Hydrology of Colter Channel

Contributory Drainage Area

July 8, 1992

DBB

LIST OF TABLES AND FIGURES

TABLES

FIGURES

APPENDICIES

Table of Contents

HYDROLOGY OF THE DRAINAGE AREA

OF COLTER CHANNEL

1. Background

The Colter Channel is an earthen drainage canal proposed to intercept stormwater runoff from 2630 acres of land north of Litchfield Park and to convey the floodwaters to the Agua Fria River. The channel is so named because the alignment runs just north of Colter Steet. The diversion of floodwaters will permit the upgrading of Camelback Road between Litchfield Road and El Mirage Road.

The drainage area of the proposed Colter Channel is included in the study area of the White Tanks Area Drainage Master Study (ADMS), which was performed by WLB, Inc. In the ADMS, flood hazard areas were identified, and 150 miles of floodplain were delineated. The hydrologic analysis performed in the ADMS was also intended to be used for investigating proposed solutions to drainage problems in the area. The design of the Colter Channel is one such application of the ADMS. Figure 1 shows an aerial photograph of the southern portion of the study area along with the proposed alignment of Colter Channel.

The hydrologic analysis of the drainage area of Colter Channel employs the HEC-1 computer model. At the request of the Flood Control District (FCD), WLB, Inc. refined the original subbasin delineations in the White Tanks ADMS and recalculated HEC-1 input parameters for the area draining toward the alignment of Colter Channel.

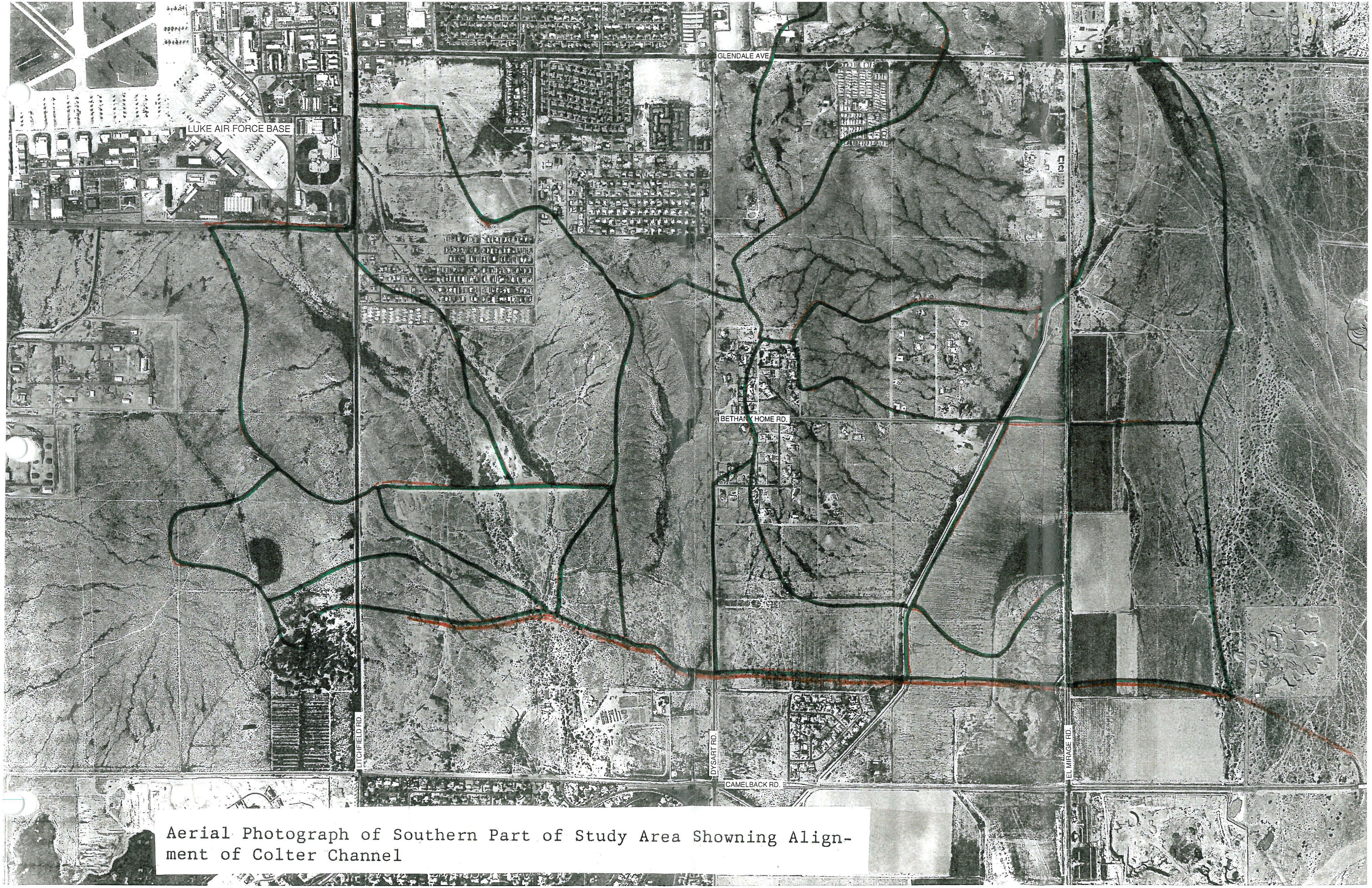
A copy of the HEC-1 model input and output is found in Appendix I, "Existing Condition". This HEC-1 model was reviewed by the FCD and found to be a reasonable representation of the existing hydrology for the Colter Channel drainage area. The methods and assumptions used to develop the Colter Channel hydrology are generally as recommended in the FCD Hydrologic Design Manual.

2. Study Purpose

This hydrologic analysis was performed to determine the required capacity of the Colter Channel under several scenarios to account for the effects of development, on-site stormwater retention, and drainage patterns. The following conditions were modeled:

1. "*Existing Condition*": examines the current relatively undeveloped condition and the existing drainage paths;

2. *Case 1*: considers full development and only minor



Aerial Photograph of Southern Part of Study Area Showning Alignment of Colter Channel changes in drainage in central subbasins of the Colter drainage area;

3. *Case 2*: considers full development with drainage pattern modifications in the eastern subbasins of Colter Channel drainage area (Wigwam Creek Subdivision);

4. *Case 3*: same as Case 2, except improvements (raising) of El Mirage Road further alter drainage pattern;

5. *Case 4*: same as "Existing Condition" in terms of imperviousness; El Mirage Road improvement is assumed as in Case 3.

There are three subdivisions currently planned within the Colter Channel drainage area: Litchfield Ridge (Amcor Investments), New Village Homes (GP Shanti Developers), and Wigwam Creek (Suncor Developers).

It was intended to analyze the effect of development without on-site retention of stormwater flows upon the required Colter Channel capacity. It was envisioned that the developers in the area might exchange a 200-foot-wide right-of-way easement for the Colter Channel for an exemption from on-site containment of stormwater runoff.

3. Existing Drainage Conditions

3.1 Model Layout and Assumptions

Delineation of subbasins used by WLB in the "Existing Condition" HEC-1 model is shown in Figure 1. Methods and assumptions used in the HEC-1 modeling are summarized below:

3.1.1 Rainfall: A 100-year, 24-hour storm of 4.03 inches depth having the SCS Type II temporal distribution was used in the analysis. The same storm was used as in the ADMS floodplain delineation for the area. An areal reduction of rainfall depth was applied as per values from the NOAA Hydro-40 Report. The HEC-1 JD record option was employed to apply an appropriate areal reduction at each subbasin concentration point. The 6-hour 100-year rainfall with a pattern of 2.2 was also used in the study, as per FCD guidelines in the Hydrologic Design Manual.

3.1.2 Rainfall Excess: The Green-Ampt option of HEC-1 was used to determine rainfall excess. The Green-Ampt input values are calculated using a WLB-developed spreadsheet based upon local soil texture data obtained in the ADMS. The spreadsheet output is presented in Appendix II.

3.1.3 Hydrograph Generation: The FCD S-Graph unit hydrograph procedure was used to generate hydrographs for each subbasin. The FCD computer program MCUHP2 was used to calculate the input parameters for S-Graphs as used in the UI records of HEC-1.

3.1.4 Flow Routing: The normal depth routing option of HEC-1 was used to route flow from one concentration point to the next. Modified Puls method was used where storage routing was required.

3.1.5 Split Flow: The flow diversion capability of HEC-1 was used to partition flow at points where it was possible for flow to go in more than one direction. The split flow rating curves were generated by a WRB spreadsheet supplied with cross section data obtained from field investigations and maps at 2 foot contour intervals as part of the White Tanks ADMS. Split flow calculations are included in Appendix III of this report.

3.2 Special Considerations

For the hydrologic analysis, it was assumed that no overflow from Dysart Drain would enter the Colter Channel drainage area. The rationale for this assumption is as follows: 1. Overflow from Dysart Drain into Subbasin 226 would pass through the Litchfield Detention Basin in Subbasin 225, delaying the flow sufficiently so as not to affect the peak flow reaching Colter Channel. 2. Overflow from Dysart Drain into Subbasin 228 is unlikely to occur; however if it does occur, the distance from Dysart Drain to Colter Channel is great enough that the impact of the overflow would come long after the peak flow in Colter Channel has occurred.

Flow into Colter Channel from Wigwam Creek Development between Concentration Point (CP) 243A and the Agua Fria River at CP 245 is significantly affected by the split flows at CP 229, CP230A, and CP 244, as shown in Figure 2. These split flows direct most flow from the drainage area between Dysart and El Mirage Roads across the low point of El Mirage Road, approximately 2500 feet north of the proposed Colter Channel alignment. Future improvements in this drainage area, such as raising El Mirage Road (Case 3) or eliminating the Airline Canal (Case 2) will have a significant effect on the capacity requirement of the Colter Channel between CP 243A and CP 245.

An approximate cross section for the Colter Channel was used in the hydrologic analysis. The assumed channel was 140 feet wide at CP 242B and 190 feet wide at CP 243A. The HEC-1 analysis may be repeated with new cross section data after a more accurate estimate of the Colter Channel cross section is available; however the resulting change in peak flows in the channel are expected to be small, and well within the range of error inherent in the entire hydrologic analysis.

3.3 Results of "Existing Condition" Modeling

The results of the "Existing Condition" HEC-1 analysis are shown in Table 1. Both 24-hr. and 6-hr. storms were used in the analysis.

TABLE 1

SUMMARY OF PEAK DISCHARGES IN COLTER CHANNEL
FROM REVISED WHITE TANKS HEC-1 MODEL
FOR "EXISTING CONDITIONS"

Concentration Point	Peak Discharge (cfs)	
	24-hr Storm	6-Hr. Storm
242B	120	90
242C	270	220
242D	490	385
242E	490	445
242F	840	770
243A	950	905
243	1040	990
245	2170	1700

A maximum peak discharge of 2170 cfs in Colter Channel occurs at CP 245 in the "Existing Condition" model with the 24-hr. storm event. Much of the additional contribution to the peak flows between CP 243 and CP 245 is from split flows crossing El Mirage Road and the Airline Canal.

4. **Future Conditions**

The most recent available development plans for Litchfield Ridge, New Village Homes, and Wigwam Creek developments were used to estimate the future areal extent of urbanization and the future drainage patterns. Development plans fcr these proposed subdivisions are included in Appendix IV. These plans were used to modify HEC-1 input parameters and to redefine subbasin boundaries to produce HEC-1 models that reasonably represent future drainage conditions. Methods and assumptions employed in the HEC-1 modeling of future conditions are detailed below:

4.1 Subbasin Boundaries: Due to future development, it was necessary to further sub-divide Subbasins 242F and 243A. Subbasin 242F is subdivided into a developed southern portion (D242F) and an undeveloped northern portion (N242F). Subbasin 243A is subdivided into three units: undeveloped NV1 and two developed sub-subasins: NV2 and NV3. Future condition boundaries are shown in Figures 2, 3 and 4.

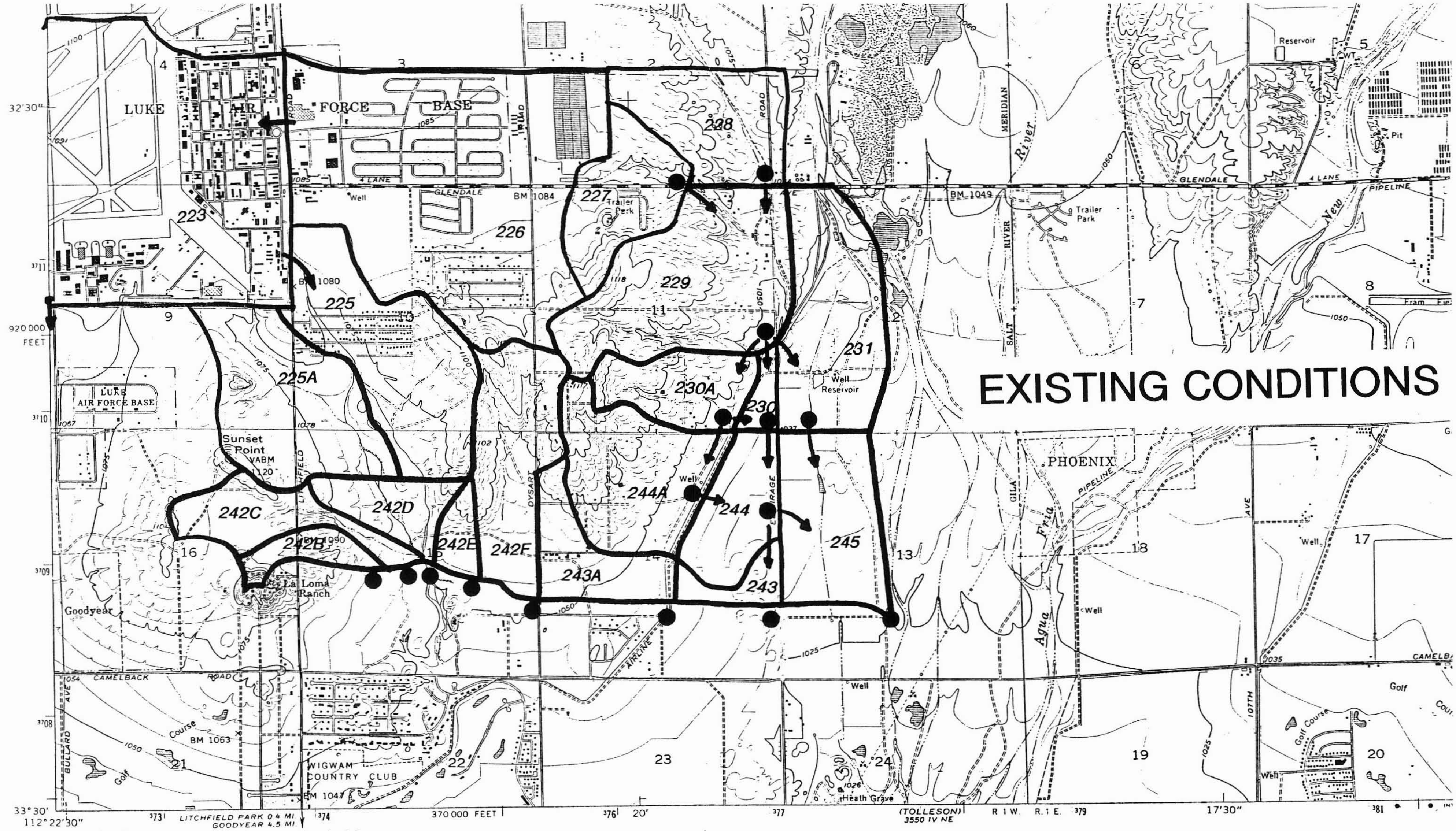
4.2 Unit Hydrographs: The Phoenix Valley S-Graph was used to generate unit hydrographs for all the new subbasins, as in the White Tanks ADMS. The unit hydrograph parameters length (L), length to centroid (Lca), and slope (S) were estimated from the development plans (Appendix V) and from the 2 foot contour interval maps produced for the White Tanks ADMS. A subbasin roughness factor (Kb)

Table

GILBERT		MESA		CHANDLER		MARICOPA CO.		PHOENIX		CaveCrFIS	Gilbert-Chandler		Tempe
Map Unit	Description	Map Unit	Description	Map Unit	Description	Map Unit	Description	Map Unit	Description	% Imp.	Land Use Category	% Imp.	
AG	Agriculture	AG	Agriculture	AG-1	Agriculture						Agriculture		Ag
		R1-90	Single Residence			RURAL-190	190,000 sq.ft./dwelling	S-1	Ranch or Farm Res.,>1 ac	15	Very Low	15	
		SR	Suburban Ranch			RURAL-70	70,000 sq.ft./dwelling	S-2	Ranch or Farm Commercial	18	Density	15	
R1-43	Rural					RURAL-43	One acre/dwelling unit	RE-43	Single Family, 1 acre min	20	Residential	15	
R1-35	Rural Residential	R1-35	Single Residence	SF-33	Single Family	R1-35	Sin.Fam.Res.,35,000sqft	RE-35	SF, 35,000 sqft min	22	Low	25	
								RE-24	SF, 24,000 sqft min	25	Density	25	
R1-20	" "			SF-18	Single Family	R1-18	SFR, 18,000 sq ft/unit	R1-18	SF, 18,000 sqft min	25	Residential	25	
R1-15	SF, Residential	R1-15	" "					R1-14	SF, 14,000 sqft min	30		25	R-15
R1-10	SF, Residential	R1-9	Single Residence	SF-10	Single Family	R1-10	SFR, 10,000 sq ft/unit	R1-10	SF, 10,000 sqft min	38	Medium	45	R1-10
R1-8	" "					R1-8	SFR, 8,000 sq ft/unit	R1-8	SF, 8,000 sqft min	45	Density	45	R1-8
R1-7	" "	R1-7	" "	SF-7	Single Family	R1-7	SFR, 7,000 sqft/unit				Residential	45	R1-7
		R1-6	" "			R1-6	SFR, 6,000 sqft/unit	R1-6	SF, 6,000 sqft min	50		45	R1-6
		TCR-1	Town Ctr, Single Family					R-0	Res. Office	50		45	RO
R-2	Duplex	R-2	Restricted Multi.Res.	MF-1	Medium Density	R-2	2 Family Residence	R-2	MF, 4,000 sqft per unit	60		65	R-2
R-3	Multi-Fam., Apartments	R-3	Ltd Multi Res.	MF-2	Multi-Family	R-3	Multi-Fam., Residential	R-3	MF, 3,000 sqft per unit	65		65	R-3R
R-4	Multi-Fam., General	R-4	General Multi Res.	MF-3	High Density	R-4	" "	R-4	MF, 1,500 sqft per unit	65	Multiple	65	R-4
R-5	Townhouse Residential					R-5	" "	R-4A	MF, 1,000 sqft per unit	70	Family	65	R-Th
								R-5	" "	70	Residential	65	RMH
MH	Mobile Home	TCR-2	TC, Restricted Multi.Res	MH-1	Mobile Homes	MHR	Manufctrd Housing, Res	CP/BP	Business Park	65		65	MHS
CTP	Commercial Trailer Park	TCR-3	TC, General Multi. Res.					R-H	Resort District	65		65	TP
C-1	Light Commercial	C-1	Neighborhood Commercial	C-1	Neighborhood Commercial	C-1	Neighborhood Commercial	C-1	Neighborhood Commercial	95		90	CCR
C-2	General Commercial	C-2	Limited Commercial	C-2	Community Commercial	C-2	Intermediate Commercial	C-2	Intermediate Commercial	95		90	C-1
C-3	Central Commercial	C-3	General Commercial	C-3	Regional Commercial	C-3	General Commercial	C-3	General Commercial	95		90	C-2
											Commercial		CCD
RS	Residential Services	OS	Office-Service			C-0	Commercial Office	C-0	Comm. Office/Rest. Comm.	75		90	
RCC	Residential Conveniences	TCC	TC,HighIntensity MixedUse					HR	High Rise District	85		90	
		TCB-1	TC, Ltd. Comm./Gen. Mnfct										
		TCB-2	TC, Gen. Comm./Lgt. Mnfct										
I-1	Garden Type Industial	M-1	Limited Industrial					IND PARK	Industrial Park	75		75	I-1
I-2	Light Industrial	M-2	General Industrial	I-1	Light Industrial	I-2	Light Industrial	A-1	Light Industrial	75	Industrial	75	I-2
I-3	General Industrial			I-2	General Industrial	I-3	Heavy Industrial	A-2	Heavy Industrial	75		75	I-3

MISCELLANEOUS CATEGORIES: These map units should be evaluated on a case by case basis.

PAD	Planned Area Development			PAD	Planned Area Development	PD	Planned Dev. Overlay	PAD	Planned Area Development	85			PCC-1
PSC-1	Planned Ngbrhd Shopping												PCC-2
PSC-2	Planned Shopping Center					CS	Planned Shopping Center	PSC	Planned Shopping Center	85			MG
IB	Industrial Buffer												IBD
		PEP	Planned Employment Park	PCO	Planned C Offices								S
		PF	Public Facilities			SU	Special Uses						
						SC	Sr Citzen Overlay	PCD	Planned Community Dev.	60			
						NUP	Ngbrhd Plan of Dev.						
						RUP	Residential Plan of Dev.						
						IUP	Industrial Plan of Dev.						
								R.O.W.	Right of Way	VARIABLE			
								P-1	Parking, Open	VARIABLE			
								P-2	Parking, Structures	VARIABLE			
								D.G.	Dwelling Group	85			



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1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue. 1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 2 meters south and 66 meters east as shown by dashed corner ticks

There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

GN MN 0°44' 13 MILS 13° 231 MILS

SCALE 1:24 000

1 MILE

7000 FEET

1 KILOMETER

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

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ARIZONA
QUADRANGLE LOCATION

FIGURE 2

of 0.025 was used for most of the developed subbasins. Appendix II shows input values used in the generation of unit hydrographs for the new subbasins.

4.3 Rainfall Loss: The developed subbasins used the same Green-Ampt parameters as calculated for the existing conditions model, except that percent imperviousness values were changed for the future land use class as per development plans for Litchfield Ridge, New Valley Homes, and Wigwam Creek. Table 2 shows the values of imperviousness used. Most of the newly developed areas were assumed to be 45 percent impervious. For developed subbasins in which development covered only a portion of the total area, the percent of the total imperviousness was prorated accordingly.

4.4 Channel Routing: Muskinghum-Cunge routing was utilized to route flows between concentration points in the new subbasins. Detailed drainage plans were not available for the new developments, so hydrologic judgement was used to estimate trapezoidal channel dimensions that would ensure reasonable depths and velocities of flow in the model output.

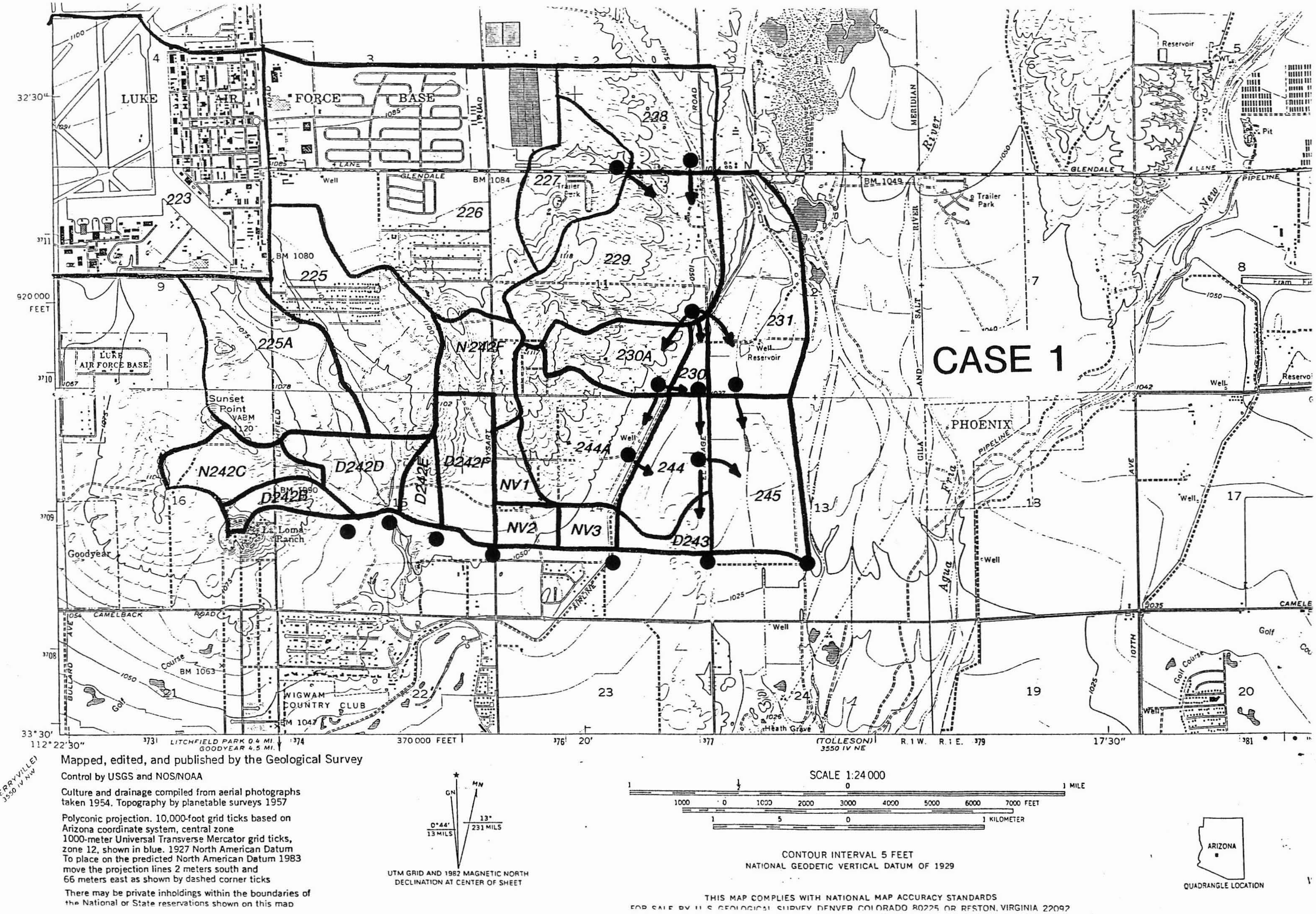
4.5 Drainage Network: Throughout most of the length of Colter Channel, inflow points from the new developments were located at the same points as in the "Existing Condition" HEC-1 model, except for New Valley Homes, where an additional inflow point was added at CP-NV2, and in Litchfield Ridge, where an inflow point was removed. These changes were made to represent future conditions more accurately.

Due to the possible split flow situations that may be caused by the proposed water features within the Wigwam Creek development, and due to the possibility that El Mirage Road may be raised, several alternative scenarios were analyzed using HEC-1. The scenarios are described below.

4.6 CASE 1:

For Case 1, it was assumed that the currently-planned new developments in the drainage area (Litchfield Ridge, New Valley Homes, and Wigwam Creek) would be exempt from on-site stormwater retention requirements. It was further assumed that drainage from these developments (except for eastern Wigwam Creek) would directly enter Colter Channel. Discharge of floodwaters outside these three developments are the same as in the "Existing Condition" model, indicating that the area remains undeveloped.

Subbasin 242 is sub-divided into developed and undeveloped sections, and Subbasin 243A is further sub-divided for the HEC-1 modeling of future conditions. In all future conditon scenarios, drainage from Subbasin 242C reaches Colter Channel via Subbasin 242D due to the planned drainage modifications in Litchfield Ridge. Case 1 subbasin delineations and flow patterns are shown in Figure 3. The prefix "D" in a subbasin name indicates it is developed in the future


CASE 1
LUKE AIR FORCE BASE
223
225
225A
226
227
228
229
230
230A
231
244
244A
245
N242C
N242F
D242B
D242D
D242E
D242P
D243
NV1
NV2
NV3
Sunset Point
La Loma Ranch
Goodyear
PHOENIX
GLENDALE
CAMELBACK ROAD
WIGWAM COUNTRY CLUB
Trailer Park
Reservoir
Well
Heath Grave
Agua Fria
Salt River
Gila and Salt River Meridian
New River
920 000 FEET
370 000 FEET
33°30'
112°22'30"
LITCHFIELD PARK 0.4 MI.
GOODYEAR 4.5 MI.
(TOLLESON)
3550 IV NE
(PERRYVILLE)
3550 IV NW
R.1 W.
R.1 E.
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UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
SCALE 1:24 000
CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
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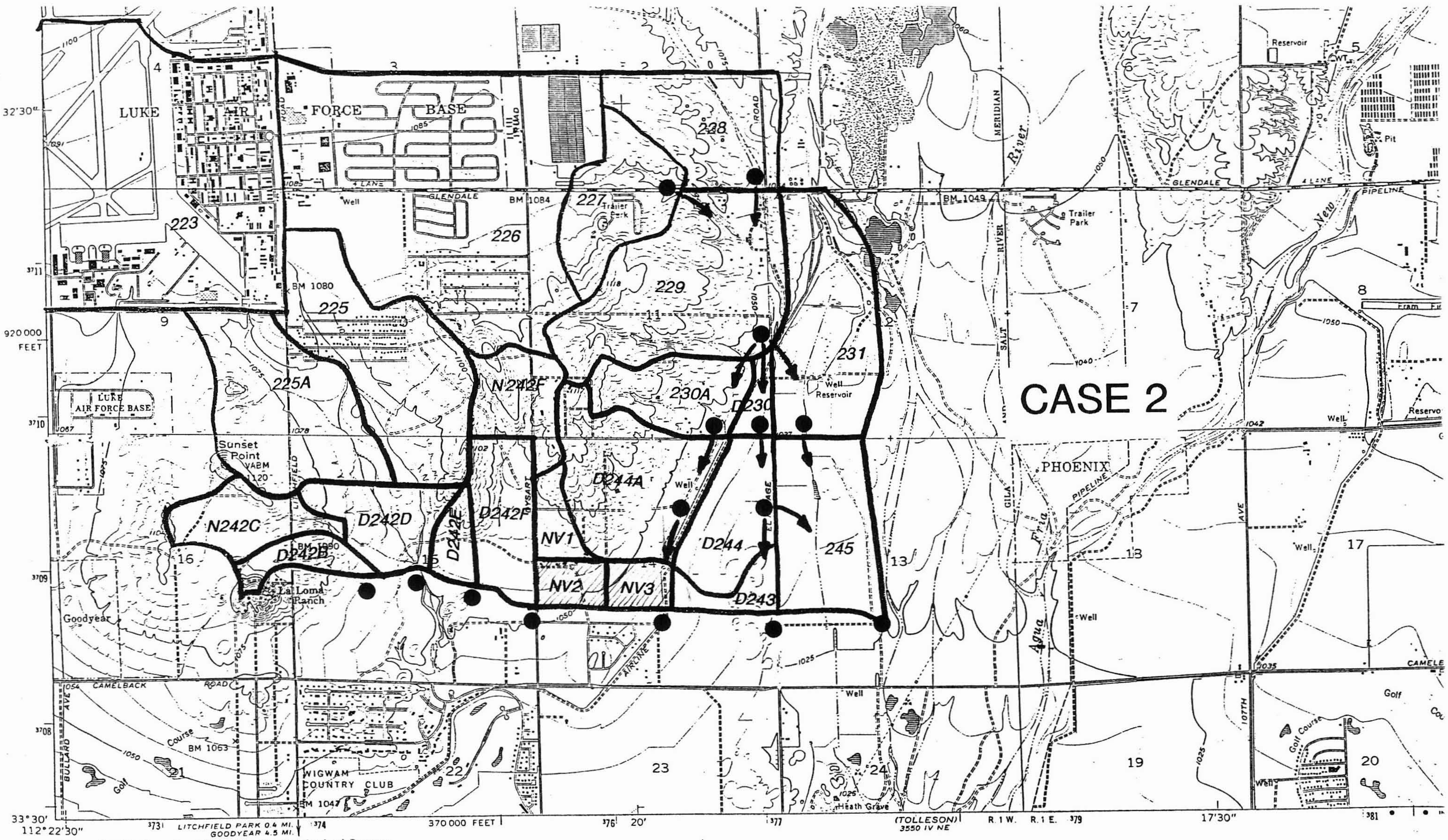
ARIZONA
QUADRANGLE LOCATION

FIGURE 3



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QUADRANGLE LOCATION

FIGURE 4

Suncor's Wigwam Creek Development
New Village Homes

condition; "NV" stands for New Valley, and "N" refers to the undeveloped condition.

For Wigwam Creek Subdivision, only Subbasin 243 drains directly to Colter Channel. See Figure 3. The same hydrographs as in the "Existing Condition" model for Subbasins 230 and 244 continue to discharge eastward across El Mirage Road under the Case 1 scenario. In the "Existing Condition" model, floodwaters crossing Airline Canal from Subbasin 244 contribute significantly to peak flows reaching Colter Channel. This condition results in the highest peak flows possible for the future condition. Future development with retention will result in a smaller hydrograph.

The HEC-1 input listing, schematic diagram of stream network, and runoff summary output are provided in Appendix V-A for the Case 1 scenario.

4.7 CASE 2:

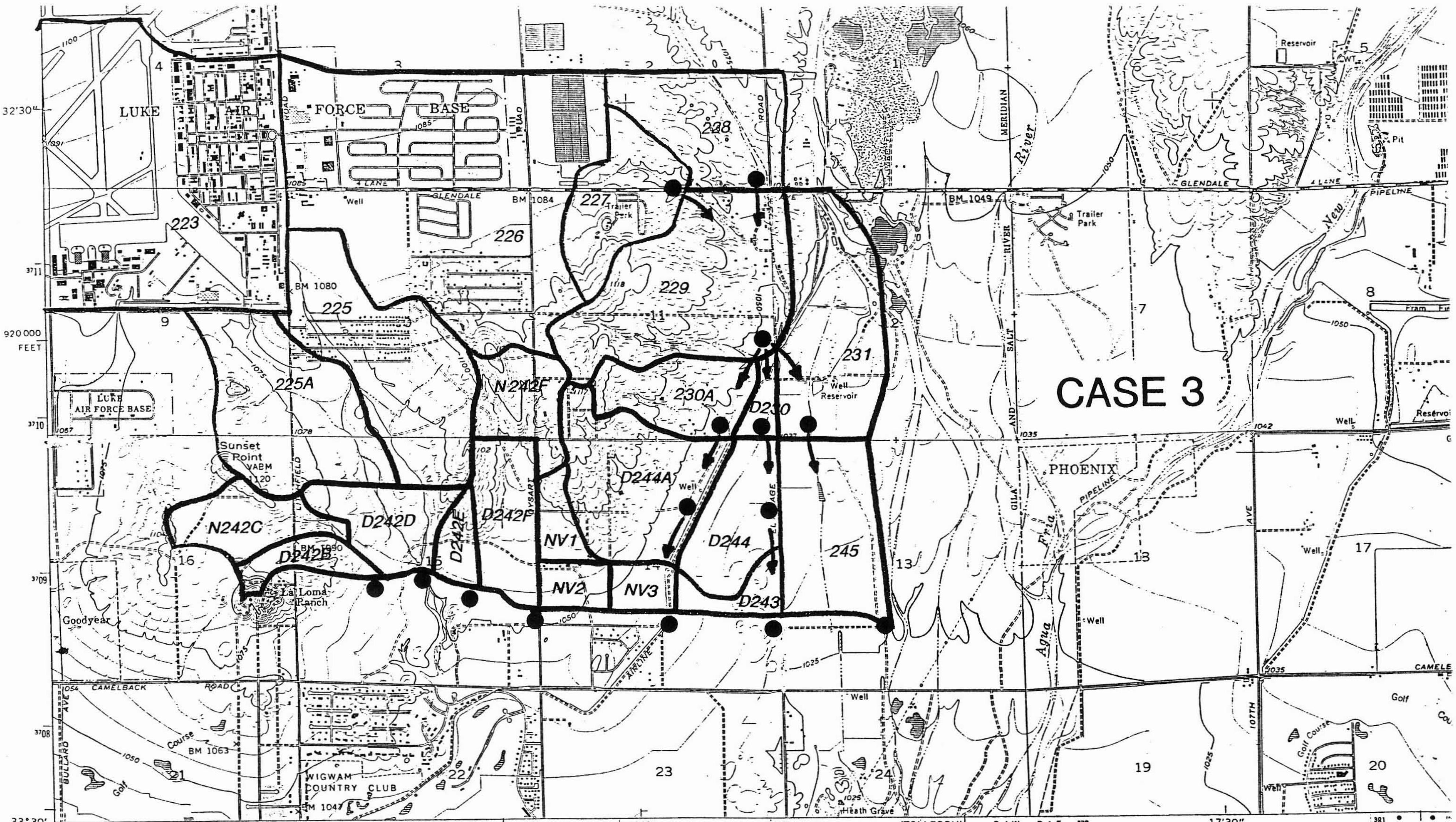
For Case 2, Subbasins 230 and 244 in Wigwam Creek are considered developed and the HEC-1 input is modified accordingly to reflect the higher percent imperviousness. This reflects a no on-site retention policy. A major change in the drainage pattern is caused in Case 2 by the removal of the Airline Canal. Without the Airline Canal, floodwaters from Subbasin 230A split into Subbasin D230, and flows from Subbasin D244A split into Subbasin D244. See Figure 4 for drainage flow patterns. HEC-1 model input and output for Case 2 are provided in Appendix V-B.

4.8 CASE 3:

For Case 3, developments and drainage patterns are the same as in Case 2 (full development with no on-site retention) except it is assumed that El Mirage Road is improved by raising the elevation of the roadway so that floodwaters can no longer spill across the road from Subbasin D244. Instead, the floodwaters flow along the western side of El Mirage Road and drain into Colter Channel at CP D243. Figure 5 shows Case 3 flow paths. Appendix V-C provides the HEC-1 model input and output for Case 3.

4.9 CASE 4:

For Case 4, the drainage pattern is the same as for Case 3. The only difference in this scenario is that the "Existing Condition" parameters of percent imperviousness are used. The raising of El Mirage Road in Case 4 prevents spillover of floodwaters from Subbasin D244 as in Case 3. Case 4 represents the condition in which El Mirage Road is improved (raised) before the area is developed. Appendix IV-D contains the HEC-1 input and output for the Case 4 scenario. Appendix V-D contains the Case 4 HEC-1 input and output.



33°30′
112°22′30″
LITCHFIELD PARK 0.4 MI.
GOODYEAR 4.5 MI.
370 000 FEET
20′
(TOLLESON)
3550 IV NE
R.1W. R.1E.
17′30″
(PERRYVILLE)
3550 IV NW

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1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

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ARIZONA
QUADRANGLE LOCATION

FIGURE 5

4.10 Other possible future scenarios :

The condition of on-site retention was not explicitly considered in this analysis. To do so, the estimated storage volume required to contain the 2-hour duration storm with a 100-yr return period would be used to reduce the runoff from the 100-yr 24-hr event. It was considered that the "Existing Condition" represents a higher peak flow and a greater runoff volume and should therefore be used for the sizing of the Colter Channel rather than some future condition that may produce lower peak flows at a later date.

5. Results of HEC-1 Modeling of Future Conditions

Results of the HEC-1 modeling for future conditions are presented in Table 3.

TABLE 3

HEC-1 RESULTS FOR FUTURE CONDITIONS
COLTER CHANNEL DRAINAGE AREA

CP	Peak Discharge in Cubic Feet Per Second (cfs)			
	Case 1	Case 2	Case 3	Case 4
242B	125	125	125	110
242D	540	540	540	510
242E	620	620	620	580
242F	1060	1060	1060	975
243A	1080	1900	1900	1730 *
243	1210	2000*	2400*	2050 *
245	1900*	2400*	2400*	2150 *

Note: All above Qp's are based upon the 24-hr duration rainfall.

* Includes an additional 100 cfs added to runoff from commercial development in Subbasin 243.

Case 1 represents only a slight change to the existing drainage pattern, with fully developed future conditions. Compared to the "Existing Condition" peak flows in Table 1, the Case 1 peak flows (Qp) are slightly higher, except for the lower reaches of Colter Channel between CP-243 and CP-245. Higher imperviousness in the developed state produces the higher subbasin Qp's. Desynchronization of peak flows in the developed state results in lower net peaks between CP-243 and CP-245.

Cases 2 and 3 represent additional changes to the drainage network within the proposed subdivisions. Both reflect a policy of no on-site retention within the net developments. Higher peak flows result from both the increased imperviousness and the synchronization of Qp's in the modified drainage network.

In Case 3, the lower reach of Colter Channel between CP-243 and CP-245 would have to convey the highest estimated peak flow of 2400 cfs. In Case 2, the 2400 cfs capacity is not needed until at CP-245 because of the spills across El Mirage Road. In Case 3 (in which El Mirage Road is raised) 2400 cfs capacity is required for a greater length of channel than in Case 2.

Case 4 represents exactly the same drainage pattern as Case 3 (raised El Mirage Road) except that the undeveloped condition is assumed. With lower imperviousness, the peak flows in Case 4 are five to ten percent lower than the peak flows in Case 3.

6. Sensitivity Analysis

6.1 Design Storm

6.1.1 RATIONAL METHOD COMPARISIONS

The design storm used in this analysis was the 24-hour, 100-year storm. This is the same storm used in the White Tanks ADMS for floodplaine delineation. It was desired to compare the results of various possible storms with the method used in the design of the drainage system of the proposed developments in Litchfield Ridge, New Village Homes, and Wigwam Creek.

Since drainage design for small subdivisions such as these usually employ the Rational Method, it was decided to compare the Rational Method peak flow estimates with peak flow estimates generated by the HEC-1 model using the following three different storm duration and storm centering assumptions:

24 Hr JD: The 100-yr. 24 Hr. SCS Type II storm was used with the JD record option of HEC-1 to critically center the storm over each concentration point.

6 Hr JD: The 100-yr 6 Hr. FCD "Queen Creek" design storm was used with the HEC-1 JD cards to critically center the storm over each concentration point.

6 Hr: The 100-yr. 6 Hr. FCD "Queen Creek" design storm was centered over the entire drainage area. HEC-1 JD cards are not used.

Rational Method computations are presented in Appendix VI. For the sensitivity analysis, six subbasins were selected in the Case 1 scenario for comparison. The results of the analysis are displayed in Table 4.

TABLE 4

COMPARISION OF DESIGN STORM DURATIION AND LOCATION
WITH RATIONAL METHOD

Subbasin ID	Rational Method	Peak Flow in CFS* 6 Hr JD[1]	24 Hr JD[2]	6 Hr[1]
D242D	428	511	393	319
D242E	156	183	125	101
D242F	441	540	418	339
D243	261	234	166	131
NV2	201	236	165	134

* Based on 100-yr. return period.

[1] Design storm critically centered over each subbasin
[2] Design storm critically centered over entire basin

As shown in Table 4, none of the HEC-1 peak flow estimates agrees well with the Rational Method estimates for all subbasins. The 6-hr storm HEC-1 model (with storm centered over the entire basin) consistently underpredicts peak flows as compared to the Rational Method. The 24 Hr. JD storm also consistently underpredicts the Rational Method results, but to a lesser degree than the 6 hr. The HEC-1 model run with the 6 Hr JD overpredicts the Rational Method results by about 20 %, except for Subbasin D243 which is underpredicted by about 10 %. The plans for Subbasin D243 are for Commercial/Industrial land use. Since drainage structures for this area are likely to be sized based upon the Rational Method, the HEC-1 estimates of peak flows may be low. Due to this possible underestimation of Qp from D243 by HEC-1, an additional 100 cfs was added to the HEC-1-generated Qp for the 24-hour rainfall, as marked by an asterisk in Table 3.

6.1.2 STORM DURATION: 24 HR. VS 6 HR.

To compare the effects of using the 6-hour and the 24-hour 100-year storms, HEC-1 runs were made with the 6-hour duration rainfall as well as the 24-hour event. The Pattern 2.2 rainfall was indicated by the 4.12 square mile drainage area as per Figure 2.15 in the <u>Hydrologic Design Manual</u>. The 6-hour duration rainfall event was run with JD cards to critically center the storm over individual subbasins, and without JD cards to spread the storm uniformly over the entire watershed. Appropriate areal reduction factors were used as specified in the <u>Hydrologic Design Manual.</u> The HEC-1 runs considered both the "Existing Conditions" and the Case 1 development scenario. Results of these runs are presented in Table 6.

TABLE 5

Effects of Rainfall Duration on HEC-1-Predicted Peak Flow

A. "Existing Condition"

Concentration Point	Peak Flow in CFS 6-Hour 100-Yr No JD*	6-Hour 100-Yr With JD*	24-Hour 100-Yr With JD*	24-Hour 100-Yr No JD*
242B	80	79	118	113
242C	217	214	271	265
242D	357	341	491	470
242E	382	369	493	471
242F	669	650	842	807
243A	768	743	949	909
243	876	832	1037	993
245	1864	1746	2165	2070

B. Case 1 Scenario

Concentration Point	6-Hour 100-Yr No JD*	6-Hour 100-Yr With JD*	24-Hour 100-Yr With JD*	24-Hour 100-Yr No JD*
242B	87	90	124	119
242D	396	384	540	520
242E	436	442	618	594
242F	759	767	1059	1017
243A	895	903	1078	1033
243	986	988	1112	1069
245	1690	1693	1807	1732

*Refers to use of the HEC-1 JD Card Option for Centering of Storms, Refer to HEC-1 User's Manual.

As shown in Table 5, the 6-hour duration 100-year rainfall produced lower peak flow estimates than the 24-hour duration event did. The use of JD cards in HEC-1 resulted in peak flow estimates 6.3% less than those estimates made without the JD cards. The 24-hour event was used in the White Tanks ADMS and floodplain delineations.

6.2 Timing

The peak flows experienced in Colter Channel will be greatly influenced by the timing of the individual subbasin hydrographs along the channel. To investigate the degree to which the timing influences the peak flows in Colter Channel, the inflow hydrographs along each of the four Colter Channel sections were plotted. The graphs indicate that the model is sensetive to timing. Most of the hydrographs are steep, with a short base time. A small change in timing can significantly change the peak flow reaching Colter

Channel. Appendix VII shows plots of the HEC-1-generated hydrographs at key locations along the Colter Channel alignment.

The relatively small changes in HEC-1 estimates of Qp in the "Existing Conditions" and Case 1 Future Condition (especially for the 6-hour duration rainfall) are partly a result of desynchronization of inflow hydrographs along Colter Channel. The timing of these hydrographs is realistic. The hydrographs are the result of the best available estimate of the future developed condition.

An alternative method to increase the safety of the hydrologic estimates of peak flow into Colter Channel would be to assume that occurrence of all the contributory subbasin flow peaks were to coincide. This would increase Qp by 10 to 20 percent in Colter Channel. However, this is not recommended, as it is probably too conservative and ignores the value of the hydrologic procedures employed in the estimate, specifically the HEC-1 model.

6.3 New Subdivision Development

In Cases 1 through 4, it was assumed that the future extent of new subdivision development in the watershed will be limited to the currently-planned subdivisions of Litchfield Ridge, New Village Homes, and Wigwam Creek. If additional developments do occur, expected increases in peak stormwater flows are small due to the requirements of on-site retention of stormwater runoff resulting from the 2-hour duration, 100-year rainfall event. There is no plan to exempt any additional subdivisions from the on-site retention requirement.

If additional subdivisions are located in the Colter Catchment, some increase in peak flows can be expected. To address this possibility, a HEC-1 model was prepared in which all of the contributory subbasins were coded as 45% impervious, indicating residential development. No provision was made for on-site retention in the model. The results of this HEC-1 run are presented in Table 6.
Table 6 shows that without on-site retention, a fully subdivided catchment could increase peak flows in Colter Channel by as much as 400 cfs at El Mirage Road. However, it is considered extremely unlikely that the catchment will become fully developed without on-site retention or additional drainage improvements.

Possible drainage improvements to reduce peak flows to Colter Channel include construction of another channel along Bethany Home Road and installation of a detention basin to dampen peak flows reaching Colter Channel.

The additional 400 cfs in peak flows reaching Colter Channel would be greatly reduced or eliminated by the on-site retention of the 2-hour, 100-year storm in new subdivisions. HEC-1 analysis can address the situation by coding a "diversion" of a volume of stormwater equal to the runoff from the 2-hour, 100-year rainfall event. This detailed analysis was not performed due to the likelihood of additional drainage improvements such as a detention basin or a Bethany Home canal and due to time limitations.

6.4 Ultimate Development

HEC-1 runs were made to investigate the peak flows resulting from complete development of the Colter catchment. To give a rough idea of the possible maximum Qp without on-site retention, a value of 45 percent imperviousness was input for a contributory subbasins. For the 24-hour rain, the peak flow at CP 245 was 2800 cfs. The condition was not analyzed with the 6-hour storm.

The 100-year 2-hour storm was input to the fully residential catchment model as described above. The resulting volume of runoff was 278 acre feet in the first 6 hours and 326 acre feet in the first 24 hours. No runoff occurs after 24 hours from the 2-hour storm.

If on-site retention is practised in the catchment, this volume of 326 acre feet must be subtracted from the runoff from the developed catchment. There is no indication that on-site retention may be waive anywhere in the catchment, except for those subbasins that drain directly into Colter Channel.

Table 6

Peak Flows Resulting from Complete Development of Colter Channel Catchment without On-site Retention

CP	Peak Flow in CFS		
	"Existing"	Case 3	Complete Development
242B	120	125	132
242D	490	540	601
242E	490	620	679
242F	840	1060	1159
243A	950	1900	2242
243	1040	2400	2739
245	2170	2400	2813

```
1*****************************************              ***************************************
*                                       *              *                                     *
*   ,OOD HYDROGRAPH PACKAGE  (HEC-1)    *              *   U.S. ARMY CORPS OF ENGINEERS      *
*       SEPTEMBER 1990                  *              *   HYDROLOGIC ENGINEERING CENTER     *
*         VERSION 4.0                   *              *       609 SECOND STREET             *
*                                       *              *   DAVIS, CALIFORNIA 95616           *
* RUN DATE  04/16/1992  TIME  14:17:53  *              *       (916) 756-1104                *
*                                       *              *                                     *
*****************************************              ***************************************
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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                              HEC-1 INPUT                              PAGE  1

   LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

     1       ID    WLB HYDROLOGY FOR PROPOSED COLTER CHANNEL
     2       ID    EXISTING CONDITIONS, 100 YEAR 24 HOUR STORM
     3       ID
            *DIAGRAM
     4       IT     5               300
     5       IO     5
     6       IN    15
     7       JD   4.03    .001
     8       PC   .000    .002    .005    .008    .011    .014    .017     .02    .023    .026
     9       PC   .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
    10       PC   .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
    11       PC   .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
    12       PC   .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
    13       PC   .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
    14       PC   .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
    15       PC   .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
    16       PC   .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
    17       PC   .983    .986    .989    .992    .995    .998    1.00    1.00    1.00    1.00
    18       JD   3.99      10
    19       JD   3.83      50
    20       JD   3.76     100
    21       JD   3.70     200
            *

    22       KK    223
    23       BA   1.26
    24       LG    .12     .33    5.09     .20    72.0
    25       UI    119     218     491     643     786    1003    1453    1254     993     797
    26       UI    634     465     257     200     140     112      37      37      37      37
    27       UI     37       0       0       0       0       0       0       0       0       0
            *

    28       KK   D223
    29       DT  DI225
    30       DI      0      60     400    1000    4000    8000
    31       DQ      0      60      60      60      60      60
            *

    32       KK   R223
    33       RS      4              -1
    34       RC    .03    .025     .03    2900   .0017
    35       RX   1000    1120    1350    1590    1780    1960    2129    2130
```

```
36      RY  1067   1066   1064   1063   1063   1064  1065.5  1065.5
        *

37      KK  D223
38      DR  DI225
        *

39      KK  R223
40      RS   13           -1      0
41      RC  .07   .035   .07   5680  .0028
42      RX  515    790    960    990   1010   1070   1225   1300
43      RY   74     70     69     68     68     72     74     76
        *

44      KK   225
45      BA  0.43
46      LG   .3    .33   3.63   .31    4.0
47      UI   39     67    156    206    250    311    448    450    347    284
48      UI  227    179    112     68     59     39     25     12     12     12
49      UI   12     12      0      0      0      0      0      0      0      0
        *

50      KK  1I225
51      HC    2    .43
        *

52      KK   225A
53      BA   .37
54      LG   .35   .35   3.91   .25    0.0
55      UI   38     82    169    219    275    386    456    340    271    210
56      UI  153     82     64     41     28     12     12     12     12      0
        *

57      KK  CP225
58      HC    2    .80
        *

59      KK  SR225
60      RS    1   STOR      0      0
61      SV    0    .15   4.51  15.36  32.82  74.75 118.94 130.82 143.56 173.50
62      SQ    0      2      7     15     43     82    110    116   1359   6554
63      SE 1058.8  1059   1060   1061   1062   1064   1066 1066.5   1067   1068
        *

64      KK   R225
65      RS    3           -1      0
66      RC  .06    .03    .06   1790  .0039
67      RX  800    930    955    995   1005   1020   1360   1525
68      RY 1064   1060   1058   1057   1057   1058   1060   1064
        *

69      KK  242D
70      BA  .13
71      LG  .35    .35   3.76   .31    0.0
72      UI   45    142    250    274    164     74     34     11      8      0
        *

73      KK  1I242D
74      HC    2    .93
        *

75      KK  242B
76      BA  .07
77      LG  .35    .35   3.76   .31    0.0
78      UI   20     67    108    152     97     56     22     11      4      4
79      UI    0      0      0      0      0      0      0      0      0      0
        *

80      KK  R242B
```

```
81    RS    1           -1     0
82    RC    .04   .022   .04   1080   .0061
83    RX    1000   1005   1010   1028   1122   1140   1145   1150
84    RY    1056   1056   1055  1049.5  1049.5  1055   1056   1056
      *

85    KK    242C
86    BA    .16
87    LG    .35    .35   3.76   .31    0.0
88    UI    17     39     78    100    127    187    191    144    113    87
89    UI    58     30     25     17     7      5      5      5      0      0
      *

90    KK  CP242C
91    HC     2    .23
      *

92    KK   R242C
93    RS    1           -1     0
94    RC    .04   .022   .04    200   .0061
95    RX    1000   1005   1010   1028   1122   1140   1145   1150
96    RY 1053.5 1053.5 1052.5   1048   1048 1052.5 1053.5 1053.5
      *

97    KK  CP242D
98    HC     2   1.16
      *

99    KK   R242D
100   RS    1           -1     0
101   RC    .04   .022   .04    870   .0011
102   RX    1000   1005   1010   1028   1172   1190   1195   1200
103   RY    1053   1053   1052  1047.5  1047.5  1052   1053   1053
      *

104   KK    242E
105   BA    0.05
106   LG    .35    .35   3.76   .31    0.0
107   UI    46    147    132     46     11     0      0      0      0      0
      *

108   KK  CP242E
109   HC     2   1.21
      *

110   KK   R242E
111   RS    1    -1     0
112   RC    .04   .022   .04    720   .0011
113   RX    1000   1005   1010   1028   1172   1190   1195   1200
114   RY    1052   1052   1051  1046.5  1046.5  1051   1052   1052
      *

115   KK    242F
116   BA    .30
117   LG    .35    .35   3.76   .31    0.0
118   UI    35     94    173    223    303    428    323    248    187    124
119   UI    61     48     32     11     11     11     11     0      0      0
      *

120   KK  CP242F
121   HC     2   1.51
      *

122   KK   R242F
123   RS    3           -1     0
124   RC    .04   .022   .04   3800   .0022
125   RX    1000   1005   1010   1028   1172   1190   1195   1200
126   RY 1048.5 1048.5 1047.5   1043   1043 1047.5 1048.5 1048.5
      *
```

```
127   KK   243A
128   BA   0.17
129   LG   .37    .15   4.14   .39    5.0
130   UI   14     16    49     66     79     94     116    163    156    124
131   UI   104    86    70     54     32     24     20     14     11     4
132   UI   4      4     4      4      0      0      0      0      0      0
      *
133   KK   CP243A
134   HC   2      1.68
      *
135   KK   R243A
136   RS   1      -1    0
137   RC   .04    .022  .04    2400   .072
138   RX   1000   1005  1010   1028   1172   1190   1195   1200
139   RY   1035.5 1035.5 1034.5 1030  1030   1034.5 1035.5 1035.5
      *
140   KK   227
141   BA   .23
142   LG   .32    .34   3.77   .33    3.0
143   UI   34     132   200    294    397    277    195    117    58     36
144   UI   14     10    10     0      0      0      0      0      0      0
      *
145   KK   R227
146   RS   6            -1     0
147   RC   .02    .045  .07    4400   .0061
148   RX   1000   1010  1020   1040   1055   1150   1275   1325
149   RY   1050.9 1050.5 1050.5 1050  1050   1052   1054   1056
      *
150   KK   228
151   BA   .28
152   LG   .35    .36   3.58   .29    0.0
153   UI   34     96    172    224    319    402    293    222    164    91
154   UI   57     37    20     10     10     10     0      0      0      0
      *
155   KK   R228
156   RS   5            -1     0
157   RC   .02    .045  .07    3550   .0061
158   RX   1000   1010  1020   1040   1055   1150   1275   1325
159   RY   1050.9 1050.5 1050.5 1050  1050   1052   1054   1056
      *
160   KK   229
161   BA   .51
162   LG   .33    .34   4.11   .37    2.0
163   UI   86     338   507    805    853    577    387    174    107    51
164   UI   25     25    0      0      0      0      0      0      0      0
      *
165   KK   CP229
166   HC   3      1.02
      *
167   KK   D229
168   DT   1D230
169   DI   0      612   1224   2470   3990   4952
170   DQ   0      133   265    750    1379   2121
      *
171   KK   D229
172   DT   DI231
173   DI   0      523   1047   1970   3071   3538
174   DQ   0      133   265    750    1379   2121
```

```
*
KK    R229
RS     4            -1     0
RC    .03   .035    .07   2100  .0011
RX   1000   1005   1010   1020   1040   1050   1060   1140
RY   1047   1047 1046.5   1046   1046   1047   1048   1050
*
KK    230A
BA    .18
LG    .35    .35   4.03    .36    0.0
UI     54    177    293    390    243    133     55     25     11     11
UI      0      0      0      0      0      0      0      0      0      0
*
1
KK  CP230A
HC      2    1.2
*
KK   D230A
DT   2D230
DI      0     26    221    743   1717   3247   5429
DQ      0     17    190    653   1515   2867   4799
*
KK   R230A
RS     10           -1     0
RC    .07   .045    .07   1400 .00043
RX   1000   1005   1010   1040   1110   1150   1275   1400
RY   1046   1046   1046 1043.5   1044   1046   1047   1048
*
KK    244A
BA    .31
LG    .35    .35   4.08    .36    0.0
UI     78    267    414    654    451    288    123     69     24     18
UI      0      0      0      0      0      0      0      0      0      0
*
KK  CP244A
HC      2   1.51
*
KK   R244A
RS      5           -1     0
RC    .05    .05    .05   1650 .00625
RX   1000   1200   1400   1700   2175   3000   3160   3300
RY   1040   1039   1038   1036   1036   1038   1039   1040
*
KK     244
BA    .19
LG    .50     .0   3.69    .43    0.0
UI     15     15     52     70     84     99    119    163    182    142
UI    120     99     82     67     46     26     25     18     15      7
UI      5      5      5      5      5      0      0      0      0      0
*
KK   1I244
HC      2    1.7
*
KK   DR229
DR   1D230
*
KK    R229
RS      2           -1     0
```

```
RC    .02   .045    .06   1850   .005
RX    980    985    990   1000   1020   1040   1100   1150
RY   1044 1043.5 1043.5   1042   1042   1044 1044.5   1045
*

KK    230
BA    .04
LG     .5    0.0   3.55   0.47    0.0
UI      5     13     24     31     43     57     43     33     24     15
UI      8      6      4      1      1      1      0      0      0      0
*

KK  1I230
HC      2   1.06
*

KK  D230A
DR  2D230
*

KK  R230A
RS      1            -1      0
RC    .05   .035    .03   1000  .0091
RX   1000   1005   1010   1020   1040   1060   1100   1300
RY   1041 1040.5 1040.5   1040   1040 1040.5   1038 1040.5
*

KK  CP230
HC      2   1.24
*

KK   R230
RS      2            -1      0
RC    .03    .04    .05   1450  .0027
RX   1000   1010   1020   1030   1050   1110   1250   1475
RY 1034.5   1034   1034 1032.5 1032.5   1034   1035   1036
*

KK  CP244
HC      2   1.74
*

KK   D244
DT  DI245
DI      0      4     20     37    409   1849   4296
DQ      0      0      0      0    354   1750   4133
*
1
KK   R244
RS      3            -1      0
RC   .025   .035    .06   2200  .0018
RX   1000   1015   1020   1025   1035   1040   1060   1080
RY 1032.3   1032   1032   1031   1031   1032   1034 1034.5
*

KK    243
BA    .06
LG     .4    .22    4.3    .26    0.0
UI      8     28     45     61     96     77     57     40     21     13
UI             8      3      3      3      0      0      0      0      0
*

KK  1I243
HC      2    1.8
*

KK  CP243
HC      2   3.48
*
```

```
264    KK   R243
265    RS    1          -1    0
266    RC    0.4  0.022   0.4   1000   .001
267    RX   1000   1005   1010   1028   1172   1190   1195   1200
268    RY 1028.5 1028.5 1027.5   1023   1023 1027.5 1028.5 1028.5
   *

269    KK   D229
270    DR   DI231
   *

271    KK   R229
272    RS    7          -1    0
273    RC   .07    .05   .07   2400   .002
274    RX   1000   1010   1040   1075   1110   1340   1600   1830
275    RY 1038.5   1038   1036   1035   1035   1036   1038 1038.5
   *

276    KK    231
277    BA   .35
278    LG   .37    .31   3.61   .79    0.0
279    UI    34     65    143    186    230    299    422    339    271    215
280    UI   170    115     61     54     34     22     10     10     10     10
281    UI     0      0      0      0      0      0      0      0      0      0
   *

282    KK   CP231
283    HC     2   1.37
   *

284    KK   R231
285    RS    13         -1    0
286    RC   .07    .05   .07   3900  .0018
287    RX   1000   1010   1040   1075   1110   1310   1600   1830
288    RY 1032.5   1032   1030   1029   1029   1030   1032 1032.5
   *

289    KK    245
290    BA   0.28
291    LG   0.47   .07   3.88   0.89    0.0
292    UI    16     16     27     57     72     83     94    106    122    145
293    UI   188    202    165    142    127    110     96     83     72     54
294    UI    36     28     26     22     16     16      8      5      5      5
295    UI     5      5      5      5      5      0      0      0      0      0
   *

296    KK   D244
297    DR   DI245
   *

298    KK   R244
299    RS    3          -1    0
300    RC   .07    .05   .07   1870  .0037
301    RX   1000   1010   1040   1075   1110   1340   1600   1830
302    RY 1032.5   1032   1030   1029   1029   1030   1032 1032.5
   *

303    KK   1I245
304    HC     3   2.37
   *

305    KK   CP245
306    HC     2   4.11
307    ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE   (V) ROUTING   (--->) DIVERSION OR PUMP FLOW

```
NO.    (.) CONNECTOR      (<---) RETURN OF DIVERTED OR PUMPED FLOW

        223
         .
         .
29       .------>  DI225
28      D223
         V
         V
32      R223
         .
         .
38       .        .<------  DI225
37       .      D223
         .        V
         .        V
39       .      R223
         .        .
         .        .
44       .        .       225
         .        .        .
         .        .        .
50       .      1I225...........
         .        .
         .        .
52       .        .       225A
         .        .        .
         .        .        .
57       .      CP225...........
         .        V
         .        V
59       .      SR225
         .        V
         .        V
64       .      R225
         .        .
         .        .
69       .        .       242D
         .        .        .
         .        .        .
73       .     1I242D...........
         .        .
         .        .
75       .        .       242B
         .        .        V
         .        .        V
80       .        .      R242B
         .        .        .
         .        .        .
85       .        .        .        242C
         .        .        .         .
         .        .        .         .
90       .        .      CP242C...........
         .        .        V
         .        .        V
92       .        .      R242C
         .        .        .
         .        .        .
97       .     CP242D...........
         .        V
         .        V
99       .      R242D
         .        .
         .        .
         .        .       242E
         .        .        .
         .        .        .
108      .     CP242E...........
         .        V
```

```
        .    V
1[illegible]    .   R242E
        .    .
        .    .
115     .    .    242F
        .    .    .
        .    .    .
120     .   CP242F............
        .    V
        .    V
122     .   R242F
        .    .
        .    .
127     .    .    243A
        .    .    .
        .    .    .
133     .   CP243A............
        .    V
        .    V
135     .   R243A
        .    .
        .    .
140     .    .    227
        .    .    V
        .    .    V
145     .    .    R227
        .    .    .
        .    .    .
150     .    .    .    228
        .    .    .    V
        .    .    .    V
155     .    .    .    R228
        .    .    .    .
        .    .    .    .
160     .    .    .    .    229
        .    .    .    .    .
        .    .    .    .    .
165     .    .   CP229........................
        .    .    .
        .    .    .
168     .    .    .-------->  1D230
167     .    .    D229
        .    .    .
        .    .    .
172     .    .    .-------->  DI231
171     .    .    D229
        .    .    V
        .    .    V
175     .    .    R229
        .    .    .
        .    .    .
180     .    .    .    230A
        .    .    .    .
        .    .    .    .
185     .    .   CP230A............
        .    .    .
        .    .    .
188     .    .    .-------->  2D230
187     .    .   D230A
        .    .    V
        .    .    V
191     .    .   R230A
        .    .    .
        .    .    .
        .    .    .    244A
        .    .    .    .
        .    .    .    .
201     .    .   CP244A............
        .    .    V
```

```
        .     .     V
203     .     .     R244A
        .     .     .
        .     .     .
208     .     .     .     244
        .     .     .     .
        .     .     .     .
214     .     .     1I244............
        .     .     .
        .     .     .
217     .     .     .     .<-------  1D230
216     .     .     .     DR229
        .     .     .     V
        .     .     .     V
218     .     .     .     R229
        .     .     .     .
        .     .     .     .
223     .     .     .     .     230
        .     .     .     .     .
        .     .     .     .     .
228     .     .     .     1I230............
        .     .     .     .
        .     .     .     .
231     .     .     .     .     .<-------  2D230
230     .     .     .     .     D230A
        .     .     .     .     V
        .     .     .     .     V
232     .     .     .     .     R230A
        .     .     .     .     .
        .     .     .     .     .
237     .     .     .     CP230............
        .     .     .     V
        .     .     .     V
        .     .     .     R230
        .     .     .     .
        .     .     .     .
244     .     .     CP244............
        .     .     .
        .     .     .
247     .     .     .------->  DI245
246     .     .     D244
        .     .     V
        .     .     V
250     .     .     R244
        .     .     .
        .     .     .
255     .     .     .     243
        .     .     .     .
        .     .     .     .
260     .     .     1I243............
        .     .     .
        .     .     .
262     .     CP243............
        .     V
        .     V
264     .     R243
        .     .
        .     .
270     .     .     .<-------  DI231
269     .     .     D229
        .     .     V
        .     .     V
271     .     .     R229
        .     .     .
        .     .     .
276     .     .     .     231
        .     .     .     .
        .     .     .     .
282     .     .     CP231............
```

```
          .    .    V
          .    .    V
          .    .    R231
          .    .    .
          .    .    .
289       .    .    .    245
          .    .    .    .
          .    .    .    .
297       .    .    .    .    .<------ DI245
296       .    .    .    .    D244
          .    .    .    .    V
          .    .    .    .    V
298       .    .    .    .    R244
          .    .    .    .    .
          .    .    .    .    .
303       .    .    1I245.........................
          .    .    .
          .    .    .
305       .    CP245............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1**************************************          **************************************
*                                     *          *                                    *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *          *  U.S. ARMY CORPS OF ENGINEERS      *
*         SEPTEMBER 1990              *          *  HYDROLOGIC ENGINEERING CENTER     *
*          VERSION 4.0                *          *        609 SECOND STREET           *
*                                     *          *  DAVIS, CALIFORNIA 95616           *
*  RUN DATE 04/16/1992  TIME 14:17:53 *          *        (916) 756-1104              *
*                                     *          *                                    *
**************************************           **************************************
```

WLB HYDROLOGY FOR PROPOSED COLTER CHANNEL
EXISTING CONDITIONS, 100 YEAR 24 HOUR STORM

```
 5 IO      OUTPUT CONTROL VARIABLES
             IPRNT        5  PRINT CONTROL
             IPLOT        0  PLOT CONTROL
             QSCAL       0.  HYDROGRAPH PLOT SCALE

   IT      HYDROGRAPH TIME DATA
             NMIN         5  MINUTES IN COMPUTATION INTERVAL
             IDATE    1   0  STARTING DATE
             ITIME     0000  STARTING TIME
               NQ       300  NUMBER OF HYDROGRAPH ORDINATES
            NDDATE    2   0  ENDING DATE
            NDTIME     0055  ENDING TIME
            ICENT        19  CENTURY MARK

           COMPUTATION INTERVAL    .08 HOURS
              TOTAL TIME BASE   24.92 HOURS

     ENGLISH UNITS
        DRAINAGE AREA         SQUARE MILES
        PRECIPITATION DEPTH   INCHES
        LENGTH, ELEVATION     FEET
        FLOW                  CUBIC FEET PER SECOND
        STORAGE VOLUME        ACRE-FEET
        SURFACE AREA          ACRES
        TEMPERATURE           DEGREES FAHRENHEIT

   JD      INDEX STORM NO. 1
             STRM      4.03  PRECIPITATION DEPTH
             TRDA       .00  TRANSPOSITION DRAINAGE AREA
```

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	223	1763.	12.42	327.	110.	106.	1.26		
DIVERSION TO	DI225	60.	8.92	60.	43.	42.	1.26		
HYDROGRAPH AT	D223	1703.	12.42	267.	67.	64.	1.26		
ROUTED TO	R223	1577.	12.67	266.	67.	64.	1.26		
HYDROGRAPH AT	D223	60.	8.92	60.	43.	42.	1.26		
ROUTED TO	R223	60.	10.33	60.	42.	41.	1.26		
HYDROGRAPH AT	225	460.	12.42	59.	15.	15.	.43		
2 COMBINED AT	1I225	520.	12.42	119.	58.	55.	.43		
HYDROGRAPH AT	225A	441.	12.42	50.	12.	12.	.37		
2 COMBINED AT	CP225	959.	12.42	168.	70.	67.	.80		
ROUTED TO	SR225	83.	13.50	80.	45.	43.	.80		
ROUTED TO	R225	83.	13.67	80.	44.	42.	.80		
HYDROGRAPH AT	242D	228.	12.08	16.	4.	4.	.13		
2 COMBINED AT	1I242D	259.	12.08	90.	48.	46.	.93		
HYDROGRAPH AT	242B	118.	12.17	9.	2.	2.	.07		
ROUTED TO	R242B	108.	12.25	9.	2.	2.	.07		
HYDROGRAPH AT	242C	184.	12.33	20.	5.	5.	.16		
2 COMBINED AT	CP242C	271.	12.25	29.	7.	7.	.23		
ROUTED TO	R242C	269.	12.25	29.	7.	7.	.23		
2 COMBINED AT	CP242D	491.	12.17	119.	55.	53.	1.16		
ROUTED TO									

+		R242D	474.	12.25	118.	55.	53.	1.16
	HYDROGRAPH AT	242E	105.	12.00	6.	2.	2.	.05
+	2 COMBINED AT	CP242E	493.	12.25	124.	56.	54.	1.21
+	ROUTED TO	R242E	489.	12.25	123.	56.	54.	1.21
+	HYDROGRAPH AT	242F	372.	12.33	38.	9.	9.	.30
+	2 COMBINED AT	CP242F	842.	12.25	160.	65.	63.	1.51
+	ROUTED TO	R242F	781.	12.50	158.	63.	61.	1.51
+	HYDROGRAPH AT	243A	169.	12.50	24.	6.	6.	.17
+	2 COMBINED AT	CP243A	949.	12.50	180.	70.	67.	1.68
+	ROUTED TO	R243A	932.	12.50	180.	69.	67.	1.68
+	HYDROGRAPH AT	227	331.	12.25	30.	8.	7.	.23
	ROUTED TO	R227	271.	12.58	30.	8.	7.	.23
+	HYDROGRAPH AT	228	361.	12.33	36.	9.	9.	.28
+	ROUTED TO	R228	322.	12.50	36.	9.	9.	.28
+	HYDROGRAPH AT	229	724.	12.17	61.	16.	15.	.51
+	3 COMBINED AT	CP229	863.	12.33	127.	32.	31.	1.02
+	DIVERSION TO	1D230	187.	12.33	28.	7.	7.	1.02
+	HYDROGRAPH AT	D229	676.	12.33	99.	25.	24.	1.02
+	DIVERSION TO	DI231	172.	12.33	25.	6.	6.	1.02
+	HYDROGRAPH AT	D229	505.	12.33	74.	19.	18.	1.02
+	ROUTED TO	R229	482.	12.58	74.	19.	18.	1.02
	HYDROGRAPH AT	230A	292.	12.17	21.	5.	5.	.18
+	2 COMBINED AT	CP230A	530.	12.25	95.	24.	23.	1.20
	DIVERSION TO							

+		2D230	464.	12.25	81.	20.	20.	1.20
	HYDROGRAPH AT	D230A	66.	12.25	14.	4.	3.	1.20
+	ROUTED TO	R230A	63.	12.83	14.	4.	3.	1.20
+	HYDROGRAPH AT	244A	486.	12.17	36.	9.	9.	.31
+	2 COMBINED AT	CP244A	485.	12.17	49.	13.	12.	1.51
+	ROUTED TO	R244A	406.	12.42	49.	12.	12.	1.51
+	HYDROGRAPH AT	244	200.	12.58	28.	7.	7.	.19
+	2 COMBINED AT	1I244	582.	12.42	78.	20.	19.	1.70
+	HYDROGRAPH AT	DR229	187.	12.33	28.	7.	7.	1.02
+	ROUTED TO	R229	181.	12.50	27.	7.	7.	1.02
+	HYDROGRAPH AT	230	56.	12.33	6.	1.	1.	.04
	2 COMBINED AT	1I230	227.	12.42	33.	8.	8.	1.06
+	HYDROGRAPH AT	D230A	464.	12.25	81.	20.	20.	1.20
+	ROUTED TO	R230A	452.	12.33	81.	20.	20.	1.20
+	2 COMBINED AT	CP230	672.	12.42	114.	29.	28.	1.24
+	ROUTED TO	R230	652.	12.58	114.	29.	28.	1.24
+	2 COMBINED AT	CP244	1195.	12.50	192.	48.	47.	1.74
+	DIVERSION TO	DI245	1116.	12.50	162.	40.	39.	1.74
+	HYDROGRAPH AT	D244	79.	12.50	30.	8.	8.	1.74
+	ROUTED TO	R244	76.	12.75	30.	8.	8.	1.74
+	HYDROGRAPH AT	243	89.	12.25	8.	2.	2.	.06
	2 COMBINED AT	1I243	126.	12.33	38.	10.	10.	1.80
+	2 COMBINED AT	CP243	1037.	12.50	216.	79.	76.	3.48
	ROUTED TO							

+	R243	1020.	12.58	216.	79.	76.	3.48
HYDROGRAPH AT							
	D229	172.	12.33	25.	6.	6.	1.02
ROUTED TO							
+	R229	142.	12.92	25.	6.	6.	1.02
HYDROGRAPH AT							
+	231	265.	12.42	28.	7.	7.	.35
2 COMBINED AT							
+	CP231	279.	12.50	53.	13.	13.	1.37
ROUTED TO							
+	R231	234.	13.33	53.	13.	13.	1.37
HYDROGRAPH AT							
+	245	168.	12.83	29.	7.	7.	.28
HYDROGRAPH AT							
+	D244	1116.	12.50	162.	40.	39.	1.74
ROUTED TO							
+	R244	1043.	12.67	162.	40.	39.	1.74
3 COMBINED AT							
+	1I245	1192.	12.75	242.	61.	59.	2.37
2 COMBINED AT							
+	CP245	2164.	12.67	457.	140.	134.	4.11

.NORMAL END OF HEC-1 ***

```
1***************************************                ***************************************
*                                      *                *                                     *
*   OOD HYDROGRAPH PACKAGE  (HEC-1)    *                *  U.S. ARMY CORPS OF ENGINEERS       *
*      SEPTEMBER 1990                  *                *  HYDROLOGIC ENGINEERING CENTER      *
*        VERSION 4.0                   *                *        609 SECOND STREET            *
*                                      *                *  DAVIS, CALIFORNIA 95616            *
* RUN DATE  06/03/1992  TIME  10:34:57 *                *        (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


1                                HEC-1 INPUT                                PAGE  1

    LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      1       ID     REVISION OF WLB HYDROLOGY FOR PROPOSED COLTER CHANNEL
      2       ID     100 YEAR 24 HOUR SCS TYPE II STORM
      3       ID     CASE 1: FULL DEVELOPMENT; EXISTING CONDITION FLOW PATHS THROUGH THE
      4       ID     WIGWAM CREEK DEVELOPMENT
      5       ID
              *DIAGRAM
      6       IT      5 15APR92    0100      300
      7       IO      5
      8       IN     15
      9       JD   4.03    .001
     10       PC   .000    .002    .005    .008    .011    .014    .017     .02    .023    .026
     11       PC   .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
     12       PC   .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
     13       PC   .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
     14       PC   .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
     15       PC   .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
     16       PC   .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
     17       PC   .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
     18       PC   .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
     19       PC   .983    .986    .989    .992    .995    .998    1.00    1.00    1.00    1.00
     20       JD   3.99      10
     21       JD   3.83      50
     22       JD   3.76     100
     23       JD   3.70     200
              *

     24       KK    223
     25       BA   1.26
     26       LG    .12     .33    5.09     .20    72.0
```

```
UI   119   218   491   643   786  1003  1453  1254   993   797
UI   634   465   257   200   140   112    37    37    37    37
UI    37     0     0     0     0     0     0     0     0     0
*

KK   D223
DT   DI225
DI     0    60   400  1000  4000  8000
DQ     0    60    60    60    60    60
*

KK   R223
RS     4           -1
RC   .03  .025    .03  2900  .0017
RX  1000  1120   1350  1590  1780  1960   2129   2130
RY  1067  1066   1064  1063  1063  1064 1065.5 1065.5
*

KK   D223
DR   DI225
*

KK   R223
RS    13           -1     0
RC   .07  .035    .07  5680  .0028
RX   515   790    960   990  1010  1070   1225   1300
RY    74    70     69    68    68    72     74     76
*

KK   225
BA   0.43
LG    .3   .33   3.63   .31   4.0
UI    39    67    156   206   250   311   448   450   347   284
UI   227   179    112    68    59    39    25    12    12    12
UI    12    12      0     0     0     0     0     0     0     0
*

KK   1I225
HC     2   .43
*

KK   225A
BA   .37
LG   .35   .35   3.91   .25   0.0
UI    38    82    169   219   275   386   456   340   271   210
UI   153    82     64    41    28    12    12    12    12     0
*

KK   CP225
HC     2   .80
*

KK   SR225
RS     1   STOR     0     0
SV     0   .15   4.51  15.36  32.82  74.75  118.94  130.82  143.56  173.50
SQ     0     2      7     15     43     82     110     116    1359    6554
SE 1058.8  1059   1060   1061   1062   1064    1066  1066.5    1067    1068
*

KK   R225
RS     3           -1     0
RC   .06   .03    .06  1790  .0039
RX   800   930    955   995  1005  1020   1360   1525
RY  1064  1060   1058  1057  1057  1058   1060   1064
*

KK   D242D
KM   DEVELOPED SUBBASIN 242D
KM   L = 2500', Lca = 1400', S = 0.007, Kn = 0.025, %IMP = 37
KM   LAG = 8 MIN.
```

```
KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA   .16
LG   .35   .35   3.76   .31   37.
UI   229.   643.   295.   57.   0.   0.   0.   0.   0.   0.
ZW      A=COLTER  C=FLOW  F=D242D
*

KK  1I242D
HC     2   .93
*

KK  D242B
KM   DEVELOPED WLB SUBBASIN 242B
KM   THE UNIT HYDROGRAPH WAS NOT CHANGED, BUT THE % IMPERVIOUS WAS INCREASED
KM   FROM 0% TO 19% TO ACCOUNT FOR DEVELOPMENT IN THE EASTERN PART OF THE SUBASIN
BA   .07
LG   .35   .35   3.76   .31   19.
UI    20    67    108    152    97    56    22    11    4    4
UI    0    0    0    0    0    0    0    0    0    0
ZW      A=COLTER  C=FLOW  F=D242B
*

KK  R242B
KM   LENGTH OF ROUTING REACH INCREASED BY 200 FT TO INCLUDE R242C FROM
KM   THE ORIGINAL MODEL
RS    1          -1    0
RC   .04   .022   .04   1280  .0061
RX   1000   1005   1010   1028   1122   1140   1145   1150
RY   1056   1056   1055  1049.5  1049.5   1055   1056   1056
ZW      A=COLTER  C=FLOW  F=R242B
*

KK  N242C
KM   UNDEVELOPED PART OF SUBBASIN 242C
KM   L = 4200', Lca = 2100', S = 0.009, Kn = 0.05, %IMP = 0.
KM   LAG = 22 MIN.
KM   THE PHOENIX VALLEY S GRAPH WAS USED TO GENERATE THE UNIT HYDROGRAPH
BA   0.13
LG   .35   .35   3.76   .31   0.0
UI   20.   80.   120.   181.   224.   153.   106.   55.   31.   18.
UI   6.   6.   6.   0.   0.   0.   0.   0.   0.   0.
ZW      A=COLTER   C=FLOW   F=N242C
*

KK  RN242C
KM   ROUTE FLOW TO CP242D:
RD   2200  0.006   .03        TRAP    15    3
ZW      A=COLTER  C=FLOW  F=RN242C
*

KK  CP242D
HC     3   1.16
ZW      A=COLTER  C=FLOW  F=CP242D
*

KK  R242D
RS    1          -1    0
RC   .04   .022   .04   870   .0011
RX   1000   1005   1010   1028   1172   1190   1195   1200
RY   1053   1053   1052  1047.5  1047.5   1052   1053   1053
*
1
KK  D242E
KM   DEVELOPED SUBBASIN 242E
KM   L = 2000'. Lca = 1000', S = 0.017, Kn = 0.035, %IMP = 45
KM   LAG = 8 MIN.
KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA   .05
LG   .35   .35   3.76   .31   45.
```

```
UI   71.   201.   92.   18.    0.    0.    0.    0.    0.    0.
ZW      A=COLTER  C=FLOW  F=D242E
*

KK  CP242E
HC      2   1.21
ZW      A=COLTER  C=FLOW  F=CP242E
*

KK   R242E
RS      1     -1      0
RC     .04    .022    .04     720  .0011
RX    1000    1005    1010    1028    1172    1190    1195    1200
RY    1052    1052    1051  1046.5  1046.5    1051    1052    1052
*

KK   N242F
KM    UNDEVELOPED PART OF SUBBASIN 242F
KM    L = 1900', Lca = 950', S = 0.029, Kn = 0.05, %IMP =  0.
KM    LAG = 16 MIN.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA    .13
LG    .35    .35   3.76    .31    0.0
UI    44.   141.   247.   275.   164.    75.    35.    11.    8.    0.
ZW      A=COLTER  C=FLOW  F=N242F
*

KK  RN242F
RD   3000  .0067    .03          TRAP     15      3
ZW      A=COLTER  C=FLOW  F=RN242F
*

KK   D242F
KM    DEVELOPED PART OF SUBBASINS 242F
KM    L = 3000', Lca = 1500', S = 0.015, Kn = 0.025,  %IMP = 38
KM    LAG = 8 MIN.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA    .17
LG    .35    .35   3.76    .31    38.
UI   243.   683.   313.    60.    0.    0.    0.    0.    0.    0.
ZW      A=COLTER  C=FLOW  F=D242F
*
1
KK  CP242F
HC      3   1.51
ZW      A=COLTER  C=FLOW  F=CP242F
*

KK     NV1
KM    UNDEVELOPED PART OF SUBBASIN 243A
KM    L = 1700', Lca = 750', S = 0.021, Kn = 0.05, %IMP = 0.
KM    LAG = 9 MIN.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA    .047
LG    .37    .15   4.14    .39    0.0
UI    54.   165.   110.    28.    6.    0.    0.    0.    0.    0.
ZW      A=COLTER  C=FLOW  F=NV1
*

KK    RNV1
RD    1000    .005    .03          TRAP     10      3
*

KK   CPNV1
HC      2
ZW      A=COLTER  C=FLOW  F=CPNV1
*

KK  RCPNV1
```

```
RS     1          -1     0
RC    .04   .022   .04   1320  .0022
RX   1000   1005   1010   1028   1172   1190   1195   1200
RY 1048.5 1048.5 1047.5   1043   1043 1047.5 1048.5 1048.5
*

KK    NV2
KM    DEVELOPED PART OF SUBBASIN 243A (NEW VILLAGE HOME DEVELOPMENT)
KM    L = 1200', Lca = 600', S = 0.008, Kn = 0.025, %IMP = 38.
KM    LAG = 4 MIN.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA   .064
LG    .37    .15   4.14   .39    38
UI   349.   141.    0.     0.     0.     0.     0.     0.     0.     0.
ZW       A=COLTER  C=FLOW  F=NV2
*

KK  CPNV2
HC      2
ZW       A=COLTER  C=FLOW  F=CPNV2
*

KK  RCPNV2
RS     1          -1     0
RC    .04   .022   .04   1320  .0022
RX   1000   1005   1010   1028   1172   1190   1195   1200
RY 1048.5 1048.5 1047.5   1043   1043 1047.5 1048.5 1048.5
*
KK    NV3
KM    DEVELOPED PART OF SUBBASIN 243A (NEW VILLAGE HOME DEVELOPMENT)
KM    L = 1200', Lca = 600', S = 0.008, Kn = 0.025, %IMP = 38.
KM    LAG = 4 MIN.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA   .064
LG    .37    .15   4.14   .39    38
UI   349.   141.    0.     0.     0.     0.     0.     0.     0.     0.
ZW       A=COLTER  C=FLOW  F=NV3
*

KK  CP243A
HC      2   1.68
ZW       A=COLTER  C=FLOW  F=CP243A
*

KK   R243A
RS     1    -1     0
RC    .04   .022   .04   2400   .072
RX   1000   1005   1010   1028   1172   1190   1195   1200
RY 1035.5 1035.5 1034.5   1030   1030 1034.5 1035.5 1035.5
ZW       A=COLTER  C=FLOW  F=R243A
*

KK    227
BA    .23
LG    .32    .34   3.77   .33    3.0
UI     34    132    200    294    397    277    195    117     58     36
UI     14     10     10      0      0      0      0      0      0      0
*

KK   R227
RS     6          -1     0
RC    .02   .045    .07   4400  .0061
RX   1000   1010   1020   1040   1055   1150   1275   1325
RY 1050.9 1050.5 1050.5   1050   1050   1052   1054   1056
*

KK    228
BA    .28
LG    .35    .36   3.58   .29    0.0
```

```
UI    34    96   172   224   319   402   293   222   164    91
UI    57    37    20    10    10    10     0     0     0     0
*
KK   R228
RS     5          -1     0
RC   .02  .045   .07  3550 .0061
RX  1000  1010  1020  1040  1055  1150  1275  1325
RY 1050.9 1050.5 1050.5 1050  1050  1052  1054  1056
*
KK   229
BA   .51
LG   .33   .34  4.11   .37   2.0
UI    86   338   507   805   853   577   387   174   107    51
UI    25    25     0     0     0     0     0     0     0     0
*
KK  CP229
HC     3  1.02
*
KK  D229
DT  1D230
DI     0   612  1224  2470  3990  4952
DQ     0   133   265   750  1379  2121
*
KK  D229
DT  DI231
DI     0   523  1047  1970  3071  3538
DQ     0   133   265   750  1379  2121
*
KK  R229
RS     4          -1     0
RC   .03  .035   .07  2100 .0011
RX  1000  1005  1010  1020  1040  1050  1060  1140
RY  1047  1047 1046.5 1046  1046  1047  1048  1050
*
KK  230A
BA   .18
LG   .35   .35  4.03   .36   0.0
UI    54   177   293   390   243   133    55    25    11    11
UI     0     0     0     0     0     0     0     0     0     0
*
KK CP230A
HC     2   1.2
*
KK D230A
DT 2D230
DI     0    26   221   743  1717  3247  5429
DQ     0    17   190   653  1515  2867  4799
*
KK R230A
RS    10          -1     0
RC   .07  .045   .07  1400 .00043
RX  1000  1005  1010  1040  1110  1150  1275  1400
RY  1046  1046  1046 1043.5 1044  1046  1047  1048
*
KK  244A
BA   .31
LG   .35   .35  4.08   .36   0.0
UI    78   267   414   654   451   288   123    69    24    18
```

```
UI     0     0     0     0     0     0     0     0     0     0
*

KK  CP244A
HC     2   1.51
*

KK   R244A
RS     5          -1     0
RC   .05   .05   .05  1650 .00625
RX  1000  1200  1400  1700  2175  3000  3160  3300
RY  1040  1039  1038  1036  1036  1038  1039  1040
*

KK   244
BA   .19
LG   .50    .0  3.69   .43   0.0
UI    15    15    52    70    84    99   119   163   182   142
UI   120    99    82    67    46    26    25    18    15     7
UI     5     5     5     5     5     0     0     0     0     0
*

KK  1I244
HC     2   1.7
*

KK  DR229
DR  1D230
*

KK   R229
RS     2          -1     0
RC   .02  .045   .06  1850  .005
RX   980   985   990  1000  1020  1040  1100  1150
RY  1044 1043.5 1043.5 1042 1042  1044 1044.5 1045
*

KK   230
BA   .04
LG    .5   0.0  3.55  0.47   0.0
UI     5    13    24    31    43    57    43    33    24    15
UI     8     6     4     1     1     1     0     0     0     0
*

KK  1I230
HC     2  1.06
*

KK  D230A
DR  2D230
*

KK  R230A
RS     1          -1     0
RC   .05  .035   .03  1000 .0091
RX  1000  1005  1010  1020  1040  1060  1100  1300
RY  1041 1040.5 1040.5 1040 1040 1040.5 1038 1040.5
*

KK  CP230
HC     2  1.24
*

KK   R230
RS     2          -1     0
RC   .03   .04   .05  1450 .0027
RX  1000  1010  1020  1030  1050  1110  1250  1475
RY 1034.5 1034 1034 1032.5 1032.5 1034 1035  1036
*
```

Compare Existing

Same

```
KK   CP244
HC      2   1.74
*

KK    D244
DT   DI245
DI      0      4     20     37    409   1849   4296
DQ      0      0      0      0    354   1750   4133
*

KK    R244
RS      3             -1      0
RC   .025   .035    .06   2200  .0018
RX   1000   1015   1020   1025   1035   1040   1060   1080
RY 1032.3   1032   1032   1031   1031   1032   1034 1034.5
ZW     A=COLTER  C=FLOW  F=R244
*

KK    D243
KM    L = 1200', Lca = 400', S = 0.0075, Kn = 0.025, %IMP = 80
KM    LAG = 4 MIN.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA    .06
LG     .4    .22    4.3    .26    80.
UI   327.   132.     0.     0.     0.     0.     0.     0.     0.     0.
ZW      A=COLTER  C=FLOW  F=D243
*

KK   1I243
HC      2    1.8
ZW      A=COLTER  C=FLOW  F=1I243
*

KK   CP243
HC      2   3.48
ZW      A=COLTER  C=FLOW  F=CP243
*

KK    R243
RS      1             -1      0
RC    0.4  0.022    0.4   1000   .001
RX   1000   1005   1010   1028   1172   1190   1195   1200
RY 1028.5 1028.5 1027.5   1023   1023 1027.5 1028.5 1028.5
ZW      A=COLTER  C=FLOW  F=R243
*

KK    D229
DR   DI231
*

KK    R229
RS      7             -1      0
RC    .07    .05    .07   2400   .002
RX   1000   1010   1040   1075   1110   1340   1600   1830
RY 1038.5   1038   1036   1035   1035   1036   1038 1038.5
*

KK    231
BA    .35
LG    .37    .31   3.61    .79    0.0
UI     34     65    143    186    230    299    422    339    271    215
UI    170    115     61     54     34     22     10     10     10     10
UI      0      0      0      0      0      0      0      0      0      0
*

KK   CP231
HC      2   1.37
*
```

```
367      KK   R231
368      RS    13          -1    0
369      RC    .07   .05   .07   3900  .0018
370      RX   1000  1010  1040  1075  1110  1310  1600  1830
371      RY 1032.5  1032  1030  1029  1029  1030  1032 1032.5
372      ZW      A=COLTER  C=FLOW  F=R231
        *

373      KK    245
374      BA   0.28
375      LG   0.47   .07  3.88  0.89   0.0
376      UI    16    16    27    57    72    83    94   106   122   145
377      UI   188   202   165   142   127   110    96    83    72    54
378      UI    36    28    26    22    16    16     8     5     5     5
379      UI     5     5     5     5     5     0     0     0     0     0
        *

380      KK   D244
381      DR  DI245
382      ZW      A=COLTER  C=FLOW  F=D244
        *

383      KK   R244
384      RS     3          -1    0
385      RC    .07   .05   .07   1870  .0037
386      RX   1000  1010  1040  1075  1110  1340  1600  1830
387      RY 1032.5  1032  1030  1029  1029  1030  1032 1032.5
388      ZW      A=COLTER  C=FLOW  F=R244
        *

389      KK  1I245
390      HC     3  2.37
391      ZW      A=COLTER  C=FLOW  F=1I245
        *

392      KK  CP245
393      HC     2  4.11
394      ZW      A=COLTER  C=FLOW  F=CP245
395      ZZ
```

```
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE    (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

 NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

  24      223
           .
           .
  31       .-------> DI225
  30      D223
           V
           V
  34      R223
           .
           .
  40       .       .<-------  DI225
  39       .      D223
           .       V
           .       V
  41       .      R223
           .       .
           .       .
           .       .       225
           .       .        .
           .       .        .
  52       .     1I225............
           .       .
```

```
          .    .
 --       .    .    225A
          .    .    .
          .    .    .
 59       .   CP225............
          .    V    (959 cfs)
          .    V
 61       .   SR225
          .    V
          .    V
 66       .   R225
          .    .
          .    .
 71       .    .    D242D
          .    .    .
          .    .    .
 80       .   1I242D............
          .    .
          .    .
 82       .    .    D242B
          .    .    V
          .    .    V
 91       .    .    R242B
          .    .    .
          .    .    .
 99       .    .    .    N242C
          .    .    .    V
          .    .    .    V
109       .    .    .    RN242C
          .    .    .    .
          .    .    .    .
113       .   CP242D........................
          .    V    (540 cfs)
          .    V
116       .   R242D
          .    .
          .    .
121       .    .    D242E
          .    .    .
          .    .    .
130       .   CP242E............
          .    V    (618 cfs)
          .    V
133       .   R242E
          .    .
          .    .
138       .    .    N242F
          .    .    V
          .    .    V
147       .    .    RN242F
          .    .    .
          .    .    .
150       .    .    .    D242F
          .    .    .    .
          .    .    .    .
159       .   CP242F........................
          .    .    (1059 cfs)
          .    .
162       .    .    NV1
          .    .    V
          .    .    V
171       .    .    RNV1
          .    .    .
          .    .    .
          .   CPNV1............
          .    V
          .    V
176       .   RCPNV1
          .    .
```

```
        .       .
181     .       .       NV2
        .       .       .
        .       .       .
190     .     CPNV2............
        .       V
        .       V
193     .     RCPNV2
        .       .
        .       .
198     .       .       NV3
        .       .       .
        .       .       .
207     .     CP243A............
        .       V ↖ 1078 cfs
        .       V
210     .     R243A
        .       .
        .       .
216     .       .       227
        .       .       V
        .       .       V
221     .       .       R227
        .       .       .
        .       .       .
226     .       .       .       228
        .       .       .       V
        .       .       .       V
231     .       .       .       R228
        .       .       .       .
        .       .       .       .
236     .       .       .       .       229
        .       .       .       .       .
        .       .       .       .       .
241     .       .       CP229........................
        .       .       .
        .       .       .
244     .       .       .-------> 1D230
243     .       .       D229
        .       .       .
        .       .       .
248     .       .       .-------> DI231
247     .       .       D229
        .       .       V
        .       .       V
251     .       .       R229
        .       .       .
        .       .       .
256     .       .       .       230A
        .       .       .       .
        .       .       .       .
261     .       .       CP230A............
        .       .       .
        .       .       .
264     .       .       .-------> 2D230
263     .       .       D230A
        .       .       V
        .       .       V
267     .       .       R230A
        .       .       .
        .       .       .
272     .       .       .       244A
        .       .       .       .
        .       .       .       .
        .       .       CP244A............
        .       .       V
        .       .       V
279     .       .       R244A
        .       .       .
```

```
          .     .     .
284       .     .     .     244
          .     .     .     .
          .     .     .     .
290       .     .   1I244...........
          .     .     .
          .     .     .
293       .     .     .     .<-------  1D230
292       .     .     .    DR229
          .     .     .     V
          .     .     .     V
294       .     .     .    R229
          .     .     .     .
          .     .     .     .
299       .     .     .     .     230
          .     .     .     .     .
          .     .     .     .     .
304       .     .     .   1I230...........
          .     .     .     .
          .     .     .     .
307       .     .     .     .     .<-------  2D230
306       .     .     .     .    D230A
          .     .     .     .     V
          .     .     .     .     V
308       .     .     .     .    R230A
          .     .     .     .     .
          .     .     .     .     .
313       .     .     .   CP230...........
          .     .     .     V
          .     .     .     V
315       .     .     .    R230
          .     .     .     .
          .     .     .     .
          .     .   CP244...........
          .     .     .
          .     .     .
323       .     .     .------->  DI245
322       .     .    D244 (1116 cfs)
          .     .     V
          .     .     V
326       .     .    R244
          .     .     .
          .     .     .
332       .     .     .    D243
          .     .     .     .
          .     .     .     .
340       .     .   1I243...........
          .     .     .
          .     .     .
343       .   CP243...........
          .     V  1112 cfs
          .     V
346       .    R243
          .     .
          .     .
353       .     .     .<-------  DI231
352       .     .    D229
          .     .     V
          .     .     V
354       .     .    R229
          .     .     .
          .     .     .
359       .     .     .    231
          .     .     .     .
          .     .     .     .
365       .     .   CP231...........
          .     .     V
          .     .     V
367       .     .    R231
```

```
          .       .       .
          .       .       .
          .       .       .       245( 166cfs)
          .       .       .       .
          .       .       .       .
381       .       .       .       .       .<------  DI245
380       .       .       .       .       D244
          .       .       .       .       V
          .       .       .       .       V
383       .       .       .       .       R244
          .       .       .       .       .
          .       .       .       .       .
389       .       .      1I245.........................
          .       .       .
          .       . 1807cfs.
392       .      CP245............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1***************************************                   ***************************************
*                                       *                   *                                     *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                   *  U.S. ARMY CORPS OF ENGINEERS       *
*          SEPTEMBER 1990               *                   *  HYDROLOGIC ENGINEERING CENTER      *
*            VERSION 4.0                *                   *       609 SECOND STREET             *
*                                       *                   *   DAVIS, CALIFORNIA 95616           *
*  RUN DATE  06/03/1992  TIME  10:34:57 *                   *        (916) 756-1104               *
*                                       *                   *                                     *
****************************************                   ***************************************
```

REVISION OF WLB HYDROLOGY FOR PROPOSED COLTER CHANNEL
100 YEAR 24 HOUR SCS TYPE II STORM
CASE 1: FULL DEVELOPMENT; EXISTING CONDITION FLOW PATHS THROUGH THE
WIGWAM CREEK DEVELOPMENT

```
 7 IO        OUTPUT CONTROL VARIABLES
               IPRNT          5  PRINT CONTROL
               IPLOT          0  PLOT CONTROL
               QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
               NMIN           5  MINUTES IN COMPUTATION INTERVAL
               IDATE    15APR92  STARTING DATE
               ITIME       0100  STARTING TIME
                 NQ         300  NUMBER OF HYDROGRAPH ORDINATES
              NDDATE    16APR92  ENDING DATE
              NDTIME       0155  ENDING TIME
              ICENT          19  CENTURY MARK

             COMPUTATION INTERVAL     .08 HOURS
                TOTAL TIME BASE    24.92 HOURS

      ENGLISH UNITS
          DRAINAGE AREA          SQUARE MILES
          PRECIPITATION DEPTH    INCHES
          LENGTH, ELEVATION      FEET
          FLOW                   CUBIC FEET PER SECOND
          STORAGE VOLUME         ACRE-FEET
          SURFACE AREA           ACRES
          TEMPERATURE            DEGREES FAHRENHEIT

    D        INDEX STORM NO. 1
               STRM        4.03  PRECIPITATION DEPTH
               TRDA         .00  TRANSPOSITION DRAINAGE AREA

 10 PI         PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

20 JD INDEX STORM NO. 2

STRM 3.99 PRECIPITATION DEPTH

TRDA 10.00 TRANSPOSITION DRAINAGE AREA

PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

21 JD INDEX STORM NO. 3

STRM 3.83 PRECIPITATION DEPTH

TRDA 50.00 TRANSPOSITION DRAINAGE AREA

```
*
KK  R244A
KM   APPROXIMATE CHANNEL THROUGH THE WIGWAM CREEK DEVELOPMENT
RD   2400  .003  .035        TRAP    50     2
ZW      A=COLTER  C=FLOW  F=R244A
*
KK  CP243A
HC     2  3.19
ZW      A=COLTER  C=FLOW  F=CP243A
*
KK  R243A
RS     1    -1     0
RC    .04   .022    .04  2400   .072
RX   1000   1005   1010   1028   1172   1190   1195   1200
RY 1035.5 1035.5 1034.5   1030   1030 1034.5 1035.5 1035.5
ZW      A=COLTER  C=FLOW  F=R243A
*
KK   D244
KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM   L = 0.53,  Lca = 0.21,  S = 18.9,  Kn = 0.03,  LAG = 11.0 MINUTES
KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA   .19
LG   .50    .0   3.69   .43    0.0
UI   146.  440.  551.  236.   71.   18.    0.    0.    0.    0.
*
*
KK   DR229
DR   1D230
*
KK   R229
RS     2           -1     0
RC    .02   .045    .06   1850   .005
RX    980    985    990   1000   1020   1040   1100   1150
RY   1044 1043.5 1043.5   1042   1042   1044 1044.5   1045
*
KK   D230
KM   BASIN D230
KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM   L = 0.36,  Lca = 0.13,  S = 27.8  Kn = 0.03  LAG = 7 MINUTES
KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA   .04
LG    .5   0.0   3.55   0.47   45.0
UI   74.  176.   51.    8.    0.    0.    0.    0.    0.    0.
*
KK   CP230
HC     2   1.06
*
KK   R230
RS     2          -1      0
RC    .03    .04    .05   1450  .0027
RX   1000   1010   1020   1030   1050   1110   1250   1475
RY 1034.5   1034   1034 1032.5 1032.5   1034   1035   1036
*
KK   CP244
HC     2   1.74
*
KK   Di244
DT   DI245
```

```
313    DI     0     4    20    37   409  1849  4296
314    DQ     0     0     0     0   354  1750  4133
*

315    KK   R244
316    RS     3           -1     0
317    RC   .025   .035   .06  2200  .0018
318    RX   1000   1015  1020  1025  1035  1040  1060  1080
319    RY 1032.3   1032  1032  1031  1031  1032  1034 1034.5
320    ZW     A=COLTER  C=FLOW  F=R244
*

321    KK   D243
322    KM   L = 1200', Lca = 400', S = 0.0075, Kn = 0.025, %IMP = 80
323    KM   LAG = 4 MIN.
324    KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
325    BA   .06
326    LG    .4   .22   4.3   .26   80.
327    UI   327.  132.   0.    0.    0.    0.    0.    0.    0.    0.
328    ZW     A=COLTER  C=FLOW  F=D243
*

329    KK  1I243
330    HC     2   1.8
331    ZW     A=COLTER  C=FLOW  F=NORTH
*

332    KK   CP243
333    HC     2   3.48
334    ZW     A=COLTER  C=FLOW  F=CP243
*

335    KK   R243
336    RS     1           -1     0
337    RC    0.4  0.022   0.4  1000   .001
338    RX   1000   1005  1010  1028  1172  1190  1195  1200
339    RY 1028.5 1028.5 1027.5  1023  1023 1027.5 1028.5 1028.5
340    ZW     A=COLTER  C=FLOW  F=R243
*

341    KK   D229
342    DR   DI231
*

343    KK   R229
344    RS     7           -1     0
345    RC    .07    .05   .07  2400   .002
346    RX   1000   1010  1040  1075  1110  1340  1600  1830
347    RY 1038.5   1038  1036  1035  1035  1036  1038 1038.5
*

348    KK    231
349    BA    .35
350    LG    .37    .31  3.61   .79   0.0
351    UI     34     65   143   186   230   299   422   339   271   215
352    UI    170    115    61    54    34    22    10    10    10    10
353    UI      0      0     0     0     0     0     0     0     0     0
*

354    KK   CP231
355    HC      2   1.37
*

356    KK   R231
357    RS     13          -1     0
358    RC    .07    .05   .07  3900  .0018
359    RX   1000   1010  1040  1075  1110  1310  1600  1830
360    RY 1032.5   1032  1030  1029  1029  1030  1032 1032.5
*
```

```
361      KK    245
362      BA   0.28
363      LG   0.47    .07   3.88   0.89    0.0
364      UI    16     16     27     57     72     83     94    106    122    145
365      UI   188    202    165    142    127    110     96     83     72     54
366      UI    36     28     26     22     16     16      8      5      5      5
367      UI     5      5      5      5      5      0      0      0      0      0
        *

368      KK   D244
369      DR  DI245
370      ZW      A=COLTER  C=FLOW  F=D244
        *

371      KK   R244
372      RS     3             -1      0
373      RC    .07    .05    .07   1870  .0037
374      RX   1000   1010   1040   1075   1110   1340   1600   1830
375      RY 1032.5   1032   1030   1029   1029   1030   1032 1032.5
        *

376      KK  1I245
377      HC     3   2.37
378      ZW      A=COLTER  C=FLOW  F=1I245
        *

379      KK  CP245
380      HC     2   4.11
381      ZW      A=COLTER  C=FLOW  F=CP245
382      ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
LINE    (V) ROUTING         (--->) DIVERSION OR PUMP FLOW

NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 25      223
          .
          .
 32       .------->  DI225
 31     D223
          V
          V
 35     R223
          .
          .
 41       .        .<-------  DI225
 40       .       D223
          .         V
          .         V
 42       .       R223
          .         .
          .         .
 47       .         .        225
          .         .         .
          .         .         .
 53       .       1I225............
          .         .
          .         .
 55       .         .       225A
          .         .         .
          .         .         .
          .       CP225............
          .         V
          .         V
 62       .       SR225
          .         V
```

```
         .   V
67       .  R225
         .   .
         .   .
72       .   .      D242D
         .   .        .
         .   .        .
81       .  1I242D............
         .   .
         .   .
83       .   .      242B
         .   .        V
         .   .        V
89       .   .      R242B
         .   .        .
         .   .        .
97       .   .        .      N242C
         .   .        .        V
         .   .        .        V
107      .   .        .      RN242C
         .   .        .        .
         .   .        .        .
111      .  CP242D........................
         .   V  (540 cfs)
         .   V
114      .  R242D
         .   .
         .   .
119      .   .      D242E
         .   .        .
         .   .        .
128      .  CP242E............
         .   V  (618 cfs)
         .   V
131      .  R242E
         .   .
         .   .
136      .   .      N242F
         .   .        V
         .   .        V
145      .   .      RN242F
         .   .        .
         .   .        .
148      .   .        .      D242F
         .   .        .        .
         .   .        .        .
157      .  CP242F........................
         .   .  (1059 cfs)
         .   .
160      .   .      NV1
         .   .        V
         .   .        V
169      .   .      RNV1
         .   .        .
         .   .        .
171      .  CPNV1............
         .   V
         .   V
174      .  RCPNV1
         .   .
         .   .
179      .   .      NV2
         .   .        .
         .   .        .
         .  CPNV2............
         .   V
         .   V
191      .  RCPNV2
         .   .
```

. .
[illegible] . . NV3
. . .
. . .
205 . I243A............
. .
. .
208 . . 227
. . V
. . V
213 . . R227
. . .
. . .
218 . . . 228
. . . V
. . . V
223 . . . R228
. . . .
. . . .
228 229
. . . . .
. . . . .
233 . . CP229........................
. . .
. . .
236 . . .-------> 1D230
235 . . D229
. . .
. . .
240 . . .-------> DI231
239 . . D229
. . V
. . V
. . R229
. . .
. . .
248 . . . 230A
. . . .
. . . .
253 . . CP230A............
. . V
. . V
255 . . R230A
. . .
. . .
258 . . . D244A
. . . .
. . . .
265 . . CP244A............
. . V
. . V
267 . . R244A
. . .
. . .
271 . CP243A............
. V (1889 cfs)
. V
274 . R243A
. .
. .
280 . . D244
. . .
. . .
. . . .<------- 1D230
. . . DR229
. . . V
. . . V
289 . . . R229
. . . .

```
            .        .        .        .
 ...        .        .        .        .        D230
            .        .        .        .        .
            .        .        .        .        .
 302        .        .        .       CP230............
            .        .        .        V
            .        .        .        V
 304        .        .        .       R230
            .        .        .        .
            .        .        .        .
 309        .        .       CP244............
            .        .        .
            .        .        .
 312        .        .        .------->  DI245
 311        .        .       Di244
            .        .        V
            .        .        V
 315        .        .       R244
            .        .        .
            .        .        .
 321        .        .        .       D243
            .        .        .        .
            .        .        .        .
 329        .        .       1I243............
            .        .        .
            .        .        .
 332        .      CP243............
            .        V   (1916 cfs)
            .        V
 335        .      R243
            .        .
            .        .
 ..         .        .        .<-------  DI231
            .        .       D229
            .        .        V
            .        .        V
 343        .        .       R229
            .        .        .
            .        .        .
 348        .        .        .        231
            .        .        .        .
            .        .        .        .
 354        .        .       CP231............
            .        .        V
            .        .        V
 356        .        .       R231
            .        .        .
            .        .        .
 361        .        .        .        245
            .        .        .        .
            .        .        .        .
 369        .        .        .        .        .<-------  DI245
 368        .        .        .        .       D244
            .        .        .        .        V
            .        .        .        .        V
 371        .        .        .        .       R244
            .        .        .        .        .
            .        .        .        .        .
 376        .        .       1I245........................
            .        .        .
            .        .        .
 379        .      CP245............
                   (2302 cfs)
```

RUNOFF ALSO COMPUTED AT THIS LOCATION

```
 ***********************************                       ****************************************
 *                                  *                      *                                      *
 *  FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                   *  U.S. ARMY CORPS OF ENGINEERS        *
 *       SEPTEMBER 1990              *                     *  HYDROLOGIC ENGINEERING CENTER       *
 *        VERSION 4.0                *                     *       609 SECOND STREET              *
```

* * * DAVIS, CALIFORNIA 95616 *
* RUN DATE 06/03/1992 TIME 15:19:27 * * (916) 756-1104 *
* * *
*************************************** **

REVISION OF WLB HYDROLOGY FOR PROPOSED COLTER CHANNEL
100 YEAR 24 HOUR SCS TYPE II STORM
CASE 2: FLOW ALONG THE AIRLINE CANAL DIVERTED INTO THE WIGWAM CREEK
DRAINAGE CHANNEL WHICH IS ASSUMED TO EMPTY AT CP243. DEVELOPED
CONDITIONS IN THE WIGWAM CREEK SUBDIVISION

8 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 15APR92 STARTING DATE
ITIME 0100 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 16APR92 ENDING DATE
NDTIME 0155 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

10 JD INDEX STORM NO. 1
STRM 4.03 PRECIPITATION DEPTH
TRDA .00 TRANSPOSITION DRAINAGE AREA

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									
+		223	1763.	12.42	327.	110.	106.	1.26		
	DIVERSION TO									
+		DI225	60.	8.92	60.	43.	42.	1.26		
	HYDROGRAPH AT									
+		D223	1703.	12.42	267.	67.	64.	1.26		
	ROUTED TO									
		R223	1577.	12.67	266.	67.	64.	1.26		
	HYDROGRAPH AT									
+		D223	60.	8.92	60.	43.	42.	1.26		

ROUTED TO							
+	R223	60.	10.33	60.	42.	41.	1.26
HYDROGRAPH AT							
+	225	460.	12.42	59.	15.	15.	.43
2 COMBINED AT							
+	1I225	520.	12.42	119.	58.	55.	.43
HYDROGRAPH AT							
+	225A	441.	12.42	50.	12.	12.	.37
2 COMBINED AT							
+	CP225	959.	12.42	168.	70.	67.	.80
ROUTED TO							
+	SR225	83.	13.50	80.	45.	43.	.80
ROUTED TO							
+	R225	83.	13.67	80.	44.	42.	.80
HYDROGRAPH AT							
+	D242D	393.	12.00	30.	9.	9.	.16
2 COMBINED AT							
+	1I242D	423.	12.00	101.	53.	52.	.93
HYDROGRAPH AT							
+	242B	124.	12.17	11.	3.	3.	.07
ROUTED TO							
+	R242B	113.	12.25	11.	3.	3.	.07
HYDROGRAPH AT							
+	N242C	189.	12.25	16.	4.	4.	.13
ROUTED TO							
+	RN242C	186.	12.33	16.	4.	4.	.13
3 COMBINED AT							
+	CP242D	540.	12.08	128.	61.	59.	1.16
ROUTED TO							
+	R242D	511.	12.08	128.	60.	58.	1.16
HYDROGRAPH AT							
+	D242E	125.	12.00	10.	3.	3.	.05
2 COMBINED AT							
+	CP242E	618.	12.08	137.	63.	61.	1.21
ROUTED TO							
+	R242E	574.	12.17	137.	63.	61.	1.21
HYDROGRAPH AT							
+	N242F	227.	12.08	16.	4.	4.	.13
ROUTED TO							
+	RN242F	224.	12.25	16.	4.	4.	.13
HYDROGRAPH AT							
+	D242F	418.	12.00	33.	10.	10.	.17
3 COMBINED AT							
	CP242F	1059.	12.08	183.	77.	74.	1.51
HYDROGRAPH AT							
+	NV1	107.	12.00	6.	2.	1.	.05
ROUTED TO							

+		RNV1	103.	12.08	6.	2.	1.	.05
	2 COMBINED AT	CPNV1	1161.	12.08	189.	79.	76.	1.56
+	ROUTED TO	RCPNV1	1074.	12.17	189.	78.	75.	1.56
+	HYDROGRAPH AT	NV2	165.	12.00	13.	4.	4.	.06
+	2 COMBINED AT	CPNV2	1088.	12.17	200.	82.	79.	1.62
+	ROUTED TO	RCPNV2	1065.	12.17	200.	81.	78.	1.62
+	HYDROGRAPH AT	NV3	165.	12.00	13.	4.	4.	.06
+	2 COMBINED AT	I243A	1078.	12.17	211.	85.	82.	1.68
+	HYDROGRAPH AT	227	331.	12.25	30.	8.	7.	.23
+	ROUTED TO	R227	271.	12.58	30.	8.	7.	.23
+	HYDROGRAPH AT	228	361.	12.33	36.	9.	9.	.28
	ROUTED TO	R228	322.	12.50	36.	9.	9.	.28
+	HYDROGRAPH AT	229	724.	12.17	61.	16.	15.	.51
+	3 COMBINED AT	CP229	863.	12.33	127.	32.	31.	1.02
+	DIVERSION TO	1D230	187.	12.33	28.	7.	7.	1.02
+	HYDROGRAPH AT	D229	676.	12.33	99.	25.	24.	1.02
+	DIVERSION TO	DI231	172.	12.33	25.	6.	6.	1.02
+	HYDROGRAPH AT	D229	505.	12.33	74.	19.	18.	1.02
+	ROUTED TO	R229	482.	12.58	74.	19.	18.	1.02
+	HYDROGRAPH AT	230A	292.	12.17	21.	5.	5.	.18
+	2 COMBINED AT	CP230A	530.	12.25	95.	24.	23.	1.20
	ROUTED TO	R230A	516.	12.33	95.	24.	23.	1.20
+	HYDROGRAPH AT	D244A	507.	12.17	43.	12.	12.	.31
+	2 COMBINED AT	CP244A	936.	12.25	138.	36.	35.	1.51

	ROUTED TO							
+		R244A	910.	12.33	138.	36.	35.	1.51
	2 COMBINED AT							
+		CP243A	1889.	12.25	348.	121.	117.	3.19
	ROUTED TO							
+		R243A	1842.	12.25	348.	121.	116.	3.19
	HYDROGRAPH AT							
+		D244	421.	12.08	28.	7.	7.	.19
	HYDROGRAPH AT							
+		DR229	187.	12.33	28.	7.	7.	1.02
	ROUTED TO							
+		R229	181.	12.50	27.	7.	7.	1.02
	HYDROGRAPH AT							
+		D230	106.	12.00	9.	3.	3.	.04
	2 COMBINED AT							
+		CP230	186.	12.50	36.	10.	9.	1.06
	ROUTED TO							
+		R230	178.	12.67	36.	10.	9.	1.06
	2 COMBINED AT							
+		CP244	504.	12.08	64.	17.	16.	1.74
	DIVERSION TO							
+		DI245	446.	12.08	45.	11.	11.	1.74
	HYDROGRAPH AT							
+		Di244	58.	12.08	19.	5.	5.	1.74
	ROUTED TO							
+		R244	52.	12.33	19.	5.	5.	1.74
	HYDROGRAPH AT							
+		D243	166.	12.00	16.	6.	5.	.06
	2 COMBINED AT							
+		1I243	197.	12.00	35.	11.	11.	1.80
	2 COMBINED AT							
+		CP243	1916.	12.25	381.	132.	127.	3.48
	ROUTED TO							
+		R243	1910.	12.33	381.	131.	126.	3.48
	HYDROGRAPH AT							
+		D229	172.	12.33	25.	6.	6.	1.02
	ROUTED TO							
+		R229	142.	12.92	25.	6.	6.	1.02
	HYDROGRAPH AT							
+		231	265.	12.42	28.	7.	7.	.35
	2 COMBINED AT							
+		CP231	279.	12.50	53.	13.	13.	1.37
	ROUTED TO							
		R231	234.	13.33	53.	13.	13.	1.37
	HYDROGRAPH AT							
+		245	168.	12.83	29.	7.	7.	.28
	HYDROGRAPH AT							

```
+               D244     446.  12.08      45.      11.      11.     1.74

     ROUTED TO
                R244     310.  12.33      45.      11.      11.     1.74

     3 COMBINED AT
+               1I245    410.  13.25     125.      32.      31.     2.37

     2 COMBINED AT
+               CP245   2302.  12.33     505.     163.     157.     4.11
1
                     SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                              INTERPOLATED TO
                                            COMPUTATION INTERVAL
      ISTAQ   ELEMENT     DT      PEAK   TIME TO    VOLUME     DT     PEAK   TIME TO    VOLUME
                                           PEAK                               PEAK

                         (MIN)   (CFS)   (MIN)     (IN)     (MIN)   (CFS)   (MIN)      (IN)

      FOR STORM = 1  STORM AREA (SQ MI) =      .00
       RN242C  MANE      2.25   189.33   738.00    1.18     5.00   187.13   740.00     1.18

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8195E+01 EXCESS= .0000E+00 OUTFLOW= .8192E+01 BASIN STORAGE= .2471E-02 PERCENT
ERROR=    .0

      FOR STORM = 2  STORM AREA (SQ MI) =    10.00
       RN242C  MANE      2.25   186.58   738.00    1.16     5.00   184.48   740.00     1.16

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8058E+01 EXCESS= .0000E+00 OUTFLOW= .8054E+01 BASIN STORAGE= .2346E-02 PERCENT
    OR=    .0

      FOR STORM = 3  STORM AREA (SQ MI) =    50.00
       RN242C  MANE      2.25   175.54   738.00    1.08     5.00   173.81   740.00     1.08

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7505E+01 EXCESS= .0000E+00 OUTFLOW= .7501E+01 BASIN STORAGE= .2394E-02 PERCENT
ERROR=    .0

      FOR STORM = 4  STORM AREA (SQ MI) =   100.00
       RN242C  MANE      2.25   170.77   738.00    1.05     5.00   169.23   740.00     1.05

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7268E+01 EXCESS= .0000E+00 OUTFLOW= .7265E+01 BASIN STORAGE= .2823E-02 PERCENT
ERROR=    .0

      FOR STORM = 5  STORM AREA (SQ MI) =   200.00
       RN242C  MANE      2.25   166.74   738.00    1.02     5.00   165.38   740.00     1.02

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7072E+01 EXCESS= .0000E+00 OUTFLOW= .7069E+01 BASIN STORAGE= .3612E-02 PERCENT
ERROR=    .0

      FOR STORM = 1  STORM AREA (SQ MI) =      .00
       RN242F  MANE      1.75   226.06   733.25    1.17     5.00   225.46   735.00     1.17

   TINUITY SUMMARY (AC-FT) - INFLOW= .8149E+01 EXCESS= .0000E+00 OUTFLOW= .8143E+01 BASIN STORAGE= .4235E-02 PERCENT
    OR=    .0

      FOR STORM = 2  STORM AREA (SQ MI) =    10.00
       RN242F  MANE      1.75   222.87   733.25    1.15     5.00   222.41   735.00     1.16
```

TINUITY SUMMARY (AC-FT) - INFLOW= .8013E+01 EXCESS= .0000E+00 OUTFLOW= .8007E+01 BASIN STORAGE= .3832E-02 PERCENT
R= .0

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
RN242F MANE 1.75 210.18 735.00 1.08 5.00 210.18 735.00 1.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7463E+01 EXCESS= .0000E+00 OUTFLOW= .7457E+01 BASIN STORAGE= .3348E-02 PERCENT
ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
RN242F MANE 1.75 204.88 735.00 1.04 5.00 204.88 735.00 1.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7228E+01 EXCESS= .0000E+00 OUTFLOW= .7221E+01 BASIN STORAGE= .3496E-02 PERCENT
ERROR= .0

FOR STORM = 5 STORM AREA (SQ MI) = 200.00
RN242F MANE 1.75 200.38 735.00 1.01 5.00 200.38 735.00 1.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7032E+01 EXCESS= .0000E+00 OUTFLOW= .7026E+01 BASIN STORAGE= .3729E-02 PERCENT
ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00
RNV1 MANE 1.50 104.46 724.50 1.23 5.00 103.48 725.00 1.23

TINUITY SUMMARY (AC-FT) - INFLOW= .3085E+01 EXCESS= .0000E+00 OUTFLOW= .3079E+01 BASIN STORAGE= .1047E-02 PERCENT
ERROR= .2

FOR STORM = 2 STORM AREA (SQ MI) = 10.00
RNV1 MANE 1.50 103.17 724.50 1.21 5.00 102.20 725.00 1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3038E+01 EXCESS= .0000E+00 OUTFLOW= .3031E+01 BASIN STORAGE= .1007E-02 PERCENT
ERROR= .2

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
RNV1 MANE 1.50 97.99 724.50 1.13 5.00 97.10 725.00 1.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2847E+01 EXCESS= .0000E+00 OUTFLOW= .2841E+01 BASIN STORAGE= .1232E-02 PERCENT
ERROR= .2

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
RNV1 MANE 1.50 95.72 724.50 1.10 5.00 94.86 725.00 1.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2764E+01 EXCESS= .0000E+00 OUTFLOW= .2758E+01 BASIN STORAGE= .1057E-02 PERCENT
ERROR= .2

FOR STORM = 5 STORM AREA (SQ MI) = 200.00
RNV1 MANE 1.50 93.77 724.50 1.07 5.00 92.93 725.00 1.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2692E+01 EXCESS= .0000E+00 OUTFLOW= .2686E+01 BASIN STORAGE= .1372E-02 PERCENT
ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .00
R230A MANE 4.23 525.39 741.11 .75 5.00 522.82 740.00 .75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4822E+02 EXCESS= .0000E+00 OUTFLOW= .4819E+02 BASIN STORAGE= .3281E-01 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = 10.00
R230A MANE 4.26 516.79 741.21 .74 5.00 514.05 740.00 .74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4745E+02 EXCESS= .0000E+00 OUTFLOW= .4741E+02 BASIN STORAGE= .3285E-01 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
R230A MANE 4.37 480.58 742.36 .69 5.00 479.44 740.00 .69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4439E+02 EXCESS= .0000E+00 OUTFLOW= .4436E+02 BASIN STORAGE= .3188E-01 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
R230A MANE 4.42 466.23 742.16 .67 5.00 463.42 740.00 .67

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4300E+02 EXCESS= .0000E+00 OUTFLOW= .4298E+02 BASIN STORAGE= .3153E-01 PERCENT ERROR= .0

FOR STORM = 5 STORM AREA (SQ MI) = 200.00
R230A MANE 4.46 455.64 741.00 .65 5.00 451.51 740.00 .65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4181E+02 EXCESS= .0000E+00 OUTFLOW= .4178E+02 BASIN STORAGE= .3134E-01 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00
R244A MANE 5.00 921.56 740.00 .90 5.00 921.56 740.00 .90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7234E+02 EXCESS= .0000E+00 OUTFLOW= .7230E+02 BASIN STORAGE= .7088E-01 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = 10.00
R244A MANE 5.00 906.80 740.00 .88 5.00 906.80 740.00 .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7122E+02 EXCESS= .0000E+00 OUTFLOW= .7119E+02 BASIN STORAGE= .7053E-01 PERCENT ERROR= -.1

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
R244A MANE 5.00 849.69 740.00 .83 5.00 849.69 740.00 .83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6684E+02 EXCESS= .0000E+00 OUTFLOW= .6680E+02 BASIN STORAGE= .6872E-01 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
R244A MANE 5.00 821.62 740.00 .80 5.00 821.62 740.00 .80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6483E+02 EXCESS= .0000E+00 OUTFLOW= .6479E+02 BASIN STORAGE= .6795E-01 PERCENT ERROR= .0

```
FOR STORM = 5  STORM AREA (SQ MI) =     200.00
  R244A  MANE        5.00   797.74   740.00      .78     5.00   797.74   740.00       .78
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6314E+02 EXCESS= .0000E+00 OUTFLOW= .6309E+02 BASIN STORAGE= .6731E-01 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

```
-----DSS---ZCLOSE Unit:  71,   File: CASE2.DSS
        Pointer Utilization:  .34
        Number of Records:     60
        File Size:    107.6  Kbytes
        Percent Inactive:   .00
```

```
*
KK  R244A
KM  APPROXIMATE CHANNEL THROUGH THE WIGWAM CREEK DEVELOPMENT
RD  2400  .003  .035      TRAP   50   2
ZW     A=COLTER  C=FLOW  F=R244A
*
KK  CP243A
HC     2  3.19
ZW     A=COLTER  C=FLOW  F=CP243A
*
KK  R243A
RS     1   -1    0
RC   .04  .022   .04  2400  .072
RX  1000  1005  1010  1028  1172  1190  1195  1200
RY 1035.5 1035.5 1034.5  1030  1030 1034.5 1035.5 1035.5
ZW     A=COLTER  C=FLOW  F=R243A
*
KK  D244
KM  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM  L = 0.53,  Lca = 0.21,  S = 18.9,  Kn = 0.03,  LAG = 11.0 MINUTES
KM  PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA  .19
LG  .50   .0  3.69  .43   0.0
UI  146.  440.  551.  236.  71.  18.  0.  0.  0.  0.
*
*
KK  DR229
DR  1D230
*
KK  R229
RS    2         -1    0
RC   .02  .045   .06  1850  .005
RX   980   985   990  1000  1020  1040  1100  1150
RY  1044 1043.5 1043.5  1042  1042  1044 1044.5  1045
*
KK  D230
KM  BASIN D230
KM  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM  L = 0.36,  Lca = 0.13,  S = 27.8  Kn = 0.03  LAG = 7 MINUTES
KM  PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA  .04
LG  .5   0.0  3.55  0.47  45.0
UI  74.  176.  51.  8.  0.  0.  0.  0.  0.  0.
*
KK  CP230
HC    2  1.06
*
KK  R230
RS    2         -1    0
RC   .03   .04   .05  1450  .0027
RX  1000  1010  1020  1030  1050  1110  1250  1475
RY 1034.5  1034  1034 1032.5 1032.5  1034  1035  1036
*
KK  CP244
HC    2  1.74
*
KK  Di244
DT  DI245
```

```
DI     0     4    20    37   409  1849  4296
DQ     0     0     0     0   354  1750  4133
*

KK   R244
RS     3          -1     0
RC   .025   .035   .06   2200  .0018
RX   1000   1015   1020   1025   1035   1040   1060   1080
RY 1032.3   1032   1032   1031   1031   1032   1034 1034.5
ZW     A=COLTER  C=FLOW  F=R244
*

KK   D243
KM   L = 1200', Lca = 400', S = 0.0075, Kn = 0.025, %IMP = 80
KM   LAG = 4 MIN.
KM   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA   .06
LG    .4   .22   4.3   .26   80.
UI   327.  132.   0.   0.   0.   0.   0.   0.   0.   0.
ZW     A=COLTER  C=FLOW  F=D243
*

KK   1I243
HC     2   1.8
ZW     A=COLTER  C=FLOW  F=NORTH
*

KK   CP243
HC     2   3.48
ZW     A=COLTER  C=FLOW  F=CP243
*

KK   R243
RS     1          -1     0
RC    0.4  0.022   0.4   1000   .001
RX   1000   1005   1010   1028   1172   1190   1195   1200
RY 1028.5 1028.5 1027.5   1023   1023 1027.5 1028.5 1028.5
ZW     A=COLTER  C=FLOW  F=R243
*

KK   D229
DR   DI231
*

KK   R229
RS     7          -1     0
RC    .07    .05   .07   2400   .002
RX   1000   1010   1040   1075   1110   1340   1600   1830
RY 1038.5   1038   1036   1035   1035   1036   1038 1038.5
*

KK    231
BA    .35
LG    .37    .31   3.61    .79    0.0
UI     34     65    143    186    230    299    422    339    271    215
UI    170    115     61     54     34     22     10     10     10     10
UI      0      0      0      0      0      0      0      0      0      0
*

KK   CP231
HC     2   1.37
*

KK   R231
RS    13          -1     0
RC    .07    .05   .07   3900  .0018
RX   1000   1010   1040   1075   1110   1310   1600   1830
RY 1032.5   1032   1030   1029   1029   1030   1032 1032.5
*
```

```
361       KK    245
362       BA   0.28
363       LG   0.47    .07   3.88   0.89    0.0
364       UI     16     16     27     57     72     83     94    106    122    145
365       UI    188    202    165    142    127    110     96     83     72     54
366       UI     36     28     26     22     16     16      8      5      5      5
367       UI      5      5      5      5      5      0      0      0      0      0
         *

368       KK   D244
369       DR  DI245
370       ZW       A=COLTER  C=FLOW  F=D244
         *

371       KK   R244
372       RS      3             -1      0
373       RC    .07    .05    .07   1870  .0037
374       RX   1000   1010   1040   1075   1110   1340   1600   1830
375       RY 1032.5   1032   1030   1029   1029   1030   1032 1032.5
         *

376       KK  1I245
377       HC      3   2.37
378       ZW       A=COLTER  C=FLOW  F=1I245
         *

379       KK  CP245
380       HC      2   4.11
381       ZW       A=COLTER  C=FLOW  F=CP245
382       ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 JT
LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

 25      223
          .
          .
 32       .------->  DI225
 31      D223
          V
          V
 35      R223
          .
          .
 41       .       .<-------  DI225
 40       .      D223
          .       V
          .       V
 42       .      R223
          .       .
          .       .
 47       .       .        225
          .       .         .
          .       .         .
 53       .      1I225............
          .       .
          .       .
 55       .       .        225A
          .       .         .
          .       .         .
          .      CP225............
          .       V
          .       V
 62       .      SR225
          .       V
```

```
        .     V
  --    .    R225
        .     .
        .     .
 72     .     .     D242D
        .     .       .
        .     .       .
 81     .   1I242D...........
        .     .
        .     .
 83     .     .     242B
        .     .       V
        .     .       V
 89     .     .     R242B
        .     .       .
        .     .       .
 97     .     .       .      N242C
        .     .       .        V
        .     .       .        V
107     .     .       .      RN242C
        .     .       .        .
        .     .       .        .
111     .   CP242D.......................
        .     V    (540 cfs)
        .     V
114     .    R242D
        .     .
        .     .
119     .     .     D242E
        .     .       .
        .     .       .
128     .   CP242E...........
        .     V    (618 cfs)
        .     V
131     .    R242E
        .     .
        .     .
136     .     .     N242F
        .     .       V
        .     .       V
145     .     .     RN242F
        .     .       .
        .     .       .
148     .     .       .      D242F
        .     .       .        .
        .     .       .        .
157     .   CP242F.......................
        .     .    (1059 cfs)
        .     .
160     .     .      NV1
        .     .       V
        .     .       V
169     .     .      RNV1
        .     .       .
        .     .       .
171     .   CPNV1...........
        .     V
        .     V
174     .   RCPNV1
        .     .
        .     .
179     .     .      NV2
        .     .       .
        .     .       .
        .   CPNV2...........
        .     V
        .     V
191     .   RCPNV2
        .     .
```

. .
206 . . NV3
. . .
. . .
205 . I243A............
. .
. .
208 . . 227
. . V
. . V
213 . . R227
. . .
. . .
218 . . . 228
. . . V
. . . V
223 . . . R228
. . . .
. . . .
228 229
. . . . .
. . . . .
233 . . CP229.........................
. . .
. . .
236 . . .-------> 1D230
235 . . D229
. . .
. . .
240 . . .-------> DI231
239 . . D229
. . V
. . V
. . R229
. . .
. . .
248 . . . 230A
. . . .
. . . .
253 . . CP230A............
. . V
. . V
255 . . R230A
. . .
. . .
258 . . . D244A
. . . .
. . . .
265 . . CP244A............
. . V
. . V
267 . . R244A
. . .
. . .
271 . CP243A............
. V 1889 cfs
. V
274 . R243A
. .
. .
280 . . D244
. . .
. . .
. . . .<------- 1D230
. . . DR229
. . . V
. . . V
289 . . . R229
. . . .

```
             .       .       .       .
 [illegible] .       .       .       .       D230
             .       .       .       .       .
             .       .       .       .       .
 302         .       .       .      CP230............
             .       .       .       V
             .       .       .       V
 304         .       .       .      R230
             .       .       .       .
             .       .       .       .
 309         .       .      CP244............
             .       .       .
             .       .       .
 312         .       .       .-------> DI245
 311         .       .      Di244
             .       .       V
             .       .       V
 315         .       .      R244
             .       .       .
             .       .       .
 321         .       .       .       D243
             .       .       .       .
             .       .       .       .
 329         .       .      1I243............
             .       .       .
             .       .       .
 332         .      CP243............
             .       V   (1916 cfs)
             .       V
 335         .      R243
             .       .
             .       .
 [illegible]2 .      .       .<------- DI231
             .       .      D229
             .       .       V
             .       .       V
 343         .       .      R229
             .       .       .
             .       .       .
 348         .       .       .       231
             .       .       .       .
             .       .       .       .
 354         .       .      CP231............
             .       .       V
             .       .       V
 356         .       .      R231
             .       .       .
             .       .       .
 361         .       .       .       245
             .       .       .       .
             .       .       .       .
 369         .       .       .       .       .<------- DI245
 368         .       .       .       .       D244
             .       .       .       .        V
             .       .       .       .        V
 371         .       .       .       .       R244
             .       .       .       .       .
             .       .       .       .       .
 376         .       .      1I245........................
             .       .       .
             .       .       .
 379         .      CP245............
                    (2302 cfs)
```

RUNOFF ALSO COMPUTED AT THIS LOCATION

```
*************************************                    ****************************************
*                                   *                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1) *                   *   U.S. ARMY CORPS OF ENGINEERS       *
*         SEPTEMBER 1990            *                    *   HYDROLOGIC ENGINEERING CENTER      *
*          VERSION 4.0              *                    *        609 SECOND STREET             *
```

* * * DAVIS, CALIFORNIA 95616 *
* RUN DATE 06/03/1992 TIME 15:19:27 * * (916) 756-1104 *
* * *
*************************************** ***************************************

REVISION OF WLB HYDROLOGY FOR PROPOSED COLTER CHANNEL
100 YEAR 24 HOUR SCS TYPE II STORM
CASE 2: FLOW ALONG THE AIRLINE CANAL DIVERTED INTO THE WIGWAM CREEK
DRAINAGE CHANNEL WHICH IS ASSUMED TO EMPTY AT CP243. DEVELOPED
CONDITIONS IN THE WIGWAM CREEK SUBDIVISION

8 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 5 MINUTES IN COMPUTATION INTERVAL
IDATE 15APR92 STARTING DATE
ITIME 0100 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 16APR92 ENDING DATE
NDTIME 0155 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

10 JD INDEX STORM NO. 1
STRM 4.03 PRECIPITATION DEPTH
TRDA .00 TRANSPOSITION DRAINAGE AREA

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	223	1763.	12.42	327.	110.	106.	1.26		
+	DIVERSION TO	DI225	60.	8.92	60.	43.	42.	1.26		
+	HYDROGRAPH AT	D223	1703.	12.42	267.	67.	64.	1.26		
+	ROUTED TO	R223	1577.	12.67	266.	67.	64.	1.26		
+	HYDROGRAPH AT	D223	60.	8.92	60.	43.	42.	1.26		

	ROUTED TO							
+	R223	60.	10.33	60.	42.	41.	1.26	
	HYDROGRAPH AT							
+	225	460.	12.42	59.	15.	15.	.43	
	2 COMBINED AT							
+	1I225	520.	12.42	119.	58.	55.	.43	
	HYDROGRAPH AT							
+	225A	441.	12.42	50.	12.	12.	.37	
	2 COMBINED AT							
+	CP225	959.	12.42	168.	70.	67.	.80	
	ROUTED TO							
+	SR225	83.	13.50	80.	45.	43.	.80	
	ROUTED TO							
+	R225	83.	13.67	80.	44.	42.	.80	
	HYDROGRAPH AT							
+	D242D	393.	12.00	30.	9.	9.	.16	
	2 COMBINED AT							
+	1I242D	423.	12.00	101.	53.	52.	.93	
	HYDROGRAPH AT							
+	242B	124.	12.17	11.	3.	3.	.07	
	ROUTED TO							
+	R242B	113.	12.25	11.	3.	3.	.07	
	HYDROGRAPH AT							
	N242C	189.	12.25	16.	4.	4.	.13	
	ROUTED TO							
+	RN242C	186.	12.33	16.	4.	4.	.13	
	3 COMBINED AT							
+	CP242D	540.	12.08	128.	61.	59.	1.16	
	ROUTED TO							
+	R242D	511.	12.08	128.	60.	58.	1.16	
	HYDROGRAPH AT							
+	D242E	125.	12.00	10.	3.	3.	.05	
	2 COMBINED AT							
+	CP242E	618.	12.08	137.	63.	61.	1.21	
	ROUTED TO							
+	R242E	574.	12.17	137.	63.	61.	1.21	
	HYDROGRAPH AT							
+	N242F	227.	12.08	16.	4.	4.	.13	
	ROUTED TO							
+	RN242F	224.	12.25	16.	4.	4.	.13	
	HYDROGRAPH AT							
+	D242F	418.	12.00	33.	10.	10.	.17	
	3 COMBINED AT							
	CP242F	1059.	12.08	183.	77.	74.	1.51	
	HYDROGRAPH AT							
+	NV1	107.	12.00	6.	2.	1.	.05	
	ROUTED TO							

+		RNV1	103.	12.08	6.	2.	1.	.05
	2 COMBINED AT	CPNV1	1161.	12.08	189.	79.	76.	1.56
+	ROUTED TO	RCPNV1	1074.	12.17	189.	78.	75.	1.56
+	HYDROGRAPH AT	NV2	165.	12.00	13.	4.	4.	.06
+	2 COMBINED AT	CPNV2	1088.	12.17	200.	82.	79.	1.62
+	ROUTED TO	RCPNV2	1065.	12.17	200.	81.	78.	1.62
+	HYDROGRAPH AT	NV3	165.	12.00	13.	4.	4.	.06
+	2 COMBINED AT	I243A	1078.	12.17	211.	85.	82.	1.68
+	HYDROGRAPH AT	227	331.	12.25	30.	8.	7.	.23
+	ROUTED TO	R227	271.	12.58	30.	8.	7.	.23
+	HYDROGRAPH AT	228	361.	12.33	36.	9.	9.	.28
	ROUTED TO	R228	322.	12.50	36.	9.	9.	.28
+	HYDROGRAPH AT	229	724.	12.17	61.	16.	15.	.51
+	3 COMBINED AT	CP229	863.	12.33	127.	32.	31.	1.02
+	DIVERSION TO	1D230	187.	12.33	28.	7.	7.	1.02
+	HYDROGRAPH AT	D229	676.	12.33	99.	25.	24.	1.02
+	DIVERSION TO	DI231	172.	12.33	25.	6.	6.	1.02
+	HYDROGRAPH AT	D229	505.	12.33	74.	19.	18.	1.02
+	ROUTED TO	R229	482.	12.58	74.	19.	18.	1.02
+	HYDROGRAPH AT	230A	292.	12.17	21.	5.	5.	.18
+	2 COMBINED AT	CP230A	530.	12.25	95.	24.	23.	1.20
	ROUTED TO	R230A	516.	12.33	95.	24.	23.	1.20
+	HYDROGRAPH AT	D244A	507.	12.17	43.	12.	12.	.31
+	2 COMBINED AT	CP244A	936.	12.25	138.	36.	35.	1.51

ROUTED TO							
+	R244A	910.	12.33	138.	36.	35.	1.51
2 COMBINED AT							
+	CP243A	1889.	12.25	348.	121.	117.	3.19
ROUTED TO							
+	R243A	1842.	12.25	348.	121.	116.	3.19
HYDROGRAPH AT							
+	D244	421.	12.08	28.	7.	7.	.19
HYDROGRAPH AT							
+	DR229	187.	12.33	28.	7.	7.	1.02
ROUTED TO							
+	R229	181.	12.50	27.	7.	7.	1.02
HYDROGRAPH AT							
+	D230	106.	12.00	9.	3.	3.	.04
2 COMBINED AT							
+	CP230	186.	12.50	36.	10.	9.	1.06
ROUTED TO							
+	R230	178.	12.67	36.	10.	9.	1.06
2 COMBINED AT							
+	CP244	504.	12.08	64.	17.	16.	1.74
DIVERSION TO							
+	DI245	446.	12.08	45.	11.	11.	1.74
HYDROGRAPH AT							
+	Di244	58.	12.08	19.	5.	5.	1.74
ROUTED TO							
+	R244	52.	12.33	19.	5.	5.	1.74
HYDROGRAPH AT							
+	D243	166.	12.00	16.	6.	5.	.06
2 COMBINED AT							
+	1I243	197.	12.00	35.	11.	11.	1.80
2 COMBINED AT							
+	CP243	1916.	12.25	381.	132.	127.	3.48
ROUTED TO							
+	R243	1910.	12.33	381.	131.	126.	3.48
HYDROGRAPH AT							
+	D229	172.	12.33	25.	6.	6.	1.02
ROUTED TO							
+	R229	142.	12.92	25.	6.	6.	1.02
HYDROGRAPH AT							
+	231	265.	12.42	28.	7.	7.	.35
2 COMBINED AT							
+	CP231	279.	12.50	53.	13.	13.	1.37
ROUTED TO							
	R231	234.	13.33	53.	13.	13.	1.37
HYDROGRAPH AT							
+	245	168.	12.83	29.	7.	7.	.28
HYDROGRAPH AT							

```
+                D244     446.  12.08      45.      11.      11.     1.74

   ROUTED TO
                 R244     310.  12.33      45.      11.      11.     1.74

   3 COMBINED AT
+                1I245    410.  13.25     125.      32.      31.     2.37

   2 COMBINED AT
+                CP245   2302.  12.33     505.     163.     157.     4.11
1
                     SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                          INTERPOLATED TO
                                        COMPUTATION INTERVAL
    ISTAQ   ELEMENT    DT     PEAK   TIME TO    VOLUME     DT     PEAK   TIME TO     VOLUME
                                PEAK                              PEAK

              (MIN)   (CFS)    (MIN)    (IN)    (MIN)   (CFS)    (MIN)      (IN)

    FOR STORM = 1  STORM AREA (SQ MI) =       .00
     RN242C  MANE     2.25   189.33   738.00    1.18    5.00   187.13   740.00     1.18


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8195E+01 EXCESS= .0000E+00 OUTFLOW= .8192E+01 BASIN STORAGE= .2471E-02 PERCENT
ERROR=   .0


    FOR STORM = 2  STORM AREA (SQ MI) =     10.00
     RN242C  MANE     2.25   186.58   738.00    1.16    5.00   184.48   740.00     1.16


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8058E+01 EXCESS= .0000E+00 OUTFLOW= .8054E+01 BASIN STORAGE= .2346E-02 PERCENT
   OR=   .0


    FOR STORM = 3  STORM AREA (SQ MI) =     50.00
     RN242C  MANE     2.25   175.54   738.00    1.08    5.00   173.81   740.00     1.08


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7505E+01 EXCESS= .0000E+00 OUTFLOW= .7501E+01 BASIN STORAGE= .2394E-02 PERCENT
ERROR=   .0


    FOR STORM = 4  STORM AREA (SQ MI) =    100.00
     RN242C  MANE     2.25   170.77   738.00    1.05    5.00   169.23   740.00     1.05


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7268E+01 EXCESS= .0000E+00 OUTFLOW= .7265E+01 BASIN STORAGE= .2823E-02 PERCENT
ERROR=   .0


    FOR STORM = 5  STORM AREA (SQ MI) =    200.00
     RN242C  MANE     2.25   166.74   738.00    1.02    5.00   165.38   740.00     1.02


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7072E+01 EXCESS= .0000E+00 OUTFLOW= .7069E+01 BASIN STORAGE= .3612E-02 PERCENT
ERROR=   .0


    FOR STORM = 1  STORM AREA (SQ MI) =       .00
     RN242F  MANE     1.75   226.06   733.25    1.17    5.00   225.46   735.00     1.17


  TINUITY SUMMARY (AC-FT) - INFLOW= .8149E+01 EXCESS= .0000E+00 OUTFLOW= .8143E+01 BASIN STORAGE= .4235E-02 PERCENT
   OR=   .0


    FOR STORM = 2  STORM AREA (SQ MI) =     10.00
     RN242F  MANE     1.75   222.87   733.25    1.15    5.00   222.41   735.00     1.16
```

TINUITY SUMMARY (AC-FT) - INFLOW= .8013E+01 EXCESS= .0000E+00 OUTFLOW= .8007E+01 BASIN STORAGE= .3832E-02 PERCENT
OR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
RN242F MANE 1.75 210.18 735.00 1.08 5.00 210.18 735.00 1.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7463E+01 EXCESS= .0000E+00 OUTFLOW= .7457E+01 BASIN STORAGE= .3348E-02 PERCENT
ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
RN242F MANE 1.75 204.88 735.00 1.04 5.00 204.88 735.00 1.04

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7228E+01 EXCESS= .0000E+00 OUTFLOW= .7221E+01 BASIN STORAGE= .3496E-02 PERCENT
ERROR= .0

FOR STORM = 5 STORM AREA (SQ MI) = 200.00
RN242F MANE 1.75 200.38 735.00 1.01 5.00 200.38 735.00 1.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7032E+01 EXCESS= .0000E+00 OUTFLOW= .7026E+01 BASIN STORAGE= .3729E-02 PERCENT
ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00
RNV1 MANE 1.50 104.46 724.50 1.23 5.00 103.48 725.00 1.23

TINUITY SUMMARY (AC-FT) - INFLOW= .3085E+01 EXCESS= .0000E+00 OUTFLOW= .3079E+01 BASIN STORAGE= .1047E-02 PERCENT
ERROR= .2

FOR STORM = 2 STORM AREA (SQ MI) = 10.00
RNV1 MANE 1.50 103.17 724.50 1.21 5.00 102.20 725.00 1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3038E+01 EXCESS= .0000E+00 OUTFLOW= .3031E+01 BASIN STORAGE= .1007E-02 PERCENT
ERROR= .2

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
RNV1 MANE 1.50 97.99 724.50 1.13 5.00 97.10 725.00 1.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2847E+01 EXCESS= .0000E+00 OUTFLOW= .2841E+01 BASIN STORAGE= .1232E-02 PERCENT
ERROR= .2

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
RNV1 MANE 1.50 95.72 724.50 1.10 5.00 94.86 725.00 1.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2764E+01 EXCESS= .0000E+00 OUTFLOW= .2758E+01 BASIN STORAGE= .1057E-02 PERCENT
ERROR= .2

FOR STORM = 5 STORM AREA (SQ MI) = 200.00
RNV1 MANE 1.50 93.77 724.50 1.07 5.00 92.93 725.00 1.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2692E+01 EXCESS= .0000E+00 OUTFLOW= .2686E+01 BASIN STORAGE= .1372E-02 PERCENT
ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .00
R230A MANE 4.23 525.39 741.11 .75 5.00 522.82 740.00 .75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4822E+02 EXCESS= .0000E+00 OUTFLOW= .4819E+02 BASIN STORAGE= .3281E-01 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = 10.00
R230A MANE 4.26 516.79 741.21 .74 5.00 514.05 740.00 .74

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4745E+02 EXCESS= .0000E+00 OUTFLOW= .4741E+02 BASIN STORAGE= .3285E-01 PERCENT ERROR= .0

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
R230A MANE 4.37 480.58 742.36 .69 5.00 479.44 740.00 .69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4439E+02 EXCESS= .0000E+00 OUTFLOW= .4436E+02 BASIN STORAGE= .3188E-01 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
R230A MANE 4.42 466.23 742.16 .67 5.00 463.42 740.00 .67

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4300E+02 EXCESS= .0000E+00 OUTFLOW= .4298E+02 BASIN STORAGE= .3153E-01 PERCENT ERROR= .0

FOR STORM = 5 STORM AREA (SQ MI) = 200.00
R230A MANE 4.46 455.64 741.00 .65 5.00 451.51 740.00 .65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4181E+02 EXCESS= .0000E+00 OUTFLOW= .4178E+02 BASIN STORAGE= .3134E-01 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .00
R244A MANE 5.00 921.56 740.00 .90 5.00 921.56 740.00 .90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7234E+02 EXCESS= .0000E+00 OUTFLOW= .7230E+02 BASIN STORAGE= .7088E-01 PERCENT ERROR= .0

FOR STORM = 2 STORM AREA (SQ MI) = 10.00
R244A MANE 5.00 906.80 740.00 .88 5.00 906.80 740.00 .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7122E+02 EXCESS= .0000E+00 OUTFLOW= .7119E+02 BASIN STORAGE= .7053E-01 PERCENT ERROR= -.1

FOR STORM = 3 STORM AREA (SQ MI) = 50.00
R244A MANE 5.00 849.69 740.00 .83 5.00 849.69 740.00 .83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6684E+02 EXCESS= .0000E+00 OUTFLOW= .6680E+02 BASIN STORAGE= .6872E-01 PERCENT ERROR= .0

FOR STORM = 4 STORM AREA (SQ MI) = 100.00
R244A MANE 5.00 821.62 740.00 .80 5.00 821.62 740.00 .80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6483E+02 EXCESS= .0000E+00 OUTFLOW= .6479E+02 BASIN STORAGE= .6795E-01 PERCENT ERROR= .0

```
      FOR STORM = 5  STORM AREA (SQ MI) =    200.00
        R244A  MANE      5.00   797.74   740.00     .78     5.00   797.74   740.00       .78
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6314E+02 EXCESS= .0000E+00 OUTFLOW= .6309E+02 BASIN STORAGE= .6731E-01 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

```
   -----DSS---ZCLOSE Unit:  71,  File: CASE2.DSS
        Pointer Utilization:  .34
        Number of Records:    60
        File Size:   107.6  Kbytes
        Percent Inactive:  .00
```

Relaxation of On-Site Retention Requirements
Suncor's Wigwam Creek Subdivision

The relaxation of on-site retention requirements for the proposed Suncor subdivision is modeled with the Case 2 HEC-1 simulation. For the Case 1 scenario, the subbasins NV2, NV3 and D243 are considered to be developed *without* on-site retention, while subbasins 244, 244A, and NV1 have the same basin parameters as for the *existing* condition. This simulates the condition of on-site retention for these latter subbasins, which are not *directly* contiguous with the Colter Channel.

For Case 2, subbasin 224A is presented in the developed state, with 57 acres of Suncor property (29% of the subbasin area) developed, resulting in an overall percent imperviousness of 12.9% for the entire subbasin. The unit hydrograph was not changed from the existing condition model--only RTIMP. Subbasin 244 is considered as fully developed, with a new unit hydrograph reflecting the change in basin parameters.

The results of the two scenarios are presented below:

		Qp_{100} *Case 1*	Qp_{100} *Case 2*
CP243A	Airline Canal	1078 cfs	1889 cfs
CP243	El Mirage Road	1112 cfs	1916 cfs
CP245	Agua Fria Outfall	1807 cfs	2302 cfs

Dave

looks good. Please go ahead & coordinate Directly w/ Don R.

P.S. Can you please compare our map w/ that Ash included in his report. Want to know what other places have been changed. Thanks

no other significant changes DB.

COLTER CHANNEL HYDROLOGY
LEGEND
Concentration Points on Channel with Contributory Area in Acres.
Concentration Points in Contributory Watershed.
Flow Diversion in Watershed.
Flow in Channel.
Drainage Basin Boundary
Channel Alignment
Source Inflow
Topographic Mapping from White Tanks ADMS.
CASE 1
Figure 3B
Note on Peak Flows:
The WLB hydrology for the "Existing Condition" and the FCDMC hydrology for future conditions (Case 1 through Case 4) were based upon slightly different sub-basin delineations than those shown on this map.
The delineations on this map are based upon better topographic information, and result in 10 acres being added to the overall watershed. To assess the change in peak flow, HEC-1 was re-run with the additional 10 acres. The result was not significant in peak flows reaching Colter Channel, therefore the initial HEC-1 peak flows are retained for channel design.
Luke Air Force Base
Dysart Drain
Glendale Avenue
Litchfield Park Dam
Canal
Airline
223
225
225A
226
227
228
229
230
230A
231
244
244A
245
N242C
N242F
D242B
D242D
D242F
242E
NV2
NV3
D243
CP242B
CP242D
CP242E
CP242F
CP243A
CP243
CP245
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN
DESIGN CHK.
PLANS
PLANS CHK.
SUBMITTED BY:
BY
DATE
RECOMMENDED BY:
APPROVED BY:
CHIEF ENGINEER AND GENERAL MANAGER
SHEET
OF

COLTER CHANNEL HYDROLOGY
LEGEND
Concentration Points on Channel with Contributory Area in Acres.
Concentration Points in Contributory Watershed.
Flow Diversion in Watershed.
Flow in Channel.
Drainage Basin Boundary
Channel Alignment
Source Inflow
400 200 0 400 800 1200
Topographic Mapping from White Tanks ADMS.
EXISTING CONDITIONS
Figure 3A
Note on Peak Flows:
The WLB hydrology for the "Existing Condition" and the FCDMC hydrology for future conditions (Case 1 through Case 4) were based upon slightly different sub-basin delineations than those shown on this map.
The delineations on this map are based upon better topographic information, and result in 10 acres being added to the overall watershed. To assess the change in peak flow, HEC-1 was re-run with the additional 10 acres. The result was not significant in peak flows reaching Colter Channel, therefore the initial HEC-1 peak flows are retained for channel design.
FLOOD CONTROL DISTRICT OF MARICOPA COUNT
DESIGN BY DATE
DESIGN CHK.
PLANS
PLANS CHK.
SUBMITTED BY: DATE:
RECOMMENDED BY: DATE
APPROVED BY: DATE
CHIEF ENGINEER AND GENERAL MANAGER
SHEET OF
Luke Air Force Base
Dysart Drain
Glendale Avenue
Litchfield Park Dam
Bethany Home Road Extended
Agua Fria
Canal
Airline
223
225
225A
226
227
228
229
230
230A
231
242B
242C
242D
242E
242F
243
243A
244
244A
245
CP242B
CP242C
CP242D
CP242E
CP242F
CP243A
CP243
CP245