would set up a meeting.

follow up: mtg. scheduled for 1/29/03
@ 9:00 am @ City of Scottsdale

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Robert Miller

PHONE NO. 4804232452

DATE 1/28/03

CALL FROM

TIME ☐ AM ☐ PM

MESSAGE TAKEN BY Linda Johnson

PROJECT NO. 162941

SUBJECT NW Corner Venus & Milky Way

- Property near floodplain
- house is approx 12' above floodplain elevation
- Appears he is okay, no need for flood insurance

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Alan Norey

PHONE NO. 480-595-5088

DATE 1/21/03

CALL FROM Linda Johnson

TIME 3:00 ☐ AM ☒ PM

MESSAGE TAKEN BY

PROJECT NO. 162944

SUBJECT Carefree DMP Floodplains

35923 Canyon Creek Circle
(Near Cave Creek & New River)

Told Mr. Norey house appears out of floodplain but potion of property might be — probably not going to be required to carry flood insurance, as long as FF is greater than 1' above water surface

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Harry Waple

PHONE NO. 480-575-1228

DATE 1-16-03

CALL FROM Tony Bokick

TIME 3' ☐ AM ☐ PM

MESSAGE TAKEN BY

PROJECT NO. 162944

SUBJECT

6280 E. Amber Sun Drive

Wanted to know particulars of floodplain mapping and whether or not his home might be in floodplain. I told him we'll look it up and call him back.

Returned call 1/17/03, 10:50am - Left msg.

Spoke w/ Mr. Waple on 1/21/03 - Told him no houses in Terravita will be inundated

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO James Cheney

PHONE NO. 602-371-6580

DATE 1/16/03

CALL FROM Linda Johnson

TIME 3:15 ☐ AM ☒ PM

MESSAGE TAKEN BY Linda (Raf)

PROJECT NO. 162944

SUBJECT Parcel 219-11-020

Called James Cheney regarding his parcel at Placid & Venus View. Told him that his property is outside of the floodplain/floodway (per mapping as of today).

REV 10/96 FORM 4

James Cheney
219 - 11 – 020
(602) 371-6580 W
(602) 971-9434 H
Stagecoach Pass

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Owner of NE corner CC Rd & CF highway Fred Rosenbaum

PHONE NO. 480 488 4650?

DATE 1/23/03

CALL FROM

TIME 12:26 ☐ AM ☐ PM

MESSAGE TAKEN BY LAJ

PROJECT NO. 162944

SUBJECT CF

Cave Creek Rd & CF Highway - owner called
- told him floodplain limits are around 400' wide across his property
- he would like to have meeting w/ us and his engineers to discuss

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Erich Korsten

PHONE NO. 602-697-5439

DATE 1/23/03

CALL FROM LAJ

TIME 11:00 ☒ AM ☐ PM

MESSAGE TAKEN BY

PROJECT NO. 162944

SUBJECT Caretree Mtg.

- Houses in Entrada - get FF first, postpone Report
  perhaps do channels
- Jon Pearson - Private wash - why spend $$?
  Opinions:
  - we gave info to FCD, they did review
  - why now change?
  - Town made no mistake - why spend Town's $$
  - Homeowner did everything OK, too.

Solutions. Erich will think about before next Tuesday's Mtg.

Recharge Project -
- Erich went there, basins are not maintained
- met w/ Erickson/COS, nothing happened
- Erich hoping report would reflect misbehaving...
- hydrology - assumes working...
  though for Erich
- Effluent recharge??
- no pumps in basins
- People see golf course releases water
  - no planned project that he knows of
- Erich wants report that says upstream conditions

- Huge Dike - in Scottsdale?? Jon meeting with tomorrow
- Erich wants promise of maintenance & operation

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO John Fuller

PHONE NO. (480) 792-2124

DATE 1/23/03

CALL FROM

TIME 10:45 ☐ AM ☐ PM

MESSAGE TAKEN BY LAS

PROJECT NO. 162944

SUBJECT CF

- Recharge Project potentially occurring

Erich knows - retention basin filled
Waterfall - call Erich

- On Galloway - golf course - any weather discharge

Erich wrote letter - basin needs to be cleaned
Fuller looking @ on Friday

- Lessons learned about Public Mtg:
  - @ beginning, send letter
    could be near flooding...

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Rita Lavey

PHONE NO. 641-423-7366

DATE 1/23

CALL FROM LAJ

TIME 10:30 ☒ AM ☐ PM

MESSAGE TAKEN BY

PROJECT NO. 162944

SUBJECT CF Floodplains

Called Rita about her property in Temavita
Told her no homes in Temavita in
fldplain.

REV 10/96 FORM 4

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Bill Erikson
City of Scottsdale

PHONE NO. 480-312-7652

DATE see below

CALL FROM Linda Johnson

TIME see below ☐ AM ☐ PM

MESSAGE TAKEN BY

PROJECT NO. 162944.DP.05

SUBJECT Carefree DMP

- Left message @ 9:56am 12/16
- Left message @ 4:55 pm 12/18
- Sent email on 1/8
- Sent email on 1/21
- Sent email on 1/22

Set up mtg. for 1/23/03 @ 8:30 am @ Scottsdale

REV 10/96 FORM 4

Table 2
Interview Summary

Name of Interviewee	Affiliation	Date of Interview	Interview Notes	By/Of
Rob Kuhfuss	Maricopa County Planning Department	7/30/01	Call was placed looking for As-Built Plans. According to Mr. Kuhfuss, all records are destroyed after 90 days. Additionally, upon incorporation by the Town, all records are given to the Town. He suggested that we check with MCDOT to see if they have any records. Planning Department has no as-built plans.	L. Johnson/CH2M HILL
Rich Orndoff	Maricopa County Department of Transportation	8/7/2001	Call was placed to MCDOT concerning As-Built plans for Carefree Highway between Cave Creek Road and Tom Darlington, or any other as-built plans they might have for the area. Rich indicated that they have nothing on file for this portion of the roadway, which falls within Carefree and Scottsdale limits. He indicated that even if this roadway was constructed under MCDOT, the plans would have been turned over to the Town upon incorporation.	L. Johnson/CH2M HILL
Fernando Espinoza	Town of Carefree Maintenance Supervisor	7/11/2001	Sediment removal is necessary after rainfall events in some locations around town. Mr. Espinoza identified Short Putt at Pima and Cow Track at Paint Pony as the main sediment-generating locations in the town. He does not recall ever having to unplug a culvert in the town. No underground storm drain systems are reported to exist beyond the numerous culverts.	L. Johnson/CH2M HILL
Paula Pruett	Resident on Galloway Wash at 37200 N. Pima Road	unk.	Provided some photos of floods, discussed erosion of right bank, deposition on Pima Road.	J. Fuller/JE Fuller Hydrology and Geomorphology
Jan Misseri	Resident	Unk. (email dated December 20, 2001)	Jan sent a list of sites with problems: 80th Street at Rising Sun has a gabion wall to stop slope failure, corner of Bloody Basin and Nonchalant is missing a scour pad at the driveway and debris in the wash, Lazy Lane is missing a relocated wash, concerns with the Downtown Center design and construction, flooding at Bloody Basin and Nonchalant, sediment problems at Cave Creek Road between Tom Darlington and Scopa Road, protect channel bypassed by flow at Cave Creek Road, CMP at Elbow Bend has an invert lower than existing wash bed, and lack of slope stabilization and restoration of disturbed areas.	Doug Williams/FCDMC
Erich Korsten	Town Engineer, Town of Carefree	9/5/2001	An all weather access has been created with the construction of the Dream Street Bridge. A new all-weather access should be constructed at Tranquil Trail. A sediment problem exists at Cow Track and Paint Pony. This area also has water over the roadway during storm events, but is still passable. The wash throught the airport causes flooding. The retention basins at the airport are being reshaped, and we should look at the Carefree Village report for the HEC-1 modeling of these basins. The plan for Carefree Village was denied by Town Council. The majority of the problems on the south-eastern end of Town are due to sedimentation and erosion. The downtown area was previously studied by Erich. ERich would like a typical design for a dip crossing including toe down and riprap design as a function of the unit discharge and/or velocity. Flooding problems on the very southwestern portion of the Town may be caused by Cave Creek development in the floodplain. The Boulders	L. Johnson/CH2M HILL

Table 2
Interview Summary

Name of Interviewee	Affiliation	Date of Interview	Interview Notes	By/Of
Erich Korsten, cont.	Town Engineer, Town of Carefree	9/5/2001	can be excluded from our study. Private developments do not need to be included in our study, unless there is a major problem. Sediment excavation occurred in the vicinity of the Dream Street Bridge. Erich believes the sediment problem will be better now that the bridge has been built. An improvement crossing at Father Kino would be beneficial, but does not provide access to many lots. Scopa Road does have some periods of impassible flow during storm events. No major problems have occurred on Cave Creek Road, although Erich indicated that it was not designed for the 100-year event. No good base topographic mapping exists for the town.	L. Johnson/CH2M HILL
Nancy Zeno	Town Clerk, Town of Carefree	various dates	Nancy supplied numerous existing reports and improvement plans for the Town. She also indicated that only a few development items are currently being planned in the Town, including two office parks, a church, a shopping center, and two residential subdivisions. The development of Carefree Village was denied by Town Council. She supplied the master plan for the town.	L. Johnson/CH2M HILL
Scott Hamilton	City of Scottsdale	9/25/2001	Projects immediately to the east of Carefree are Carefree Ranch Homesteads and Scottsdale Road at Carefree Highway. The Carefree Ranch Homesteads are platted in the County, with very rugged terrain and no dedications for trails in either wash. Residents don't want trails and washes and don't need anything from the City, so it is unlikely that those types of facilities will be provided. One wash has a lot of petroglyphs. Desert Hills probably won't plat north of Carefree north boundary Rockway Hills. Desert Foothills trail starts at gatehouse near Joy Ranch Road. At Scottsdale Road and Carefree Highway, trail easements exist on the south side of the highway west to 58th Street. Good connection on anything that intersects with the highway north of 58th Street. Planned grade separated crossing at Pima and Stagecoach. This will accomodate horses, etc. when Pima is rebuilt.	L. Dornfeld/DFD
Vern Willardt, Ian Cordwell, Brian Miller, Wayne Anderson	Town of Cave Creek	10/3/2001	Cave Creek requires 15-foot easements, with design standards for subdivisions includes trails standards. Galloway Wash is an important connectivity point to Cave Creek. Grapevine Wash from Gateway park to Rowe Wash is a major corridor into Carefree.	L. Dornfeld/DFD
Nancy Zeno, Carolyn Bohannan, Dennis Zwaggerman, Erich Korsten	Town of Carefree	10/3/2001	Rowe Wash dead ends at slot canyon, destination to China Wall. Provide access to many horse properties. There are trails in Ocotillo Ridge development. South of Cave Creek Road at Andora Wash there is a good trail opportunity directly into Carefree. This goes to Mule Train. Keep trails informal, people are okay with access, but probably won't want to give right-of-way for trails. Planned park at south side of Cave Creek Road across from airport. Access only by on-street bike trail. The old Ft. McDowell stone mountain historic trail crosses the park site. It used to go to Cave Creek through the McDowell Mountain Park to Verde River. No was connections in Carefree.	L. Dornfeld/DFD
Sonoran Foothills Land Trust	Sonoran Foothills Land Trust	10/3/2001	Part of Galloway Wash at Tranquil Trail and Sundance is part of trust. People use the historic trail next to Ocotillo Ridge. Extension to Ocotillo Ridge is dedicated, there is no direct access to Grapevine. Father Kino provides access. Check with land trust about parking here. Horse properties adjacent to washes make their own entrances. Any flood control structures or ROW need to permit horse and trail access.	L. Dornfeld/DFD

Table 2
Interview Summary

Name of Interviewee	Affiliation	Date of Interview	Interview Notes	By/Of
Public Meeting Comments	General Public	11/13/2001	Public Meeting held on November 13, 2001. Public comments include a sediment problem at the Mule Train crossing of Galloway Wash, erosion at Romping Road at Wildflower, sediment problem at Nevermind Trail, Carefree Highway at Whileaway wash crossing, a drainage feature constructed outside the Town's right-of-way at Nonchalant and Elbow Bend, wash cutoff with improvements at Lazy Lane and Sidewinder, flooding at the airport, and erosion and debris at Carefree Highway near the Albertson's store.	Various members of project team
Marin Holmes	Resident in Velvet Studios	8/16/2001	Water overflow from Desert Mountain reported. Runs for days every few months. No regularity to flows. Starts running down Northview Lane over into Scottsdale	T. Bokich/CH2M HILL

December 11, 2002

The Flood Control District of
Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Review of project: Carefree DMP; Contract: FCD 00-37

1. Specifications for Review: CADD Data Delivery Specification, Revision 1.0
2. Reviewed by: Mark Brewer, G.I.S. Database Administrator (602) 506-2953
3. PRJ_RID number: 1184
4. The files were reviewed as follows:
   [ ] Need to be addressed.
   [x] Accepted.
   [f] Were corrected by FCD in order to be accepted.
5. Please enclose a letter upon the next submittal stating what actions were taken for each comment, number by number, so that we know that the comment has been looked at and addressed. DO NOT resubmit approved files with the next submittal.

Current Submittal Comments:
Submitted: November 25, 2002 (hydrology only)

DRNBSN.DXF, DRNBSN.XLS (CP-305)

1.[ ] All of the line work is not drawn on the assigned layer, see note 2 under General Requirements.
2.[ ] All of the text is not drawn on the assigned layer, see note 2 under General Requirements.
3.[ ] The XLS file cannot be reviewed until there is a relationship established with a clean DXF file.

DRNPTH.DXF, DRNPTH.XLS (CP-307)

1.[ ] All of the line work is not drawn on any the assigned layer(s) , see note 2 under General Requirements.
2.[ ] All of the text is not drawn on the assigned layer, see note 2 under General Requirements.
3.[ ] The XLS file cannot be reviewed until there is a relationship established with a clean DXF file.

Previous Submittal History:
Submitted: March 12, 2002 (mapping only)
Submitted: November 4, 2002 (mapping only)

mdr
c:\reviews
\\fcdspa\mrb$\review_comments\word\CarefreeDMP3.doc

November 19, 2002

The Flood Control District of
Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

Review of project FCD 00-37, Carefree DMP
Specifications for Review:
1. The CADD Data Delivery Specification, Revision 1.0, was used for the review of this study.
2. Reviewed by: Mark Brewer, G.I.S. Database Administrator (602) 506-2953
3. The PRJ_RID for this project is 1184.
4. The following files were reviewed as follows:
   [ ] Need to be addressed.
   [x] Passed the review.
   [f] Were corrected by FCD in order to be accepted.
5. Please enclose a letter upon the next submittal stating what actions were taken for each comment, number by number, so that we know that the comment has been looked at and addressed. DO NOT resubmit approved files with the next submittal.

Current Submittal Comments:
Submitted: November 4, 2002

BRIDGE.DXF (CP-200)
1.**[ ]** See comment 5 under the CARTO.DXF deliverable.

CARTO.DXF (CP-201)
1.**[ ]** Typically, there are northing and easting grid tics along with their associated text on the hard copy maps. If these features are on the hard copy maps, please add them to this file.
2.**[ ]** The layer DTMGRID appears to be a duplication of line work that already exists on other layers. It appears to have no connection with the DTM grid or anything else. Please explain.
3.**[ ]** The line work on layer WASH does not belong with this deliverable. This feature belongs with the RIVER.DXF deliverable.
4.**[ ]** The blocks contained in this file need to be defined on the layer that the feature is associated with, i.e.: block name lipole, (which represents power poles), would need to have the entities that define the block drawn on a layer called powerpole, which can then be inserted into this drawing file.
5.**[ ]** The headwalls associated with the bridges and culverts are located here. The headwalls belong with the bridges or culverts. See note 1 under Specific Requirements (BRIDGE.DXF and CULVERT.DXF).

CTRL.XLS (CP-105)
File is tentatively accepted at this time based on the following correction made by FCD. Final acceptance is based upon a comparison against the sealed/signed Technical Data Notebook (TDN). Please make sure that the TDN contains the information that is required in this deliverable so that it can be reviewed. The review will not be complete until the TDN contains this information.
1.**[f]** Column DESC does not contain a period at the end of the sentence.

CULVERT.DXF (CP-205)
1.**[ ]** See comment 5 under the CARTO.DXF deliverable.

DQ.XLS (CP-206)
1.**[x]** File is tentatively accepted at his time. Final acceptance is based upon a comparison against the sealed/signed hard copy maps.

DTM FILES (Chapter 1)
Files are tentatively accepted at this time based on the following corrections (comments 1 thru 4) made by FCD. If comment 5 leads to changes with the DTM data (i.e.: it needs to be submitted again), then comments 1 thru 4 will need to be corrected by the consultant in the resubmitted data.

1. **[f]** All of the DTM files are missing a physical return after the 'END' statement (no quotes) on the last line of the file.
2. **[f]** The point file is not formatted per the specification.
3. **[f]** The point file is missing the 'END' statement (no quotes) at the end of the file.
4. **[f]** The exterior exclusion boundary, type 7, is not snapped to the extent of the DTM data. For an example, see file DTM-NO-SNAP1.JPG. The vertices need to be snapped to the breaklines or mass points, whichever is greater.
5. **[ ]** See comment 4 under the ELV.DXF deliverable.

ELV.DXF (CP-207)

1. **[ ]** Approximately 20% of the text is on an unassigned layer for this feature.
2. **[ ]** Some line work has undershoots and overshoots (dangles), i.e.; all arcs representing the same contour are not snapped together at their endpoints (where appropriate) in order to connect/continue the same contour line work. For examples, see file ELV-DANGLE1.JPG and ELV-DANGLE2.JPG. Please make sure that all such line work is snapped.
3. **[ ]** There are many locations where contour line work criss-crosses other contours. For examples, see file ELV-CROSS1.JPG, ELV-CROSS2.JPG and ELV-CROSS3.JPG. For a complete listing of locations, see file INTERSCT.ELV.
4. **[ ]** The extent of the contours is greater than the extent of the DTM data in some locations (as much as 30 feet). For an example, see file ELV-DTM-EXTENT1.JPG. The requirement is for the contours to be created from the DTM data.
5. **[f]** The contours are drawn with a mixture of broken when passing through some buildings, yet continuous through other buildings. Only one of these methods can be used. For examples, see file ELV-BROKEN1.JPG and ELV-BROKEN2.JPG. On future projects this will be sent back if a combination of both methods are used. This project will be approved based on the mixture of both methods, if they match the hard copy maps.

FPCTLFCD.XLS (CP-109)
File is tentatively accepted at this time based on the following corrections made by FCD. Final acceptance is based upon a comparison against the sealed/signed Technical Data Notebook (TDN). Please make sure that the TDN contains the information that is required in this deliverable so that it can be reviewed. The review will not be complete until the TDN contains this information.

1. **[f]** Column DESC does not contain a period at the end of the sentence.
2. **[f]** Column DESC has words that are using an improper case (UPPER or lower). The description needs to be written in a proper sentence format.
3. **[f]** A space is being used in the identifier (column RMNUM) of an ERM, i.e.: ERM 143. The format is 'ERM' + 'the unique id', i.e. 'ERM12' without the quotes (see RMNUM under File Structure).
4. **[f]** Column RMNUM is missing the required verbiage 'ERM' for some of the points (see RMNUM under File Structure).

PRJ.DXF (CP-211)
File is tentatively accepted at this time based on the following corrections made by FCD. Final acceptance is based upon approval of the ELV.DXF deliverable.

1. **[f]** There is line work that is duplicated on top of other line work.
2. **[f]** There are sliver polygon areas. For examples, see file PRJ-SLIVER1.JPG and PRJ-SLIVER2.JPG.

3. **[f]** The boundary is not snapped to the extent of the mapping. For examples, see file PRJ-NO-SNAP1.JPG and PRJ-NO-SNAP2.JPG. The vertices of the line work need to be snapped to the contours or spot elevations, whichever is greater.

PRJDAT.XLS (CP-212)
File is accepted at this time based on the following corrections made by FCD.

1. **[f]** There should be a space between the verbiage FCD and the contract number (column PRJ_UL; see PRJ_UL under File Structure).
2. **[f]** The format of the contract number (column PRJ_UL) is incorrect. The format is 'FCD' + ' ' + 'the two digit year' + 'the individual contract number', i.e. 'FCD 00-37' without the quotes (see PRJ_UL under File Structure).
3. **[f]** The project name (column PRJ_NM) does not match the name on the Scope of Work. The verbiage is taken from this document, i.e. Scope of Work for .... The verbiage contained in ... would be used to populate this column (see PRJ_NM under File Structure).
4. **[f]** Column BEG_DT does not match the date on the Notice to Proceed (see BEG_DT under File Structure).

RIVER.DXF, RIVER.XLS (CP-213)
Files are tentatively accepted at this time based on the following correction made by FCD. Final acceptance is based upon a comparison against the sealed/signed hard copy maps.

1. **[f]** Some of the line work contained in file CARTO.DXF (see note 3 from that deliverable) belongs here.

STRCT.DXF (CP-217)

1. **[x]** File is tentatively accepted at this time. Final acceptance is based upon a comparison against the sealed/signed hard copy maps.

STRTDTL.DXF (CP-220)
File is tentatively accepted at this time based on the following correction made by FCD. Final acceptance is based upon a comparison against the sealed/signed hard copy maps.

1. **[f]** Some of the line work has undershoots and overshoots (dangles), i.e.; the line work is not snapped to other connecting line work (where appropriate). For examples, see file STRTDTL-DANGLE1.JPG and STRTDTL-DANGLE2.JPG.

Previous Submittal History:
Submitted: This is the first submittal.

mdr
c:\reviews
\\fcdspa\mrb$\review_comments\word\CarefreeDMP1.doc

Richard Harris - FCDX

From: Richard Harris - FCDX
Sent: Wednesday, April 02, 2003 12:00 PM
To: Marilyn DeRosa - FCDX
Cc: Richard Harris - FCDX; Tim Murphy - FCDX; Doug Williams - FCDX
Subject: FW: Carefree DMP

Marilyn,

Per Tony's response below, it is important that the Town be apprised of the District's position towards not addressing the recent channel modifications in the current analysis. Tim said that the modifications occured too late in the study for us to include them, but that we need to let the Town know that if they want to have the wash restudied as a result of the modifications, they will have to initiate a restudy for that area, themselves.

A formal letter to the Town seems to be in order. We can work out details after meeting next week with Town representatives (if we are still going to have one with the town???). If you have any questions, please let me know.

Thanks,

Richard

-----Original Message-----
From: Bokich, Tony/PHX [mailto:tbokich@CH2M.com]
Sent: Tuesday, April 01, 2003 5:16 PM
To: Richard Harris - FCDX
Cc: Doug Williams - FCDX; Tim Murphy - FCDX
Subject: RE: Carefree DMP

Richard,

the floodplain is about 10 feet wide and 2 feet deep through this reach. The area is fully developed except for two lots which will have homes about 6-8 feet above the floodplain. The lowest existing home in the reach is 5 feet above the floodplain. I have discussed the issue with Marilyn and she has told me that we will not be doing additional modeling in this reach.

Tony

> -----Original Message-----
> **From:** Richard Harris - FCDX [mailto:rph@mail.maricopa.gov]
> **Sent:** April 01, 2003 1:26 PM
> **To:** Bokich, Tony/PHX
> **Cc:** Richard Harris - FCDX; Doug Williams - FCDX; Tim Murphy - FCDX
> **Subject:** RE: Carefree DMP
>
> Tony,
>
> I would tend to accept your proposal except for two things: 1. Erich used grade control structures to flatten the channel slopes, which could potentially change flow regime and WSEL's, and, 2. Although no homes are along the channel at present, the future is unpredictable in terms of lot splits, crossings, etc., which may affect the proposed delineation.Therefore, I maintain that additional analysis following surveying is warranted.

If you have any questions, please let me know.

Thanks,

Richard

-----Original Message-----
From: Bokich, Tony/PHX [mailto:tbokich@CH2M.com]
Sent: Tuesday, April 01, 2003 1:06 PM
To: rph@mail.maricopa.gov
Cc: mdr@mail.maricopa.gov; Doug@FCD; tmm@mail.maricopa.gov
Subject: Carefree DMP

Richard,

Steve Cooke forwarded the following email to me for my information. In regards adding the constructed channel to the floodplain modeling I have some thoughts. As you pointed out the plans are concept or schematic plans only. I do not believe that construction drawings exist so I agree with you that it would take ground survey to guarantee suitable data for modeling. But, the intent of the channel improvements was not to provide significant additional capacity, in my understanding, but rather to armor the existing channel preventing further erosion. In that case the effect on the WSE in the model should be expected to be negligible anyway. There are no homes in the floodplain along this wash per our current modeling, so if the new Channelization lowers the WSE by some minor amount it has no real significance. It is a more conservative approach to leave the modeling as is and ignore the effects of the channel improvements.

Thanks,

Tony

p.s. Please copy Marilyn and Doug on any requests to us that require additional effort. Thanks again.

-----Original Message-----
From: Richard Harris - FCDX [mailto:rph@mail.maricopa.gov]
Sent: March 31, 2003 5:07 PM
To: Cooke, Steve/RNO
Cc: Richard Harris - FCDX
Subject: RE: Carefree DMP

Steve,

I left a phone mesage for Rob regarding Erich Korsten's channel modifications for Unnamed Tributary to Stagecoach Pass Wash. We should discuss what the next step will be to incorporate channel geometric changes to the related hydraulic ananlysis. Erich sent me concept plans with no geometric details---survey seems in order.

Please let me know what can be planned for in terms of the final analysis time frame.

Thanks,

Richard

-----Original Message-----

From: Cooke, Steve/RNO [mailto:scooke@CH2M.com]
Sent: Monday, March 31, 2003 5:45 PM
To: Richard Harris - FCDX
Cc: Lyons, Robert/PHX; Bokich, Tony/PHX
Subject: RE: Carefree DMP

We will move ahead and make the DMP and TDN additions.

Thanks

Steve M. Cooke
CH2M HILL/Reno Office
Work: 775.329.7300
Fax: 775.329.9162
scooke@ch2m.com

-----Original Message-----
From: Richard Harris - FCDX [mailto:rph@mail.maricopa.gov]
Sent: March 31, 2003 3:14 PM
To: Cooke, Steve/RNO
Subject: RE: Carefree DMP

Steve,

The consolidation idea sounds nice, but may lead to questions as to which document---DMP vs. TDN---to look for to find certain information. Therefore, I prefer the latter approach. It seems better as far as directing the reader towards which document is referenced. If you have a differanct opinion, let me know.

Thanks,

Richard

-----Original Message-----
From: Cooke, Steve/RNO [mailto:scooke@CH2M.com]
Sent: Monday, March 31, 2003 4:08 PM
To: Richard Harris - FCDX
Cc: Lyons, Robert/PHX; Bokich, Tony/PHX
Subject: Carefree DMP

Richard,

I wanted to get some input from you with regards to the present format of both the Drainage Master Plan (DMP) and the Technical Data Notebook (TDN). The Carefree TDN is modeled after the Skyline TDN and consequently there are numerous appendices which are referred to in both the TDN and DMP. Since both documents have a large number of appendices, would you have a problem if we revised the format by possibly consolidating some of the appendices or sub-appendices? The consolidation would be to improve the ease of finding information as it is referenced. If this isn't acceptable, then at the very least, we would have a DMP and TDN added to each of the appendices and in the text to clarify which document was being referenced. For example, "Appendix A" in the DMP would be changed to "DMP Appendix A" and a similar change would be made in the TDN as well.

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]

Sent: February 05, 2003 4:44 PM

To: Johnson, Linda/PHX; Doug Williams - FCDX

Cc: Bokich, Tony/PHX; Jon Fuller

Subject: RE: Requests from citizens for Carefree data

Unless Doug has reason to disagree, you shouldn't distribute any data that is considered preliminary -- i.e. that has not been finalized, reviewed, and accepted by FCD. This certainly includes the floodplain limits and reports, and likely includes any memos (of course, it would depend upon the content of the memo). Use your best judgment in this case, but please err on the conservative side. Thanks.

Marilyn

"If there are no dogs in Heaven, then when I die
I want to go where they went." - Will Rogers

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Tuesday, February 04, 2003 11:45 AM
To: Doug Williams - FCDX; Marilyn DeRosa - FCDX
Cc: Bokich, Tony/PHX; Jon Fuller
Subject: Requests from citizens for Carefree data

We have received numerous requests for information - copies of memos, floodplain limits, etc. - from the residents in Carefree. I have told everyone asking about floodplain limits that we are unable to give that out until it has been finalized and accepted by FCD. Jon Fuller received a request for Al Austin (the gentleman Jon met with 2 Fridays ago at his ranch at the Scottsdale/CF border) for the memo he prepared documenting that area - can Jon give him a copy?

Shall we continue to tell residents that we are unable to distribute information until it has been finalized, reviewed, and accepted by FCD? Or would you like us to handle it on a case-by-case basis?

Let me know. Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: February 05, 2003 10:42 AM
To: Johnson, Linda/PHX
Subject: FW: 02/05/03 FW: Delineation Branch Review Guidelines

Linda,

Have you ever received the below Guidelines? I thought they may help in producing the TDN for Carefree. Please let me know if you have any questions.

Thanks,

Richard

-----Original Message-----
From: Richard Harris - FCDX
Sent: Wednesday, February 05, 2003 10:09 AM
To: 'mgavan@eecphx.com'; 'lvick@eecphx.com'
Cc: Richard Harris - FCDX
Subject: 02/05/03 FW: Delineation Branch Review Guidelines

<<Technical Data Notebook Guidelines.doc>> <<Data Collection .doc>> <<Delineation Drawings Guidelines.doc>> <<Hydraulic Model Guidelines.doc>>

Mark and LLoyd,

I am forwarding the above Floodplain Delineation (Branch) Review/TDN Guidelines attachments and the below text in hopes that this information will help towards development of the Waterman Wash Tributaries FDS. The "final version" is undergoing refinements, and I suggest that before going to press, you check with Tom Loomis for status. Please let me know if you have any questions.

Thanks,

Richard

-----Original Message-----
From: Richard Harris - FCDX
Sent: Wednesday, February 05, 2003 9:40 AM
To: Thomas Loomis - FCDX
Cc: Richard Harris - FCDX; Tim Murphy - FCDX; Michael Duncan - FCDX; Kathryn Gross - FCDX
Subject: FW: Delineation Branch Review Guidelines

Tom,

The additions to the below lists that come to mind at this time are:

1. The TDN Binder cover should include all the labels and logos of the study partners involved, including FEMA.

2. In the TDN, do the units shown on the Profiles, such as River Miles, match those used in the modeling?

3. In the TDN, are all modeled sections included in the Floodway tables?

4. For the Study Maps, for projects that have new topographic mapping, is there a seal and signature of the project Surveyor included ?

5. On the Study Maps, Delineation Field, are Section corners labeled?

If you need clarification on these suggestions, please let me know.

Thanks,

Richard

-----Original Message-----
From: Tim Murphy - FCDX
Sent: Wednesday, February 05, 2003 9:12 AM
To: Thomas Loomis - FCDX
Cc: Michael Duncan - FCDX; Kathryn Gross - FCDX; Richard Harris - FCDX
Subject: Delineation Branch Review Guidelines

Tom,

Attached are the review guidelines that we developed for the reviews that we do on floodplain delineations. We plan to revise and update them someday. But, so far nobody has had the time to do that. I encourage everybody to forward to Tom (and everyone else) any thoughts that you have where we need to improve these guidelines.

<<Technical Data Notebook Guidelines.doc>> <<Delineation Drawings Guidelines.doc>> <<Hydraulic Model Guidelines.doc>> <<Data Collection .doc>>

Tim Murphy

My telephone number is
602-506-4605

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: February 03, 2003 2:56 PM
To: Johnson, Linda/PHX
Subject: FW: Flood Plain in Carefree

Can you get this info. for Crystal? Thanks.

Marilyn

"If there are no dogs in Heaven, then when I die
I want to go where they went." - Will Rogers

-----Original Message-----
From: Crystal Thompson [mailto:capcrystal@yahoo.com]
Sent: Saturday, February 01, 2003 1:15 PM
To: mdr@mail.maricopa.gov
Cc: tbokich@ch2m.com; cthompson@cap-az.com
Subject: Flood Plain in Carefree

Hello Marilyn,
I'm not sure if you remember me. I work for CAP and served for a few years on the North Gateway Village Planning Committee.

However, my question to you is not work-related. I am a resident of Entrada in Carefree and was out of town on business on 1/22 when you addressed the town on our flood plain designations. I understand 11 properties in Entrada are within a floodplain.

I'd like to know if mine is one of them and whether you think any other areas of Entrada will be assessed in flood plain in the future.

I live at 5868 E. Carefree Mountain Drive (Lot #56).
How can I get this information?
Regards,
Crystal Thompson
623-869-2138 ph.

Do you Yahoo!?
Yahoo! Mail Plus - Powerful. Affordable. Sign up now.
http://mailplus.yahoo.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 27, 2003 10:37 AM
To: Tim Murphy - FCDX
Cc: Richard Harris - FCDX; Doug Williams - FCDX; Johnson, Linda/PHX
Subject: RE: Meeting with Scottsdale and Del Webb Health Center owners

Tim – yes, I'm planning on attending the meeting. I believe Richard is planning on attending, also (Richard, please verify this). No, I've not reserved a car. I have a meeting in Tempe following this meeting and will be using my personal vehicle. Can you make it? Thanks.

Marilyn

"If there are no dogs in Heaven, then when I die
I want to go where they went." - Will Rogers

-----Original Message-----
From: Tim Murphy - FCDX
Sent: Monday, January 27, 2003 10:14 AM
To: Marilyn DeRosa - FCDX
Subject: RE: Meeting with Scottsdale and Del Webb Health Center owners

Marilyn,

Will you be at the meeting? Will anybody else from the District be at the meeting? Has anybody reserved a car?

-----Original Message-----
From: Marilyn DeRosa - FCDX
Sent: Thursday, January 23, 2003 3:44 PM
To: Tim Murphy - FCDX
Cc: Doug Williams - FCDX; Richard Harris - FCDX; Linda A. Johnson PE (E-mail)
Subject: *FW: Meeting with Scottsdale and Del Webb Health Center owners*

Hey Tim. As you know, we've delineated some floodplains as part of the Carefree DMP. One of those floodplains includes a Del Webb Health Center in northern-most Scottsdale. The owners are aware and have requested a meeting with us and Bill Erickson from Scottsdale. John Kuhn (Evans Kuhn & Associates) is representing them. Given the issues in Carefree, and the sensitive nature of this particular floodplain, I think it's important for you to attend the meeting. Next Wednesday, 29-Jan-03, 9:00 a.m., City of Scottsdale. Thanks.

Marilyn

"If there are no dogs in Heaven, then when I die
I want to go where they went." - Will Rogers

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 22, 2003 3:38 PM
To: Richard Harris - FCDX; Marilyn DeRosa - FCDX; Bokich, Tony/PHX
Subject: Meeting with Scottsdale and Del Webb Health Center owners

A meeting has been scheduled for 9:00 am on Wednesday, January 29th at the City of Scottsdale with Bill Erickson to discuss this area of the floodplain delineation near 60th Street and Carefree Highway. Let me know if any of you cannot make it.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Jon Fuller [jon@jefuller.com]
Sent: January 27, 2003 9:17 AM
To: Johnson, Linda/PHX
Subject: RE: Last Friday's Carefree Visit

Linda:

No problem. I enjoy the chance to meet with people one on one. It's so much less confrontational than those mob-mentality public forums. Al & I had a great visit and were able to talk through all the issues, from the upstream basin to his own rather substantial floodplain encroachment. He also has a very cool house, in a cowboy sort of way, which was fun to see.

Re. the basin: I'll put together a brief memo this morning summarizing what I saw, but here's a synopsis. The basin upstream of Al Austin's house on North Branch Galloway Wash was modeled in our HEC-1 using the as-built plans. Therefore, there is no need to revise our model for that watershed.

There is another new major basin in the Grapevine watershed that was completed since we did our HEC-1 modeling that is not in our model. As-built plans were not available at that time. However, adding that basin to our model would not significantly change any of our conclusions or recommendations for the study area. Therefore, no modification of our HEC-1 is needed.

For the DMP final report, a general recommendation should be made that detention/retention basins be designed to account for 2-year and smaller events, rather than just the 100-year. The outlet on the basin I looked at on NBGW appears to be too large to effect any detention of the most frequent floods. Since development has the greatest impact on the peaks of the most frequent floods, and has very little impact on the peak of the 100-year flood, design for the 100-year flood only is somewhat futile.

Jon

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Monday, January 27, 2003 8:59 AM
To: Jon Fuller
Cc: Bokich, Tony/PHX; Doug Williams - FCDX; Marilyn DeRosa - FCDX
Subject: Last Friday's Carefree Visit

Jon - thanks so much for the update message, and for going out there last Friday. To recap, it sounds like the basin is not full of sediment (as the residents suggested); however, it is not retaining any sort of flow unless a 100-year event is happening.

My question: Is this the same basin that we have modeled in our HEC-1 run of the area, or is it an additional basin? If it is additional, we don't have any retention modeled so our flows are still valid. If it is the basin we have in our model, we may need to redo the retention or recommend that Scottsdale redo the basin...

Let me know. Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]

Sent: January 23, 2003 3:44 PM

To: Tim Murphy - FCDX

Cc: Doug Williams - FCDX; Richard Harris - FCDX; Johnson, Linda/PHX

Subject: FW: Meeting with Scottsdale and Del Webb Health Center owners

Hey Tim. As you know, we've delineated some floodplains as part of the Carefree DMP. One of those floodplains includes a Del Webb Health Center in northern-most Scottsdale. The owners are aware and have requested a meeting with us and Bill Erickson from Scottsdale. John Kuhn (Evans Kuhn & Associates) is representing them. Given the issues in Carefree, and the sensitive nature of this particular floodplain, I think it's important for you to attend the meeting. Next Wednesday, 29-Jan-03, 9:00 a.m., City of Scottsdale. Thanks.

Marilyn

"If there are no dogs in Heaven, then when I die
I want to go where they went." - Will Rogers

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 22, 2003 3:38 PM
To: Richard Harris - FCDX; Marilyn DeRosa - FCDX; Bokich, Tony/PHX
Subject: Meeting with Scottsdale and Del Webb Health Center owners

A meeting has been scheduled for 9:00 am on Wednesday, January 29th at the City of Scottsdale with Bill Erickson to discuss this area of the floodplain delineation near 60th Street and Carefree Highway. Let me know if any of you cannot make it.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: January 23, 2003 10:44 AM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: RE: Meeting with Scottsdale and Del Webb Health Center owners

Linda,

I'll be there. By the way, I got a recorded message from an attendee of last night's meeting, Ms. Patsy Miller, an HOA president of Carefree. She said that:

1. She wanted to get topo mapping of an area adjacent to one of the FP sheet coverages---is it available?

2. Two people received the mailer that stated they were preliminarily within the FP, and she doubts they are---could we check it? Can you use the addresses to accurately locate the homes on the study maps?

You might want to call Ms. Miller at (480) 595-6062.

Thanks,

Richard

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 22, 2003 3:38 PM
To: Richard Harris - FCDX; Marilyn DeRosa - FCDX; Bokich, Tony/PHX
Subject: Meeting with Scottsdale and Del Webb Health Center owners

A meeting has been scheduled for 9:00 am on Wednesday, January 29th at the City of Scottsdale with Bill Erickson to discuss this area of the floodplain delineation near 60th Street and Carefree Highway. Let me know if any of you cannot make it.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 22, 2003 3:44 PM
To: Johnson, Linda/PHX
Subject: another Carefree resident
Importance: High

Rita & Sterling Laaveg, APN 216-49-681. They own the parcel at 6856 E. Nightingale Star Circle in Terravita (Lot #T44). Is she in the floodplain/floodway? Please call and let her know. She's in Iowa at (641) 423-7366. I know you're on your way out of the office, but can you look this up real quick? Thanks.

Marilyn

"Outside of a dog, a book is man's best friend;

inside of a dog it's too dark to read."- Groucho Marx

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: January 22, 2003 11:30 AM
To: Johnson, Linda/PHX
Subject: RE: Meeting with Bill Erickson

Linda,

I am available on the same days as Marilyn.

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 22, 2003 11:22 AM
To: Richard Harris - FCDX
Cc: Marilyn DeRosa - FCDX; Bokich, Tony/PHX
Subject: Meeting with Bill Erickson

Richard - Bill Erickson called. He wants to see what's going on before we meet with the owner's of the health center. He was available to meet at 8:30 AM tomorrow morning, so I jumped at the chance since he's so hard to get a hold of. Tony and I will attend, and if you are available, you should probably attend as well. However, because of the short notice, I understand if you cannot make it. However, when we set up the meeting with the owners and City of Scottsdale, yourself (or Tim) should attend, as well as Marilyn (or Doug). Marilyn is available M, Tu, and W of next week.

Richard - Please check your calendar and let me know your availability for those days so that I can set something up with Bill.

Marilyn - you are welcome to attend tomorrow as well, if you'd like.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 22, 2003 9:50 AM
To: Johnson, Linda/PHX
Subject: RE: Terravita Floodplain Mapping

Be sure Richard is available. I am available tomorrow morning, and all day Monday, Tuesday and Wednesday of next week. Thanks.

Marilyn

"Outside of a dog, a book is man's best friend;
inside of a dog it's too dark to read."- Groucho Marx

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 22, 2003 9:23 AM
To: Erickson, Bill
Cc: Marilyn DeRosa - FCDX; Bokich, Tony/PHX; Melissa Lempke - FCDX; Richard Harris - FCDX; Doug Williams - FCDX
Subject: RE: Terravita Floodplain Mapping

Hello, Everyone:

I received a call from John Koon, who represents Scottsdale Health Care, the owners of building on the southeast corner of Carefree Highway and 60th Street. They would like to meet to discuss the flooding situation on their property. Due to the schedule of the floodplain mapping and the contract end date, I would like to schedule a meeting **as soon as possible**.

Bill - please let us know when you are available to meet. The flooding situation on this property will likely be controversial and it will be in everyone's best interest to discuss the issue.

Thanks,
Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

-----Original Message-----
From: Erickson, Bill [mailto:Berickson@scottsdaleaz.gov]
Sent: January 09, 2003 12:15 PM
To: Johnson, Linda/PHX
Cc: Marilyn DeRosa - FCDX; Bokich, Tony/PHX; Melissa Lempke - FCDX; Richard Harris - FCDX
Subject: RE: Terravita Floodplain Mapping

Thank you, see you then.
Bill

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Thursday, January 09, 2003 10:10 AM
To: Erickson, Bill
Cc: Marilyn DeRosa - FCDX; Bokich, Tony/PHX; Melissa Lempke - FCDX; Richard Harris -

FCDX
Subject: RE: Terravita Floodplain Mapping

Bill - we are available to meet on Tuesday at 3:30. There will likely be: myself, Tony Bokich/CH2M HILL, and at least one representative from the Flood Control District. We will plan on meeting you at the City of Scottsdale on next Tuesday, unless I hear differently from you.

Thanks,

Linda

-----Original Message-----
From: Erickson, Bill [mailto:Berickson@scottsdaleaz.gov]
Sent: January 09, 2003 9:49 AM
To: Johnson, Linda/PHX
Cc: Marilyn DeRosa - FCDX; Bokich, Tony/PHX; Melissa Lempke - FCDX; Richard Harris - FCDX
Subject: RE: Terravita Floodplain Mapping

I have 2 openings on my calendar for next week, 3:30 Tuesday Jan. 14th, and 8:30 Thursday, January 16th. Let me know which is better so I can find a meeting room. I need to know how many will attend.

Thanks, Bill

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Thursday, January 09, 2003 9:42 AM
To: Erickson, Bill
Cc: Marilyn DeRosa - FCDX; Bokich, Tony/PHX; Melissa Lempke - FCDX; Richard Harris - FCDX
Subject: RE: Terravita Floodplain Mapping

Great! The meeting will be held at the Town of Carefree (Town Hall) on January 22nd.

We would like to meet with you before the meeting as well, so that we can show you the delineation boundaries within Scottsdale. Additionally, there is a medical building that will likely end up in the floodplain, and we would like your input on the model of this area.

Let me know when you might be available to meet. We can come to your office in Scottsdale.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

-----Original Message-----
From: Erickson, Bill [mailto:Berickson@scottsdaleaz.gov]
Sent: January 09, 2003 9:34 AM
To: Johnson, Linda/PHX

Cc: Richard Harris - FCDX; Melissa Lempke - FCDX; Bokich, Tony/PHX; Marilyn DeRosa - FCDX
Subject: RE: Terravita Floodplain Mapping

Linda: I will be glad to attend. Where?
I will call you this week.

Thanks

Bill

-----Original Message-----
From: Johnson, Linda/PHX
[mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 08, 2003 1:54 PM
To: Erickson, Bill
Cc: Richard Harris - FCDX; Melissa Lempke - FCDX; Bokich, Tony/PHX; Marilyn DeRosa - FCDX
Subject: Terravita Floodplain Mapping

Bill:

As you may be aware, the Flood Control District is performing floodplain delineation on the wash that begins in Carefree, crosses Carefree Highway into Scottsdale, then crosses Carefree Highway again and back into Carefree. This is near the Terravita subdivision. We will be holding a public meeting on January 22 at 6:30 pm. Due to the fact that there is floodplain delineation occurring in Scottsdale, you may want a representative to attend this meeting.

Additionally, we would like to discuss this delineation with you. Please call me at 480-377-6273 at your earliest convenience. We are nearing the end of the project, so time is of the essence.

Thank you,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 22, 2003 9:48 AM
To: Johnson, Linda/PHX
Subject: RE: Carefree residents & floodplain delineations

Thanks Linda. You're super swell!

Marilyn

"Outside of a dog, a book is man's best friend;
inside of a dog it's too dark to read."- Groucho Marx

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Tuesday, January 21, 2003 3:09 PM
To: Marilyn DeRosa - FCDX
Subject: RE: Carefree residents & floodplain delineations

Done.

Charles Snoops: Does not live in Carefree, had no idea what I was talking about. Perhaps he called you about another project??

Alan Norey: Spoke with, he lives on Canyon Creek Circle, house appears out of floodplain but part of property might be in. He will try to make it to the public meeting.

John Koon: Left message.

Linda

-----Original Message-----
From: Marilyn DeRosa - FCDX [mailto:mdr@mail.maricopa.gov]
Sent: January 21, 2003 2:33 PM
To: Johnson, Linda/PHX
Cc: Bokich, Tony/PHX
Subject: Carefree residents & floodplain delineations

Hi Linda. As you know, I've been getting phone calls about the delineations. Could you please return the following calls:

Charles Snoops (623-434-3929)

Alan Norey (480-595-5088)

John Koon (602-241-0782)

None of them told me where their properties where. Thanks.

Marilyn

"Outside of a dog, a book is man's best friend;

inside of a dog it's too dark to read."- Groucho Marx

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: January 20, 2003 7:05 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 01/20/03 Carefree DMP
<<Comments 01-20-03_2.doc>>

Linda,

Attached above are my latest review comments concerning the Unnamed Central wash portion of the subject study Hydraulic analysis. Please review and respond to them in the usual fashion. If you have any questions, please call me at (602) 506-4528.

Thanks,

Richard

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 15, 2003 2:59 PM
To: Johnson, Linda/PHX; Bokich, Tony/PHX
Cc: Doug Williams - FCDX; Melissa Lempke - FCDX; Michael Book (E-mail)
Subject: Carefree images for AZ Republic
Importance: High

Linda -

Christina Leonard at the AZ Republic is running a Carefree story and would like a jpeg image (or two) showing the locations of the recommended improvements (I told her there were six?). Could you get something together for her THIS AFTERNOON? Thanks.

Marilyn DeRosa, RG, EIT

Planning Project Manager

Flood Control District of Maricopa County

2801 West Durango Street

Phoenix, Arizona 85009

****

Phone: (602) 506-4766

mailto: mdr@mail.maricopa.gov

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 15, 2003 2:50 PM
To: Johnson, Linda/PHX; Jon Fuller; Doug Williams - FCDX; Bokich, Tony/PHX
Cc: Dornfeld, Leslie; jon@carefree.org; Melissa Lempke - FCDX
Subject: RE: Carefree Press Wash Walk

Yes. Allen will be there.

P.S. I also spoke to the Arizona Republic today about the Carefree study. Perhaps she'll prepare a flattering piece☺.

Marilyn DeRosa, RG, EIT
Planning Project Manager
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

****
Phone: (602) 506-4766
mailto: mdr@mail.maricopa.gov

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 15, 2003 11:10 AM
To: Jon Fuller; Doug Williams - FCDX; Marilyn DeRosa - FCDX; Bokich, Tony/PHX
Cc: Dornfeld, Leslie; jon@carefree.org
Subject: RE: Carefree Press Wash Walk

Based on the comments received, here is the itinerary of sites for tomorrow. I will create a printed handout with these sites on it, a map of our route, as well as some other items such as pictures and the conceptual improvement renderings, unless you all would prefer not to have that. Let me know.

1. Town Center Construction
2. Tranquil at Sundance
3. Cow Track at Paint Pony
4. Galloway Wash at Carefree Drive
5. Wildflower Road Ditch
6. Cave Creek Road plugged culverts

Remember to meet at 9:00 am tomorrow at the Town of Carefree!

Marilyn - did you ever reach Desert Advocate?

Linda

-----Original Message-----
From: Johnson, Linda/PHX
Sent: January 13, 2003 1:38 PM
To: Jon Fuller; Doug Williams - FCDX; Marilyn DeRosa - FCDX; Bokich, Tony/PHX
Cc: Dornfeld, Leslie; 'jon@carefree.org'
Subject: Carefree Press Wash Walk

Hello, Everyone:

Per a meeting we had this morning on the Carefree Drainage Master Plan project, Marilyn and Doug requested that Jon Fuller and others provide input on the agenda for the wash walk with the press that is occurring on Thursday, January 16th (9:00 at Town Hall).

Here is a list of sites that I think would be good to look at. All: Please review and comment on these, as there might be some that would be better off not looking at with members of the press and Town Council. The Town specifically requested that we do not show any sites with severe damage that look dangerous (i.e. the damaged sites in the eastern Rolling Hills subdivision).

1. Cow Track at Paint Pony - sediment issues, slope stability, erosion setbacks, localized erosion, impassable during 100-yr. event
2. New Town Center Construction - "look at the good stuff that the Town and district have done together to fix flooding in the downtown area..." This would be a great positive press opportunity (let's NOT show them or mention the culvert that was built outside the R/W...)
3. Pima Road near Short Putt (near the Pruett's house) - flooding, impassable during 100-year event, bank protection, reflective erosion
4. Ditch along north side of Cave Creek Road between Tranquil and Sundance - the one that has concrete ditches, non-standard inlets - shows how development in a wash has upset natural balance
5. Terravita Way Flow Split - shows how flow splits affect flooding (actually located w/in Scottsdale boundaries)
6. Romping Road Ditch - the one with the gabion baskets that Erich and the Town are fixing themselves - shows what happens when you try to artificially relocate a wash w/o proper protection measures. Road was built right where wash used to be.
7. Galloway Wash - unprotected berm cutting off former avulsive channel
8. Dream Street Bridge/Footbridge sedimentation, headcuts
9. Nearly plugged culverts across Cave Creek Road.

Let me know what you think of these sites and if you want us to consider other sites or take any off the list.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 15, 2003 12:35 PM
To: Johnson, Linda/PHX
Subject: Carefree Resident
<<Bednorz.jpg>>

Linda - please call Mr. Jerold Bednorz (480-488-3883). His home/parcel are shown on the attached jpeg. He got his permit to build about one year ago. Is he in the floodplain/floodway of the new delineation? Thanks.

Marilyn

"Outside of a dog, a book is man's best friend;

inside of a dog it's too dark to read."- Groucho Marx

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: January 15, 2003 12:34 PM
To: Johnson, Linda/PHX
Subject: *RE: Want to schedule time to drop UC wash information off...*

That should be fine. See you then!

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 15, 2003 10:33 AM
To: Richard Harris - FCDX
Cc: Bokich, Tony/PHX
Subject: Want to schedule time to drop UC wash information off...

Hi, Richard - do you have time on Friday to meet so I can drop off items for your review on the UC wash? How about 9:00 am on Friday? Let me know.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: January 13, 2003 5:32 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX; Marilyn DeRosa - FCDX
Subject: 01/13/03 Carefree DMP, Preliminary FP Boundary Delineations

<<Comments 01-13-03.doc>> <<Comments 01-13-03_2.doc>> <<Comments 01-09-03.doc>> <<Comments 01-10-03.doc>>

Linda,

Attached above are my review comments to date. Please review them and respond in the usual manner. The following comments also apply to all sheets:

1. Please add the flight date and M & B contract number to the label along the bottom of each sheet.

2. As discussed, the Legend will need to be updated to reflect the specifics to this project.

3. Please add cross-hairs and labels for section corners to both the plan sheets and the legend.

4. Note number 1 on each sheet regarding the hydraulic base line should be removed (not necessary).

5. The vertical datum conversion factor will need to be added to the legend.

6. The horizontal datum should be added to under the "Elevation Reference Marks" description.

7. The FP boundary lines do not match up well at the match lines between sheets 5 and 6. Please check.

8. As discussed, the ponding limits for the Windmill and Pima Washes at their lower study limits will need to be added to the study maps.

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: January 09, 2003 2:10 PM
To: Johnson, Linda/PHX
Subject: RE: Survey Summary Map

Thanks

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Thursday, January 09, 2003 11:51 AM
To: Richard Harris - FCDX
Cc: Bokich, Tony/PHX
Subject: Survey Summary Map

Richard - I created a summary map of the locations where additional survey was done for the floodplain mapping task. I put it in the mail today, so you should have it tomorrow (or Monday at the latest).

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: January 08, 2003 2:04 PM
To: Johnson, Linda/PHX
Subject: RE: Terravita Floodplain Mapping

Linda,

As discussed, please send me the updated survey CADD files.

Thanks,

Richard

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, January 08, 2003 1:54 PM
To: berickson@ci.scottsdale.az.us
Cc: Richard Harris - FCDX; Melissa Lempke - FCDX; Bokich, Tony/PHX; Marilyn DeRosa - FCDX
Subject: Terravita Floodplain Mapping

Bill:

As you may be aware, the Flood Control District is performing floodplain delineation on the wash that begins in Carefree, crosses Carefree Highway into Scottsdale, then crosses Carefree Highway again and back into Carefree. This is near the Terravita subdivision. We will be holding a public meeting on January 22 at 6:30 pm. Due to the fact that there is floodplain delineation occurring in Scottsdale, you may want a representative to attend this meeting.

Additionally, we would like to discuss this delineation with you. Please call me at 480-377-6273 at your earliest convenience. We are nearing the end of the project, so time is of the essence.

Thank you,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]

Sent: January 08, 2003 12:58 PM

To: Johnson, Linda/PHX

Cc: Doug Williams - FCDX; Melissa Lempke - FCDX; Bokich, Tony/PHX; Michael Book (E-mail); Jonathan E. Fuller PE PH (E-mail)

Subject: RE: Update on Press Wash Walk

Hey, Linda. Let's stick with the 16th until we here from the press and the Town. Thanks.

Marilyn

"Outside of a dog, a book is man's best friend;
inside of a dog it's too dark to read."- Groucho Marx

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Tuesday, January 07, 2003 4:31 PM
To: Marilyn DeRosa - FCDX
Cc: Bokich, Tony/PHX; Melissa Lempke - FCDX; Mike Book; Jon Fuller; Doug Williams - FCDX
Subject: Update on Press Wash Walk

I called again and left messages for the Sonoran News and Desert Advocate. I wasn't able to speak with the contacts, but I gave the information to the receptionist at Desert Advocate and told her to pass it along to both Alan and Karen.

However, Erich will be out of town that week. Should we try to reschedule when Erich can be there? I also left a message for Jon Pearson, but he was not available (I know they are busy getting ready for the Town council meeting today!)

Let me know. Thanks,
Linda

-----Original Message-----
From: Marilyn DeRosa - FCDX [mailto:mdr@mail.maricopa.gov]
Sent: January 06, 2003 10:52 AM
To: Johnson, Linda/PHX
Cc: Bokich, Tony/PHX; Melissa Lempke - FCDX; Mike Book; Jon Fuller; Doug Williams - FCDX
Subject: RE: Press Wash Walk?

Hey, Linda. Yes, we're still interested in having the press walk. We would like you to do the following:

Call Karen Seemeyer (Desert Advocate) and the guy from the Sonoran News (if you don't have it, get his contact info. from Doug) and ask about their interest or availability on the 16th. If at least one of them can attend, contact the Mayor and Council members (via e-mail or telephone) and invite them to participate. Put together an agenda (with Jon F.'s help) for a three-hour field trip. Have it go from 9:30 or 10:00 to 12:30 or 1:00. Attendees will include you, me, Doug, Melissa, Tony, and Jon. This will all need to be done fairly quickly. Thanks.

P.S. Can you and Mike move tomorrow's FCD meeting to 1:30 p.m. (instead of 9:00 a.m.?) Thanks, again.

Marilyn

"Outside of a dog, a book is man's best friend;
inside of a dog it's too dark to read."- Groucho Marx

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Thursday, January 02, 2003 2:46 PM
To: Marilyn DeRosa
Cc: Bokich, Tony/PHX; mgl@mail.maricopa.gov; Mike Book; Jon Fuller
Subject: Press Wash Walk?

Hi Marilyn,

We have a press wash walk tentatively scheduled for January 16th. Are we still going to do this?

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Marilyn DeRosa - FCDX [mdr@mail.maricopa.gov]
Sent: January 06, 2003 10:52 AM
To: Johnson, Linda/PHX
Cc: Bokich, Tony/PHX; Melissa Lempke - FCDX; Mike Book; Jon Fuller; Doug Williams - FCDX
Subject: RE: Press Wash Walk?

Hey, Linda. Yes, we're still interested in having the press walk. We would like you to do the following:

Call Karen Seemeyer (Desert Advocate) and the guy from the Sonoran News (if you don't have it, get his contact info. from Doug) and ask about their interest or availability on the 16th. If at least one of them can attend, contact the Mayor and Council members (via e-mail or telephone) and invite them to participate. Put together an agenda (with Jon F.'s help) for a three-hour field trip. Have it go from 9:30 or 10:00 to 12:30 or 1:00. Attendees will include you, me, Doug, Melissa, Tony, and Jon. This will all need to be done fairly quickly. Thanks.

P.S. Can you and Mike move tomorrow's FCD meeting to 1:30 p.m. (instead of 9:00 a.m.?) Thanks, again.

Marilyn

"Outside of a dog, a book is man's best friend;
inside of a dog it's too dark to read."- Groucho Marx

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Thursday, January 02, 2003 2:46 PM
To: Marilyn DeRosa
Cc: Bokich, Tony/PHX; mgl@mail.maricopa.gov; Mike Book; Jon Fuller
Subject: Press Wash Walk?

Hi Marilyn,

We have a press wash walk tentatively scheduled for January 16th. Are we still going to do this?

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 19, 2002 6:06 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 12/19/02 Carefree DMP
<<Comments 12-19-02.doc>>

Linda,

Attached above are my latest review comments regarding the subject project. Please review and respond to them in the requested manner. I will be on vacation until December 30th, but if you need to you can reach me before that time you can call me on my cell phone:

(602) 758-8914

Happy Holidays!

Richard

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 16, 2002 9:08 AM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 12-16-02 RE: Update on Floodplain Wash delineation

Linda,

Per my last message, I hope you will go ahead and try to set up the meeting with the COS (and let Marilyn know when/where it will be).

Labeling the point file with locations would help greatly.

Meeting this Thursday will be fine. I have no other appointments so just let me know what time will be best for you.

If you have any questions, please call me at (602) 506-4528.

Thanks,

Richard

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Saturday, December 14, 2002 2:51 PM
To: rph@mail.maricopa.gov
Cc: Bokich, Tony/PHX; Lyons, Robert/PHX
Subject: Update on Floodplain Wash delineation

Hi, Richard: I know we still owe you some items. Sorry I wasn't able to get them to you sooner, but (as you know), last week was super busy! Here's an update:

1. I will have Rob Lyons in our office create the spreadsheets for you (HEC-RAS model output with top width and headloss changes) by close of business Monday.
2. We need to schedule a meeting with Scottsdale.
3. Can we plan on having another submittal meeting on Thursday, December 19th? (this Thursday)
4. I need to get you some explanation on the survey notes...the Microstation file has the locations of the points, but I'm sure that's of little use to you...perhaps I could label the point file with locations for you?

We have a progress meeting on Tuesday at the District. I would like to refrain from talking about any technical aspects, as we will be pressed for time that day. Let's save all that for Thursday meeting.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 16, 2002 9:03 AM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 12/16/02 RE: Carefree DMP Monthly Progress Meeting and Design Site Workshop Workshop

Hi Linda,

Thanks for the info & invite. Should you also be inviting the COS and Carefree reps? I haven't been able to contact Bill Erickson (as planned) in order to get COS input on the relative FP delineation issues we discussed last week. Although you said below that you didn't want to discuss technical issues at tomorrow's meeting, perhaps it would be an acceptable forum for just that part of the delineation (?). Maybe just inviting them with the request that if they can't attend, can they please schedule a meeting regarding this, for another time. Bill's e-mail address is:

berickson@ci.scottsdale.az.us

phone number is: (480) 312-7652

Please copy/forward me any correspondance between you and the COS.

Thanks,

Richard

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Saturday, December 14, 2002 2:31 PM
To: dsimpson@lsdaz.com; Doug Williams; Jon Fuller; Dornfeld, Leslie; Marilyn DeRosa; mgl@mail.maricopa.gov; Mike Book; rph@mail.maricopa.gov
Cc: Bokich, Tony/PHX
Subject: Carefree DMP Monthly Progress Meeting and Design Site Workshop

Reminder: The Carefree Meeting and workshop will be held on Tuesday, December 17th at the District from 10:00 am to 1:00 pm. THIS IS A VERY IMPORTANT MEETING! (Well, aren't they all???) We are down to the wire! This meeting will also include a workshop on the preliminary design sites. I need everyone's input so that the designs can proceed.

I think it would be a good idea if Richard and/or Tim attend on the Floodplain Delineation portion of the project. However, we DO NOT have time to cover any technical aspects on that (we've been meeting separately approximately once a week on the technical aspects), so let's try to limit it to just the administrative items on the floodplain delineation. They do not need to attend the rest of the meeting or workshop.

CH2M HILL will be arranging lunch for the meeting (this answers your question, Mike, I'll take care of it).

Please review the attached agenda and see if you would like to add anything to it. We only have two more progress meetings left, so it's important to identify all outstanding issues now.

Also, anyone else to invite?

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 10, 2002 1:03 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 12/10-02 Carefree DMP, Stagecoach Pass Wash Trib.

<<Comments 12-10-02.doc>>

Linda,

Attached above are my review comments for the preliminary hydraulic analysis of the subject study reach. Please review them in the usual manner. If you have any questions, please call me at (602) 506-4528.

Thanks,

Richard

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 04, 2002 12:32 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX; Marilyn DeRosa - FCDX; Tim Murphy - FCDX
Subject: RE: Carefree Floodway - Galloway Wash

Linda,

I agree that if FEMA requires too many modeling hoops to jump through, it may be better to not include Galloway Wash in the delineation. As you know, I have sent a message to Pernille at Baker asking her if an HEC-2 analysis would need to be included. I am awaiting her response.

Technically, It would be interesting to plot the profile of the existing (FIRM) FP elevation vs.. the currently modeled FP elevation (@ critical depth) for comparison, since under the NFIP we are mandated to regulate to the higher of the two. Care would have to be taken to ensure the two plots use the same vertical datum. If FEMA does not require the HEC-2 analysis, then the direction I would suggest the Town of Carefree to take, given the new WSEL's are higher and FW = FP, would be to go ahead and include the Galloway redelineation. If they didn't want to do that, I think it could potentially affect the County's CRS rating. Would it be possible to bring such a plot to tomorrow's meeting?

If you have any questions, please call me at (602) 506-4528.

Thanks,

Richard

-----Original Message-----
From: Johnson, Linda/PHX [mailto:ljohnso7@CH2M.com]
Sent: Wednesday, December 04, 2002 11:36 AM
To: Richard Harris - FCDX
Cc: Bokich, Tony/PHX
Subject: Carefree Floodway - Galloway Wash

Richard -

Per our telephone conversation, I looked into the Floodway determination according to State Standard 3-94. According to this standard, "If the velocity head is less than 1/3 the flow depth (subcritical profile) or greater than 2/3 the flow depth (supercritical profile), the model may be regarded as stable." (page 5 of SSA 3-94). Our model does not meet the criteria for stability in the 5 or so places that I checked. (That's ok, it just means that it's hovering around critical depth)

Additionally, the state standard talks about floodways on braided streams (page 6): "Application of floodway modeling techniques may not be appropriate for braided streams...Braided flow, if supercritical flow occurs in flow braids, is essentially a case of composite flow. Therefore, the guidelines for composite flow should be applied." So, under Composite Flow it says that the model must be considered computationally stable to apply floodway modeling techniques. Otherwise, it says to use floodplain = floodway.

Since Galloway Wash already has a mapped floodway, I think we need to either: 1) map floodway = floodplain or 2) not bother to redelineate this area. There isn't any development in the floodplain, and no lot is located entirely within a flood area (the lots are such that they include the ridge line as well as the floodplain area). Therefore, this is a very low risk area for future development as it is already built-out, and a nice, wide mapped floodway and floodplain already exist. Seems like a waste of money to redelineate to me!

Additionally, redelineation of Galloway wash may require extensive additional work, including comparisons with the existing HEC-2 runs to satisfy FEMA (which is outside the limited scope of our contract for this project). I do have those runs, if we need them.

Let me know what you think. I think we also need to discuss this with Doug, Tony, Tim, and Marilyn before making any decisions.

Thanks,

Linda A. Johnson, P.E.
Associate Project Manager
CH2M HILL/Phoenix
Direct: 480-377-6273
Fax: 480-784-6273
Email: ljohnso7@ch2m.com

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 04, 2002 11:24 AM
To: 'Pernille Buch-Pedersen'
Cc: Richard Harris - FCDX; Johnson, Linda/PHX; Marilyn DeRosa - FCDX
Subject: 12/04/02 Carefree DMP

Pernille,

I have several questions regarding guidance for the consultant towards developing Floodplain and Floodway Boundary delineations for the subject project and stream naming conventions:

1. One of the streams within the project has both AE and Floodway Zones currently shown on the FIRM panels. If the study from which these zones were determined involved HEC-2 modeling, is the consultant required to reconstruct the modeled results using HEC-2, for any reason? Can they now apply HEC-RAS to obtain revised Flood elevations, without submitting an HEC-2 model, for the LOMR?

2. The results of a HEC-RAS model show Froude numbers above 1.4 for more than 60% of cross-sections in a mixed regime run. For a subcritical run, all elevations default to critical. For such a situation, does FEMA require that the Floodplain boundary elevations be set higher that critical depth (EGL elevation)? Our state standard supports Floodway elevation determination for such cases to be relative to the EGL, but is not clear toward the Floodplain elevation to be used for boundary plots. What do you recommend?

3. The consultant for this project, CH2M Hill, is calling two unnamed streams "Unnamed Central" and "Unnamed Eastern". For other studies within the County, we have suggested that new naming to be relative to the Section, Township, and Range of the stream outlet. Does FEMA have a preferred naming convention for streams that currently have no names?

Your help in answering these questions is much appreciated. If you have any questions or need clarification of mine, please call me at (602) 506-4528.

Thanks,

Richard

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 03, 2002 1:33 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 12/03/02 Carefree DMP Galloway Middle Branch HEC-RAS

<<C-Gall.xls>>

Linda,

As discussed, above is the spreadsheet that I mentioned I would send to you. Let me know if you have any questions.

Thanks,

Richard

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: December 02, 2002 3:57 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 12/02/02 Carefree DMP

<<11-27-02 RC's.doc>>

Linda,

As discussed, attached above are my review comments for the latest Hydraulic Modeling submittal (Galloway Wash Middle Branch). Please review as described therein, and in context with our meeting tomorrow.

If you have any questions in the meantime, you can reach me at (602) 506-4528.

Thanks,

Richard

Johnson, Linda/PHX

From: Richard Harris - FCDX [rph@mail.maricopa.gov]
Sent: November 05, 2002 5:18 PM
To: Johnson, Linda/PHX
Cc: Richard Harris - FCDX
Subject: 11-05-02 Carefree DMP

<<11-05-02 RC's.doc>>

Linda,

As discussed, attached are my review comments for the Unnamed Central Wash portion of the subject study FDS. Please review the comments as suggested, and let me know if you have any questions by calling me at (602) 506-4528.

Thanks,

Richard

Johnson, Linda/PHX

From: Pat Moraca [pmoraca@deipro.com]
Sent: July 23, 2002 10:15 AM
To: Johnson, Linda/PHX
Cc: Hal Marron; Elisa Canez
Subject: Re: North Scottsdale Hydrology

Linda,

Early in our study, we determined the 100-yr 6-hr event would provide larger peak flows than the 100-yr 24-hr storm, due to the small watersheds and limited retention in our study area. Therefore, the 100-yr 24-hr storm model was not fully developed for our study. The model provided was run as a multiple storm with the 6-hr Pattern 1 rainfall distribution.

DEI contract required the 100-yr storm event. However, the smaller 2-yr, 5-yr, etc. storms were provided in the first hydrology submittal and were not run in the subsequent submittals. The model forwarded last week did not include updated runs for storms less than the 100-yr. Hence, neglect output data in this model for storm events less than the 100-yr if data appears in the DDMSW summary tables.

I hope this answers your questions. If you have any questions please call (602) 954-0038.

Thanks,

Pat

----- Original Message -----
From: Johnson, Linda/PHX
To: 'Pat Moraca'
Cc: Bokich, Tony/PHX
Sent: Monday, July 22, 2002 3:22 PM
Subject: RE: North Scottsdale Hydrology

Hi Pat - I received the flow summary spreadsheet. Question for you: Are all of these done for the 6-hr. event? I noticed the HEC-1 run you sent was for the 100-year, 6 hour frequency. Can I assume that the other events (2-year, 5-year, etc.) were done for the 6-hr as well? Let me know.

We ran both the 6-hr and 24 hr in our study, so I don't know how we will address this, as our scope says to use the greater of the 6- or 24-hour storm in our floodplain mapping.

Thanks,

Linda

-----Original Message-----
From: Pat Moraca [mailto:pmoraca@deipro.com]
Sent: June 06, 2002 11:47 AM
To: Johnson, Linda/PHX
Cc: Hal Marron; Elisa Canez
Subject: Re: North Scottsdale Hydrology

Linda,

Johnson, Linda/PHX

From: erich korsten [ekorsten@msn.com]
Sent: December 02, 2002 6:41 PM
To: Johnson, Linda/PHX
Subject: Re: Carefree - Floodway = Floodplain

Linda,

I don't think that it is a good idea to designate all floodplains = floodways. This would probably be challenged, unless the town adopts an ordinance, which would give the legal basis for that. I would rather like to see the 100-year floodplains determined and mapped, w/o mentioning of the floodway. If later somebody wants to encroach into the floodway fringe, he/she has to provide an analysis, which can be evaluated for the specific case.

Erich

>From: "Johnson, Linda/PHX" <ljohnso7@CH2M.com>
>To: <ekorsten@msn.com>
>CC: <rph@mail.maricopa.gov>,"Bokich, Tony/PHX" <tbokich@CH2M.com>
>Subject: Carefree - Floodway = Floodplain
>Date: Mon, 2 Dec 2002 16:59:05 -0700
>
>Hello, Erich:
>
>In our earlier discussions about the floodplain mapping in Carefree, it was our understanding that you wished to have "Floodway = Floodplain", or in other words, a zero encroachment floodplain. We are proceeding in >this direction. However, for our project documentation, could you >please respond to this email so that we have written documentation that >you agree with this?
>
>Thanks,
>
>Linda A. Johnson, P.E.
>Associate Project Manager
>CH2M HILL/Phoenix
>Direct: 480-377-6273
>Fax: 480-784-6273
>Email: ljohnso7@ch2m.com

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CONTRACT FCD 2000C037

CAREFREE DRAINAGE MASTER PLAN

AGENDA ITEM C-69-01-056-5-00

SECTION III—PAYMENTS TO THE CONSULTANT

The Consultant shall be paid for work under this contract a lump sum fee of $500,435.68 plus a fee not-to-exceed $206,439.59 for optional tasks as identified below and in accordance with the Scope of Work. A written authorization from the Agent will be required prior to initiating any optional task.

OPTIONAL TASK NUMBER	DESCRIPTION		TOTAL
Option 1	SOW Para. 2.2.3	Brainstorming Session	$ 2,759.56
Option 2	SOW Para. 2.2.3	Presentation of Draft Reconnaissance Report	$ 869.93
Option 3	SOW Para. 2.3.2.2	Sedimentation Analysis for Additional Crossings	$ 4,371.36
Option 4	SOW Para. 2.3.4	Coordination w/ Scottsdale on Eros. & Sed. Issues	$ 5,560.66
Option 5	SOW Para. 2.7 →	CLOMR / LOMR for FEMA	$ 11,699.46
Option 6	SOW Para. 3.1.1	Aerial Survey and Ground Control	$ 32,895.82
Option 7	SOW Para. 3.1.3 →	Additional Field Surveys	$ 4,804.41
Option 8	SOW Para. 3.3.2.5	HEC-1 Hindcast Model	$ 6,409.24
Option 9	SOW Para. 3.4.1	Floodplain Delineation and Mapping	$ 85,013.46
Option 10	SOW Para. 3.9.3.3 →	Reconnaissance for Trails & Multi-Use	$ 1,679.86
Option 11	SOW Para. 3.9.3.6.3	Presentation of Trails and Multi-use Opportunities	$ 2,599.78
Option 12	SOW Para. 3.11.2.2	Additional Field Work	$ 3,579.72
Option 13	SOW Para. 3.12.3.10 →	Additional Meetings	$ 14,433.62
Option 14	SOW Para. 3.13.1.1	Additional Public Meetings	$ 27,106.71
Option 15	SOW Para. 3.13.8 →	PowerPoint Presentations	$ 2,656.00
		Optional Tasks Total:	$206,439.59

The total contract amount will not exceed **seven hundred six thousand eight hundred seventy-five dollars and twenty-seven cents ($706,875.27)** plus any adjustments that have been approved in writing in accordance with the Maricopa County Procurement Code.

The District shall pay the Consultant upon completion of the work as accepted by the District, except that progress payments may be made as billed by the Consultant based on approved monthly progress reports subject to the limitations set forth in Exhibit A, Scope of Work. Ten percent (10%) of all contract payments made on an interim basis shall be retained by the District as insurance of proper performance of the contract or, at the option of the Consultant, a substitute security may be provided by the Consultant in an authorized form pursuant to procedures established by the District. The Consultant is entitled to all interest from any such substitute security.

When the contract is fifty percent (50%) complete, retention shall be reduced to five percent (5%) of the amount of any subsequent progress payments, and one-half (1/2) of the amount retained will be paid to the Consultant provided the Consultant is making satisfactory progress and there is no specific cause or claim requiring a greater amount to be retained. If at any time the District determines satisfactory progress is not being made, ten percent (10%) retention shall be reinstated for all progress payments made under the contract subsequent to the determination.

If the Consultant desires a partial payment in accordance with the provisions above, and a Minority/Women-Owned Small Business Enterprises (M/WSBE) goal has been established this contract, the Consultant will complete and forward the enclosed M/WSBE Participation Report (Attachment 1) indicating payment distribution to M/WSBE firms with each request for payment. A M/WSBE participation goal of ten percent (10%) has been established for this contract.

SECTION VI—RECORDS

Records of the Consultant's payroll expense pertaining to this contract and records of accounts between the District and the Consultant shall be kept on a generally recognized accounting basis and shall be available upon request to the District or its authorized representative for audit during normal business hours.

All Consultant and District procurement records shall be retained for a period of one (1) year and disposed of in accordance with the records retention guidelines and schedules approved by the State of Arizona Department of Library, Archives, and Public Records unless applicable Federal regulations require a longer period of retention.

SECTION VII—PROJECT COMPLETION

If, during the course of this contract, situations arise which prevent completion within the allotted time, the Agent may grant an extension.

SECTION VIII—TERMINATION

The District may terminate this contract at any time upon reimbursement to the Consultant of expenses that include reasonable charges for time and material for the percentage of work satisfactorily completed and provided to the District.

The District reserves the right to postpone, terminate, or abandon this contract for the Consultant's failure to complete the Project on time or failure to comply with the provisions of the contract. The District also reserves the right to terminate any or all parts of this contract for its own convenience as the District may determine at it's sole discretion.

The District hereby gives notice that pursuant to A.R.S. § 38-511 "A" this contract may be canceled without penalty or further obligation within three (3) years after execution if any person significantly involved in initiating, negotiating, securing, drafting, or creating a contract on behalf of the District is, at any time while the contract or any extension of the contract is in effect, an employee or agent of any other party to the contract in any capacity or a consultant to any other party of the contract with respect to the subject matter of the contract. Cancellation under this section shall be effective when written notice from the District Chief Engineer and General Manager is received by all of the parties to the contract. In addition, the District may recoup any fee or commission paid or due to any person significantly involved in initiating, negotiating, securing, drafting, or creating the contract on behalf of the District from any other party to the contract arising as a result of the contract.

The Consultant may terminate this contract in the event of nonpayment of fees as specified in SECTION III, PAYMENTS TO THE CONSULTANT.

SECTION IX—OWNERSHIP OF DOCUMENTS

A. All original documents including, but not limited to studies, reports, tracings, drawings, physical and computer models, estimates, field notes, investigations, design analysis, calculations, computer software, and specifications, prepared in the performance of this contract are to be and remain the

F. When this contract requires the Consultant to study specific geographic areas of Maricopa County (including but not limited to floodplain delineations, watercourse master plans, area drainage master studies, or any other site specific assignment) the Consultant agrees during the term of this contract and any extensions thereof that Consultant will not perform similar services for any clients other than the District within that specific geographic area without the written authorization and approval of the Chief Engineer and General Manager of the District.

G. The Consultant agrees that it, its principals, employees, sub-consultants, agents and assigns, shall not accept employment as consultants, expert witnesses or otherwise in any pending or contemplated litigation against the District during the term of this contract and any extensions thereof without the written authorization and approval of the Chief Engineer and General Manager of the District.

H. The Consultant agrees that it, its principals, employees, sub-consultants, agents and assigns, shall not accept employment as consultants, expert witnesses or otherwise in any future litigation against the District in regard to the subject matter of this contract without the written authorization and approval of the Chief Engineer and General Manager of the District.

I. It is understood that the District shall have the right to seek and obtain in any court of competent jurisdiction an injunction to restrain a violation or alleged violation by the Consultant, its principals, employees, sub-consultants, agents or assigns, of the provisions of F., G., and H. of this section or of the provisions of B. of Section IX, and the right of action for full damages at law, in addition to any other remedies provided by this contract. In no case shall a waiver by the District of the right to seek relief under this provision constitute a waiver of any other or further violation.

SECTION XII—SUCCESSORS AND ASSIGNS

This contract shall not be assigned by either party without prior written approval of the other except that the Consultant may use in the performance of this contract without prior approval of the District, personnel or services of its related entities and affiliated companies as if they were an integral part of the Consultant; and it shall extend to and be binding upon the heirs, executors, administrators, successors and assigns of the parties hereto.

SECTION XIII—NO KICK-BACK CERTIFICATION

The Consultant warrants that no person has been employed or retained to solicit or secure this contract upon any agreement or understanding for a commission, percentage, brokerage, or contingent fee; and that no member of the Board of Directors or any employee of the District has any interest, financially or otherwise, in the Consultant's firm.

For breach or violation of this warranty, the District shall have the right to annul this contract without liability, or at its discretion, to deduct from the contract price or consideration, the full amount of such commission, percentage, brokerage, or contingent fee.

SECTION XIV—ANTI-DISCRIMINATION PROVISION

The District will endeavor to ensure in every way possible that minority and women-owned small business enterprises shall have every opportunity to participate in providing professional services,

for whose acts Consultant may be liable regardless of whether it is caused by any party indemnified hereunder, including the District and Maricopa County.

The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

The scope of this indemnification does not extend to the sole negligence of the District.

SECTION XVI—INSURANCE REQUIREMENTS

Consultant, at Consultant's own expense, shall purchase and maintain the herein stipulated minimum insurance with companies duly licensed, possessing a current A.M. Best Company, Inc. Rating of at least B++ or a Financial Performance Rating (FPR) of at least 6, or approved unlicensed companies in the State of Arizona with policies and forms satisfactory to the District.

All insurance required herein shall be maintained in full force and effect until all work or service required to be performed under the terms of the contract is satisfactorily completed and formally accepted. Failure to do so may, at the sole discretion of the District, constitute a material breach of this contract.

The Consultant's insurance shall be primary insurance as respects the District and any insurance or self-insurance maintained by the District shall not contribute to it.

The policies required hereunder, except Workers' Compensation and Professional Liability, shall contain a waiver of transfer of rights of recovery (subrogation) against the District, its agents, representatives, officers, directors, officials, and employees for any claims arising out of the Consultant's work or service.

Any failure to comply with the claim reporting provisions of the insurance policies or any breach of an insurance policy warranty shall not affect coverage afforded under the insurance policies to protect the District.

The insurance policies may provide coverage which contains deductibles or self-insured retentions. Such deductible and/or self-insured retentions shall not be applicable with respect to the coverage provided to the District under such policies. The Consultant shall be solely responsible for the deductible and/or self-insured retention and the District, at its option, may require the Consultant to secure payment of such deductibles or self-insured retentions by a surety bond or an irrevocable and unconditional letter of credit.

The District reserves the right to request and to receive, within ten (10) working days, certified copies of any or all of the herein required insurance policies and/or endorsements. The District shall not be obligated, however, to review such policies and/or endorsements or to advise Consultant of any deficiencies in such policies and endorsements, and such receipt shall not relieve Consultant from, or be deemed a waiver of, the District's right to insist on strict fulfillment of Consultant's obligations under this contract.

The insurance policies required by this contract, except Workers' Compensation and Professional Liability, shall name the District, its agents, representatives, officers, directors, officials, and employees as Additional Insureds.

Commercial General Liability:
Consultant shall maintain Commercial General Liability insurance with a limit of not less than $1,000,000 for each occurrence with a $2,000,000 Products/Completed Operations Aggregate and a

If a policy does expire during the life of the contract, a renewal certificate must be sent to the District fifteen (15) days prior to the expiration date.

Cancellation and Expiration Notice:
Insurance required herein shall not expire, be cancelled, or materially changed without thirty (30) days prior written notice to the District.

.....

CONTRACT FCD 2000C037

CAREFREE DRAINAGE MASTER PLAN

ATTACHMENTS

1. **Minority/Women-Owned Small Business Enterprise Participation Report**

2. **Certificate of Performance**

3. **Certificate of Insurance**

Attachment 2

CERTIFICATE OF PERFORMANCE AND PAYMENT OF ALL CLAIMS

CONSULTANT CONTRACT

_____ hereby certifies to the Flood Control District of Maricopa County
(Name of Signer)
(District) that all lawful claims for labor, rental of equipment, material used, and any other claims by CH2M Hill or subcontractors in connection with the Project described in District contract FCD 2000C037 for Carefree Drainage Master Plan have been paid.

CH2 M Hill understands that with receipt of payment for previously invoiced amounts plus any retained monies, that this is a settlement of all claims of every nature and kind against the District arising out of the performance of the District's contract FCD 2000C037, relating to the material, equipment, and work covered in and required by the contract.

The undersigned hereby certifies that to his/her knowledge, no contractual disputes exist in regard to this contract and that he/she has no knowledge of any pending or potential claims in regard to this contract.

Upon submission of this document and a separate invoice for any retained funds to the District, invoice processing will be completed within forty-five (45) calendar days.

State of Arizona)
)§
County of Maricopa)

Signed this _____ day of _____, 200___.

_____
Signature

_____
Title

SUBSCRIBED AND SWORN TO before me this _____ day of _____, 200___.

_____
Notary Public

My Commission Expires:_____

EXHIBIT A

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SCOPE OF WORK

CONTRACT FCD 2000C037

CAREFREE DRAINAGE MASTER PLAN

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1.0 GENERAL DESCRIPTION

1.1 PROJECT DESCRIPTION

1.1.1 This scope of work is for professional engineering services necessary for developing a Drainage Master Plan (DMP) to identify drainage problems and develop cost-effective solutions for a storm water collection and disposal system. The scope of work will include public coordination, survey and mapping, hydraulics, identification of drainage problems, development of alternative solutions, and preparation of preliminary design plans based on a preferred alternative.

1.2 PURPOSE

1.2.1 The purpose of the Carefree DMP is to:

- quantify the extent of existing and future potential flooding problems within the Town of Carefree and develop alternative solutions to reduce flooding and to provide emergency access to as many residences as is feasible.
- conduct a Public Involvement Program with the intention of gathering and disseminating pertinent information regarding to flooding, sedimentation and traffic problems, to keep the citizens of Carefree informed on the progress of the study and to obtain acceptance of the study and its findings and recommendations.
- perform a qualitative evaluation of the erosion and sedimentation patterns and characteristics within the Town of Carefree and upstream contributing areas, where deemed appropriate, to provide a tool for estimating the long-term benefits or effects of proposed improvements.
- prepare a Traffic Management Plan to evaluate the feasibility of proposed drainage improvements and to make recommendations regarding the sequence of improvements, from a traffic standpoint. This task is intended to ensure that proposed drainage improvements enhance or maintain traffic movement within the Town of Carefree.

1.3 LOCATION

1.3.1 The total study area encompasses approximately 20 square miles bounded by the Tonto National Forest on the North, the City of Scottsdale Boundary on the East, the City of Phoenix Boundary on the South, and the Town of Cave Creek Boundary on the West.

1.4 AGENCIES

1.4.1 The CONSULTANT shall coordinate with the Town of Carefree, the City of Scottsdale, the City of Phoenix and the Town of Cave Creek.

1.5 CONTRACT TIME

1.5.1 The CONSULTANT shall complete the DMP within the contract period of 540 calendar days.

1.6 PROJECT REFERENCES

1.6.1 The DISTRICT will make available to the CONSULTANT a data collection report, dated June 19, 2000 by Coe and Van Loo, listing pertinent data from the Cities of Phoenix, Scottsdale and the Towns of Carefree and Cave Creek, and the DISTRICT files.

2.0 SPECIFIC TASKS

2.1 DATA COLLECTION & EXISTING CONDITIONS ANALYSIS

2.1.1 The CONSULTANT shall collect and review pertinent data listed in the Coe and Van Loo report, from the DISTRICT and other outside sources. The CONSULTANT shall prepare a list summarizing the collected data.

2.1.2 The CONSULTANT shall develop a comprehensive list of known flooding problems and potential flooding areas. Development of this list will require coordination with the officials from each of the communities listed above, and other sources. This list will be used in identifying drainage alternatives.

2.1.3 The CONSULTANT shall prepare an inventory of drainage facilities and proposed developments that are being planned by other public jurisdictions, or private development. These will be illustrated on the Existing Facilities Exhibit. If feasible these facilities may be incorporated into the storm water management plan alternatives.

2.1.4 The CONSULTANT shall prepare an Existing Facilities Exhibit illustrating the location of man-made drainage facilities in the watershed. The condition, capacity and ownership of man-made facilities will be noted. These facilities will become part of the base map for alternatives. The CONSULTANT shall make maximum use of these facilities, where feasible, as part of the storm water management plan alternatives. The base map for the exhibit will be developed from contour mapping provided by the DISTRICT. Base mapping will include land ownership, land use types, and soil types. The land ownership maps will indicate whether property is publicly or privately held and the owning agency. The CONSULTANT will use digital information and land ownership data provided by the DISTRICT to prepare base maps for reports.

2.1.5 The CONSULTANT shall research, become familiar and give consideration to existing hydrologic studies and models, and assumptions made and will assess the reasonableness of the input data and results. The CONSULTANT shall bring any concerns or discrepancies concerning modeling to the attention of the DISTRICT.

2.1.6 The CONSULTANT shall develop HEC-1 hydrologic models for the **Town of Carefree Area.** The models developed by others for the Andora Hills and Galloway Washes Study will be used as a baseline for this project. The existing models currently depict existing conditions for the 100-year, 24-hour event only. During this phase they will be modified to compute the 100-year, 6-hour, 10-year, 6-hour and 10-year, 24-hour events as well. In addition to revisions to these existing models new modeling will be prepared for areas south of Cave Creek Road and south of Black Mountain. The HEC-1 models are to be used for establishing base line conditions and to help verify existing and to identify future flooding areas. Hydrologic modeling tasks are described in Task 3.3.

2.1.7 The CONSULTANT shall become familiar with existing and planned local and regional recreational facilities and any local landscaping concepts as provided by involved jurisdictions and evaluate and identify landscaping and recreational opportunities.

2.1.8 The CONSULTANT shall obtain copies of all available topographic and aerial mapping of the project area, in electronic format when possible. Using existing mapping as a baseline the Consultant will obtain field survey and/or aerial mapping of all areas within the study limits that are either not covered by the existing mapping or areas that require more precise information for development of alternatives and for floodplain mapping. All aerial mapping will be produced at a scale of 1"=200' and a 2' contour interval. Field survey mapping will be produced at a 1' contour level of accuracy.

2.1.9 Floodplain Delineation. The 100-year floodplains for Galloway, Grapevine, Rowe and parts of Andora Hills Washes have been previously mapped by JEF. This study will produce floodplain delineations for: two tributaries of Galloway Wash; three large washes that flow through the developed area between 96th Street and Hayden Road, south of Cave Creek Road; and the large wash that circles the southern base of Black Mountain, crossing the Carefree Highway twice and exiting the Town limits just east of Cave Creek Road north of Carefree Highway. Floodway mapping and preparation of the ADWR Technical Data Notebook (TDN) are specifically excluded from this task. This section is supplemental to Section 3.4 and all work for floodplain-mapping tasks are to be performed as part of Section 3.4.

2.1.10 Sedimentation Engineering. The CONSULTANT shall complete a geomorphic evaluation of the major watercourses in the study area to identify areas of excessive erosion or deposition. The geomorphic evaluation shall consist of data collection, field inspection, and analyses tasks.

2.1.10.1 Data Collection. The CONSULTANT shall complete the following data collection tasks:

- Collect historical aerial photographs, maps, ground photographs, as-built plans for structures to document channel position and streambed elevations.
- Document pre- and post-development channel conditions
- Document pre- and post-development watershed conditions
- Document flow and rain history from road maintenance records, newspaper reports, accounts of flooding by local residents, and previously prepared reports and flood histories.

Based on the results of the data collection tasks, the CONSULTANT shall prepare a technical memorandum documenting the chronology of channel and watershed change within the study area. The objective of the data collection task will be to determine the spatial and temporal location of channel changes in the study area.

2.1.10.1.1 Field Investigation. The CONSULTANT shall complete a field investigation of the major washes in the study area to document existing conditions and to identify sediment problem areas such as cut banks, aggrading channels, local and long-term scour, headcuts, and other evidence of erosion. The major washes in the study area include Galloway Wash, Galloway Wash North Branch, Andora Hills Wash, Rowe Wash, and Grapevine Wash. Based on the results of the field investigation, the CONSULTANT shall prepare a map of known erosion and sedimentation problem areas.

2.1.10.1.2 *Geomorphic Analysis.* The CONSULTANT shall analyze geomorphic trends in the major washes, emphasizing stream conditions at road crossings. The methodologies used for the geomorphic analysis shall include the following:

- Equilibrium slope equations
- Longitudinal profile analysis
- Interpretation of geomorphic surfaces
- Sediment continuity principles (not detailed modeling)
- Lane's relation
- Identification of sediment sources and sinks
- Comparison of channel position on historical aerial photographs and maps
- Stream classification techniques
- Bank stability assessment techniques
- Other appropriate methodologies selected by the CONSULTANT after completion of the field investigation

2.1.10.1.3 Report. Based on the results of the data collection, field investigation tasks, and geomorphic analyses, the CONSULTANT shall prepare a technical memorandum that addresses the following items:

- Summary of qualitative and quantitative description of the erosion and sedimentation problem areas.
- Documentation of historical changes and future expected changes in each of the major washes in the study area, focusing on historical and expected changes at each of the existing and proposed road crossings of the major washes in the study area.
- Discussion of potential channel impacts within the Town of Carefree of the Level 2 alternatives, including impacts to reaches downstream and upstream of the Town of Carefree that will occur if existing sedimentation trends are not corrected.
- Summary of the results of the data collection phase.
- Recommendations for enhancing or preserving channel stability, maintaining sediment continuity, and designing roadway crossings.

2.1.10.2 Traffic Evaluation Data Collection. Master Plans for Carefree, Cave Creek and North Scottsdale will be used to predict the build-out conditions for the town of Carefree. An evaluation of present and proposed major routes will be made and a preferred emergency route plan will be prepared. This plan will be used as a planning tool for evaluating any proposed improvements to low-flow crossings

2.2 LEVEL I ANALYSIS – ALTERNATIVES FORMATION / PRELIMINARY ANALYSIS

The Level I Analysis will consist of four parts; flooding analysis, public involvement process, geomorphic evaluation, traffic analysis.

2.2.1 Flooding Analysis. At selected locations, improvements for crossings will be studied in more detail. At these locations if existing adjacent structures will be flooded under future conditions, the culvert channel sizing shall eliminate the structure flooding. The work will

include conducting site surveys, identifying required utility relocations, estimating construction costs, preparing preliminary construction plans, using Maricopa Association of Governments (MAG) or Arizona Department of Transportation (ADOT) design procedures. Consultant shall document findings and design criteria in a summary report. The previously developed existing conditions HEC-1 models will be modified to reflect future fully developed conditions and shall be used to evaluate the impact of the culvert modifications to downstream culverts and floodplains. The plans will develop alignments, right-of-way requirements, and utility conflicts and be used to develop preliminary costs for the preferred alternatives. The Consultant is to evaluate accessibility during the future conditions 100-year flow. Road overflows, or longitudinal flows at the roadway crown, less than 0.5 feet deep shall be considered passable. The evaluation shall consider:

- Maximum Depth of flow
- Duration of impassable flow
- Roadway functional classification, arterial, collector, local, to be provided by the Town.
- Scour/washout potential (high, medium, low)

A master plan report, including proposed project list, with an implementation and funding plan will be prepared.

2.2.2 100-year Flood Accessibility Emergency Routes Evaluation

2.2.2.1 The Consultant shall develop a prioritized list of improvements to reduce inaccessible conditions such that:

- No more than 30 single family residential lots, or equivalent multi-family or commercial/industrial areas, are accessible due to design flood flows in any given wash.
- No lot is inaccessible for more than 12 hours.

2.2.2.2 The results of the evaluation shall be summarized on a map showing:

- Existing and proposed accessible routes.
- Existing and proposed impassable wash crossings and roadway longitudinal segments.
- Proposed improvements.
- Existing and proposed inaccessible areas.

2.2.3 The CONSULTANT shall prepare an existing **problems and constraints** map for presentation to the Review Committee. The Review Committee shall be comprised of members of the DISTRICT, the Town of Carefree, and effected jurisdictions. The presentation shall identify existing flooding problem areas and the results from the hydrologic modeling of the area. The CONSULTANT will provide several seed ideas for potential solutions for consideration by the Review Committee. A **brainstorming session** will be scheduled to provide input to both the problem and potential solutions. The Review Committee shall include **landscaping and recreation opportunities** into development of alternatives. The CONSULTANT shall assess all alternatives with soft engineering as the first choice and rigid structures as last resort. In addition, all alternatives should mimic the natural drainage corridors and minimize being located along section line roads and at right angles. Alternatives should have a 20% buffer allocated for landscaping and recreational use. Basins will be sized and designed to incorporate recreational amenities. Basins should be located off line to allow the passage of sediment and to minimize maintenance. (OPTIONAL) Participation in the

brainstorming session by Cornoyer-Hedrick will be an optional task. (OPTIONAL) Presentation to the team of the Draft Reconnaissance Report by Cornoyer-Hedrick will be an optional task. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

2.2.3.1 Based on the brainstorming session results, the CONSULTANT shall identify a minimum of three possible project alternatives for reduction of local flooding, for the 10, 25, 50 and 100 - year frequency storms.

2.2.3.2 Based on the brainstorming session results, the CONSULTANT shall identify a minimum of three possible project alternatives for the study area. The CONSULTANT shall conduct initial studies (Using existing mapping and the new hydrologic model) in order to obtain the optimum combination of **feasible** flood reduction facilities.

2.2.3.3 Sedimentation Alternative Analysis. Evaluation of sedimentation impacts of the Level 1 alternatives shall be limited to qualitative assessments based solely on the conditions observed during the field investigation (Task 2.1.10.2) and geomorphic analysis (Task 2.1.10.3). No new sedimentation or geomorphic analyses shall be conducted by the CONSULTANT for this task.

2.2.3.4 The CONSULTANT shall participate in a Value Engineering (VE) Workshop, for the purpose of evaluating the proposed alternatives and to select the alternatives to be studied further. Those alternatives which can be initially eliminated with no or minimal analysis shall be identified and eliminated from further consideration. The DISTRICT, with recommendations from the VE workshop, and the Town of Carefree, will make the final selection of alternatives.

2.2.4 The CONSULTANT shall submit schematic drawings and a narrative description of the potential alternatives for review (Potential Alternatives Submittal). The purpose is to review and approve the alternatives prior to proceeding with the analysis. The drawings shall be sufficient to describe and compare the project requirements and alignment of the alternative. The narrative shall describe the alternatives and identify the advantages and disadvantages. The alternatives shall be based upon the available existing topographic mapping, and new supplemental field surveys and the new sub-area hydrology.

2.3 LEVEL II ANALYSIS - ALTERNATIVE ANALYSIS

2.3.1 The CONSULTANT shall evaluate the approved alternatives to determine the engineering feasibility and approximate costs. Conceptual design of the project features shall be limited to typical sizes and dimensions and shall be sufficient to determine the costs of major project components. Conceptual design for the flood reduction will be based on the 10- and 100-year, future conditions runoff. The cost estimates shall include major construction items, rights-of-way, utility relocations, contingencies, and recreation and landscaping costs.

2.3.2 The CONSULTANT shall participate with the Review Committee in an **Alternative Evaluation Workshop** that will develop weighted evaluation criteria elements for selection of the Preferred alternative. The alternatives will be evaluated by comparing each against the weighted evaluation criteria elements in an evaluation matrix. The highest numeric score will be selected as the preferred alternative. The Review Committee will have the responsibility to approve the final "preferred" alternative

2.3.2.1 Sedimentation Alternative Analysis. The CONSULTANT shall evaluate the potential sedimentation impacts of the preferred alternative for up to three (3) road crossings on upstream and downstream channel stability, performance of the alternative during design and annual flood events and likely sediment maintenance costs. Where applicable, modifications to the design of the preferred alternative will be proposed to address impacts identified by the evaluation. The evaluation will be based on the information collected in Task 2.1.10 as summarized in the technical memorandum described in Task 2.1.10.1. The deliverable for Task 2.3.2.1 will be a brief technical memorandum describing the methodologies used, the results obtained, and any recommended improvements or modifications.

2.3.2.2 Additional Crossings (OPTIONAL). The CONSULTANT shall evaluate the potential sedimentation impacts as described in Task 2.3.2.1 for up to four (4) additional crossings as authorized by the DISTRICT. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

2.3.3 The CONSULTANT shall prepare an **Alternatives Analysis Report** presenting the alternatives and details of the evaluation process used to select the preferred alternative.

2.3.4 Coordination with City of Scottsdale (OPTIONAL). The CONSULTANT shall schedule and conduct a meeting with the City of Scottsdale, the DISTRICT and the Town of Carefree to discuss possible alternative solutions to regional sedimentation and/or erosion issues. If alternative solutions are identified in the initial meeting then subsequent meetings will be scheduled to investigate the feasibility and funding of regional solutions. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

2.4 LEVEL III ANALYSIS - PREFERRED ALTERNATIVE ANALYSIS

2.4.1 The CONSULTANT shall **refine** the design and cost estimate for the **preferred alternative** identified in the **Alternatives Analysis Report.**

2.4.2 The CONSULTANT shall prepare **Preliminary Design Plans**, which will identify the approximate sizes, slopes, profiles, alignments, and plan and profile of proposed channels, pipes, boxes and bridges using the available, 2 or 4-foot contour mapping. Preliminary landscaping, recreation and aesthetic features at a schematic level showing design intent by providing typical treatments, suggested plant palette, and illustrative sections and plan views shall be included in the project drawings and cost estimates.

2.4.3 The CONSULTANT shall present the **Recommended Plan**, and the implementation **and funding** plan to the Review Committee. The Review Committee shall prioritize the features of the preferred alternative based on input from the project participants and the CONSULTANT.

2.5 MAINTENANCE PLAN

2.5.1 The CONSULTANT shall **estimate maintenance requirements and costs** for the preferred alternative on an annual basis. The life cycle to be used in calculations shall be 50 years. The DISTRICT will provide maintenance and cost data to the CONSULTANT.

2.5.2 The CONSULTANT shall prepare general maintenance and operation **guidelines for operation and maintenance** of features identified by the preferred alternative.

2.6 IMPLEMENTATION PLAN

2.6.1 The CONSULTANT shall prepare an **implementation and funding plan** for the preferred alternative that shall document the available tools, procedures and potential funding sources for implementing the results of the Project.

2.7 CLOMR (OPTIONAL)

2.7.1 The CONSULTANT shall prepare a **Conditional Letter of Map Revision** (CLOMR) submittal in accordance with 44 CRF §65.8 Review of Proposed Projects and 44 CFR §65.6 Revision of Base Flood Elevation Determinations.

2.7.2 The CONSULTANT shall compile the submittal package and **complete the required FEMA forms** and the ADWR Technical Data Notebook (TDN) documentation. The Maintenance Plan prepared under Task 2.5 shall be included in the submittal package.

2.7.3 The CONSULTANT shall **delineate the revised floodway** boundaries.

This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.0 GENERAL TASKS

3.1 FIELD SURVEY AND MAPPING

3.1.1 (OPTIONAL) The CONSULTANT shall prepare supplemental **aerial mapping** at a scale of 1" = 200' with a 2'-foot contour interval. Spot elevations to a 1-foot contour interval will be obtained on major roadway crossings. The Blue Stake service will be used for utility mapping during field surveys. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.1.2 The CONSULTANT shall obtain **field surveys** of bridges, culverts, street cross sections and drainage structures as necessary to define existing conditions at up to eight (8) locations.

3.1.3 (OPTIONAL) The CONSULTANT shall obtain field surveys of bridges, culverts, street cross sections and drainage structures as necessary to define existing conditions at up to eight (8) additional locations. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.2 HYDRAULIC ANALYSIS

3.2.1 The CONSULTANT shall prepare **preliminary hydraulic calculations** for the alternative design structures to substantiate size and shapes of the facilities. The hydraulic analysis shall be completed in sufficient detail to document the hydraulic adequacy of the project and the anticipated sizes of project elements. The CONSULTANT shall complete hydraulic computations with plots of the hydraulic gradient consistent with the procedures as provided in the Drainage Design Manual for Maricopa County, Volume II Hydraulics, and the supplement to this scope of work.

3.3 HYDROLOGIC ANALYSIS

3.3.1 The current JE Fuller/ Hydrology & Geomorphology, Inc. (JEF) HEC1 model developed for the Galloway Wash Floodplain Delineation Study (FCD 99-14) will be used to model the 100-year, 24-hour existing condition flows for the portions of the study area within the Galloway Wash watershed. The current George V. Sabol Consulting Engineers (GVSCE) model for the Cave Creek Above Carefree Highway Floodplain Delineation Study (FCD 95-28) will be used to model the 10- and 100-year, 6- and 24-hour existing condition flows for the portions of the study area within the Andora Hills watershed. New HEC-1 modeling will be required for the portions of the study area outside the Andora Hills and Galloway Wash watersheds.

3.3.2 The CONSULTANT shall revise the JEF and GVSCE HEC-1 models to evaluate alternatives. This model will be used to evaluate alternatives sized to convey the 10- and 100-year, 6- and 24-hour future condition flows. The revisions of the JEF and GVSCE HEC-1 models will consist of the following tasks:

3.3.2.1 Additional recurrence intervals. The existing JEF and GVSCE HEC-1 models will be modified to include modeling of the 10-ear 6- and 24-hour design storms. Modification of the existing JEF and GVSCE HEC-1 models will consist of revision of rainfall depth/duration, time of concentration, and unit hydrograph parameters.

3.3.2.2 Additional storm duration. The existing JEF and GVSCE HEC-1 models will be modified to include modeling of the 10- and 100-year 6-hour storm event. Modification of the existing JEF and GVSCE HEC-1 models will consist of revision of the rainfall duration, time of concentration and unit hydrograph parameters.

3.3.2.3 Additional concentration points. If necessary, the subwatershed delineations will be modified to provide concentration points where the existing model does not provide sufficient resolution at existing or proposed road crossings.

3.3.2.4 Future conditions model. The JEF and GVSCE existing condition HEC-1 models will be updated to reflect future conditions. For the purposes of this study, future conditions is assumed to be full build-out to the existing zoning or master plan condition, and implementation of current retention/detention and wash preservation/setback requirements. Modification of the existing JEF and GVSCE HEC-1 models will consist of revision of percent imperviousness, vegetative cover, time of concentration, unit hydrograph, and/or loss rate parameters.

3.3.2.5 OPTIONAL: The consultant will modify the existing HEC-1 models to predict 50-year peak discharges for proposed bridges. The revisions will be made by modifying the precipitation values in the HEC-1 models. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.3.3 The CONSULTANT shall develop a HEC-1 model for the portions of the study area outside the Galloway Wash watershed.

3.3.3.1 Those areas within the Town limits not represented by the previously described model will be modeled using the same assumptions and methods as described above. The intent is that the final model will include the hydrology for the entire Town in a single uniform model. In particular there are two areas to be modeled in this sub-task; the first is bounded by 96th Street and Hayden Road on the east and west, respectively, and by Cave Creek Rd and Cloud Rd. on the north and south. The second is the area described as being the southern hemisphere of Black Mountain to the Town Limits. Both study areas will include sizable watershed areas outside of and tributary to the Town of Carefree.

3.3.4 The CONSULTANT **will use and update** the hydrologic model following selection of the recommended alternative and as a means to test the effectiveness of potential alternatives, the CONSULTANT will re-run the existing condition hydrology with plan elements in place. This condition will be analyzed for the 10-year and 100-year peak events using the duration storm that produces the greater peak flow, either the 6- or 24-hour storm. The recommended design event will be analyzed for the preferred plan, for a 24-hour existing condition event. The design event will be modeled using the 100-year model with the rainfall input data revised.

3.4 FLOODPLAIN MAPPING (OPTIONAL)

3.4.1 The CONSULTANT shall prepare floodplain mapping for the washes described in Section 2.1.9and shall delineate the **Existing Floodplains** for the major washes in the potential future growth areas, for the **100-year** present conditions. The greater of the 6- or 24-hour storm duration peak flows will be used in the delineations. The 100-year flood plain delineation shall include flood routing of the 100-year storm through the previously delineated areas with the proposed improvement alternatives incorporated into the model. The mapping will be prepared to FEMA standards; however, no floodway mapping will be performed. The floodplain mapping effort covers a total of approximately 7.5 miles. The mapping will be performed using the Corps of Engineers computer modeling program HEC-RAS. Cross section spacing will be less than or equal to 500 feet. All washes will be field inspected to verify the accuracy of the aerial topography and to identify locations where additional field survey is required. As-built drawings of the roadways and or culverts will be obtained from the Town if available; otherwise they will be produced from new field survey. It is expected that additional HEC-RAS cross sections will be required at fifty percent of the roadway crossing locations due to man-made changes to the existing banks and streambed. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.5 LAND OWNERSHIP, RIGHT-OF-WAY AND EASEMENTS

3.5.1 The CONSULTANT shall **review** parcel ownership maps and **identify** which properties will be affected by the preferred alternatives.

3.5.2 The CONSULTANT shall **identify** permanent and temporary **right-of-way and easement** requirements necessary for the preferred alternatives.

3.5.3 The CONSULTANT will **identify** any necessary **rights-of-entry** within the study area. The DISTRICT will obtain any necessary Rights of Entry for the study area and furnish the CONSULTANT with Right of Entry letters.

3.6 IDENTIFICATION OF ENVIRONMENTAL PERMITS AND APPROVALS

3.6.1 The CONSULTANT shall be responsible for determining if plan approvals, permits, or licenses from other agencies will be required. Other agencies may include, but may not be limited to: municipalities, tribal governments, the County Health Department, the Arizona Department of Environmental Quality, the Arizona Department of Water Resources, the Army Corps of Engineers, railroads, utilities, and water districts. Requirements for permits shall be documented in the appropriate report. The CONSULTANT will identify permits required for each alternative and such requirements shall be reflected in the appropriate documents.

3.6.2 The CONSULTANT shall be responsible for providing information to assist the DISTRICT in obtaining the required permits.

3.6.2.1 The DISTRICT will be responsible for coordination with the US Army Corps of Engineers (ACOE) for processing documentation to obtain a permit application as required by Section 404 of the Clean Water Act (CWA) and with the Arizona Department of Environmental Quality (ADEQ) for water quality certification in accordance to Section 401 of the CWA. This is inclusive of pre-application meeting with the ACOE to determine the jurisdictional limits of "waters of the US" within the project area and reviewing design plans.

3.6.2.2 The DISTRICT will provide aerial photographs with a minimum scale of 1 inch equals 100 feet to a maximum scale of 1 inch equals 400 feet, defining the ACOE's jurisdictional limits within the project boundary. The Consultant shall provide digitized drawings (i.e., AutoCAD, Arcview), using photo-identified references for horizontal control, and superimpose the limits on aerial photographs for submittal with the 404 application.

3.6.2.3 The Consultant shall provide the total surface area, in acres, of impact within the jurisdictional boundaries and shall provide an estimate of the volume of material to be excavated or filled within the ACOE's jurisdictional limits of the project area. The Consultant will provide an alternative analysis report, watershed studies and scour analysis (if available) focusing on practicable solutions and engineering design drawings including typical cross-sections and plan views (8.5" x 11") to the DISTRICT for submittal with 404 application package to the ACOE and other reviewing agencies (ADEQ). Where possible the Consultant shall modify designs to minimize the impact area within the jurisdictional limits, in order to qualify for a nationwide permit.

3.6.2.4 The Consultant shall provide additional analysis and cost estimates to assist the DISTRICT in identifying modifications to the project which may reduce the impact to the jurisdictional limits, provide environmental enhancements, and serve to mitigate adverse project impacts.

3.6.2.5 The DISTRICT will be responsible for compiling and submitting all Section 401 and 404 permit application documentation inclusive of agency concurrence letters (i.e., SHPO, Arizona Game and Fish) design drawings, alternative analysis, jurisdictional delineation, standard 404 and 401 application forms, aerial photographs and maps, and mailing lists for adjacent property owners.

3.7 CULTURAL RESOURCES ASSESSMENT

3.7.1 The CONSULTANT shall conduct an Archeological Assessment to identify previously documented surveys and historic properties for the area that will be impacted by each of the proposed alternatives. The purpose of the assessment is to avoid impacting significant cultural resources. If avoidance is not practicable, the costs of additional archeological investigation and mitigation must be included in each of the project's alternatives cost estimate. This assessment includes but is not limited to literature research, an Arizona State Museum (ASM) site file check and State Historic Preservation Office (SHPO) records review to evaluate documentary records dealing with historic properties in the project area and region. The literature search shall obtain published information pertaining to the local environment and historic properties, conducted at other archives, government offices and repositories as appropriate.

3.7.2 The CONSULTANT shall prepare a report documenting the results of the archival and literature search. The report shall describe the significance of any known-recorded sites and the potential impact of the preliminary project design and alternatives on the cultural sites. The report shall include recommendations for further study and associated costs, including intensive surveys, if required.

3.8 ENVIRONMENTAL REGULATORY RECORDS REVIEW AND ECOLOGICAL ASSESSMENT

3.8.1 ENVIRONMENTAL RECORDS. The CONSULTANT shall conduct a search of the federal and state environmental lists and databases located in the project area and their respective search radius (ASTM 1527 - 97) for the recommended alternatives.

3.8.2 ENVIRONMENTAL RECORDS. The CONSULTANT shall document the locations of the regulatory sites on the area map. Each type of regulatory site shall be depicted with different symbols to distinguish the types of sites. The CONSULTANT shall include a brief description of the regulatory sites which should include, if available through the records review, the boundaries and descriptive location of the site, the type of regulated substance or waste at the site, the extent of the contamination, the status of the site (i.e. closed or open status), remediation plans of the site, and the named potentially responsible party(s).

3.8.3 ENVIRONMENTAL RECORDS. The CONSULTANT shall recommend alternatives locations and/or solutions to avoid costly remediation if any of the recommended alternatives appears to require land that is listed as a regulatory site or may be affected by a regulatory site.

3.8.4 ECOLOGICAL ASSESSMENT. The CONSULTANT shall identify any ecologically significant areas (i.e., areas with native or natural vegetation) that would be impacted as a result of each of the project's alternatives by conducting a non-intensive field survey. The CONSULTANT shall document these areas in a report that must include a general description of the habitat type, the size and mapped location of the impacted areas, and a list of the significant flora and fauna in the area.

3.8.5 ECOLOGICAL ASSESSMENT. The CONSULTANT shall make recommendations for further investigation and mitigation of the potential problems for the recommended alternative.

3.8.6 ECOLOGICAL ASSESSMENT. The CONSULTANT shall contact the Arizona Game and Fish Department (AGFD) to obtain information regarding the presence of Wildlife Species of Special Concern in the project area. Using the current US Fish & Wildlife Service's Maricopa County list of Threatened and Endangered species, the CONSULTANT shall determine if the project and its' proposed alternatives may potentially impact these species or their habitat. This information must be used in evaluating the project's alternatives.

3.9 MULTI-USE/VISUAL OVERVIEW

3.9.1 Multi-Use Analysis:

3.9.1.1 The CONSULTANT shall develop an inventory of existing and future planned regional and local recreation sites, transportation corridors, and assess multi-use opportunities. The CONSULTANT shall document the results of the corridor analysis under Part 2 of the DMP Study Report.

3.9.1.2 The CONSULTANT shall develop an inventory of existing and future planned trails and open spaces within the study area and assess trail opportunities.

3.9.2 Visual Analysis-The CONSULTANT shall prepare a visual analysis of the study area that includes the following:

3.9.2.1 The visual analysis will include at a minimum, identification of distinctive features, disturbed areas, and areas for preservation because of their inherent scenic qualities, and important views and viewpoints within the study area. The CONSULTANT will provide a written description and graphic along with photographs illustrating the analysis of the visual resources of the study area. The CONSULTANT shall document the existing landscape character of the study area. Landscape character is the physical appearance of the landscape including the natural, physical and cultural features of the study area that gives it an identity and "sense of place." The existing landscape character should reflect the overall impression of the landscape attributes of the study area, which should include but not be limited to landform, vegetative patterns, land use, channel characteristics, cultural features, rock forms, and scenic features. The existing landscape character units will be depicted on an approximate scaled map. The CONSULTANT will provide a written description of these units along with photographs illustrating the character of the unit.

3.9.3 Trails Analysis:

3.9.3.1 The CONSULTANT shall identify existing and planned trails and trail heads. In order to identify planned trails and trail heads, the CONSULTANT will contact the following entities:

- Town of Carefree Planning consultant
- Town of Carefree Staff
- Volunteer Trails Coordinator
- City of Scottsdale
- Town of Cave Creek
- City of Phoenix

3.9.3.2 The CONSULTANT shall review the proposed draft Carefree General Plan and other relevant documents to identify existing and proposed trails and trail access points.

3.9.3.3 The CONSULTANT shall conduct a field visit to identify formal and informal trails and access areas (existing) within the Town of Carefree. (Additional field work day is an Optional task for Cornoyer-Hedrick). This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.9.3.4 The CONSULTANT shall summarize its findings in a written Draft Trail Opportunities Reconnaissance report.

3.9.3.5 The consultant shall revise the Draft Trail Opportunities Reconnaissance report based on comments from the team. The report shall include one 11x17 and digital maps (identical) that show existing formal and informal trails and access points.

3.9.3.6 Opportunities Map:

3.9.3.6.1 The CONSULTANT shall identify opportunities (incorporating on floodplain delineation where already available) for potential trail alignments and trail access points on a 24"x36" Draft Opportunities Map. These opportunities shall consider floodplain delineations and road crossing considerations incorporated into the study.

3.9.3.6.2 The Draft Opportunities Map will be submitted for review and comment. Once comments are received, the CONSULTANT shall revise the opportunities map and provide a 24"x36" illustrator file copy for reproduction.

3.9.3.6.3 (OPTIONAL) The CONSULTANT shall make a presentation to the Town of Carefree of the revised Opportunities Map and the Trail Opportunities Reconnaissance report.

3.10 UTILITIES

3.10.1 The CONSULTANT shall identify major existing utilities for the alternatives. Utilities shall be identified within the project construction limits that may impact the project. The alignment of the utilities shall be shown on the project layout. Estimates of the cost to relocate or realign the utilities shall be included in the project cost estimates as a separate line item. The CONSULTANT shall contact each utility company that has facilities, known or suspected, within the project area, to request the alignment and size of the utility facilities. Record drawings shall be obtained to ascertain all underground utility locations. Where record drawings are not available, blue stake services shall be utilized to locate the horizontal alignment of the underground facilities. The vertical location of sanitary and storm sewers will be determined from field surveys as appropriate.

3.10.2 The CONSULTANT shall include existing utility locations on the alternative sketches and in profile on the Preliminary plan submittal.

3.11 SITE VISITS

3.11.1 The CONSULTANT shall make site visits as necessary to become familiar with existing conditions.

3.11.2 The CONSULTANT will make at least four site visits as follows:

3.11.2.1 The purpose of the first site visit is to orient the CONSULTANT and the DISTRICT with the project area, and to determine any initial conflicts or opportunities.

3.11.2.2 The second site visit will occur near the end of the Alternative Analysis. (Optional task for Cornoyer-Hedrick). This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.11.2.3 The third site visit will occur during the Preferred Alternative Analysis and will serve to verify that the conditions have not significantly changed during the final stages of the project.

3.11.2.4 The fourth site visit will be held to orient members of the press with the project area and will occur based on direction from the DISTRICT. The CONSULTANT will assist the DISTRICT's Public Information Officer in the preparation for the media day. A reconnaissance-planning trip will also be conducted and attended by the appropriate DISTRICT and CONSULTANT team members.

3.12 MEETINGS

3.12.1 The CONSULTANT shall meet with the jurisdictions, other affected agencies and utilities as required and the meetings shall generally be held at their offices. The DISTRICT shall be kept informed of all such meetings, and shall attend the meetings whenever possible as required. The DISTRICT shall be copied on all meeting minutes. (Optional task for Cornoyer-Hedrick).

3.12.2 The CONSULTANT is responsible for the minutes of any meetings and shall include copies of minutes of meetings, telephone conversations, and correspondence to the DISTRICT in the Project Administrative Report.

3.12.3 The CONSULTANT shall participate in the following project meetings generally held at the CONSULTANT's office:

3.12.3.1 Kick Off Meeting - The CONSULTANT shall meet with the DISTRICT to submit the project schedule that shall include dates of all proposed submittals and review meetings, and to discuss the schedule and the tasks necessary to accomplish it. The CONSULTANT shall bring the key project team members, including the project checkers, to the meeting to introduce them to the DISTRICT staff who will be working on the project. The DISTRICT will give the aerial topographic mapping to the CONSULTANT at this time.

3.12.3.2 Data Collection Report Review Meeting - The CONSULTANT shall meet with the DISTRICT Project Manager to review the overall project status and to discuss the Data Collection Report review comments which will be provided to the CONSULTANT at the meeting. The CONSULTANT should be prepared to explain all information and any assumptions made up to this point. Any problems will be identified and discussed. The first Performance Evaluation shall be completed at this time.

3.12.3.3 Review Committee Meeting No. 1 – A brainstorming session with the Review Committee members to discuss existing flooding problems, existing studies and to identify potential solutions.

3.12.3.4 Review Committee Meeting No. 2 – A meeting with Review Committee members to evaluate the alternatives.

3.12.3.5 Landscaping and Aesthetics Committee Meeting No. 1 – A meeting with the DISTRICT's Landscaping and Aesthetics Committee to review landscaping issues. This meeting will be combined with the brainstorming meeting identified in Task 2.2.1.

3.12.3.6 Alternatives Analysis Report Review Meeting - The CONSULTANT shall meet with the DISTRICT Project Manager to review the overall project status and to discuss the Alternatives Analysis Report review comments which will be provided to the CONSULTANT at the meeting. The CONSULTANT should be prepared to discuss alternative flood mitigation solutions and the preliminary cost estimates.

3.12.3.7 Review Committee Meeting No. 3 – A meeting with the Review Committee members to discuss implementation of the Recommended Plan and develop project priorities and phasing.

3.12.3.8 Recommended Design Report and Preliminary Plans Submittal Meeting - The CONSULTANT shall meet with the DISTRICT Project Manager to review the overall project status and to discuss the Recommended Design Report review comments and the Preliminary plans review comments which will be provided to the CONSULTANT at the meeting. The CONSULTANT will be prepared to explain all assumptions and calculations completed up to this point. Any problems will be identified and corrective actions agreed upon at this meeting. The CONSULTANT will make any necessary corrections and provide written responses to all comment and will resubmit the Recommended Design Report Preferred Alternative and Preliminary plans as required to the satisfaction of the DISTRICT.

3.12.3.9 Final (100%) Submittal Meeting. The CONSULTANT shall meet with the DISTRICT Project Manager to make the final submittal of the hydrology and hydraulic analyses, the alternative flood mitigation solutions, the cost estimates, and the final recommended solution as revised per the Recommended Design Report review comments. The CONSULTANT shall supply the hydraulic data and plans on 3.5" or CD diskettes. The plans should be in AutoCAD version 12 format. A Final Performance Evaluation will be completed at this time.

3.12.3.10 Additional Meetings. (OPTIONAL) The CONSULTANT shall attend meetings, other than those described above, as may be deemed necessary during the course of the project. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.13 PUBLIC INVOLVEMENT

3.13.1 The CONSULTANT will plan and conduct three open houses (two are Optional) in conjunction with this study.

3.13.1.1 The first meeting will be to inform the public of the purpose and scope of the study and to receive comments and concerns. The second meeting (OPTIONAL) will be to present project alternatives to be studied and receive public comments. The purpose of the meeting shall be to request public input regarding the alternatives, their preferences, and any recommendations they may have for other alternatives that need to be evaluated. The CONSULTANT will prepare a Photo Exhibit (or computer graphics) of approximately 20 exhibits for this meeting illustrating the proposed improvements overlaid on the existing facilities. The third meeting (OPTIONAL) will be to inform the public and obtain public comment on the study results. The purpose of the meeting is to present the results of the alternative analysis and the recommended alternative. The CONSULTANT will attend a preview meeting with the DISTRICT at a minimum of two weeks prior to each public meeting to present information on materials and the agenda for the meeting. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

3.13.1.2 The CONSULTANT shall be responsible for the preparation of handouts and display boards. Up to twenty (20) presentation exhibits (34 inch by 40 inch), color output, mounted on gatorboard will be provided at each public meeting. The presentation exhibits will be prepared in electronic format. Typical handouts are a fact sheet explaining the purpose of the study, how it is conducted, a description of the study area, and a study map. At each public meeting, 100 handouts will be prepared; each handout will be no longer than four (4) one-color 8.5 inch by 11-inch pages with a comment sheet. No mail back cards will be included as part of the meeting handouts.

3.13.1.3 The CONSULTANT shall chair the meetings. The CONSULTANT shall participate in the presentation, and respond to questions as required by making formal presentations or by written document addressing the issue.

3.13.1.4 The CONSULTANT shall provide required refreshments based on 75 people attending each public meeting.

The CONSULTANT shall be responsible for preparation of minutes of the public meetings, including concerns raised by the public.

3.13.2 The CONSULTANT shall participate with the DISTRICT in two (2) Town Council Workshop meetings with the Town of Carefree during the data collection effort in presenting the study effort purpose and scope.

3.13.3 The CONSULTANT shall attend up to fifteen (15) individual one-on-one meetings at the request of interested parties, such as civic groups, environmental groups, planning committees, homeowners associations, etc. The meetings will be informational in nature and will attempt to gain an understanding of the concerns/issues of the potentially affected interests.

3.13.4 The CONSULTANT shall assume responsibility for advertising of the public meetings. Advertisements for the public meetings will be placed in the Arizona Republic, Scottsdale Tribune, and Foothills Sentinel two weeks and one week prior to the public meeting. The notice in the Arizona Republic will be placed in Zone 8 (Scottsdale, Carefree, New River, and Paradise Valley) only. The advertisement will be equivalent to a four (4)-column inch by 10-column inch notice. The DISTRICT may be required to submit notice to the newspaper in order to get the non-profit rate for advertising the meeting.

3.13.4.1 The DISTRICT will prepare the news release announcing the public meeting for distribution to local media which explains the study and its purpose and informs them of the meeting date, time, and location, along with a phone number to call for additional information.

3.13.4.2 The DISTRICT will select and make arrangements for the location of the meetings. The DISTRICT will be responsible for providing insurance for the meeting locations and, if necessary, any fee associated with the use of the meeting facilities.

3.13.5 The CONSULTANT will develop and maintain a mailing list and list of key stakeholders in conjunction with the DISTRICT and the Town of Carefree. Up to 3000 individuals/agencies/organizations may be on the direct mail list to receive notice of the public meetings.

3.13.6 The CONSULTANT shall prepare three (3) newsletters for the project. These newsletters will discuss issues brought out at public meetings, solicit public input, provide information on the alternatives, reiterate the objectives of the project, and announce upcoming meetings. Two of the newsletters will be a one 11 inch by 17 inch folded piece and one newsletter will be two 11 inch by 17 inch folded pieces. The CONSULTANT will be responsible for printing 3,500 copies of each newsletter and mailing of 3,000 newsletters.

3.13.7 The CONSULTANT shall prepare a one page front and back, 4-color, tri-fold project 8.5 inch by 11 inch informational flyer providing the project purpose, background, history, schedule and points of contact. The DISTRICT will provide final review and approval of any document to be sent to the public. The CONSULTANT will print 3,500 of the project informational flyer. The 3,500 include 3,000 for mailing and 500 for use by the DISTRICT.

3.13.8 (OPTIONAL) The CONSULTANT will develop two (2) project presentations in PowerPoint format for use by the DISTRICT. The presentations will be submitted to the DISTRICT in electronic media that is useable in DISTRICT equipment, on compact disk. Each

presentation is estimated to be approximately 30 slides/frames in length. This optional task is not authorized with the Notice to Proceed and may be authorized in writing by the DISTRICT based upon specific need as determined by the DISTRICT during the contract period.

4.0 PROJECT ADMINISTRATION

4.1 SCHEDULE

4.1.1 The CONSULTANT shall submit within 14 days of Notice To Proceed (NTP) a project schedule to the DISTRICT showing coordination meetings, dates of all proposed submittals for each of the tasks in the scope and significant project milestones. The CONSULTANT will update this project schedule when appropriate. The project schedule outline will be consistent with the numbering and tasks defined in this scope of work and the fee proposal.

4.1.2 The CONSULTANT shall develop the project schedule in a computerized format that contains the anticipated beginning and end dates for the tasks identified, the time duration of each task, a bar chart (Gantt Chart) showing the tasks and the overall duration of the project. The schedule will be submitted in MS Project 4.0 format and in both printed and digital format, and updated as required to reflect significant changes in schedule. The CONSULTANT shall schedule the project for completion of the work within the contract time unless the DISTRICT accepts an extension. The schedule shall include a minimum of the major project milestones, project meetings, and submittal of deliverables. The CONSULTANT shall allow for a 3-week review period (unless otherwise indicated by the DISTRICT) for review and comment by the DISTRICT and other involved parties, for each report and data submittal in the schedule.

4.2 INVOICES

4.2.1 The CONSULTANT will submit a monthly estimation of the projected billing within 14 days of Notice to Proceed. Thereafter, this estimation will be updated and submitted to the DISTRICT at least 10 days prior to the end of each quarter. The projected billing will be consistent with the tasking of the scope of work, the project schedule and the fee proposal.

4.2.2 The CONSULTANT will submit monthly invoices, which reflects work accomplished during the invoice period. The DISTRICT will provide a general format for invoices. The invoices will be consistent with the tasking of the scope of work, project schedule, fee proposal and projected billing. The CONSULTANT shall submit invoices to Accounts Payable, Flood Control District of Maricopa County, 2801 West Durango, Phoenix, Arizona, 85009. A copy of the invoice will be forwarded to the DISTRICT's project manager.

4.3 PROJECT MANAGEMENT

4.3.1 The CONSULTANT shall appoint a Project Manager who shall be knowledgeable of the progress of each phase of the project. The Project Manager shall be the same person listed in the CONSULTANT's Technical Proposal unless otherwise approved by the DISTRICT. The Project Manager shall be the point of contact for the DISTRICT. The CONSULTANT's Project Manager shall attend all meetings as required by the DISTRICT. The CONSULTANT's Project Manager shall keep the DISTRICT informed of all coordination with outside agencies and other affected parties. The DISTRICT may terminate this agreement if the Project Manager is not available or if the CONSULTANT is unable to provide a replacement Project Manager acceptable to the DISTRICT. The DISTRICT may request

replacement of the Project Manager if the DISTRICT determines that this would be in the best interest of the project.

4.3.2 The CONSULTANT's Project Manager shall submit to the DISTRICT a Project Status Update on the first of each month activities for the same time period as included in the monthly invoices. The report shall be brief and should be no longer than two typed pages. The update shall provide at a minimum the following:

4.3.2.1 The status of the project to date.

4.3.2.2 Project accomplishments with a description of the work accomplished by task during the reporting month, percent (%) completed for the month and percent (%) cumulative completed for each task. The tasks shall be the same as the tasks contained in the project cost proposal.

4.3.2.3 Problems and resolutions identified since the last report.

4.3.2.4 Tasks to be accomplished before the next report.

4.3.2.5 A description of any outstanding issues requiring resolution.

4.3.3 The CONSULTANT will develop and implement a Quality Control/Quality Assurance (QA/QC) program in accordance with its project management procedures. .

4.4 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC)

4.4.1 The CONSULTANT shall perform QA/QC reviews of in-house submittals prior to or in some cases concurrent with agency reviews. The CONSULTANT shall also review the work of any sub-CONSULTANT utilized by the prime CONSULTANT for this contract (i.e., civil design and structural design). Said work shall be reviewed by the prime CONSULTANT for compliance with this scope of work and these specifications prior to submittal for review by the DISTRICT. In particular, all calculation sheets shall be initialed and dated by both a designer and a checker.

4.5 REPORTS

4.5.1 All reports shall be submitted to the DISTRICT for review in draft form. Upon receipt of review comments, the CONSULTANT shall incorporate appropriate revisions and complete the report.

4.5.2 Data Collection Report - The Data Collection Report will contain a description of information collected for this project. This information should include at a minimum the information identified under Section 2.1. Other data collected pertinent to the project should also be contained in the Data Collection Report. Existing major natural washes and existing and planned man-made drainage facilities in the watershed should be shown on the Existing Facilities Exhibit to be submitted with the Data Collection Report. The Existing Facilities Exhibit will be prepared in AutoCAD format.

4.5.2.1 The Data Collection Report should include the following:

Executive Summary
Project Description
Scope of Project
Data Collection Results
    Current Conditions
    Areas of Flooding
Existing and Future Development Plans
Areas and locations of Potential Flooding
Existing and Future Drainage Facilities
Environmental Concerns
Environmental Permits and Approvals
Biological Survey Analysis
Cultural Resources
Environmental Regulatory Records Review
Land
Parcel ownership
Rights-of-Entry Requirements
Hydrology/Hydraulics Models
Summary of Models/Conditions
Concerns
Major Utilities

Existing Facilities Exhibit
References/Figures

4.5.3 Alternative Analysis Report - The Alternative Analysis Report shall be prepared containing narrative descriptions of the alternatives considered and discarded, the alternatives selected for analysis, the results of the analysis of alternatives, and comparative cost estimates conducted by the Review Committee. The advantages and disadvantages and general impacts of each alternative shall be identified. The recommended alternative shall be identified in the report.

4.5.3.1 The Alternatives Analysis Report Format should include the following;

Summary
Description of Study Area
Scope of Project
Alternatives Descriptions/ Sketches
Outfall Alternatives
Alternatives Eliminated
Cost Estimates
Evaluation Criteria/Matrix
Evaluation of Alternatives
References/Figures

4.5.4 Recommended Design Report - The CONSULTANT shall prepare Recommended Design Report which will include engineering design guidelines to maintain 100-year conveyance, landscaping and recreation considerations, cost estimates and Preliminary Design plans.

4.5.4.1 The Recommended Design Report should include the following:

Summary
Description of Study Area
Scope of Project
Evaluation Criteria
Selection of Preferred Alternative including Outfall
Costs
Priority of Features
Maintenance Plan
Implementation Plan
Funding Plan
References/Figures
Disk Copies of applicable hydrologic, hydraulic models

4.5.4.2 Preliminary Design Plans

Indicate existing topography.
Ortho-photo of the Town Area
Indicates cultural, biological, environmental impact areas
Indicates conveyance criteria: approximate size and configuration, invert, typical cross-section
Indicate conflicting utilities

4.5.5 Project Final Submittal - Upon approval of the Recommended Design Report, the CONSULTANT shall incorporate review comments and make any required corrections, and changes, the hydrology, and/or hydraulic models

4.5.5.1 The CONSULTANT shall submit a Final Submittal with final versions of all reports applicable to the Project including:

Data Collection Report
Alternatives Analysis Report
Recommended Design Report
- Project Survey Report Annex
- Technical Report Annex
- Administrative Report Annex

4.5.5.2 The CONSULTANT shall prepare a separate, reproducible Executive Summary of the Final Design Submittal.

4.5.6 Project Survey Report Annex - Survey data will be documented in a Project Survey Report. Copies of all survey note books or printout of digital files developed with data collectors will be provided. The horizontal and vertical benchmarks used for the survey shall be documented along with documentation of the datum upon which the benchmark was originally established. Conversion to other datums as required herein shall be documented in the report. A summary table of the ERM's and benchmarks shall be included.

4.5.7 Project Technical Report Annex - The CONSULTANT shall maintain a technical report throughout the project, which contains documentation of the designs, analysis, and

calculations. The report shall be organized to include, but not limited to, the following sections as appropriate to the project:

Lateral design, configuration, alignment, and feature locations
Right-of-way and easement information
Special project features, including unusual construction techniques, special materials, and/or conditions.
Maps, sketches, calculations, and other supporting documentation as required.
Hydrology, and hydraulics
Cost estimates
Conflicting utilities that are to be relocated and/or protected.
Preliminary hydrology and hydraulics analysis and calculations
Environmental and Permit requirements

4.5.8 Project Administration Report - The Project Administration Report shall include copies of all correspondence, minutes of meetings and conversations with the DISTRICT, affected agencies and others as appropriate.

4.5.9 Maintenance Plan – The Maintenance Plan shall identify requirements for maintenance of features associated with the Recommended Plan. This maintenance plan shall detail maintenance of structures and landscaping to maintain conveyance requirements.

4.6 DELIVERABLES

4.6.1 The CONSULTANT shall submit all final documents 'sealed' by a registered civil engineer. Upon receipt of the final submittal, the DISTRICT shall review the report and preliminary plans for the accurate incorporation of all final comments. If incomplete and/or incorrect incorporation of those comments is found, the original documents shall be returned to the CONSULTANT for correction and resubmittal.

4.6.2 The CONSULTANT shall submit computer files of the information to the DISTRICT delivered on 3.5" or CD diskettes. Reports should be in Word 6.0 or a DISTRICT acceptable software. Plans should be in AutoCAD version 12 format.

4.6.3 The CONSULTANT shall submit three (3) copies for each DRAFT report, estimates, schedules or drawings to the DISTRICT and one (1) copy for each DRAFT report, estimates, schedules or drawings to each participating agency.

4.6.4 The CONSULTANT shall submit five (5) copies for each FINAL report, estimates, schedules or drawings to the DISTRICT and two (2) copies for each FINAL report, estimates, schedules or drawings to each participating agency.

4.6.5 The CONSULTANT shall provide drawings in full size sets, and floppy disks containing .DGN or .DWG files.

5.0 REFERENCES AND STANDARDS

This section provides general requirements, methodologies, and procedures to be followed in completing work for the DISTRICT. If the Scope of Work requires work tasks described herein, the work is to be completed consistent with this section. Specific variations from this section of the Scope of Work shall not be undertaken without the specific written concurrence from the DISTRICT.

5.1 STANDARD DETAILS AND SPECIFICATIONS

5.1.1 "Uniform Standard Details for Public Works Construction", Maricopa Association of Governments (MAG), latest edition;

5.1.2 "Uniform Standard Specifications for Public Works Construction", MAG, latest edition;

5.1.3 City of Phoenix (COP) "Supplement to the MAG Uniform Standards Details and Specifications, together with current revisions shall be utilized as part of the design criteria.

5.1.4 Use standard MAG details on plans unless otherwise requested by FCDMC. ADOT standard details may be used, as approved and when appropriate, then modified to be referenced to MAG specifications.

5.1.5 "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects", latest revision.

5.2 DESIGN MANUALS, POLICIES AND PROCEDURES

5.2.1 "Drainage Design Manual for Maricopa County, Arizona, Volume I Hydrology", latest edition.

5.2.2 "Drainage Design Manual for Maricopa County Arizona, Volume II Hydraulics", latest edition.

5.2.3 "Drainage Design Manual for Maricopa County, Arizona, Volume III Erosion Control", latest edition.

5.2.4 "Urban Highways, Channel Lining Design Guidelines", February 1989, ADOT.

5.2.5 Structural design shall be in accordance with current AASHTO Specifications. Street and maintenance road crossings shall be designed to accommodate HS20-44 loading. Calculations shall be based on service loads and the working stress method.

5.2.6 "Policy on Geometric Design of Highways and Streets", AASHTO, 1990, commonly referred to as the "Green Book", and "Maricopa County Department of Transportation Roadway Design Manual" latest edition and revisions shall be used, unless otherwise requested by DISTRICT.

5.2.7 "Roadside Design Guide", 1989, AASHTO, to be used to establish clear distances and other related safety issues.

5.2.8 "Landscaping and Irrigation Design Manual for the Flood Control District of Maricopa County", latest edition.

5.2.9 "Channel Design Criteria for Major Watercourses", DISTRICT, latest edition.

5.2.10 "A Levee Policy for the National Flood Insurance Program", National Research Council, 1982.

5.3 STANDARDS

5.3.1 C.A.D.D.

5.3.1.1 The CONSULTANT shall prepare data in conformance with the DISTRICT's Computer Aided Drafting and Design (C.A.D.D.) Data Delivery Specification: Rev. 1.0, January 2000, for the following themes:

MAP SHEET INDEX	CP-210
CORNER SURVEY POINTS	CP-100 thru CP-104
MISCELLANEOUS CONTROL SURVEY POINTS	CP-105 thru CP-108
CARTOGRAPHIC FEATURES	CP-201 thru CP-202
BRIDGES	CP-200
CANALS	CP-203 thru CP-204
CULVERTS	CP-205
LAKES	CP-208 thru CP-209
STRUCTURES	CP-217
DATA QUALITY	CP-206
PROJECT BOUNDARY	CP-211
PROJECT IDENTIFICATION	CP-212
RAILROADS	CP-215 thru CP-216
FLOODPLAIN BASELINES	CP-309 thru CP-310
FLOODPLAIN SURFACE WATER ELEVATIONS	CP-311
FLOOPLAIN CROSS SECTIONS	CP-312 thru CP-313
STREET DETAIL	CP-220
ELEVATION (CONTOURS & SPOT ELEVATIONS)	CP-207
RIVERS, WASHES, STREAMS	CP-213 thru CP-214
ELEVATION REFERENCE MARKS (ERM)	CP-109 thru CP-111
DRAINAGE BASINS	CP-305 thru CP-306
DRAINAGE FLOW PATHS	CP-307 thru CP-308
FLOODPLAIN ZONES	CP-314 thru CP-315
FLOODPLAIN HAZARD ZONES	CP-317 thru CP-318

5.3.2 HYDROLOGY

5.3.2.1 The CONSULTANT shall use the 1991 U.S. Army Corps of Engineers computer program HEC-1, 4.01 Version, to develop hydrologic models for the area. The methods and procedures in the Drainage Design Manual for Maricopa County, Arizona: Volume I - Hydrology will also be used.

5.3.2.2 The CONSULTANT will develop the hydrologic base maps using the topographic mapping supplied by the DISTRICT or developed by the CONSULTANT. For those areas not covered by the supplied mapping, U.S. Geological Survey (USGS) topographical quadrangle maps will be used.

5.3.2.3 An overall watershed drainage basin map with sheet index will be prepared at a scale of 1 inch = 2000 feet or as appropriate.

5.3.2.4 Using appropriate hydrologic judgement, sub-basins are to be identified that provide reasonable depiction of the watershed condition. Sub-basin break down will be done in sufficient detail to provide peak discharges at critical concentration points and at other intermediate points as necessary for the modeling process.

5.3.2.5 The specific hydrologic techniques to be used are:

5.3.2.5.1 Rainfall Depth: Point precipitation values will be determined using the information and procedures described in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology.

5.3.2.5.2 Rainfall Distribution: Peak discharges and peak volumes for the 100-year, 6-hour storm will be estimated using the DISTRICT's

Distribution(s). Peak discharges and peak volumes for the 100-year 24-hour storm will be estimated using the SCS Type II rainfall distribution.

5.3.2.5.3 Areal Reduction: The point precipitation values will be areally reduced for critical concentration points. Areal reduction for the 6 hour rainfall duration will be applied using the curves in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology, or MCUHP1.

5.3.2.5.4 NOAA HYDRO-40 will be used with the 24-hour rainfall reduction. Copies can be obtained from the DISTRICT.

5.3.2.5.5 Rainfall Excess: The Green and Ampt methodology will be utilized for estimation of rainfall losses. The soil data maps will be provided to the CONSULTANT by the DISTRICT in the form of GIS files. These files will be used for soil calculations.

5.3.2.6 Unit Hydrograph: The Clark method should be used following the procedures outlined in the Drainage Design Manual for Maricopa County, Arizona: Volume I, Hydrology, and as implemented in MCUHP1.

5.3.2.7 Time of Concentration: The Papadakis and Kazan method should be used with the Clark unit hydrograph, along with the MCUHP1 computer program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result.

5.3.2.8 Channel Routing: Channel routing will be accomplished using either the Muskingum-Cunge or the Normal-Depth or the Kinematic Wave option of HEC-1. The choice of methodology will be at the discretion of the CONSULTANT, with consent from the DISTRICT. Average cross sections will be developed utilizing available mapping and field reconnaissance data. The resulting velocities and depths, for all reaches, must be assessed for realistic values.

5.3.2.9 Reservoir Routing: Detailed analysis of structures and ponding areas will be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures will be estimated using appropriate hydraulic methodology.

5.3.2.10 The CONSULTANT shall obtain approval from the DISTRICT at each of the following steps:

Watershed boundary maps
HEC-1 parameter estimation
Flow diagram and input parameters
HEC-1 results

5.3.2.11 The DISTRICT will provide appropriate references to facilitate parameter estimation.

5.3.2.12 The CONSULTANT shall review the hydrologic models' results for accuracy and reasonableness. Adjustments to input for obtaining the most realistic results are normal to the scope.

5.3.2.13 Every attempt must be made to recover historic stream gage data and to use it to compare with the results obtained by the hydrologic models. Major differences between the models' results and historic data must be discussed with the DISTRICT prior to the finalization of the analysis.

5.3.3 HYDRAULICS

5.3.3.1 The CONSULTANT shall follow the procedures outlined in the "Drainage Design Manual for Maricopa County, Volume II Hydraulics" for all hydraulics calculations.

5.3.3.2 The CONSULTANT shall provide HEC-II Cross Section Files data files of the DTM data that will allow extrapolation of HEC-II cross-sections.

5.3.3.3 The final submittal of all maps, computer files, and other data shall be prepared and submitted in the manner defined for input by the guidelines in "Data Delivery Specifications: The Hydrologic Information System (HIS)" which is available from the DISTRICT.

5.3.4 SURVEY AND MAPPING

5.3.4.1 Accuracy and Procedural Standards. All topographic mapping and survey work shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995. This would include, but is not limited to: the establishment of "permanent" elevation reference marks (ERMs); field control; and verification of profiles by the ground survey profile procedure.

5.3.4.2 Horizontal Control Datum. All surveys shall be completed with horizontal controls necessary to tie all field data to the State Plane Coordinate System 1927. The NAD83 coordinate points and their coordinates shall be listed in the text regarding the control and survey information provided to the DISTRICT and shall also be noted along the margins of the appropriate plan sheets.

5.3.4.3 Vertical Control Datum. Surveys will be based on National Geodetic Vertical Datum (NGVD) 1929, per FEMA guidelines. A conversion factor, including documentation of how it was derived, will be provided by the CONSULTANT to allow comparison of NGVD 29 elevations to NAVD 88 elevations and will be included in the Technical Data Notebook. The conversion processes outlined in FEMA 37 shall be used.

5.3.4.4 Elevation Datum. Plans shall be based on state plane ground coordinate system of 1927 and NGVD 1929 datum, with conversions to NAD83 horizontal datum and NAVD88 vertical datum. Elevation Reference Marks (ERMS) shall be labeled on plans and described in a manner, which allows them to be relocated in the field.

5.3.4.5 Structure Surveys. Field surveys of bridges, culverts, and hydraulic structures are to be obtained by the CONSULTANT when as-built plans are not available or when changes significant to the HEC-2 or HEC-RAS modeling, such as sedimentation, have occurred since the date of as-built. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the DSR. The information presented in the drawing should be in a format appropriate for use in the HEC-2 model.

Field surveys of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 1929 NGVD.

5.3.4.6 Restoration of lost or obliterated section corners shall be set in accordance with current publications of the following and shall be per MAG Standard Detail 120-1, type C: "Minimum Standards for Arizona Land Boundary Surveys" by Arizona State Board of Technical Registration and "Restoration of Lost or Obliterated Corners and Subdivision of Sections" by the United States Department of Interior Bureau of Land Management.

5.3.4.7 Documentation of Survey Data. Benchmarks and control points shall be shown on maps and plan sheets. Survey data will be documented in a project survey report. The project survey report shall be initially submitted during the Preliminary Design Phase, and the final report shall be submitted during the Final Design Phase. The report shall include the following:

5.3.4.8 Copies of all survey note books and office calculations or printout of digital files developed with data collectors.

5.3.4.9 A summary table which lists horizontal and vertical benchmarks and includes the horizontal coordinates and elevations of each point, the datum upon which the benchmarks were originally established, and a description of the locations of the points which will allow them to be readily located in the field.

5.3.4.10 A drawing with a base map of suitable scale to show the location of the benchmarks, and aerial control points.

5.3.4.11 Conversion to other datum's as required herein.

5.3.4.12 Data Format. All field collected survey data obtained using conventional survey methods shall be noted in standard 5" x 7" hardbound survey books. All survey data collected electronically shall be submitted in an ASCII text file on 3.5" or 5.25" diskettes.

5.3.4.13 All topographic features including existing drainage swales, bridges, storm drainage outfalls, gravel mining operations, fences, buildings, roads, etc.

5.3.4.14 Aerial Photography. The CONSULTANT shall use the correct scale stereo aerial coverage to maximize the efficiency of the project layout and still meet the accuracy requirements. If aerial photography is used, the CONSULTANT shall complete a ground survey check to verify the accuracy.

5.3.4.15 Digital Topographic Mapping. The CONSULTANT shall use digital terrain modeling (DTM) and contour generating software to create data files.

5.3.4.16 Documentation of Survey Data. Survey data will be documented in a Project Survey Report. Copies of all survey note books or printout of digital files developed with data collectors will be provided. The horizontal and vertical benchmarks used for the survey shall be documented along with documentation of the datum upon which the benchmark was originally established. Conversion to other datums as required herein shall be documented in the report. A summary table of the ERM's and benchmarks shall be included.

5.3.4.17 The final submittal shall include a permanent, reproducible set of the survey and mapping information on 3 mil mylar sheets and shall be sealed by a registered land surveyor.

5.3.5 QUANTITIES/ENGINEERS ESTIMATE

5.3.5.1 The CONSULTANT shall prepare a Preliminary Engineer's Estimate for all elements of the design. Item numbers in the Preliminary Estimate shall follow MAG Specification Section numbers.

5.3.5.2 The Preliminary Engineer's Estimate shall be prepared based on the most up-to-date cost data available. This includes recent bid tabulations from the DISTRICT, ADOT, MCDOT, Town of Carefree, and any other resource available to the CONSULTANT. The CONSULTANT shall also evaluate the construction and construction materials market for recent fluctuations, shortages, work loads, etc. which may affect the unit costs used in the Engineer's Estimate.

5.3.6 DRAFTING

5.3.6.1 Design plans and construction documents will include, but not limited to:

Flood Control DISTRICT standard cover sheet
General notes

5.3.6.2 FCDMC sample plans may be provided with the intention that they shall be used as a guide, and are not a substitute for design criteria, technical assistance, or sound engineering judgement. The CONSULTANT shall use plan symbols shown in the MAG Standard Details and COP Supplement to the MAG Standard Details, unless otherwise requested. FCDMC makes extensive use of reduced plan sets. Plans not capable of producing high quality prints by FCDMC in reduced form shall be considered unacceptable and shall be redrawn by the CONSULTANT at no additional cost to FCDMC.

5.3.6.3 The DISTRICT uses a "Xerox" process for final reproduction of drawings for bid sets. The CONSULTANT shall not draw on the backside of drawings, or use any form of shading techniques that will not reproduce clearly using this form of reproduction.

5.3.6.4 Unless otherwise approved in writing by the DISTRICT, the CONSULTANT shall use the following scales.

Rural Areas 1" = 40' Horizontally, 1" = 4' Vertically
Urban Areas 1"=20" Horizontally, .1" = 4' Vertically

5.3.6.5 The CONSULTANT shall use a larger scale if necessary to obtain good clarity in the plans and reduced prints. The CONSULTANT shall be responsible for using a scale that results in good plan clarity.

5.3.6.6 Drawings shall be prepared using MicroStation PC, Version 4 or AutoCad, Release 12 per DISTRICT standards.

5.3.6.7 All lettering on drawings shall be vertical, plain, and legible. 'Architectural' style lettering shall not be accepted. The following lettering sizes apply:

1/8"	Lettering and Notes
5/32"	Subtitles
7/32"	Main Titles

5.3.6.8 The DISTRICT shall provide the CONSULTANT with a diskette containing .DWG or .DGN files for the standard cover sheet and working drawing sheets.

5.3.7 CALCULATIONS

5.3.7.1 The CONSULTANT shall independently check all design drawings and calculations. Each drawing shall be initialed and dated by both the designer and checker for each and every submittal of design drawings and calculations. The CONSULTANT shall verify the completeness of the check before submitting drawings or calculations to the DISTRICT.

5.3.7.2 All design calculations submitted to the DISTRICT shall be complete in detail and shall be checked. All engineering assumptions made during the design other than standard engineering judgements shall be documented with appropriate references on the calculation sheets.

5.3.7.3 The person checking the calculations shall not be the originator, and shall be of equal or better qualifications than the originator.

5.3.7.4 Calculations can be either hand calculations or computer generated calculations. Computer generated calculations can be used for either the design or the check, but cannot be used for both the design and the check. All hand calculations and computer-generated calculations shall be sealed prior to submittal to the DISTRICT. HEC-1 and HEC-2 modeling are excepted from the hand calculation requirement.

5.3.7.5 All design calculations and drawings shall be complete in detail, independently checked in the CONSULTANT's office, and shall be initialed and dated by both the designer and checker for each submittal. The CONSULTANT shall verify the completeness of the check before submitting drawings or calculations to the DISTRICT. The person checking the calculations shall not be the originator, and shall be of equal or better qualifications than the originator.

5.3.7.6 The CONSULTANT shall use methods and procedures that are normal and customary standards of the industry. All calculations, sketches, computer printouts, or other written or printed data used in the final design shall be included in the design data report.

5.3.8 LANDSCAPE

5.3.8.1 The CONSULTANT shall identify requirements and estimated costs for replacement of landscaping in kind where the landscaping will be impacted by the project.

Flood Control District of Maricopa County

Fax

To:	Rob Lyons	**From:**	Melissa Lempke
Fax:	480-966-9450	**Date:**	April 14, 2003
Phone:		**Pages:**	10
Re:	Carefree affidavits	**CC:**	

☐ **Urgent** X **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

•**Comments:**

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County of Maricopa

I, Rosie Wainscott acknowledge that the attached ad was published in a newspaper of general circulation.
The dates of the publication are as follows:
OCTOBER 31, NOVEMBER 6, 2001

The Tribune (East Valley & Scottsdale Editions)

Rosie Wainscott
Sales Representative

STATE OF ARIZONA
COUNTY OF MARICOPA

On MARCH 6, 2003, Rosie Wainscott personally appeared before me, whom I know personally to be the person who signed the above document and he/she proved he/she signed it.

Marie Gerz-Lilley
NOTARY PUBLIC

OFFICIAL SEAL
MARIE GERZ-LILLEY
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Commission Expires March 31, 2006

THE Tribune

Legal Advertising
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Affidavit of Publication

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County of Maricopa

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The Tribune (East Valley & Scottsdale Editions)

Rosie Wainscott
Sales Representative

STATE OF ARIZONA
COUNTY OF MARICOPA

On MARCH 6, 2003, Rosie Wainscott personally appeared before me, whom I know personally to be the person who signed the above document and he/she proved he/she signed it.

Marie Gerz Lilley
NOTARY PUBLIC

OFFICIAL SEAL
MARIE GERZ-LILLEY
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Commission Expires March 31, 2006

THE Tribune

Legal Advertising

120 W. First Avenue Mesa, Arizona 85210

Phone(480) 898-6826, Fax (480) 898-6463

Affidavit of Publication

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Invoice Number: 677373

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County of Maricopa

I, Rosie Wainscott acknowledge that the attached ad was published in a newspaper of general circulation. The dates of the publication are as follows:
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The Tribune (East Valley & Scottsdale Editions)

Rosie Wainscott
Sales Representative

STATE OF ARIZONA
COUNTY OF MARICOPA

On MARCH 6, 2003, Rosie Wainscott personally appeared before me, whom I know personally to be the person who signed the above document and he/she proved he/she signed it.

Marie Gerz-Lilley
NOTARY PUBLIC

OFFICIAL SEAL
MARIE GERZ-LILLEY
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Commission Expires March 31, 2006

THE DESERT ADVOCATE
47027 N. New River Rd.
New River, Arizona 85087
Tel: 623-465-9384 Fax: 623-465-5729
E-Mail: desertadvocate@uswest.net

CERTIFICATE OF PUBLICATION

The Desert Advocate newspaper has published a Public Meeting Notice . The Public Notice was commissioned to be published in the January 8, 2003, issue and in the January 15, 2003 issue of The Desert Advocate Newspaper and was commissioned by Carefree Drainage Master Plan.

Date: April 10, 2003

Karen K. Seemeyer
Publisher,
The Desert Advocate

THE DESERT ADVOCATE
47027 N. New River Rd.
New River, Arizona 85087
Tel: 623-465-9384 Fax: 623-465-5729
E-Mail: desertadvocate@uswest.net

CERTIFICATE OF PUBLICATION

The Desert Advocate newspaper has published an Open House Notice. The Public Notice was commissioned to be published in the May 8, 2002, issue and in the May 15, 2002 issue of The Desert Advocate Newspaper and was commissioned by Carefree Drainage Master Plan.

Date: April 10, 2003

Karen K. Seemeyer
Publisher,
The Desert Advocate

THE DESERT ADVOCATE
47027 N. New River Rd.
New River, Arizona 85087
Tel: 623-465-9384 Fax: 623-465-5729
E-Mail: desertadvocate@uswest.net

CERTIFICATE OF PUBLICATION

The Desert Advocate newspaper has published a Public Workshop. The Public Notice was commissioned to be published in the November 6, 2001, issue and in the November13, 2001 issue of The Desert Advocate Newspaper and was commissioned by Carefree Drainage Master Plan.

Date: April 10, 2003

Karen K. Seemeyer
Publisher,
The Desert Advocate

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4/9/03

Mike,

As requested here is a statement of confirmation that the ads for Maricopa County Flood Control ran on the following dates as per your instructions:

November 7, 2001
May 8 and 15 of 2002
January 8 and 15 of 2003

If you have any further questions in regards to this account please feel free to contact me at anytime. Thank you for choosing Sonoran News for your print media needs. I look forward to working with you again.

Sincerely,

Holli McGarrah

Holli McGarrah
Sonoran News
480-488-2021 x22

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For more information please call:
Angeline Fowler
Office (602) 506-6762
Cell phone (602) 292-6829

April 30, 2002

Flood Control District to involve Carefree residents in local Drainage Master Plan

CAREFREE – Over the past nine months, the Flood Control District has been working with the Town of Carefree on the first phase of a Town Drainage Master Plan – collecting information about area drainage, erosion, and sedimentation problems. Once completed, this plan should give area residents greater area access during flooding and should reduce area drainage problems.

Residents will have the opportunity to attend an Open House highlighting the completion of the plan's first phase, Wednesday, May 22, 6:00 – 8:00 p.m. at Carefree Town Hall (100 Easy Street).

At the meeting, the District will present information about the problems already identified. This data collection will provide the basis for future drainage planning and the creation of solutions.

"Although providing a safe environment for residents is the primary goal of the Flood Control District in this project," said Mike Ellegood, District Chief Engineer/General Manager. "The end result of this project should be a cost savings for taxpayers, and provide reduced risk and inconvenience for anyone traveling during flooding events."

- MORE -

The study area encompasses the entire Town of Carefree and covers approximately 20 square miles.

"Through field trips and information from both the citizens and the Town, the District has identified 46 problem drainage areas in Carefree, of which 20 require further analysis before the District can generate possible solutions," said Doug Williams, project manager. "It is important that the public come out to the meeting and look over the information we have collected. We want to make sure that we haven't missed any glaring area problems, before we start looking at solutions."

As part of the Drainage Master Plan, the study team is also conducting approximately 10 linear miles of floodplain delineations on six area washes - one of which is the North Galloway Wash and the others are unnamed at this time.

"By delineating these washes, the District can help protect public safety in those areas and provide the residents with a more accurate picture of the area flood hazards," Williams said.

In addition, the District will also present the residents with a conceptual solution of how the District plans to address the area problems, which could include road crossing improvements, development drainage guidelines, and localized structures.

One of the key issues with drainage and flooding in the Town of Carefree is sediment and possible erosion. In foothill areas, sediment moves quickly through the washes creating deposits and scouring. Sediment also blocks culverts and dip road crossings, thus creating a significant change in water direction and velocity, and creating additional erosion and undercutting in many of the washes and crossings.

"Sedimentation has a large monetary impact on the town, in terms of maintenance," Williams said. " Every year crews have to remove sediment from road crossings, which can create major maintenance headaches and an area hazard."

The Carefree watershed also has the potential for a significant amount of flow in a flooding event.

"Although, this flooding hasn't occurred in recent years, when it does it will catch many residents by surprise and could have a major effect on public safety," said Linda Johnson, CH2MHILL Consulting Engineers, Associate Project Manager . "This general area has some highly complex erosion and drainage issues, which could have a significant effect downstream through this watershed."

- MORE -

This will be the second public meeting for the Carefree Drainage Master Plan. Once the public has provided input on the data collected, the planning team will analyze the data and formulate a series of alternatives to address the problems. These alternatives should be presented to the community in Fall 2002.

Once the plan is completed at the end of the year, the Town of Carefree will be responsible for implementation and costs.

The Flood Control District invites anyone with an interest in this plan to attend the public meeting or visit the District website at www.fcd.maricopa.gov If you have questions or concerns, contact the study's project manager Doug Williams at 602-506-8743 or email: daw@mail.maricopa.gov.

- ###-

FOR IMMEDIATE RELEASE:
Nov. 5, 2000
(602) 506-1501

FLOOD CONTROL OF
MARICOPA COUNTY
CONTACT: DOUG WILLIAMS

PUBLIC WORKSHOP SET FOR DRAINAGE MASTER PLAN PROJECT IN CAREFREE AREA

Carefree, AZ (November, 2001)...The Flood Control District of Maricopa County, in association with the Town of Carefree, has scheduled a public workshop to discuss the Drainage Master Plan (DMP) for the Carefree area. The public workshop will be on November 13, 2001 at the Carefree Town Hall located at 100 Easy Street, Carefree, AZ 85377 from 6 p.m. to 8 p.m.

The purpose of the Carefree DMP is to identify methods within the study area to reduce potential damages to property or loss of life from storm runoff. The study will include several elements: identifying existing and potential flooding problems within the Town of Carefree; evaluating the erosion and sedimentation to predict long-term benefits or effects of any proposed drainage improvements; and gathering and disseminating information regarding flooding, sedimentation, and erosion problems.

The scope of the project will consist of storm water hydrology, hydraulics, and erosion/sedimentation analyses as well as the preparation of an environmental overview of the ecological, cultural, visual character, and multi-use opportunities of the study area.

The goals of the Carefree DMP are to identify known drainage problems, develop cost-effective solutions for identified drainage problems, and obtain public consensus of the study's recommendations.

The study area will encompass the entire limits of Carefree (approximately 20 square miles). The area is generally bounded by the

Tonto National Forest on the north, the City of Scottsdale on the east, the City of Phoenix on the south, and the Town of Cave Creek on the west.

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO _____ PHONE NO. _____

DATE _____

CALL FROM _____ TIME _____ ☐ AM ☐ PM

MESSAGE TAKEN BY LAJ PROJECT NO. 162944

SUBJECT Attendees @ Public Meeting

HT PO Engineering • Surveying Landscape Architecture

13229 N. Verde River Dr.
Suite 300
Fountain Hills, AZ 85268

John K. Lassen
Consultant
Phone: 480-836-0535
Fax: 480-836-0575
Cell: 602-292-2405
Home: 480-860-6903
Email: jlassen1@aol.com

HANSEN THORP PELLINEN OLSON, INC.

WBA

BEFORT & ASSOCIATES

WAYNE BEFORT, P.E.
Structural Engineer

(480) 488-0027
P.O. Box 4763
Cave Creek, Az 85327

Cell 480-215-8096
Fax 480-488-0466

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CAREFREE
Drainage Master Plan

Comment Sheet
Public Meeting
May 22, 2002

Please use this sheet to provide us with any additional comments on the Carefree Drainage Master Plan. You can leave the comment sheet with us tonight, mail it by June 5, 2002, to Tony Bokich, CH2M Hill, 2625 S. Plaza Dr., Ste. 300, Tempe, AZ 85282, or fax it to him at (480) 966-9450.

Please Print

Name: Susan Scisero

Address: Happy Hollow & Carefree Dr. **E-mail:** Sciscero@att.net

Phone Number: 480-991-3360

Comments: Culvert #27 (on 91) Carefree Dr. between Happy Hollow & Cave Creek Rd. Floods during heavy rainfalls. The culvert is too small and the sediment that is carried through the wash gets trapped - flooding occurs - Carefree Drive floods -

future Plans need to included a larger culvert and a grid that allows sediment and H_2O to move through the wash and under Carefree Dr.

Meeting Survey

How did you hear about the meeting tonight? ☒ Newspaper Notice ☐ Letter ☐ Other _____

How would you rate the overall knowledge and helpfulness of staff members who assisted you?

☒ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Did you receive all the information that you needed? ☒ Yes ☐ No

How would you rate this facility for holding future meetings?

☒ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

CAREFREE
Drainage Master Plan

Comment Sheet

Public Meeting
May 22, 2002

Please use this sheet to provide us with any additional comments on the Carefree Drainage Master Plan. You can leave the comment sheet with us tonight, mail it by June 5, 2002, to Tony Bokich, CH2M Hill, 2625 S. Plaza Dr., Ste. 300, Tempe, AZ 85282, or fax it to him at (480) 966-9450.

Please Print

Name: RANDY BOWYER

Address: PO BOX 3214 – 36843 ROMPING RD. E-mail:

Phone Number: 480 488 4803

Comments: ATTACHED.

Meeting Survey

How did you hear about the meeting tonight? ☐ Newspaper Notice ☐ Letter ☑ Other

How would you rate the overall knowledge and helpfulness of staff members who assisted you?

☐ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Did you receive all the information that you needed? ☐ Yes ☐ No

How would you rate this facility for holding future meetings?

☐ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Introduction

make boards of these

CAREFREE DRAINAGE MASTER PLAN

As part of the Carefree Drainage Master Plan, the Flood Control District (District) and the Town of Carefree determined there was a need to conduct several delineations of floodplains within the study area.

Floodplain delineation studies identify special hazard areas that are subject to inundation by a 100-year flood (1 percent chance of occurring each year).

The District is holding a pubic meeting on January 22nd to present the recommended drainage alternative for the study area. At this meeting, district representatives will present floodplain maps and will assist you in determining whether or not your property is located in a flood hazard area.

NEXT STEPS

The District will be sending the results of this study to FEMA in February 2003 for adoption. Once submitted, this process will take approximately 6-9 months. Homeowners and landowners will not be directly affected by the study until its adoption. However, study delineation maps may be used to guide adjacent land development.

Following adoption by FEMA, there is a standard 90-day appeal period for homeowners and landowners

QUESTIONS?

Homeowners and landowners affected by the delineations can contact the District's project manager or the Town of Carefree during the FEMA review process for updates.

Floodplains

WHAT IF MY PROPERTY IS IN A FLOODPLAIN?

If it is ~~mapped~~ in a mapped floodplain ~~in a floodplain~~

Your property is potentially susceptible to flooding. The floodplains show the location of water during a 100-year storm. It is impossible to predict when this flooding will occur but technical study shows that it is likely to happen to you or to your neighbor.

Did you know that there is a 26 percent chance of experiencing a flood during the life of a 30-year mortgage compared to a 4 percent chance of fire?

IS THIS DECISION FINAL?

Individual property owners can hire an agency to survey finish floor elevations and lowest adjacent grades if their properties are located within the floodplain boundaries. If this survey work shows that your property's floor is higher than the base flood elevation, you can request that an elevation certificate be submitted to FEMA in order to qualify for a Letter of Map Amendment (LOMA), which eliminates the requirement to purchase flood insurance.

In addition, it may be possible to make changes to your house or property to elevate yourself above the floodplain. Also, future changes in the watershed could affect the floodplain's location.

GETTING MORE INFORMATION

When it comes to protecting yourself, the Flood Control District and the Town of Carefree are here to help you prepare.

Flood Insurance

FLOOD INSURANCE

Most homeowners insurance policies do not cover flood losses. A special policy is required. However, flood insurance is affordable and costs around $300 per year for $100,000 of coverage. In comparison, a disaster loan could cost you more than $300 per month for $50,000 over 20 years.

You can insure your home with flood insurance for up to $250,000 for the building and $100,000 for the contents.

Note: If you purchase flood insurance prior to the map becoming effective, you will pay a much lower rate of flood insurance, as long as you do not let the policy lapse.

If your property is located in a floodplain and you do not qualify for a Letter of Map Amendment (LOMA), the District advises you to purchase flood insurance to protect yourself from loss. In addition, if your property is mortgaged, your lender may require you to purchase insurance.

Also, if you currently own your home outright and later borrow money to build, repair, reconstruct, or improve your home, your lender again may require you to purchase insurance.

You are also required by law to obtain a floodplain use permit if you wish to make any changes to the land or property that is within the floodplain.

Questions and Answers

WHAT IS A 100-YEAR FLOODPLAIN?

A 100-year floodplain is the area along a wash that gets wet and carries water during a 100-year flood. A 100-year floodplain is typically defined by the limits of flooding that would occur from a rainfall event that has a 1 percent chance of occurring in any given year.

WHAT IS A REGULATORY FLOODWAY?

The natural or artificial channel of a watercourse and portion of the adjacent floodplain that is needed to convey the base or 100-year flood event without increasing flood levels by more than one foot and without increasing velocities of flood water.

WHAT IS THE BASE FLOOD ELEVATION?

The height of the base flood (usually in feet, in relation to a datum point), or the depth of the base flood above the ground surface.

WHAT IS A FLOOD INSURANCE RATE MAP (FIRM)?

These maps are issued by FEMA and show special hazard zones, including the 100-year floodplain. They also show flood insurance risk zones and other flood-related information applicable to the community.

WHAT IS A FLOOD HAZARD ZONE?

The different area designations on a FIRM that define the level of potential risk of flooding for that area. Typically this term is used to describe areas that will be inundated by a 100-year flood to a depth over 1 foot. These zones include A, AE, A1-30, AH, AO, B, C, X, and D.

WHAT IS THE FLOODWAY FRINGE?

The areas of a delineated floodplain adjacent to the floodway where encroachment may be permitted.

WHAT ARE FLOODPLAIN REGULATIONS?

Adopted policies, codes, ordinances, and regulations pertaining to the use and development of lands that lie within a regulatory floodplain.

Questions and Answers

WHAT IS A FLOOD HAZARD ZONE?

The different area designations on a FIRM that define the level of potential risk of flooding for that area. Typically this term is used to describe areas that will be inundated by a 100-year flood to a depth over 1 foot. These zones include A, AE, A1-30, AH, AO, B, C, X, and D.

WHAT IS A ZONE A?

A Special Flood Hazard Area identified by FEMA that is subject to inundation from a 100-year event. Because detailed hydraulic analysis has not been performed, no base flood elevations or depths are shown. Mandatory flood insurance requirements apply.

WHAT ARE ZONES AE AND A1-30?

Special Flood Hazard Areas subject to inundation by the 100-year flood determined by a Flood Insurance Study (FIS). Base flood elevations are shown within these zones and mandatory flood insurance requirements apply. Zone AE is used on newer maps in place of Zones A1-30.

WHAT IS A ZONE AH?

A Special Flood Hazard Area subject to inundation by 100-year shallow flooding (usually areas of ponding) with average depths between one and three feet. Base flood elevations, derived from detailed hydraulic analysis, are shown in this zone. Mandatory flood insurance requirements apply.

WHAT IS A ZONE AO?

A Special Flood Hazard Area subject to inundation by 100-year shallow flooding usually resulting from sheet flow on sloping terrain, with average depths between one and three feet. Average flood depths, derived from detailed hydraulic analysis, are shown in this zone. Mandatory flood insurance requirements apply.

WHAT ARE ZONES B, C, AND X?

Areas that have been identified in a community flood insurance study as having moderate or minimal hazard from flooding. Buildings or other improvements in these zones could be flooded by severe, concentrated rainfall, in the absence of adequate drainage systems. *Flood insurance is not required in these zones.*

WHAT IS A ZONE D?

A unstudied area where flood hazards are undetermined but where flooding is possible. No mandatory flood insurance requirements apply.

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Public input sought on flood study

By Christina Leonard Scottsdale Republic
Scottsdale Republic
Jan. 20, 2003

CAREFREE - For more than a year, flood-control officials have worked to find ways to deal with some persistent flooding problems in Carefree.

They're now in the final stages of their study and will ask for public input on the project later this week.

Maricopa County's Flood Control District has identified six potential sites for new bridges and culverts, each of which could cost from $300,000 to $1.5 million.

"Every time it rained, they got quite a lot of sediment in the road," said Marilyn DeRosa, the district's project manager. "The residents were all complaining that they couldn't get in and out of their homes."

Flood control officials will take the plan to the Carefree Town Council for approval Feb. 4, but it could take five to 10 years to complete. The council will decide whether to absorb the cost on its own, or it could ask the Flood Control District to share expenses.

DeRosa said that if the town applied for cost-sharing, which town officials said is likely, flood control would rank the requests against other county projects.

Town officials asked the county to conduct the $700,000 study after working together on a project to ease flooding in downtown Carefree.

Town Administrator Jonathan Pearson said that the town has installed one bridge and some storm sewers after incorporating but that some areas still need work to allow emergency vehicles access to the entire town.

About 30 to 40 residents attended the last meeting, DeRosa said. Flood Control has kept town officials updated.

- SUNDAY
- MONDAY
- TUESDAY
- WEDNESDAY
- THURSDAY
- FRIDAY
- SATURDAY

"The last thing we want to do is prepare a plan that nobody likes or nobody will use, so we have kept the public involved and the elected (officials) so nobody is surprised by anything at the end," DeRosa said.

The third and final public meeting will begin at 6:30 p.m. Wednesday at Carefree Town Hall, 100 Easy St. Representatives also will be able to tell residents whether their property is in a flood plain.

Bashas'

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NEWS RELEASE

FOR IMMEDIATE RELEASE
For more information please call:
Melissa Lempke
(602) 506-0612

January 9, 2003

Final Public Meeting Scheduled for Carefree Drainage Master Plan

CAREFREE—The Flood Control District of Maricopa County (District) has scheduled the third and final public meeting regarding the Carefree Drainage Master Plan (DMP) for Wednesday, January 22 at 6:30 p.m. at the Carefree Town Hall, 100 Easy Street.

The purpose of the meeting is to provide the community with information about the Recommended Drainage Alternatives identified as a result of the study, and to discuss the floodplain/floodway delineations that are taking place.

The purpose of the Carefree DMP is to identify drainage problems and cost-effective solutions for emergency access and storm water management in the Carefree area. The Master Plan is intended to serve the town as an effective tool to reduce existing flooding and improve access during major storm events.

"This was a much needed study," said District Chief Engineer and General Manager Mike Ellegood. "Both town officials and residents are aware of the dangers that a storm event would present in this area. They are anxious for improvements to be implemented which will protect lives and property and secure access into and out of the area in a flood."

-MORE-

It is also intended to ensure that any new development's flood damage potential is minimized, that consistent floodplain and drainage guidelines are followed, and that any new development does not adversely impact existing drainage or floodplain conditions.

Since the start of the project, the study team has completed an investigation of the existing drainage conditions in the town and identified flooding concerns and erosion and sedimentation problems. In addition, peak flows for both 10 and 100-year flood events have been calculated.

From this data collection, preliminary alternatives were generated and evaluated based on a range of criteria, such as construction cost, potential impacts to the community, and opportunities that can be created from their implementation. The best of these alternatives were presented to the public for input. Based on that input and additional data collection, the project team is ready to present their recommended alternative.

"Obtaining feedback from the public is essential to the success of this project," said District Project Manager Marilyn DeRosa. "Area residents have been a vital source of information regarding problems they have witnessed as a result of past storm events. At this stage of the project, we are eager to gain support for our recommended alternative."

An additional aspect of the Carefree DMP is the delineation of several washes in the area to determine the floodplain/floodway. The purpose of the delineations is to identify areas within the town that are at a high risk for flooding so that property owners can take the appropriate steps to protect themselves and their property. Representatives will be on hand at the meeting to present floodplain maps and assist residents in determining whether or not their property is located in a flood hazard area.

After the Recommended Drainage Alternatives are presented to the Town of Carefree for its approval, the implementation of the approved drainage solutions will depend on priorities and availability of funds and could take five to 10 years to complete. Comments received from the public on the Recommended Drainage Alternatives will be considered during the design phase of the project.

The Flood Control District of Maricopa County is tasked to provide regional flood hazard identification, regulation, remediation, and education to Maricopa County residents so that they can reduce their risks of injury, death, and property damage from flooding, while still enjoying the natural and beneficial values served by floodplains.

For more information about the Flood Control District or this release, please contact Melissa Lempke, Public Involvement Coordinator at 602-506-0612.

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Mailing List for Carefree DMP

LAST NAME	FIRST NAME	COMPANY	ADDRESS	CITY	STATE	ZIP
ANDERSON	EVERETT	THE CROSSINGS AT CAREFREE II	PO BOX 3711	CAREFREE	AZ	85377
ARNOLD	RAYMOND		PO BOX 3344	CAREFREE	AZ	85377
AUSTIN	BOB	THE CROSSINGS AT CAREFREE II	PO BOX 5048	CAREFREE	AZ	85377
BAKER	ROBERT		7741 E PRIMROSE PATH	CAREFREE	AZ	85377
BLISS	BILL	CAREFREE GRANDVIEW ESTATES	PO BOX 2652	CAREFREE	AZ	85377
BOHANAN	CAROLYN		PO BOX 5010	CAREFREE	AZ	85377
BOTT	DAN	CAREFREE AIRPARK ESTATES	PO BOX 1167	CAREFREE	AZ	85377
BOWYER	RANDY		36843 N ROMPING RD	CAREFREE	AZ	85377
BREWER	JOHN		PO BOX 3554	CAREFREE	AZ	85377
CALVIS	TONY	TRANQUIL PLACE	7227 N 16TH ST, STE 235	PHOENIX	AZ	85020
CHRISTENSEN	MARIE	SKYRANCH FLIGHT ASSOCIATION	PO BOX 3604	CAREFREE	AZ	85377
COADY	BOB	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
CRANE	JOHN	CAREFREE FOOTHILLS	PO BOX 1224	CAREFREE	AZ	85377
CREMEENS	BUNNY	ARCHITECTURAL COMMITTEE	PO BOX 5801	CAREFREE	AZ	85377
DAHL	GIL		PO BOX 2399	CAREFREE	AZ	85377
DEMARCO	JOE		PO BOX 3225	CAREFREE	AZ	85377
DIERCKSMEIER	JOHN	CAREFREE ROLLING HILLS	PO BOX 2151	CAREFREE	AZ	85377
DOBAT	NED		9527 E ROMPING RD	CAREFREE	AZ	85377
EEMISSE	BEV	CAREFREE MOUNTAIN ESTATES	31043 N 45TH ST	CAVE CREEK	AZ	85331
EICHER	MIKE	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
EICHER	MIKE	BOULDERS CAREFREE	PO BOX 953	CAREFREE	AZ	85377
FRENADEZ	JEAN		PO BOX 810	CAREFREE	AZ	85377
FULCHER	WAYNE	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
GARDNER	GREG	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
GILBERT	DOUGLAS		PO BOX 1366	CAREFREE	AZ	85377
GROVE	RON	BLACK MOUNTAIN FOOTHILLS	PO BOX 3183	CAREFREE	AZ	85377
HAYNUM	JEFFREY		PO BOX 6134	CAREFREE	AZ	85377
JOHNSON	MELODY	CAREFREE VILLAS	PO BOX 2762	CAREFREE	AZ	85377
JONES	LESLIE & GERRY		PO BOX 1255	CAREFREE	AZ	85377
JONES	GERRY	HAWKSNEST PHASE II & III	PO BOX 1255	CAREFREE	AZ	85377
KAUPER	BILL	SKYRANCH HOMEOWNERS ASSOCIATION	PO BOX 2583	CAREFREE	AZ	85377
KESLER	HAL & MARY		PO BOX 5203	CAREFREE	AZ	85377
KORSTEN	ERICH		PO BOX 17915	FOUNTAIN HILLS	AZ	85269
KOSEL	VICKIE	NATIONAL PROPERTY SERVICES	PO BOX 31176	PHOENIX	AZ	85046
LINDER	MICHAEL	LOST ACRES	5670 E PERDIDO DR	CAVE CREEK	AZ	85331
LOEPER	DIETRICH	LOS REALES	PO BOX 1461	CAREFREE	AZ	85377

12/17/02

Mailing List for Carefree DMP

MACY	VICTORIA	DOUBLEGATE CONDOMINIUMS	PO BOX 3725	CAREFREE	AZ	85377
MARCAUD	VAL		2111 E HIGHLAND, STE 255	PHOENIX	AZ	85016
MEYER	LLOYD W	THE CROSSINGS AT CAREFREE III & IV	PO BOX 3440	CAREFREE	AZ	85377
MILLER	PATSY		9441 E ROMPING RD	CAREFREE	AZ	85377
MISSERI	JAN		PO BOX 3494	CAREFREE	AZ	85377
MORGAN	EDWARD C.	TOWN OF CAREFREE, MAYOR	PO BOX 740	CAREFREE	AZ	85377
NIROB	JENNY		36642 N ROMPING RD	CAREFREE	AZ	85377
ONEIL	LOIS		PO BOX 1190	CAREFREE	AZ	85377
ONEIL	LOIS	POSADA DEL SOL	PO BOX 1190	CAREFREE	AZ	85377
ORSBURN	MARV		PO BOX 5792	CAREFREE	AZ	85377
PARKER	BLAKE D	RIDGEVIEW ESTATES	8687 E VIA DE VENTURA, STE 310	SCOTTSDALE	AZ	85258
PARSONS	JOHNNY		PO BOX 5481	CAREFREE	AZ	85377
PEARSON	JONATHAN		PO BOX 740	CAREFREE	AZ	85377
PIETRO	DICK	HAWKSNEST PHASE I	PO BOX 1443	CAREFREE	AZ	85377
PRUETT	PAULA		37200 N PIMA RD	CAREFREE	AZ	85377
RABIDOUX	JOYCE	VILLA DEL SOL ASSOCIATIONS	PO BOX 982	CAREFREE	AZ	85377
RIGGS	CURTIS		6812 E CAVE CREEK RD	CAVE CREEK	AZ	85331
RIGGS	CURTIS		6812 E CAVE CREEK RD	CAVE CREEK	AZ	85331
ROOT	VAL		5818 E RESTIN RD	CAVE CREEK	AZ	85331
RUTHERFORD	DOUG	VELVET SHADOWS	PO BOX 796	CAREFREE	AZ	85377
SAVINO	MARY ANN	CAREFREE SENTINEL ROCK ESTATES	PO BOX 3791	CAREFREE	AZ	85377
SAVINO	AL	ARCHITECTURAL COMMITTEE	5839 E SENTINEL ROCK RD	CAVE CREEK	AZ	85331
SCHIANO	PATTY	CAREFREE ESTATES	PO BOX 2503	CAREFREE	AZ	85377
SMITH	DAVID		PO BOX 3578	CAREFREE	AZ	85377
SNYDER	DON	TOWN OF CAREFREE, VICE-MAYOR	PO BOX 740	CAREFREE	AZ	85377
SPERL	SCOTT		PO BOX 2722	CAREFREE	AZ	85377
STEVENS	GEOFFREY		PO BOX 3847	CAREFREE	AZ	85377
SWENSEN	JERRY	CAREFREE TERRACE CONDOMINIUMS	PO BOX 2265	CAREFREE	AZ	85377
VAUGHAN	FLOYD	ARCHITECTURAL REVIEW COMMITTEE	PO BOX 5194	CAREFREE	AZ	85377
WETTER	LARRY	BOULDER VISTA	PO BOX 2124	CAREFREE	AZ	85377
WHIPPLE	HELEN	THE CROSSINGS AT CAREFREE	PO BOX 5052	CAREFREE	AZ	85377
WILLIAMS	JAY	ARCHITECTURAL REVIEW COMMITTEE	PO BOX 2271	CAREFREE	AZ	85377
ZENO	NANCY		PO BOX 740	CAREFREE	AZ	85377
ZUCKER	GORDON	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
		LOS ARCOS REALITY & MANAGEMENT	14415 N 73RD ST, STE 100	SCOTTSDALE	AZ	85260
		OCOTILLO RIDGE ESTATES	7600 E DOUBLETREE RANCH RD, STE 220	SCOTTSDALE	AZ	85258

12/17/02

- WASH-OUT AREA OF CONCERN -
- INTERSECTION OF ROMPING ROAD & WILDFLOWER RD
- CAREFREE ROLLING HILLS AREA. -

A MAJOR FLAT PLANE WASH RUNS FROM EAST TO WEST STARTING ABOVE "MARYBELL COMPLEX" IN SCOTTSDALE & TERMINATES AT EAST SIDE OF ROMPING Rd. RUNNING NORTH TO SOUTH ACROSS THE FRONT OF LOT # 33 - 220' AND MEETS UP WITH ANOTHER FLAT PLANE WASH 60' WIDE RUNNING EAST TO WEST STARTING ABOVE MARYBELL COMPLEX IN SCOTTSDALE & TERMINATING AT A CONCRETE DEVERTER WALL ENCASING 2-3' METAL PIPES WHICH RUNS 77' & UNDER ROMPING ROAD TO THE EAST SIDE OF LOT 61 WHICH IS THE SO. SIDE OF WILDFLOWER. AT THIS POINT BOTH WASHES ENTER INTO AN OPEN DITCH 10' TO 30' WIDE 4' TO 12'. DEEP THIS FLOW RUNS 210' ALONG SIDE OF LOT # 61 AND 315' ALONG SIDE OF LOT # 58 & ON ALONG LOT # 57 - THIS OPEN DITCH SPILLWAY HAS CAUSED MUCH EROSION & DAMAGE TO BOTH WILDFLOWER ROAD AND LOTS # 61, # 58 & # 57. WILDFLOWER HAS BEEN UNDERMINED FOR ABOUT 200+' & REPAIRED BY THE CITY BY PLACING RIVER ROCK w/ WIRE COVER & SOME RETAINING WALL WHICH IN TURN HAS DIVERTED ALL THIS SWIRL EROSION TO LOTS # 61 # 58 # 57 THE PROPERTY. STAKES NO. BOUNDARY OF LOT 58 ARE GONE & A 30' WIDE 60' CUT OUT IS BEING ERODED ALONG LOT # 58 10' x 12' DEEP. THE CITY HAS PLACED 8 REFLECTOR POSTS ALONG THIS AREA 20' APART TO

TRY & KEEP AUTO, PEOPLE, TRUCKS, BIKES, ETC. FROM FALLING INTO THIS DEEP DITCH. ALREADY A PICK-UP TRUCK WAS SEEN ON ITS SIDE IN DITCH.

TWENTY MONTHS AGO THREE CITY WORKERS WERE STANDING IN FRONT OF LOT 33 ON ROMPING ROAD OBSERVING THE 1' TO 2' OF WATER SAND & GRAVEL WASHING ACROSS THE INTERSECTION OF ROMPING & WILDFLOWER ROADS.

CONCERNS.

1. WHAT ARE THE LIABILITIES OF PROPERTY OWNER LOTS #61 & 58 & 57 FROM ACCIDENTS OCCURING IN DITCH?
2. WHAT CAN BE DONE TO STOP EROSION OF PROPERTY OF LOTS #61 & 58 & 57 WHICH HAS BECOME MAJOR SINCE THE SHORING ALONG WINDFLOWER BY CITY?
3. WHAT SHOULD BE DONE ABOUT THE UTILITIES BOXES FOR LOTS 58 & 57 WHICH WILL SOON BE IN THE WASH WITH THE NEXT ONE OR TWO MAJOR DOWN FALLS.
4. WHAT ENGINEERING MUST BE DONE TO CONSTRUCT A ROAD WAY FROM WINDFLOWER ONTO LOT #58 FOR NEW CONSTRUCTION OF HOUSE. — ACROSS SPILLWAY DITCH?

NOTE: CAREFREE ROLLING HILLS ~~NOT~~ DOES NOT ALLOW - ANY FILL DIRT FOR ANY CAUSE.

: SEE ATTACHED PHOTOS OF PROBLEM AREA

LOTOWNERS - LOT 33 RANDY & QUING BOWYER
LOT 61 JERRY & JAN NICHOLS
LOT 58 RANDY & QUING BOWYER
LOT 57 DAVID & HOLLY ARNOLD

CAREFREE
Drainage Master Plan

Sign-in Sheet

Please Print

	Name:	Address:	Phone:	E-mail:
1	Paula Prewett	street: 37200 N Pima Rd Carefree AZ 85377 (Mailing: PO Box 3075)		
2	Erich Korsten	P.O. Box 17915 Fountain Hills, AZ 85269		ekorsten@msn.com
3	Robert Baker	7741 E. Primrose Path, Carefree	480-575-7349	
4	Randy Bowyer	36843 N. Romping Rd. Carefree	480 488 4883	
5	Patsy Miller	9441 E Romping Rd Carefree	480-595-6062	
6	Ned Dobat	9527 E Romping Rd Carefree	480 488 0058	
7	Susan Sciacero	Happy Hollow Development Carefree	480-9913367	Sciacero@AOL.net
8	Jonathan Pearson	PO Box 740 Carefree, AZ	480-488-3686	
9	Nancy Zeno	PO Box 740, Carefree AZ	480-488-3686	nancy@carefree.org
10	Raymond Arnold	PO Box 3344, Carefree AZ	480/488-3355	
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CAREFREE
Drainage Master Plan

Sign-in Sheet

Please Print

	Name:	Address:	Phone:	E-mail:
1	Jerry Nichols	36642 N Romping Rd	480 575 8429	jan.nichols3 @ gte.net
2	Jan Musseri	P.O. Box 3494	480-488-5182	casbin@aol.com
3	Curtis Riggs	6812 E. Carefree Creek Rd.	480-488-2612 V35	Sunpeak@aol.com
4	Douglas Gilbert	P.O. Box 1366 Carefree	480-575-1343	None
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CAREFREE
Drainage Master Plan

Sign-in Sheet

Please Print

	Name:	Address:	Phone:	E-mail:
1	JOHN VASSEN	34825 Whiteaway	480-860-6903	jlassen1@aol.com
2	BILL McNULTY	36202 N. WILDFLOWER RD	(480) 575-0191	
3	John ANDERSON	8931 E. VENUS DR.	" 488-3465	JANDJA@COX.NET
4	Richard Harris	FCDMC	602 506 4528	RPH@mail.maricopa.gov
5	Nancy Zeno	Town of Carefree	480-488-1471	nancy@carefree.org
6	Allen Nohre	35293 N. Canyon Creek Circle	480-595-5088	anohre@cox.net
7	[illegible]	8944 Robert Hunter Rd, Scott.	480-488-1588	[illegible]
8	Mary Kesler	2840 Carefree Dr.	480-488-1484	Keshr@juno.com
9	Bill Allen	1130 E Missouri	(602) 263-9522	ballen@allenstephenson.com
10	MARGARET MCKERNAN	P.O. Box 6184	480/595-9742	Peggymac43@Juno.Com
11	DAVID & Peggy DENNISON	BOX 405	480 488 2826	
12	James Cheney	4641 E. Sheena Dr.	602 971-9434	JimCheney@Qwest.net
13	JOANN REIM	8828 E. ROBERT HUNTER DR		
14	GLENN R. MILLER	8956 E. LAZYWOOD PL.	480-575-8032	C.F.D. MILLER
15	Michael Marron	8030 Golden Spur	480-488-3031	
16	James L. Davis	5950 E Restin Rd	480-595-1959	
17	Paula Pruett	37200 N. Pima Rd/Po Box 3075	480 488 2024	pprueth@extremezone.com
18	Chris Riggs	6612 E Cave Creek	488 2121 X35	
19	CALEB Soptelean	PO Box 3754 Carefree	480-234-3792	Soptelean@hotmail.com
20				

CAREFREE
Drainage Master Plan

Sign-in Sheet

Please Print

	Name:	Address:	Phone:	E-mail:
1	MICHAEL ROONEY	8821 E CAVE CREEK RD	480-595-7079	mrooney@firstam.com
2	BOB COADY	36038 N 58 ST CAREFREE		
3	Jan Misseri	P.O. Box 3494	480-488-5182	casbin@aol.com
4	WAYNE FULCHER	P.O. BOX 3106 "	480-488-0593	—
5	BOB LEWIS	6862 E NIGHTINGALE SCOTTSDALE STAR	" 525-6644	
6	RAY ELLIOTT	36656 STARDUST LN CAREFREE	480-488-9051	RADIELLIOT@AOL.COM
7	Kim Kerr	PO Box 1318 Carefree	480-595-5256	Kim5556@aol.com
8	MARVIN J CHRISTENSEN	PO Box 5354 Carefree	480-595-2243	MJCTAB1@Cox.Net
9	Steve Cline	PO Box 5096 Carefree	480-595-7263	cline@INSTOCKINC.co
10	Hurd Miller	PO Box 2765 "	480-595-9591	AZAdGuy@aol.com
11	Roger Philips	38220 N Sombrero "	480 575 7747	rap-46@hotmail.com
12	Travis Lamb	5950 Restin Rd.	480 595 7526	
13	Bob March	Box 5568	" 488-2561	
14	JC Bischoff	7333 [illegible]	480 488 1051	
15	Greg Moorhead	35422 N. 58th St.	480-488-1065	
16	Wayne Behm	5505 E. Agave Place	480-488-6053	
17	Margaret Stewart	8717 Short Putt Pl	480-488-9659	
18	KURT FRIMODIG	8402 E. CAREFREE DR. "	480-488-9375	KURT@FRIMODIGASSOC.COM
19				
20				

CAREFREE
Drainage Master Plan

Sign-in Sheet

Please Print

	Name:	Address:	Phone:	E-mail:
1	LOUIS BINICK	7101 E. RADIANT CT	480 488-3525	KENWINZ@COX.NET
2	John Kuzma	6930 E. Nightingale Stanza	480-595-7331	jkuzma@insightbb.com
3	Marian Gerstner	36729 N. Twilight Trail.		azgerstner@cox.net.
4	Charles Weirauch	36444 PLACID PLACE	480-575-9457	BUDDYWEIRAUCH@AOL.com
5	Patsy Miller	9441 E Romping Rd	480-595-6062	pmi08624939@AOL.com
6	Hal KESLER	7840 E CAREFREE DR	480 488 1484	KESHR@JUNO.COM
7	Michael & Rosemary Cascio	35791 N Sophora Dr	480-575-0725	Cascorp@COX.net
8	Nicola Morton	36143 N. Wildflower	480 595-5583	nfmorton@earthlink.net
9	[illegible]	36875 Stardust Ln	480 575 9362	
10	Peggy Dennison	BOX 1105 1033 Boulder Dr	488-2826	
11	Jonathan Pearson	PO Box 740 Carefree	488-3686	
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CAREFREE
Drainage Master Plan

Comment Sheet
Public Meeting
January 22, 2003

Given to Richard Harris on 1/28/03

Please use this sheet to provide us with any additional comments on the Carefree Drainage Master Plan. You can leave the comment sheet with us tonight, mail it by February 5, 2003, to Tony Bokich, CH2M Hill, 2625 S. Plaza Dr., Ste. 300, Tempe, AZ 85282, or fax it to him at (480) 966-9450.

Please Print

Name: WILLIAM P. McNULTY
Address: C/O GEN. DELIV., 36202 N. WILDFLOWER RD **E-mail:**
Phone Number: (480) 575-0191

Comments: * MY PROPERTY IS ON THE NORTHWEST INTERSECTION OF STAGECOACH PASS AND N. WILDFLOWER RD. IF I AM IMPACTED BY A 100-YR EVENT, THEN THE CURRENT CAREFREE STUDY DOES NOT SHOW THIS. I NEED TO SEE WHAT YOU REFER TO AS THE "NORTH SCOTTSDALE DELINEATION STUDY." PLEASE CONTACT ME IF YOU HAVE THIS INFO., OR TELL WHERE TO GO TO GET THIS OTHER STUDY.

Thank you,
Bill McNulty

Meeting Survey

How did you hear about the meeting tonight? ☐ Newspaper Notice ☐ Letter ☐ Other NEIGHBOR

How would you rate the overall knowledge and helpfulness of staff members who assisted you?
☒ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Did you receive all the information that you needed? ☐ Yes ☒ No * (SEE ABOVE)

How would you rate this facility for holding future meetings?
☐ Very Good ☒ Good ☐ Fair ☐ Poor ☐ Very Poor

CAREFREE
Drainage Master Plan

Comment Sheet

Public Meeting
January 22, 2003

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Please Print

Name: HAL KESLER

Address: 7840 E CAREFREE DR, P.O. Box 5203 **E-mail:** KESHR@JUNO.COM

Phone Number: 480 488 1484

Comments: Good General presentation - looking for the next level identifying lots in flood plain.

Meeting Survey

How did you hear about the meeting tonight? ☐ Newspaper Notice ☒ Letter ☐ Other _____

How would you rate the overall knowledge and helpfulness of staff members who assisted you?

☐ Very Good ☒ Good ☐ Fair ☐ Poor ☐ Very Poor

Did you receive all the information that you needed? ☐ Yes ☒ No

How would you rate this facility for holding future meetings?

☐ Very Good ☒ Good ☐ Fair ☐ Poor ☐ Very Poor

CAREFREE
Drainage Master Plan

Comment Sheet
Public Meeting
January 22, 2003

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Please Print

Name: DAVID DENNISON

Address: BOX 1103, CAREFREE, AZ 85377 E-mail:

Phone Number: 480 488 2826

Comments: I THINK THAT THE PLANS FOR A 100 YEAR FLOOD ARE OVERDESIGNED AND NOT TRULY NECESSARY. THERE ARE NO AREAS WHERE THE RESIDENTS CANNOT GET OUT VIA AN ALTERNATE ROUTE - IN THE WORST CASE THERE MIGHT BE A FEW HOURS DELAY. THE TOWN MAINTENANCE GROUP COULD IMPROVE THE SITUATION BY CLEANING OUT THE SEDIMENT THAT IMPAIRS THE EXISTING CULVERTS. A BRIDGE IN THESE AREAS IS A WASTE OF MONEY.

Meeting Survey

How did you hear about the meeting tonight? ☒ Newspaper Notice ☐ Letter ☐ Other

How would you rate the overall knowledge and helpfulness of staff members who assisted you?

☐ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Did you receive all the information that you needed? ☒ Yes ☐ No

How would you rate this facility for holding future meetings?

☐ Very Good ☒ Good ☐ Fair ☐ Poor ☐ Very Poor

1/22/03

CAREFREE
Drainage Master Plan

Comment Sheet
Public Meeting
January 22, 2003

Please use this sheet to provide us with any additional comments on the Carefree Drainage Master Plan. You can leave the comment sheet with us tonight, mail it by February 5, 2003, to Tony Bokich, CH2M Hill, 2625 S. Plaza Dr., Ste. 300, Tempe, AZ 85282, or fax it to him at (480) 966-9450.

Please Print

Name: GLENN R. MILLER
Address: 8956 E. LAZYWOOD PL. **E-mail:** CIFIO.MILLER
Phone Number: 480-575-8032

Comments:
EVERYBODY WAS INFORMATIVE DEPENDING ON YOUR QUESTIONS OF FIELD.

Meeting Survey

How did you hear about the meeting tonight? ☑ Newspaper Notice ☐ Letter ☐ Other TOWN NOTICE

How would you rate the overall knowledge and helpfulness of staff members who assisted you?
☑ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Did you receive all the information that you needed? ☑ Yes ☐ No

How would you rate this facility for holding future meetings?
☑ Very Good ☐ Good ☐ Fair ☐ Poor ☐ Very Poor

Mailing List for Carefree DMP

LAST NAME	FIRST NAME	COMPANY	ADDRESS	CITY	STATE	ZIP
ANDERSON	EVERETT	THE CROSSINGS AT CAREFREE II	PO BOX 3711	CAREFREE	AZ	85377
ARNOLD	RAYMOND		PO BOX 3344	CAREFREE	AZ	85377
AUSTIN	BOB	THE CROSSINGS AT CAREFREE II	PO BOX 5048	CAREFREE	AZ	85377
BAKER	ROBERT		7741 E PRIMROSE PATH	CAREFREE	AZ	85377
BLISS	BILL	CAREFREE GRANDVIEW ESTATES	PO BOX 2652	CAREFREE	AZ	85377
BOHANAN	CAROLYN		PO BOX 5010	CAREFREE	AZ	85377
BOTT	DAN	CAREFREE AIRPARK ESTATES	PO BOX 1167	CAREFREE	AZ	85377
BOWYER	RANDY		36843 N ROMPING RD	CAREFREE	AZ	85377
BREWER	JOHN		PO BOX 3554	CAREFREE	AZ	85377
CALVIS	TONY	TRANQUIL PLACE	7227 N 16TH ST, STE 235	PHOENIX	AZ	85020
CHRISTENSEN	MARIE	SKYRANCH FLIGHT ASSOCIATION	PO BOX 3604	CAREFREE	AZ	85377
COADY	BOB	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
CRANE	JOHN	CAREFREE FOOTHILLS	PO BOX 1224	CAREFREE	AZ	85377
CREMEENS	BUNNY	ARCHITECTURAL COMMITTEE	PO BOX 5801	CAREFREE	AZ	85377
DAHL	GIL		PO BOX 2399	CAREFREE	AZ	85377
DEMARCO	JOE		PO BOX 3225	CAREFREE	AZ	85377
DIERCKSMEIER	JOHN	CAREFREE ROLLING HILLS	PO BOX 2151	CAREFREE	AZ	85377
DOBAT	NED		9527 E ROMPING RD	CAREFREE	AZ	85377
EEMISSE	BEV	CAREFREE MOUNTAIN ESTATES	31043 N 45TH ST	CAVE CREEK	AZ	85331
EICHER	MIKE	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
EICHER	MIKE	BOULDERS CAREFREE	PO BOX 953	CAREFREE	AZ	85377
FRENADEZ	JEAN		PO BOX 810	CAREFREE	AZ	85377
FULCHER	WAYNE	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
GARDNER	GREG	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
GILBERT	DOUGLAS		PO BOX 1366	CAREFREE	AZ	85377
GROVE	RON	BLACK MOUNTAIN FOOTHILLS	PO BOX 3183	CAREFREE	AZ	85377
HAYNUM	JEFFREY		PO BOX 6134	CAREFREE	AZ	85377
JOHNSON	MELODY	CAREFREE VILLAS	PO BOX 2762	CAREFREE	AZ	85377
JONES	LESLIE & GERRY		PO BOX 1255	CAREFREE	AZ	85377
JONES	GERRY	HAWKSNEST PHASE II & III	PO BOX 1255	CAREFREE	AZ	85377
KAUPER	BILL	SKYRANCH HOMEOWNERS ASSOCIATION	PO BOX 2583	CAREFREE	AZ	85377
KESLER	HAL & MARY		PO BOX 5203	CAREFREE	AZ	85377
KORSTEN	ERICH		PO BOX 17915	FOUNTAIN HILLS	AZ	85269
KOSEL	VICKIE	NATIONAL PROPERTY SERVICES	PO BOX 31176	PHOENIX	AZ	85046
LINDER	MICHAEL	LOST ACRES	5670 E PERDIDO DR	CAVE CREEK	AZ	85331
LOEPER	DIETRICH	LOS REALES	PO BOX 1461	CAREFREE	AZ	85377

12/17/02

Mailing List for Carefree DMP

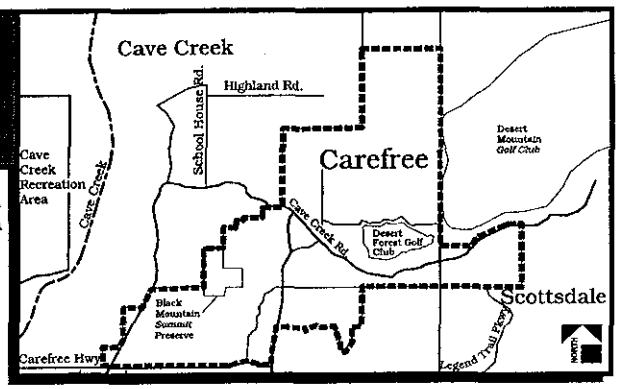
MACY	VICTORIA	DOUBLEGATE CONDOMINIUMS	PO BOX 3725	CAREFREE	AZ	85377
MARCAUD	VAL		2111 E HIGHLAND, STE 255	PHOENIX	AZ	85016
MEYER	LLOYD W	THE CROSSINGS AT CAREFREE III & IV	PO BOX 3440	CAREFREE	AZ	85377
MILLER	PATSY		9441 E ROMPING RD	CAREFREE	AZ	85377
MISSERI	JAN		PO BOX 3494	CAREFREE	AZ	85377
MORGAN	EDWARD C.	TOWN OF CAREFREE, MAYOR	PO BOX 740	CAREFREE	AZ	85377
NIROB	JENNY		36642 N ROMPING RD	CAREFREE	AZ	85377
ONEIL	LOIS		PO BOX 1190	CAREFREE	AZ	85377
ONEIL	LOIS	POSADA DEL SOL	PO BOX 1190	CAREFREE	AZ	85377
ORSBURN	MARV		PO BOX 5792	CAREFREE	AZ	85377
PARKER	BLAKE D	RIDGEVIEW ESTATES	8687 E VIA DE VENTURA, STE 310	SCOTTSDALE	AZ	85258
PARSONS	JOHNNY		PO BOX 5481	CAREFREE	AZ	85377
PEARSON	JONATHAN		PO BOX 740	CAREFREE	AZ	85377
PIETRO	DICK	HAWKSNEST PHASE I	PO BOX 1443	CAREFREE	AZ	85377
PRUETT	PAULA		37200 N PIMA RD	CAREFREE	AZ	85377
RABIDOUX	JOYCE	VILLA DEL SOL ASSOCIATIONS	PO BOX 982	CAREFREE	AZ	85377
RIGGS	CURTIS		6812 E CAVE CREEK RD	CAVE CREEK	AZ	85331
RIGGS	CURTIS		6812 E CAVE CREEK RD	CAVE CREEK	AZ	85331
ROOT	VAL		5818 E RESTIN RD	CAVE CREEK	AZ	85331
RUTHERFORD	DOUG	VELVET SHADOWS	PO BOX 796	CAREFREE	AZ	85377
SAVINO	MARY ANN	CAREFREE SENTINEL ROCK ESTATES	PO BOX 3791	CAREFREE	AZ	85377
SAVINO	AL	ARCHITECTURAL COMMITTEE	5839 E SENTINEL ROCK RD	CAVE CREEK	AZ	85331
SCHIANO	PATTY	CAREFREE ESTATES	PO BOX 2503	CAREFREE	AZ	85377
SMITH	DAVID		PO BOX 3578	CAREFREE	AZ	85377
SNYDER	DON	TOWN OF CAREFREE, VICE-MAYOR	PO BOX 740	CAREFREE	AZ	85377
SPERL	SCOTT		PO BOX 2722	CAREFREE	AZ	85377
STEVENS	GEOFFREY		PO BOX 3847	CAREFREE	AZ	85377
SWENSEN	JERRY	CAREFREE TERRACE CONDOMINIUMS	PO BOX 2265	CAREFREE	AZ	85377
VAUGHAN	FLOYD	ARCHITECTURAL REVIEW COMMITTEE	PO BOX 5194	CAREFREE	AZ	85377
WETTER	LARRY	BOULDER VISTA	PO BOX 2124	CAREFREE	AZ	85377
WHIPPLE	*HELEN*	*THE CROSSINGS AT CAREFREE*	*PO BOX 5052*	CAREFREE	AZ	85377
WILLIAMS	JAY	ARCHITECTURAL REVIEW COMMITTEE	PO BOX 2271	CAREFREE	AZ	85377
ZENO	NANCY		PO BOX 740	CAREFREE	AZ	85377
ZUCKER	GORDON	TOWN OF CAREFREE, COUNCILPERSON	PO BOX 740	CAREFREE	AZ	85377
		LOS ARCOS REALITY & MANAGEMENT	14415 N 73RD ST, STE 100	SCOTTSDALE	AZ	85260
		OCOTILLO RIDGE ESTATES	7600 E DOUBLETREE RANCH RD, STE 220	SCOTTSDALE	AZ	85258

12/17/02

CAREFREE
Drainage Master Plan

Flood Control District of Maricopa County – Public Meeting

Study Area Map



Key

Study Area

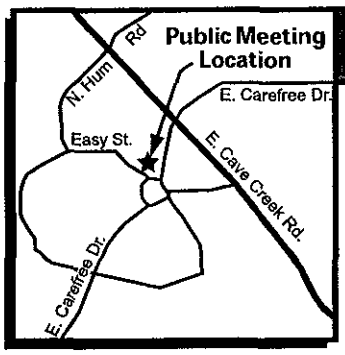
The Flood Control District of Maricopa County (District) has scheduled the third and final meeting for the first phase of the Carefree Drainage Master Plan (DMP). The purpose of this meeting is to present the Recommended Drainage Alternatives and discuss the floodplain delineation.

The Carefree DMP consists of storm water hydrology, hydraulics, and erosion/sedimentation analyses as well as the preparation of an environmental overview and identification of multi-use opportunities in the study area. The study includes delineation of floodplains and identification of potential solutions for major problem areas.

A brief presentation is scheduled for 6:45 p.m. The presentation will include an overview of the flood control and drainage recommendations followed by a question and answer period.

For more information or to submit comments, please visit the District Web site at www.fcd.maricopa.gov or contact Marilyn DeRosa, project manager, (602) 506-4766, mdr@mail.maricopa.gov. *Comments should be submitted by February 6, 2003.*

A sign language interpreter will be made available upon request with 72 hours notice. Alternative format materials, FM, or infrared listening devices are also available upon request with 72 hours notice. Additional reasonable accommodations will be made to the extent possible depending on the time available after the request.



Public Meeting Location

Thursday, January 23, 2003
6:30 p.m. to 8:00 p.m.
Presentation at 6:45 p.m.
Carefree Town Hall
100 Easy Street
Carefree, AZ

-send to Melissa

FLOOD CONTROL DISTRICT
of
Maricopa County

2801 West Durango Street • Phoenix, Arizona 85009-6399
Telephone (602) 506-1501
Fax (602) 506-4601
TT (602) 506-5897

BOARD OF DIRECTORS
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Mary Rose Garrido Wilcox
Max W. Wilson

May 17, 2004

Mr. Monther S. Madanat, Director
Engineering Division
Michael Baker, Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

SUBJECT: Case No. **Pending**
Community No. 040125
Carefree Drainage Master Study – Floodplain Delineation Study
Galloway Wash Floodplain/ Floodway Revision Request FIRM Panels 04013C0815H, 04013C0808H, 04013C0809H, 04013C0820F, 04013C0850E

Dear Mr. Madanat:

This letter serves to inform you that the Flood Control District of Maricopa County provides floodplain management review for the Town of Carefree. The Flood Control District agrees to adopt and enforce the requested revised Regulatory Floodway and Floodplain.

Please contact me at (602) 506-4779 with any questions or if we can be of further assistance.

Sincerely,

Lynn M. Thomas

Lynn M. Thomas, P.E., CFM
Floodplain Management Branch

Copy to: Jonathan H. Pearson, Town Administrator
Richard P. Harris P.E., FCD Project Manager

TOWN OF CAREFREE

100 EASY STREET
P.O. BOX 740
CAREFREE, ARIZONA 85377
(480) 488-3686 • FAX (480) 488-3845

Mr. Monther S. Madanat, Director
Engineering Division
Michael Baker, Jr., Inc.
3601 Eisenhower Avenue
Alexandria, Virginia 22304-6425

May 18, 2004

SUBJECT: Case No. **Pending**
Community No. 040125
Carefree Drainage Master Study -- Floodplain Delineation Study
Galloway Wash Floodplain/Floodway Revision Request FIRM Panels 04013C0815H, 04013C0808H, 04013C0809H, 04013C0820F, 04013C0850E

Dear Mr. Madanat:

This letter serves to inform you that the Flood Control District of Maricopa County provides floodplain management review for the Town of Carefree. The Town agrees to adopt and enforce the requested revised Regulatory Floodway and Floodplain and will forward all development requests in these areas to the Flood Control District for floodplain management purposes.

Please contact me at 480-488-3686 with any questions or if we can be of further assistance.

Sincerely,

Jonathan H. Pearson
Town Administrator

JP: jd

CC: Richard P. Harris P.E. FCD Project Manager

Patrick Wolf - FCDX

From: Richard Harris - FCDX
Sent: Friday, June 11, 2004 2:39 PM
To: Felicia Terry - FCDX
Cc: Richard Harris - FCDX; Patrick Wolf - FCDX; Michael Duncan - FCDX
Subject: Carefree FDS

Felicia

As requested by Patrick, this message is to confirm that I approve of the technical documentation within the subject study TDN, and recommend that it be sent to FEMA for review now.

If you have any questions, please let me know.

Thanks,

Richard

Wolf, Patrick/PHX

From: Erickson, Bill [Berickson@scottsdaleaz.gov]
Sent: June 04, 2004 11:53 AM
To: Wolf, Patrick/PHX; Richard Harris - FCDX (E-mail)
Cc: Bokich, Tony/PHX
Subject: Carefree DMP Review

Patrick:

City staff has reviewed the subject plan, specifically the Carefree Floodplain Delineation within Scottsdale, sheets 2 and 3 of 8 and have no objections.

One question we did observe some buildings on our 2002 and 2004 aerial photography adjacent to the unnamed central tributary to Cave Creek and just south of Stagecoach Pass on the south side of the Carefree Highway on panel 3 of 8 between the match line to sheet 2 and section 1.8424 which are not shown on sheet 3. If these are out-buildings or livestock shelters, this comment is mute. If they are habitable dwellings staff believes they should be shown prior to submitting the package to FEMA.

If I can be of further assistance, please let me know.

Sincerely,
William Erickson
Floodplain Administrator
(480) 312-7652

AZTEC ENGINEERING

Bridge Design

Civil Engineering

Construction Administration

Drainage

Graphic Design

Roadway Design

Survey

Traffic Engineering

Urban Freeway Design

Phoenix, AZ

Irvine, CA

Pasadena, CA

3747 East Grove Street
Phoenix, Arizona
85040-3982

Tel: 602-454-0402

Fax: 602-454-0403

E-mail:
aztec@aztecengcom

Web Site:
www.aztecengcom

SURVEY REPORT
For
CAREFREE DRAINAGE MASTER PLAN
FCD 2000C037

This survey was conducted to provide aerial mapping control for the above referenced project. It is understood that this mapping will be joined to existing mapping established for the adjacent delineation study of Andora Hills and Galloway Washes (FCD 99-14). Aztec Engineering has obtained survey and mapping information from J.E. Fuller/Hydrology and Geomorphology, Inc. for the FCD 99-14 project. According to the J.E. Fuller report, A Team Professional Associates, Inc. performed the survey for FCD 99-14. Reference was made to a survey report prepared by A Team for Maricopa County Flood Control District and J.E. Fuller Hydrology and Geomorphology to verify consistent horizontal and vertical harmony between this project and FCD 99-14.

The survey control used for this project is the Maricopa County GDACS Control Network. 5 triangulation stations from the GDACS Network have been incorporated into the survey (see Table 1). In addition, 6 aerial targets from the A Team survey, 5 Maricopa County ERM's and 3 FEMA benchmarks were included. All surveyed points were generated using Real Time Kinematic GPS measurements. Each point was observed twice at 90 epochs each occurrence. The initial survey was conducted using the published NAD 83 State Plane grid coordinates, Arizona Central Zone, and NAVD 88 elevations from the GDACS Control Network.

TABLE 1

POINT	Grid North	Grid East	NAVD88 El
1JH3	1008572.976	691530.951	2113.589
1KI3	1023262.290	708993.091	2580.971
1KK3	1024052.306	739568.661	2713.389
1LH3	1031267.871	692887.690	2288.553
1LJ1	1039134.439	723407.467	3254.633

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The measured horizontal coordinates from this survey were compared with record values for the aerial panels developed during the A Team survey (see Table 2). The coordinates established by this survey agree with the coordinates from the A Team survey within the accuracy level of an NGS Third Order Class 1 survey (see Table 3).

TABLE 2

A Team Coordinates				Measured Coordinates			
Point	Grid North	Grid East	NGVD29 El	Point	Grid North	Grid East	NAVD88 El
6	1023606.654	712864.859	2672.219	137	1023606.733	712864.884	2674.508
30	1026065.220	702440.121	2458.456	144	1026065.247	702440.123	2460.674
31	1027635.065	705848.963	2545.851	138	1027635.168	705848.998	2548.119
32	1027656.690	707655.810	2589.368	139	1027656.717	707655.829	2591.578
33	1028687.523	707689.390	2598.367	140	1028687.600	707689.400	2600.517
34	1026257.001	709259.505	2623.285	136	1026257.088	709259.498	2625.523

The NAVD 88 elevations from this survey were used to develop a conversion factor to the NGVD 29 vertical datum established by the A Team survey. A shift of –2.23 feet achieves a best-fit average to the elevations shown in the A Team survey report, with a vertical root mean square error (RMSE) value for the 6 targets analyzed of 0.045 feet (see Table 3).

TABLE 3

Difference (A Team to Aztec)			RMSE (Vertical)	
North	East	Elev	D	D^2
-0.079	-0.025	-2.289	-0.059	0.003481
-0.027	-0.002	-2.218	0.012	0.000144
-0.103	-0.035	-2.268	-0.038	0.001444
-0.027	-0.019	-2.210	0.02	0.000400
-0.077	-0.010	-2.150	0.08	0.006400
-0.087	0.007	-2.238	-0.008	0.000064
	Average =	-2.23	Sum D^2 =	0.011933
			Sum D^2/ 6 =	0.001989
			RMSE ($\sqrt{\sum D^2/6}$)=	0.044596

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Web Site:
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Using the shift developed from the above analysis, a comparison was made between published NGVD 29 elevations and surveyed elevations for the Maricopa County ERM's and for FEMA benchmarks listed on Flood Insurance Rate Map 04013C0805 and also listed in the survey report from A Team (See Table 4). As can be seen, ERM 119 does not fit expected accuracy and was disregarded. The remaining benchmarks have an RMSE value of 0.19 feet.

TABLE 4

Benchmark	Record Elevation	Measured Elevation	Difference	D^2
ERM 119	2113.05	2117.97	4.92	24.2064
ERM 120	2038.93	2038.90	-0.03	0.0009
ERM 133	2373.54	2373.75	0.21	0.0441
ERM 134	2389.00	2388.64	-0.36	0.1296
ERM 599	2503.56	2503.40	-0.16	0.0256
FEMA 5	2373.76	2373.71	-0.05	0.0025
FEMA 6	2443.44	2443.33	-0.11	0.0121
FEMA 7	2557.10	2556.94	-0.16	0.0256
			Sum D^2 =	0.2404
			Sum D^2/ 7 =	0.0343
			RMSE ($\sqrt{\Sigma D^2/7}$)=	0.1853

Using the 5 GDACS control points listed in Table 1 as primary control, with elevations adjusted to NGVD 29, the aerial targets were established for this project by GPS methods as described above. The horizontal and vertical positions of the aerial targets meet the accuracy standards for an NGS Third Order Class 1 survey per FEMA Manual 37. The survey is in horizontal and vertical harmony with the adjacent project, FCD 99-14.

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
25396
ALAN D.
REECE
Date Signed 4-17-02
ARIZONA, U.S.A.

TYP_LID	HOR_LID	VER_LID	XNAD27	YNAD27	XNAD83	YNAD83	NGVD29	NAVD88	MNT_LID	PNTNUM	DESC
6	7	13	0.000	0.000	703452.544	1024494.137	2485.290	0.000	3	1	Set 1/2" rebar
6	7	13	0.000	0.000	703667.386	1023517.856	2479.880	0.000	3	2	Set 1/2" rebar
6	7	13	0.000	0.000	705346.824	1024086.509	2517.520	0.000	3	3	Set 1/2" rebar
6	7	13	0.000	0.000	707133.527	1024186.504	2549.590	0.000	3	4	Set 1/2" rebar
6	7	13	0.000	0.000	708498.797	1023285.904	2580.450	0.000	3	5	Set 1/2" rebar
6	7	13	0.000	0.000	710190.252	1024842.078	2627.940	0.000	22	6	Set concrete nail
6	7	13	0.000	0.000	711819.768	1025707.020	2669.620	0.000	22	7	Set concrete nail
6	7	13	0.000	0.000	708433.004	1025458.462	2597.500	0.000	3	8	Set 1/2" rebar
6	7	13	0.000	0.000	713536.471	1023327.923	2676.120	0.000	3	9	Set 1/2" rebar
6	7	13	0.000	0.000	713552.558	1027443.923	2744.930	0.000	3	10	Set 1/2" rebar
6	7	13	0.000	0.000	707729.559	1028713.305	2602.360	0.000	22	11	Set concrete nail
6	7	13	0.000	0.000	708644.950	1032306.157	2741.250	0.000	3	12	Set 1/2" rebar
6	7	13	0.000	0.000	699907.762	1030286.911	2389.270	0.000	22	13	Set concrete nail
6	7	13	0.000	0.000	702422.181	1030272.321	2480.950	0.000	22	14	Set concrete nail
6	7	13	0.000	0.000	705127.546	1030814.217	2529.970	0.000	3	15	Set 1/2" rebar
6	7	13	0.000	0.000	706419.297	1030955.116	2576.350	0.000	22	16	Set concrete nail
6	7	13	0.000	0.000	700301.507	1027899.059	2391.850	0.000	22	17	Set concrete nail
6	7	13	0.000	0.000	697177.734	1022855.790	2368.280	0.000	3	18	Set 1/2" rebar
6	7	13	0.000	0.000	696915.934	1021490.231	2340.070	0.000	22	19	Set concrete nail
6	7	13	0.000	0.000	698759.468	1021310.432	2336.800	0.000	22	20	Set concrete nail
6	7	13	0.000	0.000	696559.702	1019414.950	2272.970	0.000	3	21	Set 1/2" rebar
6	7	13	0.000	0.000	695534.398	1019292.829	2254.610	0.000	22	22	Set concrete nail
6	7	13	0.000	0.000	694139.409	1018508.589	2222.050	0.000	3	23	Set 1/2" rebar
6	7	13	0.000	0.000	687691.398	1022224.404	2052.250	0.000	22	24	Set concrete nail
6	7	13	0.000	0.000	685766.843	1018548.933	2039.290	0.000	3	25	Set 1/2" rebar
6	7	13	0.000	0.000	689226.008	1018159.478	2115.680	0.000	3	26	Set 1/2" rebar
6	7	13	0.000	0.000	691045.657	1018265.146	2162.460	0.000	3	27	Set 1/2" rebar
6	7	13	0.000	0.000	688127.479	1019592.458	2078.200	0.000	22	28	Set concrete nail
6	7	13	0.000	0.000	692615.593	1016357.753	2177.560	0.000	3	29	Set 1/2" rebar
6	7	13	0.000	0.000	692219.858	1018385.935	2186.400	0.000	3	30	Set 1/2" rebar

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
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REECE
Date Signed 4-17-02
ARIZONA U.S.A.

HOR_LID	VER_LID	XNAD27	YNAD27	XNAD83	YNAD83	NGVD29	NAVD88	MNT_LID	RMNUM	DESC
7	13	0.000	0.000	704426.501	1024733.036	2503.400	0.000	8	ERM 599	USGS Brass cap in concrete slab 10' in front of airplane fuel pump at Carefree airport.
7	13	0.000	0.000	699813.397	1028893.587	2373.710	0.000	8	FEMA 5	Brass cap in the NW corner of Sundance Tr. And Tranquil Tl. Stamped RLS 11062.
7	13	0.000	0.000	702432.549	1028625.677	2443.330	0.000	8	FEMA 6	Brass cap in headwall at the NW corner of Mule Train Rd. and Serene St.
7	13	0.000	0.000	706517.239	1027710.893	2556.940	0.000	7	FEMA 7	Brass cap in centerline of Carefree Dr. 0.2 miles west of Pima Rd.

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
25396
ALAN D.
REECE
Date Signed 4-17-02
ARIZONA, U.S.A.

VERTICAL CHECK SURVEY
for the
Carefree Drainage Master Plan
FCD 2000C037

During the month of March 2002 AZTEC Engineering conducted a vertical check survey for the above referenced project. 29 points were surveyed on the ground and compared to measurements taken from the mapping for the same points. A summary of the results is contained in the table below.

Point #	Ground North	Ground East	Surveyed Elev	Mapped Elev	Discrepancies	D^2	Code
1001	1018945.2832	686087.2705	2041.84	2042.00	0.16	0.0256	NG
1002	1019392.8963	686321.6921	2043.99	2044.00	0.01	0.0001	NG
1006	1021191.0280	687263.5777	2038.27	2038.00	-0.27	0.0729	EL
1007	1021661.8325	687509.6705	2041.31	2041.51	0.20	0.0400	NG
1009	1018405.6800	692215.9889	2187.26	2186.63	-0.63	0.3969	NG
1010	1018327.8748	692231.0778	2184.07	2184.00	-0.07	0.0049	PAV
1011	1017832.2551	692327.7388	2182.45	2182.00	-0.45	0.2025	NG
1012	1017407.0152	692411.0544	2182.19	2182.00	-0.19	0.0361	NG
1016	1019405.4980	696608.7625	2272.31	2272.41	0.10	0.0100	NG
1017	1019928.7424	696702.5868	2282.65	2282.87	0.22	0.0484	PAV
1018	1020391.3209	696786.3726	2299.30	2299.29	-0.01	0.0001	NG
1019	1020879.6560	696874.0254	2311.18	2311.30	0.12	0.0144	NG
1026	1024669.2383	703358.1802	2481.39	2481.91	0.52	0.2704	PAV
1027	1024385.3134	703311.1128	2482.09	2482.10	0.01	0.0001	PAV
1028	1024008.4846	703734.2890	2486.50	2486.15	-0.35	0.1225	NG
1029	1023616.2614	704092.0841	2486.48	2486.58	0.10	0.0100	PAV
1034	1025923.3542	709422.5195	2624.57	2625.28	0.71	0.5041	PAV
1035	1025680.4741	709195.8761	2618.76	2619.41	0.65	0.4225	PAV
1036	1025146.2920	709639.8898	2615.18	2615.11	-0.07	0.0049	PAV
1037	1024745.9206	709757.6415	2611.44	2611.44	0.00	0.0000	PAV
1038	1024190.3147	709558.1579	2597.99	2597.99	0.00	0.0000	PAV
1053	1028720.7253	702460.9769	2445.08	2444.92	-0.16	0.0256	PAV
1054	1029221.2019	702462.4437	2446.35	2446.00	-0.35	0.1225	NG
1055	1029722.9172	702428.1911	2446.18	2446.15	-0.03	0.0009	PAV
1056	1030222.8149	702430.6049	2479.71	2479.65	-0.06	0.0036	PAV
1058	1030774.5085	702394.6959	2451.47	2451.49	0.02	0.0004	NG
1067	1029964.6391	707780.7420	2605.46	2605.71	0.25	0.0625	NG
1068	1030591.6773	707778.0148	2594.51	2594.98	0.47	0.2209	NG
1072	1031081.7248	707774.9706	2637.82	2637.63	-0.19	0.0361	NG
					Sum =	2.6589	

The accuracy of the mapping has been verified using two methods. First, from FEMA Manual 37, the check survey should produce a root mean square error (RMSE) not greater than 0.67 feet.

$RMSE = \sqrt{\sum D^2/n}$ where: $\sum D^2$ = the sum of the squared discrepancies between map-derived elevations and surveyed elevations
n = number of points surveyed

$RMSE = \sqrt{2.6589/29} = .30'$

Second, per the National Map Accuracy Standards less than 10% of the elevation measurements taken from the mapping should differ from the surveyed elevations by more than ½ of the contour interval. All measurements in the table above are within ½ contour interval (1') of the surveyed elevations.

AZTEC Engineering hereby certifies that based on the data above, the mapping contained in the files received from M&B Aerial Mapping meets the accuracy standards of a Third Order Class 1 Survey as set forth in FEMA Manual 37.

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
25396
ALAN D.
REECE
Date Signed 4-11-02
ARIZONA U.S.A.

Detailed Culvert Survey

TO: Tony Bokich

COPIES: File

FROM: Rob Lyons

DATE: September 2, 2003

This appendix contains an Existing Facilities map, the Existing Drainage Improvements table and the Carefree Culvert Survey Points table. The Carefree Culvert Survey Points Table lists the culverts used in the HEC-RAS floodplain models that were inventoried within the Carefree Drainage Master Plan. The survey point numbers are listed for reference. The survey point coordinates and elevations are listed in the field notes and date included in Appendix C.3. Field survey control, equipment and accuracy are listed in both the Survey Report in Appendix C.1 and in the field notes in Appendix C.3.

Table 10
Existing Drainage Improvements

#	APPROXIMATE LOCATION	DEVICE SIZE/TYPE	L (ft)	IE(UP)	IE(DWN)	GRND	INFORMATION SOURCE
1	CAVE CREEK RD, 83' N. OF CL OF CAREFREE HWY/CC ROAD	18" CMP	120	2037.00	2035.48	2039.80	AS BUILT PLANS CC RD. IMPROV. 9/6/90
2	CAVE CREEK RD, 557' N. OF CL OF CAREFREE HWY/CC ROAD	49" X 39" CMPA	124	2036.95	2035.07	2042.30	AS BUILT PLANS CC RD. IMPROV. 9/6/90
3	CAVE CREEK RD, 1037' N. OF CL OF CAREFREE HWY/CC ROAD	2-71" X 47" CMPA	136	2038.50	2036.53	2044.80	AS BUILT PLANS CC RD. IMPROV. 9/6/90
4	CAVE CREEK RD, 1690' N. OF CL OF CAREFREE HWY/CC ROAD	42" CMP	126	2039.65	2037.76	2046.40	AS BUILT PLANS CC RD. IMPROV. 9/6/90
5	CAVE CREEK RD, 2465' N. OF CL OF CAREFREE HWY/CC ROAD	36" CMP	122	2042.13	2040.30	2048.40	AS BUILT PLANS CC RD. IMPROV. 9/6/90
6	CAVE CREEK RD, 3552' N. OF CL OF CAREFREE HWY/CC ROAD	3-66" CMP	126	2028.35	2025.47	2036.40	AS BUILT PLANS CC RD. IMPROV. 9/6/90
7	CAVE CREEK RD, 3950' N. OF CL OF CAREFREE HWY/CC ROAD	3-64" X 43" CMPA	144	2034.82	2032.66	2040.00	AS BUILT PLANS CC RD. IMPROV. 9/6/90
8	CAVE CREEK RD, 4857' N. OF CL OF CAREFREE HWY/CC ROAD	2-42" X 29" CMPA	158	2065.87	2063.50	2069.60	AS BUILT PLANS CC RD. IMPROV. 9/6/90
9	CAVE CREEK RD, 5235' N. OF CL OF CAREFREE HWY/CC ROAD	2-49" X 33" CMPA	184	2077.76	2075.00	2082.40	AS BUILT PLANS CC RD. IMPROV. 9/6/90
10	PIMA RD, 616' N. OF CL OF PIMA RD/STAGECOACH PASS	21" CMP	74	2560.86	2559.50	2566.90	PIMA RD IMPROV. 10/5/92 (REVISED 1/93)
11	PIMA RD, 1115' N. OF CL OF PIMA RD/STAGECOACH PASS	3-57" X 38" CMPA	74	2566.00	2564.52	2572.40	PIMA RD IMPROV. 10/5/92 (REVISED 1/93) FIELD SURVEY OCT, NOV, DEC 2002
12	PIMA RD, 1417' N. OF CL OF PIMA RD/STAGECOACH PASS	18" CMP	88	2572.40	2569.85	2576.50	PIMA RD IMPROV. 10/5/92 (REVISED 1/93)
13	PIMA RD, 88' N. OF CL OF PIMA RD/CAVE CREEK	36" RGRCP	82	2573.63		2579.30	PIMA RD IMPROV. 10/5/92 (REVISED 1/93)
14	CAREFREE MTN DR	24" Concrete Pipe	108	(B) -9.0	(B) -9.9	(T) -6.2	CAREFREE MTN ESTATES GRADING PLAN, 9/94
15	CAREFREE MTN DR	24" Concrete Pipe	60	(B) -9.0	(B) -9.7	(T) -5.6	CAREFREE MTN ESTATES GRADING PLAN, 9/94
16	AGAVE PL	24" Concrete Pipe	60	(B) -9.5	(B) -9.4	(T) -5.7	CAREFREE MTN ESTATES GRADING PLAN, 9/94
17	CAREFREE MTN DR	24" Concrete Pipe	73	(B) -8.5	(B) -10	(T) -5.5	CAREFREE MTN ESTATES GRADING PLAN, 9/94
18	CANOTIA PL	24" Concrete Pipe	63	(B) -8.7	(B) -9.4	(T) -5.9	CAREFREE MTN ESTATES GRADING PLAN, 9/94
19	CAREFREE MTN DR	24" Concrete Pipe	85	(B) -9.5	(B) -9.6	(T) -5.3	CAREFREE MTN ESTATES GRADING PLAN, 9/94
20	CAREFREE MTN DR	2- 8'x3' CBC	56	2075.00	2073.50	2081.30	CAREFREE MTN ESTATES GRADING PLAN, 9/94, FIELD SURVEY OCT, NOV, DEC 02
21	DALEA PL	2-24"Concrete Pipes	48	(B)-9.0	(B)-9.6	(T)-5.5	CAREFREE MTN ESTATES GRADING PLAN, 9/94
22	UNNAMED RD	No CULVERT					CAREFREE MTN ESTATES GRADING PLAN, 9/94
23	CAREFREE MTN DR	2-10'x4' CBC	70	(B)-12.5	(B)-14	(T) -6.6	CAREFREE MTN ESTATES GRADING PLAN, 9/94
23a	CAREFREE MTN DRIVE	24" RCP	75	2083.00	2081.00	2084.80	FIELD SURVEY 10/23/01
24	TRANQUIL PL	24" RCP	95	2373.80	2373.00	2376.89	IMPROVEMENT PLANS FOR TRANQUIL PL, 1/96
25	TRANQUIL PL	2-42" RCP	45	2363.50	2362.86	2367.10	IMPROVEMENT PLANS FOR TRANQUIL PL, 1/96
26	TRANQUIL PL	2-42" RCP	45	2358.93	2358.00	2362.00	IMPROVEMENT PLANS FOR TRANQUIL PL, 1/96
27	LOS REALES DR	4-10' X 4' RCB	40	2117.15	2116.45	2123.8	DRAINAGE RPT FOR LOS GEMELOS, 6/96, FIELD SURVEY OCT, NOV, DEC 2002
28	58TH ST	2-24" CMP	60	2069.90	2067.20	2078.2	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
29	58TH ST	2-24" CMP	65	2087.70	2085.70	2091.4	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
30	61ST ST	2-36" CMP	66	2099.92	2097.65	2104.5	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
31	RESTIN RD	18" CMP	70	2107.20	2103.00	2110.0	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
32	RESTIN RD	24" CMP	76	2147.32	2142.00	2150.4	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
33	61ST ST	4-36" CMP	66	2169.25	2164.50	2173.8	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
34	61ST ST	2-36" CMP	94	2188.30	2182.70	2193.5	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
35	LITTLE HOPE PL	30" CMP	74	2216.50	2211.80	2221.1	CAREFREE SENTINEL ROCKESTATES ASBUILT 8/9/85
36	10+20 N. OF CL CAREFREE HWY/SCOTTSDALE RD	3-60" CMP	180	2267.00	2263.00	2274.0	CAREFREE IMPROVEMENT DISTRICT 7/63, FIELD SURVEY OCT, NOV, DEC 2002
37	12+50 N. OF CL CAREFREE HWY/SCOTTSDALE RD	60" CMP	128	2268.00	2267.00	2275.0	CAREFREE IMPROVEMENT DISTRICT 7/63
38	31+90 N. OF CL CAREFREE HWY/SCOTTSDALE RD	18" CMP	124	2336.00	2331.00	2341.0	CAREFREE IMPROVEMENT DISTRICT 7/63
39	41+90 N. OF CL CAREFREE HWY/SCOTTSDALE RD	24" CMP	140	2355.00	2360.00	2363.0	CAREFREE IMPROVEMENT DISTRICT 7/63
40	51+35 N. OF CL CAREFREE HWY/SCOTTSDALE RD	24" CMP	136	2371.50	2369.00	2374.0	CAREFREE IMPROVEMENT DISTRICT 7/63
41	55+85 N. OF CL CAREFREE HWY/SCOTTSDALE RD	18" CMP	120	2355.00	2358.00	2361.5	CAREFREE IMPROVEMENT DISTRICT 7/63
41a	59+25 N. OF CL CAREFREE HWY/SCOTTSDALE RD (found 10/23/01)	18" CMP	124	2348.50	2346.00	2353.0	FIELD SURVEY 10/23/01
42	68+50 N. OF CL CAREFREE HWY/SCOTTSDALE RD	60" CMP	128	2322.00	2321.00	2328.0	CAREFREE IMPROVEMENT DISTRICT 7/63
43	72+85 N. OF CL CAREFREE HWY/SCOTTSDALE RD	24" CMP	124	2321.00	2318.00	2326.0	CAREFREE IMPROVEMENT DISTRICT 7/63
44	77+50 N. OF CL CAREFREE HWY/SCOTTSDALE RD	18" CMP	110	2342.00	2338.00	2351.0	CAREFREE IMPROVEMENT DISTRICT 7/63
45	82+70 N. OF CL CAREFREE HWY/SCOTTSDALE RD	24" CMP	136	2340.00	2335.00	2345.5	CAREFREE IMPROVEMENT DISTRICT 7/63
46	86+25 N. OF CL CAREFREE HWY/SCOTTSDALE RD	30" CMP	128	2338.00	2336.00	2346.0	CAREFREE IMPROVEMENT DISTRICT 7/63
47	102+81 N. OF CL CAREFREE HWY/SCOTTSDALE RD	DOWNTOWN SD SYSTEM					SEE DOWNTOWN IMP. PLANS
48	102+48 N. OF CL CAREFREE HWY/SCOTTSDALE RD	SINGLE GRATE CB	36	2342.93(G)	2338.93	2343.0	CAREFREE IMPROVEMENT DISTRICT 7/63
49	RISING SUN RD, 450' N. OF CL RISING SUN/STEVENS	3-36" CMP	63	2367.00	2365.00	2379.5	THE CROSSINGS AT CAREFREE II IMP. PLANS 4/95
50	RISING SUN RD, 200' N. OF CL RISING SUN/STEVENS	18" CMP	68	2382.00	2379.00	2386.4	THE CROSSINGS AT CAREFREE II IMP. PLANS 4/95
51	RISING SUN	18" CMP	64	2387.00	2380.00	2388.8	THE CROSSINGS AT CAREFREE II IMP. PLANS 4/95
52	RISING SUN	18" CMP	64	2384.00	2377.85	2386.8	THE CROSSINGS AT CAREFREE II IMP. PLANS 4/95
53	W. RISING STAR CR	18" CMP	66	2377.00	2376.00	2382.0	THE CROSSINGS AT CAREFREE II IMP. PLANS 4/95

Table 10
Existing Drainage Improvements

#	APPROXIMATE LOCATION	DEVICE SIZE/TYPE	L (ft)	IE(UP)	IE(DWN)	GRND	INFORMATION SOURCE
54	W. RISING STAR CR	18" CMP	52	2371.00	2363.00	2373.2	THE CROSSINGS AT CAREFREE II IMP. PLANS 4/95
55	RISING STAR WAY	4-36" CMP	65	2340.00	2339.00	2346.4	THE CROSSINGS AT CAREFREE III IMP. PLANS 9/96
56	VALLEY VIEW CIRCLE	24" CMP	85	2350.00	2347.50	2353.0	THE CROSSINGS AT CAREFREE III IMP. PLANS 9/96
57	PERDIDO DR - ASSUME 2' COVER	24" X 18" CMPA	78	2052.63	2051.57	2054.6	IMPROVEMENT PLANS FOR LOST ACRES ESTATES. 10/93
58	PERDIDO DR - ASSUME 2' COVER	2-24" X 18" CMPA	73	2058.01	2056.99	2060.0	IMPROVEMENT PLANS FOR LOST ACRES ESTATES. 10/93
59	PERDIDO DR - ASSUME 2' COVER	4-24' X 18"CMPA	75	2067.88	2066.76	2069.9	IMPROVEMENT PLANS FOR LOST ACRES ESTATES. 10/93
60	BLOODY BASIN RD AT SIDEWINDER	24" CMP	84	2367.00	2364.00	2371.0	CAREFREE IMPROVEMENT DISTRICT 7/63
61	BLOODY BASIN RD AT SIDEWINDER	24" CMP	68	2368.00	2376.00	2381.0	CAREFREE IMPROVEMENT DISTRICT 7/63
62	ELBOW BEND BETWEEN SIDEWINDER AND NONCHALANT	30" CMP	75	2370.00	2367.00	2372.0	CAREFREE IMPROVEMENT DISTRICT 7/63
63	TRANQUIL TRAIL AT CAVE CREEK RD	36" CMP	64	2384.50	2385.00	2390.0	CAREFREE IMPROVEMENT DISTRICT 7/63
64	MULE TRAIN JUST SOUTH OF BREATHLESS DR	24" CMP	50	2456.00	2455.00	2461.0	CAREFREE IMPROVEMENT DISTRICT 7/63
65	MULE TRAIN JUST NORTH OF CAVE CREEK RD	24" CMP	110	2452.00	2455.00	2465.0	CAREFREE IMPROVEMENT DISTRICT 7/63
66	MULE TRAIN, 500' SOUTH OF PRIMROSE	24" CMP	96	2457.00	2254.00	2465.0	CAREFREE IMPROVEMENT DISTRICT 7/63
67	MULE TRAIN, 130' SOUTH OF PRIMROSE	30" CMP	100	2449.50	2446.50	2462.0	CAREFREE IMPROVEMENT DISTRICT 7/63
68	MULE TRAIN ROAD AT RAMBLING RD	2-30" CMP	170	2445.00	2445.00	2449.0	CAREFREE IMPROVEMENT DISTRICT 7/63
69	MULE TRAIN ROAD AT SERENE ST	30" CMP	75	2339.5	2337.50	2445.0	CAREFREE IMPROVEMENT DISTRICT 7/63
70	SUNDANCE TRAIL EAST OF CAVE CREEK ROAD	48" CMP	72	2331.00	2330.00	2385.7	CAREFREE IMPROVEMENT DISTRICT 7/63
71	CAREFREE DRIVE WAST OF CAVE CREEK RD	30" CMP	70	2354.00	2351.00	2359.0	CAREFREE IMPROVEMENT DISTRICT 7/63
72	TRANQUIL TRAIL S. OF CAREFREE DR, N. OF HAPPY HOLLOW	24" CMP	92	2383.00	2381.00	2390.0	CAREFREE IMPROVEMENT DISTRICT 7/63
73	TRANQUIL TRAIL 275' S. OF HUM RD	15" CMP	68	2378.50	2377.00	2483.0	CAREFREE IMPROVEMENT DISTRICT 7/63
74	DREAM ST, N. OF PRIMROSE PATH	15" CMP	48	2433.00	2431.00	2436.0	CAREFREE IMPROVEMENT DISTRICT 7/63
75	CROSSINGS AT CAREFREE IV	18" CMP	78	2347.36	2341.01	2350.0	CAREFREE IMPROVEMENT DISTRICT 7/63
76	CROSSINGS AT CAREFREE IV	18" CMP	52	2347.96	2342.85	2354.0	CAREFREE IMPROVEMENT DISTRICT 7/63
77	CROSSINGS AT CAREFREE IV	18" CMP	95	2353.97	2346.08	2357.0	CAREFREE IMPROVEMENT DISTRICT 7/63
78	CRESTED QUAIL RUN CUL DE SAC	2-30" CMP	60	2443.04	2441.26	2450.5	OCOTTILO RIDGE, APPEAR TO BE ASBUILT STAMPED 10/14/97
79	CRESTED QUAIL RUN CUL DE SAC, 145' FROM CL OCOTILLO RIDGE	15" RGRCP	60	2461.00	2458.50	2465.7	OCOTILLO RIDGE, APPEAR TO BE ASBUILT STAMPED 10/14/97
80	CAVE CREEK RD AND AUTOPLANE DR.	2-42" SD	65	2476	2471.7	2481.9	ASSUMED FROM CONTOURS
81	SUNSET TRAIL N. OF CAREFREE HWY, BEFORE OLD PAINT TRAIL	24" CMP	74	(T) -8.3	(T) -11	(T) -6.0	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83. 2" sediment (10/23/01)
82	OLD PAINT TRAIL EAST OF SUNSET TRAIL	21" CMP	68	(T) -7.9	(B) - 8.0	(T)-5.2	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83
83	HIDDEN CANYON CUL DE SAC - ASSUME 1% SLOPE	27" CMP	100	(B) -13.5	(B) -14.5	(T) -6.5	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/8. Rock & Concrete Sediment
84	CAREFREE HWY E. OF SUNSET TRAIL	30" CMP	82	2167.30	2161.50	2171.0	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83
85	CAREFREE HWY E. OF SUNSET TRAIL	48" CMP	58	2171.82	2169.52	2173.6	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83
86	CAREFREE HWY E. OF ARROYO RD	36" CMP	40	2185.68	2185.62	2189.4	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83
87	CAREFREE HWY E. OF ARROYO RD	48" CMP	75	2198.32	2196.77	2199.1	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83
88	CAREFREE HWY JUST W. OF N. RIDGEWAY DR	48" CMP	70	2198.32	2196.77	2203.6	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83
89	CAREFREE HWY JUST E. OF N. RIDGEWAY DR	48" CMP	70	2198.82	2196.38	2198.9	CAREFREE FOOTHILLS IMPROVEMENT PLANS 2/17/83
90	NONCHALANT AT BLOODY BASIN	30"CMP	70	2379.50	2377.00	2385.0	CAREFREE IMPROVEMENT DISTRICT 7/63
91	LANGUID LN AND SCOTTSDALE RD.	24" CMP	48	2281.00	2279.50	2284.5	CAREFREE IMPROVEMENT DISTRICT 7/63
92	PEACEFUL PL AT STAGE COACH PASS	24" CMP	56	2373.00	2372.00	2376.5	CAREFREE IMPROVEMENT DISTRICT 7/63
93	CAREFREE DRIVE JUST BEFORE EASY ST - ASSUME 1% SLOPE	30" CMP	100	2349.00	2348.00	2360.0	CAREFREE IMPROVEMENT DISTRICT 7/63
94	SIDEWINDER RD JUST S. OF LAZY LANE	24" CMP	92	2366.00	2365.00	2371.0	CAREFREE IMPROVEMENT DISTRICT 7/63
95	SIDEWINDER RD JUST S. OF BLOODY BASIN	24" CMP	92	2370.50	2368.00	2375.0	CAREFREE IMPROVEMENT DISTRICT 7/63
96	NONCHALANT AVE BETWEEN BLOODY BASIN AND ELBOW BEND	30" CMP	65	2379.50	2377.00	2385.0	CAREFREE IMPROVEMENT DISTRICT 7/63
97	CROSSINGS AT CAREFREE IV	RIPRAP CHANNEL					CAREFREE IMPROVEMENT DISTRICT 7/63
98	CROSSINGS AT CAREFREE IV	RIPRAP CHANNEL					CAREFREE IMPROVEMENT DISTRICT 7/63
99	CRESTED QUAIL RUN CUL DE SAC	24" CMP	79	2444.51	2441.26	2450.5	OCOTILLO RIDGE ESTATES IMP. PLANS, APPEAR TO BE AS BUILT STAMPED 10/14/9
100	STAGECOACH PASS - ASSUME 1% SLOPE	24" CULVERT	54	2455.80	2455.25	2460.0	STAGECOACH PASS PRELIMINARY PLANS 1/85
101	STAGECOACH PASS - ASSUME 1% SLOPE	2-24" CMP	60	2469.40	2468.80	2471.7	STAGECOACH PASS PRELIMINARY PLANS 1/85
102	STAGECOACH PASS - ASSUME 1% SLOPE	24" CMP	70	2479.86	2479.16	2482.0	STAGECOACH PASS PRELIMINARY PLANS 1/85
103	STAGECOACH PASS - ASSUME 1% SLOPE	18" CMP	75	2485.45	2484.70	2488.3	STAGECOACH PASS PRELIMINARY PLANS 1/85
104	STAGECOACH PASS - ASSUME 1% SLOPE	3-48" CMP	80	2490.64	2489.84	2494.0	STAGECOACH PASS PRELIMINARY PLANS 1/85
105	STAGECOACH PASS - ASSUME 1% SLOPE	18" X 27" CMPA	60	2507.79	2507.19	2510.0	STAGECOACH PASS PRELIMINARY PLANS 1/85
106	STAGECOACH PASS - ASSUME 1% SLOPE	24" CMP	67	2520.21	2519.54	2523.2	STAGECOACH PASS PRELIMINARY PLANS 1/85
107	STAGECOACH PASS - ASSUME 1% SLOPE	18" CMP	65	2531.83	2531.18	2534.0	STAGECOACH PASS PRELIMINARY PLANS 1/85
108	STAGECOACH PASS - ASSUME 1% SLOPE	18" X 27" CMPA	63	2539.33	2539.70	2540.8	STAGECOACH PASS PRELIMINARY PLANS 1/85

Table 10
Existing Drainage Improvements

#	APPROXIMATE LOCATION	DEVICE SIZE/TYPE	L (ft)	IE(UP)	IE(DWN)	GRND	INFORMATION SOURCE
109	STAGECOACH PASS - ASSUME 1% SLOPE	18" RCP	65	2559.00	2558.35	2562.0	STAGECOACH PASS PRELIMINARY PLANS 1/85
110	STAGECOACH PASS - ASSUME 1% SLOPE	36" RCP	55	2560.92	2560.37	2563.8	STAGECOACH PASS PRELIMINARY PLANS 1/85
111	STAGECOACH PASS	36"	108	2560.00	2559.00	2566.8	STAGECOACH PASS PRELIMINARY PLANS 1/85
112	STAGECOACH PASS	24"	54	2576.20	2575.80	2580.4	STAGECOACH PASS PRELIMINARY PLANS 1/85
113	STAGECOACH PASS	24"	73	2591.00	2586.00	2596.2	STAGECOACH PASS PRELIMINARY PLANS 1/85
114	STAGECOACH PASS	24"	74	2593.50	2591.00	2598.4	STAGECOACH PASS PRELIMINARY PLANS 1/85
115	STAGECOACH PASS	24"	68	2600.00	2597.50	2606.6	STAGECOACH PASS PRELIMINARY PLANS 1/85
116	STAGECOACH PASS	2-8' X 4'	67	2602.42	2601.00	2608.5	STAGECOACH PASS PRELIMINARY PLANS 1/85
117	STAGECOACH PASS	24"	88	2615.00	2611.00	2620.8	STAGECOACH PASS PRELIMINARY PLANS 1/85
118	STAGECOACH PASS	18"	22	Cattle Guard			STAGECOACH PASS PRELIMINARY PLANS 1/85
119	STAGECOACH PASS	18"	20	Cattle Guard			STAGECOACH PASS PRELIMINARY PLANS 1/85
120	STAGECOACH PASS	24"	48	2631.48	2631.00	2635.2	STAGECOACH PASS PRELIMINARY PLANS 1/85
121	STAGECOACH PASS - ASSUME 1% SLOPE	24"	60	2638.94	2638.34	2644.8	STAGECOACH PASS PRELIMINARY PLANS 1/85
122	STAGECOACH PASS	24"	45	2578.50	2577.00	2582.2	STAGECOACH PASS PRELIMINARY PLANS 1/85
123	BRIDGE OVER GALLOWAY WASH	30' W X 12' H					SURVEY OF CON-ARCH BRIDGE OVER GALLOWAY WASH AT DREAM ST
124	SKYRANCH	24"	155.98	2533.01	2532.40	2537.0	SKY RANCH PHASE II STREET SURVEY 2/87
125	SKYRANCH	18"	194.73	2536.88	2533.37	2541.0	SKY RANCH PHASE II STREET SURVEY 2/87
126	SKYRANCH	18"	231.99	2542.33	2536.88	2548.7	SKY RANCH PHASE II STREET SURVEY 2/87
127	RISING SUN	1-58" + 1-36" CMP	60	2374.50	2574.00	2582.6	CROSSINGS AT CAREFREE PAVING PLAN 5/88
128	RISING SUN	4-42" CMP	60	2361.10	2559.9	2569.0	CROSSINGS AT CAREFREE PAVING PLAN 5/88
129	CL WEST TRAVOIS TRAIL	24" RGRCP	555		2345.70		CROSSINGS AT CAREFREE PAVING PLAN 5/88
130	RIDGELINE RD	20 SY RIPRAP					CROSSINGS AT CAREFREE PAVING PLAN 5/88
131	TRANQUIL TRAIL	2-58" X 36" CMPA	40	2379.19	2378.79	2383.7	CROSSINGS AT CAREFREE PAVING PLAN 5/88
132	LAZY BURRO RD	2-10' X 4' CBC	78	2273.82	2273.55	2278.7	RIDGEVIEW ESTATES IMPROVEMENT PLANS 9/94
133	TERRACE ESTATES CIRCLE (SAME AS 210)	18" CMP	50	2329.25	2326.75	2321.0	RIDGEVIEW ESTATES IMPROVEMENT PLANS 9/94
134	TERRACE ESTATES CIRCLE	18" CMP	61	2310.35	2301.95	2312.5	RIDGEVIEW ESTATES IMPROVEMENT PLANS 9/94
135	RIDGEVIEW ESTATES	2-21" X 15" CMPA	55	2306.50	2304.45	2308.2	RIDGEVIEW ESTATES IMPROVEMENT PLANS 9/94
136	DRIVEWAY CULVERT AT NORTHVIEW LANE	2-18"CMP	25	-8.7	-9.9	-5.8	FIELD SURVEY 8/15/01
137	CAVE CREEK RD/ LUTHERAN CHURCH	3' X 2' CMPA	38	-10.6	-10.8	-4.8	FIELD SURVEY 8/15/01
138	QUAIL TRAIL AND ROMPING RD	AT GRADE X-ING					FIELD SURVEY 8/15/01
139	WILDFLOWER AT STAGECOACH PASS	24" CMP	56	-8.3	-10.0	-5.1	FIELD SURVEY 8/15/01
140	WILDFLOWER AT ROMPING RD	AT GRADE X-ING					FIELD SURVEY 8/15/01
141	WILDFLOWER BETWEEN QUAIL AND ROMPING	24" CMP	40	-9.7	-11.4	-7.0	FIELD SURVEY 8/15/01
142	WILDFLOWER JUST N. OF QUAIL	AT GRADE X-ING					FIELD SURVEY 8/15/01
143	WILDFLOWER S. OF HERETOTHERE	30" CMP	66	-11.8	-12.9	-8.0	FIELD SURVEY 8/15/01
144	WILDFLOWER AT HERETOTHERE	AT GRADE X-ING					FIELD SURVEY 8/15/01
145	WILDFLOWER N. OF TREELINED TRAIL	Ditch					FIELD SURVEY 8/15/01
146	WILDFLOWER AT TREELINED TRAIL	24" CMP	40	-8.8	-10.5	-5.3	FIELD SURVEY 8/15/01
147	WILDFLOWER AT TREELINED TRAIL	3-30" CMP	90	-7.5	-9.1	-5.2	FIELD SURVEY 8/15/01, FIELD SURVEY OCT, NOV, DEC 2002
148	DRIVEWAY WASH CROSSING - 2 DRIVEWAYS	3-30" CMP	90	-7.5	-9.1	-5.2	FIELD SURVEY 8/15/01, FIELD SURVEY OCT, NOV, DEC 2002
149	ROMPING AT HERETOTHERE	24" CMP	72	-10.7	-12.9	-8.1	FIELD SURVEY 8/15/01
150	ROMPING AT HERETOTHERE	24" CMP	72	-6.6	-7.4	-3.6	FIELD SURVEY 8/15/01
151	ROMPING N. OF HERETOTHERE	2-36" CMP	70	-7.4	-10.5	-5.1	FIELD SURVEY 8/15/01
152	ROMPING N. OF HERETOTHERE	24" CMP	70	-7.7	-9.9	-5.2	FIELD SURVEY 8/15/01
153	ROMPING AT WILDFLOWER	2-36" CMP	96	-9.8	-12.2	-6.2	FIELD SURVEY 8/15/01, FIELD SURVEY OCT, NOV, DEC 2002
154	ROMPING AT TREELINED TRAIL	24" CMP	70	-9.0	-9.7	-5.6	FIELD SURVEY 8/15/01 - ASSUME LENGTH AND 1% SLOPE
155	TREELINED TRAIL	24" CMP	52	-7.9	-8.9	-6.0	FIELD SURVEY 8/15/01
156	TREELINED TRAIL BETWEEN STARDUST AND WILDLFOWER	OVERLAND CROSSING					FIELD SURVEY 8/15/01
157	TREELINED TRAIL S. OF STARDUST	24" CMP	80	-8.3	-10.5	-6.0	FIELD SURVEY 8/15/01, FIELD SURVEY OCT, NOV, DEC 2002
158	TWILIGHT TRAIL S. OF STARDUST	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
159	TWILIGHT TRAIL S. OF VENUS VIEW	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
160	MILKYWAY AT TRAIL DRIVE	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
161	PLACID PLACE	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
162	VENUS DRIVE	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
163	MILKYWAY AT CAVE CREEK	24" CMP	82	-10.4	-11.9	-5.3	FIELD SURVEY 8/16/01, FIELD SURVEY OCT, NOV, DEC 2002

Table 10
Existing Drainage Improvements

#	APPROXIMATE LOCATION	DEVICE SIZE/TYPE	L (ft)	IE(UP)	IE(DWN)	GRND	INFORMATION SOURCE
164	MILKYWAY N. OF LAZYWOOD	30" CMP	60	-7.7	-10.9	-6.3	FIELD SURVEY 8/16/01, FIELD SURVEY OCT, NOV, DEC 2002
165	TWILIGHT TRAIL N. OF LAZYWOOD	CONC. AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
166	TWILIGHT TRAIL S. OF CAVE CREEK	CONC. AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
167	TWILIGHT TRAIL S. OF LAZYWOOD	CONC. AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
168	TWILIGHT TRAIL N. OF STARDUST	18" CMP	55	-9.5	(T) -9.4	-5.8	FIELD SURVEY 8/16/01
169	CAREFREE DRIVE JUST W. OF FOREMORE CIRCLE	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
170	DOUBLE EAGLE DRIVE W. OF PIMA ROAD	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
171	CAREFREE DRIVE E. OF FOURSOME WAY	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
172	80TH ST S. OF PLEASANT PL	AT GRADE DIP X-ING					FIELD SURVEY 8/16/01
173	MULE TRAIN AT DEAD END	30" CMP	65	2439.0	2436.0	2444.0	FIELD SURVEY 8/16/01 - ASSUME LENGTH AND ELEV'S FROM CONTOURS
174	SERENE ST	24" CMP	80	-9.1	-11.2	-5.1	FIELD SURVEY 8/16/01
175	SERENE ST W. OF FOURSOME	18" CMP	80	-9.6	-12.3	-5.5	FIELD SURVEY 8/16/01
176	FOURSOME WAY CUL DE SAC	18" CMP	155	(T) -7.3	(T) -12.4	-5.4	FIELD SURVEY 8/16/01
177	FOURSOME WAY N. OF SERENE ST	18" CMP	140	-12.8	(T) -11.0	-4.4	FIELD SURVEY 8/16/01
178	SERENE ST W. OF END	24" CMP	78	(T) -9.8	-14.0	-5.3	FIELD SURVEY 8/16/01
179	CONCHO DR AT PAINT PONY DR	2-36" CMP	69	-8.7	-10.7	-4.2	FIELD SURVEY 8/16/01
180	SOMBRERO RD	18" CMP W/ GRATE INLET					FIELD SURVEY 8/16/01
181	SILVER SADDLE	18" CMP W/ GRATE INLET					FIELD SURVEY 8/16/01
182	SILVER SADDLE	18" CMP W/ GRATE INLET					FIELD SURVEY 8/16/01
183	SILVER SADDLE AT GOLDEN SPUR	2-18" CMP W/ GRATE INLET					FIELD SURVEY 8/16/01
184	SILVER SADDLE N. OF CONCHO	18" CMP W/ GRATE INLET					FIELD SURVEY 8/16/01
185	SILVER SADDLE	18" CMP W/ GRATE INLET					FIELD SURVEY 8/16/01
186	CORONADO @SPANISH ROOT	18" HDPE	60	-7.7	-10.5	-6.0	FIELD SURVEY 8/16/01
187	HORIZON DR	18" CMP	45	-6.0	-8.9	-4.9	FIELD SURVEY 8/16/01
188	HORIZON DR NEAR TURN	18" CMP	48	-6.9	-8.7	-5.5	FIELD SURVEY 8/16/01
189	HORIZON DR AT END	18" CMP	45	-7.1	-8.1	-5.0	FIELD SURVEY 8/16/01
190	RISING SUN RD	60" X 36" CMPA + 54" CMP	50	(T) -7.4/-8.2	(T) -8.6	-5.1	FIELD SURVEY 8/16/01
191	RISING SUN W. OF 80TH ST	18" CMP	64	-7.4	-10.0	-4.5	FIELD SURVEY 8/16/01
192	STAGECOACH PASS AT LANGUID LANE	24" CMP	75	-7.6	-9.2	-5.1	FIELD SURVEY 8/20/01
193	STAGECOACH PASS NEAR RESTIN RD	18" CMP	70	(T) -5.7	(B)-8.1	-5.4	FIELD SURVEY 8/20/01
194	STAGECOACH PASS AT CAREFREE HWY	24" CMP	62	-8.6	-8.7	-5.5	FIELD SURVEY 8/20/01
195	CANYON CREEK CIRCLE E. OF CANYON CREEK COURT	15" CMP	68	-9.2	-10.4	-5.4	FIELD SURVEY 8/20/01
196	CANYON CREEK COURT	15" CMP	75	-8.0	-8.3	-5.5	FIELD SURVEY 8/20/01
197	CANYON CREEK CIRCLE E. OF CANYON CREEK COURT	24" CMP	75	-9.6	-10.5	-5.5	FIELD SURVEY 8/20/01
198	CANYON CREEK CIRCLE CUL DE SAC	15" CMP	108	-7.6	(T) -8.9	-5.9	FIELD SURVEY 8/20/01
199	CANYON CREEK CIRCLE W. OF CAVE CREEK RD	15" CMP ELLIPTICAL	72	-7.8	-10.0	-5.5	FIELD SURVEY 8/20/01
200	LEISURE LANE	2-36" CMP	105	(T) -8.4	(T) -10.9	-5.0	FIELD SURVEY 8/20/01
201	LEISURE LANE S. OF SENTINEL ROCK RD	2-36" CMP	130	-9.8	-18.1	-4.8	FIELD SURVEY 8/20/01
202	PALO VERDE (59TH ST)	18" CMP	65	-6.4	-9.0	-5.3	FIELD SURVEY 8/20/01
203	CHINO LANE	2-36" CMP	75	-12.0	-13.1	-5.0	FIELD SURVEY 8/20/01
204	EL SENDERO RD S. OF HIDDEN CANYON RD	36" CMP	68	-10.7	-15.3	-4.6	FIELD SURVEY 8/20/01
205	EL SENDERO RD	15" CMP	65	(T) -7.9	-11.7	-5.0	FIELD SURVEY 8/20/01
206	EL SENDERO RD	36" CMP	65	-11.6	(T) -12.7	-4.9	FIELD SURVEY 8/20/01
207	ARROYO RD @ CASSANDRA WAY	18" CMP	320	NO CONTOURS			FIELD SURVEY 8/20/01, TOO LONG TO OBTAIN INVERTS IN FIELD
208	NEVER MIND TRAIL AT PEDRA GRANDE DR	18" X 30" CMPA	34	-10.2	-10.9	-6.0	FIELD SURVEY 8/23/01
209	NEVER MIND TRAIL	18" X 30" CMPA	34	-9.7	-11.0	-6.2	FIELD SURVEY 8/23/01
210	LAZY BURRO RD AT TERRACE ESTATES CIRCLE	AT GRADE DIP X-ING	78	(T) -5.7	(T) -6.5	-5.4	FIELD SURVEY 8/23/01
211	STEVENS RD	15" CMP	120	(T) -4.1	(T) -7.7	-3.3	FIELD SURVEY 8/23/01
212	TRANQUIL TRAIL S. OF RISING SUN RD	18" X 30" CMPA	48	-8.8	-9.3	-4.9	FIELD SURVEY 8/23/01
213	TRANQUIL TRAIL AT CAREFREE DR	2-30" CMP	26	-8.3	(T) -8.1	-4.3	FIELD SURVEY 8/23/01
214	STAGECOACH PASS AT TOM DARLINGTON	24" CMP	60	-7.9	-9.5	-4.6	FIELD SURVEY 8/23/01
215	BLOODY BASIN RD AT CAVE CREEK RD	24" CMP	64	2384.5	2385.0	2390.0	FIELD SURVEY 8/23/01 - ASSUME EVERYTHING SAME AS #63
216	TOM DARLINGTON AT CAREFREE HWY	20" X 27" CMPA	130	(T)-6.1	(T) -6.9	(T) -4.8	FIELD SURVEY 8/23/01 - ASSUME LENGTH FROM CONTOURS
217	LOS REALES DR AT CAREFREE HWY	18" RCP	62	-8.0	-8.6	-5.8	FIELD SURVEY 8/23/01
218	CAREFREE HWY	36" CMP	74	-6.5	-6.8	-2.5	FIELD SURVEY 8/23/01 - ASSUME COVER

Table 10
Existing Drainage Improvements

#	APPROXIMATE LOCATION	DEVICE SIZE/TYPE	L (ft)	IE(UP)	IE(DWN)	GRND	INFORMATION SOURCE
219	NOT USED						
220	RISING SUN RD AT TRANQUIL TRAIL	4" PVC SLEEVE	45				CROSSINGS AT CAREFREE PAVING PLAN 5/88
221	VILLA CASSANDRA WAY AT NORTH RIDGEWAY DRIVE	24" CMP					FIELD SURVEY (OUTSIDE STUDY AREA)
222	EL SENDERO AT 66TH PLACE	2 - 36" RCP					FIELD SURVEY (OUTSIDE STUDY AREA)
223	VILLA CASSANDRA WAY NEAR SHOTGUN CIRCLE	30" CMP					FIELD SURVEY (OUTSIDE STUDY AREA)
224	VILLA CASSANDRA WAY	36" CMP					FIELD SURVEY (OUTSIDE STUDY AREA)
225	OLD PAINT TRAIL NEAR SHOTGUN CIRCLE	30" CMP					FIELD SURVEY (OUTSIDE STUDY AREA)
226	OLD PAINT TRAIL AT NORTH RIDGEWAY DRIVE	30" CMP					FIELD SURVEY (OUTSIDE STUDY AREA)
227	OLD PAINT TRAIL AT NORTH RIDGEWAY DRIVE	30" CMP					FIELD SURVEY (OUTSIDE STUDY AREA)
228	OLD PAINT TRAIL SOUTH OF LANGUID LANE	30" CMP					FIELD SURVEY (OUTSIDE STUDY AREA)
229	SKY RANCH	36" CMP	360	58.70	56.00	63.0	SKY RANCH PHASE II STREET SURVEY 2/87, S=0.76%
230	SKY RANCH	DITCH					SKY RANCH PHASE II STREET SURVEY 2/87
231	RIDGEWAY AT EL SENDERO (PRIVATE)	CULVERT					SEEN IN AERIALS, GATED COMMUNITY
232	RIDGEWAY DRIVE (PRIVATE)	CULVERT					SEEN IN AERIALS, GATED COMMUNITY
233	66TH PLACE (PRIVATE)	CULVERT					SEEN IN AERIALS, GATED COMMUNITY
234	EL SENDERO (PRIVATE)	CULVERT					SEEN IN AERIALS, GATED COMMUNITY
235	ROMPING AT WILDFLOWER	OVERLAND CROSSING					SEEN IN TOPO
236	CAREFREE HIGHWAY	OVERLAND CROSSING					SEEN IN TOPO
237	CAREFREE HIGHWAY	CULVERT					SEEN IN TOPO
238	CANYON CREEK CIRCLE	CULVERT					FIELD SURVEY
239	CAREFREE HIGHWAY NEAR SUNSET TRAIL	OVERLAND CROSSING					FIELD SURVEY
240	CAREFREE HIGHWAY NEAR WHILEAWAY	OVERLAND CROSSING					FIELD SURVEY
241	STORM DRAIN SYSTEM NEAR CAVE CREEK ROAD AT HUM RD.	ARCH PIPE					FIELD SURVEY
242	IRONWOOD ESTATES	8 - 36" RCP	64	2076.11	2076.05	2080.1	FIELD SURVEY, FIELD SURVEY OCT, NOV, DEC 2002
243	DRIVEWAY CULVERT ON STARDUST LANE	2 - 36" CMP	81	2650.79	2649.5	2655.7	FIELD SURVEY, FIELD SURVEY OCT, NOV, DEC 2002
244	DRIVEWAT CULVERT ON CAVE CREEK RD.	48" CMP	187	2615.97	2612.05	2622.5	FIELD SURVEY, FIELD SURVEY OCT, NOV, DEC 2002
245	DRIVEWAY CULVERT NEAR LAZYWOOD PLACE	3 - 24" CMP	20	2579.62	2579.32	2581.2	FIELD SURVEY, FIELD SURVEY OCT, NOV, DEC 2002

Carefree Culvert Survey Points Table

Wash	Culvert	Survey Point	R.S.
Windmill Wash North Branch	163	1100	1.2940
Windmill Wash North Branch	163	1101	1.2940
Windmill Wash South Branch	164	1120	0.1083
Windmill Wash South Branch	164	1121	0.1083
Windmill Wash	11	1122	0.9042
Windmill Wash	11	1123	0.9042
Windmill Wash	11	1124	0.9042
Windmill Wash	11	1125	0.9042
Windmill Wash	11	1126	0.9042
Windmill Wash	11	1127	0.9042
Unnamed Central Tributarty to Cave Creek	36	1129	2.2214
Unnamed Central Tributarty to Cave Creek	36	1130	2.2214
Unnamed Central Tributarty to Cave Creek	36	1131	2.2214
Unnamed Central Tributarty to Cave Creek	36	1132	2.2214
Unnamed Central Tributarty to Cave Creek	36	1133	2.2214
Unnamed Central Tributarty to Cave Creek	36	1134	2.2214
Unnamed Central Tributarty to Cave Creek	36	1135	2.2214
Unnamed Central Tributarty to Cave Creek	36	1136	2.2214
Unnamed Central Tributarty to Cave Creek	36	1137	2.2214
Unnamed Central Tributarty to Cave Creek	36	1138	2.2214
Unnamed Central Tributarty to Cave Creek	36	1139	2.2214
Unnamed Central Tributarty to Cave Creek	36	1140	2.2214
Unnamed Central Tributarty to Cave Creek	36	1141	2.2214
Unnamed Central Tributarty to Cave Creek	36	1142	2.2214
Unnamed Central Tributarty to Cave Creek	36	1143	2.2214
Unnamed Central Tributarty to Cave Creek	36	1144	2.2214
Unnamed Central Tributarty to Cave Creek	36	1145	2.2214
Unnamed Central Tributarty to Cave Creek	36	1146	2.2214
Windmill Wash	245	1377	1.0604
Windmill Wash	245	1378	1.0604
Windmill Wash	245	1379	1.0604
Windmill Wash	245	1380	1.0604
Windmill Wash	245	1381	1.0604
Windmill Wash	245	1382	1.0604
Windmill Wash	245	1383	1.0604
Windmill Wash	245	1384	1.0604
Windmill Wash	245	1385	1.0604
Windmill Wash	245	1386	1.0604
Windmill Wash	245	1387	1.0604
Windmill Wash	245	1388	1.0604
Windmill Wash	245	1389	1.0604
Windmill Wash	245	1390	1.0604
Windmill Wash	245	1391	1.0604
Windmill Wash	245	1392	1.0604
Windmill Wash	245	1393	1.0604
Windmill Wash	245	1394	1.0604
Windmill Wash	245	1395	1.0604
Windmill Wash	245	1396	1.0604
Windmill Wash	245	1397	1.0604

Windmill Wash	245	1398	1.0604
Windmill Wash	245	1399	1.0604
Windmill Wash	245	1400	1.0604
Windmill Wash	245	1401	1.0604
Windmill Wash	245	1402	1.0604
Windmill Wash	245	1403	1.0604
Windmill Wash	245	1404	1.0604
Windmill Wash	245	1405	1.0604
Windmill Wash	245	1406	1.0604
Windmill Wash	245	1407	1.0604
Windmill Wash	245	1408	1.0604
Windmill Wash	245	1409	1.0604
Windmill Wash	245	1410	1.0604
Windmill Wash	245	1411	1.0604
Windmill Wash	245	1412	1.0604
Windmill Wash	245	1413	1.0604
Windmill Wash	245	1414	1.0604
Windmill Wash	245	1415	1.0604
Windmill Wash	245	1416	1.0604
Windmill Wash	245	1417	1.0604
Windmill Wash	245	1418	1.0604
Windmill Wash	245	1419	1.0604
Windmill Wash	245	1420	1.0604
Windmill Wash	245	1421	1.0604
Windmill Wash	245	1422	1.0604
Windmill Wash	245	1423	1.0604
Windmill Wash	245	1424	1.0604
Windmill Wash	245	1425	1.0604
Windmill Wash	245	1426	1.0604
Windmill Wash	245	1427	1.0604
Windmill Wash	245	1428	1.0604
Windmill Wash	245	1429	1.0604
Windmill Wash	245	1430	1.0604
Windmill Wash	245	1431	1.0604
Windmill Wash	245	1432	1.0604
Windmill Wash	245	1433	1.0604
Windmill Wash	245	1434	1.0604
Windmill Wash	245	1435	1.0604
Windmill Wash	245	1436	1.0604
Windmill Wash	245	1437	1.0604
Windmill Wash	245	1438	1.0604
Windmill Wash North Branch	244	1439	1.3786
Windmill Wash North Branch	244	1440	1.3786
Windmill Wash North Branch	244	1441	1.3786
Windmill Wash North Branch	244	1442	1.3786
Windmill Wash North Branch	244	1443	1.3786
Windmill Wash North Branch	244	1444	1.3786
Windmill Wash North Branch	244	1445	1.3786
Windmill Wash North Branch	244	1446	1.3786
Unnamed Tributary to Stagecoach Pass Wash	148	1483	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1484	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1485	0.4910

Unnamed Tributary to Stagecoach Pass Wash	148	1486	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1487	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1488	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1489	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1490	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1491	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1492	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1493	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1494	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1495	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1496	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1497	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1498	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1499	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1500	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1501	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1502	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1503	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1504	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1505	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1506	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1507	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1508	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1509	0.4910
Unnamed Tributary to Stagecoach Pass Wash	148	1510	0.4910
Unnamed Tributary to Stagecoach Pass Wash	157	1511	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1512	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1513	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1514	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1515	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1516	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1517	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1518	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1519	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1520	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1521	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1522	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1523	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1524	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1525	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1526	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1527	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1528	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1529	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1530	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1531	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1532	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1533	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1534	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1535	0.5170
Unnamed Tributary to Stagecoach Pass Wash	157	1536	0.5170
Unnamed Tributary to Stagecoach Pass Wash	147	1537	0.5727

Unnamed Tributary to Stagecoach Pass Wash	147	1538	0.5727
Unnamed Tributary to Stagecoach Pass Wash	147	1539	0.5727
Unnamed Tributary to Stagecoach Pass Wash	147	1540	0.5727
Unnamed Tributary to Stagecoach Pass Wash	147	1541	0.5727
Unnamed Tributary to Stagecoach Pass Wash	147	1542	0.5727
Unnamed Tributary to Stagecoach Pass Wash	147	1543	0.5727
Unnamed Tributary to Stagecoach Pass Wash	147	1544	0.5727
Unnamed Tributary to Stagecoach Pass Wash	147	1545	0.5727
Unnamed Tributary to Stagecoach Pass Wash	153	1546	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1547	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1548	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1549	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1550	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1551	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1552	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1553	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1554	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1555	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1556	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1557	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1558	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1559	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1560	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1561	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1562	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1563	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1564	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1565	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1566	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1567	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1568	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1569	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1570	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1571	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1572	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1573	0.7537
Unnamed Tributary to Stagecoach Pass Wash	153	1574	0.7537

2801 West Durango Street, Phoenix, Arizona 85003
(602) 506-1501

Carefree Area Drainage Master Plan
Glossary Of Flood Control Terms

Area Drainage Master Plan (ADMP)

A plan which provides flood control recommendations that reduce flood and erosion hazards. This plan is developed through a process, which includes: data collection, flood control alternatives formulation and evaluation, public involvement and information, alternative selection, and recommendations for implementation.

Cfs

The measuring unit of cubic feet per second (cfs), which is used to quantify the amount of flow in a wash. A cubic foot is equivalent to 7.5 gallons of water. Thus, 1 cfs is 7.5 gallons of water passing by you every second.

Development

A man-made change to property, such as buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations.

Encroachment

The result of placing a building, fence, berm or other structure in a floodplain in a manner that obstructs or increases the depth (or velocity) of flow on a watercourse.

Erosion

A natural process in which soil, sand, gravel, cobbles, and boulders are moved and transported in a wash and the land is worn away by the flow of the water.

Erosion Hazard Zone

Areas along a wash that are prone to erosion. These areas are defined by technical studies.

Flood/Flooding

A temporary condition caused by the accumulation of runoff from any source, which exceeds the capacity of a natural or man-made drainage system, and results in inundation of normally dry land areas.

100-Year (or Base) Flood

A flood event that statistically has a 1 percent chance of occurring in any given year. A flood event of this magnitude is often used to determine if flood insurance is either advisable or required on a property. Magnitudes of flood events are used by engineers to compare one flood to another. A 10-year flood has a 10 percent chance of occurring in any given year.

100-Year Floodplain

The area affected by a 100-year flood. A 10-year floodplain would be the area affected by a 10-year flood.

Flood Control

Various activities and regulations that help reduce or prevent damages caused by flooding. Typical flood control activities include: structural flood control works (such as bank stabilization, levees, and drainage channels), acquisition of floodprone land, flood insurance programs and studies, river and basin management plans, public education programs, and flood warning and emergency preparedness activities.

Floodplain

The area adjoining a watercourse that may be covered by floodwater during a flood. Storm runoff and flood events may cause alterations in the floodplain in certain areas.

Floodplain Management

A program that uses corrective and preventative measures to reduce flood and erosion damage and preserve natural habitat and wildlife resources in floodprone areas. Some of these measures include: adopting and administering floodplain regulations, resolving drainage complaints, protecting riparian habitat communities, and assuring effective maintenance and operation of flood control works.

Floodway

The channel of a watercourse and portion of the adjacent floodplain that is needed to convey the base or 100-year flood event without increasing flood levels by more than one foot and without increasing velocities of flood water.

Floodway Fringe

The areas of a delineated floodplain adjacent to the Floodway where encroachment may be permitted.

Grade Control Structure

A structure used across a stream channel placed bank to bank to control bed elevation, velocity, pressure, etc.

Hydraulic Structures

The facilities used to impound, accommodate, convey, or control the flow of water, such as dams, intakes, culverts, channels, and bridges.

Hydrology

A field of study concerned with the distribution and circulation of surface water, as well as water dynamics below the ground and in the atmosphere.

Lateral Stream Migration

Change in position of a channel by lateral erosion of one bank and simultaneous deposition on the opposite bank.

Multi-use opportunities

Additional uses, other than flood control, for a project or area. These include: recreation, open space, protection and enhancement of natural landscape, and local community character.

Sedimentation

The transportation and eventual deposition of sediment (sand, silt, and rock) by flowing water

Setback

The minimum distance required between a man-made structure and a watercourse. This distance is measured from the top edge of the highest channel bank or the edge of the 100-year flood water surface elevation.

Sheet Flooding

A condition where stormwater runoff forms a sheet of water to a depth of six inches or more. Sheet flooding is often found in areas where there are no clearly defined channels.

Stormwater

Precipitation from rain or snow that accumulates in a natural or man-made watercourse or conveyance system.

Storm Drainage System

A drainage system for collecting runoff of stormwater on highways and removing it to appropriate outlets. The system includes inlets, catch basins, storm sewers, drains, reservoirs, pump stations, and detention basins.

Watercourse

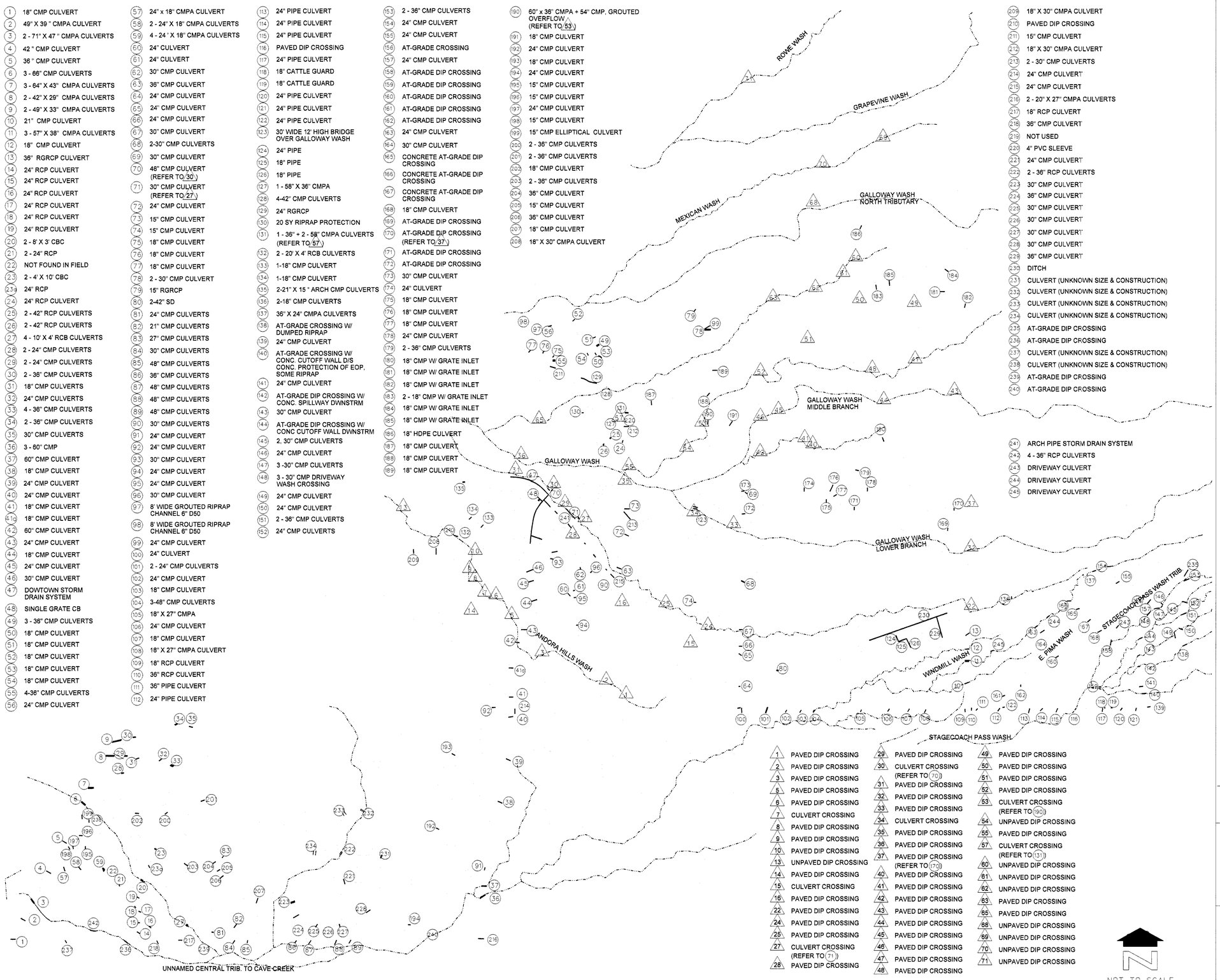
Any minor or major lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

Watershed

The total area that drains to a specific location (concentration point) on a wash or creek when rain falls on it. A watershed is also often referred to as a basin, with the basin boundary defined by a high ridge or divide, and with a lake or river located at a lower point.

Flood Control District of Maricopa County
2801 West Durnago Street
Phoenix, Arizona 85009
(602)506-4440
FAX: (602) 506-4601

1. 18" CMP CULVERT
2. 49" X 39 " CMPA CULVERT
3. 2 - 71" X 47 " CMPA CULVERTS
4. 42 " CMP CULVERT
5. 36 " CMP CULVERT
6. 3 - 66" CMP CULVERTS
7. 3 - 64" X 43" CMPA CULVERTS
8. 2 - 42" X 29" CMPA CULVERTS
9. 2 - 49" X 33" CMPA CULVERTS
10. 21" CMP CULVERT
11. 3 - 57" X 38" CMPA CULVERTS
12. 18" CMP CULVERT
13. 36" RGRCP CULVERT
14. 24" RCP CULVERT
15. 24" RCP CULVERT
16. 24" RCP CULVERT
17. 24" RCP CULVERT
18. 24" RCP CULVERT
19. 24" RCP CULVERT
20. 2 - 8' X 3' CBC
21. 2 - 24" RCP
22. NOT FOUND IN FIELD
23. 2 - 4' X 10' CBC
23a. 24" RCP
24. 24" RCP CULVERT
25. 2 - 42" RCP CULVERTS
26. 2 - 42" RCP CULVERTS
27. 4 - 10' X 4' RCB CULVERTS
28. 2 - 24" CMP CULVERTS
29. 2 - 24" CMP CULVERTS
30. 2 - 36" CMP CULVERTS
31. 18" CMP CULVERTS
32. 24" CMP CULVERTS
33. 4 - 36" CMP CULVERTS
34. 2 - 36" CMP CULVERTS
35. 30" CMP CULVERTS
36. 3 - 60" CMP
37. 60" CMP CULVERT
38. 18" CMP CULVERT
39. 24" CMP CULVERT
40. 24" CMP CULVERT
41. 18" CMP CULVERT
41a. 18" CMP CULVERT
42. 60" CMP CULVERT
43. 24" CMP CULVERT
44. 18" CMP CULVERT
45. 24" CMP CULVERT
46. 30" CMP CULVERT
47. DOWTOWN STORM DRAIN SYSTEM
48. SINGLE GRATE CB
49. 3 - 36" CMP CULVERTS
50. 18" CMP CULVERT
51. 18" CMP CULVERT
52. 18" CMP CULVERT
53. 18" CMP CULVERT
54. 18" CMP CULVERT
55. 4-36" CMP CULVERTS
56. 24" CMP CULVERT
57. 24" x 18" CMPA CULVERT
58. 2 - 24" X 18" CMPA CULVERTS
59. 4 - 24 ' X 18" CMPA CULVERTS
60. 24" CULVERT
61. 24" CULVERT
62. 30" CMP CULVERT
63. 36" CMP CULVERT
64. 24" CMP CULVERT
65. 24" CMP CULVERT
66. 24" CMP CULVERT
67. 30" CMP CULVERT
68. 2-30" CMP CULVERTS
69. 30" CMP CULVERT
70. 48" CMP CULVERT (REFER TO 30)
71. 30" CMP CULVERT (REFER TO 27)
72. 24" CMP CULVERT
73. 15" CMP CULVERT
74. 15" CMP CULVERT
75. 18" CMP CULVERT
76. 18" CMP CULVERT
77. 18" CMP CULVERT
78. 2 - 30" CMP CULVERT
79. 15" RGRCP
80. 2-42" SD
81. 24" CMP CULVERTS
82. 21" CMP CULVERTS
83. 27" CMP CULVERTS
84. 30" CMP CULVERTS
85. 48" CMP CULVERTS
86. 36" CMP CULVERTS
87. 48" CMP CULVERTS
88. 48" CMP CULVERTS
89. 48" CMP CULVERTS
90. 30" CMP CULVERTS
91. 24" CMP CULVERT
92. 24" CMP CULVERT
93. 30" CMP CULVERT
94. 24" CMP CULVERT
95. 24" CMP CULVERT
96. 30" CMP CULVERT
97. 8' WIDE GROUTED RIPRAP CHANNEL 6" D50
98. 8' WIDE GROUTED RIPRAP CHANNEL 6" D50
99. 24" CMP CULVERT
100. 24" CULVERT
101. 2 - 24" CMP CULVERTS
102. 24" CMP CULVERT
103. 18" CMP CULVERT
104. 3-48" CMP CULVERTS
105. 18" X 27" CMPA
106. 24" CMP CULVERT
107. 18" CMP CULVERT
108. 18" X 27" CMPA CULVERT
109. 18" RCP CULVERT
110. 36" RCP CULVERT
111. 36" PIPE CULVERT
112. 24" PIPE CULVERT
113. 24" PIPE CULVERT
114. 24" PIPE CULVERT
115. 24" PIPE CULVERT
116. PAVED DIP CROSSING
117. 24" PIPE CULVERT
118. 18" CATTLE GUARD
119. 18" CATTLE GUARD
120. 24" PIPE CULVERT
121. 24" PIPE CULVERT
122. 24" PIPE CULVERT
123. 30' WIDE 12' HIGH BRIDGE OVER GALLOWAY WASH
124. 24" PIPE
125. 18" PIPE
126. 18" PIPE
127. 1 - 58" X 36" CMPA
128. 4-42" CMP CULVERTS
129. 24" RGRCP
130. 20 SY RIPRAP PROTECTION
131. 1 - 36" + 2 - 58" CMPA CULVERTS (REFER TO 67)
132. 2 - 20' X 4' RCB CULVERTS
133. 1-18" CMP CULVERT
134. 1-18" CMP CULVERT
135. 2-21" X 15 " ARCH CMP CULVERTS
136. 2-18" CMP CULVERTS
137. 36" X 24" CMPA CULVERTS
138. AT-GRADE CROSSING W/ DUMPED RIPRAP
139. 24" CMP CULVERT
140. AT-GRADE CROSSING W/ CONC. CUTOFF WALL D/S CONC. PROTECTION OF EOP, SOME RIPRAP
141. 24" CMP CULVERT
142. AT-GRADE DIP CROSSING W/ CONC. SPILLWAY DWNSTRM
143. 30" CMP CULVERT
144. AT-GRADE DIP CROSSING W/ CONC CUTOFF WALL DWNSTRM
145. 2, 30" CMP CULVERTS
146. 24" CMP CULVERT
147. 3 -30" CMP CULVERTS
148. 3 - 30" CMP DRIVEWAY WASH CROSSING
149. 24" CMP CULVERT
150. 24" CMP CULVERT
151. 2 - 36" CMP CULVERTS
152. 24" CMP CULVERTS
153. 2 - 36" CMP CULVERTS
154. 24" CMP CULVERT
155. 24" CMP CULVERT
156. AT-GRADE CROSSING
157. 24" CMP CULVERT
158. AT-GRADE DIP CROSSING
159. AT-GRADE DIP CROSSING
160. AT-GRADE DIP CROSSING
161. AT-GRADE DIP CROSSING
162. AT-GRADE DIP CROSSING
163. 24" CMP CULVERT
164. 30" CMP CULVERT
165. CONCRETE AT-GRADE DIP CROSSING
166. CONCRETE AT-GRADE DIP CROSSING
167. CONCRETE AT-GRADE DIP CROSSING
168. 18" CMP CULVERT
169. AT-GRADE DIP CROSSING
170. AT-GRADE DIP CROSSING (REFER TO 37)
171. AT-GRADE DIP CROSSING
172. AT-GRADE DIP CROSSING
173. 30" CMP CULVERT
174. 24" CULVERT
175. 18" CMP CULVERT
176. 18" CMP CULVERT
177. 18" CMP CULVERT
178. 24" CMP CULVERTS
179. 2 - 36" CMP CULVERTS
180. 18" CMP W/ GRATE INLET
181. 18" CMP W/ GRATE INLET
182. 18" CMP W/ GRATE INLET
183. 2 - 18" CMP W/ GRATE INLET
184. 18" CMP W/ GRATE INLET
185. 18" CMP W/ GRATE INLET
186. 18" HDPE CULVERT
187. 18" CMP CULVERT
188. 18" CMP CULVERT
189. 18" CMP CULVERT
190. 60" x 36" CMPA + 54" CMP, GROUTED OVERFLOW (REFER TO 53)
191. 18" CMP CULVERT
192. 24" CMP CULVERT
193. 18" CMP CULVERT
194. 24" CMP CULVERT
195. 15" CMP CULVERT
196. 15" CMP CULVERT
197. 24" CMP CULVERT
198. 15" CMP CULVERT
199. 15" CMP ELLIPTICAL CULVERT
200. 2 - 36" CMP CULVERTS
201. 2 - 36" CMP CULVERTS
202. 18" CMP CULVERT
203. 2 - 36" CMP CULVERTS
204. 36" CMP CULVERT
205. 15" CMP CULVERT
206. 36" CMP CULVERT
207. 18" CMP CULVERT
208. 18" X 30" CMPA CULVERT
209. 18" X 30" CMPA CULVERT
210. PAVED DIP CROSSING
211. 15" CMP CULVERT
212. 18" X 30" CMPA CULVERT
213. 2 - 30" CMP CULVERTS
214. 24" CMP CULVERT
215. 24" CMP CULVERT
216. 2 - 20" X 27" CMPA CULVERTS
217. 18" RCP CULVERT
218. 36" CMP CULVERT
219. NOT USED
220. 4" PVC SLEEVE
221. 24" CMP CULVERT
222. 2 - 36" RCP CULVERTS
223. 30" CMP CULVERT
224. 36" CMP CULVERT
225. 30" CMP CULVERT
226. 30" CMP CULVERT
227. 30" CMP CULVERT
228. 30" CMP CULVERT
229. 36" CMP CULVERT
230. DITCH
231. CULVERT (UNKNOWN SIZE & CONSTRUCTION)
232. CULVERT (UNKNOWN SIZE & CONSTRUCTION)
233. CULVERT (UNKNOWN SIZE & CONSTRUCTION)
234. CULVERT (UNKNOWN SIZE & CONSTRUCTION)
235. AT-GRADE DIP CROSSING
236. AT-GRADE DIP CROSSING
237. CULVERT (UNKNOWN SIZE & CONSTRUCTION)
238. CULVERT (UNKNOWN SIZE & CONSTRUCTION)
239. AT-GRADE DIP CROSSING
240. AT-GRADE DIP CROSSING
241. ARCH PIPE STORM DRAIN SYSTEM
242. 4 - 36" RCP CULVERTS
243. DRIVEWAY CULVERT
244. DRIVEWAY CULVERT
245. DRIVEWAY CULVERT



1. PAVED DIP CROSSING
2. PAVED DIP CROSSING
3. PAVED DIP CROSSING
5. PAVED DIP CROSSING
6. PAVED DIP CROSSING
7. CULVERT CROSSING
8. PAVED DIP CROSSING
9. PAVED DIP CROSSING
10. PAVED DIP CROSSING
13. UNPAVED DIP CROSSING
14. PAVED DIP CROSSING
15. CULVERT CROSSING
16. PAVED DIP CROSSING
22. PAVED DIP CROSSING
24. PAVED DIP CROSSING
25. PAVED DIP CROSSING
27. CULVERT CROSSING (REFER TO 71)
28. PAVED DIP CROSSING
29. PAVED DIP CROSSING
30. CULVERT CROSSING (REFER TO 70)
31. PAVED DIP CROSSING
32. PAVED DIP CROSSING
33. PAVED DIP CROSSING
34. CULVERT CROSSING
35. PAVED DIP CROSSING
36. PAVED DIP CROSSING
37. PAVED DIP CROSSING (REFER TO 170)
40. PAVED DIP CROSSING
41. PAVED DIP CROSSING
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49. PAVED DIP CROSSING
50. PAVED DIP CROSSING
51. PAVED DIP CROSSING
52. PAVED DIP CROSSING
53. CULVERT CROSSING (REFER TO 190)
54. UNPAVED DIP CROSSING
55. PAVED DIP CROSSING
57. CULVERT CROSSING (REFER TO 131)
60. UNPAVED DIP CROSSING
61. UNPAVED DIP CROSSING
62. UNPAVED DIP CROSSING
63. PAVED DIP CROSSING
65. PAVED DIP CROSSING
68. UNPAVED DIP CROSSING
69. UNPAVED DIP CROSSING
70. UNPAVED DIP CROSSING
71. UNPAVED DIP CROSSING

NOT TO SCALE

LEGEND

153 DRAINAGE FEATURE AND NUMBER IDENTIFIER

10 DRAINAGE FEATURE AND NUMBER IDENTIFIER FROM J.E. FULLER (APPENDIX C OF REPORT)

NOTES

CULVERT LOCATIONS TAKEN FROM VARIOUS IMPROVEMENT PLANS, AS-BUILT PLANS, REPORTS, AND FIELD SURVEYS.

ACRONYMNS:

CBC = CONCRETE BOX CULVERT
CMP = CORREGATED METAL PIPE
CMPA = CORREGATED METAL PIPE ARCH
HDPE = HIGH DENSITY POLYETHYLENE
PVC = POLYVINYL CHLORIDE
RCP = REINFORCED CONCRETE PIPE
RGRCP = RUBBER GASKETED REINFORCED CONCRETE PIPE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CH2MHILL

EXISTING FACILITIES MAP

CAREFREE DRAINAGE MASTER PLAN

F.C.D. CONTRACT NO. 2000C037

2944fig02.dlv 10-APR-2003

AZTEC
www.aztec.us

3747 E. Grove St
Phoenix, Arizona 85040
[602] 454-0402
[602] 454-0403 Fax

Letter Of Transmittal

To: Tony Bokich
CH2Mhill
2625 S. Plaza Dr Ste 300
Tempe AZ 85282

From: Pete Brothers

Date/Time: 3/28/2003
Subject: Field Notes
Project: Carefree Drainage
Project Number: AZ01056.00002.01.001

Method of Delivery: U.S. Mail x Courier To Be Picked Up Hand Carry

We Are Sending You: ____ Attached ____ Under Separate Cover

____ Shop Drawings ____ Prints ____ Plans ____ Specifications ____ Submittal

____ Change Order ____ Reports ____ Letter ____ Review Comments ____ Other (CD)

Quantity	Doc Date	Doc No.	Description
1			Copy of entire field notes

The above transmitted as follows:

____ For approval ____ Approved as submitted ____ Resubmit ____ copies for approval
____ For your use ____ Approved as noted ____ Submit ____ copies for distribution
____ As requested ____ Returned for corrections ____ Return for ____ corrected prints
____ Other ____ For review and comment ____ Please sign and return one copy

Remarks:

c:

File Name and Path:

SOKKIA™

MADE IN U.S.A.

AZ01056 CAREFREE 300

[redacted]

SOKKIA™

TRANSIT FIELD BOOK

AZ01056
CAREFREE
X-SECTIONS &
DRAINAGE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
25396
ALAN D.
REECE
Date Signed 3/28/03
ARIZONA, U.S.A.

#300

No. 8152-00

4/30

CONTROL SEARCH

BASE FILE: 1056b031802

BASE @ 30
ANTHT 3.76

BASE SET HERE TEMPORARILY

RTK BASE | CAREFREE | CROSS

BASE FILE: 01056603 1902

BASE @ 1J143
ANT HT 1.131 m / 3.71
SATS 6 6/6
GDOP 2.5
TIME 08:16

ROVER FILE: 01056603 1902

V @ 30

DC # 1000 — 1021

1010 — 1015 AREA 2
1012 N6 @ SUBDIVISION WALL

1015 EL ⊥ ℄ TERRAVITA WAY

1016 — 1021 AREA 3
1017 PAV PAV @ N. F/C BOULDERS

SECTIONS 03-19-02 5/300

P.C. ELEV 6
π TOM R

SUNNY 70°

1008572.916
691530.951
214.36

REC		MEAS
1018395.935	-0.013	1018385.922
692219.858	+0.024	692219.882
2186.40	+0.161	2186.561

MAIN ENTRY

6/30a

RTK BASE CARECREE CONT

03-19-02

BASE FILE: 1056 6031902

BASE @ 1KI3
ANT HT 3.56/1.061m
SATS 6/6
LOOP 2.9
TIME 12:29

ROVER FILE: 1056r031902

V@ 5

DC # 1022 — 1038

1022-1024 AREA 3
1022 N/6 IN DIR (GRANITE)
1023 MILKY WAY DR
1032 PAV IN COLOR SAC
1036 PAV MILKY WAY DR & LAZY
1037 " & TRAIL
1038 " & VENUS

SUNNY

PC ELOY 6
T TOM R

1023262.29
708993.091
2578.741

REC		MEAS
1023285.904		1023285.917
708498.797	+0.013	708498.778
2580.45	-0.019 +0.097	2580.547

MEDIAN

WOOD PL
DR
WAY

RTK BASE CROSS SECTIONS CON T. 03-20-02 7/30

BASE FILE: 01056b032002

BASE @ 1KI3
ANT HT 1.091 m / 3.58 ft
SATS 7/7
GDOP 3.2
TIME 09:37

ROVER FILE: 1056L030002

✓ @ 9

OC # 1039 — 1025

1039 — 1047 LINE 9-10

✓ @ 10

1047 PAV I ℄ CAVE CREEK RD

1048 — 10 I ℄ MULE TRAIN N OF

1051 I ℄ MULE TRAIN RD &

EL 4 & 6
BRYAN B

1023262.29
708993.091
2578.741

MC		meas
1023327.923	+0.017	1023327.940
713536.471	-0.018	713536.453
2476.12	+0.006	2476.114

1027443.923	+0.013	1027443.910
713552.558	-0.018	713552.540
2744.93	+0.069	2744.999

ON 9-10 LINE

CAVE CREEK RD

CAREFREE DR

Cross Sections cont

03-20-02

		REC		MEAS
V@	14	1030272.321		1030272.368
		702422.181	+0.047 -0.039 +0.060	702422.142
1057	DELETE	2480.95		2481.038
V@	11	1028713.305		1028713.382
		707729.539	+0.077 +0.021 +0.077	707729.560
		2602.36		2602.437

ADDITIONAL TOPO

10-28-02

BASE FILE: 1056-1028026

BASED 1KI3
ANT HT 1.264 m / 4.15 Ft.
HDOP 6 6/6 7 7/7
SATS 8.1 28
TIME 09:10 13:41

ROVER FILE: 1056-1028026

√ @ 9

DC # 1100 —

CAVE CREEK RD & MILKY WAY

1100 CULVERT # 163
1101

1120 CULVERT # 164
1121

Eloy G.
Gary M. 10-28-02 10/300

CSYS AZCENTRAL
GPS LEICA # 2
USER ENT TOG VALVE
N 1023262.290 LAT 33° 48' 46.0274
E 718993.091 LON 111° 53' 13.4096
OHT 2578.741 EHT 2484.749

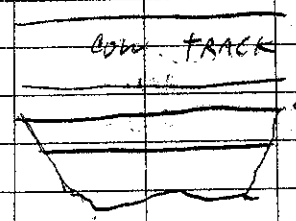
★ NOTE: THESE ELEVS DO NOT COINCIDE W GOAC CONTROL SHEET MAV 69 ⟷ MGUD 29 SHIFT. ALREADY MADE ★ 2.28

REC		MEAS
1023327.923	-0.005	1023327.918
713536.471	-0.045	713536.426
2676.12	+0.024	2676.144

INV 24° CMP (W)
4 (E)

INV 36° CMP (W)
36° (E)

DROP STRUCTURE ON COW TRACK



1102 - 1119

PIMA RD SOUTH OF CAVE CREEK RD

1122 - 1129

1125 - 1127

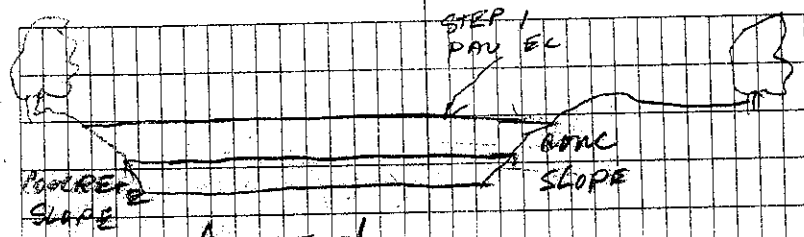
TOM DARLINGTON NORTH OF CAVE CREEK HIGHWAY

★ 1128 DELETE (1 pt)

1129 HOWL ST

1133 - 1135

1136 - 1139 EP



ANOTHER ★

STEPS 1-2 FINISHED CONC

STEP 3 UNFINISHED W/ROUGH

NG SHOTS NOT INDICATIVE OF

FL ELEVATIONS

INV 38" X CMPA (W)

" (E)

645 620 642

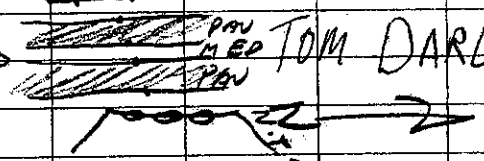
TOP ℄ 8" CMU / NEW EL [redacted] ON HEADWALL NO EL. CHANGE.

INV 50" CMP

E.P. SHOTS ON TOM DARL. ⊕ ℄

CENTER PIPE

1140 HOWL ST



TOM DARL

THERE ARE NO CUTOFF WALLS
GRANITE BOULDERS PROVIDE OUTLET
BANK PROTECTION

TOP ℄ 8" CMU

	(START)	(STOP)
Base @	IJH3	
Ant Ht. =	1222 (m)	4.01 (F)
GDOP	4.1	2.3
Sats	6 6/6	8 8/8
TIME:	9:25 am	1:15 pm

Error Variable
IN: .005
RIGHT: .005
CUT: .050

(✓) #30
Back

DC# 1200 - 1376

10-30-02

RTK Cross Sections & Wall & Culvert Location/Topo

MG
GM

80°
Nice

Base: 1056 - 1030 OLB
Rovr: 1056 - 1030 02 R

IJH3

N 1008572.976
E 691530.951
EL 2111.36

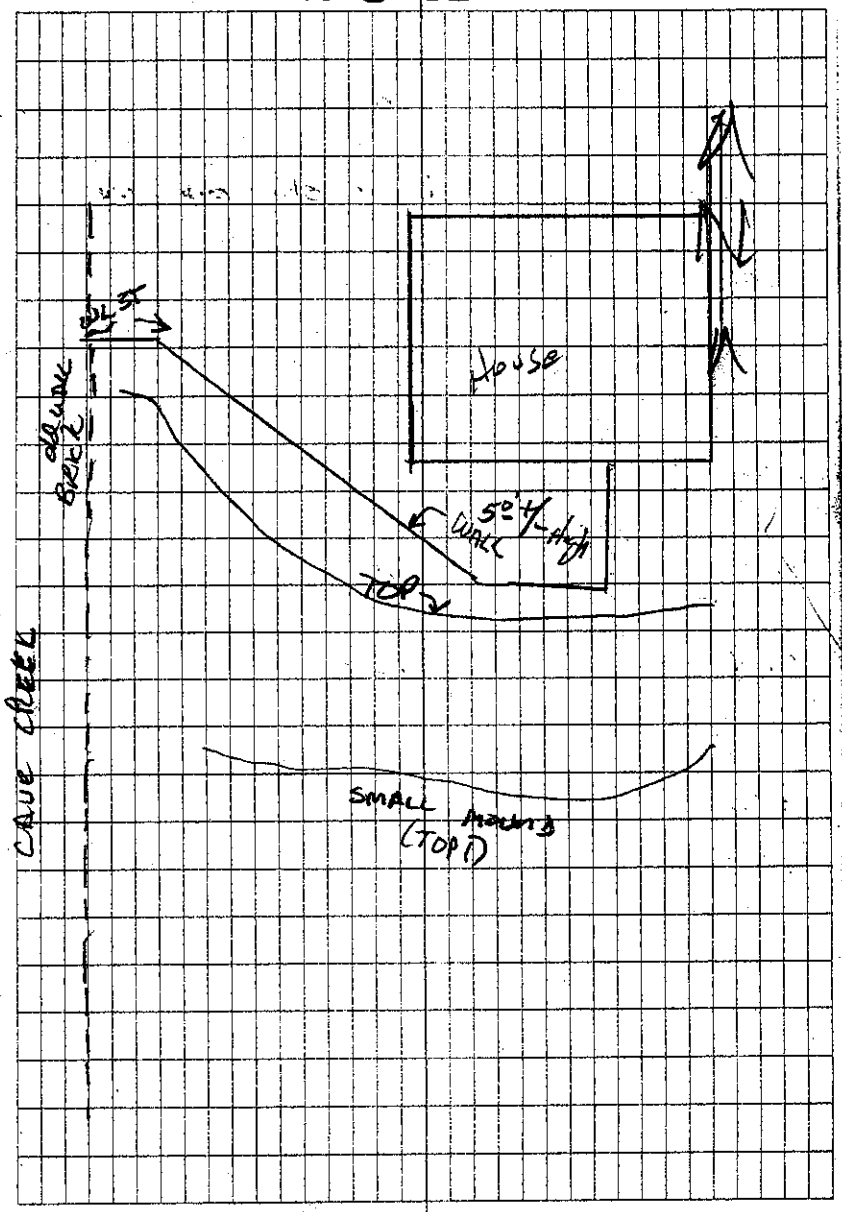
#30

N 1018385.935
E 692219.850
EL 2186.40

14/300

10-30-02

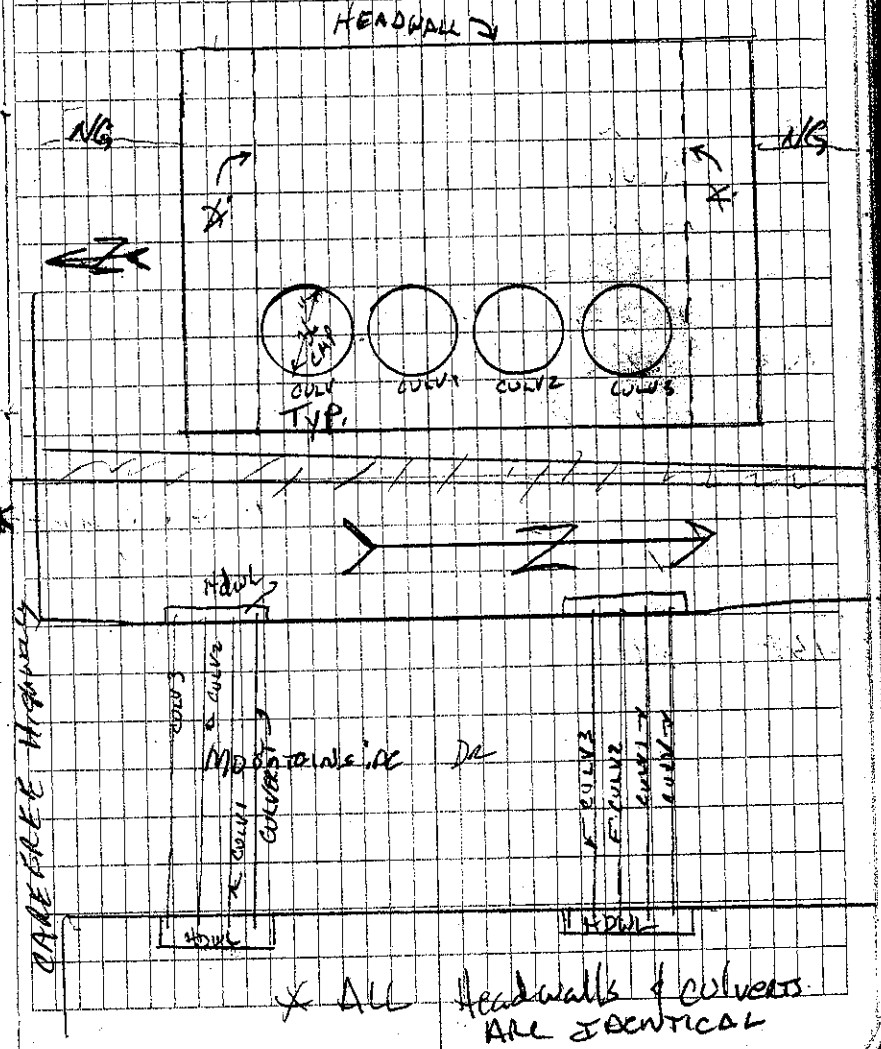
1207	WL ST	+ 4.65 (MEAS. UP FROM NG)	to top of wall 9" Thick Cave wall
1208	WL	+ 4.90	Top
1209	WL	+ 4.85	Top
1210	WL	+ 4.90	Top
1211	WL	+ 5.00	Top
1212	WL	+ 5.20	Top
1213	WL	+ 5.10	Top
1214	WL	+ 5.00	Top



1257	Hdwl ST	Shot Top ℄ 6" conc. Headwall
1258	Delete This Point shot as INV should be CULV ST	Del
1259	CULV ST (Typical)	Shot INV 36" CMP
1260	CULV1 ST	" "
1261	CULV2 ST	Delete this Point
1262	CULV3 ST	Shot INV 36" CMP
1263	CULV3 ST	" " "
1264	EL (Typical)	Shot CONC. Road w/ decorative brick
1278	CULV	Shot INV 36" CMP
1279	CULV1	" "
1280	CULV2	" "
1281	CULV3	" "

15/300

#2 (Typical) Headwall culverts



* ALL Headwalls & culverts ARE IDENTICAL

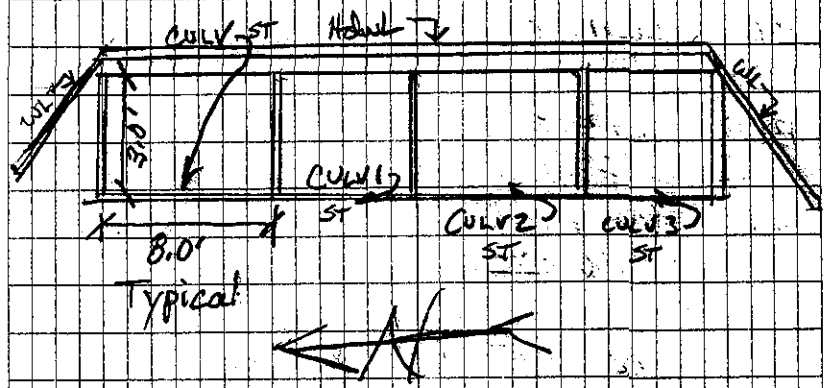
1312	WL ST	Shot TOP & 9" Thick Conc wall
1315	HdWL ST	Shot TOP & 12" Thick Headwall
1320	CULV ST HR=10 562	Shot INV. & 8'x3' Conc RT
1321	CULV1 ST HR=10 562	" " " "
1322	CULV2 ST HR=10 562	" " "
1323	CULV3 ST HR=10 562	" " "
1335	CULV HR=10 562	Shot INV 8'x3' Culvert Box
1339	HR=6 562	

10-30-02

16/300

#20

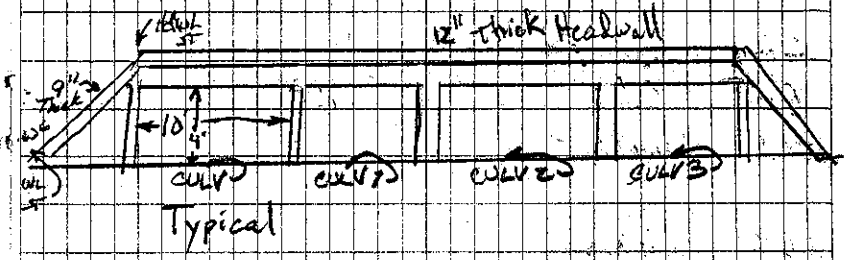
SIDE VIEW
Box Culverts
Headwall & wing walls



1364	CULV ST HR = 11 862	SHOT INV 10' x 4' Box culvert
1365	CULV1 ST HR = 11 862	" "
1366	CULV2 ST HR = 11 862	" "
1367	CULV3 ST HR = 11 862	" "
1358	PV HR = 6 562	
1373	CULV HR = 11 862	SHOT INV 10' x 4' Box culvert
1376	CULV3 HR = 11 862	

#27

Side View



Base @ 1KT3 ANT HT: 1.209 (m) 3.97 (F)

GDOP	2.8	2.2
SATS	7 7/7	9 9/9
TIME	8:36AM,	12:12PM

1KT3

N 1023262.290
E 708993.891
ohT 2578.741

LNG 33° 48' 46.0274"
LAT 111° 53' 13.4091"
E.HT 2484.747

(r) 9

N 1023327.923
E 713536.471
ohT 2676.120

(R)

Ckg Error
out: 0.035
Right: 0.025
fill: 0.015

(m)

N 1023327.941
E 713536.444
ohT 2676.100

11-01-02

18/300

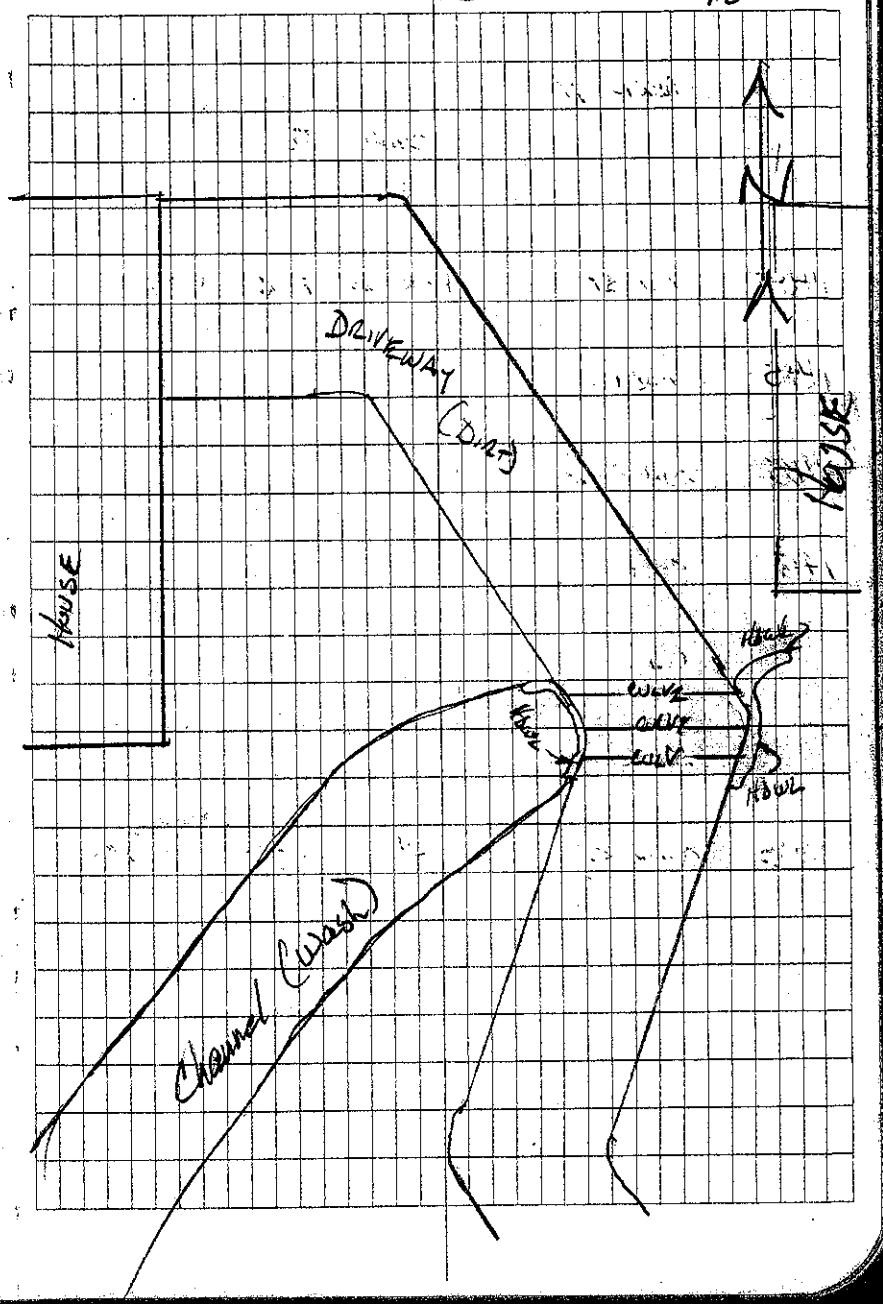
Culvert X-Sections

1056 - 110102 (B) & (R)
(B) = Base
(R) = Cover
(1377 - 1514)

MG
GM
RM

11-01-02

1377	HDWL ST	Shot TOP ℄ 9" wide STUCCO Headwall
1407	CULV ST	Shot TAN 24" CMP
1408	CULV1 ST	" " "
1409	CULV2 ST	" " "
1411	CULV1 HR= ID 922	+ 436
	CULV2	
	C	
	CULV	
1413	HDWL ST HR=6 562	(See PT# 1377 for Descr.)

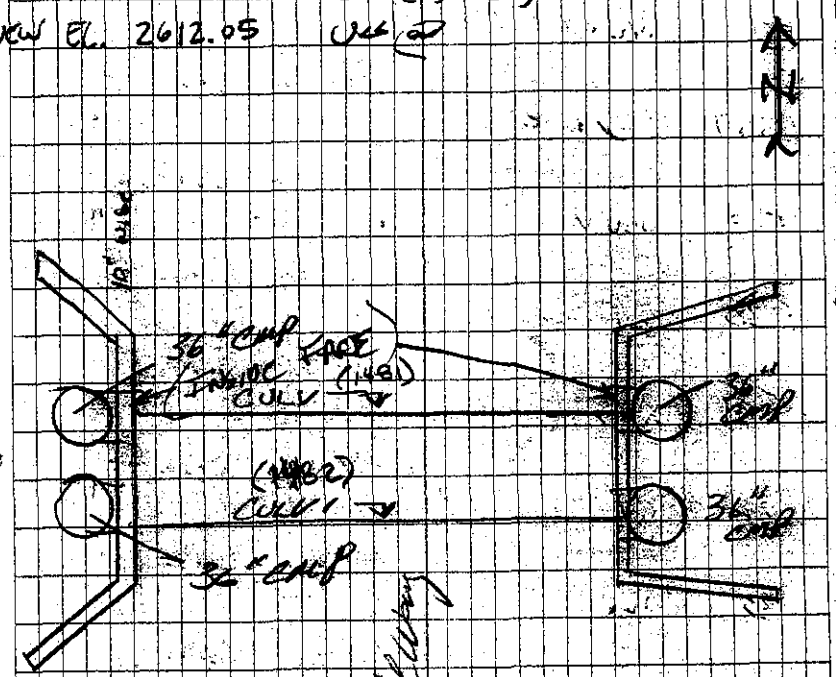


11-01-02 20/300

1439	CULV ST HR= 10 562	SHOT INV ON 48" CMP
1446	CULV HR=6 562	SHOT TOP OF 48" CMP MONTO EL. to INV
1447	CULV ST	SHOT INV ON 24" CMP
1451	CULV	SHOT INV ON 24" CMP
1452	CULV ST	SHOT INV OF 36" CMP
1453	CULVI ST	" " " "
1481	CULV	" " " "
1482	CULVI	" " "
1483	CULV ST	SHOT TOP OF 30" DIA CMP
1484	CULVI ST	" " "
1485	CULVI ST	" " "
1487	HdwL ST	SHOT TOP ℄ OF 10" STUCCO Headwall

1056—ND102 (B) & (R)

NEW EL. 2612.05 Jed



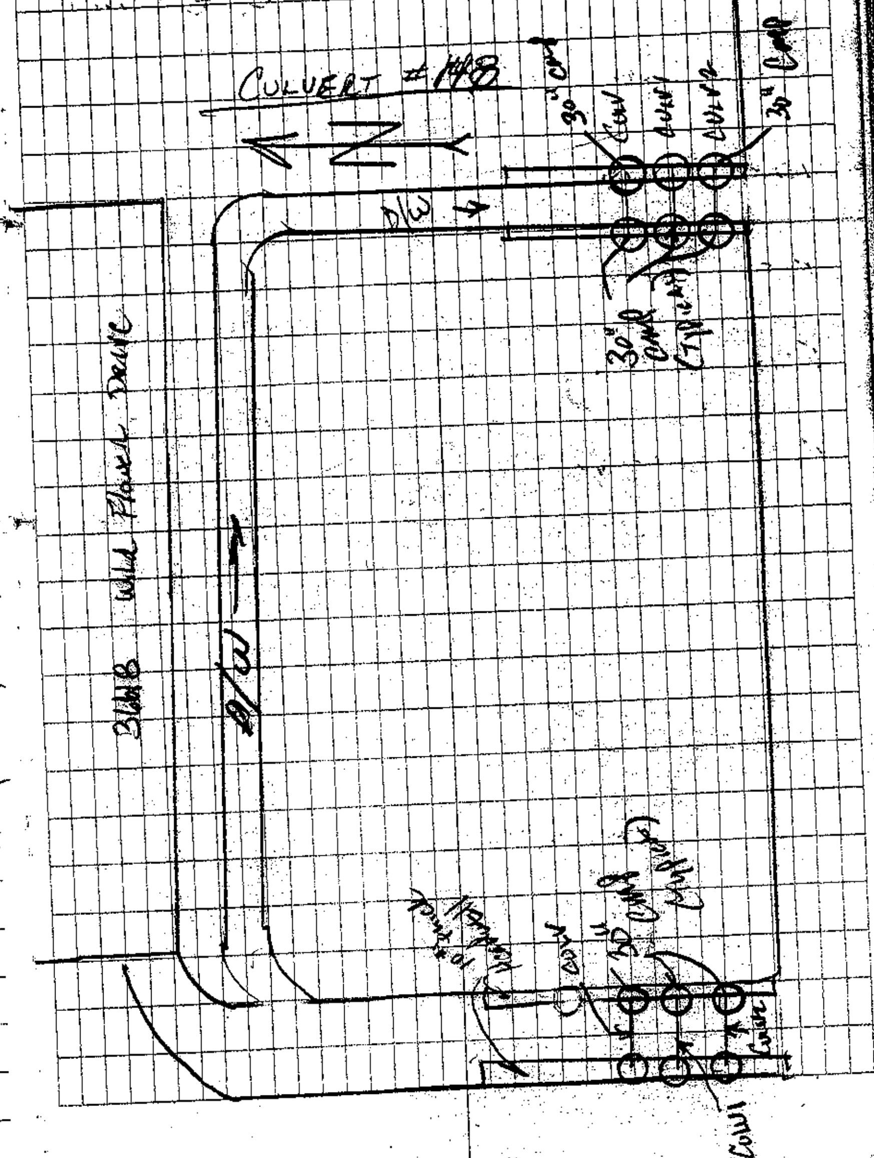
NEW EL. 2664.27

NEW EL. 2664.41 Jed

NEW EL. 2664.32

3680 STARDUST DRIVE

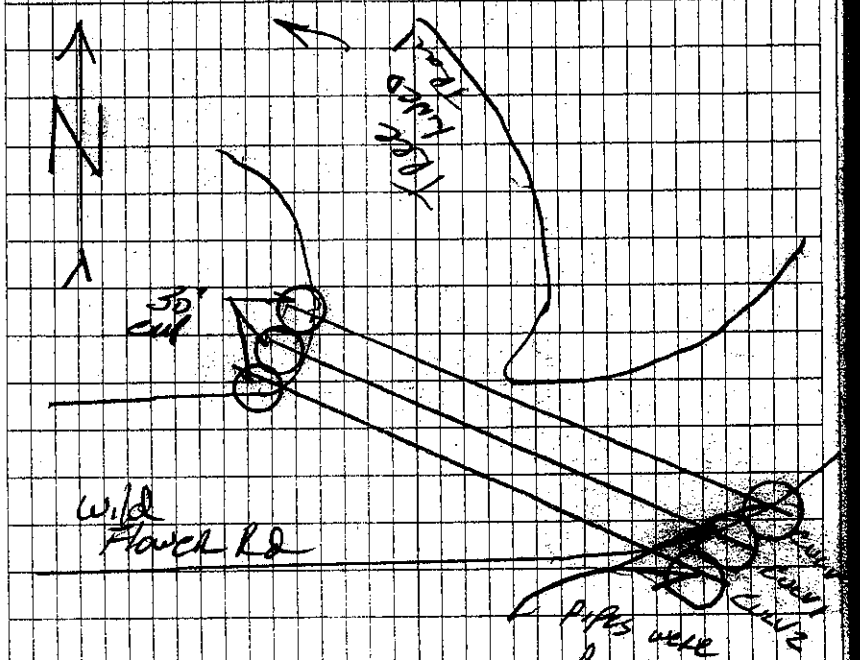
1505	CULV	Shot Top ℄ 30" CMP	
		NEW EL. 2664.48	@
		" " "	
1506	CULV1	NEW EL. 2664.90	@
		" " "	
1507	CULV2	NEW EL. 2664.65	@
		" " "	
1519	CULV ST	NEW EL. 2666.46	@
		" " "	
1520	CULV1 ST	NEW EL. 2666.34	@
		" " "	
1521	CULV2 ST	NEW EL. 2666.44	@
		" " "	
1531	CULV	NEW EL. 2666.74	@
		" " "	
1532	CULV1	NEW EL. 2666.67	@
		" " "	
1533	CULV2	NEW EL. 2666.87	@



11-01-02

1537	CULV ST	shot ~~top~~ ℄ of 30" cap			
		NEW EL.	2671.06		
1538	CULV 1 ST	"	"	"	
		NEW EL	2671.19		
1539	CULV 2 ST	"	"	"	
		NEW EL.	2671.19		
1543	CULV	"	"	"	
		NEW EL.	2672.14		
1544	CULV 1	"	"	"	
		NEW EL.	2672.09		
1545	CULV 2	"	"	"	
		NEW EL.	2672.05		

#147



Pipes were buried out dug down to get top of pipe shots

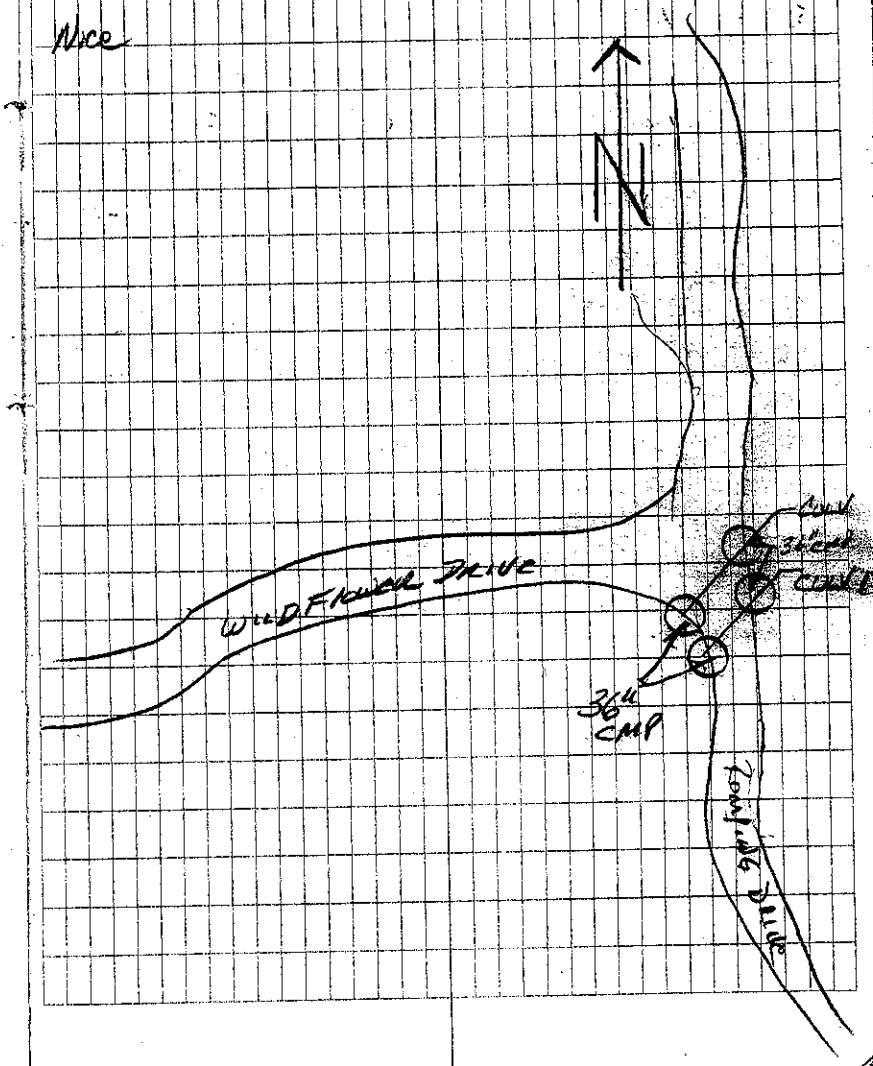
1556	CULV ST		SHOT INV OF 36" CMP		
1557	CULV 1 ST		SHOT INV OF 36" CMP		
1573	CULV		"	"	
1574	CULV 1		"	"	

11-01-02

(1056 - 110102) CONT.
(1577 - 1574)

MG
GM
PM

90°
Nice



BASE FILE: 1056112202B

BASE @ ANT HT = 1.036 M 3.40 FT

1KI3

GDOP	2.2	3.1
SATS	9 9/9	7 7/7
TIME	10:44	4:27

ROVER FILE: 1056112202R

USER ENTERED

1KI3

N 1023262.290

E 708993.091

OHT 2578.741

LAT 33° 48' 46.0274"

LONG 111° 53' 13.4091

EHT 2484.747

✓ @9 REC.

N 1023327.927

E 713536.471

OHT 2476.120

DC # 1575 – 1706

24/305

11-22-02

1.0 GB

CSYS : AZCENTRAL BB

AZCA GPS #2

TOGGLED VALUE

LAT 33° 48' 46.0477 N ✓ .02741 ✓

LONG 111° 53' 13.3923 E ✓ .40963 ✓

E HT 2484.755 .750 ✓

~~1023329.983~~ 1023327.948

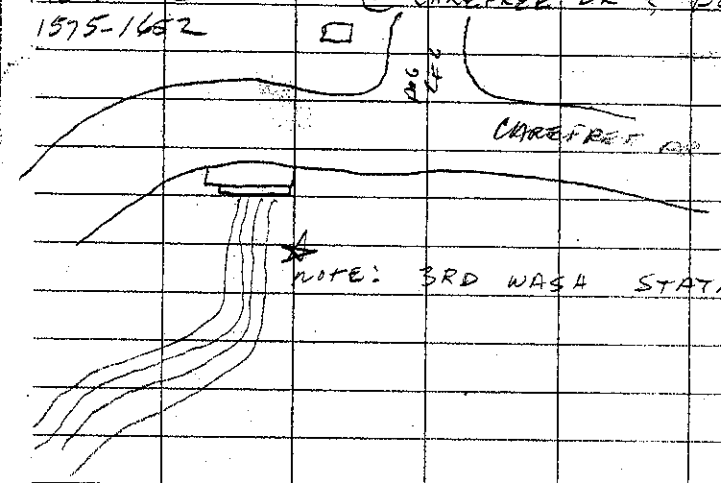
~~713537.855~~ 713536.425

~~2476.127~~ 2476.156

DC 1575-1658

ITEM # 2
1575-1662

@ CAREFREE DR & DOGLEG



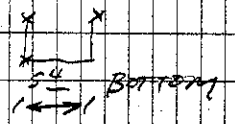
★ NOTE: 3RD WASH STATION

★

# 1626	DELETE	BAD Q
163	DELETE	"
1628	DELETE	"
1640	DELETE	
1643	"	
1644	"	
1646	"	
1629	"	
1648	"	

℄ & EP CROSS SECTIONS 100' EAST OF ℄ ℄ @ DOGLEG RD

SOUTH OF PAVEMENT CANT GET TOE SHOT OR ANY TOE SHOTS



ITEM # 4

165

1696 DELETE

1708 HDWL ST TOP & 8" CMU

1711 INV 30" CMP

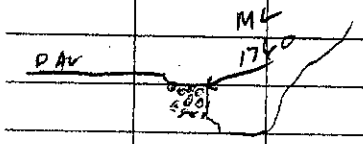
INV 30" CMP

1734 HDWL ST TOP & 8" CMU

1736 INV 30" CMP

1737 EL C 3 60 INV

ITEM 5



1760 ML ST TOP EDGE OF

1773 TOP ST

GABION STRUCTURE

1813 FIRST EXPOSED CONCRETE SLAB WITH REBAR

12-07-02

PC-ELOY
PR RAY

ADOL TOPO WALL IN WASH

BASE FILE: 1056-1202026

BASE @ .30 (1/2" REBAR CAREFREE HWY & SAN SEWER LIFT STA)

ANT HT	1.190 m / 3.90 FT	
SATS	8 8/7	9 9/9
GDOP	2.3	1.8
TIME	10:50	13:16

ROVER FILE: 1056-1202026

✓ @ 1JH3 (LONE MOUNTAIN &

(1900-1926)

6543: ALMENTARIO
LEICA GPS #2

1018365.935
692219.858
2184.4

1008572.976
691530.951
2114.36

1008572.956
691530.950
2109.655
1.4543
2114.192

ADD 1.90 TO ALL ELEVATIONS

1900 WALL ST + 5 50 to TOP
1901 WALL + 5 20
1902 WALL PC + 4 65
1903 WALL + 7 30
1904 WALL PT + 8 10 PROP to 3 ET WITH ROTION
1905 WALL + 2 40
1906 WALL + 165
1907 WALL + 160
1908 WALL + 1 80
1909 WALL + 1 30 to 6 00
1910 WALL + 6 30
1911 WALL + 5 40
1912 WALL + 6 15
1915 TOE ~~DITTO~~ delete

CORE CORRECTIONS

— 1056x+03.ASC —

1629 delete
1648 delete
1576 EP + ST
1577 EP1 + ST
1593 EP + PC
1595 EP + PC
1604 EC ST = CNL ST
1605 EC = CNL
1606 EC1 ST = CNL1 ST
1607 EC1 = CNL1
1608 EC1 = CNL1
1609 EC1 EC = CNL CNL1
1610 EC CL = CNL CL
1613 TOP + ST
1614 TOE + ST
1615 TOE1 + ST
1616 delete
1617 TOP1 + ST
1618 TOE1 = TOP1
1638 TOP + ST
1639 TOE + ST
1641 TOE1 + ST 1642 TOP1 ST
1654 EP + ST CL
1655, 56, 61, 62 EP1 = EP

1627 TOE = NG
1759 EP + ST
1783 GB = NG
1813 CNL ST + TOE3 ST
1814 CNL + TOE2 ST
1815 CNL ST + TOE1
1818 CNL + TOE
1819 TOE + ST TOE3
1820 TOE1 + ST TOE2
1823 GB ST = GB
1913 TOP + ST
1914 TOE + ST
1918 TOP + ST
1919 TOE + ST
1810 TOP + TOP2 ST
1821 TOP1 + ST TOP2

1651 TOE + TOE1

AZ01056 ADOL TOPO LOS REALES

SUBDIVISION
CETER GPS #1
AZ CENTRAL

03-11-03
Elay G.
Tom R.

Base file: 1056-031103B

BASE @ 30 (1/2" Rebar. Cap Free Higher San Sewer L.P.)

Ant Ht	1.149m / 3.77f	6/6	
Sats	5 4/4		
GDOP	4.4	3.1	
Time	09.34	02:15	

N 1018385.935
E 692219.858
Ht 2186.400

33° 47' 56.1596 N
111° 56' 33.5173 W
2092.333 E HT

Rover file: 1056-031103R

@ IJH3

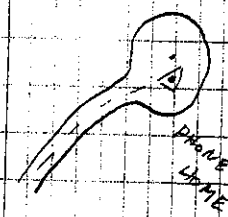
REC		MEAS
1008572.976	-0.011	1008572.965
691530.951	+0.00000	691530.951
2111.36	-0.099	2111.261

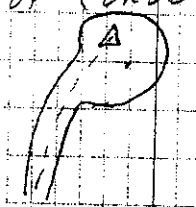
DC 100 — 106 CONTROL FOR FF ELEVATIONS
1000 — TOPO AROUND HOUSES
1133

STORE	CODE	ELEV.	DESC.	
100	BC	2117.69	BC ℄ CUL-DE-SAC	LOS REALES DR & AGAVE CIR
101	BC	2120.57	BC @ INTER	LOS REALES DR & AGAVE CIR
102	BC	2112.85	BC ℄ CUL-DE-SAC	(END LOS REALES DR
103	BC	2123.06	BC ℄ DOG LEG CUL-DE-SAC	LOS REALES DR
104	BC	2099.81	BC ℄ AGAVE PL &	90' E OF CARRERAS MTN DR
105	BC	2104.00	BC ℄ AGAVE PL	200' W OF CUL-DE-SAC (E END)

03-11-03

	ADDL	TOPO	CONT	
106	BC	2102.09	BC ℄ LYSOILOMA PL	@ E END OF CURVE @ OFFSET CLU-DE-SAC
107	EL	2093.93	NORTH RIM SAN SEWER	MH OPPOSITE HOUSE # 2 (5932 E LYSILOMA PL)
108	BC	2059.26	BC ℄ SOPHORA DR.	@ N. END OF CURVE @ OFFSET CLU-DE-SA
109	EL	2060.42	MH	RIM





ADDL TOPO CONT. 03-11-03

1000		HOUSE # 11-10 6031 E AGAVE CIR
1006	CONC	COR CONC DRIVEWAY HOUSE # 10
1027	NG	HOUSE # 9 (SW COR)
1038 ✓	* DELETE *	
1061	NG	HOUSE # 9
1062	NG	HOUSE # 9
1065 ✓	* DELETE *	
1067 ✓	ADD "TOP2"	
1090	TOP ST	WASH BEHIND HOUSE # 1
1098 ✓	TOP2	→ ADD TOP3
1099 ✓	TOE2	→ ADD TOE3
1129	NG	HOUSE # 1 (NE COR)
1130	NG	" (SE COR)
1131	NG	" (NW COR)

1033 –

ENTRADA
~~LOS RENGES~~ ADDL TOPO

03-12-03 34/300

GPS: AZ CENTRAL
LEICA GPS #1

ECOY 4
TOM REESE

BASE FILE: 1056-0312036

BASE @ 26

ANT HT	1.192 a/3.910	
SATS	6/6	7/7
GDOP	4.7	2.1
TIME	08:37	02:16

ROVER FILE: 1056-0312036

	USER ENT		TOGGLE VALUE	
N	1018159.478		33° 47' 55.5366" N	
E	689226.008		111° 57' 07.6782" W	
	2115.68 OHT		2021.081	EHT

			REC	MEHS
VE	25	STORED 25CK	1018548.933	1018548.962
			685766.843	685766.847
			2039.290	2039.225
			REC (SHOT w/BASE @ 30)	
VE	100	100CK	1018573.572	1018573.572
			689498.806	689498.871
			2117.598	2117.589
VE	101	101CK	1018543.945	1018543.908
			689601.601	689601.546
			2120.567	2120.52

	ARRO	4000 CONT				03-12-03
V	108	108 ck			1020344.526	1020346.518
					688112.095	688112.208
					2059.127	2059.263
V	109	109 ck			1020306.985	1020306.837
					688100.714	688100.746
					2060.287	2060.421
	DC #	1135				
1163	INV	14" PVC				
1164	INV	"				
1198	INV	24" PIPE "CMP"				
1213	INV	24" "RCP"				
1214-1216	TOPST TOE ST TOP, ST	SHOT AT SUB-DIVISION			WALL	
1217	MC ST	OPENING IN BOTTOM			OF WALL	Height of opening 6"
1219	HG	SHOT AROUND HOUSE #6				
1220	"	"				
1228	INV	24" RCP				
1230	EL	SHOT AT HOUSE # 6				
1242	INV	16" CMP				
1246	INV	16" CMP				

03-12-03

	ADDC	TOP 9	CONT
1258	NG		Shot at house #6
1278	INV		12" CMP
1279	INV		12" CMP
1280	EC		HOUSE #7
1281	EC		"
1282	NG		"
1283 ✓	* ADD	TOE1 ST	*
1326 ✓	* ADD	TOP1	*
1363 -	NG		HOUSE #2
- 1369	NG		SHOTS ALONG BACK WALL
1387 -	NG		HOUSE #3
- 1392	"		SHOTS ALONG BACK WALL
1403	NG		HOUSE #12
1404	EC		"
1405	NG		OUTSIDE WALL #12
1406	"		"
1407	"		"
	CHANGE TO ALL PAGE		
1454		→	TOP 4 ST TOE 1 ST
1459			TOP 4
1461			TOE ST TOE 10 ST
1462			TOE 10
1465			TOP 4
1240			TOE ST
1297			TOE 1 ST
1462 ✓			TOP ST TOE 10 ST
1467			TOP 10

1455	top 12
1454	top 12 st
1240	toe
1248	toe st
1350	toe 5
1341	toe 2 st toe 5 st
1342	top 2 st top 5 st
1221	top
1222	toe 1
1215	toe 1

LOS REMES SUB.

LEVELS TO FINISH FLOOR ELEVS. HOUSES 13-12 03-12-03 37/300

STA	+	HI	−	SS		
101					2120.57	
	7.565	2128.135				
TP 1			4.308		2123.827	
	6.051	2129.878				
HOUSE 13			2.639		2127.239	34659 LOS REALES DR
	3.363	2130.602				
TP 2			5.194		2125.408	
	2.080	2127.488				
HOUSE 12			4.460		2123.028	34619 LOS REALES DR
	4.276	2127.304				
100			9.608		2117.696	✓

CHECK ELS BETWEEN BM S

101					2120.57	
	3.019	2123.589				
100			5.903		2117.686	

LEVELS TO HOUSES 10-11 LU- REPLES 03-12-03 38/300

STA	+	H I	−	SS		
TBM 100					2117.69	
	5.903	2123.593				
HOUSE 11			7.869		2115.724	6031 AGAVE CIRCLE
	4.553	2120.277				
HOUSE 10			4.560		2115.717	6034 AGAVE CIRCLE
	4.389	2120.106				
TBM 100			2.405		2117.701	

ADDL TOPO LOS REALES

03-13-03

ELOY G.
TOM R.

BASE FILE: 1056-031303

CSYS AZCENTRAL
LEICA GPS #2

	User Entered	TOGGLE VARCE
	N 1018159.478	33° 47' 55.53455 N
	E 689226.008	111° 57' 07.67922 W
	EL 2115.68	2021.0805 E HT

BASE @ 26

ANT HT	1.248m / 4.09 F	
SATS	8 8/8	6 6
GDOP	2.1	2.9
TIME	08:11	12:08

ROVER FILE: 1056-031303R

			REC	MEAS
✓ @	30	30 ck	1018385.935	1018385.901
			692219.858	692219.903
			2186.400	2186.543

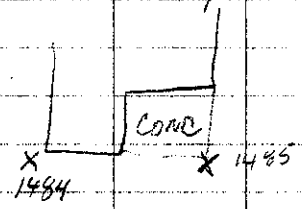
31 ck (1450) TOP SI
32 ck (1451) TOP SI
33 ck 1452 TOPI SI
34 ck ✓ (1453) TOPI SI

1454 TOPI ADD TOEI
1454 INV 24" RCP

1480 → 1484 SHOTS ALONG REAR WALL LOT # 10 (ADDED)
1484 NG SE COR LOT 10 HOUSE

ADDL. TOPO CONT.

1485 NB @ COR DWAY



0373-03 HOMEOWNER 401/300

WOULD LIKE TO PROTEST INCLUSION OF HER PROPERTY "IT'S IRRELEVANT" HER INSURANCE CARRIER AGREES

MCCALLEE
5927 E
LAUSILOM
LOT 10

STA	FE +	ELEVS HI	HOUSES −	SS	3-14-2 EL		03-3-03	41/300
								FEC03 6
TBM 106					2102.00			TOM REESE
	5.649	2107.649						
HOUSE #3			5.449		2102.2	5951 E LYSICOMA		
	5.553	2107.753						
107			12.261		2095.492			
	5.803	2101.295				5927 E LYSICOMA LOT 10		
HOUSE #4			3.542		2097.753			
	3.466	2101.219						
TBM 107			7.362		2093.857	✓ 2093.82 REC		
TBM 107					2093.86	(2093.86 REC)		
	4.977	2098.837						
HOUSE #2			6.143		2092.694	5932 E LYSICOMA		
	6.165	2098.859						
TBM 107			4.995		2093.864			

FF ELEVS HOUSES 4-5-8-7 03-13-03 42/300

STA	+	HI	−		
TBM 104					2099.31
	5.360	2105.17			
HOUSE #4			2.625		2102.545
	2.613	2105.158			
TBM 104			5.351		2099.807
	8.477	2108.284			
HOUSE #5			2.775		2105.509
	3.484	2108.993			
TBM 105			4.983		2104.01
TBM 105					2104.00
	10.618	2114.618			
HOUSE #8			2.825		2111.793
	2.841	2114.634			
			10.638		2103.996
TBM 105					2104.00
	8.051	2112.051			
HOUSE #7			3.472		2108.579
	3.404	2111.983			
			7.985		2103.998

SW QUADRANT OF INTERSECTION @ CAREFREE MTN RD & AGAVE PL

5925 E AGAVE PL

(2104.00 REC)

5973 E AGAVE

5976 E AGAVE

03-13-03

	RF	HOUSES	6-1-9		
1238					
1021	407	.55			
697	602	.19			
2027.01					
STA	+	HI	—	SS	EL
TBM 105					2104.00
	5.241	2109.241			
House #6			3.461		2105.78
	3.453	2109.238			
TBM 105			5.23		2104.008
TBM 108					2059.26
	6.805	2066.065			
House #1			3.763		2062.302
	3.785	2066.087			
TBM 109			5.730		2060.357
TBM 108				6.824	2059.263
TBM 102					2112.85
	2.670	2115.52			
TP			5.932		2109.588
	4.440	2113.988			
House #9			3.513		2110.475
	3.490	2113.965			
TP			4.417		2109.548
	4.438	2113.986			
TBM 102			1.132		2112.854

5952 E ACME PL

35191 N SAPHORA DR

(2060.42 REC)

6055 E LANDUID LN (LUS REACES)

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1101,1025555.6306,709322.1774,2606.51,INV
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1107,1030617.4087,707639.3854,2589.53,EL
1108,1030588.7653,707661.6963,2590.34,EL
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1114,1030645.6478,707609.2218,2587.39,EL
1115,1030579.2773,707652.1258,2587.86,EL
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1121,1025426.9046,709427.6559,2607.28,INV
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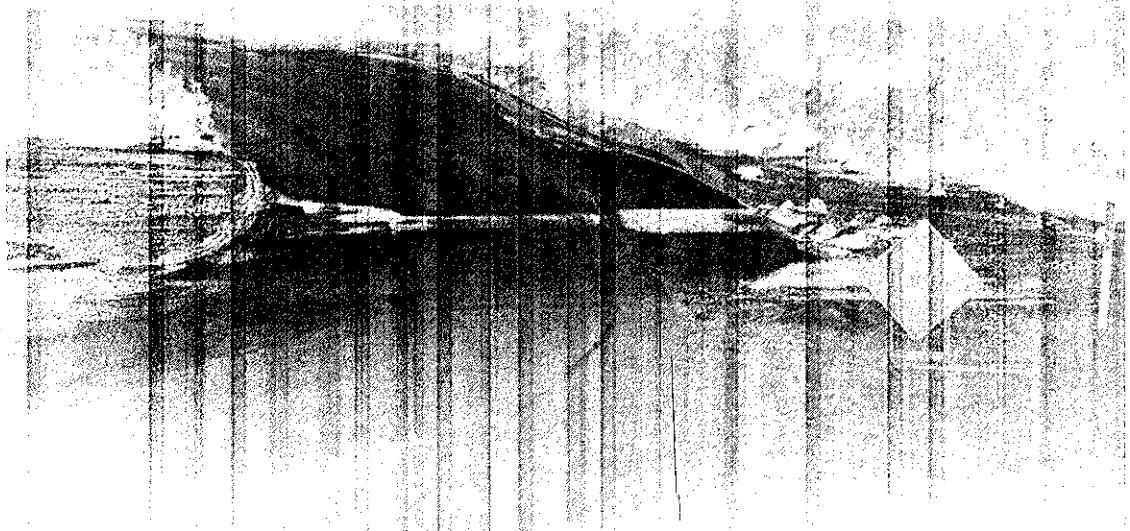

FINAL DATA COLLECTION REPORT

Carefree Drainage Master Plan

Prepared for

Flood Control District of Maricopa County

SEAL OF THE TOWN OF CAREFREE ARIZONA

Prepared by

CH2MHILL

November 2002

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Technical Memorandum

Final Data Collection Report
Carefree Drainage Master Plan

Prepared for

Flood Control District of Maricopa County

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Executive Summary

This report presents the results of the data collection phase of the Carefree Drainage Master Plan, prepared for the Flood Control District of Maricopa County. This phase includes data collection, existing conditions analysis, and preparation of hydrologic models for both existing and future conditions.

Information was gathered from existing drainage studies and reports for the study area, existing and proposed improvement plans, existing topographic mapping and aerial photography, field surveys, historical flooding documentation, stream gauging, and interviews with residents, Town personnel, and regulatory personnel. Information on problematic drainage areas within the Town was additionally compiled during this phase of the project.

Hydrology models were created for the 10-year and 100-year frequencies for the 6- and 24-hour duration for both the existing and future condition land usages within the project watershed. The watershed includes a large area previously modeled as part of the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14). This study contains two models, one for Andora Hills Wash and one for Galloway Wash. These previously developed models were updated as part of this study to include additional frequencies and durations, future conditions, and subbasins refinement. The hydrology modeling additionally provides an estimation of peak discharges at road crossing locations within the Town.

Project Description

The Carefree Drainage Master Plan (DMP) project was initiated to identify drainage problems and develop cost-effective solutions for a storm water collection and disposal system. The project encompasses the entire Carefree Town limits, covering approximately 20 square miles in area. A location map is included as Figure 1.

The purpose of the Carefree DMP is to:

- Identify and quantify the extent of existing and future potential flooding problems within the Town of Carefree and develop alternative solutions to reduce flooding and provide emergency access to residents.
- Conduct a Public Involvement Program with the intention of gathering and disseminating pertinent information regarding flooding, sedimentation and vehicle access, and to keep the citizens of Carefree informed on the progress of the study while obtaining acceptance of the study and its findings and recommendations.
- Perform a qualitative evaluation of the erosion and sedimentation patterns and characteristics within the Town of Carefree and upstream contributing areas, where deemed appropriate, to provide a tool for estimating the long-term benefits or effects of proposed improvements.

Data Collection Results

CH2M HILL has collected and reviewed data pertinent to the scope of the project and project area. The categories of data sought include: Existing drainage studies and reports for the study area, existing and proposed improvement plans, existing topographic mapping and aerial photography, field surveys, historical flooding documentation, stream gauging, and interviews with residents, Town personnel, and regulatory personnel. Table 1 in Appendix A contains a summary of the information gathered during the data collection phase of the project.

Research was performed at the Town of Carefree, City of Scottsdale, Flood Control District of Maricopa County, Maricopa County Department of Transportation, United States Geological Survey, Soil Conservation Service, and other public and private enterprises with information on the project area.

Existing and Proposed Improvement Plans

Improvement Plans were obtained from the Town of Carefree. During the research phase of the project, it was determined that the Town is the only entity that currently maintains any improvement plans for the project area, even if the improvements were developed under another jurisdiction and later annexed into the Town. At the time of annexation, all records for the developments were reportedly turned over to the town, and no longer exist at the original governing agency. The exception to this is utility plans and flood control structure plans, which may be found at the utility companies and Flood Control District, respectively.

The locations of many of the drainage related structures that exist within the Town were obtained from the gathered improvement plans. Information taken from the plans included structure type, size, invert elevations, overtopping elevations, and design flows. Plans were not available for many of the improvements within the Town. In areas not covered by improvement plans, a field survey was performed to acquire the necessary information. Reference the Field Survey section, below, for further information.

Improvements are proposed in limited areas, due to the largely developed nature of the Town. Proposed improvement plans were obtained for Canyon Crossings, Ironwood Estates, Carefree Villages, and the Town Center Drainage Improvements (currently under construction). Additional proposed improvements include a shopping center, church, office parks, and a Senior Care facility, although plans were not available for these developments. The locations of these developments are shown on the Existing Facilities Map, Figure 2 in Appendix B.

Existing and Proposed Drainage Studies and Reports

Research was performed at the Town of Carefree, City of Scottsdale, Flood Control District of Maricopa County, Maricopa County Department of Transportation, United States Geological Survey, Soil Conservation Service, and other public and private enterprises with information on the project area. Drainage studies and reports completed in conjunction with land developments were found covering a limited portion of the project area. The *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14) contains existing hydrologic analyses for the northern half of the Town and offsite drainage basins, and

detailed floodplain delineation for the Galloway Wash through the Town. These existing analyses were updated as part of this study, as described below in the Hydrologic Methodology section. Table 1 in Appendix A contains a summary of the existing studies and reports obtained during the data collection phase of the project.

Due to the largely developed nature of the Town, few future improvements are proposed at this time. Drainage reports were obtained for the proposed Canyon Crossings, Carefree Villages, and Ironwood Estates. It should be noted that the development at Carefree Villages, as it is currently proposed, was denied by Town Council, and therefore will not be developed at this time.

Field Surveys

A field survey was performed within the Town limits. The survey consisted of obtaining or verifying the locations of all drainage-related structures, including culverts, bridges, channels, and dip sections. Additionally, areas of excessive erosion and sedimentation, evidence of flooding events, and structural damage were noted. Table 10 in Appendix A contains a drainage structure summary and Appendix G contains a photo log from the field surveys.

Existing Mapping and Aerial Photography

Detailed topographic mapping is not available for a majority of the land within the Town boundaries. Areas of detailed topographic mapping within the Town limits is limited to the area covered by previous floodplain studies, or areas planned for floodplain mapping as a future phase of this project. However, the entire Town and offsite drainage areas are covered by USGS topographic mapping, with a contour interval of 20 feet. The offsite drainage areas within the limits of the City of Scottsdale are covered by topographic mapping with a contour interval of 2 feet.

Aerial photography coverage, taken in January of 2000, exists for the entire drainage area. The City of Scottsdale has additional coverage for the offsite areas within the City boundaries. Additionally, historic aerial photography coverage of the Town exists for 1999, 1994, 1990, and 1963. The historical photography exists in hard copy format, and is on file at the Town.

GIS data for the project area was supplied digitally by the FCDMC. This data includes soils data, land use data, existing hydrologic delineations, and existing section lines for the project area. An existing parcel location map and zoning map in electronic format were obtained from the Town.

Historical Flooding Documentation

Newspaper articles and photographs were previously examined at the Cave Creek Museum by JE Fuller and Associates during *the Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14). Copies of these articles and photographs were obtained. However, during the time of the preparation of this report, the Cave Creek Museum was closed for remodeling, and therefore no further research at the Museum was performed. Flood photos were additionally provided by private citizens, and are included in the Photo Log for the project, attached as Appendix G.

Stream Gauging

According to the Data Collection Summary prepared by JE Fuller Hydrology and Geomorphology Inc. ("JE Fuller") for the Floodplain Delineation Study of Andora Hills and Galloway Washes, no stream gauging records were identified for the project area. Two precipitation gauges are known to exist in Galloway Wash basin, and monthly precipitation statistics were gathered for these two gauges during the Andora Hills and Galloway Washes study.

Interviews

Interviews were performed with Town personnel, regulatory personnel, residents, and others knowledgeable about the project area. Table 2 in Appendix A, contains a summary of the information gathered during the interview process.

Environmental Surveys and Cultural Resources Assessment

The State of Arizona Game and Fish Department and the U.S. Fish and Wildlife Service were contacted for listings of potentially occurring threatened and endangered species within the project area. The response received from the State of Arizona indicates that the project does not occur in the vicinity of any proposed or designated Critical Habitats. Appendix E contains copies of the request and response letters.

A cultural resources assessment, an environmental regulatory records review, and additional ecological assessments will be performed during the Alternative Analysis phase of the project on approved alternative locations.

Multi-Use Opportunities

The natural washes that exist in the Town provide opportunities for trails, and other multi-use opportunities such as recreation areas and open space. Interviews were performed with representatives from the Town of Carefree, Town of Cave Creek, City of Scottsdale, and Sonoran Foothills Land Trust. Summaries of these interviews are found in Table 2 in Appendix A. Additionally, a Trails Component Report was produced for the project, and is included in Appendix I.

In general, the Town of Carefree prefers to see informal trail alignments. The residents of Carefree have historically allowed access to the trails and washes, but most land owners are not amenable to granting easements and right-of-ways. The Town of Cave Creek and the City of Scottsdale have identified important connectivity points between the jurisdictions, which occur at the washes. All jurisdictions indicate that providing horse and trail access to the washes is important in conjunction with any flood control structures or easements.

Existing Conditions

The Carefree area is developed with exclusive residential subdivisions, golf courses, an airport, and neighborhood commercial facilities. Development in the area tends to preserve the natural topography, which is generally undulating with numerous washes and ridges. The naturally occurring sediments tend to be highly mobile, and are composed of silts, sands and small gravel.

Drainage crossings of roadways typically occur at grade (i.e., flows are perpetuated over the pavement section). These at-grade crossings can prevent access to residents during storm events, prohibit emergency access, and pose a hazard to the public.

Development has occurred immediately adjacent to drainage pathways. Several residences and commercial developments have suffered erosion damage, flooding, and sediment deposition. Large amounts of sediment are often deposited upstream of roadway crossings, with erosion located immediately downstream. This deposition of sediments, or aggradation, is evident throughout the Town. A more detailed report for this sedimentation problem is currently being prepared, and will be submitted separately from this Data Collection Report.

Existing Drainage Facilities

Drainage facilities that exist within the town consist of numerous culverts, overland wash crossings, ditches, and bridges. An Existing Facilities map is attached as Figure 2 in Appendix B. This exhibit contains a graphical representation of the drainage improvements that exist in the Town. Additionally, Tables 10 and 11 in Appendix A summarizes the key physical properties of these drainage improvements.

Identified Existing Problem Areas

Numerous areas were discovered within the Town that are associated with drainage problems, whether associated with identified flooding problems, sedimentation, or perceived as a potential future threat by the general public. Table 12 in Appendix A contains a summary of these areas. Information on these areas was obtained from Town personnel, the *Cave Creek/Carefree ADMS Scope* letter by Coe and Van Loo L.L.C., existing reports, interviews with Town residents, comments obtained at the public meeting held on November 13, 2001, and field surveys.

Hydrologic Methodology

Hydrologic analyses were performed for the 10-year and 100-year frequencies for the 6-hour and 24-hour duration for both the existing and future land use conditions. For modeling purposes, the watershed that encompasses the Town boundaries was subdivided into four models. The first two models were previously created as part of the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14), and are referred to as Andora Hills Wash and Galloway Wash. The third model was created as part of the *North Scottsdale Floodplain Delineation Study*, a project currently being performed for the Flood Control District of Maricopa County (Contract No. FCD 2001C009) by DEI Professional Services, LLC, on an unnamed wash. For the purposes of this study, this wash is referred to as the North Scottsdale wash. The remaining model was also created on an unnamed wash, located to the south and east of the Andora Hills and Galloway Washes. For the purposes of the hydrology model, this wash was given the naming convention of Unnamed Central Wash.

The Andora Hills and Galloway Washes existing models were updated for this study by JE Fuller, the preparer of the aforementioned floodplain delineation study on the washes. The procedures, methodology, and results for these models are contained in Appendix C.

The Unnamed Central Wash was modeled in a complimentary manner to the JE Fuller models in order to provide a comprehensive modeling scheme for the Town. The 6-hour duration models were developed for existing and future land uses with the 6-hour storm patterns contained in the Drainage Design Manual for Maricopa County, Arizona (Drainage Design Manual). The 24-hour duration models were created using the Soil Conservation Service (SCS) Type II distribution. Rainfall losses were estimated using the Green and Ampt method, and hydrograph generation was by the Clark unit hydrograph method. Routing of hydrographs through the models was accomplished by normal depth storage routing.

A summary of the North Scottsdale Floodplain Delineation Study methodology is not included in this report, as the study is on-going and had not been finalized by the date that this report was published. However, the flow summary found in Appendix F does contain a summary of the 10-year and 100-year 6-hour future events, and a copy of the schematic showing locations of each identifier. Please note that the flow rates as documented in Appendix F from the North Scottsdale project are preliminary, and should be considered approximate. Final flow rates will be published by the Flood Control District once the study is completed.

HEC-1 Input Parameters

Peak discharge values were determined using the US Army Corps of Engineers (USACE) HEC-1 computer program, version 4.1, dated June of 1998, in accordance with the methodology set forth in the Drainage Design Manual. Figure 6 in Appendix B contains a schematic representation of the models for the Unnamed Central and Eastern Washes. Appendix F contains HEC-1 output files and a disk of the input files.

Basin Boundaries

Basin delineations for the Unnamed Central Wash are shown graphically on Figure 5 in Appendix B. The basin boundaries from JE Fuller's Andora Hills and Galloway Washes and

the North Scottsdale Delineation Study are additionally shown for reference purposes. Basin delineations for the unnamed washes were determined from topographic mapping. As explained above in the Data Collection Results section, the detail of the mapping varied from 20-foot contour intervals to 2-foot intervals for the watershed.

Soils

Digital format soil information for the project area was supplied by the Flood Control District, as derived from SCS and the U.S. Forest Service (USFS). The soil map unit data are based on *Soil Survey of Aguila-Carefree, Parts of Maricopa and Pinal Counties, Arizona* and on *USF, Tonto National Forest, General Ecosystem Survey*. The basin boundaries were overlaid on the soil information in CAD to determine areas of each soil type contained within a basin, as shown on Figure 3 in Appendix B.

Rainfall Losses

Rainfall loss parameters were estimated using the Green and Ampt method. Table 4 in Appendix A contains a summary of the specific loss parameters for each basin.

Land Usages

The unnamed washes generally flow through residential developments, roads, and undeveloped lands. Digital format existing land use information for the watershed was supplied by the Flood Control District. Land use was determined by overlaying the basin boundaries on the existing land uses.

Unit Hydrographs

The MCUHP1 program was used to compute Tc and R values for all of models and flow conditions. A summary of these values is contained in Table 8 of Appendix A.

Flow Splits and Diversions

The Unnamed Central Wash contains four identified flow splits. These occur at the southernmost portion of the basin, near Carefree Highway. In three out of the four flow splits (HEC-1 identifiers D5859, D87, and D84), the flows remain within the watershed, with portions of the flow transferred to different subbasins. In the remaining flow split at D64, a portion of the flow is transferred offsite to the south, out of the studied watershed.

Flow splits were determined by the hydraulic properties of the channels immediately downstream of the split. A rating curve was developed for each flow split. The division of flow at D84, which occurs at Terravita Way immediately south of Carefree Highway (outside the Town limits), occurs at a culvert system with an overland flow component. Appendix D contains the computations associated with the rating curve developments.

Future Conditions

Future conditions hydrologic models were created for the unnamed washes for the 10-year and 100-year frequencies for the 6- and 24-hour durations. Rainfall parameters, soil parameters, and drainage basin boundaries remained unchanged from the existing conditions models.

Future conditions land usages were determined from the master plans and future developments within the watershed. In some cases within the Town boundaries, the future master plan zoning is less dense than the existing developments. In these cases, the more dense, existing usages were used in the future conditions models as a conservative estimate. Vacant areas were assigned the appropriate future land use in accordance with the master plans. Table 7 in Appendix A contains the Kb resistance coefficient values for the future conditions, and Table 3 in Appendix A contains future impervious percentages and urban land usages.

Roadway Crossings and Culverts

Peak flow estimations were made for each of the identified culverts and roadway crossings within the watershed. Flow estimations were made by determining the drainage area contributing to the culvert or crossing, and compared to the total area of the respective subbasin or subbasins contributing to the nearest downstream concentration point. The ratio of the area to total area at the downstream concentration point was determined, and the flow to the culvert reduced by that ratio. Table 11 in Appendix A contains a summary of the calculations and peak flow estimations for the culverts within the watershed.

Hydrology Results

Appendix F contains a summary table and copies of the hydrology models for the Unnamed Central Wash for the 10-year and 100-year frequencies for the 6- and 24-hour durations.

Roadway Crossings and Culverts

Figure 2 in Appendix B shows the locations of the culverts and road crossings within the entire town, including the road crossings in the Andora Hills and Galloway Washes watershed. Peak discharges for each flow event are summarized in Table 11 in Appendix A.

Comparison of Existing and Future Condition Peak Discharges

Table 11 in Appendix A shows the existing and future peak discharges at the crossings for the four flow events. In general, most of the flows at these locations are similar or slightly greater than the existing condition.

Comparison of Results with Regional Regression Equations

The hydrology results were compared with two regional regression equations. These equations were developed as a means to estimate the flood magnitudes on ungauged streams, and use the variables of drainage area, mean basin elevation, and mean annual precipitation. The two methods are the "USGS Method", as found in the Arizona Department of Transportation *Highway Drainage Design Manual Hydrology*, dated March of 1993, and the "ADWR Method", found in the Arizona Department of Water Resources "A Study to Evaluate Existing Methods for Determining Peak Discharges for Ungauged Watersheds in Arizona – Phase II and III Report", dated 1995. Table 13 in Appendix A contains a summary of the equations and results.

References

See Table 1 in Appendix A for further references

Camp, P.D., 1986, *Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona*: U.S. Soil Conservation Service.

Sabol, et. Al, 1991, *Drainage Design Manual for Maricopa County, Arizona, Volume 1 Hydrology*: Engineering Division of the Flood Control District of Maricopa County.

HNTB, 1990 with revisions to 1996, *Town of Carefree Master Plan Carefree, Arizona*: Town of Carefree.

Table 3
Green and Ampt
Soil Parameters

Table Taken from Maricopa County DDMS Manual (Table 4.2) Carefree values extrapolated from Maricopa County DDMS (Figure 4.3)

Green and Ampt Loss rate Parameter values for Bare Ground And Cave Creek Soils					
Soil Texture Classification	XKSAT Inches/Hour	PSIF inches	DTHETA[1]		
			Dry (4)	Normal (5)	Saturated (6)
Loamy Sand & Sand	1.2	2.4	0.35	0.3	0
Sandy Loam	0.4	4.3	0.35	0.25	0
Loamy Sand & Sand	0.25	3.5	0.35	0.25	0
Silty Loam	0.15	6.6	0.4	0.25	0
Silt	0.1	7.5	0.35	0.15	0
Sandy Clay loam	0.06	8.6	0.25	0.15	0
Clay loam	0.04	8.2	0.25	0.15	0
Silty clay loam	0.04	10.8	0.3	0.15	0
Sandy Clay	0.02	9.4	0.2	0.1	0
Silty Clay	0.02	11.5	0.2	0.1	0
Clay	0.01	12.4	0.15	0.05	0
(6)Sandy Loam-V.Gravelly Sandy Loam	0.62	3.4	0.35	0.25	0
(8)Very Cobbly Sandy Loam	0.96	2.7	0.35	0.15	0
(12)Clay	0.01	12.4	0.15	0.05	0
(26)Clay	0.02	11.5	0.2	0.055	0
(28) Clay	0.02	11.5	0.2	0.1	0
(33)Very Gravelly Loam	0.23	5	0.36	0.25	0
(34)Very Gravelly Loam	0.23	5	0.36	0.25	0
(40)V. Gravelly Loam-Gravelly Clay Loam	0.17	3.1	0.35	0.25	0
(41)V. Gravelly Loam-Gravelly Clay Loam	0.17	3.1	0.35	0.25	0
(61)Ext.Gravelly Sandy Clay-Gravelly Sandy Loam	0.15	3.6	0.39	0.25	0
(63)Ext.Gravelly Sandy Clay-Gravelly Sandy Loam-Rock Outcrop	0.14	3.9	0.395	0.23	0
(72)Clay Loam-Rock Outcrop	0.09	7.3	0.33	0.15	0
(93)Gravelly Loam-Loam	0.33	4.3	0.35	0.25	0
(96)Gravelly Clay Loam-Clay Loam	0.07	8	0.3	0.15	0
(104)Rock Outcrop-Gravelly Clay Loam	0.14	6.2	0.395	0.23	0
(121)Clay Loam-Sandy Loam	0.12	6.6	0.37	0.18	0

[1] Selection of DTHETA
Dry = Nonirrigated lands, such as desert rangeland
Normal= Irrigated lawn, turf, and permanent pasture
Saturated = irrigated agricultrual land

Table 3a
Impervious Percentages
Urban Basins

Impervious Percentages, Urban Basins					
*Values estimated from Carefree and Scottsdale Land Use Maps and Aerial Photographs					
Existing Conditions			Future Conditions		
Subbasin	% Impervious	Primarily Urban?	Subbasin	% Impervious	Primarily Urban?
UC8	36	Y	UC8	36	Y
UC9	36	Y	UC9	36	Y
UC18	24	Y	UC18	26	Y
UC19	18	N	UC19	19	N
UC22	14	N	UC22	16	N
UC23	18	N	UC23	20	N
UC28	14	N	UC28	17	N
UC29	12	N	UC29	19	N
UC30	12	N	UC30	18	N
UC31	20	N	UC31	31	Y
UC34	12	N	UC34	21	Y
UC35	24	N	UC35	24	N
UC37	24	N	UC37	24	N
UC45	24	Y	UC45	24	Y
UC46	24	Y	UC46	24	Y
UC47	24	Y	UC47	24	Y
UC48	30	N	UC48	30	N
UC49	30	N	UC49	30	N
UC50	24	N	UC50	24	N
UC51	26	N	UC51	29	Y
UC57	20	N	UC57	20	N
UC58	20	N	UC58	20	N
UC59	14	N	UC59	16	N
UC62	14	N	UC62	14	N
UC63	19	N	UC63	19	N
UC64	14	N	UC64	17	N
UC66	14	N	UC66	15	N
UC74	14	N	UC74	16	N
UC75	14	N	UC75	16	N
UC76	14	N	UC76	15	N
UC77	16	N	UC77	16	N
UC78	17	Y	UC78	17	Y
UC79	18	Y	UC79	19	Y
UC82	14	N	UC82	15	N
UC84	14	N	UC84	15	N
UC87	8	N	UC87	9	N
UC88	14	N	UC88	15	N
UC89	17	Y	UC89	21	Y
UC90	14	N	UC90	20	N
UC91	14	N	UC91	23	N
UC93	13	N	UC93	20	N
UC94	13	N	UC94	18	N
UC95	13	N	UC95	19	N
UC96	13	N	UC96	18	N

Table 4
Existing Soil Percentages

Sub Basin	Area (mi^2)	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	Soil Map Unit # & Area (mi^2)	% of basin	IA inches	Xksat in/hr	PSIF in.	Dtheta (dry cond.)
		6	%	12	%	28	%	33	%	61	%	63	%	72	%	93	%	96	%	34	%				
UC8	0.054		0%		0%		0%	0.05032	93%		0%		0%		0%		0%		0%	0.00389128	7%	0.3	0.26	4.9	0.36
UC9	0.047		0%		0%		0%	0.04739	100%		0%		0%		0%		0%		0%		0%	0.3	0.23	5.0	0.36
UC18	0.040		0%		0%		0%	0.04030	100%		0%		0%		0%		0%		0%		0%	0.25	0.23	5.0	0.36
UC19	0.027		0%		0%		0%	0.02713	100%		0%		0%		0%		0%		0%		0%	0.25	0.23	5.0	0.36
UC20	0.012	0.00004	0%		0%		0%	0.01216	99%		0%		0%		0%		0%		0%		0%	0.25	0.23	5.0	0.36
UC22	0.032		0%		0%		0%	0.03185	100%		0%		0%		0%		0%		0%		0%	0.25	0.25	5.0	0.36
UC23	0.013		0%		0%		0%	0.01316	100%		0%		0%		0%		0%		0%		0%	0.25	0.25	4.9	0.36
UC28	0.055		0%		0%		0%	0.05521	100%		0%		0%		0%		0%		0%		0%	0.25	0.23	5.0	0.36
UC29	0.035		0%		0%		0%	0.03533	100%		0%		0%		0%		0%		0%		0%	0.25	0.23	5.0	0.36
UC30	0.012		0%		0%		0%	0.01219	100%		0%		0%		0%		0%		0%		0%	0.25	0.23	5.0	0.36
UC31	0.405		0%		0%		0%	0.15053	37%	0.2378486	59%	0.0170606	4%		0%		0%		0%		0%	0.25	0.18	4.1	0.38
UC34	0.037		0%		0%		0%	0.03378	90%	0.0036166	10%		0%		0%		0%		0%		0%	0.25	0.22	4.9	0.36
UC35	0.261		0%		0%		0%	0.01576	6%	0.1711332	66%		0%	0.00540158	2%	0.06861929	26%		0%		0%	0.25	0.20	3.9	0.38
UC37	0.207		0%		0%		0%		0%	0.20698	100%		0%		0%		0%		0%		0%	0.25	0.16	3.7	0.39
UC45	0.086		0%		0%		0%		0%	0.08567	100%		0%		0%		0%		0%		0%	0.25	0.15	3.6	0.39
UC46	0.034		0%		0%		0%		0%	0.0322793	95%	0.0018707	5%		0%		0%		0%		0%	0.25	0.15	3.6	0.39
UC47	0.031		0%		0%		0%		0%	0.0314921	100%		0%		0%		0%		0%		0%	0.25	0.15	3.6	0.39
UC48	0.197	0.00690	4%		0%		0%		0%	0.1900012	96%		0%		0%		0%		0%		0%	0.25	0.16	3.7	0.39
UC49	0.048	0.00045	1%		0%		0%		0%	0.047772	99%		0%		0%		0%		0%		0%	0.25	0.15	3.6	0.39
UC50	0.019	0.00332	17%		0%		0%	0.00183	10%	0.0065462	34%	0.0073017	38%		0%		0%		0%		0%	0.25	0.24	3.8	0.38
UC51	0.060	0.00335	6%		0%		0%	0.03214	54%	0.0035506	6%	0.0129602	22%		0%		0%	0.00764179	13%		0%	0.25	0.21	5.0	0.36
UC57	0.037	0.01109	30%		0%		0%		0%	0.0120632	33%	0.0088080	24%		0%		0%	0.0049151	13%		0%	0.25	0.28	4.2	0.37
UC58	0.110	0.00131	1%		0%		0%		0%	0.0385834	35%	0.0432166	39%		0%		0%	0.02683554	24%		0%	0.25	0.13	4.8	0.37
UC59	0.034	0.01621	48%		0%		0%		0%		0%		0%		0%		0%	0.017853	52%		0%	0.25	0.33	5.8	0.32
UC62	0.361		0%		0%		0%	0.09464	26%		0%	0.0592769	16%	0.20756044	57%		0%		0%		0%	0.25	0.13	6.1	0.35
UC63	0.117		0%		0%		0%	0.07959	68%		0%	0.0308465	26%		0%		0%	0.00686478	6%		0%	0.25	0.19	5.0	0.37
UC64	0.002	0.00054	24%		0%		0%		0%		0%		0%		0%		0%	0.00174676	76%		0%	0.25	0.20	6.9	0.31
UC66	0.037		0%		0%		0%	0.03702	100%		0%		0%		0%		0%		0%		0%	0.25	0.25	5.0	0.36
UC74	0.151		0%		0%		0%	0.04711	31%		0%		0%	0.10360383	69%		0%		0%		0%	0.25	0.13	6.6	0.34
UC75	0.192	0.00534	3%		0%		0%	0.05887	31%		0%		0%	0.12829076	67%		0%		0%		0%	0.25	0.15	6.5	0.34
UC76	0.041		0%		0%		0%	0.02073	51%		0%		0%	0.02007023	49%		0%		0%		0%	0.25	0.16	6.1	0.35
UC77	0.096	0.00146	2%		0%		0%	0.02217	23%		0%		0%	0.07236204	75%		0%		0%		0%	0.25	0.13	6.7	0.34
UC78	0.177	0.00103	1%		0%		0%	0.10117	57%		0%		0%	0.0748685	42%		0%		0%		0%	0.25	0.17	6.0	0.35
UC79	0.078	0.00460	6%		0%		0%	0.07366	94%		0%		0%		0%		0%		0%		0%	0.25	0.45	4.3	0.36
UC82	0.022	0.02071	95%		0%		0%	0.00112	5%		0%		0%		0%		0%		0%		0%	0.25	0.40	4.3	0.36
UC84	0.013	0.01303	98%		0%		0%	0.00032	2%		0%		0%		0%		0%		0%		0%	0.25	0.35	4.5	0.36
UC87	0.029	0.02863	99%		0%		0%		0%		0%		0%		0%		0%	0.0002069	1%		0%	0.25	0.62	3.4	0.35
UC88	0.108	0.10779	100%		0%		0%	0.00021	0%		0%		0%		0%		0%	0.0002069	0%		0%	0.25	0.62	6.1	0.33
UC89	0.073	0.01204	16%		0%		0%	0.01926	26%		0%		0%	0.00528614	7%		0%	0.0367246	50%		0%	0.25	0.20	6.4	0.33
UC90	0.038	0.03102	82%		0%		0%	0.00624	16%		0%		0%		0%		0%	0.00068343	2%		0%	0.25	0.55	3.7	0.35
UC91	0.073	0.00874	12%		0%		0%		0%		0%		0%		0%		0%	0.06403205	88%		0%	0.25	0.14	7.4	0.31
UC93	0.038		0%		0%		0%	0.00025	1%		0%		0%		0%		0%	0.03729346	99%		0%	0.25	0.07	8.0	0.30
UC94	0.028		0%		0%		0%	0.02840	100%		0%		0%		0%		0%		0%		0%	0.25	0.23	5.0	0.36
UC95	0.024		0%		0%		0%	0.00331	14%		0%		0%		0%		0%	0.02090723	86%		0%	0.25	0.15	3.7	0.39
UC96	0.061		0%		0%		0%	0.02107	34%		0%		0%		0%		0%	0.04035515	66%		0%	0.25	0.12	7.0	0.32
UC100	0.029	0.00065	2%		0%		0%	0.02800	98%		0%		0%		0%		0%		0%		0%	0.25	0.24	5.0	0.36

Table 5
Channel Lengths and Slopes

Subbasin Route	Channel Length (ft)	Channel Length (mi)	Channel High Elevation (ft)	Channel Low Elevation (ft)	Channel Slope (ft/ft)	Channel Slope (ft/mi)
UC 8	5494	1.04	2740	2596	0.02621	138.39
UC 9	4814	0.91	2728	2596	0.02742	144.78
UC 18	2933	0.56	2596	2540	0.01909	100.81
UC 19	2731	0.52	2610	2540	0.02563	135.34
UC 22	4001	0.76	2595	2511	0.02099	110.85
UC 28	3020	0.572	2558	2502	0.01854	97.91
UC 29	2470	0.47	2533	2482	0.02065	109.02
UC 30	1492	0.28	2520	2482	0.02547	134.48
UC 31	10770	2.04	2541	2280	0.02423	127.96
UC 34	1621	0.307	2505	2469	0.02221	117.26
UC 35	6681	1.27	2492	2318	0.02604	137.51
UC 37	10692	2.025	2506	2318	0.01758	92.84
UC 45	2548	0.48	2380	2315	0.02551	134.69
UC 46	1582	0.30	2666	2358	0.19469	1027.96
UC 47	2056	0.39	2740	2315	0.20671	1091.44
UC 48	4858	0.920	3160	2256	0.18608	982.53
UC 49	2502	0.47	2350	2280	0.02798	147.72
UC 50	1408	0.267	2528	2256	0.19318	1020.00
UC 51	2223	0.42	2528	2235	0.13180	695.92
UC 57	2505	0.47	2330	2235	0.03792	200.24
UC 58	3628	0.69	2660	2208	0.12459	657.82
UC 59	2591	0.49	2263	2208	0.02123	112.08
UC 62	7018	1.33	3340	2170	0.16671	880.25
UC 63	4264	0.808	2580	2195	0.09029	476.74
UC 64	803	0.15	2232	2200	0.03985	210.41
UC 66	2838	0.538	2325	2170	0.05462	288.37
UC 74	5963	1.13	3395	2031	0.22874	1207.77
UC 75	7302	1.38	3395	2017	0.18872	996.42
UC 76	3378	0.64	2340	2031	0.09147	482.98
UC 77	4888	0.93	3043	2048	0.20356	1074.80
UC 78	4528	0.86	2718	2054	0.14664	774.28
UC 79	4622	0.875	2280	2054	0.04890	258.17
UC 82	1185	0.224	2202	2150	0.04388	231.70
UC 84	1597	0.302	2220	2138	0.05135	271.11
UC 87	1721	0.33	2194	2161	0.01917	101.24
UC 88	5688	1.077	2161	2041	0.02110	111.39
UC 89	4070	0.77	2134	2037	0.02383	125.84
UC 90	2510	0.48	2080	2008	0.02869	151.46
UC 91	3974	0.75	2090	2008	0.02063	108.95
UC 93	3366	0.64	2127	2041	0.02555	134.90
UC 94	2775	0.53	2135	2078	0.02054	108.45
UC 95	1175	0.22	2090	2038	0.04426	233.67
UC 96	3828	0.73	2120	2038	0.02142	113.10
UC 100	2533	0.48	2668	2611	0.02250	118.82

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TABLE 6
Existing Land Use
Kb Values

162944.DP.02
By: RH
Checked: LJ

Resistance Coefficients (K_b) of assorted subbasins for Carefree, AZ

CH2MHILL

P.O. Box 28440 Tempe, AZ
85285-8440 480-966-8188

Equation for Estimating Kb: **Kb=m log A+b** Where: A is drainage area in acres and m and b are Equation parameters dependent upon the landuse type. Type A (minimal roughness) m=-0.00625 and b = 0.04. Type B (moderately low roughness) m = -0.01375 and b = 0.08. Type C (moderately high roughness) m = -0.025 and b = 0.15. Type D (maximum roughness) m = -0.030 and b = 0.20 Values taken from Maicopa County Drainage Design Manual (Table 5.1)

Sub basin	Area (mi^2)	Area (acres)	Large Lot Residential Type A (% Area)	Medium Residential Type A (% Area)	Small Lot Residential Type A (% Area)	Airport Type A (% Area)	Neighborhood Retail Type A (% Area)	Rec. Open Space Type A (% Area)	Hotel Motel Resort Type A (% Area)	Rural Type B (% Area)	Ded. or Non Dev Open Space Type B (% Area)	Vacant Type C (% Area)	Total Percent Type A	Total Percent Type B	Total Percent Type C	Weighted Average for "m"	Weighted Average for "B"	Total Weighted K_b for each subbasin
UC 8	0.05421	34.69440	99%									1%	99%	0%	1%	-0.00644	0.04110	**0.0312**
UC 9	0.05458	34.92800	100%										100%	0%	0%	-0.00625	0.04000	**0.0304**
UC 18	0.04030	25.79200	33%									67%	33%	0%	67%	-0.01881	0.11370	**0.0871**
UC 19	0.02713	17.36040	63%									37%	63%	0%	37%	-0.01319	0.08070	**0.0644**
UC 22	0.03185	20.38400	18%									82%	18%	0%	82%	-0.02163	0.13020	**0.1019**
UC 23	0.01316	8.42240										100%	0%	0%	100%	-0.02500	0.15000	**0.1269**
UC 28	0.05521	35.33440										100%	0%	0%	100%	-0.02500	0.15000	**0.1113**
UC 29	0.03533	22.61120										100%	0%	0%	100%	-0.02500	0.15000	**0.1161**
UC 30	0.01219	7.80402										100%	0%	0%	100%	-0.02500	0.15000	**0.1277**
UC 31	0.40544	259.47922	13%		1%			19%	13%			54%	46%	0%	54%	-0.01638	0.09940	**0.0599**
UC 34	0.03740	23.93600										100%	0%	0%	100%	-0.02500	0.15000	**0.1155**
UC 35	0.26091	166.98240	1%		44%	1%		37%		17%		0%	83%	17%	0%	-0.00760	0.04723	**0.0303**
UC 37	0.20698	132.46720	15%		30%			25%				30%	70%	0%	30%	-0.01188	0.07300	**0.0478**
UC 45	0.08567	54.82880	0%		91%			9%					100%	0%	0%	-0.00625	0.04000	**0.0291**
UC 46	0.03415	21.85600			6%					94%			6%	94%	0%	-0.01330	0.07760	**0.0598**
UC 47	0.03149	20.15494	0%		27%					73%			27%	73%	0%	-0.01173	0.06920	**0.0539**
UC 48	0.19690	126.01600	21%		3%					76%			24%	76%	0%	-0.01195	0.07040	**0.0453**
UC 49	0.04822	30.85907	83%		5%			6%	6%				100%	0%	0%	-0.00625	0.04000	**0.0307**
UC 50	0.01899	12.15360	78%						16%	6%			94%	6%	0%	-0.00670	0.04240	**0.0351**
UC 51	0.05964	38.16768	29%				10%		15%	27%		19%	54%	27%	19%	-0.01184	0.07170	**0.0530**
UC 57	0.03688	23.60156								100%			0%	100%	0%	-0.01375	0.08000	**0.0611**
UC 58	0.10995	70.36715	8%							91%		1%	8%	91%	1%	-0.01326	0.07750	**0.0530**
UC 59	0.03406	21.79757	16%									84%	16%	0%	84%	-0.02200	0.13240	**0.1030**
UC 62	0.35800	229.12000								97%		3%	0%	97%	3%	-0.01409	0.08210	**0.0489**
UC 63	0.11730	75.07200	0%							98%		2%	0%	98%	2%	-0.01398	0.08140	**0.0552**
UC 64	0.00466	2.98400	1%							99%			1%	99%	0%	-0.01368	0.07960	**0.0731**
UC 66	0.03702	23.69088								74%		26%	0%	74%	26%	-0.01668	0.09820	**0.0753**
UC 74	0.15071	96.45650	46%									54%	46%	0%	54%	-0.01638	0.09940	**0.0669**
UC 75	0.19250	123.19692	46%							48%		6%	46%	48%	6%	-0.01098	0.06580	**0.0429**
UC 76	0.04080	26.11251	78%									22%	78%	0%	22%	-0.01038	0.06420	**0.0495**
UC 77	0.09599	61.43388	53%							42%		5%	53%	42%	5%	-0.01038	0.06230	**0.0438**
UC 78	0.17707	113.32309	73%							27%			73%	27%	0%	-0.00828	0.05080	**0.0338**
UC 79	0.07826	50.08640	83%							13%		4%	83%	13%	4%	-0.00798	0.04960	**0.0360**
UC 82	0.02183	13.97120								34%		66%	0%	34%	66%	-0.02118	0.12620	**0.1019**
UC 84	0.01682	10.76500								52%		48%	0%	52%	48%	-0.01915	0.11360	**0.0938**
UC 87	0.02417	15.47100										100%	0%	0%	100%	-0.02500	0.15000	**0.1203**
UC 88	0.10820	69.24800										100%	0%	0%	100%	-0.02500	0.15000	**0.1040**
UC 89	0.07332	46.92215	71%									29%	71%	0%	29%	-0.01169	0.07190	**0.0524**

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162944.DP.02
By: RH
Checked: LJ

TABLE 6
Existing Land Use
Kb Values

Sub basin	Area (mi^2)	Area (acres)	Large Lot Residential Type A (% Area)	Medium Residential Type A (% Area)	Small Lot Residential Type A (% Area)	Airport Type A (% Area)	Neighborhood Retail Type A (% Area)	Rec. Open Space Type A (% Area)	Hotel Motel Resort Type A (% Area)	Rural Type B (% Area)	Ded. or Non Dev Open Space Type B (% Area)	Vacant Type C (% Area)	Total Percent Type A	Total Percent Type B	Total Percent Type C	Weighted Average for "m"	Weighted Average for "B"	Total Weighted K_b for each subbasin
UC 90	0.03794	24.28138	17%							2%		81%	17%	2%	81%	-0.02159	0.12990	0.1000
UC 91	0.07277	46.57289	1%							3%		96%	1%	3%	96%	-0.02448	0.14680	0.1060
UC 93	0.03755	24.02978	32%									68%	32%	0%	68%	-0.01900	0.11480	0.0886
UC 94	0.02840	18.17509										100%	0%	0%	100%	-0.02500	0.15000	0.1185
UC 95	0.02422	15.50005										100%	0%	0%	100%	-0.02500	0.15000	0.1202
UC 96	0.06142	39.30946										100%	0%	0%	100%	-0.02500	0.15000	0.1101
UC 100	0.02865	18.33600	100%										100%	0%	0%	-0.00625	0.04000	0.0321

Carefree DMP
Future Land Use.xls
08/16/2002 9:24 AM

TABLE 7
Future Land Use
Kb Values

162944.DP.02
By: RH
Checked: LJ

Resistance Coefficients (K_b) of assorted subbasins for Carefree, AZ

CH2MHILL

P.O. Box 28440 Tempe, AZ
85285-8440 480-966-8188

Equation for Estimating Kb: **Kb=m log A+b** Where: A is drainage area in acres and m and b are Equation parameters dependent upon the landuse type. Type A (minimal roughness) m=-0.00625 and b = 0.04. Type B (moderately low roughness) m = -0.01375 and b =

Sub basin	Area (mi^2)	Area (acres)	Large Lot Residential Type A (% Area)	Medium Residential Type A (% Area)	Small Lot Residential Type A (% Area)	Airport Type A (% Area)	Neighborhood Retail Type A (% Area)	Rec. Open Space Type A (% Area)	Hotel Motel Resort Type A (% Area)	Rural Type B (% Area)	Ded. or Non Dev Open Space Type B (% Area)	Vacant Type C (% Area)	Total Percent Type A	Total Percent Type B	Total Percent Type C	Weighted Average for "m"	Weighted Average for "B"	Total Weighted K_b for each subbasin
UC 8	0.05421	34.69440	99%	1%									100%	0%	0%	-0.00625	0.04000	**0.0304**
UC 9	0.05458	34.92800	100%										100%	0%	0%	-0.00625	0.04000	**0.0304**
UC 18	0.04030	25.79200	33%	54%			13%						100%	0%	0%	-0.00625	0.04000	**0.0312**
UC 19	0.02713	17.36040	63%	37%									100%	0%	0%	-0.00625	0.04000	**0.0323**
UC 22	0.03185	20.38400	18%	62%			20%						100%	0%	0%	-0.00625	0.04000	**0.0318**
UC 23	0.01316	8.42240		100%									100%	0%	0%	-0.00625	0.04000	**0.0342**
UC 28	0.05521	35.33440		100%									100%	0%	0%	-0.00625	0.04000	**0.0303**
UC 29	0.03533	22.61120		50%				50%					100%	0%	0%	-0.00625	0.04000	**0.0315**
UC 30	0.01219	7.80402	100%										100%	0%	0%	-0.00625	0.04000	**0.0344**
UC 31	0.40544	259.47922	13%	54%	1%			19%	13%				100%	0%	0%	-0.00625	0.04000	**0.0249**
UC 34	0.03740	23.93600	80%					20%					100%	0%	0%	-0.00625	0.04000	**0.0314**
UC 35	0.26091	166.98240	1%		44%	1%		37%		17%			83%	17%	0%	-0.00753	0.04680	**0.0301**
UC 37	0.20698	132.46720	33%		30%			37%					100%	0%	0%	-0.00625	0.04000	**0.0267**
UC 45	0.08567	54.82880	0%		91%			9%					100%	0%	0%	-0.00625	0.04000	**0.0291**
UC 46	0.03415	21.85600			6%					94%			6%	94%	0%	-0.01330	0.07760	**0.0598**
UC 47	0.03149	20.15494	0%		27%					73%			27%	73%	0%	-0.01173	0.06920	**0.0539**
UC 48	0.19690	126.01600	21%		3%					76%			24%	76%	0%	-0.01195	0.07040	**0.0453**
UC 49	0.04822	30.85907	83%		5%			6%	6%				100%	0%	0%	-0.00625	0.04000	**0.0307**
UC 50	0.01899	12.15360	78%						16%	6%			94%	6%	0%	-0.00670	0.04240	**0.0351**
UC 51	0.05964	38.16768	29%				29%		15%	27%			73%	27%	0%	-0.00828	0.05080	**0.0377**
UC 57	0.03688	23.60156								100%			0%	100%	0%	-0.01375	0.08000	**0.0611**
UC 58	0.10995	70.36715	8%					1%		91%			9%	91%	0%	-0.01308	0.07640	**0.0522**
UC 59	0.03406	21.79757	16%		84%								100%	0%	0%	-0.00625	0.04000	**0.0316**
UC 62	0.35800	229.12000						3%		97%			3%	97%	0%	-0.01353	0.07880	**0.0469**
UC 63	0.11730	75.07200	0%					2%		98%			2%	98%	0%	-0.01360	0.07920	**0.0537**
UC 64	0.00466	2.98400	1%							99%			1%	99%	0%	-0.01368	0.07960	**0.0731**
UC 66	0.03702	23.69088						26%		74%			26%	74%	0%	-0.01180	0.06960	**0.0534**
UC 74	0.15071	96.45650	59%							41%			59%	41%	0%	-0.00933	0.05640	**0.0379**
UC 75	0.19250	123.19692	83%		11%					6%			94%	6%	0%	-0.00670	0.04240	**0.0284**
UC 76	0.04080	26.11251	78%				22%						100%	0%	0%	-0.00625	0.04000	**0.0311**
UC 77	0.09599	61.43388	58%							42%			58%	42%	0%	-0.00940	0.05680	**0.0400**
UC 78	0.17707	113.32309	73%							27%			73%	27%	0%	-0.00828	0.05080	**0.0338**
UC 79	0.07826	50.08640	83%					4%		13%			87%	13%	0%	-0.00723	0.04520	**0.0329**
UC 82	0.02183	13.97120						66%		34%			66%	34%	0%	-0.00880	0.05360	**0.0435**
UC 84	0.01682	10.76500						48%		52%			48%	52%	0%	-0.01015	0.06080	**0.0503**
UC 87	0.02417	15.47100			15%			85%					100%	0%	0%	-0.00625	0.04000	**0.0326**
UC 88	0.10820	69.24800	12%		7%		40%	41%					100%	0%	0%	-0.00625	0.04000	**0.0285**
UC 89	0.07332	46.92215	71%				29%						100%	0%	0%	-0.00625	0.04000	**0.0296**

Carefree DMP
Future Land Use.xls
08/16/2002 9:24 AM

162944.DP.02
By: RH
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TABLE 7
Future Land Use
Kb Values

Sub basin	Area (mi^2)	Area (acres)	Large Lot Residential Type A (% Area)	Medium Residential Type A (% Area)	Small Lot Residential Type A (% Area)	Airport Type A (% Area)	Neighborhood Retail Type A (% Area)	Rec. Open Space Type A (% Area)	Hotel Motel Resort Type A (% Area)	Rural Type B (% Area)	Ded. or Non Dev Open Space Type B (% Area)	Vacant Type C (% Area)	Total Percent Type A	Total Percent Type B	Total Percent Type C	Weighted Average for "m"	Weighted Average for "B"	Total Weighted K_b for each subbasin
UC 90	0.03794	24.28138	17%	58%			23%			2%			98%	2%	0%	-0.00640	0.04080	0.0319
UC 91	0.07277	46.57289	1%	39%			57%			3%			97%	3%	0%	-0.00648	0.04120	0.0304
UC 93	0.03755	24.02978	32%				68%						100%	0%	0%	-0.00625	0.04000	0.0314
UC 94	0.02840	18.17509	32%				3%	65%					100%	0%	0%	-0.00625	0.04000	0.0321
UC 95	0.02221	15.50005		29%			71%						100%	0%	0%	-0.00625	0.04000	0.0326
UC 96	0.06142	39.30946		91%			9%						100%	0%	0%	-0.00625	0.04000	0.0300
UC 100	0.02865	18.33600	100%										100%	0%	0%	-0.00625	0.04000	0.0321

Table 8
Tc and R Values

Time of Concentration (T_c) and Storage Coefficient (R) for the Carefree Drainage Study in Carefree, Arizona (Based on the 100 year event).						Existing Conditions								Future Conditions							
Values for Tc were obtained from MCUHP1 program (DDM for Maricopa County, Arizona)						10-yr 6-hr		10-yr 24-hr		100-yr 6-hr		100-yr 24-hr		10-yr 6-hr		10-yr 24-hr		100-yr 6-hr		100-yr 24-hr	
Sub-basin	Length (mi)	Area (mi^2)	Kb	Slope (ft/mi)	Adjusted Slope (ft/mi)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)
UC8	1.04	0.05421	0.031	138	138	0.329	0.587	0.275	0.481	0.304	0.538	0.225	0.385	0.396	0.72	0.275	0.481	0.304	0.538	0.225	0.385
UC9	0.91	0.05458	0.030	145	145	0.296	0.507	0.246	0.413	0.279	0.476	0.208	0.344	0.354	0.619	0.246	0.413	0.279	0.476	0.208	0.344
UC18	0.56	0.04030	0.087	101	101	0.479	0.644	0.438	0.582	0.446	0.595	0.346	0.448	0.329	0.425	0.229	0.284	0.258	0.324	0.192	0.233
UC19	0.52	0.02713	0.064	135	135	0.363	0.557	0.308	0.466	0.338	0.515	0.246	0.362	0.292	0.438	0.204	0.295	0.229	0.335	0.171	0.242
UC22	0.76	0.03185	0.102	111	111	0.613	1.226	0.592	1.18	0.563	1.116	0.446	0.862	0.392	0.747	0.267	0.487	0.296	0.547	0.221	0.395
UC23	0.40	0.01316	0.127	121	121	0.454	0.880	0.408	0.782	0.421	0.808	0.321	0.598	0.262	0.479	0.183	0.321	0.204	0.362	0.154	0.265
UC28	0.57	0.05521	0.111	98	98	0.533	0.463	0.492	0.423	0.488	0.419	0.396	0.334	0.308	0.252	0.213	0.167	0.237	0.189	0.175	0.135
UC29	0.47	0.03533	0.116	109	109	0.500	0.633	0.454	0.569	0.463	0.581	0.354	0.432	0.292	0.348	0.204	0.234	0.229	0.266	0.171	0.192
UC30	0.28	0.01219	0.128	134	134	0.367	0.546	0.317	0.464	0.342	0.505	0.250	0.357	0.213	0.298	0.15	0.202	0.167	0.228	0.125	0.165
UC31	2.04	0.40544	0.060	128	128	0.742	0.786	0.771	0.821	0.692	0.728	0.579	0.598	0.525	0.536	0.4	0.396	0.417	0.415	0.325	0.315
UC34	0.31	0.03740	0.116	117	117	0.387	0.331	0.338	0.284	0.358	0.304	0.262	0.213	0.225	0.181	0.162	0.126	0.179	0.141	0.133	0.101
UC35	1.27	0.26091	0.030	138	138	0.383	0.332	0.338	0.288	0.358	0.308	0.271	0.226	0.45	0.397	0.333	0.285	0.354	0.304	0.267	0.222
UC37	2.03	0.20698	0.048	98	98	1.500	2.509	1.5	2.509	1.375	2.278	1.283	2.106	0.596	0.901	0.463	0.68	0.467	0.687	0.371	0.532
UC45	0.48	0.08567	0.029	135	135	0.208	0.146	0.179	0.123	0.196	0.136	0.150	0.101	0.242	0.172	0.179	0.123	0.196	0.136	0.15	0.101
UC46	0.30	0.03415	0.060	1028	324	0.179	0.144	0.154	0.122	0.171	0.136	0.129	0.100	0.208	0.17	0.154	0.122	0.171	0.136	0.129	0.1
UC47	0.39	0.03149	0.054	1091	324	0.200	0.211	0.171	0.177	0.188	0.197	0.142	0.144	0.229	0.246	0.171	0.177	0.188	0.197	0.142	0.144
UC48	0.92	0.19690	0.045	117	117	0.396	0.312	0.354	0.276	0.375	0.294	0.287	0.219	0.467	0.375	0.354	0.276	0.375	0.294	0.287	0.219
UC49	0.47	0.04822	0.031	148	148	0.208	0.200	0.175	0.165	0.196	0.187	0.150	0.139	0.237	0.232	0.175	0.165	0.196	0.187	0.15	0.139
UC50	0.27	0.01899	0.035	93	93	0.200	0.056	0.171	0.047	0.192	0.053	0.142	0.141	0.237	0.068	0.171	0.047	0.192	0.053	0.142	0.141
UC51	0.42	0.05964	0.053	696	317	0.221	0.172	0.188	0.143	0.208	0.161	0.158	0.119	0.213	0.165	0.154	0.115	0.171	0.129	0.129	0.095
UC57	0.47	0.03688	0.061	200	200	0.283	0.327	0.233	0.263	0.262	0.3	0.196	0.217	0.346	0.408	0.233	0.263	0.262	0.3	0.196	0.217
UC58	0.69	0.10995	0.053	658	317	0.267	0.223	0.225	0.185	0.25	0.208	0.192	0.155	0.308	0.262	0.221	0.181	0.25	0.208	0.188	0.151
UC59	0.49	0.03406	0.103	112	112	0.512	0.684	0.458	0.604	0.463	0.611	0.346	0.442	0.333	0.424	0.213	0.258	0.237	0.291	0.175	0.208
UC62	1.33	0.35800	0.049	880	321	0.433	0.328	0.346	0.256	0.367	0.273	0.275	0.198	0.417	0.314	0.3	0.218	0.329	0.242	0.246	0.175
UC63	0.81	0.11730	0.055	983	322	0.300	0.279	0.25	0.228	0.279	0.258	0.208	0.186	0.35	0.331	0.246	0.224	0.275	0.253	0.204	0.182
UC64	0.15	0.00466	0.073	166	166	0.188	0.437	0.158	0.362	0.175	0.405	0.133	0.303	0.221	0.524	0.158	0.362	0.175	0.405	0.133	0.303
UC66	0.54	0.03702	0.075	1020	324	0.304	0.395	0.25	0.318	0.283	0.365	0.208	0.259	0.279	0.359	0.208	0.259	0.233	0.294	0.171	0.208
UC74	1.13	0.15071	0.067	1208	328	0.404	0.438	0.354	0.379	0.375	0.403	0.283	0.296	0.35	0.374	0.246	0.252	0.275	0.286	0.208	0.21
UC75	1.38	0.19250	0.043	996	322	0.446	0.500	0.4	0.444	0.417	0.464	0.317	0.342	0.342	0.372	0.237	0.249	0.267	0.283	0.2	0.205
UC76	0.64	0.04080	0.050	483	302	0.262	0.362	0.221	0.299	0.246	0.337	0.183	0.243	0.237	0.324	0.171	0.225	0.192	0.256	0.142	0.183
UC77	0.93	0.09599	0.044	1075	324	0.292	0.338	0.246	0.28	0.275	0.317	0.204	0.228	0.325	0.381	0.229	0.259	0.258	0.296	0.196	0.217
UC78	0.86	0.17707	0.034	774	319	0.242	0.182	0.204	0.151	0.229	0.171	0.171	0.124	0.287	0.221	0.204	0.151	0.229	0.171	0.171	0.124
UC79	0.88	0.07826	0.036	258	233	0.321	0.405	0.258	0.318	0.292	0.364	0.225	0.272	0.396	0.511	0.237	0.29	0.271	0.335	0.196	0.234
UC82	0.22	0.02183	0.102	232	220	0.304	0.259	0.246	0.204	0.279	0.235	0.179	0.146	0.208	0.17	0.142	0.111	0.158	0.125	0.112	0.086
UC84	0.30	0.01682	0.094	271	246	0.287	0.421	0.233	0.334	0.267	0.387	0.196	0.276	0.25	0.36	0.167	0.23	0.188	0.262	0.138	0.186
UC87	0.33	0.02417	0.120	101	101	0.529	0.566	0.438	0.458	0.458	0.482	0.317	0.320	0.363	0.372	0.192	0.183	0.217	0.21	0.154	0.144
UC88	1.08	0.10820	0.104	111	111	1.008	1.412	0.771	1.048	0.683	0.917	0.558	0.731	0.463	0.595	0.321	0.396	0.346	0.431	0.25	0.3
UC89	0.77	0.07332	0.052	126	126	0.412	0.499	0.363	0.433	0.383	0.46	0.283	0.329	0.35	0.416	0.242	0.276	0.271	0.313	0.2047	0.229

Table 8
Tc and R Values

Time of Concentration (T_c) and Storage Coefficient (R) for the Carefree Drainage Study in Carefree, Arizona (Based on the 100 year event).						Existing Conditions								Future Conditions							
Values for Tc were obtained from MCUHP1 program (DDM for Maricopa County, Arizona)						10-yr 6-hr		10-yr 24-hr		100-yr 6-hr		100-yr 24-hr		10-yr 6-hr		10-yr 24-hr		100-yr 6-hr		100-yr 24-hr	
Sub-basin	Length (mi)	Area (mi^2)	Kb	Slope (ft/mi)	Adjusted Slope (ft/mi)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)	Tc (hrs)	R (hrs)
UC90	0.48	0.03794	0.100	151	151	0.492	0.603	0.417	0.502	0.433	0.524	0.304	0.354	0.338	0.397	0.188	0.207	0.229	0.259	0.167	0.182
UC91	0.75	0.07277	0.106	109	109	0.738	0.932	0.575	0.707	0.554	0.679	0.442	0.527	0.358	0.418	0.254	0.286	0.283	0.322	0.213	0.234
UC93	0.64	0.03755	0.089	135	135	0.525	0.817	0.408	0.618	0.421	0.639	0.333	0.493	0.287	0.419	0.213	0.299	0.237	0.339	0.183	0.254
UC94	0.53	0.02840	0.119	108	108	0.700	1.150	0.504	0.799	0.5	0.792	0.392	0.604	0.321	0.484	0.221	0.32	0.246	0.36	0.183	0.26
UC95	0.22	0.02422	0.120	234	220	0.300	0.073	0.217	0.051	0.242	0.057	0.179	0.137	0.15	0.034	0.112	0.025	0.125	0.028	0.096	0.021
UC96	0.73	0.06142	0.110	113	113	0.704	0.960	0.554	0.736	0.542	0.717	0.438	0.566	0.333	0.418	0.237	0.287	0.267	0.327	0.2	0.24
UC100	0.48	0.02865	0.032	119	119	0.296	0.400	0.2	0.259	0.225	0.295	0.162	0.206	0.271	0.363	0.196	0.253	0.217	0.283	0.162	0.206

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
RCP13	CPUE1 to CPUE3 through 100	84	106	2668	2611	2533	0.0225	No	0.045	0.035	5	4.9	4
		90	104										
		99	102										
		100	100										
		105	100										
		106	102										
		115	104										
		121	106										
RCP23	CPUE2 to CPUE3 through 100	84	106	2636	2611	1118	0.0224	No	0.045	0.035	5	4.9	2
		90	104										
		99	102										
		100	100										
		105	100										
		106	102										
		115	104										
		121	106										
RCP35	CPUE3 to CPUE5 through 12	81	108	2611	2575	2305	0.0156	No	0.045	0.03	25	6.6	3
		96	104										
		99	102										
		100	100										
		125	100										
		126	102										
		132	106										
		138	180										
R7CP4	Route UE7 through 11	88	106	2637	2614	932	0.0247	No	0.045	0.035	5	4.9	2
		93	104										
		99	102										
		100	100										
		105	100										
		106	102										
		112	104										
		117	106										

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
RCP45	CPUE4 to CPUE5 through 12	81	108	2614	2575	2285	0.0171	No	0.045	0.03	25	6.6	3
		96	104										
		99	102										
		100	100										
		125	100										
		126	102										
		132	106										
		138	180										
RCP5EN	CPUE5 to END through 21	80	106	2575	2490	4246	0.0200	No	0.045	0.03	20	6.5	5
		90	104										
		99	102										
		100	100										
		120	100										
		121	102										
		130	104										
		140	106										
RCP89	CP89 to CP1819 through 18	88	106	2596	2540	2933	0.0191	No	0.045	0.035	8	5.2	5
		90	104										
		99	102										
		100	100										
		108	100										
		109	102										
		120	104										
		132	103										
R1819	CP1819 to CP2223 through 23	72	106	2540	2511	1790	0.0162	No	0.045	0.03	12	6.3	2
		92	104										
		99	102										
		100	100										
		112	100										
		113	102										
		120	104										
		130	106										

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
R2223	CP2223 to CP2930 through 29	88	106	2511	2482	1862	0.0156	No	0.045	0.03	12	6.3	2
		95	104										
		99	102										
		100	100										
		112	100										
		113	102										
		117	104										
		123	106										
R10	Route 10 through 28	75	106	2558	2502	3020	0.0185	No	0.045	0.035	8	5.2	5
		87	104										
		99	102										
		100	100										
		108	100										
		109	102										
		121	104										
		133	106										
R1028	CP1028 to CP2930 through 30	73	106	2502	2482	1296	0.0154	No	0.045	0.035	8	5.2	2
		86	104										
		99	102										
		100	100										
		108	100										
		109	102										
		122	104										
		135	106										
R2930	CP2930 to CP34 through 34	78	106	2482	2469	925	0.0141	No	0.045	0.03	10	6.2	1
		89	104										
		99	102										
		100	100										
		110	100										
		111	102										
		122	104										
		133	106										

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
R34	CP34 to CP3537 through 37	80	106	2469	2318	6475	0.0233	No	0.045	0.035	5	4.9	11
		90	104										
		99	102										
		100	100										
		105	100										
		106	102										
		115	104										
		125	106										
R3537	CP3537 to CP3149 through 49	80	106	2318	2280	1829	0.0208	No	0.045	0.035	5	4.9	3
		90	104										
		99	102										
		100	100										
		105	100										
		106	102										
		115	104										
		125	106										
R3149	CP3149 to CP4850 through 50	90	106	2280	2256	1219	0.0197	No	0.045	0.03	10	6.2	2
		95	104										
		99	102										
		100	100										
		110	100										
		111	102										
		118	104										
		130	106										
R46	Route 46 to CP4547 through 45	82	106	2346	2315	1783	0.0174	No	0.045	0.035	5	4.9	3
		92	104										
		99	102										
		100	100										
		105	100										
		106	102										
		113	104										
		123	106										

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
R4547	CP4547 to CP4850 through 48	81	106	2315	2256	2170	0.0272	No	0.045	0.035	5	4.9	4
		90	104										
		99	102										
		100	100										
		105	100										
		106	102										
		115	104										
		124	106										
R4850	CP4850 to CP5157 through 57	91	106	2256	2235	1509	0.0139	No	0.045	0.03	15	6.4	2
		95	104										
		99	102										
		100	100										
		115	100										
		116	102										
		120	104										
		124	106										
R5157	CP5157 to CP5859 through 59	0	106	2235	2208	1796	0.0150	No	0.045	0.03	20	6.5	2
		60	104										
		99	102										
		100	100										
		120	100										
		121	102										
		160	104										
		220	106										
R5859N	CP5859 (N) to CP63 through 63	0	104	2208	2195	699	0.0186	No	0.045	0.03	10	6.2	1
		50	103										
		99	102										
		100	100										
		110	100										
		111	102										
		160	103										
		210	104										

Table 9
Routing Parameters

		X-Sect. Coordinates											
Routing Reach	Description	X	Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
R63	CP63 to CP6266 through 66	60	106	2195	2170	1394	0.0179	No	0.045	0.03	25	6.6	2
		80	104										
		99	102										
		100	100										
		125	100										
		126	102										
		145	104										
		165	106										
R6266	CP6266 to CP82 through 82	25	106	2170	2150	1394	0.0143	No	0.045	0.03	20	6.5	2
		85	104										
		99	102										
		100	100										
		120	100										
		121	102										
		135	104										
		195	106										
R5859S	CP5859 (S) to CP64 through 64	0	104	2208	2194	803	0.0174	No	0.045	0.03	25	6.6	1
		50	103										
		99	102										
		100	100										
		125	100										
		126	102										
		175	103										
		225	104										
RD64N	CP64 (N) to CP87 through 87	20	106	2194	2161	1721	0.0192	No	0.045	0.03	12	6.3	2
		60	104										
		99	102										
		100	100										
		112	100										
		113	102										
		152	104										
		192	106										

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
RD87N	CP87 to CP82 through 82	25	106	2161	2150	557	0.0197	No	0.045	0.03	20	6.5	1
		85	104										
		99	102										
		100	100										
		120	100										
		121	102										
		135	104										
		195	106										
R82	CP82 to CP84 through 84	50	106	2150	2138	579	0.0207	No	0.045	0.03	25	6.6	1
		75	104										
		99	102										
		100	100										
		125	100										
		126	102										
		150	104										
		175	106										
R84	CP84 to CP7879 through 79	75	106	2138	2054	3463	0.0243	No	0.045	0.03	10	6.2	5
		94	104										
		99	102										
		100	100										
		110	100										
		111	102										
		116	104										
		135	106										
R7879	CP7879 to CP77 through 77	70	106	2054	2048	256	0.0234	No	0.045	0.03	20	6.5	0
		90	104										
		99	102										
		100	100										
		120	100										
		121	102										
		130	104										
		140	106										

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
R77	CP77 to CP89 through 89	60	106	2048	2037	593	0.0185	No	0.045	0.03	15	6.4	1
		80	104										
		99	102										
		100	100										
		115	100										
		116	102										
		120	104										
		125	106										
R89	CP89 to CP90EN through 90	60	106	2037	2008	1912	0.0152	No	0.045	0.03	15	6.4	2
		80	104										
		99	102										
		100	100										
		115	100										
		116	102										
		135	104										
		155	106										
R7476	CP7476 to CP75 through 75	60	106	2031	2017	524	0.0267	No	0.045	0.03	12	6.3	1
		80	104										
		99	102										
		100	100										
		112	100										
		113	102										
		132	104										
		152	106										
R75	CP75 to CP90EN through 90	60	106	2017	2008	723	0.0124	No	0.045	0.03	15	6.4	1
		80	104										
		99	102										
		100	100										
		115	100										
		116	102										
		135	104										
		155	106										

Table 9
Routing Parameters

Routing Reach	Description	X-Sect. Coordinates X	X-Sect. Coordinates Y	Elevation Upstream (ft)	Elevation Downstream (ft)	Reach Length (ft)	Slope (ft/ft)	Tc Slope Adj.?	Overbank "n" value	Channel "n" value	Average Bottom Width (ft)	Average Velocity (ft/s)	NSTPS ((L/V)/NMIN)
RD87S	CP87 (S) to CP88END through 88	80	106	2161	2041	5688	0.0211	No	0.045	0.03	15	6.4	7
		90	104										
		99	102										
		100	100										
		115	100										
		116	102										
		125	104										
		135	106										
RD84S	CP84 (S) to CP88END through 88	80	106	2138	2041	4843	0.0200	No	0.045	0.03	15	6.4	6
		90	104										
		99	102										
		100	100										
		115	100										
		116	102										
		125	104										
		135	106										
R94	Route 94 through 88 to CP88END	80	106	2078	2041	1924	0.0192	No	0.045	0.03	15	6.4	3
		90	104										
		99	102										
		100	100										
		115	100										
		116	102										
		125	104										
		135	106										

Table 13
Regression Equations

UC Basins	
USGS Method	**ADWR Method**
$Q_{10} = 74.7A^{0.638}(E/1000)^{-1.00}p^{0.971}$ **A =** 3.65 Area (mi^2) **E=** 2375 Elevation (ft) **p =** 10 Mean Annual Precipitation (in) **Q_{10} =** **672 Peak Flow (cfs)**	$Q_{10} = 479A^{0.661}(E/1000)^{-0.398}$ **A =** 3.65 Area (mi^2) **E =** 2375 Elevation (ft) **Q_{10} =** **799 Peak Flow (cfs)**
Comparison to HEC-1 Model: ***Q_{10} =*** *1706 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*	***Q_{10} =*** *1706 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*
$Q_{100} = 553A^{0.610}(E/1000)^{-1.30}p^{0.915}$ **A =** 3.65 Area (mi^2) **E =** 2375 Elevation (ft) **p =** 10 Mean Annual Precipitation (in) **Q_{100} =** **3254 Peak Flow (cfs)**	$Q_{100} = 10^{(6.55 - 3.17A^{\wedge}-0.11)}(E/1000)^{-0.454}$ **A =** 3.65 Area (mi^2) **E =** 2375 Elevation (ft) **Q_{100} =** **4268 Peak Flow (cfs)**
Comparison to HEC-1 Model: ***Q_{100} =*** *3132 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*	***Q_{100} =*** *3132 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*

Galloway Wash Basins	
USGS Method	**ADWR Method**
$Q_{10} = 74.7A^{0.638}(E/1000)^{-1.00}p^{0.971}$ **A =** 20.98 Area (mi^2) **E=** 2375 Elevation (ft) **p =** 10 Mean Annual Precipitation (in) **Q_2 =** **2051 Peak Flow (cfs)**	$Q_{10} = 479A^{0.661}(E/1000)^{-0.398}$ **A =** 20.98 Area (mi^2) **E =** 2375 Elevation (ft) **Q_{10} =** **2538 Peak Flow (cfs)**
Comparison to HEC-1 Model: ***Q_{10} =*** *7906 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*	***Q_{10} =*** *7906 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*
$Q_{100} = 553A^{0.610}(E/1000)^{-1.30}p^{0.915}$ **A =** 20.98 Area (mi^2) **E =** 2375 Elevation (ft) **p =** 10 Mean Annual Precipitation (in) **Q_{100} =** 9455 Peak Flow (cfs)	$Q_{100} = 10^{(6.55 - 3.17A^{\wedge}-0.11)}(E/1000)^{-0.454}$ **A =** 20.98 Area (mi^2) **E =** 2375 Elevation (ft) **Q_{100} =** 12923 Peak Flow (cfs)
Comparison to HEC-1 Model: ***Q_{100} =*** *13541 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*	***Q_{100} =*** *13541 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*

Table 13
Regression Equations

Andora Hills Wash Basins	
USGS Method	**ADWR Method**
$Q_{10} = 74.7A^{0.638}(E/1000)^{-1.00}p^{0.971}$ A = 2.77 Area (mi^2) E= 2820 Elevation (ft) p = 10 Mean Annual Precipitation (in) Q_{10} = 475 Peak Flow (cfs)	$Q_{10} = 479A^{0.661}(E/1000)^{-0.398}$ A = 2.77 Area (mi^2) E = 2820 Elevation (ft) Q_{10} = 622 Peak Flow (cfs)
Comparison to HEC-1 Model: *Q_{10} = 1870 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*	*Q_{10} = 1870 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*
$Q_{100} = 553A^{0.610}(E/1000)^{-1.30}p^{0.915}$ A = 2.77 Area (mi^2) E = 2820 Elevation (ft) p = 10 Mean Annual Precipitation (in) Q_{100} = 2199 Peak Flow (cfs)	$Q_{100} = 10^{(6.55 - 3.17A^{-0.11})}(E/1000)^{-0.454}$ A = 2.77 Area (mi^2) E = 2820 Elevation (ft) Q_{100} = 3248 Peak Flow (cfs)
Comparison to HEC-1 Model: *Q_{100} = 3635 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*	*Q_{100} = 3635 Peak Flow (cfs)* *HEC-1 model, existing, 24-hr.*

CH2MHILL SUBJECT How Split Estimation D64 N, S BY LAJ

SHEET NO. 1 of 1 DATE 1/2/02

PROJECT NO. 162944. DP. 02

D64N = 218.38 cfs bankfull capacity
D64S = 178.71 cfs bankfull capacity

→ see attached Flow Master printouts

Total cfs = 218.38 + 178.71 = 397.09 cfs

$$\text{North} = \frac{218.38}{397.09} = 55.0\%$$

$$\text{South} = \frac{178.71}{397.09} = 45.0\%$$

∴ Flow split is 55% North, 45% South

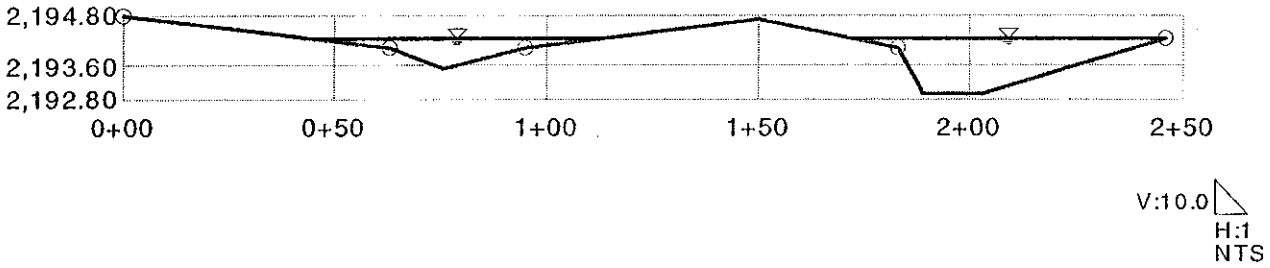
Diversion Card

INFLOW	0	50	100	500	10000
DIVERSION (to South)	0	22.5	45	225	4500

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	D64N
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

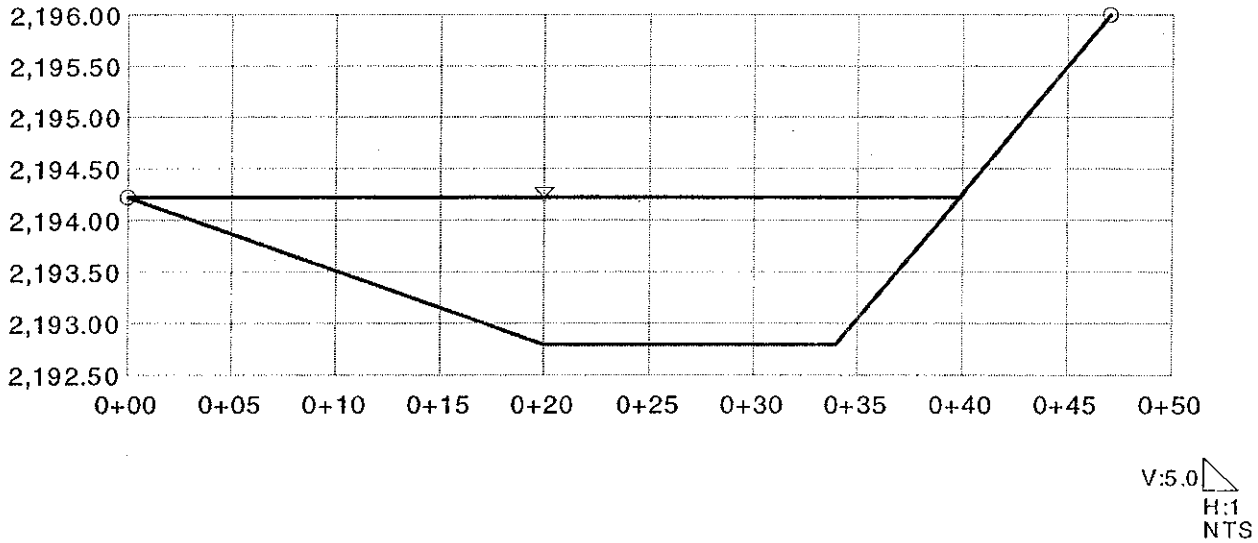
Section Data		
Mannings Coefficie	0.038	
Slope	0.014800	ft/ft
Water Surface Elev	2,194.23	ft
Elevation Range	92.90 to 2,194.80	
Discharge	218.38	cfs



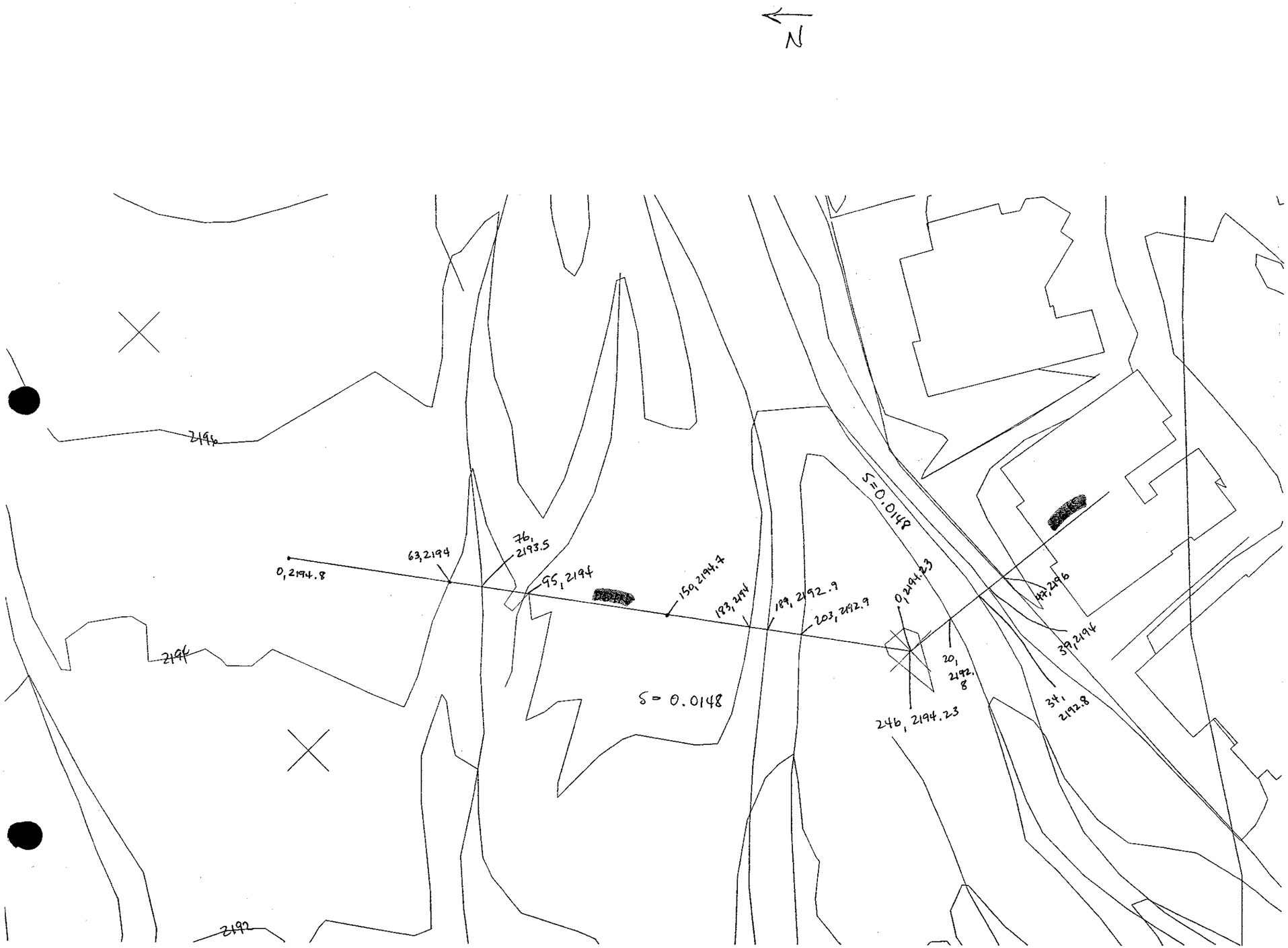
Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	D64S
Flow Element	Irregular Chani
Method	Manning's Forı
Solve For	Discharge

Section Data		
Mannings Coefficiei	0.038	
Slope	0.014800	ft/ft
Water Surface Elev	2,194.23	ft
Elevation Range	92.80 to 2,196.00	
Discharge	178.71	cfs



D64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2192
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95, 2194
150, 2194.4
183, 2194
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203, 2192.9
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S = 0.0148
20, 2192.8
246, 2194.23
34, 2192.8
39, 2194
42, 2196

40 scale

CH2MHILL SUBJECT Flow Split Estimation D87N, S BY LAJ

SHEET NO. 1 of 1 DATE 1/2/02

PROJECT NO. 162944.DP.02

D87N = 117.56 cfs bankfull capacity

D87S = 3.12 cfs " "

→ See attached Flow Master Printouts

Total cfs = 117.56 + 3.12 = 120.68 cfs

$$\text{North} = \frac{117.56}{120.68} = 97.4\%$$

$$\text{South} = \frac{3.12}{120.68} = 2.6\%$$

∴ Flow Split is 97.4% North, 2.6% South

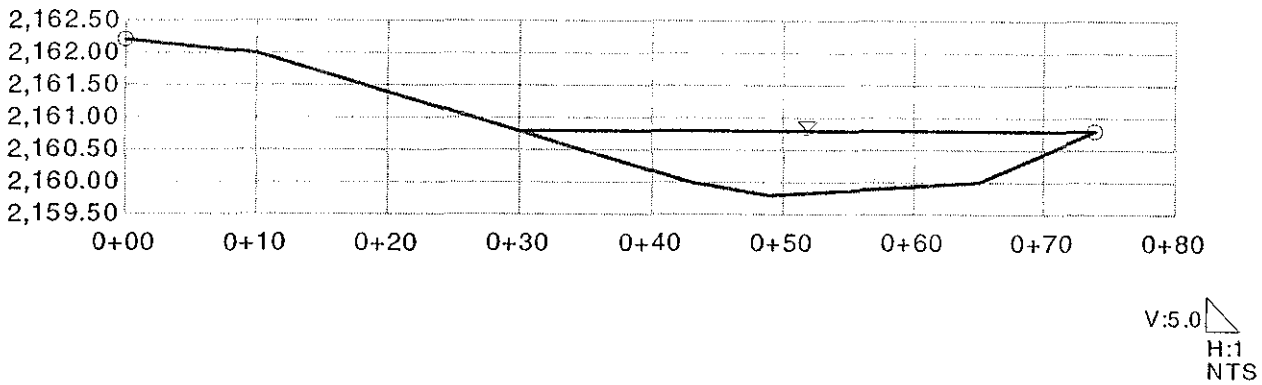
Diversion Card

INFLOW	0	50	100	500	10000
DIVERSION (to South)	0	1.3	2.6	13	260

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	D87N
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

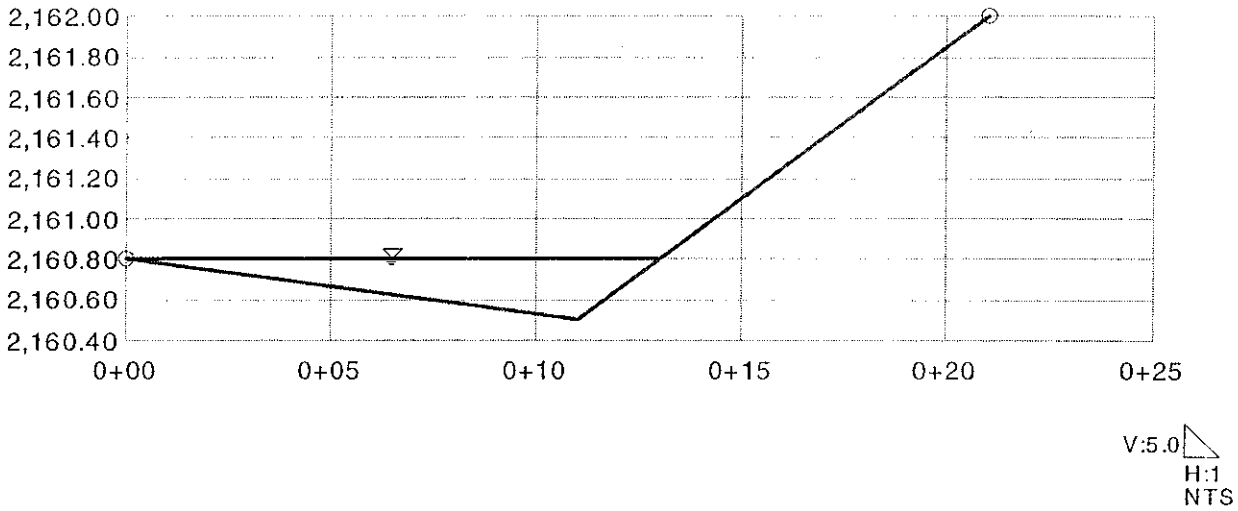
Section Data		
Mannings Coefficie	0.038	
Slope	0.019600	ft/ft
Water Surface Elev	2,160.80	ft
Elevation Range	59.80 to 2,162.20	
Discharge	117.56	cfs



Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	D87S
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data		
Mannings Coefficie	0.038	
Slope	0.021100	ft/ft
Water Surface Elev	2,160.80	ft
Elevation Range	60.50 to 2,162.00	
Discharge	3.12	cfs



D87 N, S
40 scale

Existing

Appendix F
Flow Summary

	Total Existing Flows (cfs)				Total Future Flows (cfs)			
Identifier	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr
UC8	39	22	81	82	40	45	82	83
UC9	49	28	83	82	42	46	83	82
CPC8	88	49	163	162	82	90	164	164
RCP89	87	49	161	159	81	87	162	160
UC18	25	12	54	56	43	46	85	82
UC19	19	10	41	39	27	29	54	53
CP1819	131	70	256	250	143	151	287	277
R1819	129	69	254	248	141	148	285	274
UC22	11	12	26	27	22	25	47	48
UC23	13	7	28	27	23	22	41	36
CP2223	150	86	304	295	175	182	356	340
R2223	149	86	301	292	173	180	354	337
UC28	33	39	79	79	66	70	135	126
R28	33	39	79	78	66	69	133	124
UC29	19	22	45	45	38	41	79	76
UC30	8	9	17	18	15	15	29	28
CP2930	204	141	438	427	278	284	573	534
R2930	204	140	436	423	276	280	566	530
UC34	33	31	71	71	59	57	112	99
CP34	232	155	496	477	309	310	630	580
R34	228	152	478	455	300	299	593	551
UC37	101	96	207	197	138	141	276	267
UC35	283	291	591	528	283	291	549	528
CP3537	453	387	917	877	610	644	1152	1158
R3537	450	384	911	872	603	636	1146	1147
UC49	78	74	134	123	78	74	134	123
UC31	215	211	473	814	361	365	748	716
CP3149	623	591	1305	1608	862	987	1668	1802
R3149	622	591	1303	1598	861	984	1663	1797
UC46	63	59	107	94	63	59	107	94
R46	62	57	104	92	62	57	104	92
UC45	157	147	266	235	157	147	266	235
UC47	50	48	87	79	50	48	87	79
CP4547	265	247	451	402	265	247	451	402
R4547	259	240	439	390	259	240	440	390
UC48	226	224	418	397	226	224	410	397
UC50	28	27	51	47	28	27	51	47
CP4850	821	954	1689	2335	1095	1309	2120	2467
R4850	821	948	1683	2308	1091	1298	2113	2449
UC51	95	92	170	156	105	99	190	164
UC57	36	40	74	72	36	40	74	72
CP5157	865	1031	1761	2447	1126	1345	2189	2551
R5157	860	1016	1756	2422	1121	1336	2180	2532
UC58	156	156	284	262	157	157	284	264
UC59	15	18	39	41	30	34	67	67
CP5859	929	1130	1881	2622	1190	1426	2315	2719
D5859S	462	562	935	1303	591	709	1151	1351
D5859N	467	569	946	1319	599	717	1164	1368
R5859N	466	562	944	1311	597	713	1160	1362
UC63	132	141	259	248	134	142	262	251
CP63	533	663	1064	1489	661	794	1285	1528
R63	532	661	1063	1480	660	793	1283	1522
UC66	31	36	68	79	37	41	78	76
UC62	408	423	791	762	417	431	819	775
CP6266	787	1065	1528	2173	906	1182	1742	2199

Appendix F
Flow Summary

	Total Existing Flows (cfs)				Total Future Flows (cfs)			
Identifier	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr
R6266	786	1060	1527	2164	906	1177	1740	2187
D5859S	462	562	935	1303	591	709	1151	1351
R5859S	462	561	933	1288	591	707	1147	1342
UC64	6	6	5	5	6	3	12	11
CP64	465	564	935	1290	593	708	1152	1348
D64S	209	254	421	580	267	318	519	606
D64N	256	310	514	709	326	389	634	741
RD64N	255	307	512	697	325	387	630	730
UC87	9	12	24	30	19	28	50	49
CP87	259	317	527	723	331	395	643	743
RD87N	259	318	526	721	330	394	643	743
UC82	23	25	50	48	32	32	63	56
CP82	1030	1382	2017	2849	1216	1554	2343	2882
R82	1030	1380	2015	2842	1216	1550	2340	2875
D84S	93	30	279	686	9	82	432	703
D84N	938	1350	1736	2157	1208	1467	1908	2172
UC84	14	13	24	24	20	15	30	29
CP84	945	1359	1747	2174	1210	1474	1919	2183
R84	941	1329	1738	2153	1200	1454	1909	2163
UC79	58	68	138	139	61	71	145	142
UC78	275	263	103	449	266	263	491	449
CP7879	1019	1411	1837	2328	1265	1531	2076	2331
R7879	1019	1410	1837	2327	1265	1532	2075	2329
UC77	109	115	208	225	113	119	215	205
CP77	1068	1464	1913	2417	1304	1582	2169	2432
R77	1067	1460	1912	2416	1304	1580	2165	2429
UC89	54	61	119	122	74	81	153	148
CP89	1097	1500	1972	2500	1330	1613	2233	2505
R89	1094	1482	1965	2491	1323	1598	2223	2493
UC74	67	139	265	264	171	180	331	317
UC76	42	45	83	81	51	53	97	91
CP7476	81	179	342	339	219	230	426	406
R7476	81	179	341	339	219	230	424	404
UC75	180	292	368	365	220	233	431	410
CP75	246	426	699	692	434	453	852	808
R75	246	424	696	684	432	452	841	795
UC90	16	21	46	50	33	37	78	76
UC91	39	41	86	84	76	82	153	147
CP90EN	1263	1706	2383	3132	1517	1838	2692	3188
D84S	93	30	279	686	9	82	432	703
RD84S	83	31	279	685	9	84	432	706
D84iiN	80	30	249	576	9	82	372	592
D84iiS	4	1	31	110	1	3	60	114
RD84iS	2	0	21	79	0	1	47	85
UC94	12	11	22	18	12	11	22	18
CP94DS	10	10	37	94	9	10	63	101
R94DS	10	9	36	89	8	10	61	96
D84iiN	80	30	249	576	9	82	372	592
RD84iN	53	6	203	445	5	29	320	471
UC88	38	33	69	58	38	33	69	58
CP88EN	88	43	280	566	39	64	416	603
UC95	34	34	63	58	50	44	82	71
UC93	27	29	53	53	44	12	82	78
UC96	34	35	72	70	65	70	128	124

North Scottsdale Delineation - from DEI Professional Services

Appendix F
Flow Summary

	Total Existing Flows (cfs)				Total Future Flows (cfs)			
Identifier	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr
SCP-7c					154		315	
SCP-7b					87		173	
SCP-7a					131		263	
RSCP7b					82		164	
SCP-7d					42		76	
RSCP7c					150		306	
CSCP7d					256		517	
RSCP7d					256		517	
SCP-4b					182		343	
CSCP07					580		1116	
RSCP07					576		1234	
RSCP4B					165		317	
SCP-4A					97		178	
CSCP06					620		1308	
RSCP06					617		1305	
CSCP04					884		1752	
Andora Hills and Galloway Washes Subbasin Flows - From JE Fuller (Appendix C of this report)								
GVW1	2199	2522	3749	4141	2270	2586	3860	4242
GVW2	2564	3256	4686	5492	3164	3937	5447	6408
GWW1_1	1269	1431	2427	2571	1301	1472	2473	2634
GWW1_2	609	593	1155	1110	688	660	1259	1206
GWW1_3	1026	1068	1876	1916	1026	1068	1876	1916
GWW1_4	682	646	1229	1170	686	649	1233	1173
GWW1_5	801	739	1345	1258	914	837	1497	1400
GWW1_6	503	439	899	794	509	443	904	797
GVW3_1	656	633	1227	1178	694	677	1294	1254
GVW3_2	716	682	1303	1248	739	711	1340	1294
GVW3_3	376	318	643	551	385	325	657	562
AHW1	698	553	1255	811	708	561	1258	814
AHW2	105	82	181	117	105	82	177	121
AHW3	326	265	666	464	422	337	781	520
AHW4	212	168	388	262	214	169	382	271
AHW5	240	191	447	289	299	239	514	321
AHW6	381	329	896	716	704	595	1344	986
AHW7	478	378	862	584	499	393	872	607
AHW8	845	678	1419	849	855	685	1416	862
AHW9	419	337	829	554	458	366	853	595

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN   1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   16MAR04  TIME  08:42:05   *
*                                       *
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID         UC MODEL - UNNAMED WASH, CENTRAL
  2           ID         10-YEAR 6-HOUR MODEL  FILENAME: UC106E.DAT
  3           ID         EXISTING CONDITIONS
  4           ID         CAREFREE DRAINAGE MASTER PLAN
  5           ID         FCD 2000C037
  6           ID         BY CH2M HILL
  7           ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  8           ID         DECEMBER 2001 (Final Revision March 2004)
  9           ID    ****************************************************************
 10           ID         10 YEAR ANALYSIS 6-HOUR STORM
 11           ID
 12           ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
 13           ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
 14           ID    ****************************************************************
 15           ID      DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
 16           ID
 17           ID      THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
 18           ID
 19           ID
              *DIAGRAM
 20           IT       2                    2000
 21           IO       5
 22           IN      15
 23           JD    2.32    0.01
 24           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 25           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 26           PC   0.962   0.972   0.983   0.991   1.000
 27           JD   2.305    0.50
 28           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 29           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 30           PC   0.962   0.972   0.983   0.991   1.000
 31           JD   2.262    2.80
 32           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 33           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 34           PC   0.950   0.963   0.975   0.988   1.000
 35           JD   2.139    16.0
 36           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
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 37          PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 38          PC   0.946   0.960   0.973   0.987   1.000
 39          JD   1.884    90.0
 40          PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 41          PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 42          PC   0.927   0.945   0.964   0.982   1.000
 43          JD   1.322   500.0
 44          PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 45          PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 46          PC   0.907   0.930   0.954   0.977   1.000
             *

 47          KK    UC8
 48          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 49          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 50          KM    L= 1.04   Kb= 0.031   S=138.0
 51          BA    .054
 52          LG     .30     .36     4.9     .26    36.0
1                                          HEC-1 INPUT
PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 53          UC    .383    .694
 54          UA       0       5      16      30      65      77      84      90      94      97
 55          UA     100
             *

 56          KK    UC9
 57          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 58          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 59          KM    L= 0.91   Kb= 0.031   S=145.0
 60          BA    .055
 61          LG     .30     .36     5.0     .23    36.0
 62          UC    .338    .540
 63          UA       0       5      16      30      65      77      84      90      94      97
 64          UA     100
             *

 65          KK    CPC89
 66          KM    CONCENTRATION POINT 89
 67          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 68          HC       2
             *

 69          KK   RCP89
 70          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 71          KM    NORMAL DEPTH CHANNEL ROUTING
 72          KM    ENDPOINTS WERE EXTENDED
 73          KM    SLOPE = (2596-2540)/2933
 74          RS       5    FLOW      -1
 75          RC   0.045   0.035   0.045    2933  0.0191
 76          RX       0      90      99     100     108     109     120     200
 77          RY     108     104     102     100     100     102     104     108
 78          RL                    0.15     100
             *

 79          KK    UC18
 80          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 81          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 82          KM    L= 0.56   Kb= 0.091   S=101.0
 83          BA    .040
 84          LG     .25     .36     5.0     .23   24.00
 85          UC    .563    .761
 86          UA       0       5      16      30      65      77      84      90      94      97
 87          UA     100
             *

 88          KK    UC19
 89          KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 90          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
```

```
 91          KM    L= 0.52   Kb= 0.069   S=135.0
 92          BA    .027
 93          LG     .25     .36    5.00     .23   18.00
 94          UC    .412    .638
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 95          KK  CP1819
 96          KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
 97          HC       3
             *

 98          KK   R1819
 99          KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
100          KM    ENDPOINTS WERE EXTENDED
101          KM    SLOPE = (2540-2511)/1790
102          RS       2    FLOW      -1
103          RC   0.045   0.030   0.045    1790  0.0162
104          RX       0      92      99     100     112     113     120     200
105          RY     108     104     102     100     100     102     104     108
106          RL                    0.25     100
             *

107          KK    UC22
108          KM   SUBBASIN 22, UNNAMED WASH CENTRAL
109          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
110          KM    L= .76   Kb= .104   S=111.0
111          BA    .032
112          LG     .25     .36    5.00     .23   14.00
113          UC    .746   1.527
             *

114          KK    UC23
115          KM   SUBBASIN 23, UNNAMED WASH CENTRAL
116          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
117          KM    L= .40   Kb= 0.125   S=121.0
118          BA    .013
119          LG     .25     .36    5.00     .23   18.00
120          UC    .554    .290
             *

121          KK  CP2223
122          KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
123          HC       3
             *

124          KK   R2223
125          KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
126          KM    ENDPOINTS WERE EXTENDED
127          KM    SLOPE = (2511-2482)/1862
128          RS       2    FLOW      -1
129          RC   0.045    0.03   0.045    1862  0.0156
130          RX       0      95      99     100     112     113     117     200
131          RY     108     104     102     100     100     102     104     108
132          RL                    0.25     100
             *
```


HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

133          KK    UC28
134          KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
135          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
136          KM    L= .57   Kb= 0.106   S=109.0
137          BA    .055
```

```
138          LG     .25     .36    4.90     .25   14.00
139          UC    .692    .619
             *
             *

140          KK     R28
141          KM    ROUTING REACH FROM CP28 TO CP2930 THROUGH SUBBASIN 30
142          KM    ENDPOINTS WERE EXTENDED
143          KM    SLOPE = (2502-2482)/1296
144          RS       2    FLOW      -1
145          RC   0.045   0.035   0.045    1296  0.0154
146          RX       0      86      99     100     108     109     122     200
147          RY     108     104     102     100     100     102     104     108
148          RL                    0.15     100
             *

149          KK    UC29
150          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
151          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
152          KM    L= .47   Kb= 0.116      09.0
153          BA    .035
154          LG     .25     .36    5.00     .23   12.00
155          UC    .617    .792
             *

156          KK   UC30
157          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
158          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
159          KM    L= .28   Kb= 0.126   S=134.0
160          BA    .012
161          LG     .25     .36    5.00     .23   12.00
162          UC    .450    .685
             *

163          KK  CP2930
164          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
165          KM    CP2223
166          HC       4
             *

167          KK   R2930
168          KM   Routing flow from CP2930 to CP34 through subbasin 34
169          KM    SLOPE = (2482-2469)/925
170          KM    ENDPOINTS WERE EXTENDED
171          RS       1    FLOW      -1
172          RC   0.045   0.030   0.045     925  0.0141
173          RX       0      89      99     100     110     111     122     200
174          RY     108     104     102     100     100     102     104     108
175          RL                    0.15     100
             *
```



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                                        HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

176          KK    UC34
177          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
178          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
179          KM    L= .31   Kb = 0.116   S= 117.0
180          BA    .037
181          LG     .25     .36    4.90     .22   12.00
182          UC    .463    .398
             *

183          KK    CP34
184          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
185          KM   R2930
186          HC       2
             *
```

```
187          KK     R34
188          KM   Routing flow from CP34 to CP3537 through subbasin 37
189          KM    ENDPOINTS WERE EXTENDED
190          KM    SLOPE = (2469-2318)/6475
191          RS      11    FLOW      -1
192          RC   0.045   0.035   0.045    6475   .0233
193          RX       0      90      99     100     105     106     115     200
194          RY     108     104     102     100     100     102     104     108
195          RL                    0.15     100
             *

196          KK    UC37
197          KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
198          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
199          KM    L= 2.03   Kb= 0.160   S= 98.0
200          BA    .207
201          LG     .25     .39    3.70     .16   24.00
202          UC    .767   1.189
             *

203          KK    UC35
204          KM   SUBBASIN 35, UNNAMED WASH CENTRAL
205          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
206          KM    L= 1.27   Kb= 0.035   S=138.0
207          BA    .261
208          LG     .25     .38    3.90     .20   24.00
209          UC    .408    .355
             *

210          KK  CP3537
211          KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
212          KM    R34
213          HC       3
             *
```



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                                    HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

214          KK   R3537
215          KM   Routing flow from CP3537 to CP3149 through subbasin 49
216          KM    ENDPOINTS WERE EXTENDED
217          KM    SLOPE = (2318-2280)/1829
218          RS       3    FLOW      -1
219          RC   0.045   0.035   0.045    1829  0.0208
220          RX       0      90      99     100     105     106     115     200
221          RY     108     104     102     100     100     102     104     108
222          RL                    0.15     100
             *

223          KK    UC49
224          KM   SUBBASIN 49, UNNAMED WASH CENTRAL
225          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
226          KM    L= .47   Kb= 0.032   S=148.0
227          BA    .048
228          LG     .25     .39    3.60     .15   30.00
229          UC    .225    .219
             *

230          KK    UC31
231          KM   SUBBASIN 31, UNNAMED WASH CENTRAL
232          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
233          KM    L= 2.04   Kb= 0.066   S= 128.0
234          BA    .405
235          LG     .25     .38    4.10     .18   20.00
236          UC    .846    .909
             *

237          KK  CP3149
238          KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
```

```
 239          KM     R3537
 240          HC       3
              *

 241          KK   R3149
 242          KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
 243          KM    ENDPOINTS WERE EXTENDED
 244          KM    SLOPE = (2280-2256)/1219
 245          RS       2    FLOW      -1
 246          RC   0.045   0.030   0.045    1219  0.0197
 247          RX       0      95      99     100     110     111     118     200
 248          RY     110     104     102     100     100     102     104     110
 249          RL                    0.15     100
              *

 250          KK    UC46
 251          KM   SUBBASIN 46, UNNAMED WASH CENTRAL
 252          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 253          KM    L= .30  Kb= 0.060   Adj. Slope= 324.0
 254          BA    .034
 255          LG     .25     .39    3.60     .15   24.00
 256          UC    .200    .162
 257          UA       0       5      16      30      65      77      84      90      94      97
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      LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 258          UA     100
              *

 259          KK     R46
 260          KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
 261          KM    ENDPOINTS WERE EXTENDED
 262          KM    SLOPE = (2346-2315)/1783
 263          RS       3    FLOW      -1
 264          RC   0.045   0.035   0.045    1783  0.0174
 265          RX       0      92      99     100     105     106     113     200
 266          RY     108     104     102     100     100     102     104     108
 267          RL                    0.15     100
              *

 268          KK    UC45
 269          KM   SUBBASIN 45, UNNAMED WASH CENTRAL
 270          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 271          KM    L= .48   Kb= 0.030   S= 135.0
 272          BA    .086
 273          LG     .25     .39    3.60     .15   24.00
 274          UC    .233    .167
 275          UA       0       5      16      30      65      77      84      90      94      97
 276          UA     100
              *

 277          KK    UC47
 278          KM   SUBBASIN 47, UNNAMED WASH CENTRAL
 279          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 280          KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
 281          BA    .031
 282          LG     .25     .39    3.60     .15   24.00
 283          UC    .217    .229
 284          UA       0       5      16      30      65      77      84      90      94      97
 285          UA     100
              *

 286          KK  CP4547
 287          KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
 288          KM    R46
 289          HC       3
              *

 290          KK   R4547
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```
291          KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
292          KM   ENDPOINTS WERE EXTENDED
293          KM    SLOPE = (2315-2256)/2170
294          RS       4    FLOW      -1
295          RC   0.045   0.035   0.045    2170   .0272
296          RX       0      90      99     100     105     106     115     200
297          RY     108     104     102     100     100     102     104     108
298          RL                    0.15     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

299          KK    UC48
300          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
301          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
302          KM    L= .92   Kb= 0.048   S= 117.0
303          BA    .197
304          LG     .25     .39    3.70     .16   30.00
305          UC    .438    .349
             *

306          KK    UC50
307          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
308          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
309          KM    L= .27   Kb= 0.037   S= 93.0
310          BA    .019
311          LG     .25     .38    3.80     .24   24.00
312          UC    .221    .230
             *

313          KK  CP4850
314          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
315          KM    R3149 AND R4547
316          HC       4
             *

317          KK   R4850
318          KM   Routing flow from CP4850 to CP5157 through subbasin 57
319          KM    ENDPOINTS WERE EXTENDED
320          KM    SLOPE = (2256-2235)/1509
321          RS       2    FLOW      -1
322          RC   0.045   0.030   0.045    1509  0.0139
323          RX       0      95      99     100     115     116     120     200
324          RY     106     104     102     100     100     102     104     106
325          RL                    0.25     100
             *

326          KK    UC51
327          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
328          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
329          KM    L= .42   Kb= 0.061   Adj. Slope= 317.0
330          BA    .060
331          LG     .25     .36    5.00     .21   26.00
332          UC    .237    .187
             *

333          KK    UC57
334          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
335          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
336          KM    L= .47   Kb= 0.061   S= 200.0
337          BA    .037
338          LG     .25     .37    4.20     .28   20.00
339          UC    .333    .395
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
340          KK  CP5157
341          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
342          KM     R4850
343          HC       3
             *

344          KK   R5157
345          KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
346          KM    ENDPOINTS WERE EXTENDED
347          KM    SLOPE = (2235-2208)/1796
348          RS       2    FLOW      -1
349          RC   0.045   0.030   0.045    1796  0.0150
350          RX       0      60      99     100     100     121     160     220
351          RY     110     104     102     100     100     102     104     110
352          RL                    0.35     100
             *

353          KK    UC58
354          KM   SUBBASIN 58, UNNAMED WASH CENTRAL
355          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
356          KM    L= .69   Kb= 0.055  Adj. Slope= 317.0
357          BA    .110
358          LG     .25     .37    4.80     .13   20.00
359          UC    .296    .250
             *

360          KK    UC59
361          KM   SUBBASIN 59, UNNAMED WASH CENTRAL
362          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
363          KM    L= .49   Kb= 0.105   S= 112.0
364          BA    .034
365          LG     .25     .32    5.80     .33   14.00
366          UC    .658    .904
             *

367          KK  CP5859
368          KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
369          KM     R5157
370          HC       3
             *

371          KK  D5859N
372          KM    DIVERSION OF FLOWS AT FLOW SPLIT
373          DT  D5859S
374          DI       0      50     100     500   10000
375          DQ       0    24.9    49.5   248.5    4970
             *

376          KK  R5859N
377          KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
378          KM   ENDPOINTS WERE EXTENDED
379          KM    SLOPE = (2208-2195)/699
380          RS       1    FLOW      -1
381          RC   0.045   0.030   0.045     699  0.0186
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

382          RX       0      50      99     100     110     111     160     210
383          RY     104     103     102     100     100     102     103     104
384          RL                    0.15     100
             *

385          KK    UC63
386          KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
387          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
388          KM    L= .81   Kb= 0.056   Adj. Slope= 322.0
389          BA    .117
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390          LG     .25     .36    5.00     .19   19.00
391          UC    .346    .326
             *

392          KK    CP63
393          KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
394          KM   FROM RD5859N
395          HC       2
             *

396          KK     R63
397          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
398          KM    SLOPE = (2195-2170)/1394
399          RS       2    FLOW      -1
400          RC   0.045   0.030   0.045    1394  0.0179
401          RX      60      80      99     100     125     126     145     165
402          RY     106     104     102     100     100     102     104     106
403          RL                    0.35     100
             *

404          KK    UC66
405          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
406          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
407          KM    L= .54   Kb= 0.081   Adj. Slope= 324.0
408          BA    .037
409          LG     .25     .36    5.00     .25   14.00
410          UC    .350    .460
             *

411          KK    UC62
412          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
413          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
414          KM    L= 1.33   Kb= 0.057   Adj. Slope= 321.0
415          BA    .361
416          LG     .25     .35    6.10     .13   14.00
417          UC    .417    .316
             *

418          KK  CP6266
419          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
420          KM   FROM R63
421          HC       3
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

422          KK   R6266
423          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
424          KM    SLOPE = (2170-2150)/990
425          RS       2    FLOW      -1
426          RC   0.045   0.030   0.045     990  0.0202
427          RX      25      85      99     100     100     121     135     195
428          RY     106     104     102     100     100     102     104     106
429          RL                    0.35     100
             *

430          KK  D5859S
431          KM   RECALL DIVERTED FLOW FROM D5859N
432          DR  D5859S
             *

433          KK  R5859S
434          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
435          KM    SLOPE = (2208-2194)/803
436          RS       1    FLOW      -1
437          RC   0.045   0.030   0.045     803  0.0174
438          RX       0      50      99     100     125     126     175     225
439          RY     104     103     102     100     100     102     103     104
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440          RL                    0.15     100
             *

441          KK    UC64
442          KM   SUBBASIN 64, UNNAMED WASH CENTRAL
443          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
444          KM    L= .15   Kb= 0.078   S= 166.0
445          BA    .005
446          LG     .25     .31    6.90     .20   14.00
447          UC    .213    .313
             *

448          KK    CP64
449          KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
450          KM    DIVERSION RD5859N
451          HC       2    1.88
             *

452          KK    D64N
453          KM   DIVERSION OF FLOWS AT FLOW SPLIT
454          KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
455          DT    D64S
456          DI       0      50     100     500   10000
457          DQ       0    22.5      45     225    4500
             *

458          KK   RD64N
459          KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
460          KM   ENDPOINTS WERE EXTENDED
461          KM    SLOPE = (2194-2161)/1721
462          RS       2    FLOW      -1
463          RC   0.045   0.030   0.045    1721  0.0192
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

464          RX       0      60      99     100     112     113     152     200
465          RY     106     104     102     100     100     102     104     106
466          RL                    0.25     100
             *

467          KK    UC87
468          KM   SUBBASIN 87, UNNAMED WASH CENTRAL
469          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
470          KM    L= .33   Kb= 0.118   S= 101.0
471          BA    .029
472          LG     .25     .35    3.40     .62    8.00
473          UC    .846   1.046
             *

474          KK    CP87
475          KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
476          KM    DIVERSION RD64N
477          HC       2
             *
             * erase this
             * KK  D87N
             * KM DIVERSION OF FLOWS AT FLOW SPLIT 87
             * DT  D87S
             * DI     0      50     100     500   10000
             * DQ     0     1.3     2.6      13     260
             *

478          KK   RD87N
479          KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
480          KM    SLOPE = (2161-2150)/557
481          RS       1    FLOW      -1
482          RC   0.045   0.030   0.045     557  0.0197
483          RX      25      85      99     100     120     121     135     195
484          RY     106     104     102     100     100     102     104     106
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485          RL                    0.35     100
             *

486          KK    UC82
487          KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
488          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
489          KM    L= .22   Kb= 0.136   Adj. Slope= 220.0
490          BA    .022
491          LG     .25     .36    4.30    .400   14.00
492          UC    .321    .280
             *

493          KK    CP82
494          KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
495          KM   SUBBASIN 82
496          HC       3    2.45
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

497          KK     R82
498          KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
499          KM    SLOPE = (2150-2138)/579
500          RS       1    FLOW      -1
501          RC   0.045   0.030   0.045     579  0.0207
502          RX      50      75      99     100     125     126     150     175
503          RY     106     104     102     100     100     102     104     106
504          RL                   0.35     100
             *

505          KK    D84N
506          KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
507          DT    D84S
508          DI       0     500    1000    1500    2000    3000
509          DQ       0       0      72     395     782    1633
             *

510          KK    UC84
511          KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
512          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
513          KM    L= .30   Kb= 0.102   Adj. Slope= 246.0
514          BA    .017
515          LG     .25     .36    4.50     .35   14.00
516          UC    .338    .436
             *

517          KK    CP84
518          KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
519          KM    FROM D84N
520          HC       2
             *

521          KK     R84
522          KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
523          KM   ENDPOINTS WERE EXTENDED
524          KM    SLOPE = (2138-2054)/3463
525          RS       5    FLOW      -1
526          RC   0.045   0.030   0.045    3463  0.0243
527          RX       0      94      99     100     110     111     116     200
528          RY     106     104     102     100     100     102     104     106
529          RL                   0.15     100
             *

530          KK    UC79
531          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
532          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
533          KM    L= .88   Kb= 0.040   Adj. Slope= 233.0
534          BA    .078
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535          LG     .25     .35    4.30     .45   18.00
536          UC    .383    .490
537          UA       0       5      16      30      65      77      84      90      94      97
538          UA     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


539          KK    UC78
540          KM   SUBBASIN 78, UNNAMED WASH CENTRAL
541          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
542          KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
543          BA    .177
544          LG     .25     .35    6.00     .17   17.00
545          UC    .217    .206
546          UA       0       5      16      30      65      77      84      90      94      97
547          UA     100
             *

548          KK  CP7879
549          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
550          KM    FROM R84
551          HC       3
             *

552          KK   R7879
553          KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
554          KM   ENDPOINTS WERE EXTENDED
555          KM    SLOPE = (2054-2048)/256
556          RS       1    FLOW      -1
557          RC   0.045   0.030   0.045     256   .0234
558          RX       0      90      99     100     120     121     130     200
559          RY     106     104     102     100     100     102     104     106
560          RL                    0.35     100
             *

561          KK    UC77
562          KM   SUBBASIN 77, UNNAMED WASH CENTRAL
563          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
564          KM    L= .93   Kb= 0.048  Adj. Slope= 324.0
565          BA    .096
566          LG     .25     .34    6.70     .13   16.00
567          UC    .317    .369
568          UA       0       5      16      30      65      77      84      90      94      97
569          UA     100
             *

570          KK    CP77
571          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
572          KM    FROM R7879
573          HC       2
             *

574          KK     R77
575          KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
576          KM   ENDPOINTS WERE EXTENDED
577          KM    SLOPE = (2048-2037)/593
578          RS       1    FLOW      -1
579          RC   0.045   0.030   0.045     593  0.0185
580          RX       0      80      99     100     115     116     120     200
581          RY     106     104     102     100     100     102     104     106
582          RL                    0.25     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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583          KK    UC89
584          KM   SUBBASIN 89, UNNAMED WASH CENTRAL
585          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
586          KM    L= .77   Kb= 0.057   S= 126.0
587          BA    .073
588          LG     .25     .33    6.40     .20   17.00
589          UC    .471    .577
590          UA       0       5      16      30      65      77      84      90      94      97
591          UA     100
             *

592          KK    CP89
593          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
594          KM    FROM R77
595          HC       2
             *

596          KK     R89
597          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
598          KM   CHANNEL ENDS WERE EXTENDED
599          KM    SLOPE = (2037-2008)/1912
600          RS       2    FLOW      -1
601          RC   0.045   0.030   0.045    1912  0.0152
602          RX       0      80      99     100     115     116     135     200
603          RY     106     104     102     100     100     102     104     106
604          RL                    0.25     100
             *

605          KK    UC74
606          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
607          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
608          KM    L= 1.13   Kb= 0.071   Adj. Slope= 328.0
609          BA    .151
610          LG     .25     .34    6.60     .13   14.00
611          UC   1.000   1.088
             *

612          KK    UC76
613          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
614          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
615          KM    L= .64   Kb= 0.053   Adj. Slope= 302.0
616          BA    .041
617          LG     .25     .35    6.10     .16   14.00
618          UC    .292    .408
             *

619          KK  CP7476
620          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
621          HC       2
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

622          KK   R7476
623          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
624          KM   END POINTS WERE EXTENDED
625          KM    SLOPE = (2031-2017)/524
626          RS       1    FLOW      -1
627          RC   0.045   0.030   0.045     524  0.0267
628          RX       0      80      99     100     112     113     132     200
629          RY     106     104     102     100     100     102     104     106
630          RL                    0.25     100
             *

631          KK    UC75
632          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
633          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
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```
634          KM    L= 1.38   Kb= 0.068   Adj. Slope= 322.0
635          BA    .192
636          LG     .25     .34    6.50     .15   14.00
637          UC    .404    .449
638          UA       0       5      16      30      65      77      84      90      94      97
639          UA     100
             *

640          KK    CP75
641          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
642          KM    FROM R7476
643          HC       2
             *

644          KK     R75
645          KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
646          KM   END POINTS WERE EXTENDED
647          KM    SLOPE = (2017-2008)/723
648          RS       1    FLOW      -1
649          RC   0.045   0.030   0.045     723  0.0124
650          RX       0      80      99     100     115     116     135     200
651          RY     106     104     102     100     100     102     104     106
652          RL                    0.25     100
             *

653          KK    UC90
654          KM   SUBBASIN 90, UNNAMED WASH CENTRAL
655          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
656          KM    L= .48   Kb= 0.103   S= 151.0
657          BA    .038
658          LG     .25     .35    3.70     .55   14.00
659          UC    .675    .851
             *

660          KK    UC91
661          KM   SUBBASIN 91, UNNAMED WASH CENTRAL
662          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
663          KM    L= .75   Kb= 0.107   S= 109.0
664          BA    .073
665          LG     .25     .31    7.40     .14   14.00
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

666          UC    .712    .901
             *
             *

667          KK  CP90EN
668          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
669          KM    FROM R89 AND R75
670          HC       4
             *
             *

671          KK    D84S
672          KM   RETREVIAL OF DIVERTED FLOW FROM D84S
673          DR    D84S
             *

674          KK   RD84S
675          KM   ROUTING FLOW FROM CP84 (D84S) TO CP88END THROUGH SUBBASIN 88
676          KM    SLOPE = (2138-2041)/4843
677          RS       6    FLOW      -1
678          RC   0.045   0.030   0.045    4843  0.0200
679          RX       0      50      99     100     125     126     175     225
680          RY     106     104     102     100     100     102     104     106
681          RL                    0.35     100
             *
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682          KK  D84IIS
683          KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
684          KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
685          DT  D84IIN
686          DI       0    79.7     255     490     880    1250
687          DQ       0    78.3     229     419     732    1000
             *

688          KK  RD84IS
689          KM   ROUTING FLOWS FROM D84IIS TO CP94DS
690          KM   SLOPE = (2140-2078)/3225
691          RS       1    FLOW      -1
692          RC   0.045   0.030   0.045    3225  0.0192
693          RX       0      50      99     100     125     126     175     225
694          RY     106     104     102     100     100     102     104     106
695          RL                    0.25     100
             *
             *

696          KK    UC94
697          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
698          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
699          KM    L= .53   Kb= 0.119   S= 108.0
700          BA    .028
701          LG     .25     .36    5.00     .23   13.00
702          UC    .671   1.082
             *
```



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                                          HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

703          KK  CP94DS
704          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
705          KM   FROM RD84IS
706          HC       2
             *

707          KK   R94DS
708          KM   ROUTING FLOW FROM CP94DS TO CP88EN
709          KM   SLOPE = (2078-2041)/1950
710          RS       1    FLOW      -1
711          RC   0.045   0.030   0.045    1950  0.0189
712          RX      60      85      99     100     108     109     123     148
713          RY     106     104     102     100     100     102     104     106
714          RL                    0.25     100
             *

715          KK  D84IIN
716          KM   RECALL DIVERTED FLOW FROM D84II
717          DR  D84IIN
             *

718          KK  RD84IN
719          KM   ROUTING FLOW FROM D84II TO CP88EN
720          KM   SLOPE = (2140-2041)/5175
721          RS       1    FLOW      -1
722          RC   0.045   0.030   0.045    5175  0.0191
723          RX      60      78      90     100     125     132     135     150
724          RY     106     104     102     100     100     102     104     106
725          RL                    0.25     100
             *

726          KK    UC88
727          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
728          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
729          KM    L= 1.08   Kb= 0.104   S=111.0
730          BA    .108
731          LG     .25     .33    6.10     .20   14.00
732          UC    .962   1.337
```

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                    *
 733                KK  CP88EN
 734                KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
 735                KM    FROM R94DS AND RD84IN
 736                HC       3
                    *
                    *

 737                KK    UC95
 738                KM   SUBBASIN 95, UNNAMED WASH CENTRAL
 739                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 740                KM    L= 0.22   Kb= 0.120   Adj.Slope= 220
 741                BA    .024
 742                LG     .25     .39    3.70     .15    5.00
 743                UC    .287    .233
                    *
1                                                HEC-1 INPUT
PAGE 19

           LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 744                KK    UC93
 745                KM   SUBBASIN 93, UNNAMED WASH CENTRAL
 746                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 747                KM    L= .64   Kb= 0.093   S= 135.0
 748                BA    .038
 749                LG     .25     .30    8.00     .07   13.00
 750                UC    .496    .770
                    *

 751                KK    UC96
 752                KM   SUBBASIN 96, UNNAMED WASH CENTRAL
 753                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 754                KM    L= .73   Kb= 0.110  S= 113.0
 755                BA    .061
 756                LG     .25     .32    7.00     .12   13.00
 757                UC    .683    .920
                    *
                    *
 758                ZZ
```

```
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 PUT
LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  47          UC8
               .
               .
  56           .          UC9
               .            .
               .            .
  65        CPC8............
               V
               V
  69       RCP89
               .
               .
  79           .        UC18
               .            .
               .            .
  88           .            .        UC19
               .            .           .
               .            .           .
  95      CP1819......................
               V
               V
  98       R1819
               .
               .
 107           .        UC22
               .            .
               .            .
 114           .            .        UC23
               .            .           .
               .            .           .
 121      CP2223......................
               V
               V
 124       R2223
               .
               .
 133           .        UC28
               .           V
               .           V
 140           .         R28
               .            .
               .            .
 149           .            .        UC29
               .            .           .
               .            .           .
 156           .            .           .       UC30
               .            .           .          .
               .            .           .          .
 163      CP2930.................................
               V
               V
 167       R2930
               .
               .
 176           .        UC34
               .            .
               .            .
 183        CP34............
               V
               V
 187         R34
               .
               .
 196           .        UC37
```

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              .           .
              .           .
203           .           .        UC35
              .           .           .
              .           .           .
210       CP3537.......................
              V
              V
214        R3537
              .
              .
223           .        UC49
              .           .
              .           .
230           .           .        UC31
              .           .           .
              .           .           .
237       CP3149.......................
              V
              V
241        R3149
              .
              .
250           .        UC46
              .           V
              .           V
259           .         R46
              .           .
              .           .
268           .           .        UC45
              .           .           .
              .           .           .
277           .           .           .        UC47
              .           .           .           .
              .           .           .           .
286           .      CP4547.......................
              .           V
              .           V
290           .       R4547
              .           .
              .           .
299           .           .        UC48
              .           .           .
              .           .           .
306           .           .           .        UC50
              .           .           .           .
              .           .           .           .
313       CP4850.................................
              V
              V
317        R4850
              .
              .
326           .        UC51
              .           .
              .           .
333           .           .        UC57
              .           .           .
              .           .           .
340       CP5157.......................
              V
              V
344        R5157
              .
              .
353           .        UC58
              .           .
              .           .
360           .           .        UC59
              .           .           .
              .           .           .
```

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367      CP5859.......................
              .
              .
373           .-------> D5859S
371      D5859N
              V
              V
376      R5859N
              .
              .
385           .        UC63
              .           .
              .           .
392        CP63............
              V
              V
396         R63
              .
              .
404           .        UC66
              .           .
              .           .
411           .           .        UC62
              .           .           .
              .           .           .
418      CP6266.......................
              V
              V
422       R6266
              .
              .
432           .           .<-------  D5859S
430           .      D5859S
              .           V
              .           V
433           .      R5859S
              .           .
              .           .
441           .           .        UC64
              .           .           .
              .           .           .
448           .        CP64............
              .           .
              .           .
455           .           .-------->    D64S
452           .        D64N
              .           V
              .           V
458           .       RD64N
              .           .
              .           .
467           .           .        UC87
              .           .           .
              .           .           .
474           .        CP87............
              .           V
              .           V
478           .       RD87N
              .           .
              .           .
486           .           .        UC82
              .           .           .
              .           .           .
493        CP82.......................
              V
              V
497         R82
              .
              .
507           .------->    D84S
505        D84N
```

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                .
                .
510             .        UC84
                .           .
                .           .
517          CP84............
                V
                V
521           R84
                .
                .
530             .        UC79
                .           .
                .           .
539             .           .        UC78
                .           .           .
                .           .           .
548        CP7879........................
                V
                V
552         R7879
                .
                .
561             .        UC77
                .           .
                .           .
570          CP77............
                V
                V
574           R77
                .
                .
583             .        UC89
                .           .
                .           .
592          CP89............
                V
                V
596           R89
                .
                .
605             .        UC74
                .           .
                .           .
612             .           .        UC76
                .           .           .
                .           .           .
619             .      CP7476............
                .           V
                .           V
622             .       R7476
                .           .
                .           .
631             .           .        UC75
                .           .           .
                .           .           .
640             .        CP75............
                .           V
                .           V
644             .         R75
                .           .
                .           .
653             .           .        UC90
                .           .           .
                .           .           .
660             .           .           .        UC91
                .           .           .           .
                .           .           .           .
667        CP90EN.................................
                .
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673          .          .<-------    D84S
671          .       D84S
             .          V
             .          V
674          .      RD84S
             .          .
             .          .
685          .          .-------> D84IIN
682          .     D84IIS
             .          V
             .          V
688          .     RD84IS
             .          .
             .          .
696          .          .       UC94
             .          .          .
             .          .          .
703          .     CP94DS............
             .          V
             .          V
707          .      R94DS
             .          .
             .          .
717          .          .          .<-------  D84IIN
715          .          .     D84IIN
             .          .          V
             .          .          V
718          .          .     RD84IN
             .          .          .
             .          .          .
726          .          .          .       UC88
             .          .          .          .
             .          .          .          .
733          .     CP88EN......................
             .          .
             .          .
737          .          .       UC95
             .          .          .
             .          .          .
744          .          .          .       UC93
             .          .          .          .
             .          .          .          .
751          .          .          .          .       UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	39.	4.20	8.	2.	1.	.05
+	HYDROGRAPH AT	UC9	49.	4.13	8.	2.	1.	.05
+	2 COMBINED AT	CPC8	88.	4.17	16.	4.	1.	.11
+	ROUTED TO	RCP89	87.	4.27	16.	4.	1.	.11
+	HYDROGRAPH AT	UC18	25.	4.27	5.	1.	0.	.04
+	HYDROGRAPH AT	UC19	19.	4.27	3.	1.	0.	.03
+	3 COMBINED AT	CP1819	131.	4.27	24.	6.	2.	.18
+	ROUTED TO	R1819	129.	4.30	24.	6.	2.	.18
+	HYDROGRAPH AT	UC22	11.	4.60	4.	1.	0.	.03
+	HYDROGRAPH AT	UC23	13.	4.30	2.	0.	0.	.01
+	3 COMBINED AT	CP2223	150.	4.33	29.	7.	3.	.22
+	ROUTED TO	R2223	149.	4.37	29.	7.	3.	.22
+	HYDROGRAPH AT	UC28	33.	4.47	6.	2.	1.	.05
+	ROUTED TO	R28	33.	4.53	6.	2.	1.	.05
+	HYDROGRAPH AT	UC29	19.	4.43	4.	1.	0.	.04
+	HYDROGRAPH AT	UC30	8.	4.30	1.	0.	0.	.01
+	4 COMBINED AT	CP2930	204.	4.40	41.	10.	4.	.32
+	ROUTED TO	R2930	204.	4.43	41.	10.	4.	.32
+	HYDROGRAPH AT	UC34	33.	4.27	4.	1.	0.	.04
+	2 COMBINED AT	CP34	232.	4.40	45.	11.	4.	.36
+	ROUTED TO	R34	228.	4.60	45.	11.	4.	.36

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
	HYDROGRAPH AT	UC37	101.	4.60	30.	8.	3.	.21
+	HYDROGRAPH AT	UC35	283.	4.23	37.	9.	3.	.26
+	3 COMBINED AT	CP3537	453.	4.47	106.	27.	10.	.83
+	ROUTED TO	R3537	450.	4.57	106.	27.	10.	.83
+	HYDROGRAPH AT	UC49	78.	4.10	8.	2.	1.	.05
+	HYDROGRAPH AT	UC31	215.	4.63	55.	14.	5.	.41
+	3 COMBINED AT	CP3149	623.	4.57	160.	41.	15.	1.28
+	ROUTED TO	R3149	622.	4.57	160.	41.	15.	1.28
+	HYDROGRAPH AT	UC46	63.	4.07	5.	1.	0.	.03
+	ROUTED TO	R46	62.	4.10	5.	1.	0.	.03
+	HYDROGRAPH AT	UC45	157.	4.07	13.	3.	1.	.09
	HYDROGRAPH AT	UC47	50.	4.07	5.	1.	0.	.03
+	3 COMBINED AT	CP4547	265.	4.07	23.	6.	2.	.15
+	ROUTED TO	R4547	259.	4.13	23.	6.	2.	.15
+	HYDROGRAPH AT	UC48	226.	4.23	31.	8.	3.	.20
+	HYDROGRAPH AT	UC50	28.	4.10	3.	1.	0.	.02
+	4 COMBINED AT	CP4850	821.	4.40	207.	53.	19.	1.65
+	ROUTED TO	R4850	821.	4.43	206.	53.	19.	1.65
+	HYDROGRAPH AT	UC51	95.	4.10	8.	2.	1.	.06
+	HYDROGRAPH AT	UC57	36.	4.20	5.	1.	0.	.04
+	3 COMBINED AT	CP5157	865.	4.40	217.	56.	20.	1.75
+	ROUTED TO	R5157	860.	4.47	216.	56.	20.	1.75
+	HYDROGRAPH AT	UC58	156.	4.13	16.	4.	1.	.11
	HYDROGRAPH AT							

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+		UC59	15.	4.50	4.	1.	0.	.03
+	3 COMBINED AT	CP5859	929.	4.43	232.	59.	21.	1.89
+	DIVERSION TO	D5859S	462.	4.43	115.	30.	11.	1.89
+	HYDROGRAPH AT	D5859N	467.	4.43	117.	30.	11.	1.89
+	ROUTED TO	R5859N	466.	4.47	117.	30.	11.	1.89
+	HYDROGRAPH AT	UC63	132.	4.20	15.	4.	1.	.12
+	2 COMBINED AT	CP63	533.	4.40	129.	33.	12.	2.01
+	ROUTED TO	R63	532.	4.40	129.	33.	12.	2.01
+	HYDROGRAPH AT	UC66	31.	4.20	4.	1.	0.	.04
+	HYDROGRAPH AT	UC62	408.	4.23	48.	12.	4.	.36
+	3 COMBINED AT	CP6266	787.	4.33	171.	44.	16.	2.40
+	ROUTED TO	R6266	786.	4.37	171.	44.	16.	2.40
+	HYDROGRAPH AT	D5859S	462.	4.43	115.	30.	11.	1.89
+	ROUTED TO	R5859S	462.	4.43	115.	30.	11.	1.89
+	HYDROGRAPH AT	UC64	6.	4.10	1.	0.	0.	.00
+	2 COMBINED AT	CP64	465.	4.43	116.	30.	11.	1.88
+	DIVERSION TO	D64S	209.	4.43	52.	13.	5.	1.88
+	HYDROGRAPH AT	D64N	256.	4.43	64.	16.	6.	1.88
+	ROUTED TO	RD64N	255.	4.47	63.	16.	6.	1.88
+	HYDROGRAPH AT	UC87	9.	4.63	2.	1.	0.	.03
+	2 COMBINED AT	CP87	259.	4.47	65.	17.	6.	1.91
+	ROUTED TO	RD87N	259.	4.50	65.	17.	6.	1.91
+	HYDROGRAPH AT	UC82	23.	4.17	2.	1.	0.	.02
+	3 COMBINED AT	CP82	1030.	4.37	235.	60.	22.	2.45

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
ROUTED TO	R82	1030.	4.40	235.	60.	22.	2.45
+ DIVERSION TO	D84S	93.	4.37	9.	2.	1.	2.45
+ HYDROGRAPH AT	D84N	938.	4.40	226.	58.	21.	2.45
+ HYDROGRAPH AT	UC84	14.	4.20	2.	0.	0.	.02
+ 2 COMBINED AT	CP84	945.	4.40	227.	58.	21.	2.47
+ ROUTED TO	R84	941.	4.50	227.	58.	21.	2.47
+ HYDROGRAPH AT	UC79	58.	4.17	8.	2.	1.	.08
+ HYDROGRAPH AT	UC78	275.	4.07	23.	6.	2.	.18
+ 3 COMBINED AT	CP7879	1019.	4.43	250.	64.	23.	2.72
+ ROUTED TO	R7879	1019.	4.47	250.	64.	23.	2.72
+ HYDROGRAPH AT	UC77	109.	4.13	13.	3.	1.	.10
+ 2 COMBINED AT	CP77	1068.	4.43	260.	67.	24.	2.82
+ ROUTED TO	R77	1067.	4.43	260.	67.	24.	2.82
+ HYDROGRAPH AT	UC89	54.	4.20	9.	2.	1.	.07
+ 2 COMBINED AT	CP89	1097.	4.43	267.	68.	25.	2.89
+ ROUTED TO	R89	1094.	4.50	266.	68.	25.	2.89
+ HYDROGRAPH AT	UC74	67.	4.77	20.	5.	2.	.15
+ HYDROGRAPH AT	UC76	42.	4.17	5.	1.	0.	.04
+ 2 COMBINED AT	CP7476	81.	4.63	25.	6.	2.	.19
+ ROUTED TO	R7476	81.	4.63	25.	6.	2.	.19
+ HYDROGRAPH AT	UC75	180.	4.17	25.	6.	2.	.19
+ 2 COMBINED AT	CP75	246.	4.20	49.	12.	4.	.38
+ ROUTED TO	R75	246.	4.20	49.	12.	4.	.38
HYDROGRAPH AT	UC90	16.	4.50	4.	1.	0.	.04

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC91	39.	4.53	9.	2.	1.	.07
+	4 COMBINED AT	CP90EN	1263.	4.47	312.	80.	29.	3.39
+	HYDROGRAPH AT	D84S	93.	4.37	9.	2.	1.	2.45
+	ROUTED TO	RD84S	83.	4.57	9.	2.	1.	2.45
+	DIVERSION TO	D84IIN	80.	4.57	9.	2.	1.	2.45
+	HYDROGRAPH AT	D84IIS	4.	4.47	0.	0.	0.	2.45
+	ROUTED TO	RD84IS	2.	4.67	0.	0.	0.	2.45
+	HYDROGRAPH AT	UC94	12.	4.50	3.	1.	0.	.03
+	2 COMBINED AT	CP94DS	10.	4.60	3.	1.	0.	2.48
+	ROUTED TO	R94DS	10.	4.73	3.	1.	0.	2.48
+	HYDROGRAPH AT	D84IIN	80.	4.57	9.	2.	1.	2.45
+	ROUTED TO	RD84IN	53.	4.87	8.	2.	1.	2.45
+	HYDROGRAPH AT	UC88	38.	4.77	13.	3.	1.	.11
+	3 COMBINED AT	CP88EN	88.	4.87	21.	5.	2.	2.59
+	HYDROGRAPH AT	UC95	34.	4.13	3.	1.	0.	.02
+	HYDROGRAPH AT	UC93	27.	4.37	6.	1.	1.	.04
+	HYDROGRAPH AT	UC96	34.	4.50	8.	2.	1.	.06

*** NORMAL END OF HEC-1 ***

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   16MAR04  TIME  08:41:26  *
*                                      *
****************************************
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```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

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PAGE 1

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID         UC MODEL - UNNAMED WASH, CENTRAL
  2           ID         10-YEAR 24-HOUR MODEL  FILENAME: UC1024E.DAT
  3           ID         EXISTING CONDITIONS
  4           ID         CAREFREE DRAINAGE MASTER PLAN
  5           ID         FCD 2000C037
  6           ID         BY CH2M HILL
  7           ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  8           ID         DECEMBER 2001 (Final Revision April 2004)
  9           ID    ***************************************************************
 10           ID         10 YEAR ANALYSIS 24-HOUR STORM
 11           ID
 12           ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
 13           ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
 14           ID    ****************************************************************
 15           ID      DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
 16           ID
 17           ID      THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
 18           ID
 19           ID
              *DIAGRAM
 20           IT       2                    2000
 21           IO       5
 22           IN      15
 23           JD    3.16    0.01
 24           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 25           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 26           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 27           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
 28           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 29           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 30           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 31           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 32           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 33           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 34           JD   2.970   10.00
 35           JD   2.844   30.00
 36           JD   2.718   60.00
 37           JD   2.673   90.00
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 38          JD   2.635  120.00
 39          JD   2.607  150.00
 40          JD   2.528  300.00
 41          JD   2.465  500.00
             *

 42          KK     UC8
 43          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 44          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 45          KM    L= 1.04   Kb= 0.031   S=138.0
 46          BA    .054
 47          LG     .30     .36     4.9     .26    36.0
 48          UC    .608   1.159
 49          UA       0       5      16      30      65      77      84      90      94      97
 50          UA     100
             *
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      LINE   ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 51          KK     UC9
 52          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 53          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 54          KM    L= 0.91   Kb= 0.031   S=145.0
 55          BA    .054
 56          LG     .30     .36     5.0     .23    36.0
 57          UC    .525    .882
 58          UA       0       5      16      30      65      77      84      90      94      97
 59          UA     100
             *

 60          KK    CPC89
 61          KM    CONCENTRATION POINT 89
 62          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 63          HC       2
             *

 64          KK   RCP89
 65          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 66          KM    NORMAL DEPTH CHANNEL ROUTING
 67          KM    ENDPOINTS WERE EXTENDED
 68          KM    SLOPE = (2596-2540)/2933
 69          RS       5    FLOW      -1
 70          RC   0.045   0.035   0.045    2933  0.0191
 71          RX       0      90      99     100     108     109     120     200
 72          RY     108     104     102     100     100     102     104     108
 73          RL                    0.15     100
             *

 74          KK    UC18
 75          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 76          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 77          KM    L= 0.56   Kb= 0.091   S=101.0
 78          BA    .040
 79          LG     .25     .36     5.0     .23   24.00
 80          UC   1.046   1.514
 81          UA       0       5      16      30      65      77      84      90      94      97
 82          UA     100
             *

 83          KK    UC19
 84          KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 85          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 86          KM    L= 0.52   Kb= 0.069   S=135.0
 87          BA    .027
 88          LG     .25     .36    5.00     .23   18.00
 89          UC    .683   1.118
             *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 90           KK  CP1819
 91           KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
 92           HC       3
              *

 93           KK   R1819
 94           KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
 95           KM    ENDPOINTS WERE EXTENDED
 96           KM    SLOPE = (2540-2511)/1790
 97           RS       2    FLOW      -1
 98           RC   0.045   0.030   0.045    1790  0.0162
 99           RX       0      92      99     100     112     113     120     200
100           RY     108     104     102     100     100     102     104     108
101           RL                    0.25     100
              *

102           KK    UC22
103           KM   SUBBASIN 22, UNNAMED WASH CENTRAL
104           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
105           KM    L= .76   Kb= .104   S=111.0
106           BA    .032
107           LG     .25     .36    5.00     .23   14.00
108           UC    .579   1.153
              *

109           KK    UC23
110           KM   SUBBASIN 23, UNNAMED WASH CENTRAL
111           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
112           KM    L= .40   Kb= 0.125   S=121.0
113           BA    .013
114           LG     .25     .36    5.00     .23   18.00
115           UC    .408    .782
              *

116           KK  CP2223
117           KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
118           HC       3
              *

119           KK   R2223
120           KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
121           KM    ENDPOINTS WERE EXTENDED
122           KM    SLOPE = (2511-2482)/1862
123           RS       2    FLOW      -1
124           RC   0.045    0.03   0.045    1862  0.0156
125           RX       0      95      99     100     112     113     117     200
126           RY     108     104     102     100     100     102     104     108
127           RL                    0.25     100
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

128           KK    UC28
129           KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
130           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
131           KM    L= .57   Kb= 0.106   S=109.0
132           BA    .055
133           LG     .25     .36    4.90     .25   14.00
134           UC    .492    .423
              *

135           KK     R28
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136          KM    ROUTING REACH FROM CP1028 TO CP2930 THROUGH SUBBASIN 30
137          KM    ENDPOINTS WERE EXTENDED
138          KM    SLOPE = (2502-2482)/1296
139          RS       2    FLOW      -1
140          RC   0.045   0.035   0.045    1296  0.0154
141          RX       0      86      99     100     108     109     122     200
142          RY     108     104     102     100     100     102     104     108
143          RL                    0.15     100
             *

144          KK    UC29
145          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
146          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
147          KM    L= .47   Kb= 0.116   S=109.0
148          BA    .035
149          LG     .25     .36    5.00     .23   12.00
150          UC    .454    .564
             *

151          KK   UC30
152          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
153          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
154          KM    L= .28   Kb= 0.126   S=134.0
155          BA    .012
156          LG     .25     .36    5.00     .23   12.00
157          UC    .317    .464
             *

158          KK  CP2930
159          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
160          KM    CP2223
161          HC       4
             *

162          KK   R2930
163          KM   Routing flow from CP2930 to CP34 through subbasin 34
164          KM    SLOPE = (2482-2469)/925
165          KM    ENDPOINTS WERE EXTENDED
166          RS       1    FLOW      -1
167          RC   0.045   0.030   0.045     925  0.0141
168          RX       0      89      99     100     110     111     122     200
169          RY     108     104     102     100     100     102     104     108
170          RL                    0.15     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

171          KK    UC34
172          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
173          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
174          KM    L= .31   Kb = 0.116   S= 117.0
175          BA    .031
176          LG     .25     .36    4.90     .22   12.00
177          UC    .333    .277
             *

178          KK    CP34
179          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
180          KM   R2930
181          HC       2
             *

182          KK     R34
183          KM   Routing flow from CP34 to CP3537 through subbasin 37
184          KM    ENDPOINTS WERE EXTENDED
185          KM    SLOPE = (2469-2318)/6475
186          RS      11    FLOW      -1
187          RC   0.045   0.035   0.045    6475   .0233
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188          RX       0      90      99     100     105     106     115     200
189          RY     108     104     102     100     100     102     104     108
190          RL                    0.15     100
             *

191          KK    UC37
192          KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
193          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
194          KM    L= 2.03   Kb= 0.160   S= 98.0
195          BA    .203
196          LG     .25     .39    3.70     .16   24.00
197          UC    .654    .997
             *

198          KK    UC35
199          KM   SUBBASIN 35, UNNAMED WASH CENTRAL
200          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
201          KM    L= 1.27   Kb= 0.035   S=138.0
202          BA    .261
203          LG     .25     .38    3.90     .20   24.00
204          UC    .304    .256
             *

205          KK  CP3537
206          KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
207          KM    R34
208          HC       3
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

209          KK   R3537
210          KM   Routing flow from CP3537 to CP3149 through subbasin 49
211          KM    ENDPOINTS WERE EXTENDED
212          KM    SLOPE = (2318-2280)/1829
213          RS       3    FLOW      -1
214          RC   0.045   0.035   0.045    1829  0.0208
215          RX       0      90      99     100     105     106     115     200
216          RY     108     104     102     100     100     102     104     108
217          RL                    0.15     100
             *

218          KK    UC49
219          KM   SUBBASIN 49, UNNAMED WASH CENTRAL
220          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
221          KM    L= .47   Kb= 0.032   S=148.0
222          BA    .048
223          LG     .25     .39    3.60     .15   30.00
224          UC    .175    .166
             *

225          KK    UC31
226          KM   SUBBASIN 31, UNNAMED WASH CENTRAL
227          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
228          KM    L= 2.04   Kb= 0.066   S= 128.0
229          BA    .405
230          LG     .25     .38    4.10     .18   20.00
231          UC    .712    .752
             *

232          KK  CP3149
233          KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
234          KM     R3537
235          HC       3
             *

236          KK   R3149
237          KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
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 238          KM    ENDPOINTS WERE EXTENDED
 239          KM    SLOPE = (2280-2256)/1219
 240          RS       2    FLOW      -1
 241          RC   0.045   0.030   0.045    1219  0.0197
 242          RX       0      95      99     100     110     111     118     200
 243          RY     110     104     102     100     100     102     104     110
 244          RL                    0.15     100
              *

 245          KK    UC46
 246          KM   SUBBASIN 46, UNNAMED WASH CENTRAL
 247          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 248          KM    L= .30  Kb= 0.060   Adj. Slope= 324.0
 249          BA    .034
 250          LG     .25     .39    3.60     .15   24.00
 251          UC    .154    .121
 252          UA       0       5      16      30      65      77      84      90      94      97
1                                                HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 253          UA     100
              *

 254          KK     R46
 255          KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
 256          KM    ENDPOINTS WERE EXTENDED
 257          KM    SLOPE = (2346-2315)/1783
 258          RS       3    FLOW      -1
 259          RC   0.045   0.035   0.045    1783  0.0174
 260          RX       0      92      99     100     105     106     113     200
 261          RY     108     104     102     100     100     102     104     108
 262          RL                    0.15     100
              *

 263          KK    UC45
 264          KM   SUBBASIN 45, UNNAMED WASH CENTRAL
 265          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 266          KM    L= .48   Kb= 0.030   S= 135.0
 267          BA    .086
 268          LG     .25     .39    3.60     .15   24.00
 269          UC    .175    .121
 270          UA       0       5      16      30      65      77      84      90      94      97
 271          UA     100
              *

 272          KK    UC47
 273          KM   SUBBASIN 47, UNNAMED WASH CENTRAL
 274          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 275          KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
 276          BA    .031
 277          LG     .25     .39    3.60     .15   24.00
 278          UC    .167    .171
 279          UA       0       5      16      30      65      77      84      90      94      97
 280          UA     100
              *

 281          KK  CP4547
 282          KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
 283          KM    R46
 284          HC       3
              *

 285          KK   R4547
 286          KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
 287          KM   ENDPOINTS WERE EXTENDED
 288          KM    SLOPE = (2315-2256)/2170
 289          RS       4    FLOW      -1
 290          RC   0.045   0.035   0.045    2170   .0272
 291          RX       0      90      99     100     105     106     115     200
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292          RY     108     104     102     100     100     102     104     108
293          RL                    0.15     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

294          KK    UC48
295          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
296          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
297          KM    L= .92   Kb= 0.048   S= 117.0
298          BA    .197
299          LG     .25     .39    3.70     .16   30.00
300          UC    .342    .265
             *

301          KK    UC50
302          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
303          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
304          KM    L= .27   Kb= 0.037   S= 93.0
305          BA    .019
306          LG     .25     .38    3.80     .24   24.00
307          UC    .167    .169
             *

308          KK  CP4850
309          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
310          KM    R3149 AND R4547
311          HC       4
             *

312          KK   R4850
313          KM   Routing flow from CP4850 to CP5157 through subbasin 57
314          KM    ENDPOINTS WERE EXTENDED
315          KM    SLOPE = (2256-2235)/1509
316          RS       2    FLOW      -1
317          RC   0.045   0.030   0.045    1509  0.0139
318          RX       0      95      99     100     115     116     120     200
319          RY     106     104     102     100     100     102     104     106
320          RL                    0.25     100
             *

321          KK    UC51
322          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
323          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
324          KM    L= .42   Kb= 0.061   Adj. Slope= 317.0
325          BA    .060
326          LG     .25     .36    5.00     .21   26.00
327          UC    .175    .133
             *

328          KK    UC57
329          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
330          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
331          KM    L= .47   Kb= 0.061   S= 200.0
332          BA    .037
333          LG     .25     .37    4.20     .28   20.00
334          UC    .233    .266
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

335          KK  CP5157
336          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
337          KM     R4850
338          HC       3
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                 *

339              KK   R5157
340              KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
341              KM    ENDPOINTS WERE EXTENDED
342              KM    SLOPE = (2235-2208)/1796
343              RS       2    FLOW      -1
344              RC   0.045   0.030   0.045    1796  0.0150
345              RX       0      60      99     100     100     121     160     220
346              RY     110     104     102     100     100     102     104     110
347              RL                    0.35     100
                 *

348              KK    UC58
349              KM   SUBBASIN 58, UNNAMED WASH CENTRAL
350              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
351              KM    L= .69   Kb= 0.055  Adj. Slope= 317.0
352              BA    .110
353              LG     .25     .37    4.80     .13   20.00
354              UC    .221    .180
                 *

355              KK    UC59
356              KM   SUBBASIN 59, UNNAMED WASH CENTRAL
357              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
358              KM    L= .49   Kb= 0.105   S= 112.0
359              BA    .034
360              LG     .25     .32    5.80     .33   14.00
361              UC    .454    .599
                 *

362              KK  CP5859
363              KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
364              KM     R5157
365              HC       3
                 *

366              KK  D5859N
367              KM    DIVERSION OF FLOWS AT FLOW SPLIT
368              DT  D5859S
369              DI       0      50     100     500   10000
370              DQ       0    24.9    49.5   248.5    4970
                 *

371              KK  R5859N
372              KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
373              KM   ENDPOINTS WERE EXTENDED
374              KM    SLOPE = (2208-2195)/699
375              RS       1    FLOW      -1
376              RC   0.045   0.030   0.045     699  0.0186
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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

377              RX       0      50      99     100     110     111     160     210
378              RY     104     103     102     100     100     102     103     104
379              RL                    0.15     100
                 *

380              KK    UC63
381              KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
382              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
383              KM    L= .81   Kb= 0.056   Adj. Slope= 322.0
384              BA    .117
385              LG     .25     .36    5.00     .19   19.00
386              UC    .246    .223
                 *

387              KK    CP63
388              KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
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389          KM   FROM RD5859N
390          HC       2
             *

391          KK     R63
392          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
393          KM    SLOPE = (2195-2170)/1394
394          RS       2    FLOW      -1
395          RC   0.045   0.030   0.045    1394  0.0179
396          RX      60      80      99     100     125     126     145     165
397          RY     106     104     102     100     100     102     104     106
398          RL                   0.35     100
             *

399          KK    UC66
400          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
401          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
402          KM    L= .54   Kb= 0.081   Adj. Slope= 324.0
403          BA    .037
404          LG     .25     .36    5.00     .25   14.00
405          UC    .242    .305
             *

406          KK    UC62
407          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
408          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
409          KM    L= 1.33   Kb= 0.057   Adj. Slope= 321.0
410          BA    .361
411          LG     .25     .35    6.10     .13   14.00
412          UC    .308    .226
             *

413          KK  CP6266
414          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
415          KM   FROM R63
416          HC       3
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

417          KK   R6266
418          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
419          KM    SLOPE = (2170-2150)/990
420          RS       2    FLOW      -1
421          RC   0.045   0.030   0.045     990  0.0202
422          RX      25      85      99     100     100     121     135     195
423          RY     106     104     102     100     100     102     104     106
424          RL                   0.35     100
             *

425          KK  D5859S
426          KM   RECALL DIVERTED FLOW FROM D5859N
427          DR  D5859S
             *

428          KK  R5859S
429          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
430          KM    SLOPE = (2208-2194)/803
431          RS       1    FLOW      -1
432          RC   0.045   0.030   0.045     803  0.0174
433          RX       0      50      99     100     125     126     175     225
434          RY     104     103     102     100     100     102     103     104
435          RL                   0.15     100
             *

436          KK    UC64
437          KM   SUBBASIN 64, UNNAMED WASH CENTRAL
438          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
```

```
 439          KM    L= .15   Kb= 0.078   S= 166.0
 440          BA    .005
 441          LG     .25     .31    6.90     .20   14.00
 442          UC    .154    .219
              *

 443          KK    CP64
 444          KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
 445          KM    DIVERSION RD5859N
 446          HC       2    1.88
              *

 447          KK    D64N
 448          KM   DIVERSION OF FLOWS AT FLOW SPLIT
 449          KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
 450          DT    D64S
 451          DI       0      50     100     500   10000
 452          DQ       0    22.5      45     225    4500
              *

 453          KK   RD64N
 454          KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
 455          KM   ENDPOINTS WERE EXTENDED
 456          KM    SLOPE = (2194-2161)/1721
 457          RS       2    FLOW      -1
 458          RC   0.045   0.030   0.045    1721  0.0192
1                                           HEC-1 INPUT
PAGE 12

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 459          RX       0      60      99     100     112     113     152     200
 460          RY     106     104     102     100     100     102     104     106
 461          RL                    0.25     100
              *

 462          KK    UC87
 463          KM   SUBBASIN 87, UNNAMED WASH CENTRAL
 464          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 465          KM    L= .33   Kb= 0.118   S= 101.0
 466          BA    .024
 467          LG     .25     .35    3.40     .62    8.00
 468          UC    .438    .503
              *

 469          KK    CP87
 470          KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
 471          KM    DIVERSION RD64N
 472          HC       2
              *

 473          KK   RD87N
 474          KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
 475          KM    SLOPE = (2161-2150)/557
 476          RS       1    FLOW      -1
 477          RC   0.045   0.030   0.045     557  0.0197
 478          RX      25      85      99     100     120     121     135     195
 479          RY     106     104     102     100     100     102     104     106
 480          RL                    0.35     100
              *

 481          KK    UC82
 482          KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
 483          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 484          KM    L= .22   Kb= 0.136   Adj. Slope= 220.0
 485          BA    .022
 486          LG     .25     .36    4.30    .400   14.00
 487          UC    .213    .177
              *

 488          KK    CP82
```

```
489          KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
490          KM   SUBBASIN 82
491          HC       3    2.45
             *

492          KK     R82
493          KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
494          KM    SLOPE = (2150-2138)/579
495          RS       1    FLOW      -1
496          RC   0.045   0.030   0.045     579  0.0207
497          RX      50      75      99     100     125     126     150     175
498          RY     106     104     102     100     100     102     104     106
499          RL                   0.35     100
             *
1                                          HEC-1 INPUT
PAGE 13

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

500          KK    D84N
501          KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
502          KM   PART OF TRIPLE DIVERSION JUST UPSTREAM OF TERRAVITA WAY
503          DT    D84S
504          DI       0     500    1275    1550    1964    2475    3223    4000
505          DQ       0       0       0    79.7     255     490     888    1250
             *

506          KK    UC84
507          KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
508          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
509          KM    L= .30   Kb= 0.102   Adj. Slope= 246.0
510          BA    .013
511          LG     .25     .36    4.50     .35   14.00
512          UC    .225    .278
             *

513          KK    CP84
514          KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
515          KM    FROM D84N
516          HC       2
             *

517          KK     R84
518          KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
519          KM   ENDPOINTS WERE EXTENDED
520          KM    SLOPE = (2138-2054)/3463
521          RS       5    FLOW      -1
522          RC   0.045   0.030   0.045    3463  0.0243
523          RX       0      94      99     100     110     111     116     200
524          RY     106     104     102     100     100     102     104     106
525          RL                   0.15     100
             *

526          KK    UC79
527          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
528          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
529          KM    L= .88   Kb= 0.040   Adj. Slope= 233.0
530          BA    .078
531          LG     .25     .35    4.30     .45   18.00
532          UC    .242    .294
533          UA       0       5      16      30      65      77      84      90      94      97
534          UA     100
             *

535          KK    UC78
536          KM   SUBBASIN 78, UNNAMED WASH CENTRAL
537          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
538          KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
539          BA    .177
540          LG     .25     .35    6.00     .17   17.00
```

```
541          UC    .196    .144
542          UA       0       5      16      30      65      77      84      90      94      97
543          UA     100
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

544          KK  CP7879
545          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
546          KM    FROM R84
547          HC       3
             *

548          KK   R7879
549          KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
550          KM   ENDPOINTS WERE EXTENDED
551          KM    SLOPE = (2054-2048)/256
552          RS       1    FLOW      -1
553          RC   0.045   0.030   0.045     256   .0234
554          RX       0      90      99     100     120     121     130     200
555          RY     106     104     102     100     100     102     104     106
556          RL                    0.35     100
             *

557          KK    UC77
558          KM   SUBBASIN 77, UNNAMED WASH CENTRAL
559          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
560          KM    L= .93   Kb= 0.048  Adj. Slope= 324.0
561          BA    .096
562          LG     .25     .34    6.70     .13   16.00
563          UC    .233    .263
564          UA       0       5      16      30      65      77      84      90      94      97
565          UA     100
             *

566          KK    CP77
567          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
568          KM    FROM R7879
569          HC       2
             *

570          KK     R77
571          KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
572          KM   ENDPOINTS WERE EXTENDED
573          KM    SLOPE = (2048-2037)/593
574          RS       1    FLOW      -1
575          RC   0.045   0.030   0.045     593  0.0185
576          RX       0      80      99     100     115     116     120     200
577          RY     106     104     102     100     100     102     104     106
578          RL                    0.25     100
             *

579          KK    UC89
580          KM   SUBBASIN 89, UNNAMED WASH CENTRAL
581          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
582          KM    L= .77   Kb= 0.057   S= 126.0
583          BA    .073
584          LG     .25     .33    6.40     .20   17.00
585          UC    .342    .405
586          UA       0       5      16      30      65      77      84      90      94      97
587          UA     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
588          KK    CP89
589          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
590          KM    FROM R77
591          HC       2
             *

592          KK     R89
593          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
594          KM   CHANNEL ENDS WERE EXTENDED
595          KM    SLOPE = (2037-2008)/1912
596          RS       2    FLOW      -1
597          RC   0.045   0.030   0.045    1912  0.0152
598          RX       0      80      99     100     115     116     135     200
.599         RY     106     104     102     100     100     102     104     106
600          RL                    0.25     100
             *

601          KK    UC74
602          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
603          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
604          KM    L= 1.13   Kb= 0.071   Adj. Slope= 328.0
605          BA    .151
606          LG     .25     .34    6.60     .13   14.00
607          UC    .342    .364
             *

608          KK    UC76
609          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
610          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
611          KM    L= .64   Kb= 0.053   Adj. Slope= 302.0
612          BA    .041
613          LG     .25     .35    6.10     .16   14.00
614          UC    .213    .287
             *

615          KK  CP7476
616          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
617          HC       2
             *

618          KK   R7476
619          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
620          KM   END POINTS WERE EXTENDED
621          KM    SLOPE = (2031-2017)/524
622          RS       1    FLOW      -1
623          RC   0.045   0.030   0.045     524  0.0267
624          RX       0      80      99     100     112     113     132     200
625          RY     106     104     102     100     100     102     104     106
626          RL                    0.25     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

627          KK    UC75
628          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
629          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
630          KM    L= 1.38   Kb= 0.068   Adj. Slope= 322.0
631          BA    .192
632          LG     .25     .34    6.50     .15   14.00
633          UC    .150    .149
634          UA       0       5      16      30      65      77      84      90      94      97
635          UA     100
             *

636          KK    CP75
637          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
638          KM    FROM R7476
639          HC       2
```

```
                *

640             KK     R75
641             KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
642             KM   END POINTS WERE EXTENDED
643             KM    SLOPE = (2017-2008)/723
644             RS       1    FLOW      -1
645             RC   0.045   0.030   0.045     723  0.0124
646             RX       0      80      99     100     115     116     135     200
647             RY     106     104     102     100     100     102     104     106
648             RL                    0.25     100
                *

649             KK    UC90
650             KM   SUBBASIN 90, UNNAMED WASH CENTRAL
651             KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
652             KM    L= .48   Kb= 0.103   S= 151.0
653             BA    .038
654             LG     .25     .35    3.70     .55   14.00
655             UC    .404    .482
                *

656             KK    UC91
657             KM   SUBBASIN 91, UNNAMED WASH CENTRAL
658             KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
659             KM    L= .75   Kb= 0.107   S= 109.0
660             BA    .073
661             LG     .25     .31    7.40     .14   14.00
662             UC    .571    .705
                *
                *

663             KK  CP90EN
664             KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
665             KM    FROM R89 AND R75
666             HC       4
                *
1                                          HEC-1 INPUT
PAGE 17

      LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

667             KK    D84S
668             KM   RETREIVAL OF DIVERTED FLOW FROM D84S
669             DR    D84S
                *

670             KK   RD84S
671             KM   ROUTING FLOW FROM CP84 (D84S) TO D84ii
672             KM    SLOPE = (2144-2140)/303
673             RS       6    FLOW      -1
674             RC   0.045   0.030   0.045     303  0.0132
675             RX       0      50      99     100     125     126     175     225
676             RY     106     104     102     100     100     102     104     106
677             RL                    0.35     100
                *

678             KK  D84IIS
679             KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
680             KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
681             DT  D84IIN
682             DI       0    79.7     255     490     880    1250
683             DQ       0    78.3     229     419     732    1000
                *

684             KK  RD84IS
685             KM   ROUTING FLOWS FROM D84IIS TO CP94DS
686             KM   SLOPE = (2140-2078)/3225
687             RS       1    FLOW      -1
688             RC   0.045   0.030   0.045    3225  0.0192
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```
689          RX       0      50      99     100     125     126     175     225
690          RY     106     104     102     100     100     102     104     106
691          RL                    0.25     100
             *

692          KK    UC94
693          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
694          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
695          KM    L= .53   Kb= 0.119   S= 108.0
696          BA    .028
697          LG     .25     .36    5.00     .23   13.00
698          UC    .671   1.082
             *

699          KK  CP94DS
700          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
701          KM   FROM RD84IS
702          HC       2
             *

703          KK   R94DS
704          KM   ROUTING FLOW FROM CP94DS TO CP88EN
705          KM   SLOPE = (2078-2041)/1950
706          RS       1    FLOW      -1
707          RC   0.045   0.030   0.045    1950  0.0189
708          RX      60      85      99     100     108     109     123     148
1                                          HEC-1 INPUT
PAGE 18

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

709          RY     106     104     102     100     100     102     104     106
710          RL                    0.25     100
             *

711          KK  D84IIN
712          KM   RECALL DIVERTED FLOW FROM D84II
713          DR  D84IIN
             *

714          KK  RD84IN
715          KM   ROUTING FLOW FROM D84II TO CP88EN
716          KM   SLOPE = (2140-2041)/5175
717          RS       1    FLOW      -1
718          RC   0.045   0.030   0.045    5175  0.0191
719          RX      60      78      90     100     125     132     135     150
720          RY     106     104     102     100     100     102     104     106
721          RL                    0.25     100
             *

722          KK    UC88
723          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
724          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
725          KM    L= 1.08   Kb= 0.104   S=111.0
726          BA    .108
727          LG     .25     .33    6.10     .20   14.00
728          UC    .962   1.337
             *

729          KK  CP88EN
730          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
731          KM    FROM R94DS AND RD84IN
732          HC       3
             *

733          KK    UC95
734          KM   SUBBASIN 95, UNNAMED WASH CENTRAL
735          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
736          KM    L= 0.22   Kb= 0.120   Adj.Slope= 220
737          BA    .024
738          LG     .25     .39    3.70     .15    5.00
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739          UC    .217    .170
             *

740          KK    UC93
741          KM   SUBBASIN 93, UNNAMED WASH CENTRAL
742          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
743          KM    L= .64   Kb= 0.093   S= 135.0
744          BA    .038
745          LG     .25     .30    8.00     .07   13.00
746          UC    .392    .592
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

747          KK    UC96
748          KM   SUBBASIN 96, UNNAMED WASH CENTRAL
749          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
750          KM    L= .73   Kb= 0.110  S= 113.0
751          BA    .061
752          LG     .25     .32    7.00     .12   13.00
753          UC    .550    .723
             *
             *
754          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 42         UC8
             .
             .
 51          .         UC9
             .           .
             .           .
 60       CPC8............
             V
             V
 64      RCP89
             .
             .
 74          .        UC18
             .           .
             .           .
 83          .           .        UC19
             .           .           .
             .           .           .
 90    CP1819......................
             V
             V
 93      R1819
             .
             .
102          .        UC22
             .           .
             .           .
109          .           .        UC23
             .           .           .
             .           .           .
116    CP2223......................
             V
             V
119      R2223
             .
             .
128          .        UC28
             .           V
             .           V
135          .         R28
             .           .
             .           .
144          .           .        UC29
             .           .           .
             .           .           .
151          .           .           .       UC30
             .           .           .          .
             .           .           .          .
158    CP2930..................................
             V
             V
162      R2930
             .
             .
171          .        UC34
             .           .
             .           .
178       CP34............
             V
             V
182        R34
             .
             .
191          .        UC37
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                .           .
                .           .
198             .           .        UC35
                .           .           .
                .           .           .
205       CP3537.......................
               V
               V
209        R3537
                .
                .
218             .        UC49
                .           .
                .           .
225             .           .        UC31
                .           .           .
                .           .           .
232       CP3149.......................
               V
               V
236        R3149
                .
                .
245             .        UC46
                .           V
                .           V
254             .         R46
                .           .
                .           .
263             .           .        UC45
                .           .           .
                .           .           .
272             .           .           .        UC47
                .           .           .           .
                .           .           .           .
281             .      CP4547.......................
                .           V
                .           V
285             .       R4547
                .           .
                .           .
294             .           .        UC48
                .           .           .
                .           .           .
301             .           .           .        UC50
                .           .           .           .
                .           .           .           .
308       CP4850.................................
               V
               V
312        R4850
                .
                .
321             .        UC51
                .           .
                .           .
328             .           .        UC57
                .           .           .
                .           .           .
335       CP5157.......................
               V
               V
339        R5157
                .
                .
348             .        UC58
                .           .
                .           .
355             .           .        UC59
                .           .           .
                .           .           .
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362      CP5859.......................
              .
              .
368           .-------> D5859S
366      D5859N
              V
              V
371      R5859N
              .
              .
380           .        UC63
              .           .
              .           .
387        CP63............
              V
              V
391         R63
              .
              .
399           .        UC66
              .           .
              .           .
406           .           .        UC62
              .           .           .
              .           .           .
413      CP6266.......................
              V
              V
417       R6266
              .
              .
427           .           .<-------  D5859S
425           .      D5859S
              .           V
              .           V
428           .      R5859S
              .           .
              .           .
436           .           .        UC64
              .           .           .
              .           .           .
443           .        CP64............
              .           .
              .           .
450           .           .------->    D64S
447           .        D64N
              .           V
              .           V
453           .       RD64N
              .           .
              .           .
462           .           .        UC87
              .           .           .
              .           .           .
469           .        CP87............
              .           V
              .           V
473           .       RD87N
              .           .
              .           .
481           .           .        UC82
              .           .           .
              .           .           .
488        CP82........................
              V
              V
492         R82
              .
              .
503           .------->    D84S
500        D84N
```

```
                .
                .
506             .        UC84
                .           .
                .           .
513         CP84............
               V
               V
517          R84
                .
                .
526             .        UC79
                .           .
                .           .
535             .           .        UC78
                .           .           .
                .           .           .
544       CP7879........................
               V
               V
548        R7879
                .
                .
557             .        UC77
                .           .
                .           .
566         CP77............
               V
               V
570          R77
                .
                .
579             .        UC89
                .           .
                .           .
588         CP89............
               V
               V
592          R89
                .
                .
601             .        UC74
                .           .
                .           .
608             .           .        UC76
                .           .           .
                .           .           .
615             .      CP7476............
                .           V
                .           V
618             .       R7476
                .           .
                .           .
627             .           .        UC75
                .           .           .
                .           .           .
636             .        CP75............
                .           V
                .           V
640             .         R75
                .           .
                .           .
649             .           .        UC90
                .           .           .
                .           .           .
656             .           .           .        UC91
                .           .           .           .
                .           .           .           .
663       CP90EN.................................
                .
                .
```

```
669          .           .<-------    D84S
667          .        D84S
             .           V
             .           V
670          .       RD84S
             .           .
             .           .
681          .           .------->  D84IIN
678          .      D84IIS
             .           V
             .           V
684          .      RD84IS
             .           .
             .           .
692          .           .        UC94
             .           .           .
             .           .           .
699          .      CP94DS............
             .           V
             .           V
703          .       R94DS
             .           .
             .           .
713          .           .           .<-------  D84IIN
711          .           .      D84IIN
             .           .           V
             .           .           V
714          .           .      RD84IN
             .           .           .
             .           .           .
722          .           .           .        UC88
             .           .           .           .
             .           .           .           .
729          .      CP88EN......................
             .           .
             .           .
733          .           .        UC95
             .           .           .
             .           .           .
740          .           .           .        UC93
             .           .           .           .
             .           .           .           .
747          .           .           .           .        UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	22.	12.37	7.	2.	1.	.05
+	HYDROGRAPH AT	UC9	28.	12.27	7.	2.	1.	.05
+	2 COMBINED AT	CPC8	49.	12.30	15.	5.	2.	.11
+	ROUTED TO	RCP89	49.	12.40	15.	5.	2.	.11
+	HYDROGRAPH AT	UC18	12.	12.63	5.	1.	1.	.04
+	HYDROGRAPH AT	UC19	10.	12.50	3.	1.	0.	.03
+	3 COMBINED AT	CP1819	70.	12.47	22.	7.	2.	.18
+	ROUTED TO	R1819	69.	12.50	22.	7.	2.	.18
+	HYDROGRAPH AT	UC22	12.	12.43	3.	1.	0.	.03
+	HYDROGRAPH AT	UC23	7.	12.27	2.	0.	0.	.01
+	3 COMBINED AT	CP2223	86.	12.47	27.	8.	3.	.22
+	ROUTED TO	R2223	86.	12.53	27.	8.	3.	.22
+	HYDROGRAPH AT	UC28	39.	12.30	6.	2.	1.	.05
+	ROUTED TO	R28	39.	12.33	6.	2.	1.	.05
+	HYDROGRAPH AT	UC29	22.	12.30	4.	1.	0.	.04
+	HYDROGRAPH AT	UC30	9.	12.20	1.	0.	0.	.01
+	4 COMBINED AT	CP2930	141.	12.43	37.	11.	4.	.32
+	ROUTED TO	R2930	140.	12.47	37.	11.	4.	.32
+	HYDROGRAPH AT	UC34	31.	12.17	3.	1.	0.	.03
+	2 COMBINED AT	CP34	155.	12.43	40.	12.	4.	.35
+	ROUTED TO	R34	152.	12.60	40.	11.	4.	.35

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
	HYDROGRAPH AT	UC37	96.	12.47	27.	8.	3.	.20
+	HYDROGRAPH AT	UC35	291.	12.13	33.	10.	4.	.26
+	3 COMBINED AT	CP3537	387.	12.23	98.	29.	10.	.82
+	ROUTED TO	R3537	384.	12.30	98.	29.	10.	.82
+	HYDROGRAPH AT	UC49	74.	12.07	7.	2.	1.	.05
+	HYDROGRAPH AT	UC31	211.	12.50	50.	14.	5.	.41
+	3 COMBINED AT	CP3149	591.	12.33	153.	45.	16.	1.27
+	ROUTED TO	R3149	591.	12.37	153.	45.	16.	1.27
+	HYDROGRAPH AT	UC46	59.	12.03	5.	1.	0.	.03
+	ROUTED TO	R46	57.	12.07	5.	1.	0.	.03
+	HYDROGRAPH AT	UC45	147.	12.03	12.	3.	1.	.09
	HYDROGRAPH AT	UC47	48.	12.03	4.	1.	0.	.03
+	3 COMBINED AT	CP4547	247.	12.03	21.	6.	2.	.15
+	ROUTED TO	R4547	240.	12.10	21.	6.	2.	.15
+	HYDROGRAPH AT	UC48	224.	12.17	28.	8.	3.	.20
+	HYDROGRAPH AT	UC50	27.	12.07	2.	1.	0.	.02
+	4 COMBINED AT	CP4850	954.	12.17	202.	59.	21.	1.64
+	ROUTED TO	R4850	948.	12.20	201.	59.	21.	1.64
+	HYDROGRAPH AT	UC51	92.	12.03	8.	2.	1.	.06
+	HYDROGRAPH AT	UC57	40.	12.10	4.	1.	0.	.04
+	3 COMBINED AT	CP5157	1031.	12.17	213.	63.	23.	1.73
+	ROUTED TO	R5157	1016.	12.23	212.	62.	23.	1.73
	HYDROGRAPH AT	UC58	156.	12.07	15.	4.	1.	.11
	HYDROGRAPH AT							

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+		UC59	18.	12.30	3.	1.	0.	.03
	3 COMBINED AT							
+		CP5859	1130.	12.20	229.	67.	24.	1.88
	DIVERSION TO							
+		D5859S	562.	12.20	114.	33.	12.	1.88
	HYDROGRAPH AT							
+		D5859N	569.	12.20	115.	34.	12.	1.88
	ROUTED TO							
+		R5859N	562.	12.27	115.	34.	12.	1.88
	HYDROGRAPH AT							
+		UC63	141.	12.10	14.	4.	1.	.12
	2 COMBINED AT							
+		CP63	663.	12.23	129.	38.	14.	2.00
	ROUTED TO							
+		R63	661.	12.23	128.	37.	13.	2.00
	HYDROGRAPH AT							
+		UC66	36.	12.13	4.	1.	0.	.04
	HYDROGRAPH AT							
+		UC62	423.	12.13	43.	12.	4.	.36
	3 COMBINED AT							
+		CP6266	1065.	12.20	173.	50.	18.	2.39
	ROUTED TO							
+		R6266	1060.	12.20	173.	50.	18.	2.39
	HYDROGRAPH AT							
+		D5859S	562.	12.20	114.	33.	12.	1.88
	ROUTED TO							
+		R5859S	561.	12.23	114.	33.	12.	1.88
	HYDROGRAPH AT							
+		UC64	6.	12.07	1.	0.	0.	.00
	2 COMBINED AT							
+		CP64	564.	12.23	114.	33.	12.	1.88
	DIVERSION TO							
+		D64S	254.	12.23	51.	15.	5.	1.88
	HYDROGRAPH AT							
+		D64N	310.	12.23	63.	18.	7.	1.88
	ROUTED TO							
+		RD64N	307.	12.30	63.	18.	7.	1.88
	HYDROGRAPH AT							
+		UC87	12.	12.27	2.	0.	0.	.02
	2 COMBINED AT							
+		CP87	317.	12.27	64.	19.	7.	1.90
	ROUTED TO							
+		RD87N	318.	12.30	64.	19.	7.	1.90
	HYDROGRAPH AT							
+		UC82	25.	12.07	2.	1.	0.	.02
	3 COMBINED AT							
+		CP82	1382.	12.23	239.	69.	25.	2.45

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
ROUTED TO	R82	1380.	12.23	239.	69.	25.	2.45
+ DIVERSION TO	D84S	30.	12.23	1.	0.	0.	2.45
+ HYDROGRAPH AT	D84N	1350.	12.23	238.	69.	25.	2.45
+ HYDROGRAPH AT	UC84	13.	12.10	1.	0.	0.	.01
+ 2 COMBINED AT	CP84	1359.	12.23	239.	69.	25.	2.46
+ ROUTED TO	R84	1329.	12.37	239.	69.	25.	2.46
+ HYDROGRAPH AT	UC79	68.	12.10	7.	2.	1.	.08
+ HYDROGRAPH AT	UC78	263.	12.03	21.	6.	2.	.18
+ 3 COMBINED AT	CP7879	1411.	12.33	265.	77.	28.	2.72
+ ROUTED TO	R7879	1410.	12.33	265.	77.	28.	2.72
+ HYDROGRAPH AT	UC77	115.	12.07	12.	3.	1.	.10
+ 2 COMBINED AT	CP77	1464.	12.33	276.	80.	29.	2.81
+ ROUTED TO	R77	1460.	12.37	276.	80.	29.	2.81
+ HYDROGRAPH AT	UC89	61.	12.13	8.	2.	1.	.07
+ 2 COMBINED AT	CP89	1500.	12.37	284.	82.	30.	2.89
+ ROUTED TO	R89	1482.	12.40	284.	82.	29.	2.89
+ HYDROGRAPH AT	UC74	139.	12.20	18.	5.	2.	.15
+ HYDROGRAPH AT	UC76	45.	12.10	5.	1.	0.	.04
+ 2 COMBINED AT	CP7476	179.	12.17	23.	6.	2.	.19
+ ROUTED TO	R7476	179.	12.17	23.	6.	2.	.19
+ HYDROGRAPH AT	UC75	292.	12.03	22.	6.	2.	.19
+ 2 COMBINED AT	CP75	426.	12.07	44.	12.	4.	.38
+ ROUTED TO	R75	424.	12.07	44.	12.	4.	.38
HYDROGRAPH AT	UC90	21.	12.27	3.	1.	0.	.04

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC91	41.	12.40	9.	2.	1.	.07
+	4 COMBINED AT	CP90EN	1706.	12.37	337.	96.	35.	3.38
+	HYDROGRAPH AT	D84S	30.	12.23	1.	0.	0.	2.45
+	ROUTED TO	RD84S	31.	12.27	1.	0.	0.	2.45
+	DIVERSION TO	D84IIN	30.	12.27	1.	0.	0.	2.45
+	HYDROGRAPH AT	D84IIS	1.	12.27	0.	0.	0.	2.45
+	ROUTED TO	RD84IS	0.	.00	0.	0.	0.	2.45
+	HYDROGRAPH AT	UC94	11.	12.50	3.	1.	0.	.03
+	2 COMBINED AT	CP94DS	10.	12.50	3.	1.	0.	2.48
+	ROUTED TO	R94DS	9.	12.63	3.	1.	0.	2.48
+	HYDROGRAPH AT	D84IIN	30.	12.27	1.	0.	0.	2.45
+	ROUTED TO	RD84IN	6.	12.37	0.	0.	0.	2.45
+	HYDROGRAPH AT	UC88	33.	12.73	11.	3.	1.	.11
+	3 COMBINED AT	CP88EN	43.	12.67	14.	4.	1.	2.59
+	HYDROGRAPH AT	UC95	34.	12.07	3.	1.	0.	.02
+	HYDROGRAPH AT	UC93	29.	12.27	5.	1.	1.	.04
+	HYDROGRAPH AT	UC96	35.	12.37	7.	2.	1.	.06

*** NORMAL END OF HEC-1 ***

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            JUN  1998                 *
*          VERSION 4.1                 *
*                                      *
*  RUN DATE   16MAR04  TIME  08:40:40  *
*                                      *
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****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID         UC MODEL - UNNAMED WASH, CENTRAL
  2           ID         100-YEAR 6-HOUR MODEL  FILENAME: UC1006E.DAT
  3           ID         EXISTING CONDITIONS
  4           ID         CAREFREE DRAINAGE MASTER PLAN
  5           ID         FCD 2000C037
  6           ID         BY CH2M HILL
  7           ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  8           ID         DECEMBER 2001 (Final Revision March 2004)
  9           ID    ***************************************************************
 10           ID         100 YEAR ANALYSIS 6-HOUR STORM
 11           ID
 12           ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
 13           ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
 14           ID   ******************************************************************
 15           ID     DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
 16           ID
 17           ID     THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
 18           ID
 19           ID
              *DIAGRAM
 20           IT       2                    2000
 21           IO       5
 22           IN      15
 23           JD    3.40    0.01
 24           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 25           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 26           PC   0.962   0.972   0.983   0.991   1.000
 27           JD   3.378    0.50
 28           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 29           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 30           PC   0.962   0.972   0.983   0.991   1.000
 31           JD   3.314    2.80
 32           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 33           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 34           PC   0.950   0.963   0.975   0.988   1.000
 35           JD   3.135    16.0
 36           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
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 37          PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 38          PC   0.946   0.960   0.973   0.987   1.000
 39          JD   2.761    90.0
 40          PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 41          PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 42          PC   0.927   0.945   0.964   0.982   1.000
 43          JD   1.938   500.0
 44          PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 45          PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 46          PC   0.907   0.930   0.954   0.977   1.000
             *

 47          KK     UC8
 48          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 49          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 50          KM    L= 1.04   Kb= 0.031   S=138.0
 51          BA    .054
 52          LG     .30     .36     4.9     .26    36.0
1                                          HEC-1 INPUT
PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 53          UC    .300    .529
 54          UA       0       5      16      30      65      77      84      90      94      97
 55          UA     100
             *

 56          KK     UC9
 57          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 58          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 59          KM    L= 0.91   Kb= 0.031   S=145.0
 60          BA    .047
 61          LG     .30     .36     5.0     .23    36.0
 62          UC    .267    .416
 63          UA       0       5      16      30      65      77      84      90      94      97
 64          UA     100
             *

 65          KK    CPC89
 66          KM    CONCENTRATION POINT 89
 67          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 68          HC       2
             *

 69          KK   RCP89
 70          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 71          KM    NORMAL DEPTH CHANNEL ROUTING
 72          KM    ENDPOINTS WERE EXTENDED
 73          KM    SLOPE = (2596-2540)/2933
 74          RS       5    FLOW      -1
 75          RC   0.045   0.035   0.045    2933  0.0191
 76          RX       0      90      99     100     108     109     120     200
 77          RY     108     104     102     100     100     102     104     108
 78          RL                    0.15     100
             *

 79          KK    UC18
 80          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 81          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 82          KM    L= 0.56   Kb= 0.091   S=101.0
 83          BA    .040
 84          LG     .25     .36     5.0     .23   24.00
 85          UC    .425    .557
 86          UA       0       5      16      30      65      77      84      90      94      97
 87          UA     100
             *

 88          KK    UC19
 89          KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 90          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
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 91          KM    L= 0.52   Kb= 0.069   S=135.0
 92          BA    .027
 93          LG     .25      .36    5.00      .23   18.00
 94          UC    .313     .469
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 95          KK  CP1819
 96          KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
 97          HC       3
             *

 98          KK   R1819
 99          KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
100          KM    ENDPOINTS WERE EXTENDED
101          KM    SLOPE = (2540-2511)/1790
102          RS       2    FLOW      -1
103          RC   0.045   0.030   0.045    1790  0.0162
104          RX       0      92      99     100     112     113     120     200
105          RY     108     104     102     100     100     102     104     108
106          RL                    0.25     100
             *

107          KK    UC22
108          KM   SUBBASIN 22, UNNAMED WASH CENTRAL
109          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
110          KM    L= .76   Kb= .104   S=111.0
111          BA    .032
112          LG     .25      .36    5.00      .23   14.00
113          UC    .538    1.061
             *

114          KK    UC23
115          KM   SUBBASIN 23, UNNAMED WASH CENTRAL
116          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
117          KM    L= .40   Kb= 0.125   S=121.0
118          BA    .013
119          LG     .25      .36    5.00      .23   18.00
120          UC    .412     .209
             *

121          KK  CP2223
122          KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
123          HC       3
             *

124          KK   R2223
125          KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
126          KM    ENDPOINTS WERE EXTENDED
127          KM    SLOPE = (2511-2482)/1862
128          RS       2    FLOW      -1
129          RC   0.045    0.03   0.045    1862  0.0156
130          RX       0      95      99     100     112     113     117     200
131          RY     108     104     102     100     100     102     104     108
132          RL                    0.25     100
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

133          KK    UC28
134          KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
135          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
136          KM    L= .57   Kb= 0.106   S=109.0
137          BA    .055
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138          LG     .25     .36    4.90     .25   14.00
139          UC    .496    .428
             *

140          KK     R28
141          KM    ROUTING REACH FROM CP1028 TO CP2930 THROUGH SUBBASIN 30
142          KM    ENDPOINTS WERE EXTENDED
143          KM    SLOPE = (2502-2482)/1296
144          RS       2    FLOW      -1
145          RC   0.045   0.035   0.045    1296  0.0154
146          RX       0      86      99     100     108     109     122     200
147          RY     108     104     102     100     100     102     104     108
148          RL                    0.15     100
             *

149          KK    UC29
150          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
151          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
152          KM    L= .47   Kb= 0.116   S=109.0
153          BA    .035
154          LG     .25     .36    5.00     .23   12.00
155          UC    .450    .558
             *

156          KK   UC30
157          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
158          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
159          KM    L= .28   Kb= 0.126   S=134.0
160          BA    .012
161          LG     .25     .36    5.00     .23   12.00
162          UC    .338    .498
             *

163          KK  CP2930
164          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
165          KM    CP2223
166          HC       4
             *

167          KK   R2930
168          KM   Routing flow from CP2930 to CP34 through subbasin 34
169          KM    SLOPE = (2482-2469)/925
170          KM    ENDPOINTS WERE EXTENDED
171          RS       1    FLOW      -1
172          RC   0.045   0.030   0.045     925  0.0141
173          RX       0      89      99     100     110     111     122     200
174          RY     108     104     102     100     100     102     104     108
175          RL                    0.15     100
             *
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

176          KK    UC34
177          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
178          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
179          KM    L= .31   Kb = 0.116   S= 117.0
180          BA    .037
181          LG     .25     .36    4.90     .22   12.00
182          UC    .346    .288
             *

183          KK    CP34
184          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
185          KM   R2930
186          HC       2
             *

187          KK     R34
```

```
188          KM   Routing flow from CP34 to CP3537 through subbasin 37
189          KM    ENDPOINTS WERE EXTENDED
190          KM    SLOPE = (2469-2318)/6475
191          RS      11    FLOW      -1
192          RC   0.045   0.035   0.045    6475   .0233
193          RX       0      90      99     100     105     106     115     200
194          RY     108     104     102     100     100     102     104     108
195          RL                    0.15     100
             *

196          KK    UC37
197          KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
198          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
199          KM    L= 2.03   Kb= 0.160   S= 98.0
200          BA    .207
201          LG     .25     .39    3.70     .16   24.00
202          UC    .600    .906
             *

203          KK    UC35
204          KM   SUBBASIN 35, UNNAMED WASH CENTRAL
205          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
206          KM    L= 1.27   Kb= 0.035   S=138.0
207          BA    .261
208          LG     .25     .38    3.90     .20   24.00
209          UC    .325    .226
             *

210          KK  CP3537
211          KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
212          KM    R34
213          HC       3
             *
```


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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

214          KK   R3537
215          KM   Routing flow from CP3537 to CP3149 through subbasin 49
216          KM    ENDPOINTS WERE EXTENDED
217          KM    SLOPE = (2318-2280)/1829
218          RS       3    FLOW      -1
219          RC   0.045   0.035   0.045    1829  0.0208
220          RX       0      90      99     100     105     106     115     200
221          RY     108     104     102     100     100     102     104     108
222          RL                    0.15     100
             *

223          KK    UC49
224          KM   SUBBASIN 49, UNNAMED WASH CENTRAL
225          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
226          KM    L= .47   Kb= 0.032   S=148.0
227          BA    .048
228          LG     .25     .39    3.60     .15   30.00
229          UC    .188    .179
             *

230          KK    UC31
231          KM   SUBBASIN 31, UNNAMED WASH CENTRAL
232          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
233          KM    L= 2.04   Kb= 0.066   S= 128.0
234          BA    .406
235          LG     .25     .38    4.10     .18   20.00
236          UC    .633    .659
             *

237          KK  CP3149
238          KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
239          KM     R3537
```

```
240          HC       3
             *

241          KK   R3149
242          KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
243          KM    ENDPOINTS WERE EXTENDED
244          KM    SLOPE = (2280-2256)/1219
245          RS       2    FLOW      -1
246          RC   0.045   0.030   0.045    1219  0.0197
247          RX       0      95      99     100     110     111     118     200
248          RY     110     104     102     100     100     102     104     110
249          RL                    0.15     100
             *

250          KK    UC46
251          KM   SUBBASIN 46, UNNAMED WASH CENTRAL
252          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
253          KM    L= .30  Kb= 0.060   Adj. Slope= 324.0
254          BA    .034
255          LG     .25     .39    3.60     .15   24.00
256          UC    .169    .132
257          UA       0       5      16      30      65      77      84      90      94      97
1                                                HEC-1 INPUT
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        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

258          UA     100
             *

259          KK     R46
260          KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
261          KM    ENDPOINTS WERE EXTENDED
262          KM    SLOPE = (2346-2315)/1783
263          RS       3    FLOW      -1
264          RC   0.045   0.035   0.045    1783  0.0174
265          RX       0      92      99     100     105     106     113     200
266          RY     108     104     102     100     100     102     104     108
267          RL                    0.15     100
             *

268          KK    UC45
269          KM   SUBBASIN 45, UNNAMED WASH CENTRAL
270          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
271          KM    L= .48   Kb= 0.030   S= 135.0
272          BA    .086
273          LG     .25     .39    3.60     .15   24.00
274          UC    .192    .134
275          UA       0       5      16      30      65      77      84      90      94      97
276          UA     100
             *

277          KK    UC47
278          KM   SUBBASIN 47, UNNAMED WASH CENTRAL
279          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
280          KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
281          BA    .031
282          LG     .25     .39    3.60     .15   24.00
283          UC    .179    .185
284          UA       0       5      16      30      65      77      84      90      94      97
285          UA     100
             *

286          KK  CP4547
287          KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
288          KM    R46
289          HC       3
             *

290          KK   R4547
291          KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
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292          KM   ENDPOINTS WERE EXTENDED
293          KM    SLOPE = (2315-2256)/2170
294          RS       4    FLOW      -1
295          RC   0.045   0.035   0.045    2170   .0272
296          RX       0      90      99     100     105     106     115     200
297          RY     108     104     102     100     100     102     104     108
298          RL                    0.15     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

299          KK    UC48
300          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
301          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
302          KM    L= .92   Kb= 0.048   S= 117.0
303          BA    .197
304          LG     .25     .39    3.70     .16   30.00
305          UC    .354    .276
             *

306          KK    UC50
307          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
308          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
309          KM    L= .27   Kb= 0.037   S= 93.0
310          BA    .019
311          LG     .25     .38    3.80     .24   24.00
312          UC    .179    .183
             *

313          KK  CP4850
314          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
315          KM    R3149 AND R4547
316          HC       4
             *

317          KK   R4850
318          KM   Routing flow from CP4850 to CP5157 through subbasin 57
319          KM    ENDPOINTS WERE EXTENDED
320          KM    SLOPE = (2256-2235)/1509
321          RS       2    FLOW      -1
322          RC   0.045   0.030   0.045    1509  0.0139
323          RX       0      95      99     100     115     116     120     200
324          RY     106     104     102     100     100     102     104     106
325          RL                    0.25     100
             *

326          KK    UC51
327          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
328          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
329          KM    L= .42   Kb= 0.061   Adj. Slope= 317.0
330          BA    .060
331          LG     .25     .36    5.00     .21   26.00
332          UC    .192    .148
             *

333          KK    UC57
334          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
335          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
336          KM    L= .47   Kb= 0.061   S= 200.0
337          BA    .037
338          LG     .25     .37    4.20     .28   20.00
339          UC    .258    .297
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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340          KK  CP5157
341          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
342          KM     R4850
343          HC       3
             *

344          KK   R5157
345          KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
346          KM    ENDPOINTS WERE EXTENDED
347          KM    SLOPE = (2235-2208)/1796
348          RS       2    FLOW      -1
349          RC   0.045   0.030   0.045    1796  0.0150
350          RX       0      60      99     100     100     121     160     220
351          RY     110     104     102     100     100     102     104     110
352          RL                    0.35     100
             *

353          KK    UC58
354          KM   SUBBASIN 58, UNNAMED WASH CENTRAL
355          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
356          KM    L= .69   Kb= 0.055  Adj. Slope= 317.0
357          BA    .110
358          LG     .25     .37    4.80     .13   20.00
359          UC    .237    .196
             *

360          KK    UC59
361          KM   SUBBASIN 59, UNNAMED WASH CENTRAL
362          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
363          KM    L= .49   Kb= 0.105   S= 112.0
364          BA    .034
365          LG     .25     .32    5.80     .33   14.00
366          UC    .446    .587
             *

367          KK  CP5859
368          KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
369          KM     R5157
370          HC       3
             *

371          KK  D5859N
372          KM    DIVERSION OF FLOWS AT FLOW SPLIT
373          DT  D5859S
374          DI       0      50     100     500   10000
375          DQ       0    24.9    49.5   248.5    4970
             *

376          KK  R5859N
377          KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
378          KM   ENDPOINTS WERE EXTENDED
379          KM    SLOPE = (2208-2195)/699
380          RS       1    FLOW      -1
381          RC   0.045   0.030   0.045     699  0.0186
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

382          RX       0      50      99     100     110     111     160     210
383          RY     104     103     102     100     100     102     103     104
384          RL                    0.15     100
             *

385          KK    UC63
386          KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
387          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
388          KM    L= .81   Kb= 0.056   Adj. Slope= 322.0
389          BA    .117
390          LG     .25     .36    5.00     .19   19.00
```

```
391          UC    .271     .248
             *

392          KK    CP63
393          KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
394          KM   FROM RD5859N
395          HC       2
             *

396          KK     R63
397          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
398          KM    SLOPE = (2195-2170)/1394
399          RS       2    FLOW      -1
400          RC   0.045   0.030   0.045    1394  0.0179
401          RX      60      80      99     100     125     126     145     165
402          RY     106     104     102     100     100     102     104     106
403          RL                   0.35     100
             *

404          KK    UC66
405          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
406          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
407          KM    L= .54   Kb= 0.081   Adj. Slope= 324.0
408          BA    .037
409          LG     .25     .36    5.00     .25   14.00
410          UC    .262    .334
             *

411          KK    UC62
412          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
413          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
414          KM    L= 1.33   Kb= 0.057   Adj. Slope= 321.0
415          BA    .361
416          LG     .25     .35    6.10     .13   14.00
417          UC    .329    .243
             *

418          KK  CP6266
419          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
420          KM   FROM R63
421          HC       3
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

422          KK   R6266
423          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
424          KM    SLOPE = (2170-2150)/990
425          RS       2    FLOW      -1
426          RC   0.045   0.030   0.045     990  0.0202
427          RX      25      85      99     100     100     121     135     195
428          RY     106     104     102     100     100     102     104     106
429          RL                   0.35     100
             *

430          KK  D5859S
431          KM   RECALL DIVERTED FLOW FROM D5859N
432          DR  D5859S
             *

433          KK  R5859S
434          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
435          KM    SLOPE = (2208-2194)/803
436          RS       1    FLOW      -1
437          RC   0.045   0.030   0.045     803  0.0174
438          RX       0      50      99     100     125     126     175     225
439          RY     104     103     102     100     100     102     103     104
440          RL                   0.15     100
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                 *

441              KK    UC64
442              KM   SUBBASIN 64, UNNAMED WASH CENTRAL
443              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
444              KM    L= .15   Kb= 0.078   S= 166.0
445              BA    .002
446              LG     .25     .31    6.90     .20   14.00
447              UC    .167    .239
                 *

448              KK    CP64
449              KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
450              KM    DIVERSION RD5859N
451              HC       2    1.88
                 *

452              KK    D64N
453              KM   DIVERSION OF FLOWS AT FLOW SPLIT
454              KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
455              DT    D64S
456              DI       0      50     100     500   10000
457              DQ       0    22.5      45     225    4500
                 *

458              KK   RD64N
459              KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
460              KM   ENDPOINTS WERE EXTENDED
461              KM    SLOPE = (2194-2161)/1721
462              RS       2    FLOW      -1
463              RC   0.045   0.030   0.045    1721  0.0192
1                                             HEC-1 INPUT
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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

464              RX       0      60      99     100     112     113     152     200
465              RY     106     104     102     100     100     102     104     106
466              RL                    0.25     100
                 *

467              KK    UC87
468              KM   SUBBASIN 87, UNNAMED WASH CENTRAL
469              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
470              KM    L= .33   Kb= 0.118   S= 101.0
471              BA    .024
472              LG     .25     .35    3.40     .62    8.00
473              UC    .446    .574
                 *

474              KK    CP87
475              KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
476              KM    DIVERSION RD64N
477              HC       2
                 *

478              KK   RD87N
479              KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
480              KM    SLOPE = (2161-2150)/557
481              RS       1    FLOW      -1
482              RC   0.045   0.030   0.045     557  0.0197
483              RX      25      85      99     100     120     121     135     195
484              RY     106     104     102     100     100     102     104     106
485              RL                    0.35     100
                 *

486              KK    UC82
487              KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
488              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
489              KM    L= .22   Kb= 0.136   Adj. Slope= 220.0
490              BA    .022
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491          LG     .25     .36    4.30    .400   14.00
492          UC    .233    .197
             *

493          KK    CP82
494          KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
495          KM   SUBBASIN 82
496          HC       3    2.45
             *

497          KK     R82
498          KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
499          KM    SLOPE = (2150-2138)/579
500          RS       1    FLOW      -1
501          RC   0.045   0.030   0.045     579  0.0207
502          RX      50      75      99     100     125     126     150     175
503          RY     106     104     102     100     100     102     104     106
504          RL                    0.35     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

505          KK    D84N
506          KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
507          KM   PART OF TRIPLE DIVERSION JUST UPSTREAM OF TERRAVITA WAY
508          DT    D84S
509          DI       0     500    1275    1550    1964    2475    3223    4000
510          DQ       0       0       0    79.7     255     490     888    1250
             *

511          KK    UC84
512          KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
513          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
514          KM    L= .30   Kb= 0.102   Adj. Slope= 246.0
515          BA    .013
516          LG     .25     .36    4.50     .35   14.00
517          UC    .246    .307
             *

518          KK    CP84
519          KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
520          KM    FROM D84N
521          HC       2
             *

522          KK     R84
523          KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
524          KM   ENDPOINTS WERE EXTENDED
525          KM    SLOPE = (2138-2054)/3463
526          RS       5    FLOW      -1
527          RC   0.045   0.030   0.045    3463  0.0243
528          RX       0      94      99     100     110     111     116     200
529          RY     106     104     102     100     100     102     104     106
530          RL                    0.15     100
             *

531          KK    UC79
532          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
533          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
534          KM    L= .88   Kb= 0.040   Adj. Slope= 233.0
535          BA    .078
536          LG     .25     .35    4.30     .45   18.00
537          UC    .267    .328
538          UA       0       5      16      30      65      77      84      90      94      97
539          UA     100
             *

540          KK    UC78
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```
541          KM   SUBBASIN 78, UNNAMED WASH CENTRAL
542          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
543          KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
544          BA    .177
545          LG     .25     .35    6.00     .17   17.00
546          UC   1.500   1.377
547          UA       0       5      16      30      65      77      84      90      94      97
548          UA     100
             *
1                                                HEC-1 INPUT
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

549          KK  CP7879
550          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
551          KM    FROM R84
552          HC       3
             *

553          KK   R7879
554          KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
555          KM   ENDPOINTS WERE EXTENDED
556          KM    SLOPE = (2054-2048)/256
557          RS       1    FLOW      -1
558          RC   0.045   0.030   0.045     256   .0234
559          RX       0      90      99     100     120     121     130     200
560          RY     106     104     102     100     100     102     104     106
561          RL                    0.35     100
             *

562          KK    UC77
563          KM   SUBBASIN 77, UNNAMED WASH CENTRAL
564          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
565          KM    L= .93   Kb= 0.048  Adj. Slope= 324.0
566          BA    .096
567          LG     .25     .34    6.70     .13   16.00
568          UC    .254    .289
569          UA       0       5      16      30      65      77      84      90      94      97
570          UA     100
             *

571          KK    CP77
572          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
573          KM    FROM R7879
574          HC       2
             *

575          KK     R77
576          KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
577          KM   ENDPOINTS WERE EXTENDED
578          KM    SLOPE = (2048-2037)/593
579          RS       1    FLOW      -1
580          RC   0.045   0.030   0.045     593  0.0185
581          RX       0      80      99     100     115     116     120     200
582          RY     106     104     102     100     100     102     104     106
583          RL                    0.25     100
             *

584          KK    UC89
585          KM   SUBBASIN 89, UNNAMED WASH CENTRAL
586          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
587          KM    L= .77   Kb= 0.057   S= 126.0
588          BA    .073
589          LG     .25     .33    6.40     .20   17.00
590          UC    .354    .421
591          UA       0       5      16      30      65      77      84      90      94      97
592          UA     100
             *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 593          KK    CP89
 594          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
 595          KM    FROM R77
 596          HC       2
              *

 597          KK     R89
 598          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
 599          KM   CHANNEL ENDS WERE EXTENDED
 600          KM    SLOPE = (2037-2008)/1912
 601          RS       2    FLOW      -1
 602          RC   0.045   0.030   0.045    1912  0.0152
 603          RX       0      80      99     100     115     116     135     200
 604          RY     106     104     102     100     100     102     104     106
 605          RL                    0.25     100
              *

 606          KK    UC74
 607          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
 608          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 609          KM    L= 1.13   Kb= 0.071   Adj. Slope= 328.0
 610          BA    .151
 611          LG     .25     .34    6.60     .13   14.00
 612          UC    .354    .379
              *

 613          KK    UC76
 614          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
 615          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 616          KM    L= .64   Kb= 0.053   Adj. Slope= 302.0
 617          BA    .041
 618          LG     .25     .35    6.10     .16   14.00
 619          UC    .229    .312
              *

 620          KK  CP7476
 621          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
 622          HC       2
              *

 623          KK   R7476
 624          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
 625          KM   END POINTS WERE EXTENDED
 626          KM    SLOPE = (2031-2017)/524
 627          RS       1    FLOW      -1
 628          RC   0.045   0.030   0.045     524  0.0267
 629          RX       0      80      99     100     112     113     132     200
 630          RY     106     104     102     100     100     102     104     106
 631          RL                    0.25     100
              *
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 632          KK    UC75
 633          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
 634          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 635          KM    L= 1.38   Kb= 0.068   Adj. Slope= 322.0
 636          BA    .192
 637          LG     .25     .34    6.50     .15   14.00
 638          UC    .313    .337
 639          UA       0       5      16      30      65      77      84      90      94      97
 640          UA     100
```

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                 *

641              KK    CP75
642              KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
643              KM    FROM R7476
644              HC       2
                 *

645              KK     R75
646              KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
647              KM   END POINTS WERE EXTENDED
648              KM    SLOPE = (2017-2008)/723
649              RS       1    FLOW      -1
650              RC   0.045   0.030   0.045     723  0.0124
651              RX       0      80      99     100     115     116     135     200
652              RY     106     104     102     100     100     102     104     106
653              RL                    0.25     100
                 *

654              KK    UC90
655              KM   SUBBASIN 90, UNNAMED WASH CENTRAL
656              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
657              KM    L= .48   Kb= 0.103   S= 151.0
658              BA    .038
659              LG     .25     .35    3.70     .55   14.00
660              UC    .412    .493
                 *

661              KK    UC91
662              KM   SUBBASIN 91, UNNAMED WASH CENTRAL
663              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
664              KM    L= .75   Kb= 0.107   S= 109.0
665              BA    .073
666              LG     .25     .31    7.40     .14   14.00
667              UC    .538    .659
                 *

668              KK  CP90EN
669              KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
670              KM    FROM R89 AND R75
671              HC       4
                 *
1                                                HEC-1 INPUT
PAGE 17

          LINE   ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

672              KK    D84S
673              KM   RETREVIAL OF DIVERTED FLOW FROM D84S
674              DR    D84S
                 *

675              KK   RD84S
676              KM   ROUTING FLOW FROM CP84 (D84S) TO D84ii
677              KM    SLOPE = (2144-2140)/303
678              RS       6    FLOW      -1
679              RC   0.045   0.030   0.045     303  0.0132
680              RX       0      50      99     100     125     126     175     225
681              RY     106     104     102     100     100     102     104     106
682              RL                    0.35     100
                 *

683              KK  D84IIS
684              KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
685              KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
686              DT  D84IIN
687              DI       0    79.7     255     490     880    1250
688              DQ       0    78.3     229     419     732    1000
                 *
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```
689          KK  RD84IS
690          KM   ROUTING FLOWS FROM D84IIS TO CP94DS
691          KM   SLOPE = (2140-2078)/3225
692          RS       1    FLOW      -1
693          RC   0.045   0.030   0.045    3225  0.0192
694          RX       0      50      99     100     125     126     175     225
695          RY     106     104     102     100     100     102     104     106
696          RL                    0.25     100
             *

697          KK    UC94
698          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
699          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
700          KM    L= .53   Kb= 0.119   S= 108.0
701          BA    .028
702          LG     .25     .36    5.00     .23   13.00
703          UC    .671   1.082
             *

704          KK  CP94DS
705          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
706          KM   FROM RD84IS
707          HC       2
             *

708          KK   R94DS
709          KM   ROUTING FLOW FROM CP94DS TO CP88EN
710          KM   SLOPE = (2078-2041)/1950
711          RS       1    FLOW      -1
712          RC   0.045   0.030   0.045    1950  0.0189
713          RX      60      85      99     100     108     109     123     148
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                                          HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

714          RY     106     104     102     100     100     102     104     106
715          RL                    0.25     100
             *

716          KK  D84IIN
717          KM   RECALL DIVERTED FLOW FROM D84II
718          DR  D84IIN
             *

719          KK  RD84IN
720          KM   ROUTING FLOW FROM D84II TO CP88EN
721          KM   SLOPE = (2140-2041)/5175
722          RS       1    FLOW      -1
723          RC   0.045   0.030   0.045    5175  0.0191
724          RX      60      78      90     100     125     132     135     150
725          RY     106     104     102     100     100     102     104     106
726          RL                    0.25     100
             *

727          KK    UC88
728          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
729          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
730          KM    L= 1.08   Kb= 0.104   S=111.0
731          BA    .108
732          LG     .25     .33    6.10     .20   14.00
733          UC    .962   1.337
             *

734          KK  CP88EN
735          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
736          KM    FROM R94DS AND RD84IN
737          HC       3
             *

738          KK    UC95
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 739          KM   SUBBASIN 95, UNNAMED WASH CENTRAL
 740          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 741          KM    L= 0.22   Kb= 0.120   Adj.Slope= 220
 742          BA    .024
 743          LG     .25     .39    3.70     .15    5.00
 744          UC    .233    .183
              *

 745          KK    UC93
 746          KM   SUBBASIN 93, UNNAMED WASH CENTRAL
 747          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 748          KM    L= .64   Kb= 0.093   S= 135.0
 749          BA    .038
 750          LG     .25     .30    8.00     .07   13.00
 751          UC    .400    .606
              *
1                                                HEC-1 INPUT
PAGE 19

          LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 752          KK    UC96
 753          KM   SUBBASIN 96, UNNAMED WASH CENTRAL
 754          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 755          KM    L= .73   Kb= 0.110  S= 113.0
 756          BA    .061
 757          LG     .25     .32    7.00     .12   13.00
 758          UC    .525    .686
              *
              *
 759          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
PUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 47         UC8
            .
            .
 56         .         UC9
            .           .
            .           .
 65       CPC8...........
            V
            V
 69      RCP89
            .
            .
 79         .        UC18
            .           .
            .           .
 88         .           .        UC19
            .           .           .
            .           .           .
 95     CP1819......................
            V
            V
 98      R1819
            .
            .
107         .        UC22
            .           .
            .           .
114         .           .        UC23
            .           .           .
            .           .           .
121     CP2223......................
            V
            V
124      R2223
            .
            .
133         .        UC28
            .           V
            .           V
140         .         R28
            .           .
            .           .
149         .           .        UC29
            .           .           .
            .           .           .
156         .           .           .       UC30
            .           .           .           .
            .           .           .           .
163     CP2930.................................
            V
            V
167      R2930
            .
            .
176         .        UC34
            .           .
            .           .
183       CP34...........
            V
            V
187        R34
            .
            .
196         .        UC37
```

```
                .           .
                .           .
203             .           .        UC35
                .           .           .
                .           .           .
210        CP3537.......................
                V
                V
214         R3537
                .
                .
223             .        UC49
                .           .
                .           .
230             .           .        UC31
                .           .           .
                .           .           .
237        CP3149.......................
                V
                V
241         R3149
                .
                .
250             .        UC46
                .           V
                .           V
259             .         R46
                .           .
                .           .
268             .           .        UC45
                .           .           .
                .           .           .
277             .           .           .        UC47
                .           .           .           .
                .           .           .           .
286             .      CP4547.......................
                .           V
                .           V
290             .       R4547
                .           .
                .           .
299             .           .        UC48
                .           .           .
                .           .           .
306             .           .           .        UC50
                .           .           .           .
                .           .           .           .
313        CP4850.....................................
                V
                V
317         R4850
                .
                .
326             .        UC51
                .           .
                .           .
333             .           .        UC57
                .           .           .
                .           .           .
340        CP5157.......................
                V
                V
344         R5157
                .
                .
353             .        UC58
                .           .
                .           .
360             .           .        UC59
                .           .           .
                .           .           .
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367      CP5859.......................
              .
              .
373           .-------> D5859S
371      D5859N
              V
              V
376      R5859N
              .
              .
385           .        UC63
              .           .
              .           .
392        CP63............
              V
              V
396         R63
              .
              .
404           .        UC66
              .           .
              .           .
411           .           .        UC62
              .           .           .
              .           .           .
418      CP6266.......................
              V
              V
422       R6266
              .
              .
432           .           .<-------  D5859S
430           .      D5859S
              .           V
              .           V
433           .      R5859S
              .           .
              .           .
441           .           .        UC64
              .           .           .
              .           .           .
448           .        CP64............
              .           .
              .           .
455           .           .------->    D64S
452           .        D64N
              .           V
              .           V
458           .       RD64N
              .           .
              .           .
467           .           .        UC87
              .           .           .
              .           .           .
474           .        CP87............
              .           V
              .           V
478           .       RD87N
              .           .
              .           .
486           .           .        UC82
              .           .           .
              .           .           .
493        CP82.......................
              V
              V
497         R82
              .
              .
508           .------->    D84S
505        D84N
```

```
                .
                .
511             .        UC84
                .           .
                .           .
518         CP84............
                V
                V
522          R84
                .
                .
531             .        UC79
                .           .
                .           .
540             .           .        UC78
                .           .           .
                .           .           .
549       CP7879........................
                V
                V
553        R7879
                .
                .
562             .        UC77
                .           .
                .           .
571         CP77............
                V
                V
575          R77
                .
                .
584             .        UC89
                .           .
                .           .
593         CP89............
                V
                V
597          R89
                .
                .
606             .        UC74
                .           .
                .           .
613             .           .        UC76
                .           .           .
                .           .           .
620             .      CP7476............
                .           V
                .           V
623             .       R7476
                .           .
                .           .
632             .           .        UC75
                .           .           .
                .           .           .
641             .        CP75............
                .           V
                .           V
645             .         R75
                .           .
                .           .
654             .           .        UC90
                .           .           .
                .           .           .
661             .           .           .        UC91
                .           .           .           .
                .           .           .           .
668       CP90EN.................................
                .
                .
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```
674          .            .<-------    D84S
672          .         D84S
             .            V
             .            V
675          .        RD84S
             .            .
             .            .
686          .            .------->  D84IIN
683          .       D84IIS
             .            V
             .            V
689          .       RD84IS
             .            .
             .            .
697          .            .        UC94
             .            .           .
             .            .           .
704          .       CP94DS............
             .            V
             .            V
708          .        R94DS
             .            .
             .            .
718          .            .           .<-------  D84IIN
716          .            .      D84IIN
             .            .           V
             .            .           V
719          .            .      RD84IN
             .            .           .
             .            .           .
727          .            .           .        UC88
             .            .           .           .
             .            .           .           .
734          .       CP88EN......................
             .            .
             .            .
738          .            .        UC95
             .            .           .
             .            .           .
745          .            .           .        UC93
             .            .           .           .
             .            .           .           .
752          .            .           .           .        UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	81.	4.13	13.	3.	1.	.05
+	HYDROGRAPH AT	UC9	83.	4.10	12.	3.	1.	.05
+	2 COMBINED AT	CPC8	163.	4.13	25.	6.	2.	.10
+	ROUTED TO	RCP89	161.	4.20	25.	6.	2.	.10
+	HYDROGRAPH AT	UC18	54.	4.20	9.	2.	1.	.04
+	HYDROGRAPH AT	UC19	41.	4.20	6.	1.	1.	.03
+	3 COMBINED AT	CP1819	256.	4.20	40.	10.	4.	.17
+	ROUTED TO	R1819	254.	4.23	40.	10.	4.	.17
+	HYDROGRAPH AT	UC22	26.	4.40	7.	2.	1.	.03
+	HYDROGRAPH AT	UC23	28.	4.20	3.	1.	0.	.01
+	3 COMBINED AT	CP2223	304.	4.23	49.	12.	4.	.21
+	ROUTED TO	R2223	301.	4.27	49.	12.	4.	.21
+	HYDROGRAPH AT	UC28	79.	4.30	12.	3.	1.	.05
+	ROUTED TO	R28	79.	4.33	12.	3.	1.	.05
+	HYDROGRAPH AT	UC29	45.	4.30	7.	2.	1.	.04
+	HYDROGRAPH AT	UC30	17.	4.20	3.	1.	0.	.01
+	4 COMBINED AT	CP2930	438.	4.30	70.	18.	6.	.31
+	ROUTED TO	R2930	436.	4.30	70.	18.	6.	.31
+	HYDROGRAPH AT	UC34	71.	4.17	8.	2.	1.	.04
+	2 COMBINED AT	CP34	496.	4.30	78.	20.	7.	.35
+	ROUTED TO	R34	478.	4.53	78.	20.	7.	.35

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC37	207.	4.43	51.	13.	5.	.21
+	HYDROGRAPH AT	UC35	591.	4.13	63.	16.	6.	.26
+	3 COMBINED AT	CP3537	917.	4.30	184.	47.	17.	.82
+	ROUTED TO	R3537	911.	4.40	184.	47.	17.	.82
+	HYDROGRAPH AT	UC49	134.	4.07	13.	3.	1.	.05
+	HYDROGRAPH AT	UC31	473.	4.43	95.	24.	9.	.41
+	3 COMBINED AT	CP3149	1305.	4.40	282.	72.	26.	1.27
+	ROUTED TO	R3149	1303.	4.43	282.	71.	26.	1.27
+	HYDROGRAPH AT	UC46	107.	4.03	9.	2.	1.	.03
+	ROUTED TO	R46	104.	4.07	9.	2.	1.	.03
+	HYDROGRAPH AT	UC45	266.	4.03	22.	5.	2.	.09
	HYDROGRAPH AT	UC47	87.	4.03	8.	2.	1.	.03
+	3 COMBINED AT	CP4547	451.	4.03	38.	10.	3.	.15
+	ROUTED TO	R4547	439.	4.10	38.	10.	3.	.15
+	HYDROGRAPH AT	UC48	418.	4.17	51.	13.	5.	.20
+	HYDROGRAPH AT	UC50	51.	4.07	4.	1.	0.	.02
+	4 COMBINED AT	CP4850	1689.	4.30	365.	93.	33.	1.64
+	ROUTED TO	R4850	1683.	4.37	365.	93.	33.	1.64
+	HYDROGRAPH AT	UC51	170.	4.07	14.	4.	1.	.06
+	HYDROGRAPH AT	UC57	74.	4.13	8.	2.	1.	.04
+	3 COMBINED AT	CP5157	1761.	4.33	384.	97.	35.	1.74
+	ROUTED TO	R5157	1756.	4.40	384.	97.	35.	1.74
	HYDROGRAPH AT	UC58	284.	4.10	27.	7.	2.	.11

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC59	39.	4.30	7.	2.	1.	.03
+	3 COMBINED AT	CP5859	1881.	4.37	413.	105.	38.	1.88
+	DIVERSION TO	D5859S	935.	4.37	205.	52.	19.	1.88
+	HYDROGRAPH AT	D5859N	946.	4.37	208.	53.	19.	1.88
+	ROUTED TO	R5859N	944.	4.40	208.	53.	19.	1.88
+	HYDROGRAPH AT	UC63	259.	4.13	27.	7.	2.	.12
+	2 COMBINED AT	CP63	1064.	4.33	231.	59.	21.	2.00
+	ROUTED TO	R63	1063.	4.37	231.	59.	21.	2.00
+	HYDROGRAPH AT	UC66	68.	4.13	8.	2.	1.	.04
+	HYDROGRAPH AT	UC62	791.	4.17	83.	21.	8.	.36
+	3 COMBINED AT	CP6266	1528.	4.27	311.	79.	28.	2.40
+	ROUTED TO	R6266	1527.	4.30	311.	79.	28.	2.40
+	HYDROGRAPH AT	D5859S	935.	4.37	205.	52.	19.	1.88
+	ROUTED TO	R5859S	933.	4.40	205.	52.	19.	1.88
+	HYDROGRAPH AT	UC64	5.	4.07	0.	0.	0.	.00
+	2 COMBINED AT	CP64	935.	4.40	205.	52.	19.	1.88
+	DIVERSION TO	D64S	421.	4.40	92.	23.	8.	1.88
+	HYDROGRAPH AT	D64N	514.	4.40	113.	29.	10.	1.88
+	ROUTED TO	RD64N	512.	4.43	113.	29.	10.	1.88
+	HYDROGRAPH AT	UC87	24.	4.30	4.	1.	0.	.02
+	2 COMBINED AT	CP87	527.	4.43	116.	29.	11.	1.90
+	ROUTED TO	RD87N	526.	4.47	116.	29.	11.	1.90
+	HYDROGRAPH AT	UC82	50.	4.10	4.	1.	0.	.02
+	3 COMBINED AT	CP82	2017.	4.33	428.	109.	39.	2.45

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
	ROUTED TO	R82	2015.	4.37	428.	108.	39.	2.45
+	DIVERSION TO	D84S	279.	4.33	24.	6.	2.	2.45
+	HYDROGRAPH AT	D84N	1736.	4.37	404.	102.	37.	2.45
+	HYDROGRAPH AT	UC84	24.	4.13	3.	1.	0.	.01
+	2 COMBINED AT	CP84	1747.	4.37	406.	103.	37.	2.46
+	ROUTED TO	R84	1738.	4.47	406.	103.	37.	2.46
+	HYDROGRAPH AT	UC79	138.	4.10	15.	4.	1.	.08
+	HYDROGRAPH AT	UC78	103.	4.77	39.	10.	4.	.18
+	3 COMBINED AT	CP7879	1837.	4.47	450.	115.	41.	2.72
+	ROUTED TO	R7879	1837.	4.50	450.	115.	41.	2.72
+	HYDROGRAPH AT	UC77	208.	4.10	22.	6.	2.	.10
	2 COMBINED AT	CP77	1913.	4.47	470.	120.	43.	2.81
+	ROUTED TO	R77	1912.	4.47	470.	120.	43.	2.81
+	HYDROGRAPH AT	UC89	119.	4.13	16.	4.	1.	.07
+	2 COMBINED AT	CP89	1972.	4.47	482.	123.	44.	2.89
+	ROUTED TO	R89	1965.	4.53	482.	123.	44.	2.89
+	HYDROGRAPH AT	UC74	265.	4.20	35.	9.	3.	.15
+	HYDROGRAPH AT	UC76	83.	4.10	9.	2.	1.	.04
+	2 COMBINED AT	CP7476	342.	4.17	44.	11.	4.	.19
+	ROUTED TO	R7476	341.	4.20	44.	11.	4.	.19
+	HYDROGRAPH AT	UC75	368.	4.13	43.	11.	4.	.19
+	2 COMBINED AT	CP75	699.	4.13	87.	22.	8.	.38
	ROUTED TO	R75	696.	4.17	87.	22.	8.	.38
	HYDROGRAPH AT							

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+		UC90	46.	4.27	7.	2.	1.	.04
	HYDROGRAPH AT							
+		UC91	86.	4.37	16.	4.	1.	.07
	4 COMBINED AT							
+		CP90EN	2383.	4.43	573.	146.	53.	3.38
	HYDROGRAPH AT							
+		D84S	279.	4.33	24.	6.	2.	2.45
	ROUTED TO							
+		RD84S	279.	4.37	24.	6.	2.	2.45
	DIVERSION TO							
+		D84IIN	249.	4.37	22.	5.	2.	2.45
	HYDROGRAPH AT							
+		D84IIS	31.	4.33	2.	1.	0.	2.45
	ROUTED TO							
+		RD84IS	21.	4.53	2.	1.	0.	2.45
	HYDROGRAPH AT							
+		UC94	22.	4.50	6.	1.	1.	.03
	2 COMBINED AT							
+		CP94DS	37.	4.53	7.	2.	1.	2.48
	ROUTED TO							
+		R94DS	36.	4.60	7.	2.	1.	2.48
	HYDROGRAPH AT							
+		D84IIN	249.	4.37	22.	5.	2.	2.45
	ROUTED TO							
+		RD84IN	203.	4.53	21.	5.	2.	2.45
	HYDROGRAPH AT							
+		UC88	69.	4.77	23.	6.	2.	.11
	3 COMBINED AT							
+		CP88EN	280.	4.57	47.	12.	4.	2.59
	HYDROGRAPH AT							
+		UC95	63.	4.10	5.	1.	0.	.02
	HYDROGRAPH AT							
+		UC93	53.	4.27	9.	2.	1.	.04
	HYDROGRAPH AT							
+		UC96	72.	4.37	14.	4.	1.	.06

*** NORMAL END OF HEC-1 ***

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1*************************************
*                                   *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            JUN   1998             *
*          VERSION 4.1              *
*                                   *
* RUN DATE   16MAR04  TIME  08:39:50 *
*                                   *
*************************************
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*************************************
*                                   *
*   U.S. ARMY CORPS OF ENGINEERS    *
*   HYDROLOGIC ENGINEERING CENTER   *
*         609 SECOND STREET         *
*      DAVIS, CALIFORNIA 95616      *
*          (916) 756-1104           *
*                                   *
*************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID         UC MODEL - UNNAMED WASH, CENTRAL
  2           ID         100-YEAR 24-HOUR MODEL  FILENAME: UC10024E.DAT
  3           ID         EXISTING CONDITIONS
  4           ID         CAREFREE DRAINAGE MASTER PLAN
  5           ID         FCD 2000C037
  6           ID         BY CH2M HILL
  7           ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  8           ID         DECEMBER 2001 (Final Revision March 2004)
  9           ID    ***************************************************************
 10           ID         100 YEAR ANALYSIS 24-HOUR STORM
 11           ID
 12           ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
 13           ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
 14           ID   ******************************************************************
 15           ID     DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
 16           ID
 17           ID     THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
 18           ID
 19           ID
              *DIAGRAM
 20           IT       2                    2000
 21           IO       5
 22           IN      15
 23           JD    4.60    0.01
 24           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 25           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 26           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 27           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
 28           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 29           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 30           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 31           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 32           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 33           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 34           JD   4.324   10.00
 35           JD   4.140   30.00
 36           JD   3.956   60.00
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 37          JD   3.892   90.00
 38          JD   3.836  120.00
 39          JD   3.795  150.00
 40          JD   3.680  300.00
 41          JD   3.588  500.00
             *

 42          KK     UC8
 43          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 44          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 45          KM    L= 1.04   Kb= 0.031   S=138.0
 46          BA    .054
 47          LG     .30     .36     4.9     .26    36.0
 48          UC    .229    .392
 49          UA       0       5      16      30      65      77      84      90      94      97
 50          UA     100
             *
1                                                HEC-1 INPUT
PAGE  2

      LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 51          KK     UC9
 52          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 53          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 54          KM    L= 0.91   Kb= 0.031   S=145.0
 55          BA    .047
 56          LG     .30     .36     5.0     .23    36.0
 57          UC    .208    .316
 58          UA       0       5      16      30      65      77      84      90      94      97
 59          UA     100
             *

 60          KK    CPC89
 61          KM    CONCENTRATION POINT 89
 62          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 63          HC       2
             *

 64          KK   RCP89
 65          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 66          KM    NORMAL DEPTH CHANNEL ROUTING
 67          KM    ENDPOINTS WERE EXTENDED
 68          KM    SLOPE = (2596-2540)/2933
 69          RS       5    FLOW      -1
 70          RC   0.045   0.035   0.045    2933  0.0191
 71          RX       0      90      99     100     108     109     120     200
 72          RY     108     104     102     100     100     102     104     108
 73          RL                    0.15     100
             *

 74          KK    UC18
 75          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 76          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 77          KM    L= 0.56   Kb= 0.091   S=101.0
 78          BA    .040
 79          LG     .25     .36     5.0     .23   24.00
 80          UC    .300    .426
 81          UA       0       5      16      30      65      77      84      90      94      97
 82          UA     100
             *

 83          KK    UC19
 84          KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 85          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 86          KM    L= 0.52   Kb= 0.069   S=135.0
 87          BA    .027
 88          LG     .25     .36    5.00     .23   18.00
 89          UC    .237    .400
             *
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HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  90          KK  CP1819
  91          KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
  92          HC       3
              *

  93          KK   R1819
  94          KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
  95          KM    ENDPOINTS WERE EXTENDED
  96          KM    SLOPE = (2540-2511)/1790
  97          RS       2    FLOW      -1
  98          RC   0.045   0.030   0.045    1790  0.0162
  99          RX       0      92      99     100     112     113     120     200
 100          RY     108     104     102     100     100     102     104     108
 101          RL                    0.25     100
              *

 102          KK    UC22
 103          KM   SUBBASIN 22, UNNAMED WASH CENTRAL
 104          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 105          KM    L= .76   Kb= .104   S=111.0
 106          BA    .032
 107          LG     .25     .36    5.00     .23   14.00
 108          UC    .438    .845
              *

 109          KK    UC23
 110          KM   SUBBASIN 23, UNNAMED WASH CENTRAL
 111          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 112          KM    L= .40   Kb= 0.125   S=121.0
 113          BA    .013
 114          LG     .25     .36    5.00     .23   18.00
 115          UC    .321    .158
              *

 116          KK  CP2223
 117          KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
 118          HC       3
              *

 119          KK   R2223
 120          KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
 121          KM    ENDPOINTS WERE EXTENDED
 122          KM    SLOPE = (2511-2482)/1862
 123          RS       2    FLOW      -1
 124          RC   0.045    0.03   0.045    1862  0.0156
 125          RX       0      95      99     100     112     113     117     200
 126          RY     108     104     102     100     100     102     104     108
 127          RL                    0.25     100
              *
              *
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HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 128          KK    UC28
 129          KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
 130          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 131          KM    L= .57   Kb= 0.106   S=109.0
 132          BA    .055
 133          LG     .25     .36    4.90     .25   14.00
 134          UC    .396    .333
              *
              *
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```
135          KK     R28
136          KM    ROUTING REACH FROM CP1028 TO CP2930 THROUGH SUBBASIN 30
137          KM    ENDPOINTS WERE EXTENDED
138          KM    SLOPE = (2502-2482)/1296
139          RS       2    FLOW      -1
140          RC   0.045   0.035   0.045    1296  0.0154
141          RX       0      86      99     100     108     109     122     200
142          RY     108     104     102     100     100     102     104     108
143          RL                    0.15     100
             *

144          KK    UC29
145          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
146          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
147          KM    L= .47   Kb= 0.116   S=109.0
148          BA    .035
149          LG     .25     .36    5.00     .23   12.00
150          UC    .354    .428
             *

151          KK   UC30
152          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
153          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
154          KM    L= .28   Kb= 0.126   S=134.0
155          BA    .012
156          LG     .25     .36    5.00     .23   12.00
157          UC    .250    .357
             *

158          KK  CP2930
159          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
160          KM    CP2223
161          HC       4
             *

162          KK   R2930
163          KM   Routing flow from CP2930 to CP34 through subbasin 34
164          KM    SLOPE = (2482-2469)/925
165          KM    ENDPOINTS WERE EXTENDED
166          RS       1    FLOW      -1
167          RC   0.045   0.030   0.045     925  0.0141
168          RX       0      89      99     100     110     111     122     200
169          RY     108     104     102     100     100     102     104     108
170          RL                    0.15     100
             *
1                                                HEC-1 INPUT
PAGE  5

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

171          KK    UC34
172          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
173          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
174          KM    L= .31   Kb = 0.116   S= 117.0
175          BA    .037
176          LG     .25     .36    4.90     .22   12.00
177          UC    .262    .212
             *

178          KK    CP34
179          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
180          KM   R2930
181          HC       2
             *

182          KK     R34
183          KM   Routing flow from CP34 to CP3537 through subbasin 37
184          KM    ENDPOINTS WERE EXTENDED
185          KM    SLOPE = (2469-2318)/6475
```

```
186          RS      11    FLOW      -1
187          RC   0.045   0.035   0.045    6475   .0233
188          RX       0      90      99     100     105     106     115     200
189          RY     108     104     102     100     100     102     104     108
190          RL                    0.15     100
             *

191          KK    UC37
192          KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
193          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
194          KM    L= 2.03   Kb= 0.160   S= 98.0
195          BA    .207
196          LG     .25     .39    3.70     .16   24.00
197          UC    .504    .747
             *

198          KK    UC35
199          KM   SUBBASIN 35, UNNAMED WASH CENTRAL
200          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
201          KM    L= 1.27   Kb= 0.035   S=138.0
202          BA    .261
203          LG     .25     .38    3.90     .20   24.00
204          UC    .246    .202
             *

205          KK  CP3537
206          KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
207          KM    R34
208          HC       3
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

209          KK   R3537
210          KM   Routing flow from CP3537 to CP3149 through subbasin 49
211          KM    ENDPOINTS WERE EXTENDED
212          KM    SLOPE = (2318-2280)/1829
213          RS       3    FLOW      -1
214          RC   0.045   0.035   0.045    1829  0.0208
215          RX       0      90      99     100     105     106     115     200
216          RY     110     104     102     100     100     102     104     110
217          RL                    0.15     100
             *

218          KK    UC49
219          KM   SUBBASIN 49, UNNAMED WASH CENTRAL
220          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
221          KM    L= .47   Kb= 0.032   S=148.0
222          BA    .048
223          LG     .25     .39    3.60     .15   30.00
224          UC    .146    .135
             *

225          KK    UC31
226          KM   SUBBASIN 31, UNNAMED WASH CENTRAL
227          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
228          KM    L= 2.04   Kb= 0.066   S= 128.0
229          BA    .405
230          LG     .25     .38    4.10     .18   20.00
231          UC    .225    .209
             *

232          KK  CP3149
233          KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
234          KM     R3537
235          HC       3
             *
```

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236          KK   R3149
237          KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
238          KM    ENDPOINTS WERE EXTENDED
239          KM    SLOPE = (2280-2256)/1219
240          RS       2    FLOW      -1
241          RC   0.045   0.030   0.045    1219  0.0197
242          RX       0      95      99     100     110     111     118     200
243          RY     110     104     102     100     100     102     104     110
244          RL                    0.15     100
             *

245          KK    UC46
246          KM   SUBBASIN 46, UNNAMED WASH CENTRAL
247          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
248          KM    L= .30  Kb= 0.060   Adj. Slope= 324.0
249          BA    .034
250          LG     .25     .39    3.60     .15   24.00
251          UC    .129    .100
252          UA       0       5      16      30      65      77      84      90      94      97
1                                                HEC-1 INPUT
PAGE  7

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

253          UA     100
             *

254          KK     R46
255          KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
256          KM    ENDPOINTS WERE EXTENDED
257          KM    SLOPE = (2346-2315)/1783
258          RS       3    FLOW      -1
259          RC   0.045   0.035   0.045    1783  0.0174
260          RX       0      92      99     100     105     106     113     200
261          RY     108     104     102     100     100     102     104     108
262          RL                    0.15     100
             *

263          KK    UC45
264          KM   SUBBASIN 45, UNNAMED WASH CENTRAL
265          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
266          KM    L= .48   Kb= 0.030   S= 135.0
267          BA    .086
268          LG     .25     .39    3.60     .15   24.00
269          UC    .150    .102
270          UA       0       5      16      30      65      77      84      90      94      97
271          UA     100
             *

272          KK    UC47
273          KM   SUBBASIN 47, UNNAMED WASH CENTRAL
274          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
275          KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
276          BA    .031
277          LG     .25     .39    3.60     .15   24.00
278          UC    .142    .143
279          UA       0       5      16      30      65      77      84      90      94      97
280          UA     100
             *

281          KK  CP4547
282          KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
283          KM    R46
284          HC       3
             *

285          KK   R4547
286          KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
287          KM   ENDPOINTS WERE EXTENDED
288          KM    SLOPE = (2315-2256)/2170
289          RS       4    FLOW      -1
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290          RC   0.045   0.035   0.045    2170   .0272
291          RX       0      90      99     100     105     106     115     200
292          RY     108     104     102     100     100     102     104     108
293          RL                    0.15     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

294          KK    UC48
295          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
296          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
297          KM    L= .92   Kb= 0.048   S= 117.0
298          BA    .197
299          LG     .25     .39    3.70     .16   30.00
300          UC    .275    .209
             *

301          KK    UC50
302          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
303          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
304          KM    L= .27   Kb= 0.037   S= 93.0
305          BA    .019
306          LG     .25     .38    3.80     .24   24.00
307          UC    .138    .136
             *

308          KK  CP4850
309          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
310          KM    R3149 AND R4547
311          HC       4
             *

312          KK   R4850
313          KM   Routing flow from CP4850 to CP5157 through subbasin 57
314          KM    ENDPOINTS WERE EXTENDED
315          KM    SLOPE = (2256-2235)/1509
316          RS       2    FLOW      -1
317          RC   0.045   0.030   0.045    1509  0.0139
318          RX       0      95      99     100     115     116     120     200
319          RY     110     104     102     100     100     102     104     110
320          RL                    0.25     100
             *

321          KK    UC51
322          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
323          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
324          KM    L= .42   Kb= 0.061   Adj. Slope= 317.0
325          BA    .060
326          LG     .25     .36    5.00     .21   26.00
327          UC    .146    .109
             *

328          KK    UC57
329          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
330          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
331          KM    L= .47   Kb= 0.061   S= 200.0
332          BA    .037
333          LG     .25     .37    4.20     .28   20.00
334          UC    .196    .219
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

335          KK  CP5157
336          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
```

```
337          KM     R4850
338          HC       3
             *

339          KK   R5157
340          KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
341          KM    ENDPOINTS WERE EXTENDED
342          KM    SLOPE = (2235-2208)/1796
343          RS       2    FLOW      -1
344          RC   0.045   0.030   0.045    1796  0.0150
345          RX       0      60      99     100     100     121     160     220
346          RY     112     104     102     100     100     102     104     112
347          RL                    0.35     100
             *

348          KK    UC58
349          KM   SUBBASIN 58, UNNAMED WASH CENTRAL
350          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
351          KM    L= .69   Kb= 0.055  Adj. Slope= 317.0
352          BA    .110
353          LG     .25     .37    4.80     .13   20.00
354          UC    .188    .150
             *

355          KK    UC59
356          KM   SUBBASIN 59, UNNAMED WASH CENTRAL
357          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
358          KM    L= .49   Kb= 0.105   S= 112.0
359          BA    .034
360          LG     .25     .32    5.80     .33   14.00
361          UC    .342    .437
             *

362          KK  CP5859
363          KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
364          KM     R5157
365          HC       3
             *

366          KK  D5859N
367          KM    DIVERSION OF FLOWS AT FLOW SPLIT
368          DT  D5859S
369          DI       0      50     100     500   10000
370          DQ       0    24.9    49.5   248.5    4970
             *

371          KK  R5859N
372          KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
373          KM   ENDPOINTS WERE EXTENDED
374          KM    SLOPE = (2208-2195)/699
375          RS       1    FLOW      -1
376          RC   0.045   0.030   0.045     699  0.0186
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

377          RX       0      50      99     100     110     111     160     210
378          RY     108     103     102     100     100     102     103     108
379          RL                    0.15     100
             *

380          KK    UC63
381          KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
382          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
383          KM    L= .81   Kb= 0.056   Adj. Slope= 322.0
384          BA    .117
385          LG     .25     .36    5.00     .19   19.00
386          UC    .208    .186
             *
```

```
387          KK    CP63
388          KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
389          KM   FROM RD5859N
390          HC       2
             *

391          KK     R63
392          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
393          KM    SLOPE = (2195-2170)/1394
394          RS       2    FLOW      -1
395          RC   0.045   0.030   0.045    1394  0.0179
396          RX      60      80      99     100     125     126     145     165
397          RY     108     104     102     100     100     102     104     108
398          RL                    0.35     100
             *

399          KK    UC66
400          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
401          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
402          KM    L= .54   Kb= 0.081   Adj. Slope= 324.0
403          BA    .037
404          LG     .25     .36    5.00     .25   14.00
405          UC    .154    .185
             *

406          KK    UC62
407          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
408          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
409          KM    L= 1.33   Kb= 0.057   Adj. Slope= 321.0
410          BA    .361
411          LG     .25     .35    6.10     .13   14.00
412          UC    .250    .179
             *

413          KK  CP6266
414          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
415          KM   FROM R63
416          HC       3
             *
```


HEC-1 INPUT

```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

417          KK   R6266
418          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
419          KM    SLOPE = (2170-2150)/990
420          RS       2    FLOW      -1
421          RC   0.045   0.030   0.045     990  0.0202
422          RX      25      85      99     100     100     121     135     195
423          RY     110     104     102     100     100     102     104     110
424          RL                    0.35     100
             *

425          KK  D5859S
426          KM   RECALL DIVERTED FLOW FROM D5859N
427          DR  D5859S
             *

428          KK  R5859S
429          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
430          KM    SLOPE = (2208-2194)/803
431          RS       1    FLOW      -1
432          RC   0.045   0.030   0.045     803  0.0174
433          RX       0      50      99     100     125     126     175     225
434          RY     104     103     102     100     100     102     103     104
435          RL                    0.15     100
             *

436          KK    UC64
```

```
437          KM   SUBBASIN 64, UNNAMED WASH CENTRAL
438          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
439          KM    L= .15   Kb= 0.078   S= 166.0
440          BA    .002
441          LG     .25     .31    6.90     .20   14.00
442          UC    .129    .180
             *

443          KK    CP64
444          KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
445          KM    DIVERSION RD5859N
446          HC       2    1.88
             *

447          KK    D64N
448          KM   DIVERSION OF FLOWS AT FLOW SPLIT
449          KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
450          DT    D64S
451          DI       0      50     100     500   10000
452          DQ       0    22.5      45     225    4500
             *

453          KK   RD64N
454          KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
455          KM   ENDPOINTS WERE EXTENDED
456          KM    SLOPE = (2194-2161)/1721
457          RS       2    FLOW      -1
458          RC   0.045   0.030   0.045    1721  0.0192
1                                          HEC-1 INPUT
PAGE 12

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

459          RX       0      60      99     100     112     113     152     200
460          RY     106     104     102     100     100     102     104     106
461          RL                    0.25     100
             *

462          KK    UC87
463          KM   SUBBASIN 87, UNNAMED WASH CENTRAL
464          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
465          KM    L= .33   Kb= 0.118   S= 101.0
466          BA    .025
467          LG     .25     .35    3.40     .62    8.00
468          UC    .317    .352
             *

469          KK    CP87
470          KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
471          KM    DIVERSION RD64N
472          HC       2
             *

473          KK   RD87N
474          KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
475          KM    SLOPE = (2161-2150)/557
476          RS       1    FLOW      -1
477          RC   0.045   0.030   0.045     557  0.0197
478          RX      25      85      99     100     120     121     135     195
479          RY     106     104     102     100     100     102     104     106
480          RL                    0.35     100
             *

481          KK    UC82
482          KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
483          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
484          KM    L= .22   Kb= 0.136   Adj. Slope= 220.0
485          BA    .022
486          LG     .25     .36    4.30    .400   14.00
487          UC    .175    .143
             *
```

```
488          KK    CP82
489          KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
490          KM   SUBBASIN 82
491          HC       3    2.45
             *

492          KK     R82
493          KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
494          KM    SLOPE = (2150-2138)/579
495          RS       1    FLOW      -1
496          RC   0.045   0.030   0.045     579  0.0207
497          RX      50      75      99     100     125     126     150     175
498          RY     110     104     102     100     100     102     104     110
499          RL                    0.35     100
             *
```



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                                          HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

500          KK    D84N
501          KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
502          KM   PART OF TRIPLE DIVERSION JUST UPSTREAM OF TERRAVITA WAY
503          DT    D84S
504          DI       0     500    1275    1550    1964    2475    3223    4000
505          DQ       0       0       0    79.7     255     490     888    1250
             *

506          KK    UC84
507          KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
508          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
509          KM    L= .30   Kb= 0.102   Adj. Slope= 246.0
510          BA    .013
511          LG     .25     .36    4.50     .35   14.00
512          UC    .188    .227
             *

513          KK    CP84
514          KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
515          KM    FROM D84N
516          HC       2
             *

517          KK     R84
518          KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
519          KM   ENDPOINTS WERE EXTENDED
520          KM    SLOPE = (2138-2054)/3463
521          RS       5    FLOW      -1
522          RC   0.045   0.030   0.045    3463  0.0243
523          RX       0      94      99     100     110     111     116     200
524          RY     108     104     102     100     100     102     104     108
525          RL                    0.15     100
             *

526          KK    UC79
527          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
528          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
529          KM    L= .88   Kb= 0.040   Adj. Slope= 233.0
530          BA    .078
531          LG     .25     .35    4.30     .45   18.00
532          UC    .196    .233
533          UA       0       5      16      30      65      77      84      90      94      97
534          UA     100
             *

535          KK    UC78
536          KM   SUBBASIN 78, UNNAMED WASH CENTRAL
537          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
538          KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
```

```
539          BA    .177
540          LG     .25     .35    6.00     .17   17.00
541          UC    .167    .120
542          UA       0       5      16      30      65      77      84      90      94      97
543          UA     100
             *
```


HEC-1 INPUT

```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

544          KK  CP7879
545          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
546          KM    FROM R84
547          HC       3
             *

548          KK   R7879
549          KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
550          KM   ENDPOINTS WERE EXTENDED
551          KM    SLOPE = (2054-2048)/256
552          RS       1    FLOW      -1
553          RC   0.045   0.030   0.045     256   .0234
554          RX       0      90      99     100     120     121     130     200
555          RY     108     104     102     100     100     102     104     108
556          RL                    0.35     100
             *

557          KK    UC77
558          KM   SUBBASIN 77, UNNAMED WASH CENTRAL
559          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
560          KM    L= .93   Kb= 0.048  Adj. Slope= 324.0
561          BA    .096
562          LG     .25     .34    6.70     .13   16.00
563          UC    .158    .171
564          UA       0       5      16      30      65      77      84      90      94      97
565          UA     100
             *

566          KK    CP77
567          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
568          KM    FROM R7879
569          HC       2
             *

570          KK     R77
571          KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
572          KM   ENDPOINTS WERE EXTENDED
573          KM    SLOPE = (2048-2037)/593
574          RS       1    FLOW      -1
575          RC   0.045   0.030   0.045     593  0.0185
576          RX       0      80      99     100     115     116     120     200
577          RY     110     104     102     100     100     102     104     110
578          RL                    0.25     100
             *

579          KK    UC89
580          KM   SUBBASIN 89, UNNAMED WASH CENTRAL
581          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
582          KM    L= .77   Kb= 0.057   S= 126.0
583          BA    .073
584          LG     .25     .33    6.40     .20   17.00
585          UC    .267    .307
586          UA       0       5      16      30      65      77      84      90      94      97
587          UA     100
             *
```


HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
```

```
588          KK    CP89
589          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
590          KM    FROM R77
591          HC       2
             *

592          KK     R89
593          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
594          KM   CHANNEL ENDS WERE EXTENDED
595          KM    SLOPE = (2037-2008)/1912
596          RS       2    FLOW      -1
597          RC   0.045   0.030   0.045    1912  0.0152
598          RX       0      80      99     100     115     116     135     200
599          RY     110     104     102     100     100     102     104     110
600          RL                    0.25     100
             *

601          KK    UC74
602          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
603          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
604          KM    L= 1.13   Kb= 0.071   Adj. Slope= 328.0
605          BA    .151
606          LG     .25     .34    6.60     .13   14.00
607          UC    .271    .281
             *

608          KK    UC76
609          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
610          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
611          KM    L= .64   Kb= 0.053   Adj. Slope= 302.0
612          BA    .041
613          LG     .25     .35    6.10     .16   14.00
614          UC    .179    .238
             *

615          KK  CP7476
616          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
617          HC       2
             *

618          KK   R7476
619          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
620          KM   END POINTS WERE EXTENDED
621          KM    SLOPE = (2031-2017)/524
622          RS       1    FLOW      -1
623          RC   0.045   0.030   0.045     524  0.0267
624          RX       0      80      99     100     112     113     132     200
625          RY     106     104     102     100     100     102     104     106
626          RL                    0.25     100
             *
```


HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

627          KK    UC75
628          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
629          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
630          KM    L= 1.38   Kb= 0.068   Adj. Slope= 322.0
631          BA    .192
632          LG     .25     .34    6.50     .15   14.00
633          UC    .237    .249
634          UA       0       5      16      30      65      77      84      90      94      97
635          UA     100
             *

636          KK    CP75
637          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
```

```
638          KM    FROM R7476
639          HC       2
             *

640          KK     R75
641          KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
642          KM   END POINTS WERE EXTENDED
643          KM    SLOPE = (2017-2008)/723
644          RS       1    FLOW      -1
645          RC   0.045   0.030   0.045     723  0.0124
646          RX       0      80      99     100     115     116     135     200
647          RY     106     104     102     100     100     102     104     106
648          RL                    0.25     100
             *

649          KK    UC90
650          KM   SUBBASIN 90, UNNAMED WASH CENTRAL
651          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
652          KM    L= .48   Kb= 0.103   S= 151.0
653          BA    .038
654          LG     .25     .35    3.70     .55   14.00
655          UC    .296    .341
             *

656          KK    UC91
657          KM   SUBBASIN 91, UNNAMED WASH CENTRAL
658          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
659          KM    L= .75   Kb= 0.107   S= 109.0
660          BA    .073
661          LG     .25     .31    7.40     .14   14.00
662          UC    .442    .530
             *
             *

663          KK  CP90EN
664          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
665          KM    FROM R89 AND R75
666          HC       4
             *
1                                                HEC-1 INPUT
PAGE 17

        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

667          KK    D84S
668          KM   RETREVIAL OF DIVERTED FLOW FROM D84S
669          DR    D84S
             *

670          KK   RD84S
671          KM   ROUTING FLOW FROM CP84 (D84S) TO D84ii
672          KM    SLOPE = (2144-2140)/303
673          RS       6    FLOW      -1
674          RC   0.045   0.030   0.045     303  0.0132
675          RX       0      50      99     100     125     126     175     225
676          RY     106     104     102     100     100     102     104     106
677          RL                    0.35     100
             *

678          KK  D84IIS
679          KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
680          KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
681          DT  D84IIN
682          DI       0    79.7     255     490     880    1250
683          DQ       0    78.3     229     419     732    1000
             *

684          KK  RD84IS
685          KM   ROUTING FLOWS FROM D84IIS TO CP94DS
686          KM   SLOPE = (2140-2078)/3225
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```
687          RS       1    FLOW      -1
688          RC   0.045   0.030   0.045    3225  0.0192
689          RX       0      50      99     100     125     126     175     225
690          RY     106     104     102     100     100     102     104     106
691          RL                    0.25     100
             *

692          KK    UC94
693          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
694          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
695          KM    L= .53   Kb= 0.119   S= 108.0
696          BA    .028
697          LG     .25     .36    5.00     .23   13.00
698          UC    .671   1.082
             *

699          KK  CP94DS
700          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
701          KM   FROM RD84IS
702          HC       2
             *

703          KK   R94DS
704          KM   ROUTING FLOW FROM CP94DS TO CP88EN
705          KM   SLOPE = (2078-2041)/1950
706          RS       1    FLOW      -1
707          RC   0.045   0.030   0.045    1950  0.0189
708          RX      60      85      99     100     108     109     123     148
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

709          RY     106     104     102     100     100     102     104     106
710          RL                    0.25     100
             *

711          KK  D84IIN
712          KM   RECALL DIVERTED FLOW FROM D84II
713          DR  D84IIN
             *

714          KK  RD84IN
715          KM   ROUTING FLOW FROM D84II TO CP88EN
716          KM   SLOPE = (2140-2041)/5175
717          RS       1    FLOW      -1
718          RC   0.045   0.030   0.045    5175  0.0191
719          RX      60      78      90     100     125     132     135     150
720          RY     106     104     102     100     100     102     104     106
721          RL                    0.25     100
             *

722          KK    UC88
723          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
724          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
725          KM    L= 1.08   Kb= 0.104   S=111.0
726          BA    .108
727          LG     .25     .33    6.10     .20   14.00
728          UC    .962   1.337
             *

729          KK  CP88EN
730          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
731          KM    FROM R94DS AND RD84IN
732          HC       3
             *

733          KK    UC95
734          KM   SUBBASIN 95, UNNAMED WASH CENTRAL
735          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
736          KM    L= 0.22   Kb= 0.120   Adj.Slope= 220
```

```
 737          BA    .024
 738          LG     .25     .39    3.70     .15    5.00
 739          UC    .183    .141
              *

 740          KK    UC93
 741          KM   SUBBASIN 93, UNNAMED WASH CENTRAL
 742          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 743          KM    L= .64   Kb= 0.093   S= 135.0
 744          BA    .038
 745          LG     .25     .30    8.00     .07   13.00
 746          UC    .321    .475
              *
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                                   HEC-1 INPUT

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 747          KK    UC96
 748          KM   SUBBASIN 96, UNNAMED WASH CENTRAL
 749          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 750          KM    L= .73   Kb= 0.110  S= 113.0
 751          BA    .061
 752          LG     .25     .32    7.00     .12   13.00
 753          UC    .433    .555
              *
              *
 754          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 42         UC8
            .
            .
 51         .         UC9
            .           .
            .           .
 60       CPC8............
            V
            V
 64      RCP89
            .
            .
 74         .        UC18
            .           .
            .           .
 83         .           .        UC19
            .           .          .
            .           .          .
 90    CP1819........................
            V
            V
 93      R1819
            .
            .
102         .        UC22
            .           .
            .           .
109         .           .        UC23
            .           .          .
            .           .          .
116    CP2223........................
            V
            V
119      R2223
            .
            .
128         .        UC28
            .           V
            .           V
135         .         R28
            .           .
            .           .
144         .           .        UC29
            .           .          .
            .           .          .
151         .           .          .       UC30
            .           .          .         .
            .           .          .         .
158    CP2930.......................................
            V
            V
162      R2930
            .
            .
171         .        UC34
            .           .
            .           .
178       CP34............
            V
            V
182        R34
            .
            .
191         .        UC37
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              .           .
              .           .
198           .           .        UC35
              .           .           .
              .           .           .
205      CP3537.......................
              V
              V
209       R3537
              .
              .
218           .        UC49
              .           .
              .           .
225           .           .        UC31
              .           .           .
              .           .           .
232      CP3149.......................
              V
              V
236       R3149
              .
              .
245           .        UC46
              .           V
              .           V
254           .        R46
              .           .
              .           .
263           .           .        UC45
              .           .           .
              .           .           .
272           .           .           .        UC47
              .           .           .           .
              .           .           .           .
281           .      CP4547.......................
              .           V
              .           V
285           .       R4547
              .           .
              .           .
294           .           .        UC48
              .           .           .
              .           .           .
301           .           .           .        UC50
              .           .           .           .
              .           .           .           .
308      CP4850.................................
              V
              V
312       R4850
              .
              .
321           .        UC51
              .           .
              .           .
328           .           .        UC57
              .           .           .
              .           .           .
335      CP5157.......................
              V
              V
339       R5157
              .
              .
348           .        UC58
              .           .
              .           .
355           .           .        UC59
              .           .           .
              .           .           .
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362     CP5859.......................
            .
            .
368         .-------> D5859S
366     D5859N
            V
            V
371     R5859N
            .
            .
380         .        UC63
            .           .
            .           .
387       CP63............
            V
            V
391        R63
            .
            .
399         .        UC66
            .           .
            .           .
406         .           .        UC62
            .           .           .
            .           .           .
413     CP6266.......................
            V
            V
417      R6266
            .
            .
427         .           .<-------  D5859S
425         .      D5859S
            .           V
            .           V
428         .      R5859S
            .           .
            .           .
436         .           .        UC64
            .           .           .
            .           .           .
443         .        CP64............
            .           .
            .           .
450         .           .------->    D64S
447         .        D64N
            .           V
            .           V
453         .       RD64N
            .           .
            .           .
462         .           .        UC87
            .           .           .
            .           .           .
469         .        CP87............
            .           V
            .           V
473         .       RD87N
            .           .
            .           .
481         .           .        UC82
            .           .           .
            .           .           .
488       CP82........................
            V
            V
492        R82
            .
            .
503         .------->    D84S
500       D84N
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                .
                .
506             .        UC84
                .           .
                .           .
513         CP84............
                V
                V
517          R84
                .
                .
526             .        UC79
                .           .
                .           .
535             .           .        UC78
                .           .           .
                .           .           .
544       CP7879........................
                V
                V
548        R7879
                .
                .
557             .        UC77
                .           .
                .           .
566         CP77............
                V
                V
570          R77
                .
                .
579             .        UC89
                .           .
                .           .
588         CP89............
                V
                V
592          R89
                .
                .
601             .        UC74
                .           .
                .           .
608             .           .        UC76
                .           .           .
                .           .           .
615             .      CP7476............
                .           V
                .           V
618             .       R7476
                .           .
                .           .
627             .           .        UC75
                .           .           .
                .           .           .
636             .        CP75............
                .           V
                .           V
640             .         R75
                .           .
                .           .
649             .           .        UC90
                .           .           .
                .           .           .
656             .           .           .        UC91
                .           .           .           .
                .           .           .           .
663       CP90EN.................................
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669          .          .<-------    D84S
667          .       D84S
             .          V
             .          V
670          .      RD84S
             .          .
             .          .
681          .          .-------> D84IIN
678          .     D84IIS
             .          V
             .          V
684          .     RD84IS
             .          .
             .          .
692          .          .        UC94
             .          .           .
             .          .           .
699          .     CP94DS............
             .          V
             .          V
703          .      R94DS
             .          .
             .          .
713          .          .           .<-------  D84IIN
711          .          .      D84IIN
             .          .           V
             .          .           V
714          .          .      RD84IN
             .          .           .
             .          .           .
722          .          .           .        UC88
             .          .           .           .
             .          .           .           .
729          .     CP88EN......................
             .          .
             .          .
733          .          .        UC95
             .          .           .
             .          .           .
740          .          .           .        UC93
             .          .           .           .
             .          .           .           .
747          .          .           .           .        UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	82.	12.10	12.	4.	1.	.05
+	HYDROGRAPH AT	UC9	82.	12.07	11.	3.	1.	.05
+	2 COMBINED AT	CPC8	162.	12.07	22.	7.	2.	.10
+	ROUTED TO	RCP89	159.	12.17	22.	7.	2.	.10
+	HYDROGRAPH AT	UC18	56.	12.13	8.	2.	1.	.04
+	HYDROGRAPH AT	UC19	39.	12.13	5.	1.	1.	.03
+	3 COMBINED AT	CP1819	250.	12.13	36.	11.	4.	.17
+	ROUTED TO	R1819	248.	12.20	35.	10.	4.	.17
+	HYDROGRAPH AT	UC22	27.	12.30	6.	2.	1.	.03
+	HYDROGRAPH AT	UC23	27.	12.13	3.	1.	0.	.01
+	3 COMBINED AT	CP2223	295.	12.20	44.	13.	5.	.21
+	ROUTED TO	R2223	292.	12.23	43.	13.	5.	.21
+	HYDROGRAPH AT	UC28	79.	12.20	10.	3.	1.	.05
+	ROUTED TO	R28	78.	12.27	10.	3.	1.	.05
+	HYDROGRAPH AT	UC29	45.	12.20	6.	2.	1.	.04
+	HYDROGRAPH AT	UC30	18.	12.13	2.	1.	0.	.01
+	4 COMBINED AT	CP2930	427.	12.23	61.	18.	6.	.31
+	ROUTED TO	R2930	423.	12.23	61.	18.	6.	.31
+	HYDROGRAPH AT	UC34	71.	12.10	7.	2.	1.	.04
+	2 COMBINED AT	CP34	477.	12.23	68.	19.	7.	.35
+	ROUTED TO	R34	455.	12.47	68.	19.	7.	.35

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC37	197.	12.37	46.	13.	5.	.21
+	HYDROGRAPH AT	UC35	528.	12.10	55.	16.	6.	.26
+	3 COMBINED AT	CP3537	877.	12.27	166.	48.	17.	.82
+	ROUTED TO	R3537	872.	12.33	166.	48.	17.	.82
+	HYDROGRAPH AT	UC49	123.	12.03	11.	3.	1.	.05
+	HYDROGRAPH AT	UC31	814.	12.10	83.	24.	9.	.41
+	3 COMBINED AT	CP3149	1608.	12.13	258.	74.	27.	1.27
+	ROUTED TO	R3149	1598.	12.17	258.	74.	27.	1.27
+	HYDROGRAPH AT	UC46	94.	12.00	8.	2.	1.	.03
+	ROUTED TO	R46	92.	12.07	8.	2.	1.	.03
+	HYDROGRAPH AT	UC45	235.	12.03	19.	6.	2.	.09
	HYDROGRAPH AT	UC47	79.	12.03	7.	2.	1.	.03
+	3 COMBINED AT	CP4547	402.	12.03	34.	10.	4.	.15
+	ROUTED TO	R4547	390.	12.07	34.	10.	3.	.15
+	HYDROGRAPH AT	UC48	397.	12.10	45.	13.	5.	.20
+	HYDROGRAPH AT	UC50	47.	12.03	4.	1.	0.	.02
+	4 COMBINED AT	CP4850	2335.	12.13	338.	97.	35.	1.64
+	ROUTED TO	R4850	2308.	12.17	338.	97.	35.	1.64
+	HYDROGRAPH AT	UC51	156.	12.03	13.	4.	1.	.06
+	HYDROGRAPH AT	UC57	72.	12.07	7.	2.	1.	.04
+	3 COMBINED AT	CP5157	2447.	12.17	356.	102.	37.	1.74
+	ROUTED TO	R5157	2422.	12.20	356.	102.	37.	1.74
	HYDROGRAPH AT	UC58	262.	12.07	24.	7.	2.	.11

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC59	41.	12.20	6.	2.	1.	.03
+	3 COMBINED AT	CP5859	2622.	12.20	385.	110.	40.	1.88
+	DIVERSION TO	D5859S	1303.	12.20	191.	55.	20.	1.88
+	HYDROGRAPH AT	D5859N	1319.	12.20	193.	55.	20.	1.88
+	ROUTED TO	R5859N	1311.	12.20	193.	55.	20.	1.88
+	HYDROGRAPH AT	UC63	248.	12.07	24.	7.	2.	.12
+	2 COMBINED AT	CP63	1489.	12.20	216.	62.	22.	2.00
+	ROUTED TO	R63	1480.	12.20	216.	62.	22.	2.00
+	HYDROGRAPH AT	UC66	79.	12.07	7.	2.	1.	.04
+	HYDROGRAPH AT	UC62	762.	12.10	73.	20.	7.	.36
+	3 COMBINED AT	CP6266	2173.	12.17	293.	83.	30.	2.40
+	ROUTED TO	R6266	2164.	12.17	293.	83.	30.	2.40
+	HYDROGRAPH AT	D5859S	1303.	12.20	191.	55.	20.	1.88
+	ROUTED TO	R5859S	1288.	12.23	191.	55.	20.	1.88
+	HYDROGRAPH AT	UC64	5.	12.03	0.	0.	0.	.00
+	2 COMBINED AT	CP64	1290.	12.23	191.	55.	20.	1.88
+	DIVERSION TO	D64S	580.	12.23	86.	25.	9.	1.88
+	HYDROGRAPH AT	D64N	709.	12.23	105.	30.	11.	1.88
+	ROUTED TO	RD64N	697.	12.27	105.	30.	11.	1.88
+	HYDROGRAPH AT	UC87	30.	12.17	4.	1.	0.	.03
+	2 COMBINED AT	CP87	723.	12.27	108.	31.	11.	1.90
+	ROUTED TO	RD87N	721.	12.30	108.	31.	11.	1.90
+	HYDROGRAPH AT	UC82	48.	12.07	4.	1.	0.	.02
+	3 COMBINED AT	CP82	2849.	12.20	404.	114.	41.	2.45

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
	ROUTED TO	R82	2842.	12.20	404.	114.	41.	2.45
+	DIVERSION TO	D84S	686.	12.20	41.	10.	4.	2.45
+	HYDROGRAPH AT	D84N	2157.	12.20	363.	104.	38.	2.45
+	HYDROGRAPH AT	UC84	24.	12.07	2.	1.	0.	.01
+	2 COMBINED AT	CP84	2174.	12.20	365.	105.	38.	2.46
+	ROUTED TO	R84	2153.	12.30	365.	104.	38.	2.46
+	HYDROGRAPH AT	UC79	139.	12.07	13.	4.	1.	.08
+	HYDROGRAPH AT	UC78	449.	12.03	35.	10.	4.	.18
+	3 COMBINED AT	CP7879	2328.	12.27	411.	117.	42.	2.72
+	ROUTED TO	R7879	2327.	12.27	411.	117.	42.	2.72
+	HYDROGRAPH AT	UC77	225.	12.03	20.	6.	2.	.10
	2 COMBINED AT	CP77	2417.	12.27	430.	123.	44.	2.81
+	ROUTED TO	R77	2416.	12.27	430.	123.	44.	2.81
+	HYDROGRAPH AT	UC89	122.	12.10	14.	4.	1.	.07
+	2 COMBINED AT	CP89	2500.	12.27	443.	126.	46.	2.89
+	ROUTED TO	R89	2491.	12.30	443.	126.	45.	2.89
+	HYDROGRAPH AT	UC74	264.	12.13	31.	8.	3.	.15
+	HYDROGRAPH AT	UC76	81.	12.07	8.	2.	1.	.04
+	2 COMBINED AT	CP7476	339.	12.10	39.	11.	4.	.19
+	ROUTED TO	R7476	339.	12.13	38.	11.	4.	.19
+	HYDROGRAPH AT	UC75	365.	12.07	38.	10.	4.	.19
+	2 COMBINED AT	CP75	692.	12.10	75.	21.	7.	.38
	ROUTED TO	R75	684.	12.10	75.	21.	7.	.38
	HYDROGRAPH AT							

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+		UC90	50.	12.17	6.	2.	1.	.04
	HYDROGRAPH AT							
+		UC91	84.	12.27	15.	4.	1.	.07
	4 COMBINED AT							
+		CP90EN	3132.	12.20	535.	151.	55.	3.38
	HYDROGRAPH AT							
+		D84S	686.	12.20	41.	10.	4.	2.45
	ROUTED TO							
+		RD84S	685.	12.23	41.	10.	4.	2.45
	DIVERSION TO							
+		D84IIN	576.	12.23	35.	9.	3.	2.45
	HYDROGRAPH AT							
+		D84IIS	110.	12.23	6.	1.	1.	2.45
	ROUTED TO							
+		RD84IS	79.	12.33	6.	1.	0.	2.45
	HYDROGRAPH AT							
+		UC94	18.	12.50	5.	1.	1.	.03
	2 COMBINED AT							
+		CP94DS	94.	12.33	10.	3.	1.	2.48
	ROUTED TO							
+		R94DS	89.	12.40	10.	3.	1.	2.48
	HYDROGRAPH AT							
+		D84IIN	576.	12.23	35.	9.	3.	2.45
	ROUTED TO							
+		RD84IN	445.	12.33	35.	9.	3.	2.45
	HYDROGRAPH AT							
+		UC88	58.	12.77	20.	6.	2.	.11
	3 COMBINED AT							
+		CP88EN	566.	12.37	64.	17.	6.	2.59
	HYDROGRAPH AT							
+		UC95	58.	12.07	5.	1.	0.	.02
	HYDROGRAPH AT							
+		UC93	53.	12.20	9.	2.	1.	.04
	HYDROGRAPH AT							
+		UC96	70.	12.27	13.	3.	1.	.06

*** NORMAL END OF HEC-1 ***

Future

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN  1998                *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   16MAR04  TIME  08:42:22  *
*                                      *
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*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID         UC MODEL - UNNAMED WASH, CENTRAL
  2           ID         10-YEAR 6-HOUR MODEL  FILENAME: UC106F.DAT
  3           ID         FUTURE CONDITIONS
  4           ID         CAREFREE DRAINAGE MASTER PLAN
  5           ID         FCD 2000C037
  6           ID         BY CH2M HILL
  7           ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  8           ID         DECEMBER 2001 (Final Revision March 2004)
  9           ID    ***************************************************************
 10           ID         10 YEAR ANALYSIS 6-HOUR STORM
 11           ID
 12           ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
 13           ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
 14           ID    ***************************************************************
 15           ID      DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
 16           ID
 17           ID      THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
 18           ID
 19           ID
              *DIAGRAM
 20           IT       2                    2000
 21           IO       5
 22           IN      15
 23           JD    2.32    0.01
 24           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 25           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 26           PC   0.962   0.972   0.983   0.991   1.000
 27           JD   2.305    0.50
 28           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 29           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 30           PC   0.962   0.972   0.983   0.991   1.000
 31           JD   2.262    2.80
 32           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 33           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
 34           PC   0.950   0.963   0.975   0.988   1.000
 35           JD   2.139    16.0
 36           PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
 37           PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
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 38          PC   0.946   0.960   0.973   0.987   1.000
 39          JD   1.884    90.0
 40          PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 41          PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 42          PC   0.927   0.945   0.964   0.982   1.000
 43          JD   1.322   500.0
 44          PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 45          PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 46          PC   0.907   0.930   0.954   0.977   1.000
             *
             *
1                                          HEC-1 INPUT
PAGE  2

     LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 47          KK     UC8
 48          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 49          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 50          KM    L= 1.04   Kb= 0.031   S=138.0
 51          BA    .054
 52          LG     .30     .36     4.9     .26    36.0
 53          UC    .379    .686
 54          UA       0       5      16      30      65      77      84      90      94      97
 55          UA     100
             *

 56          KK     UC9
 57          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 58          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 59          KM    L= 0.91   Kb= 0.031   S=145.0
 60          BA    .047
 61          LG     .30     .36     5.0     .23    36.0
 62          UC    .338    .540
 63          UA       0       5      16      30      65      77      84      90      94      97
 64          UA     100
             *

 65          KK    CPC89
 66          KM    CONCENTRATION POINT 89
 67          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 68          HC       2
             *

 69          KK   RCP89
 70          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 71          KM    NORMAL DEPTH CHANNEL ROUTING
 72          KM    ENDPOINTS WERE EXTENDED
 73          KM    SLOPE = (2596-2540)/2933
 74          RS       5    FLOW      -1
 75          RC   0.045   0.035   0.045    2933  0.0191
 76          RX       0      90      99     100     108     109     120     200
 77          RY     108     104     102     100     100     102     104     108
 78          RL                    0.15     100
             *

 79          KK    UC18
 80          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 81          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 82          KM    L= 0.56   Kb= 0.091   S=101.0
 83          BA    .040
 84          LG     .25     .36     5.0     .23   24.00
 85          UC    .300    .379
 86          UA       0       5      16      30      65      77      84      90      94      97
 87          UA     100
             *
1                                          HEC-1 INPUT
PAGE  3

     LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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 88          KK    UC19
 89          KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 90          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 91          KM    L= 0.52   Kb= 0.069   S=135.0
 92          BA    .027
 93          LG     .25      .36     5.00      .23   18.00
 94          UC    .271     .400
             *

 95          KK  CP1819
 96          KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
 97          HC       3
             *

 98          KK   R1819
 99          KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
100          KM    ENDPOINTS WERE EXTENDED
101          KM    SLOPE = (2540-2511)/1790
102          RS       2    FLOW      -1
103          RC   0.045   0.030   0.045    1790  0.0162
104          RX       0      92      99     100     112     113     120     200
105          RY     108     104     102     100     100     102     104     108
106          RL                    0.25     100
             *

107          KK    UC22
108          KM   SUBBASIN 22, UNNAMED WASH CENTRAL
109          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
110          KM    L= .76   Kb= .104   S=111.0
111          BA    .032
112          LG     .25      .36     5.00      .23   14.00
113          UC    .363     .658
             *

114          KK    UC23
115          KM   SUBBASIN 23, UNNAMED WASH CENTRAL
116          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
117          KM    L= .40   Kb= 0.125   S=121.0
118          BA    .013
119          LG     .25      .36     5.00      .23   18.00
120          UC    .250     .120
             *

121          KK  CP2223
122          KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
123          HC       3
             *

124          KK   R2223
125          KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
126          KM    ENDPOINTS WERE EXTENDED
127          KM    SLOPE = (2511-2482)/1862
128          RS       2    FLOW      -1
129          RC   0.045    0.03   0.045    1862  0.0156
```

1
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

130          RX       0      95      99     100     112     113     117     200
131          RY     108     104     102     100     100     102     104     108
132          RL                    0.25     100
             *

133          KK    UC28
134          KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
135          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
136          KM    L= .57   Kb= 0.106   S=109.0
137          BA    .055
```

```
138          LG     .25     .36    4.90     .25   14.00
139          UC    .308    .253
             *

140          KK     R28
141          KM    ROUTING REACH FROM CP1028 TO CP2930 THROUGH SUBBASIN 30
142          KM    ENDPOINTS WERE EXTENDED
143          KM    SLOPE = (2502-2482)/1296
144          RS       2    FLOW      -1
145          RC   0.045   0.035   0.045    1296  0.0154
146          RX       0      86      99     100     108     109     122     200
147          RY     108     104     102     100     100     102     104     108
148          RL                    0.15     100
             *

149          KK    UC29
150          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
151          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
152          KM    L= .47   Kb= 0.116   S=109.0
153          BA    .035
154          LG     .25     .36    5.00     .23   12.00
155          UC    .275    .323
             *

156          KK   UC30
157          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
158          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
159          KM    L= .28   Kb= 0.126   S=134.0
160          BA    .012
161          LG     .25     .36    5.00     .23   12.00
162          UC    .208    .291
             *

163          KK  CP2930
164          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
165          KM    CP2223
166          HC       4
             *

167          KK   R2930
168          KM   Routing flow from CP2930 to CP34 through subbasin 34
169          KM    SLOPE = (2482-2469)/925
170          KM    ENDPOINTS WERE EXTENDED
171          RS       1    FLOW      -1
172          RC   0.045   0.030   0.045     925  0.0141
1                                          HEC-1 INPUT
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        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

173          RX       0      89      99     100     110     111     122     200
174          RY     108     104     102     100     100     102     104     108
175          RL                    0.15     100
             *

176          KK    UC34
177          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
178          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
179          KM    L= .31   Kb = 0.116   S= 117.0
180          BA    .037
181          LG     .25     .36    4.90     .22   12.00
182          UC    .213    .168
             *

183          KK    CP34
184          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
185          KM   R2930
186          HC       2
             *

187          KK     R34
```

```
188          KM   Routing flow from CP34 to CP3537 through subbasin 37
189          KM    ENDPOINTS WERE EXTENDED
190          KM    SLOPE = (2469-2318)/6475
191          RS      11    FLOW      -1
192          RC   0.045   0.035   0.045    6475   .0233
193          RX       0      90      99     100     105     106     115     200
194          RY     108     104     102     100     100     102     104     108
195          RL                    0.15     100
             *

196          KK    UC37
197          KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
198          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
199          KM    L= 2.03   Kb= 0.160   S= 98.0
200          BA    .207
201          LG     .25     .39    3.70     .16   24.00
202          UC    .542    .809
             *

203          KK    UC35
204          KM   SUBBASIN 35, UNNAMED WASH CENTRAL
205          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
206          KM    L= 1.27   Kb= 0.035   S=138.0
207          BA    .261
208          LG     .25     .38    3.90     .20   24.00
209          UC    .408    .355
             *

210          KK  CP3537
211          KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
212          KM    R34
213          HC       3
             *
```


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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

214          KK   R3537
215          KM   Routing flow from CP3537 to CP3149 through subbasin 49
216          KM    ENDPOINTS WERE EXTENDED
217          KM    SLOPE = (2318-2280)/1829
218          RS       3    FLOW      -1
219          RC   0.045   0.035   0.045    1829  0.0208
220          RX       0      90      99     100     105     106     115     200
221          RY     108     104     102     100     100     102     104     108
222          RL                    0.15     100
             *

223          KK    UC49
224          KM   SUBBASIN 49, UNNAMED WASH CENTRAL
225          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
226          KM    L= .47   Kb= 0.032   S=148.0
227          BA    .048
228          LG     .25     .39    3.60     .15   30.00
229          UC    .225    .219
             *

230          KK    UC31
231          KM   SUBBASIN 31, UNNAMED WASH CENTRAL
232          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
233          KM    L= 2.04   Kb= 0.066   S= 128.0
234          BA    .405
235          LG     .25     .38    4.10     .18   20.00
236          UC    .475    .479
             *

237          KK  CP3149
238          KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
239          KM     R3537
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240          HC       3
             *

241          KK   R3149
242          KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
243          KM    ENDPOINTS WERE EXTENDED
244          KM    SLOPE = (2280-2256)/1219
245          RS       2    FLOW      -1
246          RC   0.045   0.030   0.045    1219  0.0197
247          RX       0      95      99     100     110     111     118     200
248          RY     110     104     102     100     100     102     104     110
249          RL                    0.15     100
             *

250          KK    UC46
251          KM   SUBBASIN 46, UNNAMED WASH CENTRAL
252          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
253          KM    L= .30  Kb= 0.060   Adj. Slope= 324.0
254          BA    .034
255          LG     .25     .39    3.60     .15   24.00
256          UC    .200    .162
257          UA       0       5      16      30      65      77      84      90      94      97
1                                                HEC-1 INPUT
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        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

258          UA     100
             *

259          KK     R46
260          KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
261          KM    ENDPOINTS WERE EXTENDED
262          KM    SLOPE = (2346-2315)/1783
263          RS       3    FLOW      -1
264          RC   0.045   0.035   0.045    1783  0.0174
265          RX       0      92      99     100     105     106     113     200
266          RY     108     104     102     100     100     102     104     108
267          RL                    0.15     100
             *

268          KK    UC45
269          KM   SUBBASIN 45, UNNAMED WASH CENTRAL
270          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
271          KM    L= .48   Kb= 0.030   S= 135.0
272          BA    .086
273          LG     .25     .39    3.60     .15   24.00
274          UC    .233    .167
275          UA       0       5      16      30      65      77      84      90      94      97
276          UA     100
             *

277          KK    UC47
278          KM   SUBBASIN 47, UNNAMED WASH CENTRAL
279          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
280          KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
281          BA    .031
282          LG     .25     .39    3.60     .15   24.00
283          UC    .217    .229
284          UA       0       5      16      30      65      77      84      90      94      97
285          UA     100
             *

286          KK  CP4547
287          KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
288          KM    R46
289          HC       3
             *

290          KK   R4547
291          KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
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292          KM   ENDPOINTS WERE EXTENDED
293          KM    SLOPE = (2315-2256)/2170
294          RS       4    FLOW      -1
295          RC   0.045   0.035   0.045    2170   .0272
296          RX       0      90      99     100     105     106     115     200
297          RY     108     104     102     100     100     102     104     108
298          RL                    0.15     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

299          KK    UC48
300          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
301          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
302          KM    L= .92   Kb= 0.048   S= 117.0
303          BA    .197
304          LG     .25     .39    3.70     .16   30.00
305          UC    .438    .349
             *

306          KK    UC50
307          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
308          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
309          KM    L= .27   Kb= 0.037   S= 93.0
310          BA    .019
311          LG     .25     .38    3.80     .24   24.00
312          UC    .221    .230
             *

313          KK  CP4850
314          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
315          KM    R3149 AND R4547
316          HC       4
             *

317          KK   R4850
318          KM   Routing flow from CP4850 to CP5157 through subbasin 57
319          KM    ENDPOINTS WERE EXTENDED
320          KM    SLOPE = (2256-2235)/1509
321          RS       2    FLOW      -1
322          RC   0.045   0.030   0.045    1509  0.0139
323          RX       0      95      99     100     115     116     120     200
324          RY     106     104     102     100     100     102     104     106
325          RL                    0.25     100
             *

326          KK    UC51
327          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
328          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
329          KM    L= .42   Kb= 0.061   Adj. Slope= 317.0
330          BA    .060
331          LG     .25     .36    5.00     .21   26.00
332          UC    .196    .151
             *

333          KK    UC57
334          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
335          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
336          KM    L= .47   Kb= 0.061   S= 200.0
337          BA    .037
338          LG     .25     .37    4.20     .28   20.00
339          UC    .333    .395
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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 340          KK  CP5157
 341          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
 342          KM     R4850
 343          HC       3
              *

 344          KK   R5157
 345          KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
 346          KM    ENDPOINTS WERE EXTENDED
 347          KM    SLOPE = (2235-2208)/1796
 348          RS       2    FLOW      -1
 349          RC   0.045   0.030   0.045    1796  0.0150
 350          RX       0      60      99     100     100     121     160     220
 351          RY     110     104     102     100     100     102     104     110
 352          RL                    0.35     100
              *

 353          KK    UC58
 354          KM   SUBBASIN 58, UNNAMED WASH CENTRAL
 355          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 356          KM    L= .69   Kb= 0.055  Adj. Slope= 317.0
 357          BA    .110
 358          LG     .25     .37    4.80     .13   20.00
 359          UC    .292    .246
              *

 360          KK    UC59
 361          KM   SUBBASIN 59, UNNAMED WASH CENTRAL
 362          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 363          KM    L= .49   Kb= 0.105   S= 112.0
 364          BA    .034
 365          LG     .25     .32    5.80     .33   14.00
 366          UC    .308    .389
              *

 367          KK  CP5859
 368          KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
 369          KM     R5157
 370          HC       3
              *

 371          KK  D5859N
 372          KM    DIVERSION OF FLOWS AT FLOW SPLIT
 373          DT  D5859S
 374          DI       0      50     100     500   10000
 375          DQ       0    24.9    49.5   248.5    4970
              *

 376          KK  R5859N
 377          KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
 378          KM   ENDPOINTS WERE EXTENDED
 379          KM    SLOPE = (2208-2195)/699
 380          RS       1    FLOW      -1
 381          RC   0.045   0.030   0.045     699  0.0186
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                                          HEC-1 INPUT

      LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 382          RX       0      50      99     100     110     111     160     210
 383          RY     104     103     102     100     100     102     103     104
 384          RL                    0.15     100
              *

 385          KK    UC63
 386          KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
 387          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 388          KM    L= .81   Kb= 0.056   Adj. Slope= 322.0
 389          BA    .117
 390          LG     .25     .36    5.00     .19   19.00
```

```
391          UC    .338    .317
             *

392          KK    CP63
393          KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
394          KM   FROM RD5859N
395          HC       2
             *

396          KK     R63
397          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
398          KM    SLOPE = (2195-2170)/1394
399          RS       2    FLOW      -1
400          RC   0.045   0.030   0.045    1394  0.0179
401          RX      60      80      99     100     125     126     145     165
402          RY     106     104     102     100     100     102     104     106
403          RL                    0.35     100
             *

404          KK    UC66
405          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
406          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
407          KM    L= .54   Kb= 0.081   Adj. Slope= 324.0
408          BA    .037
409          LG     .25     .36    5.00     .25   14.00
410          UC    .283    .364
             *

411          KK    UC62
412          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
413          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
414          KM    L= 1.33   Kb= 0.057   Adj. Slope= 321.0
415          BA    .361
416          LG     .25     .35    6.10     .13   14.00
417          UC    .404    .305
             *

418          KK  CP6266
419          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
420          KM   FROM R63
421          HC       3
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

422          KK   R6266
423          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
424          KM    SLOPE = (2170-2150)/990
425          RS       2    FLOW      -1
426          RC   0.045   0.030   0.045     990  0.0202
427          RX      25      85      99     100     100     121     135     195
428          RY     106     104     102     100     100     102     104     106
429          RL                    0.35     100
             *

430          KK  D5859S
431          KM   RECALL DIVERTED FLOW FROM D5859N
432          DR  D5859S
             *

433          KK  R5859S
434          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
435          KM    SLOPE = (2208-2194)/803
436          RS       1    FLOW      -1
437          RC   0.045   0.030   0.045     803  0.0174
438          RX       0      50      99     100     125     126     175     225
439          RY     104     103     102     100     100     102     103     104
440          RL                    0.15     100
```

```
                 *

441              KK    UC64
442              KM   SUBBASIN 64, UNNAMED WASH CENTRAL
443              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
444              KM    L= .15   Kb= 0.078   S= 166.0
445              BA    .005
446              LG     .25     .31    6.90     .20   14.00
447              UC    .208    .307
                 *

448              KK    CP64
449              KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
450              KM    DIVERSION RD5859N
451              HC       2    1.88
                 *

452              KK    D64N
453              KM   DIVERSION OF FLOWS AT FLOW SPLIT
454              KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
455              DT    D64S
456              DI       0      50     100     500   10000
457              DQ       0    22.5      45     225    4500
                 *

458              KK   RD64N
459              KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
460              KM   ENDPOINTS WERE EXTENDED
461              KM    SLOPE = (2194-2161)/1721
462              RS       2    FLOW      -1
463              RC   0.045   0.030   0.045    1721  0.0192
1                                             HEC-1 INPUT
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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

464              RX       0      60      99     100     112     113     152     200
465              RY     106     104     102     100     100     102     104     106
466              RL                    0.25     100
                 *

467              KK    UC87
468              KM   SUBBASIN 87, UNNAMED WASH CENTRAL
469              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
470              KM    L= .33   Kb= 0.118   S= 101.0
471              BA    .025
472              LG     .25     .35    3.40     .62    8.00
473              UC    .329    .367
                 *

474              KK    CP87
475              KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
476              KM    DIVERSION RD64N
477              HC       2
                 *

478              KK   RD87N
479              KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
480              KM    SLOPE = (2161-2150)/557
481              RS       1    FLOW      -1
482              RC   0.045   0.030   0.045     557  0.0197
483              RX      25      85      99     100     120     121     135     195
484              RY     106     104     102     100     100     102     104     106
485              RL                    0.35     100
                 *

486              KK    UC82
487              KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
488              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
489              KM    L= .22   Kb= 0.136   Adj. Slope= 220.0
490              BA    .022
```

```
491          LG     .25     .36    4.30    .400   14.00
492          UC    .196    .162
             *

493          KK    CP82
494          KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
495          KM   SUBBASIN 82
496          HC       3    2.45
             *

497          KK     R82
498          KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
499          KM    SLOPE = (2150-2138)/579
500          RS       1    FLOW      -1
501          RC   0.045   0.030   0.045     579  0.0207
502          RX      50      75      99     100     125     126     150     175
503          RY     106     104     102     100     100     102     104     106
504          RL                    0.35     100
             *
1                                          HEC-1 INPUT
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

505          KK    D84N
506          KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
507          KM   PART OF TRIPLE DIVERSION JUST UPSTREAM OF TERRAVITA WAY
508          DT    D84S
509          DI       0     500    1275    1550    1964    2475    3223    4000
510          DQ       0       0       0    79.7     255     490     888    1250
             *

511          KK    UC84
512          KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
513          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
514          KM    L= .30   Kb= 0.102   Adj. Slope= 246.0
515          BA    .013
516          LG     .25     .36    4.50     .35   14.00
517          UC    .142    .166
             *

518          KK    CP84
519          KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
520          KM    FROM D84N
521          HC       2
             *

522          KK     R84
523          KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
524          KM   ENDPOINTS WERE EXTENDED
525          KM    SLOPE = (2138-2054)/3463
526          RS       5    FLOW      -1
527          RC   0.045   0.030   0.045    3463  0.0243
528          RX       0      94      99     100     110     111     116     200
529          RY     106     104     102     100     100     102     104     106
530          RL                    0.15     100
             *

531          KK    UC79
532          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
533          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
534          KM    L= .88   Kb= 0.040   Adj. Slope= 233.0
535          BA    .078
536          LG     .25     .35    4.30     .45   18.00
537          UC    .358    .455
538          UA       0       5      16      30      65      77      84      90      94      97
539          UA     100
             *

540          KK    UC78
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```
541          KM   SUBBASIN 78, UNNAMED WASH CENTRAL
542          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
543          KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
544          BA    .177
545          LG     .25      .35    6.00      .17   17.00
546          UC    .271     .206
547          UA       0        5      16       30      65      77      84      90      94      97
548          UA     100
             *
1                                                HEC-1 INPUT
PAGE 14

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

549          KK  CP7879
550          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
551          KM    FROM R84
552          HC       3
             *

553          KK   R7879
554          KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
555          KM   ENDPOINTS WERE EXTENDED
556          KM    SLOPE = (2054-2048)/256
557          RS       1    FLOW      -1
558          RC   0.045   0.030   0.045     256   .0234
559          RX       0      90      99     100     120     121     130     200
560          RY     106     104     102     100     100     102     104     106
561          RL                   0.35     100
             *

562          KK    UC77
563          KM   SUBBASIN 77, UNNAMED WASH CENTRAL
564          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
565          KM    L= .93   Kb= 0.048  Adj. Slope= 324.0
566          BA    .096
567          LG     .25      .34    6.70      .13   16.00
568          UC    .300     .348
569          UA       0        5      16       30      65      77      84      90      94      97
570          UA     100
             *

571          KK    CP77
572          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
573          KM    FROM R7879
574          HC       2
             *

575          KK     R77
576          KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
577          KM   ENDPOINTS WERE EXTENDED
578          KM    SLOPE = (2048-2037)/593
579          RS       1    FLOW      -1
580          RC   0.045   0.030   0.045     593  0.0185
581          RX       0      80      99     100     115     116     120     200
582          RY     106     104     102     100     100     102     104     106
583          RL                   0.25     100
             *

584          KK    UC89
585          KM   SUBBASIN 89, UNNAMED WASH CENTRAL
586          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
587          KM    L= .77   Kb= 0.057   S= 126.0
588          BA    .073
589          LG     .25      .33    6.40      .20   17.00
590          UC    .329     .388
591          UA       0        5      16       30      65      77      84      90      94      97
592          UA     100
             *
```

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 593          KK    CP89
 594          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
 595          KM    FROM R77
 596          HC       2
              *

 597          KK     R89
 598          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
 599          KM   CHANNEL ENDS WERE EXTENDED
 600          KM    SLOPE = (2037-2008)/1912
 601          RS       2    FLOW      -1
 602          RC   0.045   0.030   0.045    1912  0.0152
 603          RX       0      80      99     100     115     116     135     200
 604          RY     106     104     102     100     100     102     104     106
 605          RL                    0.25     100
              *

 606          KK    UC74
 607          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
 608          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 609          KM    L= 1.13   Kb= 0.071   Adj. Slope= 328.0
 610          BA    .151
 611          LG     .25     .34    6.60     .13   14.00
 612          UC    .325    .344
              *

 613          KK    UC76
 614          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
 615          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 616          KM    L= .64   Kb= 0.053   Adj. Slope= 302.0
 617          BA    .041
 618          LG     .25     .35    6.10     .16   14.00
 619          UC    .225    .306
              *

 620          KK  CP7476
 621          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
 622          HC       2
              *

 623          KK   R7476
 624          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
 625          KM   END POINTS WERE EXTENDED
 626          KM    SLOPE = (2031-2017)/524
 627          RS       1    FLOW      -1
 628          RC   0.045   0.030   0.045     524  0.0267
 629          RX       0      80      99     100     112     113     132     200
 630          RY     106     104     102     100     100     102     104     106
 631          RL                    0.25     100
              *
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 632          KK    UC75
 633          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
 634          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 635          KM    L= 1.38   Kb= 0.068   Adj. Slope= 322.0
 636          BA    .192
 637          LG     .25     .34    6.50     .15   14.00
 638          UC    .317    .342
 639          UA       0       5      16      30      65      77      84      90      94      97
 640          UA     100
```

```
                 *

641              KK    CP75
642              KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
643              KM    FROM R7476
644              HC       2
                 *

645              KK     R75
646              KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
647              KM   END POINTS WERE EXTENDED
648              KM    SLOPE = (2017-2008)/723
649              RS       1    FLOW      -1
650              RC   0.045   0.030   0.045     723  0.0124
651              RX       0      80      99     100     115     116     135     200
652              RY     106     104     102     100     100     102     104     106
653              RL                    0.25     100
                 *

654              KK    UC90
655              KM   SUBBASIN 90, UNNAMED WASH CENTRAL
656              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
657              KM    L= .48   Kb= 0.103   S= 151.0
658              BA    .038
659              LG     .25     .35    3.70     .55   14.00
660              UC    .296    .341
                 *

661              KK    UC91
662              KM   SUBBASIN 91, UNNAMED WASH CENTRAL
663              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
664              KM    L= .75   Kb= 0.107   S= 109.0
665              BA    .073
666              LG     .25     .31    7.40     .14   14.00
667              UC    .333    .388
                 *

668              KK  CP90EN
669              KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
670              KM    FROM R89 AND R75
671              HC       4
                 *
```



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                                          HEC-1 INPUT

LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

672              KK    D84S
673              KM   RETREVIAL OF DIVERTED FLOW FROM D84S
674              DR    D84S
                 *

675              KK   RD84S
676              KM   ROUTING FLOW FROM CP84 (D84S) TO D84ii
677              KM    SLOPE = (2144-2140)/303
678              RS       6    FLOW      -1
679              RC   0.045   0.030   0.045     303  0.0132
680              RX       0      50      99     100     125     126     175     225
681              RY     106     104     102     100     100     102     104     106
682              RL                    0.35     100
                 *

683              KK  D84IIS
684              KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
685              KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
686              DT  D84IIN
687              DI       0    79.7     255     490     880    1250
688              DQ       0    78.3     229     419     732    1000
                 *
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```
689          KK  RD84IS
690          KM   ROUTING FLOWS FROM D84IIS TO CP94DS
691          KM   SLOPE = (2140-2078)/3225
692          RS       1    FLOW      -1
693          RC   0.045   0.030   0.045    3225  0.0192
694          RX       0      50      99     100     125     126     175     225
695          RY     106     104     102     100     100     102     104     106
696          RL                    0.25     100
             *

697          KK    UC94
698          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
699          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
700          KM    L= .53   Kb= 0.119   S= 108.0
701          BA    .028
702          LG     .25     .36    5.00     .23   13.00
703          UC    .671   1.082
             *

704          KK  CP94DS
705          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
706          KM   FROM RD84IS
707          HC       2
             *

708          KK   R94DS
709          KM   ROUTING FLOW FROM CP94DS TO CP88EN
710          KM   SLOPE = (2078-2041)/1950
711          RS       1    FLOW      -1
712          RC   0.045   0.030   0.045    1950  0.0189
713          RX      60      85      99     100     108     109     123     148
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                                         HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

714          RY     106     104     102     100     100     102     104     106
715          RL                    0.25     100
             *

716          KK  D84IIN
717          KM   RECALL DIVERTED FLOW FROM D84II
718          DR  D84IIN
             *

719          KK  RD84IN
720          KM   ROUTING FLOW FROM D84II TO CP88EN
721          KM   SLOPE = (2140-2041)/5175
722          RS       1    FLOW      -1
723          RC   0.045   0.030   0.045    5175  0.0191
724          RX      60      78      90     100     125     132     135     150
725          RY     106     104     102     100     100     102     104     106
726          RL                    0.25     100
             *

727          KK    UC88
728          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
729          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
730          KM    L= 1.08   Kb= 0.104   S=111.0
731          BA    .108
732          LG     .25     .33    6.10     .20   14.00
733          UC    .962   1.337
             *

734          KK  CP88EN
735          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
736          KM    FROM R94DS AND RD84IN
737          HC       3
             *

738          KK    UC95
```

```
739          KM   SUBBASIN 95, UNNAMED WASH CENTRAL
740          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
741          KM    L= 0.22   Kb= 0.120   Adj.Slope= 220
742          BA    .024
743          LG     .25     .39    3.70     .15    5.00
744          UC    .142    .106
             *

745          KK    UC93
746          KM   SUBBASIN 93, UNNAMED WASH CENTRAL
747          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
748          KM    L= .64   Kb= 0.093   S= 135.0
749          BA    .038
750          LG     .25     .30    8.00     .07   13.00
751          UC    .275    .400
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

752          KK    UC96
753          KM   SUBBASIN 96, UNNAMED WASH CENTRAL
754          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
755          KM    L= .73   Kb= 0.110  S= 113.0
756          BA    .061
757          LG     .25     .32    7.00     .12   13.00
758          UC    .317    .392
             *
             *
759          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
PUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 47         UC8
             .
             .
 56          .         UC9
             .           .
             .           .
 65       CPC8............
             V
             V
 69      RCP89
             .
             .
 79          .        UC18
             .           .
             .           .
 88          .           .        UC19
             .           .           .
             .           .           .
 95     CP1819......................
             V
             V
 98      R1819
             .
             .
107          .        UC22
             .           .
             .           .
114          .           .        UC23
             .           .           .
             .           .           .
121     CP2223......................
             V
             V
124      R2223
             .
             .
133          .        UC28
             .           V
             .           V
140          .         R28
             .           .
             .           .
149          .           .        UC29
             .           .           .
             .           .           .
156          .           .           .       UC30
             .           .           .          .
             .           .           .          .
163     CP2930.................................
             V
             V
167      R2930
             .
             .
176          .        UC34
             .           .
             .           .
183       CP34............
             V
             V
187        R34
             .
             .
196          .        UC37
```

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              .           .
              .           .
203           .           .        UC35
              .           .           .
              .           .           .
210      CP3537.......................
              V
              V
214       R3537
              .
              .
223           .        UC49
              .           .
              .           .
230           .           .        UC31
              .           .           .
              .           .           .
237      CP3149.......................
              V
              V
241       R3149
              .
              .
250           .        UC46
              .           V
              .           V
259           .         R46
              .           .
              .           .
268           .           .        UC45
              .           .           .
              .           .           .
277           .           .           .        UC47
              .           .           .           .
              .           .           .           .
286           .      CP4547........................
              .           V
              .           V
290           .       R4547
              .           .
              .           .
299           .           .        UC48
              .           .           .
              .           .           .
306           .           .           .        UC50
              .           .           .           .
              .           .           .           .
313      CP4850.................................
              V
              V
317       R4850
              .
              .
326           .        UC51
              .           .
              .           .
333           .           .        UC57
              .           .           .
              .           .           .
340      CP5157.......................
              V
              V
344       R5157
              .
              .
353           .        UC58
              .           .
              .           .
360           .           .        UC59
              .           .           .
              .           .           .
```

```
367      CP5859.......................
              .
              .
373           .-------->  D5859S
371      D5859N
              V
              V
376      R5859N
              .
              .
385           .        UC63
              .           .
              .           .
392        CP63............
              V
              V
396         R63
              .
              .
404           .        UC66
              .           .
              .           .
411           .           .        UC62
              .           .           .
              .           .           .
418      CP6266.......................
              V
              V
422       R6266
              .
              .
432           .           .<-------  D5859S
430           .      D5859S
              .           V
              .           V
433           .      R5859S
              .           .
              .           .
441           .           .        UC64
              .           .           .
              .           .           .
448           .        CP64............
              .           .
              .           .
455           .           .-------->    D64S
452           .        D64N
              .           V
              .           V
458           .       RD64N
              .           .
              .           .
467           .           .        UC87
              .           .           .
              .           .           .
474           .        CP87............
              .           V
              .           V
478           .       RD87N
              .           .
              .           .
486           .           .        UC82
              .           .           .
              .           .           .
493        CP82.......................
              V
              V
497         R82
              .
              .
508           .-------->    D84S
505        D84N
```

```
                .
                .
511             .        UC84
                .           .
                .           .
518         CP84............
               V
               V
522          R84
                .
                .
531             .        UC79
                .           .
                .           .
540             .           .        UC78
                .           .           .
                .           .           .
549       CP7879........................
               V
               V
553        R7879
                .
                .
562             .        UC77
                .           .
                .           .
571         CP77............
               V
               V
575          R77
                .
                .
584             .        UC89
                .           .
                .           .
593         CP89............
               V
               V
597          R89
                .
                .
606             .        UC74
                .           .
                .           .
613             .           .        UC76
                .           .           .
                .           .           .
620             .      CP7476............
                .           V
                .           V
623             .       R7476
                .           .
                .           .
632             .           .        UC75
                .           .           .
                .           .           .
641             .        CP75............
                .           V
                .           V
645             .         R75
                .           .
                .           .
654             .           .        UC90
                .           .           .
                .           .           .
661             .           .           .        UC91
                .           .           .           .
                .           .           .           .
668       CP90EN.................................
                .
                .
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674          .          .<-------    D84S
672          .       D84S
             .          V
             .          V
675          .      RD84S
             .          .
             .          .
686          .          .------->  D84IIN
683          .     D84IIS
             .          V
             .          V
689          .     RD84IS
             .          .
             .          .
697          .          .        UC94
             .          .           .
             .          .           .
704          .     CP94DS............
             .          V
             .          V
708          .      R94DS
             .          .
             .          .
718          .          .           .<-------  D84IIN
716          .          .     D84IIN
             .          .          V
             .          .          V
719          .          .     RD84IN
             .          .           .
             .          .           .
727          .          .           .        UC88
             .          .           .           .
             .          .           .           .
734          .     CP88EN......................
             .          .
             .          .
738          .          .        UC95
             .          .           .
             .          .           .
745          .          .           .        UC93
             .          .           .           .
             .          .           .           .
752          .          .           .           .        UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	40.	4.17	8.	2.	1.	.05
+	HYDROGRAPH AT	UC9	42.	4.13	7.	2.	1.	.05
+	2 COMBINED AT	CPC8	82.	4.17	15.	4.	1.	.10
+	ROUTED TO	RCP89	81.	4.27	15.	4.	1.	.10
+	HYDROGRAPH AT	UC18	43.	4.13	5.	1.	0.	.04
+	HYDROGRAPH AT	UC19	27.	4.17	3.	1.	0.	.03
+	3 COMBINED AT	CP1819	143.	4.20	23.	6.	2.	.17
+	ROUTED TO	R1819	141.	4.27	23.	6.	2.	.17
+	HYDROGRAPH AT	UC22	22.	4.23	4.	1.	0.	.03
+	HYDROGRAPH AT	UC23	23.	4.07	2.	0.	0.	.01
+	3 COMBINED AT	CP2223	175.	4.23	28.	7.	3.	.21
+	ROUTED TO	R2223	173.	4.27	28.	7.	3.	.21
+	HYDROGRAPH AT	UC28	66.	4.13	6.	2.	1.	.05
+	ROUTED TO	R28	66.	4.20	6.	2.	1.	.05
+	HYDROGRAPH AT	UC29	38.	4.13	4.	1.	0.	.04
+	HYDROGRAPH AT	UC30	15.	4.10	1.	0.	0.	.01
+	4 COMBINED AT	CP2930	278.	4.23	40.	10.	4.	.31
+	ROUTED TO	R2930	276.	4.27	40.	10.	4.	.31
+	HYDROGRAPH AT	UC34	59.	4.07	4.	1.	0.	.04
+	2 COMBINED AT	CP34	309.	4.23	44.	11.	4.	.35
+	ROUTED TO	R34	300.	4.40	44.	11.	4.	.35

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
	HYDROGRAPH AT	UC37	138.	4.40	31.	8.	3.	.21
+	HYDROGRAPH AT	UC35	283.	4.23	37.	9.	3.	.26
+	3 COMBINED AT	CP3537	610.	4.37	106.	27.	10.	.82
+	ROUTED TO	R3537	603.	4.43	106.	27.	10.	.82
+	HYDROGRAPH AT	UC49	78.	4.10	8.	2.	1.	.05
+	HYDROGRAPH AT	UC31	361.	4.30	56.	14.	5.	.41
+	3 COMBINED AT	CP3149	862.	4.40	161.	41.	15.	1.27
+	ROUTED TO	R3149	861.	4.40	161.	41.	15.	1.27
+	HYDROGRAPH AT	UC46	63.	4.07	5.	1.	0.	.03
+	ROUTED TO	R46	62.	4.10	5.	1.	0.	.03
+	HYDROGRAPH AT	UC45	157.	4.07	13.	3.	1.	.09
	HYDROGRAPH AT	UC47	50.	4.07	5.	1.	0.	.03
+	3 COMBINED AT	CP4547	265.	4.07	23.	6.	2.	.15
+	ROUTED TO	R4547	259.	4.13	23.	6.	2.	.15
+	HYDROGRAPH AT	UC48	226.	4.23	31.	8.	3.	.20
+	HYDROGRAPH AT	UC50	28.	4.10	3.	1.	0.	.02
+	4 COMBINED AT	CP4850	1095.	4.37	208.	53.	19.	1.64
+	ROUTED TO	R4850	1091.	4.40	208.	53.	19.	1.64
+	HYDROGRAPH AT	UC51	105.	4.07	8.	2.	1.	.06
+	HYDROGRAPH AT	UC57	36.	4.20	5.	1.	0.	.04
+	3 COMBINED AT	CP5157	1126.	4.37	218.	55.	20.	1.74
+	ROUTED TO	R5157	1121.	4.43	218.	55.	20.	1.74
	HYDROGRAPH AT	UC58	157.	4.13	16.	4.	1.	.11
	HYDROGRAPH AT							

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+		UC59	30.	4.17	4.	1.	0.	.03
+	3 COMBINED AT	CP5859	1190.	4.40	234.	59.	21.	1.88
+	DIVERSION TO	D5859S	591.	4.40	116.	29.	11.	1.88
+	HYDROGRAPH AT	D5859N	599.	4.40	118.	30.	11.	1.88
+	ROUTED TO	R5859N	597.	4.43	118.	30.	11.	1.88
+	HYDROGRAPH AT	UC63	134.	4.17	15.	4.	1.	.12
+	2 COMBINED AT	CP63	661.	4.40	130.	33.	12.	2.00
+	ROUTED TO	R63	660.	4.43	130.	33.	12.	2.00
+	HYDROGRAPH AT	UC66	37.	4.17	4.	1.	0.	.04
+	HYDROGRAPH AT	UC62	417.	4.23	48.	12.	4.	.36
+	3 COMBINED AT	CP6266	906.	4.37	173.	44.	16.	2.40
+	ROUTED TO	R6266	906.	4.37	173.	44.	16.	2.40
+	HYDROGRAPH AT	D5859S	591.	4.40	116.	29.	11.	1.88
+	ROUTED TO	R5859S	591.	4.43	116.	29.	11.	1.88
+	HYDROGRAPH AT	UC64	6.	4.10	1.	0.	0.	.00
+	2 COMBINED AT	CP64	593.	4.43	117.	30.	11.	1.88
+	DIVERSION TO	D64S	267.	4.43	52.	13.	5.	1.88
+	HYDROGRAPH AT	D64N	326.	4.43	64.	16.	6.	1.88
+	ROUTED TO	RD64N	325.	4.47	64.	16.	6.	1.88
+	HYDROGRAPH AT	UC87	19.	4.20	2.	1.	0.	.03
+	2 COMBINED AT	CP87	331.	4.47	65.	17.	6.	1.90
+	ROUTED TO	RD87N	330.	4.47	65.	16.	6.	1.90
+	HYDROGRAPH AT	UC82	32.	4.07	2.	1.	0.	.02
+	3 COMBINED AT	CP82	1216.	4.40	237.	60.	22.	2.45

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
ROUTED TO	R82	1216.	4.40	237.	60.	22.	2.45
+ DIVERSION TO	D84S	9.	4.33	0.	0.	0.	2.45
+ HYDROGRAPH AT	D84N	1208.	4.40	237.	60.	22.	2.45
+ HYDROGRAPH AT	UC84	20.	4.03	1.	0.	0.	.01
+ 2 COMBINED AT	CP84	1210.	4.40	238.	60.	22.	2.46
+ ROUTED TO	R84	1200.	4.53	238.	60.	22.	2.46
+ HYDROGRAPH AT	UC79	61.	4.17	8.	2.	1.	.08
+ HYDROGRAPH AT	UC78	266.	4.07	23.	6.	2.	.18
+ 3 COMBINED AT	CP7879	1265.	4.50	260.	66.	24.	2.72
+ ROUTED TO	R7879	1265.	4.50	260.	66.	24.	2.72
+ HYDROGRAPH AT	UC77	113.	4.10	13.	3.	1.	.10
+ 2 COMBINED AT	CP77	1304.	4.50	270.	68.	25.	2.81
+ ROUTED TO	R77	1304.	4.50	270.	68.	25.	2.81
+ HYDROGRAPH AT	UC89	74.	4.13	9.	2.	1.	.07
+ 2 COMBINED AT	CP89	1330.	4.50	277.	70.	25.	2.89
+ ROUTED TO	R89	1323.	4.57	276.	70.	25.	2.89
+ HYDROGRAPH AT	UC74	171.	4.17	20.	5.	2.	.15
+ HYDROGRAPH AT	UC76	51.	4.10	5.	1.	0.	.04
+ 2 COMBINED AT	CP7476	219.	4.17	25.	6.	2.	.19
+ ROUTED TO	R7476	219.	4.17	25.	6.	2.	.19
+ HYDROGRAPH AT	UC75	220.	4.13	25.	6.	2.	.19
+ 2 COMBINED AT	CP75	434.	4.13	50.	12.	4.	.38
+ ROUTED TO	R75	432.	4.17	50.	12.	4.	.38
HYDROGRAPH AT	UC90	33.	4.17	4.	1.	0.	.04

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC91	76.	4.20	9.	2.	1.	.07
+	4 COMBINED AT	CP90EN	1517.	4.47	322.	82.	29.	3.38
+	HYDROGRAPH AT	D84S	9.	4.33	0.	0.	0.	2.45
+	ROUTED TO	RD84S	9.	4.33	0.	0.	0.	2.45
+	DIVERSION TO	D84IIN	9.	4.33	0.	0.	0.	2.45
+	HYDROGRAPH AT	D84IIS	1.	4.33	0.	0.	0.	2.45
+	ROUTED TO	RD84IS	0.	4.47	0.	0.	0.	2.45
+	HYDROGRAPH AT	UC94	12.	4.50	3.	1.	0.	.03
+	2 COMBINED AT	CP94DS	9.	4.57	3.	1.	0.	2.48
+	ROUTED TO	R94DS	8.	4.73	2.	1.	0.	2.48
+	HYDROGRAPH AT	D84IIN	9.	4.33	0.	0.	0.	2.45
+	ROUTED TO	RD84IN	5.	4.53	0.	0.	0.	2.45
+	HYDROGRAPH AT	UC88	38.	4.77	13.	3.	1.	.11
+	3 COMBINED AT	CP88EN	39.	4.73	13.	3.	1.	2.59
+	HYDROGRAPH AT	UC95	50.	4.03	3.	1.	0.	.02
+	HYDROGRAPH AT	UC93	44.	4.17	6.	1.	1.	.04
+	HYDROGRAPH AT	UC96	65.	4.17	8.	2.	1.	.06

*** NORMAL END OF HEC-1 ***

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1*************************************
*                                   *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            JUN   1998             *
*          VERSION 4.1              *
*                                   *
*  RUN DATE   16MAR04  TIME  08:41:44 *
*                                   *
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*************************************
*                                   *
*   U.S. ARMY CORPS OF ENGINEERS    *
*   HYDROLOGIC ENGINEERING CENTER   *
*         609 SECOND STREET         *
*      DAVIS, CALIFORNIA 95616      *
*          (916) 756-1104           *
*                                   *
*************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID         UC MODEL - UNNAMED WASH, CENTRAL
   2          ID         10-YEAR 24-HOUR MODEL  FILENAME: UC1024F.DAT
   3          ID         EXISTING CONDITIONS
   4          ID         CAREFREE DRAINAGE MASTER PLAN
   5          ID         FCD 2000C037
   6          ID         BY CH2M HILL
   7          ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
   8          ID         DECEMBER 2001 (Final Revision March 2004)
   9          ID    ****************************************************************
  10          ID         10 YEAR ANALYSIS 24-HOUR STORM
  11          ID
  12          ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
  13          ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
  14          ID    ****************************************************************
  15          ID     DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
  16          ID
  17          ID     THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
  18          ID
  19          ID
              *DIAGRAM
  20          IT       2                    2000
  21          IO       5
  22          IN      15
  23          JD    3.16    0.01
  24          PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
  25          PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
  26          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
  27          PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
  28          PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
  29          PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
  30          PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
  31          PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
  32          PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
  33          PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
  34          JD   2.970   10.00
  35          JD   2.844   30.00
  36          JD   2.718   60.00
  37          JD   2.673   90.00
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 38          JD   2.635  120.00
 39          JD   2.607  150.00
 40          JD   2.528  300.00
 41          JD   2.465  500.00
             *
             *

 42          KK     UC8
 43          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 44          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 45          KM    L= 1.04   Kb= 0.031   S=138.0
 46          BA    .054
 47          LG     .30     .36     4.9     .26    36.0
 48          UC    .271    .472
 49          UA       0       5      16      30      65      77      84      90      94      97
 50          UA     100
             *
1                                          HEC-1 INPUT
PAGE  2

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 51          KK     UC9
 52          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 53          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 54          KM    L= 0.91   Kb= 0.031   S=145.0
 55          BA    .047
 56          LG     .30     .36     5.0     .23    36.0
 57          UC    .246    .380
 58          UA       0       5      16      30      65      77      84      90      94      97
 59          UA     100
             *

 60          KK    CPC89
 61          KM    CONCENTRATION POINT 89
 62          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 63          HC       2
             *

 64          KK   RCP89
 65          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 66          KM    NORMAL DEPTH CHANNEL ROUTING
 67          KM    ENDPOINTS WERE EXTENDED
 68          KM    SLOPE = (2596-2540)/2933
 69          RS       5    FLOW      -1
 70          RC   0.045   0.035   0.045    2933  0.0191
 71          RX       0      90      99     100     108     109     120     200
 72          RY     108     104     102     100     100     102     104     108
 73          RL                    0.15     100
             *

 74          KK    UC18
 75          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 76          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 77          KM    L= 0.56   Kb= 0.091   S=101.0
 78          BA    .040
 79          LG     .25     .36     5.0     .23   24.00
 80          UC    .217    .264
 81          UA       0       5      16      30      65      77      84      90      94      97
 82          UA     100
             *

 83          KK    UC19
 84          KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 85          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 86          KM    L= 0.52   Kb= 0.069   S=135.0
 87          BA    .027
 88          LG     .25     .36    5.00     .23   18.00
 89          UC    .196    .279
             *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  90          KK  CP1819
  91          KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
  92          HC       3
              *

  93          KK   R1819
  94          KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
  95          KM    ENDPOINTS WERE EXTENDED
  96          KM    SLOPE = (2540-2511)/1790
  97          RS       2    FLOW      -1
  98          RC   0.045   0.030   0.045    1790  0.0162
  99          RX       0      92      99     100     112     113     120     200
 100          RY     108     104     102     100     100     102     104     108
 101          RL                    0.25     100
              *

 102          KK    UC22
 103          KM   SUBBASIN 22, UNNAMED WASH CENTRAL
 104          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 105          KM    L= .76   Kb= .104   S=111.0
 106          BA    .032
 107          LG     .25     .36    5.00     .23   14.00
 108          UC    .254    .462
              *

 109          KK    UC23
 110          KM   SUBBASIN 23, UNNAMED WASH CENTRAL
 111          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 112          KM    L= .40   Kb= 0.125   S=121.0
 113          BA    .013
 114          LG     .25     .36    5.00     .23   18.00
 115          UC    .183    .085
              *

 116          KK  CP2223
 117          KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
 118          HC       3
              *

 119          KK   R2223
 120          KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
 121          KM    ENDPOINTS WERE EXTENDED
 122          KM    SLOPE = (2511-2482)/1862
 123          RS       2    FLOW      -1
 124          RC   0.045    0.03   0.045    1862  0.0156
 125          RX       0      95      99     100     112     113     117     200
 126          RY     108     104     102     100     100     102     104     108
 127          RL                    0.25     100
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 128          KK    UC28
 129          KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
 130          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 131          KM    L= .57   Kb= 0.106   S=109.0
 132          BA    .055
 133          LG     .25     .36    4.90     .25   14.00
 134          UC    .217    .171
              *

 135          KK     R28
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136          KM    ROUTING REACH FROM CP1028 TO CP2930 THROUGH SUBBASIN 30
137          KM    ENDPOINTS WERE EXTENDED
138          KM    SLOPE = (2502-2482)/1296
139          RS       2    FLOW      -1
140          RC   0.045   0.035   0.045    1296  0.0154
141          RX       0      86      99     100     108     109     122     200
142          RY     108     104     102     100     100     102     104     108
143          RL                    0.15     100
             *

144          KK    UC29
145          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
146          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
147          KM    L= .47   Kb= 0.116   S=109.0
148          BA    .035
149          LG     .25     .36    5.00     .23   12.00
150          UC    .200    .227
             *

151          KK   UC30
152          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
153          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
154          KM    L= .28   Kb= 0.126   S=134.0
155          BA    .012
156          LG     .25     .36    5.00     .23   12.00
157          UC    .150    .202
             *

158          KK  CP2930
159          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
160          KM    CP2223
161          HC       4
             *

162          KK   R2930
163          KM   Routing flow from CP2930 to CP34 through subbasin 34
164          KM    SLOPE = (2482-2469)/925
165          KM    ENDPOINTS WERE EXTENDED
166          RS       1    FLOW      -1
167          RC   0.045   0.030   0.045     925  0.0141
168          RX       0      89      99     100     110     111     122     200
169          RY     108     104     102     100     100     102     104     108
170          RL                    0.15     100
             *
1                                                HEC-1 INPUT
PAGE  5

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

171          KK    UC34
172          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
173          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
174          KM    L= .31   Kb = 0.116   S= 117.0
175          BA    .037
176          LG     .25     .36    4.90     .22   12.00
177          UC    .154    .118
             *

178          KK    CP34
179          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
180          KM   R2930
181          HC       2
             *

182          KK     R34
183          KM   Routing flow from CP34 to CP3537 through subbasin 37
184          KM    ENDPOINTS WERE EXTENDED
185          KM    SLOPE = (2469-2318)/6475
186          RS      11    FLOW      -1
187          RC   0.045   0.035   0.045    6475   .0233
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188          RX       0      90      99     100     105     106     115     200
189          RY     108     104     102     100     100     102     104     108
190          RL                    0.15     100
             *

191          KK    UC37
192          KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
193          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
194          KM    L= 2.03   Kb= 0.160   S= 98.0
195          BA    .207
196          LG     .25     .39    3.70     .16   24.00
197          UC    .429    .624
             *

198          KK    UC35
199          KM   SUBBASIN 35, UNNAMED WASH CENTRAL
200          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
201          KM    L= 1.27   Kb= 0.035   S=138.0
202          BA    .261
203          LG     .25     .38    3.90     .20   24.00
204          UC    .304    .256
             *

205          KK  CP3537
206          KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
207          KM    R34
208          HC       3
             *
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                                        HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

209          KK   R3537
210          KM   Routing flow from CP3537 to CP3149 through subbasin 49
211          KM    ENDPOINTS WERE EXTENDED
212          KM    SLOPE = (2318-2280)/1829
213          RS       3    FLOW      -1
214          RC   0.045   0.035   0.045    1829  0.0208
215          RX       0      90      99     100     105     106     115     200
216          RY     108     104     102     100     100     102     104     108
217          RL                    0.15     100
             *

218          KK    UC49
219          KM   SUBBASIN 49, UNNAMED WASH CENTRAL
220          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
221          KM    L= .47   Kb= 0.032   S=148.0
222          BA    .048
223          LG     .25     .39    3.60     .15   30.00
224          UC    .175    .166
             *

225          KK    UC31
226          KM   SUBBASIN 31, UNNAMED WASH CENTRAL
227          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
228          KM    L= 2.04   Kb= 0.066   S= 128.0
229          BA    .405
230          LG     .25     .38    4.10     .18   20.00
231          UC    .371    .364
             *

232          KK  CP3149
233          KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
234          KM     R3537
235          HC       3
             *

236          KK   R3149
237          KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
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 238          KM    ENDPOINTS WERE EXTENDED
 239          KM    SLOPE = (2280-2256)/1219
 240          RS       2    FLOW      -1
 241          RC   0.045   0.030   0.045    1219  0.0197
 242          RX       0      95      99     100     110     111     118     200
 243          RY     110     104     102     100     100     102     104     110
 244          RL                    0.15     100
              *

 245          KK    UC46
 246          KM   SUBBASIN 46, UNNAMED WASH CENTRAL
 247          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 248          KM    L= .30  Kb= 0.060   Adj. Slope= 324.0
 249          BA    .034
 250          LG     .25     .39    3.60     .15   24.00
 251          UC    .154    .121
 252          UA       0       5      16      30      65      77      84      90      94      97
1                                                HEC-1 INPUT
PAGE  7

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 253          UA     100
              *

 254          KK     R46
 255          KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
 256          KM    ENDPOINTS WERE EXTENDED
 257          KM    SLOPE = (2346-2315)/1783
 258          RS       3    FLOW      -1
 259          RC   0.045   0.035   0.045    1783  0.0174
 260          RX       0      92      99     100     105     106     113     200
 261          RY     108     104     102     100     100     102     104     108
 262          RL                    0.15     100
              *

 263          KK    UC45
 264          KM   SUBBASIN 45, UNNAMED WASH CENTRAL
 265          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 266          KM    L= .48   Kb= 0.030   S= 135.0
 267          BA    .086
 268          LG     .25     .39    3.60     .15   24.00
 269          UC    .175    .121
 270          UA       0       5      16      30      65      77      84      90      94      97
 271          UA     100
              *

 272          KK    UC47
 273          KM   SUBBASIN 47, UNNAMED WASH CENTRAL
 274          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 275          KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
 276          BA    .031
 277          LG     .25     .39    3.60     .15   24.00
 278          UC    .167    .171
 279          UA       0       5      16      30      65      77      84      90      94      97
 280          UA     100
              *

 281          KK  CP4547
 282          KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
 283          KM    R46
 284          HC       3
              *

 285          KK   R4547
 286          KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
 287          KM   ENDPOINTS WERE EXTENDED
 288          KM    SLOPE = (2315-2256)/2170
 289          RS       4    FLOW      -1
 290          RC   0.045   0.035   0.045    2170   .0272
 291          RX       0      90      99     100     105     106     115     200
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292          RY     108     104     102     100     100     102     104     108
293          RL                    0.15     100
             *
                                          HEC-1 INPUT
1
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

294          KK    UC48
295          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
296          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
297          KM    L= .92   Kb= 0.048   S= 117.0
298          BA    .197
299          LG     .25     .39    3.70     .16   30.00
300          UC    .342    .265
             *

301          KK    UC50
302          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
303          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
304          KM    L= .27   Kb= 0.037   S= 93.0
305          BA    .019
306          LG     .25     .38    3.80     .24   24.00
307          UC    .167    .169
             *

308          KK  CP4850
309          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
310          KM    R3149 AND R4547
311          HC       4
             *

312          KK   R4850
313          KM   Routing flow from CP4850 to CP5157 through subbasin 57
314          KM    ENDPOINTS WERE EXTENDED
315          KM    SLOPE = (2256-2235)/1509
316          RS       2    FLOW      -1
317          RC   0.045   0.030   0.045    1509  0.0139
318          RX       0      95      99     100     115     116     120     200
319          RY     106     104     102     100     100     102     104     106
320          RL                    0.25     100
             *

321          KK    UC51
322          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
323          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
324          KM    L= .42   Kb= 0.061   Adj. Slope= 317.0
325          BA    .060
326          LG     .25     .36    5.00     .21   26.00
327          UC    .146    .109
             *

328          KK    UC57
329          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
330          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
331          KM    L= .47   Kb= 0.061   S= 200.0
332          BA    .037
333          LG     .25     .37    4.20     .28   20.00
334          UC    .233    .266
             *
1                                         HEC-1 INPUT
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

335          KK  CP5157
336          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
337          KM     R4850
338          HC       3
```

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                 *

339              KK   R5157
340              KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
341              KM    ENDPOINTS WERE EXTENDED
342              KM    SLOPE = (2235-2208)/1796
343              RS       2    FLOW      -1
344              RC   0.045   0.030   0.045    1796  0.0150
345              RX       0      60      99     100     100     121     160     220
346              RY     110     104     102     100     100     102     104     110
347              RL                    0.35     100
                 *

348              KK    UC58
349              KM   SUBBASIN 58, UNNAMED WASH CENTRAL
350              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
351              KM    L= .69   Kb= 0.055  Adj. Slope= 317.0
352              BA    .110
353              LG     .25     .37    4.80     .13   20.00
354              UC    .217    .177
                 *

355              KK    UC59
356              KM   SUBBASIN 59, UNNAMED WASH CENTRAL
357              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
358              KM    L= .49   Kb= 0.105   S= 112.0
359              BA    .034
360              LG     .25     .32    5.80     .33   14.00
361              UC    .208    .252
                 *

362              KK  CP5859
363              KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
364              KM     R5157
365              HC       3
                 *

366              KK  D5859N
367              KM    DIVERSION OF FLOWS AT FLOW SPLIT
368              DT  D5859S
369              DI       0      50     100     500   10000
370              DQ       0    24.9    49.5   248.5    4970
                 *

371              KK  R5859N
372              KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
373              KM   ENDPOINTS WERE EXTENDED
374              KM    SLOPE = (2208-2195)/699
375              RS       1    FLOW      -1
376              RC   0.045   0.030   0.045     699  0.0186
```



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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

377              RX       0      50      99     100     110     111     160     210
378              RY     104     103     102     100     100     102     103     104
379              RL                    0.15     100
                 *

380              KK    UC63
381              KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
382              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
383              KM    L= .81   Kb= 0.056   Adj. Slope= 322.0
384              BA    .117
385              LG     .25     .36    5.00     .19   19.00
386              UC    .242    .219
                 *

387              KK    CP63
388              KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
```

```
389          KM   FROM RD5859N
390          HC       2
             *

391          KK     R63
392          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
393          KM    SLOPE = (2195-2170)/1394
394          RS       2    FLOW      -1
395          RC   0.045   0.030   0.045    1394  0.0179
396          RX      60      80      99     100     125     126     145     165
397          RY     106     104     102     100     100     102     104     106
398          RL                   0.35     100
             *

399          KK    UC66
400          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
401          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
402          KM    L= .54   Kb= 0.081   Adj. Slope= 324.0
403          BA    .037
404          LG     .25     .36    5.00     .25   14.00
405          UC    .200    .247
             *

406          KK    UC62
407          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
408          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
409          KM    L= 1.33   Kb= 0.057   Adj. Slope= 321.0
410          BA    .361
411          LG     .25     .35    6.10     .13   14.00
412          UC    .300    .219
             *

413          KK  CP6266
414          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
415          KM   FROM R63
416          HC       3
             *
```

1
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

417          KK   R6266
418          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
419          KM    SLOPE = (2170-2150)/990
420          RS       2    FLOW      -1
421          RC   0.045   0.030   0.045     990  0.0202
422          RX      25      85      99     100     100     121     135     195
423          RY     106     104     102     100     100     102     104     106
424          RL                   0.35     100
             *

425          KK  D5859S
426          KM   RECALL DIVERTED FLOW FROM D5859N
427          DR  D5859S
             *

428          KK  R5859S
429          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
430          KM    SLOPE = (2208-2194)/803
431          RS       1    FLOW      -1
432          RC   0.045   0.030   0.045     803  0.0174
433          RX       0      50      99     100     125     126     175     225
434          RY     104     103     102     100     100     102     103     104
435          RL                   0.15     100
             *

436          KK    UC64
437          KM   SUBBASIN 64, UNNAMED WASH CENTRAL
438          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
```

```
 439          KM    L= .15   Kb= 0.078   S= 166.0
 440          BA    .002
 441          LG     .25     .31    6.90     .20   14.00
 442          UC    .154    .219
              *

 443          KK    CP64
 444          KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
 445          KM    DIVERSION RD5859N
 446          HC       2    1.88
              *

 447          KK    D64N
 448          KM   DIVERSION OF FLOWS AT FLOW SPLIT
 449          KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
 450          DT    D64S
 451          DI       0      50     100     500   10000
 452          DQ       0    22.5      45     225    4500
              *

 453          KK   RD64N
 454          KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
 455          KM   ENDPOINTS WERE EXTENDED
 456          KM    SLOPE = (2194-2161)/1721
 457          RS       2    FLOW      -1
 458          RC   0.045   0.030   0.045    1721  0.0192
1                                           HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 459          RX       0      60      99     100     112     113     152     200
 460          RY     106     104     102     100     100     102     104     106
 461          RL                    0.25     100
              *

 462          KK    UC87
 463          KM   SUBBASIN 87, UNNAMED WASH CENTRAL
 464          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 465          KM    L= .33   Kb= 0.118   S= 101.0
 466          BA    .029
 467          LG     .25     .35    3.40     .62    8.00
 468          UC    .179    .187
              *

 469          KK    CP87
 470          KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
 471          KM    DIVERSION RD64N
 472          HC       2
              *

 473          KK   RD87N
 474          KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
 475          KM    SLOPE = (2161-2150)/557
 476          RS       1    FLOW      -1
 477          RC   0.045   0.030   0.045     557  0.0197
 478          RX      25      85      99     100     120     121     135     195
 479          RY     106     104     102     100     100     102     104     106
 480          RL                    0.35     100
              *

 481          KK    UC82
 482          KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
 483          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 484          KM    L= .22   Kb= 0.136   Adj. Slope= 220.0
 485          BA    .022
 486          LG     .25     .36    4.30    .400   14.00
 487          UC    .133    .106
              *

 488          KK    CP82
```

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489          KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
490          KM   SUBBASIN 82
491          HC       3    2.45
             *

492          KK     R82
493          KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
494          KM    SLOPE = (2150-2138)/579
495          RS       1    FLOW      -1
496          RC   0.045   0.030   0.045     579  0.0207
497          RX      50      75      99     100     125     126     150     175
498          RY     106     104     102     100     100     102     104     106
499          RL                   0.35     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

500          KK    D84N
501          KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
502          KM   PART OF TRIPLE DIVERSION JUST UPSTREAM OF TERRAVITA WAY
503          DT    D84S
504          DI       0     500    1275    1550    1964    2475    3223    4000
505          DQ       0       0       0    79.7     255     490     888    1250
             *

506          KK    UC84
507          KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
508          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
509          KM    L= .30   Kb= 0.102   Adj. Slope= 246.0
510          BA    .013
511          LG     .25     .36    4.50     .35   14.00
512          UC    .162    .194
             *

513          KK    CP84
514          KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
515          KM    FROM D84N
516          HC       2
             *

517          KK     R84
518          KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
519          KM   ENDPOINTS WERE EXTENDED
520          KM    SLOPE = (2138-2054)/3463
521          RS       5    FLOW      -1
522          RC   0.045   0.030   0.045    3463  0.0243
523          RX       0      94      99     100     110     111     116     200
524          RY     106     104     102     100     100     102     104     106
525          RL                   0.15     100
             *

526          KK    UC79
527          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
528          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
529          KM    L= .88   Kb= 0.040   Adj. Slope= 233.0
530          BA    .078
531          LG     .25     .35    4.30     .45   18.00
532          UC    .229    .277
533          UA       0       5      16      30      65      77      84      90      94      97
534          UA     100
             *

535          KK    UC78
536          KM   SUBBASIN 78, UNNAMED WASH CENTRAL
537          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
538          KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
539          BA    .177
540          LG     .25     .35    6.00     .17   17.00
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 541          UC    .196    .144
 542          UA       0       5      16      30      65      77      84      90      94      97
 543          UA     100
              *
```


HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 544          KK  CP7879
 545          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
 546          KM    FROM R84
 547          HC       3
              *

 548          KK   R7879
 549          KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
 550          KM   ENDPOINTS WERE EXTENDED
 551          KM    SLOPE = (2054-2048)/256
 552          RS      1    FLOW      -1
 553          RC   0.045   0.030   0.045     256   .0234
 554          RX       0      90      99     100     120     121     130     200
 555          RY     106     104     102     100     100     102     104     106
 556          RL                    0.35     100
              *

 557          KK    UC77
 558          KM   SUBBASIN 77, UNNAMED WASH CENTRAL
 559          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 560          KM    L= .93   Kb= 0.048 Adj. Slope= 324.0
 561          BA    .096
 562          LG     .25     .34    6.70     .13   16.00
 563          UC    .221    .247
 564          UA       0       5      16      30      65      77      84      90      94      97
 565          UA     100
              *

 566          KK    CP77
 567          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
 568          KM    FROM R7879
 569          HC       2
              *

 570          KK     R77
 571          KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
 572          KM   ENDPOINTS WERE EXTENDED
 573          KM    SLOPE = (2048-2037)/593
 574          RS       1    FLOW      -1
 575          RC   0.045   0.030   0.045     593  0.0185
 576          RX       0      80      99     100     115     116     120     200
 577          RY     106     104     102     100     100     102     104     106
 578          RL                    0.25     100
              *

 579          KK    UC89
 580          KM   SUBBASIN 89, UNNAMED WASH CENTRAL
 581          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 582          KM    L= .77   Kb= 0.057   S= 126.0
 583          BA    .073
 584          LG     .25     .33    6.40     .20   17.00
 585          UC    .233    .265
 586          UA       0       5      16      30      65      77      84      90      94      97
 587          UA     100
              *
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HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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588          KK    CP89
589          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
590          KM    FROM R77
591          HC       2
             *

592          KK     R89
593          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
594          KM   CHANNEL ENDS WERE EXTENDED
595          KM    SLOPE = (2037-2008)/1912
596          RS       2    FLOW      -1
597          RC   0.045   0.030   0.045    1912  0.0152
598          RX       0      80      99     100     115     116     135     200
599          RY     106     104     102     100     100     102     104     106
600          RL                    0.25     100
             *

601          KK    UC74
602          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
603          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
604          KM    L= 1.13   Kb= 0.071   Adj. Slope= 328.0
605          BA    .151
606          LG     .25     .34    6.60     .13   14.00
607          UC    .237    .243
             *

608          KK    UC76
609          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
610          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
611          KM    L= .64   Kb= 0.053   Adj. Slope= 302.0
612          BA    .041
613          LG     .25     .35    6.10     .16   14.00
614          UC    .167    .219
             *

615          KK  CP7476
616          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
617          HC       2
             *

618          KK   R7476
619          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
620          KM   END POINTS WERE EXTENDED
621          KM    SLOPE = (2031-2017)/524
622          RS       1    FLOW      -1
623          RC   0.045   0.030   0.045     524  0.0267
624          RX       0      80      99     100     112     113     132     200
625          RY     106     104     102     100     100     102     104     106
626          RL                    0.25     100
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

627          KK    UC75
628          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
629          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
630          KM    L= 1.38   Kb= 0.068   Adj. Slope= 322.0
631          BA    .192
632          LG     .25     .34    6.50     .15   14.00
633          UC    .229    .239
634          UA       0       5      16      30      65      77      84      90      94      97
635          UA     100
             *

636          KK    CP75
637          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
638          KM    FROM R7476
639          HC       2
```

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                 *

640              KK     R75
641              KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
642              KM   END POINTS WERE EXTENDED
643              KM    SLOPE = (2017-2008)/723
644              RS       1    FLOW      -1
645              RC   0.045   0.030   0.045     723  0.0124
646              RX       0      80      99     100     115     116     135     200
647              RY     106     104     102     100     100     102     104     106
648              RL                    0.25     100
                 *

649              KK    UC90
650              KM   SUBBASIN 90, UNNAMED WASH CENTRAL
651              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
652              KM    L= .48   Kb= 0.103   S= 151.0
653              BA    .038
654              LG     .25     .35    3.70     .55   14.00
655              UC    .192    .210
                 *

656              KK    UC91
657              KM   SUBBASIN 91, UNNAMED WASH CENTRAL
658              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
659              KM    L= .75   Kb= 0.107   S= 109.0
660              BA    .073
661              LG     .25     .31    7.40     .14   14.00
662              UC    .242    .271
                 *
                 *

663              KK  CP90EN
664              KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
665              KM    FROM R89 AND R75
666              HC       4
                 *
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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

667              KK    D84S
668              KM   RETREVIAL OF DIVERTED FLOW FROM D84S
669              DR    D84S
                 *

670              KK   RD84S
671              KM   ROUTING FLOW FROM CP84 (D84S) TO D84ii
672              KM    SLOPE = (2144-2140)/303
673              RS       6    FLOW      -1
674              RC   0.045   0.030   0.045     303  0.0132
675              RX       0      50      99     100     125     126     175     225
676              RY     106     104     102     100     100     102     104     106
677              RL                    0.35     100
                 *

678              KK  D84IIS
679              KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
680              KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
681              DT  D84IIN
682              DI       0    79.7     255     490     880    1250
683              DQ       0    78.3     229     419     732    1000
                 *

684              KK  RD84IS
685              KM   ROUTING FLOWS FROM D84IIS TO CP94DS
686              KM   SLOPE = (2140-2078)/3225
687              RS       1    FLOW      -1
688              RC   0.045   0.030   0.045    3225  0.0192
```

```
689          RX       0      50      99     100     125     126     175     225
690          RY     106     104     102     100     100     102     104     106
691          RL                    0.25     100
             *

692          KK    UC94
693          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
694          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
695          KM    L= .53   Kb= 0.119   S= 108.0
696          BA    .028
697          LG     .25     .36    5.00     .23   13.00
698          UC    .671   1.082
             *

699          KK  CP94DS
700          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
701          KM   FROM RD84IS
702          HC       2
             *

703          KK   R94DS
704          KM   ROUTING FLOW FROM CP94DS TO CP88EN
705          KM   SLOPE = (2078-2041)/1950
706          RS       1    FLOW      -1
707          RC   0.045   0.030   0.045    1950  0.0189
708          RX      60      85      99     100     108     109     123     148
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

709          RY     106     104     102     100     100     102     104     106
710          RL                    0.25     100
             *

711          KK  D84IIN
712          KM   RECALL DIVERTED FLOW FROM D84II
713          DR  D84IIN
             *

714          KK  RD84IN
715          KM   ROUTING FLOW FROM D84II TO CP88EN
716          KM   SLOPE = (2140-2041)/5175
717          RS       1    FLOW      -1
718          RC   0.045   0.030   0.045    5175  0.0191
719          RX      60      78      90     100     125     132     135     150
720          RY     106     104     102     100     100     102     104     106
721          RL                    0.25     100
             *

722          KK    UC88
723          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
724          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
725          KM    L= 1.08   Kb= 0.104   S=111.0
726          BA    .108
727          LG     .25     .33    6.10     .20   14.00
728          UC    .962   1.337
             *

729          KK  CP88EN
730          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
731          KM    FROM R94DS AND RD84IN
732          HC       3
             *

733          KK    UC95
734          KM   SUBBASIN 95, UNNAMED WASH CENTRAL
735          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
736          KM    L= 0.22   Kb= 0.120   Adj.Slope= 220
737          BA    .024
738          LG     .25     .39    3.70     .15    5.00
```

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739          UC    .108    .079
             *

740          KK    UC93
741          KM   SUBBASIN 93, UNNAMED WASH CENTRAL
742          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
743          KM    L= .64   Kb= 0.093   S= 135.0
744          BA    .038
745          LG     .25     .30    8.00     .07   13.00
746          UC   1.000   1.677
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

747          KK    UC96
748          KM   SUBBASIN 96, UNNAMED WASH CENTRAL
749          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
750          KM    L= .73   Kb= 0.110  S= 113.0
751          BA    .061
752          LG     .25     .32    7.00     .12   13.00
753          UC    .233    .279
             *
             *
754          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
PUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 42         UC8
             .
             .
 51          .         UC9
             .           .
             .           .
 60       CPC8............
             V
             V
 64      RCP89
             .
             .
 74          .        UC18
             .           .
             .           .
 83          .           .        UC19
             .           .           .
             .           .           .
 90    CP1819........................
             V
             V
 93      R1819
             .
             .
102          .        UC22
             .           .
             .           .
109          .           .        UC23
             .           .           .
             .           .           .
116    CP2223........................
             V
             V
119      R2223
             .
             .
128          .        UC28
             .           V
             .           V
135          .         R28
             .           .
             .           .
144          .           .        UC29
             .           .           .
             .           .           .
151          .           .           .       UC30
             .           .           .           .
             .           .           .           .
158    CP2930......................................
             V
             V
162      R2930
             .
             .
171          .        UC34
             .           .
             .           .
178       CP34............
             V
             V
182        R34
             .
             .
191          .        UC37
```

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            .           .
            .           .
198         .           .        UC35
            .           .           .
            .           .           .
205     CP3537.......................
            V
            V
209      R3537
            .
            .
218         .        UC49
            .           .
            .           .
225         .           .        UC31
            .           .           .
            .           .           .
232     CP3149.......................
            V
            V
236      R3149
            .
            .
245         .        UC46
            .           V
            .           V
254         .         R46
            .           .
            .           .
263         .           .        UC45
            .           .           .
            .           .           .
272         .           .           .        UC47
            .           .           .           .
            .           .           .           .
281         .      CP4547.......................
            .           V
            .           V
285         .       R4547
            .           .
            .           .
294         .           .        UC48
            .           .           .
            .           .           .
301         .           .           .        UC50
            .           .           .           .
            .           .           .           .
308     CP4850..................................
            V
            V
312      R4850
            .
            .
321         .        UC51
            .           .
            .           .
328         .           .        UC57
            .           .           .
            .           .           .
335     CP5157.......................
            V
            V
339      R5157
            .
            .
348         .        UC58
            .           .
            .           .
355         .           .        UC59
            .           .           .
            .           .           .
```

```
362      CP5859.......................
              .
              .
368           .-------> D5859S
366      D5859N
              V
              V
371      R5859N
              .
              .
380           .        UC63
              .           .
              .           .
387        CP63............
              V
              V
391         R63
              .
              .
399           .        UC66
              .           .
              .           .
406           .           .        UC62
              .           .           .
              .           .           .
413      CP6266.......................
              V
              V
417       R6266
              .
              .
427           .           .<-------  D5859S
425           .      D5859S
              .           V
              .           V
428           .      R5859S
              .           .
              .           .
436           .           .        UC64
              .           .           .
              .           .           .
443           .        CP64............
              .           .
              .           .
450           .           .------->    D64S
447           .        D64N
              .           V
              .           V
453           .       RD64N
              .           .
              .           .
462           .           .        UC87
              .           .           .
              .           .           .
469           .        CP87............
              .           V
              .           V
473           .       RD87N
              .           .
              .           .
481           .           .        UC82
              .           .           .
              .           .           .
488        CP82.......................
              V
              V
492         R82
              .
              .
503           .------->    D84S
500        D84N
```

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              .
              .
506           .        UC84
              .           .
              .           .
513        CP84............
              V
              V
517         R84
              .
              .
526           .        UC79
              .           .
              .           .
535           .           .        UC78
              .           .           .
              .           .           .
544      CP7879......................
              V
              V
548       R7879
              .
              .
557           .        UC77
              .           .
              .           .
566        CP77............
              V
              V
570         R77
              .
              .
579           .        UC89
              .           .
              .           .
588        CP89............
              V
              V
592         R89
              .
              .
601           .        UC74
              .           .
              .           .
608           .           .        UC76
              .           .           .
              .           .           .
615           .      CP7476............
              .           V
              .           V
618           .       R7476
              .           .
              .           .
627           .           .        UC75
              .           .           .
              .           .           .
636           .        CP75............
              .           V
              .           V
640           .         R75
              .           .
              .           .
649           .           .        UC90
              .           .           .
              .           .           .
656           .           .           .        UC91
              .           .           .           .
              .           .           .           .
663      CP90EN..................................
              .
              .
```

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669          .          .<-------    D84S
667          .       D84S
             .          V
             .          V
670          .      RD84S
             .          .
             .          .
681          .          .-------> D84IIN
678          .     D84IIS
             .          V
             .          V
684          .     RD84IS
             .          .
             .          .
692          .          .        UC94
             .          .           .
             .          .           .
699          .     CP94DS............
             .          V
             .          V
703          .      R94DS
             .          .
             .          .
713          .          .           .<-------  D84IIN
711          .          .     D84IIN
             .          .          V
             .          .          V
714          .          .     RD84IN
             .          .           .
             .          .           .
722          .          .           .        UC88
             .          .           .           .
             .          .           .           .
729          .     CP88EN......................
             .          .
             .          .
733          .          .        UC95
             .          .           .
             .          .           .
740          .          .           .        UC93
             .          .           .           .
             .          .           .           .
747          .          .           .           .        UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	45.	12.10	7.	2.	1.	.05
+	HYDROGRAPH AT	UC9	46.	12.10	7.	2.	1.	.05
+	2 COMBINED AT	CPC8	90.	12.10	14.	4.	2.	.10
+	ROUTED TO	RCP89	87.	12.20	14.	4.	2.	.10
+	HYDROGRAPH AT	UC18	46.	12.07	5.	1.	1.	.04
+	HYDROGRAPH AT	UC19	29.	12.10	3.	1.	0.	.03
+	3 COMBINED AT	CP1819	151.	12.13	22.	7.	2.	.17
+	ROUTED TO	R1819	148.	12.20	21.	6.	2.	.17
+	HYDROGRAPH AT	UC22	25.	12.13	3.	1.	0.	.03
+	HYDROGRAPH AT	UC23	22.	12.03	2.	0.	0.	.01
+	3 COMBINED AT	CP2223	182.	12.17	26.	8.	3.	.21
+	ROUTED TO	R2223	180.	12.20	26.	8.	3.	.21
+	HYDROGRAPH AT	UC28	70.	12.07	6.	2.	1.	.05
+	ROUTED TO	R28	69.	12.13	6.	2.	1.	.05
+	HYDROGRAPH AT	UC29	41.	12.07	4.	1.	0.	.04
+	HYDROGRAPH AT	UC30	15.	12.07	1.	0.	0.	.01
+	4 COMBINED AT	CP2930	284.	12.17	36.	11.	4.	.31
+	ROUTED TO	R2930	280.	12.20	36.	10.	4.	.31
+	HYDROGRAPH AT	UC34	57.	12.03	4.	1.	0.	.04
+	2 COMBINED AT	CP34	310.	12.17	40.	12.	4.	.35
+	ROUTED TO	R34	299.	12.33	40.	11.	4.	.35

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
	HYDROGRAPH AT	UC37	141.	12.27	28.	8.	3.	.21
+	HYDROGRAPH AT	UC35	291.	12.13	33.	10.	4.	.26
+	3 COMBINED AT	CP3537	644.	12.27	100.	29.	10.	.82
+	ROUTED TO	R3537	636.	12.33	100.	29.	10.	.82
+	HYDROGRAPH AT	UC49	74.	12.07	7.	2.	1.	.05
+	HYDROGRAPH AT	UC31	365.	12.20	50.	14.	5.	.41
+	3 COMBINED AT	CP3149	987.	12.27	155.	45.	16.	1.27
+	ROUTED TO	R3149	984.	12.30	155.	45.	16.	1.27
+	HYDROGRAPH AT	UC46	59.	12.03	5.	1.	0.	.03
+	ROUTED TO	R46	57.	12.07	5.	1.	0.	.03
+	HYDROGRAPH AT	UC45	147.	12.03	12.	3.	1.	.09
	HYDROGRAPH AT	UC47	48.	12.03	4.	1.	0.	.03
+	3 COMBINED AT	CP4547	247.	12.03	21.	6.	2.	.15
+	ROUTED TO	R4547	240.	12.10	21.	6.	2.	.15
+	HYDROGRAPH AT	UC48	224.	12.17	28.	8.	3.	.20
+	HYDROGRAPH AT	UC50	27.	12.07	2.	1.	0.	.02
+	4 COMBINED AT	CP4850	1309.	12.20	204.	59.	21.	1.64
+	ROUTED TO	R4850	1298.	12.27	204.	59.	21.	1.64
+	HYDROGRAPH AT	UC51	99.	12.03	8.	2.	1.	.06
+	HYDROGRAPH AT	UC57	40.	12.10	4.	1.	0.	.04
+	3 COMBINED AT	CP5157	1345.	12.27	215.	63.	23.	1.74
+	ROUTED TO	R5157	1336.	12.30	215.	63.	23.	1.74
+	HYDROGRAPH AT	UC58	157.	12.07	15.	4.	1.	.11
	HYDROGRAPH AT							

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+		UC59	34.	12.10	3.	1.	0.	.03
	3 COMBINED AT							
+		CP5859	1426.	12.27	232.	67.	24.	1.88
	DIVERSION TO							
+		D5859S	709.	12.27	115.	33.	12.	1.88
	HYDROGRAPH AT							
+		D5859N	717.	12.27	117.	34.	12.	1.88
	ROUTED TO							
+		R5859N	713.	12.30	117.	34.	12.	1.88
	HYDROGRAPH AT							
+		UC63	142.	12.10	14.	4.	1.	.12
	2 COMBINED AT							
+		CP63	794.	12.27	130.	38.	14.	2.00
	ROUTED TO							
+		R63	793.	12.30	130.	37.	13.	2.00
	HYDROGRAPH AT							
+		UC66	41.	12.10	4.	1.	0.	.04
	HYDROGRAPH AT							
+		UC62	431.	12.13	43.	12.	4.	.36
	3 COMBINED AT							
+		CP6266	1182.	12.20	175.	50.	18.	2.40
	ROUTED TO							
+		R6266	1177.	12.23	175.	50.	18.	2.40
	HYDROGRAPH AT							
+		D5859S	709.	12.27	115.	33.	12.	1.88
	ROUTED TO							
+		R5859S	707.	12.30	115.	33.	12.	1.88
	HYDROGRAPH AT							
+		UC64	3.	12.07	0.	0.	0.	.00
	2 COMBINED AT							
+		CP64	708.	12.30	115.	33.	12.	1.88
	DIVERSION TO							
+		D64S	318.	12.30	52.	15.	5.	1.88
	HYDROGRAPH AT							
+		D64N	389.	12.30	63.	18.	7.	1.88
	ROUTED TO							
+		RD64N	387.	12.37	63.	18.	7.	1.88
	HYDROGRAPH AT							
+		UC87	28.	12.07	2.	1.	0.	.03
	2 COMBINED AT							
+		CP87	395.	12.33	65.	19.	7.	1.91
	ROUTED TO							
+		RD87N	394.	12.37	65.	19.	7.	1.91
	HYDROGRAPH AT							
+		UC82	32.	12.03	2.	1.	0.	.02
	3 COMBINED AT							
+		CP82	1554.	12.23	241.	69.	25.	2.45

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
ROUTED TO	R82	1550.	12.27	241.	69.	25.	2.45
+ DIVERSION TO	D84S	82.	12.27	3.	1.	0.	2.45
+ HYDROGRAPH AT	D84N	1467.	12.27	238.	68.	25.	2.45
+ HYDROGRAPH AT	UC84	15.	12.07	1.	0.	0.	.01
+ 2 COMBINED AT	CP84	1474.	12.23	239.	69.	25.	2.46
+ ROUTED TO	R84	1454.	12.37	239.	68.	25.	2.46
+ HYDROGRAPH AT	UC79	71.	12.07	7.	2.	1.	.08
+ HYDROGRAPH AT	UC78	263.	12.03	21.	6.	2.	.18
+ 3 COMBINED AT	CP7879	1531.	12.37	265.	76.	27.	2.72
+ ROUTED TO	R7879	1532.	12.37	265.	76.	27.	2.72
+ HYDROGRAPH AT	UC77	119.	12.07	12.	3.	1.	.10
+ 2 COMBINED AT	CP77	1582.	12.33	277.	79.	29.	2.81
+ ROUTED TO	R77	1580.	12.37	276.	79.	29.	2.81
+ HYDROGRAPH AT	UC89	81.	12.07	8.	2.	1.	.07
+ 2 COMBINED AT	CP89	1613.	12.37	284.	81.	29.	2.89
+ ROUTED TO	R89	1598.	12.43	284.	81.	29.	2.89
+ HYDROGRAPH AT	UC74	180.	12.10	18.	5.	2.	.15
+ HYDROGRAPH AT	UC76	53.	12.07	5.	1.	0.	.04
+ 2 COMBINED AT	CP7476	230.	12.10	23.	6.	2.	.19
+ ROUTED TO	R7476	230.	12.10	23.	6.	2.	.19
+ HYDROGRAPH AT	UC75	233.	12.07	22.	6.	2.	.19
+ 2 COMBINED AT	CP75	453.	12.10	44.	12.	4.	.38
+ ROUTED TO	R75	452.	12.10	44.	12.	4.	.38
HYDROGRAPH AT	UC90	37.	12.07	3.	1.	0.	.04

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC91	82.	12.10	9.	2.	1.	.07
+	4 COMBINED AT	CP90EN	1838.	12.33	337.	96.	35.	3.38
+	HYDROGRAPH AT	D84S	82.	12.27	3.	1.	0.	2.45
+	ROUTED TO	RD84S	84.	12.27	3.	1.	0.	2.45
+	DIVERSION TO	D84IIN	82.	12.27	3.	1.	0.	2.45
+	HYDROGRAPH AT	D84IIS	3.	12.27	0.	0.	0.	2.45
+	ROUTED TO	RD84IS	1.	12.37	0.	0.	0.	2.45
+	HYDROGRAPH AT	UC94	11.	12.50	3.	1.	0.	.03
+	2 COMBINED AT	CP94DS	10.	12.47	3.	1.	0.	2.48
+	ROUTED TO	R94DS	10.	12.60	3.	1.	0.	2.48
+	HYDROGRAPH AT	D84IIN	82.	12.27	3.	1.	0.	2.45
+	ROUTED TO	RD84IN	29.	12.43	3.	1.	0.	2.45
+	HYDROGRAPH AT	UC88	33.	12.73	11.	3.	1.	.11
+	3 COMBINED AT	CP88EN	64.	12.50	17.	5.	2.	2.59
+	HYDROGRAPH AT	UC95	44.	12.00	3.	1.	0.	.02
+	HYDROGRAPH AT	UC93	12.	12.80	5.	1.	1.	.04
+	HYDROGRAPH AT	UC96	70.	12.10	7.	2.	1.	.06

*** NORMAL END OF HEC-1 ***

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN   1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   16MAR04  TIME  08:41:05   *
*                                       *
*****************************************
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*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID         UC MODEL - UNNAMED WASH, CENTRAL
   2          ID         100-YEAR 6-HOUR MODEL  FILENAME: UC1006F.DAT
   3          ID         FUTURE CONDITIONS
   4          ID         CAREFREE DRAINAGE MASTER PLAN
   5          ID         FCD 2000C037
   6          ID         BY CH2M HILL
   7          ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
   8          ID         JANUARY 2002 (Final Revision March 2004)
   9          ID    ****************************************************************
  10          ID         100 YEAR ANALYSIS 6-HOUR STORM
  11          ID
  12          ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
  13          ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
  14          ID    ****************************************************************
  15          ID      DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
  16          ID
  17          ID      THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
  18          ID
  19          ID
              *DIAGRAM
  20          IT       2                    2000
  21          IO       5
  22          IN      15
  23          JD    3.40    0.01
  24          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  25          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  26          PC   0.962   0.972   0.983   0.991   1.000
  27          JD   3.378    0.50
  28          PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
  29          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
  30          PC   0.962   0.972   0.983   0.991   1.000
  31          JD   3.314    2.80
  32          PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
  33          PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
  34          PC   0.950   0.963   0.975   0.988   1.000
  35          JD   3.135    16.0
  36          PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
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 37          PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
 38          PC   0.946   0.960   0.973   0.987   1.000
 39          JD   2.761    90.0
 40          PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
 41          PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
 42          PC   0.927   0.945   0.964   0.982   1.000
 43          JD   1.938   500.0
 44          PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
 45          PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
 46          PC   0.907   0.930   0.954   0.977   1.000
             *
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 47          KK     UC8
 48          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 49          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 50          KM    L= 1.04   Kb= 0.031   S=138.0
 51          BA    .054
 52          LG     .30     .36     4.9     .26    36.0
 53          UC    .296    .521
 54          UA       0       5      16      30      65      77      84      90      94      97
 55          UA     100
             *

 56          KK     UC9
 57          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 58          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 59          KM    L= 0.91   Kb= 0.031   S=145.0
 60          BA    .047
 61          LG     .30     .36     5.0     .23    36.0
 62          UC    .267    .416
 63          UA       0       5      16      30      65      77      84      90      94      97
 64          UA     100
             *

 65          KK    CPC89
 66          KM    CONCENTRATION POINT 89
 67          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 68          HC       2
             *

 69          KK   RCP89
 70          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 71          KM    NORMAL DEPTH CHANNEL ROUTING
 72          KM    ENDPOINTS WERE EXTENDED
 73          KM    SLOPE = (2596-2540)/2933
 74          RS       5    FLOW      -1
 75          RC   0.045   0.035   0.045    2933  0.0191
 76          RX       0      90      99     100     108     109     120     200
 77          RY     108     104     102     100     100     102     104     108
 78          RL                    0.15     100
             *

 79          KK    UC18
 80          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 81          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 82          KM    L= 0.56   Kb= 0.034   S=101.0
 83          BA    .040
 84          LG     .25     .36     5.0     .23   26.00
 85          UC    .237    .292
 86          UA       0       5      16      30      65      77      84      90      94      97
 87          UA     100
             *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 88           KK    UC19
 89           KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 90           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 91           KM    L= 0.52   Kb= 0.034   S=135.0
 92           BA    .027
 93           LG     .25      .36     5.00      .23   19.00
 94           UC    .217     .312
              *

 95           KK  CP1819
 96           KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
 97           HC       3
              *

 98           KK   R1819
 99           KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
100           KM    ENDPOINTS WERE EXTENDED
101           KM    SLOPE = (2540-2511)/1790
102           RS       2    FLOW      -1
103           RC   0.045   0.030   0.045    1790  0.0162
104           RX       0      92      99     100     112     113     120     200
105           RY     108     104     102     100     100     102     104     108
106           RL                    0.25     100
              *

107           KK    UC22
108           KM   SUBBASIN 22, UNNAMED WASH CENTRAL
109           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
110           KM    L= .76   Kb= .034   S=111.0
111           BA    .032
112           LG     .25      .36     5.00      .23   16.00
113           UC    .279     .513
              *

114           KK    UC23
115           KM   SUBBASIN 23, UNNAMED WASH CENTRAL
116           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
117           KM    L= .40   Kb= 0.034   S=121.0
118           BA    .013
119           LG     .25      .36     5.00      .23   20.00
120           UC    .200     .094
              *

121           KK  CP2223
122           KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
123           HC       3
              *

124           KK   R2223
125           KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
126           KM    ENDPOINTS WERE EXTENDED
127           KM    SLOPE = (2511-2482)/1862
128           RS       2    FLOW      -1
129           RC   0.045    0.03   0.045    1862  0.0156
1                                          HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

130           RX       0      95      99     100     112     113     117     200
131           RY     108     104     102     100     100     102     104     108
132           RL                    0.25     100
              *

133           KK    UC28
134           KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
135           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
136           KM    L= .57   Kb= 0.029   S=109.0
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137          BA    .055
138          LG     .25     .36    4.90     .25   17.00
139          UC    .237    .189
             *

140          KK     R28
141          KM    ROUTING REACH FROM CP1028 TO CP2930 THROUGH SUBBASIN 30
142          KM    ENDPOINTS WERE EXTENDED
143          KM    SLOPE = (2502-2482)/1296
144          RS       2    FLOW      -1
145          RC   0.045   0.035   0.045    1296  0.0154
146          RX       0      86      99     100     108     109     122     200
147          RY     108     104     102     100     100     102     104     108
148          RL                    0.15     100
             *

149          KK    UC29
150          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
151          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
152          KM    L= .47   Kb= 0.033   S=109.0
153          BA    .035
154          LG     .25     .36    5.00     .23   19.00
155          UC    .217    .248
             *

156          KK   UC30
157          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
158          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
159          KM    L= .28   Kb= 0.034   S=134.0
160          BA    .012
161          LG     .25     .36    5.00     .23   18.00
162          UC    .167    .227
             *

163          KK  CP2930
164          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
165          KM    CP2223
166          HC       4
             *

167          KK   R2930
168          KM   Routing flow from CP2930 to CP34 through subbasin 34
169          KM    SLOPE = (2482-2469)/925
170          KM    ENDPOINTS WERE EXTENDED
171          RS       1    FLOW      -1
172          RC   0.045   0.030   0.045     925  0.0141
1                                          HEC-1 INPUT
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        LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

173          RX       0      89      99     100     110     111     122     200
174          RY     108     104     102     100     100     102     104     108
175          RL                    0.15     100
             *

176          KK    UC34
177          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
178          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
179          KM    L= .31   Kb = 0.033   S= 117.0
180          BA    .037
181          LG     .25     .36    4.90     .22   21.00
182          UC    .171    .132
183          UA       0       5      16      30      65      77      84      90      94      97
184          UA     100
             *

185          KK    CP34
186          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
187          KM   R2930
188          HC       2
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                *
 189            KK     R34
 190            KM   Routing flow from CP34 to CP3537 through subbasin 37
 191            KM    ENDPOINTS WERE EXTENDED
 192            KM    SLOPE = (2469-2318)/6475
 193            RS      11    FLOW      -1
 194            RC   0.045   0.035   0.045    6475   .0233
 195            RX       0      90      99     100     105     106     115     200
 196            RY     108     104     102     100     100     102     104     108
 197            RL                    0.15     100
                *

 198            KK    UC37
 199            KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
 200            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 201            KM    L= 2.03   Kb= 0.030   S= 98.0
 202            BA    .207
 203            LG     .25     .39    3.70     .16   24.00
 204            UC    .429    .624
                *

 205            KK    UC35
 206            KM   SUBBASIN 35, UNNAMED WASH CENTRAL
 207            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 208            KM    L= 1.27   Kb= 0.034   S=138.0
 209            BA    .261
 210            LG     .25     .38    3.90     .20   24.00
 211            UC    .321    .272
                *
1                                          HEC-1 INPUT
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LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 212            KK  CP3537
 213            KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
 214            KM    R34
 215            HC       3
                *

 216            KK   R3537
 217            KM   Routing flow from CP3537 to CP3149 through subbasin 49
 218            KM    ENDPOINTS WERE EXTENDED
 219            KM    SLOPE = (2318-2280)/1829
 220            RS       3    FLOW      -1
 221            RC   0.045   0.035   0.045    1829  0.0208
 222            RX       0      90      99     100     105     106     115     200
 223            RY     108     104     102     100     100     102     104     108
 224            RL                    0.15     100
                *

 225            KK    UC49
 226            KM   SUBBASIN 49, UNNAMED WASH CENTRAL
 227            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 228            KM    L= .47   Kb= 0.032   S=148.0
 229            BA    .048
 230            LG     .25     .39    3.60     .15   30.00
 231            UC    .188    .179
                *

 232            KK    UC31
 233            KM   SUBBASIN 31, UNNAMED WASH CENTRAL
 234            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 235            KM    L= 2.04   Kb= 0.028   S= 128.0
 236            BA    .405
 237            LG     .25     .38    4.10     .18   31.00
 238            UC    .379    .373
 239            UA       0       5      16      30      65      77      84      90      94      97
 240            UA     100
```

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                 *

241              KK  CP3149
242              KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
243              KM     R3537
244              HC       3
                 *

245              KK   R3149
246              KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
247              KM    ENDPOINTS WERE EXTENDED
248              KM    SLOPE = (2280-2256)/1219
249              RS       2    FLOW      -1
250              RC   0.045   0.030   0.045    1219  0.0197
251              RX       0      95      99     100     110     111     118     250
252              RY     110     104     102     100     100     102     104     110
253              RL                    0.15     100
                 *
1                                                HEC-1 INPUT
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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

254              KK    UC46
255              KM   SUBBASIN 46, UNNAMED WASH CENTRAL
256              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
257              KM    L= .30  Kb= 0.061   Adj. Slope= 324.0
258              BA    .034
259              LG     .25     .39    3.60     .15   24.00
260              UC    .167    .132
261              UA       0       5      16      30      65      77      84      90      94      97
262              UA     100
                 *

263              KK     R46
264              KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
265              KM    ENDPOINTS WERE EXTENDED
266              KM    SLOPE = (2346-2315)/1783
267              RS       3    FLOW      -1
268              RC   0.045   0.035   0.045    1783  0.0174
269              RX       0      92      99     100     105     106     113     200
270              RY     108     104     102     100     100     102     104     108
271              RL                    0.15     100
                 *

272              KK    UC45
273              KM   SUBBASIN 45, UNNAMED WASH CENTRAL
274              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
275              KM    L= .48   Kb= 0.030   S= 135.0
276              BA    .086
277              LG     .25     .39    3.60     .15   24.00
278              UC    .192    .134
279              UA       0       5      16      30      65      77      84      90      94      97
280              UA     100
                 *

281              KK    UC47
282              KM   SUBBASIN 47, UNNAMED WASH CENTRAL
283              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
284              KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
285              BA    .031
286              LG     .25     .39    3.60     .15   24.00
287              UC    .179    .185
288              UA       0       5      16      30      65      77      84      90      94      97
289              UA     100
                 *

290              KK  CP4547
291              KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
292              KM    R46
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 293          HC       3
              *
                                        HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 294          KK   R4547
 295          KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
 296          KM   ENDPOINTS WERE EXTENDED
 297          KM    SLOPE = (2315-2256)/2170
 298          RS       4    FLOW      -1
 299          RC   0.045   0.035   0.045    2170   .0272
 300          RX       0      90      99     100     105     106     115     200
 301          RY     108     104     102     100     100     102     104     108
 302          RL                    0.15     100
              *

 303          KK    UC48
 304          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
 305          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 306          KM    L= .92   Kb= 0.048   S= 117.0
 307          BA    .197
 308          LG     .25     .39    3.70     .16   30.00
 309          UC    .394    .276
              *

 310          KK    UC50
 311          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
 312          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 313          KM    L= .27   Kb= 0.037   S= 93.0
 314          BA    .019
 315          LG     .25     .38    3.80     .24   24.00
 316          UC    .179    .183
              *

 317          KK  CP4850
 318          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
 319          KM    R3149 AND R4547
 320          HC       4
              *

 321          KK   R4850
 322          KM   Routing flow from CP4850 to CP5157 through subbasin 57
 323          KM    ENDPOINTS WERE EXTENDED
 324          KM    SLOPE = (2256-2235)/1509
 325          RS       2    FLOW      -1
 326          RC   0.045   0.030   0.045    1509  0.0139
 327          RX       0      95      99     100     115     116     120     250
 328          RY     110     104     102     100     100     102     104     110
 329          RL                    0.25     100
              *

 330          KK    UC51
 331          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
 332          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 333          KM    L= .42   Kb= 0.042   Adj. Slope= 317.0
 334          BA    .060
 335          LG     .25     .36    5.00     .21   29.00
 336          UC    .158    .119
 337          UA       0       5      16      30      65      77      84      90      94      97
1
                                        HEC-1 INPUT
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 338          UA     100
              *

 339          KK    UC57
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```
340          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
341          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
342          KM    L= .47   Kb= 0.061   S= 200.0
343          BA    .037
344          LG     .25     .37    4.20     .28   20.00
345          UC    .258    .297
             *

346          KK  CP5157
347          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
348          KM     R4850
349          HC       3
             *

350          KK   R5157
351          KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
352          KM    ENDPOINTS WERE EXTENDED
353          KM    SLOPE = (2235-2208)/1796
354          RS       2    FLOW      -1
355          RC   0.045   0.030   0.045    1796  0.0150
356          RX       0      60      99     100     100     121     160     250
357          RY     112     104     102     100     100     102     104     112
358          RL                    0.35     100
             *

359          KK    UC58
360          KM   SUBBASIN 58, UNNAMED WASH CENTRAL
361          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
362          KM    L= .69   Kb= 0.054  Adj. Slope= 317.0
363          BA    .110
364          LG     .25     .37    4.80     .13   20.00
365          UC    .237    .196
             *

366          KK    UC59
367          KM   SUBBASIN 59, UNNAMED WASH CENTRAL
368          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
369          KM    L= .49   Kb= 0.033   S= 112.0
370          BA    .034
371          LG     .25     .32    5.80     .33   16.00
372          UC    .229    .280
             *

373          KK  CP5859
374          KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
375          KM     R5157
376          HC       3
             *
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HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

377          KK  D5859N
378          KM    DIVERSION OF FLOWS AT FLOW SPLIT
379          DT  D5859S
380          DI       0      50     100     500   10000
381          DQ       0    24.9    49.5   248.5    4970
             *

382          KK  R5859N
383          KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
384          KM   ENDPOINTS WERE EXTENDED
385          KM    SLOPE = (2208-2195)/699
386          RS       1    FLOW      -1
387          RC   0.045   0.030   0.045     699  0.0186
388          RX       0      50      99     100     110     111     160     250
389          RY     104     103     102     100     100     102     103     104
390          RL                    0.15     100
             *
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```
391          KK    UC63
392          KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
393          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
394          KM    L= .81   Kb= 0.054   Adj. Slope= 322.0
395          BA    .117
396          LG     .25     .36    5.00     .19   19.00
397          UC    .267    .244
             *

398          KK    CP63
399          KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
400          KM   FROM RD5859N
401          HC       2
             *

402          KK     R63
403          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
404          KM    SLOPE = (2195-2170)/1394
405          RS       2    FLOW      -1
406          RC   0.045   0.030   0.045    1394  0.0179
407          RX      60      80      99     100     125     126     145     165
408          RY     106     104     102     100     100     102     104     106
409          RL                    0.35     100
             *

410          KK    UC66
411          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
412          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
413          KM    L= .54   Kb= 0.056   Adj. Slope= 324.0
414          BA    .037
415          LG     .25     .36    5.00     .25   15.00
416          UC    .211    .276
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

417          KK    UC62
418          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
419          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
420          KM    L= 1.33   Kb= 0.047   Adj. Slope= 321.0
421          BA    .361
422          LG     .25     .35    6.10     .13   14.00
423          UC    .321    .226
             *

424          KK   CP6266
425          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
426          KM   FROM R63
427          HC       3
             *

428          KK   R6266
429          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
430          KM    SLOPE = (2170-2150)/990
431          RS       2    FLOW      -1
432          RC   0.045   0.030   0.045     990  0.0202
433          RX       0      85      99     100     100     121     135     225
434          RY     106     104     102     100     100     102     104     106
435          RL                    0.35     100
             *

436          KK   D5859S
437          KM   RECALL DIVERTED FLOW FROM D5859N
438          DR   D5859S
             *

439          KK   R5859S
```

```
440          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
441          KM    SLOPE = (2208-2194)/803
442          RS       1    FLOW      -1
443          RC   0.045   0.030   0.045     803  0.0174
444          RX       0      50      99     100     125     126     175     225
445          RY     104     103     102     100     100     102     103     104
446          RL                   0.15     100
             *

447          KK    UC64
448          KM   SUBBASIN 64, UNNAMED WASH CENTRAL
449          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
450          KM    L= .15   Kb= 0.078   S= 166.0
451          BA    .005
452          LG     .25     .31    6.90     .20   17.00
453          UC    .167    .239
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

454          KK    CP64
455          KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
456          KM    DIVERSION RD5859N
457          HC       2    1.88
             *

458          KK    D64N
459          KM   DIVERSION OF FLOWS AT FLOW SPLIT
460          KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
461          DT    D64S
462          DI       0      50     100     500   10000
463          DQ       0    22.5      45     225    4500
             *

464          KK   RD64N
465          KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
466          KM   ENDPOINTS WERE EXTENDED
467          KM    SLOPE = (2194-2161)/1721
468          RS       2    FLOW      -1
469          RC   0.045   0.030   0.045    1721  0.0192
470          RX       0      60      99     100     112     113     152     200
471          RY     106     104     102     100     100     102     104     106
472          RL                   0.25     100
             *

473          KK    UC87
474          KM   SUBBASIN 87, UNNAMED WASH CENTRAL
475          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
476          KM    L= .33   Kb= 0.033   S= 101.0
477          BA    .025
478          LG     .25     .35    3.40     .62    9.00
479          UC    .208    .221
             *

480          KK    CP87
481          KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
482          KM    DIVERSION RD64N
483          HC       2
             *

484          KK   RD87N
485          KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
486          KM    SLOPE = (2161-2150)/557
487          RS       1    FLOW      -1
488          RC   0.045   0.030   0.045     557  0.0197
489          RX      25      85      99     100     120     121     135     195
490          RY     106     104     102     100     100     102     104     106
491          RL                   0.35     100
```

```
                    *
                                                HEC-1 INPUT

LINE                ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 492                KK    UC82
 493                KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
 494                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 495                KM    L= .22   Kb= 0.047   Adj. Slope= 220.0
 496                BA    .022
 497                LG     .25     .36    4.30    .400   15.00
 498                UC    .150    .120
                    *

 499                KK    CP82
 500                KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
 501                KM   SUBBASIN 82
 502                HC       3    2.45
                    *

 503                KK     R82
 504                KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
 505                KM    SLOPE = (2150-2138)/579
 506                RS       1    FLOW      -1
 507                RC   0.045   0.030   0.045     579  0.0207
 508                RX       0      75      99     100     125     126     150     225
 509                RY     108     104     102     100     100     102     104     108
 510                RL                    0.35     100
                    *

 511                KK    D84N
 512                KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
 513                KM   PART OF TRIPLE DIVERSION JUST UPSTREAM OF TERRAVITA WAY
 514                DT    D84S
 515                DI       0     500    1275    1550    1964    2475    3223    4000
 516                DQ       0       0       0    79.7     255     490     888    1250
                    *

 517                KK    UC84
 518                KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
 519                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 520                KM    L= .30   Kb= 0.054   Adj. Slope= 246.0
 521                BA    .013
 522                LG     .25     .36    4.50     .35   15.00
 523                UC    .179    .216
                    *

 524                KK    CP84
 525                KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
 526                KM    FROM D84N
 527                HC       2
                    *

 528                KK     R84
 529                KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
 530                KM   ENDPOINTS WERE EXTENDED
 531                KM    SLOPE = (2138-2054)/3463
 532                RS       5    FLOW      -1
 533                RC   0.045   0.030   0.045    3463  0.0243
1                                               HEC-1 INPUT
PAGE 14

LINE                ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 534                RX       0      94      99     100     110     111     116     200
 535                RY     106     104     102     100     100     102     104     106
 536                RL                    0.15     100
                    *
```

```
537          KK    UC79
538          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
539          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
540          KM    L= .88   Kb= 0.035   Adj. Slope= 233.0
541          BA    .078
542          LG     .25     .35    4.30     .45   19.00
543          UC    .250    .305
544          UA       0       5      16      30      65      77      84      90      94      97
545          UA     100
             *

546          KK    UC78
547          KM   SUBBASIN 78, UNNAMED WASH CENTRAL
548          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
549          KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
550          BA    .177
551          LG     .25     .35    6.00     .17   17.00
552          UC    .217    .161
553          UA       0       5      16      30      65      77      84      90      94      97
554          UA     100
             *

555          KK  CP7879
556          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
557          KM    FROM R84
558          HC       3
             *

559          KK   R7879
560          KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
561          KM   ENDPOINTS WERE EXTENDED
562          KM    SLOPE = (2054-2048)/256
563          RS       1    FLOW      -1
564          RC   0.045   0.030   0.045     256   .0234
565          RX       0      90      99     100     120     121     130     200
566          RY     106     104     102     100     100     102     104     106
567          RL                    0.35     100
             *

568          KK    UC77
569          KM   SUBBASIN 77, UNNAMED WASH CENTRAL
570          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
571          KM    L= .93   Kb= 0.043  Adj. Slope= 324.0
572          BA    .096
573          LG     .25     .34    6.70     .13   16.00
574          UC    .242    .274
575          UA       0       5      16      30      65      77      84      90      94      97
576          UA     100
             *
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

577          KK    CP77
578          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
579          KM    FROM R7879
580          HC       2
             *

581          KK     R77
582          KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
583          KM   ENDPOINTS WERE EXTENDED
584          KM    SLOPE = (2048-2037)/593
585          RS       1    FLOW      -1
586          RC   0.045   0.030   0.045     593  0.0185
587          RX       0      80      99     100     115     116     120     250
588          RY     106     104     102     100     100     102     104     106
589          RL                    0.25     100
             *
```

```
590          KK    UC89
591          KM   SUBBASIN 89, UNNAMED WASH CENTRAL
592          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
593          KM    L= .77   Kb= 0.031   S= 126.0
594          BA    .073
595          LG     .25     .33    6.40     .20   21.00
596          UC    .254    .291
597          UA       0       5      16      30      65      77      84      90      94      97
598          UA     100
             *

599          KK    CP89
600          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
601          KM    FROM R77
602          HC       2
             *

603          KK     R89
604          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
605          KM   CHANNEL ENDS WERE EXTENDED
606          KM    SLOPE = (2037-2008)/1912
607          RS       2    FLOW      -1
608          RC   0.045   0.030   0.045    1912  0.0152
609          RX       0      80      99     100     115     116     135     250
610          RY     108     104     102     100     100     102     104     108
611          RL                    0.25     100
             *

612          KK    UC74
613          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
614          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
615          KM    L= 1.13   Kb= 0.041   Adj. Slope= 328.0
616          BA    .151
617          LG     .25     .34    6.60     .13   16.00
618          UC    .258    .267
             *
```


HEC-1 INPUT

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

619          KK    UC76
620          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
621          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
622          KM    L= .64   Kb= 0.033   Adj. Slope= 302.0
623          BA    .041
624          LG     .25     .35    6.10     .16   15.00
625          UC    .179    .238
             *

626          KK  CP7476
627          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
628          HC       2
             *

629          KK   R7476
630          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
631          KM   END POINTS WERE EXTENDED
632          KM    SLOPE = (2031-2017)/524
633          RS       1    FLOW      -1
634          RC   0.045   0.030   0.045     524  0.0267
635          RX       0      80      99     100     112     113     132     200
636          RY     108     104     102     100     100     102     104     108
637          RL                    0.25     100
             *

638          KK    UC75
639          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
640          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
```

```
641          KM    L= 1.38   Kb= 0.031   Adj. Slope= 322.0
642          BA    .192
643          LG     .25     .34    6.50     .15   16.00
644          UC    .250    .263
645          UA       0       5      16      30      65      77      84      90      94      97 ,
646          UA     100
             *

647          KK    CP75
648          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
649          KM    FROM R7476
650          HC       2
             *

651          KK     R75
652          KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
653          KM   END POINTS WERE EXTENDED
654          KM    SLOPE = (2017-2008)/723
655          RS       1    FLOW      -1
656          RC   0.045   0.030   0.045     723  0.0124
657          RX       0      80      99     100     115     116     135     200
658          RY     108     104     102     100     100     102     104     108
659          RL                    0.25     100
             *
1                                                HEC-1 INPUT
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

660          KK    UC90
661          KM   SUBBASIN 90, UNNAMED WASH CENTRAL
662          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
663          KM    L= .48   Kb= 0.035   S= 151.0
664          BA    .038
665          LG     .25     .35    3.70     .55   20.00
666          UC    .213    .236
             *

667          KK    UC91
668          KM   SUBBASIN 91, UNNAMED WASH CENTRAL
669          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
670          KM    L= .75   Kb= 0.033   S= 109.0
671          BA    .073
672          LG     .25     .31    7.40     .14   23.00
673          UC    .262    .298
             *
             *

674          KK  CP90EN
675          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
676          KM    FROM R89 AND R75
677          HC       4
             *

678          KK    D84S
679          KM   RETREVIAL OF DIVERTED FLOW FROM D84S
680          DR    D84S
             *

681          KK   RD84S
682          KM   ROUTING FLOW FROM CP84 (D84S) TO D84ii
683          KM    SLOPE = (2144-2140)/303
684          RS       6    FLOW      -1
685          RC   0.045   0.030   0.045     303  0.0132
686          RX       0      50      99     100     125     126     175     225
687          RY     106     104     102     100     100     102     104     106
688          RL                    0.35     100
             *

689          KK  D84IIS
```

```
690          KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
691          KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
692          DT  D84IIN
693          DI       0    79.7     255     490     880    1250
694          DQ       0    78.3     229     419     732    1000
             *

695          KK  RD84IS
696          KM   ROUTING FLOWS FROM D84IIS TO CP94DS
697          KM   SLOPE = (2140-2078)/3225
698          RS       1    FLOW      -1
699          RC   0.045   0.030   0.045    3225  0.0192
700          RX       0      50      99     100     125     126     175     225
1                                          HEC-1 INPUT
PAGE 18

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

701          RY     106     104     102     100     100     102     104     106
702          RL                    0.25     100
             *

703          KK    UC94
704          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
705          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
706          KM    L= .53   Kb= 0.119   S= 108.0
707          BA    .028
708          LG     .25     .36    5.00     .23   13.00
709          UC    .671   1.082
             *

710          KK  CP94DS
711          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
712          KM   FROM RD84IS
713          HC       2
             *

714          KK   R94DS
715          KM   ROUTING FLOW FROM CP94DS TO CP88EN
716          KM   SLOPE = (2078-2041)/1950
717          RS       1    FLOW      -1
718          RC   0.045   0.030   0.045    1950  0.0189
719          RX      60      85      99     100     108     109     123     148
720          RY     106     104     102     100     100     102     104     106
721          RL                    0.25     100
             *

722          KK  D84IIN
723          KM   RECALL DIVERTED FLOW FROM D84II
724          DR  D84IIN
             *

725          KK  RD84IN
726          KM   ROUTING FLOW FROM D84II TO CP88EN
727          KM   SLOPE = (2140-2041)/5175
728          RS       1    FLOW      -1
729          RC   0.045   0.030   0.045    5175  0.0191
730          RX      60      78      90     100     125     132     135     150
731          RY     106     104     102     100     100     102     104     106
732          RL                    0.25     100
             *

733          KK    UC88
734          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
735          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
736          KM    L= 1.08   Kb= 0.104   S=111.0
737          BA    .108
738          LG     .25     .33    6.10     .20   14.00
739          UC    .962   1.337
             *
```

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 740          KK  CP88EN
 741          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
 742          KM    FROM R94DS AND RD84IN
 743          HC       3
              *

 744          KK    UC95
 745          KM   SUBBASIN 95, UNNAMED WASH CENTRAL
 746          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 747          KM    L= 0.22   Kb= 0.034   Adj.Slope= 220
 748          BA    .024
 749          LG     .25     .39    3.70     .15   19.00
 750          UC    .117    .086
              *

 751          KK    UC93
 752          KM   SUBBASIN 93, UNNAMED WASH CENTRAL
 753          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 754          KM    L= .64   Kb= 0.033   S= 135.0
 755          BA    .038
 756          LG     .25     .30    8.00     .07   20.00
 757          UC    .225    .320
              *

 758          KK    UC96
 759          KM   SUBBASIN 96, UNNAMED WASH CENTRAL
 760          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 761          KM    L= .73   Kb= 0.031  S= 113.0
 762          BA    .061
 763          LG     .25     .32    7.00     .12   18.00
 764          UC    .250    .307
              *
              *
 765          ZZ
```

```
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.        (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 47          UC8
             .
             .
 56          .          UC9
             .            .
             .            .
 65        CPC8............
             V
             V
 69       RCP89
             .
             .
 79          .        UC18
             .            .
             .            .
 88          .            .        UC19
             .            .           .
             .            .           .
 95      CP1819........................
             V
             V
 98       R1819
             .
             .
107          .        UC22
             .            .
             .            .
114          .            .        UC23
             .            .           .
             .            .           .
121      CP2223........................
             V
             V
124       R2223
             .
             .
133          .        UC28
             .           V
             .           V
140          .         R28
             .            .
             .            .
149          .            .        UC29
             .            .           .
             .            .           .
156          .            .           .       UC30
             .            .           .           .
             .            .           .           .
163      CP2930.....................................
             V
             V
167       R2930
             .
             .
176          .        UC34
             .            .
             .            .
185        CP34............
             V
             V
189         R34
             .
             .
198          .        UC37
```

```
                .           .
                .           .
205             .           .        UC35
                .           .           .
                .           .           .
212        CP3537.......................
               V
               V
216         R3537
                .
                .
225             .        UC49
                .           .
                .           .
232             .           .        UC31
                .           .           .
                .           .           .
241        CP3149.......................
               V
               V
245         R3149
                .
                .
254             .        UC46
                .           V
                .           V
263             .         R46
                .           .
                .           .
272             .           .        UC45
                .           .           .
                .           .           .
281             .           .           .        UC47
                .           .           .           .
                .           .           .           .
290             .      CP4547.......................
                .           V
                .           V
294             .       R4547
                .           .
                .           .
303             .           .        UC48
                .           .           .
                .           .           .
310             .           .           .        UC50
                .           .           .           .
                .           .           .           .
317        CP4850...................................
               V
               V
321         R4850
                .
                .
330             .        UC51
                .           .
                .           .
339             .           .        UC57
                .           .           .
                .           .           .
346        CP5157.......................
               V
               V
350         R5157
                .
                .
359             .        UC58
                .           .
                .           .
366             .           .        UC59
                .           .           .
                .           .           .
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373      CP5859.......................
              .
              .
379           .-------> D5859S
377      D5859N
              V
              V
382      R5859N
              .
              .
391           .        UC63
              .           .
              .           .
398        CP63............
              V
              V
402         R63
              .
              .
410           .        UC66
              .           .
              .           .
417           .           .        UC62
              .           .           .
              .           .           .
424      CP6266.......................
              V
              V
428       R6266
              .
              .
438           .           .<-------  D5859S
436           .      D5859S
              .           V
              .           V
439           .      R5859S
              .           .
              .           .
447           .           .        UC64
              .           .           .
              .           .           .
454           .        CP64............
              .           .
              .           .
461           .           .------->    D64S
458           .        D64N
              .           V
              .           V
464           .       RD64N
              .           .
              .           .
473           .           .        UC87
              .           .           .
              .           .           .
480           .        CP87............
              .           V
              .           V
484           .       RD87N
              .           .
              .           .
492           .           .        UC82
              .           .           .
              .           .           .
499        CP82........................
              V
              V
503         R82
              .
              .
514           .------->    D84S
511        D84N
```

```
                .
                .
517             .        UC84
                .           .
                .           .
524         CP84............
               V
               V
528          R84
                .
                .
537             .        UC79
                .           .
                .           .
546             .           .        UC78
                .           .           .
                .           .           .
555       CP7879........................
               V
               V
559        R7879
                .
                .
568             .        UC77
                .           .
                .           .
577         CP77............
               V
               V
581          R77
                .
                .
590             .        UC89
                .           .
                .           .
599         CP89............
               V
               V
603          R89
                .
                .
612             .        UC74
                .           .
                .           .
619             .           .        UC76
                .           .           .
                .           .           .
626             .      CP7476............
                .           V
                .           V
629             .       R7476
                .           .
                .           .
638             .           .        UC75
                .           .           .
                .           .           .
647             .        CP75............
                .           V
                .           V
651             .         R75
                .           .
                .           .
660             .           .        UC90
                .           .           .
                .           .           .
667             .           .           .        UC91
                .           .           .           .
                .           .           .           .
674       CP90EN.................................
                .
                .
```

```
680          .           .<-------    D84S
678          .        D84S
             .           V
             .           V
681          .       RD84S
             .           .
             .           .
692          .           .-------> D84IIN
689          .      D84IIS
             .           V
             .           V
695          .      RD84IS
             .           .
             .           .
703          .           .        UC94
             .           .           .
             .           .           .
710          .      CP94DS............
             .           V
             .           V
714          .       R94DS
             .           .
             .           .
724          .           .           .<-------  D84IIN
722          .           .      D84IIN
             .           .           V
             .           .           V
725          .           .      RD84IN
             .           .           .
             .           .           .
733          .           .           .        UC88
             .           .           .           .
             .           .           .           .
740          .      CP88EN......................
             .           .
             .           .
744          .           .        UC95
             .           .           .
             .           .           .
751          .           .           .        UC93
             .           .           .           .
             .           .           .           .
758          .           .           .           .        UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	82.	4.13	13.	3.	1.	.05
+	HYDROGRAPH AT	UC9	83.	4.10	12.	3.	1.	.05
+	2 COMBINED AT	CPC8	164.	4.10	25.	6.	2.	.10
+	ROUTED TO	RCP89	162.	4.20	25.	6.	2.	.10
+	HYDROGRAPH AT	UC18	85.	4.07	9.	2.	1.	.04
+	HYDROGRAPH AT	UC19	54.	4.10	6.	2.	1.	.03
+	3 COMBINED AT	CP1819	287.	4.13	40.	10.	4.	.17
+	ROUTED TO	R1819	285.	4.20	40.	10.	4.	.17
+	HYDROGRAPH AT	UC22	47.	4.17	7.	2.	1.	.03
+	HYDROGRAPH AT	UC23	41.	4.03	3.	1.	0.	.01
+	3 COMBINED AT	CP2223	356.	4.17	50.	12.	4.	.21
+	ROUTED TO	R2223	354.	4.20	50.	12.	4.	.21
+	HYDROGRAPH AT	UC28	135.	4.10	12.	3.	1.	.05
+	ROUTED TO	R28	133.	4.13	12.	3.	1.	.05
+	HYDROGRAPH AT	UC29	79.	4.10	8.	2.	1.	.04
+	HYDROGRAPH AT	UC30	29.	4.07	3.	1.	0.	.01
+	4 COMBINED AT	CP2930	573.	4.17	72.	18.	6.	.31
+	ROUTED TO	R2930	566.	4.20	71.	18.	6.	.31
+	HYDROGRAPH AT	UC34	112.	4.03	8.	2.	1.	.04
+	2 COMBINED AT	CP34	630.	4.17	80.	20.	7.	.35
+	ROUTED TO	R34	593.	4.40	80.	20.	7.	.35

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC37	276.	4.30	51.	13.	5.	.21
+	HYDROGRAPH AT	UC35	549.	4.17	63.	16.	6.	.26
+	3 COMBINED AT	CP3537	1152.	4.27	187.	47.	17.	.82
+	ROUTED TO	R3537	1146.	4.33	187.	47.	17.	.82
+	HYDROGRAPH AT	UC49	134.	4.07	13.	3.	1.	.05
+	HYDROGRAPH AT	UC31	748.	4.13	102.	26.	9.	.41
+	3 COMBINED AT	CP3149	1668.	4.27	292.	74.	27.	1.27
+	ROUTED TO	R3149	1663.	4.30	292.	74.	27.	1.27
+	HYDROGRAPH AT	UC46	107.	4.03	9.	2.	1.	.03
+	ROUTED TO	R46	104.	4.07	9.	2.	1.	.03
+	HYDROGRAPH AT	UC45	266.	4.03	22.	5.	2.	.09
+	HYDROGRAPH AT	UC47	87.	4.03	8.	2.	1.	.03
+	3 COMBINED AT	CP4547	451.	4.03	38.	10.	3.	.15
+	ROUTED TO	R4547	440.	4.10	38.	10.	3.	.15
+	HYDROGRAPH AT	UC48	410.	4.20	51.	13.	5.	.20
+	HYDROGRAPH AT	UC50	51.	4.07	4.	1.	0.	.02
+	4 COMBINED AT	CP4850	2120.	4.27	376.	95.	34.	1.64
+	ROUTED TO	R4850	2113.	4.30	376.	95.	34.	1.64
+	HYDROGRAPH AT	UC51	190.	4.03	15.	4.	1.	.06
+	HYDROGRAPH AT	UC57	74.	4.13	8.	2.	1.	.04
+	3 COMBINED AT	CP5157	2189.	4.30	396.	100.	36.	1.74
+	ROUTED TO	R5157	2180.	4.33	396.	100.	36.	1.74
	HYDROGRAPH AT	UC58	284.	4.10	27.	7.	2.	.11

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC59	67.	4.10	7.	2.	1.	.03
+	3 COMBINED AT	CP5859	2315.	4.30	425.	107.	39.	1.88
+	DIVERSION TO	D5859S	1151.	4.30	211.	53.	19.	1.88
+	HYDROGRAPH AT	D5859N	1164.	4.30	214.	54.	19.	1.88
+	ROUTED TO	R5859N	1160.	4.33	214.	54.	19.	1.88
+	HYDROGRAPH AT	UC63	262.	4.13	27.	7.	2.	.12
+	2 COMBINED AT	CP63	1285.	4.33	237.	60.	22.	2.00
+	ROUTED TO	R63	1283.	4.33	237.	60.	22.	2.00
+	HYDROGRAPH AT	UC66	78.	4.10	8.	2.	1.	.04
+	HYDROGRAPH AT	UC62	819.	4.13	83.	21.	8.	.36
+	3 COMBINED AT	CP6266	1742.	4.27	318.	80.	29.	2.40
+	ROUTED TO	R6266	1740.	4.30	318.	80.	29.	2.40
+	HYDROGRAPH AT	D5859S	1151.	4.30	211.	53.	19.	1.88
+	ROUTED TO	R5859S	1147.	4.33	211.	53.	19.	1.88
+	HYDROGRAPH AT	UC64	12.	4.07	1.	0.	0.	.00
+	2 COMBINED AT	CP64	1152.	4.33	212.	54.	19.	1.88
+	DIVERSION TO	D64S	519.	4.33	95.	24.	9.	1.88
+	HYDROGRAPH AT	D64N	634.	4.33	117.	29.	11.	1.88
+	ROUTED TO	RD64N	630.	4.40	117.	29.	11.	1.88
+	HYDROGRAPH AT	UC87	50.	4.10	4.	1.	0.	.03
+	2 COMBINED AT	CP87	643.	4.40	120.	30.	11.	1.90
+	ROUTED TO	RD87N	643.	4.40	120.	30.	11.	1.90
+	HYDROGRAPH AT	UC82	63.	4.03	4.	1.	0.	.02
	3 COMBINED AT							

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	CP82	2343.	4.33	439.	111.	40.	2.45
ROUTED TO +	R82	2340.	4.33	439.	111.	40.	2.45
DIVERSION TO +	D84S	432.	4.33	38.	9.	3.	2.45
HYDROGRAPH AT +	D84N	1908.	4.33	401.	101.	36.	2.45
HYDROGRAPH AT +	UC84	30.	4.07	3.	1.	0.	.01
2 COMBINED AT +	CP84	1919.	4.33	403.	102.	37.	2.46
ROUTED TO +	R84	1909.	4.47	403.	102.	37.	2.46
HYDROGRAPH AT +	UC79	145.	4.10	15.	4.	1.	.08
HYDROGRAPH AT +	UC78	491.	4.07	40.	10.	4.	.18
3 COMBINED AT +	CP7879	2076.	4.37	450.	114.	41.	2.72
ROUTED TO +	R7879	2075.	4.37	450.	114.	41.	2.72
HYDROGRAPH AT +	UC77	215.	4.07	22.	6.	2.	.10
2 COMBINED AT	CP77	2169.	4.37	470.	119.	43.	2.81
ROUTED TO +	R77	2165.	4.40	470.	119.	43.	2.81
HYDROGRAPH AT +	UC89	153.	4.10	17.	4.	1.	.07
2 COMBINED AT +	CP89	2233.	4.37	484.	122.	44.	2.89
ROUTED TO +	R89	2223.	4.43	483.	122.	44.	2.89
HYDROGRAPH AT +	UC74	331.	4.13	35.	9.	3.	.15
HYDROGRAPH AT +	UC76	97.	4.07	9.	2.	1.	.04
2 COMBINED AT +	CP7476	426.	4.10	44.	11.	4.	.19
ROUTED TO +	R7476	424.	4.13	44.	11.	4.	.19
HYDROGRAPH AT +	UC75	431.	4.07	44.	11.	4.	.19
2 COMBINED AT +	CP75	852.	4.10	88.	22.	8.	.38
ROUTED TO	R75	841.	4.13	88.	22.	8.	.38

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC90	78.	4.10	7.	2.	1.	.04
+	HYDROGRAPH AT	UC91	153.	4.13	18.	4.	2.	.07
+	4 COMBINED AT	CP90EN	2692.	4.37	578.	146.	53.	3.38
+	HYDROGRAPH AT	D84S	432.	4.33	38.	9.	3.	2.45
+	ROUTED TO	RD84S	432.	4.33	38.	9.	3.	2.45
+	DIVERSION TO	D84IIN	372.	4.33	33.	8.	3.	2.45
+	HYDROGRAPH AT	D84IIS	60.	4.33	4.	1.	0.	2.45
+	ROUTED TO	RD84IS	47.	4.50	4.	1.	0.	2.45
+	HYDROGRAPH AT	UC94	22.	4.50	6.	1.	1.	.03
+	2 COMBINED AT	CP94DS	63.	4.50	9.	2.	1.	2.48
+	ROUTED TO	R94DS	61.	4.57	9.	2.	1.	2.48
+	HYDROGRAPH AT	D84IIN	372.	4.33	33.	8.	3.	2.45
+	ROUTED TO	RD84IN	320.	4.50	33.	8.	3.	2.45
+	HYDROGRAPH AT	UC88	69.	4.77	23.	6.	2.	.11
+	3 COMBINED AT	CP88EN	416.	4.53	61.	15.	6.	2.59
+	HYDROGRAPH AT	UC95	82.	4.00	6.	1.	1.	.02
+	HYDROGRAPH AT	UC93	82.	4.10	10.	2.	1.	.04
+	HYDROGRAPH AT	UC96	128.	4.13	15.	4.	1.	.06

*** NORMAL END OF HEC-1 ***

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1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*            VERSION 4.1               *
*                                      *
*  RUN DATE   16MAR04  TIME  08:40:22  *
*                                      *
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*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1
PAGE 1

HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID         UC MODEL - UNNAMED WASH, CENTRAL
  2           ID         100-YEAR 24-HOUR MODEL  FILENAME: UC10024F.DAT
  3           ID         FUTURE CONDITIONS
  4           ID         CAREFREE DRAINAGE MASTER PLAN
  5           ID         FCD 2000C037
  6           ID         BY CH2M HILL
  7           ID         FOR THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  8           ID         JANUARY 2002 (Final Revision March 2004)
  9           ID    ****************************************************************
 10           ID         100 YEAR ANALYSIS 24-HOUR STORM
 11           ID
 12           ID         GREEN AND AMPT LOSS RATE METHOD, NMIN=2
 13           ID         CLARK UNIT HYDROGRAPH, NORMAL DEPTH CHANNEL ROUTING
 14           ID    ****************************************************************
 15           ID      DEPTH-AREA REDUCT FACTORS BASED ON TABLE 2.1a OF FCDMC MANUAL
 16           ID
 17           ID      THE RAINFALL WAS PRODUCED BY DDMSW v 2.1
 18           ID
 19           ID
              *DIAGRAM
 20           IT       2                    2000
 21           IO       5
 22           IN      15
 23           JD    4.60    0.01
 24           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
 25           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
 26           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 27           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
 28           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 29           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 30           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 31           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
 32           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
 33           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
 34           JD   4.324   10.00
 35           JD   4.140   30.00
 36           JD   3.956   60.00
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 37          JD   3.892   90.00
 38          JD   3.836  120.00
 39          JD   3.795  150.00
 40          JD   3.680  300.00
 41          JD   3.588  500.00
             *

 42          KK     UC8
 43          KM   SUB-BASIN 8, UNNAMED WASH CENTRAL
 44          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 45          KM    L= 1.04   Kb= 0.031   S=138.0
 46          BA    .054
 47          LG     .30     .36     4.9     .26    36.0
 48          UC    .225    .384
 49          UA       0       5      16      30      65      77      84      90      94      97
 50          UA     100
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 51          KK     UC9
 52          KM    SUBBASIN 9, UNNAMED WASH CENTRAL
 53          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 54          KM    L= 0.91   Kb= 0.031   S=145.0
 55          BA    .047
 56          LG     .30     .36     5.0     .23    36.0
 57          UC    .208    .316
 58          UA       0       5      16      30      65      77      84      90      94      97
 59          UA     100
             *

 60          KK    CPC8
 61          KM    CONCENTRATION POINT 89
 62          KM    COMBINES RUNOFF FROM SUBBASINS UC8 AND UC9
 63          HC       2
             *

 64          KK   RCP89
 65          KM    ROUTING REACH FROM CP89 TO CP1819 THROUGH SUBBASIN 18
 66          KM    NORMAL DEPTH CHANNEL ROUTING
 67          KM    ENDPOINTS WERE EXTENDED
 68          KM    SLOPE = (2596-2540)/2933
 69          RS       5    FLOW      -1
 70          RC   0.045   0.035   0.045    2933  0.0191
 71          RX       0      90      99     100     108     109     120     200
 72          RY     108     104     102     100     100     102     104     108
 73          RL                    0.15     100
             *

 74          KK    UC18
 75          KM    SUBBASIN 18, UNNAMED WASH CENTRAL
 76          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 77          KM    L= 0.56   Kb= 0.034   S=101.0
 78          BA    .040
 79          LG     .25     .36     5.0     .23   26.00
 80          UC    .183    .219
 81          UA       0       5      16      30      65      77      84      90      94      97
 82          UA     100
             *

 83          KK    UC19
 84          KM    SUBBASIN 19, UNNAMED WASH CENTRAL
 85          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 86          KM    L= 0.52   Kb= 0.034   S=135.0
 87          BA    .027
 88          LG     .25     .36    5.00     .23   19.00
 89          UC    .167    .233
             *
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HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  90          KK  CP1819
  91          KM     COMBINES RUNOFF FROM SUBBASINS UC18, UC19 AND RCP89
  92          HC       3
              *

  93          KK   R1819
  94          KM    ROUTING REACH FROM CP1819 TO CP2223 THROUGH SUBBASIN 23
  95          KM    ENDPOINTS WERE EXTENDED
  96          KM    SLOPE = (2540-2511)/1790
  97          RS       2    FLOW      -1
  98          RC   0.045   0.030   0.045    1790  0.0162
  99          RX       0      92      99     100     112     113     120     200
 100          RY     108     104     102     100     100     102     104     108
 101          RL                    0.25     100
              *

 102          KK    UC22
 103          KM   SUBBASIN 22, UNNAMED WASH CENTRAL
 104          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 105          KM    L= .76   Kb= .034   S=111.0
 106          BA    .032
 107          LG     .25     .36    5.00     .23   16.00
 108          UC    .213    .379
              *

 109          KK    UC23
 110          KM   SUBBASIN 23, UNNAMED WASH CENTRAL
 111          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 112          KM    L= .40   Kb= 0.034   S=121.0
 113          BA    .013
 114          LG     .25     .36    5.00     .23   20.00
 115          UC    .154    .070
              *

 116          KK  CP2223
 117          KM    COMBINE ROUTED FLOW FROM CP1819 WITH RUNOFF FROM SUBBASINS 22 AND 23
 118          HC       3
              *

 119          KK   R2223
 120          KM    ROUTING REACH FROM CP2223 TO CP2930 THROUGH SUBBASIN 29
 121          KM    ENDPOINTS WERE EXTENDED
 122          KM    SLOPE = (2511-2482)/1862
 123          RS       2    FLOW      -1
 124          RC   0.045    0.03   0.045    1862  0.0156
 125          RX       0      95      99     100     112     113     117     200
 126          RY     110     104     102     100     100     102     104     110
 127          RL                    0.25     100
              *
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HEC-1 INPUT

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 128          KK    UC28
 129          KM   SUBBASIN 28, UNNAMED WASH CENTRAL, COMBINED 24 THROUGH 28
 130          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 131          KM    L= .57   Kb= 0.029   S=109.0
 132          BA    .055
 133          LG     .25     .36    4.90     .25   17.00
 134          UC    .183    .142
              *

 135          KK     R28
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136          KM    ROUTING REACH FROM CP1028 TO CP2930 THROUGH SUBBASIN 30
137          KM    ENDPOINTS WERE EXTENDED
138          KM    SLOPE = (2502-2482)/1296
139          RS       2    FLOW      -1
140          RC   0.045   0.035   0.045    1296  0.0154
141          RX       0      86      99     100     108     109     122     200
142          RY     110     104     102     100     100     102     104     110
143          RL                    0.15     100
             *

144          KK    UC29
145          KM   SUBBASIN 29, UNNAMED WASH CENTRAL
146          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
147          KM    L= .47   Kb= 0.033   S=109.0
148          BA    .035
149          LG     .25     .36    5.00     .23   19.00
150          UC    .167    .185
             *

151          KK   UC30
152          KM   SUBBASIN 30, UNNAMED WASH CENTRAL
153          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
154          KM    L= .28   Kb= 0.034   S=134.0
155          BA    .012
156          LG     .25     .36    5.00     .23   18.00
157          UC    .125    .165
             *

158          KK  CP2930
159          KM    COMBINE SUBBASIN RUNOFF FROM 28, 29, 30 WITH ROUTED FLOWS FROM
160          KM    CP2223
161          HC       4
             *

162          KK   R2930
163          KM   Routing flow from CP2930 to CP34 through subbasin 34
164          KM    SLOPE = (2482-2469)/925
165          KM    ENDPOINTS WERE EXTENDED
166          RS       1    FLOW      -1
167          RC   0.045   0.030   0.045     925  0.0141
168          RX       0      89      99     100     110     111     122     200
169          RY     110     104     102     100     100     102     104     110
170          RL                    0.15     100
             *
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                                        HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

171          KK    UC34
172          KM   SUBBASIN 34, UNNAMED WASH CENTRAL, COMBINED 33 AND 34
173          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
174          KM    L= .31   Kb = 0.033   S= 117.0
175          BA    .037
176          LG     .25     .36    4.90     .22   21.00
177          UC    .129    .097
178          UA       0       5      16      30      65      77      84      90      94      97
179          UA     100
             *

180          KK    CP34
181          KM    COMBINE SUBBASIN RUNOFF FROM 34 WITH ROUTED FLOWS FROM
182          KM   R2930
183          HC       2
             *

184          KK     R34
185          KM   Routing flow from CP34 to CP3537 through subbasin 37
186          KM    ENDPOINTS WERE EXTENDED
187          KM    SLOPE = (2469-2318)/6475
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188          RS      11    FLOW      -1
189          RC   0.045   0.035   0.045    6475   .0233
190          RX       0      90      99     100     105     106     115     200
191          RY     110     104     102     100     100     102     104     110
192          RL                    0.15     100
             *

193          KK    UC37
194          KM   SUBBASIN 37, UNNAMED WASH CENTRAL, COMBINED 32 AND 37
195          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
196          KM    L= 2.03   Kb= 0.030   S= 98.0
197          BA    .207
198          LG     .25     .39    3.70     .16   24.00
199          UC    .346    .491
             *

200          KK    UC35
201          KM   SUBBASIN 35, UNNAMED WASH CENTRAL
202          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
203          KM    L= 1.27   Kb= 0.034   S=138.0
204          BA    .261
205          LG     .25     .38    3.90     .20   24.00
206          UC    .246    .202
             *

207          KK  CP3537
208          KM    COMBINE SUBBASIN RUNOFF FROM 35, 37 WITH ROUTED FLOWS FROM
209          KM    R34
210          HC       3
             *
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                                        HEC-1 INPUT

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

211          KK   R3537
212          KM   Routing flow from CP3537 to CP3149 through subbasin 49
213          KM    ENDPOINTS WERE EXTENDED
214          KM    SLOPE = (2318-2280)/1829
215          RS       3    FLOW      -1
216          RC   0.045   0.035   0.045    1829  0.0208
217          RX       0      90      99     100     105     106     115     200
218          RY     110     104     102     100     100     102     104     110
219          RL                    0.15     100
             *

220          KK    UC49
221          KM   SUBBASIN 49, UNNAMED WASH CENTRAL
222          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
223          KM    L= .47   Kb= 0.032   S=148.0
224          BA    .048
225          LG     .25     .39    3.60     .15   30.00
226          UC    .146    .135
             *

227          KK    UC31
228          KM   SUBBASIN 31, UNNAMED WASH CENTRAL
229          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
230          KM    L= 2.04   Kb= 0.028   S= 128.0
231          BA    .405
232          LG     .25     .38    4.10     .18   31.00
233          UC    .300    .288
234          UA       0       5      16      30      65      77      84      90      94      97
235          UA     100
             *

236          KK  CP3149
237          KM     COMBINE RUNOFF FROM SUBBASINS 31,49 WITH ROUTED FLOWS FROM
238          KM     R3537
239          HC       3
```

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                 *

240              KK   R3149
241              KM    ROUTING REACH FROM CP3149 TO CP4850 THROUGH SUBBASIN 50
242              KM    ENDPOINTS WERE EXTENDED
243              KM    SLOPE = (2280-2256)/1219
244              RS       2    FLOW      -1
245              RC   0.045   0.030   0.045    1219  0.0197
246              RX       0      95      99     100     110     111     118     250
247              RY     112     104     102     100     100     102     104     112
248              RL                    0.15     100
                 *

249              KK    UC46
250              KM   SUBBASIN 46, UNNAMED WASH CENTRAL
251              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
252              KM    L= .30  Kb= 0.061   Adj. Slope= 324.0
253              BA    .034
254              LG     .25     .39    3.60     .15   24.00
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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

255              UC    .129    .100
256              UA       0       5      16      30      65      77      84      90      94      97
257              UA     100
                 *

258              KK     R46
259              KM   ROUTING FLOW FROM SUBBASIN 46 TO CP4547 THROUGH SUBBASIN 45
260              KM    ENDPOINTS WERE EXTENDED
261              KM    SLOPE = (2346-2315)/1783
262              RS       3    FLOW      -1
263              RC   0.045   0.035   0.045    1783  0.0174
264              RX       0      92      99     100     105     106     113     200
265              RY     110     104     102     100     100     102     104     110
266              RL                    0.15     100
                 *

267              KK    UC45
268              KM   SUBBASIN 45, UNNAMED WASH CENTRAL
269              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
270              KM    L= .48   Kb= 0.030   S= 135.0
271              BA    .086
272              LG     .25     .39    3.60     .15   24.00
273              UC    .150    .102
274              UA       0       5      16      30      65      77      84      90      94      97
275              UA     100
                 *

276              KK    UC47
277              KM   SUBBASIN 47, UNNAMED WASH CENTRAL
278              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
279              KM    L= .39   Kb= 0.056   Adj. Slope= 324.0
280              BA    .031
281              LG     .25     .39    3.60     .15   24.00
282              UC    .142    .143
283              UA       0       5      16      30      65      77      84      90      94      97
284              UA     100
                 *

285              KK  CP4547
286              KM    COMBINE SUBBASIN RUNOFF FROM 45, 47 WITH ROUTED FLOWS FROM
287              KM    R46
288              HC       3
                 *

289              KK   R4547
290              KM   ROUTING FLOW FROM CP4547 TO CP4850 THROUGH SUBBASIN 48
291              KM   ENDPOINTS WERE EXTENDED
```

```
292          KM    SLOPE = (2315-2256)/2170
293          RS       4    FLOW      -1
294          RC   0.045   0.035   0.045    2170   .0272
295          RX       0      90      99     100     105     106     115     200
296          RY     110     104     102     100     100     102     104     110
297          RL                    0.15     100
             *
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

298          KK    UC48
299          KM   SUBBASIN 48, UNNAMED WASH CENTRAL, COMBINED 48 AND 56
300          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
301          KM    L= .92   Kb= 0.048   S= 117.0
302          BA    .197
303          LG     .25     .39    3.70     .16   30.00
304          UC    .275    .209
             *

305          KK    UC50
306          KM   SUBBASIN 50, UNNAMED WASH CENTRAL, COMBINED 50 AND 98
307          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
308          KM    L= .27   Kb= 0.037   S= 93.0
309          BA    .019
310          LG     .25     .38    3.80     .24   24.00
311          UC    .138    .136
             *

312          KK  CP4850
313          KM    COMBINE SUBBASIN RUNOFF FROM 48, 50 WITH ROUTED FLOWS FROM
314          KM    R3149 AND R4547
315          HC       4
             *

316          KK   R4850
317          KM   Routing flow from CP4850 to CP5157 through subbasin 57
318          KM    ENDPOINTS WERE EXTENDED
319          KM    SLOPE = (2256-2235)/1509
320          RS       2    FLOW      -1
321          RC   0.045   0.030   0.045    1509  0.0139
322          RX       0      95      99     100     115     116     120     200
323          RY     110     104     102     100     100     102     104     110
324          RL                    0.25     100
             *

325          KK    UC51
326          KM   SUBBASIN 51, UNNAMED WASH CENTRAL
327          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
328          KM    L= .42   Kb= 0.042   Adj. Slope= 317.0
329          BA    .060
330          LG     .25     .36    5.00     .21   29.00
331          UC    .129    .092
332          UA       0       5      16      30      65      77      84      90      94      97
333          UA     100
             *

334          KK    UC57
335          KM   SUBBASIN 57, UNNAMED WASH CENTRAL
336          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
337          KM    L= .47   Kb= 0.061   S= 200.0
338          BA    .037
339          LG     .25     .37    4.20     .28   20.00
340          UC    .196    .219
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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341          KK  CP5157
342          KM     COMBINE RUNOFF FROM SUBBASINS 51,57 WITH ROUTED FLOWS FROM
343          KM     R4850
344          HC       3
             *

345          KK   R5157
346          KM    ROUTING REACH FROM CP5157 TO CP5859 THROUGH SUBBASIN 59
347          KM    ENDPOINTS WERE EXTENDED
348          KM    SLOPE = (2235-2208)/1796
349          RS       2    FLOW      -1
350          RC   0.045   0.030   0.045    1796  0.0150
351          RX       0      60      99     100     100     121     160     220
352          RY     112     104     102     100     100     102     104     112
353          RL                    0.35     100
             *

354          KK    UC58
355          KM   SUBBASIN 58, UNNAMED WASH CENTRAL
356          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
357          KM    L= .69   Kb= 0.054  Adj. Slope= 317.0
358          BA    .110
359          LG     .25     .37    4.80     .13   20.00
360          UC    .183    .147
             *

361          KK    UC59
362          KM   SUBBASIN 59, UNNAMED WASH CENTRAL
363          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
364          KM    L= .49   Kb= 0.033   S= 112.0
365          BA    .034
366          LG     .25     .32    5.80     .33   16.00
367          UC    .171    .202
             *

368          KK  CP5859
369          KM     COMBINE RUNOFF FROM SUBBASINS 58,59 WITH ROUTED FLOWS FROM
370          KM     R5157
371          HC       3
             *

372          KK  D5859N
373          KM    DIVERSION OF FLOWS AT FLOW SPLIT
374          DT  D5859S
375          DI       0      50     100     500   10000
376          DQ       0    24.9    49.5   248.5    4970
             *

377          KK  R5859N
378          KM   ROUTE DIVERTED FLOW FROM CP5859 TO CP63 THROUGH 63
379          KM   ENDPOINTS WERE EXTENDED
380          KM    SLOPE = (2208-2195)/699
381          RS       1    FLOW      -1
382          RC   0.045   0.030   0.045     699  0.0186
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

383          RX       0      50      99     100     110     111     160     210
384          RY     108     103     102     100     100     102     103     108
385          RL                    0.15     100
             *

386          KK    UC63
387          KM   SUBBASIN 63, UNNAMED WASH CENTRAL, COMBINED BASINS 63, 65
388          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
389          KM    L= .81   Kb= 0.054   Adj. Slope= 322.0
390          BA    .117
```

```
391          LG     .25     .36    5.00     .19   19.00
392          UC    .204    .181
             *

393          KK    CP63
394          KM   COMBINE RUNOFF FROM SUBBASIN 63 WITH ROUTED FLOWS
395          KM   FROM RD5859N
396          HC       2
             *

397          KK     R63
398          KM   ROUTE FLOWS FROM CP63 TO CP6266 THROUGH SUBBASIN 66
399          KM    SLOPE = (2195-2170)/1394
400          KM    ENDPOINTS WERE EXTENDED
401          RS       2    FLOW      -1
402          RC   0.045   0.030   0.045    1394  0.0179
403          RX       0      80      99     100     125     126     145     200
404          RY     108     104     102     100     100     102     104     108
405          RL                    0.35     100
             *

406          KK    UC66
407          KM   SUBBASIN 66, UNNAMED WASH CENTRAL
408          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
409          KM    L= .54   Kb= 0.056   Adj. Slope= 324.0
410          BA    .037
411          LG     .25     .36    5.00     .25   15.00
412          UC    .167    .202
             *

413          KK    UC62
414          KM   SUBBASIN 62, UNNAMED WASH CENTRAL
415          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
416          KM    L= 1.33   Kb= 0.047   Adj. Slope= 321.0
417          BA    .361
418          LG     .25     .35    6.10     .13   14.00
419          UC    .242    .172
             *

420          KK  CP6266
421          KM   COMBINE RUNOFF FROM SUBBASINS 62, 66 WITH ROUTED FLOWS
422          KM   FROM R63
423          HC       3
             *
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


424          KK   R6266
425          KM   ROUTE FLOWS FROM CP6266 TO CP82 THROUGH SUBBASIN 82
426          KM    SLOPE = (2170-2150)/990
427          KM    ENDPOINTS WERE EXTENDED
428          RS       2    FLOW      -1
429          RC   0.045   0.030   0.045     990  0.0202
430          RX       0      85      99     100     100     121     135     250
431          RY     108     104     102     100     100     102     104     108
432          RL                    0.35     100
             *

433          KK  D5859S
434          KM   RECALL DIVERTED FLOW FROM D5859N
435          DR  D5859S
             *

436          KK  R5859S
437          KM   ROUTING DIVERTED FLOW FROM D5859S TO CP64 THROUGH SUBBASIN 64
438          KM    SLOPE = (2208-2194)/803
439          RS       1    FLOW      -1
440          RC   0.045   0.030   0.045     803  0.0174
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441          RX       0      50      99     100     125     126     175     225
442          RY     108     103     102     100     100     102     103     108
443          RL                    0.15     100
             *

444          KK    UC64
445          KM   SUBBASIN 64, UNNAMED WASH CENTRAL
446          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
447          KM    L= .15   Kb= 0.078   S= 166.0
448          BA    .005
449          LG     .25     .31    6.90     .20   17.00
450          UC    .129    .180
             *

451          KK    CP64
452          KM    COMBINE SUBBASIN RUNOFF FROM 64 WITH ROUTED FLOWS FROM
453          KM    DIVERSION RD5859N
454          HC       2    1.88
             *

455          KK    D64N
456          KM   DIVERSION OF FLOWS AT FLOW SPLIT
457          KM   SOUTHERN PART OF DIVERSION GOES OFF SITE
458          DT    D64S
459          DI       0      50     100     500   10000
460          DQ       0    22.5      45     225    4500
             *
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       LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

461          KK   RD64N
462          KM   ROUTING FLOW FROM D64N TO CP87 THROUGH SUBBASIN 87
463          KM   ENDPOINTS WERE EXTENDED
464          KM    SLOPE = (2194-2161)/1721
465          RS       2    FLOW      -1
466          RC   0.045   0.030   0.045    1721  0.0192
467          RX       0      60      99     100     112     113     152     200
468          RY     108     104     102     100     100     102     104     108
469          RL                    0.25     100
             *

470          KK    UC87
471          KM   SUBBASIN 87, UNNAMED WASH CENTRAL
472          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
473          KM    L= .33   Kb= 0.033   S= 101.0
474          BA    .025
475          LG     .25     .35    3.40     .62    9.00
476          UC    .150    .153
             *

477          KK    CP87
478          KM    COMBINE SUBBASIN RUNOFF FROM 87 WITH ROUTED FLOWS FROM
479          KM    DIVERSION RD64N
480          HC       2
             *

481          KK   RD87N
482          KM   ROUTING FLOW FROM D87N TO CP82 THROUGH SUBBASIN 82
483          KM    SLOPE = (2161-2150)/557
484          RS       1    FLOW      -1
485          RC   0.045   0.030   0.045     557  0.0197
486          RX      25      85      99     100     120     121     135     195
487          RY     108     104     102     100     100     102     104     108
488          RL                    0.35     100
             *

489          KK    UC82
490          KM    SUB-BASIN 82, UNNAMED WASH CENTRAL, COMBINED 81, 82, 83
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491          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
492          KM    L= .22   Kb= 0.047   Adj. Slope= 220.0
493          BA    .022
494          LG     .25     .36    4.30    .400   15.00
495          UC    .112    .087
             *

496          KK    CP82
497          KM   COMBINE DIVERTED FLOWS FROM D87N, ROUTED FLOWS FROM R6266,
498          KM   SUBBASIN 82
499          HC       3    2.45
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

500          KK     R82
501          KM   ROUTING FLOW FROM CP82 TO CP84 THROUGH SUBBASIN 84
502          KM    SLOPE = (2150-2138)/579
503          RS       1    FLOW      -1
504          RC   0.045   0.030   0.045     579  0.0207
505          RX       0      75      99     100     125     126     150     275
506          RY     108     104     102     100     100     102     104     108
507          RL                    0.35     100
             *

508          KK    D84N
509          KM   DIVERSION OF FLOWS AT FLOW SPLIT 84
510          KM   PART OF TRIPLE DIVERSION JUST UPSTREAM OF TERRAVITA WAY
511          DT    D84S
512          DI       0     500    1275    1550    1964    2475    3223    4000
513          DQ       0       0       0    79.7     255     490     888    1250
             *

514          KK    UC84
515          KM   SUBBASIN 84, UNNAMED WASH CENTRAL,
516          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
517          KM    L= .30   Kb= 0.054   Adj. Slope= 246.0
518          BA    .013
519          LG     .25     .36    4.50     .35   15.00
520          UC    .133    .156
             *

521          KK    CP84
522          KM    COMBINE SUBBASIN RUNOFF FROM 84 WITH REMAINDER OF DIVERTED FLOWS
523          KM    FROM D84N
524          HC       2
             *

525          KK     R84
526          KM   ROUTING FLOW FROM CP84 TO CP7879 THROUGH SUBBASIN 79
527          KM   ENDPOINTS WERE EXTENDED
528          KM    SLOPE = (2138-2054)/3463
529          RS       5    FLOW      -1
530          RC   0.045   0.030   0.045    3463  0.0243
531          RX       0      94      99     100     110     111     116     225
532          RY     108     104     102     100     100     102     104     108
533          RL                    0.15     100
             *

534          KK    UC79
535          KM   SUBBASIN 79, UNNAMED WASH CENTRAL, COMBINED 79 AND 92
536          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
537          KM    L= .88   Kb= 0.035   Adj. Slope= 233.0
538          BA    .078
539          LG     .25     .35    4.30     .45   19.00
540          UC    .188    .222
541          UA       0       5      16      30      65      77      84      90      94      97
542          UA     100
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  543         KK    UC78
  544         KM   SUBBASIN 78, UNNAMED WASH CENTRAL
  545         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  546         KM    L= .86   Kb= 0.036   Adj. Slope= 319.0
  547         BA    .177
  548         LG     .25     .35    6.00     .17   17.00
  549         UC    .167    .120
  550         UA       0       5      16      30      65      77      84      90      94      97
  551         UA     100
              *

  552         KK  CP7879
  553         KM    COMBINE SUBBASIN RUNOFF FROM BASINS 78, 79 WITH ROUTED FLOWS
  554         KM    FROM R84
  555         HC       3
              *

  556         KK   R7879
  557         KM   ROUTING FLOW FROM CP7879 TO CP77 THROUGH SUBBASIN 77
  558         KM   ENDPOINTS WERE EXTENDED
  559         KM    SLOPE = (2054-2048)/256
  560         RS       1    FLOW      -1
  561         RC   0.045   0.030   0.045     256   .0234
  562         RX       0      90      99     100     120     121     130     200
  563         RY     108     104     102     100     100     102     104     108
  564         RL                    0.35     100
              *

  565         KK    UC77
  566         KM   SUBBASIN 77, UNNAMED WASH CENTRAL
  567         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  568         KM    L= .93   Kb= 0.043  Adj. Slope= 324.0
  569         BA    .096
  570         LG     .25     .34    6.70     .13   16.00
  571         UC    .188    .206
  572         UA       0       5      16      30      65      77      84      90      94      97
  573         UA     100
              *

  574         KK    CP77
  575         KM    COMBINE SUBBASIN RUNOFF FROM BASIN 77 WITH ROUTED FLOWS
  576         KM    FROM R7879
  577         HC       2
              *

  578         KK     R77
  579         KM   ROUTING FLOW FROM CP77 TO CP89 THROUGH SUBBASIN 89
  580         KM   ENDPOINTS WERE EXTENDED
  581         KM    SLOPE = (2048-2037)/593
  582         RS       1    FLOW      -1
  583         RC   0.045   0.030   0.045     593  0.0185
  584         RX       0      80      99     100     115     116     120     200
  585         RY     108     104     102     100     100     102     104     108
  586         RL                    0.25     100
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  587         KK    UC89
  588         KM   SUBBASIN 89, UNNAMED WASH CENTRAL
  589         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
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```
590          KM    L= .77   Kb= 0.031   S= 126.0
591          BA    .073
592          LG     .25      .33     6.40      .20   21.00
593          UC    .196     .218
594          UA       0        5       16       30      65      77      84      90      94      97
595          UA     100
             *

596          KK    CP89
597          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 89 WITH ROUTED FLOWS
598          KM    FROM R77
599          HC       2
             *

600          KK     R89
601          KM   ROUTING FLOW FROM CP89 TO CP90EN THROUGH SUBBASIN 90
602          KM   CHANNEL ENDS WERE EXTENDED
603          KM    SLOPE = (2037-2008)/1912
604          RS       2    FLOW      -1
605          RC   0.045   0.030   0.045    1912  0.0152
606          RX       0      80      99     100     115     116     135     250
607          RY     108     104     102     100     100     102     104     108
608          RL                    0.25     100
             *

609          KK    UC74
610          KM   SUBBASIN 74, UNNAMED WASH CENTRAL
611          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
612          KM    L= 1.13   Kb= 0.041   Adj. Slope= 328.0
613          BA    .151
614          LG     .25      .34     6.60      .13   16.00
615          UC    .200     .201
             *

616          KK    UC76
617          KM   SUBBASIN 76, UNNAMED WASH CENTRAL
618          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
619          KM    L= .64   Kb= 0.033   Adj. Slope= 302.0
620          BA    .041
621          LG     .25      .35     6.10      .16   15.00
622          UC    .142     .183
             *

623          KK  CP7476
624          KM    COMBINE SUBBASIN RUNOFF FROM BASINS 74 AND 76
625          HC       2
             *
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

626          KK   R7476
627          KM   ROUTING FLOW FROM CP7476 TO CP75 THROUGH SUBBASIN 75
628          KM   END POINTS WERE EXTENDED
629          KM    SLOPE = (2031-2017)/524
630          RS       1    FLOW      -1
631          RC   0.045   0.030   0.045     524  0.0267
632          RX       0      80      99     100     112     113     132     200
633          RY     108     104     102     100     100     102     104     108
634          RL                    0.25     100
             *

635          KK    UC75
636          KM   SUBBASIN 75, UNNAMED WASH CENTRAL
637          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
638          KM    L= 1.38   Kb= 0.031   Adj. Slope= 322.0
639          BA    .192
640          LG     .25      .34     6.50      .15   16.00
641          UC    .192     .196
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642          UA       0       5      16      30      65      77      84      90      94      97
643          UA     100
             *

644          KK    CP75
645          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 75 AND ROUTED FLOWS
646          KM    FROM R7476
647          HC       2
             *

648          KK     R75
649          KM   ROUTING FLOW FROM CP75 TO CP90EN THROUGH SUBBASIN 90
650          KM   END POINTS WERE EXTENDED
651          KM    SLOPE = (2017-2008)/723
652          RS       1    FLOW      -1
653          RC   0.045   0.030   0.045     723  0.0124
654          RX       0      80      99     100     115     116     135     200
655          RY     108     104     102     100     100     102     104     108
656          RL                    0.25     100
             *

657          KK    UC90
658          KM   SUBBASIN 90, UNNAMED WASH CENTRAL
659          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
660          KM    L= .48   Kb= 0.035   S= 151.0
661          BA    .038
662          LG     .25     .35    3.70     .55   20.00
663          UC    .158    .170
             *

664          KK    UC91
665          KM   SUBBASIN 91, UNNAMED WASH CENTRAL
666          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
667          KM    L= .75   Kb= 0.033   S= 109.0
668          BA    .073
669          LG     .25     .31    7.40     .14   23.00
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

670          UC    .204    .225
             *
             *

671          KK  CP90EN
672          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 90 AND 91 WITH ROUTED FLOWS
673          KM    FROM R89 AND R75
674          HC       4
             *

675          KK    D84S
676          KM   RETREVIAL OF DIVERTED FLOW FROM D84S
677          DR    D84S
             *

678          KK   RD84S
679          KM   ROUTING FLOW FROM CP84 (D84S) TO D84ii
680          KM    SLOPE = (2144-2140)/303
681          RS       6    FLOW      -1
682          RC   0.045   0.030   0.045     303  0.0132
683          RX       0      50      99     100     125     126     175     225
684          RY     106     104     102     100     100     102     104     106
685          RL                    0.35     100
             *

686          KK  D84IIS
687          KM   SOUTHERN PART OF TRIPLE DIVERSION AT TERRAVITA WAY
688          KM   D84S FLOWS THROUGH DIP CROSSING AT TERRAVITA WAY
689          DT  D84IIN
690          DI       0    79.7     255     490     880    1250
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691          DQ       0    78.3     229     419     732    1000
             *

692          KK  RD84IS
693          KM   ROUTING FLOWS FROM D84IIS TO CP94DS
694          KM   SLOPE = (2140-2078)/3225
695          RS       1    FLOW      -1
696          RC   0.045   0.030   0.045    3225  0.0192
697          RX       0      50      99     100     125     126     175     225
698          RY     106     104     102     100     100     102     104     106
699          RL                    0.25     100
             *

700          KK    UC94
701          KM   SUBBASIN 94, UNNAMED WASH CENTRAL
702          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
703          KM    L= .53   Kb= 0.119   S= 108.0
704          BA    .028
705          LG     .25     .36    5.00     .23   13.00
706          UC    .671   1.082
             *
1                                          HEC-1 INPUT
PAGE 18

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

707          KK  CP94DS
708          KM   COMBINE SUBBASIN RUNOFF FROM UC94 WITH ROUTED FLOW
709          KM   FROM RD84IS
710          HC       2
             *

711          KK   R94DS
712          KM   ROUTING FLOW FROM CP94DS TO CP88EN
713          KM   SLOPE = (2078-2041)/1950
714          RS       1    FLOW      -1
715          RC   0.045   0.030   0.045    1950  0.0189
716          RX      60      85      99     100     108     109     123     148
717          RY     106     104     102     100     100     102     104     106
718          RL                    0.25     100
             *

719          KK  D84IIN
720          KM   RECALL DIVERTED FLOW FROM D84II
721          DR  D84IIN
             *

722          KK  RD84IN
723          KM   ROUTING FLOW FROM D84II TO CP88EN
724          KM   SLOPE = (2140-2041)/5175
725          RS       1    FLOW      -1
726          RC   0.045   0.030   0.045    5175  0.0191
727          RX      60      78      90     100     125     132     135     150
728          RY     106     104     102     100     100     102     104     106
729          RL                    0.25     100
             *

730          KK    UC88
731          KM   SUBBASIN 88, UNNAMED WASH CENTRAL, COMBINED SUBBASIN 86, 88, 97
732          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
733          KM    L= 1.08   Kb= 0.104   S=111.0
734          BA    .108
735          LG     .25     .33    6.10     .20   14.00
736          UC    .962   1.337
             *

737          KK  CP88EN
738          KM    COMBINE SUBBASIN RUNOFF FROM BASIN 88 WITH ROUTED FLOWS
739          KM    FROM R94DS AND RD84IN
740          HC       3
```

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                    *
 741                KK    UC95
 742                KM   SUBBASIN 95, UNNAMED WASH CENTRAL
 743                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 744                KM    L= 0.22   Kb= 0.034   Adj.Slope= 220
 745                BA    .024
 746                LG     .25     .39    3.70     .15   19.00
 747                UC    .092    .065
                    *
1                                                HEC-1 INPUT
PAGE 19

LINE                ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 748                KK    UC93
 749                KM   SUBBASIN 93, UNNAMED WASH CENTRAL
 750                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 751                KM    L= .64   Kb= 0.033   S= 135.0
 752                BA    .038
 753                LG     .25     .30    8.00     .07   20.00
 754                UC    .179    .249
                    *

 755                KK    UC96
 756                KM   SUBBASIN 96, UNNAMED WASH CENTRAL
 757                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 758                KM    L= .73   Kb= 0.031  S= 113.0
 759                BA    .061
 760                LG     .25     .32    7.00     .12   18.00
 761                UC    .196    .230
                    *
                    *
 762                ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

 NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  42        UC8
            .
            .
  51        .         UC9
            .           .
            .           .
  60      CPC8...........
            V
            V
  64     RCP89
            .
            .
  74        .        UC18
            .           .
            .           .
  83        .           .        UC19
            .           .           .
            .           .           .
  90    CP1819......................
            V
            V
  93     R1819
            .
            .
 102        .        UC22
            .           .
            .           .
 109        .           .        UC23
            .           .           .
            .           .           .
 116    CP2223......................
            V
            V
 119     R2223
            .
            .
 128        .        UC28
            .           V
            .           V
 135        .         R28
            .           .
            .           .
 144        .           .        UC29
            .           .           .
            .           .           .
 151        .           .           .       UC30
            .           .           .           .
            .           .           .           .
 158    CP2930.................................
            V
            V
 162     R2930
            .
            .
 171        .        UC34
            .           .
            .           .
 180      CP34...........
            V
            V
 184       R34
            .
            .
 193        .        UC37
```

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              .           .
              .           .
200           .           .        UC35
              .           .           .
              .           .           .
207      CP3537.......................
              V
              V
211       R3537
              .
              .
220           .        UC49
              .           .
              .           .
227           .           .        UC31
              .           .           .
              .           .           .
236      CP3149.......................
              V
              V
240       R3149
              .
              .
249           .        UC46
              .           V
              .           V
258           .         R46
              .           .
              .           .
267           .           .        UC45
              .           .           .
              .           .           .
276           .           .           .        UC47
              .           .           .           .
              .           .           .           .
285           .      CP4547.......................
              .           V
              .           V
289           .       R4547
              .           .
              .           .
298           .           .        UC48
              .           .           .
              .           .           .
305           .           .           .        UC50
              .           .           .           .
              .           .           .           .
312      CP4850.................................
              V
              V
316       R4850
              .
              .
325           .        UC51
              .           .
              .           .
334           .           .        UC57
              .           .           .
              .           .           .
341      CP5157.......................
              V
              V
345       R5157
              .
              .
354           .        UC58
              .           .
              .           .
361           .           .        UC59
              .           .           .
              .           .           .
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368      CP5859.......................
              .
              .
374           .-------->  D5859S
372      D5859N
              V
              V
377      R5859N
              .
              .
386           .        UC63
              .           .
              .           .
393        CP63............
              V
              V
397         R63
              .
              .
406           .        UC66
              .           .
              .           .
413           .           .        UC62
              .           .           .
              .           .           .
420      CP6266.......................
              V
              V
424       R6266
              .
              .
435           .           .<-------  D5859S
433           .      D5859S
              .           V
              .           V
436           .      R5859S
              .           .
              .           .
444           .           .        UC64
              .           .           .
              .           .           .
451           .        CP64............
              .           .
              .           .
458           .           .-------->    D64S
455           .        D64N
              .           V
              .           V
461           .       RD64N
              .           .
              .           .
470           .           .        UC87
              .           .           .
              .           .           .
477           .        CP87............
              .           V
              .           V
481           .       RD87N
              .           .
              .           .
489           .           .        UC82
              .           .           .
              .           .           .
496        CP82.......................
              V
              V
500         R82
              .
              .
511           .-------->    D84S
508        D84N
```

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              .
              .
514           .        UC84
              .           .
              .           .
521        CP84............
              V
              V
525         R84
              .
              .
534           .        UC79
              .           .
              .           .
543           .           .        UC78
              .           .           .
              .           .           .
552     CP7879........................
              V
              V
556      R7879
              .
              .
565           .        UC77
              .           .
              .           .
574        CP77............
              V
              V
578         R77
              .
              .
587           .        UC89
              .           .
              .           .
596        CP89............
              V
              V
600         R89
              .
              .
609           .        UC74
              .           .
              .           .
616           .           .        UC76
              .           .           .
              .           .           .
623           .      CP7476............
              .           V
              .           V
626           .       R7476
              .           .
              .           .
635           .           .        UC75
              .           .           .
              .           .           .
644           .        CP75............
              .           V
              .           V
648           .         R75
              .           .
              .           .
657           .           .        UC90
              .           .           .
              .           .           .
664           .           .           .        UC91
              .           .           .           .
              .           .           .           .
671     CP90EN.................................
              .
              .
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677          .            .<-------    D84S
675          .         D84S
             .            V
             .            V
678          .        RD84S
             .            .
             .            .
689          .            .------->  D84IIN
686          .       D84IIS
             .            V
             .            V
692          .       RD84IS
             .            .
             .            .
700          .            .        UC94
             .            .           .
             .            .           .
707          .       CP94DS............
             .            V
             .            V
711          .        R94DS
             .            .
             .            .
721          .            .           .<-------  D84IIN
719          .            .      D84IIN
             .            .           V
             .            .           V
722          .            .      RD84IN
             .            .           .
             .            .           .
730          .            .           .        UC88
             .            .           .           .
             .            .           .           .
737          .       CP88EN......................
             .            .
             .            .
741          .            .        UC95
             .            .           .
             .            .           .
748          .            .           .        UC93
             .            .           .           .
             .            .           .           .
755          .            .           .           .        UC96
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC8	83.	12.10	12.	4.	1.	.05
+	HYDROGRAPH AT	UC9	82.	12.07	11.	3.	1.	.05
+	2 COMBINED AT	CPC8	164.	12.07	22.	7.	2.	.10
+	ROUTED TO	RCP89	160.	12.17	22.	7.	2.	.10
+	HYDROGRAPH AT	UC18	82.	12.07	8.	2.	1.	.04
+	HYDROGRAPH AT	UC19	53.	12.07	5.	2.	1.	.03
+	3 COMBINED AT	CP1819	277.	12.10	36.	11.	4.	.17
+	ROUTED TO	R1819	274.	12.13	36.	11.	4.	.17
+	HYDROGRAPH AT	UC22	48.	12.10	6.	2.	1.	.03
+	HYDROGRAPH AT	UC23	36.	12.03	3.	1.	0.	.01
+	3 COMBINED AT	CP2223	340.	12.13	44.	13.	5.	.21
+	ROUTED TO	R2223	337.	12.17	44.	13.	5.	.21
+	HYDROGRAPH AT	UC28	126.	12.07	10.	3.	1.	.05
+	ROUTED TO	R28	124.	12.10	10.	3.	1.	.05
+	HYDROGRAPH AT	UC29	76.	12.07	7.	2.	1.	.04
+	HYDROGRAPH AT	UC30	28.	12.03	2.	1.	0.	.01
+	4 COMBINED AT	CP2930	534.	12.13	63.	18.	7.	.31
+	ROUTED TO	R2930	530.	12.13	63.	18.	7.	.31
+	HYDROGRAPH AT	UC34	99.	12.00	7.	2.	1.	.04
+	2 COMBINED AT	CP34	580.	12.13	70.	20.	7.	.35
+	ROUTED TO	R34	551.	12.33	70.	20.	7.	.35

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC37	267.	12.20	46.	13.	5.	.21
+	HYDROGRAPH AT	UC35	528.	12.10	55.	16.	6.	.26
+	3 COMBINED AT	CP3537	1158.	12.20	168.	48.	17.	.82
+	ROUTED TO	R3537	1147.	12.27	168.	48.	17.	.82
+	HYDROGRAPH AT	UC49	123.	12.03	11.	3.	1.	.05
+	HYDROGRAPH AT	UC31	716.	12.10	91.	27.	10.	.41
+	3 COMBINED AT	CP3149	1802.	12.17	267.	78.	28.	1.27
+	ROUTED TO	R3149	1797.	12.20	267.	78.	28.	1.27
+	HYDROGRAPH AT	UC46	94.	12.00	8.	2.	1.	.03
+	ROUTED TO	R46	92.	12.07	8.	2.	1.	.03
+	HYDROGRAPH AT	UC45	235.	12.03	19.	6.	2.	.09
	HYDROGRAPH AT	UC47	79.	12.03	7.	2.	1.	.03
+	3 COMBINED AT	CP4547	402.	12.03	34.	10.	4.	.15
+	ROUTED TO	R4547	390.	12.07	34.	10.	3.	.15
+	HYDROGRAPH AT	UC48	397.	12.10	45.	13.	5.	.20
+	HYDROGRAPH AT	UC50	47.	12.03	4.	1.	0.	.02
+	4 COMBINED AT	CP4850	2467.	12.13	347.	101.	37.	1.64
+	ROUTED TO	R4850	2449.	12.20	347.	101.	36.	1.64
+	HYDROGRAPH AT	UC51	164.	12.00	13.	4.	1.	.06
+	HYDROGRAPH AT	UC57	72.	12.07	7.	2.	1.	.04
+	3 COMBINED AT	CP5157	2551.	12.17	366.	107.	38.	1.74
+	ROUTED TO	R5157	2532.	12.23	366.	107.	38.	1.74
	HYDROGRAPH AT	UC58	264.	12.07	24.	7.	2.	.11

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+	HYDROGRAPH AT	UC59	67.	12.07	6.	2.	1.	.03
+	3 COMBINED AT	CP5859	2719.	12.20	395.	115.	41.	1.88
+	DIVERSION TO	D5859S	1351.	12.20	196.	57.	21.	1.88
+	HYDROGRAPH AT	D5859N	1368.	12.20	199.	58.	21.	1.88
+	ROUTED TO	R5859N	1362.	12.23	199.	58.	21.	1.88
+	HYDROGRAPH AT	UC63	251.	12.07	24.	7.	2.	.12
+	2 COMBINED AT	CP63	1528.	12.20	221.	64.	23.	2.00
+	ROUTED TO	R63	1522.	12.23	221.	64.	23.	2.00
+	HYDROGRAPH AT	UC66	76.	12.07	7.	2.	1.	.04
+	HYDROGRAPH AT	UC62	775.	12.10	73.	20.	7.	.36
+	3 COMBINED AT	CP6266	2199.	12.17	298.	85.	31.	2.40
+	ROUTED TO	R6266	2187.	12.20	298.	85.	31.	2.40
+	HYDROGRAPH AT	D5859S	1351.	12.20	196.	57.	21.	1.88
+	ROUTED TO	R5859S	1342.	12.23	196.	57.	21.	1.88
+	HYDROGRAPH AT	UC64	11.	12.03	1.	0.	0.	.00
+	2 COMBINED AT	CP64	1348.	12.23	197.	57.	21.	1.88
+	DIVERSION TO	D64S	606.	12.23	89.	26.	9.	1.88
+	HYDROGRAPH AT	D64N	741.	12.23	108.	31.	11.	1.88
+	ROUTED TO	RD64N	730.	12.30	108.	31.	11.	1.88
+	HYDROGRAPH AT	UC87	49.	12.03	4.	1.	0.	.03
+	2 COMBINED AT	CP87	743.	12.30	112.	32.	12.	1.90
+	ROUTED TO	RD87N	743.	12.30	111.	32.	12.	1.90
+	HYDROGRAPH AT	UC82	56.	12.00	4.	1.	0.	.02
+	3 COMBINED AT	CP82	2882.	12.20	413.	118.	43.	2.45

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
	ROUTED TO	R82	2875.	12.23	412.	118.	42.	2.45
+	DIVERSION TO	D84S	703.	12.23	46.	12.	4.	2.45
+	HYDROGRAPH AT	D84N	2172.	12.23	366.	106.	38.	2.45
+	HYDROGRAPH AT	UC84	29.	12.03	2.	1.	0.	.01
+	2 COMBINED AT	CP84	2183.	12.20	369.	107.	39.	2.46
+	ROUTED TO	R84	2163.	12.30	368.	107.	38.	2.46
+	HYDROGRAPH AT	UC79	142.	12.07	13.	4.	1.	.08
+	HYDROGRAPH AT	UC78	449.	12.03	35.	10.	4.	.18
+	3 COMBINED AT	CP7879	2331.	12.27	415.	120.	43.	2.72
+	ROUTED TO	R7879	2329.	12.27	415.	120.	43.	2.72
+	HYDROGRAPH AT	UC77	205.	12.07	20.	6.	2.	.10
	2 COMBINED AT	CP77	2432.	12.27	433.	125.	45.	2.81
+	ROUTED TO	R77	2429.	12.27	433.	125.	45.	2.81
+	HYDROGRAPH AT	UC89	148.	12.07	15.	4.	2.	.07
+	2 COMBINED AT	CP89	2505.	12.27	447.	129.	46.	2.89
+	ROUTED TO	R89	2493.	12.30	447.	129.	46.	2.89
+	HYDROGRAPH AT	UC74	317.	12.07	31.	9.	3.	.15
+	HYDROGRAPH AT	UC76	91.	12.03	8.	2.	1.	.04
+	2 COMBINED AT	CP7476	406.	12.07	39.	11.	4.	.19
+	ROUTED TO	R7476	404.	12.07	39.	11.	4.	.19
+	HYDROGRAPH AT	UC75	410.	12.07	38.	11.	4.	.19
+	2 COMBINED AT	CP75	808.	12.07	77.	21.	8.	.38
	ROUTED TO	R75	795.	12.07	77.	21.	8.	.38
	HYDROGRAPH AT							

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA
+		UC90	76.	12.07	6.	2.	1.	.04
	HYDROGRAPH AT							
+		UC91	147.	12.07	16.	5.	2.	.07
	4 COMBINED AT							
+		CP90EN	3188.	12.17	542.	155.	56.	3.38
	HYDROGRAPH AT							
+		D84S	703.	12.23	46.	12.	4.	2.45
	ROUTED TO							
+		RD84S	706.	12.23	46.	12.	4.	2.45
	DIVERSION TO							
+		D84IIN	592.	12.23	40.	10.	4.	2.45
	HYDROGRAPH AT							
+		D84IIS	114.	12.23	6.	2.	1.	2.45
	ROUTED TO							
+		RD84IS	85.	12.33	6.	2.	1.	2.45
	HYDROGRAPH AT							
+		UC94	18.	12.50	5.	1.	1.	.03
	2 COMBINED AT							
+		CP94DS	101.	12.37	11.	3.	1.	2.48
	ROUTED TO							
+		R94DS	96.	12.40	11.	3.	1.	2.48
	HYDROGRAPH AT							
+		D84IIN	592.	12.23	40.	10.	4.	2.45
	ROUTED TO							
+		RD84IN	471.	12.37	39.	10.	4.	2.45
	HYDROGRAPH AT							
+		UC88	58.	12.77	20.	6.	2.	.11
	3 COMBINED AT							
+		CP88EN	603.	12.37	69.	18.	6.	2.59
	HYDROGRAPH AT							
+		UC95	71.	12.00	5.	1.	1.	.02
	HYDROGRAPH AT							
+		UC93	78.	12.07	9.	3.	1.	.04
	HYDROGRAPH AT							
+		UC96	124.	12.07	13.	4.	1.	.06

*** NORMAL END OF HEC-1 ***

Memorandum JE Fuller/ Hydrology & Geomorphology, Inc.

DATE: December 5, 2001, revised October 23, 2002

TO: Linda Johnson, P.E., CH2M Hill

FROM: Ted Lehman, P.E.

RE: Hydrologic modeling for Carefree DMP for Andora Hills and Galloway Washes

CC: File

Registered Professional Engineer (Civil) CERTIFICATE NO. 35895 TED W. LEHMAN Date Signed 10-23-02 ARIZONA U.S.A.

This memorandum is a revision to an original memorandum dated December 5, 2001. The revisions are based on comments received from FEMA during review of the Floodplain Delineation Study for Andora Hills and Galloway Washes. The revisions requested by FEMA involved further subdivision of original subbasin GWW1_3 into three new subbasins (GWW131, GWW132, and GWW133) to provide greater resolution of discharges on Galloway Wash. The tables, text, and figures of the original memorandum have been modified to include and reflect these revisions.

1. Introduction

This memorandum describes the procedures and results of hydrologic analyses for Andora Hills and Galloway Washes performed by JE Fuller / Hydrology & Geomorphology, Inc. for the Carefree Area Drainage Master Plan. The analyses include 10-year and 100-year frequencies for the 6- and 24-hour duration for both the existing condition and future condition land uses in the subject watersheds.

The primary purpose of this modeling is to compute peak discharges at road crossing locations in the two watersheds within the Town of Carefree.

2. Description of Hydrologic Methods

2.1 Existing Conditions

2.1.1 Andora Hills Wash

The hydrologic modeling for the current study is based on modeling originally produced by George V. Sabol Consulting Engineers (GVSCE) for the *Cave Creek Above Carefree Highway Floodplain Delineation Study, FCD 95-28.* The GVSCE model was used to generate 100-year peak discharge values for Andora Hills Wash. The HEC-1 modeling performed by GVSCE to obtain these earlier results was done using the methodology set forth in the *Drainage Design Manual for Maricopa County, Volume I, Hydrology.*

The 100-year 6-hour duration HEC-1 model was developed for Andora Hills Wash for existing conditions land uses with the 6-hour storm patterns published in the Drainage Design Manual. Additionally, a 24-hour model was constructed using the SCS Type II distribution HEC-1 rainfall losses for the Andora Hills Wash watershed were estimated using the Green and Ampt method. The Clark unit hydrograph was used to generate hydrographs in the small, urban

subbasins of the Andora Hills Wash watershed. Normal depth storage routing was used for the channel routings to route hydrographs through the watershed.

The GVSCE model was revised to include a minor shift in subbasin boundaries between AHW1 and AHW3. Also, an additional combination block was added to separate hydrographs at one location. The 100-year 24-hour and 100-year 6-hour peak discharges were determined using the revised model. Additional models were created to determine 10-year 24-hour and 10-year 6-hour peak discharges.

2.1.2 Galloway Wash

The hydrologic modeling for Galloway Wash was based on the previous modeling done in for the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14) (JEF, 2001). In that study, 100-year 6-hour and 100-year 24-hour peak discharge values were determined using the US Army Corps of Engineers (COE) HEC-1 Computer Program, version 4.0.1E, dated May, 1991, in accordance with the methodology set forth in the FCDMC *Drainage Design Manual, Vol. I.*

The Galloway Wash HEC-1 model was developed for existing conditions using the 100-year 24-hour rainfall depth and the SCS Type II distribution. Additionally, a 6-hour HEC-1 model was developed using the 6-hour storm patterns in the Drainage Design Manual. HEC-1 rainfall losses for the Galloway Wash watershed were estimated using the Green and Ampt method. The Phoenix Mountain and Desert/Rangeland S-graphs were used to generate unit hydrographs. The normal depth storage routing routine was used for all channel reaches. Representative 8-point cross sections were obtained from previous FIS study model results and 2 foot contour interval topographic mapping.

For the current study, additional models for the Galloway Wash watershed were created to for the 10-year 24-hour and 10-year 6-hour peak discharges. The 10-year models were based on the 100-year models. Only the rainfall depth was modified from the 100-year models.

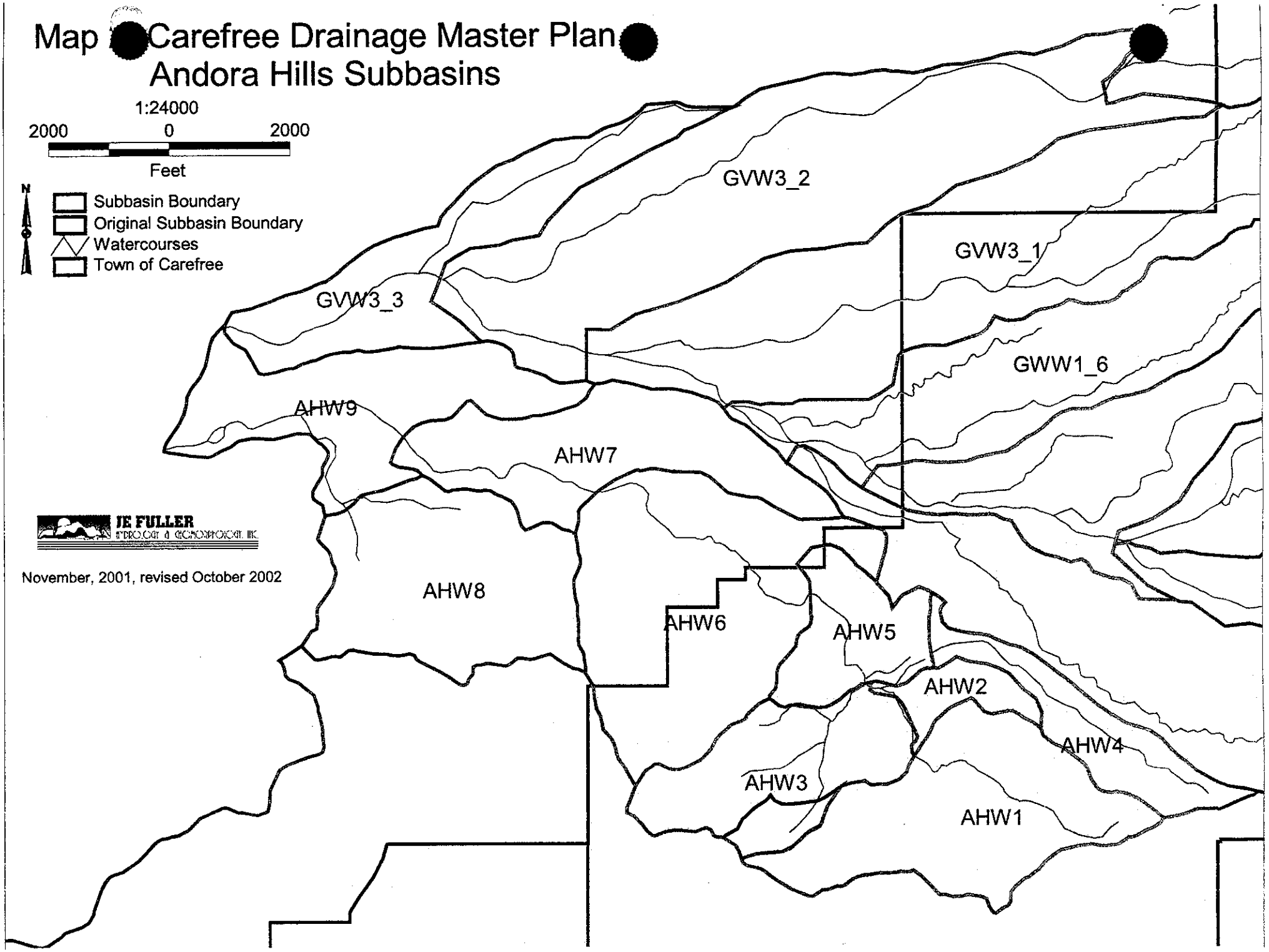
2.2 Physical Parameters

2.2.1 Drainage Area Boundaries

Map 1 shows the drainage boundaries used in the HEC-1 modeling of Andora Hills and Galloway Washes for the current study. The Andora Hills watershed is approximately 2.8 square miles. The elevation of the watershed at the confluence with Cave Creek is approximately 2000 feet. The elevation of the highest point in the watershed is 3398 feet at Black Mountain located in the southern part of the watershed.

Subbasin boundaries used in the Andora Hills Wash models were originally established by GVSCE for the *Cave Creek Above Carefree Highway Floodplain Delineation Study* (FCD 95-28), with the exception of the shared boundary between subbasins AHW1 (S320) and AHW3 (S340L). The boundary between subbasins AHW1 and AHW3 was moved based on examination of the 2001 orthophotos provided by the Flood Control District of Maricopa County (FCDMC). The shift in boundary was made to incorporate drainage that flowed into AHW3 rather than AHW1. The boundary shift involved an area of 24.2 acres (Map 2).

Map Carefree Drainage Master Plan
Andora Hills Subbasins



Ma 1: Carefree Drainage Master Pl
Andora Hills & Galloway Washes Subbasins

SCALE 1:63360

1 0 1

Miles

N

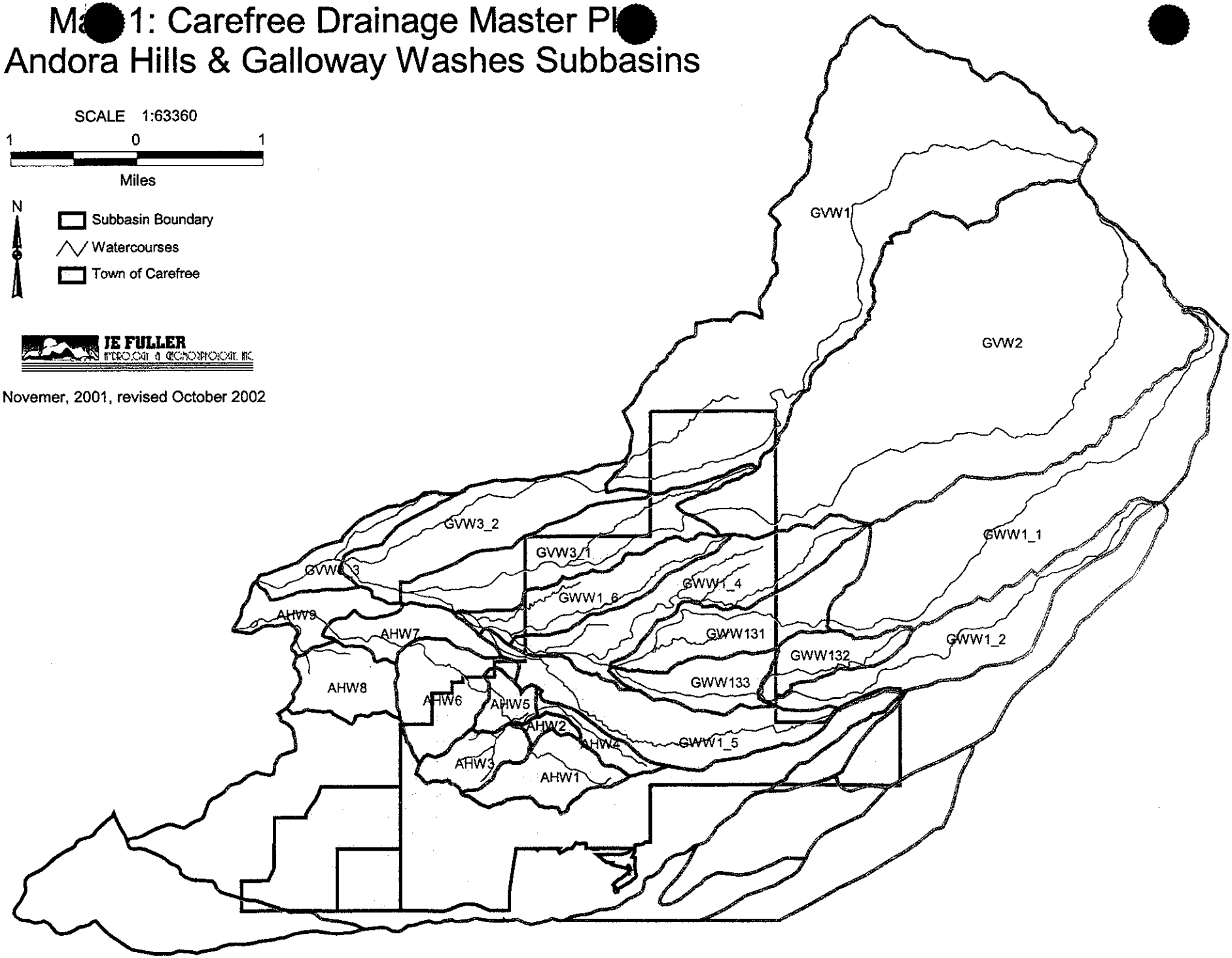
Subbasin Boundary

Watercourses

Town of Carefree

JE FULLER

Novemer, 2001, revised October 2002



The Galloway Wash watershed, including the Grapevine Wash tributary, is approximately 17.4 square miles. Galloway Wash is also referred to as "Rowler Wash" in a street map published by the Town of Carefree. The elevation of the watershed outlet at the Cave Creek confluence is approximately 2025 feet, and the elevation of the highest point in the watershed is approximately 4890 feet at Butte Peak located in the northeast part of the watershed.

Subbasin boundaries (Map 1) in the Galloway Wash model remained the same as the HEC-1 model established by JE Fuller Hydrology & Geomorphology, Inc. (JEF), in the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14).

2.2.2 Rainfall

Rainfall data for the 100-year 6-hour and 100-year 24-hour storms were taken directly from the previous GVSCE (1997) and JEF (2001) models. The 10-year point rainfall statistics were derived using 4 input PREFRE analyses. The PREFRE output are provided in Appendix A.

Areal reduction of point rainfall for the JD records in the 10-year HEC-1 models were computed using the same reduction factors as for the 100-year analyses in GVSCE (1997) for Andora Hills Wash and JEF (2001) for Galloway Wash.

The SCS Type II temporal distribution was used for the 24-hour models for both washes. The necessary FCDMC 6-hour patterns for the modeled index storms were used in the 6-hour models.

2.2.3 Rainfall Losses

Parameters for rainfall losses, including those parameters related to soils and land use classifications, were generated in prior studies. Rainfall loss parameters in the Galloway Wash watershed were determined by JEF (2001) and reported in *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14). Rainfall loss parameters in the Andora Hills Wash watershed were determined by GVSCE (1997) and reported in *Cave Creek Above Carefree Highway Floodplain Delineation Study* (FCD 95-28). Rainfall losses for both studies were estimated using the Green and Ampt method in HEC-1.

Revisions to the subbasin boundaries in the Andora Hills Wash watershed required the recalculation of rainfall loss parameters for two subbasins (AHW1 and AHW3). The original methods outlined by GVSCE in the *Cave Creek Above Carefree Highway Floodplain Delineation Study* (FCD 95-28) were used to determine the new rainfall loss parameters for these two subbasins.

2.2.3.1 Soils

The revised Andora Hills Wash watershed subbasin boundaries were overlaid on a digital soils map in ArcView. The digital soils map was derived from the Soil Conservation Service (SCS) (Camp, 1986) and the US Forest Service (USFS) and was provided by the FCDMC as ArcView shapefiles for the project area. The digital soil map unit data are based on *Soil Survey of Aguila-*

Carefree, Parts of Maricopa and Pinal Counties, Arizona (Camp, 1986) and on *USFS, Tonto National Forest, General Ecosystem Survey,* 1989.

The boundary change between subbasins AHW1 and AHW3 resulted in 24.2 acres of Gran-Wickenburg soil (Soil type 63) shifting to AHW3 from AHW1. Determining the soil-related rainfall loss parameters for the subbasins was accomplished by following the procedures outlined by GVSCE in the *Cave Creek Above Carefree Highway Floodplain Delineation Study* (FCD 95-28), *Technical Data Notebook, Book 2 of 2.* The resulting soil distributions and rainfall loss parameters in the affected subbasins are shown in Table B.1 in Appendix B.

2.2.3.2 Land Use

Both study watersheds are covered by the Upper Sonoran plant community and span across multiple jurisdictions, including Maricopa County, the City of Scottsdale, and the Towns of Cave Creek and Carefree. Most of the Galloway Wash watershed falls under the vacant land, rural and large-lot-residential land use categories. Most of the Andora Hills Wash watershed is split between natural and large-lot-residential land use categories, with small areas of commercial and high-density residential land uses.

The "existing conditions" land use for the Galloway Wash watershed is based on September 1999 aerial photographs as described in the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14) (JEF, 2001). For Andora Hills Wash, the existing land use conditions represent conditions as of 1995 as described in the *Cave Creek Above Carefree Highway Floodplain Delineation Study* (FCD 95-28) (GVSCE, 1997).

The revised Andora Hills Wash watershed subbasin boundaries were overlaid on the digital orthophotos provided by FCDMC. The photos demonstrated that only natural areas were affected by the boundary change, resulting in 24.2 acres of natural land use shifting to AHW3 from AHW1. The land use-related rainfall loss parameters for these subbasins were determined following the procedures outlined by GVSCE in the *Cave Creek Above Carefree Highway Floodplain Delineation Study* (FCD 95-28). The resulting land use distributions and rainfall loss parameters in the affected subbasins are shown in Table B.2 in Appendix B.

The final rainfall loss parameters for all subbasins for the existing condition, including the revised subbasins AHW1 and AHW3, are presented in Table 1.

Table 1. Summary of basin area and Green and Ampt method HEC-1 input parameters Existing Condition							
Subbasin ID	**HEC-1 ID**	**Area sq. mi.**	**IA inches**	**DTHETA**	**PSIF inches**	**XKSAT in/hr**	**RTIMP %**
Galloway Wash (source JEF, 2001, revised April 2002)							
GWW1_1	GWW1_1	2.552	0.19	0.25	5.3	0.26	9
GWW1_2	GWW1_2	1.043	0.20	0.25	5.2	0.28	2
GWW131	GWW131	0.774	0.20	0.25	5.4	0.23	3
GWW132	GWW132	0.347	0.20	0.25	5.3	0.26	1
GWW133	GWW133	0.397	0.18	0.25	5.8	0.22	12
GWW1_4	GWW1_4	1.004	0.20	0.25	5.8	0.20	1
GWW1_5	GWW1_5	0.983	0.16	0.23	6.2	0.19	24
GWW1_6	GWW1_6	0.593	0.20	0.25	5.3	0.24	0
GVW1	GVW1	4.905	0.20	0.17	6.8	0.13	17
GVW2	GVW2	6.023	0.20	0.23	6.2	0.18	12
GVW3_1	GVW3_1	1.043	0.20	0.25	5.2	0.26	0
GVW3_2	GVW3_2	0.972	0.20	0.25	5.3	0.24	0
GVW3_3	GVW3_3	0.341	0.20	0.25	6.0	0.19	2
Andora Hills Wash (source GVSCE, 1996)							
AHW1	S320	0.417*	0.16*	0.26*	6.00*	0.19*	23*
AHW4	S330	0.164	0.14	0.16	8.00	0.08	36
AHW3	S340L	0.278*	0.18*	0.33*	6.20*	0.18*	14*
AHW2	S340R	0.065	0.13	0.19	6.60	0.14	43
AHW5	S350	0.161	0.16	0.28	6.00	0.18	23
AHW6	S360	0.578	0.18	0.32	6.40	0.16	15
AHW7	S370	0.341	0.11	0.21	7.00	0.11	49
AHW8	S380	0.415	0.18	0.21	7.00	0.12	15
AHW9	S390	0.347	0.15	0.28	6.60	0.15	15
* Revised from original GVSCE study based on boundary change.							

2.2.4 Unit Hydrographs

2.2.4.1 Andora Hills Wash

The MCUHP1 program was used to compute new Tc and R values and develop HEC-1 KK blocks for subbasins AHW1 and AHW3 for the 100-year models. Maximum and minimum basin elevations and concentration path lengths did not change from the original GVSCE model (Table 2). Input for the rainfall loss parameters was modified from the original values to reflect the change in subbasin boundaries.

Table 2. Existing Condtion Time of Concentration Parameters for Andora Hills Wash							
Subbasin ID	HEC-1 ID	Tc Path miles	Slope Ft/mile	Adjusted Slope ft/mile	Kb	Surface Roughness Type*	Time-Area Relation
AHW1	S320	0.9470	201	201	0.05	B	Default
AHW4	S330	1.2121	111	111	0.04	A/B	Urban
AHW3	S340L	0.9659	999	350	0.10	C	Default
AHW2	S340R	0.6439	217	217	0.06	B	Urban
AHW5	S350	0.6629	219	219	0.08	A/B	Default
AHW6	S360	1.5909	141	141	0.09	C	Default
AHW7	S370	1.4962	137	137	0.04	A/B	Urban
AHW8	S380	0.9848	584	317	0.04	A/B	Urban
AHW9	S390	1.5152	158	158	0.04	AB	Urban
*See GVSCE (1997) for computation of intermediate Kb types.							

The MCUHP1 program was also used to compute Tc and R values and develop HEC-1 KK blocks for all Andora Hills Wash subbasins for the two 10-year models. Input for the rainfall loss parameters were identical to the values used for the 100-year models, including the revised subbasins. Table 3 summarizes the Clark method time of concentration results for all subbasins for Andora Hills Wash.

Table 3. Existing Condition Tc and R Values for Andora Hills Wash									
		10-yr 6-hr		10-yr 24-hr		100-yr 6-hr		100-yr 24-hr	
Subbasin ID	HEC-1 ID	Tc hrs	R hrs	Tc hrs	R hrs	Tc Hrs	R hrs	Tc hrs	R Hrs
AHW1	S320	0.287	0.146	.300	.153	0.233*	0.116*	0.242*	0.121*
AHW4	S330	0.350	0.377	.363	.392	0.275	0.288	0.321	0.342
AHW3	S340L	0.387	0.261	.396	.267	0.296*	0.193*	0.313*	0.205*
AHW2	S340R	0.237	0.251	.250	.265	0.196	0.201	0.233	0.244
AHW5	S350	0.300	0.198	.313	.207	0.238	0.152	0.279	0.182
AHW6	S360	0.783	0.559	.771	.549	0.550	0.377	0.550	0.377
AHW7	S370	0.371	0.314	.383	.325	0.292	0.241	0.333	0.279
AHW8	S380	0.217	0.111	.225	.115	0.179	0.089	0.213	0.108
AHW9	S390	0.371	0.314	.383	.325	0.283	0.233	0.329	0.275
* Revised from original GVSCE study based on boundary change									

2.2.4.2 Galloway Wash

The unit hydrograph parameters (Table 4) in the Galloway Wash model were not altered from their original form as established by JEF in *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14). It was assumed that Kn values for the 100-year and 10-year storms were similar. The computation interval also remained the same. Therefore, the lag time estimates and unit hydrographs did not require modification. Table 4 summarizes the lag time and S-graph parameters for Galloway Wash for all four models.

Table 4. Existing Condition Lag Parameters for Galloway Wash						
Subbasin	S-Graph Type	Kn	L Miles	Lca Miles	Slope ft/mile	Lag Minutes
GWW1_1	Desert/Rangeland	0.039	4.64	2.04	196.1	48.4
GWW1_2	Desert/Rangeland	0.039	3.88	1.87	164.9	45.2
GWW131	Desert/Rangeland	0.040	2.58	1.28	158.9	34.6
GWW132	Desert/Rangeland	0.039	1.56	0.70	141.0	22.7
GWW133	Desert/Rangeland	0.037	1.59	0.90	157.2	23.4
GWW1_4	Desert/Rangeland	0.040	3.64	2.11	274.7	43.0
GWW1_5	Desert/Rangeland	0.034	3.57	1.89	112.6	41.2
GWW1_6	Desert/Rangeland	0.039	2.61	1.31	164.8	34.8
GVW1	Mountain	0.045	6.19	3.56	298.9	71.1
GVW2	Mountain	0.043	5.51	2.77	371.1	56.7
GVW3_1	Desert/Rangeland	0.043	3.31	1.51	184.3	42.3
GVW3_2	Desert/Rangeland	0.043	2.42	1.26	144.6	36.8
GVW3_3	Desert/Rangeland	0.040	1.88	0.95	135.6	28.2

2.2.5 Hydrograph Combinations

The combination of hydrographs in the Andora Hills Wash model was altered to incorporate an additional concentration point to further divide the combination of subbasins AHW1, AHW2, AHW3, and AHW4. In the original model the discharges from the four subbasins were combined at a single concentration point. The revised model combines AHW1, AHW2, and AHW 3 prior to combining with the discharge from AHW4.

The combination of hydrographs in the Galloway Wash model was also altered to provide for additional concentration points at the confluence of North Galloway Wash and Galloway Wash. These new combination points were CP286L (Galloway Wash just upstream of the North Galloway Wash confluence) and CP286R (North Galloway Wash just upstream of the Galloway Wash confluence). An additional concentration point, CP295A, was also added to provide peak discharges for Grapevine Wash at its confluence with Galloway Wash.

2.3 Existing Condition Peak Discharges at Road Crossings

Map 3 shows the location of road crossings within the Andora Hills and Galloway Wash watersheds. Peak discharges at each of these road crossings were determined in the following manner. The drainage area contributing to the road crossing was determined and compared to the total area of the subbasin or subbasins contributing to the nearest downstream concentration point. The ratio of the area at the road crossing to the area at the downstream concentration point was applied to the peak discharge at the downstream concentration point in the HEC-1 model to calculate the peak discharge at the road crossing.

In one instance, peak discharge was determined by using the nearest upstream concentration point. In this cases the peak discharge at the road crossing was greater than 100 percent of the upstream concentration point, due to the drainage area contributing to the road crossing being larger than the modeled subbasin. This technique was used when the downstream concentration

Map 3 Carefree DMP Road Crossings

1:24000

2000 0 2000

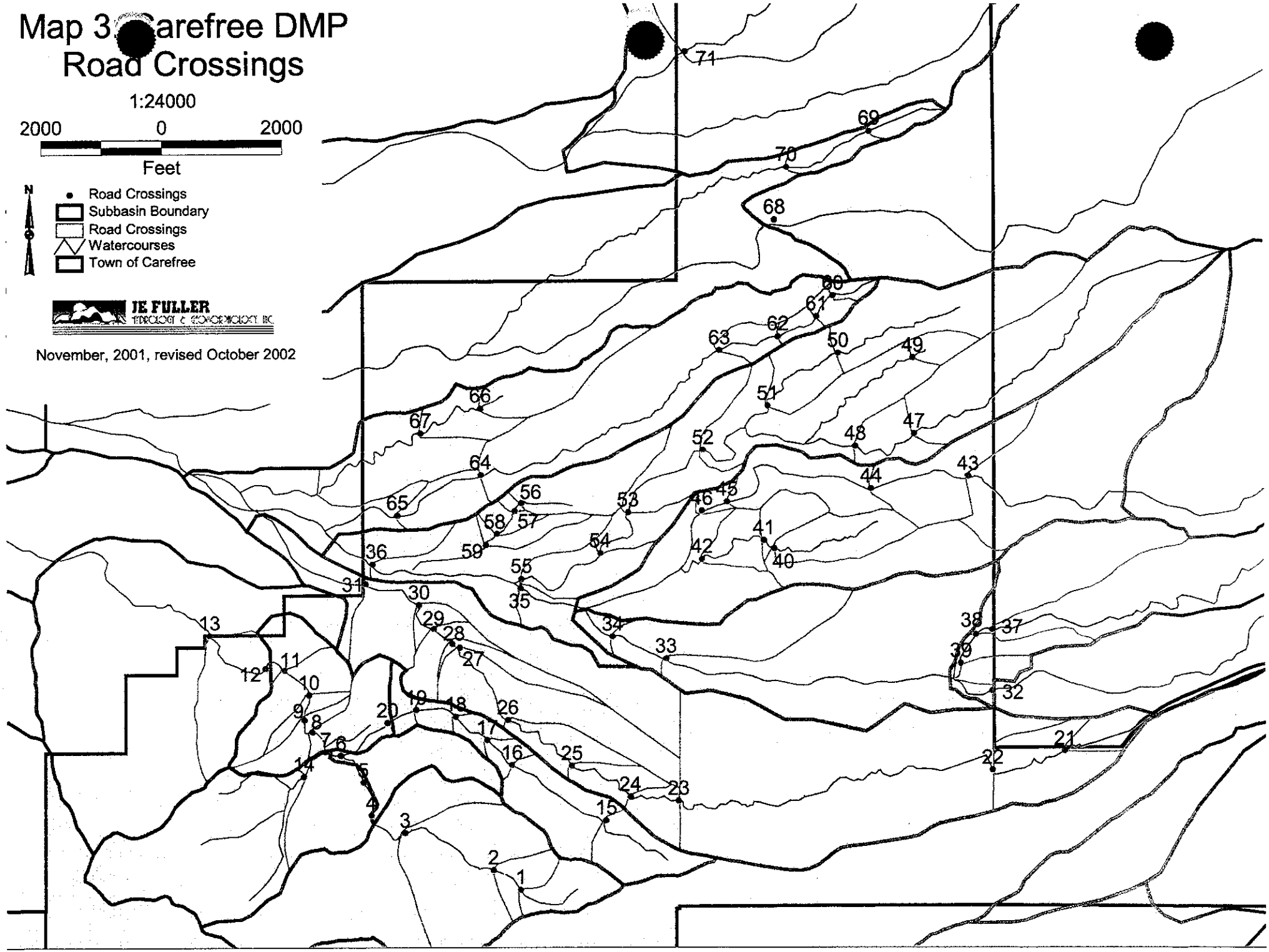
Feet

N

- Road Crossings
- Subbasin Boundary
- Road Crossings
- Watercourses
- Town of Carefree

JE FULLER HYDROLOGY & GEOMORPHOLOGY, INC.

November, 2001, revised October 2002



point included discharge from subbasins that did not affect the discharge at the road crossing. Specifically this situation occurred in the Galloway Wash model for estimation of the discharge at N. Tranquil Trail.

The results of these calculations for each crossing are presented in Table 5.

2.4 Problems encountered

The original subbasin delineations for the Andora Hills watershed from GVSCE were made available by the FCDMC in digital format. However, the subbasin boundaries do not match exactly the digital base maps (USGS digital quarter quads and 2001 digital orthophotos) provided by the FCDMC. JEF adjusted the basin boundaries to match the base data in the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (FCD 99-14). The subsequent divisions of the Andora Hills subbasins for the calculation of road crossing discharges were based on the USGS digital quarter quads and 2001 orthophotographs provided by the FCDMC. The subbasin boundary offsets are approximately 70 feet to the east and 100 feet to the south. This offset potentially results in slight errors in the peak discharges at road crossings internal to the Andora Hills Wash subbasins. The errors are considered negligible for planning purposes.

2.5 Future Conditions

Future conditions hydrologic models were created for Andora Hills and Galloway Washes for the 100-year 6-hour, 100-year 24-hour, 10-year 6-hour, and 10-year 24-hour storms. Rainfall parameters for all future conditions models remained the same as in the existing condition models. Similarly, the drainage basin boundaries and soil parameters remained the same.

Future land use conditions for the Andora Hills and Galloway Washes subbasins were derived from examination of data provided in the *Upper Cave Creek-Apache Wash WCMP* (TetraTech, 2001).

Future land use for the Andora Hills Wash subbasins, with comparison to the existing land use, is presented in Table C.1 in Appendix C. Hydrologic parameters for each land use category in Andora Hills Wash were taken from the *Cave Creek Above Carefree Highway Floodplain Delineation Study* (FCD 95-28).

For Galloway Wash, existing vacant land use areas shown in the digital land use maps developed for the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (JEF 2001) were compared to the built-out land use map shown in the *Upper Cave Creek-Apache Wash WCMP* (TetraTech, 2001). Vacant areas were assigned the appropriate future land use to based on comparison with Exhibit B from the TetraTech (2001) report. Future land use for the subbasins in the Galloway Wash watersheds, with comparison to the existing land use, is presented in Table C.2 in Appendix C. Hydrologic parameters for each land use category in Galloway Wash were taken from the *Floodplain Delineation Study of Andora Hills and Galloway Washes* (JEF 2001). A High Density Residential (HDR) land use category was added for Galloway Wash for

Table 5. Existing Condition Peak Discharges at Road Crossings, Galloway and Andora Hills Washes										
ROAD CROSSING						Drainage Area	EXISTING CONDITIONS PEAK DISCHARGES (CFS)			
ID Number	Road	Surface	Width	Crossing	Wash	(sq. miles)	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr
1	N. Sidewinder Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.04	61	48	109	71
2	E. Long Rifle Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.06	100	79	179	116
3	E. Long Rifle Rd. & N. Long Rifle Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.21	355	281	638	412
4	N. Tom Darlington Dr.	paved	4-lane d	culvert?	Tributary 1 to Andora Hills Wash	0.42	698	553	1255	811
5	E. Bivouc Tr.	paved	2-lane	dip?	Tributary 1 to Andora Hills Wash	0.42	698	553	1255	811
6	E. Bivouac Tr.	paved	2-lane	dip	Andora Hills Wash	0.65	900	759	1630	1163
7	E. Carefree Dr.	paved	2-lane	culvert?	Andora Hills Wash	0.92	1096	1020	2048	1625
8	N. Lazy Burro Rd.	paved	2-lane	dip	Andora Hills Wash	0.97	1153	1073	2154	1710
9	N. Lazy Burro Rd.	paved	2-lane	dip	Andora Hills Wash	0.99	1183	1101	2210	1753
10	N. Holiday Ln.	paved	2-lane	dip	Andora Hills Wash	1.01	1198	1115	2238	1776
11	N. Terrace	paved	2-lane	culvert	Andora Hills Wash	1.06	1257	1170	2349	1864
12	N. Piedra Grande Dr.	paved	2-lane	dip	Andora Hills Wash	1.09	1201	1138	2240	1862
13	private drive	dirt	1-lane	dip	Andora Hills Wash	1.17	1286	1219	2399	1994
14	N. Never Mind Tr.	paved	2-lane	dip	Tributary 2 to Andora Hills Wash	0.21	243	198	497	346
15	E. Long Rifle Rd.	paved	2-lane	culvert?	Andora Hills Wash	0.05	62	49	113	77
16	E. Nonchalant Av.	paved	2-lane	dip	Andora Hills Wash	0.11	148	118	272	183
17	N. Bloody Basin Rd. & E. Nonchalant Av.	paved	2-lane	culvert?	Andora Hills Wash	0.12	163	129	298	201
18	E. Elbow Bend	paved	2-lane	dip?	Andora Hills Wash	0.14	180	143	329	222
19	E. Carefree Dr.	paved	2-lane	dip?	Andora Hills Wash	0.15	195	154	357	241
20	N. Tom Darlington Dr.	paved	4-lane d	dip?	Andora Hills Wash	0.16	212	168	388	262
21	E. Northview Ln	paved	2-lane	dip	South Trib to Galloway Wash	0.02	19	18	32	30
22	N. Pima Rd.	paved	2-lane	dip?	South Trib to Galloway Wash	0.10	78	72	131	122
23	N. Mule Train Rd.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.54	438	404	736	688
24	E. Long Rifle Rd.	paved	2-lane	dip	South Trib to Galloway Wash	0.56	457	422	768	718
25	E. Primrose Path	paved	2-lane	dip	South Trib to Galloway Wash	0.59	478	441	803	751
26	N. Tranquil Tr.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.62	507	467	851	796
27	E. Carefree Dr.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.72	591	545	992	928
28	private drive	paved	2-lane	?	South Trib to Galloway Wash	0.74	607	560	1020	954
29	E. Hum Rd.	paved	2-lane	dip?	South Trib to Galloway Wash	0.77	630	581	1058	990
30	E. Sundance Tr.	paved	2-lane	dip?	South Trib to Galloway Wash	0.78	640	590	1074	1005
31	N. Scopa Trail	paved	2-lane	dip	South Trib to Galloway Wash	0.94	766	707	1287	1204
32	N. Pima Rd.	paved	2-lane	dip	Galloway Wash	1.04	609	593	1155	1110
33	N. Carefree Dr.	paved	2-lane	dip	Galloway Wash	1.68	797	839	1612	1643
34	N. Dream St.	paved	2-lane	culvert	Galloway Wash	1.78	846	891	1712	1745
35	N. Tranquil Tr.	paved	2-lane	dip	Galloway Wash	5.14	1710	1997	3250	3460
36	N. Scopa Trail	paved	2-lane	dip	Galloway Wash	6.07	2012	2475	3931	4386
37	N. Pima Rd. & E. Double Eagle Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.19	226	190	391	335
38	E. Double Eagle Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.30	359	302	622	534
39	E. Carefree Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.32	390	328	676	579
40	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.05	42	39	75	70
41	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.15	127	116	226	209
42	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.18	150	138	267	247
43	E. Cow Track Dr.	paved	2-lane	dip	North Galloway Wash	2.87	1036	1136	2002	2094
44	N. Sombrero Rd.	paved	2-lane	dip	North Galloway Wash	2.95	1065	1168	2059	2153
45	E. Cow Track Dr.	paved	2-lane	dip	North Galloway Wash	3.02	1091	1195	2107	2204
46	E. Celestial St. & E. Paint Pony Dr.	paved	2-lane	dip	North Galloway Wash	3.03	1094	1199	2113	2210
47	N. Silver Saddle Dr. & E. Maverick Cir.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.25	167	158	301	287

Table 5. Existing Condition Peak Discharges at Road Crossings, Galloway and Andora Hills Washes										
ROAD CROSSING						Drainage Area	EXISTING CONDITIONS PEAK DISCHARGES (CFS)			
ID Number	*Road*	*Surface*	*Width*	*Crossing*	*Wash*	*(sq. miles)*	*10-yr 6-hr*	*10-yr 24-hr*	*100-yr 6-hr*	*100-yr 24-hr*
48	N. Sombrero Rd.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.28	190	180	343	326
49	N. Concho Ln.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.02	11	10	20	19
50	E. Golden Spur Ln.	paved	2 lane	dip	Trib 2 to Galloway Wash	0.13	91	87	165	157
51	E. Golden Spur Ln.	paved	2 lane	dip	Trib 2 to Galloway Wash	0.18	121	115	219	208
52	E. Golden Spur Ln.	paved	2 lane	dip	Trib 2 to Galloway Wash	0.61	413	391	745	709
53	E. Rising Sun Rd.	paved	2-lane	culvert?	Trib 2 to Galloway Wash	0.68	461	437	831	791
54	E. Celestial St. & N. Dream St.	dirt	2-lane	dip	Trib 2 to Galloway Wash	0.70	478	453	862	820
55	N. Tranquil Tr.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.75	510	483	919	875
56	E. Horizon Dr.	paved	2-lane	dip?	Trib 3 to Galloway Wash	0.06	43	41	77	74
57	N. Rising Sun Rd.	paved	2-lane	culvert	Trib 3 to Galloway Wash	0.07	45	43	81	77
58	unnamed culdesac	paved	2-lane	dip	Trib 3 to Galloway Wash	0.08	53	50	96	91
59	unnamed culdesac	paved	2-lane	dip	Trib 3 to Galloway Wash	0.10	65	61	117	111
60	private drive	dirt	1-lane	dip	Trib 4 to Galloway Wash	0.01	7	6	13	11
61	private drive	dirt	1-lane	dip	Trib 4 to Galloway Wash	0.02	16	14	28	25
62	private drive	dirt	1-lane	dip	Trib 4 to Galloway Wash	0.03	24	21	43	38
63	N. Spanish Boot Rd.	paved	2 lane	dip	Trib 4 to Galloway Wash	0.05	40	35	71	63
64	N. Rising Sun Rd.	paved	2-lane	culvert	Trib 4 to Galloway Wash	0.29	246	215	439	388
65	E. Grapevine Rd.	paved	2-lane	dip	Trib 4 to Galloway Wash	0.32	276	241	493	436
66	N. Rising Sun Rd.	paved	2-lane	dip	Trib 5 to Galloway Wash	0.05	42	37	76	67
67	W. Rising Star Wy.	paved	2-lane	culvert?	Trib 5 to Galloway Wash	0.08	70	61	125	111
68	N. Father Kino Tr.	dirt	2 lane	dip	Grapevine Wash	6.02	2564	3256	4686	5492
69	N. Father Kino Tr.	dirt	2 lane	dip	Tributary to Grapevine Wash	0.02	10	9	18	18
70	E. Montezuma Rd.	dirt	2 lane	dip	Tributary to Grapevine Wash	0.04	24	23	45	44
71	unnamed road	dirt	2-lane	dip	Tributary to Rowe Wash	0.79	354	406	604	667

the future condition. The hydrologic parameters for the HDR category were taken from the *Cave Creek Above Carefree Highway Floodplain Delineation Study* (GVSCE, 1997).

Hydrologic parameters for the Green & Ampt method were recomputed for each subbasin using the same methods as in the original studies. Table 6 summarizes the future conditions LG record parameters for Andora Hills and Galloway Washes.

Table 6. Summary of basin area and Green and Ampt method HEC-1 input parameters Future Condition

Subbasin ID	HEC-1 ID	Area sq. mi.	IA Inches	DTHETA	PSIF inches	XKSAT in/hr	RTIMP %
Galloway Wash							
GWW1_1	GWW1_1	2.552	0.19	0.25	5.3	0.26	10
GWW1_2	GWW1_2	1.043	0.19	0.25	5.2	0.28	9
GWW131	GWW131	0.774	0.20	0.25	5.4	0.23	3
GWW132	GWW132	0.347	0.20	0.25	5.3	0.26	1
GWW133	GWW133	0.397	0.18	0.25	5.8	0.22	12
GWW1_4	GWW1_4	1.004	0.20	0.25	5.8	0.20	2
GWW1_5	GWW1_5	0.983	0.15	0.23	6.2	0.19	33
GWW1_6	GWW1_6	0.593	0.20	0.25	5.3	0.24	2
GVW1	GVW1	4.905	0.20	0.17	6.8	0.13	18
GVW2	GVW2	6.023	0.17	0.23	6.2	0.17	26
GVW3_1	GVW3_1	1.043	0.20	0.25	5.2	0.26	0
GVW3_2	GVW3_2	0.972	0.20	0.25	5.3	0.24	0
GVW3_3	GVW3_3	0.341	0.20	0.25	6.0	0.19	2
Andora Hills Wash							
AHW1	S320	0.417*	0.16	0.25	6.00	0.19	24
AHW4	S330	0.164	0.14	0.15	8.00	0.08	39
AHW3	S340L	0.278*	0.17	0.27	6.20	0.17	20
AHW2	S340R	0.065	0.13	0.19	6.60	0.14	43
AHW5	S350	0.161	0.16	0.25	6.00	0.18	28
AHW6	S360	0.578	0.16	0.24	6.40	0.16	23
AHW7	S370	0.341	0.10	0.15	7.00	0.11	61
AHW8	S380	0.415	0.18	0.16	7.00	0.13	16
AHW9	S390	0.347	0.16	0.19	6.60	0.15	26

* Revised from original GVSCE study based on boundary change.

Since the Clark unit hydrograph method was used in the original Andora Hills Wash modeling, Tc and R were recomputed with MCUHP1 using the future conditions LG parameters. Table 7 shows the future condition Kb values. The future condition Tc and R values for the four storms for Andora Hills Wash are summarized in Table 8.

Table 7. Future Condition Time of Concentration Parameters for Andora Hills Wash

Subbasin ID	HEC-1 ID	Tc Path miles	Slope Ft/mile	Adjusted Slope ft/mile	Kb	Surface Roughness Type*	Time-Area Relation
AHW1	S320	0.9470	201	201	0.05	B	Default
AHW4	S330	1.2121	111	111	0.04	A/B	Urban
AHW3	S340L	0.9659	999	350	0.07	B/C	Default
AHW2	S340R	0.6439	217	217	0.06	B	Urban
AHW5	S350	0.6629	219	219	0.05	B	Urban
AHW6	S360	1.5909	141	141	0.04	B	Default
AHW7	S370	1.4962	137	137	0.04	A/B	Urban
AHW8	S380	0.9848	584	317	0.04	A/B	Urban
AHW9	S390	1.5152	158	158	0.04	AB	Urban

*See GVSCE (1997) for computation of intermediate Kb types.

Table 8. Future Condition Tc and R Values for Andora Hills Wash

Subbasin ID	HEC-1 ID	10-yr 6-hr		10-yr 24-hr		100-yr 6-hr		100-yr 24-hr	
		Tc Hrs	R hrs	Tc hrs	R hrs	Tc hrs	R hrs	Tc Hrs	R hrs
AHW1	S320	.283	.144	.296	.151	.233	.116	.242	.121
AHW4	S330	.350	.377	.363	.392	.283	.298	.300	.318
AHW3	S340L	.292	.190	.304	.199	.233	.148	.246	.157
AHW2	S340R	.237	.251	.250	.265	.204	.212	.213	.221
AHW5	S350	.225	.144	.233	.150	.188	.118	.196	.123
AHW6	S360	.408	.271	.408	.271	.321	.208	.333	.217
AHW7	S370	.367	.310	.379	.321	.296	.244	.317	.263
AHW8	S380	.217	.111	.225	.115	.183	.092	.192	.096
AHW9	S390	.363	.306	.375	.317	.287	.236	.304	.252

For Galloway Wash, lag time calculations were recomputed based on changes to basin average Kn (basin roughness) resulting from the change to future conditions land use. The future conditions Kn and lag times for Galloway Wash are summarized in Table 9.

Table 9. Future Condition Lag Parameters for Galloway Wash						
Subbasin	S-Graph Type	Kn	L miles	Lca Miles	Slope ft/mile	Lag Minutes
GWW1_1	Desert/Rangeland	0.038	4.64	2.04	196.1	47.2
GWW1_2	Desert/Rangeland	0.036	3.88	1.87	164.9	41.7
GWW131	Desert/Rangeland	0.040	2.58	1.28	158.9	34.6
GWW132	Desert/Rangeland	0.039	1.56	0.70	141.0	22.7
GWW133	Desert/Rangeland	0.037	1.59	0.90	157.2	23.4
GWW1_4	Desert/Rangeland	0.040	3.64	2.11	274.7	43.0
GWW1_5	Desert/Rangeland	0.030	3.57	1.89	112.6	36.4
GWW1_6	Desert/Rangeland	0.040	2.61	1.31	164.8	34.8
GVW1	Mountain	0.043	6.19	3.56	298.9	67.9
GVW2	Mountain	0.037	5.51	2.77	371.1	48.8
GVW3_1	Desert/Rangeland	0.040	3.31	1.51	184.3	39.4
GVW3_2	Desert/Rangeland	0.041	2.42	1.26	144.6	35.0
GVW3_3	Desert/Rangeland	0.039	1.88	0.95	135.6	27.5

No retention was considered for modeling of the future conditions due to the nature of development, undulating topography, and a desire to make conservative hydrologic assumptions about the future condition in the area. This assumption is considered appropriate to a planning level study.

2.6 Future Condition Peak Discharges at Road Crossings

The results of the future condition calculations for peak discharge at road crossings in the area are presented in Table 10. Again, the locations of each crossing are shown on Map 3.

3. Comparison of Existing and Future Condition Peak Discharges

Table 11 shows a comparison of the existing and future condition peak discharges at the road crossing locations for the four modeled storms. In general, at most of the road crossings in the Town of Carefree the peak discharges for the future condition are similar to or slightly greater than the existing condition. Differences are greater for the 10-year events as compared to the 100-year events. The larges differences are in subbasin AHW3 at N. Never Trail (ID# 14), crossings within GWW1_5 (ID's 21-31), along Galloway Wash between CP284 and CP286L (ID's 32-34, and CP280 (ID 68). Effective impervious area (RTIMP) increases in AHW3 from 14 to 20 percent in the future condition. In GWW1_5, RTIMP increases from 24 to 33 as the result of built-out conditions.

For crossings in one basin (AHW4, ID's 15-20), future discharges for the 100-year 6-hour show a slight decrease. Examination of the Tc and R values show that the original GVSCE (1997) model had slightly smaller Tc and R values than those computed with MCUHP1 for the future condition. A separate MCUHP1 analysis was run using the original parameters as reported in the HEC-1 model for AHW4 for the GVSCE existing condition and the current study's future condition. The result was identical Tc and R values for each condition. The only differences in

Table 10. Future Condtions Peak Discharges at Road Crossings, Galloway and Andora Hills Washes										
ROAD CROSSING						Drainage Area	FUTURE CONDITIONS PEAK DISCHARGES (CFS)			
ID Number	Road	Surface	Width	Crossing	Wash	(sq. miles)	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr
1	N. Sidewinder Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.04	62	49	109	71
2	E. Long Rifle Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.06	101	80	180	116
3	E. Long Rifle Rd. & N. Long Rifle Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.21	360	285	639	414
4	N. Tom Darlington Dr.	paved	4-lane d	culvert?	Tributary 1 to Andora Hills Wash	0.42	708	561	1258	814
5	E. Bivouc Tr.	paved	2-lane	dip?	Tributary 1 to Andora Hills Wash	0.42	708	561	1258	814
6	E. Bivouac Tr.	paved	2-lane	dip	Andora Hills Wash	0.65	909	767	1626	1180
7	E. Carefree Dr.	paved	2-lane	culvert?	Andora Hills Wash	0.92	1187	1097	2135	1695
8	N. Lazy Burro Rd.	paved	2-lane	dip	Andora Hills Wash	0.97	1249	1154	2246	1783
9	N. Lazy Burro Rd.	paved	2-lane	dip	Andora Hills Wash	0.99	1281	1184	2304	1829
10	N. Holiday Ln.	paved	2-lane	dip	Andora Hills Wash	1.01	1297	1199	2334	1853
11	N. Terrace	paved	2-lane	culvert	Andora Hills Wash	1.06	1361	1258	2449	1944
12	N. Piedra Grande Dr.	paved	2-lane	dip	Andora Hills Wash	1.09	1269	1191	2293	1938
13	private drive	dirt	1-lane	dip	Andora Hills Wash	1.17	1359	1276	2456	2076
14	N. Never Mind Tr.	paved	2-lane	dip	Tributary 2 to Andora Hills Wash	0.21	315	251	583	388
15	E. Long Rifle Rd.	paved	2-lane	culvert?	Andora Hills Wash	0.05	62	49	112	79
16	E. Nonchalant Av.	paved	2-lane	dip	Andora Hills Wash	0.11	150	118	267	190
17	N. Bloody Basin Rd. & E. Nonchalant Av.	paved	2-lane	culvert?	Andora Hills Wash	0.12	165	130	294	208
18	E. Elbow Bend	paved	2-lane	dip?	Andora Hills Wash	0.14	182	143	324	230
19	E. Carefree Dr.	paved	2-lane	dip?	Andora Hills Wash	0.15	197	155	351	249
20	N. Tom Darlington Dr.	paved	4-lane d	dip?	Andora Hills Wash	0.16	214	169	382	271
21	E. Northview Ln	paved	2-lane	dip	South Trib to Galloway Wash	0.02	22	20	36	34
22	N. Pima Rd.	paved	2-lane	dip?	South Trib to Galloway Wash	0.10	89	81	145	136
23	N. Mule Train Rd.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.54	500	458	819	766
24	E. Long Rifle Rd.	paved	2-lane	dip	South Trib to Galloway Wash	0.56	522	478	855	799
25	E. Primrose Path	paved	2-lane	dip	South Trib to Galloway Wash	0.59	546	500	894	836
26	N. Tranquil Tr.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.62	578	529	947	886
27	E. Carefree Dr.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.72	674	617	1104	1032
28	private drive	paved	2-lane	?	South Trib to Galloway Wash	0.74	693	635	1135	1062
29	E. Hum Rd.	paved	2-lane	dip?	South Trib to Galloway Wash	0.77	719	658	1178	1101
30	E. Sundance Tr.	paved	2-lane	dip?	South Trib to Galloway Wash	0.78	730	668	1196	1118
31	N. Scopa Trail	paved	2-lane	dip	South Trib to Galloway Wash	0.94	875	801	1432	1340
32	N. Pima Rd.	paved	2-lane	dip	Galloway Wash	1.04	688	660	1259	1206
33	N. Carefree Dr.	paved	2-lane	dip	Galloway Wash	1.68	888	931	1724	1783
34	N. Dream St.	paved	2-lane	culvert	Galloway Wash	1.78	943	988	1830	1893
35	N. Tranquil Tr.	paved	2-lane	dip	Galloway Wash	5.14	1806	2112	3383	3635
36	N. Scopa Trail	paved	2-lane	dip	Galloway Wash	6.07	2116	2599	4074	4560
37	N. Pima Rd. & E. Double Eagle Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.19	226	190	391	335
38	E. Double Eagle Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.30	359	302	622	534
39	E. Carefree Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.32	390	328	676	579
40	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.05	42	39	75	70
41	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.15	127	116	226	209
42	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.18	150	138	267	247
43	E. Cow Track Dr.	paved	2-lane	dip	North Galloway Wash	2.87	1060	1158	2040	2126
44	N. Sombrero Rd.	paved	2-lane	dip	North Galloway Wash	2.95	1090	1191	2097	2186
45	E. Cow Track Dr.	paved	2-lane	dip	North Galloway Wash	3.02	1116	1219	2147	2237
46	E. Celestial St. & E. Paint Pony Dr.	paved	2-lane	dip	North Galloway Wash	3.03	1119	1222	2153	2244
47	N. Silver Saddle Dr. & E. Maverick Cir.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.25	168	159	302	287
48	N. Sombrero Rd.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.28	191	181	344	327

Table 10. Future Condtions Peak Discharges at Road Crossings, Galloway and Andora Hills Washes										
ROAD CROSSING						Drainage Area	FUTURE CONDITIONS PEAK DISCHARGES (CFS)			
ID Number	*Road*	*Surface*	*Width*	*Crossing*	*Wash*	*(sq. miles)*	*10-yr 6-hr*	*10-yr 24-hr*	*100-yr 6-hr*	*100-yr 24-hr*
49	N. Concho Ln.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.02	11	10	20	19
50	E. Golden Spur Ln.	paved	2 lane	dip	Trib 2 to Galloway Wash	0.13	92	87	165	157
51	E. Golden Spur Ln.	paved	2 lane	dip	Trib 2 to Galloway Wash	0.18	122	116	219	209
52	E. Golden Spur Ln.	paved	2 lane	dip	Trib 2 to Galloway Wash	0.61	416	393	747	711
53	E. Rising Sun Rd.	paved	2-lane	culvert?	Trib 2 to Galloway Wash	0.68	464	439	834	793
54	E. Celestial St. & N. Dream St.	dirt	2-lane	dip	Trib 2 to Galloway Wash	0.70	481	455	864	822
55	N. Tranquil Tr.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.75	513	485	922	877
56	E. Horizon Dr.	paved	2-lane	dip?	Trib 3 to Galloway Wash	0.06	43	41	78	74
57	N. Rising Sun Rd.	paved	2-lane	culvert	Trib 3 to Galloway Wash	0.07	45	43	81	77
58	unnamed culdesac	paved	2-lane	dip	Trib 3 to Galloway Wash	0.08	54	51	96	91
59	unnamed culdesac	paved	2-lane	dip	Trib 3 to Galloway Wash	0.10	65	62	117	111
60	private drive	dirt	1-lane	dip	Trib 4 to Galloway Wash	0.01	7	6	13	11
61	private drive	dirt	1-lane	dip	Trib 4 to Galloway Wash	0.02	16	14	28	25
62	private drive	dirt	1-lane	dip	Trib 4 to Galloway Wash	0.03	24	21	43	38
63	N. Spanish Boot Rd.	paved	2 lane	dip	Trib 4 to Galloway Wash	0.05	40	35	72	63
64	N. Rising Sun Rd.	paved	2-lane	culvert	Trib 4 to Galloway Wash	0.29	249	217	442	390
65	E. Grapevine Rd.	paved	2-lane	dip	Trib 4 to Galloway Wash	0.32	279	243	496	437
66	N. Rising Sun Rd.	paved	2-lane	dip	Trib 5 to Galloway Wash	0.05	43	37	76	67
67	W. Rising Star Wy.	paved	2-lane	culvert?	Trib 5 to Galloway Wash	0.08	71	62	126	111
68	N. Father Kino Tr.	dirt	2 lane	dip	Grapevine Wash	6.02	3164	3937	5447	6408
69	N. Father Kino Tr.	dirt	2 lane	dip	Tributary to Grapevine Wash	0.02	10	10	19	19
70	E. Montezuma Rd.	dirt	2 lane	dip	Tributary to Grapevine Wash	0.04	26	25	48	46
71	unnamed road	dirt	2-lane	dip	Tributary to Rowe Wash	0.79	365	416	621	683

Table 11. Comparison of Existing and Future Peak Discharges at Roadway Crossings

											(Future - Existing) / Existing			
		Drainage Area	EXISTING CONDITIONS PEAK DISCHARGES (CFS)				FUTURE CONDITIONS PEAK DISCHARGES (CFS)				% diff	% diff	% diff	% diff
ID Number	Road	(sq. miles)	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr
1	N. Sidewinder Rd.	0.04	61	48	109	71	62	49	109	71	1	2	0	0
2	E. Long Rifle Rd.	0.06	100	79	179	116	101	80	180	116	1	2	0	0
3	E. Long Rifle Rd. & N. Long Rifle Rd.	0.21	355	281	638	412	360	285	639	414	1	1	0	0
4	N. Tom Darlington Dr.	0.42	698	553	1255	811	708	561	1258	814	1	1	0	0
5	E. Bivouc Tr.	0.42	698	553	1255	811	708	561	1258	814	1	1	0	0
6	E. Bivouac Tr.	0.65	900	759	1630	1163	909	767	1626	1180	1	1	0	1
7	E. Carefree Dr.	0.92	1096	1020	2048	1625	1187	1097	2135	1695	8	8	4	4
8	N. Lazy Burro Rd.	0.97	1153	1073	2154	1710	1249	1154	2246	1783	8	8	4	4
9	N. Lazy Burro Rd.	0.99	1183	1101	2210	1753	1281	1184	2304	1829	8	8	4	4
10	N. Holiday Ln.	1.01	1198	1115	2238	1776	1297	1199	2334	1853	8	8	4	4
11	N. Terrace	1.06	1257	1170	2349	1864	1361	1258	2449	1944	8	8	4	4
12	N. Piedra Grande Dr.	1.09	1201	1138	2240	1862	1269	1191	2293	1938	6	5	2	4
13	private drive	1.17	1286	1219	2399	1994	1359	1276	2456	2076	6	5	2	4
14	N. Never Mind Tr.	0.21	243	198	497	346	315	251	583	388	30	27	17	12
15	E. Long Rifle Rd.	0.05	62	49	113	77	62	49	112	79	1	1	-1	3
16	E. Nonchalant Av.	0.11	148	118	272	183	150	118	267	190	1	0	-2	4
17	N. Bloody Basin Rd. & E. Nonchalant Av.	0.12	163	129	298	201	165	130	294	208	1	1	-1	4
18	E. Elbow Bend	0.14	180	143	329	222	182	143	324	230	1	0	-1	4
19	E. Carefree Dr.	0.15	195	154	357	241	197	155	351	249	1	1	-2	3
20	N. Tom Darlington Dr.	0.16	212	168	388	262	214	169	382	271	1	1	-2	3
21	E. Northview Ln	0.02	19	18	32	30	22	20	36	34	16	11	13	13
22	N. Pima Rd.	0.10	78	72	131	122	89	81	145	136	14	13	11	11
23	N. Mule Train Rd.	0.54	438	404	736	688	500	458	819	766	14	13	11	11
24	E. Long Rifle Rd.	0.56	457	422	768	718	522	478	855	799	14	13	11	11
25	E. Primrose Path	0.59	478	441	803	751	546	500	894	836	14	13	11	11
26	N. Tranquil Tr.	0.62	507	467	851	796	578	529	947	886	14	13	11	11
27	E. Carefree Dr.	0.72	591	545	992	928	674	617	1104	1032	14	13	11	11
28	private drive	0.74	607	560	1020	954	693	635	1135	1062	14	13	11	11
29	E. Hum Rd.	0.77	630	581	1058	990	719	658	1178	1101	14	13	11	11
30	E. Sundance Tr.	0.78	640	590	1074	1005	730	668	1196	1118	14	13	11	11
31	N. Scopa Trail	0.94	766	707	1287	1204	875	801	1432	1340	14	13	11	11
32	N. Pima Rd.	1.04	609	593	1155	1110	688	660	1259	1206	13	11	9	9
33	N. Carefree Dr.	1.72	797	839	1612	1643	888	931	1724	1783	11	11	7	9
34	N. Dream St.	1.83	846	891	1712	1745	943	988	1830	1893	11	11	7	8
35	N. Tranquil Tr.	5.14	1710	1997	3250	3460	1806	2112	3383	3635	6	6	4	5
36	N. Scopa Trail	6.07	2012	2475	3931	4386	2116	2599	4074	4560	5	5	4	4
37	N. Pima Rd. & E. Double Eagle Dr.	0.19	226	190	391	335	226	190	391	335	0	0	0	0
38	E. Double Eagle Dr.	0.30	359	302	622	534	359	302	622	534	0	0	0	0
39	E. Carefree Dr.	0.33	390	328	676	579	390	328	676	579	0	0	0	0
40	E. Paint Pony Dr.	0.07	42	39	75	70	42	39	75	70	0	0	0	0
41	E. Paint Pony Dr.	0.09	127	116	226	209	127	116	226	209	0	0	0	0
42	E. Paint Pony Dr.	0.12	150	138	267	247	150	138	267	247	0	0	0	0
43	E. Cow Track Dr.	3.23	1036	1136	2002	2094	1060	1158	2040	2126	2	2	2	2
44	N. Sombrero Rd.	3.42	1065	1168	2059	2153	1090	1191	2097	2186	2	2	2	2
45	E. Cow Track Dr.	3.58	1091	1195	2107	2204	1116	1219	2147	2237	2	2	2	1
46	E. Celestial St. & E. Paint Pony Dr.	3.60	1094	1199	2113	2210	1119	1222	2153	2244	2	2	2	2
47	N. Silver Saddle Dr. & E. Maverick Cir.	0.25	167	158	301	287	168	159	302	287	1	1	0	0
48	N. Sombrero Rd.	0.28	190	180	343	326	191	181	344	327	1	1	0	0
49	N. Concho Ln.	0.02	11	10	20	19	11	10	20	19	0	0	0	0
50	E. Golden Spur Ln.	0.13	91	87	165	157	92	87	165	157	1	0	0	0
51	E. Golden Spur Ln.	0.18	121	115	219	208	122	116	219	209	1	1	0	0
52	E. Golden Spur Ln.	0.61	413	391	745	709	416	393	747	711	1	1	0	0
53	E. Rising Sun Rd.	0.68	461	437	831	791	464	439	834	793	1	0	0	0

Table 11. Comparison of Existing and Future Peak Discharges at Roadway Crossings															
												(Future - Existing) / Existing			
		Drainage Area	EXISTING CONDITIONS PEAK DISCHARGES (CFS)				FUTURE CONDITIONS PEAK DISCHARGES (CFS)				% diff	% diff	% diff	% diff
ID Number	*Road*	*(sq. miles)*	*10-yr 6-hr*	*10-yr 24-hr*	*100-yr 6-hr*	*100-yr 24-hr*	*10-yr 6-hr*	*10-yr 24-hr*	*100-yr 6-hr*	*100-yr 24-hr*	*10-yr 6-hr*	*10-yr 24-hr*	*100-yr 6-hr*	*100-yr 24-hr*
54	E. Celestial St. & N. Dream St.	0.70	478	453	862	820	481	455	864	822	1	0	0	0
55	N. Tranquil Tr.	0.75	510	483	919	875	513	485	922	877	1	0	0	0
56	E. Horizon Dr.	0.06	43	41	77	74	43	41	78	74	0	0	1	0
57	N. Rising Sun Rd.	0.07	45	43	81	77	45	43	81	77	0	0	0	0
58	unnamed culdesac	0.08	53	50	96	91	54	51	96	91	2	2	0	0
59	unnamed culdesac	0.10	65	61	117	111	65	62	117	111	0	2	0	0
60	private drive	0.01	7	6	13	11	7	6	13	11	0	0	0	0
61	private drive	0.02	16	14	28	25	16	14	28	25	0	0	0	0
62	private drive	0.03	24	21	43	38	24	21	43	38	0	0	0	0
63	N. Spanish Boot Rd.	0.05	40	35	71	63	40	35	72	63	0	0	1	0
64	N. Rising Sun Rd.	0.29	246	215	439	388	249	217	442	390	1	1	1	1
65	E. Grapevine Rd.	0.32	276	241	493	436	279	243	496	437	1	1	1	0
66	N. Rising Sun Rd.	0.05	42	37	76	67	43	37	76	67	2	0	0	0
67	W. Rising Star Wy.	0.08	70	61	125	111	71	62	126	111	1	2	1	0
68	N. Father Kino Tr.	6.02	2564	3256	4686	5492	3164	3937	5447	6408	23	21	16	17
69	N. Father Kino Tr.	0.02	10	9	18	18	10	10	19	19	0	11	6	6
70	E. Montezuma Rd.	0.04	24	23	45	44	26	25	48	46	8	9	7	5
71	unnamed road	0.79	354	406	604	667	365	416	621	683	3	2	3	2

parameters between the conditions is DTHETA = 0.16 vs. 0.15 and RTIMP = 36 vs. 39. The reason for the different Tc and R results in the GVSCE model is therefore not clear. Perhaps the precision of data input to MCUHP1 in the original study is the cause (e.g. Kb = 0.0355 vs. 0.04). Regardless the absolute differences are very small (1-2 %).

Table 12 shows a comparison of existing and future peak discharges at the outlets of Andora Hills and Galloway Washes at Cave Creek. The percent difference for the entire watersheds are greater for the 10-year storms than the 100-year events. Also, as compared to the results at the road crossings the cumulative differences are generally larger than in individual subbasins. That is, small differences throughout the watersheds lead to larger differences at their outlets. Table 12 also shows that the effects of full build out are greater in Andora Hills Wash than Galloway Wash. This is due in part to the total portion of the watersheds that will ultimately be developed as well as the nature of the development (i.e. density).

Table 12.
Existing vs. Future Condition Peak Discharge at Confluence with Cave Creek

KK ID	Wash Name	Condition	10-yr 6-hr (cfs)	10-yr 24-hr (cfs)	100-yr 6-hr (cfs)	100-yr 24-hr (cfs)
C390L	Andora Hills	Existing	1779	1870	3485	3635
		Future	2165	2388	3848	4175
CP310	Galloway	Existing	5698	7906	11341	13541
		Future	6496	8915	12296	14895
C390L	Andora Hills	% diff	21.7%	27.7%	10.4%	14.9%
CP310	Galloway	% diff	14.0%	12.8%	8.4%	10.0%

4. References

Camp, P.D., 1986, *Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona*: U.S. Soil Conservation Service Report, 306 p., 53 maps, scale 1:24,000.

George V. Sabol Consulting Engineers (GVSCE). 1997. *Cave Creek Above Carefree Highway Floodplain Delineation Study, Technical Data Notebook, Existing Conditions.* Prepared for Flood Control District of Maricopa County, contract FCD 95-28. 2 volumes.

JE Fuller/ Hydrology & Geomorphology, Inc. (JEF). 2001. *Floodplain Delineation Study of Andora Hills and Galloway Washes, Technical Data Notebook.* Prepared for Flood Control District of Maricopa County, contract FCD 99-14. 2 volumes, as revised based on FEMA comments April 2002.

Tetra Tech, Inc. 2001. *Upper Cave Creek/Apache Wash Watercourse Master Plan, Attachment 3: Hydrology Report.* Prepared for Flood Control District of Maricopa County.

Appendix A

Precipitation Data

*** O U T P U T D A T A ***

REVISED JUNE 1988 TO UPDATE COMPUTATION OF SHORT-DURATION VALUES

PRECIPITATION FREQUENCY VALUES FOR Andora Hills Wash,
PRIMARY ZONE NUMBER= 7
SHORT-DURATION ZONE NUMBER= 8

POINT VALUES

RETURN PERIOD

DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	
5-MIN	.38	.45	.51	.59	.65	.72	.86	5-MIN
10-MIN	.56	.69	.77	.90	1.00	1.10	1.33	10-MIN
15-MIN	.68	.85	.97	1.14	1.28	1.41	1.72	15-MIN
30-MIN	.91	1.14	1.31	1.55	1.73	1.91	2.34	30-MIN
1-HR	1.10	1.41	1.62	1.92	2.16	2.39	2.93	1-HR
2-HR	1.24	1.60	1.84	2.19	2.47	2.74	3.36	2-HR
3-HR	1.33	1.72	1.99	2.37	2.67	2.97	3.65	3-HR
6-HR	1.50	1.96	2.27	2.71	3.06	3.40	4.19	6-HR
12-HR	1.70	2.26	2.64	3.17	3.59	4.00	4.95	12-HR
24-HR	1.90	2.56	3.01	3.63	4.12	4.60	5.71	24-HR

* IF YOUR SITE IS IN ARIZONA OR NEW MEXICO, PLEASE CONSULT THE FOLLOWING PAPER FOR REVISED DEPTH-AREA VALUES:
  DEPTH-AREA RATIOS IN THE SEMI-ARID SOUTHWEST UNITED STATES
  NOAA TECHNICAL MEMORANDUM NWS HYDRO-40
  ZEHR AND MYERS
  AUGUST 1984

INPUT DATA

PROJECT NAME=Andora Hills Wash,
ZONE= 7 SHORT-DURATION ZONE= 8
LATITUDE= .00 LONGITUDE= 100.00 ELEVATION= 0
2-YR, 6-HR PCPN= 1.50 100-YR, 6-HR PCPN= 3.40
2-YR, 24-HR PCPN= 1.90 100-YR, 24-HR PCPN= 4.60

* * * * E N D O F R U N * * * *

*** O U T P U T D A T A ***

REVISED JUNE 1988 TO UPDATE COMPUTATION OF SHORT-DURATION VALUES

PRECIPITATION FREQUENCY VALUES FOR Galloway Wash,
PRIMARY ZONE NUMBER= 7
SHORT-DURATION ZONE NUMBER= 8

POINT VALUES

RETURN PERIOD

DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	
5-MIN	.37	.45	.51	.59	.66	.73	.88	5-MIN
10-MIN	.55	.68	.78	.91	1.01	1.11	1.35	10-MIN
15-MIN	.67	.85	.98	1.15	1.29	1.43	1.75	15-MIN
30-MIN	.89	1.14	1.31	1.56	1.75	1.94	2.37	30-MIN
1-HR	1.09	1.41	1.63	1.94	2.18	2.42	2.98	1-HR
2-HR	1.26	1.63	1.88	2.23	2.51	2.79	3.43	2-HR
3-HR	1.38	1.77	2.05	2.43	2.74	3.03	3.73	3-HR
6-HR	1.60	2.05	2.37	2.81	3.16	3.50	4.29	6-HR
12-HR	1.90	2.44	2.81	3.33	3.74	4.15	5.09	12-HR
24-HR	2.20	2.82	3.25	3.86	4.33	4.80	5.89	24-HR

* IF YOUR SITE IS IN ARIZONA OR NEW MEXICO, PLEASE CONSULT THE FOLLOWING PAPER FOR REVISED DEPTH-AREA VALUES:
  DEPTH-AREA RATIOS IN THE SEMI-ARID SOUTHWEST UNITED STATES
  NOAA TECHNICAL MEMORANDUM NWS HYDRO-40
  ZEHR AND MYERS
  AUGUST 1984

INPUT DATA

PROJECT NAME= ,
ZONE= 7 SHORT-DURATION ZONE= 8
LATITUDE= .00 LONGITUDE= 100.00 ELEVATION= 0
2-YR, 6-HR PCPN= 1.60 100-YR, 6-HR PCPN= 3.50
2-YR, 24-HR PCPN= 2.20 100-YR, 24-HR PCPN= 4.80

* * * * E N D O F R U N * * * *

Appendix B

Hydrologic Parameters

Existing Condition

Table B.1

Soils, Vegetation Cover, and RTIMP for rainfall losses by Green & Ampt method for revised subbasins S320 (AHW1) and S340L (AHW3)

AHW1 (S320)	Soil Map Unit No.	12	61	63	72	93
	Sub-Area (acres)	3.8	171.6	33.3	19.5	38.4
	XKSAT (bare ground)	0.01	0.15	0.14	0.09	0.33
	RTIMP (rock)	0%	0%	10%	15%	0%
	XKSAT log avg (bare ground)	**0.15**				
	PSIF	**6.00** *				
	DTHETA (dry)	**0.40** *				
	DTHETA (normal)	**0.25** *				
	RTIMP avg	**2.35%**				
						Total Subbasin Area in sq. miles = 0.42
AHW3 (S340L)	Soil Map Unit No.	33	61	63	72	
	Sub-Area (acres)	6.9	47.8	108.2	15.0	
	XKSAT (bare ground)	0.23	0.15	0.14	0.09	
	RTIMP (rock)	0%	0%	10%	15%	
	XKSAT log avg (bare ground)	**0.14**				
	PSIF	**6.20** *				
	DTHETA (dry)	**0.39** *				
	DTHETA (normal)	**0.23** *				
	RTIMP avg	**7.35%**				
						Total Subbasin Area in sq. miles = 0.28

* referenced from Table A-1 in *Cave Creek Above Carefree Highway Floodplain Delineation Study FCD 95-28* (GVSCE, 1997)

Table B.2
Existing conditions land use characteristics for rainfall losses for revised subbasins S320 (AHW1) and S340L (AHW3)

AHW1 (S320)	**Land Use ID**	**GC**	**LDR-25**	**MDR**	**N**
	Natural or Developed	D	D	D	N
	Sub-Area (acres)	17.1	229.4	10.0	10.0
	RTIMP (Developed)	10%	25%	30%	---
	Veg Cover (Developed)	81%	30%	28%	---
	IA (developed)	0.19	0.16	0.16	---
	Natural Area	**3.8%**			
	Developed Area	**96.2%**			
	RTIMP (Dev.) avg.	**24.19%**			
	Veg Cover (Dev.) avg.	**33.32%**			
	IA (Dev.) avg.	**0.16**			

Total Subbasin Area in sq. miles = 0.42

AHW3 (S340L)	**Land Use ID**	**LDR-25**	**N**
	Natural or Developed	D	N
	Sub-Area (acres)	70.3	107.5
	RTIMP (Developed)	25%	---
	Veg Cover (Developed)	30%	---
	IA (developed)	0.16	---
	Natural Area	**60.5%**	
	Developed Area	**39.5%**	
	RTIMP (Dev.) avg.	**25.00%**	
	Veg Cover (Dev.) avg.	**30.00%**	
	IA (Dev.) avg.	**0.16**	

Total Subbasin Area in sq. miles = 0.28

Table B.3
Existing conditions rainfall loss parameters for Green & Ampt method for revised subbasins S320 (AHW1) and S340L (AHW3)

Sub-basin ID (1)	HEC-1 ID (2)	Total sq. mi. (3)	Area Nat. % (4)	Area Dev. % (5)	IA, in inches Nat. (6)	IA, in inches Dev. (7)	IA, in inches Wghtd. (8)	RTIMP, in % Nat. (9)	RTIMP, in % Dev. (10)	RTIMP, in % Wghtd. (11)	Veg. Cover, in % Nat. (12)	Veg. Cover, in % Dev. (13)	Veg. Cover, in % Wghtd. (14)	XKSAT Bare Ground in/hr (15)	PSIF inches (16)	DTHETA Nat. dry (17)	DTHETA Dev. normal (18)	DTHETA Wghtd. (19)	XKSAT Corrected for Veg. in/hr (20)
AHW1	S320	0.4166	3.8	96.2	0.15	0.16	0.16	2	24	23	30	33	33	0.15	6.00	0.40	0.25	0.26	0.19
AHW3	S340L	0.2780	60.5	39.5	0.20	0.16	0.18	7	25	14	35	30	33	0.14	6.20	0.39	0.23	0.33	0.18

Appendix C

Hydrologic Parameters

Future Condition

Table C.1
Comparison of existing and future land use characteristics for Andora Hills Wash subbasins

Existing Conditions (based on GVSCE 1997)

AHW1 (S320)*	Land Use ID	GC	LDR-25	MDR	N
	Natural or Developed	D	D	D	N
	Sub-Area (acres)	17.1	229.4	10.0	10.0
	RTIMP (Developed)	10%	25%	30%	---
	Veg Cover (Developed)	81%	30%	28%	---
	IA (developed)	0.19	0.16	0.16	---
	Natural Area	**3.8%**			
	Developed Area	**96.2%**			
	RTIMP (Dev.) avg.	**24.19%**			
	Veg Cover (Dev.) avg.	**33.32%**			
	IA (Dev.) avg.	**0.16**			
				Total Subbasin Area in sq. miles =	0.42

AHW4 (S330)	Land Use ID	C	LDR-25	N
	Natural or Developed	D	D	D
	Sub-Area (acres)	22.0	79.0	3.7
	RTIMP (Developed)	80%	25%	---
	Veg Cover (Developed)	10%	30%	---
	IA (developed)	0.07	0.16	---
	Natural Area	**3.5%**		
	Developed Area	**96.5%**		
	RTIMP (Dev.) avg.	**36.98%**		
	Veg Cover (Dev.) avg.	**25.64%**		
	IA (Dev.) avg.	**0.14**		
				Total Subbasin Area in sq. miles = 0.16

AHW3 (S340L)*	Land Use ID	LDR-25	N
	Natural or Developed	D	N
	Sub-Area (acres)	70.3	107.5
	RTIMP (Developed)	25%	---
	Veg Cover (Developed)	30%	---
	IA (developed)	0.16	---
	Natural Area	**60.5%**	
	Developed Area	**39.5%**	
	RTIMP (Dev.) avg.	**25.00%**	
	Veg Cover (Dev.) avg.	**30.00%**	
	IA (Dev.) avg.	**0.16**	
				Total Subbasin Area in sq. miles = 0.28

Future Conditions (interpreted from Tetra Tech, 2001)

AHW1 (S320)	Land Use ID	GC	LDR-25	MDR	N
	Natural or Developed	D	D	D	N
	Sub-Area (acres)	17.1	236.3	10.0	3.1
	RTIMP (Developed)	10%	25%	30%	---
	Veg Cover (Developed)	81%	30%	28%	---
	IA (developed)	0.19	0.16	0.16	---
	Natural Area	**1.2%**			
	Developed Area	**98.8%**			
	RTIMP (Dev.) avg.	**24.22%**			
	Veg Cover (Dev.) avg.	**33.24%**			
	IA (Dev.) avg.	**0.16**			
				Total Subbasin Area in sq. miles =	0.42

AHW4 (S330)	Land Use ID	C	LDR-25	N
	Natural or Developed	D	D	D
	Sub-Area (acres)	25.7	79.0	0.0
	RTIMP (Developed)	80%	25%	---
	Veg Cover (Developed)	10%	30%	---
	IA (developed)	0.07	0.16	---
	Natural Area	**0.0%**		
	Developed Area	**100.0%**		
	RTIMP (Dev.) avg.	**38.50%**		
	Veg Cover (Dev.) avg.	**25.09%**		
	IA (Dev.) avg.	**0.14**		
				Total Subbasin Area in sq. miles = 0.16

AHW3 (S340L)	Land Use ID	LDR-25	N
	Natural or Developed	D	N
	Sub-Area (acres)	127.3	50.5
	RTIMP (Developed)	25%	---
	Veg Cover (Developed)	30%	---
	IA (developed)	0.16	---
	Natural Area	**28.4%**	
	Developed Area	**71.6%**	
	RTIMP (Dev.) avg.	**25.00%**	
	Veg Cover (Dev.) avg.	**30.00%**	
	IA (Dev.) avg.	**0.16**	
				Total Subbasin Area in sq. miles = 0.28

* Basin boundary revised from original GVSCE, 1997 study.

Table C.1
Comparison of existing and future land use characteristics for Andora Hills Wash subbasins

Existing Conditions (based on GVSCE 1997)

AHW2 (S340R)	**Land Use ID**	**C**	**LDR-25**			
	Natural or Developed	D	D			
	Sub-Area (acres)	13.9	27.6			
	RTIMP (Developed)	80%	25%			
	Veg Cover (Developed)	10%	30%			
	IA (developed)	0.07	16%			
	Natural Area	**0.0%**				
	Developed Area	**100.0%**				
	RTIMP (Dev.) avg.	**43.42%**				
	Veg Cover (Dev.) avg.	**23.30%**				
	IA (Dev.) avg.	**0.13**				
				Total Subbasin Area in sq. miles =		0.06
AHW5 (S350)	**Land Use ID**	**C**	**HDR**	**LDR-25**	**N**	
	Natural or Developed	D	D	D	N	
	Sub-Area (acres)	3.1	5.5	71.3	22.9	
	RTIMP (Developed)	80%	45%	25%	---	
	Veg Cover (Developed)	10%	22%	30%	---	
	IA (developed)	0.07	0.13	0.16	---	
	Natural Area	**22.3%**				
	Developed Area	**77.7%**				
	RTIMP (Dev.) avg.	**28.51%**				
	Veg Cover (Dev.) avg.	**28.67%**				
	IA (Dev.) avg.	**0.15**				
				Total Subbasin Area in sq. miles =		0.16
AHW6 (S360)	**Land Use ID**	**C**	**HDR**	**LDR-25**	**N**	
	Natural or Developed	D	D	D	N	
	Sub-Area (acres)	11.4	0.6	115.8	242.2	
	RTIMP (Developed)	80%	45%	25%	---	
	Veg Cover (Developed)	10%	22%	30%	---	
	IA (developed)	0.07	0.13	0.16	---	
	Natural Area	**65.5%**				
	Developed Area	**34.5%**				
	RTIMP (Dev.) avg.	**30.00%**				
	Veg Cover (Dev.) avg.	**28.18%**				
	IA (Dev.) avg.	**0.15**				
				Total Subbasin Area in sq. miles =		0.58

Future Conditions (interpreted from Tetra Tech, 2001)

AHW2 (S340R)	**Land Use ID**	**C**	**LDR-25**			
	Natural or Developed	D	D			
	Sub-Area (acres)	13.9	27.6			
	RTIMP (Developed)	80%	25%			
	Veg Cover (Developed)	10%	30%			
	IA (developed)	0.07	16%			
	Natural Area	**0.0%**				
	Developed Area	**100.0%**				
	RTIMP (Dev.) avg.	**43.42%**				
	Veg Cover (Dev.) avg.	**23.30%**				
	IA (Dev.) avg.	**0.13**				
				Total Subbasin Area in sq. miles =		0.06
AHW5 (S350)	**Land Use ID**	**C**	**HDR**	**LDR-25**	**MDR**	**N**
	Natural or Developed	D	D	D	D	N
	Sub-Area (acres)	3.1	5.5	80.4	13.8	0.0
	RTIMP (Developed)	80%	45%	25%	30%	---
	Veg Cover (Developed)	10%	22%	30%	28%	---
	IA (developed)	0.07	0.13	0.16	0.16	---
	Natural Area	**0.0%**				
	Developed Area	**86.6%**				
	RTIMP (Dev.) avg.	**28.15%**				
	Veg Cover (Dev.) avg.	**28.81%**				
	IA (Dev.) avg.	**0.16**				
				Total Subbasin Area in sq. miles =		0.16
AHW6 (S360)	**Land Use ID**	**C**	**HDR**	**LDR-25**	**LDR-15**	**N**
	Natural or Developed	D	D	D	D	N
	Sub-Area (acres)	11.4	0.6	255.9	28.1	74.0
	RTIMP (Developed)	80%	45%	25%	15%	---
	Veg Cover (Developed)	10%	22%	30%	34%	---
	IA (developed)	0.07	0.13	0.16	0.18	---
	Natural Area	**9.5%**				
	Developed Area	**90.5%**				
	RTIMP (Dev.) avg.	**27.39%**				
	Veg Cover (Dev.) avg.	**29.13%**				
	IA (Dev.) avg.	**0.16**				
				Total Subbasin Area in sq. miles =		0.58

Table C.1
Comparison of existing and future land use characteristics for Andora Hills Wash subbasins

Existing Conditions (based on GVSCE 1997)

AHW7 (S370)	**Land Use ID**	**C**	**HDR**	**LDR-15**	**N**		
	Natural or Developed	D	D	D	N		
	Sub-Area (acres)	123.5	12.5	18.2	64.2		
	RTIMP (Developed)	80%	45%	15%	—		
	Veg Cover (Developed)	10%	22%	34%	—		
	IA (developed)	0.07	0.13	0.18	—		
	Natural Area	**29.4%**					
	Developed Area	**70.6%**					
	RTIMP (Dev.) avg.	**69.49%**					
	Veg Cover (Dev.) avg.	**13.81%**					
	IA (Dev.) avg.	**0.09**					
				Total Subbasin Area in sq. miles =		0.34	
AHW8 (S380)	**Land Use ID**	**C**	**LDR-15**	**N**			
	Natural or Developed	D	D	D			
	Sub-Area (acres)	4.7	175.0	86.1			
	RTIMP (Developed)	80%	15%	—			
	Veg Cover (Developed)	10%	34%	—			
	IA (developed)	0.07	0.18	—			
	Natural Area	**32.4%**					
	Developed Area	**67.6%**					
	RTIMP (Dev.) avg.	**16.70%**					
	Veg Cover (Dev.) avg.	**33.37%**					
	IA (Dev.) avg.	**0.18**					
				Total Subbasin Area in sq. miles =		0.42	
AHW9 (S390)	**Land Use ID**	**C**	**GC**	**HDR**	**LDR-15**	**RSRT**	**N**
	Natural or Developed	D	D	D	D	D	N
	Sub-Area (acres)	11.4	23.5	15.4	47.2	8.90	115.8
	RTIMP (Developed)	80%	10%	45%	15%	60%	—
	Veg Cover (Developed)	10%	81%	22%	34%	32%	—
	IA (developed)	0.07	0.19	0.13	0.18	0.11	—
	Natural Area	**52.1%**					
	Developed Area	**47.9%**					
	RTIMP (Dev.) avg.	**28.97%**					
	Veg Cover (Dev.) avg.	**39.91%**					
	IA (Dev.) avg.	**0.16**					
				Total Subbasin Area in sq. miles =		0.35	

Future Conditions (interpreted from Tetra Tech, 2001)

AHW7 (S370)	**Land Use ID**	**C**	**HDR**	**LDR-15**	**N**		
	Natural or Developed	D	D	D	N		
	Sub-Area (acres)	148.0	12.5	57.9	0.0		
	RTIMP (Developed)	80%	45%	15%	—		
	Veg Cover (Developed)	10%	22%	34%	—		
	IA (developed)	0.07	0.13	0.18	—		
	Natural Area	**0.0%**					
	Developed Area	**100.0%**					
	RTIMP (Dev.) avg.	**60.76%**					
	Veg Cover (Dev.) avg.	**17.05%**					
	IA (Dev.) avg.	**0.10**					
				Total Subbasin Area in sq. miles =		0.34	
AHW8 (S380)	**Land Use ID**	**C**	**LDR-15**	**N**			
	Natural or Developed	D	D	D			
	Sub-Area (acres)	4.7	241.2	19.9			
	RTIMP (Developed)	80%	15%	—			
	Veg Cover (Developed)	10%	34%	—			
	IA (developed)	0.07	0.18	—			
	Natural Area	**7.5%**					
	Developed Area	**92.5%**					
	RTIMP (Dev.) avg.	**16.24%**					
	Veg Cover (Dev.) avg.	**33.54%**					
	IA (Dev.) avg.	**0.18**					
				Total Subbasin Area in sq. miles =		0.42	
AHW9 (S390)	**Land Use ID**	**C**	**GC**	**HDR**	**LDR-15**	**RSRT**	**N**
	Natural or Developed	D	D	D	D	D	N
	Sub-Area (acres)	11.4	23.5	30.1	137.2	20.00	0.0
	RTIMP (Developed)	80%	10%	45%	15%	60%	—
	Veg Cover (Developed)	10%	81%	22%	34%	32%	—
	IA (developed)	0.07	0.19	0.13	0.18	0.11	—
	Natural Area	**0.0%**					
	Developed Area	**100.0%**					
	RTIMP (Dev.) avg.	**25.92%**					
	Veg Cover (Dev.) avg.	**35.93%**					
	IA (Dev.) avg.	**0.16**					
				Total Subbasin Area in sq. miles =		0.35	

Table C.2

Comparison of Existing and Future Land Use Conditions for Galloway Wash Subbasins

Subbasin	Land Use											
	Airport (sq. mi.)	DedOpSpc (sq. mi.)	HiDRes (sq. mi.)	LgLotRes (sq. mi.)	MedDRes (sq. mi.)	NRC (sq. mi.)	RecOpSpc (sq. mi.)	Resort (sq. mi.)	Rural (sq. mi.)	SmLotRes (sq. mi.)	Vacant (sq. mi.)	Water (sq. mi.)
GWW1_1 Existing	0.000	0.011	0.000	0.281	0.000	0.000	0.359	0.015	1.508	0.124	0.250	0.003
	0.0%	0.4%	0.0%	11.0%	0.0%	0.0%	14.1%	0.6%	59.1%	4.9%	9.8%	0.1%
GWW1_1 Future	0.000	0.011	0.000	0.374	0.000	0.000	0.402	0.015	1.564	0.182	0.000	0.003
	0.0%	0.4%	0.0%	14.7%	0.0%	0.0%	15.8%	0.6%	61.3%	7.1%	0.0%	0.1%
GWW1_2 Existing	0.000	0.007	0.000	0.007	0.000	0.007	0.215	0.000	0.588	0.025	0.194	0.000
	0.0%	0.7%	0.0%	0.7%	0.0%	0.7%	20.6%	0.0%	56.4%	2.4%	18.6%	0.0%
GWW1_2 Future	0.000	0.007	0.000	0.007	0.000	0.088	0.246	0.000	0.638	0.055	0.000	0.000
	0.0%	0.7%	0.0%	0.7%	0.0%	8.5%	23.6%	0.0%	61.3%	5.3%	0.0%	0.0%
GWW131 Existing	0.000	0.000	0.000	0.128	0.000	0.000	0.001	0.000	0.637	0.000	0.008	0.000
	0.0%	0.0%	0.0%	16.5%	0.0%	0.0%	0.1%	0.0%	82.3%	0.0%	1.1%	0.0%
GWW131 Future	0.000	0.000	0.000	0.128	0.000	0.000	0.001	0.000	0.645	0.000	0.000	0.000
	0.0%	0.0%	0.0%	16.5%	0.0%	0.0%	0.1%	0.0%	83.4%	0.0%	0.0%	0.0%
GWW132 Existing	0.000	0.000	0.000	0.034	0.000	0.000	0.032	0.000	0.280	0.000	0.002	0.000
	0.0%	0.0%	0.0%	9.7%	0.0%	0.0%	9.1%	0.0%	80.5%	0.0%	0.7%	0.0%
GWW132 Future	0.000	0.000	0.000	0.034	0.000	0.000	0.032	0.000	0.282	0.000	0.000	0.000
	0.0%	0.0%	0.0%	9.7%	0.0%	0.0%	9.1%	0.0%	81.2%	0.0%	0.0%	0.0%
GWW133 Existing	0.000	0.000	0.000	0.290	0.002	0.000	0.094	0.009	0.002	0.000	0.000	0.000
	0.0%	0.0%	0.0%	73.0%	0.6%	0.0%	23.6%	2.3%	0.5%	0.0%	0.0%	0.0%
GWW133 Future	0.000	0.000	0.000	0.290	0.002	0.000	0.094	0.009	0.002	0.000	0.000	0.000
	0.0%	0.0%	0.0%	73.0%	0.6%	0.0%	23.6%	2.3%	0.5%	0.0%	0.0%	0.0%
GWW1_4 Existing	0.000	0.000	0.000	0.026	0.011	0.000	0.000	0.000	0.905	0.000	0.062	0.000
	0.0%	0.0%	0.0%	2.6%	1.1%	0.0%	0.0%	0.0%	90.1%	0.0%	6.2%	0.0%
GWW1_4 Future	0.000	0.000	0.000	0.070	0.011	0.002	0.000	0.000	0.916	0.000	0.005	0.000
	0.0%	0.0%	0.0%	7.0%	1.1%	0.2%	0.0%	0.0%	91.2%	0.0%	0.5%	0.0%
GWW1_5 Existing	0.080	0.000	0.000	0.168	0.162	0.090	0.204	0.026	0.002	0.014	0.237	0.000
	8.1%	0.0%	0.0%	17.1%	16.5%	9.2%	20.8%	2.6%	0.2%	1.4%	24.1%	0.0%
GWW1_5 Future	0.080	0.000	0.059	0.192	0.176	0.164	0.204	0.026	0.064	0.018	0.000	0.000
	8.1%	0.0%	6.0%	19.5%	17.9%	16.7%	20.8%	2.6%	6.5%	1.8%	0.0%	0.0%
GWW1_6 Existing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.538	0.000	0.054	0.000
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	90.9%	0.0%	9.1%	0.0%
GWW1_6 Future	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.556	0.000	0.023	0.000
	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%	93.8%	0.0%	3.9%	0.0%
GVW1 Existing	0.000	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	4.854	0.000
	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.0%	0.0%
GVW1 Future	0.000	0.000	0.000	0.000	0.000	0.033	0.000	0.000	2.081	0.000	2.790	0.000
	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	42.4%	0.0%	56.9%	0.0%
GVW2 Existing	0.000	0.000	0.000	0.000	0.000	0.003	0.452	0.000	1.166	0.121	4.270	0.011
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.5%	0.0%	19.4%	2.0%	70.9%	0.2%
GVW2 Future	0.000	0.000	0.000	0.056	2.141	0.345	0.000	0.000	1.781	0.000	1.700	0.000
	0.0%	0.0%	0.0%	0.9%	35.5%	5.7%	0.0%	0.0%	29.6%	0.0%	28.2%	0.0%
GVW3_1 Existing	0.000	0.000	0.000	0.003	0.000	0.002	0.000	0.000	0.434	0.000	0.604	0.000
	0.0%	0.0%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	41.6%	0.0%	57.9%	0.0%
GVW3_1 Future	0.000	0.000	0.000	0.003	0.000	0.002	0.000	0.000	0.984	0.000	0.054	0.000
	0.0%	0.0%	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	94.3%	0.0%	5.2%	0.0%
GVW3_2 Existing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.401	0.000	0.571	0.000
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	41.3%	0.0%	58.7%	0.0%
GVW3_2 Future	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.810	0.000	0.161	0.000
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83.4%	0.0%	16.6%	0.0%
GVW3_3 Existing	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.000	0.196	0.018	0.094	0.000
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.7%	0.0%	57.5%	5.3%	27.6%	0.0%
GVW3_3 Future	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.000	0.261	0.018	0.029	0.000
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.7%	0.0%	76.5%	5.3%	8.5%	0.0%

Table C.3
Future conditions rainfall loss parameters for Green & Ampt method for Andora Hills Wash

Sub-basin ID (1)	HEC-1 ID (2)	Total sq. mi. (3)	Area Nat. % (4)	Area Dev. % (5)	IA, in inches Nat. (6)	IA, in inches Dev. (7)	IA, in inches Wghtd. (8)	RTIMP, in % Nat. (9)	RTIMP, in % Dev. (10)	RTIMP, in % Wghtd. (11)	Veg. Cover, in % Nat. (12)	Veg. Cover, in % Dev. (13)	Veg. Cover, in % Wghtd. (14)	XKSAT Bare Ground in/hr (15)	PSIF inches (16)	DTHETA Nat. dry (17)	DTHETA Dev. normal (18)	DTHETA Wghtd. (19)	XKSAT Corrected for Veg. in/hr (20)
AHW1	S320	0.417	1.2	98.8	0.15	0.16	0.16	2	24	24	30	33	33	0.15	6.00	0.40	0.25	0.25	0.19
AHW4	S330	0.164	0.0	100.0	0.15	0.14	0.14	3	39	39	30	25	25	0.07	8.00	0.30	0.15	0.15	0.08
AHW3	S340L	0.278	28.4	71.6	0.20	0.16	0.17	7	25	20	35	30	31	0.14	6.20	0.39	0.23	0.27	0.17
AHW2	S340R	0.065	0.0	100.0	0.15	0.13	0.13	0	43	43	30	23	23	0.12	6.60	0.37	0.19	0.19	0.14
AHW5	S350	0.161	0.0	100.0	0.15	0.16	0.16	4	28	28	35	29	29	0.15	6.00	0.40	0.25	0.25	0.18
AHW6	S360	0.578	20.0	80.0	0.20	0.16	0.16	7	27	23	35	29	30	0.13	6.40	0.38	0.21	0.24	0.16
AHW7	S370	0.341	0.0	100.0	0.15	0.10	0.10	1	61	61	30	17	17	0.10	7.00	0.35	0.15	0.15	0.11
AHW8	S380	0.415	7.5	92.5	0.20	0.18	0.18	12	16	16	30	34	33	0.10	7.00	0.35	0.15	0.16	0.13
AHW9	S390	0.347	0.0	100.0	0.15	0.16	0.16	2	26	26	30	36	36	0.12	6.60	0.37	0.19	0.19	0.15

LOSS PARAMETERS FOR SUBBASIN: GWW1_1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.317	12.4	0.62	0
A_24	0.010	0.4	0.02	0
A_33	0.135	5.3	0.23	0
A_40	0.183	7.2	0.17	0
A_41	0.102	4.0	0.17	0
A_61	0.083	3.3	0.15	0
A_63	1.146	44.9	0.14	25
A_72	0.096	3.8	0.09	30
A_93	0.007	0.3	0.33	0
A_96	0.079	3.1	0.07	0
T_301	0.393	15.4	0.40	0

TOTAL = 2.551 Sq.Miles XKSAT = 0.20 %Rock = 12

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.011	DedOpSpc	0.4	NORMAL	35	0	0.20	0.05	Hi	0.13
0.374	LgLotRes	14.7	NORMAL	35	15	0.18	0.04	Low	0.05
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.402	RecOpSc	15.8	NORMAL	75	0	0.20	0.03	Low	0.05
0.015	Resort	0.6	NORMAL	32	60	0.11	0.03	Low	0.07
1.564	Rural	61.3	NORMAL	30	0	0.20	0.04	Low	0.04
0.182	SmLotRes	7.1	NORMAL	30	25	0.15	0.04	Low	0.05
0.000	Vacant	0.0	NORMAL	30	0	0.20	0.05	Hi	
0.003	Water	0.1	NORMAL	0	10	0.00	0.00	Min	0.04
2.551 = Total Area			Avg. =	38	4%	0.190			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 50 % effective = 12
% EFFECTIVE IMP. = 10

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_1	2.552	4.64	2.04	0.04	196.1	0.19	0.25	5.30	0.26	10	47

LOSS PARAMETERS FOR SUBBASIN: GWW1_2

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.060	5.8	0.62	0
A_33	0.781	74.9	0.23	0
A_34	0.014	1.3	0.23	0
A_40	0.011	1.1	0.17	0
A_63	0.076	7.3	0.14	25
A_93	0.007	0.7	0.33	0
A_96	0.092	8.8	0.07	0
T_301	0.002	0.2	0.40	0

TOTAL = 1.043 Sq.Miles XKSAT = 0.21 %Rock = 2

DTHETA

Dry = 0.37 PSIF = 5.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.007	DedOpSpc	0.7	NORMAL	35	0	0.20	0.05	Hi	0.13
0.007	LgLotRes	0.7	NORMAL	35	15	0.18	0.04	Low	0.07
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.088	NRC	8.5	NORMAL	10	80	0.07	0.02	Min	0.03
0.246	RecOpSc	23.6	NORMAL	75	0	0.20	0.03	Low	0.05
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.638	Rural	61.3	NORMAL	30	0	0.20	0.04	Low	0.04
0.055	SmLotRes	5.3	NORMAL	30	25	0.15	0.04	Low	0.06
0.000	Vacant	0.0	NORMAL	30	0	0.20	0.05	Hi	
	Water		NORMAL	0	10	0.00	0.00	Min	

1.041 = Total Area Avg. = 41 8% 0.190

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.28

IMPERVIOUS AREA: URBAN @ 100 % effective = 8
ROCK OUTCROP @ 50 % effective = 2
% EFFECTIVE IMP. = 9

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_2	1.043	3.88	1.87	0.04	164.9	0.19	0.25	5.20	0.28	9	42

LOSS PARAMETERS FOR SUBBASIN: GWW131

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.074	9.6	0.62	0
A_24	0.015	1.9	0.02	0
A_34	0.028	3.6	0.23	0
A_40	0.180	23.3	0.17	0
A_41	0.337	43.5	0.17	0
A_72	0.019	2.5	0.09	30
A_93	0.086	11.1	0.33	0
A_96	0.035	4.5	0.07	0

TOTAL = 0.774 Sq.Miles XKSAT = 0.19 %Rock = 1

DTHETA

Dry = 0.38 PSIF = 5.40
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.128	LgLotRes	16.5	NORMAL	35	15	0.18	0.04	Low	0.05
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.001	RecOpSc	0.1	NORMAL	75	0	0.20	0.03	Low	0.08
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.637	Rural	82.3	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.008	Vacant	1.0	NORMAL	30	0	0.20	0.05	Hi	0.13
	Water		NORMAL	0	10	0.00	0.00	Min	

0.774 = Total Area Avg. = 31 2% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.23

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 100 % effective = 1
% EFFECTIVE IMP. = 3

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW131	0.774	2.58	1.28	0.04	158.9	0.20	0.25	5.40	0.23	3	35

LOSS PARAMETERS FOR SUBBASIN: GWW132

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.008	2.3	0.62	0
A_33	0.085	24.5	0.23	0
A_34	0.031	8.9	0.23	0
A_40	0.110	31.7	0.17	0
A_93	0.075	21.6	0.33	0
A_96	0.038	10.9	0.07	0

TOTAL = 0.347 Sq.Miles XKSAT = 0.20 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.034	LgLotRes	9.8	NORMAL	35	15	0.18	0.04	Low	0.06
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.032	RecOpSc	9.2	NORMAL	75	0	0.20	0.03	Low	0.06
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.280	Rural	80.7	NORMAL	30	0	0.20	0.04	Low	0.05
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.001	Vacant	0.3	NORMAL	30	0	0.20	0.05	Hi	0.15
	Water		NORMAL	0	10	0.00	0.00	Min	
0.347 = Total Area			Avg. =	35	1%	0.200			

PERCENT OF SUBBASIN
DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA:
URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW132	0.347	1.56	0.70	0.04	141.0	0.20	0.25	5.30	0.26	1	23

LOSS PARAMETERS FOR SUBBASIN: GWW133

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.051	12.9	0.62	0
A_34	0.056	14.1	0.23	0
A_40	0.168	42.3	0.17	0
A_93	0.001	0.3	0.33	0
A_96	0.121	30.5	0.07	0

TOTAL = 0.397 Sq.Miles XKSAT = 0.16 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 5.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.290	LgLotRes	73.1	NORMAL	35	15	0.18	0.04	Low	0.05
0.002	MedDRes	0.5	NORMAL	25	30	0.15	0.03	Low	0.08
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.094	RecOpSc	23.7	NORMAL	75	0	0.20	0.03	Low	0.06
0.009	Resort	2.3	NORMAL	32	60	0.11	0.03	Low	0.07
0.002	Rural	0.5	NORMAL	30	0	0.20	0.04	Low	0.08
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
	Vacant		NORMAL	30	0	0.20	0.05	Hi	
	Water		NORMAL	0	10	0.00	0.00	Min	
0.397 = Total Area			Avg. =	46	12%	0.180			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.22

IMPERVIOUS AREA: URBAN @ 100 % effective = 12
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 12

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW133	0.397	1.59	0.90	0.04	157.2	0.18	0.25	5.80	0.22	12	23

LOSS PARAMETERS FOR SUBBASIN: GWW1_4

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.039	3.9	0.62	0
A_33	0.034	3.4	0.23	0
A_40	0.084	8.4	0.17	0
A_41	0.579	57.7	0.17	0
A_72	0.001	0.1	0.09	30
A_93	0.084	8.4	0.33	0
A_96	0.181	18.0	0.07	0
A_121	0.002	0.2	0.12	0

TOTAL = 1.004 Sq.Miles XKSAT = 0.16 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 5.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.070	LgLotRes	7.0	NORMAL	35	15	0.18	0.04	Low	0.06
0.011	MedDRes	1.1	NORMAL	25	30	0.15	0.03	Low	0.07
0.002	NRC	0.2	NORMAL	10	80	0.07	0.02	Min	0.04
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.916	Rural	91.2	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.005	Vacant	0.5	NORMAL	30	0	0.20	0.05	Hi	0.14
	Water		NORMAL	0	10	0.00	0.00	Min	
1.004 = Total Area			Avg. =	30	2%	0.200			

PERCENT OF SUBBASIN
DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.20

IMPERVIOUS AREA:
URBAN @ 100 % effective = 2
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_4	1.004	3.64	2.11	0.04	274.7	0.20	0.25	5.80	0.20	2	43

LOSS PARAMETERS FOR SUBBASIN: GWW1_5

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.014	1.4	0.62	0
A_28	0.010	1.0	0.02	0
A_33	0.187	19.0	0.23	0
A_34	0.063	6.4	0.23	0
A_40	0.044	4.5	0.17	0
A_72	0.005	0.5	0.09	30
A_93	0.192	19.5	0.33	0
A_96	0.468	47.6	0.07	0

TOTAL = 0.983 Sq.Miles XKSAT = 0.14 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 6.20
Normal = 0.23
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.080	Airport	8.1	NORMAL	8	85	0.07	0.02	Min	0.03
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.192	LgLotRes	19.5	NORMAL	35	15	0.18	0.04	Low	0.05
0.176	MedDRes	17.9	NORMAL	25	30	0.15	0.03	Low	0.05
0.164	NRC	16.7	NORMAL	10	80	0.07	0.02	Min	0.03
0.204	RecOpSc	20.8	NORMAL	75	0	0.20	0.03	Low	0.05
0.026	Resort	2.6	NORMAL	32	60	0.11	0.03	Low	0.06
0.064	Rural	6.5	NORMAL	30	0	0.20	0.04	Low	0.06
0.018	SmLotRes	1.8	NORMAL	30	25	0.15	0.04	Low	0.07
	Vacant		NORMAL	30	0	0.20	0.05	Hi	
	Water		NORMAL	0	10	0.00	0.00	Min	
0.059	HDR	6.0	NORMAL	22	45	0.13	0.03	Min	0.03

0.983 = Total Area Avg. = 43 33% 0.150

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.23

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 33
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 33

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_5	0.983	3.57	1.89	0.03	112.6	0.15	0.23	6.20	0.19	33	36

LOSS PARAMETERS FOR SUBBASIN: GWW1_6

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.019	3.2	0.62	0
A_33	0.034	5.7	0.23	0
A_34	0.306	51.6	0.23	0
A_41	0.175	29.5	0.17	0
A_93	0.007	1.2	0.33	0
A_96	0.044	7.4	0.07	0
A_121	0.008	1.3	0.12	0

TOTAL = 0.593 Sq.Miles XKSAT = 0.20 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.014	NRC	2.4	NORMAL	10	80	0.07	0.02	Min	0.03
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.556	Rural	93.8	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.023	Vacant	3.9	NORMAL	30	0	0.20	0.05	Hi	0.12
	Water		NORMAL	0	10	0.00	0.00	Min	
0.593 = Total Area			Avg. =	30	2%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GWW1_6	0.593	2.61	1.31	0.04	164.8	0.20	0.25	5.30	0.24	2	35

LOSS PARAMETERS FOR SUBBASIN: GVW2

Soil Survey Used Custom

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_8	0.217	3.6	0.00	0
A_26	0.000	0.0	0.01	0
A_34	0.016	0.3	0.23	0
A_41	0.738	12.2	0.17	0
A_61	0.047	0.8	0.15	0
A_63	2.518	41.8	0.14	25
A_72	2.050	34.0	0.09	30
A_93	0.153	2.5	0.33	0
A_104	0.081	1.3	0.14	60
T_301	0.201	3.3	0.40	0
T_303	0.002	0.0	0.40	15

TOTAL = 6.023 Sq.Miles XKSAT = 0.14 %Rock = 21

DTHETA

Dry = 0.39 PSIF = 6.20
Normal = 0.23
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.056	LgLotRes	0.9	NORMAL	35	15	0.18	0.04	Low	0.06
2.141	MedDRes	35.5	NORMAL	25	30	0.15	0.03	Low	0.04
0.345	NRC	5.7	NORMAL	10	80	0.07	0.02	Min	0.03
0.000	RecOpSc	0.0	NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
1.781	Rural	29.6	NORMAL	30	0	0.20	0.04	Low	0.04
0.000	SmLotRes	0.0	NORMAL	30	25	0.15	0.04	Low	
1.700	Vacant	28.2	NORMAL	30	0	0.20	0.05	Hi	0.07
0.000	Water	0.0	NORMAL	0	10	0.00	0.00	Min	
6.023 = Total Area			Avg. =	28	15%	0.170			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.23

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.17

IMPERVIOUS AREA: URBAN @ 100 % effective = 15
ROCK OUTCROP @ 50 % effective = 21
% EFFECTIVE IMP. = 26

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW2	6.023	5.51	2.77	0.04	371.1	0.17	0.23	6.20	0.17	26	49

LOSS PARAMETERS FOR SUBBASIN: GVW3_1

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.113	10.8	0.62	0
A_8	0.054	5.2	0.96	0
A_26	0.069	6.6	0.01	0
A_33	0.017	1.6	0.23	0
A_34	0.541	51.9	0.23	0
A_41	0.120	11.5	0.17	0
A_93	0.067	6.4	0.33	0
A_96	0.045	4.3	0.07	0
A_121	0.017	1.6	0.12	0

TOTAL = 1.043 Sq.Miles XKSAT = 0.21 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
0.003	LgLotRes	0.3	NORMAL	35	15	0.18	0.04	Low	0.08
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.002	NRC	0.2	NORMAL	10	80	0.07	0.02	Min	0.04
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.984	Rural	94.3	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.054	Vacant	5.2	NORMAL	30	0	0.20	0.05	Hi	0.11
	Water		NORMAL	0	10	0.00	0.00	Min	

1.043 = Total Area Avg. = 30 0% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_1	1.043	3.31	1.51	0.04	184.3	0.20	0.25	5.20	0.26	0	39

LOSS PARAMETERS FOR SUBBASIN: GVW1

Soil Survey Used Custom

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.064	1.3	0.62	0
A_8	0.118	2.4	0.96	0
A_26	0.048	1.0	0.01	0
A_33	0.001	0.0	0.23	0
A_34	0.224	4.6	0.23	0
A_41	0.109	2.2	0.17	0
A_72	3.262	66.5	0.09	30
A_93	0.009	0.2	0.33	0
A_104	1.014	20.7	0.14	60
T_303	0.055	1.1	0.40	15

TOTAL = 4.904 Sq.Miles XKSAT = 0.11 %Rock = 33

DTHETA

Dry = 0.36 PSIF = 6.80
Normal = 0.17
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
0.000	DedOpSpc	0.0	NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
0.033	NRC	0.7	NORMAL	10	80	0.07	0.02	Min	0.03
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
2.081	Rural	42.4	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
2.790	Vacant	56.9	NORMAL	30	0	0.20	0.05	Hi	0.07
	Water		NORMAL	0	10	0.00	0.00	Min	
4.904 = Total Area			Avg. =	30	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.17

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 33
% EFFECTIVE IMP. = 18

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW1	4.905	6.19	3.56	0.04	298.9	0.20	0.17	6.80	0.13	18	68

LOSS PARAMETERS FOR SUBBASIN: GVW3_2

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.044	4.5	0.62	0
A_8	0.216	22.2	0.96	0
A_26	0.165	17.0	0.01	0
A_33	0.074	7.6	0.23	0
A_34	0.429	44.1	0.23	0
A_41	0.000	0.0	0.17	0
A_93	0.044	4.5	0.33	0

TOTAL = 0.972 Sq.Miles XKSAT = 0.20 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
	RecOpSc		NORMAL	75	0	0.20	0.03	Low	
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.810	Rural	83.4	NORMAL	30	0	0.20	0.04	Low	0.04
	SmLotRes		NORMAL	30	25	0.15	0.04	Low	
0.161	Vacant	16.6	NORMAL	30	0	0.20	0.05	Hi	0.10
	Water		NORMAL	0	10	0.00	0.00	Min	

0.971 = Total Area Avg. = 30 0% 0.200

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.24

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 50 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_2	0.972	2.42	1.26	0.04	144.6	0.20	0.25	5.30	0.24	0	35

LOSS PARAMETERS FOR SUBBASIN: GVW3_3

Soil Survey Used Maricopa

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
A_6	0.001	0.3	0.62	0
A_8	0.031	9.1	0.96	0
A_12	0.022	6.5	0.01	0
A_26	0.029	8.5	0.01	0
A_33	0.178	52.2	0.23	0
A_34	0.019	5.6	0.23	0
A_72	0.016	4.7	0.09	30
A_93	0.029	8.5	0.33	0
A_96	0.016	4.7	0.07	0

TOTAL = 0.341 Sq.Miles XKSAT = 0.15 %Rock = 1

DTHETA

Dry = 0.40 PSIF = 6.00
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Airport		NORMAL	8	85	0.07	0.02	Min	
	DedOpSpc		NORMAL	35	0	0.20	0.05	Hi	
	LgLotRes		NORMAL	35	15	0.18	0.04	Low	
	MedDRes		NORMAL	25	30	0.15	0.03	Low	
	NRC		NORMAL	10	80	0.07	0.02	Min	
0.033	RecOpSc	9.7	NORMAL	75	0	0.20	0.03	Low	0.06
	Resort		NORMAL	32	60	0.11	0.03	Low	
0.261	Rural	76.5	NORMAL	30	0	0.20	0.04	Low	0.05
0.018	SmLotRes	5.3	NORMAL	30	25	0.15	0.04	Low	0.07
0.029	Vacant	8.5	NORMAL	30	0	0.20	0.05	Hi	0.12
	Water		NORMAL	0	10	0.00	0.00	Min	
0.341 = Total Area			Avg. =	34	1%	0.200			

PERCENT OF SUBBASIN DRY = 0.0 %
NORMAL = 100. %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 50 % effective = 1
% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
GVW3_3	0.341	1.88	0.95	0.04	135.6	0.20	0.25	6.00	0.19	2	28

Appendix D

Road Crossing Peak Discharge Calculations

Existing and Future Conditions

Andora Hills Wash

And

Galloway Wash

	ROAD CROSSING		OSSING PEAK DISCHARGES (CFS)			Model CP	Road Xing
ID	Road	Wa	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr	Area (sq.mi.)	Area (sq.mi.)
63	N. Spanish Boot Rd.	Trib 4 to Galloway	35	72	63	0.59	0.05
64	N. Rising Sun Rd.	Trib 4 to Galloway	217	442	390	0.59	0.29
65	E. Grapevine Rd.	Trib 4 to Galloway	243	496	437	0.59	0.32
66	N. Rising Sun Rd.	Trib 5 to Galloway	37	76	67	0.59	0.05
67	W. Rising Star Wy.	Trib 5 to Galloway	62	126	111	0.59	0.08
68	N. Father Kino Tr.	Grapevine Wash	3937	5447	6408	6.02	6.02
69	N. Father Kino Tr.	Tributary to Grape	10	19	19	1.04	0.02
70	E. Montezuma Rd.	Tributary to Grape	25	48	46	1.04	0.04
71	unnamed road	Tributary to Rowe	416	621	683	4.90	0.79

Memorandum JE Fuller/ Hydrology & Geomorphology, Inc.

DATE: October 17, 2002
TO: Linda Johnson, P.E., CH2M Hill
FROM: Ted Lehman, P.E.
RE: Effects of revised hydrology for GWW1_3
CC: Rob Lyons, CH2M Hill
File

Linda and Rob,

The memorandum I sent you yesterday was based on comparisons with a preliminary modeling I performed for Brian Iserman assuming the same LG parameters for the subdivided GWW1_3 for GWW131, GWW132, and GWW133. In exploring a question Rob had for me this morning, I realized that for the actual revised FEMA models I recomputed the LG parameters based on the actual spatial distributions of soils and land use from the GIS. Consequently, the approved revised FEMA discharges are slightly different than I reported in the memorandum dated 10/16/02. Table 1 below presents those values and the values submitted to FEMA.

Table 1. Comparison of Discharges

Location	Drainage Area (sq. miles)	Original 100-yr 24-hr Peak Discharge (cfs)	Revised Gwm224.out Peak Discharge from memo of 10/16/02 (cfs)	FEMA Approved Revised Gwm224.out Peak Discharge (cfs)
Dream Street	1.72	1840	-	-
N. Carefree Drive	1.83	1960	-	-
CP 284	1.04	1110	1110	1110
CP 285	1.39	-	1459	1444
CP 286A	1.79	-	1843	1750

As you can see from Table 1, the conclusions from the 10/16/02 memo remain valid. The differences in discharges are still very similar to those provided to you originally in Dec. 2001.

In addition, Rob asked about the total flow in North Galloway Wash upstream of Galloway Wash. I added a concentration point to the Gwm224.dat model to compute this value. The result for the 100-yr 24-hr approved FEMA model is 2423 cfs. I also revised the 100-yr 6-hr existing conditions model to add this concentration point. The peak discharge from that revised model was 2317 cfs. Therefore, the 24-hr model controls for this location.

If you have any questions regarding the information provided to you with this or the 10/16/02 memorandum, please do not hesitate to call me.

Lyons, Robert/PHX

From: Ted Lehman [ted@jefuller.com]

Sent: October 17, 2002 10:00 AM

To: Johnson, Linda/PHX

Cc: Lyons, Robert/PHX

Subject: hydrology for Galloway Wash

Linda/Rob,

Attached you will find a new memo regarding the effects of the FEMA revisions to the Galloway Wash hydrology. In the process of investigating a questin Rob posed this morning, I realized that the memo to Brian Iserman I sent yesterday was for our preliminary revisions to FEMA. The approved revisions were a little different. The attached memo outlines the differences.

Also, I added a concentration point to the model to provide a total flow in North Galloway Wash at Rob's request. The results show that the 100-yr 24-hr model produces the higher discharge. That peak for the existing conditions is 2423 cfs. I have also attached the revised models for the 100-yr 24-hr and 6-hr existing conditions for your reference and/or use.

Please let me know if you have any questions.

Sincerely,

Ted Lehman, P.E.
JE Fuller/ Hydrology & Geomorphology, Inc.
Tempe, AZ

Table 5. Existing Condition Peak Discharges at Road Crossings, Galloway and Andora Hills Washes										
ROAD CROSSING						Drainage Area	EXISTING CONDITIONS PEAK DISCHARGES (CFS)			
ID Number	Road	Surface	Width	Crossing	Wash	(sq. miles)	10-yr 6-hr	10-yr 24-hr	100-yr 6-hr	100-yr 24-hr
1	N. Sidewinder Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.04	61	48	109	71
2	E. Long Rifle Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.06	100	79	179	116
3	E. Long Rifle Rd. & N. Long Rifle Rd.	paved	2-lane	dip	Tributary 1 to Andora Hills Wash	0.21	355	281	638	412
4	N. Tom Darlington Dr.	paved	4-lane d	culvert?	Tributary 1 to Andora Hills Wash	0.42	698	553	1255	811
5	E. Bivouc Tr.	paved	2-lane	dip?	Tributary 1 to Andora Hills Wash	0.42	698	553	1255	811
6	E. Bivouac Tr.	paved	2-lane	dip	Andora Hills Wash	0.65	900	759	1630	1163
7	E. Carefree Dr.	paved	2-lane	culvert?	Andora Hills Wash	0.92	1096	1020	2048	1625
8	N. Lazy Burro Rd.	paved	2-lane	dip	Andora Hills Wash	0.97	1153	1073	2154	1710
9	N. Lazy Burro Rd.	paved	2-lane	dip	Andora Hills Wash	0.99	1183	1101	2210	1753
10	N. Holiday Ln.	paved	2-lane	dip	Andora Hills Wash	1.01	1198	1115	2238	1776
11	N. Terrace	paved	2-lane	culvert	Andora Hills Wash	1.06	1257	1170	2349	1864
12	N. Piedra Grande Dr.	paved	2-lane	dip	Andora Hills Wash	1.09	1201	1138	2240	1862
13	private drive	dirt	1-lane	dip	Andora Hills Wash	1.17	1286	1219	2399	1994
14	N. Never Mind Tr.	paved	2-lane	dip	Tributary 2 to Andora Hills Wash	0.21	243	198	497	346
15	E. Long Rifle Rd.	paved	2-lane	culvert?	Andora Hills Wash	0.05	62	49	113	77
16	E. Nonchalant Av.	paved	2-lane	dip	Andora Hills Wash	0.11	148	118	272	183
17	N. Bloody Basin Rd. & E. Nonchalant Av.	paved	2-lane	culvert?	Andora Hills Wash	0.12	163	129	298	201
18	E. Elbow Bend	paved	2-lane	dip?	Andora Hills Wash	0.14	180	143	329	222
19	E. Carefree Dr.	paved	2-lane	dip?	Andora Hills Wash	0.15	195	154	357	241
20	N. Tom Darlington Dr.	paved	4-lane d	dip?	Andora Hills Wash	0.16	212	168	388	262
21	E. Northview Ln	paved	2-lane	dip	South Trib to Galloway Wash	0.02	19	18	32	30
22	N. Pima Rd.	paved	2-lane	dip?	South Trib to Galloway Wash	0.10	78	72	131	122
23	N. Mule Train Rd.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.54	438	404	736	688
24	E. Long Rifle Rd.	paved	2-lane	dip	South Trib to Galloway Wash	0.56	457	422	768	718
25	E. Primrose Path	paved	2-lane	dip	South Trib to Galloway Wash	0.59	478	441	803	751
26	N. Tranquil Tr.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.62	507	467	851	796
27	E. Carefree Dr.	paved	2-lane	culvert?	South Trib to Galloway Wash	0.72	591	545	992	928
28	private drive	paved	2-lane	?	South Trib to Galloway Wash	0.74	607	560	1020	954
29	E. Hum Rd.	paved	2-lane	dip?	South Trib to Galloway Wash	0.77	630	581	1058	990
30	E. Sundance Tr.	paved	2-lane	dip?	South Trib to Galloway Wash	0.78	640	590	1074	1005
31	N. Scopa Trail	paved	2-lane	dip	South Trib to Galloway Wash	0.94	766	707	1287	1204
32	N. Pima Rd.	paved	2-lane	dip	Galloway Wash	1.04	609	593	1155	1110
33	N. Carefree Dr.	paved	2-lane	dip	Galloway Wash	1.68	797	839	1612	1643
34	N. Dream St.	paved	2-lane	culvert	Galloway Wash	1.78	846	891	1712	1745
35	N. Tranquil Tr.	paved	2-lane	dip	Galloway Wash	5.14	1710	1997	3250	3460
36	N. Scopa Trail	paved	2-lane	dip	Galloway Wash	6.07	2012	2475	3931	4386
37	N. Pima Rd. & E. Double Eagle Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.19	226	190	391	335
38	E. Double Eagle Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.30	359	302	622	534
39	E. Carefree Dr.	paved	2-lane	dip	Trib 1 to Galloway Wash	0.32	390	328	676	579
40	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.05	42	39	75	70
41	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.15	127	116	226	209
42	E. Paint Pony Dr.	paved	2-lane	dip	Tributary to North Galloway Wash	0.18	150	138	267	247
43	E. Cow Track Dr.	paved	2-lane	dip	North Galloway Wash	2.87	1036	1136	2002	2094
44	N. Sombrero Rd.	paved	2-lane	dip	North Galloway Wash	2.95	1065	1168	2059	2153
45	E. Cow Track Dr.	paved	2-lane	dip	North Galloway Wash	3.02	1091	1195	2107	2204
46	E. Celestial St. & E. Paint Pony Dr.	paved	2-lane	dip	North Galloway Wash	3.03	1094	1199	2113	2210
47	N. Silver Saddle Dr. & E. Maverick Cir.	paved	2-lane	dip	Trib 2 to Galloway Wash	0.25	167	158	301	287

Map 3: Carefree DMP Road Crossings

1:24000

2000 0 2000

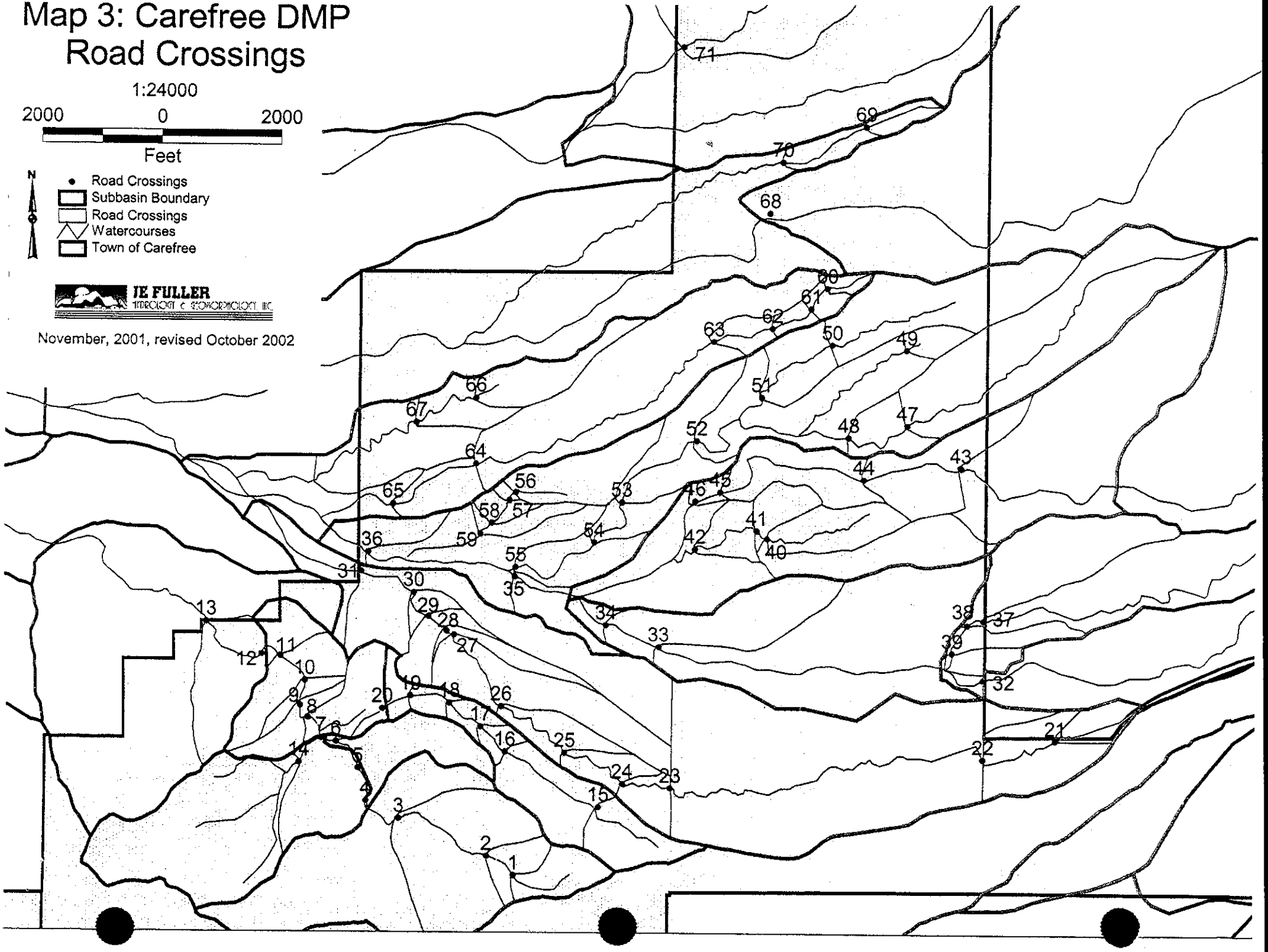
Feet

N

- Road Crossings
- Subbasin Boundary
- Road Crossings
- Watercourses
- Town of Carefree

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

November, 2001, revised October 2002



HEC-1 Report from North Scottsdale

FDS, FCD2001C009

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1*************************************                                    *************************************
 *                                   *                                    *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                *    U.S. ARMY CORPS OF ENGINEERS   *
 *              JUN   1998           *                                    *   HYDROLOGIC ENGINEERING CENTER   *
 *            VERSION 4.1            *                                    *         609 SECOND STREET         *
 *                                   *                                    *      DAVIS, CALIFORNIA 95616      *
 *  RUN DATE   03SEP02  TIME  14:00:32  *                                 *          (916) 756-1104           *
 *                                   *                                    *                                   *
 *************************************                                    *************************************

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                                        X     X  X        X     X         XX
                                        X     X  X        X               X
                                        XXXXXXX  XXXX     X        XXXXX  X
                                        X     X  X        X               X
                                        X     X  X        X     X         X
                                        X     X  XXXXXXX   XXXXX         XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                          HEC-1 INPUT                                                    PAGE  1

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    1           ID   Project ID: 01131.12 - Major Basin: NS - Return Period: 10 Years
    2           ID
    3           ID   NORTH SCOTTSDALE 100-YR FLOODPLAIN DELINEATION STUDY
    4           ID   MAY 2002
    5           ID
    6           ID   FILE NAME:  NS.DAT
    7           ID   THIS MODEL REPRESENTS THE FUTURE LAND USE CONDITIONS OF THE WATERSHEDS.
    8           ID   THE TOTAL DRAINAGE AREA FOR THE ENTIRE STUDY IS 11.2 SQUARE MILES.
    9           ID
   10           ID   100-YEAR, 6-HOUR FREQUENCY
   11           ID
   12           ID   METHODOLOGY:
   13           ID   THE US CORPS OF ENGINEERS FLOOD HYROLOGY MODEL HEC-1, DATED JUNE 1998,
   14           ID   VERSION 4.1
   15           ID   MULTIPLE STORMS
   16           ID   CLARK UNIT HYDROGRAPH
   17           ID   GREEN AMPT LOSS METHOD
   18           ID   NORMAL DEPTH BASIN AND REACH ROUTING METHOD
   19           ID
   20           ID   LAND USES PER CITY OF SCOTTSDALE PROVIDED GIS
   21           ID
   22           ID   PROJECT WASHES INCLUDE: STAGE COACH PASS (SCP)
   23           ID                           UPPER BOULDERS WASH (UB)
   24           ID                           FAN 6C (F6C)
   25           ID                           FAN 6A NORTH (F6AN)
   26           ID                           FAN 6A SOULTH (F6AS)
   27           ID                           FAN 6A (F6A)
   28           ID                           UPPER FAN 5 (UF5)
   29           ID
   30           ID   PROJECT SUB-BASINS DESIGNATED AS SUB-BASIN NAME ABREVIATION FOLLOWED BY BASIN
   31           ID   NUMBER.  I.E. STAGE COACH PASS SUB-BASIN 14 IS DESIGNATED AS SCP-14.
   32           ID
   33           ID   PROJECT CONCENTRATION POINTS DESIGNATED AS C FOLLOWED BY SUB-BASIN NAME AND
   34           ID   CONCENTRATION POINT NUMBER.  CONCENTRATION POINT NUMBER IS CHOOSEN BY THE SUB
   35           ID   BASIN THE CONCENTRATION POINT IS LOCATED IN.  I.E.  CONCENTRATION POINT IN
   36           ID   SUB-BASIN 06 OF UPPER BOULDERS WASH IS DESIGNATED AS CUB06.
   37           ID
   38           ID   PROJECT ROUTES ARE DESIGNATED AS R FOLLOWED BY SUB-BASIN NAME AND ROUTE
   39           ID   NUMBER. ROUTE NUMBER IS CHOOSEN BY THE SUB-BASIN IN WHICH THE ROUTE BEGINS.
   40           ID   IE A ROUTE FROM SUB-BASIN 4 IN FAN 6C IS DESIGNATED AS RF6C4.
   41           ID
   42           ID
   43           ID
   44           ID
   45           IT       1                    2000
   46           IO       3
   47           IN      15
   48           JD    2.37    0.01
   49           PC   0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
   50           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
   51           PC   0.962   0.972   0.983   0.991   1.000
   52           JD   2.355    0.50
   53           JD   2.310    2.80
   54           PC   0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
   55           PC   0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
1                                          HEC-1 INPUT                                                    PAGE  2
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 132          KK  CSCP09
 133          KM   COMBINE SCP09, AND RSCP10
 134          KM   EXITING MIRABEL ON WEST BOUNDARY.
 135          HC       2

 136          KK  RSCP09   ROUTE   REACH
 137          RS       3    STOR      -1
 138          RC   0.064   0.044   0.064    2968  0.0230    0.00
 139          RX   865.1   910.6   932.1   961.1  1066.2  1091.4  1109.0  1125.3
 140          RY   724.0   722.0   718.0   714.0   714.0   718.0   722.0   724.0

 141          KK  SCP-08   BASIN
 142          BA   0.127
 143          LG    0.30    0.25    3.95    0.56      45
 144          UC   0.250   0.260
 145          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 146          UA     100
1                                          HEC-1 INPUT                                          PAGE  4

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 147          KK  CSCP08
 148          KM   COMBINE SCP08, AND RSCP09
 149          KM   EXITING CITY OF SCOTTSDALE AND ENTERING TOWN OF CAREFREE.
 150          HC       2

 151          KK  RSCP08   ROUTE   REACH
 152          RS       3    STOR      -1
 153          RC   0.064   0.044   0.064    2847  0.0204    0.00
 154          RX   850.9   901.3   954.4   979.4  1000.0  1062.3  1114.0  1201.2
 155          RY   668.0   666.0   664.0   662.0   660.0   662.0   664.0   666.0

 156          KK  SCP-7E   BASIN
 157          BA   0.048
 158          LG    0.30    0.25    3.95    0.55      33
 159          UC   0.196   0.224
 160          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 161          UA     100

 162          KK  CSCP7E
 163          KM   COMBINE SCP7E, AND RSCP08
 164          KM   NORTH OF CITY OF SCOTTSDALE BOUNDARY IN SECTION 31 OF T6N5E.
 165          KM   EXITING TOWN OF CAREFREE AT STAGECOACH PASS.
 166          HC       2

 167          KK  SCP-7B   BASIN
 168          BA   0.088
 169          LG    0.30    0.25    3.95    0.50      40
 170          UC   0.300   0.462
 171          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 172          UA     100

 173          KK  RSCP7B   ROUTE   REACH
 174          RS       3    STOR      -1
 175          RC   0.064   0.044   0.064    2275  0.0224    0.00
 176          RX   947.0   967.3   977.1   990.7  1013.1  1024.4  1047.5  1074.1
 177          RY   646.0   644.0   642.0   640.0   640.0   642.0   644.0   646.0

 178          KK  SCP-7C   BASIN
 179          BA   0.177
 180          LG    0.30    0.25    3.95    0.50      41
 181          UC   0.379   0.548
 182          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 183          UA     100

 184          KK  RSCP7C   ROUTE   REACH
 185          RS       1    STOR      -1
 186          RC   0.064   0.044   0.064     821  0.0207    0.00
 187          RX   827.0   845.3   898.0   993.5  1008.9  1024.0  1042.1  1057.6
 188          RY   640.0   638.0   636.0   634.0   634.0   636.0   638.0   640.0
1                                          HEC-1 INPUT                                          PAGE  5

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 189          KK  SCP-7D   BASIN
 190          BA   0.027
 191          LG    0.30    0.25    3.95    0.56      41
 192          UC   0.171   0.216
 193          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 194          UA     100

 195          KK  CSCP7D
 196          KM   COMBINE SCP7D, RSCP7B AND RSCP7C
 197          KM   CONFLUENCE POINT WITHIN TOWN OF CAREFREE.  CROSSING AT TWILIGHT TRAIL.
 198          HC       3

 199          KK  RSCP7D   ROUTE   REACH
 200          RS       1    STOR      -1
 201          RC   0.064   0.044   0.064     217  0.0276    0.00
 202          RX   956.3   969.1   987.2   991.1  1012.9  1019.5  1030.2  1044.8
 203          RY   620.0   618.0   616.0   614.0   614.0   616.0   618.0   619.0
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278          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
279          UA     100

280          KK  SSCP5C
281          RS       1    FLOW       1
282          SA       0    0.01
283          SE    2540    2550
284          SQ       0   10000
285          SE    2540    2550

286          KK  RSCP5C   ROUTE   REACH
287          RS       3    STOR      -1
288          RC   0.064   0.044   0.064    2696  0.0185    0.00
289          RX   903.8   943.5   972.7   996.7  1005.3  1068.4  1099.0  1112.6
290          RY   542.0   540.0   538.0   536.0   536.0   538.0   540.0   542.0

291          KK  SCP-5B   BASIN
292          BA   0.027
293          LG    0.24    0.25    3.95    0.52      58
294          UC   0.200   0.301
295          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
296          UA     100

297          KK  SSCP5B
298          RS       1    FLOW       1
299          SA       0    0.01
300          SE    2550    2560
301          SQ       0   10000
302          SE    2550    2560

303          KK  RSCP5B   ROUTE   REACH
304          RS       3    STOR      -1
305          RC   0.064   0.044   0.064    2870  0.0209    0.00
306          RX   788.3   815.7   850.1   990.6  1008.8  1019.8  1037.3  1075.2
307          RY   522.0   520.0   518.0   516.0   516.0   518.0   520.0   522.0

308          KK  SCP-5A   BASIN
309          BA   0.092
310          LG    0.30    0.25    3.95    0.51      39
311          UC   0.229   0.227
312          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
313          UA     100

314          KK  CSCP04
315          KM   COMBINE CSCP4a, SCP5a, RSCP5b, AND RSCP5c
316          KM   CONFLUENCE POINT LOCATED IN SECTION 1 OF T5NR4E.
317          KM   LOCATED EAST OF SANDFLOWER EAST BOUNDARY.
318          HC       4
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

319          KK  RSCP04   ROUTE   REACH
320          RS       2    STOR      -1
321          RC   0.056   0.038   0.086    1499  0.0180    0.00
322          RX   850.6   870.5   971.1   987.9  1027.2  1050.7  1218.9  1240.9
323          RY   492.0   490.0   486.0   484.0   484.0   486.0   488.0   492.0

324          KK  SCP-03   BASIN
325          BA   0.076
326          LG    0.30    0.25    4.20    0.45      25
327          UC   0.229   0.238
328          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
329          UA     100

330          KK  CSCP03
331          KM   COMBINE SCP03, AND RSCP04
332          KM   DIVERSION SPLIT FLOW WITHIN SANDFLOWER SUBDIVISION.
333          HC       2
             * KK DSCP3
             * KM TOTAL FLOW=DI
             * KM CONTINUING FLOW=DSCP3 (DI-DQ)
             * KM DIVERTED FLOW=DSCOUT (DQ)
             * DTDSCOUT
             * DI      0   270.5   550.7   933.7  1163.6  1676.1  2827.8
             * DQ      0    76.4   161.0   289.9   352.5   629.9  1480.6

334          KK  RSCP03   ROUTE   REACH
335          RS       2    STOR      -1
336          RC   0.061   0.038   0.056    1378  0.0181    0.00
337          RX   966.2   984.0   990.6   997.6  1003.9  1019.0  1048.1  1065.0
338          RY   447.7   446.0   444.0   442.0   442.0   444.0   446.0   448.0

339          KK  SCP-2B   BASIN
340          BA   0.054
341          LG    0.30    0.25    4.10    0.43      25
342          UC   0.288   0.476
343          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
344          UA     100

345          KK  CSCP2B
346          KM   COMBINE SCP2B, AND RSCP03
347          KM   CROSSING AT 81ST STREET LOCATED WITHIN SANDFLOWER.
348          HC       2
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 421          LG    0.32    0.25    3.95    0.58      42
 422          UC   0.396   0.631
 423          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 424          UA     100

 425          KK   CF6C5
 426          KM   COMBINE CF6C4, AND F6C-5
 427          KM   CONFLUENCE WITHIN LENGEN TRAIL LOCATED IN SECTION 6 OF T5NR5E.
 428          HC       2

 429          KK   RF6C4   ROUTE   REACH
 430          RS       3    STOR      -1
 431          RC   0.050   0.035   0.050    2707  0.0070    0.00
 432          RX   697.3   735.7   986.9   990.6  1012.9  1106.1  1185.2  1250.7
 433          RY   596.0   592.0   592.0   590.0   590.0   592.0   594.0   596.0

 434          KK   F6C-3   BASIN
 435          BA   0.046
 436          LG    0.33    0.25    4.20    0.53      43
 437          UC   0.267   0.343
 438          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 439          UA     100
1                                          HEC-1 INPUT                                          PAGE 11

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 440          KK   CF6C3
 441          KM   COMBINE F6C-3, AND RF6C4
 442          KM   EXITING LEGEND TRAIL ALONG WEST BOUNDARY.
 443          HC       2

 444          KK   RF6C3   ROUTE   REACH
 445          RS       4    STOR      -1
 446          RC   0.058   0.038   0.058    3172  0.0284    0.00
 447          RX   731.4   760.4   943.4   993.9  1019.8  1057.8  1074.8  1160.5
 448          RY   552.0   550.0   548.0   548.0   548.0   550.0   550.0   552.0

 449          KK   F6C-2   BASIN
 450          BA   0.088
 451          LG    0.29    0.15    7.30    0.13      34
 452          UC   0.233   0.253
 453          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 454          UA     100

 455          KK   CF6C2
 456          KM   COMBINE F6C-2, AND RF6C3
 457          KM   AT PIMA ROAD FLOW SPLIT.
 458          HC       2

 459          KK   SF6C2
 460          RS       1    FLOW       1
 461          SA       0    0.01
 462          SE    2502    2512
 463          SQ       0   10000
 464          SE    2502    2512

 465          KK  DCF6C2
 466          KM   TOTAL FLOW=DI
 467          KM   CONTINUING FLOW=DCF6C2 (DI-DQ)
 468          KM   DIVERTED FLOW=DCUB09 (DQ)
 469          DT  DCUB09
 470          DI       0     248     969    1174    1321    1369    1517
 471          DQ       0       0       0       7      18      28      37

 472          KK   RF6C2   ROUTE   REACH
 473          RS       3    STOR      -1
 474          RC   0.058   0.038   0.058    2486  0.0193    0.00
 475          RX   963.5   971.8   977.4   981.8  1009.3  1024.9  1079.5  1115.0
 476          RY   464.0   462.0   460.0   458.0   458.0   460.0   462.0   462.4

 477          KK  F6C-1C   BASIN
 478          BA   0.077
 479          LG    0.29    0.15    8.00    0.08      21
 480          UC   0.188   0.157
 481          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 482          UA     100
1                                          HEC-1 INPUT                                          PAGE 12

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 483          KK  CF6C1C
 484          KM   COMBINE F6C-1C, AND RF6C2
 485          KM   AT WESTLAND ROAD.
 486          HC       2

 487          KK  F6C-1B   BASIN
 488          BA   0.195
 489          LG    0.30    0.17    6.80    0.16      36
 490          UC   0.375   0.472
 491          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 492          UA     100

 493          KK  SF6C1B
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567          KK   UB-11   BASIN
568          BA   0.206
569          LG    0.27    0.25    4.10    0.54      54
570          UC   0.313   0.322
571          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
572          UA     100

573          KK   CUB11
574          KM   COMBINE CUB10, AND UB-11
575          KM   EXITING LEGEND TRAIL ON NORTHWEST CORNER.
576          HC       2

577          KK   RUB10   ROUTE   REACH
578          RS       4    STOR      -1
579          RC   0.056   0.044   0.056    3907  0.0179    0.00
580          RX   810.4   844.8   959.8   972.8  1005.9  1035.5  1109.8  1164.3
581          RY   564.0   562.0   560.0   556.0   556.0   560.0   560.0   562.0

582          KK   UB-09   BASIN
583          BA   0.342
584          LG    0.28    0.23    6.20    0.20      41
585          UC   0.350   0.319
586          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
587          UA     100

588          KK   CUB09
589          KM   COMBINE UB-09, AND RUB10
590          KM   AT PIMA ROAD FLOW SPLIT.
591          HC       2

592          KK   SUB09
593          RS       1    FLOW       1
594          SA       0    0.01
595          SE    2502    2520
596          SQ       0   10000
597          SE    2502    2520

598          KK  DCUB09
599          DR  DCUB09

600          KK  DCUB09
601          KM   COMBINE DCUB09, AND SUB09
602          KM   FLOW SPLIT WEST OF PIMA ROAD FROM FAN 6C TO UPPER BOULDERS
603          HC       2

604          KK   RUB09   ROUTE   REACH
605          RS       5    STOR      -1
606          RC   0.061   0.038   0.061    4450  0.0187    0.00
607          RX   865.9   913.3   986.7   990.5  1009.0  1014.7  1037.1  1056.8
608          RY   492.0   489.0   488.0   486.0   486.0   488.0   490.0   492.0
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

609          KK   UB-07   BASIN
610          BA   0.191
611          LG    0.30    0.15    8.80    0.06      16
612          UC   0.304   0.319
613          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
614          UA     100

615          KK   CUB07
616          KM   COMBINE UB-07, AND RUB09
617          KM   CONFLUENCE POINT SOUTH OF BLACK MOUNTAIN ROAD AND EAST OF HAYDEN ROAD.
618          HC       2

619          KK  UB-08C   BASIN
620          BA   0.010
621          LG    0.25    0.25    4.00    0.55      55
622          UC   0.133   0.171
623          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
624          UA     100

625          KK  RUB08C   ROUTE   REACH
626          RS       7    STOR      -1
627          RC   0.061   0.038   0.061    5952  0.0190    0.00
628          RX   975.3   981.7   986.9   991.0  1009.2  1073.1  1118.9  1137.7
629          RY   498.0   496.0   494.0   492.0   492.0   494.0   496.0   498.0

630          KK  UB-08B   BASIN
631          BA   0.033
632          LG    0.25    0.17    6.80    0.15      42
633          UC   0.167   0.176
634          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
635          UA     100

636          KK  RUB08B   ROUTE   REACH
637          RS       7    STOR      -1
638          RC   0.061   0.038   0.061    6656  0.0173    0.00
639          RX   975.3   981.7   986.9   991.0  1009.2  1073.1  1118.9  1137.7
640          RY   498.0   496.0   494.0   492.0   492.0   494.0   496.0   498.0

641          KK  UB-08A   BASIN
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715          KK  UB-06B   BASIN
716          BA   0.053
717          LG    0.30    0.15    9.70    0.04      18
718          UC   0.242   0.374
719          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
720          UA     100

721          KK  SUB06B
722          RS       1    FLOW       1
723          SA       0    0.01
724          SE    2371    2381
725          SQ       0   10000
726          SE    2371    2381

727          KK  RUB06B   ROUTE   REACH
728          RS       2    STOR      -1
729          RC   0.076   0.038   0.076    1719  0.0180    0.00
730          RX   921.6   939.8   960.8   993.3  1002.3  1033.8  1053.5  1122.0
731          RY   366.0   364.0   362.0   360.0   360.0   362.0   364.0   366.0

732          KK  UB-06A   BASIN
733          BA   0.042
734          LG    0.24    0.17    8.80    0.06      25
735          UC   0.200   0.236
736          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
737          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

738          KK   CUB06
739          KM   COMBINE UB-06A, RUB06B, AND RUB06C
740          KM   SOUTH OF WESTLAND ROAD BETWEN HAYDEN AND SCOTTSDALE ROAD, WITHIN WINFEILD.
741          HC       3

742          KK   RUB06   ROUTE   REACH
743          RS       2    STOR      -1
744          RC   0.076   0.038   0.076    1436  0.0202    0.00
745          RX   924.2   953.8   984.0   988.7  1020.6  1078.2  1087.4  1126.5
746          RY   336.0   334.0   332.0   330.0   330.0   332.0   334.0   336.0

747          KK   UB-03   BASIN
748          BA   0.027
749          LG    0.18    0.29    4.90    0.29      38
750          UC   0.171   0.183
751          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
752          UA     100

753          KK   CUB03
754          KM   COMBINE UB-03, RUB05, AND RUB06
755          KM   CONFLUENCE POINT WITHIN WINFEILD, LOCATED SOUTH OF BLACK MOUNTAIN ROAD.
756          HC       3

757          KK   UB-04   BASIN
758          BA   0.350
759          LG    0.26    0.17    9.70    0.05      19
760          UC   0.375   0.366
761          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
762          UA     100

763          KK   CUB04
764          KM   COMBINE UB-04, AND CUB03
765          KM   CONFLUENCE POINT WITHIN WINFEILD, LOCATED SOUTH OF BLACK MOUNTAIN ROAD.
766          HC       2

767          KK   RUB03   ROUTE   REACH
768          RS       3    STOR      -1
769          RC   0.076   0.038   0.076    2425  0.0177    0.00
770          RX   785.3   899.0   967.3   981.0  1004.3  1011.0  1258.0  1351.4
771          RY   312.0   306.6   308.0   306.0   306.0   308.0   310.0   312.0

772          KK   UB-01   BASIN
773          BA   0.054
774          LG    0.20    0.27    3.95    0.54      58
775          UC   0.217   0.236
776          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
777          UA     100

778          KK   CUB01
779          KM   COMBINE UB-01, AND RUB03
780          KM   SCOTTSDALE ROAD CROSSING.
781          HC       2
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

782          KK   SUB01
783          RS       1    FLOW       1
784          SA       0    0.01
785          SE    2268    2278
786          SQ       0   10000
787          SE    2268    2278
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 864          HC       2

 865          KK  RF6AN3   ROUTE   REACH
 866          RS       1    STOR      -1
 867          RC   0.056   0.038   0.053     876  0.0171    0.00
 868          RX   978.9   986.9   991.1   995.6  1017.5  1098.7  1195.1  1228.0
 869          RY   690.0   688.0   686.0   684.0   684.0   686.0   688.0   690.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 870          KK  F6AN-2   BASIN
 871          BA   0.150
 872          LG    0.34    0.25    4.35    0.48      36
 873          UC   0.367   0.539
 874          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 875          UA     100

 876          KK  CF6AN2
 877          KM   COMBINE F6AN-2, AND RF6AN3
 878          KM   CONFLUENCE POINT IN SECTION 5 OF T5NR5E.
 879          KM   NORTHEAST OF NORTHEAST CORNER OF LENGEND TRAIL.
 880          HC       2

 881          KK  RF6AN2   ROUTE   REACH
 882          RS      27    STOR      -1
 883          RC   0.056   0.038   0.053    7999  0.0176    0.00
 884          RX   897.4   913.8   927.5   971.8  1023.5  1071.1  1152.0  1224.7
 885          RY   685.0   656.0   654.0   652.0   652.0   654.0   652.7   658.0

 886          KK  F6AN-1   BASIN
 887          BA   0.415
 888          LG    0.31    0.25    6.00    0.21      31
 889          UC   0.417   0.384
 890          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 891          UA     100

 892          KK  CF6AN1
 893          KM   COMBINE
 894          KM   UPSTREAM OF CONFLUENCE POINT
 895          HC       2

 896          KK  F6AS-5   BASIN
 897          BA   0.631
 898          LG    0.32    0.24    7.00    0.12      13
 899          UC   0.492   0.440
 900          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 901          UA     100

 902          KK  RF6AS5   ROUTE   REACH
 903          RS       9    STOR      -1
 904          RC   0.064   0.044   0.064    8083  0.0192    0.00
 905          RX   877.0   887.9   915.7   986.3  1151.0  1210.3  1238.3  1261.5
 906          RY   780.0   778.0   776.0   774.0   774.0   776.0   778.0   780.0

 907          KK  F6AS-3   BASIN
 908          BA   0.317
 909          LG    0.30    0.25    4.90    0.33      39
 910          UC   0.425   0.526
 911          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 912          UA     100
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 913          KK  CF6AS3
 914          KM   COMBINE F6AS-3, AND RF6AS5
 915          KM   CONFLUENCE POINT IN SECTION 5 OF T5NR5E, EAST OF LEGEND TRAIL.
 916          HC       2

 917          KK  F6AS-4   BASIN
 918          BA   0.433
 919          LG    0.31    0.28    4.40    0.42      37
 920          UC   0.642   0.918
 921          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 922          UA     100

 923          KK  CF6AS4
 924          KM   COMBINE F6AS-4, AND CF6AS3
 925          KM   CONFLUENCE POINT IN SECTION 5 OF T5NR5E, EAST OF LEGEND TRAIL.
 926          HC       2

 927          KK  RF6AS3   ROUTE   REACH
 928          RS       3    STOR      -1
 929          RC   0.064   0.044   0.064    2438  0.0160    0.00
 930          RX   830.7   866.0   931.0   995.0  1017.3  1026.5  1076.2  1104.9
 931          RY   652.0   650.0   648.0   646.0   646.0   648.0   650.0   652.0

 932          KK  F6AS-2   BASIN
 933          BA   0.058
 934          LG    0.29    0.25    4.15    0.52      48
 935          UC   0.229   0.282
 936          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
```

```
1009          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1010          UA     100

1011          KK   CUF54
1012          KM   COMBINE UF5-4, RUF55, AND RRHW1
1013          KM   EAST OF LEGNED TRAIL EAST BOUNDARY.
1014          HC       3

1015          KK   RUF54   ROUTE   REACH
1016          RS      13    STOR      -1
1017          RC   0.071   0.038   0.071   11314  0.0175    0.00
1018          RX   931.9   946.9   961.7   982.9  1012.6  1048.2  1068.2  1079.1
1019          RY   518.0   516.0   514.0   512.0   512.0   516.6   516.0   518.0

1020          KK   UF5-2   BASIN
1021          BA   0.624
1022          LG    0.27    0.15    7.60    0.11      34
1023          UC   0.525   0.592
1024          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1025          UA     100

1026          KK   CUF52
1027          KM   COMBINE UF5-2, AND RUF5-4
1028          KM   NORTH OF CONFLUENCE POINT IN SECTION 18 OF T5NR5E, EAST OF PIMA ROAD.
1029          HC       2

1030          KK   UF5-3   BASIN
1031          BA   0.842
1032          LG    0.25    0.15    7.60    0.11      40
1033          UC   0.667   0.801
1034          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1035          UA     100

1036          KK   CUF53
1037          KM   COMBINE UF5-3, AND CUF52
1038          KM   CONFLUENCE POINT IN SECTION 18 OF T5NR5E, EAST OF PIMA ROAD.
1039          HC       2

1040          KK   RUF52   ROUTE   REACH
1041          RS       2    STOR      -1
1042          RC   0.071   0.038   0.071    2113  0.0170    0.00
1043          RX   904.8   916.9   925.7   945.0  1017.8  1042.5  1074.4  1089.9
1044          RY   420.0   418.0   416.0   414.0   414.0   416.0   418.0   420.0
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1045          KK   UF5-1   BASIN
1046          BA   0.083
1047          LG    0.29    0.15    7.60    0.10      22
1048          UC   0.208   0.186
1049          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1050          UA     100

1051          KK   CUF51
1052          KM   COMBINE UF5-1, AND RUF5-2
1053          KM   MATCH TO EXISTING FEMA FLOODPLAIN.
1054          HC       2
1055          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   69     SCP-14
               V
               V
   75     RSCP14
               .
               .
   80          .      SCP-13
               .           .
               .           .
   86          .           .      SCP-12
               .           .           .
               .           .           .
   92     CSCP12.......................
               V
               V
   96     RSCP12
               .
               .
  101          .      SCP-10
               .           .
               .           .
  107     CSCP10............
               .
               .
  111          .      SCP-11
               .           .
               .           .
  117     CSCP11............
```

```
286          .      RSCP5C
             .          .
             .          .
291          .          .      SCP-5B
             .          .          V
             .          .          V
297          .          .      SSCP5B
             .          .          V
             .          .          V
303          .          .      RSCP5B
             .          .          .
             .          .          .
308          .          .          .      SCP-5A
             .          .          .          .
             .          .          .          .
314     CSCP04.................................
             V
             V
319     RSCP04
             .
             .
324          .      SCP-03
             .          .
             .          .
330     CSCP03............
             V
             V
334     RSCP03
             .
             .
339          .      SCP-2B
             .          .
             .          .
345     CSCP2B............
             V
             V
349     SSCP2B
             V
             V
355     RSCP2B
             .
             .
360          .      SCP-2A
             .          .
             .          .
366     CSCP02............
             V
             V
371     SSCP02
             V
             V
377     RSCP02
             .
             .
382          .      SCP-01
             .          .
             .          .
388     CSCP01............
             V
             V
392     SSCP01
             .
             .
398          .       F6C-6
             .           V
             .           V
404          .       RF6C6
             .           .
             .           .
409          .           .       F6C-4
             .           .           .
             .           .           .
415          .       CF6C4............
             .           .
             .           .
419          .           .       F6C-5
             .           .           .
             .           .           .
425          .       CF6C5............
             .           V
             .           V
429          .       RF6C4
             .           .
             .           .
434          .           .       F6C-3
             .           .           .
             .           .           .
440          .       CF6C3............
             .           V
             .           V
444          .       RF6C3
             .           .
             .           .
449          .           .       F6C-2
             .           .           .
```

```
615          CUB07............
619                   UB-08C
                           V
                           V
625                   RUB08C
630                                UB-08B
                                        V
                                        V
636                                RUB08B
641                                                UB-08A
647          CUB08..................................
                 V
                 V
651          RUB07
656                   UB-05B
662          CUB05B...........
                 V
                 V
666          SUB05B
                 V
                 V
672          RUB05B
677                   UB-05A
683          CUB05............
                 V
                 V
687          SUB05
                 V
                 V
693          RUB05
698                   UB-06C
                           V
                           V
704                   SUB06C
                           V
                           V
710                   RUB06C
715                                UB-06B
                                        V
                                        V
721                                SUB06B
                                        V
                                        V
727                                RUB06B
732                                                UB-06A
738                     CUB06........................
                           V
                           V
742                     RUB06
747                                  UB-03
753          CUB03........................
757                     UB-04
763          CUB04............
                 V
                 V
767          RUB03
772                     UB-01
778          CUB01............
```

```
942                                  RF6AS2
                                        .
947                                     .      F6AS-1
                                        .          .
                                        .          .
953                                  CF6AS1............
                                        .
                                        .
957                              CF6ASN............
                                     V
                                     V
961                              RF6AN1
                                        .
                                        .
966                                  F6A-1
                                        .
                                        .
972                               CF6A1............
                                        .
                                        .
976                                  RHW-1
                                        .
                                        .
986                                     .-------> DRHOUT
982                                  DRHW1
                                        V
                                        V
989                                  RRHW1
                                        .
                                        .
994                                     .      UF5-5
                                        .          V
                                        .          V
1000                                    .      RUF55
                                        .          .
                                        .          .
1005                                    .          .      UF5-4
                                        .          .          .
                                        .          .          .
1011                                 CUF54........................
                                        V
                                        V
1015                                 RUF54
                                        .
                                        .
1020                                    .      UF5-2
                                        .          .
                                        .          .
1026                                 CUF52............
                                        .
                                        .
1030                                    .      UF5-3
                                        .          .
                                        .          .
1036                                 CUF53............
                                        V
                                        V
1040                                 RUF52
                                        .
                                        .
1045                                    .      UF5-1
                                        .          .
                                        .          .
1051                                 CUF51............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

+	ROUTED TO	RSCP07	576.	4.68	146.	37.	27.	1.01
+	HYDROGRAPH AT	SCP-06	131.	4.10	17.	4.	3.	0.10
+	2 COMBINED AT	CSCP06	620.	4.38	160.	41.	29.	1.11
+	ROUTED TO	SSCP06	620.	4.38	160.	41.	29.	1.11
+	ROUTED TO	RSCP06	617.	4.48	160.	41.	29.	1.11
+	HYDROGRAPH AT	SCP-4B	182.	4.10	21.	5.	4.	0.14
+	ROUTED TO	SSCP4B	182.	4.10	21.	5.	4.	0.14
+	ROUTED TO	RSCP4B	165.	4.25	21.	5.	4.	0.14
+	HYDROGRAPH AT	SCP-4A	97.	4.08	12.	3.	2.	0.08
+	3 COMBINED AT	CSCP4a	734.	4.42	187.	48.	34.	1.33
+	HYDROGRAPH AT	SCP-5C	214.	4.17	25.	6.	4.	0.15
+	ROUTED TO	SSCP5C	214.	4.17	25.	6.	4.	0.15
+	ROUTED TO	RSCP5C	188.	4.32	25.	6.	4.	0.15
+	HYDROGRAPH AT	SCP-5B	40.	4.12	5.	1.	1.	0.03
+	ROUTED TO	SSCP5B	4.	3.65	4.	1.	1.	0.03
+	ROUTED TO	RSCP5B	4.	5.43	4.	1.	1.	0.03
+	HYDROGRAPH AT	SCP-5A	137.	4.07	14.	3.	2.	0.09
+	4 COMBINED AT	CSCP04	884.	4.38	221.	57.	41.	1.60
+	ROUTED TO	RSCP04	881.	4.42	221.	57.	41.	1.60
+	HYDROGRAPH AT	SCP-03	105.	4.08	10.	2.	2.	0.08
+	2 COMBINED AT	CSCP03	903.	4.42	228.	59.	42.	1.68
+	ROUTED TO	RSCP03	901.	4.45	228.	59.	42.	1.68
+	HYDROGRAPH AT	SCP-2B	49.	4.12	7.	2.	1.	0.05
+	2 COMBINED AT	CSCP2B	919.	4.45	233.	60.	43.	1.73
+	ROUTED TO	SSCP2B	919.	4.45	233.	60.	43.	1.73
+	ROUTED TO	RSCP2B	915.	4.50	233.	60.	43.	1.73
+	HYDROGRAPH AT	SCP-2A	67.	4.08	7.	2.	1.	0.05
+	2 COMBINED AT	CSCP02	929.	4.48	238.	61.	44.	1.79
+	ROUTED TO	SSCP02	929.	4.48	238.	61.	44.	1.79
+	ROUTED TO	RSCP02	911.	4.70	238.	61.	44.	1.79
+	HYDROGRAPH AT	SCP-01	285.	4.20	48.	12.	9.	0.32
	2 COMBINED AT							

+	ROUTED TO	RUB12	53.	4.57	9.	2.	2.	0.06
+	HYDROGRAPH AT	UB-10	109.	4.18	15.	4.	3.	0.09
+	2 COMBINED AT	CUB10	121.	4.20	25.	6.	4.	0.15
+	HYDROGRAPH AT	UB-11	274.	4.20	36.	9.	6.	0.21
+	2 COMBINED AT	CUB11	395.	4.20	60.	15.	11.	0.36
+	ROUTED TO	RUB10	366.	4.35	60.	15.	11.	0.36
+	HYDROGRAPH AT	UB-09	458.	4.13	58.	15.	11.	0.34
+	2 COMBINED AT	CUB09	672.	4.27	115.	29.	21.	0.70
+	ROUTED TO	SUB09	672.	4.27	115.	29.	21.	0.70
+	HYDROGRAPH AT	DCUB09	0.	0.00	0.	0.	0.	1.18
+	2 COMBINED AT	DCUB09	672.	4.27	115.	29.	21.	0.70
+	ROUTED TO	RUB09	645.	4.45	115.	29.	21.	0.70
+	HYDROGRAPH AT	UB-07	284.	4.18	32.	8.	6.	0.19
+	2 COMBINED AT	CUB07	786.	4.40	144.	36.	26.	0.89
+	HYDROGRAPH AT	UB-08C	19.	4.07	2.	0.	0.	0.01
+	ROUTED TO	RUB08C	10.	4.75	2.	0.	0.	0.01
+	HYDROGRAPH AT	UB-08B	66.	4.08	6.	2.	1.	0.03
+	ROUTED TO	RUB08B	42.	4.57	6.	2.	1.	0.03
+	HYDROGRAPH AT	UB-08A	119.	4.15	18.	4.	3.	0.12
+	4 COMBINED AT	CUB08	874.	4.40	167.	42.	30.	1.06
+	ROUTED TO	RUB07	869.	4.45	167.	42.	30.	1.06
+	HYDROGRAPH AT	UB-05B	47.	4.03	4.	1.	1.	0.02
+	2 COMBINED AT	CUB05B	875.	4.45	170.	43.	31.	1.08
+	ROUTED TO	SUB05B	875.	4.45	170.	43.	31.	1.08
+	ROUTED TO	RUB05B	870.	4.53	170.	43.	31.	1.08
+	HYDROGRAPH AT	UB-05A	140.	4.08	16.	4.	3.	0.09
+	2 COMBINED AT	CUB05	911.	4.50	184.	47.	34.	1.17
+	ROUTED TO	SUB05	911.	4.50	184.	47.	34.	1.17
+	ROUTED TO	RUB05	909.	4.53	184.	47.	34.	1.17
+	HYDROGRAPH AT	UB-06C	70.	4.05	6.	2.	1.	0.04
+	ROUTED TO	SUB06C	70.	4.05	6.	2.	1.	0.04
+	ROUTED TO	RUB06C	61.	4.17	7.	2.	1.	0.04

+		CF6AN2	831.	4.60	168.	43.	31.	1.27
+	ROUTED TO	RF6AN2	803.	5.05	168.	43.	31.	1.27
+	HYDROGRAPH AT	F6AN-1	460.	4.17	63.	16.	11.	0.41
+	2 COMBINED AT	CF6AN1	837.	5.02	220.	56.	40.	1.68
+	HYDROGRAPH AT	F6AS-5	631.	4.33	88.	22.	16.	0.63
+	ROUTED TO	RF6AS5	516.	4.80	88.	22.	16.	0.63
+	HYDROGRAPH AT	F6AS-3	300.	4.28	49.	12.	9.	0.32
+	2 COMBINED AT	CF6AS3	607.	4.80	131.	33.	24.	0.95
+	HYDROGRAPH AT	F6AS-4	254.	4.47	62.	16.	11.	0.43
+	2 COMBINED AT	CF6AS4	740.	4.80	183.	47.	34.	1.38
+	ROUTED TO	RF6AS3	730.	4.88	183.	47.	34.	1.38
+	HYDROGRAPH AT	F6AS-2	82.	4.13	9.	2.	2.	0.06
+	2 COMBINED AT	CF6AS2	736.	4.88	190.	49.	35.	1.44
+	ROUTED TO	RF6AS2	702.	5.17	190.	49.	35.	1.44
+	HYDROGRAPH AT	F6AS-1	280.	4.17	43.	11.	8.	0.28
+	2 COMBINED AT	CF6AS1	730.	5.17	225.	58.	42.	1.72
+	2 COMBINED AT	CF6ASN	1362.	5.13	416.	107.	77.	3.40
+	ROUTED TO	RF6AN1	1356.	5.20	416.	107.	77.	3.40
+	HYDROGRAPH AT	F6A-1	242.	4.12	21.	5.	4.	0.13
+	2 COMBINED AT	CF6A1	1354.	5.20	433.	111.	80.	3.53
+	HYDROGRAPH AT	RHW-1	877.	4.40	133.	33.	24.	1.05
+	DIVERSION TO	DRHOUT	527.	4.40	100.	25.	18.	1.05
+	HYDROGRAPH AT	DRHW1	349.	4.40	33.	8.	6.	1.05
+	ROUTED TO	RRHW1	261.	5.03	33.	8.	6.	1.05
+	HYDROGRAPH AT	UF5-5	180.	4.37	38.	10.	7.	0.29
+	ROUTED TO	RUF55	151.	5.05	38.	10.	7.	0.29
+	HYDROGRAPH AT	UF5-4	268.	4.27	42.	10.	8.	0.25
+	3 COMBINED AT	CUF54	429.	5.00	100.	26.	19.	1.60
+	ROUTED TO	RUF54	413.	5.37	100.	26.	19.	1.60
+	HYDROGRAPH AT	UF5-2	590.	4.37	109.	28.	20.	0.62
+	2 COMBINED AT	CUF52	555.	4.63	196.	51.	37.	2.22
+	HYDROGRAPH AT	UF5-3	624.	4.50	150.	38.	28.	0.84

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998           *
*            VERSION 4.1            *
*                                   *
*  RUN DATE   03SEP02  TIME  14:04:33   *
*                                   *
*************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X    X         XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X    X          X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID   Project ID: 01131.12 - Major Basin: NS - Return Period: 100 Years
  2           ID
  3           ID   NORTH SCOTTSDALE 100-YR FLOODPLAIN DELINEATION STUDY
  4           ID   MAY 2002
  5           ID
  6           ID   FILE NAME:  NS.DAT
  7           ID   THIS MODEL REPRESENTS THE FUTURE LAND USE CONDITIONS OF THE WATERSHEDS.
  8           ID   THE TOTAL DRAINAGE AREA FOR THE ENTIRE STUDY IS 11.2 SQUARE MILES.
  9           ID
 10           ID   100-YEAR, 6-HOUR FREQUENCY
 11           ID
 12           ID   METHODOLOGY:
 13           ID   THE US CORPS OF ENGINEERS FLOOD HYROLOGY MODEL HEC-1, DATED JUNE 1998,
 14           ID   VERSION 4.1
 15           ID   MULTIPLE STORMS
 16           ID   CLARK UNIT HYDROGRAPH
 17           ID   GREEN AMPT LOSS METHOD
 18           ID   NORMAL DEPTH BASIN AND REACH ROUTING METHOD
 19           ID
 20           ID   LAND USES PER CITY OF SCOTTSDALE PROVIDED GIS
 21           ID
 22           ID   PROJECT WASHES INCLUDE: STAGE COACH PASS (SCP)
 23           ID                           UPPER BOULDERS WASH (UB)
 24           ID                           FAN 6C (F6C)
 25           ID                           FAN 6A NORTH (F6AN)
 26           ID                           FAN 6A SOULTH (F6AS)
 27           ID                           FAN 6A (F6A)
 28           ID                           UPPER FAN 5 (UF5)
 29           ID
 30           ID   PROJECT SUB-BASINS DESIGNATED AS SUB-BASIN NAME ABREVIATION FOLLOWED BY BASIN
 31           ID   NUMBER.  I.E. STAGE COACH PASS SUB-BASIN 14 IS DESIGNATED AS SCP-14.
 32           ID
 33           ID   PROJECT CONCENTRATION POINTS DESIGNATED AS C FOLLOWED BY SUB-BASIN NAME AND
 34           ID   CONCENTRATION POINT NUMBER.  CONCENTRATION POINT NUMBER IS CHOOSEN BY THE SUB
 35           ID   BASIN THE CONCENTRATION POINT IS LOCATED IN.  I.E.  CONCENTRATION POINT IN
 36           ID   SUB-BASIN 06 OF UPPER BOULDERS WASH IS DESIGNATED AS CUB06.
 37           ID
 38           ID   PROJECT ROUTES ARE DESIGNATED AS R FOLLOWED BY SUB-BASIN NAME AND ROUTE
 39           ID   NUMBER. ROUTE NUMBER IS CHOOSEN BY THE SUB-BASIN IN WHICH THE ROUTE BEGINS.
 40           ID   IE A ROUTE FROM SUB-BASIN 4 IN FAN 6C IS DESIGNATED AS RF6C4.
 41           ID
 42           ID
 43           ID
 44           ID
 45           IT      1                    2000
 46           IO      5
 47           IN     15
 48           JD   3.50    0.01
 49           PC  0.000   0.008   0.016   0.025   0.033   0.041   0.050   0.058   0.066   0.074
 50           PC  0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931   0.950
 51           PC  0.962   0.972   0.983   0.991   1.000
 52           JD  3.477    0.50
 53           JD  3.412    2.80
 54           PC  0.000   0.009   0.016   0.025   0.034   0.042   0.051   0.059   0.067   0.076
 55           PC  0.087   0.100   0.120   0.163   0.252   0.451   0.694   0.837   0.900   0.938
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  56          PC   0.950   0.963   0.975   0.988   1.000
  57          JD   3.227    16.0
  58          PC   0.000   0.015   0.020   0.030   0.048   0.063   0.076   0.090   0.105   0.119
  59          PC   0.135   0.152   0.175   0.222   0.304   0.472   0.670   0.796   0.868   0.912
  60          PC   0.946   0.960   0.973   0.987   1.000
  61          JD   2.842    90.0
  62          PC   0.000   0.021   0.035   0.051   0.071   0.087   0.105   0.125   0.143   0.160
  63          PC   0.179   0.201   0.232   0.281   0.364   0.500   0.658   0.773   0.841   0.888
  64          PC   0.927   0.945   0.964   0.982   1.000
  65          JD   1.995   500.0
  66          PC   0.000   0.024   0.043   0.059   0.078   0.098   0.119   0.141   0.162   0.186
  67          PC   0.212   0.239   0.271   0.321   0.408   0.515   0.627   0.735   0.814   0.864
  68          PC   0.907   0.930   0.954   0.977   1.000
              *DIAGRAM

  69          KK  SCP-14   BASIN
  70          BA   0.059
  71          LG    0.30    0.15    8.80    0.06      18
  72          UC   0.171   0.260
  73          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  74          UA     100

  75          KK  RSCP14   ROUTE   REACH
  76          RS       1    STOR      -1
  77          RC   0.064   0.044   0.064    1086  0.0322    0.00
  78          RX   812.0   844.1   955.0   977.5  1000.0  1009.0  1017.6  1031.5
  79          RY   957.3   957.0   956.0   955.0   954.0   956.0   958.0   960.0

  80          KK  SCP-13   BASIN
  81          BA   0.080
  82          LG    0.30    0.15    9.70    0.04      17
  83          UC   0.171   0.228
  84          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  85          UA     100

  86          KK  SCP-12   BASIN
  87          BA   0.028
  88          LG    0.30    0.25    5.80    0.18      27
  89          UC   0.121   0.135
  90          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
  91          UA     100

  92          KK  CSCP12
  93          KM   COMBINE SCP12, SCP13, AND RSCP14
  94          KM   LOCATED AT NORTH BOUNDARY OF MIRABEL.
  95          HC       3

  96          KK  RSCP12   ROUTE   REACH
  97          RS       4    STOR      -1
  98          RC   0.064   0.044   0.064    3465  0.0268    0.00
  99          RX   870.5   892.9   951.4   993.0  1049.1  1067.0  1124.7  1164.5
 100          RY   886.0   884.0   882.0   880.0   880.0   882.0   884.0   886.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 101          KK  SCP-10   BASIN
 102          BA   0.111
 103          LG    0.24    0.29    5.60    0.19      24
 104          UC   0.200   0.232
 105          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 106          UA     100

 107          KK  CSCP10
 108          KM   COMBINE SCP10, AND RSCP12
 109          KM   EXITING MIRABEL ON WEST BOUNDARY BEFORE RE-ENTERING SUBDIVISION.
 110          HC       2

 111          KK  SCP-11   BASIN
 112          BA   0.026
 113          LG    0.31    0.25    3.95    0.46      36
 114          UC   0.129   0.152
 115          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 116          UA     100

 117          KK  CSCP11
 118          KM   COMBINE CSCP10, AND SCP11
 119          KM   EXITING MIRABEL ON WEST BOUNDARY BEFORE RE-ENTERING SUBDIVISION.
 120          HC       2

 121          KK  RSCP10   ROUTE   REACH
 122          RS       5    STOR      -1
 123          RC   0.064   0.044   0.064    4424  0.0255    0.00
 124          RX   814.2   853.2   899.7   949.5  1052.9  1130.7  1232.4  1257.1
 125          RY   820.0   815.3   816.0   812.0   812.0   814.0   818.0   820.0

 126          KK  SCP-09   BASIN
 127          BA   0.107
 128          LG    0.30    0.25    4.20    0.41      37
 129          UC   0.192   0.196
 130          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 131          UA     100
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132          KK  CSCP09
133          KM   COMBINE SCP09, AND RSCP10
134          KM   EXITING MIRABEL ON WEST BOUNDARY.
135          HC       2

136          KK  RSCP09   ROUTE   REACH
137          RS       3    STOR      -1
138          RC   0.064   0.044   0.064    2968  0.0230    0.00
139          RX   865.1   910.6   932.1   961.1  1066.2  1091.4  1109.0  1125.3
140          RY   724.0   722.0   718.0   714.0   714.0   718.0   722.0   724.0

141          KK  SCP-08   BASIN
142          BA   0.127
143          LG    0.30    0.25    3.95    0.56      45
144          UC   0.208   0.212
145          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
146          UA     100
1                                        HEC-1 INPUT                                                PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


147          KK  CSCP08
148          KM   COMBINE SCP08, AND RSCP09
149          KM   EXITING CITY OF SCOTTSDALE AND ENTERING TOWN OF CAREFREE.
150          HC       2

151          KK  RSCP08   ROUTE   REACH
152          RS       3    STOR      -1
153          RC   0.064   0.044   0.064    2847  0.0204    0.00
154          RX   850.9   901.3   954.4   979.4  1000.0  1062.3  1114.0  1201.2
155          RY   668.0   666.0   664.0   662.0   660.0   662.0   664.0   666.0

156          KK  SCP-7E   BASIN
157          BA   0.048
158          LG    0.30    0.25    3.95    0.55      33
159          UC   0.163   0.183
160          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
161          UA     100

162          KK  CSCP7E
163          KM   COMBINE SCP7E, AND RSCP08
164          KM   NORTH OF CITY OF SCOTTSDALE BOUNDARY IN SECTION 31 OF T6N5E.
165          KM   EXITING TOWN OF CAREFREE AT STAGECOACH PASS.
166          HC       2

167          KK  SCP-7B   BASIN
168          BA   0.088
169          LG    0.30    0.25    3.95    0.50      40
170          UC   0.238   0.357
171          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
172          UA     100

173          KK  RSCP7B   ROUTE   REACH
174          RS       3    STOR      -1
175          RC   0.064   0.044   0.064    2275  0.0224    0.00
176          RX   947.0   967.3   977.1   990.7  1013.1  1024.4  1047.5  1074.1
177          RY   646.0   644.0   642.0   640.0   640.0   642.0   644.0   646.0

178          KK  SCP-7C   BASIN
179          BA   0.177
180          LG    0.30    0.25    3.95    0.50      41
181          UC   0.292   0.411
182          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
183          UA     100

184          KK  RSCP7C   ROUTE   REACH
185          RS       1    STOR      -1
186          RC   0.064   0.044   0.064     821  0.0207    0.00
187          RX   827.0   845.3   898.0   993.5  1008.9  1024.0  1042.1  1057.6
188          RY   640.0   638.0   636.0   634.0   634.0   636.0   638.0   640.0
1                                        HEC-1 INPUT                                                PAGE  5

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


189          KK  SCP-7D   BASIN
190          BA   0.027
191          LG    0.30    0.25    3.95    0.56      41
192          UC   0.142   0.176
193          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
194          UA     100

195          KK  CSCP7D
196          KM   COMBINE SCP7D, RSCP7B AND RSCP7C
197          KM   CONFLUENCE POINT WITHIN TOWN OF CAREFREE.  CROSSING AT TWILIGHT TRAIL.
198          HC       3

199          KK  RSCP7D   ROUTE   REACH
200          RS       1    STOR      -1
201          RC   0.064   0.044   0.064     217  0.0276    0.00
202          RX   956.3   969.1   987.2   991.1  1012.9  1019.5  1030.2  1044.8
203          RY   620.0   618.0   616.0   614.0   614.0   616.0   618.0   619.0
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 204          KK  CSCP07
 205          KM   COMBINE CSCP7D, AND RSCP7D
 206          KM   NORTH OF CITY OF SCOTTSDALE BOUNDARY IN SECTION 31 OF T6N5E.
 207          KM   EXITING TOWN OF CAREFREE AT STAGECOACH PASS.
 208          HC       2

 209          KK  SCP-7A   BASIN
 210          BA   0.136
 211          LG    0.30    0.25    3.95    0.54      42
 212          UC   0.263   0.359
 213          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 214          UA     100

 215          KK  CSCP7A
 216          KM   COMBINE SCP7A, AND CSCP07
 217          KM   NORTH OF CITY OF SCOTTSDALE BOUNDARY IN SECTION 31 OF T6N5E.
 218          KM   EXITING TOWN OF CAREFREE AT STAGECOACH PASS.
 219          HC       2

 220          KK  RSCP07   ROUTE   REACH
 221          RS       4    STOR      -1
 222          RC   0.056   0.038   0.076    3297  0.0179    0.00
 223          RX   857.9   951.0   966.1   972.2  1006.8  1087.4  1125.8  1266.4
 224          RY   578.0   574.0   572.0   568.0   568.0   571.5   569.3   578.0

 225          KK  SCP-06   BASIN
 226          BA   0.101
 227          LG    0.25    0.25    3.95    0.54      52
 228          UC   0.229   0.271
 229          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 230          UA     100
1                                          HEC-1 INPUT                                          PAGE  6

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 231          KK  CSCP06
 232          KM   COMBINE SCP06, AND RSCP07
 233          KM   PIMA ROAD CROSSING.
 234          HC       2

 235          KK  SSCP06
 236          RS       1    FLOW       1
 237          SA       0    0.01
 238          SE    2552    2562
 239          SQ       0   10000
 240          SE    2552    2562

 241          KK  RSCP06   ROUTE   REACH
 242          RS       4    STOR      -1
 243          RC   0.064   0.044   0.064    3157  0.0196    0.00
 244          RX   627.2   683.7   977.3   987.0  1012.1  1029.7  1045.2  1079.6
 245          RY   538.0   534.0   536.0   530.0   530.0   534.0   536.0   538.0

 246          KK  SCP-4B   BASIN
 247          BA   0.140
 248          LG    0.30    0.25    3.95    0.56      42
 249          UC   0.217   0.230
 250          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 251          UA     100

 252          KK  SSCP4B
 253          RS       1    FLOW       1
 254          SA       0    0.01
 255          SE    2558    2568
 256          SQ       0   10000
 257          SE    2558    2568

 258          KK  RSCP4B   ROUTE   REACH
 259          RS       4    STOR      -1
 260          RC   0.064   0.044   0.064    3614  0.0183    0.00
 261          RX   627.2   683.7   977.3   987.0  1012.1  1029.7  1045.2  1079.6
 262          RY   538.0   534.0   536.0   530.0   530.0   534.0   536.0   538.0

 263          KK  SCP-4A   BASIN
 264          BA   0.075
 265          LG    0.26    0.25    3.95    0.49      41
 266          UC   0.208   0.259
 267          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 268          UA     100

 269          KK  CSCP4a
 270          KM   COMBINE SCP4a, RSCP4b, AND RSCP06
 271          KM   CONFLUENCE POINT LOCATED IN SECTION 1 OF T5NR4E.
 272          KM   LOCATED EAST OF SANDFLOWER EAST BOUNDARY.
 273          HC       3
1                                          HEC-1 INPUT                                          PAGE  7

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 274          KK  SCP-5C   BASIN
 275          BA   0.153
 276          LG    0.27    0.25    4.00    0.49      46
 277          UC   0.229   0.227
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278          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
279          UA     100

280          KK  SSCP5C
281          RS       1    FLOW       1
282          SA       0    0.01
283          SE    2540    2550
284          SQ       0   10000
285          SE    2540    2550

286          KK  RSCP5C   ROUTE   REACH
287          RS       3    STOR      -1
288          RC   0.064   0.044   0.064    2696  0.0185    0.00
289          RX   903.8   943.5   972.7   996.7  1005.3  1068.4  1099.0  1112.6
290          RY   542.0   540.0   538.0   536.0   536.0   538.0   540.0   542.0

291          KK  SCP-5B   BASIN
292          BA   0.027
293          LG    0.24    0.25    3.95    0.52      58
294          UC   0.171   0.253
295          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
296          UA     100

297          KK  SSCP5B
298          RS       1    FLOW       1
299          SA       0    0.01
300          SE    2550    2560
301          SQ       0   10000
302          SE    2550    2560

303          KK  RSCP5B   ROUTE   REACH
304          RS       3    STOR      -1
305          RC   0.064   0.044   0.064    2870  0.0209    0.00
306          RX   788.3   815.7   850.1   990.6  1008.8  1019.8  1037.3  1075.2
307          RY   522.0   520.0   518.0   516.0   516.0   518.0   520.0   522.0

308          KK  SCP-5A   BASIN
309          BA   0.092
310          LG    0.30    0.25    3.95    0.51      39
311          UC   0.192   0.186
312          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
313          UA     100

314          KK  CSCP04
315          KM   COMBINE CSCP4a, SCP5a, RSCP5b, AND RSCP5c
316          KM   CONFLUENCE POINT LOCATED IN SECTION 1 OF T5NR4E.
317          KM   LOCATED EAST OF SANDFLOWER EAST BOUNDARY.
318          HC       4
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

319          KK  RSCP04   ROUTE   REACH
320          RS       2    STOR      -1
321          RC   0.056   0.038   0.086    1499  0.0180    0.00
322          RX   850.6   870.5   971.1   987.9  1027.2  1050.7  1218.9  1240.9
323          RY   492.0   490.0   486.0   484.0   484.0   486.0   488.0   492.0

324          KK  SCP-03   BASIN
325          BA   0.076
326          LG    0.30    0.25    4.20    0.45      25
327          UC   0.192   0.195
328          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
329          UA     100

330          KK  CSCP03
331          KM   COMBINE SCP03, AND RSCP04
332          KM   DIVERSION SPLIT FLOW WITHIN SANDFLOWER SUBDIVISION.
333          HC       2
             * KK DSCP3
             * KM TOTAL FLOW=DI
             * KM CONTINUING FLOW=DSCP3 (DI-DQ)
             * KM DIVERTED FLOW=DSCOUT (DQ)
             * DTDSCOUT
             * DI      0   270.5   550.7   933.7  1163.6  1676.1  2827.8
             * DQ      0    76.4   161.0   289.9   352.5   629.9  1480.6

334          KK  RSCP03   ROUTE   REACH
335          RS       2    STOR      -1
336          RC   0.061   0.038   0.056    1378  0.0181    0.00
337          RX   966.2   984.0   990.6   997.6  1003.9  1019.0  1048.1  1065.0
338          RY   447.7   446.0   444.0   442.0   442.0   444.0   446.0   448.0

339          KK  SCP-2B   BASIN
340          BA   0.054
341          LG    0.30    0.25    4.10    0.43      25
342          UC   0.229   0.369
343          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
344          UA     100

345          KK  CSCP2B
346          KM   COMBINE SCP2B, AND RSCP03
347          KM   CROSSING AT 81ST STREET LOCATED WITHIN SANDFLOWER.
348          HC       2
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349          KK  SSCP2B
350          RS       1    FLOW       1
351          SA       0    0.01
352          SE    2438    2448
353          SQ       0   10000
354          SE    2438    2448
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

355          KK  RSCP2B   ROUTE   REACH
356          RS       2    STOR      -1
357          RC   0.061   0.038   0.056    1827  0.0230    0.00
358          RX   930.6   951.8   959.8   985.0  1023.8  1033.5  1198.5  1217.1
359          RY   414.0   412.0   410.0   408.0   408.0   410.0   412.0   412.7

360          KK  SCP-2A   BASIN
361          BA   0.054
362          LG    0.30    0.25    4.15    0.41      24
363          UC   0.188   0.249
364          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
365          UA     100

366          KK  CSCP02
367          KM   COMBINE SCP2A, AND RSCP2B
368          KM   EXITING SANDFLOWER ON WEST BOUNDARY AND ENTERING BOULDERS ON EAST BOUNDARY.
369          KM   HAYDEN ROAD CROSSING.
370          HC       2

371          KK  SSCP02
372          RS       1    FLOW       1
373          SA       0    0.01
374          SE    2396    2406
375          SQ       0   10000
376          SE    2396    2406

377          KK  RSCP02   ROUTE   REACH
378          RS       7    STOR      -1
379          RC   0.056   0.038   0.056    5949  0.0212    0.00
380          RX   623.1   687.8   904.9   959.7  1000.0  1016.9  1082.0  1122.3
381          RY   290.0   286.8   289.6   286.0   284.0   286.0   288.0   290.0

382          KK  SCP-01   BASIN
383          BA   0.324
384          LG    0.31    0.23    6.20    0.19      25
385          UC   0.354   0.414
386          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
387          UA     100

388          KK  CSCP01
389          KM   SCOTTSDALE ROAD CROSSING.
390          KM   COMBINE SCP01, AND RSCP02
391          HC       2

392          KK  SSCP01
393          RS       1    FLOW       1
394          SA       0    0.01
395          SE    2270    2280
396          SQ       0   10000
397          SE    2270    2280
             *  END STAGE COACH PASS AND BEGIN FAN 6C
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

398          KK   F6C-6   BASIN
399          BA   0.888
400          LG    0.33    0.25    5.40    0.25      27
401          UC   0.438   0.469
402          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
403          UA     100

404          KK   RF6C6   ROUTE   REACH
405          RS       2    STOR      -1
406          RC   0.050   0.035   0.050    1780  0.0185    0.00
407          RX   864.4   924.1   983.8   985.5  1015.1  1025.5  1034.0  1042.4
408          RY   626.0   625.0   624.0   622.0   622.0   624.0   625.0   626.0

409          KK   F6C-4   BASIN
410          BA   0.025
411          LG    0.31    0.25    3.95    0.57      43
412          UC   0.158   0.217
413          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
414          UA     100

415          KK   CF6C4
416          KM   COMBINE F6C-4, AND RF6C6
417          KM   CONFLUENCE WITHIN LENGEN TRAIL LOCATED IN SECTION 6 OF T5NR5E.
418          HC       2

419          KK   F6C-5   BASIN
420          BA   0.137
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421          LG    0.32    0.25    3.95    0.58      42
422          UC   0.300   0.464
423          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
424          UA     100

425          KK   CF6C5
426          KM   COMBINE CF6C4, AND F6C-5
427          KM   CONFLUENCE WITHIN LENGEN TRAIL LOCATED IN SECTION 6 OF T5NR5E.
428          HC       2

429          KK   RF6C4   ROUTE   REACH
430          RS       3    STOR      -1
431          RC   0.050   0.035   0.050    2707  0.0070    0.00
432          RX   697.3   735.7   986.9   990.6  1012.9  1106.1  1185.2  1250.7
433          RY   596.0   592.0   592.0   590.0   590.0   592.0   594.0   596.0

434          KK   F6C-3   BASIN
435          BA   0.046
436          LG    0.33    0.25    4.20    0.53      43
437          UC   0.221   0.278
438          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
439          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

440          KK   CF6C3
441          KM   COMBINE F6C-3, AND RF6C4
442          KM   EXITING LEGEND TRAIL ALONG WEST BOUNDARY.
443          HC       2

444          KK   RF6C3   ROUTE   REACH
445          RS       4    STOR      -1
446          RC   0.058   0.038   0.058    3172  0.0284    0.00
447          RX   731.4   760.4   943.4   993.9  1019.8  1057.8  1074.8  1160.5
448          RY   552.0   550.0   548.0   548.0   548.0   550.0   550.0   552.0

449          KK   F6C-2   BASIN
450          BA   0.088
451          LG    0.29    0.15    7.30    0.13      34
452          UC   0.200   0.214
453          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
454          UA     100

455          KK   CF6C2
456          KM   COMBINE F6C-2, AND RF6C3
457          KM   AT PIMA ROAD FLOW SPLIT.
458          HC       2

459          KK   SF6C2
460          RS       1    FLOW       1
461          SA       0    0.01
462          SE    2502    2512
463          SQ       0   10000
464          SE    2502    2512

465          KK  DCF6C2
466          KM   TOTAL FLOW=DI
467          KM   CONTINUING FLOW=DCF6C2 (DI-DQ)
468          KM   DIVERTED FLOW=DCUB09 (DQ)
469          DT  DCUB09
470          DI       0     248     969    1174    1321    1369    1517
471          DQ       0       0       0       7      18      28      37

472          KK   RF6C2   ROUTE   REACH
473          RS       3    STOR      -1
474          RC   0.058   0.038   0.058    2486  0.0193    0.00
475          RX   963.5   971.8   977.4   981.8  1009.3  1024.9  1079.5  1115.0
476          RY   464.0   462.0   460.0   458.0   458.0   460.0   462.0   462.4

477          KK  F6C-1C   BASIN
478          BA   0.077
479          LG    0.29    0.15    8.00    0.08      21
480          UC   0.158   0.129
481          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
482          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

483          KK  CF6C1C
484          KM   COMBINE F6C-1C, AND RF6C2
485          KM   AT WESTLAND ROAD.
486          HC       2

487          KK  F6C-1B   BASIN
488          BA   0.195
489          LG    0.30    0.17    6.80    0.16      36
490          UC   0.300   0.368
491          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
492          UA     100

493          KK  SF6C1B
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```
494          RS       1    FLOW       1
495          SA       0    0.01
496          SE    2480    2490
497          SQ       0   10000
498          SE    2480    2490

499          KK  RF6C1B   ROUTE   REACH
500          RS       2    STOR      -1
501          RC   0.058   0.038   0.058    1607  0.0162    0.00
502          RX   963.5   971.8   977.4   981.8  1009.3  1024.9  1079.5  1115.0
503          RY   464.0   462.0   460.0   458.0   458.0   460.0   462.0   462.4

504          KK  CF6C1B
505          KM   COMBINE CF6C1C, AND RF6C1B
506          KM   AT WESTLAND ROAD.
507          HC       2

508          KK  SF6C1C
509          RS       1    FLOW       1
510          SA       0    0.01
511          SE    2454    2464
512          SQ       0   10000
513          SE    2454    2464

514          KK  RF6C1C   ROUTE   REACH
515          RS       5    STOR      -1
516          RC   0.063   0.039   0.063    4158  0.0180    0.00
517          RX   909.7   984.0   987.5   990.5  1009.6  1023.1  1039.2  1182.5
518          RY   446.0   444.0   442.0   440.0   440.0   442.0   444.0   445.2

519          KK  F6C-1D   BASIN
520          BA   0.040
521          LG    0.30    0.15    9.70    0.04      17
522          UC   0.133   0.121
523          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
524          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

525          KK  SF6C1D
526          RS       1    FLOW       1
527          SA       0    0.01
528          SE    2442    2452
529          SQ       0   10000
530          SE    2442    2452

531          KK  RF6C1D   ROUTE   REACH
532          RS       4    STOR      -1
533          RC   0.063   0.039   0.063    3718  0.0169    0.00
534          RX   717.1   850.7   987.4   994.7  1006.6  1013.0  1206.6  1234.5
535          RY   426.0   424.0   422.0   420.0   420.0   422.0   424.0   425.3

536          KK  F6C-1A   BASIN
537          BA   0.183
538          LG    0.30    0.15    8.00    0.08      17
539          UC   0.217   0.194
540          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
541          UA     100

542          KK   CF6C1
543          KM   COMBINE F6C-1A, RF6C1D, AND RF6C1C
544          KM   MATCH TO EXISTING FEMA FLOODPLAIN
545          HC       3
             *  END FAN 6C AND BEGIN UPPER BOULDERS WASH

546          KK   UB-12   BASIN
547          BA   0.059
548          LG    0.30    0.25    3.95    0.56      46
549          UC   0.192   0.239
550          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
551          UA     100

552          KK   RUB12   ROUTE   REACH
553          RS       6    STOR      -1
554          RC   0.056   0.044   0.056    5388  0.0182    0.00
555          RX   849.6   861.9   926.8   975.3  1017.2  1046.5  1060.3  1074.7
556          RY   650.0   648.0   648.0   642.0   642.0   646.0   648.0   650.0

557          KK   UB-10   BASIN
558          BA   0.094
559          LG    0.28    0.25    4.15    0.48      47
560          UC   0.238   0.314
561          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
562          UA     100

563          KK   CUB10
564          KM   COMBINE UB-10, AND RUB12
565          KM   EXITING LEGEND TRAIL ON NORTHWEST CORNER.
566          HC       2
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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567          KK   UB-11   BASIN
568          BA   0.206
569          LG    0.27    0.25    4.10    0.54      54
570          UC   0.246   0.246
571          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
572          UA     100

573          KK   CUB11
574          KM   COMBINE CUB10, AND UB-11
575          KM   EXITING LEGEND TRAIL ON NORTHWEST CORNER.
576          HC       2

577          KK   RUB10   ROUTE   REACH
578          RS       4    STOR      -1
579          RC   0.056   0.044   0.056    3907  0.0179    0.00
580          RX   810.4   844.8   959.8   972.8  1005.9  1035.5  1109.8  1164.3
581          RY   564.0   562.0   560.0   556.0   556.0   560.0   560.0   562.0

582          KK   UB-09   BASIN
583          BA   0.342
584          LG    0.28    0.23    6.20    0.20      41
585          UC   0.279   0.248
586          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
587          UA     100

588          KK   CUB09
589          KM   COMBINE UB-09, AND RUB10
590          KM   AT PIMA ROAD FLOW SPLIT.
591          HC       2

592          KK   SUB09
593          RS       1    FLOW       1
594          SA       0    0.01
595          SE    2502    2520
596          SQ       0   10000
597          SE    2502    2520

598          KK  DCUB09
599          DR  DCUB09

600          KK  DCUB09
601          KM   COMBINE DCUB09, AND SUB09
602          KM   FLOW SPLIT WEST OF PIMA ROAD FROM FAN 6C TO UPPER BOULDERS
603          HC       2

604          KK   RUB09   ROUTE   REACH
605          RS       5    STOR      -1
606          RC   0.061   0.038   0.061    4450  0.0187    0.00
607          RX   865.9   913.3   986.7   990.5  1009.0  1014.7  1037.1  1056.8
608          RY   492.0   489.0   488.0   486.0   486.0   488.0   490.0   492.0
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

609          KK   UB-07   BASIN
610          BA   0.191
611          LG    0.30    0.15    8.80    0.06      16
612          UC   0.250   0.257
613          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
614          UA     100

615          KK   CUB07
616          KM   COMBINE UB-07, AND RUB09
617          KM   CONFLUENCE POINT SOUTH OF BLACK MOUNTAIN ROAD AND EAST OF HAYDEN ROAD.
618          HC       2

619          KK  UB-08C   BASIN
620          BA   0.010
621          LG    0.25    0.25    4.00    0.55      55
622          UC   0.113   0.143
623          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
624          UA     100

625          KK  RUB08C   ROUTE   REACH
626          RS       7    STOR      -1
627          RC   0.061   0.038   0.061    5952  0.0190    0.00
628          RX   975.3   981.7   986.9   991.0  1009.2  1073.1  1118.9  1137.7
629          RY   498.0   496.0   494.0   492.0   492.0   494.0   496.0   498.0

630          KK  UB-08B   BASIN
631          BA   0.033
632          LG    0.25    0.17    6.80    0.15      42
633          UC   0.142   0.147
634          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
635          UA     100

636          KK  RUB08B   ROUTE   REACH
637          RS       7    STOR      -1
638          RC   0.061   0.038   0.061    6656  0.0173    0.00
639          RX   975.3   981.7   986.9   991.0  1009.2  1073.1  1118.9  1137.7
640          RY   498.0   496.0   494.0   492.0   492.0   494.0   496.0   498.0

641          KK  UB-08A   BASIN
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642          BA   0.121
643          LG    0.30    0.25    5.70    0.21      26
644          UC   0.275   0.371
645          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
646          UA     100

647          KK   CUB08
648          KM   COMBINE UB-08A, RUB08B, RUB08C, AND CUB07
649          KM   CONFLUENCE POINT SOUTH OF BLACK MOUNTAIN ROAD AND EAST OF HAYDEN ROAD.
650          HC       4
1                                        HEC-1 INPUT                                          PAGE 16

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


651          KK   RUB07   ROUTE   REACH
652          RS       2    STOR      -1
653          RC   0.061   0.038   0.061    1441  0.0187    0.00
654          RX   802.8   896.1   939.4   977.6  1023.6  1036.2  1071.8  1144.8
655          RY   420.0   415.1   416.5   416.0   416.0   418.0   416.4   420.0

656          KK  UB-05B   BASIN
657          BA   0.022
658          LG    0.30    0.15    9.70    0.04      17
659          UC   0.125   0.132
660          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
661          UA     100

662          KK  CUB05B
663          KM   COMBINE UB-05B, AND RUB07
664          KM   BOULDERS EAST BOUNDARY ALONG HAYDEN ROAD.
665          HC       2

666          KK  SUB05B
667          RS       1    FLOW       1
668          SA       0    0.01
669          SE    2392    2402
670          SQ       0   10000
671          SE    2392    2402

672          KK  RUB05B   ROUTE   REACH
673          RS       3    STOR      -1
674          RC   0.076   0.038   0.076    2325  0.0206    0.00
675          RX   874.5   885.3   983.5   990.7  1012.0  1019.9  1042.6  1086.1
676          RY   370.1   370.0   368.0   366.0   366.0   368.0   369.0   369.5

677          KK  UB-05A   BASIN
678          BA   0.089
679          LG    0.29    0.15    9.70    0.05      24
680          UC   0.213   0.250
681          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
682          UA     100

683          KK   CUB05
684          KM   COMBINE UB-05A, AND RUB05B
685          KM   NORTH OF WESTLAND ROAD BETWEEN HAYDEN AND SCOTTSDALE ROAD.
686          HC       2

687          KK   SUB05
688          RS       1    FLOW       1
689          SA       0    0.01
690          SE    2344    2354
691          SQ       0   10000
692          SE    2344    2354
1                                        HEC-1 INPUT                                          PAGE 17

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


693          KK   RUB05   ROUTE   REACH
694          RS       2    STOR      -1
695          RC   0.076   0.038   0.076    1527  0.0216    0.00
696          RX   924.2   953.8   984.0   988.7  1020.6  1078.2  1087.4  1126.5
697          RY   336.0   334.0   332.0   330.0   330.0   332.0   334.0   336.0

698          KK  UB-06C   BASIN
699          BA   0.037
700          LG    0.30    0.15    9.70    0.04      17
701          UC   0.154   0.182
702          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
703          UA     100

704          KK  SUB06C
705          RS       1    FLOW       1
706          SA       0    0.01
707          SE    2377    2387
708          SQ       0   10000
709          SE    2377    2387

710          KK  RUB06C   ROUTE   REACH
711          RS       2    STOR      -1
712          RC   0.076   0.038   0.076    2022  0.0183    0.00
713          RX   921.6   939.8   960.8   993.3  1002.3  1033.8  1053.5  1122.0
714          RY   366.0   364.0   362.0   360.0   360.0   362.0   364.0   366.0
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715          KK  UB-06B   BASIN
716          BA   0.053
717          LG    0.30    0.15    9.70    0.04      18
718          UC   0.208   0.316
719          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
720          UA     100

721          KK  SUB06B
722          RS       1    FLOW       1
723          SA       0    0.01
724          SE    2371    2381
725          SQ       0   10000
726          SE    2371    2381

727          KK  RUB06B   ROUTE   REACH
728          RS       2    STOR      -1
729          RC   0.076   0.038   0.076    1719  0.0180    0.00
730          RX   921.6   939.8   960.8   993.3  1002.3  1033.8  1053.5  1122.0
731          RY   366.0   364.0   362.0   360.0   360.0   362.0   364.0   366.0

732          KK  UB-06A   BASIN
733          BA   0.042
734          LG    0.24    0.17    8.80    0.06      25
735          UC   0.171   0.198
736          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
737          UA     100
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

738          KK   CUB06
739          KM   COMBINE UB-06A, RUB06B, AND RUB06C
740          KM   SOUTH OF WESTLAND ROAD BETWEN HAYDEN AND SCOTTSDALE ROAD, WITHIN WINFEILD.
741          HC       3

742          KK   RUB06   ROUTE   REACH
743          RS       2    STOR      -1
744          RC   0.076   0.038   0.076    1436  0.0202    0.00
745          RX   924.2   953.8   984.0   988.7  1020.6  1078.2  1087.4  1126.5
746          RY   336.0   334.0   332.0   330.0   330.0   332.0   334.0   336.0

747          KK   UB-03   BASIN
748          BA   0.027
749          LG    0.18    0.29    4.90    0.29      38
750          UC   0.142   0.149
751          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
752          UA     100

753          KK   CUB03
754          KM   COMBINE UB-03, RUB05, AND RUB06
755          KM   CONFLUENCE POINT WITHIN WINFEILD, LOCATED SOUTH OF BLACK MOUNTAIN ROAD.
756          HC       3

757          KK   UB-04   BASIN
758          BA   0.350
759          LG    0.26    0.17    9.70    0.05      19
760          UC   0.304   0.290
761          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
762          UA     100

763          KK   CUB04
764          KM   COMBINE UB-04, AND CUB03
765          KM   CONFLUENCE POINT WITHIN WINFEILD, LOCATED SOUTH OF BLACK MOUNTAIN ROAD.
766          HC       2

767          KK   RUB03   ROUTE   REACH
768          RS       3    STOR      -1
769          RC   0.076   0.038   0.076    2425  0.0177    0.00
770          RX   785.3   899.0   967.3   981.0  1004.3  1011.0  1258.0  1351.4
771          RY   312.0   306.6   308.0   306.0   306.0   308.0   310.0   312.0

772          KK   UB-01   BASIN
773          BA   0.054
774          LG    0.20    0.27    3.95    0.54      58
775          UC   0.183   0.196
776          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
777          UA     100

778          KK   CUB01
779          KM   COMBINE UB-01, AND RUB03
780          KM   SCOTTSDALE ROAD CROSSING.
781          HC       2
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

782          KK   SUB01
783          RS       1    FLOW       1
784          SA       0    0.01
785          SE    2268    2278
786          SQ       0   10000
787          SE    2268    2278
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788          KK   UB-02   BASIN
789          BA   0.050
790          LG    0.24    0.27    5.40    0.26      60
791          UC   0.133   0.150
792          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
793          UA     100
             *  END UPPER BOULDERS WASH AND BEGIN FAN 6AN/6AS/6A

794          KK  F6AN-8   BASIN
795          BA   0.235
796          LG    0.30    0.15    8.80    0.06       6
797          UC   0.179   0.137
798          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
799          UA     100

800          KK  RF6AN8   ROUTE   REACH
801          RS       8    STOR      -1
802          RC   0.056   0.039   0.056    6862  0.0331    0.00
803          RX   942.1   950.5   958.9   988.7  1010.7  1028.3  1056.8  1085.2
804          RY   950.0   949.0   948.0   946.0   946.0   948.0   949.0   950.0

805          KK  F6AN-6   BASIN
806          BA   0.107
807          LG    0.33    0.25    4.40    0.41      20
808          UC   0.221   0.305
809          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
810          UA     100

811          KK  CF6AN6
812          KM   COMBINE F6AN-6, AND RF6AN8
813          KM   CONFLUENCE POINT WITHIN MIRABEL
814          HC       2

815          KK  F6AN-7   BASIN
816          BA   0.284
817          LG    0.32    0.25    5.60    0.22      23
818          UC   0.279   0.332
819          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
820          UA     100

821          KK  CF6AN7
822          KM   COMBINE CF6AN6, AND F6AN-7
823          KM   CONFLUENCE POINT WITHIN MIRABEL
824          HC       2
1                                    HEC-1 INPUT                                          PAGE 20

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

825          KK  RF6AN6   ROUTE   REACH
826          RS       5    STOR      -1
827          RC   0.056   0.038   0.053    4132  0.0225    0.00
828          RX   962.5   970.6   978.4   991.0  1006.8  1227.5  1256.1  1279.4
829          RY   806.0   804.0   802.0   800.0   800.0   802.0   804.0   806.0

830          KK  F6AN-5   BASIN
831          BA   0.104
832          LG    0.33    0.25    3.95    0.56      29
833          UC   0.213   0.238
834          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
835          UA     100

836          KK  CF6AN5
837          KM   COMBINE F6AN-5, AND RF6AN6
838          KM   EXIT MIRABEL AT SOUTH BOUNDARY, STAGECOACH PASS.
839          HC       2

840          KK  RF6AN5   ROUTE   REACH
841          RS       3    STOR      -1
842          RC   0.056   0.038   0.053    3137  0.0217    0.00
843          RX   978.0   983.5   989.4  1007.0  1029.9  1143.3  1284.4  1331.4
844          RY   732.0   730.0   728.0   728.0   729.3   729.0   726.7   732.0

845          KK  F6AN-3   BASIN
846          BA   0.138
847          LG    0.30    0.25    4.55    0.38      39
848          UC   0.313   0.544
849          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
850          UA     100

851          KK  CF6AN3
852          KM   COMBINE F6AN-3, AND RF6AN5
853          KM   CONFLUENCE POINT SOUTH OF STAGECOACH PASS WITHIN SECTION 5 OF T5NR5E.
854          HC       2

855          KK  F6AN-4   BASIN
856          BA   0.251
857          LG    0.30    0.25    4.10    0.52      44
858          UC   0.321   0.425
859          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
860          UA     100

861          KK  CF6AN4
862          KM   COMBINE CF6AN3, AND F6AN-4
863          KM   CONFLUENCE POINT SOUTH OF STAGECOACH PASS WITHIN SECTION 5 OF T5NR5E.
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 864          HC       2

 865          KK  RF6AN3   ROUTE   REACH
 866          RS       1    STOR      -1
 867          RC   0.056   0.038   0.053     876  0.0171    0.00
 868          RX   978.9   986.9   991.1   995.6  1017.5  1098.7  1195.1  1228.0
 869          RY   690.0   688.0   686.0   684.0   684.0   686.0   688.0   690.0
1                                          HEC-1 INPUT                                                    PAGE 21

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 870          KK  F6AN-2   BASIN
 871          BA   0.150
 872          LG    0.34    0.25    4.35    0.48      36
 873          UC   0.283   0.404
 874          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 875          UA     100

 876          KK  CF6AN2
 877          KM   COMBINE F6AN-2, AND RF6AN3
 878          KM   CONFLUENCE POINT IN SECTION 5 OF T5NR5E.
 879          KM   NORTHEAST OF NORTHEAST CORNER OF LENGEND TRAIL.
 880          HC       2

 881          KK  RF6AN2   ROUTE   REACH
 882          RS      27    STOR      -1
 883          RC   0.056   0.038   0.053    7999  0.0176    0.00
 884          RX   897.4   913.8   927.5   971.8  1023.5  1071.1  1152.0  1224.7
 885          RY   685.0   656.0   654.0   652.0   652.0   654.0   652.7   658.0

 886          KK  F6AN-1   BASIN
 887          BA   0.415
 888          LG    0.31    0.25    6.00    0.21      31
 889          UC   0.325   0.291
 890          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 891          UA     100

 892          KK  CF6AN1
 893          KM   COMBINE
 894          KM   UPSTREAM OF CONFLUENCE POINT
 895          HC       2

 896          KK  F6AS-5   BASIN
 897          BA   0.631
 898          LG    0.32    0.24    7.00    0.12      13
 899          UC   0.383   0.334
 900          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 901          UA     100

 902          KK  RF6AS5   ROUTE   REACH
 903          RS       9    STOR      -1
 904          RC   0.064   0.044   0.064    8083  0.0192    0.00
 905          RX   877.0   887.9   915.7   986.3  1151.0  1210.3  1238.3  1261.5
 906          RY   780.0   778.0   776.0   774.0   774.0   776.0   778.0   780.0

 907          KK  F6AS-3   BASIN
 908          BA   0.317
 909          LG    0.30    0.25    4.90    0.33      39
 910          UC   0.329   0.396
 911          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 912          UA     100
1                                          HEC-1 INPUT                                                    PAGE 22

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 913          KK  CF6AS3
 914          KM   COMBINE F6AS-3, AND RF6AS5
 915          KM   CONFLUENCE POINT IN SECTION 5 OF T5NR5E, EAST OF LEGEND TRAIL.
 916          HC       2

 917          KK  F6AS-4   BASIN
 918          BA   0.433
 919          LG    0.31    0.28    4.40    0.42      37
 920          UC   0.475   0.657
 921          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 922          UA     100

 923          KK  CF6AS4
 924          KM   COMBINE F6AS-4, AND CF6AS3
 925          KM   CONFLUENCE POINT IN SECTION 5 OF T5NR5E, EAST OF LEGEND TRAIL.
 926          HC       2

 927          KK  RF6AS3   ROUTE   REACH
 928          RS       3    STOR      -1
 929          RC   0.064   0.044   0.064    2438  0.0160    0.00
 930          RX   830.7   866.0   931.0   995.0  1017.3  1026.5  1076.2  1104.9
 931          RY   652.0   650.0   648.0   646.0   646.0   648.0   650.0   652.0

 932          KK  F6AS-2   BASIN
 933          BA   0.058
 934          LG    0.29    0.25    4.15    0.52      48
 935          UC   0.192   0.232
 936          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
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 937          UA     100

 938          KK  CF6AS2
 939          KM   COMBINE F6AS-2, AND RF6AS3
 940          KM   EAST OF EAST BOUNDARY OF LEGEND TRAIL.
 941          HC       2

 942          KK  RF6AS2   ROUTE   REACH
 943          RS       7    STOR      -1
 944          RC   0.064   0.044   0.064    5914  0.0167    0.00
 945          RX   850.1   874.8   889.0   953.7  1000.0  1016.4  1036.5  1067.1
 946          RY   602.0   600.0   598.0   596.4   595.5   596.0   598.0   602.0

 947          KK  F6AS-1   BASIN
 948          BA   0.278
 949          LG    0.29    0.25    5.30    0.29      38
 950          UC   0.317   0.344
 951          UA       0     5.0    16.0    30.0    65.0    77.0    84.0    90.0    94.0    97.0
 952          UA     100

 953          KK  CF6AS1
 954          KM   COMBINE F6AS1-4, AND RF6AS2
 955          KM   NORTH OF CONFLUENCE
 956          HC       2
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 957          KK  CF6ASN
 958          KM   COMBINE F6AN-1, F6AS1-4, RF6AN2, AND RF6AS2
 959          KM   SOUTH BOUNDARY OF LEGEND TRAIL.
 960          HC       2

 961          KK  RF6AN1   ROUTE   REACH
 962          RS       3    STOR      -1
 963          RC   0.063   0.038   0.063    2859  0.0161    0.00
 964          RX   879.7   894.2   947.2   979.7  1018.2  1032.6  1044.2  1055.2
 965          RY   540.0   538.0   536.0   534.0   534.0   536.0   538.0   540.0

 966          KK   F6A-1   BASIN
 967          BA   0.125
 968          LG    0.30    0.15    8.40    0.07      15
 969          UC   0.192   0.150
 970          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 971          UA     100

 972          KK   CF6A1
 973          KM   COMBINE F6A-1, AND RF6AN1
 974          KM   MATCH TO EXISTING FEMA FLOODPLAIN.
 975          HC       2
              *  END FAN 6AN/6AS/6A AND BEGIN UPPER FAN 5

 976          KK   RHW-1   BASIN
 977          BA   1.051
 978          LG    0.33    0.30    6.80    0.14      16
 979          UC   0.454   0.313
 980          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 981          UA     100

 982          KK  DRHW1
 983          KM   TOTAL FLOW=DI
 984          KM   CONTINUING FLOW=DRHW1 (DI-DQ)
 985          KM   DIVERTED FLOW=DRHWOUT (DQ)
 986          DT  DRHOUT
 987          DI     160     389     849    1854
 988          DQ     146     327     502    1023

 989          KK   RRHW1   ROUTE   REACH
 990          RS       9    STOR      -1
 991          RC   0.068   0.043   0.068    8155  0.0180    0.00
 992          RX   766.3   889.6   954.5   973.4  1000.0  1007.8  1108.1  1188.8
 993          RY   736.0   730.4   730.8   730.0   728.7   730.0   732.0   736.0

 994          KK   UF5-5   BASIN
 995          BA   0.294
 996          LG    0.34    0.34    6.40    0.16      17
 997          UC   0.379   0.620
 998          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
 999          UA     100
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1000          KK   RUF55   ROUTE   REACH
1001          RS       9    STOR      -1
1002          RC   0.068   0.043   0.068    8318  0.0174    0.00
1003          RX   766.3   889.6   954.5   973.4  1000.0  1007.8  1108.1  1188.8
1004          RY   736.0   730.4   730.8   730.0   728.7   730.0   732.0   736.0

1005          KK   UF5-4   BASIN
1006          BA   0.255
1007          LG    0.29    0.25    4.70    0.36      45
1008          UC   0.304   0.353
```

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1009          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1010          UA     100

1011          KK   CUF54
1012          KM   COMBINE UF5-4, RUF55, AND RRHW1
1013          KM   EAST OF LEGNED TRAIL EAST BOUNDARY.
1014          HC       3

1015          KK   RUF54   ROUTE   REACH
1016          RS      13    STOR      -1
1017          RC   0.071   0.038   0.071   11314  0.0175    0.00
1018          RX   931.9   946.9   961.7   982.9  1012.6  1048.2  1068.2  1079.1
1019          RY   518.0   516.0   514.0   512.0   512.0   516.6   516.0   518.0

1020          KK   UF5-2   BASIN
1021          BA   0.624
1022          LG    0.27    0.15    7.60    0.11      34
1023          UC   0.425   0.468
1024          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1025          UA     100

1026          KK   CUF52
1027          KM   COMBINE UF5-2, AND RUF5-4
1028          KM   NORTH OF CONFLUENCE POINT IN SECTION 18 OF T5NR5E, EAST OF PIMA ROAD.
1029          HC       2

1030          KK   UF5-3   BASIN
1031          BA   0.842
1032          LG    0.25    0.15    7.60    0.11      40
1033          UC   0.533   0.625
1034          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1035          UA     100

1036          KK   CUF53
1037          KM   COMBINE UF5-3, AND CUF52
1038          KM   CONFLUENCE POINT IN SECTION 18 OF T5NR5E, EAST OF PIMA ROAD.
1039          HC       2

1040          KK   RUF52   ROUTE   REACH
1041          RS       2    STOR      -1
1042          RC   0.071   0.038   0.071    2113  0.0170    0.00
1043          RX   904.8   916.9   925.7   945.0  1017.8  1042.5  1074.4  1089.9
1044          RY   420.0   418.0   416.0   414.0   414.0   416.0   418.0   420.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1045          KK   UF5-1   BASIN
1046          BA   0.083
1047          LG    0.29    0.15    7.60    0.10      22
1048          UC   0.179   0.158
1049          UA       0     3.0     5.0     8.0    12.0    20.0    43.0    75.0    90.0    96.0
1050          UA     100

1051          KK   CUF51
1052          KM   COMBINE UF5-1, AND RUF5-2
1053          KM   MATCH TO EXISTING FEMA FLOODPLAIN.
1054          HC       2
1055          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   69     SCP-14
               V
               V
   75     RSCP14
               .
               .
   80          .      SCP-13
               .           .
               .           .
   86          .           .      SCP-12
               .           .           .
               .           .           .
   92     CSCP12.......................
               V
               V
   96     RSCP12
               .
               .
  101          .      SCP-10
               .           .
               .           .
  107     CSCP10............
               .
               .
  111          .      SCP-11
               .           .
               .           .
  117     CSCP11............
```

```
            V
            V
121     RSCP10
            .
            .
126         .       SCP-09
            .           .
            .           .
132     CSCP09............
            V
            V
136     RSCP09
            .
            .
141         .       SCP-08
            .           .
            .           .
147     CSCP08............
            V
            V
151     RSCP08
            .
            .
156         .       SCP-7E
            .           .
            .           .
162     CSCP7E............
            .
            .
167         .       SCP-7B
            .           V
            .           V
173         .       RSCP7B
            .           .
            .           .
178         .           .       SCP-7C
            .           .           V
            .           .           V
184         .           .       RSCP7C
            .           .           .
            .           .           .
189         .           .           .       SCP-7D
            .           .           .           .
            .           .           .           .
195         .       CSCP7D........................
            .           V
            .           V
199         .       RSCP7D
            .           .
            .           .
204     CSCP07............
            .
            .
209         .       SCP-7A
            .           .
            .           .
215     CSCP7A............
            V
            V
220     RSCP07
            .
            .
225         .       SCP-06
            .           .
            .           .
231     CSCP06............
            V
            V
235     SSCP06
            V
            V
241     RSCP06
            .
            .
246         .       SCP-4B
            .           V
            .           V
252         .       SSCP4B
            .           V
            .           V
258         .       RSCP4B
            .           .
            .           .
263         .           .       SCP-4A
            .           .           .
            .           .           .
269     CSCP4a........................
            .
            .
274         .       SCP-5C
            .           V
            .           V
280         .       SSCP5C
            .           V
            .           V
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286          .      RSCP5C
             .          .
             .          .
291          .          .      SCP-5B
             .          .          V
             .          .          V
297          .          .      SSCP5B
             .          .          V
             .          .          V
303          .          .      RSCP5B
             .          .          .
             .          .          .
308          .          .          .      SCP-5A
             .          .          .          .
             .          .          .          .
314     CSCP04.................................
             V
             V
319     RSCP04
             .
             .
324          .      SCP-03
             .          .
             .          .
330     CSCP03............
             V
             V
334     RSCP03
             .
             .
339          .      SCP-2B
             .          .
             .          .
345     CSCP2B............
             V
             V
349     SSCP2B
             V
             V
355     RSCP2B
             .
             .
360          .      SCP-2A
             .          .
             .          .
366     CSCP02............
             V
             V
371     SSCP02
             V
             V
377     RSCP02
             .
             .
382          .      SCP-01
             .          .
             .          .
388     CSCP01............
             V
             V
392     SSCP01
             .
             .
398          .       F6C-6
             .           V
             .           V
404          .       RF6C6
             .           .
             .           .
409          .           .       F6C-4
             .           .           .
             .           .           .
415          .       CF6C4............
             .           .
             .           .
419          .           .       F6C-5
             .           .           .
             .           .           .
425          .       CF6C5............
             .           V
             .           V
429          .       RF6C4
             .           .
             .           .
434          .           .       F6C-3
             .           .           .
             .           .           .
440          .       CF6C3............
             .           V
             .           V
444          .       RF6C3
             .           .
             .           .
449          .           .       F6C-2
             .           .           .
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```
455          .      CF6C2............
             .          V
             .          V
459          .      SF6C2
             .          .
             .          .
469          .          .-------> DCUB09
465          .     DCF6C2
             .          V
             .          V
472          .      RF6C2
             .          .
             .          .
477          .          .      F6C-1C
             .          .           .
             .          .           .
483          .     CF6C1C............
             .          .
             .          .
487          .          .      F6C-1B
             .          .           V
             .          .           V
493          .          .      SF6C1B
             .          .           V
             .          .           V
499          .          .      RF6C1B
             .          .           .
             .          .           .
504          .     CF6C1B............
             .          V
             .          V
508          .     SF6C1C
             .          V
             .          V
514          .     RF6C1C
             .          .
             .          .
519          .          .      F6C-1D
             .          .           V
             .          .           V
525          .          .      SF6C1D
             .          .           V
             .          .           V
531          .          .      RF6C1D
             .          .           .
             .          .           .
536          .          .           .      F6C-1A
             .          .           .           .
             .          .           .           .
542          .      CF6C1........................
             .          .
             .          .
546          .          .      UB-12
             .          .           V
             .          .           V
552          .          .      RUB12
             .          .           .
             .          .           .
557          .          .           .      UB-10
             .          .           .           .
             .          .           .           .
563          .          .      CUB10............
             .          .           .
             .          .           .
567          .          .           .      UB-11
             .          .           .           .
             .          .           .           .
573          .          .      CUB11............
             .          .           V
             .          .           V
577          .          .      RUB10
             .          .           .
             .          .           .
582          .          .           .      UB-09
             .          .           .           .
             .          .           .           .
588          .          .      CUB09............
             .          .           V
             .          .           V
592          .          .      SUB09
             .          .           .
             .          .           .
599          .          .           .           .<-------  DCUB09
598          .          .           .      DCUB09
             .          .           .           .
             .          .           .           .
600          .          .     DCUB09............
             .          .           V
             .          .           V
604          .          .      RUB09
             .          .           .
             .          .           .
609          .          .           .      UB-07
             .          .           .           .
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615          CUB07............
619                  UB-08C
                          V
                          V
625                  RUB08C
630                          UB-08B
                                  V
                                  V
636                          RUB08B
641                                          UB-08A
647          CUB08.................................
                 V
                 V
651          RUB07
656                  UB-05B
662          CUB05B...........
                 V
                 V
666          SUB05B
                 V
                 V
672          RUB05B
677                  UB-05A
683          CUB05............
                 V
                 V
687          SUB05
                 V
                 V
693          RUB05
698                  UB-06C
                          V
                          V
704                  SUB06C
                          V
                          V
710                  RUB06C
715                          UB-06B
                                  V
                                  V
721                          SUB06B
                                  V
                                  V
727                          RUB06B
732                                          UB-06A
738                   CUB06......................
                          V
                          V
742                   RUB06
747                           UB-03
753          CUB03......................
757                   UB-04
763          CUB04............
                 V
                 V
767          RUB03
772                   UB-01
778          CUB01............
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```
                 .         .         V
                 .         .         V
782              .         .      SUB01
                 .         .         .
                 .         .         .
788              .         .         .      UB-02
                 .         .         .         .
                 .         .         .         .
794              .         .         .         .      F6AN-8
                 .         .         .         .          V
                 .         .         .         .          V
800              .         .         .         .      RF6AN8
                 .         .         .         .          .
                 .         .         .         .          .
805              .         .         .         .          .      F6AN-6
                 .         .         .         .          .          .
                 .         .         .         .          .          .
811              .         .         .         .      CF6AN6............
                 .         .         .         .          .
                 .         .         .         .          .
815              .         .         .         .          .      F6AN-7
                 .         .         .         .          .          .
                 .         .         .         .          .          .
821              .         .         .         .      CF6AN7............
                 .         .         .         .          V
                 .         .         .         .          V
825              .         .         .         .      RF6AN6
                 .         .         .         .          .
                 .         .         .         .          .
830              .         .         .         .          .      F6AN-5
                 .         .         .         .          .          .
                 .         .         .         .          .          .
836              .         .         .         .      CF6AN5............
                 .         .         .         .          V
                 .         .         .         .          V
840              .         .         .         .      RF6AN5
                 .         .         .         .          .
                 .         .         .         .          .
845              .         .         .         .          .      F6AN-3
                 .         .         .         .          .          .
                 .         .         .         .          .          .
851              .         .         .         .      CF6AN3............
                 .         .         .         .          .
                 .         .         .         .          .
855              .         .         .         .          .      F6AN-4
                 .         .         .         .          .          .
                 .         .         .         .          .          .
861              .         .         .         .      CF6AN4............
                 .         .         .         .          V
                 .         .         .         .          V
865              .         .         .         .      RF6AN3
                 .         .         .         .          .
                 .         .         .         .          .
870              .         .         .         .          .      F6AN-2
                 .         .         .         .          .          .
                 .         .         .         .          .          .
876              .         .         .         .      CF6AN2............
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881              .         .         .         .      RF6AN2
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886              .         .         .         .          .      F6AN-1
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892              .         .         .         .      CF6AN1............
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896              .         .         .         .          .      F6AS-5
                 .         .         .         .          .          V
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902              .         .         .         .          .      RF6AS5
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907              .         .         .         .          .          .      F6AS-3
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913              .         .         .         .          .      CF6AS3............
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917              .         .         .         .          .          .      F6AS-4
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923              .         .         .         .          .      CF6AS4............
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927              .         .         .         .          .      RF6AS3
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932              .         .         .         .          .          .      F6AS-2
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938              .         .         .         .          .      CF6AS2............
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 942                                  RF6AS2
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 947                                    .      F6AS-1
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 953                                    .      CF6AS1............
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 957                                    .
                                CF6ASN...........
                                     V
                                     V
 961                            RF6AN1
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 966                                    .       F6A-1
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 972                                    .
                                 CF6A1...........
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 976                                    .       RHW-1
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 986                                    .          .-------> DRHOUT
 982                                    .      DRHW1
                                        .          V
                                        .          V
 989                                    .       RRHW1
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 994                                    .          .       UF5-5
                                        .          .          V
                                        .          .          V
1000                                    .          .       RUF55
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1005                                    .          .          .       UF5-4
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1011                                    .       CUF54......................
                                        .          V
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1015                                    .       RUF54
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1020                                    .          .       UF5-2
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1026                                    .       CUF52...........
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1030                                    .          .       UF5-3
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1036                                    .       CUF53...........
                                        .          V
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1040                                    .       RUF52
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1045                                    .          .       UF5-1
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1051                                    .       CUF51...........
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SCP-14	157.	4.10	17.	4.	3.	0.06		
+	ROUTED TO	RSCP14	150.	4.13	17.	4.	3.	0.06		
+	HYDROGRAPH AT	SCP-13	227.	4.10	23.	6.	4.	0.08		
+	HYDROGRAPH AT	SCP-12	91.	4.05	7.	2.	1.	0.03		
+	3 COMBINED AT	CSCP12	453.	4.08	47.	12.	8.	0.17		
+	ROUTED TO	RSCP12	419.	4.22	47.	12.	8.	0.17		
+	HYDROGRAPH AT	SCP-10	286.	4.07	28.	7.	5.	0.11		
+	2 COMBINED AT	CSCP10	631.	4.17	74.	19.	13.	0.28		
+	HYDROGRAPH AT	SCP-11	78.	4.03	6.	2.	1.	0.03		
+	2 COMBINED AT	CSCP11	676.	4.15	81.	20.	15.	0.30		
+	ROUTED TO	RSCP10	635.	4.33	80.	20.	15.	0.30		
+	HYDROGRAPH AT	SCP-09	289.	4.05	27.	7.	5.	0.11		
+	2 COMBINED AT	CSCP09	758.	4.28	107.	27.	19.	0.41		
+	ROUTED TO	RSCP09	737.	4.38	107.	27.	19.	0.41		
+	HYDROGRAPH AT	SCP-08	326.	4.07	33.	8.	6.	0.13		
+	2 COMBINED AT	CSCP08	844.	4.35	139.	35.	25.	0.54		
+	ROUTED TO	RSCP08	824.	4.45	139.	35.	25.	0.54		
+	HYDROGRAPH AT	SCP-7E	130.	4.05	11.	3.	2.	0.05		
+	2 COMBINED AT	CSCP7E	836.	4.45	149.	38.	27.	0.59		
+	HYDROGRAPH AT	SCP-7B	173.	4.08	22.	6.	4.	0.09		
+	ROUTED TO	RSCP7B	164.	4.18	22.	6.	4.	0.09		
+	HYDROGRAPH AT	SCP-7C	315.	4.12	45.	11.	8.	0.18		
+	ROUTED TO	RSCP7C	306.	4.15	45.	11.	8.	0.18		
+	HYDROGRAPH AT	SCP-7D	76.	4.03	7.	2.	1.	0.03		
+	3 COMBINED AT	CSCP7D	517.	4.15	73.	18.	13.	0.29		
+	ROUTED TO	RSCP7D	517.	4.15	73.	18.	13.	0.29		
+	2 COMBINED AT	CSCP07	1116.	4.38	216.	55.	39.	0.88		
+	HYDROGRAPH AT	SCP-7A	263.	4.10	34.	9.	6.	0.14		
+	2 COMBINED AT	CSCP7A	1243.	4.35	247.	62.	45.	1.01		

+	ROUTED TO	RSCP07	1234.	4.45	247.	62.	45.	1.01
+	HYDROGRAPH AT	SCP-06	237.	4.08	28.	7.	5.	0.10
+	2 COMBINED AT	CSCP06	1308.	4.42	272.	69.	50.	1.11
+	ROUTED TO	SSCP06	1308.	4.42	272.	69.	50.	1.11
+	ROUTED TO	RSCP06	1305.	4.48	272.	69.	50.	1.11
+	HYDROGRAPH AT	SCP-4B	343.	4.07	35.	9.	6.	0.14
+	ROUTED TO	SSCP4B	343.	4.07	35.	9.	6.	0.14
+	ROUTED TO	RSCP4B	317.	4.18	35.	9.	6.	0.14
+	HYDROGRAPH AT	SCP-4A	178.	4.07	19.	5.	3.	0.08
+	3 COMBINED AT	CSCP4a	1487.	4.42	319.	81.	58.	1.33
+	HYDROGRAPH AT	SCP-5C	389.	4.13	40.	10.	7.	0.15
+	ROUTED TO	SSCP5C	389.	4.13	40.	10.	7.	0.15
+	ROUTED TO	RSCP5C	350.	4.25	40.	10.	7.	0.15
+	HYDROGRAPH AT	SCP-5B	69.	4.10	8.	2.	1.	0.03
+	ROUTED TO	SSCP5B	4.	3.50	4.	2.	1.	0.03
+	ROUTED TO	RSCP5B	4.	5.22	4.	2.	1.	0.03
+	HYDROGRAPH AT	SCP-5A	250.	4.05	23.	6.	4.	0.09
+	4 COMBINED AT	CSCP04	1752.	4.32	377.	97.	70.	1.60
+	ROUTED TO	RSCP04	1746.	4.38	377.	97.	70.	1.60
+	HYDROGRAPH AT	SCP-03	198.	4.05	17.	4.	3.	0.08
+	2 COMBINED AT	CSCP03	1792.	4.37	391.	100.	72.	1.68
+	ROUTED TO	RSCP03	1788.	4.40	391.	100.	72.	1.68
+	HYDROGRAPH AT	SCP-2B	102.	4.08	12.	3.	2.	0.05
+	2 COMBINED AT	CSCP2B	1828.	4.38	401.	103.	74.	1.73
+	ROUTED TO	SSCP2B	1828.	4.38	401.	103.	74.	1.73
+	ROUTED TO	RSCP2B	1821.	4.43	401.	103.	74.	1.73
+	HYDROGRAPH AT	SCP-2A	128.	4.07	12.	3.	2.	0.05
+	2 COMBINED AT	CSCP02	1851.	4.43	411.	105.	76.	1.79
+	ROUTED TO	SSCP02	1851.	4.43	411.	105.	76.	1.79
+	ROUTED TO	RSCP02	1813.	4.68	411.	106.	76.	1.79
+	HYDROGRAPH AT	SCP-01	583.	4.13	81.	20.	15.	0.32
	2 COMBINED AT							

+		CSCP01	1996.	4.63	481.	123.	89.	2.11
	ROUTED TO							
+		SSCP01	1996.	4.63	481.	123.	89.	2.11
	HYDROGRAPH AT							
+		F6C-6	1251.	4.18	210.	53.	38.	0.89
	ROUTED TO							
+		RF6C6	1236.	4.25	210.	53.	38.	0.89
	HYDROGRAPH AT							
+		F6C-4	65.	4.05	6.	2.	1.	0.03
	2 COMBINED AT							
+		CF6C4	1261.	4.25	215.	54.	39.	0.91
	HYDROGRAPH AT							
+		F6C-5	222.	4.12	34.	9.	6.	0.14
	2 COMBINED AT							
+		CF6C5	1399.	4.23	246.	62.	45.	1.05
	ROUTED TO							
+		RF6C4	1317.	4.43	246.	62.	45.	1.05
	HYDROGRAPH AT							
+		F6C-3	103.	4.07	12.	3.	2.	0.05
	2 COMBINED AT							
+		CF6C3	1346.	4.43	256.	64.	46.	1.10
	ROUTED TO							
+		RF6C3	1324.	4.55	256.	64.	46.	1.10
	HYDROGRAPH AT							
+		F6C-2	248.	4.12	25.	6.	5.	0.09
	2 COMBINED AT							
+		CF6C2	1369.	4.53	278.	70.	51.	1.18
	ROUTED TO							
+		SF6C2	1369.	4.53	278.	70.	51.	1.18
	DIVERSION TO							
+		DCUB09	24.	4.53	1.	0.	0.	1.18
	HYDROGRAPH AT							
+		DCF6C2	1345.	4.53	277.	70.	50.	1.18
	ROUTED TO							
+		RF6C2	1338.	4.60	277.	70.	50.	1.18
	HYDROGRAPH AT							
+		F6C-1C	260.	4.03	21.	5.	4.	0.08
	2 COMBINED AT							
+		CF6C1C	1349.	4.58	296.	75.	54.	1.26
	HYDROGRAPH AT							
+		F6C-1B	402.	4.12	54.	14.	10.	0.19
	ROUTED TO							
+		SF6C1B	402.	4.12	54.	14.	10.	0.19
	ROUTED TO							
+		RF6C1B	394.	4.17	54.	14.	10.	0.19
	2 COMBINED AT							
+		CF6C1B	1513.	4.57	345.	87.	63.	1.46
	ROUTED TO							
+		SF6C1C	1513.	4.55	345.	87.	63.	1.46
	ROUTED TO							
+		RF6C1C	1500.	4.67	345.	87.	63.	1.46
	HYDROGRAPH AT							
+		F6C-1D	140.	4.02	12.	3.	2.	0.04
	ROUTED TO							
+		SF6C1D	140.	4.02	12.	3.	2.	0.04
	ROUTED TO							
+		RF6C1D	125.	4.13	12.	3.	2.	0.04
	HYDROGRAPH AT							
+		F6C-1A	529.	4.07	50.	12.	9.	0.18
	3 COMBINED AT							
+		CF6C1	1584.	4.63	401.	102.	73.	1.68
	HYDROGRAPH AT							
+		UB-12	146.	4.12	15.	4.	3.	0.06

+	ROUTED TO	RUB12	112.	4.42	15.	4.	3.	0.06
+	HYDROGRAPH AT	UB-10	206.	4.15	25.	6.	5.	0.09
+	2 COMBINED AT	CUB10	238.	4.32	40.	10.	7.	0.15
+	HYDROGRAPH AT	UB-11	508.	4.15	57.	14.	10.	0.21
+	2 COMBINED AT	CUB11	735.	4.15	97.	24.	18.	0.36
+	ROUTED TO	RUB10	691.	4.27	97.	24.	18.	0.36
+	HYDROGRAPH AT	UB-09	848.	4.10	94.	24.	17.	0.34
+	2 COMBINED AT	CUB09	1270.	4.18	188.	47.	34.	0.70
+	ROUTED TO	SUB09	1270.	4.18	188.	47.	34.	0.70
+	HYDROGRAPH AT	DCUB09	24.	4.53	1.	0.	0.	1.18
+	2 COMBINED AT	DCUB09	1270.	4.18	190.	48.	34.	0.70
+	ROUTED TO	RUB09	1217.	4.35	190.	48.	34.	0.70
+	HYDROGRAPH AT	UB-07	496.	4.15	53.	13.	10.	0.19
+	2 COMBINED AT	CUB07	1459.	4.32	239.	60.	43.	0.89
+	HYDROGRAPH AT	UB-08C	32.	4.05	3.	1.	1.	0.01
+	ROUTED TO	RUB08C	16.	4.60	3.	1.	1.	0.01
+	HYDROGRAPH AT	UB-08B	108.	4.07	10.	2.	2.	0.03
+	ROUTED TO	RUB08B	75.	4.43	10.	2.	2.	0.03
+	HYDROGRAPH AT	UB-08A	238.	4.10	30.	8.	5.	0.12
+	4 COMBINED AT	CUB08	1629.	4.32	278.	70.	51.	1.06
+	ROUTED TO	RUB07	1617.	4.37	278.	70.	51.	1.06
+	HYDROGRAPH AT	UB-05B	76.	4.02	6.	2.	1.	0.02
+	2 COMBINED AT	CUB05B	1628.	4.37	284.	72.	52.	1.08
+	ROUTED TO	SUB05B	1628.	4.37	284.	72.	52.	1.08
+	ROUTED TO	RUB05B	1603.	4.47	284.	72.	52.	1.08
+	HYDROGRAPH AT	UB-05A	237.	4.07	26.	6.	5.	0.09
+	2 COMBINED AT	CUB05	1667.	4.45	308.	78.	56.	1.17
+	ROUTED TO	SUB05	1667.	4.45	308.	78.	56.	1.17
+	ROUTED TO	RUB05	1663.	4.48	308.	78.	56.	1.17
+	HYDROGRAPH AT	UB-06C	114.	4.03	11.	3.	2.	0.04
+	ROUTED TO	SUB06C	114.	4.03	11.	3.	2.	0.04
+	ROUTED TO	RUB06C	102.	4.13	11.	3.	2.	0.04

+	HYDROGRAPH AT	UB-06B	127.	4.07	15.	4.	3.	0.05
+	ROUTED TO	SUB06B	127.	4.07	15.	4.	3.	0.05
+	ROUTED TO	RUB06B	119.	4.17	15.	4.	3.	0.05
+	HYDROGRAPH AT	UB-06A	125.	4.05	12.	3.	2.	0.04
+	3 COMBINED AT	CUB06	326.	4.10	38.	10.	7.	0.13
+	ROUTED TO	RUB06	318.	4.17	38.	10.	7.	0.13
+	HYDROGRAPH AT	UB-03	84.	4.03	7.	2.	1.	0.03
+	3 COMBINED AT	CUB03	1810.	4.45	350.	88.	64.	1.33
+	HYDROGRAPH AT	UB-04	836.	4.10	99.	25.	18.	0.35
+	2 COMBINED AT	CUB04	2178.	4.37	441.	111.	80.	1.68
+	ROUTED TO	RUB03	2152.	4.48	441.	111.	80.	1.68
+	HYDROGRAPH AT	UB-01	151.	4.05	15.	4.	3.	0.05
+	2 COMBINED AT	CUB01	2178.	4.47	455.	115.	83.	1.73
+	ROUTED TO	SUB01	2178.	4.47	455.	115.	83.	1.73
+	HYDROGRAPH AT	UB-02	162.	4.03	15.	4.	3.	0.05
+	HYDROGRAPH AT	F6AN-8	769.	4.08	62.	16.	11.	0.23
+	ROUTED TO	RF6AN8	712.	4.23	62.	16.	11.	0.23
+	HYDROGRAPH AT	F6AN-6	221.	4.08	23.	6.	4.	0.11
+	2 COMBINED AT	CF6AN6	877.	4.22	86.	21.	15.	0.34
+	HYDROGRAPH AT	F6AN-7	585.	4.10	69.	17.	12.	0.28
+	2 COMBINED AT	CF6AN7	1321.	4.20	153.	38.	28.	0.63
+	ROUTED TO	RF6AN6	1255.	4.35	153.	38.	28.	0.63
+	HYDROGRAPH AT	F6AN-5	241.	4.07	23.	6.	4.	0.10
+	2 COMBINED AT	CF6AN5	1320.	4.33	173.	44.	31.	0.73
+	ROUTED TO	RF6AN5	1243.	4.47	173.	44.	31.	0.73
+	HYDROGRAPH AT	F6AN-3	209.	4.13	35.	9.	6.	0.14
+	2 COMBINED AT	CF6AN3	1337.	4.47	206.	52.	37.	0.87
+	HYDROGRAPH AT	F6AN-4	445.	4.20	64.	16.	12.	0.25
+	2 COMBINED AT	CF6AN4	1552.	4.45	263.	66.	48.	1.12
+	ROUTED TO	RF6AN3	1546.	4.47	263.	66.	48.	1.12
+	HYDROGRAPH AT	F6AN-2	264.	4.10	36.	9.	7.	0.15
	2 COMBINED AT							

+		CF6AN2	1645.	4.45	295.	74.	54.	1.27
+	ROUTED TO	RF6AN2	1630.	4.67	295.	74.	54.	1.27
+	HYDROGRAPH AT	F6AN-1	913.	4.12	106.	27.	19.	0.41
+	2 COMBINED AT	CF6AN1	1814.	4.62	388.	98.	71.	1.68
+	HYDROGRAPH AT	F6AS-5	1248.	4.23	153.	38.	28.	0.63
+	ROUTED TO	RF6AS5	1077.	4.60	153.	38.	28.	0.63
+	HYDROGRAPH AT	F6AS-3	599.	4.22	82.	21.	15.	0.32
+	2 COMBINED AT	CF6AS3	1284.	4.57	228.	58.	41.	0.95
+	HYDROGRAPH AT	F6AS-4	557.	4.33	105.	27.	19.	0.43
+	2 COMBINED AT	CF6AS4	1603.	4.55	323.	82.	59.	1.38
+	ROUTED TO	RF6AS3	1582.	4.63	323.	82.	59.	1.38
+	HYDROGRAPH AT	F6AS-2	147.	4.12	15.	4.	3.	0.06
+	2 COMBINED AT	CF6AS2	1600.	4.63	336.	85.	61.	1.44
+	ROUTED TO	RF6AS2	1558.	4.82	336.	85.	61.	1.44
+	HYDROGRAPH AT	F6AS-1	560.	4.12	73.	18.	13.	0.28
+	2 COMBINED AT	CF6AS1	1642.	4.82	399.	101.	73.	1.72
+	2 COMBINED AT	CF6ASN	2993.	4.75	752.	191.	138.	3.40
+	ROUTED TO	RF6AN1	2981.	4.82	751.	191.	138.	3.40
+	HYDROGRAPH AT	F6A-1	398.	4.10	34.	9.	6.	0.13
+	2 COMBINED AT	CF6A1	3002.	4.82	781.	199.	143.	3.53
+	HYDROGRAPH AT	RHW-1	1822.	4.28	240.	60.	43.	1.05
+	DIVERSION TO	DRHOUT	1006.	4.28	155.	39.	28.	1.05
+	HYDROGRAPH AT	DRHW1	815.	4.28	86.	21.	15.	1.05
+	ROUTED TO	RRHW1	645.	4.80	86.	21.	15.	1.05
+	HYDROGRAPH AT	UF5-5	404.	4.27	68.	17.	12.	0.29
+	ROUTED TO	RUF55	320.	4.95	68.	17.	12.	0.29
+	HYDROGRAPH AT	UF5-4	522.	4.18	69.	17.	12.	0.25
+	3 COMBINED AT	CUF54	979.	4.80	208.	53.	38.	1.60
+	ROUTED TO	RUF54	954.	5.10	208.	53.	38.	1.60
+	HYDROGRAPH AT	UF5-2	1094.	4.28	177.	44.	32.	0.62
+	2 COMBINED AT	CUF52	1242.	5.02	370.	95.	68.	2.22
+	HYDROGRAPH AT	UF5-3	1171.	4.37	243.	61.	44.	0.84

	2 COMBINED AT							
+		CUF53	1976.	4.52	596.	152.	110.	3.07
	ROUTED TO							
+		RUF52	1971.	4.57	596.	152.	110.	3.07
	HYDROGRAPH AT							
+		UF5-1	260.	4.08	23.	6.	4.	0.08
	2 COMBINED AT							
+		CUF51	2019.	4.55	616.	157.	113.	3.15

*** NORMAL END OF HEC-1 ***

APPENDIX D.2

Physical Parameter Calculations

The physical parameter calculations are included in the Final Data Collection Report in Appendix D.1.

APPENDIX D.3

Hydrograph Routing Data

The hydrograph routing data is included in the Final Data Collection Report in Appendix D.1.

APPENDIX D.4

Reservoir Routing Data

There are no reservoirs within the study area.

Unnamed Central Tributary to Cave Creek

From R.S. to R.S.	Discharge	Flow Equation	Source
Main			
2.2214 to 2.2064	1652	=Flow at Culvert #36 CP3149 + 93% of UC50	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
2.1828 to 2.1684	2335	=CP4850	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
2.1443 to 2.0829	2363	Add 40% of UC57	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
2.0456 to 1.9389	2391	Add 40% of UC57	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.9192 to 1.8424	2447	=CP5157	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.8096 to 1.6113	2467	Add 50% of UC59	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.5812 to 1.5549	2622	=CP5859	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.5234	2822	Add 80% of UC63 and 40% of UC 64	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.4675 to 1.3724	2779	=CP64+CP63	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.3235	2854	Add 80% of UC66 and 40% of UC87	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.2701 to 1.2175	2274	Subtract D64S	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.1824 to 1.0158	2764	=97% of CP82	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.9888 to 0.9593	2849	=CP82	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
North Branch			
0.9285 to 0.9094	2174	=CP84	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
South Branch			
0.9065	685	=RD84S	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.8919	576	=D84iiN (142 cfs diverted to the south)	CH2M HILL, Carefree DMP, Data Collection Report, 03/04

Galloway Wash Middle Branch

From R.S. to R.S.	Discharge	Flow Equation	Source
Middle Branch 2			
0.2762 to 0.2211	209	=JEF #41	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.2045 to 0.1105	228	=JEF #41 + 1/2*(42-41)	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.101 to 0.0439	247	=JEF #42	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
Middle Branch			
1.6862 to 1.606	2094	=JEF #43	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
1.5884 to 1.4639	2124	=JEF #43 + 1/2*(44-43)	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
1.4317 to 0.9366	2153	=JEF #44	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.9152 to 0.6777	2179	=JEF #44 + 1/2*(45-44)	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.6468 to 0.5644	2204	=JEF #45	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
0.5272 to 0.3517	2210	=JEF#46	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02
Combined			
0.3065 to 0	2423	=CP286R	JE Fuller, Hydrologic Modeling for Carefree DMP for Andora Hills & Galloway Washes, 10/02

Unnamed Tributary to Stagecoach Pass Wash

From R.S. to R.S.	Discharge	Flow Equation	Source
Trib to Stagecoa			
0.8707 to 0.6242	84	=Flow at Culvert #153 (32% of SCP7A)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.6025 to 0.3933	152	=Flow at Culvert #146 (58% SCP7A)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.3828 to 0.0186	225	=Flow at Culvert #158 (85% SCP7A)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02

C:\Carefree\Updated\

Windmill Wash

From R.S. to R.S.	Discharge	Flow Equation	Source
North Branch			
1.6576 to 1.3215	64	=Flow at Culvert #166 (78% of UC8)	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.311	77	=Flow at Culvert #163 (94% of UC8)	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
1.2930 to 1.2388	131	=Flow at Culvert #163 + Flow at Culvert #165	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
South Branch			
0.4414 to 0.1163	54	=Flow at Culvert #165 (66% of UC9)	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.1163 to 0.0395	131	=Flow at Culvert #163 + Flow at Culvert #165	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
Combined Branch			
1.1975 to 0.9441	162	=CPC8	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.9196 to 0.6835	198	Add 64% of UC18	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.6472 to 0.356	250	=CP1819	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.3444 to 0.0644	295	=CP2223	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.0243 to 0.008	338	Add 96% of UC29	CH2M HILL, Carefree DMP, Data Collection Report, 03/04

Pima Wash

From R.S. to R.S.	Discharge	Flow Equation	Source
Pima			
1.0178 to 0.5707	71	=Flow at Culvert #167 (21% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.5548 to 0.2552	134	=Flow at Culvert #160 (39% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.2246 to 0.0391	295	=Flow at Culvert #161 (86% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02
0.0069	323	=Flow at Culvert #111 (94% of SCP4B)	DEI, North Scottsdale Delineation Study FCD 2001C009 as of 11/02

Unnamed Central Tributary to Cave Creek - Diversion Branch

From R.S. to R.S.	Discharge	Flow Equation	Source
Main			
0.1797	494	=494 cfs Div for Los Reales	CH2M HILL, Carefree DMP, Data Collection Report, 03/04
0.1569 to 0.0241	894	=494 cfs Div + 400 cfs (Div. from South Branch)	CH2M HILL, Carefree DMP, Data Collection Report, 03/04

Boundary Conditions and Flow Split Determination, Culvert No. 36, Unnamed Central Tributary to Cave Creek

TO: Tony Bokich

COPIES: File

FROM: Patrick Wolf

DATE: March 13, 2003 (Revised March 29, 2004)

Culvert No. 36 at Tom Darlington Road exists as the upstream boundary condition for the Unnamed Central Wash floodplain delineation. According to the hydrology of the project (*see Data Collection Report*), 1, 652 cfs will arrive at the culvert during the 100-year event. The flow was calculated based on the peak at the HEC-1 concentration point CP3149 and 93 percent of the UC50. Three - 60 inch diameter CMP's convey flow under Tom Darlington at this location.

For the boundary condition analysis, this effort was completed using Haestad Methods' CulvertMaster software. The analysis indicates that the culverts can handle approximately 721 cfs (*see attached*) using site specific geometry conditions. Since the tailwater elevation of this culvert will function as the upstream boundary condition of the model, a tailwater elevation obtained from the CulvertMaster program of 2266.35 ft will be used as the upstream boundary condition.

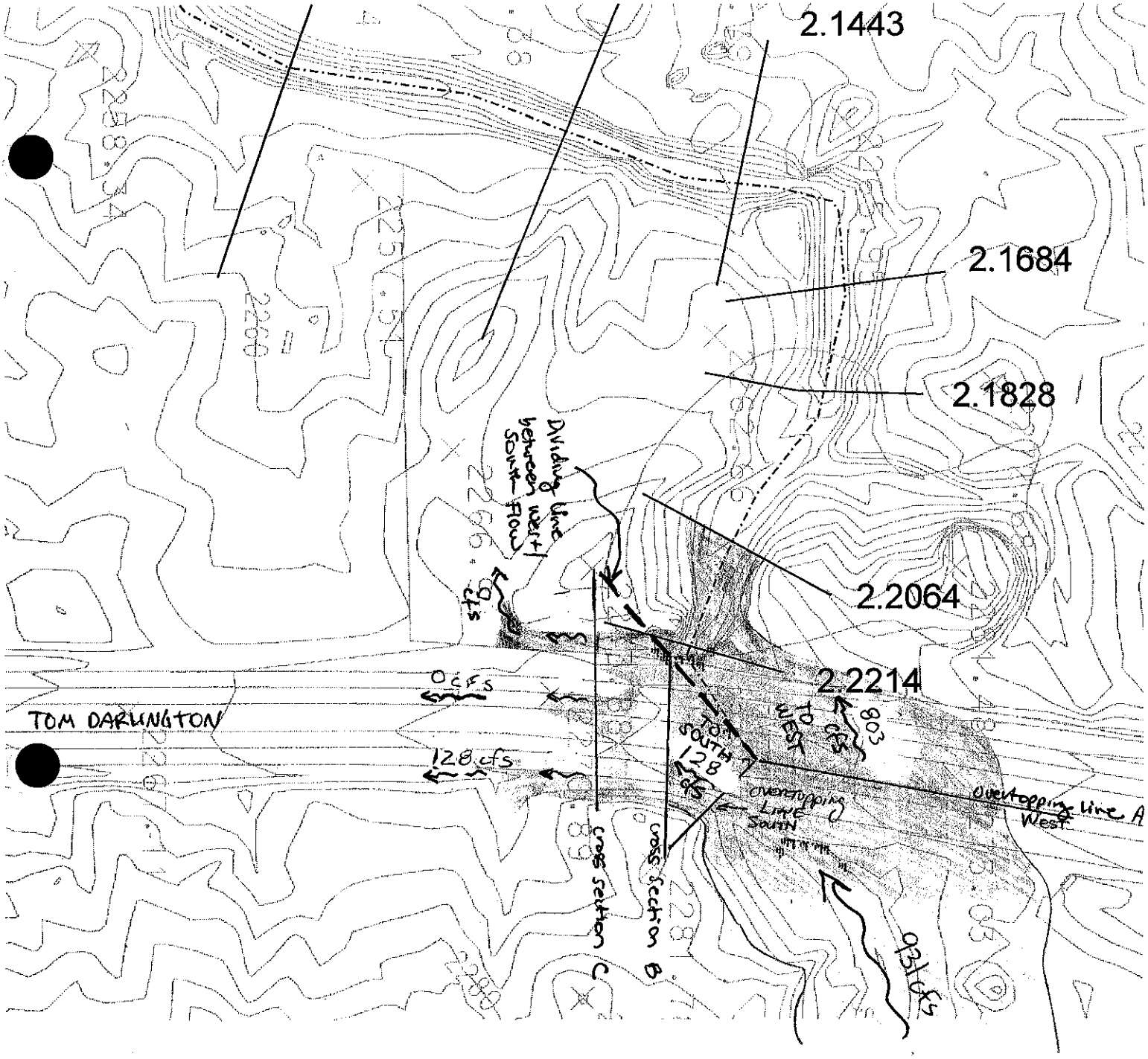
A plan view of the site (*see attached*) shows the overtopping line that the remainder of the flow, 931 cfs, will cross. The road does not have a confining dip section, so the flow that is not conveyed through the culverts will overtop road and flow both south and west, eventually joining back into the main channel. Because there is a cut section in the road at the overtopping line, not a roadside ditch, it appears that a majority, if not all, of the flow will rejoin the main channel by R.S. 2.2064 (*see attached sketch*). However, for modeling purposes, it is assumed that all of the flow is in the main channel for that entire reach as that is the more conservative assumption.

The overtopping analysis was performed to determine if the flow overtopping the road would rejoin the main channel, continue south along the west side of Tom Darlington and rejoin the main channel, or continue south along the east side of Tom Darlington and divert from the Unnamed Central Tributary to the Cave Creek floodplain model.

The results indicate that the overtopping flow will generally travel either west or south. A dividing line was established from inspection of the topography with a consideration for momentum of the overtopping flow. The amount of flow for each direction was determined by the percentage of area of each respective cross section. Several additional cross sections downstream were used to determine the amount of flow that will rejoin the

main channel, and the amount that will continue south towards the Carefree Highway intersection.

Of the 931 cfs that overtops the roadway, approximately 803 cfs will return to the main channel immediately downstream of the culvert headwall, and approximately 128 cfs will travel south, parallel to the road. The 128 cfs will continue south along the eastern roadside channel.



Boundary Condition For Flow Split —N→
Determination For Culvert No. 36

Scale 1" = 100'

Legend

2.2214 —— HEC RAS Cross Section

Culvert Designer/Analyzer Report
Number 36 Tom Darlington

Over topping Analysis, Tom Darlington

Analysis Component			
Storm Event	Design	Discharge	1,652.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,652.00 cfs	Check Discharge	1,652.00 cfs

Tailwater properties: Trapezoidal Channel

Tailwater conditions for Design Storm.			
Discharge	1,652.00 cfs	Bottom Elevation	2,261.75 ft
Depth	4.60 ft	Velocity	14.84 ft/s

Name	Description	Discharge	HW Elev.	Velocity	
Culvert-1	3-60 inch Circular	720.61 cfs	2,274.88 ft	12.71 ft/s	← Discharge of 3-60" CMP's
Weir	Roadway	930.90 cfs	2,274.88 ft	N/A	← Overtopping Roadway Discharge
Total	----------	1,651.51 cfs	2,274.88 ft	N/A	

Culvert Designer/Analyzer Report
Number 36 Tom Darlington

Component:Culvert-1 Overtopping Analysis, Tom Darlington

Culvert Summary					
Computed Headwater Elevation	2,274.88	ft	Discharge	720.61	cfs
Inlet Control HW Elev.	2,274.88	ft	Tailwater Elevation	2,266.35	ft
Outlet Control HW Elev.	2,274.25	ft	Control Type	Inlet Control	
Headwater Depth/Height	1.81				

Grades					
Upstream Invert	2,265.82	ft	Downstream Invert	2,261.75	ft
Length	155.00	ft	Constructed Slope	0.026258	ft/ft

Hydraulic Profile					
Profile	M1		Depth, Downstream	4.60	ft
Slope Type	Mild		Normal Depth	4.38	ft
Flow Regime	Subcritical		Critical Depth	4.36	ft
Velocity Downstream	12.71	ft/s	Critical Slope	0.026378	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	5.00	ft
Section Size	60 inch		Rise	5.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	2,274.25	ft	Upstream Velocity Head	2.70	ft
Ke	0.50		Entrance Loss	1.35	ft

Inlet Control Properties					
Inlet Control HW Elev.	2,274.88	ft	Flow Control	Submerged	
Inlet Type	Headwall		Area Full	58.9	ft^2
K	0.00780		HDS 5 Chart	2	
M	2.00000		HDS 5 Scale	1	
C	0.03790		Equation Form	1	
Y	0.69000				

Culvert Designer/Analyzer Report
Number 36 Tom Darlington

Component:Weir

Overtopping Analysis, Tom Darlington

Hydraulic Component(s): Roadway

Discharge	930.90	cfs	Allowable HW Elevation	2,274.88	ft
Roadway Width	146.00	ft	Overtopping Coefficient	3.04	US
Low Point	2,271.52	ft	Headwater Elevation	2,274.88	ft
Discharge Coefficient (Cr)	3.04		Submergence Factor (Kt)	1.00	
Tailwater Elevation	2,266.35	ft			

Sta (ft)	Elev. (ft)
0.00	2,281.56
35.37	2,278.50
58.10	2,271.52
79.01	2,272.85
89.70	2,273.07
111.20	2,273.08
213.55	2,274.59
308.96	2,275.80
343.24	2,276.29

Worksheet
Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.018400	ft/ft
Discharge	930.90	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.042	
Water Surface Elevation	2,272.76	ft
Elevation Range	2,268.50 to 2,281.30	
Flow Area	174.9	ft²
Wetted Perimeter	148.83	ft
Top Width	148.08	ft
Actual Depth	4.26	ft
Critical Elevation	2,272.61	ft
Critical Slope	0.025066	ft/ft
Velocity	5.32	ft/s
Velocity Head	0.44	ft
Specific Energy	2,273.20	ft
Froude Number	0.86	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+48	0.040
0+48	1+41	0.025
1+41	2+36	0.058
2+36	3+07	0.025

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	2,281.10
0+28	2,278.70
0+48	2,271.60
0+65	2,272.40
1+07	2,272.50
1+41	2,273.10
1+57	2,271.40
1+75	2,268.50

← Overtopping Line Coordinates

Worksheet
Worksheet for Irregular Channel

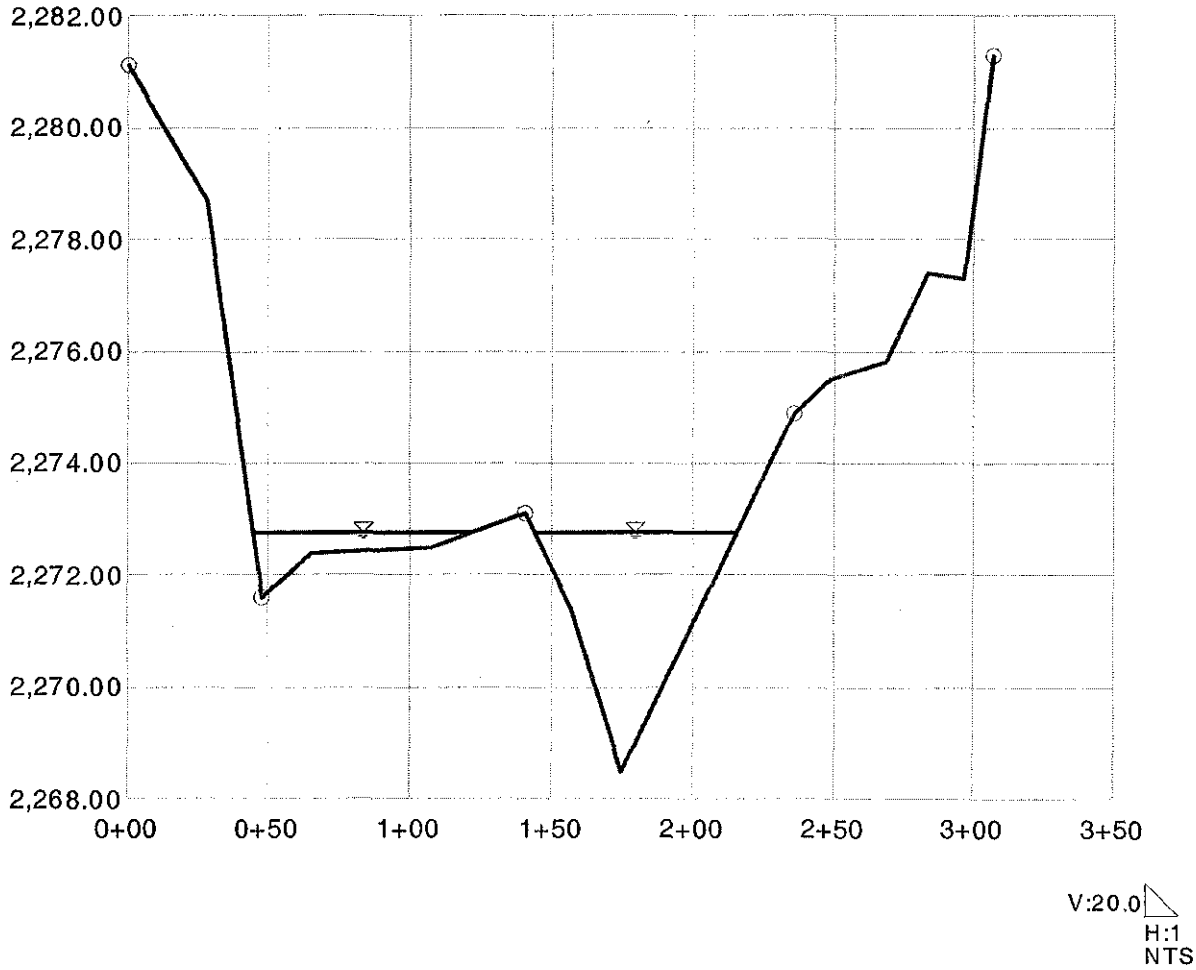
Natural Channel Points	
Station (ft)	Elevation (ft)
2+36	2,274.90
2+49	2,275.50
2+69	2,275.80
2+84	2,277.40
2+97	2,277.30
3+07	2,281.30

Cross Section
Cross Section for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.042	
Slope	0.018400	ft/ft
Water Surface Elevation	2,272.76	ft
Elevation Range	2,268.50 to 2,281.30	
Discharge	930.90	cfs



Worksheet

Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	A-South ← Overtopping Line South
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.018400	ft/ft
Water Surface Elevation	2,272.76	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.026	
Elevation Range	2,271.60 to 2,281.10	
Discharge	127.96	cfs ← Discharge at South Line
Flow Area	28.3	ft²
Wetted Perimeter	64.52	ft
Top Width	64.07	ft
Actual Depth	1.16	ft
Critical Elevation	2,272.82	ft
Critical Slope	0.012275	ft/ft
Velocity	4.53	ft/s
Velocity Head	0.32	ft
Specific Energy	2,273.08	ft
Froude Number	1.20	
Flow Type	Supercritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.23 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+48	0.040
0+48	1+09	0.025

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	2,281.10
0+28	2,278.70
0+48	2,271.60
0+65	2,272.40
1+07	2,272.50
1+09	2,272.53

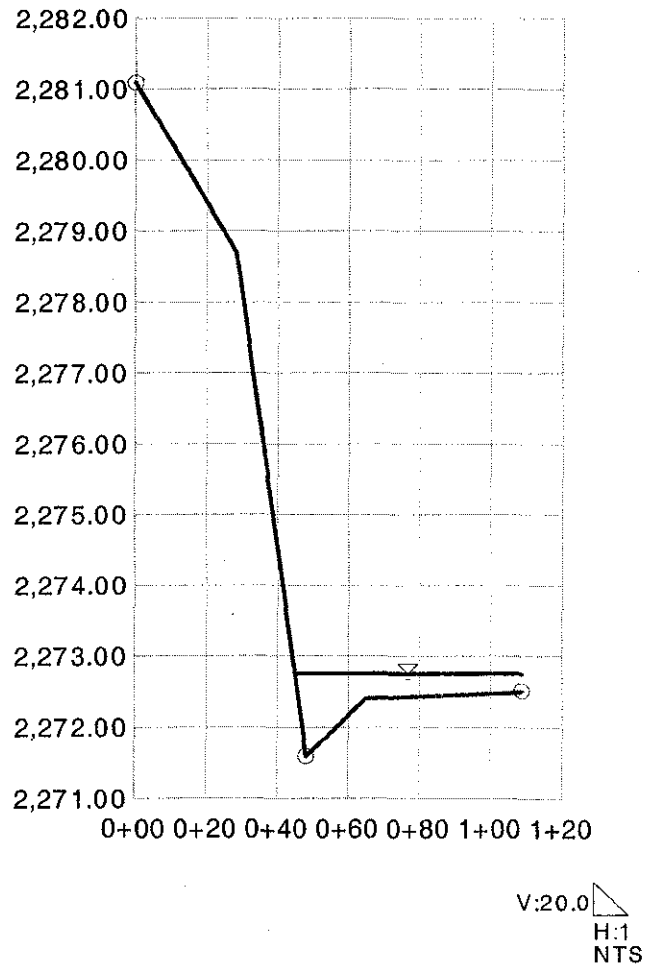
Cross Section

Cross Section for Irregular Channel

Overtopping Flow Analysis, Tom Darlington

Project Description	
Worksheet	A-South ← Overtopping Line South
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.026	
Slope	0.018400	ft/ft
Water Surface Elevation	2,272.76	ft
Elevation Range	2,271.60 to 2,281.10	
Discharge	127.96	cfs



Worksheet
Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	A-West ← overtopping Line West
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.018400	ft/ft
Water Surface Elevation	2,272.76	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.053	
Elevation Range	2,268.50 to 2,281.30	
Discharge	814.04	cfs ← Discharge at West Line
Flow Area	147.3	ft²
Wetted Perimeter	85.16	ft
Top Width	84.40	ft
Actual Depth	4.26	ft
Critical Elevation	2,272.18	ft
Critical Slope	0.033524	ft/ft
Velocity	5.53	ft/s
Velocity Head	0.47	ft
Specific Energy	2,273.23	ft
Froude Number	0.74	
Flow Type	Subcritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.23 ft.
Flow is divided.

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+09	1+41	0.025
1+41	2+36	0.058
2+36	3+07	0.025

Natural Channel Points

Station (ft)	Elevation (ft)
1+09	2,272.53
1+41	2,273.10
1+57	2,271.40
1+75	2,268.50
2+36	2,274.90
2+49	2,275.50
2+69	2,275.80
2+84	2,277.40
2+97	2,277.30

Worksheet
Worksheet for Irregular Channel

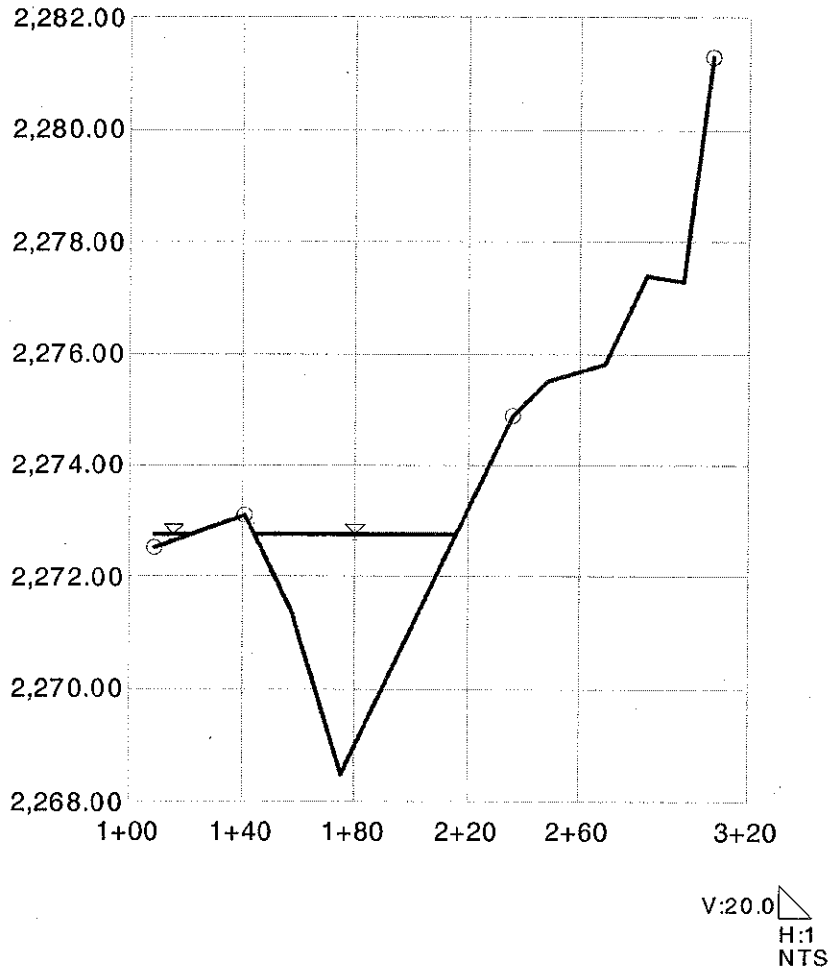
Natural Channel Points	
Station (ft)	Elevation (ft)
3+07	2,281.30

Cross Section
Cross Section for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	A-West
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.053	
Slope	0.018400	ft/ft
Water Surface Elevation	2,272.76	ft
Elevation Range	2,268.50 to 2,281.30	
Discharge	814.04	cfs



Worksheet
Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	B-with full flow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.012500	ft/ft
Discharge	127.96	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.025	
Water Surface Elevation	2,272.60	ft
Elevation Range	2,271.50 to 2,278.90	
Flow Area	33.4	ft²
Wetted Perimeter	74.18	ft
Top Width	73.83	ft
Actual Depth	1.10	ft
Critical Elevation	2,272.60	ft
Critical Slope	0.012386	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	2,272.83	ft
Froude Number	1.00	
Flow Type	Supercritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.10335529 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+31	0+50	0.040
0+50	1+21	0.025

Natural Channel Points

Station (ft)	Elevation (ft)
0+31	2,278.90
0+50	2,271.50
0+68	2,272.30
0+79	2,272.40
1+10	2,272.00
1+21	2,272.50

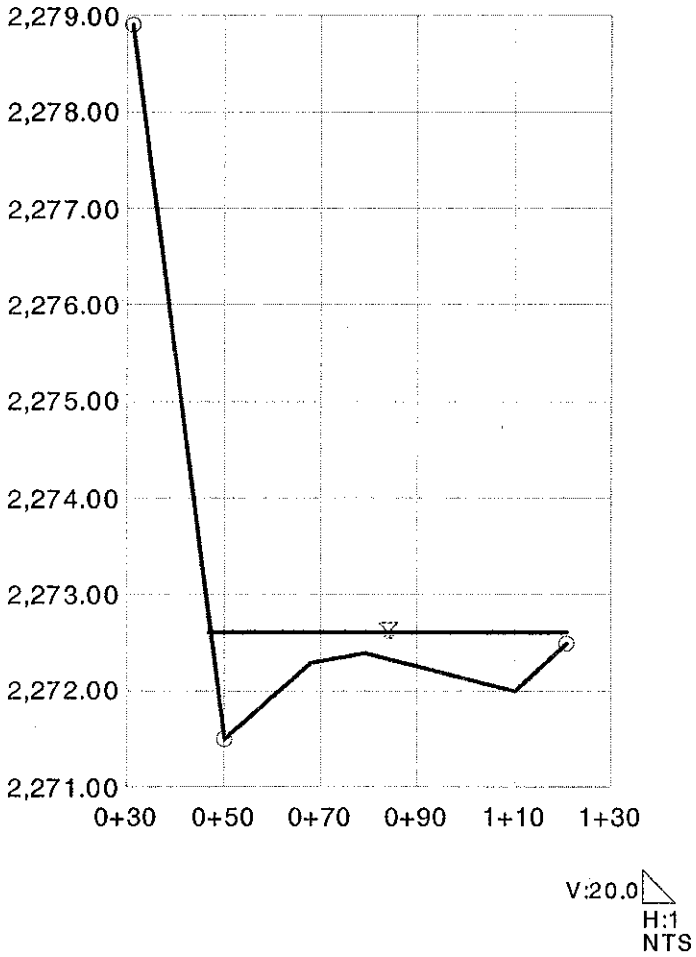
Cross Section

Cross Section for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	B-with full flow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.025	
Slope	0.012500	ft/ft
Water Surface Elevation	2,272.60	ft
Elevation Range	2,271.50 to 2,278.90	
Discharge	127.96	cfs



Worksheet
Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	C-Whole-Cross-Section
Flow Element	Irregular Channel
Method	*Manning's Formula*
Solve For	Channel Depth

Input Data	
Slope	0.012500 ft/ft
Discharge	127.96 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.058
Water Surface Elevation	2,270.25 ft
Elevation Range	2,267.80 to 2,276.50
Flow Area	39.4 ft^2
Wetted Perimeter	32.57 ft
Top Width	32.20 ft
Actual Depth	2.45 ft
Critical Elevation	2,269.68 ft
Critical Slope	0.050811 ft/ft
Velocity	3.25 ft/s
Velocity Head	0.16 ft
Specific Energy	2,270.41 ft
Froude Number	0.52
Flow Type	Subcritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+12	0+27	0.040
0+27	0+99	0.025
0+99	1+76	0.058

Natural Channel Points

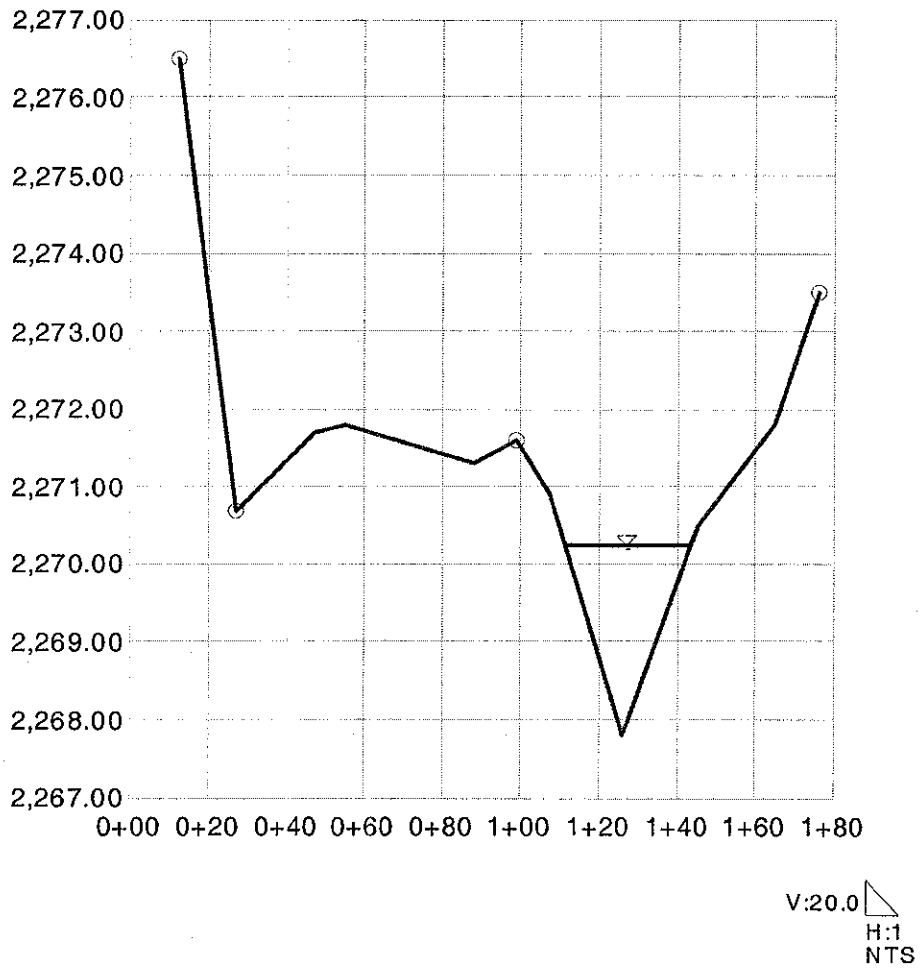
Station (ft)	*Elevation (ft)*
0+12	2,276.50
0+27	2,270.70
0+47	2,271.70
0+55	2,271.80
0+88	2,271.30
0+99	2,271.60
1+07	2,270.90
1+26	2,267.80
1+45	2,270.50
1+65	2,271.80
1+76	2,273.50

Cross Section
Cross Section for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	C-Whole-Cross-Section
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.058	
Slope	0.012500	ft/ft
Water Surface Elevation	2,270.25	ft
Elevation Range	2,267.80 to 2,276.50	
Discharge	127.96	cfs



Worksheet
Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	C-West-Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.012500	ft/ft
Water Surface Elevation	2,270.70	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.025	
Elevation Range	2,270.70 to 2,276.50	
Discharge	0.00	cfs
Flow Area	1.1e-3	ft²
Wetted Perimeter	0.23	ft
Top Width	0.23	ft
Actual Depth	0.00	ft
Critical Elevation	2,270.71	ft
Critical Slope	0.065009	ft/ft
Velocity	0.19	ft/s
Velocity Head	5.33e-4	ft
Specific Energy	2,270.71	ft
Froude Number	0.46	
Flow Type	Subcritical	

Error Messages:
Water Surface Elevation must be greater than minimum elevation.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+12	0+27	0.040
0+27	0+55	0.025

Natural Channel Points

Station (ft)	Elevation (ft)
0+12	2,276.50
0+27	2,270.70
0+47	2,271.70
0+55	2,271.80

Worksheet

Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	C-Middle-Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.012500	ft/ft
Water Surface Elevation	2,271.30	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.025	
Elevation Range	2,271.30 to 2,271.80	
Discharge	0.00	cfs
Flow Area	2.1	ft²
Wetted Perimeter	20.54	ft
Top Width	20.53	ft
Actual Depth	0.00	ft
Critical Elevation	2,271.48	ft
Critical Slope	0.020226	ft/ft
Velocity	1.43	ft/s
Velocity Head	0.03	ft
Specific Energy	2,271.53	ft
Froude Number	0.80	
Flow Type	Subcritical	

Error Messages:
Water Surface Elevation must be greater than minimum elevation.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+55	0+99	0.025

Natural Channel Points

Station (ft)	Elevation (ft)
0+55	2,271.80
0+88	2,271.30
0+99	2,271.60

Worksheet
Worksheet for Irregular Channel

Overtopping Analysis, Tom Darlington

Project Description	
Worksheet	C-East-Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.012500	ft/ft
Water Surface Elevation	2,270.25	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.058	
Elevation Range	2,267.80 to 2,273.50	
Discharge	128.59	cfs
Flow Area	39.5	ft²
Wetted Perimeter	32.63	ft
Top Width	32.26	ft
Actual Depth	2.45	ft
Critical Elevation	2,269.68	ft
Critical Slope	0.050778	ft/ft
Velocity	3.25	ft/s
Velocity Head	0.16	ft
Specific Energy	2,270.41	ft
Froude Number	0.52	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+99	1+76	0.058

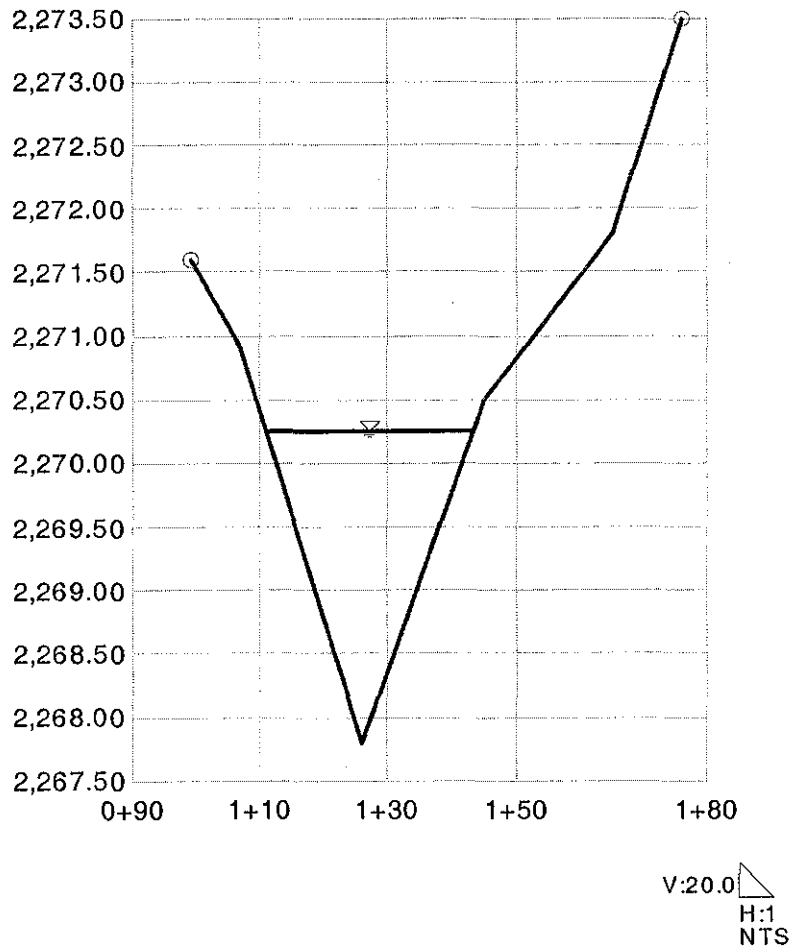
Natural Channel Points

Station (ft)	Elevation (ft)
0+99	2,271.60
1+07	2,270.90
1+26	2,267.80
1+45	2,270.50
1+65	2,271.80
1+76	2,273.50

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	C-East-Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.058	
Slope	0.012500	ft/ft
Water Surface Elevation	2,270.25	ft
Elevation Range	2,267.80 to 2,273.50	
Discharge	128.59	cfs



Terravita Way Boundary Conditions and Flow Split Determination

TO: File

COPIES: File

FROM: Tony Bokich

DATE: April 30, 2003 (Revised (3/19/04)

A hydraulic analysis was performed on Terravita Way to determine the downstream boundary condition for the Unnamed Central Tributary to Cave Creek and to determine the direction flow would travel. Flow could travel north through 4-10'x4' RCBC's, or north, south or west over Terravita Way.

The Haestad CulvertMaster program was used to determine the maximum water surface elevation at Terravita Way of 2141.45 and used as the boundary condition. This information was used to determine the maximum flow through the box culverts and overtopping flows at 4 low points along the roadway profile. Culvert and channel analyses generated a flow-rating table of box culvert and overtopping flows at four low points on the roadway profile. The analysis determined that 1,578 cfs flows through the box culvert while 142 cfs, 562 cfs, and 514 cfs will flow to the south, west, and north, respectively, of Terravita Way.

The total flow used in the analysis is 2,849 cfs. This figure omits the small side channel flow that enters the north side of the main stream about 70 feet upstream of the culvert. This wash (UC84 in the HEC-1 output) was combined at this location after the initial flow split of 2092 to the north and 704 to the south. It increased the north peak to 2116 cfs. The difference in peak flows between the overtopping analysis and the HEC-RAS flows at Terravita Way is a total of 24 cfs or 1.1% of the total flow.

The results of the flow split analysis produced rating curves that determine the flow split quantitatively. These rating curves were incorporated into the HEC-1 model. The peak flow entering the Unnamed Central Tributary to Cave Creek - North Branch is taken from concentration point CP84. The peak flow entering the South Branch is taken from RD84S and then D84IIN. Refer to the Summary of HEC-RAS Model Flow Changes table in the TDN.

Terravita Way Flow Split Estimation
03/22/2004
Carefree DMP
162944.DP.15.03

A total flow of 2849 cfs arrives at Terravita Way. The 2489 cfs flow will split at Terravita Way and will go:

1. Through the culvert to the North
2. Over the Road to the North
3. Over the Road to the West and
4. Over the Road and to the South.

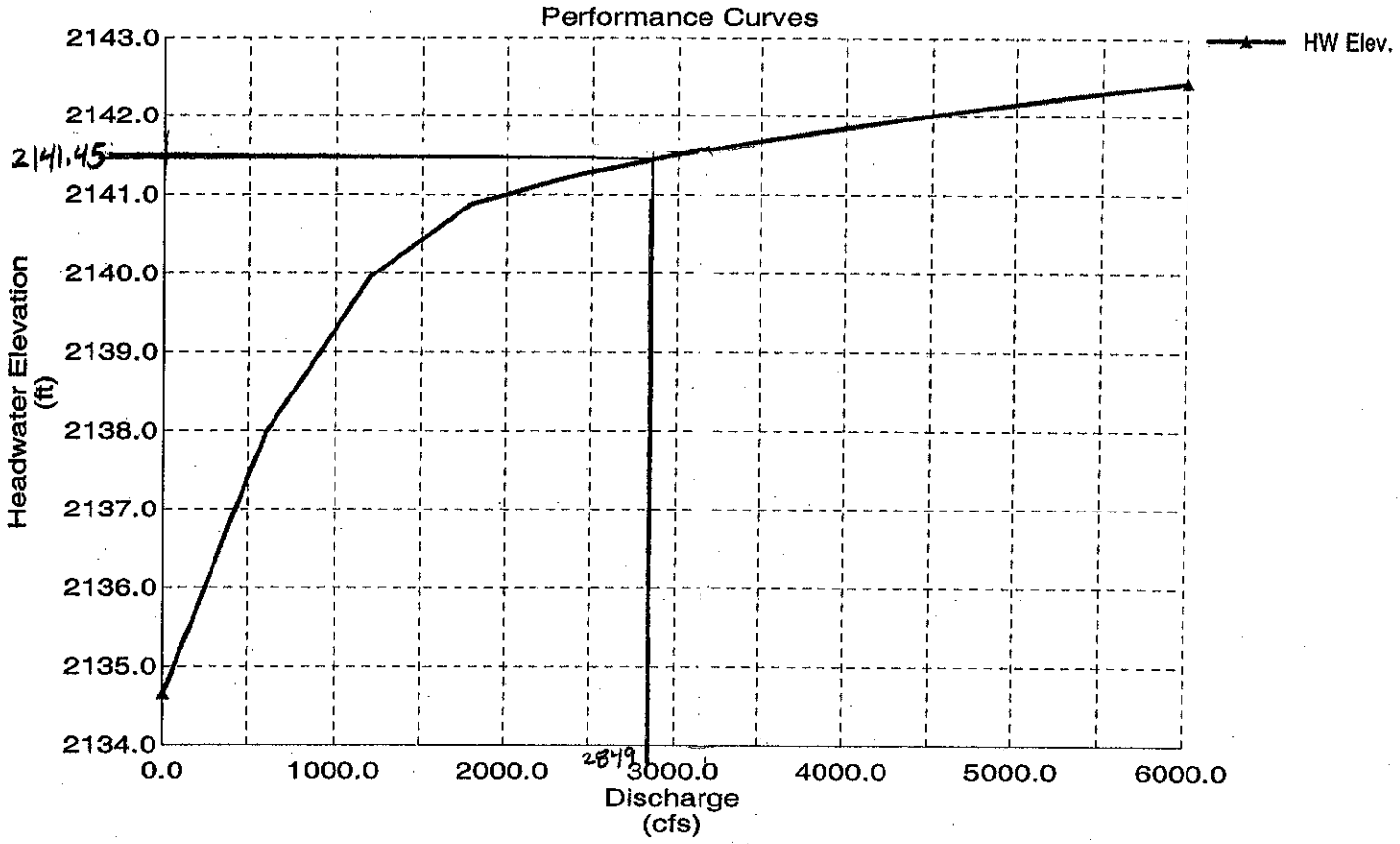
Culvert capacity was analyzed using both Culvert Master and HY-8 and the results were identical. A rating curve was developed that takes into account the headwater depths. Rating curves were developed for the total flow, culvert and overtopping and just for the culvert. The flow split was further analyzed with the Culvertmaster program at the centerline of overtopping (see attached map). This is the line at which overtopping will occur, it is not the centerline of the roadway. Using the 5 existing low points on the centerline profile, the centerline was divided into individual sections to determine the amount of flow that will go North, South, or West. A rating table was determined for each section to yield total flow for each section.

The resulting Rating Table is as follows:

WSE	Total Flow	Road	Culvert	North (Road & Culvert)	South	West
2134.64	0	0	0	0	0	0
2135.5	79.7	0	79.7	79.7	0	0
2136.55	255	0	255	255	0	0
2137.59	490	0	490	490	0	0
2138.98	880	0	880	880	0	0
2140.08	1250	50	1200	1250	0	0
2140.67	1550	175	1375	1550	0	0
2141	1964	514	1450	1839	0	125
2141.28	2475	950	1525	1992	10	375
2141.45	2849	1271	1578	2092	142	562
2141.52	3043	1443	1600	2270	150	663

Performance Curves Report
terravita way

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	6,000.00	600.00 cfs



Culvert Analysis Report
Terravita Way

Component:Culvert-1

Culvert Summary			
Computed Headwater Elevation	2,141.45 ft	Discharge	1,577.80 cfs
Inlet Control HW Elev	2,141.45 ft	Tailwater Elevation	2,133.70 ft
Outlet Control HW Elev	2,140.83 ft	Control Type	Inlet Control
Headwater Depth/ Height	1.70		

Grades			
Upstream Invert	2,134.64 ft	Downstream Invert	2,133.70 ft
Length	90.00 ft	Constructed Slope	0.010444 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	2.79 ft
Slope Type	Steep	Normal Depth	2.43 ft
Flow Regime	Supercritical	Critical Depth	3.64 ft
Velocity Downstream	14.12 ft/s	Critical Slope	0.003320 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev	2,140.83 ft	Upstream Velocity Head	1.82 ft
Ke	0.40	Entrance Loss	0.73 ft

Inlet Control Properties			
Inlet Control HW Elev	2,141.45 ft	Flow Control	Submerged
Inlet Type 3/4" chamfers; 45 ° skewed headwall		Area Full	160.0 ft²
K	0.52200	HDS 5 Chart	11
M	0.66700	HDS 5 Scale	1
C	0.04020	Equation Form	2
Y	0.73000		

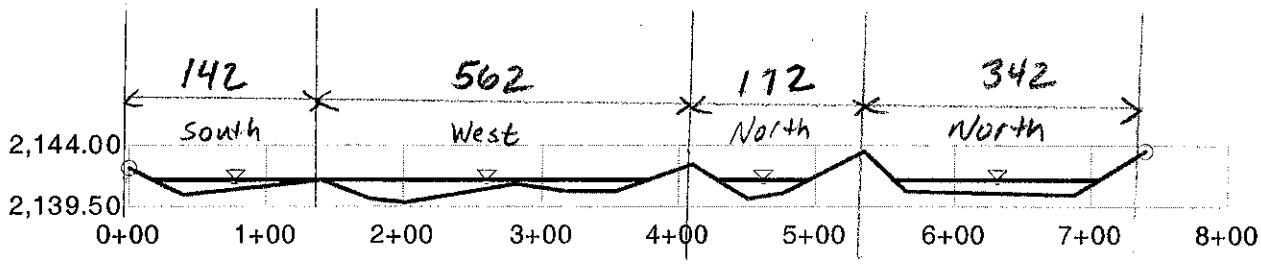
Cross Section
Cross Section for Irregular Channel

TERRAVITA WAY FLOW SPLIT ESTIMATION

Project Description	
Worksheet	Overall Roadway Section
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.035
Slope	0.005919 ft/ft
Water Surface Elevation	2,141.45 ft
Elevation Range	2,139.80 to 2,143.56
Discharge	1,271.07 cfs

Total Flow = 2849 cfs
Culvert = 1578 cfs
Road = 1271 cfs
WSE = 2141.45 ft



Roadway Profile

V:10.0
H:1
NTS

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	Overall Roadway Section
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Slope	0.005919	ft/ft
Water Surface Elevation	2,141.45	ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results		
Mannings Coefficient	0.035	
Elevation Range	2,139.80 to 2,143.56	
Discharge	1,271.07	cfs
Flow Area	453.2	ft²
Wetted Perimeter	569.63	ft
Top Width	569.39	ft
Actual Depth	1.65	ft
Critical Elevation	2,141.15	ft
Critical Slope	0.021377	ft/ft
Velocity	2.80	ft/s
Velocity Head	0.12	ft
Specific Energy	2,141.57	ft
Froude Number	0.55	
Flow Type	Subcritical	

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	7+40	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	2,142.30
0+40	2,140.35
1+40	2,141.50
1+75	2,140.05
2+01	2,139.80
2+81	2,141.14
3+17	2,140.62
3+54	2,140.62
4+10	2,142.62
4+51	2,140.08
4+76	2,140.49

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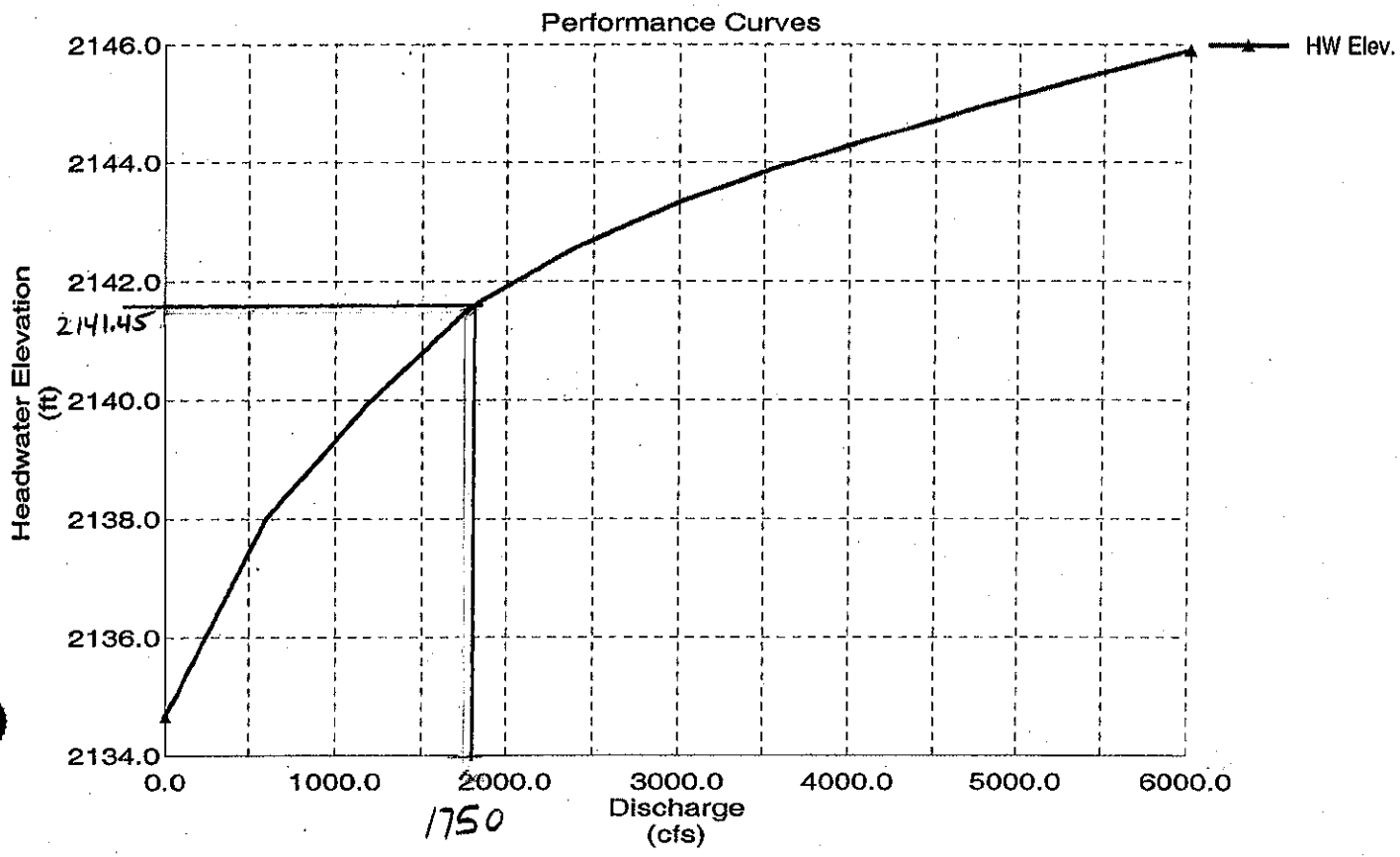
CH2M HILL
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Worksheet
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
5+35	2,143.56
5+65	2,140.58
6+88	2,140.38
7+40	2,143.50

Performance Curves Report
terravita way <north 1>

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	6,000.00	600.00 cfs



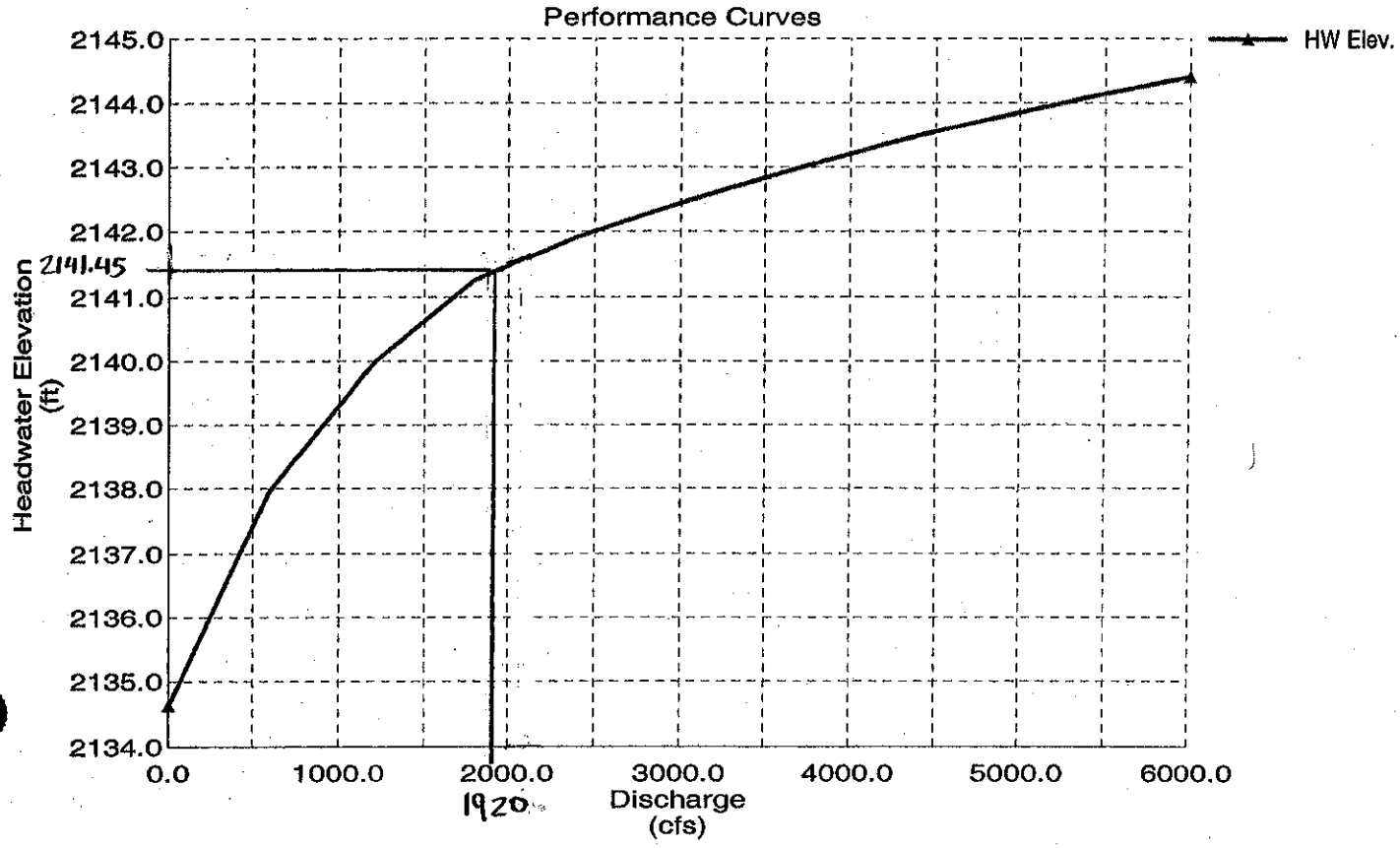
1750 - 1578 = 172 CFS

CULVERT FLOW

OVERTOPPING

Performance Curves Report
terravita way <north 2>

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	6,000.00	600.00 cfs



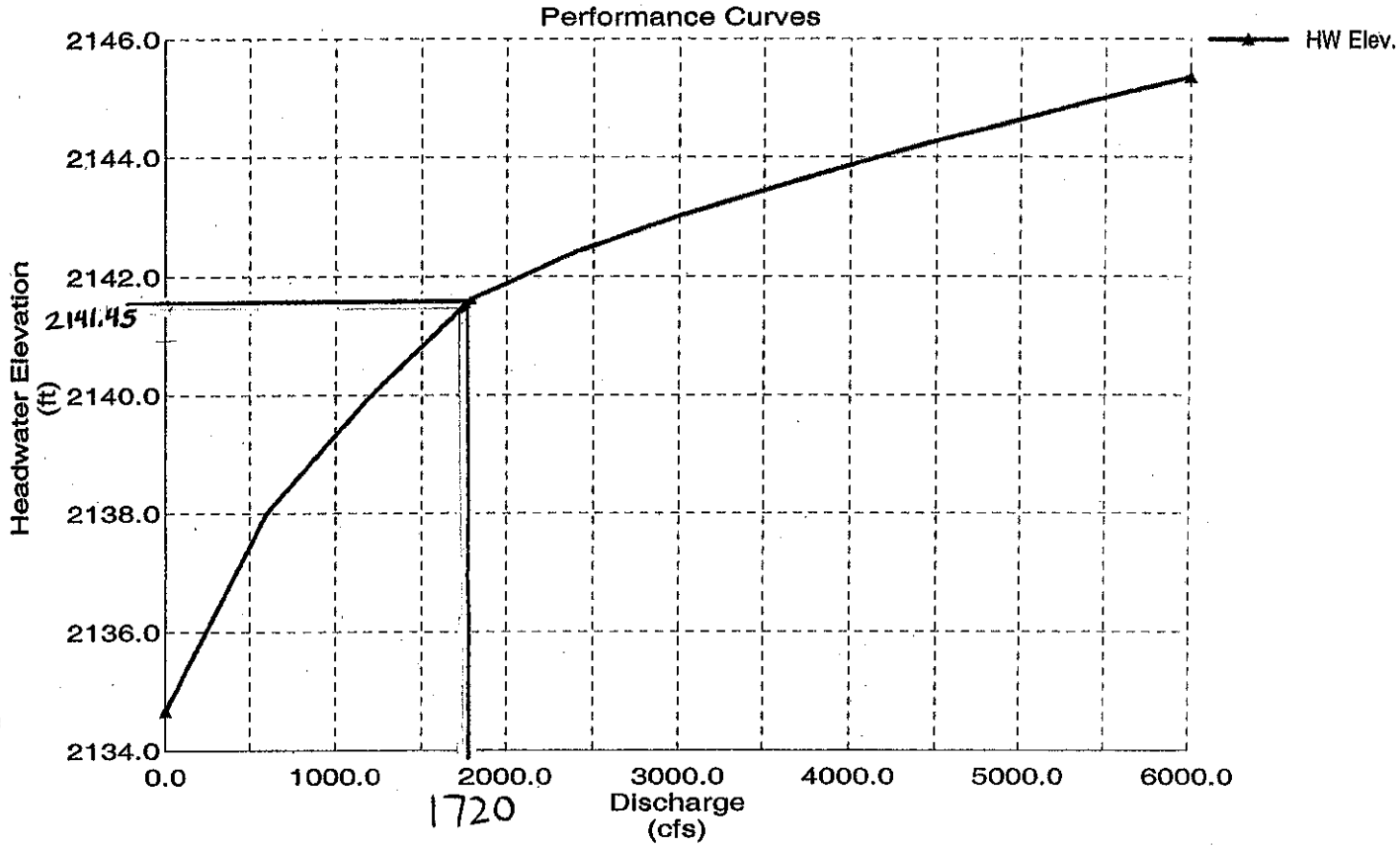
1920 - 1578 = 342 cfs

↑ CULVERT FLOW

↑ OVERTOPPING

Performance Curves Report
terravita way <south>

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	6,000.00	600.00 cfs



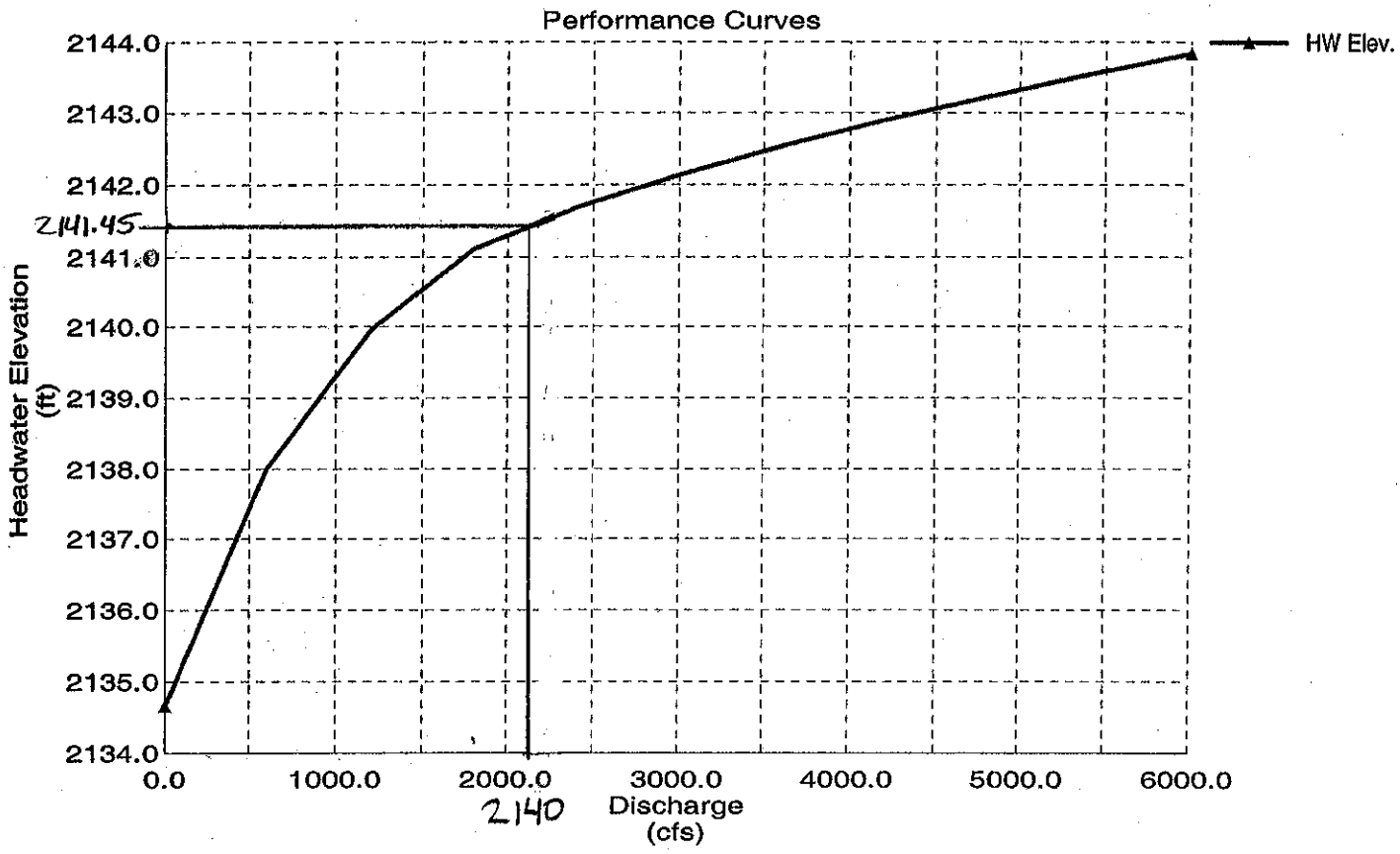
1720 - 1578 = 142 cfs

culvert flow

overtopping

Performance Curves Report
terravita way <west>

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	6,000.00	600.00	cfs

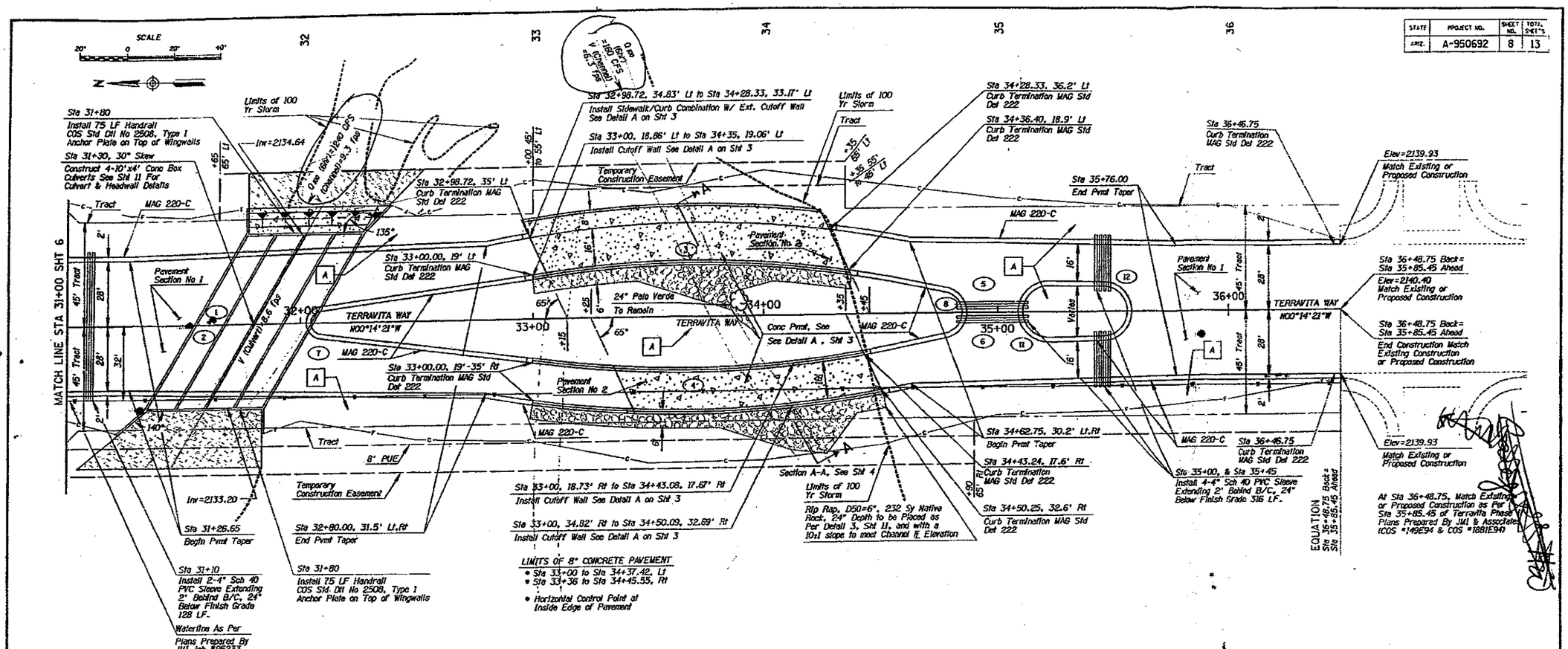


2140 − 1578 = 562 cfs

culvert flow

overtopping

STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
ARIZ.	A-950692	8	13



HORIZONTAL CONTROL-TERRAVITA WAY (All Locations At Inside EOP)						
No	Rad	Length	Tangent	Delta	PI Sta	PI Off
1	450'	58.62'	29.35'	07°27'48.58"	31+56.00	0' Lt
2	450'	58.62'	29.35'	07°27'48.58"	31+56.00	0' Lt
3	450'	150.43'	75.92'	19°09'10.30"	33+85.00	30' Lt
4	450'	150.43'	75.92'	19°09'10.30"	33+85.00	30' Rt
5	450'	91.81'	46.06'	11°41'21.80"	35+30.00	0' Lt
6	450'	91.81'	46.06'	11°41'12.80"	35+30.00	0' Lt
7	7'	18.34'	-	-	32+09.44	0' Lt
8	11'	30.18'	-	-	34+75.71	0' Lt
9	30'	47.14'	-	-	30+82.00	60' Lt
10	30'	47.14'	-	-	30+94.00	60' Rt
11	13.1'	41.85'	-	-	35+22.09	0' Lt
12	12.6'	39.10'	-	-	35+45.38	0' Lt

SURVEY MARKER Type B, MAG 120-1			
Sta	Off	Lt	Rt
31+26.65	0'	X	
31+85.35	3.84'	X	X
33+09.72	20.14'	X	X
34+55.65	14.62'	X	X
34+84.89	9.33'	X	X
35+76.06	0'	X	

SURVEY MARKER Type A, MAG 120-1			
Sta	Off	Lt	Rt
31+56.00	0'	X	
33+85.00	30'	X	X
35+30.00	0'	X	

LIST OF QUANTITIES		
Roadway Excavation	Cu Yd	2977
Aggregate Base Course (6" ABC)	Ton	842
3" Asphaltic Concrete (C-¾)	Sq Yd	2344
8" Concrete Pvmt	Sq Yd	429
Rip Rap	Sq Yd	253
Survey Marker, Type A	Each	4
Survey Marker, Type B	Each	10
Cutoff Wall	Lin Ft	560
Structure Excavation	Cu Yd	831
4" Schedule 40 PVC	Lin Ft	444
Roll Curb & Gutter, Type C	Lin Ft	1266

A See Landscape Plans for Complete Median and Roadside Design Information

Notes: 1. Transition Low Flow Crossing Grading to Natural Ground In 50' Each Side. Mesquite Trees Identified on Landscape Plans To Remain Shall Not Be Disturbed on Upstream Side.

2. DRAINAGE EASEMENT CORRIDOR as Defined Under Plat No. 553E95.

3. All Q Quantities are for 100 Year Return Storm-6 Hour Duration.

Terravita Way Construction Drawing

25719

1455E95

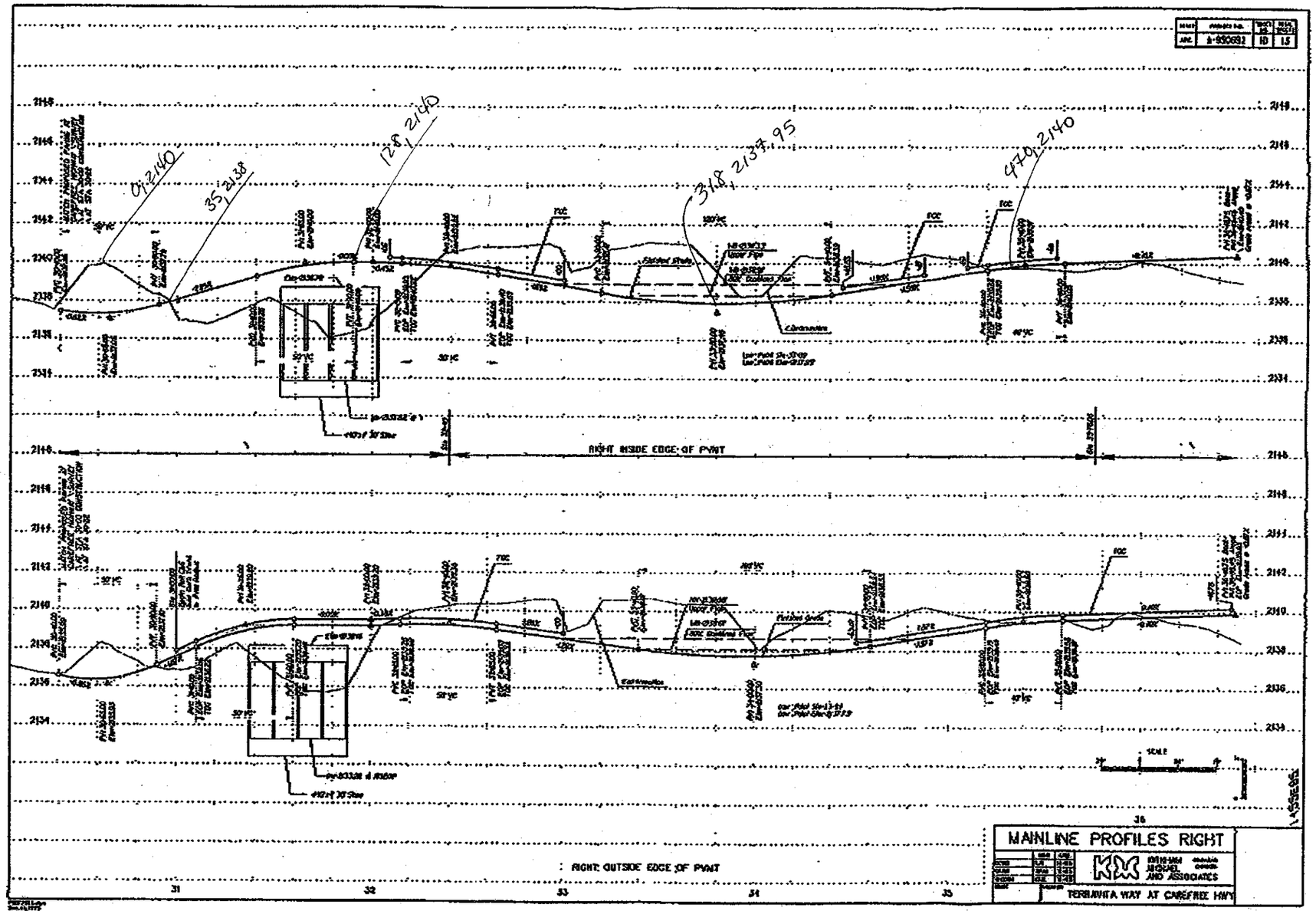
STA 31+00 TO 36+48.75

	NAME	DATE
DESIGN	LR	11-95
DRAWN	JFM	11-95
CHECKED	BJL	11-95

KIRKHAM MICHAEL AND ASSOCIATES CONSULTING ENGINEERS

ROUTE | LOCATION: TERRAVITA WAY AT CAREFREE HWY

D84



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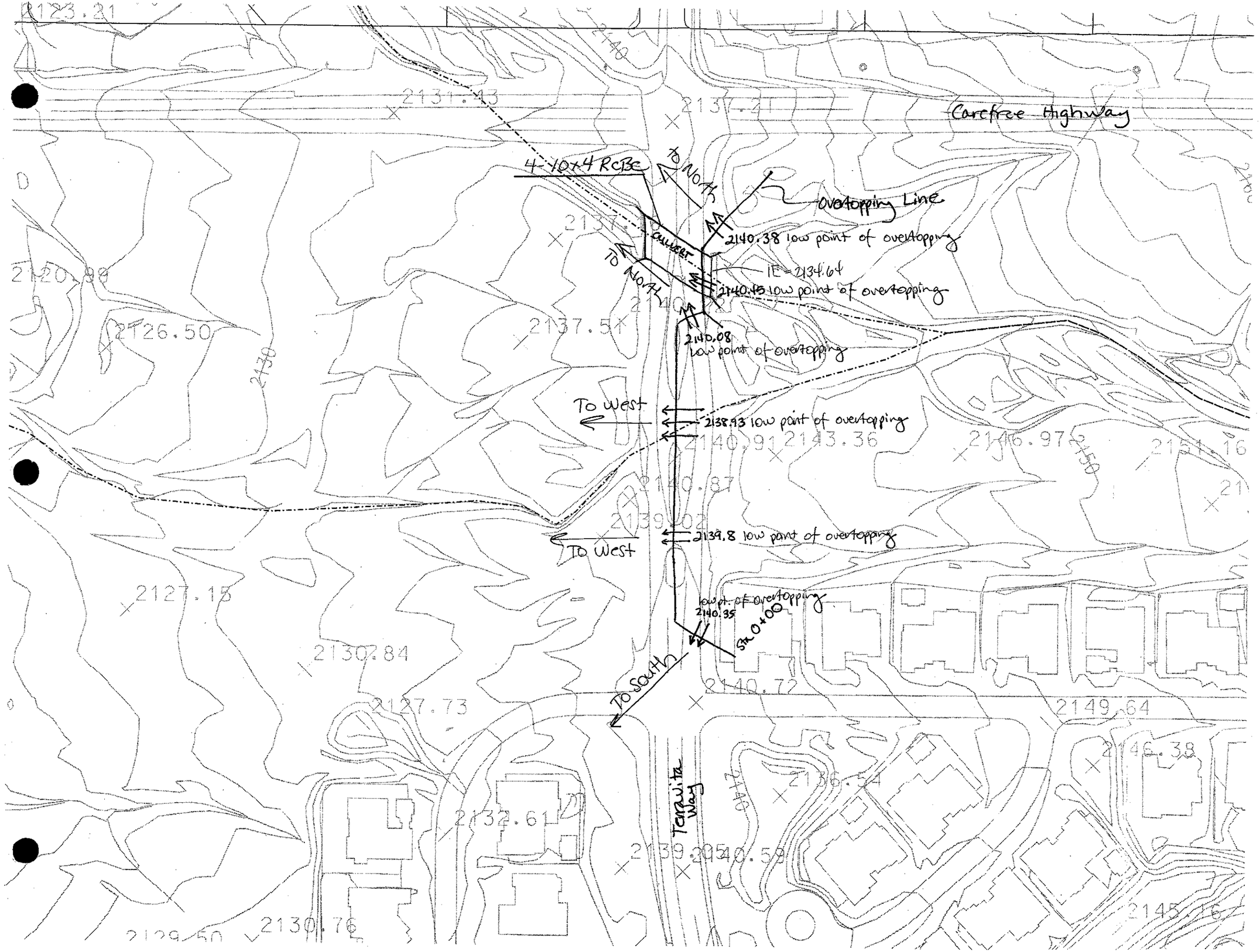
Terravita Way Roadway
Profile At Carefree
Highway



Terravita Way Flow Split Estimation

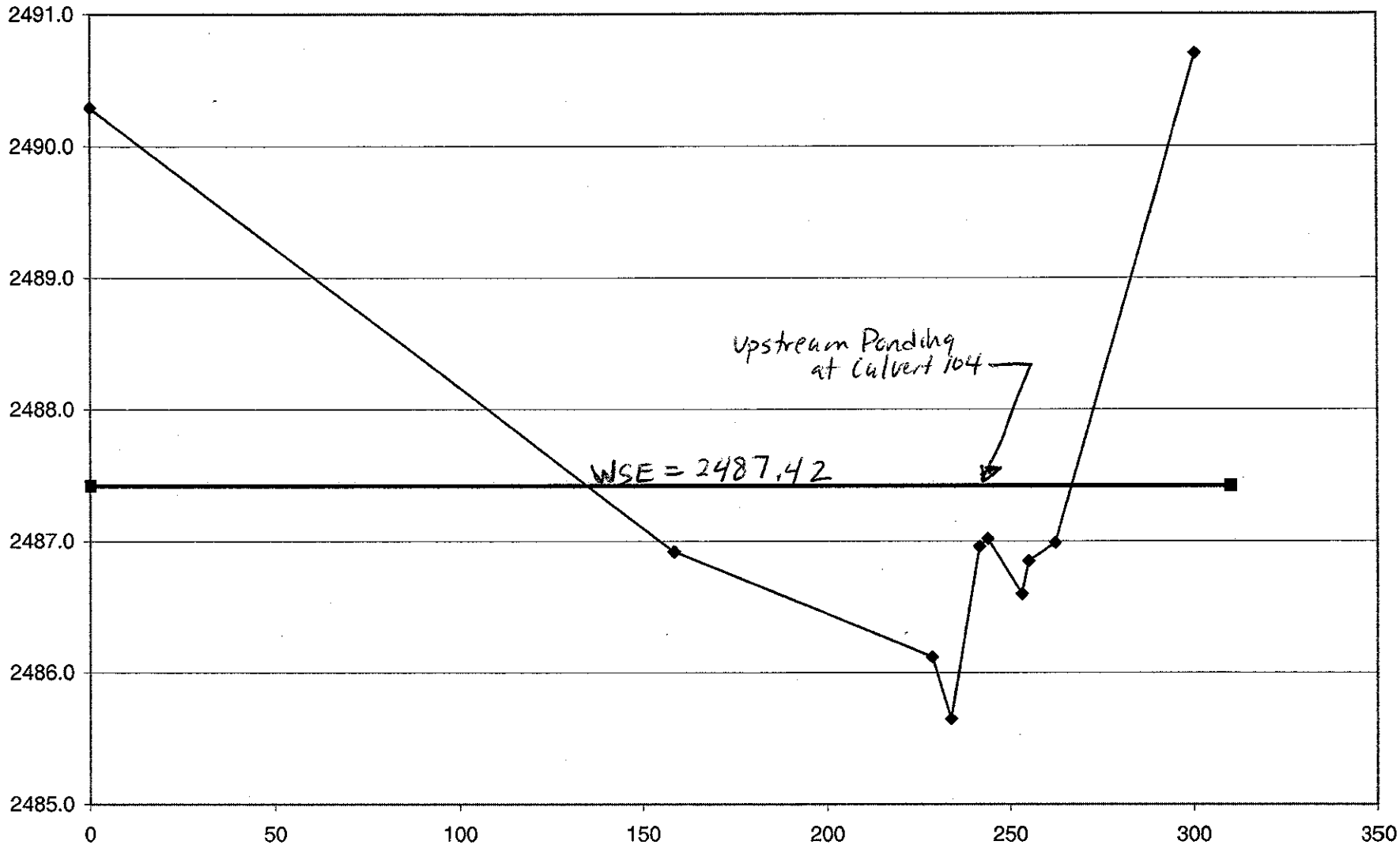
Overtopping Legend

← → 2139.8 Low Point & Low Point Elevation for overtopping

↑N

1" = 100'

Windmill Wash - Culvert 104



Culvert Designer/Analyzer Report
104

Component:Weir

Hydraulic Component(s): Roadway					
Discharge	273.28	cfs	Allowable HW Elevation	2,487.42	ft
Roadway Width	25.00	ft	Overtopping Coefficient	3.02	US
Low Point	2,485.65	ft	Headwater Elevation	2,487.42	ft
Discharge Coefficient (Cr)	3.02		Submergence Factor (Kt)	1.00	
Tailwater Elevation	2,484.03	ft			

Sta (ft)	Elev. (ft)
0.00	2,490.29
158.00	2,486.92
229.00	2,486.12
234.00	2,485.65
242.00	2,486.96
244.00	2,487.02
253.00	2,486.85
262.00	2,486.99
301.00	2,490.70

Boundary Conditions, Culvert No. 104, Windmill Wash

TO: Tony Bokich

COPIES: File

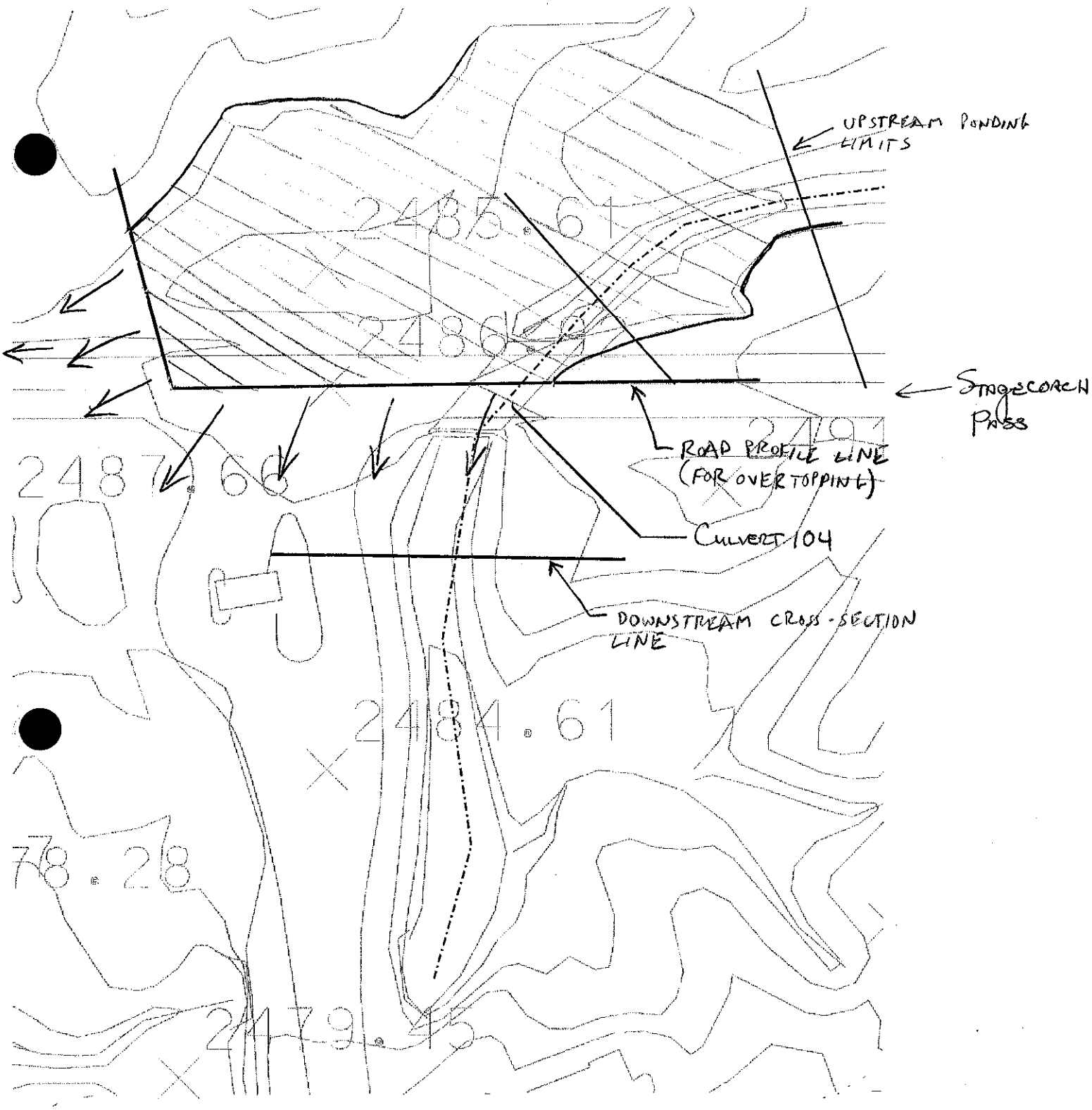
FROM: Patrick Wolf

DATE: October 29, 2002 (Revised 3/29/04)

Culvert No. 104 at Stagecoach Pass between Windmill Road and Mule Train Road exists as the downstream boundary condition for Windmill Wash. According to the hydrology of the project (*see Data Collection Report*), 338 cfs will arrive at the culvert during the 100-year event. Triple 48" corrugated metal pipes exist under Stagecoach Pass at this location.

Hydraulic analysis using Haestad Methods' CulvertMaster software indicates that the culverts can handle approximately 65 cfs (*see attached*) using site specific geometry conditions. A plan view of the site (*see attached*) shows the overtopping line that the remainder of the flow, 273 cfs, will cross. The road does not have a confining dip section, so the flow that is not conveyed through the culverts will overtop road and flow both south and west, eventually joining back into the main channel. It appears that a large amount of the flow will rejoin the main channel downstream several hundred feet (*see attached sketch*).

Since the headwater elevation of this culvert will function as the downstream boundary condition of the model, a headwater elevation obtained from the CulvertMaster program of 2487.42 will be used.



CULVERT 104, WINDMILL WASH 1" = 50' N

LEGEND

-·-·- THALWEG

— HEC RAS CROSS SECTION LOCATION

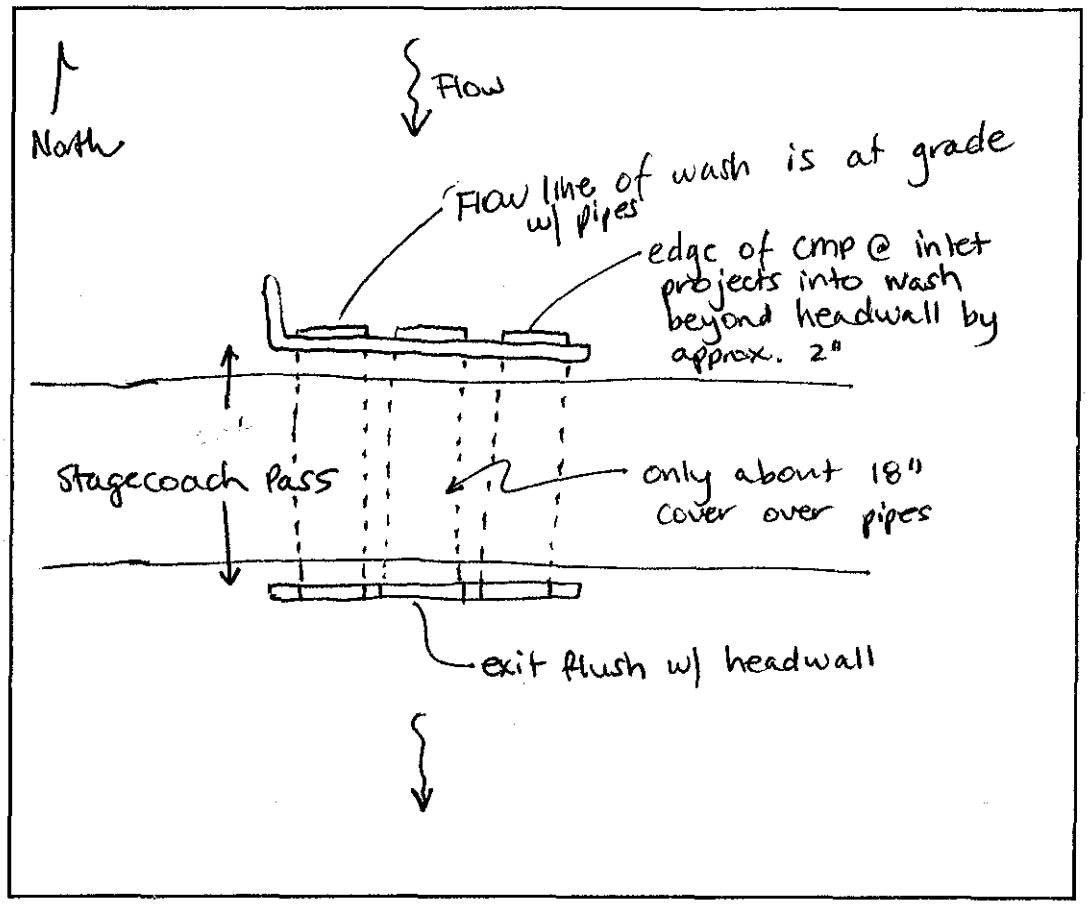
APPROXIMATE FLOODPLAIN

Carefree Drainage Master Plan
Field Survey Notes

Culvert Number: #104 - Windmill Wash

Date of Survey: 10/9/02

Location: Stagecoach Pass between Windmill Rd. and Mule Train Road



Material: Triple 48" CMP

Headwall: L-shaped inlet headwall, pipes project from headwall

Notes: Survey by L. Johnson, not much cover over pipes.

Culvert Designer/Analyzer Report
104

Windmill Wash - Culvert 104

Comments: Design Flow came from the HEC-1 Model for Unnamed Central. It is a prorated calculation adding 96% of UC29 to CP2223

Analysis Component			
Storm Event	Design	Discharge	338.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	338.00 cfs	Check Discharge	0.00 cfs

Tailwater properties: Irregular Channel

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+06	0+64	0.040
0+64	0+80	0.028
0+80	0+96	0.040

Natural Channel Points	
Station (ft)	Elevation (ft)
0+06	2,488.90
0+48	2,486.02
0+64	2,482.57
0+80	2,482.30
0+92	2,485.56
0+96	2,485.63

Tailwater conditions for Design Storm.			
Discharge	338.00 cfs	Actual Depth	1.73 ft
Velocity	9.38 ft/s		

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	3-48 inch Circular	64.96 cfs	2,487.42 ft	6.52 ft/s
Weir	Roadway	273.28 cfs	2,487.42 ft	N/A
Total	----------	338.23 cfs	2,487.42 ft	N/A

Culvert Designer/Analyzer Report
104

Component:Culvert-1

Culvert Summary					
Computed Headwater Elevation	2,487.42	ft	Discharge	64.96	cfs
Inlet Control HW Elev.	2,487.16	ft	Tailwater Elevation	2,484.03	ft
Outlet Control HW Elev.	2,487.42	ft	Control Type	Entrance Control	
Headwater Depth/Height	0.53				

Grades					
Upstream Invert	2,485.30	ft	Downstream Invert	2,484.50	ft
Length	45.00	ft	Constructed Slope	0.017778	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.24	ft
Slope Type	Steep		Normal Depth	1.24	ft
Flow Regime	Supercritical		Critical Depth	1.37	ft
Velocity Downstream	6.52	ft/s	Critical Slope	0.012113	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	4.00	ft
Section Size	48 inch		Rise	4.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	2,487.42	ft	Upstream Velocity Head	0.50	ft
Ke	0.50		Entrance Loss	0.25	ft

Inlet Control Properties					
Inlet Control HW Elev.	2,487.16	ft	Flow Control	Unsubmerged	
Inlet Type	Headwall		Area Full	37.7	ft^2
K	0.00780		HDS 5 Chart	2	
M	2.00000		HDS 5 Scale	1	
C	0.03790		Equation Form	1	
Y	0.69000				

Terravita Way Flow Diversion – Unnamed Central Tributary to Cave Creek

TO: Tony Bokich

COPIES: File

FROM: Patrick Wolf

DATE: March 19, 2003 (Revised 3-23-04)

The North and South Branch of the Unnamed Central Tributary to Cave Creek diverge downstream of Terravita Way as discussed in previous flow diversion titled "Terravita Way Flow Split Determination". The channel thalwag for the North Branch is approximately 2 feet lower than the channel thalwag for the South Branch. Consequently, the water surface profile for the North Branch is also approximately 2 feet lower than the water surface profile for the South Branch according to the HEC-RAS model results. Refer to the attached map sketches.

Although it would appear from the HEC-RAS cross sections that a levee should be added to the model along the left channel bank at x-section 0.8110, one is not required. Viewing upstream cross sections 0.8382 and 0.8717 indicate that runoff is already flowing in the extreme left portion on these channel cross sections and consequently it will also occupy this same portion of section 0.8110 even though a small topographic feature separates this flow from that of the remaining channel cross section.

Using the previous flows, it was calculated that 61 cfs spilled over the south branch into the north branch. The new flows at this location are much lower and as a result, there is no flow "spilling" back into the north branch from the south branch. The new and old weir calculations are included.

Plan: Plan 12 Unnamed Central South RS: 0.880 Lat Struct Profile: PF 1

E.G. US. (ft)	2140.51	Weir Sta US (ft)	0.00
W.S. US. (ft)	2140.31	Weir Sta DS (ft)	287.25
E.G. DS (ft)	2134.37	Weir Max Depth (ft)	0.31
W.S. DS (ft)	2134.16	Weir Avg Depth (ft)	0.18
Q US (cfs)	773.00	Weir Submerg	0.00
Q Leaving Total (cfs)	60.84	Min El Weir Flow (ft)	2134.20
Q DS (cfs)	703.00	Wr Top Wdth (ft)	287.25
Perc Q Leaving		Q Gate Group (cfs)	
Q Weir (cfs)	60.84	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Equiv (cfs)	0.00	Gate Area (sq ft)	
Q Lat RC (cfs)	0.00	Gate Submerg	
Weir Flow Area (sq ft)	52.55	Gate Invert (ft)	

Previous Flows

$Q_{weir} = 61$ cfs

Plan: Plan 02 Unnamed Central South RS: 0.880 Lat Struct Profile: PF 1

E.G. US. (ft)	2140.21	Weir Sta US (ft)	
W.S. US. (ft)	2139.82	Weir Sta DS (ft)	
E.G. DS. (ft)	2134.19	Weir Max Depth (ft)	
W.S. DS (ft)	2133.89	Weir Avg Depth (ft)	
Q US (cfs)	576.00	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	2134.20
Q DS (cfs)	576.00	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

Updated Flows

$Q_{weir} = 0$ cfs

Boundary Conditions, Culvert No. 111, Eastern Pima Wash

TO: Tony Bokich

COPIES: File

FROM: Rob Lyons

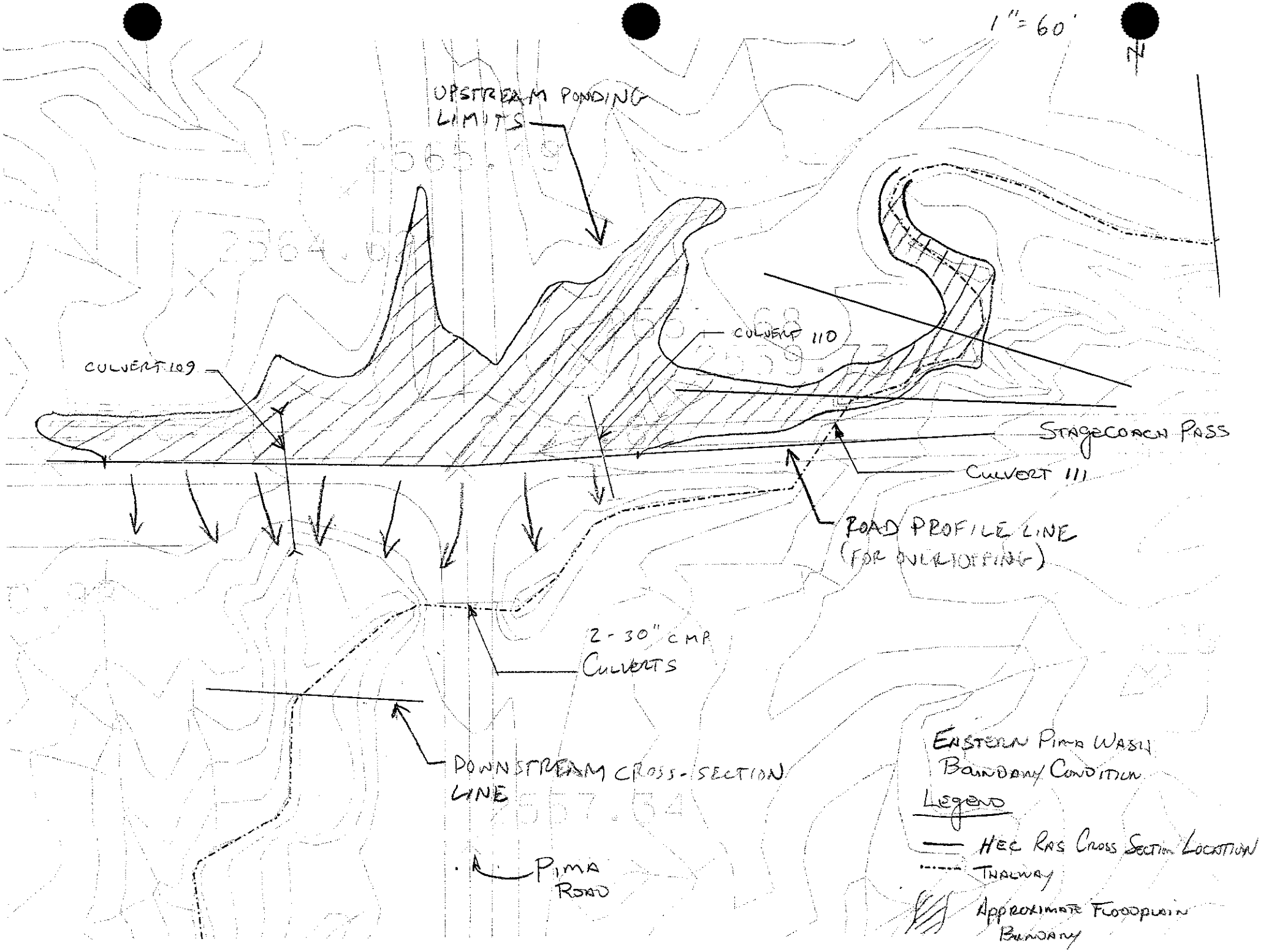
DATE: April 4, 2003

Culvert No. 111 at Stagecoach Pass near Pima Road exists as the downstream boundary condition for middle Unnamed Eastern Wash floodplain delineation. According to the hydrology of the project (*see Data Collection Report*), 323 cfs will arrive at the culvert during the 100-year event. A single 36″ CMP exists under Stagecoach Pass at this location. During a field investigation, it was observed that the culvert is almost completely plugged by sediment.

2-30″ CMPs, cross Pima Road less than 200 feet downstream of culvert 111 and would likely control the tailwater for culvert 111. A hydraulic analysis using Haestad Methods' CulvertMaster software was used to calculate the headwater for the 30″ double barrel culverts. This headwater was then used as a constant tailwater in the hydraulic analysis of culvert 111. The results indicate that the unobstructed culvert 111 can handle approximately 31 cfs (*see attached*) using site specific geometry conditions.

A second analysis was performed on the culvert using a hydraulic equivalent 12″ diameter culvert to represent the obstructed culvert. A third analysis was completed using Haestad Methods' FlowMaster software assuming the culvert was completely plugged.

A plan view of the site (*see attached*) shows the overtopping line that the flow will cross. The results of the three hydraulic analysis indicate only a very slight difference in headwater elevation between the unobstructed, obstructed and plugged conditions 2,560.46, 2,560.50 and 2560.44 respectively. Therefore, the more conservative assumption will be used as the downstream boundary condition in the HEC-RAS floodplain model, with a boundary water surface elevation of 2560.50.

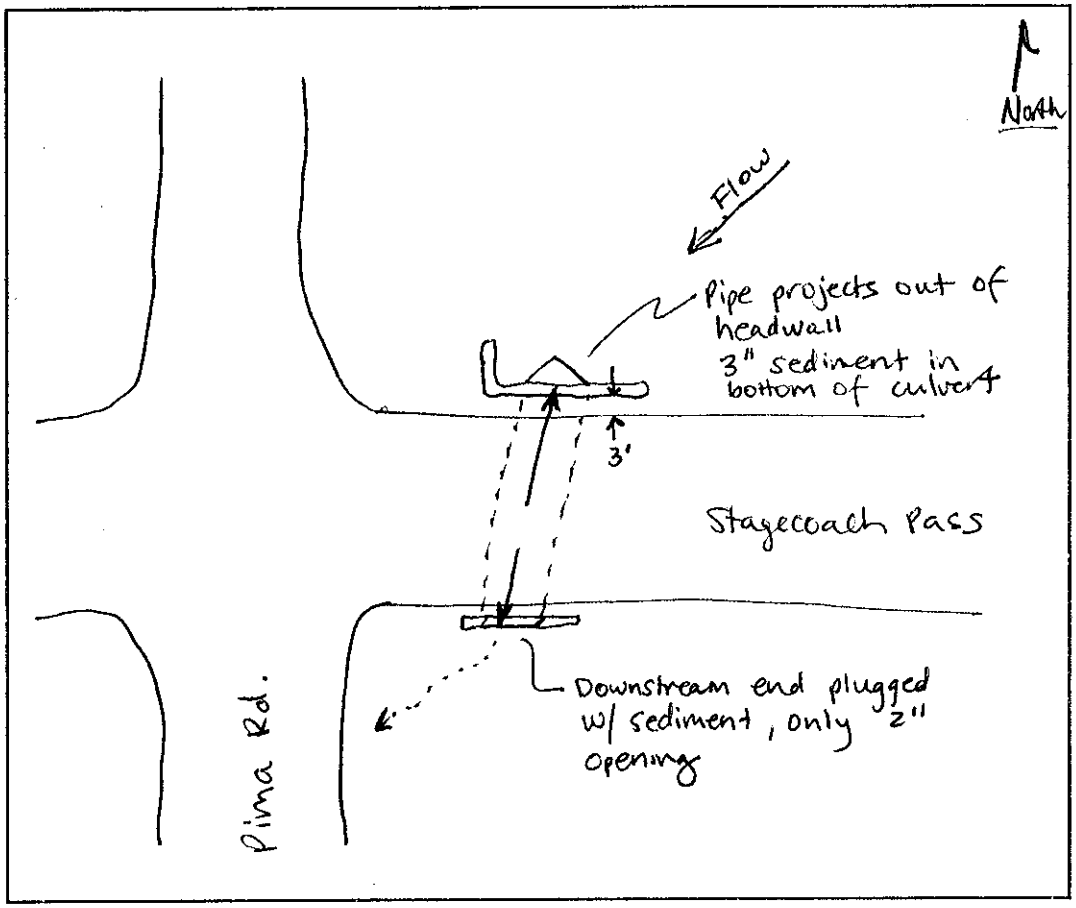

1" = 60'
N
UPSTREAM PONDING LIMITS
CULVERT 109
CULVERT 110
STAGECOACH PASS
CULVERT 111
ROAD PROFILE LINE (FOR OVERTOPPING)
2 - 30" CMP CULVERTS
DOWNSTREAM CROSS-SECTION LINE
PIMA ROAD
EASTERN PIMA WASH BOUNDARY CONDITION
Legend
HEC RAS CROSS SECTION LOCATION
THALWAY
APPROXIMATE FLOODPLAIN BOUNDARY

Carefree Drainage Master Plan
Field Survey Notes

Culvert Number: # 111

Date of Survey: 10/9/02

Location: Stagecoach Pass near Pima Road



Material: CMP - 36"

Headwall: L-shaped inlet headwall, but pipe projects into wash

Notes: Survey by L. Johnson

Culvert Designer/Analyzer Report
2-30" CMP Culverts

EASTERN PIMA WASH

Analysis Component

Storm Event	Design	Discharge	323.00 cfs

Peak Discharge Method: User-Specified

Design Discharge	323.00 cfs	Check Discharge	0.00 cfs

Tailwater properties: Irregular Channel

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+18	0+62	0.040
0+62	0+70	0.028
0+70	1+08	0.040

ANALYSIS PERFORMED TO DETERMINE CONSTANT TAILWATER FOR III

Natural Channel Points

Station (ft)	Elevation (ft)
0+18	2,557.37
0+43	2,552.38
0+44	2,552.28
0+62	2,549.77
0+65	2,550.11
0+69	2,550.24
0+70	2,550.10
0+86	2,555.22
0+92	2,555.39
1+08	2,555.86

Tailwater conditions for Design Storm.

Discharge	323.00 cfs	Actual Depth	2.17 ft
Velocity	8.97 ft/s		

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	2-30 inch Circular	93.23 cfs	2,559.34 ft	11.80 ft/s
Weir	Roadway	230.11 cfs	2,559.34 ft	N/A
Total	----------	323.34 cfs	2,559.34 ft	N/A

Culvert Designer/Analyzer Report
2-30" CMP Culverts

omponent:Culvert-1

Culvert Summary			
Computed Headwater Elevation	2,559.34 ft	Discharge	93.23 cfs
Inlet Control HW Elev.	2,559.34 ft	Tailwater Elevation	2,551.94 ft
Outlet Control HW Elev.	2,558.85 ft	Control Type	Inlet Control
Headwater Depth/Height	2.03		

Grades			
Upstream Invert	2,554.26 ft	Downstream Invert	2,551.34 ft
Length	55.00 ft	Constructed Slope	0.053091 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	1.88 ft
Slope Type	Steep	Normal Depth	1.87 ft
Flow Regime	Supercritical	Critical Depth	2.25 ft
Velocity Downstream	11.80 ft/s	Critical Slope	0.038733 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	2.50 ft
Section Size	30 inch	Rise	2.50 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	2,558.85 ft	Upstream Velocity Head	1.56 ft
Ke	0.50	Entrance Loss	0.78 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,559.34 ft	Flow Control	Submerged
Inlet Type	Headwall	Area Full	9.8 ft²
K	0.00780	HDS 5 Chart	2
M	2.00000	HDS 5 Scale	1
C	0.03790	Equation Form	1
Y	0.69000		

Culvert Designer/Analyzer Report
2-30" CMP Culverts

omponent:Weir

Hydraulic Component(s): Roadway					
Discharge	230.11	cfs	Allowable HW Elevation	2,559.34	ft
Roadway Width	25.00	ft	Overtopping Coefficient	3.01	US
Low Point	2,558.81	ft	Headwater Elevation	2,559.34	ft
Discharge Coefficient (Cr)	3.01		*Submergence Factor (Kt)*	1.00	
Tailwater Elevation	2,551.94	ft			

Sta (ft)	Elev. (ft)
0.00	2,558.81
200.00	2,558.81

INVERT ESTIMATED FROM EXISTING SURFACE FOR THE PROJECT

Culvert Designer/Analyzer Report
111-Unobstructed

EASTERN PIMA WASH

Analysis Component			
Storm Event	Design	Discharge	323.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	323.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	2,559.34 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-36 inch Circular	32.17 cfs	2,560.46 ft	4.55 ft/s
Weir	Roadway	291.13 cfs	2,560.46 ft	N/A
Total	----------	323.30 cfs	2,560.46 ft	N/A

Culvert Designer/Analyzer Report
111-Unobstructed

omponent:Culvert-1

Culvert Summary			
Computed Headwater Elevation	2,560.46 ft	Discharge	32.17 cfs
Inlet Control HW Elev.	2,559.34 ft	Tailwater Elevation	2,559.34 ft
Outlet Control HW Elev.	2,560.46 ft	Control Type	Outlet Control
Headwater Depth/Height	1.92		

Grades			
Upstream Invert	2,554.70 ft	Downstream Invert	2,553.70 ft
Length	64.00 ft	Constructed Slope	0.015625 ft/ft

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	5.64 ft
Slope Type	N/A	Normal Depth	1.87 ft
Flow Regime	N/A	Critical Depth	1.84 ft
Velocity Downstream	4.55 ft/s	Critical Slope	0.016422 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	3.00 ft
Section Size	36 inch	Rise	3.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	2,560.46 ft	Upstream Velocity Head	0.32 ft
Ke	0.90	Entrance Loss	0.29 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,559.34 ft	Flow Control	Unsubmerged
Inlet Type	Projecting	Area Full	7.1 ft²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

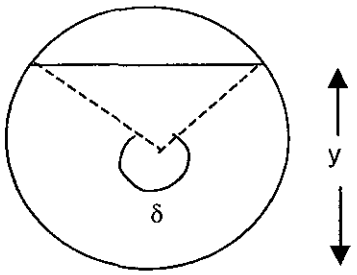
Culvert Designer/Analyzer Report
111-Unobstructed

mponent:Weir

Hydraulic Component(s): Roadway					
Discharge	291.13	cfs	Allowable HW Elevation	2,560.46	ft
Roadway Width	25.00	ft	Overtopping Coefficient	3.00	US
Low Point	2,559.53	ft	Headwater Elevation	2,560.46	ft
Discharge Coefficient (Cr)	3.00		Submergence Factor (Kt)	1.00	
Tailwater Elevation	2,559.34	ft			

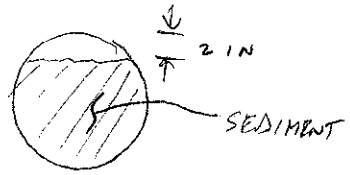
Sta (ft)	Elev. (ft)
103.00	2,561.63
116.00	2,561.23
164.00	2,560.66
187.00	2,560.40
238.00	2,559.76
247.00	2,559.71
261.00	2,559.53
272.00	2,559.66
292.00	2,559.83
296.00	2,559.85
312.00	2,559.79
316.00	2,559.82
343.00	2,559.77
358.00	2,559.86
410.00	2,560.30
417.00	2,560.30
482.00	2,560.71

EQUIVALENT DIAMETER CALCULATION FOR CULVERT 111



PIPE WAS OBSERVED TO BE ALMOST COMPLETELY PLUGGED

≈ 2 IN OPENING ON DOWNSTREAM END



Diameter =	36 in	Input
Depth =	2 in	Input
Depth =	**0.167 ft**	**Output**
A =	**0.150 sf**	**Output**
D_H =	**0.425 ft**	**Output**

FIND PIPE DIAMETER WITH EQUIVALENT HYDRAULIC CAPACITY.

$A = 0.150\ ft^2$

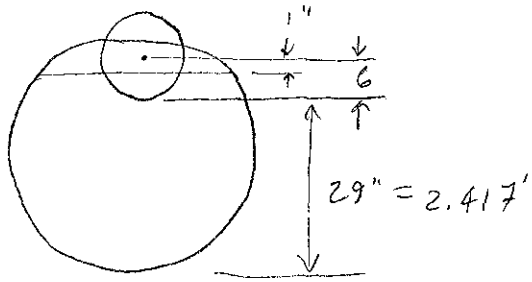
$$A = \frac{\pi D^2}{4}$$

$$0.150\ ft^2 = \frac{\pi D^2}{4}$$

$$D = 0.437\ ft$$

$$D \approx 6\ IN$$

MIN D IN CULVERT MASTER = 12"



$IE_{u/s} = 2554.7 + 2.417' = 2557.1$

$IE_{d/s} = 2553.7 + 2.417' = 2556.1$

y	δ	A	D_H
0	0	0	#DIV/0!
5.71E-05	1	9.97E-07	0.000152
0.000228	2	7.97E-06	0.000609
0.000514	3	2.69E-05	0.001371
0.000914	4	6.38E-05	0.002436
0.001428	5	0.000125	0.003806
0.002056	6	0.000215	0.00548
0.002798	7	0.000342	0.007458
0.003654	8	0.00051	0.009738
0.004624	9	0.000726	0.012322
0.005708	10	0.000995	0.015208
0.006906	11	0.001324	0.018395
0.008217	12	0.001719	0.021884
0.009642	13	0.002184	0.025674
0.011181	14	0.002727	0.029764
0.012833	15	0.003353	0.034152
0.014598	16	0.004067	0.038839
0.016476	17	0.004876	0.043824
0.018467	18	0.005785	0.049105
0.020572	19	0.0068	0.054682
0.022788	20	0.007926	0.060553
0.025118	21	0.00917	0.066718
0.027559	22	0.010537	0.073176
0.030113	23	0.012031	0.079925
0.032779	24	0.01366	0.086963
0.035556	25	0.015428	0.094291
0.038445	26	0.017341	0.101906
0.041445	27	0.019404	0.109807

Culvert Designer/Analyzer Report
111-Obstructed

Analysis Component			
Storm Event	Design	Discharge	323.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	323.00 cfs	Check Discharge	0.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	2,559.34 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	1-12 inch Circular	2.29 cfs	2,560.50 ft	2.92 ft/s
Weir	Roadway	320.35 cfs	2,560.50 ft	N/A
Total	----------	322.64 cfs	2,560.50 ft	N/A

Culvert Designer/Analyzer Report
111-Obstructed

omponent:Culvert-1

Culvert Summary			
Computed Headwater Elevation	2,560.50 ft	Discharge	2.29 cfs
Inlet Control HW Elev.	2,559.34 ft	Tailwater Elevation	2,559.34 ft
Outlet Control HW Elev.	2,560.50 ft	Control Type	Outlet Control
Headwater Depth/Height	3.40		

Grades			
Upstream Invert	2,557.10 ft	Downstream Invert	2,556.10 ft
Length	64.00 ft	Constructed Slope	0.015625 ft/ft

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	3.24 ft
Slope Type	N/A	Normal Depth	0.78 ft
Flow Regime	N/A	Critical Depth	0.65 ft
Velocity Downstream	2.92 ft/s	Critical Slope	0.024918 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	1.00 ft
Section Size	12 inch	Rise	1.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	2,560.50 ft	Upstream Velocity Head	0.13 ft
Ke	0.90	Entrance Loss	0.12 ft

Inlet Control Properties			
Inlet Control HW Elev.	2,559.34 ft	Flow Control	Unsubmerged
Inlet Type	Projecting	Area Full	0.8 ft²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Designer/Analyzer Report
111-Obstructed

mponent:Weir

Hydraulic Component(s): Roadway					
Discharge	320.35	cfs	Allowable HW Elevation	2,560.50	ft
Roadway Width	25.00	ft	Overtopping Coefficient	3.01	US
Low Point	2,559.53	ft	Headwater Elevation	2,560.50	ft
Discharge Coefficient (Cr)	3.01		Submergence Factor (Kt)	1.00	
Tailwater Elevation	2,559.34	ft			

Sta (ft)	Elev. (ft)
103.00	2,561.63
116.00	2,561.23
164.00	2,560.66
187.00	2,560.40
238.00	2,559.76
247.00	2,559.71
261.00	2,559.53
272.00	2,559.66
292.00	2,559.83
296.00	2,559.85
312.00	2,559.79
316.00	2,559.82
343.00	2,559.77
358.00	2,559.86
410.00	2,560.30
417.00	2,560.30
482.00	2,560.71

Worksheet
Worksheet for Irregular Channel

Project Description	
Worksheet	111-Road
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Channel Depth

Input Data		
Slope	010000	ft/ft
Discharg	323.00	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.035	
Water Surface Elev	2,560.44	ft
Elevation Range	59.53 to 2,561.63	
Flow Area	123.4	ft²
Wetted Perimeter	254.80	ft
Top Width	254.79	ft
Actual Depth	0.91	ft
Critical Elevation	2,560.30	ft
Critical Slope	0.023971	ft/ft
Velocity	2.62	ft/s
Velocity Head	0.11	ft
Specific Energy	2,560.55	ft
Froude Number	0.66	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
1+03	4+82	0.035

Natural Channel Points

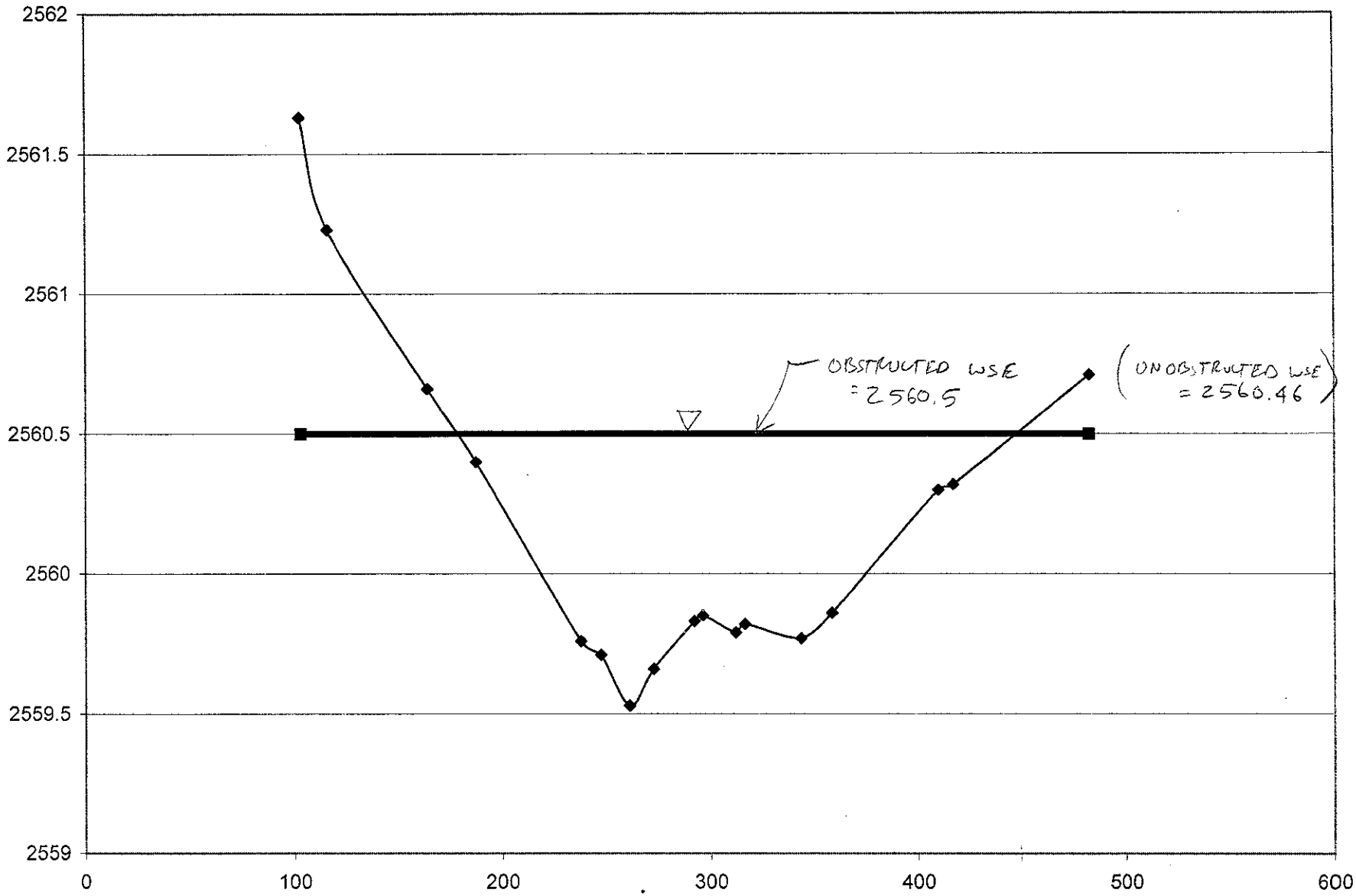
Station (ft)	Elevation (ft)
1+03	2,561.63
1+16	2,561.23
1+64	2,560.66
1+87	2,560.40
2+38	2,559.76
2+47	2,559.71
2+61	2,559.53
2+72	2,559.66
2+92	2,559.83
2+96	2,559.83
3+12	2,559.79
3+16	2,559.82
3+43	2,559.77
3+58	2,559.86
4+10	2,560.30

Worksheet
Worksheet for Irregular Channel

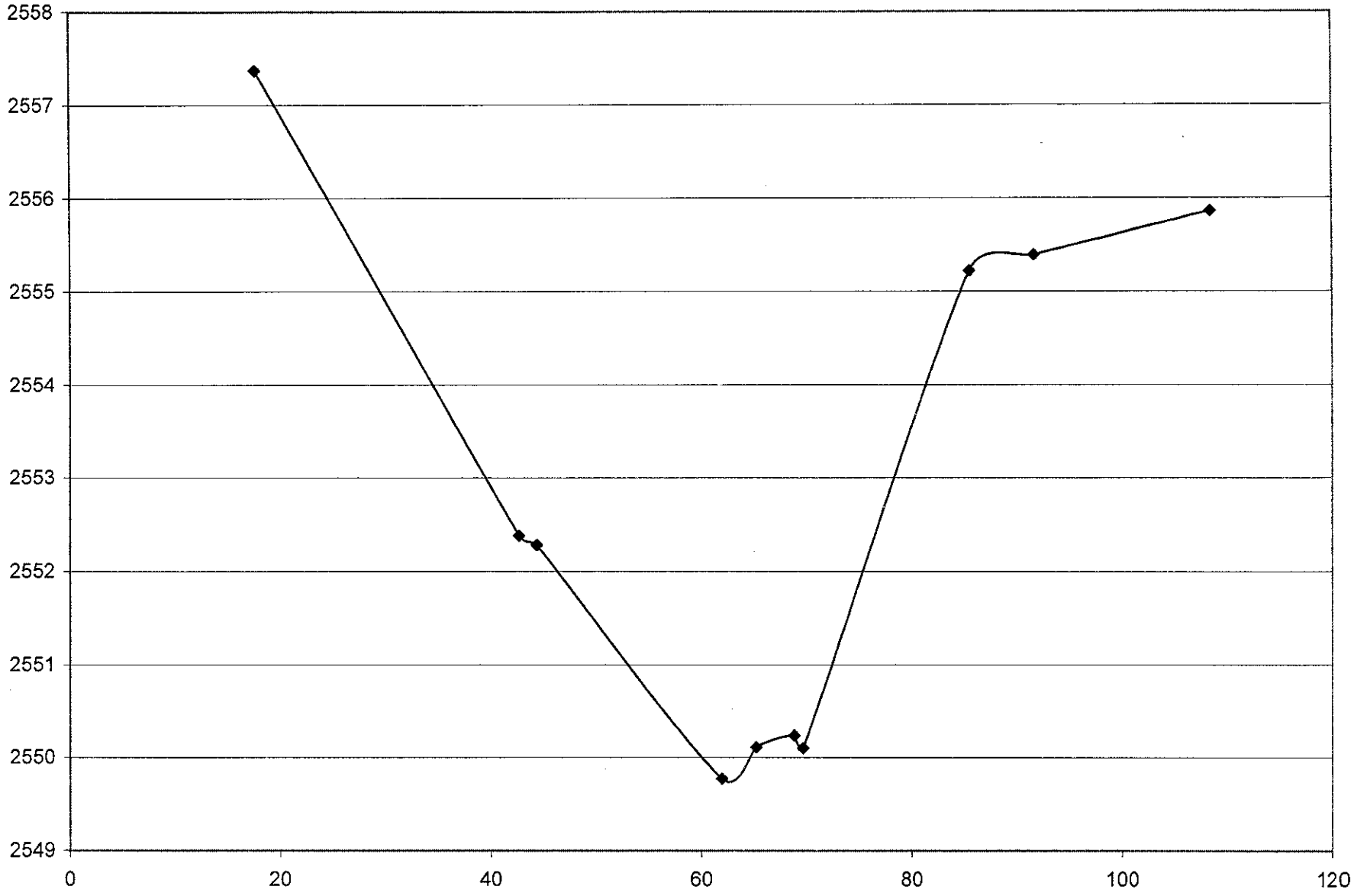
Natural Channel Points	
Station (ft)	Elevation (ft)
4+17	2,560.32
4+82	2,560.71

Notes: A composite Mannings Coefficient was used to represent the channel surface immediately upstream of the roadway crossing.

ROAD PROFILE @ 111



2-30" CMP CULVERTS - DOWNSTREAM CHANNEL X-SECTION



Carefree Technical Data Notebook

Flood Control District of Maricopa County (FCD2000C037).

May 4, 2004

This CD contains the following project files:

HEC-1 input and output files for the Unnamed Central Wash watershed including:

- 100-year 6-hour, Existing
- 100-year 24-hour, Existing
- 10-year 6-hour, Existing
- 10-year 24-hour, Existing
- 100-year 6-hour, Future
- 100-year 24-hour, Future
- 10-year 6-hour, Future
- 10-year 24-hour, Future

Naming convention example:

UC10024E.dat = Unnamed Central wash 100-year 24-hour existing condition

HEC-RAS files for the study washes including:

- Galloway Wash Middle Branch, *MG_Final.prj*
- Eastern Pima Wash, *PM_Final.prj*
- Unnamed Tributary to Stagecoach Pass Wash, *SCP_Final.prj*
- Unnamed Central Tributary to Cave Creek, *UC_Final.prj*
- Unnamed Central Tributary to Cave Creek - North and South Branch to Terravita Way, *UC_Final_NS.prj*
- Windmill Wash, *WM_Final.prj*

CAD/GIS Submittal Files including:

- Mapping
- Hydrology
- Hydraulics